



Canada

# EMC Test Report for LPRU 4410 B5B13 (With LTE and NR signals)

**Tested to:** FCC Part 15 Subpart B  
FCC Part 22 (Section 22.917(a))  
FCC Part 27 (Section - 27.53(C))  
ICES-003

## Test Result summary

FCC/ ICES 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	<a href="#">3.2</a>
15.107 / 6.1	Conducted Emissions (CE) for AC Power	FCC Part 15 / ICES 003 / ANSI C63.4	Pass	<a href="#">3.3</a>
27.53(C)	Transmitter Spurious Emissions (RE)	FCC Part 27 / ANSI C63.26	Pass	<a href="#">3.2</a>
22.917(a)	Out of band Emissions (RE)	FCC Part 22 / ANSI C63.26	Pass	<a href="#">3.2</a>

**Document number: 7169007217-TR-EMC-01-01-F15**

**Release date: 17 April 2020**

**Prepared for: Ericsson Canada**

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

Issue	Reason for change	Date released
01	initial release	17 April 2020

### Approvals

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

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## 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	<a href="mailto:Denis.lalonde@ericsson.com">Denis.lalonde@ericsson.com</a>

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## 1. Executive summary

This document reports the Electromagnetic Compatibility (EMC) testing performed on the product called LPRU 4410 B5B13 for Ericsson Canada per project number 7169007217. The objective of the test activities is to evaluate compliance of the product to following EMC regulatory standards.

The LPRU 4410 B5B13 is verified to comply with the Class B Emissions requirements of these standards:

- FCC Part 15 Subpart B [5] (Class B)
- ICES 003 [9] (Class B)
- FCC Part 22[7] (Emissions Limitations for cellular equipment, Section 22.917(a))
- FCC Part 27 [8] (Digital Base Stations, Section - 27.53(C))

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 LPRU 4410 B5B13

**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	Pass	<a href="#">3.3</a>

**Table 2: Summary of test results for the USA; FCC Part 22**

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

**Table 3: 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(C)	Transmitter Spurious Emissions (RE) – Digital Base Stations	FCC Part 27/ ANSI C63.26	Pass	<a href="#">3.2</a>

**Table 4: 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	Pass	<a href="#">3.3</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.

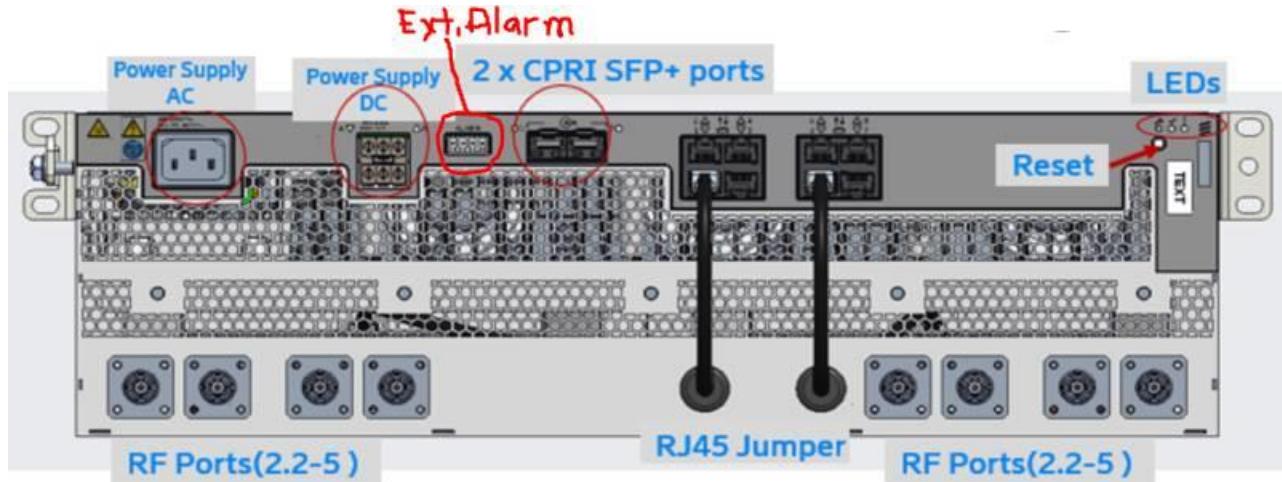
**Table 5: Assessed hardware**

Hardware component	Part number	Release
Low Power Radio Unit 4410 B5B13 (LPRU 4410, B5B13)	KRC 161 887/1	R1A

### 2.2 Product overview

The product trade name is LPRU 4410 B5B13. The LPRU 4410 product is an indoor wireless telecommunication product. It is a radio unit that provides cellular service. It can operate from AC power (100-250VAC) and DC power (-48VDC).

**Figure 1: The EUT, LPRU 4410 B5B13**



<b>Product data:</b>	
Product Name	<b>LPRU 4410 B5B13</b>
Revision:	R1A
P/N:	KRC 161 887/1
Nominal Voltage:	110VAC or -48VDC
Operating Temperature:	-5°C to +55°C
Dimensions: (H x W x D)	442 x 132 x 370mm (WxHxD)
Weight;	11.4 kg
<b>Band5: (BC2)</b>	
Capability sets (SC):	CS2
Markets:	FCC
No of RF ports:	4 (1A,1B,1C,1D)
Output power per port:	50mW
Limitation outp power:	
IBW:	25MHz
IBW limitation:	Contiguous operations only
RAT supported	NR + LTE + NB IoT IB/GB SC, MC
supported LTE BW:	5, 10MHz
supported NR BW:	5, 10, 15, 20MHz
Max No of carriers per port in MR:	
Max no of NR per port	2
Max no of LTE per port	5
Max no of GSM per port	
Modulations, LTE	QPSK, 16QAM, 64QAM, 256QAM
Modulations, GSM	
NB IoT IB per LTE host	1
NB IoT GB per LTE host (min 10MHz)	1
NB IoT SA per port	
NR FDD FR1	
CIPR	
<b>Band13: (BC1)</b>	
Capability sets (SC):	CS2
Markets:	FCC
No of RF ports:	4 (2A,2B,2C,2D)
Output power per port:	50mW
Limitation outp power:	
IBW:	10MHz
IBW limitation:	Contiguous operations only

Product data:		
RAT supported	LTE + NB IoT IB/GB	SC, MC
supported LTE BW:	5, 10MHz	
Max No of carriers per port in MR:		
Max no of LTE per port	5	
Max no of GSM per port		
Modulations, LTE	QPSK, 16QAM, 64QAM, 256QAM	
Modulations, GSM		
NB IoT IB per LTE host	1	
NB IoT GB per LTE host (min 10MHz)	1	
NB IoT SA per port		
CIPR		

The Configuration of the LPRU 4410 B5B13 that was 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 6](#) identifies all the cables and ports on the EUT. The Environment of the cables is indoor.

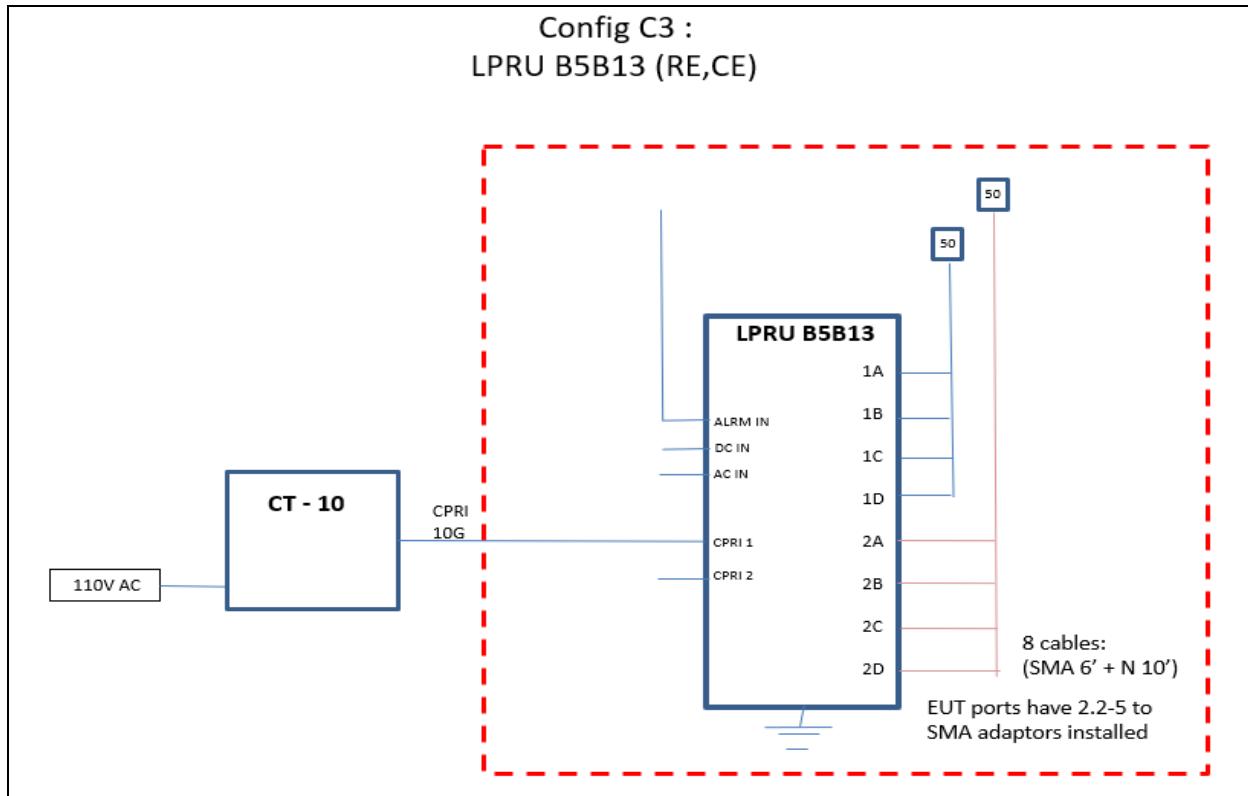
**Table 6: System port definition**

Port Name	Port Description	Port Type	Interface Detail	Plug-Cable Type	Port Test setup
AC-IN	100-250VAC, 50/60 Hz	AC Power	AC, single phase	C14, AC cable	6' cable, C14,
DC-IN-A/B	-48VDC, 3 Wire, A and B feed inputs	DC Power	3-wire or 2-wire	3-wire, AWG-10, 6mm <sup>2</sup>	1 branch is enough, test both 2w & 3w,
Alarm	External Alarm Input 1 and 2	Signal	2x2pin, single ended	AWG, unshielded,	1 branch
Data-1/2	CPRI -1 and -2	Telecom	CPRI, 2.5/5/9.8/10.1 Gbs	Optical SFP+ fiber (1km), No support for eCPRI	none
dRDI 1-8	IRU/DOT Interface, partly Internal	Internal	5G/10GBase-T, Ethernet	RJ-45, Cat6A, fixed internal termination	none
1A / 1B / 1C / 1D	RF I/O ports - Band 5	Antenna	to active DAS ports (Dot side1)	2.2-5 connector,	SMA adaptor used on all ports,
2A / 2B / 2C / 2D	RF I/O ports - Band 13	Antenna	to active DAS ports (Dot side 2)	2.2-5 connector,	SMA adaptor used on all ports,
MMI	LPRU Status LEDs	n/a	n/a	n/a	none
Ground	Ground Lug (EUT front)	Ground	AWG-6, wire	Dual Hole Flag Lug, AWG-6 (RPM777567)	6' Gnd cable attached

## 2.4 Configurations of the EUT

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

Figure 2: Test configuration for Emission tests



## 2.4.1 Radiated Emissions Single Carrier Configuration - LTE

Figure 3: Tested carrier detail - Single carrier (LTE)

Config C3, Carrier Config SC1			
B5 PORT 1A,1B, 1C,1D		B13 Port 2A, 2B, 2C, 2D	
Carrier:	<b>MIDDLE (Radiated Emissions):</b>	Carrier:	<b>MIDDLE (Radiated Emissions):</b>
1	B5: L, 5MHz, 881.5MHz	1	B13: L, 5MHz, 751MHz
Config C3, Carrier Config SC2			
B5 PORT 1A,1B, 1C,1D		B13 Port 2A, 2B, 2C, 2D	
Carrier:	<b>MIDDLE (Radiated Emissions):</b>	Carrier:	<b>MIDDLE (Radiated Emissions):</b>
1	B5: NBLoT GB 876.5MHz (PRB1)	1	B13: L, 10MHz, 751MHz
2	B5: L, 10MHz, 881.5MHz		
3	B5: NBLoT GB 886.5MHz (PRB50)		
Config C3, Carrier Config SC3			
B5 PORT 1A,1B, 1C,1D		B13 Port 2A, 2B, 2C, 2D	
Carrier:	<b>MIDDLE (Radiated Emissions):</b>	Carrier:	<b>MIDDLE (Radiated Emissions):</b>
1	B5: L, 10MHz, 881.5MHz	1	B13: NBLoT GB 746 MHz (PRB1)
		2	B13: L, 10MHz, 751MHz
		3	B13: NBLoT GB 756 MHz (PRB50)
Config C3, Carrier Config SC2 - Bottom			
B5 PORT 1A,1B, 1C,1D		B13 Port 2A, 2B, 2C, 2D	
Carrier:	<b>BOTTOM (Radiated Emissions):</b>	Carrier:	<b>BOTTOM (Radiated Emissions):</b>
1	B5: NBLoT GB 869MHz (PRB1)	1	B13: L, 10MHz, 751MHz
2	B5: L, 10MHz, 874MHz		
3	B5: NBLoT GB 879MHz (PRB50)		
Config C3, Carrier Config SC2-Middle			
B5 PORT 1A,1B, 1C,1D		B13 Port 2A, 2B, 2C, 2D	
Carrier:	<b>MIDDLE (Radiated Emissions):</b>	Carrier:	<b>MIDDLE (Radiated Emissions):</b>
1	B5: NBLoT GB 776.5MHz (PRB1)	1	B13: L, 10MHz, 751MHz
2	B5: L, 10MHz, 881.5MHz		
3	B5: NBLoT GB 786.5MHz (PRB50)		
Config C3, Carrier Config SC2-Top			
B5 PORT 1A,1B, 1C,1D		B13 Port 2A, 2B, 2C, 2D	
Carrier:	<b>TOP (Radiated Emissions):</b>	Carrier:	<b>TOP (Radiated Emissions):</b>
1	B5: NBLoT GB 884MHz (PRB1)	1	B13: L, 10MHz, 751MHz
2	B5: L, 10MHz, 889MHz		
3	B5: NBLoT GB 894MHz (PRB50)		

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

## 2.4.2 Radiated Emissions MultiCarrier Configuration - LTE

Figure 4: Tested carrier detail – Multicarrier (LTE)

Config C3, Carrier Config MC4			
B5 PORT 1A,1B, 1C,1D		B13 Port 2A, 2B, 2C, 2D	
Carrier:	<b>MIDDLE (Radiated Emissions):</b>	Carrier:	<b>MIDDLE (Radiated Emissions):</b>
1	B5: NBLoT GB 871.5MHz (PRB1)	1	B13: L, 10MHz, 751MHz
2	B5: L, 10MHz, 876.5MHz		
3	B5: NBLoT GB 881.5MHz (PRB50)		
4	B5: L, 10MHz, 886.5MHz		
Config C3, Carrier Config MC5			
B5 PORT 1A,1B, 1C,1D		B13 Port 2A, 2B, 2C, 2D	
Carrier:	<b>MIDDLE (Radiated Emissions):</b>	Carrier:	<b>MIDDLE (Radiated Emissions):</b>
1	B5: NBLoT GB 869MHz (PRB1)	1	B13: L, 10MHz, 751MHz
2	B5: L, 10MHz, 874MHz		
3	B5: NBLoT GB 879MHz (PRB50)		
4	B5: L, 10MHz, 884MHz		
5	B5: L, 5MHz, 891.5MHz		
Config C3, Carrier Config MC6			
B5 PORT 1A,1B, 1C,1D		B13 Port 2A, 2B, 2C, 2D	
Carrier:	<b>MIDDLE (Radiated Emissions):</b>	Carrier:	<b>MIDDLE (Radiated Emissions):</b>
1	B5: L, 10MHz, 876.5MHz	1	B13: NBLoT GB 746MHz (PRB1)
2	B5: L, 10MHz, 886.5MHz	2	B13: L, 10MHz, 751MHz
		3	B13: NBLoT GB 756MHz (PRB50)
Config C3, Carrier Config MC7			
B5 PORT 1A,1B, 1C,1D		B13 Port 2A, 2B, 2C, 2D	
Carrier:	<b>MIDDLE (Radiated Emissions):</b>	Carrier:	<b>MIDDLE (Radiated Emissions):</b>
1	B5: L, 10MHz, 874MHz	1	B13: NBLoT GB 746MHz (PRB1)
2	B5: L, 10MHz, 884MHz	2	B13: L, 10MHz, 751MHz
3	B5: L, 5MHz, 891.5MHz	3	B13: NBLoT GB 756MHz (PRB50)

**Note:** Radiated Emissions measurements were compared between MC4, MC5, MC6 and MC7. MC5 was found to have higher emissions. All plots with multicarrier in this report are therefore measured using MC5 carrier configuration.

## 2.4.3 Radiated Emissions Single Carrier Configuration – NR

Figure 5: Tested carrier detail – Single carrier (NR)

SINGLE RAT = NR, Config SC1			
B5 PORT 1A,1B, 1C,1D		B13 Port 2A, 2B, 2C, 2D	
<b>Carrier:</b>	<b>MIDDLE (Radiated Emissions):</b>	<b>Carrier:</b>	<b>MIDDLE (Radiated Emissions):</b>
1	B5: NR, 5MHz, 881.5MHz	1	B13: L, 10MHz, 751MHz
SINGLE RAT = NR, Config SC2			
B5 PORT 1A,1B, 1C,1D		B13 Port 2A, 2B, 2C, 2D	
<b>Carrier:</b>	<b>MIDDLE (Radiated Emissions):</b>	<b>Carrier:</b>	<b>MIDDLE (Radiated Emissions):</b>
1	B5: NR, 10MHz, 881.5MHz	1	B13: L, 10MHz, 751MHz
SINGLE RAT = NR, Config SC3			
B5 PORT 1A,1B, 1C,1D		B13 Port 2A, 2B, 2C, 2D	
<b>Carrier:</b>	<b>MIDDLE (Radiated Emissions):</b>	<b>Carrier:</b>	<b>MIDDLE (Radiated Emissions):</b>
1	B5: NR, 15MHz, 881.5MHz	1	B13: L, 10MHz, 751MHz
SINGLE RAT = NR, Config SC4			
B5 PORT 1A,1B, 1C,1D		B13 Port 2A, 2B, 2C, 2D	
<b>Carrier:</b>	<b>MIDDLE (Radiated Emissions):</b>	<b>Carrier:</b>	<b>MIDDLE (Radiated Emissions):</b>
1	B5: NR, 20MHz, 881.5MHz	1	B13: L, 10MHz, 751MHz
SINGLE RAT = NR, Config SC1- Bottom			
B5 PORT 1A,1B, 1C,1D		B13 Port 2A, 2B, 2C, 2D	
<b>Carrier:</b>	<b>Bottom (Radiated Emissions):</b>	<b>Carrier:</b>	<b>Bottom (Radiated Emissions):</b>
1	B5: NR, 5M, 871.5MHz	1	B13: L, 10MHz, 751MHz
SINGLE RAT = NR, Config SC1 - Middle			
B5 PORT 1A,1B, 1C,1D		B13 Port 2A, 2B, 2C, 2D	
<b>Carrier:</b>	<b>Middle (Radiated Emissions):</b>	<b>Carrier:</b>	<b>Middle (Radiated Emissions):</b>
1	B5: NR, 5M, 881.5MHz	1	B13: L, 10MHz, 751MHz
SINGLE RAT = NR, Config SC1 - Top			
B5 PORT 1A,1B, 1C,1D		B13 Port 2A, 2B, 2C, 2D	
<b>Carrier:</b>	<b>Top (Radiated Emissions):</b>	<b>Carrier:</b>	<b>Top (Radiated Emissions):</b>
1	B5: NR, 5M, 891.5MHz	1	B13: L, 10MHz, 751MHz

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

## 2.4.4 Radiated Emissions MultiCarrier/Single RAT Configuration – NR

Figure 6: Tested carrier detail – MultiCarrier/Single RAT Configuration (NR)

MultiCarrier/Single RAT = NR, Config MC1			
B5 PORT 1A,1B, 1C,1D		B13 Port 2A, 2B, 2C, 2D	
<b>Carrier:</b>	<b>Middle (Radiated Emissions):</b>	<b>Carrier:</b>	<b>Middle (Radiated Emissions):</b>
1	B5: NR, 5M, 881.5MHz	1	B13: L, 10MHz, 751MHz
2	B5: NR, 5M, 886.5MHz		

## 2.4.5 Radiated Emissions MultiCarrier/Multi RAT Configuration – NR+LTE

Figure 7: Tested carrier detail – MultiCarrier / Multi RAT Configuration (NR)

MultiCarrier / MultiRAT = NR+LTE, Config MR1			
B5 PORT 1A,1B, 1C,1D		B13 Port 2A, 2B, 2C, 2D	
<b>Carrier:</b>	<b>MIDDLE (Radiated Emissions):</b>	<b>Carrier:</b>	<b>MIDDLE (Radiated Emissions):</b>
1	B5: NBLoT GB 869MHz (PRB1)	1	B13: L, 10MHz, 751MHz
2	B5: L, 10MHz, 874MHz		
3	B5: NBLoT GB 879MHz (PRB50)		
4	B5: NR, 5MHz, 881.5MHz		

MultiCarrier / MultiRAT = NR+LTE, Config MR1			
B5 PORT 1A,1B, 1C,1D		B13 Port 2A, 2B, 2C, 2D	
<b>Carrier:</b>	<b>MIDDLE (Radiated Emissions):</b>	<b>Carrier:</b>	<b>MIDDLE (Radiated Emissions):</b>
1	B5: NBLoT GB 869MHz (PRB1)	1	B13: L, 10MHz, 751MHz
2	B5: L, 10MHz, 874MHz		
3	B5: NBLoT GB 879MHz (PRB50)		
4	B5: NR, 5MHz, 881.5MHz		

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

## 2.4.6 Conducted Emissions Carrier Configuration – LTE

Figure 8: CE tested carrier detail

Config C3 Carrier Config for CE			
B5 PORT 1A,1B, 1C,1D		B13 Port 2A, 2B, 2C, 2D	
Carrier:	<b>MIDDLE (Conducted Emissions):</b>	Carrier:	<b>MIDDLE (Conducted Emissions):</b>
1	<i>B5: L, 10MHz, 869MHz</i>	1	<i>B13: L, 10MHz, 751MHz</i>
2	<i>B5: NB IoT GB 874MHz (PRB50)</i>		

## 2.5 Modifications of the EUT during testing

Following modifications were made to the EUT prior to EMC testing.

Table 7: EUT Modifications

Band 5 BOM Changes:				
Ref Des	Old EPN	Description	New EPN	Description
L13A7	REG 724 5181/91PH	INDUCTOR/9.1nH 3% 0201	REG 724 5181/75PH	7.5nH 3% 0201
L14A7	REG 724 5181/91PH	INDUCTOR/9.1nH 3% 0201	REG 724 5181/75PH	7.5nH 3% 0201
Band 13 BOM Changes:				
Ref Des	Old EPN	Description	New EPN	Description
R102A8	DNI	NA	RJC 545 1111/18C	1.8pF +/-0.25pF 0201 100V HQ C0G
R103A8	DNI	NA	RJC 545 1111/18C	1.8pF +/-0.25pF 0201 100V HQ C0G
R119A10	REP 621 105/51	RESISTOR/51Kohm 1% 0201 0.05W	REP 621 104/1	1kohm 1% 0201 0.05W

## 2.6 Inventory of the EUT and support equipments

The following tables identifies the inventory of the EUT.

**Table 8: Inventory of the EUT & Support with LTE (RE & CE tests)**

Equipment Role	Product Name	Product Number	Release	Product Serial#
EUT	LPRU 4410 B5B13	KRC 161 887/1	R1A	TD3F056933
AC power cable	generic, 14AWG, C14 plug, 2m	na	na	na
DC power cable	2W DC Cable	RPM 777 825/02500	na	na
DC extension cable	TUV DC power cable, 13mm 2, 4m	na	na	na
Optical Fiber	LC, SM, 20m	na	na	na
RF Adaptor	2.2-5 to SMA Adaptor	na	na	na
RF Cable	N-type, 10m	na	na	na
RF Cable	SMA, 2m	na	na	na
Ext Alarm Cable	Custom, 4w, 16-AWG, 5m	na	na	na
TEST SET	CT-10, DU-SIM	LPC 102 487/1	R1C	T01F311639
<b>Software info</b>				
IRU load: CXP9013268%17_R80DD				

**Table 9: Inventory of the EUT & Support with NR signal (RE tests)**

Equipment Role	Product Name	Product Number	Release	Product Serial#
EUT	LPRU 4410 B5B13	KRC 161 887/1	R1A	TD3F057135
AC power cable	generic, 14AWG, C14 plug, 2m	na	na	na
Optical Fiber	LC, SM, 20m	na	na	na
RF Adaptor	2.2-5 to SMA Adaptor	na	na	na
RF Cable	N-type, 10m	na	na	na
RF Cable	SMA, 2m	na	na	na
Ext Alarm Cable	Custom, 4w, 16-AWG, 5m	na	na	na
TEST SET	CT-10, DU-SIM	LPC 102 487/1	R1C	T01F311639
<b>Software info</b>				
IRU load: CXP9013268%17_R82DD				

### 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	ANSI C63.4	USA
FCC Part 27,	ANSI C63.4	USA
ICES 003	ANSI C63.4	Canada

The limits of the RE tests are as follows.

**Table 11: RE limits at 10 m for Class B of FCC**

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 12: Emission limits for FCC Part 27 & Part 22**

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

### 3.2.2 Test procedure

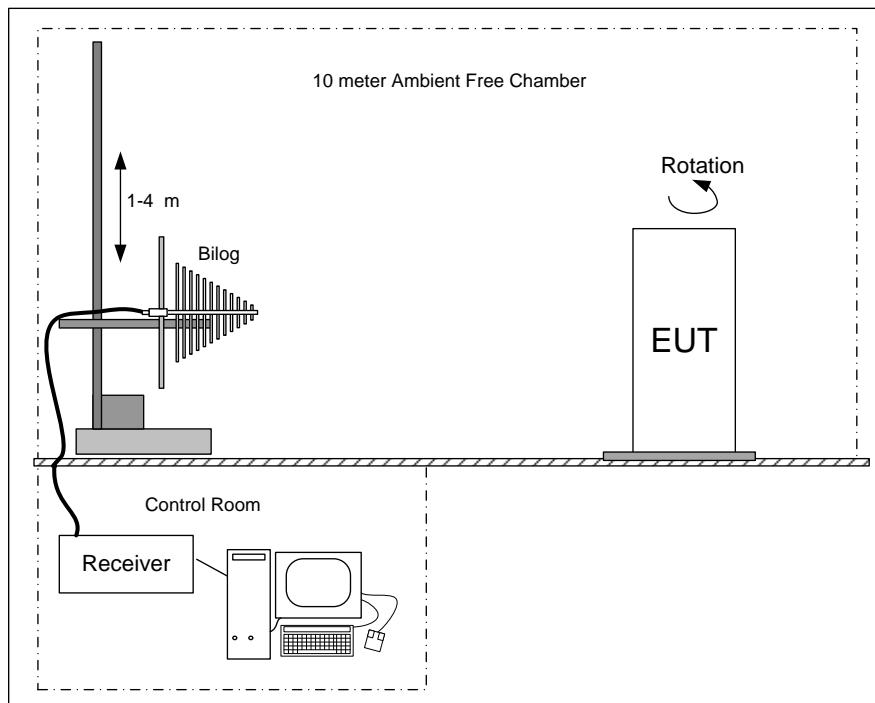
Verifications of the test equipment and AFC were performed before the installation of the EUT in accordance with the quality assurance procedures documented in the EMC test procedures document. The test was performed according to the relevant procedures listed in [Table 10](#).

- 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 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 9: 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
- $\pm 4.8$  dB between 10 GHz and 18 GHz
- $\pm 4.6$  dB between 18 GHz and 26.5 GHz
- $\pm 4.8$  dB between 26.5 GHz and 40 GHz

### 3.2.5 Test results of Radiated Emissions – (Single carrier-2 LTE - Bottom channel)

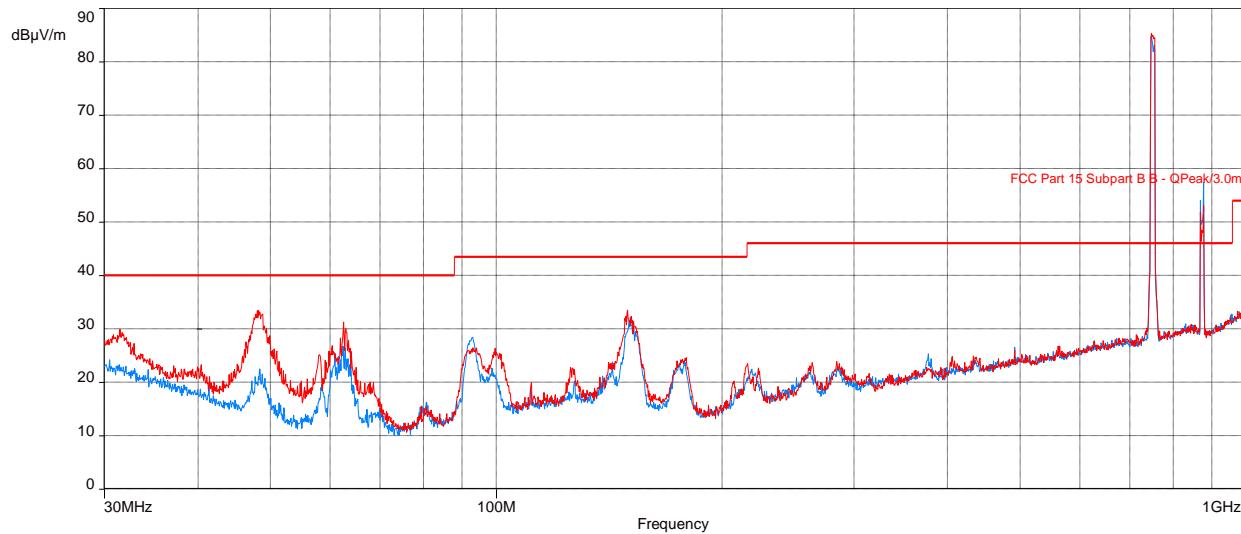
Test location: 10-meter Ambient Free Chamber (AFC)

Date tested: 6 -10 February 2020

Tested by: Turker Dagdelen

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 10: Plot of RE at 3 m – 30 to1000 MHz (LTE – Bottom channel)**

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

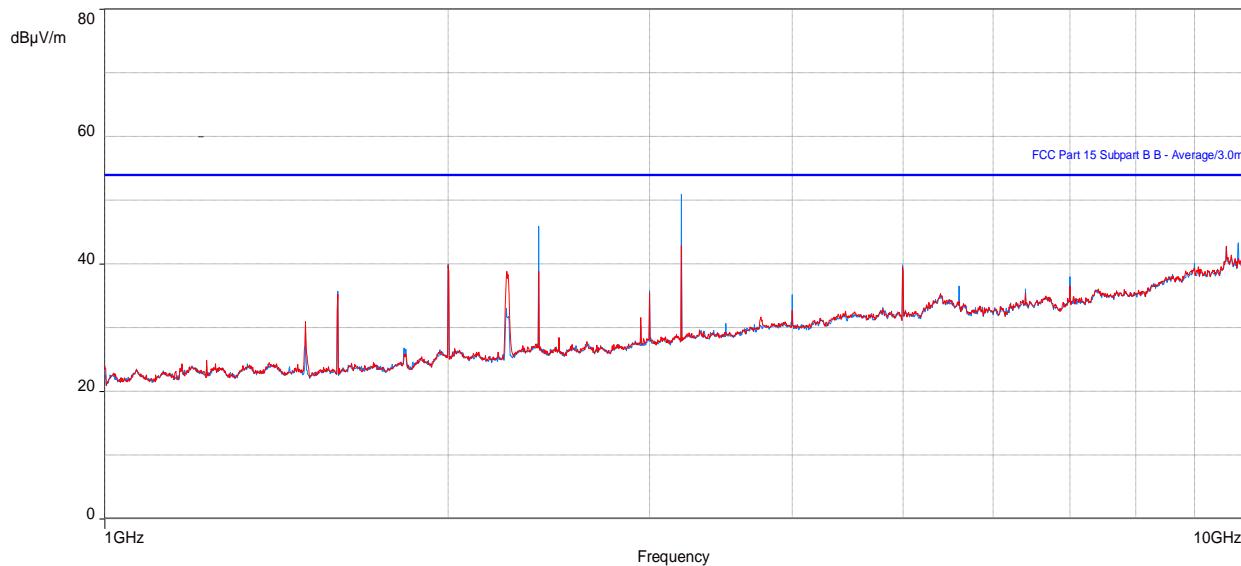
**Table 13: RE test results from 30 to 1000 MHz for FCC Part 15 (LTE – Bottom channel)**

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)
48.12666026	29.35	40.00	-10.65	1.00	19.00	Vertical	-11.40
62.62741667	24.10	40.00	-15.90	2.01	26.25	Vertical	-14.94
149.6947949	28.18	43.52	-15.34	1.12	240.25	Vertical	-8.56
150.8803877	25.22	43.52	-18.30	2.76	112.50	Horizontal	-8.61

**Table 14: RE test results from 30 to 1000 MHz for FCC Part 22/27 (LTE – bottom channel)**

Frequency (MHz)	Level (dBμV/m)	EIRP Limit (dBμV/m)	Margin to FCC part 22/27 (dB)	Height (m)	Azimuth (deg)	Polarization	Correction (dB)
48.12666026	29.35	82.2	-52.85	1.00	19.00	Vertical	-11.40
62.62741667	24.10	82.2	-58.10	2.01	26.25	Vertical	-14.94
149.6947949	28.18	82.2	-54.02	1.12	240.25	Vertical	-8.56
150.8803877	25.22	82.2	-56.98	2.76	112.50	Horizontal	-8.61

**Note:** In the table/Plot above, no emissions exceed the Part 22/Part 27 radiated spurious emissions limit when converted to dB<sub>μ</sub>V/m, except for the fundamentals. For final spurious emissions measurements to FCC Part 22/Part 27, see antenna port conducted emissions in applicable test report.

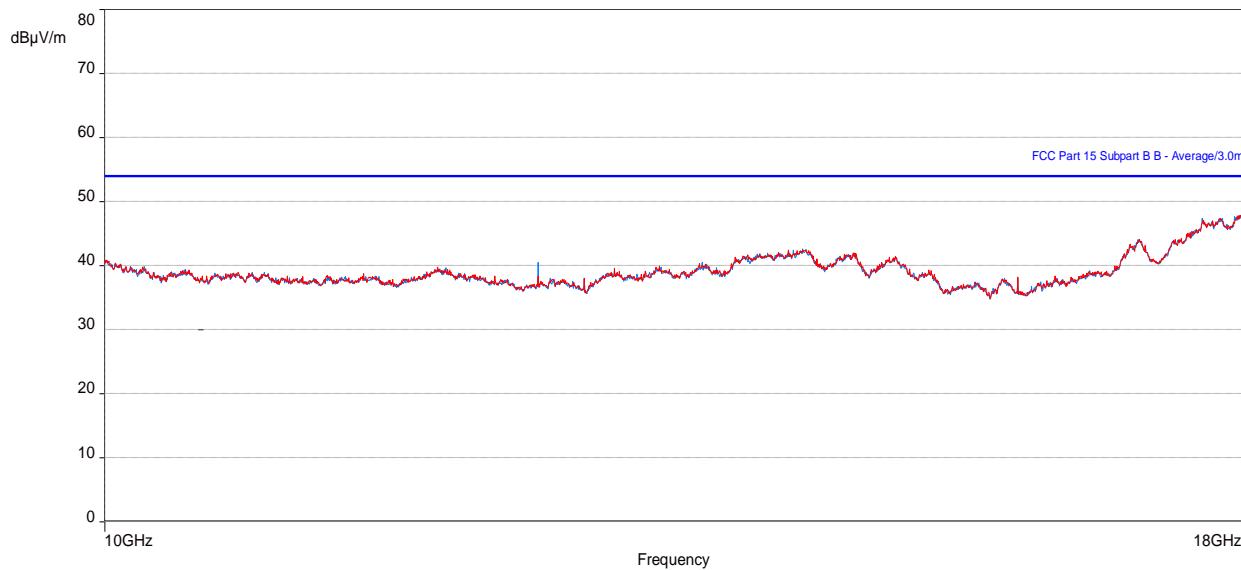
**Figure 11: Plot of RE at 3m from 1 to 10 GHz (LTE – Bottom channel)****Table 15: RE test results from 1 to 10 GHz for FCC Part 15 (LTE – Bottom channel)**

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)
2399.984295	46.23	53.96	-7.73	3.47	177.50	Horizontal	-7.74
3199.978526	51.65	53.96	-2.31	2.57	177.75	Horizontal	-6.37
3199.978526	43.83	53.96	-10.13	2.63	105.50	Vertical	-6.37

**Table 16: RE test results from 1 to 10 GHz for FCC Part 22/27 (LTE – Bottom channel)**

Frequency (MHz)	Level (dBµV/m)	EIRP Limit (dBµV/m)	Margin to FCC part 22/27 (dB)	Height (m)	Azimuth (degrees)	Polarization	Correction (dB)
2399.984295	46.23	82.2	-35.97	3.47	177.50	Horizontal	-7.74
3199.978526	51.65	82.2	-30.55	2.57	177.75	Horizontal	-6.37
3199.978526	43.83	82.2	-38.37	2.63	105.50	Vertical	-6.37

**Note:** In the table/Plot above, no emissions exceed the Part 22/27 radiated spurious emissions limit when converted to dB<sub>µ</sub>V/m. For final spurious emissions measurements to FCC Part 22/27, see antenna port conducted emissions in applicable test report.

**Figure 12: Plot of RE at 3m from 10 to 18 GHz (LTE – Bottom channel)****Table 17: RE test results from 10 to 18 GHz for FCC Part 15 (LTE – Bottom channel)**

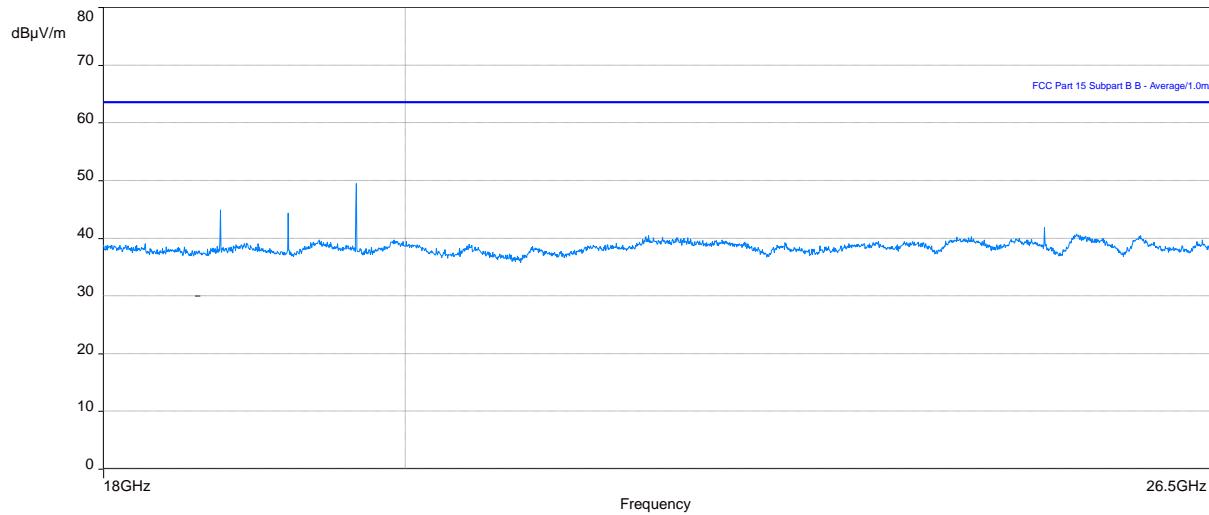
Frequency (MHz)	Level Average (dB $\mu$ V/m)	Limit Average (dB $\mu$ V/m)	Margin to FCC part 15 Class B (dB)	Height (m)	Azimuth (degrees)	Polarization	Correction (dB)
17033.3314	40.39	53.96	-13.57	1.00	16.50	Vertical	14.04
17759.31378	43.70	53.96	-10.26	1.00	360.00	Vertical	16.97

**Table 18: RE test results from 10 to 18 GHz FCC Part 22/27 (LTE – Bottom channel)**

Frequency (MHz)	Level (dB $\mu$ V/m)	EIRP Limit (dB $\mu$ V/m)	Margin to FCC part 22/27 (dB)	Height (m)	Azimuth (degrees)	Polarization	Correction (dB)
17033.3314	40.39	82.2	-41.81	1.00	16.50	Vertical	14.04
17759.31378	43.70	82.2	-38.50	1.00	360.00	Vertical	16.97

**Note:** In the table/Plot above, no emissions exceed the Part 22/27 radiated spurious emissions limit when converted to dB $\mu$ V/m. For final spurious emissions measurements to FCC Part 22/27, see antenna port conducted emissions in applicable test report.

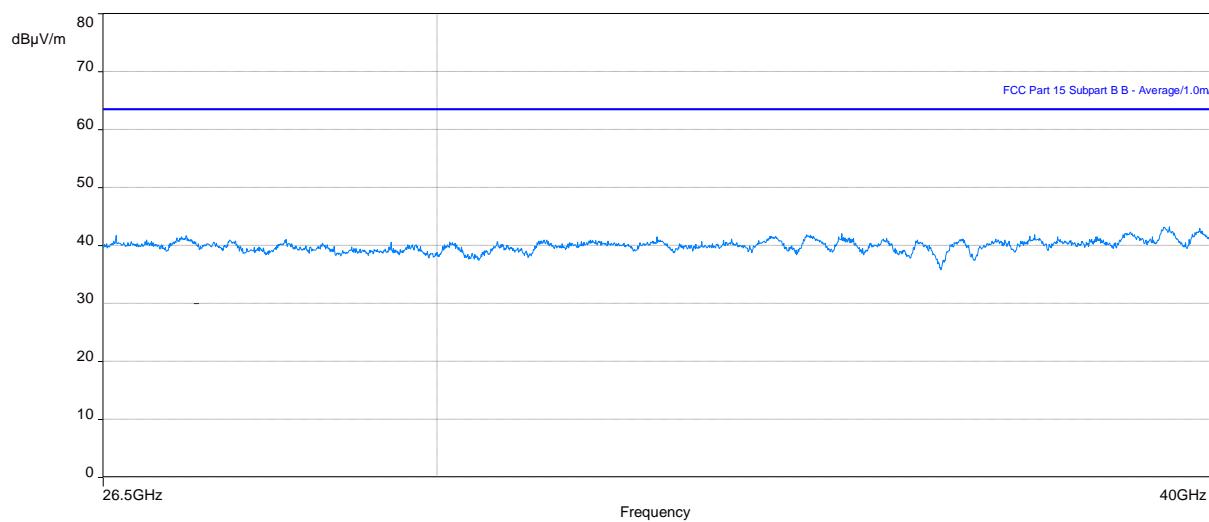
**Figure 13: Plot of RE at 1m from 18 to 26.5 GHz (LTE – Bottom channel)**



**Note 1:** In the plot above No Emissions exceeds the FCC Part 15 limit.

**Note 2:** In the plot above, no emissions exceed the Part 22/27 radiated spurious emissions limit when converted to dB $\mu$ V/m. For final spurious emissions measurements to FCC Part 22/27, see antenna port conducted emissions in applicable test report.

**Figure 14: Plot of RE at 1m from 26.5 to 40 GHz (LTE – Bottom channel)**



**Note 1:** In the plot above No Emissions exceeds the FCC Part 15 limit.

**Note 2:** In the plot above, no emissions exceed the Part 22/27 radiated spurious emissions limit when converted to dB $\mu$ V/m. For final spurious emissions measurements to FCC Part 22/27, see antenna port conducted emissions in applicable test report.

### 3.2.6 Test results of Radiated Emissions – (Single carrier-2, LTE – Middle channel)

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

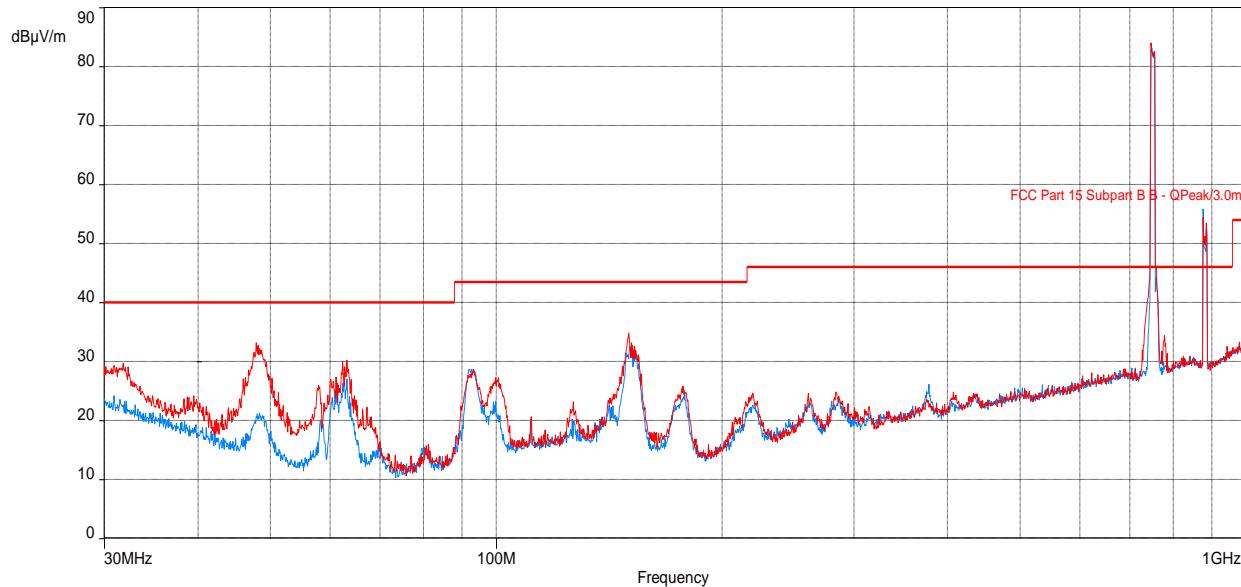
Date tested: 6 -10 February 2020

Tested by: Turker Dagdelen

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 (LTE – Middle channel)



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

Table 19: RE test results from 30 to 1000 MHz for FCC Part 15 (LTE – Middle 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)
47.85008333	29.39	40.00	-10.61	1.37	18.75	Vertical	-11.27
63.22908941	25.21	40.00	-14.79	1.34	141.50	Vertical	-14.89
150.3166569	28.50	43.52	-15.02	1.12	240.00	Vertical	-8.58

Table 20: RE test results from 30 to 1000 MHz for FCC Part 22/27 (LTE – Middle channel)

Frequency (MHz)	Level (dBµV/m)	EIRP Limit (dBµV/m)	Margin to (dB)	Height (m)	Azimuth (deg)	Polarization	Correction (dB)
47.85008333	29.39	82.2	-52.81	1.37	18.75	Vertical	-11.27
63.22908941	25.21	82.2	-56.99	1.34	141.50	Vertical	-14.89
150.3166569	28.50	82.2	-53.70	1.12	240.00	Vertical	-8.58

**Note:** In the table/Plot above, no emissions exceed the Part 22/Part 27 radiated spurious emissions limit when converted to dBµV/m, except for the fundamentals. For final spurious emissions measurements to FCC Part 22/Part 27, see antenna port conducted emissions in applicable test report.

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

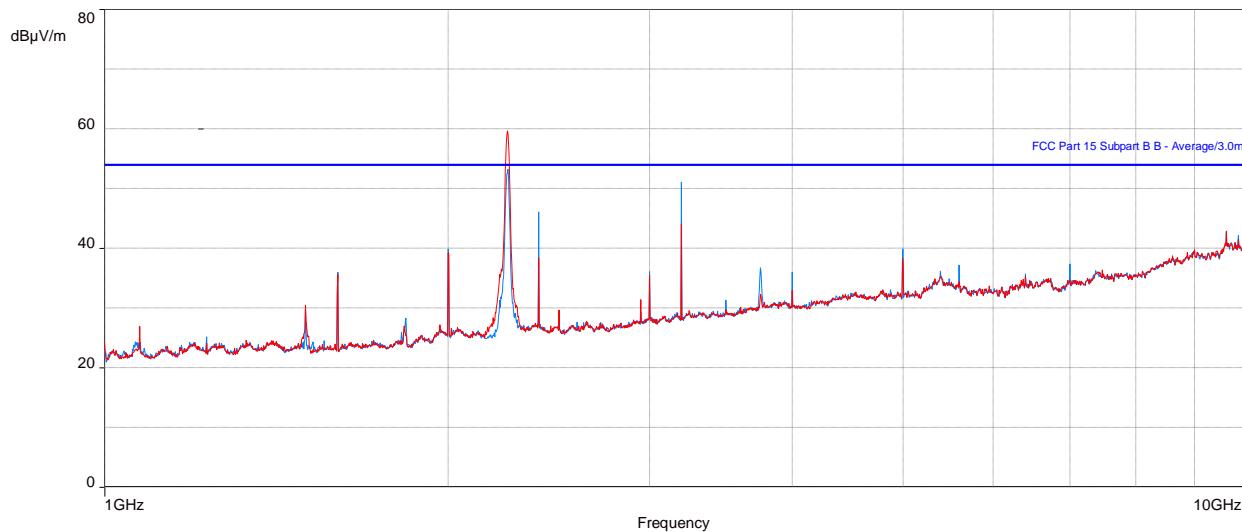


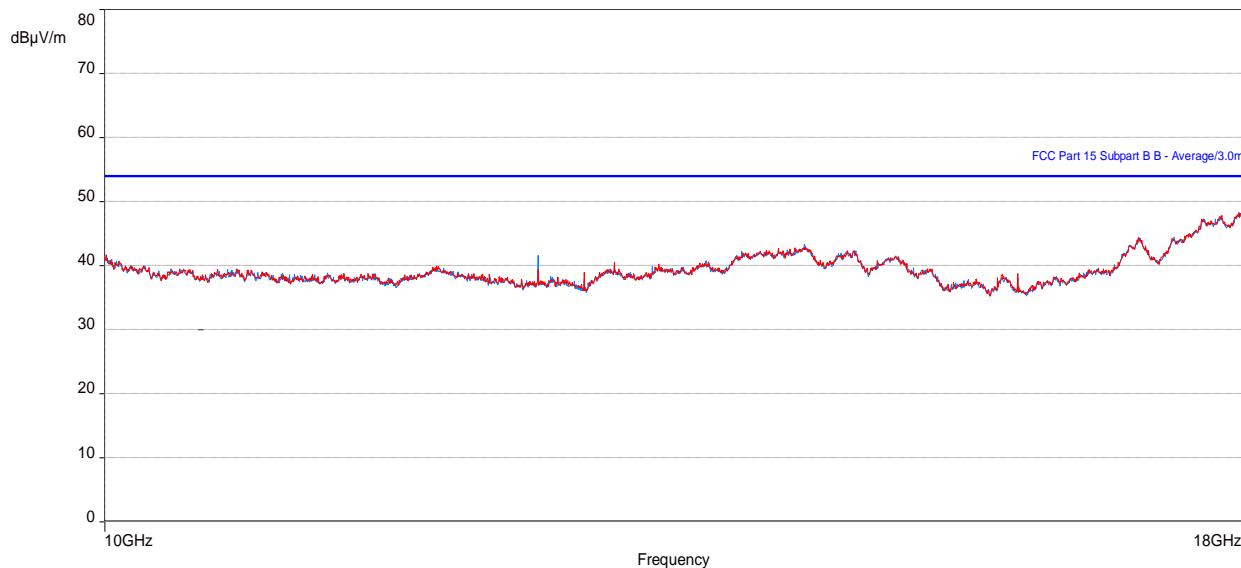
Table 21: RE test results from 1 to 10 GHz for Part 15 (LTE – Middle channel)

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)
2252.751603	39.73	53.96	-14.23	2.01	313.00	Vertical	-9.36
2254.571154	32.24	53.96	-21.72	3.26	285.75	Horizontal	-9.34
2399.984295	45.61	53.96	-8.35	1.00	178.00	Horizontal	-7.74
3199.976923	51.32	53.96	-2.64	2.57	175.50	Horizontal	-6.37
3199.978526	44.11	53.96	-9.85	2.63	112.75	Vertical	-6.37

Table 22: RE test results from 1 to 10 GHz for Part 22/27 (LTE – Middle channel)

Frequency (MHz)	Level (dB $\mu$ V/m)	EIRP Limit (dB $\mu$ V/m)	Margin to FCC part 22/27 (dB)	Height (m)	Azimuth (degrees)	Polarization	Correction (dB)
2252.751603	39.73	82.2	-42.47	2.01	313.00	Vertical	-9.36
2254.571154	32.24	82.2	-49.96	3.26	285.75	Horizontal	-9.34
2399.984295	45.61	82.2	-36.59	1.00	178.00	Horizontal	-7.74
3199.976923	51.32	82.2	-30.88	2.57	175.50	Horizontal	-6.37
3199.978526	44.11	82.2	-38.09	2.63	112.75	Vertical	-6.37

**Note:** In the table/Plot above, no emissions exceed the Part 22/27 radiated spurious emissions limit when converted to dB $\mu$ V/m. For final spurious emissions measurements to FCC Part 22/27, see antenna port conducted emissions in applicable test report.

**Figure 17: Plot of RE at 3m from 10 to 18 GHz (LTE – Middle channel)****Table 23: RE test results from 10 to 18 GHz for FCC Part 15 (LTE – Middle channel)**

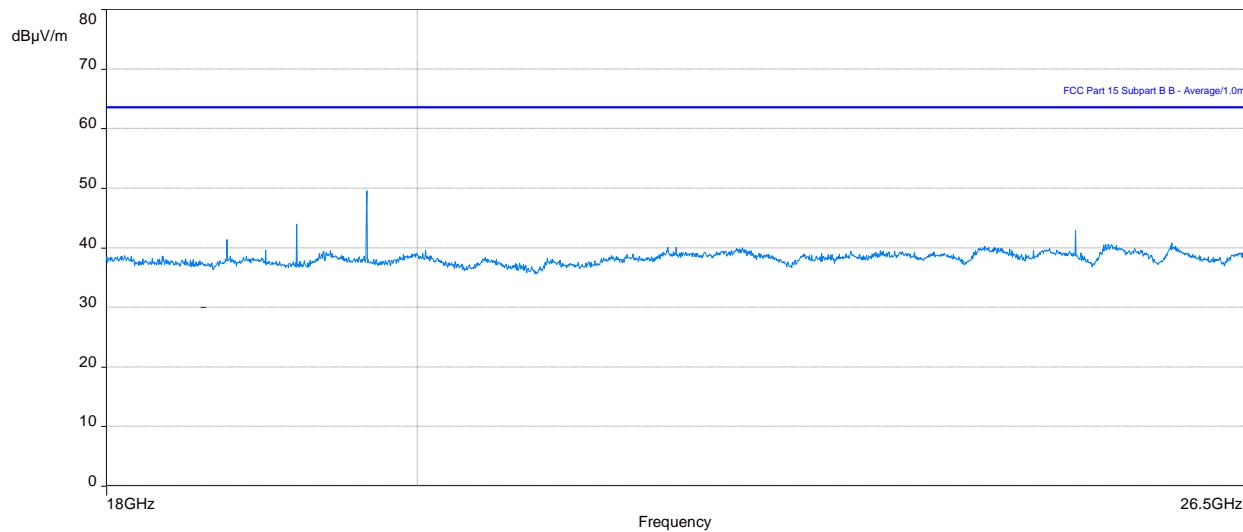
Frequency (MHz)	Level Average (dB $\mu$ V/m)	Limit Average (dB $\mu$ V/m)	Margin to FCC part 15 Class B (dB)	Height (m)	Azimuth (degrees)	Polarization	Correction (dB)
17764.48172	43.92	53.96	-10.04	1.00	299.75	Horizontal	16.91
17771.94391	43.96	53.96	-10.00	1.00	16.75	Vertical	16.82
17964.09936	44.91	53.96	-9.05	1.00	53.00	Horizontal	21.17
17967.66249	45.04	53.96	-8.92	1.00	38.75	Vertical	21.25

**Table 24: RE test results from 10 to 18 GHz for FCC Part 22/27 (LTE – Middle channel)**

Frequency (MHz)	Level (dB $\mu$ V/m)	EIRP Limit (dB $\mu$ V/m)	Margin to FCC part 22/27 (dB)	Height (m)	Azimuth (degrees)	Polarization	Correction (dB)
17764.48172	43.92	82.2	-38.28	1.00	299.75	Horizontal	16.91
17771.94391	43.96	82.2	-38.24	1.00	16.75	Vertical	16.82
17964.09936	44.91	82.2	-37.29	1.00	53.00	Horizontal	21.17
17967.66249	45.04	82.2	-37.16	1.00	38.75	Vertical	21.25

**Note:** In the table/Plot above, no emissions exceed the Part 22/27 radiated spurious emissions limit when converted to dB $\mu$ V/m. For final spurious emissions measurements to FCC Part 22/27, see antenna port conducted emissions in applicable test report.

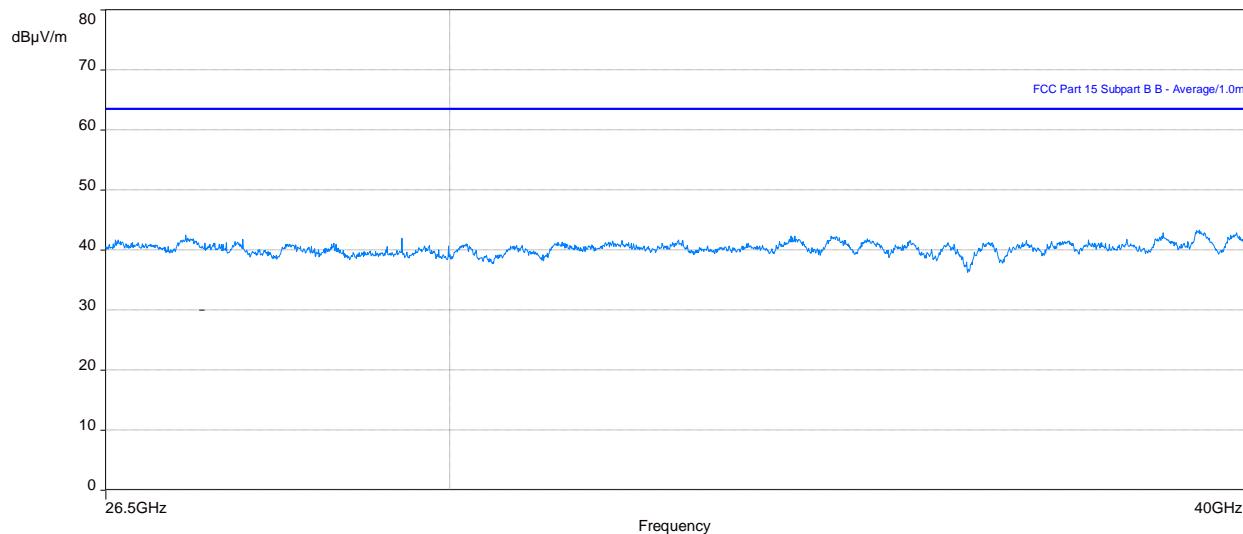
**Figure 18: Plot of RE at 1m from 18 to 26.5 GHz (LTE – Middle channel)**



**Note 1:** In the plot above No Emissions exceeds the FCC Part 15 limit.

**Note 2:** In the plot above, no emissions exceed the Part 22/27 radiated spurious emissions limit when converted to dB $\mu$ V/m. For final spurious emissions measurements to FCC Part 22/27, see antenna port conducted emissions in applicable test report.

**Figure 19: Plot of RE at 1m from 26.5 to 40 GHz (LTE – Middle channel)**



**Note 1:** In the plot above No Emissions exceeds the FCC Part 15 limit.

**Note 2:** In the plot above, no emissions exceed the Part 22/27 radiated spurious emissions limit when converted to dB $\mu$ V/m. For final spurious emissions measurements to FCC Part 22/27, see antenna port conducted emissions in applicable test report.

### 3.2.7 Test results of Radiated Emissions – (Single carrier-2, LTE – Top channel)

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

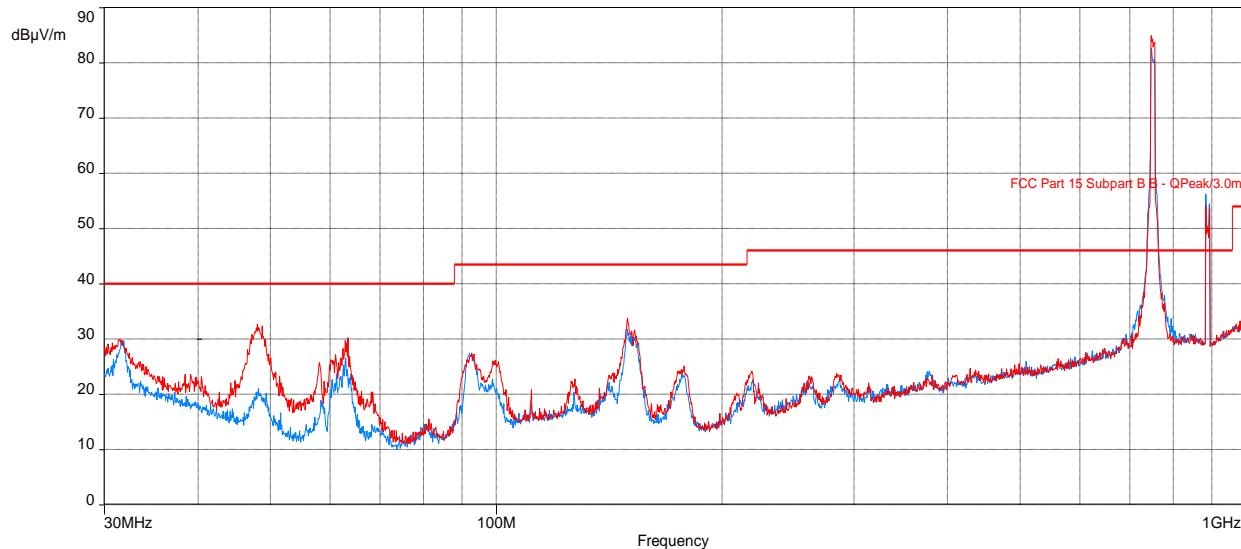
Date tested: 6 -10 February 2020

Tested by: Turker Dagdelen

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 (LTE – Top channel)



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

Table 25: RE test results from 30 to 1000 MHz for FCC part 15 (LTE – 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)
31.63774326	18.34	40.00	-21.66	2.39	282.50	Horizontal	-3.33
48.02837821	29.26	40.00	-10.74	1.00	19.00	Vertical	-11.35
63.44484649	23.87	40.00	-16.13	1.27	141.50	Vertical	-14.88
149.7833013	28.13	43.52	-15.39	1.00	246.00	Vertical	-8.56

Table 26: RE test results from 30 to 1000 MHz for Part 22/27 (LTE – Top channel)

Frequency (MHz)	Level (dBµV/m)	EIRP Limit (dBµV/m)	Margin to FCC part 22/27 (dB)	Height (m)	Azimuth (deg)	Polarization	Correction (dB)
31.63774326	18.34	82.2	-63.86	2.39	282.50	Horizontal	-3.33
48.02837821	29.26	82.2	-52.94	1.00	19.00	Vertical	-11.35
63.44484649	23.87	82.2	-58.33	1.27	141.50	Vertical	-14.88
149.7833013	28.13	82.2	-54.07	1.00	246.00	Vertical	-8.56

**Note:** In the table/Plot above, no emissions exceed the Part 22/27 radiated spurious emissions limit when converted to dBµV/m, except for the fundamentals. For final spurious emissions measurements to FCC Part 22/27, see antenna port conducted emissions in applicable test report.

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

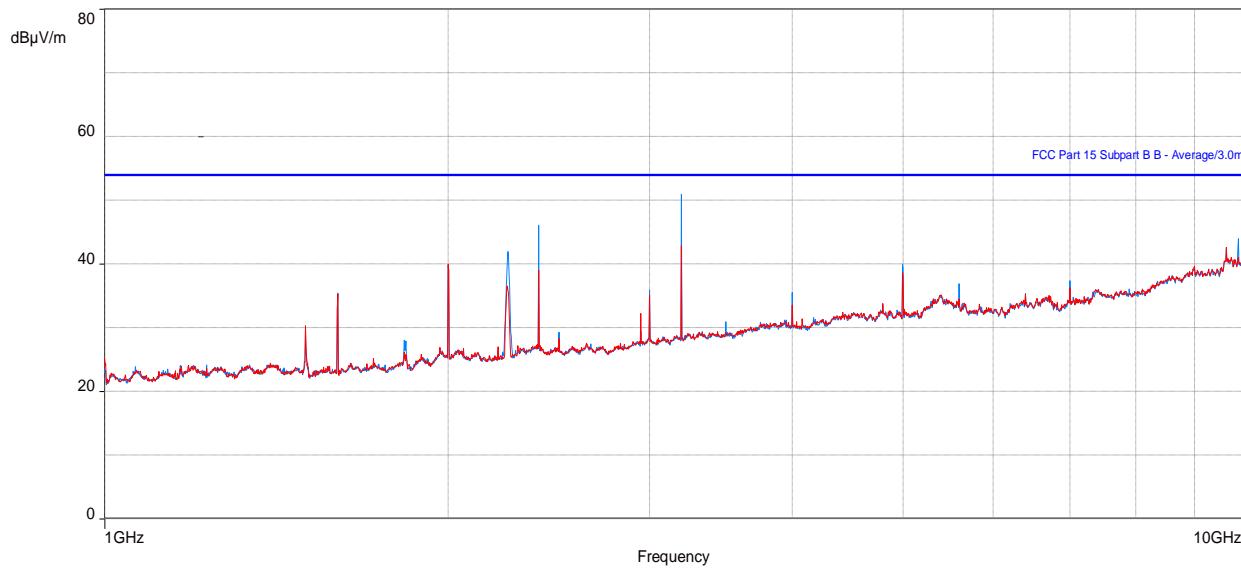


Table 27: RE test results from 1 to 10 GHz for FCC Part 15 (LTE – Top channel)

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 (deg)	Polarization	Correction (dB)
2399.984295	46.24	53.96	-7.72	3.47	177.75	Horizontal	-7.74
3199.978526	51.47	53.96	-2.49	2.92	177.50	Horizontal	-6.37
3199.978526	43.67	53.96	-10.29	2.64	105.50	Vertical	-6.37

Table 28: RE test results from 1 to 10 GHz for FCC Part 22/27 (LTE – Top channel)

Frequency (MHz)	Level (dB $\mu$ V/m)	Limit EIRP (dB $\mu$ V/m)	Margin to FCC part 27 (dB)	Height (m)	Azimuth (degrees)	Polarization	Correction (dB)
2399.984295	46.24	82.2	-35.96	3.47	177.75	Horizontal	-7.74
3199.978526	51.47	82.2	-30.73	2.92	177.50	Horizontal	-6.37
3199.978526	43.67	82.2	-38.53	2.64	105.50	Vertical	-6.37

**Note:** In the table/Plot above, no emissions exceed the Part 22/27 radiated spurious emissions limit when converted to dB $\mu$ V/m, except for the fundamental. For final spurious emissions measurements to FCC Part 22/27, see antenna port conducted emissions in applicable test report.

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

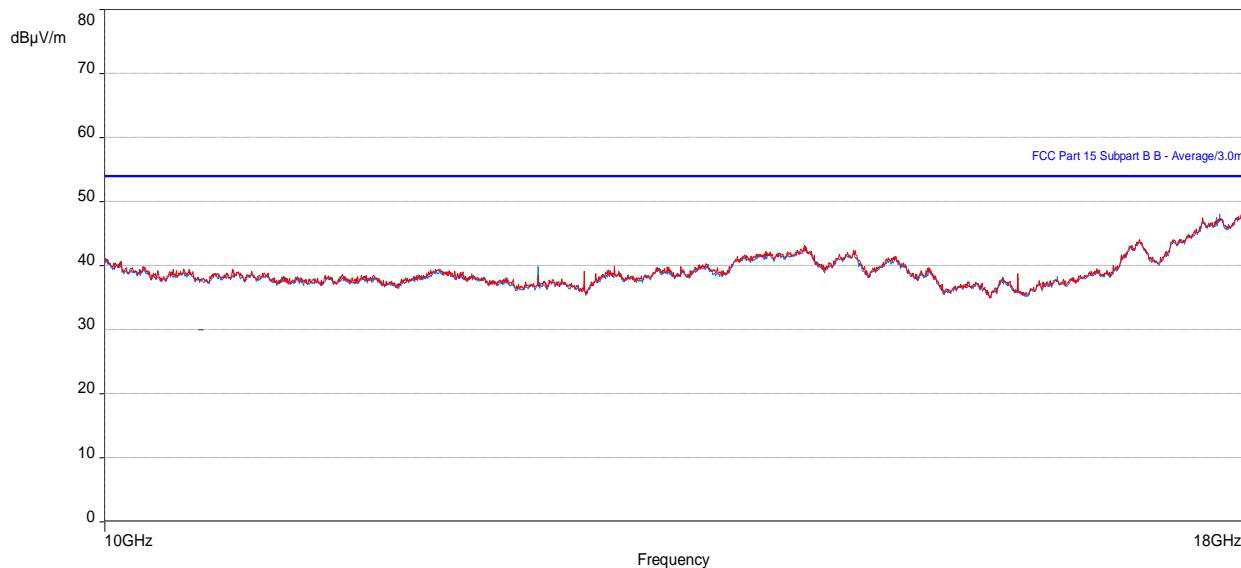


Table 29: RE test results from 10 to 18 GHz for FCC Part 15 (LTE – Top channel)

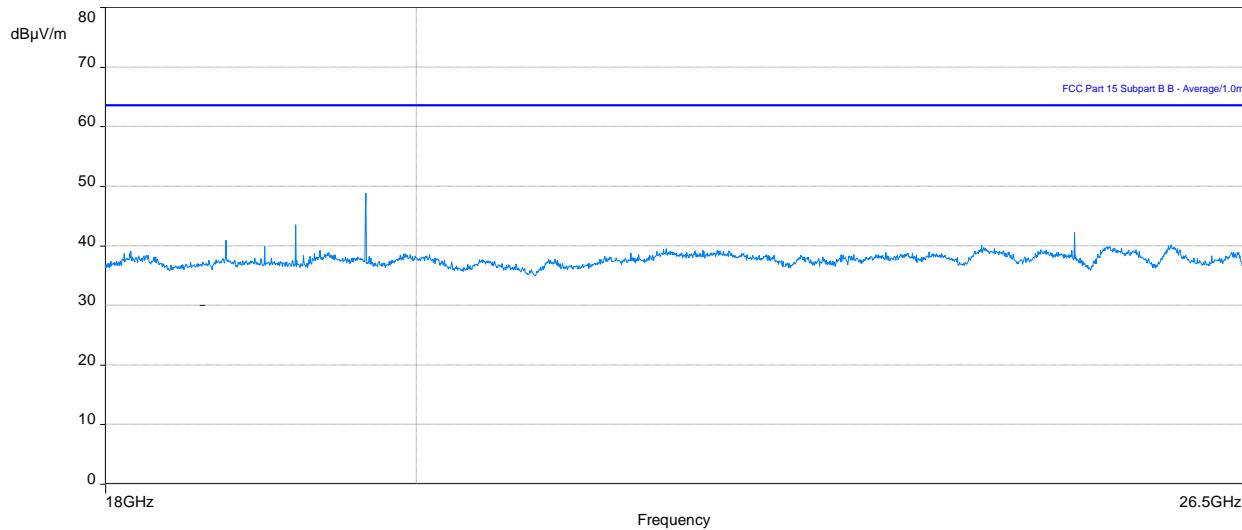
Frequency (MHz)	Level Average (dB $\mu$ V/m)	Limit Average (dB $\mu$ V/m)	Margin to FCC part 15 Class B (dB)	Height (m)	Azimuth (degrees)	Polarization	Correction (dB)
17599.02755	43.25	53.96	-10.71	4.00	343.25	Vertical	19.62
17600.48332	43.40	53.96	-10.56	4.00	307.25	Horizontal	19.61
17978.79518	45.15	53.96	-8.81	4.00	2.50	Vertical	21.51
17981.26409	45.40	53.96	-8.56	4.00	88.75	Horizontal	21.57

Table 30: RE test results from 10 to 18 GHz for FCC Part 27 (LTE – Top channel)

Frequency (MHz)	Level (dB $\mu$ V/m)	Limit EIRP (dB $\mu$ V/m)	Margin to FCC part 22/27 (dB)	Height (m)	Azimuth (deg)	Polarization	Correction (dB)
17599.02755	43.25	82.2	-38.95	4.00	343.25	Vertical	19.62
17600.48332	43.40	82.2	-38.80	4.00	307.25	Horizontal	19.61
17978.79518	45.15	82.2	-37.05	4.00	2.50	Vertical	21.51
17981.26409	45.40	82.2	-36.80	4.00	88.75	Horizontal	21.57

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

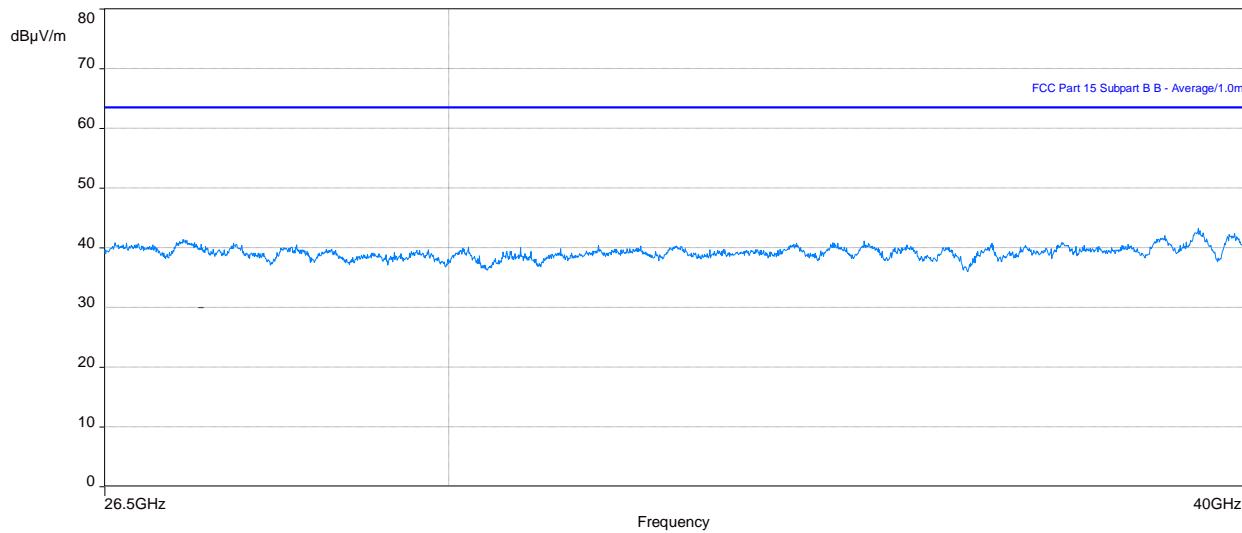
**Figure 23: Plot of RE at 1m from 18 to 26.5 GHz (LTE – Top channel)**



**Note 1:** In the plot above No Emissions exceeds the FCC Part 15 limit.

**Note 2:** In the plot above, no emissions exceed the Part 22/27 radiated spurious emissions limit when converted to dB $\mu$ V/m. For final spurious emissions measurements to FCC Part 22/27, see antenna port conducted emissions in applicable test report.

**Figure 24: Plot of RE at 1m from 26.5 to 40 GHz (LTE – Top channel)**



**Note 1:** In the plot above No Emissions exceeds the FCC Part 15 limit.

**Note 2:** In the plot above, no emissions exceed the Part 22/27 radiated spurious emissions limit when converted to dB $\mu$ V/m. For final spurious emissions measurements to FCC Part 22/27, see antenna port conducted emissions in applicable test report.

### 3.2.8 Test results of Radiated Emissions – (Multi carrier- 5, LTE – Middle channel)

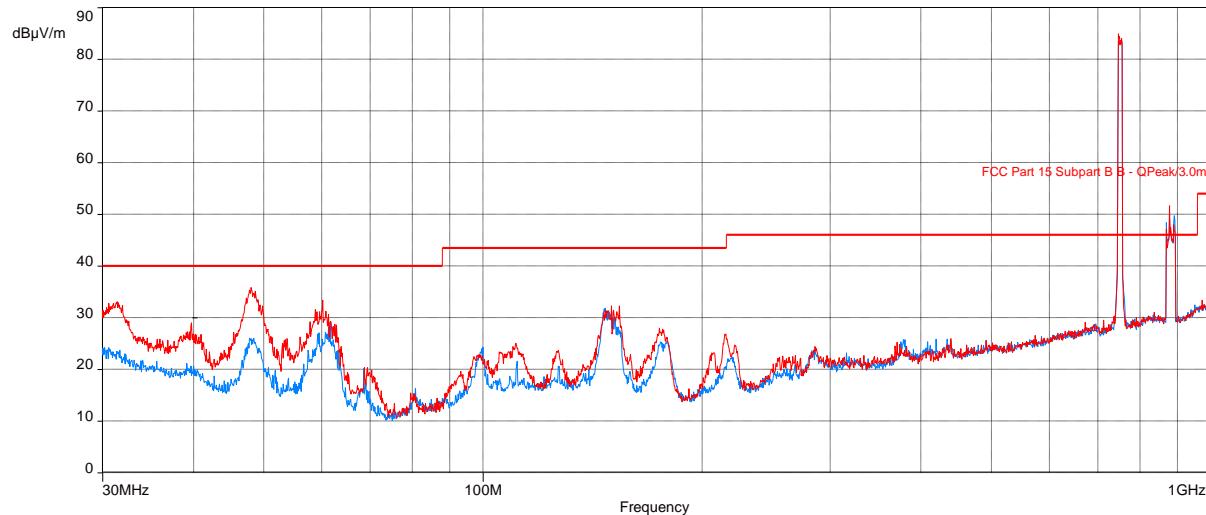
Test location: 10-meter Ambient Free Chamber (AFC)

Date tested: 6 - 10 February 2020

Tested by: Turker Dagdelen

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 to1000 MHz (MC 5, LTE – Middle channel) – AC powered**

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

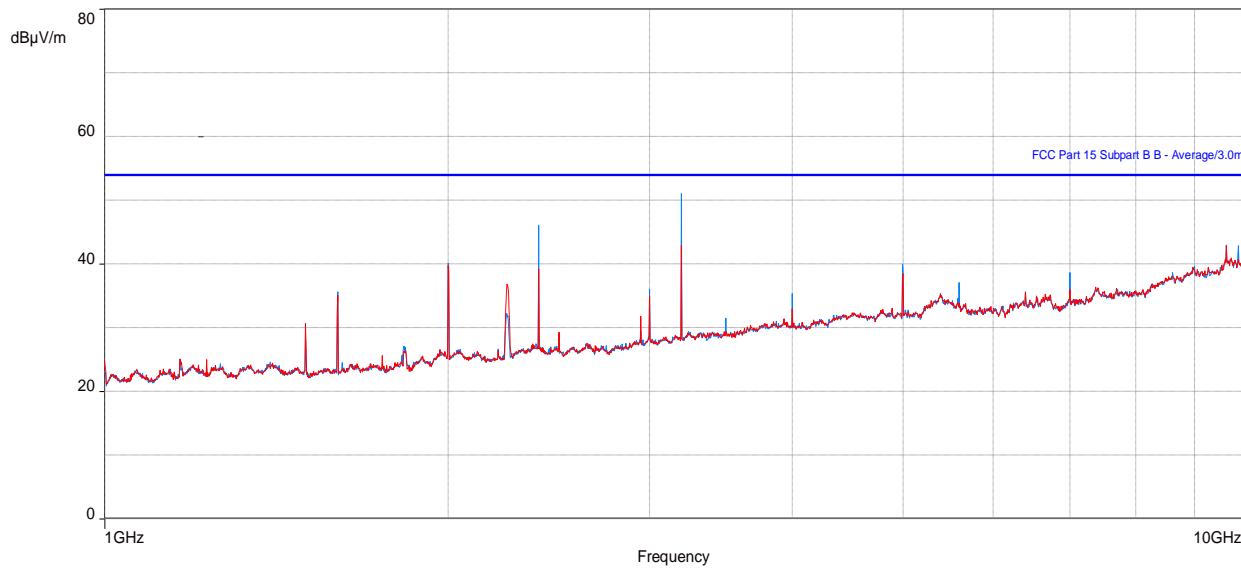
**Table 31: RE test results from 30 to 1000 MHz for FCC Part 15 (MC 5, LTE – Middle channel)**

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)
31.4451029	32.40	40.00	-7.60	1.05	343.25	Vertical	-3.24
48.01515351	33.65	40.00	-6.35	1.00	31.25	Vertical	-11.35
58.83367949	27.68	40.00	-12.32	1.86	40.75	Vertical	-14.88
60.21567915	24.55	40.00	-15.45	2.14	26.25	Vertical	-14.96

**Table 32: RE test results from 30 to 1000 MHz for FCC Part 27 (MC 5, LTE – Middle channel)**

Frequency (MHz)	Level (dBμV/m)	Limit EIRP (dBμV/m)	Margin to FCC part 22/27 (dB)	Height (m)	Azimuth (deg)	Polarization	Correction (dB)
31.4451029	32.40	82.2	-49.8	1.05	343.25	Vertical	-3.24
48.01515351	33.65	82.2	-48.55	1.00	31.25	Vertical	-11.35
58.83367949	27.68	82.2	-54.52	1.86	40.75	Vertical	-14.88
60.21567915	24.55	82.2	-57.65	2.14	26.25	Vertical	-14.96

**Note:** In the table/Plot above, no emissions exceed the Part 22/27 radiated spurious emissions limit when converted to dB<sub>μ</sub>V/m, except for the fundamentals. For final spurious emissions measurements to FCC Part 22/27, see antenna port conducted emissions in applicable test report.

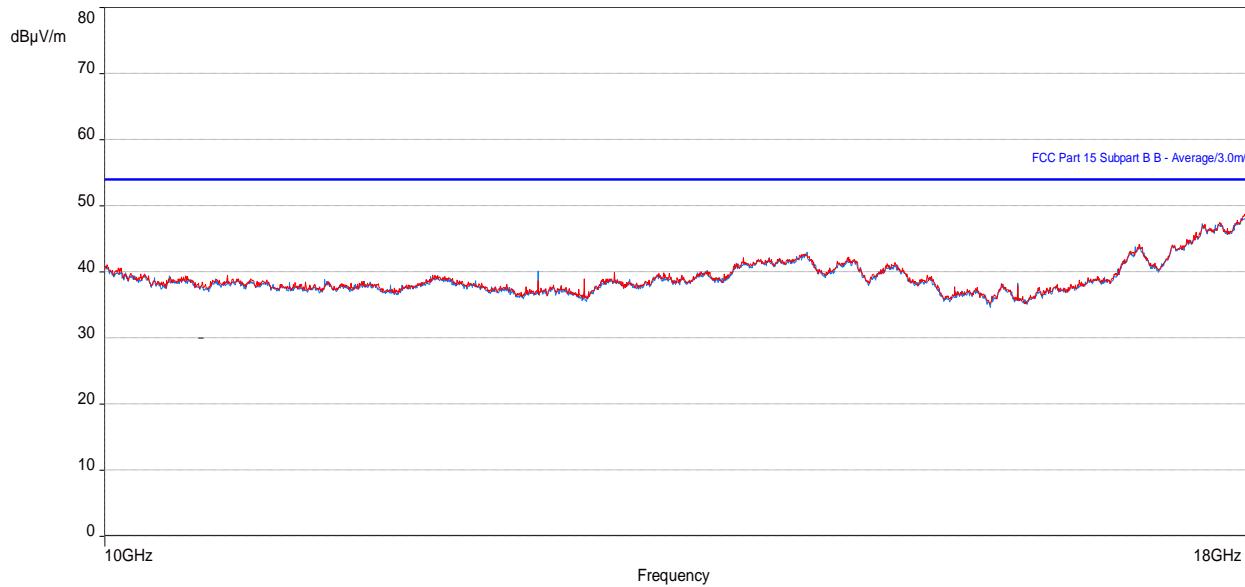
**Figure 26: Plot of RE at 3m from 1 to 10 GHz (MC 5, LTE – Middle channel) - AC powered****Table 33: RE test results from 1 to 10 GHz for FCC Part 15 (MC 5, LTE – Middle channel)**

Frequency (MHz)	Level Average (dBµV/m)	Limit Average (dBµV/m)	Margin to FCC part 15 Class B (dB)	Height (m)	Azimuth (deg)	Polarization	Correction (dB)
2399.984295	46.14	53.96	-7.82	3.47	175.00	Horizontal	-7.74
3199.978526	51.73	53.96	-2.23	2.56	177.50	Horizontal	-6.37
3199.978526	43.09	53.96	-10.87	2.63	111.50	Vertical	-6.37

**Table 34: RE test results from 1 to 10 GHz for FCC Part 27 (MC 5, LTE – Middle channel)**

Frequency (MHz)	Level (dBµV/m)	Limit EIRP (dBµV/m)	Margin to FCC part 22/27 (dB)	Height (m)	Azimuth (deg)	Polarization	Correction (dB)
2399.984295	46.14	82.2	-36.06	3.47	175.00	Horizontal	-7.74
3199.978526	51.73	82.2	-30.47	2.56	177.50	Horizontal	-6.37
3199.978526	43.09	82.2	-39.11	2.63	111.50	Vertical	-6.37

**Note:** In the table/Plot above, no emissions exceed the Part 22/27 radiated spurious emissions limit when converted to dB<sub>µ</sub>V/m. For final spurious emissions measurements to FCC Part 22/27, see antenna port conducted emissions in applicable test report.

**Figure 27: Plot of RE at 3m from 10 to 18 GHz (MC 5, LTE – Middle channel) – AC powered****Table 35: RE test results from 10 to 18 GHz for FCC Part 15 (MC 5, LTE – Middle channel)**

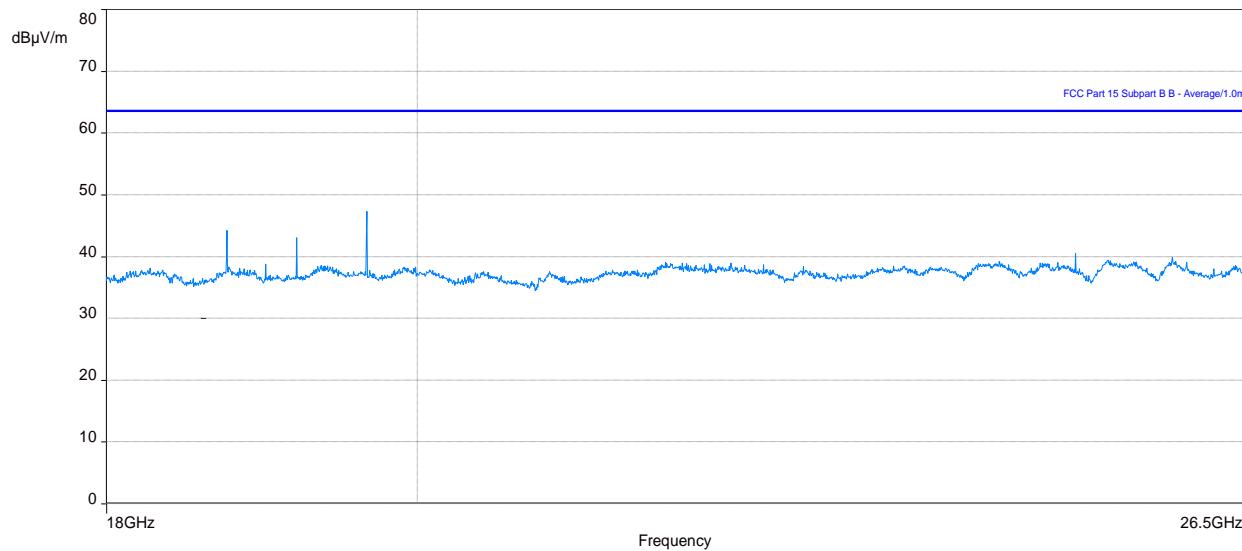
Frequency (MHz)	Level Average (dBμV/m)	Limit Average (dBμV/m)	Margin to FCC part 15 Class B (dB)	Height (m)	Azimuth (degrees)	Polarization	Correction (dB)
17032.82885	40.47	53.96	-13.49	4.00	2.50	Vertical	14.05
17033.2705	40.33	53.96	-13.63	3.99	314.25	Horizontal	14.04
17592.01826	43.34	53.96	-10.62	1.00	360.25	Vertical	19.59
17999.06762	45.26	53.96	-8.70	1.00	38.75	Horizontal	22.02

**Table 36: RE test results from 10 to 18 GHz for FCC Part 22/27 (MC 5, LTE – Middle channel)**

Frequency (MHz)	Level (dBμV/m)	Limit EIRP (dBμV/m)	Margin to FCC part 22/27 (dB)	Height (m)	Azimuth (deg)	Polarization	Correction (dB)
17032.82885	40.47	82.2	-41.73	4.00	2.50	Vertical	14.05
17033.2705	40.33	82.2	-41.87	3.99	314.25	Horizontal	14.04
17592.01826	43.34	82.2	-38.86	1.00	360.25	Vertical	19.59
17999.06762	45.26	82.2	-36.94	1.00	38.75	Horizontal	22.02

**Note:** In the table/Plot above, no emissions exceed the Part 22/27 radiated spurious emissions limit when converted to dB<sub>μ</sub>V/m. For final spurious emissions measurements to FCC Part 22/27, see antenna port conducted emissions in applicable test report.

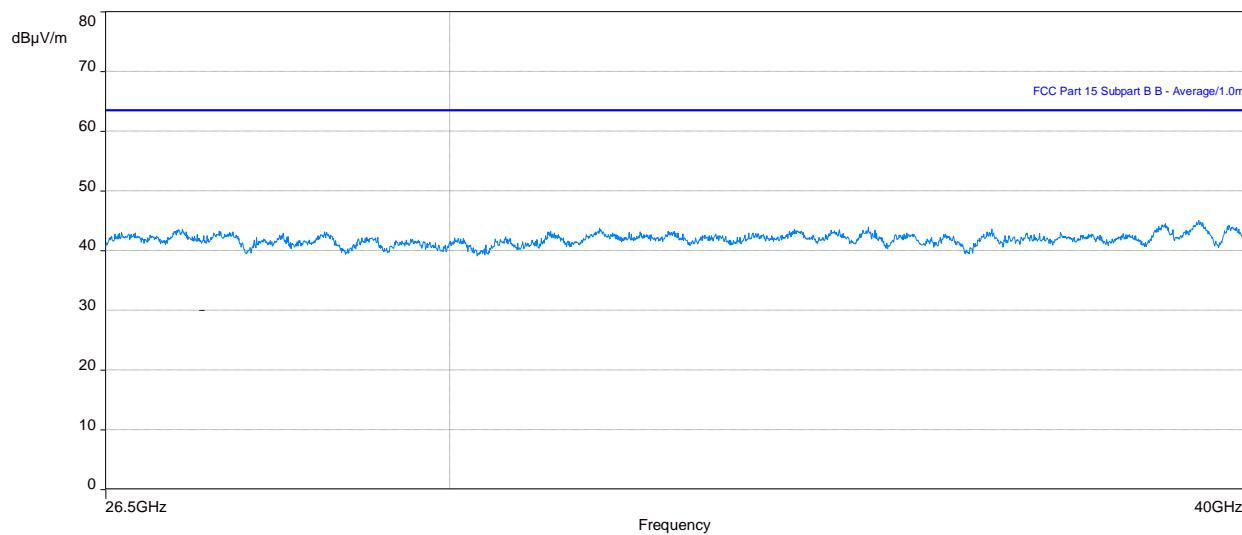
**Figure 28: Plot of RE at 1m from 18 to 26.5 GHz (MC 5, LTE – Middle channel) – AC powered**



**Note 1:** In the plot above No Emissions exceeds the FCC Part 15 limit.

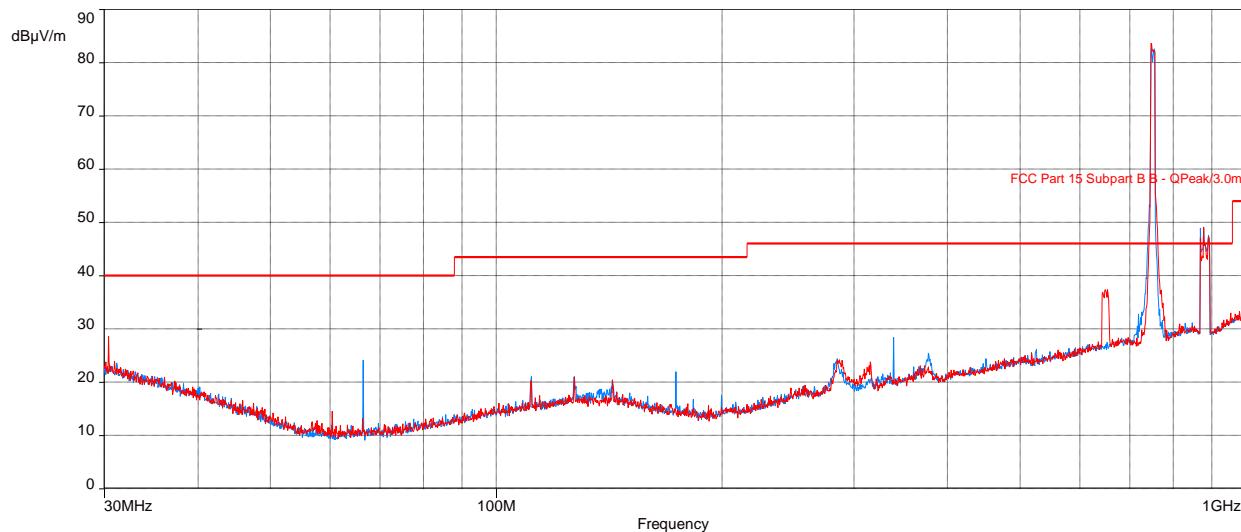
**Note 2:** In the plot above, no emissions exceed the Part 22/27 radiated spurious emissions limit when converted to dB $\mu$ V/m. For final spurious emissions measurements to FCC Part 22/27, see antenna port conducted emissions in applicable test report.

**Figure 29: Plot of RE at 1m from 26.5 to 40 GHz (MC 5, LTE – Middle channel) – AC powered**



**Note 1:** In the plot above No Emissions exceeds the FCC Part 15 limit.

**Note 2:** In the plot above, no emissions exceed the Part 22/27 radiated spurious emissions limit when converted to dB $\mu$ V/m. For final spurious emissions measurements to FCC Part 22/27, see antenna port conducted emissions in applicable test report.

**Figure 30: Plot of RE at 3 m – 30 to1000 MHz (MC 5, LTE – Middle channel) – DC powered**

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

**Table 37: RE test results from 30 to 1000 MHz for FCC Part 15 (MC 5, LTE – Middle 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)
649.7519103	21.49	46.02	-24.53	2.13	319.25	Vertical	2.02

**Table 38: RE test results from 30 to 1000 MHz for FCC Part 27 (MC 5, LTE – Middle channel)**

Frequency (MHz)	Level (dB $\mu$ V/m)	Limit EIRP (dB $\mu$ V/m)	Margin to FCC part 22/27 (dB)	Height (m)	Azimuth (deg)	Polarization	Correction (dB)
649.7519103	21.49	82.2	-60.71	2.13	319.25	Vertical	2.02

**Note:** In the table/Plot above, no emissions exceed the Part 22/27 radiated spurious emissions limit when converted to dB $\mu$ V/m, except for the fundamentals. For final spurious emissions measurements to FCC Part 22/27, see antenna port conducted emissions in applicable test report.

### 3.2.9 Test results of Radiated Emissions (SC1 - NR 5MHz/LTE 10MHz – Bot ch)

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

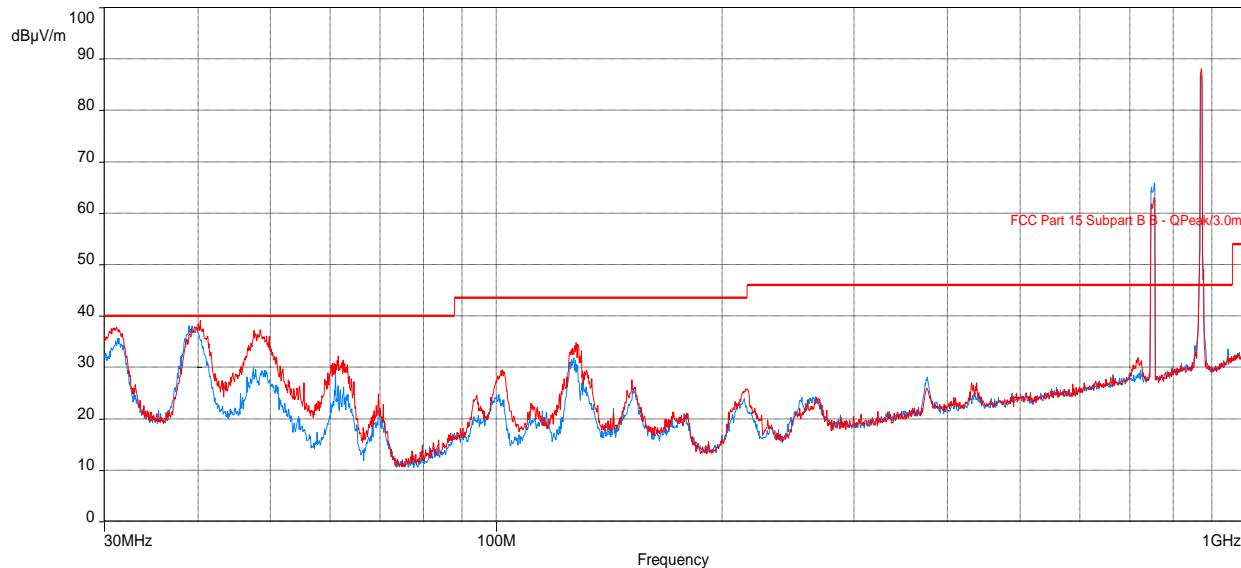
Date tested: 19 -23 March 2020

Tested by: Kurupal Patel

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 31: Plot of RE at 3 m – 30 to1000 MHz (SC1- NR 5 / LTE 10 – Bot channel)



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

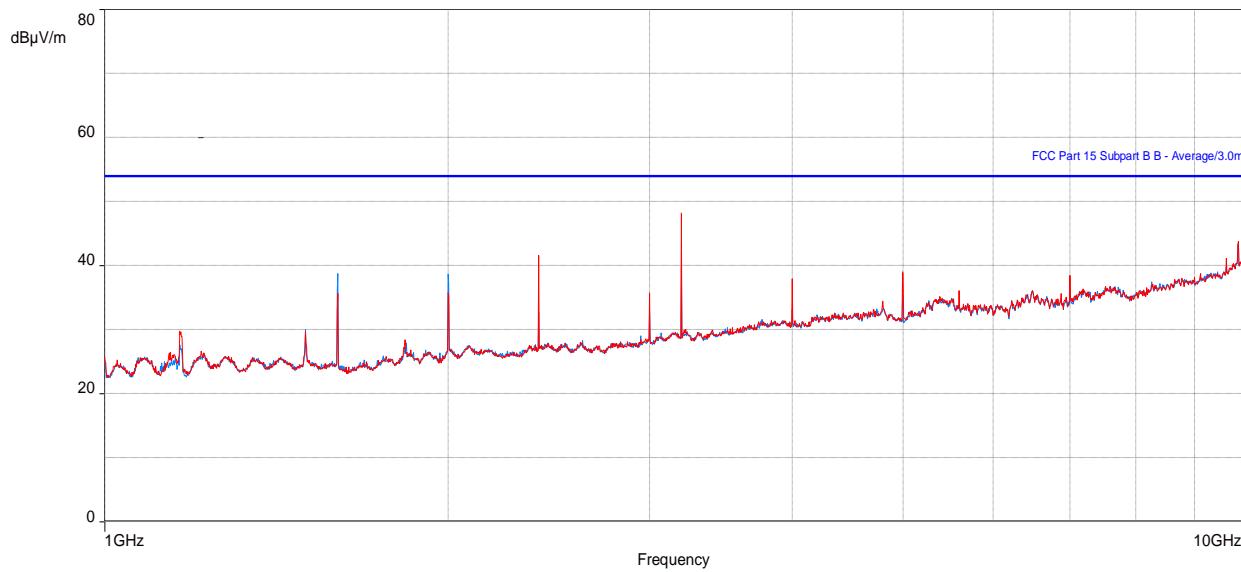
Table 39: RE test results from 30 to 1000 MHz for FCC Part 15 (SC1- NR 5 / LTE 10 – Bot channel)

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)
31.36392949	33.70	40.00	-6.30	2.57	26.25	Horizontal	-3.20
40.31401249	36.24	40.00	-3.76	1.00	33.75	Vertical	-7.59
48.39862854	33.92	40.00	-6.08	1.57	40.50	Vertical	-11.53
127.7719936	28.81	43.52	-14.71	1.00	170.25	Vertical	-8.27

Table 40: RE test results from 30 to 1000 MHz - FCC Part 22/27 (SC1- NR 5 / LTE 10 – Bot channel)

Frequency (MHz)	Level (dBμV/m)	Limit EIRP (dBμV/m)	Margin to FCC Part 22/27 (dB)	Height (m)	Azimuth (deg)	Polarization	Correction (dB)
31.36392949	33.70	82.2	-48.5	2.57	26.25	Horizontal	-3.20
40.31401249	36.24	82.2	-45.96	1.00	33.75	Vertical	-7.59
48.39862854	33.92	82.2	-48.28	1.57	40.50	Vertical	-11.53
127.7719936	28.81	82.2	-53.39	1.00	170.25	Vertical	-8.27

**Note:** In the table/Plot above, no emissions exceed the Part 22/27 radiated spurious emissions limit when converted to dBuV/m, except for the fundamentals. For final spurious emissions measurements to FCC Part 22/27, see antenna port conducted emissions in applicable test report.

**Figure 32: Plot of RE at 3m from 1 to 10 GHz (SC1- NR 5 / LTE 10 – Bot channel)****Table 41: RE test results from 1 to 10 GHz for FCC Part 15 (SC1- NR 5 / LTE 10 – Bot channel)**

Frequency (MHz)	Level Average (dBµV/m)	Limit Average (dBµV/m)	Margin to FCC part 15 Class B (dB)	Height (m)	Azimuth (deg)	Polarization	Correction (dB)
2399.984295	41.40	53.96	-12.56	1.05	182.75	Vertical	-8.61
3199.978526	48.62	53.96	-5.34	2.23	189.75	Vertical	-6.76
9830.333333	42.35	53.96	-11.61	1.87	189.75	Vertical	9.05
9830.333333	43.81	53.96	-10.15	1.00	40.50	Horizontal	9.05

**Table 42: RE test results from 1 to 10 GHz for FCC Part 22/27 (SC1- NR 5 / LTE 10 – Bot channel)**

Frequency (MHz)	Level (dBµV/m)	Limit EIRP (dBµV/m)	Margin to FCC part 22/27 (dB)	Height (m)	Azimuth (deg)	Polarization	Correction (dB)
2399.984295	41.40	82.2	-40.80	1.05	182.75	Vertical	-8.61
3199.978526	48.62	82.2	-33.58	2.23	189.75	Vertical	-6.76
9830.333333	42.35	82.2	-39.85	1.87	189.75	Vertical	9.05
9830.333333	43.81	82.2	-38.39	1.00	40.50	Horizontal	9.05

**Note:** In the table/Plot above, no emissions exceed the Part 22/27 radiated spurious emissions limit when converted to dBµV/m. For final spurious emissions measurements to FCC Part 22/27, see antenna port conducted emissions in applicable test report.

### 3.2.10 Test results of Radiated Emissions (SC1- NR 5MHz/LTE 10MHz – Mid ch)

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

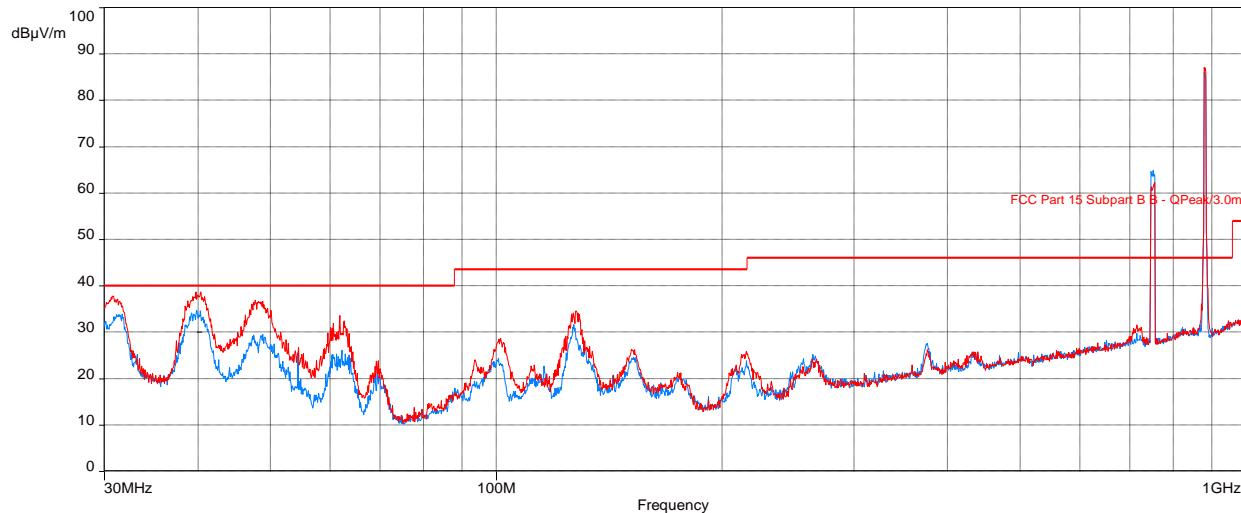
Date tested: 19 -23 March 2020

Tested by: Kurupal Patel

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 to1000 MHz (SC1- NR 5 / LTE 10 – Mid channel)



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

Table 43: RE test results from 30 to 1000 MHz for FCC Part 15 (SC1- NR 5 / LTE 10 – Mid 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)
30.75007726	36.56	40.00	-3.44	2.80	350.25	Vertical	-2.90
31.69848044	32.83	40.00	-7.17	2.57	26.25	Horizontal	-3.36
39.83862787	36.34	40.00	-3.66	2.81	24.25	Horizontal	-7.32
40.36217308	36.00	40.00	-4.00	1.00	33.50	Vertical	-7.61
47.68120479	33.49	40.00	-6.51	1.00	40.50	Vertical	-11.18

Table 44: RE test results from 30 to 1000 MHz - FCC Part 22/27 (SC1- NR 5 / LTE 10 – Mid channel)

Frequency (MHz)	Level (dBμV/m)	Limit EIRP (dBμV/m)	Margin to FCC Part 22/27 (dB)	Height (m)	Azimuth (deg)	Polarization	Correction (dB)
30.75007726	36.56	82.2	-45.64	2.80	350.25	Vertical	-2.90
31.69848044	32.83	82.2	-49.37	2.57	26.25	Horizontal	-3.36
39.83862787	36.34	82.2	-45.86	2.81	24.25	Horizontal	-7.32
40.36217308	36.00	82.2	-46.2	1.00	33.50	Vertical	-7.61
47.68120479	33.49	82.2	-48.71	1.00	40.50	Vertical	-11.18

**Note:** In the table/Plot above, no emissions exceed the Part 22/27 radiated spurious emissions limit when converted to dB $\mu$ V/m, except for the fundamentals. For final spurious emissions measurements to FCC Part 22/27, see antenna port conducted emissions in applicable test report.

Figure 34: Plot of RE at 3m from 1 to 10 GHz (SC1- NR 5 / LTE 10 – Mid channel)

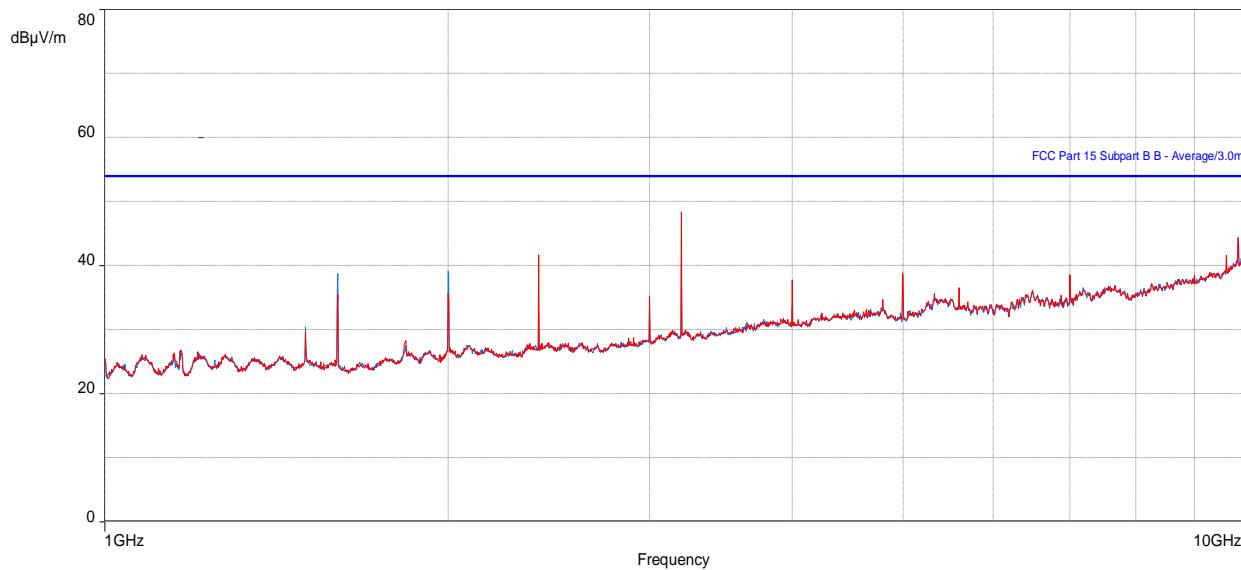


Table 45: RE test results from 1 to 10 GHz for FCC Part 15 (SC1- NR 5 / LTE 10 – Mid channel)

Frequency (MHz)	Level Average (dBµV/m)	Limit Average (dBµV/m)	Margin to FCC part 15 Class B (dB)	Height (m)	Azimuth (deg)	Polarization	Correction (dB)
2399.984295	41.43	53.96	-12.53	1.05	182.50	Vertical	-8.61
3199.978526	39.16	53.96	-14.80	1.00	127.00	Horizontal	-6.76
3199.978526	48.65	53.96	-5.31	2.23	189.75	Vertical	-6.76
9830.333013	43.85	53.96	-10.11	2.37	40.50	Horizontal	9.05

Table 46: RE test results from 1 to 10 GHz for FCC Part 22/27 (SC1- NR 5 / LTE 10 – Mid channel)

Frequency (MHz)	Level (dBµV/m)	Limit EIRP (dBµV/m)	Margin to FCC part 22/27 (dB)	Height (m)	Azimuth (deg)	Polarization	Correction (dB)
2399.984295	41.43	82.2	-40.77	1.05	182.50	Vertical	-8.61
3199.978526	39.16	82.2	-43.04	1.00	127.00	Horizontal	-6.76
3199.978526	48.65	82.2	-33.55	2.23	189.75	Vertical	-6.76
9830.333013	43.85	82.2	-38.35	2.37	40.50	Horizontal	9.05

**Note:** In the table/Plot above, no emissions exceed the Part 22/27 radiated spurious emissions limit when converted to dBµV/m. For final spurious emissions measurements to FCC Part 22/27, see antenna port conducted emissions in applicable test report.

### 3.2.11 Test results of Radiated Emissions (SC1- NR 5MHz/LTE 10MHz – Top ch)

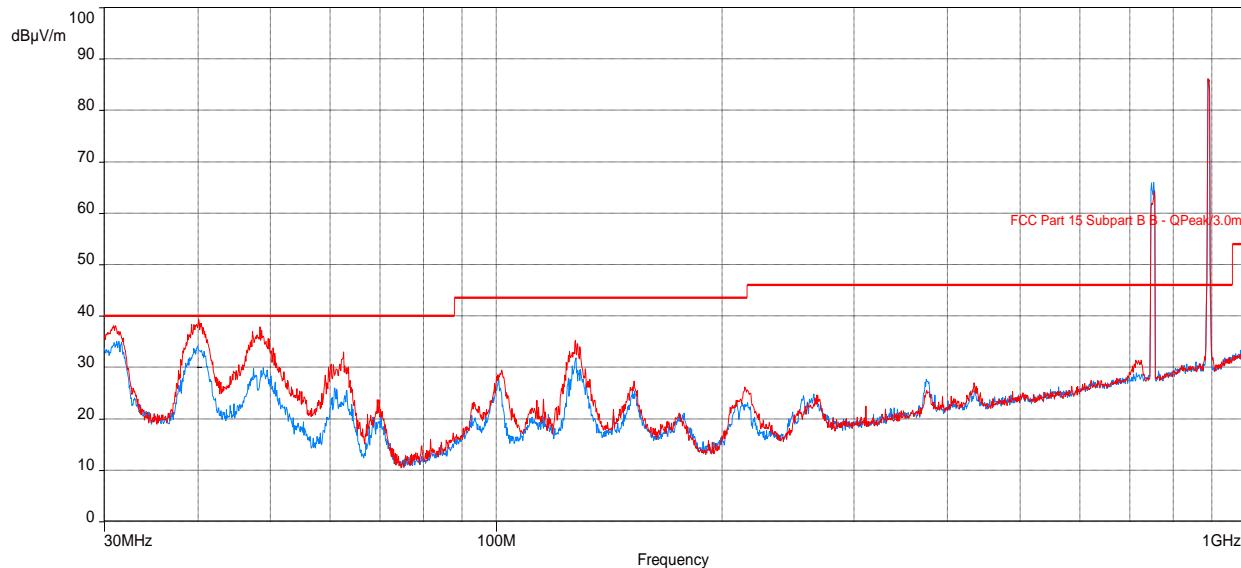
Test location: 10-meter Ambient Free Chamber (AFC)

Date tested: 19 -23 March 2020

Tested by: Kurupal Patel

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 35: Plot of RE at 3 m – 30 to1000 MHz (SC1- NR 5 / LTE 10 – Top ch)**

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

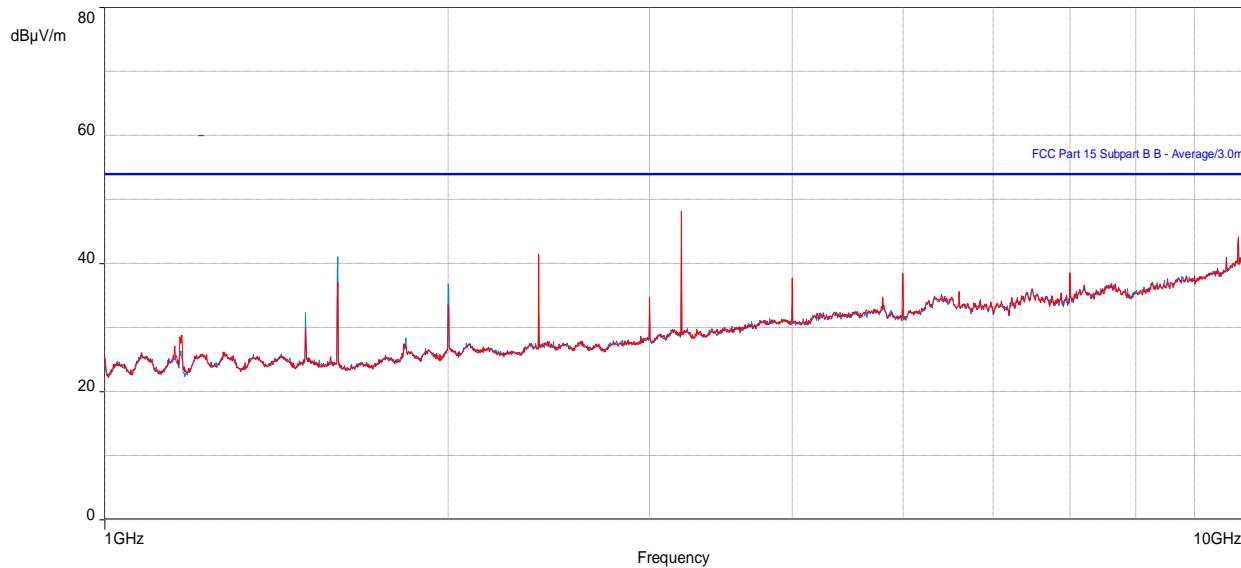
**Table 47: RE test results from 30 to 1000 MHz for FCC Part 15 (SC1- NR 5 / LTE 10 – Top ch)**

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)
31.09087821	36.46	40.00	-3.54	1.00	343.00	Vertical	-3.07
40.11857018	36.32	40.00	-3.68	1.00	26.25	Vertical	-7.48
48.39077597	33.86	40.00	-6.14	1.00	33.25	Vertical	-11.53
62.61199326	27.84	40.00	-12.16	1.96	55.25	Vertical	-14.94

**Table 48: RE test results from 30 to 1000 MHz - FCC Part 22/27 (SC1- NR 5 / LTE 10 – Top ch)**

Frequency (MHz)	Level (dBμV/m)	Limit EIRP (dBμV/m)	Margin to FCC Part 22/27 (dB)	Height (m)	Azimuth (deg)	Polarization	Correction (dB)
31.09087821	36.46	82.2	-45.74	1.00	343.00	Vertical	-3.07
40.11857018	36.32	82.2	-45.88	1.00	26.25	Vertical	-7.48
48.39077597	33.86	82.2	-48.34	1.00	33.25	Vertical	-11.53
62.61199326	27.84	82.2	-54.36	1.96	55.25	Vertical	-14.94

**Note:** In the table/Plot above, no emissions exceed the Part 22/27 radiated spurious emissions limit when converted to dBuV/m, except for the fundamentals. For final spurious emissions measurements to FCC Part 22/27, see antenna port conducted emissions in applicable test report.

**Figure 36: Plot of RE at 3m from 1 to 10 GHz (SC1- NR 5 / LTE 10 – Top ch)****Table 49: RE test results from 1 to 10 GHz for FCC Part 15 (SC1- NR 5 / LTE 10 – Top ch)**

Frequency (MHz)	Level Average (dBµV/m)	Limit Average (dBµV/m)	Margin to FCC part 15 Class B (dB)	Height (m)	Azimuth (deg)	Polarization	Correction (dB)
2399.984295	41.44	53.96	-12.52	1.05	184.75	Vertical	-8.61
3199.978526	48.60	53.96	-5.36	2.64	189.50	Vertical	-6.76
1599.988782	40.43	53.96	-13.53	3.61	290.75	Horizontal	-11.97
9830.333333	43.82	53.96	-10.14	1.00	40.75	Horizontal	9.05

**Table 50: RE test results from 1 to 10 GHz for FCC Part 22/27 (SC1- NR 5 / LTE 10 – Top ch)**

Frequency (MHz)	Level (dBµV/m)	Limit EIRP (dBµV/m)	Margin to FCC part 22/27 (dB)	Height (m)	Azimuth (deg)	Polarization	Correction (dB)
2399.984295	41.44	82.2	-40.76	1.05	184.75	Vertical	-8.61
3199.978526	48.60	82.2	-33.6	2.64	189.50	Vertical	-6.76
1599.988782	40.43	82.2	-41.77	3.61	290.75	Horizontal	-11.97
9830.333333	43.82	82.2	-38.38	1.00	40.75	Horizontal	9.05

**Note:** In the table/Plot above, no emissions exceed the Part 22/27 radiated spurious emissions limit when converted to dBµV/m. For final spurious emissions measurements to FCC Part 22/27, see antenna port conducted emissions in applicable test report.

### 3.2.12 Test results of Radiated Emissions (MC1 - 2 \* NR 5MHz / LTE 10 MHz– Mid ch)

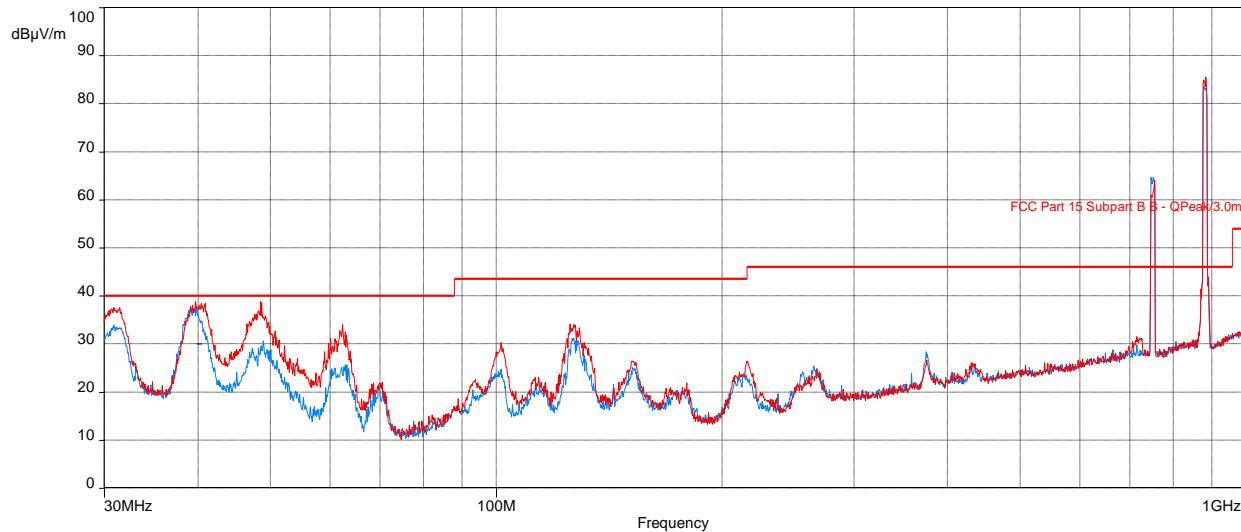
Test location: 10-meter Ambient Free Chamber (AFC)

Date tested: 19 -23 March 2020

Tested by: Kurupal Patel

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 to1000 MHz (MC1- 2 \* NR 5MHz / LTE 10 MHz– Mid ch)**

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

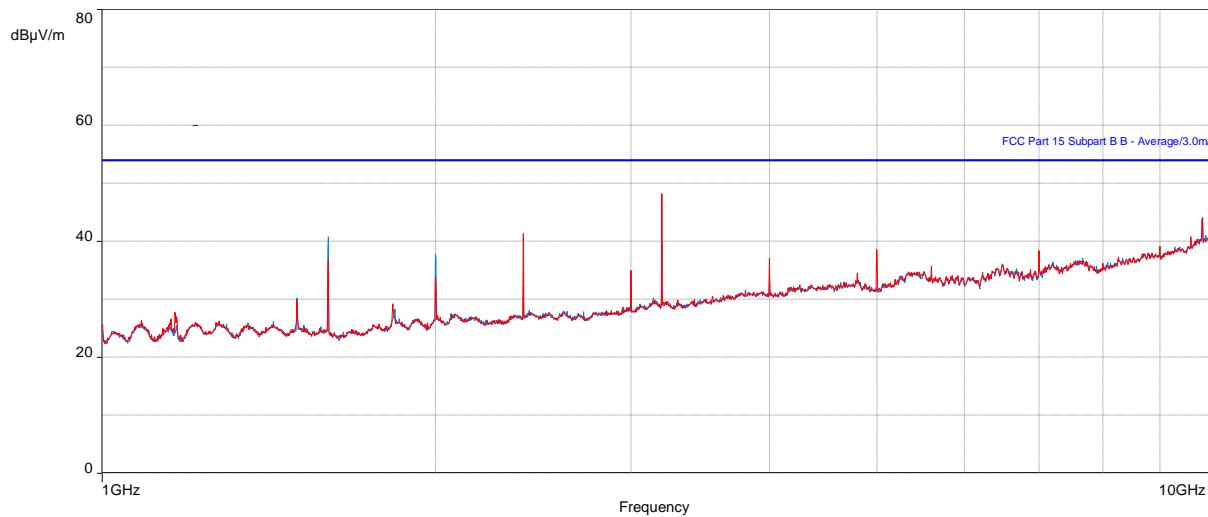
**Table 51: RE test results from 30 to 1000 MHz for FCC Part 15 (MC1- 2 \* NR 5MHz / LTE 10 MHz– Mid ch)**

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)
30.85204521	29.79	40.00	-10.21	2.66	206.00	Horizontal	-2.95
39.66554487	36.52	40.00	-3.48	1.00	40.75	Vertical	-7.22
48.52976315	33.87	40.00	-6.13	1.23	40.50	Vertical	-11.59
62.38537854	22.16	40.00	-17.84	2.86	119.75	Vertical	-14.96
125.551891	24.46	43.52	-19.06	2.17	213.25	Vertical	-8.33

**Table 52: RE test results from 30 to 1000 MHz - FCC Part 22/27 (MC1- 2 \* NR 5MHz / LTE 10MHz– Mid ch)**

Frequency (MHz)	Level (dBμV/m)	Limit EIRP (dBμV/m)	Margin to FCC Part 22/27 (dB)	Height (m)	Azimuth (deg)	Polarization	Correction (dB)
30.85204521	29.79	82.2	-52.41	2.66	206.00	Horizontal	-2.95
39.66554487	36.52	82.2	-45.68	1.00	40.75	Vertical	-7.22
48.52976315	33.87	82.2	-48.33	1.23	40.50	Vertical	-11.59
125.551891	24.46	82.2	-57.74	2.17	213.25	Vertical	-8.33

**Note:** In the table/Plot above, no emissions exceed the Part 22/27 radiated spurious emissions limit when converted to dB<sub>μ</sub>V/m, except for the fundamentals. For final spurious emissions measurements to FCC Part 22/27, see antenna port conducted emissions in applicable test report.

**Figure 38: Plot of RE at 3m from 1 to 10 GHz (MC1- 2 \* NR 5MHz / LTE 10 MHz– Mid ch)****Table 53: RE test results from 1 to 10 GHz for FCC Part 15 (MC1- 2 \* NR 5MHz / LTE 10 MHz– Mid ch)**

Frequency (MHz)	Level Average (dBμV/m)	Limit Average (dBμV/m)	Margin to FCC part 15 Class B (dB)	Height (m)	Azimuth (deg)	Polarization	Correction (dB)
1599.990064	44.44	53.96	-9.52	3.67	297.75	Horizontal	-11.97
2399.984295	35.07	53.96	-18.89	1.05	160.75	Vertical	-8.61
3199.977244	49.11	53.96	-4.85	2.23	190.50	Vertical	-6.76
9830.333333	44.18	53.96	-9.78	2.08	40.50	Horizontal	9.05

**Table 54: RE test results from 1 to 10 GHz for FCC Part 22/27 (MC1- 2 \* NR 5MHz / LTE 10 MHz– Mid ch)**

Frequency (MHz)	Level (dBμV/m)	Limit EIRP (dBμV/m)	Margin to FCC part 22/27 (dB)	Height (m)	Azimuth (deg)	Polarization	Correction (dB)
1599.990064	44.44	82.2	-37.76	3.67	297.75	Horizontal	-11.97
2399.984295	35.07	82.2	-47.13	1.05	160.75	Vertical	-8.61
3199.977244	49.11	82.2	-33.09	2.23	190.50	Vertical	-6.76
9830.333333	44.18	82.2	-38.02	2.08	40.50	Horizontal	9.05

**Note:** In the table/Plot above, no emissions exceed the Part 22/27 radiated spurious emissions limit when converted to dB<sub>μ</sub>V/m. For final spurious emissions measurements to FCC Part 22/27, see antenna port conducted emissions in applicable test report.

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### 3.2.13 Test results of Radiated Emissions (MR1- L10GB+NR5 / LTE 10MHz – Mid ch)

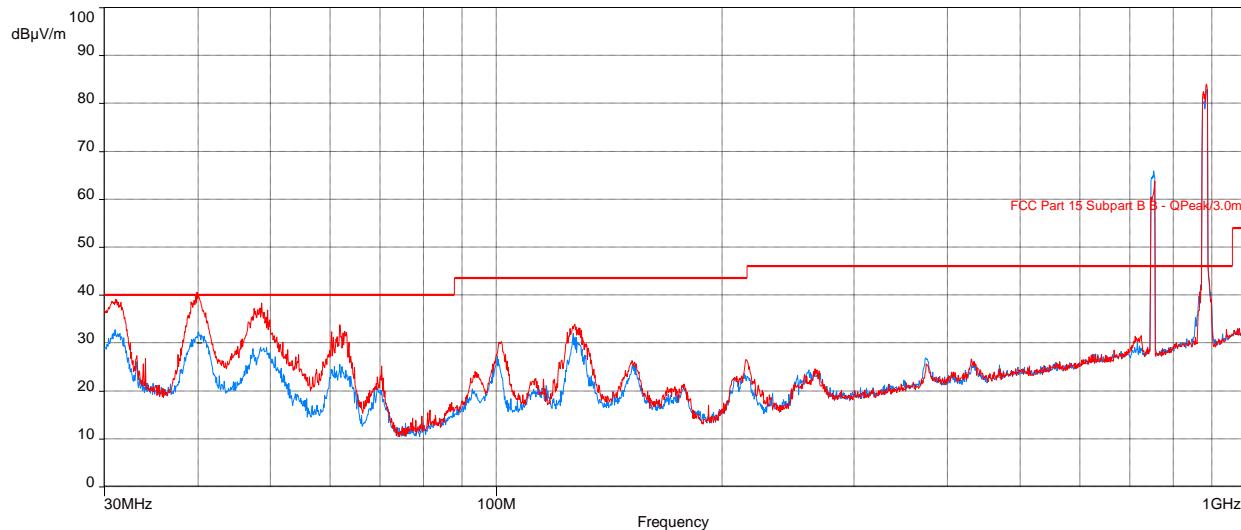
Test location: 10-meter Ambient Free Chamber (AFC)

Date tested: 19 -23 March 2020

Tested by: Kurupal Patel

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 39: Plot of RE at 3 m – 30 to1000 MHz (MR1- L10GB+NR5 / LTE 10MHz – Mid ch)**

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

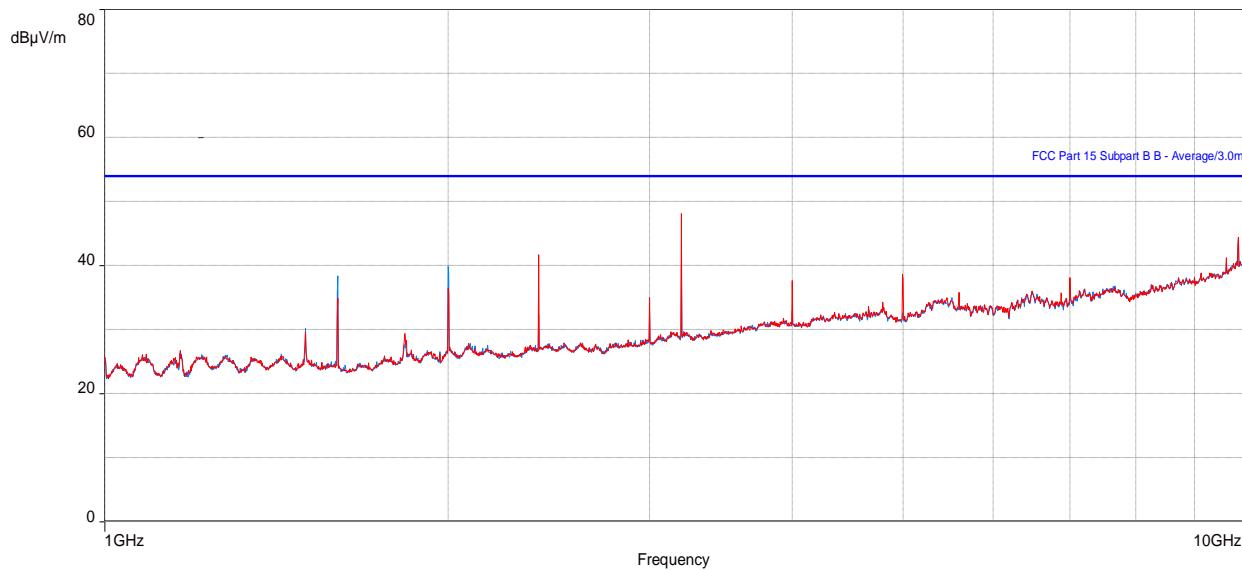
**Table 55: RE test results from 30 to 1000 MHz for FCC Part 15 (MR1- L10GB+NR5 / LTE 10MHz – Mid ch)**

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)
31.15983333	36.24	40.00	-3.76	1.87	343.25	Vertical	-3.10
39.77232051	36.40	40.00	-3.60	1.00	26.25	Vertical	-7.28
48.63377564	33.61	40.00	-6.39	1.56	55.00	Vertical	-11.65
127.3893238	29.09	43.52	-14.43	1.00	168.00	Vertical	-8.28

**Table 56: RE test results from 30 to 1000 MHz - FCC Part 22/27 (MR1- L10GB+NR5 / LTE 10MHz – Mid ch)**

Frequency (MHz)	Level (dBμV/m)	Limit EIRP (dBμV/m)	Margin to FCC Part 22/27 (dB)	Height (m)	Azimuth (deg)	Polarization	Correction (dB)
31.15983333	36.24	82.2	-45.96	1.87	343.25	Vertical	-3.10
39.77232051	36.40	82.2	-45.8	1.00	26.25	Vertical	-7.28
48.63377564	33.61	82.2	-48.59	1.56	55.00	Vertical	-11.65
127.3893238	29.09	82.2	-53.11	1.00	168.00	Vertical	-8.28

**Note:** In the table/Plot above, no emissions exceed the Part 22/27 radiated spurious emissions limit when converted to dB $\mu$ V/m, except for the fundamentals. For final spurious emissions measurements to FCC Part 22/27, see antenna port conducted emissions in applicable test report.

**Figure 40: Plot of RE at 3m from 1 to 10 GHz (MR1- L10GB+NR5 / LTE 10MHz – Mid ch)****Table 57: RE test results from 1 to 10 GHz for FCC Part 15 (MR1- L10GB+NR5 / LTE 10MHz – Mid ch)**

Frequency (MHz)	Level Average (dBµV/m)	Limit Average (dBµV/m)	Margin to FCC part 15 Class B (dB)	Height (m)	Azimuth (deg)	Polarization	Correction (dB)
1999.986538	41.40	53.96	-12.56	3.88	290.75	Horizontal	-9.56
3199.978526	47.73	53.96	-6.23	2.64	196.75	Vertical	-6.76
9830.333333	43.19	53.96	-10.77	1.00	336.00	Vertical	9.05

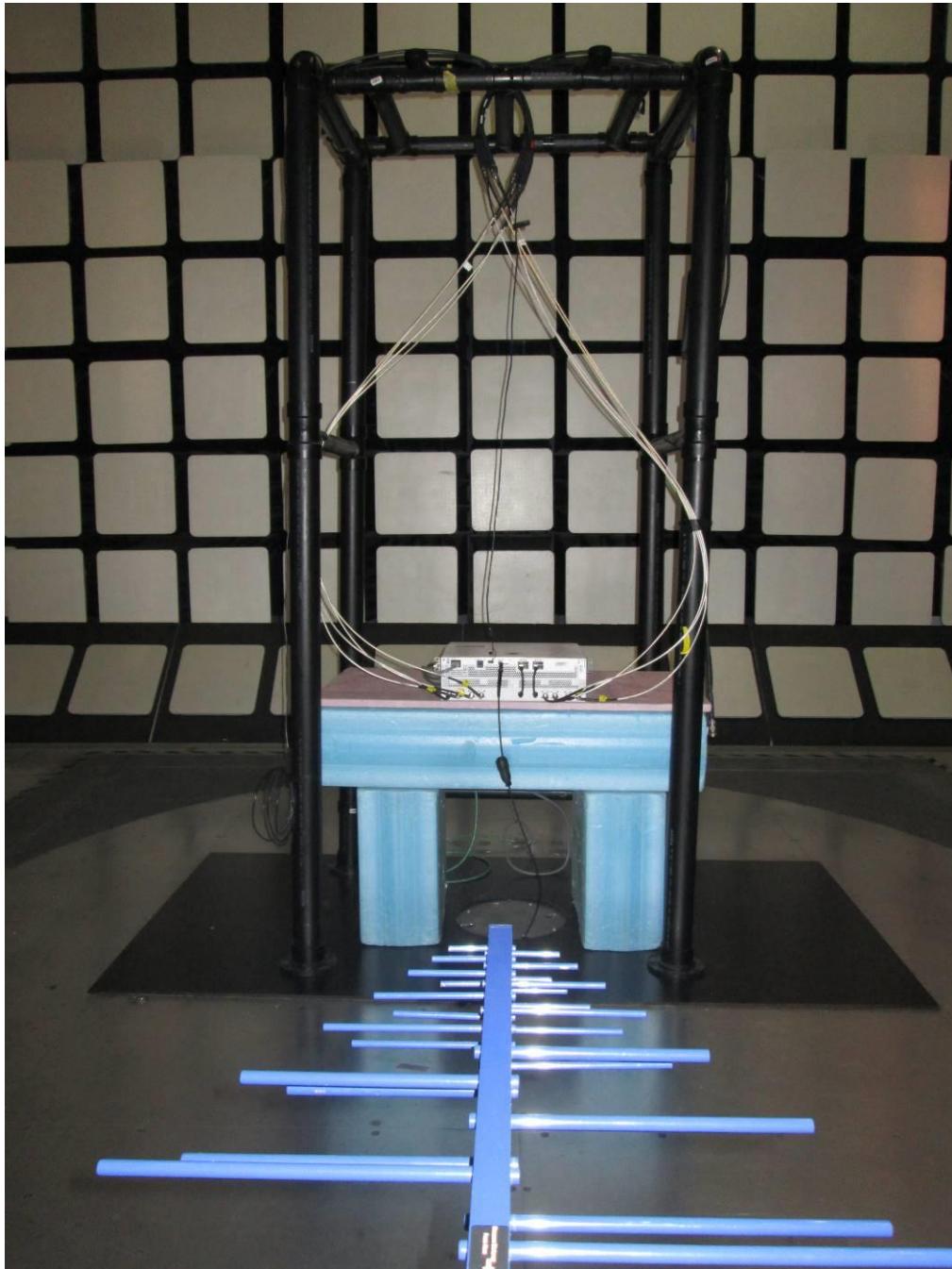
**Table 58: RE test results from 1 to 10 GHz for FCC Part 22/27 (MR1- L10GB+NR5 / LTE 10MHz – Mid ch)**

Frequency (MHz)	Level (dBµV/m)	Limit EIRP (dBµV/m)	Margin to FCC part 22/27 (dB)	Height (m)	Azimuth (deg)	Polarization	Correction (dB)
1999.986538	41.40	82.2	-40.8	3.88	290.75	Horizontal	-9.56
3199.978526	47.73	82.2	-34.47	2.64	196.75	Vertical	-6.76
9830.333333	43.19	82.2	-39.01	1.00	336.00	Vertical	9.05

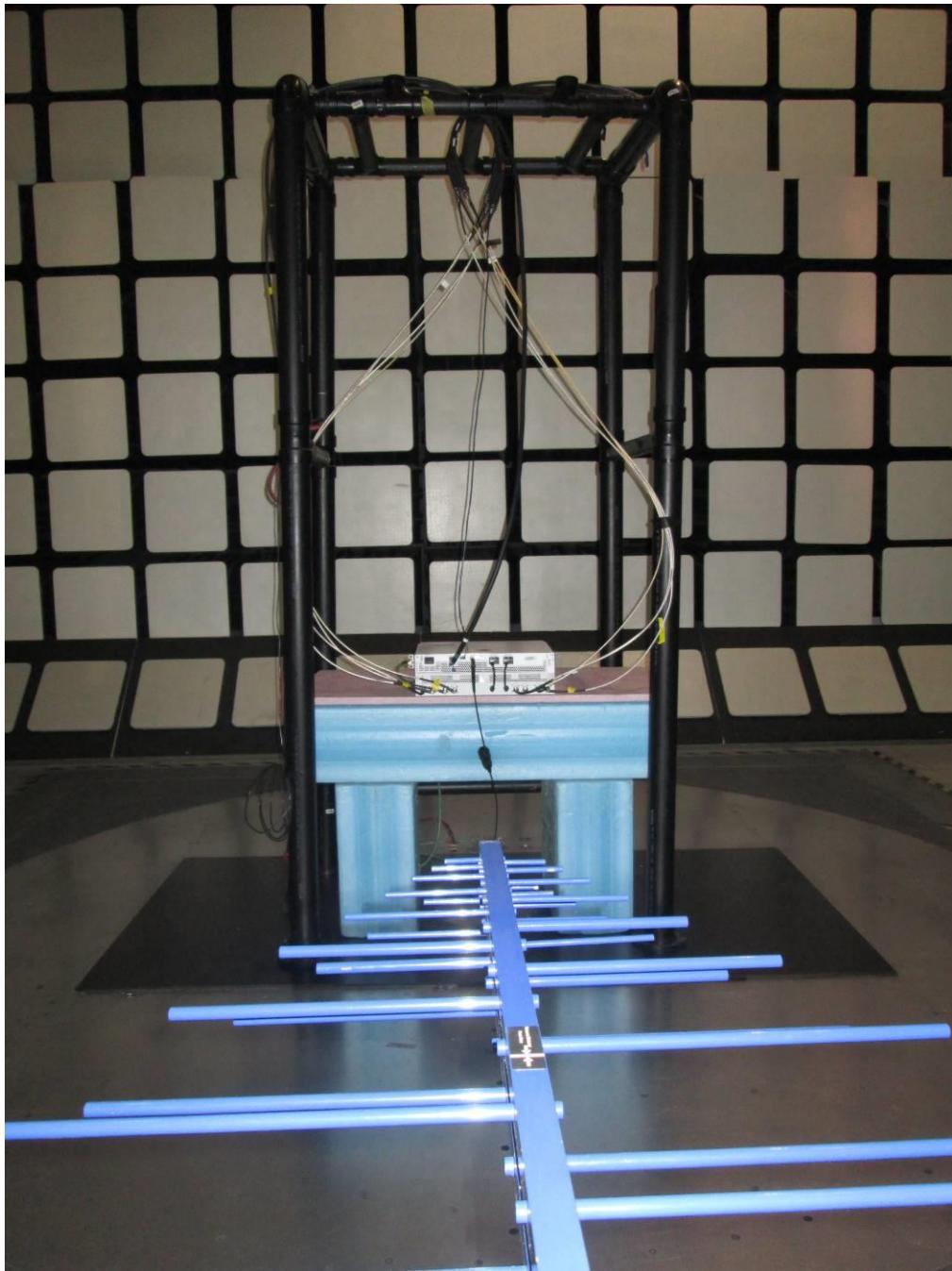
**Note:** In the table/Plot above, no emissions exceed the Part 22/27 radiated spurious emissions limit when converted to dBµV/m. For final spurious emissions measurements to FCC Part 22/27, see antenna port conducted emissions in applicable test report.

### 3.2.14 Radiated Emissions test setup pictures

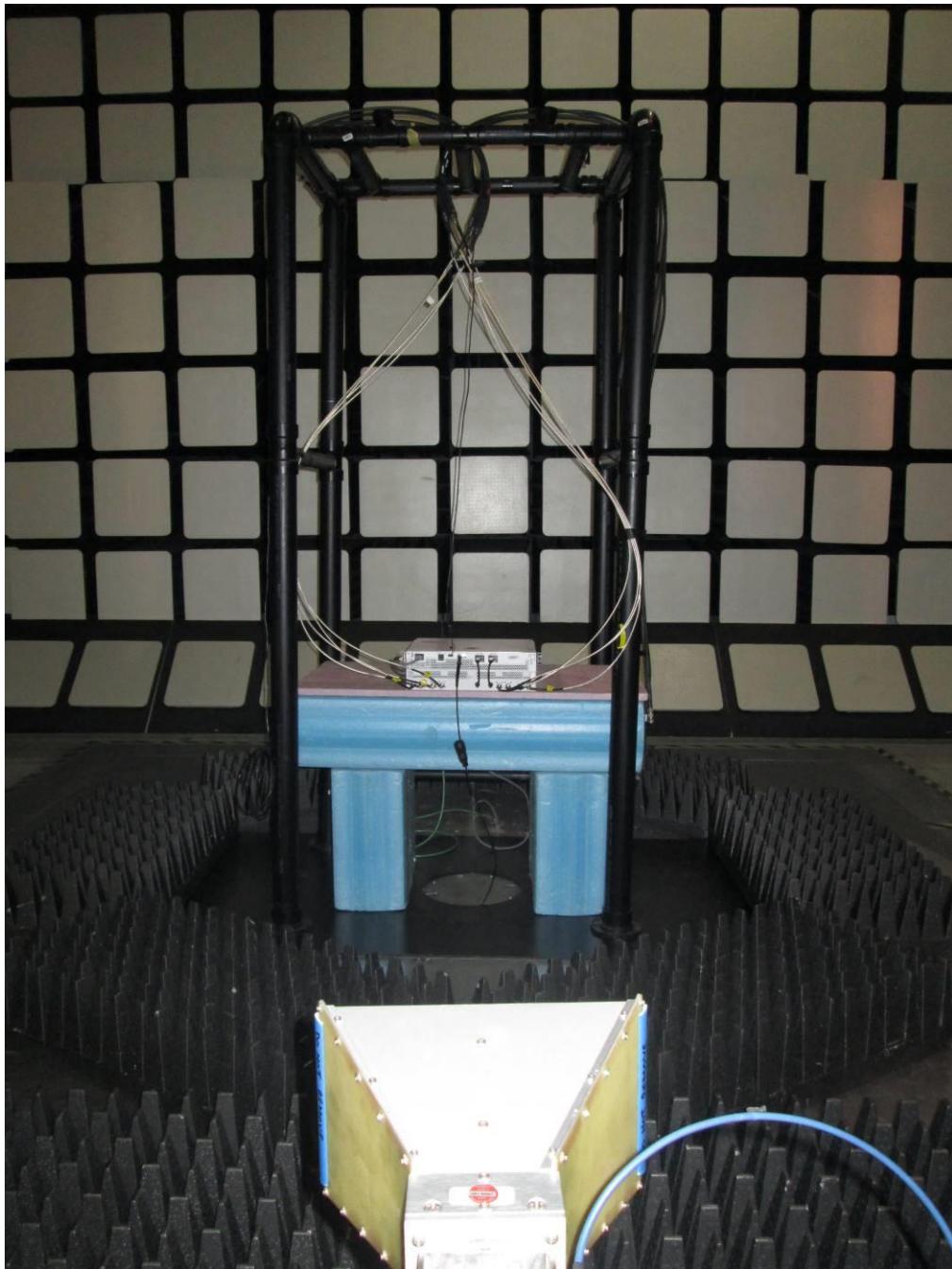
Figure 41: Setup for RE tests at 30 MHz to 1 GHz with LTE (Single & Multi Carrier)- AC Powered



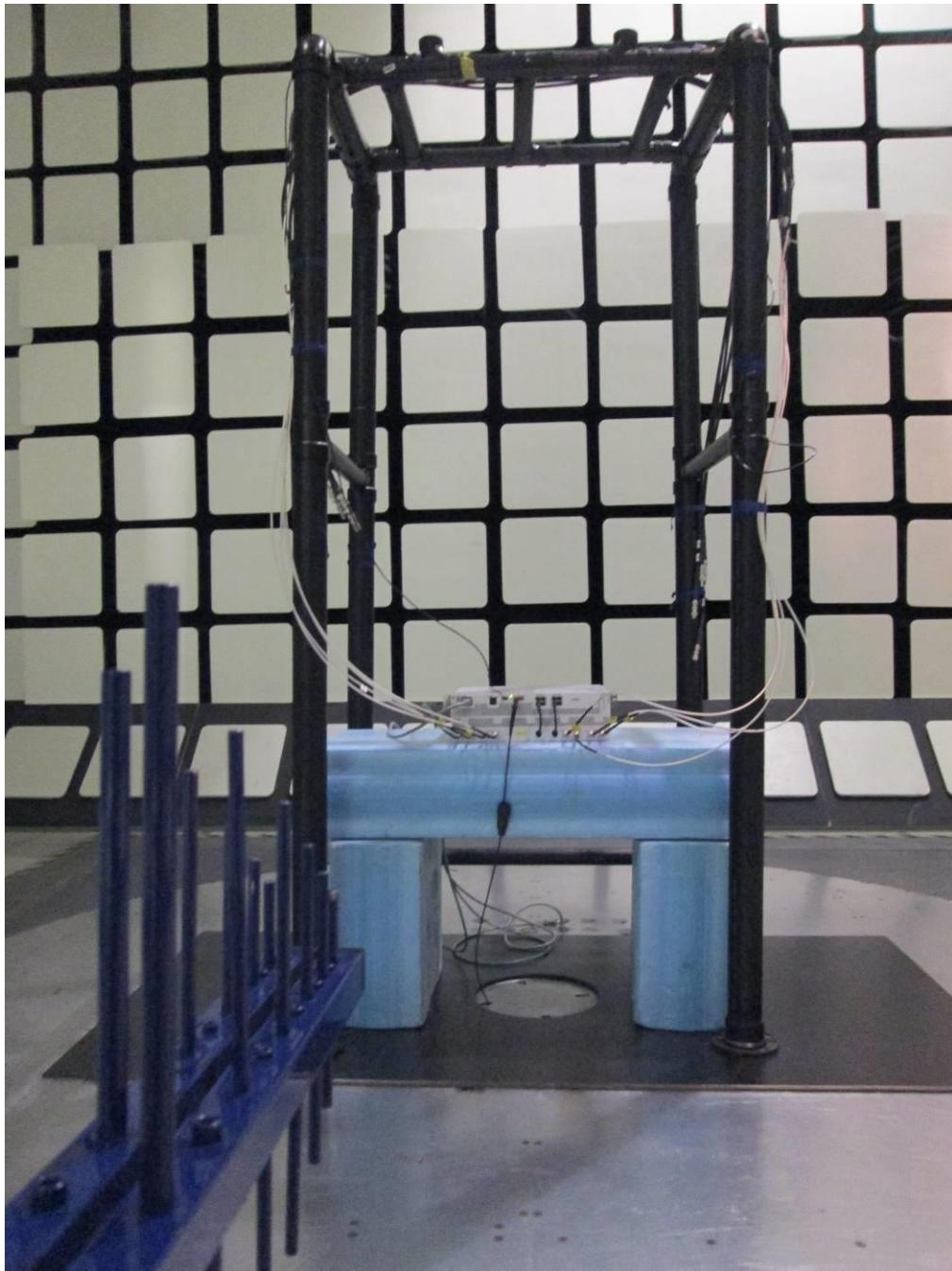
**Figure 42: Setup for RE tests at 30 MHz to 1 GHz with LTE (Single & Multi Carrier)- DC Powered**



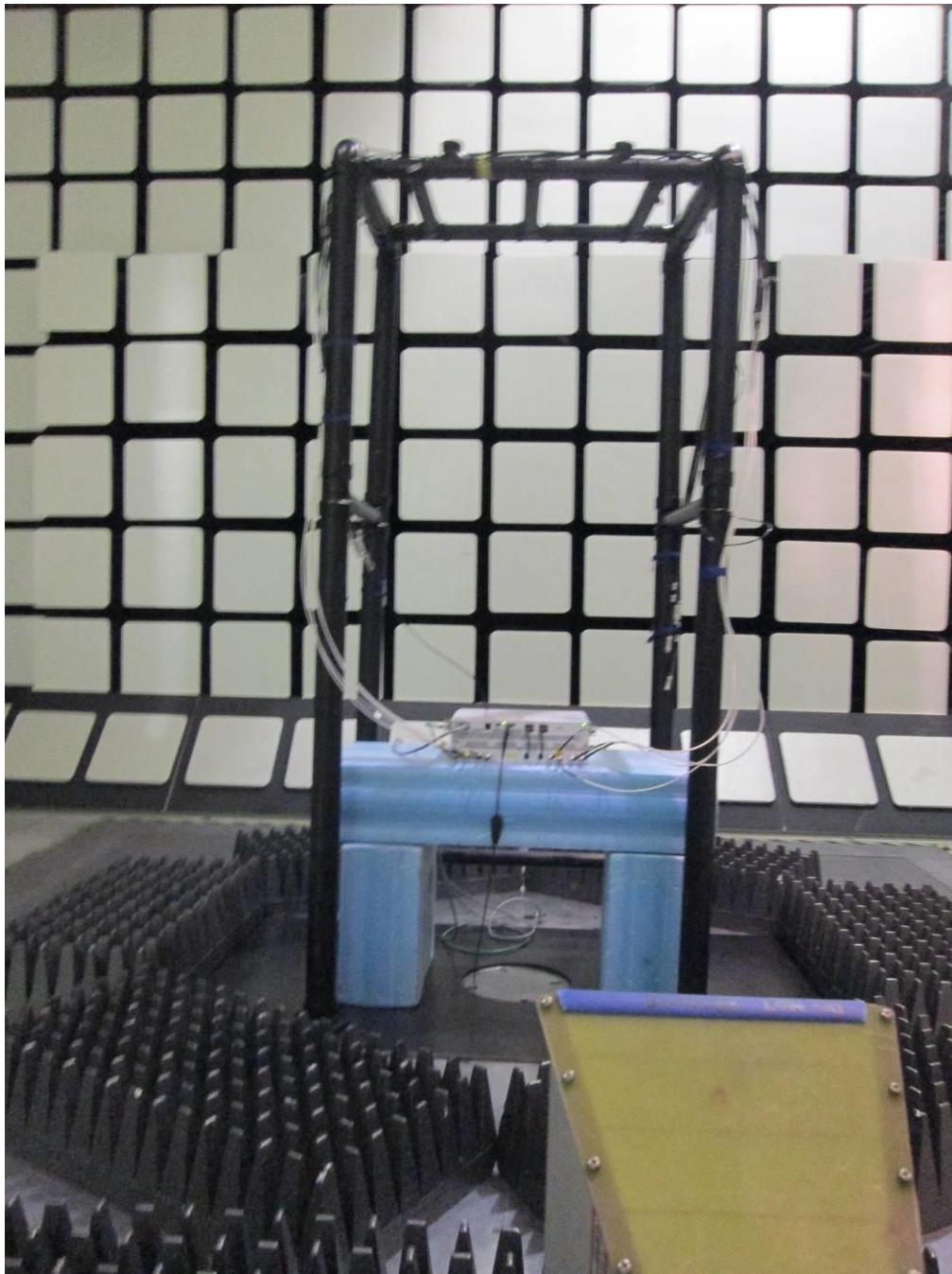
**Figure 43: Setup for RE tests for above 1 GHz with LTE (Single & Multi Carrier)**



**Figure 44: Setup for RE tests at 30 MHz to 1 GHz with NR (Single & Multi Carrier)**



**Figure 45: Setup for RE tests for above 1 GHz with NR (Single & Multi Carrier)**



### 3.2.15 Test equipment

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

**Table 59: 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	
Double Ridged Horn Antenna	Emco	3115	SSG012298	2019-05-01	2020-05-01
Bilog Antenna	Chase	CBL6111	SSG012564	2019-05-15	2020-05-15
RF Amplifier	Hewlett Packard	8447D	SSG013045	2020-01-08	2021-01-08
Pre-Amplifier	BNR	LNA	SSG012594	2019-05-22	2020-05-22
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
EMI Receiver	Rohde & Schwarz	ESU40	SSG013672	2019-10-08	2020-10-08
Coaxial Cable	Huber & Suhner	104PEA	SSG012041	2020-01-06	2021-01-06
Coaxial Cable	Huber & Suhner	106A	SSG012455	2020-01-06	2021-01-06
Coaxial Cable	Huber & Suhner	106A	SSG012711	2020-01-06	2021-01-06
Coaxial Cable	Micro-Coax	UFA 210B-1-1500-504504	SSG012376	2020-01-02	2021-01-02
Coaxial Cable	Huber & Suhner	ST18/Nm/Nm/36	SSG012786	2020-01-02	2021-01-02
Coaxial Cable	Huber & Suhner	101 PEA, Sucoflex	SSG012290	2018-11-13	2020-11-13
RF Filter: High Pass	Microwave Circuits Inc	H1G013G1	SSG013705	2020-01-06	2021-01-06

### 3.2.16 Test conclusion

The LPRU 4410 B5B13 has passed the E-field Radiated Emission (RE) tests with respect to the standards/sections listed in section [Executive summary](#).

### 3.3 Conducted Emissions on AC power leads

This test verifies the EUT does not produce excessive Conducted Emissions (CE) on the AC main power leads.

#### 3.3.1 Test specification and limits

The test requirements are as follows.

**Table 60: CE test requirements on AC power leads**

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

The limits of the CE tests on AC power leads are as follows.

**Table 61: CE test limits on AC power leads for Class B**

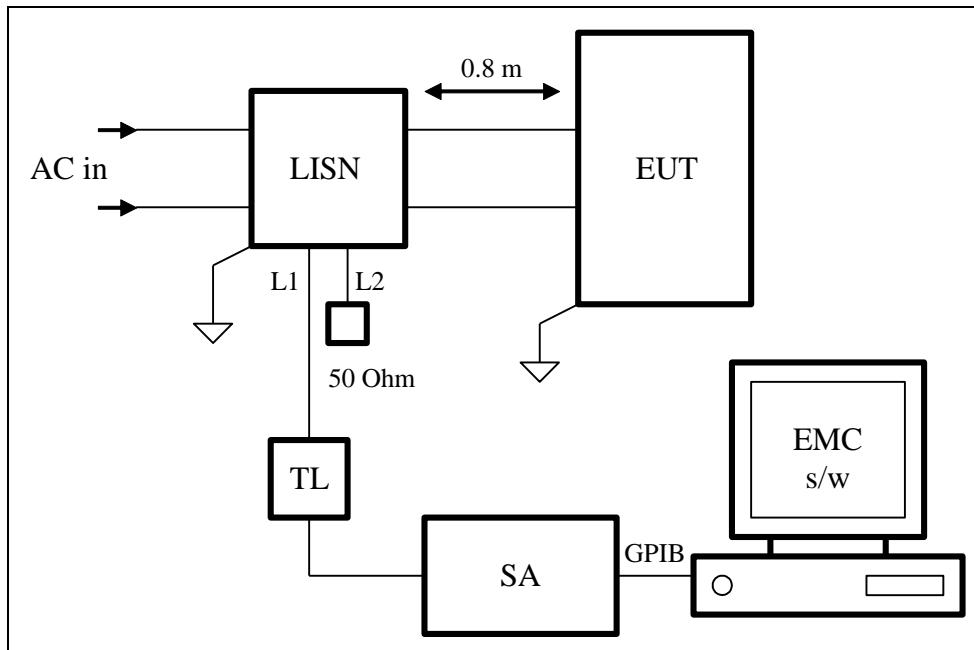
Frequency range (MHz)	FCC Part 15 Average (dB $\mu$ V)	FCC Part 15 Quasi-peak (dB $\mu$ V)
0.15 to 0.5	56 to 46	66 to 56
0.5 to 5	46	56
5 to 30	50	60

#### 3.3.2 Test procedure

Verifications of the test equipment 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 by the relevant procedures listed in [Table 60](#).

[Figure 46](#) shows the test method for regulatory CE measurements on AC Leads.

**Figure 46: CE test method on AC leads for regulatory test cases**



- The EUT was arranged and connected according to its normal mode of operation on a metallic ground plane. The EUT and all cables were insulated from the ground plane which extended by at least 0.5 m beyond the boundaries of the EUT.
- The LISNs were bonded to the ground plane; the distance between the boundary of the EUT and the closest surface of the LISN was 0.8 m. The mains cable between the EUT and the LISNs was 1 m long, or if more than 1 m, the excess cable was folded to form a non-inductive bundle, not exceeding 0.4 m in length. The safety ground connection of the EUT, if present, was connected to the reference ground plane.
- Conducted Emissions were measured by connecting the spectrum analyzer input, through the transient limiter, to the LISN outputs, L1 and L2 (the unused LISN output was terminated with a coaxial 50-Ohm termination).
- For each lead, a pre-scan was taken over the frequency range of the requirement, using peak detection on the spectrum analyzer. The pre-scan data was then compared to the specification limits. Frequencies close to the limit lines were measured using a QP and/or an AVG detector as required.

### 3.3.3 Calculation of the compliance margin

The compliance margin is computed in a similar way as for RE (see section [Calculation of the compliance margin](#)).

### 3.3.4 Measurement uncertainties

The expanded measurement instrumentation uncertainty, with a 95 % level of confidence, calculated according to the method described in CISPR 16 is:  $\pm 2.8$  dB on CISPR 22 AC power leads conducted emissions.

### 3.3.5 Test results of CE on AC power ports

Test location: Ground Plane

Date tested: 27 March 2020

Tested by: Kasi Sivaratnam

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 47: Plot of CE on AC port, line L1 for FCC Part 15 class B

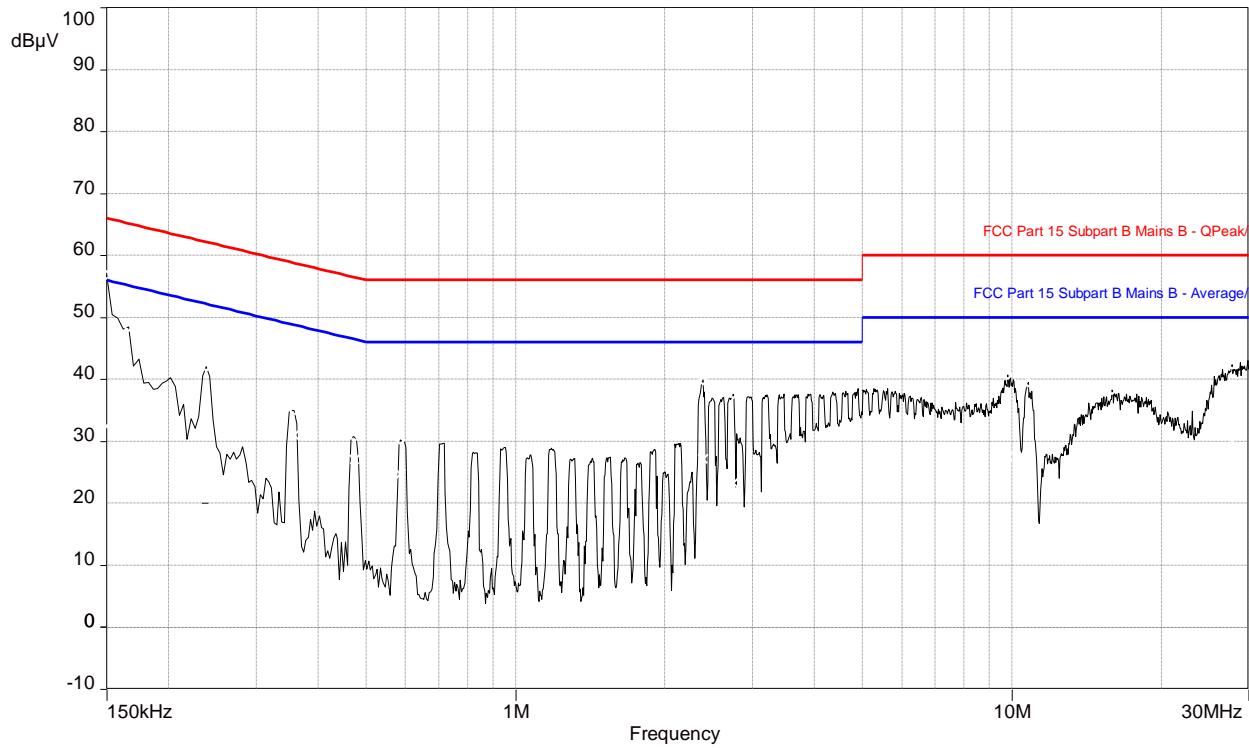


Table 62: CE test results on AC port, line L1 for FCC Part 15 class B

Frequency (MHz)	Level Average (dBµV)	Level Quasi-peak (dBµV)	Margin to Average Class B (dB)	Margin to Quasi-peak Class B (dB)	Limit Average (dBµV)	Limit Quasi-peak (dBµV)	Correction (dB)
0.148146	32.47	38.72	-23.53	-27.28	56.00	66.00	9.83
0.162634	33.14	43.21	-22.22	-22.15	55.36	65.36	9.82
0.237514	30.96	38.25	-21.21	-23.92	52.17	62.17	9.78
0.357694	30.98	34.17	-17.80	-24.61	48.77	58.77	9.77
0.472218	27.04	29.37	-19.40	-27.07	46.44	56.44	9.76
0.587134	24.73	29.00	-21.27	-27.00	46.00	56.00	9.76
2.384848	27.13	38.43	-18.87	-17.57	46.00	56.00	9.76
2.745438	23.20	35.72	-22.80	-20.28	46.00	56.00	9.76
9.813874	27.47	34.75	-22.53	-25.25	50.00	60.00	9.79
10.77858	26.89	34.57	-23.11	-25.43	50.00	60.00	9.81
15.909644	24.13	31.56	-25.87	-28.44	50.00	60.00	9.97
27.799044	30.01	35.82	-19.99	-24.18	50.00	60.00	10.08

Figure 48: Plot of CE on AC port, line L2 for FCC Part 15 class B

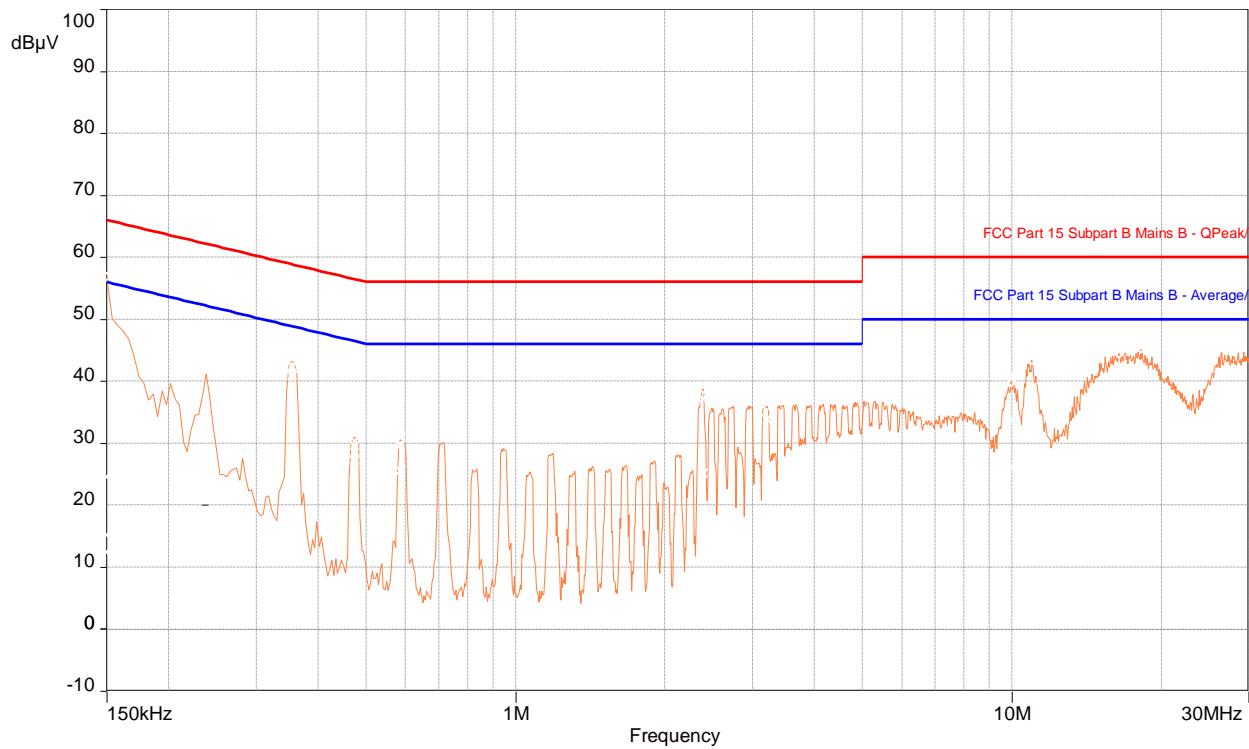


Table 63: CE test results on AC port, line L2 for FCC Part 15 class B

Frequency (MHz)	Level Average (dBµV)	Level Quasi-peak (dBµV)	Margin to Average Class B (dB)	Margin to Quasi-peak Class B (dB)	Limit Average (dBµV)	Limit Quasi-peak (dBµV)	Correction (dB)
0.145788	12.45	15.24	-43.55	-50.76	56.00	66.00	9.81
0.355656	40.85	42.32	-8.02	-16.55	48.87	58.87	9.76
0.472182	27.22	29.56	-19.22	-26.88	46.44	56.44	9.76
0.587584	25.56	29.71	-20.44	-26.29	46.00	56.00	9.75
2.387048	25.09	37.20	-20.91	-18.80	46.00	56.00	9.75
3.210288	22.67	33.84	-23.33	-22.16	46.00	56.00	9.75
9.972448	26.12	33.76	-23.88	-26.24	50.00	60.00	9.78
10.968038	32.77	38.92	-17.23	-21.08	50.00	60.00	9.81
16.453568	31.65	38.67	-18.35	-21.33	50.00	60.00	9.96
18.220542	31.47	37.73	-18.53	-22.27	50.00	60.00	9.97
27.2602	32.14	37.87	-17.86	-22.13	50.00	60.00	10.15

**Figure 49: Setup for CE tests on AC power cables**



### 3.3.6 Test equipment

The equipment used for CE testing was as follows.

**Table 64: Test equipment used for CE on AC power leads**

Description	Make	Model number	Asset ID	Calibr. date	Calibr. due
EMC Automation Software	Nexio V3.18	BAT-EMC	F0163649	Not required	Not required
Coaxial Cable	Huber & Suhner	104PEA	SSG013080	2020-01-06	2021-01-06
Transient Limiter	Hewlett Packard	11947A	SSG012403	2020-01-08	2021-01-08
Line Impedance Stabilization Network	Emco	3825/2	SSG011780	2019-09-16	2020-09-16
EMI Receiver	Rohde & Schwarz	ESCI	SSG013727	2019-09-12	2020-09-12
Termination	Narda	374BNM	SSG012451	2019-10-02	2020-10-02

### 3.3.7 Test conclusion

The LPRU 4410 B5B13 has passed the Conducted Emissions (CE) test on AC power leads with respect to class B limit of FCC Part 15 Subpart B, 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. 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. 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.
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
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**

**End of Document**