FCC/ISED RF TEST REPORT

ISSUED BY
Shenzhen BALUN Technology Co., Ltd.

FOR

Gateway Ultra client

ISSUED TO
Balboa Water Group

3030 Airway Avenue, Suite B, Costa Mesa, CA 92626

Report No.:	BL-HK1960533-602
EUT Name:	Gateway Ultra client
Model Name:	59303-C
Brand Name:	N/A
Test Standard:	47 CFR Part 15 Subpart C RSS-Gen (Issue 5, March 2019) RSS-247 (Issue 2, February 2017)
FCC ID:	2ATMV-59303-C
ISED Number:	25220-59303C
Test Conclusion:	Pass
Test Date:	Jul. 04, 2019 ~ Sep. 26, 2019
Date of Issue:	Oct. 16, 2019

Tested by: Heng Aiping
(Engineer)
Date Oct. 16, 2019

Approved by: Wei Yanquan
(Chief Engineer)
Date Oct. 16, 2019

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Revision History

Version	Issue Date	Revisions Content
Rev. 01	Oct. 08, 2019	Initial Issue
Rev. 02	Oct. 16, 2019	Update the RSS-Gen standard Correct the Clause number of RSS 247 Update the dwell time data on page 37 New pseudo-random hopping sequence on page 19

TABLE OF CONTENTS

1 ADMINISTRATIVE DATA (GENERAL INFORMATION)

1.1 Identification of the Testing Laboratory

Company Name	Shenzhen BALUN Technology Co., Ltd.
Address	Block B, 1st FL, Baisha Science and Technology Park, Shahe Xi Road, Nanshan District, Shenzhen, Guangdong Province, P. R. China
Phone Number	+86 755 6685 0100
Fax Number	+86 755 6182 4271

1.2 Identification of the Responsible Testing Location

Test Location	Shenzhen BALUN Technology Co., Ltd.
Address	Block B, 1st FL, Baisha Science and Technology Park, Shahe Xi Road, Nanshan District, Shenzhen, Guangdong Province, P. R. China
Accreditation Certificate	The laboratory has been listed by Industry Canada to perform electromagnetic emission measurements. The recognition numbers of test site are 11524A-1. The laboratory is a testing organization accredited by FCC as a accredited testing laboratory. The designation number is CN1196. The laboratory is a testing organization accredited by American Association for Laboratory Accreditation (A2LA) according to ISO/IEC 17025.The accreditation certificate is 4344.01. The laboratory is a testing organization accredited by China National Accreditation Service for Conformity Assessment (CNAS) according to ISO/IEC 17025. The accreditation certificate number is L6791.
Description	All measurement facilities used to collect the measurement data are located at Block B, FL 1, Baisha Science and Technology Park, Shahe Xi Road, Nanshan District, Shenzhen, Guangdong Province, P. R. China 518055

1.3 Laboratory Condition

Ambient Temperature	20℃ to 25℃
Ambient Relative Humidity	45% to 55%
Ambient Pressure	100 kPa to 102 kPa

1.4 Announce

(1) The test report reference to the report template version v2.2.

(2) The test report is invalid if not marked with the signatures of the persons responsible for preparing and approving the test report.

(3) The test report is invalid if there is any evidence and/or falsification.

(4) The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein.

(5) This document may not be altered or revised in any way unless done so by BALUN and all revisions are duly noted in the revisions section.

(6) Content of the test report, in part or in full, cannot be used for publicity and/or promotional purposes without

prior written approval from the laboratory.

2 PRODUCT INFORMATION

2.1 Applicant Information

Applicant	Balboa Water Group
Address	3030 Airway Avenue, Suite B, Costa Mesa, CA 92626

2.2 Manufacturer Information

Manufacturer	Balboa Water Group
Address	3030 Airway Avenue, Suite B, Costa Mesa, CA 92626

2.3 Factory Information

Factory	Balboa Water Group
Address	Aguila Azteca 6011, Baja Maq., El Aguila, Mexico 22221

2.4 General Description for Equipment under Test (EUT)

EUT Name	Gateway Ultra client
Model Name Under Test	59303-C
Series Model Name	N/A
Description of Model name differentiation	N/A
Hardware Version	2.7
Software Version	V0.9
Dimensions (Approx.)	N/A
Weight (Approx.)	N/A

2.5 Technical Information

Network and Wireless connectivity	Bluetooth 5.0 BLE RFID

The requirement for the following technical information of the EUT was tested in this report:

Modulation Technology	Frequency hopping system, Hybrid system
Modulation Type	RFID
Product Type	☐ Mobile ☐ Portable ☒ Fix Location
Frequency Range	The frequency range used is 902 MHz to 928 MHz.
Number of channel	100
Tested Channel	1 (902.75 MHz), 50 (915.00 MHz), 100 (927.50 MHz)
Antenna Type	Helical Antenna
Antenna Gain	0 dBi (In test items related to antenna gain, the final results reflect this figure.)
Antenna System(MIMO Smart Antenna)	N/A

All channel was listed on the following table:

Channel number	Freq. (MHz)	Channel number	Freq. (MHz)	Channel number	Freq. (MHz)	Channel number	Freq. (MHz)
1	902.75	26	909	51	915.25	76	921.5
2	903	27	909.25	52	915.5	77	921.75
3	903.25	28	909.5	53	915.75	78	922
4	903.5	29	909.75	54	916	79	922.25
5	903.75	30	910	55	916.25	80	922.5
6	904	31	910.25	56	916.5	81	922.75
7	904.25	32	910.5	57	916.75	82	923
8	904.5	33	910.75	58	917	83	923.25
9	904.75	34	911	59	917.25	84	923.5
10	905	35	911.25	60	917.5	85	923.75
11	905.25	36	911.5	61	917.75	86	924
12	905.5	37	911.75	62	918	87	924.25
13	905.75	38	912	63	918.25	88	924.5
14	906	39	912.25	64	918.5	89	924.75
15	906.25	40	912.5	65	918.75	90	925
16	906.5	41	912.75	66	919	91	925.25
17	906.75	42	913	67	919.25	92	925.5
18	907	43	913.25	68	919.5	93	925.75
19	907.25	44	913.5	69	919.75	94	926
20	907.5	45	913.75	70	920	95	926.25
21	907.75	46	914	71	920.25	96	926.5
22	908	47	914.25	72	920.5	97	926.75
23	908.25	48	914.5	73	920.75	98	927
24	908.5	49	914.75	74	921	99	927.25
25	908.75	50	915	75	921.25	100	927.5

2.6 Additional Instructions

EUT Software Settings:

Mode	☒ Special software is used. The software provided by client to enable the EUT under transmission condition continuously at specific channel frequencies individually.

Power level setup in software		
Test Software Version	Custom buttons for customers	
Mode	Channel	Soft Set
RFID	ALL	N/A

3 SUMMARY OF TEST RESULTS

3.1 Test Standards

No.	Identity	Document Title
1	47 CFR Part 15, Subpart C	Miscellaneous Wireless Communications Services
2	FCC PUBLIC NOTICE DA 00-705 (Mar. 30, 2000)	Filling and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems
3	RSS-Gen (Issue 5, Mar. 2019)	General Requirements for Compliance of Radio Apparatus
4	RSS-247 (Issue 2, February 2017)	Digital Transmission Systems (DTSs), Frequency Hopping Systems(FHSs) and Licence-Exemp Local Area Network (LE-LAN) Devices
5	ANSI C63.10-2013	American National Standard for Testing Unlicensed Wireless Devices
6	KDB Publication 558074 D01v05r02	GUIDANCE FOR COMPLIANCE MEASUREMENTS ON DIGITAL TRANSMISSION SYSTEM, FREQUENCY HOPPING SPREAD SPECTRUM SYSTEM, AND HYBRID SYSTEM DEVICES OPERATING UNDER SECTION 15.247 OF THE FCC RULES

3.2 Verdict

No.	Description	FCC Part No.	Modulation Technology	Channel	Test Result	Verdict	Remark
1	Antenna Requirement	15.203	N/A	N/A	--	Pass	Note [1]
2	Number of Hopping Frequencies	15.247(a)	Frequency hopping system	Hopping Mode	ANNEX A.1	Pass	--
3	Peak Output Power	15.247(b)	Frequency hopping system, Hybrid system	Low/Middle/ High	ANNEX A.2	Pass	--
4	Occupied Bandwidth	15.247(a)	Frequency hopping system, Hybrid system	Low/Middle/ High	ANNEX A.3	Pass	--
5	Carrier Frequency Separation	15.247(a)	Frequency hopping system, Hybrid system	Hopping Mode	ANNEX A.4	Pass	--
6	Time of Occupancy (Dwell time)	15.247(a)	Frequency hopping system, Hybrid system	Hopping Mode	ANNEX A.5	Pass	--

7	Conducted Spurious Emission & Authorized-band band-edge	15.247(d)	Frequency hopping system, Hybrid system	Low/Middle/ High, Hopping Mode	ANNEX A.6	Pass	--
8	Conducted Emission	15.207	Frequency hopping system, Hybrid system	Low/Middle/ High	ANNEX A.7	Pass	--
9	Radiated Spurious Emission	15.209 15.247(d)	Frequency hopping system, Hybrid system	Low/Middle/ High, Hopping Mode	ANNEX A.8	Pass	--
10	Band Edge(Restricted-b and band-edge)	15.209 15.247(d)	Frequency hopping system, Hybrid system	Low/Middle/ High, Hopping Mode	ANNEX A.9	Pass	--
Note [1]: Please refer to section 5.1							

4 GENERAL TEST CONFIGURATIONS

4.1 Test Environments

During the measurement, the normal environmental conditions were within the listed ranges:

Relative Humidity	45% to 55%	
Atmospheric Pressure	100 kPa to 102 kPa	
Temperature	NT (Normal Temperature)	+22℃ to +25℃
Working Voltage of the EUT	NV (Normal Voltage)	18 V

4.2 Test Equipment List

Description	Manufacturer	Model	Serial No.	Cal. Date	Cal. Due
Spectrum Analyzer	ROHDE&SCHWARZ	FSV-30	103118	2019.06.13	2020.06.12
Vector Signal Generator	ROHDE&SCHWARZ	SMBV100A	260592	2019.06.13	2020.06.12
Signal Generator	ROHDE&SCHWARZ	SMB100A	177746	2019.08.23	2020.08.22
Switch Unit with OSP-B157	ROHDE&SCHWARZ	OSP120	101270	2019.06.13	2020.06.12
Spectrum Analyzer	AGILENT	E4440A	MY45304434	2018.11.08	2019.11.07
EMI Receiver	ROHDE&SCHWARZ	ESRP	101036	2019.06.13	2020.06.12
LISN	SCHWARZBECK	NSLK 8127	8127-687	2019.06.13	2020.06.12
Bluetooth Tester	ROHDE&SCHWARZ	CBT	101005	2019.06.13	2020.06.12
Power Splitter	KMW	DCPD-LDC	1305003215	--	--
Power Sensor	ROHDE&SCHWARZ	NRP-Z21	103971	2019.06.13	2020.06.12
Attenuator (20 dB)	KMW	ZA-S1-201	110617091	--	--
Attenuator (6 dB)	KMW	ZA-S1-61	1305003189	--	--
DC Power Supply	ROHDE&SCHWARZ	HMP2020	018141664	2019.06.13	2020.06.12
Temperature Chamber	ANGELANTIONI SCIENCE	NTH64-40A	1310	2019.07.02	2020.07.01
Test Antenna-Loop(9 kHz-30 MHz)	SCHWARZBECK	FMZB 1519	1519-037	2017.11.07	2019.11.08
Test Antenna-Bi-Log(30 MHz-3 GHz)	SCHWARZBECK	VULB 9163	9163-624	2018.08.22	2020.08.21
Test Antenna-Horn(1-18 GHz)	SCHWARZBECK	BBHA 9120D	9120D-1148	2019.07.11	2020.07.10
Test Antenna-Horn(15-26.5 GHz)	SCHWARZBECK	BBHA 9170	9170-305	2019.06.21	2020.06.20
Test Antenna-Horn (18-40 GHz)	A-INFO	LB-180400 KF	J211060273	N/A	2020.01.06
Anechoic Chamber	RAINFORD	9m*6m*6m	N/A	2019.02.21	2021.02.20
Anechoic Chamber	EMC TECHNOLOGY LTD	21.1m*11.6 m*7.35m	N/A	2018.07.19	2020.07.18
Shielded Enclosure	ChangNing	CN-130701	130703	--	--
Signal Generator	ROHDE&SCHWARZ	SMB100A	177746	2019.06.12	2020.06.11
Power Amplifier	OPHIR RF	5225F	1037	2019.02.17	2020.02.16

Description	Manufacturer	Model	Serial No.	Cal. Date	Cal. Due
Power Amplifier	OPHIR RF	5273F	1016	2019.02.17	2020.02.16
Directional Coupler	Werlantone	C5982-10	109275	N/A	N/A
Directional Coupler	Werlantone	CHP-273E	S00801z-01	N/A	N/A
Feld Strength Meter	Narda	EP601	511WX51129	2019.05.22	2020.05.21
Mouth Simulator	B&K	4227	2423931	2018.11.16	2019.11.15
Sound Calibrator	B&K	4231	2430337	2018.11.16	2019.11.15
Sound Level Meter	B&K	NL-20	00844023	2018.11.16	2019.11.15
Ear Simulator	B&K	4185	2409449	2018.11.16	2019.11.15
Ear Simulator	B&K	4195	2418189	2018.11.16	2019.11.15
Audio analyzer	B&K	UPL 16	100129	2018.11.16	2019.11.15

4.3 Measurement Uncertainty

The following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2.

This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

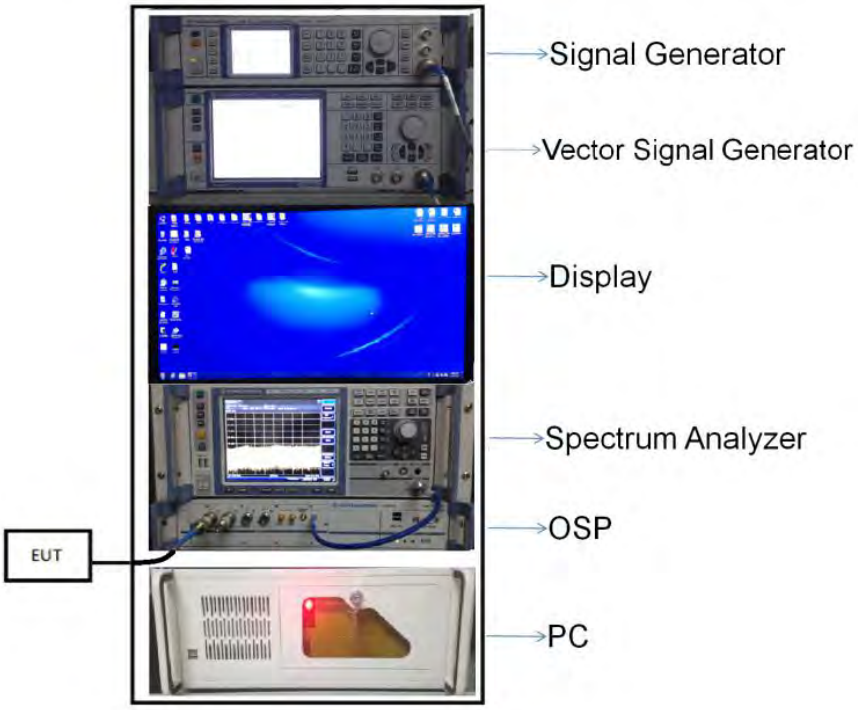
Measurement	Value
Occupied Channel Bandwidth	±4%
RF output power, conducted	±1.4 dB
Power Spectral Density, conducted	±2.5 dB
Unwanted Emissions, conducted	±2.8 dB
All emissions, radiated	±5.4 dB
Temperature	±1°C
Humidity	±4%

4.4 Description of Test Setup

4.4.1 For Antenna Port Test

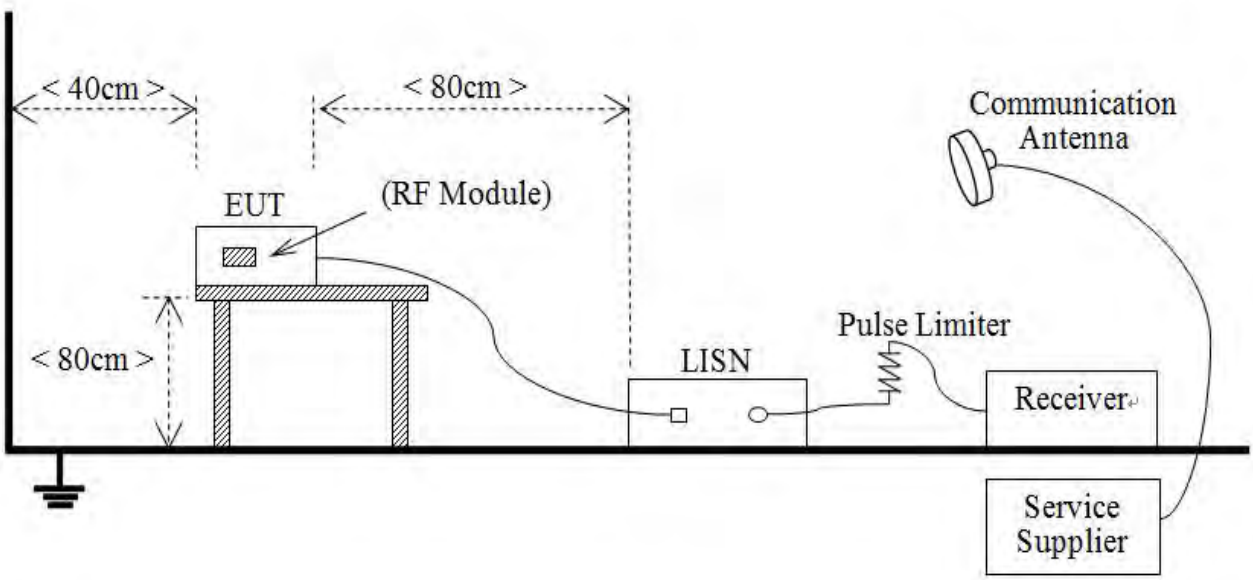
Conducted value (dBm) = Measurement value (dBm) + cable loss (dB)

For example: the measurement value is 10 dBm and the cable 0.5dBm used, then the final result of EUT:
Conducted value (dBm) = 10 dBm + 0.5 dB = 10.5 dBm



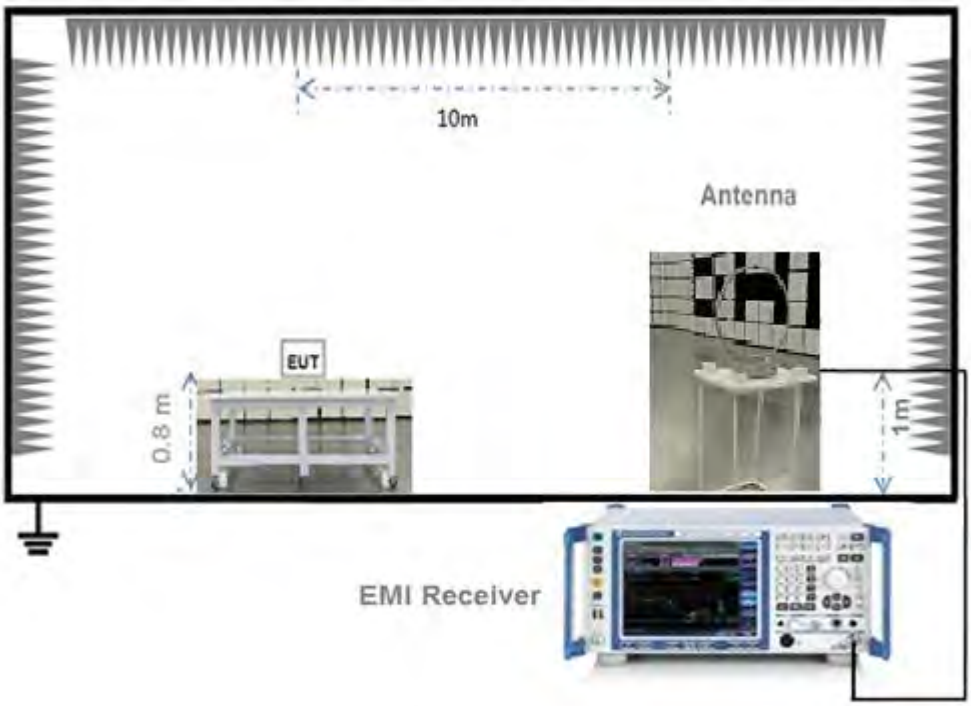
(Diagram 1)

4.4.2 For AC Power Supply Port Test



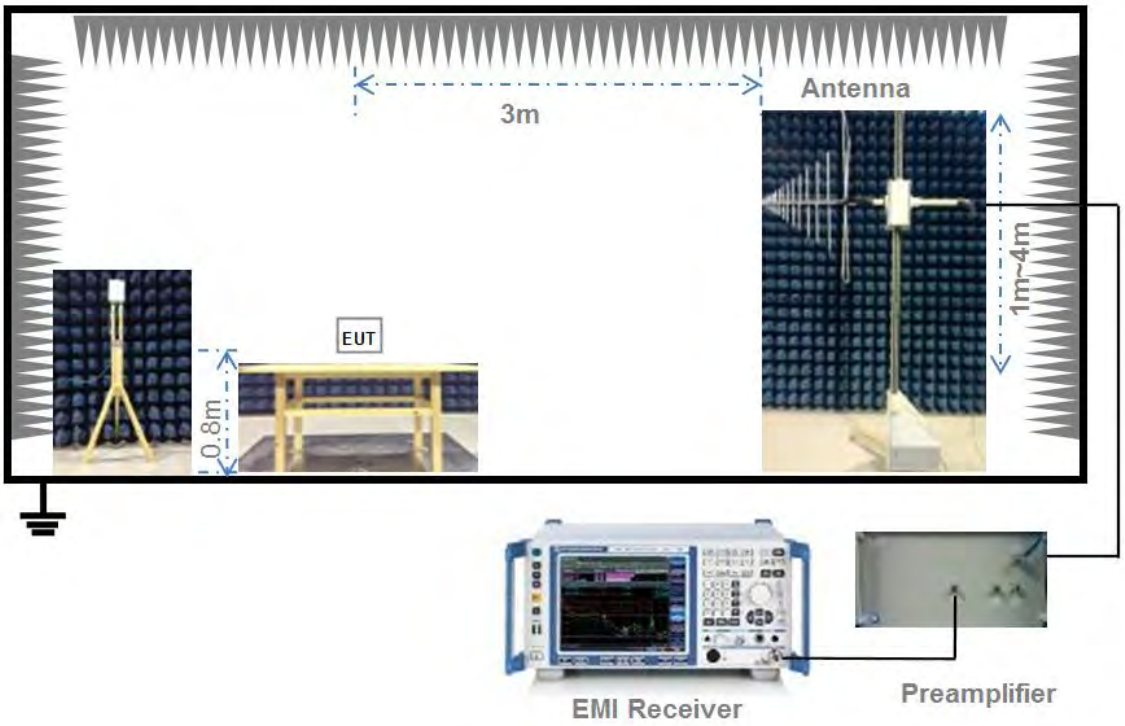
(Diagram 2)

4.4.3 For Radiated Test (Below 30 MHz)



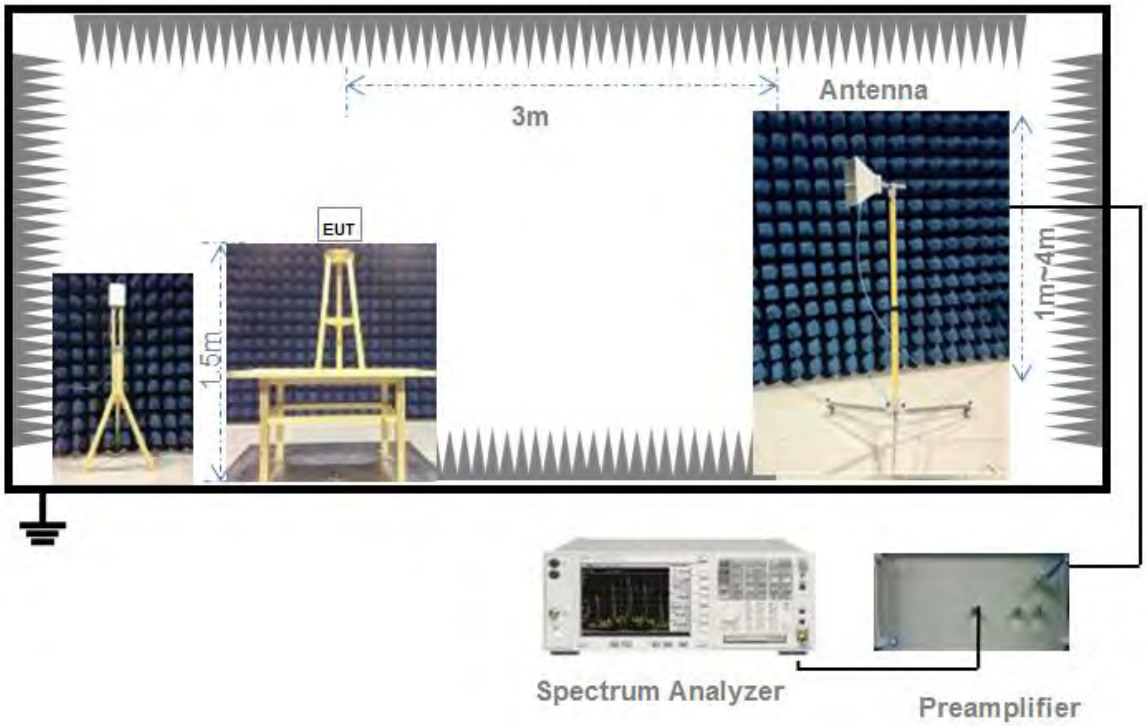
(Diagram 3)

4.4.4 For Radiated Test (30 MHz-1 GHz)



(Diagram 4)

4.4.5 For Radiated Test (Above 1 GHz)



(Diagram 5)

4.5 Measurement Results Explanation Example

4.5.1 For conducted test items:

The offset level is set in the spectrum analyzer to compensate the RF cable loss and attenuator between EUT conducted output port and spectrum analyzer. With the offset compensation, the spectrum analyzer reading level is exactly the EUT RF output level.
The spectrum analyzer offset is derived from RF cable loss and attenuator factor.
Offset = RF cable loss + attenuator factor.

4.5.2 For radiated band edges and spurious emission test:

Per part 15.35(c), the EUT Bluetooth average emission level could be determined by the peak emission level applying duty cycle correction factor, to represent averaging over the whole pulse train.
The average level is derived from the peak level corrected with “Duty cycle correction factor”.
Average Emission Level (dBuV/m) = Peak Emission Level (dBuV/m) + Duty cycle correction factor (dB)
Duty cycle correction factor (dB) = 20 * log (Duty cycle).
Duty cycle = on time / 100 milliseconds
On time = dwell time * hopping number in 100 ms
For example: bluetooth with dwell time 2.9 ms and 3 hops in 100 ms, then
Duty cycle correction factor (dB) = 20 * log ((2.9 * 3) / 100) = -21.21 dB
Following shows an average computation example with duty cycle correction factor = -21.21 dB, and the peak emission level is 45.61 dBuV/m.
Example:
Average Emission Level (dBuV/m) = Peak Emission Level (dBuV/m) + duty cycle correction factor (dB)
= 45.61 + (-21.21) = 24.4 (dBuV/m)

5 TEST ITEMS

5.1 Antenna Requirements

5.1.1 Relevant Standards

FCC §15.203 & 15.247(b); RSS-247, 5.4 (f)

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited. This requirement does not apply to carrier current devices or to devices operated under the provisions of § 15.211, § 15.213, § 15.217, § 15.219, or § 15.221. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with § 15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this part are not exceeded.

If directional gain of transmitting antennas is greater than 6 dBi, the power shall be reduced by the same level in dB comparing to gain minus 6 dBi. For the fixed point-to-point operation, the power shall be reduced by one dB for every 3 dB that the directional gain of the antenna exceeds 6 dBi. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the FCC rule.

5.1.2 Antenna Anti-Replacement Construction

The Antenna Anti-Replacement as following method:

Protected Method	Description
The antenna is embedded in the product	The antenna is welded on the mainboard, can't be replaced by the consumer

Reference Documents	Item
Photo	Please refer to the EUT Photo documents.

5.1.3 Antenna Gain

The antenna peak gain of EUT is less than 6 dBi. Therefore, it is not necessary to reduce maximum peak output power limit.

5.2 Frequency Hopping Systems

5.2.1 Relevant Standards

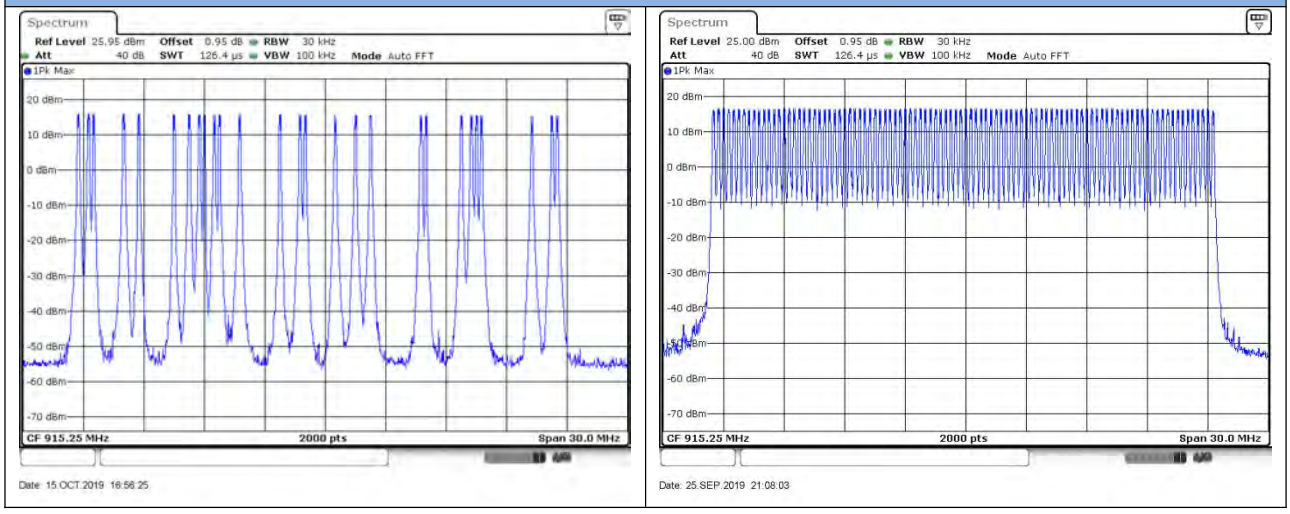
FCC §15.247(a) (1) (i) (ii) (iii) (iv); FCC §15.247(g); FCC §15.247(h)

Describe how the hopping sequence is generated. Provide an example of the hopping sequence channels, to demonstrate that the sequence meets the requirement specified in the definition of an FHSS system. Per the definition in Section 2.1(c), the hop set shall appear as random in the near term, shall appear as evenly distributed in the long term, and sequential hops shall be randomly distributed in both direction and magnitude of change.
Describe how each individual EUT meets the requirement that each of its hopping channels is used equally on average (e.g., that each new transmission event begins on the next channel in the hopping sequence after the final channel used in the previous transmission event).
Describe how the associated receiver(s) complies with the requirement that the input bandwidth (either RF or IF) matches the bandwidth of the transmitted signal.
Describe how the associated receiver(s) has the ability to shift frequencies in synchronization with the transmitted signals.
For short burst systems, describe how the EUT complies with the requirement that it be designed to be capable of operating as a true frequency hopping system. Specifically, the device shall comply with the equal frequency use and pseudorandom hopping sequence requirement when transmitting in short bursts, and shall be designed to comply when presented with continuous data (or information) stream.
Describe how the EUT complies with the requirement that it not have the ability to be coordinated with other FHSS systems in an effort to avoid the simultaneous occupancy of individual hopping frequencies by multiple transmitters.

5.2.2 Description of the systems

1. According to the preset procedure of the whole network, all the stations in the automatic control network synchronously change the frequency multiple times within one second, and temporarily stay on each frequency hopping channel. Periodic synchronization signaling is sent from the primary station, instructing all slaves to simultaneously change the operating frequency, then the hopping sequence is generated.
2. The hop set shall appear as random in the near term, shall appear as evenly distributed in the long term, and sequential hops shall be randomly distributed in both direction and magnitude of change.

Reference Documents



3. Channels are classified into two categories, used and unused, where used channels are part of the hopping sequence and unused channels are replaced in the hopping sequence by used channels in a pseudo-random way. Make each individual EUT meets the requirement that each of its hopping channels is used equally on

average.

4. The input bandwith and transmitted bandwith are both 1MHz, the associated receiver(s) complies with the requirement that the input bandwidth matches the bandwidth of the transmitted signal.
5. Connected devices communicate on the same physical channel by synchronizing with a common clock and hopping sequence.
6. EUT isn’t short burst systems.
7. EUT can’t have the ability to be coordinated with other FHSS systems in an effort.

5.3 Number of Hopping Frequencies

5.3.1 Limit

FCC §15.247(a) (1) (i); RSS-247, 5.1 (d)

For frequency hopping systems operating in the 902-928 MHz band: the system shall use at least 50 hopping frequencies.

Test Setup

See section 4.4.1 for test setup description for the antenna port. The photo of test setup please refer to ANNEX B.

5.3.2 Test Procedure

The EUT must have its hopping function enabled. Use the following spectrum analyzer settings:

Span = the frequency band of operation

RBW ≥ 1% of the span

VBW ≥ RBW

Sweep = auto

Detector function = peak

Trace = max hold

Allow the trace to stabilize

5.3.3 Test Result

Please refer to ANNEX A.1.

5.4 Peak Output Power and E.I.R.P

5.4.1 Test Limit

FCC § 15.247(b)(1)

For frequency hopping systems operating in the 902-928 MHz band: 1 watt for systems employing at least 50 hopping channels; and, 0.25 watts for systems employing less than 50 hopping channels, but at least 25 hopping channels, as permitted under paragraph (a)(1)(i) of this section.

RSS-247, 5.4 (b)

For FHSs operating in the band 902-928 MHz, the maximum peak conducted output power shall not exceed 1.0 W and the e.i.r.p. shall not exceed 4 W if the hopset uses 75 or more hopping channels; the maximum peak conducted output power shall not exceed 0.125 W and the e.i.r.p. shall not exceed 0.5 W if the hopset uses less than 75 hopping channels (see Section 5.4(5) for exceptions).

5.4.2 Test Setup

See section 4.4.1 for test setup description for the antenna port. The photo of test setup please refer to ANNEX B.

5.4.3 Test Procedure

The Module operates at hopping-off test mode. The lowest, middle and highest channels are selected to perform testing to verify the conducted RF output peak power of the Module.

Use the following spectrum analyzer settings:

Span = approximately 5 times the 20 dB bandwidth, centered on a hopping channel

RBW > the 20 dB bandwidth of the emission being measured

VBW ≥ RBW

Sweep = auto

Detector function = peak

Trace = max hold

Allow the trace to stabilize.

5.4.4 Test Result

Please refer to ANNEX A.2.

5.5 Occupied Bandwidth

5.5.1 Limit

FCC §15.247(a)(1)(i); RSS-247, 5.1 (a)

Measurement of the 20dB bandwidth of the modulated signal. The maximum allowed 20 dB bandwidth of the hopping channel is 500 kHz.

5.5.2 Test Setup

See section 4.4.1 for test setup description for the antenna port. The photo of test setup please refer to ANNEX B.

5.5.3 Test Procedure

Use the following spectrum analyzer settings:

Span = approximately 2 to 3 times the 20 dB bandwidth, centered on a hopping channel

RBW = in the range of 1% to 5% of the OBW

VBW ≥ RBW

Sweep = auto

Detector function = peak

Trace = max hold

The EUT should be transmitting at its maximum data rate, Allow the trace to stabilize.

5.5.4 Test Result

Please refer to ANNEX A.3.

5.6 Carrier Frequency Separation

5.6.1 Limit

FCC §15.247(a)(1); RSS-247, 5.1 (b)

Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater.

5.6.2 Test Setup

See section 4.4.1 for test setup description for the antenna port. The photo of test setup please refer to ANNEX B.

5.6.3 Test Procedure

The EUT must have its hopping function enabled. Use the following spectrum analyzer settings:

Span = wide enough to capture the peaks of two adjacent channels

Resolution (or IF) Bandwidth (RBW) ≥ 1% of the span

Video (or Average) Bandwidth (VBW) ≥ RBW

Sweep = auto

Detector function = peak

Trace = max hold

Allow the trace to stabilize. Use the marker-delta function to determine the separation between the peaks of the adjacent channels.

5.6.4 Test Result

Please refer to ANNEX A.4.

5.7 Time of Occupancy (Dwell time)

5.7.1 Limit

FCC §15.247(a)(1)(i); RSS-247, 5.1 (d)

For frequency hopping systems operating in the 902-928 MHz band: if the 20 dB bandwidth of the hopping channel is less than 250 kHz, the system shall use at least 50 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 20 second period; if the 20 dB bandwidth of the hopping channel is 250 kHz or greater, the system shall use at least 25 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 10 second period.

5.7.2 Test Setup

See section 4.4.1 for test setup description for the antenna port. The photo of test setup please refer to ANNEX B.

5.7.3 Test Procedure

The lowest, middle and highest channels are selected to perform testing to record the dwell time of each occupation measured in this channel, which is called Pulse Time here.

5.7.4 Test Result

Please refer to ANNEX A.5

5.8 Conducted Spurious Emission & Authorized-band band-edge

5.8.1 Limit

FCC §15.247(d); RSS-247, 5.5

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.

5.8.2 Test Setup

See section 4.4.1 for test setup description for the antenna port. The photo of test setup please refer to ANNEX B.

5.8.3 Test Procedure

Use the following spectrum analyzer settings:

Span = wide enough to capture the peak level of the in-band emission and all spurious emissions (e.g., harmonics) from the lowest frequency generated in the EUT up through the 10th harmonic. Typically, several plots are required to cover this entire span.
RBW = 100 kHz
VBW ≥ RBW
Sweep = auto
Detector function = peak
Trace = max hold
Allow the trace to stabilize

5.8.4 Test Result

Please refer to ANNEX A.6 and A.7

5.9 Conducted Emission

5.9.1 Limit

FCC §15.207; RSS-GEN, 8.8

For an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency within the band 150 kHz to 30 MHz shall not exceed the limits in the following table, as measured using a 50μH/50Ω line impedance stabilization network (LISN).

Frequency range (MHz)	Conducted Limit (dBμV)	
	Quai-peak	Average
0.15 - 0.50	66 to 56	56 to 46
0.50 - 5	56	46
0.50 - 30	60	50

5.9.2 Test Setup

See section 4.4.2 for test setup description for the AC power supply port. The photo of test setup please refer to ANNEX B.

5.9.3 Test Procedure

The maximum conducted interference is searched using Peak (PK), if the emission levels more than the AV and QP limits, and that have narrow margins from the AV and QP limits will be re-measured with AV and QP detectors. Tests for both L phase and N phase lines of the power mains connected to the EUT are performed. Refer to recorded points and plots below.
Devices subject to Part 15 must be tested for all available U.S. voltages and frequencies (such as a nominal 120 VAC, 50/60 Hz and 240 VAC, 50/60 Hz) for which the device is capable of operation. A device rated for 50/60 Hz operation need not be tested at both frequencies provided the radiated and line conducted emissions are the same at both frequencies.

5.9.4 Test Result

Please refer to ANNEX A.7.

5.10 Radiated Spurious Emission

5.10.1 Limit

FCC §15.209&15.247(d); RSS-247, 5.5

Radiated emission outside the frequency band attenuation below the general limits specified in FCC section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in FCC section 15.205(a), must also comply with the radiated emission limits specified in FCC section 15.209(a).

According to FCC section 15.209 (a), except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency (MHz)	Field Strength (μV/m)	Measurement Distance (m)
0.009 - 0.490	2400/F(kHz)	300
0.490 - 1.705	24000/F(kHz)	30
1.705 - 30.0	30	30
30 - 88	100	3
88 - 216	150	3
216 - 960	200	3
Above 960	500	3

Note:

1. Field Strength (dBμV/m) = 20*log[Field Strength (μV/m)].
2. In the emission tables above, the tighter limit applies at the band edges.
3. For Above 1000 MHz, the emission limit in this paragraph is based on measurement instrumentation employing an average detector, measurement using instrumentation with a peak detector function, corresponding to 20dB above the maximum permitted average limit.
4. For above 1000 MHz, limit field strength of harmonics: 54dBuV/m@3m (AV) and 74dBuV/m@3m (PK).

5.10.2 Test Setup

See section 4.4.3 to 4.4.5 for test setup description for the antenna port. The photo of test setup please refer to ANNEX B.

5.10.3 Test Procedure

The measurement frequency range is from 9 kHz to the 10th harmonic of the fundamental frequency. The Turn Table is actuated to turn from 0° to 360°, and both horizontal and vertical polarizations of the Test Antenna are used to find the maximum radiated power. Mid channels on all channel bandwidth verified. Only the worst RB size/offset presented.

The power of the EUT transmitting frequency should be ignored.

All Spurious Emission tests were performed in X, Y, Z axis direction. And only the worst axis test condition was recorded in this test report.

Use the following spectrum analyzer settings:

Span = wide enough to fully capture the emission being measured
RBW = 1 MHz for f ≥ 1 GHz, 100 kHz for f < 1 GHz
VBW ≥ RBW

Sweep = auto
Detector function = peak
Trace = max hold
For measurement below 1GHz, If the emission level of the EUT measured by the peak detector is 3 dB lower than the applicable limit, the peak emission level will be reported, Otherwise, the emission measurement will be repeated using the quasi-peak detector and reported.

5.10.4 Test Result

Please refer to ANNEX A.8.

5.11 Band Edge (Restricted-band band-edge)

5.11.1 Limit

FCC §15.209&15.247(d)

Radiated emission outside the frequency band attenuation below the general limits specified in FCC section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in FCC section 15.205(a), must also comply with the radiated emission limits specified in FCC section 15.209(a).

5.11.2 Test Setup

See section 4.4.3 to 4.4.5 for test setup description for the antenna port. The photo of test setup please refer to ANNEX B.

5.11.3 Test Procedure

The measurement frequency range is from 9 kHz to the 10th harmonic of the fundamental frequency. The Turn Table is actuated to turn from 0° to 360°, and both horizontal and vertical polarizations of the Test Antenna are used to find the maximum radiated power. Mid channels on all channel bandwidth verified. Only the worst RB size/offset presented.

The power of the EUT transmitting frequency should be ignored.

All Spurious Emission tests were performed in X, Y, Z axis direction. And only the worst axis test condition was recorded in this test report.

Use the following spectrum analyzer settings:

Span = wide enough to fully capture the emission being measured
RBW = 1 MHz for f ≥ 1 GHz, 100 kHz for f < 1 GHz
VBW ≥ RBW
Sweep = auto
Detector function = peak
Trace = max hold

For measurement below 1GHz, If the emission level of the EUT measured by the peak detector is 3 dB lower than the applicable limit, the peak emission level will be reported, Otherwise, the emission measurement will be repeated using the quasi-peak detector and reported.

5.11.4 Test Result

Please refer to ANNEX A.9.

ANNEX A TEST RESULT

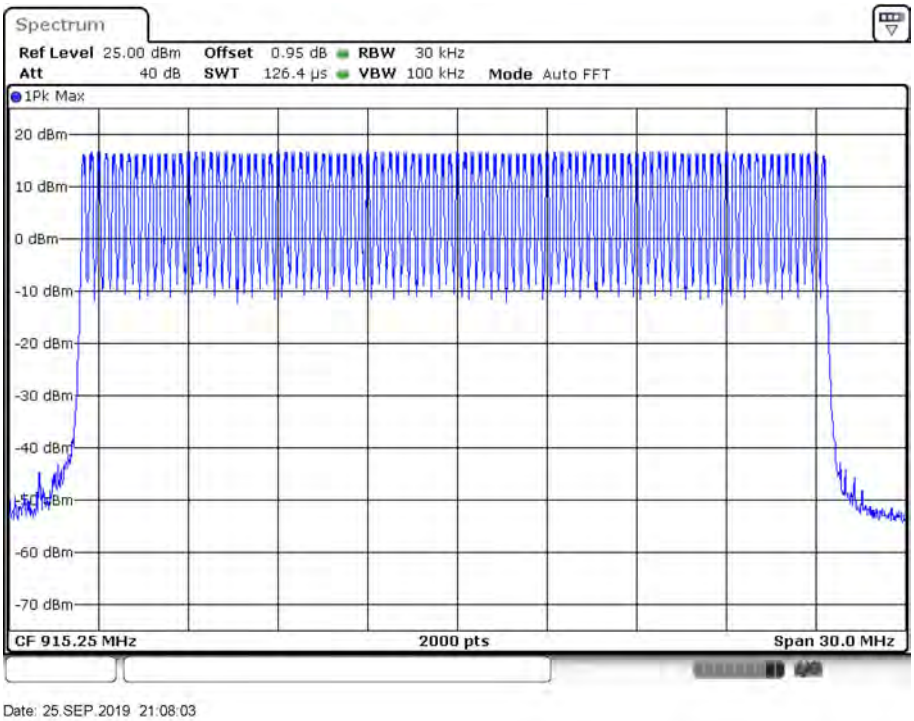
A.1 Number of Hopping Frequency

Test Data

Test Mode	Frequency Block (MHz)	Measured Channel Numbers	Min. Limit	Verdict
RFID	902-928	100	50	Pass

Test plots

RFID



A.2 Peak Output Power

Peak Power Test Data

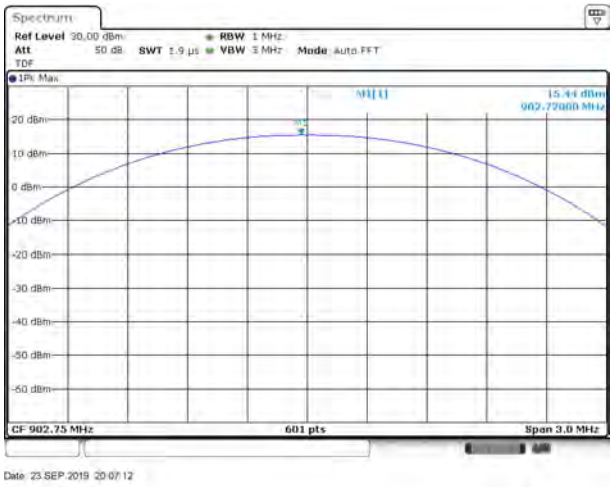
Channel	Measured Output Peak Power		Limit		Verdict
	RFID		dBm	mW	
	dBm	mW			
Low	15.44	34.99	30	1000	Pass
Middle	15.37	34.43			Pass
High	15.17	32.89			Pass

E.I.R.P Test Data (For ISED)

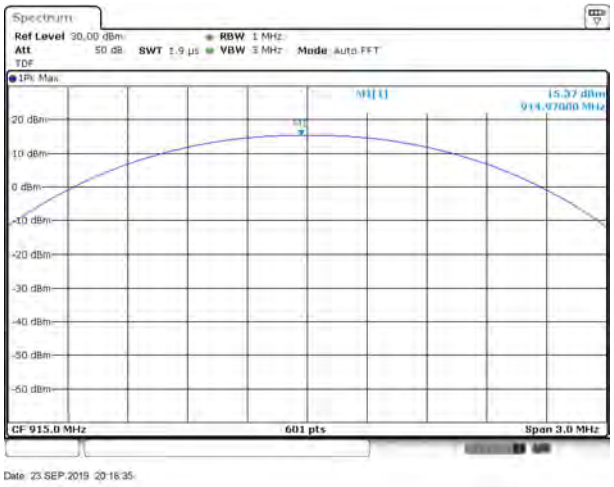
Channel	E.I.R.P		Limit		Verdict
	RFID		dBm	mW	
	dBm	mW			
Low	15.44	34.99	36	4000	Pass
Middle	15.37	34.43			Pass
High	15.17	32.89			Pass

Test plots

LOW CHANNEL



MIDDLE CHANNEL



HIGH CHANNEL

A.3 20 dB and 99% bandwidth

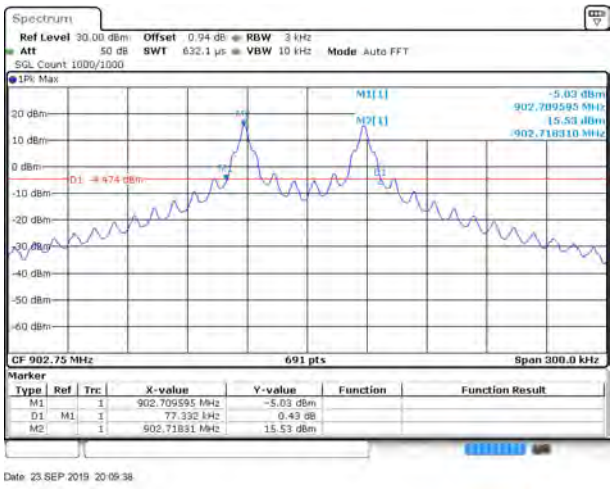
Test Data

RFID			
Channel	20 dB Bandwidth (MHz)	99% Bandwidth (MHz)	Verdict
Low	0.077332	0.091823	Pass
Middle	0.091248	0.092948	Pass
High	0.077393	0.091373	Pass

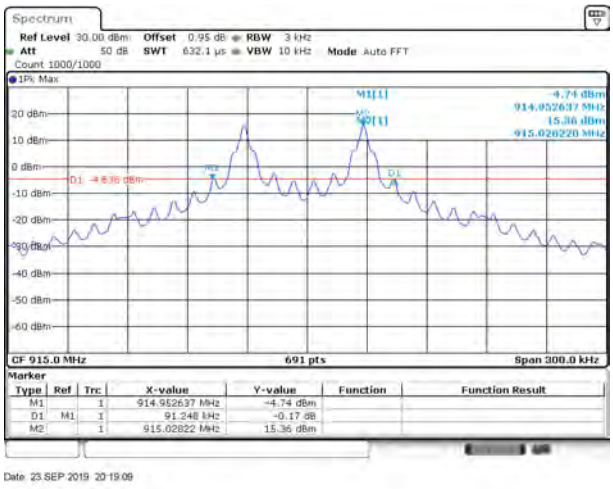
Test plots

20 dB Bandwidth

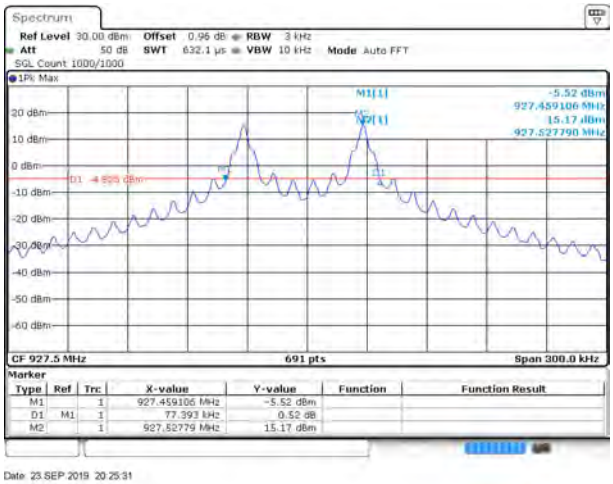
LOW CHANNEL



MIDDLE CHANNEL

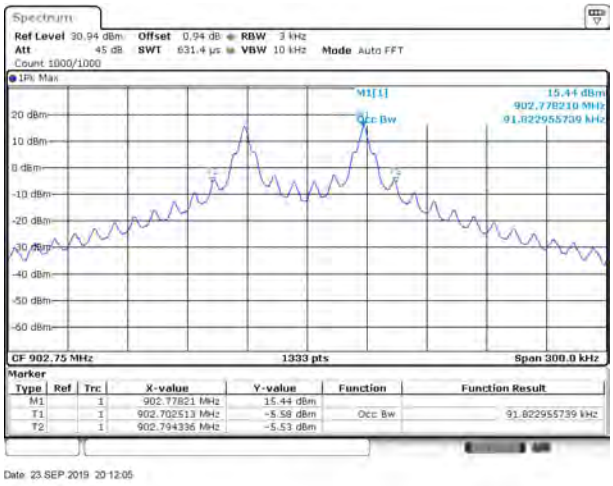


HIGH CHANNEL

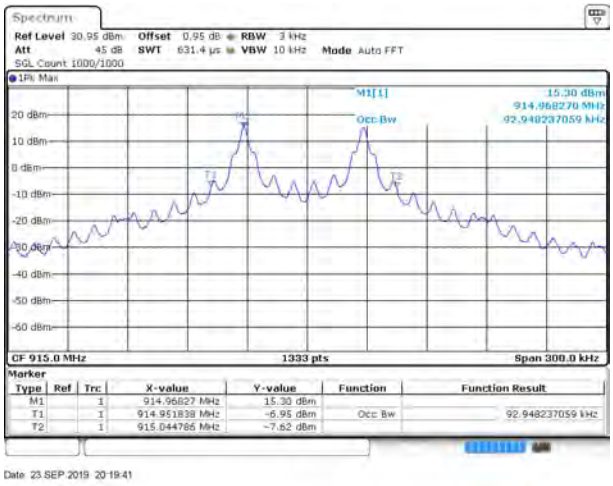


99% Bandwidth

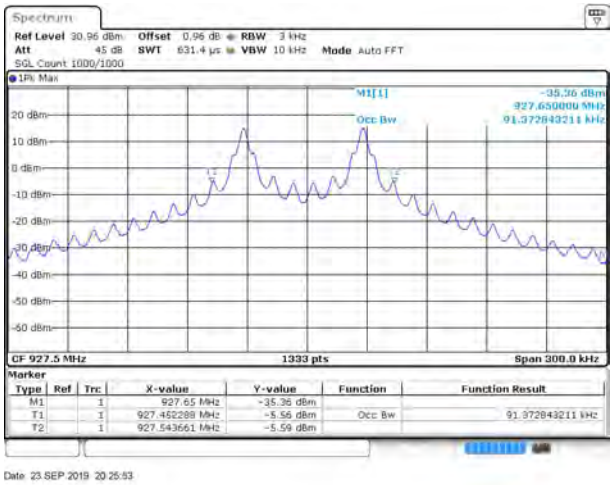
LOW CHANNEL



MIDDLE CHANNEL



HIGH CHANNEL



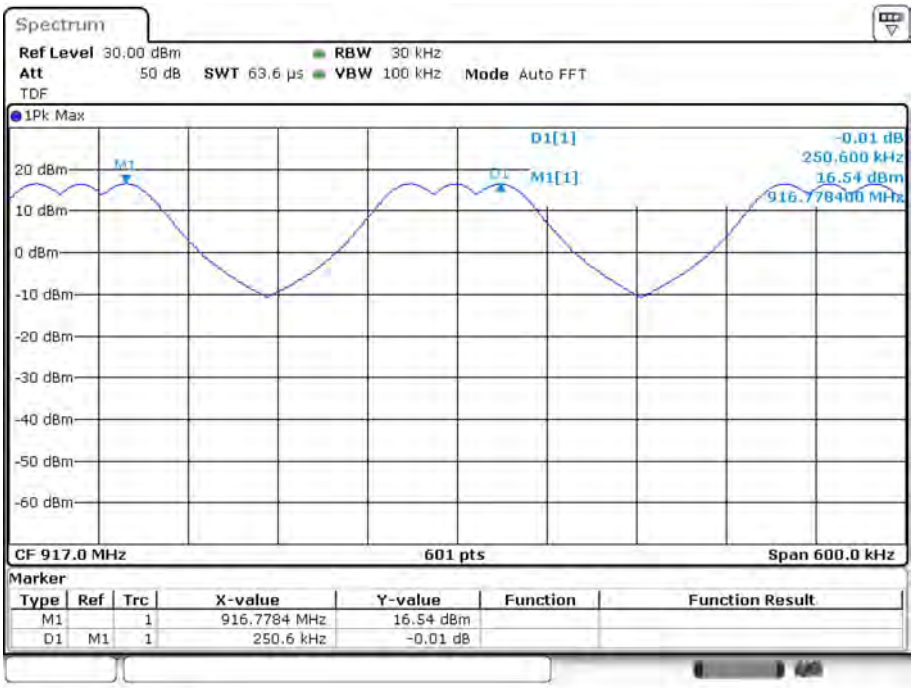
A.4 Hopping Frequency Separation

Test Data

Mode	Frequency separation (MHz)	Max 20 dB Bandwidth (MHz)	Verdict
RFID	0.2506	0.091248	Pass

Test Plots

RFID



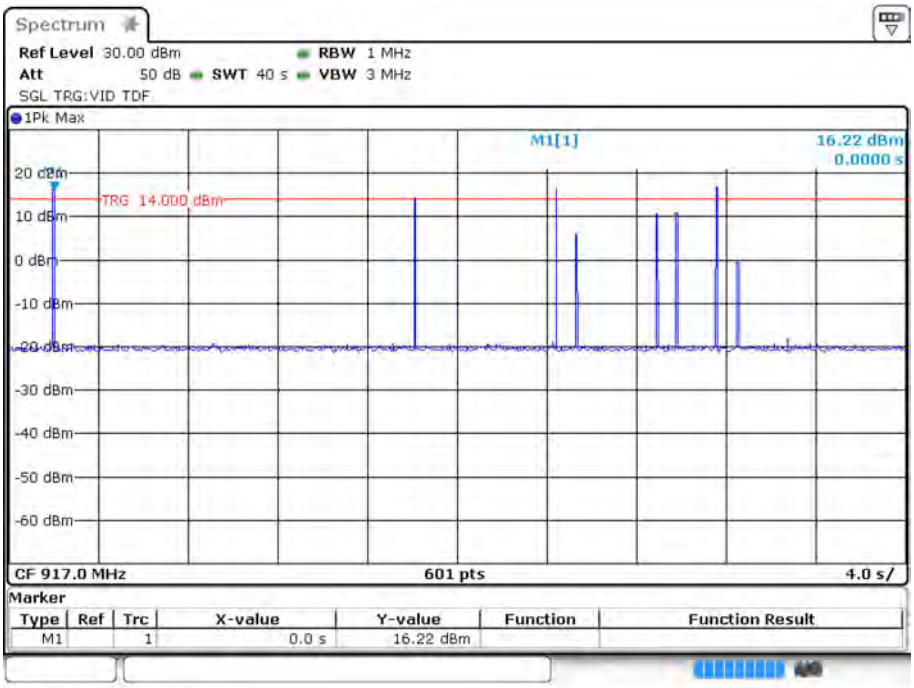
A.5 Average Time of Occupancy

Test Data

Total of Dwell (ms)	Limit (sec)	Verdict
390.640	0.4	Pass

Test Plots

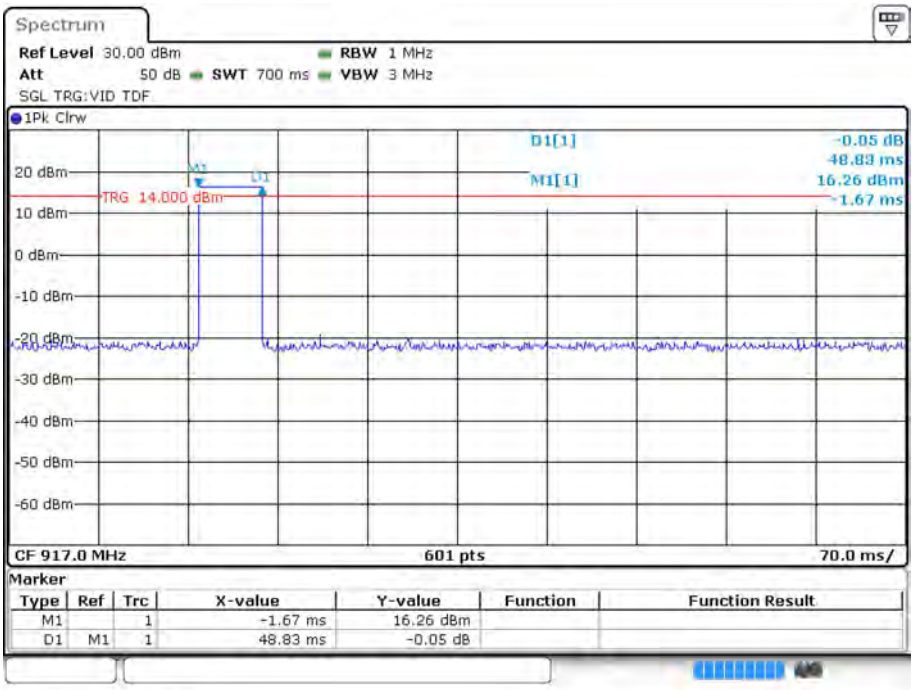
RFID



Date: 25.SEP.2019 21:21:53

Test Plots

RFID



Date: 25.SEP.2019 21:26:05

Conducted Spurious Emissions & Authorized-band band-edge

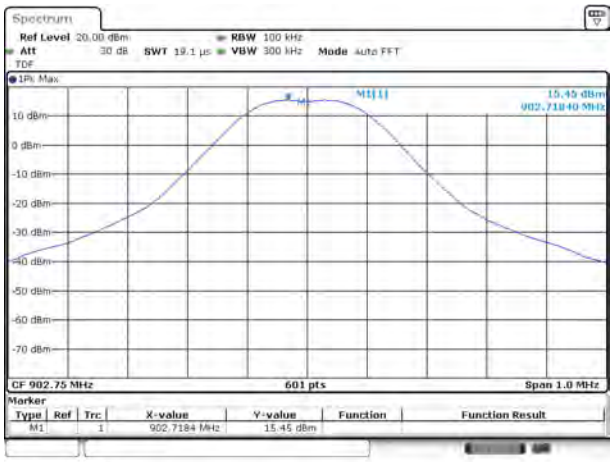
Test Data

RFID				
Channel	Measured Max. Out of Band Emission (dBm)	Limit (dBm)		Verdict
		Carrier Level	Calculated 20 dBc Limit	
Low	-38.94	15.45	-4.55	Pass
Middle	-38.69	15.29	-4.71	Pass
High	-37.67	15.18	-4.82	Pass

RFID				
Mode	Measured Max. Out of Band Emission (dBm)	Limit (dBm)		Verdict
		Carrier Level	Calculated 20 dBc Limit	
Hopping	-18.13	17.00	-3.00	Pass

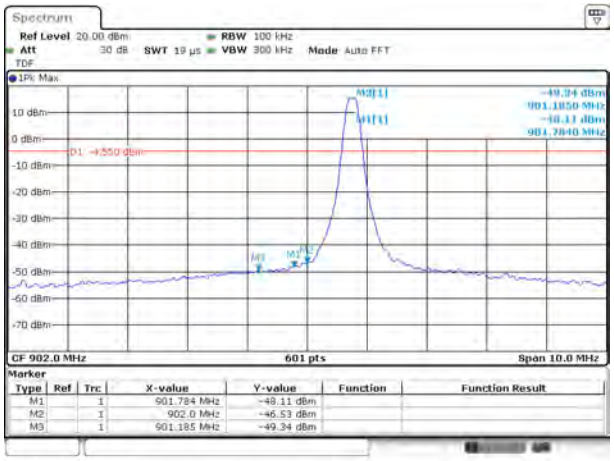
Test Plots

LOW CHANNEL, CARRIER LEVEL



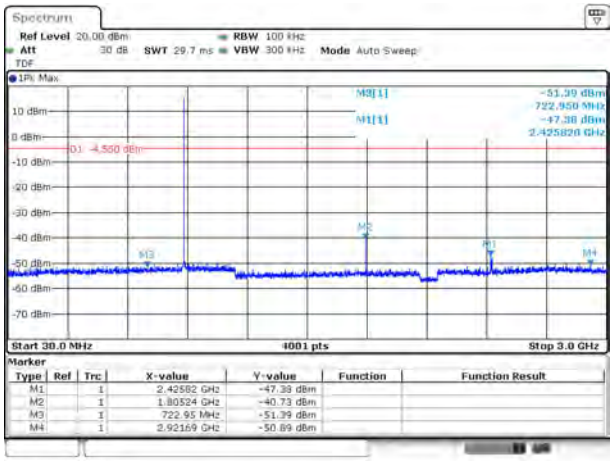
Date: 23.SEP.2019 20:12:22

LOW CHANNEL, Band Edge



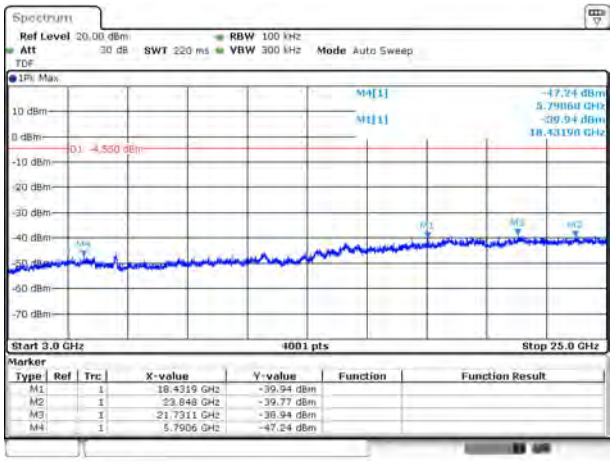
Date: 23.SEP.2019 20:16:44

LOW CHANNEL , SPURIOUS 30 MHz ~ 1 GHz



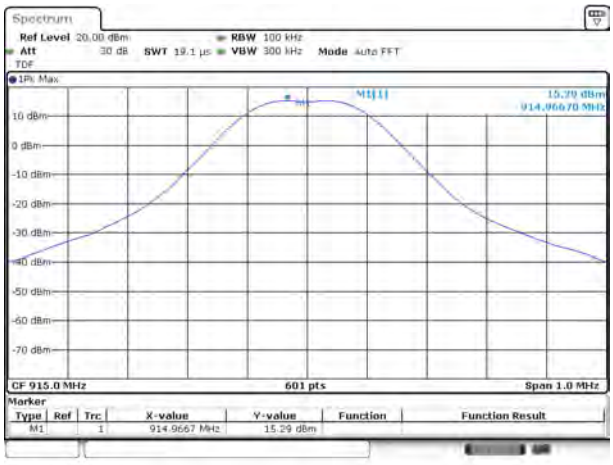
Date: 23.SEP.2019 20:15:41

LOW CHANNEL , SPURIOUS 1 GHz ~ 10 GHz



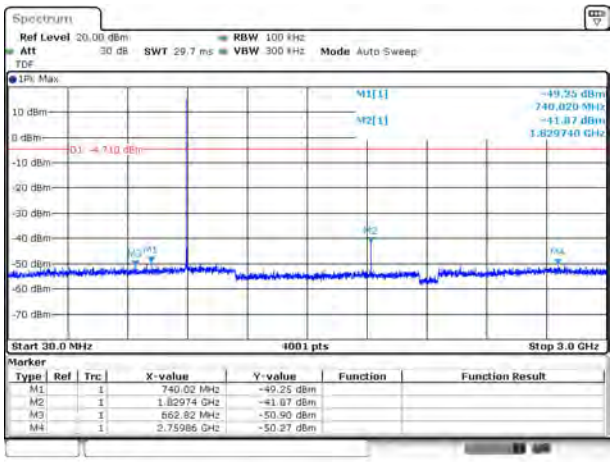
Date: 23.SEP.2019 20:16:09

MIDDLE CHANNEL, CARRIER LEVEL



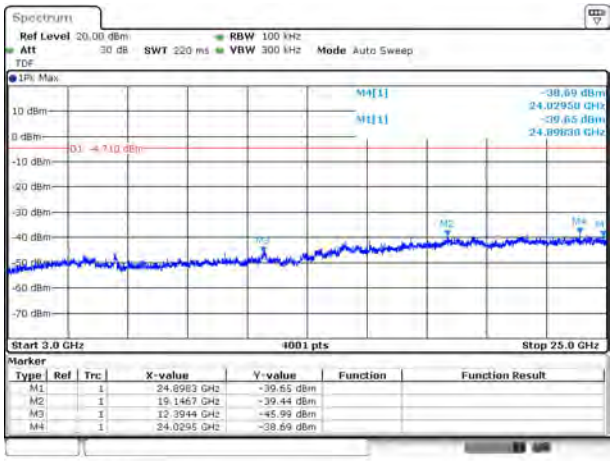
Date: 23.SEP.2019 20:19:53

MIDDLE CHANNEL , SPURIOUS 30 MHz ~ 1 GHz



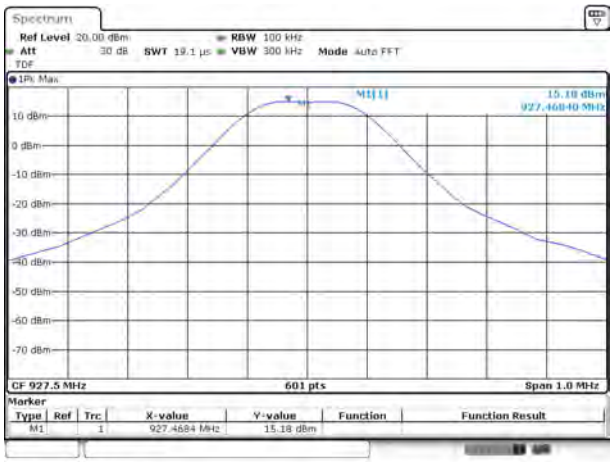
Date: 23.SEP.2019 20:20:29

MIDDLE CHANNEL , SPURIOUS 1 GHz ~ 10 GHz



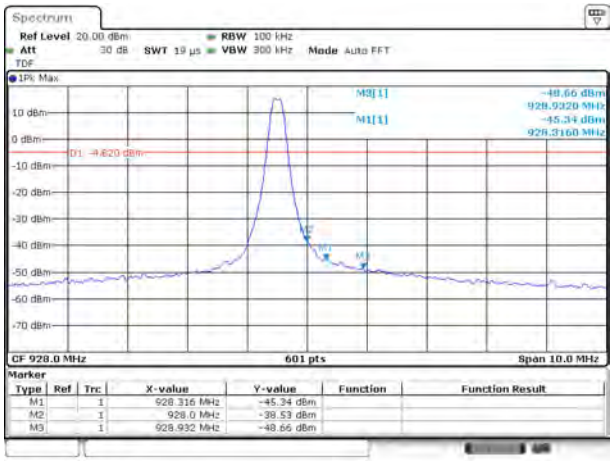
Date: 23.SEP.2019 20:20:49

HIGH CHANNEL, CARRIER LEVEL



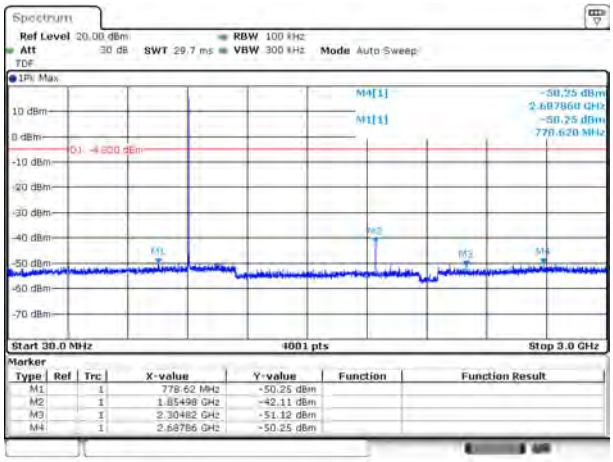
Date: 23.SEP.2019 20:26:04

HIGH CHANNEL , BAND EDGE



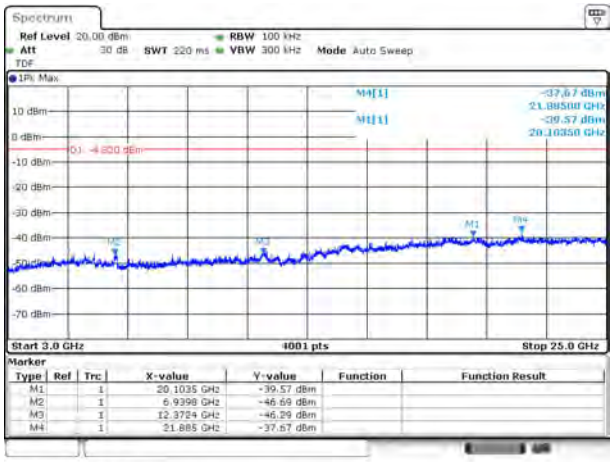
Date: 23.SEP.2019 20:29:09

HIGH CHANNEL , SPURIOUS 30 MHz ~ 1 GHz



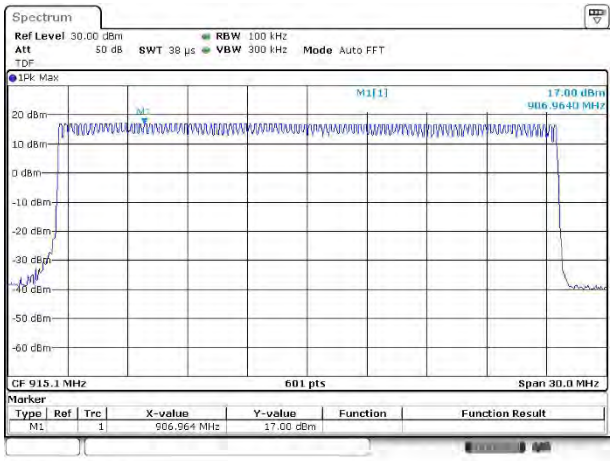
Date: 23.SEP.2019 20:27:55

HIGH CHANNEL , SPURIOUS 1 GHz ~ 10 GHz



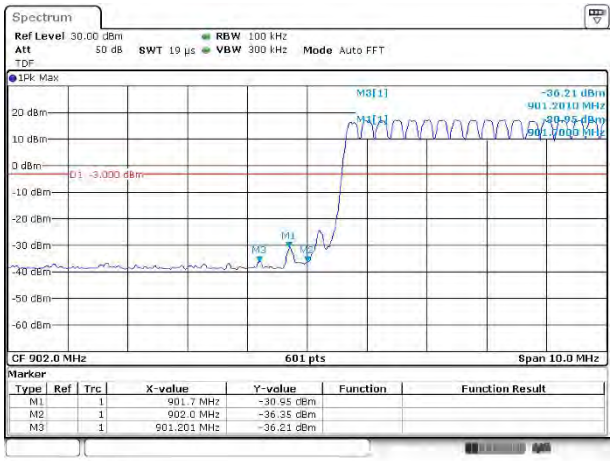
Date: 23.SEP.2019 20:28:38

HOPPING, CARRIER LEVEL



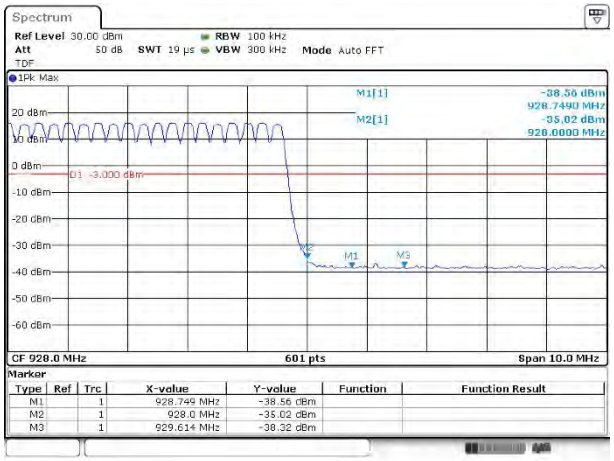
Date: 25.SEP.2019 21:33:47

Hopping BAND EDGE (LOW)



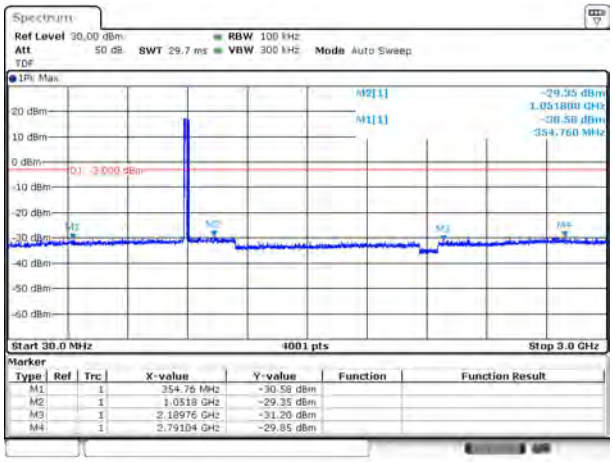
Date: 25.SEP.2019 21:41:49

Hopping BAND EDGE (HIGH)



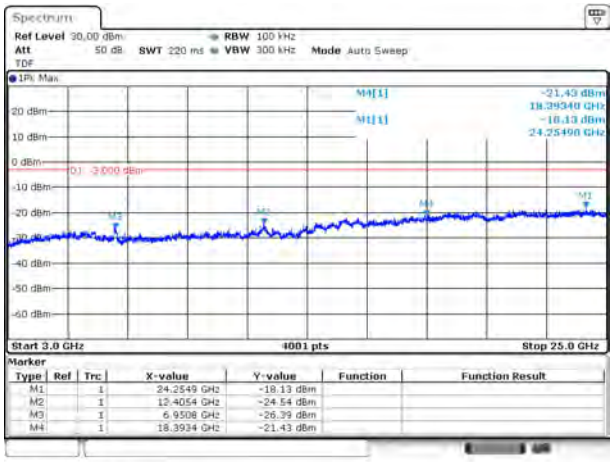
Date: 25.SEP.2019 21:54:20

Hopping Mode, SPURIOUS 30 MHz ~ 1 GHz



Date: 25.SEP.2019 21:39:00

Hopping Mode, SPURIOUS 1GHz ~ 10 GHz



Date: 25.SEP.2019 21:39:52

A.7 Conducted Emissions

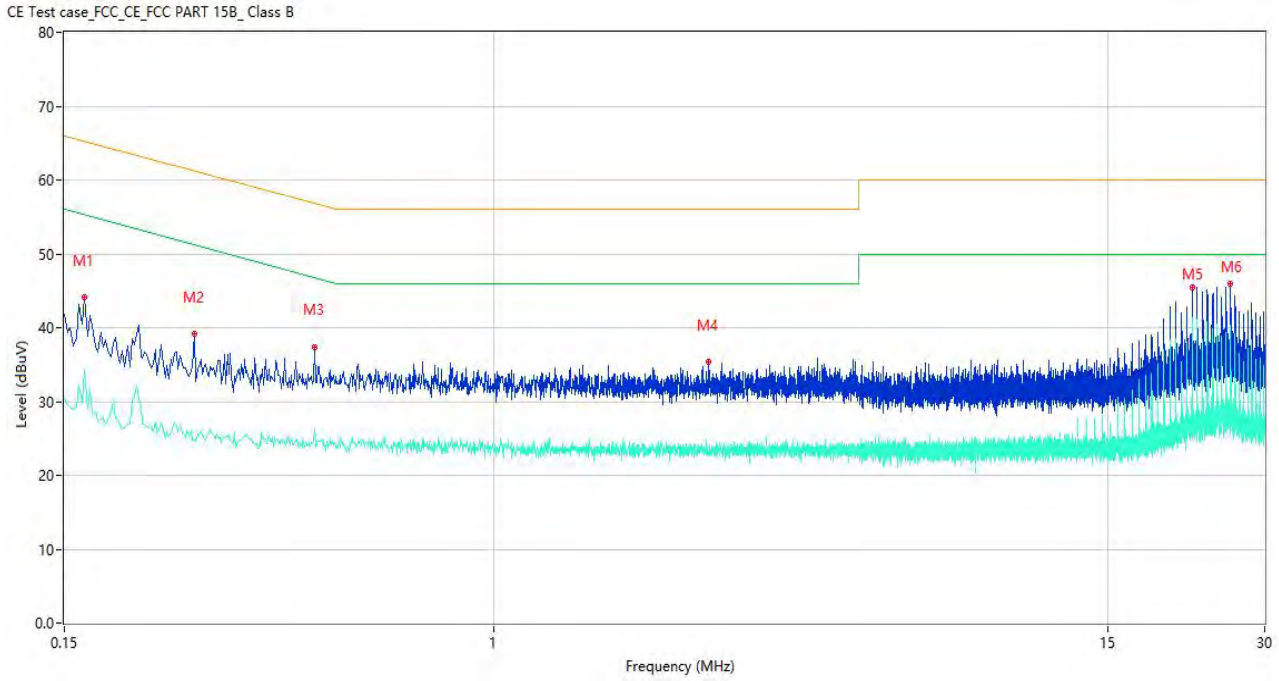
Note [1]: The EUT is working in the Normal link mode.

Note [2]: Devices subject to Part 15 must be tested for all available U.S. voltages and frequencies (such as a nominal 120 VAC, 60 Hz and 240 VAC, 50 Hz) for which the device is capable of operation. So, The configuration 120 VAC, 60 Hz and 240 VAC, 50 Hz were tested respectively, but only the worst configuration (120 VAC, 60 Hz) shown here.

Note [3]: Results (dBuV) = Original reading level of Spectrum Analyzer (dBuV) + Factor (dB)

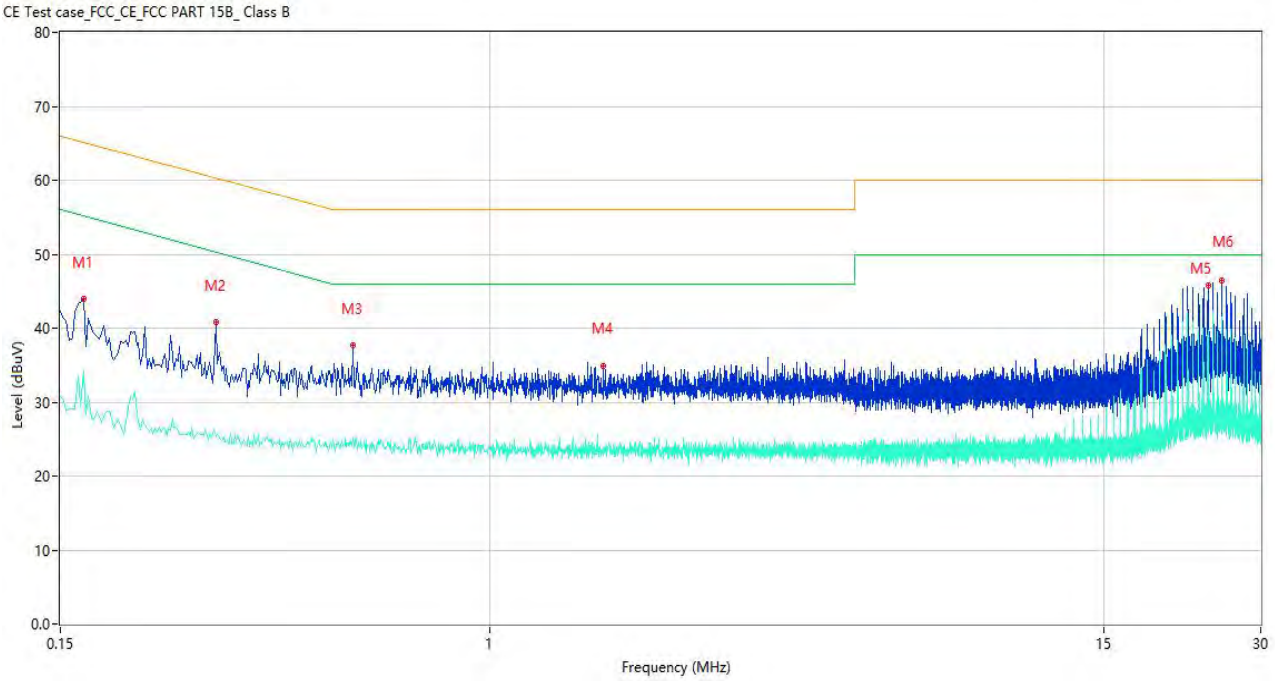
Test Data and Plots

PHASE L



No.	Frequency (MHz)	Results (dBuV)	Factor (dB)	Limit (dBuV)	Over Limit (dB)	Detector	Line	Verdict
1	0.164	44.08	10.40	65.26	-21.18	Peak	L	Pass
1**	0.164	34.38	10.40	55.26	-20.88	AV	L	Pass
2	0.266	39.16	10.34	61.24	-22.08	Peak	L	Pass
2**	0.266	24.83	10.34	51.24	-26.41	AV	L	Pass
3	0.452	37.43	10.30	56.84	-19.41	Peak	L	Pass
3**	0.452	26.45	10.30	46.84	-20.39	AV	L	Pass
4	2.574	35.30	10.28	56.00	-20.70	Peak	L	Pass
4**	2.574	23.25	10.28	46.00	-22.75	AV	L	Pass
5	21.762	45.42	10.59	60.00	-14.58	Peak	L	Pass
5**	21.762	41.40	10.59	50.00	-8.60	AV	L	Pass
6	25.814	45.92	10.67	60.00	-14.08	Peak	L	Pass
6**	25.814	39.57	10.67	50.00	-10.43	AV	L	Pass

PHASE N



No.	Frequency (MHz)	Results (dBuV)	Factor (dB)	Limit (dBuV)	Over Limit (dB)	Detector	Line	Verdict
1	0.166	43.89	10.40	65.16	-21.27	Peak	N	Pass
1**	0.166	34.19	10.40	55.16	-20.97	AV	N	Pass
2	0.298	40.75	10.33	60.30	-19.55	Peak	N	Pass
2**	0.298	25.47	10.33	50.30	-24.83	AV	N	Pass
3	0.546	37.65	10.29	56.00	-18.35	Peak	N	Pass
3**	0.546	25.05	10.29	46.00	-20.95	AV	N	Pass
4	1.646	34.80	10.26	56.00	-21.20	Peak	N	Pass
4**	1.646	23.65	10.26	46.00	-22.35	AV	N	Pass
5	23.764	45.72	10.63	60.00	-14.28	Peak	N	Pass
5**	23.764	39.64	10.63	50.00	-10.36	AV	N	Pass
6	25.284	46.47	10.66	60.00	-13.53	Peak	N	Pass
6**	25.284	39.55	10.66	50.00	-10.45	AV	N	Pass

A.8 Radiated Spurious Emission

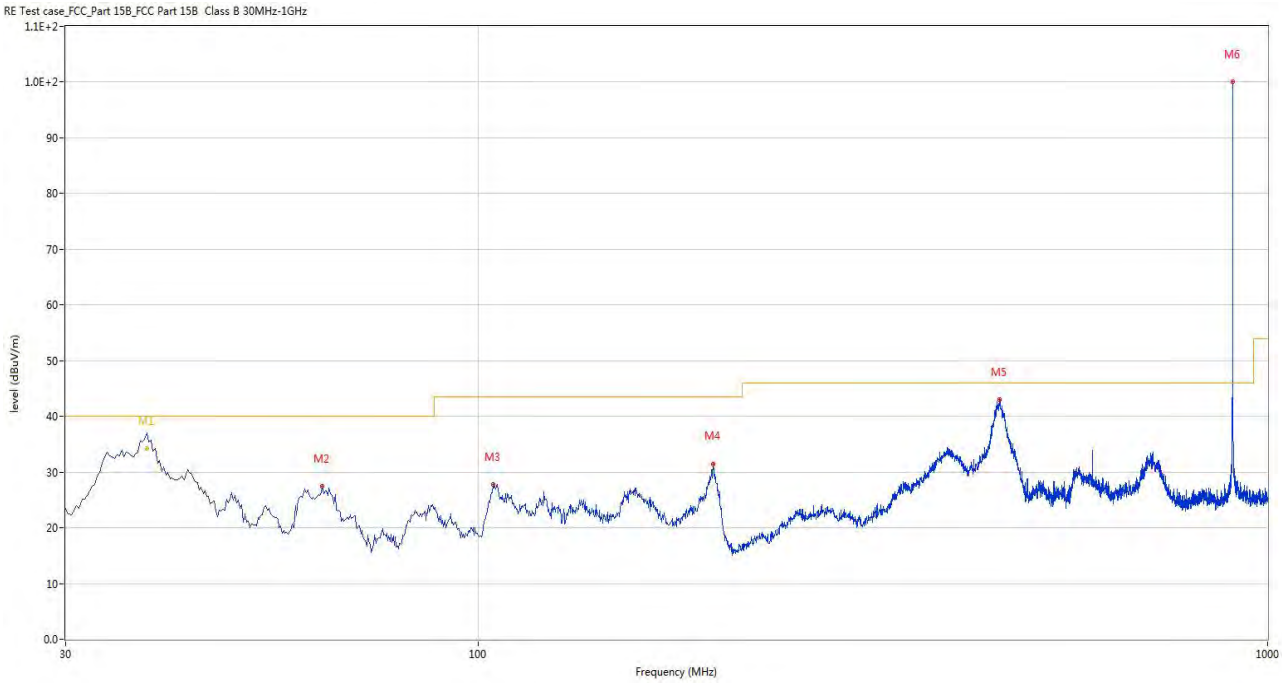
Note [1]: The symbol of "--" in the table which means not application.

Note [2]: For the test data above 1 GHz, according the ANSI C63.10-2013, where limits are specified for both average and peak (or quasi-peak) detector functions, if the peak (or quasi-peak) measured value complies with the average limit, it is unnecessary to perform an average measurement.

Note [3]: The low frequency, which started from 9 kHz to 30 MHz, was pre-scanned and the result which was 20 dB lower than the limit line per 15.31(o) was not reported.

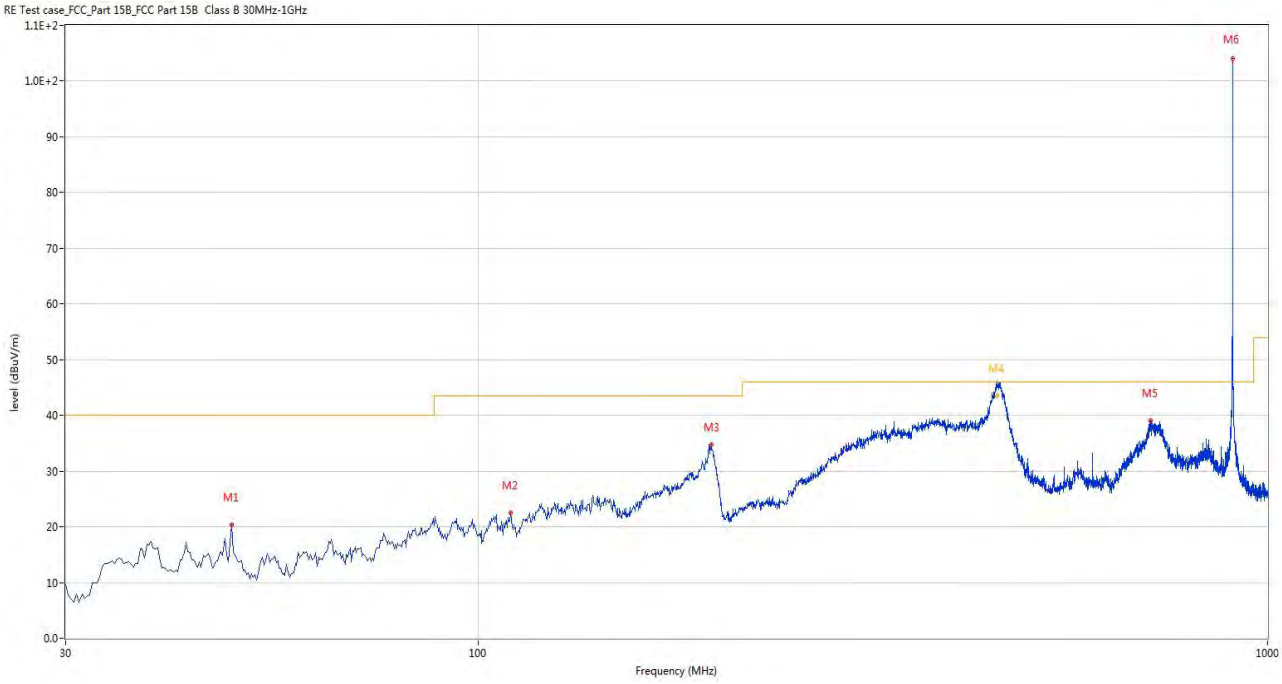
Test Data and Plots

LOW CHANNEL ANT V



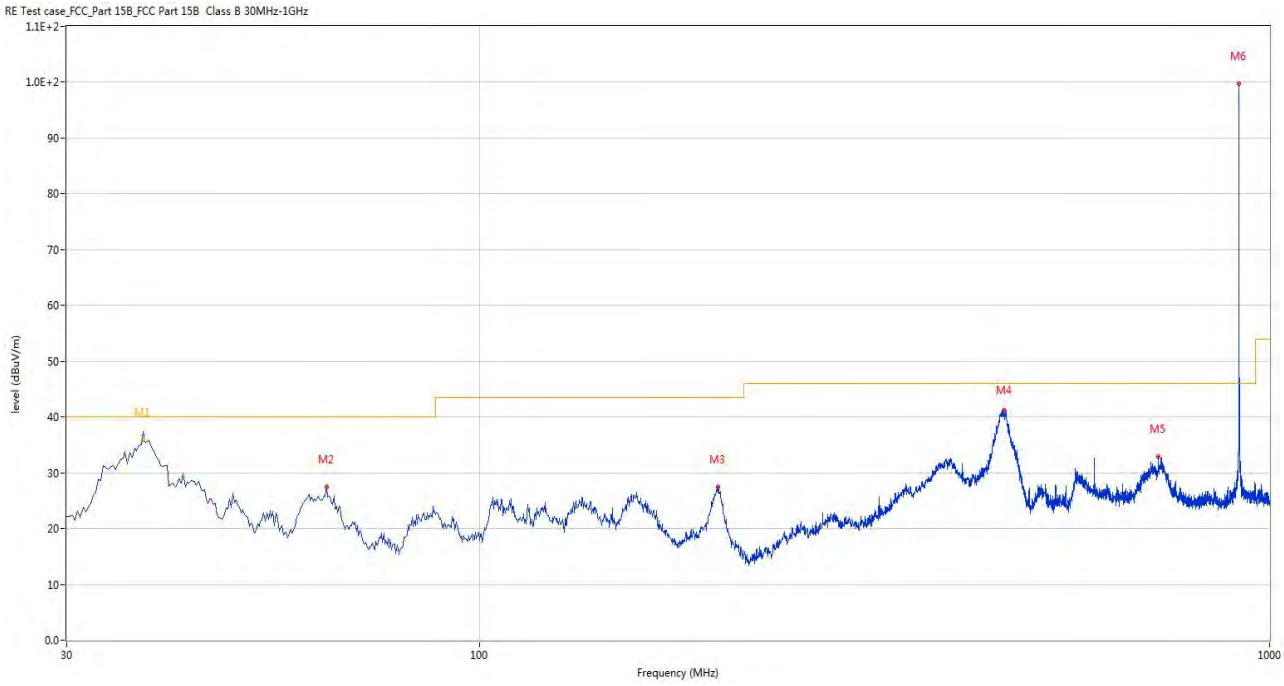
No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Over Limit (dB)	Detector	Table (o)	Height (cm)	ANT	Verdict
1	37.997	37.16	-24.49	40.0	-2.84	Peak	160.90	103	Vertical	N/A
1*	37.997	34.32	-24.49	40.0	-5.68	QP	160.90	103	Vertical	Pass
2	63.465	27.40	-24.84	40.0	-12.60	Peak	0.00	200	Vertical	Pass
3	104.448	27.74	-24.35	43.5	-15.76	Peak	248.90	100	Vertical	Pass
4	198.295	31.48	-24.18	43.5	-12.02	Peak	223.10	200	Vertical	Pass
5	457.285	42.93	-17.77	46.0	-3.07	Peak	269.90	100	Vertical	Pass
6	902.758	100.12	-9.68	46.0	54.12	Peak	255.60	100	Vertical	N/A

LOW CHANNEL, ANT H



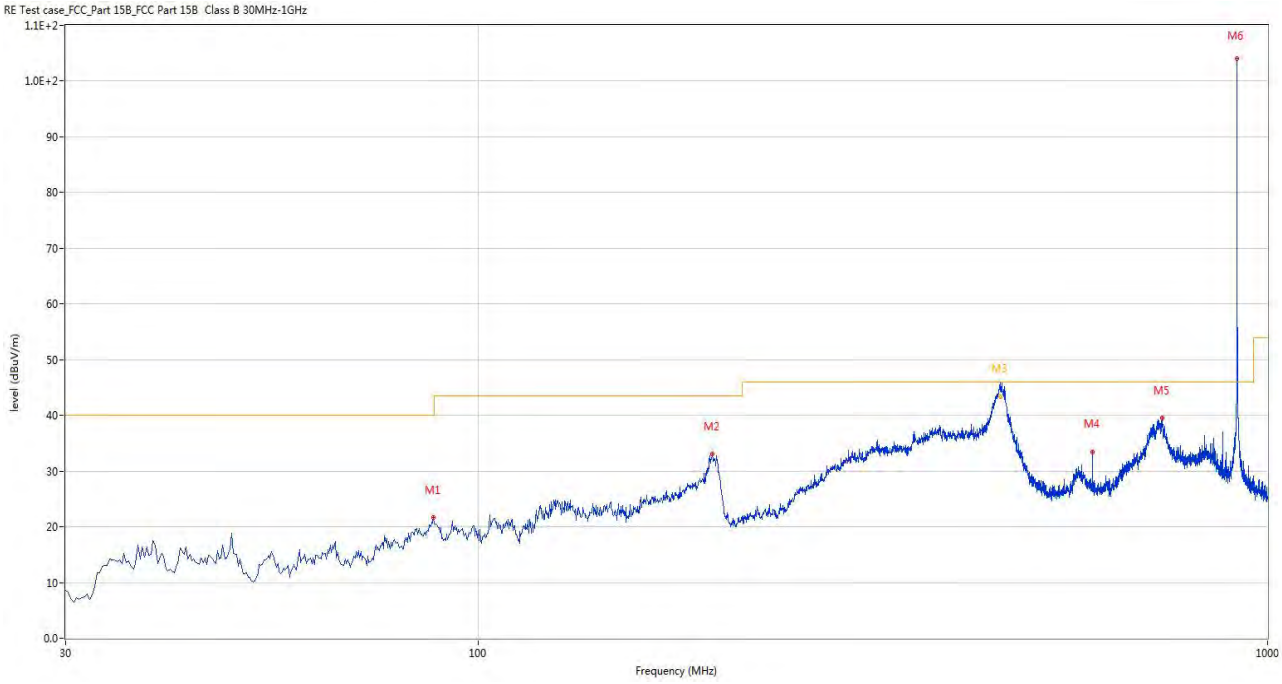
No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Over Limit (dB)	Detector	Table (o)	Height (cm)	ANT	Verdict
1	48.672	20.29	-22.50	40.0	-19.71	Peak	212.70	100	Horizontal	Pass
2	109.783	22.49	-24.42	43.5	-21.01	Peak	329.60	200	Horizontal	Pass
3	197.325	34.80	-24.23	43.5	-8.70	Peak	308.30	100	Horizontal	Pass
4	453.659	47.15	-17.88	46.0	1.15	Peak	43.60	200	Horizontal	N/A
4*	453.659	43.47	-17.88	46.0	-2.53	QP	43.60	200	Horizontal	Pass
5	710.213	38.97	-13.05	46.0	-7.03	Peak	308.30	100	Horizontal	Pass
6	902.758	104.09	-9.68	46.0	58.09	Peak	32.20	100	Horizontal	N/A

MIDDLE CHANNEL ANT V



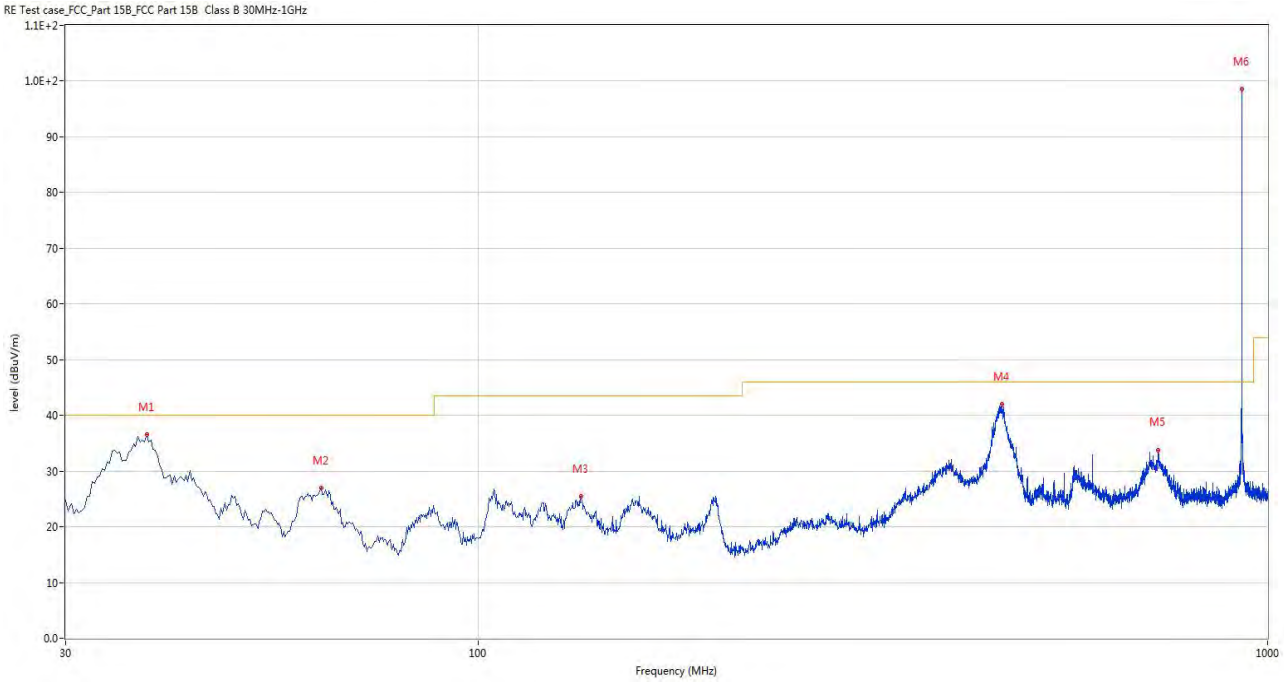
No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Over Limit (dB)	Detector	Table (o)	Height (cm)	ANT	Verdict
1	37.523	37.79	-24.56	40.0	-2.21	Peak	264.20	103	Vertical	N/A
1*	37.523	35.94	-24.56	40.0	-4.06	QP	264.20	103	Vertical	Pass
2	63.950	27.40	-24.92	40.0	-12.60	Peak	213.60	100	Vertical	Pass
3	200.477	27.47	-24.03	43.5	-16.03	Peak	183.50	100	Vertical	Pass
4	460.438	41.13	-17.88	46.0	-4.87	Peak	267.80	100	Vertical	Pass
5	723.308	32.85	-13.00	46.0	-13.15	Peak	114.80	100	Vertical	Pass
6	915.125	99.75	-9.45	46.0	53.75	Peak	360.00	200	Vertical	N/A

MIDDLE CHANNEL ANT H



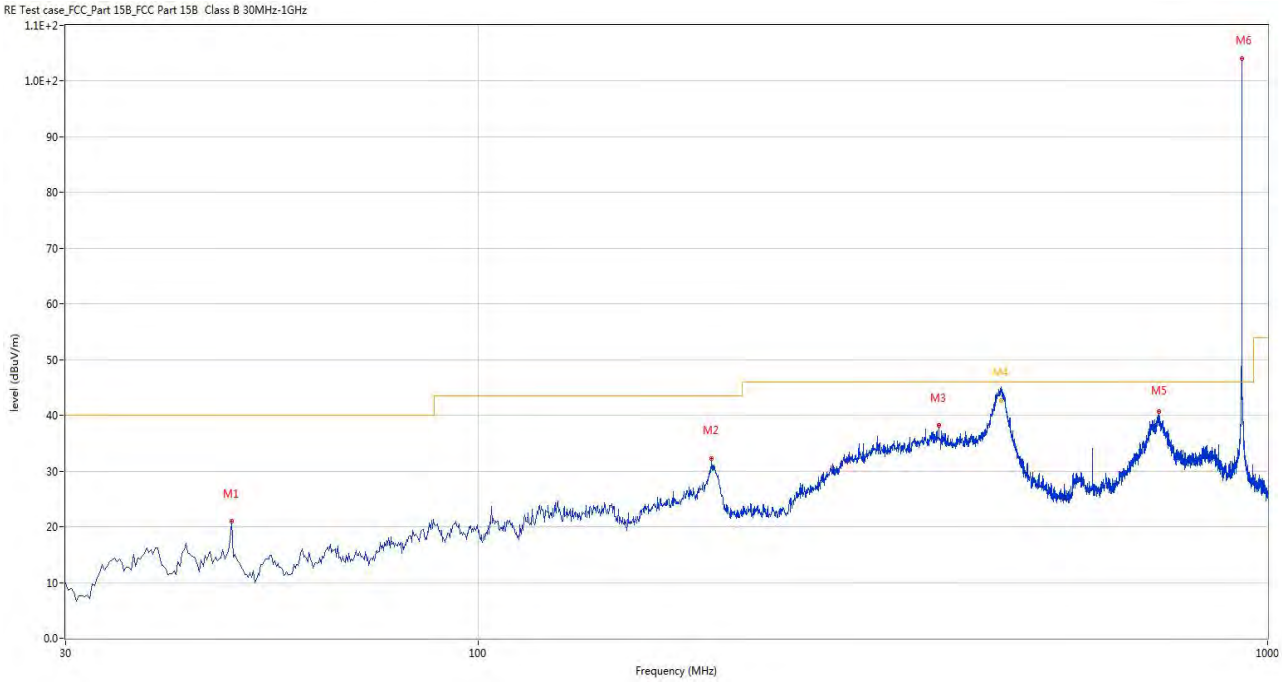
No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Over Limit (dB)	Detector	Table (o)	Height (cm)	ANT	Verdict
1	87.715	21.64	-26.53	40.0	-18.36	Peak	186.00	200	Horizontal	Pass
2	198.053	33.01	-24.19	43.5	-10.49	Peak	319.60	100	Horizontal	Pass
3	458.511	46.79	-17.86	46.0	0.79	Peak	41.50	200	Horizontal	N/A
3*	458.511	43.26	-17.86	46.0	-2.74	QP	41.50	200	Horizontal	Pass
4	599.875	33.37	-14.56	46.0	-12.63	Peak	34.40	200	Horizontal	Pass
5	734.463	39.53	-12.73	46.0	-6.47	Peak	33.40	100	Horizontal	Pass
6	915.125	104.08	-9.45	46.0	58.08	Peak	296.20	100	Horizontal	N/A

HIGH CHANNEL ANT V



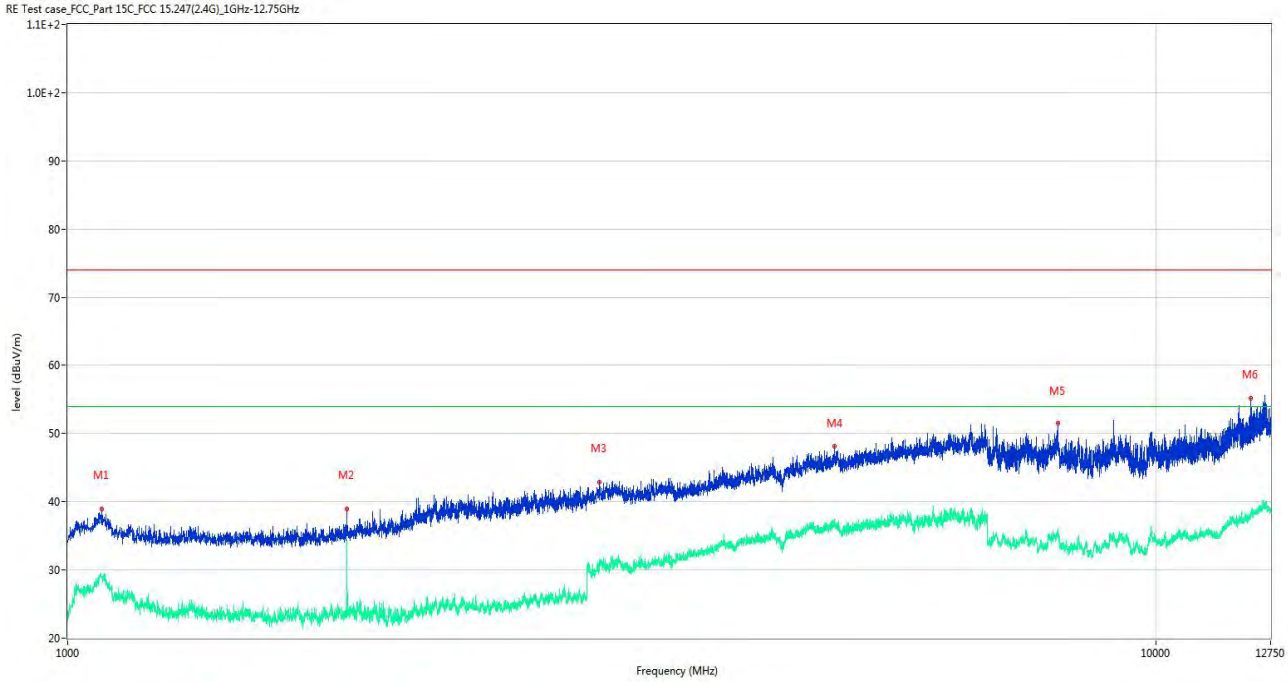
No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Over Limit (dB)	Detector	Table (o)	Height (cm)	ANT	Verdict
1	38.002	36.48	-24.49	40.0	-3.52	Peak	297.70	100	Vertical	Pass
2	63.222	26.96	-24.80	40.0	-13.04	Peak	144.20	100	Vertical	Pass
3	135.002	25.47	-27.41	43.5	-18.03	Peak	0.80	200	Vertical	Pass
4	460.438	42.06	-17.88	46.0	-3.94	Peak	280.80	100	Vertical	Pass
5	727.188	33.82	-12.35	46.0	-12.18	Peak	260.50	100	Vertical	Pass
6	927.492	98.57	-9.57	46.0	52.57	Peak	97.20	100	Vertical	N/A

HIGH CHANNEL ANT H



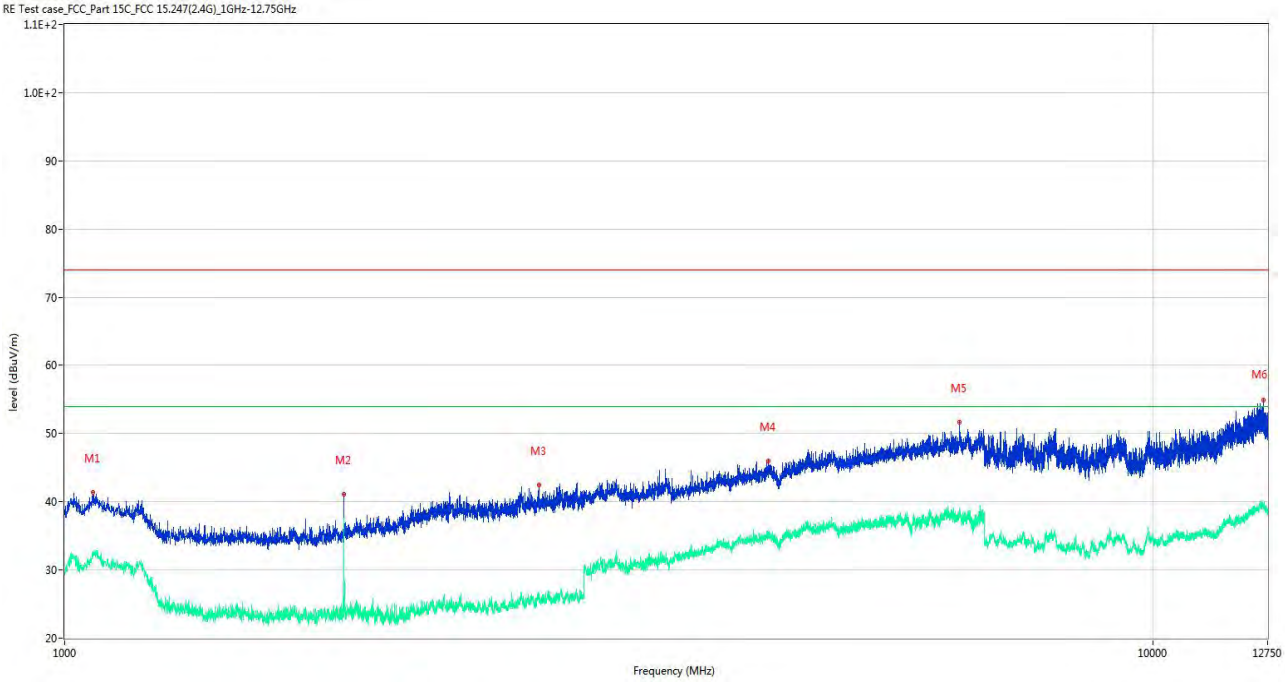
No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Over Limit (dB)	Detector	Table (o)	Height (cm)	ANT	Verdict
1	48.672	20.97	-22.50	40.0	-19.03	Peak	71.90	100	Horizontal	Pass
2	197.568	32.28	-24.21	43.5	-11.22	Peak	334.20	200	Horizontal	Pass
3	383.080	38.25	-19.06	46.0	-7.75	Peak	259.30	100	Horizontal	Pass
4	459.545	46.94	-17.88	46.0	0.94	Peak	225.30	183	Horizontal	N/A
4*	459.545	42.65	-17.88	46.0	-3.35	QP	225.30	183	Horizontal	Pass
5	727.430	40.65	-12.41	46.0	-5.35	Peak	24.70	100	Horizontal	Pass
6	927.492	103.97	-9.57	46.0	57.97	Peak	307.50	100	Horizontal	N/A

LOW CHANNEL 1 GHz to 12.75 GHz, ANT V



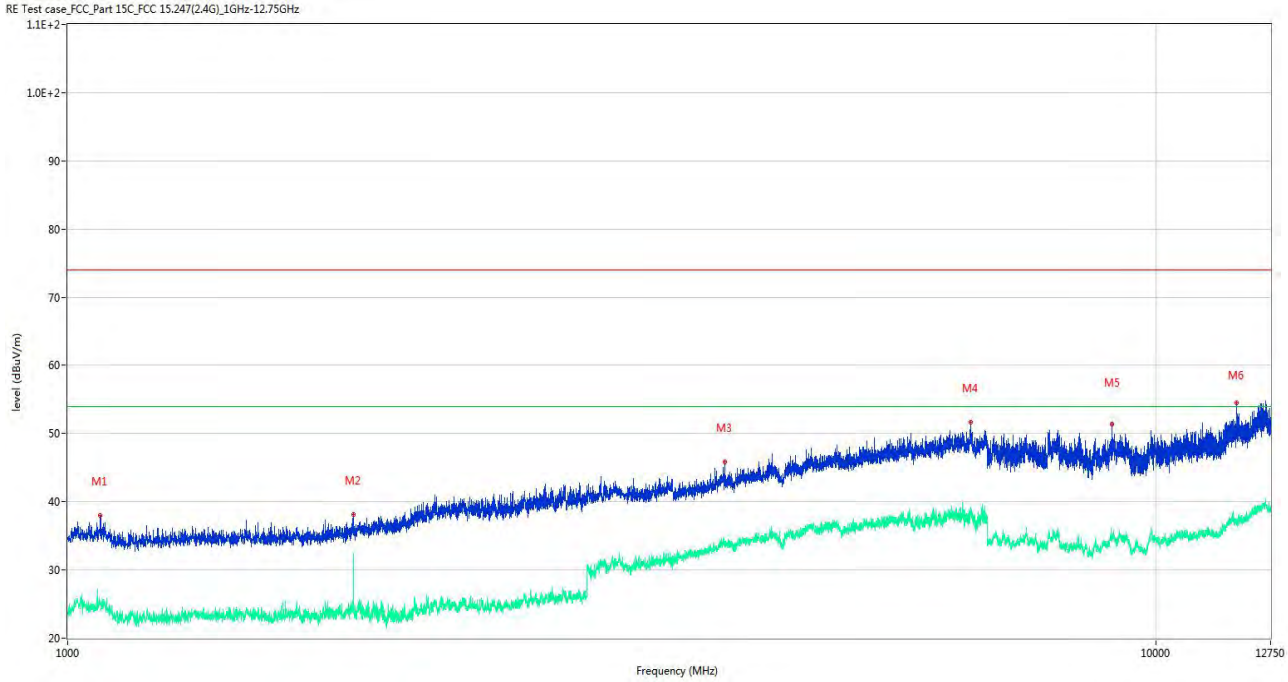
No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Over Limit (dB)	Detector	Table (o)	Height (cm)	ANT	Verdict
1**	1075.500	28.77	-15.13	54.0	-25.23	AV	252.00	150	Vertical	Pass
1	1075.500	38.91	-15.13	74.0	-35.09	Peak	252.00	150	Vertical	Pass
2**	1805.500	30.90	-14.84	54.0	-23.10	AV	197.00	150	Vertical	Pass
2	1805.500	38.98	-14.84	74.0	-35.02	Peak	197.00	150	Vertical	Pass
3**	3083.000	31.51	-6.59	54.0	-22.49	AV	99.00	150	Vertical	Pass
3	3083.000	42.83	-6.59	74.0	-31.17	Peak	99.00	150	Vertical	Pass
4**	5064.000	37.04	-0.98	54.0	-16.96	AV	303.00	150	Vertical	Pass
4	5064.000	48.15	-0.98	74.0	-25.85	Peak	303.00	150	Vertical	Pass
5**	8125.562	35.66	19.04	54.0	-18.34	AV	122.00	150	Vertical	Pass
5	8125.562	51.54	19.04	74.0	-22.46	Peak	122.00	150	Vertical	Pass
6**	12228.187	37.63	21.68	54.0	-16.37	AV	190.00	150	Vertical	Pass
6	12228.187	55.19	21.68	74.0	-18.81	Peak	190.00	150	Vertical	Pass

LOW CHANNEL 1 GHz to 12.75 GHz, ANT H



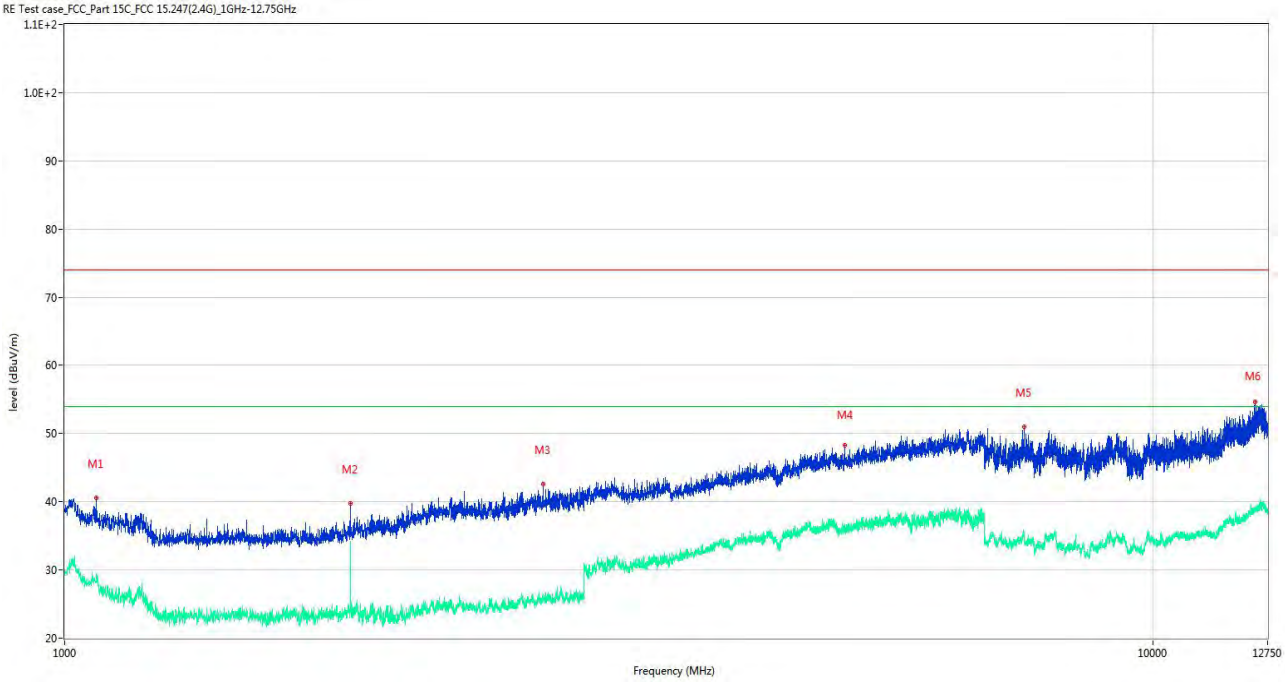
No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Over Limit (dB)	Detector	Table (o)	Height (cm)	ANT	Verdict
1**	1062.500	32.77	-15.05	54.0	-21.23	AV	233.00	150	Horizontal	Pass
1	1062.500	41.37	-15.05	74.0	-32.63	Peak	233.00	150	Horizontal	Pass
2**	1805.500	33.86	-14.84	54.0	-20.14	AV	17.00	150	Horizontal	Pass
2	1805.500	41.10	-14.84	74.0	-32.90	Peak	17.00	150	Horizontal	Pass
3**	2730.000	26.58	-8.72	54.0	-27.42	AV	198.00	150	Horizontal	Pass
3	2730.000	42.43	-8.72	74.0	-31.57	Peak	198.00	150	Horizontal	Pass
4**	4434.000	34.93	-2.72	54.0	-19.07	AV	360.00	150	Horizontal	Pass
4	4434.000	46.02	-2.72	74.0	-27.98	Peak	360.00	150	Horizontal	Pass
5**	6641.000	38.65	3.72	54.0	-15.35	AV	17.00	150	Horizontal	Pass
5	6641.000	51.66	3.72	74.0	-22.34	Peak	17.00	150	Horizontal	Pass
6**	12635.000	39.32	22.03	54.0	-14.68	AV	140.00	150	Horizontal	Pass
6	12635.000	54.87	22.03	74.0	-19.13	Peak	140.00	150	Horizontal	Pass

MIDDLE CHANNEL 1 GHz to 12.75 GHz, ANT V



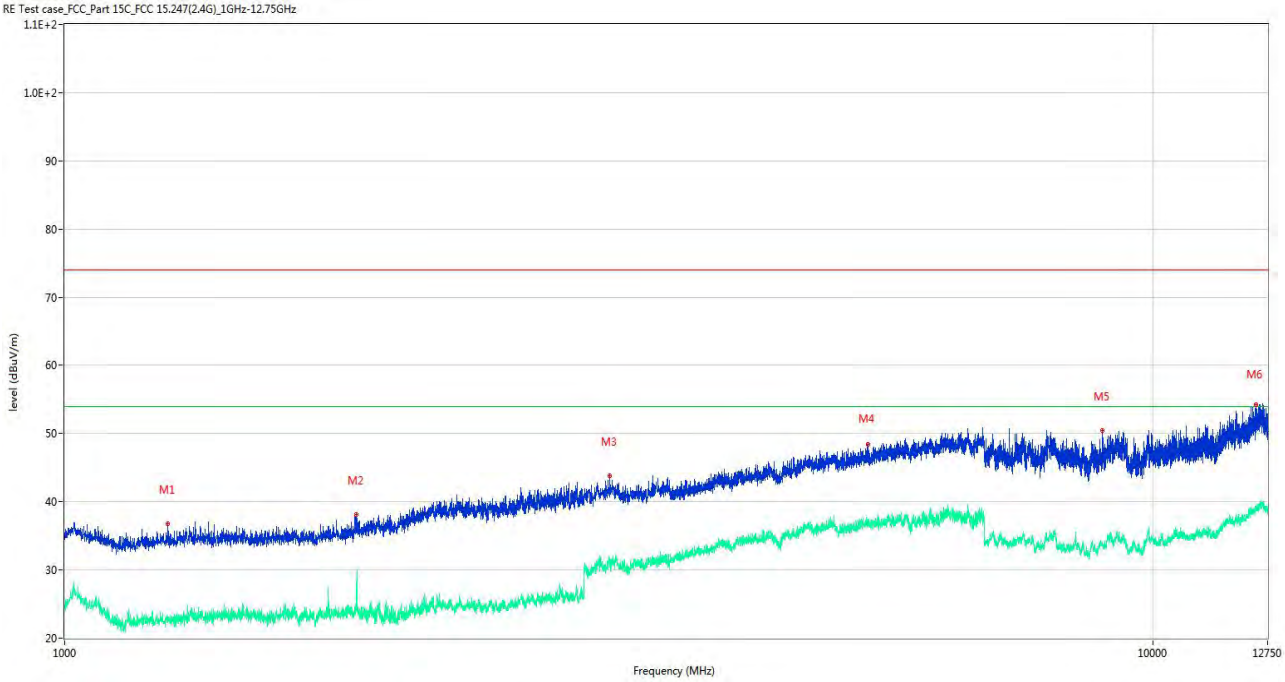
No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Over Limit (dB)	Detector	Table (o)	Height (cm)	ANT	Verdict
1**	1071.000	25.18	-14.99	54.0	-28.82	AV	248.00	150	Vertical	Pass
1	1071.000	38.00	-14.99	74.0	-36.00	Peak	248.00	150	Vertical	Pass
2**	1829.500	23.91	-14.52	54.0	-30.09	AV	183.00	150	Vertical	Pass
2	1829.500	38.19	-14.52	74.0	-35.81	Peak	183.00	150	Vertical	Pass
3**	4016.000	33.76	-4.47	54.0	-20.24	AV	302.00	150	Vertical	Pass
3	4016.000	45.81	-4.47	74.0	-28.19	Peak	302.00	150	Vertical	Pass
4**	6762.000	38.65	4.90	54.0	-15.35	AV	253.00	150	Vertical	Pass
4	6762.000	51.62	4.90	74.0	-22.38	Peak	253.00	150	Vertical	Pass
5**	9118.875	34.41	18.13	54.0	-19.59	AV	348.00	150	Vertical	Pass
5	9118.875	51.34	18.13	74.0	-22.66	Peak	348.00	150	Vertical	Pass
6**	11870.250	36.67	19.35	54.0	-17.33	AV	40.00	150	Vertical	Pass
6	11870.250	54.44	19.35	74.0	-19.56	Peak	40.00	150	Vertical	Pass

MIDDLE CHANNEL 1 GHz to 12.75 GHz, ANT H



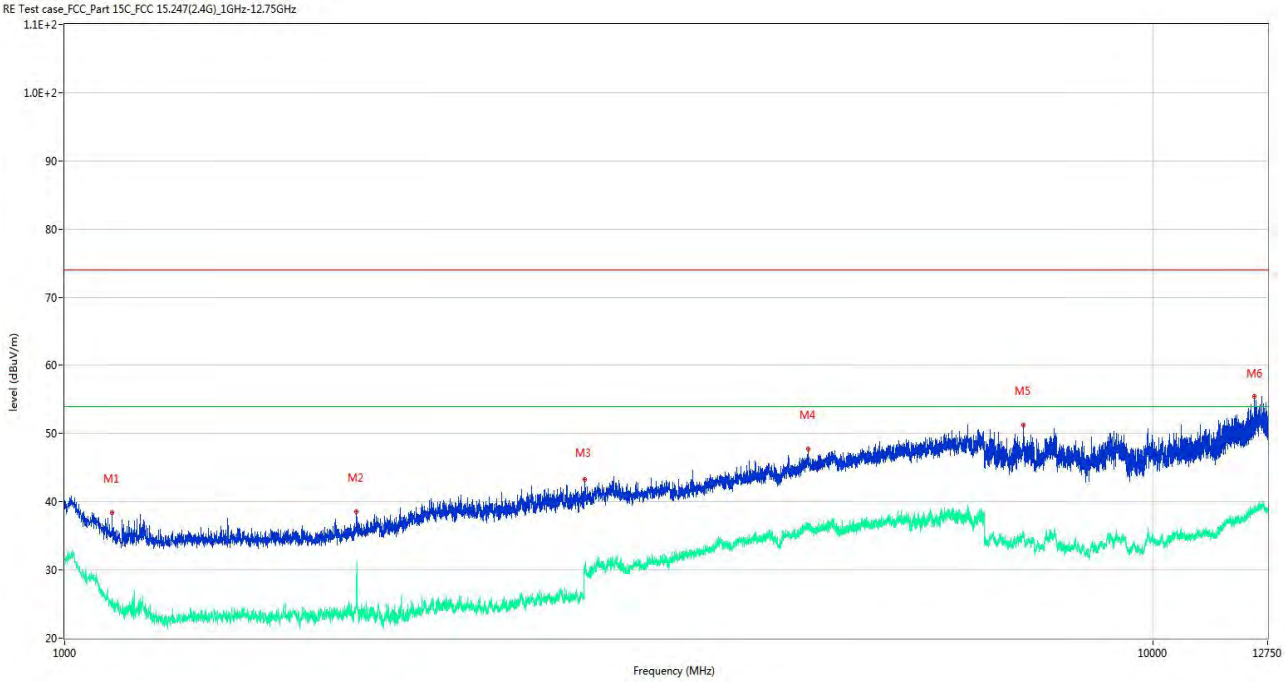
No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Over Limit (dB)	Detector	Table (o)	Height (cm)	ANT	Verdict
1**	1070.000	29.42	-15.03	54.0	-24.58	AV	233.00	150	Horizontal	Pass
1	1070.000	40.56	-15.03	74.0	-33.44	Peak	233.00	150	Horizontal	Pass
2**	1830.000	30.54	-14.53	54.0	-23.46	AV	14.00	150	Horizontal	Pass
2	1830.000	39.77	-14.53	74.0	-34.23	Peak	14.00	150	Horizontal	Pass
3**	2752.000	25.89	-8.85	54.0	-28.11	AV	326.00	150	Horizontal	Pass
3	2752.000	42.57	-8.85	74.0	-31.43	Peak	326.00	150	Horizontal	Pass
4**	5207.000	35.57	-1.09	54.0	-18.43	AV	0.00	150	Horizontal	Pass
4	5207.000	48.31	-1.09	74.0	-25.69	Peak	0.00	150	Horizontal	Pass
5**	7610.937	35.07	18.11	54.0	-18.93	AV	325.00	150	Horizontal	Pass
5	7610.937	50.98	18.11	74.0	-23.02	Peak	325.00	150	Horizontal	Pass
6**	12423.687	39.17	20.90	54.0	-14.83	AV	51.00	150	Horizontal	Pass
6	12423.687	54.58	20.90	74.0	-19.42	Peak	51.00	150	Horizontal	Pass

HIGH CHANNEL 1 GHz to 12.75 GHz, ANT V



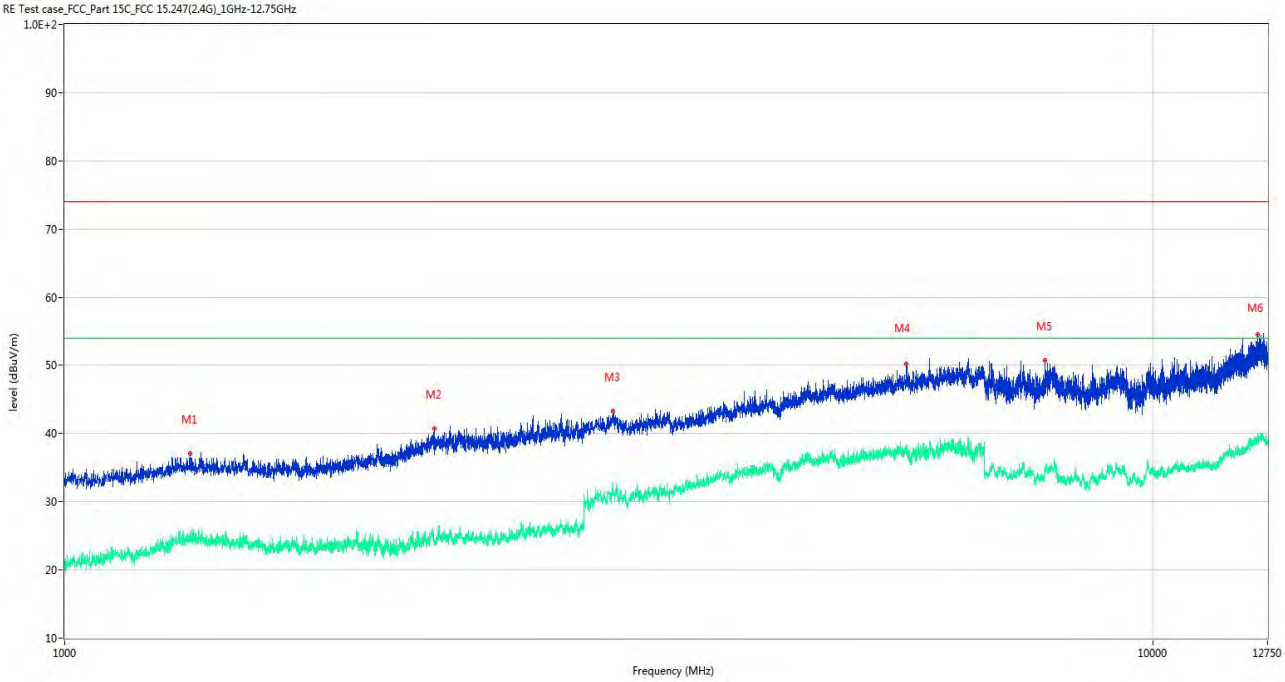
No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Over Limit (dB)	Detector	Table (o)	Height (cm)	ANT	Verdict
1**	1244.500	22.90	-14.77	54.0	-31.10	AV	296.00	150	Vertical	Pass
1	1244.500	36.82	-14.77	74.0	-37.18	Peak	296.00	150	Vertical	Pass
2**	1855.000	26.58	-13.73	54.0	-27.42	AV	257.00	150	Vertical	Pass
2	1855.000	38.09	-13.73	74.0	-35.91	Peak	257.00	150	Vertical	Pass
3**	3167.000	31.20	-6.97	54.0	-22.80	AV	292.00	150	Vertical	Pass
3	3167.000	43.79	-6.97	74.0	-30.21	Peak	292.00	150	Vertical	Pass
4**	5470.000	36.88	-0.20	54.0	-17.12	AV	252.00	150	Vertical	Pass
4	5470.000	48.40	-0.20	74.0	-25.60	Peak	252.00	150	Vertical	Pass
5**	8983.750	33.63	18.03	54.0	-20.37	AV	276.00	150	Vertical	Pass
5	8983.750	50.41	18.03	74.0	-23.59	Peak	276.00	150	Vertical	Pass
6**	12440.937	39.12	21.05	54.0	-14.88	AV	72.00	150	Vertical	Pass
6	12440.937	54.30	21.05	74.0	-19.70	Peak	72.00	150	Vertical	Pass

HIGH CHANNEL 1 GHz to 12.75 GHz, ANT H



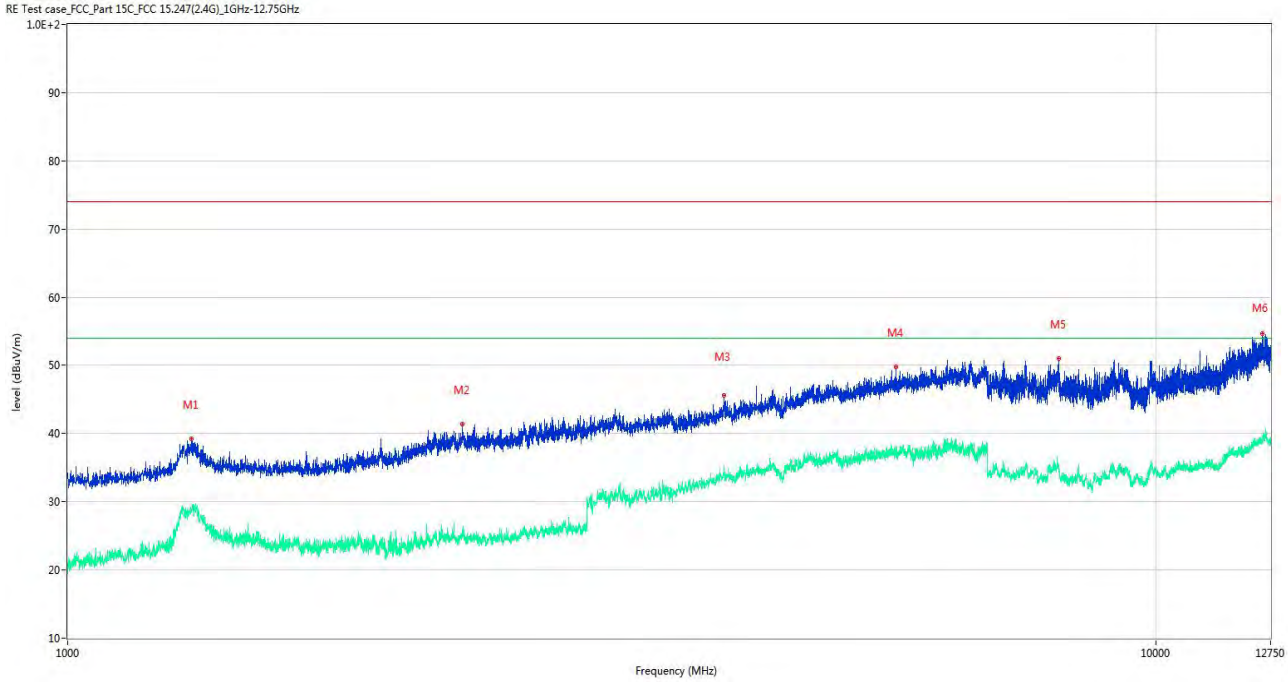
No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Over Limit (dB)	Detector	Table (o)	Height (cm)	ANT	Verdict
1**	1105.500	24.56	-15.09	54.0	-29.44	AV	289.00	150	Horizontal	Pass
1	1105.500	38.45	-15.09	74.0	-35.55	Peak	289.00	150	Horizontal	Pass
2**	1855.000	27.64	-13.73	54.0	-26.36	AV	3.00	150	Horizontal	Pass
2	1855.000	38.54	-13.73	74.0	-35.46	Peak	3.00	150	Horizontal	Pass
3**	3008.000	30.15	-7.40	54.0	-23.85	AV	168.00	150	Horizontal	Pass
3	3008.000	43.25	-7.40	74.0	-30.75	Peak	168.00	150	Horizontal	Pass
4**	4824.000	36.78	-1.52	54.0	-17.22	AV	-1.00	150	Horizontal	Pass
4	4824.000	47.80	-1.52	74.0	-26.20	Peak	-1.00	150	Horizontal	Pass
5**	7602.313	35.40	18.35	54.0	-18.60	AV	162.00	150	Horizontal	Pass
5	7602.313	51.29	18.35	74.0	-22.71	Peak	162.00	150	Horizontal	Pass
6**	12406.438	38.60	21.02	54.0	-15.40	AV	348.00	150	Horizontal	Pass
6	12406.438	55.45	21.02	74.0	-18.55	Peak	348.00	150	Horizontal	Pass

HOPPING 1 GHz to 12.75 GHz, ANT V



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Over Limit (dB)	Detector	Table (o)	Height (cm)	ANT	Verdict
1**	1305.000	25.53	-14.65	54.0	-28.47	AV	216.00	150	Vertical	Pass
1	1305.000	37.05	-14.65	74.0	-36.95	Peak	216.00	150	Vertical	Pass
2**	2185.500	24.29	-10.81	54.0	-29.71	AV	307.00	150	Vertical	Pass
2	2185.500	40.74	-10.81	74.0	-33.26	Peak	307.00	150	Vertical	Pass
3**	3189.000	31.36	-5.85	54.0	-22.64	AV	325.00	150	Vertical	Pass
3	3189.000	43.33	-5.85	74.0	-30.67	Peak	325.00	150	Vertical	Pass
4**	5935.000	37.54	0.92	54.0	-16.46	AV	181.00	150	Vertical	Pass
4	5935.000	50.15	0.92	74.0	-23.85	Peak	181.00	150	Vertical	Pass
5**	7964.562	34.83	18.37	54.0	-19.17	AV	231.00	150	Vertical	Pass
5	7964.562	50.70	18.37	74.0	-23.30	Peak	231.00	150	Vertical	Pass
6**	12484.062	38.87	20.91	54.0	-15.13	AV	360.00	150	Vertical	Pass
6	12484.062	54.50	20.91	74.0	-19.50	Peak	360.00	150	Vertical	Pass

HOPPING 1 GHz to 12.75 GHz, ANT H



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Over Limit (dB)	Detector	Table (o)	Height (cm)	ANT	Verdict
1**	1298.500	28.43	-14.63	54.0	-25.57	AV	218.00	150	Horizontal	Pass
1	1298.500	39.22	-14.63	74.0	-34.78	Peak	218.00	150	Horizontal	Pass
2**	2305.500	25.58	-10.15	54.0	-28.42	AV	218.00	150	Horizontal	Pass
2	2305.500	41.39	-10.15	74.0	-32.61	Peak	218.00	150	Horizontal	Pass
3**	4013.000	34.51	-4.32	54.0	-19.49	AV	347.00	150	Horizontal	Pass
3	4013.000	45.59	-4.32	74.0	-28.41	Peak	347.00	150	Horizontal	Pass
4**	5767.000	37.57	-0.12	54.0	-16.43	AV	356.00	150	Horizontal	Pass
4	5767.000	49.82	-0.12	74.0	-24.18	Peak	356.00	150	Horizontal	Pass
5**	8139.937	34.92	18.73	54.0	-19.08	AV	183.00	150	Horizontal	Pass
5	8139.937	50.97	18.73	74.0	-23.03	Peak	183.00	150	Horizontal	Pass
6**	12522.875	38.85	21.12	54.0	-15.15	AV	82.00	150	Horizontal	Pass
6	12522.875	54.70	21.12	74.0	-19.30	Peak	82.00	150	Horizontal	Pass

A.9 Band Edge (Restricted-band band-edge)

Pass

Note: The adjacent to the restricted frequency band (608-614MHz and 960-1240MHz) is far away the fundamental, it is noise only. Please refer to Section A.8 for test data.

ANNEX B TEST SETUP PHOTOS

Please refer the document “BL-HK1960533-AR-2.PDF”.

ANNEX C EUT EXTERNAL PHOTOS

Please refer the document “BL-HK1960533-AW-2.PDF”.

ANNEX D EUT INTERNAL PHOTOS

Please refer the document “BL-HK1960533-AI-2.PDF”.

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