Appendix A.8 Dipole Calibration certificate (D2600V2_1050)

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

S Schweizerischer Kalibrierdienst
C Service suisse d'étalonnage
S Servizio svizzero di taratura
S Swiss Calibration Service

Accredited by the Swiss Accreditation Service (SAS)
The Swiss Accreditation Service is one of the signatories to the EA Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: SCS 0108

Client KCTL (Dymstec)

Certificate No: D2600V2-1050_Jul18

CALIBRATION CERTIFICATE

Object	D2600V2 - SN:1050
Calibration procedure(s)	QA CAL-05.v10 Calibration procedure for dipole validation kits above 700 MHz
Calibration date:	July 26, 2018

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 NRP	SN: 104778	04-Apr-18 (No. 217-02672/02673)	Apr-19
Power sensor NRP-Z91	SN: 103244	04-Apr-18 (No. 217-02672)	Apr-19
Power sensor NRP-Z91	SN: 103245	04-Apr-18 (No. 217-02673)	Apr-19
Reference 20 dB Attenuator	SN: 5058 (20k)	04-Apr-18 (No. 217-02682)	Apr-19
Type-N mismatch combination	SN: 5047.2 / 06327	04-Apr-18 (No. 217-02683)	Apr-19
Reference Probe EX3DV4	SN: 7349	30-Dec-17 (No. EX3-7349_Dec17)	Dec-18
DAE4	SN: 601	26-Oct-17 (No. DAE4-601_Oct17)	Oct-18

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power meter EPM-442A	SN: GB37480704	07-Oct-15 (in house check Oct-16)	In house check: Oct-18
Power sensor HP 8481A	SN: US37292783	07-Oct-15 (in house check Oct-16)	In house check: Oct-18
Power sensor HP 8481A	SN: MY41092317	07-Oct-15 (in house check Oct-16)	In house check: Oct-18
RF generator R&S SMT-06	SN: 100972	15-Jun-15 (in house check Oct-16)	In house check: Oct-18
Network Analyzer Agilent E8358A	SN: US41080477	31-Mar-14 (in house check Oct-17)	In house check: Oct-18

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

Issued: July 26, 2018

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

Certificate No: D2600V2-1050_Jul18 Page 1 of 8

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The Swiss Accreditation Service is one of the signatories to the EA Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: SCS 0108

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, "Measurement procedure for the assessment of Specific Absorption Rate (SAR) from hand-held and body-mounted devices used next to the ear (frequency range of 300 MHz to 6 GHz)", July 2016
c) IEC 62209-2, "Procedure to determine the Specific Absorption Rate (SAR) for wireless communication devices used in close proximity to the human body (frequency range of 30 MHz to 6 GHz)", March 2010
d) KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

Additional Documentation:

e) 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	V52.10.1
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	2600 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	39.0	1.96 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	37.2 ± 6 %	2.02 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	14.4 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**56.2 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	6.42 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**25.3 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	52.5	2.16 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	51.5 ± 6 %	2.20 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	13.9 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**54.9 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm³ (10 g) of Body TSL	condition	
SAR measured	250 mW input power	6.21 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**24.7 W/kg ± 16.5 % (k=2)**

Appendix (Additional assessments outside the scope of SCS 0108)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	48.7 Ω - 7.5 jΩ
Return Loss	- 22.3 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	45.6 Ω - 5.0 jΩ
Return Loss	- 23.1 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.150 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	May 24, 2011

DASY5 Validation Report for Head TSL

Date: 26.07.2018

Test Laboratory: SPEAG, Zurich, Switzerland

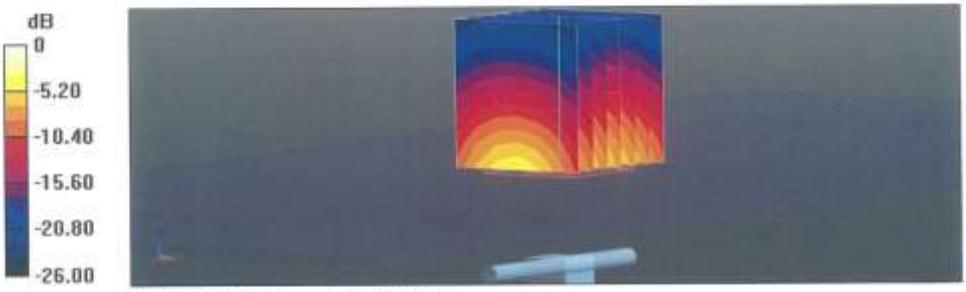
DUT: Dipole 2600 MHz; Type: D2600V2; Serial: D2600V2 - SN:1050

Communication System: UID 0 - CW; Frequency: 2600 MHz
Medium parameters used: f = 2600 MHz; σ = 2.02 S/m; ε_r = 37.2; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

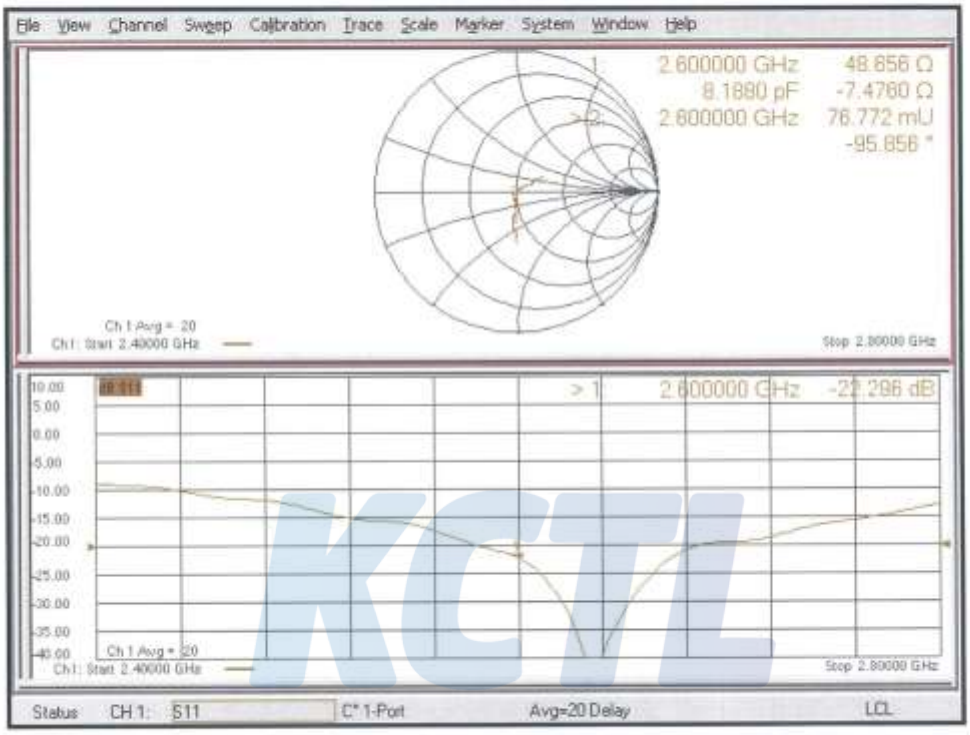
- Probe: EX3DV4 - SN7349; ConvF(7.7, 7.7, 7.7) @ 2600 MHz; Calibrated: 30.12.2017
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 26.10.2017
- Phantom: Flat Phantom 5.0 (front); Type: QD 000 P50 AA; Serial: 1001
- DASY52 52.10.1(1476); SEMCAD X 14.6.11(7439)

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 = 119.1 V/m; Power Drift = 0.00 dB
Peak SAR (extrapolated) = 28.9 W/kg
SAR(1 g) = 14.4 W/kg; SAR(10 g) = 6.42 W/kg
Maximum value of SAR (measured) = 24.0 W/kg



0 dB = 24.0 W/kg = 13.80 dBW/kg

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 26.07.2018

Test Laboratory: SPEAG, Zurich, Switzerland

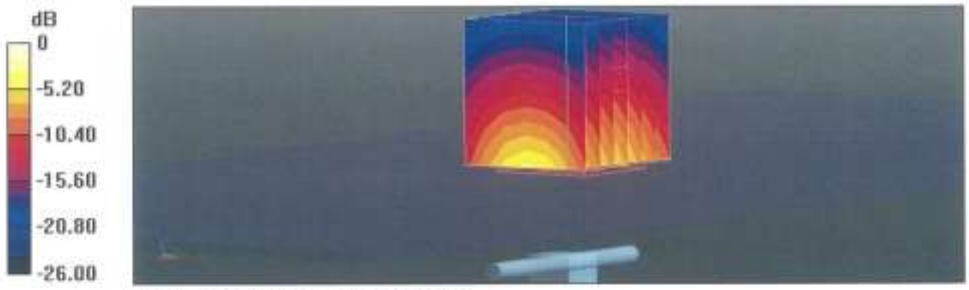
DUT: Dipole 2600 MHz; Type: D2600V2; Serial: D2600V2 - SN:1050

Communication System: UID 0 - CW; Frequency: 2600 MHz
Medium parameters used: f = 2600 MHz; σ = 2.2 S/m; ε_r = 51.5; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

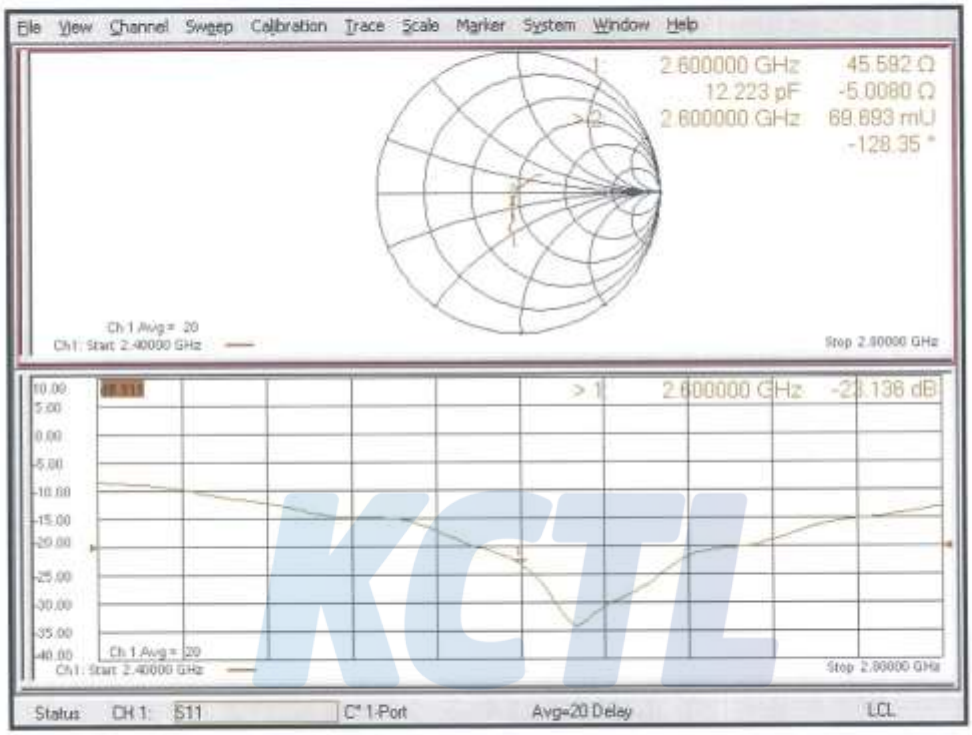
- Probe: EX3DV4 - SN7349; ConvF(7.81, 7.81, 7.81) @ 2600 MHz; Calibrated: 30.12.2017
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 26.10.2017
- Phantom: Flat Phantom 5.0 (back); Type: QD 000 P50 AA; Serial: 1002
- DASY52 52.10.1(1476); SEMCAD X 14.6.11(7439)

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 = 108.6 V/m; Power Drift = -0.05 dB
Peak SAR (extrapolated) = 28.0 W/kg
SAR(1 g) = 13.9 W/kg; SAR(10 g) = 6.21 W/kg
Maximum value of SAR (measured) = 23.0 W/kg



0 dB = 23.0 W/kg = 13.62 dBW/kg

Impedance Measurement Plot for Body TSL



Appendix A.9 Dipole Calibration certificate (D5GHzV2_1293)

Calibration Laboratory of
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Engineering AG
Zeughausstrasse 43, 8004 Zurich, Switzerland

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Accreditation No.: **SCS 0108**

Client **KCTL (Dymstec)** Certificate No: **D5GHzV2-1293_Jul19**

CALIBRATION CERTIFICATE

Object	D5GHzV2 - SN:1293
Calibration procedure(s)	QA CAL-22.v4 Calibration Procedure for SAR Validation Sources between 3-6 GHz
Calibration date:	July 04, 2019

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 NRP	SN: 104778	03-Apr-19 (No. 217-02892/02893)	Apr-20
Power sensor NRP-Z91	SN: 103244	03-Apr-19 (No. 217-02892)	Apr-20
Power sensor NRP-Z91	SN: 103245	03-Apr-19 (No. 217-02893)	Apr-20
Reference 20 dB Attenuator	SN: 5058 (20k)	04-Apr-19 (No. 217-02894)	Apr-20
Type-N mismatch combination	SN: 5047.2 / 06327	04-Apr-19 (No. 217-02895)	Apr-20
Reference Probe EX3DV4	SN: 3503	25-Mar-19 (No. EX3-3503_Mar19)	Mar-20
DAE4	SN: 601	30-Apr-19 (No. DAE4-601_Apr19)	Apr-20

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power meter E4419B	SN: GB39512475	30-Oct-14 (in house check Feb-19)	In house check: Oct-20
Power sensor HP 8481A	SN: US37292783	07-Oct-15 (in house check Oct-18)	In house check: Oct-20
Power sensor HP 8481A	SN: MY41092317	07-Oct-15 (in house check Oct-18)	In house check: Oct-20
RF generator R&S SMT-06	SN: 100972	15-Jun-15 (in house check Oct-18)	In house check: Oct-20
Network Analyzer Agilent E8358A	SN: US41080477	31-Mar-14 (in house check Oct-18)	In house check: Oct-19

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

Issued: July 5, 2019

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Certificate No: D5GHzV2-1293_Jul19 Page 1 of 9

Calibration Laboratory of
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Engineering AG
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Accreditation No.: SCS 0108

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, "Measurement procedure for the assessment of Specific Absorption Rate (SAR) from hand-held and body-mounted devices used next to the ear (frequency range of 300 MHz to 6 GHz)", July 2016
c) IEC 62209-2, "Procedure to determine the Specific Absorption Rate (SAR) for wireless communication devices used in close proximity to the human body (frequency range of 30 MHz to 6 GHz)", March 2010
d) KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

Additional Documentation:

e) 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	V52.10.2
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 5300 MHz ± 1 MHz 5500 MHz ± 1 MHz 5600 MHz ± 1 MHz 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	35.5 ± 6 %	4.46 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL at 5200 MHz

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	7.96 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**79.3 W/kg ± 19.9 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.27 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**22.6 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	35.4 ± 6 %	4.56 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	**81.1 W/kg ± 19.9 % (k=2)**

SAR averaged over 10 cm³ (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.33 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**23.2 W/kg ± 19.5 % (k=2)**

Head TSL parameters at 5500 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	35.6	4.96 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	35.1 ± 6 %	4.76 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL at 5500 MHz

SAR averaged over 1 cm³ (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	8.38 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**83.4 W/kg ± 19.9 % (k=2)**

SAR averaged over 10 cm³ (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.39 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**23.8 W/kg ± 19.5 % (k=2)**

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	35.0 ± 6 %	4.86 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	8.30 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**82.6 W/kg ± 19.9 % (k=2)**

SAR averaged over 10 cm³ (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.37 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**23.6 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	34.7 ± 6 %	5.07 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	7.97 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**79.3 W/kg ± 19.9 % (k=2)**

SAR averaged over 10 cm³ (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.26 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**22.5 W/kg ± 19.5 % (k=2)**

Appendix (Additional assessments outside the scope of SCS 0108)

Antenna Parameters with Head TSL at 5200 MHz

Impedance, transformed to feed point	47.6 Ω - 6.6 jΩ
Return Loss	- 22.9 dB

Antenna Parameters with Head TSL at 5300 MHz

Impedance, transformed to feed point	47.4 Ω - 1.9 jΩ
Return Loss	- 29.6 dB

Antenna Parameters with Head TSL at 5500 MHz

Impedance, transformed to feed point	48.1 Ω - 1.9 jΩ
Return Loss	- 31.1 dB

Antenna Parameters with Head TSL at 5600 MHz

Impedance, transformed to feed point	51.2 Ω - 0.3 jΩ
Return Loss	- 38.1 dB

Antenna Parameters with Head TSL at 5800 MHz

Impedance, transformed to feed point	50.4 Ω + 1.4 jΩ
Return Loss	- 37.1 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.195 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

DASY5 Validation Report for Head TSL

Date: 04.07.2019

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole D5GHzV2; Type: D5GHzV2; Serial: D5GHzV2 - SN:1293

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; σ = 4.46 S/m; ε_r = 35.5; ρ = 1000 kg/m^3
Medium parameters used: f = 5300 MHz; σ = 4.56 S/m; ε_r = 35.4; ρ = 1000 kg/m^3
Medium parameters used: f = 5500 MHz; σ = 4.76 S/m; ε_r = 35.1; ρ = 1000 kg/m^3
Medium parameters used: f = 5600 MHz; σ = 4.86 S/m; ε_r = 35; ρ = 1000 kg/m^3
Medium parameters used: f = 5800 MHz; σ = 5.07 S/m; ε_r = 34.7; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN3503; ConvF(5.64, 5.64, 5.64) @ 5200 MHz, ConvF(5.39, 5.39, 5.39) @ 5300 MHz, ConvF(5.1, 5.1, 5.1) @ 5500 MHz, ConvF(4.95, 4.95, 4.95) @ 5600 MHz, ConvF(4.96, 4.96, 4.96) @ 5800 MHz; Calibrated: 25.03.2019
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 30.04.2019
- Phantom: Flat Phantom 5.0 (front); Type: QD 000 P50 AA; Serial: 1001
- DASY52 52.10.2(1504); SEMCAD X 14.6.12(7470)

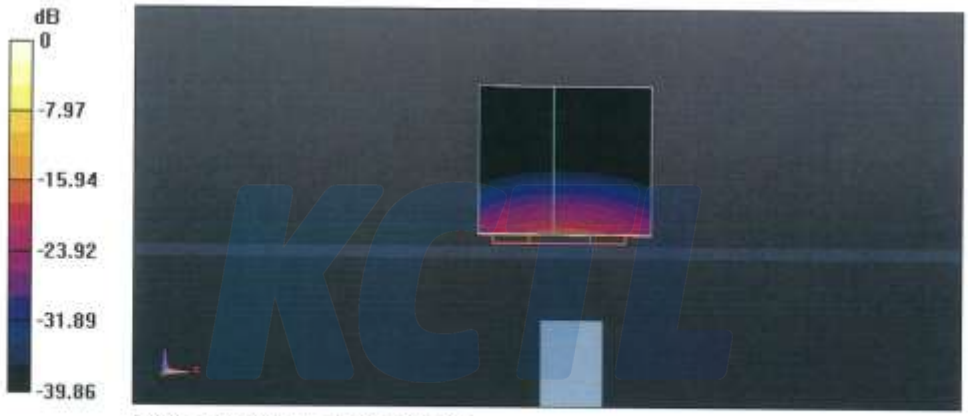
Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5200 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 75.78 V/m; Power Drift = 0.08 dB
Peak SAR (extrapolated) = 28.2 W/kg
SAR(1 g) = 7.96 W/kg; SAR(10 g) = 2.27 W/kg
Maximum value of SAR (measured) = 18.4 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 = 76.45 V/m; Power Drift = 0.03 dB
Peak SAR (extrapolated) = 28.5 W/kg
SAR(1 g) = 8.14 W/kg; SAR(10 g) = 2.33 W/kg
Maximum value of SAR (measured) = 18.9 W/kg

Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5500 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 76.11 V/m; Power Drift = 0.03 dB
Peak SAR (extrapolated) = 31.8 W/kg
SAR(1 g) = 8.38 W/kg; SAR(10 g) = 2.39 W/kg
Maximum value of SAR (measured) = 19.9 W/kg

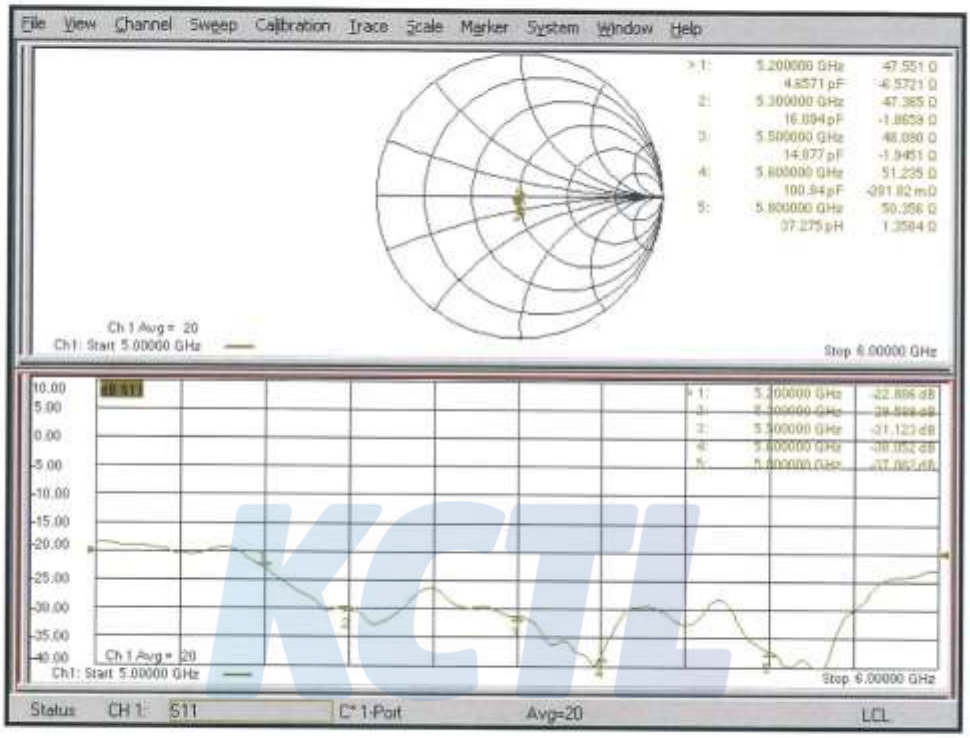
Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5600 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 76.33 V/m; Power Drift = 0.02 dB
Peak SAR (extrapolated) = 30.5 W/kg
SAR(1 g) = 8.3 W/kg; SAR(10 g) = 2.37 W/kg
Maximum value of SAR (measured) = 19.6 W/kg

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 = 73.46 V/m; Power Drift = 0.05 dB
Peak SAR (extrapolated) = 31.2 W/kg
SAR(1 g) = 7.97 W/kg; SAR(10 g) = 2.26 W/kg
Maximum value of SAR (measured) = 19.2 W/kg



0 dB = 18.4 W/kg = 12.65 dBW/kg

Impedance Measurement Plot for Head TSL



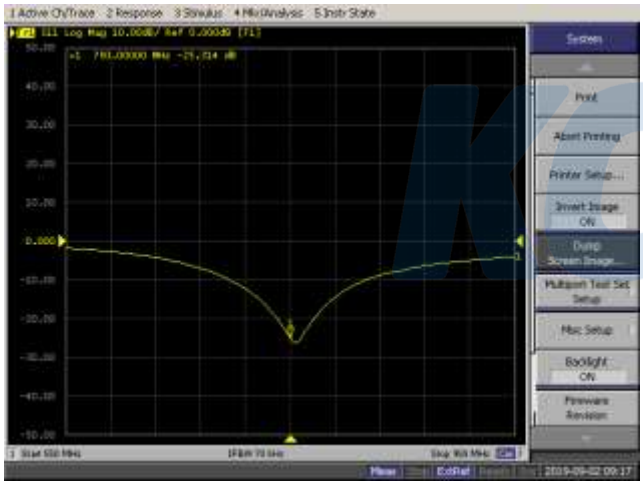
Appendix A.10 Justification for Extended SAR Dipole Calibrations

Instead of the typical annual calibration recommended by measurement standards, longer calibration intervals of up to three years may be considered when it is demonstrated that the SAR target, impedance and return loss of a dipole have remain stable according to the following requirements

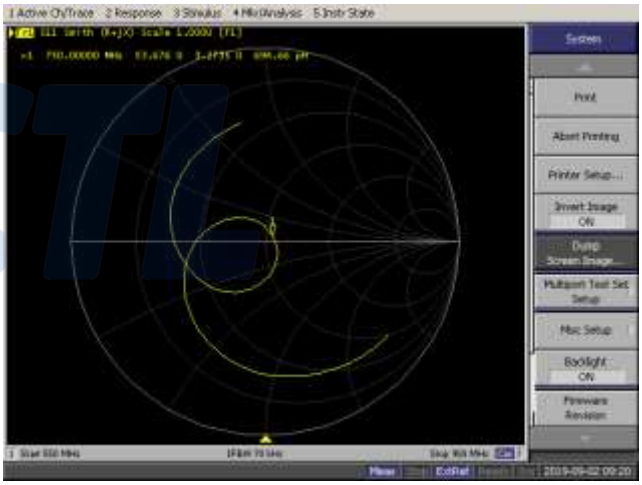
KDB 865664 D01v01r04 requirements
a) Return loss: < - 20 dB, within 20 % of previous measurement
b) Impedance: within 5 Ω from previous measurement.

750 MHz

Dipole Antenna	Head/Body	Date of Measurement	Return Loss (dB)	Δ %	Impedance (Ω)	Δ Ω
D750V3 SN 1183	Head	2018.09.03	-26.9	5.95	54.2	0.5
		2019.09.02	-25.3		53.7	



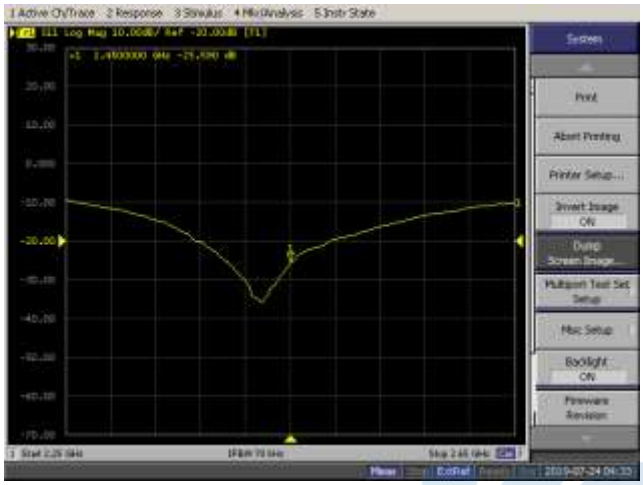
< Figure 1. Measurement result of Head Return Loss>



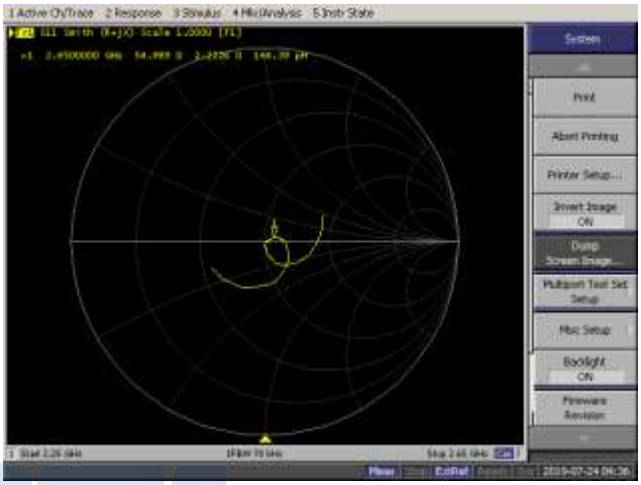
< Figure 2. Measurement result of Head Impedance>

2450 MHz

Dipole Antenna	Head/Body	Date of Measurement	Return Loss (dB)	Δ %	Impedance (Ω)	Δ Ω
D2450V2 SN 895	Head	2018.07.24	-27.9	8.3	53.8	1.2
		2019.07.24	-25.6		55.0	



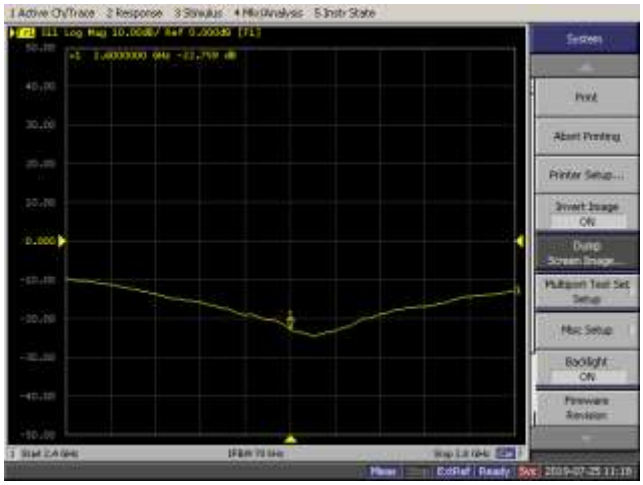
< Figure 1. Measurement result of Head Return Loss>



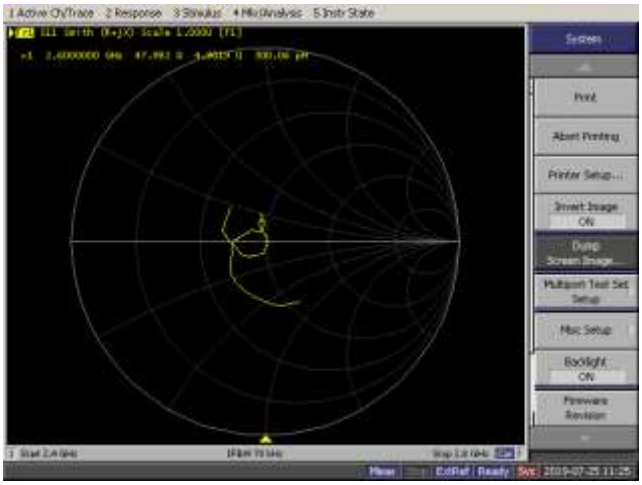
< Figure 2. Measurement result of Head Impedance>

2600 MHz

Dipole Antenna	Head/Body	Date of Measurement	Return Loss (dB)	Δ %	Impedance (Ω)	Δ Ω
D2600V2 SN 1050	Head	2018.07.26	-22.3	2.24	48.7	0.8
		2019.07.25	-22.8		47.9	



< Figure 1. Measurement result of Head Return Loss>



< Figure 2. Measurement result of Head Impedance>

c) Extrapolated peak SAR: within 15% of that reported in the calibration data

Dipole Antenna	Head/Body	Date of Measurement	extrapolated peak SAR (W/kg)	△ %
D750V3 SN 1183	Head	2018.09.03	12.32	-
		2020-06-21	11.36	7.79
		2020-06-22	12.24	0.65
D2450V2 SN 895	Head	2018.07.24	104.4	-
		2020-05-25	116.0	11.11
		2020-05-26	115.0	10.15
		2020-06-17	116.0	11.11
		2020-06-21	112.0	7.28
		2020-06-22	116.0	11.11
D2600V2 SN 1050	Head	2018.07.26	115.6	-
		2020-05-08	118.0	2.08
		2020-06-13	125.0	8.13

Appendix B. SAR Tissue Specification

The brain mixtures consist of a viscous gel using hydrox-ethl cellullose(HEC) gelling agent and saline solution. Preservation with a bacteriacide is added and visual inspection is made to make sure air bubbles are not trapped during the mixing process. The mixture is calibrated to obtain proper dielectric constant (permittivity) and conductivity of the desired tissue.

Frequency (㎒)	**750 ~ 835**		**1 750**		**1 900**		**2 450**		**5 200 ~ 5 800**	
Tissue Type	Head	Body	Head	Body	Head	Body	Head	Body	Head	Body
Ingredient	**% by weight**									
Water	40.29	51.97	53.00	68.00	55.00	70.50	72.00	73.00	65.52	80.00
Salt (NaCl)	1.38	0.93	0.40	0.20	0.35	0.30	0.10	0.10	0	0
Sugar	57.90	47.00	0	0	0	0	0	0	0	0
HEC	0.24	0	0	0	0	0	0	0	0	0
Bactericide	0.19	0.10	0	0	0	0	0	0	0	0
Triton X-100	0	0	0	0	0	0	20.00	0	17.24	0
DGBE	0	0	46.60	31.80	44.65	29.20	0	26.90	0	0
Diethylene glycol hexyl ether	0	0	0	0	0	0	7.90	0	17.24	0
Polysorbate (Tween) 80	0	0	0	0	0	0	0	0	0	20.00
Tissue parameter target by C. Gabriel and G. Harts grove.										

Salt: 99 % Pure Sodium Chloride
Sucrose: 98 % Pure Sucrose
Water: De-ionized, 16 M resistivity
HEC: Hydroxyethyl Cellulose
DGBE: 99 % Di(ethylene glycol) butyl ether, [2-(2-butoxyethoxy) ethanol]
Triton X-100(ultra-pure): Polyethylene glycol mono[4-(1,1,3,3-tetramethybutyl)phenyl] ether

Appendix C. Dynamic Antenna Tuner Testing

C.1 Dynamic Antenna Tuning

Per April 2019 TCB Workshop Notes, SAR is measured according to required procedures with dynamic tuner active allowing device to automatically tune. Auto-tune state determined by device during normal SAR measurement verified and listed alongside the reported SAR results.

Additional single point SAR measurements to verify other tuner configurations result in equivalent or lower SAR value.

The additional tuner hardware has no influence on the antenna characteristics, other impedance matching.

i) Total number tuner states divided evenly among each supported band / air interface and exposure condition combination

ii) Tuner state is established remotely so that the device is not moved for the entire series of single point SAR measurements for the tuner states in each combination

iii) Single point measurements performed at the peak SAR location of the highest measured SAR configuration for each combination. SAR probe remains stationary throughout the entire series of single point measurements for each combination

iiii) If any single point SAR measurement result is > 1.2 W/kg for a band/exposure condition combination set, all supported tuner states are evaluated with single point SAR measurements for the combination.

To evaluate all the tuner states, the 120 tuner states were divided among the aggregate band, mode and exposure combinations. Single point time-sweep measurements were performed at the peak SAR location determined by the zoom scan of the configuration with the highest reported SAR for each combination.

The tuner state was able to be established remotely so that the device was not moved for the entire series of single point SAR for the tuner states in each combination. The SAR probe remained stationary at the same position throughout the entire series of single point measurements for each combination. When the single point SAR or 1g SAR was > 1.2 W/kg for a particular band/mode/exposure condition, point SAR measurements were made for all 120 states.

The operational description contains more information about the design and implementation of the dynamic antenna tuning.

C.2 Dynamic Antenna Tuner Test Result

C.2.1 Body SAR data

WCDMA Band II		WCDMA Band IV		WCDMA Band V		LTE B.2	
RMC		RMC		RMC		QPSK, 20 MHz, 50 RB, 24 RB Offset	
Test Position	Top	Test Position	Top	Test Position	Top	Test Position	Top
Distance (mm)	0	Distance (mm)	0	Distance (mm)	0	Distance (mm)	0
Frequency (MHz)	1 880.0	Frequency (MHz)	1 732.4	Frequency (MHz)	836.6	Frequency (MHz)	1 900.0
Channel	9400	Channel	1412	Channel	4183	Channel	19100
Measured 1g SAR (W/kg)	0.794	Measured 1g SAR (W/kg)	0.559	Measured 1g SAR (W/kg)	0.610	Measured 1g SAR (W/kg)	0.811
Average Value of Time Sweep (W/kg)		Average Value of Time Sweep (W/kg)		Average Value of Time Sweep (W/kg)		Average Value of Time Sweep (W/kg)	
Auto-Tune (State 9)	2.106	Auto-Tune (State 10)	1.616	Auto-Tune (State 33)	1.997	Auto-Tune (State 6)	2.047
State 0	1.957	State 0	1.288	State 0	1.121	State 0	1.991
State 1	1.994	State 1	1.344	State 1	1.400	State 1	2.015
State 2	2.005	State 2	1.355	State 2	1.443	State 2	2.022
State 3	2.010	State 3	1.358	State 3	1.485	State 3	2.026
State 4	2.022	State 4	1.375	State 4	1.572	State 4	2.030
State 5	2.022	State 5	1.380	State 5	1.663	State 5	2.030
State 6	2.048	State 6	1.440	State 6	1.838	State 6	2.051
State 7	2.065	State 7	1.467	State 7	1.949	State 7	2.043
State 8	2.098	State 8	1.521	State 8	1.909	State 8	2.022
State 9	2.102	State 9	1.573	State 9	1.578	State 9	2.021
State 10	2.075	State 10	1.615	State 10	1.232	State 10	1.975
State 11	1.990	State 11	1.567	State 11	0.820	State 11	1.876
State 12	1.759	State 12	1.422	State 12	0.434	State 12	1.656
State 13	1.665	State 13	1.020	State 13	0.629	State 13	1.778
State 14	1.726	State 14	1.089	State 14	0.830	State 14	1.829
State 15	1.743	State 15	1.098	State 15	0.858	State 15	1.843
State 16	1.756	State 16	1.113	State 16	0.880	State 16	1.859
State 17	1.780	State 17	1.145	State 17	0.918	State 17	1.879
State 18	1.782	State 18	1.153	State 18	0.940	State 18	1.878
State 19	1.839	State 19	1.226	State 19	0.911	State 19	1.924
State 20	1.866	State 20	1.284	State 20	0.788	State 20	1.956
State 21	1.921	State 21	1.349	State 21	0.604	State 21	1.983
State 22	1.923	State 22	1.432	State 22	0.366	State 22	1.982
State 23	1.903	State 23	1.450	State 23	0.250	State 23	1.943
State 24	1.798	State 24	1.400	State 24	0.154	State 24	1.808
State 25	1.505	State 25	1.166	State 25	0.080	State 25	1.508
State 26	1.847	State 26	1.380	State 26	1.238	State 26	1.827
State 27	1.871	State 27	1.429	State 27	1.525	State 27	1.850
State 28	1.881	State 28	1.434	State 28	1.566	State 28	1.852
State 29	1.887	State 29	1.444	State 29	1.604	State 29	1.865
State 30	1.895	State 30	1.464	State 30	1.688	State 30	1.867
State 31	1.895	State 31	1.468	State 31	1.765	State 31	1.869
State 32	1.917	State 32	1.496	State 32	1.922	State 32	1.870
State 33	1.926	State 33	1.531	State 33	1.975	State 33	1.863
State 34	1.923	State 34	1.554	State 34	1.878	State 34	1.850
State 35	1.875	State 35	1.562	State 35	1.506	State 35	1.791
State 36	1.816	State 36	1.548	State 36	1.159	State 36	1.719
State 37	1.674	State 37	1.456	State 37	0.773	State 37	1.582
State 38	1.405	State 38	1.247	State 38	0.413	State 38	1.318
State 39	0.208	State 39	0.289	State 39	1.304	State 39	0.193
State 40	0.252	State 40	0.341	State 40	1.653	State 40	0.232
State 41	0.252	State 41	0.342	State 41	1.702	State 41	0.231
State 42	0.251	State 42	0.344	State 42	1.740	State 42	0.230
State 43	0.255	State 43	0.350	State 43	1.812	State 43	0.233
State 44	0.271	State 44	0.368	State 44	1.873	State 44	0.247
State 45	0.278	State 45	0.380	State 45	1.891	State 45	0.249
State 46	0.290	State 46	0.395	State 46	1.759	State 46	0.258
State 47	0.294	State 47	0.403	State 47	1.462	State 47	0.258
State 48	0.291	State 48	0.396	State 48	0.978	State 48	0.251
State 49	0.276	State 49	0.372	State 49	0.695	State 49	0.235
State 50	0.242	State 50	0.320	State 50	0.435	State 50	0.205
State 51	0.175	State 51	0.223	State 51	0.226	State 51	0.148
State 52	1.804	State 52	1.200	State 52	0.697	State 52	1.835
State 53	1.878	State 53	1.272	State 53	0.892	State 53	1.900
State 54	1.898	State 54	1.286	State 54	0.913	State 54	1.911
State 55	1.912	State 55	1.299	State 55	0.927	State 55	1.918
State 56	1.932	State 56	1.327	State 56	0.950	State 56	1.944

State 57	1.935	State 57	1.337	State 57	0.952	State 57	1.936
State 58	1.981	State 58	1.392	State 58	0.879	State 58	1.976
State 59	2.003	State 59	1.437	State 59	0.730	State 59	2.000
State 60	1.997	State 60	1.476	State 60	0.549	State 60	1.989
State 61	1.932	State 61	1.471	State 61	0.334	State 61	1.923
State 62	1.817	State 62	1.418	State 62	0.231	State 62	1.807
State 63	1.594	State 63	1.276	State 63	0.144	State 63	1.593
State 64	1.201	State 64	0.959	State 64	0.077	State 64	1.204
State 65	0.217	State 65	0.314	State 65	1.032	State 65	0.201
State 66	0.288	State 66	0.414	State 66	1.173	State 66	0.262
State 67	0.293	State 67	0.422	State 67	1.152	State 67	0.266
State 68	0.296	State 68	0.430	State 68	1.125	State 68	0.268
State 69	0.310	State 69	0.453	State 69	1.036	State 69	0.279
State 70	0.332	State 70	0.486	State 70	0.933	State 70	0.301
State 71	0.370	State 71	0.550	State 71	0.665	State 71	0.329
State 72	0.412	State 72	0.609	State 72	0.464	State 72	0.361
State 73	0.448	State 73	0.647	State 73	0.313	State 73	0.386
State 74	0.467	State 74	0.615	State 74	0.179	State 74	0.399
State 75	0.432	State 75	0.518	State 75	0.123	State 75	0.372
State 76	0.332	State 76	0.355	State 76	0.078	State 76	0.293
State 77	0.182	State 77	0.179	State 77	0.042	State 77	0.168
State 78	0.184	State 78	0.246	State 78	1.260	State 78	0.173
State 79	0.218	State 79	0.288	State 79	1.618	State 79	0.204
State 80	0.219	State 80	0.290	State 80	1.669	State 80	0.204
State 81	0.219	State 81	0.290	State 81	1.707	State 81	0.203
State 82	0.222	State 82	0.297	State 82	1.782	State 82	0.205
State 83	0.234	State 83	0.311	State 83	1.848	State 83	0.217
State 84	0.242	State 84	0.325	State 84	1.859	State 84	0.221
State 85	0.252	State 85	0.339	State 85	1.707	State 85	0.229
State 86	0.256	State 86	0.346	State 86	1.402	State 86	0.229
State 87	0.258	State 87	0.344	State 87	0.910	State 87	0.224
State 88	0.244	State 88	0.323	State 88	0.640	State 88	0.211
State 89	0.217	State 89	0.280	State 89	0.395	State 89	0.185
State 90	0.159	State 90	0.197	State 90	0.204	State 90	0.134
State 91	0.190	State 91	0.261	State 91	1.067	State 91	0.187
State 92	0.246	State 92	0.343	State 92	1.228	State 92	0.228
State 93	0.250	State 93	0.351	State 93	1.201	State 93	0.231
State 94	0.254	State 94	0.360	State 94	1.164	State 94	0.232
State 95	0.267	State 95	0.381	State 95	1.054	State 95	0.243
State 96	0.285	State 96	0.407	State 96	0.936	State 96	0.260
State 97	0.319	State 97	0.464	State 97	0.638	State 97	0.287
State 98	0.356	State 98	0.519	State 98	0.434	State 98	0.317
State 99	0.391	State 99	0.561	State 99	0.288	State 99	0.342
State 100	0.415	State 100	0.551	State 100	0.162	State 100	0.357
State 101	0.390	State 101	0.467	State 101	0.111	State 101	0.337
State 102	0.302	State 102	0.321	State 102	0.070	State 102	0.269
State 103	0.166	State 103	0.159	State 103	0.038	State 103	0.154
State 104	1.952	State 104	1.305	State 104	1.175	State 104	1.970
State 105	1.678	State 105	1.033	State 105	0.639	State 105	1.762
State 106	1.852	State 106	1.391	State 106	1.253	State 106	1.808
State 107	0.203	State 107	0.286	State 107	1.320	State 107	0.186
State 108	1.805	State 108	1.206	State 108	0.704	State 108	1.819
State 109	0.212	State 109	0.307	State 109	1.033	State 109	0.194
State 110	0.182	State 110	0.243	State 110	1.259	State 110	0.170
State 111	0.187	State 111	0.258	State 111	1.068	State 111	0.172
State 112	1.949	State 112	1.306	State 112	1.177	State 112	1.953
State 113	1.685	State 113	1.033	State 113	0.639	State 113	1.757
State 114	1.852	State 114	1.390	State 114	1.256	State 114	1.804
State 115	0.207	State 115	0.287	State 115	1.324	State 115	0.189
State 116	1.804	State 116	1.206	State 116	0.703	State 116	1.802
State 117	0.214	State 117	0.309	State 117	1.035	State 117	0.196
State 118	0.184	State 118	0.245	State 118	1.258	State 118	0.173
State 119	0.190	State 119	0.260	State 119	1.068	State 119	0.177

LTE B.5		LTE B.12		LTE B.13		LTE B.25	
QPSK, 10 MHz, 25 RB, 25 RB Offset		QPSK, 10 MHz, 25 RB, 12 RB Offset		QPSK, 10 MHz, 25 RB, 12 RB Offset		QPSK, 20 MHz, 50 RB, 24 RB Offset	
Test Position	Top	Test Position	Rear	Test Position	Top	Test Position	Top
Distance (mm)	0	Distance (mm)	0	Distance (mm)	0	Distance (mm)	0
Frequency (MHz)	836.5	Frequency (MHz)	707.5	Frequency (MHz)	782.0	Frequency (MHz)	1 882.5
Channel	20525	Channel	23095	Channel	23230	Channel	26365
Measured 1g SAR (W/kg)	0.767	Measured 1g SAR (W/kg)	0.652	Measured 1g SAR (W/kg)	0.663	Measured 1g SAR (W/kg)	0.799
Average Value of Time Sweep (W/kg)		Average Value of Time Sweep (W/kg)		Average Value of Time Sweep (W/kg)		Average Value of Time Sweep (W/kg)	
Auto-Tune (State 8)	2.537	Auto-Tune (State 10)	2.343	Auto-Tune (State 33)	2.449	Auto-Tune (State 6)	1.936
State 0	1.382	State 0	1.767	State 0	1.572	State 0	1.887
State 1	1.722	State 1	2.152	State 1	2.001	State 1	1.904
State 2	1.773	State 2	2.161	State 2	2.054	State 2	1.909
State 3	1.834	State 3	2.167	State 3	2.099	State 3	1.911
State 4	1.940	State 4	2.125	State 4	2.201	State 4	1.914
State 5	2.063	State 5	2.049	State 5	2.300	State 5	1.912
State 6	2.316	State 6	1.704	State 6	2.380	State 6	1.934
State 7	2.487	State 7	1.316	State 7	2.289	State 7	1.932
State 8	2.533	State 8	0.947	State 8	1.988	State 8	1.933
State 9	2.118	State 9	0.559	State 9	1.367	State 9	1.900
State 10	1.670	State 10	0.385	State 10	0.985	State 10	1.863
State 11	1.117	State 11	0.241	State 11	0.623	State 11	1.766
State 12	0.587	State 12	0.128	State 12	0.327	State 12	1.547
State 13	0.748	State 13	1.105	State 13	0.859	State 13	1.695
State 14	0.998	State 14	1.322	State 14	1.106	State 14	1.747
State 15	1.034	State 15	1.318	State 15	1.127	State 15	1.770
State 16	1.063	State 16	1.304	State 16	1.150	State 16	1.769
State 17	1.111	State 17	1.247	State 17	1.170	State 17	1.789
State 18	1.144	State 18	1.158	State 18	1.445	State 18	1.784
State 19	1.117	State 19	0.888	State 19	1.043	State 19	1.830
State 20	0.967	State 20	0.645	State 20	0.839	State 20	1.854
State 21	0.740	State 21	0.445	State 21	0.607	State 21	1.876
State 22	0.446	State 22	0.253	State 22	0.354	State 22	1.870
State 23	0.305	State 23	0.174	State 23	0.241	State 23	1.838
State 24	0.187	State 24	0.109	State 24	0.149	State 24	1.714
State 25	0.097	State 25	0.059	State 25	0.079	State 25	1.433
State 26	1.501	State 26	1.852	State 26	1.695	State 26	1.721
State 27	1.859	State 27	2.158	State 27	2.111	State 27	1.747
State 28	1.926	State 28	2.153	State 28	2.179	State 28	1.751
State 29	1.960	State 29	2.142	State 29	2.204	State 29	1.752
State 30	2.079	State 30	2.076	State 30	2.291	State 30	1.756
State 31	2.195	State 31	1.974	State 31	2.364	State 31	1.751
State 32	2.406	State 32	1.590	State 32	2.394	State 32	1.744
State 33	2.511	State 33	1.219	State 33	2.225	State 33	1.746
State 34	2.459	State 34	0.877	State 34	1.870	State 34	1.721
State 35	2.013	State 35	0.526	State 35	1.278	State 35	1.660
State 36	1.568	State 36	0.366	State 36	0.923	State 36	1.592
State 37	1.050	State 37	0.232	State 37	0.590	State 37	1.458
State 38	0.558	State 38	0.125	State 38	0.314	State 38	1.209
State 39	1.596	State 39	2.304	State 39	1.907	State 39	0.185
State 40	2.039	State 40	2.149	State 40	2.358	State 40	0.221
State 41	2.098	State 41	2.061	State 41	2.453	State 41	0.221
State 42	2.147	State 42	1.971	State 42	2.414	State 42	0.219
State 43	2.262	State 43	1.758	State 43	2.412	State 43	0.220
State 44	2.348	State 44	1.561	State 44	2.376	State 44	0.235
State 45	2.452	State 45	1.105	State 45	2.072	State 45	0.235
State 46	2.319	State 46	0.787	State 46	1.672	State 46	0.243
State 47	1.994	State 47	0.551	State 47	1.243	State 47	0.240
State 48	1.353	State 48	0.330	State 48	0.755	State 48	0.231
State 49	0.965	State 49	0.233	State 49	0.530	State 49	0.215
State 50	0.604	State 50	0.151	State 50	0.335	State 50	0.186
State 51	0.311	State 51	0.083	State 51	0.180	State 51	0.133
State 52	0.828	State 52	1.174	State 52	0.938	State 52	1.744
State 53	1.069	State 53	1.317	State 53	1.153	State 53	1.798
State 54	1.096	State 54	1.298	State 54	1.157	State 54	1.806
State 55	1.114	State 55	1.272	State 55	1.170	State 55	1.820
State 56	1.145	State 56	1.192	State 56	1.165	State 56	1.845
State 57	1.150	State 57	1.089	State 57	1.135	State 57	1.840
State 58	1.061	State 58	0.817	State 58	0.975	State 58	1.864
State 59	0.888	State 59	0.594	State 59	0.757	State 59	1.866
State 60	0.667	State 60	0.411	State 60	0.550	State 60	1.885
State 61	0.406	State 61	0.240	State 61	0.325	State 61	1.809
State 62	0.279	State 62	0.167	State 62	0.225	State 62	1.700

State 63	0.175	State 63	0.106	State 63	0.141	State 63	1.502
State 64	0.093	State 64	0.058	State 64	0.076	State 64	1.143
State 65	1.225	State 65	1.525	State 65	1.358	State 65	0.192
State 66	1.413	State 66	1.226	State 66	1.342	State 66	0.250
State 67	1.382	State 67	1.147	State 67	1.280	State 67	0.254
State 68	1.367	State 68	1.076	State 68	1.231	State 68	0.255
State 69	1.262	State 69	0.922	State 69	1.089	State 69	0.265
State 70	1.136	State 70	0.780	State 70	0.947	State 70	0.286
State 71	0.814	State 71	0.525	State 71	0.648	State 71	0.309
State 72	0.571	State 72	0.365	State 72	0.454	State 72	0.337
State 73	0.386	State 73	0.253	State 73	0.310	State 73	0.358
State 74	0.221	State 74	0.152	State 74	0.181	State 74	0.365
State 75	0.152	State 75	0.108	State 75	0.128	State 75	0.339
State 76	0.095	State 76	0.071	State 76	0.082	State 76	0.270
State 77	0.052	State 77	0.040	State 77	0.046	State 77	0.157
State 78	1.525	State 78	2.378	State 78	1.932	State 78	0.167
State 79	1.981	State 79	2.161	State 79	2.397	State 79	0.195
State 80	2.044	State 80	2.064	State 80	2.438	State 80	0.195
State 81	2.102	State 81	1.958	State 81	2.441	State 81	0.194
State 82	2.207	State 82	1.727	State 82	2.427	State 82	0.195
State 83	2.310	State 83	1.507	State 83	2.374	State 83	0.207
State 84	2.394	State 84	1.046	State 84	2.026	State 84	0.209
State 85	2.265	State 85	0.734	State 85	1.594	State 85	0.215
State 86	1.891	State 86	0.509	State 86	1.156	State 86	0.214
State 87	1.257	State 87	0.303	State 87	0.701	State 87	0.207
State 88	0.883	State 88	0.215	State 88	0.482	State 88	0.194
State 89	0.545	State 89	0.139	State 89	0.305	State 89	0.169
State 90	0.278	State 90	0.077	State 90	0.162	State 90	0.123
State 91	1.273	State 91	1.608	State 91	1.434	State 91	0.170
State 92	1.491	State 92	1.223	State 92	1.384	State 92	0.218
State 93	1.455	State 93	1.137	State 93	1.309	State 93	0.221
State 94	1.421	State 94	1.055	State 94	1.245	State 94	0.223
State 95	1.285	State 95	0.893	State 95	1.079	State 95	0.232
State 96	1.137	State 96	0.748	State 96	0.918	State 96	0.249
State 97	0.779	State 97	0.494	State 97	0.612	State 97	0.272
State 98	0.531	State 98	0.339	State 98	0.416	State 98	0.298
State 99	0.352	State 99	0.234	State 99	0.280	State 99	0.318
State 100	0.198	State 100	0.140	State 100	0.163	State 100	0.328
State 101	0.136	State 101	0.100	State 101	0.114	State 101	0.308
State 102	0.086	State 102	0.065	State 102	0.074	State 102	0.248
State 103	0.046	State 103	0.038	State 103	0.041	State 103	0.145
State 104	1.402	State 104	1.769	State 104	1.591	State 104	1.879
State 105	0.751	State 105	1.109	State 105	0.860	State 105	1.694
State 106	1.514	State 106	1.867	State 106	1.697	State 106	1.725
State 107	1.590	State 107	2.304	State 107	1.965	State 107	0.180
State 108	0.829	State 108	1.172	State 108	0.938	State 108	1.738
State 109	1.222	State 109	1.530	State 109	1.358	State 109	0.186
State 110	1.520	State 110	2.372	State 110	1.928	State 110	0.165
State 111	1.271	State 111	1.598	State 111	1.432	State 111	0.168
State 112	1.410	State 112	1.769	State 112	1.593	State 112	1.877
State 113	0.751	State 113	1.111	State 113	0.725	State 113	1.693
State 114	1.517	State 114	1.865	State 114	1.695	State 114	1.722
State 115	1.590	State 115	2.302	State 115	1.966	State 115	0.182
State 116	0.827	State 116	1.169	State 116	0.940	State 116	1.741
State 117	1.226	State 117	1.525	State 117	1.358	State 117	0.188
State 118	1.518	State 118	2.370	State 118	1.932	State 118	0.166
State 119	1.272	State 119	1.597	State 119	1.433	State 119	0.171

TE B.26		LTE B.66	
QPSK, 15 MHz, 1 RB, 0 RB Offset		QPSK, 20 MHz, 50 RB, 24 RB Offset	
Test Position	Rear	Test Position	Top
Distance (mm)	0	Distance (mm)	0
Frequency (MHz)	831.5	Frequency (MHz)	1 770.0
Channel	26865	Channel	132572
Measured 1g SAR (W/kg)	0.587	Measured 1g SAR (W/kg)	0.726
Average Value of Time Sweep (W/kg)		Average Value of Time Sweep (W/kg)	
Auto-Tune (State 83)	1.696	Auto-Tune (State 10)	1.879
State 0	0.873	State 0	1.656
State 1	1.171	State 1	1.707
State 2	1.224	State 2	1.694
State 3	1.266	State 3	1.724
State 4	1.357	State 4	1.738
State 5	1.440	State 5	1.745
State 6	1.617	State 6	1.788
State 7	1.663	State 7	1.818
State 8	1.523	State 8	1.857
State 9	1.079	State 9	1.852
State 10	0.771	State 10	1.864
State 11	0.475	State 11	1.838
State 12	0.239	State 12	1.642
State 13	0.476	State 13	1.347
State 14	0.635	State 14	1.412
State 15	0.652	State 15	1.429
State 16	0.667	State 16	1.443
State 17	0.691	State 17	1.469
State 18	0.695	State 18	1.477
State 19	0.637	State 19	1.558
State 20	0.517	State 20	1.602
State 21	0.376	State 21	1.675
State 22	0.221	State 22	1.740
State 23	0.149	State 23	1.746
State 24	0.092	State 24	1.688
State 25	0.049	State 25	1.419
State 26	0.983	State 26	1.714
State 27	1.270	State 27	1.753
State 28	1.322	State 28	1.765
State 29	1.364	State 29	1.763
State 30	1.442	State 30	1.777
State 31	1.526	State 31	1.781
State 32	1.648	State 32	1.812
State 33	1.633	State 33	1.824
State 34	1.435	State 34	1.833
State 35	0.986	State 35	1.815
State 36	0.703	State 36	1.761
State 37	0.437	State 37	1.657
State 38	0.225	State 38	1.409
State 39	1.125	State 39	0.291
State 40	1.552	State 40	0.341
State 41	1.605	State 41	0.341
State 42	1.656	State 42	0.340
State 43	1.723	State 43	0.345
State 44	1.694	State 44	0.361
State 45	1.664	State 45	0.369
State 46	1.385	State 46	0.381
State 47	1.007	State 47	0.382
State 48	0.585	State 48	0.370
State 49	0.391	State 49	0.345
State 50	0.234	State 50	0.296
State 51	0.119	State 51	0.208
State 52	0.524	State 52	1.535
State 53	0.669	State 53	1.611
State 54	0.681	State 54	1.626
State 55	0.689	State 55	1.638
State 56	0.693	State 56	1.667
State 57	0.683	State 57	1.669
State 58	0.592	State 58	1.727
State 59	0.467	State 59	1.757
State 60	0.336	State 60	1.787
State 61	0.198	State 61	1.769
State 62	0.137	State 62	1.701

State 63	0.085	State 63	1.525
State 64	0.045	State 64	1.166
State 65	0.804	State 65	0.312
State 66	0.861	State 66	0.406
State 67	0.831	State 67	0.414
State 68	0.795	State 68	0.420
State 69	0.706	State 69	0.440
State 70	0.614	State 70	0.471
State 71	0.410	State 71	0.523
State 72	0.276	State 72	0.572
State 73	0.185	State 73	0.606
State 74	0.105	State 74	0.593
State 75	0.072	State 75	0.518
State 76	0.046	State 76	0.372
State 77	0.025	State 77	0.195
State 78	1.081	State 78	0.252
State 79	1.536	State 79	0.293
State 80	1.590	State 80	0.293
State 81	1.635	State 81	0.293
State 82	1.727	State 82	0.297
State 83	1.767	State 83	0.312
State 84	1.648	State 84	0.320
State 85	1.332	State 85	0.330
State 86	0.943	State 86	0.333
State 87	0.528	State 87	0.324
State 88	0.349	State 88	0.306
State 89	0.209	State 89	0.262
State 90	0.106	State 90	0.186
State 91	0.839	State 91	0.267
State 92	0.901	State 92	0.343
State 93	0.856	State 93	0.350
State 94	0.816	State 94	0.356
State 95	0.708	State 95	0.375
State 96	0.602	State 96	0.401
State 97	0.385	State 97	0.448
State 98	0.254	State 98	0.496
State 99	0.166	State 99	0.532
State 100	0.094	State 100	0.530
State 101	0.064	State 101	0.466
State 102	0.041	State 102	0.336
State 103	0.022	State 103	0.175
State 104	0.893	State 104	1.655
State 105	0.470	State 105	1.343
State 106	0.968	State 106	1.711
State 107	1.106	State 107	0.283
State 108	0.517	State 108	1.526
State 109	0.794	State 109	0.304
State 110	1.070	State 110	0.248
State 111	0.835	State 111	0.262
State 112	0.890	State 112	1.653
State 113	0.467	State 113	1.341
State 114	0.967	State 114	1.709
State 115	1.105	State 115	0.284
State 116	0.518	State 116	1.523
State 117	0.791	State 117	0.305
State 118	1.070	State 118	0.248
State 119	0.835	State 119	0.264

Appendix D. Downlink LTE CA RF Conducted Power

D.1 LTE Downlink Carrier Aggregation

The tables below show the supported frequency bands of the device for DL Inter-band and DL Intra-band combinations.

Power measurements were performed on the channel with the highest maximum output power from Tune-up Procedure.

In applying the power measurement procedures of KDB 941225 D05A for DL CA to qualify for UL SAR test exclusion, power measurement is required only for the subset in each row with the largest combination of frequency bands and CCs

Index	2CC	Restriction	Completely Covered by Measurement Superset
2CC #1	CA_2A-2A	N/A	No
2CC #2	CA_2C	N/A	No
2CC #3	CA_2A-4A	N/A	3CC #1
2CC #4	CA_2A-5A	N/A	3CC #1
2CC #5	CA_2A-12A	N/A	No
2CC #6	CA_2A-13A	N/A	3CC #1
2CC #7	CA_2A-66A	N/A	No
2CC #8	CA_4A-4A	N/A	3CC #3
2CC #9	CA_4A-5A	N/A	3CC #1
2CC #10	CA_4A-12A	N/A	3CC #3
2CC #11	CA_4A-13A	N/A	3CC #2
2CC #12	CA_5A-41A	B41 SCC Only	No
2CC #13	CA_5A-66A	N/A	3CC #4
2CC #14	CA_12A-66A	N/A	3CC #5
2CC #15	CA_26A-41A	B41 SCC Only	No
2CC #16	CA_41A-41A	N/A	No
2CC #17	CA_41C	N/A	3CC #6
2CC #18	CA_66A-66A	N/A	3CC #4
2CC #19	CA_66B	N/A	No
2CC #20	CA_66C	N/A	No

Index	3CC	Restriction	Completely Covered by Measurement Superset
3CC #1	CA_2A-4A-5A	N/A	No
3CC #2	CA_2A-4A-13A	N/A	No
3CC #3	CA_4A-4A-12A	N/A	No
3CC #4	CA_5A-66A-66A	N/A	No
3CC #5	CA_12A-66A-66A	N/A	No
3CC #6	CA_26A-41C	B41 SCC Only	No
3CC #7	CA_41A-41C	N/A	No
3CC #8	CA_41D	N/A	No

Index	4CC	Restriction	Completely Covered by Measurement Superset
4CC #1	CA_41A-41D	N/A	No
4CC #2	CA_41C-41C	N/A	No

Note: Only yellow highlight cells need power measurement according to LTE DL CA SAR test Exclusion in TCB workshop (April 2018).

In applying the power measurement procedures of KDB 941225 D05A for DL CA to qualify for UL SAR test exclusion, power measurement is required only for the CA configuration with the largest aggregated DL CA BW in each frequency band, independently for contiguous and non-contiguous CA; however, if the same frequency band is used for both contiguous and non-contiguous CA, power measurement was performed using the configuration with the largest aggregated BW and maximum output power among contiguous and non-contiguous CA.

D.2 Downlink Carrier Aggregation RF Conducted Powers

D.2.1 LTE Band 2 as PCC

Combination	PCC									SCC 1				SCC 2				Power	
	Band	BW [MHz]	(UL) Ch.	(UL) Freq. [MHz]	Mod.	(UL) RB Size	(UL) RB Offset	(DL) Ch.	(DL) Freq. [MHz]	Band	BW [MHz]	(DL) Ch.	(DL) Freq. [MHz]	Band	BW [MHz]	(DL) Ch.	(DL) Freq. [MHz]	LTE Tx. Power with DL CA Enabled (dBm)	LTE Single Carrier Tx Power (dBm)
CA_2A-2A	LTE B2	20	18900	1880.0	QPSK	1	0	900	1960.0	LTE B2	20	1100	1980.0	N/A				23.11	23.18
CA_2C	LTE B2	20	18900	1880.0	QPSK	1	0	900	1960.0	LTE B2	20	1098	1979.8	N/A				23.15	23.18
CA_2A-12A	LTE B2	20	18900	1880.0	QPSK	1	0	900	1960.0	LTE B12	10	5095	737.5	N/A				23.17	23.18
CA_2A-66A	LTE B2	20	18900	1880.0	QPSK	1	0	900	1960.0	LTE B66	20	66786	2145.0	N/A				23.08	23.18
CA_2A-4A-5A	LTE B2	20	18900	1880.0	QPSK	1	0	900	1960.0	LTE B4	20	2175	2132.5	LTE B5	10	2525	881.5	23.10	23.83
CA_2A-4A-13A	LTE B2	20	18900	1880.0	QPSK	1	0	900	1960.0	LTE B4	20	2175	2132.5	LTE B13	10	5230	751.0	23.14	23.83

D.2.2 LTE Band 4 as PCC

Combination	PCC									SCC 1				SCC 2				Power	
	Band	BW [MHz]	(UL) Ch.	(UL) Freq. [MHz]	Mod.	(UL) RB Size	(UL) RB Offset	(DL) Ch.	(DL) Freq. [MHz]	Band	BW [MHz]	(DL) Ch.	(DL) Freq. [MHz]	Band	BW [MHz]	(DL) Ch.	(DL) Freq. [MHz]	LTE Tx. Power with DL CA Enabled (dBm)	LTE Single Carrier Tx Power (dBm)
CA_2A-4A-5A	LTE B4	20	20175	1732.5	QPSK	1	49	2175	2132.5	LTE B2	20	1100	1980.0	LTE B5	10	2525	881.5	22.65	22.74
CA_2A-4A-13A	LTE B4	20	20175	1732.5	QPSK	1	49	2175	2132.5	LTE B2	20	1100	1980.0	LTE B13	10	5230	751.0	22.71	22.74
CA_4A-4A-12A	LTE B4	20	20300	1745.0	QPSK	1	49	2300	2145.0	LTE B4	20	2050	2120.0	LTE B12	10	5095	737.5	22.73	22.92

D.2.3 LTE Band 5 as PCC

Combination	PCC									SCC 1				SCC 2				Power	
	Band	BW [MHz]	(UL) Ch.	(UL) Freq. [MHz]	Mod.	(UL) RB Size	(UL) RB Offset	(DL) Ch.	(DL) Freq. [MHz]	Band	BW [MHz]	(DL) Ch.	(DL) Freq. [MHz]	Band	BW [MHz]	(DL) Ch.	(DL) Freq. [MHz]	LTE Tx. Power with DL CA Enabled (dBm)	LTE Single Carrier Tx Power (dBm)
CA_5A-41A	LTE B5	10	20525	836.5	QPSK	1	49	2525	881.5	LTE B41	20	40620	2593.0	N/A				23.88	23.91
CA_2A-4A-5A	LTE B5	10	20525	836.5	QPSK	1	49	2525	881.5	LTE B2	20	900	1960.0	LTE B4	20	2175	2132.5	23.85	23.91
CA_5A-66A-66A	LTE B5	10	20525	836.5	QPSK	1	49	2525	881.5	LTE B66	20	66786	2145.0	LTE B66	20	67036	2170.0	23.81	23.91

D.2.4 LTE Band 12 as PCC

Combination	PCC									SCC 1				SCC 2				Power	
	Band	BW [MHz]	(UL) Ch.	(UL) Freq. [MHz]	Mod.	(UL) RB Size	(UL) RB Offset	(DL) Ch.	(DL) Freq. [MHz]	Band	BW [MHz]	(DL) Ch.	(DL) Freq. [MHz]	Band	BW [MHz]	(DL) Ch.	(DL) Freq. [MHz]	LTE Tx. Power with DL CA Enabled (dBm)	LTE Single Carrier Tx Power (dBm)
CA_2A-12A	LTE B12	10	23095	707.5	QPSK	1	49	5095	737.5	LTE B2	20	900	1960.0	N/A				23.90	23.98
CA_4A-4A-12A	LTE B12	10	23095	707.5	QPSK	1	49	5095	737.5	LTE B4	20	2300	2145.0	LTE B4	20	2050	2120.0	23.92	23.98
CA_12A-66A-66A	LTE B12	10	23095	707.5	QPSK	1	49	5095	737.5	LTE B66	20	66786	2145.0	LTE B66	20	67036	2170.0	23.88	23.98

D.2.5 LTE Band 13 as PCC

Combination	PCC									SCC 1				SCC 2				Power	
	Band	BW [MHz]	(UL) Ch.	(UL) Freq. [MHz]	Mod.	(UL) RB Size	(UL) RB Offset	(DL) Ch.	(DL) Freq. [MHz]	Band	BW [MHz]	(DL) Ch.	(DL) Freq. [MHz]	Band	BW [MHz]	(DL) Ch.	(DL) Freq. [MHz]	LTE Tx. Power with DL CA Enabled (dBm)	LTE Single Carrier Tx Power (dBm)
CA_2A-4A-13A	LTE B13	10	23230	782.0	QPSK	1	25	5230	751.0	LTE B2	20	900	1960.0	LTE B4	20	2175	2132.5	23.55	23.61

D.2.6 LTE Band 26 as PCC

Combination	PCC									SCC 1				SCC 2				Power	
	Band	BW [MHz]	(UL) Ch.	(UL) Freq. [MHz]	Mod.	(UL) RB Size	(UL) RB Offset	(DL) Ch.	(DL) Freq. [MHz]	Band	BW [MHz]	(DL) Ch.	(DL) Freq. [MHz]	Band	BW [MHz]	(DL) Ch.	(DL) Freq. [MHz]	LTE Tx. Power with DL CA Enabled (dBm)	LTE Single Carrier Tx Power (dBm)
CA_26A-41A	LTE B26	15	26865	831.5	QPSK	1	36	8865	876.5	LTE B41	20	40620	2593.0	N/A				23.41	23.48
CA_26A-41C	LTE B26	15	26865	831.5	QPSK	1	36	8865	876.5	LTE B41	20	40620	2593.0	LTE B41	20	40818	2612.8	23.38	23.48

D.2.7 LTE Band 41 as PCC

Combination	PCC									SCC 1				SCC 2				SCC 3				Power	
	Band	BW [MHz]	(UL) Ch.	(UL) Freq. [MHz]	Mod.	(UL) RB Size	(UL) RB Offset	(DL) Ch.	(DL) Freq. [MHz]	Band	BW [MHz]	(DL) Ch.	(DL) Freq. [MHz]	Band	BW [MHz]	(DL) Ch.	(DL) Freq. [MHz]	Band	BW [MHz]	(DL) Ch.	(DL) Freq. [MHz]	LTE Tx. Power with DL CA Enabled (dBm)	LTE Single Carrier Tx Power (dBm)
CA-41A-41A	LTE B41	20	39750	2506.0	QPSK	1	0	39750	2506.0	LTE B41	20	41490	2680.0	N/A								23.91	23.95
CA-41A-41C	LTE B41	20	39750	2506.0	QPSK	1	0	39750	2506.0	LTE B41	20	41490	2680.0	LTE B41	20	41292	2660.2	N/A				23.88	23.95
CA-41C-41A	LTE B41	20	39750	2506.0	QPSK	1	0	39750	2506.0	LTE B41	20	39948	2525.8	LTE B41	20	41490	2680.0	N/A				23.90	23.95
CA-41D	LTE B41	20	39750	2506.0	QPSK	1	0	39750	2506.0	LTE B41	20	39948	2525.8	LTE B41	20	40146	2545.6	N/A				23.90	23.95
CA-41A-41D	LTE B41	20	39750	2506.0	QPSK	1	0	39750	2506.0	LTE B41	20	41490	2680.0	LTE B41	20	41292	2660.2	LTE B41	20	41094	2640.4	23.85	23.95
CA-41D-41A	LTE B41	20	39750	2506.0	QPSK	1	0	39750	2506.0	LTE B41	20	39948	2525.8	LTE B41	20	40146	2545.6	LTE B41	20	41490	2680.0	23.86	23.95
CA-41C-41C	LTE B41	20	39750	2506.0	QPSK	1	0	39750	2506.0	LTE B41	20	39948	2525.8	LTE B41	20	41490	2680.0	LTE B41	20	41292	2660.2	23.82	23.95

D.2.8 LTE Band 66 as PCC

Combination	PCC									SCC 1				SCC 2				Power	
	Band	BW [MHz]	(UL) Ch.	(UL) Freq. [MHz]	Mod.	(UL) RB Size	(UL) RB Offset	(DL) Ch.	(DL) Freq. [MHz]	Band	BW [MHz]	(DL) Ch.	(DL) Freq. [MHz]	Band	BW [MHz]	(DL) Ch.	(DL) Freq. [MHz]	LTE Tx. Power with DL CA Enabled (dBm)	LTE Single Carrier Tx Power (dBm)
CA_2A-66A	LTE B66	20	132572	1770.0	QPSK	1	49	67036	2170.0	LTE B2	20	900	1960.0	N/A				23.02	23.09
CA_66B	LTE B66	15	132597	1772.5	QPSK	1	0	67061	2172.5	LTE B66	5	66968	2163.2	N/A				23.05	23.11
CA_66C	LTE B66	20	132572	1770.0	QPSK	1	49	67036	2170.0	LTE B66	20	66838	2150.2	N/A				23.07	23.09
CA_5A-66A-66A	LTE B66	20	132572	1770.0	QPSK	1	49	67036	2170.0	LTE B66	20	66536	2120.0	LTE B5	10	2525	881.5	23.01	23.09
CA_12A-66A-66A	LTE B66	20	132572	1770.0	QPSK	1	49	67036	2170.0	LTE B66	20	66536	2120.0	LTE B12	10	5095	737.5	23.05	23.09

D.3 LTE Downlink Carrier Aggregation with 4X4 MIMO

This device supports downlink 4x4 MIMO operations for some LTE bands.

Uplink transmission is limited to a single output stream. When carrier aggregation was applicable, the general test selection and setup procedures described in Appendix C.1 were applied.

According to LTE Test conditions in TCB workshop(May, 2017), SAR is excluded for LTE downlink 4x4 MIMO operation when uplink output with DL MIMO does not exceed highest uplink output power configuration without DL MIMO by more than a 1/4 dB. And for DL MIMO with carrier aggregation, the same SAR test exclusion procedure is considered.

Index	2CC	Restriction	Completely Covered by Measurement Superset
2CC #1	CA_2A-[4A]	N/A	3CC #1
2CC #2	CA_2A-[66A]	N/A	No
2CC #3	CA_[4A]-4A	N/A	No
2CC #4	CA_4A-[4A]	N/A	No
2CC #5	CA_[4A]-[4A]	N/A	No
2CC #6	CA_[4A]-5A	N/A	3CC #1
2CC #7	CA_[4A]-12A	N/A	No
2CC #8	CA_[4A]-13A	N/A	3CC #2
2CC #9	CA_5A-[66A]	N/A	3CC #3
2CC #10	CA_12A-[66A]	N/A	3CC #6
2CC #11	CA_[66A]-66A	N/A	3CC #3
2CC #12	CA_66A-[66A]	N/A	3CC #4
2CC #13	CA_[66A]-[66A]	N/A	3CC #5
2CC #14	CA_[66B]	N/A	No
2CC #15	CA_[66C]	N/A	No

Index	3CC	Restriction	Completely Covered by Measurement Superset
3CC #1	CA_2A-[4A]-5A	N/A	No
3CC #2	CA_2A-[4A]-13A	N/A	No
3CC #3	CA_5A-[66A]-66A	N/A	No
3CC #4	CA_5A-66A-[66A]	N/A	No
3CC #5	CA_5A-[66A]-[66A]	N/A	No
3CC #6	CA_12A-[66A]-66A	N/A	No
3CC #7	CA_12A-66A-[66A]	N/A	No
3CC #8	CA_12A-[66A]-[66A]	N/A	No

Note: “[ ]” is 4X4 MIMO Configuration.

D.4 Downlink Carrier Aggregation RF Conducted Powers With 4X4 MIMO

D.4.1 LTE 4X4 MIMO DL Standalone Powers

LTE Band	BW [MHz]	Ch.	Freq. [MHz]	Mod.	RB Size	RB Offset	4X4 DL MIMO Tx. Power (dBm)	Single Antenna Tx Power (dBm)
4	20	20175	1732.5	QPSK	1	49	23.70	23.74
66	20	132572	1770.0	QPSK	1	49	22.95	23.09

D.4.2 LTE Band 2 as PCC

Combination	PCC									SCC 1				SCC 2				Power	
	Band	BW [MHz]	(UL) Ch.	(UL) Freq. [MHz]	Mod.	(UL) RB Size	(UL) RB Offset	(DL) Ch.	(DL) Freq. [MHz]	Band	BW [MHz]	(DL) Ch.	(DL) Freq. [MHz]	Band	BW [MHz]	(DL) Ch.	(DL) Freq. [MHz]	LTE Tx. Power with DL CA Enabled (dBm)	LTE Single Carrier Tx Power (dBm)
CA_2A-[66A]	LTE B2	20	18900	1880.0	QPSK	1	0	900	1960.0	LTE B66	20	66786	2145.0	N/A				23.11	23.18
CA_2A-[4A]-5A	LTE B2	20	18900	1880.0	QPSK	1	0	900	1960.0	LTE B4	20	2175	2132.5	LTE B5	10	2525	881.5	23.06	23.18
CA_2A-[4A]-13A	LTE B2	20	18900	1880.0	QPSK	1	0	900	1960.0	LTE B4	20	2175	2132.5	LTE B13	10	5230	751.0	23.09	23.18

D.4.3 LTE Band 4 as PCC

Combination	PCC									SCC 1				SCC 2				Power	
	Band	BW [MHz]	(UL) Ch.	(UL) Freq. [MHz]	Mod.	(UL) RB Size	(UL) RB Offset	(DL) Ch.	(DL) Freq. [MHz]	Band	BW [MHz]	(DL) Ch.	(DL) Freq. [MHz]	Band	BW [MHz]	(DL) Ch.	(DL) Freq. [MHz]	LTE Tx. Power with DL CA Enabled (dBm)	LTE Single Carrier Tx Power (dBm)
CA_[4A]-4A	LTE B4	20	20300	1745.0	QPSK	1	49	2300	2145.0	LTE B4	20	2050	2120.0	N/A				22.88	22.92
CA_4A-[4A]	LTE B4	20	20300	1745.0	QPSK	1	49	2300	2145.0	LTE B4	20	2050	2120.0	N/A				22.85	22.92
CA_[4A]-[4A]	LTE B4	20	20300	1745.0	QPSK	1	49	2300	2145.0	LTE B4	20	2050	2120.0	N/A				22.87	22.92
CA_[4A]-12A	LTE B4	20	20175	1732.5	QPSK	1	49	2175	2132.5	LTE B12	10	5095	737.5	N/A				22.70	22.74
CA_2A-[4A]-5A	LTE B4	20	20175	1732.5	QPSK	1	49	2175	2132.5	LTE B2	20	1100	1980.0	LTE B5	10	2525	881.5	22.66	22.74
CA_2A-[4A]-13A	LTE B4	20	20175	1732.5	QPSK	1	49	2175	2132.5	LTE B2	20	1100	1980.0	LTE B13	10	5230	751.0	22.55	22.74

D.4.4 LTE Band 5 as PCC

Combination	PCC									SCC 1				SCC 2				Power	
	Band	BW [MHz]	(UL) Ch.	(UL) Freq. [MHz]	Mod.	(UL) RB Size	(UL) RB Offset	(DL) Ch.	(DL) Freq. [MHz]	Band	BW [MHz]	(DL) Ch.	(DL) Freq. [MHz]	Band	BW [MHz]	(DL) Ch.	(DL) Freq. [MHz]	LTE Tx. Power with DL CA Enabled (dBm)	LTE Single Carrier Tx Power (dBm)
CA_2A-[4A]-5A	LTE B5	10	20525	836.5	QPSK	1	49	2525	881.5	LTE B2	20	900	1960.0	LTE B4	20	2175	2132.5	23.80	23.91
CA_5A-[66A]-66A	LTE B5	10	20525	836.5	QPSK	1	49	2525	881.5	LTE B66	20	66786	2145.0	LTE B66	20	67036	2170.0	23.84	23.91
CA_5A-66A-[66A]	LTE B5	10	20525	836.5	QPSK	1	49	2525	881.5	LTE B66	20	66786	2145.0	LTE B66	20	67036	2170.0	23.77	23.91
CA_5A-[66A]-[66A]	LTE B5	10	20525	836.5	QPSK	1	49	2525	881.5	LTE B66	20	66786	2145.0	LTE B66	20	67036	2170.0	23.79	23.91

D.4.5 LTE Band 12 as PCC

Combination	PCC									SCC 1				SCC 2				Power	
	Band	BW [MHz]	(UL) Ch.	(UL) Freq. [MHz]	Mod.	(UL) RB Size	(UL) RB Offset	(DL) Ch.	(DL) Freq. [MHz]	Band	BW [MHz]	(DL) Ch.	(DL) Freq. [MHz]	Band	BW [MHz]	(DL) Ch.	(DL) Freq. [MHz]	LTE Tx. Power with DL CA Enabled (dBm)	LTE Single Carrier Tx Power (dBm)
CA_[4A]-12A	LTE B12	10	23095	707.5	QPSK	1	49	5095	737.5	LTE B4	20	2300	2145.0	N/A				23.90	23.98
CA_12A-[66A]-66A	LTE B12	10	23095	707.5	QPSK	1	49	5095	737.5	LTE B66	20	66786	2145.0	LTE B66	20	67036	2170.0	23.85	23.98
CA_12A-66A-[66A]	LTE B12	10	23095	707.5	QPSK	1	49	5095	737.5	LTE B66	20	66786	2145.0	LTE B66	20	67036	2170.0	23.81	23.98
CA_12A-[66A]-[66A]	LTE B12	10	23095	707.5	QPSK	1	49	5095	737.5	LTE B66	20	66786	2145.0	LTE B66	20	67036	2170.0	23.80	23.98

D.4.6 LTE Band 13 as PCC

Combination	PCC									SCC 1				SCC 2				Power	
	Band	BW [MHz]	(UL) Ch.	(UL) Freq. [MHz]	Mod.	(UL) RB Size	(UL) RB Offset	(DL) Ch.	(DL) Freq. [MHz]	Band	BW [MHz]	(DL) Ch.	(DL) Freq. [MHz]	Band	BW [MHz]	(DL) Ch.	(DL) Freq. [MHz]	LTE Tx. Power with DL CA Enabled (dBm)	LTE Single Carrier Tx Power (dBm)
CA_2A-[4A]-13A	LTE B13	10	23230	782.0	QPSK	1	25	5230	751.0	LTE B2	20	900	1960.0	LTE B4	20	2175	2132.5	23.49	23.61

D.4.7 LTE Band 66 as PCC

Combination	PCC									SCC 1				SCC 2				Power	
	Band	BW [MHz]	(UL) Ch.	(UL) Freq. [MHz]	Mod.	(UL) RB Size	(UL) RB Offset	(DL) Ch.	(DL) Freq. [MHz]	Band	BW [MHz]	(DL) Ch.	(DL) Freq. [MHz]	Band	BW [MHz]	(DL) Ch.	(DL) Freq. [MHz]	LTE Tx. Power with DL CA Enabled (dBm)	LTE Single Carrier Tx Power (dBm)
CA_2A-[66A]	LTE B66	20	132572	1770.0	QPSK	1	49	67036	2170.0	LTE B2	20	900	1960.0	N/A				23.05	23.09
CA_[66B]	LTE B66	15	132597	1772.5	QPSK	1	0	67061	2172.5	LTE B66	5	66968	2163.2	N/A				23.01	23.11
CA_[66C]	LTE B66	20	132572	1770.0	QPSK	1	49	67036	2170.0	LTE B66	20	66838	2150.2	N/A				22.99	23.09
CA_5A-[66A]-66A	LTE B66	20	132572	1770.0	QPSK	1	49	67036	2170.0	LTE B66	20	66536	2120.0	LTE B5	10	2525	881.5	22.95	23.09
CA_5A-66A-[66A]	LTE B66	20	132572	1770.0	QPSK	1	49	67036	2170.0	LTE B66	20	66536	2120.0	LTE B5	10	2525	881.5	23.01	23.09
CA_5A-[66A]-[66A]	LTE B66	20	132572	1770.0	QPSK	1	49	67036	2170.0	LTE B66	20	66536	2120.0	LTE B5	10	2525	881.5	22.98	23.09
CA_12A-[66A]-66A	LTE B66	20	132572	1770.0	QPSK	1	49	67036	2170.0	LTE B66	20	66536	2120.0	LTE B12	10	5095	737.5	22.95	23.09
CA_12A-66A-[66A]	LTE B66	20	132572	1770.0	QPSK	1	49	67036	2170.0	LTE B66	20	66536	2120.0	LTE B12	10	5095	737.5	22.91	23.09
CA_12A-[66A]-[66A]	LTE B66	20	132572	1770.0	QPSK	1	49	67036	2170.0	LTE B66	20	66536	2120.0	LTE B12	10	5095	737.5	22.94	23.09

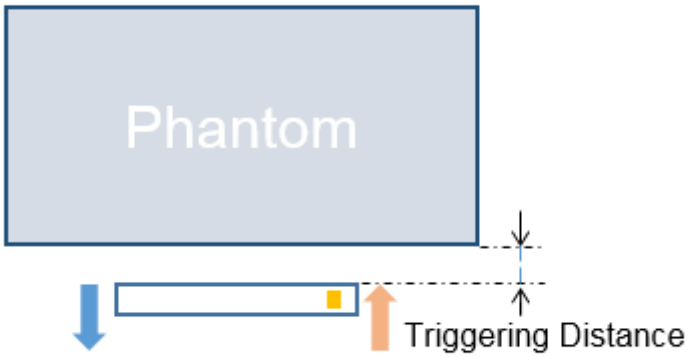
Appendix E. Power Reduction Verification

Proximity Sensor Triggering Distance (KDB 616217 §6.2)

Rear, Right Edge, Right Corner, Left Edge, Left Corner and Top of the DUT was placed directly below the flat phantom. The DUT was moved toward the phantom in accordance with the steps outlined in KDB 616217 §6.2 to determine the trigger distance for enabling power reduction. The DUT was moved away from the phantom to determine the trigger distance for resuming full power.

The DUT featured a visual indicator on its display that showed the status of the proximity sensor (Triggered or not triggered).This was used to determine the status of the sensor during the proximity sensor assessment as monitoring the output power directly was not practical without affecting the measurement.

It was confirmed separately that the output power was altered according to the proximity sensor status indication. This was achieved by observing the proximity sensor status at the same time as monitoring the conducted power contains both the full and reduced conducted power measurements.



LEGEND
Direction of DUT travel for determination of power reduction triggering point
Direction of DUT travel for determination of full power resumption triggering point

Resulting test positions for SAR mearsurementes

Tissue simulating liquid	Band	Trigger distance – Rear		
		Moving toward phantom	Moving from phantom	Worst case distance for SAR
750 Head	LTE Band 12	20mm	20mm	19mm
	LTE Band 13			
850 Head	GSM 850	20mm	20mm	19mm
	WCDMA V			
	LTE Band 5			
	LTE Band 26			
1750 Head	WCDMA IV	20mm	20mm	19mm
	LTE Band 4			
	LTE Band 66			
1900 Head	GSM1900	20mm	20mm	19mm
	WCDMA II			
	LTE Band 2			
	LTE Band 25			
2600 Head	LTE Band 41	20mm	20mm	19mm
2450 Head	WLAN Ant.1	19mm	19mm	18mm
5000 Head		19mm	19mm	18mm
2450 Head	WLAN Ant.2	11mm	11mm	10mm
5000 Head		11mm	11mm	10mm

Proximity Sensor Triggering Distance Measurement Results – Rear Side

DUT Moving Toward (Trigger) and Away (Release) from the Phantom

Distance to DUT Output Power (dBm)										
Distance (mm)	25	24	23	22	21	20	19	18	17	16
GSM850 Voice &GPRS 1Tx	33.39	33.38	33.35	33.38	33.45	22.76	22.85	22.78	22.81	22.85
GSM850 GPRS2Tx	32.27	32.27	32.29	32.27	32.26	21.71	21.75	21.75	21.70	21.72
GSM850 GPRS3Tx	30.25	30.20	30.25	30.25	30.17	19.71	19.76	19.73	19.70	19.76
GSM850 GPRS4Tx	28.31	28.24	28.30	28.35	28.32	17.67	17.74	17.72	17.64	17.66
GSM1900 Voice &GPRS 1Tx	29.85	29.82	29.83	29.87	29.79	21.76	21.83	21.73	21.83	21.81
GSM1900 GPRS2Tx	28.96	28.95	28.93	28.98	28.87	19.77	19.84	19.83	19.81	19.78
GSM1900 GPRS3Tx	27.47	27.48	27.44	27.47	27.40	17.92	17.85	17.93	17.89	17.95
GSM1900 GPRS4Tx	25.43	25.48	25.44	25.39	25.39	15.81	15.88	15.86	15.88	15.93
WCDMA II	23.13	23.05	23.07	23.05	23.09	13.08	13.11	13.19	13.16	13.16
WCDMA IV	22.73	22.69	22.71	22.70	22.69	12.76	12.70	12.65	12.68	12.73
WCDMA V	23.52	23.55	23.52	23.43	23.46	13.86	13.92	13.93	13.83	13.84
LTE Band 2	23.23	23.18	23.23	23.17	23.23	13.37	13.40	13.44	13.34	13.43
LTE Band 4	22.78	22.75	22.76	22.80	22.68	12.77	12.72	12.71	12.69	12.71
LTE Band 5	23.92	23.91	23.87	23.94	23.86	15.11	15.07	15.09	15.14	15.03
LTE Band 12	24.04	23.94	24.02	24.04	23.95	14.54	14.47	14.52	14.42	14.46
LTE Band 13	23.57	23.67	23.61	23.63	23.65	13.90	13.89	13.82	13.80	13.86
LTE Band 25	23.33	23.35	23.42	23.42	23.42	13.43	13.33	13.41	13.38	13.42
LTE Band 26	23.49	23.47	23.45	23.44	23.44	13.96	14.00	14.04	14.01	13.96
LTE Band 41	24.01	23.92	23.92	23.97	23.98	13.93	13.97	13.94	13.99	13.97
LTE Band 66	23.06	23.06	23.03	23.07	23.14	13.20	13.26	13.25	13.31	13.31

Proximity Sensor Triggering Distance Measurement Results – Rear Side (Ant.1)

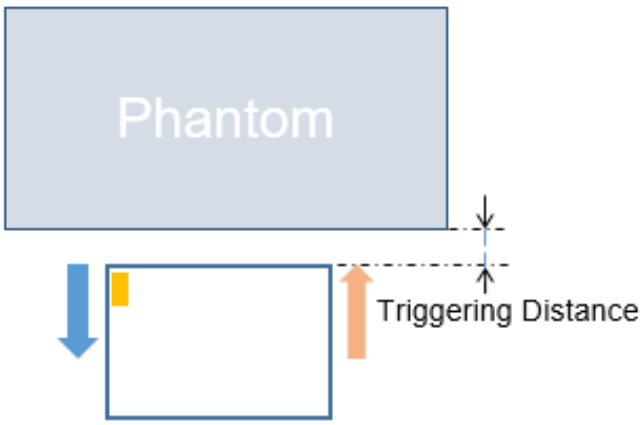
DUT Moving Toward (Trigger) and Away (Release) from the Phantom

Distance to DUT Output Power (dBm)										
Distance (mm)	24	23	22	21	20	19	18	17	16	15
2.4 GHz 802.11b	19.83	19.84	19.81	19.84	19.78	12.19	12.19	12.19	12.24	12.24
2.4 GHz 802.11g	18.27	18.23	18.15	18.21	18.23	12.37	12.27	12.34	12.25	12.34
2.4 GHz 802.11n	16.86	16.96	16.94	16.95	16.91	12.54	12.59	12.50	12.57	12.54
5 GHz 802.11a	17.73	17.69	17.76	17.73	17.80	8.64	8.60	8.62	8.58	8.60
5 GHz 802.11n 20MHz	16.67	16.66	16.72	16.74	16.65	8.63	8.53	8.56	8.57	8.53
5 GHz 802.11n 40MHz	16.83	16.91	16.87	16.86	16.89	8.82	8.82	8.90	8.84	8.88
5 GHz 802.11ac 20MHz	16.87	16.89	16.91	16.83	16.82	8.80	8.75	8.74	8.70	8.78
5 GHz 802.11ac 40MHz	14.47	14.44	14.46	14.52	14.47	8.61	8.63	8.61	8.66	8.62
5 GHz 802.11ac 80MHz	13.50	13.50	13.54	13.52	13.49	8.35	8.35	8.37	8.39	8.37

Proximity Sensor Triggering Distance Measurement Results – Rear Side (Ant.2)

DUT Moving Toward (Trigger) and Away (Release) from the Phantom

Distance to DUT Output Power (dBm)										
Distance (mm)	16	15	14	13	12	11	10	9	8	7
2.4 GHz 802.11b	19.91	19.97	19.94	19.95	19.88	12.27	12.21	12.25	12.23	12.31
2.4 GHz 802.11g	18.43	18.49	18.48	18.53	18.51	12.72	12.82	12.71	12.82	12.76
2.4 GHz 802.11n	17.29	17.24	17.23	17.27	17.23	12.85	12.91	12.93	12.86	12.82
5 GHz 802.11a	17.17	17.17	17.17	17.13	17.23	8.73	8.71	8.77	8.81	8.70
5 GHz 802.11n 20MHz	16.02	16.01	16.00	15.98	16.07	8.67	8.60	8.64	8.59	8.57
5 GHz 802.11n 40MHz	16.36	16.33	16.38	16.35	16.34	8.52	8.50	8.54	8.50	8.54
5 GHz 802.11ac 20MHz	16.13	16.14	16.12	16.19	16.18	8.41	8.37	8.46	8.45	8.41
5 GHz 802.11ac 40MHz	14.41	14.45	14.45	14.45	14.46	8.51	8.50	8.50	8.49	8.52
5 GHz 802.11ac 80MHz	13.38	13.34	13.40	13.44	13.37	8.45	8.53	8.51	8.44	8.52



LEGEND
Direction of DUT travel for determination of power reduction triggering point
Direction of DUT travel for determination of full power resumption triggering point

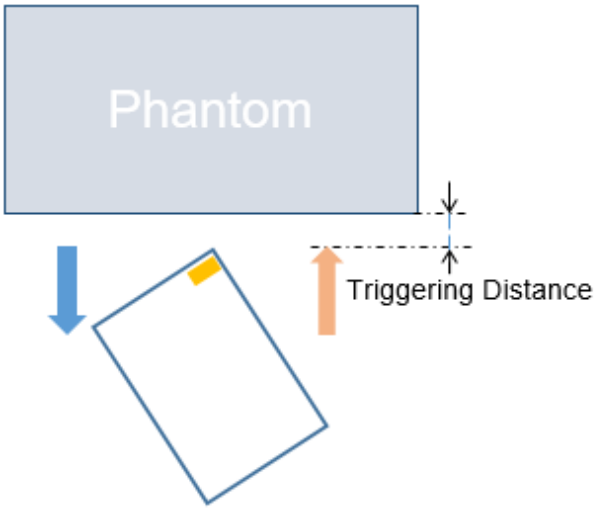
Resulting test positions for SAR mearsurementes

Tissue simulating liquid	Band	Trigger distance – Right Edge		
		Moving toward phantom	Moving from phantom	Worst case distance for SAR
750 Head	LTE Band 12	8mm	8mm	7mm
	LTE Band 13			
850 Head	GSM 850	8mm	8mm	7mm
	WCDMA V			
	LTE Band 5			
	LTE Band 26			
1750 Head	WCDMA IV	8mm	8mm	7mm
	LTE Band 4			
	LTE Band 66			
1900 Head	GSM1900	8mm	8mm	7mm
	WCDMA II			
	LTE Band 2			
	LTE Band 25			
2600 Head	LTE Band 41	8mm	8mm	7mm
2450 Head	WLAN Ant.1	8mm	8mm	7mm
5000 Head		8mm	8mm	7mm
2450 Head	Bluetooth Ant.1	8mm	8mm	7mm

Proximity Sensor Triggering Distance Measurement Results – Right Edge

DUT Moving Toward (Trigger) and Away (Release) from the Phantom

Distance to DUT Output Power (dBm)										
Distance (mm)	13	12	11	10	9	8	7	6	5	4
GSM850 Voice &GPRS 1Tx	33.44	33.42	33.42	33.43	33.35	22.80	22.88	22.79	22.83	22.76
GSM850 GPRS2Tx	32.24	32.30	32.24	32.22	32.21	21.74	21.75	21.67	21.73	21.70
GSM850 GPRS3Tx	30.17	30.19	30.25	30.24	30.22	19.65	19.66	19.64	19.71	19.72
GSM850 GPRS4Tx	28.25	28.32	28.31	28.29	28.31	17.66	17.72	17.67	17.69	17.72
GSM1900 Voice &GPRS 1Tx	29.81	29.86	29.81	29.84	29.77	21.80	21.78	21.74	21.76	21.75
GSM1900 GPRS2Tx	28.94	28.89	28.93	28.90	28.92	19.82	19.83	19.73	19.80	19.84
GSM1900 GPRS3Tx	27.38	27.36	27.46	27.43	27.40	17.95	17.92	17.93	17.96	17.93
GSM1900 GPRS4Tx	25.39	25.37	25.42	25.37	25.38	15.93	15.83	15.93	15.87	15.90
WCDMA II	23.07	23.07	23.10	23.11	23.07	13.09	13.12	13.12	13.15	13.17
WCDMA IV	22.69	22.71	22.71	22.74	22.68	12.76	12.64	12.65	12.67	12.72
WCDMA V	23.43	23.47	23.43	23.45	23.44	13.82	13.88	13.93	13.92	13.81
LTE Band 2	23.18	23.17	23.20	23.23	23.17	13.37	13.42	13.36	13.35	13.34
LTE Band 4	22.74	22.76	22.76	22.73	22.74	12.76	12.74	12.78	12.77	12.80
LTE Band 5	23.94	23.97	23.87	23.85	23.91	15.11	15.06	15.10	15.04	15.11
LTE Band 12	23.93	24.04	23.94	23.92	23.95	14.43	14.46	14.45	14.45	14.53
LTE Band 13	23.65	23.60	23.56	23.67	23.67	13.85	13.89	13.86	13.87	13.86
LTE Band 25	23.31	23.35	23.41	23.38	23.36	13.37	13.31	13.39	13.41	13.38
LTE Band 26	23.50	23.49	23.51	23.44	23.54	14.02	14.07	14.06	13.97	14.05
LTE Band 41	23.89	23.92	23.98	24.01	23.99	14.00	14.00	13.97	13.91	13.91
LTE Band 66	23.03	23.15	23.03	23.06	23.09	13.21	13.25	13.25	13.29	13.29
2.4 GHz 802.11b	19.76	19.72	19.79	19.73	19.79	12.25	12.21	12.30	12.24	12.21
2.4 GHz 802.11g	18.20	18.15	18.17	18.21	18.21	12.36	12.33	12.35	12.27	12.30
2.4 GHz 802.11n	16.97	16.92	16.97	16.86	16.97	12.57	12.58	12.52	12.58	12.50
5 GHz 802.11a	17.69	17.70	17.78	17.72	17.81	8.58	8.55	8.56	8.63	8.63
5 GHz 802.11n 20MHz	16.68	16.69	16.75	16.66	16.70	8.60	8.59	8.57	8.61	8.63
5 GHz 802.11n 40MHz	16.82	16.86	16.87	16.87	16.86	8.83	8.91	8.83	8.83	8.82
5 GHz 802.11ac 20MHz	16.85	16.92	16.91	16.83	16.84	8.81	8.80	8.79	8.76	8.75
5 GHz 802.11ac 40MHz	14.52	14.47	14.52	14.52	14.43	8.68	8.69	8.69	8.61	8.61
5 GHz 802.11ac 80MHz	13.45	13.56	13.51	13.49	13.47	8.31	8.35	8.32	8.32	8.29
Bluetooth BDR_DH5	12.42	12.40	12.50	12.42	12.40	10.84	10.78	10.79	10.84	10.80



LEGEND
Direction of DUT travel for determination of power reduction triggering point
Direction of DUT travel for determination of full power resumption triggering point

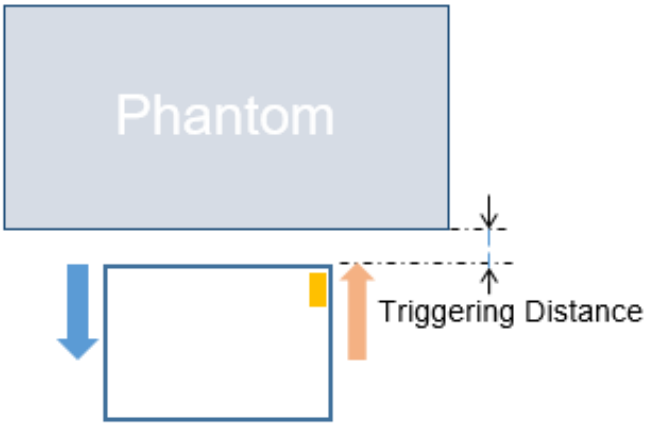
Resulting test positions for SAR mearsurementes

Tissue simulating liquid	Band	Trigger distance – Right Corner		
		Moving toward phantom	Moving from phantom	Worst case distance for SAR
750 Head	LTE Band 12	12mm	12mm	11mm
	LTE Band 13			
850 Head	GSM 850	12mm	12mm	11mm
	WCDMA V			
	LTE Band 5			
	LTE Band 26			
1750 Head	WCDMA IV	12mm	12mm	11mm
	LTE Band 4			
	LTE Band 66			
1900 Head	GSM1900	12mm	12mm	11mm
	WCDMA II			
	LTE Band 2			
	LTE Band 25			
2600 Head	LTE Band 41	12mm	12mm	11mm
2450 Head	WLAN Ant.1	12mm	12mm	11mm
5000 Head		12mm	12mm	11mm
2450 Head	Bluetooth Ant.1	12mm	12mm	11mm

Proximity Sensor Triggering Distance Measurement Results – Right Corner

DUT Moving Toward (Trigger) and Away (Release) from the Phantom

Distance to DUT Output Power (dBm)										
Distance (mm)	17	16	15	14	13	12	11	10	9	8
GSM850 Voice &GPRS 1Tx	33.38	33.38	33.45	33.37	33.39	22.87	22.85	22.80	22.83	22.79
GSM850 GPRS2Tx	32.28	32.21	32.26	32.24	32.26	21.73	21.73	21.78	21.70	21.77
GSM850 GPRS3Tx	30.28	30.23	30.21	30.20	30.27	19.67	19.73	19.72	19.70	19.66
GSM850 GPRS4Tx	28.28	28.33	28.36	28.28	28.29	17.74	17.71	17.73	17.74	17.63
GSM1900 Voice &GPRS 1Tx	29.80	29.82	29.79	29.80	29.85	21.80	21.77	21.82	21.81	21.79
GSM1900 GPRS2Tx	28.87	28.87	28.88	28.91	28.88	19.74	19.81	19.78	19.72	19.78
GSM1900 GPRS3Tx	27.45	27.38	27.40	27.46	27.46	17.85	17.94	17.95	17.87	17.84
GSM1900 GPRS4Tx	25.48	25.38	25.46	25.48	25.47	15.87	15.91	15.92	15.89	15.82
WCDMA II	23.05	23.09	23.12	23.12	23.09	13.10	13.13	13.12	13.19	13.17
WCDMA IV	22.75	22.70	22.74	22.68	22.76	12.71	12.71	12.65	12.70	12.73
WCDMA V	23.52	23.52	23.50	23.51	23.52	13.93	13.87	13.93	13.89	13.88
LTE Band 2	23.18	23.19	23.14	23.13	23.23	13.42	13.38	13.36	13.44	13.42
LTE Band 4	22.70	22.68	22.68	22.79	22.73	12.74	12.76	12.71	12.71	12.77
LTE Band 5	23.86	23.91	23.95	23.96	23.96	15.08	15.10	15.07	15.10	15.10
LTE Band 12	24.04	23.94	23.95	23.96	23.97	14.45	14.51	14.48	14.50	14.45
LTE Band 13	23.61	23.60	23.66	23.56	23.63	13.88	13.83	13.83	13.87	13.87
LTE Band 25	23.40	23.41	23.31	23.37	23.41	13.36	13.31	13.31	13.31	13.33
LTE Band 26	23.45	23.45	23.44	23.48	23.50	14.01	14.01	14.06	13.98	14.00
LTE Band 41	24.01	23.95	23.99	23.90	23.92	14.00	13.95	13.99	14.00	14.01
LTE Band 66	23.08	23.07	23.13	23.11	23.05	13.32	13.27	13.22	13.25	13.25
2.4 GHz 802.11b	19.76	19.76	19.80	19.80	19.80	12.21	12.23	12.20	12.18	12.28
2.4 GHz 802.11g	18.19	18.20	18.27	18.15	18.17	12.29	12.33	12.29	12.25	12.36
2.4 GHz 802.11n	16.93	16.92	16.87	16.96	16.95	12.52	12.59	12.48	12.47	12.54
5 GHz 802.11a	17.75	17.77	17.70	17.72	17.74	8.65	8.62	8.67	8.61	8.66
5 GHz 802.11n 20MHz	16.71	16.66	16.65	16.68	16.76	8.58	8.54	8.54	8.54	8.62
5 GHz 802.11n 40MHz	16.94	16.85	16.91	16.89	16.94	8.83	8.87	8.88	8.83	8.80
5 GHz 802.11ac 20MHz	16.86	16.86	16.85	16.85	16.82	8.72	8.76	8.76	8.78	8.75
5 GHz 802.11ac 40MHz	14.54	14.47	14.44	14.49	14.52	8.63	8.71	8.71	8.71	8.67
5 GHz 802.11ac 80MHz	13.55	13.52	13.49	13.56	13.54	8.30	8.31	8.39	8.35	8.35
Bluetooth BDR_DH5	12.46	12.42	12.43	12.43	12.43	10.85	10.82	10.87	10.84	10.77



LEGEND
Direction of DUT travel for determination of power reduction triggering point
Direction of DUT travel for determination of full power resumption triggering point

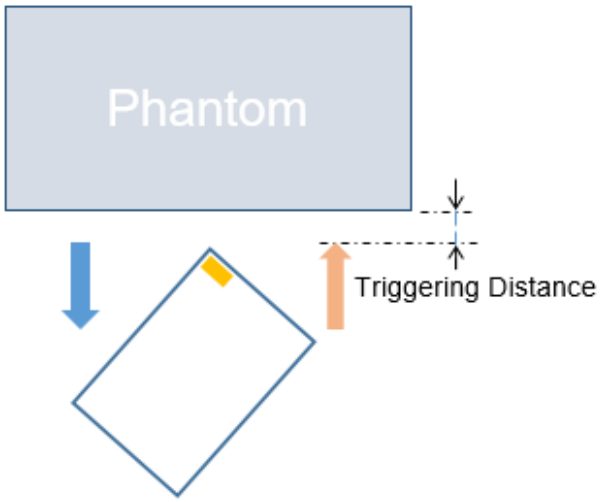
Resulting test positions for SAR mearsurementes

Tissue simulating liquid	Band	Trigger distance – Left Edge		
		Moving toward phantom	Moving from phantom	Worst case distance for SAR
2450 Head	Bluetooth Ant.2	5mm	5mm	4mm
2450 Head	WLAN Ant.2	5mm	5mm	4mm
5000 Head		5mm	5mm	4mm

Proximity Sensor Triggering Distance Measurement Results – Left Edge

DUT Moving Toward (Trigger) and Away (Release) from the Phantom

Distance to DUT Output Power (dBm)										
Distance (mm)	10	9	8	7	6	5	4	3	2	1
2.4 GHz 802.11b	19.96	19.98	19.92	19.86	19.90	12.27	12.30	12.29	12.22	12.26
2.4 GHz 802.11g	18.42	18.44	18.46	18.48	18.53	12.72	12.82	12.72	12.79	12.79
2.4 GHz 802.11n	17.31	17.27	17.25	17.27	17.30	12.84	12.89	12.92	12.85	12.91
5 GHz 802.11a	17.19	17.15	17.23	17.18	17.12	8.78	8.77	8.74	8.81	8.72
5 GHz 802.11n 20MHz	16.02	16.04	16.06	16.07	16.02	8.59	8.61	8.63	8.57	8.67
5 GHz 802.11n 40MHz	16.41	16.40	16.39	16.39	16.32	8.47	8.53	8.51	8.57	8.53
5 GHz 802.11ac 20MHz	16.09	16.16	16.16	16.18	16.12	8.38	8.46	8.43	8.39	8.46
5 GHz 802.11ac 40MHz	14.48	14.49	14.47	14.48	14.52	8.54	8.57	8.54	8.50	8.52
5 GHz 802.11ac 80MHz	13.34	13.35	13.43	13.44	13.40	8.49	8.44	8.52	8.48	8.49
Bluetooth BDR_DH5	11.70	11.63	11.62	11.59	11.67	9.36	9.40	9.43	9.35	9.40



LEGEND
Direction of DUT travel for determination of power reduction triggering point
Direction of DUT travel for determination of full power resumption triggering point

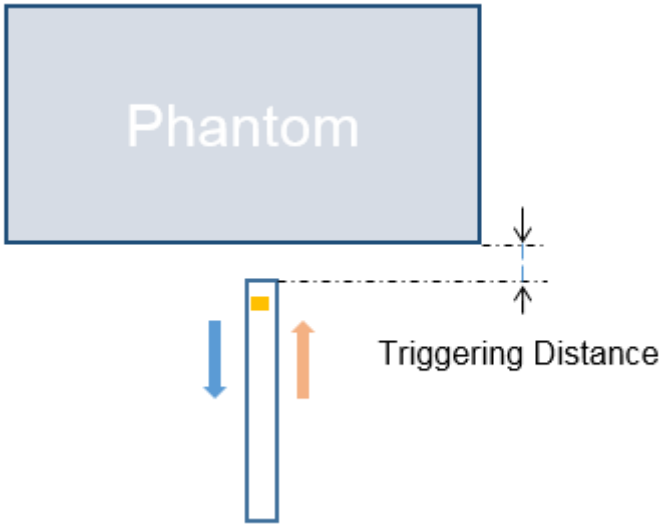
Resulting test positions for SAR mearsurementes

Tissue simulating liquid	Band	Trigger distance – Left Corner		
		Moving toward phantom	Moving from phantom	Worst case distance for SAR
2450 Head	Bluetooth Ant.2	10mm	10mm	9mm
2450 Head	WLAN Ant.2	10mm	10mm	9mm
5000 Head		10mm	10mm	9mm

Proximity Sensor Triggering Distance Measurement Results – Left Corner

DUT Moving Toward (Trigger) and Away (Release) from the Phantom

Distance to DUT Output Power (dBm)										
Distance (mm)	15	14	13	12	11	10	9	8	7	6
2.4 GHz 802.11b	19.86	19.86	19.96	19.92	19.87	12.24	12.27	12.31	12.22	12.22
2.4 GHz 802.11g	18.50	18.52	18.45	18.41	18.46	12.79	12.72	12.81	12.81	12.75
2.4 GHz 802.11n	17.22	17.21	17.32	17.27	17.33	12.83	12.91	12.84	12.85	12.85
5 GHz 802.11a	17.18	17.20	17.14	17.21	17.22	8.79	8.69	8.70	8.81	8.74
5 GHz 802.11n 20MHz	16.05	16.01	15.97	16.04	16.06	8.59	8.68	8.65	8.56	8.58
5 GHz 802.11n 40MHz	16.32	16.41	16.37	16.33	16.36	8.55	8.52	8.46	8.56	8.48
5 GHz 802.11ac 20MHz	16.15	16.16	16.17	16.19	16.15	8.38	8.35	8.47	8.43	8.42
5 GHz 802.11ac 40MHz	14.45	14.44	14.42	14.46	14.52	8.58	8.47	8.54	8.54	8.54
5 GHz 802.11ac 80MHz	13.45	13.44	13.33	13.38	13.42	8.49	8.49	8.46	8.44	8.51
Bluetooth BDR_DH5	11.68	11.65	11.68	11.62	11.61	9.34	9.35	9.39	9.37	9.33



LEGEND
Direction of DUT travel for determination of power reduction triggering point
Direction of DUT travel for determination of full power resumption triggering point

Resulting test positions for SAR mearsurementes

Tissue simulating liquid	Band	Trigger distance – Top		
		Moving toward phantom	Moving from phantom	Worst case distance for SAR
750 Head	LTE Band 12	24mm	24mm	23mm
	LTE Band 13			
850 Head	GSM 850	24mm	24mm	23mm
	WCDMA V			
	LTE Band 5			
	LTE Band 26			
1750 Head	WCDMA IV	24mm	24mm	23mm
	LTE Band 4			
	LTE Band 66			
1900 Head	GSM1900	24mm	24mm	23mm
	WCDMA II			
	LTE Band 2			
	LTE Band 25			
2600 Head	LTE Band 41	24mm	24mm	23mm
2450 Head	WLAN Ant.1	20mm	20mm	19mm
5000 Head		20mm	20mm	19mm
2450 Head	WLAN Ant.2	15mm	15mm	14mm
5000 Head		15mm	15mm	14mm

Proximity Sensor Triggering Distance Measurement Results – Top Side

DUT Moving Toward (Trigger) and Away (Release) from the Phantom

Distance to DUT Output Power (dBm)										
Distance (mm)	29	28	27	26	25	24	23	22	21	20
GSM850 Voice &GPRS 1Tx	33.38	33.44	33.42	33.46	33.41	22.83	22.83	22.79	22.85	22.78
GSM850 GPRS2Tx	32.24	32.32	32.27	32.29	32.28	21.74	21.78	21.73	21.73	21.73
GSM850 GPRS3Tx	30.20	30.28	30.21	30.26	30.19	19.74	19.75	19.71	19.73	19.71
GSM850 GPRS4Tx	28.36	28.26	28.27	28.31	28.34	17.67	17.74	17.73	17.65	17.67
GSM1900 Voice &GPRS 1Tx	29.84	29.78	29.88	29.83	29.83	21.82	21.80	21.74	21.74	21.85
GSM1900 GPRS2Tx	28.90	28.96	28.99	28.91	28.98	19.84	19.84	19.72	19.74	19.76
GSM1900 GPRS3Tx	27.42	27.43	27.43	27.40	27.45	17.90	17.91	17.88	17.90	17.89
GSM1900 GPRS4Tx	25.45	25.37	25.47	25.42	25.38	15.84	15.82	15.91	15.93	15.90
WCDMA II	23.05	23.04	23.08	23.07	23.04	13.12	13.19	13.10	13.17	13.10
WCDMA IV	22.65	22.66	22.65	22.73	22.67	12.68	12.72	12.72	12.74	12.74
WCDMA V	23.49	23.48	23.43	23.45	23.43	13.88	13.86	13.87	13.90	13.93
LTE Band 2	23.23	23.15	23.23	23.21	23.20	13.32	13.40	13.33	13.41	13.38
LTE Band 4	22.77	22.78	22.73	22.69	22.71	12.75	12.78	12.79	12.70	12.75
LTE Band 5	23.96	23.92	23.90	23.92	23.85	15.04	15.15	15.04	15.07	15.08
LTE Band 12	24.00	23.95	23.92	23.96	24.03	14.52	14.52	14.46	14.43	14.53
LTE Band 13	23.61	23.55	23.59	23.64	23.57	13.91	13.87	13.92	13.89	13.80
LTE Band 25	23.35	23.38	23.42	23.39	23.38	13.35	13.40	13.33	13.41	13.35
LTE Band 26	23.51	23.42	23.42	23.43	23.52	14.05	14.06	13.99	13.96	13.96
LTE Band 41	24.01	23.99	23.89	23.98	23.94	13.94	13.98	14.00	13.92	13.92
LTE Band 66	23.03	23.12	23.13	23.06	23.10	13.32	13.25	13.22	13.22	13.23

Proximity Sensor Triggering Distance Measurement Results – Top Side (Ant.1)

DUT Moving Toward (Trigger) and Away (Release) from the Phantom

Distance to DUT Output Power (dBm)										
Distance (mm)	25	24	23	22	21	20	19	18	17	16
2.4 GHz 802.11b	19.75	19.82	19.72	19.84	19.79	12.30	12.18	12.27	12.27	12.26
2.4 GHz 802.11g	18.17	18.22	18.15	18.24	18.26	12.26	12.34	12.25	12.31	12.34
2.4 GHz 802.11n	16.97	16.86	16.86	16.91	16.88	12.52	12.58	12.52	12.59	12.57
5 GHz 802.11a	17.81	17.78	17.77	17.78	17.71	8.64	8.56	8.66	8.55	8.64
5 GHz 802.11n 20MHz	16.66	16.67	16.65	16.74	16.68	8.63	8.56	8.53	8.58	8.54
5 GHz 802.11n 40MHz	16.88	16.87	16.87	16.90	16.82	8.84	8.84	8.83	8.84	8.79
5 GHz 802.11ac 20MHz	16.88	16.83	16.89	16.90	16.85	8.72	8.71	8.82	8.70	8.70
5 GHz 802.11ac 40MHz	14.54	14.50	14.42	14.42	14.51	8.71	8.59	8.69	8.68	8.69
5 GHz 802.11ac 80MHz	13.54	13.50	13.56	13.47	13.49	8.29	8.39	8.36	8.32	8.35

Proximity Sensor Triggering Distance Measurement Results – Top Side (Ant.2)

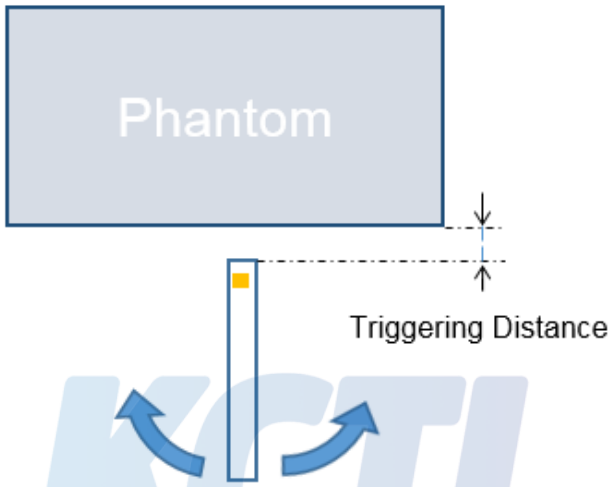
DUT Moving Toward (Trigger) and Away (Release) from the Phantom

Distance to DUT Output Power (dBm)										
Distance (mm)	20	19	18	17	16	15	14	13	12	11
2.4 GHz 802.11b	19.97	19.93	19.90	19.98	19.98	12.24	12.27	12.29	12.25	12.21
2.4 GHz 802.11g	18.50	18.49	18.45	18.42	18.42	12.82	12.78	12.74	12.73	12.75
2.4 GHz 802.11n	17.25	17.22	17.24	17.29	17.21	12.86	12.84	12.83	12.88	12.85
5 GHz 802.11a	17.18	17.19	17.17	17.11	17.19	8.81	8.81	8.77	8.73	8.72
5 GHz 802.11n 20MHz	16.09	16.07	16.08	16.04	15.99	8.65	8.61	8.66	8.61	8.62
5 GHz 802.11n 40MHz	16.39	16.32	16.39	16.35	16.36	8.47	8.47	8.53	8.51	8.56
5 GHz 802.11ac 20MHz	16.19	16.13	16.14	16.16	16.08	8.47	8.35	8.45	8.40	8.36
5 GHz 802.11ac 40MHz	14.52	14.43	14.51	14.47	14.52	8.48	8.55	8.47	8.52	8.57
5 GHz 802.11ac 80MHz	13.45	13.34	13.38	13.45	13.42	8.52	8.52	8.52	8.54	8.56

Proximity Sensor Tilt Angle Assessment (KDB 616217 §6.4)

The DUT was positioned directly below the flat phantom at the minimum measured trigger distance with Bottom parallel to the base of the flat phantom for each band.

The EUT was rotated about Bottom for angles up to +/- 45°. If the output power increased during the rotation the DUT was moved 1mm toward the phantom and the rotation repeated.
This procedure was repeated until the power remained reduced for all angles up to +/- 45°.



Proximity sensor tilt angle assessment KDB 616217 §6.4

Summary of Tilt Angle Influence to Proximity Sensor Triggering (Top)

Band [MHz]	Minimum trigger distance measured according to KDB 616217 §6.2	Minimum distance at which power reduction was maintained over +/-45°	Power reduction status										
			-45°	-40°	-30°	-20°	-10°	0°	10°	20°	30°	40°	45°
750.0	24 mm	24 mm	On	On	On	On	On	On	On	On	On	On	On
850.0	24 mm	24 mm	On	On	On	On	On	On	On	On	On	On	On
1 750.0	24 mm	24 mm	On	On	On	On	On	On	On	On	On	On	On
1 900.0	24 mm	24 mm	On	On	On	On	On	On	On	On	On	On	On
2 600.0	24 mm	24 mm	On	On	On	On	On	On	On	On	On	On	On
2 450.0 (Ant.1)	20 mm	20 mm	On	On	On	On	On	On	On	On	On	On	On
2 450.0 (Ant.2)	15 mm	15 mm	On	On	On	On	On	On	On	On	On	On	On
5 000.0 (Ant.1)	20 mm	20 mm	On	On	On	On	On	On	On	On	On	On	On
5 000.0 (Ant.2)	15 mm	15 mm	On	On	On	On	On	On	On	On	On	On	On

Summary of Tilt Angle Influence to Proximity Sensor Triggering (Left)

Band [MHz]	Minimum trigger distance measured according to KDB 616217 §6.2	Minimum distance at which power reduction was maintained over +/-45°	Power reduction status										
			-45°	-40°	-30°	-20°	-10°	0°	10°	20°	30°	40°	45°
2 450.0 (Ant.2)	5 mm	5 mm	On	On	On	On	On	On	On	On	On	On	On
5 000.0 (Ant.2)	5 mm	5 mm	On	On	On	On	On	On	On	On	On	On	On

Summary of Tilt Angle Influence to Proximity Sensor Triggering (Right)

Band [MHz]	Minimum trigger distance measured according to KDB 616217 §6.2	Minimum distance at which power reduction was maintained over +/-45°	Power reduction status										
			-45°	-40°	-30°	-20°	-10°	0°	10°	20°	30°	40°	45°
750.0	8 mm	8 mm	On	On	On	On	On	On	On	On	On	On	On
850.0	8 mm	8 mm	On	On	On	On	On	On	On	On	On	On	On
1 750.0	8 mm	8 mm	On	On	On	On	On	On	On	On	On	On	On
1 900.0	8 mm	8 mm	On	On	On	On	On	On	On	On	On	On	On
2 600.0	8 mm	8 mm	On	On	On	On	On	On	On	On	On	On	On
2 450.0 (Ant.1)	8 mm	8 mm	On	On	On	On	On	On	On	On	On	On	On
5 000.0 (Ant.1)	8 mm	8 mm	On	On	On	On	On	On	On	On	On	On	On