Radiated Emissions Test Report
for
DOT 4489 B41K (KRY 901 432/2) and DOT 4479 B41K (KRY 901 432/1) (with NR and LTE)

Tested to: FCC Part 15 Subpart B
FCC Part 27 (Section - 27.53(m)(2))

Test Result summury

FCC/ ICES Section	Description	Specification/Method	Pass or Fail	Results in section
15.109 / 6.2	Radiated Emissions (RE)	FCC Part 15 / ANSI C63.4	Pass	3.2
15.107 / 6.1	Conducted Emissions (CE) for AC Power	FCC Part 15 / ANSI C63.4	NA	NA
27.53(m)(2)	Transmitter Spurious Emissions (RE)	FCC Part 27 / ANSI C63.26	Pass	3.2

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Release control record

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Issue	Reason for change	Date released
01	initial release	6 August 2021

Approvals

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

Accreditations

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1. Executive summary

This document reports the Electromagnetic Compatibility (EMC) testing performed on the product called DOT 4489 B41K (KRY 901 432/2) and DOT 4479 B41K (KRY 901 432/1) for Ericsson Canada per project number 7169009974. The objective of the test activities is to evaluate compliance of the product to following EMC regulatory standards.

The DOT 4489 B41K (KRY 901 432/2) and DOT 4479 B41K (KRY 901 432/1) is verified to comply with the Class B Emissions requirements of these standards:

- FCC Part 15 Subpart B [5] (Class B)
- FCC Part 27 [7] (Digital Base Stations, Section - 27.53(m)(2))

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 DOT 4489 B41K (KRY 901 432/2) and DOT 4479 B41K (KRY 901 432/1)

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 27 subpart C

FCC Section	Description	Specification/Method	Pass or Fail	Results in section
27.53(m)(2)	Transmitter Spurious Emissions (RE) – Digital Base Stations	FCC Part 27/ ANSI C63.26	Pass	3.2

2. Details of the equipment under test

This section describes the equipment under test (EUT).

2.1 Assessed hardware

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

Table 3: Assessed hardware

Hardware component [1]	Part number
DOT 4479 B41K, with internal Antenna port	KRY 901 432/1
DOT 4489 B41K, with External Antenna port	KRY 901 432/2
Table Notes	
1. The 2 units above use the same pcb and hardware. The only difference between the units is the presence of the internal/external antennas. There fore all EMC tests were done only on the external port variant.	

2.2 Product overview

The product trade name is DOT 4489 B41K (KRY 901 432/2) and DOT 4479 B41K (KRY 901 432/1). DOT 4489 B41K (KRY 901 432/2) and DOT 4479 B41K (KRY 901 432/1) are indoor wireless telecommunication products; transmit and receive the cellular signals for 5G wireless systems. And operates from POE (56 VDC).

Figure 1: The EUT with four external RF ports

The 2 units above use the same pcb and hardware. The only difference between the units is the presence of the internal/external antennas. There fore all EMC tests were done only on the external port variant;

configurations of the DOT 4489 B41K (KRY 901 432/2) that was tested is shown in the section Configurations of the EUT. The EUT was tested in a tabletop setting.

Table 4: EUT info

Product data:	DOT 4489 B41K
Product family:	Ph4 Higher Tier Dot, dual 4T4R
P/N:	KRY 901 432/2
Revision	R1B
Nominal Voltage:	POE, 56Vdc
Operating Temperature:	+5°C to +40°C
Bands	B41K
Antennas	external, 4T4R
Output Power per branch	250mW
RAT support	LTE-TDD, NR-TDD
Mixed Mode supported	LTE + NR
IBW	100MHz
Nominal O/P per TDD Antenna Port:	Single Carrier: 1 x 250mW (24dBm)
	Multi-Carrier: 2 x 125mW (21dBm)
	Multi-Carrier: 3 x 83.33mW (19.2dBm)
	Multi-Carrier: 4 x 62.5mW (18dBm)
	Multi-Carrier: 5 x 50mW (17dBm)
	Multi-Carrier: 6 x 41.7mW (16.2dBm)
Max number carriers per Port	6c (Contiguous operations only)
Total number of NR carriers	3c (single Xenon limit)
Total number of UTRA carriers	na
Total number of E-UTRA carriers	6c
Modulation:	LTE: QPSK, 16QAM, 64QAM, 256 QAM
	NR: 15, 30KHz SCS
Channel Bandwidth:	LTE: 5, 10, 15, 20MHz
	NR: 20, 40, 50, 60, 70, 80, 90, 100MHz
RJ45 Interface:	Digital, 10Gb/s, dRDI rev = D1 (standard compression)
Channel Raster:	LTE: 100kHz,
Mounting	ceiling or wall
Dimensions: (H x W) (with bracket)	73mm x 200mm
Weight;	1.0 kg

2.3 Product port definition and EUT cable information

Table 5 identifies all the cables and ports on the EUT. The Environment of the cables is indoor.

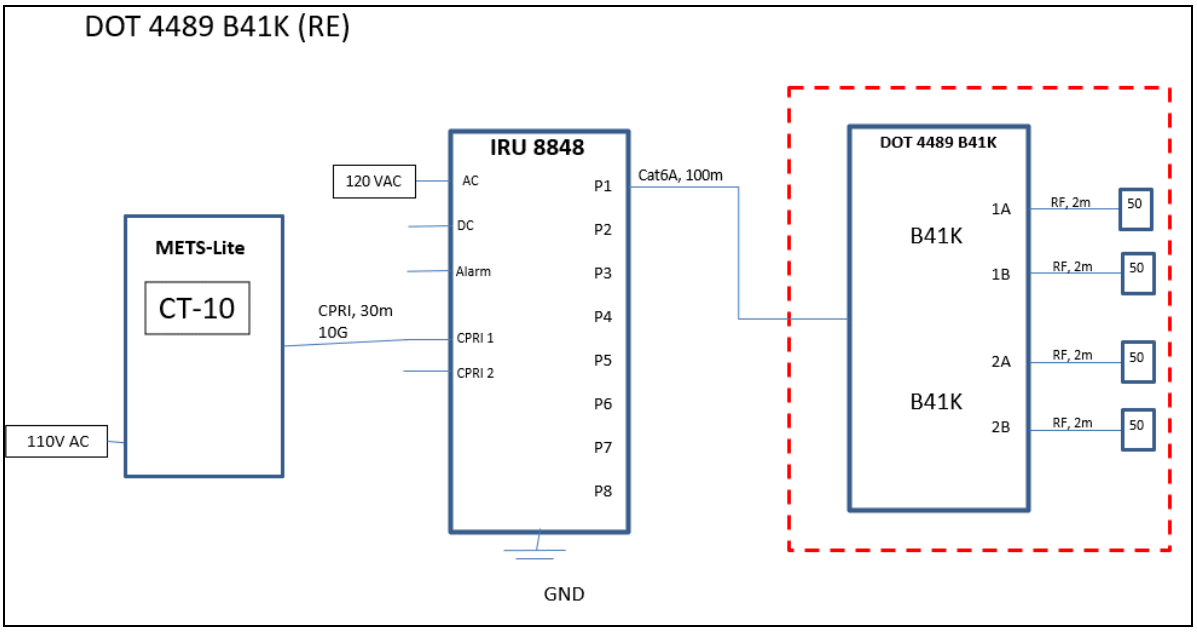
Table 5: System port definition

DOT 4489 B41K Port Name	Port Description	Port Type	Interface Detail	Plug-Cable Type
dRDI	Digital RDI	Telecom	ethernet	RJ-45, CAT6A
1A, 1B, 2A, 2B	RF to external antenna B41K	Antenna	RF	SMA, Coax >3m

2.4 Configurations of the EUT

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

Figure 2: Test configuration for Emission tests



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

- Radiated Emissions Single RAT/Single Carrier Configurations (LTE)
- Radiated Emissions Single RAT / Single Carrier Configurations (NR)
- Radiated Emissions Single RAT / Multi Carriers Configurations (LTE)
- Radiated Emissions Multi RAT/Multi Carrier Configuration (LTE + NR)

2.4.1 Radiated Emissions Single RAT/Single Carrier Configurations (LTE)

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

Single RAT/Single Carrier - LTE setups for Emissions			
B41K PORT 1A,1B,2A,2B,3A,3B,4A,4B			
BS type 1-C, CS16 (NR, LTE) TC21			
SR LTE Config SC 1 Carrier setups for Emissions			
Carrier	Middle channel		
1	B41K: LTE, 5MHz, 2595MHz		
SR LTE Config SC 2 Carrier setups for Emissions			
Carrier	Middle channel		
1	B41K: LTE, 10MHz, 2595MHz		
SR LTE Config SC 3 Carrier setups for Emissions			
Carrier	Middle channel		
1	B41K: LTE, 15MHz, 2595MHz		
SR LTE Config SC 4 Carrier setups for Emissions			
Carrier	Middle channel		
1	B41K: LTE, 20MHz, 2595MHz		

Radiated Emissions measurements were compared between above 4 LTE carrier setups. SC1 was found to have higher emissions than SC2, SC3 and SC4. Single RAT/Single carrier LTE in this report are therefore measured using SC1 Bottom, Middle and Top channel carrier setup.

2.4.2 Radiated Emissions Single RAT / Single Carrier Configurations (NR)

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

Single RAT/Single Carrier - NR setups for Emissions			
B41K PORT 1A,1B,2A,2B,3A,3B,4A,4B			
BS type 1-C, CS16 (NR, LTE) TC21			
SR LTE Config SC 5 Carrier setups for Emissions			
Carrier	Middle channel		
1	B41K: NR, 20MHz, 2595MHz		
SR LTE Config SC 6 Carrier setups for Emissions			
Carrier	Middle channel		
1	B41K: NR, 40MHz, 2595MHz		
SR LTE Config SC 7 Carrier setups for Emissions			
Carrier	Middle channel		
1	B41K: NR, 50MHz, 2595MHz		
SR LTE Config SC 8 Carrier setups for Emissions			
Carrier	Middle channel		
1	B41K: NR, 60MHz, 2595MHz		
SR LTE Config SC 9 Carrier setups for Emissions			
Carrier	Middle channel		
1	B41K: NR, 70MHz, 2595MHz		
SR LTE Config SC 10 Carrier setups for Emissions			
Carrier	Middle channel		
1	B41K: NR, 80MHz, 2595MHz		
SR LTE Config SC 11 Carrier setups for Emissions			
Carrier	Middle channel		
1	B41K: NR, 90MHz, 2595MHz		
SR LTE Config SC 12 Carrier setups for Emissions			
Carrier	Middle channel		
1	B41K: NR, 100MHz, 2595MHz		

Note: Radiated Emissions measurements were compared between above 8 NR carrier setups. SC5 was found to have higher emissions than SC6, SC7, SC8, SC9, SC10, SC11, and SC12. All plots with single NR carrier in this report are therefore measured using SC5 Middle channel carrier setup.

2.4.3 Radiated Emissions Single RAT / Multi Carriers Configurations (LTE)

Figure 5: Tested carrier detail – Single RAT / Multi carrier (LTE)

Single RAT / Multi Carrier - LTE setups for Emissions			
B41K PORT 1A,1B,2A,2B,3A,3B,4A,4B			
BS type 1-C, CS16 (NR, LTE) TC21			
SR LTE Config MC1 Carrier setups for Emissions			
Carrier:	Middle channel		
1	B41K: LTE, 5MHz, 2595MHz		
2	B41K: LTE, 5MHz, 2590MHz		
SR LTE Config MC2 Carrier setups for Emissions			
Carrier:	Middle channel		
1	B41K: LTE, 5MHz, 2590MHz		
2	B41K: LTE, 5MHz, 2595MHz		
3	B41K: LTE, 5MHz, 2600MHz		
SR LTE Config MC3 Carrier setups for Emissions			
Carrier:	Middle channel		
1	B41K: LTE, 5MHz, 2580MHz		
2	B41K: LTE, 5MHz, 2585MHz		
3	B41K: LTE, 5MHz, 2590MHz		
4	B41K: LTE, 5MHz, 2595MHz		
5	B41K: LTE, 5MHz, 2600MHz		
6	B41K: LTE, 5MHz, 2605MHz		

Note: Radiated Emissions measurements were compared between MC1, MC2 and MC3. MC1 was found to have higher emissions. All plots with Single RAT/Multi carrier in this report are therefore measured using MC1 middle carrier setups.

2.4.4 Radiated Emissions Multi RAT/Multi Carrier Configuration (LTE + NR)

Figure 6: Tested carrier detail – MultiCarrier / Multi RAT Configuration

Single RAT / Multi Carrier - LTE + NR setups for Emissions			
B41K PORT 1A,1B,2A,2B,3A,3B,4A,4B			
BS type 1-C, CS16 (NR, LTE) TC21			
MR Config MR1 Carrier setups for Emissions			
Carrier:	Middle channel		
1	B41K: LTE, 5MHz, 2582.5MHZ		
2	B41K: NR, 20MHz, 2595MHz		
MR Config MR2 Carrier setups for Emissions			
Carrier:	Middle channel		
1	B41K: LTE, 5MHz, 2572.5MHZ		
2	B41K: LTE, 5MHz, 2577.5MHZ		
3	B41K: LTE, 5MHz, 2582.5MHZ		
4	B41K: NR, 20MHz, 2595MHz		
5	B41K: NR, 20MHz, 2615MHz		
6	B41K: NR, 20MHz, 2635MHz		

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

2.5 Modifications of the EUT during testing

The EUT was not modified prior to or during testing.

2.6 Inventory of the EUT and support equipments

The following table identifies the inventory of the EUT.

Table 6: Inventory of the EUT

Equipment Role	Product Name	Product Number	Release	Product Serial#
EUT #1	DOT 4489 B41K (external Ant)	KRY 901 432/2	R1B	TD3T789179
SUPPORT	IRU 8848	KRC 161 889/1	R1C	TD3F064177
CABLE	RDI CAT6A, 100m, F/FTP	na	na	na
CABLE	RF COAX, 2m, SMA	na	na	na
TEST SET	CT-10 DU-SIM, METS-Lite	LPC 102 487/1	R1C	T01F311639
Software				
IRU load:	CXP2030045_25-R9B946			
RUX rev:	R9F			
RUX testDef:	_RRUS_DOT_TDD_B41K_MM_V4			
Tester:	Uzair			

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 27	FCC Part 27/ ANSI C63.26	USA

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 (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	Average

Table 9: Emission limits for FCC Part 27

Frequency range (MHz)	FCC Part 27 EIRP Limit (dBm)	Calculated EIRP Limit in dBµV/m
30 - 40000	-13	82.2

3.2.2 Test procedure

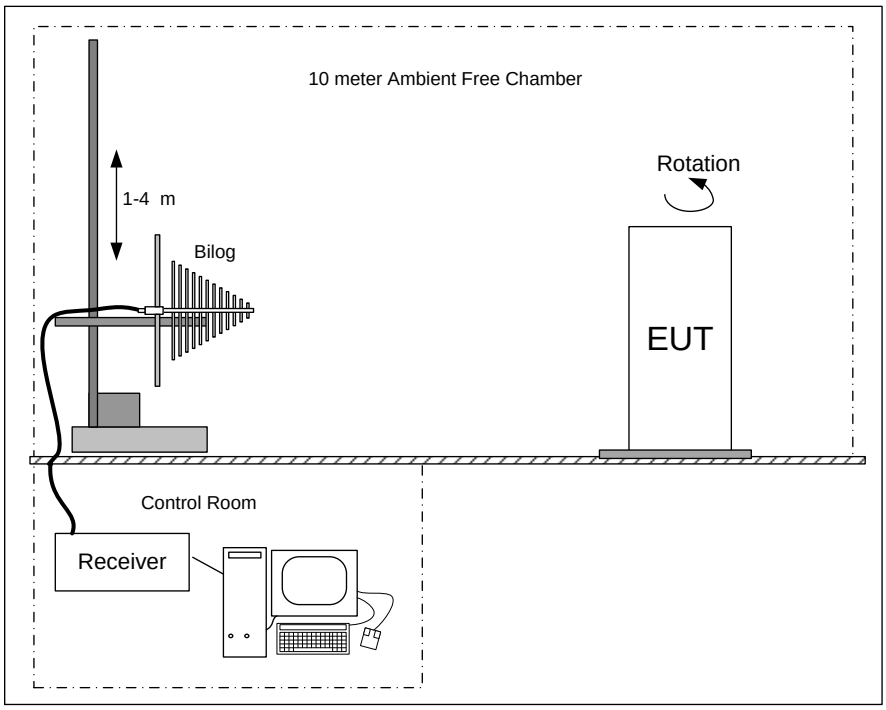
Verifications of the test equipment and AFC were performed before the installation of the EUT in accordance with the quality assurance procedures documented in the EMC test procedures document. The test was performed according to the relevant procedures listed in Table 7.

- 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 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 7: 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
- ± 4.8 dB between 10 GHz and 18 GHz
- ± 4.6 dB between 18 GHz and 26.5 GHz
- ± 4.8 dB between 26.5 GHz and 40 GHz

3.2.5 Test results of RE – (Single RAT/Single Carrier (LTE) – Bottom channel)

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

Date tested: 23 - 30 June 2021

Tested by: Steve Mcfarlane

Test configurations are listed as SC LTE in 2.4.1 as identified in the section Configurations of the EUT. For the following test results that have supporting data tables, negative margin values indicate a pass.

Red trace – Vertical antenna polarity, Blue trace – Horizonatal antenna polarity

Figure 8: Plot of RE at 3 m – 30 to1000 MHz (LTE – Bottom channel)

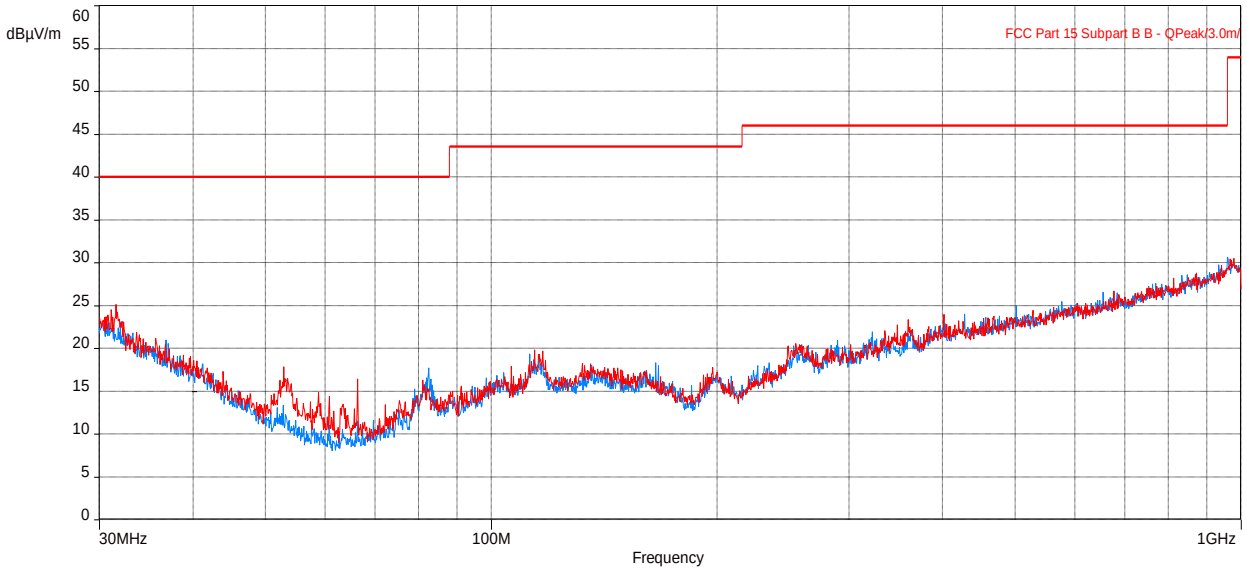


Table 10: RE test results from 30 to 1000 MHz for FCC Part 15 (LTE – Bottom channel)

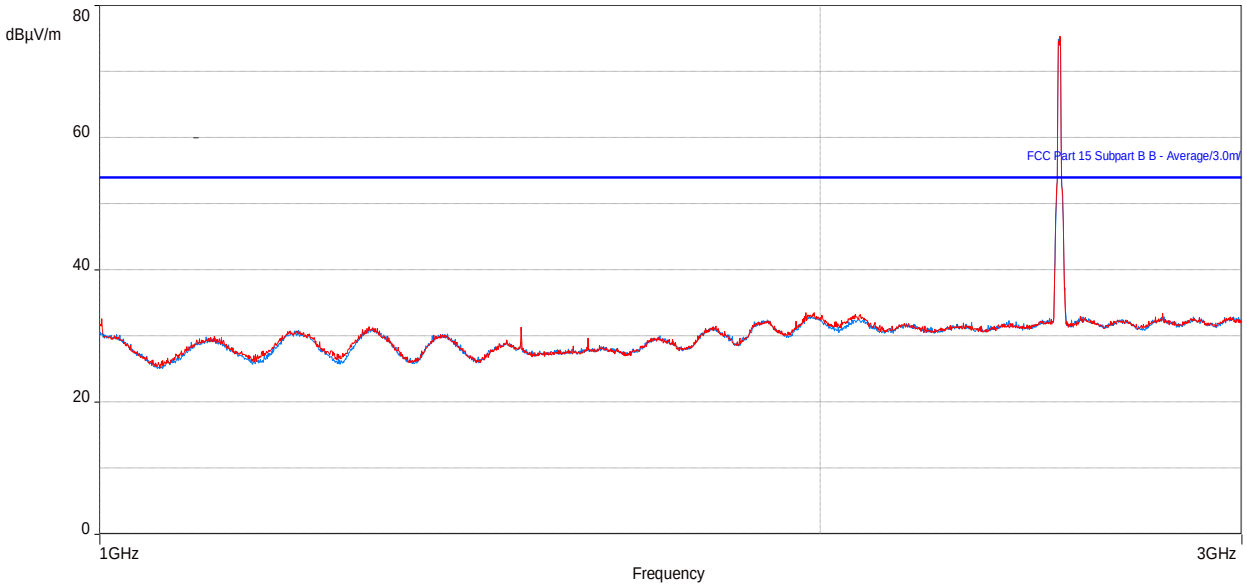
Frequency (MHz)	Level (dBµV)	Limit Quasi-peak (dBµV)	Margin to FCC part 15 Class B (dB)	Height (m)	Azimuth (deg)	Polarization	Correction (dB)
31.6067311	22.09	40.00	-17.91	1.00	263.75	Vertical	-2.63
942.2517085	23.44	46.02	-22.58	3.78	69.50	Vertical	5.72
32.05767308	17.41	40.00	-22.59	1.66	304.75	Horizontal	-2.89
933.9220482	22.93	46.02	-23.09	2.22	141.50	Horizontal	5.58

Table 11: RE test results from 30 to 1000 MHz for FCC Part 27 (LTE – Bottom channel)

Frequency (MHz)	Level (dBµV)	Limit EIRP (dBµV)	Margin to EIRP Limit (dB)	Height (m)	Azimuth (deg)	Polarization	Correction (dB)
31.6067311	22.09	82.2	-60.11	1.00	263.75	Vertical	-2.63
942.2517085	23.44	82.2	-58.76	3.78	69.50	Vertical	5.72
32.05767308	17.41	82.2	-64.79	1.66	304.75	Horizontal	-2.89
933.9220482	22.93	82.2	-59.27	2.22	141.50	Horizontal	5.58

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

Figure 9: Plot of RE at 3m from 1 to 3 GHz (LTE – Bottom channel)



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

Table 12: RE test results from 1 to 3 GHz for FCC Part 15 (LTE – Bottom channel)

Frequency (MHz)	Level Average (dBµV)	Limit Average (dBµV)	Margin to FCC part 15 Class B (dB)	Height (m)	Azimuth (degrees)	Polarization	Correction (dB)
1987.503205	30.03	53.96	-23.93	4.00	170.25	Vertical	-5.67
2779.652277	29.39	53.96	-24.57	3.75	261.50	Vertical	-5.27
1982.964744	29.80	53.96	-24.16	2.01	283.50	Horizontal	-5.73
2863.817021	29.33	53.96	-24.63	2.28	304.75	Horizontal	-5.22

Table 13: RE test results from 1 to 3 GHz for FCC Part 27 (LTE – Bottom channel)

Frequency (MHz)	Level (dBµV)	Limit EIRP (dBµV)	Margin to EIRP Limit (dB)	Height (m)	Azimuth (deg)	Polarization	Correction (dB)
1987.503205	30.03	82.2	-52.17	4.00	170.25	Vertical	-5.67
2779.652277	29.39	82.2	-52.81	3.75	261.50	Vertical	-5.27
1982.964744	29.80	82.2	-52.4	2.01	283.50	Horizontal	-5.73
2863.817021	29.33	82.2	-52.87	2.28	304.75	Horizontal	-5.22

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

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

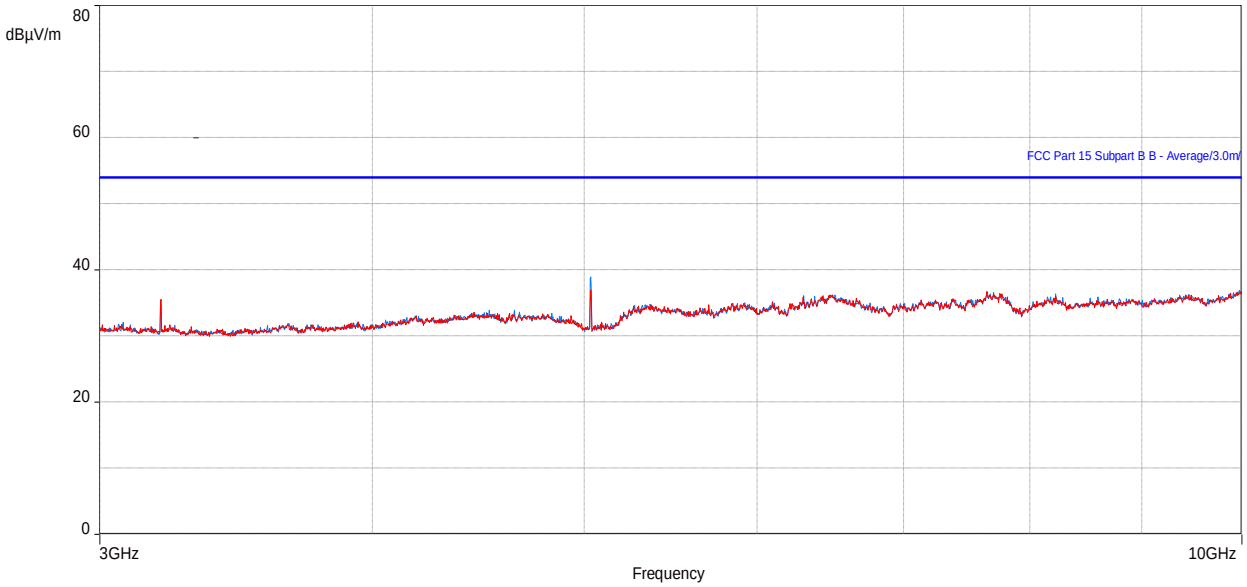


Table 14: RE test results from 3 to 10 GHz for FCC Part 15 (LTE – Bottom channel)

Frequency (MHz)	Level Average (dBµV)	Limit Average (dBµV)	Margin to FCC part 15 Class B (dB)	Height (m)	Azimuth (degrees)	Polarization	Correction (dB)
3199.978492	34.69	53.96	-19.27	3.17	276.00	Vertical	-4.43
5034.678846	33.91	53.96	-20.05	3.00	357.75	Vertical	-2.45
3199.978492	34.44	53.96	-19.52	2.14	275.75	Horizontal	-4.43
5035.192595	35.99	53.96	-17.97	3.48	113.00	Horizontal	-2.45

Table 15: RE test results from 3 to 10 GHz for FCC Part 27 (LTE – Bottom channel)

Frequency (MHz)	Level (dBµV)	Limit EIRP (dBµV)	Margin to EIRP Limit (dB)	Height (m)	Azimuth (deg)	Polarization	Correction (dB)
3199.978492	34.69	82.2	-47.51	3.17	276.00	Vertical	-4.43
5034.678846	33.91	82.2	-48.29	3.00	357.75	Vertical	-2.45
3199.978492	34.44	82.2	-47.76	2.14	275.75	Horizontal	-4.43
5035.192595	35.99	82.2	-46.21	3.48	113.00	Horizontal	-2.45

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

Figure 11: Plot of RE at 3m from 10 to 18 GHz (LTE – Bottom channel)

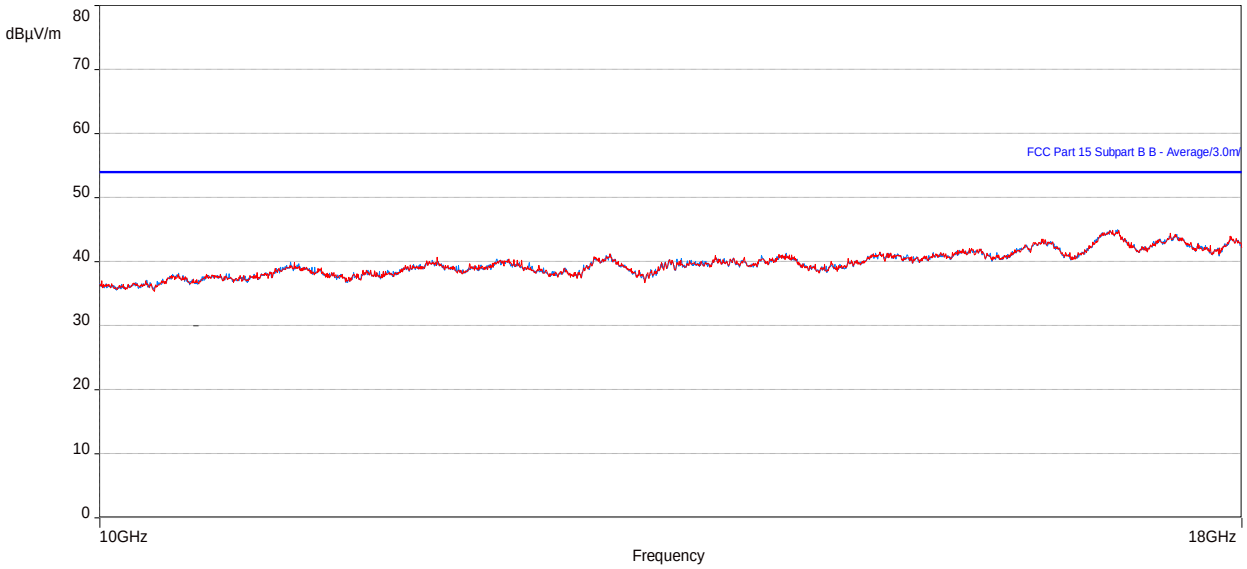


Table 16: RE test results from 10 to 18 GHz for FCC Part 15 (LTE – Bottom channel)

Frequency (MHz)	Level Average (dBµV)	Limit Average (dBµV)	Margin to FCC part 15 Class B (dB)	Height (m)	Azimuth (degrees)	Polarization	Correction (dB)
16844.84487	40.56	53.96	-13.40	4.00	350.25	Vertical	14.93
16870.50417	40.29	53.96	-13.67	3.79	293.00	Horizontal	14.95
17349.04136	40.13	53.96	-13.83	4.00	343.00	Vertical	14.53
17407.59197	39.94	53.96	-14.02	4.00	9.75	Horizontal	14.76

Table 17: RE test results from 10 to 18 GHz (LTE – Bottom channel)

Frequency (MHz)	Level (dBµV)	Limit EIRP (dBµV)	Margin to EIRP Limit (dB)	Height (m)	Azimuth (deg)	Polarization	Correction (dB)
16844.84487	40.56	82.2	-41.64	4.00	350.25	Vertical	14.93
16870.50417	40.29	82.2	-41.91	3.79	293.00	Horizontal	14.95
17349.04136	40.13	82.2	-42.07	4.00	343.00	Vertical	14.53
17407.59197	39.94	82.2	-42.26	4.00	9.75	Horizontal	14.76

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

3.2.6 Test results of RE – (Single RAT/Single Carrier (LTE) – Middle channel)

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

Date tested: 23 – 30, June 2021

Tested by: Steve Mcfarlane

Test configurations are listed as SC LTE in 2.4.1 as identified in the section Configurations of the EUT. For the following test results that have supporting data tables, negative margin values indicate a pass.

Red trace – Vertical antenna polarity, Blue trace – Horizonatal antenna polarity

Figure 12: Plot of RE at 3 m – 30 to1000 MHz (LTE – Middle channel)

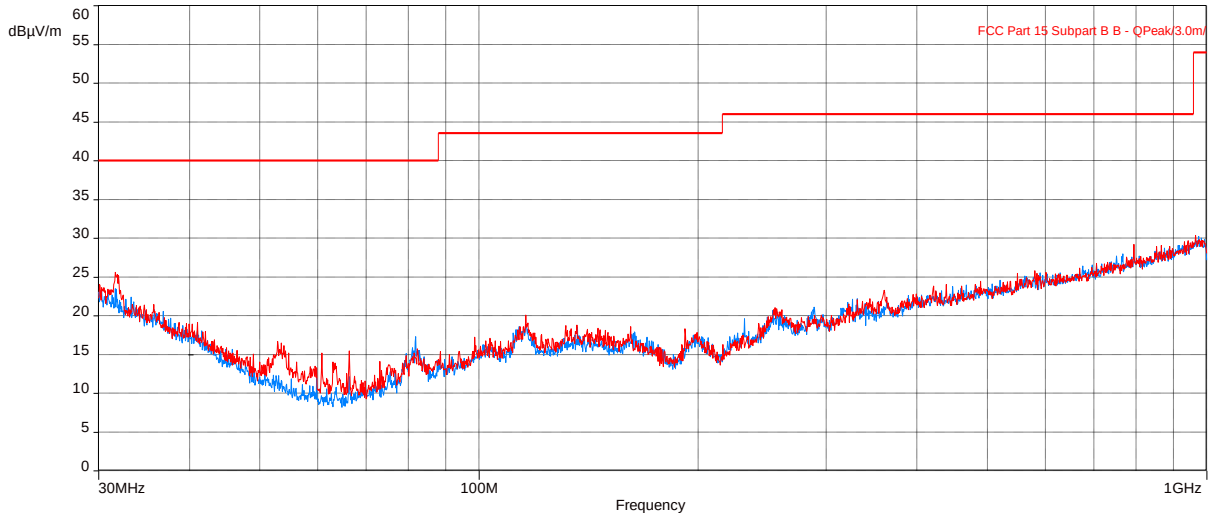


Table 18: RE test results from 30 to 1000 MHz for FCC Part 15 (LTE – Middle channel)

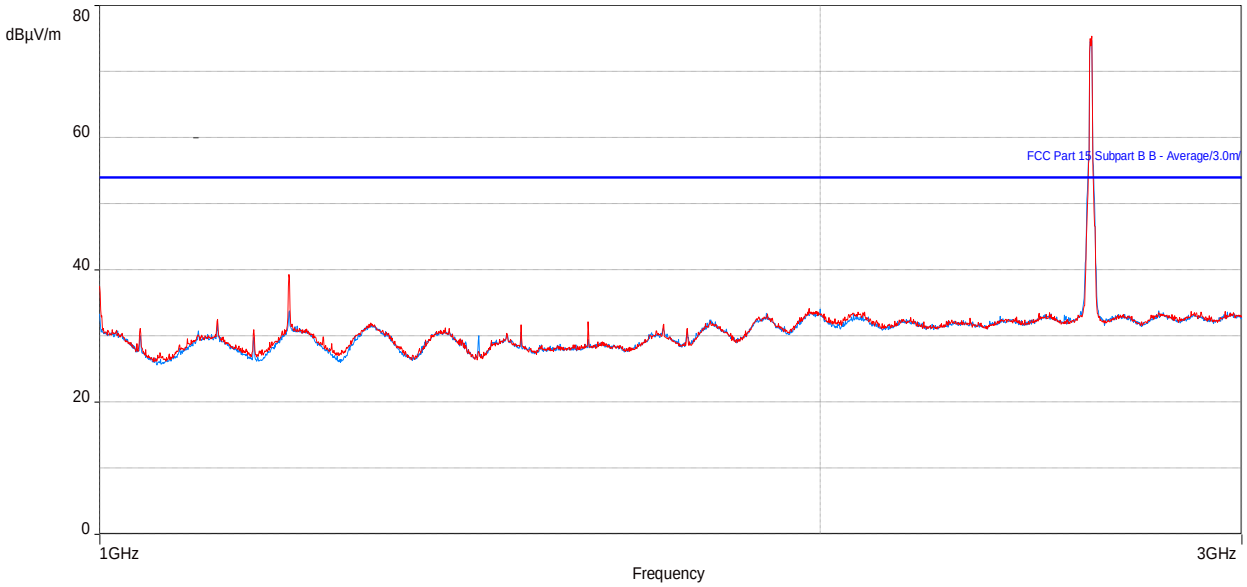
Frequency (MHz)	Level (dBµV)	Limit Quasi-peak (dBµV)	Margin to FCC part 15 Class B (dB)	Height (m)	Azimuth (deg)	Polarization	Correction (dB)
31.64483333	22.93	40.00	-17.07	1.00	270.25	Vertical	-2.65
932.1632277	23.16	46.02	-22.86	1.79	313.50	Vertical	5.59
31.74263462	17.90	40.00	-22.10	1.62	360.00	Horizontal	-2.71
956.4289328	24.00	46.02	-22.02	2.69	169.25	Horizontal	6.34

Table 19: RE test results from 30 to 1000 MHz for FCC Part 27 (LTE – Middle channel)

Frequency (MHz)	Level (dBµV)	Limit EIRP (dBµV)	Margin to EIRP Limit (dB)	Height (m)	Azimuth (deg)	Polarization	Correction (dB)
31.64483333	22.93	82.2	-59.27	1.00	270.25	Vertical	-2.65
932.1632277	23.16	82.2	-59.04	1.79	313.50	Vertical	5.59
31.74263462	17.90	82.2	-64.30	1.62	360.00	Horizontal	-2.71
956.4289328	24.00	82.2	-58.20	2.69	169.25	Horizontal	6.34

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

Figure 13: Plot of RE at 3m from 1 to 3 GHz (LTE – Middle channel)



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

Table 20: RE test results from 1 to 3 GHz for FCC Part 15 (LTE – Middle channel)

Frequency (MHz)	Level Average (dBµV)	Limit Average (dBµV)	Margin to FCC part 15 Class B (dB)	Height (m)	Azimuth (degrees)	Polarization	Correction (dB)
1199.862787	33.67	53.96	-20.29	2.49	134.25	Vertical	-10.73
1979.201315	30.21	53.96	-23.75	4.00	170.25	Vertical	-5.78
1200.0125	29.35	53.96	-24.61	1.00	360.25	Horizontal	-10.73
1999.86471	29.93	53.96	-24.03	2.01	204.00	Horizontal	-5.52

Table 21: RE test results from 1 to 3 GHz for FCC Part 27 (LTE – Middle channel)

Frequency (MHz)	Level (dBµV)	Limit EIRP (dBµV)	Margin to EIRP Limit (dB)	Height (m)	Azimuth (deg)	Polarization	Correction (dB)
1199.862787	33.67	82.2	-48.53	2.49	134.25	Vertical	-10.73
1979.201315	30.21	82.2	-51.99	4.00	170.25	Vertical	-5.78
1200.0125	29.35	82.2	-52.85	1.00	360.25	Horizontal	-10.73
1999.86471	29.93	82.2	-52.27	2.01	204.00	Horizontal	-5.52

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

Figure 14: Plot of RE at 3m from 3 to 10 GHz (LTE – Middle channel)

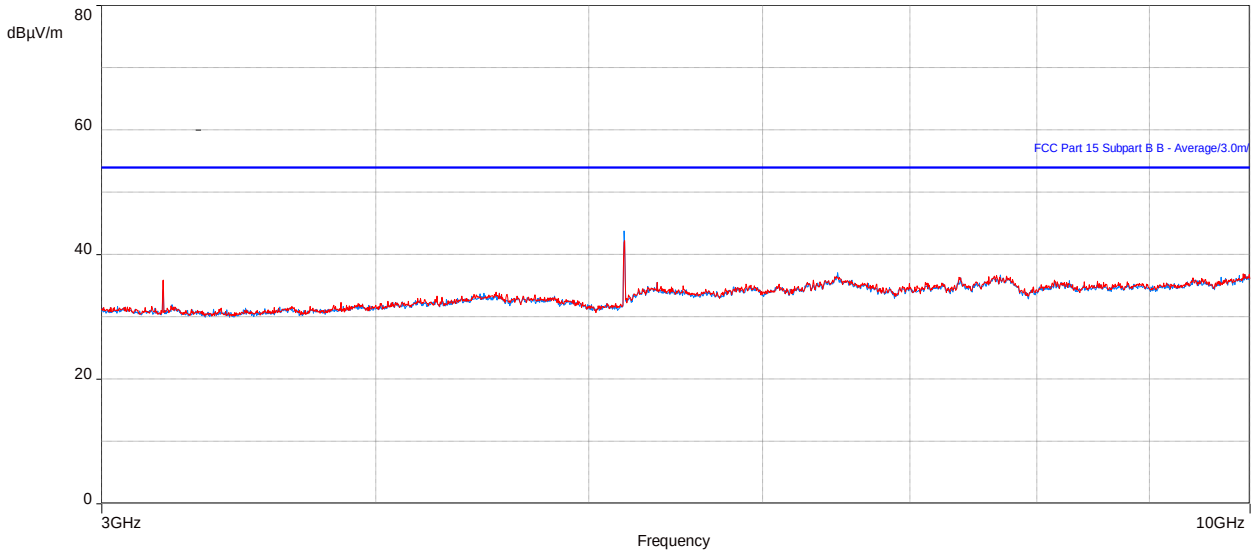


Table 22: RE test results from 3 to 10 GHz for FCC Part 15 (LTE – Middle channel)

Frequency (MHz)	Level Average (dBµV)	Limit Average (dBµV)	Margin to FCC part 15 Class B (dB)	Height (m)	Azimuth (degrees)	Polarization	Correction (dB)
5190.334582	38.97	53.96	-14.99	3.89	68.50	Vertical	-1.71
7372.617021	33.09	53.96	-20.87	4.00	327.50	Vertical	2.93
5189.677851	38.57	53.96	-15.39	3.61	104.50	Horizontal	-1.71
6491.851603	32.53	53.96	-21.43	4.00	342.50	Horizontal	1.37

Table 23: RE test results from 3 to 10 GHz for FCC Part 27 (LTE – Middle channel)

Frequency (MHz)	Level (dBµV)	Limit EIRP (dBµV)	Margin to EIRP Limit (dB)	Height (m)	Azimuth (deg)	Polarization	Correction (dB)
5190.334582	38.97	82.2	-43.23	3.89	68.50	Vertical	-1.71
7372.617021	33.09	82.2	-49.11	4.00	327.50	Vertical	2.93
5189.677851	38.57	82.2	-43.63	3.61	104.50	Horizontal	-1.71
6491.851603	32.53	82.2	-49.67	4.00	342.50	Horizontal	1.37

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

Figure 15: Plot of RE at 3m from 10 to 18 GHz (LTE – Middle channel)

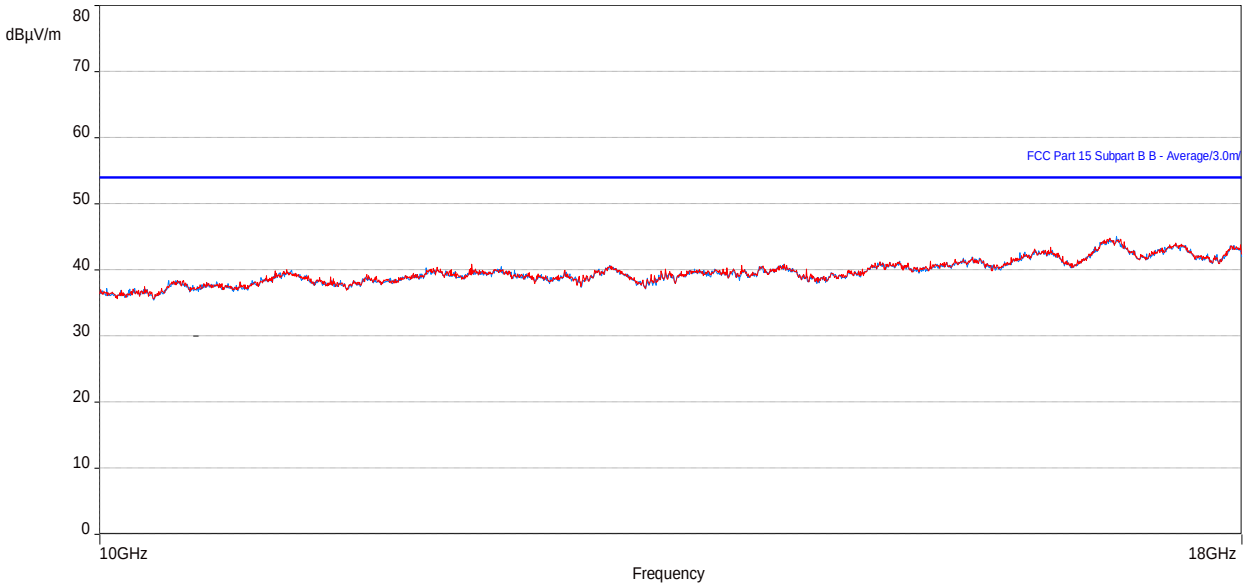


Table 24: RE test results from 10 to 18 GHz for FCC Part 15 (LTE – Middle channel)

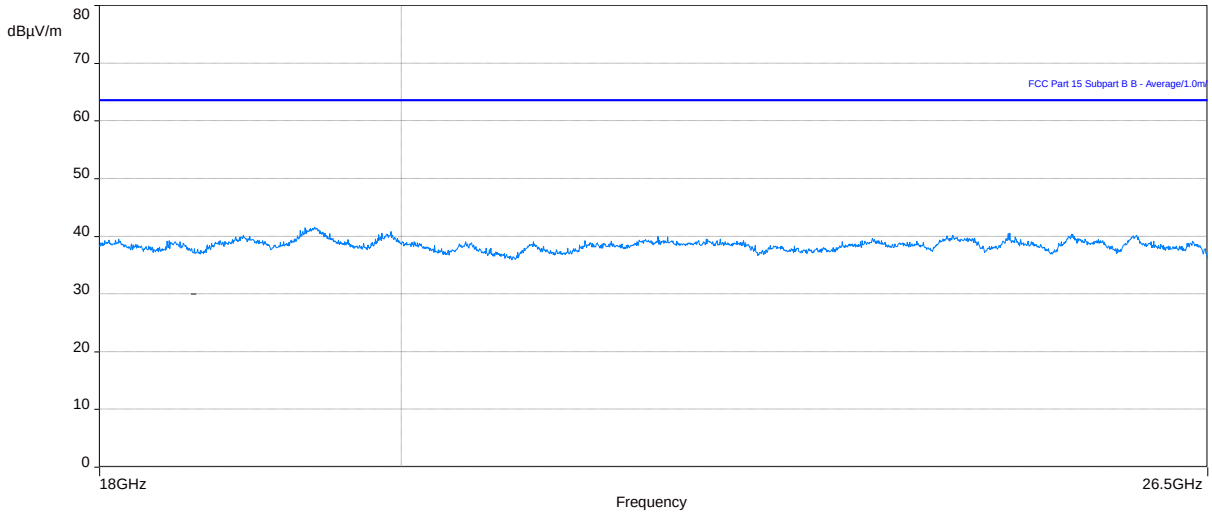
Frequency (MHz)	Level Average (dBµV)	Limit Average (dBµV)	Margin to FCC part 15 Class B (dB)	Height (m)	Azimuth (degrees)	Polarization	Correction (dB)
16820.13559	40.89	53.96	-13.07	3.66	2.50	Vertical	14.87
17898.47532	40.77	53.96	-13.19	4.00	350.25	Vertical	14.88
16875.72979	40.50	53.96	-13.46	4.00	2.75	Horizontal	14.95
17892.71186	40.48	53.96	-13.48	3.45	360.25	Horizontal	14.74

Table 25: RE test results from 10 to 18 GHz (LTE – Middle channel)

Frequency (MHz)	Level (dBµV)	Limit EIRP (dBµV)	Margin to EIRP Limit (dB)	Height (m)	Azimuth (deg)	Polarization	Correction (dB)
16820.13559	40.89	82.2	-41.31	3.66	2.50	Vertical	14.87
17898.47532	40.77	82.2	-41.43	4.00	350.25	Vertical	14.88
16875.72979	40.50	82.2	-41.70	4.00	2.75	Horizontal	14.95
17892.71186	40.48	82.2	-41.72	3.45	360.25	Horizontal	14.74

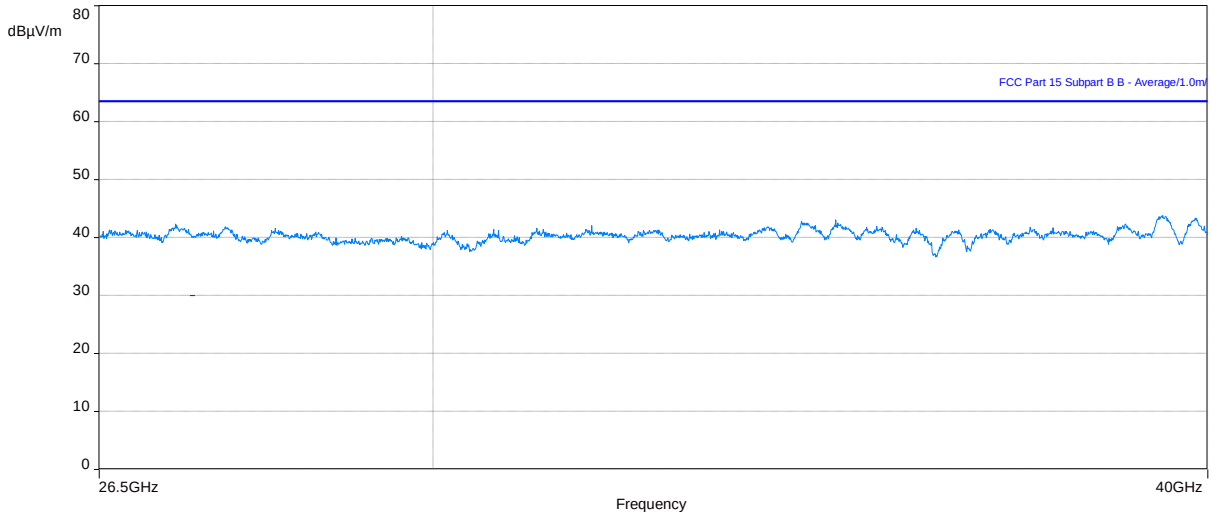
Note: In the table/Plot above, no emissions exceed the Part 27 radiated spurious emissions limit when converted to dBuV/m. For final spurious emissions measurements to FCC Part 27, see antenna port conducted emissions in applicable test report.

Figure 16: 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 27 radiated spurious emissions limit when converted to dBuV/m. For final spurious emissions measurements to FCC Part 27, see antenna port conducted emissions in applicable test report.

Figure 17: 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 27 radiated spurious emissions limit when converted to dBuV/m. For final spurious emissions measurements to FCC Part 27, see antenna port conducted emissions in applicable test report.

3.2.7 Test results of RE – (Single RAT/Single Carrier (LTE) – Top channel)

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

Date tested: 23-30, June 2021

Tested by: Steve Mcfarlane

Test configurations are listed as SC LTE in 2.4.1 as identified in the section Configurations of the EUT. For the following test results that have supporting data tables, negative margin values indicate a pass.

Red trace – Vertical antenna polarity, Blue trace – Horizonatal antenna polarity

Figure 18: Plot of RE at 3 m – 30 to1000 MHz (LTE – Top channel)

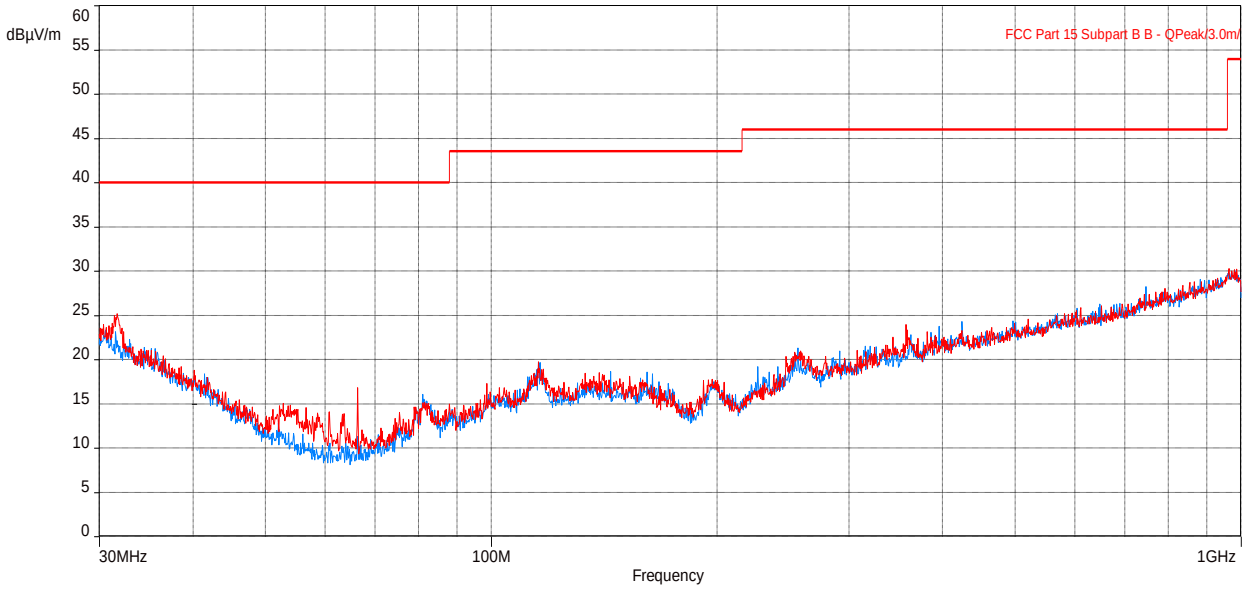


Table 26: RE test results from 30 to 1000 MHz for FCC Part 15 (LTE – Top channel)

Frequency (MHz)	Level (dBµV)	Limit Quasi-peak (dBµV)	Margin to FCC part 15 Class B (dB)	Height (m)	Azimuth (deg)	Polarization	Correction (dB)
31.67203813	23.08	40.00	-16.92	1.00	261.75	Vertical	-2.67
31.49258367	17.86	40.00	-22.14	2.19	149.00	Horizontal	-2.56
965.5227341	24.19	53.98	-29.79	2.05	350.50	Horizontal	6.48

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

Frequency (MHz)	Level (dBµV)	Limit EIRP (dBµV)	Margin to EIRP Limit (dB)	Height (m)	Azimuth (deg)	Polarization	Correction (dB)
31.67203813	23.08	82.2	-59.12	1.00	261.75	Vertical	-2.67
31.49258367	17.86	82.2	-64.34	2.19	149.00	Horizontal	-2.56
965.5227341	24.19	82.2	-58.01	2.05	350.50	Horizontal	6.48

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

Figure 19: Plot of RE at 3m from 1 to 3 GHz (LTE – Top channel)

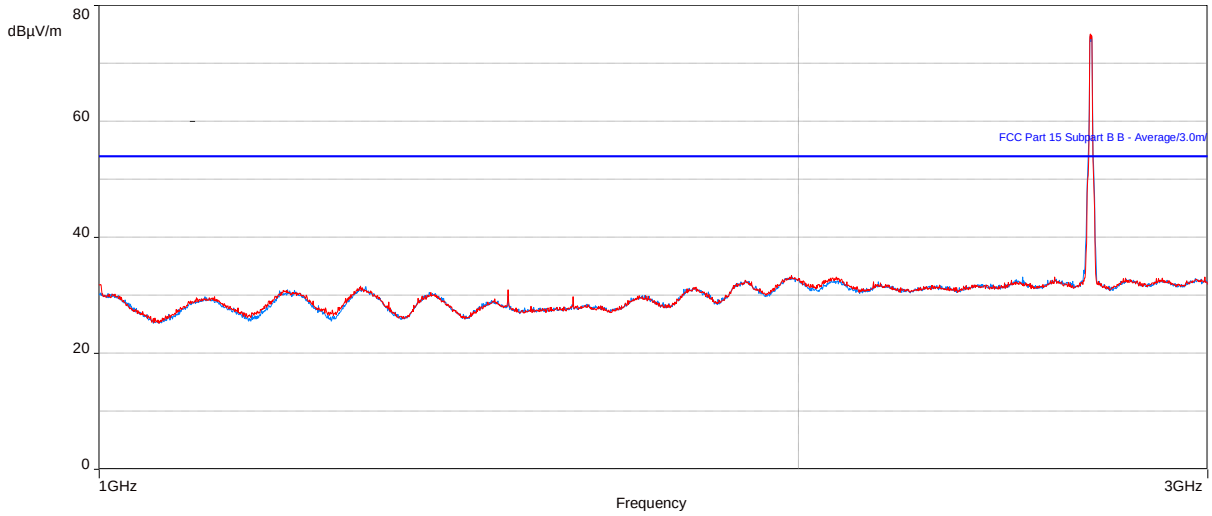


Table 28: RE test results from 1 to 3 GHz for FCC Part 15 (LTE – Top channel)

Frequency (MHz)	Level Average (dBµV)	Limit Average (dBµV)	Margin to FCC part 15 Class B (dB)	Height (m)	Azimuth (degrees)	Polarization	Correction (dB)
1295.573751	28.06	53.96	-25.90	2.76	163.25	Vertical	-9.96
1986.26859	30.11	53.96	-23.85	3.24	175.25	Vertical	-5.69
1302.1542	27.62	53.96	-26.34	1.00	249.50	Horizontal	-9.95
1987.503559	29.64	53.96	-24.32	3.55	196.75	Horizontal	-5.67

Table 29: RE test results from 1 to 3 GHz for FCC Part 27 (LTE – Top channel)

Frequency (MHz)	Level (dBµV)	Limit EIRP (dBµV)	Margin to EIRP Limit (dB)	Height (m)	Azimuth (deg)	Polarization	Correction (dB)
1295.573751	28.06	82.2	-54.14	2.76	163.25	Vertical	-9.96
1986.26859	30.11	82.2	-52.09	3.24	175.25	Vertical	-5.69
1302.1542	27.62	82.2	-54.58	1.00	249.50	Horizontal	-9.95
1987.503559	29.64	82.2	-52.56	3.55	196.75	Horizontal	-5.67

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

Figure 20: Plot of RE at 3m from 3 to 10 GHz (LTE – Top channel)

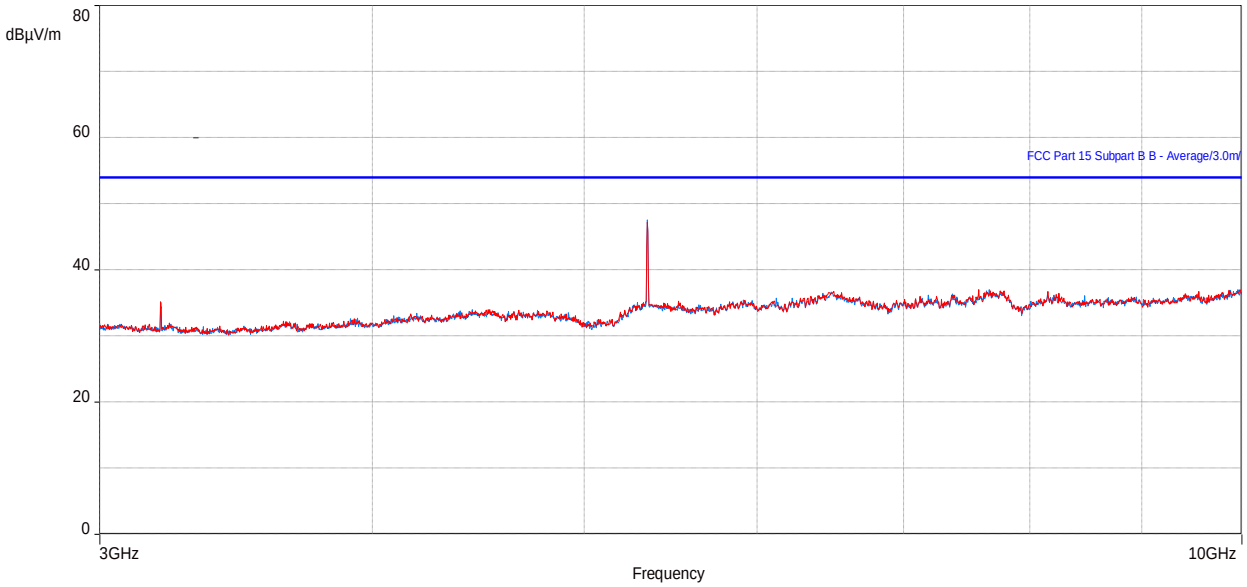


Table 30: RE test results from 3 to 10 GHz for FCC Part 15 (LTE – Top channel)

Frequency (MHz)	Level Average (dBµV)	Limit Average (dBµV)	Margin to FCC part 15 Class B (dB)	Height (m)	Azimuth (degrees)	Polarization	Correction (dB)
5345.334936	41.63	53.96	-12.33	2.76	182.25	Vertical	-0.72
3199.977918	34.40	53.96	-19.56	2.14	276.00	Horizontal	-4.43
5344.421121	41.38	53.96	-12.58	3.41	68.75	Horizontal	-0.73

Table 31: RE test results from 3 to 10 GHz for FCC Part 27 (LTE – Top channel)

Frequency (MHz)	Level (dBµV)	Limit EIRP (dBµV)	Margin to EIRP Limit (dB)	Height (m)	Azimuth (deg)	Polarization	Correction (dB)
5345.334936	41.63	82.2	-40.57	2.76	182.25	Vertical	-0.72
3199.977918	34.40	82.2	-47.80	2.14	276.00	Horizontal	-4.43
5344.421121	41.38	82.2	-40.82	3.41	68.75	Horizontal	-0.73

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

Figure 21: Plot of RE at 3m from 10 to 18 GHz (LTE – Top channel)

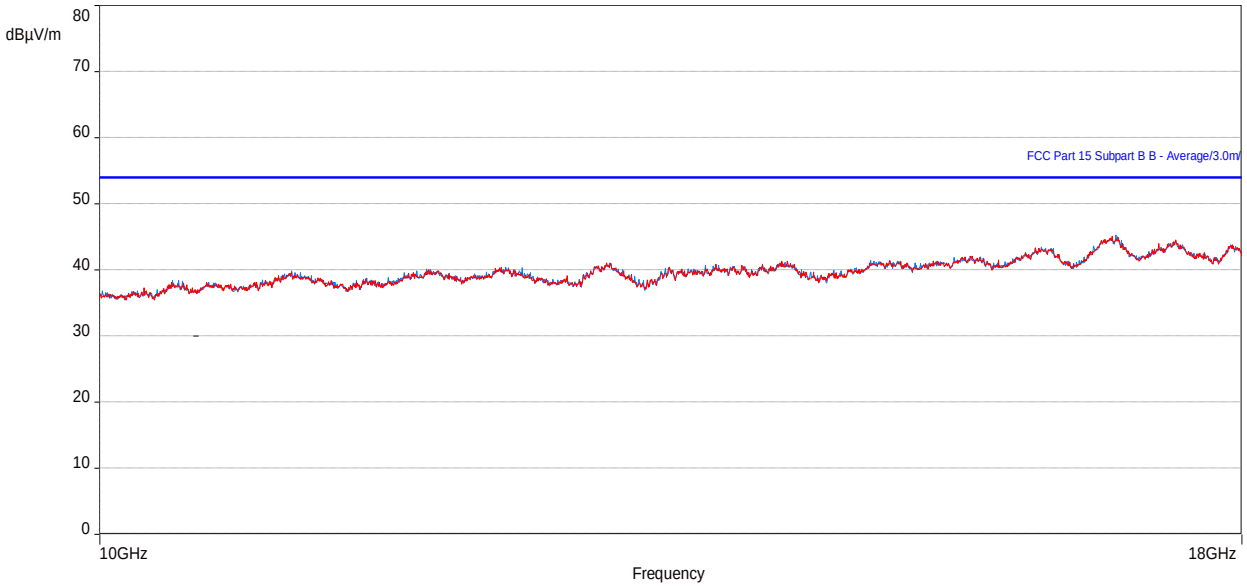


Table 32: RE test results from 10 to 18 GHz for FCC Part 15 (LTE – Top channel)

Frequency (MHz)	Level Average (dBµV)	Limit Average (dBµV)	Margin to FCC part 15 Class B (dB)	Height (m)	Azimuth (degrees)	Polarization	Correction (dB)
16840.04968	40.32	53.96	-13.64	4.00	329.00	Vertical	14.92
16873.458	40.40	53.96	-13.56	3.31	292.75	Horizontal	14.95
17397.77886	40.39	53.96	-13.57	3.73	53.00	Horizontal	14.79
17399.56155	40.18	53.96	-13.78	3.31	357.25	Vertical	14.79

Table 33: RE test results from 10 to 18 GHz (LTE – Top channel)

Frequency (MHz)	Level (dBµV)	Limit EIRP (dBµV)	Margin to EIRP Limit (dB)	Height (m)	Azimuth (deg)	Polarization	Correction (dB)
16840.04968	40.32	82.2	-41.88	4.00	329.00	Vertical	14.92
16873.458	40.40	82.2	-41.80	3.31	292.75	Horizontal	14.95
17397.77886	40.39	82.2	-41.81	3.73	53.00	Horizontal	14.79
17399.56155	40.18	82.2	-42.02	3.31	357.25	Vertical	14.79

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

3.2.8 Test results of RE – (Single RAT/Single Carrier (NR) – Middle channel)

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

Date tested: 23 – 30, June 2021

Tested by: Steve Mcfarlane

Test configurations are listed as SC NR in 2.4.2 as identified in the section Configurations of the EUT. For the following test results that have supporting data tables, negative margin values indicate a pass.

Red trace – Vertical antenna polarity, Blue trace – Horizonatal antenna polarity

Figure 22: Plot of RE at 3 m – 30 to1000 MHz (NR – Middle channel)

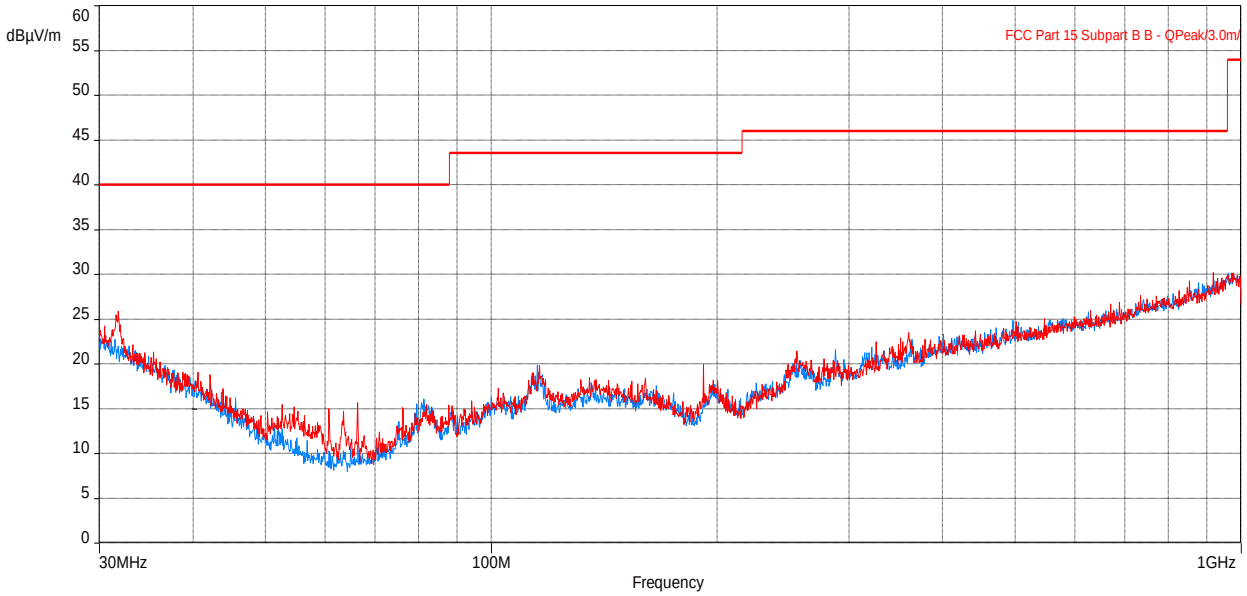


Table 34: RE test results from 30 to 1000 MHz for FCC Part 15 (NR – Middle channel)

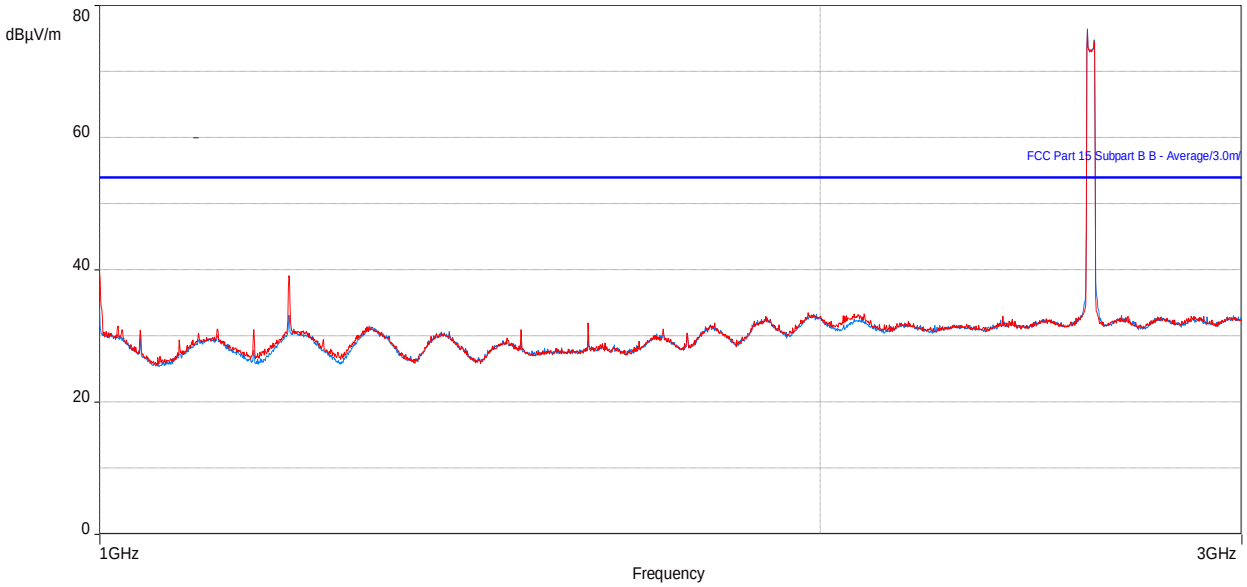
Frequency (MHz)	Level (dBµV)	Limit Quasi-peak (dBµV)	Margin to FCC part 15 Class B (dB)	Height (m)	Azimuth (deg)	Polarization	Correction (dB)
31.75253172	23.43	40.00	-16.57	1.00	270.00	Vertical	-2.72
919.1886251	23.15	46.02	-22.87	1.59	349.50	Vertical	5.54
31.50223685	17.84	40.00	-22.16	1.06	335.00	Horizontal	-2.57
962.7949069	24.17	53.98	-29.81	2.68	283.25	Horizontal	6.55

Table 35: RE test results from 30 to 1000 MHz for FCC Part 27 (NR – Middle channel)

Frequency (MHz)	Level (dBµV)	Limit EIRP (dBµV)	Margin to EIRP Limit (dB)	Height (m)	Azimuth (deg)	Polarization	Correction (dB)
31.75253172	23.43	82.2	-58.77	1.00	270.00	Vertical	-2.72
919.1886251	23.15	82.2	-59.05	1.59	349.50	Vertical	5.54
31.50223685	17.84	82.2	-64.36	1.06	335.00	Horizontal	-2.57
962.7949069	24.17	82.2	-58.03	2.68	283.25	Horizontal	6.55

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

Figure 23: Plot of RE at 3m from 1 to 3 GHz (NR – Middle channel)



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

Table 36: RE test results from 1 to 3 GHz for FCC Part 15 (NR – Middle channel)

Frequency (MHz)	Level Average (dBµV)	Limit Average (dBµV)	Margin to FCC part 15 Class B (dB)	Height (m)	Azimuth (degrees)	Polarization	Correction (dB)
1199.992308	27.92	53.96	-26.04	3.31	170.25	Vertical	-10.73
1987.506764	30.13	53.96	-23.83	4.00	170.25	Vertical	-5.67
1199.813815	27.14	53.96	-26.82	1.00	283.25	Horizontal	-10.73
1992.92689	29.45	53.96	-24.51	3.76	254.50	Horizontal	-5.61

Table 37: RE test results from 1 to 3 GHz for FCC Part 27 (NR – Middle channel)

Frequency (MHz)	Level (dBµV)	Limit EIRP (dBµV)	Margin to EIRP Limit (dB)	Height (m)	Azimuth (deg)	Polarization	Correction (dB)
1199.992308	27.92	82.2	-54.28	3.31	170.25	Vertical	-10.73
1987.506764	30.13	82.2	-52.07	4.00	170.25	Vertical	-5.67
1199.813815	27.14	82.2	-55.06	1.00	283.25	Horizontal	-10.73
1992.92689	29.45	82.2	-52.75	3.76	254.50	Horizontal	-5.61

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

Figure 24: Plot of RE at 3m from 3 to 10 GHz (NR – Middle channel)

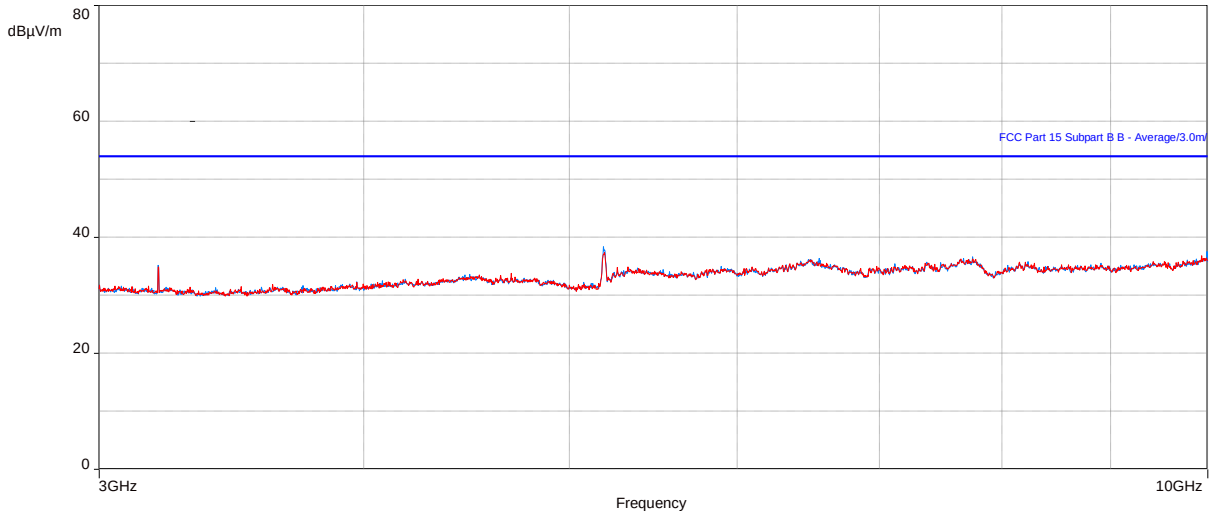


Table 38: RE test results from 3 to 10 GHz for FCC Part 15 (NR – Middle channel)

Frequency (MHz)	Level Average (dBµV)	Limit Average (dBµV)	Margin to FCC part 15 Class B (dB)	Height (m)	Azimuth (degrees)	Polarization	Correction (dB)
5193.930736	34.02	53.96	-19.94	3.88	68.25	Vertical	-1.67
7749.3917	32.65	53.96	-21.31	4.00	17.25	Vertical	4.08
5189.127564	34.77	53.96	-19.19	3.62	112.75	Horizontal	-1.72
7750.159008	32.65	53.96	-21.31	2.01	360.25	Horizontal	4.09

Table 39: RE test results from 3 to 10 GHz for FCC Part 27 (NR – Middle channel)

Frequency (MHz)	Level (dBµV)	Limit EIRP (dBµV)	Margin to EIRP Limit (dB)	Height (m)	Azimuth (deg)	Polarization	Correction (dB)
5193.930736	34.02	82.2	-48.18	3.88	68.25	Vertical	-1.67
7749.3917	32.65	82.2	-49.55	4.00	17.25	Vertical	4.08
5189.127564	34.77	82.2	-47.43	3.62	112.75	Horizontal	-1.72
7750.159008	32.65	82.2	-49.55	2.01	360.25	Horizontal	4.09

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

Figure 25: Plot of RE at 3m from 10 to 18 GHz (NR – Middle channel)

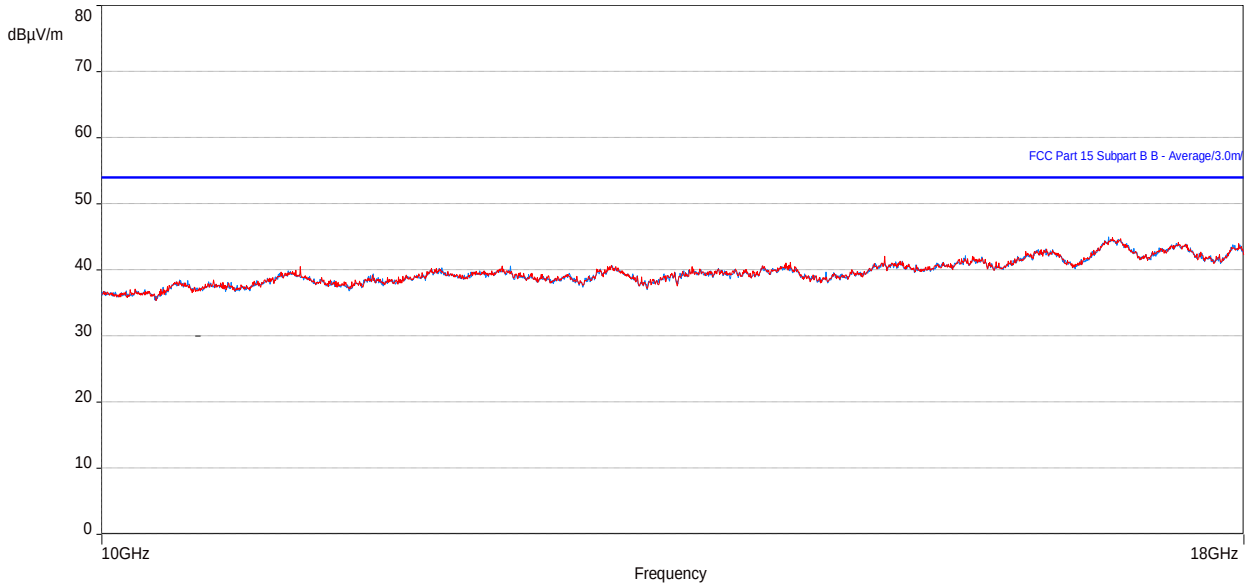


Table 40: RE test results from 10 to 18 GHz for FCC Part 15 (NR – Middle channel)

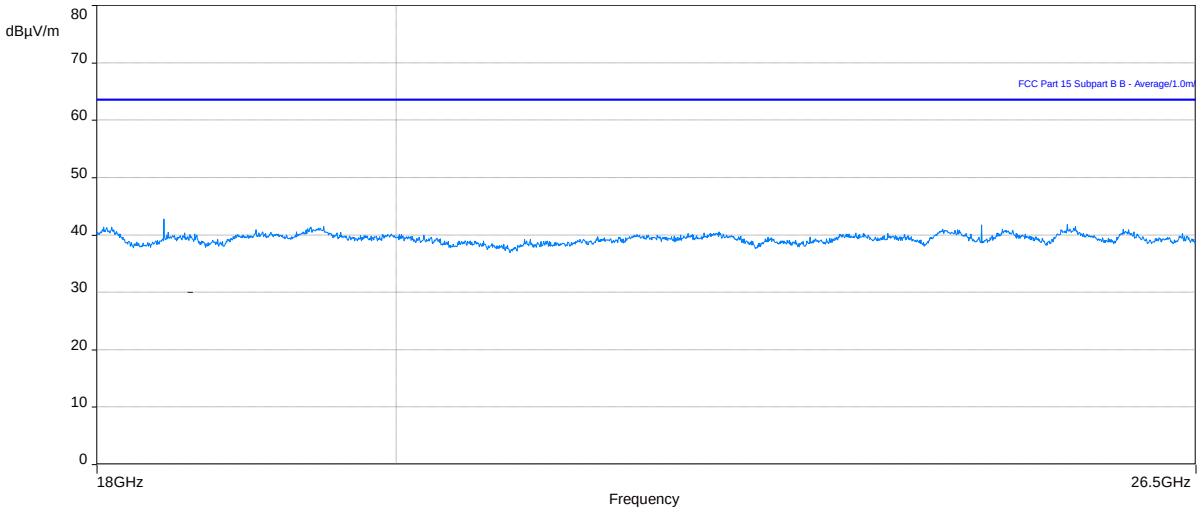
Frequency (MHz)	Level Average (dBµV)	Limit Average (dBµV)	Margin to FCC part 15 Class B (dB)	Height (m)	Azimuth (degrees)	Polarization	Correction (dB)
16827.67854	40.71	53.96	-13.25	4.00	328.50	Vertical	14.89
17405.08623	40.42	53.96	-13.54	3.82	38.50	Vertical	14.77
16793.75963	40.52	53.96	-13.44	4.00	333.75	Horizontal	14.74
17391.75223	40.19	53.96	-13.77	1.00	-0.25	Horizontal	14.76

Table 41: RE test results from 10 to 18 GHz (NR – Middle channel)

Frequency (MHz)	Level (dBµV)	Limit EIRP (dBµV)	Margin to EIRP Limit (dB)	Height (m)	Azimuth (deg)	Polarization	Correction (dB)
16827.67854	40.71	82.2	-41.49	4.00	328.50	Vertical	14.89
17405.08623	40.42	82.2	-41.78	3.82	38.50	Vertical	14.77
16793.75963	40.52	82.2	-41.68	4.00	333.75	Horizontal	14.74
17391.75223	40.19	82.2	-42.01	1.00	-0.25	Horizontal	14.76

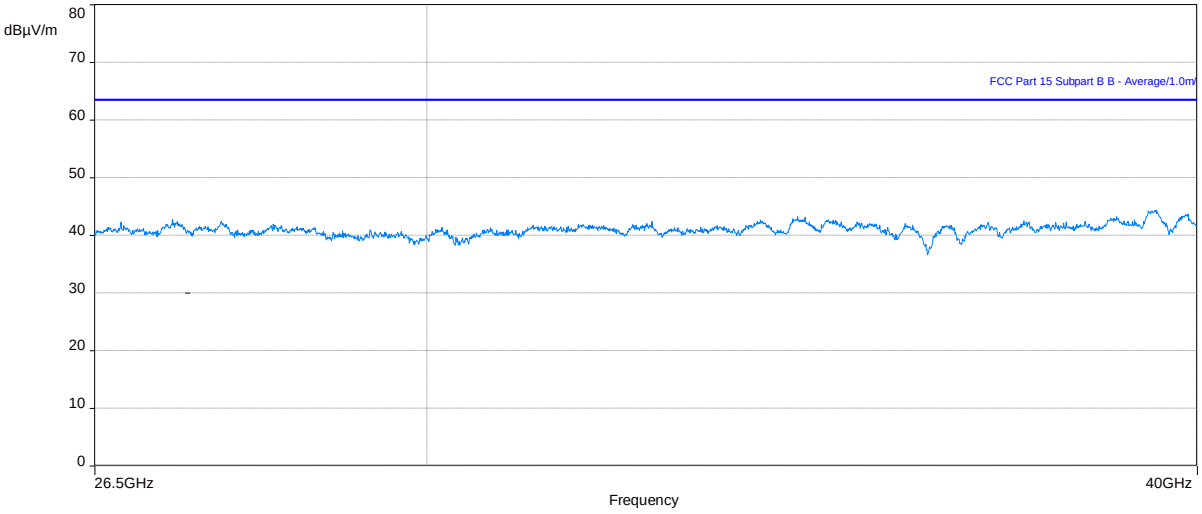
Note: In the table/Plot above, no emissions exceed the Part 27 radiated spurious emissions limit when converted to dBuV/m. For final spurious emissions measurements to FCC Part 27, see antenna port conducted emissions in applicable test report.

Figure 26: Plot of RE at 1m from 18 to 26.5 GHz (NR – 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 27 radiated spurious emissions limit when converted to dBuV/m. For final spurious emissions measurements to FCC Part 27, see antenna port conducted emissions in applicable test report.

Figure 27: Plot of RE at 1m from 26.5 to 40 GHz (NR – 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 27 radiated spurious emissions limit when converted to dBuV/m. For final spurious emissions measurements to FCC Part 27, see antenna port conducted emissions in applicable test report.

3.2.9 Test results of RE – (Single RAT / Multi Carrier (MC LTE) – Mid channel)

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

Date tested: 23 – 30, June 2021

Tested by: Steve Mcfarlane

Test configurations are listed as MC LTE in 2.4.3 as identified in the section Configurations of the EUT. For the following test results that have supporting data tables, negative margin values indicate a pass.

Red trace – Vertical antenna polarity, Blue trace – Horizonatal antenna polarity

Figure 28: Plot of RE at 3 m – 30 to1000 MHz (MC LTE – Mid channel)

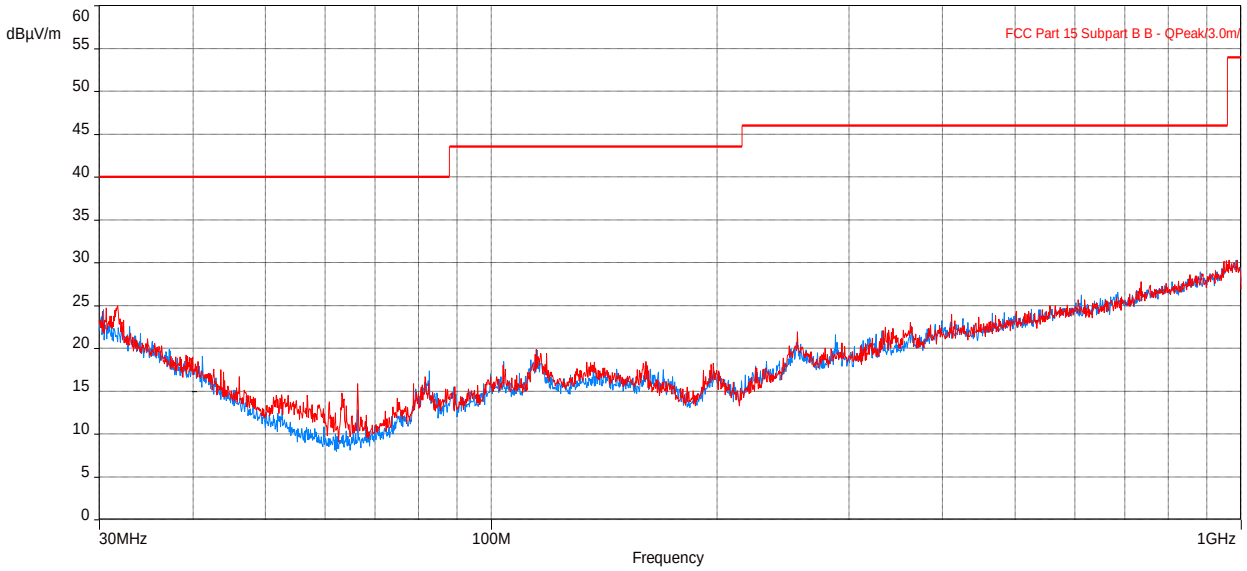


Table 42: RE test results from 30 to 1000 MHz for FCC Part 15 (MC LTE – Mid channel)

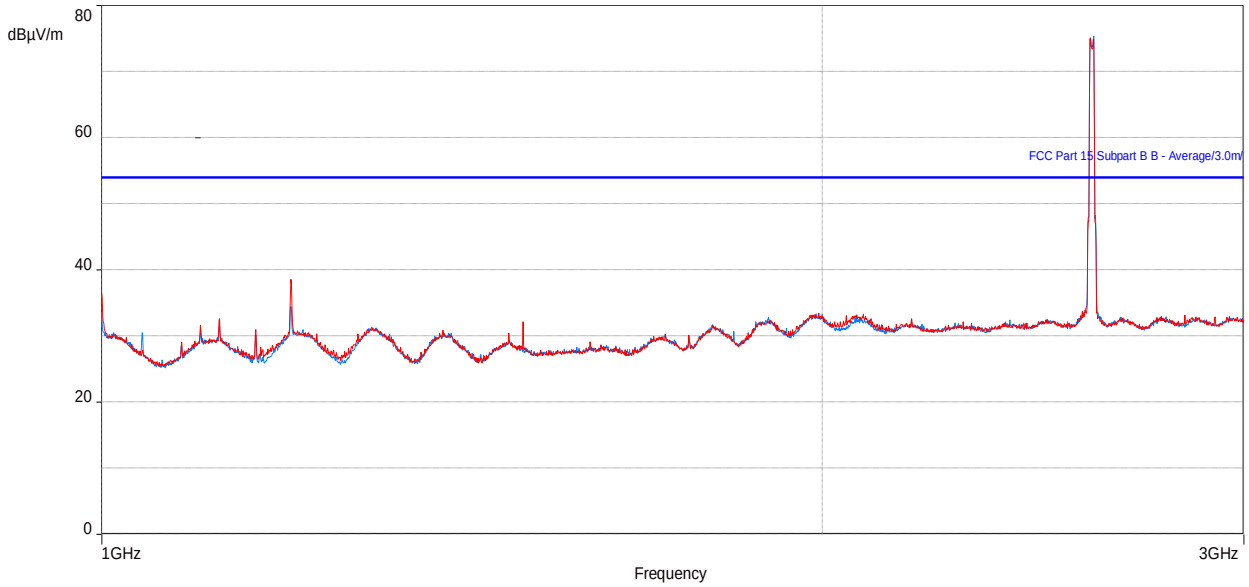
Frequency (MHz)	Level (dBµV)	Limit Quasi-peak (dBµV)	Margin to FCC part 15 Class B (dB)	Height (m)	Azimuth (deg)	Polarization	Correction (dB)
31.76186538	22.08	40.00	-17.92	1.00	278.25	Vertical	-2.72
950.1682403	23.80	46.02	-22.22	2.97	110.50	Vertical	6.07
30.44004454	18.52	40.00	-21.48	3.21	228.00	Horizontal	-2.00
957.4693621	23.97	46.02	-22.05	1.95	54.75	Horizontal	6.39

Table 43: RE test results from 30 to 1000 MHz for FCC Part 27 (MC LTE – Mid channel)

Frequency (MHz)	Level (dBµV)	Limit EIRP (dBµV)	Margin to EIRP Limit (dB)	Height (m)	Azimuth (deg)	Polarization	Correction (dB)
31.76186538	22.08	82.2	-60.12	1.00	278.25	Vertical	-2.72
950.1682403	23.80	82.2	-58.40	2.97	110.50	Vertical	6.07
30.44004454	18.52	82.2	-63.68	3.21	228.00	Horizontal	-2.00
957.4693621	23.97	82.2	-58.23	1.95	54.75	Horizontal	6.39

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

Figure 29: Plot of RE at 3m from 1 to 3 GHz (MC LTE – Mid channel)



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

Table 44: RE test results from 1 to 3 GHz for FCC Part 15 (MC LTE – Mid channel)

Frequency (MHz)	Level Average (dBµV)	Limit Average (dBµV)	Margin to FCC part 15 Class B (dB)	Height (m)	Azimuth (degrees)	Polarization	Correction (dB)
1199.810223	27.85	53.96	-26.11	3.38	175.25	Vertical	-10.73
1199.994585	27.12	53.96	-26.84	1.00	285.00	Horizontal	-10.73
1200.186892	27.17	53.96	-26.79	1.00	283.25	Horizontal	-10.72
1988.767341	29.62	53.96	-24.34	2.07	197.75	Horizontal	-5.66

Table 45: RE test results from 1 to 3 GHz for FCC Part 27 (MC LTE – Mid channel)

Frequency (MHz)	Level (dBµV)	Limit EIRP (dBµV)	Margin to EIRP Limit (dB)	Height (m)	Azimuth (deg)	Polarization	Correction (dB)
1199.810223	27.85	82.2	-54.35	3.38	175.25	Vertical	-10.73
1199.994585	27.12	82.2	-55.08	1.00	285.00	Horizontal	-10.73
1200.186892	27.17	82.2	-55.03	1.00	283.25	Horizontal	-10.72
1988.767341	29.62	82.2	-52.58	2.07	197.75	Horizontal	-5.66

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

Figure 30: Plot of RE at 3m from 3 to 10 GHz (MC LTE – Mid channel)

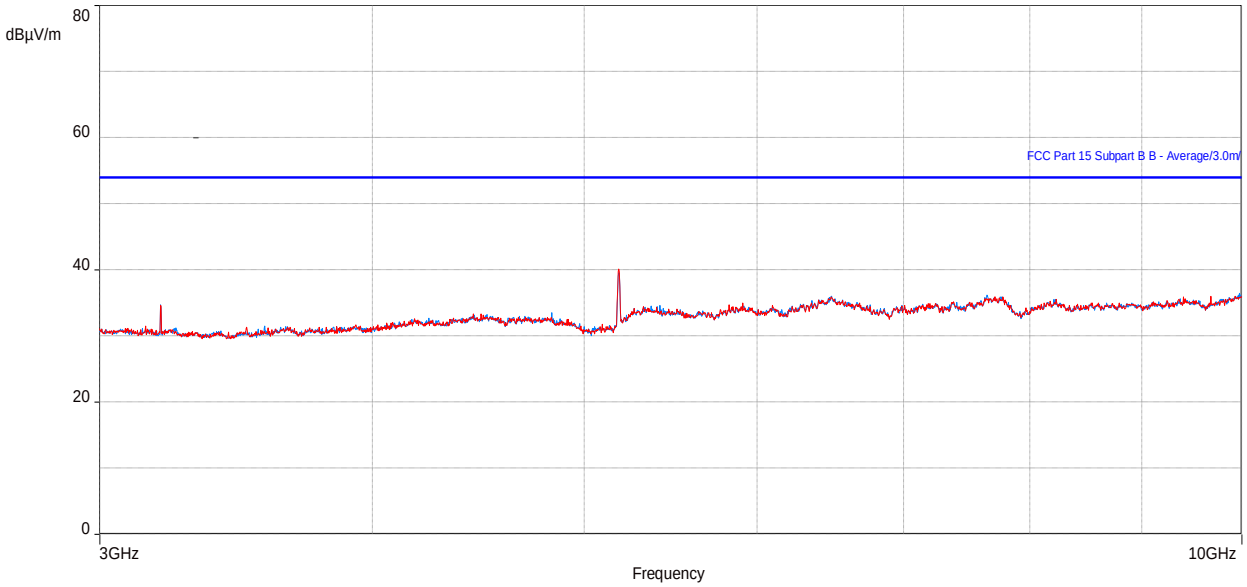


Table 46: RE test results from 3 to 10 GHz for FCC Part 15 (MC LTE – Mid channel)

Frequency (MHz)	Level Average (dBµV)	Limit Average (dBµV)	Margin to FCC part 15 Class B (dB)	Height (m)	Azimuth (degrees)	Polarization	Correction (dB)
3199.978492	34.68	53.96	-19.28	3.79	268.75	Vertical	-4.43
5185.999038	35.72	53.96	-18.24	3.55	69.75	Vertical	-1.75
3199.978492	32.99	53.96	-20.97	4.00	133.50	Horizontal	-4.43
5185.008621	35.50	53.96	-18.46	4.00	104.75	Horizontal	-1.76

Table 47: RE test results from 3 to 10 GHz for FCC Part 27 (MC LTE – Mid channel)

Frequency (MHz)	Level (dBµV)	Limit EIRP (dBµV)	Margin to EIRP Limit (dB)	Height (m)	Azimuth (deg)	Polarization	Correction (dB)
3199.978492	34.68	82.2	-47.52	3.79	268.75	Vertical	-4.43
5185.999038	35.72	82.2	-46.48	3.55	69.75	Vertical	-1.75
3199.978492	32.99	82.2	-49.21	4.00	133.50	Horizontal	-4.43
5185.008621	35.50	82.2	-46.70	4.00	104.75	Horizontal	-1.76

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

Figure 31: Plot of RE at 3m from 10 to 18 GHz (MC LTE – Mid channel)

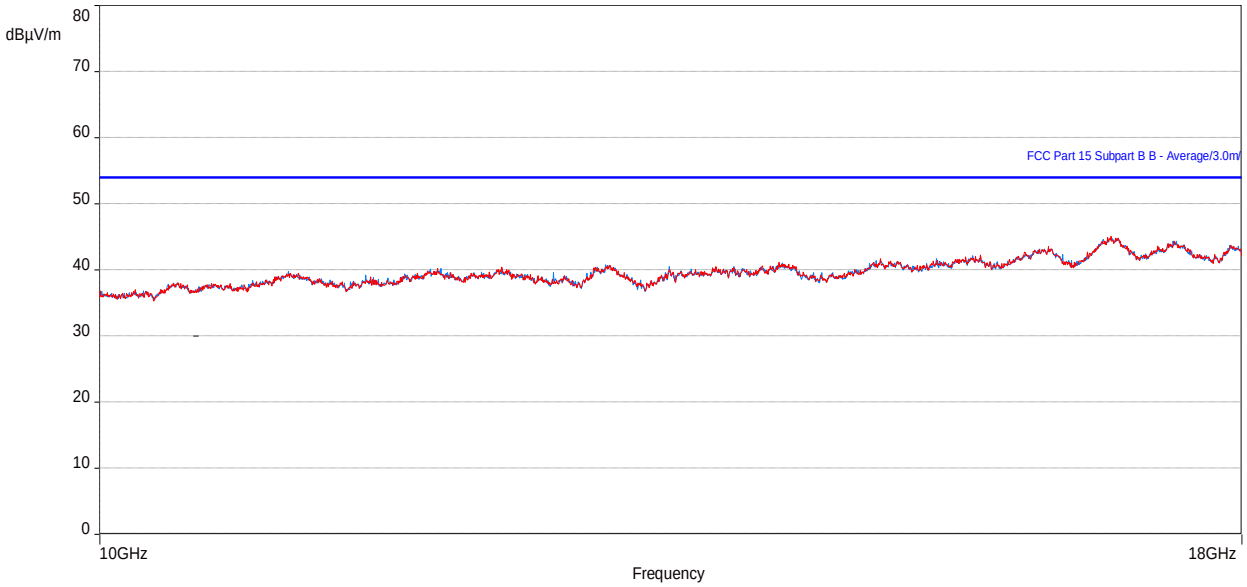


Table 48: RE test results from 10 to 18 GHz for FCC Part 15 (MC LTE – Mid channel)

Frequency (MHz)	Level Average (dBµV)	Limit Average (dBµV)	Margin to FCC part 15 Class B (dB)	Height (m)	Azimuth (degrees)	Polarization	Correction (dB)
16763.96955	40.32	53.96	-13.64	3.72	336.00	Horizontal	14.40
16830.46891	40.48	53.96	-13.48	4.00	62.50	Vertical	14.89
17375.78268	39.86	53.96	-14.10	3.93	307.25	Horizontal	14.68
17383.20962	40.25	53.96	-13.71	4.00	321.25	Vertical	14.71

Table 49: RE test results from 10 to 18 GHz (MC LTE – Mid channel)

Frequency (MHz)	Level (dBµV)	Limit EIRP (dBµV)	Margin to EIRP Limit (dB)	Height (m)	Azimuth (deg)	Polarization	Correction (dB)
16763.96955	40.32	82.2	-41.88	3.72	336.00	Horizontal	14.40
16830.46891	40.48	82.2	-41.72	4.00	62.50	Vertical	14.89
17375.78268	39.86	82.2	-42.34	3.93	307.25	Horizontal	14.68
17383.20962	40.25	82.2	-41.95	4.00	321.25	Vertical	14.71

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

3.2.10 Test results of RE – (Multi RAT / Multi Carrier (LTE + NR) – Mid channel)

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

Date tested: 23 – 30, June 2021

Tested by: Steve Mcfarlane

Test configurations are listed as MR (LTE + NR) in 2.4.4 as identified in the section Configurations of the EUT. For the following test results that have supporting data tables, negative margin values indicate a pass.

Red trace – Vertical antenna polarity, Blue trace – Horizonatal antenna polarity

Figure 32: Plot of RE at 3 m from 30 to 1000 MHz (MR (LTE + NR) – Mid channel)

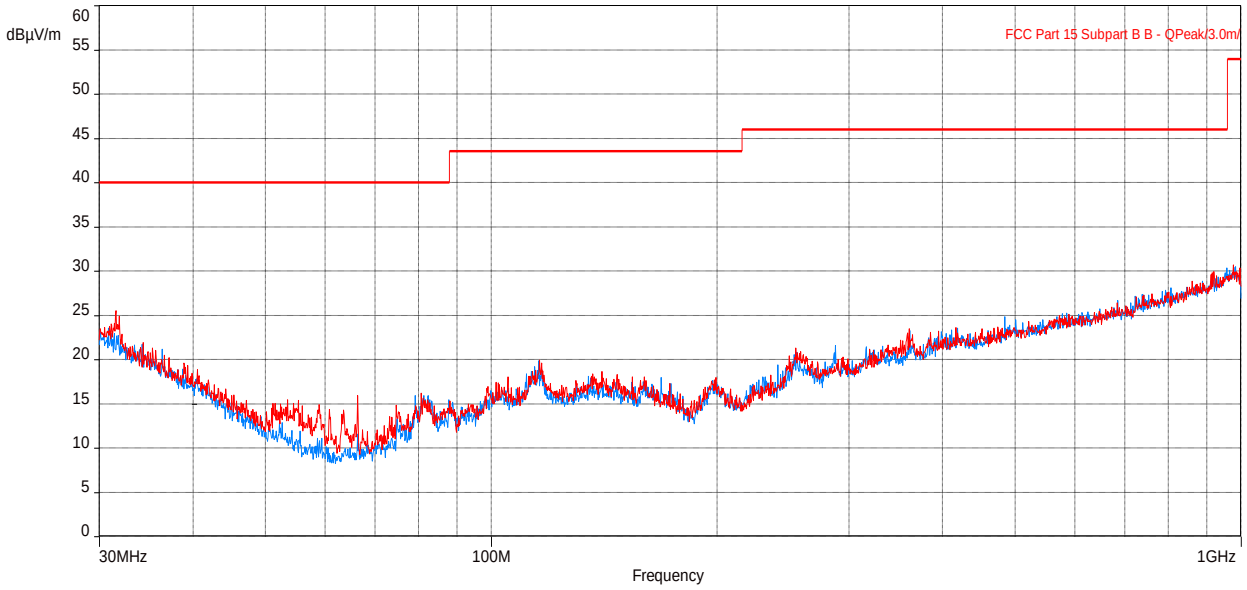


Table 50: RE test results from 30 to 1000 MHz for FCC Part 15 (MR (LTE + NR) – Mid channel)

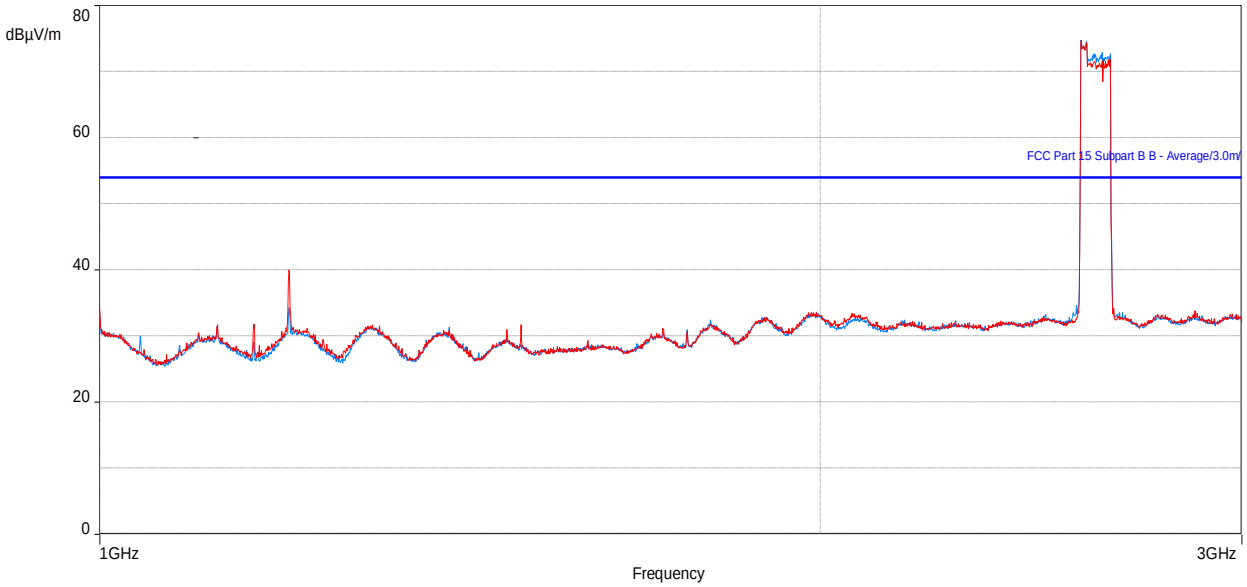
Frequency (MHz)	Level (dBµV)	Limit Quasi-peak (dBµV)	Margin to FCC part 15 Class B (dB)	Height (m)	Azimuth (deg)	Polarization	Correction (dB)
31.63301315	22.27	40.00	-17.73	1.00	264.00	Vertical	-2.65
919.6484649	23.21	46.02	-22.81	1.73	60.25	Vertical	5.54
30.86146154	18.24	40.00	-21.76	2.12	4.75	Horizontal	-2.21
952.3486828	23.73	46.02	-22.29	3.50	161.00	Horizontal	6.14

Table 51: RE test results from 30 to 1000 MHz for FCC Part 27 (MR (LTE + NR) – Mid channel)

Frequency (MHz)	Level (dBµV)	Limit EIRP (dBµV)	Margin to EIRP Limit (dB)	Height (m)	Azimuth (deg)	Polarization	Correction (dB)
31.63301315	22.27	82.2	-59.93	1.00	264.00	Vertical	-2.65
919.6484649	23.21	82.2	-58.99	1.73	60.25	Vertical	5.54
30.86146154	18.24	82.2	-63.96	2.12	4.75	Horizontal	-2.21
952.3486828	23.73	82.2	-58.47	3.50	161.00	Horizontal	6.14

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

Figure 33: Plot of RE at 3m from 1 to 3 GHz (MR (LTE + NR) – Mid channel)



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

Table 52: RE test results from 1 to 3 GHz for FCC Part 15 (MR (LTE + NR) – Mid channel)

Frequency (MHz)	Level Average (dBµV)	Limit Average (dBµV)	Margin to FCC part 15 Class B (dB)	Height (m)	Azimuth (degrees)	Polarization	Correction (dB)
1199.872115	32.65	53.96	-21.31	1.46	198.25	Vertical	-10.73
1983.324646	30.15	53.96	-23.81	3.31	170.50	Vertical	-5.73
1199.925995	29.98	53.96	-23.98	1.00	319.25	Horizontal	-10.73
1992.747723	29.55	53.96	-24.41	1.00	242.50	Horizontal	-5.61

Table 53: RE test results from 1 to 3 GHz for FCC Part 27 (MR (LTE + NR) – Mid channel)

Frequency (MHz)	Level (dBµV)	Limit EIRP (dBµV)	Margin to EIRP Limit (dB)	Height (m)	Azimuth (deg)	Polarization	Correction (dB)
1199.872115	32.65	82.2	-49.55	1.46	198.25	Vertical	-10.73
1983.324646	30.15	82.2	-52.05	3.31	170.50	Vertical	-5.73
1199.925995	29.98	82.2	-52.22	1.00	319.25	Horizontal	-10.73
1992.747723	29.55	82.2	-52.65	1.00	242.50	Horizontal	-5.61

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

Figure 34: Plot of RE at 3m from 3 to 10 GHz (MR (LTE + NR) – Mid channel)

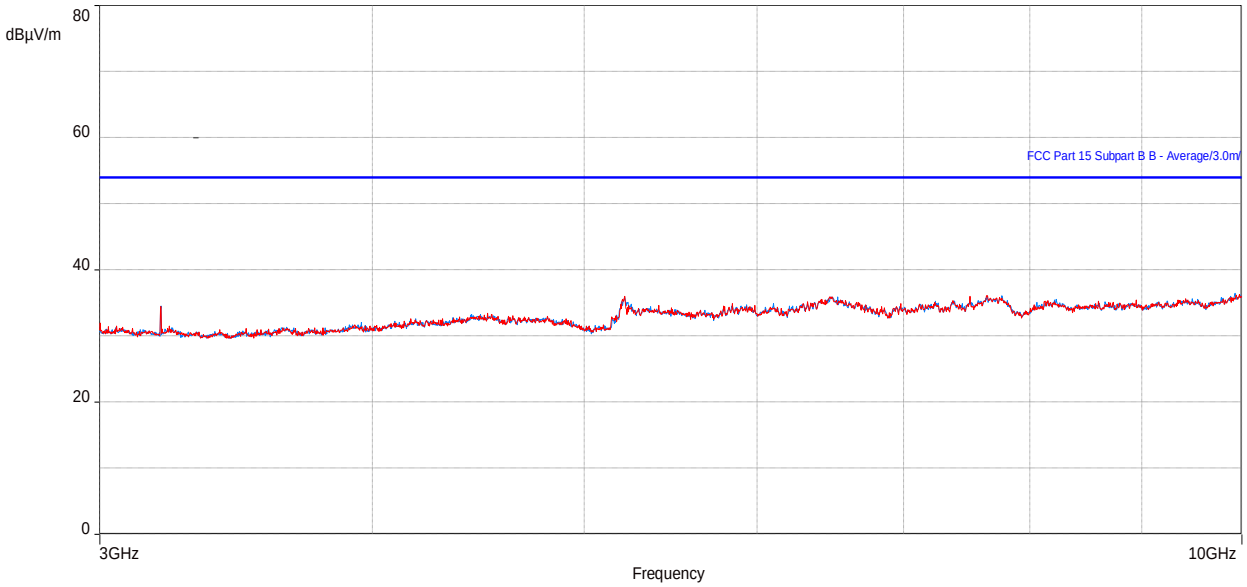


Table 54: RE test results from 3 to 10 GHz for FCC Part 15 (MR (LTE + NR) – Mid channel)

Frequency (MHz)	Level Average (dBµV)	Limit Average (dBµV)	Margin to FCC part 15 Class B (dB)	Height (m)	Azimuth (degrees)	Polarization	Correction (dB)
3199.978492	34.56	53.96	-19.40	3.20	275.75	Vertical	-4.43
5219.541346	31.61	53.96	-22.35	2.62	360.00	Vertical	-1.49
3199.977918	34.51	53.96	-19.45	2.14	275.75	Horizontal	-4.43
5217.886185	31.69	53.96	-22.27	3.95	84.25	Horizontal	-1.50

Table 55: RE test results from 3 to 10 GHz for FCC Part 27 (MR (LTE + NR) – Mid channel)

Frequency (MHz)	Level (dBµV)	Limit EIRP (dBµV)	Margin to EIRP Limit (dB)	Height (m)	Azimuth (deg)	Polarization	Correction (dB)
3199.978492	34.56	82.2	-47.64	3.20	275.75	Vertical	-4.43
5219.541346	31.61	82.2	-50.59	2.62	360.00	Vertical	-1.49
3199.977918	34.51	82.2	-47.69	2.14	275.75	Horizontal	-4.43
5217.886185	31.69	82.2	-50.51	3.95	84.25	Horizontal	-1.50

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

Figure 35: Plot of RE at 3m from 10 to 18 GHz (MR (LTE + NR) – Mid channel)

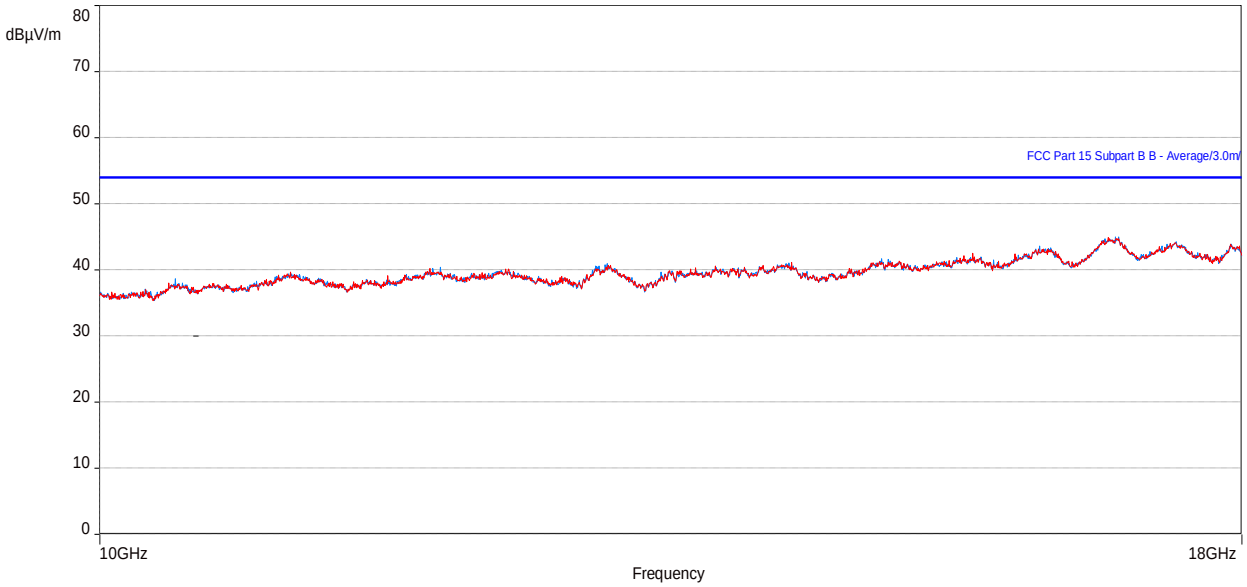


Table 56: RE test results from 10 to 18 GHz for FCC Part 15 (MR (LTE + NR) – Mid channel)

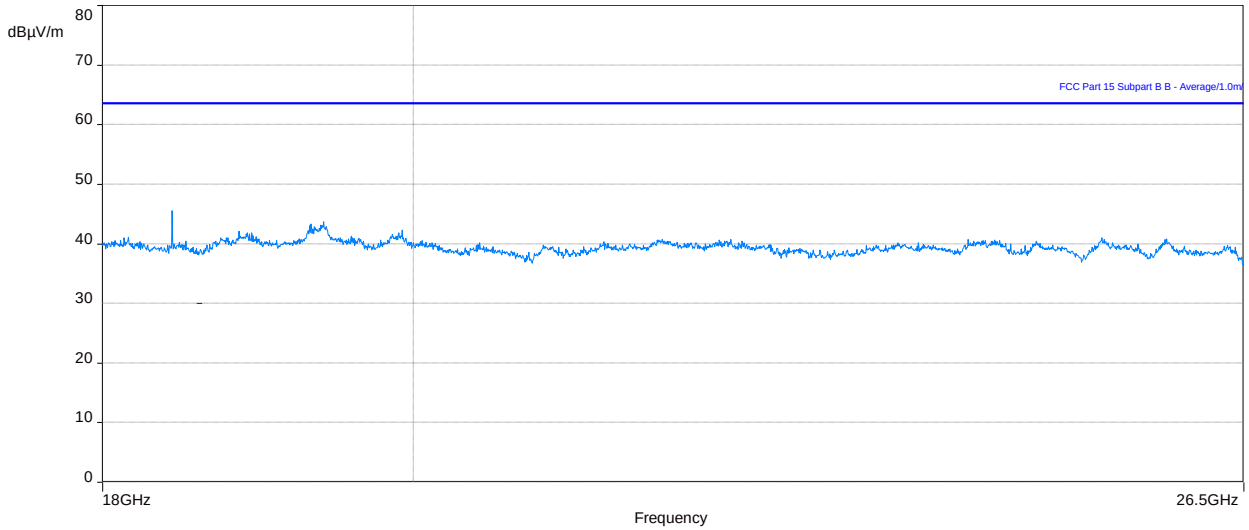
Frequency (MHz)	Level Average (dBµV)	Limit Average (dBµV)	Margin to FCC part 15 Class B (dB)	Height (m)	Azimuth (degrees)	Polarization	Correction (dB)
16805.89424	40.36	53.96	-13.60	3.75	45.75	Vertical	14.83
17395.80191	40.33	53.96	-13.63	4.00	342.75	Vertical	14.78
17403.78428	40.31	53.96	-13.65	3.62	321.25	Horizontal	14.78

Table 57: RE test results from 10 to 18 GHz (MR (LTE + NR) – Mid channel)

Frequency (MHz)	Level (dBµV)	Limit EIRP (dBµV)	Margin to EIRP Limit (dB)	Height (m)	Azimuth (deg)	Polarization	Correction (dB)
16805.89424	40.36	82.2	-41.84	3.75	45.75	Vertical	14.83
17395.80191	40.33	82.2	-41.87	4.00	342.75	Vertical	14.78
17403.78428	40.31	82.2	-41.89	3.62	321.25	Horizontal	14.78

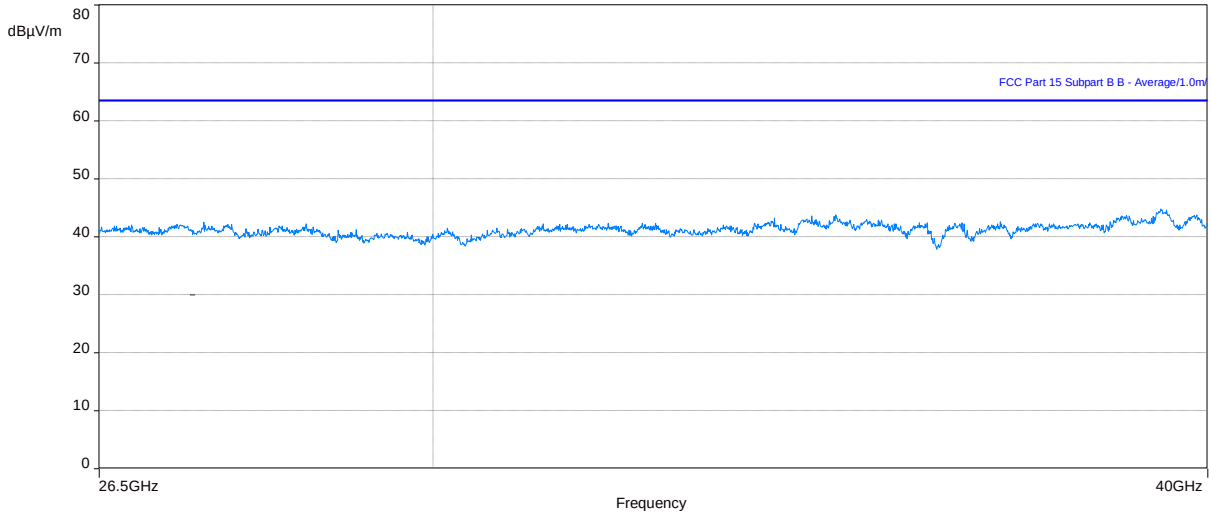
Note: In the table/Plot above, no emissions exceed the Part 27 radiated spurious emissions limit when converted to dBuV/m. For final spurious emissions measurements to FCC Part 27, see antenna port conducted emissions in applicable test report.

Figure 36: Plot of RE at 1m from 18 to 26.5 GHz (MR (LTE + NR) – Mid 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 27 radiated spurious emissions limit when converted to dBuV/m. For final spurious emissions measurements to FCC Part 27, see antenna port conducted emissions in applicable test report.

Figure 37: Plot of RE at 1m from 26.5 to 40 GHz (MR (LTE + NR) – Mid 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 27 radiated spurious emissions limit when converted to dBuV/m. For final spurious emissions measurements to FCC Part 27, see antenna port conducted emissions in applicable test report.

3.2.11 Radiated Emissions test setup pictures

Figure 38: Setup for RE tests - Close up

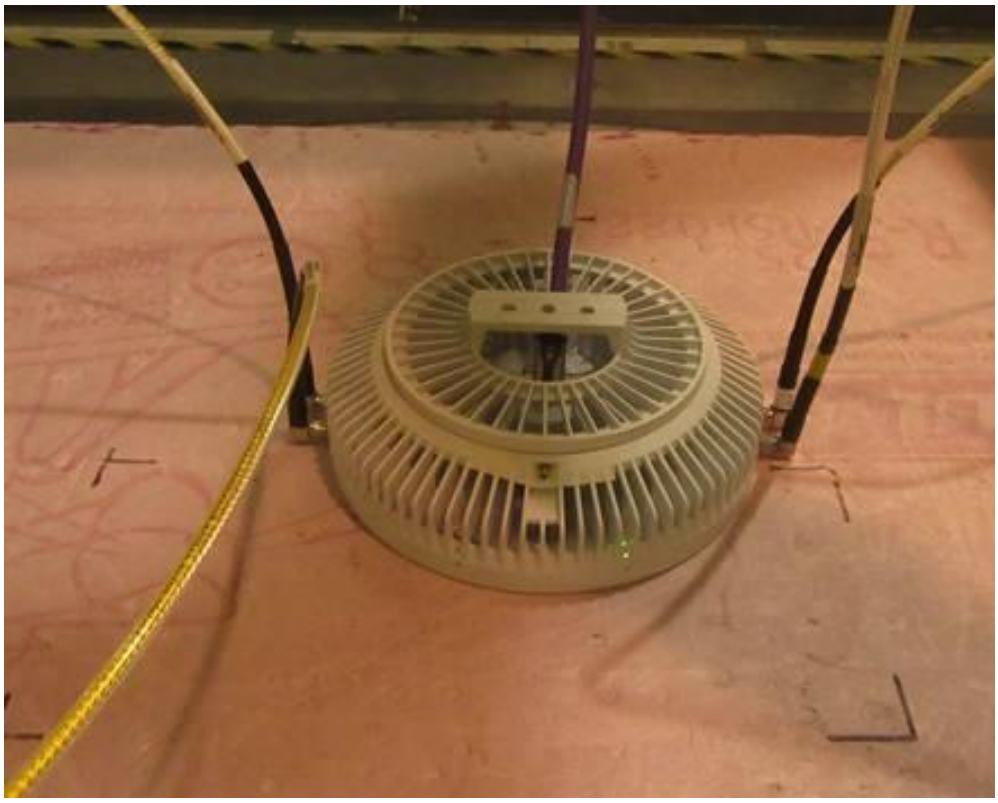


Figure 39: Setup for RE tests at 30 MHz to 1 GHz

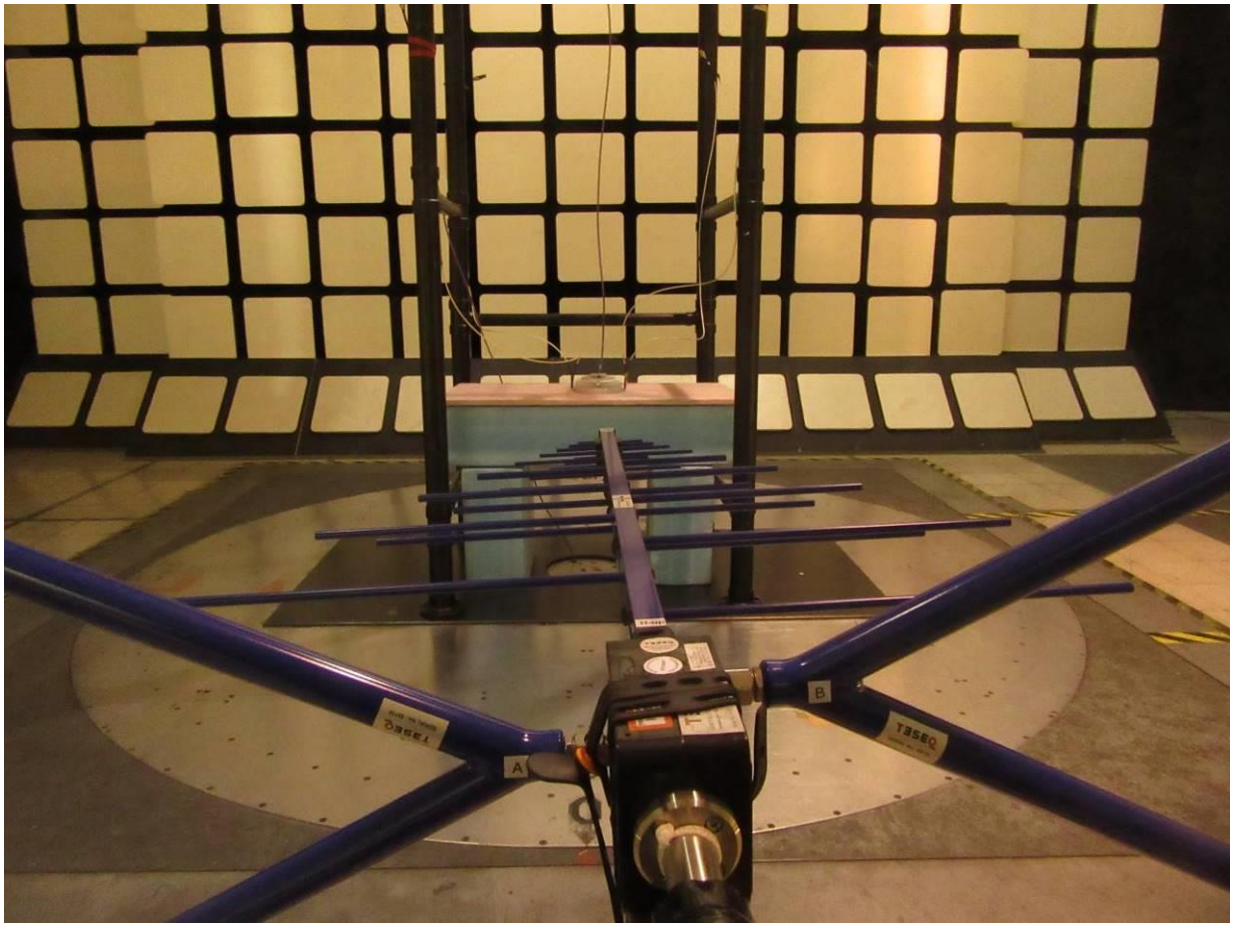
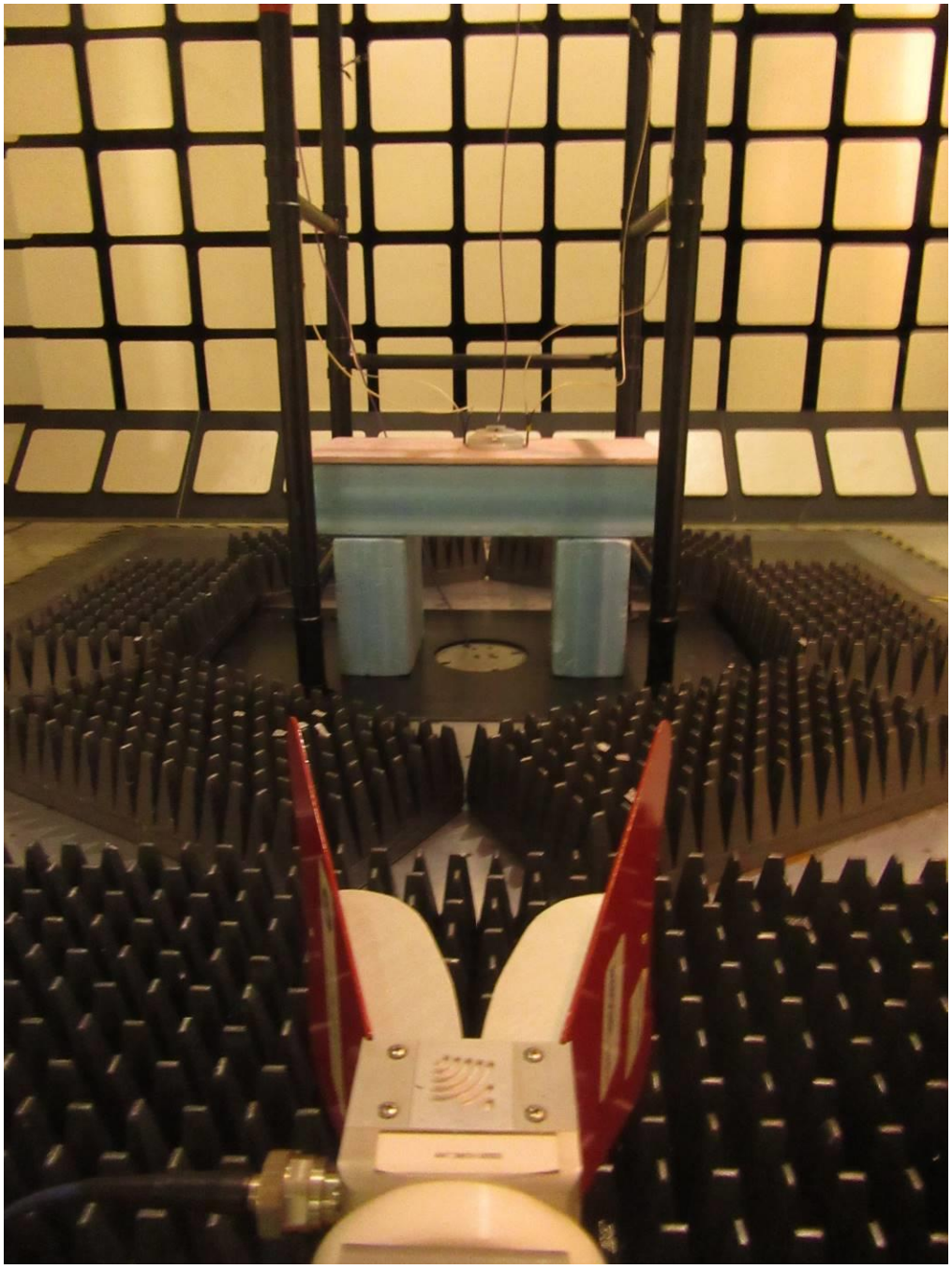


Figure 40: Setup for RE tests for above 1 GHz



3.2.12 Test equipment

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

Table 58: 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	Not required
Bilog Antenna	TESEQ	CBL 6111D	SSG013965	2021-05-04	2022-05-04
Horn Antenna 3MCH 00003	ETS	3117	LAVE04211	2021-03-30	2022-03-30
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	ESU26	SSG013729	2021-03-31	2022-03-31
EMI Receiver	Rohde & Schwarz	ESU40	SSG013672	2020-10-29	2021-10-29
Coaxial Cable	Huber & Suhner	106A	SSG013841	2021-01-05	2022-01-05
Coaxial Cable	Huber & Suhner	106A	SSG012711	2021-01-05	2022-01-05
Coaxial Cable	Huber & Suhner	104PEA	SSG012041	2021-01-05	2022-01-05
Coaxial Cable	Huber & Suhner	ST18/Nm/Nm/36	SSG012785	2021-01-06	2022-01-06
Coaxial Cable	Micro-Coax	UFA 210B-1-1500-504504	SSG012376	2021-01-06	2022-01-06
Coaxial Cable	Huber & Suhner	101 PEA, Sucoflex	SSG012290	2020-11-04	2022-11-04
Pre-Amplifier	Hp	8447D	LAVE04346	2020-09-10	2021-09-10
Pre-Amplifier	BNR	LNA	SSG012360	2020-11-16	2021-11-16
Power Supply	Hewlett Packard	6216A	SSG013063	not required	not required
Power Supply	Lambda	LPD-421A-FM	SSG013085	not required	not required
RF Filter: High Pass	Microwave Circuits inc.	H3G02G1	SSG012728	2021-01-06	2022-01-06

3.2.13 Test conclusion

The DOT 4489 B41K (KRY 901 432/2) and DOT 4479 B41K (KRY 901 432/1) have passed the E-field Radiated Emission (RE) tests with respect to the Class B limits of FCC Part 15 Subpart B and FCC Part 27 section 27.53(m)(2).

4. References

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

1. ANSI C63.2-2009, American National Standards Institute for Electromagnetic Noise and Field Strength Instrumentation, 10 Hz to 40 GHz – Specifications.
2. ANSI C63.4-2014, American National Standards Institute for Methods of Measurement of Radio-Noise Emission from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz.
3. CISPR 16 Publications (all parts and sections), Specification for Radio Disturbance and Immunity Measuring Apparatus and Methods - Part 1: Radio Disturbance and Immunity Measuring Apparatus.
4. CISPR 22 (2008, +IS 1, + IS 2, + IS 3: 2012), Information technology equipment - Radio disturbance characteristics - Limits and methods of measurement.
5. FCC Rules for Radio Frequency Devices, Title 47 of the Code of Federal Regulations, Part 2, U.S. Federal Communications Commission.
6. FCC Rules for Radio Frequency Devices, Title 47 of the Code of Federal Regulations, Part 15 Radio Frequency Devices, U.S. Federal Communications Commission.
7. FCC Rules for Radio Frequency Devices, Title 47 of the Code of Federal Regulations, Part 27 Miscellaneous Wireless Communications Services, U.S. Federal Communications Commission.

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 registered 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
HVP	High Voltage Probe

Term	Definition
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

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