



TEST REPORT

Report Number : TZ0037260606FRF04
Product Name : Wireless Car Adapter
Model/Type reference : TC03A
FCC ID : 2A2P5-TC03A
Prepared for : Acer Gadget Inc.
24F., No. 112, Sec. 1, Xintai 5th Rd., Xizhi Dist. New Taipei City 221, Taiwan

Prepared By : Shenzhen Tongzhou Testing Co.,Ltd.
1st Floor, Building 1, Haomai High-tech Park, Huating Road 387, Dalang Street, Longhua, Shenzhen, China
Standards : FCC CFR Title 47 Part 15E, ANSI C63.10-2020 + Cor.1-2023
Date of Test : 2026-06-26 ~ 2026-07-13
Date of Issue : 2026-07-13

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(Authorized Officer)



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**** Report Revise Record ****

Report Version	Revise Time	Issued Date	Valid Version	Notes
V1.0	/	2026-07-13	Valid	Initial release





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1. GENERAL INFORMATION

1.1. Client Information

Applicant	: Acer Gadget Inc.
Address	: 24F., No. 112, Sec. 1, Xintai 5th Rd., Xizhi Dist. New Taipei City 221, Taiwan
Manufacturer	: HK Linghan Technology Co., Limited
Address	: Room 803B, 8/F., West Coast International Building, 290-296 Un Chau Street, Cheung Sha Wan, Kowloon, Hong Kong

1.2. Description of Device (EUT)

Product Name	: Wireless Car Adapter
Trade Mark	: <i>acer</i>
Model Number	: TC03A
Model Declaration	: N/A
Test Model	: TC03A
Power Supply	: Input: 5V $\overline{\text{---}}$ 1A
Hardware version	: V1.0
Software version	: V1.0

1.3. Wireless Function Tested in this Report

WiFi	
WLAN	: Supported IEEE 802.11a/n/ac
WLAN FCC Operation Frequency	: IEEE 802.11a: 5180-5240MHz IEEE 802.11ac VHT20: 5180-5240MHz IEEE 802.11ac VHT40: 5190-5230MHz
WLAN Channel Number	: 4 Channels for 5180-5240MHz (IEEE 802.11a/ac VHT20/n HT20) 2 Channels for 5190-5230MHz (IEEE 802.11ac VHT40/n HT40)
WLAN Modulation Technology	: IEEE 802.11n: OFDM (64QAM, 16QAM, QPSK, BPSK) IEEE 802.11a: OFDM (64QAM, 16QAM, QPSK, BPSK) IEEE 802.11ac: OFDM (256QAM, 64QAM, 16QAM, QPSK, BPSK)
Antenna Type And Gain	: PCB antenna, 0.67dBi

Note 1: Antenna position refer to EUT Photos.

Note 2: the above information was supplied by the applicant.





1.4. EUT configuration

The following peripheral devices and interface cables were connected during the measurement:

● supplied by the manufacturer

○ supplied by the lab

●	/	Model:	/
		Input:	/
		Output:	/

1.5. Description of Test Facility

FCC

Designation Number: CN1275

Test Firm Registration Number: 167722

Shenzhen Tongzhou Testing Co.,Ltd has been listed on the US Federal Communications Commission list of test facilities recognized to perform electromagnetic emissions measurements.

A2LA

Certificate Number: 5463.01

Shenzhen Tongzhou Testing Co.,Ltd has been listed by American Association for Laboratory Accreditation to perform electromagnetic emission measurement.

IC

ISED#: 22033

CAB identifier: CN0099

Shenzhen Tongzhou Testing Co.,Ltd has been listed by Innovation, Science and Economic Development Canada to perform electromagnetic emission measurement.

The 3m-Semi anechoic test site fulfils CISPR 16-1-4 according to ANSI C63.10 and CISPR 16-1-4:2010





1.6. Statement of the Measurement Uncertainty

The data and results referenced in this document are true and accurate. The reader is cautioned that there may be errors within the calibration limits of the equipment and facilities. The measurement uncertainty was calculated for all measurements listed in this test report acc. To CISPR 16 – 4 “Specification for radio disturbance and immunity measuring apparatus and methods – Part 4: Uncertainty in EMC Measurements” and is documented in the Shenzhen Tongzhou Testing Co.,Ltd quality system acc. To DIN EN ISO/IEC 17025. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.

1.7. Measurement Uncertainty

Test Item	Uncertainty	Note
Radiation Uncertainty(9KHz~30MHz)	: $\pm 3.26\text{dB}$	(1)
Radiation Uncertainty(30MHz~1000MHz)	: $\pm 3.92\text{dB}$	(1)
Radiation Uncertainty(1GHz~40GHz)	: $\pm 5.62\text{dB}$	(1)
Conduction Uncertainty	: $\pm 2.71\text{dB}$	(1)
Occupied Channel Bandwidth	: $\pm 3.0\%$	(1)
RF power, conducted	: $\pm 0.16\text{dB}$	(1)
Power Spectral Density, conducted	: $\pm 1.3\text{dB}$	(1)
Unwanted Emissions, conducted	: $\pm 1.3\text{dB}$	(1)
Time	: $\pm 1.0\%$	(1)
Duty Cycle	: $\pm 3.0\%$	(1)

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

1.8. Description of Test Modes

The EUT has been tested under operating condition.

This test was performed with EUT in X, Y, Z position and the worst case was found when EUT in X position.

Worst-case mode and channel used for 150 kHz-30 MHz power line conducted emissions was the mode and channel with the highest output power that was determined to be **802.11n HT20 low channel**

Worst-case mode and channel used for 9kHz-1000 MHz radiated emissions was the mode and channel with the highest output power, that was determined to be **802.11n HT20 low channel**

Worst-Case data rates were utilized from preliminary testing of the Chipset, worst-case data rates used during the testing are as follows:

IEEE 802.11a Mode : 6 Mbps, OFDM
IEEE 802.11ac VHT20 Mode: MCS0
IEEE 802.11n HT20 Mode: MCS0
IEEE 802.11ac VHT40 Mode: MCS0
IEEE 802.11n HT40 Mode: MCS0

Antenna & Bandwidth

Antenna	Antenna 1			Simultaneously
Bandwidth Mode	20MHz	40MHz	80MHz	/
IEEE 802.11a	☒	☐	☐	☐
IEEE 802.11n	☒	☒	☐	☐
IEEE 802.11ac	☒	☒	☐	☐





2. TEST METHODOLOGY

All measurements contained in this report were conducted with ANSI C63.10-2020 + Cor.1-2023, American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices.

The radiated testing was performed at an antenna-to-EUT distance of 3 meters. All radiated and conducted emissions measurement was performed at Shenzhen Tongzhou Testing Co.,Ltd

2.1. EUT Configuration

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

2.2. EUT Exercise

The EUT was operated in the engineering mode to fix the TX frequency that was for the purpose of the measurements.

According to FCC's request, Test Procedure 789033 D02 General UNII Test Procedures New Rules v02r01 and KDB 662911 are required to be used for this kind of FCC 15.407 UII device.

According to its specifications, the EUT must comply with the requirements of the Section 15.203, 15.205, 15.207, 15.209 and 15.407 under the FCC Rules Part 15 Subpart E

2.3. Test Sample

Sample ID	Description
TZ0037260606-1#	Engineer sample – continuous transmit
TZ0037260606-2#	Normal sample – Intermittent transmit





3. SYSTEM TEST CONFIGURATION

3.1. Justification

The system was configured for testing in a continuous transmits condition.

3.2. EUT Exercise Software

The system was configured for testing in a continuous transmits condition and change test channels by engineer mode (Xshell 7(Build 0076) at power level 8) provided by application.

3.3. Special Accessories

No.	Equipment	Manufacturer	Model No.	Serial No.	Length	shielded/ unshielded	Notes
1	PC	ASUS	X454L	15105-0038A100	/	/	/

3.4. Block Diagram/Schematics

Please refer to the related document

3.5. Equipment Modifications

Shenzhen Tongzhou Testing Co.,Ltd has not done any modification on the EUT.

3.6. Test Setup

Please refer to the test setup photo.





4. SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Sample ID	Result
§15.407(a)	Maximum Conducted Output Power	TZ0037260606-1#	Compliant
§15.407(a)	Power Spectral Density	TZ0037260606-1#	Compliant
§15.407(a)	26dB Bandwidth	TZ0037260606-1#	Compliant
/	99% Occupied Bandwidth	TZ0037260606-1#	Note 1
§15.407(b)	Radiated Emissions	TZ0037260606-1#& TZ0037260606-2#	Compliant
§15.407(b)	Band edge Emissions	TZ0037260606-1#	Compliant
§15.205	Emissions at Restricted Band	TZ0037260606-1#	Compliant
§15.407(g)	Frequency Stability	TZ0037260606-1#	Compliant
§15.207(a)	Line Conducted Emissions	TZ0037260606-2#	Compliant
§15.203	Antenna Requirements	N/A	Compliant

Note 1: only for report purpose.

Remark: The measurement uncertainty is not included in the test result.





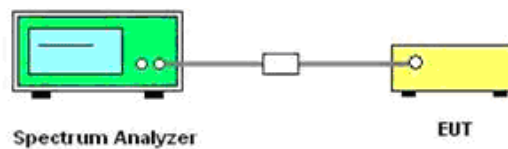
5. TEST RESULT

5.1. On Time and Duty Cycle

5.1.1. Standard Applicable

None. for reporting purpose only.

5.1.2. Block Diagram of Test Setup



5.1.3. Test Procedures

1. Set the centre frequency of the spectrum analyzer to the transmitting frequency.
2. Set the span=0MHz, RBW=8MHz, VBW=8MHz.
3. Detector = peak.
4. Trace mode = Single hold.

5.1.4. Test result

Pass

Remark:

1. Please refer to Appendix F of Appendix Test Data for RLAN(5.2G).





5.2. Maximum Conducted Output Power Measurement

5.2.1. Standard Applicable

(1) For the band 5.15-5.25 GHz.

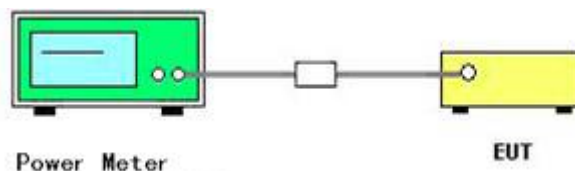
(i) For an outdoor access point operating in the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W provided the maximum antenna gain does not exceed 6 dBi. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi. The maximum e.i.r.p. at any elevation angle above 30 degrees as measured from the horizon must not exceed 125 mW (21 dBm).

(ii) For an indoor access point operating in the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W provided the maximum antenna gain does not exceed 6 dBi. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

(iii) For fixed point-to-point access points operating in the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W. Fixed point-to-point U-NII devices may employ antennas with directional gain up to 23 dBi without any corresponding reduction in the maximum conducted output power. For fixed point-to-point transmitters that employ a directional antenna gain greater than 23 dBi, a 1dB reduction in maximum conducted output power is required for each 1 dB of antenna gain in excess of 23 dBi. Fixed, point-to-point operations exclude the use of point-to-multipoint systems, omnidirectional applications, and multiple collocated transmitters transmitting the same information. The operator of the U-NII device, or if the equipment is professionally installed, the installer, is responsible for ensuring that systems employing high gain directional antennas are used exclusively for fixed, point-to-point operations.

(iv) For mobile and portable client devices in the 5.15-5.25 GHz band, the maximum conducted output power over the frequency band of operation shall not exceed 250 mW provided the maximum antenna gain does not exceed 6 dBi. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

5.2.2. Block Diagram of Test Setup



5.2.3. Test Procedures

The transmitter output (antenna port) was connected to the power meter.

According to KDB 789033 D02 Section 3 (a) Method PM (Measurement using an RF average power meter): Measurements may be performed using a wideband RF power meter with a thermocouple detector or equivalent if all of the conditions listed below are satisfied.

The EUT is configured to transmit continuously or to transmit with a constant duty cycle.

At all times when the EUT is transmitting, it must be transmitting at its maximum power control level.

The integration period of the power meter exceeds the repetition period of the transmitted signal by at least a factor of five.

If the transmitter does not transmit continuously, measure the duty cycle, x , of the transmitter output signal as described in section II.B.





Measure the average power of the transmitter. This measurement is an average over both the on and off periods of the transmitter.

Adjust the measurement in dBm by adding $10 \log (1/x)$ where x is the duty cycle (e.g., $10 \log (1/0.25)$ if the duty cycle is 25%).

5.2.4. Test Results

Pass

Remark:

1. Measured output power at difference data rate for each mode and recorded worst case for each mode.
2. Test results including cable loss.
3. Report conducted power = Measured conducted average power + Duty Cycle factor.
4. Please refer to Appendix B of Appendix Test Data for RLAN(5.2G).





5.3. Power Spectral Density Measurement

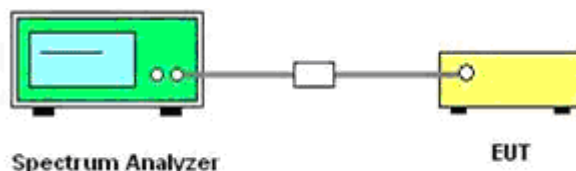
5.3.1. Standard Applicable

For 5150~5250MHz

- (i) For an outdoor access point operating in the band 5.15 - 5.25 GHz, the maximum power spectral density shall not exceed 17 dBm in any 1 MHz band.^{note1}
- (ii) For an indoor access point operating in the band 5.15 - 5.25 GHz, the maximum power spectral density shall not exceed 17 dBm in any 1 MHz band.^{note1}
- (iii) For fixed point-to-point access points operating in the band 5.15 - 5.25 GHz, transmitters that employ a directional antenna gain greater than 23 dBi, a 1 dB reduction in maximum power spectral density is required for each 1 dB of antenna gain in excess of 23 dBi.
- (iv) For mobile and portable client devices in the 5.15 - 5.25 GHz band, the maximum power spectral density shall not exceed 11 dBm in any 1 MHz band.^{note1}

Note1: If transmitting antennas of directional gain greater than 6 dBi are used, the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

5.3.2. Block Diagram of Test Setup



5.3.3. Test Procedures

1. The transmitter was connected directly to a Spectrum Analyzer through a directional coupler.
2. The power was monitored at the coupler port with a Spectrum Analyzer. The power level was set to the maximum level.
3. Set the RBW = 1MHz.
4. Set the VBW $\geq$ 3MHz
5. Span=Encompass the entire emissions bandwidth (EBW) of the signal (or, alternatively, the entire 99% occupied bandwidth) of the signal.
6. Number of points in sweep $\geq 2 \times \text{span} / \text{RBW}$. (This ensures that bin-to-bin spacing is $\leq \text{RBW}/2$, so that narrowband signals are not lost between frequency bins.)
7. Manually set sweep time $\geq 10 \times (\text{number of points in sweep}) \times (\text{total on/off period of the transmitted signal})$.
8. Set detector = power averaging (rms).
9. Sweep time = auto couple.
10. Trace mode = max hold.
11. Allow trace to fully stabilize.
12. Compute power by integrating the spectrum across the EBW (or, alternatively, the entire 99% occupied bandwidth) of the signal using the instrument's band power measurement function with band limits set equal to the EBW (or occupied bandwidth) band edges. If the instrument does not have a band power function, sum the spectrum levels (in power units) at 1 MHz intervals extending across the EBW (or, alternatively, levels (in power units) at 1 MHz intervals extending across the EBW (or, alternatively,
13. Add $10 \log(1/x)$, where x is the duty cycle, to the measured power in order to compute the average power during the actual transmission times (because the measurement represents an average over both the on and off times of the transmission). For example, add $10 \log(1/0.25) = 6 \text{ dB}$ if the duty cycle is 25%.
14. Use the peak marker function to determine the maximum power level in any 1MHz band segment within the fundamental EBW.

5.3.4. Test Results

Pass

Remark:

1. Measured power spectrum density at difference data rate for each mode and recorded worst case for each mode.
2. Test results including cable loss.





3. Report conducted PSD = Measured conducted PSD + Duty Cycle factor.
4. Please refer to Appendix C of Appendix Test Data for RLAN(5.2G).



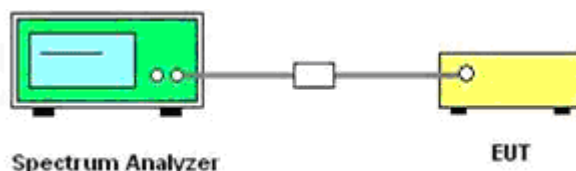


5.4. 99% Occupied Bandwidth and 26dB Emission Bandwidth Measurement

5.4.1. Standard Applicable

No restriction limits. But resolution bandwidth within band edge measurement is 1% of the 99% occupied bandwidth.

5.4.2. Block Diagram of Test Setup



5.4.3. Test Procedures

For 26dB Emission Bandwidth

- Set RBW = approximately 1% of the emission bandwidth.
- Set the VBW > RBW.
- Detector = Peak.
- Trace mode = max hold.
- Measure the maximum width of the emission that is 26 dB down from the maximum of the emission. Compare this with the RBW setting of the analyzer. Readjust RBW and repeat measurement as needed until the RBW/EBW ratio is approximately 1%.

For 99% Occupied Bandwidth

- Set center frequency to the nominal EUT channel center frequency.
- Set span = 1.5 times to 5.0 times the OBW.
- Set RBW = 1% to 5% of the OBW
- Set VBW $\geq 3 \times$ RBW
- Video averaging is not permitted. Where practical, a sample detection and single sweep mode shall be used. Otherwise, peak detection and max hold mode (until the trace stabilizes) shall be used.
- Use the 99% power bandwidth function of the instrument (if available).
- If the instrument does not have a 99% power bandwidth function, the trace data points are recovered and directly summed in power units. The recovered amplitude data points, beginning at the lowest frequency, are placed in a running sum until 0.5% of the total is reached. that frequency is recorded as the lower frequency. The process is repeated until 99.5% of the total is reached. that frequency is recorded as the upper frequency. The 99% occupied bandwidth is the difference between these two frequencies.

5.4.4. Test Results

Pass

Remark:

- Measured 99% and 26dB bandwidth at difference data rate for each mode and recorded worst case for each mode.
- Test results including cable loss.
- Please refer to Appendix A of Appendix Test Data for RLAN(5.2G).





5.5. Radiated Emissions Measurement

5.5.1. Standard Applicable

15.205 (a) Except as shown in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.090-0.110	16.42-16.423	399.9-410	4.5-5.15
\1\ 0.495-0.505	16.69475-16.69525	608-614	5.35-5.46
2.1735-2.1905	16.80425-16.80475	960-1240	7.25-7.75
4.125-4.128	25.5-25.67	1300-1427	8.025-8.5
4.17725-4.17775	37.5-38.25	1435-1626.5	9.0-9.2
4.20725-4.20775	73-74.6	1645.5-1646.5	9.3-9.5
6.215-6.218	74.8-75.2	1660-1710	10.6-12.7
6.26775-6.26825	108-121.94	1718.8-1722.2	13.25-13.4
6.31175-6.31225	123-138	2200-2300	14.47-14.5
8.291-8.294	149.9-150.05	2310-2390	15.35-16.2
8.362-8.366	156.52475-156.52525	2483.5-2500	17.7-21.4
8.37625-8.38675	156.7-156.9	2690-2900	22.01-23.12
8.41425-8.41475	162.0125-167.17	3260-3267	23.6-24.0
12.29-12.293	167.72-173.2	3332-3339	31.2-31.8
12.51975-12.52025	240-285	3345.8-3358	36.43-36.5
12.57675-12.57725	322-335.4	3600-4400	(\2\)
13.36-13.41			

\1\ Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz.

\2\ Above 38.6

For transmitters operating in the 5.15-5.25 GHz band: All emissions outside of the 5.15-5.35 GHz band shall not exceed an e.i.r.p. of -27 dBm/MHz (68.2dBuV/m at 3m).

In addition, In case the emission fall within the restricted band specified on 15.205(a), then the 15.209(a) limit in the table below has to be followed.

Frequencies (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
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

5.5.2. Measuring Instruments and Setting

The following table is the setting of spectrum analyzer and receiver.

Spectrum Parameter	Setting
Attenuation	Auto
Start Frequency	1000 MHz
Stop Frequency	10 th carrier harmonic
RB / VB (Emission in restricted band)	1MHz / 1MHz for Peak, 1 MHz / 3 MHz for Average
RB / VB (Emission in non-restricted band)	1MHz / 1MHz for Peak, 1 MHz / 3 MHz for Average

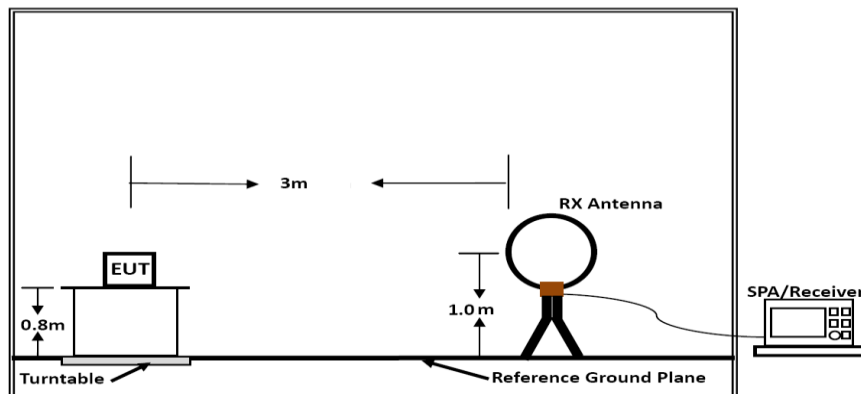
Receiver Parameter	Setting
Attenuation	Auto
Start ~ Stop Frequency	9kHz~150kHz / RB/VB 200Hz/1KHz for QP/AVG
Start ~ Stop Frequency	150kHz~30MHz / RB/VB 9kHz/30KHz for QP/AVG
Start ~ Stop Frequency	30MHz~1000MHz / RB/VB 120kHz/1MHz for QP



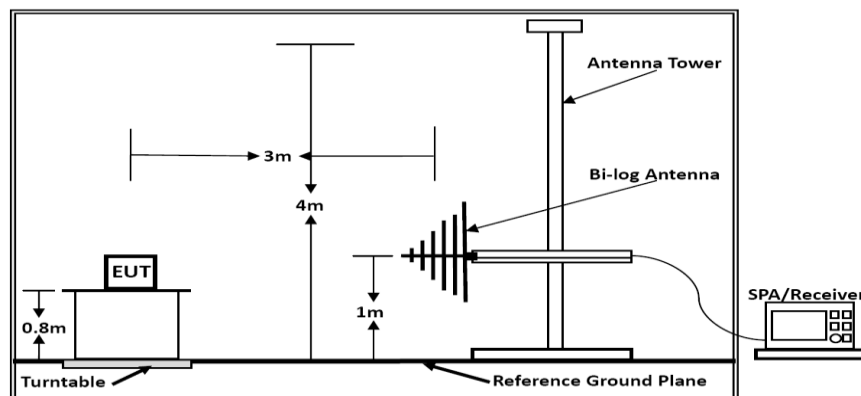


5.5.3. Block Diagram of Test Setup

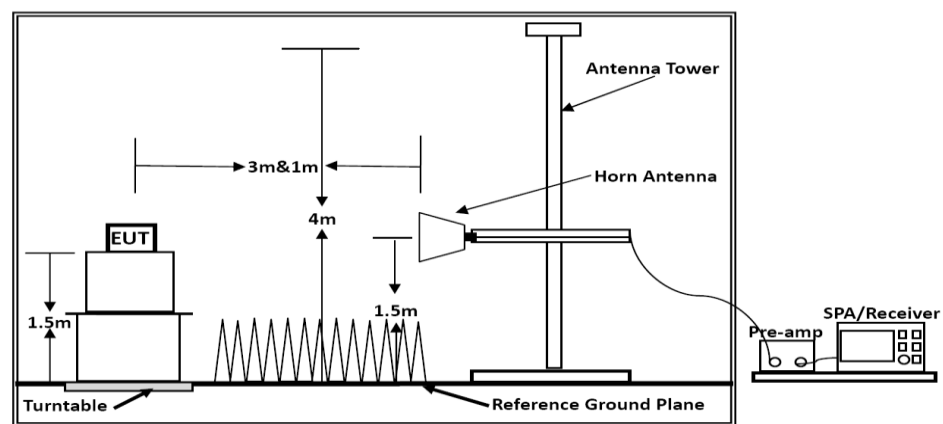
For radiated emissions below 30MHz



Below 30MHz



Below 1GHz



Above 1GHz

Above 18 GHz shall be extrapolated to the specified distance using an extrapolation factor of 20 dB/decade from 3m to 1m.

Distance extrapolation factor = $20 \log (\text{specific distance [3m]} / \text{test distance [1m]})$ (dB).

Limit line = specific limits (dBuV) + distance extrapolation factor [6 dB].

5.5.4. Test Procedures

1) Sequence of testing 9 kHz to 30 MHz

Setup:

Shenzhen Tongzhou Testing Co., Ltd.

Add: 1st Floor, Building 1, Haomai High-tech Park, Huating Road 387, Dalang Street, Longhua, Shenzhen, China

<https://www.sz-tz-testing.com>

E-mail: sztz@sz-tz-testing.com

Tel: +86-755-3209 2199





- The equipment was set up to simulate a typical usage like described in the user manual or described by manufacturer.
- If the EUT is a tabletop system, a rotatable table with 0.8 m height is used.
- If the EUT is a floor standing device, it is placed on the ground.
- Auxiliary equipment and cables were positioned to simulate normal operation conditions.
- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.
- The measurement distance is 3 meter.
- The EUT was set into operation.

Premeasurement:

- The turntable rotates from 0° to 315° using 45° steps.
- The antenna height is 1.0 meter.
- At each turntable position the analyzer sweeps with peak detection to find the maximum of all emissions

Final measurement:

- Identified emissions during the premeasurement the software maximizes by rotating the turntable position (0° to 360°) and by rotating the elevation axes (0° to 360°).
- The final measurement will be done in the position (turntable and elevation) causing the highest emissions with QPK detector.
- The final levels, frequency, measuring time, bandwidth, turntable position, correction factor, margin to the limit and limit will be recorded. Also a plot with the graph of the premeasurement and the limit will be stored.

2) Sequence of testing 30 MHz to 1 GHz**Setup:**

- The equipment was set up to simulate a typical usage like described in the user manual or described by manufacturer.
- If the EUT is a tabletop system, a table with 0.8 m height is used, which is placed on the ground plane.
- If the EUT is a floor standing device, it is placed on the ground plane with insulation between both.
- Auxiliary equipment and cables were positioned to simulate normal operation conditions
- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.
- The measurement distance is 3 meter.
- The EUT was set into operation.

Premeasurement:

- The turntable rotates from 0° to 315° using 45° steps.
- The antenna is polarized vertical and horizontal.
- The antenna height changes from 1 to 3 meter.
- At each turntable position, antenna polarization and height the analyzer sweeps three times in peak to find the maximum of all emissions.

Final measurement:

- The final measurement will be performed with minimum the six highest peaks.
- According to the maximum antenna and turntable positions of premeasurement the software maximize the peaks by changing turntable position ($\pm 45^\circ$) and antenna movement between 1 and 4 meter.
- The final measurement will be done with QP detector with an EMI receiver.
- The final levels, frequency, measuring time, bandwidth, antenna height, antenna polarization, turntable angle, correction factor, margin to the limit and limit will be recorded. Also a plot with the graph of the premeasurement with marked maximum final measurements and the limit will be stored.

3) Sequence of testing 1 GHz to 40 GHz**Setup:**

- The equipment was set up to simulate a typical usage like described in the user manual or described by manufacturer.
- If the EUT is a tabletop system, a rotatable table with 1.5 m height is used.
- If the EUT is a floor standing device, it is placed on the ground plane with insulation between both.
- Auxiliary equipment and cables were positioned to simulate normal operation conditions
- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.
- The measurement distance is 3 meter.
- The EUT was set into operation.

Premeasurement:

- The turntable rotates from 0° to 315° using 45° steps.
- The antenna is polarized vertical and horizontal.





- The antenna height scan range is 1 meter to 2.5 meter.
- At each turntable position and antenna polarization the analyzer sweeps with peak detection to find the maximum of all emissions.

Final measurement:

- The final measurement will be performed with minimum the six highest peaks.
- According to the maximum antenna and turntable positions of premeasurement the software maximize the peaks by changing turntable position ($\pm 45^\circ$) and antenna movement between 1 and 4 meters. This procedure is repeated for both antenna polarizations.
- The final measurement will be done in the position (turntable, EUT-table and antenna polarization) causing the highest emissions with Peak and Average detector.
- The final levels, frequency, measuring time, bandwidth, turntable position, EUT-table position, antenna polarization, correction factor, margin to the limit and limit will be recorded. Also a plot with the graph of the premeasurement with marked maximum final measurements and the limit will be stored.

4) Sequence of testing above 18 GHz**Setup:**

- The equipment was set up to simulate a typical usage like described in the user manual or described by manufacturer.
- If the EUT is a tabletop system, a rotatable table with 1.5 m height is used.
- If the EUT is a floor standing device, it is placed on the ground plane with insulation between both.
- Auxiliary equipment and cables were positioned to simulate normal operation conditions
- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.
- The measurement distance is 1 meter.
- The EUT was set into operation.

Premeasurement:

- The antenna is moved spherical over the EUT in different polarizations of the antenna.

Final measurement:

- The final measurement will be performed at the position and antenna orientation for all detected emissions that were found during the premeasurements with Peak and Average detector.
- The final levels, frequency, measuring time, bandwidth, correction factor, margin to the limit and limit will be recorded. Also a plot with the graph of the premeasurement and the limit will be stored.





5.5.5. Test Results

Pass

Results of Radiated Emissions (9 KHz~30MHz)

Temperature	22.5℃	Humidity	56%
Test Engineer	Tony Luo	Configurations	IEEE 802.11a/n/ac
Test Volgate	DC 5V	/	/

Freq. (MHz)	Level (dBuV)	Over Limit (dB)	Over Limit (dBuV)	Remark
-	-	-	-	See Note

Note:

The amplitude of spurious emissions which are attenuated by more than 20 dB below the permissible value has no need to be reported.

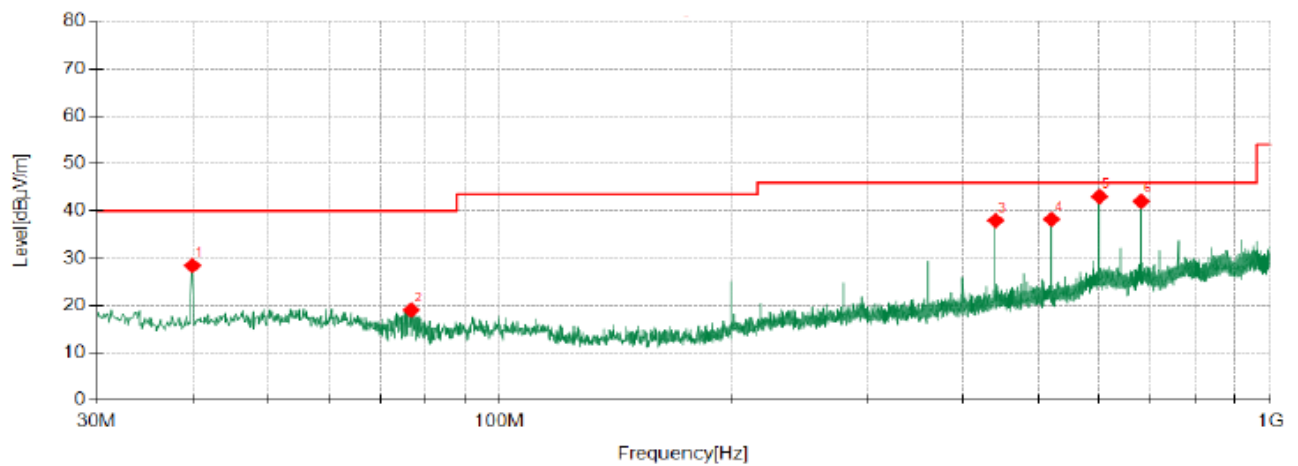
Distance extrapolation factor = $40 \log (\text{specific distance} / \text{test distance})$ (dB).

Limit line = specific limits (dBuV) + distance extrapolation factor.

Results of Radiated Emissions (30MHz~1GHz)

Temperature	22.5℃	Humidity	56%
Test Engineer	Tony Luo	Configurations	IEEE 802.11a/n/ac
Test Volgate	DC 5V	/	/



**Vertical**

◆ QF Detector

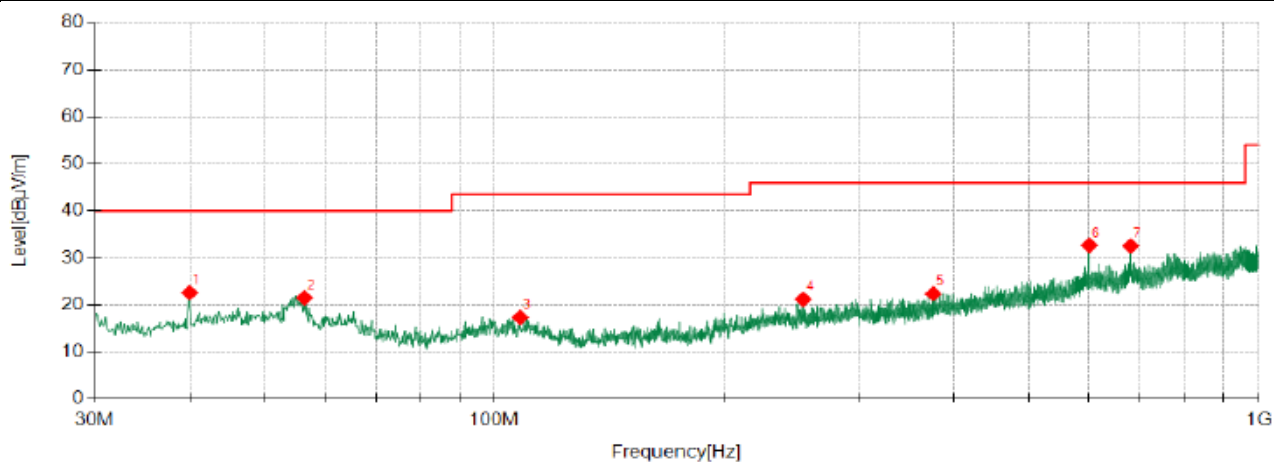
Suspected Data List

NO.	Freq. [MHz]	Reading [dBμV]	Factor [dB]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	39.94	14.32	14.14	28.46	40.00	11.54	100	110	Vertical
2	76.80	9.23	9.82	19.05	40.00	20.95	100	160	Vertical
3	440.0	18.32	19.64	37.96	46.00	8.04	100	360	Vertical
4	520.0	17.30	20.92	38.22	46.00	7.78	100	190	Vertical
5	599.9	20.10	22.90	43.00	46.00	3.00	100	260	Vertical
6	680.0	17.97	24.06	42.03	46.00	3.97	100	270	Vertical

*****Note:**

1. Level [dBμV/m] = Reading [dBμV] + Factor [dB/m]
2. Margin [dB] = Limit [dBμV/m] - Level [dBμV/m]
3. Pre-scan all modes and recorded the worst case results in this report.



**Horizontal****Suspected Data List**

NO.	Freq. [MHz]	Reading [dBμV]	Factor [dB]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	39.94	8.45	14.14	22.59	40.00	17.41	100	270	Horizontal
2	56.43	7.15	14.34	21.49	40.00	18.51	100	50	Horizontal
3	108.0	4.64	12.70	17.34	43.50	26.16	100	220	Horizontal
4	253.4	6.35	14.85	21.20	46.00	24.80	100	130	Horizontal
5	375.0	4.27	18.09	22.36	46.00	23.64	100	230	Horizontal
6	599.9	9.78	22.90	32.68	46.00	13.32	100	120	Horizontal
7	680.0	8.48	24.06	32.54	46.00	13.46	100	270	Horizontal

*****Note:**

1. Level [dBμV/m] = Reading [dBμV] + Factor [dB/m]
2. Margin [dB] = Limit [dBμV/m] - Level [dBμV/m]
3. Pre-scan all modes and recorded the worst case results in this report.



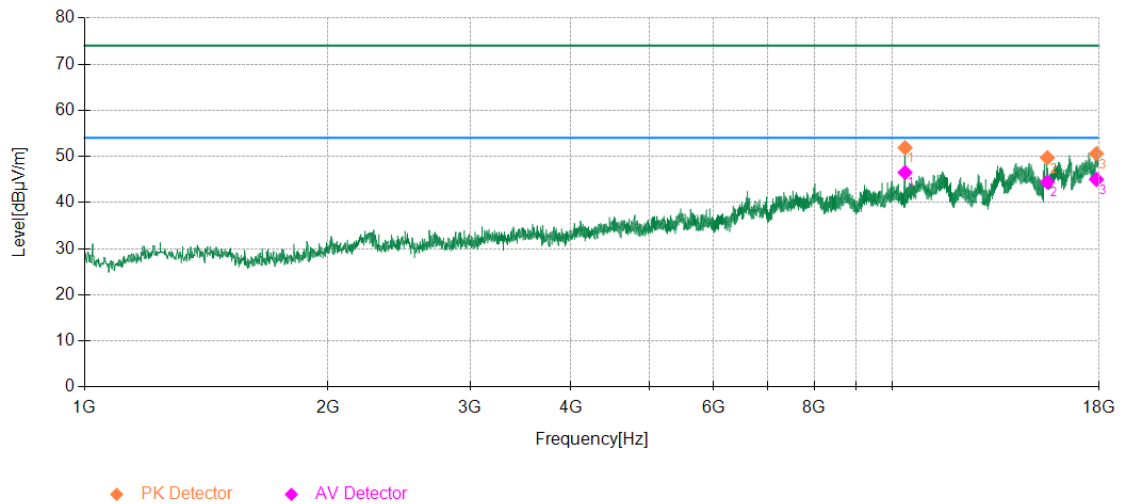


Results for Radiated Emissions (1GHz to 40GHz)

Temperature	24°C	Humidity	55.2%
Test Engineer	Tony Luo	Configurations	IEEE 802.11 a/n/ac
Test Volgate	DC 5V	/	/

Remark: Measured all modes and recorded worst case (802.11 a mode).

Low Channel - 1-18 GHz - Horizontal



PK Final Data List

NO.	Freq. [MHz]	PK Reading [dBμV]	Factor [dB]	PK Value [dBμV/m]	PK Limit [dBμV/m]	PK Margin [dB]	Height [cm]	Angle [°]	Polarity
1	10360.2	49.24	2.64	51.88	74.00	22.12	126	281	Horizontal
2	15540.3	44.61	5.11	49.72	74.00	24.28	157	329	Horizontal
3	17871.4	37.89	12.71	50.60	74.00	23.40	205	127	Horizontal

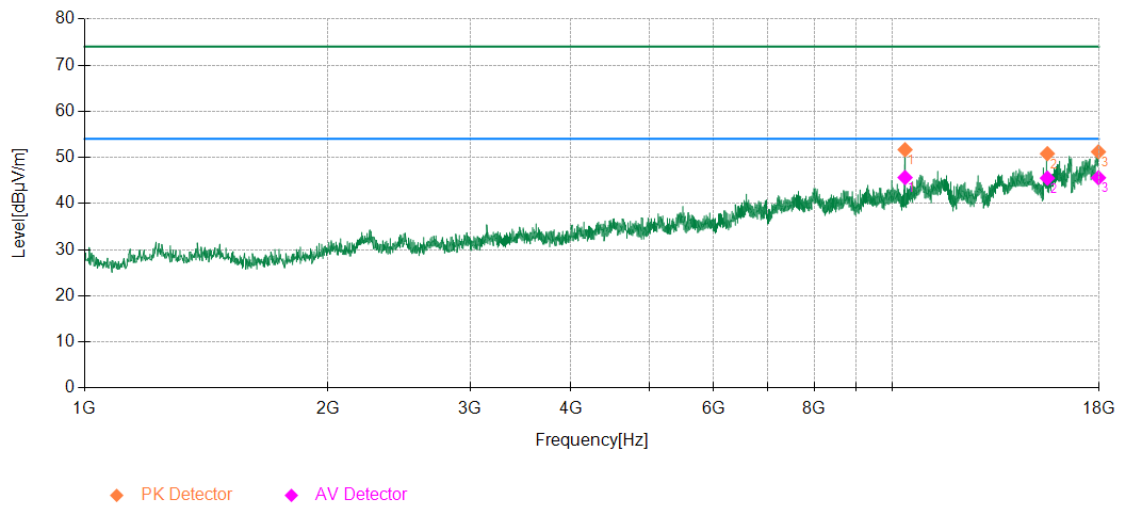
AV Final Data List

NO.	Freq. [MHz]	AV Reading [dBμV]	Factor [dB]	AV Value [dBμV/m]	AV Limit [dBμV/m]	AV Margin [dB]	Height [cm]	Angle [°]	Polarity
1	10360.2	43.87	2.64	46.51	54.00	7.49	126	281	Horizontal
2	15540.3	39.34	5.11	44.45	54.00	9.55	157	329	Horizontal
3	17871.4	32.29	12.71	45.00	54.00	9.00	205	127	Horizontal





Low Channel - 1-18 GHz - Vertical



PK Final Data List

NO.	Freq. [MHz]	PK Reading [dBμV]	Factor [dB]	PK Value [dBμV/m]	PK Limit [dBμV/m]	PK Margin [dB]	Height [cm]	Angle [°]	Polarity
1	10360.2	48.56	3.11	51.67	74.00	22.33	179	121	Vertical
2	15540.3	45.71	5.09	50.80	74.00	23.20	181	145	Vertical
3	17973.1	37.95	13.26	51.21	74.00	22.79	333	167	Vertical

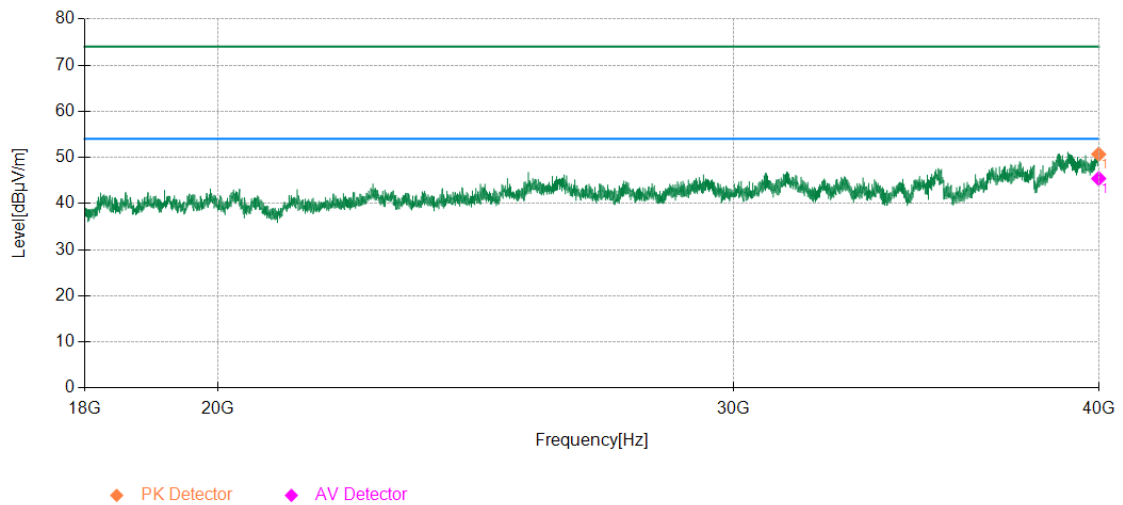
AV Final Data List

NO.	Freq. [MHz]	AV Reading [dBμV]	Factor [dB]	AV Value [dBμV/m]	AV Limit [dBμV/m]	AV Margin [dB]	Height [cm]	Angle [°]	Polarity
1	10360.2	42.52	3.11	45.63	54.00	8.37	179	121	Vertical
2	15540.3	40.41	5.09	45.50	54.00	8.50	181	145	Vertical
3	17973.1	32.32	13.26	45.58	54.00	8.42	333	167	Vertical





Low Channel - 18-40 GHz - Horizontal



PK Final Data List

NO.	Freq. [MHz]	PK Reading [dBμV]	Factor [dB]	PK Value [dBμV/m]	PK Limit [dBμV/m]	PK Margin [dB]	Height [cm]	Angle [°]	Polarity
1	39992.27	42.29	8.40	50.69	74.00	23.31	231	132	Horizontal

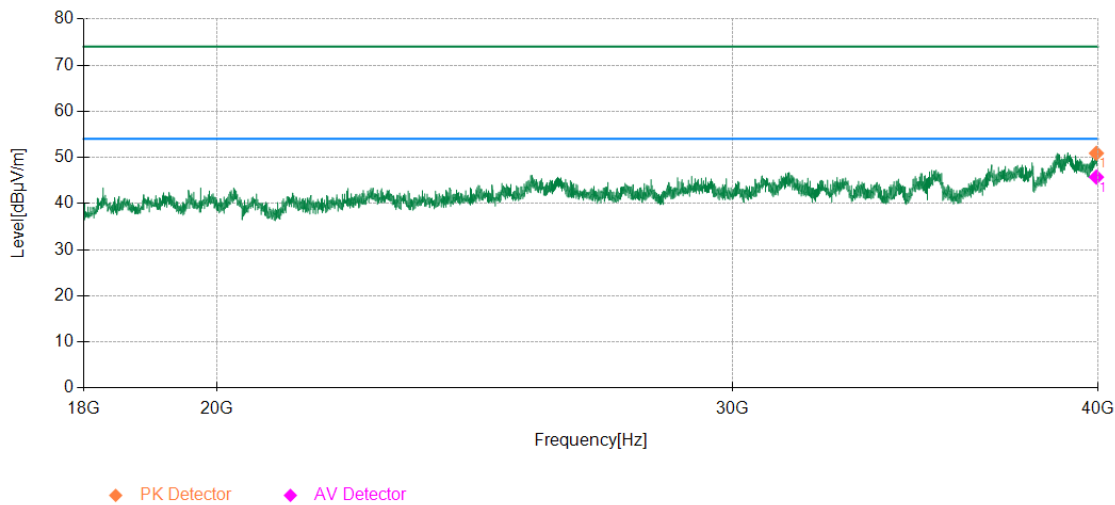
AV Final Data List

NO.	Freq. [MHz]	AV Reading [dBμV]	Factor [dB]	AV Value [dBμV/m]	AV Limit [dBμV/m]	AV Margin [dB]	Height [cm]	Angle [°]	Polarity
1	39992.27	37.01	8.40	45.41	54.00	8.59	231	132	Horizontal





Low Channel - 18-40 GHz - Vertical



PK Final Data List

NO.	Freq. [MHz]	PK Reading [dBμV]	Factor [dB]	PK Value [dBμV/m]	PK Limit [dBμV/m]	PK Margin [dB]	Height [cm]	Angle [°]	Polarity
1	39951.49	42.52	8.38	50.90	74.00	23.10	142	172	Vertical

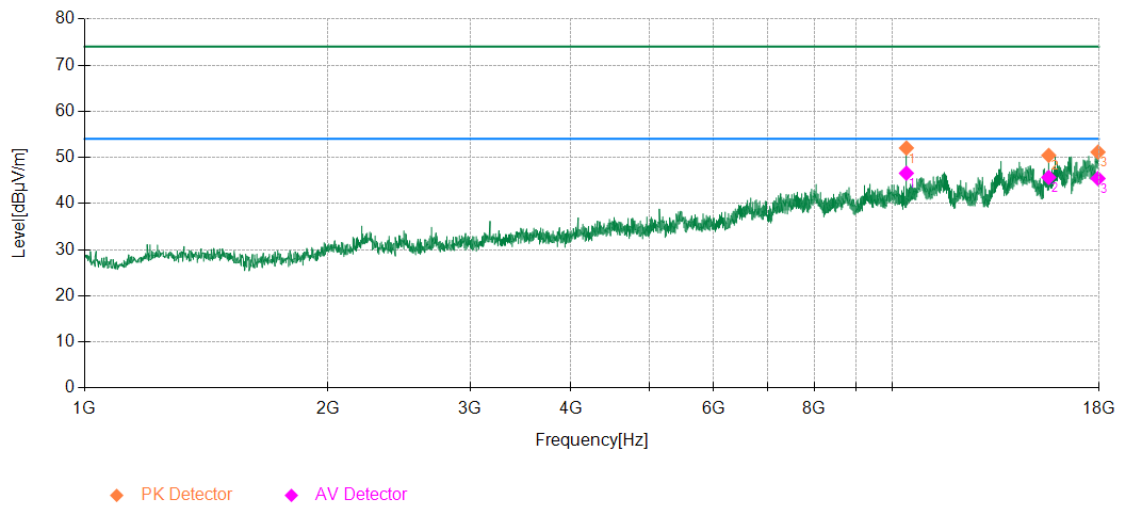
AV Final Data List

NO.	Freq. [MHz]	AV Reading [dBμV]	Factor [dB]	AV Value [dBμV/m]	AV Limit [dBμV/m]	AV Margin [dB]	Height [cm]	Angle [°]	Polarity
1	39951.49	37.34	8.38	45.72	54.00	8.28	142	172	Vertical





Mid Channel - 1-18 GHz - Horizontal



PK Final Data List

NO.	Freq. [MHz]	PK Reading [dBμV]	Factor [dB]	PK Value [dBμV/m]	PK Limit [dBμV/m]	PK Margin [dB]	Height [cm]	Angle [°]	Polarity
1	10400.1	48.92	3.11	52.03	74.00	21.97	125	321	Horizontal
2	15600.2	45.34	5.09	50.43	74.00	23.57	198	142	Horizontal
3	17954.1	37.85	13.29	51.14	74.00	22.86	164	178	Horizontal

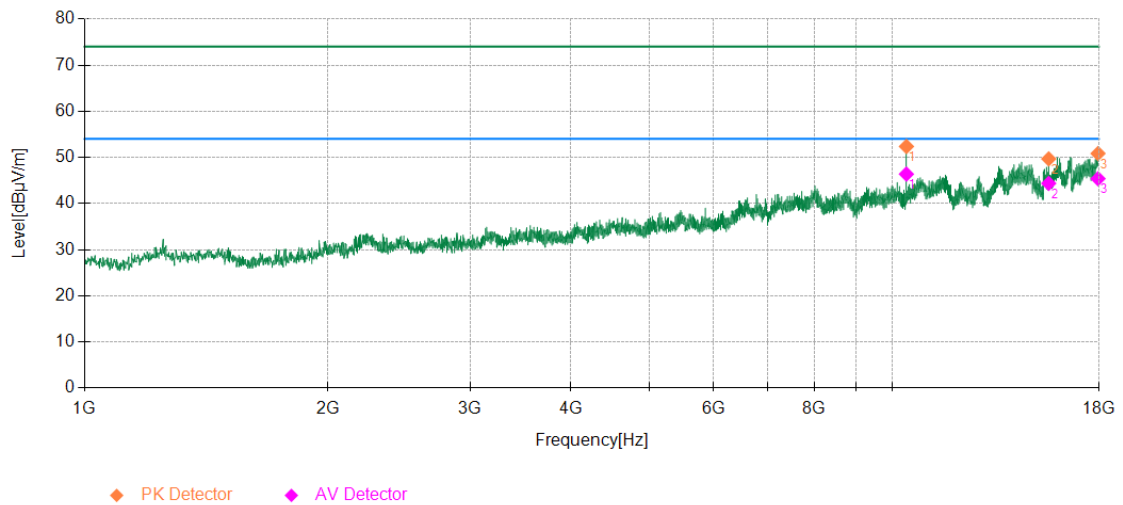
AV Final Data List

NO.	Freq. [MHz]	AV Reading [dBμV]	Factor [dB]	AV Value [dBμV/m]	AV Limit [dBμV/m]	AV Margin [dB]	Height [cm]	Angle [°]	Polarity
1	10400.1	43.46	3.11	46.57	54.00	7.43	125	321	Horizontal
2	15600.2	40.58	5.09	45.67	54.00	8.33	198	142	Horizontal
3	17954.1	32.13	13.29	45.42	54.00	8.58	164	178	Horizontal





Mid Channel - 1-18 GHz - Vertical



PK Final Data List

NO.	Freq. [MHz]	PK Reading [dBμV]	Factor [dB]	PK Value [dBμV/m]	PK Limit [dBμV/m]	PK Margin [dB]	Height [cm]	Angle [°]	Polarity
1	10400.1	48.51	3.86	52.37	74.00	21.63	199	173	Vertical
2	15600.2	44.67	5.01	49.68	74.00	24.32	201	161	Vertical
3	17952.8	37.63	13.22	50.85	74.00	23.15	159	124	Vertical

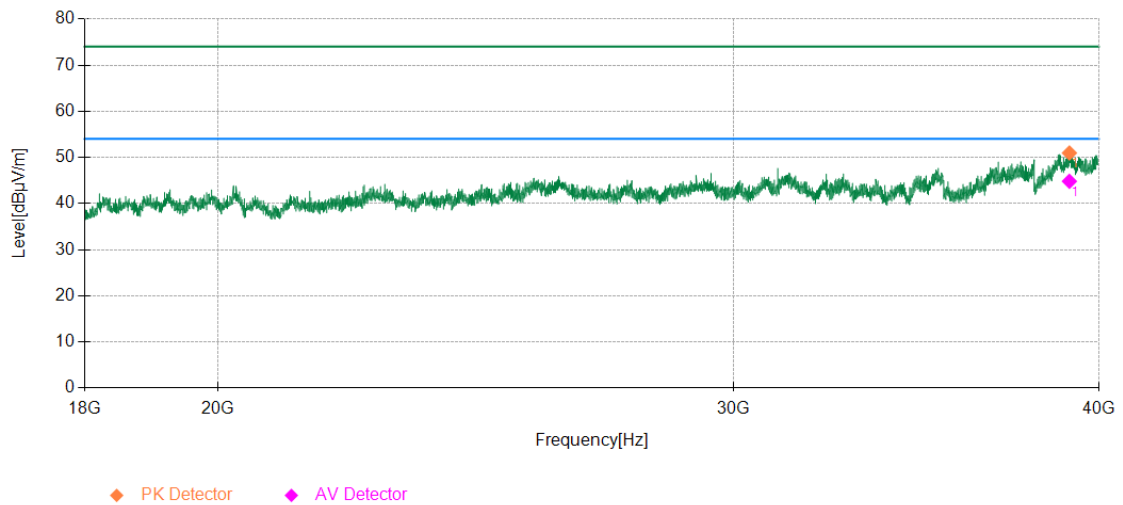
AV Final Data List

NO.	Freq. [MHz]	AV Reading [dBμV]	Factor [dB]	AV Value [dBμV/m]	AV Limit [dBμV/m]	AV Margin [dB]	Height [cm]	Angle [°]	Polarity
1	10400.1	42.52	3.86	46.38	54.00	7.62	199	173	Vertical
2	15600.2	39.35	5.01	44.36	54.00	9.64	201	161	Vertical
3	17952.8	32.16	13.22	45.38	54.00	8.62	159	124	Vertical





Mid Channel - 18-40 GHz - Horizontal



PK Final Data List

NO.	Freq. [MHz]	PK Reading [dBμV]	Factor [dB]	PK Value [dBμV/m]	PK Limit [dBμV/m]	PK Margin [dB]	Height [cm]	Angle [°]	Polarity
1	39081.14	43.45	7.50	50.95	74.00	23.05	142	101	Horizontal

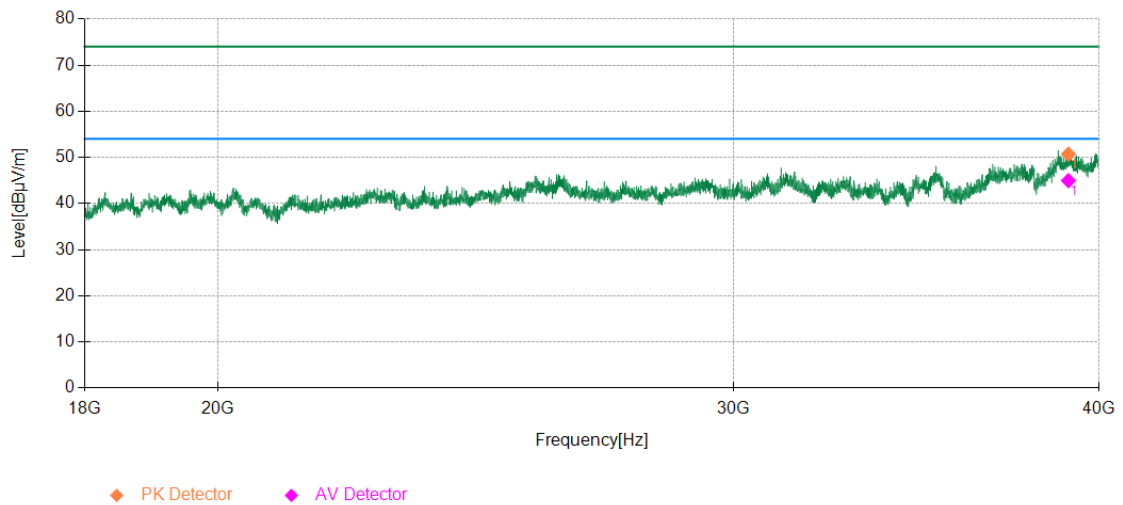
AV Final Data List

NO.	Freq. [MHz]	AV Reading [dBμV]	Factor [dB]	AV Value [dBμV/m]	AV Limit [dBμV/m]	AV Margin [dB]	Height [cm]	Angle [°]	Polarity
1	39081.14	37.32	7.50	44.82	54.00	9.18	142	101	Horizontal





Mid Channel - 18-40 GHz - Vertical



PK Final Data List

NO.	Freq. [MHz]	PK Reading [dBμV]	Factor [dB]	PK Value [dBμV/m]	PK Limit [dBμV/m]	PK Margin [dB]	Height [cm]	Angle [°]	Polarity
1	39051.47	43.24	7.47	50.71	74.00	23.29	234	268	Vertical

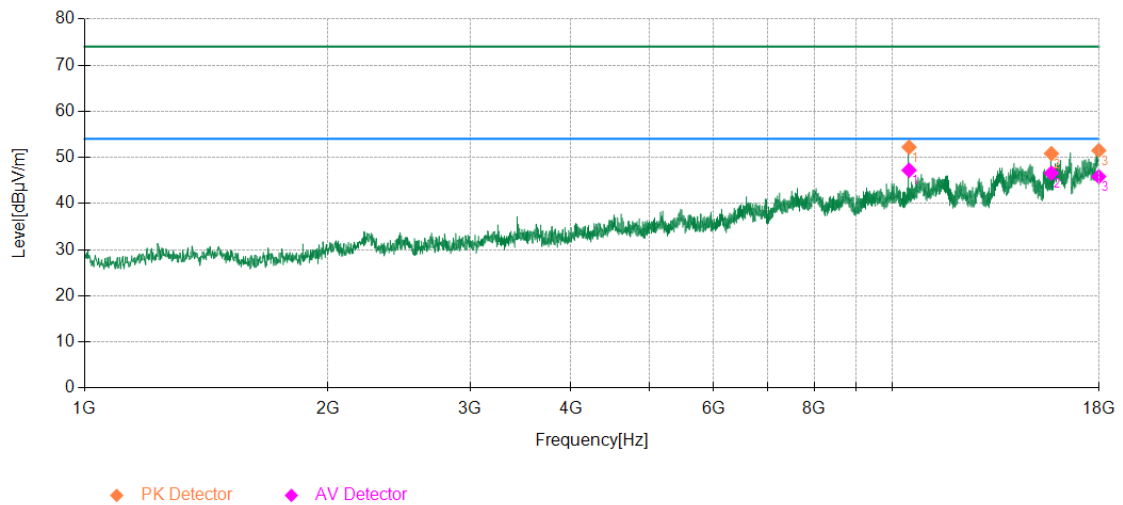
AV Final Data List

NO.	Freq. [MHz]	AV Reading [dBμV]	Factor [dB]	AV Value [dBμV/m]	AV Limit [dBμV/m]	AV Margin [dB]	Height [cm]	Angle [°]	Polarity
1	39051.47	37.49	7.47	44.96	54.00	9.04	234	268	Vertical





High Channel - 1-18 GHz - Horizontal



PK Final Data List

NO.	Freq. [MHz]	PK Reading [dBμV]	Factor [dB]	PK Value [dBμV/m]	PK Limit [dBμV/m]	PK Margin [dB]	Height [cm]	Angle [°]	Polarity
1	10480.2	48.36	3.86	52.22	74.00	21.78	165	71	Horizontal
2	15720.1	45.82	5.01	50.83	74.00	23.17	119	342	Horizontal
3	17992.2	38.18	13.32	51.50	74.00	22.50	151	241	Horizontal

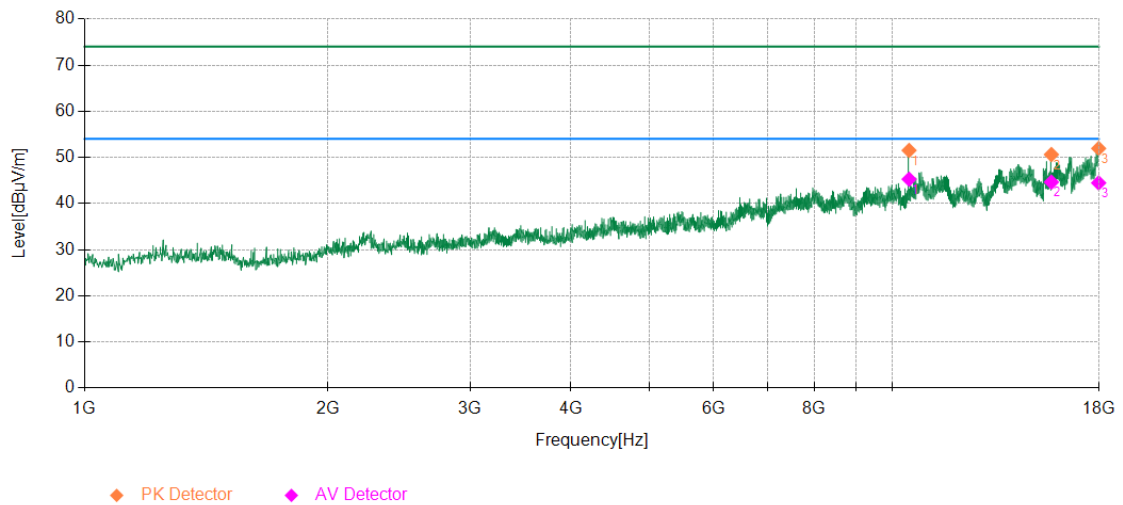
AV Final Data List

NO.	Freq. [MHz]	AV Reading [dBμV]	Factor [dB]	AV Value [dBμV/m]	AV Limit [dBμV/m]	AV Margin [dB]	Height [cm]	Angle [°]	Polarity
1	10480.2	43.36	3.86	47.22	54.00	6.78	165	71	Horizontal
2	15720.1	41.59	5.01	46.60	54.00	7.40	119	342	Horizontal
3	17992.2	32.52	13.32	45.84	54.00	8.16	151	241	Horizontal





High Channel - 1-18 GHz - Vertical



PK Final Data List

NO.	Freq. [MHz]	PK Reading [dBμV]	Factor [dB]	PK Value [dBμV/m]	PK Limit [dBμV/m]	PK Margin [dB]	Height [cm]	Angle [°]	Polarity
1	10480.2	48.87	2.64	51.51	74.00	22.49	164	263	Vertical
2	15720.1	45.51	5.11	50.62	74.00	23.38	152	257	Vertical
3	17985.9	38.68	13.26	51.94	74.00	22.06	183	142	Vertical

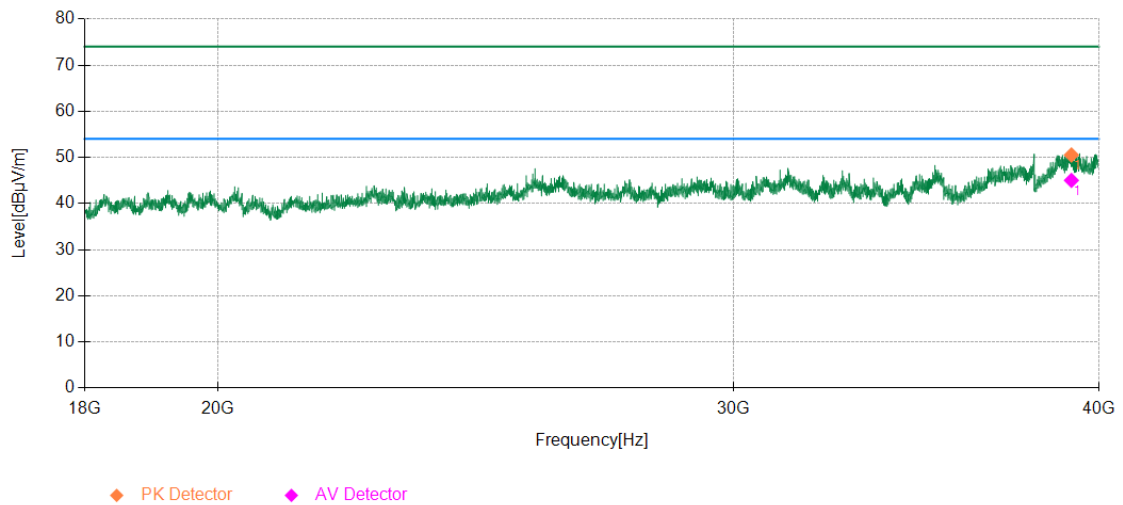
AV Final Data List

NO.	Freq. [MHz]	AV Reading [dBμV]	Factor [dB]	AV Value [dBμV/m]	AV Limit [dBμV/m]	AV Margin [dB]	Height [cm]	Angle [°]	Polarity
1	10480.2	42.63	2.64	45.27	54.00	8.73	164	263	Vertical
2	15720.1	39.54	5.11	44.65	54.00	9.35	152	257	Vertical
3	17985.9	31.21	13.26	44.47	54.00	9.53	183	142	Vertical





High Channel - 18-40 GHz - Horizontal



PK Final Data List

NO.	Freq. [MHz]	PK Reading [dBμV]	Factor [dB]	PK Value [dBμV/m]	PK Limit [dBμV/m]	PK Margin [dB]	Height [cm]	Angle [°]	Polarity
1	39143.57	42.97	7.55	50.52	74.00	23.48	111	142	Horizontal

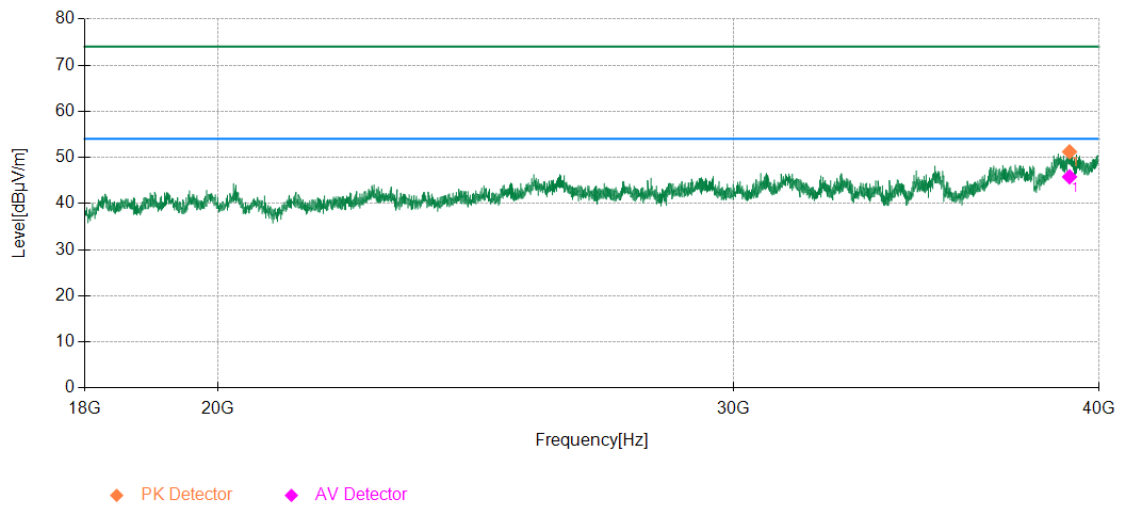
AV Final Data List

NO.	Freq. [MHz]	AV Reading [dBμV]	Factor [dB]	AV Value [dBμV/m]	AV Limit [dBμV/m]	AV Margin [dB]	Height [cm]	Angle [°]	Polarity
1	39143.57	37.46	7.55	45.01	54.00	8.99	111	142	Horizontal





High Channel - 18-40 GHz - Vertical



PK Final Data List

NO.	Freq. [MHz]	PK Reading [dBμV]	Factor [dB]	PK Value [dBμV/m]	PK Limit [dBμV/m]	PK Margin [dB]	Height [cm]	Angle [°]	Polarity
1	39085.62	43.71	7.51	51.22	74.00	22.78	129	168	Vertical

AV Final Data List

NO.	Freq. [MHz]	AV Reading [dBμV]	Factor [dB]	AV Value [dBμV/m]	AV Limit [dBμV/m]	AV Margin [dB]	Height [cm]	Angle [°]	Polarity
1	39085.62	38.27	7.51	45.78	54.00	8.22	129	168	Vertical

Notes:

Factor = Ant. Fac - Pre. Fac. + Cab. Loss.

Margin = Limit – Level.





5.6. Power line conducted emissions

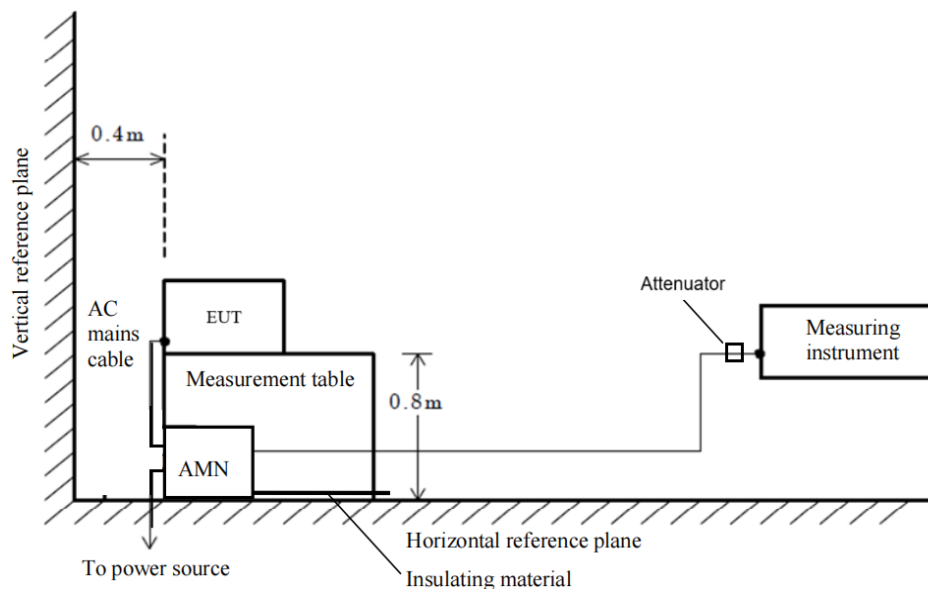
5.6.1. Standard Applicable

According to §15.207 (a): For an intentional radiator which 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 or frequencies within the band 150 kHz to 30 MHz shall not exceed 250 microvolts (The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz). The limits at specific frequency range are listed as follows:

Frequency Range (MHz)	Limits (dB μ V)	
	Quasi-peak	Average
0.15 to 0.50	66 to 56	56 to 46
0.50 to 5	56	46
5 to 30	60	50

* Decreasing linearly with the logarithm of the frequency

5.6.2. Block Diagram of Test Setup



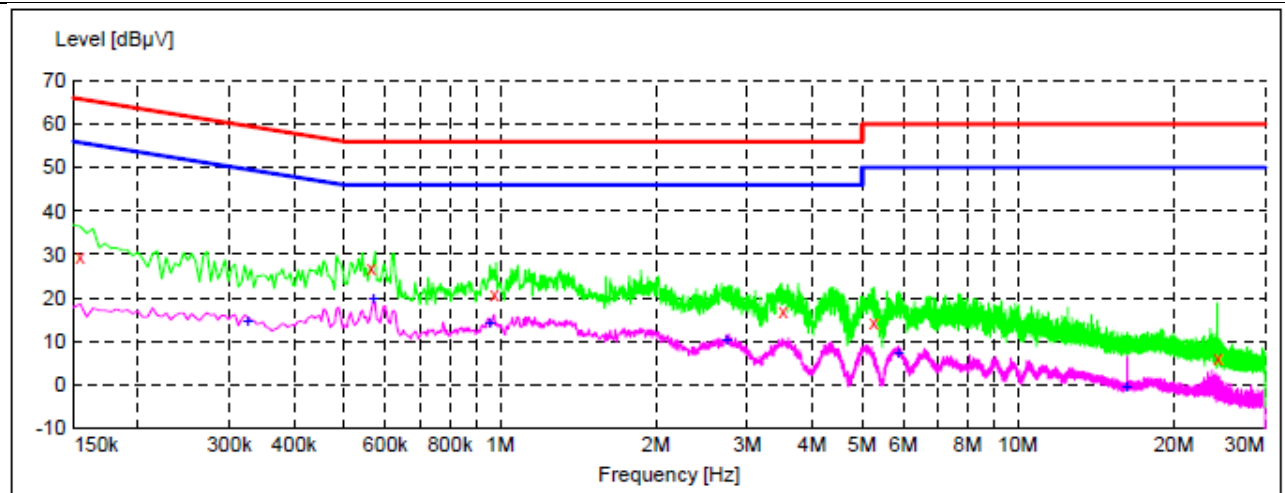
Note: the distance between LISN and Vertical reference plane is 40 cm and the distance between LISN and EUT is 80 cm.

5.6.3. Test Results

PASS.

Temperature	24.3°C	Humidity	55.4%
Test Engineer	Tony Luo	Configurations	802.11a/n/ac
Test Volgate	AC 120V 60Hz	/	/



**Neutral Line**

Frequency MHz	Level dBμV	Transd dB	Limit dBμV	Margin dB	Detector	Line	PE
0.154500	29.60	9.6	66	36.2	QP	N	GND
0.564000	26.70	9.6	56	29.3	QP	N	GND
0.973500	21.00	9.7	56	35.0	QP	N	GND
3.516000	16.90	9.7	56	39.1	QP	N	GND
5.257500	14.10	9.7	60	45.9	QP	N	GND
24.306000	6.20	9.8	60	53.8	QP	N	GND
Frequency MHz	Level dBμV	Transd dB	Limit dBμV	Margin dB	Detector	Line	PE
0.325500	14.70	9.7	50	34.9	AV	N	GND
0.568500	19.90	9.6	46	26.1	AV	N	GND
0.955500	14.20	9.7	46	31.8	AV	N	GND
2.733000	10.40	9.7	46	35.6	AV	N	GND
5.878500	7.50	9.7	50	42.5	AV	N	GND
16.188000	-0.30	9.8	50	50.3	AV	N	GND

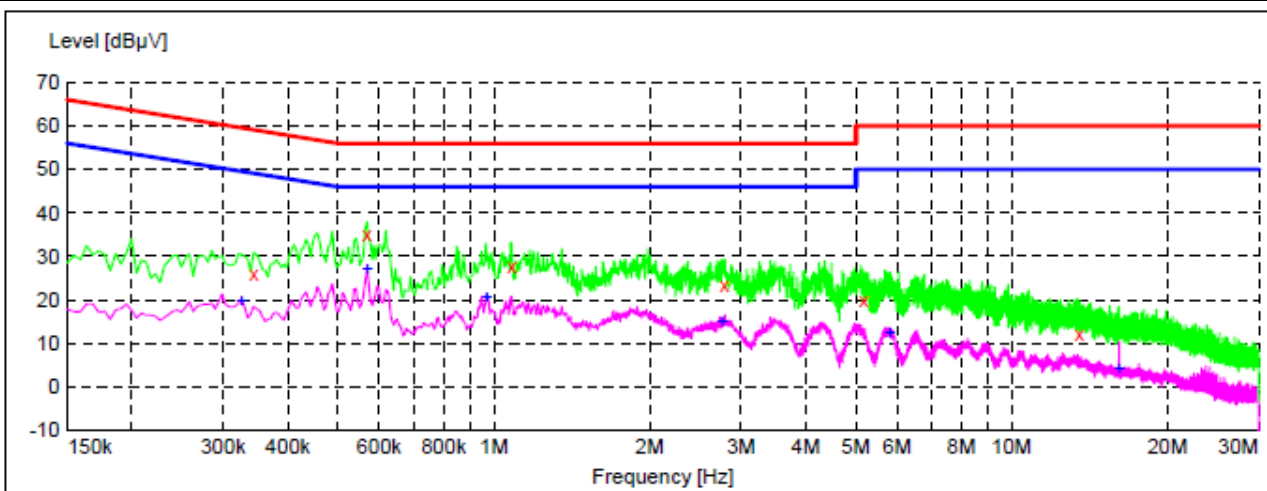
Note:

1. $\text{Margin(dB)} = \text{Limit(dB}\mu\text{V)} - \text{Level(dB}\mu\text{V)}$
2. If QP Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Test setup: RBW: 9 kHz (150 kHz—30 MHz), Step size: 4 kHz, Scan time: auto.
4. Pre-scan all modes and recorded the worst case results in this report.





Live Line



Frequency MHz	Level dBμV	Transd dB	Limit dBμV	Margin dB	Detector	Line	PE
0.343500	26.10	9.7	59	33.0	QP	L1	GND
0.568500	35.20	9.6	56	20.8	QP	L1	GND
1.081500	27.50	9.7	56	28.5	QP	L1	GND
2.787000	23.40	9.7	56	32.6	QP	L1	GND
5.172000	19.80	9.7	60	40.2	QP	L1	GND
13.501500	12.00	9.7	60	48.0	QP	L1	GND
Frequency MHz	Level dBμV	Transd dB	Limit dBμV	Margin dB	Detector	Line	PE
0.325500	20.10	9.7	50	29.5	AV	L1	GND
0.568500	27.30	9.6	46	18.7	AV	L1	GND
0.969000	20.90	9.7	46	25.1	AV	L1	GND
2.760000	15.00	9.7	46	31.0	AV	L1	GND
5.811000	12.50	9.7	50	37.5	AV	L1	GND
16.093500	4.40	9.8	50	45.6	AV	L1	GND

Note:

1. $\text{Margin(dB)} = \text{Limit(dB}\mu\text{V)} - \text{Level(dB}\mu\text{V)}$
2. If QP Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Test setup: RBW: 9 kHz (150 kHz—30 MHz), Step size: 4 kHz, Scan time: auto.
4. Pre-scan all modes and recorded the worst case results in this report.





5.7. Undesirable Emissions Measurement

5.7.1. Limit

According to §15.407 (b) Undesirable emission limits. Except as shown in paragraph (b) (7) of this section, the maximum emissions outside of the frequency bands of operation shall be attenuated in accordance with the following limits:

(a) For transmitters operating in the 5.15-5.25 GHz band: All emissions outside of the 5.15-5.35 GHz band shall not exceed an e.i.r.p. of -27 dBm/MHz.

(b) For transmitters operating in the 5.25-5.35 GHz band: All emissions outside of the 5.15-5.35 GHz band shall not exceed an e.i.r.p. of -27 dBm/MHz.

(c) For transmitters operating in the 5.47-5.725 GHz band: All emissions outside of the 5.47-5.725 GHz band shall not exceed an e.i.r.p. of -27 dBm/MHz.

(d) For transmitters operating in the 5.725-5.85 GHz band:

(i) All emissions shall be limited to a level of -27 dBm/MHz at 75 MHz or more above or below the band edge increasing linearly to 10 dBm/MHz at 25 MHz above or below the band edge, and from 25 MHz above or below the band edge increasing linearly to a level of 15.6 dBm/MHz at 5 MHz above or below the band edge, and from 5 MHz above or below the band edge increasing linearly to a level of 27 dBm/MHz at the band edge.

(ii) Devices certified before March 2, 2017 with antenna gain greater than 10 dBi may demonstrate compliance with the emission limits in §15.247(d), but manufacturing, marketing and importing of devices certified under this alternative must cease by March 2, 2018. Devices certified before March 2, 2018 with antenna gain of 10 dBi or less may demonstrate compliance with the emission limits in §15.247(d), but manufacturing, marketing and importing of devices certified under this alternative must cease before March 2, 2020.

(e) The emission measurements shall be performed using a minimum resolution bandwidth of 1 MHz. A lower resolution bandwidth may be employed near the band edge, when necessary, provided the measured energy is integrated to show the total power over 1 MHz.

(f) Unwanted emissions below 1 GHz must comply with the general field strength limits set forth in §15.209. Further, any U-NII devices using an AC power line are required to comply also with the conducted limits set forth in §15.207.

(g) The provisions of §15.205 apply to intentional radiators operating under this section.

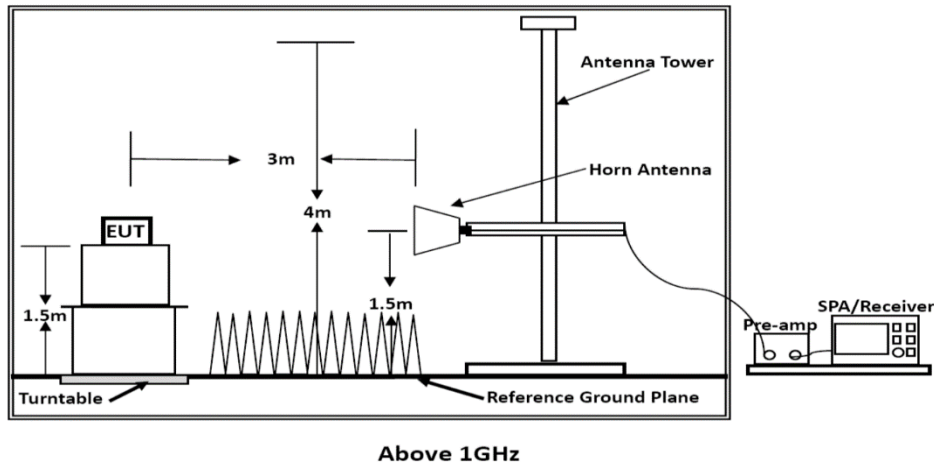
(h) When measuring the emission limits, the nominal carrier frequency shall be adjusted as close to the upper and lower frequency band edges as the design of the equipment permits.



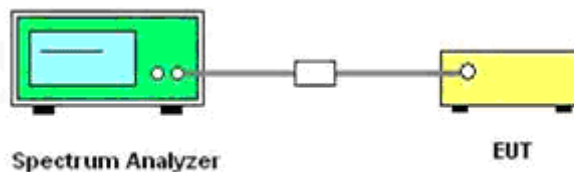


5.7.2. Block Diagram of Test Setup

☒ For Radiated



☐ For Conducted



5.7.3. Test Procedure

☒ Radiated Method:

1. The EUT was placed on a turn table which is 1.5m above ground plane.
2. Maximum procedure was performed by raising the receiving antenna from 1m to 4m and rotating the turn table from 0° to 360° to acquire the highest emissions from EUT.
3. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
4. Repeat above procedures until all frequency measurements have been completed..
5. Setting test receiver/spectrum as following table states:

Test Frequency range	Test Receiver/Spectrum Setting	Detector
1GHz-40GHz	Peak Value: RBW=1MHz/VBW=3MHz, Sweep time=Auto	Peak
	Average Value: RBW=1MHz/VBW=3MHz, Sweep time=Auto	Average

☐ Conducted Method:

According to KDB789033 D02 General UNII Test Procedures New Rules v02r01 Section G: Unwanted Emission Measurement

1. Unwanted Emissions in the Restricted Bands
 - a) For all measurements, follow the requirements in section II.G.3. "General Requirements for Unwanted Emissions Measurements."
 - b) At frequencies below 1000 MHz, use the procedure described in section II.G.4. "Procedure for Unwanted





Emissions Measurements below 1000 MHz."

- c) At frequencies above 1000 MHz, measurements performed using the peak and average measurement procedures described in sections II.G.5. and II.G.6, respectively, must satisfy the respective peak and average limits. If all peak measurements satisfy the average limit, then average measurements are not required.
- d) For conducted measurements above 1000 MHz, EIRP shall be computed as specified in section II.G.3.b) and then field strength shall be computed as follows (see KDB Publication 412172):
- i) $E[\text{dB}\mu\text{V/m}] = \text{EIRP}[\text{dBm}] - 20 \log(d[\text{meters}]) + 104.77$, where E = field strength and d = distance at which field strength limit is specified in the rules.
- ii) $E[\text{dB}\mu\text{V/m}] = \text{EIRP}[\text{dBm}] + 95.2$, for d = 3 meters
- e) For conducted measurements below 1000 MHz, the field strength shall be computed as specified in d), above, and then an additional 4.7 dB shall be added as an upper bound on the field strength that would be observed on a test range with a ground plane for frequencies between 30 MHz and 1000 MHz, or an additional 6 dB shall be added for frequencies below 30 MHz.

2. Unwanted Emissions that fall Outside of the Restricted Bands

- a) For all measurements, follow the requirements in section II.G.3. "General Requirements for Unwanted Emissions Measurements."
- b) At frequencies below 1000 MHz, use the procedure described in section II.G.4. "Procedure for Unwanted Emissions Measurements below 1000 MHz."
- c) At frequencies above 1000 MHz, use the procedure for maximum emissions described in section II.G.5., "Procedure for Unwanted Maximum Unwanted Emissions Measurements Above 1000 MHz."
- d) Section 15.407(b) (1-3) specifies the unwanted emissions limit for the U-NII-1 and 2 bands. As specified, emissions above 1000 MHz that are outside of the restricted bands are subject to a peak emission limit of -27 dBm/MHz. However, an out-of-band emission that complies with both the average and peak limits of Section 15.209 is not required to satisfy the -27 dBm/MHz dBm/MHz peak emission limit.
- i) Section 15.407(b) (4) specifies the unwanted emissions limit for the U-NII-3 band. A band emissions mask is specified in Section 15.407(b) (4) (i). An alternative to the band emissions mask is specified in Section 15.407(b) (4) (ii). The alternative limits are based on the highest antenna gain specified in the filing. There are also marketing and importation restrictions for the alternative limit.
- e) If radiated measurements are performed, field strength is then converted to EIRP as follows:
- i) $\text{EIRP} = ((E \times d)^2) / 30$
Where:
- E is the field strength in V/m.
 - d is the measurement distance in meters.
 - EIRP is the equivalent isotopically radiated power in watts.
- ii) Working in dB units, the above equation is equivalent to:
 $\text{EIRP} [\text{dBm}] = E [\text{dB}\mu\text{V/m}] + 20 \log(d [\text{meters}]) - 104.77$
- iii) Or, if d is 3 meters:
 $\text{EIRP} [\text{dBm}] = E [\text{dB}\mu\text{V/m}] - 95.23$

3. Radiated versus Conducted Measurements.

The unwanted emission limits in both the restricted and non-restricted bands are based on radiated measurements. however, as an alternative, antenna-port conducted measurements in conjunction with cabinet emissions tests will be permitted to demonstrate compliance provided that the following steps are performed:

- (i) Cabinet emissions measurements. A radiated test shall be performed to ensure that cabinet emissions are below the emission limits. For the cabinet-emission measurements the antenna may be replaced by a termination matching the nominal impedance of the antenna.
- (ii) Impedance matching. Conducted tests shall be performed using equipment that matches the nominal impedance of the antenna assembly used with the EUT.
- (iii) EIRP calculation. A value representative of an upper bound on out-of-band antenna gain (in dBi) shall be added to the measured antenna-port conducted emission power to compute EIRP within the specified measurement bandwidth. (For emissions in the restricted bands, additional calculations are required to convert EIRP to field strength at the specified distance.) The upper bound on antenna gain for a device with a single RF output shall be selected as the maximum in-band gain of the antenna across all operating bands or 2 dBi, whichever is greater.³ However, for devices that operate in multiple bands using the same transmit antenna, the highest gain of the antenna within the operating band nearest to the out-of-band frequency being measured may be used in lieu of the overall highest gain when measuring emissions at





frequencies within 20% of the absolute frequency at the nearest edge of that band, but in no case shall a value less than 2 dBi be selected.

- (iv) EIRP adjustments for multiple outputs. For devices with multiple outputs occupying the same or overlapping frequency ranges in the same band (e.g., MIMO or beamforming devices), compute the total EIRP as follows:
- Compute EIRP for each output, as described in (iii), above.
 - Follow the procedures specified in KDB Publication 662911 for summing emissions across the outputs or adjusting emission levels measured on individual outputs by $10 \log(N_{\text{ANT}})$, where N_{ANT} is the number of outputs.
 - Add the array gain term specified in KDB Publication 662911 for out-of-band and spurious signals.
- (v) Direction of maximum emission.
For all radiated emissions tests, measurements shall correspond to the direction of maximum emission level for each measured emission (see ANSI C63.10 for guidance).

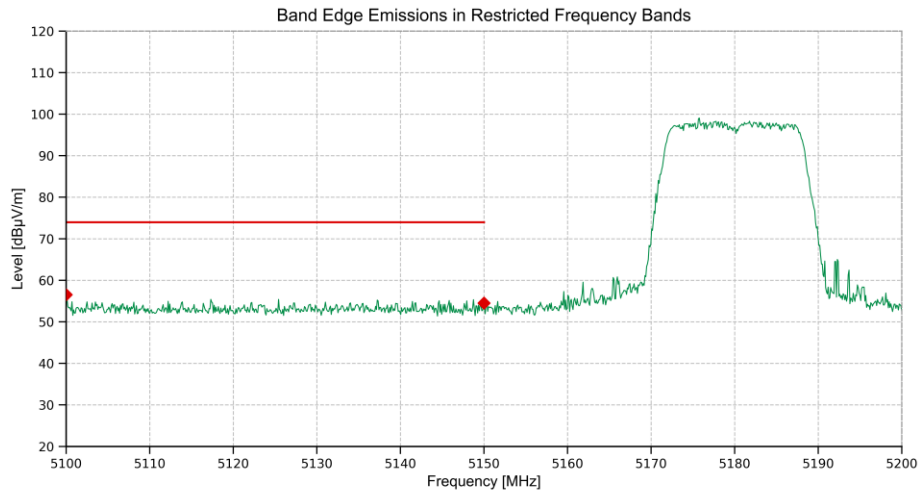




5.7.4. Test Results

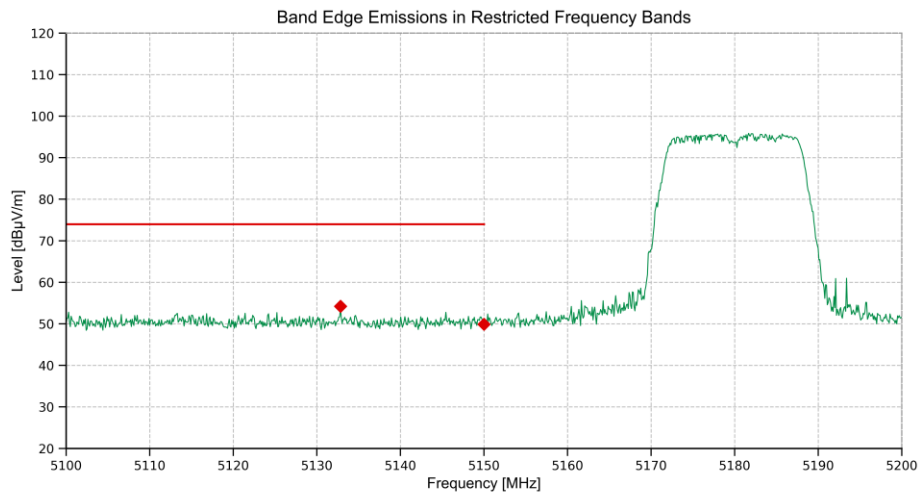
Temperature	24.3℃	Humidity	55.4%
Test Engineer	Tony Luo	Configurations	802.11a/n/ac
Test Volgate	DC 5V	/	/

11a_ANT1_5180_6Mbps



◆ Peak Detector

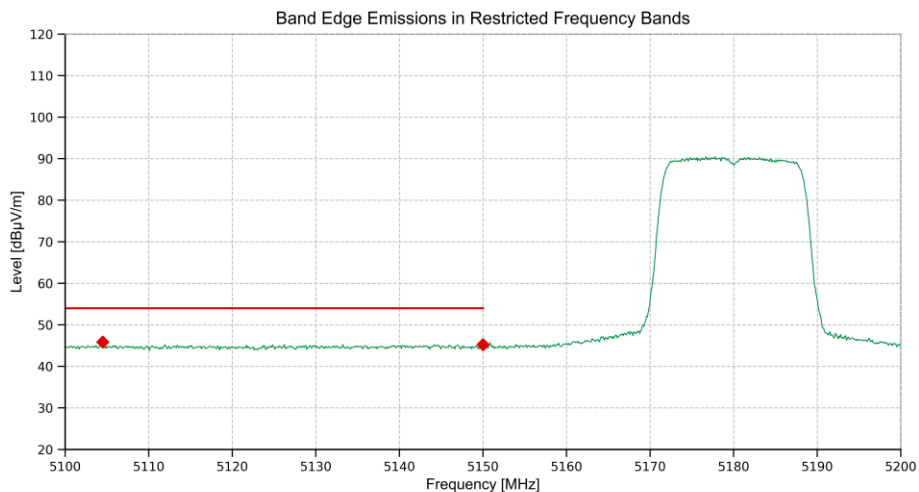
Freq. MHz	Reading dBμV	Ant. Fac. dB/m	Cable Loss dB	Level dBμV/m	Limit dBμV/m	Margin dB	Detector	Pol.
5100.00	16.81	32.10	7.11	56.02	74.00	17.98	Peak	Horizontal
5150.00	14.78	32.10	7.11	53.99	74.00	20.01	Peak	Horizontal



◆ Peak Detector

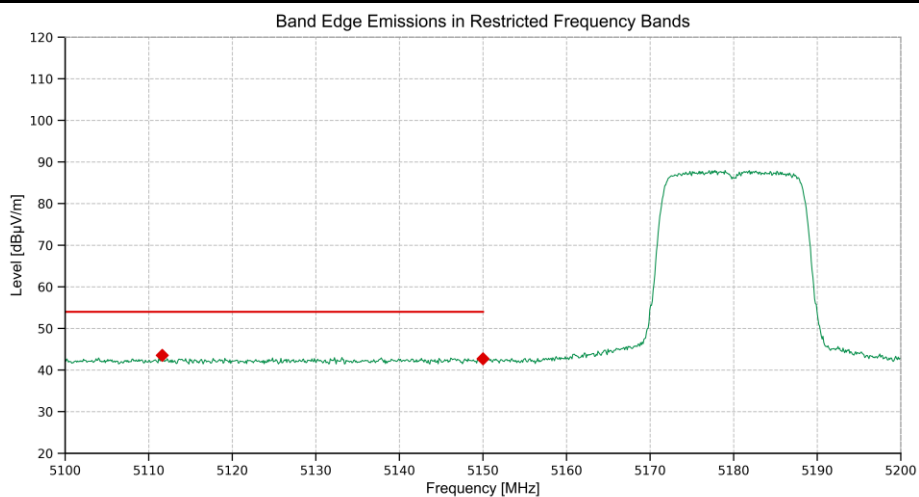
Freq. MHz	Reading dBμV	Ant. Fac. dB/m	Cable Loss dB	Level dBμV/m	Limit dBμV/m	Margin dB	Detector	Pol.
5132.83	14.56	32.03	7.14	53.73	74.00	20.27	Peak	Vertical
5150.00	10.24	32.03	7.14	49.41	74.00	24.59	Peak	Vertical





◆ Average Detector

Freq. MHz	Reading dBμV	Ant. Fac. dB/m	Cable Loss dB	Level dBμV/m	Limit dBμV/m	Margin dB	Detector	Pol.
5104.50	6.14	32.09	7.11	45.35	54.00	8.65	Average	Horizontal
5150.00	5.55	32.09	7.11	44.75	54.00	9.25	Average	Horizontal



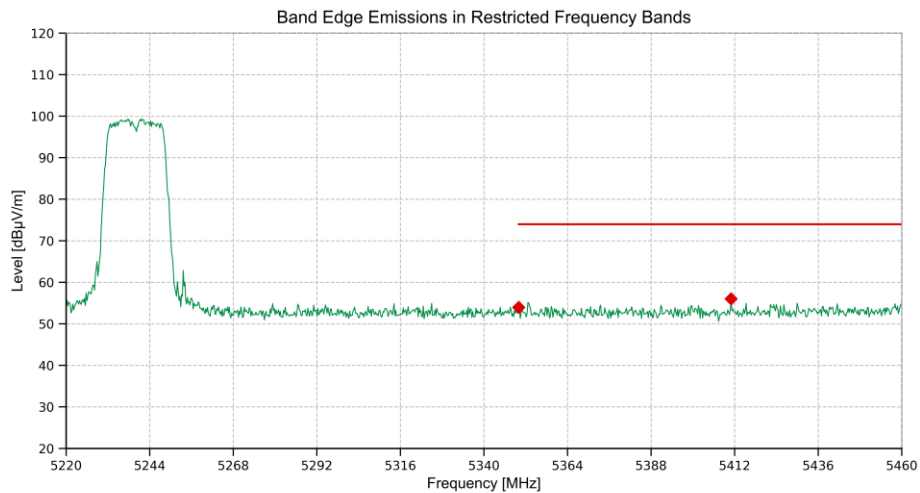
◆ Average Detector

Freq. MHz	Reading dBμV	Ant. Fac. dB/m	Cable Loss dB	Level dBμV/m	Limit dBμV/m	Margin dB	Detector	Pol.
5111.61	3.83	32.08	7.12	43.03	54.00	10.97	Average	Vertical
5150.00	3.02	32.08	7.12	42.22	54.00	11.78	Average	Vertical



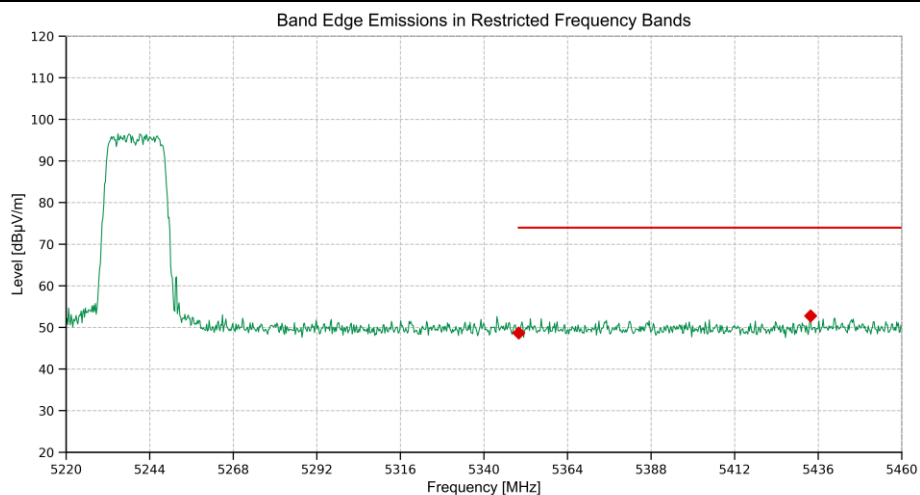


11a_ANT1_5240_6Mbps



◆ Peak Detector

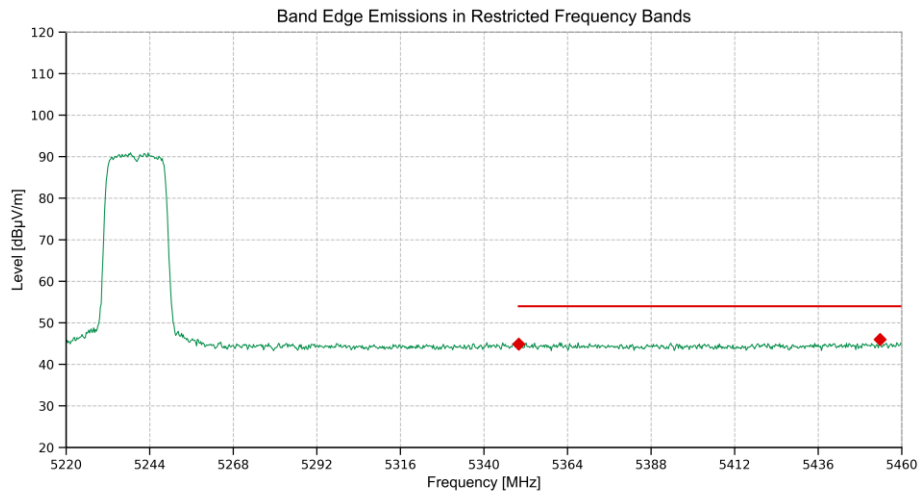
Freq. MHz	Reading dBμV	Ant. Fac. dB/m	Cable Loss dB	Level dBμV/m	Limit dBμV/m	Margin dB	Detector	Pol.
5410.99	16.55	31.59	7.39	55.53	74.00	18.47	Peak	Horizontal
5350.00	14.49	31.59	7.39	53.46	74.00	20.54	Peak	Horizontal



◆ Peak Detector

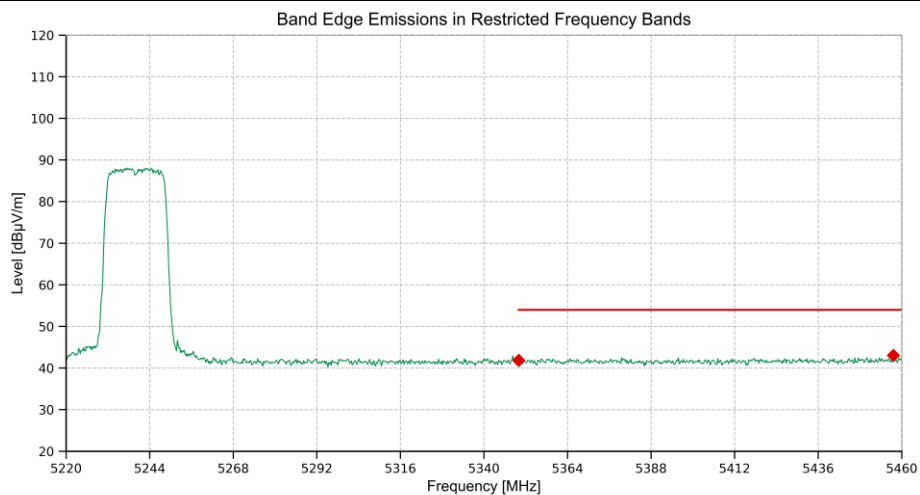
Freq. MHz	Reading dBμV	Ant. Fac. dB/m	Cable Loss dB	Level dBμV/m	Limit dBμV/m	Margin dB	Detector	Pol.
5433.81	13.11	31.77	7.41	52.29	74.00	21.71	Peak	Vertical
5350.00	9.00	31.77	7.41	48.18	74.00	25.82	Peak	Vertical





◆ Average Detector

Freq. MHz	Reading dBμV	Ant. Fac. dB/m	Cable Loss dB	Level dBμV/m	Limit dBμV/m	Margin dB	Detector	Pol.
5453.75	6.15	31.91	7.42	45.48	54.00	8.52	Average	Horizontal
5350.00	5.05	31.91	7.42	44.39	54.00	9.61	Average	Horizontal



◆ Average Detector

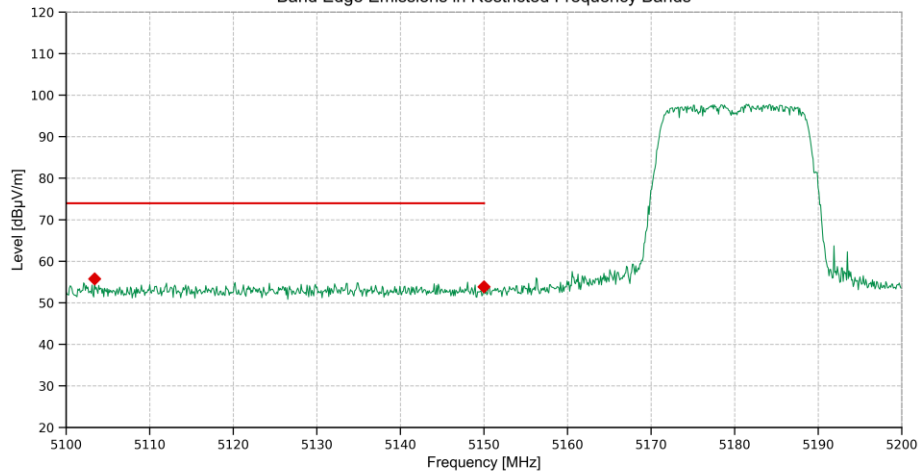
Freq. MHz	Reading dBμV	Ant. Fac. dB/m	Cable Loss dB	Level dBμV/m	Limit dBμV/m	Margin dB	Detector	Pol.
5457.60	3.19	31.92	7.43	42.53	54.00	11.47	Average	Vertical
5350.00	2.02	31.92	7.43	41.36	54.00	12.64	Average	Vertical





11n20_ANT1_5180_MCS0

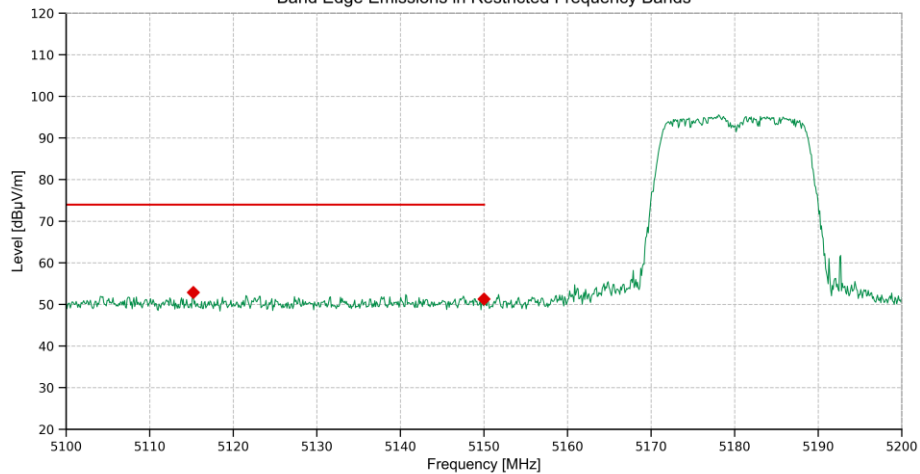
Band Edge Emissions in Restricted Frequency Bands



◆ Peak Detector

Freq. MHz	Reading dBμV	Ant. Fac. dB/m	Cable Loss dB	Level dBμV/m	Limit dBμV/m	Margin dB	Detector	Pol.
5103.40	16.06	32.09	7.11	55.27	74.00	18.73	Peak	Horizontal
5150.00	14.15	32.09	7.11	53.35	74.00	20.65	Peak	Horizontal

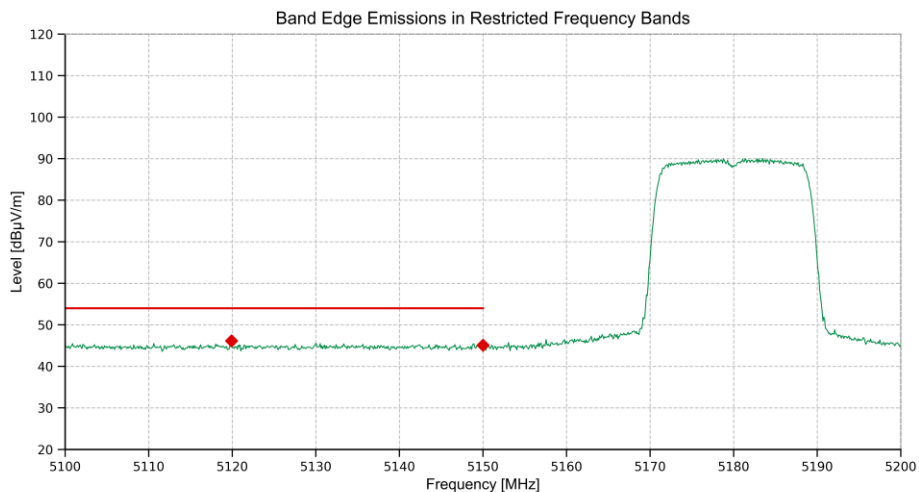
Band Edge Emissions in Restricted Frequency Bands



◆ Peak Detector

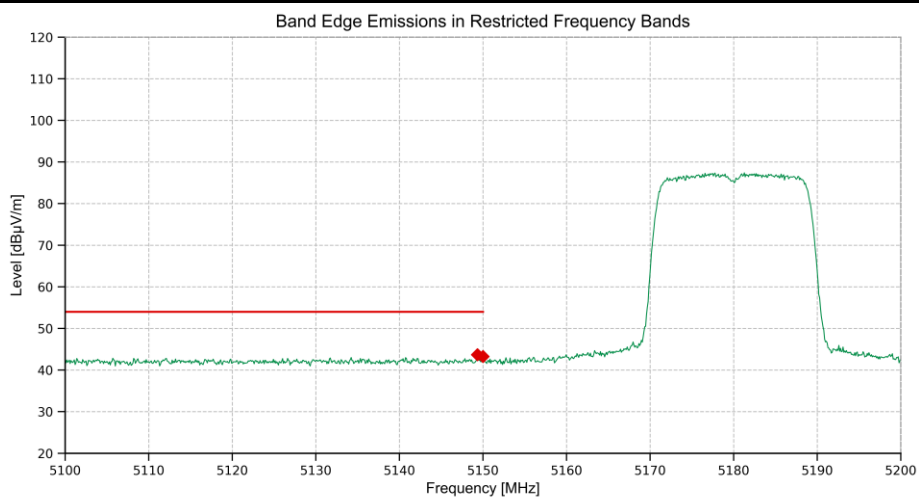
Freq. MHz	Reading dBμV	Ant. Fac. dB/m	Cable Loss dB	Level dBμV/m	Limit dBμV/m	Margin dB	Detector	Pol.
5115.22	13.19	32.07	7.12	52.38	74.00	21.62	Peak	Vertical
5150.00	11.59	32.07	7.12	50.78	74.00	23.22	Peak	Vertical





◆ Average Detector

Freq. MHz	Reading dBμV	Ant. Fac. dB/m	Cable Loss dB	Level dBμV/m	Limit dBμV/m	Margin dB	Detector	Pol.
5119.92	6.45	32.06	7.13	45.63	54.00	8.37	Average	Horizontal
5150.00	5.41	32.06	7.13	44.60	54.00	9.40	Average	Horizontal



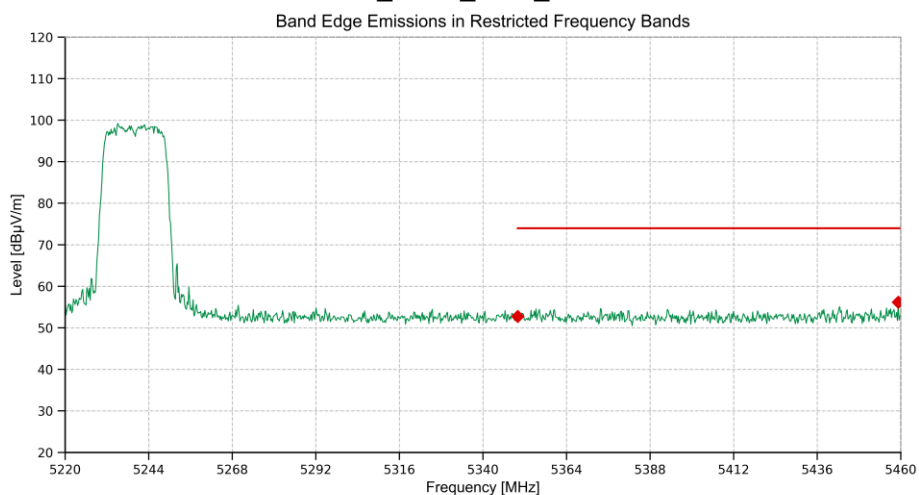
◆ Average Detector

Freq. MHz	Reading dBμV	Ant. Fac. dB/m	Cable Loss dB	Level dBμV/m	Limit dBμV/m	Margin dB	Detector	Pol.
5149.35	4.03	32.00	7.15	43.19	54.00	10.81	Average	Vertical
5150.00	3.61	32.00	7.15	42.76	54.00	11.24	Average	Vertical



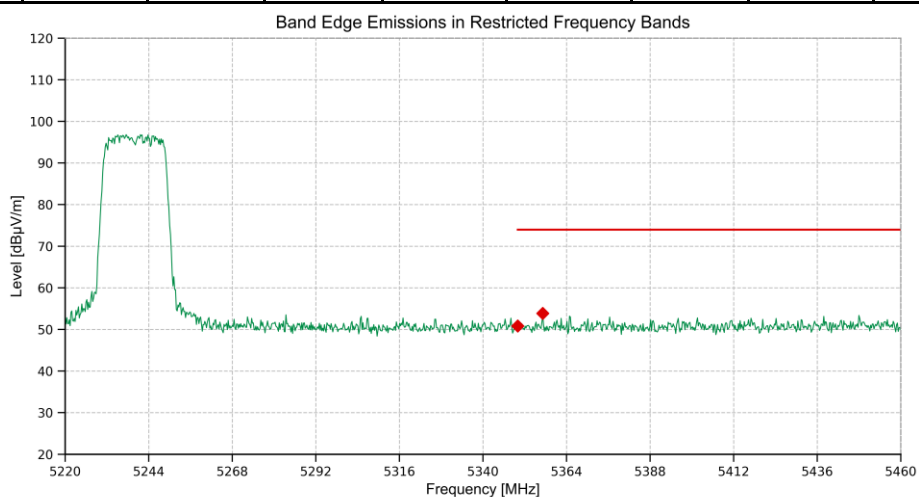


11n20_ANT1_5240_MCS0



◆ Peak Detector

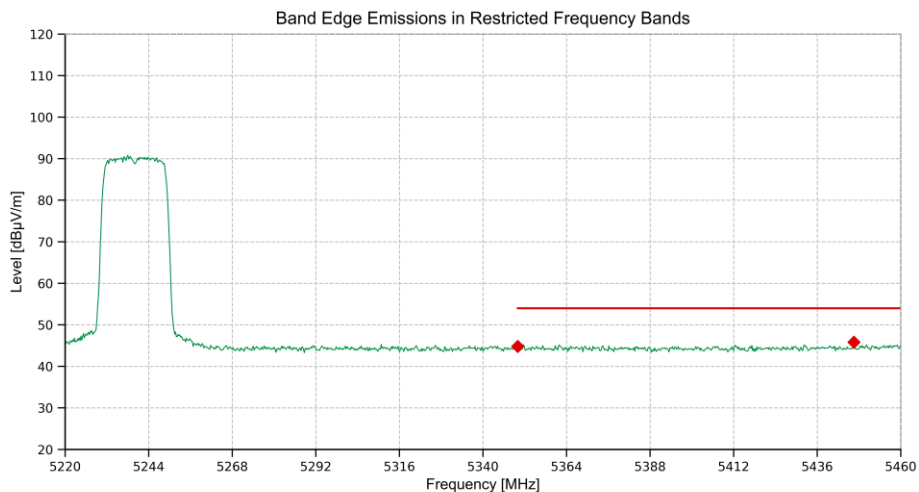
Freq. MHz	Reading dBμV	Ant. Fac. dB/m	Cable Loss dB	Level dBμV/m	Limit dBμV/m	Margin dB	Detector	Pol.
5459.28	16.31	31.92	7.43	55.66	74.00	18.34	Peak	Horizontal
5350.00	12.88	31.92	7.43	52.23	74.00	21.77	Peak	Horizontal



◆ Peak Detector

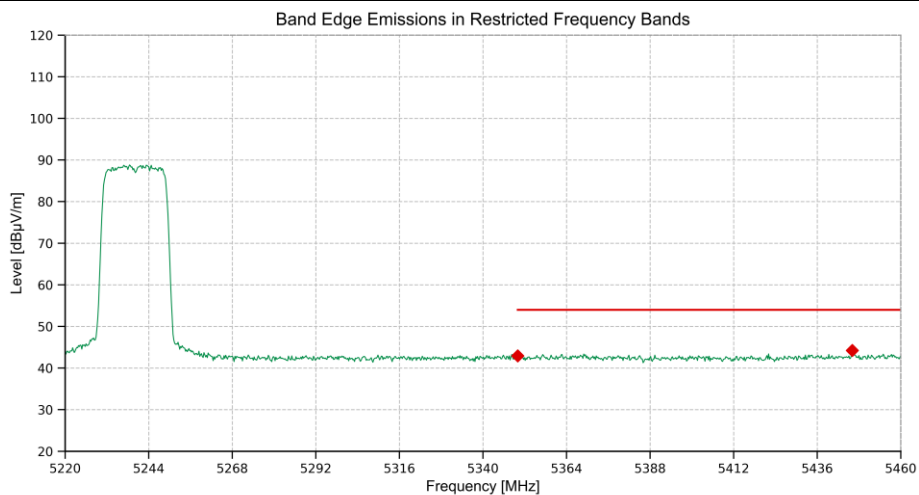
Freq. MHz	Reading dBμV	Ant. Fac. dB/m	Cable Loss dB	Level dBμV/m	Limit dBμV/m	Margin dB	Detector	Pol.
5357.18	14.53	31.50	7.34	53.37	74.00	20.63	Peak	Vertical
5350.00	11.49	31.50	7.34	50.32	74.00	23.68	Peak	Vertical





◆ Average Detector

Freq. MHz	Reading dBμV	Ant. Fac. dB/m	Cable Loss dB	Level dBμV/m	Limit dBμV/m	Margin dB	Detector	Pol.
5446.55	6.03	31.87	7.42	45.32	54.00	8.68	Average	Horizontal
5350.00	5.00	31.87	7.42	44.29	54.00	9.71	Average	Horizontal



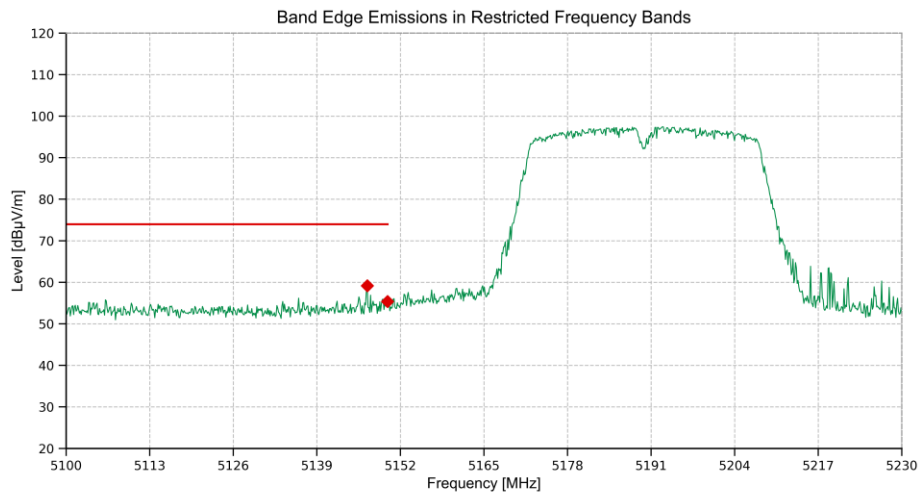
◆ Average Detector

Freq. MHz	Reading dBμV	Ant. Fac. dB/m	Cable Loss dB	Level dBμV/m	Limit dBμV/m	Margin dB	Detector	Pol.
5446.07	4.45	31.87	7.42	43.73	54.00	10.27	Average	Vertical
5350.00	3.13	31.87	7.42	42.41	54.00	11.59	Average	Vertical



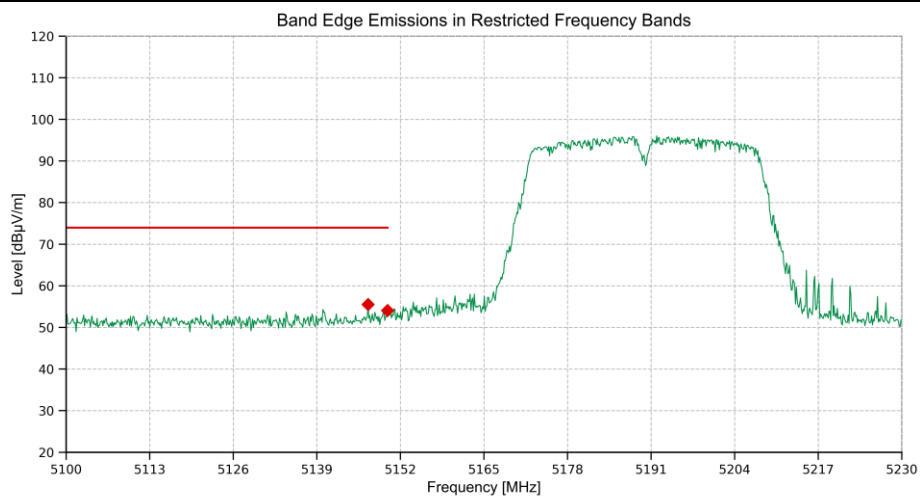


11n40_ANT1_5190_MCS0



◆ Peak Detector

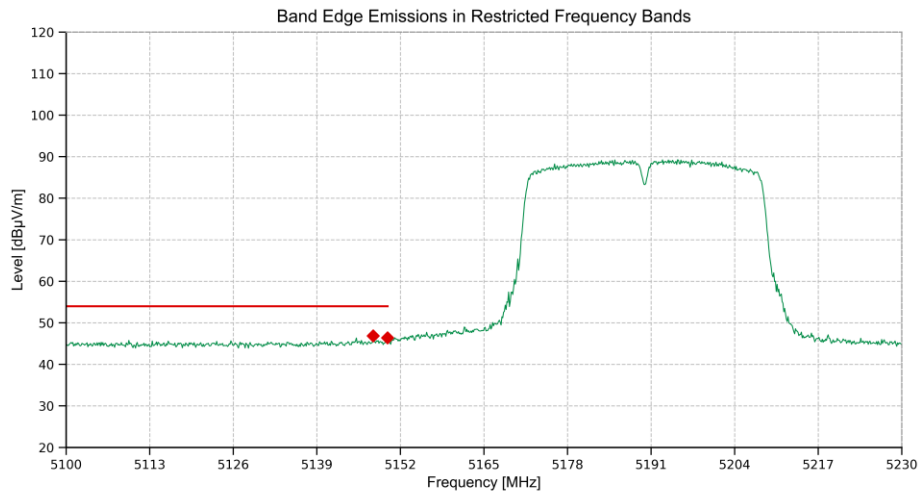
Freq. MHz	Reading dBμV	Ant. Fac. dB/m	Cable Loss dB	Level dBμV/m	Limit dBμV/m	Margin dB	Detector	Pol.
5146.85	19.49	32.01	7.15	58.65	74.00	15.35	Peak	Horizontal
5150.00	15.71	32.01	7.15	54.86	74.00	19.14	Peak	Horizontal



◆ Peak Detector

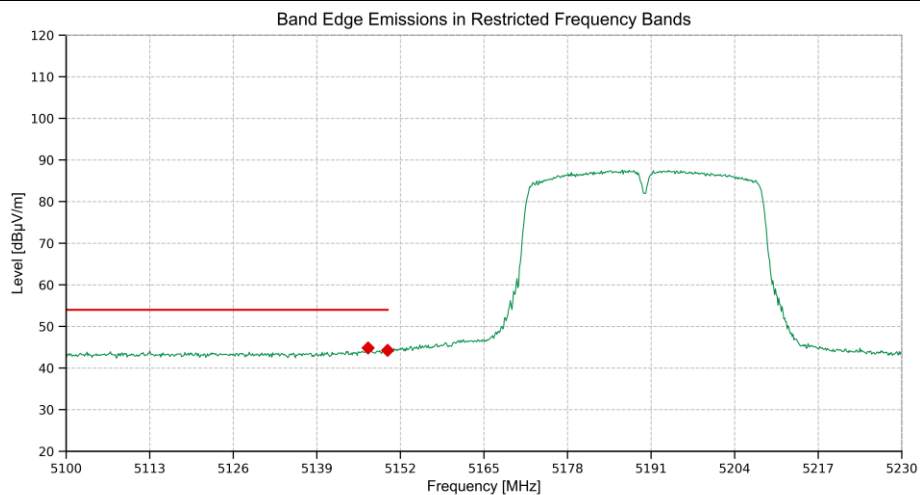
Freq. MHz	Reading dBμV	Ant. Fac. dB/m	Cable Loss dB	Level dBμV/m	Limit dBμV/m	Margin dB	Detector	Pol.
5146.98	15.86	32.01	7.15	55.02	74.00	18.98	Peak	Vertical
5150.00	14.43	32.01	7.15	53.59	74.00	20.41	Peak	Vertical





◆ Average Detector

Freq. MHz	Reading dBμV	Ant. Fac. dB/m	Cable Loss dB	Level dBμV/m	Limit dBμV/m	Margin dB	Detector	Pol.
5147.76	7.20	32.00	7.15	46.35	54.00	7.65	Average	Horizontal
5150.00	6.75	32.00	7.15	45.91	54.00	8.09	Average	Horizontal



◆ Average Detector

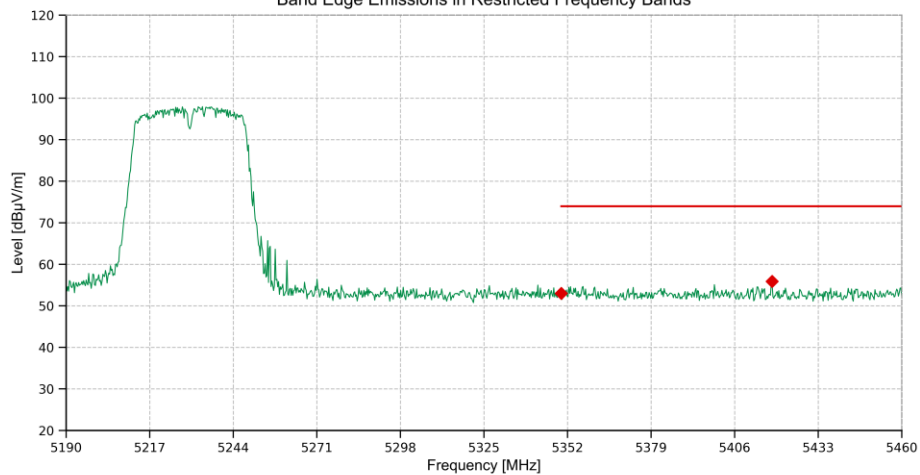
Freq. MHz	Reading dBμV	Ant. Fac. dB/m	Cable Loss dB	Level dBμV/m	Limit dBμV/m	Margin dB	Detector	Pol.
5146.98	5.17	32.01	7.15	44.33	54.00	9.67	Average	Vertical
5150.00	4.60	32.01	7.15	43.76	54.00	10.24	Average	Vertical





11n40_ANT1_5230_MCS0

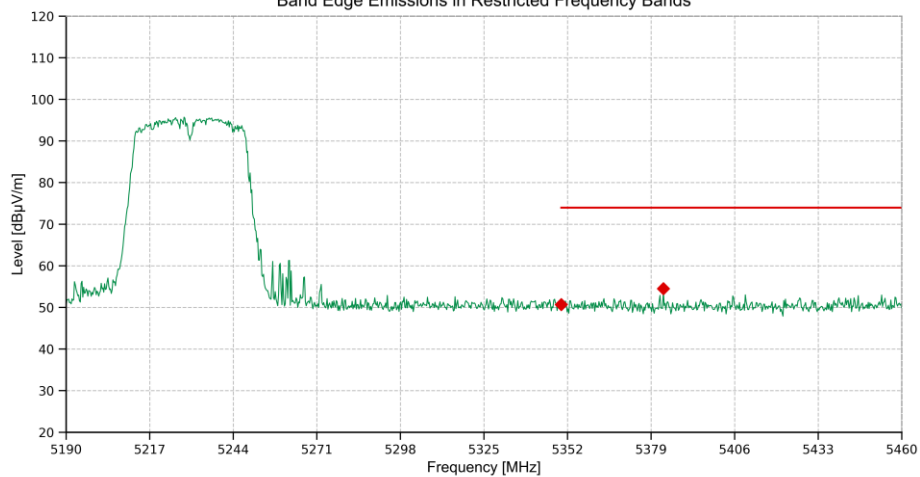
Band Edge Emissions in Restricted Frequency Bands



◆ Peak Detector

Freq. MHz	Reading dBμV	Ant. Fac. dB/m	Cable Loss dB	Level dBμV/m	Limit dBμV/m	Margin dB	Detector	Pol.
5418.11	16.35	31.64	7.39	55.39	74.00	18.61	Peak	Horizontal
5350.00	13.44	31.64	7.39	52.48	74.00	21.52	Peak	Horizontal

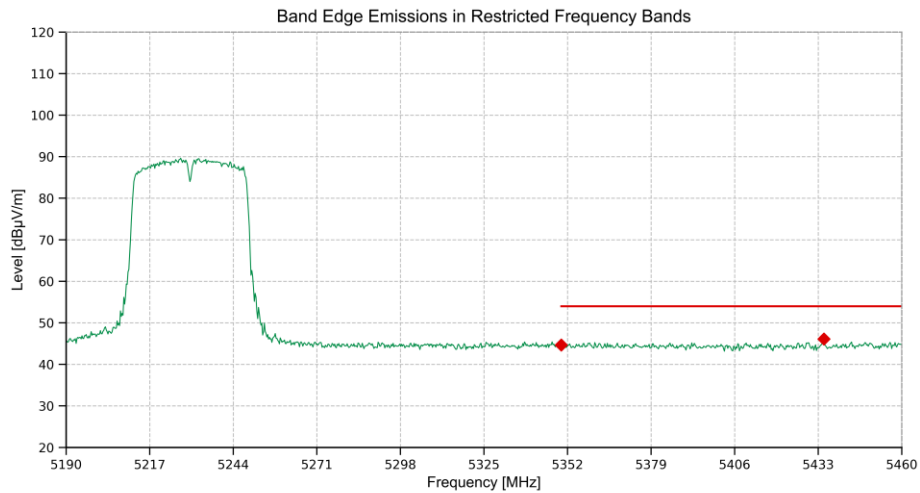
Band Edge Emissions in Restricted Frequency Bands



◆ Peak Detector

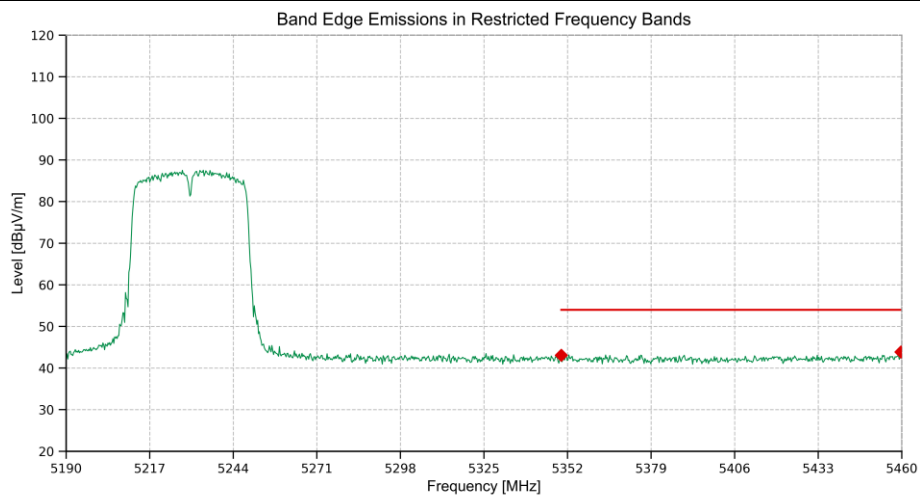
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5382.97	15.14	31.50	7.36	54.00	74.00	20.00	Peak	Vertical
5350.00	11.33	31.50	7.36	50.19	74.00	23.81	Peak	Vertical





◆ Average Detector

Freq. MHz	Reading dBμV	Ant. Fac. dB/m	Cable Loss dB	Level dBμV/m	Limit dBμV/m	Margin dB	Detector	Pol.
5434.86	6.42	31.78	7.41	45.60	54.00	8.40	Average	Horizontal
5350.00	4.97	31.78	7.41	44.15	54.00	9.85	Average	Horizontal



◆ Average Detector

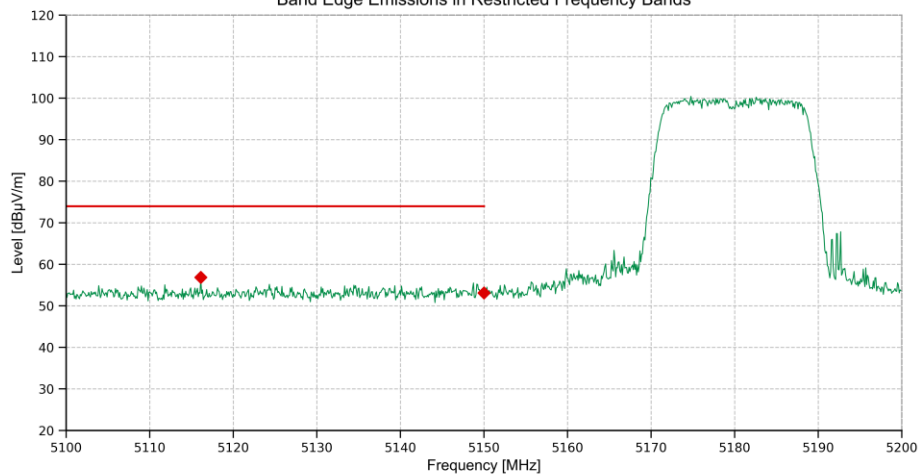
Freq. MHz	Reading dBμV	Ant. Fac. dB/m	Cable Loss dB	Level dBμV/m	Limit dBμV/m	Margin dB	Detector	Pol.
5459.73	4.00	31.92	7.43	43.35	54.00	10.65	Average	Vertical
5350.00	3.22	31.92	7.43	42.57	54.00	11.43	Average	Vertical





11ac20_ANT1_5180_MCS0

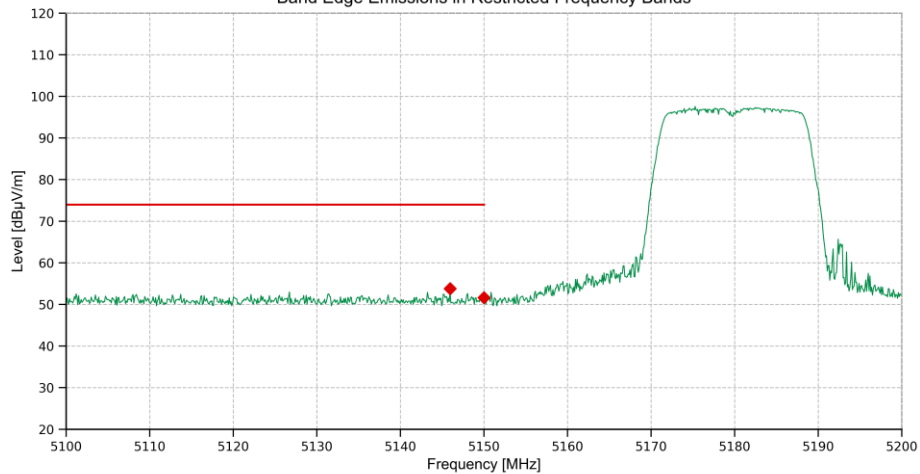
Band Edge Emissions in Restricted Frequency Bands



◆ Peak Detector

Freq. MHz	Reading dBμV	Ant. Fac. dB/m	Cable Loss dB	Level dBμV/m	Limit dBμV/m	Margin dB	Detector	Pol.
5116.12	17.17	32.07	7.12	56.36	74.00	17.64	Peak	Horizontal
5150.00	13.40	32.07	7.12	52.59	74.00	21.41	Peak	Horizontal

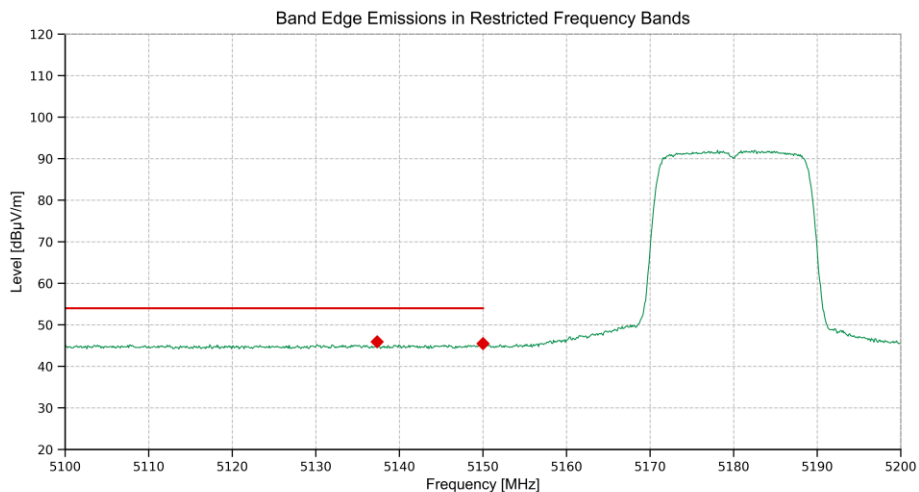
Band Edge Emissions in Restricted Frequency Bands



◆ Peak Detector

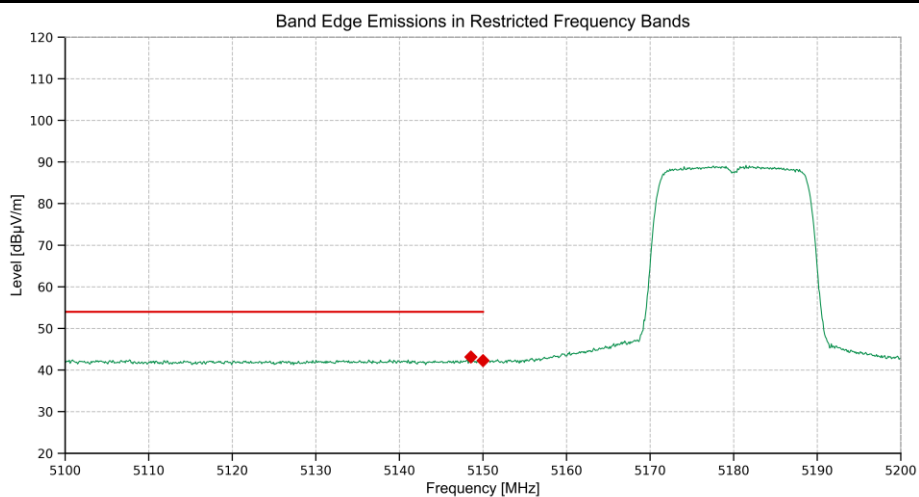
Freq. MHz	Reading dBμV	Ant. Fac. dB/m	Cable Loss dB	Level dBμV/m	Limit dBμV/m	Margin dB	Detector	Pol.
5145.95	14.11	32.01	7.15	53.27	74.00	20.73	Peak	Vertical
5150.00	11.97	32.01	7.15	51.13	74.00	22.87	Peak	Vertical





◆ Average Detector

Freq. MHz	Reading dBμV	Ant. Fac. dB/m	Cable Loss dB	Level dBμV/m	Limit dBμV/m	Margin dB	Detector	Pol.
5137.34	6.24	32.03	7.14	45.41	54.00	8.59	Average	Horizontal
5150.00	5.82	32.03	7.14	44.99	54.00	9.01	Average	Horizontal



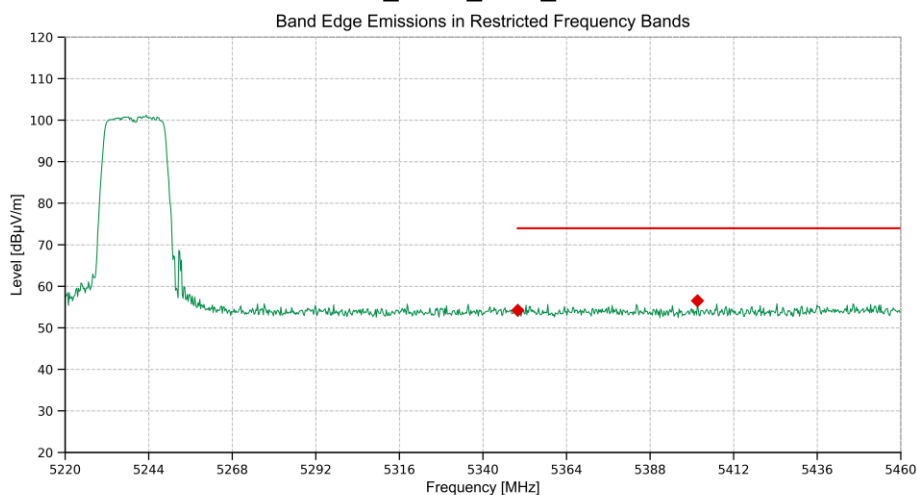
◆ Average Detector

Freq. MHz	Reading dBμV	Ant. Fac. dB/m	Cable Loss dB	Level dBμV/m	Limit dBμV/m	Margin dB	Detector	Pol.
5148.55	3.47	32.00	7.15	42.63	54.00	11.37	Average	Vertical
5150.00	2.64	32.00	7.15	41.79	54.00	12.21	Average	Vertical



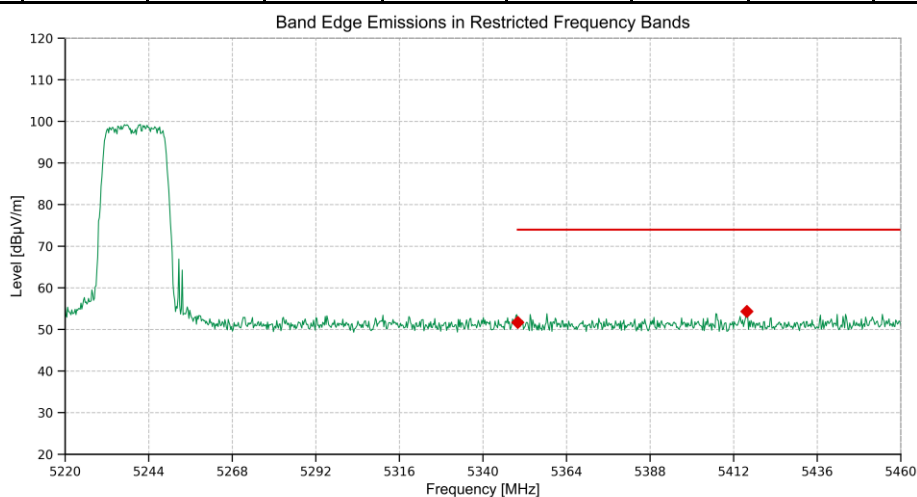


11ac20_ANT1_5240_MCS0



◆ Peak Detector

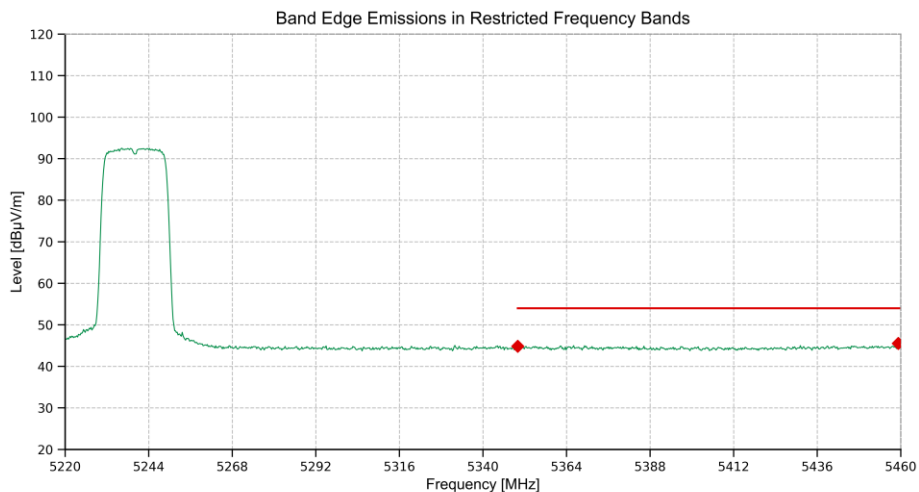
Freq. MHz	Reading dBμV	Ant. Fac. dB/m	Cable Loss dB	Level dBμV/m	Limit dBμV/m	Margin dB	Detector	Pol.
5401.62	17.13	31.51	7.38	56.02	74.00	17.98	Peak	Horizontal
5350.00	14.82	31.51	7.38	53.71	74.00	20.29	Peak	Horizontal



◆ Peak Detector

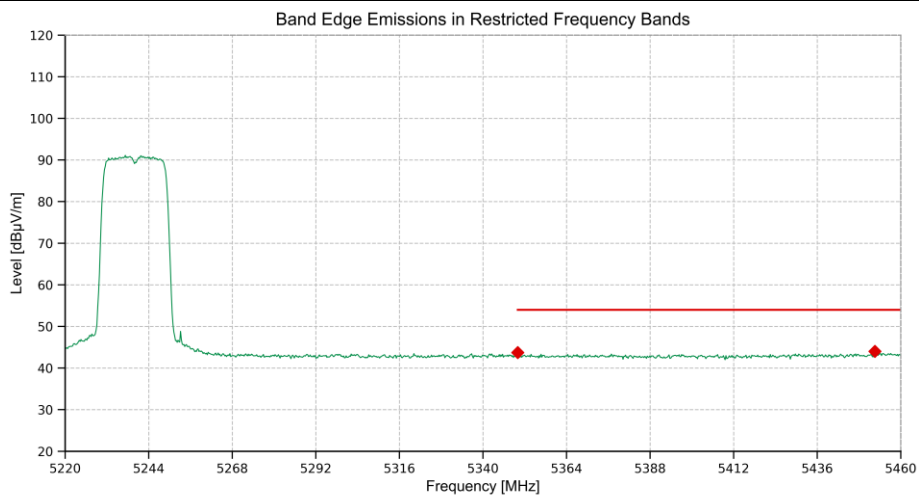
Freq. MHz	Reading dBμV	Ant. Fac. dB/m	Cable Loss dB	Level dBμV/m	Limit dBμV/m	Margin dB	Detector	Pol.
5415.80	14.81	31.63	7.39	53.83	74.00	20.17	Peak	Vertical
5350.00	12.17	31.63	7.39	51.19	74.00	22.81	Peak	Vertical





◆ Average Detector

Freq. MHz	Reading dBμV	Ant. Fac. dB/m	Cable Loss dB	Level dBμV/m	Limit dBμV/m	Margin dB	Detector	Pol.
5459.28	5.68	31.92	7.43	45.03	54.00	8.97	Average	Horizontal
5350.00	4.99	31.92	7.43	44.34	54.00	9.66	Average	Horizontal



◆ Average Detector

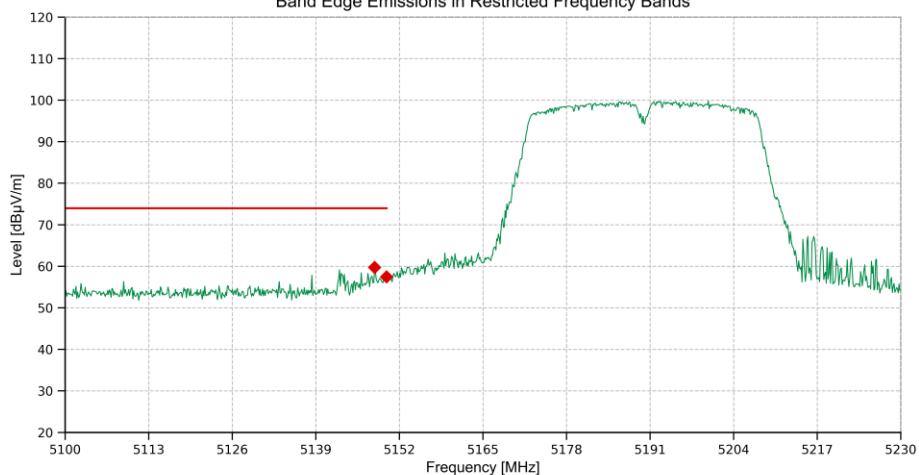
Freq. MHz	Reading dBμV	Ant. Fac. dB/m	Cable Loss dB	Level dBμV/m	Limit dBμV/m	Margin dB	Detector	Pol.
5452.55	4.19	31.91	7.42	43.52	54.00	10.48	Average	Vertical
5350.00	3.90	31.91	7.42	43.23	54.00	10.77	Average	Vertical





11ac40_ANT1_5190_MCS0

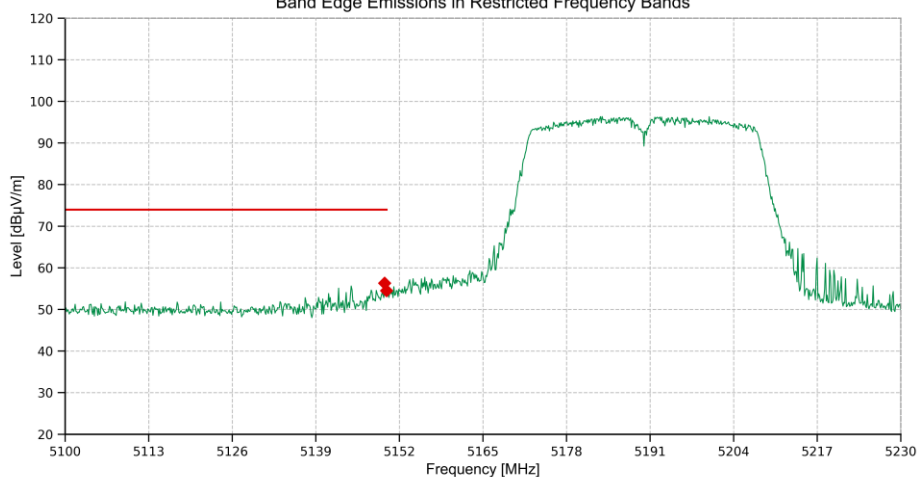
Band Edge Emissions in Restricted Frequency Bands



◆ Peak Detector

Freq. MHz	Reading dBμV	Ant. Fac. dB/m	Cable Loss dB	Level dBμV/m	Limit dBμV/m	Margin dB	Detector	Pol.
5148.15	20.07	32.00	7.15	59.22	74.00	14.78	Peak	Horizontal
5150.00	17.82	32.00	7.15	56.98	74.00	17.02	Peak	Horizontal

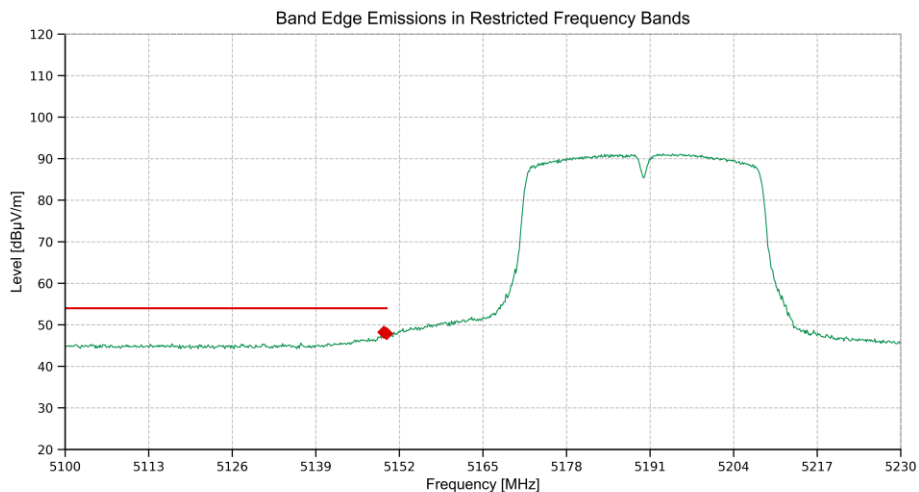
Band Edge Emissions in Restricted Frequency Bands



◆ Peak Detector

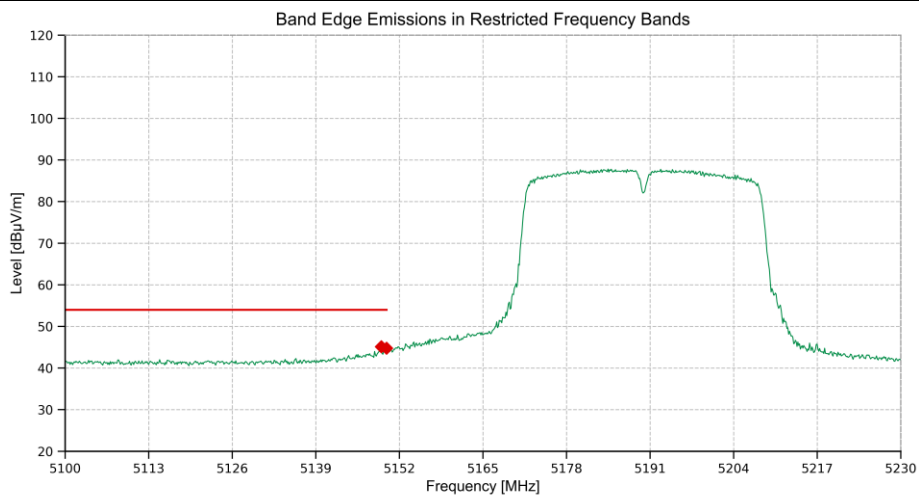
Freq. MHz	Reading dBμV	Ant. Fac. dB/m	Cable Loss dB	Level dBμV/m	Limit dBμV/m	Margin dB	Detector	Pol.
5149.71	16.66	32.00	7.15	55.81	74.00	18.19	Peak	Vertical
5150.00	14.85	32.00	7.15	54.00	74.00	20.00	Peak	Vertical





◆ Average Detector

Freq. MHz	Reading dBμV	Ant. Fac. dB/m	Cable Loss dB	Level dBμV/m	Limit dBμV/m	Margin dB	Detector	Pol.
5149.58	8.57	32.00	7.15	47.72	54.00	6.28	Average	Horizontal
5150.00	8.25	32.00	7.15	47.41	54.00	6.59	Average	Horizontal



◆ Average Detector

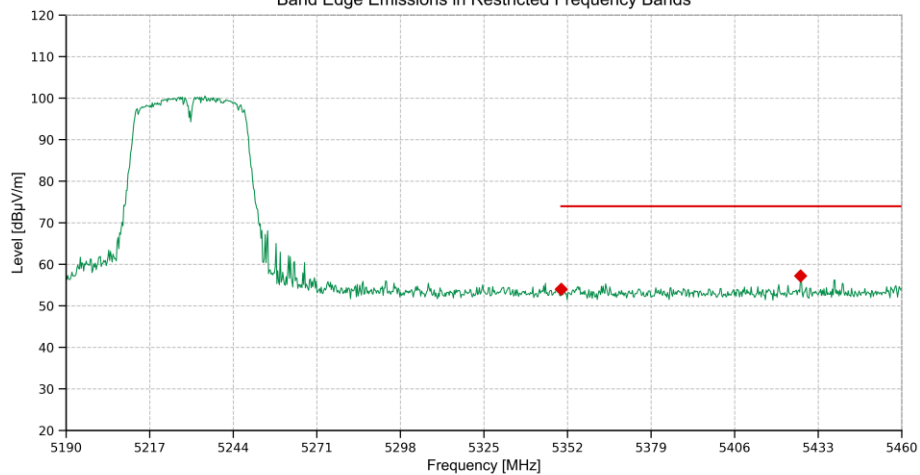
Freq. MHz	Reading dBμV	Ant. Fac. dB/m	Cable Loss dB	Level dBμV/m	Limit dBμV/m	Margin dB	Detector	Pol.
5149.19	5.48	32.00	7.15	44.63	54.00	9.37	Average	Vertical
5150.00	5.11	32.00	7.15	44.27	54.00	9.73	Average	Vertical





11ac40_ANT1_5230_MCS0

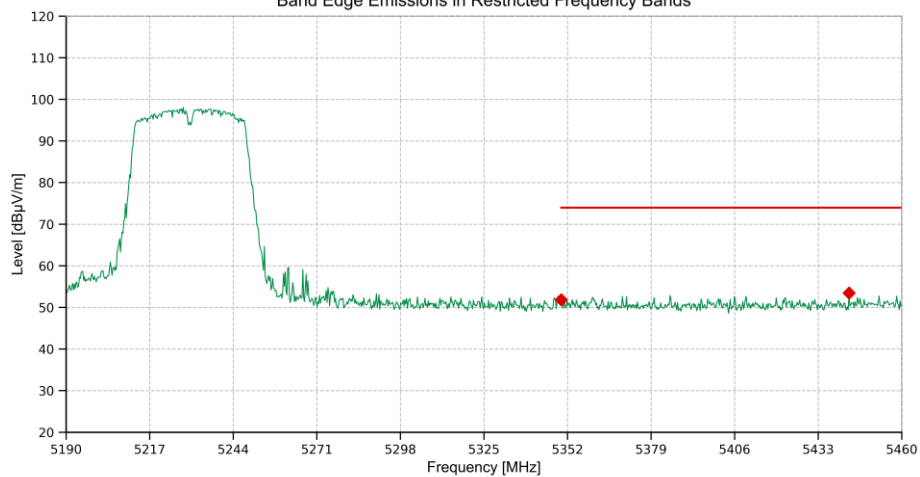
Band Edge Emissions in Restricted Frequency Bands



◆ Peak Detector

Freq. MHz	Reading dBμV	Ant. Fac. dB/m	Cable Loss dB	Level dBμV/m	Limit dBμV/m	Margin dB	Detector	Pol.
5427.30	17.60	31.72	7.40	56.72	74.00	17.28	Peak	Horizontal
5350.00	14.38	31.72	7.40	53.50	74.00	20.50	Peak	Horizontal

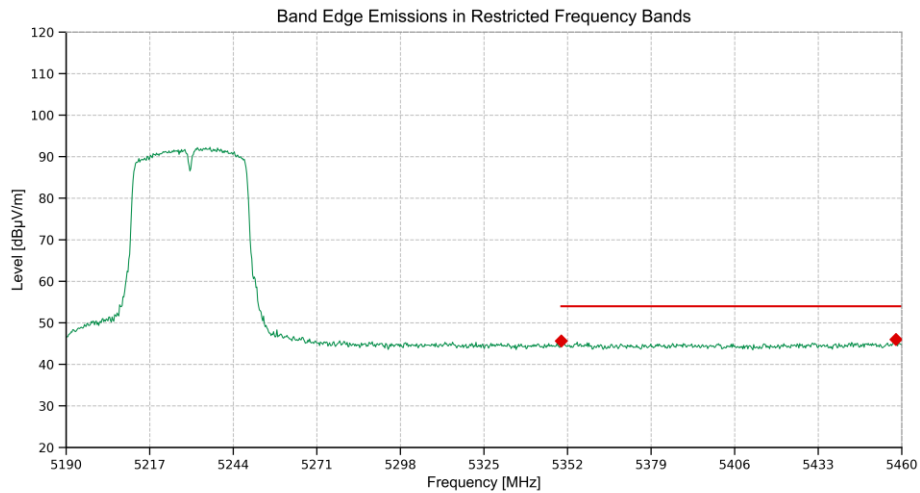
Band Edge Emissions in Restricted Frequency Bands



◆ Peak Detector

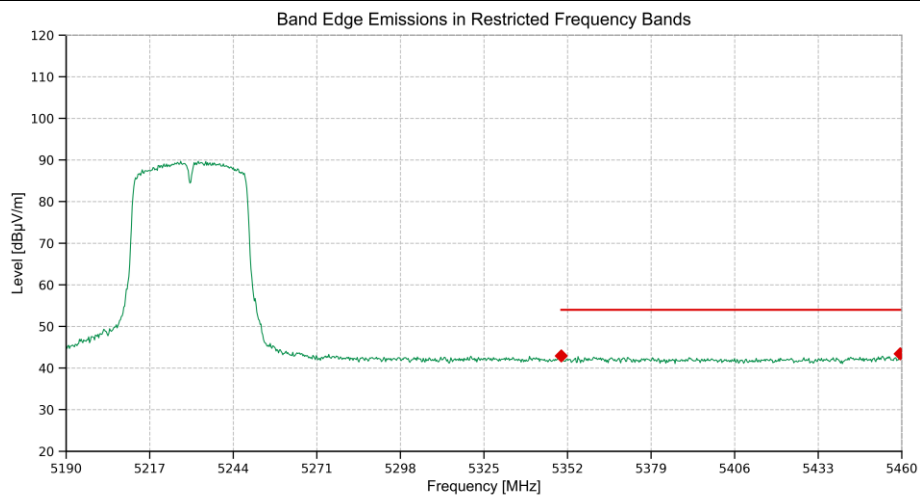
Freq. MHz	Reading dBμV	Ant. Fac. dB/m	Cable Loss dB	Level dBμV/m	Limit dBμV/m	Margin dB	Detector	Pol.
5442.97	13.69	31.84	7.41	52.95	74.00	21.05	Peak	Vertical
5350.00	12.10	31.84	7.41	51.36	74.00	22.64	Peak	Vertical





◆ Average Detector

Freq. MHz	Reading dBμV	Ant. Fac. dB/m	Cable Loss dB	Level dBμV/m	Limit dBμV/m	Margin dB	Detector	Pol.
5458.11	6.17	31.92	7.43	45.51	54.00	8.49	Average	Horizontal
5350.00	5.77	31.92	7.43	45.12	54.00	8.88	Average	Horizontal



◆ Average Detector

Freq. MHz	Reading dBμV	Ant. Fac. dB/m	Cable Loss dB	Level dBμV/m	Limit dBμV/m	Margin dB	Detector	Pol.
5459.46	3.59	31.92	7.43	42.94	54.00	11.06	Average	Vertical
5350.00	3.10	31.92	7.43	42.44	54.00	11.56	Average	Vertical

Remark:

Result Level = Read Level + Antenna Factor + Cable loss.

Margin = Limit - Emission Level





5.8. Antenna Requirements

5.8.1. Standard Applicable

For intentional device, according to FCC 47 CFR Section 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, 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

And according to FCC 47 CFR Section 15.407 (a), if transmitting antennas of directional gain greater than 6dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

5.8.2. Antenna Connector Construction

The directional gains of antenna refer to section 1.3, and the antenna is an internal antenna connect to PCB board and no consideration of replacement. Please see EUT photo for details.

5.8.3. Results

Compliance

