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

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Accreditation No.: SCS 0108

Client **HCT (Dymstec)**

Certificate No: **EX3-3797_Nov18**

결 재	담 당 자	확 인 자
직위/성명	SW 1팀/과장	GM 1부/과장
일 자	2018.12.03	2018.12.03

CALIBRATION CERTIFICATE

Object **EX3DV4 - SN:3797**

Calibration procedure(s) **QA CAL-01.v9, QA CAL-12.v9, QA CAL-14.v4, QA CAL-23.v5, QA CAL-25.v6**
Calibration procedure for dosimetric E-field probes

Calibration date: **November 22, 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: S5277 (20x)	04-Apr-18 (No. 217-02682)	Apr-19
Reference Probe ES3DV2	SN: 3013	30-Dec-17 (No. ES3-3013_Dec17)	Dec-18
DAE4	SN: 660	21-Dec-17 (No. DAE4-660_Dec17)	Dec-18
Secondary Standards	ID	Check Date (in house)	Scheduled Check
Power meter E4419B	SN: GB41293874	06-Apr-16 (in house check Jun-18)	In house check: Jun-20
Power sensor E4412A	SN: MY41498087	06-Apr-16 (in house check Jun-18)	In house check: Jun-20
Power sensor E4412A	SN: 000110210	06-Apr-16 (in house check Jun-18)	In house check: Jun-20
RF generator HP 8648C	SN: US3642U01700	04-Aug-99 (in house check Jun-18)	In house check: Jun-20
Network Analyzer E8358A	SN: US41080477	31-Mar-14 (in house check Oct-18)	In house check: Oct-19

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

Issued: November 22, 2018

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Accreditation No.: **SCS 0108**

Glossary:

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

Calibration is Performed According to the Following Standards:

a) IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
b) IEC 62209-1, ", "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"

Methods Applied and Interpretation of Parameters:

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

Probe EX3DV4

SN:3797

Manufactured: April 5, 2011
Calibrated: November 22, 2018

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

DASY/EASY - Parameters of Probe: EX3DV4 - SN:3797

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm ($\mu V/(V/m)^2$)[A]	0.61	0.56	0.55	± 10.1 %
DCP (mV)[B]	99.4	98.1	97.8	

Modulation Calibration Parameters

UID	Communication System Name		A dB	B dB√μV	C	D dB	VR mV	Unc[E] (k=2)
0	CW	X	0.0	0.0	1.0	0.00	150.2	±3.5 %
		Y	0.0	0.0	1.0		150.0	
		Z	0.0	0.0	1.0		144.4	

Note: For details on UID parameters see Appendix.

Sensor Model Parameters

	C1 fF	C2 fF	α V^{-1}	T1 $ms.V^{-2}$	T2 $ms.V^{-1}$	T3 ms	T4 V^{-2}	T5 V^{-1}	T6
X	42.14	323.8	37.43	10.96	0.298	5.100	0.00	0.505	1.010
Y	42.30	318.1	36.05	13.52	0.084	5.100	0.00	0.435	1.006
Z	39.25	303.9	37.78	8.692	0.301	5.100	0.00	0.312	1.015

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

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

EX3DV4– SN:3797 November 22, 2018

DASY/EASY - Parameters of Probe: EX3DV4 - SN:3797

Calibration Parameter Determined in Head Tissue Simulating Media

f (MHz) [C]	Relative Permittivity [F]	Conductivity (S/m) [F]	ConvF X	ConvF Y	ConvF Z	Alpha [G]	Depth [G] (mm)	Unc (k=2)
150	52.3	0.76	11.53	11.53	11.53	0.00	1.00	± 13.3 %
450	43.5	0.87	10.22	10.22	10.22	0.14	1.30	± 13.3 %
750	41.9	0.89	9.34	9.34	9.34	0.56	0.80	± 12.0 %
835	41.5	0.90	9.09	9.09	9.09	0.50	0.85	± 12.0 %
900	41.5	0.97	8.89	8.89	8.89	0.41	0.95	± 12.0 %
1450	40.5	1.20	8.05	8.05	8.05	0.37	0.80	± 12.0 %
1750	40.1	1.37	8.00	8.00	8.00	0.38	0.84	± 12.0 %
1900	40.0	1.40	7.82	7.82	7.82	0.34	0.86	± 12.0 %
2300	39.5	1.67	7.43	7.43	7.43	0.40	0.84	± 12.0 %
2450	39.2	1.80	7.06	7.06	7.06	0.38	0.86	± 12.0 %
2600	39.0	1.96	6.94	6.94	6.94	0.42	0.85	± 12.0 %
3500	37.9	2.91	6.68	6.68	6.68	0.27	1.25	± 13.1 %
5250	35.9	4.71	4.89	4.89	4.89	0.40	1.80	± 13.1 %
5600	35.5	5.07	4.52	4.52	4.52	0.40	1.80	± 13.1 %
5750	35.4	5.22	4.70	4.70	4.70	0.40	1.80	± 13.1 %

[C] Frequency validity above 300 MHz of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band. Frequency validity below 300 MHz is ± 10, 25, 40, 50 and 70 MHz for ConvF assessments at 30, 64, 128, 150 and 220 MHz respectively. Above 5 GHz frequency validity can be extended to ± 110 MHz.

[F] At frequencies below 3 GHz, the validity of tissue parameters (ε and σ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (ε and σ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

[G] Alpha/Depth are determined during calibration. SPEAG warrants that the remaining deviation due to the boundary effect after compensation is always less than ± 1% for frequencies below 3 GHz and below ± 2% for frequencies between 3-6 GHz at any distance larger than half the probe tip diameter from the boundary.

EX3DV4– SN:3797 November 22, 2018

DASY/EASY - Parameters of Probe: EX3DV4 - SN:3797

Calibration Parameter Determined in Body Tissue Simulating Media

f (MHz) [C]	Relative Permittivity [F]	Conductivity (S/m) [F]	ConvF X	ConvF Y	ConvF Z	Alpha [G]	Depth [G] (mm)	Unc (k=2)
150	61.9	0.80	11.04	11.04	11.04	0.00	1.00	± 13.3 %
450	56.7	0.94	10.35	10.35	10.35	0.08	1.20	± 13.3 %
750	55.5	0.96	9.55	9.55	9.55	0.51	0.80	± 12.0 %
835	55.2	0.97	9.16	9.16	9.16	0.51	0.80	± 12.0 %
1750	53.4	1.49	7.86	7.86	7.86	0.42	0.90	± 12.0 %
1900	53.3	1.52	7.52	7.52	7.52	0.39	0.90	± 12.0 %
2300	52.9	1.81	7.26	7.26	7.26	0.46	0.85	± 12.0 %
2450	52.7	1.95	7.13	7.13	7.13	0.40	0.88	± 12.0 %
2600	52.5	2.16	7.05	7.05	7.05	0.29	1.05	± 12.0 %
3500	51.3	3.31	6.91	6.91	6.91	0.25	1.25	± 13.1 %
5250	48.9	5.36	4.37	4.37	4.37	0.50	1.90	± 13.1 %
5600	48.5	5.77	3.94	3.94	3.94	0.50	1.90	± 13.1 %
5750	48.3	5.94	4.16	4.16	4.16	0.50	1.90	± 13.1 %

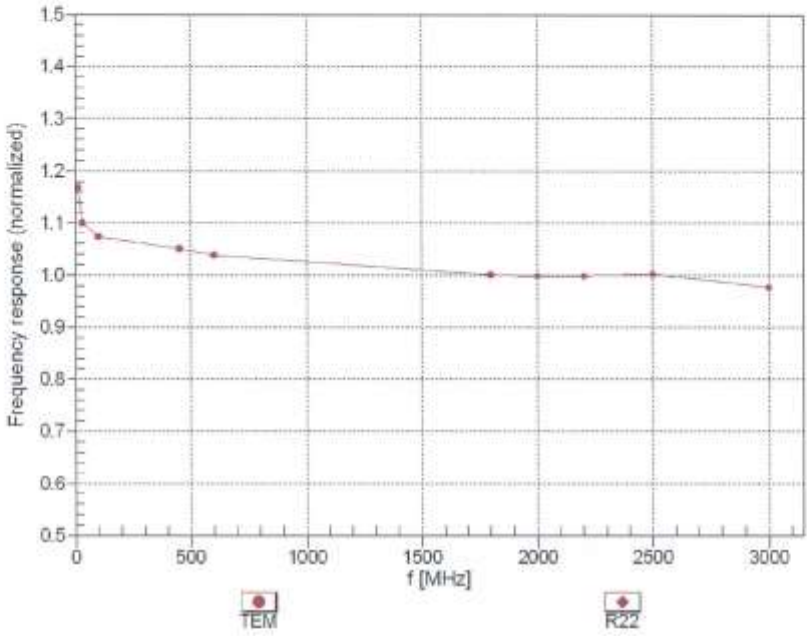
[C] Frequency validity above 300 MHz of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band. Frequency validity below 300 MHz is ± 10, 25, 40, 50 and 70 MHz for ConvF assessments at 30, 64, 128, 150 and 220 MHz respectively. Above 5 GHz frequency validity can be extended to ± 110 MHz.

[F] At frequencies below 3 GHz, the validity of tissue parameters (ε and σ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (ε and σ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

[G] Alpha/Depth are determined during calibration. SPEAG warrants that the remaining deviation due to the boundary effect after compensation is always less than ± 1% for frequencies below 3 GHz and below ± 2% for frequencies between 3-6 GHz at any distance larger than half the probe tip diameter from the boundary.

EX3DV4– SN:3797 November 22, 2018

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

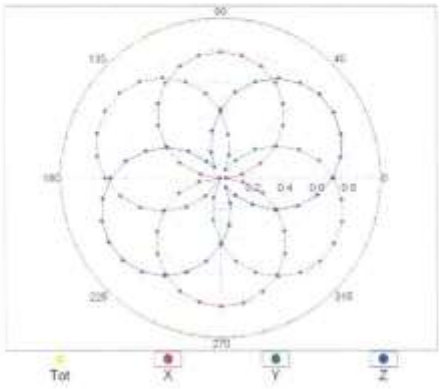


Uncertainty of Frequency Response of E-field: ± 6.3% (k=2)

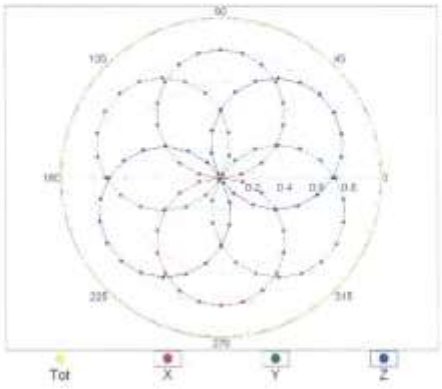
EX3DV4– SN:3797 November 22, 2018

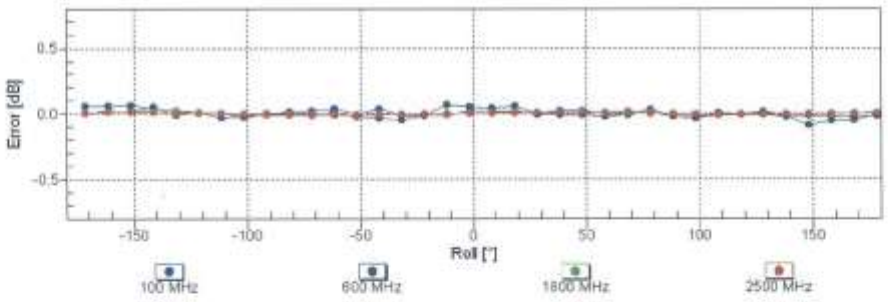
Receiving Pattern (ϕ), ϑ = 0°

f=600 MHz,TEM



f=1800 MHz,R22

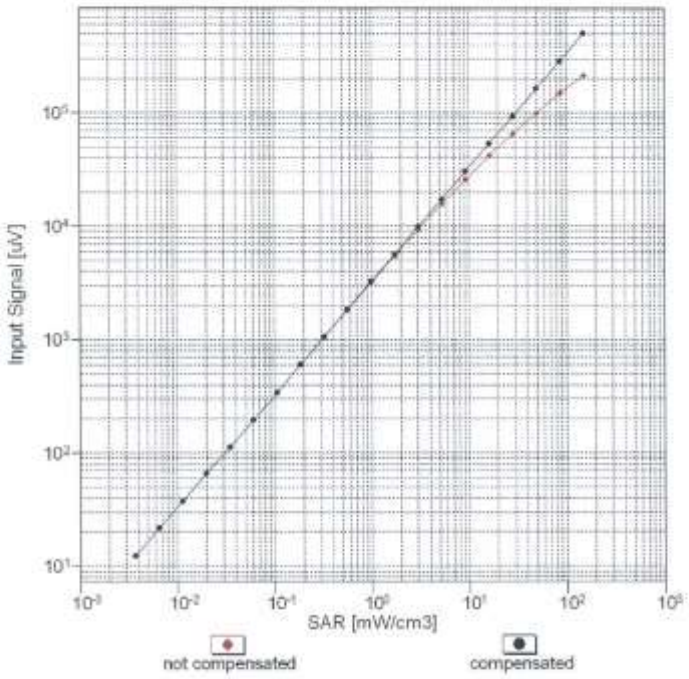


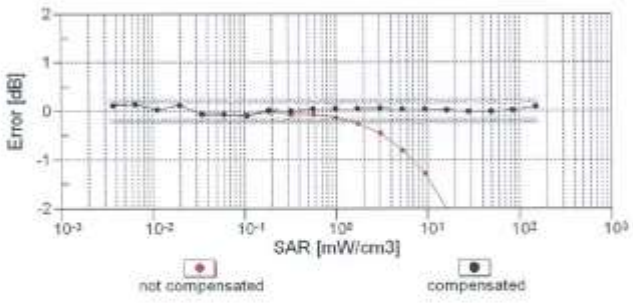


Uncertainty of Axial Isotropy Assessment: ± 0.5% (k=2)

EX3DV4– SN:3797 November 22, 2018

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



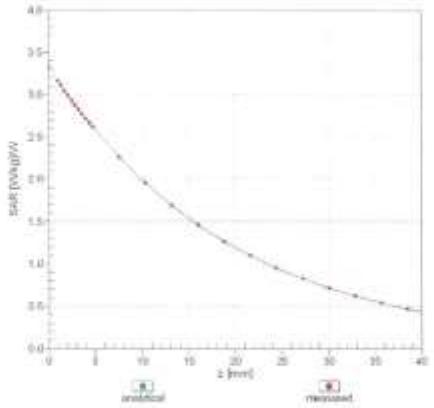


Uncertainty of Linearity Assessment: ± 0.6% (k=2)

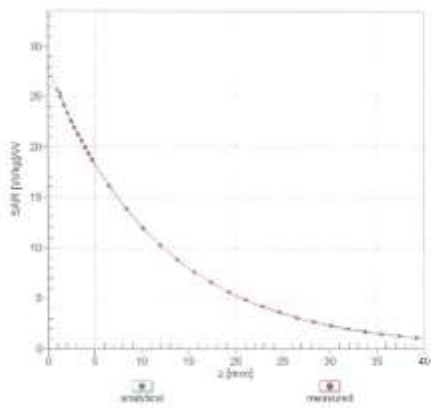
EX3DV4– SN:3797 November 22, 2018

Conversion Factor Assessment

f = 835 MHz,WGLS R9 (H_convF)

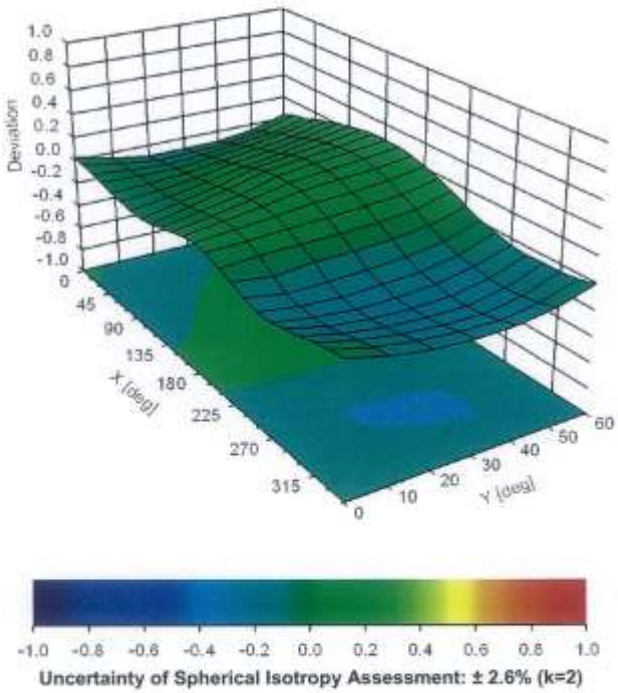


f = 1900 MHz,WGLS R22 (H_convF)



Deviation from Isotropy in Liquid

Error (ϕ, ϑ), f = 900 MHz



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

DASY/EASY - Parameters of Probe: EX3DV4 - SN:3797

Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle (°)	68.3
Mechanical Surface Detection Mode	enabled
Optical Surface Detection Mode	disabled
Probe Overall Length	337 mm
Probe Body Diameter	10 mm
Tip Length	9 mm
Tip Diameter	2.5 mm
Probe Tip to Sensor X Calibration Point	1 mm
Probe Tip to Sensor Y Calibration Point	1 mm
Probe Tip to Sensor Z Calibration Point	1 mm
Recommended Measurement Distance from Surface	1.4 mm

EX3DV4– SN:3797 November 22, 2018

Appendix: Modulation Calibration Parameters

UID	Communication System Name		A dB	B dB√μV	C	D dB	VR mV	Max Unc[E] (k=2)
0	CW	X	0.00	0.00	1.00	0.00	150.2	± 3.5 %
		Y	0.00	0.00	1.00		150.0	
		Z	0.00	0.00	1.00		144.4	
10010-CAA	SAR Validation (Square, 100ms, 10ms)	X	2.43	67.28	10.79	10.00	20.0	± 9.6 %
		Y	2.76	69.01	11.38		20.0	
		Z	2.08	65.60	9.91		20.0	
10011-CAB	UMTS-FDD (WCDMA)	X	0.95	66.88	14.73	0.00	150.0	± 9.6 %
		Y	1.02	67.69	15.34		150.0	
		Z	0.81	64.15	12.71		150.0	
10012-CAB	IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps)	X	1.11	63.63	15.17	0.41	150.0	± 9.6 %
		Y	1.16	64.05	15.43		150.0	
		Z	1.05	62.45	14.04		150.0	
10013-CAB	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 6 Mbps)	X	4.79	66.72	17.21	1.46	150.0	± 9.6 %
		Y	4.82	66.83	17.24		150.0	
		Z	4.71	66.47	16.95		150.0	
10021-DAC	GSM-FDD (TDMA, GMSK)	X	100.00	115.64	27.76	9.39	50.0	± 9.6 %
		Y	100.00	115.68	27.58		50.0	
		Z	100.00	114.37	27.11		50.0	
10023-DAC	GPRS-FDD (TDMA, GMSK, TN 0)	X	100.00	114.89	27.46	9.57	50.0	± 9.6 %
		Y	100.00	114.91	27.27		50.0	
		Z	100.00	113.59	26.80		50.0	
10024-DAC	GPRS-FDD (TDMA, GMSK, TN 0-1)	X	100.00	117.40	27.44	6.56	60.0	± 9.6 %
		Y	100.00	117.72	27.58		60.0	
		Z	100.00	115.59	26.46		60.0	
10025-DAC	EDGE-FDD (TDMA, 8PSK, TN 0)	X	4.48	74.20	29.24	12.57	50.0	± 9.6 %
		Y	11.74	110.03	46.33		50.0	
		Z	3.97	70.05	26.73		50.0	
10026-DAC	EDGE-FDD (TDMA, 8PSK, TN 0-1)	X	8.28	92.40	33.92	9.56	60.0	± 9.6 %
		Y	12.03	103.56	38.43		60.0	
		Z	6.61	86.51	31.47		60.0	
10027-DAC	GPRS-FDD (TDMA, GMSK, TN 0-1-2)	X	100.00	120.48	27.94	4.80	80.0	± 9.6 %
		Y	100.00	121.28	28.40		80.0	
		Z	100.00	117.35	26.35		80.0	
10028-DAC	GPRS-FDD (TDMA, GMSK, TN 0-1-2-3)	X	100.00	124.42	28.82	3.55	100.0	± 9.6 %
		Y	100.00	126.11	29.75		100.0	
		Z	100.00	118.56	26.07		100.0	
10029-DAC	EDGE-FDD (TDMA, 8PSK, TN 0-1-2)	X	5.13	80.54	27.84	7.80	80.0	± 9.6 %
		Y	6.15	85.39	30.07		80.0	
		Z	4.39	76.83	26.09		80.0	
10030-CAA	IEEE 802.15.1 Bluetooth (GFSK, DH1)	X	100.00	116.07	26.36	5.30	70.0	± 9.6 %
		Y	100.00	116.79	26.74		70.0	
		Z	100.00	113.50	25.02		70.0	
10031-CAA	IEEE 802.15.1 Bluetooth (GFSK, DH3)	X	100.00	116.20	23.87	1.88	100.0	± 9.6 %
		Y	100.00	126.20	28.25		100.0	
		Z	100.00	101.52	17.73		100.0	

10032-CAA	IEEE 802.15.1 Bluetooth (GFSK, DH5)	X	100.00	112.02	21.23	1.17	100.0	± 9.6 %
		Y	100.00	136.79	31.30		100.0	
		Z	0.16	60.22	4.52		100.0	
10033-CAA	IEEE 802.15.1 Bluetooth (PI/4-DQPSK, DH1)	X	100.00	131.62	35.50	5.30	70.0	± 9.6 %
		Y	100.00	132.08	35.76		70.0	
		Z	22.59	106.63	28.78		70.0	
10034-CAA	IEEE 802.15.1 Bluetooth (PI/4-DQPSK, DH3)	X	5.74	87.09	21.40	1.88	100.0	± 9.6 %
		Y	8.49	92.58	23.30		100.0	
		Z	2.09	72.85	15.61		100.0	
10035-CAA	IEEE 802.15.1 Bluetooth (PI/4-DQPSK, DH5)	X	2.46	76.34	17.25	1.17	100.0	± 9.6 %
		Y	3.26	80.08	18.87		100.0	
		Z	1.32	67.90	13.03		100.0	
10036-CAA	IEEE 802.15.1 Bluetooth (8-DPSK, DH1)	X	100.00	132.20	35.76	5.30	70.0	± 9.6 %
		Y	100.00	132.62	36.01		70.0	
		Z	50.75	119.58	32.16		70.0	
10037-CAA	IEEE 802.15.1 Bluetooth (8-DPSK, DH3)	X	4.80	84.78	20.64	1.88	100.0	± 9.6 %
		Y	7.00	90.05	22.53		100.0	
		Z	1.92	71.86	15.20		100.0	
10038-CAA	IEEE 802.15.1 Bluetooth (8-DPSK, DH5)	X	2.52	76.94	17.62	1.17	100.0	± 9.6 %
		Y	3.31	80.62	19.20		100.0	
		Z	1.33	68.14	13.26		100.0	
10039-CAB	CDMA2000 (1xRTT, RC1)	X	1.42	69.17	13.54	0.00	150.0	± 9.6 %
		Y	1.65	71.11	14.72		150.0	
		Z	0.95	64.31	10.49		150.0	
10042-CAB	IS-54 / IS-136 FDD (TDMA/FDM, PI/4-DQPSK, Halfrate)	X	100.00	111.47	25.07	7.78	50.0	± 9.6 %
		Y	100.00	111.92	25.21		50.0	
		Z	100.00	109.88	24.25		50.0	
10044-CAA	IS-91/EIA/TIA-553 FDD (FDMA, FM)	X	0.03	119.39	12.00	0.00	150.0	± 9.6 %
		Y	0.00	103.59	3.95		150.0	
		Z	0.03	121.88	0.98		150.0	
10048-CAA	DECT (TDD, TDMA/FDM, GFSK, Full Slot, 24)	X	100.00	111.20	27.29	13.80	25.0	± 9.6 %
		Y	100.00	111.87	27.12		25.0	
		Z	100.00	109.47	26.56		25.0	
10049-CAA	DECT (TDD, TDMA/FDM, GFSK, Double Slot, 12)	X	100.00	112.58	26.76	10.79	40.0	± 9.6 %
		Y	980.92	139.65	31.95		40.0	
		Z	100.00	111.36	26.17		40.0	
10056-CAA	UMTS-TDD (TD-SCDMA, 1.28 Mcps)	X	100.00	125.87	34.11	9.03	50.0	± 9.6 %
		Y	100.00	126.99	34.54		50.0	
		Z	100.00	124.38	33.29		50.0	
10058-DAC	EDGE-FDD (TDMA, 8PSK, TN 0-1-2-3)	X	4.04	75.49	24.77	6.55	100.0	± 9.6 %
		Y	4.56	78.44	26.18		100.0	
		Z	3.57	72.72	23.36		100.0	
10059-CAB	IEEE 802.11b WiFi 2.4 GHz (DSSS, 2 Mbps)	X	1.15	64.80	15.90	0.61	110.0	± 9.6 %
		Y	1.20	65.32	16.20		110.0	
		Z	1.07	63.29	14.59		110.0	
10060-CAB	IEEE 802.11b WiFi 2.4 GHz (DSSS, 5.5 Mbps)	X	100.00	142.79	37.47	1.30	110.0	± 9.6 %
		Y	100.00	143.52	37.98		110.0	
		Z	3.25	88.20	22.84		110.0	

EX3DV4– SN:3797 November 22, 2018

10061-CAB	IEEE 802.11b WiFi 2.4 GHz (DSSS, 11 Mbps)	X	3.24	84.95	24.64	2.04	110.0	± 9.6 %
		Y	4.06	88.64	25.98		110.0	
		Z	1.99	75.80	20.63		110.0	
10062-CAC	IEEE 802.11a/h WiFi 5 GHz (OFDM, 6 Mbps)	X	4.58	66.64	16.56	0.49	100.0	± 9.6 %
		Y	4.61	66.76	16.59		100.0	
		Z	4.49	66.34	16.26		100.0	
10063-CAC	IEEE 802.11a/h WiFi 5 GHz (OFDM, 9 Mbps)	X	4.60	66.75	16.68	0.72	100.0	± 9.6 %
		Y	4.63	66.87	16.71		100.0	
		Z	4.51	66.45	16.38		100.0	
10064-CAC	IEEE 802.11a/h WiFi 5 GHz (OFDM, 12 Mbps)	X	4.87	67.00	16.91	0.86	100.0	± 9.6 %
		Y	4.90	67.11	16.93		100.0	
		Z	4.77	66.71	16.62		100.0	
10065-CAC	IEEE 802.11a/h WiFi 5 GHz (OFDM, 18 Mbps)	X	4.75	66.91	17.04	1.21	100.0	± 9.6 %
		Y	4.77	67.02	17.06		100.0	
		Z	4.64	66.60	16.74		100.0	
10066-CAC	IEEE 802.11a/h WiFi 5 GHz (OFDM, 24 Mbps)	X	4.76	66.93	17.22	1.46	100.0	± 9.6 %
		Y	4.79	67.05	17.24		100.0	
		Z	4.66	66.63	16.92		100.0	
10067-CAC	IEEE 802.11a/h WiFi 5 GHz (OFDM, 36 Mbps)	X	5.06	67.18	17.71	2.04	100.0	± 9.6 %
		Y	5.09	67.30	17.74		100.0	
		Z	4.96	66.94	17.46		100.0	
10068-CAC	IEEE 802.11a/h WiFi 5 GHz (OFDM, 48 Mbps)	X	5.10	67.17	17.93	2.55	100.0	± 9.6 %
		Y	5.12	67.29	17.96		100.0	
		Z	5.00	66.90	17.66		100.0	
10069-CAC	IEEE 802.11a/h WiFi 5 GHz (OFDM, 54 Mbps)	X	5.17	67.19	18.13	2.67	100.0	± 9.6 %
		Y	5.20	67.32	18.17		100.0	
		Z	5.07	66.94	17.87		100.0	
10071-CAB	IEEE 802.11g WiFi 2.4 GHz (DSSS/OFDM, 9 Mbps)	X	4.89	66.81	17.54	1.99	100.0	± 9.6 %
		Y	4.91	66.93	17.57		100.0	
		Z	4.81	66.58	17.29		100.0	
10072-CAB	IEEE 802.11g WiFi 2.4 GHz (DSSS/OFDM, 12 Mbps)	X	4.86	67.13	17.78	2.30	100.0	± 9.6 %
		Y	4.89	67.25	17.81		100.0	
		Z	4.77	66.85	17.51		100.0	
10073-CAB	IEEE 802.11g WiFi 2.4 GHz (DSSS/OFDM, 18 Mbps)	X	4.92	67.31	18.14	2.83	100.0	± 9.6 %
		Y	4.95	67.44	18.18		100.0	
		Z	4.83	67.04	17.87		100.0	
10074-CAB	IEEE 802.11g WiFi 2.4 GHz (DSSS/OFDM, 24 Mbps)	X	4.91	67.21	18.29	3.30	100.0	± 9.6 %
		Y	4.93	67.34	18.34		100.0	
		Z	4.83	66.96	18.04		100.0	
10075-CAB	IEEE 802.11g WiFi 2.4 GHz (DSSS/OFDM, 36 Mbps)	X	4.94	67.28	18.61	3.82	90.0	± 9.6 %
		Y	4.96	67.42	18.66		90.0	
		Z	4.85	67.01	18.34		90.0	
10076-CAB	IEEE 802.11g WiFi 2.4 GHz (DSSS/OFDM, 48 Mbps)	X	4.95	67.09	18.74	4.15	90.0	± 9.6 %
		Y	4.97	67.23	18.80		90.0	
		Z	4.88	66.86	18.50		90.0	
10077-CAB	IEEE 802.11g WiFi 2.4 GHz (DSSS/OFDM, 54 Mbps)	X	4.98	67.16	18.85	4.30	90.0	± 9.6 %
		Y	5.00	67.30	18.91		90.0	
		Z	4.91	66.94	18.61		90.0	

10081-CAB	CDMA2000 (1xRTT, RC3)	X	0.66	63.94	10.50	0.00	150.0	± 9.6 %
		Y	0.75	65.23	11.58		150.0	
		Z	0.52	61.29	8.23		150.0	
10082-CAB	IS-54 / IS-136 FDD (TDMA/FDM, PI/4-DQPSK, Fullrate)	X	1.28	62.90	5.22	4.77	80.0	± 9.6 %
		Y	0.66	60.00	4.27		80.0	
		Z	3.68	66.40	5.96		80.0	
10090-DAC	GPRS-FDD (TDMA, GMSK, TN 0-4)	X	100.00	117.49	27.50	6.56	60.0	± 9.6 %
		Y	100.00	117.76	27.62		60.0	
		Z	100.00	115.71	26.53		60.0	
10097-CAB	UMTS-FDD (HSDPA)	X	1.76	67.54	15.36	0.00	150.0	± 9.6 %
		Y	1.82	67.97	15.67		150.0	
		Z	1.58	65.73	13.99		150.0	
10098-CAB	UMTS-FDD (HSUPA, Subtest 2)	X	1.72	67.49	15.33	0.00	150.0	± 9.6 %
		Y	1.78	67.94	15.65		150.0	
		Z	1.54	65.66	13.95		150.0	
10099-DAC	EDGE-FDD (TDMA, 8PSK, TN 0-4)	X	8.36	92.60	33.99	9.56	60.0	± 9.6 %
		Y	12.20	103.90	38.55		60.0	
		Z	6.66	86.68	31.54		60.0	
10100-CAE	LTE-FDD (SC-FDMA, 100% RB, 20 MHz, QPSK)	X	2.99	69.83	16.49	0.00	150.0	± 9.6 %
		Y	3.07	70.27	16.71		150.0	
		Z	2.72	68.21	15.49		150.0	
10101-CAE	LTE-FDD (SC-FDMA, 100% RB, 20 MHz, 16-QAM)	X	3.13	67.20	15.80	0.00	150.0	± 9.6 %
		Y	3.18	67.46	15.92		150.0	
		Z	2.99	66.38	15.18		150.0	
10102-CAE	LTE-FDD (SC-FDMA, 100% RB, 20 MHz, 64-QAM)	X	3.24	67.20	15.90	0.00	150.0	± 9.6 %
		Y	3.28	67.42	16.00		150.0	
		Z	3.10	66.43	15.32		150.0	
10103-CAG	LTE-TDD (SC-FDMA, 100% RB, 20 MHz, QPSK)	X	6.21	76.81	21.40	3.98	65.0	± 9.6 %
		Y	6.83	78.45	22.01		65.0	
		Z	5.32	74.17	20.21		65.0	
10104-CAG	LTE-TDD (SC-FDMA, 100% RB, 20 MHz, 16-QAM)	X	5.85	73.50	20.74	3.98	65.0	± 9.6 %
		Y	6.22	74.66	21.21		65.0	
		Z	5.39	72.11	20.01		65.0	
10105-CAG	LTE-TDD (SC-FDMA, 100% RB, 20 MHz, 64-QAM)	X	5.63	72.54	20.60	3.98	65.0	± 9.6 %
		Y	6.09	74.10	21.28		65.0	
		Z	5.01	70.41	19.51		65.0	
10108-CAG	LTE-FDD (SC-FDMA, 100% RB, 10 MHz, QPSK)	X	2.59	69.15	16.32	0.00	150.0	± 9.6 %
		Y	2.66	69.54	16.54		150.0	
		Z	2.35	67.51	15.27		150.0	
10109-CAG	LTE-FDD (SC-FDMA, 100% RB, 10 MHz, 16-QAM)	X	2.78	67.09	15.66	0.00	150.0	± 9.6 %
		Y	2.83	67.34	15.80		150.0	
		Z	2.63	66.15	14.93		150.0	
10110-CAG	LTE-FDD (SC-FDMA, 100% RB, 5 MHz, QPSK)	X	2.08	68.31	15.85	0.00	150.0	± 9.6 %
		Y	2.15	68.74	16.13		150.0	
		Z	1.86	66.52	14.61		150.0	
10111-CAG	LTE-FDD (SC-FDMA, 100% RB, 5 MHz, 16-QAM)	X	2.49	68.01	15.86	0.00	150.0	± 9.6 %
		Y	2.54	68.25	16.02		150.0	
		Z	2.29	66.65	14.83		150.0	

10112-CAG	LTE-FDD (SC-FDMA, 100% RB, 10 MHz, 64-QAM)	X	2.90	67.13	15.74	0.00	150.0	± 9.6 %
		Y	2.95	67.35	15.86		150.0	
		Z	2.75	66.25	15.04		150.0	
10113-CAG	LTE-FDD (SC-FDMA, 100% RB, 5 MHz, 64-QAM)	X	2.64	68.20	16.02	0.00	150.0	± 9.6 %
		Y	2.69	68.40	16.15		150.0	
		Z	2.44	66.90	15.03		150.0	
10114-CAC	IEEE 802.11n (HT Greenfield, 13.5 Mbps, BPSK)	X	5.04	67.07	16.44	0.00	150.0	± 9.6 %
		Y	5.06	67.18	16.45		150.0	
		Z	4.94	66.72	16.15		150.0	
10115-CAC	IEEE 802.11n (HT Greenfield, 81 Mbps, 16-QAM)	X	5.30	67.14	16.49	0.00	150.0	± 9.6 %
		Y	5.31	67.23	16.49		150.0	
		Z	5.20	66.83	16.22		150.0	
10116-CAC	IEEE 802.11n (HT Greenfield, 135 Mbps, 64-QAM)	X	5.13	67.26	16.47	0.00	150.0	± 9.6 %
		Y	5.14	67.35	16.47		150.0	
		Z	5.02	66.92	16.18		150.0	
10117-CAC	IEEE 802.11n (HT Mixed, 13.5 Mbps, BPSK)	X	5.01	66.94	16.39	0.00	150.0	± 9.6 %
		Y	5.02	67.05	16.41		150.0	
		Z	4.92	66.66	16.14		150.0	
10118-CAC	IEEE 802.11n (HT Mixed, 81 Mbps, 16-QAM)	X	5.38	67.36	16.61	0.00	150.0	± 9.6 %
		Y	5.39	67.44	16.60		150.0	
		Z	5.28	67.06	16.35		150.0	
10119-CAC	IEEE 802.11n (HT Mixed, 135 Mbps, 64-QAM)	X	5.11	67.23	16.46	0.00	150.0	± 9.6 %
		Y	5.12	67.31	16.46		150.0	
		Z	5.02	66.91	16.19		150.0	
10140-CAE	LTE-FDD (SC-FDMA, 100% RB, 15 MHz, 16-QAM)	X	3.27	67.21	15.82	0.00	150.0	± 9.6 %
		Y	3.31	67.44	15.93		150.0	
		Z	3.12	66.44	15.23		150.0	
10141-CAE	LTE-FDD (SC-FDMA, 100% RB, 15 MHz, 64-QAM)	X	3.39	67.34	16.00	0.00	150.0	± 9.6 %
		Y	3.43	67.55	16.09		150.0	
		Z	3.25	66.61	15.44		150.0	
10142-CAE	LTE-FDD (SC-FDMA, 100% RB, 3 MHz, QPSK)	X	1.84	68.20	15.29	0.00	150.0	± 9.6 %
		Y	1.92	68.72	15.66		150.0	
		Z	1.59	66.01	13.74		150.0	
10143-CAE	LTE-FDD (SC-FDMA, 100% RB, 3 MHz, 16-QAM)	X	2.31	68.50	15.23	0.00	150.0	± 9.6 %
		Y	2.38	68.90	15.52		150.0	
		Z	2.02	66.48	13.77		150.0	
10144-CAE	LTE-FDD (SC-FDMA, 100% RB, 3 MHz, 64-QAM)	X	2.05	65.96	13.46	0.00	150.0	± 9.6 %
		Y	2.13	66.43	13.81		150.0	
		Z	1.85	64.54	12.27		150.0	
10145-CAF	LTE-FDD (SC-FDMA, 100% RB, 1.4 MHz, QPSK)	X	0.93	62.61	9.49	0.00	150.0	± 9.6 %
		Y	1.02	63.56	10.30		150.0	
		Z	0.77	60.78	7.75		150.0	
10146-CAF	LTE-FDD (SC-FDMA, 100% RB, 1.4 MHz, 16-QAM)	X	1.53	64.18	10.10	0.00	150.0	± 9.6 %
		Y	1.40	63.23	9.48		150.0	
		Z	1.28	62.90	9.09		150.0	
10147-CAF	LTE-FDD (SC-FDMA, 100% RB, 1.4 MHz, 64-QAM)	X	1.75	65.67	10.97	0.00	150.0	± 9.6 %
		Y	1.54	64.27	10.14		150.0	
		Z	1.42	63.99	9.78		150.0	

10149-CAE	LTE-FDD (SC-FDMA, 50% RB, 20 MHz, 16-QAM)	X	2.79	67.15	15.71	0.00	150.0	± 9.6 %
		Y	2.83	67.40	15.84		150.0	
		Z	2.63	66.20	14.97		150.0	
10150-CAE	LTE-FDD (SC-FDMA, 50% RB, 20 MHz, 64-QAM)	X	2.91	67.18	15.78	0.00	150.0	± 9.6 %
		Y	2.96	67.41	15.90		150.0	
		Z	2.76	66.30	15.09		150.0	
10151-CAG	LTE-TDD (SC-FDMA, 50% RB, 20 MHz, QPSK)	X	6.63	79.87	22.73	3.98	65.0	± 9.6 %
		Y	7.34	81.59	23.36		65.0	
		Z	5.70	77.30	21.58		65.0	
10152-CAG	LTE-TDD (SC-FDMA, 50% RB, 20 MHz, 16-QAM)	X	5.41	73.65	20.48	3.98	65.0	± 9.6 %
		Y	5.80	74.91	21.01		65.0	
		Z	4.93	72.09	19.63		65.0	
10153-CAG	LTE-TDD (SC-FDMA, 50% RB, 20 MHz, 64-QAM)	X	5.79	74.70	21.31	3.98	65.0	± 9.6 %
		Y	6.18	75.87	21.78		65.0	
		Z	5.29	73.15	20.48		65.0	
10154-CAG	LTE-FDD (SC-FDMA, 50% RB, 10 MHz, QPSK)	X	2.13	68.70	16.10	0.00	150.0	± 9.6 %
		Y	2.19	69.10	16.35		150.0	
		Z	1.89	66.81	14.80		150.0	
10155-CAG	LTE-FDD (SC-FDMA, 50% RB, 10 MHz, 16-QAM)	X	2.50	68.04	15.89	0.00	150.0	± 9.6 %
		Y	2.55	68.28	16.04		150.0	
		Z	2.29	66.68	14.85		150.0	
10156-CAG	LTE-FDD (SC-FDMA, 50% RB, 5 MHz, QPSK)	X	1.67	68.03	14.84	0.00	150.0	± 9.6 %
		Y	1.75	68.67	15.30		150.0	
		Z	1.40	65.49	13.04		150.0	
10157-CAG	LTE-FDD (SC-FDMA, 50% RB, 5 MHz, 16-QAM)	X	1.86	66.26	13.25	0.00	150.0	± 9.6 %
		Y	1.95	66.85	13.70		150.0	
		Z	1.62	64.41	11.79		150.0	
10158-CAG	LTE-FDD (SC-FDMA, 50% RB, 10 MHz, 64-QAM)	X	2.65	68.27	16.07	0.00	150.0	± 9.6 %
		Y	2.70	68.46	16.20		150.0	
		Z	2.44	66.97	15.07		150.0	
10159-CAG	LTE-FDD (SC-FDMA, 50% RB, 5 MHz, 64-QAM)	X	1.96	66.64	13.50	0.00	150.0	± 9.6 %
		Y	2.05	67.24	13.94		150.0	
		Z	1.69	64.66	11.97		150.0	
10160-CAE	LTE-FDD (SC-FDMA, 50% RB, 15 MHz, QPSK)	X	2.65	68.54	16.21	0.00	150.0	± 9.6 %
		Y	2.69	68.75	16.35		150.0	
		Z	2.45	67.22	15.28		150.0	
10161-CAE	LTE-FDD (SC-FDMA, 50% RB, 15 MHz, 16-QAM)	X	2.80	67.14	15.68	0.00	150.0	± 9.6 %
		Y	2.85	67.36	15.81		150.0	
		Z	2.65	66.20	14.93		150.0	
10162-CAE	LTE-FDD (SC-FDMA, 50% RB, 15 MHz, 64-QAM)	X	2.92	67.33	15.81	0.00	150.0	± 9.6 %
		Y	2.96	67.54	15.93		150.0	
		Z	2.76	66.42	15.09		150.0	
10166-CAF	LTE-FDD (SC-FDMA, 50% RB, 1.4 MHz, QPSK)	X	3.44	69.55	19.40	3.01	150.0	± 9.6 %
		Y	3.33	68.90	18.87		150.0	
		Z	3.24	68.96	19.27		150.0	
10167-CAF	LTE-FDD (SC-FDMA, 50% RB, 1.4 MHz, 16-QAM)	X	4.13	72.29	19.77	3.01	150.0	± 9.6 %
		Y	3.90	71.32	19.14		150.0	
		Z	3.70	71.38	19.59		150.0	

EX3DV4– SN:3797 November 22, 2018

10168-CAF	LTE-FDD (SC-FDMA, 50% RB, 1.4 MHz, 64-QAM)	X	4.63	74.86	21.28	3.01	150.0	± 9.6 %
		Y	4.29	73.38	20.41		150.0	
		Z	4.15	74.02	21.18		150.0	
10169-CAE	LTE-FDD (SC-FDMA, 1 RB, 20 MHz, QPSK)	X	2.79	68.20	18.83	3.01	150.0	± 9.6 %
		Y	2.65	67.41	18.22		150.0	
		Z	2.49	66.85	18.41		150.0	
10170-CAE	LTE-FDD (SC-FDMA, 1 RB, 20 MHz, 16-QAM)	X	3.64	73.58	21.05	3.01	150.0	± 9.6 %
		Y	3.29	71.87	20.05		150.0	
		Z	3.00	71.52	20.54		150.0	
10171-AAE	LTE-FDD (SC-FDMA, 1 RB, 20 MHz, 64-QAM)	X	3.04	69.71	18.31	3.01	150.0	± 9.6 %
		Y	2.83	68.75	17.68		150.0	
		Z	2.54	67.99	17.82		150.0	
10172-CAG	LTE-TDD (SC-FDMA, 1 RB, 20 MHz, QPSK)	X	7.18	91.49	29.93	6.02	65.0	± 9.6 %
		Y	8.71	95.67	31.16		65.0	
		Z	4.19	81.85	26.91		65.0	
10173-CAG	LTE-TDD (SC-FDMA, 1 RB, 20 MHz, 16-QAM)	X	17.70	105.49	32.36	6.02	65.0	± 9.6 %
		Y	16.61	103.92	31.56		65.0	
		Z	10.92	99.79	31.44		65.0	
10174-CAG	LTE-TDD (SC-FDMA, 1 RB, 20 MHz, 64-QAM)	X	14.21	99.83	30.00	6.02	65.0	± 9.6 %
		Y	14.18	99.46	29.55		65.0	
		Z	10.79	98.15	30.21		65.0	
10175-CAG	LTE-FDD (SC-FDMA, 1 RB, 10 MHz, QPSK)	X	2.76	67.91	18.58	3.01	150.0	± 9.6 %
		Y	2.63	67.19	18.02		150.0	
		Z	2.47	66.60	18.17		150.0	
10176-CAG	LTE-FDD (SC-FDMA, 1 RB, 10 MHz, 16-QAM)	X	3.65	73.60	21.06	3.01	150.0	± 9.6 %
		Y	3.30	71.89	20.06		150.0	
		Z	3.00	71.54	20.55		150.0	
10177-CAI	LTE-FDD (SC-FDMA, 1 RB, 5 MHz, QPSK)	X	2.78	68.05	18.67	3.01	150.0	± 9.6 %
		Y	2.65	67.30	18.09		150.0	
		Z	2.49	66.72	18.25		150.0	
10178-CAG	LTE-FDD (SC-FDMA, 1 RB, 5 MHz, 16-QAM)	X	3.62	73.43	20.96	3.01	150.0	± 9.6 %
		Y	3.26	71.76	19.98		150.0	
		Z	2.98	71.39	20.46		150.0	
10179-CAG	LTE-FDD (SC-FDMA, 1 RB, 10 MHz, 64-QAM)	X	3.31	71.56	19.56	3.01	150.0	± 9.6 %
		Y	3.04	70.27	18.77		150.0	
		Z	2.75	69.71	19.08		150.0	
10180-CAG	LTE-FDD (SC-FDMA, 1 RB, 5 MHz, 64-QAM)	X	3.03	69.66	18.27	3.01	150.0	± 9.6 %
		Y	2.82	68.72	17.65		150.0	
		Z	2.53	67.95	17.79		150.0	
10181-CAE	LTE-FDD (SC-FDMA, 1 RB, 15 MHz, QPSK)	X	2.77	68.03	18.66	3.01	150.0	± 9.6 %
		Y	2.64	67.28	18.08		150.0	
		Z	2.48	66.71	18.25		150.0	
10182-CAE	LTE-FDD (SC-FDMA, 1 RB, 15 MHz, 16-QAM)	X	3.61	73.41	20.94	3.01	150.0	± 9.6 %
		Y	3.27	71.74	19.97		150.0	
		Z	2.98	71.37	20.44		150.0	
10183-AAD	LTE-FDD (SC-FDMA, 1 RB, 15 MHz, 64-QAM)	X	3.03	69.63	18.26	3.01	150.0	± 9.6 %
		Y	2.82	68.70	17.64		150.0	
		Z	2.53	67.93	17.78		150.0	

10184-CAE	LTE-FDD (SC-FDMA, 1 RB, 3 MHz, QPSK)	X	2.78	68.07	18.68	3.01	150.0	± 9.6 %
		Y	2.65	67.32	18.10		150.0	
		Z	2.49	66.75	18.27		150.0	
10185-CAE	LTE-FDD (SC-FDMA, 1 RB, 3 MHz, 16-QAM)	X	3.63	73.47	20.98	3.01	150.0	± 9.6 %
		Y	3.29	71.79	20.00		150.0	
		Z	2.99	71.44	20.48		150.0	
10186-AAE	LTE-FDD (SC-FDMA, 1 RB, 3 MHz, 64-QAM)	X	3.04	69.70	18.29	3.01	150.0	± 9.6 %
		Y	2.83	68.75	17.67		150.0	
		Z	2.54	67.99	17.81		150.0	
10187-CAF	LTE-FDD (SC-FDMA, 1 RB, 1.4 MHz, QPSK)	X	2.79	68.13	18.75	3.01	150.0	± 9.6 %
		Y	2.66	67.37	18.17		150.0	
		Z	2.50	66.80	18.34		150.0	
10188-CAF	LTE-FDD (SC-FDMA, 1 RB, 1.4 MHz, 16-QAM)	X	3.73	74.07	21.34	3.01	150.0	± 9.6 %
		Y	3.36	72.26	20.30		150.0	
		Z	3.06	71.98	20.83		150.0	
10189-AAF	LTE-FDD (SC-FDMA, 1 RB, 1.4 MHz, 64-QAM)	X	3.10	70.08	18.56	3.01	150.0	± 9.6 %
		Y	2.88	69.07	17.91		150.0	
		Z	2.59	68.34	18.07		150.0	
10193-CAC	IEEE 802.11n (HT Greenfield, 6.5 Mbps, BPSK)	X	4.42	66.52	16.10	0.00	150.0	± 9.6 %
		Y	4.45	66.65	16.14		150.0	
		Z	4.32	66.20	15.78		150.0	
10194-CAC	IEEE 802.11n (HT Greenfield, 39 Mbps, 16-QAM)	X	4.57	66.80	16.23	0.00	150.0	± 9.6 %
		Y	4.60	66.94	16.27		150.0	
		Z	4.47	66.47	15.92		150.0	
10195-CAC	IEEE 802.11n (HT Greenfield, 65 Mbps, 64-QAM)	X	4.61	66.84	16.25	0.00	150.0	± 9.6 %
		Y	4.64	66.97	16.29		150.0	
		Z	4.51	66.50	15.94		150.0	
10196-CAC	IEEE 802.11n (HT Mixed, 6.5 Mbps, BPSK)	X	4.41	66.56	16.11	0.00	150.0	± 9.6 %
		Y	4.44	66.69	16.14		150.0	
		Z	4.31	66.22	15.77		150.0	
10197-CAC	IEEE 802.11n (HT Mixed, 39 Mbps, 16-QAM)	X	4.59	66.82	16.25	0.00	150.0	± 9.6 %
		Y	4.62	66.95	16.28		150.0	
		Z	4.48	66.48	15.93		150.0	
10198-CAC	IEEE 802.11n (HT Mixed, 65 Mbps, 64-QAM)	X	4.61	66.85	16.26	0.00	150.0	± 9.6 %
		Y	4.64	66.98	16.30		150.0	
		Z	4.50	66.51	15.95		150.0	
10219-CAC	IEEE 802.11n (HT Mixed, 7.2 Mbps, BPSK)	X	4.36	66.58	16.07	0.00	150.0	± 9.6 %
		Y	4.39	66.71	16.11		150.0	
		Z	4.26	66.23	15.73		150.0	
10220-CAC	IEEE 802.11n (HT Mixed, 43.3 Mbps, 16-QAM)	X	4.58	66.78	16.23	0.00	150.0	± 9.6 %
		Y	4.61	66.92	16.27		150.0	
		Z	4.47	66.45	15.92		150.0	
10221-CAC	IEEE 802.11n (HT Mixed, 72.2 Mbps, 64-QAM)	X	4.62	66.78	16.25	0.00	150.0	± 9.6 %
		Y	4.65	66.91	16.28		150.0	
		Z	4.52	66.45	15.94		150.0	
10222-CAC	IEEE 802.11n (HT Mixed, 15 Mbps, BPSK)	X	4.98	66.93	16.38	0.00	150.0	± 9.6 %
		Y	5.00	67.04	16.40		150.0	
		Z	4.89	66.63	16.12		150.0	

EX3DV4– SN:3797 November 22, 2018

10223-CAC	IEEE 802.11n (HT Mixed, 90 Mbps, 16-QAM)	X	5.28	67.18	16.53	0.00	150.0	± 9.6 %
		Y	5.30	67.28	16.54		150.0	
		Z	5.18	66.90	16.28		150.0	
10224-CAC	IEEE 802.11n (HT Mixed, 150 Mbps, 64-QAM)	X	5.02	67.04	16.36	0.00	150.0	± 9.6 %
		Y	5.04	67.15	16.38		150.0	
		Z	4.93	66.73	16.09		150.0	
10225-CAB	UMTS-FDD (HSPA+)	X	2.68	65.94	15.03	0.00	150.0	± 9.6 %
		Y	2.73	66.16	15.17		150.0	
		Z	2.55	65.17	14.29		150.0	
10226-CAA	LTE-TDD (SC-FDMA, 1 RB, 1.4 MHz, 16-QAM)	X	19.48	107.50	33.05	6.02	65.0	± 9.6 %
		Y	18.01	105.59	32.15		65.0	
		Z	11.90	101.66	32.13		65.0	
10227-CAA	LTE-TDD (SC-FDMA, 1 RB, 1.4 MHz, 64-QAM)	X	20.78	106.86	32.13	6.02	65.0	± 9.6 %
		Y	18.24	103.95	30.91		65.0	
		Z	14.02	103.23	31.84		65.0	
10228-CAA	LTE-TDD (SC-FDMA, 1 RB, 1.4 MHz, QPSK)	X	8.44	95.43	31.41	6.02	65.0	± 9.6 %
		Y	9.06	96.77	31.59		65.0	
		Z	5.47	87.97	29.35		65.0	
10229-CAC	LTE-TDD (SC-FDMA, 1 RB, 3 MHz, 16-QAM)	X	17.84	105.62	32.41	6.02	65.0	± 9.6 %
		Y	16.73	104.02	31.59		65.0	
		Z	11.02	99.94	31.49		65.0	
10230-CAC	LTE-TDD (SC-FDMA, 1 RB, 3 MHz, 64-QAM)	X	18.76	104.86	31.47	6.02	65.0	± 9.6 %
		Y	16.76	102.31	30.36		65.0	
		Z	12.64	101.15	31.14		65.0	
10231-CAC	LTE-TDD (SC-FDMA, 1 RB, 3 MHz, QPSK)	X	8.03	94.27	30.94	6.02	65.0	± 9.6 %
		Y	8.64	95.70	31.16		65.0	
		Z	5.26	87.04	28.92		65.0	
10232-CAF	LTE-TDD (SC-FDMA, 1 RB, 5 MHz, 16-QAM)	X	17.81	105.60	32.40	6.02	65.0	± 9.6 %
		Y	16.70	104.01	31.59		65.0	
		Z	10.99	99.90	31.48		65.0	
10233-CAF	LTE-TDD (SC-FDMA, 1 RB, 5 MHz, 64-QAM)	X	18.68	104.80	31.46	6.02	65.0	± 9.6 %
		Y	16.70	102.27	30.35		65.0	
		Z	12.57	101.06	31.11		65.0	
10234-CAF	LTE-TDD (SC-FDMA, 1 RB, 5 MHz, QPSK)	X	7.74	93.35	30.50	6.02	65.0	± 9.6 %
		Y	8.33	94.80	30.73		65.0	
		Z	5.12	86.37	28.55		65.0	
10235-CAF	LTE-TDD (SC-FDMA, 1 RB, 10 MHz, 16-QAM)	X	17.85	105.67	32.42	6.02	65.0	± 9.6 %
		Y	16.74	104.08	31.61		65.0	
		Z	11.01	99.95	31.50		65.0	
10236-CAF	LTE-TDD (SC-FDMA, 1 RB, 10 MHz, 64-QAM)	X	19.05	105.11	31.54	6.02	65.0	± 9.6 %
		Y	17.02	102.57	30.43		65.0	
		Z	12.83	101.40	31.21		65.0	
10237-CAF	LTE-TDD (SC-FDMA, 1 RB, 10 MHz, QPSK)	X	8.04	94.35	30.97	6.02	65.0	± 9.6 %
		Y	8.66	95.80	31.20		65.0	
		Z	5.25	87.08	28.94		65.0	
10238-CAF	LTE-TDD (SC-FDMA, 1 RB, 15 MHz, 16-QAM)	X	17.77	105.58	32.40	6.02	65.0	± 9.6 %
		Y	16.67	103.99	31.59		65.0	
		Z	10.96	99.87	31.47		65.0	

10239-CAF	LTE-TDD (SC-FDMA, 1 RB, 15 MHz, 64-QAM)	X	18.60	104.75	31.45	6.02	65.0	± 9.6 %
		Y	16.63	102.22	30.34		65.0	
		Z	12.50	100.98	31.09		65.0	
10240-CAF	LTE-TDD (SC-FDMA, 1 RB, 15 MHz, QPSK)	X	8.02	94.30	30.95	6.02	65.0	± 9.6 %
		Y	8.64	95.75	31.18		65.0	
		Z	5.24	87.04	28.93		65.0	
10241-CAA	LTE-TDD (SC-FDMA, 50% RB, 1.4 MHz, 16-QAM)	X	7.68	81.84	26.30	6.98	65.0	± 9.6 %
		Y	7.79	82.28	26.37		65.0	
		Z	6.72	80.23	25.93		65.0	
10242-CAA	LTE-TDD (SC-FDMA, 50% RB, 1.4 MHz, 64-QAM)	X	7.22	80.50	25.66	6.98	65.0	± 9.6 %
		Y	7.61	81.83	26.11		65.0	
		Z	6.03	77.86	24.83		65.0	
10243-CAA	LTE-TDD (SC-FDMA, 50% RB, 1.4 MHz, QPSK)	X	5.76	76.50	24.87	6.98	65.0	± 9.6 %
		Y	6.07	77.93	25.44		65.0	
		Z	5.01	74.07	23.97		65.0	
10244-CAC	LTE-TDD (SC-FDMA, 50% RB, 3 MHz, 16-QAM)	X	6.36	78.37	19.60	3.98	65.0	± 9.6 %
		Y	5.83	76.62	18.65		65.0	
		Z	5.73	77.48	19.17		65.0	
10245-CAC	LTE-TDD (SC-FDMA, 50% RB, 3 MHz, 64-QAM)	X	5.99	77.12	19.03	3.98	65.0	± 9.6 %
		Y	5.55	75.60	18.17		65.0	
		Z	5.35	76.12	18.55		65.0	
10246-CAC	LTE-TDD (SC-FDMA, 50% RB, 3 MHz, QPSK)	X	6.26	81.92	21.11	3.98	65.0	± 9.6 %
		Y	7.50	84.58	22.10		65.0	
		Z	4.19	75.68	18.29		65.0	
10247-CAF	LTE-TDD (SC-FDMA, 50% RB, 5 MHz, 16-QAM)	X	4.80	74.45	18.85	3.98	65.0	± 9.6 %
		Y	5.23	75.76	19.42		65.0	
		Z	4.03	71.73	17.30		65.0	
10248-CAF	LTE-TDD (SC-FDMA, 50% RB, 5 MHz, 64-QAM)	X	4.69	73.54	18.43	3.98	65.0	± 9.6 %
		Y	5.11	74.83	19.00		65.0	
		Z	3.98	71.02	16.95		65.0	
10249-CAF	LTE-TDD (SC-FDMA, 50% RB, 5 MHz, QPSK)	X	7.96	86.51	23.96	3.98	65.0	± 9.6 %
		Y	9.50	89.31	24.93		65.0	
		Z	5.58	80.58	21.48		65.0	
10250-CAF	LTE-TDD (SC-FDMA, 50% RB, 10 MHz, 16-QAM)	X	5.61	76.81	21.78	3.98	65.0	± 9.6 %
		Y	6.05	78.05	22.26		65.0	
		Z	4.95	74.65	20.64		65.0	
10251-CAF	LTE-TDD (SC-FDMA, 50% RB, 10 MHz, 64-QAM)	X	5.26	74.26	20.26	3.98	65.0	± 9.6 %
		Y	5.67	75.54	20.81		65.0	
		Z	4.70	72.42	19.23		65.0	
10252-CAF	LTE-TDD (SC-FDMA, 50% RB, 10 MHz, QPSK)	X	7.24	84.15	24.32	3.98	65.0	± 9.6 %
		Y	8.33	86.51	25.15		65.0	
		Z	5.78	80.23	22.65		65.0	
10253-CAF	LTE-TDD (SC-FDMA, 50% RB, 15 MHz, 16-QAM)	X	5.31	73.15	20.20	3.98	65.0	± 9.6 %
		Y	5.67	74.35	20.72		65.0	
		Z	4.86	71.69	19.38		65.0	
10254-CAF	LTE-TDD (SC-FDMA, 50% RB, 15 MHz, 64-QAM)	X	5.65	74.10	20.93	3.98	65.0	± 9.6 %
		Y	6.02	75.23	21.40		65.0	
		Z	5.18	72.63	20.11		65.0	

EX3DV4– SN:3797 November 22, 2018

10255-CAF	LTE-TDD (SC-FDMA, 50% RB, 15 MHz, QPSK)	X	6.22	78.90	22.55	3.98	65.0	± 9.6 %
		Y	6.86	80.57	23.17		65.0	
		Z	5.41	76.51	21.43		65.0	
10256-CAA	LTE-TDD (SC-FDMA, 100% RB, 1.4 MHz, 16-QAM)	X	4.34	72.18	15.80	3.98	65.0	± 9.6 %
		Y	4.09	71.08	15.11		65.0	
		Z	3.73	70.71	14.99		65.0	
10257-CAA	LTE-TDD (SC-FDMA, 100% RB, 1.4 MHz, 64-QAM)	X	4.04	70.80	15.07	3.98	65.0	± 9.6 %
		Y	3.87	69.98	14.50		65.0	
		Z	3.47	69.31	14.21		65.0	
10258-CAA	LTE-TDD (SC-FDMA, 100% RB, 1.4 MHz, QPSK)	X	3.93	74.08	16.95	3.98	65.0	± 9.6 %
		Y	4.66	76.42	17.97		65.0	
		Z	2.76	69.17	14.33		65.0	
10259-CAC	LTE-TDD (SC-FDMA, 100% RB, 3 MHz, 16-QAM)	X	5.15	75.48	19.97	3.98	65.0	± 9.6 %
		Y	5.59	76.75	20.50		65.0	
		Z	4.42	72.99	18.59		65.0	
10260-CAC	LTE-TDD (SC-FDMA, 100% RB, 3 MHz, 64-QAM)	X	5.14	75.03	19.77	3.98	65.0	± 9.6 %
		Y	5.56	76.25	20.28		65.0	
		Z	4.44	72.66	18.43		65.0	
10261-CAC	LTE-TDD (SC-FDMA, 100% RB, 3 MHz, QPSK)	X	7.02	84.08	23.61	3.98	65.0	± 9.6 %
		Y	8.17	86.55	24.48		65.0	
		Z	5.35	79.48	21.59		65.0	
10262-CAF	LTE-TDD (SC-FDMA, 100% RB, 5 MHz, 16-QAM)	X	5.60	76.74	21.73	3.98	65.0	± 9.6 %
		Y	6.03	77.99	22.21		65.0	
		Z	4.94	74.58	20.59		65.0	
10263-CAF	LTE-TDD (SC-FDMA, 100% RB, 5 MHz, 64-QAM)	X	5.25	74.23	20.25	3.98	65.0	± 9.6 %
		Y	5.66	75.51	20.80		65.0	
		Z	4.69	72.39	19.22		65.0	
10264-CAF	LTE-TDD (SC-FDMA, 100% RB, 5 MHz, QPSK)	X	7.15	83.88	24.20	3.98	65.0	± 9.6 %
		Y	8.23	86.24	25.03		65.0	
		Z	5.72	80.00	22.53		65.0	
10265-CAF	LTE-TDD (SC-FDMA, 100% RB, 10 MHz, 16-QAM)	X	5.41	73.66	20.48	3.98	65.0	± 9.6 %
		Y	5.80	74.91	21.02		65.0	
		Z	4.93	72.09	19.64		65.0	
10266-CAF	LTE-TDD (SC-FDMA, 100% RB, 10 MHz, 64-QAM)	X	5.79	74.68	21.29	3.98	65.0	± 9.6 %
		Y	6.17	75.86	21.77		65.0	
		Z	5.28	73.13	20.47		65.0	
10267-CAF	LTE-TDD (SC-FDMA, 100% RB, 10 MHz, QPSK)	X	6.62	79.81	22.71	3.98	65.0	± 9.6 %
		Y	7.32	81.53	23.33		65.0	
		Z	5.69	77.25	21.56		65.0	
10268-CAF	LTE-TDD (SC-FDMA, 100% RB, 15 MHz, 16-QAM)	X	5.99	73.34	20.75	3.98	65.0	± 9.6 %
		Y	6.34	74.42	21.20		65.0	
		Z	5.56	72.06	20.07		65.0	
10269-CAF	LTE-TDD (SC-FDMA, 100% RB, 15 MHz, 64-QAM)	X	5.97	72.89	20.59	3.98	65.0	± 9.6 %
		Y	6.30	73.93	21.03		65.0	
		Z	5.56	71.68	19.94		65.0	
10270-CAF	LTE-TDD (SC-FDMA, 100% RB, 15 MHz, QPSK)	X	6.24	76.14	21.33	3.98	65.0	± 9.6 %
		Y	6.69	77.35	21.78		65.0	
		Z	5.63	74.45	20.52		65.0	

10274-CAB	UMTS-FDD (HSUPA, Subtest 5, 3GPP Rel8.10)	X	2.49	66.39	14.98	0.00	150.0	± 9.6 %
		Y	2.54	66.66	15.17		150.0	
		Z	2.35	65.48	14.17		150.0	
10275-CAB	UMTS-FDD (HSUPA, Subtest 5, 3GPP Rel8.4)	X	1.51	67.52	15.15	0.00	150.0	± 9.6 %
		Y	1.58	68.12	15.56		150.0	
		Z	1.33	65.38	13.60		150.0	
10277-CAA	PHS (QPSK)	X	1.79	60.76	6.30	9.03	50.0	± 9.6 %
		Y	1.71	60.71	6.14		50.0	
		Z	1.67	60.31	5.83		50.0	
10278-CAA	PHS (QPSK, BW 884MHz, Rolloff 0.5)	X	5.04	74.25	15.99	9.03	50.0	± 9.6 %
		Y	6.19	77.50	17.27		50.0	
		Z	3.73	69.93	13.77		50.0	
10279-CAA	PHS (QPSK, BW 884MHz, Rolloff 0.38)	X	5.21	74.65	16.22	9.03	50.0	± 9.6 %
		Y	6.43	77.96	17.52		50.0	
		Z	3.85	70.27	13.99		50.0	
10290-AAB	CDMA2000, RC1, SO55, Full Rate	X	1.12	66.14	11.84	0.00	150.0	± 9.6 %
		Y	1.26	67.58	12.85		150.0	
		Z	0.84	62.90	9.47		150.0	
10291-AAB	CDMA2000, RC3, SO55, Full Rate	X	0.65	63.77	10.38	0.00	150.0	± 9.6 %
		Y	0.74	65.01	11.45		150.0	
		Z	0.51	61.20	8.16		150.0	
10292-AAB	CDMA2000, RC3, SO32, Full Rate	X	0.84	67.52	12.62	0.00	150.0	± 9.6 %
		Y	1.02	69.87	14.15		150.0	
		Z	0.56	62.63	9.27		150.0	
10293-AAB	CDMA2000, RC3, SO3, Full Rate	X	1.51	75.03	16.30	0.00	150.0	± 9.6 %
		Y	1.93	78.54	18.12		150.0	
		Z	0.70	64.95	10.93		150.0	
10295-AAB	CDMA2000, RC1, SO3, 1/8th Rate 25 fr.	X	22.67	101.79	29.16	9.03	50.0	± 9.6 %
		Y	23.36	103.59	30.00		50.0	
		Z	22.16	99.99	28.03		50.0	
10297-AAD	LTE-FDD (SC-FDMA, 50% RB, 20 MHz, QPSK)	X	2.61	69.25	16.39	0.00	150.0	± 9.6 %
		Y	2.67	69.64	16.61		150.0	
		Z	2.36	67.60	15.33		150.0	
10298-AAD	LTE-FDD (SC-FDMA, 50% RB, 3 MHz, QPSK)	X	1.29	65.83	12.46	0.00	150.0	± 9.6 %
		Y	1.40	66.79	13.17		150.0	
		Z	1.05	63.24	10.46		150.0	
10299-AAD	LTE-FDD (SC-FDMA, 50% RB, 3 MHz, 16-QAM)	X	2.37	68.99	13.63	0.00	150.0	± 9.6 %
		Y	2.01	66.88	12.49		150.0	
		Z	2.07	67.96	12.95		150.0	
10300-AAD	LTE-FDD (SC-FDMA, 50% RB, 3 MHz, 64-QAM)	X	1.67	63.94	10.40	0.00	150.0	± 9.6 %
		Y	1.56	63.22	9.90		150.0	
		Z	1.46	63.12	9.72		150.0	
10301-AAA	IEEE 802.16e WiMAX (29:18, 5ms, 10MHz, QPSK, PUSC)	X	4.67	65.59	17.41	4.17	50.0	± 9.6 %
		Y	4.75	65.98	17.66		50.0	
		Z	4.59	65.51	17.20		50.0	
10302-AAA	IEEE 802.16e WiMAX (29:18, 5ms, 10MHz, QPSK, PUSC, 3 CTRL symbols)	X	5.13	66.16	18.11	4.96	50.0	± 9.6 %
		Y	5.19	66.48	18.33		50.0	
		Z	5.00	65.78	17.74		50.0	

EX3DV4– SN:3797 November 22, 2018

10303-AAA	IEEE 802.16e WiMAX (31:15, 5ms, 10MHz, 64QAM, PUSC)	X	4.88	65.79	17.92	4.96	50.0	± 9.6 %
		Y	4.93	66.10	18.14		50.0	
		Z	4.76	65.41	17.53		50.0	
10304-AAA	IEEE 802.16e WiMAX (29:18, 5ms, 10MHz, 64QAM, PUSC)	X	4.70	65.67	17.42	4.17	50.0	± 9.6 %
		Y	4.75	65.97	17.62		50.0	
		Z	4.57	65.27	17.01		50.0	
10305-AAA	IEEE 802.16e WiMAX (31:15, 10ms, 10MHz, 64QAM, PUSC, 15 symbols)	X	4.37	67.94	19.50	6.02	35.0	± 9.6 %
		Y	4.33	67.88	19.63		35.0	
		Z	4.23	67.43	18.90		35.0	
10306-AAA	IEEE 802.16e WiMAX (29:18, 10ms, 10MHz, 64QAM, PUSC, 18 symbols)	X	4.66	66.87	19.15	6.02	35.0	± 9.6 %
		Y	4.65	66.91	19.28		35.0	
		Z	4.55	66.53	18.71		35.0	
10307-AAA	IEEE 802.16e WiMAX (29:18, 10ms, 10MHz, QPSK, PUSC, 18 symbols)	X	4.55	66.98	19.09	6.02	35.0	± 9.6 %
		Y	4.54	67.00	19.21		35.0	
		Z	4.43	66.58	18.61		35.0	
10308-AAA	IEEE 802.16e WiMAX (29:18, 10ms, 10MHz, 16QAM, PUSC)	X	4.53	67.21	19.24	6.02	35.0	± 9.6 %
		Y	4.52	67.24	19.37		35.0	
		Z	4.41	66.79	18.75		35.0	
10309-AAA	IEEE 802.16e WiMAX (29:18, 10ms, 10MHz, 16QAM, AMC 2x3, 18 symbols)	X	4.70	67.05	19.29	6.02	35.0	± 9.6 %
		Y	4.70	67.11	19.42		35.0	
		Z	4.58	66.67	18.83		35.0	
10310-AAA	IEEE 802.16e WiMAX (29:18, 10ms, 10MHz, QPSK, AMC 2x3, 18 symbols)	X	4.61	66.94	19.14	6.02	35.0	± 9.6 %
		Y	4.60	66.97	19.26		35.0	
		Z	4.50	66.58	18.68		35.0	
10311-AAD	LTE-FDD (SC-FDMA, 100% RB, 15 MHz, QPSK)	X	2.96	68.49	16.05	0.00	150.0	± 9.6 %
		Y	3.03	68.88	16.25		150.0	
		Z	2.71	66.96	15.10		150.0	
10313-AAA	iDEN 1:3	X	4.96	79.98	19.19	6.99	70.0	± 9.6 %
		Y	7.33	85.06	20.91		70.0	
		Z	3.06	73.73	16.75		70.0	
10314-AAA	iDEN 1:6	X	10.49	95.79	27.60	10.00	30.0	± 9.6 %
		Y	12.16	99.13	28.82		30.0	
		Z	5.40	84.58	23.81		30.0	
10315-AAB	IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps, 96pc duty cycle)	X	1.03	63.50	15.02	0.17	150.0	± 9.6 %
		Y	1.07	63.88	15.27		150.0	
		Z	0.97	62.27	13.82		150.0	
10316-AAB	IEEE 802.11g WiFi 2.4 GHz (ERP-OFDM, 6 Mbps, 96pc duty cycle)	X	4.48	66.60	16.30	0.17	150.0	± 9.6 %
		Y	4.50	66.73	16.33		150.0	
		Z	4.38	66.27	15.98		150.0	
10317-AAC	IEEE 802.11a WiFi 5 GHz (OFDM, 6 Mbps, 96pc duty cycle)	X	4.48	66.60	16.30	0.17	150.0	± 9.6 %
		Y	4.50	66.73	16.33		150.0	
		Z	4.38	66.27	15.98		150.0	
10400-AAD	IEEE 802.11ac WiFi (20MHz, 64-QAM, 99pc duty cycle)	X	4.55	66.85	16.23	0.00	150.0	± 9.6 %
		Y	4.59	67.00	16.27		150.0	
		Z	4.44	66.50	15.90		150.0	
10401-AAD	IEEE 802.11ac WiFi (40MHz, 64-QAM, 99pc duty cycle)	X	5.32	67.13	16.48	0.00	150.0	± 9.6 %
		Y	5.30	67.14	16.44		150.0	
		Z	5.18	66.70	16.14		150.0	

10402-AAD	IEEE 802.11ac WiFi (80MHz, 64-QAM, 99pc duty cycle)	X	5.54	67.28	16.41	0.00	150.0	± 9.6 %
		Y	5.56	67.40	16.43		150.0	
		Z	5.45	67.00	16.17		150.0	
10403-AAB	CDMA2000 (1xEV-DO, Rev. 0)	X	1.12	66.14	11.84	0.00	115.0	± 9.6 %
		Y	1.26	67.58	12.85		115.0	
		Z	0.84	62.90	9.47		115.0	
10404-AAB	CDMA2000 (1xEV-DO, Rev. A)	X	1.12	66.14	11.84	0.00	115.0	± 9.6 %
		Y	1.26	67.58	12.85		115.0	
		Z	0.84	62.90	9.47		115.0	
10406-AAB	CDMA2000, RC3, SO32, SCH0, Full Rate	X	100.00	125.47	31.86	0.00	100.0	± 9.6 %
		Y	21.02	102.87	25.98		100.0	
		Z	100.00	129.86	33.20		100.0	
10410-AAF	LTE-TDD (SC-FDMA, 1 RB, 10 MHz, QPSK, UL Subframe=2,3,4,7,8,9, Subframe Conf=4)	X	100.00	132.52	34.83	3.23	80.0	± 9.6 %
		Y	100.00	128.98	33.11		80.0	
		Z	100.00	139.25	37.49		80.0	
10415-AAA	IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps, 99pc duty cycle)	X	0.96	62.72	14.40	0.00	150.0	± 9.6 %
		Y	1.00	63.06	14.64		150.0	
		Z	0.91	61.66	13.28		150.0	
10416-AAA	IEEE 802.11g WiFi 2.4 GHz (ERP-OFDM, 6 Mbps, 99pc duty cycle)	X	4.42	66.55	16.18	0.00	150.0	± 9.6 %
		Y	4.45	66.68	16.21		150.0	
		Z	4.32	66.22	15.86		150.0	
10417-AAB	IEEE 802.11a/h WiFi 5 GHz (OFDM, 6 Mbps, 99pc duty cycle)	X	4.42	66.55	16.18	0.00	150.0	± 9.6 %
		Y	4.45	66.68	16.21		150.0	
		Z	4.32	66.22	15.86		150.0	
10418-AAA	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 6 Mbps, 99pc duty cycle, Long preambule)	X	4.41	66.73	16.21	0.00	150.0	± 9.6 %
		Y	4.44	66.86	16.25		150.0	
		Z	4.31	66.39	15.89		150.0	
10419-AAA	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 6 Mbps, 99pc duty cycle, Short preambule)	X	4.43	66.67	16.21	0.00	150.0	± 9.6 %
		Y	4.46	66.80	16.24		150.0	
		Z	4.33	66.34	15.88		150.0	
10422-AAB	IEEE 802.11n (HT Greenfield, 7.2 Mbps, BPSK)	X	4.54	66.66	16.22	0.00	150.0	± 9.6 %
		Y	4.57	66.79	16.26		150.0	
		Z	4.44	66.34	15.91		150.0	
10423-AAB	IEEE 802.11n (HT Greenfield, 43.3 Mbps, 16-QAM)	X	4.69	66.94	16.32	0.00	150.0	± 9.6 %
		Y	4.72	67.08	16.36		150.0	
		Z	4.57	66.61	16.01		150.0	
10424-AAB	IEEE 802.11n (HT Greenfield, 72.2 Mbps, 64-QAM)	X	4.61	66.90	16.30	0.00	150.0	± 9.6 %
		Y	4.64	67.03	16.33		150.0	
		Z	4.50	66.56	15.98		150.0	
10425-AAB	IEEE 802.11n (HT Greenfield, 15 Mbps, BPSK)	X	5.24	67.19	16.51	0.00	150.0	± 9.6 %
		Y	5.25	67.27	16.51		150.0	
		Z	5.14	66.90	16.25		150.0	
10426-AAB	IEEE 802.11n (HT Greenfield, 90 Mbps, 16-QAM)	X	5.27	67.30	16.56	0.00	150.0	± 9.6 %
		Y	5.27	67.35	16.55		150.0	
		Z	5.17	67.01	16.30		150.0	

10427-AAB	IEEE 802.11n (HT Greenfield, 150 Mbps, 64-QAM)	X	5.25	67.18	16.50	0.00	150.0	± 9.6 %
		Y	5.26	67.26	16.50		150.0	
		Z	5.14	66.83	16.21		150.0	
10430-AAD	LTE-FDD (OFDMA, 5 MHz, E-TM 3.1)	X	4.16	71.19	18.14	0.00	150.0	± 9.6 %
		Y	4.13	70.88	17.97		150.0	
		Z	3.92	70.23	17.36		150.0	
10431-AAD	LTE-FDD (OFDMA, 10 MHz, E-TM 3.1)	X	4.06	67.10	16.09	0.00	150.0	± 9.6 %
		Y	4.10	67.25	16.16		150.0	
		Z	3.92	66.63	15.65		150.0	
10432-AAC	LTE-FDD (OFDMA, 15 MHz, E-TM 3.1)	X	4.37	66.96	16.23	0.00	150.0	± 9.6 %
		Y	4.41	67.10	16.27		150.0	
		Z	4.26	66.58	15.86		150.0	
10433-AAC	LTE-FDD (OFDMA, 20 MHz, E-TM 3.1)	X	4.63	66.93	16.32	0.00	150.0	± 9.6 %
		Y	4.66	67.06	16.35		150.0	
		Z	4.52	66.59	16.00		150.0	
10434-AAA	W-CDMA (BS Test Model 1, 64 DPCH)	X	4.26	72.02	17.99	0.00	150.0	± 9.6 %
		Y	4.21	71.70	17.85		150.0	
		Z	3.92	70.69	17.00		150.0	
10435-AAF	LTE-TDD (SC-FDMA, 1 RB, 20 MHz, QPSK, UL Subframe=2,3,4,7,8,9)	X	100.00	132.27	34.71	3.23	80.0	± 9.6 %
		Y	100.00	128.74	32.99		80.0	
		Z	100.00	138.97	37.36		80.0	
10447-AAD	LTE-FDD (OFDMA, 5 MHz, E-TM 3.1, Clipping 44%)	X	3.32	66.96	15.14	0.00	150.0	± 9.6 %
		Y	3.37	67.18	15.28		150.0	
		Z	3.13	66.17	14.41		150.0	
10448-AAD	LTE-FDD (OFDMA, 10 MHz, E-TM 3.1, Clippin 44%)	X	3.91	66.88	15.96	0.00	150.0	± 9.6 %
		Y	3.95	67.04	16.02		150.0	
		Z	3.78	66.41	15.50		150.0	
10449-AAC	LTE-FDD (OFDMA, 15 MHz, E-TM 3.1, Cliping 44%)	X	4.20	66.79	16.12	0.00	150.0	± 9.6 %
		Y	4.23	66.93	16.17		150.0	
		Z	4.09	66.39	15.75		150.0	
10450-AAC	LTE-FDD (OFDMA, 20 MHz, E-TM 3.1, Clipping 44%)	X	4.41	66.70	16.17	0.00	150.0	± 9.6 %
		Y	4.44	66.84	16.21		150.0	
		Z	4.31	66.34	15.84		150.0	
10451-AAA	W-CDMA (BS Test Model 1, 64 DPCH, Clipping 44%)	X	3.16	66.92	14.55	0.00	150.0	± 9.6 %
		Y	3.22	67.20	14.75		150.0	
		Z	2.93	65.93	13.68		150.0	
10456-AAB	IEEE 802.11ac WiFi (160MHz, 64-QAM, 99pc duty cycle)	X	6.17	67.85	16.73	0.00	150.0	± 9.6 %
		Y	6.16	67.90	16.71		150.0	
		Z	6.12	67.67	16.56		150.0	
10457-AAA	UMTS-FDD (DC-HSDPA)	X	3.72	65.22	15.89	0.00	150.0	± 9.6 %
		Y	3.75	65.35	15.92		150.0	
		Z	3.66	64.93	15.56		150.0	
10458-AAA	CDMA2000 (1xEV-DO, Rev. B, 2 carriers)	X	3.83	70.92	17.07	0.00	150.0	± 9.6 %
		Y	3.84	70.86	17.09		150.0	
		Z	3.45	69.27	15.84		150.0	
10459-AAA	CDMA2000 (1xEV-DO, Rev. B, 3 carriers)	X	4.95	68.68	18.05	0.00	150.0	± 9.6 %
		Y	4.90	68.38	17.86		150.0	
		Z	4.77	68.23	17.54		150.0	

EX3DV4– SN:3797 November 22, 2018

10460-AAA	UMTS-FDD (WCDMA, AMR)	X	0.83	67.74	15.57	0.00	150.0	± 9.6 %
		Y	0.90	68.60	16.23		150.0	
		Z	0.68	64.30	13.06		150.0	
10461-AAA	LTE-TDD (SC-FDMA, 1 RB, 1.4 MHz, QPSK, UL Subframe=2,3,4,7,8,9)	X	100.00	138.46	37.60	3.29	80.0	± 9.6 %
		Y	100.00	133.94	35.46		80.0	
		Z	100.00	145.34	40.34		80.0	
10462-AAA	LTE-TDD (SC-FDMA, 1 RB, 1.4 MHz, 16-QAM, UL Subframe=2,3,4,7,8,9)	X	100.00	113.15	25.89	3.23	80.0	± 9.6 %
		Y	12.26	87.96	19.03		80.0	
		Z	100.00	117.04	27.13		80.0	
10463-AAA	LTE-TDD (SC-FDMA, 1 RB, 1.4 MHz, 64-QAM, UL Subframe=2,3,4,7,8,9)	X	100.00	107.41	23.25	3.23	80.0	± 9.6 %
		Y	1.73	67.17	11.65		80.0	
		Z	100.00	109.44	23.70		80.0	
10464-AAB	LTE-TDD (SC-FDMA, 1 RB, 3 MHz, QPSK, UL Subframe=2,3,4,7,8,9)	X	100.00	135.93	36.22	3.23	80.0	± 9.6 %
		Y	100.00	131.14	33.97		80.0	
		Z	100.00	142.97	39.01		80.0	
10465-AAB	LTE-TDD (SC-FDMA, 1 RB, 3 MHz, 16-QAM, UL Subframe=2,3,4,7,8,9)	X	100.00	112.23	25.47	3.23	80.0	± 9.6 %
		Y	5.34	79.32	16.48		80.0	
		Z	100.00	115.81	26.57		80.0	
10466-AAB	LTE-TDD (SC-FDMA, 1 RB, 3 MHz, 64-QAM, UL Subframe=2,3,4,7,8,9)	X	14.68	88.25	18.68	3.23	80.0	± 9.6 %
		Y	1.42	65.25	10.80		80.0	
		Z	100.00	108.37	23.23		80.0	
10467-AAE	LTE-TDD (SC-FDMA, 1 RB, 5 MHz, QPSK, UL Subframe=2,3,4,7,8,9)	X	100.00	136.33	36.40	3.23	80.0	± 9.6 %
		Y	100.00	131.51	34.13		80.0	
		Z	100.00	143.45	39.21		80.0	
10468-AAE	LTE-TDD (SC-FDMA, 1 RB, 5 MHz, 16-QAM, UL Subframe=2,3,4,7,8,9)	X	100.00	112.55	25.61	3.23	80.0	± 9.6 %
		Y	6.54	81.46	17.15		80.0	
		Z	100.00	116.26	26.77		80.0	
10469-AAE	LTE-TDD (SC-FDMA, 1 RB, 5 MHz, 64-QAM, UL Subframe=2,3,4,7,8,9)	X	16.31	89.29	18.95	3.23	80.0	± 9.6 %
		Y	1.43	65.31	10.83		80.0	
		Z	100.00	108.44	23.25		80.0	
10470-AAE	LTE-TDD (SC-FDMA, 1 RB, 10 MHz, QPSK, UL Subframe=2,3,4,7,8,9)	X	100.00	136.40	36.42	3.23	80.0	± 9.6 %
		Y	100.00	131.56	34.15		80.0	
		Z	100.00	143.55	39.25		80.0	
10471-AAE	LTE-TDD (SC-FDMA, 1 RB, 10 MHz, 16-QAM, UL Subframe=2,3,4,7,8,9)	X	100.00	112.47	25.57	3.23	80.0	± 9.6 %
		Y	6.43	81.26	17.07		80.0	
		Z	100.00	116.16	26.72		80.0	
10472-AAE	LTE-TDD (SC-FDMA, 1 RB, 10 MHz, 64-QAM, UL Subframe=2,3,4,7,8,9)	X	15.68	88.86	18.81	3.23	80.0	± 9.6 %
		Y	1.42	65.22	10.78		80.0	
		Z	100.00	108.30	23.19		80.0	
10473-AAE	LTE-TDD (SC-FDMA, 1 RB, 15 MHz, QPSK, UL Subframe=2,3,4,7,8,9)	X	100.00	136.36	36.40	3.23	80.0	± 9.6 %
		Y	100.00	131.52	34.13		80.0	
		Z	100.00	143.51	39.23		80.0	
10474-AAE	LTE-TDD (SC-FDMA, 1 RB, 15 MHz, 16-QAM, UL Subframe=2,3,4,7,8,9)	X	100.00	112.48	25.57	3.23	80.0	± 9.6 %
		Y	6.32	81.09	17.02		80.0	
		Z	100.00	116.18	26.72		80.0	
10475-AAE	LTE-TDD (SC-FDMA, 1 RB, 15 MHz, 64-QAM, UL Subframe=2,3,4,7,8,9)	X	14.93	88.40	18.70	3.23	80.0	± 9.6 %
		Y	1.41	65.18	10.76		80.0	
		Z	100.00	108.33	23.20		80.0	

EX3DV4– SN:3797 November 22, 2018

10477-AAF	LTE-TDD (SC-FDMA, 1 RB, 20 MHz, 16-QAM, UL Subframe=2,3,4,7,8,9)	X	100.00	112.19	25.43	3.23	80.0	± 9.6 %
		Y	5.42	79.47	16.50		80.0	
		Z	100.00	115.79	26.55		80.0	
10478-AAF	LTE-TDD (SC-FDMA, 1 RB, 20 MHz, 64-QAM, UL Subframe=2,3,4,7,8,9)	X	13.76	87.56	18.47	3.23	80.0	± 9.6 %
		Y	1.40	65.09	10.71		80.0	
		Z	100.00	108.20	23.14		80.0	
10479-AAA	LTE-TDD (SC-FDMA, 50% RB, 1.4 MHz, QPSK, UL Subframe=2,3,4,7,8,9)	X	89.95	128.32	35.03	3.23	80.0	± 9.6 %
		Y	14.02	97.76	26.84		80.0	
		Z	100.00	132.70	36.43		80.0	
10480-AAA	LTE-TDD (SC-FDMA, 50% RB, 1.4 MHz, 16-QAM, UL Subframe=2,3,4,7,8,9)	X	100.00	117.40	29.50	3.23	80.0	± 9.6 %
		Y	12.27	88.87	21.87		80.0	
		Z	100.00	119.38	30.10		80.0	
10481-AAA	LTE-TDD (SC-FDMA, 50% RB, 1.4 MHz, 64-QAM, UL Subframe=2,3,4,7,8,9)	X	47.27	105.49	26.10	3.23	80.0	± 9.6 %
		Y	8.10	82.51	19.45		80.0	
		Z	100.00	116.46	28.67		80.0	
10482-AAB	LTE-TDD (SC-FDMA, 50% RB, 3 MHz, QPSK, UL Subframe=2,3,4,7,8,9)	X	3.31	74.64	17.60	2.23	80.0	± 9.6 %
		Y	3.79	76.47	18.43		80.0	
		Z	1.88	67.00	13.90		80.0	
10483-AAB	LTE-TDD (SC-FDMA, 50% RB, 3 MHz, 16-QAM, UL Subframe=2,3,4,7,8,9)	X	8.02	82.44	19.90	2.23	80.0	± 9.6 %
		Y	4.27	73.84	16.65		80.0	
		Z	8.45	83.47	20.04		80.0	
10484-AAB	LTE-TDD (SC-FDMA, 50% RB, 3 MHz, 64-QAM, UL Subframe=2,3,4,7,8,9)	X	6.29	79.01	18.74	2.23	80.0	± 9.6 %
		Y	3.83	72.21	16.02		80.0	
		Z	6.17	79.15	18.61		80.0	
10485-AAE	LTE-TDD (SC-FDMA, 50% RB, 5 MHz, QPSK, UL Subframe=2,3,4,7,8,9)	X	3.71	76.64	19.69	2.23	80.0	± 9.6 %
		Y	4.01	77.69	20.16		80.0	
		Z	2.47	70.47	16.76		80.0	
10486-AAE	LTE-TDD (SC-FDMA, 50% RB, 5 MHz, 16-QAM, UL Subframe=2,3,4,7,8,9)	X	3.16	70.36	16.39	2.23	80.0	± 9.6 %
		Y	3.38	71.24	16.84		80.0	
		Z	2.40	66.52	14.23		80.0	
10487-AAE	LTE-TDD (SC-FDMA, 50% RB, 5 MHz, 64-QAM, UL Subframe=2,3,4,7,8,9)	X	3.11	69.73	16.10	2.23	80.0	± 9.6 %
		Y	3.32	70.59	16.54		80.0	
		Z	2.40	66.15	14.03		80.0	
10488-AAE	LTE-TDD (SC-FDMA, 50% RB, 10 MHz, QPSK, UL Subframe=2,3,4,7,8,9)	X	3.59	74.05	19.63	2.23	80.0	± 9.6 %
		Y	3.82	74.87	19.97		80.0	
		Z	2.86	70.36	17.79		80.0	
10489-AAE	LTE-TDD (SC-FDMA, 50% RB, 10 MHz, 16-QAM, UL Subframe=2,3,4,7,8,9)	X	3.37	69.68	17.68	2.23	80.0	± 9.6 %
		Y	3.50	70.17	17.89		80.0	
		Z	2.95	67.59	16.43		80.0	
10490-AAE	LTE-TDD (SC-FDMA, 50% RB, 10 MHz, 64-QAM, UL Subframe=2,3,4,7,8,9)	X	3.45	69.44	17.57	2.23	80.0	± 9.6 %
		Y	3.58	69.91	17.78		80.0	
		Z	3.04	67.48	16.39		80.0	
10491-AAE	LTE-TDD (SC-FDMA, 50% RB, 15 MHz, QPSK, UL Subframe=2,3,4,7,8,9)	X	3.70	71.76	18.84	2.23	80.0	± 9.6 %
		Y	3.88	72.44	19.11		80.0	
		Z	3.16	69.23	17.51		80.0	
10492-AAE	LTE-TDD (SC-FDMA, 50% RB, 15 MHz, 16-QAM, UL Subframe=2,3,4,7,8,9)	X	3.65	68.52	17.53	2.23	80.0	± 9.6 %
		Y	3.77	68.97	17.71		80.0	
		Z	3.33	67.05	16.63		80.0	

10493-AAE	LTE-TDD (SC-FDMA, 50% RB, 15 MHz, 64-QAM, UL Subframe=2,3,4,7,8,9)	X	3.71	68.36	17.46	2.23	80.0	± 9.6 %
		Y	3.83	68.79	17.64		80.0	
		Z	3.39	66.95	16.58		80.0	
10494-AAF	LTE-TDD (SC-FDMA, 50% RB, 20 MHz, QPSK, UL Subframe=2,3,4,7,8,9)	X	4.06	73.48	19.41	2.23	80.0	± 9.6 %
		Y	4.29	74.26	19.71		80.0	
		Z	3.37	70.45	17.92		80.0	
10495-AAF	LTE-TDD (SC-FDMA, 50% RB, 20 MHz, 16-QAM, UL Subframe=2,3,4,7,8,9)	X	3.68	68.86	17.75	2.23	80.0	± 9.6 %
		Y	3.80	69.32	17.92		80.0	
		Z	3.34	67.30	16.82		80.0	
10496-AAF	LTE-TDD (SC-FDMA, 50% RB, 20 MHz, 64-QAM, UL Subframe=2,3,4,7,8,9)	X	3.75	68.55	17.64	2.23	80.0	± 9.6 %
		Y	3.87	68.99	17.80		80.0	
		Z	3.43	67.12	16.77		80.0	
10497-AAA	LTE-TDD (SC-FDMA, 100% RB, 1.4 MHz, QPSK, UL Subframe=2,3,4,7,8,9)	X	1.86	66.84	13.06	2.23	80.0	± 9.6 %
		Y	2.31	69.41	14.35		80.0	
		Z	1.16	61.51	9.89		80.0	
10498-AAA	LTE-TDD (SC-FDMA, 100% RB, 1.4 MHz, 16-QAM, UL Subframe=2,3,4,7,8,9)	X	1.24	60.00	8.45	2.23	80.0	± 9.6 %
		Y	1.36	60.85	9.10		80.0	
		Z	1.20	60.00	7.87		80.0	
10499-AAA	LTE-TDD (SC-FDMA, 100% RB, 1.4 MHz, 64-QAM, UL Subframe=2,3,4,7,8,9)	X	1.26	60.00	8.29	2.23	80.0	± 9.6 %
		Y	1.30	60.21	8.59		80.0	
		Z	1.21	60.00	7.71		80.0	
10500-AAB	LTE-TDD (SC-FDMA, 100% RB, 3 MHz, QPSK, UL Subframe=2,3,4,7,8,9)	X	3.56	75.15	19.52	2.23	80.0	± 9.6 %
		Y	3.82	76.08	19.92		80.0	
		Z	2.62	70.35	17.15		80.0	
10501-AAB	LTE-TDD (SC-FDMA, 100% RB, 3 MHz, 16-QAM, UL Subframe=2,3,4,7,8,9)	X	3.29	70.30	16.97	2.23	80.0	± 9.6 %
		Y	3.46	70.96	17.30		80.0	
		Z	2.68	67.27	15.22		80.0	
10502-AAB	LTE-TDD (SC-FDMA, 100% RB, 3 MHz, 64-QAM, UL Subframe=2,3,4,7,8,9)	X	3.33	70.05	16.79	2.23	80.0	± 9.6 %
		Y	3.50	70.71	17.12		80.0	
		Z	2.72	67.11	15.07		80.0	
10503-AAE	LTE-TDD (SC-FDMA, 100% RB, 5 MHz, QPSK, UL Subframe=2,3,4,7,8,9)	X	3.54	73.81	19.52	2.23	80.0	± 9.6 %
		Y	3.77	74.65	19.86		80.0	
		Z	2.82	70.17	17.69		80.0	
10504-AAE	LTE-TDD (SC-FDMA, 100% RB, 5 MHz, 16-QAM, UL Subframe=2,3,4,7,8,9)	X	3.35	69.57	17.61	2.23	80.0	± 9.6 %
		Y	3.48	70.07	17.83		80.0	
		Z	2.93	67.49	16.37		80.0	
10505-AAE	LTE-TDD (SC-FDMA, 100% RB, 5 MHz, 64-QAM, UL Subframe=2,3,4,7,8,9)	X	3.43	69.34	17.51	2.23	80.0	± 9.6 %
		Y	3.56	69.82	17.72		80.0	
		Z	3.02	67.39	16.33		80.0	
10506-AAE	LTE-TDD (SC-FDMA, 100% RB, 10 MHz, QPSK, UL Subframe=2,3,4,7,8,9)	X	4.03	73.32	19.33	2.23	80.0	± 9.6 %
		Y	4.25	74.11	19.64		80.0	
		Z	3.35	70.32	17.85		80.0	
10507-AAE	LTE-TDD (SC-FDMA, 100% RB, 10 MHz, 16-QAM, UL Subframe=2,3,4,7,8,9)	X	3.67	68.79	17.71	2.23	80.0	± 9.6 %
		Y	3.79	69.26	17.89		80.0	
		Z	3.33	67.24	16.78		80.0	

10508-AAE	LTE-TDD (SC-FDMA, 100% RB, 10 MHz, 64-QAM, UL Subframe=2,3,4,7,8,9)	X	3.74	68.47	17.59	2.23	80.0	± 9.6 %
		Y	3.86	68.92	17.76		80.0	
		Z	3.42	67.06	16.73		80.0	
10509-AAE	LTE-TDD (SC-FDMA, 100% RB, 15 MHz, QPSK, UL Subframe=2,3,4,7,8,9)	X	4.29	71.60	18.60	2.23	80.0	± 9.6 %
		Y	4.48	72.24	18.84		80.0	
		Z	3.76	69.45	17.50		80.0	
10510-AAE	LTE-TDD (SC-FDMA, 100% RB, 15 MHz, 16-QAM, UL Subframe=2,3,4,7,8,9)	X	4.12	68.30	17.60	2.23	80.0	± 9.6 %
		Y	4.24	68.75	17.76		80.0	
		Z	3.82	67.07	16.86		80.0	
10511-AAE	LTE-TDD (SC-FDMA, 100% RB, 15 MHz, 64-QAM, UL Subframe=2,3,4,7,8,9)	X	4.17	68.04	17.52	2.23	80.0	± 9.6 %
		Y	4.29	68.47	17.67		80.0	
		Z	3.89	66.90	16.82		80.0	
10512-AAF	LTE-TDD (SC-FDMA, 100% RB, 20 MHz, QPSK, UL Subframe=2,3,4,7,8,9)	X	4.54	73.38	19.19	2.23	80.0	± 9.6 %
		Y	4.79	74.17	19.49		80.0	
		Z	3.84	70.62	17.86		80.0	
10513-AAF	LTE-TDD (SC-FDMA, 100% RB, 20 MHz, 16-QAM, UL Subframe=2,3,4,7,8,9)	X	4.01	68.56	17.72	2.23	80.0	± 9.6 %
		Y	4.13	69.03	17.89		80.0	
		Z	3.70	67.20	16.93		80.0	
10514-AAF	LTE-TDD (SC-FDMA, 100% RB, 20 MHz, 64-QAM, UL Subframe=2,3,4,7,8,9)	X	4.03	68.11	17.57	2.23	80.0	± 9.6 %
		Y	4.15	68.55	17.73		80.0	
		Z	3.75	66.88	16.84		80.0	
10515-AAA	IEEE 802.11b WiFi 2.4 GHz (DSSS, 2 Mbps, 99pc duty cycle)	X	0.92	62.89	14.44	0.00	150.0	± 9.6 %
		Y	0.96	63.25	14.71		150.0	
		Z	0.87	61.74	13.25		150.0	
10516-AAA	IEEE 802.11b WiFi 2.4 GHz (DSSS, 5.5 Mbps, 99pc duty cycle)	X	0.56	70.18	16.62	0.00	150.0	± 9.6 %
		Y	0.63	71.55	17.72		150.0	
		Z	0.40	64.42	12.64		150.0	
10517-AAA	IEEE 802.11b WiFi 2.4 GHz (DSSS, 11 Mbps, 99pc duty cycle)	X	0.76	64.69	14.94	0.00	150.0	± 9.6 %
		Y	0.81	65.22	15.36		150.0	
		Z	0.69	62.67	13.15		150.0	
10518-AAB	IEEE 802.11a/h WiFi 5 GHz (OFDM, 9 Mbps, 99pc duty cycle)	X	4.41	66.63	16.16	0.00	150.0	± 9.6 %
		Y	4.44	66.77	16.20		150.0	
		Z	4.31	66.30	15.83		150.0	
10519-AAB	IEEE 802.11a/h WiFi 5 GHz (OFDM, 12 Mbps, 99pc duty cycle)	X	4.57	66.83	16.27	0.00	150.0	± 9.6 %
		Y	4.60	66.96	16.30		150.0	
		Z	4.46	66.49	15.94		150.0	
10520-AAB	IEEE 802.11a/h WiFi 5 GHz (OFDM, 18 Mbps, 99pc duty cycle)	X	4.43	66.78	16.18	0.00	150.0	± 9.6 %
		Y	4.46	66.91	16.22		150.0	
		Z	4.32	66.41	15.84		150.0	
10521-AAB	IEEE 802.11a/h WiFi 5 GHz (OFDM, 24 Mbps, 99pc duty cycle)	X	4.36	66.76	16.16	0.00	150.0	± 9.6 %
		Y	4.39	66.90	16.20		150.0	
		Z	4.25	66.37	15.81		150.0	
10522-AAB	IEEE 802.11a/h WiFi 5 GHz (OFDM, 36 Mbps, 99pc duty cycle)	X	4.42	66.89	16.27	0.00	150.0	± 9.6 %
		Y	4.45	67.03	16.31		150.0	
		Z	4.31	66.51	15.92		150.0	

10523-AAB	IEEE 802.11a/h WiFi 5 GHz (OFDM, 48 Mbps, 99pc duty cycle)	X	4.32	66.79	16.13	0.00	150.0	± 9.6 %
		Y	4.35	66.93	16.17		150.0	
		Z	4.21	66.44	15.80		150.0	
10524-AAB	IEEE 802.11a/h WiFi 5 GHz (OFDM, 54 Mbps, 99pc duty cycle)	X	4.36	66.81	16.24	0.00	150.0	± 9.6 %
		Y	4.39	66.95	16.27		150.0	
		Z	4.25	66.44	15.89		150.0	
10525-AAB	IEEE 802.11ac WiFi (20MHz, MCS0, 99pc duty cycle)	X	4.38	65.88	15.84	0.00	150.0	± 9.6 %
		Y	4.40	66.02	15.88		150.0	
		Z	4.27	65.52	15.51		150.0	
10526-AAB	IEEE 802.11ac WiFi (20MHz, MCS1, 99pc duty cycle)	X	4.52	66.20	15.97	0.00	150.0	± 9.6 %
		Y	4.55	66.35	16.01		150.0	
		Z	4.40	65.82	15.63		150.0	
10527-AAB	IEEE 802.11ac WiFi (20MHz, MCS2, 99pc duty cycle)	X	4.44	66.16	15.91	0.00	150.0	± 9.6 %
		Y	4.48	66.31	15.95		150.0	
		Z	4.33	65.77	15.56		150.0	
10528-AAB	IEEE 802.11ac WiFi (20MHz, MCS3, 99pc duty cycle)	X	4.46	66.18	15.94	0.00	150.0	± 9.6 %
		Y	4.49	66.32	15.98		150.0	
		Z	4.34	65.79	15.59		150.0	
10529-AAB	IEEE 802.11ac WiFi (20MHz, MCS4, 99pc duty cycle)	X	4.46	66.18	15.94	0.00	150.0	± 9.6 %
		Y	4.49	66.32	15.98		150.0	
		Z	4.34	65.79	15.59		150.0	
10531-AAB	IEEE 802.11ac WiFi (20MHz, MCS6, 99pc duty cycle)	X	4.44	66.24	15.93	0.00	150.0	± 9.6 %
		Y	4.47	66.39	15.98		150.0	
		Z	4.31	65.82	15.57		150.0	
10532-AAB	IEEE 802.11ac WiFi (20MHz, MCS7, 99pc duty cycle)	X	4.31	66.09	15.86	0.00	150.0	± 9.6 %
		Y	4.34	66.24	15.91		150.0	
		Z	4.19	65.67	15.49		150.0	
10533-AAB	IEEE 802.11ac WiFi (20MHz, MCS8, 99pc duty cycle)	X	4.47	66.25	15.94	0.00	150.0	± 9.6 %
		Y	4.50	66.39	15.98		150.0	
		Z	4.35	65.85	15.59		150.0	
10534-AAB	IEEE 802.11ac WiFi (40MHz, MCS0, 99pc duty cycle)	X	5.02	66.26	16.02	0.00	150.0	± 9.6 %
		Y	5.04	66.38	16.04		150.0	
		Z	4.92	65.93	15.74		150.0	
10535-AAB	IEEE 802.11ac WiFi (40MHz, MCS1, 99pc duty cycle)	X	5.08	66.44	16.11	0.00	150.0	± 9.6 %
		Y	5.10	66.55	16.12		150.0	
		Z	4.97	66.08	15.82		150.0	
10536-AAB	IEEE 802.11ac WiFi (40MHz, MCS2, 99pc duty cycle)	X	4.96	66.40	16.07	0.00	150.0	± 9.6 %
		Y	4.98	66.52	16.09		150.0	
		Z	4.85	66.05	15.77		150.0	
10537-AAB	IEEE 802.11ac WiFi (40MHz, MCS3, 99pc duty cycle)	X	5.01	66.36	16.05	0.00	150.0	± 9.6 %
		Y	5.03	66.47	16.07		150.0	
		Z	4.91	66.03	15.77		150.0	
10538-AAB	IEEE 802.11ac WiFi (40MHz, MCS4, 99pc duty cycle)	X	5.09	66.36	16.09	0.00	150.0	± 9.6 %
		Y	5.11	66.47	16.11		150.0	
		Z	4.98	66.03	15.81		150.0	
10540-AAB	IEEE 802.11ac WiFi (40MHz, MCS6, 99pc duty cycle)	X	5.02	66.34	16.10	0.00	150.0	± 9.6 %
		Y	5.04	66.46	16.12		150.0	
		Z	4.91	65.99	15.81		150.0	

10541-AAB	IEEE 802.11ac WiFi (40MHz, MCS7, 99pc duty cycle)	X	5.00	66.22	16.03	0.00	150.0	± 9.6 %
		Y	5.02	66.35	16.05		150.0	
		Z	4.89	65.87	15.73		150.0	
10542-AAB	IEEE 802.11ac WiFi (40MHz, MCS8, 99pc duty cycle)	X	5.15	66.32	16.10	0.00	150.0	± 9.6 %
		Y	5.17	66.44	16.11		150.0	
		Z	5.05	66.00	15.82		150.0	
10543-AAB	IEEE 802.11ac WiFi (40MHz, MCS9, 99pc duty cycle)	X	5.22	66.34	16.13	0.00	150.0	± 9.6 %
		Y	5.24	66.46	16.14		150.0	
		Z	5.12	66.07	15.88		150.0	
10544-AAB	IEEE 802.11ac WiFi (80MHz, MCS0, 99pc duty cycle)	X	5.35	66.35	16.02	0.00	150.0	± 9.6 %
		Y	5.37	66.48	16.04		150.0	
		Z	5.26	66.04	15.76		150.0	
10545-AAB	IEEE 802.11ac WiFi (80MHz, MCS1, 99pc duty cycle)	X	5.54	66.82	16.21	0.00	150.0	± 9.6 %
		Y	5.55	66.90	16.20		150.0	
		Z	5.45	66.52	15.96		150.0	
10546-AAB	IEEE 802.11ac WiFi (80MHz, MCS2, 99pc duty cycle)	X	5.39	66.50	16.06	0.00	150.0	± 9.6 %
		Y	5.41	66.63	16.08		150.0	
		Z	5.30	66.17	15.79		150.0	
10547-AAB	IEEE 802.11ac WiFi (80MHz, MCS3, 99pc duty cycle)	X	5.47	66.59	16.10	0.00	150.0	± 9.6 %
		Y	5.48	66.70	16.11		150.0	
		Z	5.38	66.29	15.85		150.0	
10548-AAB	IEEE 802.11ac WiFi (80MHz, MCS4, 99pc duty cycle)	X	5.69	67.46	16.51	0.00	150.0	± 9.6 %
		Y	5.68	67.48	16.48		150.0	
		Z	5.57	67.05	16.21		150.0	
10550-AAB	IEEE 802.11ac WiFi (80MHz, MCS6, 99pc duty cycle)	X	5.45	66.65	16.15	0.00	150.0	± 9.6 %
		Y	5.45	66.73	16.14		150.0	
		Z	5.36	66.37	15.91		150.0	
10551-AAB	IEEE 802.11ac WiFi (80MHz, MCS7, 99pc duty cycle)	X	5.42	66.56	16.06	0.00	150.0	± 9.6 %
		Y	5.43	66.68	16.08		150.0	
		Z	5.30	66.18	15.77		150.0	
10552-AAB	IEEE 802.11ac WiFi (80MHz, MCS8, 99pc duty cycle)	X	5.35	66.42	16.00	0.00	150.0	± 9.6 %
		Y	5.38	66.56	16.02		150.0	
		Z	5.26	66.12	15.74		150.0	
10553-AAB	IEEE 802.11ac WiFi (80MHz, MCS9, 99pc duty cycle)	X	5.42	66.42	16.03	0.00	150.0	± 9.6 %
		Y	5.44	66.55	16.05		150.0	
		Z	5.33	66.10	15.77		150.0	
10554-AAC	IEEE 802.11ac WiFi (160MHz, MCS0, 99pc duty cycle)	X	5.77	66.71	16.11	0.00	150.0	± 9.6 %
		Y	5.78	66.82	16.12		150.0	
		Z	5.69	66.41	15.87		150.0	
10555-AAC	IEEE 802.11ac WiFi (160MHz, MCS1, 99pc duty cycle)	X	5.89	67.00	16.24	0.00	150.0	± 9.6 %
		Y	5.89	67.10	16.24		150.0	
		Z	5.79	66.68	15.99		150.0	
10556-AAC	IEEE 802.11ac WiFi (160MHz, MCS2, 99pc duty cycle)	X	5.91	67.07	16.26	0.00	150.0	± 9.6 %
		Y	5.92	67.17	16.27		150.0	
		Z	5.83	66.77	16.03		150.0	
10557-AAC	IEEE 802.11ac WiFi (160MHz, MCS3, 99pc duty cycle)	X	5.87	66.93	16.21	0.00	150.0	± 9.6 %
		Y	5.88	67.05	16.22		150.0	
		Z	5.78	66.62	15.97		150.0	

10558-AAC	IEEE 802.11ac WiFi (160MHz, MCS4, 99pc duty cycle)	X	5.91	67.08	16.30	0.00	150.0	± 9.6 %
		Y	5.92	67.20	16.31		150.0	
		Z	5.80	66.73	16.04		150.0	
10560-AAC	IEEE 802.11ac WiFi (160MHz, MCS6, 99pc duty cycle)	X	5.90	66.93	16.27	0.00	150.0	± 9.6 %
		Y	5.92	67.06	16.28		150.0	
		Z	5.81	66.62	16.02		150.0	
10561-AAC	IEEE 802.11ac WiFi (160MHz, MCS7, 99pc duty cycle)	X	5.84	66.94	16.30	0.00	150.0	± 9.6 %
		Y	5.85	67.04	16.31		150.0	
		Z	5.75	66.62	16.05		150.0	
10562-AAC	IEEE 802.11ac WiFi (160MHz, MCS8, 99pc duty cycle)	X	5.92	67.19	16.43	0.00	150.0	± 9.6 %
		Y	5.93	67.31	16.45		150.0	
		Z	5.80	66.81	16.15		150.0	
10563-AAC	IEEE 802.11ac WiFi (160MHz, MCS9, 99pc duty cycle)	X	6.01	67.12	16.36	0.00	150.0	± 9.6 %
		Y	6.01	67.20	16.35		150.0	
		Z	5.91	66.79	16.11		150.0	
10564-AAA	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 9 Mbps, 99pc duty cycle)	X	4.73	66.70	16.33	0.46	150.0	± 9.6 %
		Y	4.76	66.85	16.37		150.0	
		Z	4.64	66.41	16.03		150.0	
10565-AAA	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 12 Mbps, 99pc duty cycle)	X	4.94	67.13	16.64	0.46	150.0	± 9.6 %
		Y	4.97	67.25	16.67		150.0	
		Z	4.84	66.82	16.35		150.0	
10566-AAA	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 18 Mbps, 99pc duty cycle)	X	4.78	66.96	16.45	0.46	150.0	± 9.6 %
		Y	4.81	67.09	16.49		150.0	
		Z	4.67	66.63	16.15		150.0	
10567-AAA	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 24 Mbps, 99pc duty cycle)	X	4.81	67.35	16.82	0.46	150.0	± 9.6 %
		Y	4.84	67.46	16.83		150.0	
		Z	4.70	67.01	16.51		150.0	
10568-AAA	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 36 Mbps, 99pc duty cycle)	X	4.69	66.74	16.23	0.46	150.0	± 9.6 %
		Y	4.72	66.90	16.29		150.0	
		Z	4.58	66.40	15.91		150.0	
10569-AAA	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 48 Mbps, 99pc duty cycle)	X	4.78	67.52	16.93	0.46	150.0	± 9.6 %
		Y	4.81	67.61	16.93		150.0	
		Z	4.68	67.19	16.62		150.0	
10570-AAA	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 54 Mbps, 99pc duty cycle)	X	4.80	67.33	16.83	0.46	150.0	± 9.6 %
		Y	4.83	67.44	16.84		150.0	
		Z	4.69	67.01	16.53		150.0	
10571-AAA	IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps, 90pc duty cycle)	X	1.10	64.06	15.41	0.46	130.0	± 9.6 %
		Y	1.15	64.53	15.70		130.0	
		Z	1.03	62.72	14.18		130.0	
10572-AAA	IEEE 802.11b WiFi 2.4 GHz (DSSS, 2 Mbps, 90pc duty cycle)	X	1.11	64.63	15.78	0.46	130.0	± 9.6 %
		Y	1.16	65.10	16.06		130.0	
		Z	1.03	63.13	14.46		130.0	
10573-AAA	IEEE 802.11b WiFi 2.4 GHz (DSSS, 5.5 Mbps, 90pc duty cycle)	X	2.01	86.99	23.67	0.46	130.0	± 9.6 %
		Y	2.65	91.42	25.49		130.0	
		Z	0.79	71.06	16.55		130.0	
10574-AAA	IEEE 802.11b WiFi 2.4 GHz (DSSS, 11 Mbps, 90pc duty cycle)	X	1.20	70.42	18.78	0.46	130.0	± 9.6 %
		Y	1.26	70.92	19.07		130.0	
		Z	1.00	66.77	16.35		130.0	

10575-AAA	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 6 Mbps, 90pc duty cycle)	X	4.52	66.52	16.40	0.46	130.0	± 9.6 %
		Y	4.55	66.65	16.44		130.0	
		Z	4.43	66.21	16.09		130.0	
10576-AAA	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 9 Mbps, 90pc duty cycle)	X	4.55	66.70	16.47	0.46	130.0	± 9.6 %
		Y	4.58	66.83	16.51		130.0	
		Z	4.45	66.39	16.17		130.0	
10577-AAA	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 12 Mbps, 90pc duty cycle)	X	4.73	66.96	16.63	0.46	130.0	± 9.6 %
		Y	4.76	67.08	16.66		130.0	
		Z	4.62	66.64	16.32		130.0	
10578-AAA	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 18 Mbps, 90pc duty cycle)	X	4.63	67.11	16.74	0.46	130.0	± 9.6 %
		Y	4.66	67.21	16.75		130.0	
		Z	4.52	66.77	16.41		130.0	
10579-AAA	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 24 Mbps, 90pc duty cycle)	X	4.39	66.34	16.01	0.46	130.0	± 9.6 %
		Y	4.43	66.51	16.08		130.0	
		Z	4.28	65.99	15.68		130.0	
10580-AAA	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 36 Mbps, 90pc duty cycle)	X	4.44	66.42	16.05	0.46	130.0	± 9.6 %
		Y	4.47	66.59	16.13		130.0	
		Z	4.33	66.07	15.72		130.0	
10581-AAA	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 48 Mbps, 90pc duty cycle)	X	4.53	67.16	16.69	0.46	130.0	± 9.6 %
		Y	4.56	67.28	16.71		130.0	
		Z	4.43	66.81	16.37		130.0	
10582-AAA	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 54 Mbps, 90pc duty cycle)	X	4.33	66.11	15.80	0.46	130.0	± 9.6 %
		Y	4.37	66.30	15.88		130.0	
		Z	4.22	65.77	15.47		130.0	
10583-AAB	IEEE 802.11a/h WiFi 5 GHz (OFDM, 6 Mbps, 90pc duty cycle)	X	4.52	66.52	16.40	0.46	130.0	± 9.6 %
		Y	4.55	66.65	16.44		130.0	
		Z	4.43	66.21	16.09		130.0	
10584-AAB	IEEE 802.11a/h WiFi 5 GHz (OFDM, 9 Mbps, 90pc duty cycle)	X	4.55	66.70	16.47	0.46	130.0	± 9.6 %
		Y	4.58	66.83	16.51		130.0	
		Z	4.45	66.39	16.17		130.0	
10585-AAB	IEEE 802.11a/h WiFi 5 GHz (OFDM, 12 Mbps, 90pc duty cycle)	X	4.73	66.96	16.63	0.46	130.0	± 9.6 %
		Y	4.76	67.08	16.66		130.0	
		Z	4.62	66.64	16.32		130.0	
10586-AAB	IEEE 802.11a/h WiFi 5 GHz (OFDM, 18 Mbps, 90pc duty cycle)	X	4.63	67.11	16.74	0.46	130.0	± 9.6 %
		Y	4.66	67.21	16.75		130.0	
		Z	4.52	66.77	16.41		130.0	
10587-AAB	IEEE 802.11a/h WiFi 5 GHz (OFDM, 24 Mbps, 90pc duty cycle)	X	4.39	66.34	16.01	0.46	130.0	± 9.6 %
		Y	4.43	66.51	16.08		130.0	
		Z	4.28	65.99	15.68		130.0	
10588-AAB	IEEE 802.11a/h WiFi 5 GHz (OFDM, 36 Mbps, 90pc duty cycle)	X	4.44	66.42	16.05	0.46	130.0	± 9.6 %
		Y	4.47	66.59	16.13		130.0	
		Z	4.33	66.07	15.72		130.0	
10589-AAB	IEEE 802.11a/h WiFi 5 GHz (OFDM, 48 Mbps, 90pc duty cycle)	X	4.53	67.16	16.69	0.46	130.0	± 9.6 %
		Y	4.56	67.28	16.71		130.0	
		Z	4.43	66.81	16.37		130.0	
10590-AAB	IEEE 802.11a/h WiFi 5 GHz (OFDM, 54 Mbps, 90pc duty cycle)	X	4.33	66.11	15.80	0.46	130.0	± 9.6 %
		Y	4.37	66.30	15.88		130.0	
		Z	4.22	65.77	15.47		130.0	

10591-AAB	IEEE 802.11n (HT Mixed, 20MHz, MCS0, 90pc duty cycle)	X	4.68	66.59	16.51	0.46	130.0	± 9.6 %
		Y	4.70	66.71	16.54		130.0	
		Z	4.59	66.31	16.22		130.0	
10592-AAB	IEEE 802.11n (HT Mixed, 20MHz, MCS1, 90pc duty cycle)	X	4.81	66.91	16.64	0.46	130.0	± 9.6 %
		Y	4.84	67.03	16.67		130.0	
		Z	4.71	66.61	16.35		130.0	
10593-AAB	IEEE 802.11n (HT Mixed, 20MHz, MCS2, 90pc duty cycle)	X	4.73	66.79	16.51	0.46	130.0	± 9.6 %
		Y	4.76	66.92	16.54		130.0	
		Z	4.63	66.48	16.21		130.0	
10594-AAB	IEEE 802.11n (HT Mixed, 20MHz, MCS3, 90pc duty cycle)	X	4.79	66.97	16.67	0.46	130.0	± 9.6 %
		Y	4.81	67.09	16.70		130.0	
		Z	4.68	66.66	16.37		130.0	
10595-AAB	IEEE 802.11n (HT Mixed, 20MHz, MCS4, 90pc duty cycle)	X	4.75	66.93	16.57	0.46	130.0	± 9.6 %
		Y	4.78	67.06	16.60		130.0	
		Z	4.65	66.62	16.28		130.0	
10596-AAB	IEEE 802.11n (HT Mixed, 20MHz, MCS5, 90pc duty cycle)	X	4.69	66.92	16.57	0.46	130.0	± 9.6 %
		Y	4.72	67.05	16.61		130.0	
		Z	4.58	66.59	16.26		130.0	
10597-AAB	IEEE 802.11n (HT Mixed, 20MHz, MCS6, 90pc duty cycle)	X	4.64	66.80	16.43	0.46	130.0	± 9.6 %
		Y	4.67	66.94	16.48		130.0	
		Z	4.53	66.46	16.12		130.0	
10598-AAB	IEEE 802.11n (HT Mixed, 20MHz, MCS7, 90pc duty cycle)	X	4.62	67.02	16.70	0.46	130.0	± 9.6 %
		Y	4.65	67.14	16.72		130.0	
		Z	4.52	66.67	16.37		130.0	
10599-AAB	IEEE 802.11n (HT Mixed, 40MHz, MCS0, 90pc duty cycle)	X	5.36	67.12	16.76	0.46	130.0	± 9.6 %
		Y	5.37	67.18	16.74		130.0	
		Z	5.29	66.89	16.54		130.0	
10600-AAB	IEEE 802.11n (HT Mixed, 40MHz, MCS1, 90pc duty cycle)	X	5.50	67.59	16.97	0.46	130.0	± 9.6 %
		Y	5.49	67.59	16.93		130.0	
		Z	5.42	67.34	16.74		130.0	
10601-AAB	IEEE 802.11n (HT Mixed, 40MHz, MCS2, 90pc duty cycle)	X	5.38	67.30	16.84	0.46	130.0	± 9.6 %
		Y	5.39	67.35	16.82		130.0	
		Z	5.30	67.05	16.60		130.0	
10602-AAB	IEEE 802.11n (HT Mixed, 40MHz, MCS3, 90pc duty cycle)	X	5.51	67.45	16.84	0.46	130.0	± 9.6 %
		Y	5.52	67.53	16.84		130.0	
		Z	5.43	67.22	16.61		130.0	
10603-AAB	IEEE 802.11n (HT Mixed, 40MHz, MCS4, 90pc duty cycle)	X	5.58	67.72	17.10	0.46	130.0	± 9.6 %
		Y	5.58	67.76	17.08		130.0	
		Z	5.52	67.57	16.92		130.0	
10604-AAB	IEEE 802.11n (HT Mixed, 40MHz, MCS5, 90pc duty cycle)	X	5.46	67.40	16.93	0.46	130.0	± 9.6 %
		Y	5.46	67.42	16.90		130.0	
		Z	5.39	67.20	16.72		130.0	
10605-AAB	IEEE 802.11n (HT Mixed, 40MHz, MCS6, 90pc duty cycle)	X	5.50	67.49	16.97	0.46	130.0	± 9.6 %
		Y	5.49	67.53	16.95		130.0	
		Z	5.40	67.21	16.72		130.0	
10606-AAB	IEEE 802.11n (HT Mixed, 40MHz, MCS7, 90pc duty cycle)	X	5.23	66.75	16.45	0.46	130.0	± 9.6 %
		Y	5.24	66.84	16.46		130.0	
		Z	5.16	66.56	16.25		130.0	

EX3DV4– SN:3797 November 22, 2018

10607-AAB	IEEE 802.11ac WiFi (20MHz, MCS0, 90pc duty cycle)	X	4.52	65.93	16.15	0.46	130.0	± 9.6 %
		Y	4.55	66.05	16.18		130.0	
		Z	4.42	65.60	15.84		130.0	
10608-AAB	IEEE 802.11ac WiFi (20MHz, MCS1, 90pc duty cycle)	X	4.68	66.30	16.31	0.46	130.0	± 9.6 %
		Y	4.71	66.43	16.34		130.0	
		Z	4.57	65.95	15.99		130.0	
10609-AAB	IEEE 802.11ac WiFi (20MHz, MCS2, 90pc duty cycle)	X	4.58	66.13	16.13	0.46	130.0	± 9.6 %
		Y	4.61	66.27	16.17		130.0	
		Z	4.46	65.77	15.81		130.0	
10610-AAB	IEEE 802.11ac WiFi (20MHz, MCS3, 90pc duty cycle)	X	4.63	66.30	16.30	0.46	130.0	± 9.6 %
		Y	4.66	66.42	16.33		130.0	
		Z	4.51	65.94	15.98		130.0	
10611-AAB	IEEE 802.11ac WiFi (20MHz, MCS4, 90pc duty cycle)	X	4.54	66.10	16.15	0.46	130.0	± 9.6 %
		Y	4.57	66.24	16.18		130.0	
		Z	4.43	65.74	15.82		130.0	
10612-AAB	IEEE 802.11ac WiFi (20MHz, MCS5, 90pc duty cycle)	X	4.54	66.25	16.19	0.46	130.0	± 9.6 %
		Y	4.57	66.39	16.24		130.0	
		Z	4.42	65.87	15.85		130.0	
10613-AAB	IEEE 802.11ac WiFi (20MHz, MCS6, 90pc duty cycle)	X	4.54	66.09	16.05	0.46	130.0	± 9.6 %
		Y	4.57	66.24	16.10		130.0	
		Z	4.42	65.70	15.71		130.0	
10614-AAB	IEEE 802.11ac WiFi (20MHz, MCS7, 90pc duty cycle)	X	4.50	66.29	16.29	0.46	130.0	± 9.6 %
		Y	4.52	66.42	16.32		130.0	
		Z	4.38	65.90	15.95		130.0	
10615-AAB	IEEE 802.11ac WiFi (20MHz, MCS8, 90pc duty cycle)	X	4.54	65.94	15.92	0.46	130.0	± 9.6 %
		Y	4.57	66.10	15.98		130.0	
		Z	4.43	65.58	15.59		130.0	
10616-AAB	IEEE 802.11ac WiFi (40MHz, MCS0, 90pc duty cycle)	X	5.18	66.33	16.35	0.46	130.0	± 9.6 %
		Y	5.19	66.44	16.35		130.0	
		Z	5.08	66.03	16.08		130.0	
10617-AAB	IEEE 802.11ac WiFi (40MHz, MCS1, 90pc duty cycle)	X	5.25	66.56	16.44	0.46	130.0	± 9.6 %
		Y	5.26	66.64	16.43		130.0	
		Z	5.15	66.23	16.16		130.0	
10618-AAB	IEEE 802.11ac WiFi (40MHz, MCS2, 90pc duty cycle)	X	5.14	66.57	16.45	0.46	130.0	± 9.6 %
		Y	5.15	66.66	16.45		130.0	
		Z	5.04	66.24	16.18		130.0	
10619-AAB	IEEE 802.11ac WiFi (40MHz, MCS3, 90pc duty cycle)	X	5.15	66.34	16.28	0.46	130.0	± 9.6 %
		Y	5.16	66.45	16.29		130.0	
		Z	5.06	66.05	16.02		130.0	
10620-AAB	IEEE 802.11ac WiFi (40MHz, MCS4, 90pc duty cycle)	X	5.23	66.37	16.34	0.46	130.0	± 9.6 %
		Y	5.25	66.47	16.35		130.0	
		Z	5.13	66.08	16.08		130.0	
10621-AAB	IEEE 802.11ac WiFi (40MHz, MCS5, 90pc duty cycle)	X	5.24	66.51	16.53	0.46	130.0	± 9.6 %
		Y	5.25	66.59	16.52		130.0	
		Z	5.14	66.18	16.26		130.0	
10622-AAB	IEEE 802.11ac WiFi (40MHz, MCS6, 90pc duty cycle)	X	5.25	66.68	16.61	0.46	130.0	± 9.6 %
		Y	5.26	66.75	16.60		130.0	
		Z	5.14	66.30	16.31		130.0	

10623-AAB	IEEE 802.11ac WiFi (40MHz, MCS7, 90pc duty cycle)	X	5.12	66.16	16.21	0.46	130.0	± 9.6 %
		Y	5.14	66.28	16.24		130.0	
		Z	5.01	65.81	15.93		130.0	
10624-AAB	IEEE 802.11ac WiFi (40MHz, MCS8, 90pc duty cycle)	X	5.32	66.39	16.40	0.46	130.0	± 9.6 %
		Y	5.33	66.49	16.40		130.0	
		Z	5.22	66.09	16.14		130.0	
10625-AAB	IEEE 802.11ac WiFi (40MHz, MCS9, 90pc duty cycle)	X	5.54	66.97	16.74	0.46	130.0	± 9.6 %
		Y	5.56	67.07	16.75		130.0	
		Z	5.36	66.40	16.36		130.0	
10626-AAB	IEEE 802.11ac WiFi (80MHz, MCS0, 90pc duty cycle)	X	5.50	66.39	16.31	0.46	130.0	± 9.6 %
		Y	5.51	66.50	16.32		130.0	
		Z	5.41	66.10	16.06		130.0	
10627-AAB	IEEE 802.11ac WiFi (80MHz, MCS1, 90pc duty cycle)	X	5.75	67.05	16.61	0.46	130.0	± 9.6 %
		Y	5.74	67.08	16.57		130.0	
		Z	5.67	66.78	16.38		130.0	
10628-AAB	IEEE 802.11ac WiFi (80MHz, MCS2, 90pc duty cycle)	X	5.51	66.41	16.22	0.46	130.0	± 9.6 %
		Y	5.52	66.53	16.24		130.0	
		Z	5.41	66.10	15.97		130.0	
10629-AAB	IEEE 802.11ac WiFi (80MHz, MCS3, 90pc duty cycle)	X	5.60	66.53	16.28	0.46	130.0	± 9.6 %
		Y	5.60	66.63	16.28		130.0	
		Z	5.52	66.28	16.05		130.0	
10630-AAB	IEEE 802.11ac WiFi (80MHz, MCS4, 90pc duty cycle)	X	5.98	67.90	16.96	0.46	130.0	± 9.6 %
		Y	5.94	67.83	16.89		130.0	
		Z	5.84	67.46	16.65		130.0	
10631-AAB	IEEE 802.11ac WiFi (80MHz, MCS5, 90pc duty cycle)	X	5.87	67.67	17.04	0.46	130.0	± 9.6 %
		Y	5.87	67.71	17.00		130.0	
		Z	5.75	67.29	16.75		130.0	
10632-AAB	IEEE 802.11ac WiFi (80MHz, MCS6, 90pc duty cycle)	X	5.73	67.13	16.79	0.46	130.0	± 9.6 %
		Y	5.72	67.15	16.74		130.0	
		Z	5.65	66.90	16.58		130.0	
10633-AAB	IEEE 802.11ac WiFi (80MHz, MCS7, 90pc duty cycle)	X	5.58	66.62	16.36	0.46	130.0	± 9.6 %
		Y	5.59	66.73	16.37		130.0	
		Z	5.47	66.28	16.09		130.0	
10634-AAB	IEEE 802.11ac WiFi (80MHz, MCS8, 90pc duty cycle)	X	5.55	66.62	16.41	0.46	130.0	± 9.6 %
		Y	5.57	66.74	16.42		130.0	
		Z	5.46	66.32	16.17		130.0	
10635-AAB	IEEE 802.11ac WiFi (80MHz, MCS9, 90pc duty cycle)	X	5.42	65.92	15.80	0.46	130.0	± 9.6 %
		Y	5.45	66.09	15.85		130.0	
		Z	5.33	65.63	15.55		130.0	
10636-AAC	IEEE 802.11ac WiFi (160MHz, MCS0, 90pc duty cycle)	X	5.93	66.76	16.40	0.46	130.0	± 9.6 %
		Y	5.94	66.86	16.40		130.0	
		Z	5.85	66.49	16.18		130.0	
10637-AAC	IEEE 802.11ac WiFi (160MHz, MCS1, 90pc duty cycle)	X	6.08	67.15	16.59	0.46	130.0	± 9.6 %
		Y	6.08	67.22	16.57		130.0	
		Z	5.99	66.85	16.35		130.0	
10638-AAC	IEEE 802.11ac WiFi (160MHz, MCS2, 90pc duty cycle)	X	6.08	67.13	16.55	0.46	130.0	± 9.6 %
		Y	6.08	67.21	16.54		130.0	
		Z	6.00	66.86	16.33		130.0	

EX3DV4– SN:3797 November 22, 2018

10639-AAC	IEEE 802.11ac WiFi (160MHz, MCS3, 90pc duty cycle)	X	6.04	67.03	16.54	0.46	130.0	± 9.6 %
		Y	6.05	67.12	16.54		130.0	
		Z	5.96	66.74	16.31		130.0	
10640-AAC	IEEE 802.11ac WiFi (160MHz, MCS4, 90pc duty cycle)	X	6.04	67.03	16.46	0.46	130.0	± 9.6 %
		Y	6.05	67.14	16.50		130.0	
		Z	5.94	66.70	16.23		130.0	
10641-AAC	IEEE 802.11ac WiFi (160MHz, MCS5, 90pc duty cycle)	X	6.12	67.03	16.51	0.46	130.0	± 9.6 %
		Y	6.11	67.11	16.50		130.0	
		Z	6.03	66.77	16.29		130.0	
10642-AAC	IEEE 802.11ac WiFi (160MHz, MCS6, 90pc duty cycle)	X	6.13	67.21	16.76	0.46	130.0	± 9.6 %
		Y	6.14	67.29	16.75		130.0	
		Z	6.04	66.92	16.53		130.0	
10643-AAC	IEEE 802.11ac WiFi (160MHz, MCS7, 90pc duty cycle)	X	5.98	66.93	16.52	0.46	130.0	± 9.6 %
		Y	5.99	67.02	16.52		130.0	
		Z	5.90	66.65	16.29		130.0	
10644-AAC	IEEE 802.11ac WiFi (160MHz, MCS8, 90pc duty cycle)	X	6.08	67.23	16.69	0.46	130.0	± 9.6 %
		Y	6.09	67.34	16.70		130.0	
		Z	5.96	66.86	16.41		130.0	
10645-AAC	IEEE 802.11ac WiFi (160MHz, MCS9, 90pc duty cycle)	X	6.23	67.35	16.71	0.46	130.0	± 9.6 %
		Y	6.21	67.36	16.68		130.0	
		Z	6.17	67.13	16.52		130.0	
10646-AAF	LTE-TDD (SC-FDMA, 1 RB, 5 MHz, QPSK, UL Subframe=2,7)	X	15.30	110.33	39.18	9.30	60.0	± 9.6 %
		Y	25.33	123.77	43.31		60.0	
		Z	9.37	99.56	36.09		60.0	
10647-AAF	LTE-TDD (SC-FDMA, 1 RB, 20 MHz, QPSK, UL Subframe=2,7)	X	12.82	106.62	38.16	9.30	60.0	± 9.6 %
		Y	19.74	118.28	41.87		60.0	
		Z	8.13	96.53	35.17		60.0	
10648-AAA	CDMA2000 (1x Advanced)	X	0.54	61.77	8.73	0.00	150.0	± 9.6 %
		Y	0.59	62.62	9.61		150.0	
		Z	0.44	60.08	6.98		150.0	
10652-AAD	LTE-TDD (OFDMA, 5 MHz, E-TM 3.1, Clipping 44%)	X	3.47	66.98	16.64	2.23	80.0	± 9.6 %
		Y	3.56	67.32	16.79		80.0	
		Z	3.22	65.84	15.83		80.0	
10653-AAD	LTE-TDD (OFDMA, 10 MHz, E-TM 3.1, Clipping 44%)	X	3.98	66.10	16.74	2.23	80.0	± 9.6 %
		Y	4.06	66.42	16.87		80.0	
		Z	3.79	65.35	16.19		80.0	
10654-AAD	LTE-TDD (OFDMA, 15 MHz, E-TM 3.1, Clipping 44%)	X	3.97	65.69	16.74	2.23	80.0	± 9.6 %
		Y	4.04	66.01	16.86		80.0	
		Z	3.81	65.00	16.23		80.0	
10655-AAE	LTE-TDD (OFDMA, 20 MHz, E-TM 3.1, Clipping 44%)	X	4.03	65.63	16.77	2.23	80.0	± 9.6 %
		Y	4.11	65.96	16.89		80.0	
		Z	3.88	64.95	16.27		80.0	
10658-AAA	Pulse Waveform (200Hz, 10%)	X	100.00	111.48	26.15	10.00	50.0	± 9.6 %
		Y	100.00	111.18	25.80		50.0	
		Z	100.00	110.33	25.57		50.0	
10659-AAA	Pulse Waveform (200Hz, 20%)	X	100.00	111.27	24.95	6.99	60.0	± 9.6 %
		Y	100.00	111.46	25.01		60.0	
		Z	100.00	109.63	24.08		60.0	

EX3DV4– SN:3797 November 22, 2018

10660-AAA	Pulse Waveform (200Hz, 40%)	X	100.00	112.39	24.07	3.98	80.0	± 9.6 %
		Y	100.00	114.44	25.09		80.0	
		Z	100.00	108.23	22.06		80.0	
10661-AAA	Pulse Waveform (200Hz, 60%)	X	100.00	111.71	22.51	2.22	100.0	± 9.6 %
		Y	100.00	119.20	25.85		100.0	
		Z	100.00	101.54	18.12		100.0	
10662-AAA	Pulse Waveform (200Hz, 80%)	X	100.00	91.71	13.22	0.97	120.0	± 9.6 %
		Y	100.00	125.14	26.40		120.0	
		Z	0.16	60.00	3.44		120.0	
10670-AAA	Bluetooth Low Energy	X	100.00	119.73	26.15	2.19	100.0	± 9.6 %
		Y	100.00	123.30	27.96		100.0	
		Z	100.00	110.82	22.17		100.0	

[F] Uncertainty is determined using the max. deviation from linear response applying rectangular distribution and is expressed for the square of the field value.

Attachment 7. – Dipole Calibration Data

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

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Accredited by the Swiss Accreditation Service (SAS)
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Accreditation No.: SCS 0108

Client **HCT (Dymstec)** Certificate No: **D750V3-1014_Aug18**

CALIBRATION CERTIFICATE

Object D750V3 - SN:1014

Calibration procedure(s) QA CAL-05.v10
Calibration procedure for dipole validation kits above 700 MHz

결 재	담 당 자	확 인 자
직위/성명	GW / 강태규	연구 / 최영호
일 자	2018. 08. 23	2018. 08. 23

Calibration date: August 14, 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:	Manu Seitz	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: August 14, 2018

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

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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

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	15 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	750 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	41.9	0.89 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	40.9 ± 6 %	0.89 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm³ (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	2.05 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**8.15 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	1.33 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**5.30 W/kg ± 16.5 % (k=2)**

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	55.5	0.96 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	55.0 ± 6 %	0.96 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm³ (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	2.15 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**8.58 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm³ (10 g) of Body TSL	condition	
SAR measured	250 mW input power	1.41 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**5.63 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	56.4 Ω + 6.4 jΩ
Return Loss	- 21.4 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	50.3 Ω + 1.0 jΩ
Return Loss	- 39.6 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.035 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	March 22, 2010

DASY5 Validation Report for Head TSL

Date: 14.08.2018

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 750 MHz; Type: D750V3; Serial: D750V3 - SN:1014

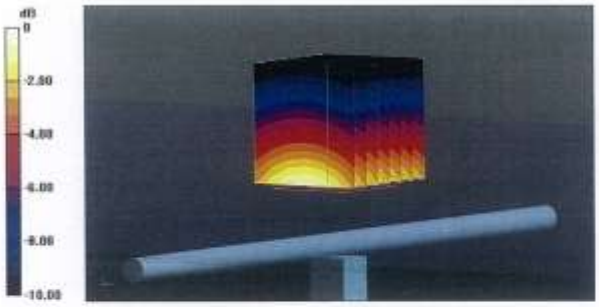
Communication System: UID 0 - CW; Frequency: 750 MHz
Medium parameters used: f = 750 MHz; σ = 0.89 S/m; ε_r = 40.9; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(10.22, 10.22, 10.22) @ 750 MHz; Calibrated: 30.12.2017
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 26.10.2017
- Phantom: Flat Phantom 4.9 (front); Type: QD 00L P49 AA; Serial: 1001
- DASY52 52.10.1(1476); SEMCAD X 14.6.11(7439)

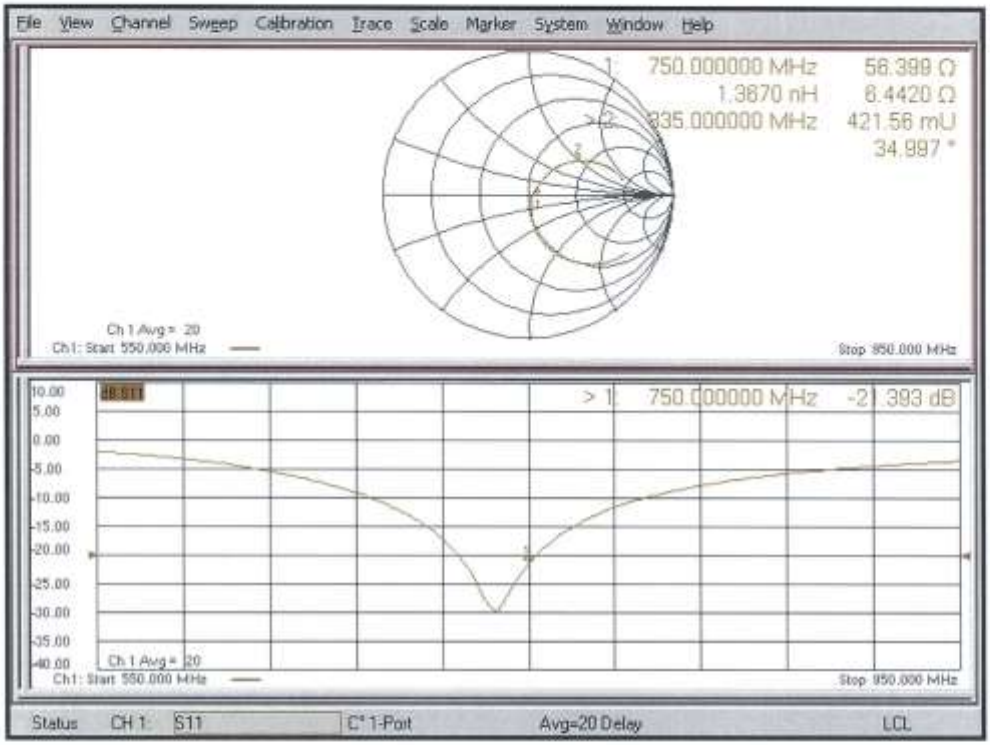
Dipole Calibration for Head Tissue/Pin=250 mW, d=15mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 59.30 V/m; Power Drift = -0.04 dB
Peak SAR (extrapolated) = 3.10 W/kg
SAR(1 g) = 2.05 W/kg; SAR(10 g) = 1.33 W/kg
Maximum value of SAR (measured) = 2.76 W/kg



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

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 14.08.2018

Test Laboratory: SPEAG, Zurich, Switzerland

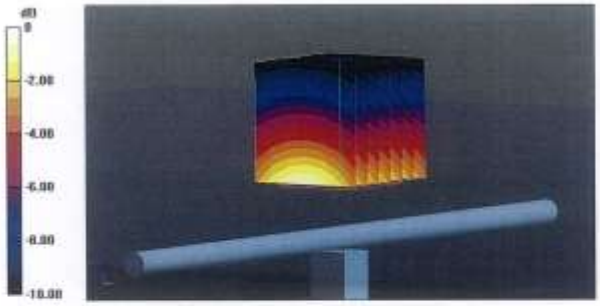
DUT: Dipole 750 MHz; Type: D750V3; Serial: D750V3 - SN:1014

Communication System: UID 0 - CW; Frequency: 750 MHz
Medium parameters used: f = 750 MHz; σ = 0.96 S/m; ε_r = 55; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

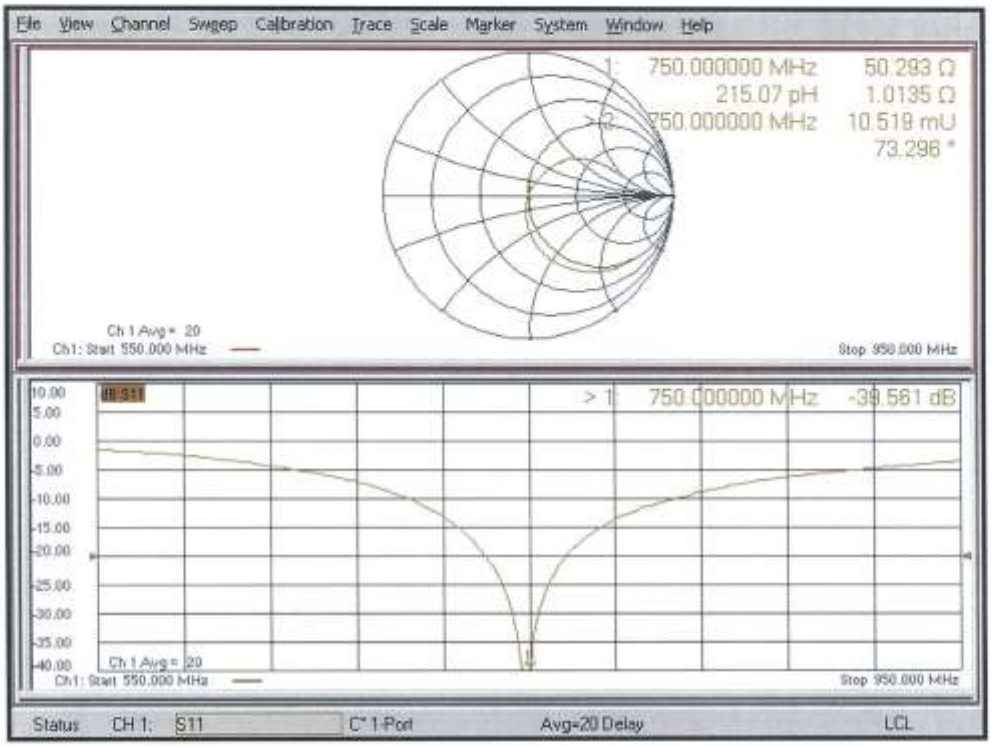
- Probe: EX3DV4 - SN7349; ConvF(10.19, 10.19, 10.19) @ 750 MHz; Calibrated: 30.12.2017
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 26.10.2017
- Phantom: Flat Phantom 4.9 (Back); Type: QD 00R P49 AA; Serial: 1005
- DASY52 52.10.1(1476); SEMCAD X 14.6.11(7439)

Dipole Calibration for Body Tissue/Pin=250 mW, d=15mm/Zoom Scan (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 57.92 V/m; Power Drift = -0.02 dB
Peak SAR (extrapolated) = 3.20 W/kg
SAR(1 g) = 2.15 W/kg; SAR(10 g) = 1.41 W/kg
Maximum value of SAR (measured) = 2.85 W/kg



0 dB = 2.85 W/kg = 4.55 dBW/kg

Impedance Measurement Plot for Body TSL



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Accreditation No.: SCS 0108

Client HCT (Dymstec) **Certificate No: D835V2-4d165_Sep18**

CALIBRATION CERTIFICATE

결	담 당 자	확 인 자
재		
서명/성명	SW / 정재훈	대표 / 최동현
일 자	2018 / 10. 05	2018 / 10. 5

Object: D835V2 - SN:4d165

Calibration procedure(s): QA CAL-05.v10
Calibration procedure for dipole validation kits above 700 MHz

Calibration date: September 18, 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:	Jeton Kastrati	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: September 19, 2018

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

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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

Glossary:

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ConvF	sensitivity in TSL / NORM x,y,z
N/A	not applicable or not measured

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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	15 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	835 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	41.5	0.90 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	40.8 ± 6 %	0.91 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm³ (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	2.38 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**9.41 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	1.53 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**6.06 W/kg ± 16.5 % (k=2)**

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	55.2	0.97 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	55.4 ± 6 %	0.99 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm³ (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	2.41 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**9.50 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm³ (10 g) of Body TSL	condition	
SAR measured	250 mW input power	1.57 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**6.21 W/kg ± 16.5 % (k=2)**

Appendix (Additional assessments outside the scope of SCS 0108)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	50.5 Ω - 5.3 jΩ
Return Loss	- 25.5 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	45.5 Ω - 7.6 jΩ
Return Loss	- 20.7 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.436 ns

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

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

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	December 28, 2012

DASY5 Validation Report for Head TSL

Date: 18.09.2018

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN:4d165

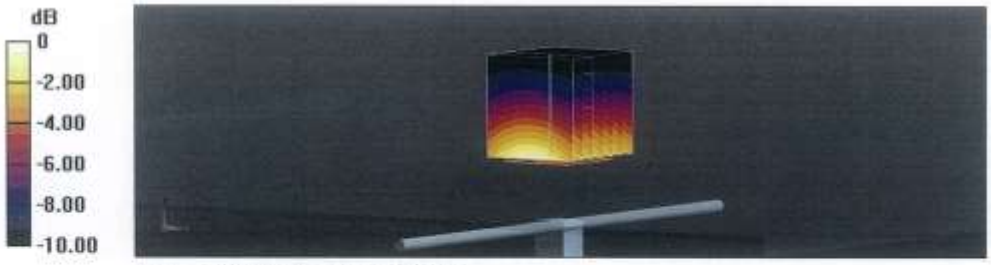
Communication System: UID 0 - CW; Frequency: 835 MHz
Medium parameters used: f = 835 MHz; σ = 0.91 S/m; ε_r = 40.8; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(9.9, 9.9, 9.9) @ 835 MHz; Calibrated: 30.12.2017
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 26.10.2017
- Phantom: Flat Phantom 4.9 (front); Type: QD 00L P49 AA; Serial: 1001
- DASY52 52.10.1(1476); SEMCAD X 14.6.11(7439)

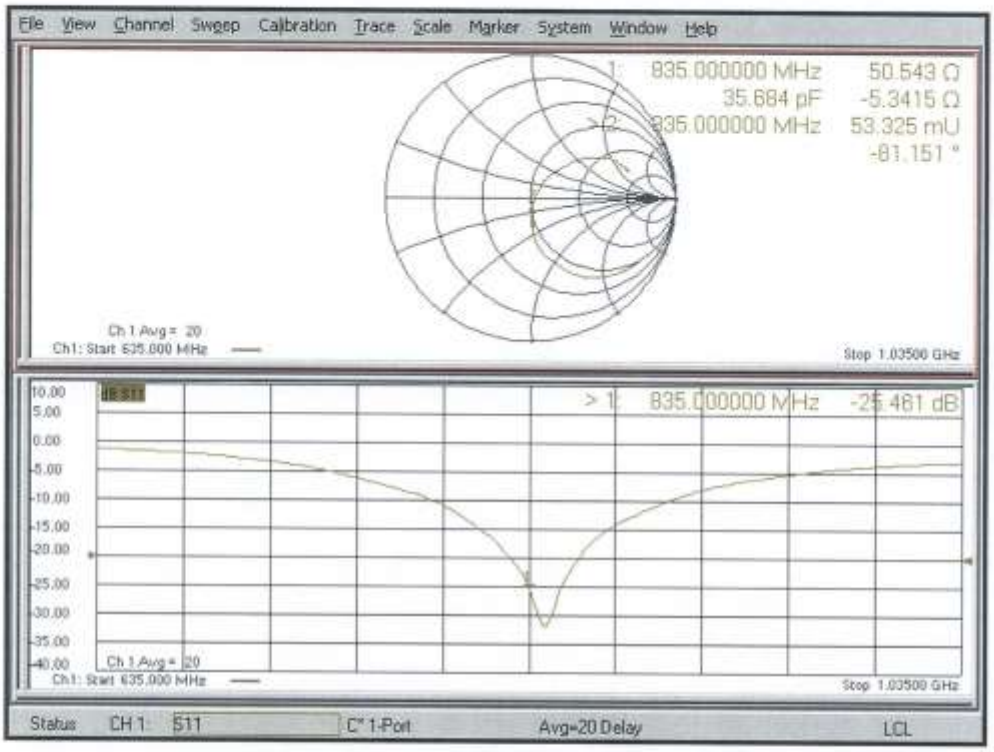
Dipole Calibration for Head Tissue/Pin=250 mW, d=15mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 65.64 V/m; Power Drift = 0.08 dB
Peak SAR (extrapolated) = 3.70 W/kg
SAR(1 g) = 2.38 W/kg; SAR(10 g) = 1.53 W/kg
Maximum value of SAR (measured) = 3.24 W/kg



0 dB = 3.24 W/kg = 5.11 dBW/kg

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 18.09.2018

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN:4d165

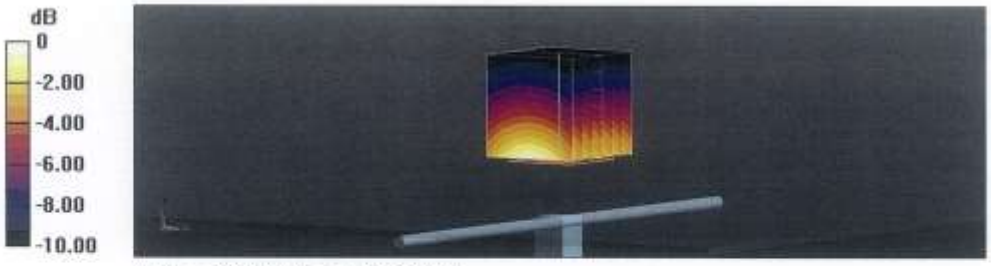
Communication System: UID 0 - CW; Frequency: 835 MHz
Medium parameters used: f = 835 MHz; σ = 0.99 S/m; ε_r = 55.4; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(10.05, 10.05, 10.05) @ 835 MHz; Calibrated: 30.12.2017
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 26.10.2017
- Phantom: Flat Phantom 4.9 (Back); Type: QD 00R P49 AA; Serial: 1005
- DASY52 52.10.1(1476); SEMCAD X 14.6.11(7439)

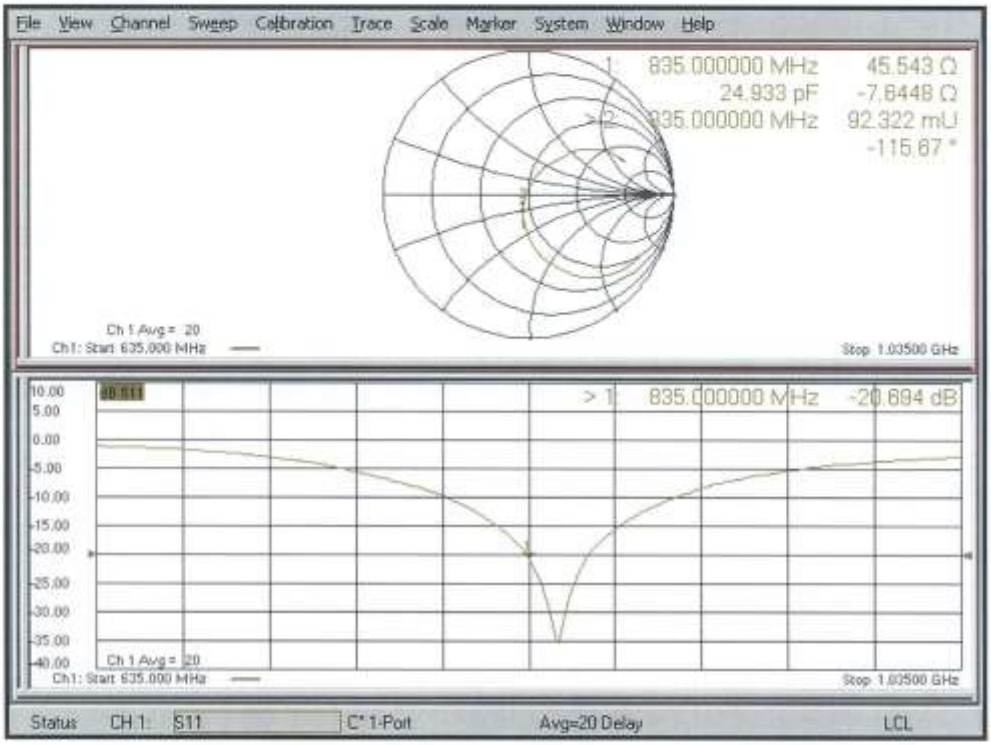
Dipole Calibration for Body Tissue/Pin=250 mW, d=15mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 60.86 V/m; Power Drift = -0.08 dB
Peak SAR (extrapolated) = 3.62 W/kg
SAR(1 g) = 2.41 W/kg; SAR(10 g) = 1.57 W/kg
Maximum value of SAR (measured) = 3.22 W/kg



0 dB = 3.22 W/kg = 5.08 dBW/kg

Impedance Measurement Plot for Body TSL



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Accreditation No.: SCS 0108

Client HCT (Dymstec)

Certificate No: D1800V2-2d007_Nov18

CALIBRATION CERTIFICATE

결	담 당 자	확 인 자
재		
직위/성명	SW 기술책임	팀 기술검토
일 자	2018 / 12. 03	2018 / 12. 03

Object	D1800V2 - SN:2d007
Calibration procedure(s)	QA CAL-05.v10 Calibration procedure for dipole validation kits above 700 MHz
Calibration date:	November 19, 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	04-Oct-18 (No. DAE4-601_Oct18)	Oct-19

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power meter EPM-442A	SN: GB37480704	07-Oct-15 (in house check Oct-18)	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:	Manu Seitz	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: November 20, 2018

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

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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	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	1800 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	40.0	1.40 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	39.5 ± 6 %	1.37 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	---	---

SAR result with Head TSL

SAR averaged over 1 cm³ (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	9.67 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**39.1 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	5.05 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**20.3 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	53.3	1.52 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	54.0 ± 6 %	1.49 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	---	---

SAR result with Body TSL

SAR averaged over 1 cm³ (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	9.45 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**38.4 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm³ (10 g) of Body TSL	condition	
SAR measured	250 mW input power	4.96 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**20.0 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	47.3 Ω - 7.3 jΩ
Return Loss	- 22.0 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	43.0 Ω - 6.0 jΩ
Return Loss	- 20.1 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.205 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	July 23, 2001

DASY5 Validation Report for Head TSL

Date: 19.11.2018

Test Laboratory: SPEAG, Zurich, Switzerland

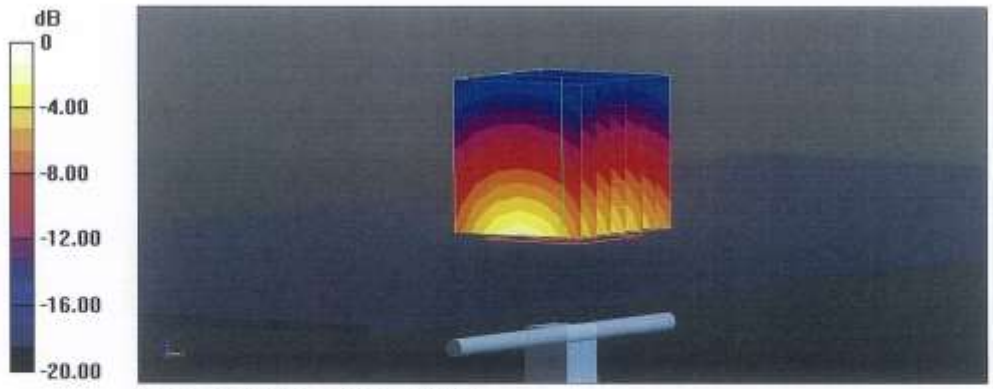
DUT: Dipole 1800 MHz; Type: D1800V2; Serial: D1800V2 - SN:2d007

Communication System: UID 0 - CW; Frequency: 1800 MHz
Medium parameters used: f = 1800 MHz; σ = 1.37 S/m; ε_r = 39.5; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

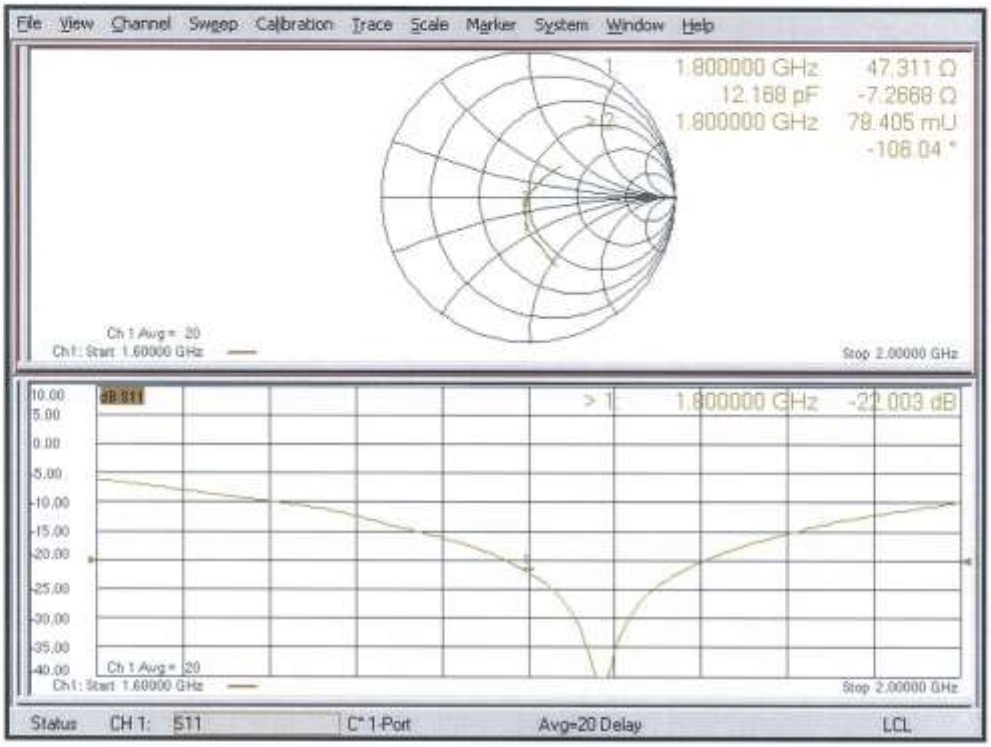
- Probe: EX3DV4 - SN7349; ConvF(8.3, 8.3, 8.3) @ 1800 MHz; Calibrated: 30.12.2017
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 04.10.2018
- Phantom: Flat Phantom 5.0 (front); Type: QD 000 P50 AA; Serial: 1001
- DASY52 52.10.2(1495); SEMCAD X 14.6.12(7450)

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 = 110.2 V/m; Power Drift = -0.05 dB
Peak SAR (extrapolated) = 18.0 W/kg
SAR(1 g) = 9.67 W/kg; SAR(10 g) = 5.05 W/kg
Maximum value of SAR (measured) = 15.0 W/kg



0 dB = 15.0 W/kg = 11.76 dBW/kg

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 19.11.2018

Test Laboratory: SPEAG, Zurich, Switzerland

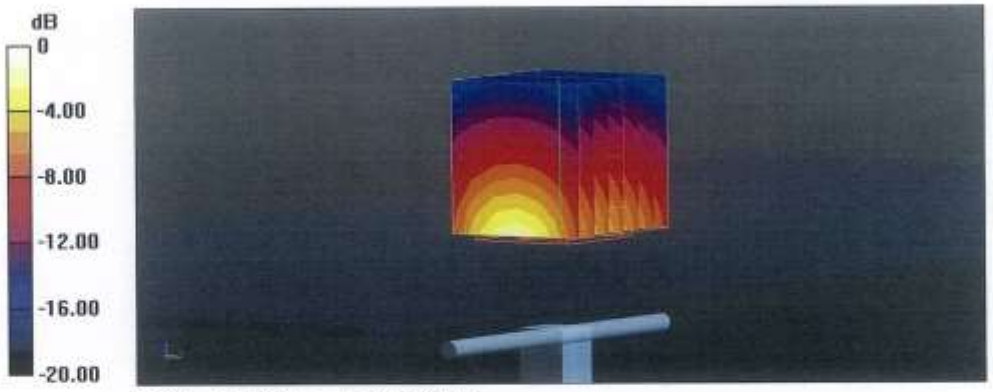
DUT: Dipole 1800 MHz; Type: D1800V2; Serial: D1800V2 - SN:2d007

Communication System: UID 0 - CW; Frequency: 1800 MHz
Medium parameters used: f = 1800 MHz; σ = 1.49 S/m; ε_r = 54; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

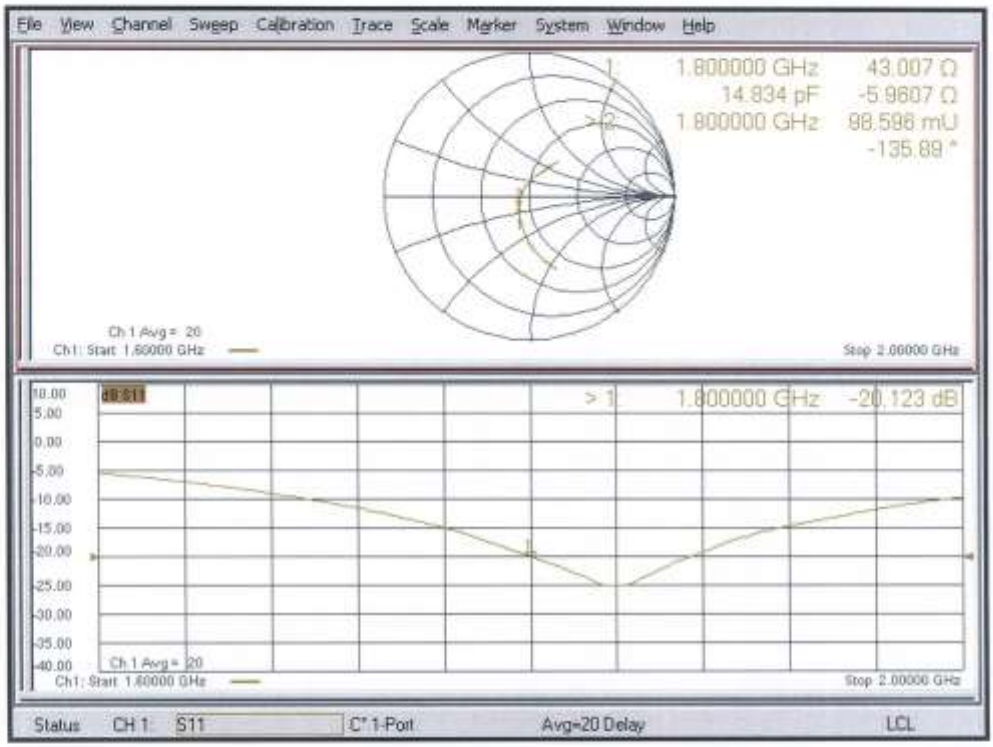
- Probe: EX3DV4 - SN7349; ConvF(8.25, 8.25, 8.25) @ 1800 MHz; Calibrated: 30.12.2017
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 04.10.2018
- Phantom: Flat Phantom 5.0 (back); Type: QD 000 P50 AA; Serial: 1002
- DASY52 52.10.2(1495); SEMCAD X 14.6.12(7450)

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 = 103.8 V/m; Power Drift = -0.01 dB
Peak SAR (extrapolated) = 16.9 W/kg
SAR(1 g) = 9.45 W/kg; SAR(10 g) = 4.96 W/kg
Maximum value of SAR (measured) = 14.4 W/kg



0 dB = 14.4 W/kg = 11.58 dBW/kg

Impedance Measurement Plot for Body TSL



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Accreditation No.: **SCS 0108**

Client **HCT (Dymstec)** Certificate No: **D1900V2-5d061_Mar18**

CALIBRATION CERTIFICATE

Object D1900V2 - SN:5d061

Calibration procedure(s) QA CAL-05.v10
Calibration procedure for dipole validation kits above 700 MHz

결재	담 당 자	확 인 자

Calibration date: March 15, 2018

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI). 2018.4.2
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-17 (No. 217-02521/02522)	Apr-18
Power sensor NRP-Z91	SN: 103244	04-Apr-17 (No. 217-02521)	Apr-18
Power sensor NRP-Z91	SN: 103245	04-Apr-17 (No. 217-02522)	Apr-18
Reference 20 dB Attenuator	SN: 5058 (20k)	07-Apr-17 (No. 217-02528)	Apr-18
Type-N mismatch combination	SN: 5047.2 / 06327	07-Apr-17 (No. 217-02529)	Apr-18
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 HP 8753E	SN: US37390585	18-Oct-01 (in house check Oct-17)	In house check: Oct-18

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

Issued: March 15, 2018

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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	V52.10.0
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	1900 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	40.0	1.40 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	40.5 ± 6 %	1.37 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	---	---

SAR result with Head TSL

SAR averaged over 1 cm³ (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	9.88 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**40.1 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	5.19 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**21.0 W/kg ± 16.5 % (k=2)**

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	53.3	1.52 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	55.2 ± 6 %	1.47 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	---	---

SAR result with Body TSL

SAR averaged over 1 cm³ (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	9.64 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**39.6 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm³ (10 g) of Body TSL	condition	
SAR measured	250 mW input power	5.14 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**20.9 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	51.4 Ω + 8.2 jΩ
Return Loss	- 24.0 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	47.7 Ω + 4.9 jΩ
Return Loss	- 25.1 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.194 ns

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

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

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	December 10, 2004

DASY5 Validation Report for Head TSL

Date: 15.03.2018

Test Laboratory: SPEAG, Zurich, Switzerland

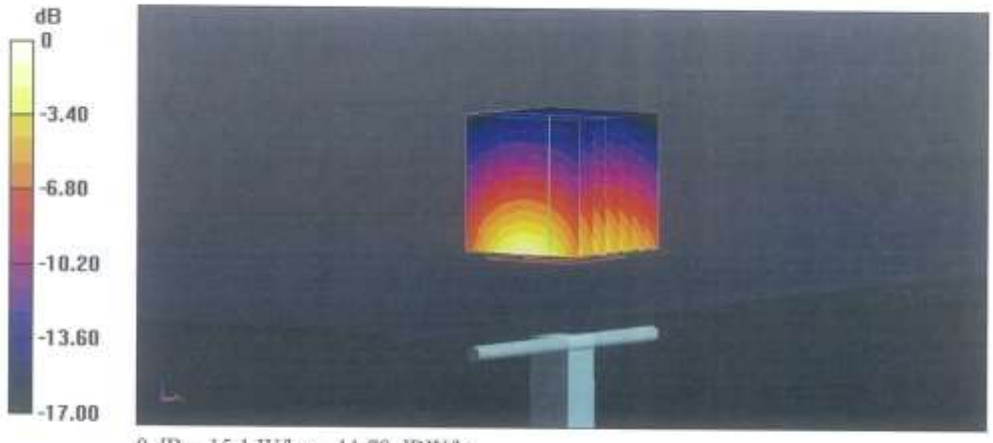
DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN:5d061

Communication System: UID 0 - CW; Frequency: 1900 MHz
Medium parameters used: f = 1900 MHz; σ = 1.37 S/m; ε_r = 40.5; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

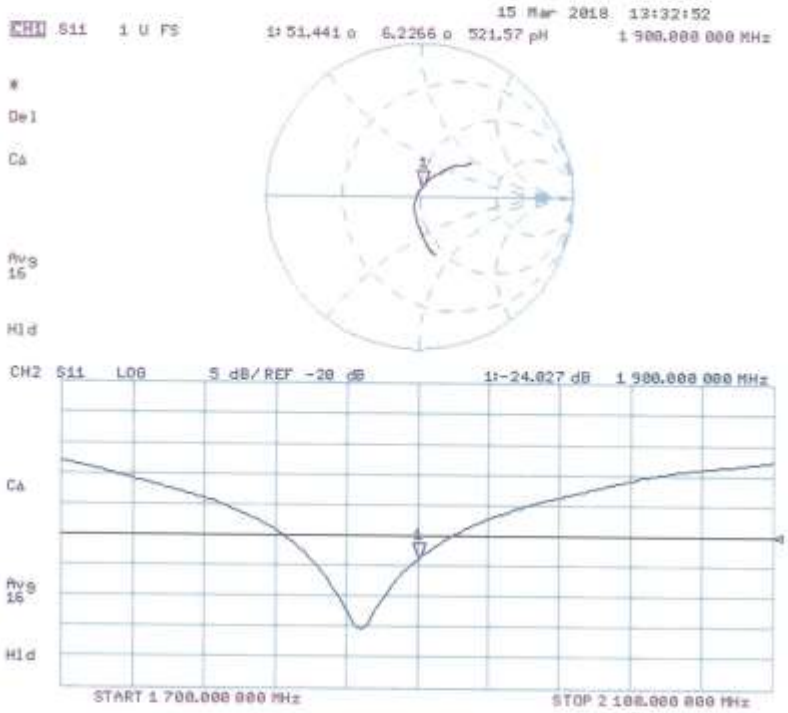
- Probe: EX3DV4 - SN7349; ConvF(8.18, 8.18, 8.18); Calibrated: 30.12.2017;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 26.10.2017
- Phantom: Flat Phantom 5.0 (front); Type: QD 000 P50 AA; Serial: 1001
- DASY52 52.10.0(1446); SEMCAD X 14.6.10(7417)

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 = 107.8 V/m; Power Drift = -0.09 dB
Peak SAR (extrapolated) = 18.3 W/kg
SAR(1 g) = 9.88 W/kg; SAR(10 g) = 5.19 W/kg
Maximum value of SAR (measured) = 15.1 W/kg



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

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 15.03.2018

Test Laboratory: SPEAG, Zurich, Switzerland

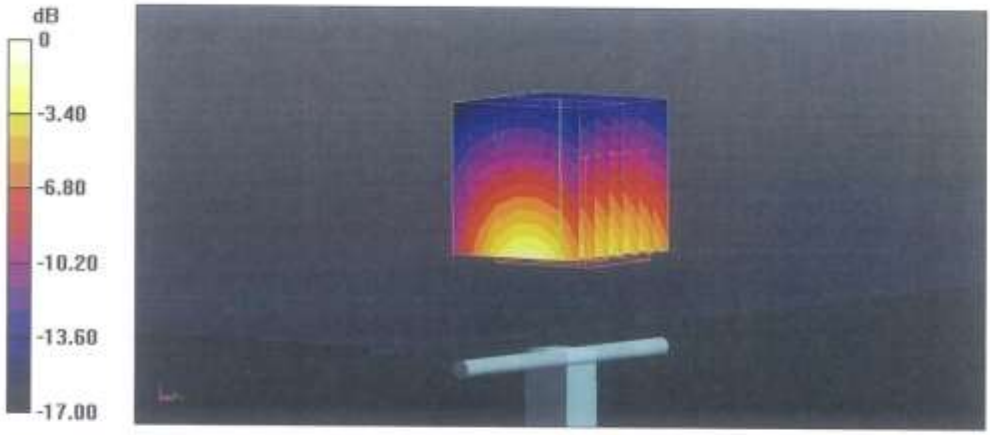
DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN:5d061

Communication System: UID 0 - CW; Frequency: 1900 MHz
Medium parameters used: f = 1900 MHz; σ = 1.47 S/m; ε_r = 55.2; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

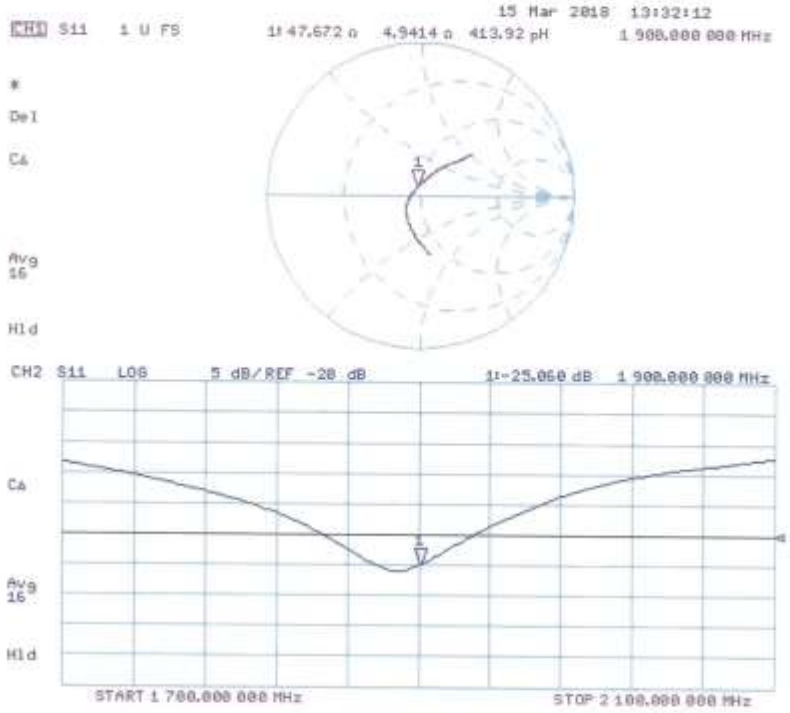
- Probe: EX3DV4 - SN7349; ConvF(8.15, 8.15, 8.15); Calibrated: 30.12.2017;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 26.10.2017
- Phantom: Flat Phantom 5.0 (back); Type: QD 000 P50 AA; Serial: 1002
- DASY52 52.10.0(1446); SEMCAD X 14.6.10(7417)

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 = 101.9 V/m; Power Drift = -0.04 dB
Peak SAR (extrapolated) = 17.1 W/kg
SAR(1 g) = 9.64 W/kg; SAR(10 g) = 5.14 W/kg
Maximum value of SAR (measured) = 13.9 W/kg



0 dB = 13.9 W/kg = 11.43 dBW/kg

Impedance Measurement Plot for Body TSL



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Accreditation No.: SCS 0108

Client **HCT (Dymstec)** Certificate No: **D2450V2-965_Feb18**

CALIBRATION CERTIFICATE

Object	D2450V2 - SN:965
Calibration procedure(s)	QA CAL-05.v9 Calibration procedure for dipole validation kits above 700 MHz
Calibration date:	February 16, 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-17 (No. 217-02521/02522)	Apr-18
Power sensor NRP-Z91	SN: 103244	04-Apr-17 (No. 217-02521)	Apr-18
Power sensor NRP-Z91	SN: 103245	04-Apr-17 (No. 217-02522)	Apr-18
Reference 20 dB Attenuator	SN: 5058 (20k)	07-Apr-17 (No. 217-02528)	Apr-18
Type-N mismatch combination	SN: 5047.2 / 06327	07-Apr-17 (No. 217-02529)	Apr-18
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 HP 8753E	SN: US37390585	18-Oct-01 (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: February 19, 2018

결재	담당자	확인자
직위/성명	과장	팀장
일자	2018.03.06	2018.03.06

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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	V52.10.0
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	2450 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	39.2	1.80 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	37.9 ± 6 %	1.87 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm³ (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	13.1 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**51.1 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	6.07 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**23.9 W/kg ± 16.5 % (k=2)**

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	52.7	1.95 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	51.4 ± 6 %	2.04 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm³ (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	12.9 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**50.2 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm³ (10 g) of Body TSL	condition	
SAR measured	250 mW input power	5.98 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**23.6 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	54.9 Ω + 4.2 jΩ
Return Loss	- 24.2 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	50.9 Ω + 6.3 jΩ
Return Loss	- 24.0 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.163 ns

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

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

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	November 19, 2014

DASY5 Validation Report for Head TSL

Date: 16.02.2018

Test Laboratory: SPEAG, Zurich, Switzerland

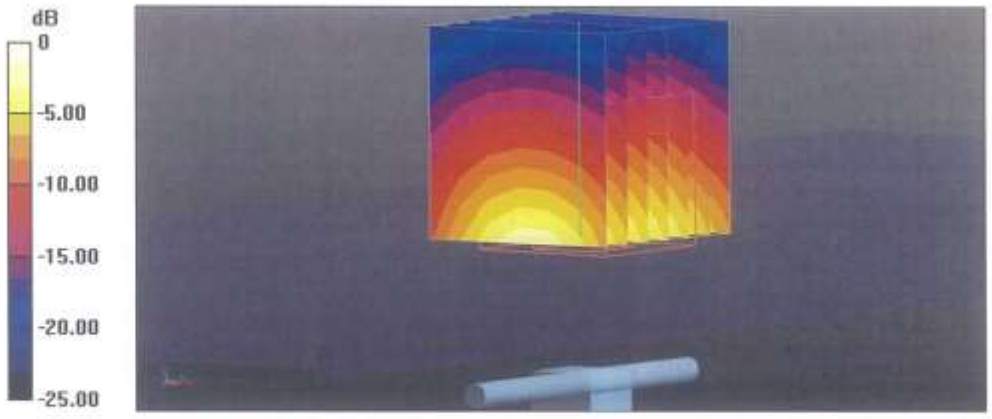
DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN: 965

Communication System: UID 0 - CW; Frequency: 2450 MHz
Medium parameters used: f = 2450 MHz; σ = 1.87 S/m; ε_r = 37.9; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

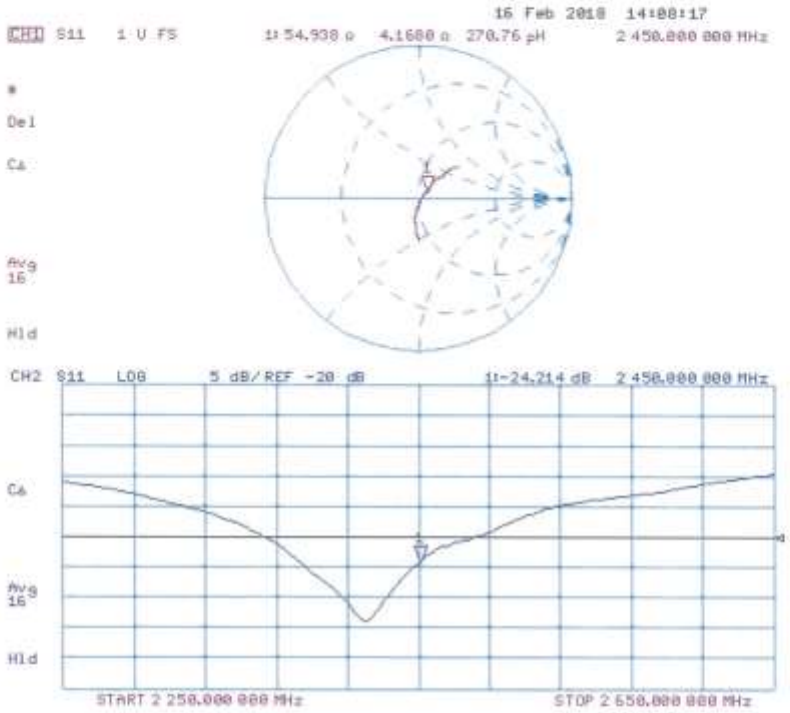
- Probe: EX3DV4 - SN7349; ConvF(7.88, 7.88, 7.88); Calibrated: 30.12.2017;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 26.10.2017
- Phantom: Flat Phantom 5.0 (front); Type: QD 000 P50 AA; Serial: 1001
- DASY52 52.10.0(1446); SEMCAD X 14.6.10(7417)

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 = 112.7 V/m; Power Drift = -0.05 dB
Peak SAR (extrapolated) = 26.2 W/kg
SAR(1 g) = 13.1 W/kg; SAR(10 g) = 6.07 W/kg
Maximum value of SAR (measured) = 20.7 W/kg



0 dB = 20.7 W/kg = 13.16 dBW/kg

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 16.02.2018

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN: 965

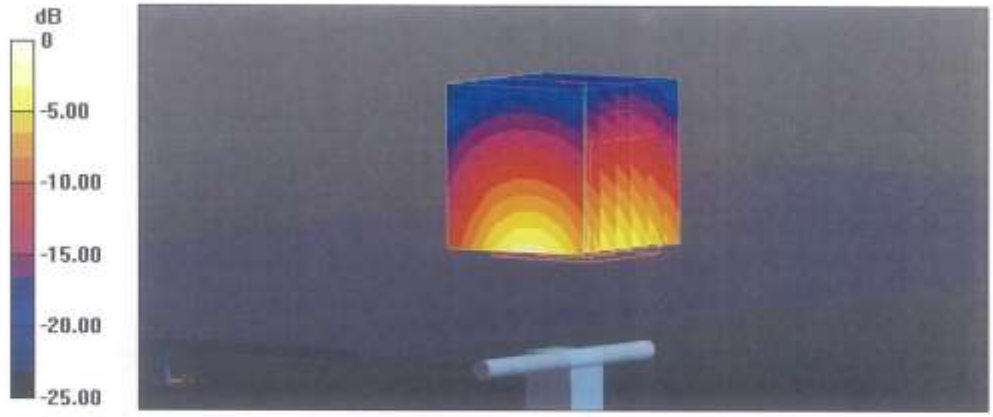
Communication System: UID 0 - CW; Frequency: 2450 MHz
Medium parameters used: f = 2450 MHz; σ = 2.04 S/m; ε_r = 51.4; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(8.01, 8.01, 8.01); 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 52.10.0(1446); SEMCAD X 14.6.10(7417)

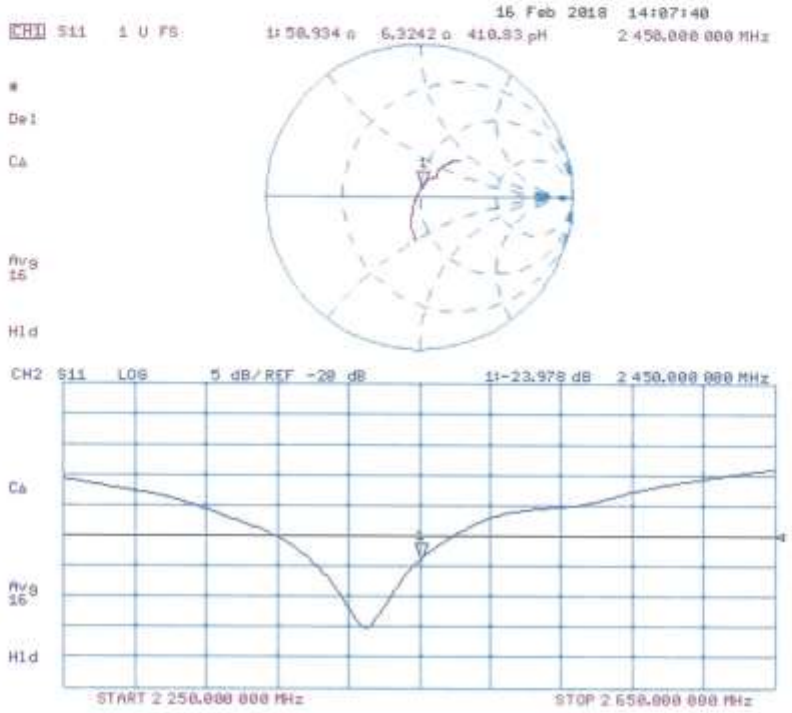
Dipole Calibration for Body Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 104.7 V/m; Power Drift = -0.03 dB
Peak SAR (extrapolated) = 25.8 W/kg
SAR(1 g) = 12.9 W/kg; SAR(10 g) = 5.98 W/kg
Maximum value of SAR (measured) = 20.0 W/kg



0 dB = 20.0 W/kg = 13.01 dBW/kg

Impedance Measurement Plot for Body TSL



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Accreditation No.: SCS 0108

Client HCT (Dymstec)

Certificate No: D2600V2-1015_Nov18

CALIBRATION CERTIFICATE

결	담 당 자	확 인 자
재		
직위/성명	SW 선임연구원	GS 차장급
일 자	2018.12.03	2018.12.03

Object: D2600V2 - SN:1015

Calibration procedure(s): QA CAL-05.v10
Calibration procedure for dipole validation kits above 700 MHz

Calibration date: November 20, 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	04-Oct-18 (No. DAE4-601_Oct18)	Oct-19

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power meter EPM-442A	SN: GB37480704	07-Oct-15 (in house check Oct-18)	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:	Leif Klysner	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: November 20, 2018

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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	
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	37.3 ± 6 %	2.03 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	14.9 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**58.1 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	6.63 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**26.1 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	50.9 ± 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	**54.8 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm³ (10 g) of Body TSL	condition	
SAR measured	250 mW input power	6.14 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**24.3 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	49.6 Ω - 4.1 jΩ
Return Loss	- 27.6 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	45.8 Ω - 2.8 jΩ
Return Loss	- 25.5 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	October 30, 2007

DASY5 Validation Report for Head TSL

Date: 16.11.2018

Test Laboratory: SPEAG, Zurich, Switzerland

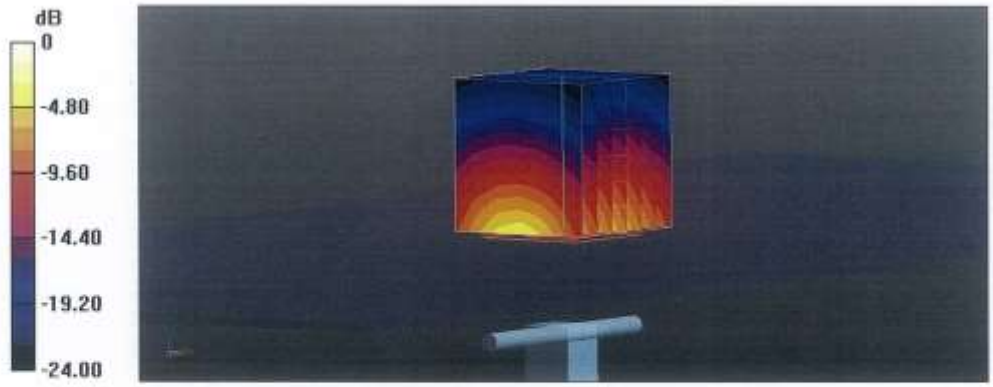
DUT: Dipole 2600 MHz; Type: D2600V2; Serial: D2600V2 - SN:1015

Communication System: UID 0 - CW; Frequency: 2600 MHz
Medium parameters used: f = 2600 MHz; σ = 2.03 S/m; ε_r = 37.3; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

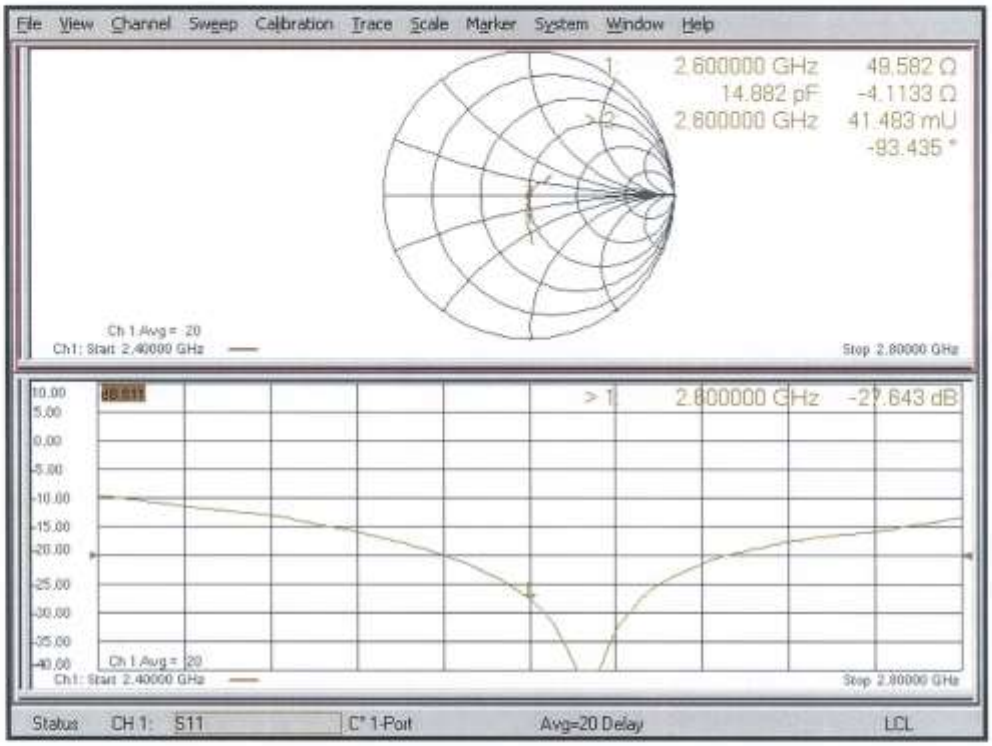
- Probe: EX3DV4 - SN7349; ConvF(7.7, 7.7, 7.7) @ 2600 MHz; Calibrated: 30.12.2017
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 04.10.2018
- Phantom: Flat Phantom 5.0 (front); Type: QD 000 P50 AA; Serial: 1001
- DASY52 52.10.2(1495); SEMCAD X 14.6.12(7450)

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 = 121.3 V/m; Power Drift = -0.04 dB
Peak SAR (extrapolated) = 30.2 W/kg
SAR(1 g) = 14.9 W/kg; SAR(10 g) = 6.63 W/kg
Maximum value of SAR (measured) = 25.0 W/kg



0 dB = 25.0 W/kg = 13.98 dBW/kg

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 20.11.2018

Test Laboratory: SPEAG, Zurich, Switzerland

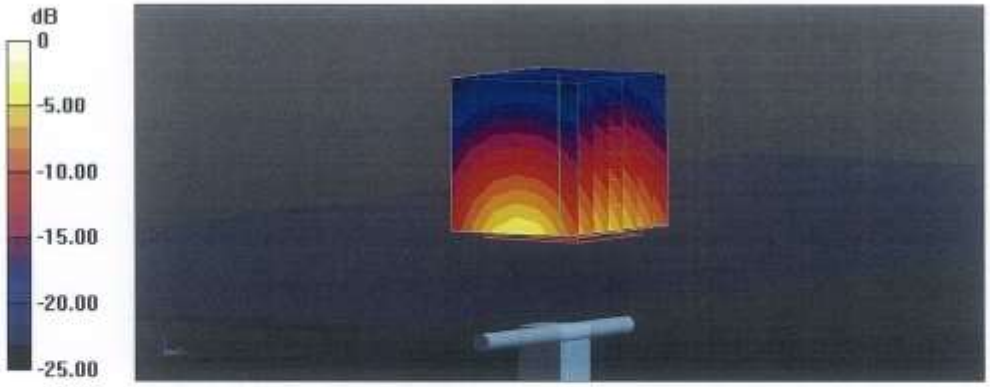
DUT: Dipole 2600 MHz; Type: D2600V2; Serial: D2600V2 - SN:1015

Communication System: UID 0 - CW; Frequency: 2600 MHz
Medium parameters used: f = 2600 MHz; σ = 2.2 S/m; ε_r = 50.9; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

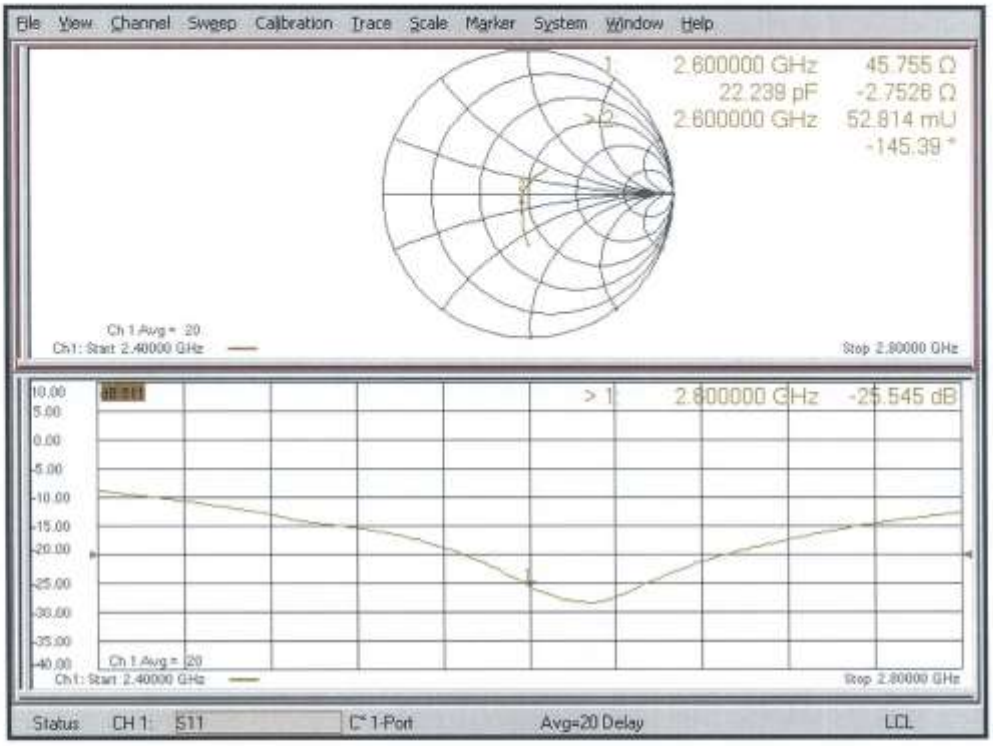
- Probe: EX3DV4 - SN7349; ConvF(7.81, 7.81, 7.81) @ 2600 MHz; Calibrated: 30.12.2017
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 04.10.2018
- Phantom: Flat Phantom 5.0 (back); Type: QD 000 P50 AA; Serial: 1002
- DASY52 52.10.2(1495); SEMCAD X 14.6.12(7450)

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 = 108.5 V/m; Power Drift = -0.09 dB
Peak SAR (extrapolated) = 28.6 W/kg
SAR(1 g) = 13.9 W/kg; SAR(10 g) = 6.14 W/kg
Maximum value of SAR (measured) = 23.1 W/kg



0 dB = 23.1 W/kg = 13.64 dBW/kg

Impedance Measurement Plot for Body TSL



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

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Accreditation No.: SCS 0108

Client **HCT (Dymstec)**

Certificate No: D5GHzV2-1253_Nov18

CALIBRATION CERTIFICATE

결재	담당자	확인자
직위/성명		
일자		

Object	D5GHzV2 - SN:1253
Calibration procedure(s)	QA CAL-22.v3 Calibration procedure for dipole validation kits between 3-6 GHz
Calibration date:	November 22, 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: 3503	30-Dec-17 (No. EX3-3503_Dec17)	Dec-18
DAE4	SN: 601	04-Oct-18 (No. DAE4-601_Oct18)	Oct-19

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power meter EPM-442A	SN: GB37480704	07-Oct-15 (in house check Oct-18)	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:	Jeton Kastrati	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: November 22, 2018

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

Certificate No: D5GHzV2-1253_Nov18 Page 1 of 13

Calibration Laboratory of
Schmid & Partner
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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	5250 MHz ± 1 MHz 5600 MHz ± 1 MHz 5750 MHz ± 1 MHz	

Head TSL parameters at 5250 MHz

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Head TSL parameters	22.0 °C	35.9	4.71 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	36.2 ± 6 %	4.50 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL at 5250 MHz

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	8.20 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**82.0 W/kg ± 19.9 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.34 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**23.4 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	35.7 ± 6 %	4.84 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	8.39 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**83.8 W / kg ± 19.9 % (k=2)**

SAR averaged over 10 cm³ (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.39 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**23.9 W/kg ± 19.5 % (k=2)**

Head TSL parameters at 5750 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	35.4	5.22 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	35.5 ± 6 %	5.10 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL at 5750 MHz

SAR averaged over 1 cm³ (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	8.23 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**82.3 W/kg ± 19.9 % (k=2)**

SAR averaged over 10 cm³ (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.34 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**23.4 W/kg ± 19.5 % (k=2)**

Body TSL parameters at 5250 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	48.9	5.36 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	47.5 ± 6 %	5.46 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL at 5250 MHz

SAR averaged over 1 cm³ (1 g) of Body TSL	Condition	
SAR measured	100 mW input power	7.84 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**78.0 W/kg ± 19.9 % (k=2)**

SAR averaged over 10 cm³ (10 g) of Body TSL	condition	
SAR measured	100 mW input power	2.17 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**21.6 W/kg ± 19.5 % (k=2)**

Body TSL parameters at 5600 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	48.5	5.77 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	46.8 ± 6 %	5.94 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL at 5600 MHz

SAR averaged over 1 cm³ (1 g) of Body TSL	Condition	
SAR measured	100 mW input power	8.21 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**81.6 W/kg ± 19.9 % (k=2)**

SAR averaged over 10 cm³ (10 g) of Body TSL	condition	
SAR measured	100 mW input power	2.28 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**22.6 W/kg ± 19.5 % (k=2)**

Body TSL parameters at 5750 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	48.3	5.94 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	46.6 ± 6 %	6.15 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL at 5750 MHz

SAR averaged over 1 cm³ (1 g) of Body TSL	Condition	
SAR measured	100 mW input power	7.77 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**77.3 W/kg ± 19.9 % (k=2)**

SAR averaged over 10 cm³ (10 g) of Body TSL	condition	
SAR measured	100 mW input power	2.16 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**21.4 W/kg ± 19.5 % (k=2)**

Appendix (Additional assessments outside the scope of SCS 0108)

Antenna Parameters with Head TSL at 5250 MHz

Impedance, transformed to feed point	49.2 Ω - 4.2 jΩ
Return Loss	- 27.4 dB

Antenna Parameters with Head TSL at 5600 MHz

Impedance, transformed to feed point	52.7 Ω + 2.7 jΩ
Return Loss	- 28.6 dB

Antenna Parameters with Head TSL at 5750 MHz

Impedance, transformed to feed point	54.1 Ω + 4.0 jΩ
Return Loss	- 25.2 dB

Antenna Parameters with Body TSL at 5250 MHz

Impedance, transformed to feed point	49.4 Ω - 2.0 jΩ
Return Loss	- 33.6 dB

Antenna Parameters with Body TSL at 5600 MHz

Impedance, transformed to feed point	52.5 Ω + 3.1 jΩ
Return Loss	- 28.2 dB

Antenna Parameters with Body TSL at 5750 MHz

Impedance, transformed to feed point	56.5 Ω + 3.8 jΩ
Return Loss	- 23.0 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
Manufactured on	January 22, 2016

DASY5 Validation Report for Head TSL

Date: 15.11.2018

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole D5GHzV2; Type: D5GHzV2; Serial: D5GHzV2 - SN:1253

Communication System: UID 0 - CW; Frequency: 5250 MHz, Frequency: 5600 MHz, Frequency: 5750 MHz
Medium parameters used: f = 5250 MHz; σ = 4.5 S/m; ε_r = 36.2; ρ = 1000 kg/m^3 ,
Medium parameters used: f = 5600 MHz; σ = 4.84 S/m; ε_r = 35.7; ρ = 1000 kg/m^3 ,
Medium parameters used: f = 5750 MHz; σ = 5.1 S/m; ε_r = 35.5; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

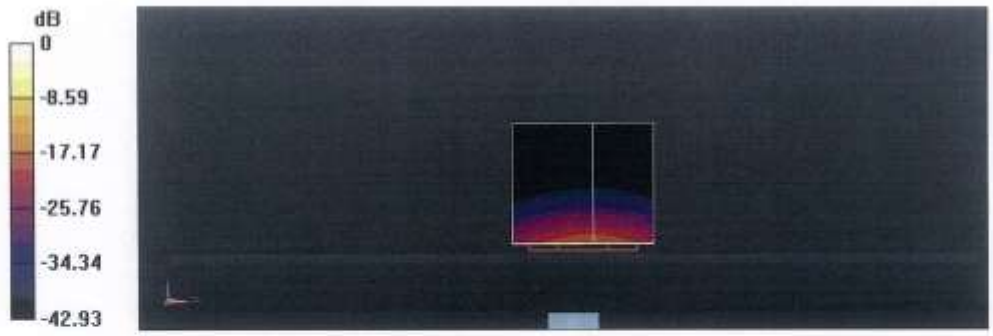
DASY52 Configuration:

- Probe: EX3DV4 - SN3503; ConvF(5.51, 5.51, 5.51) @ 5250 MHz,
  ConvF(5.05, 5.05, 5.05) @ 5600 MHz,
  ConvF(4.98, 4.98, 4.98) @ 5750 MHz; Calibrated: 30.12.2017
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601 (5G); Calibrated: 04.10.2018
- Phantom: Flat Phantom 5.0 (front); Type: QD 000 P50 AA; Serial: 1001
- DASY52 52.10.2(1495); SEMCAD X 14.6.12(7446)

Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5250 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 80.61 V/m; Power Drift = -0.09 dB
Peak SAR (extrapolated) = 27.6 W/kg
SAR(1 g) = 8.2 W/kg; SAR(10 g) = 2.34 W/kg
Maximum value of SAR (measured) = 18.3 W/kg

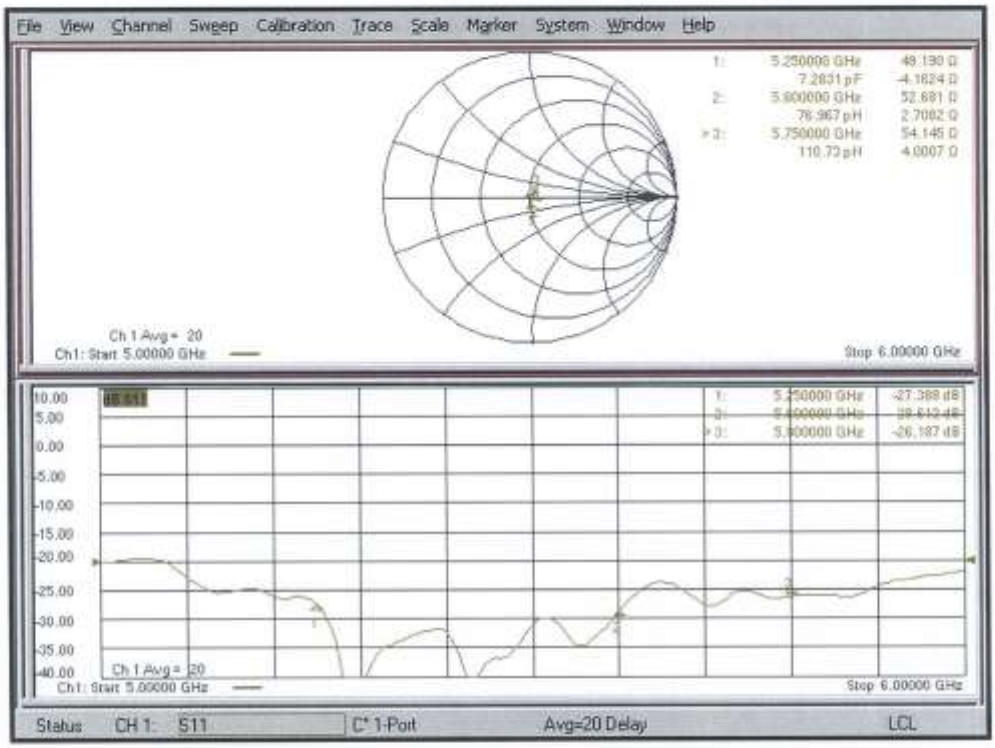
Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5600 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 77.68 V/m; Power Drift = -0.01 dB
Peak SAR (extrapolated) = 30.8 W/kg
SAR(1 g) = 8.39 W/kg; SAR(10 g) = 2.39 W/kg
Maximum value of SAR (measured) = 19.6 W/kg

Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5750 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 75.48 V/m; Power Drift = -0.04 dB
Peak SAR (extrapolated) = 30.7 W/kg
SAR(1 g) = 8.23 W/kg; SAR(10 g) = 2.34 W/kg
Maximum value of SAR (measured) = 19.2 W/kg



0 dB = 18.5 W/kg = 12.67 dBW/kg

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 22.11.2018

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole D5GHzV2; Type: D5GHzV2; Serial: D5GHzV2 - SN:1253

Communication System: UID 0 - CW; Frequency: 5250 MHz, Frequency: 5600 MHz, Frequency: 5750 MHz
Medium parameters used: f = 5250 MHz; σ = 5.46 S/m; ε_r = 47.5; ρ = 1000 kg/m^3 ,
Medium parameters used: f = 5600 MHz; σ = 5.94 S/m; ε_r = 46.8; ρ = 1000 kg/m^3 ,
Medium parameters used: f = 5750 MHz; σ = 6.15 S/m; ε_r = 46.6; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN3503; ConvF(5.26, 5.26, 5.26) @ 5250 MHz,
  ConvF(4.65, 4.65, 4.65) @ 5600 MHz,
  ConvF(4.57, 4.57, 4.57) @ 5750 MHz; Calibrated: 30.12.2017
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601 (5G); Calibrated: 04.10.2018
- Phantom: Flat Phantom 5.0 (back); Type: QD 000 P50 AA; Serial: 1002
- DASY52 52.10.2(1495); SEMCAD X 14.6.12(7450)

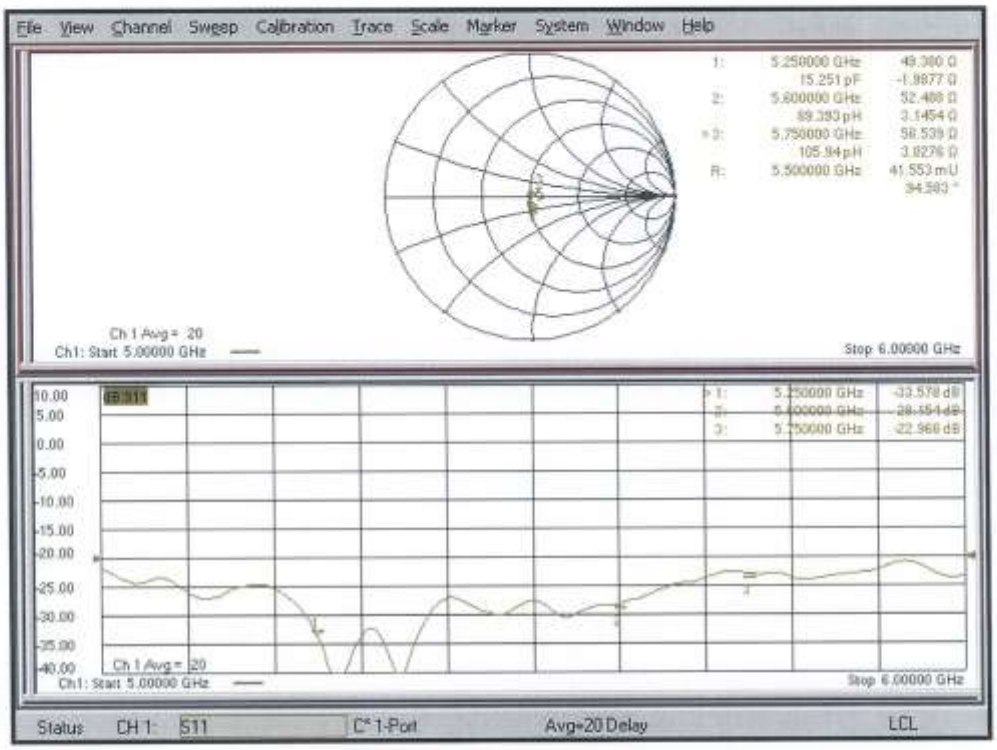
Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5250 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 69.32 V/m; Power Drift = -0.03 dB
Peak SAR (extrapolated) = 30.5 W/kg
SAR(1 g) = 7.84 W/kg; SAR(10 g) = 2.17 W/kg
Maximum value of SAR (measured) = 18.6 W/kg

Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5600 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 69.85 V/m; Power Drift = -0.04 dB
Peak SAR (extrapolated) = 34.8 W/kg
SAR(1 g) = 8.21 W/kg; SAR(10 g) = 2.28 W/kg
Maximum value of SAR (measured) = 20.3 W/kg

Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5750 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 67.21 V/m; Power Drift = -0.04 dB
Peak SAR (extrapolated) = 33.5 W/kg
SAR(1 g) = 7.77 W/kg; SAR(10 g) = 2.16 W/kg
Maximum value of SAR (measured) = 19.3 W/kg

0 dB = 18.6 W/kg = 12.70 dBW/kg

Impedance Measurement Plot for Body TSL



Schmid & Partner Engineering AG
s p e a g
Zeughausstrasse 43, 8004 Zurich, Switzerland
Phone +41 44 245 9700, Fax +41 44 245 9779
info@speag.com, http://www.speag.com

Certificate of conformity / First Article Inspection

Item	Triple Modular Flat Phantom V5.1
Type No	QD 000 P51 C
Series No	1100 and higher
Manufacturer / Origin	Untersee Composites Knebelstrasse 8, CH-8268 Mannenbach, Switzerland

Tests
The sub-units of item 1100 are identified with the designation 1100/1, 1100/2 and 1100/3. Tests were conducted on all 3 sub-units of this phantom.

Test	Requirement	Details	Units tested
Material thickness	Compliant with the standard requirements.	2 mm +/- 0.2 mm 30 points over the bottom area	all
Material parameters	Dielectric parameters for required frequencies	200 MHz – 6 GHz - Relative permittivity 3 - 5 Loss tangent < 0.05.	Material sample
Material resistivity	The material is compatible with the liquids defined in the standards if handled and cleaned according to the instructions.	DGBE based simulating liquids. Observe Technical Note for material compatibility.	Material Samples
Shape	Internal dimensions	Internal height: > 175 mm Bottom internal length: 280 mm Bottom internal width: 175 mm Nominal filling height: 155 mm Nominal volume: 9.2 l	Pre-series, design
Sagging	Depending on standard	No initial sagging (negative preshaped, change < 0.5 mm)	1100/2

Standards
[1] IEEE 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
[2] IEC 62209 – 1, "Specific Absorption Rate (SAR) in the frequency range of 300 MHz to 3 GHz – Measurement Procedure, Part 1: Hand-held mobile wireless communication devices", February 2005
[3] IEC 62209 – 2, "Evaluation of Human Exposure to Radio Frequency Fields from Handheld and Body-Mounted Wireless Communication Devices in the Frequency Range of 30 MHz to 6 GHz: Human models, Instrumentation and Procedures, Part 2: Procedure to determine the Specific Absorption Rate (SAR) for ... including accessories and multiple transmitters", March 2010
[4] KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

Conformity
Based on the dimensions and sample tests above, we certify that this item is in compliance with the standards [1] to [4] for frequencies > 700 MHz, if operated according to the specific requirements.

Date 16.07.2015

Signature / Stamp

s p e a g
Schmid & Partner Engineering AG
Zeughausstrasse 43, 8004 Zurich, Switzerland
Phone +41 44 245 9700, Fax +41 44 245 9779
info@speag.com, http://www.speag.com