RF EXPOSURE EVALUATION REPORT

FCC ID	**: PKRISGM1000**
Equipment	**: Wireless Hotspot Modem**
Brand Name	**: inseego**
Model Name	**: M1000**
Marketing Name	**: 5G MiFi M1000**
Applicant	**: Inseego Corp. 9605 Scranton Road, Suite 300, San Diego, CA 92121**
Manufacturer	**: Inseego Corp. 9605 Scranton Road, Suite 300, San Diego, CA 92121**
Standard	**: FCC 47 CFR Part 2 (2.1093)**

We, SPORTON INTERNATIONAL INC have been evaluated in accordance with 47 CFR Part 2.1093 for the device and pass the limit.

The test results in this report apply exclusively to the tested model / sample. Without written approval of SPORTON INTERNATIONAL INC. EMC & Wireless Communications Laboratory, the test report shall not be reproduced except in full.

Cona Huang

Approved by: Cona Huang / Deputy Manager

SPORTON INTERNATIONAL INC. EMC & Wireless Communications Laboratory

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Table of Contents

History of this test report

Report No.	Version	Description	Issued Date
FA950301B	01	Initial issue of report	May. 10, 2019
FA950301B	02	Update section12 description	May. 15, 2019
FA950301B	03	added test results for the 2nd worst position	May. 17, 2019

1. Summary

The maximum measured average power density found during testing for Inseego Corp., Wireless Hotspot Modem, are as follows.

Standalone transmission		
Wireless Band	Highest Total Power Density, averaging over 4cm^2 (mW/cm^2)	Limit (FCC part 1.310) (mW/cm^2)
5GNR n260	0.255	1

Reviewed by: Eric Huang
Report Producer: Wan Liu

2. Guidance Applied

The Power Density testing specification, method, and procedure for this device is in accordance with the following standards:

- FCC 47 CFR Part 2.1091
- FCC 47 CFR Part 2.1093
- FCC KDB 865664 D02 SAR Reporting v01r02
- FCC KDB 447498 D01 General RF Exposure Guidance v06
- TCBC workshop notes
- IEC Draft TR 63170

3. Equipment Under Test (EUT) Information

3.1 General Information

Product Feature & Specification	
Equipment Name	Wireless Hotspot Modem
Brand Name	inseego
Model Name	M1000
Marketing Name	5G MiFi M1000
FCC ID	PKRISGM1000
HW Version	3.0
Wireless Technology and Frequency Range	5G NR n260: 37GHz~40GHz
Modulation	5GNR n260: QPSK, 16QAM, and 64QAM for CP-OFDM
Antenna Information	This device has 4 antenna array modules, only one module can be turned on and transmits at a time.
Maximum Number of contiguous CC	4CC
Maximum Aggregated Bandwidth	400MHz
Supported Channel Bandwidth	50MHz/100MHz
5GNR Operation	Non-Standalone Mode
Max. Duty Cycle	25% (as attested by the carrier)
EUT Stage	Identical Prototype

4. RF Exposure Limits

4.1 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.

4.2 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. The 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.

The criteria listed in Table 1 shall be used to evaluate the environmental impact of human exposure above 6GHz to radio frequency (RF) radiation as specified in §1.1310.

General Population Basic restriction for power density for frequencies between 1.5GHz and 100 GHz is 1.0 mW/cm^2 = 10 W/m^2

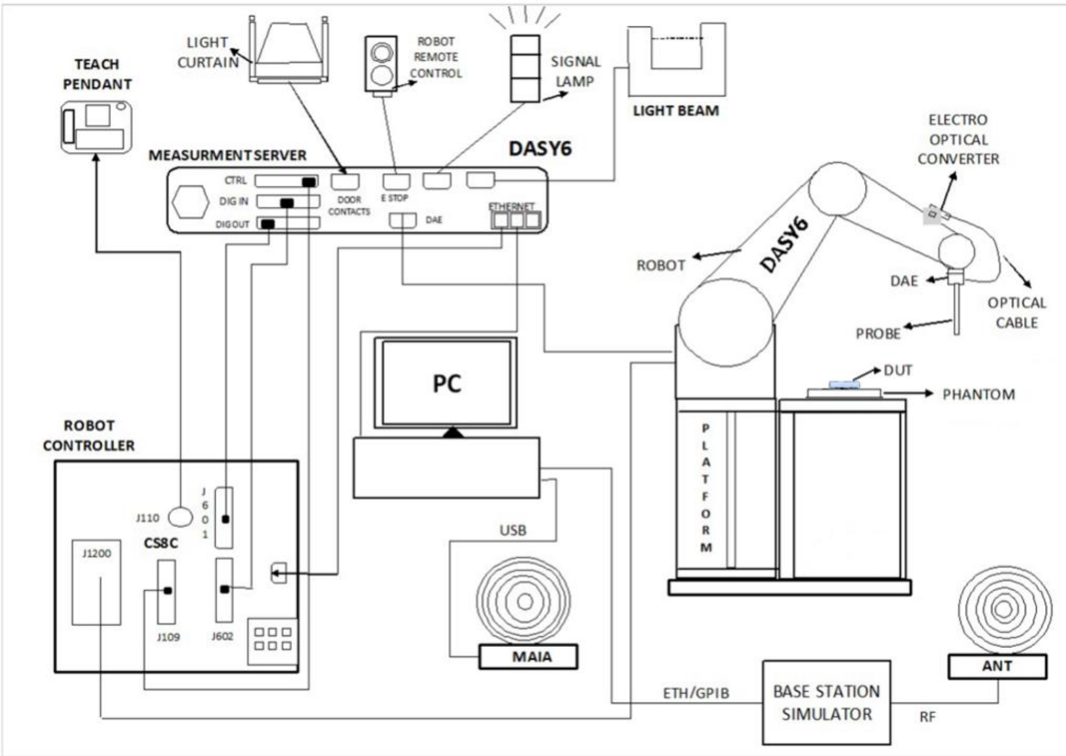
Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm^2)	Averaging time (minutes)
(A) Limits for Occupational/Controlled Exposures				
0.3-3.0	614	1.63	*(100)	6
3.0-30	1842/f	4.89/f	*(900/f2)	6
30-300	61.4	0.163	1.0	6
300-1500			f/300	6
1500-100,000			5	6
(B) Limits for General Population/Uncontrolled Exposure				
0.3-1.34	614	1.63	*(100)	30
1.34-30	824/f	2.19/f	*(180/f2)	30
30-300	27.5	0.073	0.2	30
300-1500			f/1500	30
1500-100,000			1.0	30

Table 1

5. System Description and Setup

The system to be used for the near field power density measurement

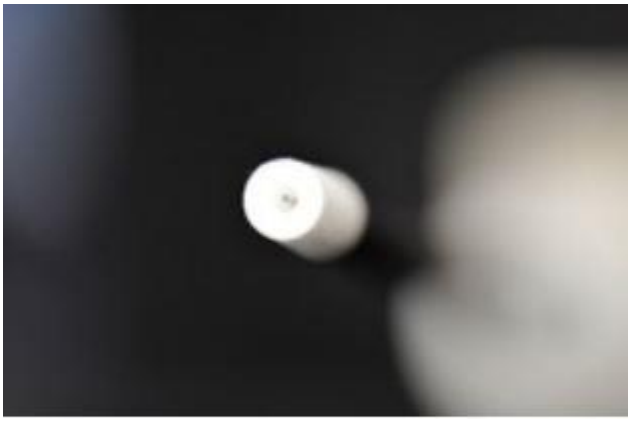
- SPEAG DASY6 system
- SPEAG cDASY6 5G module software
- EUmmWVx probe
- 5G Phantom cover

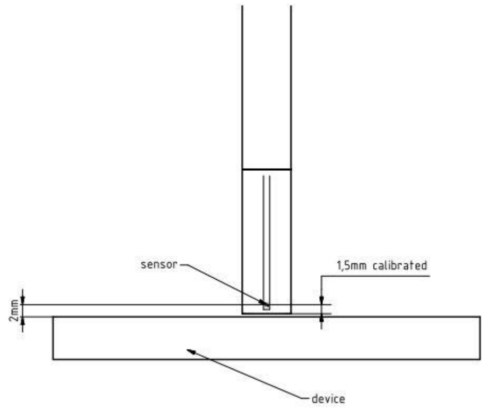


5.1 EUmmWave Probe / E-Field 5G Probe

The probe design allows measurements at distances as small as 2 mm from the sensors to the surface of the device under test (DUT). The typical sensor to probe tip distance is 1.5 mm.

Frequency	750 MHz – 110 GHz
Probe Overall Length	320 mm
Probe Body Diameter	8.0 mm
Tip Length	23.0 mm
Tip Diameter	8.0 mm
Probe's two dipoles length	0.9 mm – Diode loaded
Dynamic Range	< 20 V/m - 10000 V/m with PRE-10 (min < 50 V/m - 3000 V/m)
Position Precision	< 0.2 mm
Distance between diode sensors and probe's tip	1.5 mm
Minimum Mechanical separation between probe tip and a Surface	0.5 mm
Applications	E-field measurements of 5G devices and other mm-wave transmitters operating above 10GHz in < 2 mm distance from device (free-space) Power density, H-field and far-field analysis using total field reconstruction.
Compatibility	cDASY6 + 5G-Module SW1.0 and higher

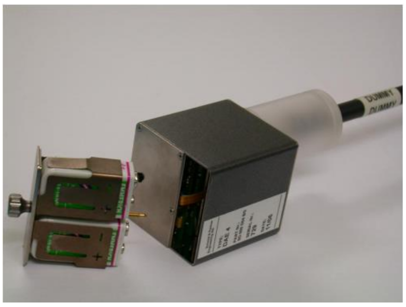




5.2 Data Acquisition Electronics (DAE)

The data acquisition electronics (DAE) consists of a highly sensitive electrometer-grade preamplifier with auto-zeroing, a channel and gain-switching multiplexer, a fast 16 bit AD-converter and a command decoder and control logic unit. Transmission to the measurement server is accomplished through an optical downlink for data and status information as well as an optical uplink for commands and the clock.

The input impedance of the DAE is 200 MOhm; the inputs are symmetrical and floating. Common mode rejection is above 80 dB.



5.3 Scan configuration

Fine-resolution scans on 2 different planes are performed to reconstruct the E- and H-fields as well as the power density; the z-distance between the 2 planes is set to $\lambda/4$.

The (x, y) grid step is also set $\lambda/4$, the grid extent is set to sufficiently large to identify the field pattern and the peak.

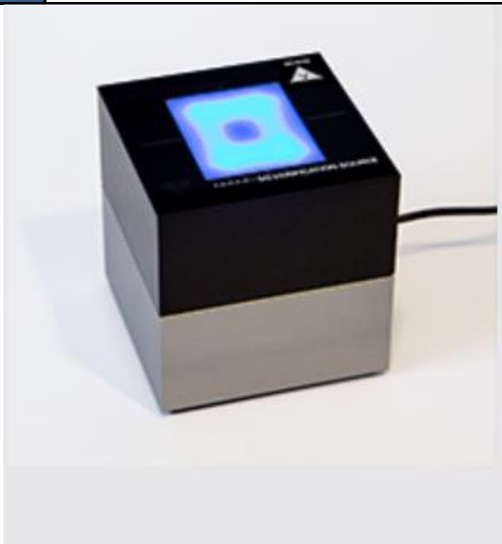
6. Test Equipment List

Manufacturer	Name of Equipment	Type/Model	Serial Number	Calibration	
				Last Cal.	Due Date
SPEAG	5G Verification Source	30 GHz	1007	Apr. 24, 2019	Apr. 23, 2020
SPEAG	EUmmWV Probe Tip Protection	EUmmWV3	9413	Feb. 13, 2019	Feb. 12, 2020
SPEAG	EUmmWV Probe Tip Protection	EUmmWV3	9390	Jun. 28, 2018	Jun. 27, 2019
SPEAG	Data Acquisition Electronics	DAE4	853	Jul. 24, 2018	Jul. 23, 2019
RCPTWN	Thermometer	HTC-1	TM560-2	Nov. 12, 2018	Nov. 11, 2019
Rohde & Schwarz	Spectrum Analyzer	FSV40	101408	Jul. 30, 2018	Jul. 29, 2019
Custom Microwave	Standard Horn antenna	M15RH	V91113-A	NCR	NCR

7. System Verification Source

The System Verification sources at 30 GHz and above comprise horn-antennas and very stable signal generators.

Model	Ka-band horn antenna
Calibrated frequency:	30 GHz at 10mm from the case surface
Frequency accuracy	± 100 MHz
E-field polarization	linear
Harmonics	-20 dBc
Total radiated power	14 dBm
Power stability	0.05 dB
Power consumption	5 W
Size	00 x 100 x 100 mm
Weight	1 kg



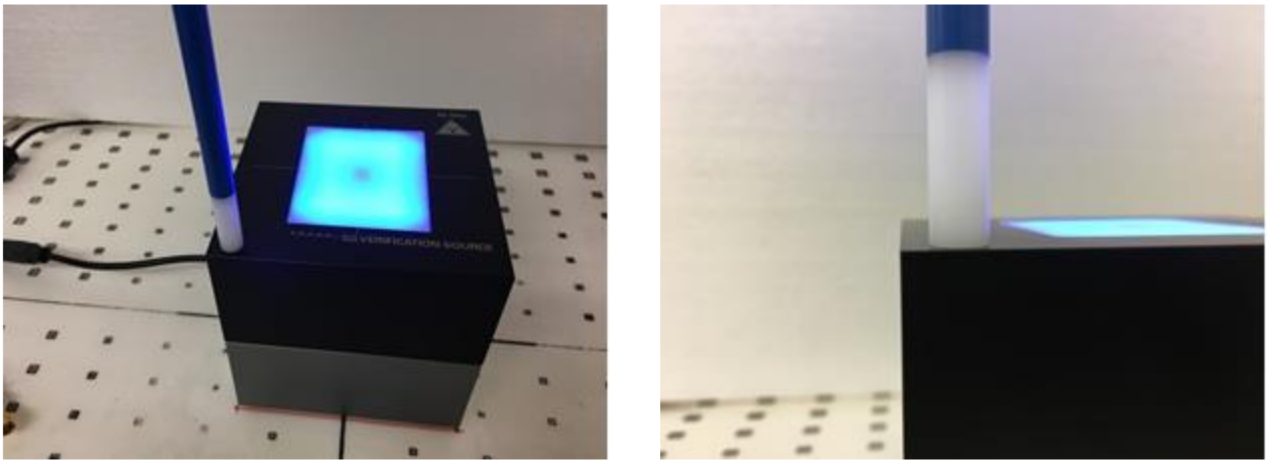
8. Power Density System Verification

The system performance check verifies that the system operates within its specifications.

The EUT is replaced by a calibrated source, the same spatial resolution, measurement region and the test separation used in the calibration was applied to system check. Through visual inspection into the measured power density distribution, both spatially (shape) and numerically (level) have no noticeable difference. The measured results should be within 10% of the calibrated targets.

Frequency [GHz]	Grid step	Grid extent X/Y [mm]	Measurement points
10	0.25 $(\frac{\lambda}{4})$	120/120	16 × 16
30	0.25 $(\frac{\lambda}{4})$	60/60	24 × 24
60	0.25 $(\frac{\lambda}{4})$	32.5/32.5	26 × 26
90	0.25 $(\frac{\lambda}{4})$	30/30	36 × 36

Settings for measurement of verification sources



Verification Setup photo

9. System Verification Results

Date	Frequency (GHz)	5G Verification Source	Probe S/N	DAE S/N	Distance (mm)	Measured 4 cm^2 (W/m^2)	Targeted 4 cm^2 (W/m^2)	Deviation (%)
2019/5/2	30	30GHz-1007	9390	853	10	38.7	37.9	2.11%
2019/5/8	30	30GHz-1007	9413	853	10	38.5	37.9	1.58%
2019/5/14	30	30GHz-1007	9413	853	10	36.2	37.9	-4.49%

10. Power Density Measurement Evaluation

1. The 5G NR n260 signal under testing was configured by test Qualcomm software, and the test tool can be used and set the relevant 5G radio parameters (e.g. TX carrier, polarization, band, channel, bandwidth and output power etc.)
2. The device was configured to transmit maximum power and at 100% duty cycle, for each RB configuration/modulation/bandwidth/channel to be tested
3. According to TCBC Workshop in October 2018, 4 cm2 averaging area may now be considered.
4. Above 6 GHz, Maximum Permissible Exposure (MPE) limits apply to portable exposure conditions according to 47 CFR §2.1093.

11. Power Density Measurement Procedure

1. Simulate all beams with all array elements transmitting in Near-Field for selected antenna
2. Measure Beam ID with highest PD for Selected Side with Full Bandwidth
   a. SISO, Vertical Polarization, 1 RB, QPSK, Mid
   b. SISO, Horizontal Polarization, 1 RB, QPSK, Mid Ch.
   c. MIMO, 1 RB, QPSK, Mid Ch.
3. If result > 50% of limit, repeat for 2nd, 3rd, and 4th highest beams from PD simulation
4. Test other half and Full RB
5. Test other modulations
6. Test other bandwidths.
7. Test other component carriers.
8. Test high and low channels.
9. Test other sides.

11.1 Computation of the Electric Field Polarization Ellipse

For the numerical description of an arbitrarily oriented ellipse in three-dimensional space, five parameters are needed: the semi-major axis (a), the semi-minor axis (b), two angles describing the orientation of the normal vector of the ellipse (∅, θ), and one angle describing the tilt of the semi-major axis (ψ). For the two extreme cases, i.e., circular and linear polarizations, three parameters only (a, ∅ and θ) are sufficient for the description of the incident field.

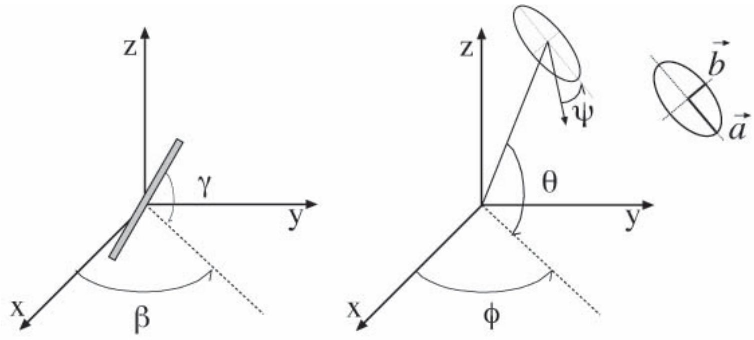


Illustration of the angles used for the numerical description of the sensor and the orientation of an ellipse in 3-D space.

For the reconstruction of the ellipse parameters from measured data, the problem can be reformulated as a nonlinear search problem. The semi-major and semi-minor axes of an elliptical field can be expressed as functions of the three angles (∅, θ and ψ). The parameters can be uniquely determined towards minimizing the error based on least-squares for the given set of angles and the measured data. In this way, the number of free parameters is reduced from five to three, which means that at least three sensor readings are necessary to gain sufficient information for the reconstruction of the ellipse parameters. However, to suppress the noise and increase the reconstruction accuracy, it is desirable that the system of equations be over determined. The solution to use a probe consisting of two sensors angled by r_1 and r_2 toward the probe axis and to perform measurements at three angular positions of the probe, i.e., at β_1, β_2 and β_3, results in over-determinations by a factor of two. If there is a need for more information or increased accuracy, more rotation angles can be added. The reconstruction of the ellipse parameters can be separated into linear and non-linear parts that are best solved by the Givens algorithm combined with a downhill simplex algorithm. To minimize the mutual coupling, sensor angles are set with a shift of 90 degree ($r_2 = r_1 + 90$ degree), and to simplify, the first rotation angle of the probe (β_1) can be set to 0 degree

11.2 Total Field and Power Flux Density Reconstruction

Computation of the power density in general requires knowledge of the electric and magnetic field amplitudes and phases in the plane of incidence. Reconstruction of these quantities from pseudo-vector E-field measurements is feasible, as they are constrained by Maxwell's equations. SPEAG have developed a reconstruction approach based on the Gerchberg-Saxton algorithm, which benefits from the availability of the E-field polarization ellipse information obtained with the EUmmWV2 probe.
The average of the reconstructed power density is evaluated over a circular area in each measurement plane. Two average power density values can be computed, the average total power density and the average incident power density, and the average total power density is used to determine compliance.

- $|Re\{S\}|$ is the total Poynting vector
- $\mathrm{n} \cdot Re\{S\}$ is the normal Poything vector

The software post-processing reports to values, “S avg tot” and “S avg inc”. “S avg tot” represents average total power density (all three xyz components included), and “S avg inc” represents average normal power density.   The average total power density “S avg tot” is reported to determine the device compliance.

11.3 Test Positions

Module	Measurement Plane					
	Front @ 10 mm	Back @ 10 mm	Left @ 10 mm	Right @ 10 mm	Top @ 10 mm	Bottom @ 10 mm
0	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**
1	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**
2	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**
3	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**

General Note:

1. The detailed test setup is illustrated in the appendix D.

12. RF Exposure Evaluation Results

General Note:

1. Use beam ID with highest PD from simulation as basis for measurement
2. Begin by measuring PD with full bandwidth for different polarizations at 1 QPSK, 1 RB, Mid Ch.
3. Power density results were scaled down from the test software duty cycle of 100% to the maximum duty cycle 25% (as attested by the carrier(s)) to demonstrate compliance

Plot No.	bandwidth of 1CC (MHz)	carrier aggregation	antenna module	Beam ID 1 (H)	Beam ID 2 (V)	Frequency (GHz)	Exposure Surface	Test separation	RB allocation	RB Offset	modulation	E-peak [V/m]	H-peak [A/m]	Measured results Savg inc 4cm^2 (W/m2)	Measured results Savg tot 4cm^2 (W/m2)	25% Duty cycle Reported Savg tot 4cm^2 (W/m2)
	100	1cc	0	15		38.5	Top/S2	10mm	1 RB	32	QPSK, CP-OFDM	93.7	0.25	6.92	7.84	1.96
	100	1cc	0		142	38.5	Top/S2	10mm	1 RB	32	QPSK, CP-OFDM	59.6	0.155	3	3.34	0.84
	100	1cc	0	15	142	38.5	Top/S2	10mm	1 RB	32	QPSK, CP-OFDM	111	0.289	8.72	9.76	2.44
	100	1cc	0	15	142	38.5	Top/S2	10mm	33 RB	16	QPSK, CP-OFDM	101	0.27	6.88	7.44	1.86
	100	1cc	0	15	142	38.5	Top/S2	10mm	66 RB	0	QPSK, CP-OFDM	111	0.288	9.03	10.1	2.53
1	100	1cc	0	15	142	38.5	Top/S2	10mm	66 RB	0	16QAM, CP-OFDM	111	0.293	9.14	10.2	2.55
	100	1cc	0	15	142	38.5	Top/S2	10mm	66 RB	0	64QAM, CP-OFDM	87.6	0.239	6.31	7.08	1.77
	50	1cc	0	15	142	38.5	Top/S2	10mm	32 RB	0	16QAM, CP-OFDM	90.7	0.252	6.22	6.79	1.70
	100	4cc	0	15	142	38.5	Top/S2	10mm	66 RB	0	16QAM, CP-OFDM	33	0.091	0.99	1.05	0.26
	100	1cc	0	15	142	37.05	Top/S2	10mm	66 RB	0	16QAM, CP-OFDM	80.7	0.213	6.29	6.99	1.75
	100	1cc	0	15	142	39.95	Top/S2	10mm	66 RB	0	16QAM, CP-OFDM	78.9	0.214	5.91	6.49	1.62
	100	1cc	0	15	142	38.5	Bottom/S10	10mm	66 RB	0	16QAM, CP-OFDM	6.77	0.013	0.022	0.029	0.01
	100	1cc	0	15	142	38.5	Front/S8	10mm	66 RB	0	16QAM, CP-OFDM	5.51	0.015	0.031	0.036	0.01
	100	1cc	0	15	142	38.5	Back/S6	10mm	66 RB	0	16QAM, CP-OFDM	30.9	0.077	1.07	1.1	0.28
	100	1cc	0	15	142	38.5	Left/S7	10mm	66 RB	0	16QAM, CP-OFDM	9.2	0.027	0.143	0.149	0.04
	100	1cc	0	15	142	38.5	Right/S5	10mm	66 RB	0	16QAM, CP-OFDM	14.5	0.038	0.418	0.422	0.11
	100	1cc	0	57	182	38.5	Back/S6	10mm	66 RB	0	16QAM, CP-OFDM	50.6	0.13	2.47	2.67	0.67

Plot No.	bandwidth of 1CC (MHz)	carrier aggregation	antenna module	Beam ID 1 (H)	Beam ID 2 (V)	Frequency (GHz)	Exposure Surface	Test separation	RB allocation	RB Offset	modulation	E-peak [V/m]	H-peak [A/m]	Measured results Savg inc 4cm^2 (W/m2)	Measured results Savg tot 4cm^2 (W/m2)	25% Duty cycle Reported Savg tot 4cm^2 (W/m2)
	100	1cc	1	32		38.5	Top/S4	10mm	1 RB	32	QPSK, CP-OFDM	68.1	0.191	4.29	4.88	1.22
	100	1cc	1		160	38.5	Top/S4	10mm	1 RB	32	QPSK, CP-OFDM	33.6	0.09	1.07	1.17	0.29
	100	1cc	1	32	160	38.5	Top/S4	10mm	1 RB	32	QPSK, CP-OFDM	77.2	0.188	3.83	3.97	0.99
2	100	1cc	1	32		38.5	Top/S4	10mm	33 RB	16	QPSK, CP-OFDM	69.6	0.196	4.63	5.13	1.28
	100	1cc	1	32		38.5	Top/S4	10mm	66 RB	0	QPSK, CP-OFDM	66.8	0.19	4.2	4.68	1.17
	100	1cc	1	32		38.5	Top/S4	10mm	33 RB	16	16QAM, CP-OFDM	62.5	0.177	3.68	4.09	1.02
	100	1cc	1	32		38.5	Top/S4	10mm	33 RB	16	64QAM, CP-OFDM	50.8	0.142	2.44	2.69	0.67
	50	1cc	1	32		38.5	Top/S4	10mm	16 RB	7	QPSK, CP-OFDM	68.7	0.199	4.35	4.94	1.24
	100	4cc	1	32		38.5	Top/S4	10mm	33 RB	16	QPSK, CP-OFDM	51.7	0.141	2.39	2.78	0.70
	100	1cc	1	32		37.05	Top/S4	10mm	33 RB	16	QPSK, CP-OFDM	69.5	0.18	4.52	4.86	1.22
	100	1cc	1	32		39.95	Top/S4	10mm	33 RB	16	QPSK, CP-OFDM	54.2	0.151	2.85	3.27	0.82
	100	1cc	1	32		38.5	Bottom/S12	10mm	33 RB	16	QPSK, CP-OFDM	7.83	0.024	0.066	0.074	0.02
	100	1cc	1	32		38.5	Front/S8	10mm	33 RB	16	QPSK, CP-OFDM	26.3	0.069	0.681	0.75	0.19
	100	1cc	1	32		38.5	Back/S6	10mm	33 RB	16	QPSK, CP-OFDM	15.6	0.041	0.274	0.302	0.08
	100	1cc	1	32		38.5	Left/S7	10mm	33 RB	16	QPSK, CP-OFDM	13.8	0.042	0.284	0.305	0.08
	100	1cc	1	32		38.5	Right/S5	10mm	33 RB	16	QPSK, CP-OFDM	14.8	0.042	0.454	0.462	0.12
	100	1cc	1		177	38.5	Front/S8	10mm	33 RB	16	QPSK, CP-OFDM	49.9	0.112	2.83	3.52	0.88
	100	1cc	2	30		38.5	Top/S1	10mm	1 RB	32	QPSK, CP-OFDM	70.2	0.186	3.96	4.53	1.13
	100	1cc	2		159	38.5	Top/S1	10mm	1 RB	32	QPSK, CP-OFDM	29.9	0.082	0.894	1.11	0.28
	100	1cc	2	30	159	38.5	Top/S1	10mm	1 RB	32	QPSK, CP-OFDM	46.2	0.111	2.31	2.66	0.67
	100	1cc	2	30		38.5	Top/S1	10mm	33 RB	16	QPSK, CP-OFDM	72.1	0.178	4.09	4.5	1.13
	100	1cc	2	30		38.5	Top/S1	10mm	66 RB	0	QPSK, CP-OFDM	70.5	0.186	4.02	4.59	1.15
	100	1cc	2	30		38.5	Top/S1	10mm	66 RB	0	16QAM, CP-OFDM	62.7	0.163	3.08	3.45	0.86
	100	1cc	2	30		38.5	Top/S1	10mm	66 RB	0	64QAM, CP-OFDM	51.2	0.129	2.06	2.27	0.57
3	50	1cc	2	30		38.5	Top/S1	10mm	32 RB	0	QPSK, CP-OFDM	72	0.19	4.17	4.66	1.17
	50	4cc	2	30		38.5	Top/S1	10mm	32 RB	0	QPSK, CP-OFDM	52.8	0.133	2.2	2.5	0.63
	50	1cc	2	30		37.025	Top/S1	10mm	32 RB	0	QPSK, CP-OFDM	68.6	0.178	3.96	4.34	1.09
	50	1cc	2	30		39.975	Top/S1	10mm	32 RB	0	QPSK, CP-OFDM	53.3	0.147	2.58	2.8	0.70
	50	1cc	2	30		38.5	Bottom/S9	10mm	32 RB	0	QPSK, CP-OFDM	7.51	0.023	0.052	0.057	0.01
	50	1cc	2	30		38.5	Front/S8	10mm	32 RB	0	QPSK, CP-OFDM	11.2	0.028	0.145	0.155	0.04
	50	1cc	2	30		38.5	Back/S6	10mm	32 RB	0	QPSK, CP-OFDM	12.7	0.032	0.192	0.198	0.05
	50	1cc	2	30		38.5	Left/S7	10mm	32 RB	0	QPSK, CP-OFDM	13.9	0.04	0.198	0.224	0.06
	50	1cc	2	30		38.5	Right/S5	10mm	32 RB	0	QPSK, CP-OFDM	21.9	0.059	1.08	1.09	0.27
	50	1cc	2		210	38.5	Right/S5	10mm	32 RB	0	QPSK, CP-OFDM	47.3	0.103	2.54	2.94	0.74
	100	1cc	3	41		38.5	Top/S3	10mm	1 RB	32	QPSK, CP-OFDM	80.8	0.203	6.45	7.41	1.85
	100	1cc	3		169	38.5	Top/S3	10mm	1 RB	32	QPSK, CP-OFDM	50.8	0.127	2.69	3.04	0.76
	100	1cc	3	41	169	38.5	Top/S3	10mm	1 RB	32	QPSK, CP-OFDM	97.3	0.255	6.67	7.28	1.82
	100	1cc	3	41		38.5	Top/S3	10mm	33 RB	16	QPSK, CP-OFDM	83.1	0.234	6.94	7.99	2.00
	100	1cc	3	41		38.5	Top/S3	10mm	66 RB	0	QPSK, CP-OFDM	83.3	0.221	6.8	7.85	1.96
	100	1cc	3	41		38.5	Top/S3	10mm	33 RB	16	16QAM, CP-OFDM	75.9	0.211	6.12	6.93	1.73
	100	1cc	3	41		38.5	Top/S3	10mm	33 RB	16	64QAM, CP-OFDM	50.2	0.141	2.25	2.47	0.62
	50	1cc	3	41		38.5	Top/S3	10mm	16RB	7	QPSK, CP-OFDM	83.4	0.232	7.36	8.34	2.09
	50	4cc	3	41		38.5	Top/S3	10mm	16RB	7	QPSK, CP-OFDM	68.7	0.176	4.03	4.63	1.16
	50	1cc	3	41		37.025	Top/S3	10mm	16RB	7	QPSK, CP-OFDM	68.6	0.19	4.87	5.41	1.35
4	50	1cc	3	41		39.975	Top/S3	10mm	16RB	7	QPSK, CP-OFDM	90	0.247	8.18	9.36	2.34
	50	1cc	3	41		39.975	Bottom/S11	10mm	16RB	7	QPSK, CP-OFDM	8.61	0.024	0.06	0.066	0.02
	50	1cc	3	41		39.975	Front/S8	10mm	16RB	7	QPSK, CP-OFDM	12.1	0.028	0.079	0.084	0.02
	50	1cc	3	41		39.975	Back/S6	10mm	16RB	7	QPSK, CP-OFDM	17.7	0.048	0.48	0.496	0.12
	50	1cc	3	41		39.975	Left/S7	10mm	16RB	7	QPSK, CP-OFDM	23.5	0.063	1.11	1.13	0.28
	50	1cc	3	41		39.975	Right/S5	10mm	16RB	7	QPSK, CP-OFDM	14.5	0.041	0.389	0.398	0.10
	50	1cc	3		188	39.975	Left/S7	10mm	16RB	7	QPSK, CP-OFDM	58.8	0.137	3.44	4.15	1.04

Test Engineer： Bevis Chang, and Galen Zhang

13. Uncertainty Assessment

The budget is valid for evaluation distances > λ/2π. For specific tests and configurations, the Uncertainty could be considerably smaller.

Preliminary Module mmWave Uncertainty Budget Evaluation Distances to the Antennas > λ / 2π						
Error Description	**Uncertainty Value (± dB)**	**Probability**	**Divisor**	**(Ci)**	**Standard Uncertainty (±dB)**	**(Vi) Veff**
Measurement System						
Probe Calibration	0.49	N	1	1	0.49	∞
Hemispherical Isotropy	0.50	R	1.732	1	0.29	∞
Linearity	0.20	R	1.732	0	0.12	∞
System Detection Limits	0.04	R	1.732	1	0.02	∞
Modulation Response	0.40	R	1.732	1	0.23	∞
Readout Electronics	0.03	N	1	1	0.03	∞
Response Time	0.00	R	1.732	1	0.00	∞
Integration Time	0.00	R	1.732	1	0.00	∞
RF Ambient Noise	0.2	R	1.732	1	0.12	∞
RF Ambient Reflections	0.21	R	1.732	1	0.12	∞
Probe Positioner	0.04	R	1.732	1	0.02	∞
Probe Positioning	0.30	R	1.732	1	0.17	∞
S_{avg} Reconstruction	0.60	R	1.732	1	0.35	∞
Test Sample Related						
Power Drift	0.2	R	1.732	1	0.12	∞
Input Power	0	N	1	0	0.00	∞
Combined Std. Uncertainty					0.76 dB	∞
Coverage Factor for 95 %					K=2	
Expanded STD Uncertainty					1.52 dB	

14. References

[1] FCC 47 CFR Part 2 “Frequency Allocations and Radio Treaty Matters; General Rules and Regulations”

[2] FCC KDB 447498 D01 v06, “Mobile and Portable Device RF Exposure Procedures and Equipment Authorization Policies”, Oct 2015

[3] FCC KDB 865664 D02 v01r02, “RF Exposure Compliance Reporting and Documentation Considerations” Oct 2015.