# SAR TEST REPORT

The following samples were submitted and identified on behalf of the client as:

| | |
|---|---|
| **Equipment Under Test** | Tablet |
| **Brand Name** | hp |
| **Model No.** | HSTNH-I508OC |
| **Company Name** | Hewlett-Packard Company |
| **Company Address** | Hewlett-Packard Company, 16399 West Bernardo Dr. , San Diego, CA 92127, USA |
| **Standards** | IEEE /ANSI C95.1 , C95.3, IEEE 1528, KDB248227 D01, KDB616217 D04, KDB865664 D01, KDB865664 D02, KDB941225 D01, KDB941225 D02, KDB941225 D03, KDB447498 D01 |
| **FCC ID** | B94HHI508OC |
| **Date of Receipt** | Nov. 18, 2014 |
| **Date of Test(s)** | Nov. 24, 2014 ~ Dec. 10, 2014 |
| **Date of Issue** | Dec. 22, 2014 |

In the configuration tested, the EUT complied with the standards specified above.

**Remarks:**

This report details the results of the testing carried out on one sample, the results contained in this test report do not relate to other samples of the same product. The manufacturer should ensure that all products in series production are in conformity with the product sample detailed in this report.

This report may only be reproduced and distributed in full. If the product in this report is used in any configuration other than that detailed in the report, the manufacturer must ensure the new system complies with all relevant standards. Any mention of SGS Taiwan Electronic & Communication Laboratory or testing done by SGS Taiwan Electronic & Communication Laboratory in connection with distribution or use of the product described in this report must be approved by SGS Taiwan Electronic & Communication Laboratory in writing.

**Signed on behalf of SGS**

| **Engineer** | **Sr. Engineer** |
|---|---|
| **Mason Wu** Mason Wu | **John Yeh** John Yeh |
| **Date: Dec. 22, 2014** | **Date: Dec. 22, 2014** |

# Version

| Report Number | Revision | Date | Memo |
|---|---|---|---|
| EN/2014/B0020 | 00 | 2014/12/15 | Initial creation of test report. |
| EN/2014/B0020 | 01 | 2014/12/22 | 1st modification |
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**This test report contains a reference to the previous version test report that it replaces.**

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# 1. General Information

## 1.1 Testing Laboratory

| | |
|---|---|
| SGS Taiwan Ltd. Electronics & Communication Laboratory | |
| No.134, Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan | |
| Tel | +886-2-2299-3279 |
| Fax | +886-2-2298-0488 |
| Internet | http://www.tw.sgs.com/ |

## 1.2 Details of Applicant

| | |
|---|---|
| Company Name | Hewlett-Packard Company |
| Company Address | Hewlett-Packard Company, 16399 West Bernardo Dr. , San Diego, CA 92127, USA |

## 1.3 Description of EUT

| | | |
|---|---|---|
| Equipment Under Test | Tablet | |
| Brand Name | hp | |
| Model No. | HSTNH-I508OC | |
| FCC ID | B94HHI508OC | |
| Mode of Operation | ☒GPRS ☒EDGE ☒WCDMA ☒HSDPA ☒HSUPA ☒HSPA+ ☒WLAN802.11 a/b/g/n(20M/40M) ☒Bluetooth | |
| Duty Cycle | GPRS | 1/2 (1Dn4UP)<br>1/2.76 (1Dn3UP)<br>1/4.1 (1Dn2UP)<br>1/8.3 (1Dn1UP) |
| | EDGE | 1/2 (1Dn4UP)<br>1/2.76 (1Dn3UP)<br>1/4.1 (1Dn2UP)<br>1/8.3 (1Dn1UP) |
| | WCDMA | 1 |
| | WLAN802.11 a/b/g/n(20M/40M) | 1 |
| | Bluetooth | 1 |

| | | | | |
|---|---|---|---|---|
| TX Frequency Range (MHz) | GPRS850 | 824.2 | — | 848.8 |
| | GPRS1900 | 1850.2 | — | 1909.8 |
| | WCDMA Band II | 1852.4 | — | 1907.6 |
| | WCDMA Band IV | 1712.4 | — | 1752.6 |
| | WCDMA Band V | 826.4 | — | 846.6 |
| | WLAN802.11 b/g/n(20M) | 2412 | — | 2462 |
| | WLAN802.11 a 5.2G | 5180 | — | 5240 |
| | WLAN802.11 n (20M) 5.2G | 5180 | — | 5240 |
| | WLAN802.11 n (40M) 5.2G | 5190 | — | 5230 |
| | WLAN802.11 a 5.3G | 5260 | — | 5320 |
| | WLAN802.11 n (20M) 5.3G | 5260 | — | 5320 |
| | WLAN802.11 n (40M) 5.3G | 5270 | — | 5310 |
| | WLAN802.11 a 5.6G | 5500 | — | 5700 |
| | WLAN802.11 n (20M) 5.6G | 5500 | — | 5700 |
| | WLAN802.11 n (40M) 5.6G | 5510 | — | 5670 |
| | WLAN802.11 a 5.8G | 5745 | — | 5825 |
| | WLAN802.11 n (20M) 5.8G | 5745 | — | 5825 |
| | WLAN802.11 n (40M) 5.8G | 5755 | — | 5795 |
| | Bluetooth | 2402 | — | 2480 |

| | | | | |
|---|---|---|---|---|
| Channel Number (ARFCN) | GPRS850 | 128 | — | 251 |
| | GPRS1900 | 512 | — | 810 |
| | WCDMA Band II | 9262 | — | 9538 |
| | WCDMA Band IV | 1312 | — | 1513 |
| | WCDMA Band V | 4132 | — | 4233 |
| | WLAN802.11 b/g/n(20M) | 1 | — | 11 |
| | WLAN802.11 a 5.2G | 36 | — | 48 |
| | WLAN802.11 n (20M) 5.2G | 36 | — | 48 |
| | WLAN802.11 n (40M) 5.2G | 38 | — | 46 |
| | WLAN802.11 a 5.3G | 52 | — | 64 |
| | WLAN802.11 n (20M) 5.3G | 52 | — | 64 |
| | WLAN802.11 n (40M) 5.3G | 54 | — | 62 |
| | WLAN802.11 a 5.6G | 100 | — | 140 |
| | WLAN802.11 n (20M) 5.6G | 100 | — | 140 |
| | WLAN802.11 n (40M) 5.6G | 102 | — | 134 |
| | WLAN802.11 a 5.8G | 149 | — | 165 |
| | WLAN802.11 n (20M) 5.8G | 149 | — | 165 |
| | WLAN802.11 n (40M) 5.8G | 151 | — | 159 |
| | Bluetooth | 0 | — | 78 |

| Max. SAR (1 g) (Unit: W/Kg) | | | | |
|---|---|---|---|---|
| Band | Measured | Reported | Channel | Position |
| GPRS 850 | 0.659 | 0.869 | 251 | Back side |
| GRPS 1900 | 0.267 | 0.336 | 512 | Left side |
| WCDMA Band II | 0.969 | 1.045 | 9400 | Back side |
| WCDMA Band IV | 0.861 | 0.91 | 1312 | Back side* |
| WCDMA Band V | 1.04 | 1.213 | 4183 | Back side |

* - repeated at the highest SAR measurement according to the KDB 865664 D01

| Max. SAR (1 g) (Unit: W/Kg) | | | | | |
|---|---|---|---|---|---|
| Antenna | Band | Measured | Reported | Channel | Position |
| Main | WLAN802.11 b | 1.03 | 1.052 | 1 | Top side |
| | WLAN802.11 n(20M) | 0.679 | 0.696 | 6 | Top side |
| | WLAN802.11 a 5.2G | 1.26 | 1.322 | 44 | Back side |
| | WLAN802.11 n(40M) 5.2G | 1.13 | 1.175 | 46 | Back side |
| | WLAN802.11 a 5.3G | 1.4 | 1.429 | 60 | Back side |
| | WLAN802.11 n(40M) 5.3G | 1.33 | 1.409 | 62 | Back side |
| | WLAN802.11 a 5.6G | 1.31 | 1.536 | 100 | Back side |
| | WLAN802.11 n(40M) 5.6G | 1.24 | 1.287 | 102 | Back side |
| | WLAN802.11 a 5.8G | 1.18 | 1.513 | 165 | Back side |
| | WLAN802.11 n(40M) 5.8G | 0.951 | 1.012 | 159 | Back side |
| Aux | WLAN802.11 b | 1.28 | 1.307 | 6 | Back side* |
| | WLAN802.11 n(20M) | 0.763 | 0.767 | 1 | Back side |
| | WLAN802.11 a 5.2G | 0.871 | 1.274 | 44 | Back side* |
| | WLAN802.11 n(40M) 5.2G | 0.78 | 0.789 | 38 | Back side |
| | WLAN802.11 a 5.3G | 0.857 | 1.271 | 52 | Back side* |
| | WLAN802.11 n(40M) 5.3G | 0.959 | 0.972 | 54 | Back side |
| | WLAN802.11 a 5.6G | 0.684 | 1.019 | 136 | Back side |
| | WLAN802.11 n(40M) 5.6G | 0.726 | 0.753 | 134 | Back side |
| | WLAN802.11 a 5.8G | 0.608 | 0.628 | 161 | Back side |
| | WLAN802.11 n(40M) 5.8G | 0.58 | 0.588 | 151 | Back side |

* - repeated at the highest SAR measurement according to the KDB 865664 D01

**GPRS/EDGE conducted power table:**

| Burst average power | | | | | | |
|---|---|---|---|---|---|---|
| Max. Rated Avg. Power + Max. Tolerance (dBm) | | | 33.5 | 31 | 29.5 | 28 |
| | | | 1Dn1UP | 1Dn2UP | 1Dn3UP | 1Dn4UP |
| EUT mode | Frequency (MHz) | CH | Avg. (dBm) | Avg. (dBm) | Avg. (dBm) | Avg. (dBm) |
| GPRS 850 (GMSK) | 824.2 | 128 | 31.80 | 29.60 | 28.00 | 26.60 |
| | 836.6 | 190 | 31.80 | 29.70 | 28.20 | 26.70 |
| | 848.8 | 251 | 31.90 | 29.70 | 28.20 | 26.80 |
| Source-based time average power | | | | | | |
| GPRS 850 (GMSK) | 824.2 | 128 | 22.77 | 23.58 | 23.74 | 23.59 |
| | 836.6 | 190 | 22.77 | 23.68 | 23.94 | 23.69 |
| | 848.8 | 251 | 22.87 | 23.68 | 23.94 | 23.79 |
| The division factor compared to the number of TX time slot | | | | | | |
| Division factor | | | 1 TX time slot | 2 TX time slot | 3 TX time slot | 4 TX time slot |
| | | | -9.03 | -6.02 | -4.26 | -3.01 |

| Burst average power | | | | | | |
|---|---|---|---|---|---|---|
| Max. Rated Avg. Power + Max. Tolerance (dBm) | | | 28 | 25.5 | 24 | 22.5 |
| | | | 1Dn1UP | 1Dn2UP | 1Dn3UP | 1Dn4UP |
| EUT mode | Frequency (MHz) | CH | Avg. (dBm) | Avg. (dBm) | Avg. (dBm) | Avg. (dBm) |
| EDGE 850 | 824.2 | 128 | 26.20 | 23.80 | 22.40 | 20.90 |
| | 836.6 | 190 | 26.30 | 23.80 | 22.40 | 20.90 |
| | 848.8 | 251 | 26.40 | 23.90 | 22.50 | 21.00 |
| Source-based time average power | | | | | | |
| EDGE 850 | 824.2 | 128 | 17.17 | 17.78 | 18.14 | 17.89 |
| | 836.6 | 190 | 17.27 | 17.78 | 18.14 | 17.89 |
| | 848.8 | 251 | 17.37 | 17.88 | 18.24 | 17.99 |
| The division factor compared to the number of TX time slot | | | | | | |
| Division factor | | | 1 TX time slot | 2 TX time slot | 3 TX time slot | 4 TX time slot |
| | | | -9.03 | -6.02 | -4.26 | -3.01 |

| Burst average power | | | | | | |
|---|---|---|---|---|---|---|
| Max. Rated Avg. Power + Max. Tolerance (dBm) | | | 30.5 | 28 | 26.5 | 25 |
| | | | 1Dn1UP | 1Dn2UP | 1Dn3UP | 1Dn4UP |
| EUT mode | Frequency (MHz) | CH | Avg. (dBm) | Avg. (dBm) | Avg. (dBm) | Avg. (dBm) |
| GPRS 1900 (GMSK) | 1850.2 | 512 | 29.70 | 27.00 | 25.50 | 24.10 |
| | 1880 | 661 | 29.60 | 27.00 | 25.40 | 24.00 |
| | 1909.8 | 810 | 29.50 | 26.90 | 25.40 | 24.00 |
| Source-based time average power | | | | | | |
| GPRS 1900 (GMSK) | 1850.2 | 512 | 20.67 | 20.98 | 21.24 | 21.09 |
| | 1880 | 661 | 20.57 | 20.98 | 21.14 | 20.99 |
| | 1909.8 | 810 | 20.47 | 20.88 | 21.14 | 20.99 |
| The division factor compared to the number of TX time slot | | | | | | |
| Division factor | | | 1 TX time slot | 2 TX time slot | 3 TX time slot | 4 TX time slot |
| | | | -9.03 | -6.02 | -4.26 | -3.01 |

| Burst average power | | | | | | |
|---|---|---|---|---|---|---|
| Max. Rated Avg. Power + Max. Tolerance (dBm) | | | 27 | 24.5 | 23 | 21.5 |
| | | | 1Dn1UP | 1Dn2UP | 1Dn3UP | 1Dn4UP |
| EUT mode | Frequency (MHz) | CH | Avg. (dBm) | Avg. (dBm) | Avg. (dBm) | Avg. (dBm) |
| EDGE 1900 | 1850.2 | 512 | 26.10 | 23.60 | 22.20 | 20.60 |
| | 1880 | 661 | 26.00 | 23.50 | 22.00 | 20.50 |
| | 1909.8 | 810 | 25.90 | 23.50 | 22.00 | 20.40 |
| Source-based time average power | | | | | | |
| EDGE 1900 | 1850.2 | 512 | 17.07 | 17.58 | 17.94 | 17.59 |
| | 1880 | 661 | 16.97 | 17.48 | 17.74 | 17.49 |
| | 1909.8 | 810 | 16.87 | 17.48 | 17.74 | 17.39 |
| The division factor compared to the number of TX time slot | | | | | | |
| Division factor | | | 1 TX time slot | 2 TX time slot | 3 TX time slot | 4 TX time slot |
| | | | -9.03 | -6.02 | -4.26 | -3.01 |

**GPRS 850 / EDGE 850 /GPRS 1900 / EDGE 1900 conducted power table (Reduced power):**

| Burst average power | | | | | | |
|---|---|---|---|---|---|---|
| Max. Rated Avg. Power + Max. Tolerance (dBm) | | | 27.5 | 24.5 | 22.5 | 21.5 |
| | | | 1Dn1UP | 1Dn2UP | 1Dn3UP | 1Dn4UP |
| EUT mode | Frequency (MHz) | CH | Avg. (dBm) | Avg. (dBm) | Avg. (dBm) | Avg. (dBm) |
| GPRS 850 (GMSK) | 824.2 | 128 | 26.10 | 23.20 | 21.20 | 20.10 |
| | 836.6 | 190 | 26.10 | 23.20 | 21.30 | 20.20 |
| | 848.8 | 251 | 26.20 | 23.30 | 21.30 | 20.30 |
| Source-based time average power | | | | | | |
| GPRS 850 (GMSK) | 824.2 | 128 | 17.07 | 17.18 | 16.94 | 17.09 |
| | 836.6 | 190 | 17.07 | 17.18 | 17.04 | 17.19 |
| | 848.8 | 251 | 17.17 | 17.28 | 17.04 | 17.29 |
| The division factor compared to the number of TX time slot | | | | | | |
| Division factor | | | 1 TX time slot | 2 TX time slot | 3 TX time slot | 4 TX time slot |
| | | | -9.03 | -6.02 | -4.26 | -3.01 |

| Burst average power | | | | | | |
|---|---|---|---|---|---|---|
| Max. Rated Avg. Power + Max. Tolerance (dBm) | | | 26.5 | 23.5 | 21.5 | 20.5 |
| | | | 1Dn1UP | 1Dn2UP | 1Dn3UP | 1Dn4UP |
| EUT mode | Frequency (MHz) | CH | Avg. (dBm) | Avg. (dBm) | Avg. (dBm) | Avg. (dBm) |
| EDGE 850 | 824.2 | 128 | 25.20 | 22.40 | 20.30 | 19.30 |
| | 836.6 | 190 | 25.20 | 22.40 | 20.40 | 19.40 |
| | 848.8 | 251 | 25.30 | 22.40 | 20.40 | 19.40 |
| Source-based time average power | | | | | | |
| EDGE 850 | 824.2 | 128 | 16.17 | 16.38 | 16.04 | 16.29 |
| | 836.6 | 190 | 16.17 | 16.38 | 16.14 | 16.39 |
| | 848.8 | 251 | 16.27 | 16.38 | 16.14 | 16.39 |
| The division factor compared to the number of TX time slot | | | | | | |
| Division factor | | | 1 TX time slot | 2 TX time slot | 3 TX time slot | 4 TX time slot |
| | | | -9.03 | -6.02 | -4.26 | -3.01 |

| Burst average power | | | | | | |
|---|---|---|---|---|---|---|
| Max. Rated Avg. Power + Max. Tolerance (dBm) | | | 22 | 19 | 17 | 16 |
| | | | 1Dn1UP | 1Dn2UP | 1Dn3UP | 1Dn4UP |
| EUT mode | Frequency (MHz) | CH | Avg. (dBm) | Avg. (dBm) | Avg. (dBm) | Avg. (dBm) |
| GPRS 1900 (GMSK) | 1850.2 | 512 | 20.60 | 17.80 | 15.70 | 14.60 |
| | 1880 | 661 | 20.50 | 17.70 | 15.60 | 14.50 |
| | 1909.8 | 810 | 20.40 | 17.60 | 15.50 | 14.40 |
| Source-based time average power | | | | | | |
| GPRS 1900 (GMSK) | 1850.2 | 512 | 11.57 | 11.78 | 11.44 | 11.59 |
| | 1880 | 661 | 11.47 | 11.68 | 11.34 | 11.49 |
| | 1909.8 | 810 | 11.37 | 11.58 | 11.24 | 11.39 |
| The division factor compared to the number of TX time slot | | | | | | |
| Division factor | | | 1 TX time slot | 2 TX time slot | 3 TX time slot | 4 TX time slot |
| | | | -9.03 | -6.02 | -4.26 | -3.01 |

| Burst average power | | | | | | |
|---|---|---|---|---|---|---|
| Max. Rated Avg. Power + Max. Tolerance (dBm) | | | 21 | 18 | 16 | 15 |
| | | | 1Dn1UP | 1Dn2UP | 1Dn3UP | 1Dn4UP |
| EUT mode | Frequency (MHz) | CH | Avg. (dBm) | Avg. (dBm) | Avg. (dBm) | Avg. (dBm) |
| EDGE 1900 | 1850.2 | 512 | 20.10 | 17.10 | 15.20 | 14.10 |
| | 1880 | 661 | 20.00 | 17.00 | 15.10 | 14.00 |
| | 1909.8 | 810 | 19.90 | 16.90 | 15.00 | 13.90 |
| Source-based time average power | | | | | | |
| EDGE 1900 | 1850.2 | 512 | 11.07 | 11.08 | 10.94 | 11.09 |
| | 1880 | 661 | 10.97 | 10.98 | 10.84 | 10.99 |
| | 1909.8 | 810 | 10.87 | 10.88 | 10.74 | 10.89 |
| The division factor compared to the number of TX time slot | | | | | | |
| Division factor | | | 1 TX time slot | 2 TX time slot | 3 TX time slot | 4 TX time slot |
| | | | -9.03 | -6.02 | -4.26 | -3.01 |

## WCDMA Band II / Band IV / Band V - HSDPA / HSUPA/ HSDPA+ conducted power table:

| Band | CH | Max. Rated Avg. Power + Max. Tolerance (dBm) | Rel99 AV(dBm) | HSDPA mode AV(dBm) | | | | HSUPA mode AV(dBm) | | | | | HSPA+ mode AV(dBm) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | SUB-1 | SUB-2 | SUB-3 | SUB-4 | SUB-1 | SUB-2 | SUB-3 | SUB-4 | SUB-5 | SUB-1 | SUB-2 | SUB-3 | SUB-4 | SUB-5 |
| WCDMA Band II Rel 7 | 9262 | 24.5 | 23.08 | 22.01 | 22.96 | 21.53 | 21.6 | 23.00 | 20.97 | 21.48 | 21.10 | 21.86 | 23.01 | 20.99 | 21.98 | 21.10 | 22.81 |
| | 9400 | 24.5 | 23.12 | 22.04 | 22.98 | 21.48 | 21.49 | 23.10 | 21.15 | 21.60 | 21.20 | 22.03 | 23.09 | 21.13 | 22.08 | 21.17 | 22.94 |
| | 9538 | 24.5 | 23.17 | 22.12 | 23.02 | 21.45 | 21.57 | 23.11 | 21.09 | 21.63 | 21.13 | 22.09 | 23.12 | 21.11 | 22.13 | 21.15 | 22.98 |
| WCDMA Band IV Rel 7 | 1312 | 24.5 | 23.48 | 22.39 | 23.36 | 21.91 | 21.98 | 23.40 | 21.37 | 21.88 | 21.50 | 22.24 | 23.41 | 21.39 | 22.38 | 21.50 | 23.21 |
| | 1412 | 24.5 | 23.25 | 22.21 | 23.11 | 21.65 | 21.66 | 23.23 | 21.28 | 21.73 | 21.33 | 22.11 | 23.22 | 21.26 | 22.21 | 21.30 | 23.07 |
| | 1513 | 24.5 | 23.18 | 22.09 | 23.03 | 21.42 | 21.54 | 23.12 | 21.10 | 21.64 | 21.14 | 22.00 | 23.13 | 21.12 | 22.14 | 21.16 | 22.99 |
| WCDMA Band V Rel 7 | 4132 | 24.5 | 22.75 | 22.27 | 22.68 | 21.60 | 21.65 | 22.71 | 20.73 | 21.21 | 20.78 | 21.59 | 22.72 | 20.75 | 21.70 | 20.78 | 22.53 |
| | 4183 | 24.5 | 22.80 | 22.29 | 22.69 | 21.67 | 21.71 | 22.73 | 20.74 | 21.22 | 20.80 | 21.68 | 22.72 | 20.74 | 21.72 | 20.80 | 22.49 |
| | 4233 | 24.5 | 22.68 | 22.17 | 22.55 | 21.80 | 21.86 | 22.60 | 20.56 | 21.10 | 20.62 | 21.51 | 22.59 | 20.56 | 21.58 | 20.62 | 22.41 |

HSDPA

| SUB-TEST | $\beta_c$ | $\beta_d$ | $\beta_d$ *(SF)* | $\beta_c/\beta_d$ | $\beta_{HS}$ (*Note1, Note 2*) | CM (dB) *(Note 3)* | MPR (dB) *(Note 3)* |
|---|---|---|---|---|---|---|---|
| 1 | 2/15 | 15/15 | 64 | 2/15 | 4/15 | 0.0 | 0.0 |
| 2 | 12/15 | 15/15 | 64 | 12/15 | 24/15 | 1.0 | 0.0 |
| 3 | 15/15 | 8/15 | 64 | 15/8 | 30/15 | 1.5 | 0.5 |
| 4 | 15/15 | 4/15 | 64 | 15/4 | 30/15 | 1.5 | 0.5 |

HSUPA

| SUB-TEST | $\beta_c$ | $\beta_d$ | $\beta_d$ *(SF)* | $\beta_c/\beta_d$ | $\beta_{HS}$ *(Note1)* | $\beta_{ec}$ | $\beta_{ed}$ *(Note 5) (Note 6)* | $\beta_{ed}$ *(SF)* | $\beta_{ed}$ *(Codes)* | CM *(dB) (Note 2)* | MPR *(dB) (Note 2)* | *AG Index (Note 6)* | *E-TFCI* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 11/15 | 15/15 | 64 | 11/15 | 22/15 | 209/225 | 1309/225 | 4 | 1 | 1.0 | 0.0 | 20 | 75 |
| 2 | 6/15 | 15/15 | 64 | 6/15 | 12/15 | 12/15 | 94/75 | 4 | 1 | 3.0 | 2.0 | 12 | 67 |
| 3 | 15/15 | 9/15 | 64 | 15/9 | 30/15 | 30/15 | $\beta_{ed}$1: 47/15<br>$\beta_{ed}$2: 47/15 | 4<br>4 | 2 | 2.0 | 1.0 | 15 | 92 |
| 4 | 2/15 | 15/15 | 64 | 2/15 | 4/15 | 2/15 | 56/75 | 4 | 1 | 3.0 | 2.0 | 17 | 71 |
| 5 | 15/15 | 15/15 | 64 | 15/15 | 30/15 | 24/15 | 134/15 | 4 | 1 | 1.0 | 0.0 | 21 | 81 |

## WCDMA Band II / Band IV / Band V - HSDPA / HSUPA / HSPA+ conducted power table (Reduced power) :

| Band | CH | Max. Rated Avg. Power + Max. Tolerance (dBm) | Rel99 AV(dBm) | HSDPA mode AV(dBm) | | | | HSUPA mode AV(dBm) | | | | | HSPA+ mode AV(dBm) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | SUB-1 | SUB-2 | SUB-3 | SUB-4 | SUB-1 | SUB-2 | SUB-3 | SUB-4 | SUB-5 | SUB-1 | SUB-2 | SUB-3 | SUB-4 | SUB-5 |
| WCDMA Band II Rel 7 | 9262 | 16 | 15.61 | 15.48 | 15.49 | 15 | 15.07 | 15.53 | 13.50 | 14.51 | 13.63 | 15.41 | 15.54 | 13.52 | 14.51 | 13.63 | 15.34 |
| | 9400 | 16 | 15.67 | 15.50 | 15.53 | 14.94 | 14.95 | 15.65 | 13.70 | 14.65 | 13.75 | 15.34 | 15.64 | 13.68 | 14.63 | 13.72 | 15.49 |
| | 9538 | 16 | 15.60 | 15.37 | 15.45 | 14.70 | 14.82 | 15.54 | 13.52 | 14.56 | 13.56 | 15.27 | 15.55 | 13.54 | 14.56 | 13.58 | 15.41 |
| WCDMA Band IV Rel 7 | 1312 | 17 | 16.76 | 16.61 | 16.64 | 16.13 | 16.2 | 16.68 | 14.65 | 15.66 | 14.78 | 16.53 | 16.69 | 14.67 | 15.66 | 14.78 | 16.49 |
| | 1412 | 17 | 16.71 | 16.48 | 16.57 | 15.92 | 15.93 | 16.69 | 14.74 | 15.69 | 14.79 | 16.38 | 16.68 | 14.72 | 15.67 | 14.76 | 16.53 |
| | 1513 | 17 | 16.51 | 16.42 | 16.36 | 15.75 | 15.87 | 16.45 | 14.43 | 15.47 | 14.47 | 16.28 | 16.46 | 14.45 | 15.47 | 14.49 | 16.32 |
| WCDMA Band V Rel 7 | 4132 | 19 | 18.20 | 18.04 | 18.13 | 17.37 | 17.42 | 18.16 | 16.18 | 17.16 | 16.23 | 18.00 | 18.17 | 16.20 | 17.15 | 16.23 | 17.98 |
| | 4183 | 19 | 18.33 | 18.11 | 18.22 | 17.49 | 17.53 | 18.26 | 16.27 | 17.25 | 16.33 | 18.04 | 18.25 | 16.27 | 17.25 | 16.33 | 18.02 |
| | 4233 | 19 | 18.20 | 18.01 | 18.07 | 17.64 | 17.70 | 18.12 | 16.08 | 17.12 | 16.14 | 17.94 | 18.11 | 16.08 | 17.10 | 16.14 | 17.93 |

HSDPA

| SUB-TEST | $\beta_c$ | $\beta_d$ | $\beta_d$ *(SF)* | $\beta_c/\beta_d$ | $\beta_{HS}$ (*Note1, Note 2*) | CM (dB) *(Note 3)* | MPR (dB) *(Note 3)* |
|---|---|---|---|---|---|---|---|
| 1 | 2/15 | 15/15 | 64 | 2/15 | 4/15 | 0.0 | 0.0 |
| 2 | 12/15 | 15/15 | 64 | 12/15 | 24/15 | 1.0 | 0.0 |
| 3 | 15/15 | 8/15 | 64 | 15/8 | 30/15 | 1.5 | 0.5 |
| 4 | 15/15 | 4/15 | 64 | 15/4 | 30/15 | 1.5 | 0.5 |

HSUPA

| SUB-TEST | $\beta_c$ | $\beta_d$ | $\beta_d$ *(SF)* | $\beta_c/\beta_d$ | $\beta_{HS}$ *(Note1)* | $\beta_{ec}$ | $\beta_{ed}$ *(Note 5) (Note 6)* | $\beta_{ed}$ *(SF)* | $\beta_{ed}$ *(Codes)* | CM *(dB) (Note 2)* | MPR *(dB) (Note 2)* | *AG Index (Note 6)* | *E-TFCI* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 11/15 | 15/15 | 64 | 11/15 | 22/15 | 209/225 | 1309/225 | 4 | 1 | 1.0 | 0.0 | 20 | 75 |
| 2 | 6/15 | 15/15 | 64 | 6/15 | 12/15 | 12/15 | 94/75 | 4 | 1 | 3.0 | 2.0 | 12 | 67 |
| 3 | 15/15 | 9/15 | 64 | 15/9 | 30/15 | 30/15 | $\beta_{ed}1$: 47/15 $\beta_{ed}2$: 47/15 | 4 4 | 2 | 2.0 | 1.0 | 15 | 92 |
| 4 | 2/15 | 15/15 | 64 | 2/15 | 4/15 | 2/15 | 56/75 | 4 | 1 | 3.0 | 2.0 | 17 | 71 |
| 5 | 15/15 | 15/15 | 64 | 15/15 | 30/15 | 24/15 | 134/15 | 4 | 1 | 1.0 | 0.0 | 21 | 81 |

## #. WLAN802.11 a/b/g/n(20M/40M) conducted power table:

| Band \ Antenna | SISO | | MIMO |
|---|---|---|---|
| | Chain 0 | Chain 1 | Chain0+1 |
| WLAN802.11b | V | V | — |
| WLAN802.11g | V | V | — |
| WLAN802.11n(20M) | V | V | V |
| WLAN802.11a | V | V | — |
| WLAN802.11n(20M) 5G | V | V | V |
| WLAN802.11n(40M) 5G | V | V | V |

## Main Antenna (CH0)

| 802.11 b | | Max. Rated Avg. Power + Max. Tolerance (dBm) | Average Power Output (dBm) | | | |
|---|---|---|---|---|---|---|
| CH | Frequency (MHz) | | Data Rate (Mbps) | | | |
| | | | 1 | 2 | 5.5 | 11 |
| 1 | 2412 | 17 | 16.91 | 16.89 | 16.87 | 16.86 |
| 6 | 2437 | 17 | 16.96 | 16.94 | 16.93 | 16.91 |
| 11 | 2462 | 17 | 16.71 | 16.68 | 16.66 | 16.65 |

| 802.11 g | | Max. Rated Avg. Power + Max. Tolerance (dBm) | Average Power Output(dBm) | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| CH | Frequency (MHz) | | Data Rate (Mbps) | | | | | | | |
| | | | 6 | 9 | 12 | 18 | 24 | 36 | 48 | 54 |
| 1 | 2412 | 10.5 | 10.46 | 10.35 | 10.18 | 10.06 | 9.85 | 9.64 | 9.37 | 9.11 |
| 6 | 2437 | 10.5 | 10.48 | 10.39 | 10.28 | 10.12 | 9.91 | 9.69 | 9.41 | 9.17 |
| 11 | 2462 | 10.5 | 10.35 | 10.22 | 10.09 | 9.97 | 9.76 | 9.53 | 9.26 | 9.04 |

**Main Antenna (CH0)**

| 802.11 n (20M) | | Max. Rated Avg. Power + Max. Tolerance (dBm) | Average Power Output(dBm) | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| CH | Frequency (MHz) | | Data Rate (Mbps) | | | | | | | |
| | | | 6.5 | 13 | 19.5 | 26 | 39 | 52 | 58.5 | 65 |
| 1 | 2412 | 15.5 | 15.47 | 15.30 | 15.11 | 14.93 | 14.74 | 14.56 | 14.39 | 14.27 |
| 6 | 2437 | 15.5 | 15.39 | 15.20 | 15.01 | 14.83 | 14.65 | 14.48 | 14.30 | 14.21 |
| 11 | 2462 | 15.5 | 15.33 | 15.16 | 14.97 | 14.80 | 14.61 | 14.43 | 14.25 | 14.02 |

## Main Antenna (CH0)

| 802.11 a 5.2/5.3/5.6/5.8G | | Max. Rated Avg. Power + Max. Tolerance (dBm) | Average Power Output(dBm) | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| CH | Frequency (MHz) | | Data Rate (Mbps) | | | | | | | |
| | | | 6 | 9 | 12 | 18 | 24 | 36 | 48 | 54 |
| 36 | 5180 | 12.5 | 12.30 | 12.18 | 12.01 | 11.83 | 11.63 | 11.43 | 11.25 | 11.07 |
| 40 | 5200 | 12.5 | 12.39 | 12.23 | 12.06 | 11.89 | 11.73 | 11.57 | 11.38 | 11.23 |
| 44 | 5220 | 12.5 | 12.29 | 12.09 | 11.95 | 11.79 | 11.65 | 11.51 | 11.31 | 11.16 |
| 48 | 5240 | 12.5 | 12.20 | 12.07 | 11.87 | 11.72 | 11.59 | 11.41 | 11.23 | 11.03 |
| 52 | 5260 | 12.5 | 12.45 | 12.30 | 12.18 | 11.99 | 11.81 | 11.64 | 11.52 | 11.36 |
| 56 | 5280 | 12.5 | 12.26 | 12.13 | 11.98 | 11.86 | 11.66 | 11.49 | 11.37 | 11.25 |
| 60 | 5300 | 12.5 | 12.41 | 12.29 | 12.13 | 11.97 | 11.81 | 11.63 | 11.46 | 11.26 |
| 64 | 5320 | 12.5 | 12.19 | 12.01 | 11.85 | 11.71 | 11.53 | 11.37 | 11.20 | 11.04 |
| 100 | 5500 | 13 | 12.31 | 12.06 | 11.92 | 11.75 | 11.62 | 11.48 | 11.35 | 11.16 |
| 104 | 5520 | 13 | 12.27 | 12.11 | 11.96 | 11.82 | 11.64 | 11.52 | 11.38 | 11.23 |
| 108 | 5540 | 13 | 12,29 | 12.17 | 12.05 | 11.89 | 11.77 | 11.63 | 11.48 | 11.35 |
| 112 | 5560 | 13 | 12.22 | 12.04 | 11.90 | 11.76 | 11.58 | 11.44 | 11.26 | 11.13 |
| 116 | 5580 | 13 | 12.42 | 12.28 | 12.15 | 11.99 | 11.79 | 11.59 | 11.40 | 11.28 |
| 132 | 5660 | 13 | 12.27 | 12.09 | 11.89 | 11.77 | 11.64 | 11.47 | 11.29 | 11.14 |
| 136 | 5680 | 13 | 12.29 | 12.17 | 12.01 | 11.88 | 11.71 | 11.56 | 11.43 | 11.27 |
| 140 | 5700 | 13 | 12.31 | 12.15 | 11.99 | 11.85 | 11.72 | 11.59 | 11.42 | 11.27 |
| 149 | 5745 | 13.5 | 12.29 | 12.10 | 11.95 | 11.75 | 11.61 | 11.44 | 11.29 | 11.15 |
| 153 | 5765 | 13.5 | 12.25 | 12.06 | 11.93 | 11.78 | 11.66 | 11.50 | 11.33 | 11.13 |
| 157 | 5785 | 13.5 | 12.45 | 12.30 | 12.11 | 11.99 | 11.82 | 11.63 | 11.45 | 11.31 |
| 161 | 5805 | 13.5 | 12.36 | 12.19 | 12.02 | 11.84 | 11.71 | 11.57 | 11.45 | 11.32 |
| 165 | 5825 | 13.5 | 12.42 | 12.23 | 12.06 | 11.94 | 11.78 | 11.61 | 11.49 | 11.34 |

## Main Antenna (CH0)

| 802.11 n(20M) 5.2/5.3/5.6/5.8G | | Max. Rated Avg. Power + Max. Tolerance (dBm) | Average Power Output(dBm) | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| CH | Frequency (MHz) | | Data Rate (Mbps) | | | | | | | |
| | | | 6.5 | 13 | 19.5 | 26 | 39 | 52 | 58.5 | 65 |
| 36 | 5180 | 12 | 11.95 | 11.77 | 11.57 | 11.42 | 11.20 | 11.04 | 10.84 | 10.69 |
| 40 | 5200 | 12 | 11.96 | 11.79 | 11.60 | 11.39 | 11.22 | 11.00 | 10.80 | 10.59 |
| 44 | 5220 | 12 | 11.89 | 11.74 | 11.56 | 11.34 | 11.14 | 10.95 | 10.74 | 10.55 |
| 48 | 5240 | 12 | 11.85 | 11.69 | 11.54 | 11.35 | 11.14 | 10.98 | 10.83 | 10.68 |
| 52 | 5260 | 12 | 11.94 | 11.73 | 11.53 | 11.31 | 11.12 | 10.92 | 10.75 | 10.57 |
| 56 | 5280 | 12 | 11.76 | 11.58 | 11.37 | 11.18 | 11.01 | 10.83 | 10.67 | 10.51 |
| 60 | 5300 | 12 | 11.88 | 11.73 | 11.55 | 11.39 | 11.24 | 11.07 | 10.85 | 10.64 |
| 64 | 5320 | 12 | 11.93 | 11.75 | 11.58 | 11.39 | 11.19 | 10.97 | 10.82 | 10.64 |
| 100 | 5500 | 12 | 11.86 | 11.71 | 11.54 | 11.38 | 11.19 | 10.99 | 10.83 | 10.63 |
| 104 | 5520 | 12 | 11.91 | 11.74 | 11.57 | 11.41 | 11.23 | 11.08 | 10.91 | 10.71 |
| 108 | 5540 | 12 | 11.90 | 11.68 | 11.49 | 11.32 | 11.12 | 10.90 | 10.74 | 10.56 |
| 112 | 5560 | 12 | 11.72 | 11.56 | 11.40 | 11.19 | 11.04 | 10.87 | 10.66 | 10.50 |
| 116 | 5580 | 12 | 11.84 | 11.65 | 11.48 | 11.31 | 11.10 | 10.92 | 10.70 | 10.55 |
| 132 | 5660 | 12 | 11.95 | 11.74 | 11.54 | 11.35 | 11.18 | 10.98 | 10.77 | 10.57 |
| 136 | 5680 | 12 | 11.96 | 11.76 | 11.60 | 11.44 | 11.24 | 11.04 | 10.89 | 10.70 |
| 140 | 5700 | 12 | 11.82 | 11.67 | 11.46 | 11.25 | 11.10 | 10.89 | 10.71 | 10.51 |
| 149 | 5745 | 12 | 11.80 | 11.61 | 11.43 | 11.21 | 11.01 | 10.82 | 10.62 | 10.42 |
| 153 | 5765 | 12 | 11.76 | 11.57 | 11.40 | 11.19 | 11.01 | 10.79 | 10.62 | 10.45 |
| 157 | 5785 | 12 | 11.70 | 11.53 | 11.31 | 11.10 | 10.95 | 10.75 | 10.54 | 10.34 |
| 161 | 5805 | 12 | 11.97 | 11.78 | 11.57 | 11.37 | 11.15 | 10.97 | 10.80 | 10.62 |
| 165 | 5825 | 12 | 11.87 | 11.70 | 11.55 | 11.40 | 11.20 | 11.05 | 10.84 | 10.69 |

**Main Antenna (CH0)**

| 802.11 n(40M) 5.2/5.3/5.6/5.8G | | Max. Rated Avg. Power + Max. Tolerance (dBm) | Average Power Output (dBm) | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| CH | Frequency (MHz) | | Data Rate (Mbps) | | | | | | | |
| | | | 13.5 | 27 | 40.5 | 54 | 81 | 108 | 121.5 | 135 |
| 38 | 5190 | 12 | 11.94 | 11.64 | 11.37 | 11.07 | 10.81 | 10.48 | 10.17 | 9.84 |
| 46 | 5230 | 12 | 11.83 | 11.51 | 11.21 | 10.88 | 10.61 | 10.28 | 10.01 | 9.87 |
| 54 | 5270 | 12 | 11.91 | 11.64 | 11.32 | 11.05 | 10.78 | 10.45 | 10.19 | 9.90 |
| 62 | 5310 | 12 | 11.75 | 11.43 | 11.11 | 10.85 | 10.52 | 10.26 | 9.96 | 9.67 |
| 102 | 5510 | 12 | 11.84 | 11.53 | 11.21 | 10.88 | 10.58 | 10.31 | 10.04 | 9.73 |
| 110 | 5550 | 12 | 11.97 | 11.66 | 11.39 | 11.12 | 10.85 | 10.52 | 10.25 | 9.95 |
| 134 | 5670 | 12 | 11.92 | 11.59 | 11.30 | 10.98 | 10.69 | 10.43 | 10.17 | 9.95 |
| 151 | 5755 | 12 | 11.85 | 11.56 | 11.24 | 10.98 | 10.67 | 10.41 | 10.12 | 9.85 |
| 159 | 5795 | 12 | 11.73 | 11.40 | 11.10 | 10.82 | 10.51 | 10.20 | 9.94 | 9.64 |

**#.** Per FCC KDB443999, transmission on channels which overlap the 5600-5650 MHz is prohibited as a client.

**Aux Antenna (CH1)**

| 802.11 b | | Max. Rated Avg. Power + Max. Tolerance (dBm) | Average Power Output (dBm) | | | |
|---|---|---|---|---|---|---|
| CH | Frequency (MHz) | | Data Rate (Mbps) | | | |
| | | | 1 | 2 | 5.5 | 11 |
| 1 | 2412 | 17 | 16.88 | 16.84 | 16.81 | 16.75 |
| 6 | 2437 | 17 | 16.93 | 16.88 | 16.82 | 16.79 |
| 11 | 2462 | 17 | 16.91 | 16.86 | 16.80 | 16.77 |

| 802.11 g | | Max. Rated Avg. Power + Max. Tolerance (dBm) | Average Power Output(dBm) | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| CH | Frequency (MHz) | | Data Rate (Mbps) | | | | | | | |
| | | | 6 | 9 | 12 | 18 | 24 | 36 | 48 | 54 |
| 1 | 2412 | 10.5 | 10.43 | 10.29 | 10.16 | 10.04 | 9.88 | 9.71 | 9.56 | 9.34 |
| 6 | 2437 | 10.5 | 10.36 | 10.21 | 10.08 | 9.91 | 9.77 | 9.59 | 9.39 | 9.22 |
| 11 | 2462 | 10.5 | 10.32 | 10.16 | 10.03 | 9.85 | 9.66 | 9.43 | 9.18 | 9.06 |

| 802.11 n (20M) | | Max. Rated Avg. Power + Max. Tolerance (dBm) | Average Power Output(dBm) | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| CH | Frequency (MHz) | | Data Rate (Mbps) | | | | | | | |
| | | | 6.5 | 13 | 19.5 | 26 | 39 | 52 | 58.5 | 65 |
| 1 | 2412 | 15.5 | 15.48 | 15.30 | 15.11 | 14.93 | 14.75 | 14.56 | 14.37 | 14.15 |
| 6 | 2437 | 15.5 | 15.39 | 15.21 | 15.02 | 14.84 | 14.65 | 14.46 | 14.27 | 14.04 |
| 11 | 2462 | 15.5 | 15.46 | 15.28 | 15.10 | 14.89 | 14.67 | 14.44 | 14.24 | 13.96 |

## Aux Antenna (CH1)

| 802.11 a 5.2/5.3/5.6/5.8G | | Max. Rated Avg. Power + Max. Tolerance (dBm) | Average Power Output(dBm) | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| CH | Frequency (MHz) | | Data Rate (Mbps) | | | | | | | |
| | | | 6 | 9 | 12 | 18 | 24 | 36 | 48 | 54 |
| 36 | 5180 | 14 | 12.25 | 12.07 | 11.88 | 11.70 | 11.55 | 11.40 | 11.19 | 11.01 |
| 40 | 5200 | 14 | 12.33 | 12.15 | 11.95 | 11.78 | 11.58 | 11.37 | 11.15 | 10.95 |
| 44 | 5220 | 14 | 12.35 | 12.16 | 12.01 | 11.84 | 11.66 | 11.46 | 11.25 | 11.06 |
| 48 | 5240 | 14 | 12.35 | 12.17 | 12.02 | 11.81 | 11.59 | 11.43 | 11.24 | 11.04 |
| 52 | 5260 | 14 | 12.29 | 12.09 | 11.92 | 11.76 | 11.56 | 11.40 | 11.23 | 11.05 |
| 56 | 5280 | 14 | 12.25 | 12.03 | 11.81 | 11.66 | 11.47 | 11.30 | 11.11 | 10.95 |
| 60 | 5300 | 14 | 12.39 | 12.18 | 12.00 | 11.79 | 11.59 | 11.44 | 11.25 | 11.05 |
| 64 | 5320 | 14 | 12.27 | 12.10 | 11.95 | 11.76 | 11.59 | 11.40 | 11.22 | 11.03 |
| 100 | 5500 | 14 | 12.38 | 12.19 | 12.00 | 11.85 | 11.64 | 11.48 | 11.30 | 11.12 |
| 104 | 5520 | 14 | 12.31 | 12.15 | 11.96 | 11.79 | 11.60 | 11.43 | 11.28 | 11.08 |
| 108 | 5540 | 14 | 12.26 | 12.09 | 11.90 | 11.75 | 11.55 | 11.36 | 11.21 | 11.03 |
| 112 | 5560 | 14 | 12.40 | 12.21 | 12.05 | 11.83 | 11.64 | 11.48 | 11.27 | 11.11 |
| 116 | 5580 | 14 | 12.49 | 12.28 | 12.10 | 11.90 | 11.70 | 11.54 | 11.38 | 11.19 |
| 132 | 5660 | 14 | 12.21 | 12.00 | 11.85 | 11.68 | 11.47 | 11.25 | 11.06 | 10.84 |
| 136 | 5680 | 14 | 12.27 | 12.11 | 11.89 | 11.72 | 11.53 | 11.31 | 11.12 | 10.95 |
| 140 | 5700 | 14 | 12.26 | 12.06 | 11.87 | 11.72 | 11.54 | 11.36 | 11.16 | 10.97 |
| 149 | 5745 | 12.5 | 12.31 | 12.15 | 12.00 | 11.82 | 11.62 | 11.44 | 11.24 | 11.03 |
| 153 | 5765 | 12.5 | 12.33 | 12.16 | 11.98 | 11.78 | 11.58 | 11.37 | 11.15 | 10.93 |
| 157 | 5785 | 12.5 | 12.44 | 12.22 | 12.05 | 11.84 | 11.62 | 11.41 | 11.19 | 10.98 |
| 161 | 5805 | 12.5 | 12.36 | 12.21 | 12.01 | 11.80 | 11.65 | 11.47 | 11.28 | 11.09 |
| 165 | 5825 | 12.5 | 12.22 | 12.05 | 11.88 | 11.71 | 11.52 | 11.35 | 11.16 | 11.01 |

## Aux Antenna (CH1)

| 802.11 n(20M) 5.2/5.3/5.6/5.8G | | Max. Rated Avg. Power + Max. Tolerance (dBm) | Average Power Output(dBm) | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| CH | Frequency (MHz) | | Data Rate (Mbps) | | | | | | | |
| | | | 6.5 | 13 | 19.5 | 26 | 39 | 52 | 58.5 | 65 |
| 36 | 5180 | 12 | 11.84 | 11.67 | 11.47 | 11.30 | 11.15 | 10.97 | 10.83 | 10.66 |
| 40 | 5200 | 12 | 11.92 | 11.78 | 11.63 | 11.42 | 11.27 | 11.12 | 10.91 | 10.74 |
| 44 | 5220 | 12 | 11.82 | 11.61 | 11.42 | 11.22 | 11.03 | 10.82 | 10.62 | 10.41 |
| 48 | 5240 | 12 | 11.78 | 11.59 | 11.39 | 11.21 | 11.00 | 10.83 | 10.69 | 10.48 |
| 52 | 5260 | 12 | 11.87 | 11.72 | 11.53 | 11.34 | 11.18 | 10.99 | 10.81 | 10.60 |
| 56 | 5280 | 12 | 11.88 | 11.70 | 11.51 | 11.37 | 11.21 | 11.03 | 10.89 | 10.72 |
| 60 | 5300 | 12 | 11.98 | 11.80 | 11.65 | 11.48 | 11.30 | 11.15 | 10.96 | 10.76 |
| 64 | 5320 | 12 | 11.91 | 11.75 | 11.56 | 11.40 | 11.24 | 11.06 | 10.89 | 10.72 |
| 100 | 5500 | 12 | 11.78 | 11.63 | 11.42 | 11.22 | 11.03 | 10.89 | 10.72 | 10.58 |
| 104 | 5520 | 12 | 11.71 | 11.57 | 11.40 | 11.23 | 11.06 | 10.86 | 10.69 | 10.53 |
| 108 | 5540 | 12 | 11.70 | 11.54 | 11.38 | 11.19 | 11.00 | 10.80 | 10.59 | 10.39 |
| 112 | 5560 | 12 | 11.85 | 11.71 | 11.54 | 11.40 | 11.19 | 11.01 | 10.82 | 10.64 |
| 116 | 5580 | 12 | 11.73 | 11.53 | 11.36 | 11.19 | 11.01 | 10.84 | 10.66 | 10.51 |
| 132 | 5660 | 12 | 11.83 | 11.67 | 11.46 | 11.31 | 11.16 | 11.00 | 10.81 | 10.60 |
| 136 | 5680 | 12 | 11.74 | 11.59 | 11.44 | 11.30 | 11.11 | 10.95 | 10.79 | 10.62 |
| 140 | 5700 | 12 | 11.91 | 11.75 | 11.58 | 11.43 | 11.25 | 11.11 | 10.90 | 10.69 |
| 149 | 5745 | 12 | 11.88 | 11.67 | 11.46 | 11.25 | 11.04 | 10.88 | 10.69 | 10.52 |
| 153 | 5765 | 12 | 11.89 | 11.68 | 11.49 | 11.31 | 11.16 | 10.96 | 10.77 | 10.63 |
| 157 | 5785 | 12 | 11.77 | 11.56 | 11.40 | 11.23 | 11.06 | 10.91 | 10.72 | 10.57 |
| 161 | 5805 | 12 | 11.90 | 11.75 | 11.54 | 11.36 | 11.22 | 11.01 | 10.84 | 10.70 |
| 165 | 5825 | 12 | 11.86 | 11.66 | 11.46 | 11.25 | 11.06 | 10.92 | 10.77 | 10.62 |

**Aux Antenna (CH1)**

| 802.11 n(40M) 5.2/5.3/5.6/5.8G | | Max. Rated Avg. Power + Max. Tolerance (dBm) | Average Power Output (dBm) | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| CH | Frequency (MHz) | | Data Rate (Mbps) | | | | | | | |
| | | | 13.5 | 27 | 40.5 | 54 | 81 | 108 | 121.5 | 135 |
| 38 | 5190 | 12 | 11.95 | 11.68 | 11.40 | 11.14 | 10.85 | 10.55 | 10.24 | 9.96 |
| 46 | 5230 | 12 | 11.88 | 11.58 | 11.28 | 10.99 | 10.67 | 10.40 | 10.11 | 9.81 |
| 54 | 5270 | 12 | 11.94 | 11.63 | 11.33 | 11.01 | 10.72 | 10.40 | 10.09 | 9.84 |
| 62 | 5310 | 12 | 11.84 | 11.58 | 11.33 | 11.02 | 10.77 | 10.45 | 10.14 | 9.86 |
| 102 | 5510 | 12 | 11.85 | 11.56 | 11.30 | 11.01 | 10.69 | 10.43 | 10.17 | 9.86 |
| 110 | 5550 | 12 | 11.75 | 11.45 | 11.17 | 10.85 | 10.56 | 10.30 | 10.04 | 9.75 |
| 134 | 5670 | 12 | 11.84 | 11.55 | 11.27 | 11.00 | 10.69 | 10.39 | 10.12 | 9.84 |
| 151 | 5755 | 12 | 11.94 | 11.69 | 11.44 | 11.18 | 10.93 | 10.64 | 10.33 | 10.06 |
| 159 | 5795 | 12 | 11.87 | 11.56 | 11.24 | 10.93 | 10.62 | 10.31 | 10.03 | 9.77 |

**#.** Per FCC KDB443999, transmission on channels which overlap the 5600-5650 MHz is prohibited as a client.

**MIMO (CH0 + CH1)**

| 802.11 n(20M) | | Max. Rated Avg. Power + Max. Tolerance (dBm) | Average Power Output(dBm) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Data Rate (Mbps) | | | | | | | | | | | |
| | | | 13 | | | 26 | | | 39 | | | 52 | | |
| CH | Frequency (MHz) | | ch 0 | ch 1 | ch 0+1 | ch 0 | ch 1 | ch 0+1 | ch 0 | ch 1 | ch 0+1 | ch 0 | ch 1 | ch 0+1 |
| 1 | 2412 | 15.5 | 12.42 | 11.37 | 14.94 | 12.19 | 11.25 | 14.76 | 11.98 | 10.97 | 14.51 | 11.75 | 10.79 | 14.31 |
| 6 | 2437 | 15.5 | 12.51 | 11.15 | 14.89 | 12.18 | 10.93 | 14.61 | 11.86 | 10.71 | 14.33 | 11.54 | 10.48 | 14.05 |
| 11 | 2462 | 15.5 | 12.68 | 10.75 | 14.83 | 12.35 | 10.56 | 14.56 | 12.03 | 10.37 | 14.29 | 11.69 | 10.16 | 14.00 |

| 802.11 n(20M) | | Max. Rated Avg. Power + Max. Tolerance (dBm) | Average Power Output(dBm) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Data Rate (Mbps) | | | | | | | | | | | |
| | | | 78 | | | 104 | | | 117 | | | 130 | | |
| CH | Frequency (MHz) | | ch 0 | ch 1 | ch 0+1 | ch 0 | ch 1 | ch 0+1 | ch 0 | ch 1 | ch 0+1 | ch 0 | ch 1 | ch 0+1 |
| 1 | 2412 | 15.5 | 11.51 | 10.55 | 14.07 | 11.26 | 10.28 | 13.81 | 11.31 | 10.09 | 13.75 | 10.31 | 9.85 | 13.10 |
| 6 | 2437 | 15.5 | 11.21 | 10.24 | 13.76 | 10.88 | 10.02 | 13.48 | 10.54 | 9.78 | 13.19 | 10.23 | 9.55 | 12.91 |
| 11 | 2462 | 15.5 | 11.37 | 9.98 | 13.74 | 11.05 | 9.77 | 13.47 | 10.72 | 9.58 | 13.20 | 10.35 | 9.42 | 12.92 |

**MIMO (CH0 + CH1)**

| 802.11 n(20M) | | Max. Rated Avg. Power + Max. Tolerance (dBm) | Average Power Output(dBm) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 5.2/5.3/5.6/5.8G | | | Data Rate (Mbps) | | | | | | | | | | | |
| CH | Frequency (MHz) | | 13 | | | 26 | | | 39 | | | 52 | | |
| | | | ch 0 | ch 1 | ch 0+1 | ch 0 | ch 1 | ch 0+1 | ch 0 | ch 1 | ch 0+1 | ch 0 | ch 1 | ch 0+1 |
| 36 | 5180 | 15 | 11.94 | 10.79 | 14.41 | 11.65 | 10.52 | 14.13 | 11.36 | 10.25 | 13.85 | 11.08 | 9.98 | 13.58 |
| 40 | 5200 | 15 | 11.85 | 10.66 | 14.31 | 11.60 | 10.39 | 14.05 | 11.35 | 10.14 | 13.80 | 11.09 | 9.87 | 13.53 |
| 44 | 5220 | 15 | 11.71 | 10.63 | 14.21 | 11.45 | 10.36 | 13.95 | 11.20 | 10.09 | 13.69 | 10.92 | 9.81 | 13.41 |
| 48 | 5240 | 15 | 11.91 | 10.81 | 14.41 | 11.65 | 10.55 | 14.15 | 11.38 | 10.29 | 13.88 | 11.09 | 10.04 | 13.61 |
| 52 | 5260 | 15 | 11.83 | 10.98 | 14.44 | 11.57 | 10.69 | 14.16 | 11.28 | 10.44 | 13.89 | 11.01 | 10.19 | 13.63 |
| 56 | 5280 | 15 | 11.82 | 10.63 | 14.28 | 11.56 | 10.37 | 14.02 | 11.30 | 10.12 | 13.76 | 11.05 | 9.84 | 13.50 |
| 60 | 5300 | 15 | 11.94 | 10.18 | 14.16 | 11.66 | 9.89 | 13.87 | 11.40 | 9.63 | 13.61 | 11.12 | 9.37 | 13.34 |
| 64 | 5320 | 15 | 11.40 | 11.01 | 14.22 | 11.15 | 10.72 | 13.95 | 10.87 | 10.47 | 13.68 | 10.60 | 10.20 | 13.41 |
| 100 | 5500 | 15 | 11.91 | 10.67 | 14.34 | 11.62 | 10.39 | 14.06 | 11.35 | 10.10 | 13.78 | 11.10 | 9.84 | 13.53 |
| 104 | 5520 | 15 | 11.81 | 10.59 | 14.25 | 11.53 | 10.33 | 13.98 | 11.24 | 10.08 | 13.71 | 10.98 | 9.82 | 13.45 |
| 108 | 5540 | 15 | 11.83 | 10.88 | 14.39 | 11.54 | 10.62 | 14.11 | 11.27 | 10.34 | 13.84 | 11.01 | 10.05 | 13.57 |
| 112 | 5560 | 15 | 11.91 | 11.05 | 14.51 | 11.66 | 10.76 | 14.24 | 11.41 | 10.47 | 13.98 | 11.16 | 10.21 | 13.72 |
| 116 | 5580 | 15 | 11.83 | 10.36 | 14.17 | 11.56 | 10.11 | 13.91 | 11.28 | 9.84 | 13.63 | 11.00 | 9.58 | 13.36 |
| 132 | 5660 | 15 | 11.88 | 10.35 | 14.19 | 11.59 | 10.08 | 13.91 | 11.32 | 9.79 | 13.63 | 11.07 | 9.51 | 13.37 |
| 136 | 5680 | 15 | 11.81 | 10.39 | 14.17 | 11.54 | 10.13 | 13.90 | 11.27 | 9.86 | 13.63 | 11.02 | 9.58 | 13.37 |
| 140 | 5700 | 15 | 11.79 | 10.48 | 14.19 | 11.51 | 10.21 | 13.92 | 11.25 | 9.93 | 13.65 | 11.00 | 9.64 | 13.38 |
| 149 | 5745 | 15 | 11.88 | 10.33 | 14.18 | 11.63 | 10.07 | 13.93 | 11.36 | 9.80 | 13.66 | 11.08 | 9.54 | 13.39 |
| 153 | 5765 | 15 | 11.97 | 10.76 | 14.42 | 11.72 | 10.47 | 14.15 | 11.47 | 10.22 | 13.90 | 11.20 | 9.96 | 13.63 |
| 157 | 5785 | 15 | 11.88 | 10.72 | 14.35 | 11.61 | 10.47 | 14.09 | 11.35 | 10.22 | 13.83 | 11.07 | 9.94 | 13.55 |
| 161 | 5805 | 15 | 11.78 | 11.08 | 14.45 | 11.51 | 10.79 | 14.18 | 11.26 | 10.52 | 13.92 | 11.00 | 10.25 | 13.65 |
| 165 | 5825 | 15 | 11.86 | 10.87 | 14.40 | 11.60 | 10.59 | 14.13 | 11.32 | 10.32 | 13.86 | 11.05 | 10.05 | 13.59 |

**MIMO (CH0+CH1)**

| 802.11 n(20M) | | Max. Rated Avg. Power + Max. Tolerance (dBm) | Average Power Output(dBm) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 5.2/5.3/5.6/5.8G | | | Data Rate (Mbps) | | | | | | | | | | | |
| CH | Frequency (MHz) | | 78 | | | 104 | | | 117 | | | 130 | | |
| | | | ch 0 | ch 1 | ch 0+1 | ch 0 | ch 1 | ch 0+1 | ch 0 | ch 1 | ch 0+1 | ch 0 | ch 1 | ch 0+1 |
| 36 | 5180 | 15 | 10.81 | 9.70 | 13.30 | 10.52 | 9.42 | 13.02 | 10.25 | 9.17 | 12.75 | 9.96 | 8.88 | 12.46 |
| 40 | 5200 | 15 | 10.80 | 9.60 | 13.25 | 10.54 | 9.31 | 12.98 | 10.28 | 9.04 | 12.71 | 10.01 | 8.77 | 12.44 |
| 44 | 5220 | 15 | 10.67 | 9.52 | 13.14 | 10.39 | 9.27 | 12.88 | 10.10 | 9.00 | 12.60 | 9.82 | 8.75 | 12.33 |
| 48 | 5240 | 15 | 10.81 | 9.78 | 13.34 | 10.56 | 9.52 | 13.08 | 10.27 | 9.27 | 12.81 | 10.02 | 8.99 | 12.55 |
| 52 | 5260 | 15 | 10.74 | 9.90 | 13.35 | 10.45 | 9.62 | 13.07 | 10.17 | 9.36 | 12.79 | 9.89 | 9.11 | 12.53 |
| 56 | 5280 | 15 | 10.76 | 9.55 | 13.21 | 10.47 | 9.28 | 12.93 | 10.18 | 9.02 | 12.65 | 9.93 | 8.73 | 12.38 |
| 60 | 5300 | 15 | 10.86 | 9.10 | 13.08 | 10.60 | 8.84 | 12.82 | 10.34 | 8.55 | 12.55 | 10.09 | 8.28 | 12.29 |
| 64 | 5320 | 15 | 10.34 | 9.93 | 13.15 | 10.07 | 9.68 | 12.89 | 9.78 | 9.42 | 12.61 | 9.49 | 9.16 | 12.34 |
| 100 | 5500 | 15 | 10.84 | 9.59 | 13.27 | 10.57 | 9.32 | 13.00 | 10.28 | 9.03 | 12.71 | 10.00 | 8.76 | 12.43 |
| 104 | 5520 | 15 | 10.73 | 9.53 | 13.18 | 10.44 | 9.28 | 12.91 | 10.17 | 9.02 | 12.64 | 9.89 | 8.76 | 12.37 |
| 108 | 5540 | 15 | 10.75 | 9.78 | 13.30 | 10.49 | 9.53 | 13.05 | 10.20 | 9.28 | 12.77 | 9.94 | 8.99 | 12.50 |
| 112 | 5560 | 15 | 10.91 | 9.95 | 13.47 | 10.65 | 9.67 | 13.20 | 10.37 | 9.40 | 12.92 | 10.09 | 9.11 | 12.64 |
| 116 | 5580 | 15 | 10.72 | 9.29 | 13.07 | 10.43 | 9.03 | 12.80 | 10.14 | 8.76 | 12.51 | 9.86 | 8.49 | 12.24 |
| 132 | 5660 | 15 | 10.79 | 9.22 | 13.09 | 10.54 | 8.93 | 12.82 | 10.28 | 8.65 | 12.55 | 10.02 | 8.40 | 12.30 |
| 136 | 5680 | 15 | 10.73 | 9.29 | 13.08 | 10.47 | 9.03 | 12.82 | 10.20 | 8.78 | 12.56 | 9.92 | 8.51 | 12.28 |
| 140 | 5700 | 15 | 10.71 | 9.36 | 13.10 | 10.44 | 9.07 | 12.82 | 10.17 | 8.80 | 12.55 | 9.90 | 8.52 | 12.27 |
| 149 | 5745 | 15 | 10.81 | 9.29 | 13.13 | 10.52 | 9.01 | 12.84 | 10.27 | 8.72 | 12.57 | 10.02 | 8.45 | 12.32 |
| 153 | 5765 | 15 | 10.93 | 9.69 | 13.36 | 10.67 | 9.42 | 13.10 | 10.39 | 9.13 | 12.82 | 10.12 | 8.84 | 12.54 |
| 157 | 5785 | 15 | 10.81 | 9.66 | 13.28 | 10.52 | 9.40 | 13.01 | 10.24 | 9.15 | 12.74 | 9.98 | 8.89 | 12.48 |
| 161 | 5805 | 15 | 10.73 | 9.97 | 13.38 | 10.45 | 9.72 | 13.11 | 10.16 | 9.47 | 12.84 | 9.88 | 9.19 | 12.56 |
| 165 | 5825 | 15 | 10.76 | 9.80 | 13.32 | 10.49 | 9.51 | 13.04 | 10.24 | 9.25 | 12.78 | 9.96 | 8.99 | 12.51 |

**MIMO (CH0 + CH1)**

| 802.11 n(40M) 5.2/5.3/5.6/5.8G | | Max. Rated Avg. Power + Max. Tolerance (dBm) | Average Power Output(dBm) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Data Rate (Mbps) | | | | | | | | | | | |
| | | | 27 | | | 54 | | | 81 | | | 108 | | |
| CH | Frequency (MHz) | | ch 0 | ch 1 | ch 0+1 | ch 0 | ch 1 | ch 0+1 | ch 0 | ch 1 | ch 0+1 | ch 0 | ch 1 | ch 0+1 |
| 38 | 5190 | 15 | 11.87 | 11.53 | 14.71 | 11.52 | 11.16 | 14.35 | 11.17 | 10.83 | 14.01 | 10.81 | 10.46 | 13.65 |
| 46 | 5230 | 15 | 11.73 | 11.30 | 14.53 | 11.36 | 10.96 | 14.17 | 10.99 | 10.60 | 13.81 | 10.63 | 10.25 | 13.45 |
| 54 | 5270 | 15 | 11.58 | 11.35 | 14.48 | 11.26 | 10.99 | 14.14 | 10.92 | 10.64 | 13.79 | 10.58 | 10.28 | 13.44 |
| 62 | 5310 | 15 | 11.91 | 11.54 | 14.74 | 11.58 | 11.20 | 14.40 | 11.26 | 10.86 | 14.07 | 10.94 | 10.49 | 13.73 |
| 102 | 5510 | 15 | 11.75 | 11.30 | 14.54 | 11.40 | 10.97 | 14.20 | 11.03 | 10.63 | 13.84 | 10.70 | 10.28 | 13.51 |
| 110 | 5550 | 15 | 11.76 | 11.72 | 14.75 | 11.44 | 11.37 | 14.42 | 11.11 | 11.03 | 14.08 | 10.78 | 10.67 | 13.74 |
| 134 | 5670 | 15 | 11.50 | 10.75 | 14.15 | 11.17 | 10.42 | 13.82 | 10.84 | 10.10 | 13.50 | 10.49 | 9.74 | 13.14 |
| 151 | 5755 | 15 | 11.93 | 11.24 | 14.61 | 11.60 | 10.88 | 14.27 | 11.26 | 10.51 | 13.91 | 10.93 | 10.16 | 13.57 |
| 159 | 5795 | 15 | 11.66 | 11.35 | 14.52 | 11.32 | 11.03 | 14.19 | 10.97 | 10.68 | 13.84 | 10.63 | 10.33 | 13.49 |

**MIMO (CH0+CH1)**

| 802.11 n(40M) 5.2/5.3/5.6/5.8G | | Max. Rated Avg. Power + Max. Tolerance (dBm) | Average Power Output(dBm) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Data Rate (Mbps) | | | | | | | | | | | |
| | | | 162 | | | 216 | | | 243 | | | 270 | | |
| CH | Frequency (MHz) | | ch 0 | ch 1 | ch 0+1 | ch 0 | ch 1 | ch 0+1 | ch 0 | ch 1 | ch 0+1 | ch 0 | ch 1 | ch 0+1 |
| 38 | 5190 | 15 | 10.45 | 10.09 | 13.28 | 10.08 | 9.73 | 12.92 | 9.73 | 9.41 | 12.58 | 9.39 | 9.04 | 12.23 |
| 46 | 5230 | 15 | 10.31 | 9.92 | 13.13 | 9.96 | 9.60 | 12.79 | 9.64 | 9.27 | 12.47 | 9.32 | 8.91 | 12.13 |
| 54 | 5270 | 15 | 10.24 | 9.96 | 13.11 | 9.89 | 9.63 | 12.77 | 9.52 | 9.27 | 12.41 | 9.19 | 8.93 | 12.07 |
| 62 | 5310 | 15 | 10.61 | 10.15 | 13.40 | 10.26 | 9.82 | 13.06 | 9.94 | 9.49 | 12.73 | 9.58 | 9.13 | 12.37 |
| 102 | 5510 | 15 | 10.38 | 9.93 | 13.17 | 10.03 | 9.57 | 12.82 | 9.69 | 9.23 | 12.48 | 9.32 | 8.90 | 12.13 |
| 110 | 5550 | 15 | 10.43 | 10.34 | 13.40 | 10.07 | 9.97 | 13.03 | 9.74 | 9.65 | 12.71 | 9.41 | 9.31 | 12.37 |
| 134 | 5670 | 15 | 10.17 | 9.38 | 12.80 | 9.81 | 9.06 | 12.46 | 9.48 | 8.70 | 12.12 | 9.16 | 8.35 | 11.78 |
| 151 | 5755 | 15 | 10.57 | 9.84 | 13.23 | 10.20 | 9.47 | 12.86 | 9.86 | 9.14 | 12.53 | 9.51 | 8.77 | 12.17 |
| 159 | 5795 | 15 | 10.30 | 9.96 | 13.14 | 9.95 | 9.61 | 12.79 | 9.59 | 9.27 | 12.44 | 9.22 | 8.93 | 12.09 |

**#.** Per FCC KDB443999, transmission on channels which overlap the 5600-5650 MHz is prohibited as a client.

**#.** The maximum power of CH0 and CH1 in 5G MIMO is minus 3dB from the maximum power of CH0+CH1

## #. Bluetooth conducted power table:

| Frequency (MHz) | Data Rate | Peak | |
|---|---|---|---|
| | | dBm | mW |
| 2402 | 1 | 4.72 | 2.965 |
| 2441 | 1 | 5.85 | 3.846 |
| 2480 | 1 | 5.54 | 3.581 |
| 2402 | 2 | 3.93 | 2.472 |
| 2441 | 2 | 4.75 | 2.985 |
| 2480 | 2 | 5.1 | 3.236 |
| 2402 | 3 | 4.42 | 2.767 |
| 2441 | 3 | 5.34 | 3.420 |
| 2480 | 3 | 4.79 | 3.013 |

| Frequency (MHz) | Avg. (dBm) |
|---|---|
| | BT4.0 |
| 2402 | 4.52 |
| 2442 | 5.14 |
| 2480 | 5.25 |

## 1.4 Test Environment

Ambient Temperature: 22±2° C
Tissue Simulating Liquid: 22±2° C

## 1.5 Operation Description

### 1. WWAN (GPRS/EDGE/WCDMA/HSDPA/HSUPA):

The EUT is controlled by using Radio Communication Tester(R&S CMU200), and the communication between the EUT and the tester is established by air link. The EUT was tested in four configurations:

**Configuration 1: Back side_0mm with power reduction and_26mm without power reduction.**

**Configuration 2: Bottom side_0mm with power reduction and_10mm without power reduction.**

**Configuration 3: Left side_0mm without power reduction.**

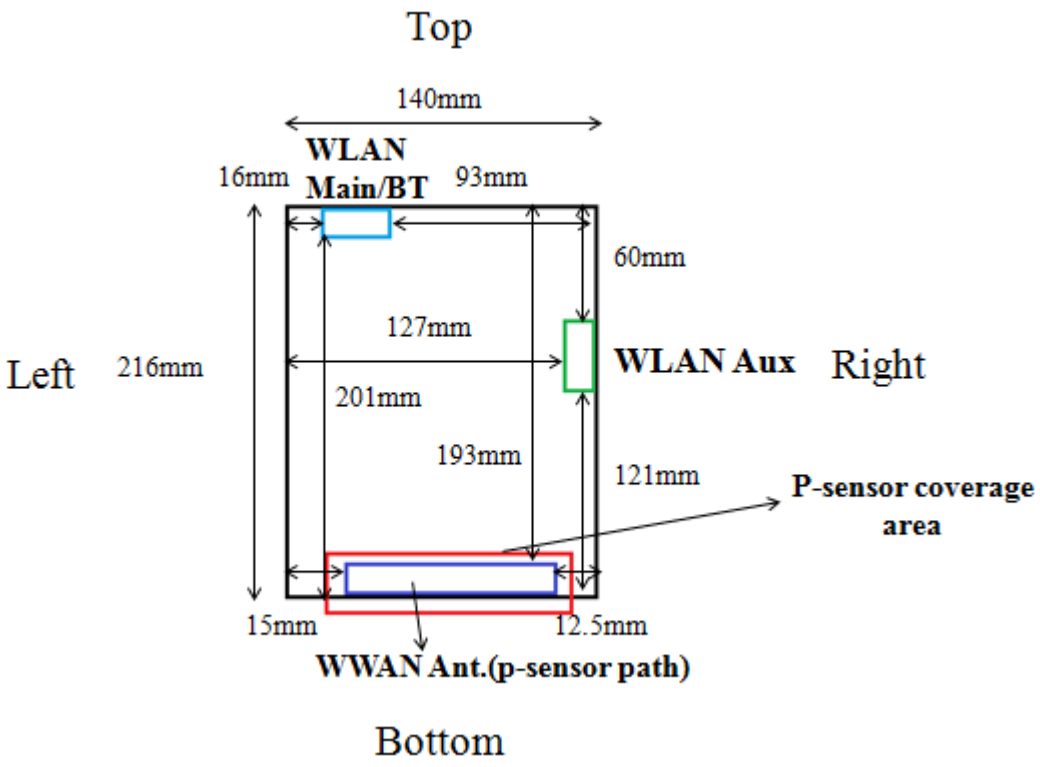
**Configuration 4: Right side_0mm without power reduction.**

| Band | Power Reduction |
|---|---|
| GPRS850 | YES |
| EDGE850 | YES |
| GPRS1900 | YES |
| EDGE1900 | YES |
| WCDMA B2 | YES |
| WCDMA B4 | YES |
| WCDMA B5 | YES |
| WLAN | NO |
| BT | NO |

## 2. WLAN (802.11 a/b/g/n):

Use chipset specific software to control the EUT, and makes it transmit in maximum power. The EUT was tested in five configurations:

**Configurations: Back/Right/Left/Bottom/Top side_0mm.**




**Front view of the tablet**

(Note:The proximity sensor is collocated with WWAN antenna.)

Note:

**1.** The SAR test of GPRS was performed on the maximum sourced-based time-averaged power.

**2.** The SAR measurement is not required for HSPA since its maximum output power is less than ¼ dB higher than RMC without HSPA.

**3.** The SAR measurement is not required for HSPA+ since its maximum output power is less than ¼ dB higher than RMC without HSPA+.

**4.** The SAR measurement is not required for 802.11g/n since its maximum output power is less than 1/4 dB higher than 802.11b.

**5.** The SAR measurement is not required for 802.11n since its maximum output power is less than 1/4 dB higher than 802.11a.

**6.** Testing at higher data rates is not required since the maximum output power is less than 1/4 dB higher than those measured at the lowest data rate.

**7.** BT and WLAN technology can't transmit simultaneously according to client's description.

**8.** For 2.4GHz WLAN Main and Aux antennas, the maximum output power for 802.11b is larger than that for 802.11n and the maximum output power of each antenna during simultaneous transmission for 802.11n is less than that used in standalone transmission for 802.11n, so it is more conservative to use the sum of 1-g SAR provision in KDB447498D01 for 802.11b to exclude the SAR measurement for 802.11n MIMO.

**9.** For 5GHz WLAN Main and Aux antennas, the maximum output power for 802.11a is larger than that for 802.11n, so it is more conservative to use the sum of 1-g SAR provision in KDB447498D01 for 802.11a to exclude the SAR measurement for 802.11n MIMO.

**10.** According to KDB447498 D01,

(1) The SAR test exclusion thresholds for 100 MHz to 6 GHz at test separation distances≤ 50 mm are determined by:

$$\frac{\text{Max. tune up power(mW)}}{\text{Min. test separation distance(mm)}} \times \sqrt{f(\text{GHz})} \leq 3$$

When the minimum test separation distance is < 5mm, 5mm is applied to determine SAR test exclusion.

(2) For test separation distances > 50 mm, and the frequency at 100 MHz to 1500MHz,

the SAR test exclusion threshold is determined according to the following, and as illustrated in Appendix B of KDB447498 D01.

[(Threshold at 50mm in step1) + (test separation distance-50mm)x($\frac{f(MHz)}{160}$)](mW),

(3) For test separation distances > 50 mm, and the frequency at >1500MHz to 6GHz, the SAR test exclusion threshold is determined according to the following, and as illustrated in Appendix B of KDB447498 D01.

[(Threshold at 50mm in step1) + (test separation distance-50mm)x10](mW),

| Mode | Max. tune-up power(dBm) | Max. tune-up power(mW) | Top side | | | Right side | | | Left side | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Ant. to surface (mm) | Exclusion threshold (mW) | Require SAR testing? | Ant. to surface (mm) | Exclusion threshold (mW) | Require SAR testing? | Ant. to surface (mm) | Exclusion threshold (mW) | Require SAR testing? |
| GPRS850 class11 | 29.5 | 891.251 | 193 | 825.612 | NO | 12.5 | 65.689 | YES | 15 | 54.741 | YES |
| GPRS1900 class11 | 26.5 | 446.684 | 193 | 1442.346 | NO | 12.5 | 49.384 | YES | 15 | 41.153 | YES |
| WCDMA B2 | 24.5 | 281.838 | 193 | 1437.785 | NO | 12.5 | 31.141 | YES | 15 | 25.951 | YES |
| WCDMA B4 | 24.5 | 281.838 | 193 | 1437.462 | NO | 12.5 | 29.849 | YES | 15 | 24.874 | YES |
| WCDMA B5 | 24.5 | 281.838 | 193 | 812.278 | NO | 12.5 | 20.746 | YES | 15 | 17.288 | YES |
| WLAN Main | 17 | 50.119 | less than 5 | 15.728 | YES | 93 | 431.573 | NO | 16 | 4.915 | YES |
| WLAN Aux | 17 | 50.119 | 60 | 101.573 | NO | less than 5 | 15.728 | YES | 127 | 771.573 | NO |

| Mode | Max. tune-up power(dBm) | Max. tune-up power(mW) | Bottom side | | | Back side | | |
|---|---|---|---|---|---|---|---|---|
| | | | Ant. to surface (mm) | Exclusion threshold (mW) | Require SAR testing? | Ant. to surface (mm) | Exclusion threshold (mW) | Require SAR testing? |
| GPRS850 class11 | 29.5 | 891.251 | less than 5 | 164.223 | YES | less than 5 | 164.223 | YES |
| GPRS1900 class10 | 26.5 | 446.684 | less than 5 | 123.459 | YES | less than 5 | 123.459 | YES |
| WCDMA B2 | 24.5 | 281.838 | less than 5 | 77.853 | YES | less than 5 | 77.853 | YES |
| WCDMA B4 | 24.5 | 281.838 | less than 5 | 74.623 | YES | less than 5 | 74.623 | YES |
| WCDMA B5 | 24.5 | 281.838 | less than 5 | 51.864 | YES | less than 5 | 51.864 | YES |
| WLAN Main | 17 | 50.119 | 201 | - | NO | less than 5 | 15.728 | YES |
| WLAN Aux | 17 | 50.119 | 121 | 711.573 | NO | less than 5 | 15.728 | YES |

| Mode | Maximum power(dBm) | Maximum power(mW) | Top side | | | Right side | | | Left side | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Ant. to surface (mm) | Exclusion threshold (mW) | Require SAR testing? | Ant. to surface (mm) | Exclusion threshold (mW) | Require SAR testing? | Ant. to surface (mm) | Exclusion threshold (mW) | Require SAR testing? |
| BT | 5.85 | 3.846 | less than 5 | 1.211 | NO | 93 | 430.12 | NO | 16 | 0.379 | NO |

| Mode | Maximum power(dBm) | Maximum power(mW) | Bottom side | | | Back side | | |
|---|---|---|---|---|---|---|---|---|
| | | | Ant. to surface (mm) | Exclusion threshold (mW) | Require SAR testing? | Ant. to surface (mm) | over 200mm | Require SAR testing? |
| BT | 5.85 | 3.846 | 201 | - | NO | less than 5 | 1.211 | NO |

**11.** According to KDB447498 D01, testing of other required channels is not required when the reported 1-g SAR for the highest output channel is ≤ 0.8 W/kg, when the transmission band is ≤ 100 MHz.

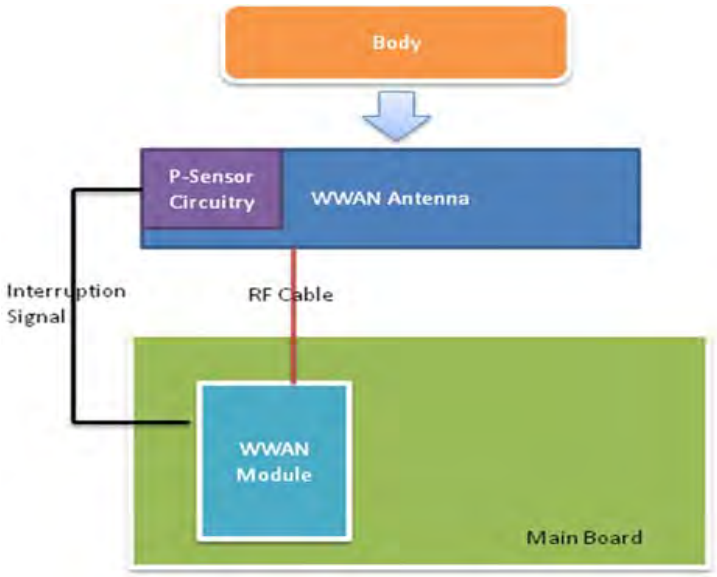
**12.** According to KDB447498 D01, testing of other required channels is not required when the reported 1-g SAR for the highest output channel is ≤ 0.6 W/kg, when the transmission band is between 100 MHz and 200MHz.

**13.** According to KDB447498 D01, testing of other required channels is not required when the reported 1-g SAR for the highest output channel is ≤ 0.4 W/kg, when the transmission band is ≥ 200MHz.

**14.** According to KDB865664 D01, SAR measurement variability must be assessed for each frequency band. When the original highest measured SAR is ≥ 0.8 W/kg, repeated that measurement once. Perform a second repeated measurement only if the ratio of largest to smallest SAR for the original and first repeated measurements is > 1.20 or when the original or repeated measurement is ≥ 1.45 W/kg (~ 10% from the 1-g SAR limit)

## 1.6 Proximity sensor operation description

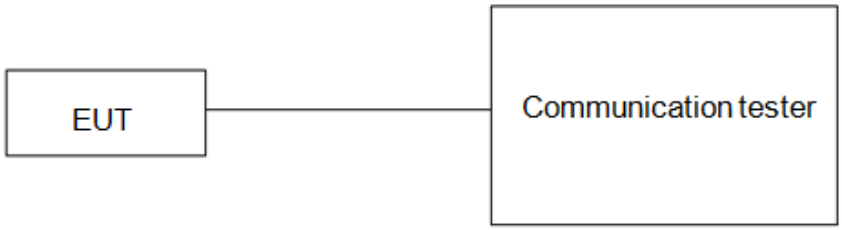
The P-sensor being used to reduce output power is capacitive in which when the object such as human body, metal or plastic is being approached, the sensing capacitance would be increased with the antenna pad. Once the capacitance is accumulated, and reached over the threshold as set in MCU of the microchip, the interruption signal is pulled low (High state without trigger ) and further inform modem module of the transmitter to make power reduction.




1.6.1 Proximity sensor measurement procedure

(1) The proximity sensor is collocated with WWAN antenna.

(2) Output power is measured, and monitored by using the communication tester. A RF cables with sufficient length was being attached from the antenna port of the module, and used for the measurement. The appropriate loss attenuated from cable is compensated in the communication tester.



1.6.2 Trigger distances for back and bottom sides

Test procedure:

1) The entire back surface or edge of the tablet is positioned below a flat phantom filled with the required tissue equivalent medium and positioned at least 20 mm further than the distance that triggers power reduction.

2) The back surface or edge is moved toward the phantom in 3 mm steps until the sensor triggers.

3) The back surface or edge is then moved back (further away) from the phantom until maximum output power is returned to the normal maximum level.

4) The back surface or edge is again moved toward the phantom, but in 1 mm steps, until it is at least 5 mm past the triggering point or touching the phantom

5) If the tablet is not touching the phantom, it is moved in 3 mm steps until it touches the phantom to confirm that the sensor remains triggered and the maximum power stays reduced.

6) The process is then reversed by moving the tablet away from the phantom to determine triggering release, until it is at least 10 mm beyond the point that triggers the return of normal maximum power.

7) The measured output power within ± 5 mm of the triggering points, or until the tablet is touching the phantom, for movements to and from the phantom should be tabulated.

8) To ensure all production units are compliant, it is generally necessary to reduce the triggering distance determined from the triggering tests by 1 mm, or more if it is necessary, and use the smallest distance for movements to and from the phantom, minus 1 mm, as the sensor triggering distance for determining the SAR measurement distance.

9) For back side, the trigger distance of proximity sensor is 27mm.

10) For bottom side, the trigger distance of proximity sensor is 15mm, and we perform the 1.6.3 tilt angle testing in next step.

1.6.3 Tilt angle testing

Test procedure:

1) The influence of table tilt angles to proximity sensor triggering is determined by positioning each tablet edge that contains a transmitting antenna, perpendicular to the flat phantom, at the smallest sensor triggering test distance determined in sections 1.6.2 by rotating the tablet around the edge next to the phantom in ≤ 10 deg increments until the tablet is +/- 45deg or more from the vertical position at 0 deg.

2) If sensor triggering is released and normal maximum output power is restored within the +/- 45deg range, the procedures in step 1) should be repeated by reducing the tablet to phantom separation distance by 1 mm until the proximity sensor no longer releases triggering, and maximum output power remains in the reduced mode.

3) The smallest separation distance determined in steps 1) and 2), minus 1 mm, is the sensor triggering distance for tablet tilt coverage. The smallest separation distance determined in sections 1.6.2, 1.6.3 minus 1 mm should be used in the SAR measurements.

4) The influence of table tilt angles to proximity sensor triggering is determined by positioning top and left sides, please refer to table 1.6.5 and 1.6.6.

5) After the tilt angle testing for bottom side, the sensor is released during +/- 45deg until 12mm, so 12-1=11mm, is the sensor triggering distance for tablet tilt coverage. The smallest separation distance minus 1 mm(11-1=10mm) should be used in the SAR measurements.

1.6.4 Proximity sensor coverage

The following procedures do not apply and are not required for configurations where the antenna and sensor are collocated and the peak SAR location is overlapping with the sensor.

Test procedure:

1) The back surface or edges of the tablet is positioned at a test separation distance less than or equal to the distance required for back surface or edge triggering, with both the antenna and sensor pad located at least 20 mm laterally outside the edge (boundary) of the phantom, along the direction of maximum antenna and sensor offset.

2) The similar sequence of steps applied to determine sensor triggering distance in section 1.6.2 are used to verify back surface and edge sensor coverage by moving the tablet (sensor and antenna) horizontally toward the phantom while maintaining the same vertical separation between the back surface or edge and the phantom.

3) After the exact location where triggering of power reduction is determined, with respect to the sensor and antenna, the tablet movement should be continued, in 3 mm increments, until both the sensor and antenna(s) are fully under the phantom and at least 20 mm inside the phantom edge.

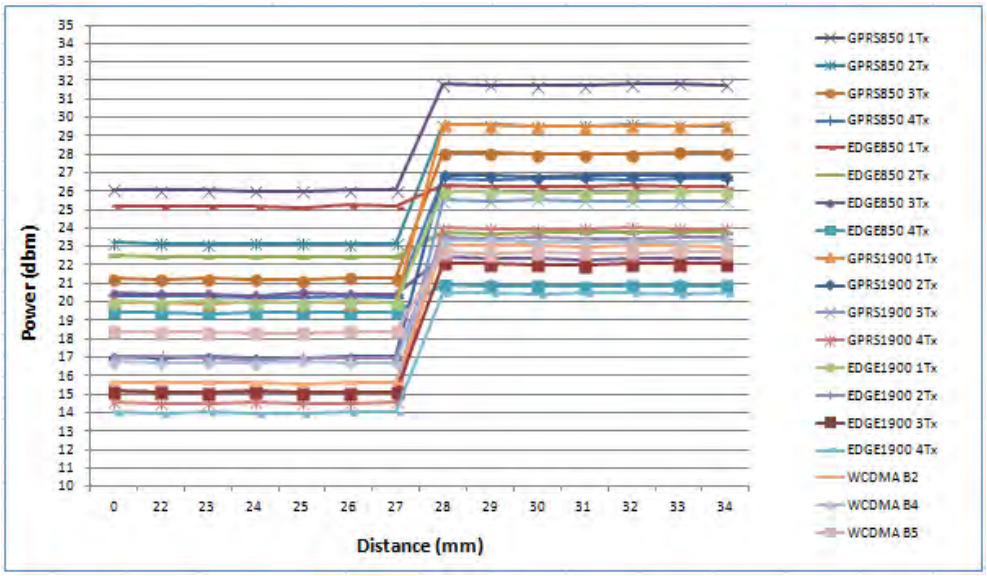
4) The process is then repeated from the other direction, at the opposite end of maximum antenna and sensor offset, by rotating the tablet 180 degrees.

1.6.5 Results

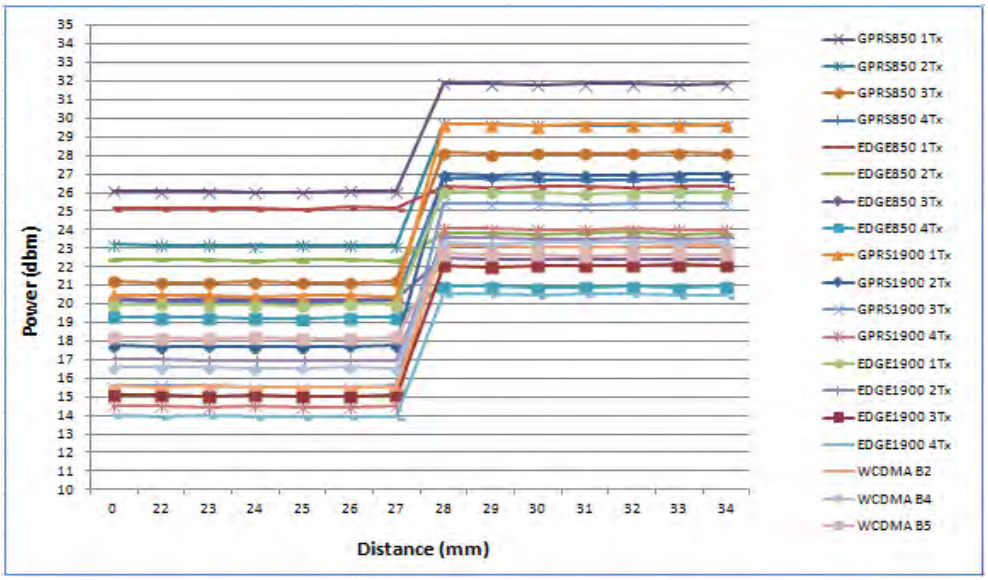
The measured output power within ± 5 mm of the triggering points, or until the tablet is touching the phantom, for movements to and from the phantom is tabulated in the following.

**Back side**

Moving device toward the phantom



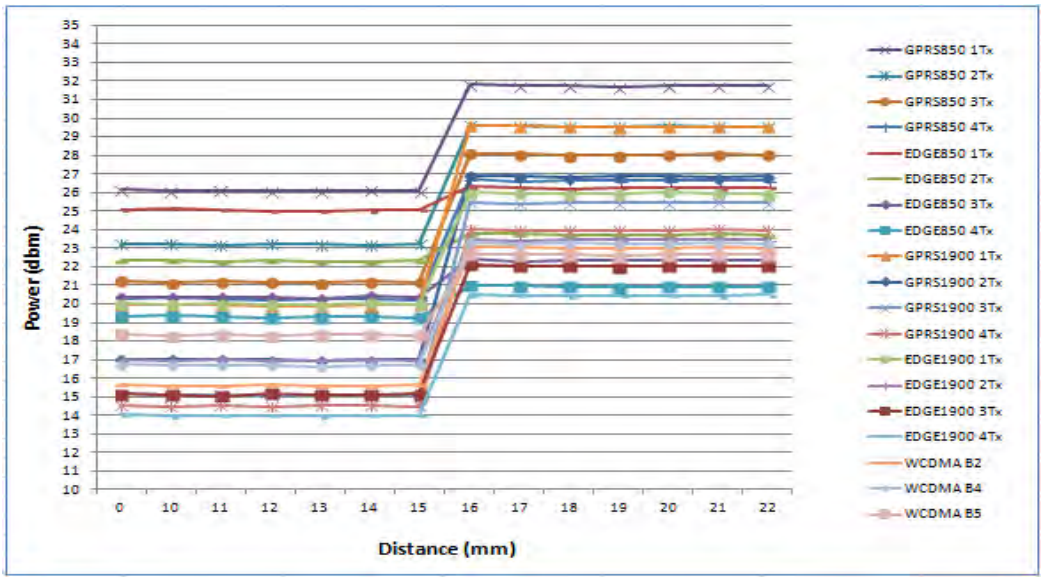

Moving device away from the phantom



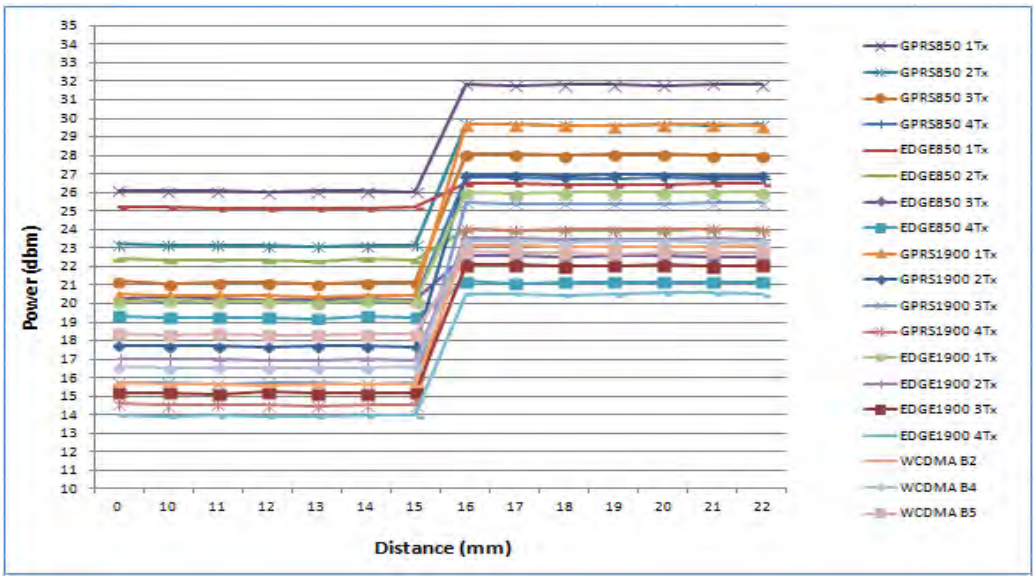
For back side, the worst trigger distance of proximity sensor is 27mm, thus we test back side SAR in 26mm without power reduction and 0mm with power reduction.

## Bottom side

Moving device toward the phantom




Moving device away from the phantom



For bottom side, the worst trigger distance of proximity sensor is 15mm, so next we perform the tilt angle testing.

Table 1.6.5 Tilt angle test results for bottom side

| P-sensor ON/OFF | -50 deg | -45 deg | -40 deg | -30 deg | -20 deg | -10 deg | 0 deg | 10 deg | 20 deg | 30 deg | 40 deg | 45 deg | 50 deg |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 12mm | ON | ON | ON | ON | ON | ON | ON | ON | ON | ON | ON | ON | ON |
| 13mm | OFF | OFF | ON | ON | ON | ON | ON | ON | ON | ON | ON | OFF | OFF |
| 14mm | OFF | OFF | OFF | ON | ON | ON | ON | ON | ON | ON | OFF | OFF | OFF |
| 15mm | OFF | OFF | OFF | OFF | ON | ON | ON | ON | ON | OFF | OFF | OFF | OFF |

During the tilt angle testing for top side, the sensor is released during ± 45° until 12mm, so 12-1=11mm, is the sensor triggering distance for tablet tilt coverage. The smallest separation distance minus 1 mm(11-1=10mm) should be used in the SAR measurements for bottom side.

Note:

1. The triggering variations and hysteresis effect has been evaluated separately according to the tissue-equivalent medium required for each frequency band, and sensor triggering does not change with different tissue-equivalent media.

2. The default power level for sensor failure and malfunctioning, including all compliance concerns, has been addressed in the client's operation description (1.6.6) for the proximity sensor implementation to be acceptable.

3. Conducted power is monitored qualitatively to identify the general triggering characteristics and recorded quantitatively, versus spacing.

1.6.6 Operation description for P-sensor

**Power Reduction Design Specification (for P-sensor)**

The mechanism of power reduction is used only for WWAN, not for Wi-Fi and Bluetooth. The reduced power for each technology/band is defined in Table1-1. With P-sensor mechanism, the GPRS/WCDMA default power when P-sensor failure or malfunction are show in Table1-2 as below.

**Table1-1：The power reduction scenario table**

| Band | Power Reduction |
|---|---|
| GPRS850 | YES |
| EDGE850 | YES |
| GPRS1900 | YES |
| EDGE1900 | YES |
| WCDMA B2 | YES |
| WCDMA B4 | YES |
| WCDMA B5 | YES |
| WLAN | NO |
| BT | NO |

**Table1-2：The default power when p-sensor failure or malfunction**

| Technology / Band | Mode | Default Power (dBm) |
|---|---|---|
| GPRS 850 | Class 8 | 25.5~27.5 |
| | Class 10 | 22.5~24.5 |
| | Class 11 | 20.5~22.5 |
| | Class 12 | 19.5~21.5 |
| EDGE 850 | Class 8 | 24.5~26.5 |
| | Class 10 | 21.5~23.5 |
| | Class 11 | 19.5~21.5 |
| | Class 12 | 18.5~20.5 |
| GPRS 1900 | Class 8 | 20~22 |
| | Class 10 | 17~19 |
| | Class 11 | 15~17 |
| | Class 12 | 14~16 |
| EDGE 1900 | Class 8 | 19~21 |
| | Class 10 | 16~18 |
| | Class 11 | 14~16 |
| | Class 12 | 13~15 |

| | | |
|---|---|---|
| UMTS B2 | RMC 12.2K data | 14~16 |
| | HSDPA | 13.5~16 |
| | HSUPA | 12~16 |
| UMTS B4 | RMC 12.2K data | 15~17 |
| | HSDPA | 14.5~17 |
| | HSUPA | 13~17 |
| UMTS B5 | RMC 12.2K data | 17~19 |
| | HSDPA | 16.5~19 |
| | HSUPA | 15~19 |

## 1.7 The SAR Measurement System

A block diagram of the SAR measurement System is given in Fig. a. This SAR Measurement System uses a Computer-controlled 3-D stepper motor system (SPEAG DASY 5 professional system). The model EX3DV4 field probe is used to determine the internal electric fields. The SAR can be obtained from the equation SAR= $\sigma$ ($|Ei|^2$)/ $\rho$ where $\sigma$ and $\rho$ are the conductivity and mass density of the tissue-simulant.

The DASY 5 system for performing compliance tests consists of the following items:

- A standard high precision 6-axis robot (Staubli RX family) with controller, teach pendant and software. An arm extension is for accommodating the data acquisition electronics (DAE).
- A dosimetric probe, i.e., an isotropic E-field probe optimized and calibrated for usage intissue simulating liquid. The probe is equipped with an optical surface detector system.
- A data acquisition electronics (DAE) which performs the signal amplification, signal multiplexing, AD-conversion, offset measurements, mechanical surface detection, collision detection, etc. The unit is battery powered with standard or rechargeable batteries. The signal is optically transmitted to the EOC.

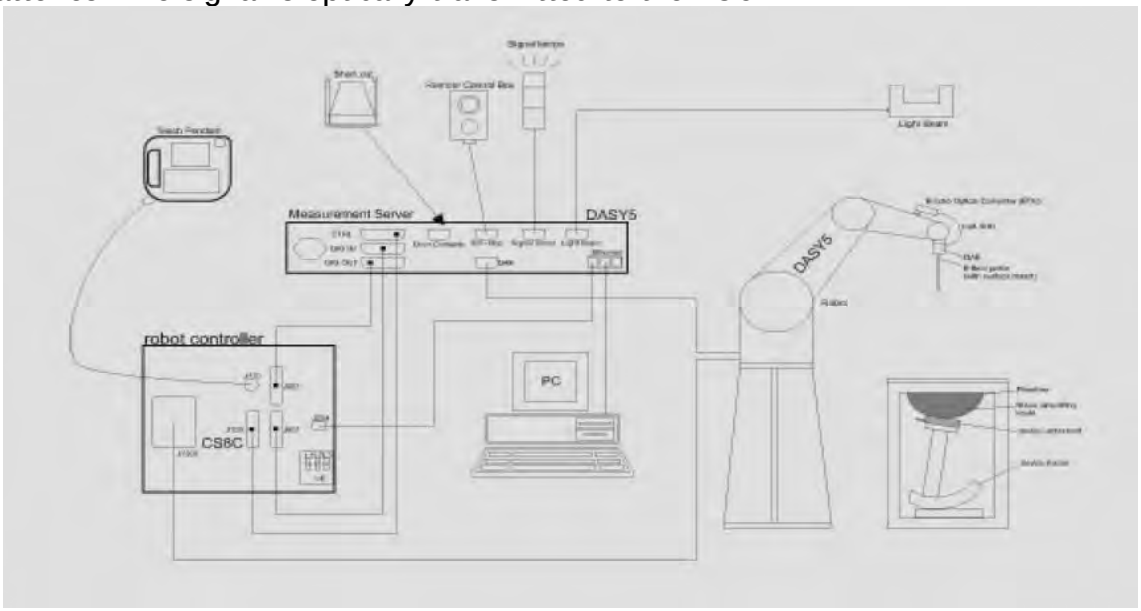



Fig. a The block diagram of SAR system

- The Electro-optical converter (EOC) performs the conversion between optical and electrical of the signals for the digital communication to the DAE and for the analog signal from the optical surface detection. The EOC is connected to the measurement server.
- The function of the measurement server is to perform the time critical tasks such as signal filtering, control of the robot operation and fast movement interrupts.
- A probe alignment unit which improves the (absolute) accuracy of the probe positioning.
- A computer operating Windows 7.
- DASY 5 software.
- Remote control with teach pendant and additional circuitry for robot safety such as warning lamps, etc.
- The SAM twin phantom enabling testing left-hand and right-hand usage.
- The device holder for handheld mobile phones.
- Tissue simulating liquid mixed according to the given recipes.
- Validation dipole kits allowing to validate the proper functioning of the system.

## 1.8 System Components

### EX3DV4 E-Field Probe

| | | |
|---|---|---|
| Construction | Symmetrical design with triangular core<br>Built-in shielding against static charges<br>PEEK enclosure material (resistant to organic solvents, e.g., DGBE) |  |
| Calibration | Basic Broad Band Calibration in air<br>Conversion Factors (CF) for HSL 835/ 1750/1900/2450/5200/5300/5600/5800 MHz Additional CF for other liquids and frequencies upon request | |
| Frequency | 10 MHz to > 6 GHz | |
| Directivity | ± 0.3 dB in HSL (rotation around probe axis)<br>± 0.5 dB in tissue material (rotation normal to probe axis) | |
| Dynamic Range | 10 µW/g to > 100 mW/g<br>Linearity: ± 0.2 dB (noise: typically < 1 µW/g) | |
| Dimensions | Tip diameter: 2.5 mm | |
| Application | High precision dosimetric measurements in any exposure scenario (e.g., very strong gradient fields). Only probe which enables compliance testing for frequencies up to 6 GHz with precision of better 30%. | |

## SAM PHANTOM V4.0C

| | | |
|---|---|---|
| Construction | The shell corresponds to the specifications of the Specific Anthropomorphic Mannequin (SAM) phantom defined in IEEE 1528-200X, CENELEC 50361 and IEC 62209.<br>It enables the dosimetric evaluation of left and right hand phone usage as well as body mounted usage at the flat phantom region. A cover prevents evaporation of the liquid. Reference markings on the phantom allow the complete setup of all predefined phantom positions and measurement grids by manually teaching three points with the robot. | |
| Shell Thickness | 2 ± 0.2 mm |  |
| Filling Volume | Approx. 25 liters | |
| Dimensions | Height: 850 mm;<br>Length: 1000 mm;<br>Width: 500 mm | |

## DEVICE HOLDER

| | | |
|---|---|---|
| Construction | The device holder (Supporter) for Notebook is made by POM (polyoxymethylene resin ) , which is non-metal and non-conductive. The height can be adjusted to fit varies kind of notebooks. |  <br>Device Holder |

## 1.9 SAR System Verification

The microwave circuit arrangement for system verification is sketched in Fig. b. The daily system accuracy verification occurs within the flat section of the SAM phantom. A SAR measurement was performed to see if the measured SAR was within +/- 10% from the target SAR values. These tests were done at 835/1750/1900/2450/5200/5300/5600/ 5800MHz. The tests were conducted on the same days as the measurement of the DUT. The obtained results from the system accuracy verification are displayed in the table 1 (SAR values are normalized to 1W forward power delivered to the dipole). During the tests, the ambient temperature of the laboratory was 21.7°C, the relative humidity was 62% and the liquid depth above the ear reference points was ≥ 15 cm ± 5 mm (frequency ≤ 3 GHz) or ≥ 10 cm ± 5 mm (frequency > 3 G Hz) in all the cases. It is seen that the system is operating within its specification, as the results are within acceptable tolerance of the reference values.

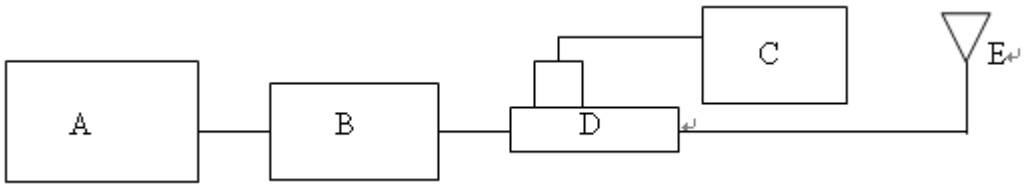



Fig. b The block diagram of system verification

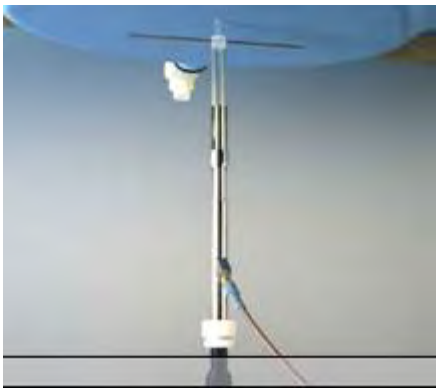
A. Signal generator

B. Amplifier

C. Power meter

D. Dual directional coupling

E. Reference dipole antenna



Photograph of the dipole Antenna

| Validation Kit | S/N | Frequency (MHz) | | Target SAR (1g) (Pin=250mW) (mW/g) | Measured SAR (1g)(mW/g) | Deviation (%) | Measured Date |
|---|---|---|---|---|---|---|---|
| D835V2 | 4d063 | 835 | Body | 2.41 | 2.45 | -1.66% | Nov. 24, 2014 |
| D1750V2 | 1008 | 1750 | Body | 9.44 | 9.06 | 4.03% | Nov. 25, 2014 |
| D1900V2 | 5d027 | 1900 | Body | 9.87 | 9.77 | 1.01% | Nov. 26, 2014 |
| D2450V2 | 727 | 2450 | Body | 12.8 | 12.1 | 5.47% | Dec. 5, 2014 |
| D5GHzV2 | 1023 | 5200 | Body | 7.39 | 7.76 | -5.01% | Dec. 6, 2014 |
| | | 5300 | Body | 7.62 | 7.39 | 3.02% | Dec. 7, 2014 |
| | | 5600 | Body | 8.04 | 8.45 | -5.10% | Dec. 8, 2014 |
| | | 5800 | Body | 7.44 | 7.36 | 1.08% | Dec. 10, 2014 |

Table 1. Results of system validation

## 1.10 Tissue Simulant Fluid for the Frequency Band

The dielectric properties for this body-simulant fluid were measured by using the Agilent Model 85070E Dielectric Probe (rates frequency band 200 MHz to 20 GHz) in conjunction with Network Analyzer (30 KHz-6000 MHz).

All dielectric parameters of tissue simulates were measured within 24 hours of SAR measurements. The depth of the tissue simulant in the flat section of the phantom was ≥ 15 cm ± 5 mm (Frequency ≤3G) or ≥ 10 cm ± 5 mm (Frequency >3G) during all tests. (Fig. 2)

| Tissue Type | Measurement Date | Measured Frequency (MHz) | Target Dielectric Constant, εr | Target Conductivity, σ (S/m) | Measured Dielectric Constant, εr | Measured Conductivity, σ (S/m) | % dev εr | % dev σ |
|---|---|---|---|---|---|---|---|---|
| Body | Nov. 24, 2014 | 824.2 | 55.242 | 0.969 | 53.002 | 0.997 | 4.06% | -2.87% |
| | | 826.4 | 55.234 | 0.969 | 52.991 | 0.998 | 4.06% | -2.99% |
| | | 835 | 55.2 | 0.97 | 52.823 | 0.999 | 4.31% | -2.99% |
| | | 836.6 | 55.195 | 0.972 | 52.75 | 1 | 4.43% | -2.88% |
| | | 846.6 | 55.164 | 0.984 | 52.619 | 1.008 | 4.61% | -2.44% |
| | | 848.8 | 55.158 | 0.987 | 52.576 | 1.011 | 4.68% | -2.43% |
| | Nov. 25, 2014 | 1712.4 | 53.531 | 1.465 | 55.156 | 1.428 | -3.04% | 2.53% |
| | | 1732.4 | 53.478 | 1.477 | 54.958 | 1.43 | -2.77% | 3.18% |
| | | 1750 | 55.432 | 1.488 | 54.916 | 1.445 | 0.93% | 2.89% |
| | | 1752.6 | 53.425 | 1.49 | 54.755 | 1.448 | -2.49% | 2.82% |
| | Nov. 26, 2014 | 1850.2 | 53.300 | 1.520 | 54.823 | 1.483 | -2.86% | 2.43% |
| | | 1852.4 | 53.300 | 1.520 | 54.734 | 1.489 | -2.69% | 2.04% |
| | | 1880 | 53.300 | 1.520 | 54.692 | 1.543 | -2.61% | -1.51% |
| | | 1900 | 53.300 | 1.520 | 54.591 | 1.57 | -2.42% | -3.29% |
| | | 1907.6 | 53.300 | 1.520 | 54.585 | 1.572 | -2.41% | -3.42% |
| | | 1909.8 | 53.300 | 1.520 | 54.582 | 1.586 | -2.41% | -4.34% |
| | Dec. 05, 2014 | 2412 | 52.751 | 1.914 | 53.618 | 1.94 | -1.64% | -1.36% |
| | | 2437 | 52.717 | 1.938 | 53.445 | 1.969 | -1.38% | -1.62% |
| | | 2450 | 52.700 | 1.950 | 53.416 | 1.997 | -1.36% | -2.41% |
| | | 2462 | 52.685 | 1.967 | 53.318 | 2.003 | -1.20% | -1.83% |

| Tissue Type | Measurement Date | Measured Frequency (MHz) | Target Dielectric Constant, εr | Target Conductivity, σ (S/m) | Measured Dielectric Constant, εr | Measured Conductivity, σ (S/m) | % dev εr | % dev σ |
|---|---|---|---|---|---|---|---|---|
| Body | Dec. 6, 2014 | 5200 | 49.014 | 5.299 | 47.940 | 5.215 | 2.19% | 1.59% |
| | | 5220 | 48.987 | 5.323 | 47.918 | 5.241 | 2.18% | 1.54% |
| | | 5230 | 48.974 | 5.334 | 47.874 | 5.248 | 2.25% | 1.61% |
| | Dec. 7, 2014 | 5260 | 48.933 | 5.369 | 47.837 | 5.293 | 2.24% | 1.42% |
| | | 5270 | 48.919 | 5.381 | 47.795 | 5.303 | 2.30% | 1.45% |
| | | 5300 | 48.879 | 5.416 | 47.700 | 5.388 | 2.41% | 0.52% |
| | | 5310 | 48.865 | 5.428 | 47.585 | 5.391 | 2.62% | 0.68% |
| | Dec. 8, 2014 | 5500 | 48.607 | 5.650 | 47.522 | 5.694 | 2.23% | -0.78% |
| | | 5510 | 48.594 | 5.661 | 47.492 | 5.713 | 2.27% | -0.91% |
| | | 5550 | 48.539 | 5.708 | 47.365 | 5.764 | 2.42% | -0.98% |
| | | 5580 | 48.499 | 5.743 | 47.316 | 5.830 | 2.44% | -1.51% |
| | | 5600 | 48.471 | 5.766 | 47.150 | 5.838 | 2.73% | -1.25% |
| | | 5670 | 48.376 | 5.848 | 47.031 | 5.948 | 2.78% | -1.71% |
| | | 5680 | 48.363 | 5.860 | 46.979 | 5.992 | 2.86% | -2.26% |
| | | 5700 | 48.336 | 5.883 | 46.921 | 6.017 | 2.93% | -2.28% |
| | Dec. 10, 2014 | 5745 | 48.275 | 5.936 | 46.551 | 6.112 | 3.57% | -2.96% |
| | | 5755 | 48.261 | 5.947 | 46.486 | 6.141 | 3.68% | -3.25% |
| | | 5765 | 48.248 | 5.959 | 46.397 | 6.172 | 3.84% | -3.57% |
| | | 5785 | 48.220 | 5.982 | 46.322 | 6.182 | 3.94% | -3.34% |
| | | 5795 | 48.207 | 5.994 | 46.273 | 6.200 | 4.01% | -3.43% |
| | | 5800 | 48.200 | 6.000 | 46.238 | 6.217 | 4.07% | -3.62% |
| | | 5805 | 48.193 | 6.006 | 46.217 | 6.236 | 4.10% | -3.83% |
| | | 5825 | 48.166 | 6.029 | 46.180 | 6.278 | 4.12% | -4.13% |

Table 2. Dielectric Parameters of Tissue Simulant Fluid

The composition of the body tissue simulating liquid:

| Frequency (MHz) | Mode | Ingredient | | | | | | Total amount |
|---|---|---|---|---|---|---|---|---|
| | | DGMBE | Water | Salt | Preventol D-7 | Cellulose | Sugar | |
| 850 | Body | — | 631.68 g | 11.72 g | 1.2 g | — | 600 g | 1.0L(Kg) |
| 1900 | Body | 300.67 g | 716.56 g | 4.0 g | — | — | — | 1.0L(Kg) |
| 2450 | Body | 301.7ml | 698.3ml | — | — | — | — | 1.0L(Kg) |

Simulating Liquids for 5 GHz, Manufactured by SPEAG:

| Ingredients | Water | Esters, Emulsifiers, Inhibitors | Sodium and Salt |
|---|---|---|---|
| (% by weight) | 60-80 | 20-40 | 0-1.5 |

Table 3. Recipes for Tissue Simulating Liquid

## 1.11 Evaluation Procedures

The entire evaluation of the spatial peak values is performed within the Post-processing engine (SEMCAD). The system always gives the maximum values for the 1 g and 10 g cubes. The algorithm to find the cube with highest averaged SAR is divided into the following stages:

1. The extraction of the measured data (grid and values) from the Zoom Scan.
2. The calculation of the SAR value at every measurement point based on all stored data (A/D values and measurement parameters)
3. The generation of a high-resolution mesh within the measured volume
4. The interpolation of all measured values from the measurement grid to the high-resolution grid
5. The extrapolation of the entire 3-D field distribution to the phantom surface over the distance from sensor to surface
6. The calculation of the averaged SAR within masses of 1g and 10g.

The probe is calibrated at the center of the dipole sensors that is located 1 to 2.7mm away from the probe tip. During measurements, the probe stops shortly above the phantom surface, depending on the probe and the surface detecting system. Both distances are included as parameters in the probe configuration file. The software always knows exactly how far away the measured point is from the surface. As the probe cannot directly measure at the surface, the values between the deepest measured point and the surface must be extrapolated. The angle between the probe axis and the surface normal line is less than 30 degree.

In the Area Scan, the gradient of the interpolation function is evaluated to find all the extreme of the SAR distribution. The uncertainty on the locations of the extreme is less than 1/20 of the grid size. Only local maximum within –2 dB of the global maximum are searched and passed for the Cube Scan measurement. In the Cube Scan, the interpolation function is used to extrapolate the Peak SAR from the lowest measurement points to the inner phantom surface (the extrapolation distance). The uncertainty increases with the extrapolation distance. To keep the uncertainty within 1% for the 1 g and 10 g cubes, the extrapolation distance should not be larger than 5mm.

The maximum search is automatically performed after each area scan measurement. It is based on splines in two or three dimensions. The procedure can find the maximum for most SAR distributions even with relatively large grid spacing. After the area scanning measurement, the probe is automatically moved to a position at the interpolated maximum. The following scan can directly use this position for reference, e.g., for a finer resolution grid or the cube evaluations. The 1g and 10g peak evaluations are only available for the predefined cube 7x7x7 scans. The routines are verified and optimized for the grid dimensions used in these cube measurements.

The measured volume of 30x30x30mm contains about 30g of tissue.

The first procedure is an extrapolation (incl. Boundary correction) to get the points between the lowest measured plane and the surface. The next step uses 3D interpolation to get all points within the measured volume. In the last step, a 1g cube is placed numerically into the volume and its averaged SAR is calculated. This cube is the moved around until the highest averaged SAR is found. If the highest SAR is found at the edge of the measured volume, the system will issue a warning: higher SAR values might be found outside of the measured volume. In that case the cube measurement can be repeated, using the new interpolated maximum as the center.

## 1.12 Probe Calibration Procedures

For the calibration of E-field probes in lossy liquids, an electric field with an accurately known field strength must be produced within the measured liquid. For standardization purposes it would be desirable if all measurements which are necessary to assess the correct field strength would be traceable to standardized measurement procedures. In the following two different calibration techniques are summarized:

### 1.12.1 Transfer Calibration with Temperature Probes

In lossy liquids the specific absorption rate (SAR) is related both to the electric field ($E$) and the temperature gradient ($\delta T / \delta t$) in the liquid.

$$SAR = \frac{\sigma}{\rho}|E|^2 = c\frac{\delta T}{\delta t}$$

whereby σ is the conductivity, ρ the density and c the heat capacity of the liquid.

Hence, the electric field in lossy liquid can be measured indirectly by measuring the temperature gradient in the liquid. Non-disturbing temperature probes (optical probes or thermistor probes with resistive lines) with high spatial resolution (<1-2 mm) and fast reaction time (<1 s) are available and can be easily calibrated with high precision [1]. The setup and the exciting source have no influence on the calibration; only the relative positioning uncertainties of the standard temperature probe and the E-field probe to be calibrated must be considered. However, several problems limit the available accuracy of probe calibrations with temperature probes:

- The temperature gradient is not directly measurable but must be evaluated from temperature measurements at different time steps. Special precaution is necessary to avoid measurement errors caused by temperature gradients due to energy equalizing effects or convection currents in the liquid. Such effects cannot be completely avoided, as the measured field itself destroys the thermal equilibrium in the liquid. With a careful setup these errors can be kept small.

- The measured volume around the temperature probe is not well defined. It is difficult to calculate the energy transfer from a surrounding gradient temperature field into the probe. These effects must be considered, since temperature probes are calibrated in liquid with homogeneous temperatures. There is no traceable standard for temperature rise measurements.
- The calibration depends on the assessment of the specific density, the heat capacity and the conductivity of the medium. While the specific density and heat capacity can be measured accurately with standardized procedures (~ 2% for c; much better for ρ) , there is no standard for the measurement of the conductivity. Depending on the method and liquid, the error can well exceed ±5%.
- Temperature rise measurements are not very sensitive and therefore are often performed at a higher power level than the E-field measurements. The nonlinearities in the system (e.g., power measurements, different components, etc.) must be considered.

Considering these problems, the possible accuracy of the calibration of E-field probes with temperature gradient measurements in a carefully designed setup is about ±10% (RSS) [2]. Recently, a setup which is a combination of the waveguide techniques and the thermal measurements was presented in [3]. The estimated uncertainty of the setup is ±5% (RSS) when the same liquid is used for the calibration and for actual measurements and ±7-9% (RSS) when not, which is in good agreement with the estimates given in [2].

### 1.12.2 Calibration with Analytical Fields

In this method a technical setup is used in which the field can be calculated analytically from measurements of other physical magnitudes (e.g., input power). This corresponds to the standard field method for probe calibration in air; however, there is no standard defined for fields in lossy liquids.

When using calculated fields in lossy liquids for probe calibration, several points must be considered in the assessment of the uncertainty:

- The setup must enable accurate determination of the incident power.
- The accuracy of the calculated field strength will depend on the assessment of the dielectric parameters of the liquid.
- Due to the small wavelength in liquids with high permittivity, even small setups might be above the resonant cutoff frequencies. The field distribution in the setup must be carefully checked for conformity with the theoretical field distribution.

## References

[1] N. Kuster, Q. Balzano, and J.C. Lin, Eds., *Mobile Communications Safety*, Chapman & Hall, London, 1997.

[2] K. Meier, M. Burkhardt, T. Schmid, and N. Kuster, \Broadband calibration of E-field probes in lossy media", *IEEE Transactions on Microwave Theory and Techniques*, vol. 44, no. 10, pp. 1954{1962, Oct. 1996.

[3] K. Jokela, P. Hyysalo, and L. Puranen, \Calibration of specific absorption rate (SAR) probes in waveguide at 900 MHz", *IEEE Transactions on Instrumentation and Measurements*, vol. 47, no. 2, pp. 432{438, Apr. 1998.

## 1.13 Test Standards and Limits

According to FCC 47CFR §2.1093(d) The limits to be used for evaluation are based generally on criteria published by the American National Standards Institute (ANSI) for localized specific absorption rate ("SAR") in Section 4.2 of "IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz," ANSI/IEEE C95.1–1992, Copyright 1992 by the Institute of Electrical and Electronics Engineers, Inc., New York, New York 10017. These criteria for SAR evaluation are similar to those recommended by the National Council on Radiation Protection and Measurements (NCRP) in "Biological Effects and Exposure Criteria for Radio frequency Electromagnetic Fields," NCRP Report No. 86, Section 17.4.5. Copyright NCRP, 1986, Bethesda, Maryland 20814. SAR is a measure of the rate of energy absorption due to exposure to an RF transmitting source. SAR values have been related to threshold levels for potential biological hazards. The criteria to be used are specified in paragraphs (d)(1) and (d)(2) of this section and shall apply for portable devices transmitting in the frequency range from 100 kHz to 6 GHz. Portable devices that transmit at frequencies above 6 GHz are to be evaluated in terms of the MPE limits specified in § 1.1310 of this chapter. Measurements and calculations to demonstrate compliance with MPE field strength or power density limits for devices operating above 6 GHz should be made at a minimum distance of 5 cm from the radiating source.

(1) Limits for Occupational/Controlled exposure: 0.4 W/kg as averaged over the whole-body and spatial peak SAR not exceeding 8 W/kg as averaged over any 1 gram of tissue (defined as a tissue volume in the shape of a cube). Exceptions are the hands, wrists, feet and ankles where the spatial peak SAR shall not exceed 20 W/kg, as averaged over an 10 grams of tissue (defined as a tissue volume in the shape of a cube).

(2) Occupational/Controlled limits apply when persons are exposed as a consequence of their employment provided these persons are fully aware of and exercise control over their exposure. Awareness of exposure can be accomplished by use of warning labels or by specific training or education through appropriate means, such as an RF safety program in a work environment.

(3) Limits for General Population/Uncontrolled exposure: 0.08 W/kg as averaged over the whole-body and spatial peak SAR not exceeding 1.6 W/kg as averaged over any 1 gram of tissue (defined as a tissue volume in the shape of a cube). Exceptions are the hands, wrists, feet and ankles where the spatial peak SAR shall not exceed 4 W/kg, as averaged over any 10 grams of tissue (defined as a tissue volume in the shape of a cube). General Population/Uncontrolled limits apply when the general public may be exposed, or when persons that are exposed as a consequence of their employment may not be fully aware of the potential for exposure or do not exercise control over their exposure. Warning labels placed on consumer devices such as cellular telephones will not be sufficient reason to allow these devices to be evaluated subject to limits for occupational/controlled exposure in paragraph (d)(1)

of this section. (Table 4.)

| Human Exposure | Uncontrolled Environment General Population | Controlled Environment Occupational |
|---|---|---|
| Spatial Peak SAR (Brain) | 1.60 m W/g | 8.00 m W/g |
| Spatial Average SAR (Whole Body) | 0.08 m W/g | 0.40 m W/g |
| Spatial Peak SAR (Hands/Feet/Ankle/Wrist) | 4.00 m W/g | 20.00 m W/g |

Table 4. RF exposure limits

Notes:
1. Uncontrolled environments are defined as locations where there is potential exposure of individuals who have no knowledge or control of their potential exposure.
2. Controlled environments are defined as locations where there is potential exposure of individuals who have knowledge of their potential exposure and can exercise control over their exposure.

# 2. Summary of Results

## GPRS 850 MHz (without power reduction)

| Mode | Position | Distance (mm) | CH | Freq. (MHz) | Max. Rated Avg. Power + Max. Tolerance (dBm) | Measured Avg. Power (dBm) | Scaling | Averaged SAR over 1g (W/kg) | | Plot page |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | Measured | Reported | |
| GPRS (1D3UP) | Back side | 26mm | 190 | 836.6 | 29.5 | 28.2 | 34.90% | 0.197 | 0.266 | - |
| | Bottom side | 10mm | 128 | 824.2 | 29.5 | 28 | 41.25% | 0.528 | 0.746 | - |
| | Bottom side | 10mm | 190 | 836.6 | 29.5 | 28.2 | 34.90% | 0.608 | 0.820 | - |
| | Bottom side | 10mm | 251 | 848.8 | 29.5 | 28.2 | 34.90% | 0.619 | 0.835 | - |
| | Left side | 0mm | 190 | 836.6 | 29.5 | 28.2 | 34.90% | 0.169 | 0.228 | - |
| | Right side | 0mm | 190 | 836.6 | 29.5 | 28.2 | 34.90% | 0.503 | 0.679 | - |

## GPRS 850 MHz (with power reduction)

| Mode | Position | Distance (mm) | CH | Freq. (MHz) | Max. Rated Avg. Power + Max. Tolerance (dBm) | Measured Avg. Power (dBm) | Scaling | Averaged SAR over 1g (W/kg) | | Plot page |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | Measured | Reported | |
| GPRS (1D4UP) | Back side | 0mm | 128 | 824.2 | 21.5 | 20.1 | 38.04% | 0.599 | 0.827 | - |
| | Back side | 0mm | 190 | 836.6 | 21.5 | 20.2 | 34.90% | 0.63 | 0.850 | - |
| | Back side | 0mm | 251 | 848.8 | 21.5 | 20.3 | 31.83% | 0.659 | 0.869 | 97 |
| | Bottom side | 0mm | 251 | 848.8 | 21.5 | 20.3 | 31.83% | 0.401 | 0.529 | - |

## GPRS 1900 MHz (without power reduction)

| Mode | Position | Distance (mm) | CH | Freq. (MHz) | Max. Rated Avg. Power + Max. Tolerance (dBm) | Measured Avg. Power (dBm) | Scaling | Averaged SAR over 1g (W/kg) | | Plot page |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | Measured | Reported | |
| GPRS (1Dn3UP) | Back side | 26mm | 512 | 1850.2 | 26.5 | 25.5 | 25.89% | 0.078 | 0.098 | - |
| | Bottom side | 10mm | 512 | 1850.2 | 26.5 | 25.5 | 25.89% | 0.206 | 0.259 | - |
| | Left side | 0mm | 512 | 1850.2 | 26.5 | 25.5 | 25.89% | 0.267 | 0.336 | 98 |
| | Left side | 0mm | 661 | 1880 | 26.5 | 25.4 | 28.82% | 0.2 | 0.258 | - |
| | Left side | 0mm | 810 | 1909.8 | 26.5 | 25.4 | 28.82% | 0.164 | 0.211 | - |
| | Right side | 0mm | 512 | 1850.2 | 26.5 | 25.5 | 25.89% | 0.03 | 0.038 | - |

## GPRS 1900 MHz (with power reduction)

| Mode | Position | Distance (mm) | CH | Freq. (MHz) | Max. Rated Avg. Power + Max. Tolerance (dBm) | Measured Avg. Power (dBm) | Scaling | Averaged SAR over 1g (W/kg) | | Plot page |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | Measured | Reported | |
| GPRS (1Dn2UP) | Back side | 0mm | 512 | 1850.2 | 19 | 17.8 | 31.83% | 0.25 | 0.330 | - |
| | Bottom side | 0mm | 512 | 1850.2 | 19 | 17.8 | 31.83% | 0.104 | 0.137 | - |

## WCDMA Band II (without power reduction)

| Mode | Position | Distance (mm) | CH | Freq. (MHz) | Max. Rated Avg. Power + Max. Tolerance (dBm) | Measured Avg. Power (dBm) | Scaling | Averaged SAR over 1g (W/kg) | | Plot page |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | Measured | Reported | |
| WCDMA Band II | Back side | 26mm | 9538 | 1907.6 | 24.5 | 23.17 | 35.83% | 0.175 | 0.238 | - |
| | Bottom side | 10mm | 9538 | 1907.6 | 24.5 | 23.17 | 35.83% | 0.442 | 0.600 | - |
| | Left side | 0mm | 9538 | 1907.6 | 24.5 | 23.17 | 35.83% | 0.374 | 0.508 | - |
| | Right side | 0mm | 9538 | 1907.6 | 24.5 | 23.17 | 35.83% | 0.164 | 0.223 | - |

## WCDMA Band II (with power reduction)

| Mode | Position | Distance (mm) | CH | Freq. (MHz) | Max. Rated Avg. Power + Max. Tolerance (dBm) | Measured Avg. Power (dBm) | Scaling | Averaged SAR over 1g (W/kg) | | Plot page |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | Measured | Reported | |
| WCDMA Band II | Back side | 0mm | 9262 | 1852.4 | 16 | 15.61 | 9.40% | 0.759 | 0.830 | - |
| | Back side | 0mm | 9400 | 1880 | 16 | 15.67 | 7.89% | 0.969 | 1.045 | 99 |
| | Back side | 0mm | 9538 | 1907.6 | 16 | 15.60 | 9.65% | 0.9 | 0.987 | - |
| | Back side* | 0mm | 9400 | 1880 | 16 | 15.67 | 7.89% | 0.968 | 1.044 | - |
| | Bottom side | 0mm | 9400 | 1880 | 16 | 15.67 | 7.89% | 0.363 | 0.392 | - |

* - repeated at the highest SAR measurement according to the KDB 865664 D01

## WCDMA Band IV (without power reduction)

| Mode | Position | Distance (mm) | CH | Freq. (MHz) | Max. Rated Avg. Power + Max. Tolerance (dBm) | Measured Avg. Power (dBm) | Scaling | Averaged SAR over 1g (W/kg) | | Plot page |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | Measured | Reported | |
| WCDMA Band IV | Back side | 26mm | 1312 | 1712.4 | 24.5 | 23.48 | 26.47% | 0.149 | 0.188 | - |
| | Bottom side | 10mm | 1312 | 1712.4 | 24.5 | 23.48 | 26.47% | 0.337 | 0.426 | - |
| | Left side | 0mm | 1312 | 1712.4 | 24.5 | 23.48 | 26.47% | 0.316 | 0.400 | - |
| | Right side | 0mm | 1312 | 1712.4 | 24.5 | 23.48 | 26.47% | 0.121 | 0.153 | - |

## WCDMA Band IV (with power reduction)

| Mode | Position | Distance (mm) | CH | Freq. (MHz) | Max. Rated Avg. Power + Max. Tolerance (dBm) | Measured Avg. Power (dBm) | Scaling | Averaged SAR over 1g (W/kg) | | Plot page |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | Measured | Reported | |
| WCDMA Band IV | Back side | 0mm | 1312 | 1712.4 | 17 | 16.76 | 5.68% | 0.848 | 0.896 | - |
| | Back side | 0mm | 1412 | 1732.4 | 17 | 16.71 | 6.91% | 0.769 | 0.822 | - |
| | Back side | 0mm | 1513 | 1752.6 | 17 | 16.51 | 11.94% | 0.776 | 0.869 | - |
| | Back side* | 0mm | 1312 | 1712.4 | 17 | 16.76 | 5.68% | 0.861 | 0.910 | 100 |
| | Bottom side | 0mm | 1312 | 1712.4 | 17 | 16.76 | 5.68% | 0.295 | 0.312 | - |

* - repeated at the highest SAR measurement according to the KDB 865664 D01

## WCDMA Band V (without power reduction)

| Mode | Position | Distance (mm) | CH | Freq. (MHz) | Max. Rated Avg. Power + Max. Tolerance (dBm) | Measured Avg. Power (dBm) | Scaling | Averaged SAR over 1g (W/kg) | | Plot page |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | Measured | Reported | |
| WCDMA Band V | Back side | 26mm | 4183 | 836.6 | 24.5 | 22.80 | 47.91% | 0.16 | 0.237 | - |
| | Bottom side | 10mm | 4132 | 826.4 | 24.5 | 22.75 | 49.62% | 0.523 | 0.783 | - |
| | Bottom side | 10mm | 4183 | 836.6 | 24.5 | 22.80 | 47.91% | 0.545 | 0.806 | - |
| | Bottom side | 10mm | 4233 | 846.6 | 24.5 | 22.68 | 52.05% | 0.537 | 0.817 | - |
| | Left side | 0mm | 4183 | 836.6 | 24.5 | 22.80 | 47.91% | 0.129 | 0.191 | - |
| | Right side | 0mm | 4183 | 836.6 | 24.5 | 22.80 | 47.91% | 0.278 | 0.411 | - |

## WCDMA Band V (with power reduction)

| Mode | Position | Distance (mm) | CH | Freq. (MHz) | Max. Rated Avg. Power + Max. Tolerance (dBm) | Measured Avg. Power (dBm) | Scaling | Averaged SAR over 1g (W/kg) | | Plot page |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | Measured | Reported | |
| WCDMA Band V | Back side | 0mm | 4132 | 826.4 | 19 | 18.20 | 20.23% | 0.996 | 1.197 | - |
| | Back side | 0mm | 4183 | 836.6 | 19 | 18.33 | 16.68% | 1.04 | 1.213 | 101 |
| | Back side | 0mm | 4233 | 846.6 | 19 | 18.20 | 20.23% | 1 | 1.202 | - |
| | Back side* | 0mm | 4183 | 836.6 | 19 | 18.33 | 16.68% | 1 | 1.167 | - |
| | Bottom side | 0mm | 4183 | 836.6 | 19 | 18.33 | 16.68% | 0.616 | 0.719 | - |

* - repeated at the highest SAR measurement according to the KDB 865664 D01

## WLAN802.11

| Antenna | Mode | Position | Distance (mm) | CH | Freq. (MHz) | Max. Rated Avg. Power + Max. Tolerance (dBm) | Measured Avg. Power (dBm) | Scaling | Averaged SAR over 1g (W/kg) | | Plot page |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | Measured | Reported | |
| Main | WLAN802.11 b | Back side | - | 6 | 2437 | 17.00 | 16.96 | 0.93% | 0.725 | 0.732 | - |
| | | Top side | - | 1 | 2412 | 17.00 | 16.91 | 2.09% | 1.03 | 1.052 | 102 |
| | | Top side | - | 6 | 2437 | 17.00 | 16.96 | 0.93% | 0.952 | 0.961 | - |
| | | Top side | - | 11 | 2462 | 17.00 | 16.71 | 6.91% | 0.883 | 0.944 | - |
| | | Top side* | - | 1 | 2412 | 17.00 | 16.91 | 2.09% | 0.965 | 0.985 | - |
| | | Left side | - | 6 | 2437 | 17.00 | 16.96 | 0.93% | 0.069 | 0.070 | - |
| | | Right side | - | 6 | 2437 | 17.00 | 16.96 | 0.93% | 0.041 | 0.041 | - |
| | | Bottom side | - | 6 | 2437 | 17.00 | 16.96 | 0.93% | 0.016 | 0.016 | - |
| | WLAN802.11 n (20M) | Top side | - | 6 | 2437 | 15.50 | 15.39 | 2.57% | 0.679 | 0.696 | 103 |
| | WLAN802.11 a 5.2G | Back side | - | 40 | 5200 | 12.50 | 12.39 | 2.57% | 1.27 | 1.303 | 104 |
| | | Back side | - | 44 | 5220 | 12.50 | 12.29 | 4.95% | 1.26 | 1.322 | - |
| | | Back side* | - | 40 | 5200 | 12.50 | 12.39 | 2.57% | 1.22 | 1.251 | - |
| | | Top side | - | 40 | 5200 | 12.50 | 12.39 | 2.57% | 0.213 | 0.218 | - |
| | | Left side | - | 40 | 5200 | 12.50 | 12.39 | 2.57% | 0.042 | 0.043 | - |
| | | Right side | - | 40 | 5200 | 12.50 | 12.39 | 2.57% | 0.014 | 0.014 | - |
| | | Bottom side | - | 40 | 5200 | 12.50 | 12.39 | 2.57% | 0.0059 | 0.006 | - |
| | WLAN802.11 n(40M) 5.2G | Back side | - | 38 | 5190 | 12.00 | 11.94 | 1.39% | 1.12 | 1.136 | - |
| | | Back side | - | 46 | 5230 | 12.00 | 11.83 | 3.99% | 1.13 | 1.175 | 105 |
| | WLAN802.11 a 5.3G | Back side | - | 52 | 5260 | 12.50 | 12.45 | 1.16% | 1.4 | 1.416 | - |
| | | Back side | - | 60 | 5300 | 12.50 | 12.41 | 2.09% | 1.4 | 1.429 | 106 |
| | | Back side* | - | 60 | 5300 | 12.50 | 12.41 | 2.09% | 1.38 | 1.409 | - |
| | | Top side | - | 52 | 5260 | 12.50 | 12.45 | 1.16% | 0.314 | 0.318 | - |
| | | Left side | - | 52 | 5260 | 12.50 | 12.45 | 1.16% | 0.04 | 0.040 | - |
| | | Right side | - | 52 | 5260 | 12.50 | 12.45 | 1.16% | 0.0112 | 0.011 | - |
| | | Bottom side | - | 52 | 5260 | 12.50 | 12.45 | 1.16% | 0.00232 | 0.002 | - |
| | WLAN802.11 n(40M) 5.3G | Back side | - | 54 | 5270 | 12.00 | 11.91 | 2.09% | 1.23 | 1.256 | - |
| | | Back side | - | 62 | 5310 | 12.00 | 11.75 | 5.93% | 1.33 | 1.409 | 107 |
| | WLAN802.11 a 5.6G | Back side | - | 100 | 5500 | 13.00 | 12.31 | 17.22% | 1.31 | 1.536 | 108 |
| | | Back side | - | 116 | 5580 | 13.00 | 12.42 | 14.29% | 1.31 | 1.497 | - |
| | | Back side | - | 140 | 5700 | 13.00 | 12.31 | 17.22% | 0.945 | 1.108 | - |
| | | Back side* | - | 116 | 5580 | 13.00 | 12.42 | 14.29% | 1.27 | 1.451 | - |
| | | Top side | - | 116 | 5580 | 13.00 | 12.42 | 14.29% | 0.198 | 0.226 | - |
| | | Left side | - | 116 | 5580 | 13.00 | 12.42 | 14.29% | 0.071 | 0.081 | - |
| | | Right side | - | 116 | 5580 | 13.00 | 12.42 | 14.29% | 0.0117 | 0.013 | - |
| | | Bottom side | - | 116 | 5580 | 13.00 | 12.42 | 14.29% | 0.00263 | 0.003 | - |
| | WLAN802.11 n(40M) 5.6G | Back side | - | 102 | 5510 | 12.00 | 11.84 | 3.75% | 1.24 | 1.287 | 109 |
| | | Back side | - | 110 | 5550 | 12.00 | 11.97 | 0.69% | 1.16 | 1.168 | - |
| | | Back side | - | 134 | 5670 | 12.00 | 11.92 | 1.86% | 1.02 | 1.039 | - |

* - repeated at the highest SAR measurement according to the KDB 865664 D01

| Antenna | Mode | Position | Distance (mm) | CH | Freq. (MHz) | Max. Rated Avg. Power + Max. Tolerance (dBm) | Measured Avg. Power (dBm) | Scaling | Averaged SAR over 1g (W/kg) | | Plot page |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | Measured | Reported | |
| Main | WLAN802.11 a 5.8G | Back side | - | 149 | 5745 | 13.50 | 12.29 | 32.13% | 0.955 | 1.262 | - |
| | | Back side | - | 157 | 5785 | 13.50 | 12.45 | 27.35% | 1.09 | 1.388 | - |
| | | Back side | - | 165 | 5825 | 13.50 | 12.42 | 28.23% | 1.17 | 1.500 | - |
| | | Back side* | - | 165 | 5825 | 13.50 | 12.42 | 28.23% | 1.18 | 1.513 | 110 |
| | | Top side | - | 157 | 5785 | 13.50 | 12.45 | 27.35% | 0.184 | 0.234 | - |
| | | Left side | - | 157 | 5785 | 13.50 | 12.45 | 27.35% | 0.052 | 0.066 | - |
| | | Right side | - | 157 | 5785 | 13.50 | 12.45 | 27.35% | 0.0124 | 0.016 | - |
| | | Bottom side | - | 157 | 5785 | 13.50 | 12.45 | 27.35% | 0.00318 | 0.004 | - |
| | WLAN802.11 n(40M) 5.8G | Back side | - | 151 | 5755 | 12.00 | 11.85 | 3.51% | 0.919 | 0.951 | - |
| | | Back side | - | 159 | 5795 | 12.00 | 11.73 | 6.41% | 0.951 | 1.012 | 111 |

* - repeated at the highest SAR measurement according to the KDB 865664 D01

| Antenna | Mode | Position | Distance (mm) | CH | Freq. (MHz) | Max. Rated Avg. Power + Max. Tolerance (dBm) | Measured Avg. Power (dBm) | Scaling | Averaged SAR over 1g (W/kg) | | Plot page |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | Measured | Reported | |
| Aux | WLAN802.11 b | Back side | - | 1 | 2412 | 17.00 | 16.88 | 2.80% | 1.15 | 1.182 | - |
| | | Back side | - | 6 | 2437 | 17.00 | 16.93 | 1.62% | 1.12 | 1.138 | - |
| | | Back side | - | 11 | 2462 | 17.00 | 16.91 | 2.09% | 1.23 | 1.256 | - |
| | | Back side* | - | 11 | 2462 | 17.00 | 16.91 | 2.09% | 1.28 | 1.307 | 112 |
| | | Top side | - | 6 | 2437 | 17.00 | 16.93 | 1.62% | 0.088 | 0.089 | - |
| | | Right side | - | 6 | 2437 | 17.00 | 16.93 | 1.62% | 0.542 | 0.551 | - |
| | | Bottom side | - | 6 | 2437 | 17.00 | 16.93 | 1.62% | 0.027 | 0.027 | - |
| | WLAN802.11 n (20M) | Back side | - | 1 | 2412 | 15.50 | 15.48 | 0.46% | 0.763 | 0.767 | 113 |
| | WLAN802.11 a 5.2G | Back side | - | 40 | 5200 | 14.00 | 12.33 | 46.89% | 0.807 | 1.185 | - |
| | | Back side | - | 44 | 5220 | 14.00 | 12.35 | 46.22% | 0.863 | 1.262 | - |
| | | Back side* | - | 44 | 5220 | 14.00 | 12.35 | 46.22% | 0.871 | 1.274 | 114 |
| | | Top side | - | 44 | 5220 | 14.00 | 12.35 | 46.22% | 0.045 | 0.066 | - |
| | | Right side | - | 44 | 5220 | 14.00 | 12.35 | 46.22% | 0.403 | 0.589 | - |
| | | Bottom side | | 44 | 5220 | 14.00 | 12.35 | 46.22% | 0.014 | 0.020 | - |
| | WLAN802.11 n(40M) 5.2G | Back side | - | 38 | 5190 | 12.00 | 11.95 | 1.16% | 0.78 | 0.789 | 115 |
| | WLAN802.11 a 5.3G | Back side | - | 52 | 5260 | 14.00 | 12.29 | 48.25% | 0.852 | 1.263 | - |
| | | Back side | - | 60 | 5300 | 14.00 | 12.39 | 44.88% | 0.822 | 1.191 | - |
| | | Back side* | - | 52 | 5260 | 14.00 | 12.29 | 48.25% | 0.857 | 1.271 | 116 |
| | | Top side | - | 60 | 5300 | 14.00 | 12.39 | 44.88% | 0.00584 | 0.008 | - |
| | | Right side | - | 60 | 5300 | 14.00 | 12.39 | 44.88% | 0.552 | 0.800 | - |
| | | Bottom side | - | 60 | 5300 | 14.00 | 12.39 | 44.88% | 0.0737 | 0.107 | - |
| | WLAN802.11 n(40M) 5.3G | Back side | - | 54 | 5270 | 12.00 | 11.94 | 1.39% | 0.959 | 0.972 | 117 |
| | | Back side | - | 62 | 5310 | 12.00 | 11.84 | 3.75% | 0.872 | 0.905 | - |
| | WLAN802.11 a 5.6G | Back side | - | 100 | 5500 | 14.00 | 12.38 | 45.21% | 0.676 | 0.982 | - |
| | | Back side | - | 116 | 5580 | 14.00 | 12.49 | 41.58% | 0.677 | 0.958 | - |
| | | Back side | - | 136 | 5680 | 14.00 | 12.27 | 48.94% | 0.684 | 1.019 | 118 |
| | | Top side | - | 116 | 5580 | 14.00 | 12.49 | 41.58% | 0.0044 | 0.006 | - |
| | | Right side | - | 100 | 5500 | 14.00 | 12.38 | 45.21% | 0.392 | 0.569 | - |
| | | Right side | - | 116 | 5580 | 14.00 | 12.49 | 41.58% | 0.422 | 0.597 | - |
| | | Right side | - | 136 | 5680 | 14.00 | 12.27 | 48.94% | 0.47 | 0.700 | - |
| | | Bottom side | - | 116 | 5580 | 14.00 | 12.49 | 41.58% | 0.0239 | 0.034 | - |
| | WLAN802.11 n(40M) 5.6G | Back side | - | 102 | 5510 | 12.00 | 11.85 | 3.51% | 0.713 | 0.738 | - |
| | | Back side | - | 110 | 5550 | 12.00 | 11.75 | 5.93% | 0.687 | 0.728 | - |
| | | Back side | - | 134 | 5670 | 12.00 | 11.84 | 3.75% | 0.726 | 0.753 | 119 |

* - repeated at the highest SAR measurement according to the KDB 865664 D01

| Antenna | Mode | Position | Distance (mm) | CH | Freq. (MHz) | Max. Rated Avg. Power + Max. Tolerance (dBm) | Measured Avg. Power (dBm) | Scaling | Averaged SAR over 1g (W/kg) | | Plot page |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | Measured | Reported | |
| Aux | WLAN802.11 a 5.8G | Back side | - | 153 | 5765 | 12.50 | 12.33 | 3.99% | 0.528 | 0.549 | - |
| | | Back side | - | 157 | 5785 | 12.50 | 12.44 | 1.39% | 0.548 | 0.556 | - |
| | | Back side | - | 161 | 5805 | 12.50 | 12.36 | 3.28% | 0.608 | 0.628 | 120 |
| | | Top side | - | 157 | 5785 | 12.50 | 12.44 | 1.39% | 0.0148 | 0.015 | - |
| | | Right side | - | 157 | 5785 | 12.50 | 12.44 | 1.39% | 0.403 | 0.409 | - |
| | | Bottom side | - | 157 | 5785 | 12.50 | 12.44 | 1.39% | 0.00153 | 0.002 | - |
| | WLAN802.11 n(40M) 5.8G | Back side | - | 151 | 5755 | 12.00 | 11.94 | 1.39% | 0.58 | 0.588 | 121 |

* - repeated at the highest SAR measurement according to the KDB 865664 D01

# 3. Simultaneous Transmission Analysis

## Simultaneous Transmission Scenarios:

| Simultaneous Transmit Configurations | Body |
|---|---|
| GPRS850/1900 + 2.4GHz WLAN Main | Yes |
| GPRS850/1900 + 2.4GHz WLAN Aux | Yes |
| GPRS850/1900 + 2.4GHz WLAN MIMO | Yes |
| WCDMA B2/4/5 + 2.4GHz WLAN Main | Yes |
| WCDMA B2/4/5 + 2.4GHz WLAN Aux | Yes |
| WCDMA B2/4/5 + 2.4GHz WLAN MIMO | Yes |
| GPRS850/1900 + 5GHz WLAN Main | Yes |
| GPRS850/1900 + 5GHz WLAN Aux | Yes |
| GPRS850/1900 + 5GHz WLAN MIMO | Yes |
| WCDMA B2/4/5 + 5GHz WLAN Main | Yes |
| WCDMA B2/4/5 + 5GHz WLAN Aux | Yes |
| WCDMA B2/4/5 + 5GHz WLAN MIMO | Yes |
| GPRS850/1900 + BT | Yes |
| WCDMA B2/4/5 + BT | Yes |

Note:
1. WWAN and WLAN antennas may transmit simultaneously.
2. Bluetooth and WLAN technologies cannot transmit simultaneously.
3. For 2.4GHz WLAN Main and Aux antennas, the maximum output power for 802.11b is larger than that for 802.11n and the maximum output power of each antenna during simultaneous transmission for 802.11n is less than that used in standalone transmission for 802.11n, so it is more conservative to use the sum of 1-g SAR provision in KDB447498D01 for 802.11b to exclude the SAR measurement for 802.11n MIMO.
4. For 5GHz WLAN Main and Aux antennas, the maximum output power for 802.11a is larger than that for 802.11n, so it is more conservative to use the sum of 1-g SAR provision in KDB447498D01 for 802.11a to exclude the SAR measurement for 802.11n MIMO.

## 3.1 Estimated SAR calculation

According to KDB447498 D01v05 – When standalone SAR test exclusion applies to an antenna that transmits simultaneously with other antennas, the standalone SAR must be estimated according to following to determine simultaneous transmission SAR test exclusion:

$$\text{Estimated SAR} = \frac{\text{Max. tune up power(mW)}}{\text{Min. test separation distance(mm)}} \times \frac{\sqrt{f(\text{GHz})}}{7.5}$$

If the minimum test separation distance is < 5mm, a distance of 5mm is used for estimated SAR calculation. When the test separation distance is >50mm, the 0.4W/kg is used for SAR-1g.

| Mode / Band | frequency(GHz) | Max. tune-up power(dBm) | Test position | test separation distance(mm) | Estimated SAR(W/kg) |
|---|---|---|---|---|---|
| GPRS 850 (class 11) | 0.8488 | 29.5 | Top side | 193 | 0.4 |
| GPRS 1900 (class 11) | 1.9098 | 26.5 | Top side | 193 | 0.4 |
| WCDMA B2 | 1.9076 | 24.5 | Top side | 193 | 0.4 |
| WCDMA B4 | 1.7526 | 24.5 | Top side | 193 | 0.4 |
| WCDMA B5 | 0.8466 | 24.5 | Top side | 193 | 0.4 |
| WLAN(Aux) | 2.462 | 17 | Left | 127 | 0.4 |
| WLAN(Aux) | 5.825 | 14 | Left | 127 | 0.4 |

| Mode / Band | frequency(GHz) | Maximum power(dBm) | Test position | test separation distance(mm) | Estimated SAR(W/kg) |
|---|---|---|---|---|---|
| BT | 2.48 | 5.85 | Top/Back sides | 0 | 0.162 |
| BT | 2.48 | 5.85 | Left side | 16 | 0.05 |
| BT | 2.48 | 5.85 | Right / Bottom sides | Larger than 50 | 0.4 |

### 3.2 SPLSR evaluation and analysis

Per KDB447498D01, when the sum of SAR is larger than the limit, SAR test exclusion is determined by the SAR sum to peak location separation ratio(SPLSR).

The simultaneous transmitting antennas in each operating mode and exposure condition combination must be considered one pair at a time to determine the SAR to peak location separation ratio to qualify for test exclusion.

The ratio is determined by **(SAR1 + SAR2)^1.5/Ri**, rounded to two decimal digits, and must be **≤ 0.04** for all antenna pairs in the configuration to qualify for 1-g SAR test exclusion.

SAR1 and SAR2 are the highest reported or estimated SAR for each antenna in the pair, and Ri is the separation distance between the peak SAR locations for the antenna pair in mm.

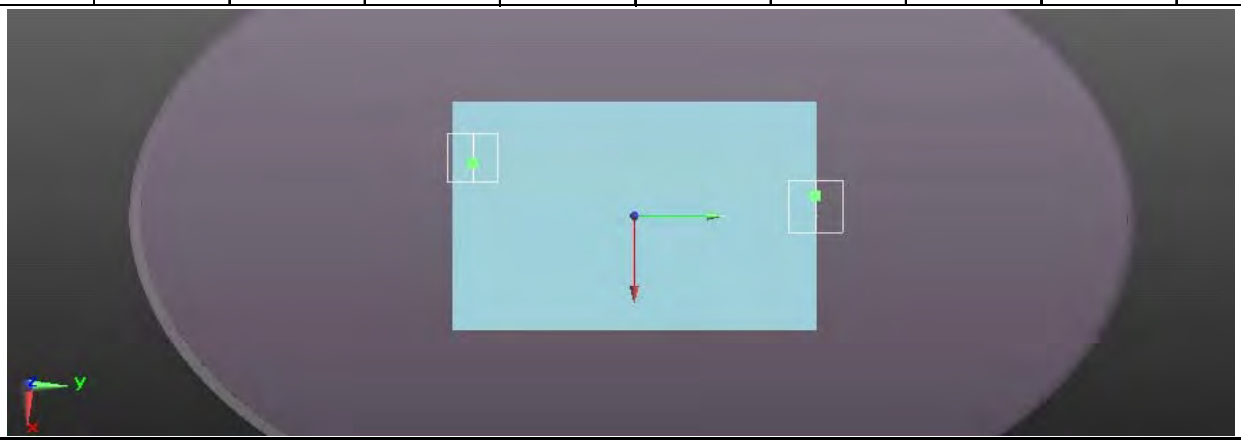
When standalone test exclusion applies, SAR is estimated; the peak location is assumed to be at the feed-point or geometric center of the antenna.

## GPRS 850 + 2.4GHz WLAN MIMO

| No. | Conditions | Position | Distance (mm) | Max. GPRS850 | Max. WLAN Main | Max. WLAN Aux | SAR Sum | SPLSR GPRS850 & WLAN Main | SPLSR GPRS850 & WLAN Aux | SPLSR WLAN Main & WLAN Aux |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | GPRS850 + 2.4GHz WLAN MIMO | Back side | 0 | 0.869 | 0.732 | 1.307 | **2.908** | Analyzed as below | Analyzed as below | Analyzed as below |
| | | Back side | 26 | 0.266 | - | - | 0.266 | ΣSAR<1.6, Not required | ΣSAR<1.6, Not required | ΣSAR<1.6, Not required |
| | | Top side | 0 | 0.4 (Estimated SAR) | 1.052 | 0.089 | 1.541 | ΣSAR<1.6, Not required | ΣSAR<1.6, Not required | ΣSAR<1.6, Not required |
| | | Left side | 0 | 0.679 | 0.07 | 0.4 (Estimated SAR) | 1.149 | ΣSAR<1.6, Not required | ΣSAR<1.6, Not required | ΣSAR<1.6, Not required |
| | | Right side | 0 | 0.228 | 0.041 | 0.551 | 0.82 | ΣSAR<1.6, Not required | ΣSAR<1.6, Not required | ΣSAR<1.6, Not required |
| | | Bottom side | 0 | 0.529 | 0.016 | 0.027 | 0.572 | ΣSAR<1.6, Not required | ΣSAR<1.6, Not required | ΣSAR<1.6, Not required |
| | | Bottom side | 10 | 0.835 | - | - | 0.835 | ΣSAR<1.6, Not required | ΣSAR<1.6, Not required | ΣSAR<1.6, Not required |

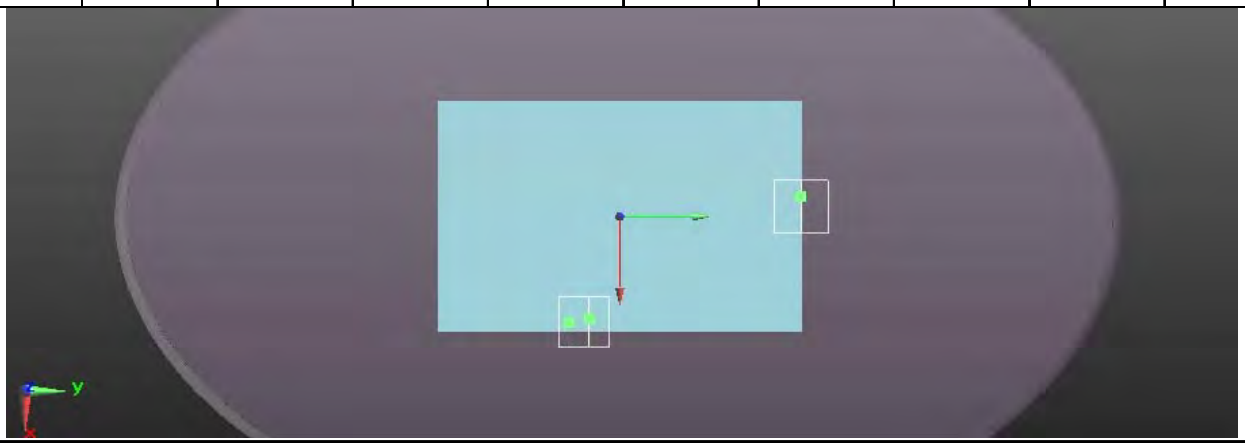
### SPLSR GPRS850 & WLAN Main

| Conditions | Position | SAR Value (W/kg) | Coordinates (cm) | | | ΣSAR (W/kg) | Peak Location Separation Distance (mm) | SPLSR | Simultaneous Transmission SAR Test |
|---|---|---|---|---|---|---|---|---|---|
| | | | x | y | z | | | | |
| GPRS850 CH 251 | Back side | 0.869 | -1.24 | 10.75 | 0.37 | 1.601 | 204.1 | 0.010 | SPLSR<0.04, Not required |
| 802.11b CH 6 | | 0.732 | -3.28 | -9.56 | 0.45 | | | | |



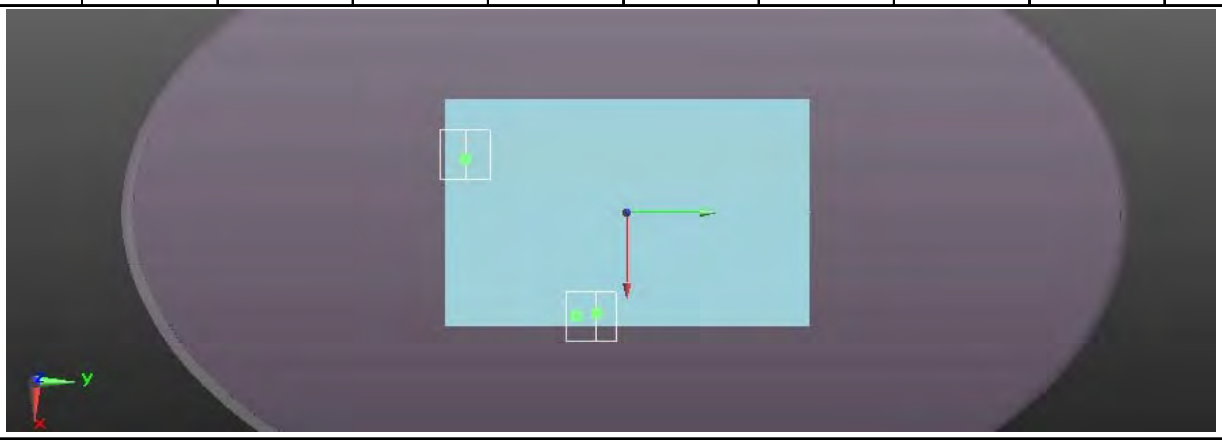
## SPLSR GPRS850 & WLAN Aux

| Conditions | Position | SAR Value (W/kg) | Coordinates (cm) | | | ΣSAR (W/kg) | Peak Location Separation Distance (mm) | SPLSR | Simultaneous Transmission SAR Test |
|---|---|---|---|---|---|---|---|---|---|
| | | | x | y | z | | | | |
| GPRS850 CH 251 | Back side | 0.869 | -1.24 | 10.75 | 0.37 | 2.176 | 145.8 | 0.022 | SPLSR<0.04, Not required |
| 802.11b CH 11 | | 1.307 | 6.18 | -1.8 | 0.6 | | | | |



## SPLSR WLAN Main & WLAN Aux

| Conditions | Position | SAR Value (W/kg) | Coordinates (cm) | | | ΣSAR (W/kg) | Peak Location Separation Distance (mm) | SPLSR | Simultaneous Transmission SAR Test |
|---|---|---|---|---|---|---|---|---|---|
| | | | x | y | z | | | | |
| 802.11b CH 6 | Back side | 0.732 | -3.28 | -9.56 | 0.45 | 2.039 | 122.4 | 0.024 | SPLSR<0.04, Not required |
| 802.11b CH 11 | | 1.307 | 6.18 | -1.8 | 0.6 | | | | |

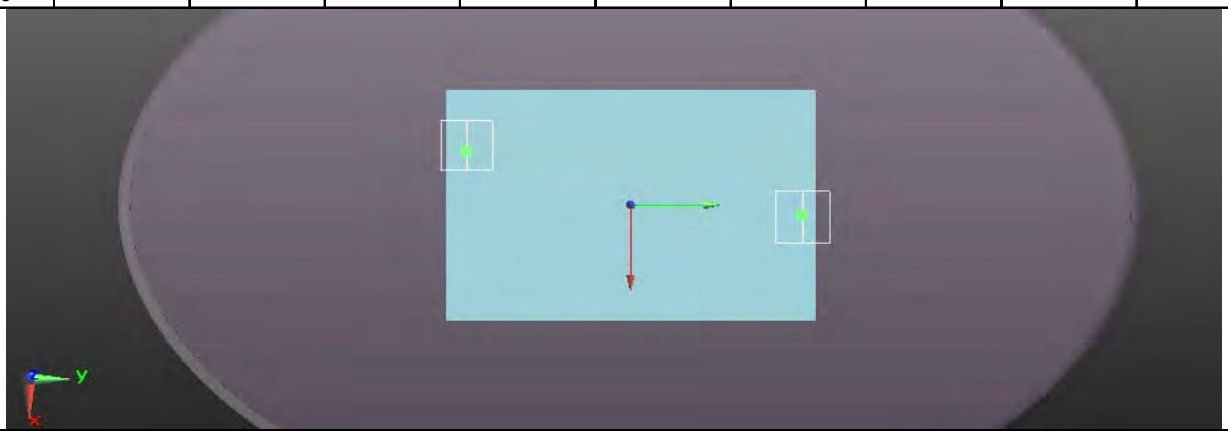


## GPRS 1900 + 2.4GHz WLAN MIMO

| No. | Conditions | Position | Distance (mm) | Max. GPRS1900 | Max. WLAN Main | Max. WLAN Aux | SAR Sum | SPLSR GPRS1900 & WLAN Main | SPLSR GPRS1900 & WLAN Aux | SPLSR WLAN Main & WLAN Aux |
|---|---|---|---|---|---|---|---|---|---|---|
| 2 | GPRS1900 + 2.4GHz WLAN MIMO | Back side | 0 | 0.33 | 0.732 | 1.307 | **2.369** | Analyzed as below | Analyzed as below | Analyzed as below |
| | | Back side | 26 | 0.098 | - | - | 0.098 | ΣSAR<1.6, Not required | ΣSAR<1.6, Not required | ΣSAR<1.6, Not required |
| | | Top side | 0 | 0.4 (Estimated SAR) | 1.052 | 0.089 | 1.541 | ΣSAR<1.6, Not required | ΣSAR<1.6, Not required | ΣSAR<1.6, Not required |
| | | Left side | 0 | 0.336 | 0.07 | 0.4 (Estimated SAR) | 0.806 | ΣSAR<1.6, Not required | ΣSAR<1.6, Not required | ΣSAR<1.6, Not required |
| | | Right side | 0 | 0.038 | 0.041 | 0.551 | 0.63 | ΣSAR<1.6, Not required | ΣSAR<1.6, Not required | ΣSAR<1.6, Not required |
| | | Bottom side | 0 | 0.137 | 0.016 | 0.027 | 0.18 | ΣSAR<1.6, Not required | ΣSAR<1.6, Not required | ΣSAR<1.6, Not required |
| | | Bottom side | 10 | 0.259 | - | - | 0.259 | ΣSAR<1.6, Not required | ΣSAR<1.6, Not required | ΣSAR<1.6, Not required |

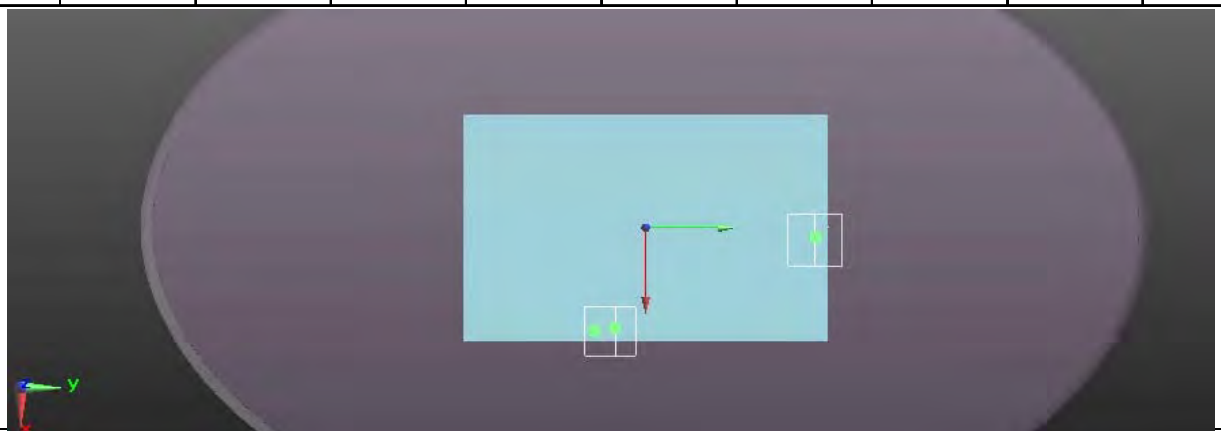
### SPLSR GPRS1900 & WLAN Main

| Conditions | Position | SAR Value (W/kg) | Coordinates (cm) | | | ΣSAR (W/kg) | Peak Location Separation Distance (mm) | SPLSR | Simultaneous Transmission SAR Test |
|---|---|---|---|---|---|---|---|---|---|
| | | | x | y | z | | | | |
| GPRS1900 CH 512 | Back side | 0.33 | 0.59 | 10.05 | 0.45 | 1.062 | 199.9 | 0.005 | SPLSR<0.04, Not required |
| 802.11b CH 6 | | 0.732 | -3.28 | -9.56 | 0.45 | | | | |



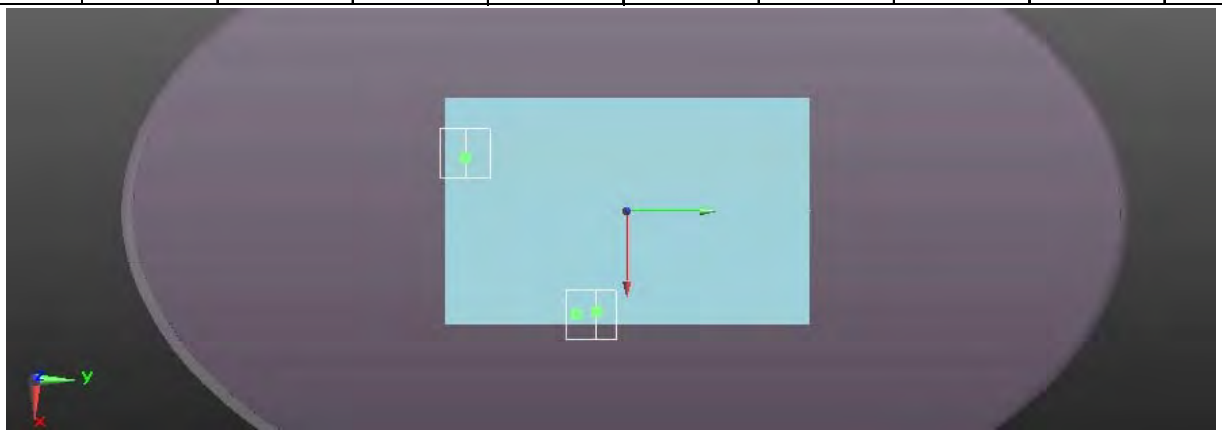
## SPLSR GPRS1900 & WLAN Aux

| Conditions | Position | SAR Value (W/kg) | Coordinates (cm) | | | ΣSAR (W/kg) | Peak Location Separation Distance (mm) | SPLSR | Simultaneous Transmission SAR Test |
|---|---|---|---|---|---|---|---|---|---|
| | | | x | y | z | | | | |
| GPRS1900 CH 512 | Back side | 0.33 | 0.59 | 10.05 | 0.45 | 1.637 | 131 | 0.016 | SPLSR<0.04, Not required |
| 802.11b CH 11 | | 1.307 | 6.18 | -1.8 | 0.6 | | | | |



## SPLSR WLAN Main & WLAN Aux

| Conditions | Position | SAR Value (W/kg) | Coordinates (cm) | | | ΣSAR (W/kg) | Peak Location Separation Distance (mm) | SPLSR | Simultaneous Transmission SAR Test |
|---|---|---|---|---|---|---|---|---|---|
| | | | x | y | z | | | | |
| 802.11b CH 6 | Back side | 0.732 | -3.28 | -9.56 | 0.45 | 2.039 | 122.4 | 0.024 | SPLSR<0.04, Not required |
| 802.11b CH 11 | | 1.307 | 6.18 | -1.8 | 0.6 | | | | |

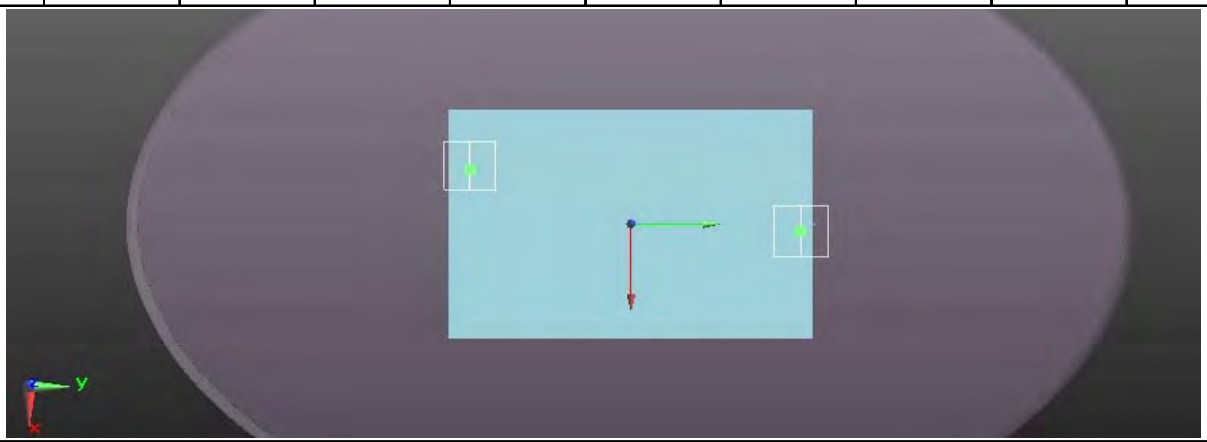


## WCDMA Band II + 2.4GHz WLAN MIMO

| No. | Conditions | Position | Distance (mm) | Max. WCDMA B2 | Max. WLAN Main | Max. WLAN Aux | SAR Sum | SPLSR WCDMA B2 & WLAN Main | SPLSR WCDMA B2 & WLAN Aux | SPLSR WLAN Main & WLAN Aux |
|---|---|---|---|---|---|---|---|---|---|---|
| 3 | WCDMA B2 + 2.4GHz WLAN MIMO | Back side | 0 | 1.045 | 0.732 | 1.307 | **3.084** | Analyzed as below | Analyzed as below | Analyzed as below |
| | | Back side | 26 | 0.238 | - | - | 0.238 | ΣSAR<1.6, Not required | ΣSAR<1.6, Not required | ΣSAR<1.6, Not required |
| | | Top side | 0 | 0.4 (Estimated SAR) | 1.052 | 0.089 | 1.541 | ΣSAR<1.6, Not required | ΣSAR<1.6, Not required | ΣSAR<1.6, Not required |
| | | Left side | 0 | 0.508 | 0.07 | 0.4 (Estimated SAR) | 0.978 | ΣSAR<1.6, Not required | ΣSAR<1.6, Not required | ΣSAR<1.6, Not required |
| | | Right side | 0 | 0.223 | 0.041 | 0.551 | 0.815 | ΣSAR<1.6, Not required | ΣSAR<1.6, Not required | ΣSAR<1.6, Not required |
| | | Bottom side | 0 | 0.392 | 0.016 | 0.027 | 0.435 | ΣSAR<1.6, Not required | ΣSAR<1.6, Not required | ΣSAR<1.6, Not required |
| | | Bottom side | 10 | 0.6 | - | - | 0.6 | ΣSAR<1.6, Not required | ΣSAR<1.6, Not required | ΣSAR<1.6, Not required |

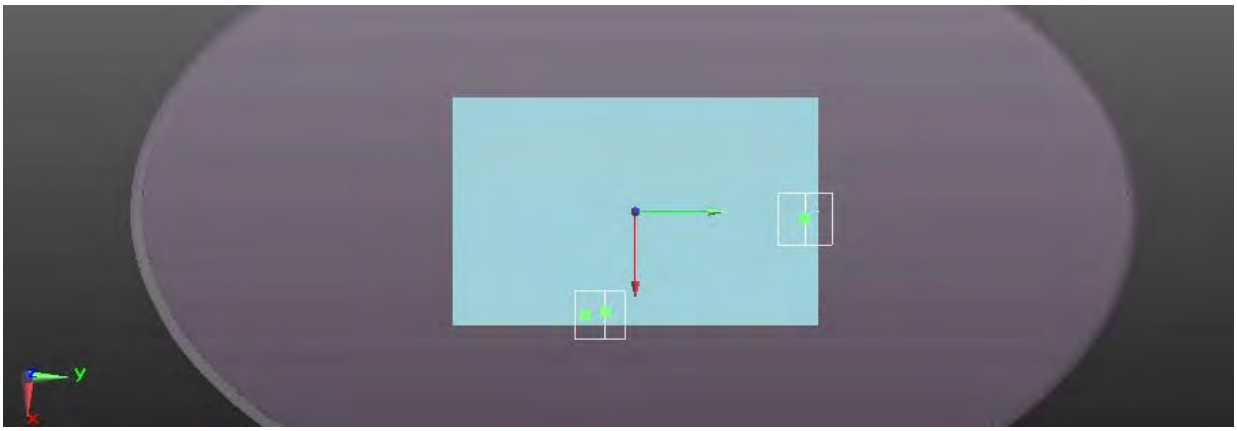
### SPLSR WCDMA B2 & WLAN Main

| Conditions | Position | SAR Value (W/kg) | Coordinates (cm) | | | ΣSAR (W/kg) | Peak Location Separation Distance (mm) | SPLSR | Simultaneous Transmission SAR Test |
|---|---|---|---|---|---|---|---|---|---|
| | | | x | y | z | | | | |
| WCDMA B2 CH 9400 | Back side | 1.045 | 0.45 | 10.05 | 0.49 | 1.777 | 199.6 | 0.012 | SPLSR<0.04, Not required |
| 802.11b CH 6 | | 0.732 | -3.28 | -9.56 | 0.45 | | | | |



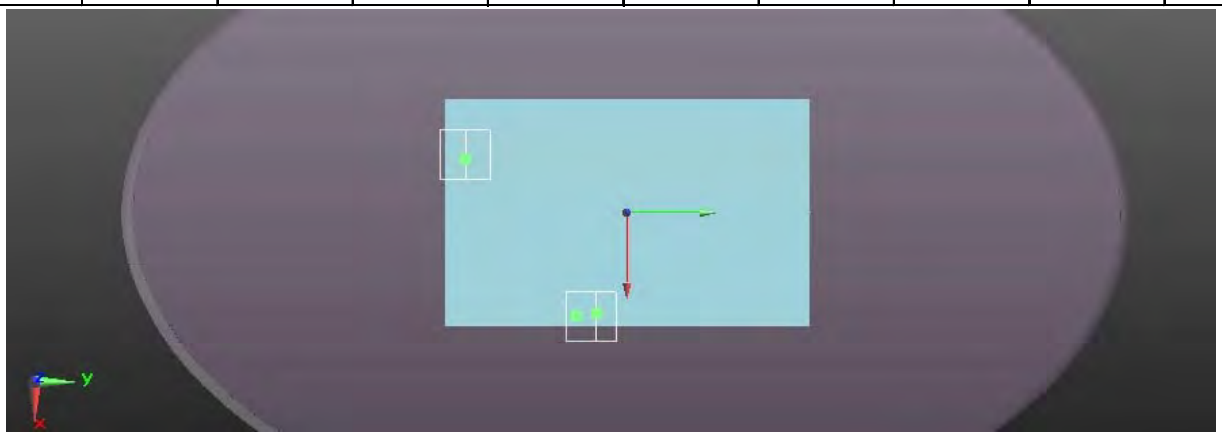
## SPLSR WCDMA B2 & WLAN Aux

| Conditions | Position | SAR Value (W/kg) | Coordinates (cm) | | | ΣSAR (W/kg) | Peak Location Separation Distance (mm) | SPLSR | Simultaneous Transmission SAR Test |
|---|---|---|---|---|---|---|---|---|---|
| | | | x | y | z | | | | |
| WCDMA B2 CH 9400 | Back side | 1.045 | 0.45 | 10.05 | 0.49 | 2.352 | 131.6 | 0.027 | SPLSR<0.04, Not required |
| 802.11b CH 11 | | 1.307 | 6.18 | -1.8 | 0.6 | | | | |



## SPLSR WLAN Main & WLAN Aux

| Conditions | Position | SAR Value (W/kg) | Coordinates (cm) | | | ΣSAR (W/kg) | Peak Location Separation Distance (mm) | SPLSR | Simultaneous Transmission SAR Test |
|---|---|---|---|---|---|---|---|---|---|
| | | | x | y | z | | | | |
| 802.11b CH 6 | Back side | 0.732 | -3.28 | -9.56 | 0.45 | 2.039 | 122.4 | 0.024 | SPLSR<0.04, Not required |
| 802.11b CH 11 | | 1.307 | 6.18 | -1.8 | 0.6 | | | | |

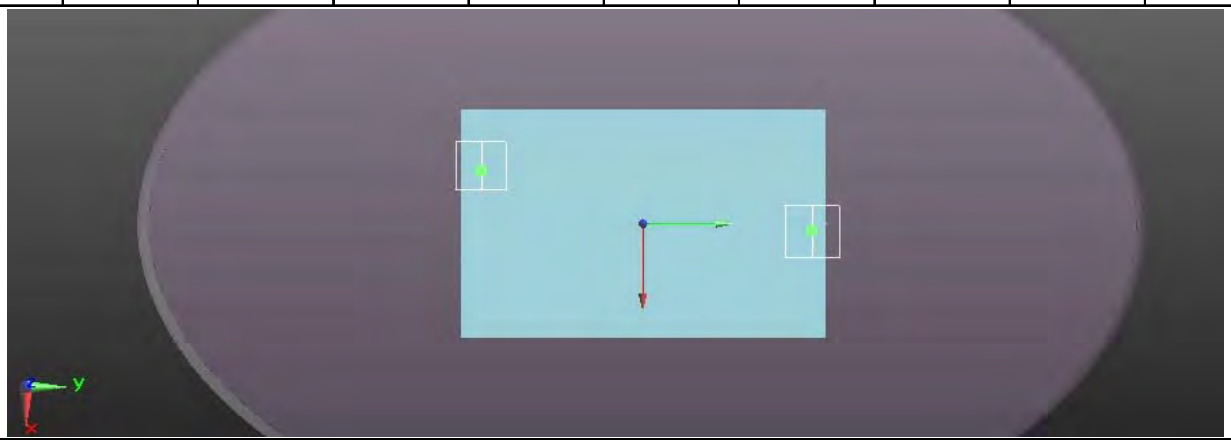


## WCDMA Band IV + 2.4GHz WLAN MIMO

| No. | Conditions | Position | Distance (mm) | Max. WCDMA B4 | Max. WLAN Main | Max. WLAN Aux | SAR Sum | SPLSR WCDMA B4 & WLAN Main | SPLSR WCDMA B4 & WLAN Aux | SPLSR WLAN Main & WLAN Aux |
|---|---|---|---|---|---|---|---|---|---|---|
| 4 | WCDMA B4 + 2.4GHz WLAN MIMO | Back side | 0 | 0.91 | 0.732 | 1.307 | **2.949** | Analyzed as below | Analyzed as below | Analyzed as below |
| | | Back side | 26 | 0.188 | - | - | 0.188 | ΣSAR<1.6, Not required | ΣSAR<1.6, Not required | ΣSAR<1.6, Not required |
| | | Top side | 0 | 0.4 (Estimated SAR) | 1.052 | 0.089 | 1.541 | ΣSAR<1.6, Not required | ΣSAR<1.6, Not required | ΣSAR<1.6, Not required |
| | | Left side | 0 | 0.4 | 0.07 | 0.4 (Estimated SAR) | 0.87 | ΣSAR<1.6, Not required | ΣSAR<1.6, Not required | ΣSAR<1.6, Not required |
| | | Right side | 0 | 0.153 | 0.041 | 0.551 | 0.745 | ΣSAR<1.6, Not required | ΣSAR<1.6, Not required | ΣSAR<1.6, Not required |
| | | Bottom side | 0 | 0.312 | 0.016 | 0.027 | 0.355 | ΣSAR<1.6, Not required | ΣSAR<1.6, Not required | ΣSAR<1.6, Not required |
| | | Bottom side | 10 | 0.426 | - | - | 0.426 | ΣSAR<1.6, Not required | ΣSAR<1.6, Not required | ΣSAR<1.6, Not required |

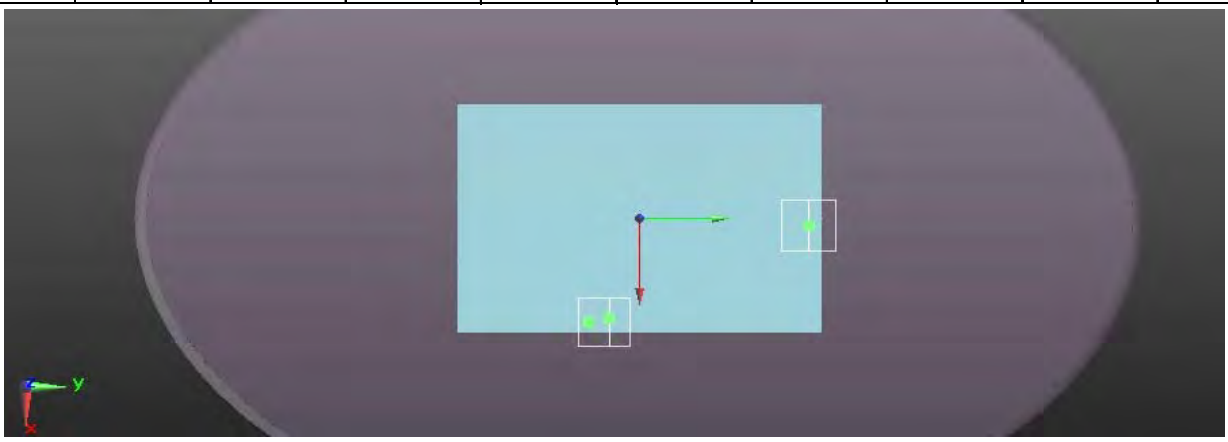
### SPLSR WCDMA B4 & WLAN Main

| Conditions | Position | SAR Value (W/kg) | Coordinates (cm) | | | ΣSAR (W/kg) | Peak Location Separation Distance (mm) | SPLSR | Simultaneous Transmission SAR Test |
|---|---|---|---|---|---|---|---|---|---|
| | | | x | y | z | | | | |
| WCDMA B4 CH 1312 | Back side | 0.91 | 0.45 | 10.05 | 0.49 | 1.642 | 199.6 | 0.011 | SPLSR<0.04, Not required |
| 802.11b CH 6 | | 0.732 | -3.28 | -9.56 | 0.45 | | | | |



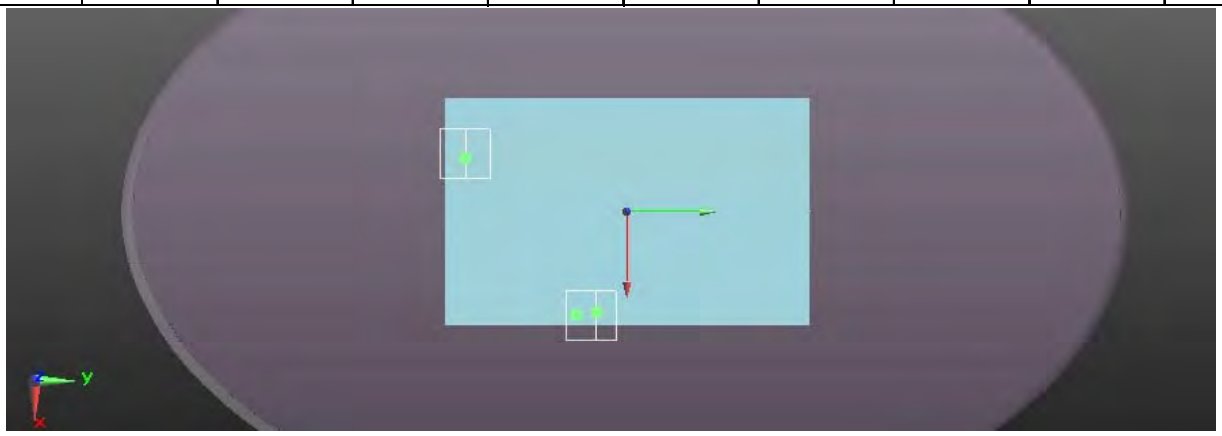
## SPLSR WCDMA B4 & WLAN Aux

| Conditions | Position | SAR Value (W/kg) | Coordinates (cm) | | | ΣSAR (W/kg) | Peak Location Separation Distance (mm) | SPLSR | Simultaneous Transmission SAR Test |
|---|---|---|---|---|---|---|---|---|---|
| | | | x | y | z | | | | |
| WCDMA B4 CH 1312 | Back side | 0.91 | 0.45 | 10.05 | 0.49 | 2.217 | 131.6 | 0.025 | SPLSR<0.04, Not required |
| 802.11b CH 11 | | 1.307 | 6.18 | -1.8 | 0.6 | | | | |



## SPLSR WLAN Main & WLAN Aux

| Conditions | Position | SAR Value (W/kg) | Coordinates (cm) | | | ΣSAR (W/kg) | Peak Location Separation Distance (mm) | SPLSR | Simultaneous Transmission SAR Test |
|---|---|---|---|---|---|---|---|---|---|
| | | | x | y | z | | | | |
| 802.11b CH 6 | Back side | 0.732 | -3.28 | -9.56 | 0.45 | 2.039 | 122.4 | 0.024 | SPLSR<0.04, Not required |
| 802.11b CH 11 | | 1.307 | 6.18 | -1.8 | 0.6 | | | | |

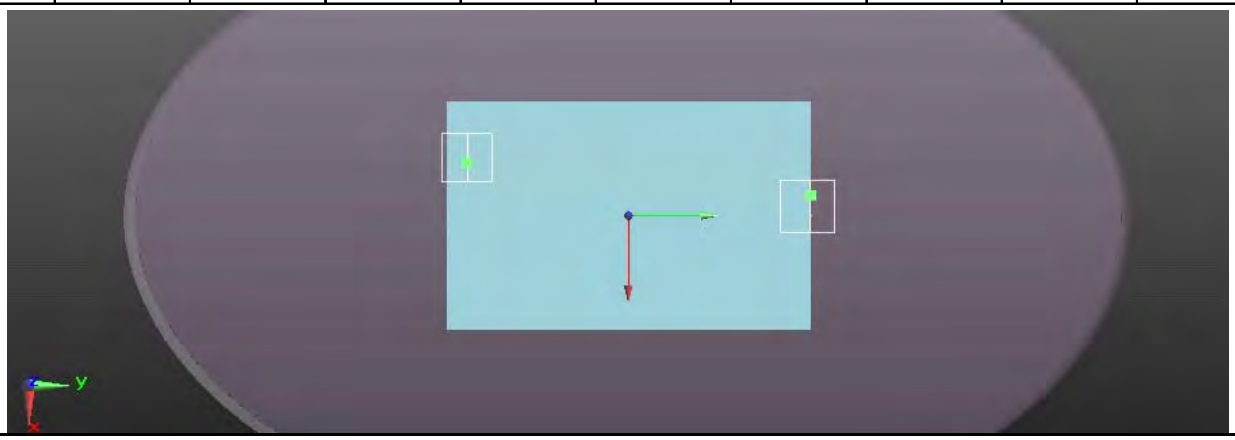


## WCDMA Band V + 2.4GHz WLAN MIMO

| No. | Conditions | Position | Distance (mm) | Max. WCDMA B5 | Max. WLAN Main | Max. WLAN Aux | SAR Sum | SPLSR WCDMA B5 & WLAN Main | SPLSR WCDMA B5 & WLAN Aux | SPLSR WLAN Main & WLAN Aux |
|---|---|---|---|---|---|---|---|---|---|---|
| 5 | WCDMA B5 + 2.4GHz WLAN MIMO | Back side | 0 | 1.213 | 0.732 | 1.307 | **3.252** | Analyzed as below | Analyzed as below | Analyzed as below |
| | | Back side | 26 | 0.237 | - | - | 0.237 | ΣSAR<1.6, Not required | ΣSAR<1.6, Not required | ΣSAR<1.6, Not required |
| | | Top side | 0 | 0.4 (Estimated SAR) | 1.052 | 0.089 | 1.541 | ΣSAR<1.6, Not required | ΣSAR<1.6, Not required | ΣSAR<1.6, Not required |
| | | Left side | 0 | 0.191 | 0.07 | 0.4 (Estimated SAR) | 0.661 | ΣSAR<1.6, Not required | ΣSAR<1.6, Not required | ΣSAR<1.6, Not required |
| | | Right side | 0 | 0.411 | 0.041 | 0.551 | 1.003 | ΣSAR<1.6, Not required | ΣSAR<1.6, Not required | ΣSAR<1.6, Not required |
| | | Bottom side | 0 | 0.719 | 0.016 | 0.027 | 0.762 | ΣSAR<1.6, Not required | ΣSAR<1.6, Not required | ΣSAR<1.6, Not required |
| | | Bottom side | 10 | 0.817 | - | - | 0.817 | ΣSAR<1.6, Not required | ΣSAR<1.6, Not required | ΣSAR<1.6, Not required |

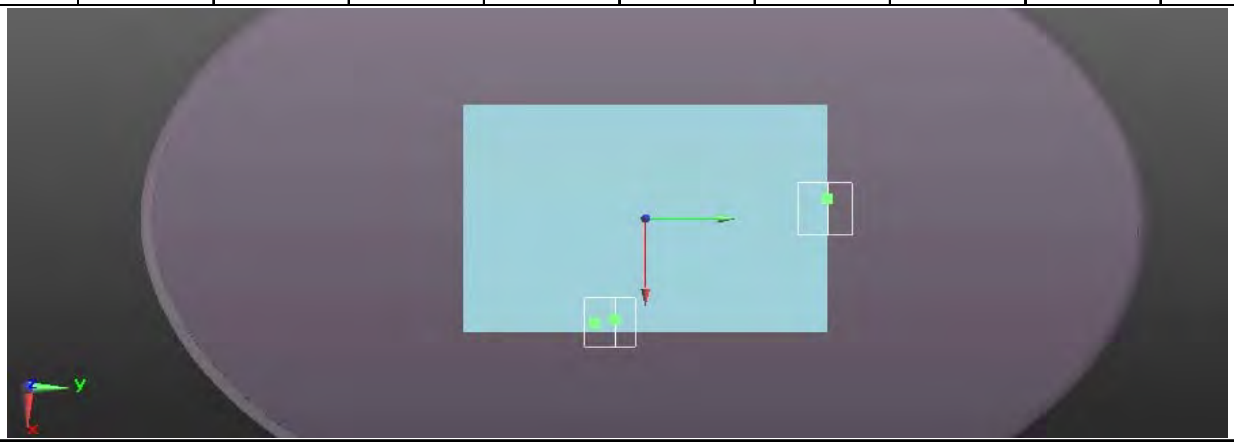
### SPLSR WCDMA B5 & WLAN Main

| Conditions | Position | SAR Value (W/kg) | Coordinates (cm) | | | ΣSAR (W/kg) | Peak Location Separation Distance (mm) | SPLSR | Simultaneous Transmission SAR Test |
|---|---|---|---|---|---|---|---|---|---|
| | | | x | y | z | | | | |
| WCDMA B5 CH 4183 | Back side | 1.213 | -1.24 | 10.81 | 0.39 | 1.945 | 204.7 | 0.013 | SPLSR<0.04, Not required |
| 802.11b CH 6 | | 0.732 | -3.28 | -9.56 | 0.45 | | | | |



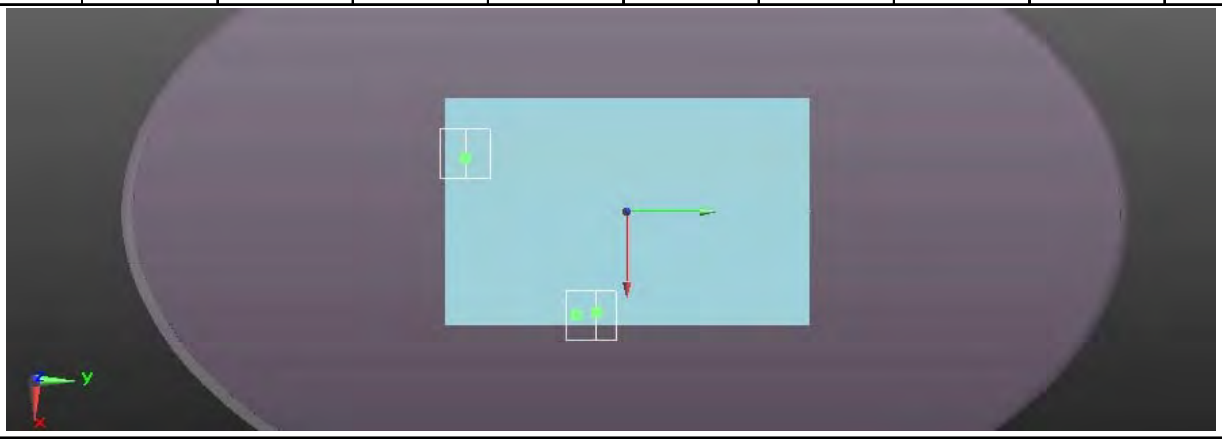
## SPLSR WCDMA B5 & WLAN Aux

| Conditions | Position | SAR Value (W/kg) | Coordinates (cm) | | | ΣSAR (W/kg) | Peak Location Separation Distance (mm) | SPLSR | Simultaneous Transmission SAR Test |
|---|---|---|---|---|---|---|---|---|---|
| | | | x | y | z | | | | |
| WCDMA B5 CH 4183 | Back side | 1.213 | -1.24 | 10.81 | 0.39 | 2.52 | 146.3 | 0.027 | SPLSR<0.04, Not required |
| 802.11b CH 11 | | 1.307 | 6.18 | -1.8 | 0.6 | | | | |



## SPLSR WLAN Main & WLAN Aux

| Conditions | Position | SAR Value (W/kg) | Coordinates (cm) | | | ΣSAR (W/kg) | Peak Location Separation Distance (mm) | SPLSR | Simultaneous Transmission SAR Test |
|---|---|---|---|---|---|---|---|---|---|
| | | | x | y | z | | | | |
| 802.11b CH 6 | Back side | 0.732 | -3.28 | -9.56 | 0.45 | 2.039 | 122.4 | 0.024 | SPLSR<0.04, Not required |
| 802.11b CH 11 | | 1.307 | 6.18 | -1.8 | 0.6 | | | | |

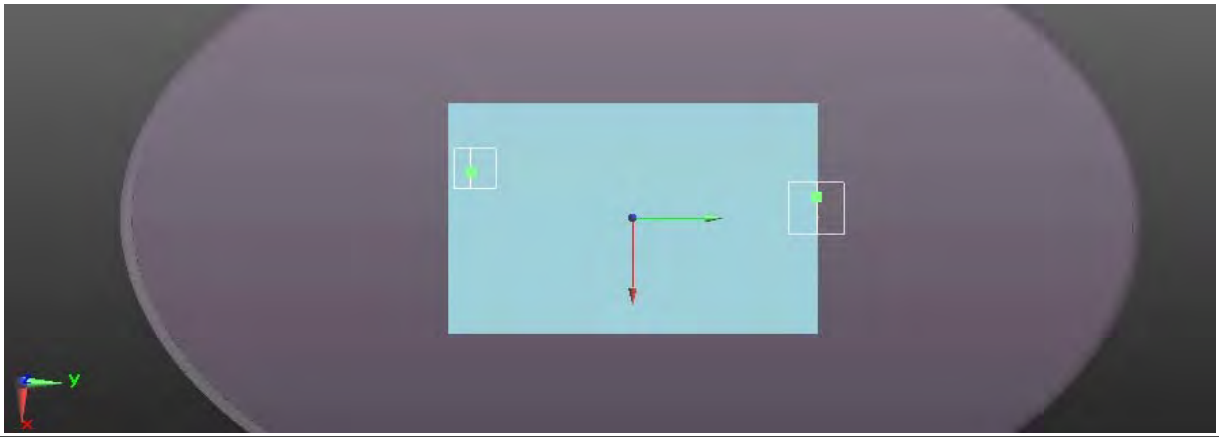


## GPRS 850 + 5GHz WLAN MIMO

| No. | Conditions | Position | Distance (mm) | Max. GPRS850 | Max. WLAN Main | Max. WLAN Aux | SAR Sum | SPLSR GPRS850 & WLAN Main | SPLSR GPRS850 & WLAN Aux | SPLSR WLAN Main & WLAN Aux |
|---|---|---|---|---|---|---|---|---|---|---|
| 6 | GPRS850 + 5GHz WLAN MIMO | Back side | 0 | 0.869 | 1.536 | 1.274 | **3.679** | Analyzed as below | Analyzed as below | Analyzed as below |
| | | Back side | 26 | 0.266 | - | - | 0.266 | ΣSAR<1.6, Not required | ΣSAR<1.6, Not required | ΣSAR<1.6, Not required |
| | | Top side | 0 | 0.4 (Estimated SAR) | 0.318 | 0.107 | 0.825 | ΣSAR<1.6, Not required | ΣSAR<1.6, Not required | ΣSAR<1.6, Not required |
| | | Left side | 0 | 0.679 | 0.081 | 0.4 (Estimated SAR) | 1.16 | ΣSAR<1.6, Not required | ΣSAR<1.6, Not required | ΣSAR<1.6, Not required |
| | | Right side | 0 | 0.228 | 0.016 | 0.8 | 1.044 | ΣSAR<1.6, Not required | ΣSAR<1.6, Not required | ΣSAR<1.6, Not required |
| | | Bottom side | 0 | 0.529 | 0.006 | 0.02 | 0.555 | ΣSAR<1.6, Not required | ΣSAR<1.6, Not required | ΣSAR<1.6, Not required |
| | | Bottom side | 10 | 0.835 | - | - | 0.835 | ΣSAR<1.6, Not required | ΣSAR<1.6, Not required | ΣSAR<1.6, Not required |

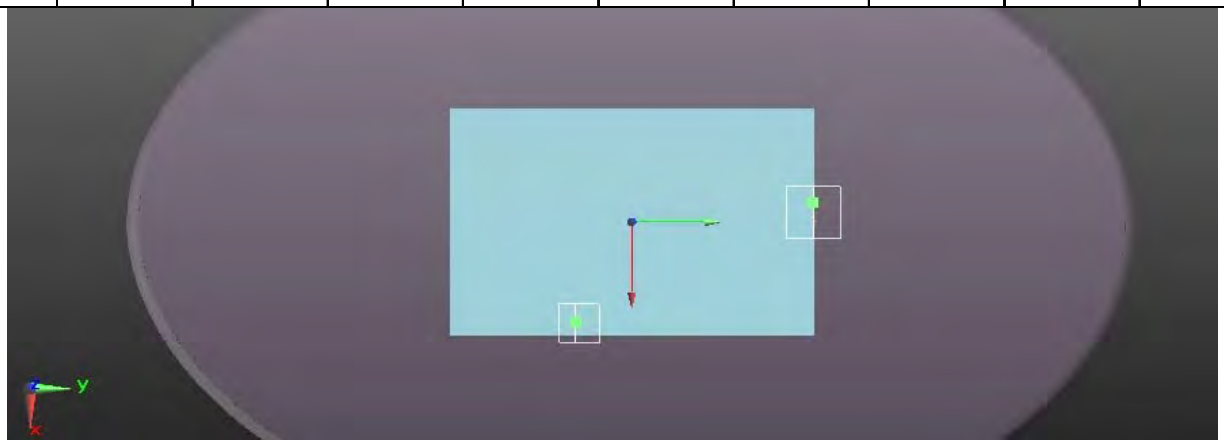
### SPLSR GPRS850 & WLAN Main

| Conditions | Position | SAR Value (W/kg) | Coordinates (cm) | | | ΣSAR (W/kg) | Peak Location Separation Distance (mm) | SPLSR | Simultaneous Transmission SAR Test |
|---|---|---|---|---|---|---|---|---|---|
| | | | x | y | z | | | | |
| GPRS850 CH 251 | Back side | 0.869 | -1.24 | 10.75 | 0.37 | 2.405 | 202.5 | 0.018 | SPLSR<0.04, Not required |
| 802.11a CH 100 | | 1.536 | -2.76 | -9.44 | 0.48 | | | | |



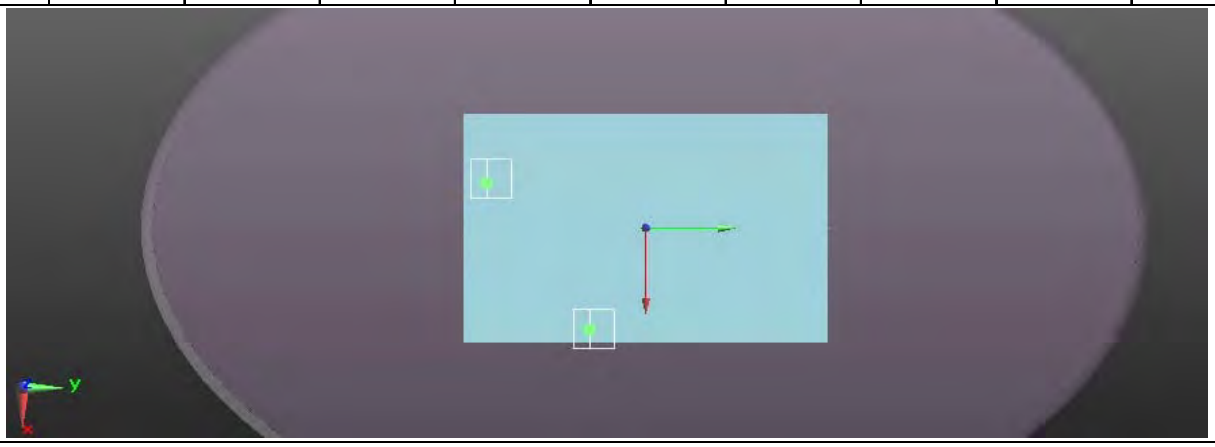
## SPLSR GPRS850 & WLAN Aux

| Conditions | Position | SAR Value (W/kg) | Coordinates (cm) | | | ΣSAR (W/kg) | Peak Location Separation Distance (mm) | SPLSR | Simultaneous Transmission SAR Test |
|---|---|---|---|---|---|---|---|---|---|
| | | | x | y | z | | | | |
| GPRS850 CH 251 | Back side | 0.869 | -1.24 | 10.75 | 0.37 | 2.143 | 159.9 | 0.020 | SPLSR<0.04, Not required |
| 802.11a CH 44 | | 1.274 | 7.2 | -2.84 | 0.59 | | | | |



## SPLSR WLAN Main & WLAN Aux

| Conditions | Position | SAR Value (W/kg) | Coordinates (cm) | | | ΣSAR (W/kg) | Peak Location Separation Distance (mm) | SPLSR | Simultaneous Transmission SAR Test |
|---|---|---|---|---|---|---|---|---|---|
| | | | x | y | z | | | | |
| 802.11a CH 100 | Back side | 1.536 | -2.76 | -9.44 | 0.48 | 2.81 | 119.49 | 0.039 | SPLSR<0.04, Not required |
| 802.11a CH 44 | | 1.274 | 7.2 | -2.84 | 0.59 | | | | |

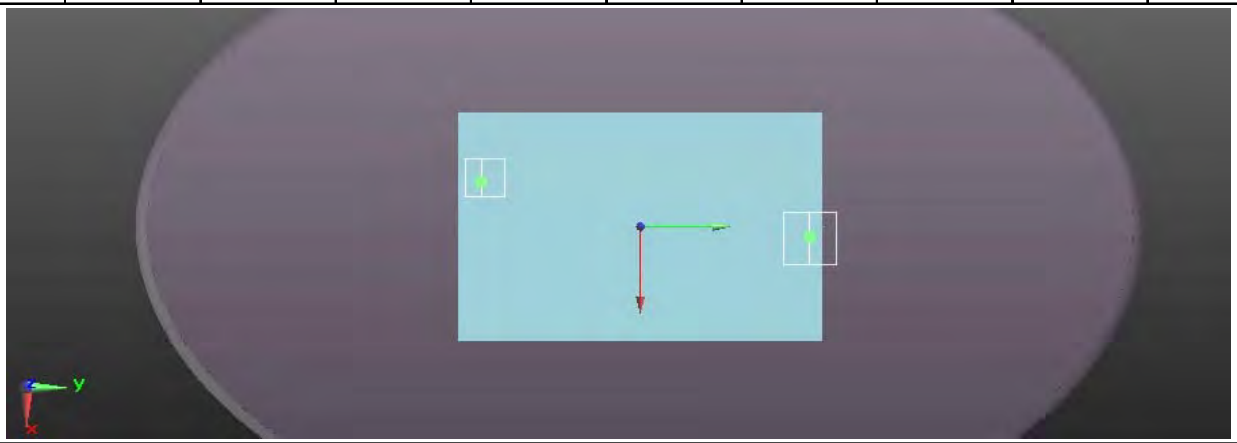


## GPRS 1900 + 5GHz WLAN MIMO

| No. | Conditions | Position | Distance (mm) | Max. GPRS1900 | Max. WLAN Main | Max. WLAN Aux | SAR Sum | SPLSR GPRS1900 & WLAN Main | SPLSR GPRS1900 & WLAN Aux | SPLSR WLAN Main & WLAN Aux |
|---|---|---|---|---|---|---|---|---|---|---|
| 7 | GPRS1900 + 5GHz WLAN MIMO | Back side | 0 | 0.33 | 1.536 | 1.274 | **3.14** | Analyzed as below | Analyzed as below | Analyzed as below |
| | | Back side | 26 | 0.098 | - | - | 0.098 | ΣSAR<1.6, Not required | ΣSAR<1.6, Not required | ΣSAR<1.6, Not required |
| | | Top side | 0 | 0.4 (Estimated SAR) | 0.318 | 0.107 | 0.825 | ΣSAR<1.6, Not required | ΣSAR<1.6, Not required | ΣSAR<1.6, Not required |
| | | Left side | 0 | 0.336 | 0.081 | 0.4 (Estimated SAR) | 0.817 | ΣSAR<1.6, Not required | ΣSAR<1.6, Not required | ΣSAR<1.6, Not required |
| | | Right side | 0 | 0.038 | 0.016 | 0.8 | 0.854 | ΣSAR<1.6, Not required | ΣSAR<1.6, Not required | ΣSAR<1.6, Not required |
| | | Bottom side | 0 | 0.137 | 0.006 | 0.02 | 0.163 | ΣSAR<1.6, Not required | ΣSAR<1.6, Not required | ΣSAR<1.6, Not required |
| | | Bottom side | 10 | 0.259 | - | - | 0.259 | ΣSAR<1.6, Not required | ΣSAR<1.6, Not required | ΣSAR<1.6, Not required |

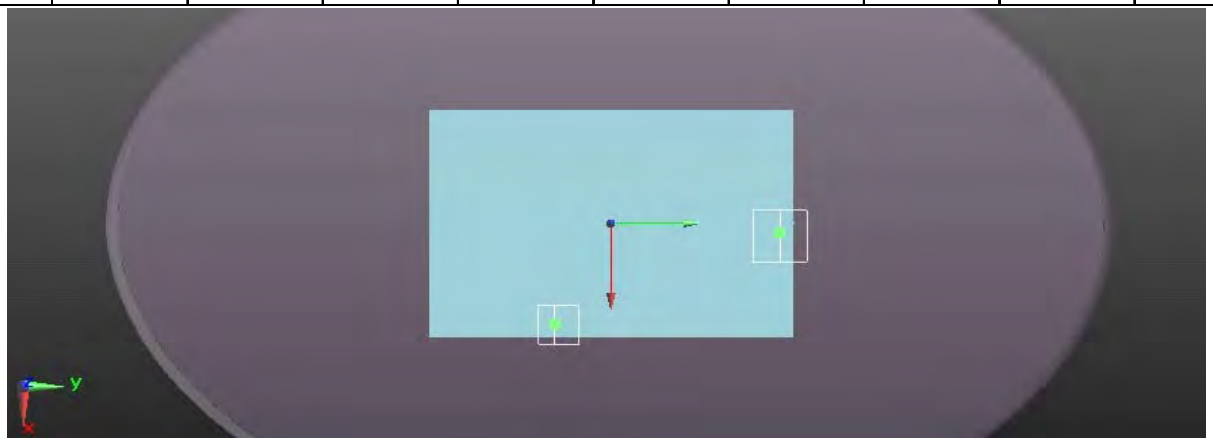
### SPLSR GPRS1900 & WLAN Main

| Conditions | Position | SAR Value (W/kg) | Coordinates (cm) | | | ΣSAR (W/kg) | Peak Location Separation Distance (mm) | SPLSR | Simultaneous Transmission SAR Test |
|---|---|---|---|---|---|---|---|---|---|
| | | | x | y | z | | | | |
| GPRS1900 CH 512 | Back side | 0.33 | 0.59 | 10.05 | 0.45 | 1.866 | 197.8 | 0.013 | SPLSR<0.04, Not required |
| 802.11a CH 100 | | 1.536 | -2.76 | -9.44 | 0.48 | | | | |



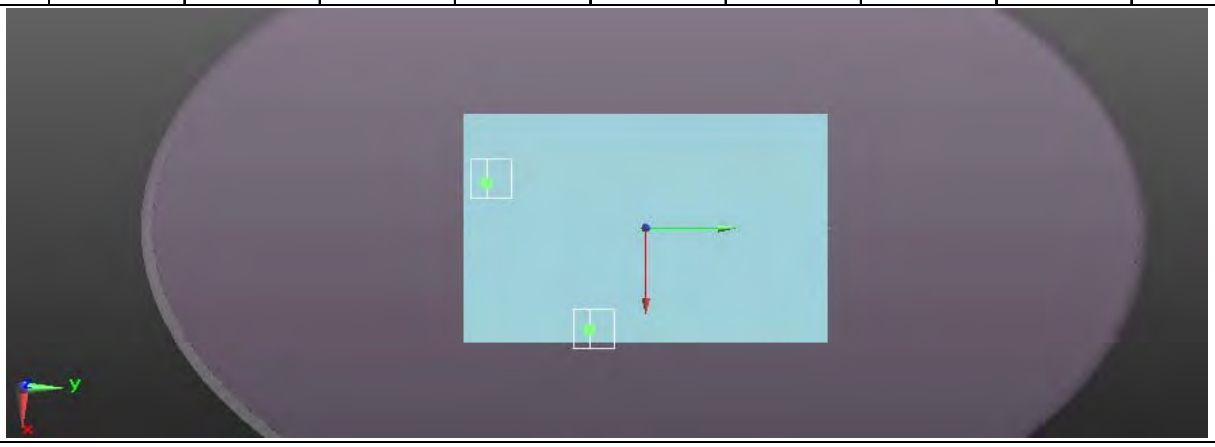
## SPLSR GPRS1900 & WLAN Aux

| Conditions | Position | SAR Value (W/kg) | Coordinates (cm) | | | ΣSAR (W/kg) | Peak Location Separation Distance (mm) | SPLSR | Simultaneous Transmission SAR Test |
|---|---|---|---|---|---|---|---|---|---|
| | | | x | y | z | | | | |
| GPRS1900 CH 512 | Back side | 0.33 | 0.59 | 10.05 | 0.45 | 1.604 | 144.87 | 0.014 | SPLSR<0.04, Not required |
| 802.11a CH 44 | | 1.274 | 7.2 | -2.84 | 0.59 | | | | |



## SPLSR WLAN Main & WLAN Aux

| Conditions | Position | SAR Value (W/kg) | Coordinates (cm) | | | ΣSAR (W/kg) | Peak Location Separation Distance (mm) | SPLSR | Simultaneous Transmission SAR Test |
|---|---|---|---|---|---|---|---|---|---|
| | | | x | y | z | | | | |
| 802.11a CH 100 | Back side | 1.536 | -2.76 | -9.44 | 0.48 | 2.81 | 119.49 | 0.039 | SPLSR<0.04, Not required |
| 802.11a CH 44 | | 1.274 | 7.2 | -2.84 | 0.59 | | | | |

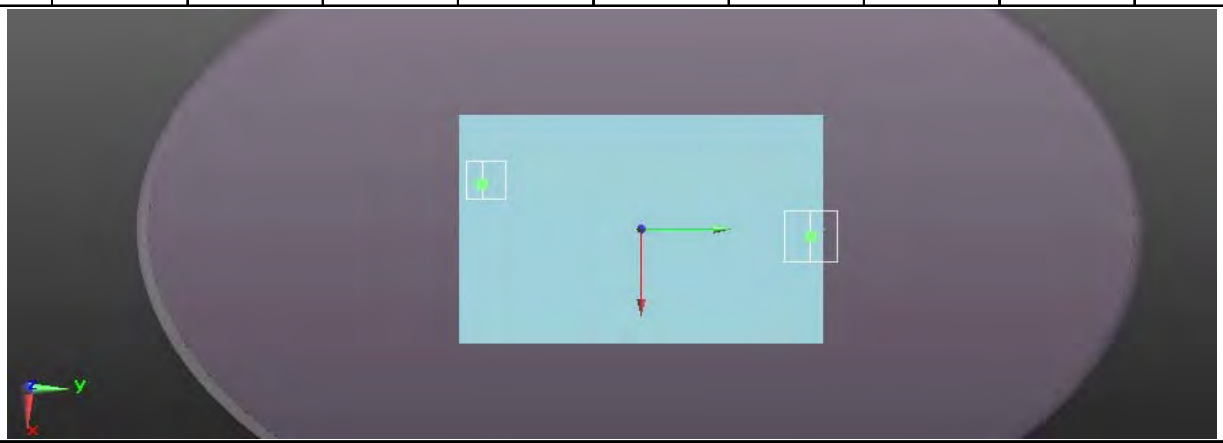


## WCDMA Band II + 5GHz WLAN MIMO

| No. | Conditions | Position | Distance (mm) | Max. WCDMA B2 | Max. WLAN Main | Max. WLAN Aux | SAR Sum | SPLSR WCDMA B2 & WLAN Main | SPLSR WCDMA B2 & WLAN Aux | SPLSR WLAN Main & WLAN Aux |
|---|---|---|---|---|---|---|---|---|---|---|
| 8 | WCDMA B2 + 5GHz WLAN MIMO | Back side | 0 | 1.045 | 1.536 | 1.274 | **3.855** | Analyzed as below | Analyzed as below | Analyzed as below |
| | | Back side | 26 | 0.238 | - | - | 0.238 | ΣSAR<1.6, Not required | ΣSAR<1.6, Not required | ΣSAR<1.6, Not required |
| | | Top side | 0 | 0.4 (Estimated SAR) | 0.318 | 0.107 | 0.825 | ΣSAR<1.6, Not required | ΣSAR<1.6, Not required | ΣSAR<1.6, Not required |
| | | Left side | 0 | 0.508 | 0.081 | 0.4 (Estimated SAR) | 0.989 | ΣSAR<1.6, Not required | ΣSAR<1.6, Not required | ΣSAR<1.6, Not required |
| | | Right side | 0 | 0.223 | 0.016 | 0.8 | 1.039 | ΣSAR<1.6, Not required | ΣSAR<1.6, Not required | ΣSAR<1.6, Not required |
| | | Bottom side | 0 | 0.392 | 0.006 | 0.02 | 0.418 | ΣSAR<1.6, Not required | ΣSAR<1.6, Not required | ΣSAR<1.6, Not required |
| | | Bottom side | 10 | 0.6 | - | - | 0.6 | ΣSAR<1.6, Not required | ΣSAR<1.6, Not required | ΣSAR<1.6, Not required |

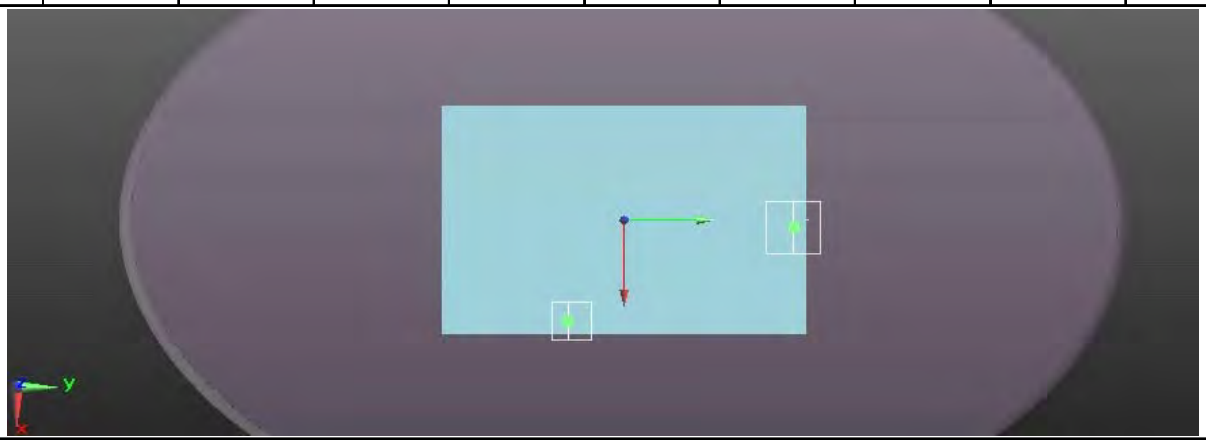
### SPLSR WCDMA B2 & WLAN Main

| Conditions | Position | SAR Value (W/kg) | Coordinates (cm) | | | ΣSAR (W/kg) | Peak Location Separation Distance (mm) | SPLSR | Simultaneous Transmission SAR Test |
|---|---|---|---|---|---|---|---|---|---|
| | | | x | y | z | | | | |
| WCDMA B2 CH 9400 | Back side | 1.045 | 0.45 | 10.05 | 0.49 | 2.581 | 197.5 | 0.021 | SPLSR<0.04, Not required |
| 802.11a CH 100 | | 1.536 | -2.76 | -9.44 | 0.48 | | | | |



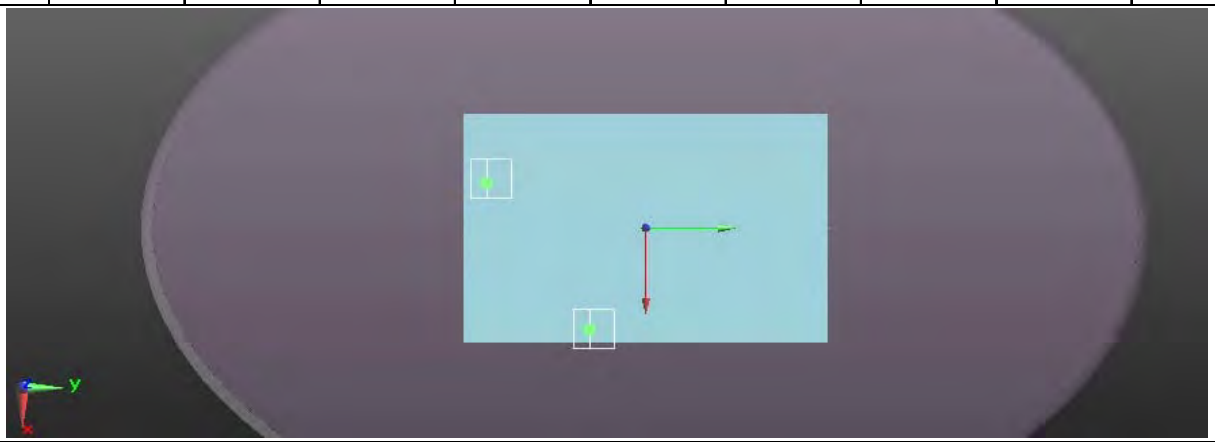
## SPLSR WCDMA B2 & WLAN Aux

| Conditions | Position | SAR Value (W/kg) | Coordinates (cm) | | | ΣSAR (W/kg) | Peak Location Separation Distance (mm) | SPLSR | Simultaneous Transmission SAR Test |
|---|---|---|---|---|---|---|---|---|---|
| | | | x | y | z | | | | |
| WCDMA B2 CH 9400 | Back side | 1.045 | 0.45 | 10.05 | 0.49 | 2.319 | 145.51 | 0.024 | SPLSR<0.04, Not required |
| 802.11a CH 44 | | 1.274 | 7.2 | -2.84 | 0.59 | | | | |



## SPLSR WLAN Main & WLAN Aux

| Conditions | Position | SAR Value (W/kg) | Coordinates (cm) | | | ΣSAR (W/kg) | Peak Location Separation Distance (mm) | SPLSR | Simultaneous Transmission SAR Test |
|---|---|---|---|---|---|---|---|---|---|
| | | | x | y | z | | | | |
| 802.11a CH 100 | Back side | 1.536 | -2.76 | -9.44 | 0.48 | 2.81 | 119.49 | 0.039 | SPLSR<0.04, Not required |
| 802.11a CH 44 | | 1.274 | 7.2 | -2.84 | 0.59 | | | | |

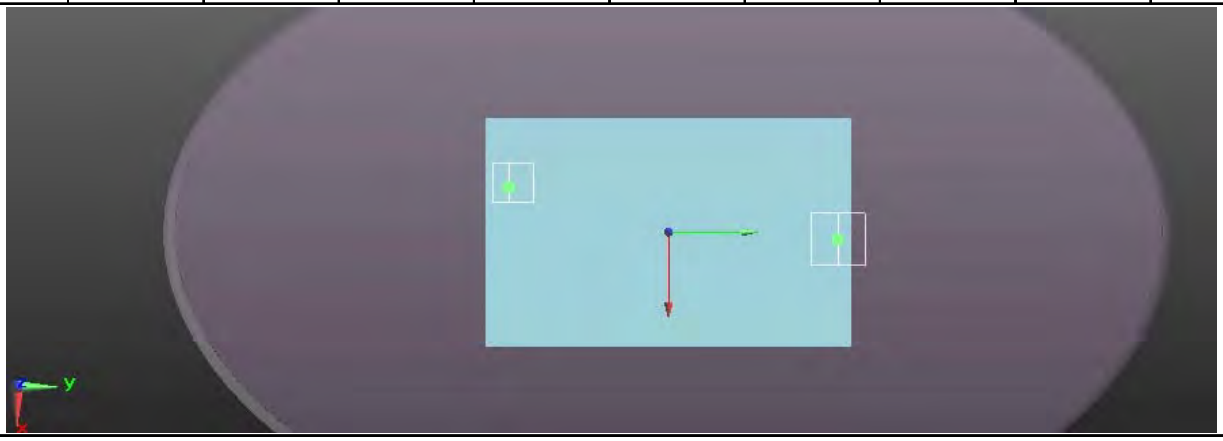


## WCDMA Band IV + 5GHz WLAN MIMO

| No. | Conditions | Position | Distance (mm) | Max. WCDMA B4 | Max. WLAN Main | Max. WLAN Aux | SAR Sum | SPLSR WCDMA B4 & WLAN Main | SPLSR WCDMA B4 & WLAN Aux | SPLSR WLAN Main & WLAN Aux |
|---|---|---|---|---|---|---|---|---|---|---|
| 9 | WCDMA B4 + 5GHz WLAN MIMO | Back side | 0 | 0.91 | 1.536 | 1.274 | **3.72** | Analyzed as below | Analyzed as below | Analyzed as below |
| | | Back side | 26 | 0.188 | - | - | 0.188 | ΣSAR<1.6, Not required | ΣSAR<1.6, Not required | ΣSAR<1.6, Not required |
| | | Top side | 0 | 0.4 (Estimated SAR) | 0.318 | 0.107 | 0.825 | ΣSAR<1.6, Not required | ΣSAR<1.6, Not required | ΣSAR<1.6, Not required |
| | | Left side | 0 | 0.4 | 0.081 | 0.4 (Estimated SAR) | 0.881 | ΣSAR<1.6, Not required | ΣSAR<1.6, Not required | ΣSAR<1.6, Not required |
| | | Right side | 0 | 0.153 | 0.016 | 0.8 | 0.969 | ΣSAR<1.6, Not required | ΣSAR<1.6, Not required | ΣSAR<1.6, Not required |
| | | Bottom side | 0 | 0.312 | 0.006 | 0.02 | 0.338 | ΣSAR<1.6, Not required | ΣSAR<1.6, Not required | ΣSAR<1.6, Not required |
| | | Bottom side | 10 | 0.426 | - | - | 0.426 | ΣSAR<1.6, Not required | ΣSAR<1.6, Not required | ΣSAR<1.6, Not required |

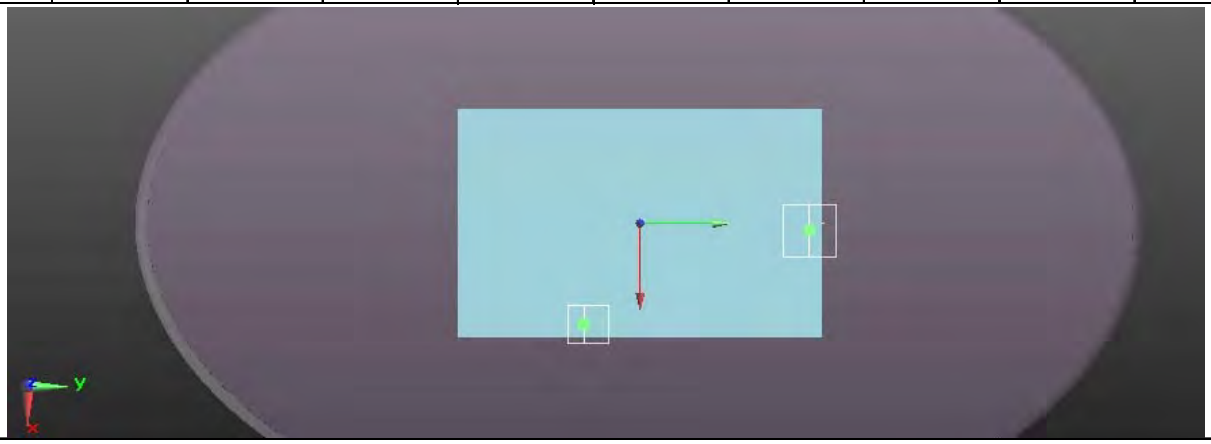
### SPLSR WCDMA B4 & WLAN Main

| Conditions | Position | SAR Value (W/kg) | Coordinates (cm) | | | ΣSAR (W/kg) | Peak Location Separation Distance (mm) | SPLSR | Simultaneous Transmission SAR Test |
|---|---|---|---|---|---|---|---|---|---|
| | | | x | y | z | | | | |
| WCDMA B4 CH 1312 | Back side | 0.91 | 0.45 | 10.05 | 0.49 | 2.446 | 197.5 | 0.019 | SPLSR<0.04, Not required |
| 802.11a CH 100 | | 1.536 | -2.76 | -9.44 | 0.48 | | | | |



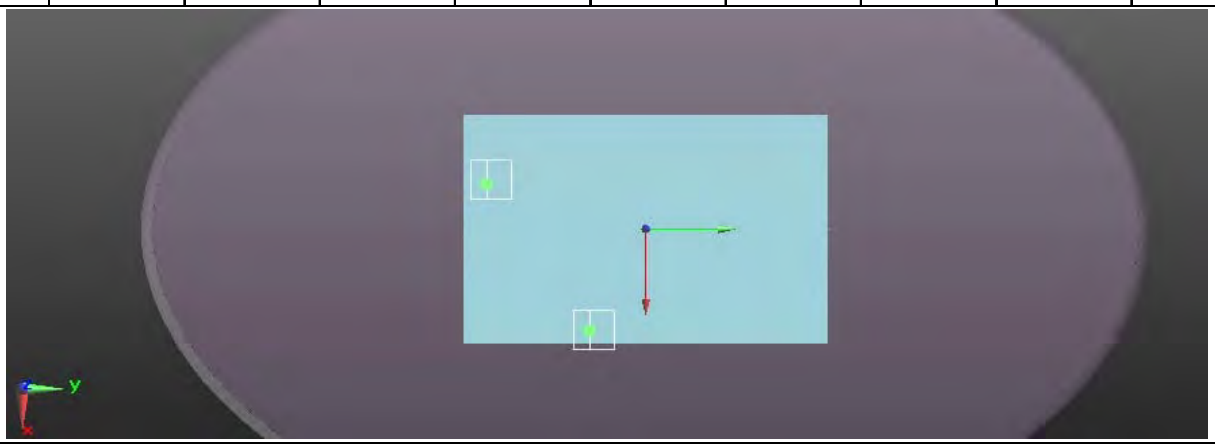
## SPLSR WCDMA B4 & WLAN Aux

| Conditions | Position | SAR Value (W/kg) | Coordinates (cm) | | | ΣSAR (W/kg) | Peak Location Separation Distance (mm) | SPLSR | Simultaneous Transmission SAR Test |
|---|---|---|---|---|---|---|---|---|---|
| | | | x | y | z | | | | |
| WCDMA B4 CH 1312 | Back side | 0.91 | 0.45 | 10.05 | 0.49 | 2.184 | 145.51 | 0.022 | SPLSR<0.04, Not required |
| 802.11a CH 44 | | 1.274 | 7.2 | -2.84 | 0.59 | | | | |



## SPLSR WLAN Main & WLAN Aux

| Conditions | Position | SAR Value (W/kg) | Coordinates (cm) | | | ΣSAR (W/kg) | Peak Location Separation Distance (mm) | SPLSR | Simultaneous Transmission SAR Test |
|---|---|---|---|---|---|---|---|---|---|
| | | | x | y | z | | | | |
| 802.11a CH 100 | Back side | 1.536 | -2.76 | -9.44 | 0.48 | 2.81 | 119.49 | 0.039 | SPLSR<0.04, Not required |
| 802.11a CH 44 | | 1.274 | 7.2 | -2.84 | 0.59 | | | | |

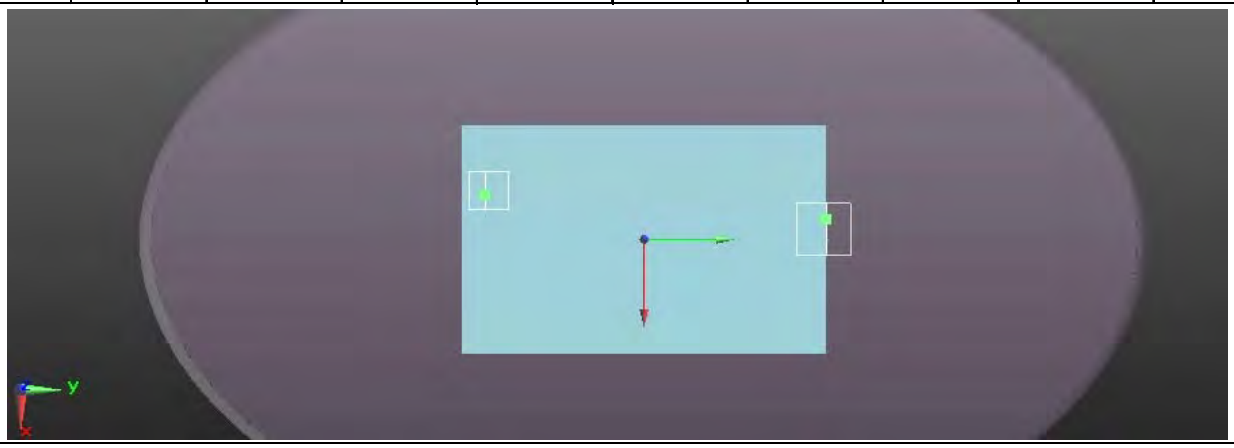


## WCDMA Band V + 5GHz WLAN MIMO

| No. | Conditions | Position | Distance (mm) | Max. WCDMA B5 | Max. WLAN Main | Max. WLAN Aux | SAR Sum | SPLSR WCDMA B5 & WLAN Main | SPLSR WCDMA B5 & WLAN Aux | SPLSR WLAN Main & WLAN Aux |
|---|---|---|---|---|---|---|---|---|---|---|
| 10 | WCDMA B5 + 5GHz WLAN MIMO | Back side | 0 | 1.213 | 1.536 | 1.274 | **4.023** | Analyzed as below | Analyzed as below | Analyzed as below |
| | | Back side | 26 | 0.237 | - | - | 0.237 | ΣSAR<1.6, Not required | ΣSAR<1.6, Not required | ΣSAR<1.6, Not required |
| | | Top side | 0 | 0.4 (Estimated SAR) | 0.318 | 0.107 | 0.825 | ΣSAR<1.6, Not required | ΣSAR<1.6, Not required | ΣSAR<1.6, Not required |
| | | Left side | 0 | 0.191 | 0.081 | 0.4 (Estimated SAR) | 0.672 | ΣSAR<1.6, Not required | ΣSAR<1.6, Not required | ΣSAR<1.6, Not required |
| | | Right side | 0 | 0.411 | 0.016 | 0.8 | 1.227 | ΣSAR<1.6, Not required | ΣSAR<1.6, Not required | ΣSAR<1.6, Not required |
| | | Bottom side | 0 | 0.719 | 0.006 | 0.02 | 0.745 | ΣSAR<1.6, Not required | ΣSAR<1.6, Not required | ΣSAR<1.6, Not required |
| | | Bottom side | 10 | 0.817 | - | - | 0.817 | ΣSAR<1.6, Not required | ΣSAR<1.6, Not required | ΣSAR<1.6, Not required |

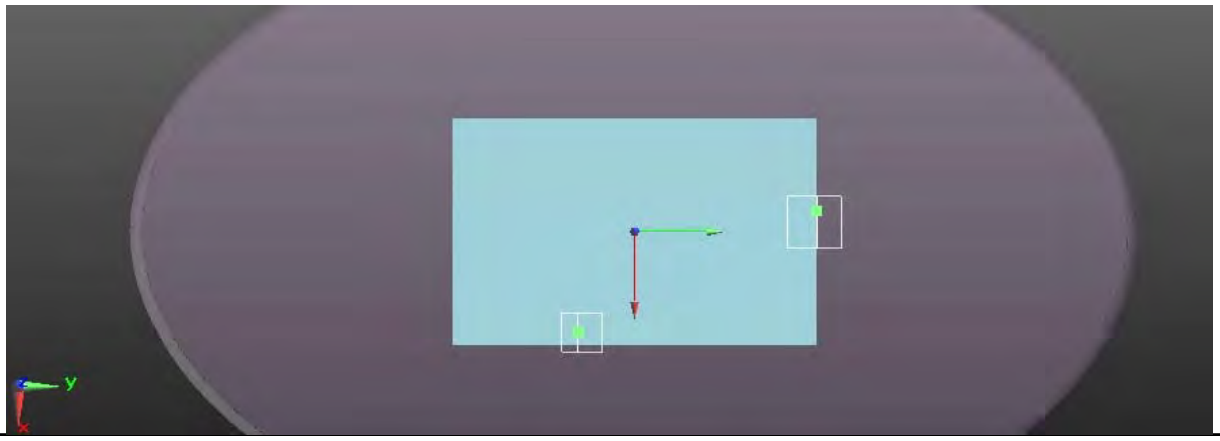
### SPLSR WCDMA B5 & WLAN Main

| Conditions | Position | SAR Value (W/kg) | Coordinates (cm) | | | ΣSAR (W/kg) | Peak Location Separation Distance (mm) | SPLSR | Simultaneous Transmission SAR Test |
|---|---|---|---|---|---|---|---|---|---|
| | | | x | y | z | | | | |
| WCDMA B5 CH 4183 | Back side | 1.213 | -1.24 | 10.81 | 0.39 | 2.749 | 203.1 | 0.022 | SPLSR<0.04, Not required |
| 802.11a CH 100 | | 1.536 | -2.76 | -9.44 | 0.48 | | | | |



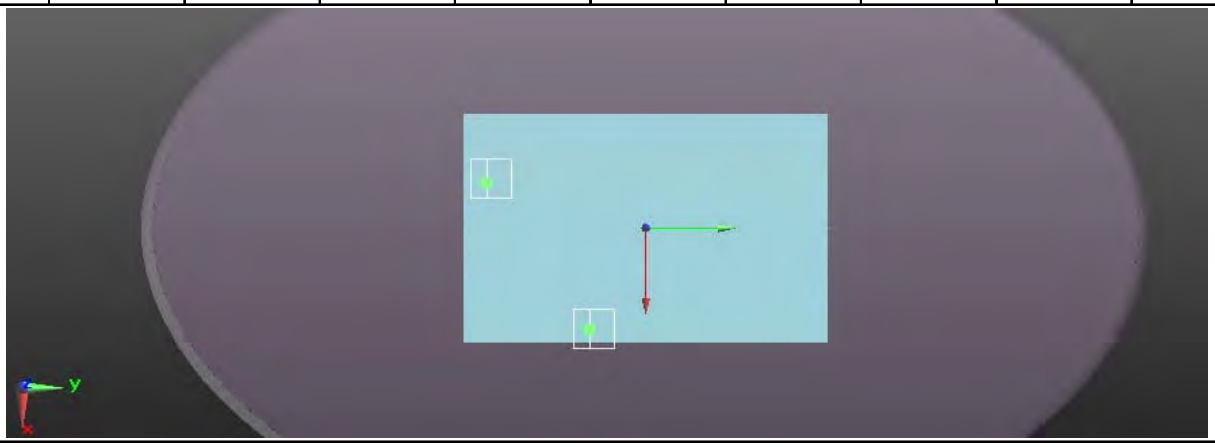
## SPLSR WCDMA B5 & WLAN Aux

| Conditions | Position | SAR Value (W/kg) | Coordinates (cm) | | | ΣSAR (W/kg) | Peak Location Separation Distance (mm) | SPLSR | Simultaneous Transmission SAR Test |
|---|---|---|---|---|---|---|---|---|---|
| | | | x | y | z | | | | |
| WCDMA B5 CH 4183 | Back side | 1.213 | -1.24 | 10.81 | 0.39 | 2.487 | 160.5 | 0.024 | SPLSR<0.04, Not required |
| 802.11a CH 44 | | 1.274 | 7.2 | -2.84 | 0.59 | | | | |



## SPLSR WLAN Main & WLAN Aux

| Conditions | Position | SAR Value (W/kg) | Coordinates (cm) | | | ΣSAR (W/kg) | Peak Location Separation Distance (mm) | SPLSR | Simultaneous Transmission SAR Test |
|---|---|---|---|---|---|---|---|---|---|
| | | | x | y | z | | | | |
| 802.11a CH 100 | Back side | 1.536 | -2.76 | -9.44 | 0.48 | 2.81 | 119.49 | 0.039 | SPLSR<0.04, Not required |
| 802.11a CH 44 | | 1.274 | 7.2 | -2.84 | 0.59 | | | | |



## GPRS 850 + BT

| No. | Conditions | Position | Distance (mm) | Max. GPRS850 | Max. BT | SAR Sum | SPLSR GPRS850 & BT |
|---|---|---|---|---|---|---|---|
| 11 | GPRS850 + BT | Back side | 0 | 0.869 | 0.162 | 1.031 | ΣSAR<1.6, Not required |
| | | Back side | 26 | 0.266 | - | 0.266 | ΣSAR<1.6, Not required |
| | | Top side | 0 | 0.4 (Estimated SAR) | 0.162 | 0.562 | ΣSAR<1.6, Not required |
| | | Left side | 0 | 0.679 | 0.05 | 0.729 | ΣSAR<1.6, Not required |
| | | Right side | 0 | 0.228 | 0.4 | 0.628 | ΣSAR<1.6, Not required |
| | | Bottom side | 0 | 0.529 | 0.4 | 0.929 | ΣSAR<1.6, Not required |
| | | Bottom side | 10 | 0.835 | - | 0.835 | ΣSAR<1.6, Not required |

## GPRS 1900 + BT

| No. | Conditions | Position | Distance (mm) | Max. GPRS1900 | Max. BT | SAR Sum | SPLSR GPRS1900 & BT |
|---|---|---|---|---|---|---|---|
| 12 | GPRS1900 + BT | Back side | 0 | 0.33 | 0.162 | 0.492 | ΣSAR<1.6, Not required |
| | | Back side | 26 | 0.098 | - | 0.098 | ΣSAR<1.6, Not required |
| | | Top side | 0 | 0.4 (Estimated SAR) | 0.162 | 0.562 | ΣSAR<1.6, Not required |
| | | Left side | 0 | 0.336 | 0.05 | 0.386 | ΣSAR<1.6, Not required |
| | | Right side | 0 | 0.038 | 0.4 | 0.438 | ΣSAR<1.6, Not required |
| | | Bottom side | 0 | 0.137 | 0.4 | 0.537 | ΣSAR<1.6, Not required |
| | | Bottom side | 10 | 0.259 | - | 0.259 | ΣSAR<1.6, Not required |

## WCDMA Band II + BT

| No. | Conditions | Position | Distance (mm) | Max. WCDMA B2 | Max. BT | SAR Sum | SPLSR WCDMA B2 & BT |
|---|---|---|---|---|---|---|---|
| 13 | WCDMA B2 + BT | Back side | 0 | 1.045 | 0.162 | 1.207 | ΣSAR<1.6, Not required |
| | | Back side | 26 | 0.238 | - | 0.238 | ΣSAR<1.6, Not required |
| | | Top side | 0 | 0.4 (Estimated SAR) | 0.162 | 0.562 | ΣSAR<1.6, Not required |
| | | Left side | 0 | 0.508 | 0.05 | 0.558 | ΣSAR<1.6, Not required |
| | | Right side | 0 | 0.223 | 0.4 | 0.623 | ΣSAR<1.6, Not required |
| | | Bottom side | 0 | 0.392 | 0.4 | 0.792 | ΣSAR<1.6, Not required |
| | | Bottom side | 10 | 0.6 | - | 0.6 | ΣSAR<1.6, Not required |

## WCDMA Band IV + BT

| No. | Conditions | Position | Distance (mm) | Max. WCDMA B4 | Max. BT | SAR Sum | SPLSR WCDMA B4 & BT |
|---|---|---|---|---|---|---|---|
| 14 | WCDMA B4 + BT | Back side | 0 | 0.91 | 0.162 | 1.072 | ΣSAR<1.6, Not required |
| | | Back side | 26 | 0.188 | - | 0.188 | ΣSAR<1.6, Not required |
| | | Top side | 0 | 0.4 (Estimated SAR) | 0.162 | 0.562 | ΣSAR<1.6, Not required |
| | | Left side | 0 | 0.4 | 0.05 | 0.45 | ΣSAR<1.6, Not required |
| | | Right side | 0 | 0.153 | 0.4 | 0.553 | ΣSAR<1.6, Not required |
| | | Bottom side | 0 | 0.312 | 0.4 | 0.712 | ΣSAR<1.6, Not required |
| | | Bottom side | 10 | 0.426 | - | 0.426 | ΣSAR<1.6, Not required |

## WCDMA Band V + BT

| No. | Conditions | Position | Distance (mm) | Max. WCDMA B5 | Max. BT | SAR Sum | SPLSR WCDMA B5 & BT |
|---|---|---|---|---|---|---|---|
| 15 | WCDMA B5 + BT | Back side | 0 | 1.213 | 0.162 | 1.375 | ΣSAR<1.6, Not required |
| | | Back side | 26 | 0.237 | - | 0.237 | ΣSAR<1.6, Not required |
| | | Top side | 0 | 0.4 (Estimated SAR) | 0.162 | 0.562 | ΣSAR<1.6, Not required |
| | | Left side | 0 | 0.191 | 0.05 | 0.241 | ΣSAR<1.6, Not required |
| | | Right side | 0 | 0.411 | 0.4 | 0.811 | ΣSAR<1.6, Not required |
| | | Bottom side | 0 | 0.719 | 0.4 | 1.119 | ΣSAR<1.6, Not required |
| | | Bottom side | 10 | 0.817 | - | 0.817 | ΣSAR<1.6, Not required |

# 4. Instruments List

| Manufacturer | Device | Type | Serial number | Date of last calibration | Date of next calibration |
|---|---|---|---|---|---|
| Schmid & Partner Engineering AG | Dosimetric E-Field Probe | EX3DV4 | 3820 | May.15,2014 | May.14,2015 |
| Schmid & Partner Engineering AG | System Validation Dipole | D835V2 | 4d063 | Aug.28,2014 | Aug.27,2015 |
| | | D1750V2 | 1008 | Aug.28,2014 | Aug.27,2015 |
| | | D1900V2 | 5d027 | Apr.23,2014 | Apr.22,2015 |
| | | D2450V2 | 727 | Apr.23,2014 | Apr.22,2015 |
| | | D5GHzV2 | 1023 | Jan.30,2014 | Jan.29,2015 |
| Schmid & Partner Engineering AG | Data acquisition Electronics | DAE4 | 547 | Mar.26,2014 | Mar.25,2015 |
| Schmid & Partner Engineering AG | Software | DASY 52 V52.8.8 | N/A | Calibration not required | Calibration not required |
| Schmid & Partner Engineering AG | Phantom | SAM | N/A | Calibration not required | Calibration not required |
| Agilent | Network Analyzer | E5071C | MY46107530 | Feb.14,2014 | Feb.13,2015 |
| Agilent | Dielectric Probe Kit | 85070E | MY44300677 | Calibration not required | Calibration not required |
| Agilent | Dual-directional coupler | 772D | MY46151242 | Jul.14,2014 | Jul.13,2015 |
| | | 778D | MY48220468 | Apr.01,2014 | Mar.31,2015 |
| Agilent | RF Signal Generator | N5181A | MY50144143 | Jun.25.2014 | Jun.24.2015 |
| Agilent | Power Meter | E4417A | MY51410006 | Oct.25,2013 | Oct.24,2015 |
| Agilent | Power Sensor | E9301H | MY51470001 | Dec.16,2013 | Dec.15,2014 |
| TECPEL | Digital thermometer | DTM-303A | TP130077 | Mar.17,2014 | Mar.16,2015 |

| Manufacturer | Device | Type | Serial number | Date of last calibration | Date of next calibration |
|---|---|---|---|---|---|
| R&S | Radio Communication Test | CMU200 | 113505 | May.08,2014 | May.07,2015 |
| Anritsu | Power Meter | ML2495A | 1005007 | Jan.13,2014 | Jan.12,2015 |
| Anritsu | Power Sensor | MA2411B | 917032 | Jan.13,2014 | Jan.12,2015 |
| Mini-Circuit | Attenuator | BW-S10W2+ | 002 | Feb.27,2014 | Feb.26,2015 |

# 5. Measurements

Date: 2014/11/24

## GPRS 850_Body-worn_Back side_CH 251_4up_0mm

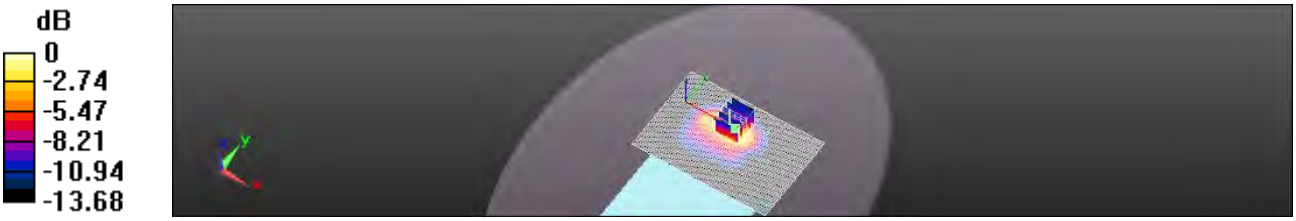
Communication System: GPRS (1Dn4Up); Frequency: 848.8 MHz
Medium parameters used: f = 849 MHz; $\sigma$ = 1.011 S/m; $\varepsilon_r$ = 52.576; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3820; ConvF(9.01, 9.01, 9.01); Calibrated: 2014/5/15;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn547; Calibrated: 2014/3/26
- Phantom: Body;
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

**Configuration/Body/Area Scan (121x81x1):** Interpolated grid: dx=15 mm, dy=15 mm
Maximum value of SAR (interpolated) = 0.804 W/kg

**Configuration/Body/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 2.703 V/m; Power Drift = -0.17 dB
Peak SAR (extrapolated) = 1.25 W/kg
**SAR(1 g) = 0.659 W/kg; SAR(10 g) = 0.367 W/kg**
Maximum value of SAR (measured) = 0.971 W/kg




0 dB = 0.971 W/kg = -0.13 dBW/kg

Date: 2014/11/26

## GPRS 1900_Body-worn_Left side_CH 512_3up_0mm

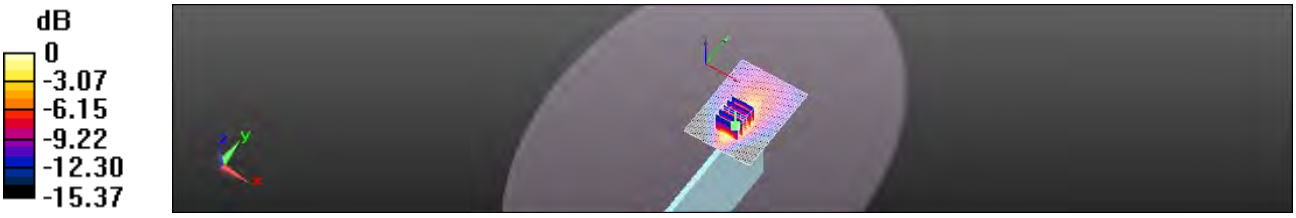
Communication System: GPRS (1Dn3Up); Frequency: 1850.2 MHz
Medium parameters used: f = 1850.2 MHz; $\sigma$ = 1.483 S/m; $\varepsilon_r$ = 54.823; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3820; ConvF(7.23, 7.23, 7.23); Calibrated: 2014/5/15;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn547; Calibrated: 2014/3/26
- Phantom: Body;
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

**Configuration/Body/Area Scan (61x81x1):** Interpolated grid: dx=15 mm, dy=15 mm
Maximum value of SAR (interpolated) = 0.402 W/kg

**Configuration/Body/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 7.332 V/m; Power Drift = -0.08 dB
Peak SAR (extrapolated) = 0.484 W/kg
**SAR(1 g) = 0.267 W/kg; SAR(10 g) = 0.149 W/kg**
Maximum value of SAR (measured) = 0.375 W/kg




0 dB = 0.375 W/kg = -4.26 dBW/kg

## WCDMA Band 2_Body-worn_Back side_CH 9400_0mm

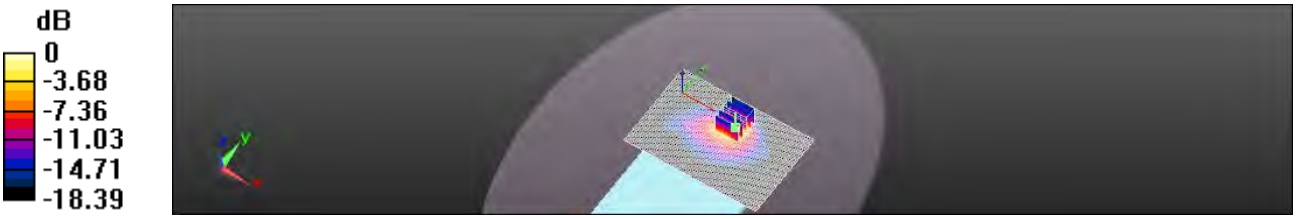
Communication System: WCDMA; Frequency: 1880 MHz
Medium parameters used: f = 1880 MHz; $\sigma$ = 1.543 S/m; $\varepsilon_r$ = 54.692; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3820; ConvF(7.23, 7.23, 7.23); Calibrated: 2014/5/15;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn547; Calibrated: 2014/3/26
- Phantom: Body;
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

**Configuration/Body/Area Scan (121x81x1):** Interpolated grid: dx=15 mm, dy=15 mm
Maximum value of SAR (interpolated) = 1.54 W/kg

**Configuration/Body/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 2.063 V/m; Power Drift = 0.18 dB
Peak SAR (extrapolated) = 2.04 W/kg
**SAR(1 g) = 0.969 W/kg; SAR(10 g) = 0.443 W/kg**
Maximum value of SAR (measured) = 1.56 W/kg




0 dB = 1.56 W/kg = 1.94 dBW/kg

Date: 2014/11/25

## WCDMA Band 4_Body-worn_Back side_CH 1312_0mm_repeat SAR test at the highest SAR measurement

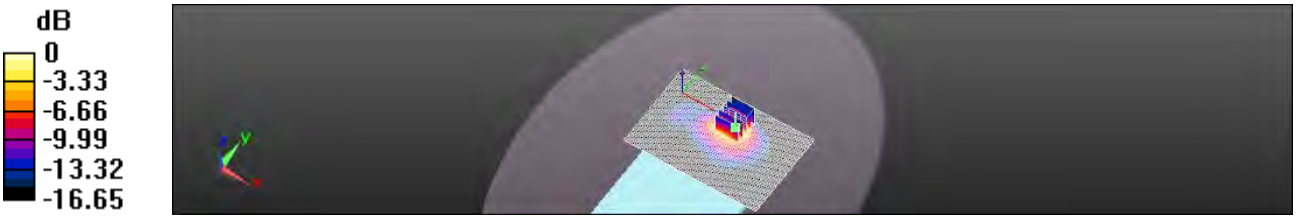
Communication System: WCDMA; Frequency: 1712.4 MHz
Medium parameters used: f = 1712.4 MHz; $\sigma$ = 1.428 S/m; $\varepsilon_r$ = 55.156; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3820; ConvF(7.48, 7.48, 7.48); Calibrated: 2014/5/15;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn547; Calibrated: 2014/3/26
- Phantom: Body;
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

**Configuration/Body/Area Scan (121x81x1):** Interpolated grid: dx=15 mm, dy=15 mm
Maximum value of SAR (interpolated) = 1.41 W/kg

**Configuration/Body/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 2.561 V/m; Power Drift = 0.13 dB
Peak SAR (extrapolated) = 1.75 W/kg
**SAR(1 g) = 0.861 W/kg; SAR(10 g) = 0.430 W/kg**
Maximum value of SAR (measured) = 1.33 W/kg




0 dB = 1.33 W/kg = 1.25 dBW/kg

Date: 2014/11/24

## WCDMA Band 5_Body-worn_Back side_CH 4183_0mm

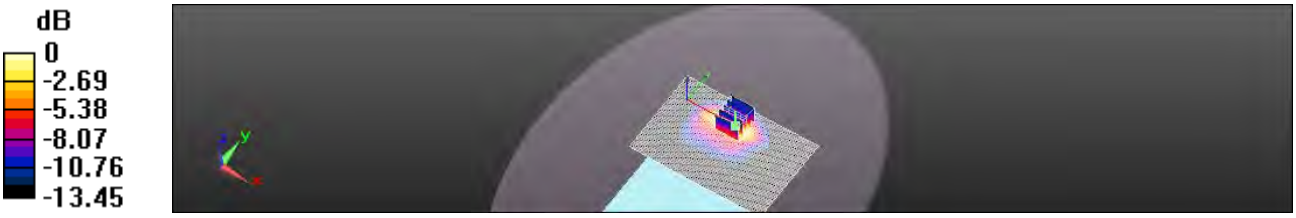
Communication System: WCDMA; Frequency: 836.6 MHz
Medium parameters used: f = 837 MHz; $\sigma$ = 1 S/m; $\varepsilon_r$ = 52.75; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3820; ConvF(9.01, 9.01, 9.01); Calibrated: 2014/5/15;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn547; Calibrated: 2014/3/26
- Phantom: Body;
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

**Configuration/Body/Area Scan (121x81x1):** Interpolated grid: dx=15 mm, dy=15 mm
Maximum value of SAR (interpolated) = 1.45 W/kg

**Configuration/Body/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 3.544 V/m; Power Drift = 0.15 dB
Peak SAR (extrapolated) = 1.95 W/kg
**SAR(1 g) = 1.04 W/kg; SAR(10 g) = 0.568 W/kg**
Maximum value of SAR (measured) = 1.50 W/kg




0 dB = 1.50 W/kg = 1.75 dBW/kg

Date: 2014/12/5

## WLAN802.11b_Body-worn_Top side_CH 1_Main

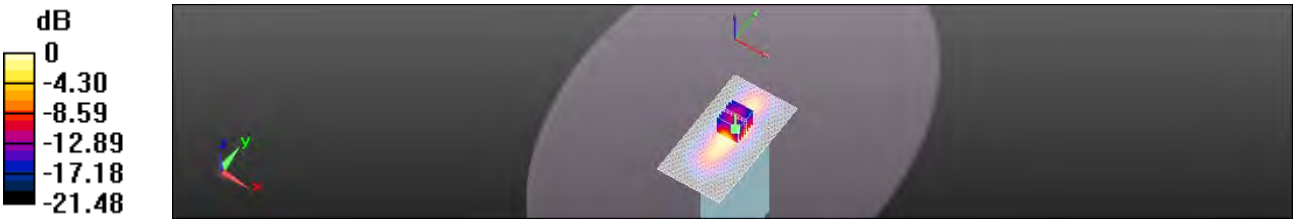
Communication System: WLAN(2.45G); Frequency: 2412 MHz
Medium parameters used: f = 2412 MHz; $\sigma$ = 1.94 S/m; $\varepsilon_r$ = 53.618; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3820; ConvF(6.87, 6.87, 6.87); Calibrated: 2014/5/15;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn547; Calibrated: 2014/3/26
- Phantom: Body;
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

**Configuration/Body/Area Scan (71x131x1):** Interpolated grid: dx=12 mm, dy=12 mm
Maximum value of SAR (interpolated) = 1.62 W/kg

**Configuration/Body/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 27.00 V/m; Power Drift = 0.17 dB
Peak SAR (extrapolated) = 2.06 W/kg
**SAR(1 g) = 1.03 W/kg; SAR(10 g) = 0.475 W/kg**
Maximum value of SAR (measured) = 1.56 W/kg




0 dB = 1.56 W/kg = 1.93 dBW/kg

Date: 2014/12/5

## WLAN802.11n(20M)_Body-worn_Top side_CH 6_Main

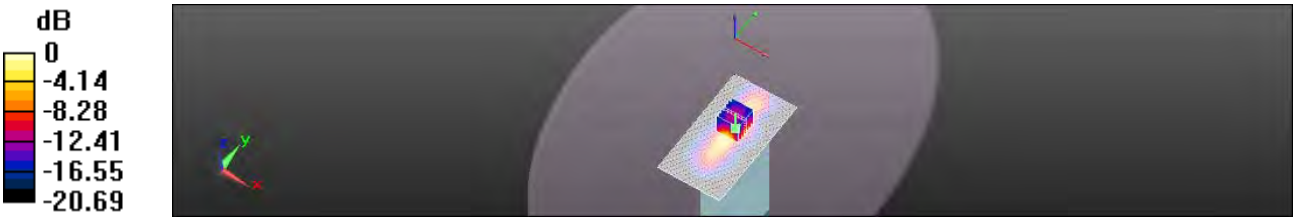
Communication System: WLAN(2.45G); Frequency: 2437 MHz
Medium parameters used: f = 2437 MHz; $\sigma$ = 1.969 S/m; $\varepsilon_r$ = 53.445; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3820; ConvF(6.87, 6.87, 6.87); Calibrated: 2014/5/15;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn547; Calibrated: 2014/3/26
- Phantom: Body;
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

**Configuration/Body/Area Scan (71x131x1):** Interpolated grid: dx=12 mm, dy=12 mm
Maximum value of SAR (interpolated) = 1.04 W/kg

**Configuration/Body/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 22.10 V/m; Power Drift = -0.00 dB
Peak SAR (extrapolated) = 1.37 W/kg
**SAR(1 g) = 0.679 W/kg; SAR(10 g) = 0.312 W/kg**
Maximum value of SAR (measured) = 1.03 W/kg




0 dB = 1.03 W/kg = 0.13 dBW/kg

Date: 2014/12/6

## WLAN802.11a 5.2G_Body-worn_Back side_CH 40_Main

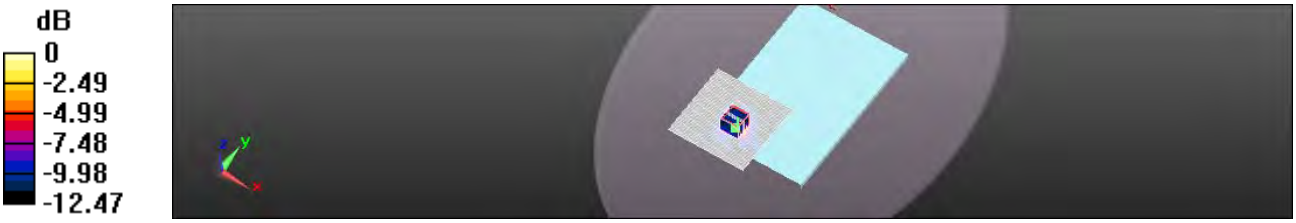
Communication System: WLAN(5G); Frequency: 5200 MHz
Medium parameters used: f = 5200 MHz; $\sigma$ = 5.215 S/m; $\varepsilon_r$ = 47.94; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3820; ConvF(4.44, 4.44, 4.44); Calibrated: 2014/5/15;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn547; Calibrated: 2014/3/26
- Phantom: Body;
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

**Configuration/Body/Area Scan (101x101x1):** Interpolated grid: dx=10 mm, dy=10 mm
Maximum value of SAR (interpolated) = 2.25 W/kg

**Configuration/Body/Zoom Scan (7x7x12)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 3.953 V/m; Power Drift = 0.16 dB
Peak SAR (extrapolated) = 5.04 W/kg
**SAR(1 g) = 1.27 W/kg; SAR(10 g) = 0.534 W/kg**
Maximum value of SAR (measured) = 2.30 W/kg




0 dB = 2.30 W/kg = 3.62 dBW/kg

Date: 2014/12/6

## WLAN802.11n(40M) 5.2G_Body-worn_Back side_CH 46_Main

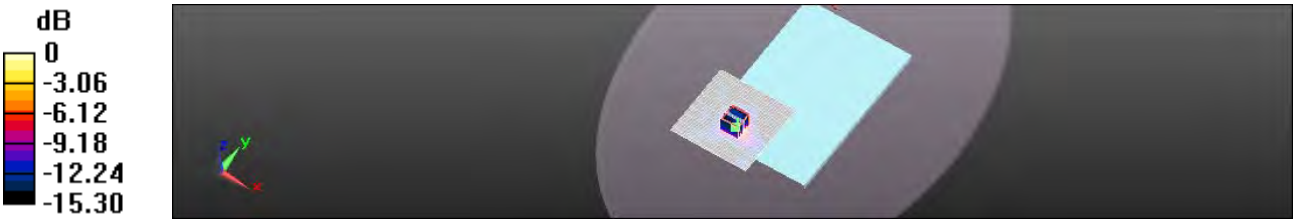
Communication System: WLAN(5G); Frequency: 5230 MHz
Medium parameters used: f = 5230 MHz; $\sigma$ = 5.248 S/m; $\varepsilon_r$ = 47.874; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3820; ConvF(4.44, 4.44, 4.44); Calibrated: 2014/5/15;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn547; Calibrated: 2014/3/26
- Phantom: Body;
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

**Configuration/Body/Area Scan (101x101x1):** Interpolated grid: dx=10 mm, dy=10 mm
Maximum value of SAR (interpolated) = 2.29 W/kg

**Configuration/Body/Zoom Scan (7x7x12)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 4.113 V/m; Power Drift = -0.08 dB
Peak SAR (extrapolated) = 4.61 W/kg
**SAR(1 g) = 1.13 W/kg; SAR(10 g) = 0.429 W/kg**
Maximum value of SAR (measured) = 2.12 W/kg




0 dB = 2.12 W/kg = 3.26 dBW/kg

Date: 2014/12/7

## WLAN802.11a 5.3G_Body-worn_Back side_CH 60_Main

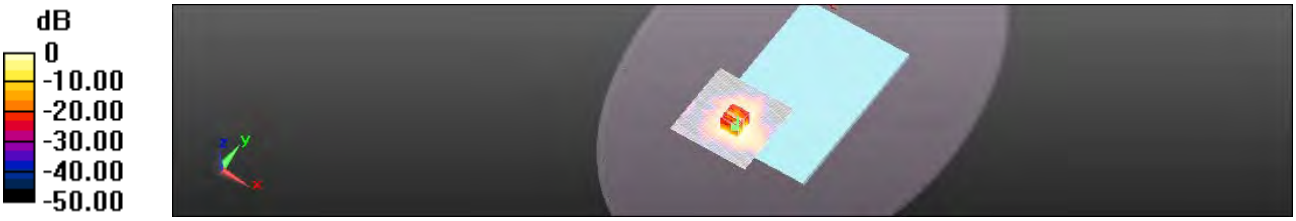
Communication System: WLAN(5G); Frequency: 5300 MHz
Medium parameters used: f = 5300 MHz; $\sigma$ = 5.388 S/m; $\varepsilon_r$ = 47.7; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3820; ConvF(4.25, 4.25, 4.25); Calibrated: 2014/5/15;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn547; Calibrated: 2014/3/26
- Phantom: Body;
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

**Configuration/Body/Area Scan (101x101x1):** Interpolated grid: dx=10 mm, dy=10 mm
Maximum value of SAR (interpolated) = 2.90 W/kg

**Configuration/Body/Zoom Scan (7x7x12)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 4.245 V/m; Power Drift = 0.19 dB
Peak SAR (extrapolated) = 5.69 W/kg
**SAR(1 g) = 1.4 W/kg; SAR(10 g) = 0.450 W/kg**
Maximum value of SAR (measured) = 2.76 W/kg




0 dB = 2.76 W/kg = 4.41 dBW/kg

Date: 2014/12/7

## WLAN802.11n(40M) 5.3G_Body-worn_Back side_CH 62_Main

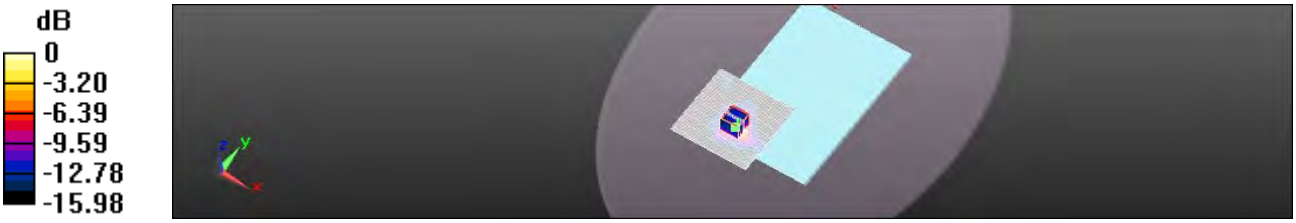
Communication System: WLAN(5G); Frequency: 5310 MHz
Medium parameters used: f = 5310 MHz; $\sigma$ = 5.391 S/m; $\varepsilon_r$ = 47.585; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3820; ConvF(4.25, 4.25, 4.25); Calibrated: 2014/5/15;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn547; Calibrated: 2014/3/26
- Phantom: Body;
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

**Configuration/Body/Area Scan (101x101x1):** Interpolated grid: dx=10 mm, dy=10 mm
Maximum value of SAR (interpolated) = 2.76 W/kg

**Configuration/Body/Zoom Scan (7x7x12)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 4.731 V/m; Power Drift = -0.17 dB
Peak SAR (extrapolated) = 5.24 W/kg
**SAR(1 g) = 1.33 W/kg; SAR(10 g) = 0.508 W/kg**
Maximum value of SAR (measured) = 2.51 W/kg




0 dB = 2.51 W/kg = 4.00 dBW/kg

Date: 2014/12/8

## WLAN802.11a 5.6G_Body-worn_Back side_CH 100_Main

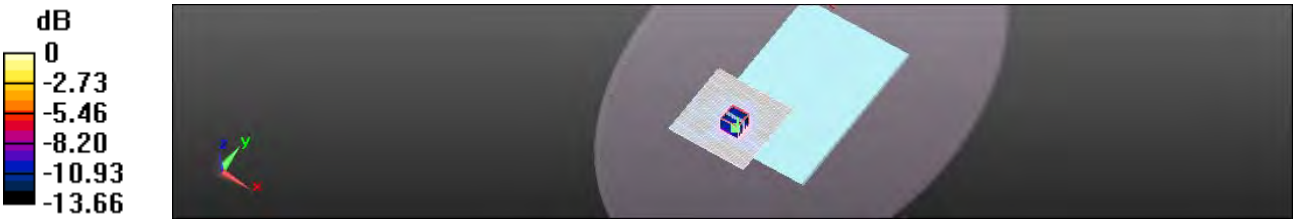
Communication System: WLAN(5G); Frequency: 5500 MHz
Medium parameters used: f = 5500 MHz; $\sigma$ = 5.694 S/m; $\varepsilon_r$ = 47.522; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3820; ConvF(3.99, 3.99, 3.99); Calibrated: 2014/5/15;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn547; Calibrated: 2014/3/26
- Phantom: Body;
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

**Configuration/Body/Area Scan (101x101x1):** Interpolated grid: dx=10 mm, dy=10 mm
Maximum value of SAR (interpolated) = 2.59 W/kg

**Configuration/Body/Zoom Scan (7x7x12)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 4.836 V/m; Power Drift = 0.06 dB
Peak SAR (extrapolated) = 5.68 W/kg
**SAR(1 g) = 1.31 W/kg; SAR(10 g) = 0.519 W/kg**
Maximum value of SAR (measured) = 2.41 W/kg




0 dB = 2.41 W/kg = 3.82 dBW/kg

Date: 2014/12/8

## WLAN802.11n(40M) 5.6G_Body-worn_Back side_CH 102_Main

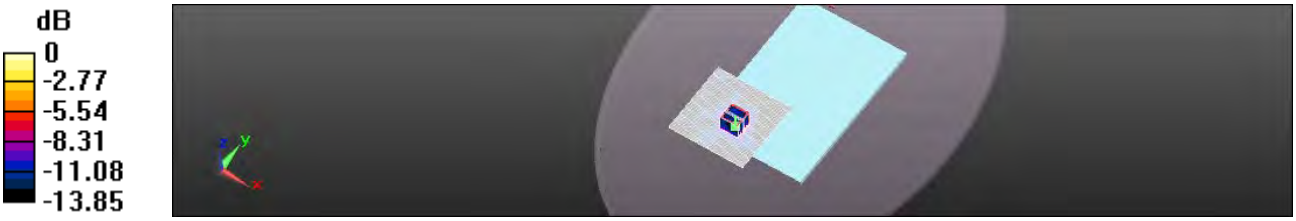
Communication System: WLAN(5G); Frequency: 5510 MHz
Medium parameters used: f = 5510 MHz; $\sigma$ = 5.713 S/m; $\varepsilon_r$ = 47.492; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3820; ConvF(3.99, 3.99, 3.99); Calibrated: 2014/5/15;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn547; Calibrated: 2014/3/26
- Phantom: Body;
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

**Configuration/Body/Area Scan (101x101x1):** Interpolated grid: dx=10 mm, dy=10 mm
Maximum value of SAR (interpolated) = 2.46 W/kg

**Configuration/Body/Zoom Scan (7x7x12)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 4.258 V/m; Power Drift = -0.12 dB
Peak SAR (extrapolated) = 5.23 W/kg
**SAR(1 g) = 1.24 W/kg; SAR(10 g) = 0.483 W/kg**
Maximum value of SAR (measured) = 2.31 W/kg




0 dB = 2.31 W/kg = 3.64 dBW/kg

Date: 2014/12/10

## WLAN802.11a 5.8G_Body-worn_Back side_CH 165_Main_repeat SAR test at the highest SAR measurement

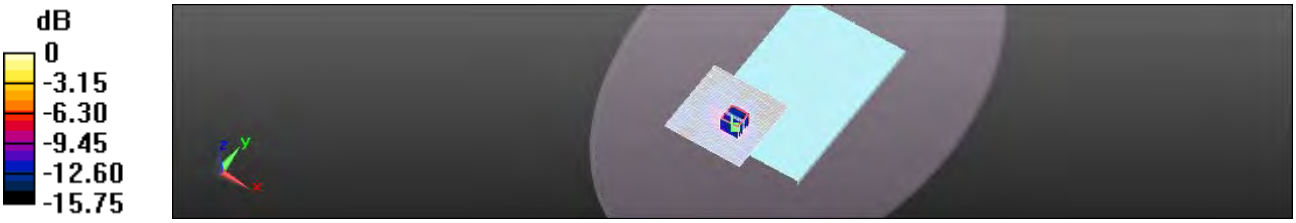
Communication System: WLAN(5G); Frequency: 5825 MHz
Medium parameters used: f = 5825 MHz; $\sigma$ = 6.278 S/m; $\varepsilon_r$ = 46.18; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3820; ConvF(4, 4, 4); Calibrated: 2014/5/15;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn547; Calibrated: 2014/3/26
- Phantom: Body;
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

**Configuration/Body/Area Scan (101x101x1):** Interpolated grid: dx=10 mm, dy=10 mm
Maximum value of SAR (interpolated) = 2.58 W/kg

**Configuration/Body/Zoom Scan (7x7x12)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 4.382 V/m; Power Drift = -0.19 dB
Peak SAR (extrapolated) = 5.52 W/kg
**SAR(1 g) = 1.18 W/kg; SAR(10 g) = 0.404 W/kg**
Maximum value of SAR (measured) = 2.35 W/kg




0 dB = 2.35 W/kg = 3.71 dBW/kg

Date: 2014/12/10

## WLAN802.11n(40M) 5.8G_Body-worn_Back side_CH 159_Main

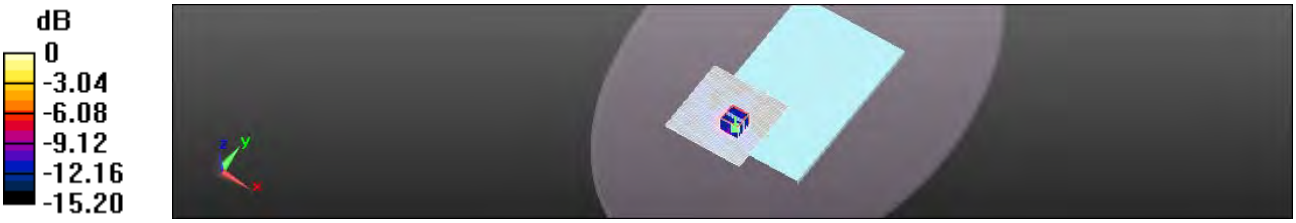
Communication System: WLAN(5G); Frequency: 5795 MHz
Medium parameters used: f = 5795 MHz; $\sigma$ = 6.2 S/m; $\varepsilon_r$ = 46.273; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3820; ConvF(4, 4, 4); Calibrated: 2014/5/15;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn547; Calibrated: 2014/3/26
- Phantom: Body;
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

**Configuration/Body/Area Scan (101x101x1):** Interpolated grid: dx=10 mm, dy=10 mm
Maximum value of SAR (interpolated) = 1.96 W/kg

**Configuration/Body/Zoom Scan (7x7x12)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 4.258 V/m; Power Drift = -0.06 dB
Peak SAR (extrapolated) = 4.58 W/kg
**SAR(1 g) = 0.951 W/kg; SAR(10 g) = 0.344 W/kg**
Maximum value of SAR (measured) = 1.85 W/kg




0 dB = 1.85 W/kg = 2.67 dBW/kg

Date: 2014/12/5

## WLAN802.11b_Body-worn_Back side_CH 11_Aux_repeat SAR test at the highest SAR measurement

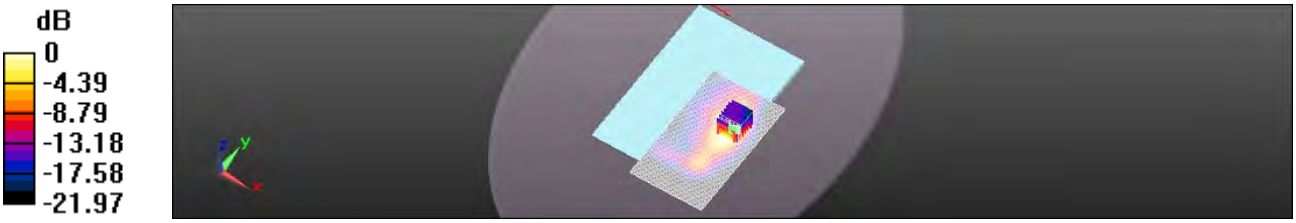
Communication System: WLAN(2.45G); Frequency: 2462 MHz
Medium parameters used: f = 2462 MHz; $\sigma$ = 2.003 S/m; $\varepsilon_r$ = 53.318; $\rho$ = 1000 kg/$m^3$
Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3820; ConvF(6.87, 6.87, 6.87); Calibrated: 2014/5/15;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn547; Calibrated: 2014/3/26
- Phantom: Body;
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

**Configuration/Body/Area Scan (81x141x1):** Interpolated grid: dx=12 mm, dy=12 mm
Maximum value of SAR (interpolated) = 2.05 W/kg

**Configuration/Body/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 3.400 V/m; Power Drift = 0.16 dB
Peak SAR (extrapolated) = 2.62 W/kg
**SAR(1 g) = 1.28 W/kg; SAR(10 g) = 0.636 W/kg**
Maximum value of SAR (measured) = 1.96 W/kg




0 dB = 1.96 W/kg = 2.92 dBW/kg

Date: 2014/12/5

## WLAN802.11n(20M)_Body-worn_Back side_CH 1_Aux

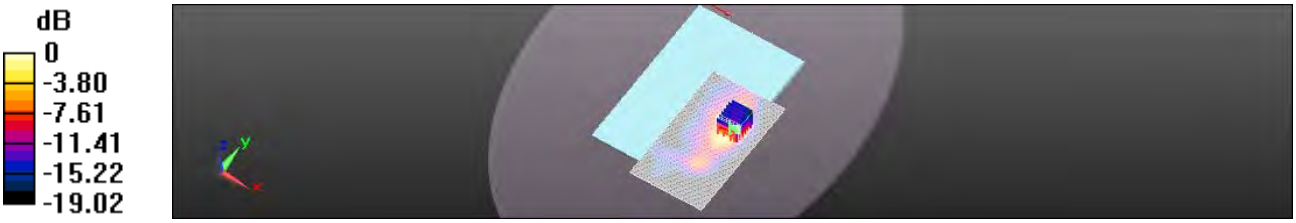
Communication System: WLAN(2.45G); Frequency: 2412 MHz
Medium parameters used: f = 2412 MHz; $\sigma$ = 1.94 S/m; $\varepsilon_r$ = 53.618; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3820; ConvF(6.87, 6.87, 6.87); Calibrated: 2014/5/15;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn547; Calibrated: 2014/3/26
- Phantom: Body;
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

**Configuration/Body/Area Scan (81x141x1):** Interpolated grid: dx=12 mm, dy=12 mm
Maximum value of SAR (interpolated) = 1.13 W/kg

**Configuration/Body/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 3.361 V/m; Power Drift = 0.13 dB
Peak SAR (extrapolated) = 1.60 W/kg
**SAR(1 g) = 0.763 W/kg; SAR(10 g) = 0.383 W/kg**
Maximum value of SAR (measured) = 1.18 W/kg




0 dB = 1.18 W/kg = 0.72 dBW/kg

Date: 2014/12/6

## WLAN802.11a 5.2G_Body-worn_Back side_CH 44_Aux_repeat SAR test at the highest SAR measurement

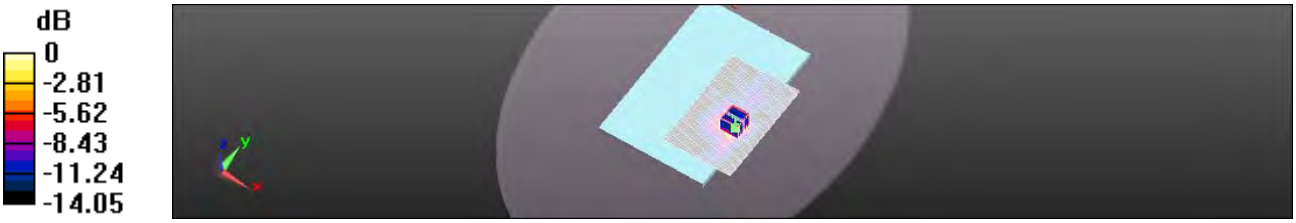
Communication System: WLAN(5G); Frequency: 5220 MHz
Medium parameters used: f = 5220 MHz; $\sigma$ = 5.241 S/m; $\varepsilon_r$ = 47.918; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3820; ConvF(4.44, 4.44, 4.44); Calibrated: 2014/5/15;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn547; Calibrated: 2014/3/26
- Phantom: Body;
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

**Configuration/Body/Area Scan (91x141x1):** Interpolated grid: dx=10 mm, dy=10 mm
Maximum value of SAR (interpolated) = 1.69 W/kg

**Configuration/Body/Zoom Scan (7x7x12)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 3.480 V/m; Power Drift = 0.04 dB
Peak SAR (extrapolated) = 3.23 W/kg
**SAR(1 g) = 0.871 W/kg; SAR(10 g) = 0.367 W/kg**
Maximum value of SAR (measured) = 1.59 W/kg




0 dB = 1.59 W/kg = 2.01 dBW/kg

Date: 2014/12/6

## WLAN802.11n(40M) 5.2G_Body-worn_Back side_CH 38_Aux

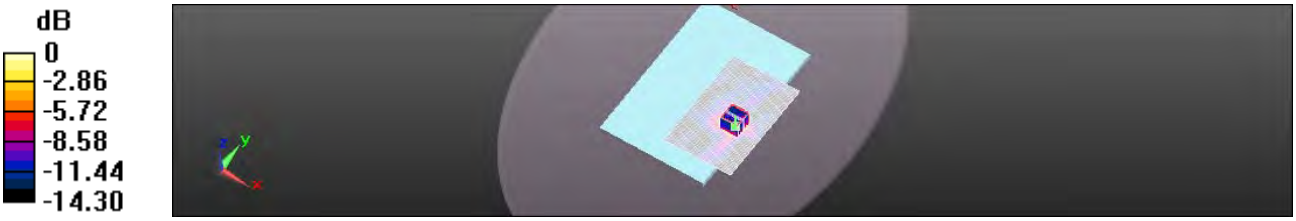
Communication System: WLAN(5G); Frequency: 5190 MHz
Medium parameters used: f = 5190 MHz; $\sigma$ = 5.203 S/m; $\varepsilon_r$ = 47.969; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3820; ConvF(4.44, 4.44, 4.44); Calibrated: 2014/5/15;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn547; Calibrated: 2014/3/26
- Phantom: Body;
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

**Configuration/Body/Area Scan (91x141x1):** Interpolated grid: dx=10 mm, dy=10 mm
Maximum value of SAR (interpolated) = 1.43 W/kg

**Configuration/Body/Zoom Scan (7x7x12)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 3.098 V/m; Power Drift = 0.05 dB
Peak SAR (extrapolated) = 2.84 W/kg
**SAR(1 g) = 0.780 W/kg; SAR(10 g) = 0.330 W/kg**
Maximum value of SAR (measured) = 1.40 W/kg




0 dB = 1.40 W/kg = 1.46 dBW/kg

Date: 2014/12/7

## WLAN802.11a 5.3G_Body-worn_Back side_CH 52_Aux_repeat SAR test at the highest SAR measurement

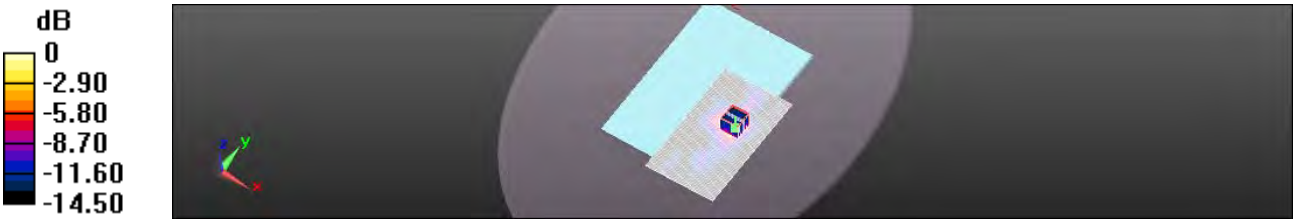
Communication System: WLAN(5G); Frequency: 5260 MHz
Medium parameters used: f = 5260 MHz; $\sigma$ = 5.293 S/m; $\varepsilon_r$ = 47.837; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3820; ConvF(4.25, 4.25, 4.25); Calibrated: 2014/5/15;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn547; Calibrated: 2014/3/26
- Phantom: Body;
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

**Configuration/Body/Area Scan (91x161x1):** Interpolated grid: dx=10 mm, dy=10 mm
Maximum value of SAR (interpolated) = 1.45 W/kg

**Configuration/Body/Zoom Scan (7x7x12)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 3.847 V/m; Power Drift = 0.13 dB
Peak SAR (extrapolated) = 3.15 W/kg
**SAR(1 g) = 0.857 W/kg; SAR(10 g) = 0.336 W/kg**
Maximum value of SAR (measured) = 1.53 W/kg




0 dB = 1.53 W/kg = 1.85 dBW/kg

Date: 2014/12/7

## WLAN802.11n(40M) 5.3G_Body-worn_Back side_CH 54_Aux

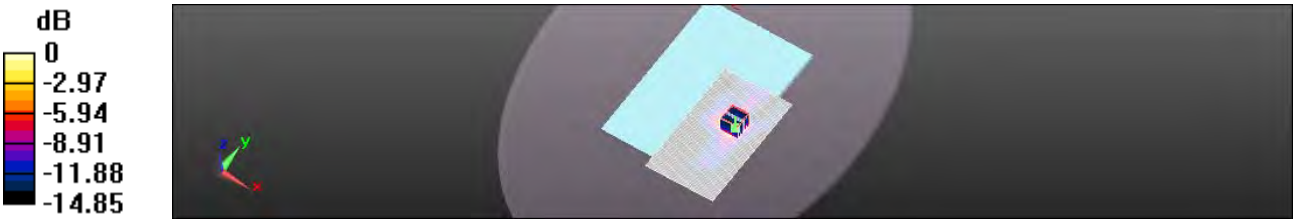
Communication System: WLAN(5G); Frequency: 5270 MHz
Medium parameters used: f = 5270 MHz; $\sigma$ = 5.303 S/m; $\varepsilon_r$ = 47.795; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3820; ConvF(4.25, 4.25, 4.25); Calibrated: 2014/5/15;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn547; Calibrated: 2014/3/26
- Phantom: Body;
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

**Configuration/Body/Area Scan (91x161x1):** Interpolated grid: dx=10 mm, dy=10 mm
Maximum value of SAR (interpolated) = 1.64 W/kg

**Configuration/Body/Zoom Scan (7x7x12)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 4.449 V/m; Power Drift = -0.13 dB
Peak SAR (extrapolated) = 3.61 W/kg
**SAR(1 g) = 0.959 W/kg; SAR(10 g) = 0.370 W/kg**
Maximum value of SAR (measured) = 1.70 W/kg




0 dB = 1.70 W/kg = 2.30 dBW/kg

Date: 2014/12/8

## WLAN802.11a 5.6G_Body-worn_Back side_CH 136_Aux

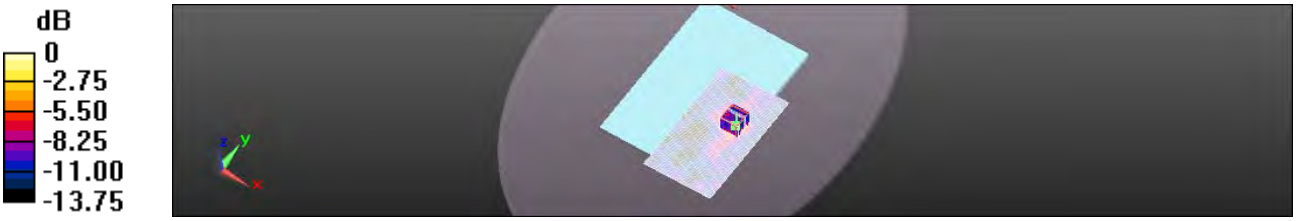
Communication System: WLAN(5G); Frequency: 5680 MHz
Medium parameters used: f = 5680 MHz; $\sigma$ = 5.992 S/m; $\varepsilon_r$ = 46.979; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3820; ConvF(3.83, 3.83, 3.83); Calibrated: 2014/5/15;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn547; Calibrated: 2014/3/26
- Phantom: Body;
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

**Configuration/Body/Area Scan (91x161x1):** Interpolated grid: dx=10 mm, dy=10 mm
Maximum value of SAR (interpolated) = 1.12 W/kg

**Configuration/Body/Zoom Scan (7x7x12)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 5.768 V/m; Power Drift = -0.08 dB
Peak SAR (extrapolated) = 2.71 W/kg
**SAR(1 g) = 0.684 W/kg; SAR(10 g) = 0.306 W/kg**
Maximum value of SAR (measured) = 1.22 W/kg




0 dB = 1.22 W/kg = 0.86 dBW/kg

Date: 2014/12/8

## WLAN802.11n(40M) 5.6G_Body-worn_Back side_CH 134_Aux

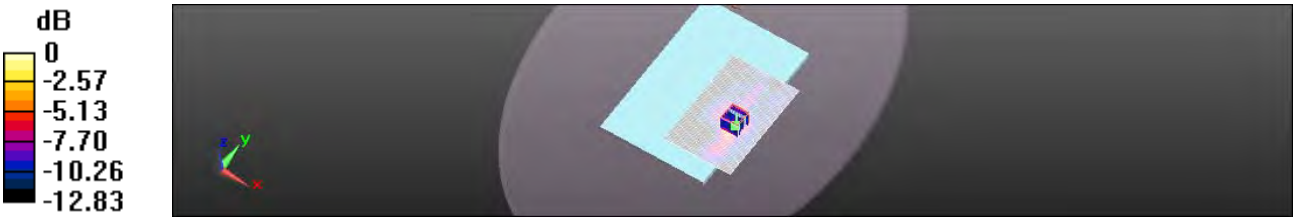
Communication System: WLAN(5G); Frequency: 5670 MHz
Medium parameters used: f = 5670 MHz; $\sigma$ = 5.948 S/m; $\varepsilon_r$ = 47.031; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3820; ConvF(3.83, 3.83, 3.83); Calibrated: 2014/5/15;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn547; Calibrated: 2014/3/26
- Phantom: Body;
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

**Configuration/Body/Area Scan (91x141x1):** Interpolated grid: dx=10 mm, dy=10 mm
Maximum value of SAR (interpolated) = 1.27 W/kg

**Configuration/Body/Zoom Scan (7x7x12)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 4.775 V/m; Power Drift = -0.19 dB
Peak SAR (extrapolated) = 2.83 W/kg
**SAR(1 g) = 0.726 W/kg; SAR(10 g) = 0.326 W/kg**
Maximum value of SAR (measured) = 1.38 W/kg




0 dB = 1.38 W/kg = 1.40 dBW/kg

Date: 2014/12/10

## WLAN802.11a 5.8G_Body-worn_Back side_CH 161_Aux

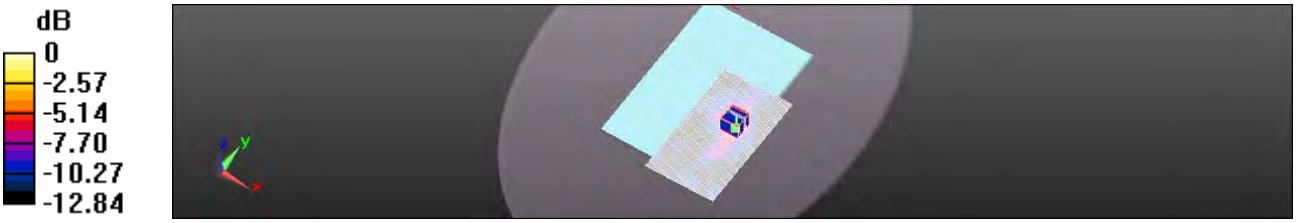
Communication System: WLAN(5G); Frequency: 5805 MHz
Medium parameters used: f = 5805 MHz; $\sigma$ = 6.236 S/m; $\varepsilon_r$ = 46.217; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3820; ConvF(4, 4, 4); Calibrated: 2014/5/15;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn547; Calibrated: 2014/3/26
- Phantom: Body;
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

**Configuration/Body/Area Scan (91x161x1):** Interpolated grid: dx=10 mm, dy=10 mm
Maximum value of SAR (interpolated) = 0.911 W/kg

**Configuration/Body/Zoom Scan (7x7x12)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 3.731 V/m; Power Drift = 0.11 dB
Peak SAR (extrapolated) = 2.35 W/kg
**SAR(1 g) = 0.608 W/kg; SAR(10 g) = 0.260 W/kg**
Maximum value of SAR (measured) = 1.10 W/kg




0 dB = 1.10 W/kg = 0.41 dBW/kg

Date: 2014/12/10

## WLAN802.11n(40M) 5.8G_Body-worn_Back side_CH 151_Aux

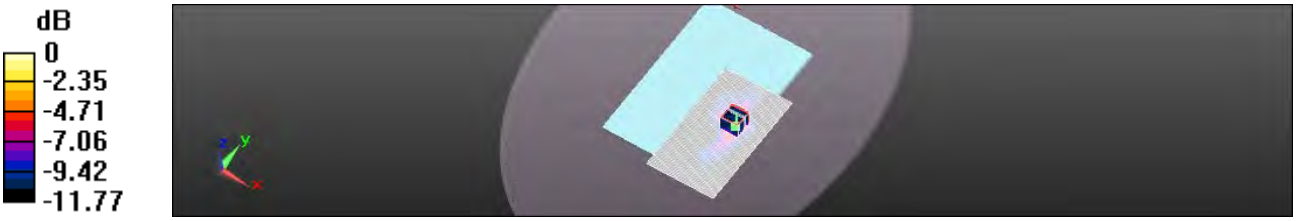
Communication System: WLAN(5G); Frequency: 5755 MHz
Medium parameters used: f = 5755 MHz; $\sigma$ = 6.141 S/m; $\varepsilon_r$ = 46.486; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3820; ConvF(4, 4, 4); Calibrated: 2014/5/15;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn547; Calibrated: 2014/3/26
- Phantom: Body;
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

**Configuration/Body/Area Scan (91x161x1):** Interpolated grid: dx=10 mm, dy=10 mm
Maximum value of SAR (interpolated) = 0.921 W/kg

**Configuration/Body/Zoom Scan (7x7x12)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 4.023 V/m; Power Drift = -0.17 dB
Peak SAR (extrapolated) = 2.24 W/kg
**SAR(1 g) = 0.580 W/kg; SAR(10 g) = 0.250 W/kg**
Maximum value of SAR (measured) = 1.10 W/kg




0 dB = 1.10 W/kg = 0.41 dBW/kg

# 6. SAR System Performance Verification

Date: 2014/11/24

## Dipole 835 MHz_SN:4d063_Body

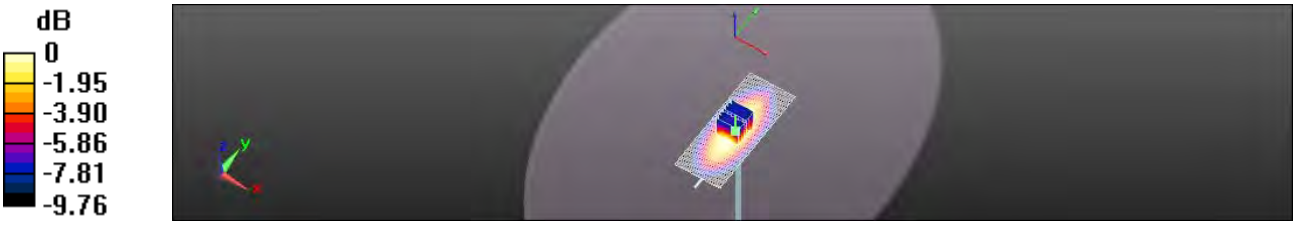
Communication System: CW; Frequency: 835 MHz
Medium parameters used: f = 835 MHz; $\sigma$ = 0.999 S/m; $\varepsilon_r$ = 52.823; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3820; ConvF(9.01, 9.01, 9.01); Calibrated: 2014/5/15;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn547; Calibrated: 2014/3/26
- Phantom: Body;
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

**Configuration/Pin=250mW/Area Scan (41x101x1):** Interpolated grid: dx=15 mm, dy=15 mm
Maximum value of SAR (interpolated) = 3.09 W/kg

**Configuration/Pin=250mW/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 56.81 V/m; Power Drift = -0.15 dB
Peak SAR (extrapolated) = 3.56 W/kg
**SAR(1 g) = 2.45 W/kg; SAR(10 g) = 1.65 W/kg**
Maximum value of SAR (measured) = 3.06 W/kg




0 dB = 3.06 W/kg = 4.86 dBW/kg

## Dipole 1750 MHz_SN:1008_Body

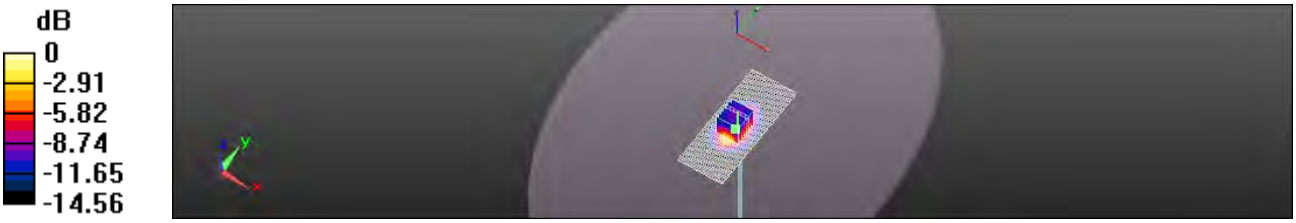
Communication System: CW; Frequency: 1750 MHz
Medium parameters used: f = 1750 MHz; $\sigma$ = 1.445 S/m; $\varepsilon_r$ = 54.916; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3820; ConvF(7.48, 7.48, 7.48); Calibrated: 2014/5/15;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn547; Calibrated: 2014/3/26
- Phantom: Body;
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

**Configuration/Pin=250mW/Area Scan (41x101x1):** Interpolated grid: dx=15 mm, dy=15 mm
Maximum value of SAR (interpolated) = 12.5 W/kg

**Configuration/Pin=250mW/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 96.66 V/m; Power Drift = -0.15 dB
Peak SAR (extrapolated) = 15.4 W/kg
**SAR(1 g) = 9.06 W/kg; SAR(10 g) = 5.06 W/kg**
Maximum value of SAR (measured) = 12.4 W/kg




0 dB = 12.4 W/kg = 10.93 dBW/kg

## Dipole 1900 MHz_SN:5d027_Body

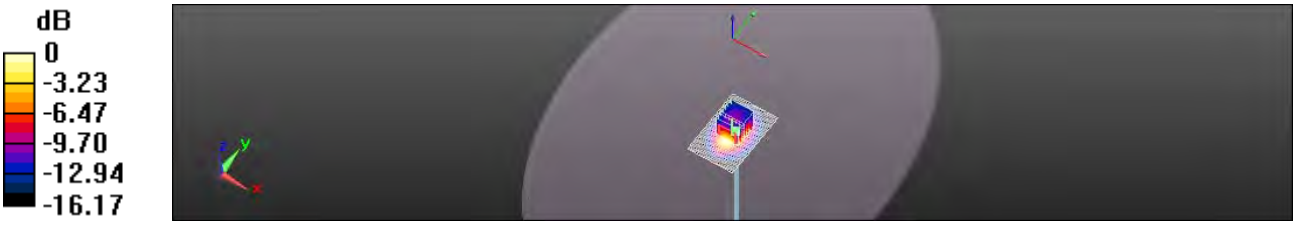
Communication System: CW; Frequency: 1900 MHz
Medium parameters used: f = 1900 MHz; $\sigma$ = 1.57 S/m; $\varepsilon_r$ = 54.591; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3820; ConvF(7.23, 7.23, 7.23); Calibrated: 2014/5/15;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn547; Calibrated: 2014/3/26
- Phantom: Body;
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

**Configuration/Pin=250mW/Area Scan (41x61x1):** Interpolated grid: dx=15 mm, dy=15 mm
Maximum value of SAR (interpolated) = 14.0 W/kg

**Configuration/Pin=250mW/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 96.28 V/m; Power Drift = -0.16 dB
Peak SAR (extrapolated) = 17.0 W/kg
**SAR(1 g) = 9.77 W/kg; SAR(10 g) = 5.28 W/kg**
Maximum value of SAR (measured) = 13.7 W/kg




0 dB = 13.7 W/kg = 11.37 dBW/kg

## Dipole 2450 MHz_SN:727_Body

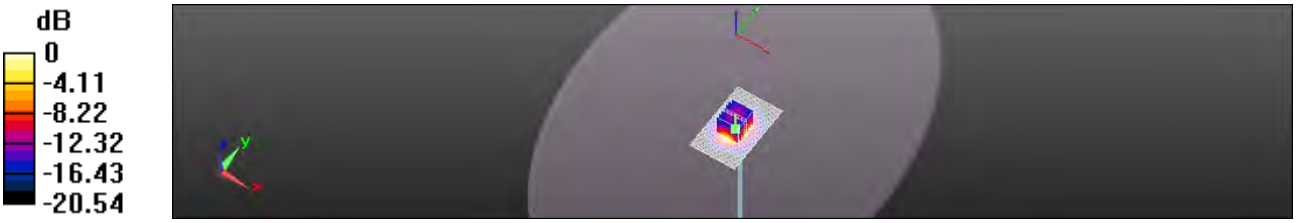
Communication System: CW; Frequency: 2450 MHz
Medium parameters used: f = 2450 MHz; $\sigma$ = 1.997 S/m; $\varepsilon_r$ = 53.416; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3820; ConvF(6.87, 6.87, 6.87); Calibrated: 2014/5/15;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn547; Calibrated: 2014/3/26
- Phantom: Body;
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

**Configuration/Pin=250mW/Area Scan (51x81x1):** Interpolated grid: dx=12 mm, dy=12 mm
Maximum value of SAR (interpolated) = 19.0 W/kg

**Configuration/Pin=250mW/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 96.26 V/m; Power Drift = -0.16 dB
Peak SAR (extrapolated) = 24.1 W/kg
**SAR(1 g) = 12.1 W/kg; SAR(10 g) = 5.78 W/kg**
Maximum value of SAR (measured) = 18.1 W/kg




0 dB = 18.1 W/kg = 12.58 dBW/kg

## Dipole 5200 MHz_SN:1023_Body

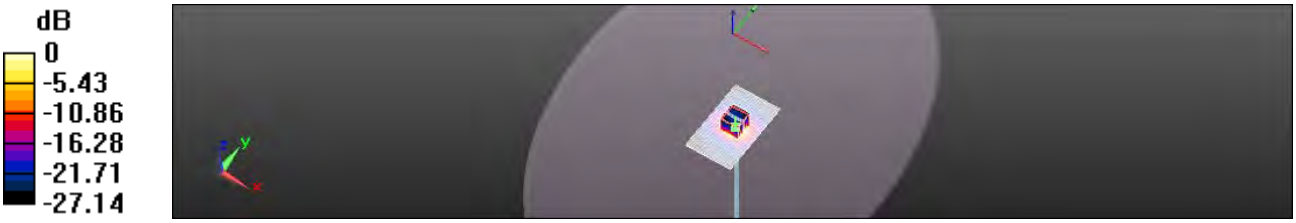
Communication System: CW; Frequency: 5200 MHz
Medium parameters used: f = 5200 MHz; $\sigma$ = 5.215 S/m; $\varepsilon_r$ = 47.94; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3820; ConvF(4.44, 4.44, 4.44); Calibrated: 2014/5/15;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn547; Calibrated: 2014/3/26
- Phantom: Body;
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

**Configuration/Pin=100mW/Area Scan (61x101x1):** Interpolated grid: dx=10 mm, dy=10 mm
Maximum value of SAR (interpolated) = 16.0 W/kg

**Configuration/Pin=100mW/Zoom Scan (7x7x12)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 57.17 V/m; Power Drift = -0.01 dB
Peak SAR (extrapolated) = 27.8 W/kg
**SAR(1 g) = 7.76 W/kg; SAR(10 g) = 2.18 W/kg**
Maximum value of SAR (measured) = 15.8 W/kg




0 dB = 15.8 W/kg = 11.99 dBW/kg

## Dipole 5300 MHz_SN:1023_Body

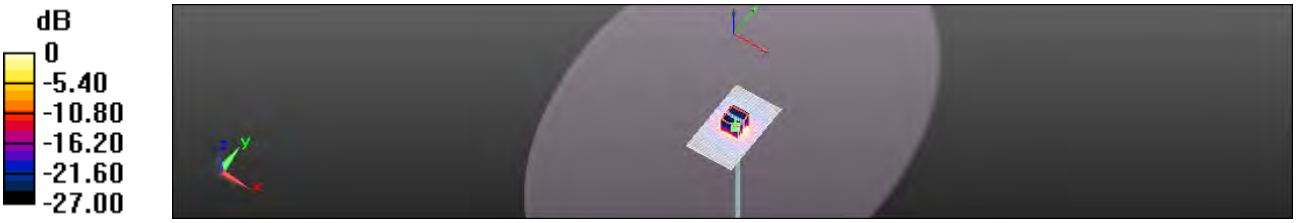
Communication System: CW; Frequency: 5300 MHz
Medium parameters used: f = 5300 MHz; $\sigma$ = 5.388 S/m; $\varepsilon_r$ = 47.7; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3820; ConvF(4.25, 4.25, 4.25); Calibrated: 2014/5/15;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn547; Calibrated: 2014/3/26
- Phantom: Body;
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

**Configuration/Pin=100mW/Area Scan (61x101x1):** Interpolated grid: dx=10 mm, dy=10 mm
Maximum value of SAR (interpolated) = 15.4 W/kg

**Configuration/Pin=100mW/Zoom Scan (7x7x12)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 57.18 V/m; Power Drift = -0.02 dB
Peak SAR (extrapolated) = 26.9 W/kg
**SAR(1 g) = 7.39 W/kg; SAR(10 g) = 2.11 W/kg**
Maximum value of SAR (measured) = 15.1 W/kg




0 dB = 15.1 W/kg = 11.79 dBW/kg

## Dipole 5600 MHz_SN:1023_Body

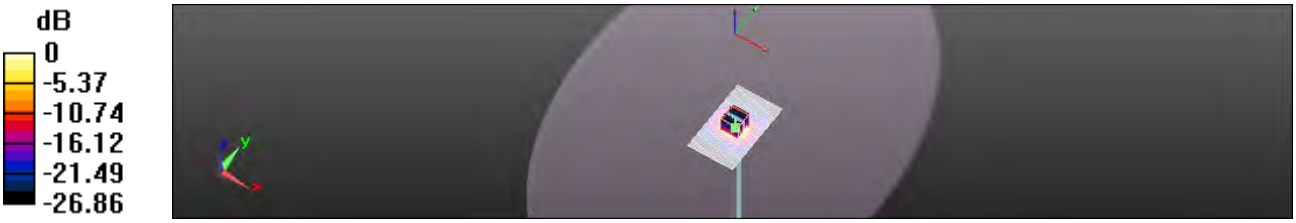
Communication System: CW; Frequency: 5600 MHz
Medium parameters used: f = 5600 MHz; $\sigma$ = 5.838 S/m; $\varepsilon_r$ = 47.15; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3820; ConvF(3.99, 3.99, 3.99); Calibrated: 2014/5/15;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn547; Calibrated: 2014/3/26
- Phantom: Body;
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

**Configuration/Pin=100mW/Area Scan (61x101x1):** Interpolated grid: dx=10 mm, dy=10 mm
Maximum value of SAR (interpolated) = 18.9 W/kg

**Configuration/Pin=100mW/Zoom Scan (7x7x12)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 63.52 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 34.2 W/kg
**SAR(1 g) = 8.45 W/kg; SAR(10 g) = 2.3 W/kg**
Maximum value of SAR (measured) = 18.9 W/kg




0 dB = 18.9 W/kg = 12.76 dBW/kg

## Dipole 5800 MHz_SN:1023_Body

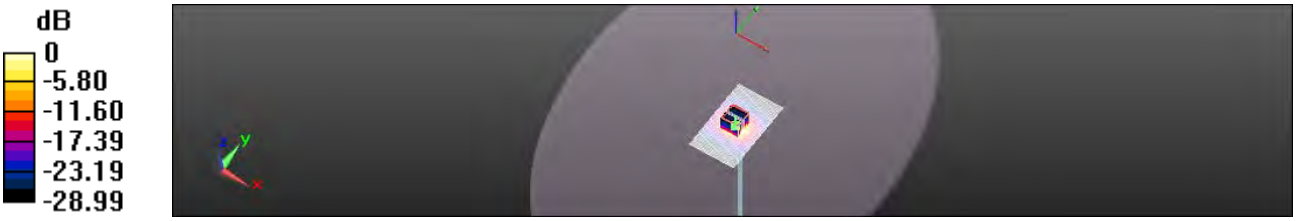
Communication System: CW; Frequency: 5800 MHz
Medium parameters used: f = 5800 MHz; $\sigma$ = 6.217 S/m; $\varepsilon_r$ = 46.238; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3820; ConvF(4, 4, 4); Calibrated: 2014/5/15;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn547; Calibrated: 2014/3/26
- Phantom: Body;
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

**Configuration/Pin=100mW/Area Scan (61x101x1):** Interpolated grid: dx=10 mm, dy=10 mm
Maximum value of SAR (interpolated) = 15.7 W/kg

**Configuration/Pin=100mW/Zoom Scan (7x7x12)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 55.62 V/m; Power Drift = 0.06 dB
Peak SAR (extrapolated) = 31.5 W/kg
**SAR(1 g) = 7.36 W/kg; SAR(10 g) = 2.08 W/kg**
Maximum value of SAR (measured) = 15.7 W/kg




0 dB = 15.7 W/kg = 11.96 dBW/kg

# 7. DAE & Probe Calibration Certificate

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Accreditation No.: SCS 108

Client SGS - TW (Auden)

Certificate No: DAE4-547_Mar14

## CALIBRATION CERTIFICATE

| | |
|---|---|
| Object | DAE4 - SD 000 D04 BM - SN: 547 |
| Calibration procedure(s) | QA CAL-06.v26<br>Calibration procedure for the data acquisition electronics (DAE) |
| Calibration date: | March 26, 2014 |

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI).
The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature (22 ± 3)°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

| Primary Standards | ID # | Cal Date (Certificate No.) | Scheduled Calibration |
|---|---|---|---|
| Keithley Multimeter Type 2001 | SN: 0810278 | 01-Oct-13 (No:13876) | Oct-14 |
| **Secondary Standards** | **ID #** | **Check Date (in house)** | **Scheduled Check** |
| Auto DAE Calibration Unit | SE UWS 053 AA 1001 | 07-Jan-14 (in house check) | In house check: Jan-15 |
| Calibrator Box V2.1 | SE UMS 006 AA 1002 | 07-Jan-14 (in house check) | In house check: Jan-15 |

| | Name | Function | Signature |
|---|---|---|---|
| Calibrated by: | Eric Hainfeld | Technician | |
| Approved by: | Fin Bomholt | Deputy Technical Manager | |

Issued: March 26, 2014

This calibration certificate shall not be reproduced except in full without written approval of the laboratory.

Certificate No: DAE4-547_Mar14 Page 1 of 5

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Accreditation No.: SCS 108

**Glossary**

| | |
|---|---|
| DAE | data acquisition electronics |
| Connector angle | information used in DASY system to align probe sensor X to the robot coordinate system. |

**Methods Applied and Interpretation of Parameters**

- *DC Voltage Measurement:* Calibration Factor assessed for use in DASY system by comparison with a calibrated instrument traceable to national standards. The figure given corresponds to the full scale range of the voltmeter in the respective range.
- *Connector angle*: The angle of the connector is assessed measuring the angle mechanically by a tool inserted. Uncertainty is not required.
- The following parameters as documented in the Appendix contain technical information as a result from the performance test and require no uncertainty.
  - *DC Voltage Measurement Linearity:* Verification of the Linearity at +10% and -10% of the nominal calibration voltage. Influence of offset voltage is included in this measurement.
  - *Common mode sensitivity:* Influence of a positive or negative common mode voltage on the differential measurement.
  - *Channel separation:* Influence of a voltage on the neighbor channels not subject to an input voltage.
  - *AD Converter Values with inputs shorted:* Values on the internal AD converter corresponding to zero input voltage
  - *Input Offset Measurement*: Output voltage and statistical results over a large number of zero voltage measurements.
  - *Input Offset Current:* Typical value for information; Maximum channel input offset current, not considering the input resistance.
  - *Input resistance:* Typical value for information: DAE input resistance at the connector, during internal auto-zeroing and during measurement.
  - *Low Battery Alarm Voltage:* Typical value for information. Below this voltage, a battery alarm signal is generated.
  - *Power consumption:* Typical value for information. Supply currents in various operating modes.

## DC Voltage Measurement

A/D - Converter Resolution nominal

| | | | | |
|---|---|---|---|---|
| High Range: | 1LSB = | 6.1μV , | full range = | -100...+300 mV |
| Low Range: | 1LSB = | 61nV , | full range = | -1.....,+3mV |

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

| Calibration Factors | X | Y | Z |
|---|---|---|---|
| High Range | 404.032 ± 0.02% (k=2) | 404.058 ± 0.02% (k=2) | 404.202 ± 0.02% (k=2) |
| Low Range | 3.95713 ± 1.50% (k=2) | 3.96202 ± 1.50% (k=2) | 3.97561 ± 1.50% (k=2) |

## Connector Angle

| | |
|---|---|
| **Connector Angle** to be used in DASY system | 158.0 ° ± 1 ° |





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## Appendix

### 1. DC Voltage Linearity

| High Range | | Reading (μV) | Difference (μV) | Error (%) |
|---|---|---|---|---|
| Channel X | + Input | 199995.43 | -0.60 | -0.00 |
| Channel X | + Input | 20004.43 | 4.15 | 0.02 |
| Channel X | - Input | -19997.69 | 3.25 | -0.02 |
| Channel Y | + Input | 199994.67 | -1.15 | -0.00 |
| Channel Y | + Input | 19998.43 | -1.93 | -0.01 |
| Channel Y | - Input | -20001.87 | -0.85 | 0.00 |
| Channel Z | + Input | 199997.48 | 1.41 | 0.00 |
| Channel Z | + Input | 20001.10 | 0.79 | 0.00 |
| Channel Z | - Input | -20003.63 | -2.53 | 0.01 |

| Low Range | | Reading (μV) | Difference (μV) | Error (%) |
|---|---|---|---|---|
| Channel X | + Input | 2000.64 | 0.17 | 0.01 |
| Channel X | + Input | 201.77 | 0.85 | 0.42 |
| Channel X | - Input | -199.11 | -0.24 | 0.12 |
| Channel Y | + Input | 2000.97 | 0.62 | 0.03 |
| Channel Y | + Input | 200.19 | -0.69 | -0.34 |
| Channel Y | - Input | -199.95 | -0.97 | 0.49 |
| Channel Z | + Input | 2000.53 | 0.21 | 0.01 |
| Channel Z | + Input | 200.38 | -0.40 | -0.20 |
| Channel Z | - Input | -199.62 | -0.59 | 0.29 |

### 2. Common mode sensitivity

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

| | Common mode Input Voltage (mV) | High Range Average Reading (μV) | Low Range Average Reading (μV) |
|---|---|---|---|
| Channel X | 200 | 19.65 | 17.65 |
| | - 200 | -14.62 | -15.76 |
| Channel Y | 200 | -6.89 | -7.43 |
| | - 200 | 3.98 | 4.06 |
| Channel Z | 200 | 20.93 | 20.96 |
| | - 200 | -22.42 | -22.42 |

### 3. Channel separation

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

| | Input Voltage (mV) | Channel X (μV) | Channel Y (μV) | Channel Z (μV) |
|---|---|---|---|---|
| Channel X | 200 | - | 2.53 | -2.12 |
| Channel Y | 200 | 9.67 | - | 3.63 |
| Channel Z | 200 | 5.84 | 6.75 | - |





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## 4. AD-Converter Values with inputs shorted

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

| | High Range (LSB) | Low Range (LSB) |
|---|---|---|
| Channel X | 16141 | 15478 |
| Channel Y | 16453 | 16523 |
| Channel Z | 15984 | 17120 |

## 5. Input Offset Measurement

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec
Input 10MΩ

| | Average (μV) | min. Offset (μV) | max. Offset (μV) | Std. Deviation (μV) |
|---|---|---|---|---|
| Channel X | 2.01 | 0.79 | 3.52 | 0.47 |
| Channel Y | -0.51 | -1.15 | 0.66 | 0.34 |
| Channel Z | -0.87 | -1.96 | 0.11 | 0.45 |

## 6. Input Offset Current

Nominal Input circuitry offset current on all channels: <25fA

## 7. Input Resistance (Typical values for information)

| | Zeroing (kOhm) | Measuring (MOhm) |
|---|---|---|
| Channel X | 200 | 200 |
| Channel Y | 200 | 200 |
| Channel Z | 200 | 200 |

## 8. Low Battery Alarm Voltage (Typical values for information)

| Typical values | Alarm Level (VDC) |
|---|---|
| Supply (+ Vcc) | +7.9 |
| Supply (- Vcc) | -7.6 |

## 9. Power Consumption (Typical values for information)

| Typical values | Switched off (mA) | Stand by (mA) | Transmitting (mA) |
|---|---|---|---|
| Supply (+ Vcc) | +0.01 | +6 | +14 |
| Supply (- Vcc) | -0.01 | -8 | -9 |





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Accreditation No.: SCS 108

Client Auden

Certificate No: EX3-3820_May14

# CALIBRATION CERTIFICATE

Object: EX3DV4 - SN:3820

Calibration procedure(s): QA CAL-01.v9, QA CAL-14.v4, QA CAL-23.v5, QA CAL-25.v6
Calibration procedure for dosimetric E-field probes

Calibration date: May 15, 2014

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI).
The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature (22 ± 3)°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

| Primary Standards | ID | Cal. Date (Certificate No.) | Scheduled Calibration |
|---|---|---|---|
| Power meter E4419B | GB41293874 | 03-Apr-14 (No. 217-01911) | Apr-15 |
| Power sensor E4412A | MY41498087 | 03-Apr-14 (No. 217-01911) | Apr-15 |
| Reference 3 dB Attenuator | SN: S5054 (3c) | 03-Apr-14 (No. 217-01915) | Apr-15 |
| Reference 20 dB Attenuator | SN: S5277 (20x) | 03-Apr-14 (No. 217-01919) | Apr-15 |
| Reference 30 dB Attenuator | SN: S5129 (30b) | 03-Apr-14 (No. 217-01920) | Apr-15 |
| Reference Probe ES3DV2 | SN: 3013 | 30-Dec-13 (No. ES3-3013_Dec13) | Dec-14 |
| DAE4 | SN: 660 | 13-Dec-13 (No. DAE4-660_Dec13) | Dec-14 |
| | | | |
| Secondary Standards | ID | Check Date (in house) | Scheduled Check |
| RF generator HP 8648C | US3642U01700 | 4-Aug-99 (in house check Apr-13) | In house check: Apr-16 |
| Network Analyzer HP 8753E | US37390585 | 18-Oct-01 (in house check Oct-13) | In house check: Oct-14 |

| | Name | Function | Signature |
|---|---|---|---|
| Calibrated by: | Claudio Leubler | Laboratory Technician | |
| Approved by: | Katja Pokovic | Technical Manager | |

Issued: May 17, 2014

This calibration certificate shall not be reproduced except in full without written approval of the laboratory.

**Calibration Laboratory of**
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Engineering AG
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Swiss Calibration Service

Accredited by the Swiss Accreditation Service (SAS) Accreditation No.: SCS 108
The Swiss Accreditation Service is one of the signatories to the EA Multilateral Agreement for the recognition of calibration certificates

## Glossary:

| | |
|---|---|
| TSL | tissue simulating liquid |
| NORMx,y,z | sensitivity in free space |
| ConvF | sensitivity in TSL / NORMx,y,z |
| DCP | diode compression point |
| CF | crest factor (1/duty_cycle) of the RF signal |
| A, B, C, D | modulation dependent linearization parameters |
| Polarization φ | φ rotation around probe axis |
| Polarization ϑ | ϑ rotation around an axis that is in the plane normal to probe axis (at measurement center), i.e., ϑ = 0 is normal to probe axis |
| Connector Angle | information used in DASY system to align probe sensor X to the robot coordinate system |

## Calibration is Performed According to the Following Standards:

a) IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
b) IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005

## Methods Applied and Interpretation of Parameters:

- *NORMx,y,z:* Assessed for E-field polarization ϑ = 0 (f ≤ 900 MHz in TEM-cell; f > 1800 MHz: R22 waveguide). NORMx,y,z are only intermediate values, i.e., the uncertainties of NORMx,y,z does not affect the $E^2$-field uncertainty inside TSL (see below *ConvF*).
- *NORM(f)x,y,z = NORMx,y,z * frequency_response* (see Frequency Response Chart). This linearization is implemented in DASY4 software versions later than 4.2. The uncertainty of the frequency response is included in the stated uncertainty of *ConvF*.
- *DCPx,y,z:* DCP are numerical linearization parameters assessed based on the data of power sweep with CW signal (no uncertainty required). DCP does not depend on frequency nor media.
- *PAR:* PAR is the Peak to Average Ratio that is not calibrated but determined based on the signal characteristics
- *Ax,y,z; Bx,y,z; Cx,y,z; Dx,y,z; VRx,y,z: A, B, C, D* are numerical linearization parameters assessed based on the data of power sweep for specific modulation signal. The parameters do not depend on frequency nor media. *VR* is the maximum calibration range expressed in RMS voltage across the diode.
- *ConvF and Boundary Effect Parameters:* Assessed in flat phantom using E-field (or Temperature Transfer Standard for f ≤ 800 MHz) and inside waveguide using analytical field distributions based on power measurements for f > 800 MHz. The same setups are used for assessment of the parameters applied for boundary compensation (alpha, depth) of which typical uncertainty values are given. These parameters are used in DASY4 software to improve probe accuracy close to the boundary. The sensitivity in TSL corresponds to *NORMx,y,z * ConvF* whereby the uncertainty corresponds to that given for *ConvF*. A frequency dependent *ConvF* is used in DASY version 4.4 and higher which allows extending the validity from ± 50 MHz to ± 100 MHz.
- *Spherical isotropy (3D deviation from isotropy):* in a field of low gradients realized using a flat phantom exposed by a patch antenna.
- *Sensor Offset:* The sensor offset corresponds to the offset of virtual measurement center from the probe tip (on probe axis). No tolerance required.
- *Connector Angle:* The angle is assessed using the information gained by determining the *NORMx* (no uncertainty required).

# Probe EX3DV4

## SN:3820

| | |
|---|---|
| Manufactured: | September 2, 2011 |
| Repaired: | April 28, 2014 |
| Calibrated: | May 15, 2014 |

Calibrated for DASY/EASY Systems
(Note: non-compatible with DASY2 system!)

# DASY/EASY - Parameters of Probe: EX3DV4 - SN:3820

## Basic Calibration Parameters

| | Sensor X | Sensor Y | Sensor Z | Unc (k=2) |
|---|---|---|---|---|
| Norm ($\mu V/(V/m)^2$)[A] | 0.41 | 0.48 | 0.51 | ± 10.1 % |
| DCP (mV)[B] | 101.9 | 94.0 | 97.6 | |

## Modulation Calibration Parameters

| UID | Communication System Name | | A dB | B dB√μV | C | D dB | VR mV | Unc[E] (k=2) |
|---|---|---|---|---|---|---|---|---|
| 0 | CW | X | 0.0 | 0.0 | 1.0 | 0.00 | 144.8 | ±3.5 % |
| | | Y | 0.0 | 0.0 | 1.0 | | 131.9 | |
| | | Z | 0.0 | 0.0 | 1.0 | | 142.9 | |

The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k=2, which for a normal distribution corresponds to a coverage probability of approximately 95%.

[A] The uncertainties of NormX,Y,Z do not affect the $E^2$-field uncertainty inside TSL (see Pages 5 and 6).
[B] Numerical linearization parameter: uncertainty not required.
[E] Uncertainty is determined using the max. deviation from linear response applying rectangular distribution and is expressed for the square of the field value.





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# DASY/EASY - Parameters of Probe: EX3DV4 - SN:3820

## Calibration Parameter Determined in Head Tissue Simulating Media

| f (MHz) [C] | Relative Permittivity [F] | Conductivity (S/m) [F] | ConvF X | ConvF Y | ConvF Z | Alpha [G] | Depth [G] (mm) | Unct. (k=2) |
|---|---|---|---|---|---|---|---|---|
| 750 | 41.9 | 0.89 | 9.55 | 9.55 | 9.55 | 0.41 | 0.88 | ± 12.0 % |
| 835 | 41.5 | 0.90 | 9.22 | 9.22 | 9.22 | 0.30 | 1.08 | ± 12.0 % |
| 900 | 41.5 | 0.97 | 9.23 | 9.23 | 9.23 | 0.47 | 0.78 | ± 12.0 % |
| 1450 | 40.5 | 1.20 | 8.49 | 8.49 | 8.49 | 0.27 | 1.21 | ± 12.0 % |
| 1750 | 40.1 | 1.37 | 8.26 | 8.26 | 8.26 | 0.80 | 0.59 | ± 12.0 % |
| 1900 | 40.0 | 1.40 | 7.73 | 7.73 | 7.73 | 0.58 | 0.68 | ± 12.0 % |
| 2100 | 39.8 | 1.49 | 7.71 | 7.71 | 7.71 | 0.75 | 0.58 | ± 12.0 % |
| 2450 | 39.2 | 1.80 | 6.85 | 6.85 | 6.85 | 0.41 | 0.85 | ± 12.0 % |
| 2600 | 39.0 | 1.96 | 6.73 | 6.73 | 6.73 | 0.40 | 0.85 | ± 12.0 % |
| 5200 | 36.0 | 4.66 | 4.94 | 4.94 | 4.94 | 0.35 | 1.80 | ± 13.1 % |
| 5300 | 35.9 | 4.76 | 4.66 | 4.66 | 4.66 | 0.35 | 1.80 | ± 13.1 % |
| 5500 | 35.6 | 4.96 | 4.70 | 4.70 | 4.70 | 0.35 | 1.80 | ± 13.1 % |
| 5600 | 35.5 | 5.07 | 4.47 | 4.47 | 4.47 | 0.35 | 1.80 | ± 13.1 % |
| 5800 | 35.3 | 5.27 | 4.29 | 4.29 | 4.29 | 0.40 | 1.80 | ± 13.1 % |

[C] Frequency validity of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. Above 5 GHz frequency validity can be extended to ± 110 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.
[F] At frequencies below 3 GHz, the validity of tissue parameters (ε and σ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (ε and σ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.
[G] Alpha/Depth are determined during calibration. SPEAG warrants that the remaining deviation due to the boundary effect after compensation is always less than ± 1% for frequencies below 3 GHz and below ± 2% for frequencies between 3-6 GHz at any distance larger than half the probe tip diameter from the boundary.

# DASY/EASY - Parameters of Probe: EX3DV4 - SN:3820

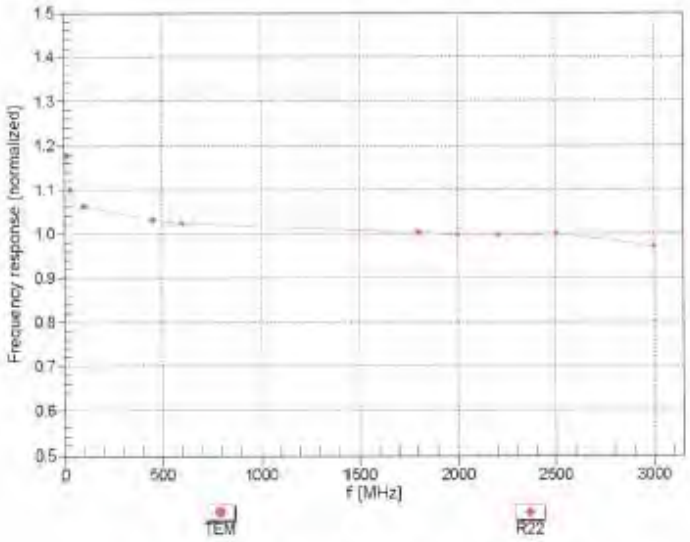
## Calibration Parameter Determined in Body Tissue Simulating Media

| f (MHz) [C] | Relative Permittivity [F] | Conductivity (S/m) [F] | ConvF X | ConvF Y | ConvF Z | Alpha [G] | Depth [G] (mm) | Unct. (k=2) |
|---|---|---|---|---|---|---|---|---|
| 750 | 55.5 | 0.96 | 9.12 | 9.12 | 9.12 | 0.42 | 0.92 | ± 12.0 % |
| 835 | 55.2 | 0.97 | 9.01 | 9.01 | 9.01 | 0.37 | 0.97 | ± 12.0 % |
| 900 | 55.0 | 1.05 | 8.83 | 8.83 | 8.83 | 0.59 | 0.73 | ± 12.0 % |
| 1450 | 54.0 | 1.30 | 7.88 | 7.88 | 7.88 | 0.58 | 0.73 | ± 12.0 % |
| 1750 | 53.4 | 1.49 | 7.48 | 7.48 | 7.48 | 0.80 | 0.61 | ± 12.0 % |
| 1900 | 53.3 | 1.52 | 7.23 | 7.23 | 7.23 | 0.63 | 0.70 | ± 12.0 % |
| 2100 | 53.2 | 1.62 | 7.54 | 7.54 | 7.54 | 0.53 | 0.75 | ± 12.0 % |
| 2450 | 52.7 | 1.95 | 6.87 | 6.87 | 6.87 | 0.80 | 0.58 | ± 12.0 % |
| 2600 | 52.5 | 2.16 | 6.63 | 6.63 | 6.63 | 0.80 | 0.50 | ± 12.0 % |
| 5200 | 49.0 | 5.30 | 4.44 | 4.44 | 4.44 | 0.40 | 1.90 | ± 13.1 % |
| 5300 | 48.9 | 5.42 | 4.25 | 4.25 | 4.25 | 0.40 | 1.90 | ± 13.1 % |
| 5500 | 48.6 | 5.65 | 3.99 | 3.99 | 3.99 | 0.45 | 1.90 | ± 13.1 % |
| 5600 | 48.5 | 5.77 | 3.83 | 3.83 | 3.83 | 0.45 | 1.90 | ± 13.1 % |
| 5800 | 48.2 | 6.00 | 4.00 | 4.00 | 4.00 | 0.50 | 1.90 | ± 13.1 % |

[C] Frequency validity of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. Above 5 GHz frequency validity can be extended to ± 110 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.
[F] At frequencies below 3 GHz, the validity of tissue parameters (ε and σ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (ε and σ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.
[G] Alpha/Depth are determined during calibration. SPEAG warrants that the remaining deviation due to the boundary effect after compensation is always less than ± 1% for frequencies below 3 GHz and below ± 2% for frequencies between 3-6 GHz at any distance larger than half the probe tip diameter from the boundary.

EX3DV4- SN:3820 May 15, 2014

## Frequency Response of E-Field
(TEM-Cell:ifi110 EXX, Waveguide: R22)




Uncertainty of Frequency Response of E-field: ± 6.3% (k=2)





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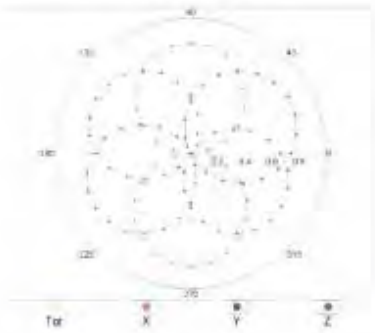
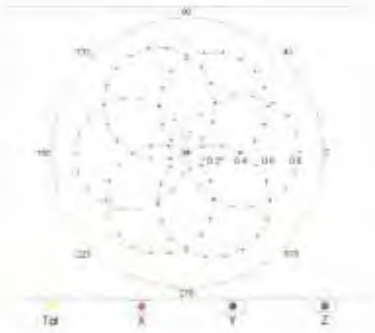
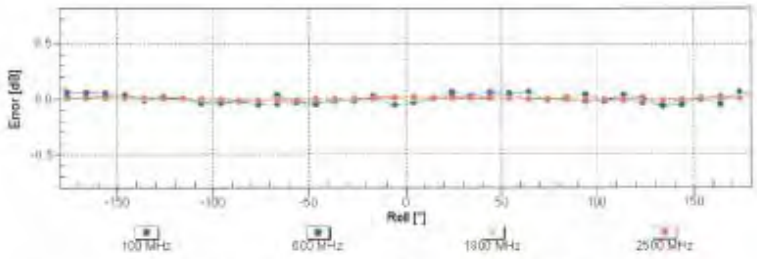
## Receiving Pattern (ϕ), ϑ = 0°

f=600 MHz,TEM



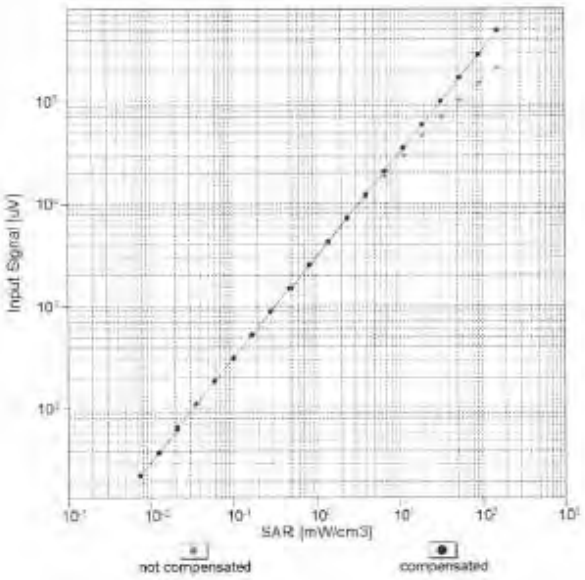

f=1800 MHz,R22

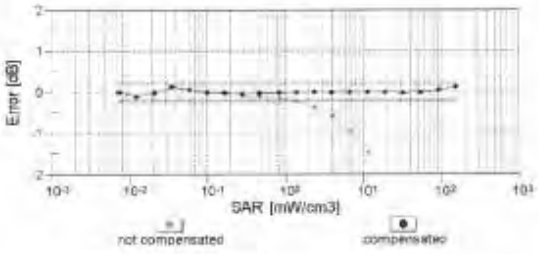



Uncertainty of Axial Isotropy Assessment: ± 0.5% (k=2)

## Dynamic Range f(SAR$_{head}$)
(TEM cell , $f_{eval}$= 1900 MHz)



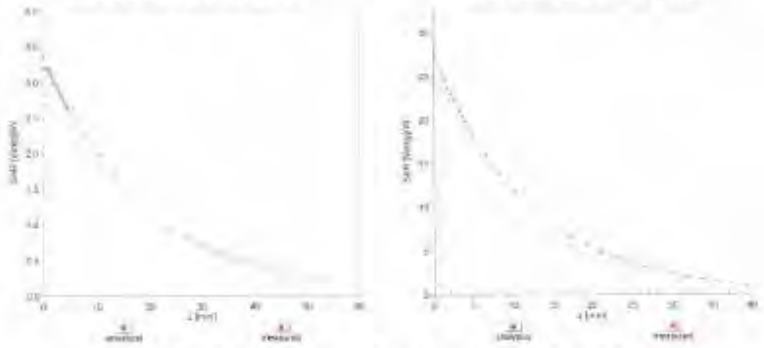




Uncertainty of Linearity Assessment: ± 0.6% (k=2)

EX3DV4- SN:3820 May 15, 2014

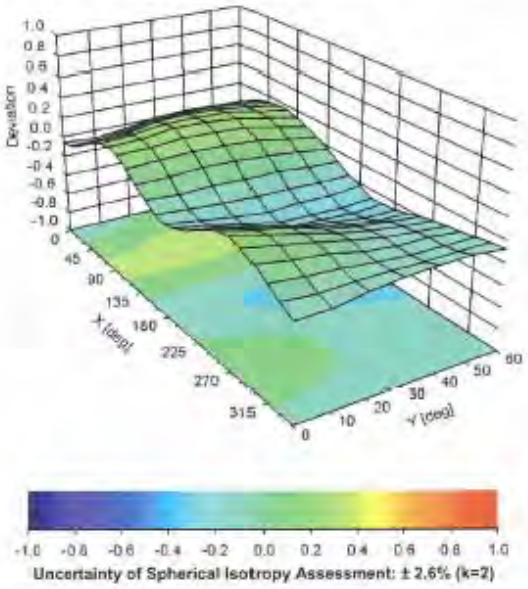
## Conversion Factor Assessment

f = 835 MHz,WGLS R9 (H_convF) f = 1900 MHz,WGLS R22 (H_convF)



## Deviation from Isotropy in Liquid

Error (φ, θ), f = 900 MHz




Uncertainty of Spherical Isotropy Assessment: ± 2.6% (k=2)

# DASY/EASY - Parameters of Probe: EX3DV4 - SN:3820

**Other Probe Parameters**

| | |
|---|---|
| Sensor Arrangement | Triangular |
| Connector Angle (°) | -56 |
| Mechanical Surface Detection Mode | enabled |
| Optical Surface Detection Mode | disabled |
| Probe Overall Length | 337 mm |
| Probe Body Diameter | 10 mm |
| Tip Length | 9 mm |
| Tip Diameter | 2.5 mm |
| Probe Tip to Sensor X Calibration Point | 1 mm |
| Probe Tip to Sensor Y Calibration Point | 1 mm |
| Probe Tip to Sensor Z Calibration Point | 1 mm |
| Recommended Measurement Distance from Surface | 2 mm |

# 8. Uncertainty Budget

Measurement Uncertainty evaluation template for DUT SAR test
IEEE 1528

| A | c | D | e | | f | g | h=c * f / e | i=c * g / e | k |
|---|---|---|---|---|---|---|---|---|---|
| Source of Uncertainty | Tolerance/ Uncertainty | Probability | Div | Div Value | ci (1g) | ci (10g) | Standard uncertainty | Standard uncertainty | vi, or Veff |
| | | | | | | | | | |
| **Measurement system** | | | | | | | | | |
| Probe calibration | 6.55% | N | 1 | 1 | 1 | 1 | 6.55% | 6.55% | ∞ |
| ***Isotropy , Axial*** | 3.50% | R | √3 | 1.732 | 1 | 1 | 2.02% | 2.02% | ∞ |
| ***Isotropy, Hemispherical*** | 9.60% | R | √3 | 1.732 | 1 | 1 | 5.54% | 5.54% | ∞ |
| Boundary Effect | 1.00% | R | √3 | 1.732 | 1 | 1 | 0.58% | 0.58% | ∞ |
| Linearity | 4.70% | R | √3 | 1.732 | 1 | 1 | 2.71% | 2.71% | ∞ |
| Detection Limits | 1.00% | R | √3 | 1.732 | 1 | 1 | 0.58% | 0.58% | ∞ |
| Readout Electronics | 0.30% | N | 1 | 1 | 1 | 1 | 0.30% | 0.30% | ∞ |
| Response time | 0.80% | R | √3 | 1.732 | 1 | 1 | 0.46% | 0.46% | ∞ |
| Integration Time | 2.60% | R | √3 | 1.732 | 1 | 1 | 1.50% | 1.50% | ∞ |
| ***Measurement drift (class A evaluation)*** | 1.75% | R | √3 | 1.732 | 1 | 1 | 1.01% | 1.01% | ∞ |
| RF ambient condition - noise | 3.00% | R | √3 | 1.732 | 1 | 1 | 1.73% | 1.73% | ∞ |
| RF ambient conditions - reflections | 3.00% | R | √3 | 1.732 | 1 | 1 | 1.73% | 1.73% | ∞ |
| Probe positioner Mechanical restrictions | 0.40% | R | √3 | 1.732 | 1 | 1 | 0.23% | 0.23% | ∞ |
| Probe Positioning with respect to phantom | 2.90% | R | √3 | 1.732 | 1 | 1 | 1.67% | 1.67% | ∞ |
| Post-processing | 1.00% | R | √3 | 1.732 | 1 | 1 | 0.58% | 0.58% | ∞ |
| Max SAR Eval | 1.00% | R | √3 | 1.732 | 1 | 1 | 0.58% | 0.58% | ∞ |
| | | | | | | | | | |
| **Test Sample related** | | | | | | | | | |
| Test sample positioning | 2.90% | N | 1 | 1 | 1 | 1 | 2.90% | 2.90% | M-1 |
| Device Holder Uncertainty | 3.60% | N | 1 | 1 | 1 | 1 | 3.60% | 3.60% | M-1 |
| Drift of output power | 5.00% | R | √3 | 1.732 | 1 | 1 | 2.89% | 2.89% | ∞ |
| | | | | | | | | | |
| **Phantom and Setup** | | | | | | | | | |
| Phantom Uncertainty | 4.00% | R | √3 | 1.732 | 1 | 1 | 2.31% | 2.31% | ∞ |
| Deviation from reference | 4.68% | N | 1 | 1 | 0.64 | 0.43 | 3.00% | 2.01% | M |
| Deviation from reference | 4.34% | N | 1 | 1 | 0.6 | 0.49 | 2.60% | 2.13% | M |
| | | | | | | | | | |
| Combined standard uncertainty | | RSS | | | | | 12.23% | 11.94% | |
| Expant uncertainty (95% confidence | | | | | | | 24.46% | 23.87% | |

# 9. Phantom Description

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s p e a g

## Certificate of Conformity / First Article Inspection

| | |
|---|---|
| Item | SAM Twin Phantom V4.0 |
| Type No | QD 000 P40 C |
| Series No | TP-1150 and higher |
| Manufacturer | SPEAG<br>Zeughausstrasse 43<br>CH-8004 Zürich<br>Switzerland |

**Tests**
The series production process used allows the limitation to test of first articles.
Complete tests were made on the pre-series Type No. QD 000 P40 AA, Serial No. TP-1001 and on the series first article Type No. QD 000 P40 BA, Serial No. TP-1006. Certain parameters have been retested using further series items (called samples) or are tested at each item.

| Test | Requirement | Details | Units tested |
|---|---|---|---|
| Dimensions | Compliant with the geometry according to the CAD model. | IT'IS CAD File (*) | First article, Samples |
| Material thickness of shell | Compliant with the requirements according to the standards | 2mm +/- 0.2mm in flat and specific areas of head section | First article, Samples, TP-1314 ff. |
| Material thickness at ERP | Compliant with the requirements according to the standards | 6mm +/- 0.2mm at ERP | First article, All items |
| Material parameters | Dielectric parameters for required frequencies | 300 MHz – 6 GHz: Relative permittivity < 5, Loss tangent < 0.05 | Material samples |
| Material resistivity | The material has been tested to be compatible with the liquids defined in the standards if handled and cleaned according to the instructions. Observe technical Note for material compatibility. | DEGMBE based simulating liquids | Pre-series, First article, Material samples |
| Sagging | Compliant with the requirements according to the standards. Sagging of the flat section when filled with tissue simulating liquid | < 1% typical < 0.8% if filled with 155mm of HSL900 and without DUT below | Prototypes, Sample testing |

**Standards**
[1] CENELEC EN 50361
[2] IEEE Std 1528-2003
[3] IEC 62209 Part I
[4] FCC OET Bulletin 65, Supplement C, Edition 01-01
(*) The IT'IS CAD file is derived from [2] and is also within the tolerance requirements of the shapes of the other documents.

**Conformity**
Based on the sample tests above, we certify that this item is in compliance with the uncertainty requirements of SAR measurements specified in standards [1] to [4].

**Date** 07.07.2005

**Signature / Stamp**

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info@speag.com, http://www.speag.com

# 10. System Validation from Original Equipment Supplier

Calibration Laboratory of
Schmid & Partner
Engineering AG
Zeughausstrasse 43, 8004 Zurich, Switzerland

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S Swiss Calibration Service

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Accreditation No.: SCS 108

Client SGS-TW (Auden)

Certificate No: D835V2-4d063_Aug14

## CALIBRATION CERTIFICATE

Object: D835V2 - SN: 4d063

Calibration procedure(s): QA CAL-05.v9
Calibration procedure for dipole validation kits above 700 MHz

Calibration date: August 28, 2014

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI). The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature (22 ± 3)°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

| Primary Standards | ID # | Cal Date (Certificate No.) | Scheduled Calibration |
|---|---|---|---|
| Power meter EPM-442A | GB37480704 | 09-Oct-13 (No. 217-01827) | Oct-14 |
| Power sensor HP 8481A | US37292783 | 09-Oct-13 (No. 217-01827) | Oct-14 |
| Power sensor HP 8481A | MY41092317 | 09-Oct-13 (No. 217-01828) | Oct-14 |
| Reference 20 dB Attenuator | SN: 5058 (20k) | 03-Apr-14 (No. 217-01916) | Apr-15 |
| Type-N mismatch combination | SN: 5047.2 / 06327 | 03-Apr-14 (No. 217-01991) | Apr-15 |
| Reference Probe ES3DV3 | SN: 3205 | 30-Dec-13 (No. ES3-3205_Dec13) | Dec-14 |
| DAE4 | SN: 601 | 18-Aug-14 (No. DAE4-601_Aug14) | Aug-15 |

| Secondary Standards | ID # | Check Date (in house) | Scheduled Check |
|---|---|---|---|
| RF generator R&S SMT-06 | 100005 | 04-Aug-99 (in house check Oct-13) | In house check: Oct-16 |
| Network Analyzer HP 8753E | US37390585 S4206 | 18-Oct-01 (in house check Oct-13) | In house check: Oct-14 |

| | Name | Function | Signature |
|---|---|---|---|
| Calibrated by: | Michael Weber | Laboratory Technician | |
| Approved by: | Katja Pokovic | Technical Manager | |

Issued: August 28, 2014

This calibration certificate shall not be reproduced except in full without written approval of the laboratory.

Certificate No: D835V2-4d063_Aug14 Page 1 of 8

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Accreditation No.: SCS 108

**Glossary:**

| | |
|---|---|
| TSL | tissue simulating liquid |
| ConvF | sensitivity in TSL / NORM x,y,z |
| N/A | not applicable or not measured |

**Calibration is Performed According to the Following Standards:**

a) IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
b) IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005
c) KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

**Additional Documentation:**

d) DASY4/5 System Handbook

**Methods Applied and Interpretation of Parameters:**

- *Measurement Conditions:* Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- *Antenna Parameters with TSL:* The dipole is mounted with the spacer to position its feed point exactly below the center marking of the flat phantom section, with the arms oriented parallel to the body axis.
- *Feed Point Impedance and Return Loss:* These parameters are measured with the dipole positioned under the liquid filled phantom. The impedance stated is transformed from the measurement at the SMA connector to the feed point. The Return Loss ensures low reflected power. No uncertainty required.
- *Electrical Delay:* One-way delay between the SMA connector and the antenna feed point. No uncertainty required.
- *SAR measured:* SAR measured at the stated antenna input power.
- *SAR normalized:* SAR as measured, normalized to an input power of 1 W at the antenna connector.
- *SAR for nominal TSL parameters:* The measured TSL parameters are used to calculate the nominal SAR result.

The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k=2, which for a normal distribution corresponds to a coverage probability of approximately 95%.

## Measurement Conditions

DASY system configuration, as far as not given on page 1.

| DASY Version | DASY5 | V52.8.8 |
|---|---|---|
| Extrapolation | Advanced Extrapolation | |
| Phantom | Modular Flat Phantom | |
| Distance Dipole Center - TSL | 15 mm | with Spacer |
| Zoom Scan Resolution | dx, dy, dz = 5 mm | |
| Frequency | 835 MHz ± 1 MHz | |

## Head TSL parameters

The following parameters and calculations were applied.

| | Temperature | Permittivity | Conductivity |
|---|---|---|---|
| Nominal Head TSL parameters | 22.0 °C | 41.5 | 0.90 mho/m |
| Measured Head TSL parameters | (22.0 ± 0.2) °C | 42.0 ± 6 % | 0.94 mho/m ± 6 % |
| Head TSL temperature change during test | < 0.5 °C | ---- | ---- |

## SAR result with Head TSL

| SAR averaged over 1 cm³ (1 g) of Head TSL | Condition | |
|---|---|---|
| SAR measured | 250 mW input power | 2.38 W/kg |
| SAR for nominal Head TSL parameters | normalized to 1W | **9.24 W/kg ± 17.0 % (k=2)** |

| SAR averaged over 10 cm³ (10 g) of Head TSL | condition | |
|---|---|---|
| SAR measured | 250 mW input power | 1.55 W/kg |
| SAR for nominal Head TSL parameters | normalized to 1W | **6.05 W/kg ± 16.5 % (k=2)** |

## Body TSL parameters

The following parameters and calculations were applied.

| | Temperature | Permittivity | Conductivity |
|---|---|---|---|
| Nominal Body TSL parameters | 22.0 °C | 55.2 | 0.97 mho/m |
| Measured Body TSL parameters | (22.0 ± 0.2) °C | 55.2 ± 6 % | 1.01 mho/m ± 6 % |
| Body TSL temperature change during test | < 0.5 °C | ---- | ---- |

## SAR result with Body TSL

| SAR averaged over 1 cm³ (1 g) of Body TSL | Condition | |
|---|---|---|
| SAR measured | 250 mW input power | 2.41 W/kg |
| SAR for nominal Body TSL parameters | normalized to 1W | **9.35 W/kg ± 17.0 % (k=2)** |

| SAR averaged over 10 cm³ (10 g) of Body TSL | condition | |
|---|---|---|
| SAR measured | 250 mW input power | 1.59 W/kg |
| SAR for nominal Body TSL parameters | normalized to 1W | **6.21 W/kg ± 16.5 % (k=2)** |

## Appendix (Additional assessments outside the scope of SCS108)

### Antenna Parameters with Head TSL

| | |
|---|---|
| Impedance, transformed to feed point | 51.7 Ω - 3.6 jΩ |
| Return Loss | - 28.2 dB |

### Antenna Parameters with Body TSL

| | |
|---|---|
| Impedance, transformed to feed point | 47.1 Ω - 5.6 jΩ |
| Return Loss | - 23.7 dB |

### General Antenna Parameters and Design

| | |
|---|---|
| Electrical Delay (one direction) | 1.391 ns |

After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.
No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

### Additional EUT Data

| | |
|---|---|
| Manufactured by | SPEAG |
| Manufactured on | November 27, 2006 |





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**DASY5 Validation Report for Head TSL**

Date: 28.08.2014

Test Laboratory: SPEAG, Zurich, Switzerland

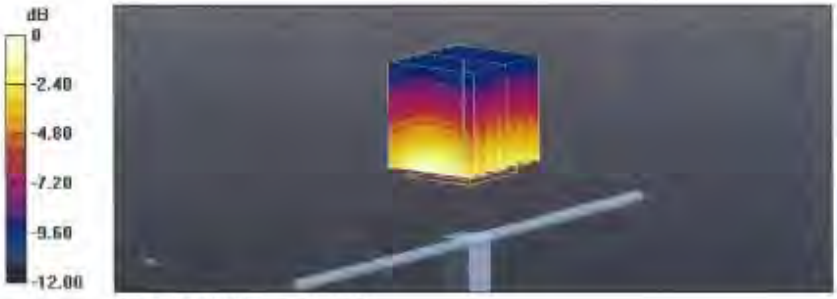
**DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN: 4d063**

Communication System: UID 0 - CW; Frequency: 835 MHz
Medium parameters used: f = 835 MHz; $\sigma$ = 0.94 S/m; $\varepsilon_r$ = 42; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

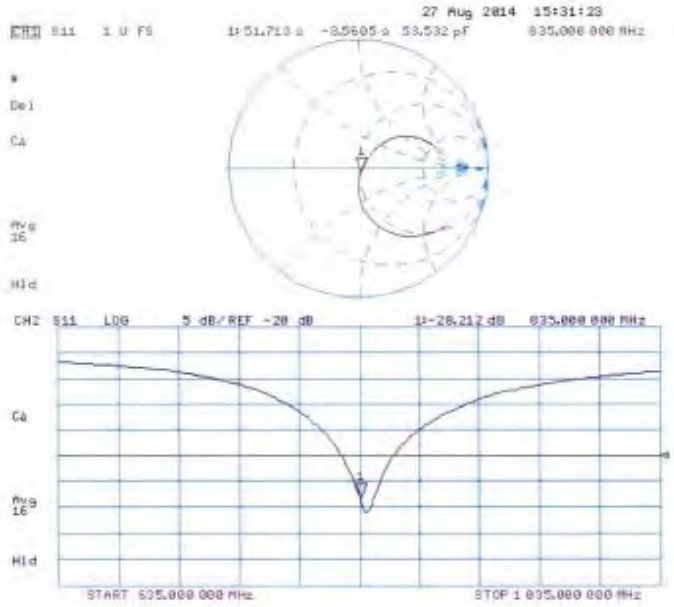
- Probe: ES3DV3 - SN3205; ConvF(6.22, 6.22, 6.22); Calibrated: 30.12.2013;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 18.08.2014
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; Serial: 1001
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

**Dipole Calibration for Head Tissue/Pin=250 mW, d=15mm/Zoom Scan (7x7x7)/Cube 0:**
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 56.23 V/m; Power Drift = -0.02 dB
Peak SAR (extrapolated) = 3.53 W/kg
**SAR(1 g) = 2.38 W/kg; SAR(10 g) = 1.55 W/kg**
Maximum value of SAR (measured) = 2.78 W/kg




0 dB = 2.78 W/kg = 4.44 dBW/kg

**Impedance Measurement Plot for Head TSL**





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**DASY5 Validation Report for Body TSL**

Date: 27.08.2014

Test Laboratory: SPEAG, Zurich, Switzerland

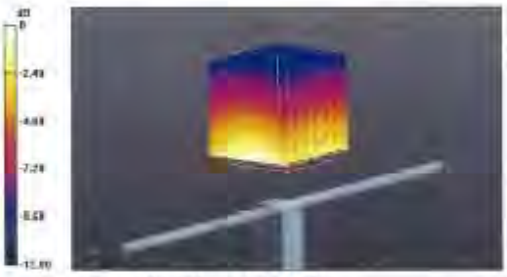
**DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN: 4d063**

Communication System: UID 0 - CW; Frequency: 835 MHz
Medium parameters used: f = 835 MHz; $\sigma$ = 1.01 S/m; $\varepsilon_r$ = 55.2; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

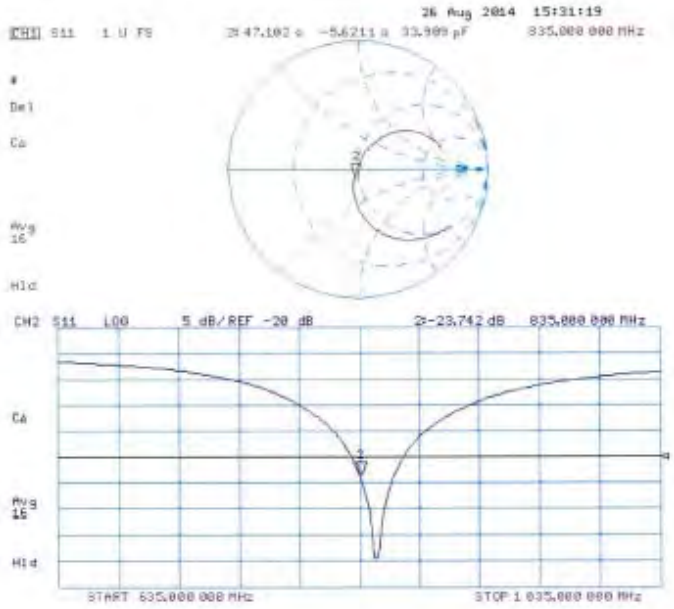
- Probe: ES3DV3 - SN3205; ConvF(6.09, 6.09, 6.09); Calibrated: 30.12.2013;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 18.08.2014
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; Serial: 1001
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

**Dipole Calibration for Body Tissue/Pin=250 mW, d=15mm/Zoom Scan (7x7x7)/Cube 0:**
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 54.65 V/m; Power Drift = -0.03 dB
Peak SAR (extrapolated) = 3.53 W/kg
**SAR(1 g) = 2.41 W/kg; SAR(10 g) = 1.59 W/kg**
Maximum value of SAR (measured) = 2.80 W/kg



0 dB = 2.80 W/kg = 4.47 dBW/kg

**Impedance Measurement Plot for Body TSL**





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Accreditation No.: SCS 108

Client SGS-TW (Auden)

Certificate No: D1750V2-1008_Aug14

# CALIBRATION CERTIFICATE

Object D1750V2 - SN: 1008

Calibration procedure(s) QA CAL-05.v9
Calibration procedure for dipole validation kits above 700 MHz

Calibration date: August 28, 2014

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI).
The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature (22 ± 3)°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

| Primary Standards | ID # | Cal Date (Certificate No.) | Scheduled Calibration |
|---|---|---|---|
| Power meter EPM-442A | GB37480704 | 09-Oct-13 (No. 217-01827) | Oct-14 |
| Power sensor HP 8481A | US37292783 | 09-Oct-13 (No. 217-01827) | Oct-14 |
| Power sensor HP 8481A | MY41092317 | 09-Oct-13 (No. 217-01828) | Oct-14 |
| Reference 20 dB Attenuator | SN: 5058 (20k) | 03-Apr-14 (No. 217-01918) | Apr-15 |
| Type-N mismatch combination | SN: 5047.2 / 06327 | 03-Apr-14 (No. 217-01921) | Apr-15 |
| Reference Probe ES3DV3 | SN: 3205 | 30-Dec-13 (No. ES3-3205_Dec13) | Dec-14 |
| DAE4 | SN: 601 | 18-Aug-14 (No. DAE4-601_Aug14) | Aug-15 |

| Secondary Standards | ID # | Check Date (in house) | Scheduled Check |
|---|---|---|---|
| RF generator R&S SMT-06 | 100005 | 04-Aug-99 (in house check Oct-13) | in house check: Oct-15 |
| Network Analyzer HP 8753E | US37390585 S4206 | 18-Oct-01 (in house check Oct-13) | in house check: Oct-14 |

| | Name | Function | Signature |
|---|---|---|---|
| Calibrated by: | Michael Weber | Laboratory Technician | |
| Approved by: | Katja Pokovic | Technical Manager | |

Issued: August 28, 2014

This calibration certificate shall not be reproduced except in full without written approval of the laboratory.

Certificate No: D1750V2-1008_Aug14 Page 1 of 8

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Accreditation No.: SCS 108

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**Glossary:**

| | |
|---|---|
| TSL | tissue simulating liquid |
| ConvF | sensitivity in TSL / NORM x,y,z |
| N/A | not applicable or not measured |

**Calibration is Performed According to the Following Standards:**

a) IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
b) IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005
c) KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

**Additional Documentation:**

d) DASY4/5 System Handbook

**Methods Applied and Interpretation of Parameters:**

- *Measurement Conditions:* Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- *Antenna Parameters with TSL:* The dipole is mounted with the spacer to position its feed point exactly below the center marking of the flat phantom section, with the arms oriented parallel to the body axis.
- *Feed Point Impedance and Return Loss:* These parameters are measured with the dipole positioned under the liquid filled phantom. The impedance stated is transformed from the measurement at the SMA connector to the feed point. The Return Loss ensures low reflected power. No uncertainty required.
- *Electrical Delay:* One-way delay between the SMA connector and the antenna feed point. No uncertainty required.
- *SAR measured:* SAR measured at the stated antenna input power.
- *SAR normalized:* SAR as measured, normalized to an input power of 1 W at the antenna connector.
- *SAR for nominal TSL parameters:* The measured TSL parameters are used to calculate the nominal SAR result.

The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k=2, which for a normal distribution corresponds to a coverage probability of approximately 95%.

## Measurement Conditions

DASY system configuration, as far as not given on page 1.

| | | |
|---|---|---|
| **DASY Version** | DASY5 | V52.6.8 |
| **Extrapolation** | Advanced Extrapolation | |
| **Phantom** | Modular Flat Phantom | |
| **Distance Dipole Center – TSL** | 10 mm | with Spacer |
| **Zoom Scan Resolution** | dx, dy, dz = 5 mm | |
| **Frequency** | 1750 MHz ± 1 MHz | |

## Head TSL parameters

The following parameters and calculations were applied.

| | Temperature | Permittivity | Conductivity |
|---|---|---|---|
| **Nominal Head TSL parameters** | 22.0 °C | 40.1 | 1.37 mho/m |
| **Measured Head TSL parameters** | (22.0 ± 0.2) °C | 39.2 ± 6 % | 1.37 mho/m ± 6 % |
| **Head TSL temperature change during test** | < 0.5 °C | — | — |

## SAR result with Head TSL

| **SAR averaged over 1 cm³ (1 g) of Head TSL** | Condition | |
|---|---|---|
| SAR measured | 250 mW input power | 9.26 W/kg |
| SAR for nominal Head TSL parameters | normalized to 1W | **36.9 W/kg ± 17.0 % (k=2)** |

| **SAR averaged over 10 cm³ (10 g) of Head TSL** | condition | |
|---|---|---|
| SAR measured | 250 mW input power | 4.91 W/kg |
| SAR for nominal Head TSL parameters | normalized to 1W | **19.6 W/kg ± 16.5 % (k=2)** |

## Body TSL parameters

The following parameters and calculations were applied.

| | Temperature | Permittivity | Conductivity |
|---|---|---|---|
| **Nominal Body TSL parameters** | 22.0 °C | 53.4 | 1.49 mho/m |
| **Measured Body TSL parameters** | (22.0 ± 0.2) °C | 52.0 ± 6 % | 1.49 mho/m ± 6 % |
| **Body TSL temperature change during test** | < 0.5 °C | — | — |

## SAR result with Body TSL

| **SAR averaged over 1 cm³ (1 g) of Body TSL** | Condition | |
|---|---|---|
| SAR measured | 250 mW input power | 9.44 W/kg |
| SAR for nominal Body TSL parameters | normalized to 1W | **37.5 W/kg ± 17.0 % (k=2)** |

| **SAR averaged over 10 cm³ (10 g) of Body TSL** | condition | |
|---|---|---|
| SAR measured | 250 mW input power | 5.07 W/kg |
| SAR for nominal Body TSL parameters | normalized to 1W | **20.2 W/kg ± 16.5 % (k=2)** |





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## Appendix (Additional assessments outside the scope of SCS108)

### Antenna Parameters with Head TSL

| | |
|---|---|
| Impedance, transformed to feed point | 50.4 Ω + 0.3 jΩ |
| Return Loss | - 46.4 dB |

### Antenna Parameters with Body TSL

| | |
|---|---|
| Impedance, transformed to feed point | 46.4 Ω + 0.3 jΩ |
| Return Loss | - 28.5 dB |

### General Antenna Parameters and Design

| | |
|---|---|
| Electrical Delay (one direction) | 1.222 ns |

After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.
No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

### Additional EUT Data

| | |
|---|---|
| Manufactured by | SPEAG |
| Manufactured on | February 11, 2009 |





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**DASY5 Validation Report for Head TSL**

Date: 28.08.2014

Test Laboratory: SPEAG, Zurich, Switzerland

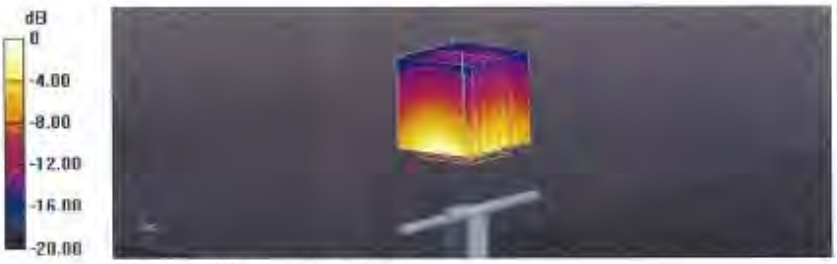
**DUT: Dipole 1750 MHz; Type: D1750V2; Serial: D1750V2 - SN: 1008**

Communication System: UID 0 - CW; Frequency: 1750 MHz
Medium parameters used: f = 1750 MHz; $\sigma$ = 1.37 S/m; $\varepsilon_r$ = 39.2; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

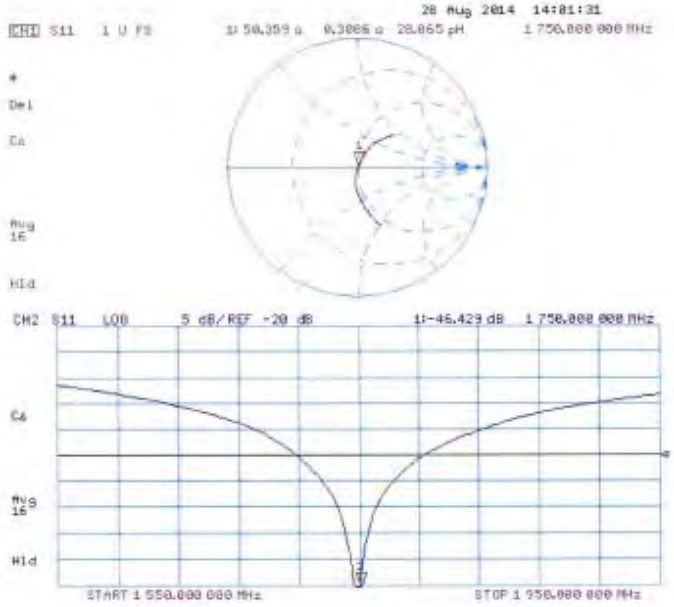
- Probe: ES3DV3 - SN3205; ConvF(5.23, 5.23, 5.23); Calibrated: 30.12.2013;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 18.08.2014
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

**Dipole Calibration for Head Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:**
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 95.53 V/m; Power Drift = -0.01 dB
Peak SAR (extrapolated) = 16.7 W/kg
**SAR(1 g) = 9.26 W/kg; SAR(10 g) = 4.91 W/kg**
Maximum value of SAR (measured) = 11.6 W/kg




0 dB = 11.6 W/kg = 10.64 dBW/kg

**Impedance Measurement Plot for Head TSL**





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**DASY5 Validation Report for Body TSL**

Date: 28.08.2014

Test Laboratory: SPEAG, Zurich, Switzerland

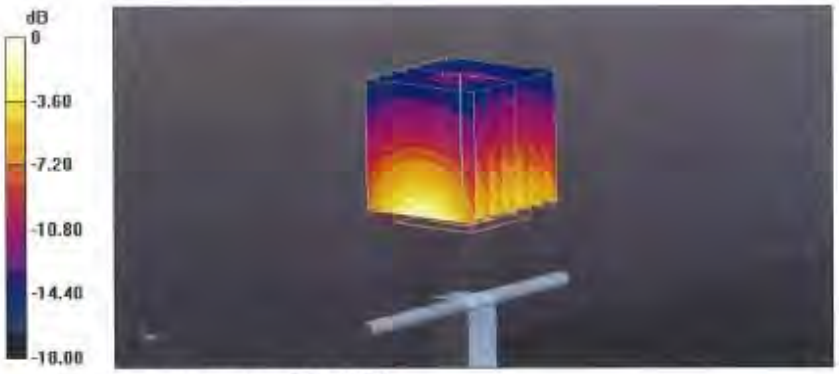
**DUT: Dipole 1750 MHz; Type: D1750V2; Serial: D1750V2 - SN: 1008**

Communication System: UID 0 - CW; Frequency: 1750 MHz
Medium parameters used: f = 1750 MHz; $\sigma$ = 1.49 S/m; $\varepsilon_r$ = 52; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

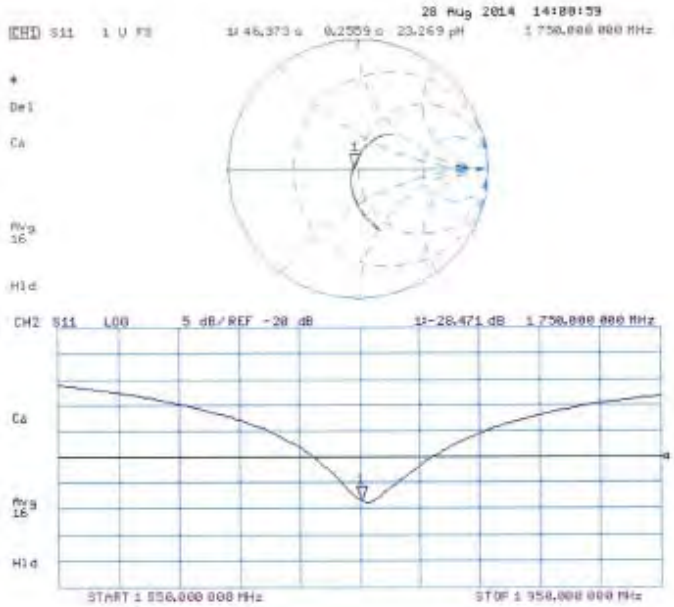
- Probe: ES3DV3 - SN3205; ConvF(4.89, 4.89, 4.89); Calibrated: 30.12.2013;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 18.08.2014
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

**Dipole Calibration for Body Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:**
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 93.44 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 16.3 W/kg
**SAR(1 g) = 9.44 W/kg; SAR(10 g) = 5.07 W/kg**
Maximum value of SAR (measured) = 11.9 W/kg




0 dB = 11.9 W/kg = 10.76 dBW/kg

**Impedance Measurement Plot for Body TSL**





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Accreditation No.: SCS 108

Client SGS-TW (Auden)

Certificate No: D1900V2-5d027_Apr14

# CALIBRATION CERTIFICATE

| | |
|---|---|
| Object | D1900V2 - SN: 5d027 |
| Calibration procedure(s) | QA CAL-05.v9<br>Calibration procedure for dipole validation kits above 700 MHz |
| Calibration date | April 23, 2014 |

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI).
The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature (22 ± 3)°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

| Primary Standards | ID # | Cal Date (Certificate No.) | Scheduled Calibration |
|---|---|---|---|
| Power meter EPM-442A | GB37480704 | 09-Oct-13 (No. 217-01827) | Oct-14 |
| Power sensor HP 8481A | US37292783 | 09-Oct-13 (No. 217-01827) | Oct-14 |
| Power sensor HP 8481A | MY41092317 | 09-Oct-13 (No. 217-01828) | Oct-14 |
| Reference 20 dB Attenuator | SN: 5058 (20k) | 03-Apr-14 (No. 217-01918) | Apr-15 |
| Type-N mismatch combination | SN: 5047.2 / 06327 | 03-Apr-14 (No. 217-01921) | Apr-15 |
| Reference Probe ES3DV3 | SN: 3205 | 30-Dec-13 (No. ES3-3205_Dec13) | Dec-14 |
| DAE4 | SN: 601 | 25-Apr-13 (No. DAE4-601_Apr13) | Apr-14 |

| Secondary Standards | ID # | Check Date (in house) | Scheduled Check |
|---|---|---|---|
| RF generator R&S SMT-06 | 100005 | 04-Aug-99 (in house check Oct-13) | In house check: Oct-15 |
| Network Analyzer HP 8753E | US37390585 S4206 | 18-Oct-01 (in house check Oct-13) | In house check: Oct-14 |

| | Name | Function | Signature |
|---|---|---|---|
| Calibrated by: | Jeton Kastrati | Laboratory Technician | |
| Approved by: | Katja Pokovic | Technical Manager | |

Issued: April 23, 2014

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Certificate No: D1900V2-5d027_Apr14 Page 1 of 8

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Accreditation No.: SCS 108

**Glossary:**

| | |
|---|---|
| TSL | tissue simulating liquid |
| ConvF | sensitivity in TSL / NORM x,y,z |
| N/A | not applicable or not measured |

**Calibration is Performed According to the Following Standards:**

a) IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
b) IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005
c) KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

**Additional Documentation:**

d) DASY4/5 System Handbook

**Methods Applied and Interpretation of Parameters:**

- *Measurement Conditions:* Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- *Antenna Parameters with TSL:* The dipole is mounted with the spacer to position its feed point exactly below the center marking of the flat phantom section, with the arms oriented parallel to the body axis.
- *Feed Point Impedance and Return Loss:* These parameters are measured with the dipole positioned under the liquid filled phantom. The impedance stated is transformed from the measurement at the SMA connector to the feed point. The Return Loss ensures low reflected power. No uncertainty required.
- *Electrical Delay:* One-way delay between the SMA connector and the antenna feed point. No uncertainty required.
- *SAR measured:* SAR measured at the stated antenna input power.
- *SAR normalized:* SAR as measured, normalized to an input power of 1 W at the antenna connector.
- *SAR for nominal TSL parameters:* The measured TSL parameters are used to calculate the nominal SAR result.

The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k=2, which for a normal distribution corresponds to a coverage probability of approximately 95%.

## Measurement Conditions

DASY system configuration, as far as not given on page 1.

| | | |
|---|---|---|
| **DASY Version** | DASY5 | V52.8.7 |
| **Extrapolation** | Advanced Extrapolation | |
| **Phantom** | Modular Flat Phantom | |
| **Distance Dipole Center - TSL** | 10 mm | with Spacer |
| **Zoom Scan Resolution** | dx, dy, dz = 5 mm | |
| **Frequency** | 1900 MHz ± 1 MHz | |

## Head TSL parameters

The following parameters and calculations were applied.

| | Temperature | Permittivity | Conductivity |
|---|---|---|---|
| **Nominal Head TSL parameters** | 22.0 °C | 40.0 | 1.40 mho/m |
| **Measured Head TSL parameters** | (22.0 ± 0.2) °C | 39.1 ± 6 % | 1.36 mho/m ± 6 % |
| **Head TSL temperature change during test** | < 0.5 °C | ---- | ---- |

## SAR result with Head TSL

| **SAR averaged over 1 cm³ (1 g) of Head TSL** | Condition | |
|---|---|---|
| SAR measured | 250 mW input power | 9.71 W/kg |
| SAR for nominal Head TSL parameters | normalized to 1W | **39.3 W/kg ± 17.0 % (k=2)** |

| **SAR averaged over 10 cm³ (10 g) of Head TSL** | condition | |
|---|---|---|
| SAR measured | 250 mW input power | 5.10 W/kg |
| SAR for nominal Head TSL parameters | normalized to 1W | **20.6 W/kg ± 16.5 % (k=2)** |

## Body TSL parameters

The following parameters and calculations were applied.

| | Temperature | Permittivity | Conductivity |
|---|---|---|---|
| **Nominal Body TSL parameters** | 22.0 °C | 53.3 | 1.52 mho/m |
| **Measured Body TSL parameters** | (22.0 ± 0.2) °C | 52.4 ± 6 % | 1.52 mho/m ± 6 % |
| **Body TSL temperature change during test** | < 0.5 °C | ---- | ---- |

## SAR result with Body TSL

| **SAR averaged over 1 cm³ (1 g) of Body TSL** | Condition | |
|---|---|---|
| SAR measured | 250 mW input power | 9.87 W/kg |
| SAR for nominal Body TSL parameters | normalized to 1W | **39.3 W/kg ± 17.0 % (k=2)** |

| **SAR averaged over 10 cm³ (10 g) of Body TSL** | condition | |
|---|---|---|
| SAR measured | 250 mW input power | 5.22 W/kg |
| SAR for nominal Body TSL parameters | normalized to 1W | **20.8 W/kg ± 16.5 % (k=2)** |





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## Appendix

### Antenna Parameters with Head TSL

| | |
|---|---|
| Impedance, transformed to feed point | 52.5 Ω + 6.8 jΩ |
| Return Loss | - 23.0 dB |

### Antenna Parameters with Body TSL

| | |
|---|---|
| Impedance, transformed to feed point | 46.3 Ω + 2.8 jΩ |
| Return Loss | - 26.4 dB |

### General Antenna Parameters and Design

| | |
|---|---|
| Electrical Delay (one direction) | 1.199 ns |

After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.
No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

### Additional EUT Data

| | |
|---|---|
| Manufactured by | SPEAG |
| Manufactured on | December 17, 2002 |





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**DASY5 Validation Report for Head TSL**

Date: 23.04.2014

Test Laboratory: SPEAG, Zurich, Switzerland

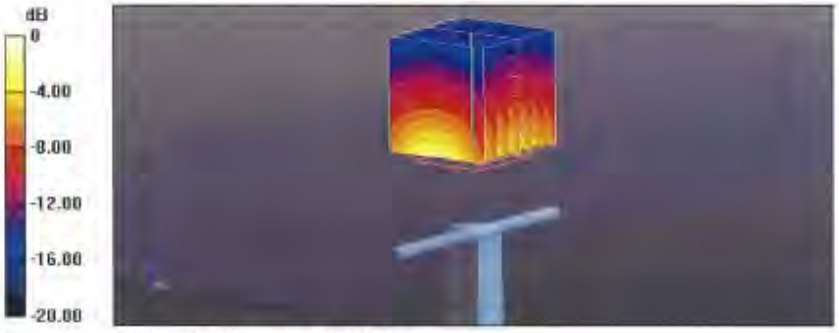
**DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN: 5d027**

Communication System: UID 0 - CW; Frequency: 1900 MHz
Medium parameters used: f = 1900 MHz; $\sigma$ = 1.36 S/m; $\varepsilon_r$ = 39.1; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

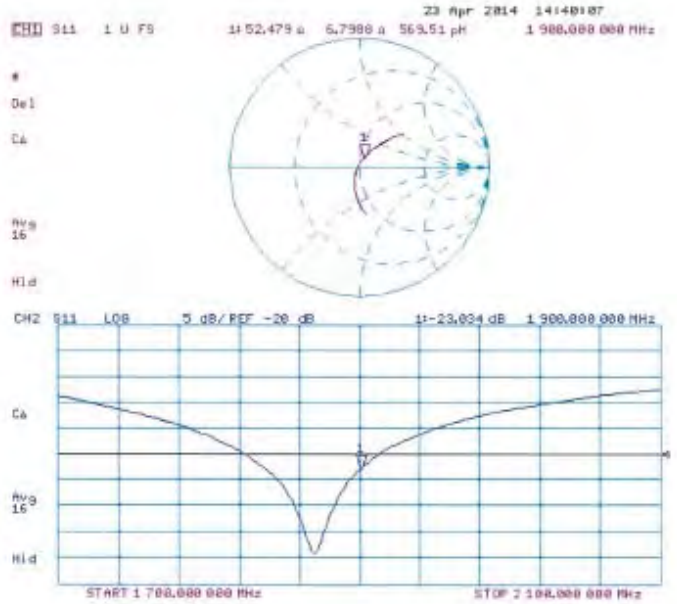
- Probe: ES3DV3 - SN3205; ConvF(5.06, 5.06, 5.06); Calibrated: 30.12.2013;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 25.04.2013
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

**Dipole Calibration for Head Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:**
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 97.825 V/m; Power Drift = 0.06 dB
Peak SAR (extrapolated) = 17.8 W/kg
**SAR(1 g) = 9.71 W/kg; SAR(10 g) = 5.1 W/kg**
Maximum value of SAR (measured) = 12.3 W/kg




0 dB = 12.3 W/kg = 10.90 dBW/kg

**Impedance Measurement Plot for Head TSL**





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**DASY5 Validation Report for Body TSL**

Date: 22.04.2014

Test Laboratory: SPEAG, Zurich, Switzerland

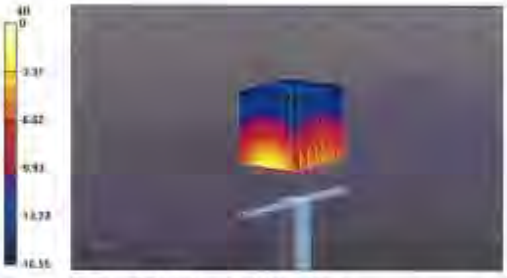
**DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN: 5d027**

Communication System: UID 0 - CW; Frequency: 1900 MHz
Medium parameters used: f = 1900 MHz; $\sigma$ = 1.52 S/m; $\varepsilon_r$ = 52.4; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

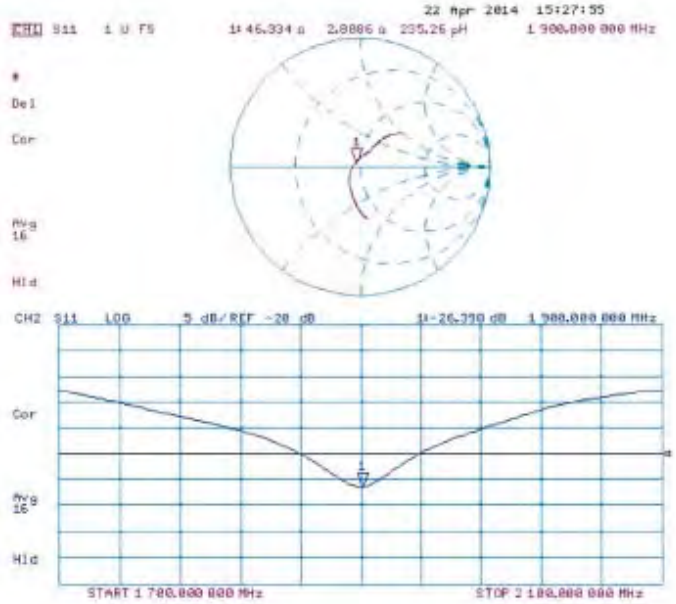
- Probe: ES3DV3 - SN3205; ConvF(4.76, 4.76, 4.76); Calibrated: 30.12.2013;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 25.04.2013
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

**Dipole Calibration for Body Tissue/Pin=250 mW, d=10mm 2/Zoom Scan (7x7x7)/Cube 0:**
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 94.526 V/m; Power Drift = -0.01 dB
Peak SAR (extrapolated) = 17.2 W/kg
**SAR(1 g) = 9.87 W/kg; SAR(10 g) = 5.22 W/kg**
Maximum value of SAR (measured) = 12.5 W/kg




0 dB = 12.5 W/kg = 10.97 dBW/kg

**Impedance Measurement Plot for Body TSL**





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Accreditation No.: SCS 108

Client SGS-TW (Auden)

Certificate No: D2450V2-727_Apr14

# CALIBRATION CERTIFICATE

| | |
|---|---|
| Object | D2450V2 - SN: 727 |
| Calibration procedure(s) | QA CAL-05.v9<br>Calibration procedure for dipole validation kits above 700 MHz |
| Calibration date | April 23, 2014 |

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI).
The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature (22 ± 3)°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

| Primary Standards | ID # | Cal Date (Certificate No.) | Scheduled Calibration |
|---|---|---|---|
| Power meter EPM-442A | GB37480704 | 09-Oct-13 (No. 217-01827) | Oct-14 |
| Power sensor HP 8481A | US37292783 | 09-Oct-13 (No. 217-01827) | Oct-14 |
| Power sensor HP 8481A | MY41092317 | 09-Oct-13 (No. 217-01828) | Oct-14 |
| Reference 20 dB Attenuator | SN: 5058 (20k) | 03-Apr-14 (No. 217-01918) | Apr-15 |
| Type-N mismatch combination | SN: 5047.2 / 06327 | 03-Apr-14 (No. 217-01921) | Apr-15 |
| Reference Probe ES3DV3 | SN: 3205 | 30-Dec-13 (No. ES3-3205_Dec13) | Dec-14 |
| DAE4 | SN: 601 | 25-Apr-13 (No. DAE4-601_Apr13) | Apr-14 |

| Secondary Standards | ID # | Check Date (in house) | Scheduled Check |
|---|---|---|---|
| RF generator R&S SMT-06 | 100005 | 04-Aug-99 (in house check Oct-13) | In house check: Oct-16 |
| Network Analyzer HP 8753E | US37390585 S4206 | 18-Oct-01 (in house check Oct-13) | In house check: Oct-14 |

| | Name | Function | Signature |
|---|---|---|---|
| Calibrated by | Jeton Kastrati | Laboratory Technician | |
| Approved by | Katja Pokovic | Technical Manager | |

Issued: April 23, 2014

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Accreditation No.: SCS 108

**Glossary:**

| | |
|---|---|
| TSL | tissue simulating liquid |
| ConvF | sensitivity in TSL / NORM x,y,z |
| N/A | not applicable or not measured |

**Calibration is Performed According to the Following Standards:**

a) IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
b) IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005
c) KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

**Additional Documentation:**

d) DASY4/5 System Handbook

**Methods Applied and Interpretation of Parameters:**

- *Measurement Conditions:* Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- *Antenna Parameters with TSL:* The dipole is mounted with the spacer to position its feed point exactly below the center marking of the flat phantom section, with the arms oriented parallel to the body axis.
- *Feed Point Impedance and Return Loss:* These parameters are measured with the dipole positioned under the liquid filled phantom. The impedance stated is transformed from the measurement at the SMA connector to the feed point. The Return Loss ensures low reflected power. No uncertainty required.
- *Electrical Delay:* One-way delay between the SMA connector and the antenna feed point. No uncertainty required.
- *SAR measured:* SAR measured at the stated antenna input power.
- *SAR normalized:* SAR as measured, normalized to an input power of 1 W at the antenna connector.
- *SAR for nominal TSL parameters:* The measured TSL parameters are used to calculate the nominal SAR result.

The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k=2, which for a normal distribution corresponds to a coverage probability of approximately 95%.

## Measurement Conditions

DASY system configuration, as far as not given on page 1.

| DASY Version | DASY5 | V52.8.7 |
|---|---|---|
| Extrapolation | Advanced Extrapolation | |
| Phantom | Modular Flat Phantom | |
| Distance Dipole Center - TSL | 10 mm | with Spacer |
| Zoom Scan Resolution | dx, dy, dz = 5 mm | |
| Frequency | 2450 MHz ± 1 MHz | |

## Head TSL parameters

The following parameters and calculations were applied.

| | Temperature | Permittivity | Conductivity |
|---|---|---|---|
| Nominal Head TSL parameters | 22.0 °C | 39.2 | 1.80 mho/m |
| Measured Head TSL parameters | (22.0 ± 0.2) °C | 38.2 ± 6 % | 1.81 mho/m ± 6 % |
| Head TSL temperature change during test | < 0.5 °C | --- | --- |

## SAR result with Head TSL

| SAR averaged over 1 cm³ (1 g) of Head TSL | Condition | |
|---|---|---|
| SAR measured | 250 mW input power | 13.1 W/kg |
| SAR for nominal Head TSL parameters | normalized to 1W | **52.0 W/kg ± 17.0 % (k=2)** |

| SAR averaged over 10 cm³ (10 g) of Head TSL | condition | |
|---|---|---|
| SAR measured | 250 mW input power | 6.09 W/kg |
| SAR for nominal Head TSL parameters | normalized to 1W | **24.2 W/kg ± 16.5 % (k=2)** |

## Body TSL parameters

The following parameters and calculations were applied.

| | Temperature | Permittivity | Conductivity |
|---|---|---|---|
| Nominal Body TSL parameters | 22.0 °C | 52.7 | 1.95 mho/m |
| Measured Body TSL parameters | (22.0 ± 0.2) °C | 50.6 ± 6 % | 2.01 mho/m ± 6 % |
| Body TSL temperature change during test | < 0.5 °C | --- | --- |

## SAR result with Body TSL

| SAR averaged over 1 cm³ (1 g) of Body TSL | Condition | |
|---|---|---|
| SAR measured | 250 mW input power | 12.8 W/kg |
| SAR for nominal Body TSL parameters | normalized to 1W | **50.0 W/kg ± 17.0 % (k=2)** |

| SAR averaged over 10 cm³ (10 g) of Body TSL | condition | |
|---|---|---|
| SAR measured | 250 mW input power | 5.90 W/kg |
| SAR for nominal Body TSL parameters | normalized to 1W | **23.3 W/kg ± 16.5 % (k=2)** |





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## Appendix

### Antenna Parameters with Head TSL

| | |
|---|---|
| Impedance, transformed to feed point | 54.6 Ω + 1.9 jΩ |
| Return Loss | - 26.5 dB |

### Antenna Parameters with Body TSL

| | |
|---|---|
| Impedance, transformed to feed point | 51.1 Ω + 3.5 jΩ |
| Return Loss | - 28.7 dB |

### General Antenna Parameters and Design

| | |
|---|---|
| Electrical Delay (one direction) | 1.148 ns |

After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.
No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

### Additional EUT Data

| | |
|---|---|
| Manufactured by | SPEAG |
| Manufactured on | January 09, 2003 |





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**DASY5 Validation Report for Head TSL**

Date: 23.04.2014

Test Laboratory: SPEAG, Zurich, Switzerland

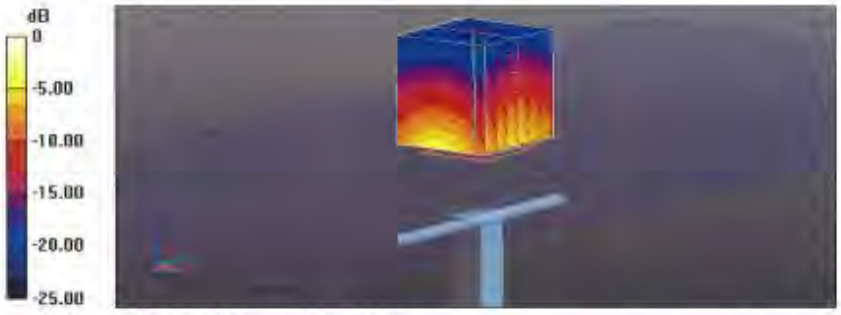
**DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN: 727**

Communication System: UID 0 - CW; Frequency: 2450 MHz
Medium parameters used: f = 2450 MHz; $\sigma$ = 1.81 S/m; $\varepsilon_r$ = 38.2; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

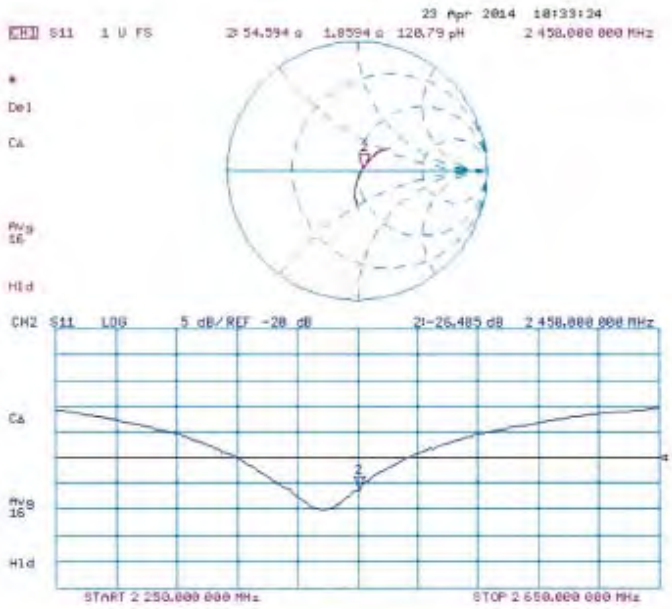
- Probe: ES3DV3 - SN3205; ConvF(4.53, 4.53, 4.53); Calibrated: 30.12.2013;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 25.04.2013
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

**Dipole Calibration for Head Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:**
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 100.01 V/m; Power Drift = 0.03 dB
Peak SAR (extrapolated) = 27.0 W/kg
**SAR(1 g) = 13.1 W/kg; SAR(10 g) = 6.09 W/kg**
Maximum value of SAR (measured) = 17.1 W/kg




0 dB = 17.1 W/kg = 12.33 dBW/kg

**Impedance Measurement Plot for Head TSL**





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**DASY5 Validation Report for Body TSL**

Date: 23.04.2014

Test Laboratory: SPEAG, Zurich, Switzerland

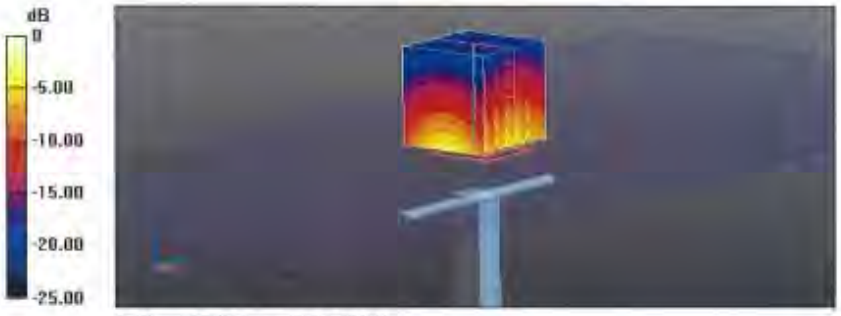
**DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN: 727**

Communication System: UID 0 - CW; Frequency: 2450 MHz
Medium parameters used: f = 2450 MHz; $\sigma$ = 2.01 S/m; $\varepsilon_r$ = 50.6; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

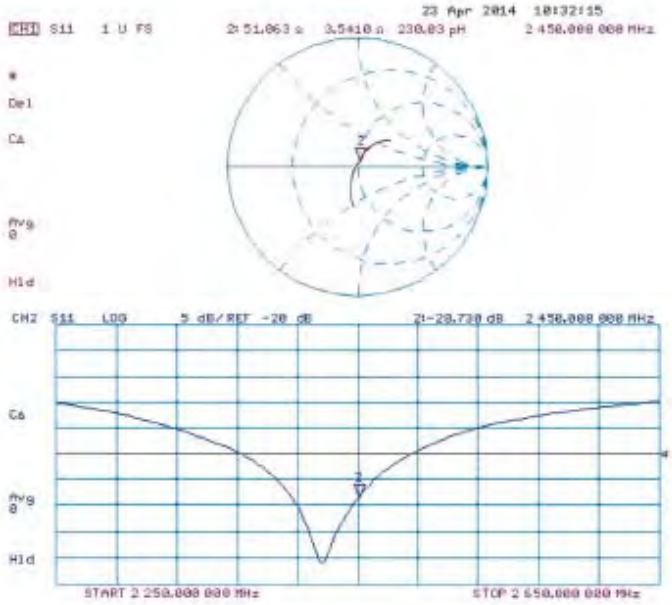
- Probe: ES3DV3 - SN3205; ConvF(4.35, 4.35, 4.35); Calibrated: 30.12.2013;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 25.04.2013
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

**Dipole Calibration for Body Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:**
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 94.356 V/m; Power Drift = -0.07 dB
Peak SAR (extrapolated) = 26.9 W/kg
**SAR(1 g) = 12.8 W/kg; SAR(10 g) = 5.9 W/kg**
Maximum value of SAR (measured) = 16.7 W/kg




0 dB = 16.7 W/kg = 12.23 dBW/kg

**Impedance Measurement Plot for Body TSL**





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Accreditation No.: SCS 108

Client SGS-TW (Auden)

Certificate No: D5GHzV2-1023_Jan14

# CALIBRATION CERTIFICATE

| | |
|---|---|
| Object | D5GHzV2 - SN: 1023 |
| Calibration procedure(s) | QA CAL-22.v2<br>Calibration procedure for dipole validation kits between 3-6 GHz |
| Calibration date: | January 30, 2014 |

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI).
The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature (22 ± 3)°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

| Primary Standards | ID # | Cal Date (Certificate No.) | Scheduled Calibration |
|---|---|---|---|
| Power meter EPM-442A | GB37480704 | 09-Oct-13 (No. 217-01827) | Oct-14 |
| Power sensor HP 8481A | US37292783 | 09-Oct-13 (No. 217-01827) | Oct-14 |
| Power sensor HP 8481A | MY41092317 | 09-Oct-13 (No. 217-01828) | Oct-14 |
| Reference 20 dB Attenuator | SN: 5058 (20k) | 04-Apr-13 (No. 217-01736) | Apr-14 |
| Type-N mismatch combination | SN: 5047.3 / 06327 | 04-Apr-13 (No. 217-01739) | Apr-14 |
| Reference Probe EX3DV4 | SN: 3503 | 30-Dec-13 (No. EX3-3503_Dec13) | Dec-14 |
| DAE4 | SN: 601 | 25-Apr-13 (No. DAE4-601_Apr13) | Apr-14 |

| Secondary Standards | ID # | Check Date (in house) | Scheduled Check |
|---|---|---|---|
| RF generator R&S SMT-06 | 100005 | 04-Aug-99 (in house check Oct-13) | in house check: Oct-14 |
| Network Analyzer HP 8753E | US37390585 S4206 | 18-Oct-01 (in house check Oct-13) | in house check: Oct-14 |

| | Name | Function | Signature |
|---|---|---|---|
| Calibrated by: | Jeton Kastrati | Laboratory Technician | |
| Approved by: | Katja Pokovic | Technical Manager | |

Issued: January 31, 2014

This calibration certificate shall not be reproduced except in full without written approval of the laboratory.

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Accreditation No.: SCS 108

**Glossary:**

| | |
|---|---|
| TSL | tissue simulating liquid |
| ConvF | sensitivity in TSL / NORM x,y,z |
| N/A | not applicable or not measured |

**Calibration is Performed According to the Following Standards:**

a) IEC 62209-2, "Evaluation of Human Exposure to Radio Frequency Fields from Handheld and Body-Mounted Wireless Communication Devices in the Frequency Range of 30 MHz to 6 GHz: Human models, Instrumentation, and Procedures"; Part 2: "Procedure to determine the Specific Absorption Rate (SAR) for including accessories and multiple transmitters", March 2010
b) KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"
c) IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013

**Additional Documentation:**

d) DASY4/5 System Handbook

**Methods Applied and Interpretation of Parameters:**

- *Measurement Conditions:* Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- *Antenna Parameters with TSL:* The dipole is mounted with the spacer to position its feed point exactly below the center marking of the flat phantom section, with the arms oriented parallel to the body axis.
- *Feed Point Impedance and Return Loss:* These parameters are measured with the dipole positioned under the liquid filled phantom. The impedance stated is transformed from the measurement at the SMA connector to the feed point. The Return Loss ensures low reflected power. No uncertainty required.
- *Electrical Delay:* One-way delay between the SMA connector and the antenna feed point. No uncertainty required.
- *SAR measured:* SAR measured at the stated antenna input power.
- *SAR normalized:* SAR as measured, normalized to an input power of 1 W at the antenna connector.
- *SAR for nominal TSL parameters:* The measured TSL parameters are used to calculate the nominal SAR result.

The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k=2, which for a normal distribution corresponds to a coverage probability of approximately 95%.

## Measurement Conditions

DASY system configuration, as far as not given on page 1.

| DASY Version | DASY5 | V52.8.7 |
|---|---|---|
| Extrapolation | Advanced Extrapolation | |
| Phantom | Modular Flat Phantom V5.0 | |
| Distance Dipole Center - TSL | 10 mm | with Spacer |
| Zoom Scan Resolution | dx, dy = 4.0 mm, dz = 1.4 mm | Graded Ratio = 1.4 (Z direction) |
| Frequency | 5200 MHz ± 1 MHz<br>5300 MHz ± 1 MHz<br>5600 MHz ± 1 MHz<br>5800 MHz ± 1 MHz | |

## Head TSL parameters at 5200 MHz

The following parameters and calculations were applied.

| | Temperature | Permittivity | Conductivity |
|---|---|---|---|
| Nominal Head TSL parameters | 22.0 °C | 36.0 | 4.66 mho/m |
| Measured Head TSL parameters | (22.0 ± 0.2) °C | 37.2 ± 6 % | 4.54 mho/m ± 6 % |
| Head TSL temperature change during test | < 0.5 °C | ---- | ---- |

## SAR result with Head TSL at 5200 MHz

| SAR averaged over 1 cm³ (1 g) of Head TSL | Condition | |
|---|---|---|
| SAR measured | 100 mW input power | 7.67 W/kg |
| SAR for nominal Head TSL parameters | normalized to 1W | **77.2 W/kg ± 19.9 % (k=2)** |

| SAR averaged over 10 cm³ (10 g) of Head TSL | condition | |
|---|---|---|
| SAR measured | 100 mW input power | 2.19 W/kg |
| SAR for nominal Head TSL parameters | normalized to 1W | **22.1 W/kg ± 19.5 % (k=2)** |

## Head TSL parameters at 5300 MHz

The following parameters and calculations were applied.

| | Temperature | Permittivity | Conductivity |
|---|---|---|---|
| Nominal Head TSL parameters | 22.0 °C | 35.9 | 4.76 mho/m |
| Measured Head TSL parameters | (22.0 ± 0.2) °C | 37.0 ± 6 % | 4.65 mho/m ± 6 % |
| Head TSL temperature change during test | < 0.5 °C | ---- | ---- |

## SAR result with Head TSL at 5300 MHz

| SAR averaged over 1 cm³ (1 g) of Head TSL | Condition | |
|---|---|---|
| SAR measured | 100 mW input power | 8.14 W/kg |
| SAR for nominal Head TSL parameters | normalized to 1W | **81.8 W / kg ± 19.9 % (k=2)** |

| SAR averaged over 10 cm³ (10 g) of Head TSL | condition | |
|---|---|---|
| SAR measured | 100 mW input power | 2.32 W/kg |
| SAR for nominal Head TSL parameters | normalized to 1W | **23.4 W/kg ± 19.5 % (k=2)** |





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**Head TSL parameters at 5600 MHz**

The following parameters and calculations were applied.

| | Temperature | Permittivity | Conductivity |
|---|---|---|---|
| **Nominal Head TSL parameters** | 22.0 °C | 35.5 | 5.07 mho/m |
| **Measured Head TSL parameters** | (22.0 ± 0.2) °C | 36.6 ± 6 % | 4.96 mho/m ± 6 % |
| **Head TSL temperature change during test** | < 0.5 °C | ---- | ---- |

**SAR result with Head TSL at 5600 MHz**

| **SAR averaged over 1 cm³ (1 g) of Head TSL** | Condition | |
|---|---|---|
| SAR measured | 100 mW input power | 8.09 W/kg |
| SAR for nominal Head TSL parameters | normalized to 1W | **81.3 W/kg ± 19.9 % (k=2)** |

| **SAR averaged over 10 cm³ (10 g) of Head TSL** | condition | |
|---|---|---|
| SAR measured | 100 mW input power | 2.30 W/kg |
| SAR for nominal Head TSL parameters | normalized to 1W | **23.2 W/kg ± 19.5 % (k=2)** |

**Head TSL parameters at 5800 MHz**

The following parameters and calculations were applied.

| | Temperature | Permittivity | Conductivity |
|---|---|---|---|
| **Nominal Head TSL parameters** | 22.0 °C | 35.3 | 5.27 mho/m |
| **Measured Head TSL parameters** | (22.0 ± 0.2) °C | 36.3 ± 6 % | 5.18 mho/m ± 6 % |
| **Head TSL temperature change during test** | < 0.5 °C | ---- | ---- |

**SAR result with Head TSL at 5800 MHz**

| **SAR averaged over 1 cm³ (1 g) of Head TSL** | Condition | |
|---|---|---|
| SAR measured | 100 mW input power | 7.77 W/kg |
| SAR for nominal Head TSL parameters | normalized to 1W | **78.1 W/kg ± 19.9 % (k=2)** |

| **SAR averaged over 10 cm³ (10 g) of Head TSL** | condition | |
|---|---|---|
| SAR measured | 100 mW input power | 2.20 W/kg |
| SAR for nominal Head TSL parameters | normalized to 1W | **22.1 W/kg ± 19.5 % (k=2)** |





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**Body TSL parameters at 5200 MHz**

The following parameters and calculations were applied.

| | Temperature | Permittivity | Conductivity |
|---|---|---|---|
| **Nominal Body TSL parameters** | 22.0 °C | 49.0 | 5.30 mho/m |
| **Measured Body TSL parameters** | (22.0 ± 0.2) °C | 47.8 ± 6 % | 5.40 mho/m ± 6 % |
| **Body TSL temperature change during test** | < 0.5 °C | ---- | ---- |

**SAR result with Body TSL at 5200 MHz**

| **SAR averaged over 1 cm³ (1 g) of Body TSL** | Condition | |
|---|---|---|
| SAR measured | 100 mW input power | 7.39 W/kg |
| SAR for nominal Body TSL parameters | normalized to 1W | **73.6 W/kg ± 19.9 % (k=2)** |

| **SAR averaged over 10 cm³ (10 g) of Body TSL** | condition | |
|---|---|---|
| SAR measured | 100 mW input power | 2.06 W/kg |
| SAR for nominal Body TSL parameters | normalized to 1W | **20.5 W/kg ± 19.5 % (k=2)** |

**Body TSL parameters at 5300 MHz**

The following parameters and calculations were applied.

| | Temperature | Permittivity | Conductivity |
|---|---|---|---|
| **Nominal Body TSL parameters** | 22.0 °C | 48.9 | 5.42 mho/m |
| **Measured Body TSL parameters** | (22.0 ± 0.2) °C | 47.6 ± 6 % | 5.53 mho/m ± 6 % |
| **Body TSL temperature change during test** | < 0.5 °C | ---- | ---- |

**SAR result with Body TSL at 5300 MHz**

| **SAR averaged over 1 cm³ (1 g) of Body TSL** | Condition | |
|---|---|---|
| SAR measured | 100 mW input power | 7.62 W/kg |
| SAR for nominal Body TSL parameters | normalized to 1W | **75.8 W/kg ± 19.9 % (k=2)** |

| **SAR averaged over 10 cm³ (10 g) of Body TSL** | condition | |
|---|---|---|
| SAR measured | 100 mW input power | 2.13 W/kg |
| SAR for nominal Body TSL parameters | normalized to 1W | **21.2 W/kg ± 19.5 % (k=2)** |





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### Body TSL parameters at 5600 MHz

The following parameters and calculations were applied.

| | Temperature | Permittivity | Conductivity |
|---|---|---|---|
| Nominal Body TSL parameters | 22.0 °C | 48.5 | 5.77 mho/m |
| Measured Body TSL parameters | (22.0 ± 0.2) °C | 47.1 ± 6 % | 5.93 mho/m ± 6 % |
| Body TSL temperature change during test | < 0.5 °C | ---- | ---- |

### SAR result with Body TSL at 5600 MHz

| SAR averaged over 1 cm³ (1 g) of Body TSL | Condition | |
|---|---|---|
| SAR measured | 100 mW input power | 8.04 W/kg |
| SAR for nominal Body TSL parameters | normalized to 1W | **80.0 W/kg ± 19.9 % (k=2)** |

| SAR averaged over 10 cm³ (10 g) of Body TSL | condition | |
|---|---|---|
| SAR measured | 100 mW input power | 2.23 W/kg |
| SAR for nominal Body TSL parameters | normalized to 1W | **22.2 W/kg ± 19.5 % (k=2)** |

### Body TSL parameters at 5800 MHz

The following parameters and calculations were applied.

| | Temperature | Permittivity | Conductivity |
|---|---|---|---|
| Nominal Body TSL parameters | 22.0 °C | 48.2 | 6.00 mho/m |
| Measured Body TSL parameters | (22.0 ± 0.2) °C | 46.8 ± 6 % | 6.21 mho/m ± 6 % |
| Body TSL temperature change during test | < 0.5 °C | ---- | ---- |

### SAR result with Body TSL at 5800 MHz

| SAR averaged over 1 cm³ (1 g) of Body TSL | Condition | |
|---|---|---|
| SAR measured | 100 mW input power | 7.44 W/kg |
| SAR for nominal Body TSL parameters | normalized to 1W | **74.1 W/kg ± 19.9 % (k=2)** |

| SAR averaged over 10 cm³ (10 g) of Body TSL | condition | |
|---|---|---|
| SAR measured | 100 mW input power | 2.05 W/kg |
| SAR for nominal Body TSL parameters | normalized to 1W | **20.4 W/kg ± 19.5 % (k=2)** |





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## Appendix

### Antenna Parameters with Head TSL at 5200 MHz

| | |
|---|---|
| Impedance, transformed to feed point | 49.9 Ω - 7.7 jΩ |
| Return Loss | - 22.3 dB |

### Antenna Parameters with Head TSL at 5300 MHz

| | |
|---|---|
| Impedance, transformed to feed point | 51.2 Ω - 4.0 jΩ |
| Return Loss | - 27.6 dB |

### Antenna Parameters with Head TSL at 5600 MHz

| | |
|---|---|
| Impedance, transformed to feed point | 53.8 Ω - 2.5 jΩ |
| Return Loss | - 27.1 dB |

### Antenna Parameters with Head TSL at 5800 MHz

| | |
|---|---|
| Impedance, transformed to feed point | 56.5 Ω + 0.5 jΩ |
| Return Loss | - 24.3 dB |

### Antenna Parameters with Body TSL at 5200 MHz

| | |
|---|---|
| Impedance, transformed to feed point | 50.0 Ω - 6.1 jΩ |
| Return Loss | - 24.3 dB |

### Antenna Parameters with Body TSL at 5300 MHz

| | |
|---|---|
| Impedance, transformed to feed point | 51.3 Ω - 1.9 jΩ |
| Return Loss | - 32.7 dB |

### Antenna Parameters with Body TSL at 5600 MHz

| | |
|---|---|
| Impedance, transformed to feed point | 54.3 Ω - 0.4 jΩ |
| Return Loss | - 27.6 dB |

### Antenna Parameters with Body TSL at 5800 MHz

| | |
|---|---|
| Impedance, transformed to feed point | 57.1 Ω + 3.3 jΩ |
| Return Loss | - 22.7 dB |





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## General Antenna Parameters and Design

| | |
|---|---|
| Electrical Delay (one direction) | 1.199 ns |

After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.
No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

## Additional EUT Data

| | |
|---|---|
| Manufactured by | SPEAG |
| Manufactured on | February 05, 2004 |





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**DASY5 Validation Report for Head TSL**

Date: 30.01.2014

Test Laboratory: SPEAG, Zurich, Switzerland

**DUT: Dipole 5GHz; Type: D5GHzV2; Serial: D5GHzV2 - SN: 1023**

Communication System: UID 0 - CW; Frequency: 5200 MHz, Frequency: 5300 MHz, Frequency: 5500 MHz, Frequency: 5600 MHz, Frequency: 5800 MHz
Medium parameters used: f = 5200 MHz; $\sigma$ = 4.54 S/m; $\varepsilon_r$ = 37.2; $\rho$ = 1000 kg/m$^3$ , Medium parameters used: f = 5300 MHz; $\sigma$ = 4.65 S/m; $\varepsilon_r$ = 37; $\rho$ = 1000 kg/m$^3$ , Medium parameters used: f = 5600 MHz; $\sigma$ = 4.96 S/m; $\varepsilon_r$ = 36.6; $\rho$ = 1000 kg/m$^3$ , Medium parameters used: f = 5800 MHz; $\sigma$ = 5.18 S/m; $\varepsilon_r$ = 36.3; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: EX3DV4 - SN3503; ConvF(5.52, 5.52, 5.52); Calibrated: 30.12.2013, ConvF(5.2, 5.2, 5.2); Calibrated: 30.12.2013, ConvF(4.86, 4.86, 4.86); Calibrated: 30.12.2013, ConvF(4.91, 4.91, 4.91); Calibrated: 30.12.2013;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 25.04.2013
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

**Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5200 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 62.583 V/m; Power Drift = 0.03 dB
Peak SAR (extrapolated) = 28.2 W/kg
**SAR(1 g) = 7.67 W/kg; SAR(10 g) = 2.19 W/kg**
Maximum value of SAR (measured) = 18.2 W/kg

**Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5300 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 63.619 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 30.8 W/kg
**SAR(1 g) = 8.14 W/kg; SAR(10 g) = 2.32 W/kg**
Maximum value of SAR (measured) = 19.4 W/kg

**Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5600 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 61.852 V/m; Power Drift = 0.04 dB
Peak SAR (extrapolated) = 32.3 W/kg
**SAR(1 g) = 8.09 W/kg; SAR(10 g) = 2.3 W/kg**
Maximum value of SAR (measured) = 19.7 W/kg




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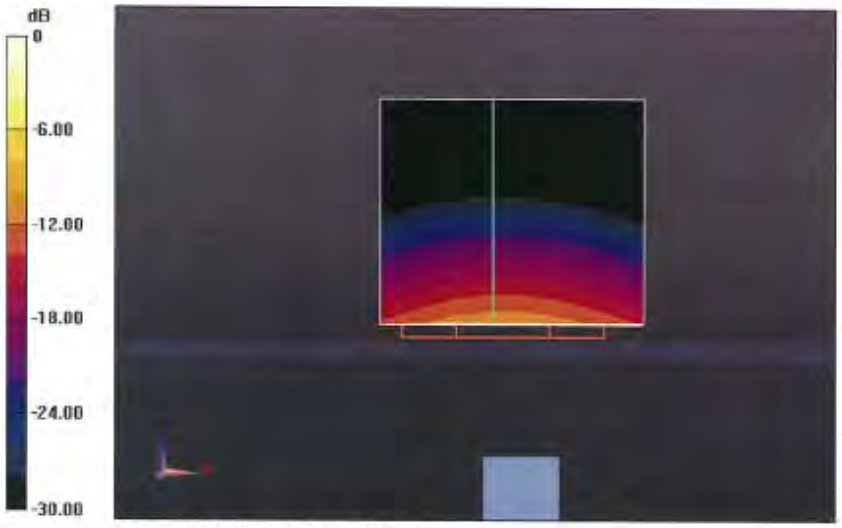
**Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5800 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 59.398 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 32.6 W/kg
**SAR(1 g) = 7.77 W/kg; SAR(10 g) = 2.2 W/kg**
Maximum value of SAR (measured) = 19.2 W/kg




0 dB = 19.2 W/kg = 12.83 dBW/kg





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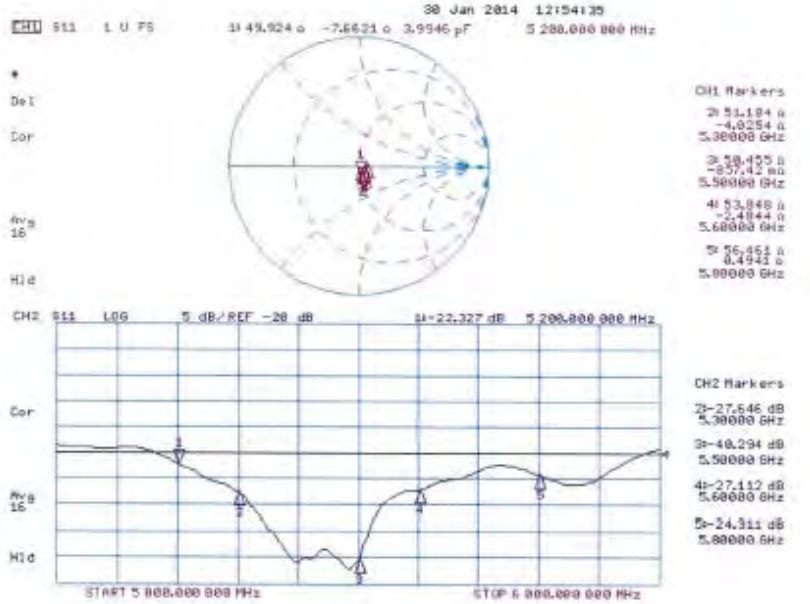
**Impedance Measurement Plot for Head TSL**





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**DASY5 Validation Report for Body TSL**

Date: 29.01.2014

Test Laboratory: SPEAG, Zurich, Switzerland

**DUT: Dipole 5GHz; Type: D5GHzV2; Serial: D5GHzV2 - SN: 1023**

Communication System: UID 0 - CW; Frequency: 5200 MHz, Frequency: 5300 MHz, Frequency: 5500 MHz, Frequency: 5600 MHz, Frequency: 5800 MHz
Medium parameters used: f = 5200 MHz; $\sigma$ = 5.4 S/m; $\varepsilon_r$ = 47.8; $\rho$ = 1000 kg/m$^3$ , Medium parameters used: f = 5300 MHz; $\sigma$ = 5.53 S/m; $\varepsilon_r$ = 47.6; $\rho$ = 1000 kg/m$^3$, Medium parameters used: f = 5600 MHz; $\sigma$ = 5.93 S/m; $\varepsilon_r$ = 47.1; $\rho$ = 1000 kg/m$^3$ , Medium parameters used: f = 5800 MHz; $\sigma$ = 6.21 S/m; $\varepsilon_r$ = 46.8; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: EX3DV4 - SN3503; ConvF(5.01, 5.01, 5.01); Calibrated: 30.12.2013, ConvF(4.76, 4.76, 4.76); Calibrated: 30.12.2013, ConvF(4.3, 4.3, 4.3); Calibrated: 30.12.2013, ConvF(4.47, 4.47, 4.47); Calibrated: 30.12.2013;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 25.04.2013
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

**Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5200 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 57.977 V/m; Power Drift = -0.03 dB
Peak SAR (extrapolated) = 29.2 W/kg
**SAR(1 g) = 7.39 W/kg; SAR(10 g) = 2.06 W/kg**
Maximum value of SAR (measured) = 17.6 W/kg

**Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5300 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 58.404 V/m; Power Drift = 0.00 dB
Peak SAR (extrapolated) = 30.9 W/kg
**SAR(1 g) = 7.62 W/kg; SAR(10 g) = 2.13 W/kg**
Maximum value of SAR (measured) = 18.5 W/kg

**Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5600 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 58.115 V/m; Power Drift = 0.02 dB
Peak SAR (extrapolated) = 35.7 W/kg
**SAR(1 g) = 8.04 W/kg; SAR(10 g) = 2.23 W/kg**
Maximum value of SAR (measured) = 20.0 W/kg





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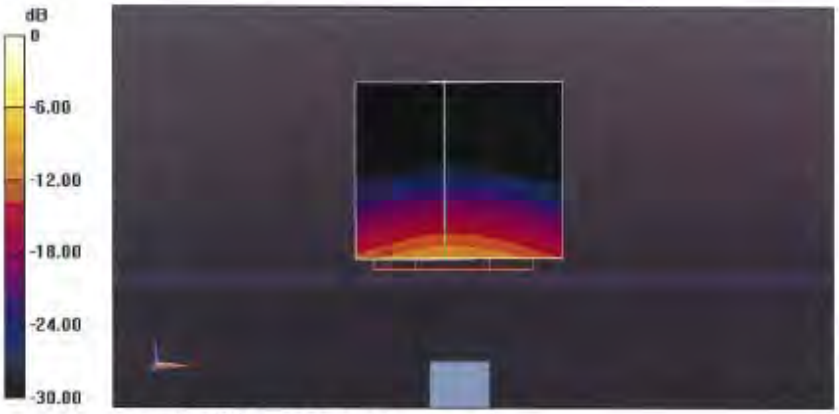
**Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5800 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 54.877 V/m; Power Drift = 0.00 dB
Peak SAR (extrapolated) = 34.9 W/kg
**SAR(1 g) = 7.44 W/kg; SAR(10 g) = 2.05 W/kg**
Maximum value of SAR (measured) = 19.0 W/kg




0 dB = 19.0 W/kg = 12.79 dBW/kg

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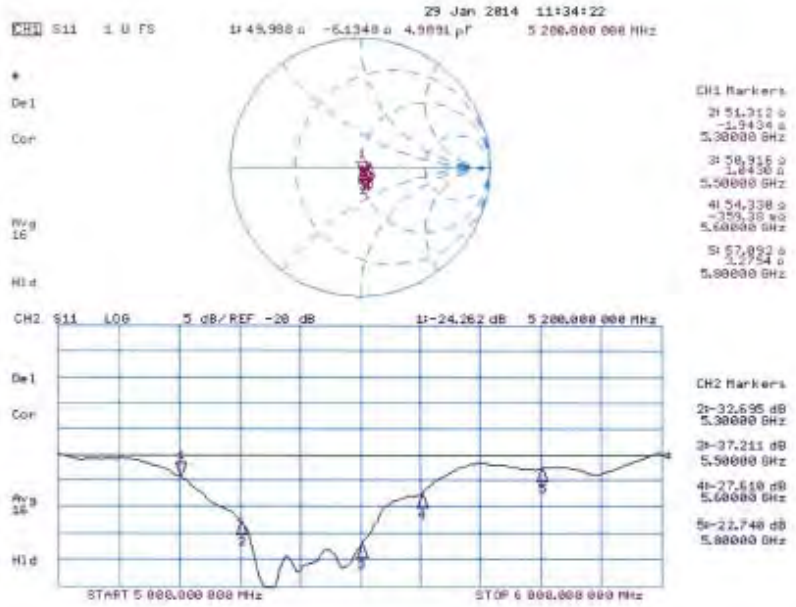
**Impedance Measurement Plot for Body TSL**






**- End of 1st part of report -**



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