

## SAR Compliance Test Report

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<b>Number of pages:</b>	81	<b>Responsible Test engineer:</b>	Kirsi Kyllönen
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<b>Tested device</b>	<b>MX Rugged Enhanced</b>		
<b>Related reports:</b>	-		
<b>Testing has been carried out in accordance with:</b>	<b>47CFR §2.1093</b> Radiofrequency Radiation Exposure Evaluation: Portable Devices <b>FCC published RF exposure KDB procedures</b>  <b>IEEE 1528 - 2013</b> IEEE Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Technique		
<b>Documentation:</b>	The test report must always be reproduced in full; reproduction of an excerpt only is subject to written approval of the testing laboratory		
<b>Test Results:</b>	<b>The EUT complies with the requirements in respect of all parameters subject to the test.</b> The test results relate only to devices specified in this document		
<b>Date and signatures:</b>	24.05.2017		
For the contents:			

**Laboratory Manager**

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## 1. SUMMARY OF SAR TEST REPORT

### 1.1 Test Details

#### Equipment under Test (EUT):

Product:	Mx Rugged E
Manufacturer:	Bittium Wireless Ltd
Type:	SSD-53
Serial Number:	356244060507997, 356244060506840
FCC ID Number:	V27SSD-53
Hardware Version:	1201
DUT Number:	23103, 23099
Battery Type used in testing:	Li-Ion Polymer 9304569A01
Portable/ Mobile device	Portable
State of the Sample	Prototype

#### Testing information:

Testing performed:	11.1.2017 – 30.1.2017
Notes:	Verkotan ref ID451
Document name:	FCC_SAR_Report_MX Rugged E_24052017.docx
Temperature °C	22±2 / Controlled
Humidity RH%	30±20 / Controlled
Measurement performed by:	Ilpo Joensuu/ Kirsi Kyllönen

### 1.2 Maximum Results

The maximum reported\* SAR values for Head Exposure Condition and Body-worn configurations are reported below. The device conforms to the requirements of the standards when the maximum reported SAR value is less than or equal to the limit. The SAR limit specified in FCC 47 CFR part 2 (2.1093) for Head & Body is SAR<sub>1g</sub> 1.6 W/kg,

Equipment Class	System	Highest Reported* SAR <sub>1g</sub> (W/kg) in Head Exposure Condition	Highest Reported* SAR <sub>1g</sub> (W/kg) in Body-Worn Condition	Result
PCE	GSM850	0.39	1.57	PASS
	PCS1900	0.23	0.54	PASS
	WCDMA II	0.62	0.96	PASS
	WCDMA IV	0.44	1.01	PASS
	WCDMA V	0.57	1.18	PASS
	LTE 4	0.43	0.96	PASS
TNE	Satellite	1.51	0.38	PASS
DSS	Bluetooth	0.006	0.018	PASS

\* Reported SAR Values are scaled to upper limit of power tuning tolerance.

### 1.2.1 Simultaneous Transmission SAR

Highest Simultaneous Transmission SAR	SAR <sub>1g</sub> (W/kg) in Head Exposure Condition*	SAR <sub>1g</sub> (W/kg) in Body-Worn Condition*	Result
PCE +DSS	0.63	1.59	PASS
TNE + DSS	1.51	0.40	PASS

\* Reported SAR Values are scaled to upper limit of power tuning tolerance.

### 1.2.2 Maximum Drift

Maximum Drift During Measurements	-0.516 ≤ dB
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\*Larger than 5% drifts included to scaling factors

### 1.2.3 Measurement Uncertainty

Expanded Uncertainty (k=2) 95 %	±24.5 %
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## 2. DESCRIPTION OF THE DEVICE UNDER TEST (DUT)

The Mexsat Rugged Enhanced is a mobile phone supporting cellular and satellite radio access technologies. Satellite connection can be used as a Push-to-talk radio or against head.

Device Category	Portable
Exposure Environment	Uncontrolled

### 2.1 Supported Frequency Bands and Operational Modes

TX Frequency bands	Modes of Operation	Modulation Mode	Transmitter Frequency Range (MHz)
	GSM/GPRS/EDGE 850	GMSK/8PSK	824.2 - 848.8
	GSM/GPRS/EDGE 1900	GMSK/8PSK	1850.2 - 1909.8
	WCDMA/ HSUPA/ HSDPA II	QPSK	1852.4 - 1907.6
	WCDMA/ HSUPA/ HSDPA IV	QPSK	1712.4 - 1752.6
	WCDMA/ HSUPA/HSDPA V	QPSK	826.4 - 846.6
	LTE 4	QPSK/16QAM	1710.7 - 1754.3
	Bluetooth	GFSK, $\pi/4$ -DQPSK, 8-DPSK	2402 - 2480
	Satellite GMR-1 3G	PI/2 BPSK / PI/4 QPSK	1626.5-1660.5

Bands Operating Outside USA are GSM 900, GSM1800 and LTE28, and not part of this filing.

### 2.2 Simultaneous transmission

The DUT is utilizing 4 different antennas for tested frequencies.

Possible Simultaneous TX combinations
PCE Low Band + Bluetooth
PCE High Band + Bluetooth
Satellite + Bluetooth

PCE Low Band = GSM/GPRS/EDGE 850 or WCDMA/ HSUPA/HSDPA V

PCE High Band = GSM/GPRS/EDGE 1900 or WCDMA/ HSUPA/HSDPA IV or II

### 2.3 SAR Test Exclusion

Bluetooth and Bluetooth Low Energy use the same frequency and antenna. Since Bluetooth tuning power is higher, Bluetooth SAR is a conservative estimation of Bluetooth Low Energy SAR. Thus, Bluetooth Low Energy SAR can be deemed to comply without further analysis or measurements. The maximum and tested conducted powers for BT and BLE are shown in chapter 3 of this report.

### 3. CONDUCTED POWERS

#### 3.1 Tested conducted power

Power is reported as dBm.

Slot Configuration	GSM 850 CH 128 824.2 MHz	GSM 850 CH 190 836.6 MHz	GSM 850 CH 251 848.8 MHz	GSM 1900 CH 512 1850.2 MHz	GSM 1900 CH 661 1880.0 MHz	GSM 1900 CH 810 1909.8 MHz
GSM (GMSK, 1Tx-slot)	33.24	33.3	33.18	30.57	30.36	30.37
GPRS (GMSK, 1Tx-slot)	33.29	33.38	33.27	30.65	30.43	30.42
GPRS (GMSK, 2Tx-slot)	31.22	31.27	31.36	28.1	28.03	28.21
GPRS (GMSK, 3Tx-slot)	29.24	29.47	29.34	26.14	26.03	26.13
GPRS (GMSK, 4Tx-slot)	27.51	27.65	27.68	24.64	24.57	24.73
EDGE (8PSK, 1Tx-slot)	27.91	28.0	27.91	25.86	25.08	25.27
EDGE (8PSK, 2Tx-slot)	25.42	25.38	25.31	24.68	23.79	24.0
EDGE (8PSK, 3Tx-slot)	23.43	23.45	23.27	22.85	21.9	22.32
EDGE (8PSK, 4Tx-slot)	21.88	22.02	21.87	21.5	20.51	20.67

The number of Tx slots in GPRS tests was 2 at GSM850 MHz and PCS1900 MHz band. Selection was based on conducted power result comparison with all available uplink slot configurations.

Time averaged power:

Slot Configuration	GSM850 CH 128 824.2 MHz	GSM 850 CH 190 836.6 MHz	GSM 850 CH 251 848.8MHz	GSM 1900 CH 512 1850.2 MHz	GSM 1900 CH 661 1880.0 MHz	GSM 1900 CH 810 1909.8 MHz
GSM	24.21	24.27	24.15	21.54	21.33	21.34
GPRS 1-slot	24.26	24.35	24.24	21.62	21.40	21.39
GPRS 2-slot	<b>25.20</b>	<b>25.25</b>	<b>25.34</b>	<b>22.08</b>	<b>22.01</b>	<b>22.19</b>
GPRS 3-slot	24.98	25.21	25.08	21.88	21.77	21.87
GPRS 4-slot	24.50	24.64	24.67	21.63	21.56	21.72
EDGE 1-slot	18.88	18.97	18.88	16.83	16.05	16.24
EDGE 2-slot	19.40	19.36	19.29	18.66	17.77	17.98
EDGE 3-slot	19.17	19.19	19.01	18.59	17.64	18.06
EDGE 4-slot	18.87	19.01	18.86	18.49	17.50	17.66

SAR tests for HSDPA mode have not been performed as no HSDPA Sub-test mode has an average power > 0.25 dB above the basic WCDMA 12.2 kbps RMC mode.

SAR tests for HSUPA mode have not been performed as no HSUPA Sub-test mode has an average power > 0.25 dB above the basic WCDMA 12.2 kbps RMC mode.

Mode	WCDMA V			WCDMA IV			WCDMA II		
	CH 4132 826.4 MHz	CH 4182 836.4 MHz	CH 4233 846.6 MHz	CH 1312 1712.4 MHz	CH 1413 1732.6 MHz	CH 1513 1752.6 MHz	CH 9262 1852.4 MHz	CH 9400 1880.0 MHz	CH 9538 1907.6 MHz
RMC 12.2K	23.9	23.93	23.99	24.17	24.28	24.31	24.0	24.29	24.1
HSDPA Subtest-1	22.92	22.92	23.01	23.21	23.28	23.27	22.98	23.3	23.05
HSDPA Subtest-2	22.93	22.95	23.04	23.24	23.3	23.3	23.02	23.21	23.17
HSDPA Subtest-3	22.44	22.45	22.54	22.75	22.8	22.92	22.5	22.8	22.8

HSDPA Subtest-4	22.44	22.46	22.54	22.75	22.8	22.92	22.59	22.8	22.86
HSUPA Subtest-1	22.93	22.94	23.02	23.23	23.29	23.35	23.13	23.21	23.14
HSUPA Subtest-2	22.43	22.42	22.52	22.73	22.77	22.87	22.46	22.78	22.61
HSUPA Subtest-3	22.94	22.96	23.03	23.24	23.3	23.4	23.02	23.21	23.26
HSUPA Subtest-4	22.91	22.91	23.0	23.2	23.27	23.34	22.96	23.19	23.04
HSUPA Subtest-5	22.93	22.95	23.02	23.23	23.29	23.39	23.0	23.2	23.24

LTE Band / BW	RB Size RBs	RB Offset RB Start	QPSK				16QAM			
			CH 19957 1710.7 MHz	CH 20175 1732.5 MHz	CH 20393 1754.3 MHz	3GPP MPR [dB]	CH 19957 1710.7 MHz	CH 20175 1732.5 MHz	CH 20393 1754.3 MHz	3GPP MPR [dB]
4 / 1.4M	1	0	24.15	24.08	24.18	0	23.2	23.14	23.19	1
	1	2	24.07	24.06	24.16	0	23.07	23.16	23.14	1
	1	5	24.09	24.13	24.24	0	23.12	23.21	23.12	1
	3	0	24.08	24.09	24.15	0	23.07	23.14	23.22	1
	3	1	24.06	24.05	24.16	0	23.08	23.01	23.2	1
	3	3	24.05	24.07	24.17	0	23.13	23.09	23.08	1
	6	0	23.18	23.14	23.18	1	22.22	22.15	22.17	2

LTE Band / BW	RB Size RBs	RB Offset RB Start	QPSK				16QAM			
			CH 19965 1711.5 MHz	CH 20175 1732.5 MHz	CH 20385 1753.5 MHz	3GPP MPR [dB]	CH 19965 1711.5 MHz	CH 20175 1732.5 MHz	CH 20385 1753.5 MHz	3GPP MPR [dB]
4 / 3M	1	0	24.14	24.19	24.27	0	23.26	23.06	23.24	1
	1	7	24.21	24.09	24.25	0	23.24	23.12	23.2	1
	1	14	24.23	24.17	24.19	0	23.16	23.1	23.12	1
	8	0	23.2	23.1	23.24	1	22.18	22.09	22.3	2
	8	3	23.28	23.05	23.22	1	22.25	22.18	22.34	2
	8	7	23.27	23.12	23.16	1	22.19	22.19	22.15	2
	15	0	23.28	23.13	23.12	1	22.3	22.18	22.24	2

LTE Band / BW	RB Size RBs	RB Offset RB Start	QPSK				16QAM			
			CH 19975 1711.5 MHz	CH 20175 1732.5 MHz	CH 20375 1753.5 MHz	3GPP MPR [dB]	CH 19975 1711.5 MHz	CH 20175 1732.5 MHz	CH 20375 1753.5 MHz	3GPP MPR [dB]
4 / 5M	1	0	24.13	24.17	24.28	0	23.11	23.18	23.23	1
	1	12	24.25	24.11	24.24	0	23.1	23.03	23.1	1
	1	24	24.24	24.16	24.21	0	23.28	23.05	23.1	1
	12	0	23.13	23.19	23.21	1	22.18	22.25	22.29	2
	12	6	23.28	23.13	23.23	1	22.26	22.16	22.28	2
	12	13	23.29	23.08	23.07	1	22.28	22.13	22.18	2
	25	0	23.26	23.09	23.22	1	22.25	22.19	22.28	2

LTE Band / BW	RB Size RBs	RB Offset RB Start	QPSK				16QAM			
			CH 20000 1715.0 MHz	CH 20175 1732.5 MHz	CH 20350 1750.0 MHz	3GPP MPR [dB]	CH 20000 1715.0 MHz	CH 20175 1732.5 MHz	CH 20350 1750.0 MHz	3GPP MPR [dB]
4 / 10M	1	0	24.16	24.17	24.31	0	23.29	23.28	23.16	1
	1	24	24.32	24.28	24.35	0	23.25	23.07	23.35	1
	1	49	24.11	24.24	24.24	0	23.19	23.22	23.05	1
	25	0	23.26	23.25	23.3	1	22.36	22.28	22.31	2
	25	12	23.26	23.16	23.31	1	22.35	22.2	22.4	2
	25	25	23.26	23.16	23.3	1	22.35	22.26	22.35	2
50	0	23.41	23.25	23.31	1	22.4	22.28	22.36	2	

LTE Band / BW	RB Size RBs	RB Offset RB Start	QPSK				16QAM			
			CH 20025 1717.0 MHz	CH 20175 1732.5 MHz	CH 20325 1747.5 MHz	3GPP MPR [dB]	CH 20025 1717.0 MHz	CH 20175 1732.5 MHz	CH 20325 1747.5 MHz	3GPP MPR [dB]
4 / 15M	1	0	24.24	24.14	24.28	0	23.25	23.32	23.22	1
	1	37	24.21	24.31	24.28	0	23.1	23.07	23.23	1
	1	74	24.05	24.16	24.24	0	23.17	23.12	23.07	1
	36	0	23.42	23.29	23.38	1	22.39	22.32	22.4	2
	36	19	23.4	23.19	23.22	1	22.35	22.21	22.28	2
	36	39	23.17	23.25	23.25	1	22.21	22.22	22.35	2
	75	0	23.36	23.34	23.28	1	22.43	22.37	22.36	2

LTE Band / BW	RB Size RBs	RB Offset RB Start	QPSK				16QAM			
			CH 20050 1720.0 MHz	CH 20175 1732.5 MHz	CH 20300 1745.0 MHz	3GPP MPR [dB]	CH 20050 1720.0 MHz	CH 20175 1732.5 MHz	CH 20300 1745.0 MHz	3GPP MPR [dB]
4 / 20M	1	0	24.26	24.01	24.2	0	23.29	23.23	23.15	1
	1	50	24.1	24.34	24.26	0	23.24	22.98	23.12	1
	1	99	23.97	24.21	24.18	0	23.23	22.95	23.17	1
	50	0	23.49	23.2	23.39	1	22.53	22.21	22.41	2
	50	25	23.26	23.44	23.36	1	22.29	22.48	22.39	2
	50	50	23.07	23.28	23.32	1	22.11	22.29	22.38	2
	100	0	23.19	23.3	23.35	1	22.21	22.4	22.43	2

	Bluetooth		
	CH 0 2402 MHz	CH 38 2440 MHz	CH 78 2480 MHz
Conducted Power [dBm]	9.3	8.01	10.59

	Bluetooth Low Energy		
	CH 0 2402 MHz	CH 19 2440 MHz	CH 39 2480 MHz
Conducted Power [dBm]	0.65	-0.44	1.49

	Satellite		
	CH 1 1626.5 MHz	CH 220 1643.5 MHz	CH 43F 1660.5 MHz
Conducted Power [dBm]	29.63	29.68	29.7

### 3.2 Maximum Conducted powers

GSM 850 Slot Configuration	Target [dBm]	Tolerance [dB]
GSM (GMSK, 1Tx-slot)	33.0	+0.8/-1.5
GPRS (GMSK, 1Tx-slot)	33.0	+0.8/-1.5
GPRS (GMSK, 2Tx-slot)	31.0	+1.0/-1.5
GPRS (GMSK, 3Tx-slot)	29.0	+1.0/-1.5
GPRS (GMSK, 4Tx-slot)	27.5	+1.0/-1.5
EDGE (8PSK, 1Tx-slot)	28.0	+0.5/-1.5
EDGE (8PSK, 2Tx-slot)	25.0	+1.0/-1.5
EDGE (8PSK, 3Tx-slot)	23.0	+1.0/-1.5
EDGE (8PSK, 4Tx-slot)	22.0	+1.0/-1.5

GSM 1900 Slot Configuration	Target [dBm]	Tolerance [dB]
GSM (GMSK, 1Tx-slot)	30.0	+1.0/-1.5
GPRS (GMSK, 1Tx-slot)	30.0	+1.0/-1.5
GPRS (GMSK, 2Tx-slot)	28.0	+1.0/-1.5
GPRS (GMSK, 3Tx-slot)	26.0	+1.0/-1.5
GPRS (GMSK, 4Tx-slot)	25.0	+1.0/-1.5
EDGE (8PSK, 1Tx-slot)	26.0	+1.0/-1.5
EDGE (8PSK, 2Tx-slot)	24.0	+1.0/-1.5
EDGE (8PSK, 3Tx-slot)	22.0	+1.0/-1.5
EDGE (8PSK, 4Tx-slot)	21.0	+1.0/-1.5

WCDMA II Mode	Target [dBm]	Tolerance [dB]
RMC 12,2K	24.0	+0.5/-2.0
HSDPA Subtest-1	23.0	+0.5/-2.0
HSDPA Subtest-2	23.0	+0.5/-2.0
HSDPA Subtest-3	22.0	+1.0/-2.0
HSDPA Subtest-4	22.0	+1.0/-2.0
HSUPA Subtest-1	23.0	+1.0/-2.0
HSUPA Subtest-2	22.0	+1.0/-2.0
HSUPA Subtest-3	23.0	+1.0/-2.0
HSUPA Subtest-4	23.0	+1.0/-2.0
HSUPA Subtest-5	23.0	+1.0/-2.0

WCDMA IV Mode	Target [dBm]	Tolerance [dB]
RMC 12,2K	24.0	+0.5/-2.0
HSDPA Subtest-1	23.0	+0.5/-2.0
HSDPA Subtest-2	23.0	+0.5/-2.0
HSDPA Subtest-3	22.0	+1.0/-2.0
HSDPA Subtest-4	22.0	+1.0/-2.0
HSUPA Subtest-1	23.0	+1.0/-2.0
HSUPA Subtest-2	22.0	+1.0/-2.0
HSUPA Subtest-3	23.0	+1.0/-2.0
HSUPA Subtest-4	23.0	+1.0/-2.0
HSUPA Subtest-5	23.0	+1.0/-2.0

WCDMA V Mode	Target [dBm]	Tolerance [dB]
RMC 12,2K	24.0	+0.5/-2.0
HSDPA Subtest-1	23.0	+0.5/-2.0
HSDPA Subtest-2	23.0	+0.5/-2.0
HSDPA Subtest-3	22.0	+1.0/-2.0
HSDPA Subtest-4	22.0	+1.0/-2.0
HSUPA Subtest-1	23.0	+1.0/-2.0
HSUPA Subtest-2	22.0	+1.0/-2.0
HSUPA Subtest-3	23.0	+1.0/-2.0
HSUPA Subtest-4	23.0	+1.0/-2.0
HSUPA Subtest-5	23.0	+1.0/-2.0

Band	Target [dBm]	Tolerance [dB]
LTE4	24.0	+0.5/-1.5
LTE28	24.0	+0.5/-1.5

Following power reductions are used for higher RB allocations and 16QAM modulation:

Modulation	Channel bandwidth / Transmission bandwidth configuration [RB]						MPR (dB)
	1.4 MHz	3.0 MHz	5 MHz	10 MHz	15 MHz	20 MHz	
QPSK	> 5	> 4	> 8	> 12	> 16	> 18	≤ 1
16 QAM	≤ 5	≤ 4	≤ 8	≤ 12	≤ 16	≤ 18	≤ 1
16 QAM	> 5	> 4	> 8	> 12	> 16	> 18	≤ 2

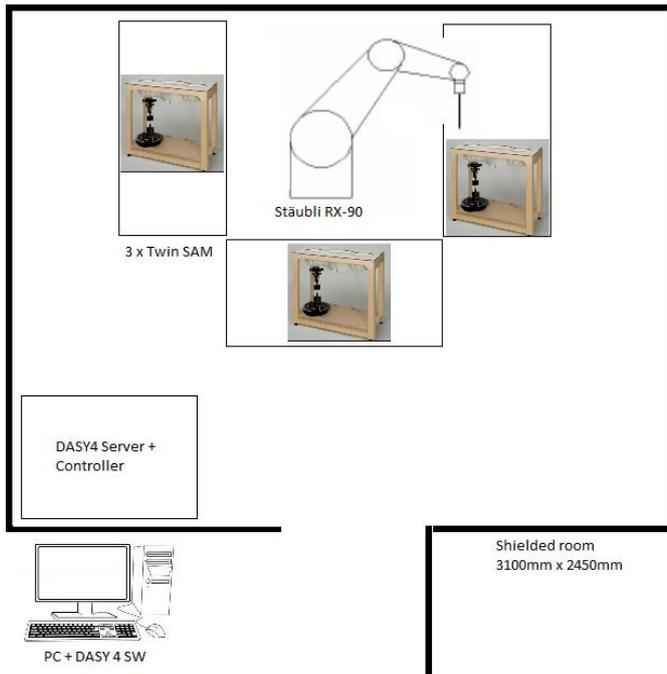
	Bluetooth			
	CH 0 2402 MHz	CH 38 2440 MHz	CH 78 2480 MHz	Max Tolerance* [dB]
Conducted Power [dBm]	9.3	8.01	10.59	+0.5
*the maximum power according to the manufacturer can be 0.5dB above nominal i.e. measured conducted power				

	Bluetooth Low Energy			
	CH 0 2402 MHz	CH 19 2442 MHz	CH 39 2480 MHz	Tolerance* [dB]
Conducted Power [dBm]	0.65	-0.44	1.49	+1
*the maximum power according to the manufacturer can be 1 dB above nominal i.e. measured conducted power				

Satellite	Target [dBm]	Tolerance [dB]
Waveform 0x29 – 31.25KHz PI/2 BPSK	29.5	+0.5/-1.5
Waveform 0x31 – 31.25KHz PI/4 QPSK	29.5	+0.5/-1.5
Waveform 0x39 – 62.5KHz PI/4 QPSK	29.5	+0.5/-1.5
Waveform 0x41 – 156.25KHz PI/4 QPSK	29.5	+0.5/-1.5

#### 4. TEST EQUIPMENT

Dasy4 near field scanning system, manufactured by SPEAG was used for SAR testing. The test system consists of high precision robotics system (Staubli), robot controller, computer, near-field probe, probe alignment sensor, and a phantom containing the brain equivalent material. The robot is a six-axis industrial robot performing precise movements to position the probe to the location of maximum electromagnetic field.



**Figure 1 Schematic Laboratory Picture**

##### 4.1 Test Equipment List

Main used test system components are listed below. For full equipment list and calibration intervals, please contact the testing laboratory.

Test Equipment	Model	Serial Number	Calibration Date	Calibration Expiry
DAE	DAE3	371	04/2016	04/2017
Probe	EX3DV4	3570	01/2016	01/2017
Probe	EX3DV4	3892	03/2016	03/2017
Probe	ET3DV6	1381	09/2016	09/2017
Dipole	D835V2	448	01/2016	01/2019
Dipole	SID1640	37/16DIP1G640-433	09/2016	09/2019
Dipole	D1800V2	249	01/2016	01/2019
Dipole	D1900V2	511	01/2016	01/2019
Dipole	D2450V2	758	01/2016	01/2019
DASY Software	v4.7	na	na	na
Signal Generator	SMIQ06B	834968/023	na	na
Amplifier	AR 5S1G4	27573	na	na
Power Sensor	NRT Z-11	100265	01/2016	01/2018

#### 4.1.1 Isotropic E-field Probe Type EX3DV4

<b>Construction</b>	Symmetrical design with triangular core Built-in shielding against static charges PEEK enclosure material (resistant to organic solvents, e.g., DGBE)
<b>Calibration</b>	Calibration certificate in Appendix D
<b>Frequency</b>	10 MHz to >6 GHz (dosimetry); Linearity: $\pm 0.2$ dB (30 MHz to 6 GHz)
<b>Directivity</b>	$\pm 0.3$ dB in HSL (rotation around probe axis) $\pm 0.5$ dB in tissue material (rotation normal to probe axis)
<b>Dynamic Range</b>	10 $\mu$ W/g to > 100 mW/g, Linearity: $\pm 0.2$ dB
<b>Dimensions</b>	Overall length: 330 mm Tip length: 10 mm Body diameter: 12 mm Tip diameter: 2.5 mm Distance from probe tip to dipole centers: 1.0 mm
<b>Application</b>	General dosimetry up to 6 GHz Compliance tests of mobile phones Fast automatic scanning in arbitrary phantoms

#### 4.1.2 Isotropic E-field Probe Type ET3DV6

<b>Construction</b>	Symmetric design with triangular core Built-in optical fiber for surface detection system (ET3DV6 only) Built-in shielding against static charges PEEK enclosure material (resistant to organic solvents, e.g., DGBE)
<b>Calibration</b>	Calibration certificate in Appendix D
<b>Frequency</b>	10 MHz – 2.3 GHz Linearity: $\pm 0.2$ dB (30 MHz – 2.3 GHz)
<b>Directivity</b>	$\pm 0.2$ dB in TSL (rotation around probe axis) $\pm 0.4$ dB in TSL (rotation normal to probe axis)
<b>Dynamic Range</b>	5 $\mu$ W/g – >100 mW/g; Linearity: $\pm 0.2$ dB
<b>Dimensions</b>	Overall length: 337 mm (tip: 16 mm) Tip diameter: 6.8 mm (body: 12 mm) Distance from probe tip to dipole centers: 2.7 mm
<b>Application</b>	General dosimetric measurements up to 2.3 GHz Compliance tests of mobile phones Fast automatic scanning in arbitrary phantoms

## 4.2 Phantoms

The phantom used in SAR tests was the twin-headed "SAM Phantom", manufactured by SPEAG. The phantom conforms to the requirements of IEEE 1528 and FCC published RF Exposure KDB Procedures.

## 4.3 Tissue Simulants

Recommended values for the dielectric parameters of the tissue simulants are given in IEEE 1528 and FCC published RF Exposure KDB Procedures. The dielectric parameters of the used tissue simulants were within  $\pm 5\%$  of the recommended values in all frequencies used. SAR testing was carried out within 24 hours of measuring the dielectric parameters. Depth of the tissue simulant was at least 15.0 cm from the inner surface of the flat phantom.

#### 4.3.1 Recipes

##### 850 – 935 MHz:

Ingredient (% by weight)	HEAD 650-935	BODY 650-935
Deionized Water	51.5	69.25
Tween 20	47.35	30.0
Salt	1.15	0.75

##### 1700 – 2000 MHz:

Ingredient (% by weight)	HEAD 1700 – 2000	BODY 1700 – 2000
Deionized Water	54.5	70.25
Tween 20	45.23	29.41
Salt	0.27	0.34

##### 2350 - 2700 MHz:

Ingredient (% by weight)	HEAD 2350 – 2700	BODY 2350 – 2700
Deionized Water	56.0	70.2
Tween 20	44.0	29.62
Salt	-	0.18

#### 4.4 System Validation Status

Frequency [MHz]	Dipole Type / SN	Probe Type / SN	Calibrated Signal Type	DAE Unit / SN	Validation Done	
					Head tissue simulant	Body tissue simulant
835	D835V2 / 448	EX3DV4 / 3570	CW	DAE3 / 371	02/2016	02/2016
1640	SID1640/37/16DIP1G640-433	ET3DV6 / 1381	CW	DAE3 / 371	10/2016	10/2016
1800	D1800V2 / 249	EX3DV4 / 3570	CW	DAE3 / 371	02/2016	02/2016
1900	D1900V2 / 511	EX3DV4 / 3570	CW	DAE3 / 371	02/2016	02/2016
2450	D2450V2 / 758	EX3DV4 / 3892	CW	DAE3 / 371	01/2017	01/2017
1800	D1800V2 / 249	EX3DV4 / 3892	CW	DAE3 / 371	01/2017	-

#### 4.5 System Check

Date	Tissue Type	Tissue Temp. [°C]	Frequency [MHz]	Input Power	Measured SAR <sub>1g</sub> [W/kg]	1 W Target SAR <sub>1g</sub> [W/kg]	1 W Normalized SAR <sub>1g</sub> [W/kg]	Deviation <sub>1g</sub> (%)	Plot #
11.01.2017	H900	23	835	250mW	2.48	9.27	9.92	7.0	1
12.01.2017	H1900	21.8	1800	250mW	10.2	39.3	40.8	3.8	2
11.01.2017	H1900	21.6	1900	250mW	9.23	38.9	36.92	-5.1	3
16.01.2017	H2450	21.1	2450	250mW	13.8	51.4	55.2	7.4	4
12.01.2017	M900	22.6	835	250mW	2.53	9.55	10.12	6.0	5
13.01.2017	M1900	22.0	1800	250mW	9.97	39.1	39.88	2.0	6
14.01.2017	M1900	22.0	1800	250mW	9.96	39.1	39.84	1.9	7
13.01.2017	M1900	22.0	1900	250mW	10.8	40.3	43.2	7.2	8
16.01.2017	M2450	21.2	2450	250mW	13.0	51.2	52	1.6	9
23.01.2017	H1900	21.7	1640	250mW	8.53	35.78	34.12	-4.6	10
24.01.2017	M1900	21.4	1640	250mW	8.3	35.66	33.2	-6.9	11
24.01.2017	H1900	21.3	1800	250mW	9.45	39.3	37.8	-3.8	12
30.01.2017	M1900	23.6	1800	250mW	9.78	39.1	39.12	0.1	13

#### 4.5.1 Tissue Simulant Verification

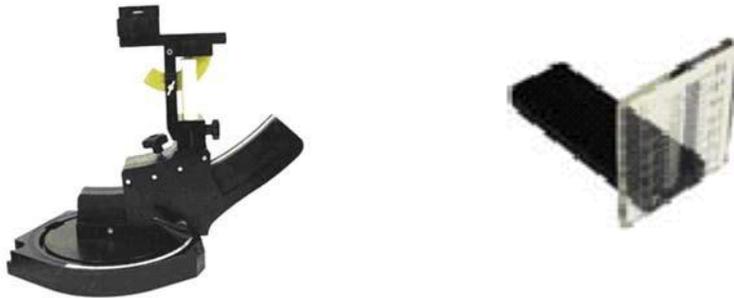
Date	Tissue Type	Tissue Temp. [°C]	Frequency [MHz]	Target		Measured		Deviation	
				Conductivity, $\sigma$ [S/m]	Dielectric Constant [ε]	Conductivity, $\sigma$ [S/m]	Dielectric Constant [ε]	$\sigma$ (%)	ε (%)
11.01.2017	H900	22	835	0.9	41.5	0.94	41.6	4.4	0.2
			836.6	0.9	41.5	0.946	41.6	4.8	0.2
12.01.2017	H1900	22	1800	1.4	40.0	1.39	38.8	-0.7	-3.0
			1733	1.36	40.1	1.33	39.2	-2.2	-2.2
11.01.2017	H1900	22	1900	1.4	40.0	1.38	38.5	-1.4	-3.8
			1880	1.4	40.0	1.36	38.6	-3.0	-3.4
16.01.2017	H2450	22	2450	1.80	39.2	1.83	39.4	1.7	0.5
			2440	1.79	39.2	1.82	39.4	1.7	0.5
12.01.2017	M900	22	835	0.97	55.2	1.0	54.3	3.1	-1.6
			824.2	0.97	55.2	0.99	54.3	2.1	-1.6
			826.4	0.97	55.2	0.99	54.3	2.1	-1.6
			836.6	0.97	55.2	1.0	54.3	3.1	-1.6
			846.6	0.99	55.2	1.0	54.2	1.0	-1.8
13.01.2017	M1900	22	848.8	0.99	55.2	1.0	54.2	1.0	-1.8
			1800	1.52	53.3	1.49	53.1	-2.0	-0.4
			1712.4	1.46	53.5	1.39	53.5	-4.8	0
			1720	1.47	53.5	1.4	53.5	-4.8	0
			1732.5	1.48	53.4	1.41	53.3	-4.7	-0.2
14.01.2017	M1900	22	1736.6	1.48	53.4	1.42	53.3	-4.1	-0.2
			1745	1.49	53.4	1.43	53.3	-4.0	-0.2
			1752.6	1.49	53.4	1.44	53.3	-3.4	-0.2
			1800	1.52	53.3	1.51	52.1	-0.7	-2.3
			1720	1.47	53.5	1.42	52.5	-3.4	-1.9
13.01.2017	M1900	22	1732.5	1.48	53.4	1.44	52.4	-2.7	-1.9
			1745	1.49	53.4	1.45	52.4	-2.7	-1.9
			1900	1.52	53.3	1.58	52.6	3.9	-1.3
			1852.4	1.52	53.3	1.53	52.8	1	-0.9
			1880	1.52	53.3	1.56	52.7	2.6	-1.1
16.01.2017	M2450	22	1907.6	1.52	53.3	1.58	52.6	4	-1.4
			2450	1.95	52.7	1.93	52.1	-1.0	-1.1
23.01.2017	H1900	22	2440	1.94	52.7	1.92	52.2	-1.0	-0.9
			1640	1.31	40.2	1.26	39.7	-3.8	-1.2
24.01.2017	M1900	22	1626.5	1.3	40.2	1.25	39.9	-3.8	-0.7
			1643.5	1.31	40.2	1.26	39.7	-3.8	-1.2
			1660.5	1.32	40.2	1.28	39.5	-3.0	-1.7
			1640	1.42	53.7	1.36	53.6	-4.2	-0.2
24.01.2017	H1900	22	1643.5	1.42	53.7	1.36	53.6	-4.2	-0.2
			1800	1.4	40.0	1.36	38.5	-2.9	-3.5
30.01.2017	M1900	22	1732.5	1.36	40.1	1.3	38.8	-4.4	-3.2
			1800	1.52	53.3	1.49	53.3	-2.0	0
			1720	1.47	53.5	1.41	53.5	-4.0	0
			1732.5	1.48	53.4	1.43	53.5	-3.6	0.1
			1745	1.49	53.4	1.44	53.5	-3.2	0.1

## 5. TEST PROCEDURE

The device output power was set to maximum power level for all tests. A fully charged battery was used for every test sequence.

### 5.1 Device Holder

The device was placed in the device holder that is supplied by SPEAG.



A custom-made spacer on the right, was used to position the device within the SPEAG holder. The spacer positions the device so that the holder has minimal effect on the test results but still holds the device securely. The spacer was removed before the tests.

### 5.2 Test Positions

See Appendix A for photos of the test positions.

#### 5.2.1 Against Head Configuration

Measurements were made in “cheek” and “tilt” positions on both the left hand and right hand sides of the phantom as defined in IEEE 1528 "IEEE Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques".

#### 5.2.2 In Front of Face Configuration, 25mm separation distance

The device was placed in the SPEAG device holder below the flat phantom, front of the device facing the phantom. The distance between the device and the flat phantom was 25mm as required in KDB 447498 D01 General RF Exposure Guidance, section 6.1.

#### 5.2.3 Body-worn Configuration, 10 mm separation distance

The device was placed in the SPEAG device holder below the flat phantom. The distance between the device and the phantom was kept at the defined separation distance using a separate flat spacer that was removed before the start of the measurements. The device was oriented back and front side facing the phantom to find the highest results.

### 5.3 Scan Procedures

Area scans were first measured for the determination of the field distribution. Next, a zoom scan with minimum of 5x5x7 points covering a volume of at least 30x30x30mm, was performed around the highest E-field value to determine the averaged SAR value. Power drift was determined by measuring the same point at the start of the area scan and again at the end of the zoom scan.

### 5.4 SAR Averaging Methods

The maximum SAR value is averaged over a cube of tissue using interpolation and extrapolation.

Extrapolation routines are used to obtain SAR values between the lowest measurement points and the inner phantom surface. The extrapolation distance is determined by the surface detection distance and the probe sensor offset. Several measurements at different distances are necessary for the extrapolation.

The interpolation, extrapolation and maximum search routines within Dasy47 are all based on the modified Quadratic Shepard's method (Robert J. Renka, "Multivariate Interpolation of Large Sets of Scattered Data", University of North Texas ACM Transactions on Mathematical Software, vol. 14, no. 2, June 1988, pp. 139-148).

## 6. MEASUREMENT UNCERTAINTY

<p style="text-align: center;"><b>Uncertainty Budget</b> According to IEEE 1528-2013 and IEC 62209-1/201x (3 - 6 GHz range)</p>								
Error Description	Uncert. value	Prob. Dist.	Div.	(c <sub>i</sub> ) 1g	(c <sub>i</sub> ) 10g	Std. Unc. (1g)	Std. Unc. (10g)	(v <sub>i</sub> ) V <sub>eff</sub>
<b>Measurement System</b>								
Probe Calibration	±6.55 %	N	1	1	1	±6.55 %	±6.55 %	∞
Axial Isotropy	±4.7 %	R	√ <sub>2</sub>	0.7	0.7	±1.9 %	±1.9 %	∞
Hemispherical Isotropy	±9.6 %	R	√ <sub>2</sub>	0.7	0.7	±3.9 %	±3.9 %	∞
Boundary Effects	±2.0 %	R	√ <sub>2</sub>	1	1	±1.2 %	±1.2 %	∞
Linearity	±4.7 %	R	√ <sub>2</sub>	1	1	±2.7 %	±2.7 %	∞
System Detection Limits	±1.0 %	R	√ <sub>2</sub>	1	1	±0.6 %	±0.6 %	∞
Modulation Response <sup>m</sup>	±2.4 %	R	√ <sub>2</sub>	1	1	±1.4 %	±1.4 %	∞
Readout Electronics	±0.3 %	N	1	1	1	±0.3 %	±0.3 %	∞
Response Time	±0.8 %	R	√ <sub>2</sub>	1	1	±0.5 %	±0.5 %	∞
Integration Time	±2.6 %	R	√ <sub>2</sub>	1	1	±1.5 %	±1.5 %	∞
RF Ambient Noise	±3.0 %	R	√ <sub>2</sub>	1	1	±1.7 %	±1.7 %	∞
RF Ambient Reflections	±3.0 %	R	√ <sub>2</sub>	1	1	±1.7 %	±1.7 %	∞
Probe Positioner	±0.8 %	R	√ <sub>2</sub>	1	1	±0.5 %	±0.5 %	∞
Probe Positioning	±6.7 %	R	√ <sub>2</sub>	1	1	±3.9 %	±3.9 %	∞
Max. SAR Eval.	±4.0 %	R	√ <sub>2</sub>	1	1	±2.3 %	±2.3 %	∞
<b>Test Sample Related</b>								
Device Positioning	±2.9 %	N	1	1	1	±2.9 %	±2.9 %	145
Device Holder	±3.6 %	N	1	1	1	±3.6 %	±3.6 %	5
Power Drift	±5.0 %	R	√ <sub>2</sub>	1	1	±2.9 %	±2.9 %	∞
Power Scaling <sup>p</sup>	±0 %	R	√ <sub>2</sub>	1	1	±0.0 %	±0.0 %	∞
<b>Phantom and Setup</b>								
Phantom Uncertainty	±6.6 %	R	√ <sub>2</sub>	1	1	±3.8 %	±3.8 %	∞
SAR correction	±1.9 %	R	√ <sub>2</sub>	1	0.84	±1.1 %	±0.9 %	∞
Liquid Conductivity (mea.) <sup>DAK</sup>	±2.5 %	R	√ <sub>2</sub>	0.78	0.71	±1.1 %	±1.0 %	∞
Liquid Permittivity (mea.) <sup>DAK</sup>	±2.5 %	R	√ <sub>2</sub>	0.26	0.26	±0.3 %	±0.4 %	∞
Temp. unc. - Conductivity <sup>BB</sup>	±3.4 %	R	√ <sub>2</sub>	0.78	0.71	±1.5 %	±1.4 %	∞
Temp. unc. - Permittivity <sup>BB</sup>	±0.4 %	R	√ <sub>2</sub>	0.23	0.26	±0.1 %	±0.1 %	∞
Combined Std. Uncertainty						±12.3 %	±12.2 %	748
<b>Expanded STD Uncertainty</b>						<b>±24.6 %</b>	<b>±24.5 %</b>	

## 7. TEST RESULTS

### 7.1 SAR Results for Head Exposure Condition

Band	Channel	TX Slot configuration	Maximun Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Test Position	Duty Cycle	Measured SAR 1g [mW/g]	Scaling Factor	Reported SAR 1g [mW/g]	Plot #
GSM 850	190	1	33.8	33.3	-0.05	Right Cheek	1:8.3	0.346	1.12	<b>0.39</b>	14
GSM 850	190	1	33.8	33.3	0.03	Right Tilted	1:8.3	0.343	1.12	0.38	
GSM 850	190	1	33.8	33.3	-0.332*	Left Cheek	1:8.3	0.314	1.21	0.38	
GSM 850	190	1	33.8	33.3	-0.12	Left Tilted	1:8.3	0.294	1.12	0.33	
GSM 1900	661	1	31.0	30.36	0.293*	Right Cheek	1:8.3	0.155	1.24	0.19	
GSM 1900	661	1	31.0	30.36	-0.03	Right Tilted	1:8.3	0.122	1.16	0.14	
GSM 1900	661	1	31.0	30.36	0.19	Left Cheek	1:8.3	0.199	1.16	<b>0.23</b>	15
GSM 1900	661	1	31.0	30.36	0.06	Left Tilted	1:8.3	0.13	1.16	0.15	

\*Drift considered in scaling factor

Band	Channel	Mode	Maximun Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Test Position	Duty Cycle	Measured SAR 1g [mW/g]	Scaling Factor	Reported SAR 1g [mW/g]	Plot #
II	9400	RMC 12.2K	24.5	24.29	0.09	Right Cheek	1:1	0.376	1.05	0.39	
II	9400	RMC 12.2K	24.5	24.29	-0.06	Right Tilted	1:1	0.295	1.05	0.31	
II	9400	RMC 12.2K	24.5	24.29	-0.03	Left Cheek	1:1	0.589	1.05	<b>0.62</b>	16
II	9400	RMC 12.2K	24.5	24.29	-0.265*	Left Tilted	1:1	0.32	1.12	0.36	
IV	1413	RMC 12.2K	24.5	24.28	-0.13	Right Cheek	1:1	0.226	1.05	0.24	
IV	1413	RMC 12.2K	24.5	24.28	0.01	Right Tilted	1:1	0.321	1.05	0.34	
IV	1413	RMC 12.2K	24.5	24.28	-0.05	Left Cheek	1:1	0.414	1.05	<b>0.44</b>	17
IV	1413	RMC 12.2K	24.5	24.28	-0.339*	Left Tilted	1:1	0.297	1.14	0.34	
V	4183	RMC 12.2K	24.5	23.93	-0.454*	Right Cheek	1:1	0.454	1.26	<b>0.57</b>	18
V	4183	RMC 12.2K	24.5	23.93	0.04	Right Tilted	1:1	0.355	1.14	0.40	
V	4183	RMC 12.2K	24.5	23.93	-0.07	Left Cheek	1:1	0.414	1.14	0.47	
V	4183	RMC 12.2K	24.5	23.93	-0.08	Left Tilted	1:1	0.277	1.14	0.32	

\*Drift considered in scaling factor

Band	Channel	Modulation / BW [Mhz]	RB size	RB Offset	Maximun Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Test Position	Duty Cycle	Measured SAR 1g [mW/g]	Scaling Factor	Reported SAR 1g [mW/g]	Plot #
LTE 4	20175	QPSK / 20	1	50	24.5	24.34	0.13	Right Cheek	1:1	0.328	1.04	0.34	
LTE 4	20050	QPSK / 20	50	0	24.5	23.49	0.06	Right Cheek	1:1	0.252	1.26	0.32	
LTE 4	20175	QPSK / 20	1	50	24.5	24.34	-0.11	Right Tilted	1:1	0.282	1.04	0.29	
LTE 4	20050	QPSK / 20	50	0	24.5	23.49	-0.04	Right Tilted	1:1	0.239	1.26	0.30	
LTE 4	20175	QPSK / 20	1	50	24.5	24.34	-0.08	Left Cheek	1:1	0.415	1.04	<b>0.43</b>	19
LTE 4	20050	QPSK / 20	50	0	24.5	23.49	0.12	Left Cheek	1:1	0.317	1.26	0.40	
LTE 4	20175	QPSK / 20	1	50	24.5	24.34	-0.02	Left Tilted	1:1	0.286	1.04	0.30	
LTE 4	20050	QPSK / 20	50	0	24.5	23.49	-0.11	Left Tilted	1:1	0.215	1.26	0.27	

Band	Channel	Maximun Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Test Position	Duty Cycle	Measured SAR 1g [mW/g]	Scaling Factor	Reported SAR 1g [mW/g]	Plot #
BT	38	8.51	8.01	0.18	Right Cheek	1:1.3	0.00133	1.12	0.001	
BT	38	8.51	8.01	-0.245	Right Tilted	1:1.3	0.00296	1.19	0.004	
BT	38	8.51	8.01	0	Left Cheek	1:1.3	0.0053	1.12	0.006	20
BT	38	8.51	8.01	-0.272	Left Tilted	1:1.3	0.00187	1.12	0.002	

\*Drift considered in scaling factor

Band	Channel	Maximun Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Test Position	Antenna	Duty Cycle	Measured SAR 1g [mW/g]	Scaling Factor	Reported SAR 1g [mW/g]	Plot #
SAT L	1	30	29.63	0.169	Right Cheek	EXT	1:6.64	0.46	1.09	0.50	
SAT L	1	30	29.63	-0.11	Right Tilted	EXT	1:6.64	1.33	1.09	1.45	
SAT L	1	30	29.63	-0.07	Left Cheek	EXT	1:6.64	0.23	1.09	0.25	
SAT L	1	30	29.63	-0.15	Left Tilted	EXT	1:6.64	0.613	1.09	0.67	
SAT L	220	30	29.68	-0.102	Right Cheek	EXT	1:6.64	0.464	1.08	0.50	
SAT L	220	30	29.68	-0.01	Right Tilted	EXT	1:6.64	1.37	1.08	1.47	
SAT L	220	30	29.68	-0.18	Left Cheek	EXT	1:6.64	0.24	1.08	0.26	
SAT L	220	30	29.68	-0.12	Left Tilted	EXT	1:6.64	0.72	1.08	0.78	
SAT L	43F	30	29.7	0.15	Right Cheek	EXT	1:6.64	0.597	1.07	0.64	
SAT L	43F	30	29.7	0.17	Right Tilted	EXT	1:6.64	1.41	1.07	1.51	21
SAT L	43F	30	29.7	0.15	Left Cheek	EXT	1:6.64	0.283	1.07	0.30	
SAT L	43F	30	29.7	-0.12	Left Tilted	EXT	1:6.64	0.791	1.07	0.85	

### Repeated measurements

Band	Channel	Maximun Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Test Position	Antenna	Duty Cycle	Measured SAR 1g [mW/g]	Scaling Factor	Reported SAR 1g [mW/g]	Plot #
SAT L	1	30	29.63	-0.08	Right Tilted	EXT	1:6.64	1.18	1.09	1.28	
SAT L	220	30	29.68	-0.21	Right Tilted	EXT	1:6.64	1.37	1.08	1.47	
SAT L	43F	30	29.7	0.03	Right Tilted	EXT	1:6.64	1.37	1.07	1.47	

In Front of Face, 25mm separation distance

Band	Channel	Maximun Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Test Position	Antenna	Duty Cycle	Measured SAR 1g [mW/g]	Scaling Factor	Reported SAR 1g [mW/g]	Plot #
SAT L	220	30	29.68	-0.0324	In front of Face	EXT	1:6.64	0.104	1.08	0.11	22

## 7.2 SAR Results for Body-Worn Configuration, 10 mm separation distance

Band	Channel	TX Slot configuration	Maximun Power [dBm]	Conducted Power [dBm]	Power Drift [dB0.02]	Test Position	GPRS Duty Cycle	Measured SAR 1g [mW/g]	Scaling Factor	Reported SAR 1g [mW/g]	Plot #
GPRS 850	128	2	32	31.22	0.08	back	1:4.2	1.2	1.20	1.44	
GPRS 850	190	2	32	31.27	-0.0	front	1:4.2	0.448	1.18	0.53	
GPRS 850	190	2	32	31.27	-0.06	back	1:4.2	1.22	1.18	1.44	
GPRS 850	251	2	32	31.36	-0.09	back	1:4.2	0.928	1.16	1.08	
GPRS 1900	661	2	29	28.03	-0.516*	front	1:4.2	0.281	1.41	0.40	
GPRS 1900	661	2	29	28.03	-0.14	back	1:4.2	0.432	1.25	<b>0.54</b>	24

\*Drift considered in scaling factor

Repeated Measurements											
Band	Channel	TX Slot configuration	Maximun Power [dBm]	Conducted Power [dBm]	Power Drift [dB0.02]	Test Position	GPRS Duty Cycle	Measured SAR 1g [mW/g]	Scaling Factor	Reported SAR 1g [mW/g]	Plot #
GPRS 850	128	2	32	31.22	0.09	back	1:4.2	1.31	1.20	<b>1.57</b>	23
GPRS 850	190	2	32	31.27	-0.02	back	1:4.2	1.21	1.18	1.43	
GPRS 850	251	2	32	31.36	0.10	back	1:4.2	0.971	1.16	1.13	

Band	Channel	Mode	Maximun Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Test Position	Duty Cycle	Measured SAR 1g [mW/g]	Scaling Factor	Reported SAR 1g [mW/g]	Plot #
II	9400	RMC 12.2K	24.5	24.29	-0.23*	Back	1:1	0.868	1.11	0.96	
II	9400	RMC 12.2K	24.5	24.29	-0.2	Front	1:1	0.498	1.05	0.52	
II	9262	RMC 12.2K	24.5	24	0.01	Back	1:1	0.761	1.12	0.85	
II	9538	RMC 12.2K	24.5	24.1	-0.05	Back	1:1	0.874	1.10	<b>0.96</b>	25
IV	1413	RMC 12.2K	24.5	24.28	-0.01	Back	1:1	0.934	1.05	0.98	
IV	1413	RMC 12.2K	24.5	24.28	-0.01	Front	1:1	0.561	1.05	0.59	
IV	1312	RMC 12.2K	24.5	24.17	-0.04	Back	1:1	0.937	1.08	1.01	26
IV	1513	RMC 12.2K	24.5	24.31	0.05	Back	1:1	0.925	1.04	0.97	
V	4183	RMC 12.2K	24.5	23.93	0.03	Back	1:1	1.03	1.14	1.17	
V	4183	RMC 12.2K	24.5	23.93	-0.17	Front	1:1	0.340	1.14	0.39	
V	4132	RMC 12.2K	24.5	23.9	0.08	Back	1:1	0.951	1.15	1.09	
V	4233	RMC 12.2K	24.5	23.99	0.02	Back	1:1	0.974	1.12	1.10	

\*Drift considered in scaling factor

Repeated Measurements											
Band	Channel	Mode	Maximum Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Test Position	Duty Cycle	Measured SAR 1g [mW/g]	Scaling Factor	Reported SAR 1g [mW/g]	Plot #
II	9400	RMC 12.2K	24.5	24.29	-0.13	Back	1:1	0.852	1.05	0.89	
II	9262	RMC 12.2K	24.5	24	-0.06	Back	1:1	0.774	1.12	0.87	
II	9538	RMC 12.2K	24.5	24.1	-0.07	Back	1:1	0.872	1.10	0.96	
IV	1413	RMC 12.2K	24.5	24.28	0.186	Back	1:1	0.875	1.05	0.92	
IV	1312	RMC 12.2K	24.5	24.17	0.1	Back	1:1	0.835	1.08	0.90	
IV	1513	RMC 12.2K	24.5	24.31	-0.07	Back	1:1	0.85	1.04	0.89	
V	4183	RMC 12.2K	24.5	23.93	0.03	Back	1:1	0.966	1.14	1.10	
V	4132	RMC 12.2K	24.5	23.9	0.04	Back	1:1	1.03	1.15	<b>1.18</b>	27
V	4233	RMC 12.2K	24.5	23.99	0.02	Back	1:1	0.918	1.12	1.03	

Band	Channel	Modulation / BW [MHz]	RB size	RB Offset	Maximum Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Test Position	Duty Cycle	Measured SAR 1g [mW/g]	Scaling Factor	Reported SAR 1g [mW/g]	Plot #
LTE 4	20175	QPSK/ 20	1	50	24.5	24.34	-0.05	Back	1:1	0.856	1.04	0.89	
LTE 4	20050	QPSK/ 20	50	0	24.5	23.49	0.06	Back	1:1	0.725	1.26	<b>0.91</b>	28
LTE 4	20175	QPSK/ 20	1	50	24.5	24.34	0.01	Front	1:1	0.605	1.04	0.63	
LTE 4	20050	QPSK/ 20	50	0	24.5	23.49	-0.08	Front	1:1	0.488	1.26	0.62	
LTE 4	20050	QPSK/ 20	1	0	24.5	24.26	0.0	Back	1:1	0.85	1.06	0.90	
LTE 4	20175	QPSK/ 20	50	25	24.5	23.44	-0.03	Back	1:1	0.673	1.28	0.86	
LTE 4	20300	QPSK/ 20	1	50	24.5	24.26	-0.14	Back	1:1	0.787	1.06	0.83	
LTE 4	20300	QPSK/ 20	50	0	24.5	23.39	0.01	Back	1:1	0.61	1.29	0.79	
LTE 4	20300	QPSK/ 20	100	0	24.5	23.35	0.02	Back	1:1	0.527	1.3	0.69	

Repeated Measurements													
Band	Channel	Modulation / BW [MHz]	RB size	RB Offset	Maximum Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Test Position	Duty Cycle	Measured SAR 1g [mW/g]	Scaling Factor	Reported SAR 1g [mW/g]	Plot #
LTE 4	20175	QPSK/ 20	1	50	24.5	24.34	0.01	Back	1:1	0.823	1.04	0.85	
LTE 4	20175	QPSK/ 20	50	0	24.5	23.2	-0.09	Back	1:1	0.656	1.35	0.88	
LTE 4	20050	QPSK/ 20	1	50	24.5	24.10	-0.01	Back	1:1	0.822	1.10	0.90	
LTE 4	20050	QPSK/ 20	50	0	24.5	23.49	0.09	Back	1:1	0.684	1.26	0.86	
LTE 4	20300	QPSK/ 20	1	50	24.5	24.26	0.06	Back	1:1	0.787	1.06	0.83	

Band	Channel	Maximum Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Test Position	Duty Cycle	Measured SAR 1g [mW/g]	Scaling Factor	Reported SAR 1g [mW/g]	Plot #
BT	38	8.51	8.01	-0.08	Front	1:1.3	<b>0.00187</b>	1.12	0.002	
BT	38	8.51	8.01	0.17	Back	1:1.3	<b>0.0161</b>	1.12	0.018	29

Band	Channel	Maximum Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Test Position	Antenna	Duty Cycle	Measured SAR 1g [mW/g]	Scaling Factor	Reported SAR 1g [mW/g]	Plot #
SAT L	220	30	29.68	-0.08	Front	EXT	1:6.64	0.323	1.08	0.35	
SAT L	220	30	29.68	-0.02	Back	EXT	1:6.64	0.354	1.08	0.38	30

### 7.3 SAR Results for simultaneous transmission

Simultaneous transmission SAR test exclusion is determined for each operating configuration and exposure condition according to the reported standalone SAR of each applicable simultaneous transmitting antenna. When the sum of SAR<sub>1g</sub> of all simultaneously transmitting antennas in an operating mode and exposure condition combination is within the SAR limit (SAR<sub>1g</sub> 1.6 W/kg), the simultaneous transmission SAR is not required.

When the sum of SAR<sub>1g</sub> is greater than the SAR limit (SAR<sub>1g</sub> 1.6 W/kg), SAR test exclusion is determined by the SPLSR.

	Exposure Condition	Head				Body	
	Test Position	Right Cheek	Right Tilt	Left Cheek	Left Tilt	Front	Back
PCE	GSM850	0.39	0.38	0.38	0.33	0.4	1.57
	GSM1900	0.19	0.14	0.23	0.15	0.4	0.54
	WCDMA V	0.57	0.4	0.47	0.32	0.39	1.18
	WCDMA IV	0.24	0.34	0.44	0.34	0.59	1.01
	WCDMA II	0.39	0.31	0.62	0.36	0.52	0.96
	LTE 4	0.34	0.30	0.43	0.3	0.63	0.91
Maximum PCE(LB) SAR		0.57	0.4	0.47	0.33	0.4	1.57
Maximum PCE(HB) SAR		0.39	0.34	0.62	0.36	0.63	1.01
Bluetooth SAR		0.001	0.004	0.006	0.002	0.002	0.018
Summation PCE(LB) + BT		0.57	0.40	0.48	0.33	0.40	1.59
Summation PCE(HB) + BT		0.39	0.34	0.63	0.36	0.63	1.03
SPLSR Analysis		Σ SAR < 1.6, Analysis Not Required					

	Exposure Condition	Head				Body	
	Test Position	Right Cheek	Right Tilt	Left Cheek	Left Tilt	Front	Back
	Satellite	0.64	1.51	0.30	0.85	0.35	0.38
	Bluetooth	0.001	0.004	0.006	0.002	0.002	0.018
	<b>SAR Summation</b>	<b>0.64</b>	<b>1.51</b>	<b>0.31</b>	<b>0.85</b>	<b>0.35</b>	<b>0.40</b>
	<b>SPLSR Analysis</b>	<b><math>\Sigma</math> SAR &lt; 1.6, Analysis Not Required</b>					

## APPENDIX A: PHOTOS OF THE DUT

Dimension of the DUT are 152mm x 47mm x 24.5mm



Front of the DUT:



Back of the DUT:



Head Exposure Condition:

Right cheek position



Right tilt position



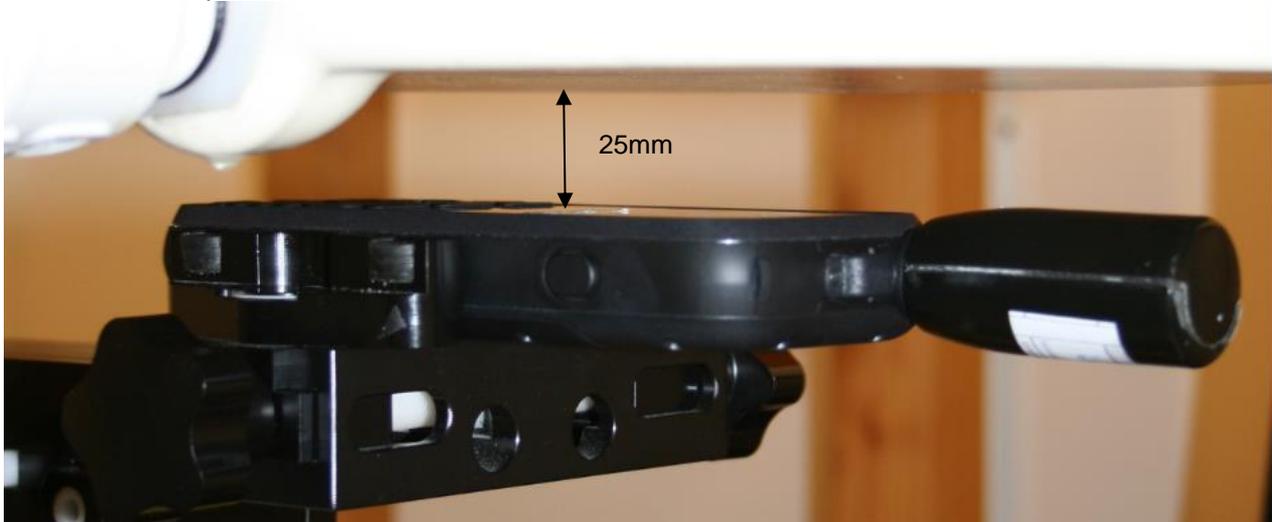
Left cheek position



Left tilt position



Front of the face position



Body-worn Exposure Condition:

Backside toward phantom



Frontside toward phantom

