



Canada

EMC Test Report for RD 2242 B4 (with NR + LTE)

Tested to: **FCC Part 15 Subpart B / ICES 003**
FCC Part 27 (Section - 27.53(h))
RSS-Gen (Section 7.0)
RSS-139 (Section 6.6)

Test Result summary

FCC/ ICES/ RSS Section	Description	Specification/Method	Pass or Fail	Results in section
15.109 / 6.2	Radiated Emissions (RE)	FCC Part 15 / ICES 003 / ANSI C63.4	Pass	3.2
7.0	Receiver Emissions Limits	RSS-Gen / ANSI C63.4	Pass	3.2
15.107 / 6.1	Conducted Emissions (CE) for AC Power	FCC Part 15 / ICES 003 / ANSI C63.4	Not Applicable	
27.53(h)	Transmitter Spurious Emissions (RE)	FCC Part 27 / ANSI C63.26	Pass	3.2
RSS-139 / 6.6	Transmitter unwanted Emissions	RSS-139 / ANSI C63.26	Pass	3.2

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Release control record

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01	initial release	8 April, 2021

Approvals

Function	Name	Job title	Signature
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1. Executive summary

This document reports the Electromagnetic Compatibility (EMC) testing performed on the product called RD 2242 B4 for Ericsson Canada per project number 7169009376. The objective of the test activities is to evaluate compliance of the product to following EMC regulatory standards.

The RD 2242 B4 is verified to comply with the Emissions requirements of these standards:

- FCC Part 15 Subpart B [5] (Class B)
- FCC Part 27 [7] (Digital Base Stations, Section - 27.53(h))
- ICES 003 [8] (Class B)
- RSS-Gen [10] (Receiver emissions Limits, Section 7.0)
- RSS-139 [9] (Transmitter unwanted Emissions, Section 6.6)

Information about the test result summary and, the equipment under test (EUT) is in the sections:

- [Compliance summary](#)
- [Details of the equipment under test](#)
- [Detailed test results of Emissions](#)



1.1 Compliance summary

The test results in this report apply only to the tested components that are identified in the section [Assessed hardware](#).

The following table summarizes the EMC test results for the test cases performed on the RD 2242 B4

Table 1: Summary of test results for the USA; FCC Part 15 subpart B

FCC Section	Description	Specification/Method	Pass or Fail	Results in section
15.109	Radiated Emissions (RE)	FCC Part 15/ANSI C63.4	Pass	3.2
15.107	Conducted Emissions (CE) for AC Power	FCC Part 15/ANSI C63.4	Not applicable ¹	
Table Notes				
1. EUT is not AC powered.				

Table 2: Summary of test results for the USA; FCC Part 27 subpart C

FCC Section	Description	Specification/Method	Pass or Fail	Results in section
27.53(h)	AWS emission limits	FCC Part 27/ ANSI C63.26	Pass	3.2

Table 3: Summary of test results for Canada; ICES-003

ICES Section	Description	Specification/Method	Pass or Fail	Results in section
6.2	Radiated Emissions (RE)	ICES 003/ANSI C63.4	Pass	3.2
6.1	Conducted Emissions (CE) for AC Power	ICES 003/ANSI C63.4	Not applicable ¹	
Table Notes				
1. EUT is not AC powered.				

Table 4: Summary of test results for RSS-Gen, Section 7.0

RSS-Gen Section	Description	Specification/Method	Pass or Fail	Results in section
7.3	Receiver Radiated Emissions	RSS-Gen / ANSI C63.4	Pass	3.2
7.2	Conducted Emissions (CE) for AC Power	RSS-Gen / ANSI C63.4	Not applicable ¹	
7.4	Receiver Conducted Emissions	See antenna port conducted emissions in applicable test report		
Table Notes				
1. EUT is not AC powered.				



Table 5: Summary of test results for Canada, RSS-139

RSS-139 Section	Description	Specification/Method	Pass or Fail	Results in section
6.6	Transmitter unwanted Emissions	RSS-139 / ANSI C63.26	Pass	3.2

2. Details of the equipment under test

This section describes the equipment under test (EUT).

2.1 Assessed hardware

The following table indicates the hardware components that were assessed during this test program.

Table 6: Assessed hardware

Hardware component	Part number	Rev
RD 2242 B4	KRY 901 309/1	R2A

2.2 Product overview

The product trade name is RD 2242 B4. The RD 2242 B4 product is an indoor wireless telecommunication product. It is a radio unit that provides cellular service. It can operate from POE (-56 Vdc) power. The EUT was tested with test fixture which connect the internal antenna ports to external 50 Ohm terminations; as shown in [Figure 2](#).

Figure 1: The EUT, RD 2242 B4



Figure 2: The EUT, RD 2242 B4 (With Test fixture)





Table 7: Product Info – RD 2242 B4

Product data:	RD 2242 B4,
Product	Ph1 Dot, 2T2R
Revision	R2A
P/N:	KRY 901 309/1
Nominal Voltage:	56Vdc
Operating Temperature:	+5°C to +40°C
Bands	B4
Antennas	2T2R
Output Power per band	2x50mW (FDD)
RAT support	LTE-FDD, WCDMA & NR
Mixed Mode support	LTE+WCDMA (2 LTE carriers and 4 WCDMA carriers)
	LTE+NR (1 LTE carrier and 1 NR carrier)
IBW	40 MHz
Nominal O/P per FDD Antenna Port:	Single Carrier: 1 x 50mW (17dBm)
	Multi-Carrier: 2 x 25mW (14dBm)
	Multi-Carrier: 3 x 16.7mW (12.2dBm)
	Multi-Carrier: 4 x 12.5mW (11dBm)
	Multi-Carrier: 5 x 10mW (10dBm)
	Multi-Carrier: 6 x 8.3mW (9.2dBm)
Max LTE carriers per Port	2 (Contiguous operations only)
Total number of NR carriers	2
Total number of UTRA carriers	4
Total number of E-UTRA carriers	2
Modulation:	LTE: QPSK, 16QAM, 64QAM, 256QAM
	NR: QPSK, 16QAM, 64QAM, 256QAM
	WCDMA: QPSK, 16QAM, 64QAM
Channel Bandwidth:	LTE: 5, 10, 15, 20MHz
	WCDMA: 5MHz
	NR: 5, 10, 15, 20MHz
Maximum Combined OBW per Port:	40MHz
RDI Interface:	Analog, DL: 110 – 150MHz, UL: 40 - 80MHz
Channel Raster:	LTE: 100kHz, WCDMA: 200kHz
Mounting	ceiling
Dimensions: (W x H)	109 x 50mm
Weight;	0.265 kg

The Configurations of the RD 2242 B4 that were tested is shown in the section [Configurations of the EUT](#). The EUT was tested in a tabletop setting.

2.3 Product port definition and EUT cable information

[Table 8](#) identifies all the cables and ports on the EUT. The Environment of the cables is indoor.

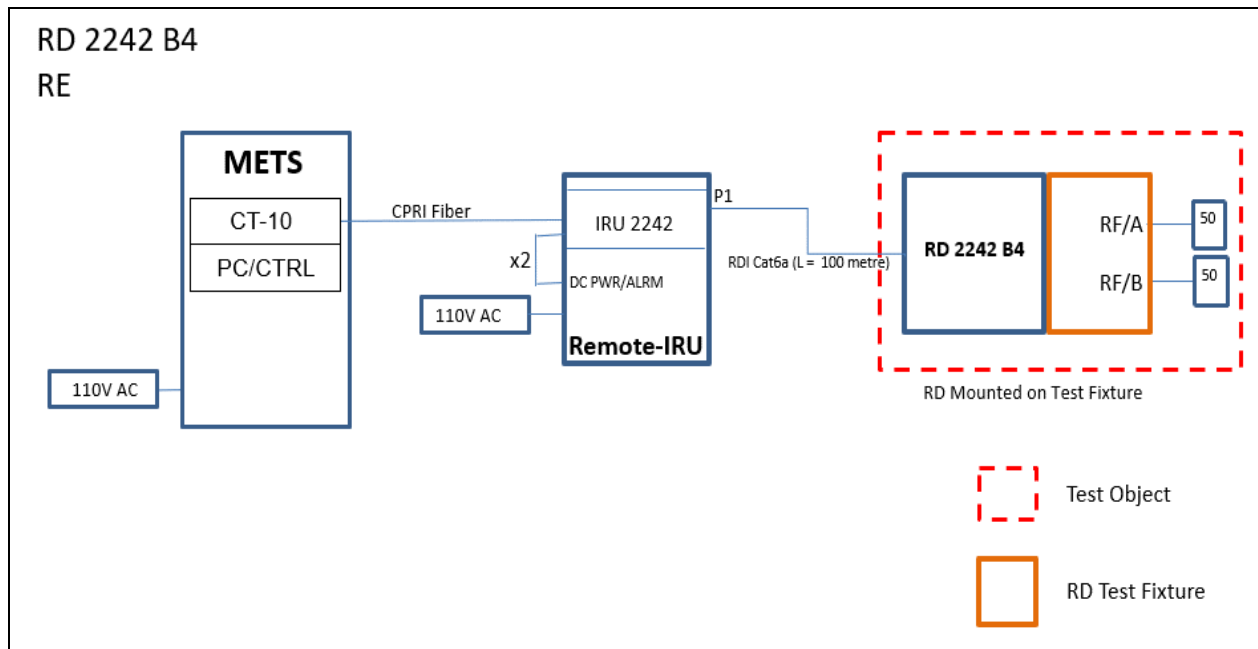
Table 8: System port definition

DOT Port Name	DOT Port Description	Port Type	Interface Detail	Plug-Cable Type
RDI	Analog Radio DOT Interface	Signal	Analog, TX/RX IF signal, Cable AGC Control signal, 10MHz Ref and FSK signal are multiplexed on CAT6 cable	RJ-45, CAT6A shielded
RF/A, RF/B	RF, B4 TX/RX internal test ports	RF	RF probe to Test Fixture	only connects to Test Fixture

2.4 Configurations of the EUT

[Figure 3](#) shows the configuration of the EUT for Emissions test.

Figure 3: Test configuration for Emission tests



2.4.1 Radiated Emissions Single RAT / Single Carrier (NR)

Figure 4: Tested carrier detail – NR, 5MHz Config (SC1) - Middle

SR NR Config SC1 BW 5M Carrier setups for Emissions			
B4 PORT (RF/A, RF/B) - NR			
Carrier:	Middle		
1	B4: NR, 5MHz, 2132.5MHz		

Figure 5: Tested carrier detail – NR, 10 MHz Config (SC2) - Middle

SR NR Config SC2 BW 10M Carrier setups for Emissions			
B4 PORT (RF/A, RF/B) - NR			
Carrier:	Middle		
1	B4: NR, 10MHz, 2132.5MHz		

Figure 6: Tested carrier detail – NR, 15 MHz Config (SC3) - Middle

SR NR Config SC3 BW 15M Carrier setups for Emissions			
B4 PORT (RF/A, RF/B) - NR			
Carrier:	Middle		
1	B4: NR, 15MHz, 2132.5MHz		

Figure 7: Tested carrier detail – NR, 20 MHz Config (SC4) - Middle

SR NR Config SC4 BW 20M Carrier setups for Emissions			
B4 PORT (RF/A, RF/B) - NR			
Carrier:	Middle		
1	B4: NR, 20MHz, 2132.5MHz		

Note: Radiated Emissions measurements were compared between **SC1**, **SC2**, **SC3** and **SC4** middle channel. **SC1** was found to have higher emissions than **SC2**, **SC3** and **SC4**; therefore EUT with **SC1** carrier configuration was fully tested at all three channels and reported. See **Figure 8** for tested carrier detail

Figure 8: Tested carrier detail – Single carrier (SC)

SR NR Config SC BW 5M Carrier setups for Emissions			
B2 PORT (RF/A, RF/B) - NR			
Carrier:	Bottom		
1	B4: NR, 5MHz, 2112.5MHz		
Carrier:	Middle		
1	B4: NR, 5MHz, 2132.5MHz		
Carrier:	Top		
1	B4: NR, 5MHz, 2152.5MHz		

2.4.2 Radiated Emissions Single RAT / Multi Carrier (NR)

Figure 9: Tested carrier detail – NR Config (MC1) – Middle

SR/MC NR Config MC1 Carrier setups for Emissions			
B4 PORT (RF/A, RF/B) - NR			
Carrier:	Middle		
1	B4: NR, 5MHz, 2130MHz		
2	B4: NR, 5MHz, 2135MHz		

2.4.3 Radiated Emissions Multi RAT / Multi Carrier (LTE + NR)

Figure 10: Tested carrier detail – NR+LTE Config (MR1) – Middle

MR/MC NR+LTE Config MR1 Carrier setups for Emissions			
B4 PORT (RF/A, RF/B) – NR + LTE			
Carrier:	Middle		
1	B4: LTE, 5MHz, 2130MHz		
2	B4: NR, 5MHz, 2135MHz		

Figure 11: Tested carrier detail – NR+LTE Config (MR2) – Middle

MR/MC NR+LTE Config MR2 Carrier setups for Emissions			
B4 PORT (RF/A, RF/B) – NR + LTE			
Carrier:	Middle		
1	B4: LTE, 10MHz, 2130MHz		
2	B4: NR, 5MHz, 2137.5MHz		

Figure 12: Tested carrier detail – NR+LTE Config (MR3) – Middle

MR/MC NR+LTE Config MR3 Carrier setups for Emissions		
B4 PORT (RF/A, RF/B) – NR + LTE		
Carrier:	Middle	
1	B4: LTE, 15MHz, 2130MHz	
2	B4: NR, 5MHz, 2140MHz	

Figure 13: Tested carrier detail – NR+LTE Config (MR4) – Middle

MR/MC NR+LTE Config MR4 Carrier setups for Emissions		
B4 PORT (RF/A, RF/B) – NR + LTE		
Carrier:	Middle	
1	B4: LTE, 20MHz, 2130MHz	
2	B4: NR, 5MHz, 2142.5MHz	

Note: Radiated Emissions measurements were compared between MR1, MR2, MR3 and MR4 middle channel. MR1 was found to have higher emissions than MR2, MR3 and MR4; therefore EUT with MR1 - middle carrier configuration was tested and reported.

2.4.4 Radiated Emissions Receiver mode (LTE + NR)

Figure 14: Tested carrier detail – NR+LTE Config (MR - Rx) – Middle

NR+LTE Config MR-Rx Carrier setups for Emissions		
B4 PORT (RF/A, RF/B) – NR + LTE		
Carrier:	Middle	
1	B4: LTE, 5MHz, 2130MHz (Rx only)	
2	B4: NR, 5MHz, 2135MHz (Rx only)	

2.5 Modifications of the EUT during testing

The EUT was not modified prior to or during testing.

2.6 Inventory of the EUT and support equipments

The following tables identifies the inventory of the EUT.

Table 9: Inventory of the EUT

Equipment Role	Product Name	Product Number	Release	Product Serial#
EUT	RD 2242 B4	KRY 901 309/1	R2A	C828676641
Support	RIE (Remote IRU Enclosure)	1/BFL 901 141/1	R2A	BW95728240
Support	IRU 2242	KRC 161 444/3	R1C	D825699225
Support	Ph-1 Dot Test Fixture	na	na	na
SFP+	Optical SFP+, LC Dual, SM, 10G, 1.4km	RDH 102 65/2	na	na
Cable	IRU CPRI, Fiber, LC, SM, 20m			na
Cable	RDI cable: 100m Cat6A, F/FTP, M-M			na
TEST SET	METS-Lite, CT-10	LPC 102 487/1	R1C	T01F311639
Software info				
EUT S/W: R80BY IRU load: iru_app-CXP9013268_14-R80BY.xlf RUX Version: R9F RUX: testDef: _RRUS_DOT_Ph1_B4_NR_V1p9.txt				



3. Detailed test results of Emissions

Emissions from systems manifest themselves in two forms: conducted emissions on cables and radiated emissions from the entire system (i.e. electronic modules, hardware, and cables). Regulatory standards restrict these different forms of emissions generated by the system.

The temperature and humidity in the test facilities are controlled. The temperature is maintained between 20 °C and 25 °C, with a relative humidity between 30 % and 60 %. Levels are recorded and any exceptions are included in the detailed test results sections of this report.

3.1 Measurement instrumentation

The measurement instrumentation conforms to the relevant standards in this report: ANSI C63.2, CISPR 16, CISPR 22, and CISPR 32. Calibration of the measurement instrumentation is maintained in accordance with the supplier's recommendations, or as necessary to ensure its accuracy.

3.2 Radiated Emissions, E-field

This test verifies that the EUT does not produce excess amounts of E-field Radiated Emissions (RE) that could interfere with licensed radiators.

3.2.1 Test specification and limits

The testing requirements are as follows.

Table 10: RE test requirements

Requirement	Method	Country of application
FCC Part 15, Subpart B	FCC Part 15 / ANSI C63.4	USA
FCC Part 27 (Section 27.53(h))	ANSI C63.26	USA
ICES 003	FCC Part 15 / ICES 003 / ANSI C63.4	Canada
RSS-Gen (Section 7.3)	FCC Part 15 / ICES 003 / ANSI C63.4	Canada
RSS- 139 (Section 6.6)	ANSI C63.26	Canada

The limits of the RE tests are as follows.

Table 11: RE limits at 10 m for Class B of FCC Part 15, ICES 003 & RSS-Gen

Frequency range (MHz)	FCC Part 15 & ICES 003 (dB μ V/m)	Detector
30 to 88	29.5	Quasi-Peak
88 to 216	33.0	Quasi-Peak
216 to 960	35.5	Quasi-Peak
960 to 1000	43.5	Quasi-Peak
1000 to 40000	43.5 ¹	Average

Table 12: Emission limits for FCC Part 27, and RSS-139

Frequency range (MHz)	EIRP Limit (dBm)	Calculated EIRP Limit in dB μ V/m
30 - 40000	-13	82.2

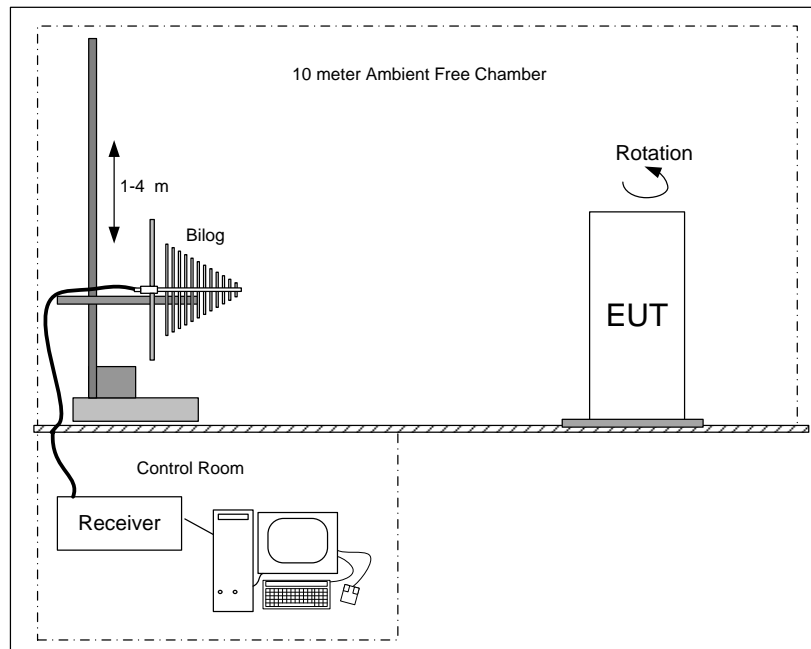
3.2.2 Test procedure

Verifications of the test equipment and AFC were performed before the installation of the EUT in accordance with the quality assurance procedures documented in the EMC test procedures document. The test was performed according to the relevant procedures listed in [Table 10](#).

- The EUT was placed on the turntable inside the AFC (configured for normal operation). The system and its cables were separated from the ground plane by an insulating support 10 mm in height.

- For tests between 30 MHz and 1 GHz the receive antenna (BiLog®) was placed 3 m away from the EUT. An initial scan was performed to find emissions/frequencies requiring detailed measurement. The pre-scan was performed by rotating the system 360 degrees while recording all emissions (frequency and amplitude). This procedure was repeated for antenna heights of 1 to 4 m, as well as both polarizations of the receiving antenna.
- For tests above 1 GHz the receive antenna (horn) was placed 3 m away from the EUT. Absorbing cones were placed on the floor between the antenna and the EUT. An initial scan was performed to find emissions/frequencies requiring detailed measurement. The pre-scan was performed by rotating the system 360 degrees while recording all emissions (frequency and amplitude). This procedure was repeated for antenna heights of 1 to 4 m, as well as both polarizations of the receiving antenna.
- For tests between 18 and 40 GHz the receive horn antenna was placed at a 1 m distance from the EUT with the absorbing cones placed on the floor. An initial scan was performed to find emissions/frequencies requiring detail measurement. The pre-scan was performed on all sides of the EUT, using both polarizations of the receive antenna to find any system emissions.
- For all above frequency ranges, the pre-scan peak data was compared to the limits. Peaks with less than 6 dB of margin were maximized using the proper detector: the EUT was rotated in azimuth over 360 degrees to identify the direction of maximum emission, antenna height was then varied from 1 to 4 m to obtain maximum emission level.

Figure 15: Setup of Radiated Emissions



3.2.3 Calculation of the compliance margin

The following example shows the way in which the compliance margin is calculated in the “RE Test Results” tables.

The rows in these tables are defined as follows.

Meter Reading (dB μ V) = Voltage measured using the spectrum analyzer with the proper detector

Correction (dB) = Cumulative gain or loss of pre-amplifier and cables used in the measurement path (dB) + Antenna Factor (dB)

Level (dB μ V/m) = Corrected value or field strength, that is, the parameter of interest that is compared to the limit

Margin (dB) = Level with respect to the appropriate limit (a negative Margin indicates that the Level is below the limit and that the measurement is a Pass)

The values in the Level row are calculated as follows: Level = Meter Reading + Correction (dB)

The values in the Margin row are calculated as follows: Margin = Level - Limit

3.2.4 Measurement uncertainties

The expanded measurement instrumentation uncertainty with a 95 % level of confidence, calculated according to the method described in CISPR 16 is:

- ± 3.8 dB between 30 MHz and 1 GHz
- ± 4.7 dB between 1 GHz and 10 GHz
- ± 4.8 dB between 10 GHz and 18 GHz
- ± 4.6 dB between 18 GHz and 26.5 GHz
- ± 4.8 dB between 26.5 GHz and 40 GHz

3.2.5 Test results of RE (Single RAT/Carrier, SC – NR 5MHz, Bottom channel)

Test location: 10-meter Ambient Free Chamber (AFC)

Date tested: 12 - 17, March 2021

Tested by: Richer, Christopher & Tom Ott

Test configurations are identified in the section [Configurations of the EUT](#).

For the following test results that have supporting data tables, negative margin values indicate a pass.

Figure 16: Plot of RE at 3 m – 30 to 1000 MHz (SC – Bot channel)

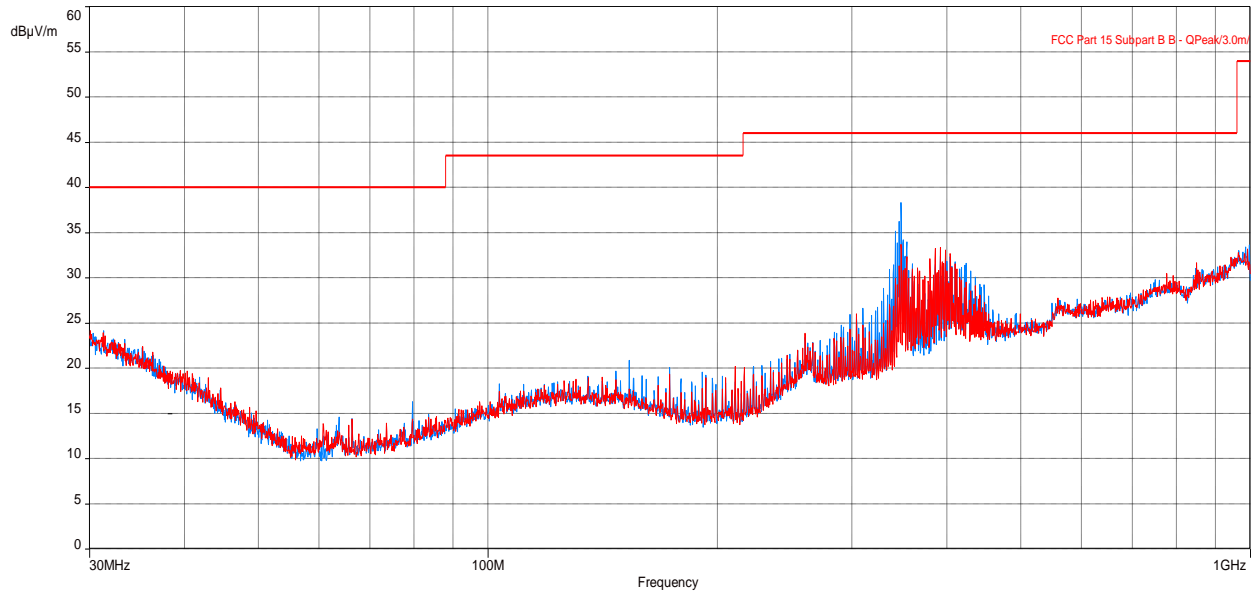


Table 13: RE test results from 30 to 1000 MHz for FCC Part 15 (SC – Bot channel)

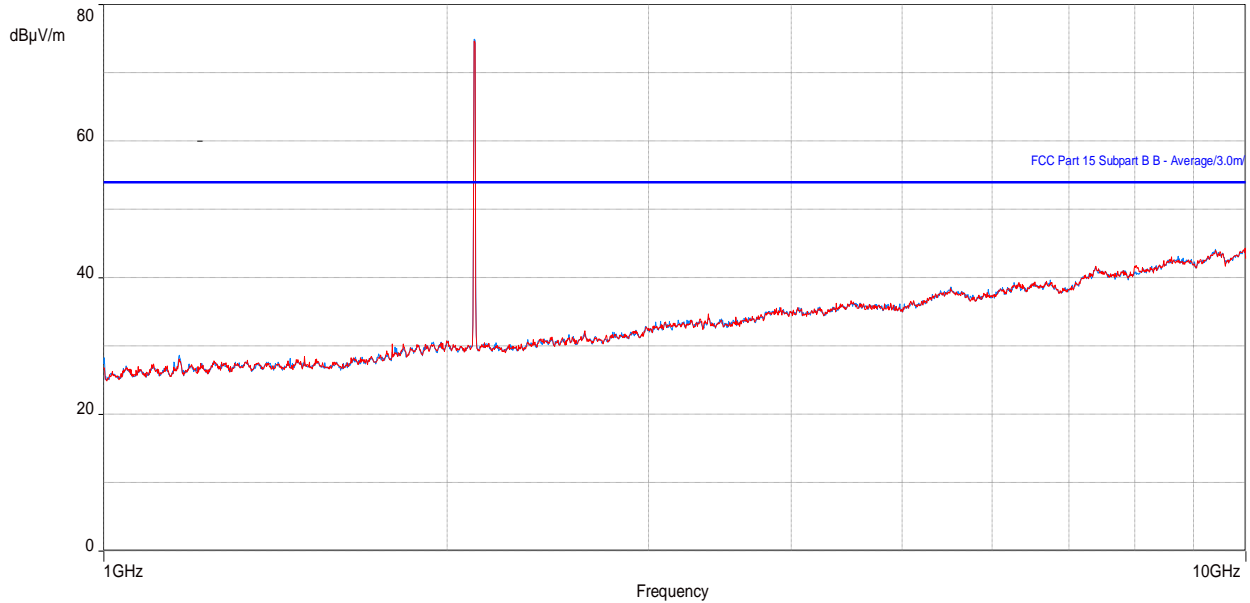
Frequency (MHz)	Level Quasi Peak (dBµV/m)	Limit Quasi-peak (dBµV/m)	Margin to FCC part 15 Class B (dB)	Height (m)	Azimuth (deg)	Polarization	Correction (dB)
342.2940064	34.69	46.02	-11.33	1.00	182.50	Horizontal	-3.88
346.2452469	35.24	46.02	-10.78	1.00	177.75	Horizontal	-3.73
348.252471	37.10	46.02	-8.92	1.05	163.00	Horizontal	-3.65
354.2578172	31.78	46.02	-14.24	1.08	170.25	Horizontal	-3.41

Table 14: RE test results from 30 to 1000 MHz for FCC Part 27 (SC – Bot channel)

Frequency (MHz)	Level (dBµV/m)	EIRP Limit (dBµV/m)	Margin to (dB)	Height (m)	Azimuth (deg)	Polarization	Correction (dB)
342.2940064	34.69	82.2	-47.51	1.00	182.50	Horizontal	-3.88
346.2452469	35.24	82.2	-46.96	1.00	177.75	Horizontal	-3.73
348.252471	37.10	82.2	-45.10	1.05	163.00	Horizontal	-3.65
354.2578172	31.78	82.2	-50.42	1.08	170.25	Horizontal	-3.41

Note: In the table/Plot above, no emissions exceed the Part 27 radiated spurious emissions limit when converted to dBµV/m. For final spurious emissions measurements to FCC Part 27, see antenna port conducted emissions in applicable test report.

Figure 17: Plot of RE at 3m from 1 to 10 GHz (SC – Bot channel)



Note: Peaks above the limit are leakage of the EUT's fundamentals from the 50-ohm terminations.

Note: In the Plot above, no emissions exceed the Part 27 radiated spurious emissions limit when converted to dBµV/m, except for the fundamentals. For final spurious emissions measurements to FCC Part 27, see antenna port conducted emissions in applicable test report.

Figure 18: Plot of RE at 3m from 10 to 18 GHz (SC – Bot channel)

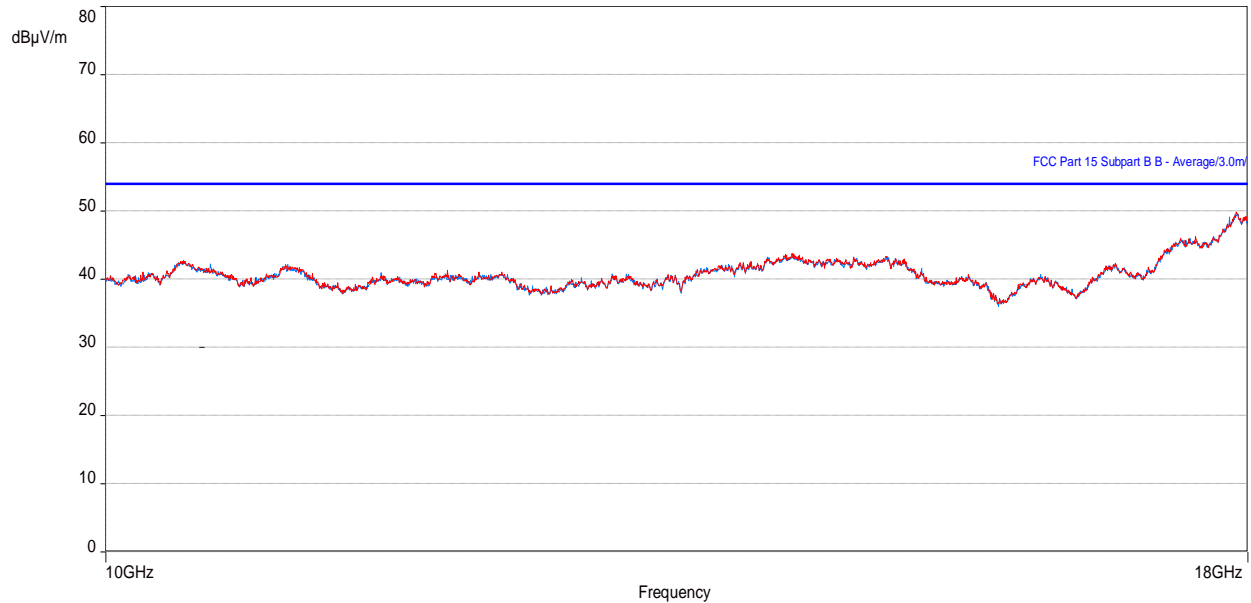


Table 15: RE test results from 10 to 18 GHz for FCC Part 15 (SC – Bot channel)

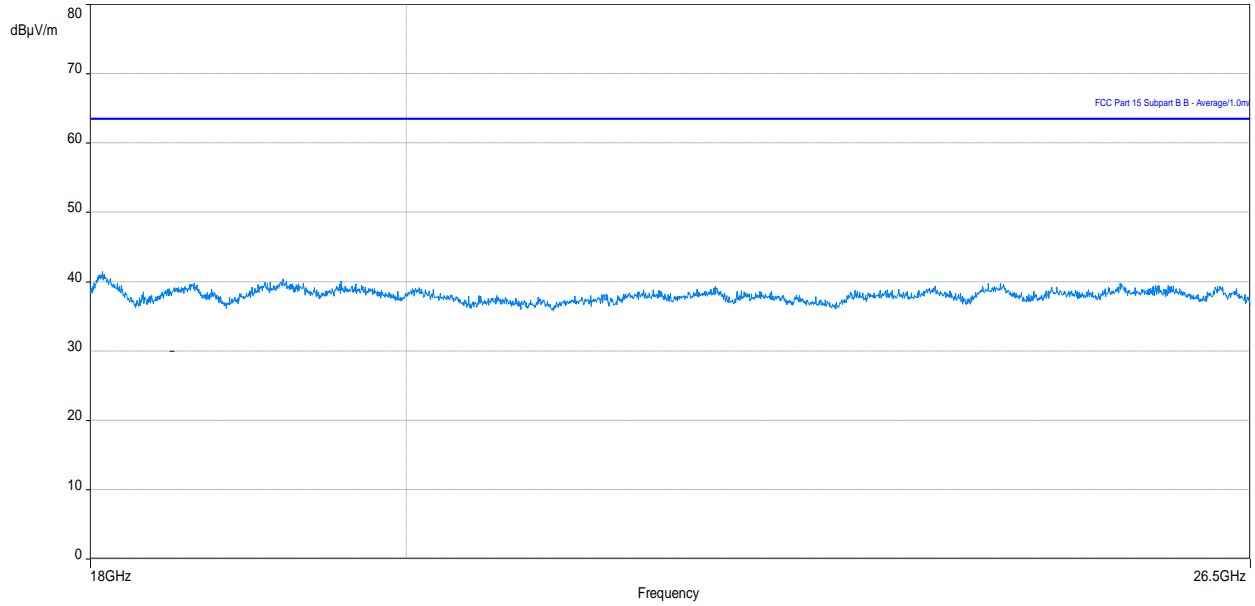
Frequency (MHz)	Level Average (dBµV/m)	Limit Average (dBµV/m)	Margin to FCC part 15 Class B (dB)	Height (m)	Azimuth (degrees)	Polarization	Correction (dB)
17892.13141	46.46	53.96	-7.50	4.00	2.50	Vertical	19.83
17903.01473	46.58	53.96	-7.38	1.00	360.00	Horizontal	19.99

Table 16: RE test results from 10 to 18 GHz for Part 27 (SC – Bot channel)

Frequency (MHz)	Level (dBµV/m)	EIRP Limit (dBµV/m)	Margin to (dB)	Height (m)	Azimuth (degrees)	Polarization	Correction (dB)
17892.13141	46.46	82.2	-35.74	4.00	2.50	Vertical	19.83
17903.01473	46.58	82.2	-35.62	1.00	360.00	Horizontal	19.99

Note: In the table/Plot above, no emissions exceed the Part 27 radiated spurious emissions limit when converted to dBuV/m. For final spurious emissions measurements to FCC Part 27, see antenna port conducted emissions in applicable test report.

Figure 19: Plot of RE at 1m from 18 to 26.5 GHz (SC – Bot channel)



Note 1: In the plots above No Emissions exceeds the FCC Part 15/ICES 003 limit.

Note 2: In the plots above, no emissions exceed the Part 27 radiated spurious emissions limit when converted to dBuV/m. For final spurious emissions measurements to FCC Part 27, see antenna port conducted emissions in applicable test report.



3.2.6 Test results of RE (Single RAT/Carrier, SC – NR 5MHz, Middle channel)

Test location: 10-meter Ambient Free Chamber (AFC)

Date tested: 12 - 17, March 2021

Tested by: Richer, Christopher & Tom Ott

Test configurations are identified in the section [Configurations of the EUT](#).

For the following test results that have supporting data tables, negative margin values indicate a pass.

Figure 20: Plot of RE at 3 m – 30 to 1000 MHz (SC – Mid channel)

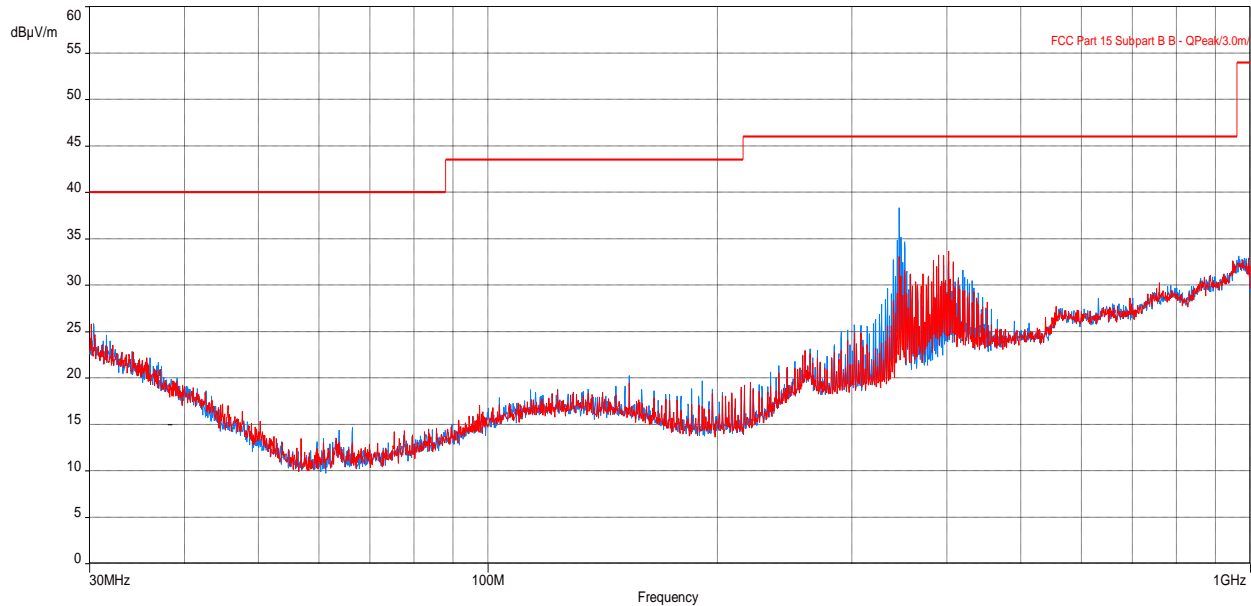


Table 17: RE test results from 30 to 1000 MHz for FCC Part 15 (SC - Mid channel)

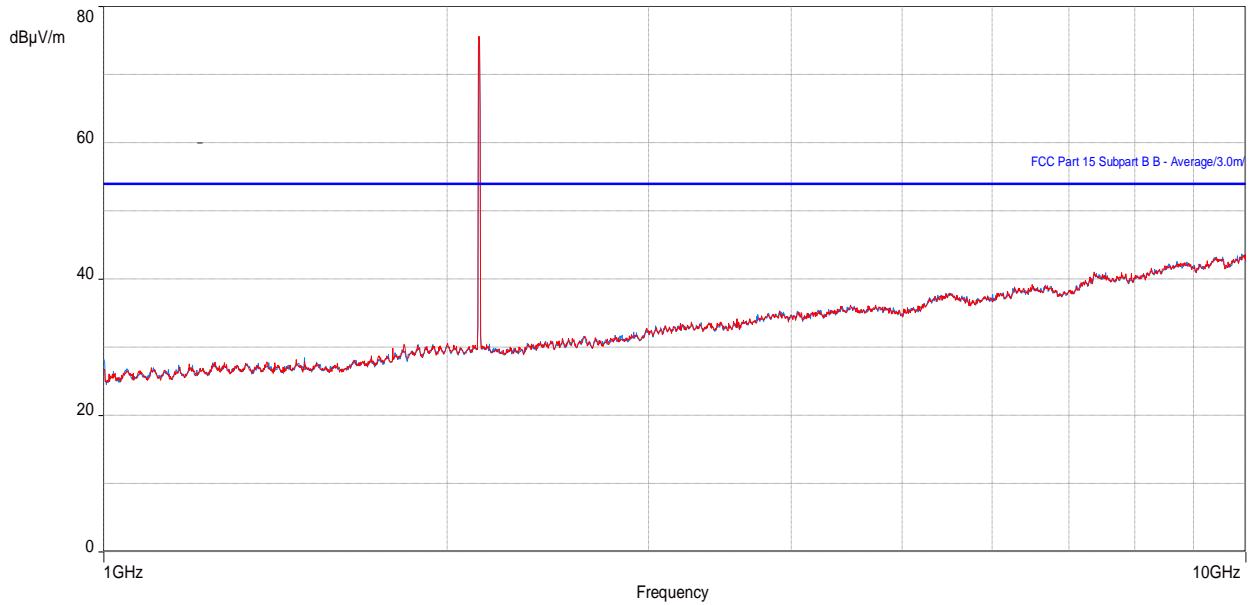
Frequency (MHz)	Level Quasi Peak (dBµV/m)	Limit Quasi-peak (dBµV/m)	Margin to FCC part 15 Class B (dB)	Height (m)	Azimuth (deg)	Polarization	Correction (dB)
344.2571251	33.92	46.02	-12.10	1.00	182.25	Horizontal	-3.77
346.2605031	38.23	46.02	-7.79	1.00	177.50	Horizontal	-3.73
352.222141	34.64	46.02	-11.38	1.00	170.25	Horizontal	-3.52
390.038561	34.39	46.02	-11.63	1.37	283.00	Vertical	-2.45

Table 18: RE test results from 30 to 1000 MHz for FCC Part 27 (SC – Mid channel)

Frequency (MHz)	Level (dBµV/m)	EIRP Limit (dBµV/m)	Margin to (dB)	Height (m)	Azimuth (deg)	Polarization	Correction (dB)
344.2571251	33.92	82.2	-48.28	1.00	182.25	Horizontal	-3.77
346.2605031	38.23	82.2	-43.97	1.00	177.50	Horizontal	-3.73
352.222141	34.64	82.2	-47.56	1.00	170.25	Horizontal	-3.52
390.038561	34.39	82.2	-47.81	1.37	283.00	Vertical	-2.45

Note: In the table/Plot above, no emissions exceed the Part 27 radiated spurious emissions limit when converted to dBµV/m. For final spurious emissions measurements to FCC Part 27, see antenna port conducted emissions in applicable test report.

Figure 21: Plot of RE at 3m from 1 to 10 GHz (SC – Mid channel)



Note: Peaks above the limit are leakage of the EUT's fundamentals from the 50-ohm terminations.

Note: In the Plot above, no emissions exceed the Part 27 radiated spurious emissions limit when converted to dBuV/m, except for the fundamentals. For final spurious emissions measurements to FCC Part 27, see antenna port conducted emissions in applicable test report.

Figure 22: Plot of RE at 3m from 10 to 18 GHz (SC – Mid channel)

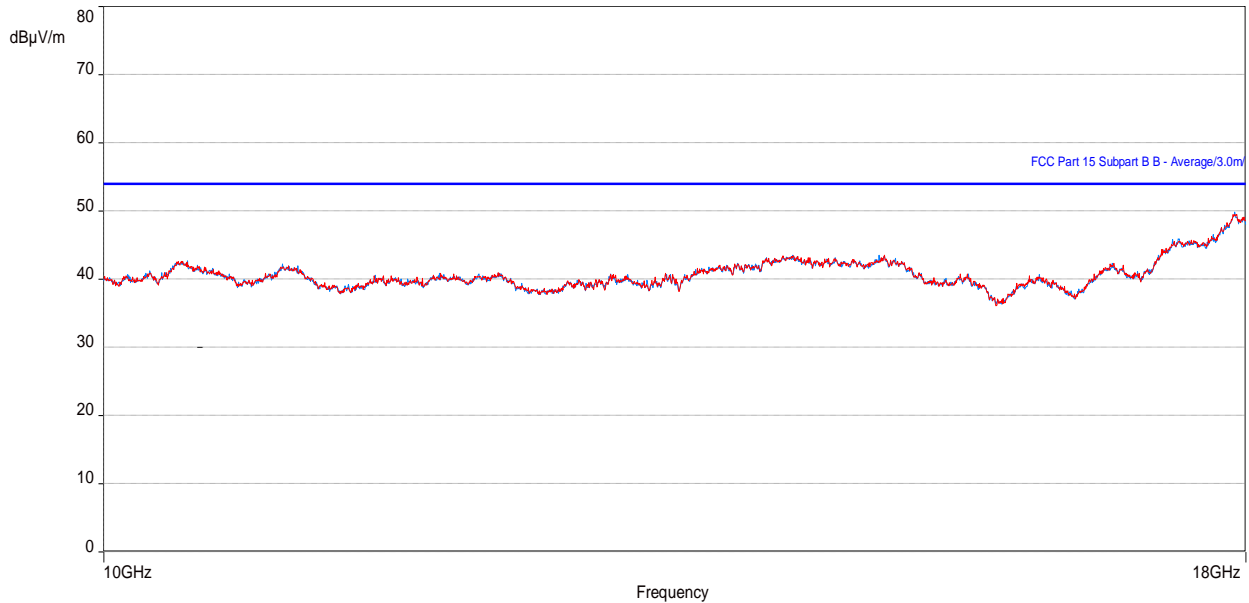


Table 19: RE test results from 10 to 18 GHz for FCC Part 15 (SC – Mid channel)

Frequency (MHz)	Level Average (dBµV/m)	Limit Average (dBµV/m)	Margin to FCC part 15 Class B (dB)	Height (m)	Azimuth (degrees)	Polarization	Correction (dB)
17899.5439	46.78	53.96	-7.18	1.00	-0.25	Horizontal	20.01
17899.59521	46.55	53.96	-7.41	1.00	0.00	Vertical	20.01

Table 20: RE test results from 10 to 18 GHz for Part 27 (SC – Mid channel)

Frequency (MHz)	Level (dBµV/m)	EIRP Limit (dBµV/m)	Margin to (dB)	Height (m)	Azimuth (degrees)	Polarization	Correction (dB)
17899.5439	46.78	82.2	-35.42	1.00	-0.25	Horizontal	20.01
17899.59521	46.55	82.2	-35.65	1.00	0.00	Vertical	20.01

Note: In the table/Plot above, no emissions exceed the Part 27 radiated spurious emissions limit when converted to dBuV/m. For final spurious emissions measurements to FCC Part 27, see antenna port conducted emissions in applicable test report.

Figure 23: Plot of RE at 1m from 18 to 26.5 GHz (SC – Mid channel)

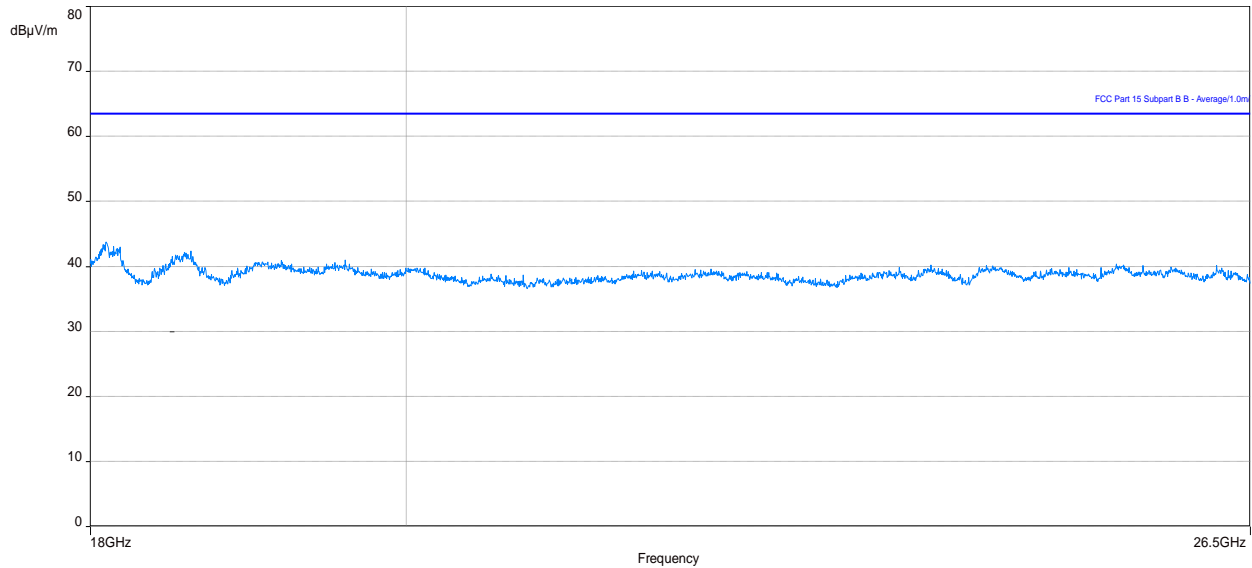
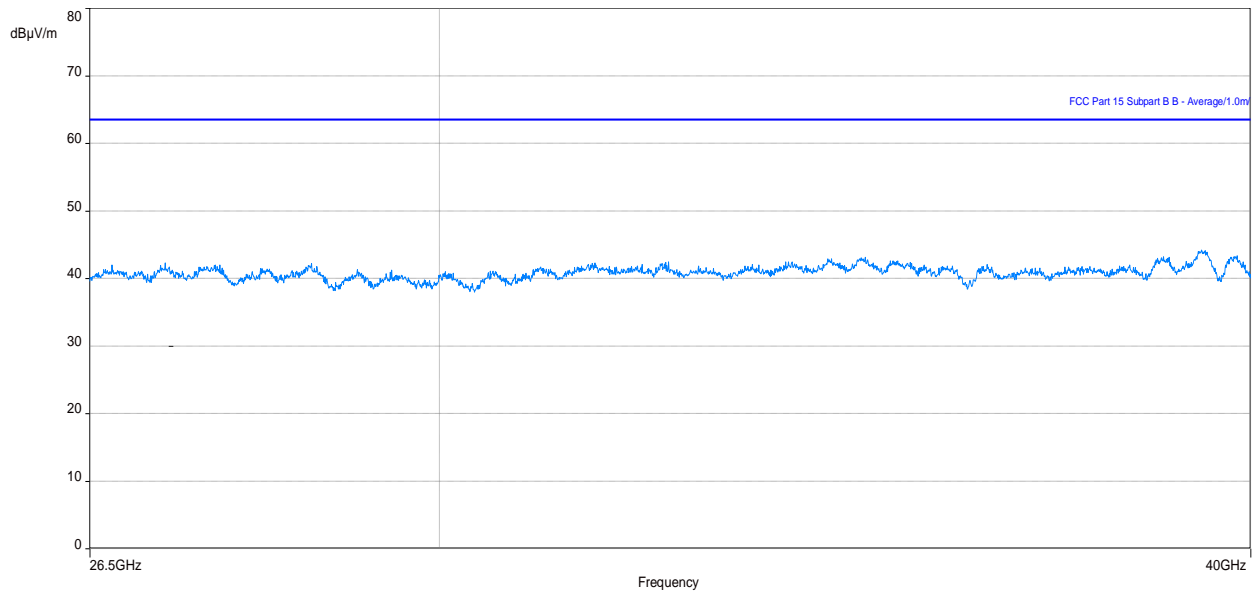


Figure 24: Plot of RE at 1m from 26.5 to 40 GHz (SC – Mid channel)



Note 1: In the plot above No Emissions exceeds the FCC Part 15/ICES 003 limit.

Note 2: In the plot above, no emissions exceed the Part 27 radiated spurious emissions limit when converted to dBuV/m. For final spurious emissions measurements to FCC Part 27, see antenna port conducted emissions in applicable test report.



3.2.7 Test results of RE (Single RAT/Carrier, SC – NR 5MHz, Top channel)

Test location: 10-meter Ambient Free Chamber (AFC)

Date tested: 12 - 17, March 2021

Tested by: Richer, Christopher & Tom Ott

Test configurations are identified in the section [Configurations of the EUT](#).

For the following test results that have supporting data tables, negative margin values indicate a pass.

Figure 25: Plot of RE at 3 m – 30 to 1000 MHz (SC – Top channel)

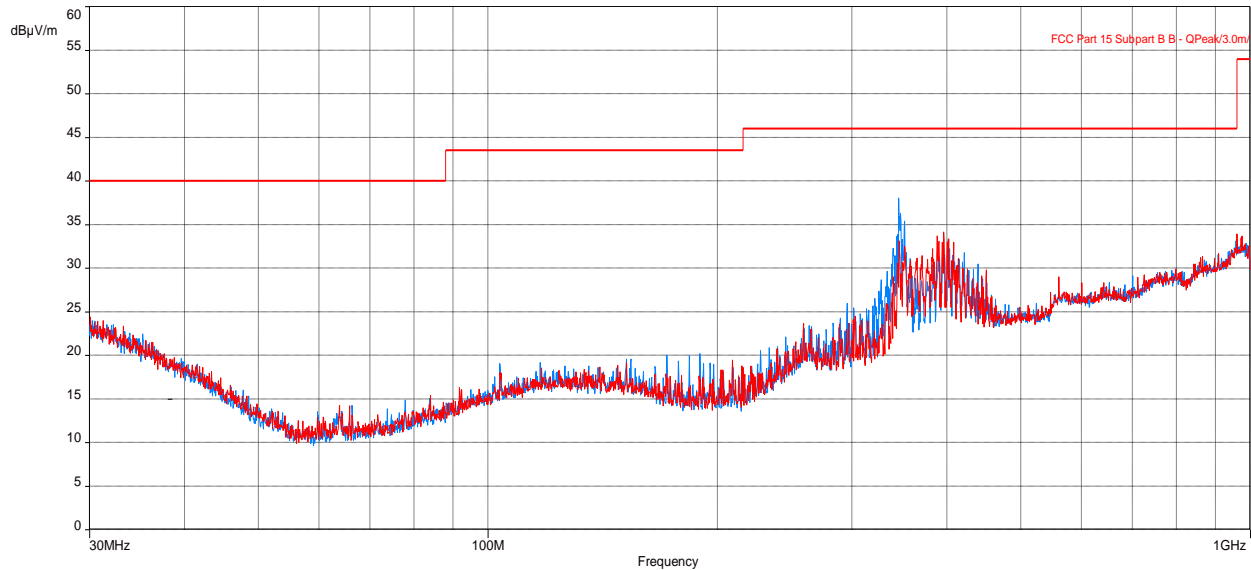


Table 21: RE test results from 30 to 1000 MHz for FCC Part 15 (SC – Top channel)

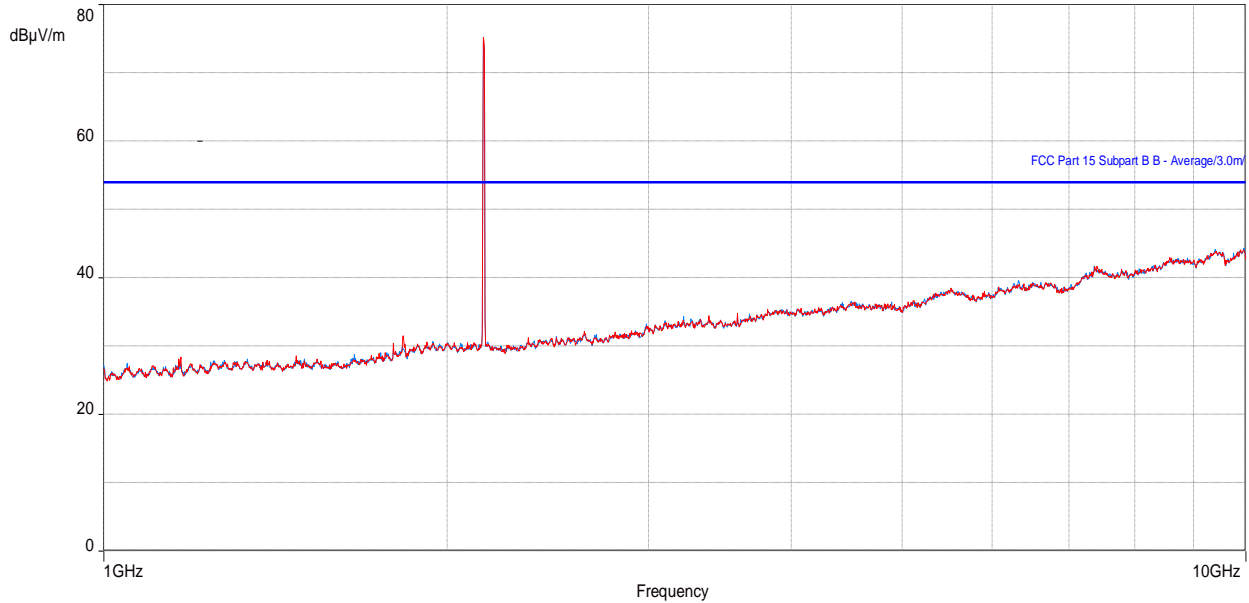
Frequency (MHz)	Level Quasi Peak (dBµV/m)	Limit Quasi-peak (dBµV/m)	Margin to FCC part 15 Class B (dB)	Height (m)	Azimuth (deg)	Polarization	Correction (dB)
346.2555351	33.42	46.02	-12.60	1.33	297.75	Vertical	-3.73
396.2151508	32.10	46.02	-13.92	1.33	275.75	Vertical	-2.11
402.2086379	25.00	46.02	-21.02	1.11	261.50	Vertical	-1.81
960.4318526	26.92	53.98	-27.06	3.02	141.50	Vertical	8.89

Table 22: RE test results from 30 to 1000 MHz for FCC Part 27 (SC – Top channel)

Frequency (MHz)	Level (dBµV/m)	EIRP Limit (dBµV/m)	Margin to (dB)	Height (m)	Azimuth (deg)	Polarization	Correction (dB)
346.2555351	33.42	82.2	-48.78	1.33	297.75	Vertical	-3.73
396.2151508	32.10	82.2	-50.1	1.33	275.75	Vertical	-2.11
402.2086379	25.00	82.2	-57.2	1.11	261.50	Vertical	-1.81
960.4318526	26.92	82.2	-55.28	3.02	141.50	Vertical	8.89

Note: In the table/Plot above, no emissions exceed the Part 27 radiated spurious emissions limit when converted to dBµV/m. For final spurious emissions measurements to FCC Part 27, see antenna port conducted emissions in applicable test report.

Figure 26: Plot of RE at 3m from 1 to 10 GHz (SC – Top channel)



Note: Peaks above the limit are leakage of the EUT's fundamentals from the 50-ohm terminations.

Note: In the table/Plot above, no emissions exceed the Part 27 radiated spurious emissions limit when converted to dBuV/m, except for the fundamentals. For final spurious emissions measurements to FCC Part 27, see antenna port conducted emissions in applicable test report.

Figure 27: Plot of RE at 3m from 10 to 18 GHz (SC – Top channel)

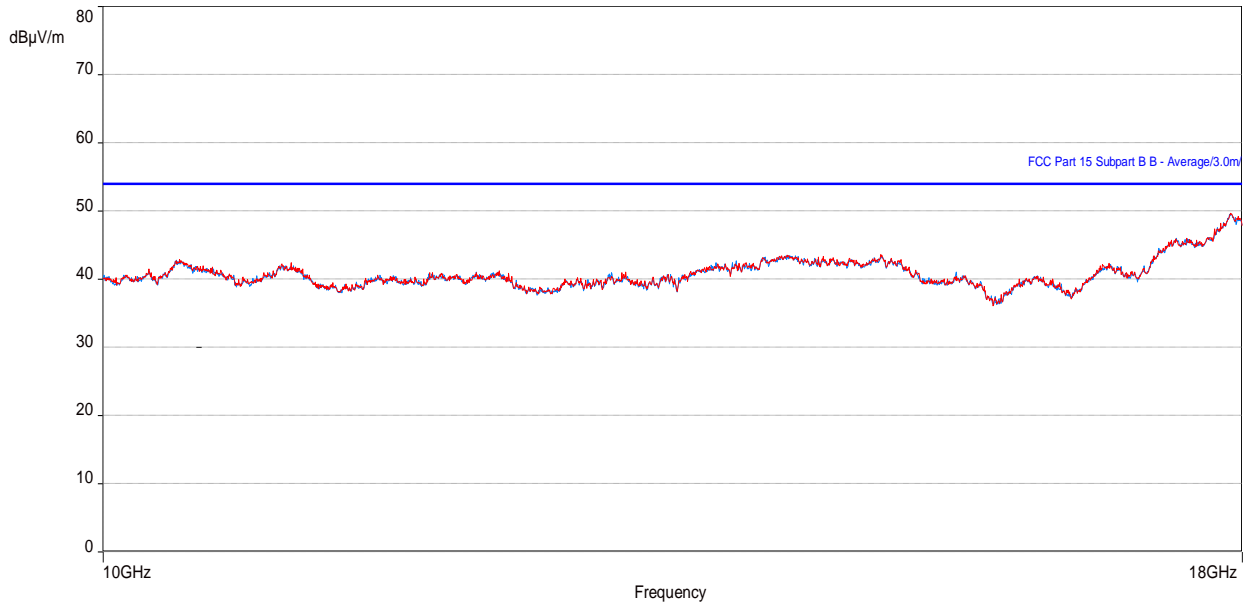


Table 23: RE test results from 10 to 18 GHz for FCC Part 15 (SC – Top channel)

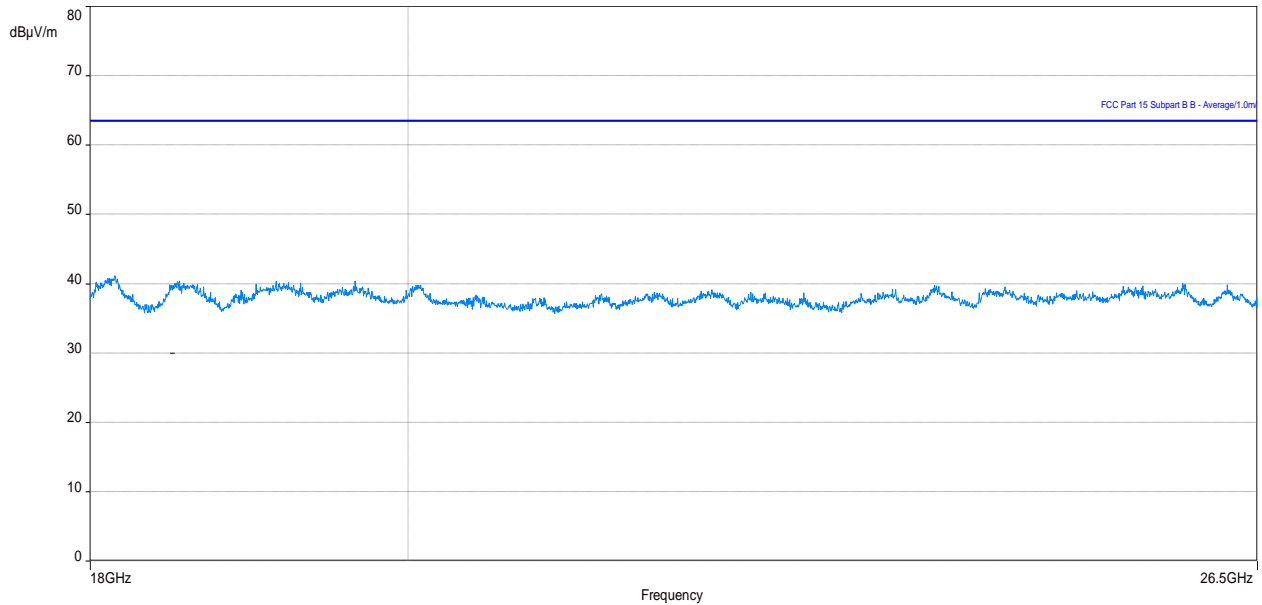
Frequency (MHz)	Level Average (dBµV/m)	Limit Average (dBµV/m)	Margin to FCC part 15 Class B (dB)	Height (m)	Azimuth (degrees)	Polarization	Correction (dB)
17885.09422	45.95	53.96	-8.01	3.96	360.25	Horizontal	19.67
17895.34838	46.57	53.96	-7.39	4.00	2.50	Vertical	19.91

Table 24: RE test results from 10 to 18 GHz for Part 27 (SC – Top channel)

Frequency (MHz)	Level (dBµV/m)	EIRP Limit (dBµV/m)	Margin to (dB)	Height (m)	Azimuth (degrees)	Polarization	Correction (dB)
17885.09422	45.95	82.2	-36.25	3.96	360.25	Horizontal	19.67
17895.34838	46.57	82.2	-35.63	4.00	2.50	Vertical	19.91

Note: In the table/Plot above, no emissions exceed the Part 27 radiated spurious emissions limit when converted to dBuV/m. For final spurious emissions measurements to FCC Part 27, see antenna port conducted emissions in applicable test report.

Figure 28: Plot of RE at 1m from 18 to 26.5 GHz (SC – Top channel)



Note 1: In the plot above No Emissions exceeds the FCC Part 15/ICES 003 limit.

Note 2: In the plot above, no emissions exceed the Part 27 radiated spurious emissions limit when converted to dBuV/m. For final spurious emissions measurements to FCC Part 27, see antenna port conducted emissions in applicable test report.



3.2.8 Test results of RE (Single RAT/Multi carrier, MC1- 2xNR 5MHz, Mid channel)

Test location: 10-meter Ambient Free Chamber (AFC)

Date tested: 12 - 17, March 2021

Tested by: Richer, Christopher & Tom Ott

Test configurations are identified in the section [Configurations of the EUT](#).

For the following test results that have supporting data tables, negative margin values indicate a pass.

Figure 29: Plot of RE at 3 m – 30 to 1000 MHz (MC1- 2xNR 5MHz Mid channel)

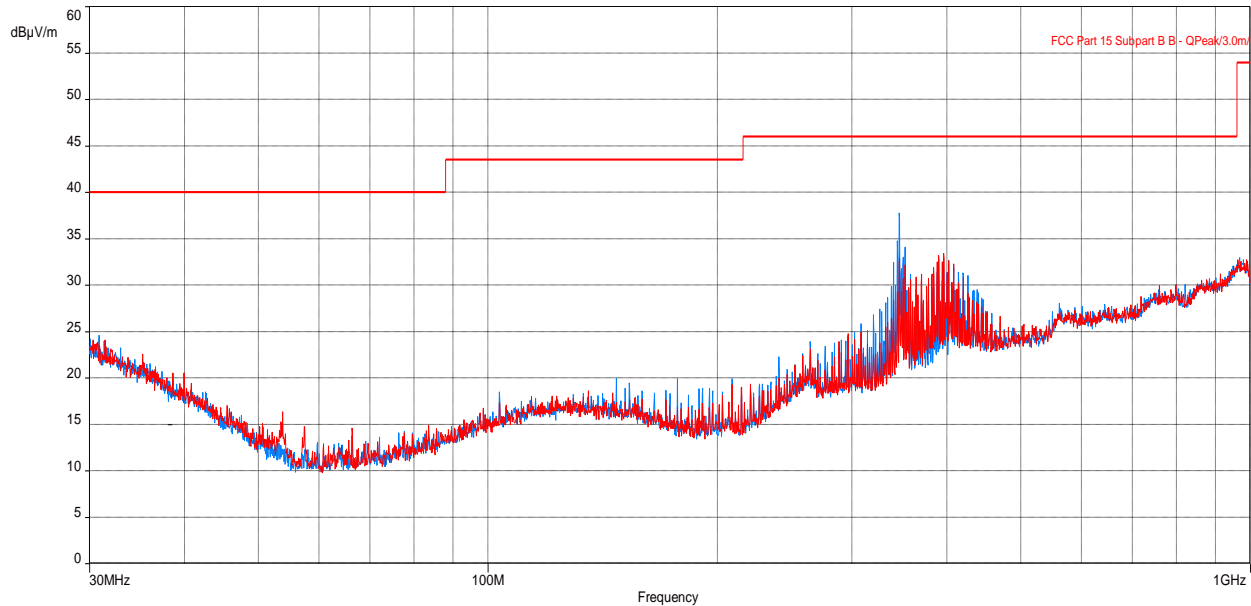


Table 25: RE test results from 30 to 1000 MHz for FCC Part 15 (MC1- 2xNR 5MHz Mid channel)

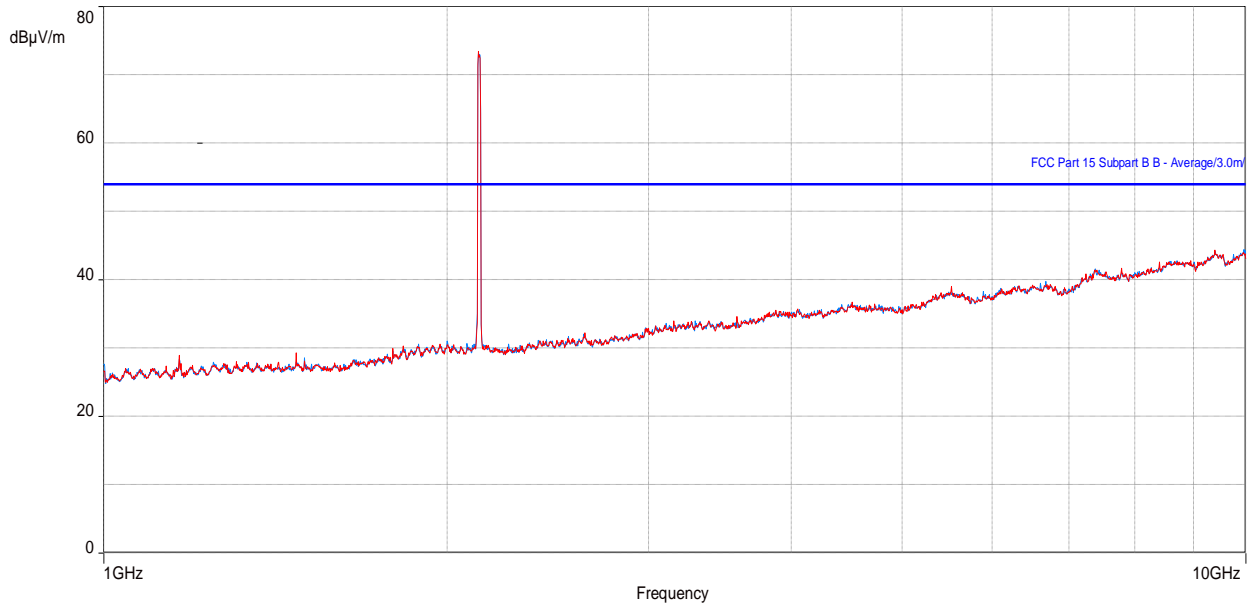
Frequency (MHz)	Level Quasi Peak (dBµV/m)	Limit Quasi-peak (dBµV/m)	Margin to FCC part 15 Class B (dB)	Height (m)	Azimuth (deg)	Polarization	Correction (dB)
346.4170449	37.72	46.02	-8.30	1.00	168.00	Horizontal	-3.71

Table 26: RE test results from 30 to 1000 MHz for FCC Part 27 (MC1- 2xNR 5MHz Mid channel)

Frequency (MHz)	Level (dBµV/m)	EIRP Limit (dBµV/m)	Margin to (dB)	Height (m)	Azimuth (deg)	Polarization	Correction (dB)
346.4170449	37.72	82.2	-44.48	1.00	168.00	Horizontal	-3.71

Note: In the table/Plot above, no emissions exceed the Part 27 radiated spurious emissions limit when converted to dBµV/m. For final spurious emissions measurements to FCC Part 27, see antenna port conducted emissions in applicable test report.

Figure 30: Plot of RE at 3m from 1 to 10 GHz (MC1- 2xNR 5MHz Mid channel)



Note: Peaks above the limit are leakage of the EUT's fundamentals from the 50-ohm terminations.

Note: In the table/Plot above, no emissions exceed the Part 27 radiated spurious emissions limit when converted to dBuV/m, except for the fundamentals. For final spurious emissions measurements to FCC Part 27, see antenna port conducted emissions in applicable test report.

Figure 31: Plot of RE at 3m from 10 to 18 GHz (MC1- 2xNR 5MHz Mid channel)

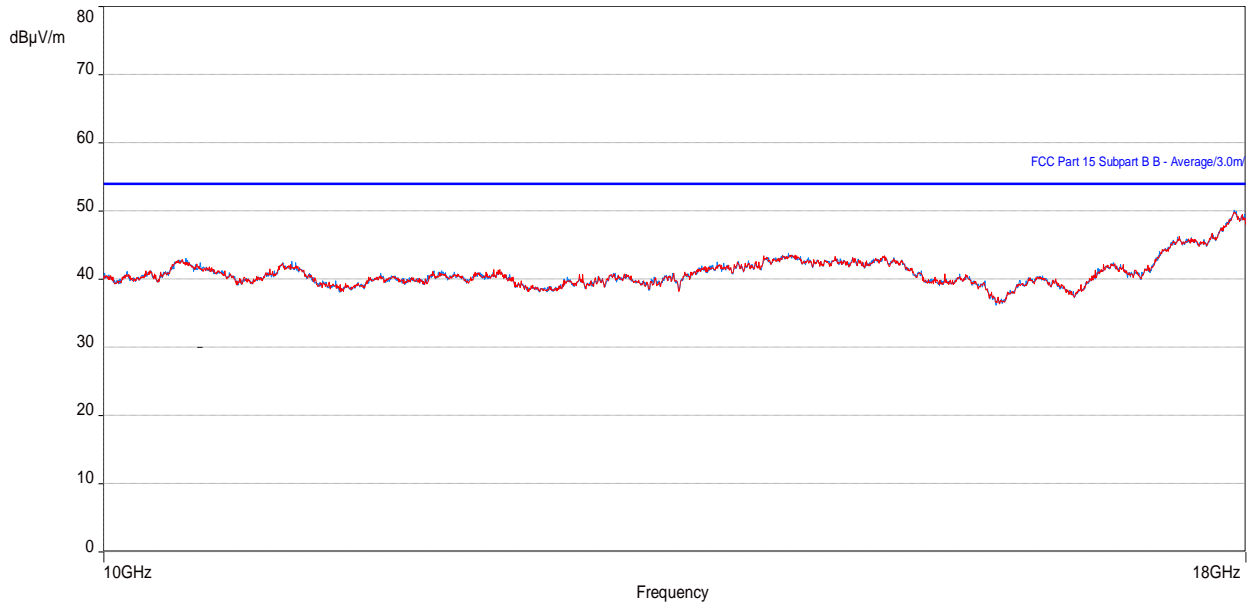


Table 27: RE test results from 10 to 18 GHz for FCC Part 15 (MC1- 2xNR 5MHz Mid channel)

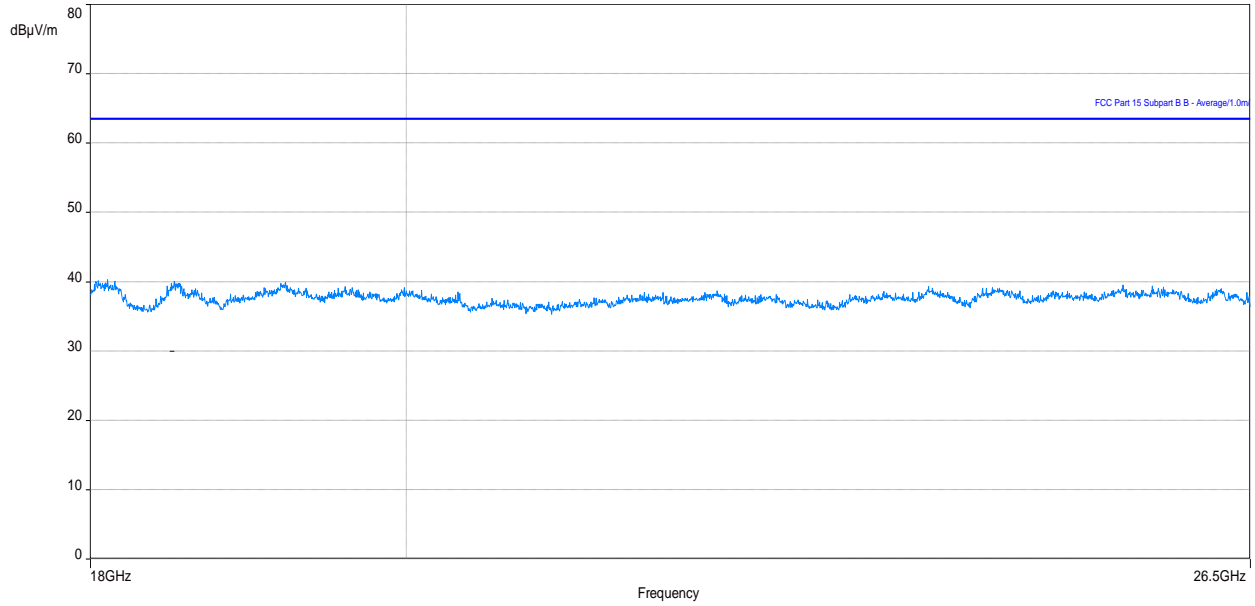
Frequency (MHz)	Level Average (dBµV/m)	Limit Average (dBµV/m)	Margin to FCC part 15 Class B (dB)	Height (m)	Azimuth (degrees)	Polarization	Correction (dB)
17893.35641	46.58	53.96	-7.38	3.96	0.00	Vertical	19.86
17895.34904	46.58	53.96	-7.38	1.00	38.50	Horizontal	19.91

Table 28: RE test results from 10 to 18 GHz for Part 27 (MC1- 2xNR 5MHz Mid channel)

Frequency (MHz)	Level (dBµV/m)	EIRP Limit (dBµV/m)	Margin to (dB)	Height (m)	Azimuth (degrees)	Polarization	Correction (dB)
17893.35641	46.58	82.2	-35.62	3.96	0.00	Vertical	19.86
17895.34904	46.58	82.2	-35.62	1.00	38.50	Horizontal	19.91

Note: In the table/Plot above, no emissions exceed the Part 27 radiated spurious emissions limit when converted to dBuV/m. For final spurious emissions measurements to FCC Part 27, see antenna port conducted emissions in applicable test report.

Figure 32: Plot of RE at 1m from 18 to 26.5 GHz (MC1- 2xNR 5MHz Mid channel)



Note 1: In the plot above No Emissions exceeds the FCC Part 15/ICES 003 limit.

Note 2: In the plot above, no emissions exceed the Part 27 radiated spurious emissions limit when converted to dBuV/m. For final spurious emissions measurements to FCC Part 27, see antenna port conducted emissions in applicable test report.



3.2.9 Test results of RE (Multi RAT/Carrier, **MR1**- NR 5MHz & LTE 5MHz, Mid channel)

Test location: 10-meter Ambient Free Chamber (AFC)

Date tested: 12 - 17, March 2021

Tested by: Richer, Christopher & Tom Ott

Test configurations are identified in the section [Configurations of the EUT](#).

For the following test results that have supporting data tables, negative margin values indicate a pass.

Figure 33: Plot of RE at 3 m – 30 to 1000 MHz (Config - MR1, Mid channel)

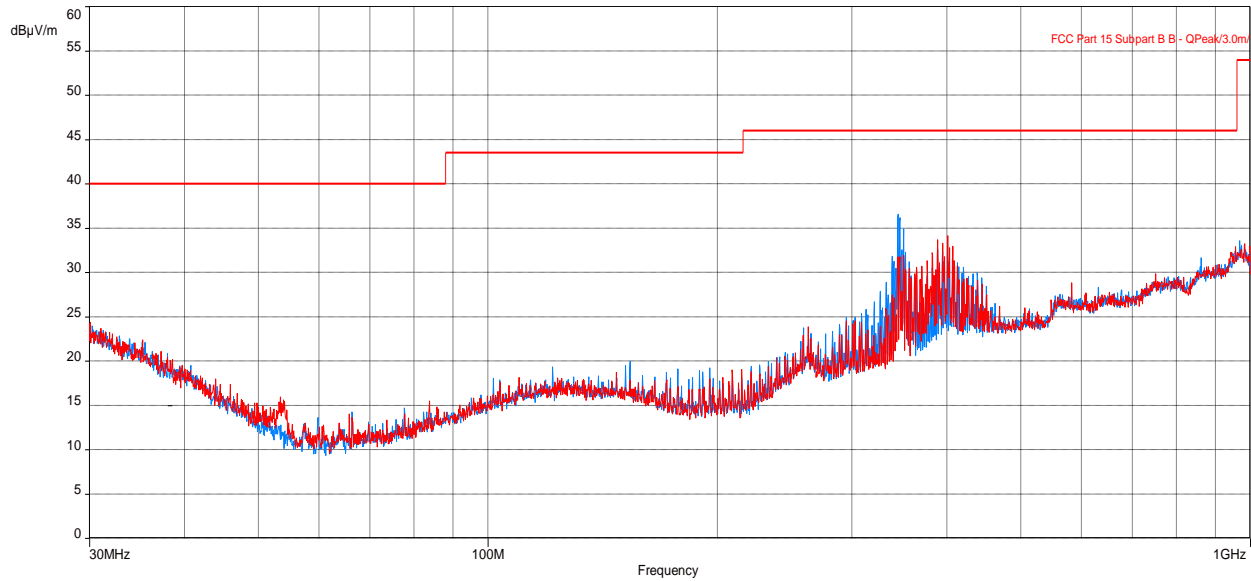


Table 29: RE test results from 30 to 1000 MHz for FCC Part 15 (Config - MR1, Mid channel)

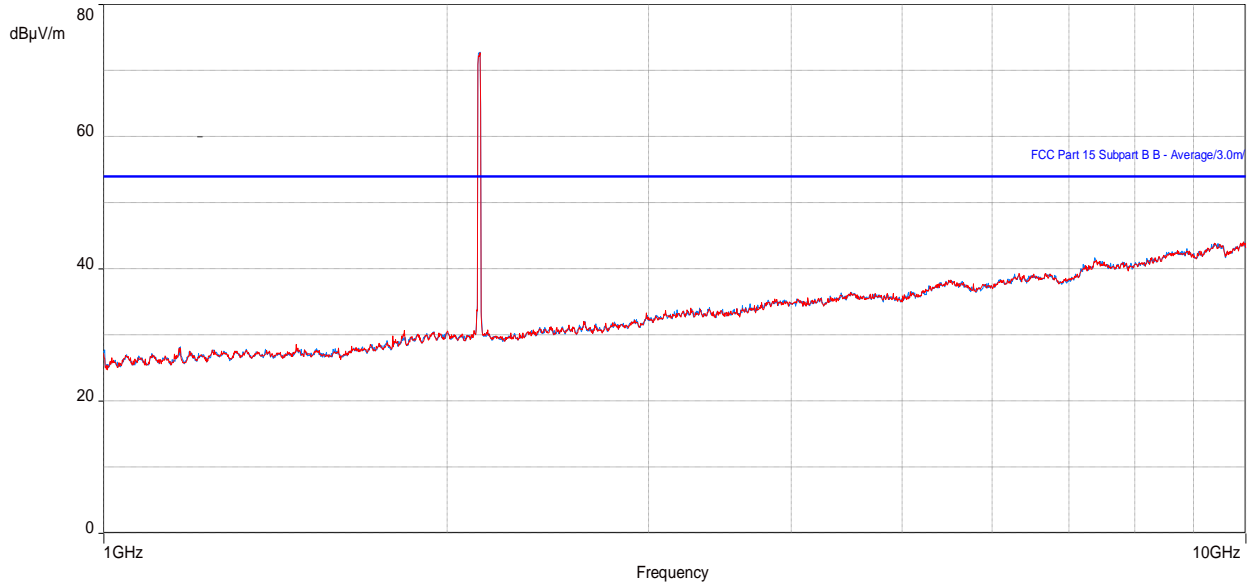
Frequency (MHz)	Level Quasi Peak (dBµV/m)	Limit Quasi-peak (dBµV/m)	Margin to FCC part 15 Class B (dB)	Height (m)	Azimuth (deg)	Polarization	Correction (dB)
345.1224328	21.05	46.02	-24.97	1.00	175.25	Horizontal	-3.76
347.130939	24.09	46.02	-21.93	1.00	170.50	Horizontal	-3.65
400.9822533	21.15	46.02	-24.87	1.26	261.50	Vertical	-1.92

Table 30: RE test results from 30 to 1000 MHz for FCC Part 27 (Config - MR1, Mid channel)

Frequency (MHz)	Level (dBµV/m)	EIRP Limit (dBµV/m)	Margin to (dB)	Height (m)	Azimuth (deg)	Polarization	Correction (dB)
345.1224328	21.05	82.2	-61.15	1.00	175.25	Horizontal	-3.76
347.130939	24.09	82.2	-58.11	1.00	170.50	Horizontal	-3.65
400.9822533	21.15	82.2	-61.05	1.26	261.50	Vertical	-1.92

Note: In the table/Plot above, no emissions exceeded the Part 27 radiated spurious emissions limit when converted to dBµV/m. For final spurious emissions measurements to FCC Part 27, see antenna port conducted emissions in applicable test report.

Figure 34: Plot of RE at 3m from 1 to 10 GHz (Config - MR1, Mid channel)



Note: Peaks above the limit are leakage of the EUT's fundamentals from the 50-ohm terminations.

Note: In the Plot above, no emissions exceed the Part 27 radiated spurious emissions limit when converted to dBuV/m, except for the fundamentals. For final spurious emissions measurements to FCC Part 27, see antenna port conducted emissions in applicable test report.

Figure 35: Plot of RE at 3m from 10 to 18 GHz (Config - MR1, Mid channel)

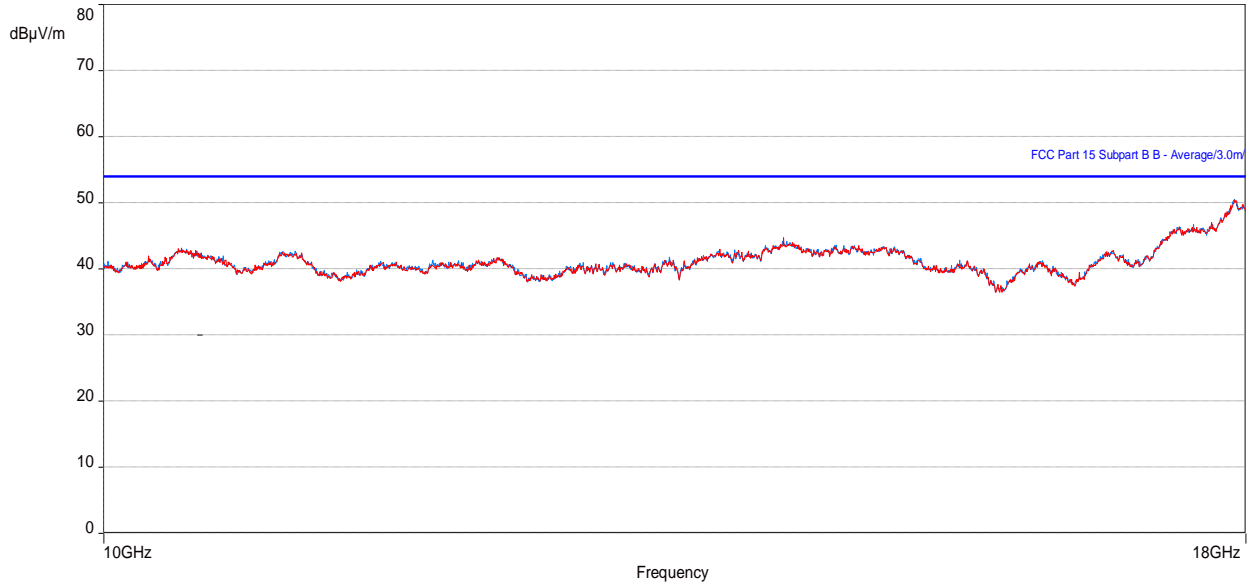


Table 31: RE test results from 10 to 18 GHz for FCC Part 15 (Config - MR1, Mid channel)

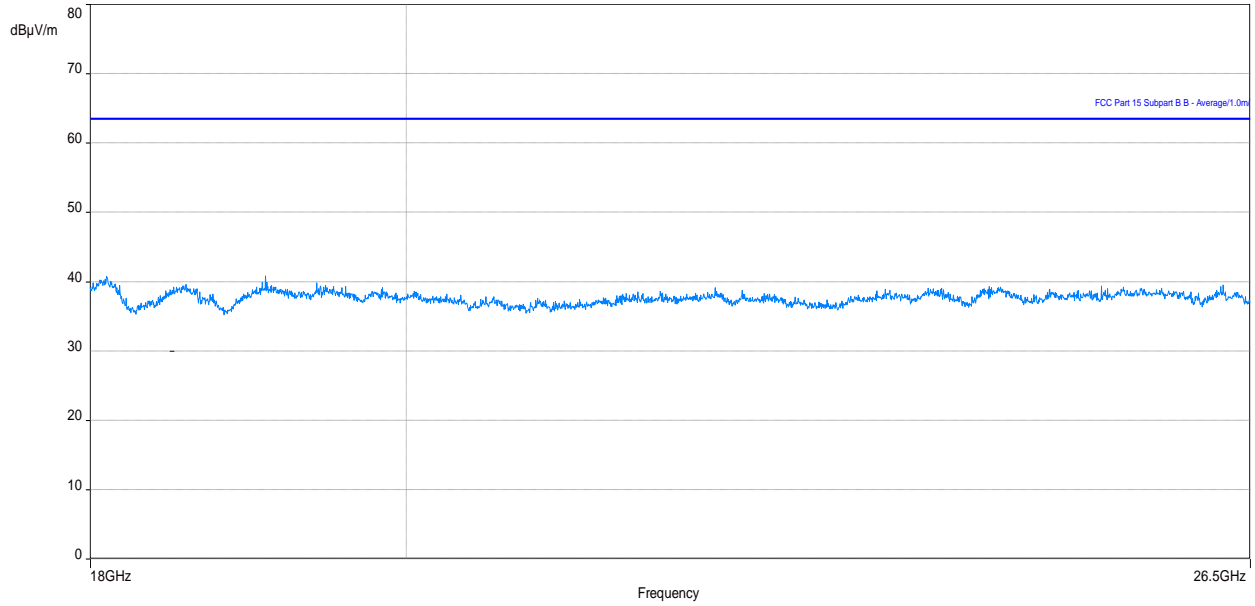
Frequency (MHz)	Level Average (dBµV/m)	Limit Average (dBµV/m)	Margin to FCC part 15 Class B (dB)	Height (m)	Azimuth (degrees)	Polarization	Correction (dB)
17896.58108	46.54	53.96	-7.42	4.00	-0.25	Vertical	19.94
17900.13559	46.24	53.96	-7.72	4.00	31.25	Horizontal	20.02

Table 32: RE test results from 10 to 18 GHz for Part 27 (Config - MR1, Mid channel)

Frequency (MHz)	Level (dBµV/m)	EIRP Limit (dBµV/m)	Margin to (dB)	Height (m)	Azimuth (degrees)	Polarization	Correction (dB)
17896.58108	46.54	82.2	-35.66	4.00	-0.25	Vertical	19.94
17900.13559	46.24	82.2	-35.96	4.00	31.25	Horizontal	20.02

Note: In the table/Plot above, no emissions exceed the Part 27 radiated spurious emissions limit when converted to dBuV/m. For final spurious emissions measurements to FCC Part 27, see antenna port conducted emissions in applicable test report.

Figure 36: Plot of RE at 1m from 18 to 26.5 GHz (Config - MR1, Mid channel)



Note 1: In the plot above No Emissions exceeds the FCC Part 15/ICES 003 limit.

Note 2: In the plot above, no emissions exceed the Part 27 radiated spurious emissions limit when converted to dBuV/m. For final spurious emissions measurements to FCC Part 27, see antenna port conducted emissions in applicable test report.



3.2.10 Test results of RE (Multi RAT/Carrier, MR - Rx, Receiver mode)

Test location: 10-meter Ambient Free Chamber (AFC)

Date tested: 12 -17, March 2021

Tested by: Richer, Christopher & Tom Ott

Test configurations are identified in the section [Configurations of the EUT](#).

For the following test results that have supporting data tables, negative margin values indicate a pass.

Figure 37: Plot of RE at 3 m – 30 to 1000 MHz (Rx mode)

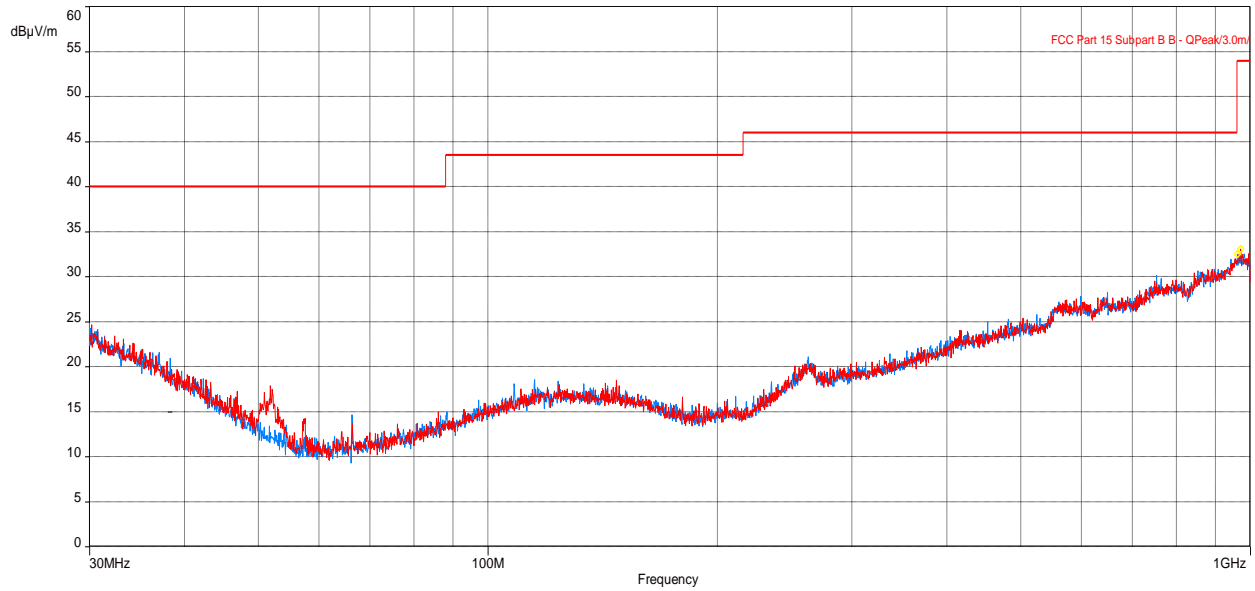


Table 33: RE test results from 30 to 1000 MHz for RSS Gen (Rx mode)

Frequency (MHz)	Level Quasi Peak (dBµV/m)	Limit Quasi-peak (dBµV/m)	Margin to FCC part 15 Class B (dB)	Height (m)	Azimuth (deg)	Polarization	Correction (dB)
971.2532662	26.96	53.98	-27.02	3.34	204.25	Vertical	9.02
961.7296697	26.81	53.98	-27.17	1.01	148.50	Horizontal	8.95

Figure 38: Plot of RE at 3m from 1 to 10 GHz (Rx mode)

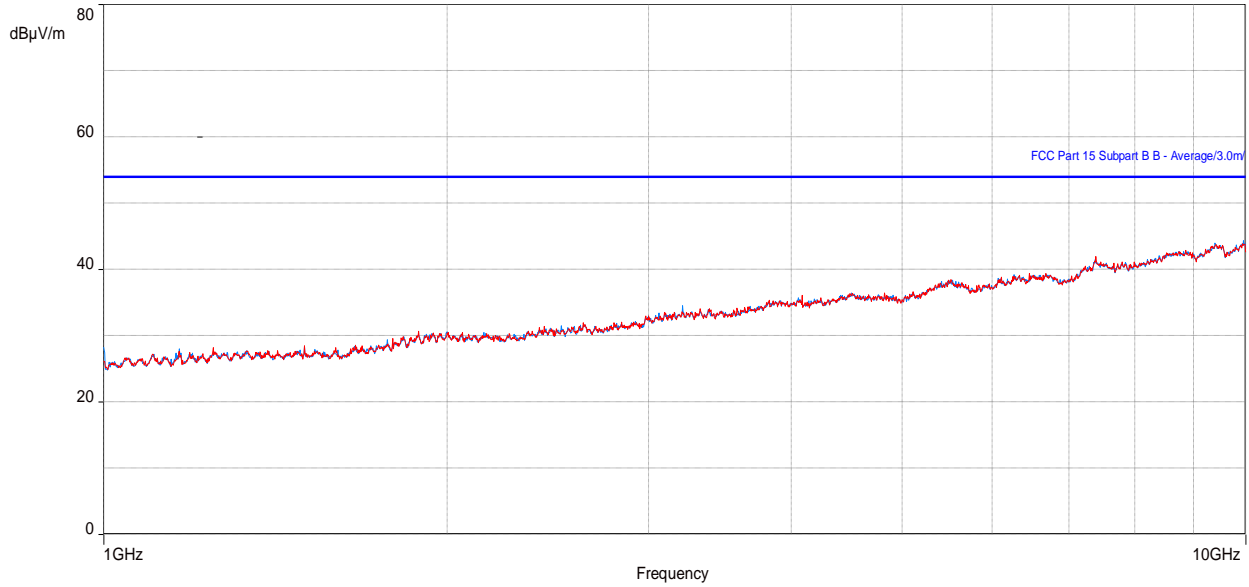


Table 34: RE test results from 1 to 10 GHz for RSS Gen (Rx mode)

Frequency (MHz)	Level Average (dBµV/m)	Limit Average (dBµV/m)	Margin to FCC part 15 Class B (dB)	Height (m)	Azimuth (degrees)	Polarization	Correction (dB)
9403.18109	40.20	53.96	-13.76	3.69	74.25	Horizontal	10.79
9414.772115	40.18	53.96	-13.78	1.62	45.50	Vertical	10.81



Figure 39: Plot of RE at 3m from 10 to 18 GHz (Rx mode)

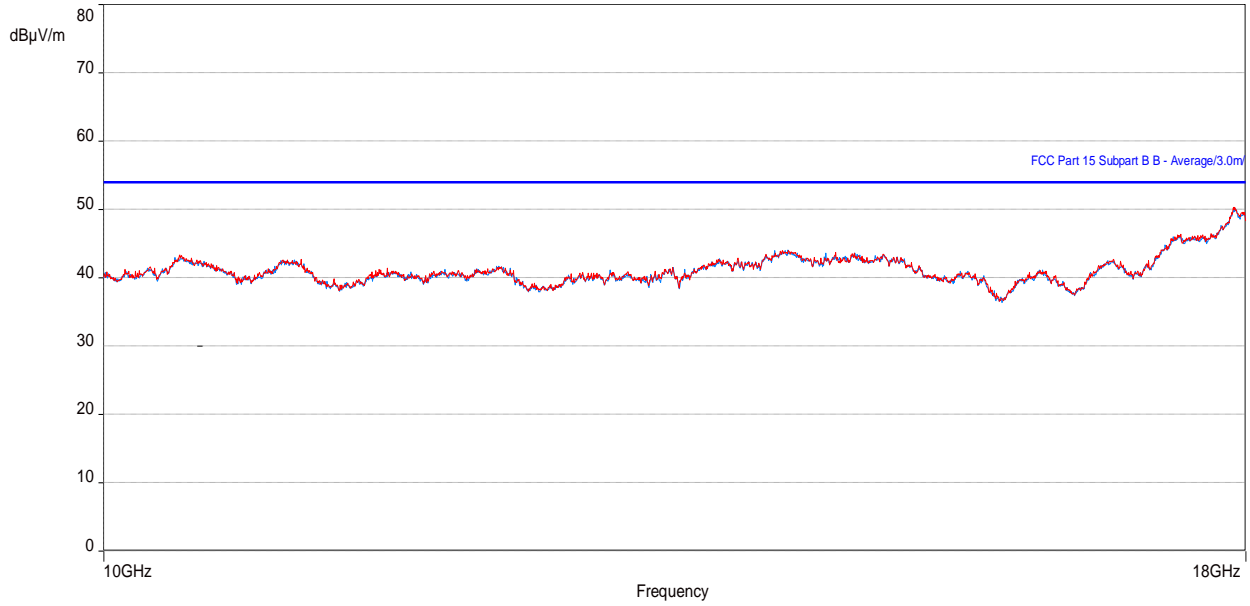
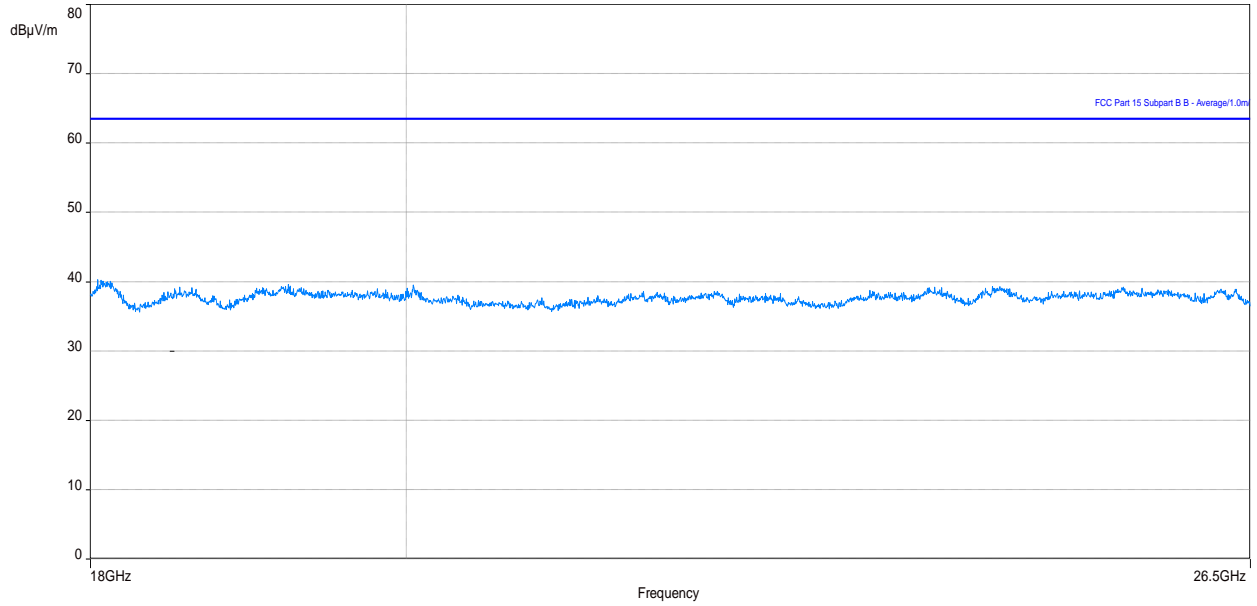


Table 35: RE test results from 10 to 18 GHz for RSS Gen (Rx mode)

Frequency (MHz)	Level Average (dBµV/m)	Limit Average (dBµV/m)	Margin to FCC part 15 Class B (dB)	Height (m)	Azimuth (degrees)	Polarization	Correction (dB)
17901.65226	46.05	53.96	-7.91	1.00	357.25	Horizontal	20.00
17902.30865	45.42	53.96	-8.54	4.00	95.75	Vertical	20.00

Figure 40: Plot of RE at 1m from 18 to 26.5 GHz (Rx mode)



Note 1: In the plot above No Emissions exceeds the RSS Gen limit.

3.2.11 Radiated Emissions test setup pictures

Figure 41: EUT Setup for RE tests (Closeup) – Other than Rx mode

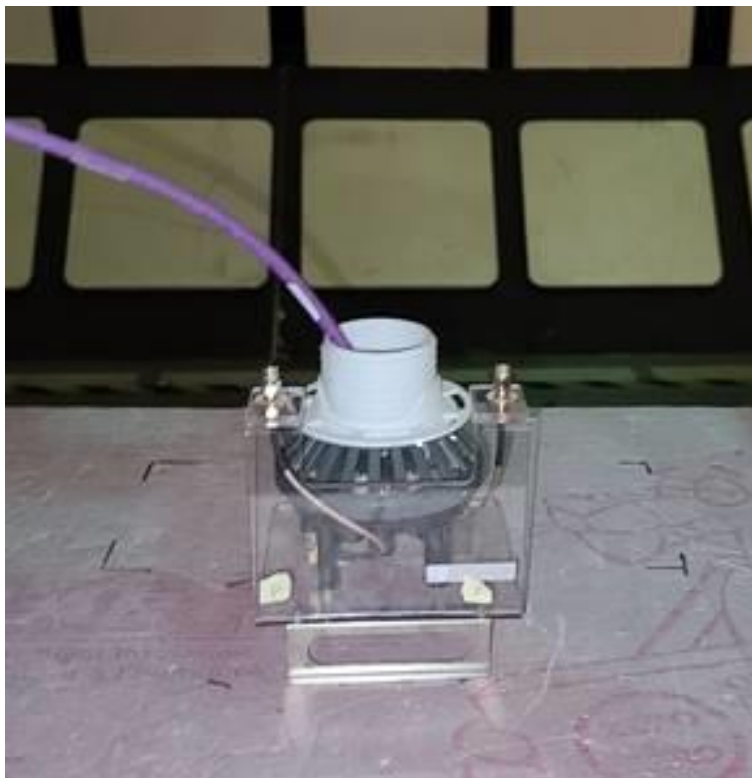


Figure 42: EUT Setup for RE tests at 30 MHz to 1 GHz – Other than Rx mode

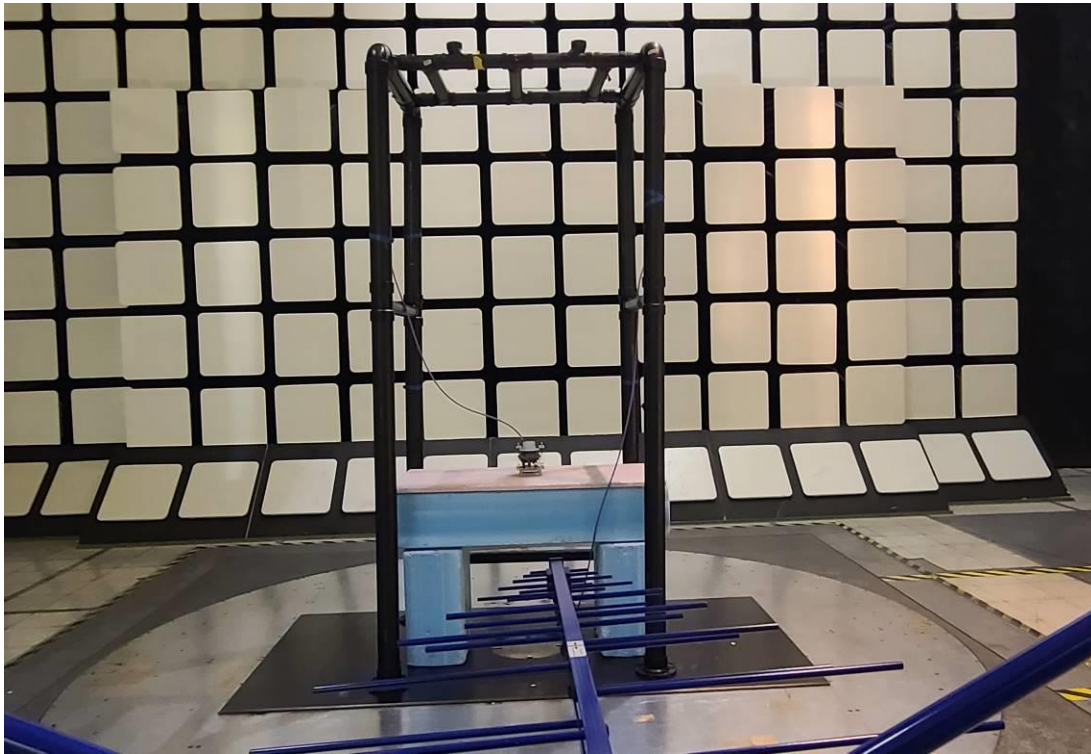


Figure 43: EUT Setup for RE tests for above 1 GHz – Other than Rx mode

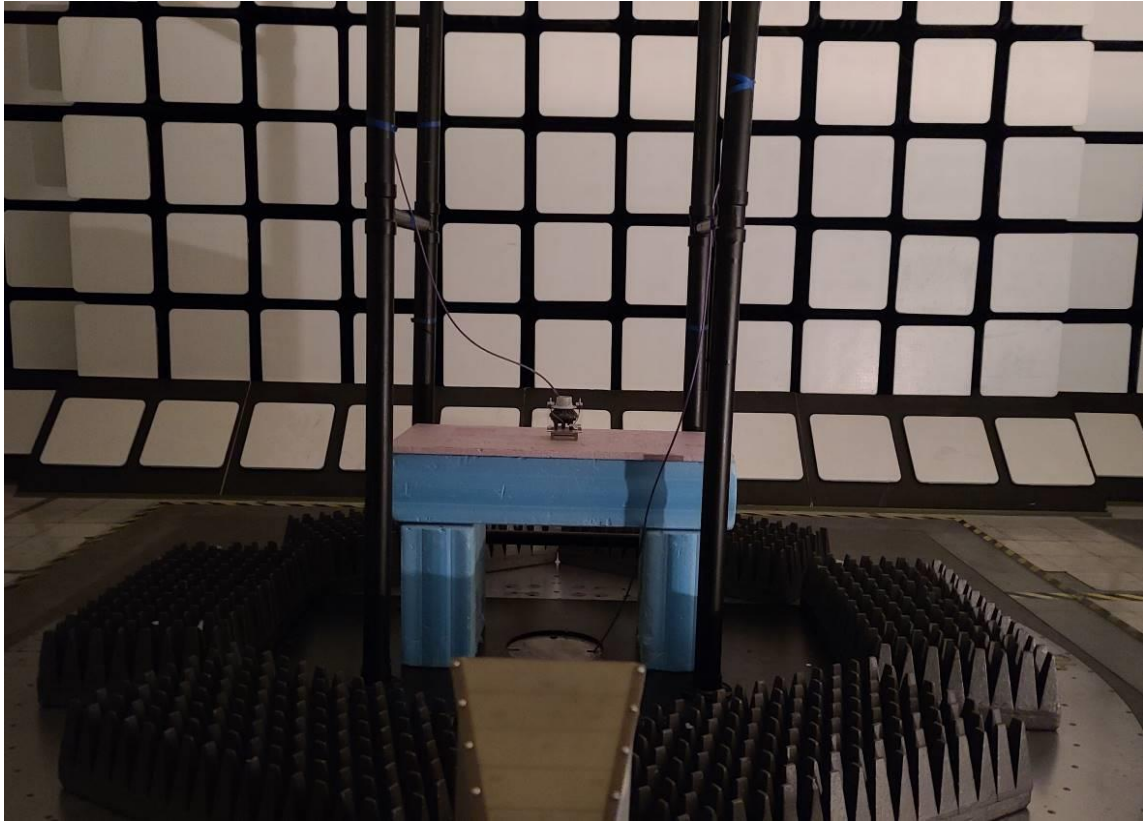
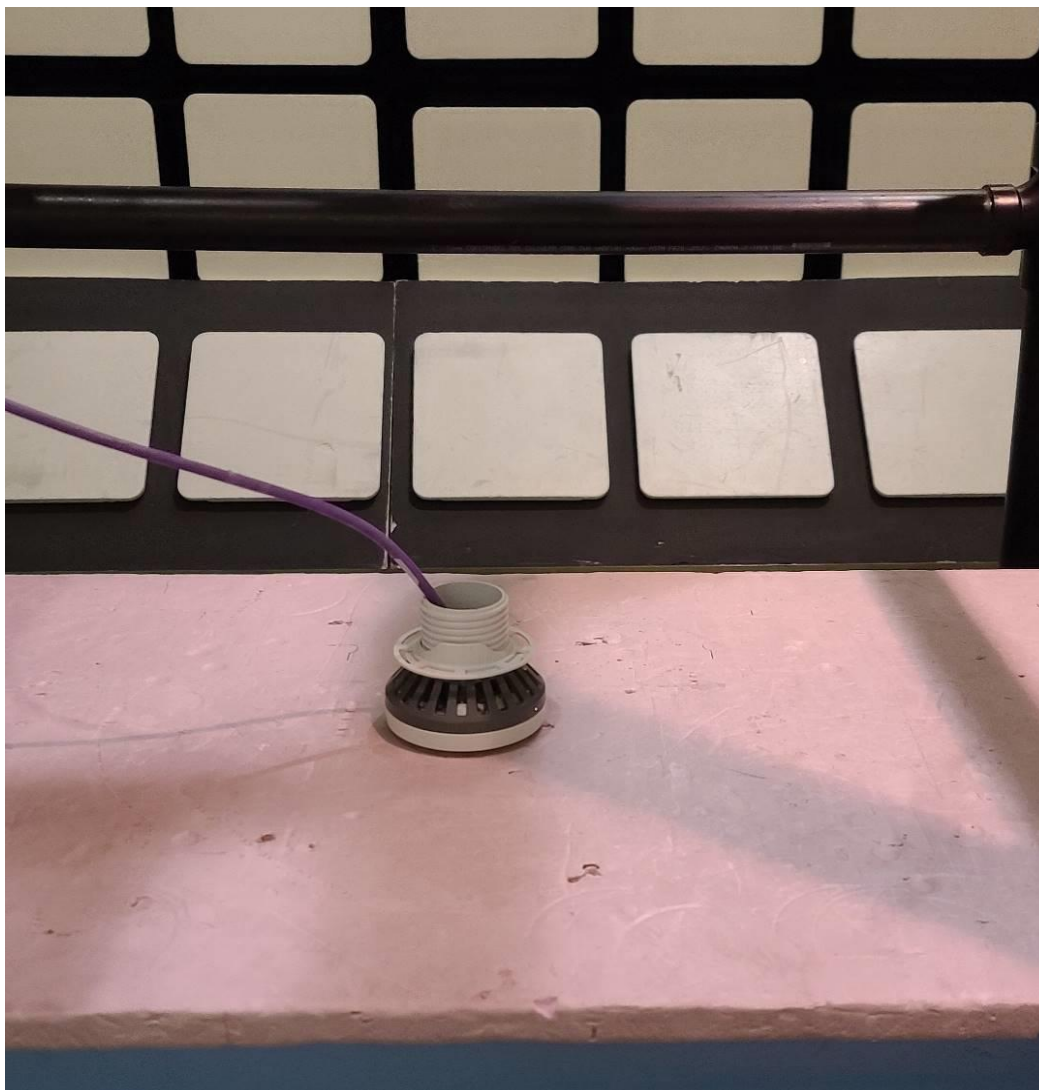


Figure 44: EUT Setup for RE tests, Rx mode only



3.2.12 Test equipment

The equipment used for E-field RE testing was as follows.

Table 36: Test equipment used for RE

Description	Make	Model number	Asset ID	Calibr. date	Calibr. due
EMC Automation Software	Nexio V3.18	BAT-EMC	F0163649	Not required	
EMI Receiver	Rohde & Schwarz	ESU26	SSG013729	2020-03-19	2021-06-19
Coaxial Cable	Huber & Suhner	104PEA	SSG012041	2021-01-05	2022-01-05
Coaxial Cable	Huber & Suhner	106A	SSG013841	2021-01-05	2022-01-05
Pre-Amplifier	Hp	8447D	LAVE04346	2020-09-10	2021-09-10
Coaxial Cable	Huber & Suhner	106A	SSG012711	2021-01-05	2022-01-05
Bilog Antenna	Teseq	6111D	SSG013955	2019-12-03	2021-06-03
EMI Receiver	Rohde & Schwarz	ESU40	SSG013672	2020-10-29	2021-10-29
Coaxial Cable	Micro-Coax	UFA 210B-1-1500-504504	SSG012376	2021-01-06	2022-01-06
Coaxial Cable	Huber & Suhner	ST18/Nm/Nm/36	SSG012786	2021-01-05	2022-01-05
Pre-Amplifier	BNR	LNA	SSG012360	2020-11-16	2021-11-16
Double Ridged Horn Antenna	Emco	3115	SSG012508	2020-05-11	2021-05-11
Coaxial Cable	Huber & Suhner	101 PEA, Sucoflex	SSG012290	2020-11-04	2022-11-04
Horn Antenna (18 - 26.5 GHz)	Emco	3160-09	SSG012292	2019-08-26	2021-08-26
Horn Antenna (26.5 - 40 GHz)	Emco	3160-10	SSG012294	2019-08-26	2021-08-26
RF Filter: High Pass	Microwave Circuits inc.	H3G02G1	SSG012728	2021-01-06	2022-01-06
Attenuator	Narda	N/A	SSG013687	2021-01-06	2022-01-06

3.2.13 Test conclusion

The RD 2242 B4 has passed the E-field Radiated Emission (RE) tests with respect to the standards/sections listed in section [Executive summary](#).

4. References

The documents, regulations, and standards that are referenced throughout this test report are listed alphabetically as follows.

1. ANSI C63.2-2009, American National Standards Institute for Electromagnetic Noise and Field Strength Instrumentation, 10 Hz to 40 GHz – Specifications.
2. ANSI C63.4-2014, American National Standards Institute for Methods of Measurement of Radio-Noise Emission from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz.
3. CISPR 16 Publications (all parts and sections), Specification for Radio Disturbance and Immunity Measuring Apparatus and Methods - Part 1: Radio Disturbance and Immunity Measuring Apparatus.
4. CISPR 22 (2008, +IS 1, + IS 2, + IS 3: 2012), Information technology equipment - Radio disturbance characteristics - Limits and methods of measurement.
5. FCC Rules for Radio Frequency Devices, Title 47 of the Code of Federal Regulations, Part 2, U.S. Federal Communications Commission.
6. FCC Rules for Radio Frequency Devices, Title 47 of the Code of Federal Regulations, Part 15 Radio Frequency Devices, U.S. Federal Communications Commission.
7. FCC Rules for Radio Frequency Devices, Title 47 of the Code of Federal Regulations, Part 27 Miscellaneous Wireless Communications Services, U.S. Federal Communications Commission.
8. ICES-003 Issue 6 (2016), Spectrum Management and Telecommunications, Interference-Causing Equipment Standard: Information Technology Equipment (ITE) – Limits and methods of measurement.
9. Radio Standards Specification RSS-139, issue 3 (July 2015), Advanced Wireless Services (AWS) Equipment Operating in the Bands 1710 - 1780 MHz and 2110-2180 MHz. Ministry of Industry, Government of Canada.
10. RSS-Gen – General Requirements for Compliance of Radio Apparatus, Issue 5 (March 2019); Ministry of Industry, Government of Canada.

4.1 Appendix A: Abbreviations

The abbreviations of terms used in this document are as follows.

Term	Definition
A	6 dB Coaxial Attenuator (Conducted Immunity)
AAN	Asymmetric Artificial Network (ISN)
AE	Auxiliary equipment
AFC	Ambient Free Chamber
ANSI	American National Standards Institute
AVG	Average detector
BiLog	Biconical Log-Periodic Hybrid antenna (a registered trademark of Schaffner-Chase EMC Limited, 1993)
CDN	Coupling-decoupling Network
CE	Conducted Emissions
CISPR	Comité International Spécial Perturbation Radioélectrique (International Special Committee on Radio Interference)
CSA	Canadian Standards Association
DN/P	Decoupling / Protection Network
EMC	Electromagnetic Compatibility
EMI	Electromagnetic Interference
EUT	equipment under test
GND	Ground
HCP	Horizontal Coupling Plane
HME	Harmonics Measurement Equipment
HV	High Voltage
HVP	High Voltage Probe
h/w	hardware
IC	Industry Canada
ICES	Canadian Specification: ICES-003, Issue 3, "Spectrum Management: Interference-causing equipment standard (Digital Apparatus)
IEC	International Electro Technical Association
ISN	Impedance Stabilization Network
ms	millisecond, unless otherwise specified
NA, na	not applicable
PA	Broadband Power Amplifier
PK	Peak Detector



Term	Definition
PS	Power Supply
QP	Quasi-peak Detector
QPA	Quasi-peak Adapter (for the Spectrum Analyzer)
R	100-ohm Injection Resistor (Conducted Immunity)
RBW	Resolution Bandwidth
RE	Radiated Emissions
RF	Radio-Frequency
s/w	software
SA	Spectrum Analyzer, the CISPR 16, ANSI C63.2 Compliant EMI meter
STP	Shielded Twisted Pair
T	50-ohm Coaxial Termination (Conducted Emissions / Immunity)
TL	Transient Limiter
UFA	Uniform field Area
VBW	Video Bandwidth



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