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NEAR-FIELD POWER DENSITY EVALUATION REPORT

Applicant Name
Samsung Electronics Co., Ltd.
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Date of Testing
10/29/2020 - 11/12/2020
Test Site/Location
PCTEST, Columbia, MD, USA
Document Serial No:
1M2009140143-22-R2.A3L

FCC ID:	**A3LSMG996U**
APPLICANT:	**SAMSUNG ELECTRONICS CO., LTD.**

DUT Type:	Portable Handset
Application Type:	Certification
FCC Rule Part(s):	CFR §2.1093
Model:	SM-G996U
Additional Models:	SM-G996U1

Band & Mode	Tx Frequency	Measured psPD	Reported psPD
	MHz	mW/cm²	mW/cm²
5G NR - n261	27500 - 28350	0.647	0.891
5G NR - n260	37000 - 40000	0.467	0.891
Total Exposure Ratio		**0.992**	
Verdict		**PASS**	

Note: This revised Test Report (S/N: 1M2009140143-22-R2.A3L) supersedes and replaces the previously issued test report on the same subject device for the same type of testing as indicated. Please discard or destroy the previously issued test report(s) and dispose of it accordingly.

I attest to the accuracy of data. All measurements reported herein were performed by me or were made under my supervision and are correct to the best of my knowledge and belief. I assume full responsibility for the completeness of these measurements and vouch for the qualifications of all persons taking them. Test results reported herein relate only to the item(s) tested.

Randy Ortanez
President

ACCREDITED
CERT #2041.01

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1 DEVICE UNDER TEST

1.1 Device Overview

NR FR2 Operations Information						
Form Factor	Portable Handset					
Channel Bandwidths per NR Band	NR Band n261: 50MHz, 100MHz					
Channel Bandwidths per NR Band	NR Band n260: 50MHz, 100MHz					
Channel Numbers and Frequencies	Low		Mid		High	
	Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
NR Band n261: 50MHz BW	2071249	27525.00	2077915	27924.96	2084581	28324.92
NR Band n261: 100MHz BW	2071665	27550.08	2077915	27924.96	2084165	28299.96
NR Band n260: 50MHz BW	2229599	37026.00	2254165	38499.96	2278749	39975.00
NR Band n260: 100MHz BW	2229999	37050.00	2254165	38499.96	2278315	39949.92
Subcarrier Spacing (kHz)	120					
Total Number of Supported Uplink CCs (SISO)	2					
Total Number of Supported Uplink CCs (MIMO)	2 (CP-OFDM Only)					
Total Number of Supported DL CCs	8					
CP-OFDM Modulations Supported in UL	QPSK, 16QAM, 64QAM					
DFT-s-OFDM Modulations Supported in UL	PI/2 BPSK, QPSK, 16QAM, 64QAM					
LTE Anchor Bands (n261)	2, 5, 12, 13, 48, 66					
LTE Anchor Bands (n260)	2, 5, 12, 13, 14, 30, 48, 66					
Duplex Type (mmWave)	TDD					

1.2 Time-Averaging Algorithm for RF Exposure Compliance

This device is enabled with Qualcomm® Smart Transmit (GEN2) feature. This feature performs time averaging algorithm in real time to control and manage transmitting power and ensure the time-averaged RF exposure is in compliance with FCC requirements all the time. Refer to Compliance Summary document for detailed description of Qualcomm® Smart Transmit. Note that WLAN operations are not enabled with Smart Transmit.

The Smart Transmit algorithm maintains the time-averaged transmit power, in turn, time-averaged RF exposure of *SAR_design_target* or *PD_design_target*, below the predefined time-averaged power limit (i.e., P_{limit} for sub-6 radio, and *input.power.limit* for 5G mmW NR), for each characterized technology and band (see RF Exposure Part 0 Test Report).

Smart Transmit allows the device to transmit at higher power instantaneously when needed, but manages power limiting to maintain time-averaged transmit power to *input.power.limit*.

The purpose of this report (Part 1 test) is to demonstrate that the EUT meets FCC PD limits when transmitting in static transmission scenario at maximum allowable time-averaged power level given by *input.power.limit.*

1.3 Input Power Specifications

All power density measurements for this device were performed at the *input.power.limit* given in below tables. Input power is per antenna element and polarization for each antenna module. When input.power.limit is calculated to be above the maximum input power, the device is limited to the maximum input power.

Table 1-1
5G mmWave NR n261 K patch

Band	Beam ID 1	Beam ID 2	input.power.limit
n261	2	-	8.1
n261	3	-	8.6
n261	4	-	9.7
n261	8	-	5.7
n261	9	-	4.7
n261	10	-	5.7
n261	13	-	7.7
n261	14	-	4.9
n261	20	-	2.4
n261	21	-	1.5
n261	22	-	2.3
n261	23	-	1.7
n261	24	-	2.5
n261	29	-	1.8
n261	30	-	2.0
n261	31	-	2.1
n261	32	-	2.3
n261	-	130	10.7
n261	-	131	9.8
n261	-	132	9.9
n261	-	136	7.9
n261	-	137	9.4
n261	-	138	8.2
n261	-	141	10.3
n261	-	142	8.9
n261	-	148	4.6
n261	-	149	3.8
n261	-	150	2.9
n261	-	151	3.6
n261	-	152	5.1
n261	-	157	4.0
n261	-	158	3.0
n261	-	159	3.2
n261	-	160	4.3
n261	2	130	6.5
n261	3	131	5.5
n261	4	132	6.8
n261	8	136	3.5
n261	9	137	3.8
n261	10	138	3.6
n261	13	141	5.4
n261	14	142	3.7
n261	20	148	-0.3
n261	21	149	-0.6
n261	22	150	-0.4
n261	23	151	-0.2
n261	24	152	0.5
n261	29	157	-0.6
n261	30	158	-0.4
n261	31	159	-0.4
n261	32	160	-0.1

Table 1-2
5G mmWave NR n261 L patch

Band	Beam ID 1	Beam ID 2	input.power.limit
n261	0	-	10.7
n261	1	-	9.2
n261	5	-	6.2
n261	6	-	7.3
n261	7	-	8.2
n261	11	-	7.1
n261	12	-	5.9
n261	15	-	2.7
n261	16	-	2.4
n261	17	-	2.8
n261	18	-	2.5
n261	19	-	2.7
n261	25	-	2.3
n261	26	-	2.6
n261	27	-	2.7
n261	28	-	2.5
n261	-	128	12.1
n261	-	129	12.3
n261	-	133	8.8
n261	-	134	8.9
n261	-	135	8.6
n261	-	139	10.0
n261	-	140	8.4
n261	-	143	5.5
n261	-	144	4.7
n261	-	145	4.0
n261	-	146	4.7
n261	-	147	4.8
n261	-	153	5.2
n261	-	154	4.6
n261	-	155	4.3
n261	-	156	4.6
n261	0	128	8.7
n261	1	129	7.6
n261	5	133	4.1
n261	6	134	5.4
n261	7	135	5.9
n261	11	139	5.4
n261	12	140	4.3
n261	15	143	0.5
n261	16	144	0.2
n261	17	145	0.4
n261	18	146	0.7
n261	19	147	0.5
n261	25	153	0.2
n261	26	154	0.4
n261	27	155	0.5
n261	28	156	0.5

Table 1-3
5G mmWave NR n260 K patch

Band	Beam ID 1	Beam ID 2	input.power.limit
n260	3	-	11.5
n260	4	-	8.9
n260	5	-	9.0
n260	9	-	7.2
n260	10	-	9.6
n260	11	-	6.9
n260	14	-	10.1
n260	15	-	5.4
n260	21	-	4.1
n260	22	-	3.7
n260	23	-	3.4
n260	24	-	3.1
n260	25	-	2.4
n260	30	-	4.2
n260	31	-	3.3
n260	32	-	3.4
n260	33	-	2.5
n260	-	131	8.5
n260	-	132	10.6
n260	-	133	10.3
n260	-	137	7.3
n260	-	138	6.2
n260	-	139	6.0
n260	-	142	6.7
n260	-	143	5.0
n260	-	149	3.7
n260	-	150	3.3
n260	-	151	3.4
n260	-	152	3.5
n260	-	153	4.2
n260	-	158	3.7
n260	-	159	2.7
n260	-	160	3.2
n260	-	161	3.9
n260	3	131	4.9
n260	4	132	5.4
n260	5	133	5.8
n260	9	137	3.4
n260	10	138	3.7
n260	11	139	2.1
n260	14	142	4.2
n260	15	143	2.1
n260	21	149	0.2
n260	22	150	-0.1
n260	23	151	-0.5
n260	24	152	-1.5
n260	25	153	-1.8
n260	30	158	0.7
n260	31	159	-0.5
n260	32	160	-1.1
n260	33	161	-1.9

Table 1-4
5G mmWave NR n260 L patch

Band	Beam ID 1	Beam ID 2	input.power.limit
n260	0	-	9.6
n260	1	-	8.9
n260	2	-	10.1
n260	6	-	6.8
n260	7	-	7.4
n260	8	-	6.5
n260	12	-	7.6
n260	13	-	6.1
n260	16	-	4.2
n260	17	-	3.8
n260	18	-	3.2
n260	19	-	3.1
n260	20	-	3.1
n260	26	-	3.7
n260	27	-	3.3
n260	28	-	3.2
n260	29	-	3.1
n260	-	128	10.0
n260	-	129	10.2
n260	-	130	11.2
n260	-	134	7.5
n260	-	135	6.4
n260	-	136	7.9
n260	-	140	7.1
n260	-	141	6.5
n260	-	144	5.9
n260	-	145	4.1
n260	-	146	3.5
n260	-	147	3.3
n260	-	148	4.0
n260	-	154	4.5
n260	-	155	3.9
n260	-	156	3.3
n260	-	157	3.5
n260	0	128	6.1
n260	1	129	5.5
n260	2	130	7.4
n260	6	134	4.4
n260	7	135	3.3
n260	8	136	3.0
n260	12	140	3.8
n260	13	141	2.2
n260	16	144	1.3
n260	17	145	0.7
n260	18	146	-0.2
n260	19	147	-1.0
n260	20	148	-1.3
n260	26	154	0.5
n260	27	155	0.5
n260	28	156	-0.4
n260	29	157	-1.1

1.4 DUT Antenna Locations

The table below indicates the surfaces evaluated for near field power density (part 1) evaluation. Refer to RF Exposure Part 0 Test Report for justification of these worst-surfaces.

Table 1-5
Device Surfaces

Band	Antenna	Antenna Type	Back	Front	Top	Bottom	Right	Left
n261	L	Patch	Yes	No	No	No	Yes	No
n261	K	Patch	Yes	No	No	No	No	Yes
n260	L	Patch	Yes	No	No	No	Yes	No
n260	K	Patch	Yes	No	No	No	No	Yes

1.5 Simultaneous Transmission Capabilities

According to FCC KDB Publication 447498 D01v06, transmitters are considered to be operating simultaneously when there is overlapping transmission, with the exception of transmissions during network hand-offs with maximum hand-off duration less than 30 seconds.

This device contains multiple transmitters that may operate simultaneously, and therefore requires a simultaneous transmission analysis according to FCC KDB Publication 447498 D01v06 4.3.2 procedures.

Table 1-6
Simultaneous Transmission Scenarios

Capable Transmit Configuration	Head	Body-worn	Wireless Router	Phablet	Notes
LTE + 5G NR	Yes	Yes	N/A	Yes	
LTE + 2.4 GHz WI-FI + 5G NR	Yes	Yes	Yes	Yes	
LTE + 5 GHz WI-FI + 5G NR	Yes	Yes	Yes	Yes	
LTE + 2.4 GHz Bluetooth + 5G NR	Yes^	Yes	Yes^	Yes^	^Bluetooth Tethering is considered
LTE + 2.4 GHz Bluetooth + 5 GHz WI-FI + 5G NR	Yes^	Yes	Yes^	Yes^	^Bluetooth Tethering is considered
LTE + 2.4 GHz WI-FI MIMO + 5G NR	Yes	Yes	Yes	Yes	
LTE + 5 GHz WI-FI MIMO + 5G NR	Yes	Yes	Yes	Yes	
LTE + 2.4 GHz WI-FI + 5 GHz WI-FI + 5G NR	Yes	Yes	Yes	Yes	
LTE + 2.4 GHz WI-FI MIMO + 5 GHz WI-FI MIMO + 5G NR	Yes	Yes	Yes	Yes	
LTE + 2.4 GHz Bluetooth + 5 GHz WI-FI MIMO + 5G NR	Yes^	Yes	Yes^	Yes^	^Bluetooth Tethering is considered

NOTE:

1. 5G NR mmW Operations are limited to Non-Standalone (EN-DC) operations only.
2. NR antenna arrays cannot transmit simultaneously.
3. LTE + 5G NR FR2 Scenarios are limited to EN-DC combinations with anchor bands as shown in the NR FR2 checklist.
4. 2.4 GHz WLAN, and 2.4 GHz Bluetooth share the same antenna path and cannot transmit simultaneously.
5. All non-5G NR licensed modes share the same antenna path and cannot transmit simultaneously.
6. 5G NR bands cannot transmit simultaneously.
7. This device supports time averaging smart transmit algorithm in WWAN. Smart transmit adds directly the time-averaged RF exposure from 4G and time-averaged RF exposure from 5G mmW NR to ensure that the normalized RF exposure from both 4G and 5G mmW NR does not exceed FCC limit.

1.6 Guidance Applied

- November 2017, October 2018, April 2019, November 2019 TCBC Workshop Notes
- SPEAG DASY6 System Handbook (June 2020)
- IEC TR 63170:2018
- FCC KDB 865664 D02 v01r04
- FCC KDB 447498 D01 v02r01

1.7 Bibliography

Table 1-7
Bibliography

Report Type	Report Serial Number
FCC SAR Evaluation Report (Part 1)	1M2009140143-01-R2.A3L
Power Density Part 0 Test Report	Rev.A
RF Exposure Part 2 Test Report	1M2009140143-23-R1.A3L
RF Exposure Compliance Summary Report	1M2009140143-24-R1.A3L
Power Density Simulation Report	Rev.A

2 MEASUREMENT SYSTEM

2.1 Measurement Setup

Peak spatially averaged power density (psPD) measurements for mmWave frequencies were performed using the DASY6 with cDASY6 5G module. The DASY6 is made by Schmid & Partner Engineering AG (SPEAG) in Zurich, Switzerland and consists of a high precision robotics system (Staubli), robot controller, desktop computer, near-field probe, probe alignment sensor, and the 5G phantom. The robot is a six-axis industrial robot, performing precise movements to position the probe to the location (points) of maximum electromagnetic field (EMF).

2.2 SPEAG EUmmWV3 Probe / E-Field 5G Probe

The EUmmWV3 probe consists of two dipoles optimally arranged to obtain pseudo-vector information.

Frequency Range	750 MHz – 110 GHz
Dynamic Range	< 20 V/m – 10,000 V/m with PRE-10 (min < 50 V/m – 3,000 V/m)
Position Precision	< 0.2 mm (cDASY6)
Dimensions	Probe Overall Length: 320 mm Probe Body Diameter: 8 mm Probe Tip Length: 23 mm Probe Tip Diameter: Encapsulation 8 mm Distance from Probe Tip to Sensor X Calibration Point: 1.5 mm Distance from Probe Tip to Sensor Y Calibration Point: 1.5 mm
Applications	E-field measurements of 5G devices and other mm-wave transmitters operating above 10 GHz in < 2 mm distance from device (free-space) Power density, H-field and far-field analysis using total field reconstruction
Compatibility	cDASY6 + 5G-Module SW 2.0.2.34

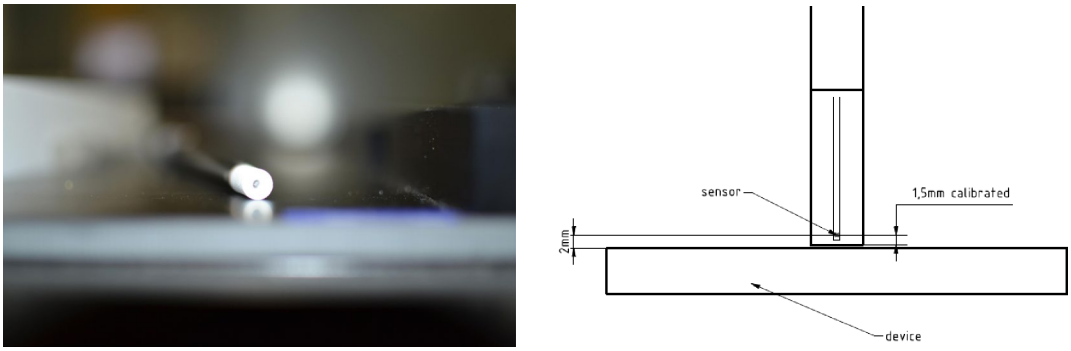

Figure 2-1
EUmmWV3 Probe

2.3 Peak Spatially Averaged Power Density Assessment Based on E-field Measurements

Within a short distance from the transmitting source, power density was determined based on both electric and magnetic fields. Generally, the magnitude and phase of two components of either the E-field or H-field were needed on a sufficiently large surface to fully characterize the total E-field and H-field distributions. Nevertheless, solutions based on direct measurement of E-field and H-field can be used to compute power density. The general measurement approach used for this device was:

a) The local E field on the measurement surface was measured at a reference location where the field is well above the noise level. This reference level was used at the end of this procedure to assess output power drift of the DUT during the measurement.

b) The electric field on the measurement surface was scanned. Measurements are conducted according to the instructions provided by the measurement system manufacturer. Measurement spatial resolution can depend on the measured field characteristic and measurement methodology used by the system. The planar scan step size was configured at λ/4.

c) For cDASY6, H-field was calculated from the measured E-field using a reconstruction algorithm. As the power density calculation requires knowledge of both amplitude and phase, reconstruction algorithms can also be used to obtain field information from the measured E-field data (e.g. the phase from the amplitude if only the amplitude is measured). H-field and phase data was reconstructed from repeated measurements (three per measurement point) on two measurement planes separated by λ/4.

d) The total Peak spatially averaged power density (psPD) distribution on the evaluation surface is determined per the below equation. The spatial averaging area, *A*, is specified by the applicable exposure limits or regulatory requirements. A circular shape was used.

$$psPD = \frac{1}{2A_{av}} \iint_{A_{av}} || Re\{E \times H^*\} || \, dA$$

e) The maximum spatial-average on the evaluation surface is the final quantity to determine compliance against applicable limits.

f) The local E field reference value, at the same location as step 2, was re-measured after the scan was complete to calculate the power drift. If the drift deviated by more than 5%, the power density test and drift measurements were repeated.

2.4 Reconstruction Algorithm

Computation of the power density in general requires measurement information from the both E-field and H-field amplitudes and phases in the plane of incidence. Reconstruction of these quantities from pseudo-vector E-field measurements is feasible according to the manufacturer, as they are determined via Maxwell's equations. As such, the SPEAG reconstruction approach was based on the Gerchberg-Saxton algorithm, which benefits from the availability of the E-field polarization ellipse information obtained with the EUmmWV3 probe.

3 RF EXPOSURE LIMITS FOR POWER DENSITY

3.1 Uncontrolled Environment

UNCONTROLLED ENVIRONMENTS are defined as locations where there is the exposure of individuals who have no knowledge or control of their exposure. The general population/uncontrolled exposure limits are applicable to situations in which the general public may be exposed or in which persons who are exposed as a consequence of their employment may not be made fully aware of the potential for exposure or cannot exercise control over their exposure. Members of the general public would come under this category when exposure is not employment-related; for example, in the case of a wireless transmitter that exposes persons in its vicinity.

3.2 Controlled Environment

CONTROLLED ENVIRONMENTS are defined as locations where there is exposure that may be incurred by persons who are aware of the potential for exposure, (i.e. as a result of employment or occupation). In general, occupational/controlled exposure limits are applicable to situations in which persons are exposed as a consequence of their employment, who have been made fully aware of the potential for exposure and can exercise control over their exposure. This exposure category is also applicable when the exposure is of a transient nature due to incidental passage through a location where the exposure levels may be higher than the general population/uncontrolled limits, but the exposed person is fully aware of the potential for exposure and can exercise control over his or her exposure by leaving the area or by some other appropriate means.

3.3 RF Exposure Limits for Frequencies Above 6 GHz

Per §1.1310 (d)(3), the MPE limits are applied for frequencies above 6 GHz. Power Density is expressed in units of W/m^2 or mW/cm^2.

Peak Spatially Averaged Power Density was evaluated over a circular area of 4 cm^2 per interim FCC Guidance for near-field power density evaluations per October 2018 TCB Workshop notes.

Table 3-1
Human Exposure Limits Specified in FCC 47 CFR §1.1310

Human Exposure to Radiofrequency (RF) Radiation Limits		
Frequency Range [MHz]	**Power Density** [mW/cm^2]	**Average Time** [Minutes]
(A) Limits For Occupational / Controlled Environments		
1,500 – 100,000	5.0	6
(B) Limits For General Population / Uncontrolled Environments		
1,500 – 100,000	1.0	30

Note: 1.0 mW/cm^2 is 10 W/m^2

4 SYSTEM VERIFICATION

4.1 Test System Verification

The system was verified to be within ±0.66 dB of the power density targets on the calibration certificate according to the test system specification in the user's manual and calibration facility recommendation. The 0.66 dB deviation threshold represents the expanded uncertainty for system performance checks using SPEAG's mmWave verification sources. The same spatial resolution and measurement region used in the source calibration was applied during the system check.

The measured power density distribution of verification source was also confirmed through visual inspection to have no noticeable differences, both spatially (shape) and numerically (level) from the distribution provided by the manufacturer, per November 2017 TCBC Workshop Notes.

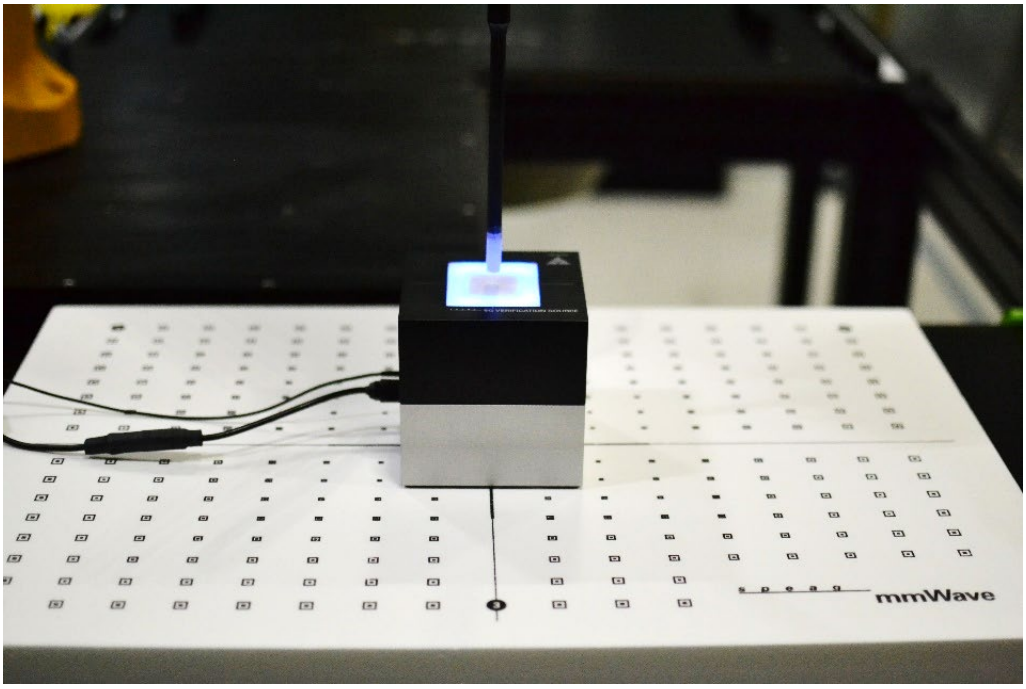

Figure 4-1
System Verification Setup Photo

Table 4-1
30 GHz Verifications

System Verification										
System	Frequency	Date	Source S/N	Probe S/N	Normal psPD (W/m² over 4 cm²)		Deviation (dB)	Total psPD (W/m² over 4 cm²)		Deviation (dB)
					Measured	Target		Measured	Target	
R	30	10/29/20	1044	9407	30.20	34.70	-0.60	30.70	35.00	-0.57
R	30	10/30/20	1044	9407	31.60	34.70	-0.41	32.10	35.00	-0.38
Q	30	10/30/20	1035	9415	28.20	32.10	-0.56	28.70	32.50	-0.54
Q	30	11/02/20	1035	9415	28.60	32.10	-0.50	29.10	32.50	-0.48
R	30	11/02/20	1044	9407	32.10	34.70	-0.34	32.60	35.00	-0.31
Q	30	11/03/20	1035	9415	28.80	32.10	-0.47	29.30	32.50	-0.45
R	30	11/03/20	1044	9407	31.70	34.70	-0.39	32.20	35.00	-0.36
R	30	11/09/20	1044	9407	30.70	34.70	-0.53	31.20	35.00	-0.50
R	30	11/10/20	1044	9407	31.00	34.70	-0.49	31.50	35.00	-0.46
R	30	11/12/20	1044	9407	32.00	34.70	-0.35	32.50	35.00	-0.32

Note: A **10 mm distance spacing** was used from the reference horn antenna aperture to the probe element. This includes 4.45 mm from the reference antenna horn aperture to the surface of the verification source plus 5.55 mm from the surface to the probe. The SPEAG software requires a setting of “5.55 mm” for the correct set up.

5 POWER DENSITY DATA @ INPUT.POWER.LIMIT

5.1 Power Density Results

Power density measurements were performed with DUT transmitting at *input.power.limit* for one single beam for each polarization (H & V) and one beam-pair, for each antenna on each worst-surface.

Table 5-1
5G mmWave NR Band n261

MEASUREMENT RESULTS															
Band	Module	Antenna Type	Frequency	Channel	Beam ID 1	Beam ID 2	input.power.limit	Signal Type	DUT S/N	Power Drift	Distance	DUT Surface	Normal psPD	Total psPD	Plot #
			MHz		V	H	dBm			dB	mm		mW/cm²	mW/cm²	
n261	K	Patch	27550.08	Low	21	-	1.5	CW	TI20515M	-0.07	2	Back	0.411	0.495	A1
n261	K	Patch	28299.96	High	30	-	2.0	CW	TI30411M	0.02	10	Back	0.209	0.215	
n261	K	Patch	27550.08	Low	21	-	1.5	CW	TI20515M	-0.20	2	Left	0.437	0.468	
n261	K	Patch	27550.08	Low	-	150	2.9	CW	TI20515M	-0.10	2	Back	0.219	0.339	
n261	K	Patch	27550.08	Low	-	150	2.9	CW	TI20515M	-0.15	2	Left	0.337	0.431	
n261	K	Patch	27550.08	Low	21	149	-0.6	CW	TI20515M	0.08	2	Back	0.303	0.428	
n261	K	Patch	27924.96	Mid	29	157	-0.6	CW	TI20515M	0.19	2	Left	0.217	0.320	
n261	L	Patch	27924.96	Mid	25	-	2.3	CW	TI20515M	0.02	2	Back	0.429	0.570	
n261	L	Patch	27550.08	Low	17	-	2.8	CW	TI30411M	0.09	10	Back	0.411	0.420	
n261	L	Patch	27924.96	Mid	25	-	2.3	CW	TI30411M	-0.07	2	Right	0.374	0.474	
n261	L	Patch	27924.96	Mid	-	145	4.0	CW	TI20515M	-0.13	2	Back	0.271	0.433	
n261	L	Patch	27924.96	Mid	-	145	4.0	CW	TI30411M	0.13	2	Right	0.527	0.647	A2
n261	L	Patch	27550.08	Low	16	144	0.2	CW	TI20515M	0.07	2	Back	0.393	0.496	
n261	L	Patch	27550.08	Low	25	153	0.2	CW	TI30411M	0.05	2	Right	0.280	0.389	
47 CFR §1.1310 - SAFETY LIMIT Spatial Average Uncontrolled Exposure / General Population									Power Density 1 mW/cm² averaged over 4 cm²						

Table 5-2
5G mmWave NR Band n260

MEASUREMENT RESULTS															
Band	Module	Antenna Type	Frequency	Channel	Beam ID 1	Beam ID 2	input.power.limit	Signal Type	DUT S/N	Power Drift	Distance	DUT Surface	Normal psPD	Total psPD	Plot #
			MHz		V	H	dBm			dB	mm		mW/cm²	mW/cm²	
n260	K	Patch	39949.92	High	25	-	2.4	CW	TI20515M	-0.07	2	Back	0.096	0.147	
n260	K	Patch	39949.92	High	25	-	2.4	CW	TI20515M	-0.03	2	Left	0.192	0.261	
n260	K	Patch	37050.00	Low	-	159	2.7	CW	TI20515M	-0.04	2	Back	0.224	0.304	
n260	K	Patch	37050.00	Low	-	159	2.7	CW	TI30411M	0.00	10	Back	0.177	0.188	
n260	K	Patch	37050.00	Low	-	159	2.7	CW	TI20515M	-0.15	2	Left	0.292	0.362	A3
n260	K	Patch	38499.96	Mid	32	160	-1.1	CW	TI20515M	-0.03	2	Back	0.097	0.149	
n260	K	Patch	39949.92	High	33	161	-1.9	CW	TI20515M	0.08	2	Left	0.069	0.107	
n260	L	Patch	39949.92	High	19	-	3.1	CW	TI20515M	-0.03	2	Back	0.181	0.243	
n260	L	Patch	39949.92	High	20	-	3.1	CW	TI30411M	-0.20	2	Right	0.213	0.335	
n260	L	Patch	38499.96	Mid	-	156	3.3	CW	TI20515M	-0.12	2	Back	0.278	0.391	
n260	L	Patch	37050.00	Low	-	156	3.3	CW	TI30411M	0.08	2	Right	0.371	0.467	A4
n260	L	Patch	38499.96	Mid	19	147	-1.0	CW	TI20515M	-0.03	2	Back	0.183	0.256	
n260	L	Patch	37050.00	Low	26	154	0.5	CW	TI30411M	-0.10	10	Back	0.110	0.120	
n260	L	Patch	39949.92	High	20	148	-1.3	CW	TI30411M	-0.14	2	Right	0.342	0.434	
47 CFR §1.1310 - SAFETY LIMIT Spatial Average Uncontrolled Exposure / General Population									Power Density 1 mW/cm² averaged over 4 cm²						

5.2 Power Density Test Notes

General Notes:

1. The manufacturer has confirmed that the devices tested have the same physical, mechanical and thermal characteristics and are within operational tolerances expected for production units.
2. Batteries are fully charged at the beginning of the measurements. The DUT was connected to a wall charger for some measurements due to the test duration. It was confirmed that the charger plugged into this DUT did not impact the near-field PD test results.
3. Power density was calculated by repeated E-field measurements on two measurement planes separated by λ/4.
4. DUT was configured to transmit with a manufacturer provided test software to control specific antenna(s), Beam ID(s), and signal type to ensure the test configurations constant for the entire evaluation.
5. This device utilizes power reduction for some WLAN wireless modes and technologies for simultaneous transmission compliance. These mechanisms are assessed in the SAR Test Report.
6. *PD_design_target* of 0.6166 mW/cm^2 was used with mmW device design related uncertainty of 2.1 dB.
7. *Input.power.limit* parameter for 5G mmW NR radio was calculated in RF Exposure Part 0 test report.
8. This device is enabled with Qualcomm® Smart Transmit feature to control and manage transmitting power in real time and to ensure that the time-averaged RF exposure from WWAN is in compliance with FCC requirements. Per FCC guidance for devices enabled with Qualcomm® Smart Transmit feature, 4G LTE and 5G mmW NR simultaneous transmission scenario does not need to be evaluated under Total Exposure Ratio (TER). The validation of the time-averaging algorithm and compliance under the Tx varying transmission scenario for WWAN technologies are reported in Part 2 report.
9. Per FCC guidance for devices enabled with Qualcomm® Smart Transmit feature, simultaneous transmission analysis is evaluated by combining the exposure from each WWAN and WLAN antenna. 5G mmW NR and WLAN simultaneous transmission scenario is evaluated under the Total Exposure Ratio (TER) in Appendix C.
10. The Beam IDs with one of the highest initial simulated power density for that surface and distance was selected for Part 1 Power Density measurements.
11. The device was configured to transmit CW wave signal for testing. Per FCC guidance for devices enabled with Qualcomm® Smart Transmit feature, additional testing was not required for different modulations (CP-OFDM: QPSK, 16QAM, 64QAM, DFT-s-OFDM: PI/2 BPSK, QPSK, 16QAM, 64QAM), RB configurations, component carriers, channel configurations (low channel, mid channel, high channel) since the smart transmit algorithm monitors powers on a per symbol basis, which is independent of these signal characteristics.
12. The device was configured to MIMO configuration with H and V polarization beams transmitting together.
13. The beam ID with the highest ratio of 10mm back side simulated power density to worst case 2mm simulated power density was selected for Part 1 Power Density measurements at 10mm back side.

6 COMBINED POWER DENSITY VERIFICATION

This device supports GEN2 Smart Transmit. The following verifications were performed per 80-w2112-4.

Measured psPD results in the below verifications were measured at a reduced power level as per the manufacturer. For combined power density analysis, all psPD values were scaled to reflect the original input.power.limit (before permanent back-off applied) corresponding to the PD_design_target. The permanent back-off values are included in the Part 0 test report.

6.1 Verification Criteria 1 (Power Density per beam):

The measured psPD results from the previous section are confirmed to meet:

$$Measured\ psPD\ \leq \left(b_j * PD\_design\_target + total\ uncertainty\right) < FCC\ psPD\ limit$$

Table 6-1
Power Density Per Beam

PD_design_target (mW/cm^2)			0.6166					
Total uncertainty (dB)			2.1					
Band	Antenna	Printed backoff value b_j	Beam ID 1	Beam ID 2	Measured psPD (mW/cm^2)	psPD scaled to input.power.limit without permanent backoff (mW/cm^2)	b_j * PD_design_target + total uncertainty (mW/cm^2)	FCC psPD Limit (mW/cm^2)
n261	K	0.955	21	-	0.495	0.699	0.955	1
n261	L	0.933	-	145	0.647	0.726	0.933	1
n260	K	0.977	-	159	0.362	0.511	0.977	1
n260	L	0.977	-	156	0.467	0.524	0.977	1

6.2 Verification Criteria 2 (combined Power Density):

Combined Power Density results in the below tables are confirmed to meet:

$$combined\ psPD = \left(c(p,j) * measured.psPD.beam_p + c(q,j) * measured.psPD.beam_q\right) \leq PD\_design\_target + total\ uncertainty$$

where,

$$meas.psPD.beam_i = measured\ 4cm^2\ PD\ for\ beam\ i, i = p, q$$
$$c(i,j) = \text{ contribution factor from beam}_i \text{ to antenna}_j, i = p, q \text{ and } j = 0,1$$

Beam$_p$ = beam having the highest measured psPD among all beams tested for first antenna
Beam$_q$ = beam having the highest measured psPD among all beams tested for second antenna

Table 6-2
Highest Measured psPD

Band	Module	Beam ID 1	Beam ID 2	Surface	Measured psPD (mW/cm^2)	psPD scaled to input.power.limit without permanent backoff (mW/cm^2)
n261	K	21	-	Left	0.468	0.661
n261	K	21	-	Back	0.495	0.699
n261	L	-	145	Right	0.647	0.726
n261	L	25	-	Back	0.570	0.640
n260	K	-	159	Left	0.362	0.511
n260	K	-	159	Back	0.304	0.429
n260	L	-	156	Right	0.467	0.524
n260	L	-	156	Back	0.391	0.439

Table 6-3
Combined psPD Band n261

Band	Beam ID	Contribution Factors per module location		Band	Beam ID	Contribution Factors per module location		Band	Beam ID	Contribution Factors per module location		Band	Beam ID	Contribution Factors per module location	
		K	L			K	L			K	L			K	L
		Back	Back			Back	Right			Left	Back			Left	Right
n261	21	1	0.0035	n261	21	1	0.002	n261	21	0.994	0.004	n261	21	0.994	0.002
	25	0.0003	1		145	0.002	1		25	0	1		145	0.002	1
Combined psPD (mW/cm^2)		0.699	0.642	Combined psPD (mW/cm^2)		0.701	0.727	Combined psPD (mW/cm^2)		0.657	0.642	Combined psPD (mW/cm^2)		0.659	0.727
[PD_design_target + total uncertainty] (mW/cm^2)		1	1	[PD_design_target + total uncertainty] (mW/cm^2)		1	1	[PD_design_target + total uncertainty] (mW/cm^2)		1	1	[PD_design_target + total uncertainty] (mW/cm^2)		1	1

Table 6-4
Combined psPD Band n260

Band	Beam ID	Contribution Factors per module location		Band	Beam ID	Contribution Factors per module location		Band	Beam ID	Contribution Factors per module location		Band	Beam ID	Contribution Factors per module location	
		K	L			K	L			K	L			K	L
		Back	Back			Back	Right			Left	Back			Left	Right
n260	159	0.9213	0.0016	n260	159	0.9213	0.0018	n260	159	1	0.002	n260	159	1	0.001
	156	0.003	1		156	0.003	0.873		156	0.003	1		156	0.003	0.986
Combined psPD (mW/cm^2)		0.397	0.439	Combined psPD (mW/cm^2)		0.397	0.458	Combined psPD (mW/cm^2)		0.513	0.440	Combined psPD (mW/cm^2)		0.513	0.517
[PD_design_target + total uncertainty] (mW/cm^2)		1	1	[PD_design_target + total uncertainty] (mW/cm^2)		1	1	[PD_design_target + total uncertainty] (mW/cm^2)		1	1	[PD_design_target + total uncertainty] (mW/cm^2)		1	1

7 EQUIPMENT LIST

Table 7-1
5G mmWave NR Equipment List

Manufacturer	Model	Description	Cal Date	Cal Interval	Cal Due	Serial Number
-	WL25-1	Conducted Cable Set (25GHz)	09/16/20	Annual	09/16/21	WL25-1
-	WL40-1	Conducted Cable Set (40GHz)	09/16/20	Annual	09/16/21	WL40-1
Agilent	N9038A	MXE EMI Receiver	08/11/20	Annual	08/11/21	MY51210133
Agilent	N9030A	PXA Signal Analyzer (44GHz)	08/17/20	Annual	08/17/21	MY52350166
Emco	3116	Horn Antenna (18 - 40GHz)	06/07/18	Triennial	06/07/21	9203-2178
Rohde & Schwarz	ESU40	EMI Test Receiver (40GHz)	9/92020	Annual	09/09/21	100348
Rohde & Schwarz	SFUNIT-Rx	Shielded Filter Unit	02/21/20	Annual	02/21/21	102133
Rohde & Schwarz	FSW67	Signal / Spectrum Analyzer	08/10/20	Annual	08/10/21	103200
Sunol	JB5	Bi-Log Antenna (30M - 5GHz)	07/27/20	Biennial	07/27/22	A051107
SPEAG	EUmmWV3	EUmmWV3 Probe	02/14/20	Annual	02/14/21	9415
SPEAG	EUmmWV3	EUmmWV3 Probe	12/10/19	Annual	12/10/20	9407
SPEAG	SM 003 100 AA	30GHz System Verification Ka- Band Source Antenna	02/12/20	Annual	02/12/21	1035
SPEAG	SM 003 100 AA	30GHz System Verification Ka- Band Source Antenna	05/14/20	Annual	05/14/21	1044
SPEAG	DAE4	Dasy Data Acquisition Electronics	03/12/20	Annual	03/12/21	1415
SPEAG	DAE4	Dasy Data Acquisition Electronics	02/20/20	Annual	02/20/21	1272
Agilent	N9030A	PXA Signal Analyzer (44GHz)	08/17/20	Annual	08/17/21	MY52350166
Emco	3115	Horn Antenna (1-18GHz)	06/18/20	Biennial	06/18/22	9704-5182
Keysight Technologies	N9030A	3Hz-44GHz PXA Signal Analyzer	07/17/20	Annual	07/17/21	MY49430494
Rohde & Schwarz	ESU26	EMI Test Receiver (26.5GHz)	07/15/20	Annual	07/15/21	100342
Rohde & Schwarz	SFUNIT-Rx	Shielded Filter Unit	02/10/20	Annual	02/10/21	102134
Sunol	JB5	Bi-Log Antenna (30M - 5GHz)	07/27/20	Biennial	07/27/22	A051107

Note:
1. Each equipment item was used solely within its respective calibration period.

8 MEASUREMENT UNCERTAINTIES

a	b	c	d	e	f = b x e/d	g
Uncertainty Component	Unc. (± dB)	Prob. Dist.	Div.	ci	ui (± dB)	vi
Calibration	0.49	N	1	1.0	0.49	∞
Probe correction	0	R	1.73	1.0	0.00	∞
Frequency Response (BW ≤ 1 GHz)	0.20	R	1.73	1.0	0.12	∞
Sensor cross coupling	0	R	1.73	1.0	0.00	∞
Isotropy	0.50	R	1.73	1.0	0.29	∞
Linearity	0.20	R	1.73	1.0	0.12	∞
Probe Scattering	0	R	1.73	1.0	0	∞
Probe Positioning Offset	0.30	R	1.73	1.0	0.17	∞
Probe Positioning Repeatability	0.04	R	1.73	1.0	0.02	∞
Sensor Mechanical Offset	0	R	1.73	1.0	0	∞
Probe Spatial Resolution	0	R	1.73	1.0	0	∞
Field Impedance Dependence	0	R	1.73	1.0	0	∞
Amplitude and phase drift	0	R	1.73	1.0	0	∞
Amplitude and phase noise	0.04	R	1.73	1.0	0.02	∞
Measurement area truncation	0	R	1.73	1.0	0	∞
Data acquisition	0.03	N	1	1.0	0.03	∞
Sampling	0	R	1.73	1.0	0	∞
Field Reconstruction	0.60	R	1.73	1.0	0.35	∞
Forward Transformation	0	R	1.73	1.0	0	∞
Power Density Scaling	-	R	1.73	1.0	-	∞
Spatial Averaging	0.10	R	1.73	1.0	0.06	∞
System Detection Limit	0.04	R	1.73	1.0	0.02	∞
Test Sample and Environmental Factors						
Probe Coupling with DUT	0	R	1.73	1.0	0	∞
Modulation Response	0.40	R	1.73	1.0	0.23	∞
Integration Time	0	R	1.73	1.0	0	∞
Response Time	0	R	1.73	1.0	0	∞
Device Holder Influence	0.10	R	1.73	1.0	0.06	∞
DUT Alignment	0	R	1.73	1.0	0	∞
RF Ambient Conditions	0.04	R	1.73	1.0	0.02	∞
Ambient Reflections	0.04	R	1.73	1.0	0.02	∞
Immunity / Secondary Reception	0	R	1.73	1.0	0	∞
Drift of the DUT	0.22	R	1.73	1.0	0.13	∞
Combined Standard Uncertainty (k=1)		RSS			0.76	∞
(95% CONFIDENCE LEVEL)		**k=2**			**1.53**	

9 CONCLUSION

9.1 Measurement Conclusion

The power density measurements and total exposure ratio analysis indicate that the DUT complies with the RF radiation exposure limits of the FCC, with respect to all parameters subject to this test. These measurements were taken to simulate the RF effects of RF exposure under worst-case conditions. Precise laboratory measures were taken to assure repeatability of the tests. The results and statements relate only to the item(s) tested.

Please note that the RF Exposure and distribution of electromagnetic energy in the body are very complex phenomena that depend on the mass, shape, and size of the body, the orientation of the body with respect to the field vectors, and the electrical properties of both the body and the environment. Other variables that may play a substantial role in possible biological effects are those that characterize the environment (e.g. ambient temperature, air velocity, relative humidity, and body insulation) and those that characterize the individual (e.g. age, gender, activity level, debilitation, or disease). Because various factors may interact with one another to vary the specific biological outcome of an exposure to electromagnetic fields, any protection guide should consider maximal amplification of biological effects as a result of field-body interactions, environmental conditions, and physiological variables.

10 REFERENCES

[1] ANSI/IEEE C95.1-1992, American National Standard safety levels with respect to human exposure to radio frequency electromagnetic fields, 3kHz to 300GHz, New York: IEEE, Sept. 1992.

[2] IEC TR 63170:2018, Measurement Procedure for the Evaluation of Power Density Related to Human Exposure to Radiofrequency Fields from Wireless Communication Devices Operating between 6 GHz and 100 GHz

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[4] K. Pokovic, T. Schmid, J. Frohlich, and N. Kuster. Novel Probes and Evaluation Procedures to Assess Field Magnitude and Polarization. IEEE Transactions on Electromagnetic Compatibility 42(2): 240 -244, 2000

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[6] A. P. Anderson and S. Sali. New Possibilities for Phaseless Microwave Diagnostics. Part 1: Error Reduction Techniques. IEE Proceedings H – Microwaves, Antennas and Propagation 132(5): 290 – 298, 1985

[7] FCC KDB 865664 D02 v01r04: SAR Measurement Requirements for 100 MHz to 6 GHz. Federal Communications Commission – Office of Engineering and Technology, Laboratory Division.

[8] FCC KDB 447498 D01 v02r01: RF Exposure Procedures and Equipment Authorization Policies for Mobile and Portable Devices. Federal Communications Commission – Office of Engineering and Technology, Laboratory Division.

[9] November 2017 Telecommunications Certification Body Council (TCBC) Workshop Notes

[10] October 2018 Telecommunications Certification Body Council (TCBC) Workshop Notes

[11] April 2019 Telecommunications Certification Body Council (TCBC) Workshop Notes

[12] November 2019 Telecommunications Certification Body Council (TCBC) Workshop Notes

[13] SPEAG DASY6 System Handbook (September 2019)

APPENDIX A: POWER DENSITY TEST PLOTS

PCTEST

Date: 11/03/20

Antenna K; Beam 21; V; Low Ch.; CW

Device Under Test Properties

DUT	Serial Number	DUT Type
A3LSMG996U	TI20515M	Portable Handset

Exposure Conditions

Phantom Section	Position	Test Distance [mm]	Band	Frequency [MHz]
5G	BACK	2.00	n261	27550.10

Hardware Setup

Probe, Calibration Date	DAE, Calibration Date
EUmmWV3 - SN9415, 02/14/20	DAE4 SN1415, 03/12/20

Software Setup

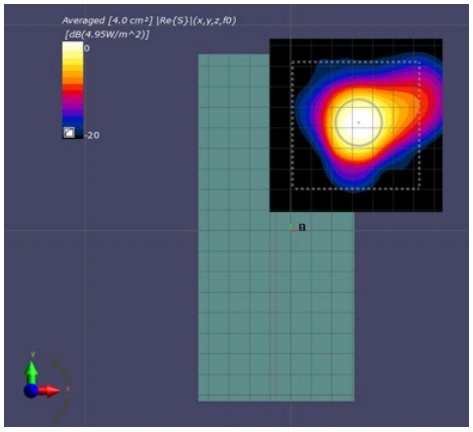
Software	Software Version
cDASY6 Module mmWave	2.0.2.34

Scans Setup

Scan Type	5G Scan
Grid Extents [mm]	80x80
Grid Steps [lambda]	0.25 x 0.25
Sensor Surface [mm]	2.0

Measurement Results

Scan Type	5G Scan
Avg. Area [cm²]	4.00
pS_{tot} avg [W/m²]	4.95
pS_n avg [W/m²]	4.11
E_{peak} [V/m]	72.5
Power Drift [dB]	-0.07



PCTEST

Date: 11/03/20

Antenna L; Beam 145; H; Mid Ch.; CW

Device Under Test Properties

DUT	Serial Number	DUT Type
A3LSMG996U	TI30411M	Portable Handset

Exposure Conditions

Phantom Section	Position	Test Distance [mm]	Band	Frequency [MHz]
5G	RIGHT	2.00	n261	27925.00

Hardware Setup

Probe, Calibration Date	DAE, Calibration Date
EUmmWV3 - SN9407, 12/10/19	DAE4 SN1272, 02/20/20

Software Setup

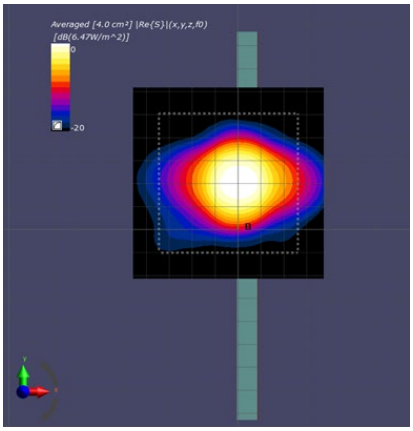
Software	Software Version
cDASY6 Module mmWave	2.0.2.34

Scans Setup

Scan Type	5G Scan
Grid Extents [mm]	80x80
Grid Steps [lambda]	0.25 x 0.25
Sensor Surface [mm]	2.0

Measurement Results

Scan Type	5G Scan
Avg. Area [cm²]	4.00
pS_{tot} avg [W/m²]	6.47
pS_n avg [W/m²]	5.27
E_{peak} [V/m]	83.2
Power Drift [dB]	0.13



PCTEST

Date: 11/03/20

Antenna K; Beam 159; H; Low Ch.; CW

Device Under Test Properties

DUT	Serial Number	DUT Type
A3LSMG996U	TI20515M	Portable Handset

Exposure Conditions

Phantom Section	Position	Test Distance [mm]	Band	Frequency [MHz]
5G	LEFT	2.00	n260	37050.00

Hardware Setup

Probe, Calibration Date	DAE, Calibration Date
EUmmWV3 - SN9415, 02/14/20	DAE4 SN1415, 03/12/20

Software Setup

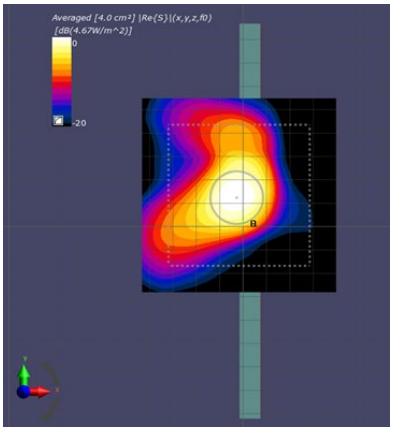
Software	Software Version
cDASY6 Module mmWave	2.0.2.34

Scans Setup

Scan Type	5G Scan
Grid Extents [mm]	80x80
Grid Steps [lambda]	0.25 x 0.25
Sensor Surface [mm]	2.0

Measurement Results

Scan Type	5G Scan
Avg. Area [cm²]	4.00
pS_{tot} avg [W/m²]	3.62
pS_n avg [W/m²]	2.92
E_{peak} [V/m]	69.2
Power Drift [dB]	-0.15



PCTEST

Date: 11/03/20

Antenna L; Beam 156; H; Low Ch.; CW

Device Under Test Properties

DUT	Serial Number	DUT Type
A3LSMG996U	TI30411M	Portable Handset

Exposure Conditions

Phantom Section	Position	Test Distance [mm]	Band	Frequency [MHz]
5G	RIGHT	2.00	n260	37050.00

Hardware Setup

Probe, Calibration Date	DAE, Calibration Date
EUmmWV3 - SN9407, 12/10/19	DAE4 SN1272, 02/20/20

Software Setup

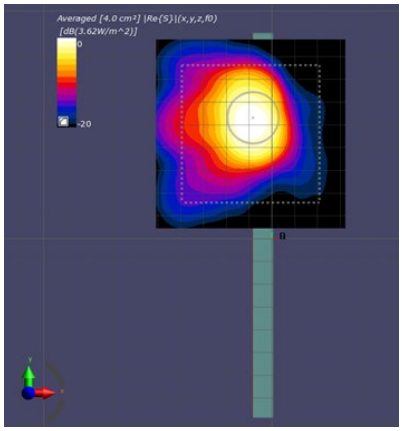
Software	Software Version
cDASY6 Module mmWave	2.0.2.34

Scans Setup

Scan Type	5G Scan
Grid Extents [mm]	80x80
Grid Steps [lambda]	0.25 x 0.25
Sensor Surface [mm]	2.0

Measurement Results

Scan Type	5G Scan
Avg. Area [cm²]	4.00
pS_{tot} avg [W/m²]	4.67
pS_n avg [W/m²]	3.71
E_{peak} [V/m]	75.6
Power Drift [dB]	0.08



APPENDIX B: POWER DENSITY SYSTEM VERIFICATION PLOTS

PCTEST

Date: 10/29/20

30 GHz System Verification

Device Under Test Properties

DUT	Serial Number
30 GHz Verification Source	1044

Exposure Conditions

Phantom Section	Position	Test Distance [mm]	Band	Frequency [MHz]
5G	FRONT	5.55	Validation band	30000.00

Hardware Setup

Probe, Calibration Date	DAE, Calibration Date
EUmmWV3 - SN9407, 12/10/19	DAE4 SN1272, 02/20/20

Software Setup

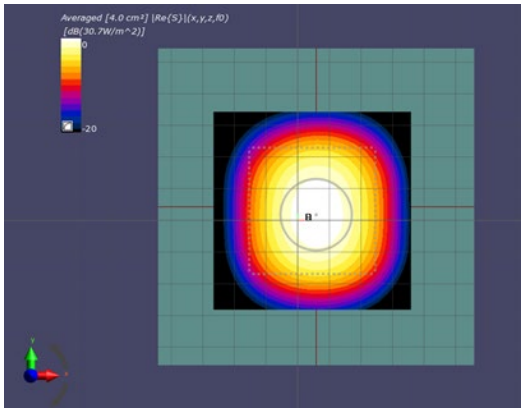
Software	Software Version
cDASY6 Module mmWave	2.0.2.34

Scans Setup

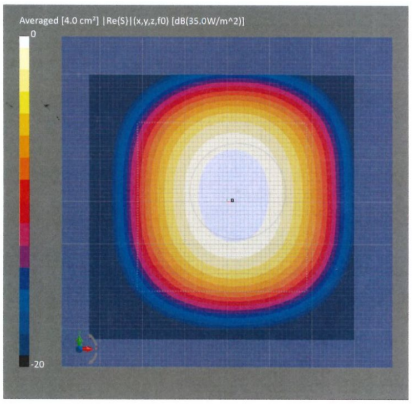
Scan Type	5G Scan
Grid Extents [mm]	60.0 x 60.0
Grid Steps [lambda]	0.25 x 0.25
Sensor Surface [mm]	5.55

Measurement Results

Scan Type	5G Scan
Avg. Area [cm²]	4.00
pS_{tot} avg [W/m²]	30.7
pS_n avg [W/m²]	30.2
E_{peak} [V/m]	129
Deviation (dB)	-0.57



30GHz System Verification



Calibration Certificate

PCTEST

Date: 10/30/20

30 GHz System Verification

Device Under Test Properties

DUT	Serial Number
30 GHz Verification Source	1035

Exposure Conditions

Phantom Section	Position	Test Distance [mm]	Band	Frequency [MHz]
5G	FRONT	5.55	Validation band	30000.00

Hardware Setup

Probe, Calibration Date	DAE, Calibration Date
EUmmWV3 - SN9415, 02/14/20	DAE4 SN1415, 03/12/20

Software Setup

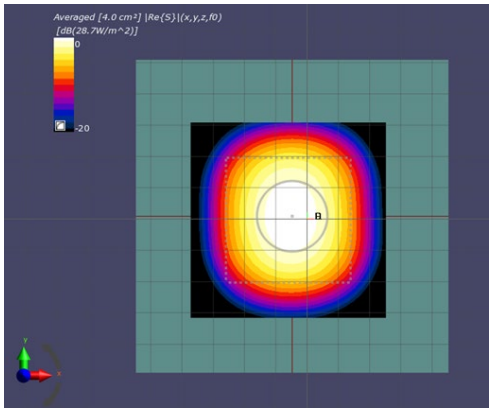
Software	Software Version
cDASY6 Module mmWave	2.0.2.34

Scans Setup

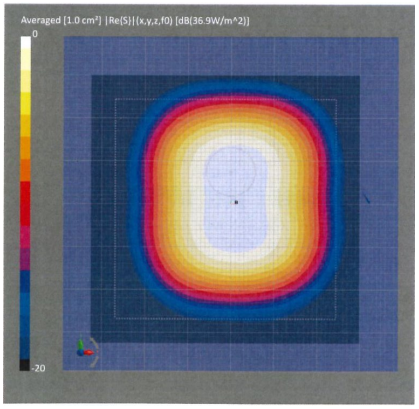
Scan Type	5G Scan
Grid Extents [mm]	60.0 x 60.0
Grid Steps [lambda]	0.25 x 0.25
Sensor Surface [mm]	5.55

Measurement Results

Scan Type	5G Scan
Avg. Area [cm²]	4.00
pS_{tot} avg [W/m²]	28.7
pS_n avg [W/m²]	28.2
E_{peak} [V/m]	124
Deviation (dB)	-0.54



30GHz System Verification



Calibration Certificate

APPENDIX C: TOTAL EXPOSURE RATIO

The Total Exposure Ratio (TER) is calculated by combining all SAR measurements and power density measurements after normalizing to their respective limits. The general expression is below.

$$TER = \sum_{a=1}^{A} \frac{SAR_a}{SAR_a, limit} + \sum_{b=1}^{B} \frac{psPD_b}{psPD_b, limit} < 1$$

The TER shall be less than unity to ensure compliance with the limits.

$$\sum_{n=1}^{N} \frac{4G\ SAR_n}{4G\ SAR_n, limit} + \sum_{m=1}^{M} \frac{5G\ mmW\ NR\ psPD_m}{5G\ mmW\ NR\ psPD_m, limit} + \sum_{p=1}^{P} \frac{WLAN\ SAR_p}{WLAN\ SAR_p, limit} < 1$$

Qualcomm® Smart Transmit algorithm for WWAN adds directly the time-averaged RF exposure from 4G and time-averaged RFexposure from 5G mmW NR. Smart Transmit algorithm controls the total RF exposure from both 4G and 5G mmW NR to not exceed FCC limit. Therefore, per FCC guidance, TER does not need to be evaluated directly for the 4G and 5G simultaneous compliance via summation. The following equations are derived later in Appendix C. The validation of the time-averaging algorithm and compliance under the Tx varying transmission scenario for WWAN technologies are reported in Part 2 report. The report SN could be found in Bibliography section.

$$\sum_{n=1}^{N} \frac{4G\ SAR_n}{4G\ SAR_n, limit} + \sum_{p=1}^{P} \frac{WLAN\ SAR_p}{WLAN\ SAR_p, limit} < 1$$

$$\sum_{m=1}^{M} \frac{5G\ mmW\ NR\ psPD_m}{5G\ mmW\ NR\ psPD_m, limit} + \sum_{p=1}^{P} \frac{WLAN\ SAR_p}{WLAN\ SAR_p, limit} < 1$$

For 5G mmW NR, since there is total design-related uncertainty arising from TxAGC and device-to-device variation, the worst-case RF exposure should be determined by accounting for device uncertainty. For this device, the manufacturer has added an additional permanent back-off (indicated below as WWAN backoff) for every beam in the calculations for input.power.limits used in the EFS file. The back-off levels can be found in the Part 0 Test report. Therefore, 5G mmW NR RF exposure for this DUT is evaluated by reported psPD calculated as:

$$reported\_psPD = (PD\_design\_target + PD\_uncertainty) \times 10^{(-WWAN\ backoff\ in\ dB)/10}$$

Note that since not all the beams supported by this EUT are measured, *reported_psPD* cannot be computed based on limited *measured psPD* data. Alternatively, since *measured psPD* for all the beams will be ≤ *PD_design_target* + *PD_uncertainty* uncertainty, *reported_psPD* is computed based on this worst-case PSPD as shown above.

The compliance analysis for simultaneous transmission scenarios of WWAN (4G LTE & 5G mmW NR) with Smart Transmit and 4G & WLAN can be found in two reports indicated in the table below. This appendix demonstrates compliance for the 5G + WLAN scenarios. The report SNs can be found in Bibliography section.

	Simultaneous Scenario	**Evaluation Report**
1.	4G LTE WWAN + WLAN	FCC SAR Evaluation Report (Part 1)
2.	4G LTE WWAN + 5G mmW NR WWAN	RF Exposure Part 2 Test Report

RF exposure compliance with 5G mmW NR WWAN+WLAN simultaneous transmission scenarios is demonstrated for various radio configurations below.

Note that the above *reported psPD* applies to the worst-case surfaces of the DUT at 2mm evaluation distance.

Worst-case PD on other surfaces of the DUT are calculated from simulated PD data (see Power Density Simulation Report), by multiplying reported psPD with the highest proportion out of all beams and out of all three channels in each band, where the adjustment for each beam/channel is computed as the proportion of “simulated PD on desired surface” to “simulated PD on worst-surface”. For example, to determine worst-case PD on front surface (needed for Head RF Exposure evaluation during simultaneous transmission), highest proportion of (simulated PD on front surface)/(simulated PD on worst surface) was determined out of all supported beams and out of all three channels by the DUT in each band.

In some cases, the simulation vs measurement for some surfaces can exceed the device's total uncertainty. In those cases, if the measured psPD > simulated adjusted psPD (assuming a linear congruency of the psPD across surfaces), then measured psPD should be used towards the simultaneous TX analysis. Table C-1 lists the relevant worst-case reported psPD values based on the additional surfaces and evaluation distances needed to perform the TER analysis. The highest of the adjusted Reported_psPD and Measured Total psPD was chosen for TER analysis and the chosen values are indicated by bolded psPD values.

Table C-1
5G mmW NR psPD

NR Band	Antenna	Surface	Evaluation Distance (mm)	Adjustment Factor due to Simulation	Adjusted Reported psPD (mW/cm²)	Measured Total psPD (mW/cm²)	Final Reported psPD (mW/cm²)
n261	K	Back	2	1.000	0.708	0.495	**0.708**
n261	K	Front	2	0.466	0.330	0.246	**0.330**
n261	K	Top	2	0.178	0.126	-	**0.126**
n261	K	Bottom	2	0.010	0.007	-	**0.007**
n261	K	Right	2	0.038	0.027	-	**0.027**
n261	K	Left	2	1.000	0.708	0.468	**0.708**
n260	K	Back	2	0.933	0.660	0.304	**0.660**
n260	K	Front	2	0.519	0.367	0.226	**0.367**
n260	K	Top	2	0.237	0.168	-	**0.168**
n260	K	Bottom	2	0.025	0.018	-	**0.018**
n260	K	Right	2	0.034	0.024	-	**0.024**
n260	K	Left	2	1.000	0.708	0.362	**0.708**
n261	L	Back	2	1.000	0.891	0.570	**0.891**
n261	L	Front	2	0.478	0.426	0.293	**0.426**
n261	L	Top	2	0.023	0.021	-	**0.021**
n261	L	Bottom	2	0.053	0.047	-	**0.047**
n261	L	Right	2	1.000	0.891	0.647	**0.891**
n261	L	Left	2	0.077	0.069	-	**0.069**
n260	L	Back	2	1.000	0.891	0.391	**0.891**
n260	L	Front	2	0.519	0.462	0.244	**0.462**
n260	L	Top	2	0.039	0.035	-	**0.035**
n260	L	Bottom	2	0.074	0.066	-	**0.066**
n260	L	Right	2	1.000	0.891	0.467	**0.891**
n260	L	Left	2	0.030	0.027	-	**0.027**
n261	K	Back	10	0.584	0.413	0.215	**0.413**
n260	K	Back	10	0.453	0.321	0.188	**0.321**
n261	L	Back	10	0.578	0.515	0.420	**0.515**
n260	L	Back	10	0.573	0.511	0.120	**0.511**

Note: Adjusted factor is (simulated PD on desired exposure plane)/(PD on worst-surface at 2mm evaluation distance) out of all beams and out of all channels. See Power Density Simulation Report.

Table C-2
5G mmW NR Head Total Exposure Ratio

		psPD	2.4 GHz WLAN Ant1 Reported SAR	2.4 GHz WLAN Ant2 Reported SAR	2.4 GHz WLAN MIMO Reported SAR	2.4 GHz WLAN MIMO Reported SAR during simultaneous conditions with 5GHz	Bluetooth Reported SAR	5 GHz WLAN Ant1 Reported SAR	5 GHz WLAN Ant2 Reported SAR	5 GHz WLAN MIMO Reported SAR	psPD + 2.4 GHz WLAN Ant1	psPD + 2.4 GHz WLAN Ant2	psPD + 2.4 GHz WLAN MIMO	psPD + 5 GHz WLAN Ant 1	psPD + 5 GHz WLAN Ant 2	psPD + 5 GHz WLAN MIMO	psPD + 2.4 GHz MIMO + 5 GHz MIMO	psPD + BT	psPD + BT + 5 GHz WLAN Ant 1	psPD + BT + 5GHz WLAN Ant 2	psPD + BT + 5GHz WLAN MIMO
			15.0 dBm	15.0 dBm	18.0 dBm	15.0 dBm	17.0 dBm	10.0 dBm	10.0 dBm	13.0 dBm											
		mW/cm²	W/kg	W/kg	W/kg	W/kg	W/kg	W/kg	W/kg	W/kg											
		1	2	3	4	5	6	7	8	9	1 + 2	1 + 3	1 + 4	1 + 7	1 + 8	1 + 9	1 + 5 + 9	1 + 6	1 + 6 + 7	1 + 6 + 8	1 + 6 + 9
Applicable Limit		1.0	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Front Side	Reported Value	0.462	0.408	0.265	0.673	0.220	0.530	0.271	0.107	0.298											
	Ratio to Limit	0.462	0.255	0.166	0.421	0.138	0.331	0.169	0.067	0.186	0.717	0.628	0.883	0.631	0.529	0.648	0.786	0.793	0.963	0.860	**0.980**

Table C-3
5G mmW NR Body-Worn Total Exposure Ratio - Back Side at 15 mm

		psPD	2.4 GHz WLAN Ant1 Reported SAR	2.4 GHz WLAN Ant2 Reported SAR	2.4 GHz WLAN MIMO Reported SAR	Bluetooth Reported SAR	5 GHz WLAN Ant1 Reported SAR	5 GHz WLAN Ant2 Reported SAR	5 GHz WLAN MIMO Reported SAR	psPD + 2.4 GHz WLAN Ant1	psPD + 2.4 GHz WLAN Ant2	psPD + 2.4 GHz WLAN MIMO	psPD + 5 GHz WLAN Ant 1	psPD + 5 GHz WLAN Ant 2	psPD + 5 GHz WLAN MIMO	psPD + 2.4 GHz MIMO + 5 GHz MIMO	psPD + BT	psPD + BT + 5 GHz WLAN Ant 1	psPD + BT + 5GHz WLAN Ant 2	psPD + BT + 5GHz WLAN MIMO
			20.0 dBm	18.5 dBm	19.0 dBm	17.0 dBm	17.5 dBm	10.0 dBm	13.0 dBm											
		mW/cm²	W/kg	W/kg	W/kg	W/kg	W/kg	W/kg	W/kg											
		1	2	3	4	5	6	7	8	1 + 2	1 + 3	1 + 4	1 + 6	1 + 7	1 + 8	1 + 4 + 8	1 + 5	1 + 5 + 6	1 + 5 + 7	1 + 5 + 8
Applicable Limit		1.0	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Back Side	Reported Value	0.708	0.120	0.140	0.143	0.046	0.194	0.202	0.211											
	Ratio to Limit	0.708	0.075	0.088	0.089	0.029	0.121	0.126	0.132	0.783	0.796	0.797	0.829	0.834	0.840	**0.929**	0.737	0.858	0.863	0.869

Body-worn back side for antenna L was not considered for TER analysis due to spatial separation of mmWave antenna and WLAN/BT antennas.

Table C-4
5G mmW NR Hotspot Total Exposure Ratio

		psPD	2.4 GHz WLAN Ant1 Reported SAR	2.4 GHz WLAN Ant2 Reported SAR	2.4 GHz WLAN MIMO Reported SAR	Bluetooth Reported SAR	5 GHz WLAN Ant1 Reported SAR	5 GHz WLAN Ant2 Reported SAR	5 GHz WLAN MIMO Reported SAR	psPD + 2.4 GHz WLAN Ant1	psPD + 2.4 GHz WLAN Ant2	psPD + 2.4 GHz WLAN MIMO	psPD + 5 GHz WLAN Ant 1	psPD + 5 GHz WLAN Ant 2	psPD + 5 GHz WLAN MIMO	psPD + 2.4 GHz MIMO + 5 GHz MIMO	psPD + BT	psPD + BT + 5 GHz WLAN Ant 1	psPD + BT + 5GHz WLAN Ant 2	psPD + BT + 5GHz WLAN MIMO
			20.0 dBm	18.5 dBm	18.0 dBm	17.0 dBm	17.5 dBm	16.5 dBm	15.0 dBm											
		mW/cm²	W/kg	W/kg	W/kg	W/kg	W/kg	W/kg	W/kg											
		1.0	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1 + 2	1 + 3	1 + 4	1 + 6	1 + 7	1 + 8	1 + 4 + 8	1 + 5	1 + 5 + 6	1 + 5 + 7	1 + 5 + 8
Applicable Limit		1.0	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Back Side	Reported Value	0.515	0.255	0.351	0.200	0.106	0.046	0.288	0.357											
	Ratio to Limit	0.515	0.159	0.219	0.125	0.066	0.029	0.180	0.223	0.674	0.734	0.640	0.544	0.695	0.738	0.863	0.581	0.610	0.761	0.804
Front Side	Reported Value	0.462	0.455	0.351	0.200	0.103	0.249	0.031	0.143											
	Ratio to Limit	0.462	0.284	0.219	0.125	0.064	0.156	0.019	0.089	0.746	0.681	0.587	0.618	0.481	0.551	0.676	0.526	0.682	0.546	0.616
Top Edge	Reported Value	0.168	0.000	0.351	0.200	0.000	0.000	0.179	0.152											
	Ratio to Limit	0.168	0.000	0.219	0.125	0.000	0.000	0.112	0.095	0.168	0.387	0.293	0.168	0.280	0.263	0.388	0.168	0.168	0.280	0.263
Bottom Edge	Reported Value	0.066	0.000	0.000	0.000	0.000	0.000	0.000	0.000											
	Ratio to Limit	0.066	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.066	0.066	0.066	0.066	0.066	0.066	0.066	0.066	0.066	0.066	0.066
Right Edge	Reported Value	0.891	0.000	0.000	0.000	0.000	0.000	0.000	0.000											
	Ratio to Limit	0.891	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.891	0.891	0.891	0.891	0.891	0.891	0.891	0.891	0.891	0.891	0.891
Left Edge	Reported Value	0.708	0.455	0.351	0.200	0.176	0.088	0.007	0.083											
	Ratio to Limit	0.708	0.284	0.219	0.125	0.110	0.055	0.004	0.052	**0.992**	0.927	0.833	0.763	0.712	0.760	0.885	0.818	0.873	0.822	0.870

Table C-5
5G mmW NR Phablet Total Exposure Ratio

		psPD	5 GHz WLAN Ant1 Reported SAR	5 GHz WLAN Ant2 Reported SAR	5 GHz WLAN MIMO Reported SAR	psPD + 5 GHz WLAN Ant 1	psPD + 5 GHz WLAN Ant 2	psPD + 5 GHz WLAN MIMO
			17.5 dBm	16.5 dBm	13.0 dBm			
		mW/cm²	W/kg	W/kg	W/kg			
		1	2	3	4	1 + 2	1 + 3	1 + 4
Applicable Limit		1.0	4.0	4.0	4.0	1.0	1.0	1.0
Back Side	Reported Value	0.708	0.370	0.631	0.527			
	Ratio to Limit	0.708	0.093	0.158	0.132	0.801	0.866	0.840
Front Side	Reported Value	0.462	1.139	0.194	1.333			
	Ratio to Limit	0.462	0.285	0.049	0.333	0.747	0.511	0.795
Top Edge	Reported Value	0.168	0.000	0.278	0.278			
	Ratio to Limit	0.168	0.000	0.070	0.070	0.168	0.238	0.238
Bottom Edge	Reported Value	0.066	0.000	0.000	0.000			
	Ratio to Limit	0.066	0.000	0.000	0.000	0.066	0.066	0.066
Right Edge	Reported Value	0.891	0.000	0.000	0.000			
	Ratio to Limit	0.891	0.000	0.000	0.000	**0.891**	**0.891**	**0.891**
Left Edge	Reported Value	0.708	0.565	0.069	0.605			
	Ratio to Limit	0.708	0.141	0.017	0.151	0.849	0.725	0.859

Phablet back side for antenna L was not considered for TER analysis due to spatial separation of mmWave antenna and WLAN/BT antennas.

TER for back side Antenna L in body-worn, hotspot and phablet conditions applied spatial separation of the antennas per 248227 Section 6.1 and as described in 80-w2112-4 section G.1.3. In the below plots, it is demonstrated that the -10 dB contours of the SAR distributions have no overlap with the -10dB contours of the simulated power density. After visual inspection of all simulated power density distributions of all beams for back side, the below simulated condition was chosen as a representative worst case (most potential for overlap with BT/WLAN) for both n260 and n261 operations. Appendix A of the simulation report includes plots for all beams. Additionally, the maximum TER contribution for power density for back side is < 0.9. The SAR contribution of TER for BT/WLAN Operations is < 0.9. TER analysis for hotspot back side Antenna L was calculated as:

a) TER at $4cm^2$ PD hotspot = reported normalized $4cm^2$ PD + $10^{(-10dB/10)}$ * reported normalized WLAN/BT SAR
b) TER at WLAN/BT SAR hotspot = reported normalized WLAN/BT SAR + $10^{(-10dB/10)}$ * reported normalized $4cm^2$ PD

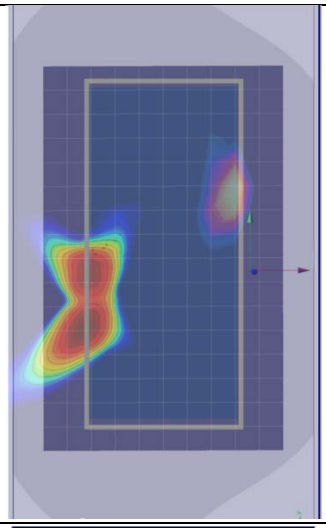
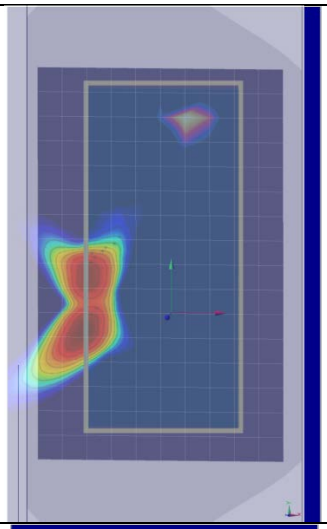
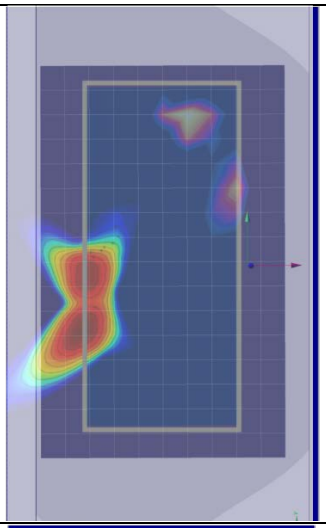
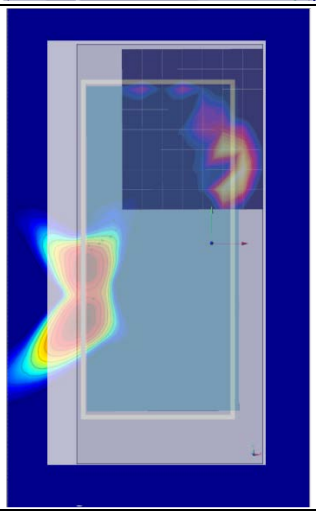
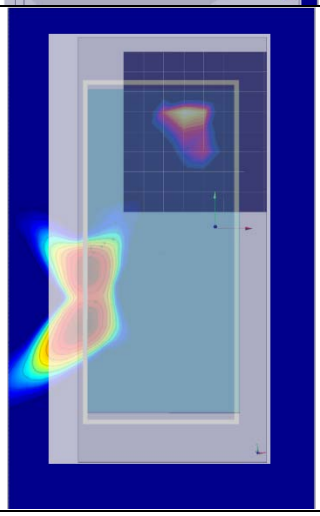
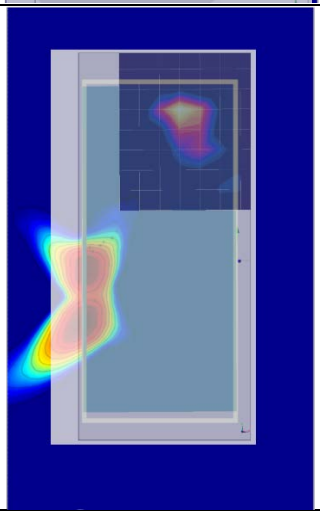
	WLAN Antenna 1	WLAN Antenna 2	WLAN MIMO
mmWave antenna L + 2.4 GHz WLAN			
mmWave antenna L + 5 GHz WLAN			

Figure C-1
DUT back side spatial separation of mmWave antenna L and WLAN antennas

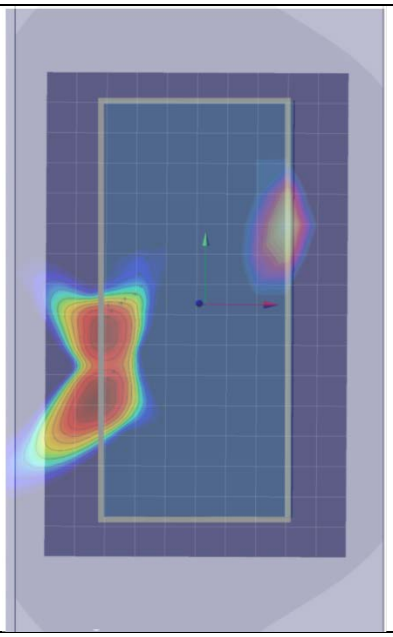
	Bluetooth
mmWave antenna L + Bluetooth	

Figure C-2
DUT back side spatial separation of mmWave antenna L and Bluetooth Antenna

Table C-6
5G mmW NR Body-worn Back Side Antenna L - Total Exposure Ratio at 4cm2 PD body-worn location

		psPD	2.4 GHz WLAN Ant1 Reported SAR	2.4 GHz WLAN Ant2 Reported SAR	2.4 GHz WLAN MIMO Reported SAR	Bluetooth Reported SAR	5 GHz WLAN Ant1 Reported SAR	5 GHz WLAN Ant2 Reported SAR	5 GHz WLAN MIMO Reported SAR	psPD + 2.4 GHz WLAN Ant1	psPD + 2.4 GHz WLAN Ant2	psPD + 2.4 GHz WLAN MIMO	psPD + 5 GHz WLAN Ant 1	psPD + 5 GHz WLAN Ant 2	psPD + 5 GHz WLAN MIMO	psPD + 2.4 GHz MIMO + 5 GHz MIMO	psPD + BT	psPD + BT + 5 GHz WLAN Ant 1	psPD + BT + 5GHz WLAN Ant 2	psPD + BT + 5GHz WLAN MIMO
			20.0 dBm	18.5 dBm	18.0 dBm	17.0 dBm	17.5 dBm	10.0 dBm	13.0 dBm												
		mW/cm²	W/kg	W/kg	W/kg	W/kg	W/kg	W/kg	W/kg												
		1	2	3	4	5	6	7	8	1 + 2	1 + 3	1 + 4	1 + 6	1 + 7	1 + 8	1 + 4 + 8	1 + 5	1 + 5 + 6	1 + 5 + 7	1 + 5 + 8
Applicable Limit		1.0	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Back Side	Reported Value	0.891	0.120	0.140	0.143	0.046	0.194	0.202	0.211											
	Ratio to Limit	0.891	0.075	0.088	0.089	0.029	0.121	0.126	0.132											
	Adjusted Ratio to Limit	0.891	0.008	0.009	0.009	0.003	0.012	0.013	0.013	0.899	0.900	0.900	0.903	0.904	0.904	0.913	0.894	0.906	0.907	0.907

Table C-7
5G mmW NR Body-worn Back Side Antenna L - Total Exposure Ratio at WLAN/BT SAR body-worn location

		psPD	2.4 GHz WLAN Ant1 Reported SAR	2.4 GHz WLAN Ant2 Reported SAR	2.4 GHz WLAN MIMO Reported SAR	Bluetooth Reported SAR	5 GHz WLAN Ant1 Reported SAR	5 GHz WLAN Ant2 Reported SAR	5 GHz WLAN MIMO Reported SAR	psPD + 2.4 GHz WLAN Ant1	psPD + 2.4 GHz WLAN Ant2	psPD + 2.4 GHz WLAN MIMO	psPD + 5 GHz WLAN Ant 1	psPD + 5 GHz WLAN Ant 2	psPD + 5 GHz WLAN MIMO	psPD + 2.4 GHz MIMO + 5 GHz MIMO	psPD + BT	psPD + BT + 5 GHz WLAN Ant 1	psPD + BT + 5GHz WLAN Ant 2	psPD + BT + 5GHz WLAN MIMO
			20.0 dBm	18.5 dBm	18.0 dBm	17.0 dBm	17.5 dBm	10.0 dBm	13.0 dBm												
		mW/cm²	W/kg	W/kg	W/kg	W/kg	W/kg	W/kg	W/kg												
		1	2	3	4	5	6	7	8	1 + 2	1 + 3	1 + 4	1 + 6	1 + 7	1 + 8	1 + 4 + 8	1 + 5	1 + 5 + 6	1 + 5 + 7	1 + 5 + 8
Applicable Limit		1.0	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Back Side	Reported Value	0.891	0.120	0.140	0.143	0.046	0.194	0.202	0.211											
	Ratio to Limit	0.891	0.075	0.088	0.089	0.029	0.121	0.126	0.132											
	Adjusted Ratio to Limit	0.089	0.075	0.088	0.089	0.029	0.121	0.126	0.132	0.164	0.177	0.178	0.210	0.215	0.221	**0.310**	0.118	0.239	0.244	0.250

Table C-8
5G mmW NR Hotspot Back Side Antenna L - Total Exposure Ratio at 4cm2 PD hotspot location

		psPD	2.4 GHz WLAN Ant1 Reported SAR	2.4 GHz WLAN Ant2 Reported SAR	2.4 GHz WLAN MIMO Reported SAR	Bluetooth Reported SAR	5 GHz WLAN Ant1 Reported SAR	5 GHz WLAN Ant2 Reported SAR	5 GHz WLAN MIMO Reported SAR	psPD + 2.4 GHz WLAN Ant1	psPD + 2.4 GHz WLAN Ant2	psPD + 2.4 GHz WLAN MIMO	psPD + 5 GHz WLAN Ant 1	psPD + 5 GHz WLAN Ant 2	psPD + 5 GHz WLAN MIMO	psPD + 2.4 GHz MIMO + 5 GHz MIMO	psPD + BT	psPD + BT + 5 GHz WLAN Ant 1	psPD + BT + 5GHz WLAN Ant 2	psPD + BT + 5GHz WLAN MIMO
			20.0 dBm	18.5 dBm	18.0 dBm	17.0 dBm	17.5 dBm	16.5 dBm	13.0 dBm												
		mW/cm²	W/kg	W/kg	W/kg	W/kg	W/kg	W/kg	W/kg												
		1	2	3	4	5	6	7	8	1 + 2	1 + 3	1 + 4	1 + 6	1 + 7	1 + 8	1 + 4 + 8	1 + 5	1 + 5 + 6	1 + 5 + 7	1 + 5 + 8
Applicable Limit		1.0	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Back Side	Reported Value	0.891	0.255	0.351	0.200	0.106	0.046	0.288	0.357											
	Ratio to Limit	0.891	0.159	0.219	0.125	0.066	0.029	0.180	0.223											
	Adjusted Ratio to Limit	0.891	0.016	0.022	0.013	0.007	0.003	0.018	0.022	0.907	0.913	0.904	0.894	0.909	0.913	**0.926**	0.898	0.901	0.916	0.920

Table C-9
5G mmW NR Hotspot Back Side Antenna L - Total Exposure Ratio at WLAN/BT SAR hotspot location

		psPD	2.4 GHz WLAN Ant1 Reported SAR	2.4 GHz WLAN Ant2 Reported SAR	2.4 GHz WLAN MIMO Reported SAR	Bluetooth Reported SAR	5 GHz WLAN Ant1 Reported SAR	5 GHz WLAN Ant2 Reported SAR	5 GHz WLAN MIMO Reported SAR	psPD + 2.4 GHz WLAN Ant1	psPD + 2.4 GHz WLAN Ant2	psPD + 2.4 GHz WLAN MIMO	psPD + 5 GHz WLAN Ant 1	psPD + 5 GHz WLAN Ant 2	psPD + 5 GHz WLAN MIMO	psPD + 2.4 GHz MIMO + 5 GHz MIMO	psPD + BT	psPD + BT + 5 GHz WLAN Ant 1	psPD + BT + 5GHz WLAN Ant 2	psPD + BT + 5GHz WLAN MIMO
			20.0 dBm	18.5 dBm	18.0 dBm	17.0 dBm	17.5 dBm	16.5 dBm	13.0 dBm												
		mW/cm²	W/kg	W/kg	W/kg	W/kg	W/kg	W/kg	W/kg												
		1	2	3	4	5	6	7	8	1 + 2	1 + 3	1 + 4	1 + 6	1 + 7	1 + 8	1 + 4 + 8	1 + 5	1 + 5 + 6	1 + 5 + 7	1 + 5 + 8
Applicable Limit		1.0	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Back Side	Reported Value	0.891	0.255	0.351	0.200	0.106	0.046	0.288	0.357											
	Ratio to Limit	0.891	0.159	0.219	0.125	0.066	0.029	0.180	0.223											
	Adjusted Ratio to Limit	0.089	0.159	0.219	0.125	0.066	0.029	0.180	0.223	0.248	0.308	0.214	0.118	0.269	0.312	**0.437**	0.155	0.184	0.335	0.378

Table C-10
5G mmW NR Phablet Back Side Antenna L - Total Exposure Ratio at 4cm2 PD phablet location

		psPD	5 GHz WLAN Ant1 Reported SAR	5 GHz WLAN Ant2 Reported SAR	5 GHz WLAN MIMO Reported SAR	psPD + 5 GHz WLAN Ant 1	psPD + 5 GHz WLAN Ant 2	psPD + 5 GHz WLAN MIMO
			17.5 dBm	16.5 dBm	13.0 dBm			
		mW/cm²	W/kg	W/kg	W/kg			
		1	2	3	4	1 + 2	1 + 3	1 + 4
Applicable Limit		1.0	4.0	4.0	4.0	1.0	1.0	1.0
Back Side	Reported Value	0.891	0.370	0.631	0.527			
	Ratio to Limit	0.891	0.093	0.158	0.132			
	Ajusted Ratio to Limit	0.891	0.009	0.016	0.013	0.900	**0.907**	0.904

Table C-11
5G mmW NR Phablet Back Side Antenna L - Total Exposure Ratio at WLAN/BT SAR phablet location

		psPD	5 GHz WLAN Ant1 Reported SAR	5 GHz WLAN Ant2 Reported SAR	5 GHz WLAN MIMO Reported SAR	psPD + 5 GHz WLAN Ant 1	psPD + 5 GHz WLAN Ant 2	psPD + 5 GHz WLAN MIMO
			17.5 dBm	16.5 dBm	13.0 dBm			
		mW/cm²	W/kg	W/kg	W/kg			
		1	2	3	4	1 + 2	1 + 3	1 + 4
Applicable Limit		1.0	4.0	4.0	4.0	1.0	1.0	1.0
Back Side	Reported Value	0.891	0.370	0.631	0.527			
	Ratio to Limit	0.891	0.093	0.158	0.132			
	Adjusted Ratio to Limit	0.089	0.093	0.158	0.132	0.182	0.247	0.221

Notes:

1. Worst-case power density results for each test configuration among all antenna arrays and among all supported bands were considered for TER analysis.
2. If test positions were not required to be evaluated for WLAN SAR per FCC KDB publication 248227, the worst-case WLAN SAR result for the applicable exposure conditions was used for simultaneous transmission analysis. Any such values are indicated in the above tables in blue.
3. If Part 1 SAR report does not include standalone WLAN MIMO results, then per KDB Publication 248227 D01v02r02, SAR for MIMO was evaluated by following the simultaneous SAR provisions from KDB Publication 447498 D01v06 by evaluating the sum of the 1g SAR values of each antenna transmitting independently. Any such values are indicated in the above tables in green.
4. Power density results at 2mm were considered as a more conservative for body-worn configurations at a greater separation distance
5. For hotspot back side, power density results at 10mm were used for TER. For all other sides, power density results at 2mm were considered as a more conservative evaluation for hotspot configurations at a greater separation distance.
6. Per FCC guidance, the bands/modes that are not required to be evaluated for Phablet SAR are not considered for TER analysis.
7. Per FCC guidance, for power density measurements, a test separation distance of 2 mm was used for phablet configuration due to probe restraints.
8. Worst-case front side reported psPD was considered for Head TER analysis.
9. The worst-case between Adjusted Reported_psPD and Measured Total psPD was chosen for TER analysis. The bolded psPD values in Table C-1 indicate the worst-case Reported psPD used in TER analysis.
10. In WLAN MIMO operations, each antenna transmits at target powers to achieve the MIMO target powers as indicated above.

The above numerical summed PD and SAR for all the worst-case simultaneous transmission conditions were below the Total Exposure Ratio. Therefore, the above analysis is sufficient to determine no further test cases are required and that simultaneous transmission is compliant to the FCC RF Exposure Limit.

Mathematical Derivation of TER Compliance

$$Total\ Normalized\ RFx\ =\ Normalized\ RFx_{\ Time\ Averaged\ WWAN} + Normalized\ RFx_{\ WLAN}\ \leq\ 1.0 \quad (1)$$

Since WWAN Smart Transmit algorithm adds directly the time-averaged RF exposure from 4G and time-averaged RF exposure from 5G mmW NR, per chipset manufacturer's guidance, Normalized RF exposure from 4G and from 5G mmW NR could be assumed as

$$Normalized\ RFx_{\ Time\ Averaged\ WWAN} = \frac{4G\ SAR}{4G\ SAR\ Limit} + \frac{5G\ mmW\ NR\ psPD}{5G\ mmW\ NR\ psPD\ Limit} \leq 1.0 \quad (2)$$

Smart Transmit algorithm assumes that 4G and 5G mmW NR hotspots are co-located and therefore:

$$Time\ Averaged\ WWAN = [\ x(t)\times A] + [(1\text{-}x(t))\times B] \leq 1.0\ Normalized\ Limit \quad (3)$$

A = Max normalized time-averaged SAR exposure from 4G
B = Max normalized time-averaged PD exposure from 5G mmW NR

x(t) = Ranges between [0,1]
x(t)× A = Percentage of normalized time-averaged RF exposure from 4G
(1-x(t))× B = Remaining percentage of RF exposure contribution from 5G mmW NR

Smart Transmit controls "*x*" in real time such that the sum of these exposures never exceeds 1.0 Normalized Limit. If the equations below (4a, 4b) are proven, then, mathematically equation (5) would be proven.

$$A\ +\ norm.\ SAR\ from\ WLAN \leq 1.0\ normalized\ limit \quad (4a)$$

$$B\ +\ norm.\ SAR\ from\ WLAN \leq 1.0\ normalized\ limit \quad (4b)$$

$$[x(t)\times A] + [(1-x(t))\times B] +\ norm.\ SAR\ from\ WLAN \leq 1.0\ normalized\ limit \quad (5)$$

Without 5G mmW NR, Smart Transmit limits the maximum RF exposure contributed from 4G to 100% normalized exposure. For this device, the manufacturer has added an additional permanent back-off (indicated below as WWAN backoff) for every beam in the calculations for input.power.limits used in the EFS file. Therefore,

Smart Tx WWAN: A = max (normalized SAR exposure from 4G) $\leq 1.0\ normalized\ limit$ (6a)

Smart Tx WWAN: B = max (normalized PD exposure from 5G mmW NR)x10$^{(-WWAN\ backoff\ in\ dB)/10}$ $\leq 1.0\ normalized\ limit$ (6b)

To demonstrate simultaneous transmission compliance in equation (1), below equations (7a & 7b) obtained by combining equations (4a & 4b) and (6a & 6b), should be proven for simultaneous transmission compliance:

$$Total\ Normalized\ RFx\ =\ Normalized\ SAR_{\ 4G\ WWAN} + Normalized\ SAR_{\ WLAN} < 1.0 \quad (7a)$$

$$Total\ Normalized\ RFx\ =\ 10^{(-WWAN\ backoff\ in\ dB)/10} x\ Normalized\ psPD_{\ 5G\ mmW\ NR\ WWAN} + Normalized\ SAR_{\ WLAN} < 1.0 \quad (7b)$$

which are re-written as:

$$Total\ Normalized\ RFx\ =\ \frac{4G\ SAR}{4G\ SAR\ Limit} + \frac{WLAN\ SAR}{WLAN\ SAR\ Limit} < 1 \quad (8a)$$

$$Total\ Normalized\ RFx\ =\ 10^{(-WWAN\ backoff\ in\ dB)/10} * \frac{5G\ mmW\ NR\ psPD}{5G\ mmW\ NR\ psPD\ Limit} + \frac{WLAN\ SAR}{WLAN\ SAR\ Limit} < 1 \quad (8b)$$

Analysis for equation (8a) is performed in Section 12 of FCC SAR Evaluation Report (Part 1). Analysis for equation (8b) is performed in this appendix.

APPENDIX E: EQUIPMENT CALIBRATION CERTIFICATES

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

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S Servizio svizzero di taratura
S Swiss Calibration Service

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

Accreditation No.: SCS 0108

Client PC Test

Certificate No: 5G-Veri30-1035_Feb20

CALIBRATION CERTIFICATE

Object	5G Verification Source 30 GHz - SN: 1035
Calibration procedure(s)	QA CAL-45.v2 Calibration procedure for sources in air above 6 GHz
Calibration date:	February 12, 2020

MAB 4/8/20

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
Reference Probe EUmmWV3	SN: 9374	31-Dec-19 (No. EUmmWV3-9374_Dec19)	Dec-20
DAE4ip	SN: 1602	01-Oct-19 (No. DAE4ip-1602_Oct19)	Oct-20

Secondary Standards	ID #	Check Date (in house)	Scheduled Check

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

Issued: February 18, 2020

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

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

Accreditation No.: SCS 0108

Glossary

CW Continuous wave

Calibration is Performed According to the Following Standards

- Internal procedure QA CAL-45-5Gsources
- IEC TR 63170 ED1, "Measurement procedure for the evaluation of power density related to human exposure to radio frequency fields from wireless communication devices operating between 6 GHz and 100 GHz", January 2018

Methods Applied and Interpretation of Parameters

- *Coordinate System:* z-axis in the waveguide horn boresight, x-axis is in the direction of the E-field, y-axis normal to the others in the field scanning plane parallel to the horn flare and horn flange.
- *Measurement Conditions: (1) 10 GHz:* The forward power to the horn antenna is measured prior and after the measurement with a power sensor. During the measurements, the horn is directly connected to the cable and the antenna ohmic and mismatch losses are determined by far-field measurements. *(2) 30, 45, 60 and 90 GHz:* The verification sources are switched on for at least 30 minutes. Absorbers are used around the probe cub and at the ceiling to minimize reflections.
- *Horn Positioning:* The waveguide horn is mounted vertically on the flange of the waveguide source to allow vertical positioning of the EUmmW probe during the scan. The plane is parallel to the phantom surface. Probe distance is verified using mechanical gauges positioned on the flare of the horn.
- *E- field distribution:* E field is measured in two x-y-plane (10mm, 10mm + $\lambda/4$) with a vectorial E-field probe. The E-field value stated as calibration value represents the E-field-maxima and the averaged (1cm^2 and 4cm^2) power density values at 10mm in front of the horn.
- *Field polarization:* Above the open horn, linear polarization of the field is expected. This is verified graphically in the field representation.

Calibrated Quantity

- Local peak E-field (V/m) and peak values of the total and normal component of the poynting vector |Re{S}| and n.Re{S} averaged over the surface area of 1 cm^2 ($pS_{tot}avg1cm^2$ and $pS_navg1cm^2$) and 4cm^2 ($pS_{tot}avg4cm^2$ and $pS_navg4cm^2$) at the nominal operational frequency of the verification source.

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	cDASY6 Module mmWave	V2.0
Phantom	5G Phantom	
Distance Horn Aperture - plane	10 mm	
XY Scan Resolution	dx, dy = 2.5 mm	
Number of measured planes	2 (10mm, 10mm + λ/4)	
Frequency	30 GHz ± 10 MHz	

Calibration Parameters, 30 GHz

Distance Horn Aperture to Measured Plane	***Prad*[1] *(mW)***	**Max E-field (V/m)**	Uncertainty (k = 2)	Avg Power Density n.Re{S}, |Re{S}| (W/m2)		Uncertainty (k = 2)
				1 cm^2	**4** cm^2	
10 mm	29.0	**126**	1.27 dB	**36.5, 36.9**	**32.1, 32.5**	1.28 dB

[1] derived from far-field data

DASY Report

Measurement Report for 5G Verification Source 30 GHz, UID 0 -, Channel 30000 (30000.0MHz)

Device under Test Properties

Name, Manufacturer	Dimensions [mm]	IMEI	DUT Type
5G Verification Source 30 GHz	100.0 x 100.0 x 100.0	SN: 1035	-

Exposure Conditions

Phantom Section	Position, Test Distance [mm]	Band	Group,	Frequency [MHz], Channel Number	Conversion Factor
5G -	5.55 mm	Validation band	CW	30000.0, 30000	1.0

Hardware Setup

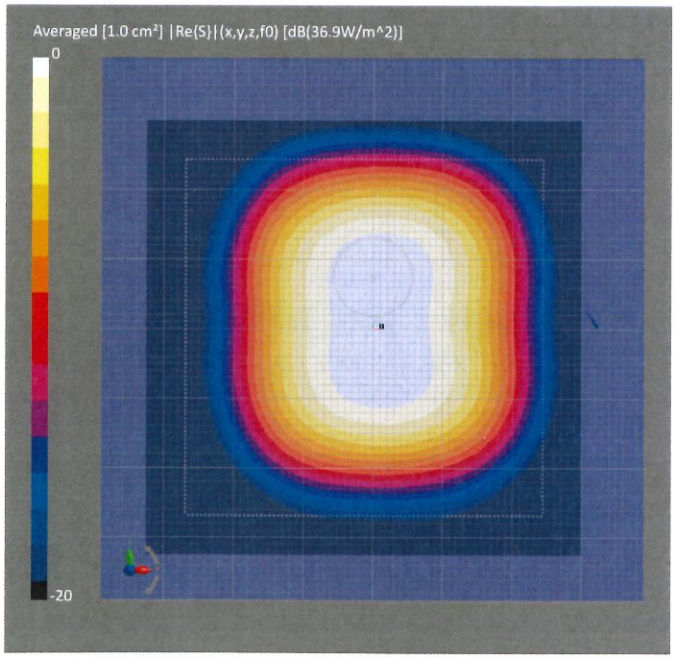
Phantom	Medium	Probe, Calibration Date	DAE, Calibration Date
mmWave Phantom - 1002	Air	EUmmWV3 - SN9374_F1-78GHz, 2019-12-31	DAE4ip Sn1602, 2019-10-01

Scan Setup

	5G Scan
Grid Extents [mm]	60.0 x 60.0
Grid Steps [lambda]	0.25 x 0.25
Sensor Surface [mm]	5.55
MAIA	MAIA not used

Measurement Results

	5G Scan
Date	2020-02-12, 08:14
Avg. Area [cm²]	1.00
pS_{tot} avg [W/m²]	36.9
pS_n avg [W/m²]	36.5
E_{peak} [V/m]	126
Power Drift [dB]	-0.05



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Accreditation No.: SCS 0108

Client PC Test

Certificate No: 5G-Veri30-1044_May20

CALIBRATION CERTIFICATE

Object	5G Verification Source 30 GHz - SN: 1044
Calibration procedure(s)	QA CAL-45.v3 Calibration procedure for sources in air above 6 GHz
Calibration date:	May 14, 2020

MAB 6/2/20

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
Reference Probe EUmmWV3	SN: 9374	31-Dec-19 (No. EUmmWV3-9374_Dec19)	Dec-20
DAE4ip	SN: 1602	01-Oct-19 (No. DAE4ip-1602_Oct19)	Oct-20

Secondary Standards	ID #	Check Date (in house)	Scheduled Check

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

Issued: May 18, 2020

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

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Accreditation No.: SCS 0108

Glossary

CW Continuous wave

Calibration is Performed According to the Following Standards

- Internal procedure QA CAL-45-5Gsources
- IEC TR 63170 ED1, "Measurement procedure for the evaluation of power density related to human exposure to radio frequency fields from wireless communication devices operating between 6 GHz and 100 GHz", January 2018

Methods Applied and Interpretation of Parameters

- *Coordinate System:* z-axis in the waveguide horn boresight, x-axis is in the direction of the E-field, y-axis normal to the others in the field scanning plane parallel to the horn flare and horn flange.
- *Measurement Conditions: (1) 10 GHz:* The forward power to the horn antenna is measured prior and after the measurement with a power sensor. During the measurements, the horn is directly connected to the cable and the antenna ohmic and mismatch losses are determined by far-field measurements. *(2) 30, 45, 60 and 90 GHz*: The verification sources are switched on for at least 30 minutes. Absorbers are used around the probe cub and at the ceiling to minimize reflections.
- *Horn Positioning:* The waveguide horn is mounted vertically on the flange of the waveguide source to allow vertical positioning of the EUmmW probe during the scan. The plane is parallel to the phantom surface. Probe distance is verified using mechanical gauges positioned on the flare of the horn.
- *E- field distribution:* E field is measured in two x-y-plane (10mm, 10mm + λ/4) with a vectorial E-field probe. The E-field value stated as calibration value represents the E-field-maxima and the averaged (1cm^2 and 4cm^2) power density values at 10mm in front of the horn.
- *Field polarization:* Above the open horn, linear polarization of the field is expected. This is verified graphically in the field representation.

Calibrated Quantity

- Local peak E-field (V/m) and peak values of the total and normal component of the poynting vector |Re{S}| and n.Re{S} averaged over the surface area of 1 cm^2 ($pS_{tot}avg1cm^2$ and $pS_navg1cm^2$) and 4cm^2 ($pS_{tot}avg4cm^2$ and $pS_navg4cm^2$) at the nominal operational frequency of the verification source.

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	cDASY6 Module mmWave	V2.0
Phantom	5G Phantom	
Distance Horn Aperture - plane	10 mm	
XY Scan Resolution	dx, dy = 2.5 mm	
Number of measured planes	2 (10mm, 10mm + λ/4)	
Frequency	30 GHz ± 10 MHz	

Calibration Parameters, 30 GHz

Distance Horn Aperture to Measured Plane	***Prad*[1] *(mW)***	**Max E-field (V/m)**	Uncertainty (k = 2)	Avg Power Density n.Re{S}, |Re{S}| (W/m2)		Uncertainty (k = 2)
				1 cm^2	4 cm^2	
10 mm	32.5	**131**	1.27 dB	**39.3, 39.8**	**34.7, 35.0**	1.28 dB

[1] derived from far-field data

DASY Report

Measurement Report for 5G Verification Source 30 GHz, UID 0 -, Channel 30000 (30000.0MHz)

Device under Test Properties

Name, Manufacturer	Dimensions [mm]	IMEI	DUT Type
5G Verification Source 30 GHz	100.0 x 100.0 x 100.0	SN: 1044	-

Exposure Conditions

Phantom Section	Position, Test Distance [mm]	Band	Group,	Frequency [MHz], Channel Number	Conversion Factor
5G -	5.55 mm	Validation band	CW	30000.0, 30000	1.0

Hardware Setup

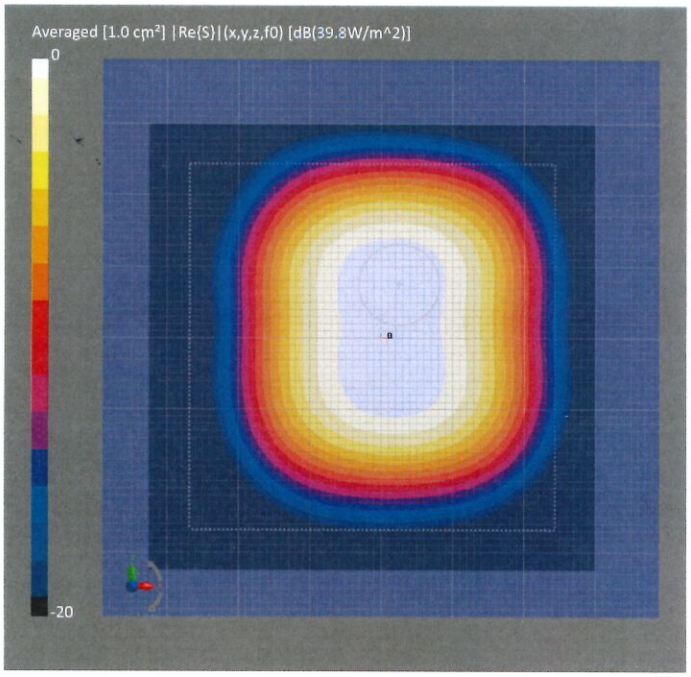
Phantom	Medium	Probe, Calibration Date	DAE, Calibration Date
mmWave Phantom - 1002	Air	EUmmWV3 - SN9374_F1-78GHz, 2019-12-31	DAE4ip Sn1602, 2019-10-01

Scan Setup

	5G Scan
Grid Extents [mm]	60.0 x 60.0
Grid Steps [lambda]	0.25 x 0.25
Sensor Surface [mm]	5.55
MAIA	MAIA not used

Measurement Results

	5G Scan
Date	2020-05-14, 16:40
Avg. Area [cm²]	1.00
pS_{tot} avg [W/m²]	39.8
pS_n avg [W/m²]	39.3
E_{peak} [V/m]	131
Power Drift [dB]	-0.02



DASY Report

Measurement Report for 5G Verification Source 30 GHz, UID 0 -, Channel 30000 (30000.0MHz)

Device under Test Properties

Name, Manufacturer	Dimensions [mm]	IMEI	DUT Type
5G Verification Source 30 GHz	100.0 x 100.0 x 100.0	SN: 1044	-

Exposure Conditions

Phantom Section	Position, Test Distance [mm]	Band	Group,	Frequency [MHz], Channel Number	Conversion Factor
5G -	5.55 mm	Validation band	CW	30000.0, 30000	1.0

Hardware Setup

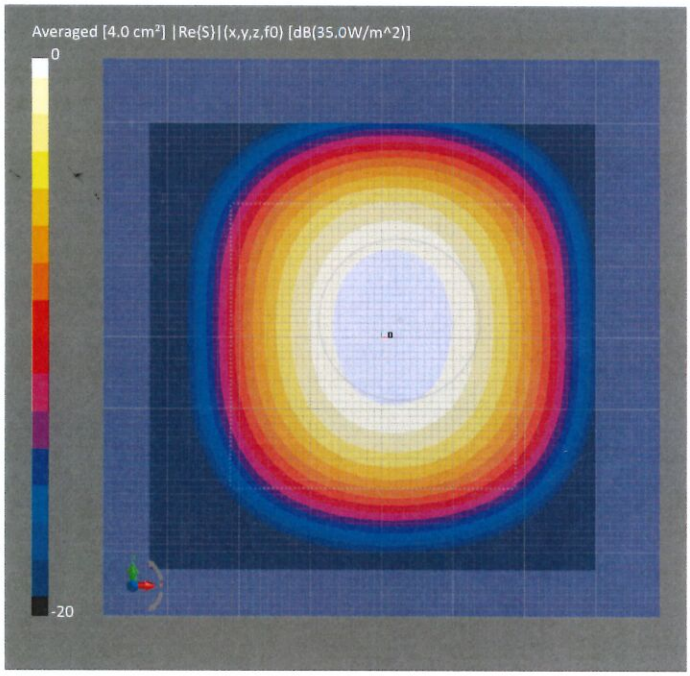
Phantom	Medium	Probe, Calibration Date	DAE, Calibration Date
mmWave Phantom - 1002	Air	EUmmWV3 - SN9374_F1-78GHz, 2019-12-31	DAE4ip Sn1602, 2019-10-01

Scan Setup

	5G Scan
Grid Extents [mm]	60.0 x 60.0
Grid Steps [lambda]	0.25 x 0.25
Sensor Surface [mm]	5.55
MAIA	MAIA not used

Measurement Results

	5G Scan
Date	2020-05-14, 16:40
Avg. Area [cm²]	4.00
pS_{tot} avg [W/m²]	35.0
pS_n avg [W/m²]	34.7
E_{peak} [V/m]	131
Power Drift [dB]	-0.02



Calibration Laboratory of
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Accreditation No.: SCS 0108

Client PC Test

Certificate No: EUmmWV3-9407_Dec19

CALIBRATION CERTIFICATE

MAB 4/10/20

Object: EUmmWV3 - SN:9407

Calibration procedure(s): QA CAL-02.v9, QA CAL-25.v7, QA CAL-42.v2
Calibration procedure for E-field probes optimized for close near field evaluations in air

Calibration date: December 10, 2019

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID	Cal Date (Certificate No.)	Scheduled Calibration
Power meter NRP	SN: 104778	03-Apr-19 (No. 217-02892/02893)	Apr-20
Power sensor NRP-Z91	SN: 103244	03-Apr-19 (No. 217-02892)	Apr-20
Power sensor NRP-Z91	SN: 103245	03-Apr-19 (No. 217-02893)	Apr-20
Reference 20 dB Attenuator	SN: S5277 (20x)	04-Apr-19 (No. 217-02894)	Apr-20
Reference Probe ER3DV6	SN: 2328	05-Oct-19 (No. ER3-2328_Oct19)	Oct-20
DAE4	SN: 789	14-Jan-19 (No. DAE4-789_Jan19)	Jan-20
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 HP 8753E	SN: US37390585	18-Oct-01 (in house check Oct-19)	In house check: Oct-20

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

Issued: December 17, 2019

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Glossary:

NORMx,y,z	sensitivity in free space
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
Sensor Angles	sensor deviation from the probe axis, used to calculate the field orientation and polarization
k	is the wave propagation direction

Calibration is Performed According to the Following Standards:

a) IEEE Std 1309-2005, "IEEE Standard for calibration of electromagnetic field sensors and probes, excluding antennas, from 9 kHz to 40 GHz", December 2005

Methods Applied and Interpretation of Parameters:

- *NORMx,y,z:* Assessed for E-field polarization ϑ = 0 for XY sensors and ϑ = 90 for Z sensor (f ≤ 900 MHz in TEM-cell; f > 1800 MHz: R22 waveguide). For frequencies > 6 GHz, the far field in front of waveguide horn antennas is measured for a set of frequencies in various waveguide bands up to 110 GHz.
- *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
- The frequency sensor model parameters are determined prior to calibration based on a frequency sweep (sensor model involving resistors R, R_p, inductance L and capacitors C, C_p).
- *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.
- *Sensor Offset*: The sensor offset corresponds to the mechanical 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).
- *Equivalent Sensor Angle*: The two probe sensors are mounted in the same plane at different angles. The angles are assessed using the information gained by determining the *NORMx* (no uncertainty required).
- *Spherical isotropy (3D deviation from isotropy)*: in a locally homogeneous field realized using an open waveguide / horn setup.

DASY - Parameters of Probe: EUmmWV3 - SN:9407

Basic Calibration Parameters

	Sensor X	Sensor Y	Unc (k=2)
Norm ($\mu V/(V/m)^2$)	0.02290	0.02745	± 10.1 %
DCP (mV)[B]	102.0	113.0	
Equivalent Sensor Angle	-58.6	31.2	

Calibration results for Frequency Response (750 MHz – 110 GHz)

Frequency GHz	Target E-Field V/m	Deviation Sensor X dB	Deviation Sensor Y dB	Unc (k=2) dB
0.75	77.2	-0.15	0.33	± 0.43 dB
1.8	140.4	0.13	0.23	± 0.43 dB
2	133.0	0.07	0.13	± 0.43 dB
2.2	124.8	0.05	0.04	± 0.43 dB
2.5	123.0	-0.07	-0.19	± 0.43 dB
3.5	256.2	0.02	-0.32	± 0.43 dB
3.7	249.8	0.08	-0.30	± 0.43 dB
6.6	41.8	0.47	0.49	± 0.98 dB
8	48.4	-0.03	-0.20	± 0.98 dB
10	54.4	-0.04	0.00	± 0.98 dB
15	71.5	0.36	-0.21	± 0.98 dB
18	85.3	-0.36	0.03	± 0.98 dB
26.6	96.9	-0.14	0.03	± 0.98 dB
30	92.6	0.12	0.08	± 0.98 dB
35	93.7	-0.37	-0.21	± 0.98 dB
40	91.5	-0.62	-0.59	± 0.98 dB
50	19.6	-0.07	0.01	± 0.98 dB
55	22.4	0.68	0.42	± 0.98 dB
60	23.0	0.06	0.02	± 0.98 dB
65	27.4	-0.38	-0.09	± 0.98 dB
70	23.9	-0.15	-0.23	± 0.98 dB
75	20.0	-0.09	-0.06	± 0.98 dB
75	14.8	0.10	0.21	± 0.98 dB
80	22.5	0.38	0.35	± 0.98 dB
85	22.8	0.13	0.09	± 0.98 dB
90	23.8	-0.03	0.04	± 0.98 dB
92	23.9	0.12	-0.08	± 0.98 dB
95	20.5	-0.03	-0.19	± 0.98 dB
97	24.4	-0.06	-0.15	± 0.98 dB
100	22.6	0.09	-0.07	± 0.98 dB
105	22.7	-0.08	0.00	± 0.98 dB
110	19.7	0.08	0.23	± 0.98 dB

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%.

[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.

DASY - Parameters of Probe: EUmmWV3 - SN:9407

Calibration Results for Modulation Response

UID	Communication System Name		A dB	B dB√μV	C	D dB	VR mV	Max dev.	Max Unc^E (k=2)
0	CW	X	0.00	0.00	1.00	0.00	109.4	± 2.7 %	± 4.7 %
		Y	0.00	0.00	1.00		86.2		
10352-AAA	Pulse Waveform (200Hz, 10%)	X	2.12	60.00	13.39	10.00	6.0	± 1.3 %	± 9.6 %
		Y	1.41	60.00	14.71		6.0		
10353-AAA	Pulse Waveform (200Hz, 20%)	X	1.37	60.00	12.36	6.99	12.0	± 0.8 %	± 9.6 %
		Y	0.94	60.00	13.81		12.0		
10354-AAA	Pulse Waveform (200Hz, 40%)	X	0.78	60.00	11.17	3.98	23.0	± 1.0 %	± 9.6 %
		Y	0.56	60.00	12.74		23.0		
10355-AAA	Pulse Waveform (200Hz, 60%)	X	0.48	60.00	10.18	2.22	27.0	± 0.9 %	± 9.6 %
		Y	0.38	60.00	11.82		27.0		
10387-AAA	QPSK Waveform, 1 MHz	X	1.19	117.15	13.96	0.00	22.0	± 1.1 %	± 9.6 %
		Y	3.79	84.56	1.83		22.0		
10388-AAA	QPSK Waveform, 10 MHz	X	1.27	60.00	11.50	0.00	22.0	± 0.6 %	± 9.6 %
		Y	1.17	60.00	11.99		22.0		
10396-AAA	64-QAM Waveform, 100 kHz	X	1.93	60.00	13.68	3.01	17.0	± 0.6 %	± 9.6 %
		Y	1.90	60.00	13.43		17.0		
10399-AAA	64-QAM Waveform, 40 MHz	X	2.13	60.00	12.16	0.00	19.0	± 0.7 %	± 9.6 %
		Y	1.93	60.00	12.50		19.0		
10414-AAA	WLAN CCDF, 64-QAM, 40MHz	X	3.20	60.00	12.63	0.00	12.0	± 0.8 %	± 9.6 %
		Y	2.86	60.00	12.92		12.0		

Note: For details on all calibrated UID parameters see Appendix

Calibration Results for Linearity Response

Frequency GHz	Target E-Field V/m	Deviation Sensor X dB	Deviation Sensor Y dB	Unc (k=2) dB
0.9	50.0	0.10	-0.02	± 0.2 dB
0.9	100.0	0.01	0.02	± 0.2 dB
0.9	500.0	0.00	-0.02	± 0.2 dB
0.9	1000.0	0.03	0.01	± 0.2 dB
0.9	1500.0	0.00	0.00	± 0.2 dB
0.9	2000.0	-0.04	0.01	± 0.2 dB

Sensor Frequency Model Parameters (750 MHz – 78 GHz)

	Sensor X	Sensor Y
R (Ω)	47.82	49.82
R_p (Ω)	92.12	88.50
L (nH)	0.03674	0.04042
C (pF)	0.2744	0.2956
C_p (pF)	0.1087	0.1004

Sensor Frequency Model Parameters (55 GHz – 110 GHz)

	Sensor X	Sensor Y
R (Ω)	34.05	43.37
R_p (Ω)	97.85	91.31
L (nH)	0.03646	0.02927
C (pF)	0.1587	0.3237
C_p (pF)	0.1222	0.1221

DASY - Parameters of Probe: EUmmWV3 - SN:9407

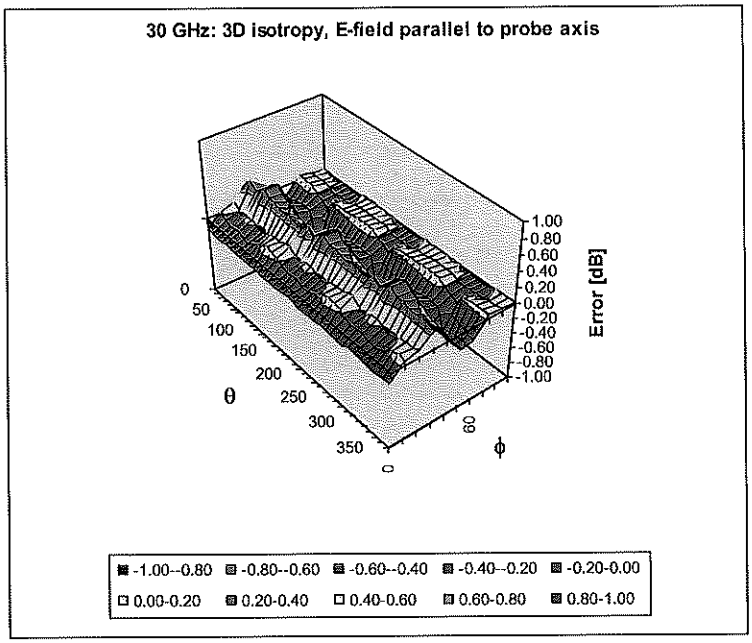
Sensor Model Parameters

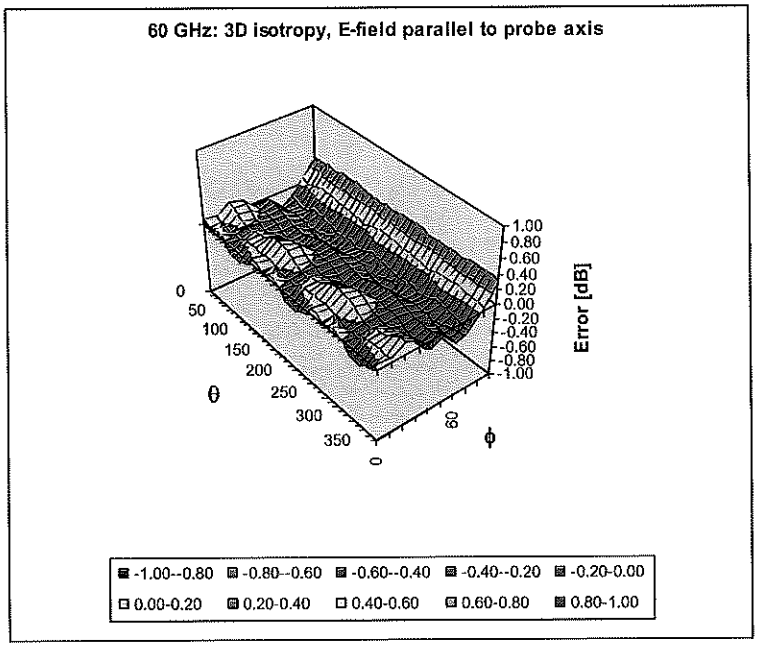
	C1 fF	C2 fF	α V^{-1}	T1 $ms.V^{-2}$	T2 $ms.V^{-1}$	T3 ms	T4 V^{-2}	T5 V^{-1}	T6
X	28.4	213.34	35.57	0.92	3.76	4.99	0.00	1.13	1.01
Y	28.5	198.32	31.35	0.92	2.68	5.01	0.00	1.20	1.00

Other Probe Parameters

Sensor Arrangement	Rectangular
Connector Angle (°)	201.2
Mechanical Surface Detection Mode	enabled
Optical Surface Detection Mode	disabled
Probe Overall Length	320 mm
Probe Body Diameter	8 mm
Tip Length	23 mm
Tip Diameter	8.0 mm
Probe Tip to Sensor X Calibration Point	1.5 mm
Probe Tip to Sensor Y Calibration Point	1.5 mm

Deviation from Isotropy in Air
f = 30, 60 GHz





Probe isotropy for E_{tot}: probe rotated φ = 0° to 360°, tilted from field propagation direction $\vec{k}$
Parallel to the field propagation (ψ =0° - 90°) at 30 GHz: deviation within ± 0.39 dB
Parallel to the field propagation (ψ =0° - 90°) at 60 GHz: deviation within ± 0.30 dB

Appendix: Modulation Calibration Parameters

UID	Rev	Communication System Name	Group	PAR (dB)	Unc[E] (k=2)
0		CW	CW	0.00	± 4.7 %
10010	CAA	SAR Validation (Square, 100ms, 10ms)	Test	10.00	± 9.6 %
10011	CAB	UMTS-FDD (WCDMA)	WCDMA	2.91	± 9.6 %
10012	CAB	IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps)	WLAN	1.87	± 9.6 %
10013	CAB	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 6 Mbps)	WLAN	9.46	± 9.6 %
10021	DAC	GSM-FDD (TDMA, GMSK)	GSM	9.39	± 9.6 %
10023	DAC	GPRS-FDD (TDMA, GMSK, TN 0)	GSM	9.57	± 9.6 %
10024	DAC	GPRS-FDD (TDMA, GMSK, TN 0-1)	GSM	6.56	± 9.6 %
10025	DAC	EDGE-FDD (TDMA, 8PSK, TN 0)	GSM	12.62	± 9.6 %
10026	DAC	EDGE-FDD (TDMA, 8PSK, TN 0-1)	GSM	9.55	± 9.6 %
10027	DAC	GPRS-FDD (TDMA, GMSK, TN 0-1-2)	GSM	4.80	± 9.6 %
10028	DAC	GPRS-FDD (TDMA, GMSK, TN 0-1-2-3)	GSM	3.55	± 9.6 %
10029	DAC	EDGE-FDD (TDMA, 8PSK, TN 0-1-2)	GSM	7.78	± 9.6 %
10030	CAA	IEEE 802.15.1 Bluetooth (GFSK, DH1)	Bluetooth	5.30	± 9.6 %
10031	CAA	IEEE 802.15.1 Bluetooth (GFSK, DH3)	Bluetooth	1.87	± 9.6 %
10032	CAA	IEEE 802.15.1 Bluetooth (GFSK, DH5)	Bluetooth	1.16	± 9.6 %
10033	CAA	IEEE 802.15.1 Bluetooth (PI/4-DQPSK, DH1)	Bluetooth	7.74	± 9.6 %
10034	CAA	IEEE 802.15.1 Bluetooth (PI/4-DQPSK, DH3)	Bluetooth	4.53	± 9.6 %
10035	CAA	IEEE 802.15.1 Bluetooth (PI/4-DQPSK, DH5)	Bluetooth	3.83	± 9.6 %
10036	CAA	IEEE 802.15.1 Bluetooth (8-DPSK, DH1)	Bluetooth	8.01	± 9.6 %
10037	CAA	IEEE 802.15.1 Bluetooth (8-DPSK, DH3)	Bluetooth	4.77	± 9.6 %
10038	CAA	IEEE 802.15.1 Bluetooth (8-DPSK, DH5)	Bluetooth	4.10	± 9.6 %
10039	CAB	CDMA2000 (1xRTT, RC1)	CDMA2000	4.57	± 9.6 %
10042	CAB	IS-54 / IS-136 FDD (TDMA/FDM, PI/4-DQPSK, Halfrate)	AMPS	7.78	± 9.6 %
10044	CAA	IS-91/EIA/TIA-553 FDD (FDMA, FM)	AMPS	0.00	± 9.6 %
10048	CAA	DECT (TDD, TDMA/FDM, GFSK, Full Slot, 24)	DECT	13.80	± 9.6 %
10049	CAA	DECT (TDD, TDMA/FDM, GFSK, Double Slot, 12)	DECT	10.79	± 9.6 %
10056	CAA	UMTS-TDD (TD-SCDMA, 1.28 Mcps)	TD-SCDMA	11.01	± 9.6 %
10058	DAC	EDGE-FDD (TDMA, 8PSK, TN 0-1-2-3)	GSM	6.52	± 9.6 %
10059	CAB	IEEE 802.11b WiFi 2.4 GHz (DSSS, 2 Mbps)	WLAN	2.12	± 9.6 %
10060	CAB	IEEE 802.11b WiFi 2.4 GHz (DSSS, 5.5 Mbps)	WLAN	2.83	± 9.6 %
10061	CAB	IEEE 802.11b WiFi 2.4 GHz (DSSS, 11 Mbps)	WLAN	3.60	± 9.6 %
10062	CAC	IEEE 802.11a/h WiFi 5 GHz (OFDM, 6 Mbps)	WLAN	8.68	± 9.6 %
10063	CAC	IEEE 802.11a/h WiFi 5 GHz (OFDM, 9 Mbps)	WLAN	8.63	± 9.6 %
10064	CAC	IEEE 802.11a/h WiFi 5 GHz (OFDM, 12 Mbps)	WLAN	9.09	± 9.6 %
10065	CAC	IEEE 802.11a/h WiFi 5 GHz (OFDM, 18 Mbps)	WLAN	9.00	± 9.6 %
10066	CAC	IEEE 802.11a/h WiFi 5 GHz (OFDM, 24 Mbps)	WLAN	9.38	± 9.6 %
10067	CAC	IEEE 802.11a/h WiFi 5 GHz (OFDM, 36 Mbps)	WLAN	10.12	± 9.6 %
10068	CAC	IEEE 802.11a/h WiFi 5 GHz (OFDM, 48 Mbps)	WLAN	10.24	± 9.6 %
10069	CAC	IEEE 802.11a/h WiFi 5 GHz (OFDM, 54 Mbps)	WLAN	10.56	± 9.6 %
10071	CAB	IEEE 802.11g WiFi 2.4 GHz (DSSS/OFDM, 9 Mbps)	WLAN	9.83	± 9.6 %
10072	CAB	IEEE 802.11g WiFi 2.4 GHz (DSSS/OFDM, 12 Mbps)	WLAN	9.62	± 9.6 %
10073	CAB	IEEE 802.11g WiFi 2.4 GHz (DSSS/OFDM, 18 Mbps)	WLAN	9.94	± 9.6 %
10074	CAB	IEEE 802.11g WiFi 2.4 GHz (DSSS/OFDM, 24 Mbps)	WLAN	10.30	± 9.6 %
10075	CAB	IEEE 802.11g WiFi 2.4 GHz (DSSS/OFDM, 36 Mbps)	WLAN	10.77	± 9.6 %
10076	CAB	IEEE 802.11g WiFi 2.4 GHz (DSSS/OFDM, 48 Mbps)	WLAN	10.94	± 9.6 %
10077	CAB	IEEE 802.11g WiFi 2.4 GHz (DSSS/OFDM, 54 Mbps)	WLAN	11.00	± 9.6 %
10081	CAB	CDMA2000 (1xRTT, RC3)	CDMA2000	3.97	± 9.6 %
10082	CAB	IS-54 / IS-136 FDD (TDMA/FDM, PI/4-DQPSK, Fullrate)	AMPS	4.77	± 9.6 %
10090	DAC	GPRS-FDD (TDMA, GMSK, TN 0-4)	GSM	6.56	± 9.6 %
10097	CAB	UMTS-FDD (HSDPA)	WCDMA	3.98	± 9.6 %
10098	CAB	UMTS-FDD (HSUPA, Subtest 2)	WCDMA	3.98	± 9.6 %
10099	DAC	EDGE-FDD (TDMA, 8PSK, TN 0-4)	GSM	9.55	± 9.6 %
10100	CAE	LTE-FDD (SC-FDMA, 100% RB, 20 MHz, QPSK)	LTE-FDD	5.67	± 9.6 %
10101	CAE	LTE-FDD (SC-FDMA, 100% RB, 20 MHz, 16-QAM)	LTE-FDD	6.42	± 9.6 %
10102	CAE	LTE-FDD (SC-FDMA, 100% RB, 20 MHz, 64-QAM)	LTE-FDD	6.60	± 9.6 %
10103	CAG	LTE-TDD (SC-FDMA, 100% RB, 20 MHz, QPSK)	LTE-TDD	9.29	± 9.6 %
10104	CAG	LTE-TDD (SC-FDMA, 100% RB, 20 MHz, 16-QAM)	LTE-TDD	9.97	± 9.6 %
10105	CAG	LTE-TDD (SC-FDMA, 100% RB, 20 MHz, 64-QAM)	LTE-TDD	10.01	± 9.6 %
10108	CAG	LTE-FDD (SC-FDMA, 100% RB, 10 MHz, QPSK)	LTE-FDD	5.80	± 9.6 %

10109	CAG	LTE-FDD (SC-FDMA, 100% RB, 10 MHz, 16-QAM)	LTE-FDD	6.43	± 9.6 %
10110	CAG	LTE-FDD (SC-FDMA, 100% RB, 5 MHz, QPSK)	LTE-FDD	5.75	± 9.6 %
10111	CAG	LTE-FDD (SC-FDMA, 100% RB, 5 MHz, 16-QAM)	LTE-FDD	6.44	± 9.6 %
10112	CAG	LTE-FDD (SC-FDMA, 100% RB, 10 MHz, 64-QAM)	LTE-FDD	6.59	± 9.6 %
10113	CAG	LTE-FDD (SC-FDMA, 100% RB, 5 MHz, 64-QAM)	LTE-FDD	6.62	± 9.6 %
10114	CAC	IEEE 802.11n (HT Greenfield, 13.5 Mbps, BPSK)	WLAN	8.10	± 9.6 %
10115	CAC	IEEE 802.11n (HT Greenfield, 81 Mbps, 16-QAM)	WLAN	8.46	± 9.6 %
10116	CAC	IEEE 802.11n (HT Greenfield, 135 Mbps, 64-QAM)	WLAN	8.15	± 9.6 %
10117	CAC	IEEE 802.11n (HT Mixed, 13.5 Mbps, BPSK)	WLAN	8.07	± 9.6 %
10118	CAC	IEEE 802.11n (HT Mixed, 81 Mbps, 16-QAM)	WLAN	8.59	± 9.6 %
10119	CAC	IEEE 802.11n (HT Mixed, 135 Mbps, 64-QAM)	WLAN	8.13	± 9.6 %
10140	CAE	LTE-FDD (SC-FDMA, 100% RB, 15 MHz, 16-QAM)	LTE-FDD	6.49	± 9.6 %
10141	CAE	LTE-FDD (SC-FDMA, 100% RB, 15 MHz, 64-QAM)	LTE-FDD	6.53	± 9.6 %
10142	CAE	LTE-FDD (SC-FDMA, 100% RB, 3 MHz, QPSK)	LTE-FDD	5.73	± 9.6 %
10143	CAE	LTE-FDD (SC-FDMA, 100% RB, 3 MHz, 16-QAM)	LTE-FDD	6.35	± 9.6 %
10144	CAE	LTE-FDD (SC-FDMA, 100% RB, 3 MHz, 64-QAM)	LTE-FDD	6.65	± 9.6 %
10145	CAF	LTE-FDD (SC-FDMA, 100% RB, 1.4 MHz, QPSK)	LTE-FDD	5.76	± 9.6 %
10146	CAF	LTE-FDD (SC-FDMA, 100% RB, 1.4 MHz, 16-QAM)	LTE-FDD	6.41	± 9.6 %
10147	CAF	LTE-FDD (SC-FDMA, 100% RB, 1.4 MHz, 64-QAM)	LTE-FDD	6.72	± 9.6 %
10149	CAE	LTE-FDD (SC-FDMA, 50% RB, 20 MHz, 16-QAM)	LTE-FDD	6.42	± 9.6 %
10150	CAE	LTE-FDD (SC-FDMA, 50% RB, 20 MHz, 64-QAM)	LTE-FDD	6.60	± 9.6 %
10151	CAG	LTE-TDD (SC-FDMA, 50% RB, 20 MHz, QPSK)	LTE-TDD	9.28	± 9.6 %
10152	CAG	LTE-TDD (SC-FDMA, 50% RB, 20 MHz, 16-QAM)	LTE-TDD	9.92	± 9.6 %
10153	CAG	LTE-TDD (SC-FDMA, 50% RB, 20 MHz, 64-QAM)	LTE-TDD	10.05	± 9.6 %
10154	CAG	LTE-FDD (SC-FDMA, 50% RB, 10 MHz, QPSK)	LTE-FDD	5.75	± 9.6 %
10155	CAG	LTE-FDD (SC-FDMA, 50% RB, 10 MHz, 16-QAM)	LTE-FDD	6.43	± 9.6 %
10156	CAG	LTE-FDD (SC-FDMA, 50% RB, 5 MHz, QPSK)	LTE-FDD	5.79	± 9.6 %
10157	CAG	LTE-FDD (SC-FDMA, 50% RB, 5 MHz, 16-QAM)	LTE-FDD	6.49	± 9.6 %
10158	CAG	LTE-FDD (SC-FDMA, 50% RB, 10 MHz, 64-QAM)	LTE-FDD	6.62	± 9.6 %
10159	CAG	LTE-FDD (SC-FDMA, 50% RB, 5 MHz, 64-QAM)	LTE-FDD	6.56	± 9.6 %
10160	CAE	LTE-FDD (SC-FDMA, 50% RB, 15 MHz, QPSK)	LTE-FDD	5.82	± 9.6 %
10161	CAE	LTE-FDD (SC-FDMA, 50% RB, 15 MHz, 16-QAM)	LTE-FDD	6.43	± 9.6 %
10162	CAE	LTE-FDD (SC-FDMA, 50% RB, 15 MHz, 64-QAM)	LTE-FDD	6.58	± 9.6 %
10166	CAF	LTE-FDD (SC-FDMA, 50% RB, 1.4 MHz, QPSK)	LTE-FDD	5.46	± 9.6 %
10167	CAF	LTE-FDD (SC-FDMA, 50% RB, 1.4 MHz, 16-QAM)	LTE-FDD	6.21	± 9.6 %
10168	CAF	LTE-FDD (SC-FDMA, 50% RB, 1.4 MHz, 64-QAM)	LTE-FDD	6.79	± 9.6 %
10169	CAE	LTE-FDD (SC-FDMA, 1 RB, 20 MHz, QPSK)	LTE-FDD	5.73	± 9.6 %
10170	CAE	LTE-FDD (SC-FDMA, 1 RB, 20 MHz, 16-QAM)	LTE-FDD	6.52	± 9.6 %
10171	AAE	LTE-FDD (SC-FDMA, 1 RB, 20 MHz, 64-QAM)	LTE-FDD	6.49	± 9.6 %
10172	CAG	LTE-TDD (SC-FDMA, 1 RB, 20 MHz, QPSK)	LTE-TDD	9.21	± 9.6 %
10173	CAG	LTE-TDD (SC-FDMA, 1 RB, 20 MHz, 16-QAM)	LTE-TDD	9.48	± 9.6 %
10174	CAG	LTE-TDD (SC-FDMA, 1 RB, 20 MHz, 64-QAM)	LTE-TDD	10.25	± 9.6 %
10175	CAG	LTE-FDD (SC-FDMA, 1 RB, 10 MHz, QPSK)	LTE-FDD	5.72	± 9.6 %
10176	CAG	LTE-FDD (SC-FDMA, 1 RB, 10 MHz, 16-QAM)	LTE-FDD	6.52	± 9.6 %
10177	CAI	LTE-FDD (SC-FDMA, 1 RB, 5 MHz, QPSK)	LTE-FDD	5.73	± 9.6 %
10178	CAG	LTE-FDD (SC-FDMA, 1 RB, 5 MHz, 16-QAM)	LTE-FDD	6.52	± 9.6 %
10179	CAG	LTE-FDD (SC-FDMA, 1 RB, 10 MHz, 64-QAM)	LTE-FDD	6.50	± 9.6 %
10180	CAG	LTE-FDD (SC-FDMA, 1 RB, 5 MHz, 64-QAM)	LTE-FDD	6.50	± 9.6 %
10181	CAE	LTE-FDD (SC-FDMA, 1 RB, 15 MHz, QPSK)	LTE-FDD	5.72	± 9.6 %
10182	CAE	LTE-FDD (SC-FDMA, 1 RB, 15 MHz, 16-QAM)	LTE-FDD	6.52	± 9.6 %
10183	AAD	LTE-FDD (SC-FDMA, 1 RB, 15 MHz, 64-QAM)	LTE-FDD	6.50	± 9.6 %
10184	CAE	LTE-FDD (SC-FDMA, 1 RB, 3 MHz, QPSK)	LTE-FDD	5.73	± 9.6 %
10185	CAE	LTE-FDD (SC-FDMA, 1 RB, 3 MHz, 16-QAM)	LTE-FDD	6.51	± 9.6 %
10186	AAE	LTE-FDD (SC-FDMA, 1 RB, 3 MHz, 64-QAM)	LTE-FDD	6.50	± 9.6 %
10187	CAF	LTE-FDD (SC-FDMA, 1 RB, 1.4 MHz, QPSK)	LTE-FDD	5.73	± 9.6 %
10188	CAF	LTE-FDD (SC-FDMA, 1 RB, 1.4 MHz, 16-QAM)	LTE-FDD	6.52	± 9.6 %
10189	AAF	LTE-FDD (SC-FDMA, 1 RB, 1.4 MHz, 64-QAM)	LTE-FDD	6.50	± 9.6 %
10193	CAC	IEEE 802.11n (HT Greenfield, 6.5 Mbps, BPSK)	WLAN	8.09	± 9.6 %
10194	CAC	IEEE 802.11n (HT Greenfield, 39 Mbps, 16-QAM)	WLAN	8.12	± 9.6 %
10195	CAC	IEEE 802.11n (HT Greenfield, 65 Mbps, 64-QAM)	WLAN	8.21	± 9.6 %
10196	CAC	IEEE 802.11n (HT Mixed, 6.5 Mbps, BPSK)	WLAN	8.10	± 9.6 %
10197	CAC	IEEE 802.11n (HT Mixed, 39 Mbps, 16-QAM)	WLAN	8.13	± 9.6 %
10198	CAC	IEEE 802.11n (HT Mixed, 65 Mbps, 64-QAM)	WLAN	8.27	± 9.6 %
10219	CAC	IEEE 802.11n (HT Mixed, 7.2 Mbps, BPSK)	WLAN	8.03	± 9.6 %

10220	CAC	IEEE 802.11n (HT Mixed, 43.3 Mbps, 16-QAM)	WLAN	8.13	± 9.6 %
10221	CAC	IEEE 802.11n (HT Mixed, 72.2 Mbps, 64-QAM)	WLAN	8.27	± 9.6 %
10222	CAC	IEEE 802.11n (HT Mixed, 15 Mbps, BPSK)	WLAN	8.06	± 9.6 %
10223	CAC	IEEE 802.11n (HT Mixed, 90 Mbps, 16-QAM)	WLAN	8.48	± 9.6 %
10224	CAC	IEEE 802.11n (HT Mixed, 150 Mbps, 64-QAM)	WLAN	8.08	± 9.6 %
10225	CAB	UMTS-FDD (HSPA+)	WCDMA	5.97	± 9.6 %
10226	CAB	LTE-TDD (SC-FDMA, 1 RB, 1.4 MHz, 16-QAM)	LTE-TDD	9.49	± 9.6 %
10227	CAB	LTE-TDD (SC-FDMA, 1 RB, 1.4 MHz, 64-QAM)	LTE-TDD	10.26	± 9.6 %
10228	CAB	LTE-TDD (SC-FDMA, 1 RB, 1.4 MHz, QPSK)	LTE-TDD	9.22	± 9.6 %
10229	CAD	LTE-TDD (SC-FDMA, 1 RB, 3 MHz, 16-QAM)	LTE-TDD	9.48	± 9.6 %
10230	CAD	LTE-TDD (SC-FDMA, 1 RB, 3 MHz, 64-QAM)	LTE-TDD	10.25	± 9.6 %
10231	CAD	LTE-TDD (SC-FDMA, 1 RB, 3 MHz, QPSK)	LTE-TDD	9.19	± 9.6 %
10232	CAG	LTE-TDD (SC-FDMA, 1 RB, 5 MHz, 16-QAM)	LTE-TDD	9.48	± 9.6 %
10233	CAG	LTE-TDD (SC-FDMA, 1 RB, 5 MHz, 64-QAM)	LTE-TDD	10.25	± 9.6 %
10234	CAG	LTE-TDD (SC-FDMA, 1 RB, 5 MHz, QPSK)	LTE-TDD	9.21	± 9.6 %
10235	CAG	LTE-TDD (SC-FDMA, 1 RB, 10 MHz, 16-QAM)	LTE-TDD	9.48	± 9.6 %
10236	CAG	LTE-TDD (SC-FDMA, 1 RB, 10 MHz, 64-QAM)	LTE-TDD	10.25	± 9.6 %
10237	CAG	LTE-TDD (SC-FDMA, 1 RB, 10 MHz, QPSK)	LTE-TDD	9.21	± 9.6 %
10238	CAF	LTE-TDD (SC-FDMA, 1 RB, 15 MHz, 16-QAM)	LTE-TDD	9.48	± 9.6 %
10239	CAF	LTE-TDD (SC-FDMA, 1 RB, 15 MHz, 64-QAM)	LTE-TDD	10.25	± 9.6 %
10240	CAF	LTE-TDD (SC-FDMA, 1 RB, 15 MHz, QPSK)	LTE-TDD	9.21	± 9.6 %
10241	CAB	LTE-TDD (SC-FDMA, 50% RB, 1.4 MHz, 16-QAM)	LTE-TDD	9.82	± 9.6 %
10242	CAB	LTE-TDD (SC-FDMA, 50% RB, 1.4 MHz, 64-QAM)	LTE-TDD	9.86	± 9.6 %
10243	CAB	LTE-TDD (SC-FDMA, 50% RB, 1.4 MHz, QPSK)	LTE-TDD	9.46	± 9.6 %
10244	CAD	LTE-TDD (SC-FDMA, 50% RB, 3 MHz, 16-QAM)	LTE-TDD	10.06	± 9.6 %
10245	CAD	LTE-TDD (SC-FDMA, 50% RB, 3 MHz, 64-QAM)	LTE-TDD	10.06	± 9.6 %
10246	CAD	LTE-TDD (SC-FDMA, 50% RB, 3 MHz, QPSK)	LTE-TDD	9.30	± 9.6 %
10247	CAG	LTE-TDD (SC-FDMA, 50% RB, 5 MHz, 16-QAM)	LTE-TDD	9.91	± 9.6 %
10248	CAG	LTE-TDD (SC-FDMA, 50% RB, 5 MHz, 64-QAM)	LTE-TDD	10.09	± 9.6 %
10249	CAG	LTE-TDD (SC-FDMA, 50% RB, 5 MHz, QPSK)	LTE-TDD	9.29	± 9.6 %
10250	CAG	LTE-TDD (SC-FDMA, 50% RB, 10 MHz, 16-QAM)	LTE-TDD	9.81	± 9.6 %
10251	CAG	LTE-TDD (SC-FDMA, 50% RB, 10 MHz, 64-QAM)	LTE-TDD	10.17	± 9.6 %
10252	CAG	LTE-TDD (SC-FDMA, 50% RB, 10 MHz, QPSK)	LTE-TDD	9.24	± 9.6 %
10253	CAF	LTE-TDD (SC-FDMA, 50% RB, 15 MHz, 16-QAM)	LTE-TDD	9.90	± 9.6 %
10254	CAF	LTE-TDD (SC-FDMA, 50% RB, 15 MHz, 64-QAM)	LTE-TDD	10.14	± 9.6 %
10255	CAF	LTE-TDD (SC-FDMA, 50% RB, 15 MHz, QPSK)	LTE-TDD	9.20	± 9.6 %
10256	CAB	LTE-TDD (SC-FDMA, 100% RB, 1.4 MHz, 16-QAM)	LTE-TDD	9.96	± 9.6 %
10257	CAB	LTE-TDD (SC-FDMA, 100% RB, 1.4 MHz, 64-QAM)	LTE-TDD	10.08	± 9.6 %
10258	CAB	LTE-TDD (SC-FDMA, 100% RB, 1.4 MHz, QPSK)	LTE-TDD	9.34	± 9.6 %
10259	CAD	LTE-TDD (SC-FDMA, 100% RB, 3 MHz, 16-QAM)	LTE-TDD	9.98	± 9.6 %
10260	CAD	LTE-TDD (SC-FDMA, 100% RB, 3 MHz, 64-QAM)	LTE-TDD	9.97	± 9.6 %
10261	CAD	LTE-TDD (SC-FDMA, 100% RB, 3 MHz, QPSK)	LTE-TDD	9.24	± 9.6 %
10262	CAG	LTE-TDD (SC-FDMA, 100% RB, 5 MHz, 16-QAM)	LTE-TDD	9.83	± 9.6 %
10263	CAG	LTE-TDD (SC-FDMA, 100% RB, 5 MHz, 64-QAM)	LTE-TDD	10.16	± 9.6 %
10264	CAG	LTE-TDD (SC-FDMA, 100% RB, 5 MHz, QPSK)	LTE-TDD	9.23	± 9.6 %
10265	CAG	LTE-TDD (SC-FDMA, 100% RB, 10 MHz, 16-QAM)	LTE-TDD	9.92	± 9.6 %
10266	CAG	LTE-TDD (SC-FDMA, 100% RB, 10 MHz, 64-QAM)	LTE-TDD	10.07	± 9.6 %
10267	CAG	LTE-TDD (SC-FDMA, 100% RB, 10 MHz, QPSK)	LTE-TDD	9.30	± 9.6 %
10268	CAF	LTE-TDD (SC-FDMA, 100% RB, 15 MHz, 16-QAM)	LTE-TDD	10.06	± 9.6 %
10269	CAF	LTE-TDD (SC-FDMA, 100% RB, 15 MHz, 64-QAM)	LTE-TDD	10.13	± 9.6 %
10270	CAF	LTE-TDD (SC-FDMA, 100% RB, 15 MHz, QPSK)	LTE-TDD	9.58	± 9.6 %
10274	CAB	UMTS-FDD (HSUPA, Subtest 5, 3GPP Rel8.10)	WCDMA	4.87	± 9.6 %
10275	CAB	UMTS-FDD (HSUPA, Subtest 5, 3GPP Rel8.4)	WCDMA	3.96	± 9.6 %
10277	CAA	PHS (QPSK)	PHS	11.81	± 9.6 %
10278	CAA	PHS (QPSK, BW 884MHz, Rolloff 0.5)	PHS	11.81	± 9.6 %
10279	CAA	PHS (QPSK, BW 884MHz, Rolloff 0.38)	PHS	12.18	± 9.6 %
10290	AAB	CDMA2000, RC1, SO55, Full Rate	CDMA2000	3.91	± 9.6 %
10291	AAB	CDMA2000, RC3, SO55, Full Rate	CDMA2000	3.46	± 9.6 %
10292	AAB	CDMA2000, RC3, SO32, Full Rate	CDMA2000	3.39	± 9.6 %
10293	AAB	CDMA2000, RC3, SO3, Full Rate	CDMA2000	3.50	± 9.6 %
10295	AAB	CDMA2000, RC1, SO3, 1/8th Rate 25 fr.	CDMA2000	12.49	± 9.6 %
10297	AAD	LTE-FDD (SC-FDMA, 50% RB, 20 MHz, QPSK)	LTE-FDD	5.81	± 9.6 %
10298	AAD	LTE-FDD (SC-FDMA, 50% RB, 3 MHz, QPSK)	LTE-FDD	5.72	± 9.6 %
10299	AAD	LTE-FDD (SC-FDMA, 50% RB, 3 MHz, 16-QAM)	LTE-FDD	6.39	± 9.6 %

10300	AAD	LTE-FDD (SC-FDMA, 50% RB, 3 MHz, 64-QAM)	LTE-FDD	6.60	± 9.6 %
10301	AAA	IEEE 802.16e WiMAX (29:18, 5ms, 10MHz, QPSK, PUSC)	WiMAX	12.03	± 9.6 %
10302	AAA	IEEE 802.16e WiMAX (29:18, 5ms, 10MHz, QPSK, PUSC, 3 CTRL symbols)	WiMAX	12.57	± 9.6 %
10303	AAA	IEEE 802.16e WiMAX (31:15, 5ms, 10MHz, 64QAM, PUSC)	WiMAX	12.52	± 9.6 %
10304	AAA	IEEE 802.16e WiMAX (29:18, 5ms, 10MHz, 64QAM, PUSC)	WiMAX	11.86	± 9.6 %
10305	AAA	IEEE 802.16e WiMAX (31:15, 10ms, 10MHz, 64QAM, PUSC, 15 symbols)	WiMAX	15.24	± 9.6 %
10306	AAA	IEEE 802.16e WiMAX (29:18, 10ms, 10MHz, 64QAM, PUSC, 18 symbols)	WiMAX	14.67	± 9.6 %
10307	AAA	IEEE 802.16e WiMAX (29:18, 10ms, 10MHz, QPSK, PUSC, 18 symbols)	WiMAX	14.49	± 9.6 %
10308	AAA	IEEE 802.16e WiMAX (29:18, 10ms, 10MHz, 16QAM, PUSC)	WiMAX	14.46	± 9.6 %
10309	AAA	IEEE 802.16e WiMAX (29:18, 10ms, 10MHz, 16QAM, AMC 2x3, 18 symbols)	WiMAX	14.58	± 9.6 %
10310	AAA	IEEE 802.16e WiMAX (29:18, 10ms, 10MHz, QPSK, AMC 2x3, 18 symbols)	WiMAX	14.57	± 9.6 %
10311	AAD	LTE-FDD (SC-FDMA, 100% RB, 15 MHz, QPSK)	LTE-FDD	6.06	± 9.6 %
10313	AAA	iDEN 1:3	iDEN	10.51	± 9.6 %
10314	AAA	iDEN 1:6	iDEN	13.48	± 9.6 %
10315	AAB	IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps, 96pc duty cycle)	WLAN	1.71	± 9.6 %
10316	AAB	IEEE 802.11g WiFi 2.4 GHz (ERP-OFDM, 6 Mbps, 96pc duty cycle)	WLAN	8.36	± 9.6 %
10317	AAC	IEEE 802.11a WiFi 5 GHz (OFDM, 6 Mbps, 96pc duty cycle)	WLAN	8.36	± 9.6 %
10352	AAA	Pulse Waveform (200Hz, 10%)	Generic	10.00	± 9.6 %
10353	AAA	Pulse Waveform (200Hz, 20%)	Generic	6.99	± 9.6 %
10354	AAA	Pulse Waveform (200Hz, 40%)	Generic	3.98	± 9.6 %
10355	AAA	Pulse Waveform (200Hz, 60%)	Generic	2.22	± 9.6 %
10356	AAA	Pulse Waveform (200Hz, 80%)	Generic	0.97	± 9.6 %
10387	AAA	QPSK Waveform, 1 MHz	Generic	5.10	± 9.6 %
10388	AAA	QPSK Waveform, 10 MHz	Generic	5.22	± 9.6 %
10396	AAA	64-QAM Waveform, 100 kHz	Generic	6.27	± 9.6 %
10399	AAA	64-QAM Waveform, 40 MHz	Generic	6.27	± 9.6 %
10400	AAD	IEEE 802.11ac WiFi (20MHz, 64-QAM, 99pc duty cycle)	WLAN	8.37	± 9.6 %
10401	AAD	IEEE 802.11ac WiFi (40MHz, 64-QAM, 99pc duty cycle)	WLAN	8.60	± 9.6 %
10402	AAD	IEEE 802.11ac WiFi (80MHz, 64-QAM, 99pc duty cycle)	WLAN	8.53	± 9.6 %
10403	AAB	CDMA2000 (1xEV-DO, Rev. 0)	CDMA2000	3.76	± 9.6 %
10404	AAB	CDMA2000 (1xEV-DO, Rev. A)	CDMA2000	3.77	± 9.6 %
10406	AAB	CDMA2000, RC3, SO32, SCH0, Full Rate	CDMA2000	5.22	± 9.6 %
10410	AAG	LTE-TDD (SC-FDMA, 1 RB, 10 MHz, QPSK, UL Subframe=2,3,4,7,8,9, Subframe Conf=4)	LTE-TDD	7.82	± 9.6 %
10414	AAA	WLAN CCDF, 64-QAM, 40MHz	Generic	8.54	± 9.6 %
10415	AAA	IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps, 99pc duty cycle)	WLAN	1.54	± 9.6 %
10416	AAA	IEEE 802.11g WiFi 2.4 GHz (ERP-OFDM, 6 Mbps, 99pc duty cycle)	WLAN	8.23	± 9.6 %
10417	AAB	IEEE 802.11a/h WiFi 5 GHz (OFDM, 6 Mbps, 99pc duty cycle)	WLAN	8.23	± 9.6 %
10418	AAA	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 6 Mbps, 99pc duty cycle, Long preambule)	WLAN	8.14	± 9.6 %
10419	AAA	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 6 Mbps, 99pc duty cycle, Short preambule)	WLAN	8.19	± 9.6 %
10422	AAB	IEEE 802.11n (HT Greenfield, 7.2 Mbps, BPSK)	WLAN	8.32	± 9.6 %
10423	AAB	IEEE 802.11n (HT Greenfield, 43.3 Mbps, 16-QAM)	WLAN	8.47	± 9.6 %
10424	AAB	IEEE 802.11n (HT Greenfield, 72.2 Mbps, 64-QAM)	WLAN	8.40	± 9.6 %
10425	AAB	IEEE 802.11n (HT Greenfield, 15 Mbps, BPSK)	WLAN	8.41	± 9.6 %
10426	AAB	IEEE 802.11n (HT Greenfield, 90 Mbps, 16-QAM)	WLAN	8.45	± 9.6 %
10427	AAB	IEEE 802.11n (HT Greenfield, 150 Mbps, 64-QAM)	WLAN	8.41	± 9.6 %
10430	AAD	LTE-FDD (OFDMA, 5 MHz, E-TM 3.1)	LTE-FDD	8.28	± 9.6 %
10431	AAD	LTE-FDD (OFDMA, 10 MHz, E-TM 3.1)	LTE-FDD	8.38	± 9.6 %
10432	AAC	LTE-FDD (OFDMA, 15 MHz, E-TM 3.1)	LTE-FDD	8.34	± 9.6 %
10433	AAC	LTE-FDD (OFDMA, 20 MHz, E-TM 3.1)	LTE-FDD	8.34	± 9.6 %
10434	AAA	W-CDMA (BS Test Model 1, 64 DPCH)	WCDMA	8.60	± 9.6 %
10435	AAF	LTE-TDD (SC-FDMA, 1 RB, 20 MHz, QPSK, UL Subframe=2,3,4,7,8,9)	LTE-TDD	7.82	± 9.6 %
10447	AAD	LTE-FDD (OFDMA, 5 MHz, E-TM 3.1, Clipping 44%)	LTE-FDD	7.56	± 9.6 %
10448	AAD	LTE-FDD (OFDMA, 10 MHz, E-TM 3.1, Clippin 44%)	LTE-FDD	7.53	± 9.6 %
10449	AAC	LTE-FDD (OFDMA, 15 MHz, E-TM 3.1, Cliping 44%)	LTE-FDD	7.51	± 9.6 %
10450	AAC	LTE-FDD (OFDMA, 20 MHz, E-TM 3.1, Clipping 44%)	LTE-FDD	7.48	± 9.6 %

10451	AAA	W-CDMA (BS Test Model 1, 64 DPCH, Clipping 44%)	WCDMA	7.59	± 9.6 %
10456	AAB	IEEE 802.11ac WiFi (160MHz, 64-QAM, 99pc duty cycle)	WLAN	8.63	± 9.6 %
10457	AAA	UMTS-FDD (DC-HSDPA)	WCDMA	6.62	± 9.6 %
10458	AAA	CDMA2000 (1xEV-DO, Rev. B, 2 carriers)	CDMA2000	6.55	± 9.6 %
10459	AAA	CDMA2000 (1xEV-DO, Rev. B, 3 carriers)	CDMA2000	8.25	± 9.6 %
10460	AAA	UMTS-FDD (WCDMA, AMR)	WCDMA	2.39	± 9.6 %
10461	AAB	LTE-TDD (SC-FDMA, 1 RB, 1.4 MHz, QPSK, UL Subframe=2,3,4,7,8,9)	LTE-TDD	7.82	± 9.6 %
10462	AAB	LTE-TDD (SC-FDMA, 1 RB, 1.4 MHz, 16-QAM, UL Subframe=2,3,4,7,8,9)	LTE-TDD	8.30	± 9.6 %
10463	AAB	LTE-TDD (SC-FDMA, 1 RB, 1.4 MHz, 64-QAM, UL Subframe=2,3,4,7,8,9)	LTE-TDD	8.56	± 9.6 %
10464	AAC	LTE-TDD (SC-FDMA, 1 RB, 3 MHz, QPSK, UL Subframe=2,3,4,7,8,9)	LTE-TDD	7.82	± 9.6 %
10465	AAC	LTE-TDD (SC-FDMA, 1 RB, 3 MHz, 16-QAM, UL Subframe=2,3,4,7,8,9)	LTE-TDD	8.32	± 9.6 %
10466	AAC	LTE-TDD (SC-FDMA, 1 RB, 3 MHz, 64-QAM, UL Subframe=2,3,4,7,8,9)	LTE-TDD	8.57	± 9.6 %
10467	AAF	LTE-TDD (SC-FDMA, 1 RB, 5 MHz, QPSK, UL Subframe=2,3,4,7,8,9)	LTE-TDD	7.82	± 9.6 %
10468	AAF	LTE-TDD (SC-FDMA, 1 RB, 5 MHz, 16-QAM, UL Subframe=2,3,4,7,8,9)	LTE-TDD	8.32	± 9.6 %
10469	AAF	LTE-TDD (SC-FDMA, 1 RB, 5 MHz, 64-QAM, UL Subframe=2,3,4,7,8,9)	LTE-TDD	8.56	± 9.6 %
10470	AAF	LTE-TDD (SC-FDMA, 1 RB, 10 MHz, QPSK, UL Subframe=2,3,4,7,8,9)	LTE-TDD	7.82	± 9.6 %
10471	AAF	LTE-TDD (SC-FDMA, 1 RB, 10 MHz, 16-QAM, UL Subframe=2,3,4,7,8,9)	LTE-TDD	8.32	± 9.6 %
10472	AAF	LTE-TDD (SC-FDMA, 1 RB, 10 MHz, 64-QAM, UL Subframe=2,3,4,7,8,9)	LTE-TDD	8.57	± 9.6 %
10473	AAE	LTE-TDD (SC-FDMA, 1 RB, 15 MHz, QPSK, UL Subframe=2,3,4,7,8,9)	LTE-TDD	7.82	± 9.6 %
10474	AAE	LTE-TDD (SC-FDMA, 1 RB, 15 MHz, 16-QAM, UL Subframe=2,3,4,7,8,9)	LTE-TDD	8.32	± 9.6 %
10475	AAE	LTE-TDD (SC-FDMA, 1 RB, 15 MHz, 64-QAM, UL Subframe=2,3,4,7,8,9)	LTE-TDD	8.57	± 9.6 %
10477	AAF	LTE-TDD (SC-FDMA, 1 RB, 20 MHz, 16-QAM, UL Subframe=2,3,4,7,8,9)	LTE-TDD	8.32	± 9.6 %
10478	AAF	LTE-TDD (SC-FDMA, 1 RB, 20 MHz, 64-QAM, UL Subframe=2,3,4,7,8,9)	LTE-TDD	8.57	± 9.6 %
10479	AAB	LTE-TDD (SC-FDMA, 50% RB, 1.4 MHz, QPSK, UL Subframe=2,3,4,7,8,9)	LTE-TDD	7.74	± 9.6 %
10480	AAB	LTE-TDD (SC-FDMA, 50% RB, 1.4 MHz, 16-QAM, UL Subframe=2,3,4,7,8,9)	LTE-TDD	8.18	± 9.6 %
10481	AAB	LTE-TDD (SC-FDMA, 50% RB, 1.4 MHz, 64-QAM, UL Subframe=2,3,4,7,8,9)	LTE-TDD	8.45	± 9.6 %
10482	AAC	LTE-TDD (SC-FDMA, 50% RB, 3 MHz, QPSK, UL Subframe=2,3,4,7,8,9)	LTE-TDD	7.71	± 9.6 %
10483	AAC	LTE-TDD (SC-FDMA, 50% RB, 3 MHz, 16-QAM, UL Subframe=2,3,4,7,8,9)	LTE-TDD	8.39	± 9.6 %
10484	AAC	LTE-TDD (SC-FDMA, 50% RB, 3 MHz, 64-QAM, UL Subframe=2,3,4,7,8,9)	LTE-TDD	8.47	± 9.6 %
10485	AAF	LTE-TDD (SC-FDMA, 50% RB, 5 MHz, QPSK, UL Subframe=2,3,4,7,8,9)	LTE-TDD	7.59	± 9.6 %
10486	AAF	LTE-TDD (SC-FDMA, 50% RB, 5 MHz, 16-QAM, UL Subframe=2,3,4,7,8,9)	LTE-TDD	8.38	± 9.6 %
10487	AAF	LTE-TDD (SC-FDMA, 50% RB, 5 MHz, 64-QAM, UL Subframe=2,3,4,7,8,9)	LTE-TDD	8.60	± 9.6 %
10488	AAF	LTE-TDD (SC-FDMA, 50% RB, 10 MHz, QPSK, UL Subframe=2,3,4,7,8,9)	LTE-TDD	7.70	± 9.6 %
10489	AAF	LTE-TDD (SC-FDMA, 50% RB, 10 MHz, 16-QAM, UL Subframe=2,3,4,7,8,9)	LTE-TDD	8.31	± 9.6 %
10490	AAF	LTE-TDD (SC-FDMA, 50% RB, 10 MHz, 64-QAM, UL Subframe=2,3,4,7,8,9)	LTE-TDD	8.54	± 9.6 %
10491	AAE	LTE-TDD (SC-FDMA, 50% RB, 15 MHz, QPSK, UL Subframe=2,3,4,7,8,9)	LTE-TDD	7.74	± 9.6 %

10492	AAE	LTE-TDD (SC-FDMA, 50% RB, 15 MHz, 16-QAM, UL Subframe=2,3,4,7,8,9)	LTE-TDD	8.41	± 9.6 %
10493	AAE	LTE-TDD (SC-FDMA, 50% RB, 15 MHz, 64-QAM, UL Subframe=2,3,4,7,8,9)	LTE-TDD	8.55	± 9.6 %
10494	AAF	LTE-TDD (SC-FDMA, 50% RB, 20 MHz, QPSK, UL Subframe=2,3,4,7,8,9)	LTE-TDD	7.74	± 9.6 %
10495	AAF	LTE-TDD (SC-FDMA, 50% RB, 20 MHz, 16-QAM, UL Subframe=2,3,4,7,8,9)	LTE-TDD	8.37	± 9.6 %
10496	AAF	LTE-TDD (SC-FDMA, 50% RB, 20 MHz, 64-QAM, UL Subframe=2,3,4,7,8,9)	LTE-TDD	8.54	± 9.6 %
10497	AAB	LTE-TDD (SC-FDMA, 100% RB, 1.4 MHz, QPSK, UL Subframe=2,3,4,7,8,9)	LTE-TDD	7.67	± 9.6 %
10498	AAB	LTE-TDD (SC-FDMA, 100% RB, 1.4 MHz, 16-QAM, UL Subframe=2,3,4,7,8,9)	LTE-TDD	8.40	± 9.6 %
10499	AAB	LTE-TDD (SC-FDMA, 100% RB, 1.4 MHz, 64-QAM, UL Subframe=2,3,4,7,8,9)	LTE-TDD	8.68	± 9.6 %
10500	AAC	LTE-TDD (SC-FDMA, 100% RB, 3 MHz, QPSK, UL Subframe=2,3,4,7,8,9)	LTE-TDD	7.67	± 9.6 %
10501	AAC	LTE-TDD (SC-FDMA, 100% RB, 3 MHz, 16-QAM, UL Subframe=2,3,4,7,8,9)	LTE-TDD	8.44	± 9.6 %
10502	AAC	LTE-TDD (SC-FDMA, 100% RB, 3 MHz, 64-QAM, UL Subframe=2,3,4,7,8,9)	LTE-TDD	8.52	± 9.6 %
10503	AAF	LTE-TDD (SC-FDMA, 100% RB, 5 MHz, QPSK, UL Subframe=2,3,4,7,8,9)	LTE-TDD	7.72	± 9.6 %
10504	AAF	LTE-TDD (SC-FDMA, 100% RB, 5 MHz, 16-QAM, UL Subframe=2,3,4,7,8,9)	LTE-TDD	8.31	± 9.6 %
10505	AAF	LTE-TDD (SC-FDMA, 100% RB, 5 MHz, 64-QAM, UL Subframe=2,3,4,7,8,9)	LTE-TDD	8.54	± 9.6 %
10506	AAF	LTE-TDD (SC-FDMA, 100% RB, 10 MHz, QPSK, UL Subframe=2,3,4,7,8,9)	LTE-TDD	7.74	± 9.6 %
10507	AAF	LTE-TDD (SC-FDMA, 100% RB, 10 MHz, 16-QAM, UL Subframe=2,3,4,7,8,9)	LTE-TDD	8.36	± 9.6 %
10508	AAF	LTE-TDD (SC-FDMA, 100% RB, 10 MHz, 64-QAM, UL Subframe=2,3,4,7,8,9)	LTE-TDD	8.55	± 9.6 %
10509	AAE	LTE-TDD (SC-FDMA, 100% RB, 15 MHz, QPSK, UL Subframe=2,3,4,7,8,9)	LTE-TDD	7.99	± 9.6 %
10510	AAE	LTE-TDD (SC-FDMA, 100% RB, 15 MHz, 16-QAM, UL Subframe=2,3,4,7,8,9)	LTE-TDD	8.49	± 9.6 %
10511	AAE	LTE-TDD (SC-FDMA, 100% RB, 15 MHz, 64-QAM, UL Subframe=2,3,4,7,8,9)	LTE-TDD	8.51	± 9.6 %
10512	AAF	LTE-TDD (SC-FDMA, 100% RB, 20 MHz, QPSK, UL Subframe=2,3,4,7,8,9)	LTE-TDD	7.74	± 9.6 %
10513	AAF	LTE-TDD (SC-FDMA, 100% RB, 20 MHz, 16-QAM, UL Subframe=2,3,4,7,8,9)	LTE-TDD	8.42	± 9.6 %
10514	AAF	LTE-TDD (SC-FDMA, 100% RB, 20 MHz, 64-QAM, UL Subframe=2,3,4,7,8,9)	LTE-TDD	8.45	± 9.6 %
10515	AAA	IEEE 802.11b WiFi 2.4 GHz (DSSS, 2 Mbps, 99pc duty cycle)	WLAN	1.58	± 9.6 %
10516	AAA	IEEE 802.11b WiFi 2.4 GHz (DSSS, 5.5 Mbps, 99pc duty cycle)	WLAN	1.57	± 9.6 %
10517	AAA	IEEE 802.11b WiFi 2.4 GHz (DSSS, 11 Mbps, 99pc duty cycle)	WLAN	1.58	± 9.6 %
10518	AAB	IEEE 802.11a/h WiFi 5 GHz (OFDM, 9 Mbps, 99pc duty cycle)	WLAN	8.23	± 9.6 %
10519	AAB	IEEE 802.11a/h WiFi 5 GHz (OFDM, 12 Mbps, 99pc duty cycle)	WLAN	8.39	± 9.6 %
10520	AAB	IEEE 802.11a/h WiFi 5 GHz (OFDM, 18 Mbps, 99pc duty cycle)	WLAN	8.12	± 9.6 %
10521	AAB	IEEE 802.11a/h WiFi 5 GHz (OFDM, 24 Mbps, 99pc duty cycle)	WLAN	7.97	± 9.6 %
10522	AAB	IEEE 802.11a/h WiFi 5 GHz (OFDM, 36 Mbps, 99pc duty cycle)	WLAN	8.45	± 9.6 %
10523	AAB	IEEE 802.11a/h WiFi 5 GHz (OFDM, 48 Mbps, 99pc duty cycle)	WLAN	8.08	± 9.6 %
10524	AAB	IEEE 802.11a/h WiFi 5 GHz (OFDM, 54 Mbps, 99pc duty cycle)	WLAN	8.27	± 9.6 %
10525	AAB	IEEE 802.11ac WiFi (20MHz, MCS0, 99pc duty cycle)	WLAN	8.36	± 9.6 %
10526	AAB	IEEE 802.11ac WiFi (20MHz, MCS1, 99pc duty cycle)	WLAN	8.42	± 9.6 %
10527	AAB	IEEE 802.11ac WiFi (20MHz, MCS2, 99pc duty cycle)	WLAN	8.21	± 9.6 %
10528	AAB	IEEE 802.11ac WiFi (20MHz, MCS3, 99pc duty cycle)	WLAN	8.36	± 9.6 %
10529	AAB	IEEE 802.11ac WiFi (20MHz, MCS4, 99pc duty cycle)	WLAN	8.36	± 9.6 %
10531	AAB	IEEE 802.11ac WiFi (20MHz, MCS6, 99pc duty cycle)	WLAN	8.43	± 9.6 %
10532	AAB	IEEE 802.11ac WiFi (20MHz, MCS7, 99pc duty cycle)	WLAN	8.29	± 9.6 %
10533	AAB	IEEE 802.11ac WiFi (20MHz, MCS8, 99pc duty cycle)	WLAN	8.38	± 9.6 %
10534	AAB	IEEE 802.11ac WiFi (40MHz, MCS0, 99pc duty cycle)	WLAN	8.45	± 9.6 %

10535	AAB	IEEE 802.11ac WiFi (40MHz, MCS1, 99pc duty cycle)	WLAN	8.45	± 9.6 %
10536	AAB	IEEE 802.11ac WiFi (40MHz, MCS2, 99pc duty cycle)	WLAN	8.32	± 9.6 %
10537	AAB	IEEE 802.11ac WiFi (40MHz, MCS3, 99pc duty cycle)	WLAN	8.44	± 9.6 %
10538	AAB	IEEE 802.11ac WiFi (40MHz, MCS4, 99pc duty cycle)	WLAN	8.54	± 9.6 %
10540	AAB	IEEE 802.11ac WiFi (40MHz, MCS6, 99pc duty cycle)	WLAN	8.39	± 9.6 %
10541	AAB	IEEE 802.11ac WiFi (40MHz, MCS7, 99pc duty cycle)	WLAN	8.46	± 9.6 %
10542	AAB	IEEE 802.11ac WiFi (40MHz, MCS8, 99pc duty cycle)	WLAN	8.65	± 9.6 %
10543	AAB	IEEE 802.11ac WiFi (40MHz, MCS9, 99pc duty cycle)	WLAN	8.65	± 9.6 %
10544	AAB	IEEE 802.11ac WiFi (80MHz, MCS0, 99pc duty cycle)	WLAN	8.47	± 9.6 %
10545	AAB	IEEE 802.11ac WiFi (80MHz, MCS1, 99pc duty cycle)	WLAN	8.55	± 9.6 %
10546	AAB	IEEE 802.11ac WiFi (80MHz, MCS2, 99pc duty cycle)	WLAN	8.35	± 9.6 %
10547	AAB	IEEE 802.11ac WiFi (80MHz, MCS3, 99pc duty cycle)	WLAN	8.49	± 9.6 %
10548	AAB	IEEE 802.11ac WiFi (80MHz, MCS4, 99pc duty cycle)	WLAN	8.37	± 9.6 %
10550	AAB	IEEE 802.11ac WiFi (80MHz, MCS6, 99pc duty cycle)	WLAN	8.38	± 9.6 %
10551	AAB	IEEE 802.11ac WiFi (80MHz, MCS7, 99pc duty cycle)	WLAN	8.50	± 9.6 %
10552	AAB	IEEE 802.11ac WiFi (80MHz, MCS8, 99pc duty cycle)	WLAN	8.42	± 9.6 %
10553	AAB	IEEE 802.11ac WiFi (80MHz, MCS9, 99pc duty cycle)	WLAN	8.45	± 9.6 %
10554	AAC	IEEE 802.11ac WiFi (160MHz, MCS0, 99pc duty cycle)	WLAN	8.48	± 9.6 %
10555	AAC	IEEE 802.11ac WiFi (160MHz, MCS1, 99pc duty cycle)	WLAN	8.47	± 9.6 %
10556	AAC	IEEE 802.11ac WiFi (160MHz, MCS2, 99pc duty cycle)	WLAN	8.50	± 9.6 %
10557	AAC	IEEE 802.11ac WiFi (160MHz, MCS3, 99pc duty cycle)	WLAN	8.52	± 9.6 %
10558	AAC	IEEE 802.11ac WiFi (160MHz, MCS4, 99pc duty cycle)	WLAN	8.61	± 9.6 %
10560	AAC	IEEE 802.11ac WiFi (160MHz, MCS6, 99pc duty cycle)	WLAN	8.73	± 9.6 %
10561	AAC	IEEE 802.11ac WiFi (160MHz, MCS7, 99pc duty cycle)	WLAN	8.56	± 9.6 %
10562	AAC	IEEE 802.11ac WiFi (160MHz, MCS8, 99pc duty cycle)	WLAN	8.69	± 9.6 %
10563	AAC	IEEE 802.11ac WiFi (160MHz, MCS9, 99pc duty cycle)	WLAN	8.77	± 9.6 %
10564	AAA	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 9 Mbps, 99pc duty cycle)	WLAN	8.25	± 9.6 %
10565	AAA	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 12 Mbps, 99pc duty cycle)	WLAN	8.45	± 9.6 %
10566	AAA	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 18 Mbps, 99pc duty cycle)	WLAN	8.13	± 9.6 %
10567	AAA	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 24 Mbps, 99pc duty cycle)	WLAN	8.00	± 9.6 %
10568	AAA	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 36 Mbps, 99pc duty cycle)	WLAN	8.37	± 9.6 %
10569	AAA	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 48 Mbps, 99pc duty cycle)	WLAN	8.10	± 9.6 %
10570	AAA	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 54 Mbps, 99pc duty cycle)	WLAN	8.30	± 9.6 %
10571	AAA	IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps, 90pc duty cycle)	WLAN	1.99	± 9.6 %
10572	AAA	IEEE 802.11b WiFi 2.4 GHz (DSSS, 2 Mbps, 90pc duty cycle)	WLAN	1.99	± 9.6 %
10573	AAA	IEEE 802.11b WiFi 2.4 GHz (DSSS, 5.5 Mbps, 90pc duty cycle)	WLAN	1.98	± 9.6 %
10574	AAA	IEEE 802.11b WiFi 2.4 GHz (DSSS, 11 Mbps, 90pc duty cycle)	WLAN	1.98	± 9.6 %
10575	AAA	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 6 Mbps, 90pc duty cycle)	WLAN	8.59	± 9.6 %
10576	AAA	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 9 Mbps, 90pc duty cycle)	WLAN	8.60	± 9.6 %
10577	AAA	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 12 Mbps, 90pc duty cycle)	WLAN	8.70	± 9.6 %
10578	AAA	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 18 Mbps, 90pc duty cycle)	WLAN	8.49	± 9.6 %
10579	AAA	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 24 Mbps, 90pc duty cycle)	WLAN	8.36	± 9.6 %
10580	AAA	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 36 Mbps, 90pc duty cycle)	WLAN	8.76	± 9.6 %
10581	AAA	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 48 Mbps, 90pc duty cycle)	WLAN	8.35	± 9.6 %
10582	AAA	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 54 Mbps, 90pc duty cycle)	WLAN	8.67	± 9.6 %
10583	AAB	IEEE 802.11a/h WiFi 5 GHz (OFDM, 6 Mbps, 90pc duty cycle)	WLAN	8.59	± 9.6 %
10584	AAB	IEEE 802.11a/h WiFi 5 GHz (OFDM, 9 Mbps, 90pc duty cycle)	WLAN	8.60	± 9.6 %
10585	AAB	IEEE 802.11a/h WiFi 5 GHz (OFDM, 12 Mbps, 90pc duty cycle)	WLAN	8.70	± 9.6 %
10586	AAB	IEEE 802.11a/h WiFi 5 GHz (OFDM, 18 Mbps, 90pc duty cycle)	WLAN	8.49	± 9.6 %
10587	AAB	IEEE 802.11a/h WiFi 5 GHz (OFDM, 24 Mbps, 90pc duty cycle)	WLAN	8.36	± 9.6 %

10588	AAB	IEEE 802.11a/h WiFi 5 GHz (OFDM, 36 Mbps, 90pc duty cycle)	WLAN	8.76	± 9.6 %
10589	AAB	IEEE 802.11a/h WiFi 5 GHz (OFDM, 48 Mbps, 90pc duty cycle)	WLAN	8.35	± 9.6 %
10590	AAB	IEEE 802.11a/h WiFi 5 GHz (OFDM, 54 Mbps, 90pc duty cycle)	WLAN	8.67	± 9.6 %
10591	AAB	IEEE 802.11n (HT Mixed, 20MHz, MCS0, 90pc duty cycle)	WLAN	8.63	± 9.6 %
10592	AAB	IEEE 802.11n (HT Mixed, 20MHz, MCS1, 90pc duty cycle)	WLAN	8.79	± 9.6 %
10593	AAB	IEEE 802.11n (HT Mixed, 20MHz, MCS2, 90pc duty cycle)	WLAN	8.64	± 9.6 %
10594	AAB	IEEE 802.11n (HT Mixed, 20MHz, MCS3, 90pc duty cycle)	WLAN	8.74	± 9.6 %
10595	AAB	IEEE 802.11n (HT Mixed, 20MHz, MCS4, 90pc duty cycle)	WLAN	8.74	± 9.6 %
10596	AAB	IEEE 802.11n (HT Mixed, 20MHz, MCS5, 90pc duty cycle)	WLAN	8.71	± 9.6 %
10597	AAB	IEEE 802.11n (HT Mixed, 20MHz, MCS6, 90pc duty cycle)	WLAN	8.72	± 9.6 %
10598	AAB	IEEE 802.11n (HT Mixed, 20MHz, MCS7, 90pc duty cycle)	WLAN	8.50	± 9.6 %
10599	AAB	IEEE 802.11n (HT Mixed, 40MHz, MCS0, 90pc duty cycle)	WLAN	8.79	± 9.6 %
10600	AAB	IEEE 802.11n (HT Mixed, 40MHz, MCS1, 90pc duty cycle)	WLAN	8.88	± 9.6 %
10601	AAB	IEEE 802.11n (HT Mixed, 40MHz, MCS2, 90pc duty cycle)	WLAN	8.82	± 9.6 %
10602	AAB	IEEE 802.11n (HT Mixed, 40MHz, MCS3, 90pc duty cycle)	WLAN	8.94	± 9.6 %
10603	AAB	IEEE 802.11n (HT Mixed, 40MHz, MCS4, 90pc duty cycle)	WLAN	9.03	± 9.6 %
10604	AAB	IEEE 802.11n (HT Mixed, 40MHz, MCS5, 90pc duty cycle)	WLAN	8.76	± 9.6 %
10605	AAB	IEEE 802.11n (HT Mixed, 40MHz, MCS6, 90pc duty cycle)	WLAN	8.97	± 9.6 %
10606	AAB	IEEE 802.11n (HT Mixed, 40MHz, MCS7, 90pc duty cycle)	WLAN	8.82	± 9.6 %
10607	AAB	IEEE 802.11ac WiFi (20MHz, MCS0, 90pc duty cycle)	WLAN	8.64	± 9.6 %
10608	AAB	IEEE 802.11ac WiFi (20MHz, MCS1, 90pc duty cycle)	WLAN	8.77	± 9.6 %
10609	AAB	IEEE 802.11ac WiFi (20MHz, MCS2, 90pc duty cycle)	WLAN	8.57	± 9.6 %
10610	AAB	IEEE 802.11ac WiFi (20MHz, MCS3, 90pc duty cycle)	WLAN	8.78	± 9.6 %
10611	AAB	IEEE 802.11ac WiFi (20MHz, MCS4, 90pc duty cycle)	WLAN	8.70	± 9.6 %
10612	AAB	IEEE 802.11ac WiFi (20MHz, MCS5, 90pc duty cycle)	WLAN	8.77	± 9.6 %
10613	AAB	IEEE 802.11ac WiFi (20MHz, MCS6, 90pc duty cycle)	WLAN	8.94	± 9.6 %
10614	AAB	IEEE 802.11ac WiFi (20MHz, MCS7, 90pc duty cycle)	WLAN	8.59	± 9.6 %
10615	AAB	IEEE 802.11ac WiFi (20MHz, MCS8, 90pc duty cycle)	WLAN	8.82	± 9.6 %
10616	AAB	IEEE 802.11ac WiFi (40MHz, MCS0, 90pc duty cycle)	WLAN	8.82	± 9.6 %
10617	AAB	IEEE 802.11ac WiFi (40MHz, MCS1, 90pc duty cycle)	WLAN	8.81	± 9.6 %
10618	AAB	IEEE 802.11ac WiFi (40MHz, MCS2, 90pc duty cycle)	WLAN	8.58	± 9.6 %
10619	AAB	IEEE 802.11ac WiFi (40MHz, MCS3, 90pc duty cycle)	WLAN	8.86	± 9.6 %
10620	AAB	IEEE 802.11ac WiFi (40MHz, MCS4, 90pc duty cycle)	WLAN	8.87	± 9.6 %
10621	AAB	IEEE 802.11ac WiFi (40MHz, MCS5, 90pc duty cycle)	WLAN	8.77	± 9.6 %
10622	AAB	IEEE 802.11ac WiFi (40MHz, MCS6, 90pc duty cycle)	WLAN	8.68	± 9.6 %
10623	AAB	IEEE 802.11ac WiFi (40MHz, MCS7, 90pc duty cycle)	WLAN	8.82	± 9.6 %
10624	AAB	IEEE 802.11ac WiFi (40MHz, MCS8, 90pc duty cycle)	WLAN	8.96	± 9.6 %
10625	AAB	IEEE 802.11ac WiFi (40MHz, MCS9, 90pc duty cycle)	WLAN	8.96	± 9.6 %
10626	AAB	IEEE 802.11ac WiFi (80MHz, MCS0, 90pc duty cycle)	WLAN	8.83	± 9.6 %
10627	AAB	IEEE 802.11ac WiFi (80MHz, MCS1, 90pc duty cycle)	WLAN	8.88	± 9.6 %
10628	AAB	IEEE 802.11ac WiFi (80MHz, MCS2, 90pc duty cycle)	WLAN	8.71	± 9.6 %
10629	AAB	IEEE 802.11ac WiFi (80MHz, MCS3, 90pc duty cycle)	WLAN	8.85	± 9.6 %
10630	AAB	IEEE 802.11ac WiFi (80MHz, MCS4, 90pc duty cycle)	WLAN	8.72	± 9.6 %
10631	AAB	IEEE 802.11ac WiFi (80MHz, MCS5, 90pc duty cycle)	WLAN	8.81	± 9.6 %
10632	AAB	IEEE 802.11ac WiFi (80MHz, MCS6, 90pc duty cycle)	WLAN	8.74	± 9.6 %
10633	AAB	IEEE 802.11ac WiFi (80MHz, MCS7, 90pc duty cycle)	WLAN	8.83	± 9.6 %
10634	AAB	IEEE 802.11ac WiFi (80MHz, MCS8, 90pc duty cycle)	WLAN	8.80	± 9.6 %
10635	AAB	IEEE 802.11ac WiFi (80MHz, MCS9, 90pc duty cycle)	WLAN	8.81	± 9.6 %
10636	AAC	IEEE 802.11ac WiFi (160MHz, MCS0, 90pc duty cycle)	WLAN	8.83	± 9.6 %
10637	AAC	IEEE 802.11ac WiFi (160MHz, MCS1, 90pc duty cycle)	WLAN	8.79	± 9.6 %
10638	AAC	IEEE 802.11ac WiFi (160MHz, MCS2, 90pc duty cycle)	WLAN	8.86	± 9.6 %
10639	AAC	IEEE 802.11ac WiFi (160MHz, MCS3, 90pc duty cycle)	WLAN	8.85	± 9.6 %
10640	AAC	IEEE 802.11ac WiFi (160MHz, MCS4, 90pc duty cycle)	WLAN	8.98	± 9.6 %
10641	AAC	IEEE 802.11ac WiFi (160MHz, MCS5, 90pc duty cycle)	WLAN	9.06	± 9.6 %
10642	AAC	IEEE 802.11ac WiFi (160MHz, MCS6, 90pc duty cycle)	WLAN	9.06	± 9.6 %
10643	AAC	IEEE 802.11ac WiFi (160MHz, MCS7, 90pc duty cycle)	WLAN	8.89	± 9.6 %
10644	AAC	IEEE 802.11ac WiFi (160MHz, MCS8, 90pc duty cycle)	WLAN	9.05	± 9.6 %
10645	AAC	IEEE 802.11ac WiFi (160MHz, MCS9, 90pc duty cycle)	WLAN	9.11	± 9.6 %
10646	AAG	LTE-TDD (SC-FDMA, 1 RB, 5 MHz, QPSK, UL Subframe=2,7)	LTE-TDD	11.96	± 9.6 %
10647	AAF	LTE-TDD (SC-FDMA, 1 RB, 20 MHz, QPSK, UL Subframe=2,7)	LTE-TDD	11.96	± 9.6 %
10648	AAA	CDMA2000 (1x Advanced)	CDMA2000	3.45	± 9.6 %
10652	AAE	LTE-TDD (OFDMA, 5 MHz, E-TM 3.1, Clipping 44%)	LTE-TDD	6.91	± 9.6 %
10653	AAE	LTE-TDD (OFDMA, 10 MHz, E-TM 3.1, Clipping 44%)	LTE-TDD	7.42	± 9.6 %
10654	AAD	LTE-TDD (OFDMA, 15 MHz, E-TM 3.1, Clipping 44%)	LTE-TDD	6.96	± 9.6 %