EMC Test Report
for
RD2243 B14 (KRY 901 451/1)

Tested to: FCC Part 15 Subpart B
FCC Part 90
ICES-003

Test Result summury

FCC/ ICES/ RSS-140 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
15.107 / 6.1	Conducted Emissions (CE) for AC Power	FCC Part 15 / ICES 003 / ANSI C63.4	NA	NA
90.543 (e)	Transmitter Spurious Emissions (RE)	FCC Part 90 / ANSI C63.26	Pass	3.2

Document number: 7169006545-TR-EMC-01-01-F15

Release date: 10 September, 2019

Prepared for: Ericsson Canada

About this document

This document is written and distributed by TÜV SÜD Canada Inc. Whenever TÜV SÜD is mentioned in this document it shall be taken as referring to TÜV SÜD Canada Inc.

This test report does not imply product endorsement by any government, accreditation agency, or TÜV SÜD Canada Inc. Opinions or interpretations expressed in this report, if any, are outside the scope of the accreditations of TÜV SÜD Canada Inc. Any opinions expressed do not necessarily reflect the opinions of TÜV SÜD Canada Inc, unless otherwise stated.

Throughout this document:

- text in blue font is a clickable link
- text in italics is provided as-is from the customer

The release control record, document approvals, and laboratory Accreditations are as follows.

Release control record

This document is based on document template KG000347-TR-EMC-08-03.

Issue	Reason for change	Date released
01	initial release	10 September, 2019

Approvals

Function	Name	Job title	Signature
Technical Reviewer	Scott Drysdale	Canada Wireless Manager	
Author	Kasi Sivaratnam	EMC Test Engineer	

Accreditations

The test facilities of TÜV SÜD Canada Inc are accredited by the American Association for Laboratory Accreditation (A2LA) to ISO/IEC 17025:2005 in accordance with the scope of accreditation outlined at the website portal.a2la.org/scopepdf/2955-19.pdf.

A2LA Cert. No. 2955.19	**DISCLAIMER AND COPYRIGHT** This non-binding report has been prepared by TÜV SÜD Canada with all reasonable skill and care. The document is confidential to the potential Client and TÜV SÜD Canada. No part of this document may be reproduced without the prior written approval of TÜV SÜD Canada. © TÜV SÜD.
	ACCREDITATION Our A2LA Accreditation does not cover opinions and interpretations and any expressed are outside the scope of our A2LA Accreditation.

The Canadian lab registration number associated with the TÜV SÜD test facilities is 24015.

Test lab information

Lab name	TÜV SÜD Canada Inc
Company name	TÜV SÜD Canada Inc
Mailing or shipping address	1280 Teron Road, Ottawa, Ontario, K2K 2C1, Canada
Primary technical contact	Stephen Tippet
Title	Lab Manager
Phone	613-668-5149

Customer information

Company name	Ericsson Canada
Mailing address	349 Terry Fox Drive, Ottawa, On, K2K 2V6, Canada
Primary contact	Denis Lalonde
Title	Team Leader RA Verification
Phone	613-790-2901
E-mail	Denis.lalonde@ericsson.com

Table of contents

List of figures

List of tables

1. Executive summary

This document reports the Electromagnetic Compatibility (EMC) testing performed on the product called RD2243 B14 (KRY 901 451/1) for Ericsson Canada per project number 7169006545. The objective of the test activities is to evaluate compliance of the product to following EMC regulatory standards.

The RD2243 B14 (KRY 901 451/1) is verified to comply with the Emissions requirements of these standards:

- FCC Part 15 Subpart B [6] (Class B)
- ICES 003 [9] (Class B)
- FCC Part 90 [8] (Section – 90.543 (e))

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 RD2243 B14 (KRY 901 451/1)

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	3.2
15.107	Conducted Emissions (CE) for AC Power	FCC Part 15/ANSI C63.4	NA	NA
Table Notes				
1. Not Applicable; EUT operates from POE (56 VDC).				

Table 2: Summary of test results for the USA; FCC Part 90 subpart R

FCC Section	Description	Specification/Method	Pass or Fail	Results in section
90.543 (e)	Radiated Emissions Limitations Note: Antenna conducted emissions are covered in a separate report	FCC Part 90/ 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	NA	NA
Table Notes				
1. Not Applicable; EUT operates from POE (56 VDC).				

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 4: Assessed hardware

Hardware component	Part number
RD 2243 B14	KRY 901 451/1

Figure 1: RD2243 B14

2.2 Product overview

The product trade name is RD2243 B14 (KRY 901 451/1) . RD2243 B14 (KRY 901 451/1) are indoor wireless telecommunication products; transmit and receive the cellular signals for wireless systems. And operates from POE (56 VDC).

Table 5: Product detail, RD 2243 B14

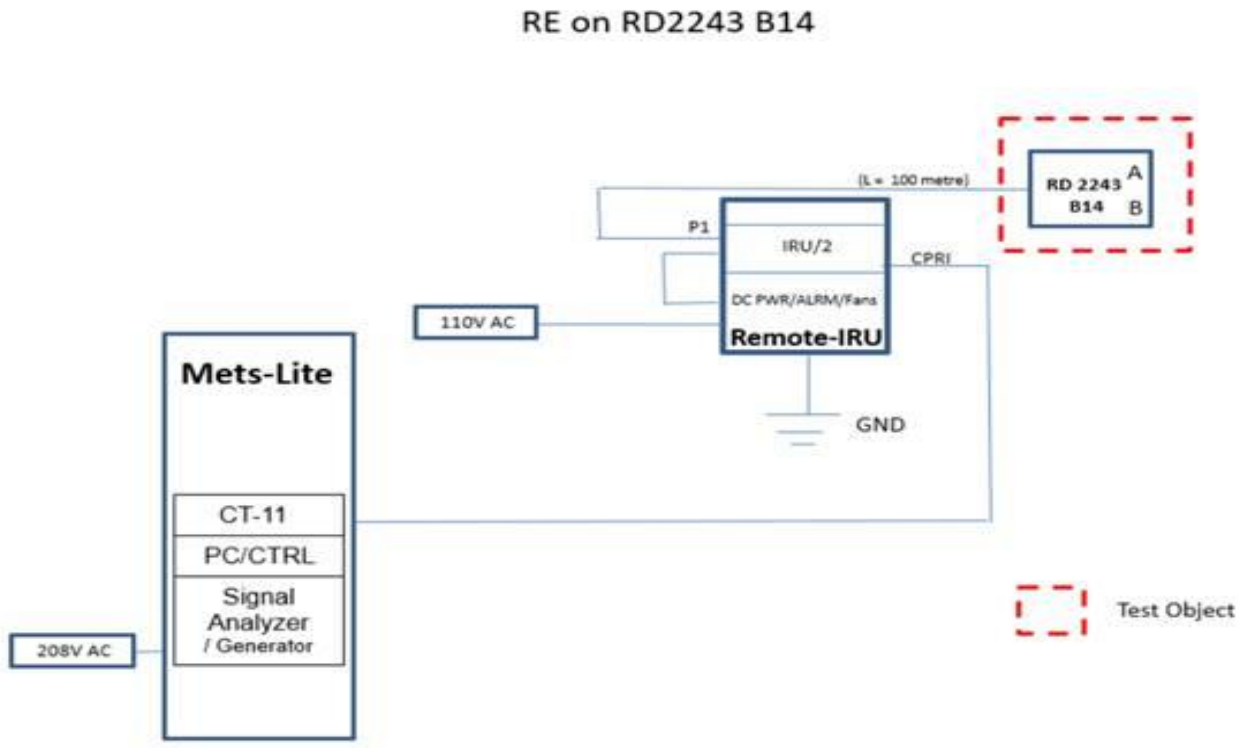
Model:	**RD 2243 B14**
Part No.	KRY 901 451/1
Antenna Ports:	2 TX/RX Ports
IBW:	10MHz (Contiguous operation only)
FDD:	NA
Frequency:	TX: 758 - 768MHz RX: 788- 798 MHz
Nominal O/P per Antenna Port:	Single Carrier: 1 x 50mW (17dBm) Multi-Carrier: 2 x 25mW (14dBm)
Accuracy (Nominal):	+/- 0.1 PPM
Nominal Voltage:	-48 VDC @ 0.5A
RAT:	LTE: SC, MC
Modulation:	LTE: QPSK, 16QAM, 64QAM, 256QAM
Channel Bandwidth:	LTE: 5, 10MHz
Maximum Combined OBW per Port:	10MHz
IF Interface:	DL: 110 – 150MHz UL: 40 - 80MHz
Channel Raster:	100kHz
Regulatory Requirements:	Radio: FCC Part 2 and 90 ISED RSS-140 EMC: FCC Part 15 and 90 ISED ICES-003
Multi-carrier:	Single Antenna, Tx Diversity, MIMO
Operating Temperature:	5°C to +40°C
Total Power based on IBW:	2 x 50mW
Dimensions: (H x W x D)	140 x 140 x 52mm
Weigth;	0.388 kg
WCDMA Supported Carrier Configurations:	NA
Supported Carrier Configurations:	LTE BW=5 (1-2), 10 (1)

The RD2243 B14 (KRY 901 451/1) that was tested is shown in the section Configurations of the EUT. The EUT was tested in a tabletop setting.

2.3 Configurations of the EUT

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

Figure 2: Test configuration for Emission tests



RD 2243 B14 Test Frequencies

Test frequencies for LTE 5 MHz BW:

- Bottom: 760.5 MHz
- Middle: 763 MHz MHz
- Top: 765.5 MHz

Test frequencies for LTE 10 MHz BW:

- Bottom: 763 MHz

2.4 Modifications of the EUT during testing

The EUT was not modified prior to or during testing.

2.5 Inventory of the EUT and support equipments

The following table identifies the inventory of the EUT.

Table 6: Inventory of the EUT

Equipment Role	Product Name	Product Number	Release	Product Serial#
EUT	RD 2243 B14	KRY 901 451/1	R1B	TD3T789631
SUPPORT	Remote IRU 2242	BFL 901 141/1	R3A	BW90100004
TEST SET	METS-Lite			

2.6 Software and operations of the EUT

The software used to operate the system was representative of the latest production version. The software version number was IRU load: CXP9013268%14_R68DD.

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 ºC and 25 ºC, 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 7: RE test requirements

Requirement	Method	Country of application
FCC Part 15, Subpart B	ANSI C63.4	USA
FCC Part 90	FCC Part 90/ ANSI C63.26	USA
ICES 003	ANSI C63.4	Canada

The limits of the RE tests are as follows.

Table 8: RE limits at 10 m for Class B of FCC

Frequency range (MHz)	FCC Part 15 & ICES 003 (dBμV/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 9: Emission limits for FCC Part 90.543 (e)

Frequency range (MHz)	FCC Part 90 EIRP Limit (dBm)	Calculated EIRP Limit in dBμV/m
30 - 40000	-13	82.2

3.2.2 Test procedure

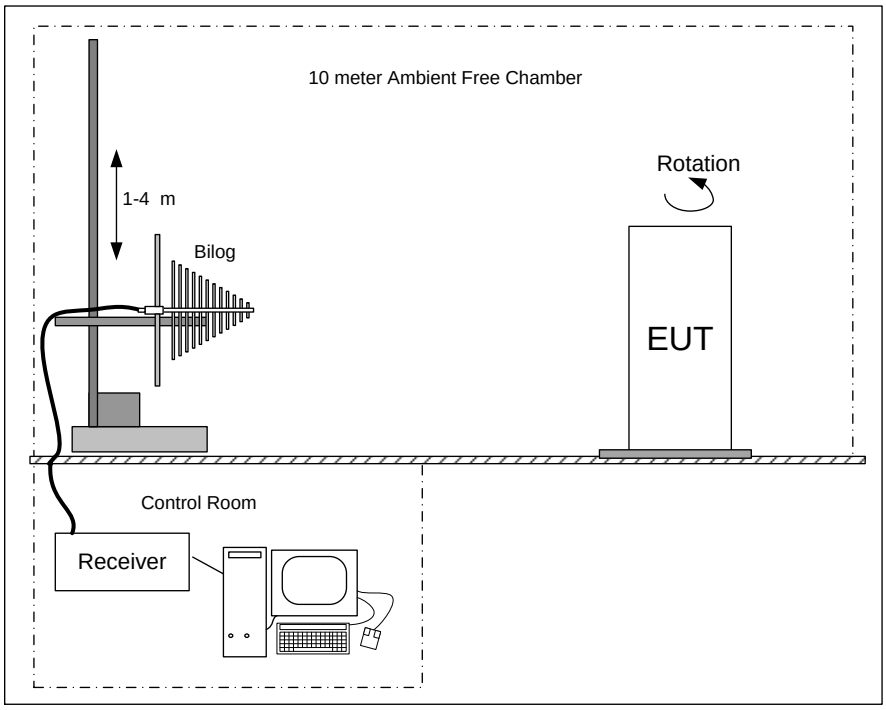
Verifications of the test equipment and AFC were performed before the installation of the EUT in accordance with the quality assurance procedures documented in the EMC test procedures document. The test was performed according to the relevant procedures listed in Table 7.

- 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 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 3: 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 (dBµV) =	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 (dBµV/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

3.2.5 Test results of Radiated Emissions – (5M LTE - Bottom channel)

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

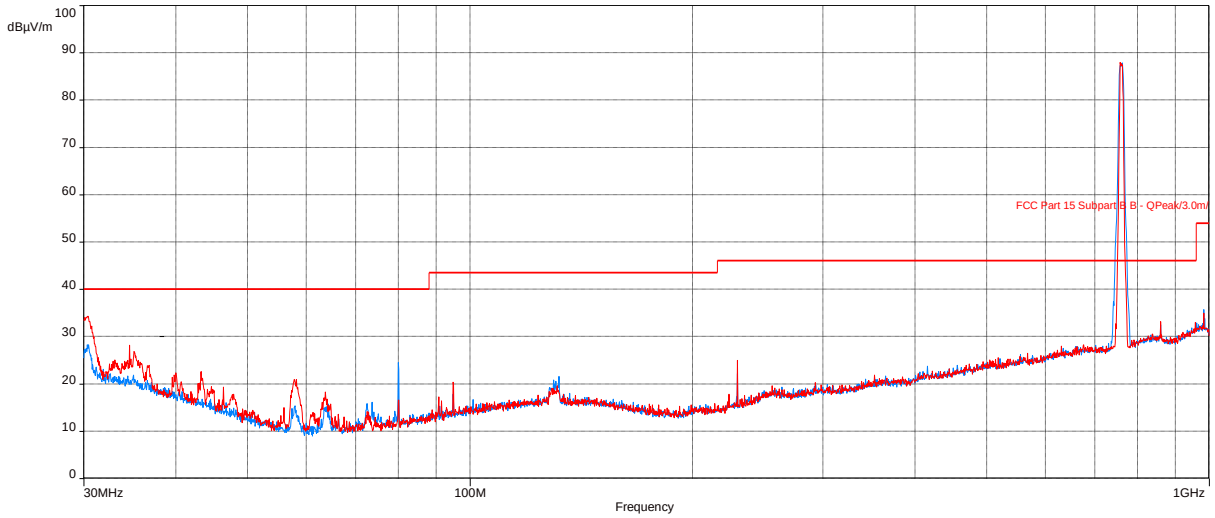
Date tested: 15, August 2019 – Sept 10, 2019

Tested by: Nikolai Viktorov & Scott Drysdale

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 4: Plot of RE at 3 m – 30 to1000 MHz (5M LTE – Bottom channel)



Note: Emissions between 755 MHz and 805 MHz for radiated spurious emissions were seperatly verified, see top channel vertical for worst case results.

Table 10: RE test results from 30 to 1000 MHz for FCC Part 15 (5M LTE – Bottom channel)

Frequency (MHz)	Level (dBµV/m)	Limit Quasi-peak (dBµV/m)	Margin to FCC part 15 Class B (dB)	Height (m)	Azimuth (deg)	Polarization	Correction (dB)
30.42146	31.38	40.00	-8.62	1.00	268.75	Vertical	-2.74
758.33346		N/A		1.00	249.50	Vertical	3.51
762.70278		N/A		1.08	249.50	Horizontal	3.60

Table 11: RE test results from 30 to 1000 MHz for FCC Part 90 (5M LTE – Bottom channel)

Frequency (MHz)	Level (dBµV/m)	Limit Quasi-peak (dBµV/m)	Margin to FCC part 90 (dB)	Height (m)	Azimuth (deg)	Polarization	Correction (dB)
30.42145479	31.38	82.2	-50.82	1.00	268.75	Vertical	-2.74
758.3334585		N/A		1.00	249.50	Vertical	3.51
762.7027854		N/A		1.08	249.50	Horizontal	3.60

Note 1: Peaks 758.33346 & 762.70278 are the EUT's fundamental. See graph for worst case reported margin.

Note 2: In the table/Plot above, no emissions other than the EUT fundamental exceed the Part 90 radiated spurious emissions limit when converted to dBuV/m. For final spurious antenna port conducted emissions measurements to Part 90, see antenna port conducted emissions in separate applicable test report.

Figure 5: Plot of RE at 3m from 1 to 10 GHz (5M LTE – Bottom channel)

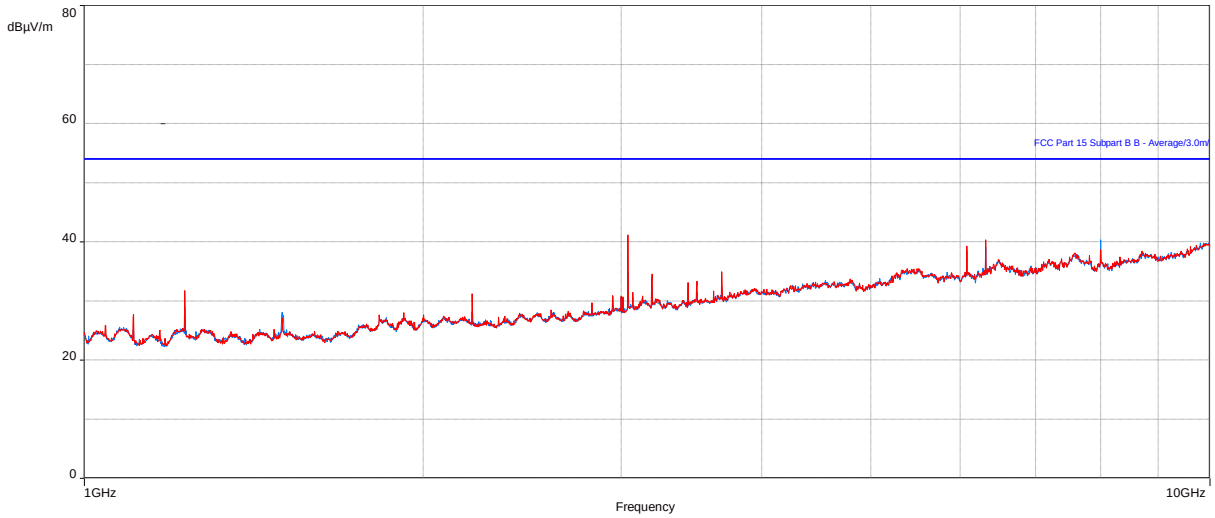


Table 12: RE test results from 1 to 10 GHz for FCC Part 15 (5M LTE – Bottom channel)

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)
3041.979487	39.69	53.96	-14.27	2.49	83.75	Vertical	-7.31
6083.960256	36.52	53.96	-17.44	2.08	334.00	Vertical	-0.28
6323.960577	39.82	53.96	-14.14	1.53	334.00	Vertical	0.45

Table 13: RE test results from 1 to 10 GHz for FCC Part 90 (5M LTE – Bottom channel)

Frequency (MHz)	Level Average (dBµV/m)	Limit Average (dBµV/m)	Margin to FCC part 90 (dB)	Height (m)	Azimuth (degrees)	Polarization	Correction (dB)
3041.979487	39.69	82.2	-45.51	2.49	83.75	Vertical	-7.31
6083.960256	36.52	82.2	-45.68	2.08	334.00	Vertical	-0.28
6323.960577	39.82	82.2	-42.38	1.53	334.00	Vertical	0.45

Note 2: In the table/Plot above, no emissions exceed the Part 90 radiated spurious emissions limit when converted to dBuV/m. For final antenna conducted spurious emissions measurements to Part 90, see antenna port conducted emissions in applicable test report.

3.2.6 Test results of Radiated Emissions – (5M LTE - Middle channel)

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

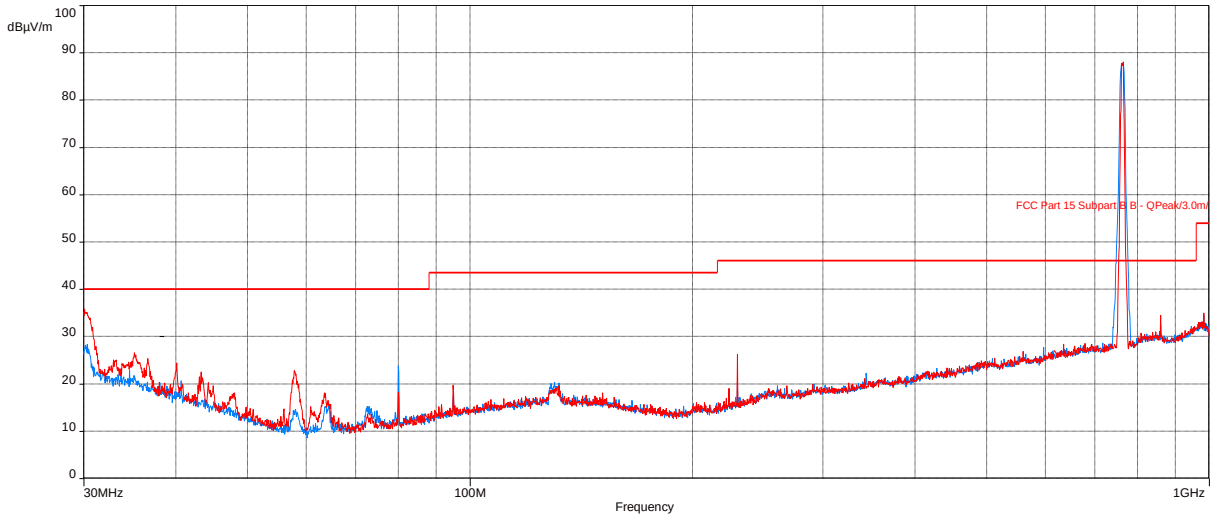
Date tested: 15, August 2019 – Sept 10, 2019

Tested by: Nikolai Viktorov & Scott Drysdale

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 6: Plot of RE at 3 m – 30 to1000 MHz (5M LTE – Middle channel)



Note: Emissions between 755 MHz and 805 MHz for radiated spurious emissions were seperatly verified, see top channel vertical for worst case results.

Table 14: RE test results from 30 to 1000 MHz for FCC Part 15 (5M LTE – Middle channel)

Frequency (MHz)	Level (dBµV/m)	Limit Quasi-peak (dBµV/m)	Margin to FCC part 15 Class B (dB)	Height (m)	Azimuth (deg)	Polarization	Correction (dB)
30.08754	32.20	40.00	-7.80	3.41	67.25	Vertical	-2.59
765.24157		N/A		2.62	254.50	Vertical	3.68
762.64485		N/A		1.09	283.50	Horizontal	3.60

Table 15: RE test results from 30 to 1000 MHz for FCC Part 90 (5M LTE – Middle channel)

Frequency (MHz)	Level (dBµV/m)	Limit Quasi-peak (dBµV/m)	Margin to FCC Part 90 (dB)	Height (m)	Azimuth (deg)	Polarization	Correction (dB)
30.08754	32.20	82.2	-50.00	3.41	67.25	Vertical	-2.59
765.24157		N/A		2.62	254.50	Vertical	3.68
762.64485		N/A		1.09	283.50	Horizontal	3.60

Note 1: Peaks 762.64485 & 765.24157 are the EUT's fundamental. See graph for worst case reported margin.

Note 2: In the table/Plot above, no emissions other than the EUT fundamental exceed the Part 90 radiated spurious emissions limit when converted to dBuV/m. For final antenna conducted spurious emissions measurements to Part 90 , see antenna port conducted emissions in applicable test report.

Figure 7: Plot of RE at 3m from 1 to 10 GHz (5M LTE – Middle channel)

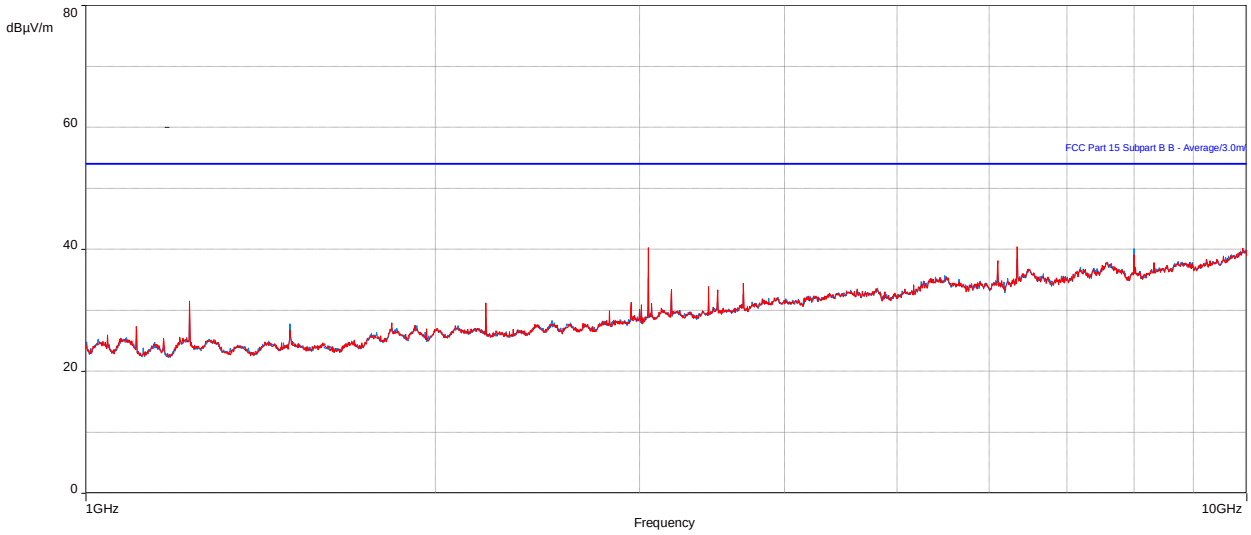


Table 16: RE test results from 1 to 10 GHz for FCC Part 15 (5M LTE – Middle channel)

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)
3051.979167	39.21	53.96	-14.75	3.47	98.00	Vertical	-7.26
6103.959615	38.53	53.96	-15.43	2.99	55.25	Vertical	-0.23
6343.958013	39.98	53.96	-13.98	1.00	319.50	Vertical	0.48

Table 17: RE test results from 1 to 10 GHz for FCC Part 90 (5M LTE – Middle channel)

Frequency (MHz)	Level Average (dBµV/m)	Limit Average (dBµV/m)	Margin to FCC Part 90 (dB)	Height (m)	Azimuth (degrees)	Polarization	Correction (dB)
3051.979167	39.21	82.2	-42.99	3.47	98.00	Vertical	-7.26
6103.959615	38.53	82.2	-43.67	2.99	55.25	Vertical	-0.23
6343.958013	39.98	82.2	-42.22	1.00	319.50	Vertical	0.48

Note 2: In the table/Plot above, no emissions exceed the Part 90 radiated spurious emissions limit when converted to dBuV/m. For final antenna conducted spurious emissions measurements to Part 90, see antenna port conducted emissions in applicable test report.

3.2.7 Test results of Radiated Emissions – (5M LTE - Top channel)

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

Date tested: 15, August 2019 – Sept 10, 2019

Tested by: Nikolai Viktorov and Scott Drysdale

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 8: Plot of RE at 3 m – 30 to1000 MHz (5M LTE – Top channel)

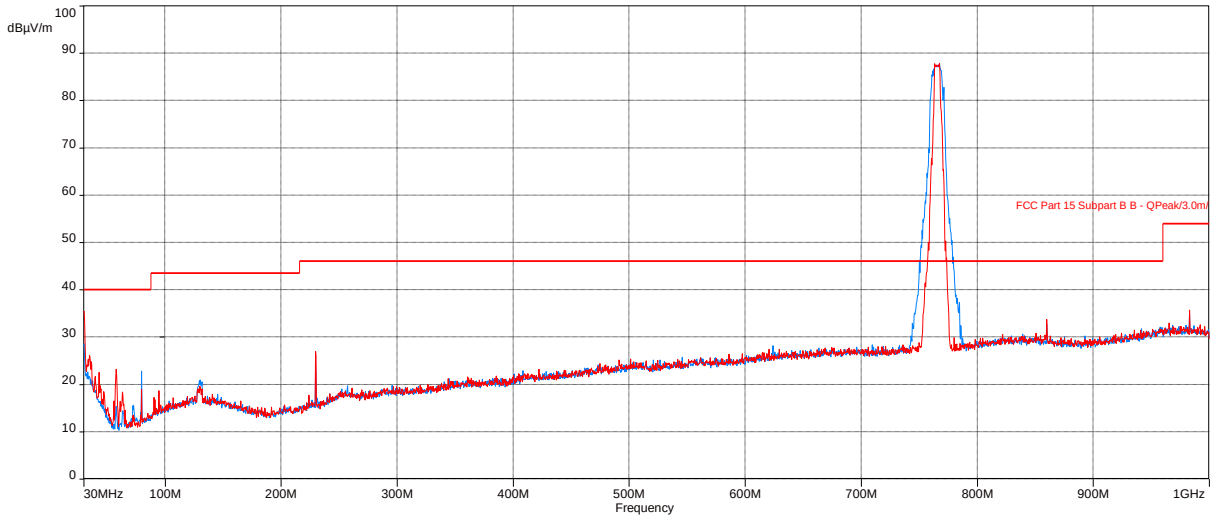
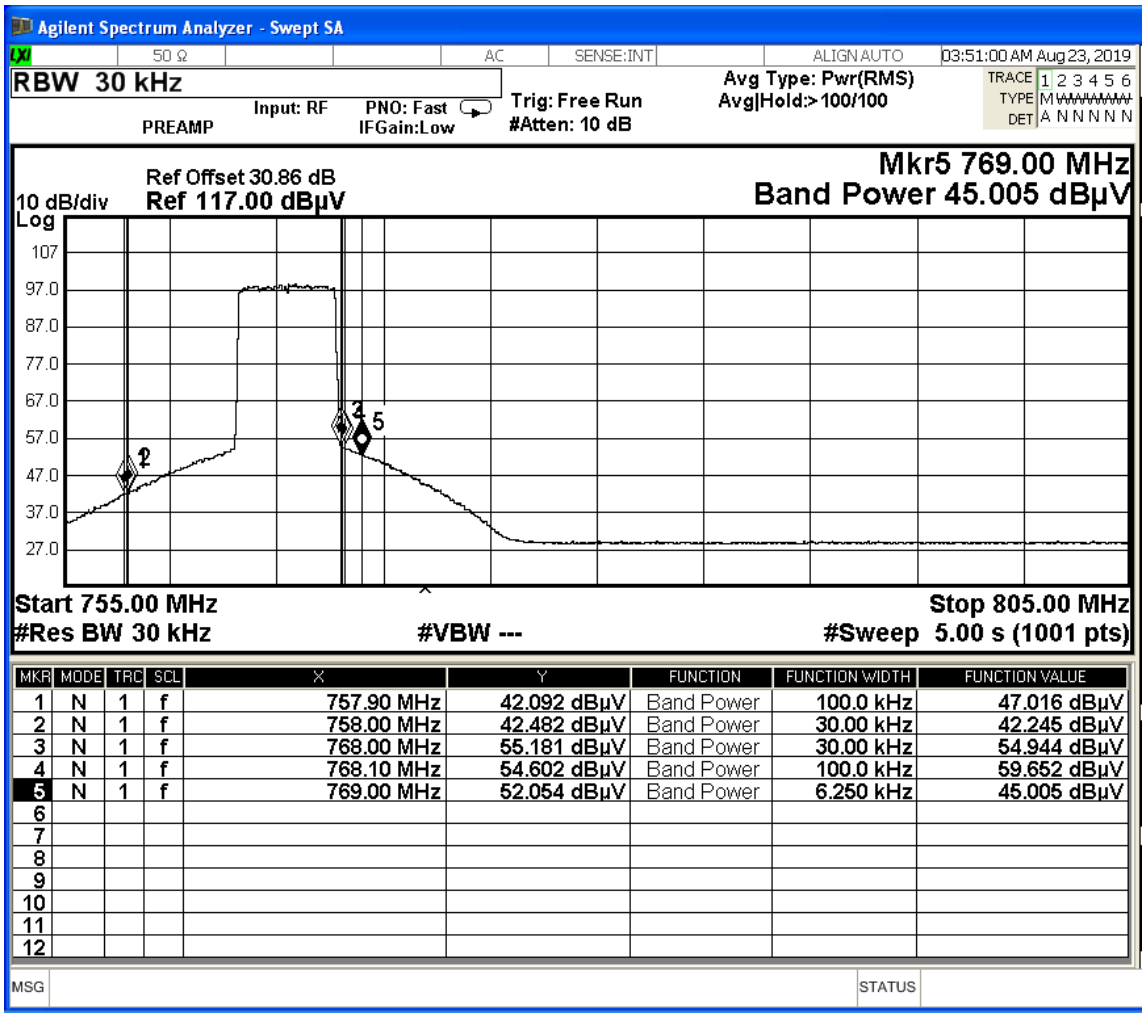


Figure 9: Plot of RE at 3 m – 755 to 805 MHz (5M LTE – Top channel, worst case vertical)



Note: The function value is the factored dBuV/m reading with the applicable Resolution Bandwidth. At 769 MHz, marker 5, the limit of an attenuation of 76 + 10 log (P) dB this works out to -46 dBm antenna conducted. At 3 meters, this will be 49.2 dBuV/m based on -46 dBm + 95.2 conversion factor. At 769 MHz this passes with a worst case margin of 4.2 dB for the configuration shown above.

Table 18: RE test results from 30 to 1000 MHz for FCC Part 15 (5M LTE – Top channel)

Frequency (MHz)	Level (dBµV/m)	Limit Quasi-peak (dBµV/m)	Margin to FCC part 15 Class B (dB)	Height (m)	Azimuth (deg)	Polarization	Correction (dB)
30.21463428	32.25	40.00	-7.75	3.11	254.75	Vertical	-2.65
767.6855992		N/A		2.67	247.50	Vertical	3.72
79.99951249	24.10	40.00	-15.90	2.03	0.00	Horizontal	-13.20
767.62767		N/A		1.09	254.50	Horizontal	3.72

Table 19: RE test results from 30 to 1000 MHz for FCC Part 90 (5M LTE – Top channel)

Frequency (MHz)	Level (dBµV/m)	Limit Quasi-peak (dBµV/m)	Margin to FCC Part 90 (dB)	Height (m)	Azimuth (deg)	Polarization	Correction (dB)
30.21463428	32.25	82.2	-49.95	3.11	254.75	Vertical	-2.65
767.68560				2.67	247.50	Vertical	3.72
79.99951249	24.10	82.2	-58.10	2.03	0.00	Horizontal	-13.20
767.62767				1.09	254.50	Horizontal	3.72

Note 1: Peaks 767.68560 & 767.62767 are the EUT's fundamental.

Note 2: In the table/Plot above, no emissions other than the EUT fundamental exceed the Part 90 radiated spurious emissions limit when converted to dBuV/m. For final antenna conducted spurious emissions measurements to Part 90, see antenna port conducted emissions in applicable test report.

Figure 10: Plot of RE at 3m from 1 to 10 GHz (5M LTE – Top channel)

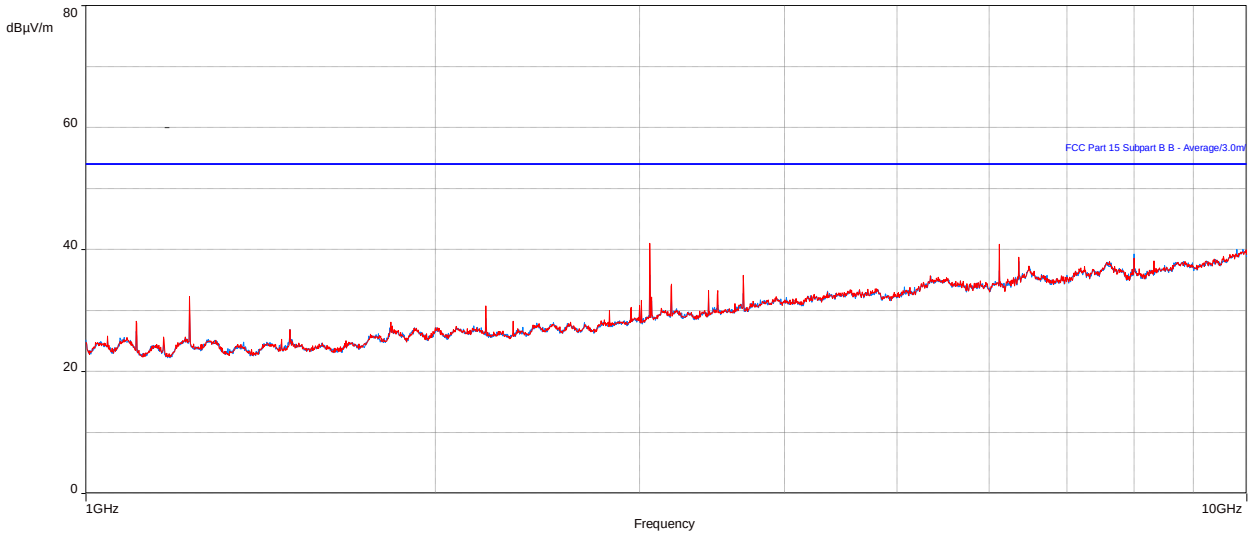


Table 20: RE test results from 1 to 10 GHz for FCC Part 15 (5M LTE – Top channel)

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)
1228.790705	31.42	53.96	-22.54	3.68	69.25	Vertical	-13.17
3061.978526	40.12	53.96	-13.84	2.08	90.75	Vertical	-7.20
6123.959936	37.57	53.96	-16.39	2.97	47.50	Vertical	-0.17

Table 21: RE test results from 1 to 10 GHz for FCC Part 90 (5M LTE – Top channel)

Frequency (MHz)	Level Average (dBµV/m)	Limit Average (dBµV/m)	Margin to FCC Part 90 (dB)	Height (m)	Azimuth (degrees)	Polarization	Correction (dB)
1228.790705	31.42	82.2	-50.78	3.68	69.25	Vertical	-13.17
3061.978526	40.12	82.2	-42.08	2.08	90.75	Vertical	-7.20
6123.959936	37.57	82.2	-44.63	2.97	47.50	Vertical	-0.17

Note 2: In the table/Plot above, no emissions exceed the Part 90 radiated spurious emissions limit when converted to dBuV/m. For final antenna conducted spurious emissions measurements to Part 90, see antenna port conducted emissions in applicable test report.

3.2.8 Test results of Radiated Emissions – (2 * 5M LTE - Only channel)

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

Date tested: 14, August 2019 to 10 September 2019

Tested by: Nikolai Viktorov and Scott Drysdale

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 (2 * 5M LTE – only channel)

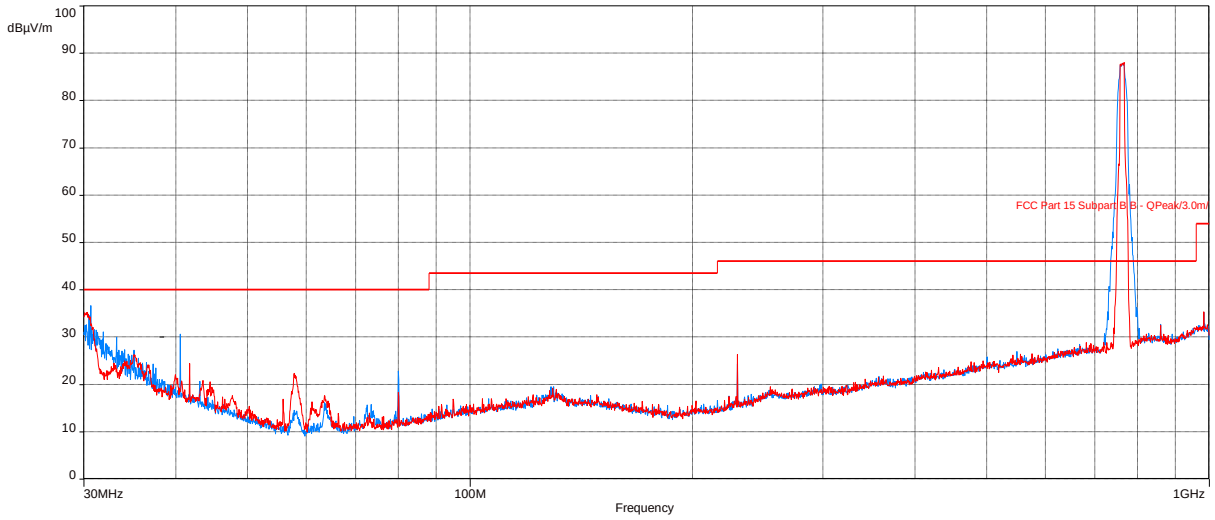
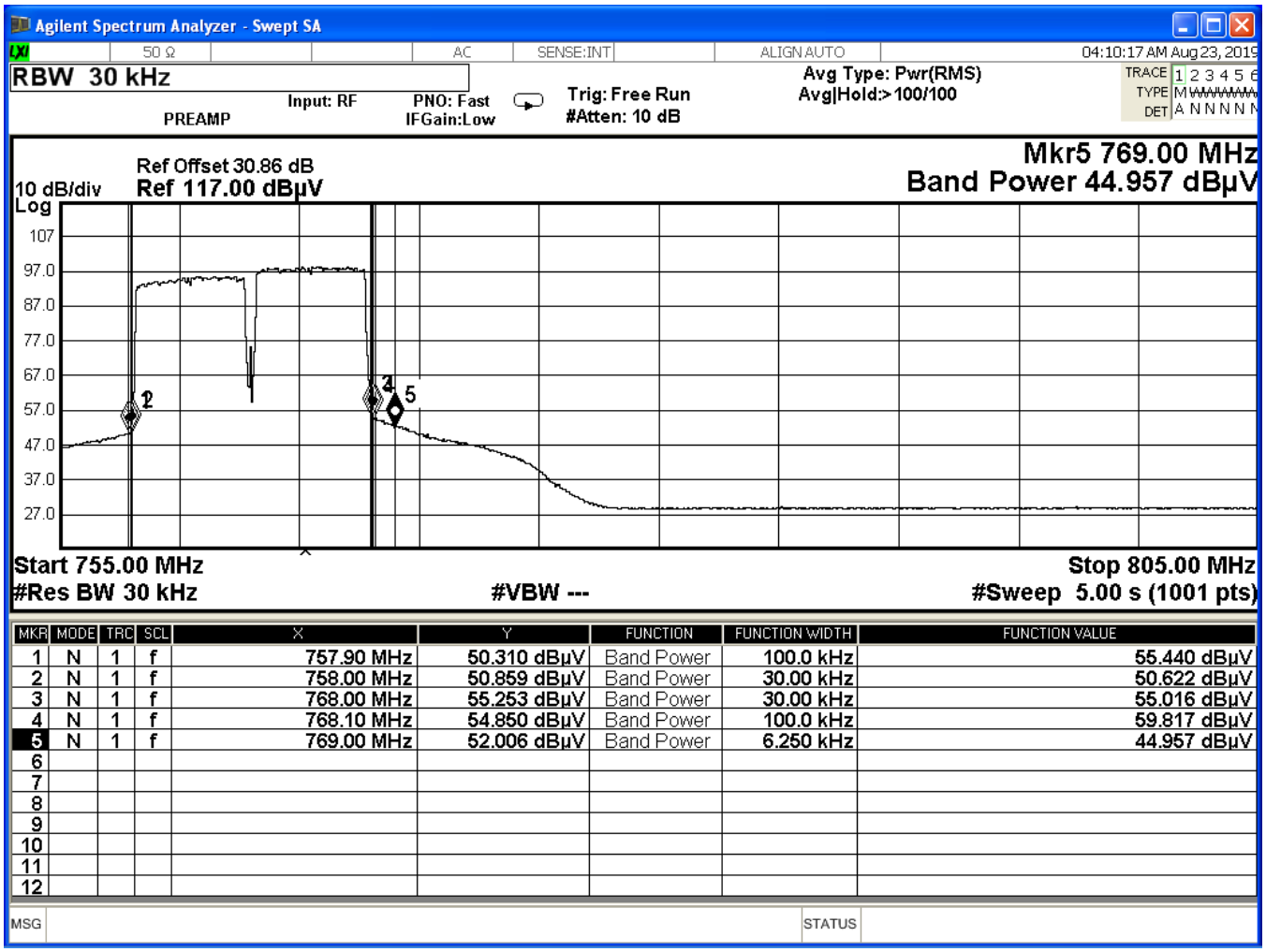


Figure 12: Plot of RE at 3 m – 755 MHz to 805 MHz (2 * 5M LTE –Only channel – worst case vertical)



MKR	MODE	TRC	SCL	X	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE
1	N	1	f	757.90 MHz	50.310 dBµV	Band Power	100.0 kHz	55.440 dBµV
2	N	1	f	758.00 MHz	50.859 dBµV	Band Power	30.00 kHz	50.622 dBµV
3	N	1	f	768.00 MHz	55.253 dBµV	Band Power	30.00 kHz	55.016 dBµV
4	N	1	f	768.10 MHz	54.850 dBµV	Band Power	100.0 kHz	59.817 dBµV
5	N	1	f	769.00 MHz	52.006 dBµV	Band Power	6.250 kHz	44.957 dBµV
6								
7								
8								
9								
10								
11								
12								

Note: The function value is the factored dBuV/m reading with the applicable Resolution Bandwidth. At 769 MHz, marker 5, the limit of an attenuation of 76 + 10 log (P) dB this works out to -46 dBm antenna conducted. At 3 meters, this will be 49.2 dBuV/m based on -46 dBm + 95.2 conversion factor. At 769 MHz this passes with a worst case margin of 4.2 dB for the configuration shown above.

Table 22: RE test results from 30 to 1000 MHz for FCC Part 15 (2 * 5M LTE –Only channel)

Frequency (MHz)	Level (dBµV/m)	Limit Quasi-peak (dBµV/m)	Margin to FCC part 15 Class B (dB)	Height (m)	Azimuth (deg)	Polarization	Correction (dB)
30.34813495	32.47	40.00	-7.53	3.20	96.25	Vertical	-2.71
229.9504518	29.30	46.02	-16.72	2.99	84.00	Vertical	-8.33
767.6835577		N/A		2.72	119.75	Vertical	3.72
763.3869136		N/A		1.09	256.50	Horizontal	3.62

Table 23: RE test results from 30 to 1000 MHz for FCC Part 90 (2 * 5M LTE – Bottom channel)

Frequency (MHz)	Level (dBµV/m)	Limit Quasi-peak (dBµV/m)	Margin to FCC Part 90 (dB)	Height (m)	Azimuth (deg)	Polarization	Correction (dB)
30.34813495	32.47	82.2	-49.73	3.20	96.25	Vertical	-2.71
229.9504518	29.30	82.2	-52.9	2.99	84.00	Vertical	-8.33
767.68356		N/A		2.72	119.75	Vertical	3.72
763.38691		N/A		1.09	256.50	Horizontal	3.62

Note 1: Peaks 763.38691& 767.68356 are the EUT's fundamental.

Note 2: In the table/Plot above, no emissions other than the EUT fundamental exceed the Part 90 radiated spurious emissions limit when converted to dBuV/m. For final antenna conducted spurious emissions measurements to Part 90, see antenna port conducted emissions in applicable test report.

Figure 13: Plot of RE at 3m from 1 to 10 GHz (2 * 5M LTE –Only channel)

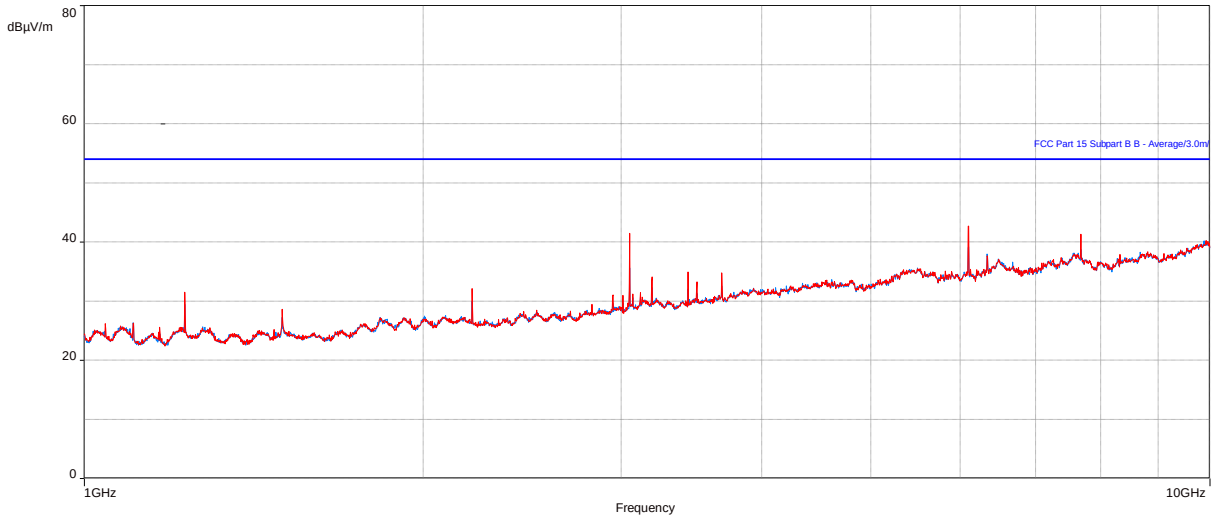


Table 24: RE test results from 1 to 10 GHz for FCC Part 15 (2 * 5M LTE – Bottom/Only channel)

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)
3051.980769	40.41	53.96	-13.55	3.45	98.50	Vertical	-7.26
6103.961218	39.51	53.96	-14.45	3.75	98.50	Horizontal	-0.23
7679.950962	40.46	53.96	-13.50	2.78	182.25	Vertical	4.73

Table 25: RE test results from 1 to 10 GHz for FCC Part 90 (2 * 5M LTE – Bottom channel)

Frequency (MHz)	Level Average (dBµV/m)	Limit Average (dBµV/m)	Margin to FCC Part 90 (dB)	Height (m)	Azimuth (degrees)	Polarization	Correction (dB)
3051.980769	40.41	82.2	-41.79	3.45	98.50	Vertical	-7.26
6103.961218	39.51	82.2	-42.69	3.75	98.50	Horizontal	-0.23
7679.950962	40.46	82.2	-41.74	2.78	182.25	Vertical	4.73

Note 2: In the table/Plot above, no emissions exceed the Part 90 radiated spurious emissions limit when converted to dBuV/m. For final antenna conducted spurious emissions measurements to Part 90, see antenna port conducted emissions in applicable test report.

3.2.9 Test results of Radiated Emissions – (10M LTE – Only channel)

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

Date tested: 16, August 2019 to 10 September, 2019

Tested by: Nikolai Viktorov and Scott Drysdale

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 14: Plot of RE at 3 m – 30 to1000 MHz (10M LTE – Only channel)

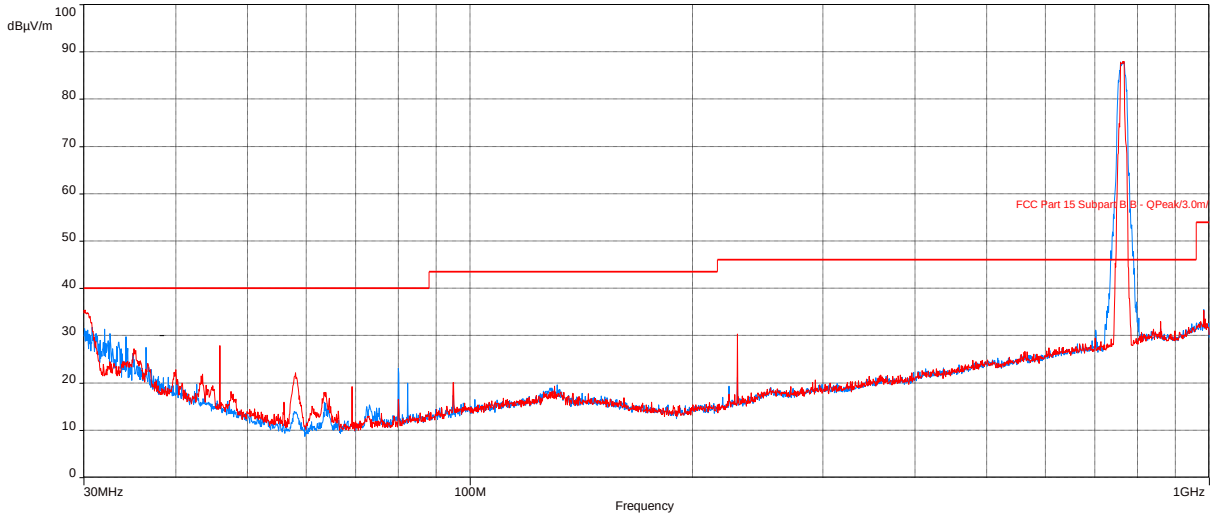
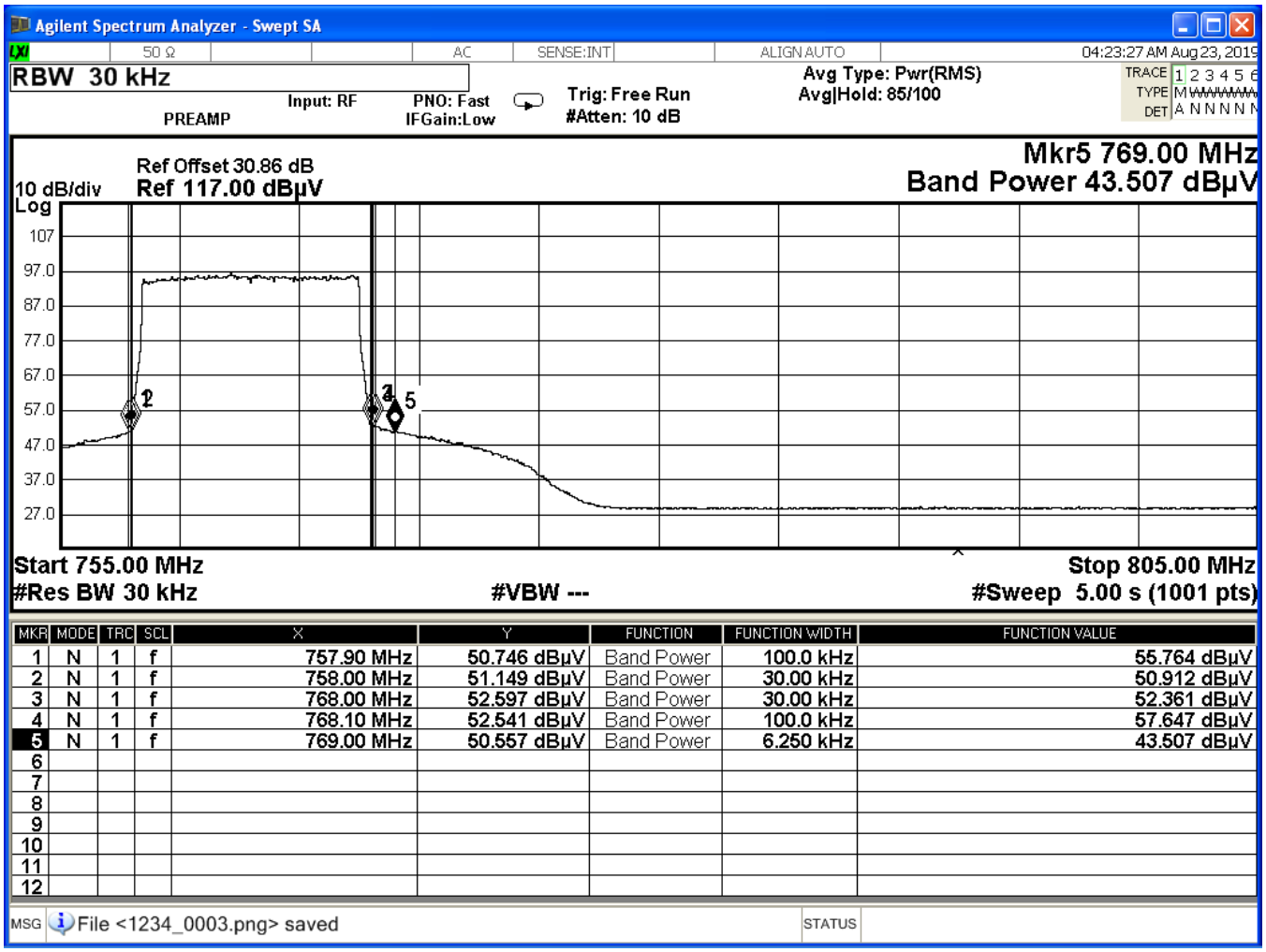


Figure 15: Plot of RE at 3 m – 755 MHz to 805 MHz (10M LTE – Only channel – worst case vertical)



Note: The function value is the factored dBuV/m reading with the applicable Resolution Bandwidth. At 769 MHz, marker 5, the limit of an attenuation of 76 + 10 log (P) dB this works out to -46 dBm antenna conducted. At 3 meters, this will be 49.2 dBuV/m based on -46 dBm + 95.2 conversion factor. At 769 MHz this passes with a worst case margin of 4.7 dB for the configuration shown above.

Table 26: RE test results from 30 to 1000 MHz for FCC Part 15 (10M LTE – Bottom channel)

Frequency (MHz)	Level (dBµV/m)	Limit Quasi-peak (dBµV/m)	Margin to FCC part 15 Class B (dB)	Height (m)	Azimuth (deg)	Polarization	Correction (dB)
30.12500608	32.83	40.00	-7.17	3.52	98.25	Vertical	-2.60
229.9496505	29.11	46.02	-16.91	3.00	127.00	Vertical	-8.33
767.46492	100.96	46.02	54.94	1.12	249.50	Horizontal	3.72

Table 27: RE test results from 30 to 1000 MHz for FCC Part 90 (10M LTE – Bottom channel)

Frequency (MHz)	Level (dBµV/m)	Limit Quasi-peak	Margin to (dB)	Height (m)	Azimuth (deg)	Polarization	Correction (dB)
30.12500608	32.83	82.2	-49.37	3.52	98.25	Vertical	-2.60
229.9496505	29.11	82.2	-53.09	3.00	127.00	Vertical	-8.33
767.46492	100.96	82.2	18.76	1.12	249.50	Horizontal	3.72

Note 1: Peaks 767.46492 are the EUT's fundamental.

Note 2: In the table/Plot above, no emissions other than the EUT fundamental exceed the Part 90 radiated spurious emissions limit when converted to dBuV/m. For final antenna conducted spurious emissions measurements to Part 90, see antenna port conducted emissions in applicable test report.

Figure 16: Plot of RE at 3m from 1 to 10 GHz (10M LTE – Bottom channel)

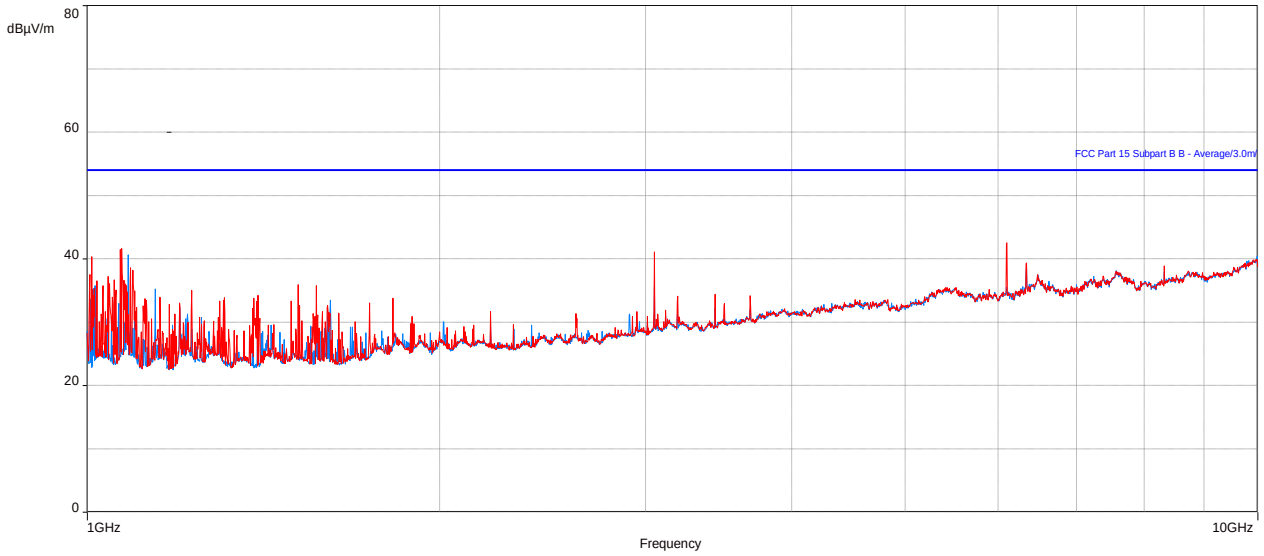


Table 28: RE test results from 1 to 10 GHz for Part 15 (10M LTE – Bottom channel)

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)
3051.980769	39.38	53.96	-14.58	1.60	91.00	Vertical	-7.26
6103.961218	36.37	53.96	-17.59	3.11	336.00	Vertical	-0.23
6343.959615	38.45	53.96	-15.51	3.27	91.00	Horizontal	0.48

Table 29: RE test results from 1 to 10 GHz for Part 90 (10M LTE – Bottom channel)

Frequency (MHz)	Level Average (dBµV/m)	Limit Average (dBµV/m)	Margin to FCC Part 90 (dB)	Height (m)	Azimuth (degrees)	Polarization	Correction (dB)
3051.980769	39.38	82.2	-42.82	1.60	91.00	Vertical	-7.26
6103.961218	36.37	82.2	-45.83	3.11	336.00	Vertical	-0.23
6343.959615	38.45	82.2	-43.75	3.27	91.00	Horizontal	0.48

Note 2: In the table/Plot above, no emissions exceed the Part 90 radiated spurious emissions limit when converted to dBuV/m. For final antenna conducted spurious emissions measurements to Part 90, see antenna port conducted emissions in applicable test report.

3.2.10 Radiated Emissions test setup pictures

Figure 17: Setup for RE tests at 30 MHz to 1 GHz

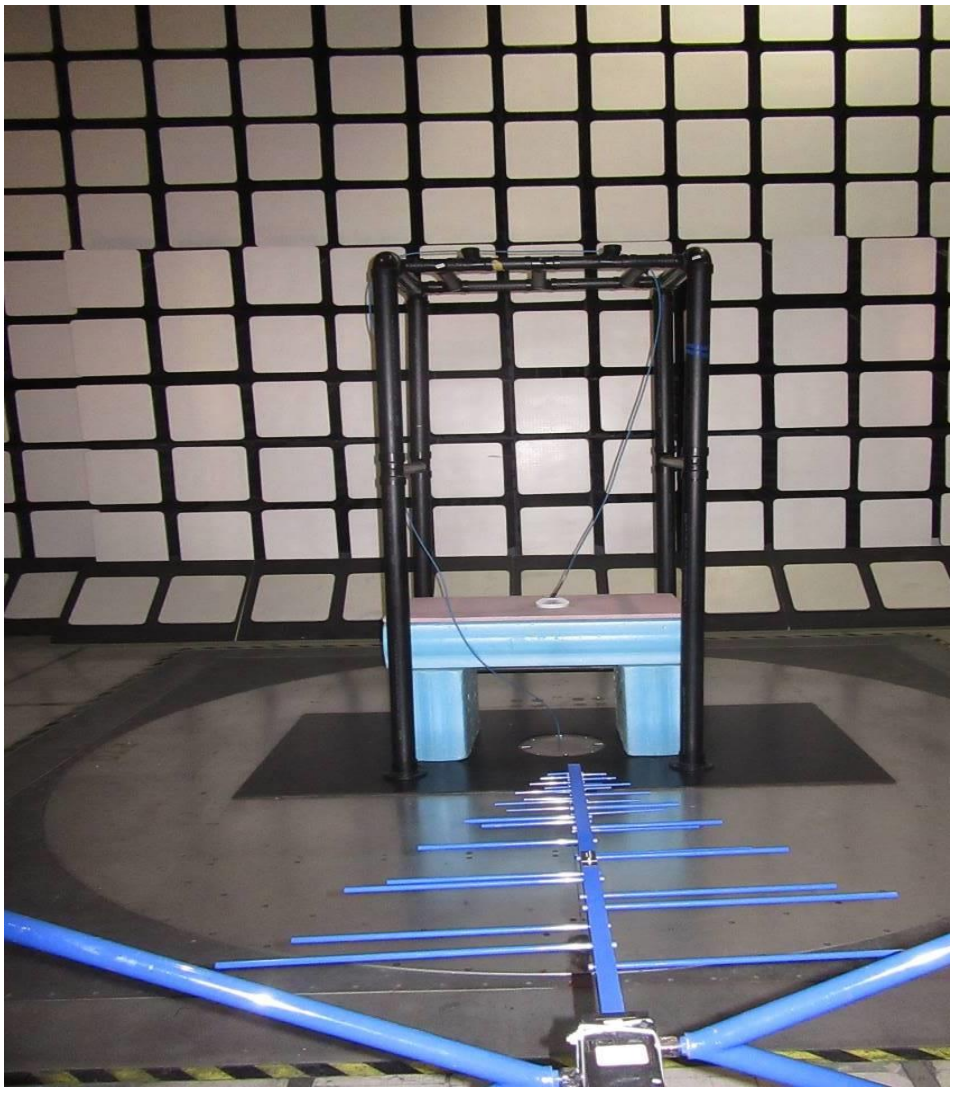
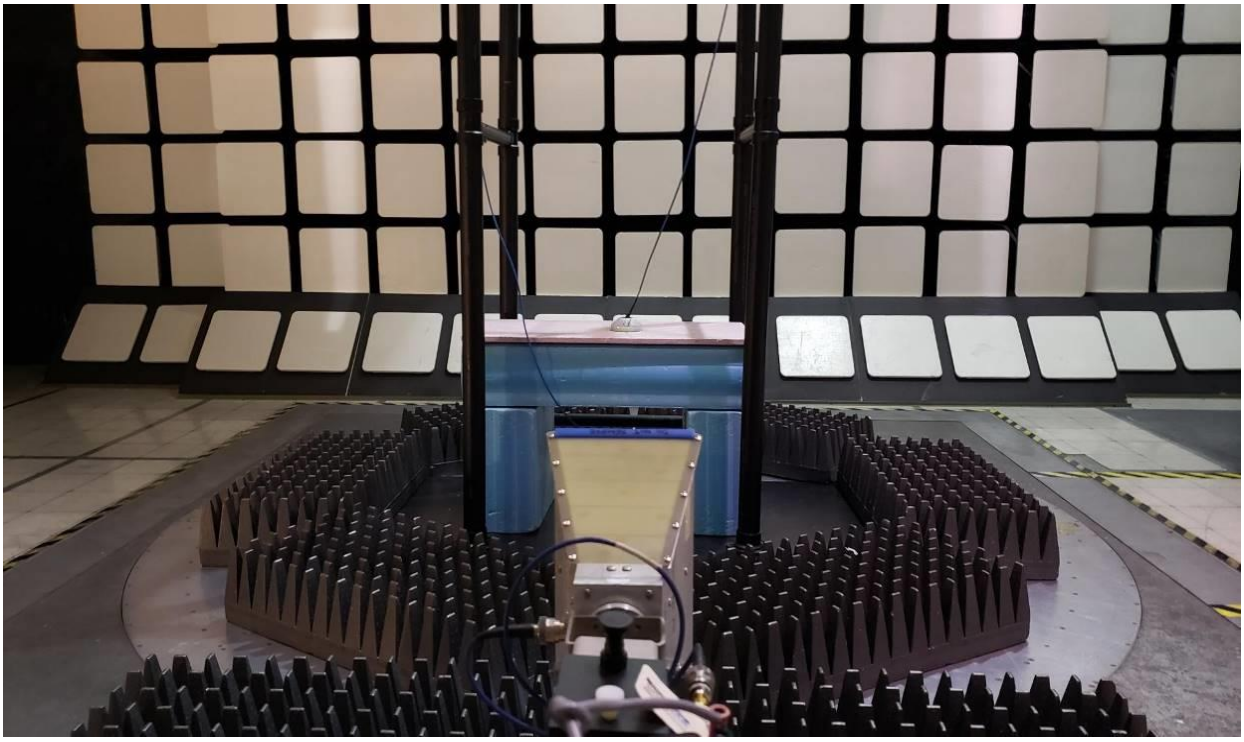


Figure 18: Setup for RE tests for above 1 GHz



3.2.11 Test equipment

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

Table 30: Test equipment used for RE

Description	Make	Model number	Asset ID	Calibr. date	Calibr. due
Coaxial Cable	Huber & Suhner	106A	SSG012455	2019-01-04	2020-01-05
Coaxial Cable	Huber & Suhner	106A	SSG012711	2019-01-03	2020-01-04
Coaxial Cable	Huber & Suhner	104PEA	SSG012041	2019-01-03	2020-01-04
Bilog Antenna	Chase	CBL6111	SSG012564	2019-05-15	2020-05-15
RF Amplifier	Hewlett Packard	8447D	SSG013045	2019-01-08	2020-01-09
EMI Receiver	Rohde & Schwarz	ESU40	SSG013672	2018-11-21	2019-11-21
EMI Receiver	Rohde & Schwarz	ESU26	SSG013729	2019-02-21	2020-02-21
Double Ridged Horn Antenna	Emco	3115	SSG012508	2019-01-29	2020-01-29
Pre-Amplifier	BNR	LNA	SSG012360	2018-10-03	2019-10-03
Coaxial Cable	Micro-Coax	UFA 210B-1-1500-504504	SSG012376	2019-01-03	2020-01-04
Coaxial Cable	Huber & Suhner	ST18/Nm/Nm/36	SSG012786	2019-01-03	2020-01-04
Antenna	ETS - Lindgren	3116	Laval ANT 3MCH 00004	2019-01-07	2020-01-07
Pre-Amplifier	ComPower	PAM-840A	Gormley - GEMC 252	2019-03-20	2020-03-20
Coaxial Cable	Huber & Suhner	101 PEA, Sucoflex	SSG012290	2018-11-13	2019-11-13
Coaxial Cable	Huber & Suhner	101 PEA	SSG013785	2018-10-03	2019-10-03
Signal Analyzer	Agilent	MXA	SSG013930	2019-01-15	2020-01-15

3.2.12 Test conclusion

The RD2243 B14 (KRY 901 451/1) have passed the E-field Radiated Emission (RE) tests with respect to the Class B limits of FCC Part 15 Subpart B, FCC Part 90.543 (e) and ICES 003.

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. ANSI C63.26-2015, American National Standard for Compliance Testing of Transmitters Used in Licensed Radio Services
4. 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.
5. CISPR 22 (2008, +IS 1, + IS 2, + IS 3: 2012), Information technology equipment - Radio disturbance characteristics - Limits and methods of measurement.
6. FCC Rules for Radio Frequency Devices, Title 47 of the Code of Federal Regulations, Part 2, U.S. Federal Communications Commission.
7. FCC Rules for Radio Frequency Devices, Title 47 of the Code of Federal Regulations, Part 15 Radio Frequency Devices, U.S. Federal Communications Commission.
8. FCC Rules for Radio Frequency Devices, Title 47 of the Code of Federal Regulations, Part 90 Private land mobile radio services, U.S. Federal Communications Commission.
9. ICES-003 Issue 6 (2016), Spectrum Management and Telecommunications, Interference-Causing Equipment Standard: Information Technology Equipment (ITE) – Limits and methods of measurement.

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
AM	Amplitude modulation
ANSI	American National Standards Institute
AVG	Average detector
BiLog	Biconical Log-Periodic Hybrid antenna (a registeblue trademark of Schaffner-Chase EMC Limited, 1993)
CC	RF Current Clamp
CCC	Capacitive Coupling Clamp
CDN	Coupling-decoupling Network
CE	Conducted Emissions
CI	Conducted Immunity
CISPR	Comité International Spécial Perturbation Radioélectrique (International Special Committee on Radio Interference)
CP	RF Current Probe
CSA	Canadian Standards Association
DI	Direct Injection
DN/P	Decoupling / Protection Network
EFT	Electrical Fast Transient
EFT/B	Electrical Fast Transient / Burst Generator
EMC	Electromagnetic Compatibility
EMI	Electromagnetic Interference
ESD	Electrostatic Discharge
ETSI	European Telecommunications Standards Institute
EUT	equipment under test
GND	Ground
HCP	Horizontal Coupling Plane
HME	Harmonics Measurement Equipment
HV	High Voltage

Term	Definition
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
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
SG	RF Signal Generator
SGen	Surge Generator
STP	Shielded Twisted Pair
T	50-ohm Coaxial Termination (Conducted Emissions / Immunity)
TL	Transient Limiter
UFA	Uniform field Area
VBW	Video Bandwidth
VCP	Vertical Coupling Plane
VDI	Voltage Dips and Short Interruptions
VFF	Voltage Fluctuations and Flicker

TÜV SÜD Canada Inc

EMC Test Report

End of Document