



Canada

# EMC Test Report

## for

### RD 2242 B5 (KRY 901 332/1)

(With LTE & NR signals)

**Tested to:** FCC Part 15 Subpart B / ICES 003  
FCC Part 22 (Section 22.359(a))  
RSS-Gen (Section 7.0)  
RSS-132 (Section 5.5 & 5.6)

#### 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
RSS-Gen 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	
FCC 22.359(a)	Out of band Emissions (RE)	FCC Part 24 / ANSI C63.26	Pass	3.2
RSS-132 / 5.5	Transmitter unwanted Emissions	RSS-133 / ANSI C63.26	Pass	3.2
RSS-132 / 5.6	Receiver Spurious Emissions	RSS-Gen / ANSI C63.4	Pass	3.2

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## 1. Executive summary

This document reports the Electromagnetic Compatibility (EMC) testing performed on the product called RD 2242 B5 (KRY 901 332/1) for Ericsson Canada per project number 7169008761. The objective of the test activities is to evaluate compliance of the product to following EMC regulatory standards.

The RD 2242 B5 (KRY 901 332/1) is verified to comply with the Radiated Emissions requirements of these standards:

- FCC Part 15 Subpart B [5] (Class B)
- FCC Part 22 [7] (Emissions Limitations for public mobile services, Section 22.359(a))
- ICES 003 [8] (Class B)
- RSS-Gen [10] (Receiver emissions Limits, Section 7.0)
- RSS-132 [9] (Transmitter unwanted Emissions, Section 5.5)
- RSS-132[9] (Receiver Spurious Emissions, Section 5.6)

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 B5 (KRY 901 332/1)

**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	<a href="#">3.2</a>
15.107	Conducted Emissions (CE) for AC Power	FCC Part 15/ANSI C63.4		Not applicable EUT is POE powered

**Table 2: Summary of test results for the USA; FCC Part 22, Section 22.359 (a)**

FCC Section	Description	Specification/Method	Pass or Fail	Results in section
22.359 (a)	Emissions Limitations for PUBLIC MOBILE SERVICES – Out of band emissions	FCC Part 22/ ANSI C63.26	Pass	<a href="#">3.2</a>

**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	<a href="#">3.2</a>
6.1	Conducted Emissions (CE) for AC Power	ICES 003/ANSI C63.4		Not applicable EUT is POE 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	<a href="#">3.2</a>
7.2	Conducted Emissions (CE) for AC Power	RSS-Gen / ANSI C63.4		Not applicable EUT is POE powered
7.4	Receiver Conducted Emissions	See antenna port conducted emissions in applicable test report		

**Table 5: Summary of test results for Canada, RSS-132**

RSS-132 Section	Description	Specification/Method	Pass or Fail	Results in section
5.5	Transmitter unwanted Emissions	RSS-132 / ANSI C63.26	Pass	<a href="#">3.2</a>
5.6	Receiver Spurious Emissions	RSS-132 / ANSI C63.26	Pass	<a href="#">3.2</a>

## 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 B5	KRY 901 332/1	R1D

### 2.2 Product overview

The product trade name is RD 2242 B5 (KRY 901 332/1). The RD 2242 products are indoor wireless telecommunication products. They transmit and receives the cellular signals for 4G and 5G wireless systems; and operates from POE (56 VDC).

**Figure 1: The EUT with External antenna (RD 2242 B5)**



**Table 7: Product specifications – Tested RD 2242 B5**

Product data:	Detail
Product	RD 2242 B5, Ph1 Dot, 2T2R
Revision:	R1D
P/N:	KRY 901 332/1
Nominal Voltage:	56Vdc
Operating Temperature:	+5°C to +40°C
Bands	B5
Antennas	2T2R
Output Power per band	2x50mW (FDD)
RAT support	LTE-FDD + WCDMA
	LTE-FDD + NR
IBW	25 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)
Total number of NR carriers	5
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, 10MHz
	WCDMA: 5MHz
	NR: 5, 10, 15, 20MHz
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 tested RD 2242 (KRY 901 332/1) are shown in the section [Configurations of the EUT](#).

## 2.3 Clocks, oscillators, or switching frequencies

The maximum clock frequency used to determine the Radiated Emissions (RE) frequency range to test is 1.0 GHz.

**Table 8** lists all the clock sources (for example, discrete crystals, VCXOs, and DC/DC converter switching frequencies) used in the EUT.

**Table 8: EUT fundamental frequencies**

Fundamental frequencies (MHz)
0.4, 2.0, 10.0, 12.5, 16.667, 40.0, 122.8, 230.0

## 2.4 Product port definition and EUT cable information

**Table 9** identifies all the cables and ports on the EUT. The Environment of the cables is indoor.

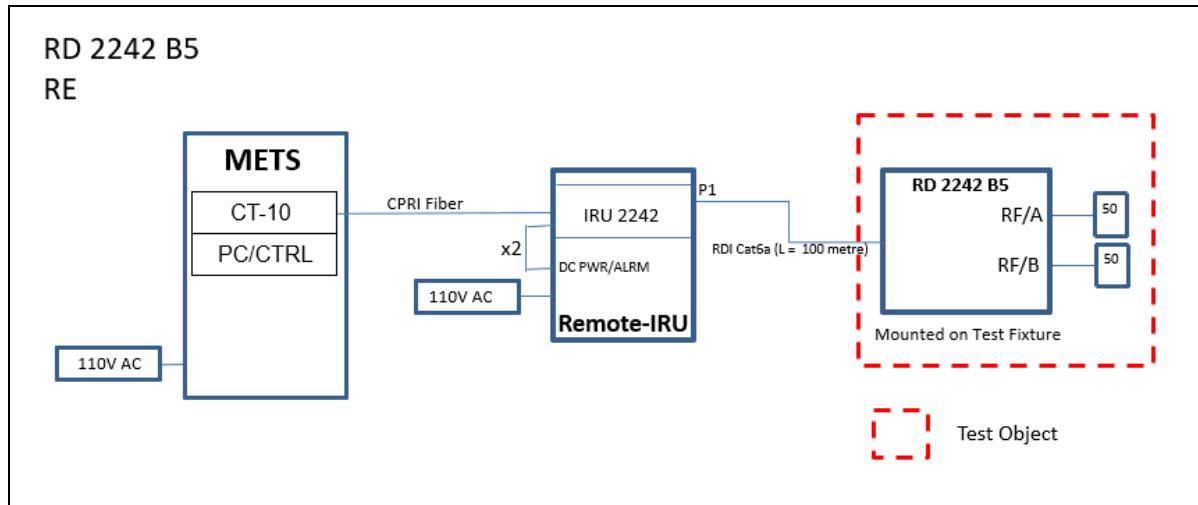
**Table 9: System port definition**

Port Name	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, B5 TX/RX internal test ports	RF	RF probe to Test Fixture	only connects to Test Fixture

## 2.5 Configurations of the EUT

Figure 2 shows the configuration of the EUT for Emissions test.

**Figure 2: Test configuration for Emission tests**



Following RAT/carrier configurations were tested during this Radiated Emissions evaluations.

- Radiated Emissions Single RAT / Single Carrier Configurations, SC (NR)
- Radiated Emissions Single RAT / Multi Carriers Configurations, MC (NR)
- Radiated Emissions Multi RAT/Carrier Configurations, MR (LTE + NR)
- Radiated Emissions – Receiver mode only

## 2.5.1 Radiated Emissions Single RAT / Single Carrier Configurations, **SC (NR)**

Figure 3: Tested carrier detail – Single RAT /Single carrier (NR)

Tested carrier detail – Single RAT /Single carrier (NR)		
B5 PORT (RF/A, RF/B)		
<b>SR NR Config SC1 BW 5M Carrier setups for Emissions</b>		
Carrier:	<b>Middle</b>	
1	B5: NR, <b>5MHz</b> , 881.5MHz	
<b>SR NR Config SC2 BW 10M Carrier setups for Emissions</b>		
Carrier:	<b>Middle</b>	
1	B5: NR, <b>10MHz</b> , 881.5MHz	
<b>SR NR Config SC3 BW 15M Carrier setups for Emissions</b>		
Carrier:	<b>Middle</b>	
1	B5: NR, <b>15MHz</b> , 881.5MHz	
<b>SR NR Config SC4 BW 20M Carrier setups for Emissions</b>		
Carrier:	<b>Middle</b>	
1	B5: NR, <b>20MHz</b> , 881.5MHz	
<b>SR NR Config SC3 Middle Carrier setups for Emissions</b>		
Carrier:	<b>Middle</b>	
1	B5: NR, <b>15MHz</b> , 881.5MHz	
<b>SR NR Config SC3 Bottom Carrier setups for Emissions</b>		
Carrier:	<b>Bottom</b>	
1	B5: NR, <b>15MHz</b> , 876.5MHz	
<b>SR NR Config SC3 Top Carrier setups for Emissions</b>		
Carrier:	<b>Top</b>	
1	B5: NR, <b>15MHz</b> , 886.5MHz	

**Note:** Radiated Emissions measurements were compared between above 4 NR carrier setups. **SC3** was found to have higher emissions than **SC1**, **SC2** and **SC4**. All plots with single NR carrier in this report are therefore measured using **SC3** carrier setup.

## 2.5.2 Radiated Emissions Single RAT / Multi Carriers Configurations, MC (NR)

Figure 4: Tested carrier detail – Single RAT / Multi carrier (NR)

Single RAT / Multi carrier (NR)		
B5 PORT (RF/A, RF/B)		
<b>SR NR Config MC1 Carrier setups for Emissions</b>		
Carrier:	<b>Middle</b>	
1	B5: NR, 5MHz, 871.5MHz	
2	B5: NR, 5MHz, 876.5MHz	
3	B5: NR, 15MHz, 886.5MHz	
<b>SR NR Config MC2 Carrier setups for Emissions</b>		
Carrier:	<b>Middle</b>	
1	B5: NR, 10MHz, 874MHz	
2	B5: NR, 15MHz, 886.5MHz	

**Note:** Radiated Emissions measurements were compared between **MC1**, and **MC2**. **MC2** was found to have higher emissions. All plots with Single RAT/Multi carrier in this report are therefore measured using **MC2** Middle channel carrier setups.

## 2.5.3 Radiated Emissions Multi RAT/Carrier Configurations, MR (LTE + NR)

Figure 5: Tested carrier detail – MultiCarrier / Multi RAT Configuration

MultiCarrier / Multi RAT Configuration		
B5 PORT (RF/A, RF/B)		
LTE+NR		
<b>MR LTE+NR Config MR-1 Carrier setups for Emissions</b>		
Carrier:	<b>Middle</b>	
1	B5: LTE, 5MHz, 874MHz	
2	B5: NR, 15MHz, 884MHz	
<b>MR LTE+NR Config MR-2 Carrier setups for Emissions</b>		
Carrier:	<b>Middle</b>	
1	B5: LTE, 5MHz, 871.5MHz	
2	B5: LTE, 5MHz, 876.5MHz	
3	B5: NR, 15MHz, 886.5MHz	

**Note:** Radiated Emissions measurements were compared between **MR1**, and **MR2**. **MR2** was found to have higher emissions than **MR1**. All plots with Multi RAT/Multi carrier in this report are therefore measured using **MR2** Middle channel carrier configuration.

## 2.6 Modifications of the EUT during testing

The EUT was not modified prior to or during testing.

## 2.7 Inventory of the EUT and support equipments

The following tables identifies the inventory of the EUT.

**Table 10: Inventory of the EUT (RE tests)**

Equipment Role	Product Name	Product Number	Release	Product Serial#
EUT	RD 2242 B5	KRY 901 332/1	R1D	TD3T930438
Support	RIE (Remote IRU Enclosure)	1/BFL 901 141/1	R3A	BW90100004
Support	IRU 2242	KRC 161 444/3	R1B	D825358526
Support	Ph-1 Dot Test Fixture	na	na	na
SFP+	Optical SFP+, LC Dual, SM, 10G, 1.4km	RDH 102 65/2	na	
Cable	IRU CPRI, Fiber, LC, SM, 20m	na	na	na
Cable	RDI cable: 100m Cat6A, F/FTP, M-M	na	na	na
TEST SET	METS-Lite, CT-10	LPC 102 487/1	R1C	T01F311639
<b>Software info</b>				
EUT SW: R79FE				

### 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 (RE)

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 11: RE test requirements**

Requirement	Method	Country of application
FCC Part 15, Subpart B	FCC Part 15 / ANSI C63.4	USA
FCC Part 22 (Section 22.359(a))	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-132 (Section 5.5 & 5.6)	ANSI C63.26	Canada

The limits of the RE tests are as follows.

**Table 12: 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 $\mu$ 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 <sup>1</sup>	Average

**Table 13: Tx unwanted Emissions limits for FCC Part 22, & RSS-132**

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

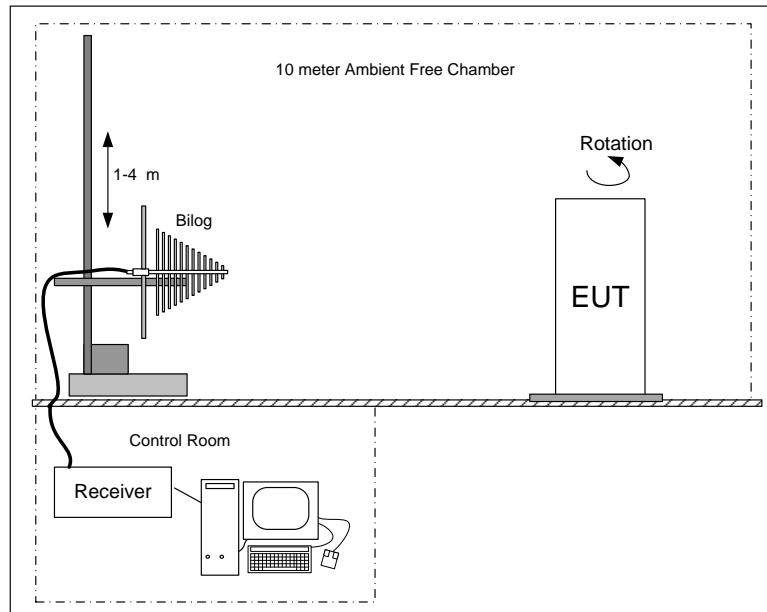
### 3.2.2 Test procedure

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 11](#).

- 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 polarization 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 6: 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 $\mu$ 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 $\mu$ 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:

- $\pm 3.8$  dB between 30 MHz and 1 GHz
- $\pm 4.7$  dB between 1 GHz and 10 GHz

### 3.2.5 Test results of RE (Single RAT/Single carrier – SC3, NR 15MHz-Bottom channel)

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

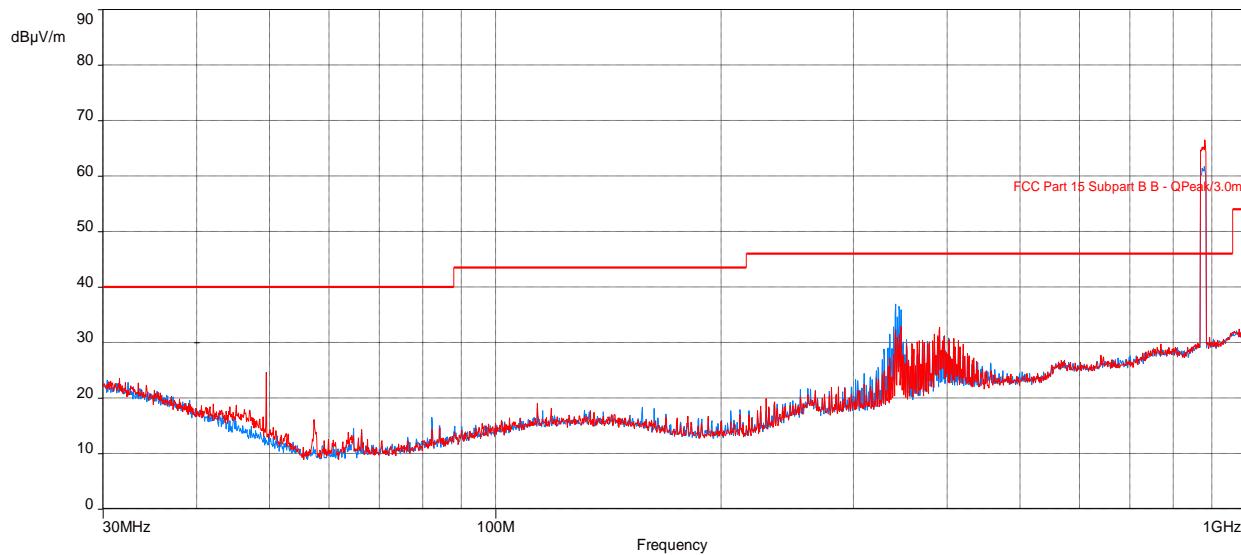
Date tested: 13 – 17, November 2020

Tested by: Kasi Sivaratnam & 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 7: Plot of RE at 3 m – 30 to1000 MHz (NR 15MHz – Bot channel)**



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

**Table 14: RE test results from 30 to 1000 MHz for FCC Part 15 (NR 15MHz – Bot channel)**

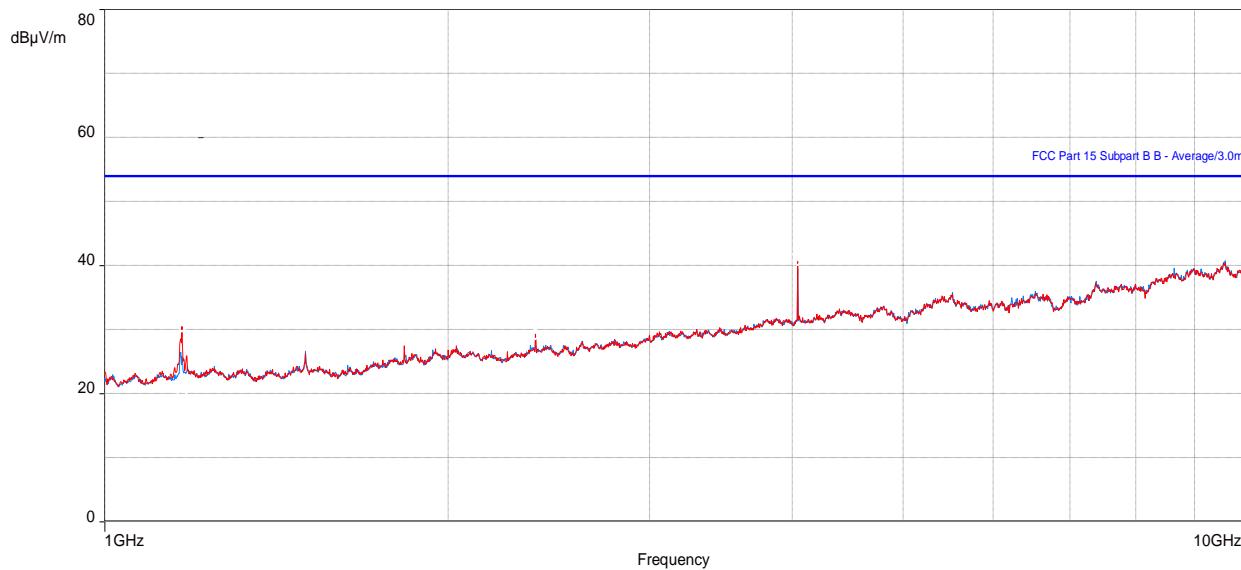
Frequency (MHz)	Level Quasi Peak (dB $\mu$ V/m)	Limit Quasi-peak (dB $\mu$ V/m)	Margin to FCC part 15 Class B (dB)	Height (m)	Azimuth (deg)	Polarization	Correction (dB)
339.2466954	25.02	46.02	-21.00	3.56	182.50	Horizontal	-4.83
341.292391	27.76	46.02	-18.26	1.14	197.25	Horizontal	-4.74
345.0408941	30.59	46.02	-15.43	3.33	182.75	Horizontal	-4.65
347.1903205	24.99	46.02	-21.03	1.11	196.75	Horizontal	-4.56

**Table 15: RE test results from 30 to 1000 MHz for FCC Part 22 (NR 15MHz – Bot channel)**

Frequency (MHz)	Level (dB $\mu$ V/m)	EIRP Limit (dB $\mu$ V/m)	Margin to (dB)	Height (m)	Azimuth (deg)	Polarization	Correction (dB)
339.2466954	25.02	82.2	-57.18	3.56	182.50	Horizontal	-4.83
341.292391	27.76	82.2	-54.44	1.14	197.25	Horizontal	-4.74
345.0408941	30.59	82.2	-51.61	3.33	182.75	Horizontal	-4.65
347.1903205	24.99	82.2	-57.21	1.11	196.75	Horizontal	-4.56

**Note:** In the table/Plot above, no emissions exceed the Part 22 radiated spurious emissions limit when converted to dB $\mu$ V/m. For final spurious emissions measurements to FCC Part 22, see antenna port conducted emissions in applicable test report.

**Figure 8: Plot of RE at 3m from 1 to 10GHz (NR 15MHz – Bot channel)**



**Table 16: RE test results from 1 to 10 GHz for FCC Part 15 (NR 15MHz – 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)
1168.629167	20.75	53.96	-33.21	3.34	335.50	Vertical	-13.26
2385.009936	23.39	53.96	-30.57	1.94	148.75	Vertical	-8.46
4045.412179	40.90	53.96	-13.06	1.73	62.25	Vertical	-3.35

**Table 17: RE test results from 1 to 10 GHz for Part 22 (NR 15MHz – Bot channel)**

Frequency (MHz)	Level (dBµV/m)	EIRP Limit (dBµV/m)	Margin to (dB)	Height (m)	Azimuth (degrees)	Polarization	Correction (dB)
1168.629167	20.75	82.2	-61.45	3.34	335.50	Vertical	-13.26
2385.009936	23.39	82.2	-58.81	1.94	148.75	Vertical	-8.46
4045.412179	40.90	82.2	-41.3	1.73	62.25	Vertical	-3.35

**Note:** In the table/Plot above, no emissions exceed the Part 22 radiated spurious emissions limit when converted to dBµV/m. For final spurious emissions measurements to FCC Part 22, see antenna port conducted emissions in applicable test report.

### 3.2.6 Test results of RE (Single RAT/Single carrier-SC3, NR 15MHz-Middle channel)

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

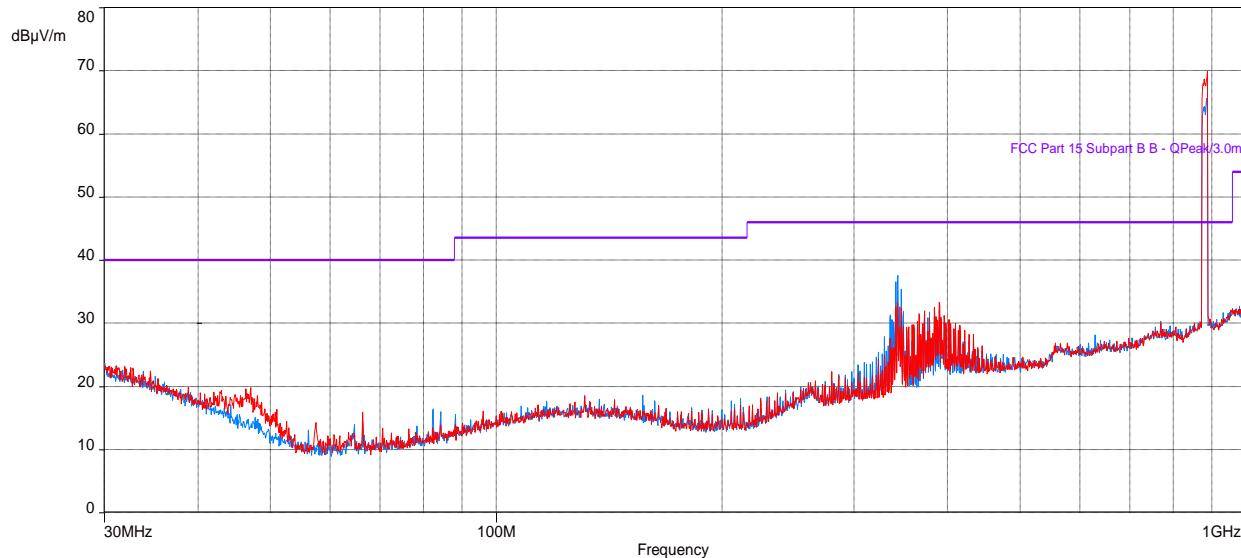
Date tested: 13 – 17, November 2020

Tested by: Kasi Sivaratnam & 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 9: Plot of RE at 3 m – 30 to1000 MHz (NR 15MHz – Mid channel)**



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

**Table 18: RE test results from 30 to 1000 MHz for FCC Part 15 (NR 15MHz – Mid channel)**

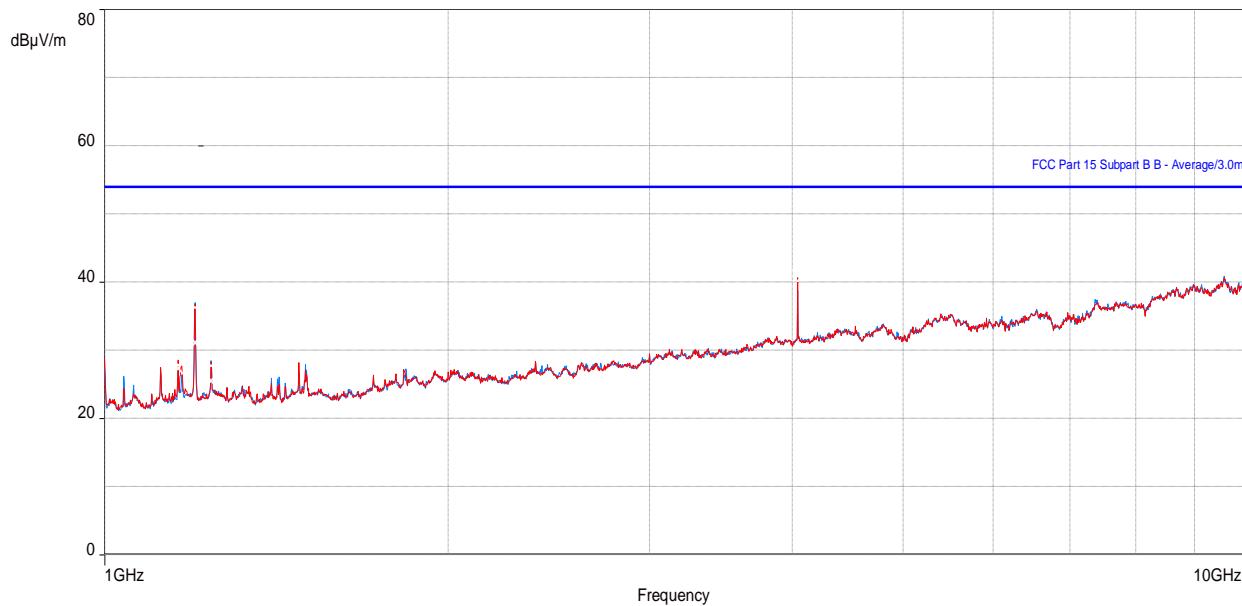
Frequency (MHz)	Level Quasi Peak (dB $\mu$ V/m)	Limit Quasi-peak (dB $\mu$ V/m)	Margin to FCC part 15 Class B (dB)	Height (m)	Azimuth (deg)	Polarization	Correction (dB)
341.0884551	36.19	46.02	-9.83	1.04	196.75	Horizontal	-4.74
341.0967149	34.86	46.02	-11.16	1.11	9.75	Horizontal	-4.74
343.1316633	33.73	46.02	-12.29	1.05	197.25	Horizontal	-4.73
346.9813749	33.06	46.02	-12.96	3.73	211.50	Horizontal	-4.56

**Table 19: RE test results from 30 to 1000 MHz for FCC Part 22 (NR 15MHz – Mid channel)**

Frequency (MHz)	Level (dB $\mu$ V/m)	EIRP Limit (dB $\mu$ V/m)	Margin to (dB)	Height (m)	Azimuth (deg)	Polarization	Correction (dB)
341.0884551	36.19	82.2	-46.01	1.04	196.75	Horizontal	-4.74
341.0967149	34.86	82.2	-47.34	1.11	9.75	Horizontal	-4.74
343.1316633	33.73	82.2	-48.47	1.05	197.25	Horizontal	-4.73
346.9813749	33.06	82.2	-49.14	3.73	211.50	Horizontal	-4.56

**Note:** In the table/Plot above, no emissions exceed the Part 22 radiated spurious emissions limit when converted to dB $\mu$ V/m. For final spurious emissions measurements to FCC Part 22, see antenna port conducted emissions in applicable test report.

**Figure 10: Plot of RE at 3m from 1 to 10GHz (NR 15MHz – Mid channel)**



**Table 20: RE test results from 1 to 10 GHz for FCC Part 15 (NR 15MHz – 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)
1159.822756	27.31	53.96	-26.65	2.93	248.50	Vertical	-13.32
4045.412179	40.96	53.96	-13.00	1.73	62.25	Vertical	-3.35
1199.91859	31.09	53.96	-22.87	2.31	11.75	Horizontal	-13.02

**Table 21: RE test results from 1 to 10 GHz for Part 22 (NR 15MHz – Mid channel)**

Frequency (MHz)	Level (dBμV/m)	EIRP Limit (dBμV/m)	Margin to (dB)	Height (m)	Azimuth (degrees)	Polarization	Correction (dB)
1159.822756	27.31	82.2	-54.89	2.93	248.50	Vertical	-13.32
4045.412179	40.96	82.2	-41.24	1.73	62.25	Vertical	-3.35
1199.91859	31.09	82.2	-51.11	2.31	11.75	Horizontal	-13.02

**Note:** In the table/Plot above, no emissions exceed the Part 22 radiated spurious emissions limit when converted to dB $\mu$ V/m. For final spurious emissions measurements to FCC Part 22, see antenna port conducted emissions in applicable test report.

### 3.2.7 Test results of RE (Single RAT/Single carrier-SC3, NR 15MHz-Top channel)

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

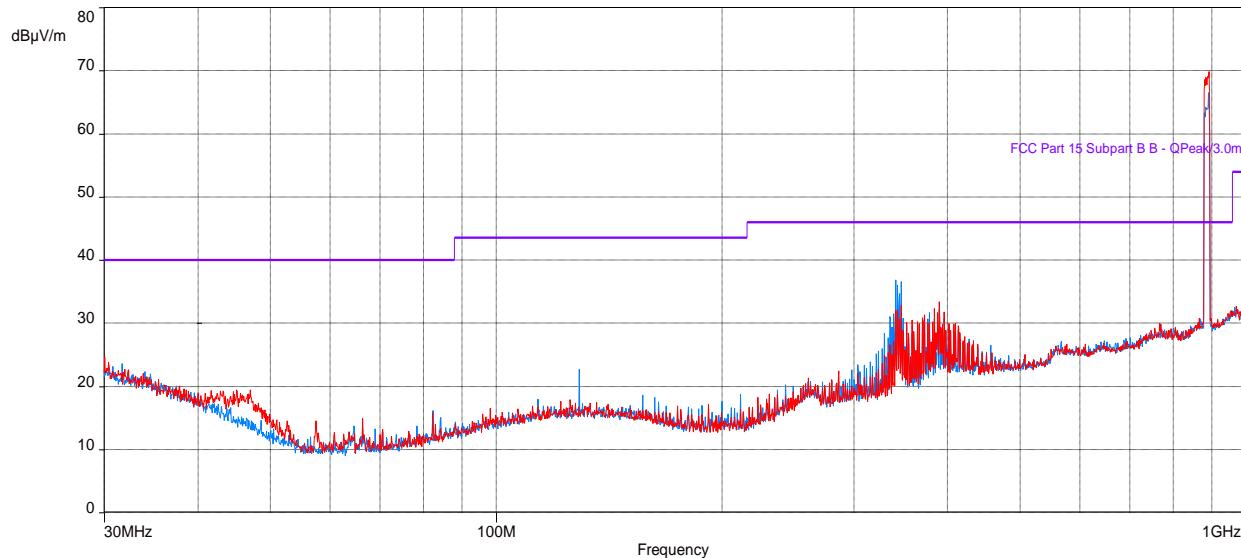
Date tested: 13 – 17, November 2020

Tested by: Kasi Sivaratnam & 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 11: Plot of RE at 3 m – 30 to1000 MHz (NR 15MHz – Top channel)**



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

**Table 22: RE test results from 30 to 1000 MHz for FCC Part 15 (NR 15MHz – Top channel)**

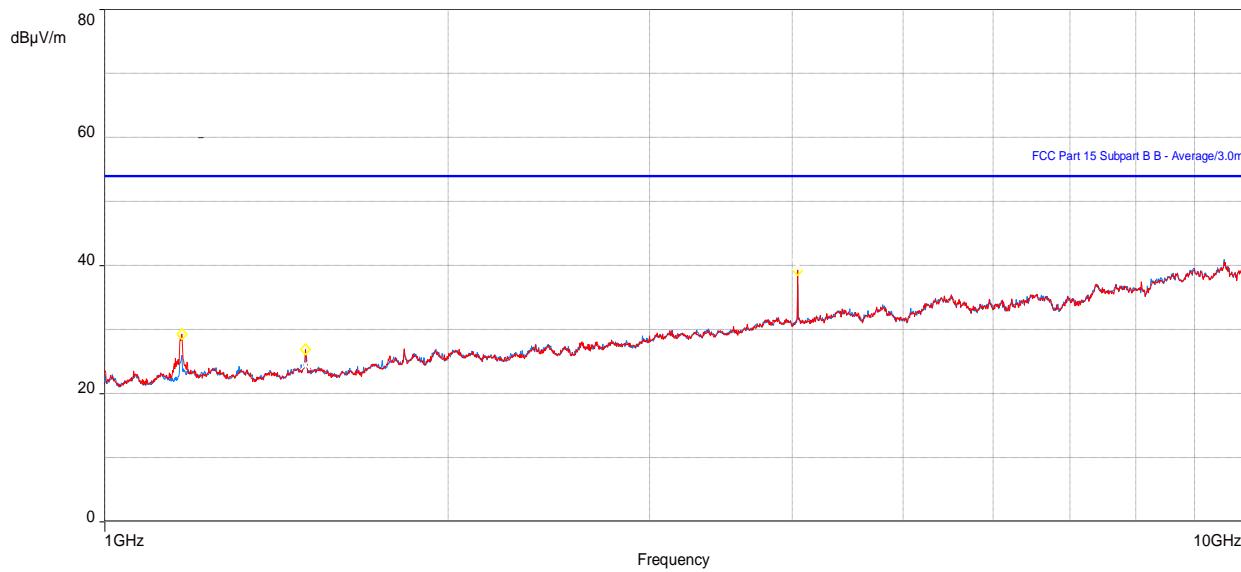
Frequency (MHz)	Level Quasi Peak (dBµV/m)	Limit Quasi-peak (dBµV/m)	Margin to FCC part 15 Class B (dB)	Height (m)	Azimuth (deg)	Polarization	Correction (dB)
341.0749936	36.49	46.02	-9.53	1.04	190.00	Horizontal	-4.74
343.0381572	35.57	46.02	-10.45	1.00	189.75	Horizontal	-4.74
346.9042885	35.68	46.02	-10.34	1.00	189.75	Horizontal	-4.57

**Table 23: RE test results from 30 to 1000 MHz for FCC Part 22 (NR 15MHz – Top channel)**

Frequency (MHz)	Level (dBµV/m)	EIRP Limit (dBµV/m)	Margin to (dB)	Height (m)	Azimuth (deg)	Polarization	Correction (dB)
341.0749936	36.49	82.2	-45.71	1.04	190.00	Horizontal	-4.74
343.0381572	35.57	82.2	-46.63	1.00	189.75	Horizontal	-4.74
346.9042885	35.68	82.2	-46.52	1.00	189.75	Horizontal	-4.57

**Note:** In the table/Plot above, no emissions exceed the Part 22 radiated spurious emissions limit when converted to dBµV/m. For final spurious emissions measurements to FCC Part 22, see antenna port conducted emissions in applicable test report.

**Figure 12: Plot of RE at 3m from 1 to 10GHz (NR 15MHz – Top channel)**



**Table 24: RE test results from 1 to 10 GHz for FCC Part 15 (NR 15MHz – Top channel)**

Frequency (MHz)	Level Average (dB $\mu$ V/m)	Limit Average (dB $\mu$ V/m)	Margin to FCC part 15 Class B (dB)	Height (m)	Azimuth (degrees)	Polarization	Correction (dB)
1168.630449	20.96	53.96	-33.00	3.00	335.75	Vertical	-13.26
1500.007051	24.51	53.96	-29.45	3.95	189.50	Vertical	-12.01
4045.412179	40.14	53.96	-13.82	1.66	112.50	Vertical	-3.35

**Table 25: RE test results from 1 to 10 GHz for Part 22 (NR 15MHz – Top channel)**

Frequency (MHz)	Level (dB $\mu$ V/m)	EIRP Limit (dB $\mu$ V/m)	Margin to (dB)	Height (m)	Azimuth (degrees)	Polarization	Correction (dB)
1168.630449	20.96	82.2	-61.24	3.00	335.75	Vertical	-13.26
1500.007051	24.51	82.2	-57.69	3.95	189.50	Vertical	-12.01
4045.412179	40.14	82.2	-42.06	1.66	112.50	Vertical	-3.35

**Note:** In the table/Plot above, no emissions exceed the Part 22 radiated spurious emissions limit when converted to dB $\mu$ V/m. For final spurious emissions measurements to FCC Part 22, see antenna port conducted emissions in applicable test report.

### 3.2.8 Test results of RE (Single RAT/Multi carrier config - MC2, Mid channel)

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

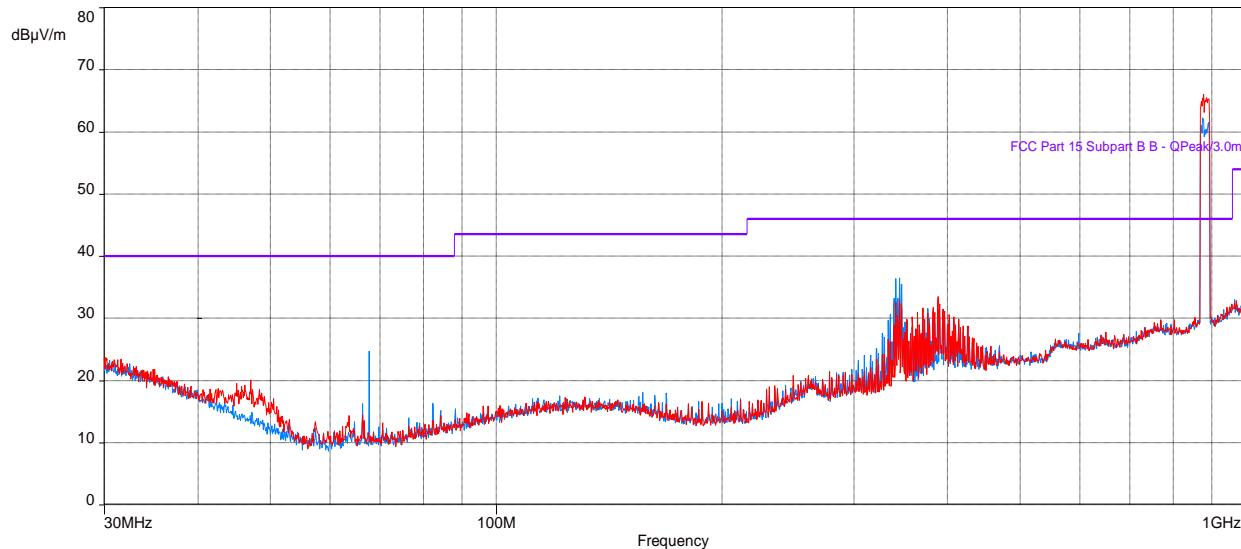
Date tested: 13 – 17, November 2020

Tested by: Kasi Sivaratnam & 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 13: Plot of RE at 3 m – 30 to1000 MHz (MC2 – Mid channel)**



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

**Table 26: RE test results from 30 to 1000 MHz for FCC Part 15 (MC2 – Mid channel)**

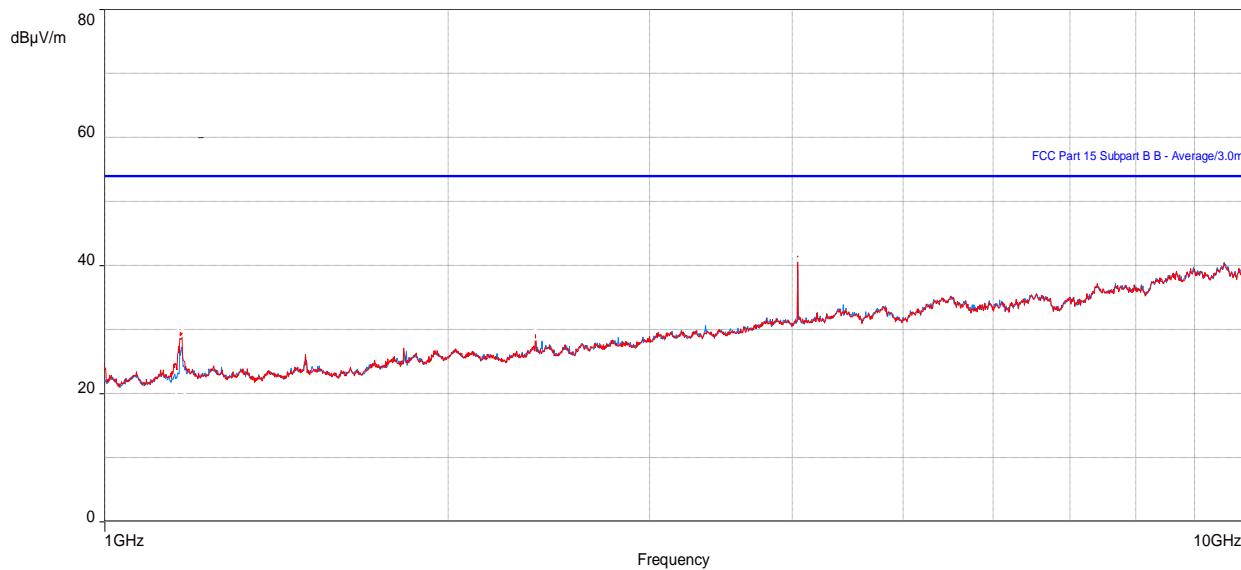
Frequency (MHz)	Level Quasi Peak (dBμV/m)	Limit Quasi-peak (dBμV/m)	Margin to FCC part 15 Class B (dB)	Height (m)	Azimuth (deg)	Polarization	Correction (dB)
341.2172726	28.82	46.02	-17.20	1.27	105.50	Vertical	-4.74
345.1188654	26.54	46.02	-19.48	1.26	98.00	Vertical	-4.65
341.3021249	26.87	46.02	-19.15	3.54	199.00	Horizontal	-4.74
345.0450608	33.24	46.02	-12.78	1.04	197.00	Horizontal	-4.65

**Table 27: RE test results from 30 to 1000 MHz for FCC Part 22 (MC2 – Mid channel)**

Frequency (MHz)	Level (dBμV/m)	EIRP Limit (dBμV/m)	Margin to (dB)	Height (m)	Azimuth (deg)	Polarization	Correction (dB)
341.2172726	28.82	82.2	-53.38	1.27	105.50	Vertical	-4.74
345.1188654	26.54	82.2	-55.66	1.26	98.00	Vertical	-4.65
341.3021249	26.87	82.2	-55.33	3.54	199.00	Horizontal	-4.74
345.0450608	33.24	82.2	-48.96	1.04	197.00	Horizontal	-4.65

**Note:** In the table/Plot above, no emissions exceed the Part 22 radiated spurious emissions limit when converted to dB $\mu$ V/m. For final spurious emissions measurements to FCC Part 22, see antenna port conducted emissions in applicable test report.

**Figure 14: Plot of RE at 3m from 1 to 10GHz (MC2 – Mid channel)**



**Table 28: RE test results from 1 to 10 GHz for FCC Part 15 (MC2– Mid channel)**

Frequency (MHz)	Level Average (dB $\mu$ V/m)	Limit Average (dB $\mu$ V/m)	Margin to FCC part 15 Class B (dB)	Height (m)	Azimuth (degrees)	Polarization	Correction (dB)
1165.129808	20.77	53.96	-33.19	3.00	333.75	Vertical	-13.28
2385.009936	23.34	53.96	-30.62	1.94	360.00	Vertical	-8.46
4045.412179	41.03	53.96	-12.93	1.80	62.25	Vertical	-3.35

**Table 29: RE test results from 1 to 10 GHz for Part 22 (MC2– Mid channel)**

Frequency (MHz)	Level (dB $\mu$ V/m)	EIRP Limit (dB $\mu$ V/m)	Margin to (dB)	Height (m)	Azimuth (degrees)	Polarization	Correction (dB)
1165.129808	20.77	82.2	-61.43	3.00	333.75	Vertical	-13.28
2385.009936	23.34	82.2	-58.86	1.94	360.00	Vertical	-8.46
4045.412179	41.03	82.2	-41.17	1.80	62.25	Vertical	-3.35

**Note:** In the table/Plot above, no emissions exceed the Part 22 radiated spurious emissions limit when converted to dB $\mu$ V/m. For final spurious emissions measurements to FCC Part 22, see antenna port conducted emissions in applicable test report.

### 3.2.9 Test results of RE (Multi RAT/Carrier configuration, MR2 - Mid channel)

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

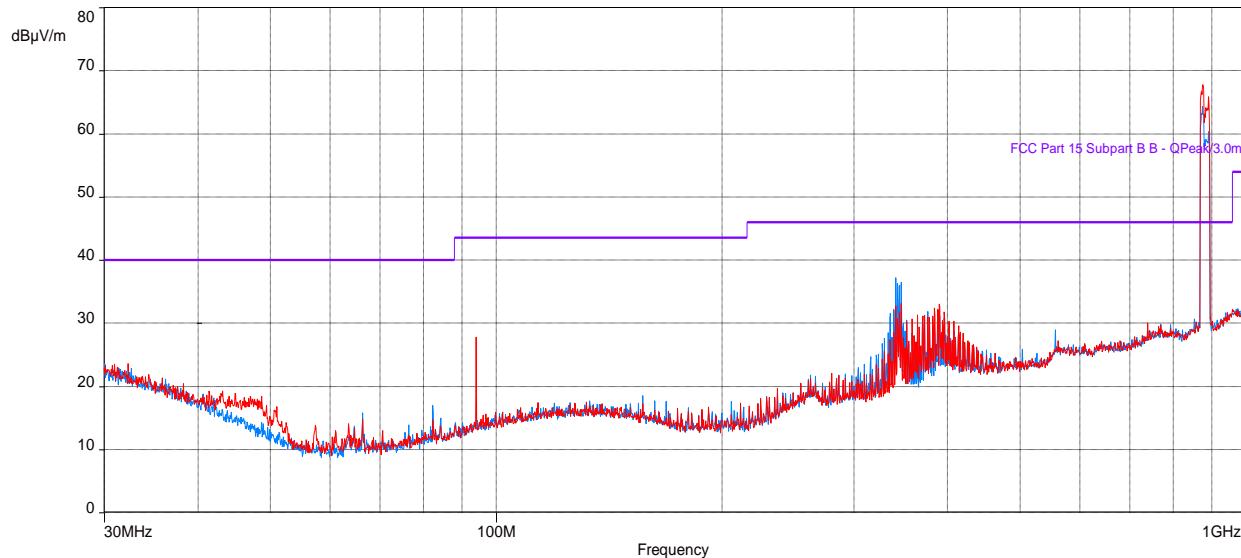
Date tested: 13 – 17, November 2020

Tested by: Kasi Sivaratnam & 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 15: Plot of RE at 3 m – 30 to1000 MHz (MR2 – Mid channel)**



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

**Table 30: RE test results from 30 to 1000 MHz for FCC Part 15 (MR2 – Mid channel)**

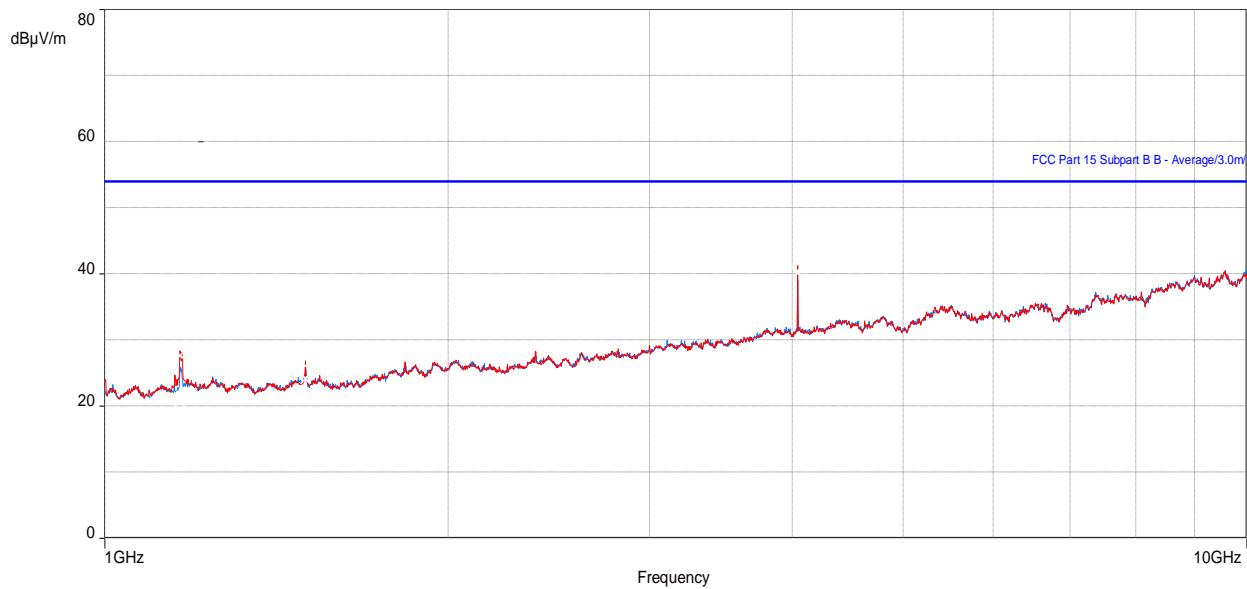
Frequency (MHz)	Level Quasi Peak (dB $\mu$ V/m)	Limit Quasi-peak (dB $\mu$ V/m)	Margin to FCC part 15 Class B (dB)	Height (m)	Azimuth (deg)	Polarization	Correction (dB)
341.0746731	32.41	46.02	-13.61	1.20	83.75	Vertical	-4.74
347.0358303	32.02	46.02	-14.00	1.20	69.50	Vertical	-4.56
341.1383397	33.91	46.02	-12.11	1.04	31.50	Horizontal	-4.74
346.9597821	35.48	46.02	-10.54	1.00	182.75	Horizontal	-4.56

**Table 31: RE test results from 30 to 1000 MHz for FCC Part 22 (MR2 – Mid channel)**

Frequency (MHz)	Level (dB $\mu$ V/m)	EIRP Limit (dB $\mu$ V/m)	Margin to (dB)	Height (m)	Azimuth (deg)	Polarization	Correction (dB)
341.0746731	32.41	82.2	-49.79	1.20	83.75	Vertical	-4.74
347.0358303	32.02	82.2	-50.18	1.20	69.50	Vertical	-4.56
341.1383397	33.91	82.2	-48.29	1.04	31.50	Horizontal	-4.74
346.9597821	35.48	82.2	-46.72	1.00	182.75	Horizontal	-4.56

**Note:** In the table/Plot above, no emissions exceed the Part 22 radiated spurious emissions limit when converted to dB $\mu$ V/m. For final spurious emissions measurements to FCC Part 22, see antenna port conducted emissions in applicable test report.

**Figure 16: Plot of RE at 3m from 1 to 10GHz (MR2 – Mid channel)**



**Table 32: RE test results from 1 to 10 GHz for FCC Part 15 (MR2– Mid channel)**

Frequency (MHz)	Level Average (dB $\mu$ V/m)	Limit Average (dB $\mu$ V/m)	Margin to FCC part 15 Class B (dB)	Height (m)	Azimuth (degrees)	Polarization	Correction (dB)
1163.880449	20.70	53.96	-33.26	3.14	357.25	Vertical	-13.29
1168.920833	21.26	53.96	-32.70	3.00	24.25	Vertical	-13.26
1500.006731	24.16	53.96	-29.80	3.95	299.75	Vertical	-12.01
4045.412179	40.11	53.96	-13.85	1.87	62.25	Vertical	-3.35

**Table 33: RE test results from 1 to 10 GHz for Part 22 (MR2 – Mid channel)**

Frequency (MHz)	Level (dB $\mu$ V/m)	EIRP Limit (dB $\mu$ V/m)	Margin to (dB)	Height (m)	Azimuth (degrees)	Polarization	Correction (dB)
1163.880449	20.70	82.2	-61.50	3.14	357.25	Vertical	-13.29
1168.920833	21.26	82.2	-60.94	3.00	24.25	Vertical	-13.26
1500.006731	24.16	82.2	-58.04	3.95	299.75	Vertical	-12.01
4045.412179	40.11	82.2	-42.09	1.87	62.25	Vertical	-3.35

**Note:** In the table/Plot above, no emissions exceed the Part 22 radiated spurious emissions limit when converted to dB $\mu$ V/m. For final spurious emissions measurements to FCC Part 22, see antenna port conducted emissions in applicable test report.

### 3.2.10 Test results of RE (Receiver Mode Only)

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

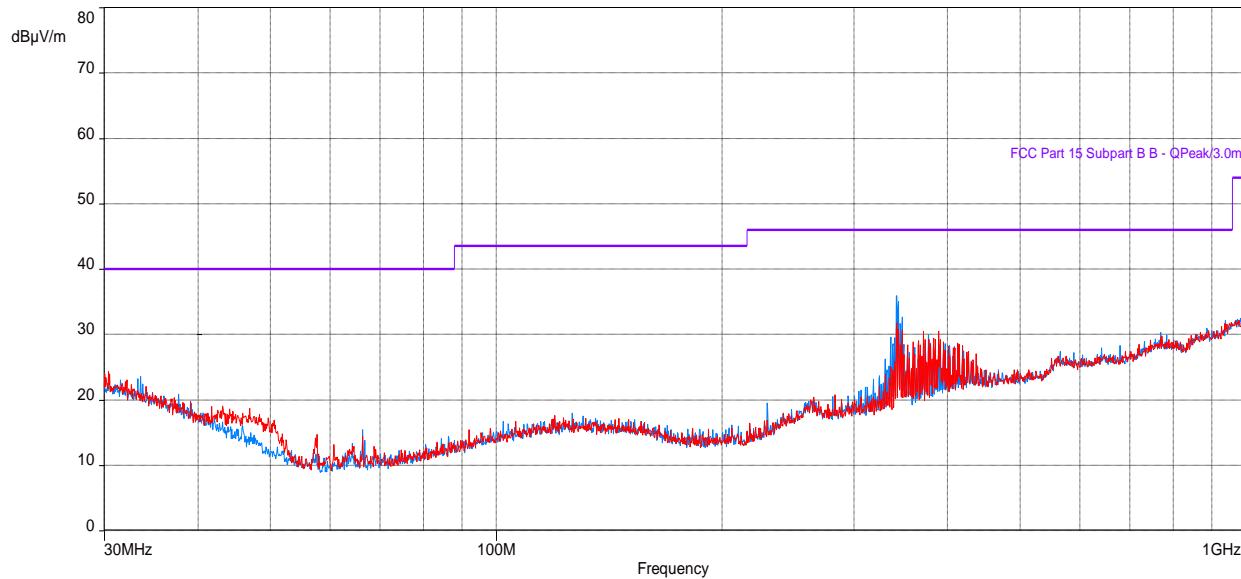
Date tested: 13 – 17, November 2020

Tested by: Kasi Sivaratnam & 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.

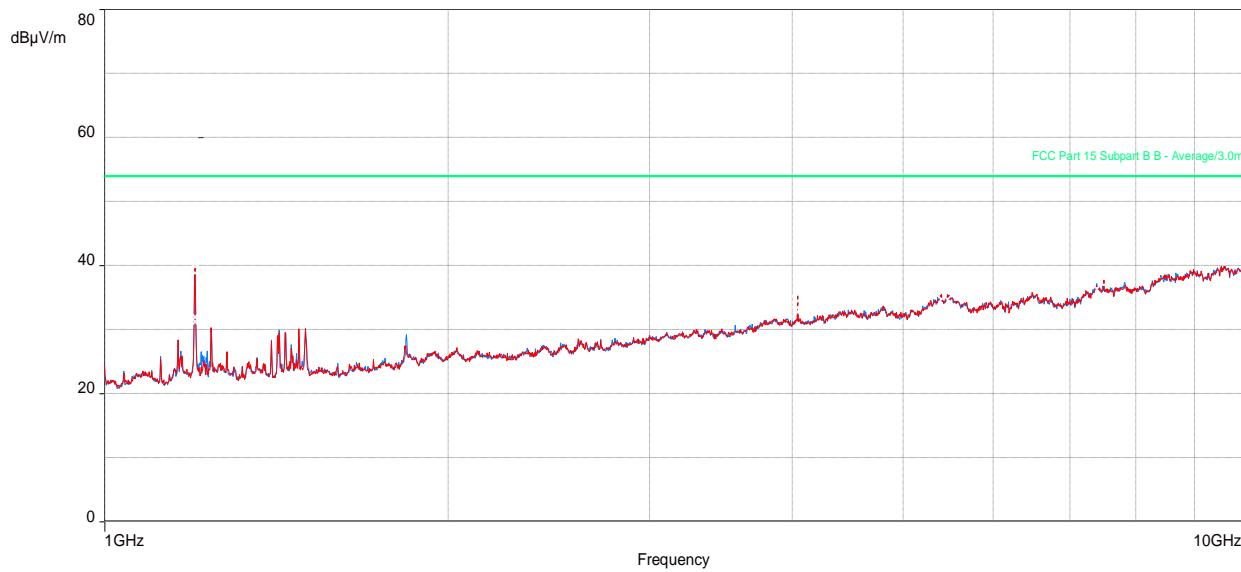
**Figure 17: Plot of RE at 3 m – 30 to1000 MHz (Receiver mode)**



**Table 34: RE test results from 30 to 1000 MHz for RSS-132, Sec 5.6 (Receiver mode)**

Frequency (MHz)	Level Quasi Peak (dBμV/m)	Limit Quasi-peak (dBμV/m)	Margin to RSS-132 (dB)	Height (m)	Azimuth (deg)	Polarization	Correction (dB)
968.4712723	26.41	53.98	-27.57	3.15	254.75	Vertical	8.24
341.9626954	21.58	46.02	-24.44	1.00	189.75	Horizontal	-4.74
344.0138397	23.04	46.02	-22.98	1.04	189.50	Horizontal	-4.65
938.8398815	25.32	46.02	-20.70	1.33	74.75	Horizontal	6.99

**Figure 18: Plot of RE at 3m from 1 to 10GHz (Receiver mode)**

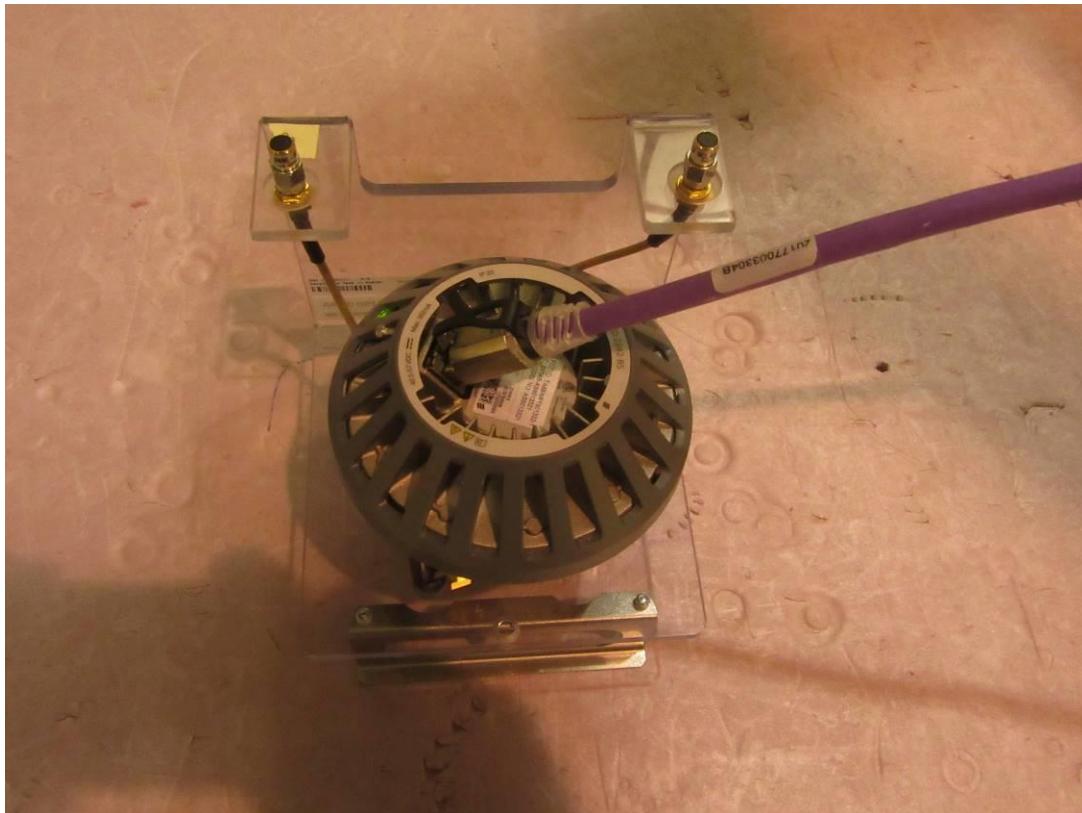


**Table 35: RE test results from 1 to 10 GHz for RSS-132, Sec 5.6 (Receiver mode)**

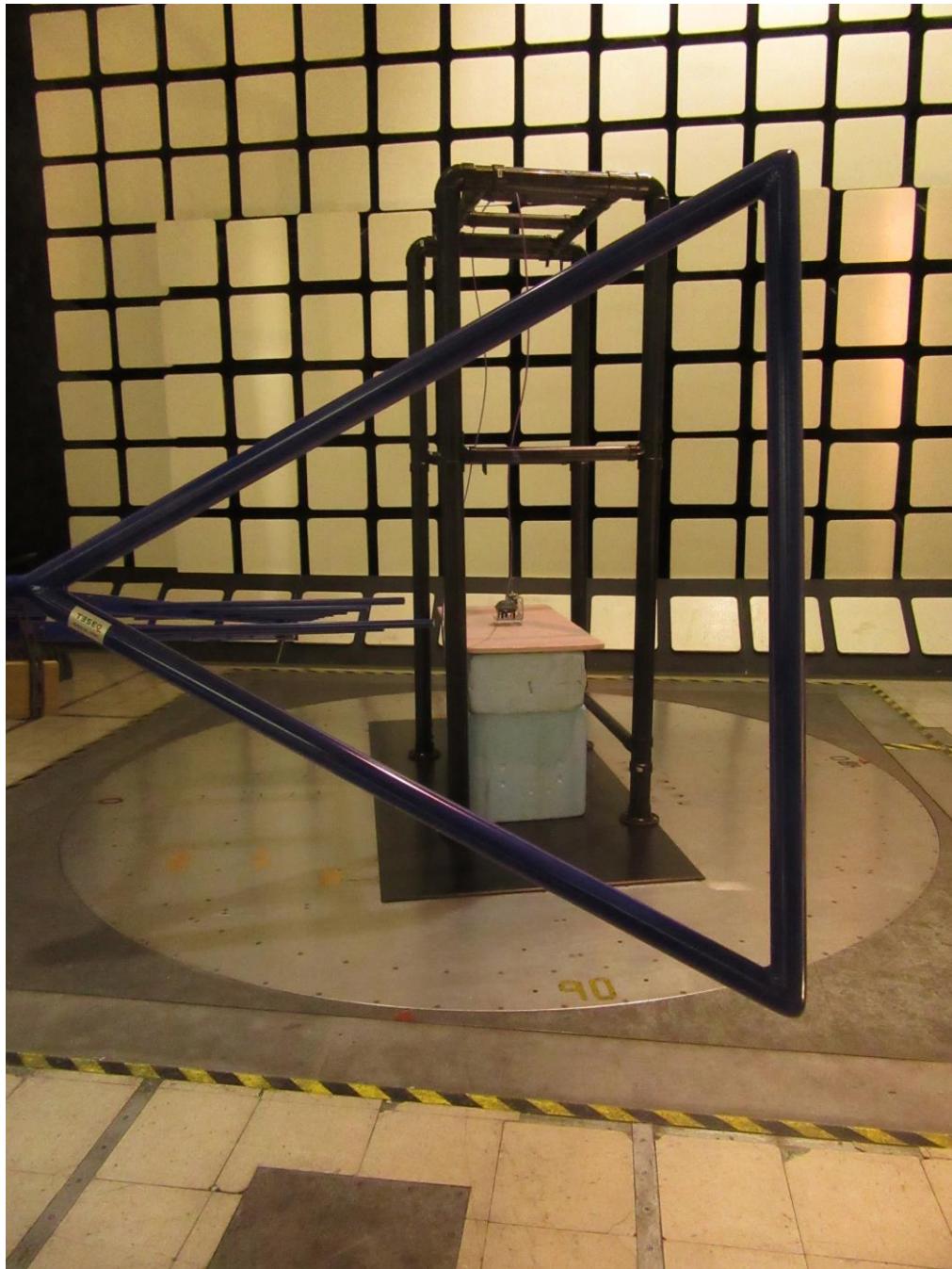
Frequency (MHz)	Level Average (dB $\mu$ V/m)	Limit Average (dB $\mu$ V/m)	Margin to FCC part 15 Class B (dB)	Height (m)	Azimuth (degrees)	Polarization	Correction (dB)
7497.860577	32.97	53.96	-20.99	0.99	0.00	Vertical	2.55
9985.920833	36.26	53.96	-17.70	1.00	74.50	Vertical	7.44
4045.412179	33.39	53.96	-20.57	3.41	153.50	Horizontal	-3.35
7394.721474	33.13	53.96	-20.83	1.00	335.75	Horizontal	2.39
9987.483654	36.29	53.96	-17.67	1.00	328.50	Horizontal	7.48

### 3.2.11 Radiated Emissions test setup pictures

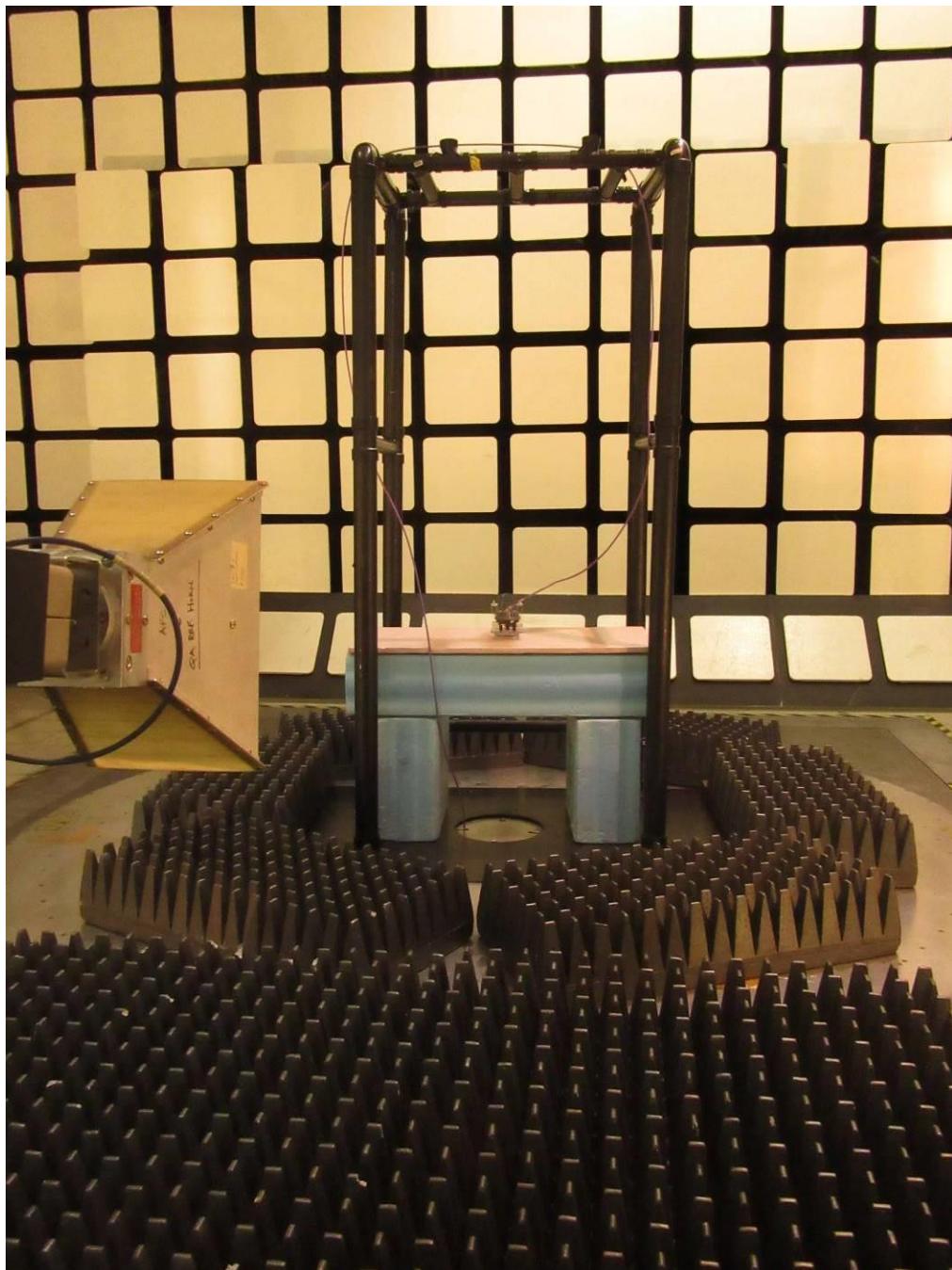
Figure 19: EUT Setup for RE tests (Closeup)



**Figure 20: EUT Setup for RE tests at 30 MHz to 1 GHz**



**Figure 21: EUT Setup for RE tests for above 1 GHz**



### 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	
Bilog Antenna	Teseq	6111D	SSG013955	2019-12-03	2020-12-03
Double Ridged Horn Antenna	Emco	3115	SSG012508	2020-05-11	2021-05-11
EMI Receiver	Rohde & Schwarz	ESU26	SSG013729	2020-03-19	2021-03-19
EMI Receiver	Rohde & Schwarz	ESU40	SSG013672	2019-10-08	2021-01-08
Coaxial Cable	Huber & Suhner	106A	SSG013841	2020-01-06	2021-01-06
Coaxial Cable	Huber & Suhner	106A	SSG012711	2020-01-06	2021-01-06
Coaxial Cable	Huber & Suhner	104PEA	SSG012041	2020-01-06	2021-01-06
Coaxial Cable	Huber & Suhner	ST18/Nm/Nm/36	SSG012785	2020-01-06	2021-01-06
Coaxial Cable	Micro-Coax	UFA 210B-1-1500-504504	SSG012376	2020-01-02	2021-01-02
RF Amplifier	Hewlett Packard	8447D	SSG013045	2020-01-08	2021-01-08
Pre-Amplifier	BNR	LNA	SSG012360	2019-09-26	2020-12-26
Power Supply	Hewlett Packard	6216A	SSG013063	not required	not required
Power Supply	Lambda	LPD-421A-FM	SSG013085	not required	not required

### 3.2.13 Test conclusion

The RD 2242 B5 (KRY 901 332/1) 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 22 – PUBLIC MOBILE 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-132, issue 3 (January 2013), Cellular Telephone Systems Operating in the Bands 824-849 MHz and 869-894 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
ETSI	European Telecommunications Standards Institute
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
LISN	Line Impedance Stabilization Network
ms	millisecond, unless otherwise specified
NA, na	not applicable

Term	Definition
PA	Broadband Power Amplifier
PK	Peak Detector
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
RI	Radiated Immunity
RMS	Root-mean-square
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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## **EMC Test Report**

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