

ELECTROMAGNETIC EMISSIONS COMPLIANCE REPORT

INTENTIONAL RADIATOR CERTIFICATION TO FCC PART 15 SUBPART C REQUIREMENT

OF

Applicant: Sony Mobile Communications INC.

EUT Description: Mobile Phone

FCC ID: PY7-04605A

Report Number: ZR/2018/A001106

FCC Rule Part: §15.247, Cat: DTS & DSS
§15.407, Cat: NII

Issue Date: 2018/11/30

Date of Test: 2018/10/19 to 2018/11/14

Date of EUT Received: 2018/10/18

We hereby certify that:

The above equipment was tested by SGS Shenzhen Ltd. Electronics & Communication Laboratory. The test data, data evaluation, test procedures, and equipment configurations shown in this report were made in accordance with the procedures given in ANSI C63.10:2013 and the energy emitted by the sample EUT tested as described in this report is in compliance with conducted and radiated emission limits.

The test results of this report relate only to the tested sample identified in this report.

Authorized for issue by:		
Tested By	<i>Mike Hu</i>	2018/11/30
	(Mike Hu) /Project Engineer	Date
Checked By	<i>David Chen</i>	2018/11/30
	(David Chen) /Reviewer	Date
Approved By	<i>Derek yang</i>	2018/11/30
	(Derek Yang) Wireless Laboratory Manager	Date

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Revision History

Report Number	Revision	Description	Effected Page	Issue Date	Revised By
--	Rev.00	Initial creation of document	All	2018/11/30	--

Result Summary

	Worst Case	Worst point (Original Report)	Worst point (Spot Check)
Radiated Band Edge Measurement Result for 2.4G WiFi	802.11N40_ Highest Channel_ Peak_ Horizontal	-11.84	-18.26
	802.11 N40_ Highest Channel_ Peak_ Vertical	-12.59	-11.76
Radiated Band Edge Measurement Result for BT	Highest Channel_ Peak_ Horizontal	-21.73	-23.27
Radiated Band Edge Measurement Result for BLE	Highest Channel_ Peak_ Horizontal	-21.81	-23.43
Radiated Band Edge Measurement Result for 5G WiFi	11A20_100 ANT 1_Peak_Vertical	-16.73	-17.06
	11A20_100 ANT 1_Average_Vertical	-10.93	-11.40
Transmitter emission above 1GHz for 2.4G WiFi	802.11G_ Highest Channel_ Peak_ Horizontal	-20.26	-20.18
Transmitter Emission above 1GHz for BT	GFSK(DH5)_ Middle Channel_ Peak_ Vertical	-20.92	-20.47
Transmitter Emission above 1GHz for BLE	Middle Channel_ Peak_ Horizontal	-20.01	-20.28
Transmitter Emission above 1GHz for 5G WiFi	11A20_100 ANT 1_Peak_Vertical	-14.99	-15.13
Radiated Emissions for NFC	Horizontal	36.29	36.82
	Vertical	36.41	36.63

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Table of Contents

1	GENERAL INFORMATION.....	4
2	SYSTEM TEST CONFIGURATION	6
3	SUMMARY OF TEST RESULTS	8
4	RADIATED BANDEDGE AND SPURIOUS EMISSION MEASUREMENT.....	9
5	PHOTOGRAPHS - EUT TEST SETUP DETAILS.....	31

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1 GENERAL INFORMATION

1.1 Product description

General:

EUT Description:	Mobile Phone
Trade Mark:	Sony
Power Supply:	Lithium-ion battery:3.85V or charge by USB

1.2 Test Methodology of Applied Standards

FCC Part 15, Subpart C §15.247

FCC Part 15, Subpart E §15.407

FCC KDB 558074 D01 DTS Meas. Guidance v05

KDB 789033 D02 General UNII Test Procedures New Rules v02

ANSI C63.10:2013

Note: All test items have been performed and record as per the above standards.

1.3 Test Facility

The test facility is recognized, certified, or accredited by the following organizations:

- **CNAS (No. CNAS L2929)**

CNAS has accredited SGS-CSTC Standards Technical Services Co., Ltd. Shenzhen Branch EMC Lab to ISO/IEC 17025:2005 General Requirements for the Competence of Testing and Calibration Laboratories (CNAS-CL01 Accreditation Criteria for the Competence of Testing and Calibration Laboratories) for the competence in the field of testing.

- **A2LA (Certificate No. 3816.01)**

SGS-CSTC Standards Technical Services Co., Ltd., Shenzhen EMC Laboratory is accredited by the American Association for Laboratory Accreditation(A2LA). Certificate No. 3816.01.

- **VCCI**

The 3m Fully-anechoic chamber for above 1GHz, 10m Semi-anechoic chamber for below 1GHz, Shielded Room for Mains Port Conducted Interference Measurement and Telecommunication Port Conducted Interference Measurement of SGS-CSTC Standards Technical Services Co., Ltd. have been registered in accordance with the Regulations for Voluntary Control Measures with Registration No.: G-20026, R-14188, C-12383 and T-11153 respectively.

- **FCC –Designation Number: CN1178**

SGS-CSTC Standards Technical Services Co., Ltd., Shenzhen EMC Laboratory has been recognized as an accredited testing laboratory.

Designation Number: CN1178. Test Firm Registration Number: 406779.

- **Industry Canada (IC)**

Two 3m Semi-anechoic chambers and the 10m Semi-anechoic chamber of SGS-CSTC Standards Technical Services Co., Ltd. Shenzhen Branch EMC Lab have been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No.: 4620C-1, 4620C-2, 4620C-3.

1.4 Special Accessories

AC Charger, USB cable and Earphone are used while the test is conducted and there is no other accessory attached. This is the worst case condition.

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1.5 Equipment Modifications

There was no modification incorporated into the EUT.

1.6 Radiated Emission Test Sites For Measurements From 9 kHz To 30 MHz

Radiated emission below 30MHz is measured in a 9m*9m*6m semi-anechoic chamber,the measurements correspond to those obtained at an open-field test site.There is a comparison data of both open-field test site and semi-Anechoic chamber, and the result came out very similar.

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2 SYSTEM TEST CONFIGURATION

2.1 EUT Configuration

The EUT configuration for testing is installed on RF field strength measurement to meet the Commissions requirement and operating in a manner which intends to maximize its emission characteristics in a continuous normal application.

2.2 EUT Exercise

An engineering test mode (software/firmware) that applicant provided was utilized to manipulate the EUT into transmit, selection of the test channel, and modulation scheme.

2.3 Test Procedure

2.3.1 Radiated Emissions

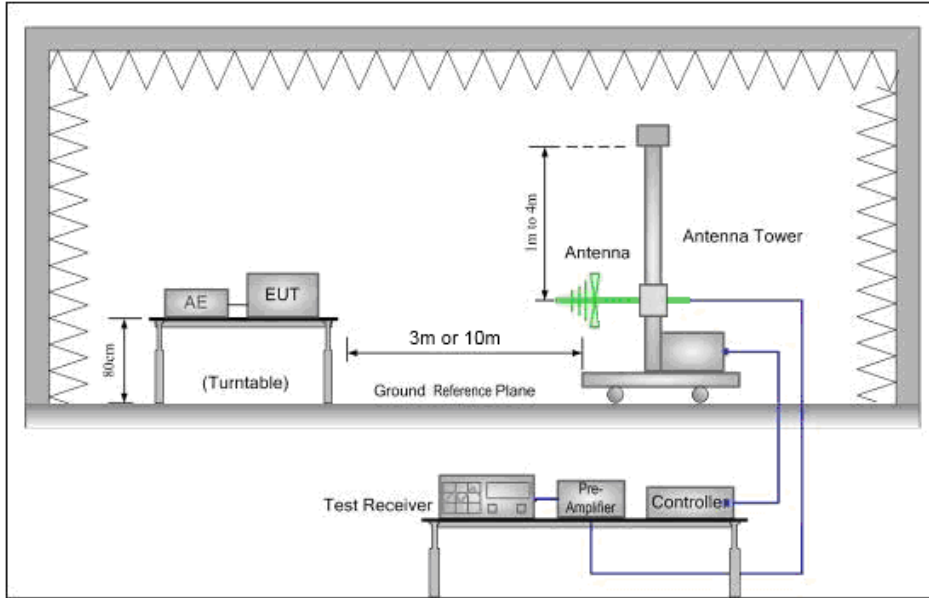
The EUT is placed on a turn table. For emissions testing at or below 1 GHz, the table height shall be 0.8 m above the reference ground plane. For emission measurements above 1 GHz, the table height shall be 1.5 m. The turn table shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3m away from the receiving antenna which varied from 1m to 4m to find out the highest emission. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. In order to find out the max. emission, the relative positions of this transmitter (EUT) was rotated through three orthogonal axes and measurement procedures for electric field radiated emissions above 1 GHz the EUT measurement is to be made "while keeping the antenna in the 'cone of radiation' from that area and pointed at the area both in azimuth and elevation, with polarization oriented for maximum response." is still within the 3dB illumination BW of the measurement antenna.

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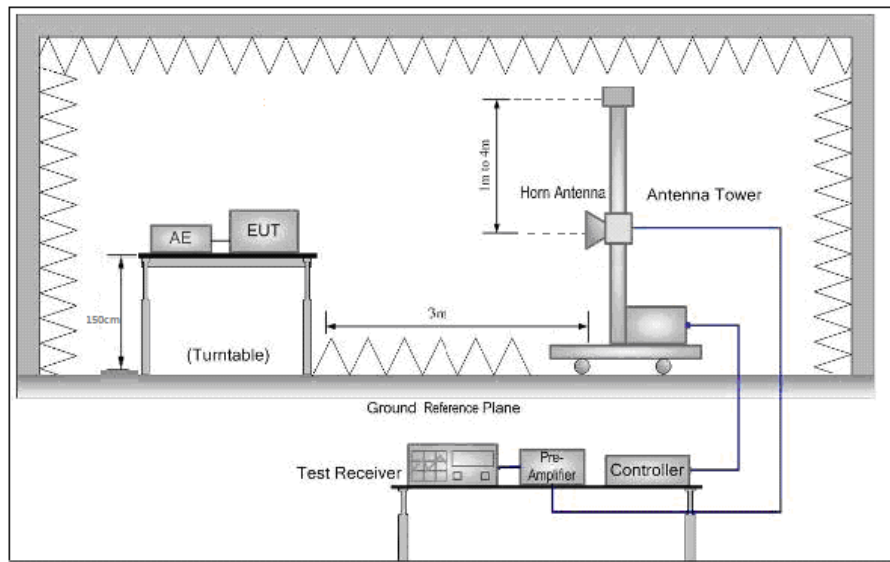
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2.4 Configuration of Tested System

Fig. 2-1 Radiated Emission Configuration



30MHz to 1GHz



Above 1 GHz

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3 SUMMARY OF TEST RESULTS

FCC Rules	Description Of Test	Result
§15.247(d)	Radiated Band Edge and Spurious Emission	Compliant
§15.209 §15.407	Unwanted Emissions (Radiated)	Compliant

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4 RADIATED BANDEDGE AND SPURIOUS EMISSION MEASUREMENT

The maximum emissions outside of the frequency bands of operation shall be attenuated in accordance with the following limits:

1. For transmitters operating in the 5.15-5.25 GHz band: All emissions outside of the 5.15-5.35 GHz band shall not exceed an e.i.r.p. of -27 dBm/MHz.
2. For transmitters operating in the 5.725-5.85 GHz band: All emissions shall be limited to a level of -27 dBm/MHz at 75 MHz or more above or below the band edge increasing linearly to 10 dBm/MHz at 25 MHz above or below the band edge, and from 25 MHz above or below the band edge increasing linearly to a level of 15.6 dBm/MHz at 5 MHz above or below the band edge, and from 5 MHz above or below the band edge increasing linearly to a level of 27 dBm/MHz at the band edge.

APPLICABLE TO	LIMIT	
FCC KDB 789033 D02 General UNII Test Procedures New Rules	FIELD STRENGTH AT 3m	
	PK: 74 (dBµV/m)	AV 54 (dBµV/m)
APPLICABLE TO	EIRP LIMIT	FIELD STRENGTH AT 3m
15.407(b)(1)	PK: -27 (dBm/MHz)	PK: 68.3 (dBµV/m)
15.407(b)(2)		
15.407(b)(3)		
15.407(b)(4)(i)	PK:-27 (dBm/MHz) *1 PK:10 (dBm/MHz) *2 PK:15.6 (dBm/MHz) *3 PK:27 (dBm/MHz) *4	PK: 68.2(dBµV/m) *1 PK:105.2 (dBµV/m) *2 PK: 110.8(dBµV/m) *3 PK:122.2 (dBµV/m) *4
*1 beyond 75 MHz or more above of the bandedge. *2 below the band edge increasing linearly to 10 dBm/MHz at 25 MHz above. *3 below the band edge increasing linearly to a level of 15.6 dBm/MHz at 5 MHz above. *4 from 5 MHz above or below the band edge increasing linearly to a level of 27 dBm/MHz at the band edge.		

$EIRP = (E \cdot d)^2 / 30$, where E is the field in V/m, d is the measurement distance (3m), EIRP is the equivalent isotropically radiated power in Watts.

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Standard Applicable

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. In addition, radiated emissions which fall in the restricted bands must also comply with the §15.209 limit as below.

And according to §15.33(a) (1), for an intentional radiator operates below 10GHz, the frequency range of measurements: to the tenth harmonic of the highest fundamental frequency or to 40GHz, whichever is lower.

Frequency (MHz)	Field strength (microvolts/meter)	Distance (meters)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

Note:

1. The lower limit shall apply at the transition frequencies.
2. Emission level (dBµV/m) = 20 log Emission level (dBµV/m)

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4.1 Measurement Equipment Used:

RE in Chamber					
Test Equipment	Manufacturer	Model No.	Inventory No.	Cal. date	Cal. Due date
				(yyyy-mm-dd)	(yyyy-mm-dd)
3m Semi-Anechoic Chamber	ETS-LINDGREN	N/A	SEM001-01	2017/8/5	2020/8/4
Measurement Software	AUDIX	e3 V8.2014-6-27	N/A	N/A	N/A
Coaxial Cable	SGS	N/A	SEM025-01	2018/7/12	2019/7/11
MXE EMI Receiver (20Hz-8.4GHz)	Agilent Technologies	N9038A	SEM004-05	2018/9/2	2019/9/2
BiConiLog Antenna (26-3000MHz)	ETS-LINDGREN	3142C	SEM003-01	2017/6/27	2020/6/26
Pre-amplifier (0.1-1.3GHz)	Agilent Technologies	8447D	SEM005-01	2018/4/2	2019/4/1

RE in Chamber					
Test Equipment	Manufacturer	Model No.	Inventory No.	Cal. Date	Cal. Due date
				(yyyy-mm-dd)	(yyyy-mm-dd)
10m Semi-Anechoic Chamber	SAEMC	FSAC1018	SEM001-03	2018/3/31	2021/3/30
EMI Test Receiver (9k-7GHz)	Rohde & Schwarz	ESR	SEM004-03	2018/4/2	2019/4/1
Trilog-Broadband Antenna(25M-2GHz)	Schwarzbeck	VULB9168	SEM003-18	2016/6/29	2019/6/28
Pre-amplifier (9k-1GHz)	Sonoma	310N	SEM005-03	2018/4/13	2019/4/12
Loop Antenna (9kHz-30MHz)	ETS-Lindgren	6502	SEM003-08	2017/8/22	2020/8/21
Measurement Software	AUDIX	e3 V8.2014-6-27	N/A	N/A	N/A
Coaxial Cable	SGS	N/A	SEM029-01	2018/7/12	2019/7/11

RE in Chamber					
Test Equipment	Manufacturer	Model No.	Inventory No.	Cal. date	Cal. Due date
				(yyyy-mm-dd)	(yyyy-mm-dd)
3m Semi-Anechoic Chamber	AUDIX	N/A	SEM001-02	2018/3/13	2021/3/12
Measurement Software	AUDIX	e3V8.2014-6-27	N/A	N/A	N/A
Coaxial Cable	SGS	N/A	SEM026-01	2018/7/12	2019/7/11
EXA Signal Analyzer (10Hz-26.5GHz)	Agilent Technologies Inc	N9010A	SEM004-09	2018/4/13	2019/4/12
BiConiLog Antenna (26-3000MHz)	ETS-Lindgren	3142C	SEM003-01	2017/6/27	2020/6/26
Horn Antenna (0.8-18GHz)	Rohde & Schwarz	HF907	SEM003-07	2018/4/13	2021/4/12
Pre-amplifier(0.1-1.3GHz)	HP	8447D	SEM005-02	2018/9/2	2019/9/2
Low Noise Amplifier(100MHz-18GHz)	Black Diamond Series	BDLNA-0118-352810	SEM005-05	2018/9/27	2019/9/27
Pre-amplifier(18-26GHz)	Rohde & Schwarz	CH14-H052	SEM005-17	2018/4/2	2019/4/1

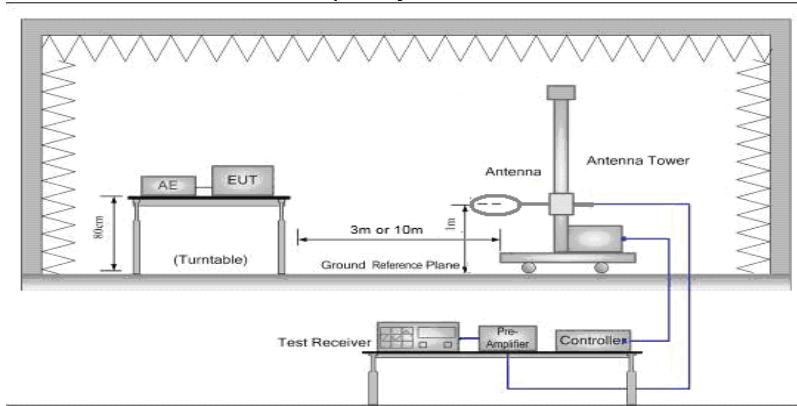
NOTE: N/A refers to Not Calibrated Required.

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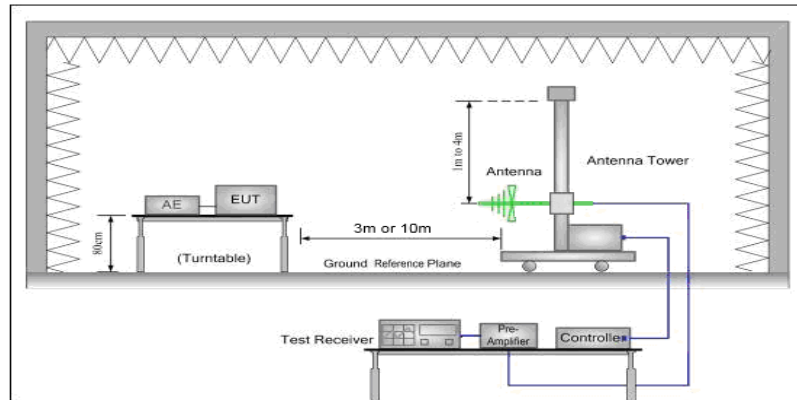
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4.2 Test SET-UP

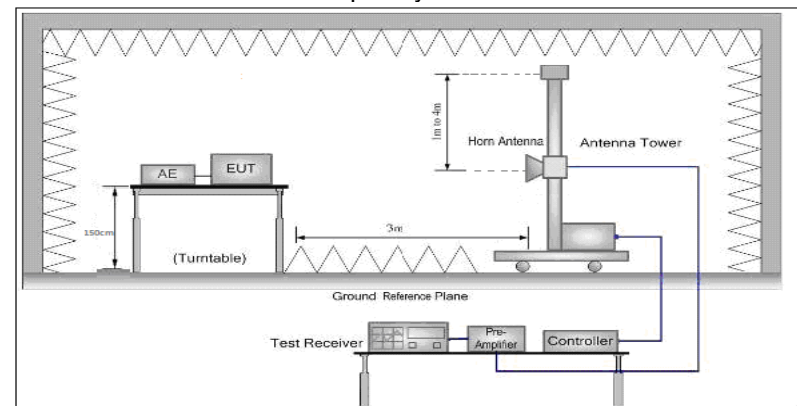
(A) Radiated Emission Test Set-UP Frequency Below 30MHz.



(B) Radiated Emission Test Set-Up, Frequency form 30MHz to 1000MHz



(C) Radiated Emission Test Set-UP Frequency Over 1 GHz



4.3 Measurement Procedure

1. The testing follows the Measurement Procedure of FCC KDB 558074 D01 DTS Meas. Guidance .
2. The EUT was placed on a turn table with 0.8m for frequency < 1GHz and 1.5m for frequency > 1GHz above ground plane.
3. The turn table shall rotate 360 degrees to determine the position of maximum emission level.

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4. EUT is set 3m away from the receiving antenna which varied from 1m to 4m to find out the highest emissions.
5. When measurement procedures for electric field radiated emissions above 1 GHz the EUT measurement is to be made "while keeping the antenna in the 'cone of radiation' from that area and pointed at the area both in azimuth and elevation, with polarization oriented for maximum response." is still within the 3dB illumination BW of the measurement antenna.
6. Set the spectrum analyzer as RBW=120 kHz and VBW=300 kHz for Peak Detector (PK) and Quasi-peak (QP) at frequency below 1 GHz.
7. Set the spectrum analyzer as RBW=1 MHz, VBW=3 MHz for Peak Detector at frequency above 1 GHz.
8. Set the spectrum analyzer as RBW=1 MHz, VBW=10 Hz (Duty cycle > 98%) or VBW \geq 1/T (Duty cycle < 98%) for Average Detector at frequency above 1 GHz.
9. The test-receiver system was set to quasi-peak detect function and specified bandwidth with maximum hold mode when the test frequency is below 1 GHz.
10. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
11. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. On spectrum, change spectrum mode in linear display mode, and reduce VBW = 10Hz if average reading is measured.
12. Repeat above procedures until all default test channel measured were complete.

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4.4 Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor and subtracting the Amplifier Gain and Duty Cycle Correction Factor (if any) from the measured reading. The basic equation with a sample calculation is as follows:

$$FS = RA + AF + CL - AG$$

Where	FS = Field Strength	CL = Cable Attenuation Factor (Cable Loss)
	RA = Reading Amplitude	AG = Amplifier Gain
	AF = Antenna Factor	

$$\text{Actual FS(dB}\mu\text{V/m)} = \text{SPA. Reading level(dB}\mu\text{V)} + \text{Factor(dB)}$$

$$\text{Factor(dB)} = \text{Antenna Factor(dB}\mu\text{V/m)} + \text{Cable Loss(dB)} - \text{Pre_Amplifier Gain(dB)}$$

4.5 Test Results of Radiated Spurious Emissions form 9 kHz to 30 MHz

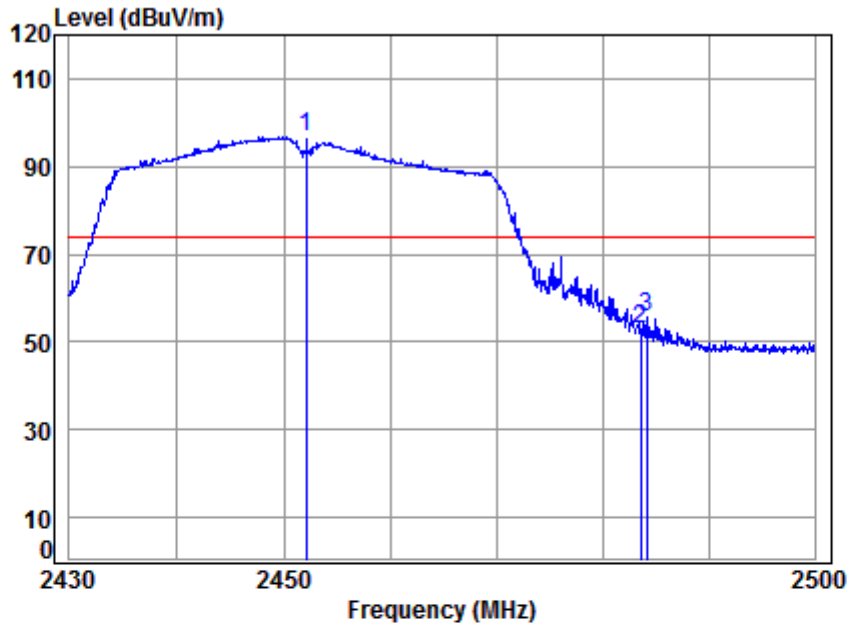
The low frequency, which started from 9 kHz to 30MHz, was pre-scanned and the result which was 20dB lower than the limit per 15.31(o) was not reported.

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4.5.1 Radiated Band Edge Measurement Result for 2.4G WiFi

4.5.1.1 802.11N40_ Highest Channel_ Peak_ Horizontal



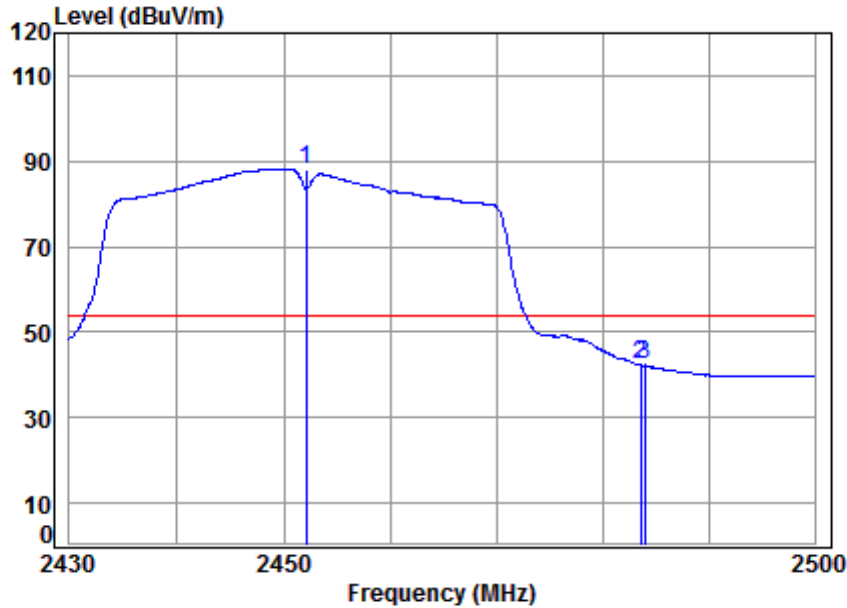
Site : chamber
 Condition: 3m HORIZONTAL
 Job No : A0011
 Mode : 2452 Band edge
 Note : 2.4G WIFI 11N40

	Cable	Ant	Preamp	Read	Limit	Over		
Freq	Loss	Factor	Factor	Level	Level	Line	Limit	Remark
MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1 *	2452.000	5.56	28.62	41.90	104.46	96.74	74.00	22.74 peak
2	2483.500	5.60	28.67	41.91	60.35	52.71	74.00	-21.29 peak
3	2484.076	5.60	28.67	41.91	63.38	55.74	74.00	-18.26 peak

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4.5.1.2 802.11 N40_ Highest Channel_ Peak_ Vertical



Site : chamber
Condition: 3m HORIZONTAL
Job No : A0011
Mode : 2452 Band edge
Note : 2.4G WIFI 11N40

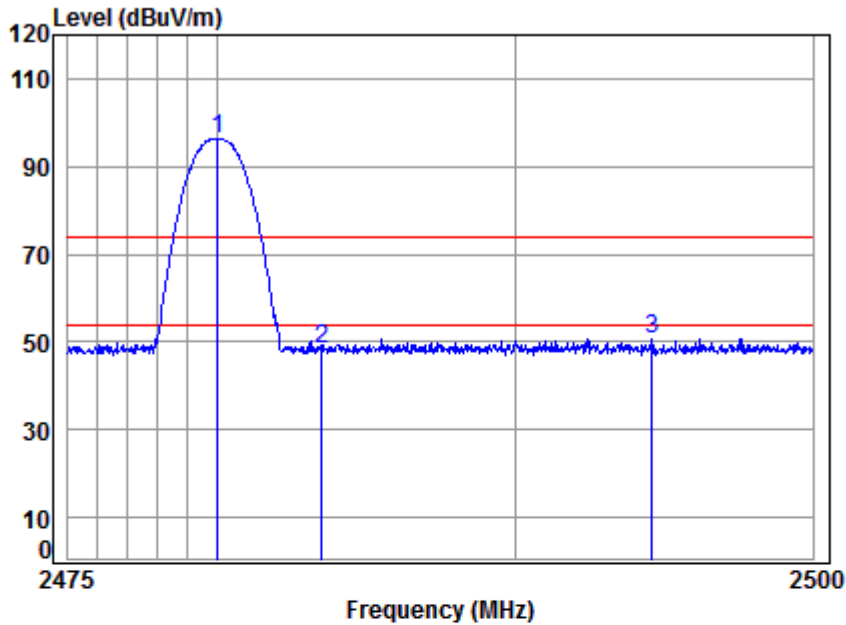
	Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1 *	2452.000	5.56	28.62	41.90	95.98	88.26	54.00	34.26	Average
2	2483.500	5.60	28.67	41.91	49.88	42.24	54.00	-11.76	Average
3	2483.865	5.60	28.67	41.91	49.86	42.22	54.00	-11.78	Average

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4.5.2 Radiated Band Edge Measurement Result for BT

4.5.2.1 Highest Channel_Peak_Horizontal



Site : chamber
Condition: 3m HORIZONTAL
Job No : A0011
Mode : 2480 Band edge
Note : BT

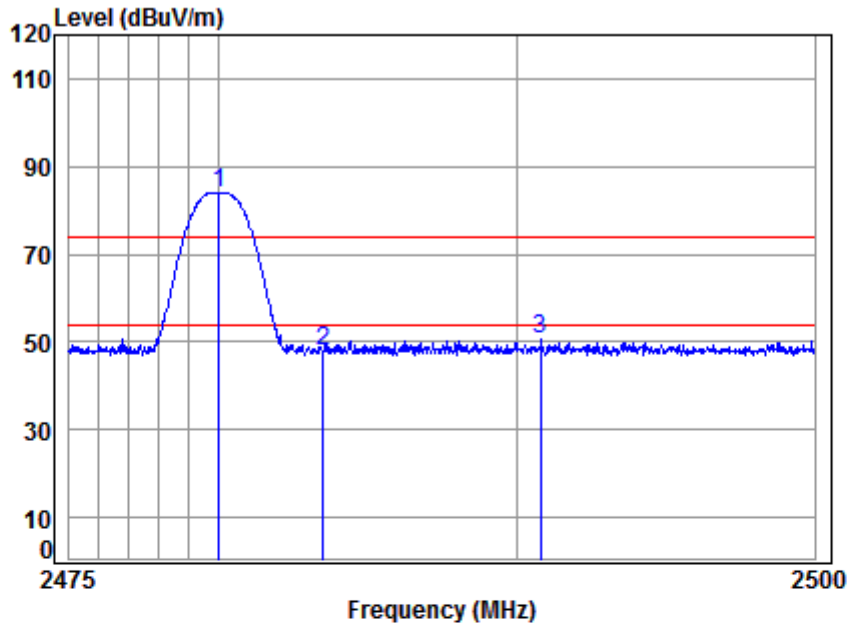
	Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Limit Level	Over Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB
1 *	2480.000	5.59	28.67	41.91	104.01	96.36	74.00	22.36 peak
2	2483.500	5.60	28.67	41.91	56.14	48.50	74.00	-25.50 peak
3	2494.579	5.61	28.69	41.92	58.35	50.73	74.00	-23.27 peak

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4.5.3 Radiated Band Edge Measurement Result for BLE

4.5.3.1 Highest Channel_Peak_Horizontal



Site : chamber
Condition: 3m HORIZONTAL
Job No : A0011
Mode : 2480 Band edge
Note : BLE

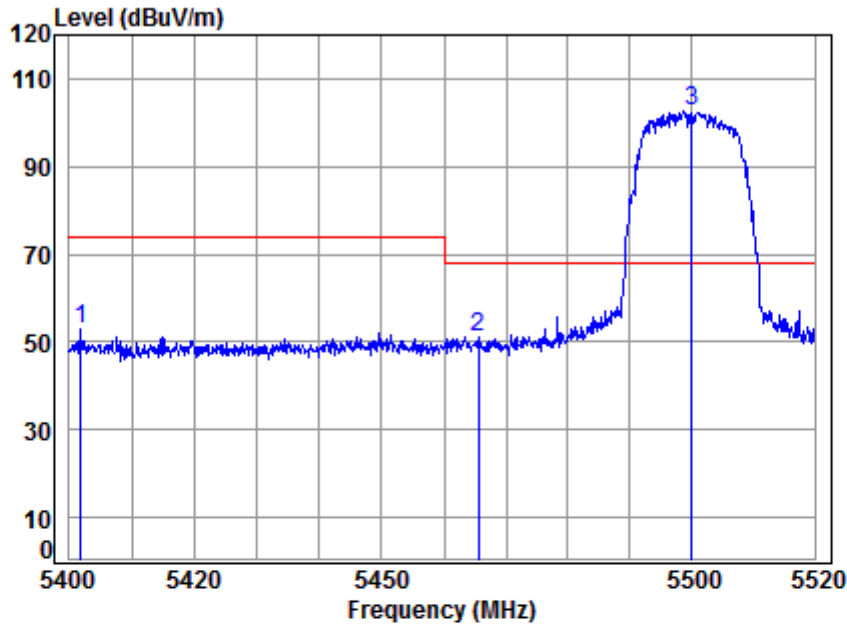
	Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1 *	2480.000	5.59	28.67	41.91	91.64	83.99	74.00	9.99	peak
2	2483.500	5.60	28.67	41.91	55.55	47.91	74.00	-26.09	peak
3	2490.796	5.61	28.69	41.91	58.18	50.57	74.00	-23.43	peak

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4.5.4 Radiated Band Edge Measurement Result for 5G WiFi

4.5.4.1 11A20_100 ANT 1_Peak_Vertical



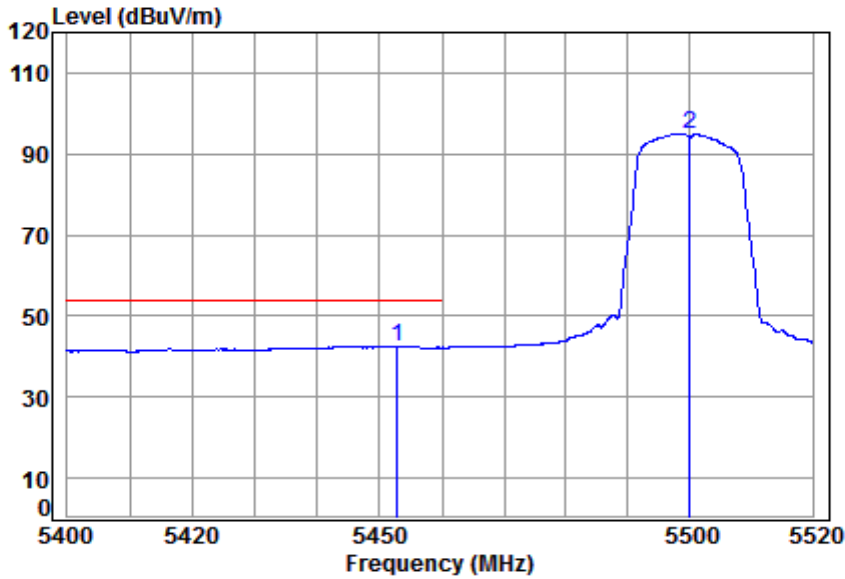
Site : chamber
Condition: 3m VERTICAL
Job No : A0011
Mode : 5500 Band edge
Note : 5G WIFI 11A

	Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1	5401.781	8.71	34.52	42.12	51.87	52.98	74.00	-21.02	peak
2	5465.553	8.80	34.57	42.06	49.83	51.14	68.20	-17.06	peak
3 *	5500.000	8.85	34.60	42.03	101.09	102.51	68.20	34.31	peak

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4.5.4.2 11A20_100 ANT 1_Average_Vertical



Site : chamber
Condition: 3m VERTICAL
Job No : A0011
Mode : 5500 Band edge
Note : 5G WIFI 11A

	Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1	5452.835	8.78	34.56	42.08	41.34	42.60	54.00	-11.40	Average
2	5500.000	8.85	34.60	42.03	93.69	95.11	-----	-----	Average

Remark:

The field strength is calculated by adding the Antenna Factor, Cable Factor & Preamplifier. The basic equation with a sample calculation is as follows:

$$\text{Final Test Level} = \text{Receiver Reading} + \text{Antenna Factor} + \text{Cable Factor} - \text{Preamplifier Factor}$$

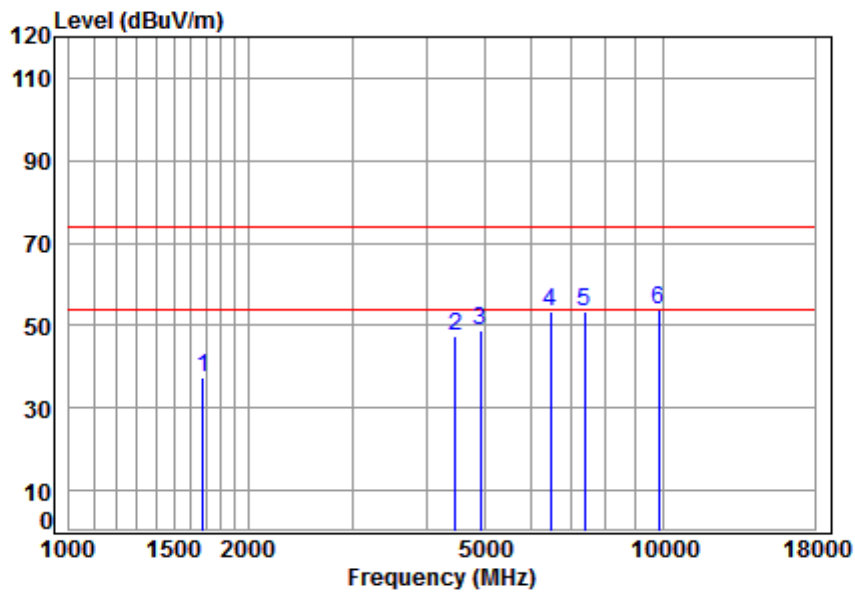
All Modes have been tested, but only the worst case data displayed in this report.

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4.5.5 Transmitter emission above 1GHz for 2.4G WiFi

4.5.5.1 802.11G_ Highest Channel_ Peak_ Horitontal



Site : chamber
Condition: 3m HORIZONTAL
Job No : A0011
Mode : 2462 TX SE
Note : 2.4G WIFI 11G

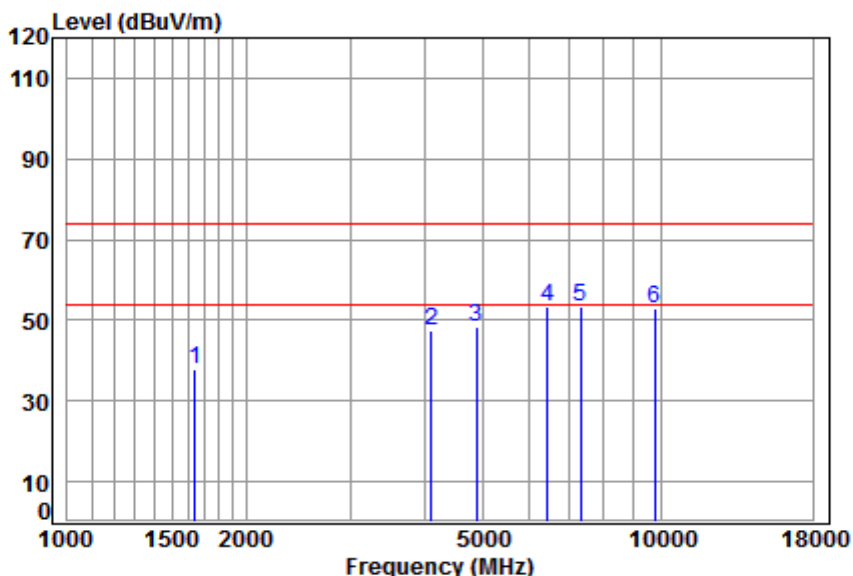
	Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1	1682.477	5.25	26.60	41.52	47.22	37.55	74.00	-36.45	peak
2	4469.214	7.53	33.55	42.41	48.60	47.27	74.00	-26.73	peak
3	4924.000	8.01	34.11	42.49	49.12	48.75	74.00	-25.25	peak
4	6470.026	11.48	35.57	41.24	47.35	53.16	74.00	-20.84	peak
5	7386.000	10.03	36.21	40.59	47.83	53.48	74.00	-20.52	peak
6	9848.000	10.87	37.81	37.41	42.55	53.82	74.00	-20.18	peak

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4.5.6 Transmitter Emission above 1GHz for BT

4.5.6.1 GFSK(DH5) _Middle Channel_ Peak _Vertical



Site : chamber
Condition: 3m VERTICAL
Job No : A0011
Mode : 2441 TX SE
Note : BT

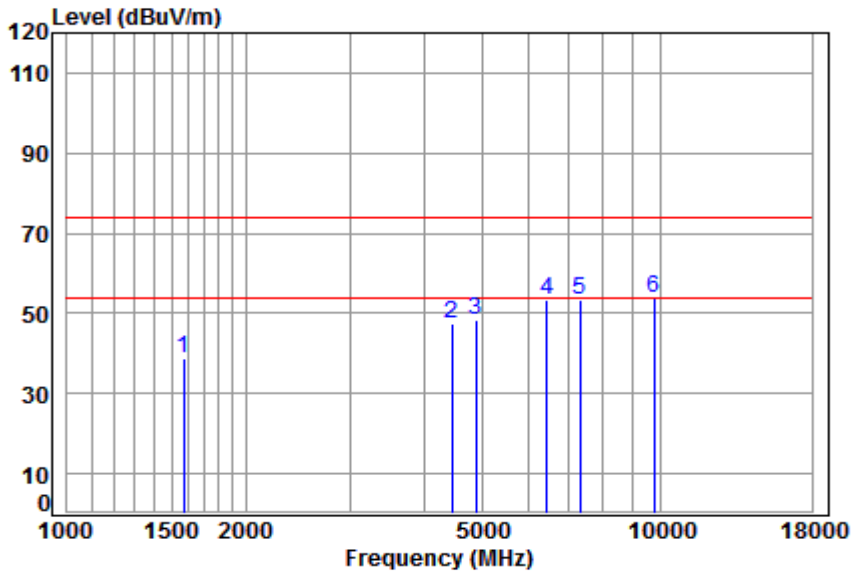
	Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1	1639.274	5.30	26.42	41.49	47.78	38.01	74.00	-35.99	peak
2	4109.872	7.11	32.91	42.35	49.82	47.49	74.00	-26.51	peak
3	4882.000	7.97	34.06	42.48	48.81	48.36	74.00	-25.64	peak
4	6451.353	11.45	35.55	41.25	47.78	53.53	74.00	-20.47	peak
5	7323.000	10.05	36.16	40.63	47.92	53.50	74.00	-20.50	peak
6	9764.000	10.82	37.76	37.52	41.89	52.95	74.00	-21.05	peak

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4.5.7 Transmitter Emission above 1GHz for BLE

4.5.7.1 Middle Channel_Peak_Horizontal



Site : chamber
Condition: 3m HORIZONTAL
Job No : A0011
Mode : 2440 TX SE
Note : BLE

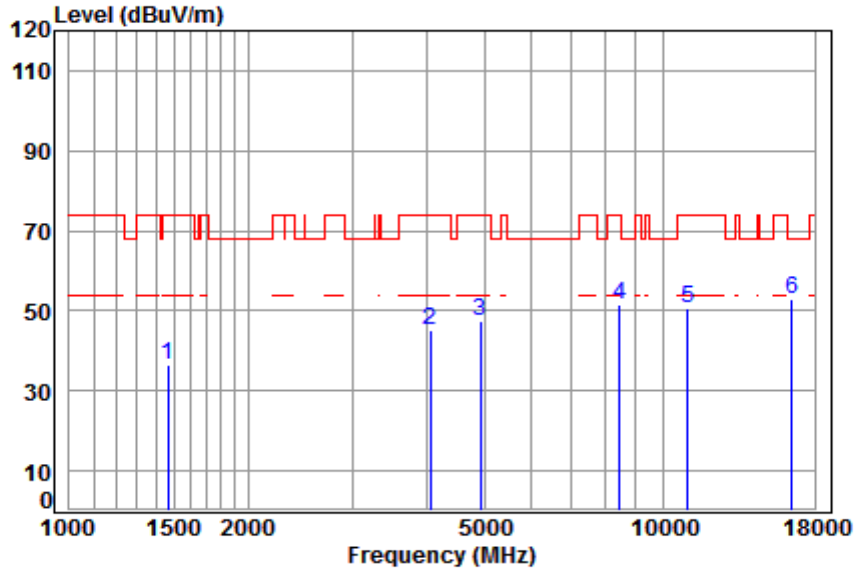
	Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1	1574.265	5.38	26.14	41.45	48.72	38.79	74.00	-35.21	peak
2	4456.315	7.51	33.53	42.41	49.01	47.64	74.00	-26.36	peak
3	4880.000	7.97	34.06	42.48	48.89	48.44	74.00	-25.56	peak
4	6451.353	11.45	35.55	41.25	47.69	53.44	74.00	-20.56	peak
5	7320.000	10.05	36.16	40.63	47.84	53.42	74.00	-20.58	peak
6	9760.000	10.82	37.76	37.53	42.67	53.72	74.00	-20.28	peak

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4.5.8 Transmitter Emission above 1GHz for 5G WiFi

4.5.8.1 11A20_100 ANT 1_Peak_Vertical



Site : chamber
Condition: 3m VERTICAL
Job No : A0011
Mode : 5700 TX SE
Note : 5G WIFI 11A

	Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Limit Level	Over Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dB	
1	1468.761	5.38	25.69	41.38	47.03	74.00	-37.28	peak
2	4050.904	7.04	32.80	42.34	47.74	74.00	-28.76	peak
3	4924.000	8.01	34.11	42.49	47.93	74.00	-26.44	peak
4	8440.945	10.23	36.97	39.48	43.81	74.00	-22.47	peak
5	11000.000	11.63	37.80	37.88	39.27	74.00	-23.18	peak
6	16500.000	14.50	42.20	39.86	36.23	68.20	-15.13	peak

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Remark:

- 1) The field strength is calculated by adding the Antenna Factor, Cable Factor & Preamplifier. The basic equation with a sample calculation is as follows:
Final Test Level = Receiver Reading + Antenna Factor + Cable Factor – Preamplifier Factor
- 2) Scan from 9kHz to 25GHz, the disturbance between 9KHz to 30MHz and 18GHz to 25GHz was very low, and the above harmonics were the highest point could be found when testing, The amplitude of spurious emissions from the radiator which are attenuated more than 20dB below the limit need not be reported.
- 3) As shown in this section, for frequencies above 1GHz, the field strength limits are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation. So, only the peak measurements were shown in the report.
- 4) All Modes have been tested, but only the worst case data displayed in this report.

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4.5.9 Spot Check data for NFC

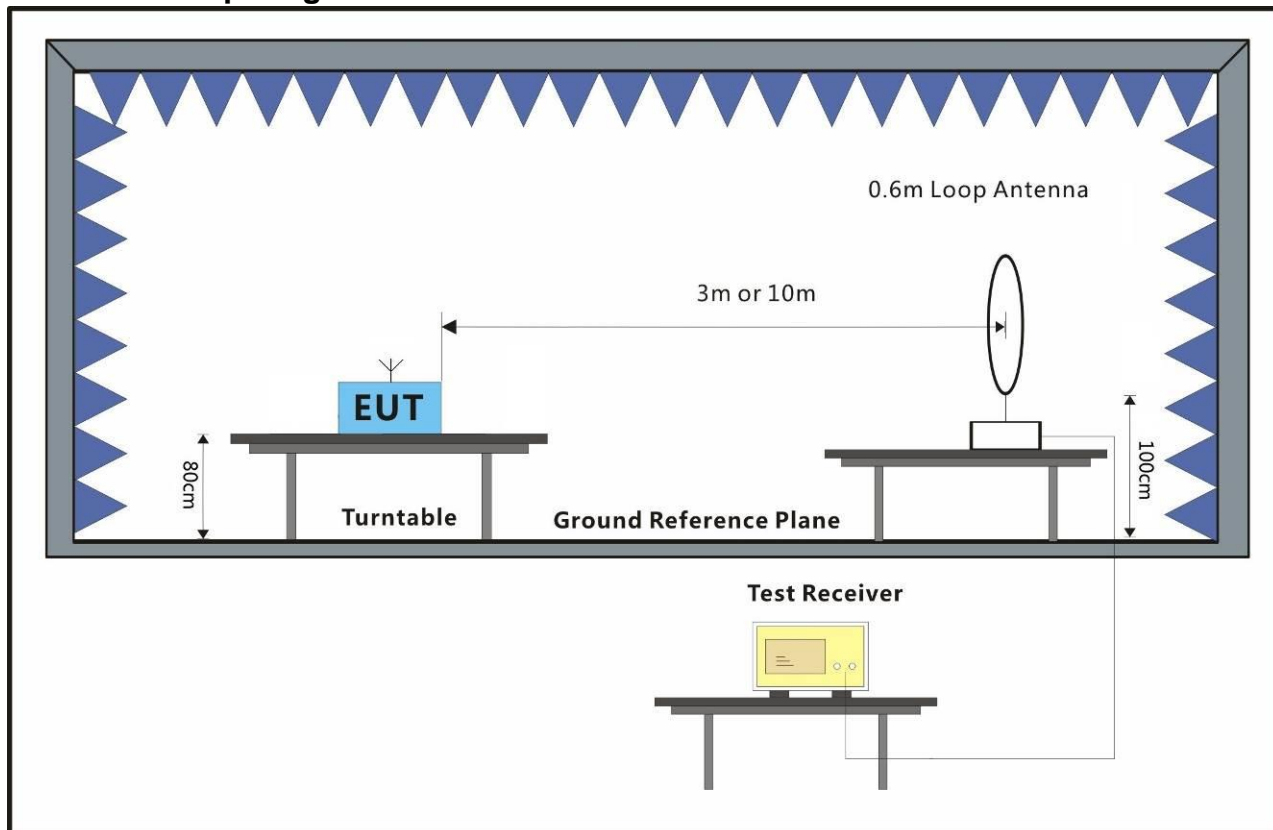
1.1.1 E.U.T. Operation

Operating Environment:

Temperature: 25 °C Humidity: 51 % RH Atmospheric Pressure: 1010 mbar

Test mode i:TX mode_Keep the EUT in transmitting with modulation mode.

1.1.2 Test Setup Diagram



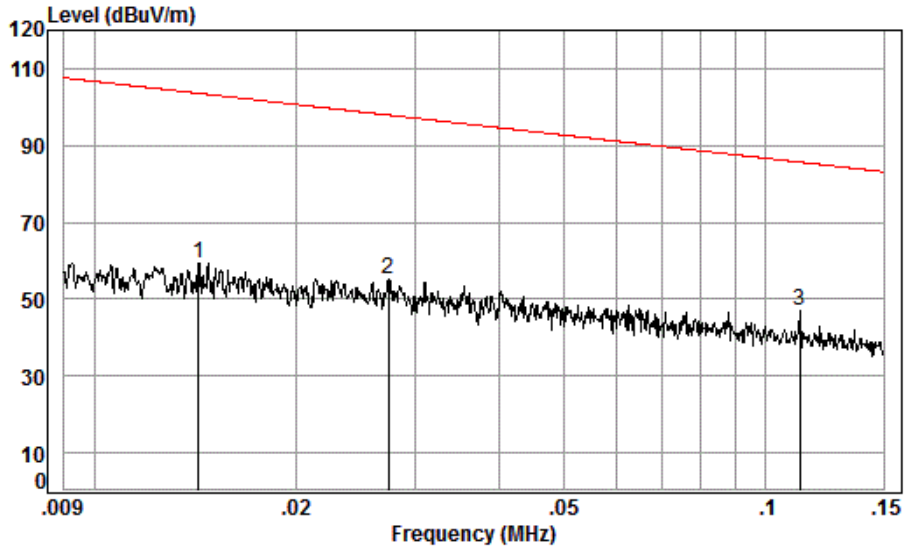
1.1.3 Measurement Procedure and Data

For testing performed with the loop antenna, the center of the loop was positioned 1 m above the ground and positioned with its plane vertical at the specified distance from the EUT. During testing the loop was rotated about its vertical axis for maximum response at each azimuth and also investigated with the loop positioned in the horizontal plane. Only the worst position of vertical was shown in the report.

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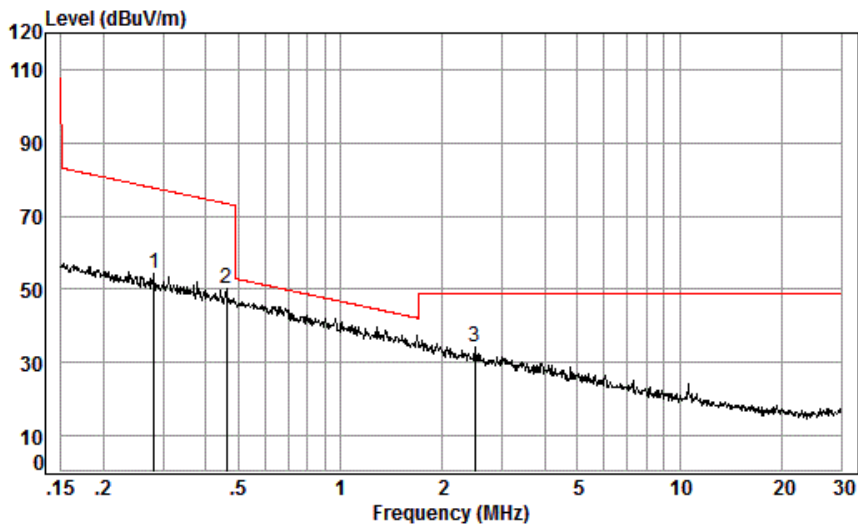
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9kHz~150kHz:



Condition: 10m
Job No. : A0011
Test Mode: i

150kHz~30MHz:



Condition: 10m
Job No. : A0011
Test Mode: i

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Remark:

1) The field strength is calculated by adding the Antenna Factor, Cable Factor & Preamplifier. The basic equation with a sample calculation is as follows:

Final Test Level = Receiver Reading + Antenna Factor + Cable Factor – Preamplifier Factor

Frequency (MHz)	Level @ 10m (dBuV/m)	Limit @ 300m (dBuV/m)	Limit @ 30m (dBuV/m)	Factor (dB)	Level @ 300m (dBuV/m)	Level @ 30m (dBuV/m)	Margin (dB)
0.01	59.46	44.51	-	59.08	0.38	-	-44.13
0.03	55.18	38.84	-	59.08	-3.90	-	-42.75
0.11	46.81	26.57	-	59.08	-12.27	-	-38.85
0.28	54.23	18.61	-	59.08	-4.85	-	-23.46
0.46	50.00	14.33	-	59.08	-9.08	-	-23.41
2.49	34.15	-	29.54	19.08	-	15.07	-14.48

1.2 Radiated Emissions(30MHz-1GHz)

Test Requirement 47 CFR Part 15, Subpart C 15.225(d) & 15.209

Test Method: ANSI C63.10 (2013) Section 6.4&6.5

Measurement Distance: 10m

Limit:

Frequency	Field strength (microvolt/meter)	Limit (dBuV/m)	Remark	Measurement distance (m)
30MHz-88MHz	100	40.0	Quasi-peak	3
88MHz-216MHz	150	43.5	Quasi-peak	3
216MHz-960MHz	200	46.0	Quasi-peak	3
960MHz-1GHz	500	54.0	Quasi-peak	3

1.2.1 E.U.T. Operation

Operating Environment:

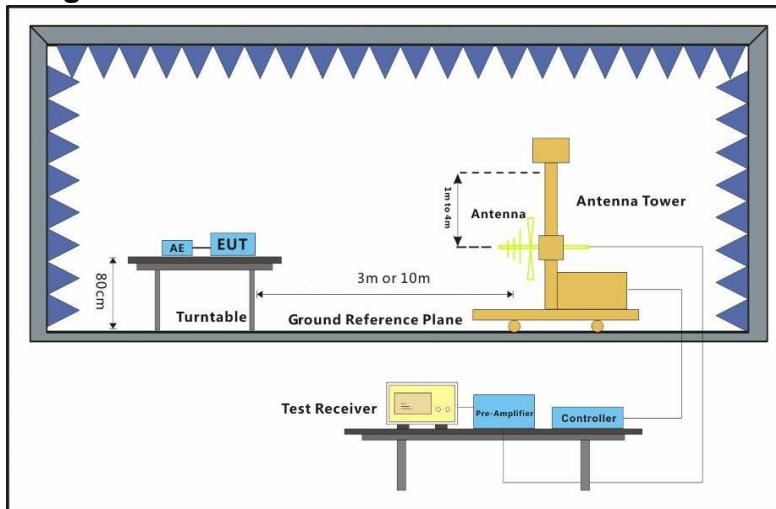
Temperature: 25 °C Humidity: 51 % RH Atmospheric Pressure: 1010 mbar

Test mode i:TX mode_Keep the EUT in transmitting with modulation mode.

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1.2.2 Test Setup Diagram



1.2.3 Measurement Procedure and Data

- The EUT was placed on the top of a rotating table 0.8 meters above the ground for below 1GHz at a 3 or 10m meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
- The EUT was set 3 or 10m meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters (for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter) and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
- If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.
- The radiation measurements are performed in X, Y, Z axis positioning. And found the X axis positioning which it is worse case, only the test worst case mode is recorded in the report.
Remark: $Level = Read\ Level + Cable\ Loss + Antenna\ Factor - Preamp\ Factor$
- According to KDB 414788, we have a site validation between OATS and Semi Chamber for radiated emission measurements below 30 MHz, and the result of Chamber measured is worst case result.

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Mode:i;

Radiated Emissions

Polarization	Frequency (MHz)	Cable_ Loss (dB)	Antenna Factor (dB)	Pre- Amp Gain (dB)	Reading at 10m (dB μ V)	Net at 3m (dB μ V/m)	Limit at 3m (dB μ V/m)	Margin (dB)
Horizontal	40.702	6.83	13.26	32.46	25.57	23.66	40.00	-16.34
Horizontal	154.821	7.46	13.40	32.43	27.14	26.03	43.50	-17.47
Horizontal	283.979	7.96	12.26	32.37	26.12	24.43	46.00	-21.57
Horizontal	413.271	8.35	15.23	32.34	25.88	27.58	46.00	-18.42
Horizontal	638.369	8.96	19.39	32.35	26.35	32.81	46.00	-13.19
Horizontal	919.287	9.51	22.48	31.42	25.79	36.82	46.00	-9.18
Vertical	47.492	6.89	12.84	32.45	26.73	24.47	40.00	-15.53
Vertical	166.068	7.50	12.79	32.42	27.18	25.51	43.50	-17.99
Vertical	248.552	7.83	11.22	32.38	26.20	23.33	46.00	-22.67
Vertical	350.477	8.17	13.85	32.35	27.24	27.37	46.00	-18.63
Vertical	515.437	8.65	17.09	32.35	26.12	29.97	46.00	-16.03
Vertical	912.862	9.50	22.40	31.48	25.75	36.63	46.00	-9.37

NOTES:

1. Quasi-Peak detector is used except for others stated.
2. All measurements were made at 10 meters.
3. Negative value in the margin column shows emission below limit.

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5 PHOTOGRAPHS - EUT TEST SETUP DETAILS

Refer to Appendix A - Photographs of EUT Test Setup Details for ZR/2018/A0011.

~ End of Report ~

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