

FCC

RF

TEST REPORT

ISSUED BY
Shenzhen BALUN Technology Co., Ltd.



FOR
pointing device

ISSUED TO
Shenzhen Chang Ju Technology Co., Ltd

A-513, No.168, Baoyuan Rd., BaoAn District, Shenzhen City, China



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(Engineer)

Date: Dec 06, 2019

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(Chief Engineer)

Date: Dec 06, 2019

Report No.: BL-SZ1990087-402

EUT Name: pointing device

Model Name: UWB-03S

Brand Name: N/A

Test Standard: 47 CFR Part 15 Subpart F

FCC ID: 2AUJG-UWB-03S

Test Conclusion: Pass

Test Date: Sep. 09, 2019 ~ Nov. 30, 2019

Date of Issue: Dec. 06, 2019

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Revision History

<u>Version</u>	<u>Issue Date</u>	<u>Revisions</u>
<u>Rev. 01</u>	<u>Dec. 06, 2019</u>	<u>Initial Issue</u>

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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

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°C to 25°C
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 v1.2.
- (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

Applicant	Shenzhen Chang Ju Technology Co., Ltd
Address	A-513, No.168, Baoyuan Rd., BaoAn District, Shenzhen City, China

2.2 Manufacturer

Manufacturer	N/A
Address	N/A

2.3 Factory Information

Manufacturer	N/A
Address	N/A

2.4 General Description for Equipment under Test (EUT)

EUT Name	pointing device
Under Test Model Name	UWB-03S
Series Model Name	N/A
Description of Model name differentiation	N/A
Hardware Version	UWB-03S
Software Version	N/A
Dimensions (Approx.)	N/A
Weight (Approx.)	N/A

2.5 Technical Information

Network and Wireless connectivity	WIFI 802.11b, 802.11g, 802.11n UWB
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The requirement for the following technical information of the EUT was tested in this report:

Modulation Type	UWB
Product Type	☐ Mobile ☐ Portable ☒ Fix Location
Operating Frequency	3.5GHz-6.5GHz
Antenna Type	Dipole Antenna
Antenna Gain	2 dBi

All channel was listed on the following table:

Channel number	Centre Frequency (MHz)	Bandwidth (MHz)
1	3494.4	499.2
2	3993.6	499.2
3	4492.8	499.2
5	6489.6	499.2

Note: The above EUT information in section 2.4 and 2.6 was declared by manufacturer and for more detailed features description, please refer to the manufacturer's specifications or user's manual.

3 SUMMARY OF TEST RESULTS

3.1 Test Standards

No.	Identity	Document Title
1	47 CFR Part 15, Subpart F (10-1-18 Edition)	Ultra - Wideband Operation
2	ANSI C63.10-2013	American National Standard for Testing Unlicensed Wireless Devices

3.2 Verdict

No.	Description	FCC Part No.	Test Result	Verdict
1	Antenna Requirement	15.203	--	Pass ^{Note}
2	Conducted Emission	15.207	ANNEX A.1	Pass
3	UWB Bandwidth	15.517(b)	ANNEX A.2	Pass
4	Radiated Emissions	15.517(c)/15.209	ANNEX A.3	Pass
5	Radiated Emissions in GPS Bands	15.517(d)	ANNEX A.4	Pass
6	Peak Emissions within a 50 MHz Bandwidth	15.517(e)	ANNEX A.5	Pass

Note: 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°C to +25°C
Working Voltage of the EUT	NV (Normal Voltage)	5.2 V

4.2 Test Equipment List

Description	Manufacturer	Model	Serial No.	Cal. Date	Cal. Due
EMI Receiver	KEYSIGHT	N9010B	MY57110309	2019.06.13	2020.06.12
LISN	SCHWARZBECK	NSLK 8127	8127-687	2019.07.04	2020.07.03
Shielded Enclosure	YiHeng Electronic Co., Ltd	3.4m*3.1m*2.8m	N/A	2018.08.16	2021.08.15
EMI Receiver	KEYSIGHT	N9038A	MY53220118	2019.10.29	2020.10.28
EMI Receiver	ROHDE&SCHWARZ	ESRP	101036	2019.06.13	2020.06.12
Spectrum Analyzer	ROHDE&SCHWARZ	FSV-40	103118	2019.06.13	2020.06.12
Test Antenna-Loop(9 kHz-30 MHz)	SCHWARZBECK	FMZB 1519	1519-037	2019.10.29	2021.10.28
Test Antenna-Bi-Log(30 MHz-1 GHz)	SCHWARZBECK	VULB 9163	9163-624	2018.08.22	2020.08.21
Test Antenna-Horn(1-18 GHz)	SCHWARZBECK	BBHA 9120D	9120D-1148	2018.07.11	2020.07.10
Test Antenna-Horn (18-40 GHz)	A-INFO	LB-180400KF	J211060273	2019.01.06	2021.01.05
Anechoic Chamber	RAINFORD	9m*6m*6m	N/A	2017.02.21	2020.02.20
Anechoic Chamber	EMC Electronic Co., Ltd	20.10*11.60*7.35m	N/A	2018.08.08	2021.08.07
Test Software	BALUN	BL410_E	V19.918	--	--

4.3 Measurement Uncertainty

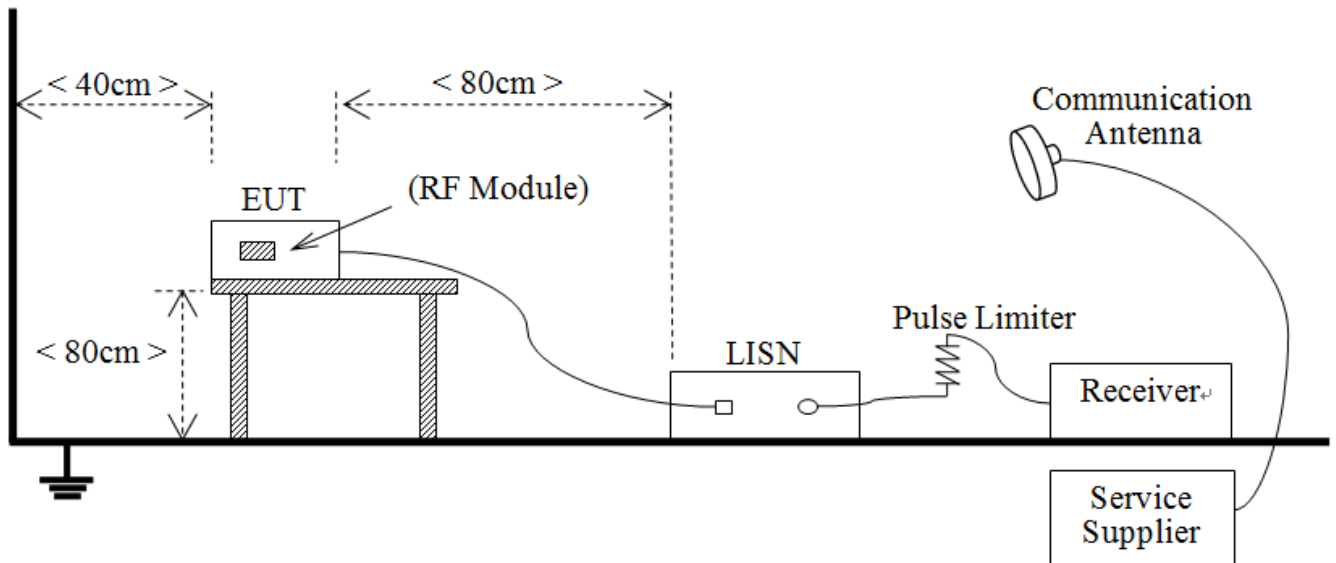
The following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2.

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

Measurement	Value
Conducted emissions (9 kHz-30 MHz)	2.96 dB
Radiated emissions (9 kHz-30 MHz)	3.76 dB
Radiated emissions (30 MHz-1 GHz)	3.66 dB
Radiated emissions (1 GHz-18 GHz)	5.57 dB
Radiated emissions (18 GHz-40 GHz)	6.12 dB

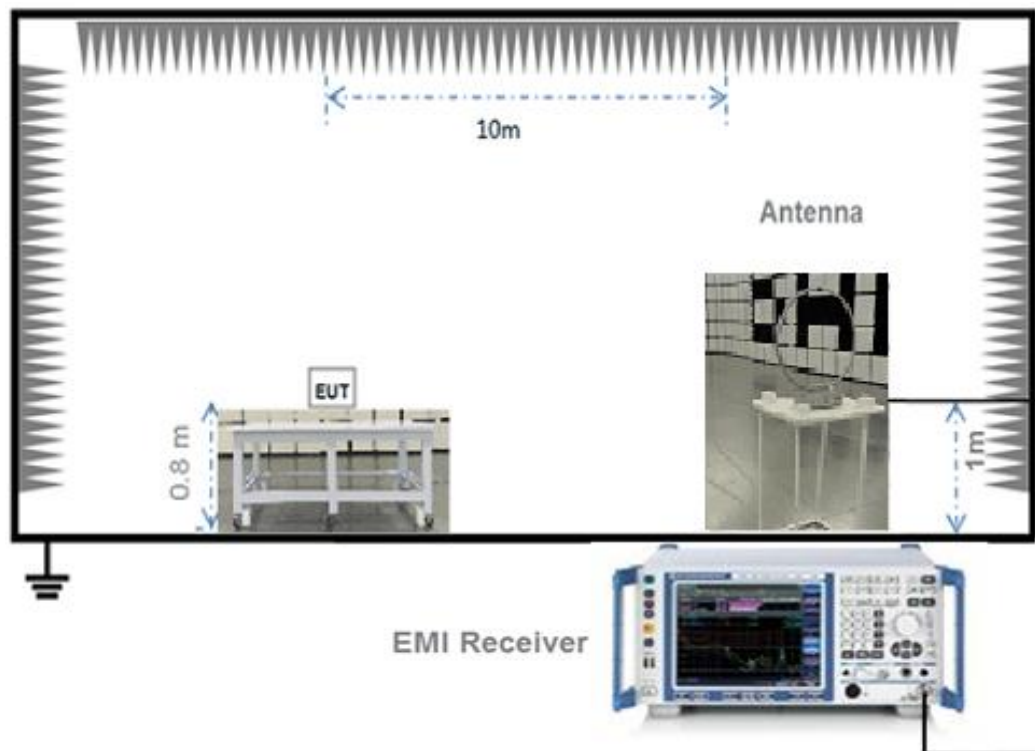
4.4 Description of Test Setup

4.4.1 For AC Power Supply Port Test



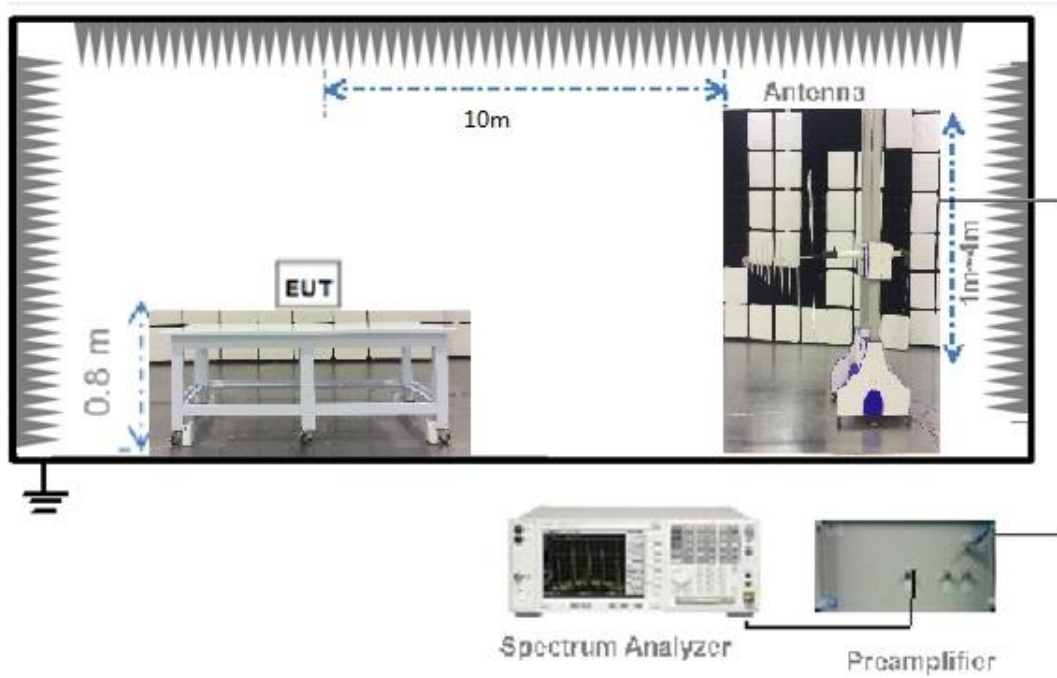
(Diagram 1)

4.4.2 For Radiated Test (Below 30 MHz)



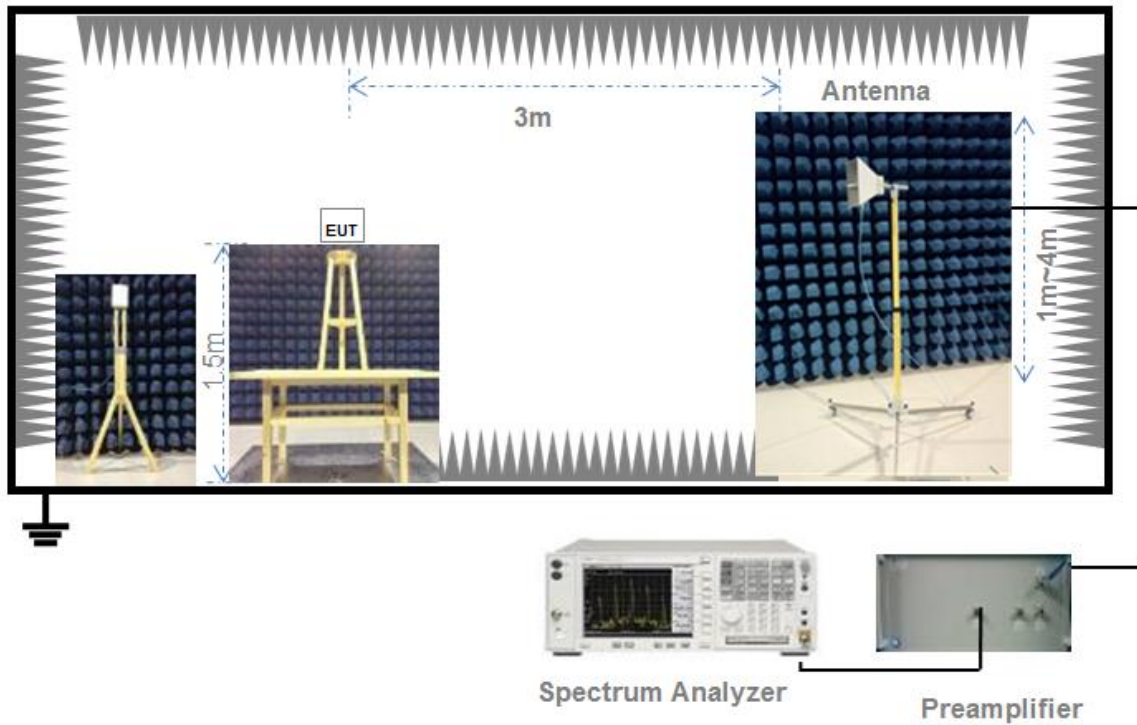
(Diagram 2)

4.4.3 For Radiated Test (30 MHz-1 GHz)



(Diagram 3)

4.4.4 For Radiated Test (Above 1 GHz)



(Diagram 4)

5 TEST ITEMS

5.1 Antenna Requirements

5.1.1 Relevant Standards

FCC §15.203 & 15.247(b)

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.	An embedded-in antenna design is used.

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 Conducted Emission

5.2.1 Limit

FCC §15.207

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 50 μ H/50 Ω line impedance stabilization network (LISN).

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

5.2.2 Test Setup

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

5.2.3 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.

5.2.4 Test Result

Please refer to ANNEX A.1.

5.3 UWB Bandwidth

5.3.1 Limit

FCC §15.503(d)

Ultra-wideband (UWB) transmitter. An intentional radiator that, at any point in time, has a fractional bandwidth equal to or greater than 0.20 or has a UWB bandwidth equal to or greater than 500 MHz, regardless of the fractional bandwidth.

FCC §15.517(b)

The UWB bandwidth of a UWB system operating under the provisions of this section must be contained between 3100 MHz and 10,600 MHz.

5.3.2 Test Setup

See section 4.4.4 for test setup description for the antenna port. The photo of test setup please refer to ANNEX B.

5.3.3 Test Procedure

Use the following spectrum analyzer settings:

RBW = 1 MHz

VBW $\geq$ 3 MHz

Sweep = auto

Detector function = RMS

Trace = max hold

5.3.4 Test Result

Please refer to ANNEX A.2.

5.4 Radiated Emissions

5.4.1 Limit

FCC §15.517(c)

The radiated emissions at or below 960 MHz from a device operating under the provisions of this section shall not exceed the emission levels in §15.209. The radiated emissions above 960 MHz from a device operating under the provisions of this section shall not exceed the following average limits when measured using a resolution bandwidth of 1 MHz:

Frequency in MHz	EIPR in dBm
960–1610	-75.3
1610–1990	-53.3
1990–3100	-51.3
3100–10600	-41.3
Above 10600	-51.3

FCC §15.209

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 ($\mu\text{V/m}$)	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

5.4.2 Test Setup

See section 4.4.2 to 4.4.4 for test setup description for the antenna port. The photo of test setup please refer to ANNEX B.

5.4.3 Test Procedure

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. The height of the antenna was varied from 1 to 4 meters. For each suspected emissions, the antenna tower was scan (from 1m to 4m) and the the turntables was turned (from 0° to 360°) to find the maximum reading.

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:

9 kHz to 960 MHz:

Span = wide enough to fully capture the emission being measured

RBW = 100 kHz

VBW = 300 kHz

Sweep time = auto

Detector function = peak (Margin which is less than 3 dB will be repeated one by one using the quasi-peak)

Trace = max hold

960 MHz to 40 GHz:

Span = wide enough to fully capture the emission being measured

RBW = 1 MHz

VBW = 3 MHz

Sweep time = 1s

Detector function = RMS

Trace = max hold

5.4.4 Test Result

Please refer to ANNEX A.3.

5.5 Radiated Emissions in GPS Bands

5.5.1 Limit

FCC §15.517(d)

In addition to the radiated emission limits specified in the table in paragraph (c) of this section, UWB transmitters operating under the provisions of this section shall not exceed the following average limits when measured using a resolution bandwidth of no less than 1 kHz:

Frequency in MHz	EIPR in dBm
1164–1240	-85.3
1559–1610	-85.3

5.5.2 Test Setup

See section 4.4.4 for test setup description for the antenna port. The photo of test setup please refer to ANNEX B.

5.5.3 Test Procedure

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. The height of the antenna was varied from 1 to 4 meters. For each suspected emissions, the antenna tower was scan (from 1m to 4m) and the the turntables was turned (from 0° to 360°) to find the maximum reading.

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 kHz

VBW = 3 kHz

Sweep time = 1s

Detector function = RMS

Trace = max hold

5.5.4 Test Result

Please refer to ANNEX A.4.

5.6 Peak Emissions within a 50MHz Bandwidth

5.6.1 Limit

FCC §15.517(e)

There is a limit on the peak level of the emissions contained within a 50 MHz bandwidth centered on the frequency at which the highest radiated emission occurs, fM. That limit is 0 dBm EIRP. It is acceptable to employ a different resolution bandwidth, and a correspondingly different peak emission limit, following the procedures described in §15.521.

It is acceptable to employ an RBW of less than 50 MHz (but no less than 1 MHz) when performing the required peak power measurements. When this approach is employed, the peak emissions EIRP limit (0 dBm / 50 MHz) is converted to a limit commensurate with the RBW by employing a $[20 \log (RBW/50 \text{ MHz})]$ relationship. For example, the peak power limit could be expressed in a 1 MHz bandwidth as follows in Equation :

$$\text{EIRP}_{1 \text{ MHz}} = \text{EIRP}_{50 \text{ MHz}} + 20 \log (1 \text{ MHz} / 50 \text{ MHz}) = 0 \text{ dBm} + (- 34 \text{ dBm}) = -34 \text{ dBm}$$

5.6.2 Test Setup

See section 4.4.4 for test setup description for the antenna port. The photo of test setup please refer to ANNEX B.

5.6.3 Test Procedure

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. The height of the antenna was varied from 1 to 4 meters. For each suspected emissions, the antenna tower was scan (from 1m to 4m) and the the turntables was turned (from 0° to 360°) to find the maximum reading.

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:

Use the following spectrum analyzer settings:

Span = wide enough to fully capture the emission being measured

RBW = 1 MHz

VBW = 3 MHz

Sweep = auto

Detector function = peak

Trace = max hold

5.6.4 Test Result

Please refer to ANNEX A.5.

ANNEX A TEST RESULT

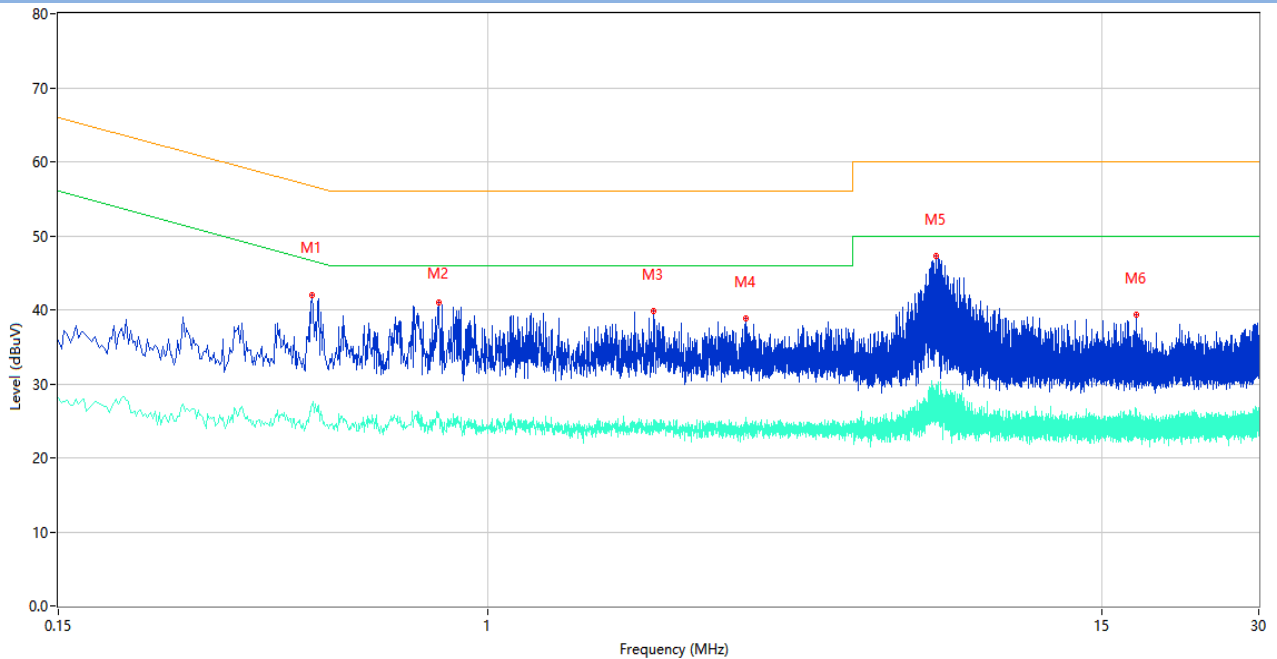
A.1 Conducted Emission

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

Test Data and Plots

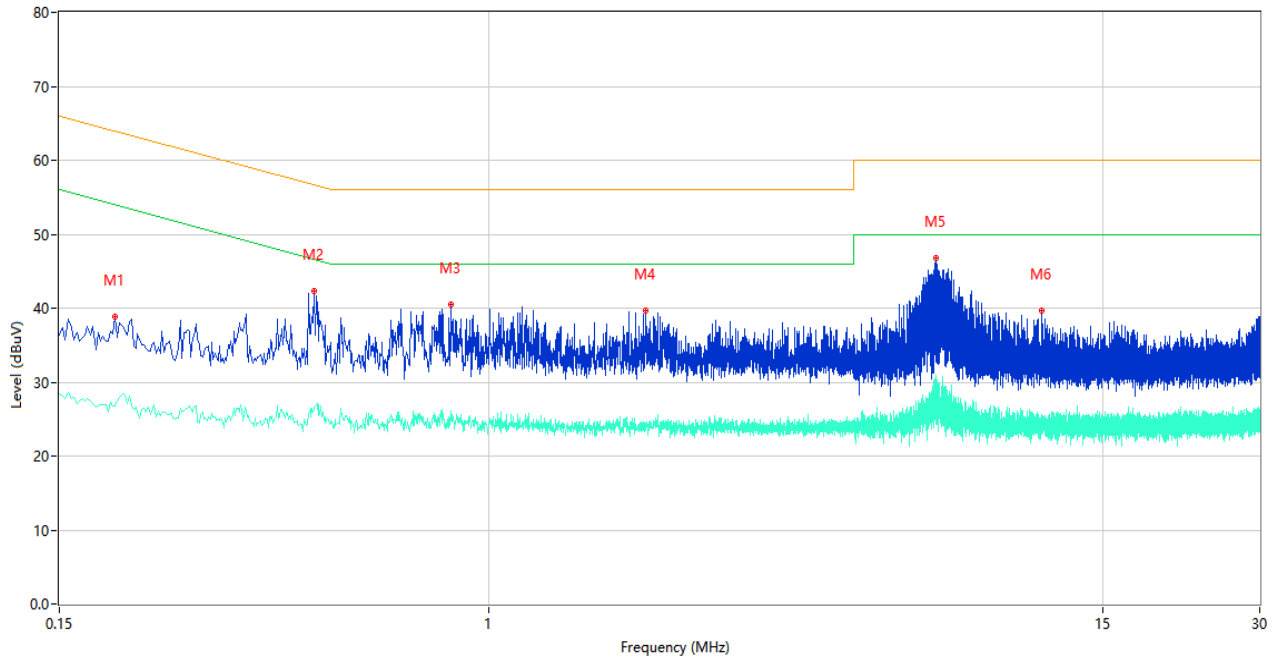
CH1

PHASE L



No.	Frequency (MHz)	Results (dBuV)	Factor (dB)	Limit (dBuV)	Over Limit (dB)	Detector	Line	Verdict
1	0.460	42.00	10.30	56.69	-14.69	Peak	L	Pass
1**	0.460	27.05	10.30	46.69	-19.64	AV	L	Pass
2	0.804	41.01	10.27	56.00	-14.99	Peak	L	Pass
2**	0.804	25.51	10.27	46.00	-20.49	AV	L	Pass
3	2.074	39.77	10.26	56.00	-16.23	Peak	L	Pass
3**	2.074	25.18	10.26	46.00	-20.82	AV	L	Pass
4	3.120	38.79	10.28	56.00	-17.21	Peak	L	Pass
4**	3.120	25.39	10.28	46.00	-20.61	AV	L	Pass
5	7.238	47.23	10.35	60.00	-12.77	Peak	L	Pass
5**	7.238	28.03	10.35	50.00	-21.97	AV	L	Pass
6	17.488	39.31	10.48	60.00	-20.69	Peak	L	Pass
6**	17.488	24.42	10.48	50.00	-25.58	AV	L	Pass

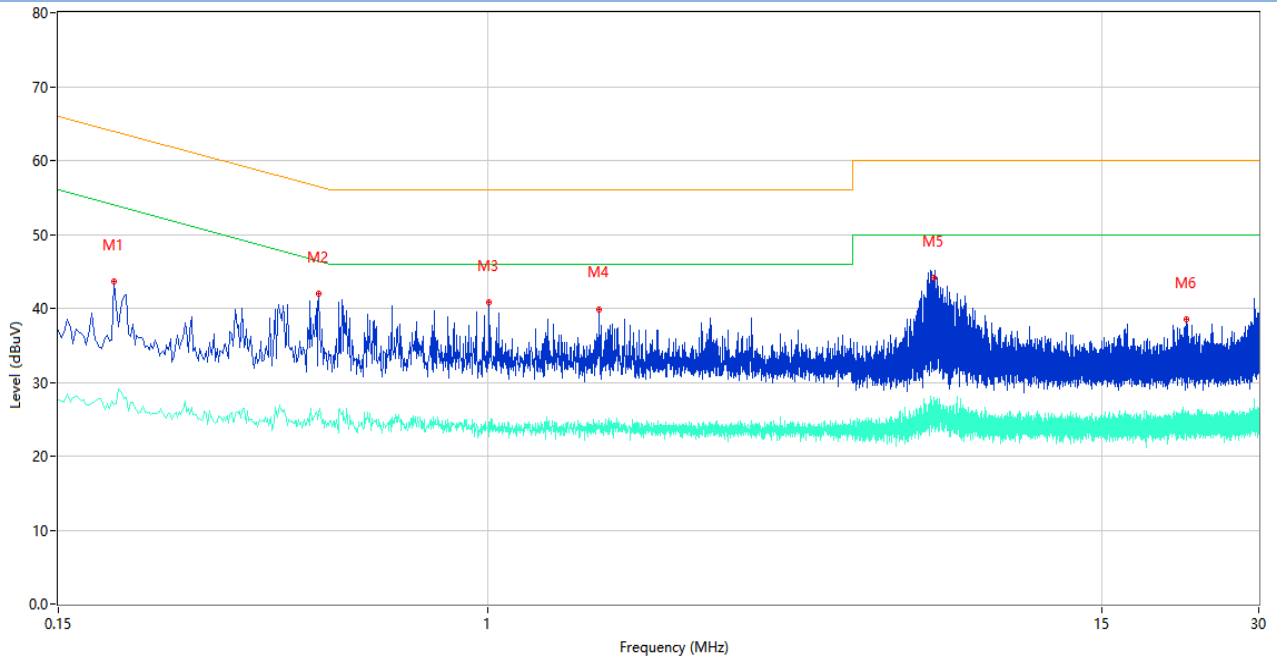
PHASE N



No.	Frequency (MHz)	Results (dBuV)	Factor (dB)	Limit (dBuV)	Over Limit (dB)	Detector	Line	Verdict
1	0.192	38.79	10.38	63.95	-25.16	Peak	N	Pass
1**	0.192	26.76	10.38	53.95	-27.19	AV	N	Pass
2	0.462	42.29	10.30	56.66	-14.37	Peak	N	Pass
2**	0.462	26.44	10.30	46.66	-20.22	AV	N	Pass
3	0.844	40.43	10.25	56.00	-15.57	Peak	N	Pass
3**	0.844	26.16	10.25	46.00	-19.84	AV	N	Pass
4	1.998	39.67	10.26	56.00	-16.33	Peak	N	Pass
4**	1.998	23.39	10.26	46.00	-22.61	AV	N	Pass
5	7.176	46.77	10.35	60.00	-13.23	Peak	N	Pass
5**	7.176	28.88	10.35	50.00	-21.12	AV	N	Pass
6	11.436	39.72	10.38	60.00	-20.28	Peak	N	Pass
6**	11.436	24.02	10.38	50.00	-25.98	AV	N	Pass

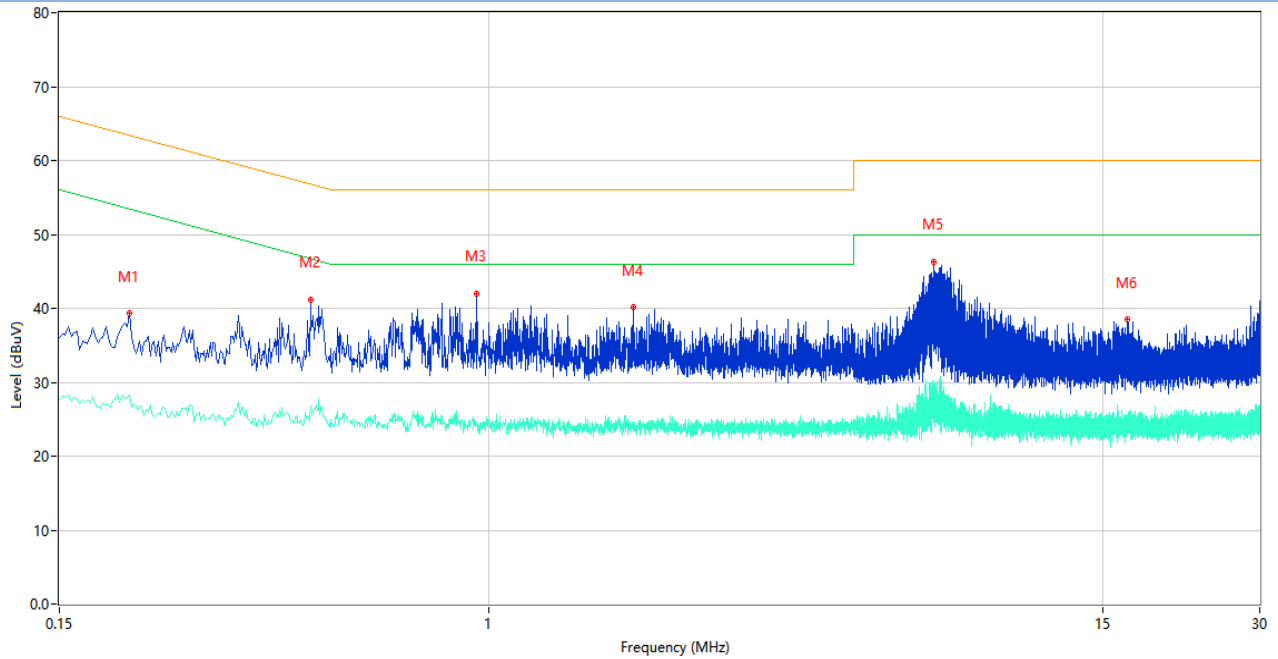
CH2

PHASE L



No.	Frequency (MHz)	Results (dBuV)	Factor (dB)	Limit (dBuV)	Over Limit (dB)	Detector	Line	Verdict
1	0.192	43.66	10.38	63.95	-20.29	Peak	L	Pass
1**	0.192	26.89	10.38	53.95	-27.06	AV	L	Pass
2	0.474	41.96	10.30	56.44	-14.48	Peak	L	Pass
2**	0.474	25.77	10.30	46.44	-20.67	AV	L	Pass
3	1.004	40.78	10.23	56.00	-15.22	Peak	L	Pass
3**	1.004	24.64	10.23	46.00	-21.36	AV	L	Pass
4	1.632	39.91	10.26	56.00	-16.09	Peak	L	Pass
4**	1.632	23.88	10.26	46.00	-22.12	AV	L	Pass
5	7.160	44.11	10.34	60.00	-15.89	Peak	L	Pass
5**	7.160	27.87	10.34	50.00	-22.13	AV	L	Pass
6	21.836	38.53	10.59	60.00	-21.47	Peak	L	Pass
6**	21.836	25.02	10.59	50.00	-24.98	AV	L	Pass

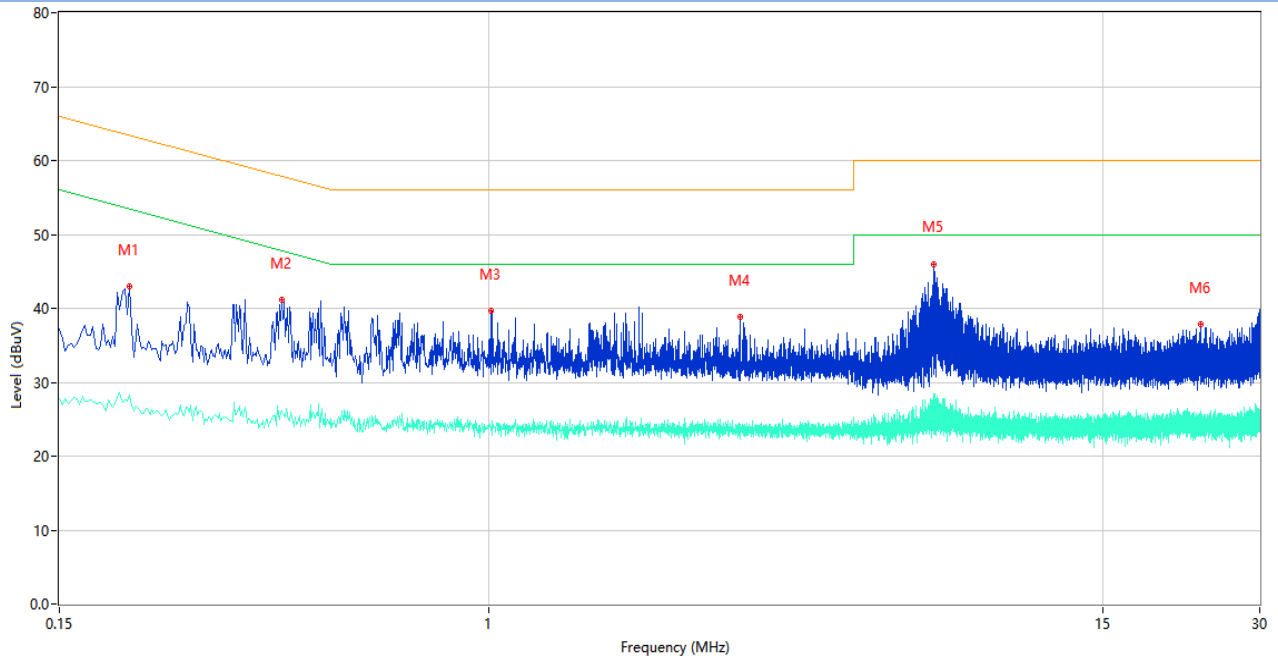
PHASE N



No.	Frequency (MHz)	Results (dBuV)	Factor (dB)	Limit (dBuV)	Over Limit (dB)	Detector	Line	Verdict
1	0.204	39.34	10.38	63.45	-24.11	Peak	N	Pass
1**	0.204	28.19	10.38	53.45	-25.26	AV	N	Pass
2	0.454	41.23	10.30	56.80	-15.57	Peak	N	Pass
2**	0.454	26.75	10.30	46.80	-20.05	AV	N	Pass
3	0.948	42.05	10.24	56.00	-13.95	Peak	N	Pass
3**	0.948	24.25	10.24	46.00	-21.75	AV	N	Pass
4	1.886	40.24	10.25	56.00	-15.76	Peak	N	Pass
4**	1.886	24.31	10.25	46.00	-21.69	AV	N	Pass
5	7.116	46.33	10.34	60.00	-13.67	Peak	N	Pass
5**	7.116	26.97	10.34	50.00	-23.03	AV	N	Pass
6	16.692	38.57	10.45	60.00	-21.43	Peak	N	Pass
6**	16.692	25.50	10.45	50.00	-24.50	AV	N	Pass

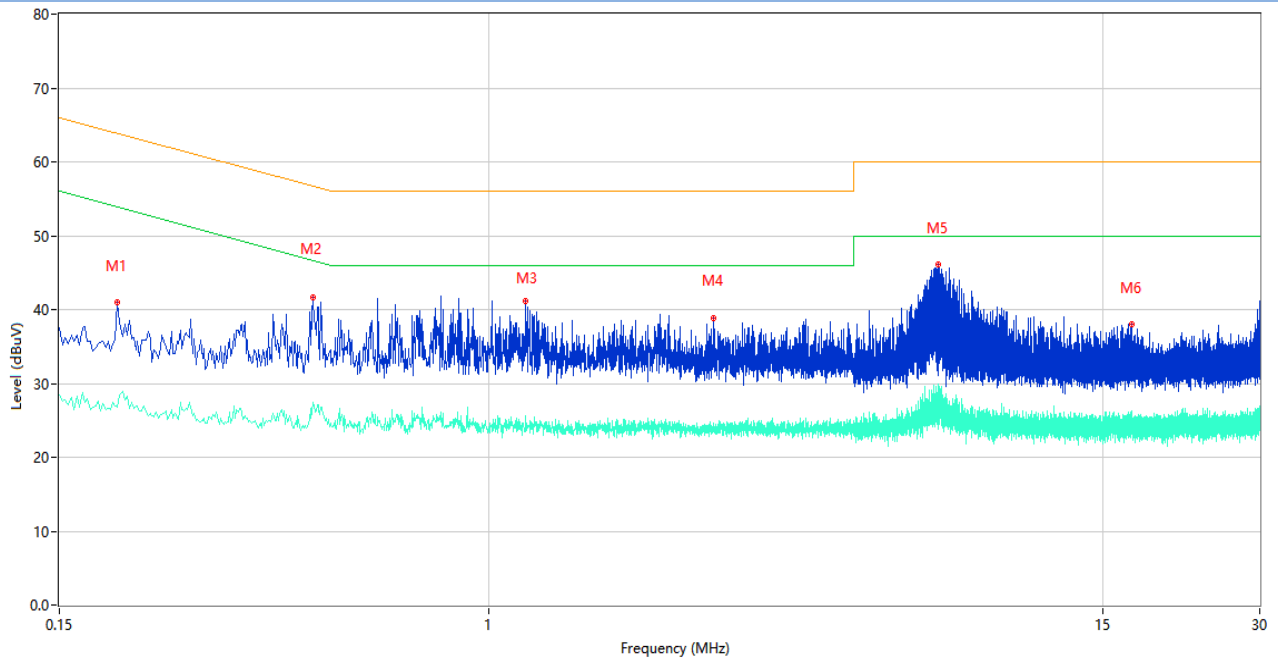
CH3

PHASE L



No.	Frequency (MHz)	Results (dBuV)	Factor (dB)	Limit (dBuV)	Over Limit (dB)	Detector	Line	Verdict
1	0.204	42.90	10.38	63.45	-20.55	Peak	L	Pass
1**	0.204	28.34	10.38	53.45	-25.11	AV	L	Pass
2	0.400	41.17	10.31	57.85	-16.68	Peak	L	Pass
2**	0.400	26.12	10.31	47.85	-21.73	AV	L	Pass
3	1.006	39.70	10.23	56.00	-16.30	Peak	L	Pass
3**	1.006	23.88	10.23	46.00	-22.12	AV	L	Pass
4	3.032	38.79	10.28	56.00	-17.21	Peak	L	Pass
4**	3.032	24.10	10.28	46.00	-21.90	AV	L	Pass
5	7.110	45.94	10.34	60.00	-14.06	Peak	L	Pass
5**	7.110	28.43	10.34	50.00	-21.57	AV	L	Pass
6	23.154	37.83	10.62	60.00	-22.17	Peak	L	Pass
6**	23.154	24.28	10.62	50.00	-25.72	AV	L	Pass

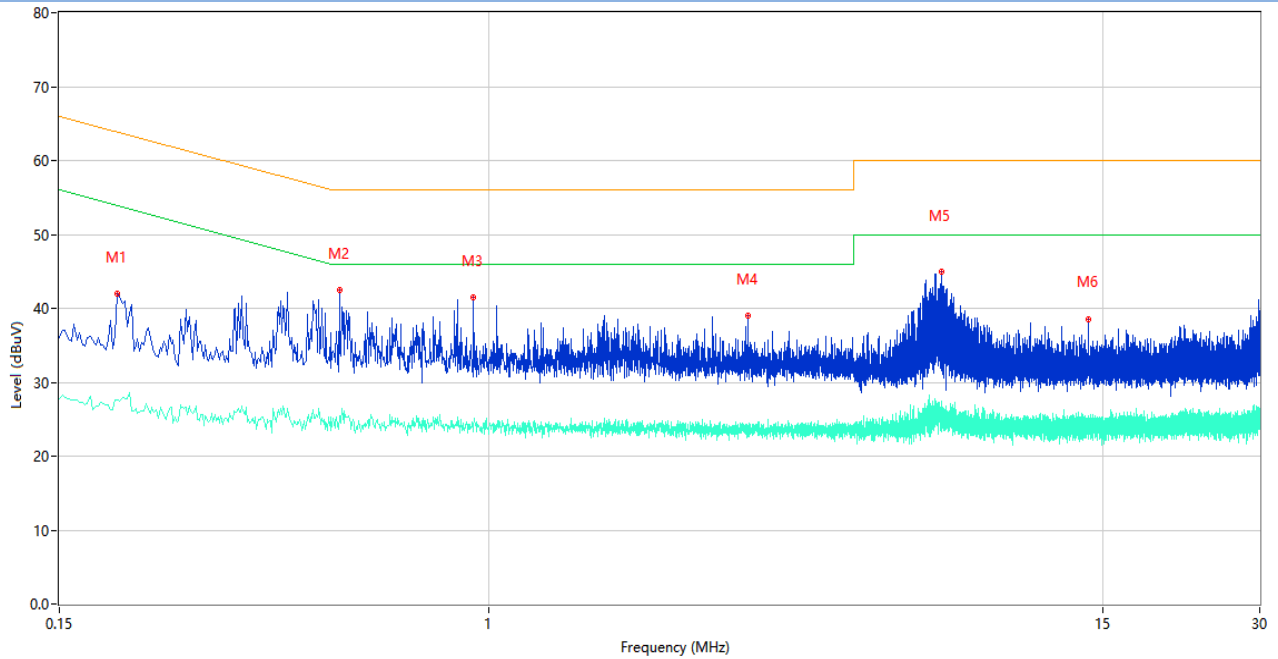
PHASE N



No.	Frequency (MHz)	Results (dBuV)	Factor (dB)	Limit (dBuV)	Over Limit (dB)	Detector	Line	Verdict
1	0.194	40.94	10.38	63.86	-22.92	Peak	N	Pass
1**	0.194	26.85	10.38	53.86	-27.01	AV	N	Pass
2	0.460	41.71	10.30	56.69	-14.98	Peak	N	Pass
2**	0.460	27.36	10.30	46.69	-19.33	AV	N	Pass
3	1.174	41.16	10.24	56.00	-14.84	Peak	N	Pass
3**	1.174	25.61	10.24	46.00	-20.39	AV	N	Pass
4	2.694	38.86	10.28	56.00	-17.14	Peak	N	Pass
4**	2.694	24.57	10.28	46.00	-21.43	AV	N	Pass
5	7.248	46.19	10.35	60.00	-13.81	Peak	N	Pass
5**	7.248	29.88	10.35	50.00	-20.12	AV	N	Pass
6	17.082	38.08	10.46	60.00	-21.92	Peak	N	Pass
6**	17.082	24.45	10.46	50.00	-25.55	AV	N	Pass

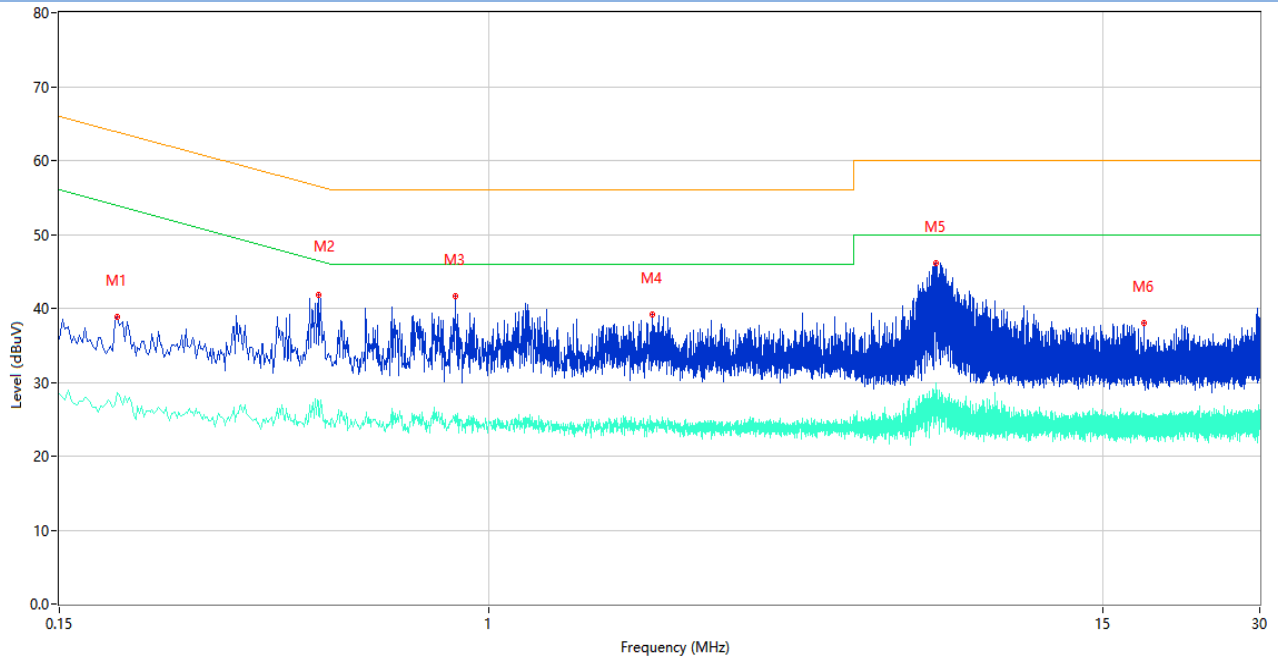
CH5

PHASE L



No.	Frequency (MHz)	Results (dBuV)	Factor (dB)	Limit (dBuV)	Over Limit (dB)	Detector	Line	Verdict
1	0.194	42.02	10.38	63.86	-21.84	Peak	L	Pass
1**	0.194	27.61	10.38	53.86	-26.25	AV	L	Pass
2	0.516	42.41	10.30	56.00	-13.59	Peak	L	Pass
2**	0.516	25.49	10.30	46.00	-20.51	AV	L	Pass
3	0.934	41.42	10.24	56.00	-14.58	Peak	L	Pass
3**	0.934	24.48	10.24	46.00	-21.52	AV	L	Pass
4	3.132	38.94	10.28	56.00	-17.06	Peak	L	Pass
4**	3.132	24.19	10.28	46.00	-21.81	AV	L	Pass
5	7.364	44.88	10.34	60.00	-15.12	Peak	L	Pass
5**	7.364	24.62	10.34	50.00	-25.38	AV	L	Pass
6	14.098	38.55	10.40	60.00	-21.45	Peak	L	Pass
6**	14.098	23.37	10.40	50.00	-26.63	AV	L	Pass

PHASE N



No.	Frequency (MHz)	Results (dBuV)	Factor (dB)	Limit (dBuV)	Over Limit (dB)	Detector	Line	Verdict
1	0.194	38.78	10.38	63.86	-25.08	Peak	N	Pass
1**	0.194	28.66	10.38	53.86	-25.20	AV	N	Pass
2	0.470	41.76	10.30	56.51	-14.75	Peak	N	Pass
2**	0.470	27.37	10.30	46.51	-19.14	AV	N	Pass
3	0.860	41.58	10.24	56.00	-14.42	Peak	N	Pass
3**	0.860	25.61	10.24	46.00	-20.39	AV	N	Pass
4	2.056	39.10	10.27	56.00	-16.90	Peak	N	Pass
4**	2.056	24.68	10.27	46.00	-21.32	AV	N	Pass
5	7.170	46.10	10.35	60.00	-13.90	Peak	N	Pass
5**	7.170	29.29	10.35	50.00	-20.71	AV	N	Pass
6	18.024	38.04	10.49	60.00	-21.96	Peak	N	Pass
6**	18.024	23.82	10.49	50.00	-26.18	AV	N	Pass

A.2 UWB Bandwidth

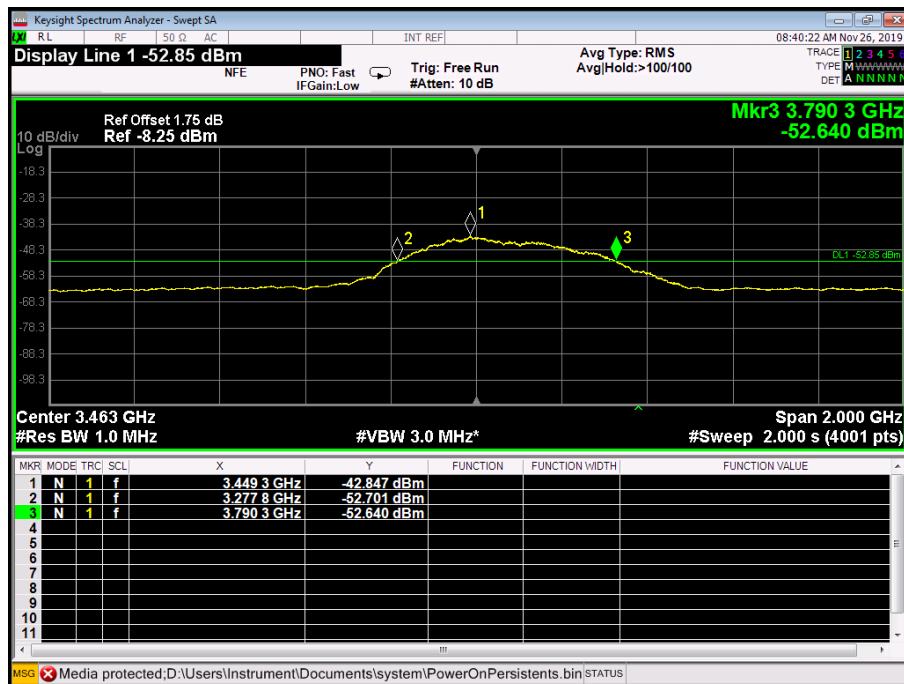
CH1

Test Data

F _L (MHz)	F _H (MHz)	Fractional bandwidth $2*(F_H-F_L)/(F_H+F_L)$	UWB Bandwidth (MHz)	Limit (MHz)	Verdict
3277.8	3790.3	0.15	512.50	Fractional bandwidth ≥ 0.2 or UWB Bandwidth ≥ 500 MHz	Pass

Test plots

UWB Bandwidth



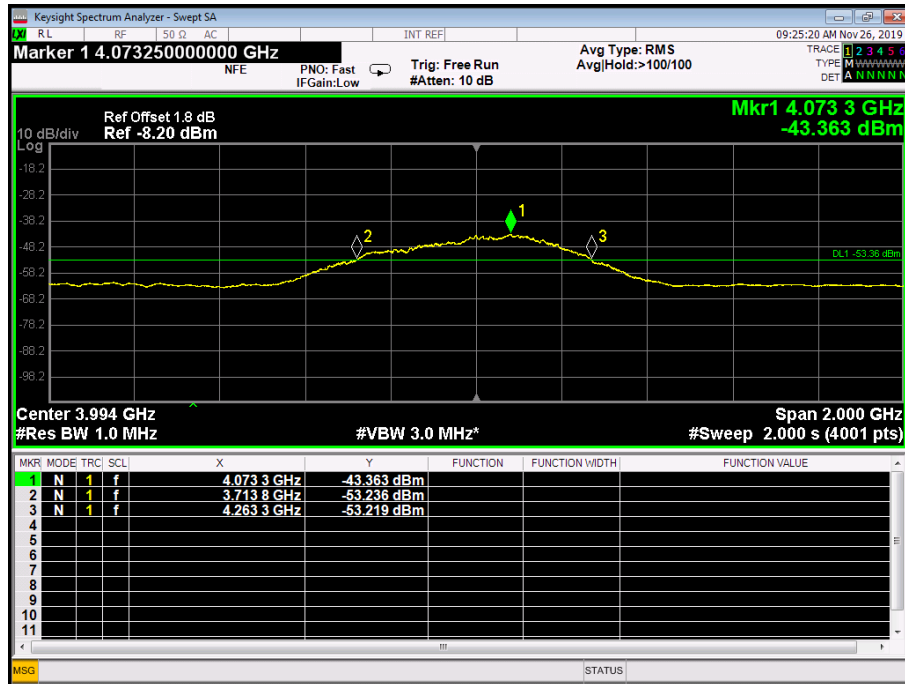
CH2

Test Data

F_L (MHz)	F_H (MHz)	Fractional bandwidth $2*(F_H-F_L)/(F_H+F_L)$	UWB Bandwidth (MHz)	Limit (MHz)	Verdict
3713.8	4263.3	0.14	549.50	Fractional bandwidth ≥ 0.2 or UWB Bandwidth ≥ 500 MHz	Pass

Test plots

UWB Bandwidth



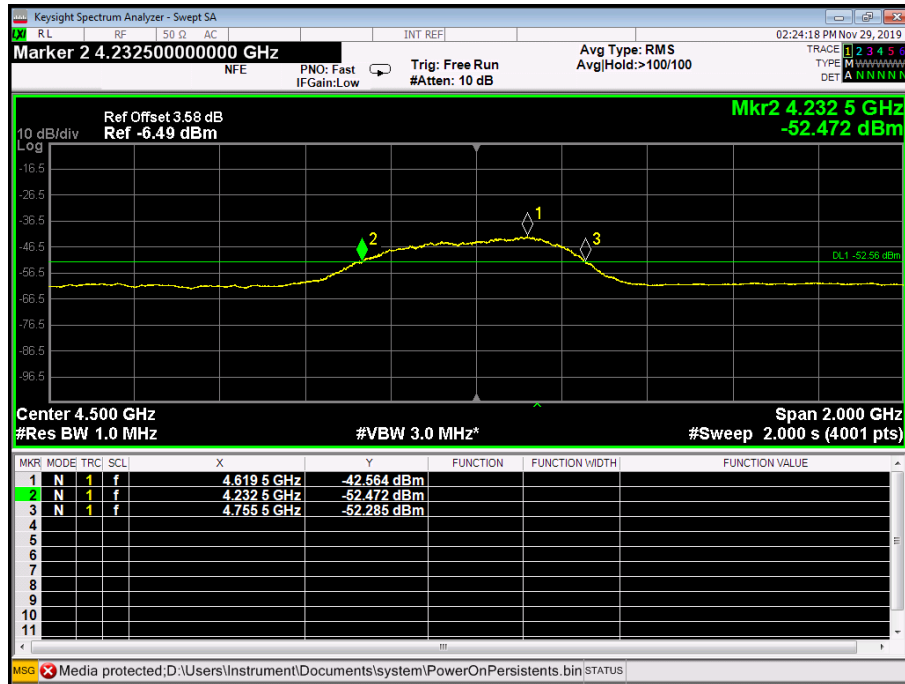
CH3

Test Data

F_L (MHz)	F_H (MHz)	Fractional bandwidth $2*(F_H-F_L)/(F_H+F_L)$	UWB Bandwidth (MHz)	Limit (MHz)	Verdict
4232.5	4755.5	0.12	523.00	Fractional bandwidth ≥ 0.2 or UWB Bandwidth ≥ 500 MHz	Pass

Test plots

UWB Bandwidth



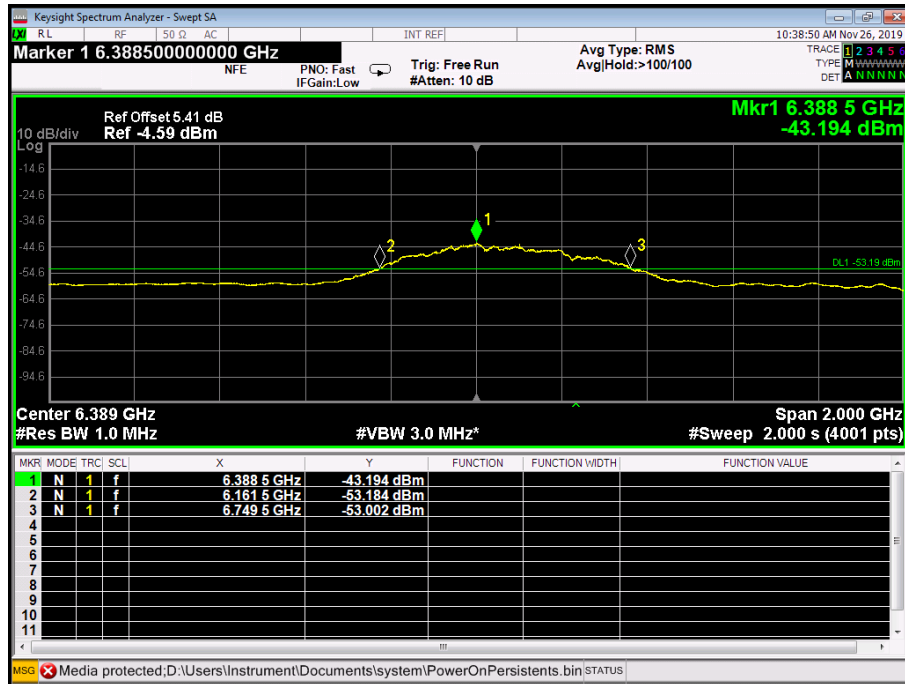
CH5

Test Data

F_L (MHz)	F_H (MHz)	Fractional bandwidth $2*(F_H-F_L)/(F_H+F_L)$	UWB Bandwidth (MHz)	Limit (MHz)	Verdict
6161.5	6749.5	0.09	588.00	Fractional bandwidth ≥ 0.2 or UWB Bandwidth ≥ 500 MHz	Pass

Test plots

UWB Bandwidth



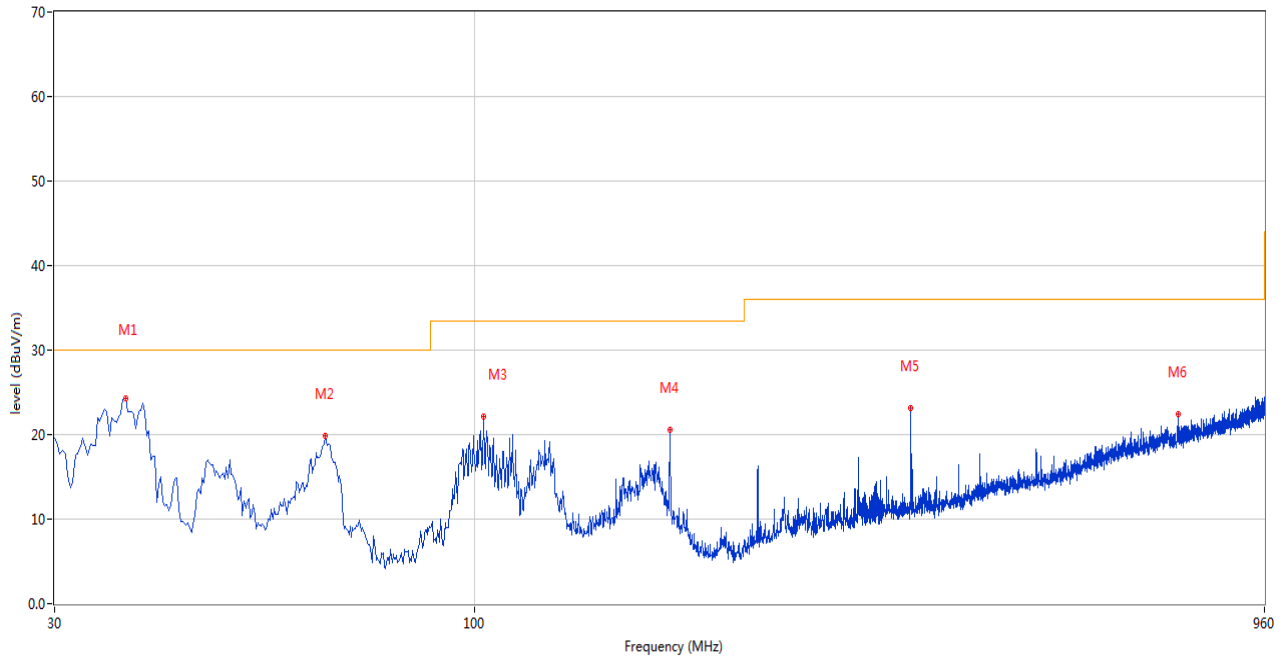
A.3 Radiated Emissions

Note ¹: 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 15.209 was not reported.

Test Data and Plots (30 MHz to 960 MHz)

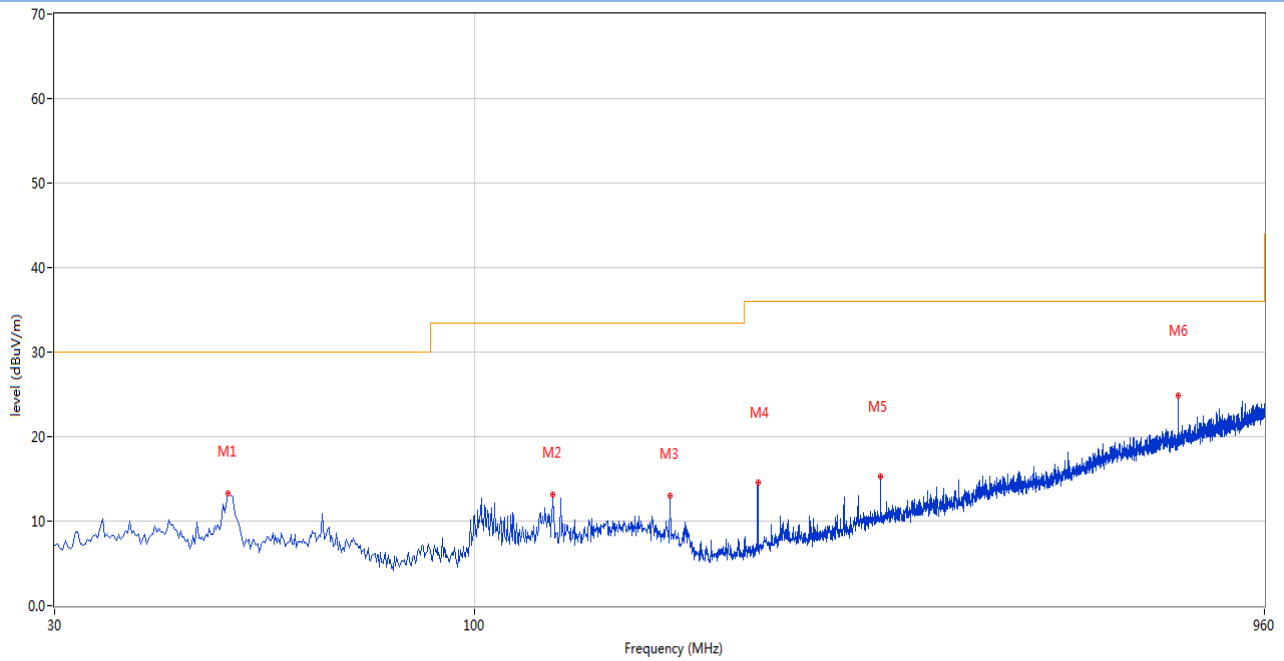
CH1

30 MHz to 960 MHz, ANT V



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Over Limit (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	36.741	24.26	-27.18	30.0	-5.74	Peak	29.00	100	Vertical	Pass
2	65.099	19.83	-28.84	30.0	-10.17	Peak	167.00	200	Vertical	Pass
3	102.522	22.13	-29.91	33.5	-11.37	Peak	300.00	100	Vertical	Pass
4	174.811	20.58	-27.43	33.5	-12.92	Peak	237.00	100	Vertical	Pass
5	348.445	23.08	-24.27	36.0	-12.92	Peak	237.00	200	Vertical	Pass
6	749.873	22.47	-14.90	36.0	-13.53	Peak	161.00	400	Vertical	Pass

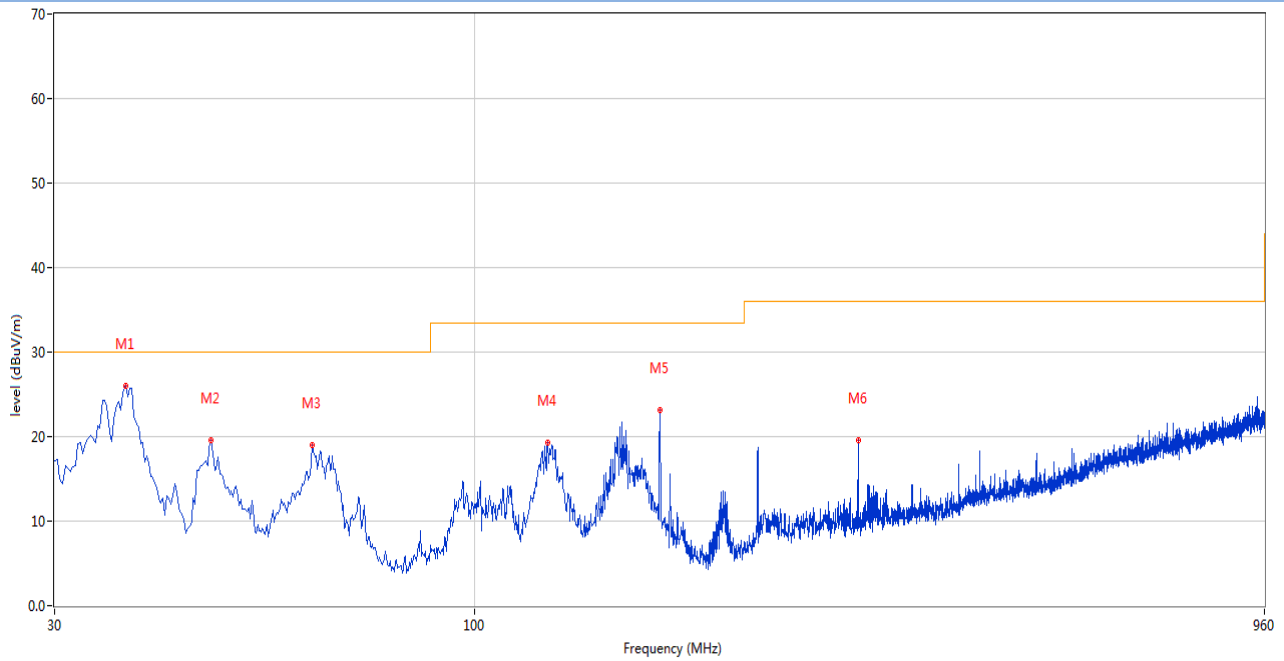
30 MHz to 960 MHz, ANT H



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Over Limit (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	49.293	13.30	-27.34	30.0	-16.70	Peak	85.00	100	Horizontal	Pass
2	124.836	13.16	-27.66	33.5	-20.34	Peak	10.00	400	Horizontal	Pass
3	174.811	12.99	-27.43	33.5	-20.51	Peak	306.00	300	Horizontal	Pass
4	225.019	14.54	-28.27	36.0	-21.46	Peak	287.00	400	Horizontal	Pass
5	319.855	15.32	-25.32	36.0	-20.68	Peak	360.00	400	Horizontal	Pass
6	749.873	24.87	-14.90	36.0	-11.13	Peak	287.00	300	Horizontal	Pass

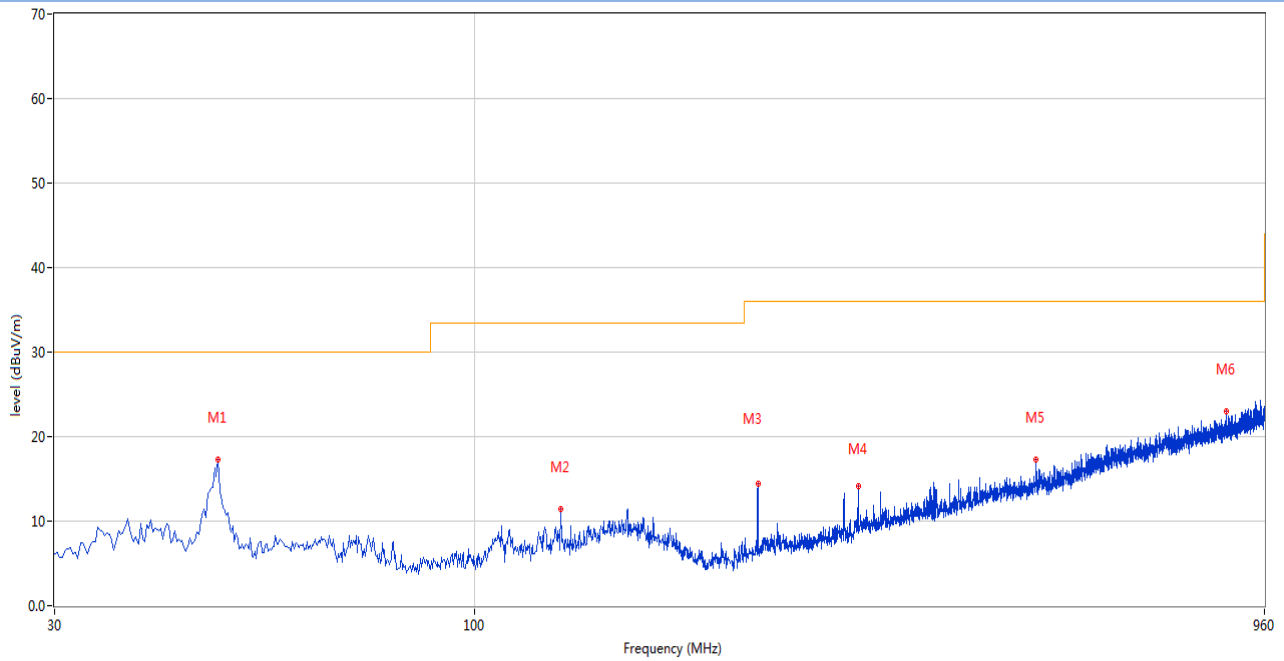
CH2

30 MHz to 960 MHz, ANT V



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Over Limit (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	36.741	26.05	-27.18	30.0	-3.95	Peak	10.00	100	Vertical	Pass
2	46.968	19.55	-27.04	30.0	-10.45	Peak	73.00	200	Vertical	Pass
3	62.774	18.94	-28.40	30.0	-11.06	Peak	117.00	100	Vertical	Pass
4	123.209	19.34	-27.87	33.5	-14.16	Peak	193.00	300	Vertical	Pass
5	170.162	23.21	-26.74	33.5	-10.29	Peak	360.00	300	Vertical	Pass
6	299.865	19.53	-25.89	36.0	-16.47	Peak	300.00	100	Vertical	Pass

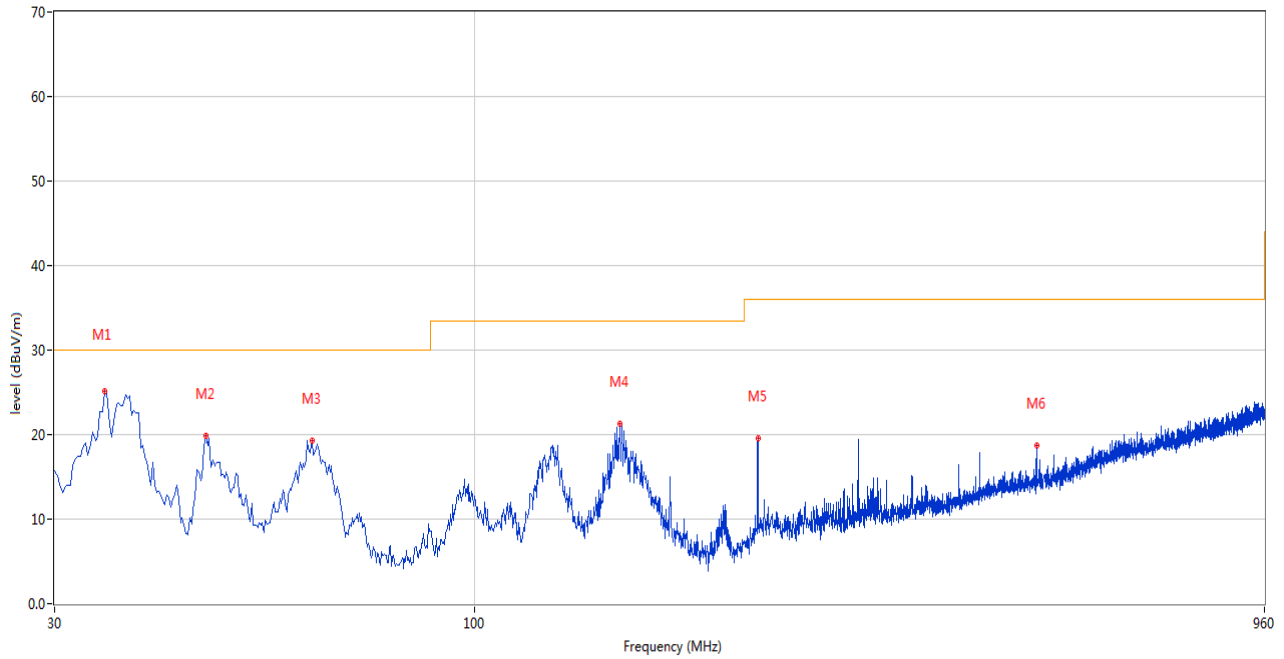
30 MHz to 960 MHz, ANT H



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Over Limit (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	47.898	17.34	-27.16	30.0	-12.66	Peak	16.00	100	Horizontal	Pass
2	127.858	11.38	-27.34	33.5	-22.12	Peak	73.00	100	Horizontal	Pass
3	225.019	14.47	-28.27	36.0	-21.53	Peak	268.00	200	Horizontal	Pass
4	299.865	14.20	-25.89	36.0	-21.80	Peak	111.00	200	Horizontal	Pass
5	499.068	17.30	-20.66	36.0	-18.70	Peak	136.00	100	Horizontal	Pass
6	859.818	22.93	-13.26	36.0	-13.07	Peak	79.00	200	Horizontal	Pass

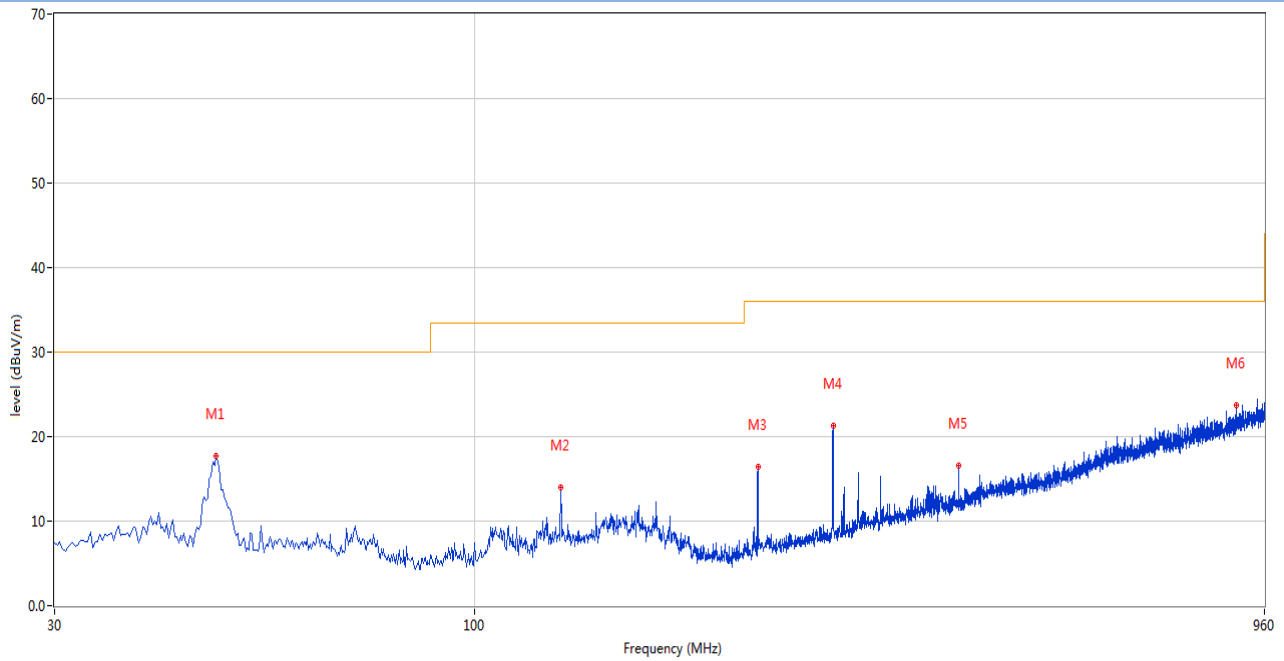
CH3

30 MHz to 960 MHz, ANT V



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Over Limit (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	34.649	25.10	-27.37	30.0	-4.90	Peak	22.00	100	Vertical	Pass
2	46.271	19.83	-27.09	30.0	-10.17	Peak	0.00	300	Vertical	Pass
3	62.774	19.35	-28.40	30.0	-10.65	Peak	104.00	200	Vertical	Pass
4	151.335	21.23	-26.02	33.5	-12.27	Peak	262.00	100	Vertical	Pass
5	225.019	19.64	-28.27	36.0	-16.36	Peak	350.00	100	Vertical	Pass
6	499.998	18.65	-20.62	36.0	-17.35	Peak	155.00	300	Vertical	Pass

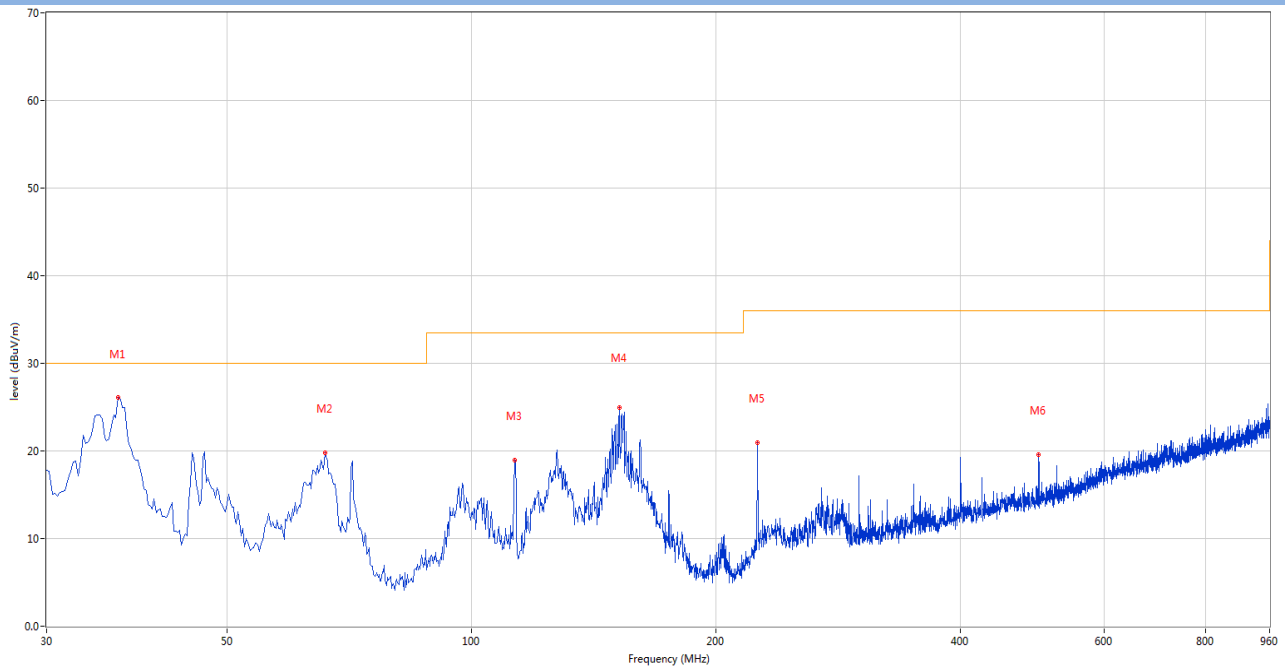
30 MHz to 960 MHz, ANT H



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Over Limit (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	47.666	17.65	-27.12	30.0	-12.35	Peak	98.00	100	Horizontal	Pass
2	127.858	14.05	-27.34	33.5	-19.45	Peak	167.00	100	Horizontal	Pass
3	225.019	16.39	-28.27	36.0	-19.61	Peak	262.00	300	Horizontal	Pass
4	278.945	21.24	-26.29	36.0	-14.76	Peak	155.00	200	Horizontal	Pass
5	400.047	16.62	-23.17	36.0	-19.38	Peak	256.00	200	Horizontal	Pass
6	887.013	23.72	-12.83	36.0	-12.28	Peak	0.00	200	Horizontal	Pass

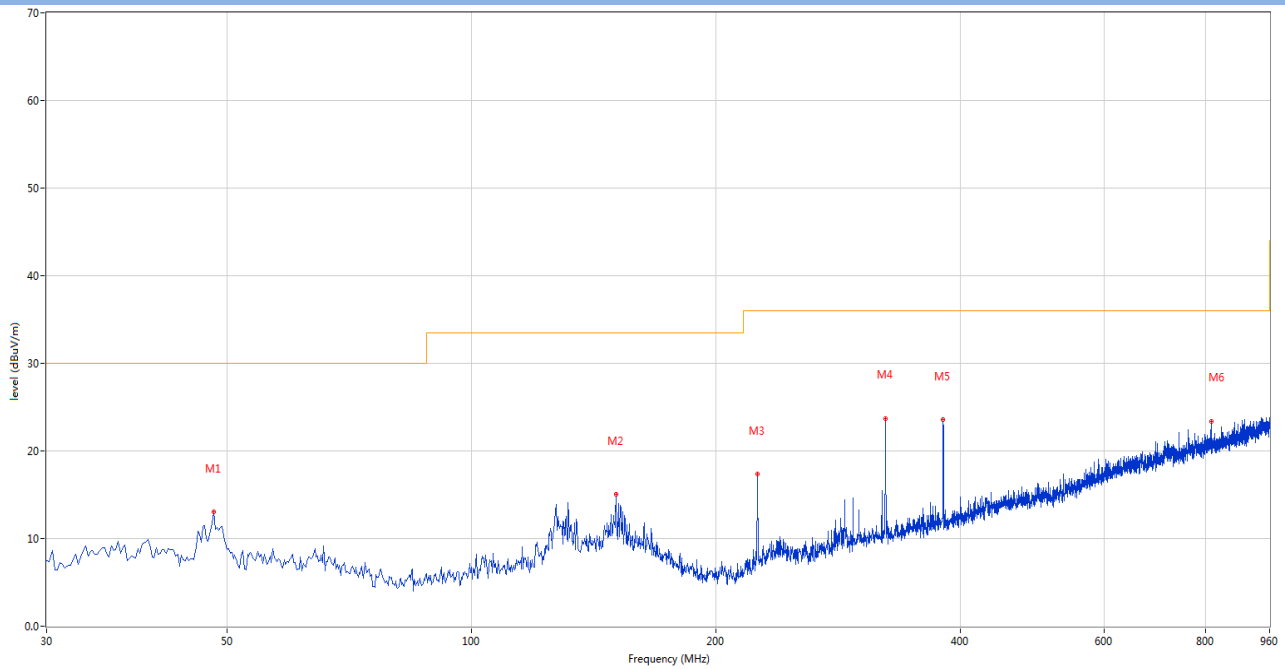
CH5

30 MHz to 960 MHz, ANT V



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Over Limit (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	36.741	26.07	-27.18	30.0	-3.93	Peak	98.00	100	Vertical	Pass
2	66.028	19.81	-29.06	30.0	-10.19	Peak	249.00	200	Vertical	Pass
3	112.982	18.99	-28.77	33.5	-14.51	Peak	0.00	300	Vertical	Pass
4	152.032	24.91	-25.98	33.5	-8.59	Peak	287.00	100	Vertical	Pass
5	225.019	20.96	-28.27	36.0	-15.04	Peak	161.00	100	Vertical	Pass
6	499.068	19.61	-20.66	36.0	-16.39	Peak	155.00	300	Vertical	Pass

30 MHz to 960 MHz, ANT H

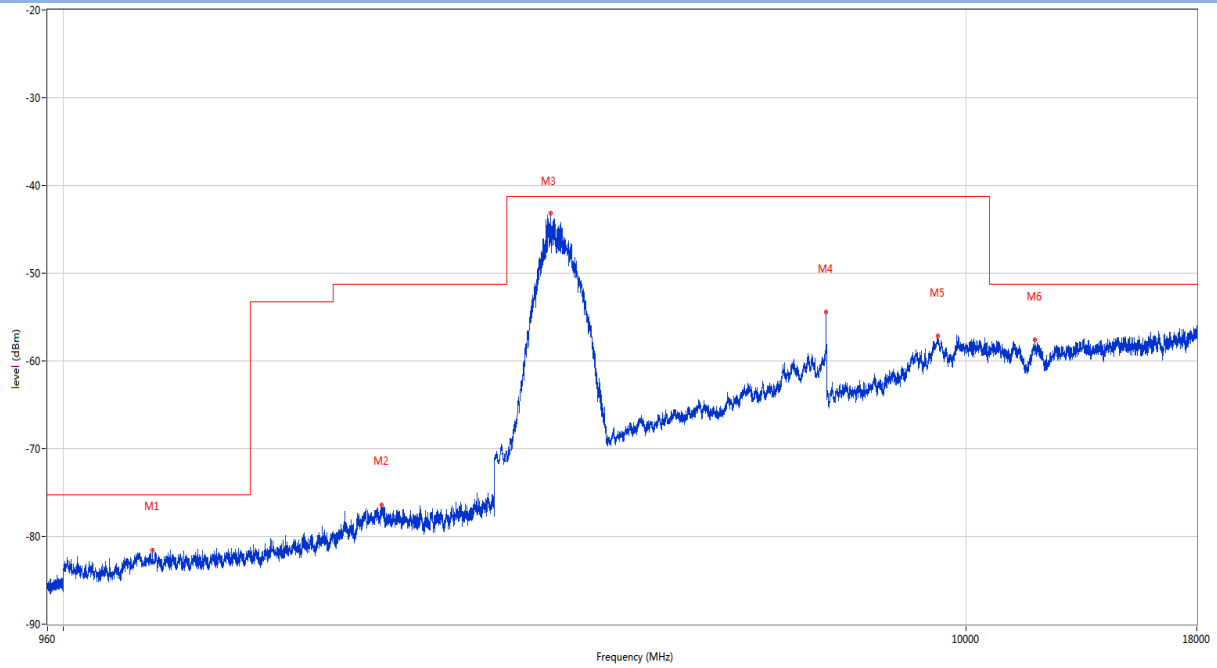


No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Over Limit (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	48.130	13.00	-27.19	30.0	-17.00	Peak	360.00	300	Horizontal	Pass
2	150.637	15.08	-25.99	33.5	-18.42	Peak	274.00	400	Horizontal	Pass
3	225.019	17.36	-28.27	36.0	-18.64	Peak	243.00	400	Horizontal	Pass
4	323.342	23.72	-24.76	36.0	-12.28	Peak	117.00	200	Horizontal	Pass
5	380.755	23.58	-23.50	36.0	-12.42	Peak	117.00	200	Horizontal	Pass
6	813.097	23.41	-13.81	36.0	-12.59	Peak	275.00	100	Horizontal	Pass

Test Data and Plots (960 MHz to 18 GHz)

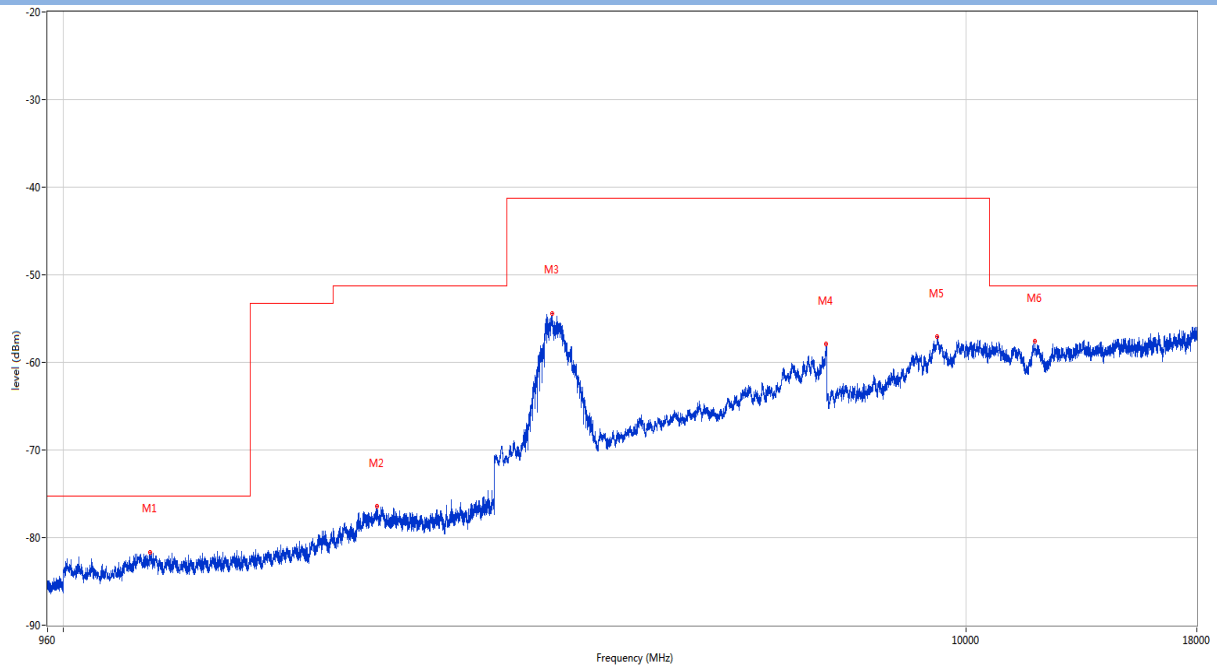
CH1

960 MHz to 18 GHz, ANT V



Frequency (MHz)	Result (dBm)	Factor (dB)	PK Limit (dBm)	Over Limit (dB)	Table (o)	ANT	EUT	Verdict
1254.000	-81.59	-15.07	-75.3	-6.29	166.00	Vertical	Vertical	Pass
2250.500	-76.42	-9.36	-51.3	-25.12	63.00	Vertical	Vertical	Pass
3450.000	-43.02	-5.38	-41.3	-1.72	328.00	Vertical	Vertical	Pass
6990.000	-54.43	6.59	-41.3	-13.13	339.00	Vertical	Vertical	Pass
9292.812	-57.19	10.31	-41.3	-15.89	75.00	Vertical	Vertical	Pass
11909.063	-57.58	10.90	-51.3	-6.28	360.00	Vertical	Vertical	Pass

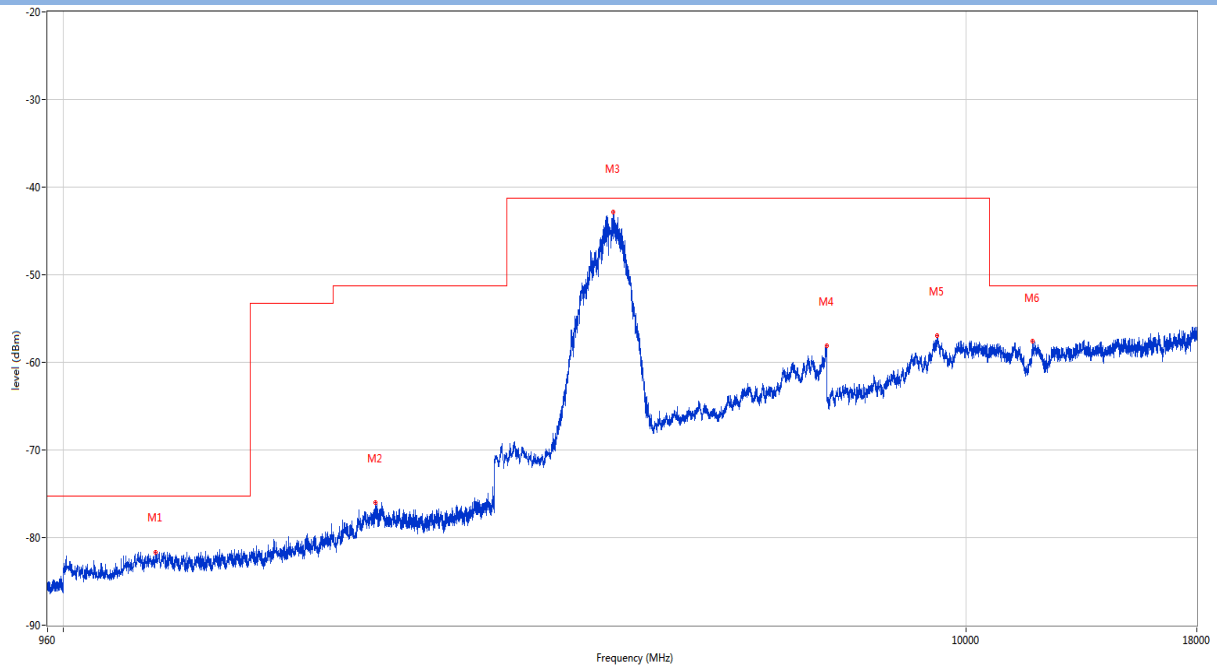
960 MHz to 18 GHz, ANT H



Frequency (MHz)	Result (dBm)	Factor (dB)	PK Limit (dBm)	Over Limit (dB)	Table (o)	ANT	EUT	Verdict
1246.500	-81.66	-15.17	-75.3	-6.36	271.00	Horizontal	Vertical	Pass
2225.500	-76.46	-9.77	-51.3	-25.16	360.00	Horizontal	Vertical	Pass
3474.000	-54.37	-4.87	-41.3	-13.07	14.00	Horizontal	Vertical	Pass
6990.000	-57.85	6.59	-41.3	-16.55	34.00	Horizontal	Vertical	Pass
9285.625	-57.06	10.09	-41.3	-15.76	151.00	Horizontal	Vertical	Pass
11910.500	-57.62	10.88	-51.3	-6.32	280.00	Horizontal	Vertical	Pass

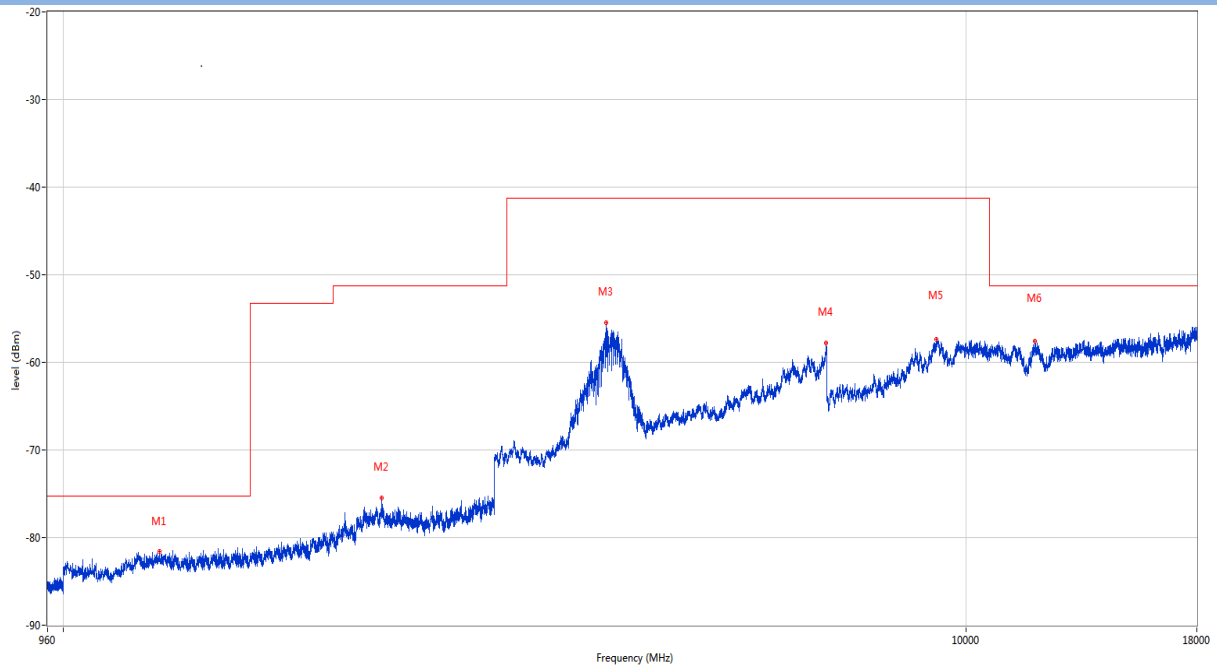
CH2

960 MHz to 18 GHz, ANT V



Frequency (MHz)	Result (dBm)	Factor (dB)	PK Limit (dBm)	Over Limit (dB)	Table (o)	ANT	EUT	Verdict
1265.000	-81.72	-14.54	-75.3	-6.42	357.00	Vertical	Vertical	Pass
2215.000	-75.97	-10.02	-51.3	-24.67	253.00	Vertical	Vertical	Pass
4061.000	-42.86	-2.81	-41.3	-1.56	333.00	Vertical	Vertical	Pass
6999.000	-58.09	6.67	-41.3	-16.79	266.00	Vertical	Vertical	Pass
9271.250	-56.92	9.78	-41.3	-15.62	287.00	Vertical	Vertical	Pass
11831.437	-57.60	9.87	-51.3	-6.30	48.00	Vertical	Vertical	Pass

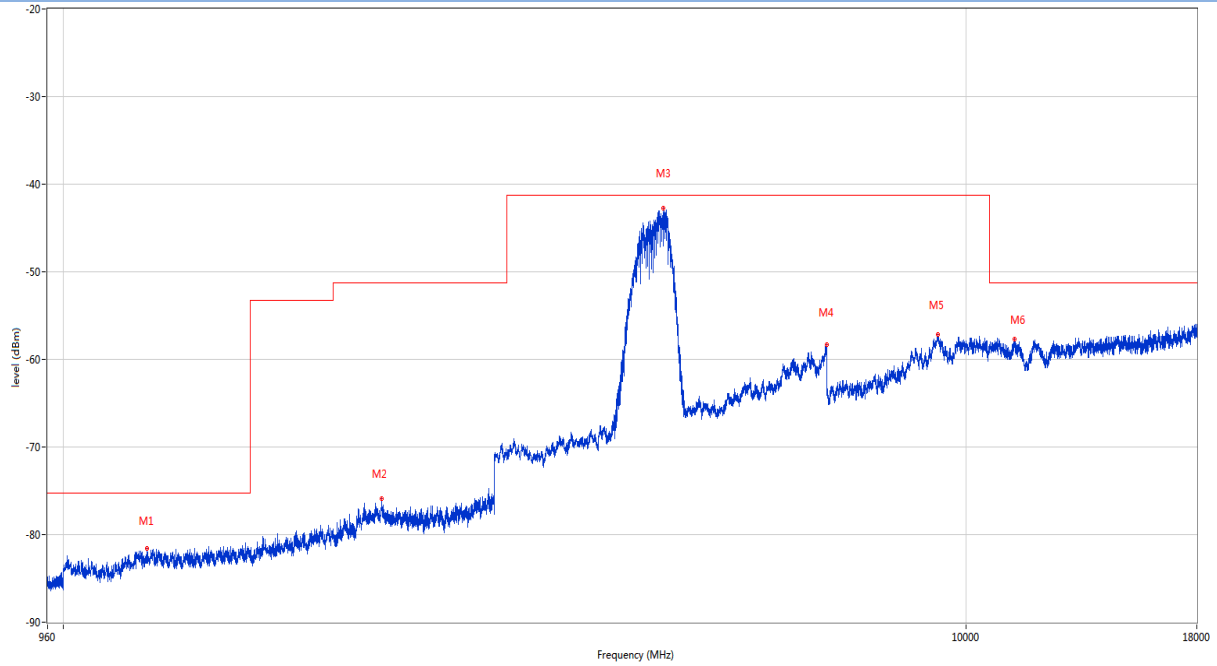
960 MHz to 18 GHz, ANT H



Frequency (MHz)	Result (dBm)	Factor (dB)	PK Limit (dBm)	Over Limit (dB)	Table (o)	ANT	EUT	Verdict
1276.000	-81.56	-14.67	-75.3	-6.26	313.00	Horizontal	Vertical	Pass
2252.000	-75.51	-9.68	-51.3	-24.21	74.00	Horizontal	Vertical	Pass
3993.000	-55.51	-3.20	-41.3	-14.21	352.00	Horizontal	Vertical	Pass
6995.000	-57.76	6.62	-41.3	-16.46	48.00	Horizontal	Vertical	Pass
9256.875	-57.34	9.59	-41.3	-16.04	2.00	Horizontal	Vertical	Pass
11903.313	-57.59	11.00	-51.3	-6.29	62.00	Horizontal	Vertical	Pass

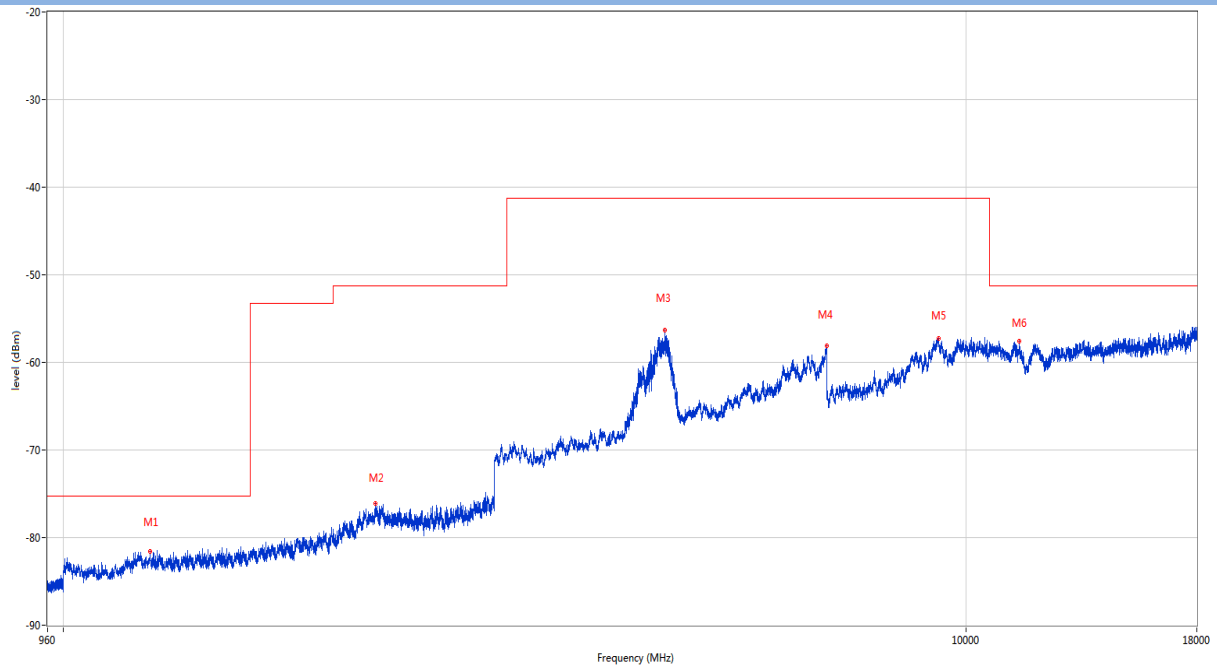
CH3

960 MHz to 18 GHz, ANT V



Frequency (MHz)	Result (dBm)	Factor (dB)	PK Limit (dBm)	Over Limit (dB)	Table (o)	ANT	EUT	Verdict
1238.000	-81.53	-15.23	-75.3	-6.23	352.00	Vertical	Vertical	Pass
2250.500	-75.86	-9.36	-51.3	-24.56	198.00	Vertical	Vertical	Pass
4620.000	-42.75	-1.90	-41.3	-1.45	344.00	Vertical	Vertical	Pass
6998.000	-58.30	6.68	-41.3	-17.00	169.00	Vertical	Vertical	Pass
9298.562	-57.19	10.49	-41.3	-15.89	1.00	Vertical	Vertical	Pass
11316.813	-57.68	10.14	-51.3	-6.38	360.00	Vertical	Vertical	Pass

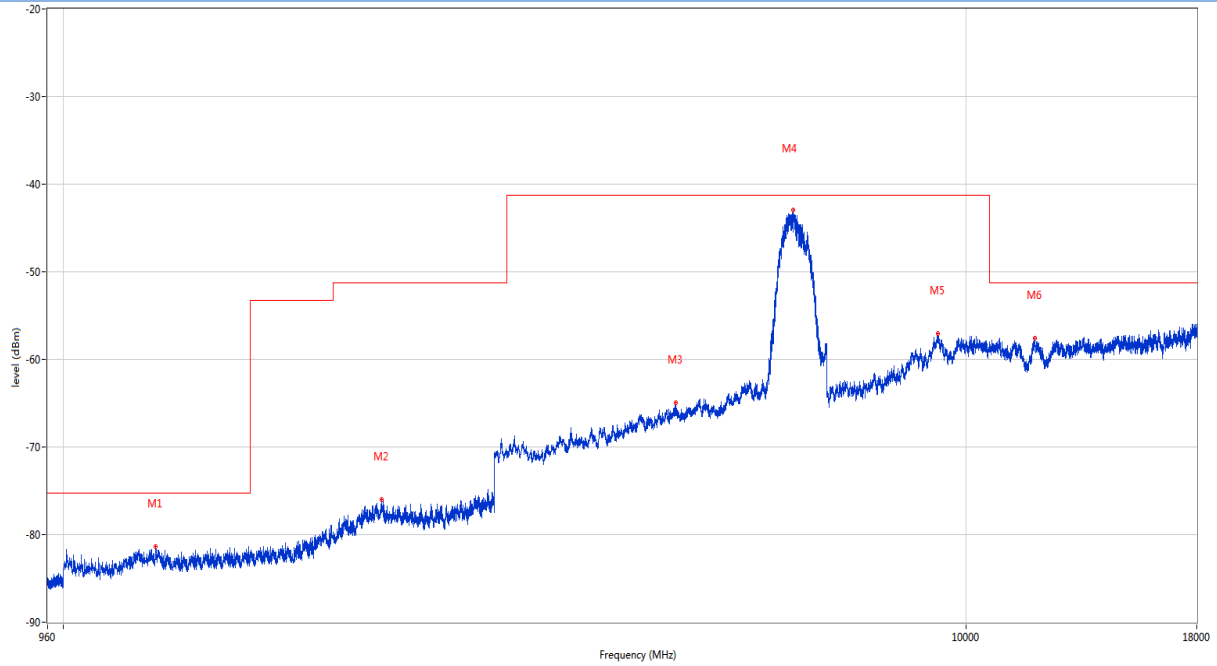
960 MHz to 18 GHz, ANT H



Frequency (MHz)	Result (dBm)	Factor (dB)	PK Limit (dBm)	Over Limit (dB)	Table (o)	ANT	EUT	Verdict
1246.000	-81.60	-15.25	-75.3	-6.30	360.00	Horizontal	Vertical	Pass
2217.000	-76.10	-10.12	-51.3	-24.80	186.00	Horizontal	Vertical	Pass
4639.000	-56.32	-1.19	-41.3	-15.02	126.00	Horizontal	Vertical	Pass
6998.000	-58.13	6.68	-41.3	-16.83	162.00	Horizontal	Vertical	Pass
9312.938	-57.30	10.26	-41.3	-16.00	269.00	Horizontal	Vertical	Pass
11447.625	-57.57	9.28	-51.3	-6.27	74.00	Horizontal	Vertical	Pass

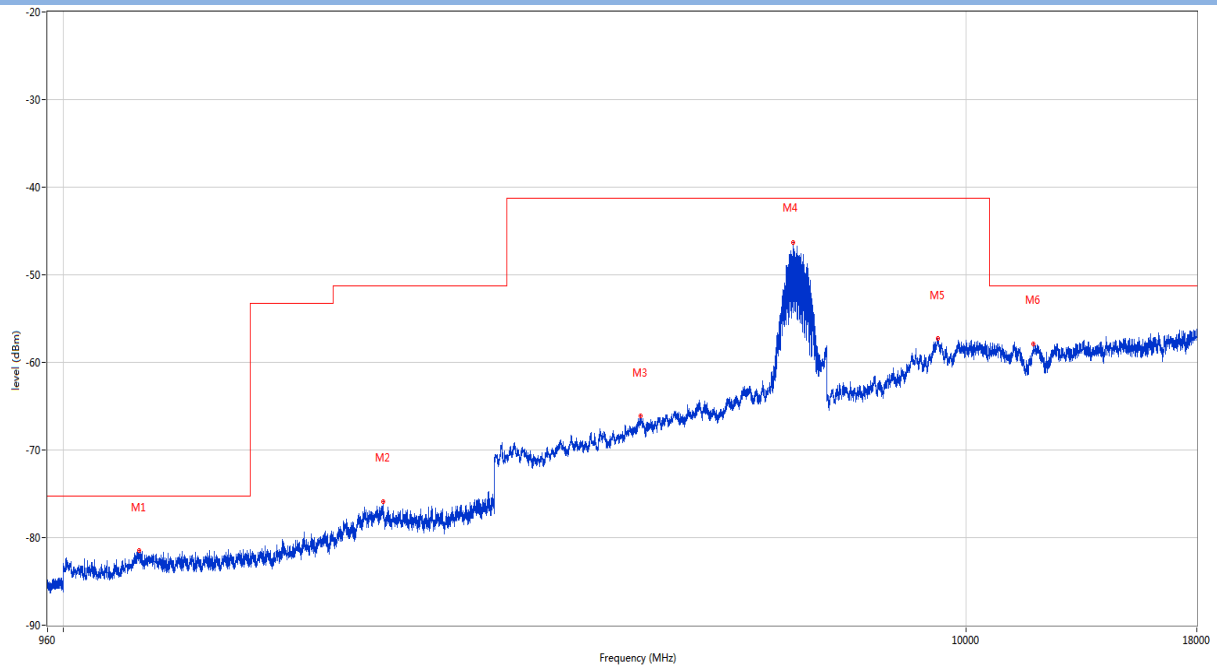
CH5

960 MHz to 18 GHz, ANT V



Frequency (MHz)	Result (dBm)	Factor (dB)	PK Limit (dBm)	Over Limit (dB)	Table (o)	ANT	EUT	Verdict
1264.500	-81.35	-14.53	-75.3	-6.05	300.00	Vertical	Vertical	Pass
2250.500	-76.04	-9.36	-51.3	-24.74	38.00	Vertical	Vertical	Pass
4768.000	-64.96	-0.51	-41.3	-23.66	338.00	Vertical	Vertical	Pass
6382.000	-42.81	2.92	-41.3	-1.51	43.00	Vertical	Vertical	Pass
9294.250	-57.06	10.36	-41.3	-15.76	99.00	Vertical	Vertical	Pass
11914.812	-57.60	10.80	-51.3	-6.30	130.00	Vertical	Vertical	Pass

960 MHz to 18 GHz, ANT H



Frequency (MHz)	Result (dBm)	Factor (dB)	PK Limit (dBm)	Over Limit (dB)	Table (o)	ANT	EUT	Verdict
1213.500	-81.47	-14.57	-75.3	-6.17	246.00	Horizontal	Vertical	Pass
2258.000	-75.87	-9.78	-51.3	-24.57	182.00	Horizontal	Vertical	Pass
4355.000	-66.11	-0.41	-41.3	-24.81	345.00	Horizontal	Vertical	Pass
6435.000	-46.31	4.18	-41.3	-5.01	304.00	Horizontal	Vertical	Pass
9298.562	-57.30	10.49	-41.3	-16.00	21.00	Horizontal	Vertical	Pass
11867.375	-57.85	10.53	-51.3	-6.55	261.00	Horizontal	Vertical	Pass

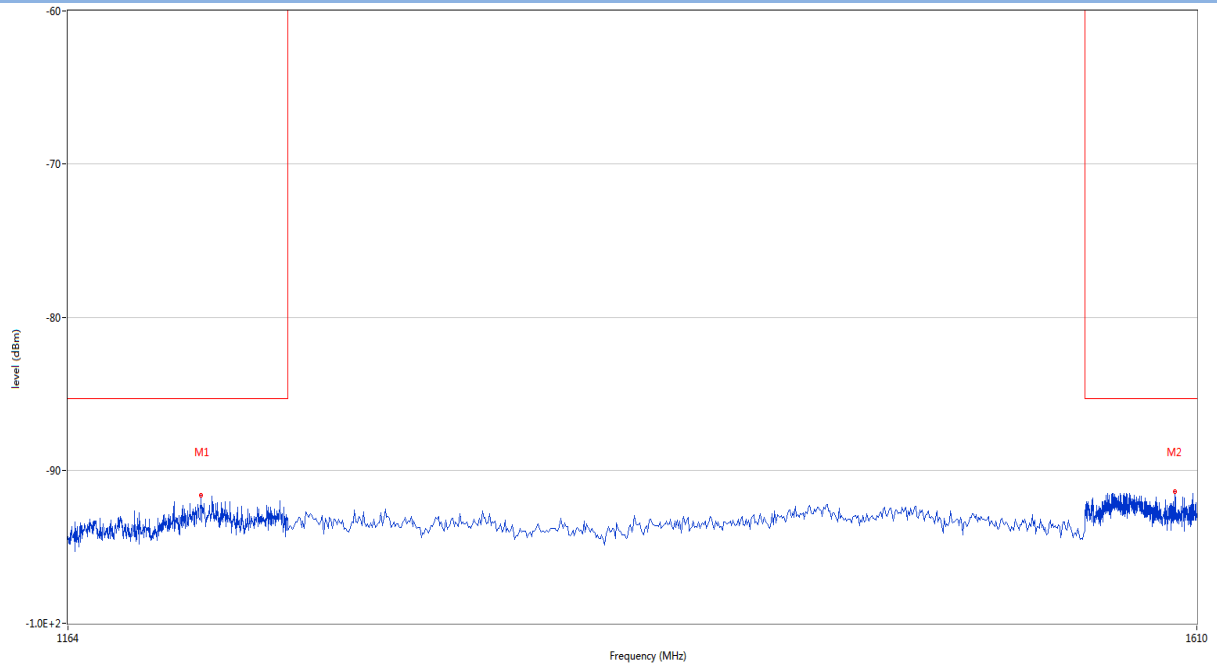
Note: The Radiated Emissions from 18G-40G is noise only, do not show in the report.

A.4 Radiated Emissions in GPS Bands

Test Data and Plot

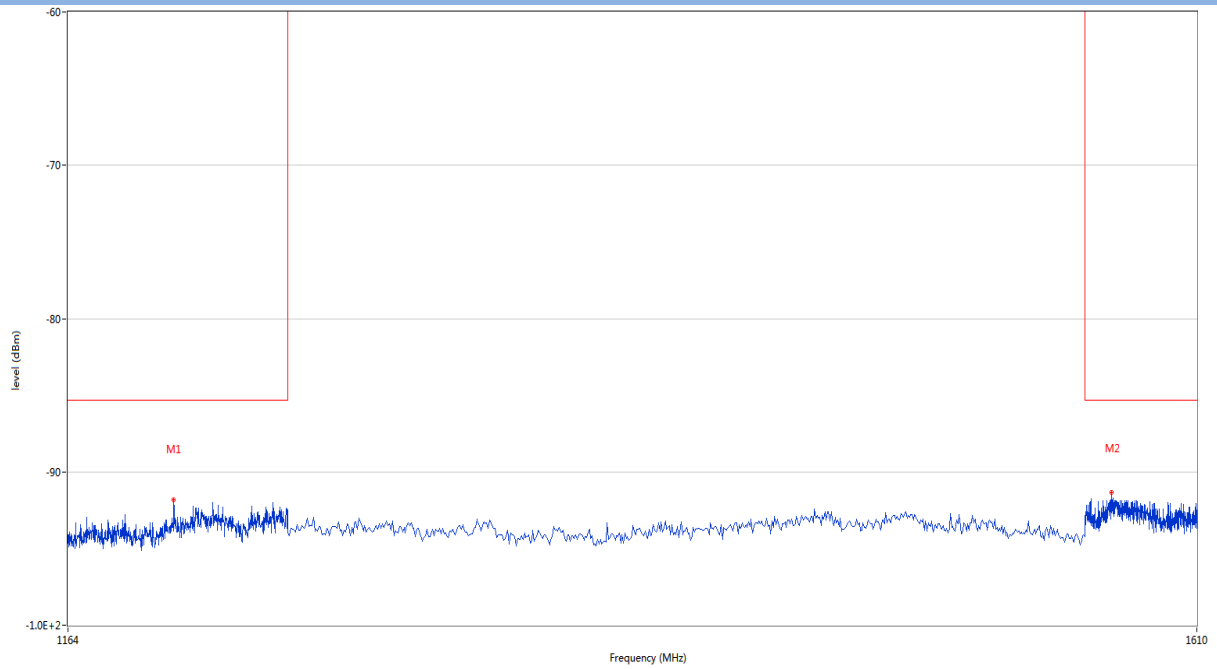
CH1

1.164 GHz to 1.61 GHz, ANT V



Frequency (MHz)	Result (dBm)	Factor (dB)	PK Limit (dBm)	Over Limit (dB)	Table (o)	ANT	EUT	Verdict
1209.473	91.99	-7.41	-85.3	-6.69	234.00	Vertical	Vertical	Pass
1600.055	91.85	-7.76	-85.3	-6.55	316.00	Vertical	Vertical	Pass

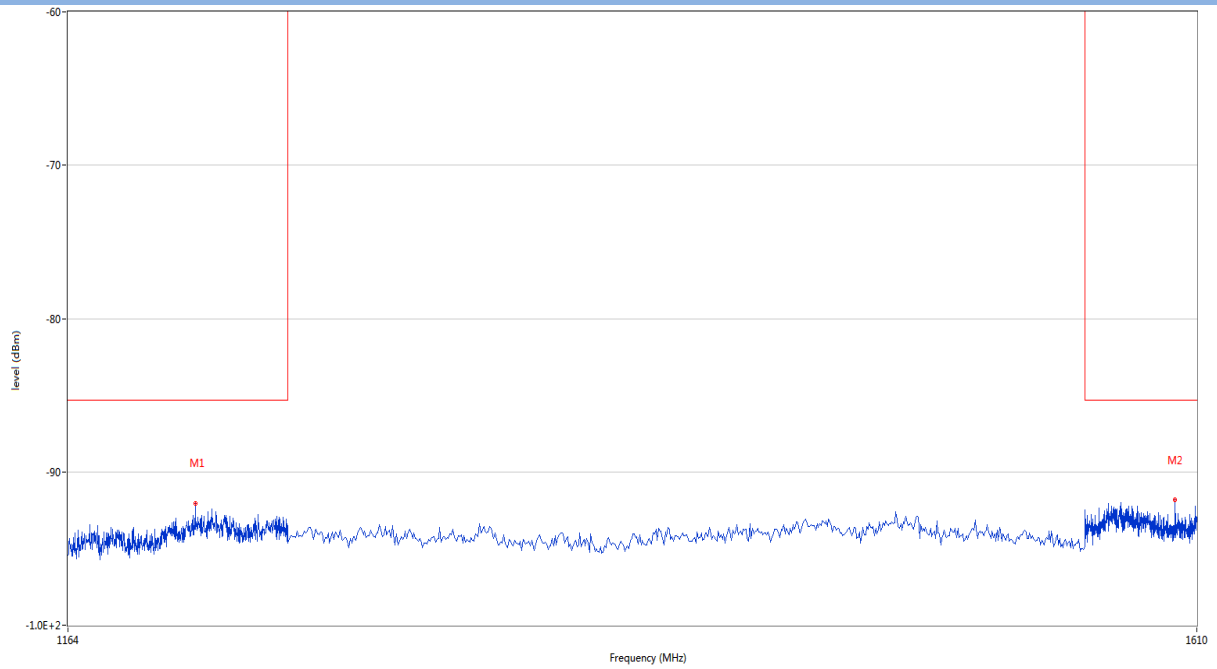
1.164 GHz to 1.61 GHz, ANT H



Frequency (MHz)	Result (dBm)	Factor (dB)	PK Limit (dBm)	Over Limit (dB)	Table (o)	ANT	EUT	Verdict
1200.100	-92.01	-7.41	-85.3	-6.71	118.00	Horizontal	Vertical	Pass
1571.495	-91.98	-7.54	-85.3	-6.68	258.00	Horizontal	Vertical	Pass

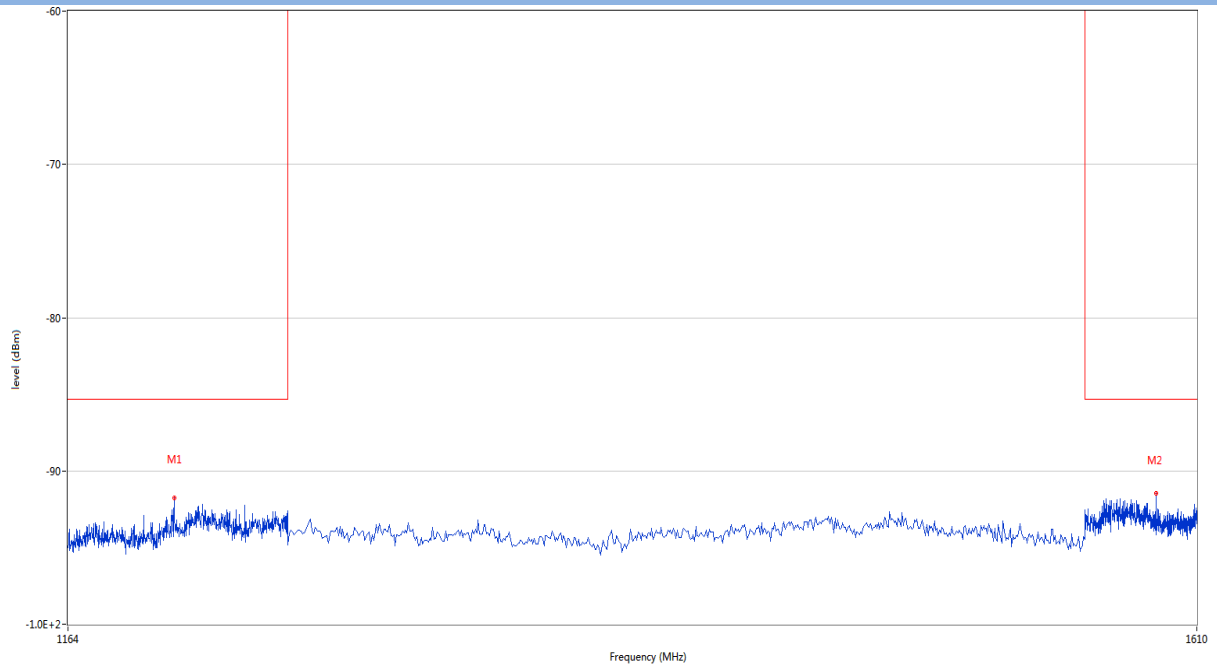
CH2

1.164 GHz to 1.61 GHz, ANT V



Frequency (MHz)	Result (dBm)	Factor (dB)	PK Limit (dBm)	Over Limit (dB)	Table (o)	ANT	EUT	Verdict
1207.320	92.05	-7.53	-85.3	-6.75	199.00	Vertical	Vertical	Pass
1600.055	92.02	-7.76	-85.3	-6.72	358.00	Vertical	Vertical	Pass

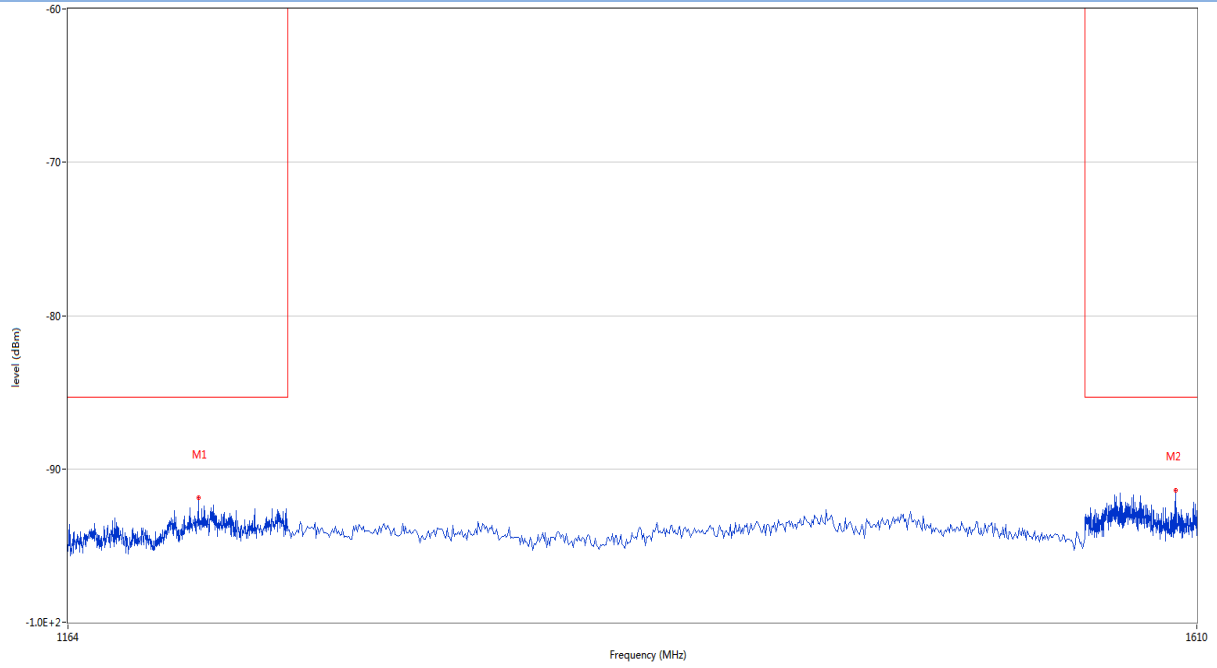
1.164 GHz to 1.61 GHz, ANT H



Frequency (MHz)	Result (dBm)	Factor (dB)	PK Limit (dBm)	Over Limit (dB)	Table (o)	ANT	EUT	Verdict
1200.100	92.03	-7.41	-85.3	-6.73	166.00	Horizontal	Vertical	Pass
1591.215	91.97	-7.73	-85.3	-6.67	152.00	Horizontal	Vertical	Pass

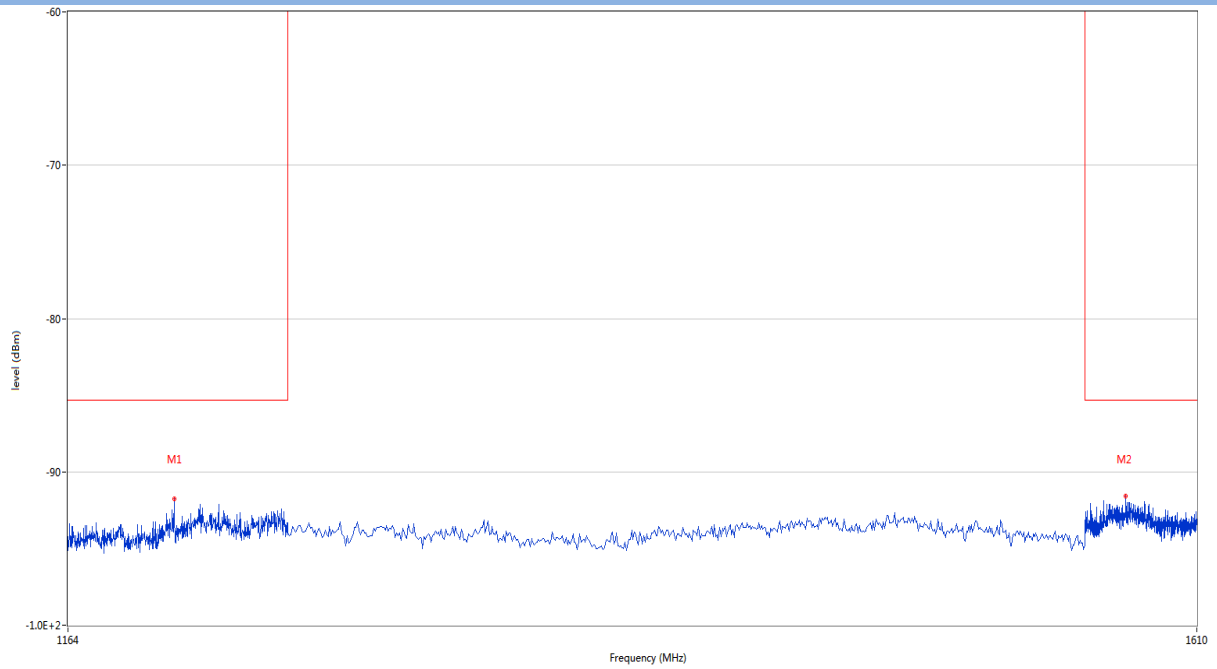
CH3

1.164 GHz to 1.61 GHz, ANT V



Frequency (MHz)	Result (dBm)	Factor (dB)	PK Limit (dBm)	Over Limit (dB)	Table (o)	ANT	EUT	Verdict
1208.460	91.99	-7.46	-85.3	-6.69	233.00	Vertical	Vertical	Pass
1600.055	91.84	-7.76	-85.3	-6.54	-3.00	Vertical	Vertical	Pass

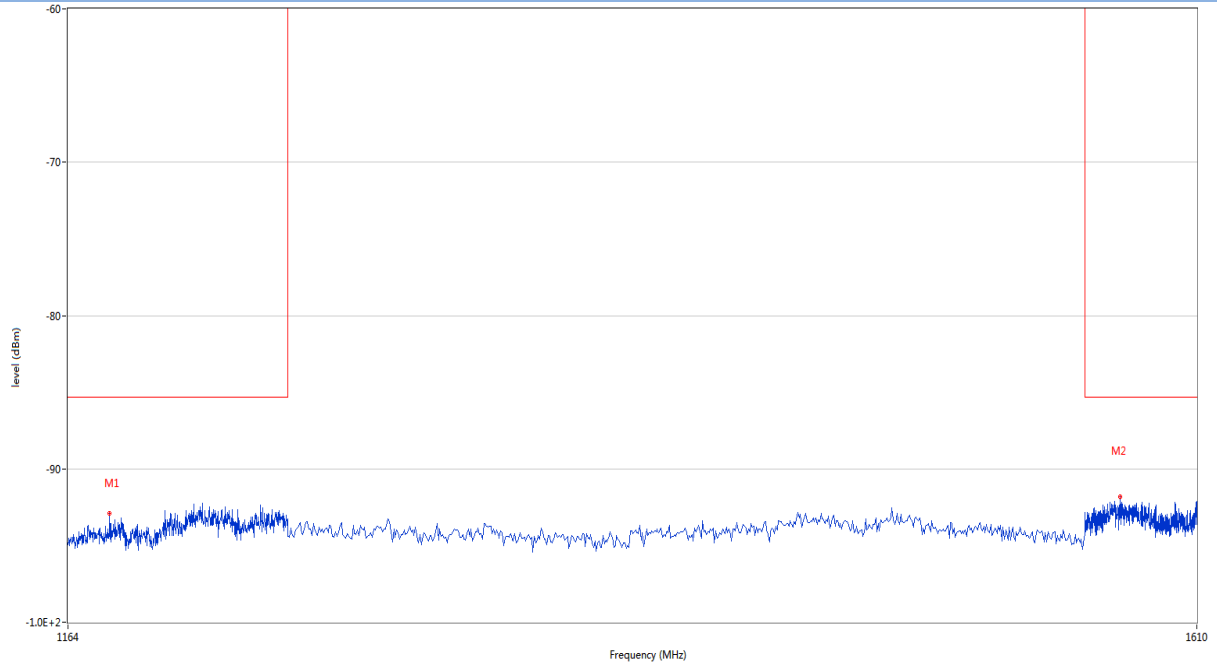
1.164 GHz to 1.61 GHz, ANT H



Frequency (MHz)	Result (dBm)	Factor (dB)	PK Limit (dBm)	Over Limit (dB)	Table (o)	ANT	EUT	Verdict
1200.100	92.08	-7.41	-85.3	-6.78	164.00	Horizontal	Vertical	Pass
1577.445	92.01	-7.78	-85.3	-6.71	215.00	Horizontal	Vertical	Pass

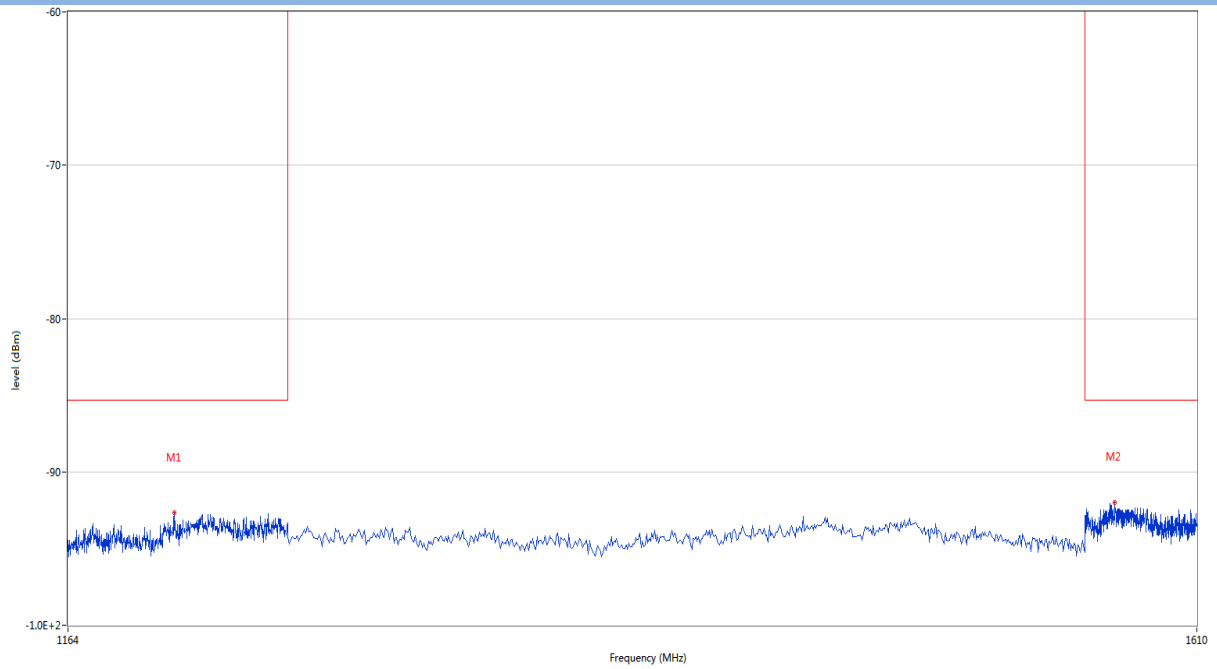
CH5

1.164 GHz to 1.61 GHz, ANT V



Frequency (MHz)	Result (dBm)	Factor (dB)	PK Limit (dBm)	Over Limit (dB)	Table (o)	ANT	EUT	Verdict
1178.060	92.45	-8.34	-85.3	-7.15	90.00	Vertical	Vertical	Pass
1575.065	92.04	-7.84	-85.3	-6.74	-1.00	Vertical	Vertical	Pass

1.164 GHz to 1.61 GHz, ANT H



Frequency (MHz)	Result (dBm)	Factor (dB)	PK Limit (dBm)	Over Limit (dB)	Table (o)	ANT	EUT	Verdict
1200.100	92.75	-7.41	-85.3	-7.45	166.00	Horizontal	Vertical	Pass
1572.600	92.23	-7.46	-85.3	-6.93	50.00	Horizontal	Vertical	Pass

A.5 Peak Emissions within a 50MHz Bandwidth

Test Data and Plot

ANT V

Test Mode	Frequency (MHz)	Result (dBm)	PK Limit (dBm)	Over Limit (dB)	Table (o)	ANT	Verdict
1	3450.00	-36.82	-34.00	-2.82	328.00	Vertical	Pass
2	4061.00	-36.76	-34.00	-2.76	333.00	Vertical	Pass
3	4620.00	-36.55	-34.00	-2.55	344.00	Vertical	Pass
4	6382.00	-36.61	-34.00	-2.61	43.00	Vertical	Pass

ANT H

Test Mode	Frequency (MHz)	Result (dBm)	PK Limit (dBm)	Over Limit (dB)	Table (o)	ANT	Verdict
1	3474.00	-48.17	-34.00	-14.17	14.00	Horizontal	Pass
2	3993.00	-49.21	-34.00	-15.21	352.00	Horizontal	Pass
3	4639.00	-50.02	-34.00	-16.02	126.00	Horizontal	Pass
4	6435.00	-41.81	-34.00	-7.81	304.00	Horizontal	Pass

ANNEX B TEST SETUP PHOTOS

Please refer the document “BL-SZ1990087-AE-2.PDF”.

ANNEX C EUT EXTERNAL PHOTOS

Please refer the document “BL-SZ1990087-AW.PDF”.

ANNEX D EUT INTERNAL PHOTOS

Please refer the document “BL-SZ1990087-AI.PDF”.

--END OF REPORT--