TESTING LABORATORY
CERTIFICATE #4820.01

FCC PART 15.255

TEST REPORT

For

Nokia Shanghai Bell Co. Ltd.

No. 388, Ningqiao Rd. Pilot Free Trade Zone Shanghai China，201206

FCC ID: 2ADZR7577WPONAPP

Report Type:	**Product Name:**
Revised Report	WPON

Report Number:	RSH180504050-00CM2
Report Date:	2018-07-17
Reviewed By:	Jerry Zhang EMC Manager
Test Laboratory:	Bay Area Compliance Laboratories Corp. (Dongguan) No.69 Pulongcun, Puxinhu Industry Area, Tangxia, Dongguan, Guangdong, China Tel: +86-769-86858888 Fax: +86-769-86858891 www.baclcorp.com.cn

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DOCUMENT REVISION HISTORY

Revision Number	Report Number	Description of Revision	Date of Revision
0	RSH180504050-00C	Original Report	2018-05-14
1	RSH180504050-00CM1	Revised Report	2018-06-27
2	RSH180504050-00CM2	Revised Report	2018-07-17

GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

EUT Name:	WPON
EUT Model:	WPON AP-Pole
Multiple Model:	WPON AP-Wall
FCC ID:	2ADZR7577WPONAPP
Rated Input Voltage:	AC 100-240V
External Dimension:	246mm(L)* 160 mm(W)*73mm(H)
Serial Number:	180504050
EUT Received Date:	2018.04.23

Note: The series product, models WPON AP-Pole, WPON AP-Wall are electrically identical, we selected WPON AP-Pole for full test , and please refer to the declaration letter for details.

Objective

This type approval report is prepared on behalf of *Nokia Shanghai Bell Co. Ltd.* in accordance with Part 2-Subpart J, and Part 15-Subparts A, B and C of the Federal Communication Commissions rules.

The tests were performed in order to determine compliance with FCC Part 15, Subpart C, and section 15.203 15.205 15.207 15.209 and 15.255 rules.

Related Submittal(s)/Grant(s)

FCC Part 15C DSS submissions with FCC ID: 2ADZR7577WPONAPP.

Test Methodology

All measurements contained in this report were conducted with ANSI C63.10-2013, American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices.

All emissions measurement was performed and Bay Area Compliance Laboratories Corp. (Dongguan).

Test Facility

The Test site used by Bay Area Compliance Laboratories Corp. (Dongguan) to collect test data is located on the No.69 Pulongcun, Puxinhu Industry Area, Tangxia, Dongguan, Guangdong, China

The test site has been approved by the FCC under the KDB 974614 D01 and is listed in the FCC Public Access Link (PAL) database, FCC Registration No. : 897218,the FCC Designation No. : CN1220.

The test site has been registered with ISED Canada under ISED Canada Registration Number 3062D.

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
R&S	EMI Test Receiver	ESCS 30	830245/006	2017-12-11	2018-12-11
R&S	Two-line V-network	ENV 216	101614	2017-12-08	2018-12-08
R&S	Test Software	EMC32	Version8.53.0	N/A	N/A
Unknown	Coaxial Cable	C-NJNJ-50	C-0200-01	2017-09-05	2018-09-05
R&S	EMI Test Receiver	ESCI	100224	2017-12-11	2018-12-11
Sunol Sciences	Antenna	JB3	A060611-1	2017-11-10	2020-11-10
HP	Amplifier	8447D	2727A05902	2017-09-05	2018-09-05
R&S	Spectrum Analyzer	8564E	3943A01781	2018-01-04	2019-01-04
Farad	Test Software	EZ-EMC	V1.1.4.2	N/A	N/A
Unknown	Coaxial Cable	C-NJNJ-50	C-0400-01	2017-09-05	2018-09-05
Unknown	Coaxial Cable	C-NJNJ-50	C-0075-01	2017-09-05	2018-09-05
Unknown	Coaxial Cable	C-NJNJ-50	C-1000-01	2017-09-05	2018-09-05
TDK RF	Horn Antenna	HRN-0118	130 084	2016-01-05	2019-01-04
Mini	Pre-amplifier	ZVA-183-S+	5969001149	2017-09-05	2018-09-05
R&S	Spectrum Analyzer	FSP 38	100478	2017-12-08	2018-12-08
Ducommun Technolagies	Horn Antenna	ARH-4223-02	1007726-01 1304	2016-11-18	2019-11-18
Ducommun Technolagies	Horn Antenna	ARH-2823-02	1007726-01 1302	2016-11-18	2019-11-18
Quinstar	Amplifier	QLW-18405536-JO	15964001001	2017-06-27	2018-06-27
Quinstar	Amplifier	QLW-18405536-JO	15964001001	2018-06-27	2019-06-27
OML	Harmonic Mixer	WR19/M19HWD	U60313-1	2016-10-14	2019-10-14
OML	Horn Antenna	M19RH	11648-01	2016-10-14	2019-10-14
Agilent	Harmonic Mixer	Agilent 11970V	2521A01767	2016-12-07	2019-12-07
Flann Micowave	Horn Antenna	861V/385	736	2016-12-07	2019-12-07
OML	Harmonic Mixer	WR12/M12HWD	E60120-1	2016-10-19	2019-10-19
OML	Horn Antenna	M12RH	E60120-2	2016-10-19	2019-10-19
OML	Harmonic Mixer	WR08/M08HWD	F60313-1	2016-10-24	2019-10-24
OML	Horn Antenna	M08RH	F60313-2	2016-10-24	2019-10-24
OML	Harmonic Mixer	WR05/M05HWD	G60106-1	2016-10-27	2019-10-27
OML	Horn Antenna	M05RH	G60106-2	2016-10-27	2019-10-27
millitech	RF Detector	DET-15-RPFW0	A18521	2017-12-15	2019-12-15
Tektronix	Digital Phosphor Oscilloscope	TDS 3054	B015264	2017-07-18	2018-07-18
Agilent	Signal Generator	E8247C	MY43321350	2017-12-11	2018-12-11
Agilent	mm-Wave Source Modules	83557A	2735A00145	2017-08-16	2019-08-15
UNI-T	Multimeter	UT39A	M130199938	2017-05-09	2018-05-09
UNI-T	Multimeter	UT39A	M130199938	2018-05-09	2019-05-09
Dongzhixu	High Temperature Test Chamber	DP1000	201105083-4	2017-08-28	2018-08-28
OML	Diplexer	DPL.26	EM-128	2016-10-11	2019-10-10

*** Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Dongguan) attests that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).

FAR Field Boundary Calculations

The far-field boundary is given in ANSI C63.10-2013:

$$R_m = 2D^2 / \lambda$$

Where:

D is the largest dimension of the antenna aperture in m and

λ is the free-space wavelength in m at the frequency of measurement.

The minimum test distance for the frequency range 40GHz-200GHz determine as below:

Model	Frequency Range (GHz)	Largest Dimension of the Horn Antenna (mm)	Minimum Test Distance R_m (m)
M19RH	40-60	46.3	0.57
861V/385	50-75	43.7	0.64
M12RH	60-90	30.02	0.36
M08RH	90-140	19.7	0.23
M05RH	140-220	12.5	0.30

Note: the maximum antenna dimension of the EUT was 18 mm. This length is smaller than the largest dimension of the smallest Horn Antenna used to measure up in the frequency range 40 GHz to 140 GHz. and larger than 140GHz to 220GHz. Given that the test distances used were 1.0 m from 40 GHz to 90 GHz, and 0.5 m from 90 GHz to 200 GHz, it can be seen that the EUT was always in the Far-field of the Receive Antenna during all Radiated Emissions Tests.

SYSTEM TEST CONFIGURATION

Description of Test Configuration

The system was configured for testing in Engineering Mode, which was provided by the manufacturer.

The device built in 3 identical 60 GHz module, but module 1 only supports SISO mode(ANT0,1,2), and module 2(ANT 3,4) and 3(ANT 5,6) only supports MIMO mode(Output from Port 0 and 1), that was default by software.

All of the modules only support 3 channels as below:

Channel Number	Frequency (MHz)	Channel Number	Frequency (MHz)
1	58320	3	62640
2	60480	/	/

EUT Exercise Software

The software "QRCT3.0" was used for testing, which was provided by manufacturer. The worst condition (maximum power) was configured by system default setting. The worst data rate: 1Gbps.

Equipment Modifications

No modifications were made to the EUT.

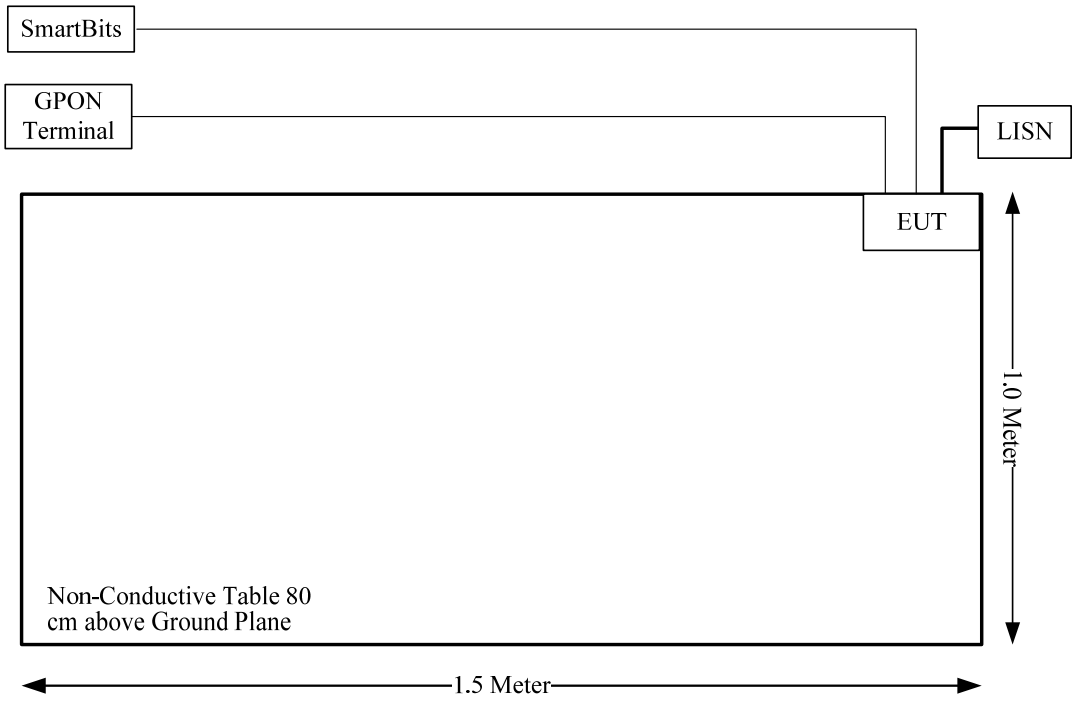
Local Support Equipment List and Details

Manufacturer	Description	Model	Serial Number
HUAWEI	GPON Terminal	HG8245Q2	2102311RGB6RH1000087
Sprient	SmartBits	600B	DE7885

Support Cable List and Details

Cable Description	Shielding Type	Ferrite Core	Length (m)	From Port	To
RJ45 Cable	yes	no	10	EUT	GPON Terminal
Optical Cable	no	no	10	EUT	SmartBits

Block Diagram of Test Setup



SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Result
§1.1310&§2.1091	Maximum Permissible Exposure	Compliance
§15.203	Antenna Requirement	Compliance
§15.207 (a)	AC Line Conducted Emissions	Compliance
§ 15.255 (e)(1)	Occupied Bandwidth	Compliance
§15.255 (c)	EIRP Power	Compliance
§15.255 (e)	Peak Conducted Output Power	Compliance
§15.255 (d)	Spurious Emissions	Compliance
§15.255 (f)	Frequency Stability	Compliance
§15.255 (a)(h)	Operation Restriction And Group Installation	Compliance

FCC§1.1310 & §2.1091- MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Applicable Standard

According to subpart §1.1310, systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy level in excess of the Commission's guidelines.

Limits for Maximum Permissible Exposure (MPE) (§1.1310, §2.1091)

(B) Limits for General Population/Uncontrolled Exposure				
Frequency Range (MHz)	**Electric Field Strength (V/m)**	**Magnetic Field Strength (A/m)**	**Power Density (mW/cm^2)**	**Averaging Time (minutes)**
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

f = frequency in MHz; * = Plane-wave equivalent power density;

According to §1.1310 and §2.1091 RF exposure is calculated.

Calculation Formula:

Prediction of Power Density at the distance of the applicable MPE Limit

$S = PG/4\pi R^2$ = power density (in appropriate units, e.g. mW/cm^2);
P = power input to the antenna (in appropriate units, e.g., mW);
G = power gain of the antenna in the direction of interest relative to an isotropic radiator, the power gain factor, is normally numeric gain;
R = distance to the center of radiation of the antenna (appropriate units, e.g., cm);

For simultaneously transmit system, the calculated power density should comply with:

$$\sum_i \frac{S_i}{S_{Limit,i}} \leq 1$$

Calculated Data:

Radio	Frequency (GHz)	E.I.R.P		Evaluation Distance (cm)	Power Density (mW/cm^2)	MPE Limit (mW/cm^2)
		(dBm)	(mW)			
60G Module 1	58.32-62.64	31	2511.89	25	0.16	1.0
60G Module 2	58.32-62.64	34	1258.93	25	0.32	1.0
60G Module 3	58.32-62.64	34	1258.93	25	0.32	1.0
Bluetooth	2.402-2.48	2.92	1.96	25	0.0003	1.0

Note: The output power was declared by manufacturer(Bluetooth conducted power is -2dBm, antenna gain 4.92dBi)

The three 60GHz radio and Bluetooth can transmit simultaneously:

$$\sum_i \frac{S_i}{S_{Limit,i}}$$

$= S_{60G1}/Limit_{60G1} + S_{60G2}/Limit_{60G2} + S_{60G3}/Limit_{60G3} + S_{BT}/Limit_{BT}$

$= 0.16/1.0+0.32/1.0+0.32/1.0 + 0.0003/1.0$

$=0.8$

Result: The device complied with the applicable MPE Limit at the 25 cm distance.

FCC§15.203 - ANTENNA REQUIREMENT

Applicable Standard

For intentional device, according to §15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used.

Antenna Connector Construction

The EUT has 7 internal antennas, which can be seen in the EUT internal Photos. Therefore, the EUT complied with the antenna requirements stated in FCC Rules Part 15 Subpart C Section 15.203.

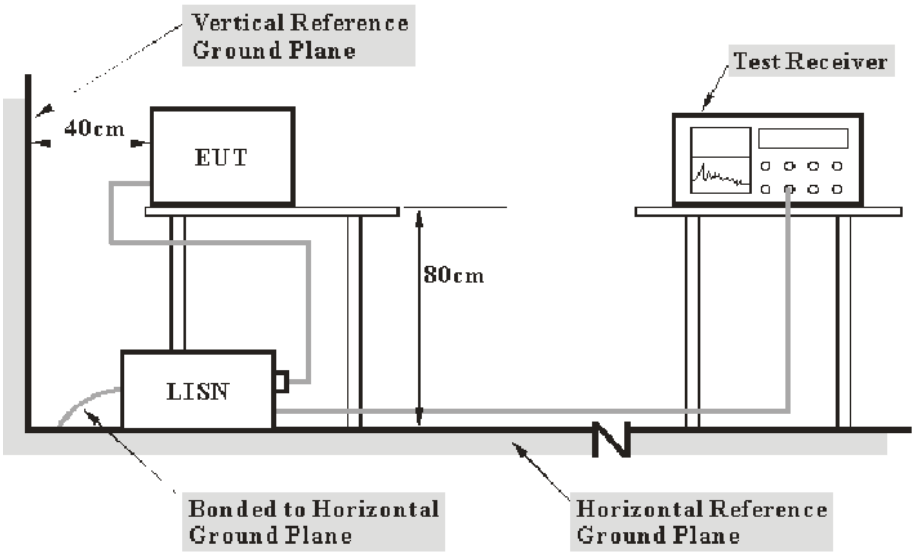
Result: Compliant.

FCC §15.207 (a) – AC LINE CONDUCTED EMISSIONS

Applicable Standard

FCC§15.207

EUT Setup



Note: 1. Support units were connected to second LISN.
2. Both of LISNs (AMN) 80 cm from EUT and at the least 80 cm from other units and other metal planes support units.

The setup of EUT is according with per ANSI C63.10-2013 measurement procedure. The specification used was with the FCC Part 15.207 limits.

The spacing between the peripherals was 10 cm.

The adapter was connected to a 120 VAC/60 Hz power source

EMI Test Receiver Setup

The EMI test receiver was set to investigate the spectrum from 150 kHz to 30 MHz.

During the conducted emission test, the EMI test receiver was set with the following configurations:

Frequency Range	IF B/W
150 kHz – 30 MHz	9 kHz

Test Procedure

During the conducted emission test, the adapter was connected to the first LISN.

Maximizing procedure was performed on the six (6) highest emissions of the EUT.

All data was recorded in the Quasi-peak and average detection mode.

Corrected Amplitude & Margin Calculation

The basic equation is as follows:

$V_C = V_R + A_C + VDF$
$C_f = A_C + VDF$

Herein,
V_C (cord. Reading): corrected voltage amplitude
V_R: reading voltage amplitude
A_c: attenuation caused by cable loss
VDF: voltage division factor of AMN
C_f: Correction Factor

The "**Margin**" column of the following data tables indicates the degree of compliance within the applicable limit. For example, a margin of 7dB means the emission is 7dB below the limit. The equation for margin calculation is as follows:

Margin = Limit – Corrected Amplitude

Test Results Summary

According to the recorded data in following table, the EUT complied with the FCC Part 15.207.

Test Data

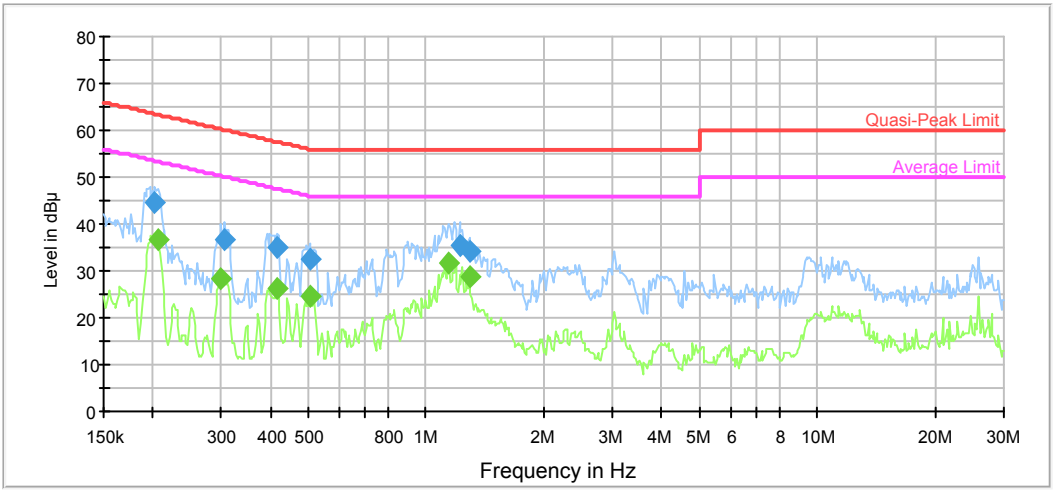
Environmental Conditions

Temperature:	25.5 °C
Relative Humidity:	57 %
ATM Pressure:	101.7 kPa

The testing was performed by Sider Huang on 2018-04-26.

Test Mode: Transmitting(Module 1+2+3)

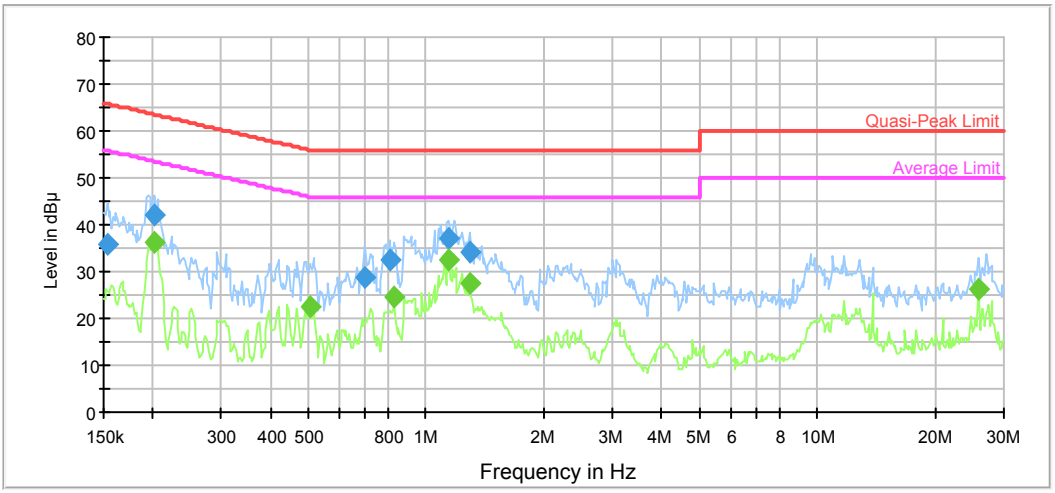
AC120 V, 60 Hz, Line:



Frequency (MHz)	QuasiPeak (dBµV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.203045	44.4	9.000	L1	10.6	19.1	63.5	Compliance
0.304845	36.5	9.000	L1	10.1	23.6	60.1	Compliance
0.415949	34.9	9.000	L1	10.0	22.6	57.5	Compliance
0.503608	32.3	9.000	L1	9.9	23.7	56.0	Compliance
1.219583	35.4	9.000	L1	9.8	20.6	56.0	Compliance
1.289541	34.0	9.000	L1	9.8	22.0	56.0	Compliance

Frequency (MHz)	Average (dBµV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.206306	36.7	9.000	L1	10.6	16.7	53.4	Compliance
0.300025	28.5	9.000	L1	10.1	21.7	50.2	Compliance
0.415949	26.1	9.000	L1	10.0	21.4	47.5	Compliance
0.503608	24.5	9.000	L1	9.9	21.5	46.0	Compliance
1.144267	31.7	9.000	L1	9.8	14.3	46.0	Compliance
1.289541	28.8	9.000	L1	9.8	17.2	46.0	Compliance

AC120 V, 60 Hz, Neutral:



Frequency (MHz)	QuasiPeak (dBµV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.153629	35.7	9.000	N	11.1	30.1	65.8	Compliance
0.203045	42.2	9.000	N	10.6	21.3	63.5	Compliance
0.698191	28.8	9.000	N	9.8	27.2	56.0	Compliance
0.805868	32.6	9.000	N	9.8	23.4	56.0	Compliance
1.144267	37.0	9.000	N	9.8	19.0	56.0	Compliance
1.289541	34.2	9.000	N	9.8	21.8	56.0	Compliance

Frequency (MHz)	Average (dBµV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.203045	36.1	9.000	N	10.6	17.4	53.5	Compliance
0.503608	22.6	9.000	N	9.9	23.4	46.0	Compliance
0.831967	24.5	9.000	N	9.8	21.5	46.0	Compliance
1.144267	32.6	9.000	N	9.8	13.4	46.0	Compliance
1.289541	27.6	9.000	N	9.8	18.4	46.0	Compliance
25.798550	26.4	9.000	N	10.1	23.6	50.0	Compliance

FCC§15.255(c) - EQUIVALENT ISOTROPICALLY RADIATED POWER (EIRP)

Applicable Standard

(c) Within the 57-71 GHz band, emission levels shall not exceed the following equivalent isotropically radiated power (EIRP):

(1) Products other than fixed field disturbance sensors and short-range devices for interactive motion sensing shall comply with one of the following emission limits, as measured during the transmit interval:

(i) The average power of any emission shall not exceed 40 dBm and the peak power of any emission shall not exceed 43 dBm; or

(ii) For fixed point-to-point transmitters located outdoors, the average power of any emission shall not exceed 82 dBm, and shall be reduced by 2 dB for every dB that the antenna gain is less than 51 dBi. The peak power of any emission shall not exceed 85 dBm, and shall be reduced by 2 dB for every dB that the antenna gain is less than 51 dBi.

(A) The provisions in this paragraph for reducing transmit power based on antenna gain shall not require that the power levels be reduced below the limits specified in paragraph (b)(1)(i) of this section.

(B) The provisions of §15.204(c)(2) and (4) that permit the use of different antennas of the same type and of equal or less directional gain do not apply to intentional radiator systems operating under this provision. In lieu thereof, intentional radiator systems shall be certified using the specific antenna(s) with which the system will be marketed and operated. Compliance testing shall be performed using the highest gain and the lowest gain antennas for which certification is sought and with the intentional radiator operated at its maximum available output power level. The responsible party, as defined in §2.909 of this chapter, shall supply a list of acceptable antennas with the application for certification.

(2) For fixed field disturbance sensors that occupy 500 MHz or less of bandwidth and that are contained wholly within the frequency band 61.0-61.5 GHz, the average power of any emission, measured during the transmit interval, shall not exceed 40 dBm, and the peak power of any emission shall not exceed 43 dBm. In addition, the average power of any emission outside of the 61.0-61.5 GHz band, measured during the transmit interval, but still within the 57-71 GHz band, shall not exceed 10 dBm, and the peak power of any emission shall not exceed 13 dBm.

(3) For fixed field disturbance sensors other than those operating under the provisions of paragraph (b)(2) of this section, and short-range devices for interactive motion sensing, the peak transmitter conducted output power shall not exceed −10 dBm and the peak EIRP level shall not exceed 10 dBm.

(4) The peak power shall be measured with an RF detector that has a detection bandwidth that encompasses the 57-71 GHz band and has a video bandwidth of at least 10 MHz. The average emission levels shall be measured over the actual time period during which transmission occurs.

Test Procedure

Refer to ANSI C63.10-2013 Clause 9.11

Maximizing procedure was performed on the highest emissions to ensure that the EUT complied with all installation combinations.

At frequencies greater than or equal to 1 GHz, measurements were recorded using the Peak Detector and the CISPR Average Detector.

Environmental Conditions

Temperature:	27.6 °C
Relative Humidity:	60 %
ATM Pressure:	100.4 kPa

The testing was performed by Blake Yang on 2018-04-24.

Test Data

Please refer to the following table:

Test Mode: Transmitting (per pretest, WPON AP-Pole was the worst*)*

ANT0:

Frequency (GHz)	Detector (PK/AV)	Polar (H/V)	Substituted Level (dBm)	Antenna Gain (dBi)	EIPR Power (dBm)	Limit (dBm)	Margin (dB)
58.32	PK	V	-14.58	24	29.29	43	13.71
58.32	AV	V	-22.33	24	21.54	40	18.46
60.48	PK	V	-14.14	24	30.05	43	12.95
60.48	AV	V	-21.96	24	22.23	40	17.77
62.64	PK	V	-15.07	24	29.42	43	13.58
62.64	AV	V	-22.55	24	21.94	40	18.06

ANT1:

Frequency (GHz)	Detector (PK/AV)	Polar (H/V)	Substituted Level (dBm)	Antenna Gain (dBi)	EIPR Power (dBm)	Limit (dBm)	Margin (dB)
58.32	PK	V	-14.06	24	29.81	43	13.19
58.32	AV	V	-21.81	24	22.06	40	17.94
60.48	PK	V	-13.88	24	30.31	43	12.69
60.48	AV	V	-21.86	24	22.33	40	17.67
62.64	PK	V	-14.11	24	30.38	43	12.62
62.64	AV	V	-21.96	24	22.53	40	17.47

ANT2:

Frequency (GHz)	Detector (PK/AV)	Polar (H/V)	Substituted Level (dBm)	Antenna Gain (dBi)	EIPR Power (dBm)	Limit (dBm)	Margin (dB)
58.32	PK	V	-16.53	24	27.34	43	15.66
58.32	AV	V	-24.14	24	19.73	40	20.27
60.48	PK	V	-14.14	24	30.05	43	12.95
60.48	AV	V	-22.01	24	22.18	40	17.82
62.64	PK	V	-15.24	24	29.25	43	13.75
62.64	AV	V	-22.67	24	21.82	40	18.18

ANT3&ANT4:

Frequency (GHz)	Detector (PK/AV)	Polar (H/V)	Substituted SG Level (dBm)	Horn Antenna Gain (dBi)	EIPR Power (dBm)	Limit (dBm)	Margin (dB)
58.32	PK	H	-13.52	24	30.35	43	12.65
58.32	AV	H	-21.39	24	22.48	40	17.52
60.48	PK	H	-10.3	24	33.89	43	9.11
60.48	AV	H	-17.82	24	26.37	40	13.63
62.64	PK	H	-11.13	24	33.36	43	9.64
62.64	AV	H	-19.02	24	25.47	40	14.53

ANT5&ANT6:

Frequency (GHz)	Detector (PK/AV)	Polar (H/V)	Substituted SG Level (dBm)	Horn Antenna Gain (dBi)	EIPR Power (dBm)	Limit (dBm)	Margin (dB)
58.32	PK	H	-14.87	24	29	43	14
58.32	AV	H	-22.67	24	21.2	40	18.8
60.48	PK	H	-11.13	24	33.06	43	9.94
60.48	AV	H	-18.92	24	25.27	40	14.73
62.64	PK	H	-12.22	24	32.27	43	10.73
62.64	AV	H	-19.97	24	24.52	40	15.48

Note 1:The measurement distance is 1.0 m.
Note 2: RF Detector and a DSO with a Bandwidth greater than 10 MHz were used to make the measurements
Note 3: the measurement performed with radiation method, according to ANSI C63.10-2013 Clause 9.11:

$$E = 126.8 - 20\log(\lambda) + P - G$$

$$\mathrm{EIRP} = E_{\mathrm{Meas}} + 20\log(d_{\mathrm{Meas}}) - 104.7$$

*=>EIRP=126.8-20*log(λ)+P-G+20log(1)-104.7*
*= 22.1-20*log(λ)+P-G*

λ the free-space wavelength in m at the frequency of measurement.
= 3 x 10^8/f

f is frequency in Hz.

Note 4: The Mixers and it`s RF cables is compose a system for calibration.
Note 5: the test data recorded was the maximum polarization.
Note 6: Substituted SG Level is the power recoded in Step e) 9) of §9.11 of ANSI C63.10-2013
Note 7: Horn antenna gain is 24dBi

FCC§15.255(e)(1)- OCCUPIED BANDWIDTH

Applicable Standard

Transmitters with an emission bandwidth of less than 100 MHz must limit their peak transmitter conducted output power to the product of 500 mW times their emission bandwidth divided by 100 MHz. For the purposes of this paragraph, emission bandwidth is defined as the instantaneous frequency range occupied by a steady state radiated signal with modulation, outside which the radiated power spectral density never exceeds 6 dB below the maximum radiated power spectral density in the band, as measured with a 100 kHz resolution bandwidth spectrum analyzer. The center frequency must be stationary during the measurement interval, even if not stationary during normal operation (e.g., for frequency hopping devices).

Test Procedure

Refer to ANSI C63.10-2013 Clause 6.9 & 9.3

the Marker is to be placed on the highest amplitude peak of the “hash”, and then the Display Line should be moved to the -6dB than the highest amplitude peak, the Marker should be moved leftward off of the peak amplitude point to identify the -6 dB point, the Delta should be moved rightward off of the peak amplitude point to identify the -6 dB point. The Delta is the 6 dB Bandwidth.

Environmental Conditions

Temperature:	27.6 °C
Relative Humidity:	60 %
ATM Pressure:	100.4 kPa

The testing was performed by George Pang on 2018-04-24.

Test Data

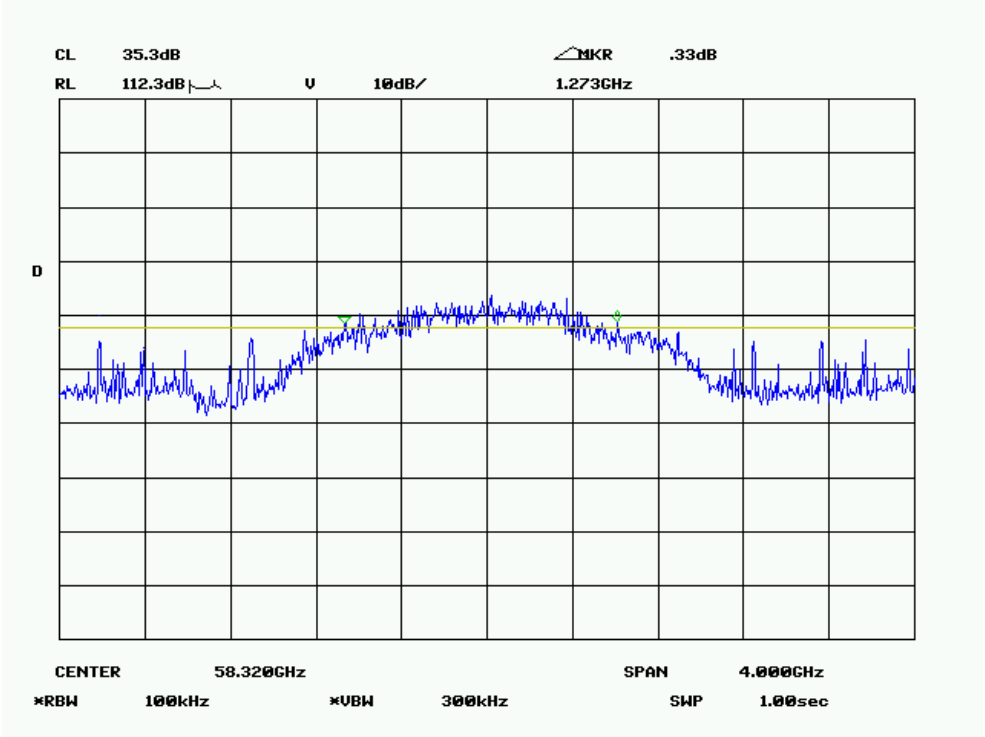
Please refer to the following tables and plots:

Test Mode: Transmitting(Test performed at ANT 0)

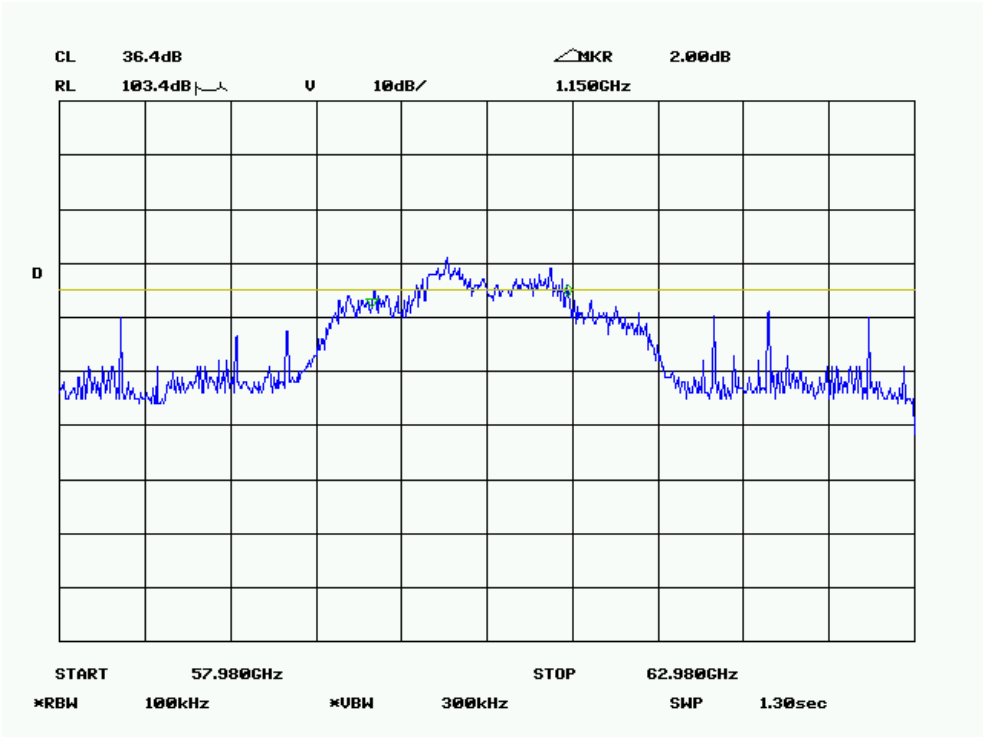
Channel	Frequency	6 dB Bandwidth	99% Bandwidth
	(GHz)	(MHz)	(MHz)
Low	58.32	1273	1833
Middle	60.48	1150	1813
High	62.64	1280	1820

6dB Bandwidth

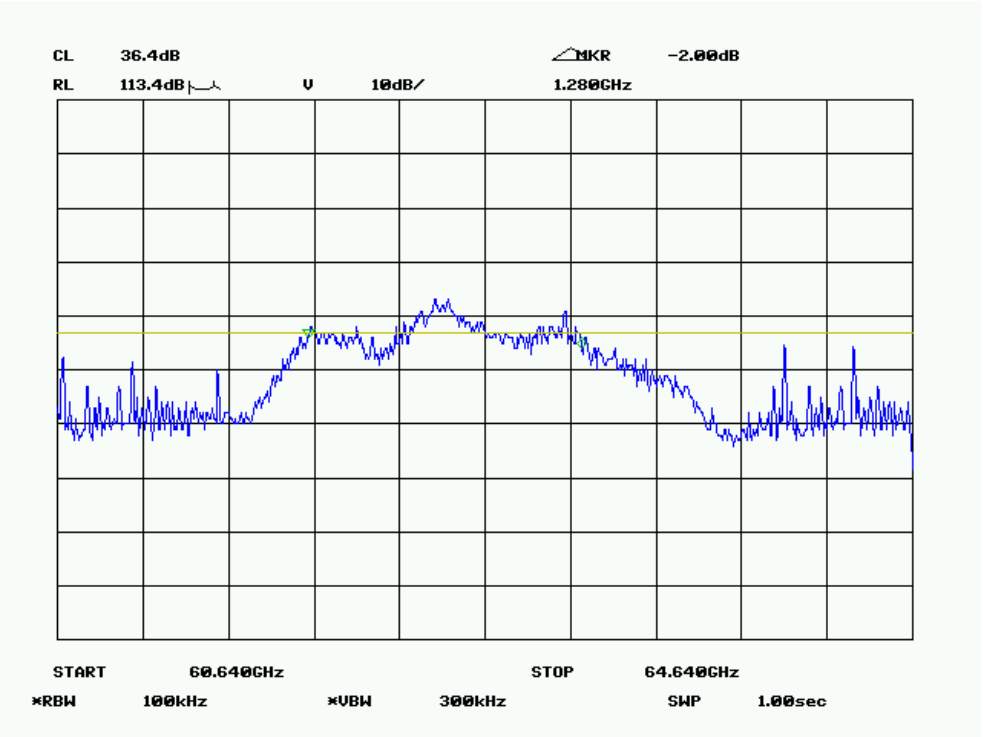
Low Channel



Middle Channel

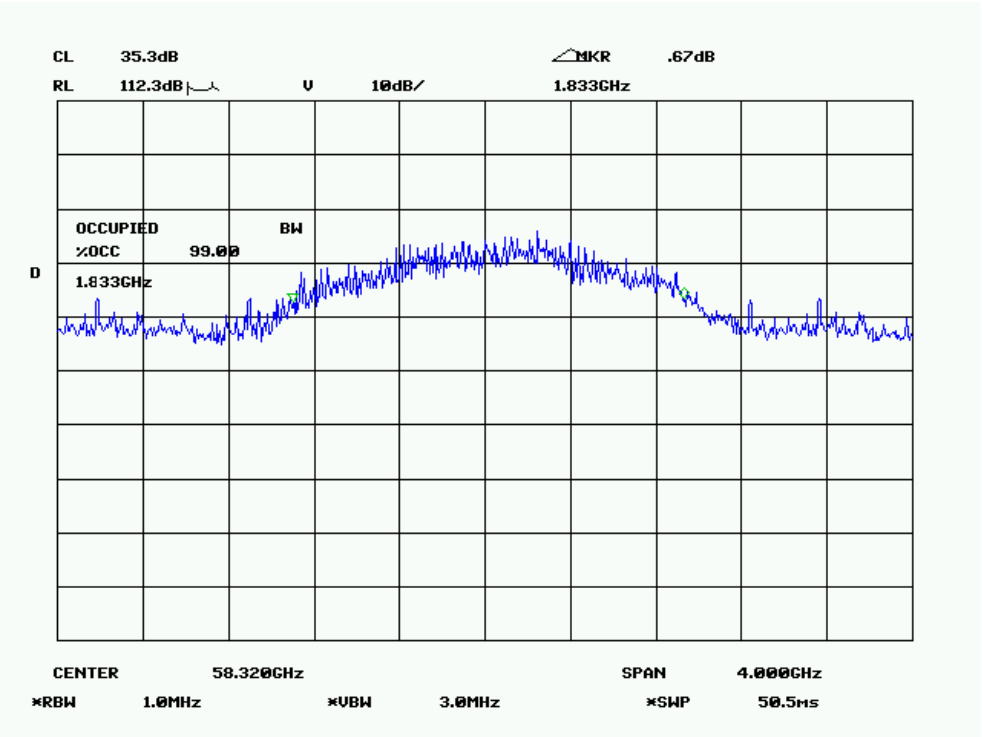


High Channel

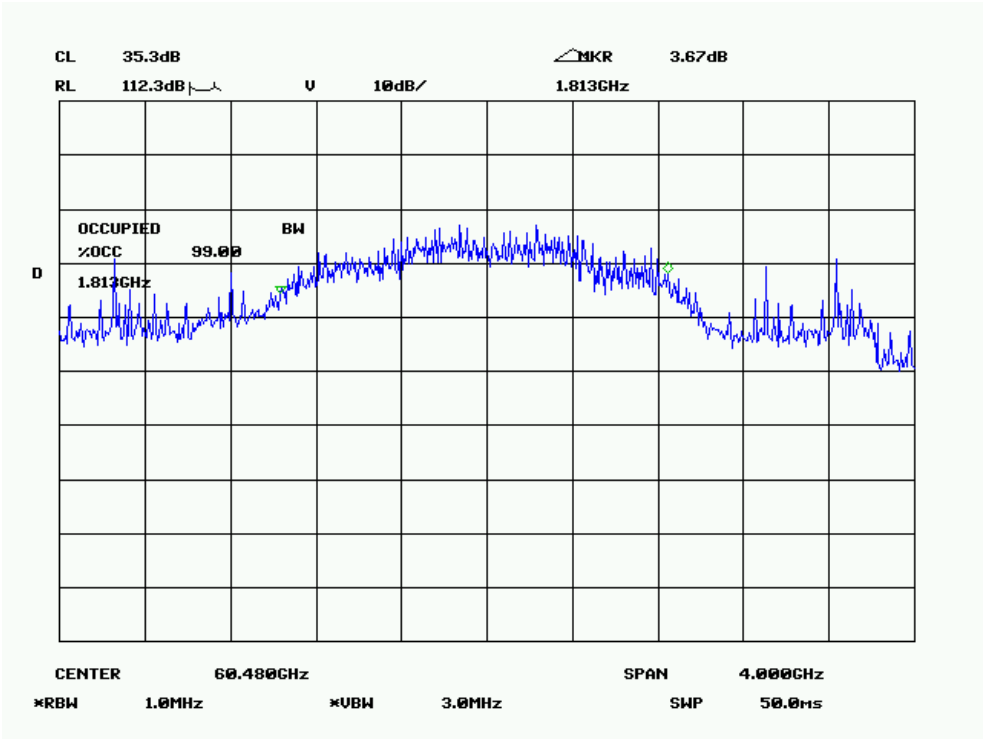


99% Bandwidth

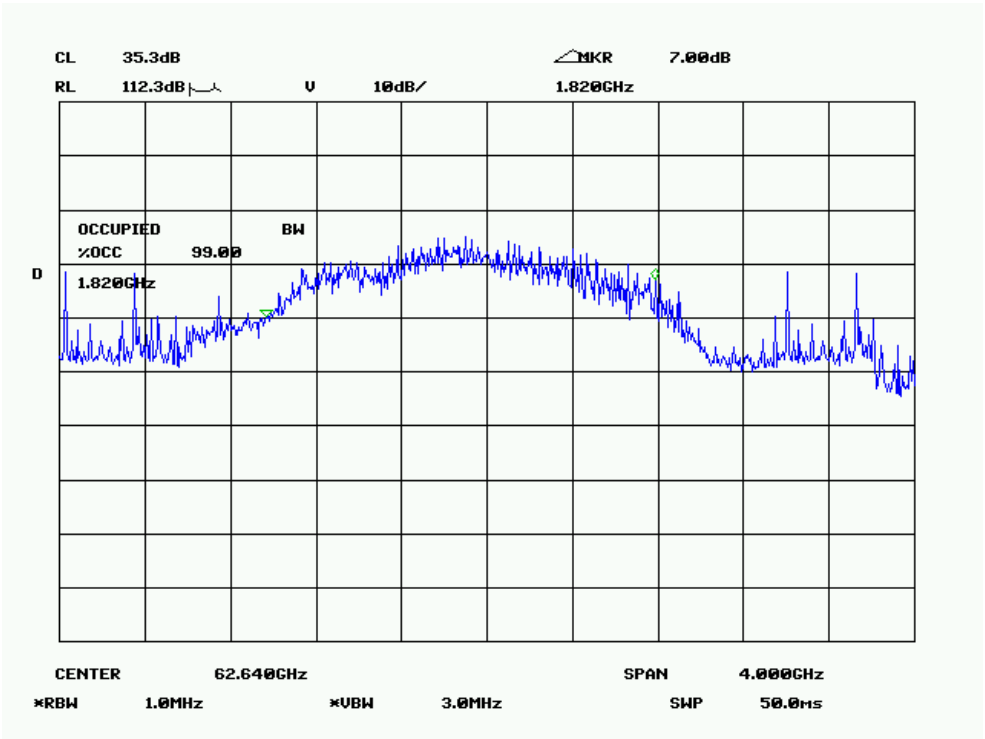
Low Channel



Middle Channel



High Channel



FCC§15.255(e) –PEAK CONDUCTED OUTPUT POWER

Applicable Standard

(e) Except as specified paragraph (e)(1) of this section, the peak transmitter conducted output power shall not exceed 500 mW. Depending on the gain of the antenna, it may be necessary to operate the intentional radiator using a lower peak transmitter output power in order to comply with the EIRP limits specified in paragraph (b) of this section.

(1) Transmitters with an emission bandwidth of less than 100 MHz must limit their peak transmitter conducted output power to the product of 500 mW times their emission bandwidth divided by 100 MHz. For the purposes of this paragraph, emission bandwidth is defined as the instantaneous frequency range occupied by a steady state radiated signal with modulation, outside which the radiated power spectral density never exceeds 6 dB below the maximum radiated power spectral density in the band, as measured with a 100 kHz resolution bandwidth spectrum analyzer. The center frequency must be stationary during the measurement interval, even if not stationary during normal operation (e.g., for frequency hopping devices).
(2) Peak transmitter conducted output power shall be measured with an RF detector that has a detection bandwidth that encompasses the 57-71 GHz band and that has a video bandwidth of at least 10 MHz.
(3) For purposes of demonstrating compliance with this paragraph, corrections to the transmitter conducted output power may be made due to the antenna and circuit loss.

Test Procedure

Refer to ANSI C63.10-2013 Clause 9.7 : equation to calculate power output.

Environmental Conditions

Temperature:	27.6 °C
Relative Humidity:	60 %
ATM Pressure:	100.4 kPa

The testing was performed by Blake Yang on 2018-04-24.

Test Data

Please refer to the following table:

Test Mode: Transmitting

Frequency (GHz)	Peak EIPR Power (dBm)	Antenna Gain (dBi)	Peak conducted power (dBm)	Limit (dBm)	Margin (dB)
ANT0					
58.32	29.29	18	11.29	27	15.71
60.48	30.05	18	12.05	27	14.95
62.64	29.42	18	11.42	27	15.58
ANT1					
58.32	29.81	18	11.81	27	15.19
60.48	30.31	18	12.31	27	14.69
62.64	30.38	18	12.38	27	14.62
ANT2					
58.32	27.34	18	9.34	27	17.66
60.48	30.05	18	12.05	27	14.95
62.64	29.25	18	11.25	27	15.75
ANT3&ANT4					
58.32	30.35	18	12.35	27	14.65
60.48	33.89	18	15.89	27	11.11
62.64	33.36	18	15.36	27	11.64
ANT5&ANT6					
58.32	29	18	11	27	16
60.48	33.06	18	15.06	27	11.94
62.64	32.27	18	14.27	27	12.73

Note 1: EIRP Power refer to §15.255 (b)
Note 2: For radiated emissions measurements, calculated transmitter conducted output power P(con)
P(con)=EIRP-Antenna gain(dBi)

FCC§15.205, §15.209&§15.255(d)- TRANSMITTER SPURIOUS EMISSIONS

Applicable Standard

(d) Limits on spurious emissions:

(1) The power density of any emissions outside the 57-64 GHz band shall consist solely of spurious emissions.

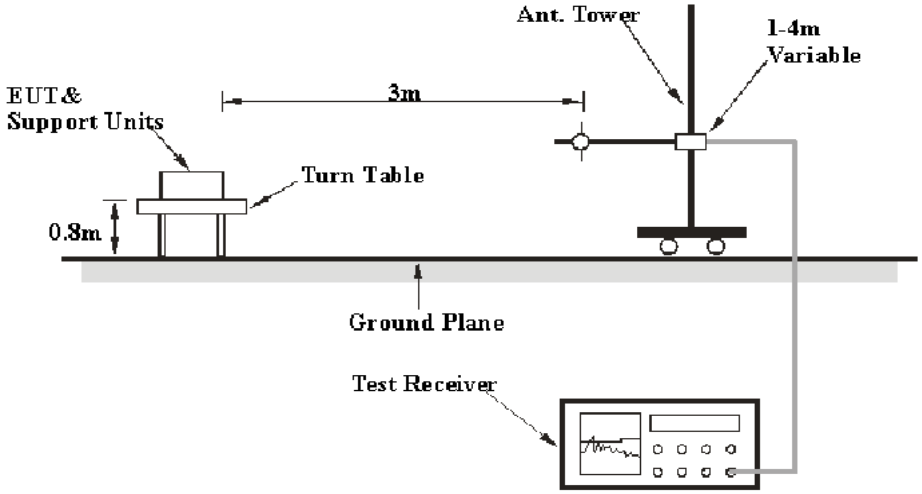
(2) Radiated emissions below 40 GHz shall not exceed the general limits in §15.209.

(3) Between 40 GHz and 200 GHz, the level of these emissions shall not exceed 90 pW/cm^2 at a distance of 3 meters.

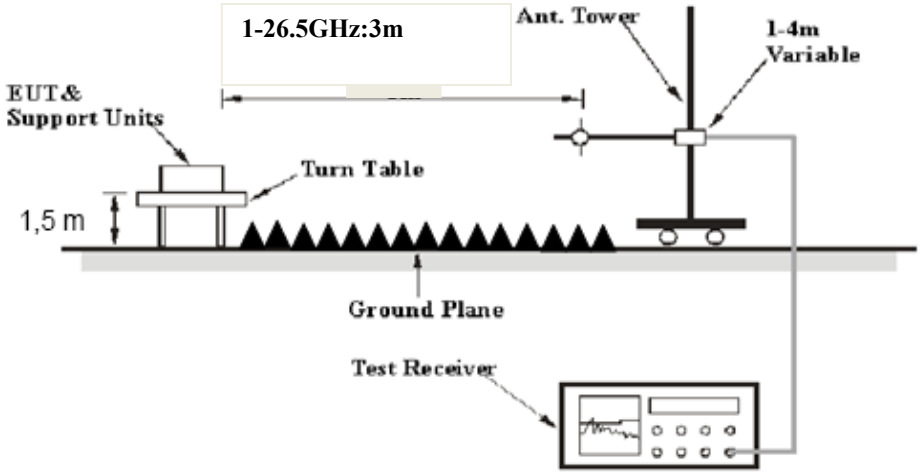
(4) The levels of the spurious emissions shall not exceed the level of the fundamental emission.

EUT Setup

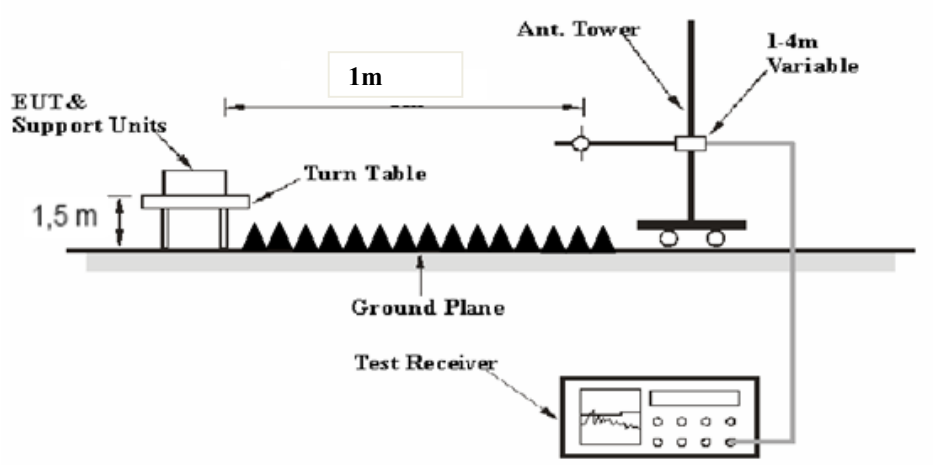
Below 1 GHz:



1-26.5 GHz:



26.5-40 GHz:



Above 40GHz:

The antenna is scanned around the entire perimeter surface of the EUT, in both horizontal and vertical polarizations, at the distance of 1.0 m from 40 GHz to 90 GHz, and 0.5 m from 90 GHz to 200 GHz.

The radiated emission and out of band emission tests were performed in the 3 meters chamber test site A, using the setup accordance with the ANSI C63.10-2013 The specification used was the FCC 15.209/15.205 and FCC 15.255 limits.

Test Equipment Setup

The system was investigated from 30 MHz to 200 GHz.

During the radiated emission test, the EMI test receiver & Spectrum Analyzer Setup were set with the following configurations:

Frequency Range	RBW	Video B/W	IF B/W	Detector
30 MHz – 1000 MHz	120 kHz	300 kHz	120 kHz	QP
1-40 GHz	1MHz	3 MHz	/	PK
	1MHz	10 Hz	/	Ave
40 GHz – 200 GHz	1MHz	3 MHz	/	PK

Test Procedure

Refer to ANSI C63.10-2013 Clauses 9.9, 9.12, and 9.13.

A Maximizing procedure was performed to ensure that the highest emissions from the EUT were actually measured in all of the Test Arrangements of the EUT and Local Support Equipment.

In accordance with FCC Rules Part 15 Subpart A Section 15.35, from 30 MHz to 1 GHz all radiated emissions measurements were made using a Quasi-peak Detector, and from 1 GHz to 40 GHz, all radiated emissions measurements were made using a Peak Detector and CISPR Average Detector. In accordance with FCC Rules Part 15 Subpart C Section 15.255, from 40 GHz to 200 GHz, all radiated emissions measurements were made using a Peak Detector.

According to C63.10, the 26.5-40GHz test result shall be extrapolated to the specified distance using an extrapolation factor of 20dB/decade from 3m to 1m

Distance extrapolation factor =20 log (specific distance [3m]/test distance [1m]) dB= 9.54 dB

All emissions under the average limit and under the noise floor have not recorded in the report.

Corrected Amplitude & Margin Calculation

The Corrected Amplitude is calculated by adding the Antenna Loss and Cable Loss, and subtracting the Amplifier Gain from the Meter Reading. The basic equation is as follows:

Corrected = Antenna Loss + Cable Loss - Amplifier Gain

Or

Corrected Amplitude = Antenna Loss + Cable Loss - Amplifier Gain- Distance extrapolation factor

The "**Margin**" column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of 7dB means the emission is 7dB below the limit. The equation for margin calculation is as follows:

Result = Reading + Corrected

Margin = Limit - Result

Environmental Conditions

Temperature:	25.6-27.6 °C
Relative Humidity:	45-60 %
ATM Pressure:	100.4-101.6 kPa

The testing was performed by Vern Shen&Blake Yang from 2018-04-24 to 2018-07-15.

*Test Mode: Transmitting(*WPON AP-Pole was the worst*)*

Test Data

Please refer to the following table:

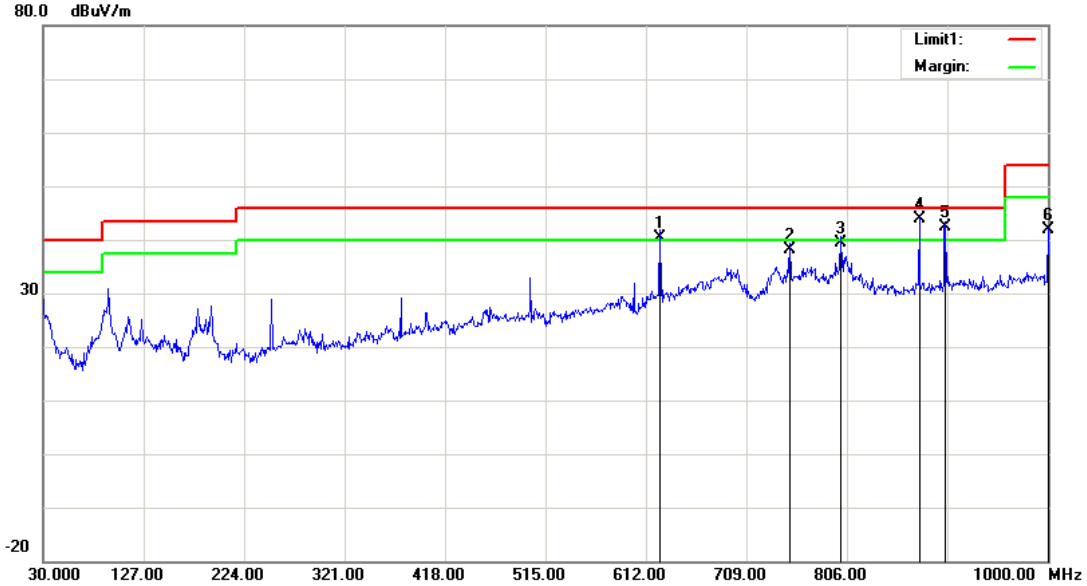
Module 1(Antenna 1 was the worst)**:**

30MHz-1GHz:

Low Channel:

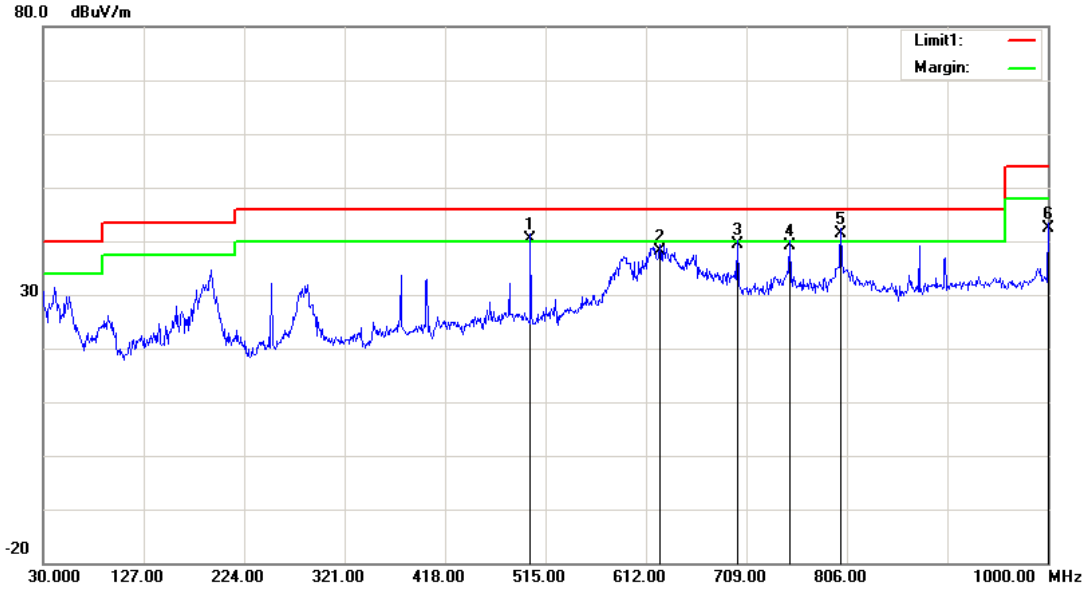
Horizontal

Frequency (MHz)	Reading (dBuV)	Detector	Corrected (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
625.5800	38.58	QP	1.72	40.30	46.00	5.70
750.7100	34.48	QP	3.62	38.10	46.00	7.90
800.1800	34.89	QP	4.61	39.50	46.00	6.50
875.8400	38.38	QP	5.52	43.90	46.00	2.10
901.0600	36.07	QP	6.23	42.30	46.00	3.70
1000.0000	12.20	QP	29.60	41.80	54.00	12.20



Vertical

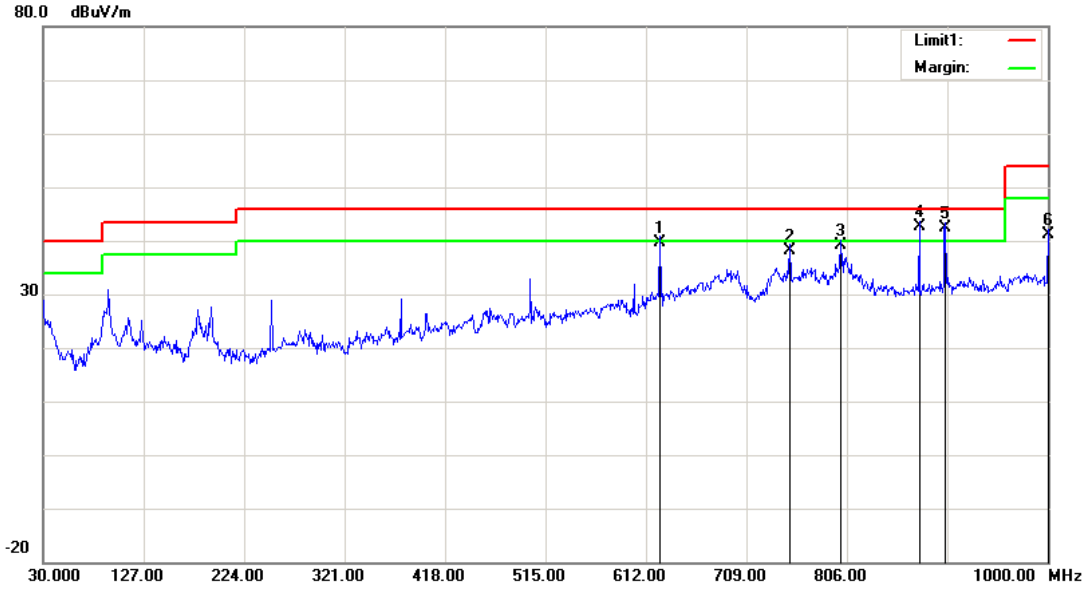
Frequency (MHz)	Reading (dBuV)	Detector	Corrected (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
500.4500	40.62	QP	-0.32	40.30	46.00	5.70
625.5800	36.48	QP	1.72	38.20	46.00	7.80
700.2700	36.14	QP	3.16	39.30	46.00	6.70
750.7100	35.48	QP	3.62	39.10	46.00	6.90
800.1800	36.69	QP	4.61	41.30	46.00	4.70
1000.0000	12.90	QP	29.60	42.50	54.00	11.50



Middle Channel:

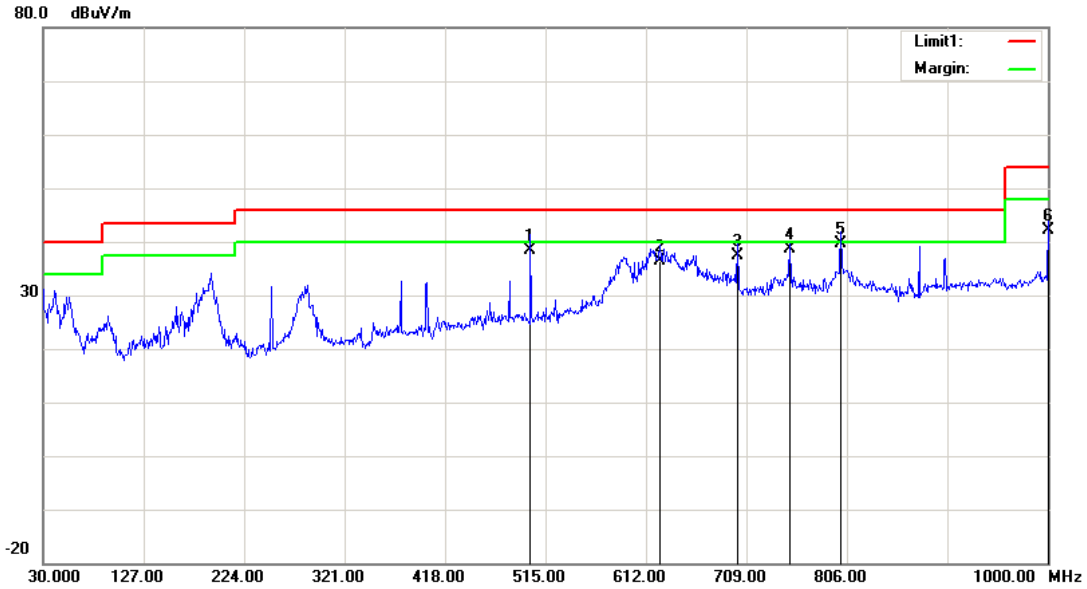
Horizontal

Frequency (MHz)	Reading (dBuV)	Detector	Corrected (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
625.5800	37.98	QP	1.72	39.70	46.00	6.30
750.7100	34.58	QP	3.62	38.20	46.00	7.80
800.1800	34.49	QP	4.61	39.10	46.00	6.90
875.8400	37.08	QP	5.52	42.60	46.00	3.40
901.0600	36.07	QP	6.23	42.30	46.00	3.70
1000.0000	11.60	QP	29.60	41.20	54.00	12.80



Vertical

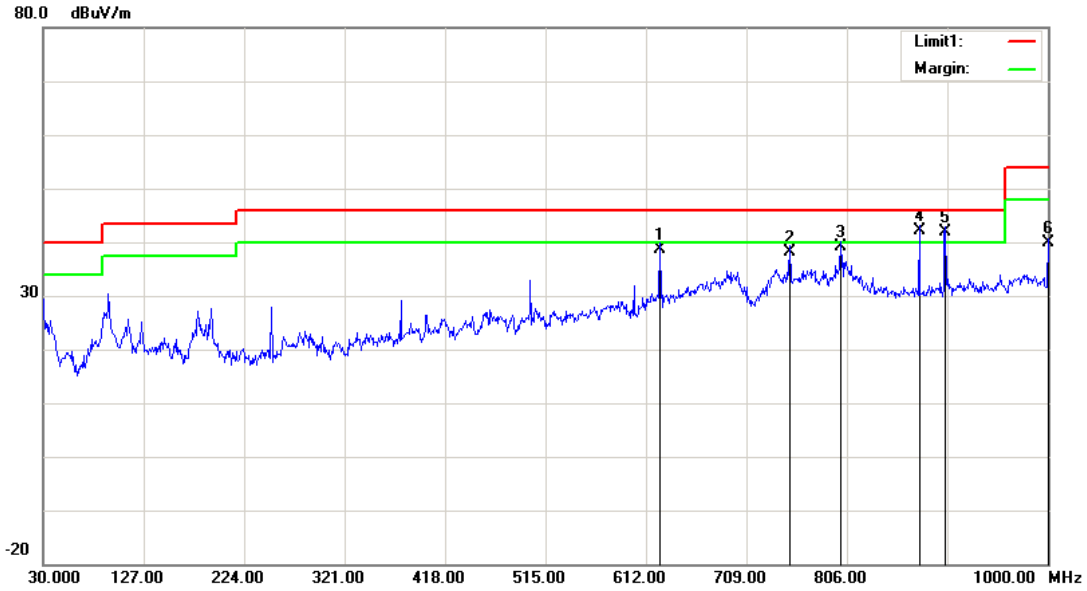
Frequency (MHz)	Reading (dBuV)	Detector	Corrected (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
500.4500	38.72	QP	-0.32	38.40	46.00	7.60
625.5800	34.68	QP	1.72	36.40	46.00	9.60
700.2700	34.34	QP	3.16	37.50	46.00	8.50
750.7100	34.98	QP	3.62	38.60	46.00	7.40
800.1800	34.99	QP	4.61	39.60	46.00	6.40
1000.0000	12.60	QP	29.60	42.20	54.00	11.80



High Channel:

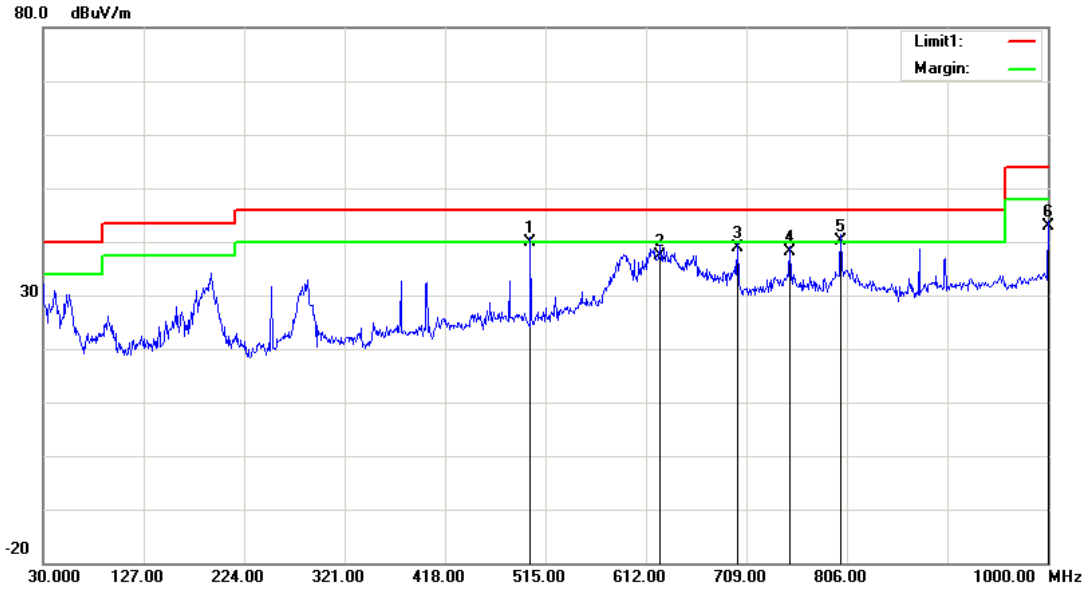
Horizontal

Frequency (MHz)	Reading (dBuV)	Detector	Corrected (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
625.5800	36.98	QP	1.72	38.70	46.00	7.30
750.7100	34.58	QP	3.62	38.20	46.00	7.80
800.1800	34.49	QP	4.61	39.10	46.00	6.90
875.8400	36.58	QP	5.52	42.10	46.00	3.90
901.0600	35.57	QP	6.23	41.80	46.00	4.20
1000.0000	10.20	QP	29.60	39.80	54.00	14.20



Vertical

Frequency (MHz)	Reading (dBuV)	Detector	Corrected (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
500.4500	40.12	QP	-0.32	39.80	46.00	6.20
625.5800	35.78	QP	1.72	37.50	46.00	8.50
700.2700	35.74	QP	3.16	38.90	46.00	7.10
750.7100	34.58	QP	3.62	38.20	46.00	7.80
800.1800	35.59	QP	4.61	40.20	46.00	5.80
1000.0000	13.40	QP	29.60	43.00	54.00	11.00



1GHz -40 GHz:

Frequency (MHz)	Receiver		Rx Antenna		Cable loss (dB)	Amplifier Gain (dB)	Corrected Amplitude (dBμV/m)	Limit (dBμV/m)	Margin (dB)
	Reading (dBμV)	Detector	Polar (H/V)	Factor (dB/m)					
Low Channel									
7290.00	41.23	PK	H	34.06	5.66	27.28	53.67	74.00	20.33
7290.00	35.65	AV	H	34.06	5.66	27.28	48.09	54.00	5.91
7830.00	42.65	PK	H	34.66	5.95	27.02	56.24	74.00	17.76
7830.00	38.38	AV	H	34.66	5.95	27.02	51.97	54.00	2.03
7290.00	40.98	PK	V	34.06	5.66	27.28	53.42	74.00	20.58
7290.00	36.03	AV	V	34.06	5.66	27.28	48.47	54.00	5.53
7830.00	42.35	PK	V	34.66	5.95	27.02	55.94	74.00	18.06
7830.00	37.57	AV	V	34.66	5.95	27.02	51.16	54.00	2.84
Middle Channel									
7290.00	39.46	PK	H	34.06	5.66	27.28	51.90	74.00	22.10
7290.00	34.56	AV	H	34.06	5.66	27.28	47.00	54.00	7.00
7560.00	42.34	PK	H	34.45	5.86	27.24	55.41	74.00	18.59
7560.00	37.05	AV	H	34.45	5.86	27.24	50.12	54.00	3.88
7290.00	40.96	PK	V	34.06	5.66	27.28	53.40	74.00	20.60
7290.00	35.21	AV	V	34.06	5.66	27.28	47.65	54.00	6.35
7560.00	39.47	PK	V	34.45	5.86	27.24	52.54	74.00	21.46
7560.00	32.45	AV	V	34.45	5.86	27.24	45.52	54.00	8.48
High Channel									
7560.00	36.94	PK	H	34.45	5.86	27.24	50.01	74.00	23.99
7560.00	30.72	AV	H	34.45	5.86	27.24	43.79	54.00	10.21
7830.00	43.30	PK	H	34.66	5.95	27.02	56.89	74.00	17.11
7830.00	38.19	AV	H	34.66	5.95	27.02	51.78	54.00	2.22
7560.00	40.06	PK	V	34.45	5.86	27.24	53.13	74.00	20.87
7560.00	34.26	AV	V	34.45	5.86	27.24	47.33	54.00	6.67
7830.00	42.32	PK	V	34.66	5.95	27.02	55.91	74.00	18.09
7830.00	35.41	AV	V	34.66	5.95	27.02	49.00	54.00	5.00

40GHz~200GHz:

Frequency	Receiver		Rx Antenna		Corrected Amplitude	EIPR Power	Power Density	Limit
	Reading	Detector	Polar	Factor				
GHz	dBµV	PK/QP/AV	H/V	dB(1/m)	dBµV/m	dBm	pW/cm^2	pW/cm^2
Low Channel								
47.9	38.45	PK	H	40.33	78.78	-25.92	2.26	90
47.9	37.52	PK	V	40.33	77.85	-26.85	1.83	90
77.55	43.20	PK	H	45.87	89.07	-15.63	24.19	90
77.55	43.07	PK	V	45.87	88.94	-15.76	23.47	90
116.64	45.32	PK	H	53.18	98.5	-12.22	53.03	90
116.64	44.93	PK	V	53.18	98.11	-12.61	48.48	90
Middle Channel								
48.9	38.43	PK	H	40.52	78.95	-25.75	2.35	90
48.9	37.24	PK	V	40.52	77.76	-26.94	1.79	90
120.96	45.12	PK	H	53.98	99.1	-11.62	60.89	90
120.96	44.97	PK	V	53.98	98.95	-11.77	58.82	90
High Channel								
50.12	39.54	PK	H	40.75	80.29	-24.41	3.2	90
50.12	37.85	PK	V	40.75	78.6	-26.1	2.17	90
80.65	46.01	PK	H	46.45	92.46	-12.24	52.79	90
80.65	44.65	PK	V	46.45	91.1	-13.6	38.6	90
125.28	44.12	PK	H	54.79	98.91	-11.81	58.29	90
125.28	44.32	PK	V	54.79	99.11	-11.61	61.03	90

Note 1:

EIRP = E-meas +20log(d-meas)-104.7

where:

EIRP : is the equivalent isotopically radiated power, in dBm

E-meas. : is the field strength of the emission at the measurement distance, in dBµV/m

d-meas. : is the measurement distance, in m

Note 2:The test distance is 1 m. for 40-90GHz, and 0.5m for 90-200GHz

Note 3:Corrected Amplitude = Meter Reading + Antenna Factor

Note 4: The Mixers and it`s RF cables is compose a system for calibration, the conversion factor was added into the test Spectrum Analyzer in testing.

Note 5:

$$PD = \frac{EIRP_{Linear}}{4\pi d^2}$$

where

PD is the power density at the distance specified by the limit, in W/m^2

$EIRP_{Linear}$ is the equivalent isotropically radiated power, in watts

d is the distance at which the power density limit is specified, in m

The Specified distance is 3m.

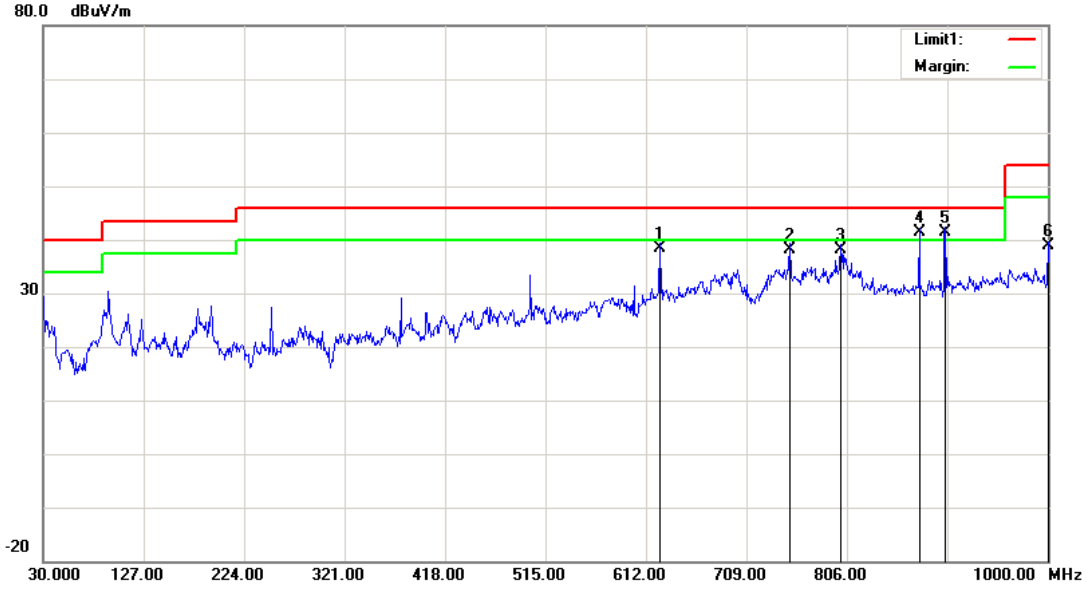
Module 2:

30MHz-1GHz:

Low Channel:

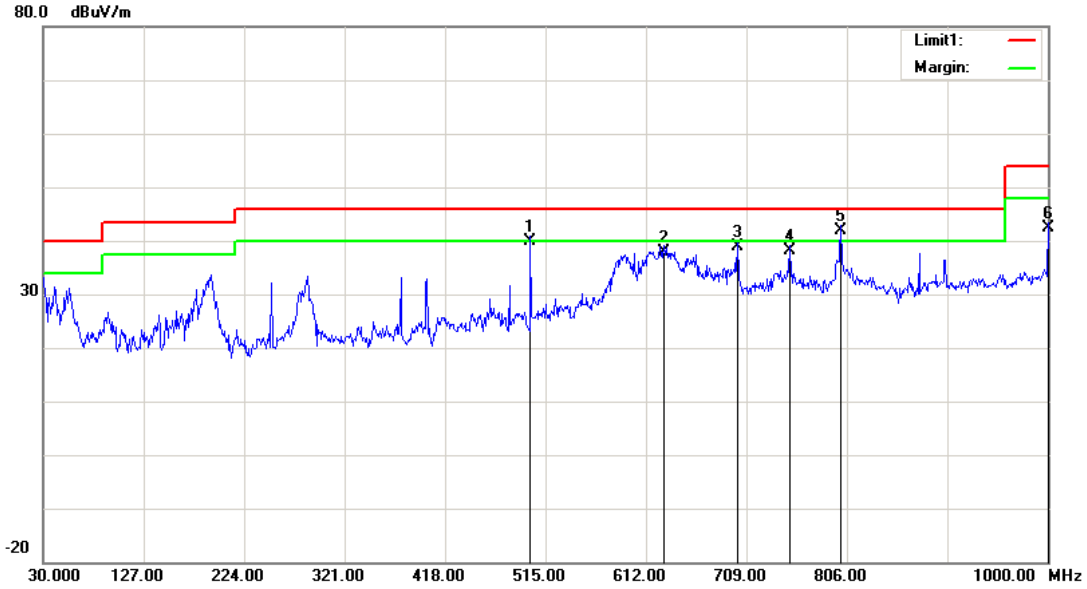
Horizontal

Frequency (MHz)	Reading (dBuV)	Detector	Corrected (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
625.5800	36.68	QP	1.72	38.40	46.00	7.60
750.7100	34.58	QP	3.62	38.20	46.00	7.80
800.1800	33.49	QP	4.61	38.10	46.00	7.90
875.8400	35.78	QP	5.52	41.30	46.00	4.70
901.0600	35.27	QP	6.23	41.50	46.00	4.50
1000.0000	9.30	QP	29.60	38.90	54.00	15.10



Vertical

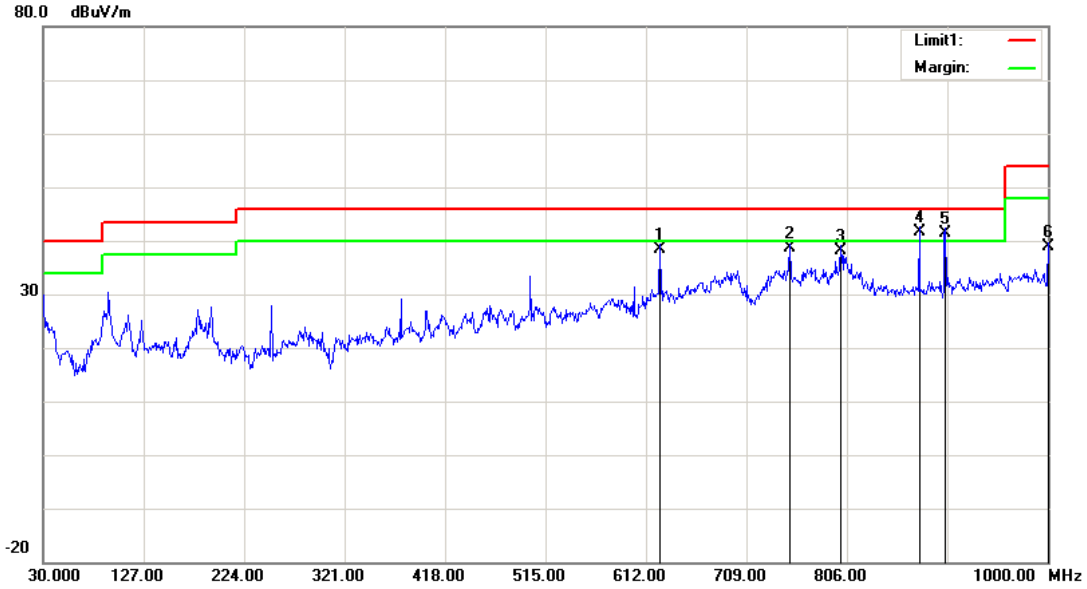
Frequency (MHz)	Reading (dBuV)	Detector	Corrected (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
500.4500	40.22	QP	-0.32	39.90	46.00	6.10
629.4600	35.86	QP	1.94	37.80	46.00	8.20
700.2700	35.64	QP	3.16	38.80	46.00	7.20
750.7100	34.48	QP	3.62	38.10	46.00	7.90
800.1800	37.19	QP	4.61	41.80	46.00	4.20
1000.0000	12.90	QP	29.60	42.50	54.00	11.50



Middle Channel:

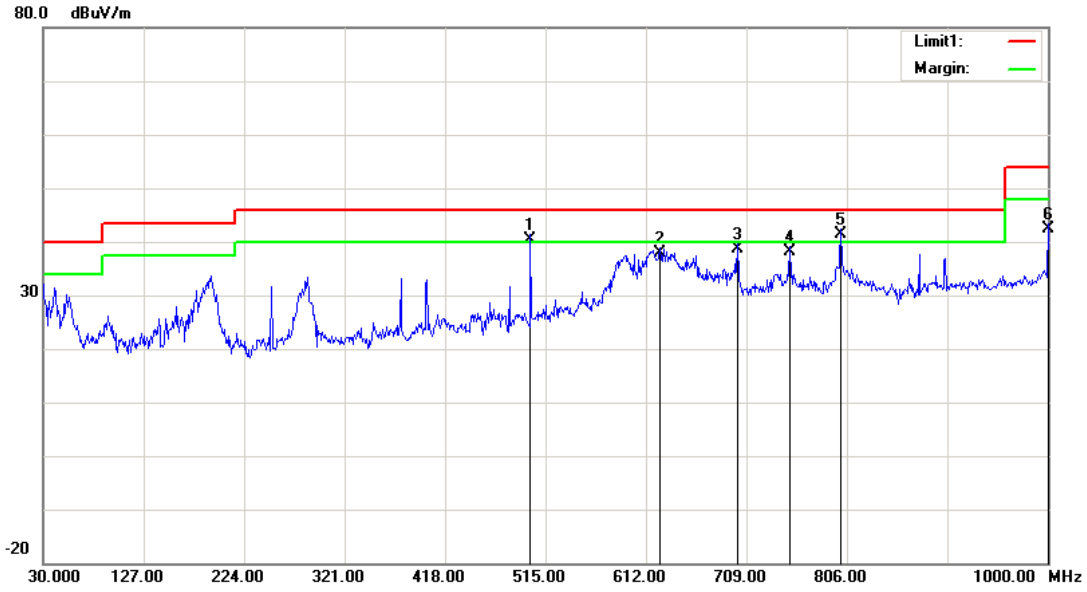
Horizontal

Frequency (MHz)	Reading (dBuV)	Detector	Corrected (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
625.5800	36.68	QP	1.72	38.40	46.00	7.60
750.7100	34.98	QP	3.62	38.60	46.00	7.40
800.1800	33.59	QP	4.61	38.20	46.00	7.80
875.8400	36.08	QP	5.52	41.60	46.00	4.40
901.0600	35.27	QP	6.23	41.50	46.00	4.50
1000.0000	9.20	QP	29.60	38.80	54.00	15.20



Vertical

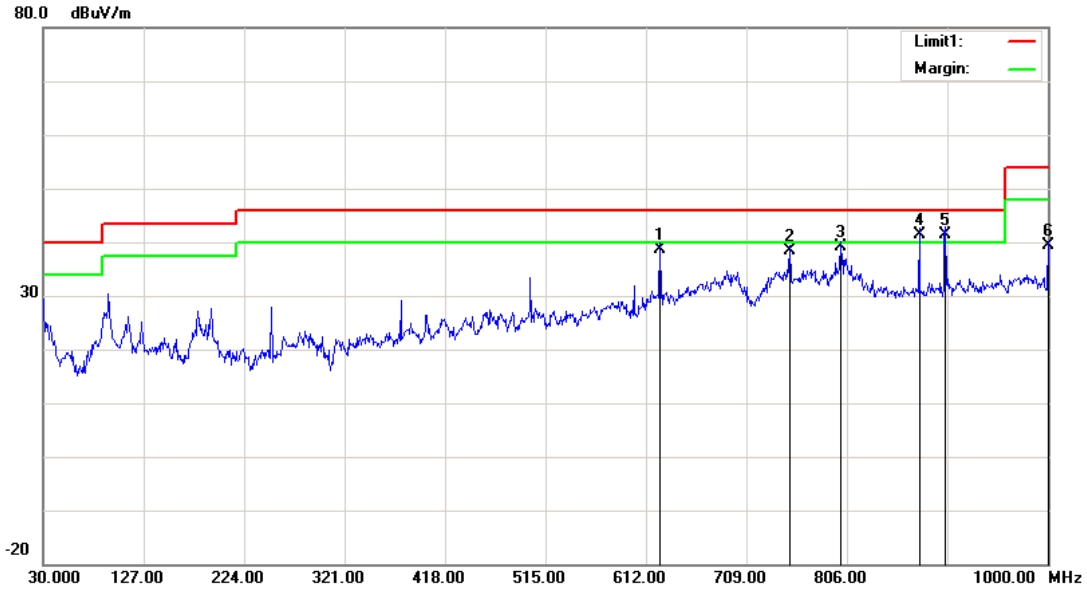
Frequency (MHz)	Reading (dBuV)	Detector	Corrected (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
500.4500	40.62	QP	-0.32	40.30	46.00	5.70
625.5800	36.18	QP	1.72	37.90	46.00	8.10
700.2700	35.44	QP	3.16	38.60	46.00	7.40
750.7100	34.48	QP	3.62	38.10	46.00	7.90
800.1800	36.69	QP	4.61	41.30	46.00	4.70
1000.0000	12.90	QP	29.60	42.50	54.00	11.50



High Channel:

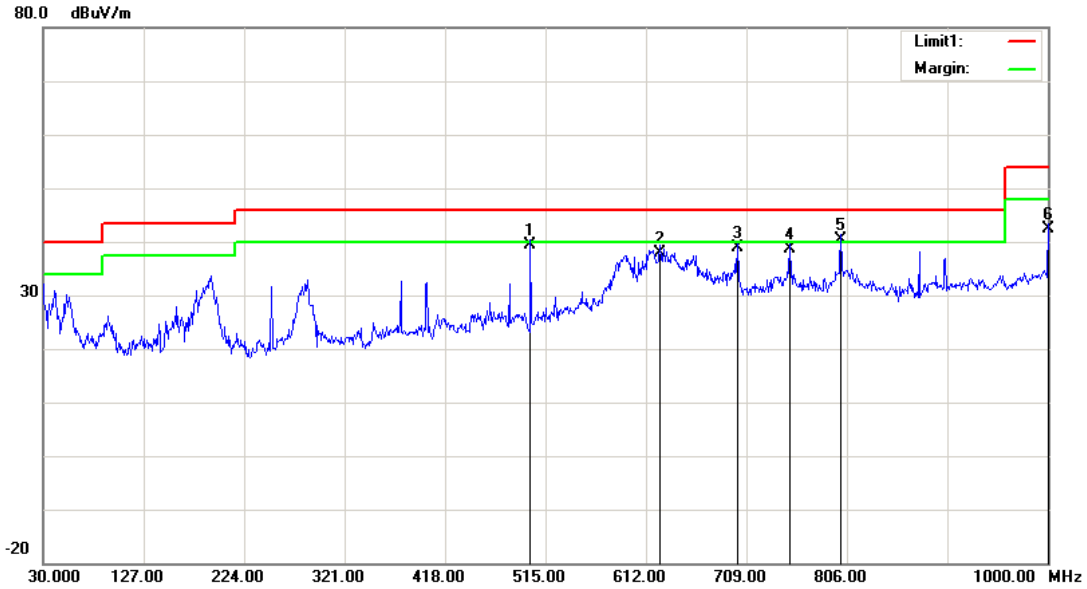
Horizontal

Frequency (MHz)	Reading (dBuV)	Detector	Corrected (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
625.5800	36.98	QP	1.72	38.70	46.00	7.30
750.7100	34.78	QP	3.62	38.40	46.00	7.60
800.1800	34.59	QP	4.61	39.20	46.00	6.80
875.8400	35.98	QP	5.52	41.50	46.00	4.50
901.0600	35.17	QP	6.23	41.40	46.00	4.60
1000.0000	9.70	QP	29.60	39.30	54.00	14.70



Vertical

Frequency (MHz)	Reading (dBuV)	Detector	Corrected (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
500.4500	39.82	QP	-0.32	39.50	46.00	6.50
625.5800	36.18	QP	1.72	37.90	46.00	8.10
700.2700	35.64	QP	3.16	38.80	46.00	7.20
750.7100	34.98	QP	3.62	38.60	46.00	7.40
800.1800	35.69	QP	4.61	40.30	46.00	5.70
1000.0000	12.90	QP	29.60	42.50	54.00	11.50



1GHz -40 GHz:

Frequency (MHz)	Receiver		Rx Antenna		Cable loss (dB)	Amplifier Gain (dB)	Corrected Amplitude (dBμV/m)	Limit (dBμV/m)	Margin (dB)
	Reading (dBμV)	Detector	Polar (H/V)	Factor (dB/m)					
Low Channel									
7290.00	41.43	PK	H	34.06	5.66	27.28	53.87	74.00	20.13
7290.00	35.67	AV	H	34.06	5.66	27.28	48.11	54.00	5.89
7830.00	42.87	PK	H	34.66	5.95	27.02	56.46	74.00	17.54
7830.00	38.28	AV	H	34.66	5.95	27.02	51.87	54.00	2.13
7290.00	40.70	PK	V	34.06	5.66	27.28	53.14	74.00	20.86
7290.00	35.80	AV	V	34.06	5.66	27.28	48.24	54.00	5.76
7830.00	42.19	PK	V	34.66	5.95	27.02	55.78	74.00	18.22
7830.00	37.91	AV	V	34.66	5.95	27.02	51.50	54.00	2.50
Middle Channel									
7290.00	39.30	PK	H	34.06	5.66	27.28	51.74	74.00	22.26
7290.00	34.51	AV	H	34.06	5.66	27.28	46.95	54.00	7.05
7560.00	42.34	PK	H	34.45	5.86	27.24	55.41	74.00	18.59
7560.00	37.10	AV	H	34.45	5.86	27.24	50.17	54.00	3.83
7290.00	41.06	PK	V	34.06	5.66	27.28	53.50	74.00	20.50
7290.00	35.11	AV	V	34.06	5.66	27.28	47.55	54.00	6.45
7560.00	39.41	PK	V	34.45	5.86	27.24	52.48	74.00	21.52
7560.00	32.55	AV	V	34.45	5.86	27.24	45.62	54.00	8.38
High Channel									
7560.00	37.07	PK	H	34.45	5.86	27.24	50.14	74.00	23.86
7560.00	30.42	AV	H	34.45	5.86	27.24	43.49	54.00	10.51
7830.00	43.08	PK	H	34.66	5.95	27.02	56.67	74.00	17.33
7830.00	38.03	AV	H	34.66	5.95	27.02	51.62	54.00	2.38
7560.00	40.34	PK	V	34.45	5.86	27.24	53.41	74.00	20.59
7560.00	34.52	AV	V	34.45	5.86	27.24	47.59	54.00	6.41
7830.00	42.04	PK	V	34.66	5.95	27.02	55.63	74.00	18.37
7830.00	35.18	AV	V	34.66	5.95	27.02	48.77	54.00	5.23

40GHz~200GHz:

Frequency	Receiver		Rx Antenna		Corrected Amplitude	EIPR Power	Power Density	Limit
	Reading	Detector	Polar	Factor				
GHz	dBµV	PK/QP/AV	H/V	dB(1/m)	dBµV/m	dBm	pW/cm^2	pW/cm^2
Low Channel								
47.9	38.26	PK	H	40.33	78.59	-26.11	2.17	90
47.9	37.65	PK	V	40.33	77.98	-26.72	1.88	90
77.55	43.32	PK	H	45.87	89.19	-15.51	24.86	90
77.55	43.16	PK	V	45.87	89.03	-15.67	23.96	90
116.64	45.43	PK	H	53.18	98.61	-12.11	54.4	90
116.64	44.79	PK	V	53.18	97.97	-12.75	46.94	90
Middle Channel								
48.9	38.32	PK	H	40.52	78.84	-25.86	2.29	90
48.9	36.96	PK	V	40.52	77.48	-27.22	1.68	90
120.96	44.91	PK	H	53.98	98.89	-11.83	58.02	90
120.96	45.14	PK	V	53.98	99.12	-11.6	61.17	90
High Channel								
50.12	39.8	PK	H	40.75	80.55	-24.15	3.4	90
50.12	37.68	PK	V	40.75	78.43	-26.27	2.09	90
80.65	46.29	PK	H	46.45	92.74	-11.96	56.31	90
80.65	44.68	PK	V	46.45	91.13	-13.57	38.87	90
125.28	44.28	PK	H	54.79	99.07	-11.65	60.47	90
125.28	44.3	PK	V	54.79	99.09	-11.63	60.75	90

Note 1:

EIRP = E-meas +20log(d-meas)-104.7

where:

EIRP : is the equivalent isotopically radiated power, in dBm

E-meas. : is the field strength of the emission at the measurement distance, in dBµV/m

d-meas. : is the measurement distance, in m

Note 2:The test distance is 1 m. for 40-90GHz, and 0.5m for 90-200GHz

Note 3:Corrected Amplitude = Meter Reading + Antenna Factor

Note 4: The Mixers and it`s RF cables is compose a system for calibration, the conversion factor was added into the test Spectrum Analyzer in testing.

Note 5:

$$PD = \frac{EIRP_{Linear}}{4\pi d^2}$$

where

PD is the power density at the distance specified by the limit, in W/m^2

$EIRP_{Linear}$ is the equivalent isotropically radiated power, in watts

d is the distance at which the power density limit is specified, in m

The Specified distance is 3m.

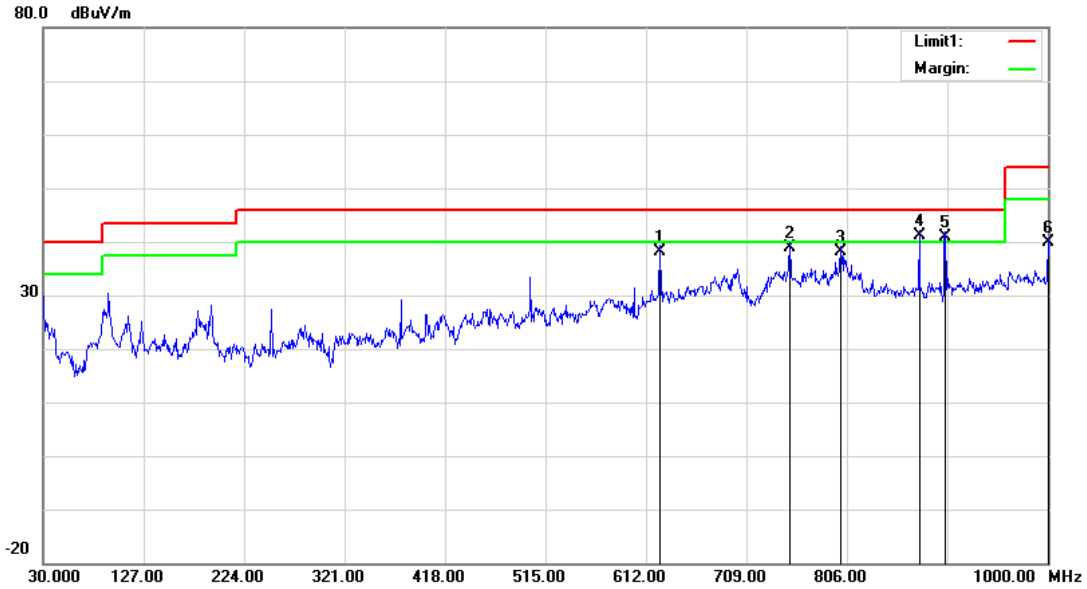
Module 3:

30MHz-1GHz:

Low Channel:

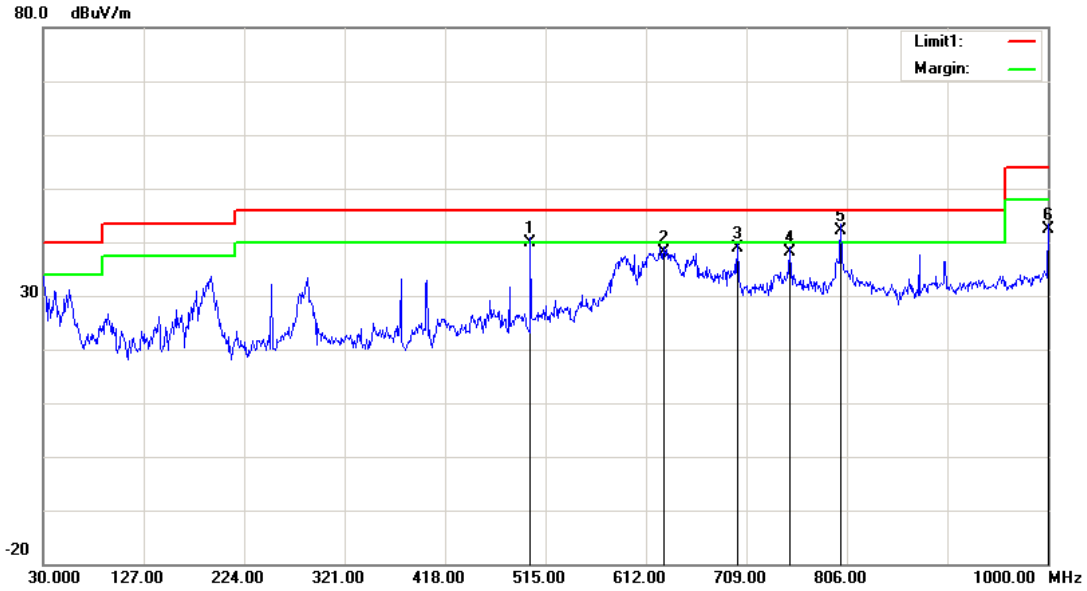
Horizontal

Frequency (MHz)	Reading (dBuV)	Detector	Corrected (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
625.5800	36.48	QP	1.72	38.20	46.00	7.80
750.7100	35.28	QP	3.62	38.90	46.00	7.10
800.1800	33.49	QP	4.61	38.10	46.00	7.90
875.8400	35.58	QP	5.52	41.10	46.00	4.90
901.0600	34.57	QP	6.23	40.80	46.00	5.20
1000.0000	10.20	QP	29.60	39.80	54.00	14.20



Vertical

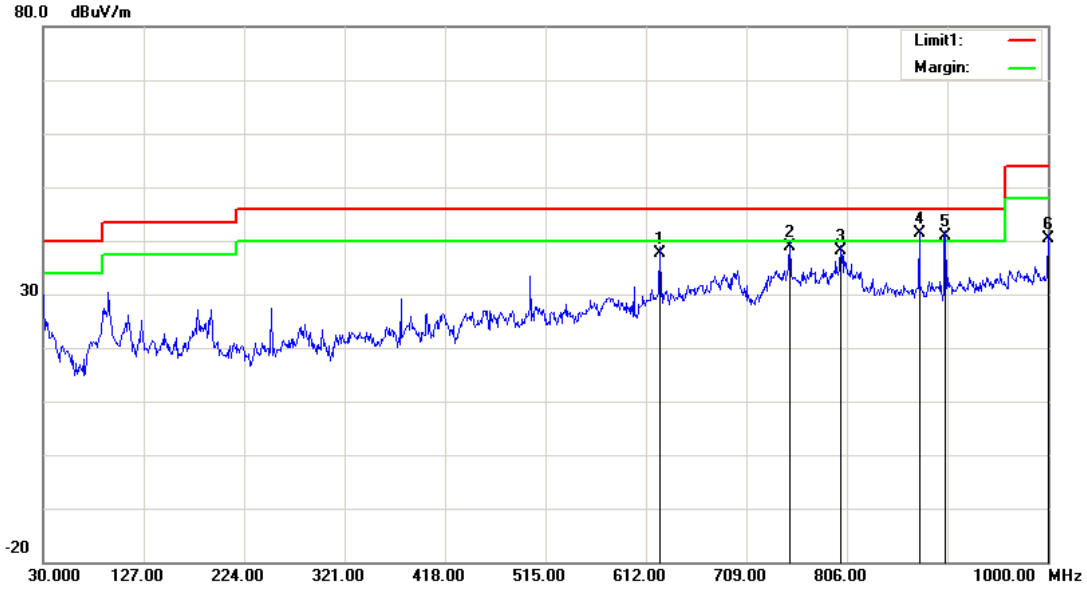
Frequency (MHz)	Reading (dBuV)	Detector	Corrected (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
500.4500	40.12	QP	-0.32	39.80	46.00	6.20
629.4600	36.26	QP	1.94	38.20	46.00	7.80
700.2700	35.64	QP	3.16	38.80	46.00	7.20
750.7100	34.48	QP	3.62	38.10	46.00	7.90
800.1800	37.59	QP	4.61	42.20	46.00	3.80
1000.0000	12.90	QP	29.60	42.50	54.00	11.50



Middle Channel:

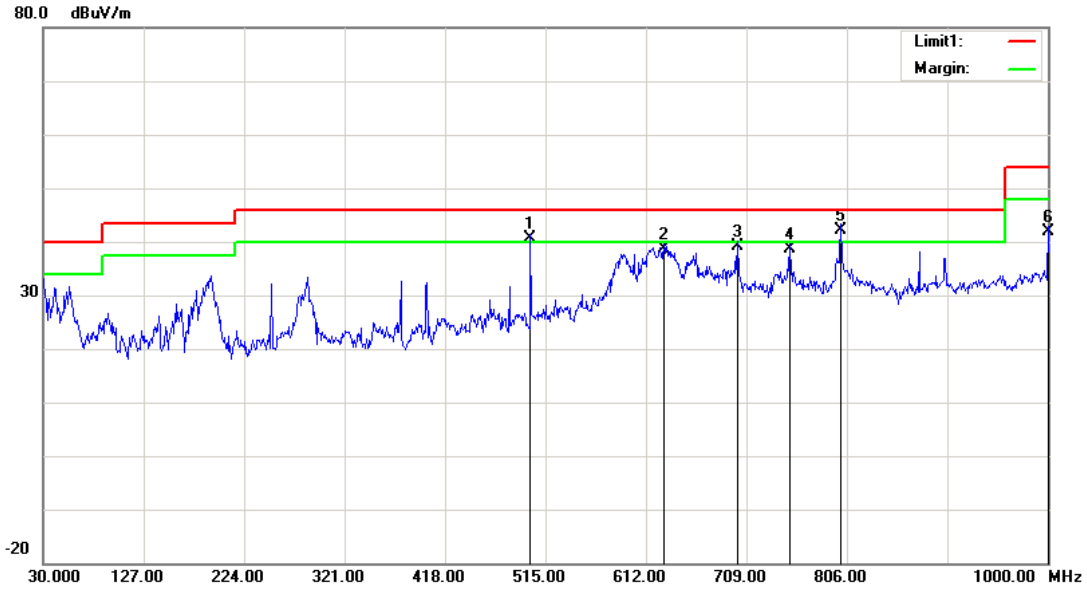
Horizontal

Frequency (MHz)	Reading (dBuV)	Detector	Corrected (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
625.5800	35.98	QP	1.72	37.70	46.00	8.30
750.7100	35.18	QP	3.62	38.80	46.00	7.20
800.1800	33.49	QP	4.61	38.10	46.00	7.90
875.8400	35.78	QP	5.52	41.30	46.00	4.70
901.0600	34.67	QP	6.23	40.90	46.00	5.10
1000.0000	10.70	QP	29.60	40.30	54.00	13.70



Vertical

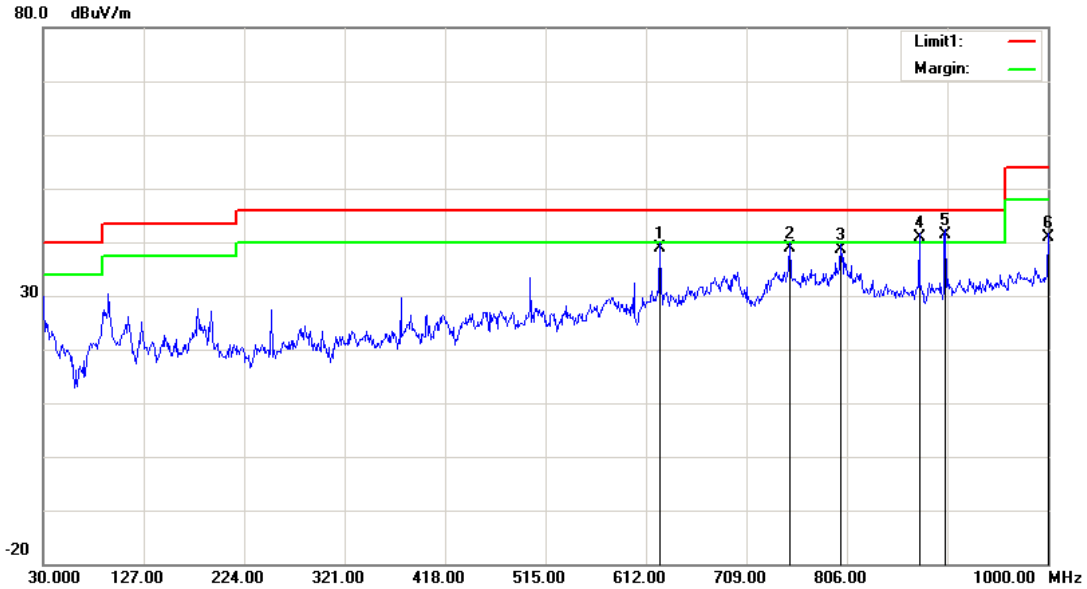
Frequency (MHz)	Reading (dBuV)	Detector	Corrected (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
500.4500	40.92	QP	-0.32	40.60	46.00	5.40
629.4600	36.76	QP	1.94	38.70	46.00	7.30
700.2700	35.94	QP	3.16	39.10	46.00	6.90
750.7100	34.98	QP	3.62	38.60	46.00	7.40
800.1800	37.49	QP	4.61	42.10	46.00	3.90
1000.0000	12.40	QP	29.60	42.00	54.00	12.00



High Channel:

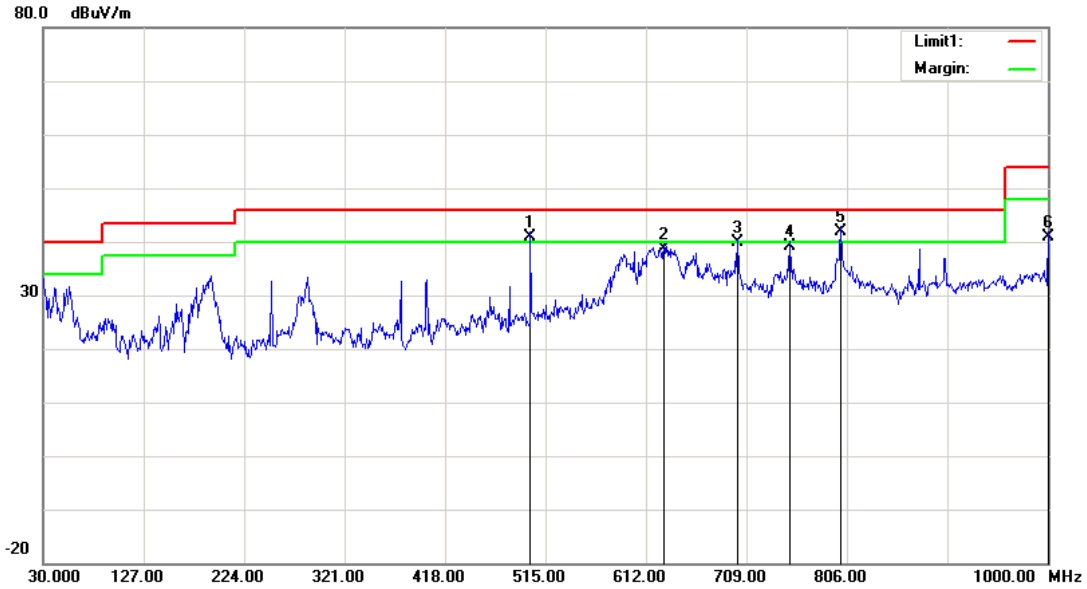
Horizontal

Frequency (MHz)	Reading (dBuV)	Detector	Corrected (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
625.5800	37.18	QP	1.72	38.90	46.00	7.10
750.7100	35.28	QP	3.62	38.90	46.00	7.10
800.1800	34.09	QP	4.61	38.70	46.00	7.30
875.8400	35.28	QP	5.52	40.80	46.00	5.20
901.0600	35.07	QP	6.23	41.30	46.00	4.70
1000.0000	11.20	QP	29.60	40.80	54.00	13.20



Vertical

Frequency (MHz)	Reading (dBuV)	Detector	Corrected (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
500.4500	41.12	QP	-0.32	40.80	46.00	5.20
629.4600	36.76	QP	1.94	38.70	46.00	7.30
700.2700	36.64	QP	3.16	39.80	46.00	6.20
750.7100	35.48	QP	3.62	39.10	46.00	6.90
800.1800	37.19	QP	4.61	41.80	46.00	4.20
1000.0000	11.40	QP	29.60	41.00	54.00	13.00



1GHz -40 GHz:

Frequency (MHz)	Receiver		Rx Antenna		Cable loss (dB)	Amplifier Gain (dB)	Corrected Amplitude (dBμV/m)	Limit (dBμV/m)	Margin (dB)
	Reading (dBμV)	Detector	Polar (H/V)	Factor (dB/m)					
Low Channel									
7290.00	41.21	PK	H	34.06	5.66	27.28	53.65	74.00	20.35
7290.00	35.81	AV	H	34.06	5.66	27.28	48.25	54.00	5.75
7830.00	43.17	PK	H	34.66	5.95	27.02	56.76	74.00	17.24
7830.00	38.28	AV	H	34.66	5.95	27.02	51.87	54.00	2.13
7290.00	40.88	PK	V	34.06	5.66	27.28	53.32	74.00	20.68
7290.00	35.97	AV	V	34.06	5.66	27.28	48.41	54.00	5.59
7830.00	42.49	PK	V	34.66	5.95	27.02	56.08	74.00	17.92
7830.00	37.82	AV	V	34.66	5.95	27.02	51.41	54.00	2.59
Middle Channel									
7290.00	39.15	PK	H	34.06	5.66	27.28	51.59	74.00	22.41
7290.00	34.60	AV	H	34.06	5.66	27.28	47.04	54.00	6.96
7560.00	42.43	PK	H	34.45	5.86	27.24	55.50	74.00	18.50
7560.00	37.21	AV	H	34.45	5.86	27.24	50.28	54.00	3.72
7290.00	41.12	PK	V	34.06	5.66	27.28	53.56	74.00	20.44
7290.00	35.28	AV	V	34.06	5.66	27.28	47.72	54.00	6.28
7560.00	39.55	PK	V	34.45	5.86	27.24	52.62	74.00	21.38
7560.00	32.63	AV	V	34.45	5.86	27.24	45.70	54.00	8.30
High Channel									
7560.00	36.97	PK	H	34.45	5.86	27.24	50.04	74.00	23.96
7560.00	30.40	AV	H	34.45	5.86	27.24	43.47	54.00	10.53
7830.00	43.06	PK	H	34.66	5.95	27.02	56.65	74.00	17.35
7830.00	38.06	AV	H	34.66	5.95	27.02	51.65	54.00	2.35
7560.00	40.21	PK	V	34.45	5.86	27.24	53.28	74.00	20.72
7560.00	34.29	AV	V	34.45	5.86	27.24	47.36	54.00	6.64
7830.00	41.91	PK	V	34.66	5.95	27.02	55.50	74.00	18.50
7830.00	35.41	AV	V	34.66	5.95	27.02	49.00	54.00	5.00

40GHz~200GHz:

Frequency	Receiver		Rx Antenna		Corrected Amplitude	EIPR Power	Power Density	Limit
	Reading	Detector	Polar	Factor				
GHz	dBµV	PK/QP/AV	H/V	dB(1/m)	dBµV/m	dBm	pW/cm^2	pW/cm^2
Test Frequency:58320 MHz								
47.9	38.45	PK	H	40.33	78.78	-25.92	2.26	90
47.9	37.26	PK	V	40.33	77.59	-27.11	1.72	90
77.55	43.15	PK	H	45.87	89.02	-15.68	23.91	90
77.55	43.06	PK	V	45.87	88.93	-15.77	23.42	90
116.64	45.52	PK	H	53.18	98.7	-12.02	55.53	90
116.64	44.99	PK	V	53.18	98.17	-12.55	49.15	90
Test Frequency:60480MHz								
48.9	38.54	PK	H	40.52	79.06	-25.64	2.41	90
48.9	37.49	PK	V	40.52	78.01	-26.69	1.89	90
120.96	44.91	PK	H	53.98	98.89	-11.83	58.02	90
120.96	45.03	PK	V	53.98	99.01	-11.71	59.64	90
Test Frequency:62640MHz								
50.12	39.58	PK	H	40.75	80.33	-24.37	3.23	90
50.12	38.04	PK	V	40.75	78.79	-25.91	2.27	90
80.65	45.72	PK	H	46.45	92.17	-12.53	49.38	90
80.65	44.65	PK	V	46.45	91.1	-13.6	38.6	90
125.28	43.94	PK	H	54.79	98.73	-11.99	55.92	90
125.28	44.46	PK	V	54.79	99.25	-11.47	63.03	90

Note 1:

EIRP = E-meas +20log(d-meas)-104.7

where:

EIRP : is the equivalent isotopically radiated power, in dBm

E-meas. : is the field strength of the emission at the measurement distance, in dBµV/m

d-meas. : is the measurement distance, in m

Note 2:The test distance is 1 m. for 40-90GHz, and 0.5m for 90-200GHz

Note 3:Corrected Amplitude = Meter Reading + Antenna Factor

Note 4: The Mixers and it`s RF cables is compose a system for calibration, the conversion factor was added into the test Spectrum Analyzer in testing.

Note 5:

$$PD = \frac{EIRP_{Linear}}{4\pi d^2}$$

where

PD is the power density at the distance specified by the limit, in W/m^2

$EIRP_{Linear}$ is the equivalent isotropically radiated power, in watts

d is the distance at which the power density limit is specified, in m

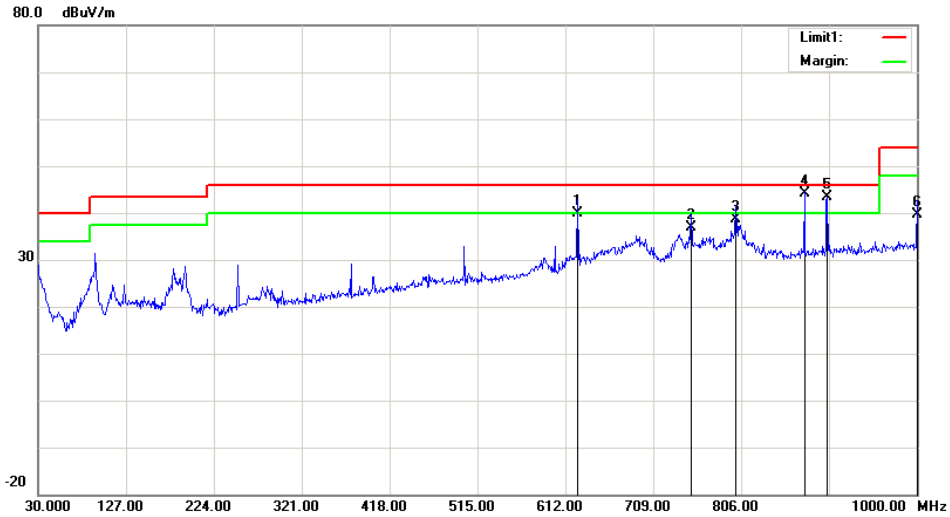
The Specified distance is 3m.

Worst Mode: *Module 1ANT 1 58320MHz+ Module 2 60480MHz + module 3 62640MHz transmit simultaneously*

30MHz-1GHz

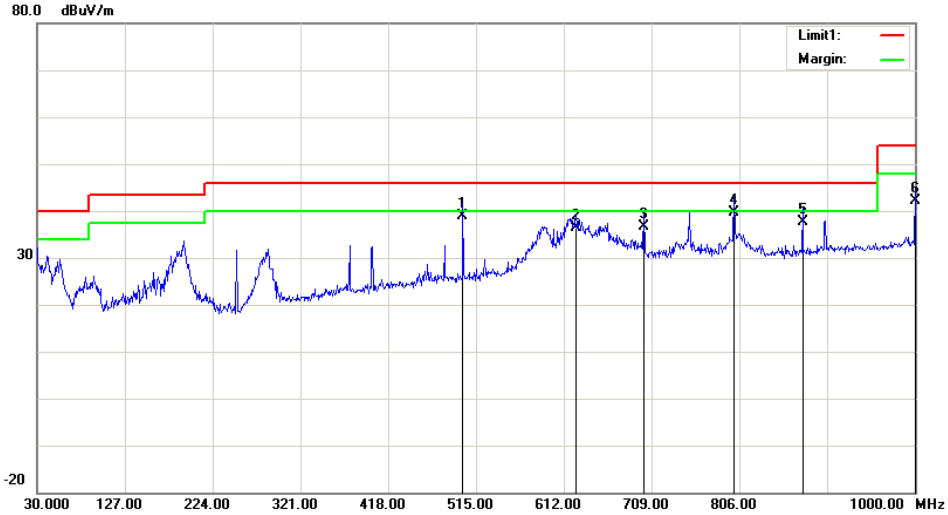
Horizontal

Frequency (MHz)	Reading (dBuV)	Detector	Corrected (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
625.5800	38.08	QP	1.72	39.80	46.00	6.20
750.7100	33.18	QP	3.62	36.80	46.00	9.20
800.1800	33.99	QP	4.61	38.60	46.00	7.40
875.8400	38.68	QP	5.52	44.20	46.00	1.80
901.0600	37.17	QP	6.23	43.40	46.00	2.60
1000.0000	10.10	QP	29.60	39.70	54.00	14.30



Vertical

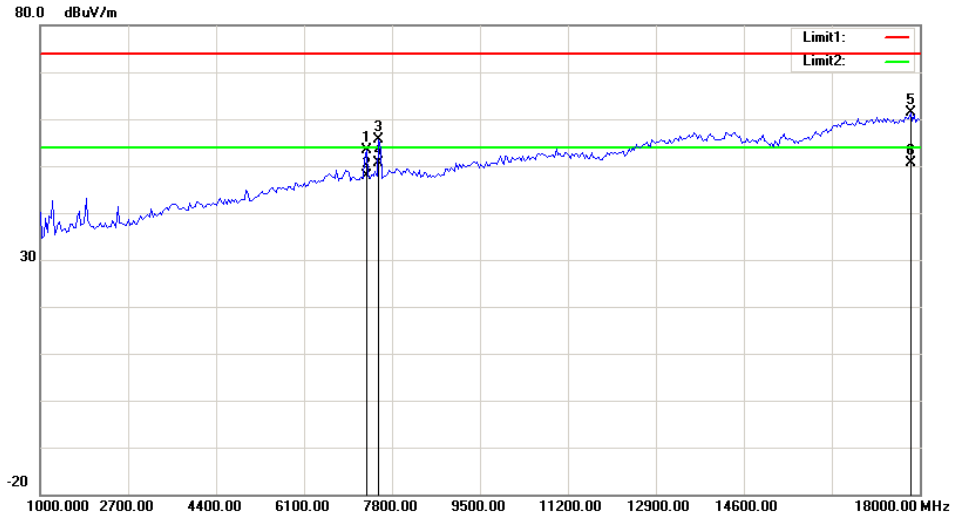
Frequency (MHz)	Reading (dBuV)	Detector	Corrected (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
500.4500	39.22	QP	-0.32	38.90	46.00	7.10
625.5800	34.58	QP	1.72	36.30	46.00	9.70
700.2700	33.54	QP	3.16	36.70	46.00	9.30
800.1800	35.09	QP	4.61	39.70	46.00	6.30
875.8400	32.18	QP	5.52	37.70	46.00	8.30
1000.0000	12.50	QP	29.60	42.10	54.00	11.90

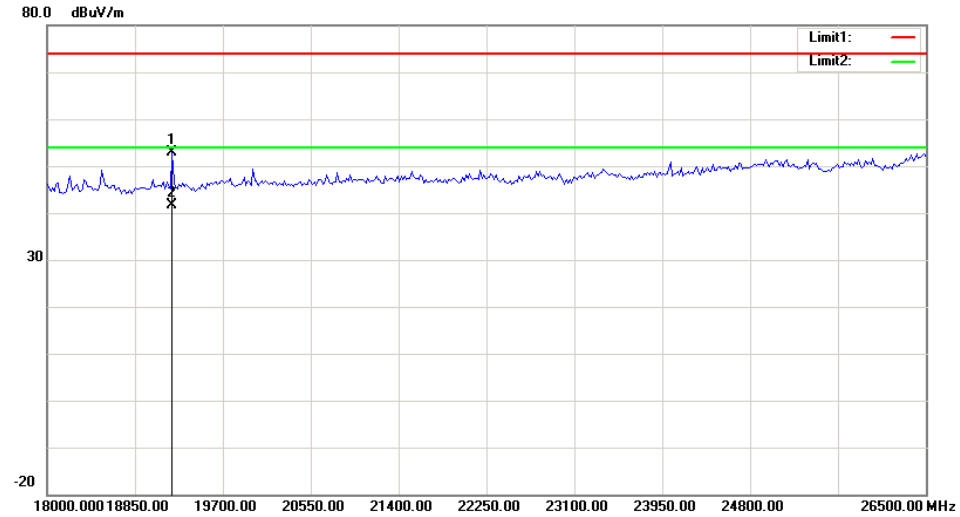


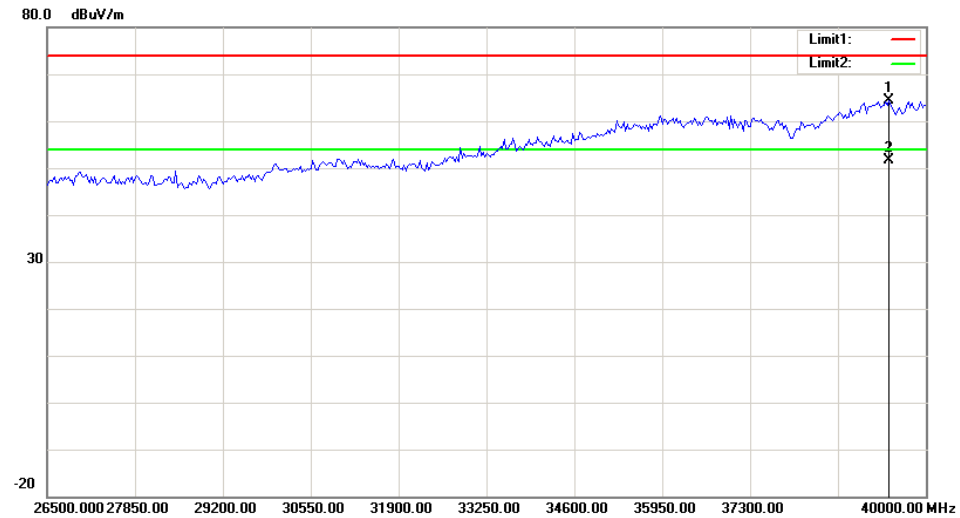
1GHz -40 GHz:

Frequency (MHz)	Receiver		Rx Antenna		Cable loss (dB)	Amplifier Gain (dB)	Corrected Amplitude (dBµV/m)	Limit (dBµV/m)	Margin (dB)
	Reading (dBµV)	Detector	Polar (H/V)	Factor (dB/m)					
7290.00	40.86	PK	H	34.06	5.66	27.28	53.30	74.00	20.70
7290.00	35.40	AV	H	34.06	5.66	27.28	47.84	54.00	6.16
7560.00	42.68	PK	H	34.45	5.86	27.24	55.75	74.00	18.25
7560.00	37.71	AV	H	34.45	5.86	27.24	50.78	54.00	3.22
17829.659	33.64	PK	H	43.12	9.13	24.58	61.31	74.00	12.69
17829.659	23.00	AV	H	43.12	9.13	24.58	50.67	54.00	3.33
19209.419	47.80	PK	H	33.42	9.63	38.08	52.77	74.00	21.23
19209.419	36.66	AV	H	33.42	9.63	38.08	41.63	54.00	12.37
39433.00	48.38	PK	H	39.67	13.49	37.43	64.11	74.00	9.89
39433.00	35.84	AV	H	39.67	13.49	37.43	51.57	54.00	2.43
7290.00	41.69	PK	V	34.06	5.66	27.28	54.13	74.00	19.87
7290.00	37.34	AV	V	34.06	5.66	27.28	49.78	54.00	4.22
7560.00	42.83	PK	V	34.45	5.86	27.24	55.90	74.00	18.10
7560.00	36	AV	V	34.45	5.86	27.24	49.07	54.00	4.93
17829.659	32.93	PK	V	43.12	9.13	24.58	60.60	74.00	13.40
17829.659	23.13	AV	V	43.12	9.13	24.58	50.80	54.00	3.20
19209.419	47.04	PK	V	33.42	9.63	38.08	52.01	74.00	21.99
19209.419	36.31	AV	V	33.42	9.63	38.08	41.28	54.00	12.72
39244	50.41	PK	V	39.63	13.50	37.24	66.30	74.00	7.70
39244	36.19	AV	V	39.63	13.50	37.24	52.08	54.00	1.92

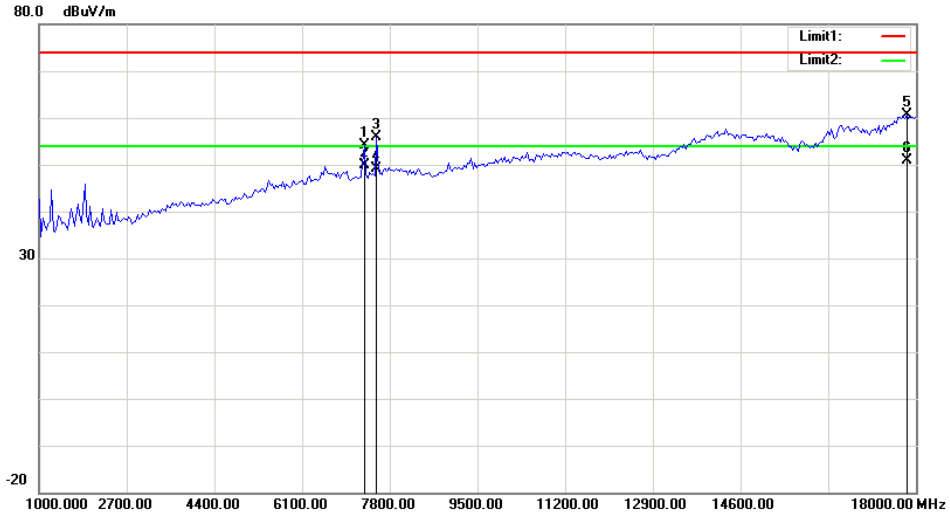
Horizontal

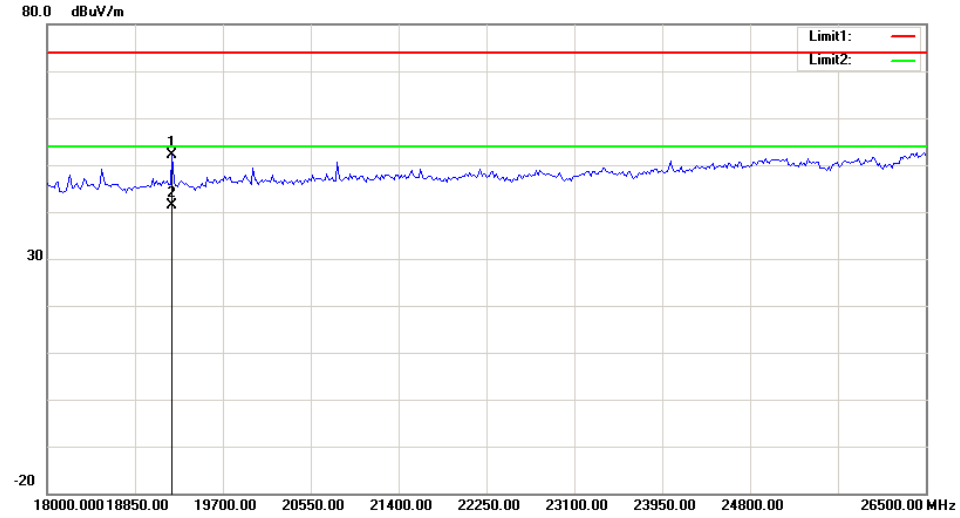

80.0 dBuV/m
Limit1:
Limit2:
1
3
5
6
30
-20
1000.000 2700.00 4400.00 6100.00 7800.00 9500.00 11200.00 12900.00 14600.00 18000.00 MHz

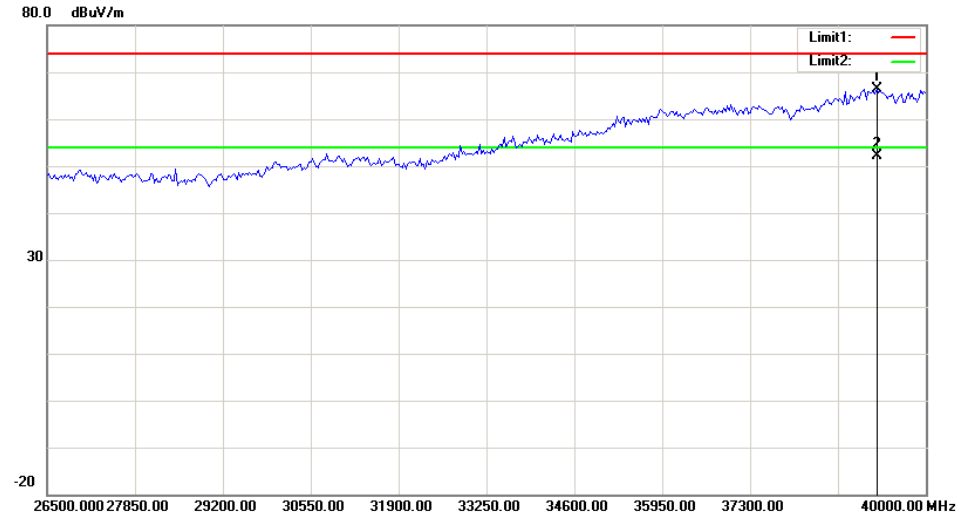

80.0 dBuV/m
Limit1:
Limit2:
1
30
-20
18000.000 18850.00 19700.00 20550.00 21400.00 22250.00 23100.00 23950.00 24800.00 26500.00 MHz


80.0 dBuV/m
Limit1:
Limit2:
1
2
30
-20
26500.000 27850.00 29200.00 30550.00 31900.00 33250.00 34600.00 35950.00 37300.00 40000.00 MHz

Vertical


80.0 dBuV/m
Limit1:
Limit2:
30
-20
1000.000 2700.00 4400.00 6100.00 7800.00 9500.00 11200.00 12900.00 14600.00 18000.00 MHz


80.0 dBuV/m
Limit1:
Limit2:
30
-20
18000.000 18850.00 19700.00 20550.00 21400.00 22250.00 23100.00 23950.00 24800.00 26500.00 MHz


80.0 dBuV/m
Limit1:
Limit2:
30
-20
26500.000 27850.00 29200.00 30550.00 31900.00 33250.00 34600.00 35950.00 37300.00 40000.00 MHz

40GHz~200GHz:

Frequency	Receiver		Rx Antenna		Corrected Amplitude	EIPR Power	Power Density	Limit
	Reading	Detector	Polar	Factor				
GHz	dBµV	PK/QP/AV	H/V	dB(1/m)	dBµV/m	dBm	pW/cm^2	pW/cm^2
Module 1 ANT 1 58320MHz+ Module 2 60480MHz + module 3 62640MHz transmit simultaneously was the worst								
47.9	38.32	PK	H	40.33	78.65	-26.05	2.2	90
47.9	37.5	PK	V	40.33	77.83	-26.87	1.82	90
77.55	43.45	PK	H	45.87	89.32	-15.38	25.62	90
77.55	43.18	PK	V	45.87	89.05	-15.65	24.07	90
116.64	45.27	PK	H	53.18	98.45	-12.27	52.43	90
116.64	45.14	PK	V	53.18	98.32	-12.4	50.88	90
48.9	38.59	PK	H	40.52	79.11	-25.59	2.44	90
48.9	37.05	PK	V	40.52	77.57	-27.13	1.71	90
120.96	45.1	PK	H	53.98	99.08	-11.64	60.61	90
120.96	45.01	PK	V	53.98	98.99	-11.73	59.37	90
50.12	39.61	PK	H	40.75	80.36	-24.34	3.26	90
50.12	37.77	PK	V	40.75	78.52	-26.18	2.13	90
80.65	46.31	PK	H	46.45	92.76	-11.94	56.57	90
80.65	44.81	PK	V	46.45	91.26	-13.44	40.05	90
125.28	44.32	PK	H	54.79	99.11	-11.61	61.03	90
125.28	44.07	PK	V	54.79	98.86	-11.86	57.62	90

Note 1:

EIRP = E-meas +20log(d-meas)-104.7

where:

EIRP : is the equivalent isotopically radiated power, in dBm

E-meas. : is the field strength of the emission at the measurement distance, in dBµV/m

d-meas. : is the measurement distance, in m

Note 2:The test distance is 1 m. for 40-90GHz, and 0.5m for 90-200GHz

Note 3:Corrected Amplitude = Meter Reading + Antenna Factor

Note 4: The Mixers and it`s RF cables is compose a system for calibration, the conversion factor was added into the test Spectrum Analyzer in testing.

Note 5:

$$PD = \frac{EIRP_{Linear}}{4\pi d^2}$$

where

PD	is the power density at the distance specified by the limit, in W/m^2
$EIRP_{Linear}$	is the equivalent isotropically radiated power, in watts
d	is the distance at which the power density limit is specified, in m

The Specified distance is 3m.

FCC§15.255(f) - FREQUENCY STABILITY

Applicable Standard

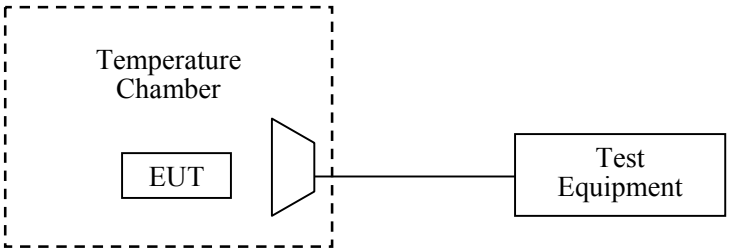
Fundamental emissions must be contained within the frequency bands specified in this section during all conditions of operation. Equipment is presumed to operate over the temperature range −20 to +50 degrees Celsius with an input voltage variation of 85% to 115% of rated input voltage, unless justification is presented to demonstrate otherwise.

Test Procedure

Frequency Stability vs. Temperature: The adapter of the equipment under test was connected to an AC power source. The EUT was placed inside the temperature chamber. Place the Horn antenna outside the temperature chamber. Place the EUT antenna toward the Horn antenna.

After the temperature stabilized for approximately 20 minutes, the frequency output was recorded from the communication test set.

Frequency Stability vs. Voltage: An external variable AC power supply was connected to the equipment under test. The voltage was set from 85% to 115% of the nominal value. The output frequency was recorded for each voltage.



Environmental Conditions

Temperature:	27.6 °C
Relative Humidity:	60 %
ATM Pressure:	100.4 kPa

The testing was performed by Blake Yang on 2018-04-24.

Test Mode: Transmitting(test performed at ANT 0 transmitting)

Test Data

Please refer to the following table:

Temperature	Voltage	Frequency (MHz)			
℃	V_{AC}	f_L at Low Channel	f_H at High Channel	f_L Limit	f_H Limit
-20	120	57402	63559	57000	71000
-10	120	57401	63558	57000	71000
0	120	57399	63557	57000	71000
10	120	57399	63555	57000	71000
20	120	57400	63558	57000	71000
30	120	57401	63557	57000	71000
40	120	57402	63557	57000	71000
50	120	57401	63558	57000	71000
25	102	57403	63559	57000	71000
25	138	57398	63560	57000	71000

§15.255(a) (h)– OPERATION RESTRICTION AND GROUP INSTALLTION

Applicable Standard

§15.255 (a) Operation under the provisions of this section is not permitted for the following products:
(1) Equipment used on aircraft or satellites.
(2) Field disturbance sensors, including vehicle radar systems, unless the field disturbance sensors are employed for fixed operation. For the purposes of this section, the reference to fixed operation includes field disturbance sensors installed in fixed equipment, even if the sensor itself moves within the equipment.

§15.255 (h) Any transmitter that has received the necessary FCC equipment authorization under the rules of this chapter may be mounted in a group installation for simultaneous operation with one or more other transmitter(s) that have received the necessary FCC equipment authorization, without any additional equipment authorization. However, no transmitter operating under the provisions of this section may be equipped with external phase-locking inputs that permit beam-forming arrays to be realized.

Result of Operation Restriction

The Manufacturer declared that the EUT will not be advertised or sold for use on aircraft or satellites. The user manual includes a statement that cautions users that it is not permitted to use the product on aircraft or satellites.

Result of Group installation

The frequency, amplitude and phase of the transmit sign al are set within the EUT. There are no external phase-locking inputs or any other means of combining two or more units together to realize a beam-forming array

******* END OF REPORT *******