TEST REPORT

APPLICANT	:	PASCE Ltd
PRODUCT NAME	:	Bluetooth speaker with rechargeable battery
MODEL NAME	:	MRS4
BRAND NAME	:	Minirig
FCC ID	:	2AD65MRS4
STANDARD(S)	:	47 CFR Part 15 Subpart C
RECEIPT DATE	:	2025-03-19
TEST DATE	:	2025-04-08 to 2025-06-09
ISSUE DATE	:	2025-07-07

Edited by: Peng Mi (Rapporteur)

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DIRECTORY

Change History		
Version	**Date**	**Reason for change**
1.0	2025-07-07	First edition

1. Summary of Test Result

No.	Section	Description	Test Date	Test Engineer	Result	Remark
1	15.203	Antenna Requirement	N/A	N/A	PASS	/
2	N/A	Duty Cycle of Test Signal	Apr. 27, 2025	Lin Haoyang	PASS	/
3	15.247(b)	Maximum Peak Conducted Output Power	Apr. 27, 2025	Lin Haoyang	PASS	/
4	15.247(b)	Maximum Average Conducted Output Power	Apr. 27, 2025	Lin Haoyang	PASS	/
5	15.247(a)	Bandwidth	Apr. 27, 2025	Lin Haoyang	PASS	/
6	15.247(d)	Conducted Spurious Emission and Band Edge	Apr. 27, 2025	Lin Haoyang	PASS	/
7	15.247(e)	Power Spectral Density	Apr. 27, 2025	Lin Haoyang	PASS	/
8	15.207	Conducted Emission	Apr. 09, 2025	Fan Shengquan	PASS	/
9	15.247(d)	Restricted Frequency Bands	Apr. 08 to Jun. 09, 2025	Gao Jianrou	PASS	/
10	15.209, 15.247(d)	Radiated Emission	Apr. 08 to 09, 2025	Gao Jianrou	PASS	/

Note 1: The tests were performed according to the method of measurements prescribed in ANSI C63.10-2013 and KDB 558074 D01 v05r02.

Note 2: Any additions, deviation, or exclusions from the method shall be noted in the “Remark".

1.1. Testing Applied Standards

According to the specifications of the manufacturer, the EUT must comply with the requirements of the following standards:

• 47 CFR Part 15 Subpart C Radio Frequency Devices

1.2. Test Equipment List

1.2.1 Conducted Test Equipment

Equipment	Serial No.	Type	Manufacturer	Cal. Date	Due Date
EXA Signal Analyzer	MY53470836	N9010A	Agilent	2025.01.15	2026.01.14
RF Cable (30MHz-26GHz)	CB01	RF01	Morlab	N/A	N/A
Coaxial Cable	CB02	RF02	Morlab	N/A	N/A
SMA Connector	CN01	RF03	HUBER-SUHNER	N/A	N/A

1.2.2 Conducted Emission Test Equipment

Equipment	Serial No.	Type	Manufacturer	Cal. Date	Due Date
Receiver	MY56400093	N9038A	KEYSIGHT	2025.01.06	2026.01.05
LISN	8127449	NSLK 8127	Schwarzbeck	2025.01.09	2026.01.08
Pulse Limiter (10dB)	VTSD 9561 F-B #206	VTSD 9561-F	Schwarzbeck	2024.05.30	2025.05.29
				2025.05.13	2026.05.12
RF Coaxial Cable (DC-100MHz)	BNC	MRE04	Qualwave	2024.07.02	2025.07.01

1.2.3 List of Software Used

Description	Manufacturer	Software Version
Test System	MaiWei	2.0.0.0
JS32-RE	Tonscend	5.0.0
TS+ -[JS32-CE]	Tonscend	2.5.0.0

1.2.4 Radiated Test Equipment

Equipment	Serial No.	Type	Manufacturer	Cal. Date	Due Date
Signal Analyzer	MY56060145	N9020A	Agilent	2024.05.30	2025.05.29
				2025.05.13	2026.05.12
Test Antenna - Bi-Log	9163-519	VULB 9163	Schwarzbeck	2024.06.22	2025.06.21
Test Antenna - Loop	1519-022	FMZB1519	Schwarzbeck	2024.06.03	2025.06.02
				2025.05.16	2026.05.15
Test Antenna – Horn	01774	BBHA 9120D	Schwarzbeck	2024.06.22	2025.06.21
Test Antenna – Horn	BBHA9170 #773	BBHA9170	Schwarzbeck	2024.06.22	2025.06.21
Preamplifier (10MHz-6GHz)	46732	S10M100L3802	LUCIX CORP.	2024.05.30	2025.05.29
				2025.05.13	2026.05.12
Preamplifier (2GHz-18GHz)	61171/61172	S020180L3203	LUCIX CORP.	2024.05.30	2025.05.29
				2025.05.13	2026.05.12
Preamplifier (18GHz-40GHz)	DS77209	DCLNA0118-40C-S	Decentest	2024.05.30	2025.05.29
				2025.05.13	2026.05.12
RF Coaxial Cable (DC-18GHz)	MRE001	PE330	Pasternack	2024.05.30	2025.05.29
				2025.05.13	2026.05.12
RF Coaxial Cable (DC-18GHz)	MRE002	CLU18	Pasternack	2024.05.30	2025.05.29
				2025.05.13	2026.05.12
RF Coaxial Cable (DC-18GHz)	MRE003	CLU18	Pasternack	2024.05.30	2025.05.29
				2025.05.13	2026.05.12
RF Coaxial Cable (DC-40GHz)	22290045	QA360-40-KK-0.5	Qualwave	2024.07.03	2025.07.02
RF Coaxial Cable (DC-40GHz)	22290046	QA360-40-KKF-2	Qualwave	2024.07.03	2025.07.02
RF Coaxial Cable (DC-18GHz)	22120181	QA500-18-NN-5	Qualwave	2024.07.03	2025.07.02
Notch Filter	N/A	WRCG-2400-2483.5-60SS	Wainwright	N/A	N/A
Anechoic Chamber	N/A	9m*6m*6m	CRT	2025.04.19	2028.04.18
Anechoic Chamber	N/A	9m*6m*6m	CRT	2022.11.30	2025.11.29

1.3. Measurement Uncertainty

Test Items	Uncertainty	Remark
Peak Output Power	±2.22dB	Confidence levels of 95%
Power Spectral Density	±2.22dB	Confidence levels of 95%
Bandwidth	±5%	Confidence levels of 95%
Conducted Spurious Emission	±2.77dB	Confidence levels of 95%
Restricted Frequency Bands	±5%	Confidence levels of 95%
Radiated Emission	±2.95dB	Confidence levels of 95%
Conducted Emission	±2.44dB	Confidence levels of 95%

1.4. Testing Laboratory

Laboratory Name:	Shenzhen Morlab Communications Technology Co., Ltd.
Laboratory Address:	FL.3, Building A, FeiYang Science Park, No.8 LongChang Road, Block 67, BaoAn District, ShenZhen, GuangDong Province, P. R. China
Telephone:	+86 755 36698555
Facsimile:	+86 755 36698525
FCC Designation Number:	CN1192
FCC Test Firm Registration Number:	226174

2. General Description

2.1. Information of Applicant and Manufacturer

Applicant:	PASCE Ltd
Applicant Address:	Unit 4 City Business Park, Easton Way, Bristol, BS5 0SP,United Kingdom
Manufacturer:	PASCE Ltd
Manufacturer Address:	Unit 4 City Business Park, Easton Way, Bristol, BS5 0SP,United Kingdom

2.2. Information of EUT

Product Name:	Bluetooth speaker with rechargeable battery
Sample No.:	3#, 2#, 1#
Hardware Version:	V1H
Software Version:	18
Equipment Type:	Bluetooth LE
Bluetooth Version:	5.0
Modulation Type:	GFSK
Data Rate:	1Mbps
Operating Frequency Range:	2402MHz-2480MHz
Antenna Type:	PCB Antenna
Antenna Gain:	1.90dBi

Note 1: The EUT description presented in the report are provided by applicant and/or manufacturer, and the test laboratory is not responsible for the accuracy of the information. For a more detailed description, please refer to Specification or User's Manual supplied by the applicant and/or manufacturer.

2.3. Channel List of EUT

Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
0	**2402**	10	2422	20	2442	30	2462
1	2404	11	2424	21	2444	31	2464
2	2406	12	2426	22	2446	32	2466
3	2408	13	2428	23	2448	33	2468
4	2410	14	2430	24	2450	34	2470
5	2412	15	2432	25	2452	35	2472
6	2414	16	2434	26	2454	36	2474
7	2416	17	2436	27	2456	37	2476
8	2418	18	2438	28	2458	38	2478
9	2420	**19**	**2440**	29	2460	**39**	**2480**

Note 1: The black bold channels were selected for test.

2.4. Test Configuration of EUT

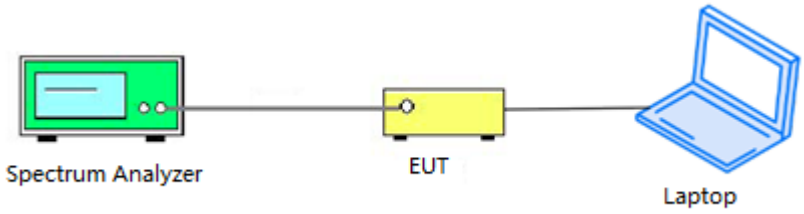
Test mode is used to control the EUT under the maximum power level during test.

2.5. Test Conditions

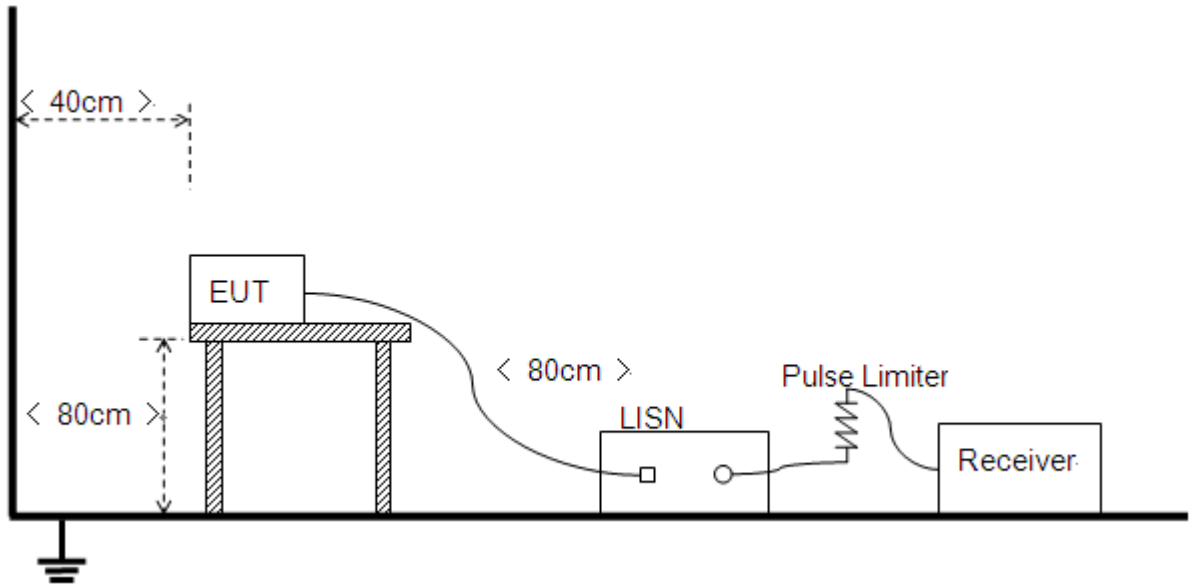
Temperature (°C):	15–35
Relative Humidity (%):	30–60
Atmospheric Pressure (kPa):	86–106

2.6. Test Setup Layout Diagram

2.6.1.Conducted Measurement

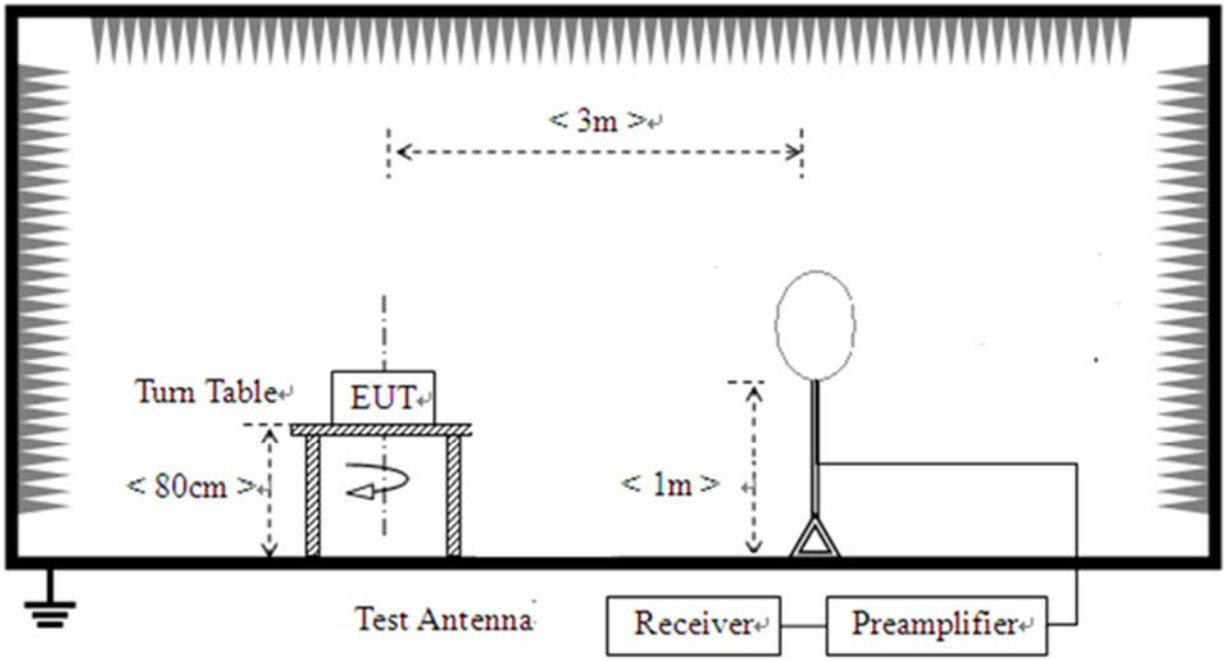


2.6.2.Conducted Emission Measurement

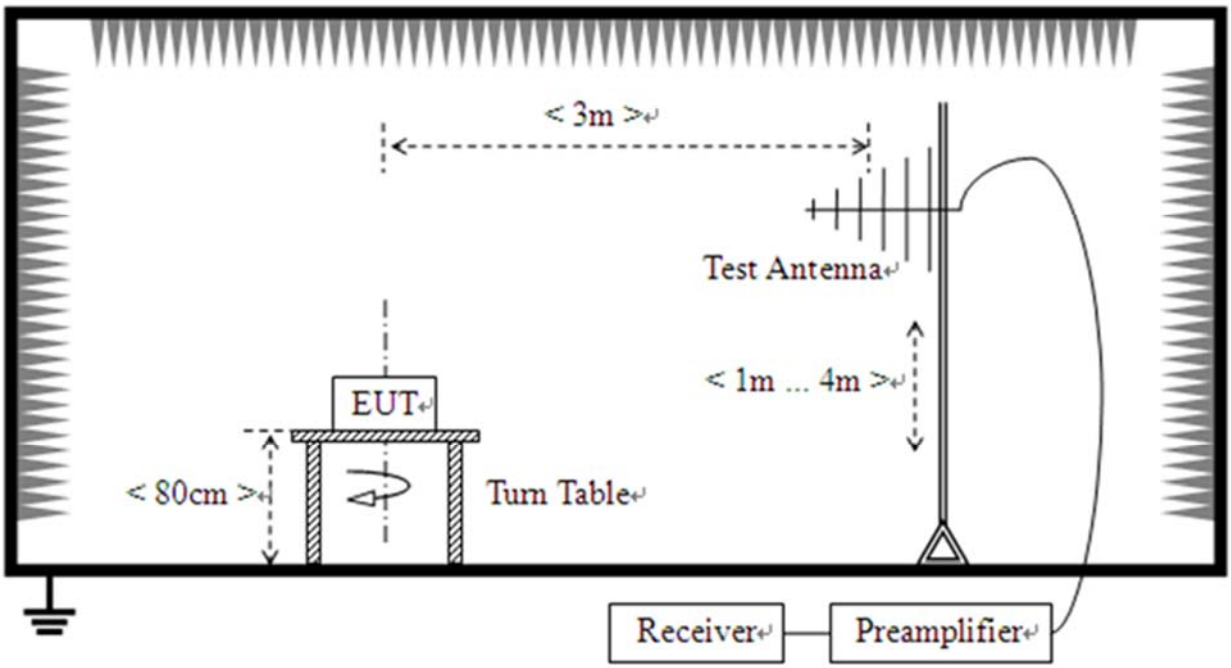


2.6.3.Radiation Measurement

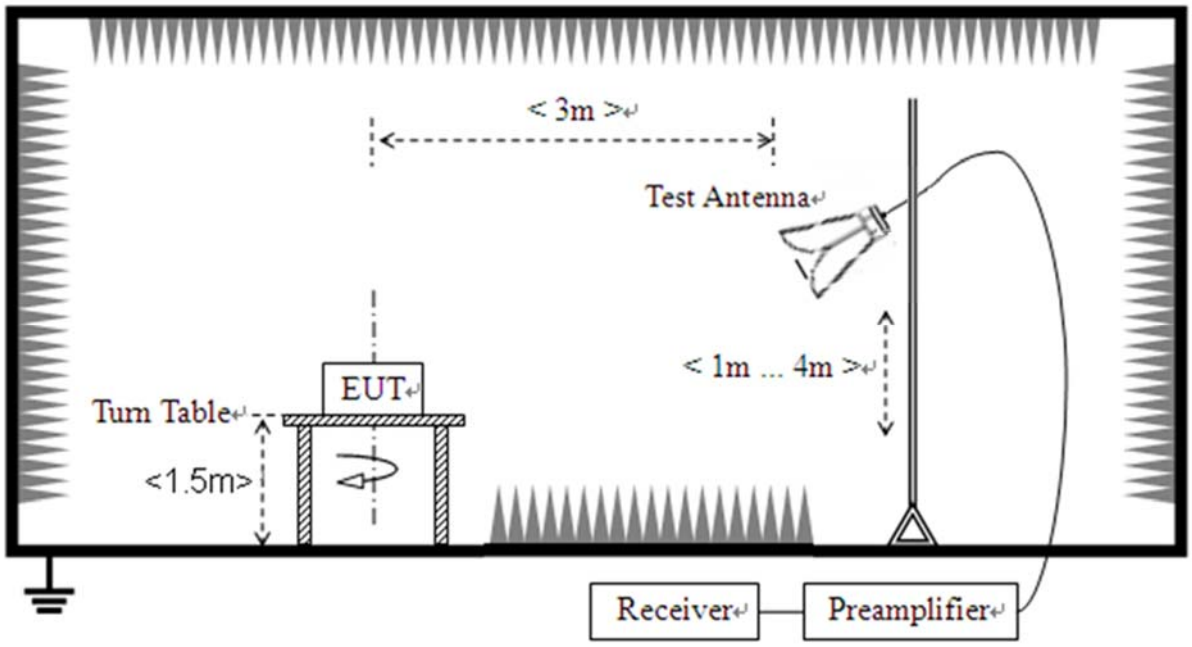
1) For radiated emissions from 9kHz to 30MHz



2) For radiated emissions from 30MHz to1GHz



3) For radiated emissions above 1GHz



3. Test Results

3.1. Antenna Requirement

3.1.1.Requirement

According to FCC 15.203, 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.

3.1.2.Test Result

Antenna location	Antenna Type	Coupling Method
☒Internal ☐External	☐FPC Antenna ☐Spring Antenna ☐Ceramic Antenna ☐Integrated Antenna ☐Dipole Antenna ☒PCB Antenna ☐PIFA Antenna ☐On-board Antenna	☐I-PEX Connector ☐SMA Connector ☐RP-SMA Connector ☐Metal Shrapnel ☒Layout

3.2. Duty Cycle of Test Signal

3.2.1.Requirement

Preferably, all measurements of maximum conducted (average) output power will be performed with the EUT transmitting continuously (i.e., with a duty cycle of greater than or equal to 98%). When continuous operation cannot be realized, then the use of sweep triggering/signal gating techniques can be used to ensure that measurements are made only during transmissions at the maximum power control level. Such sweep triggering/signal gating techniques will require knowledge of the minimum transmission duration(T) over which the transmitter is on and is transmitting at its maximum power control level for the tested mode of operation. Sweep triggering/signal gating techniques can then be used if the measurement/sweep time of the analyzer can be set such that it does not exceed T at any time that data are being acquired (i.e.,no transmitter OFF-time is to be considered).
When continuous transmission cannot be achieved and sweep triggering/signal gating cannot be implemented, alternative procedures are provided that can be used to measure the average power; however, they will require an additional measurement of the transmitter duty cycle (D). Within this sub clause, the duty cycle refers to the fraction of time over which the transmitter is ON and is transmitting at its maximum power control level. The duty cycle is considered to be constant if variations are less than ±2%; otherwise, the duty cycle is considered to be non constant.

3.2.2.Test Result

Refer to Annex A.1 in this report.

3.3. Maximum Peak Conducted Output Power

3.3.1.Requirement

According to FCC section 15.247(b)(3), For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands: The maximum peak conducted output power of the intentional radiator shall not exceed 1 Watt.

3.3.2.Test Procedures

KDB 558074 Section 8.3.1 was used in order to prove compliance.

3.3.3.Test Setup Layout

Refer to chapter 2.6.1 in this report.

3.3.4.Test Result

Refer to Annex A.2 in this report.

3.4. Maximum Average Conducted Output Power

3.4.1.Requirement

According to FCC section 15.247(b)(3), for systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands: The maximum average conducted output power of the intentional radiator shall not exceed 1 Watt.

3.4.2.Test Procedures

KDB 558074 Section 8.3.2 was used in order to prove compliance.

3.4.3.Test Setup Layout

Refer to chapter 2.6.1 in this report.

3.4.4.Test Result

Refer to Annex A.3 in this report.

3.5.6 dB Bandwidth

3.5.1.Requirement

According to FCC section 15.247(a) (2), systems using digital modulation techniques may operate in the 902 - 928 MHz, 2400 - 2483.5 MHz, and 5725 - 5850 MHz bands. The minimum 6dB bandwidth shall be at least 500 kHz.

3.5.1.Test Procedures

The steps for the first option are as follows:
a) Set analyzer center frequency to channel center frequency
b) Set RBW to100kHz
c) Set VBW to 300kHz
d) Detector = peak.
e) Trace mode = max hold
f) Sweep time = auto couple
g) Allow the trace to fully stabilize
h) Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by6 dB relative to the maximum level measured in the fundamental emission
The automatic bandwidth measurement capability of an instrument may be employed using the X dB bandwidth mode with X set to 6 dB, if the functionality described in 11.8.1 (i.e., RBW = 100 kHz, VBW ≥ 3 ×RBW, and peak detector with maximum hold) is implemented by the instrumentation function. When using this capability, care shall be taken so that the bandwidth measurement is not influenced by any intermediate power nulls in the fundamental emission that might be ≥6 dB.

3.5.2.Test Setup Layout

Refer to chapter 2.6.1 in this report.

3.5.3.Test Result

Refer to Annex A.4 in this report.

3.6. Conducted Spurious Emissions and Band Edge

3.6.1.Requirement

According to FCC section 15.247(d), in any 100kHz 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 20dB below that in the 100kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement.

3.6.2.Test Procedures

KDB 558074 Section 8.5 and 8.7 was used in order to prove compliance.

3.6.3.Test Setup Layout

Refer to chapter 2.6.1 in this report.

3.6.4.Test Result

Refer to Annex A.5 and A.6 in this report.

3.7. Power Spectral Density

3.7.1.Requirement

For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8dBm in any 3 kHz band during any time interval of continuous transmission. This power spectral density shall be determined in accordance with the provisions of paragraph (b) of this section. The same method of determining the conducted output power shall be used to determine the power spectral density.

3.7.2.Test Procedures

The measured power spectral density was calculated by the reading of the spectrum analyzer and calibration. Following is the test procedure for PSD test:
a) Set analyzer center frequency to channel center frequency
b) Set span to1.5 times DTS
c) Set RBW to 3kHz
d) Set VBW to 10kHz
e) Detector = peak
f) Sweep time = auto couple
g) Trace mode = max hold
h) Allow trace to fully stabilize
i) Use the peak marker function to determine the maximum amplitude level within the RBW

3.7.3.Test Setup Layout

Refer to chapter 2.6.1 in this report.

3.7.4.Test Result

Refer to Annex A.7 in this report.

3.8. Conducted Emission

3.8.1.Requirement

According to FCC section 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 150kHz to 30MHz 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
5 - 30	60	50

Note:

(a) The lower limit shall apply at the band edges.

(b) The limit decreases linearly with the logarithm of the frequency in the range 0.15 - 0.50MHz.

3.8.2.Test Procedures

The Table-top EUT was placed upon a non-metallic table 0.8m above the horizontal metal reference ground plane. EUT was connected to LISN and LISN was connected to reference Ground Plane. EUT was 80cm from LISN. The set-up and test methods were according to ANSI C63.10: 2013.

3.8.3.Test Setup Layout

Refer to chapter 2.6.2 in this report.

3.8.4.Test Result

Refer to Annex A.8 in this report.

3.9. Restricted Frequency Bands

3.9.1.Requirement

According to FCC section 15.247(d), in any 100kHz 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 20dB below that in the 100kHz bandwidth within the band that contains the highest level of the desired power, In addition, radiated emissions which fall in the restricted bands, as defined in 15.205(a), must also comply with the radiated emission limits specified in 15.209(a).

3.9.2.Test Procedures

The EUT is located in a 3m Semi-Anechoic Chamber; the antenna factors, cable loss and so on of the site as factors are calculated to correct the reading.
For the Test Antenna:
Test Antenna is 3m away from the EUT. Test Antenna height is varied from 1m to 4m above the ground to determine the maximum value of the field strength.
Span = wide enough to fully capture the emission being measured
RBW = 1 MHz for f ≥ 1GHz, 100 kHz for f < 1GHz
VBW = 3 MHz
Sweep = auto
Detector function = peak/average
Trace = max hold
Allow the trace to stabilize

3.9.3.Test Setup Layout

Refer to chapter 2.6.3 in this report.

3.9.4.Test Result

Refer to Annex A.9 in this report.

3.10. Radiated Emission

3.10.1.Requirement

According to FCC section 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).

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

Note1: For above 1000MHz, 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.
Note2: For above 1000MHz, limit field strength of harmonics: 54dBuV/m@3m (AV) and 74dBuV/m@3m (PK).In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), also should comply with the radiated emission limits specified in Section 15.209(a)(above table).

3.10.2.Test Procedures

The EUT is placed on a non-conducting table 80 cm above the ground plane for measurement below 1GHz; 1.5 m above the ground plane for measurement above 1GHz.The antenna to EUT distance is 3meters. The EUT is configured in accordance with ANSI C63.10. The EUT is set to transmit in a continuous mode.

For measurements below 30MHz, the emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9kHz-90 kHz, 110kHz-490 kHz. Radiated emission limits in these two bands are based on measurements employing an average detector.

For measurements below 1GHz the resolution bandwidth is set to 100kHz for peak detection measurements or 120kHz for quasi-peak detection measurements. Peak detection is used unless otherwise noted as quasi-peak.

For measurements above 1GHz the resolution bandwidth is set to 1MHz, the video band width is set to 3MHz for peak measurements and as applicable for average measurements.

The EUT is rotated through 360 degrees to maximize emissions received. The antenna is scanned from 1 to 4 meters above the ground plane to further maximize the emission. Measurements are made with the antenna polarized in both the vertical and the horizontal positions. For measurements above 1 GHz, keeping the measurement antenna aimed at the source of emissions at each frequency of significant emissions, with polarization oriented for maximum response.

3.10.3.Test Setup Layout

Refer to chapter 2.6.3 in this report.

3.10.4.Test Result

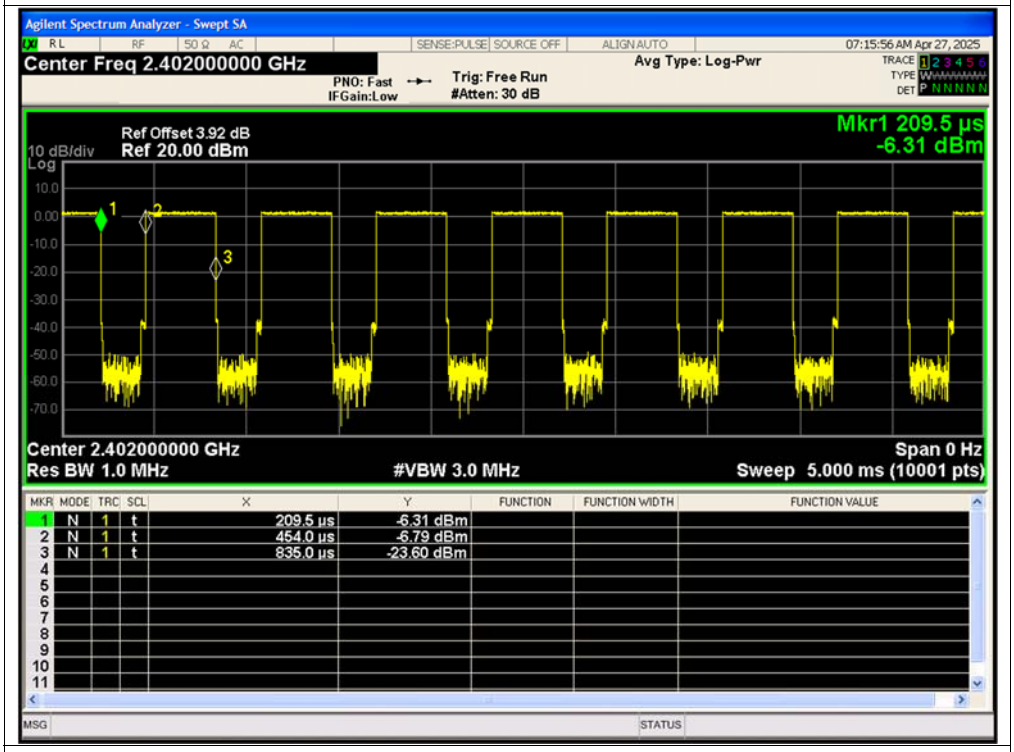
Refer to Annex A.10 in this report.

Annex A Test Data and Result

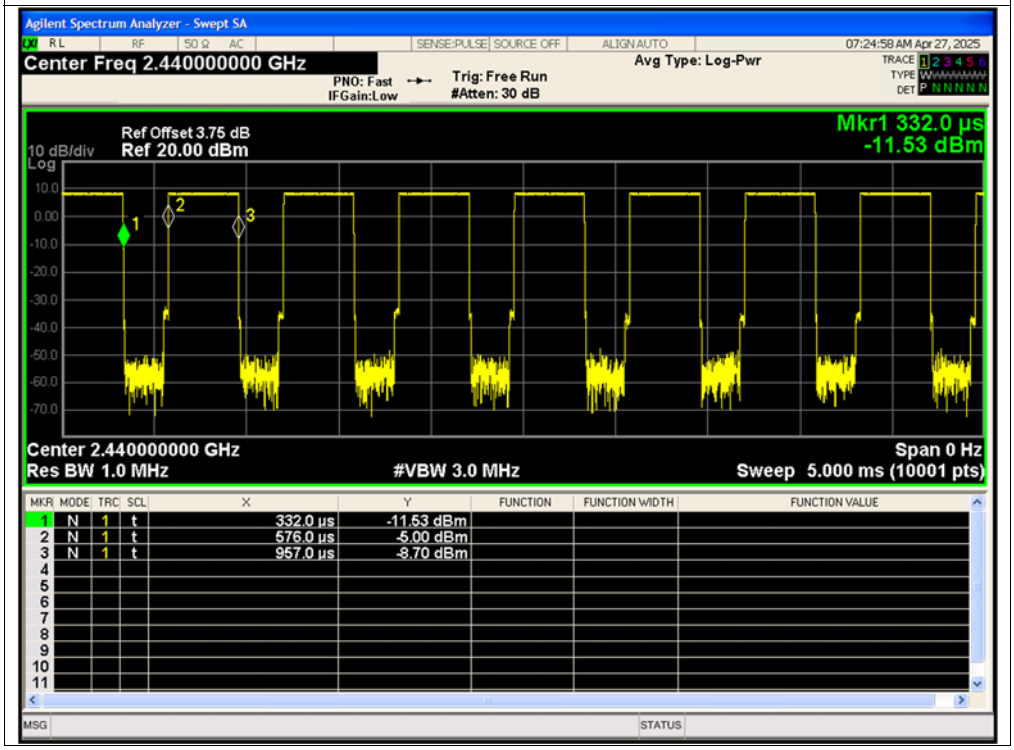
A.1. Duty Cycle of Test Signal

Condition	Mode	Frequency (MHz)	Antenna	Duty Cycle (%)	Correction Factor (dB)	1/T (kHz)
NVNT	BLE 1M	2402	Ant1	60.91	2.15	2.62
NVNT	BLE 1M	2440	Ant1	60.96	2.15	2.62
NVNT	BLE 1M	2480	Ant1	60.96	2.15	2.62

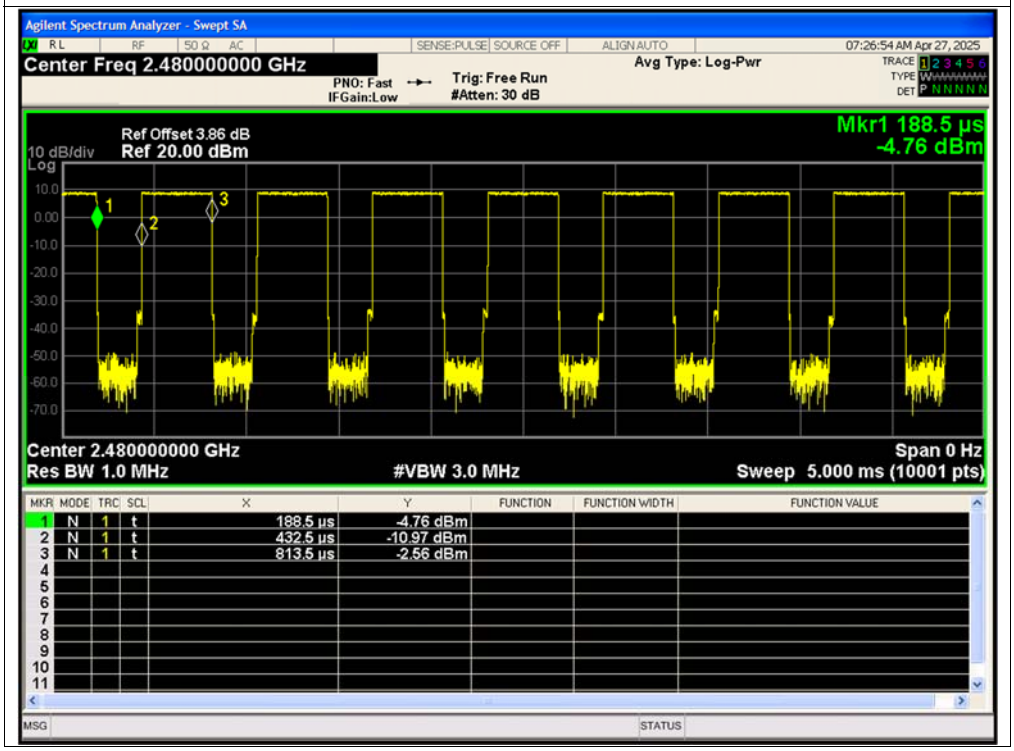
Test Graphs
Duty Cycle NVNT BLE 1M 2402MHz Ant1



Duty Cycle NVNT BLE 1M 2440MHz Ant1



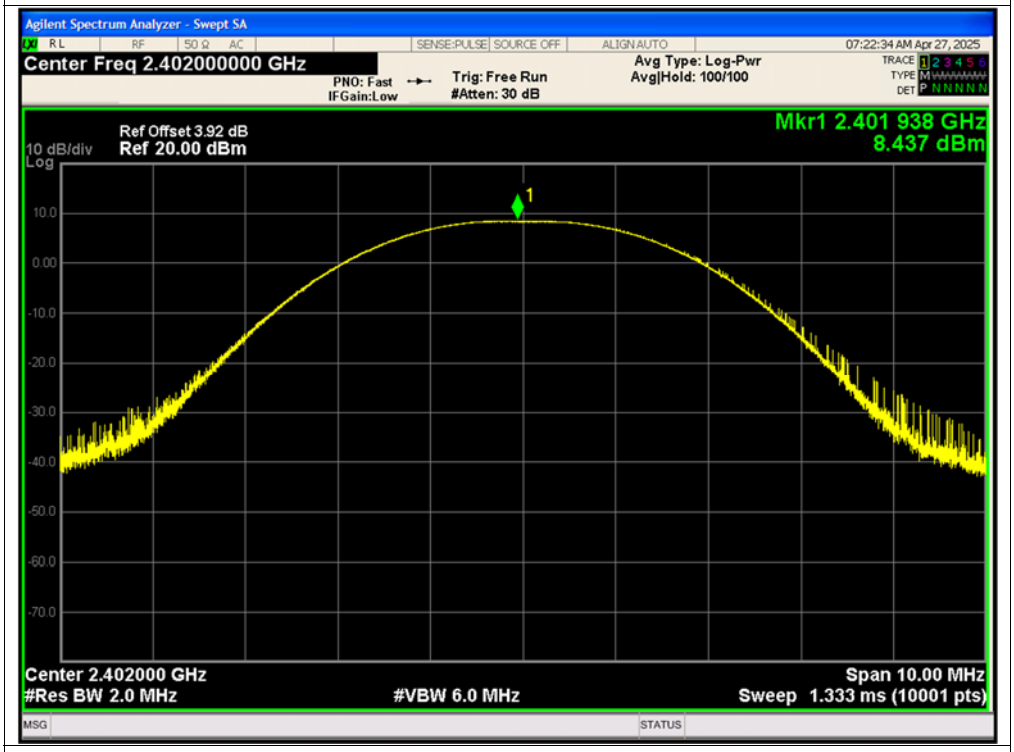
Duty Cycle NVNT BLE 1M 2480MHz Ant1



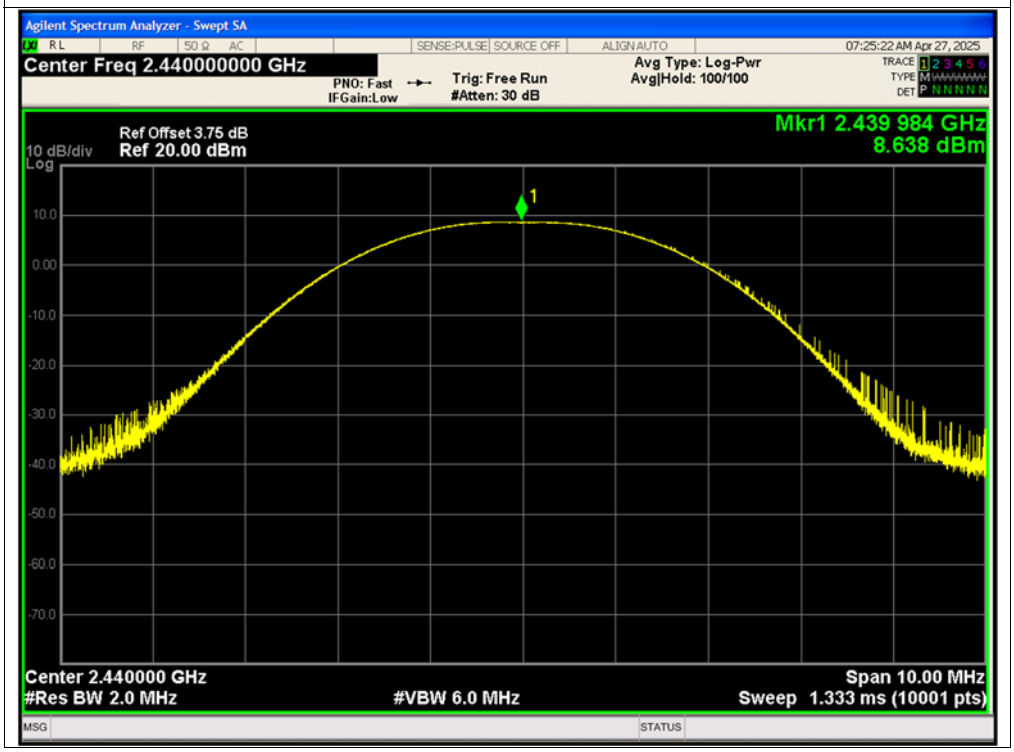
A.2. Maximum Peak Conducted Output Power

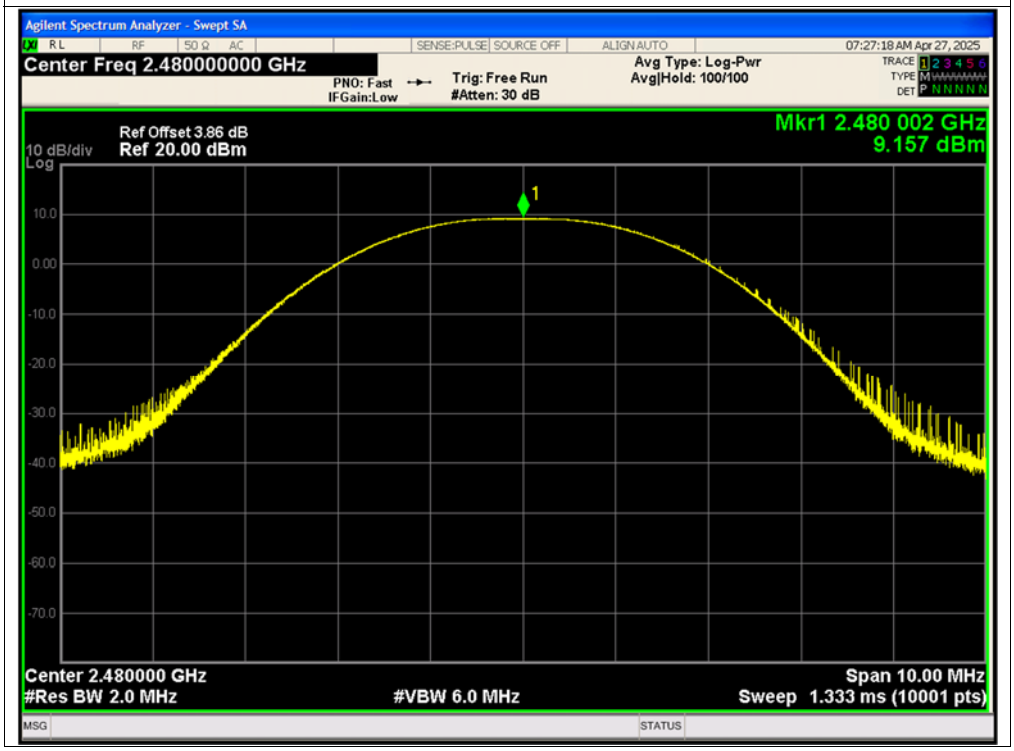
Condition	Mode	Frequency (MHz)	Antenna	Conducted Power (dBm)	Duty Factor (dB)	Total Conducted Power (dBm)	Total Conducted Power (W)	Limit Conducted (dBm)	Verdict
NVNT	BLE 1M	2402	Ant1	8.44	0	8.44	0.00698	30	Pass
NVNT	BLE 1M	2440	Ant1	8.64	0	8.64	0.00731	30	Pass
NVNT	BLE 1M	2480	Ant1	9.16	0	9.16	0.00824	30	Pass

Test Graphs
Peak Power NVNT BLE 1M 2402MHz Ant1



Peak Power NVNT BLE 1M 2440MHz Ant1

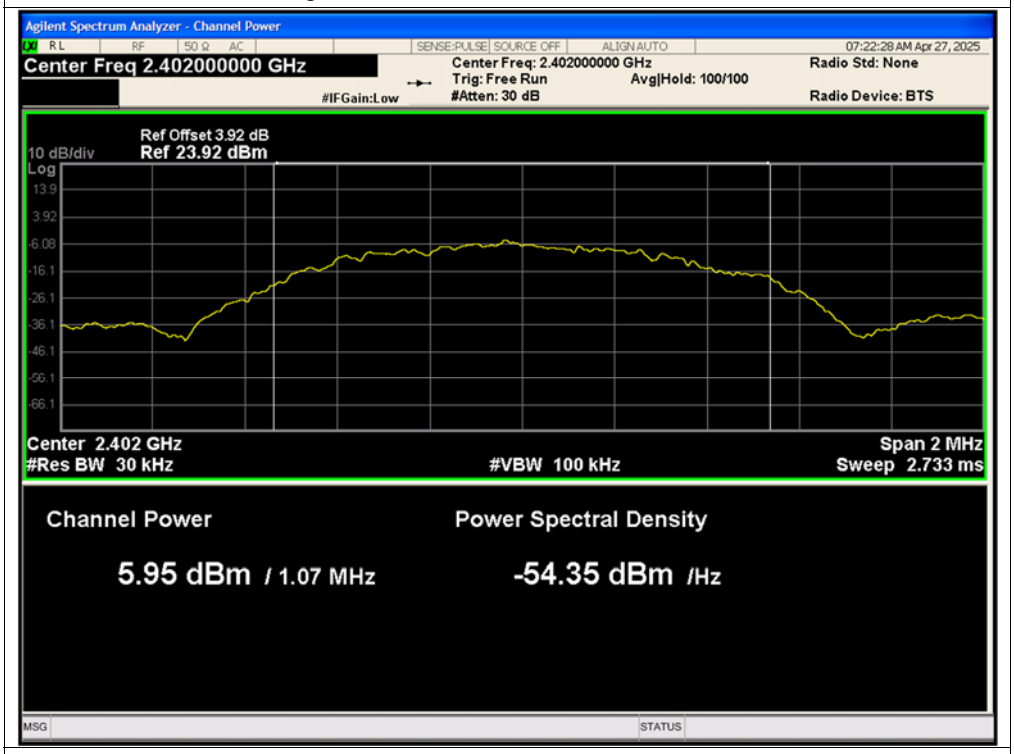


Peak Power NVNT BLE 1M 2480MHz Ant1


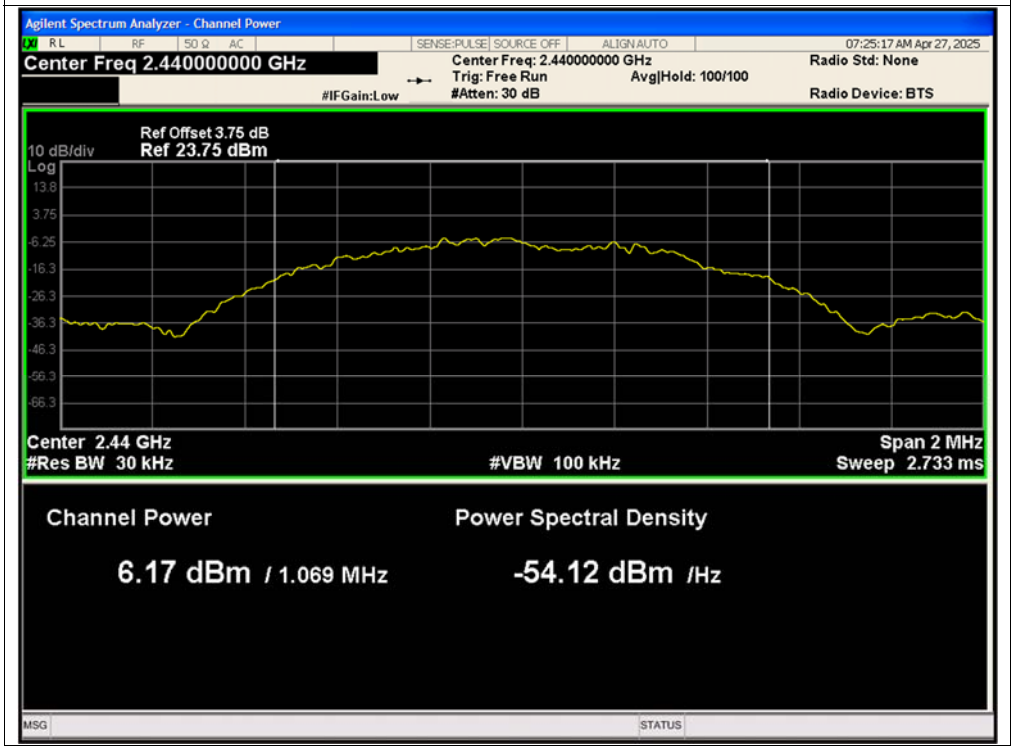
A.3. Maximum Average Conducted Output Power

Condition	Mode	Frequency (MHz)	Antenna	Conducted Power (dBm)	Duty Factor (dB)	Total Conducted Power (dBm)	Total Conducted Power (W)	Limit Conducted (dBm)	Verdict
NVNT	BLE 1M	2402	Ant1	5.95	2.15	8.1	0.00646	30	Pass
NVNT	BLE 1M	2440	Ant1	6.17	2.15	8.32	0.00679	30	Pass
NVNT	BLE 1M	2480	Ant1	6.74	2.15	8.89	0.00774	30	Pass

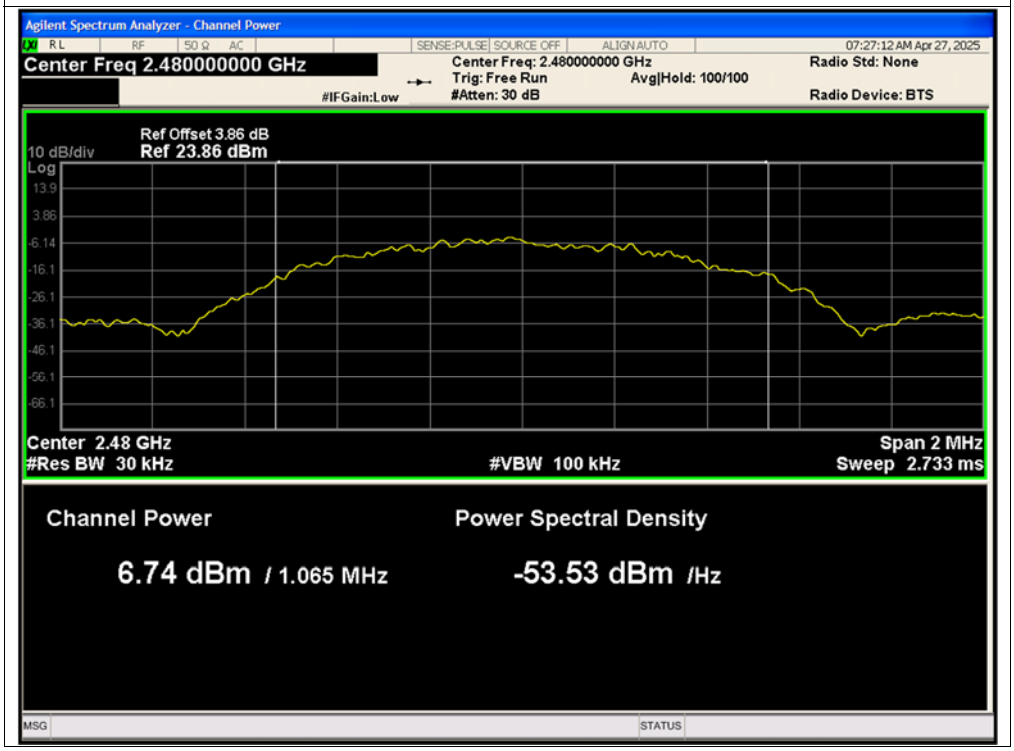
Test Graphs
Average Power NVNT BLE 1M 2402MHz Ant1



Average Power NVNT BLE 1M 2440MHz Ant1



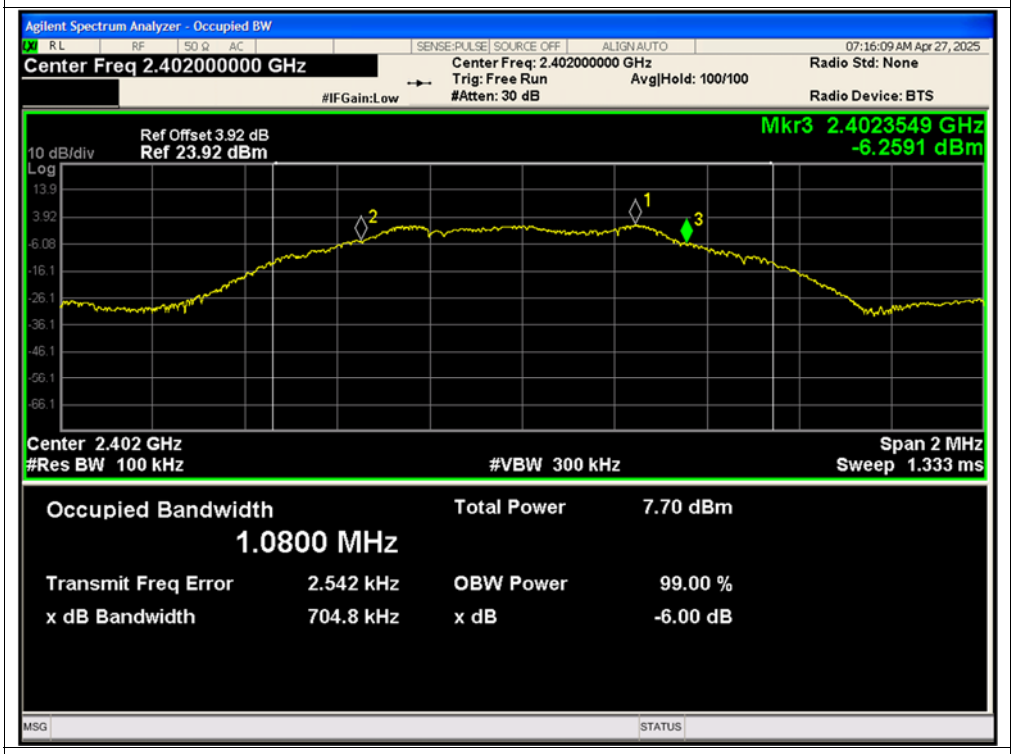
Average Power NVNT BLE 1M 2480MHz Ant1



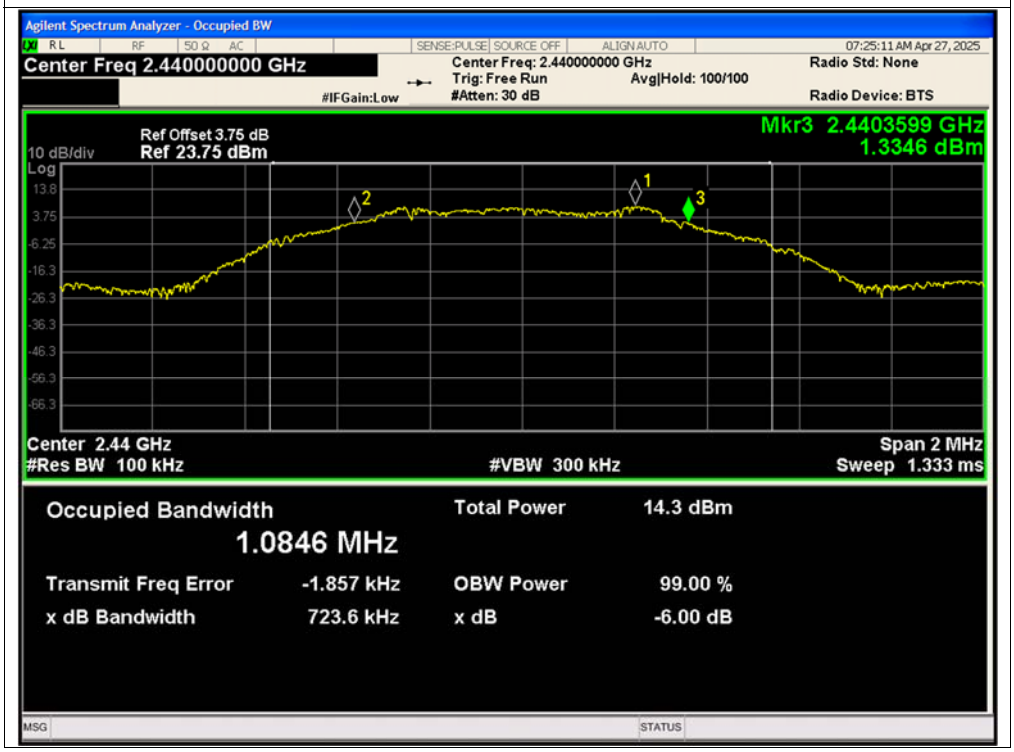
A.4. 6 dB Bandwidth

Condition	Mode	Frequency (MHz)	Antenna	-6 dB Bandwidth (MHz)	Limit -6 dB Bandwidth (MHz)	Verdict
NVNT	BLE 1M	2402	Ant1	0.7048	0.5	Pass
NVNT	BLE 1M	2440	Ant1	0.7236	0.5	Pass
NVNT	BLE 1M	2480	Ant1	0.7221	0.5	Pass

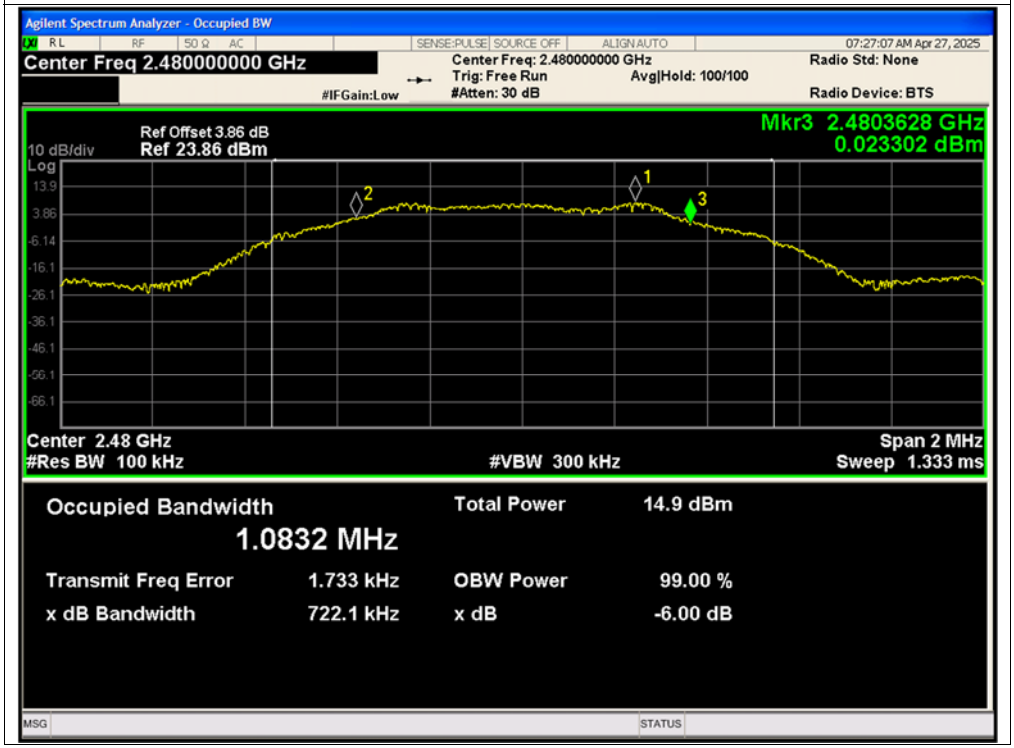
Test Graphs
-6dB Bandwidth NVNT BLE 1M 2402MHz Ant1



-6dB Bandwidth NVNT BLE 1M 2440MHz Ant1



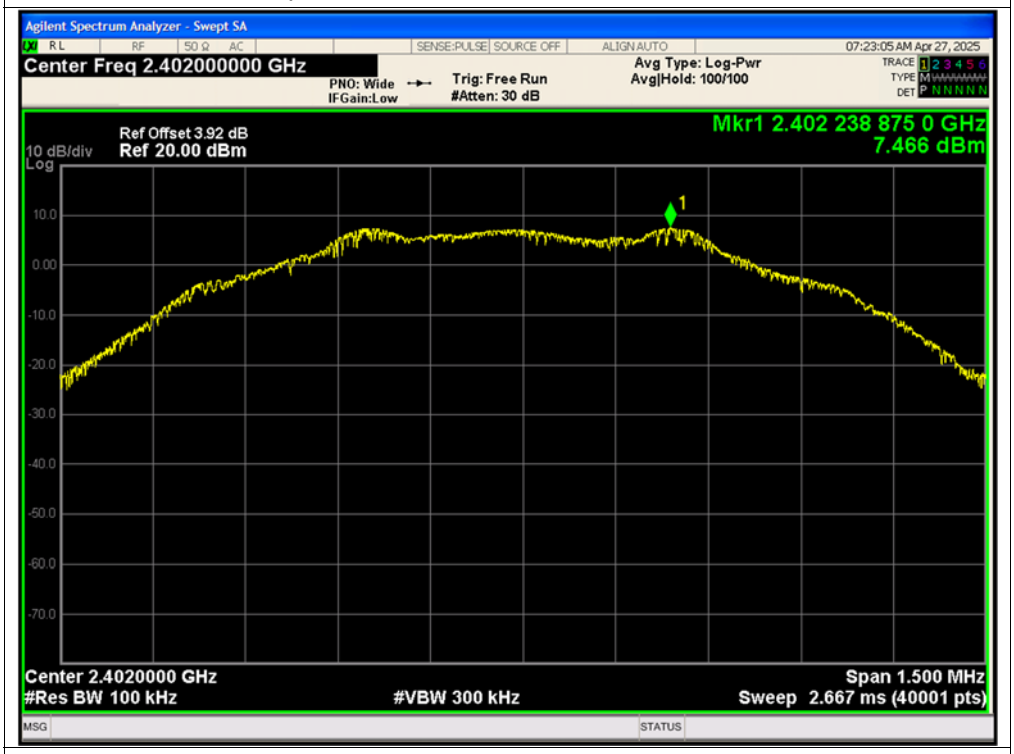
-6dB Bandwidth NVNT BLE 1M 2480MHz Ant1



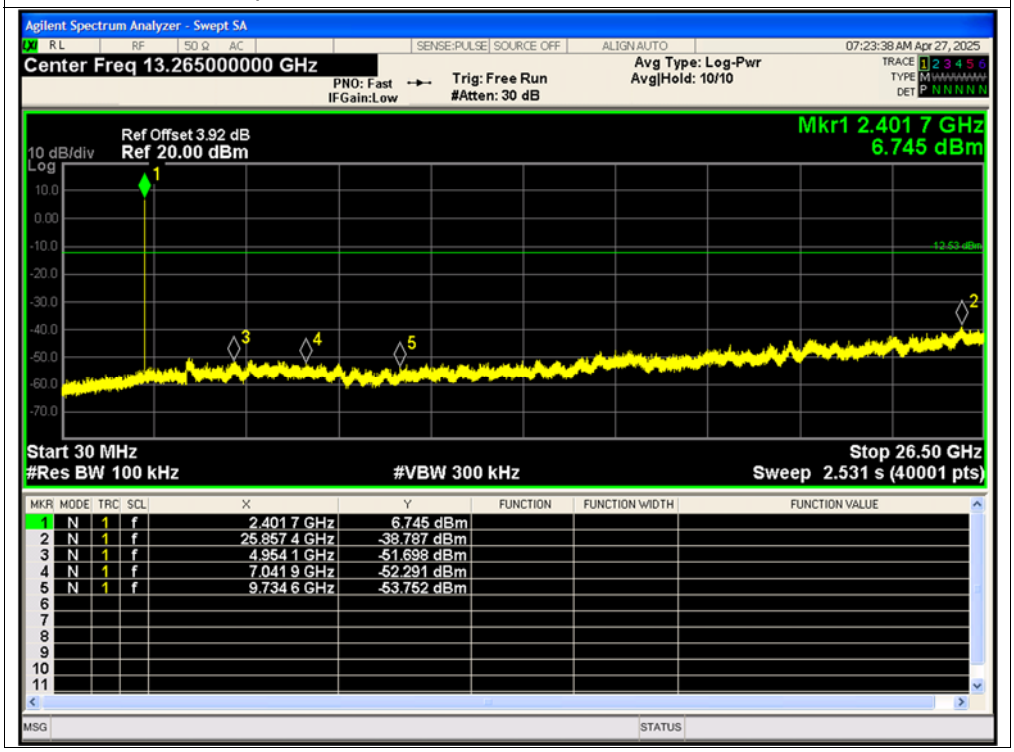
A.5. Conducted Spurious Emissions

Condition	Mode	Frequency (MHz)	Antenna	Max Value (dBc)	Limit (dBc)	Verdict
NVNT	BLE 1M	2402	Ant1	-46.25	-20	Pass
NVNT	BLE 1M	2440	Ant1	-47.34	-20	Pass
NVNT	BLE 1M	2480	Ant1	-46.29	-20	Pass

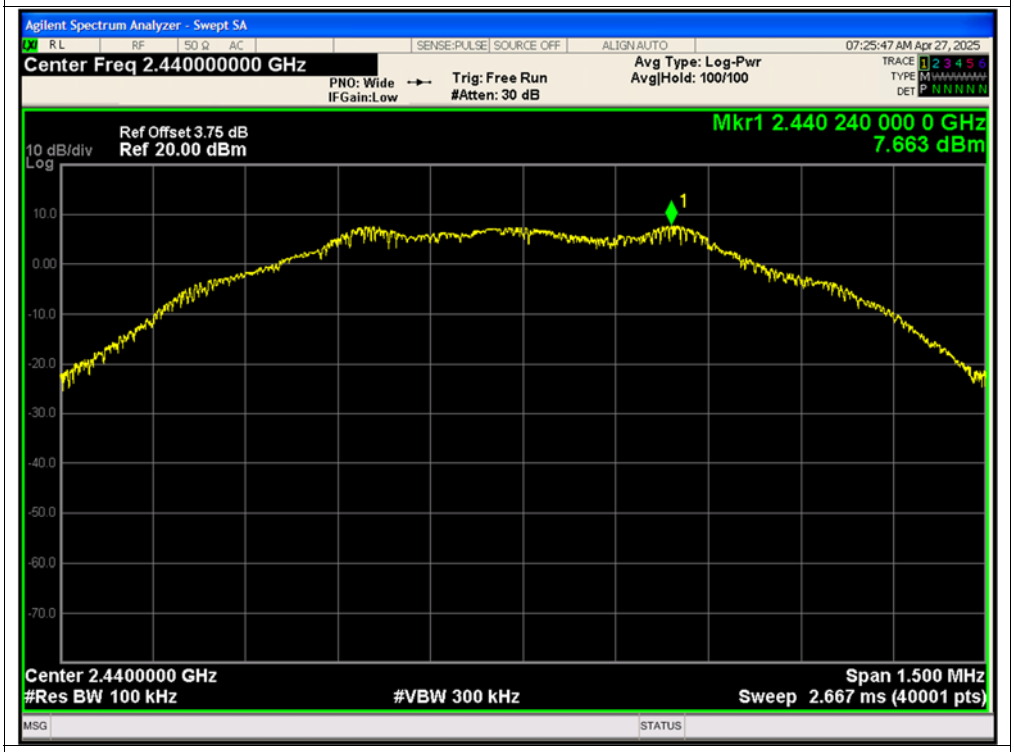
Test Graphs
Tx. Spurious NVNT BLE 1M 2402MHz Ant1 Ref



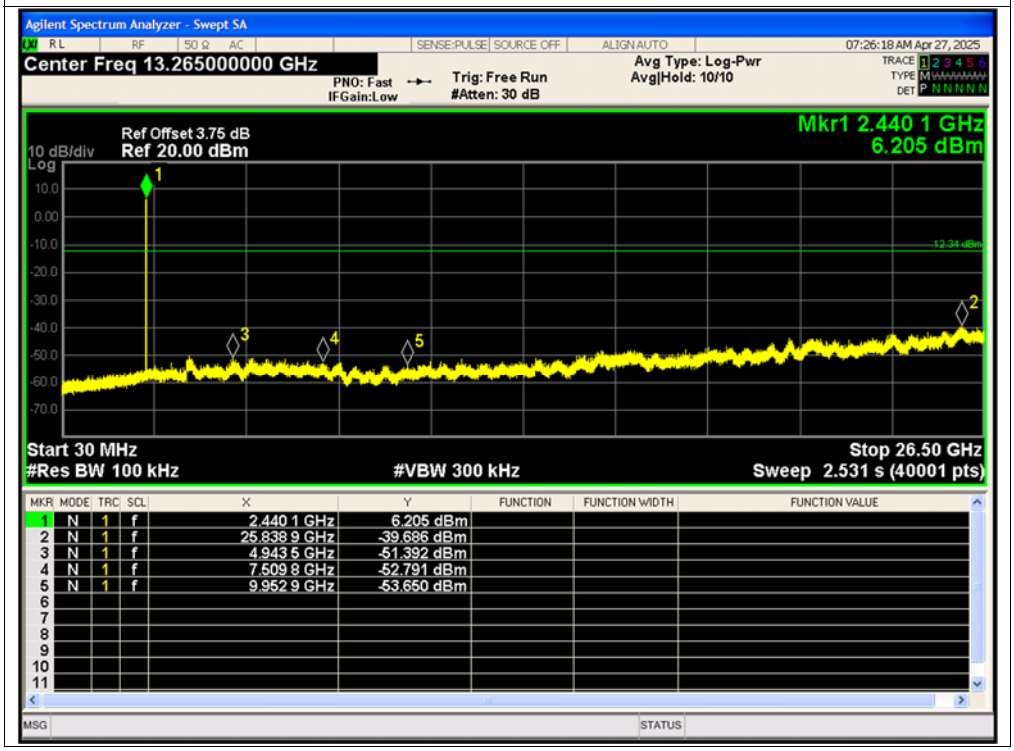
Tx. Spurious NVNT BLE 1M 2402MHz Ant1 Emission



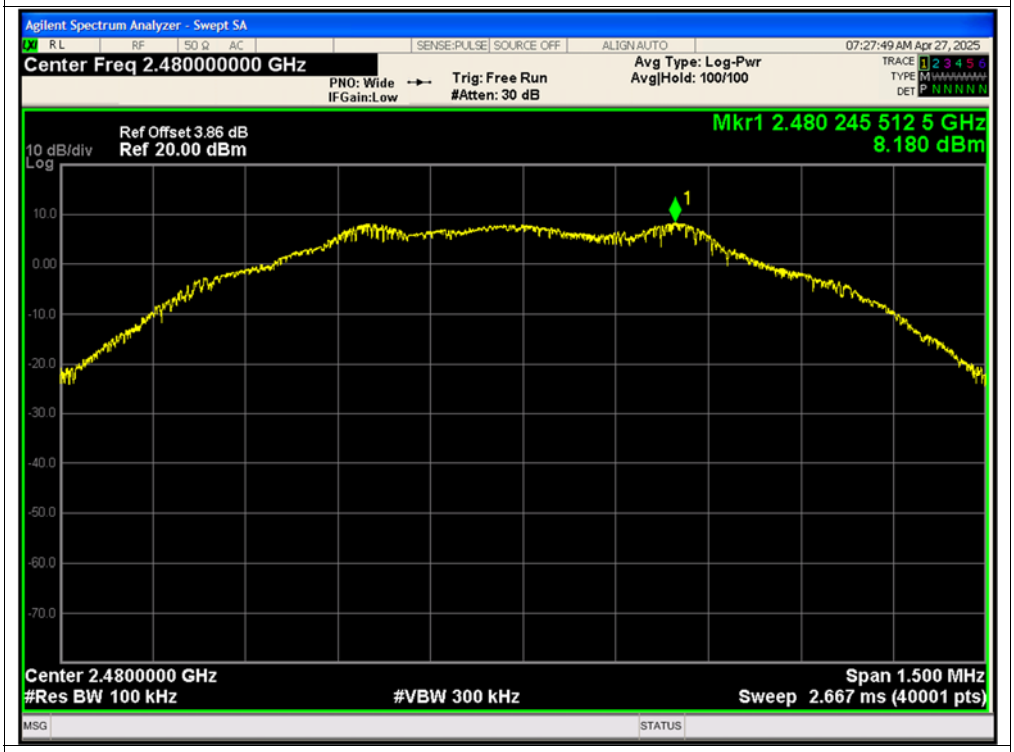
Tx. Spurious NVNT BLE 1M 2440MHz Ant1 Ref



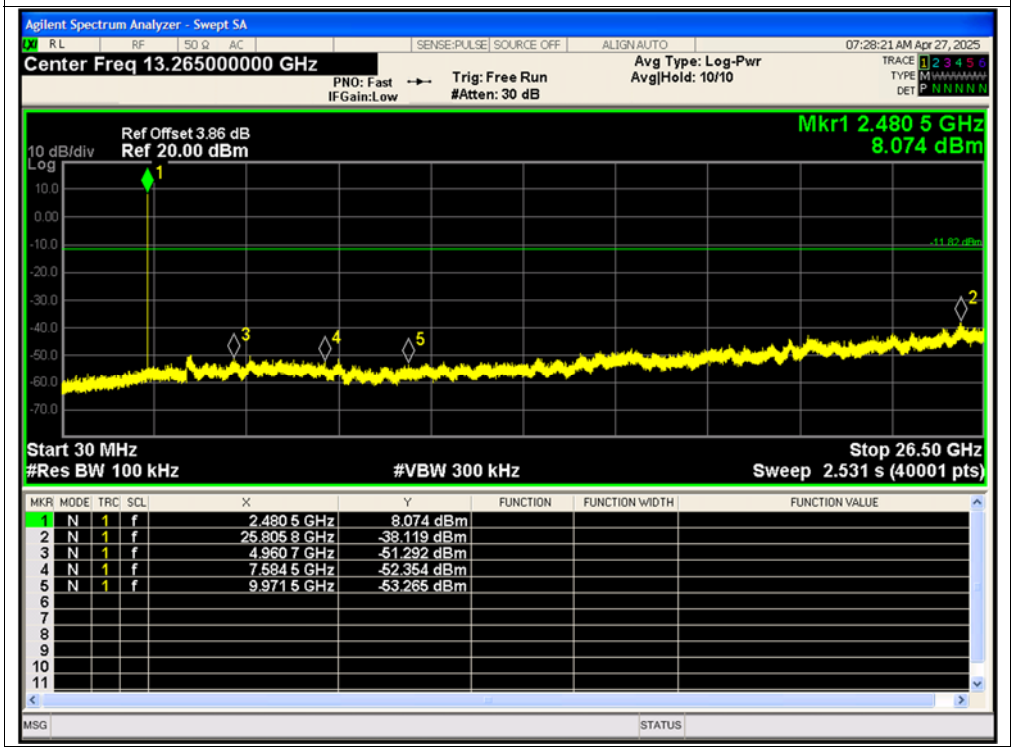
Tx. Spurious NVNT BLE 1M 2440MHz Ant1 Emission



Tx. Spurious NVNT BLE 1M 2480MHz Ant1 Ref



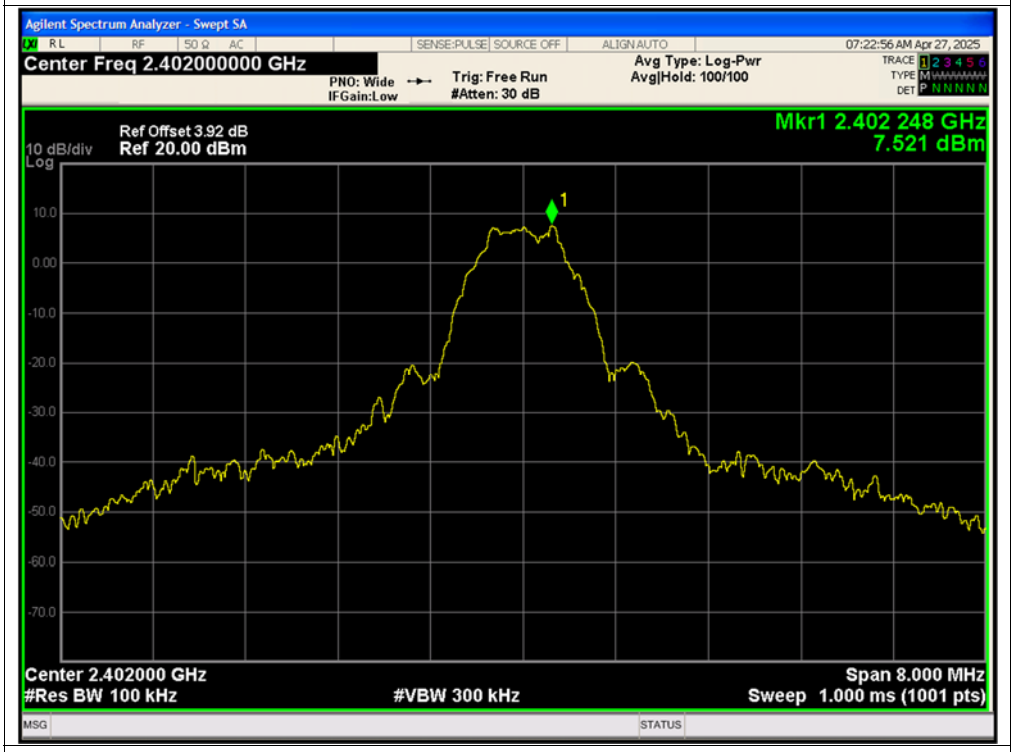
Tx. Spurious NVNT BLE 1M 2480MHz Ant1 Emission



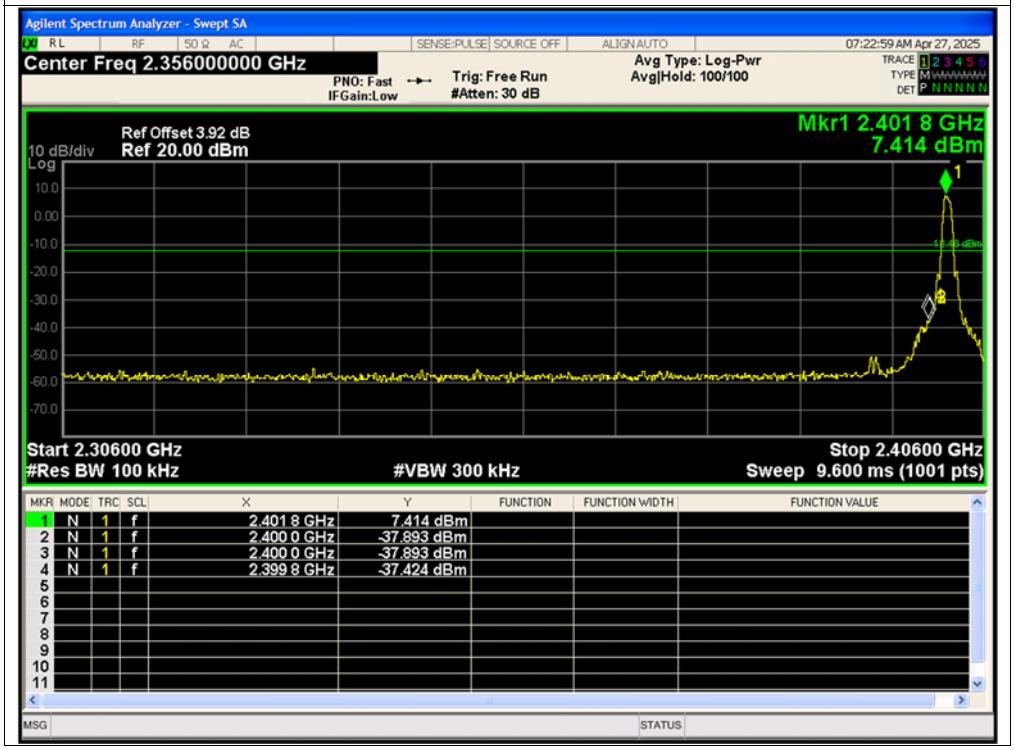
A.6. Band Edge

Condition	Mode	Frequency (MHz)	Antenna	Max Value (dBc)	Limit (dBc)	Verdict
NVNT	BLE 1M	2402	Ant1	-44.94	-20	Pass
NVNT	BLE 1M	2480	Ant1	-53.38	-20	Pass

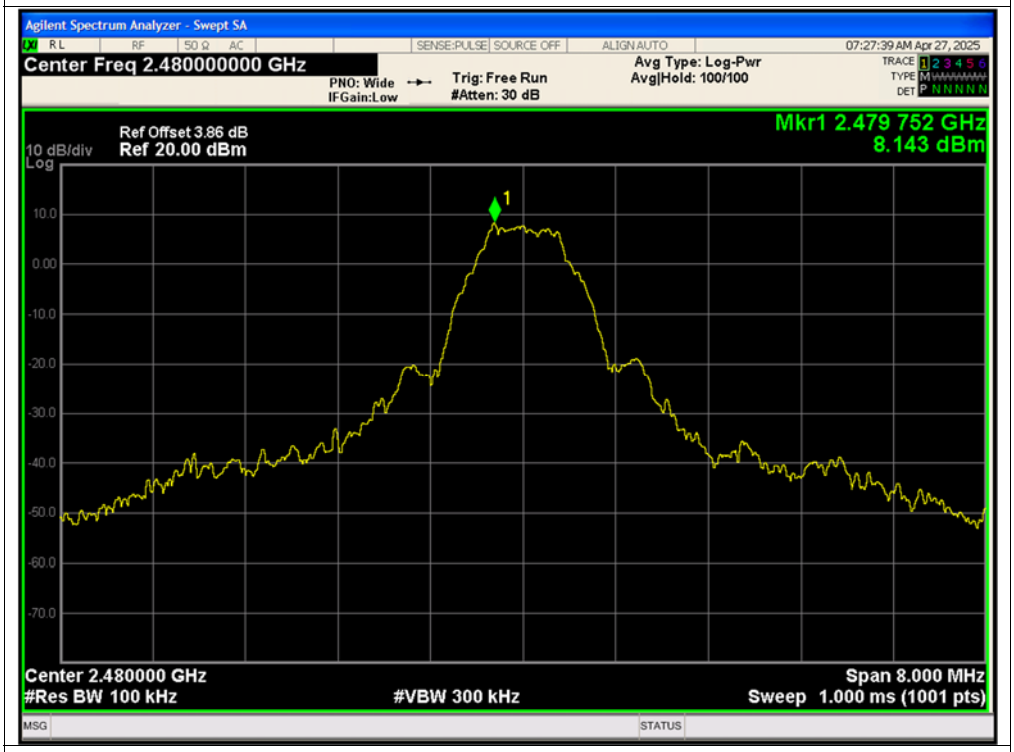
Test Graphs
Band Edge NVNT BLE 1M 2402MHz Ant1 Ref



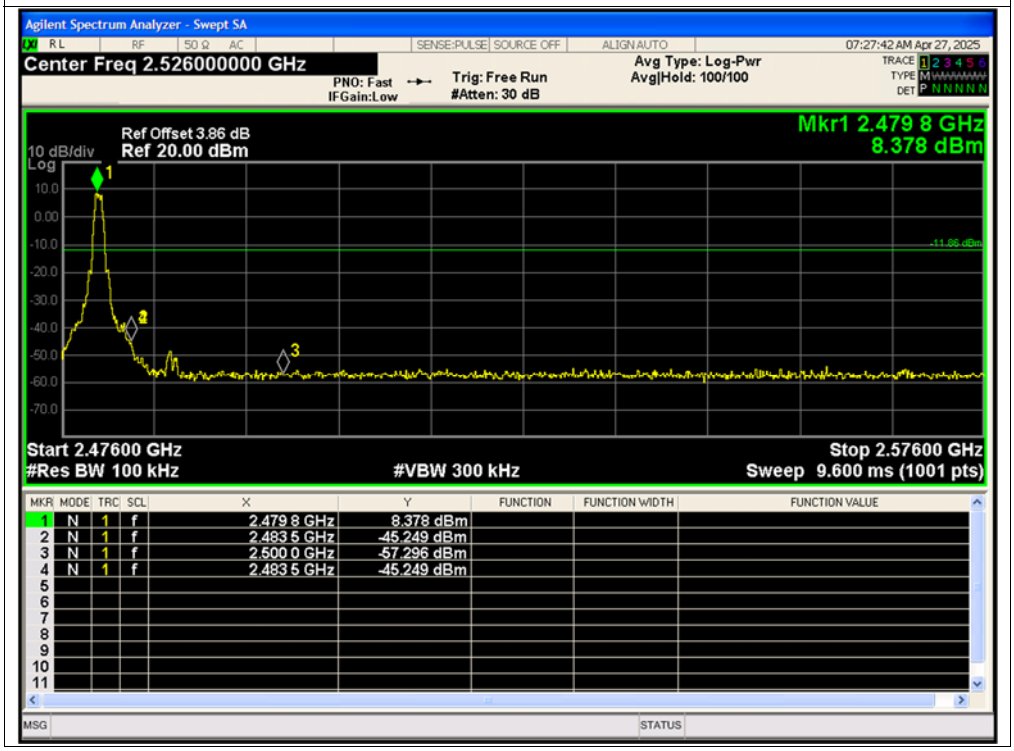
Band Edge NVNT BLE 1M 2402MHz Ant1 Emission



Band Edge NVNT BLE 1M 2480MHz Ant1 Ref



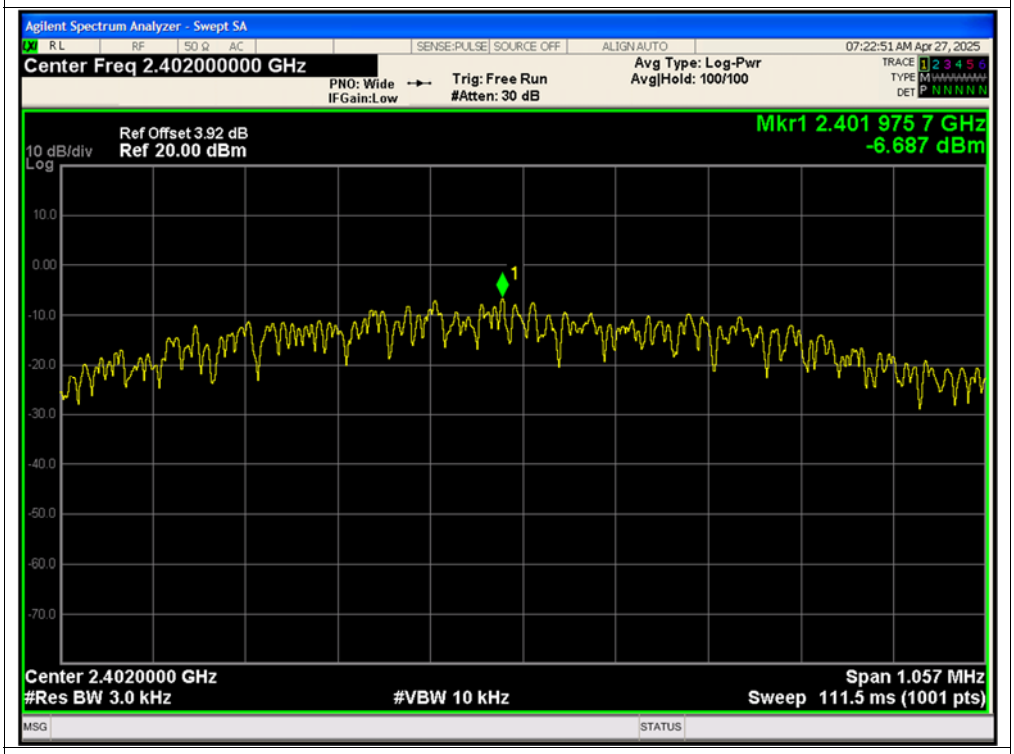
Band Edge NVNT BLE 1M 2480MHz Ant1 Emission



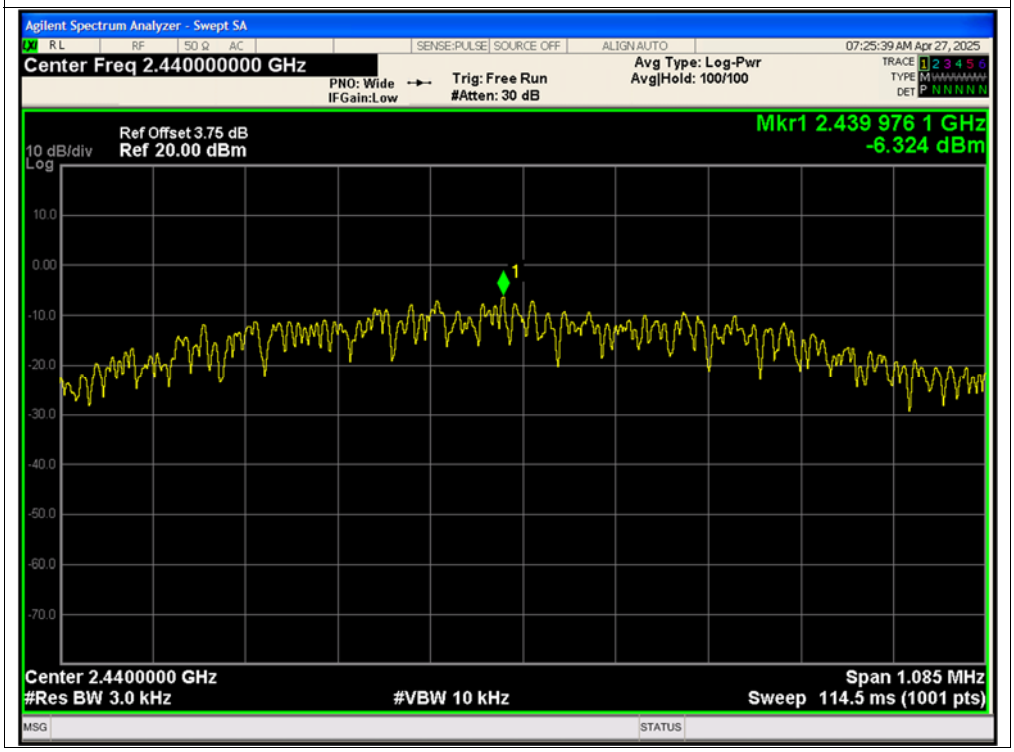
A.7. Power Spectral Density

Condition	Mode	Frequency (MHz)	Antenna	Conducted PSD (dBm/3kHz)	Duty Factor (dB)	Total PSD (dBm/3kHz)	Limit (dBm/3kHz)	Verdict
NVNT	BLE 1M	2402	Ant1	-6.69	0	-6.69	8	Pass
NVNT	BLE 1M	2440	Ant1	-6.32	0	-6.32	8	Pass
NVNT	BLE 1M	2480	Ant1	-5.82	0	-5.82	8	Pass

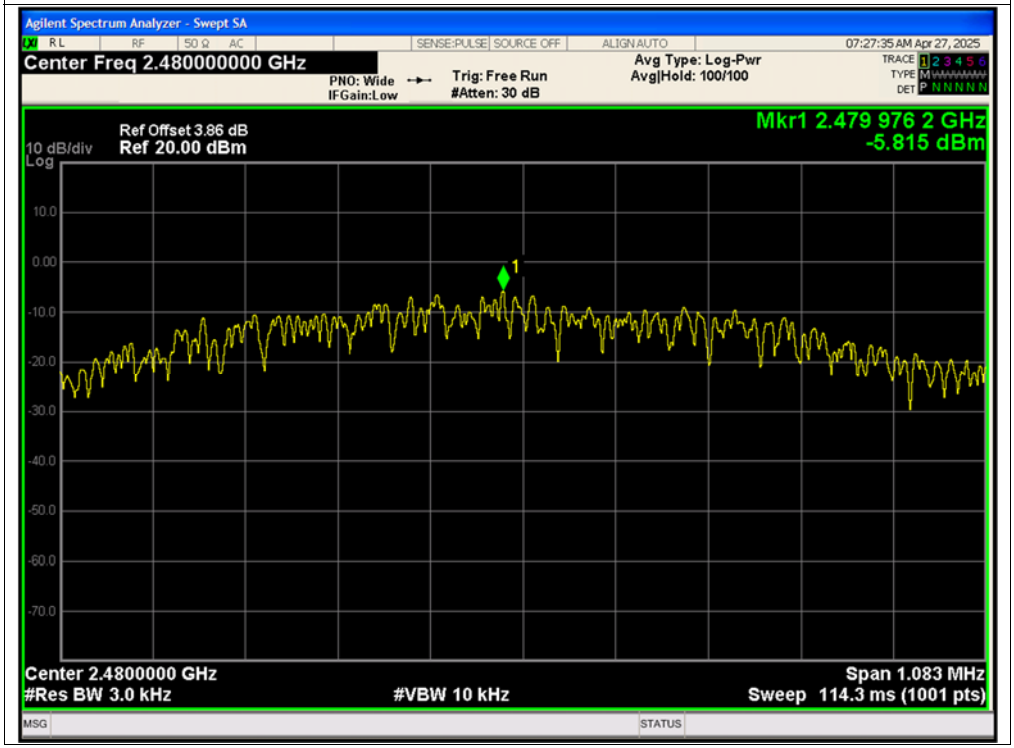
Test Graphs
PSD NVNT BLE 1M 2402MHz Ant1



PSD NVNT BLE 1M 2440MHz Ant1



PSD NVNT BLE 1M 2480MHz Ant1



A.8. Conducted Emission

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. Set RBW=9kHz, VBW=30kHz. Refer to recorded points and plots below.

Note: Both of the test voltage AC 120V/60Hz and AC 230V/50Hz were considered and tested respectively, only the results of the worst case AC 120V/60Hz were recorded in this report.

A. Test Setup:

Test Mode: EUT+Adapter+Data cable+Mobile phone+Small speaker box + BT TX

Test voltage: AC 120V/60Hz

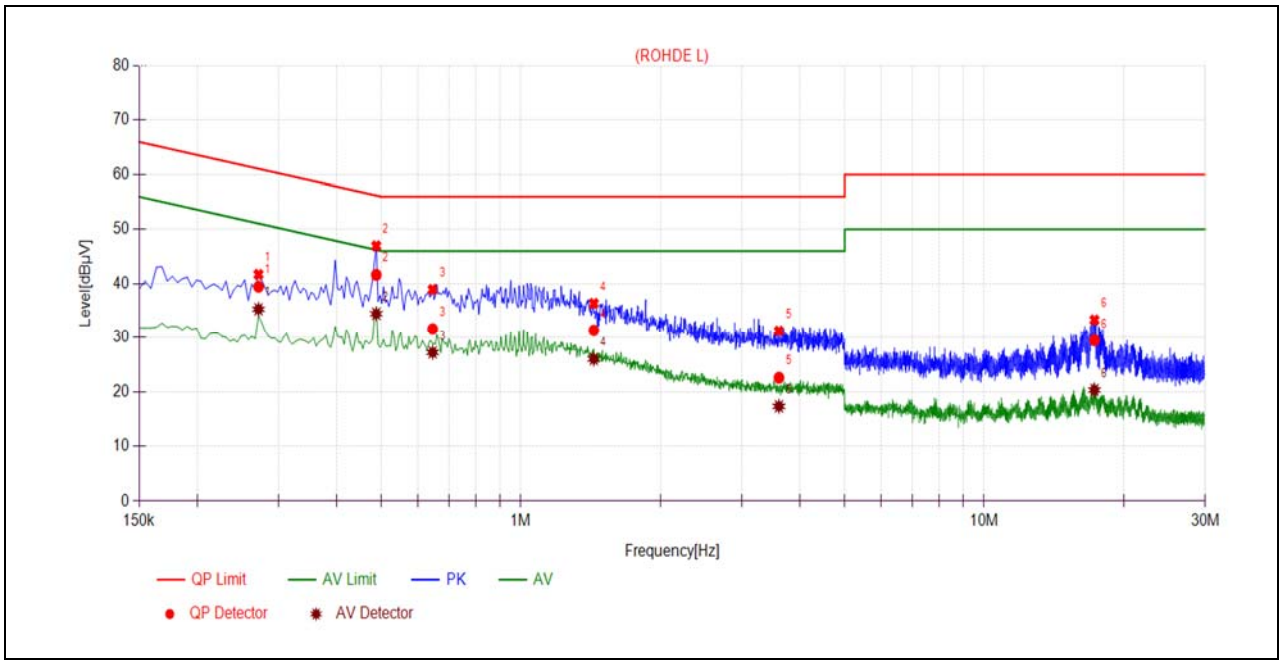
The measurement results are obtained as below:

$E\ [dB\mu V] = U_R + L_{Cable\ loss}\ [dB] + A_{Factor}$

U_R: Receiver Reading

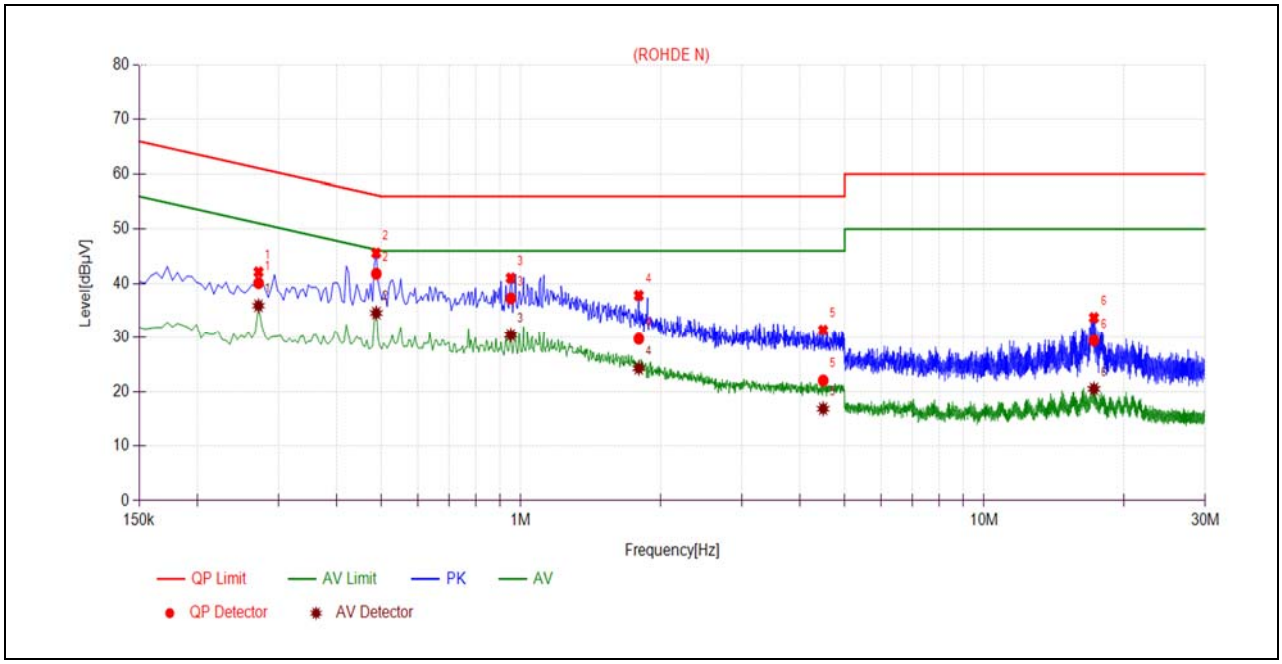
A_{Factor}: Voltage division factor of LISN

B. Test Plot:



(L Phase)

No.	Fre. (MHz)	Emission Level (dBµV)		Limit (dBµV)		Power-line	Verdict
		Quai-peak	Average	Quai-peak	Average		
1	0.2715	39.45	35.29	61.07	51.07	Line	PASS
2	0.4875	41.64	34.45	56.21	46.21		PASS
3	0.6450	31.59	27.21	56.00	46.00		PASS
4	1.4370	31.33	26.00	56.00	46.00		PASS
5	3.6061	22.55	17.30	56.00	46.00		PASS
6	17.3038	29.45	20.29	60.00	50.00		PASS



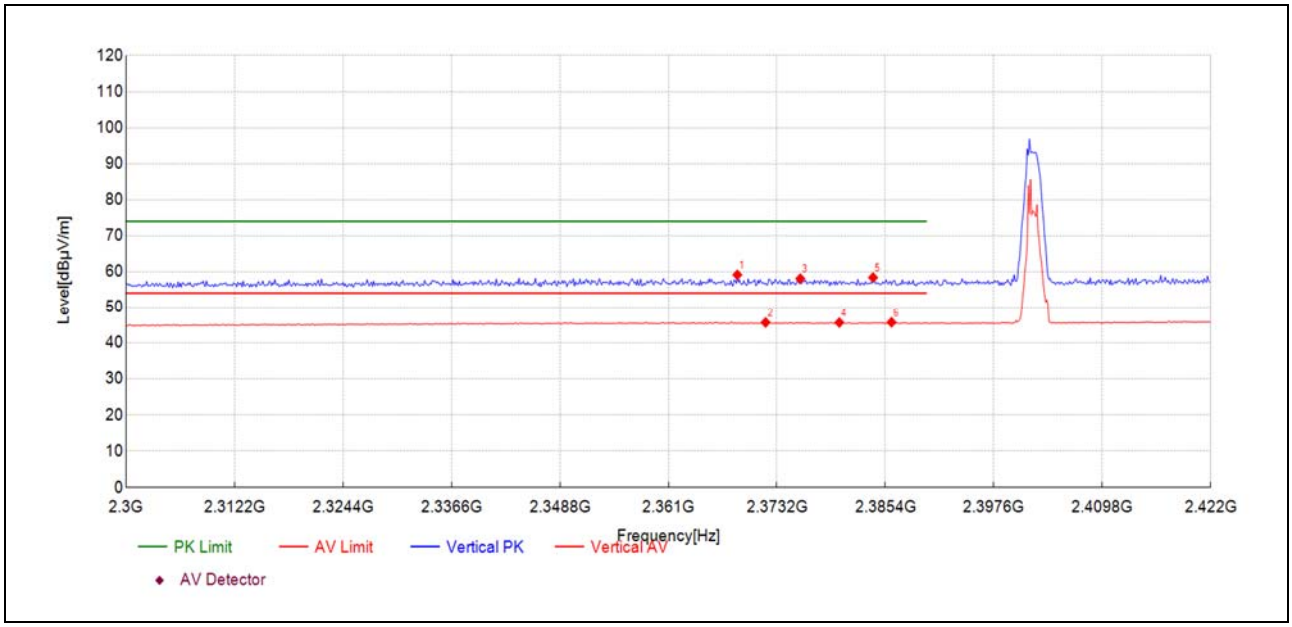
(N Phase)

No.	Fre. (MHz)	Emission Level (dBµV)		Limit (dBµV)		Power-line	Verdict
		Quai-peak	Average	Quai-peak	Average		
1	0.2715	40.10	35.94	61.07	51.07	Neutral	PASS
2	0.4875	41.81	34.59	56.21	46.21		PASS
3	0.9511	37.30	30.48	56.00	46.00		PASS
4	1.7969	29.74	24.26	56.00	46.00		PASS
5	4.4926	22.01	16.82	56.00	46.00		PASS
6	17.2583	29.42	20.47	60.00	50.00		PASS

A.9. Restricted Frequency Bands

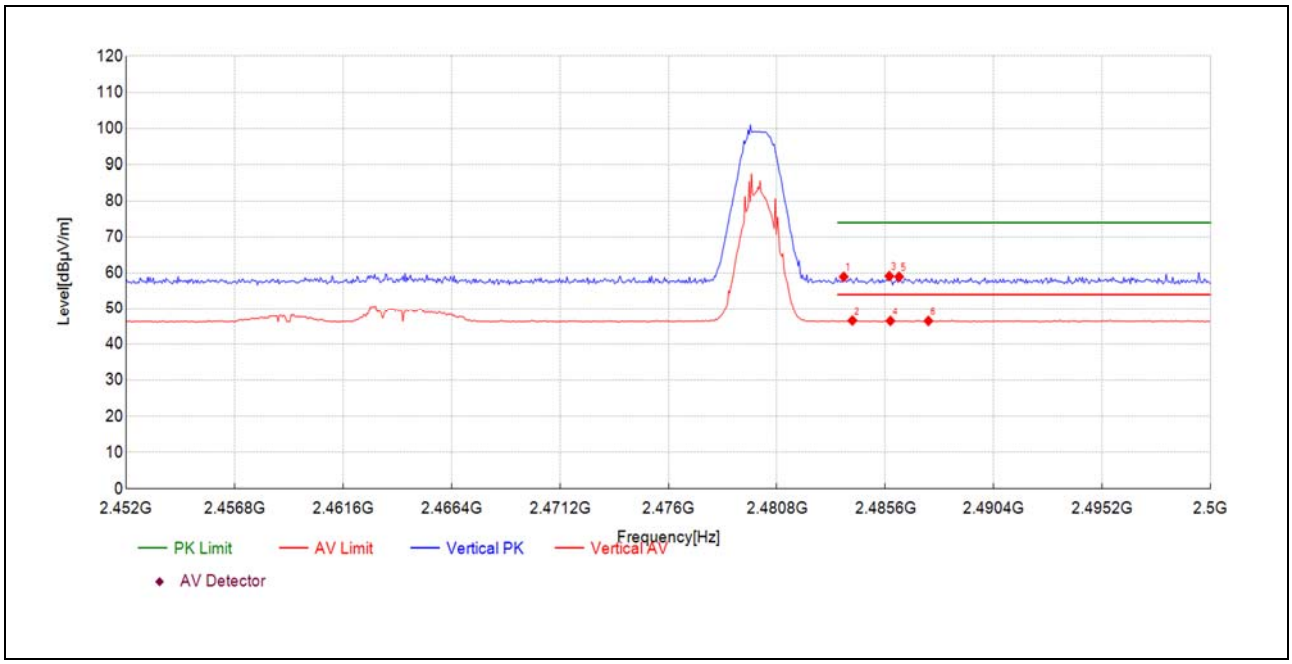
Note: Restricted Frequency Bands were performed when antenna was at vertical and horizontal polarity, and only the worse test condition (Horizontal) was recorded in this test report.

Plot for Channel 0



Fre. (MHz)	Reading [dBµV]	Level [dBµV/m]	Factor [dB/m]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Detector	Verdict
2368.75	21.7	59.14	37.470	74.00	14.86	150	18	PK	PASS
2371.93	8.2	45.68	37.470	54.00	8.32	150	37	AV	PASS
2375.84	20.6	58.09	37.480	74.00	15.91	150	89	PK	PASS
2380.23	8.2	45.65	37.480	54.00	8.35	150	187	AV	PASS
2384.02	20.9	58.39	37.490	74.00	15.61	150	37	PK	PASS
2386.10	8.2	45.73	37.490	54.00	8.27	150	340	AV	PASS

Plot for Channel 39



Fre. (MHz)	Reading [dBµV]	Level [dBµV/m]	Factor [dB/m]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Detector	Verdict
2483.76	20.7	58.98	38.270	74.00	15.02	150	261	PK	PASS
2484.14	8.3	46.56	38.270	54.00	7.44	150	2	AV	PASS
2485.78	20.9	59.15	38.270	74.00	14.85	150	48	PK	PASS
2485.83	8.2	46.45	38.270	54.00	7.55	150	224	AV	PASS
2486.21	20.7	58.98	38.280	74.00	15.02	150	39	PK	PASS
2487.51	8.2	46.44	38.270	54.00	7.56	150	351	AV	PASS

A.10. Radiated Emission

According to ANSI C63.10, because of peak detection will yield amplitudes equal to or greater than amplitudes measured with the quasi-peak (or average) detector, the measurement data from a spectrum analyzer peak detector will represent the worst-case results, if the peak measured value complies with the quasi-peak (or average) limit, it is unnecessary to perform an quasi-peak measurement (or average).

The measurement results are obtained as below:

$E\ [dB\mu V/m] = U_R + A_T + A_{Factor}\ [dB]$; $A_T = L_{Cable\ loss}\ [dB] - G_{preamp}\ [dB]$

A_T: Total correction Factor except Antenna

U_R: Receiver Reading

G_{preamp}: Preamplifier Gain

A_{Factor}: Antenna Factor at 3m

During the test, the total correction Factor A_T and A_{Factor} were built in test software.

Note1: All radiated emission tests were performed in X, Y, Z axis direction. And only the worst axis test condition was recorded in this test report.

Note2: For the frequency, which started from 9kHz to 30MHz, was pre-scanned and the result which was 20dB lower than the limit was not recorded.

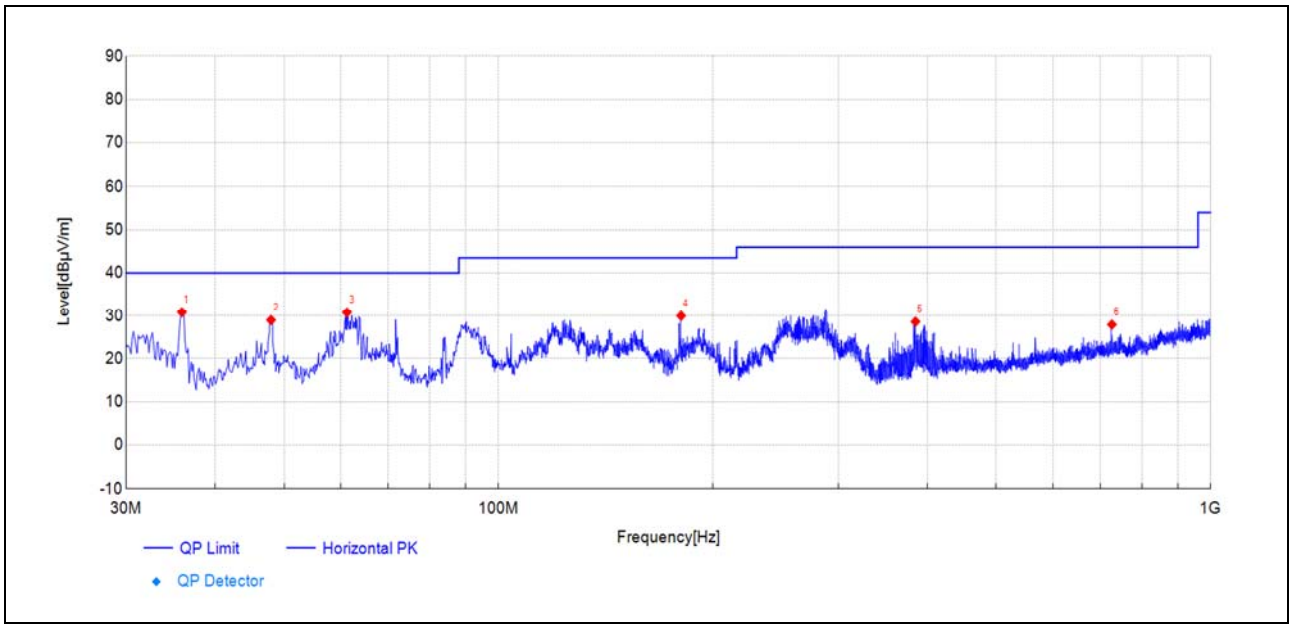
Note3: For the frequency, which started from 18GHz to 10th harmonic of the highest frequency, was pre-scanned and the result which was 20dB lower than the limit was not recorded.

Field strength of fundamental:

Frequency [MHz]	Reading [dBμV]	Level [dBμV/m]	Factor [dB/m]	Detector	Antenna Polarity
2401.61	59.4	96.87	37.520	PK	Vertical

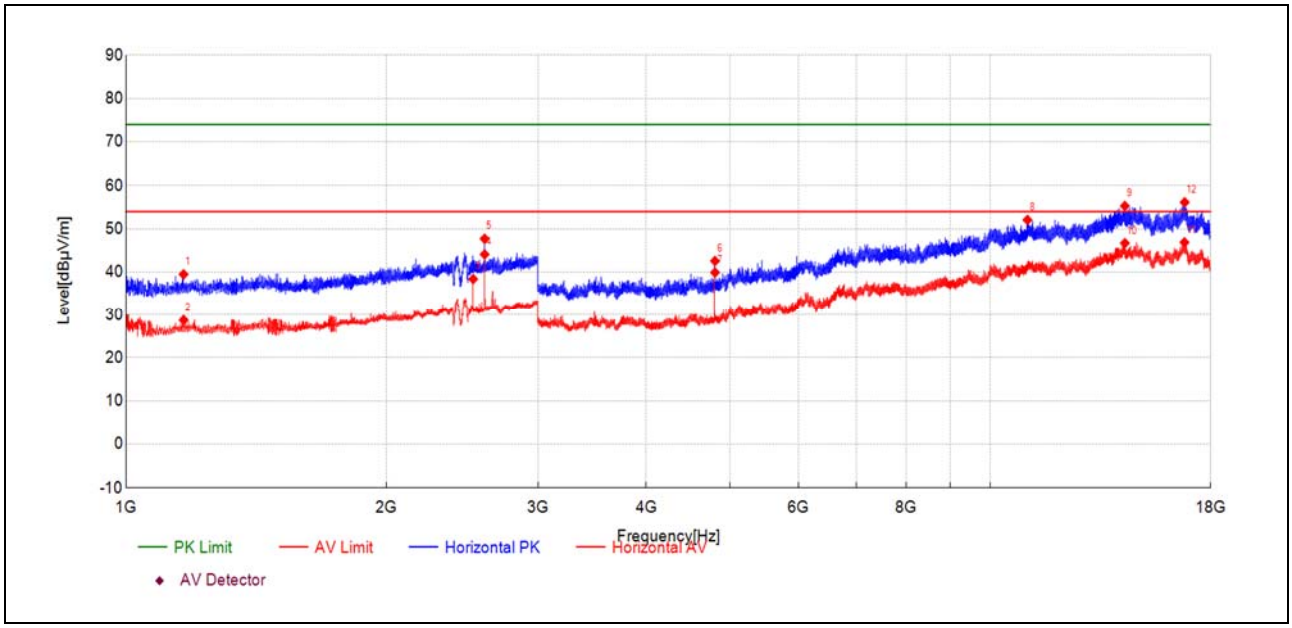
The field strength (the lowest) of fundamenta is more than 20dB higher than the unwanted emissions, in accordance with FCC part 15.215(b).

Plot for Channel 0



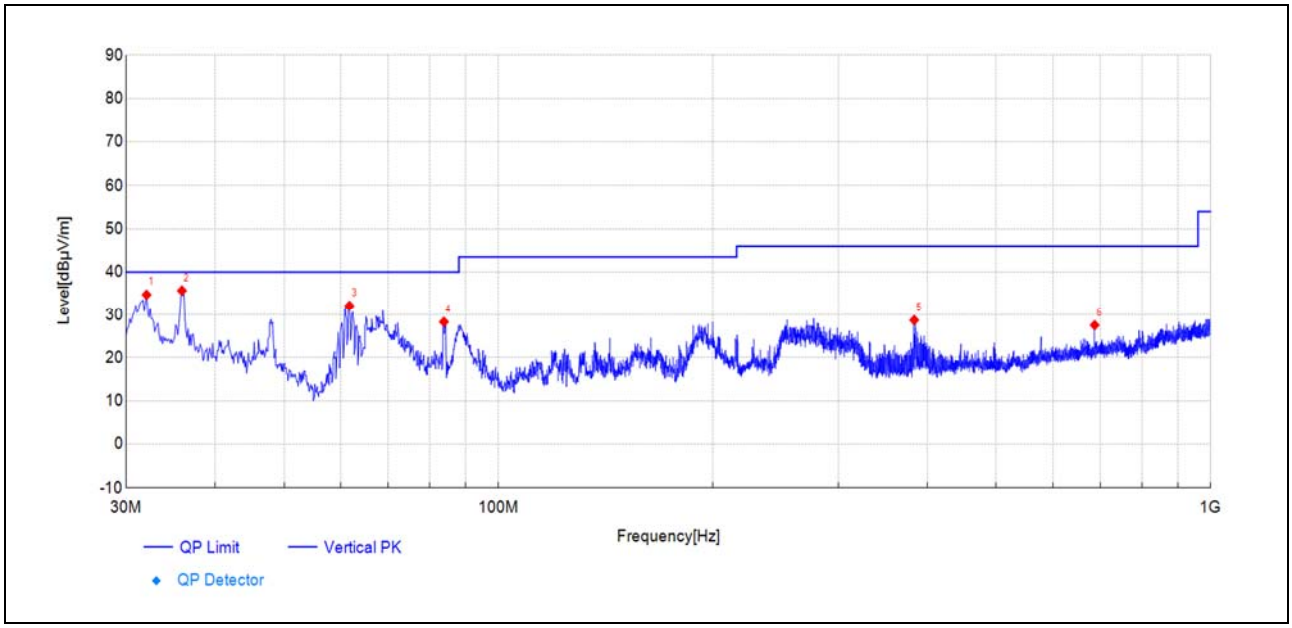
(Antenna Horizontal, 30MHz to 1GHz)

Fre. (MHz)	Reading [dBµV]	Level [dBµV/m]	Factor [dB/m]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Detector	Verdict
35.94	60.4	30.82	-29.610	40.00	9.18	150	218	PK	PASS
47.95	57.5	28.96	-28.520	40.00	11.04	150	245	PK	PASS
61.28	59.5	30.76	-28.750	40.00	9.24	150	80	PK	PASS
180.47	60.4	29.95	-30.490	43.50	13.55	150	53	PK	PASS
385.02	51.2	28.58	-22.590	46.00	17.42	150	102	PK	PASS
726.58	43.4	27.89	-15.510	46.00	18.11	150	312	PK	PASS



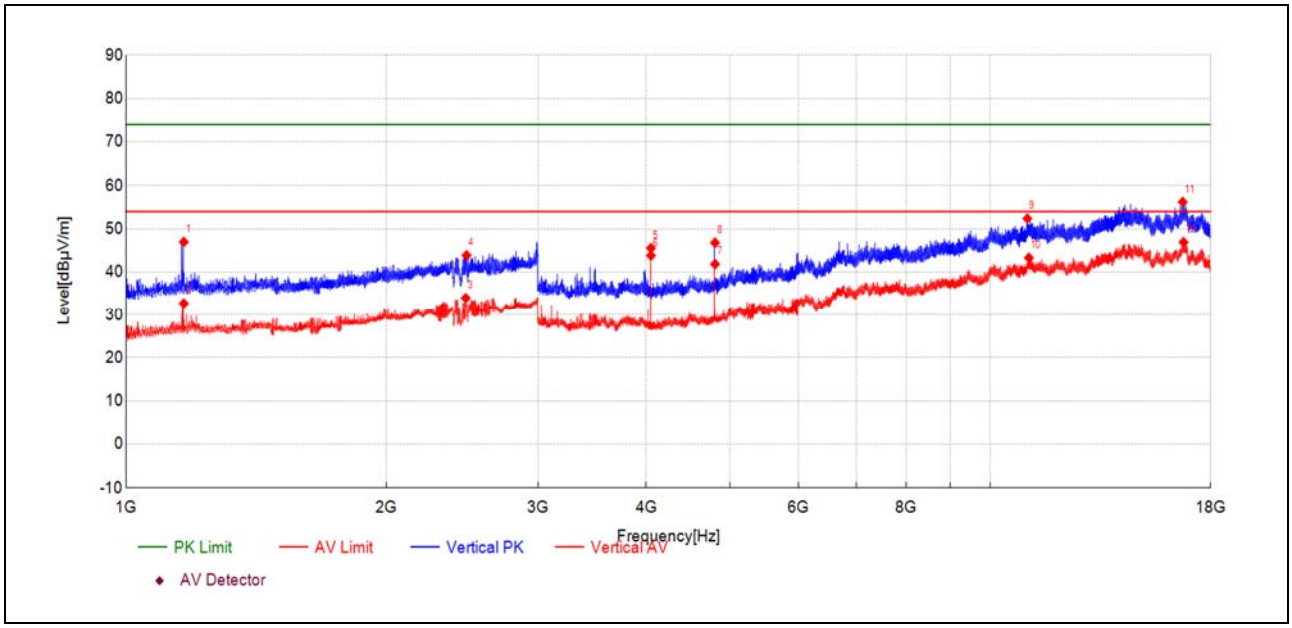
(Antenna Horizontal, 1GHz to 18GHz)

Fre. (MHz)	Reading [dBµV]	Level [dBµV/m]	Factor [dB/m]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Detector	Verdict
1165.77	41.2	39.49	-1.690	74.00	34.51	150	262	PK	PASS
1166.02	30.4	28.71	-1.690	54.00	25.29	150	262	AV	PASS
2522.19	32.7	38.39	5.680	54.00	15.61	150	173	AV	PASS
2600.20	38.1	44.10	6.020	54.00	9.90	150	167	AV	PASS
2600.20	41.7	47.72	6.020	74.00	26.28	150	167	PK	PASS
4803.56	47.7	42.57	-5.150	74.00	31.43	150	333	PK	PASS
4804.06	45.1	39.91	-5.150	54.00	14.09	150	333	AV	PASS
11047.27	38.7	52.07	13.400	74.00	21.93	150	158	PK	PASS
14317.88	35.9	55.31	19.460	74.00	18.69	150	109	PK	PASS
14319.38	27.3	46.69	19.440	54.00	7.31	150	184	AV	PASS
16785.46	26.9	46.89	19.950	54.00	7.11	150	270	AV	PASS
16793.96	36.2	56.15	20.000	74.00	17.85	150	296	PK	PASS



(Antenna Vertical, 30MHz to 1GHz)

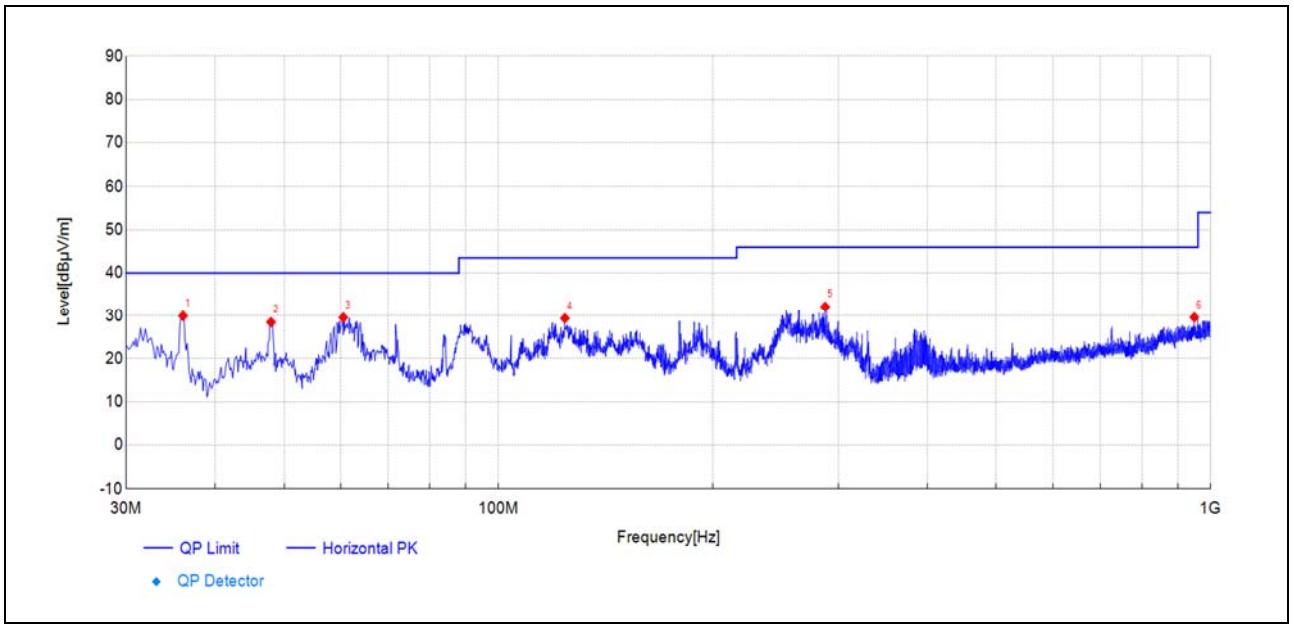
Fre. (MHz)	Reading [dBµV]	Level [dBµV/m]	Factor [dB/m]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Detector	Verdict
32.06	65.2	34.73	-30.480	40.00	5.27	150	88	PK	PASS
35.94	65.3	35.69	-29.610	40.00	4.31	150	118	PK	PASS
61.77	60.7	32.10	-28.600	40.00	7.90	150	154	PK	PASS
83.84	60.2	28.31	-31.920	40.00	11.69	150	74	PK	PASS
383.44	51.5	28.72	-22.810	46.00	17.28	150	16	PK	PASS
687.18	43.8	27.54	-16.280	46.00	18.46	150	48	PK	PASS



(Antenna Vertical, 1GHz to 18GHz)

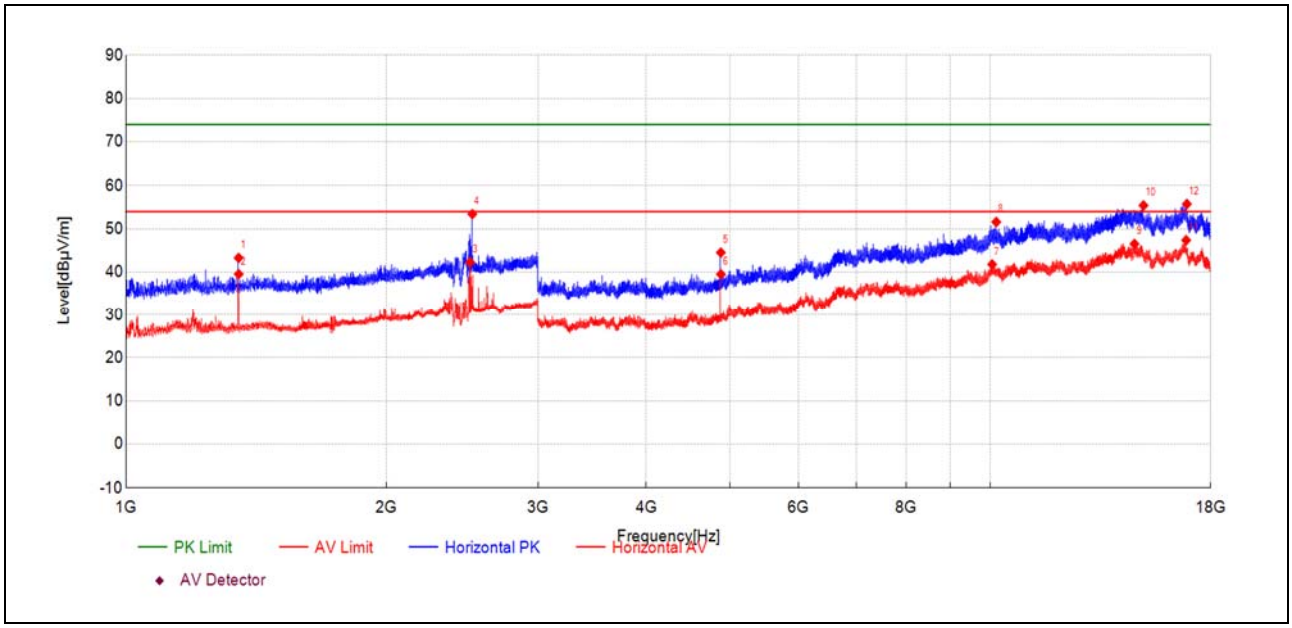
Fre. (MHz)	Reading [dBµV]	Level [dBµV/m]	Factor [dB/m]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Detector	Verdict
1166.52	48.6	46.97	-1.670	74.00	27.03	150	103	PK	PASS
1166.52	34.4	32.71	-1.670	54.00	21.29	150	135	AV	PASS
2472.43	28.1	33.97	5.910	54.00	20.03	150	147	AV	PASS
2478.18	38.0	43.89	5.900	74.00	30.11	150	274	PK	PASS
4050.04	53.8	45.55	-8.270	74.00	28.45	150	146	PK	PASS
4050.54	52.1	43.84	-8.270	54.00	10.16	150	134	AV	PASS
4804.56	47.0	41.85	-5.140	54.00	12.15	150	71	AV	PASS
4804.56	51.9	46.80	-5.140	74.00	27.20	150	71	PK	PASS
11042.77	39.1	52.40	13.340	74.00	21.60	150	171	PK	PASS
11087.27	29.4	43.30	13.920	54.00	10.70	150	208	AV	PASS
16705.96	36.7	56.22	19.500	74.00	17.78	150	321	PK	PASS
16742.46	27.2	46.91	19.710	54.00	7.09	150	83	AV	PASS

Plot for Channel 19



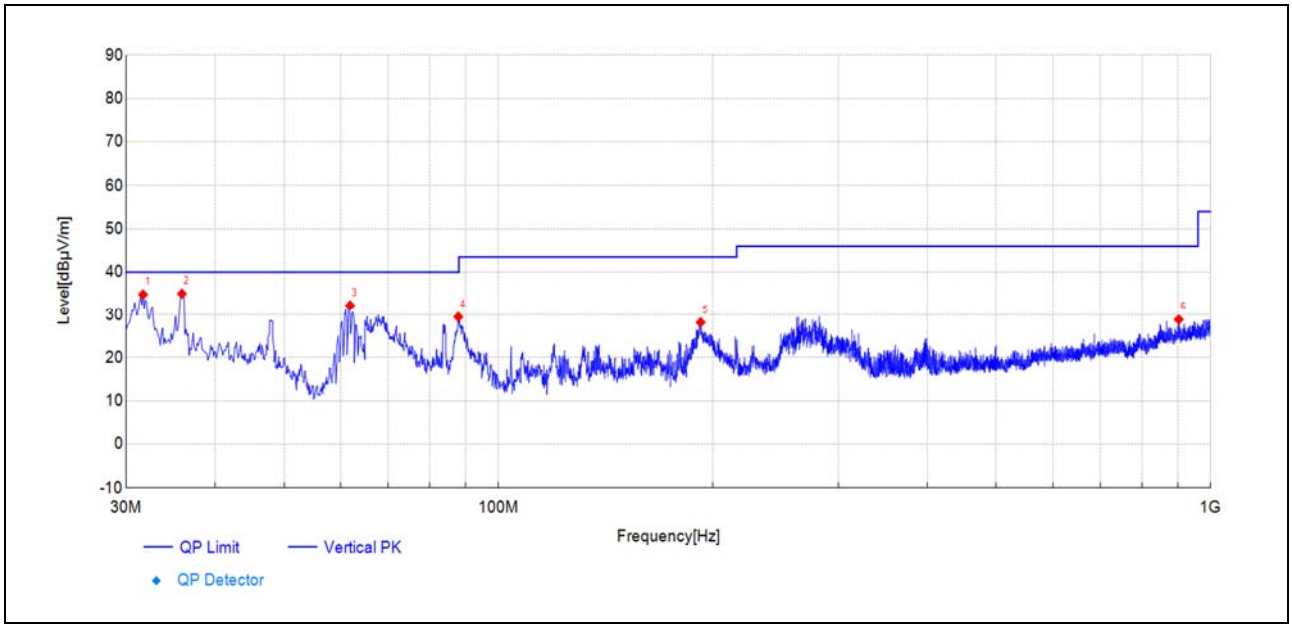
(Antenna Horizontal, 30MHz to 1GHz)

Fre. (MHz)	Reading [dBµV]	Level [dBµV/m]	Factor [dB/m]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Detector	Verdict
36.06	59.5	29.92	-29.570	40.00	10.08	150	209	PK	PASS
47.95	57.0	28.45	-28.520	40.00	11.55	150	204	PK	PASS
60.56	58.3	29.55	-28.700	40.00	10.45	150	35	PK	PASS
123.97	60.2	29.36	-30.790	43.50	14.14	150	80	PK	PASS
287.54	58.5	32.13	-26.350	46.00	13.87	150	146	PK	PASS
948.23	40.6	29.60	-10.990	46.00	16.40	150	316	PK	PASS



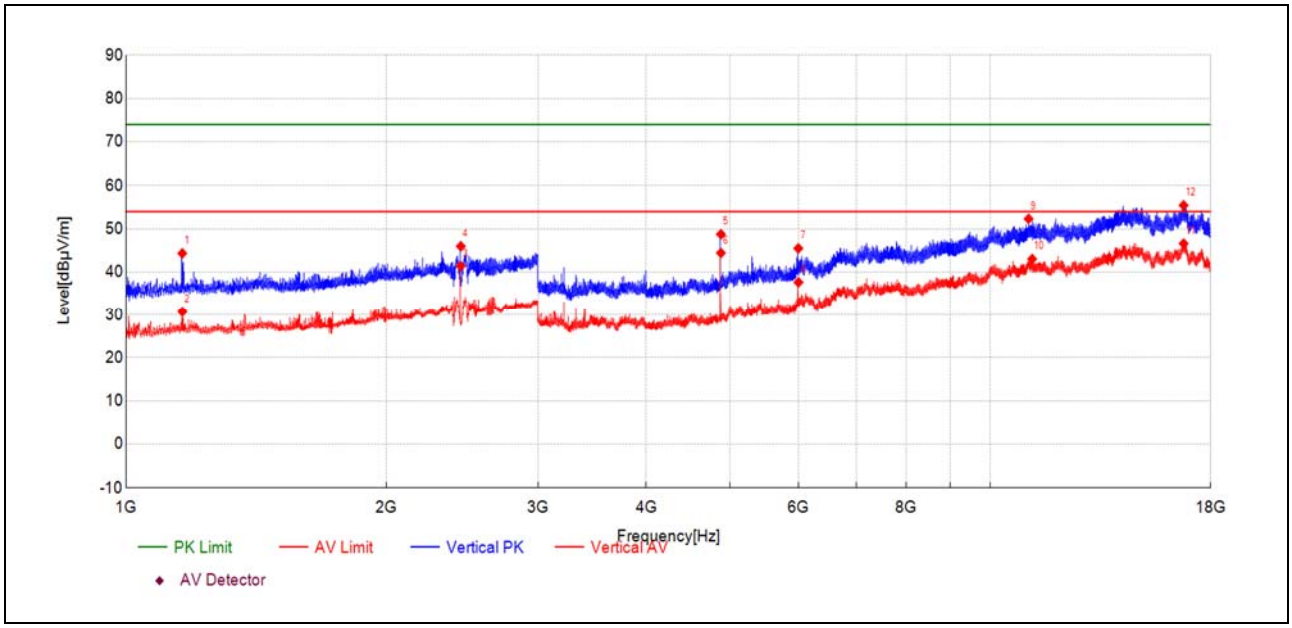
(Antenna Horizontal, 1GHz to 18GHz)

Fre. (MHz)	Reading [dBµV]	Level [dBµV/m]	Factor [dB/m]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Detector	Verdict
1350.04	44.1	43.29	-0.800	74.00	30.71	150	3	PK	PASS
1350.29	40.3	39.54	-0.800	54.00	14.46	150	8	AV	PASS
2501.69	36.5	42.29	5.830	54.00	11.71	150	40	AV	PASS
2516.44	47.7	53.42	5.730	74.00	20.58	150	40	PK	PASS
4879.56	49.5	44.53	-5.000	74.00	29.47	150	9	PK	PASS
4880.06	44.5	39.51	-5.000	54.00	14.49	150	9	AV	PASS
10054.24	31.1	41.79	10.650	54.00	12.21	150	158	AV	PASS
10164.24	40.7	51.60	10.870	74.00	22.40	150	184	PK	PASS
14689.89	26.0	46.53	20.570	54.00	7.47	150	222	AV	PASS
15048.40	36.4	55.43	18.990	74.00	18.57	150	321	PK	PASS
16859.96	27.1	47.39	20.260	54.00	6.61	150	109	AV	PASS
16891.96	35.4	55.76	20.380	74.00	18.24	150	360	PK	PASS



(Antenna Vertical, 30MHz to 1GHz)

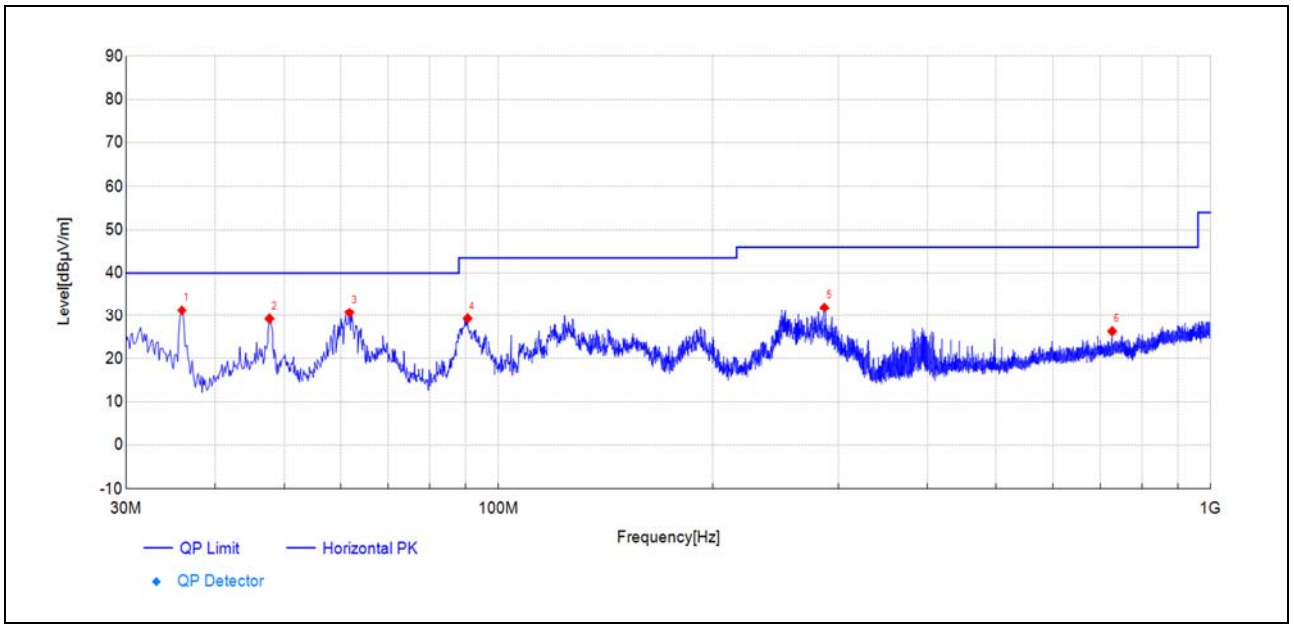
Fre. (MHz)	Reading [dBµV]	Level [dBµV/m]	Factor [dB/m]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Detector	Verdict
31.70	65.3	34.79	-30.550	40.00	5.21	150	77	PK	PASS
35.94	64.6	34.97	-29.610	40.00	5.03	150	121	PK	PASS
61.89	60.8	32.21	-28.560	40.00	7.79	150	161	PK	PASS
87.84	61.5	29.47	-32.000	40.00	10.53	150	307	PK	PASS
192.23	58.3	28.18	-30.110	43.50	15.32	150	352	PK	PASS
901.79	40.4	28.84	-11.520	46.00	17.16	150	9	PK	PASS



(Antenna Vertical, 1GHz to 18GHz)

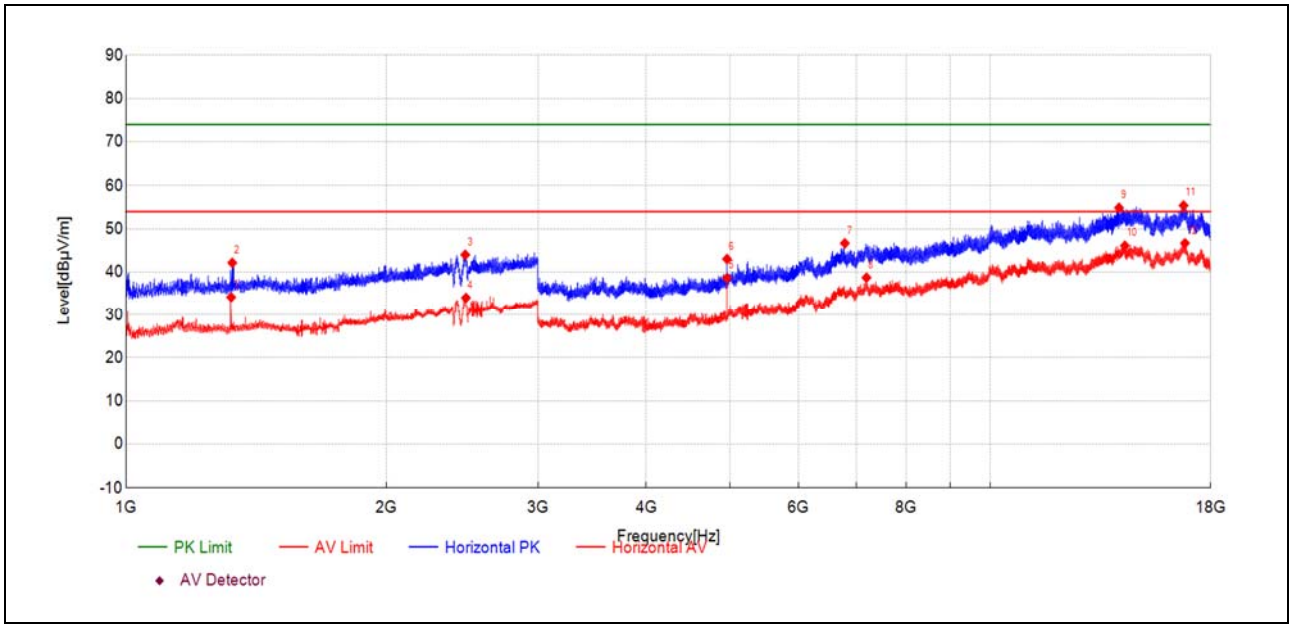
Fre. (MHz)	Reading [dBµV]	Level [dBµV/m]	Factor [dB/m]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Detector	Verdict
1161.77	46.1	44.35	-1.760	74.00	29.65	150	148	PK	PASS
1162.02	32.5	30.70	-1.760	54.00	23.30	150	148	AV	PASS
2440.18	35.6	41.40	5.820	-	-	150	275	AV	NA
2440.18	40.2	45.98	5.820	-	-	150	238	PK	NA
4880.06	53.8	48.77	-5.000	74.00	25.23	150	71	PK	PASS
4880.56	49.4	44.44	-5.000	54.00	9.56	150	71	AV	PASS
5998.10	45.7	45.49	-0.180	74.00	28.51	150	158	PK	PASS
6000.60	37.8	37.64	-0.150	54.00	16.36	150	108	AV	PASS
11079.77	38.5	52.33	13.820	74.00	21.67	150	183	PK	PASS
11185.27	29.5	43.04	13.560	54.00	10.96	150	120	AV	PASS
16743.96	26.9	46.60	19.720	54.00	7.40	150	134	AV	PASS
16745.46	35.7	55.45	19.720	74.00	18.55	150	9	PK	PASS

Plot for Channel 39



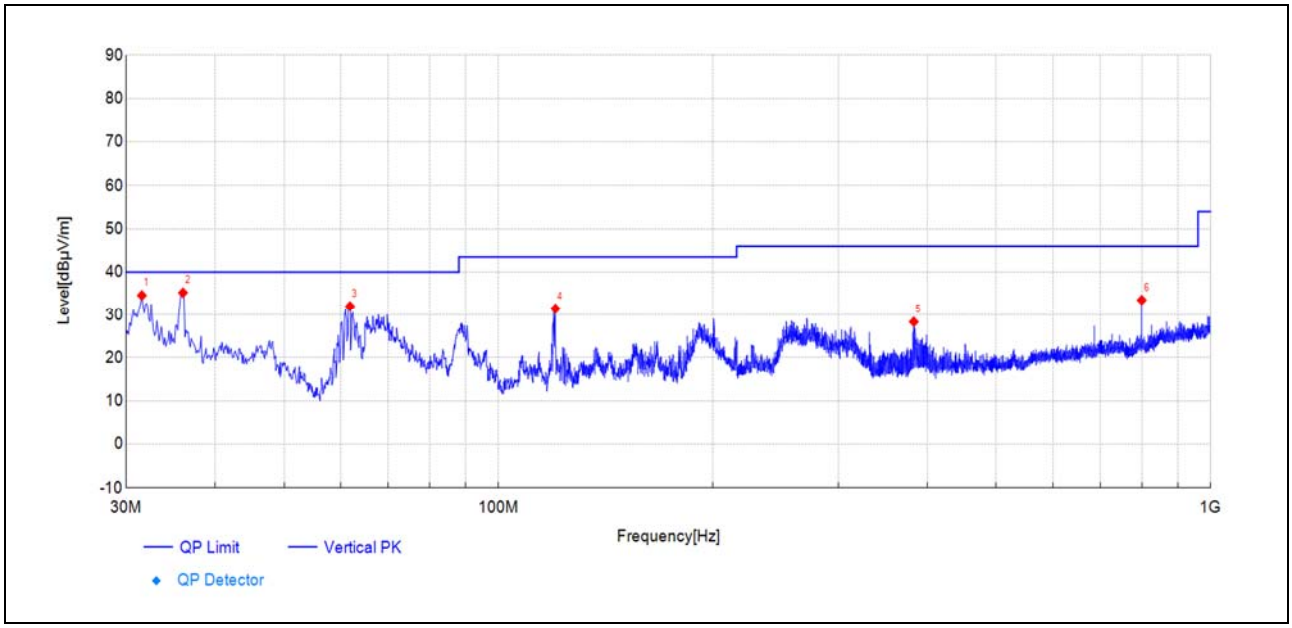
(Antenna Horizontal, 30MHz to 1GHz)

Fre. (MHz)	Reading [dBµV]	Level [dBµV/m]	Factor [dB/m]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Detector	Verdict
35.94	60.9	31.27	-29.610	40.00	8.73	150	214	PK	PASS
47.70	57.7	29.24	-28.470	40.00	10.76	150	237	PK	PASS
61.77	59.3	30.70	-28.600	40.00	9.30	150	103	PK	PASS
90.50	60.7	29.28	-31.460	43.50	14.22	150	45	PK	PASS
286.81	58.2	31.91	-26.330	46.00	14.09	150	156	PK	PASS
727.19	41.9	26.31	-15.540	46.00	19.69	150	277	PK	PASS



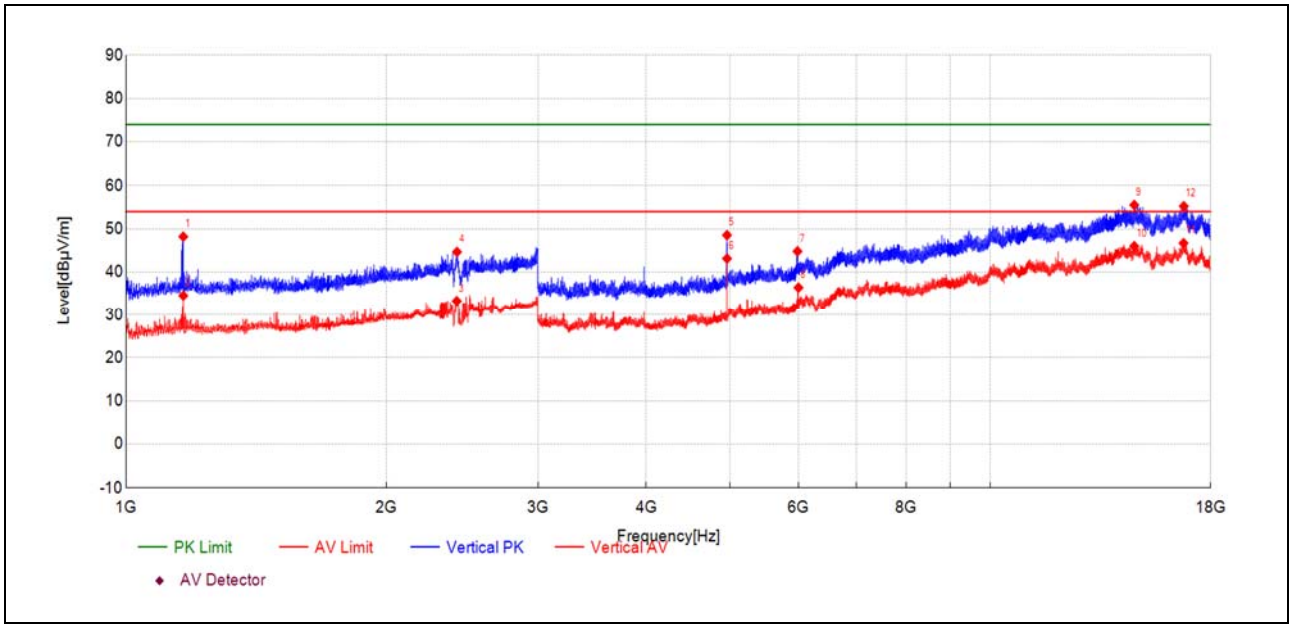
(Antenna Horizontal, 1GHz to 18GHz)

Fre. (MHz)	Reading [dBµV]	Level [dBµV/m]	Factor [dB/m]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Detector	Verdict
1323.29	35.1	34.16	-0.900	54.00	19.84	150	192	AV	PASS
1327.29	43.0	42.15	-0.890	74.00	31.85	150	71	PK	PASS
2469.18	38.1	44.01	5.920	74.00	29.99	150	166	PK	PASS
2473.93	28.1	34.02	5.900	54.00	19.98	150	147	AV	PASS
4960.07	43.2	38.62	-4.610	54.00	15.38	150	120	AV	PASS
4960.57	47.6	43.03	-4.600	74.00	30.97	150	360	PK	PASS
6789.63	42.9	46.66	3.810	74.00	27.34	150	34	PK	PASS
7193.14	33.7	38.72	5.050	54.00	15.28	150	269	AV	PASS
14097.37	35.6	54.89	19.320	74.00	19.11	150	257	PK	PASS
14318.88	26.7	46.11	19.440	54.00	7.89	150	245	AV	PASS
16743.46	35.7	55.42	19.710	74.00	18.58	150	108	PK	PASS
16805.46	26.6	46.69	20.050	54.00	7.31	150	344	AV	PASS



(Antenna Vertical, 30MHz to 1GHz)

Fre. (MHz)	Reading [dBµV]	Level [dBµV/m]	Factor [dB/m]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Detector	Verdict
31.58	65.2	34.58	-30.570	40.00	5.42	150	65	PK	PASS
36.06	64.8	35.20	-29.570	40.00	4.80	150	88	PK	PASS
61.89	60.6	31.99	-28.560	40.00	8.01	150	154	PK	PASS
120.21	62.0	31.43	-30.520	43.50	12.07	150	132	PK	PASS
382.96	51.2	28.33	-22.880	46.00	17.67	150	12	PK	PASS
800.06	48.3	33.48	-14.820	46.00	12.52	150	173	PK	PASS



(Antenna Vertical, 1GHz to 18GHz)

Fre. (MHz)	Reading [dBµV]	Level [dBµV/m]	Factor [dB/m]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Detector	Verdict
1164.77	49.9	48.20	-1.700	74.00	25.80	150	122	PK	PASS
1165.02	36.2	34.54	-1.700	54.00	19.46	150	122	AV	PASS
2414.18	27.8	33.27	5.430	54.00	20.73	150	351	AV	PASS
2415.68	39.2	44.67	5.450	74.00	29.33	150	84	PK	PASS
4959.57	53.2	48.55	-4.630	74.00	25.45	150	96	PK	PASS
4960.57	47.7	43.13	-4.600	54.00	10.87	150	258	AV	PASS
5985.60	45.1	44.81	-0.300	74.00	29.19	150	96	PK	PASS
6000.60	36.6	36.40	-0.150	54.00	17.60	150	146	AV	PASS
14681.39	35.0	55.53	20.550	74.00	18.47	150	232	PK	PASS
14682.39	25.5	46.02	20.550	54.00	7.98	150	158	AV	PASS
16739.46	27.0	46.71	19.690	54.00	7.29	150	120	AV	PASS
16755.46	35.5	55.25	19.780	74.00	18.75	150	9	PK	PASS

END OF REPORT