Justification for Extended SAR Dipole Calibrations

Usage of SAR dipoles calibrated less than 3 years ago but more than 1 year ago were confirmed in maintaining return loss (< - 20 dB, within 20% of prior calibration) and impedance (within 5 ohm from prior calibration) requirements per extended calibrations in KDB 865664 D01:

Dipole		Date of Measurement	Return Loss(dB)	Δ %	Impedance (Ω)	ΔΩ
Dipole D5GHzV2 SN: 1151 (5250MHz)	Body Liquid	1/5/2017	-24.7	/	50.4	/
		1/4/2018	-24.4	1.2%	49.9	-0.5Ω
Dipole D5GHzV2 SN: 1151 (5750MHz)	Body Liquid	1/5/2017	-24.9	/	56.0	/
		1/4/2018	-25.2	-1.2%	56.4	0.4Ω

System Check results

Frequency (MHz)		Test Date	Temp ℃	250mW/ 100mW Measured SAR_{1g} (W/kg)	1W Normalized SAR_{1g} (W/kg)	1W Target SAR_{1g} (W/kg)	Δ % (Limit ±10%)	Plot No.
5250	Body	3/17/2018	21.5	7.46	74.6	75.60	-1.32	1
5750	Body	3/18/2018	21.5	7.15	71.5	74.60	-4.16	2
Note：Target Values used derive from the calibration certificate Data Storage and Evaluation.								

9 Normal and Maximum Output Power

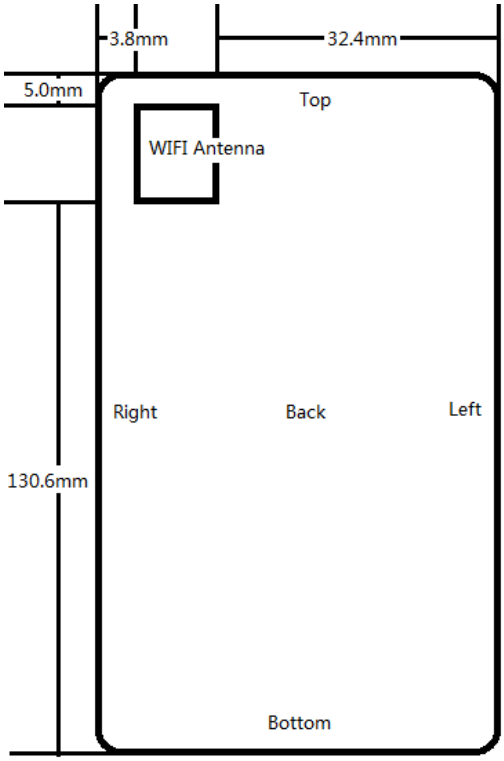
KDB 447498 D01 at the maximum rated output power and within the tune-up tolerance range specified for the product, but not more than 2 dB lower than the maximum tune-up tolerance limit.

9.1 WLAN Mode

Wi-Fi 5G	Channel	Frequency (MHz)	Average Conducted Power (dBm) Data Rate (bps)	Tune-up Limit (dBm)	TX Power Setting level
Mode			6M		
802.11a	36	5180	12.74	13.50	13
	40	5200	12.71	13.50	13
	44	5220	12.30	13.50	13
	48	5240	12.62	13.50	13
	149	5745	10.63	11.50	13
	157	5785	10.51	11.50	13
	165	5825	10.53	11.50	13
Mode	Channel	Frequency (MHz)	MCS0	Tune-up Limit (dBm)	TX Power Setting level
802.11n (HT20)	36	5180	12.41	13.50	13
	40	5200	12.58	13.50	13
	44	5220	12.52	13.50	13
	48	5240	12.45	13.50	13
	149	5745	11.60	12.50	13
	157	5785	11.54	12.50	13
	165	5825	11.67	12.50	13
Mode	Channel	Frequency (MHz)	MCS0	Tune-up Limit (dBm)	TX Power Setting level
802.11n (HT40)	38	5190	12.75	13.50	13
	46	5230	12.67	13.50	13
	151	5755	11.81	12.50	13
	159	5795	12.08	12.50	13
Note: Initial test configuration is 802.11n HT40 mode, since the highest maximum output power, the largest channel bandwidth. Subsequent test configuration is 802.11n HT20 mode, since the highest maximum output power.					

10 Measured and Reported (Scaled) SAR Results

10.1 EUT Antenna Locations



Overall (Length x Width): 145.3 mm x 52.2 mm						
Distance of the Antenna to the EUT surface/edge						
Antenna	Back Side	Front side	Left Edge	Right Edge	Top Edge	Bottom Edge
Wi-Fi Antenna	0	0	＞25mm	＜25mm	＜25mm	＞25mm
Positions for SAR tests						
Mode	Back Side	Front side	Left Edge	Right Edge	Top Edge	Bottom Edge
Wi-Fi Antenna	Yes	Yes	N/A	Yes	Yes	N/A

Note: 1. Per KDB 941225 D06, when the overall device length and width are ≥ 9cm*5cm, the test distance is 10mm. SAR must be measured for all sides and surfaces with a transmitting antenna located within 25mm from that surface or edge.

2. Per FCC KDB Publication 447498 D01, if the reported (scaled) SAR measured at the middle channel or highest output power channel for each test configuration is ≤ 0.8 W/kg (for 1g SAR) or ≤ 2 W/kg (for 10g SAR) then testing at the other channels is not required for such test configuration(s).

3. When the original highest measured SAR is ⩾ 0.80 W/kg, the measurement was repeated once.

4. The device has no headphones, and the head SAR does not need to be evaluated.

10.2 Measured SAR Results

Table 1: Wi-Fi (5G, U-NII-1)

Test Position	Cover Type	Channel/ Frequency (MHz)	Mode 802.11n HT40	Duty Cycle	Tune-up limit (dBm)	Conducted Power (dBm)	Drift (dB)	Area Scan Max.SAR (W/Kg)	Measured SAR_{1g} (W/kg)	Scaling Factor	Reported SAR_{1g} (W/kg)	Plot No.
Body SAR (Distance 10mm)												
Back Side	standard	38/5190	OFDM	97.62%	13.50	12.75	0.192	0.408	0.497	1.22	0.605	3
Front Side	standard	38/5190	OFDM	97.62%	13.50	12.75	0.100	0.147	0.094	1.22	0.114	/
Left Edge	standard	38/5190	OFDM	97.62%	13.50	12.75	0.000	0.098	0.105	1.22	0.128	/
Right Edge	standard	38/5190	OFDM	97.62%	13.50	12.75	0.096	0.341	0.350	1.22	0.426	/
Top Edge	standard	38/5190	OFDM	97.62%	13.50	12.75	0.088	0.215	0.226	1.22	0.275	/
Bottom Edge	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Note: 1. The value with blue color is the maximum SAR Value of each test band.

2. Initial test configuration is 802.11n HT40 mode, since the highest maximum output power.

Table 2: Wi-Fi (5G, U-NII-3)

Test Position	Cover Type	Channel/ Frequency (MHz)	Mode 802.11n HT40	Duty Cycle	Tune-up limit (dBm)	Conducted Power (dBm)	Drift (dB)	Area Scan Max.SAR (W/Kg)	Measured SAR_{1g} (W/kg)	Scaling Factor	Reported SAR_{1g} (W/kg)	Plot No.
Body SAR (Distance 10mm)												
Back Side	standard	159/5795	OFDM	97.62%	12.50	12.08	0.020	1.030	1.210	1.13	1.365	4
		151/5755	OFDM	97.62%	12.50	11.81	0.067	0.912	1.050	1.20	1.261	/
Front Side	standard	159/5795	OFDM	97.62%	12.50	12.08	-0.110	0.859	0.724	1.13	0.817	/
		151/5755	OFDM	97.62%	12.50	11.81	0.061	0.730	0.671	1.20	0.806	/
Left Edge	standard	159/5795	OFDM	97.62%	12.50	12.08	0.146	0.300	0.318	1.13	0.359	/
Right Edge	standard	159/5795	OFDM	97.62%	12.50	12.08	0.038	0.733	0.752	1.13	0.849	/
		151/5755	OFDM	97.62%	12.50	11.81	0.030	0.687	0.691	1.20	0.830	/
Top Edge	standard	159/5795	OFDM	97.62%	12.50	12.08	0.033	0.612	0.634	1.13	0.715	/
Bottom Edge	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Back Side	Repeated	159/5795	OFDM	97.62%	12.50	12.08	0.036	0.980	1.160	1.13	1.309	/

Note: 1. The value with blue color is the maximum SAR Value of each test band.

2. Per KDB 248227 D01, Initial test configuration is 802.11n HT40 mode, since the highest maximum output power, the largest channel bandwidth.

Measurement Variability				
Test Position	**Channel/ Frequency(MHz)**	**MAX Measured SAR_{1g} (W/kg)**	**1st Repeated SAR_{1g} (W/kg)**	**Ratio**
Back Side	159/5795	1.210	1.160	1.04

Note: 1) A second repeated measurement was preformed only if the ratio of largest to smallest SAR for the original and first repeated measurements was > 1.20 or when the original or repeated measurement was ≥ 1.45 W/kg (~ 10% from the 1-g SAR limit).

2) A third repeated measurement was performed only if the original, first or second repeated measurement was ≥ 1.5 W/kg and the ratio of largest to smallest SAR for the original, first and second repeated measurements is > 1.20.

Test Position	Cover Type	Channel/ Frequency (MHz)	Mode 802.11n HT20	Duty Cycle	Tune-up limit (dBm)	Conducted Power (dBm)	Drift (dB)	Area Scan Max.SAR (W/Kg)	Measured SAR_{1g} (W/kg)	Scaling Factor	Reported SAR_{1g} (W/kg)	Plot No.
Body SAR (Distance 10mm)												
Back Side	standard	165/5825	OFDM	97.62%	12.00	11.67	0.038	1.050	0.955	1.11	1.056	/
		157/5785	OFDM	97.62%	12.00	11.54	0.091	0.809	0.790	1.14	0.900	/
		149/5749	OFDM	97.62%	12.00	11.60	0.085	0.814	0.963	1.12	1.082	5
Front Side	standard	165/5825	OFDM	97.62%	12.00	11.67	0.012	0.670	0.685	1.11	0.757	/
Left Edge	standard	165/5825	OFDM	97.62%	12.00	11.67	0.060	0.270	0.286	1.11	0.316	/
Right Edge	standard	165/5825	OFDM	97.62%	12.00	11.67	-0.009	0.660	0.677	1.11	0.748	/
Top Edge	standard	165/5825	OFDM	97.62%	12.00	11.67	-0.054	0.551	0.571	1.11	0.631	/
Bottom Edge	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Back Side	Repeated	165/5825	OFDM	97.62%	12.00	11.67	0.036	0.946	0.917	1.11	1.014	/

Note: 1. The value with blue color is the maximum SAR Value of each test band.

2. Per KDB 248227 D01, subsequent test configuration is 802.11n HT20 mode, since the highest maximum output power.

Measurement Variability				
Test Position	**Channel/ Frequency(MHz)**	**MAX Measured SAR_{1g} (W/kg)**	**1st Repeated SAR_{1g} (W/kg)**	**Ratio**
Back Side	165/5825	0.963	0.917	1.05

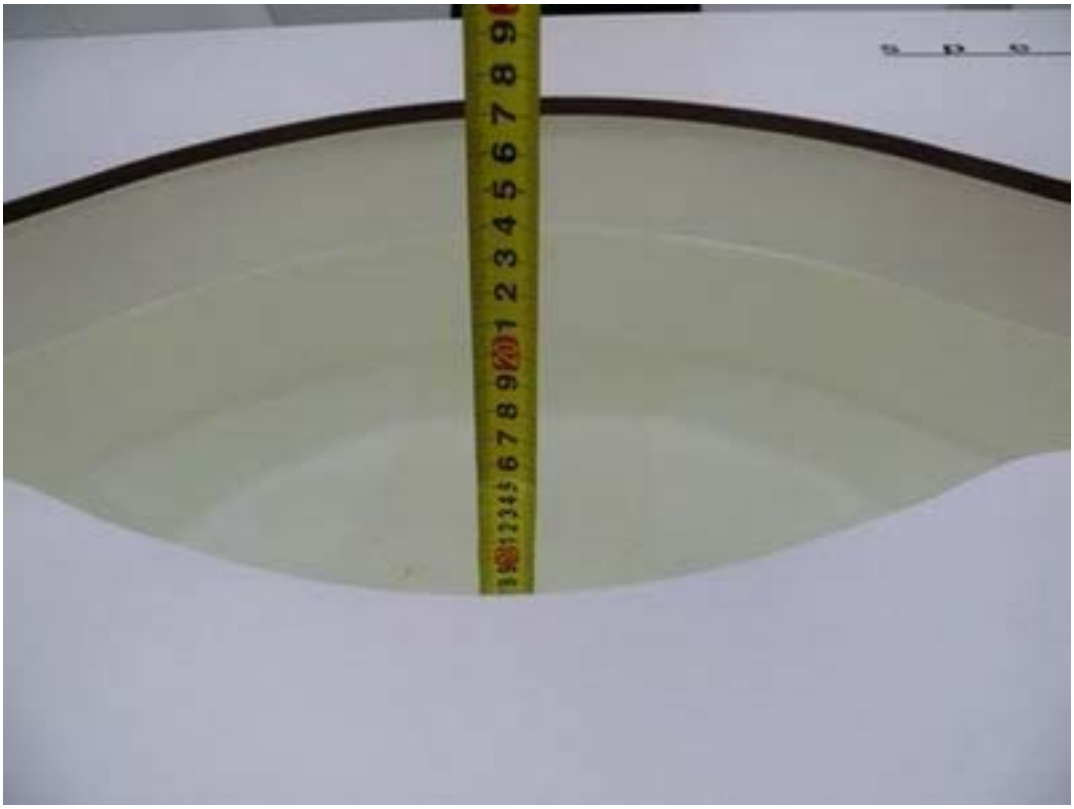
Note: 1) A second repeated measurement was preformed only if the ratio of largest to smallest SAR for the original and first repeated measurements was > 1.20 or when the original or repeated measurement was ≥ 1.45 W/kg (~ 10% from the 1-g SAR limit).

2) A third repeated measurement was performed only if the original, first or second repeated measurement was ≥ 1.5 W/kg and the ratio of largest to smallest SAR for the original, first and second repeated measurements is > 1.20.

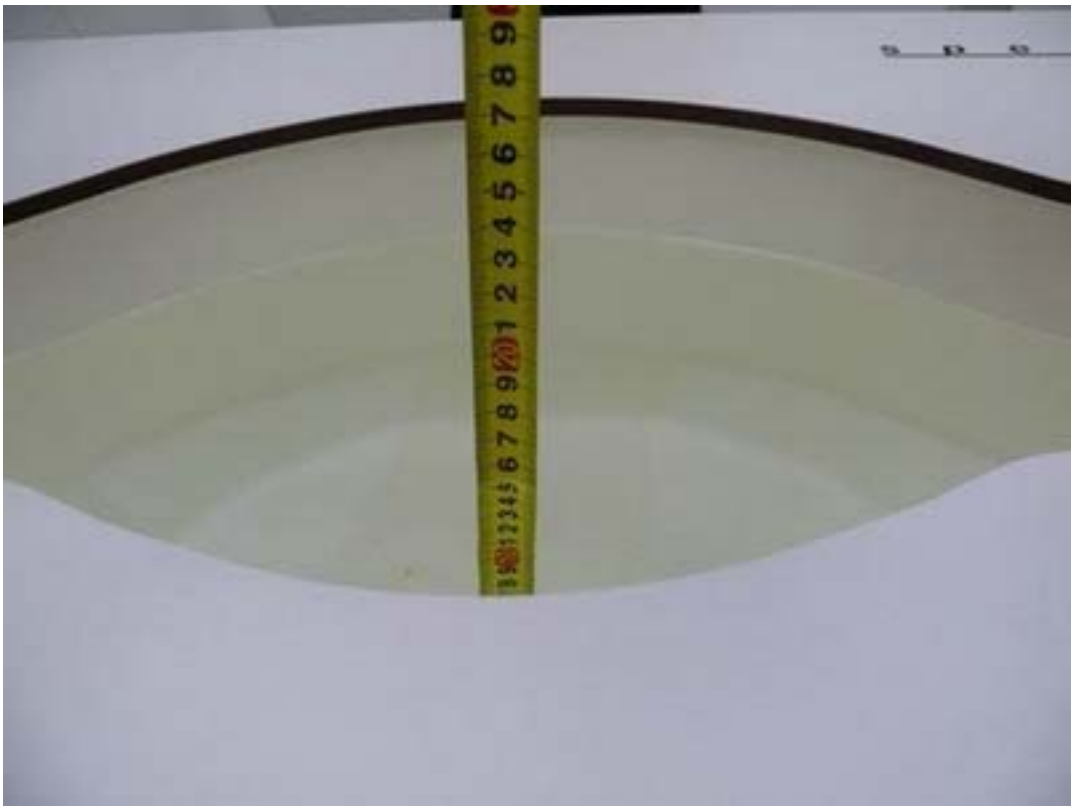
11 Measurement Uncertainty

Per KDB 865664 D01 SAR Measurement 100 MHz to 6 GHz, when the highest measured 1-g SAR within a frequency band is < 1.5 W/kg, the extensive SAR measurement uncertainty analysis described in IEEE Std 1528- 2013 is not required in SAR reports submitted for equipment approval. This also applies to the 10-g SAR required for phablets in KDB Publication 648474.

ANNEX A: Test Layout



Picture 3: Liquid depth in the flat Phantom (5250 MHz, 15.3cm depth)



Picture 4: Liquid depth in the flat Phantom (5750 MHz, 15.0cm depth)

ANNEX B: System Check Results

Plot 1 System Performance Check at 5250 MHz Body TSL

DUT: Dipole 5250 MHz; Type: D5GHzV2; Serial: D5GHzV2 - SN: 1151

Date: 3/17/2018

Communication System: CW; Frequency: 5250 MHz;Duty Cycle: 1:1

Medium parameters used: f = 5250 MHz; σ = 5.32 mho/m; ε_r = 48.1; ρ = 1000 kg/m^3

Ambient Temperature:22.3 ℃ Liquid Temperature: 21.5℃

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3898; ConvF(5.13, 5.13, 5.13); Calibrated: 6/27/2017;

Electronics: DAE4 Sn1291; Calibrated: 10/31/2017

Phantom: SAM1; Type: SAM; Serial: TP-1534

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

d=10mm, Pin=250mW/Area Scan (61x101x1): Measurement grid: dx=1.000mm, dy=1.000mm

Maximum value of SAR (interpolated) = 7.69 mW/g

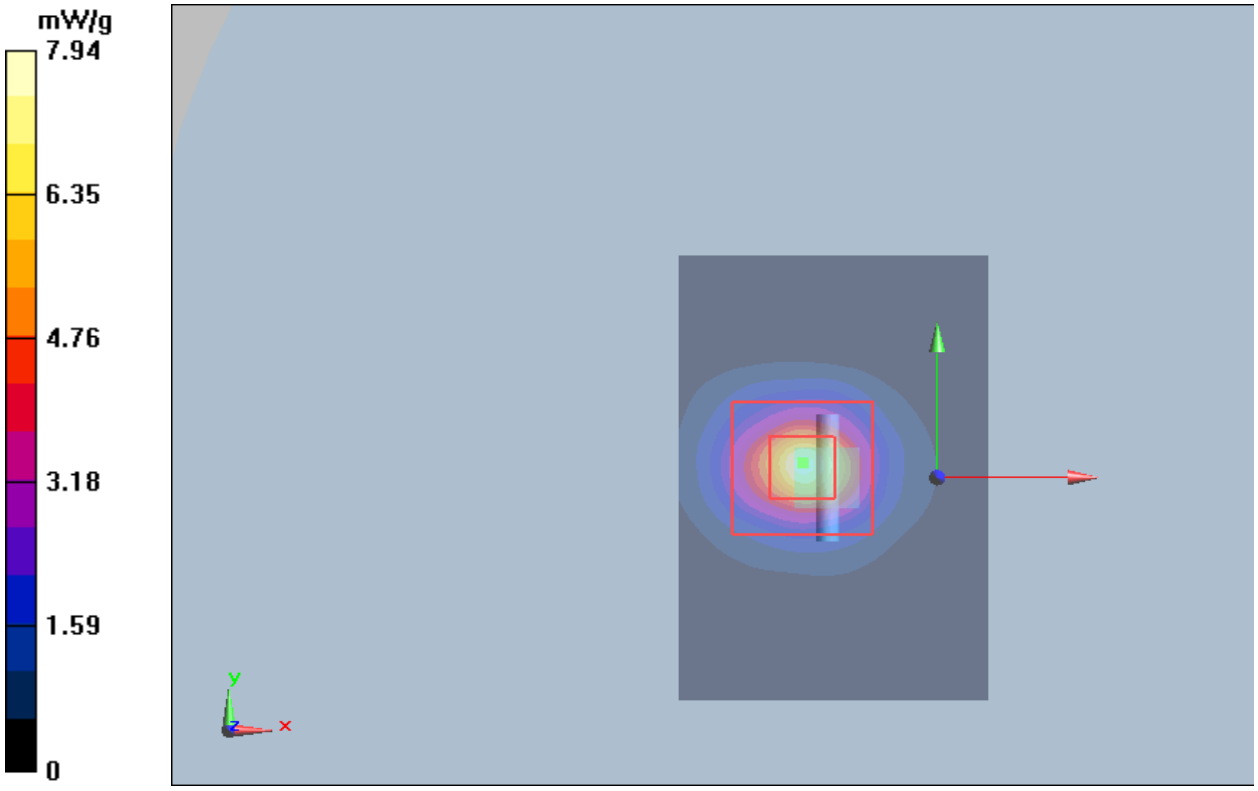
d=10mm, Pin=250mW/Zoom Scan (7x7x12)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm

Reference Value = 36.3 V/m; Power Drift = 0.0277 dB

Peak SAR (extrapolated) = 47.7 W/kg

SAR(1 g) = 7.46 mW/g; SAR(10 g) = 2.26 mW/g

Maximum value of SAR (measured) = 7.94 mW/g



Plot 2 System Performance Check at 5750 MHz Body TSL

DUT: Dipole 5750 MHz; Type: D5GHzV2; Serial: D5GHzV2 - SN: 1151

Date: 3/18/2018

Communication System: CW; Frequency: 5750 MHz;Duty Cycle: 1:1

Medium parameters used: f = 5750 MHz; σ = 6.14 mho/m; ε_r = 47.6; ρ = 1000 kg/m^3

Ambient Temperature:22.3 ℃ Liquid Temperature: 21.5℃

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3898; ConvF(4.50, 4.50, 4.50); Calibrated: 6/27/2017;

Electronics: DAE4 Sn1291; Calibrated: 10/31/2017

Phantom: SAM1; Type: SAM; Serial: TP-1534

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

d=10mm, Pin=250mW/Area Scan (61x101x1): Measurement grid: dx=1.000mm, dy=1.000mm

Maximum value of SAR (interpolated) = 7.84 mW/g

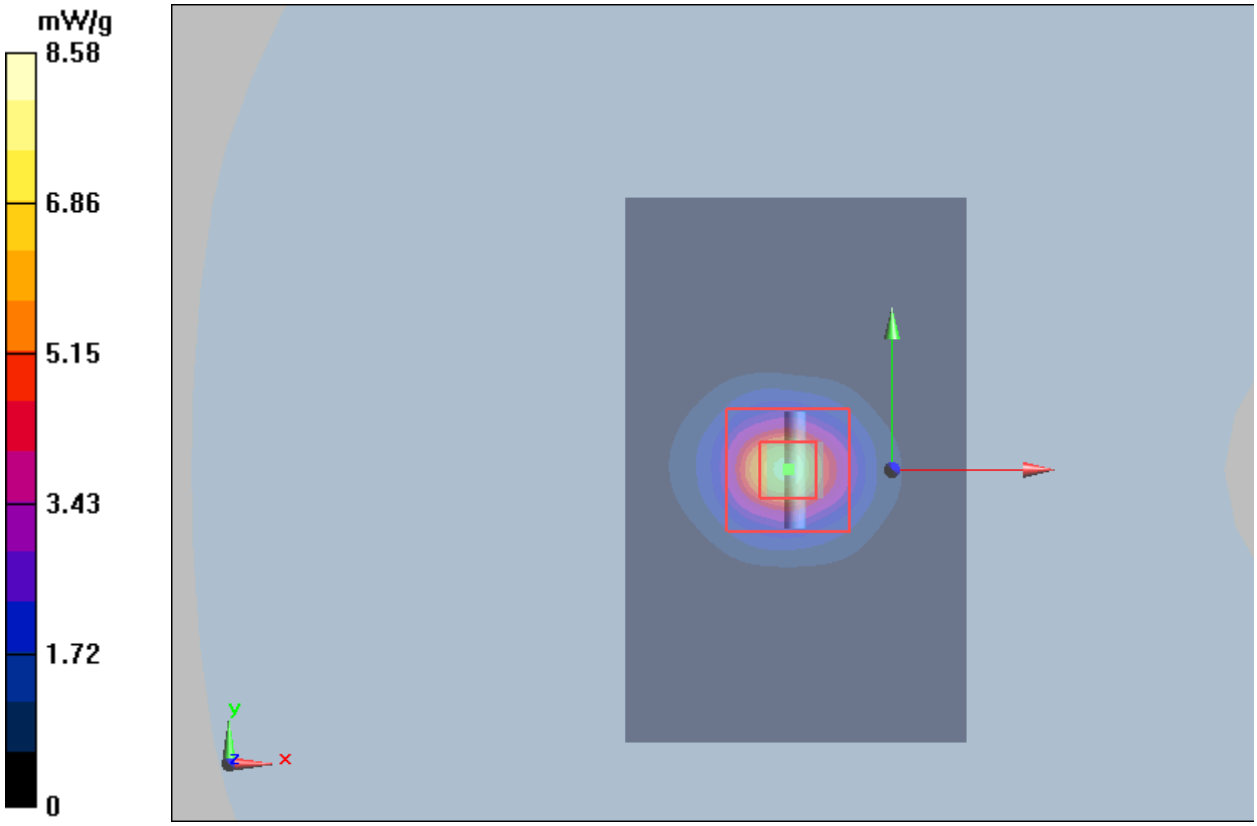
d=10mm, Pin=250mW/Zoom Scan (7x7x12)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm

Reference Value = 38 V/m; Power Drift = -0.018 dB

Peak SAR (extrapolated) = 22.6 W/kg

SAR(1 g) = 7.15 mW/g; SAR(10 g) = 1.99 mW/g

Maximum value of SAR (measured) = 8.58 mW/g



ANNEX C: Highest Graph Results

Plot 3 802.11n HT40 U-NII-1 Back Side CH38 (Distance 10mm)

Date: 3/17/2018

Communication System: UID 0, 802.11n(40M) (0); Frequency: 5190 MHz;Duty Cycle: 1:1.0244

Medium parameters used: f = 5190 MHz; σ = 5.304 S/m; ε_r = 48.069; ρ = 1000 kg/m^3

Ambient Temperature:22.3 ℃ Liquid Temperature: 21.5℃

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3898; ConvF(5.13, 5.13, 5.13); Calibrated: 6/27/2017;

Electronics: DAE4 Sn1291; Calibrated: 10/31/2017

Phantom: SAM1; Type: SAM; Serial: TP-1534

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Back Side CH38/Area Scan (91x181x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm

Maximum value of SAR (interpolated) = 0.532 W/kg

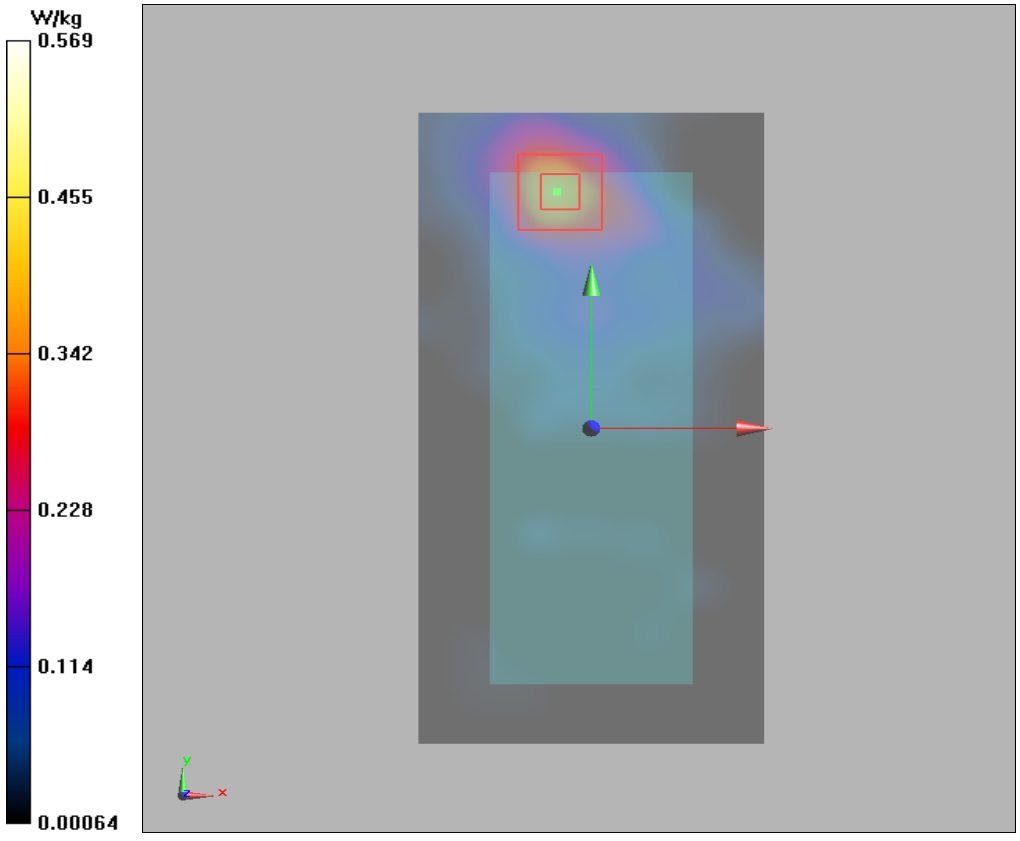
Back Side CH38/Zoom Scan (7x7x11)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm

Reference Value = 2.526 V/m; Power Drift = 0.192 dB

Peak SAR (extrapolated) = 2.01 W/kg

SAR(1 g) = 0.497 W/kg; SAR(10 g) = 0.196 W/kg

Maximum value of SAR (measured) = 0.569 W/kg



Plot 4 802.11n HT40 U-NII-3 Back Side CH159 (Distance 10mm)

Date: 3/18/2018

Communication System: UID 0, 802.11n(40M) (0); Frequency: 5795 MHz;Duty Cycle: 1:1.0244

Medium parameters used: f = 5795 MHz; σ = 6.129 S/m; ε_r = 47.605; ρ = 1000 kg/m^3

Ambient Temperature:22.3 ℃ Liquid Temperature: 21.5℃

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3898; ConvF(4.50, 4.50, 4.50); Calibrated: 6/27/2017;

Electronics: DAE4 Sn1291; Calibrated: 10/31/2017

Phantom: SAM1; Type: SAM; Serial: TP-1534

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Back Side CH159/Area Scan (91x181x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm

Maximum value of SAR (interpolated) = 1.40 W/kg

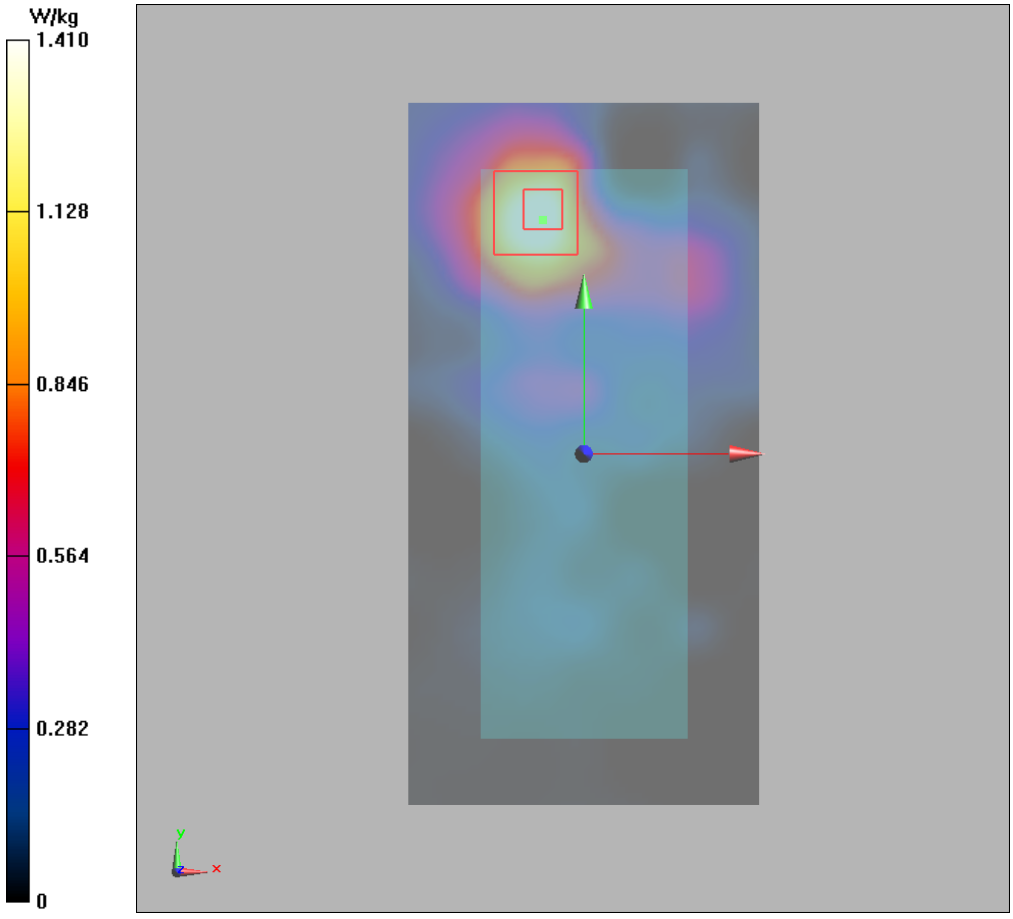
Back Side CH159/Zoom Scan (7x7x11)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm

Reference Value = 4.241 V/m; Power Drift = 0.02 dB

Peak SAR (extrapolated) = 6.99 W/kg

SAR(1 g) = 1.21 W/kg; SAR(10 g) = 0.480 W/kg

Maximum value of SAR (measured) = 1.41 W/kg



Plot 5 802.11n HT20 U-NII-3 Back Side CH149 (Distance 10mm)

Date: 3/18/2018

Communication System: UID 0, 802.11n(20M) (0); Frequency: 5745 MHz;Duty Cycle: 1:1.0244

Medium parameters used: f = 5745 MHz; σ = 6.06 S/m; ε_r = 47.742; ρ = 1000 kg/m^3

Ambient Temperature:22.3 ℃ Liquid Temperature: 21.5℃

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3898; ConvF(4.50, 4.50, 4.50); Calibrated: 6/27/2017;

Electronics: DAE4 Sn1291; Calibrated: 10/31/2017

Phantom: SAM1; Type: SAM; Serial: TP-1534

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Back Side CH149/Area Scan (91x181x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm

Maximum value of SAR (interpolated) = 1.260 W/kg

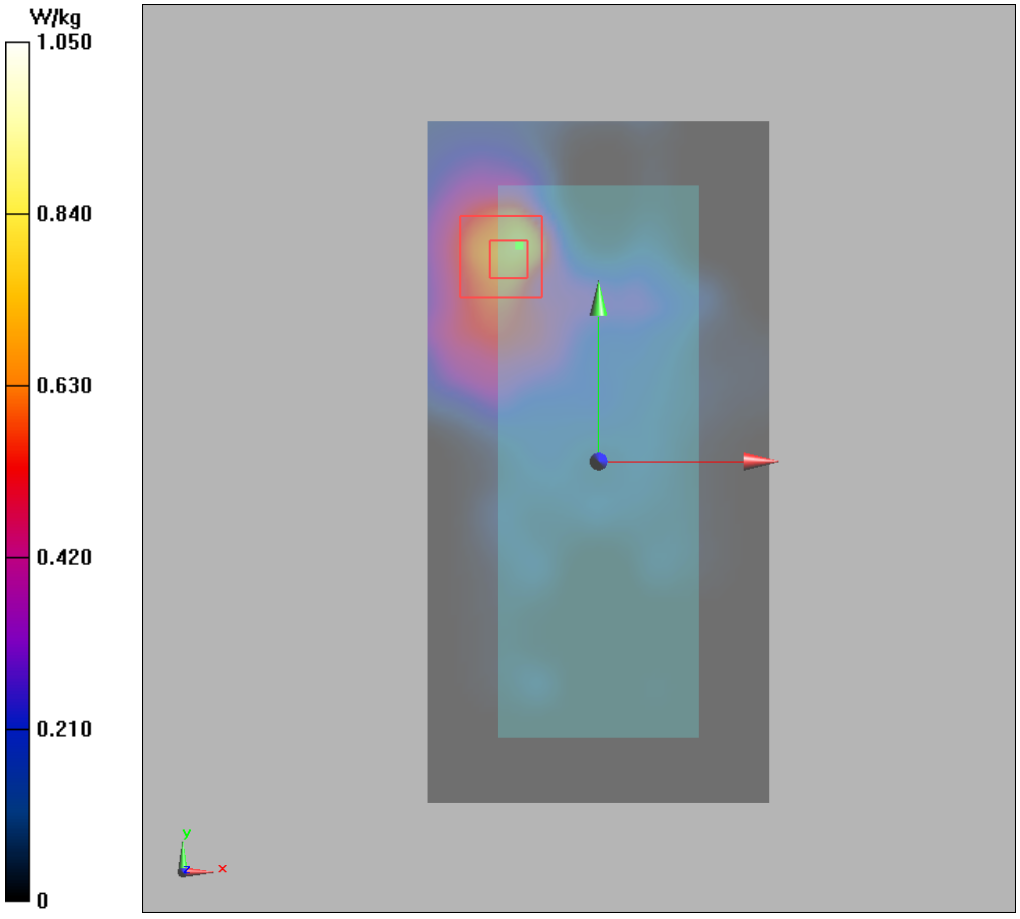
Back Side CH149/Zoom Scan (7x7x11)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm

Reference Value = 4.120 V/m; Power Drift = 0.085 dB

Peak SAR (extrapolated) = 4.10 W/kg

SAR(1 g) = 0.963 W/kg; SAR(10 g) = 0.372 W/kg

Maximum value of SAR (measured) = 1.05 W/kg



ANNEX D: Probe Calibration Certificate

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

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

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

Accreditation No.: SCS 0108

Client Auden

Certificate No: EX3-3898_Jun17

CALIBRATION CERTIFICATE

Object: EX3DV4 - SN:3898

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

Calibration date: June 27, 2017

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. 217-02525)	Apr-18
Reference 20 dB Attenuator	SN: S5277 (20x)	07-Apr-17 (No. 217-02528)	Apr-18
Reference Probe ES3DV2	SN: 3013	31-Dec-16 (No. ES3-3013_Dec16)	Dec-17
DAE4	SN: 660	7-Dec-16 (No. DAE4-660_Dec16)	Dec-17
Secondary Standards	ID	Check Date (in house)	Scheduled Check
Power meter E4419B	SN: GB41293874	06-Apr-16 (in house check Jun-16)	In house check: Jun-18
Power sensor E4412A	SN: MY41498087	06-Apr-16 (in house check Jun-16)	In house check: Jun-18
Power sensor E4412A	SN: 000110210	06-Apr-16 (in house check Jun-16)	In house check: Jun-18
RF generator HP 8648C	SN: US3642U01700	04-Aug-99 (in house check Jun-16)	In house check: Jun-18
Network Analyzer HP 8753E	SN: US37390585	18-Oct-01 (in house check Oct-16)	In house check: Oct-17

	Name	Function	Signature
Calibrated by:	Leif Klysner	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: June 28, 2017

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

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

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:3898

Manufactured: October 9, 2012
Calibrated: June 27, 2017

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

EX3DV4– SN:3898 June 27, 2017

DASY/EASY - Parameters of Probe: EX3DV4 - SN:3898

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm ($\mu V/(V/m)^2$)[A]	0.38	0.35	0.31	± 10.1 %
DCP (mV)[B]	99.1	99.4	100.3	

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	143.9	±2.7 %
		Y	0.0	0.0	1.0		142.2	
		Z	0.0	0.0	1.0		145.7	

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	32.49	240.5	35.09	11.03	0.713	4.958	1.269	0.147	1.005
Y	33.00	245.0	35.30	9.807	0.625	4.966	1.221	0.120	1.005
Z	31.60	235.2	35.43	7.345	0.706	4.969	1.116	0.151	1.005

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.