EMC Test Report
for
DOT 4489 B41K (KRY 901 432/2) and DOT 4479 B41K (KRY 901 432/1)

Tested to: FCC Part 15 Subpart B
FCC Part 27
ICES-003

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 / ICES 003 / ANSI C63.4	Pass	3.2
15.107 / 6.1	Conducted Emissions (CE) for AC Power	FCC Part 15 / ICES 003 / ANSI C63.4	NA	NA
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	25 August 2019

Approvals

Function	Name	Job title	Signature
Technical Reviewer	Nikolai Viktorov	EMC Test Technician	
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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 7169006431. 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]
- ICES 003 [8]
- 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

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

ICES Section	Description	Specification/Method	Pass or Fail	Results in section
6.2	Radiated Emissions (RE)	ICES 003/ANSI C63.4	Pass	3.2
6.1	Conducted Emissions (CE) for AC Power	ICES 003/ANSI C63.4	NA	NA
Table Notes				
1. Not Applicable; EUT operates from POE (56 VDC).				

2. Details of the equipment under test

This section describes the equipment under test (EUT).

2.1 Assessed hardware

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

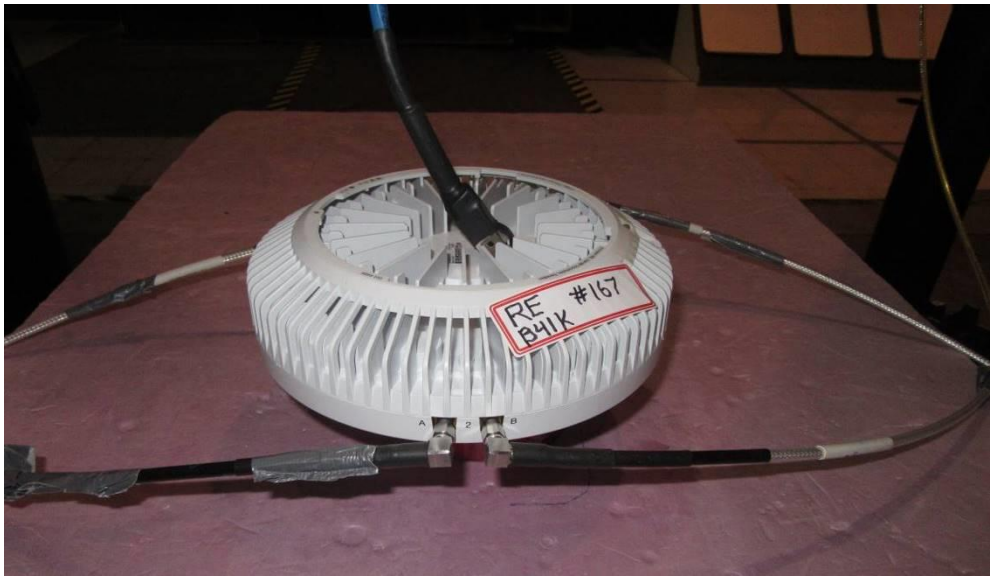
Table 4: Assessed hardware

Hardware component [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; configuration of the DOT 4489 B41K(KRY 901 432/2) DOT 4489 B41K (KRY 901 432/2) and DOT

4479 B41K (KRY 901 432/1)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 5 identifies all the cables and ports on the EUT. The Environment of the cables is indoor.

Table 5: System port definition

Port or cable designation	Interface description	Permanent connection for operation?	Shielded cable?	Max cable length (m)	Max quantity	port type
digRDI	CAT 6 STP	Yes	Yes	> 10	1	Telecom / POE
RF	COAX	Yes	Yes	< 4	4	Non-telecom

Table 6 identifies the cables present during testing for all configurations of the EUT.

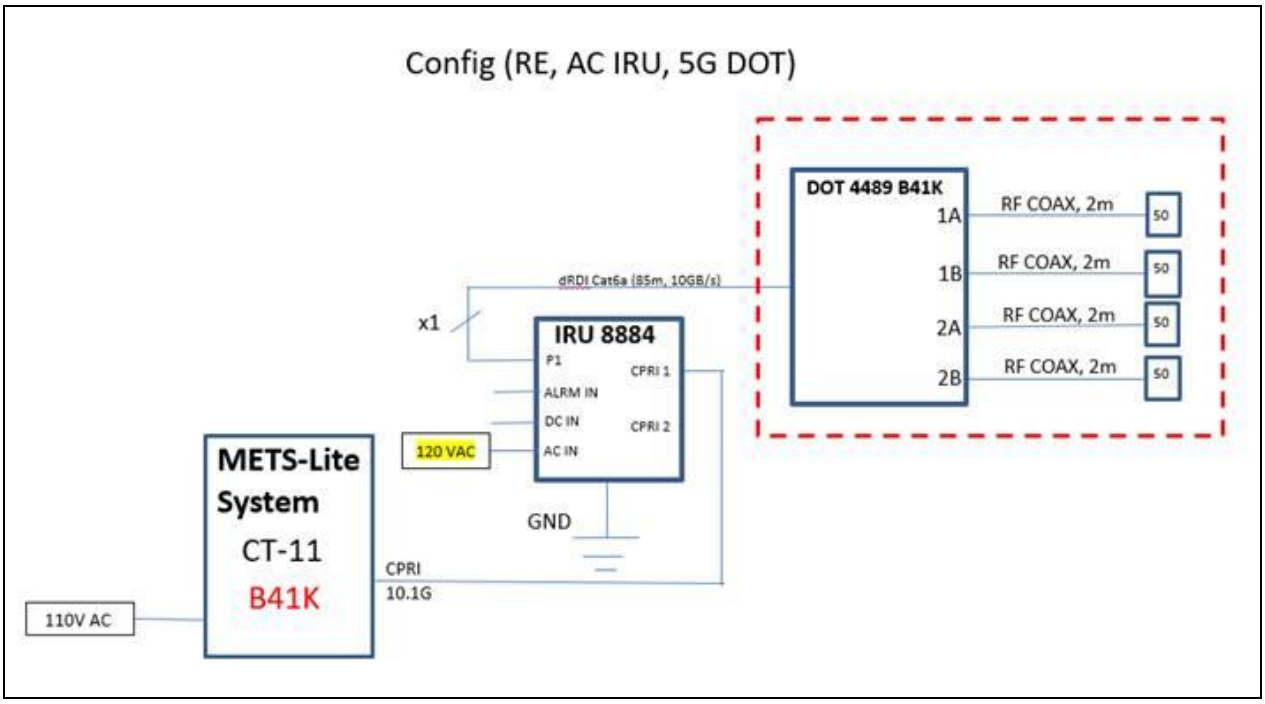
Table 6: Cable configuration for the EUT

Port designation or cable name	Qty	Cable length (m)	Termination during testing
DigRDI	1	100	Ericsson IRU 8884
RF 1A	1	2	Termination
RF 1B	1	2	Termination
RF 2A	1	2	Termination
RF 2B	1	2	Termination

2.4 Configurations of the EUT

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

Figure 2: Test configuration for Emission tests



Test frequencies for 20 MHz BW

- Bottom: 2525 MHz
- Middle: 2595 MHz
- Top: 2665 MHz

Note: The middle channel was also used for NR100 MHz. NR20 MHz and NR100MHz emissions were compared and NR20 MHz was found to have higher emissions. All NR plots in this report are therefore measured using NR20 MHz signals.

Test frequencies for 3xLTE20MHz + 1xNR20MHz

- Bottom: 2525+2545+2565+2585MHz
- Middle: 2565+2585+2605+2635 MHz
- Top: 2605+2625+2645+2665 MHz

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 7: Inventory of the EUT

Equipment Role	Product Name	Product Number	Release	Product Serial#
EUT	DOT 4489 B41K	KRY 901 432/2	R1B	TD3T789167
SUPPORT	IRU 8884	KRC 161 754/1	R1D	D828475392
TEST SET	METS-Lite			

2.7 Software and operations of the EUT

The software used to operate the system was representative of the latest production version. The software version number was CXP9013268%17_R79GZ05.

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 8: 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 9: RE limits at 10 m for Class B of FCC

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

Table 10: 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

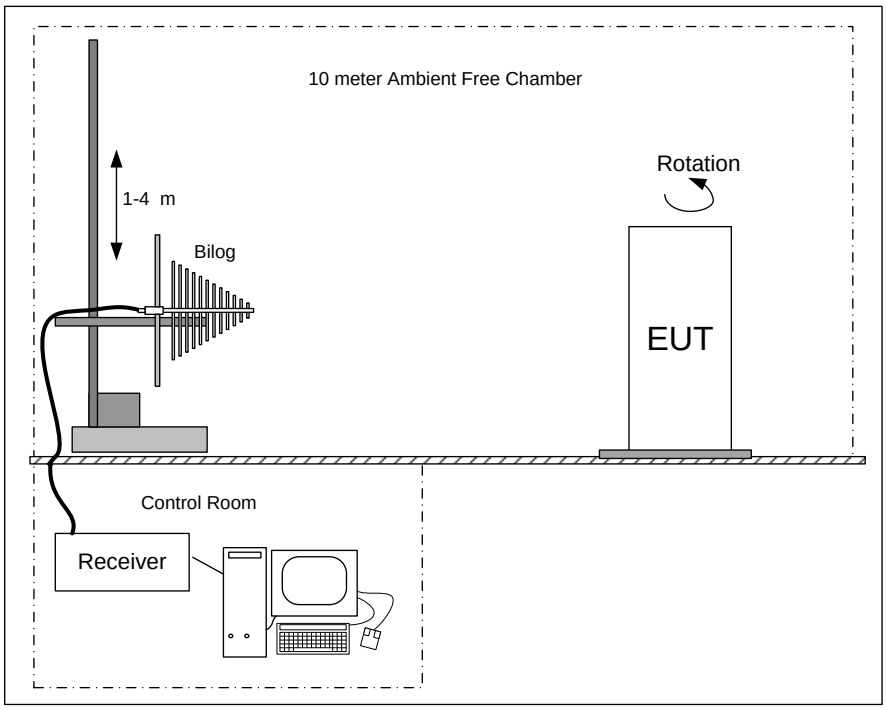
Verifications of the test equipment and AFC were performed before the installation of the EUT in accordance with the quality assurance procedures documented in the EMC test procedures document. The test was performed according to the relevant procedures listed in Table 8.

- 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 3: Setup of Radiated Emissions



3.2.3 Calculation of the compliance margin

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

The rows in these tables are defined as follows.

Meter Reading (dBμV) =	Voltage measured using the spectrum analyzer with the proper detector
Correction (dB) =	Cumulative gain or loss of pre-amplifier and cables used in the measurement path (dB) + Antenna Factor (dB)
Level (dBμV/m) =	Corrected value or field strength, that is, the parameter of interest that is compared to the limit
Margin (dB) =	Level with respect to the appropriate limit (a negative Margin indicates that the Level is below the limit and that the measurement is a Pass)

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

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

3.2.4 Measurement uncertainties

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

- ± 3.8 dB between 30 MHz and 1 GHz
- ± 4.7 dB between 1 GHz and 10 GHz
- ± 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 Radiated Emissions – (Single carrier, LTE - Middle chanel)

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

Date tested: 30, July 2019

Tested by: Scott Turner

Test configurations are identified in the section Configurations of the EUT.

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

Figure 4: Plot of RE at 3 m – 30 to1000 MHz (LTE – Middle channel)

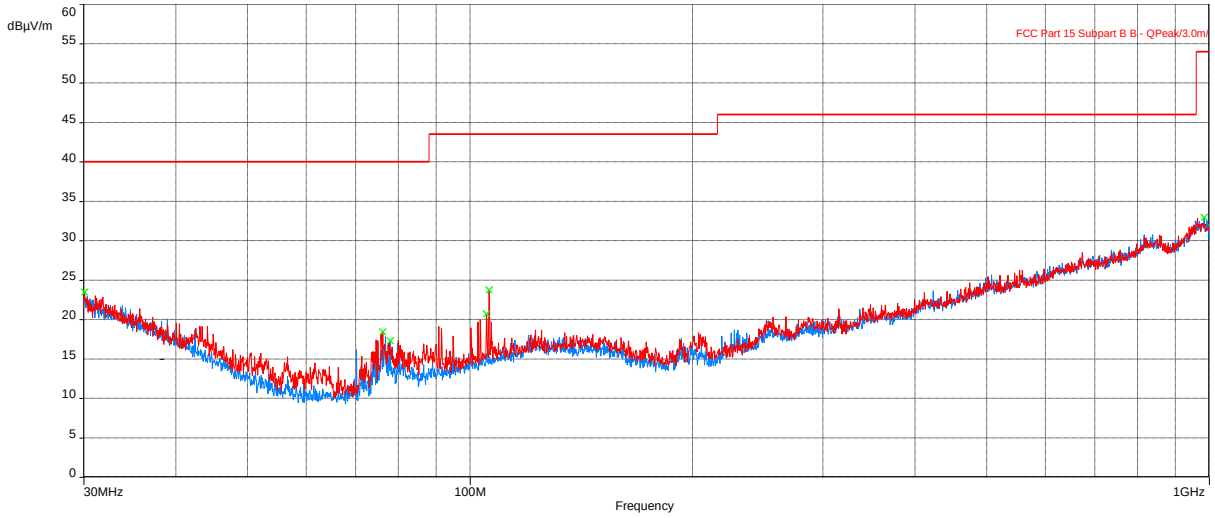


Table 11: RE test results from 30 to 1000 MHz for FCC Part 15 (LTE – Middle channel)

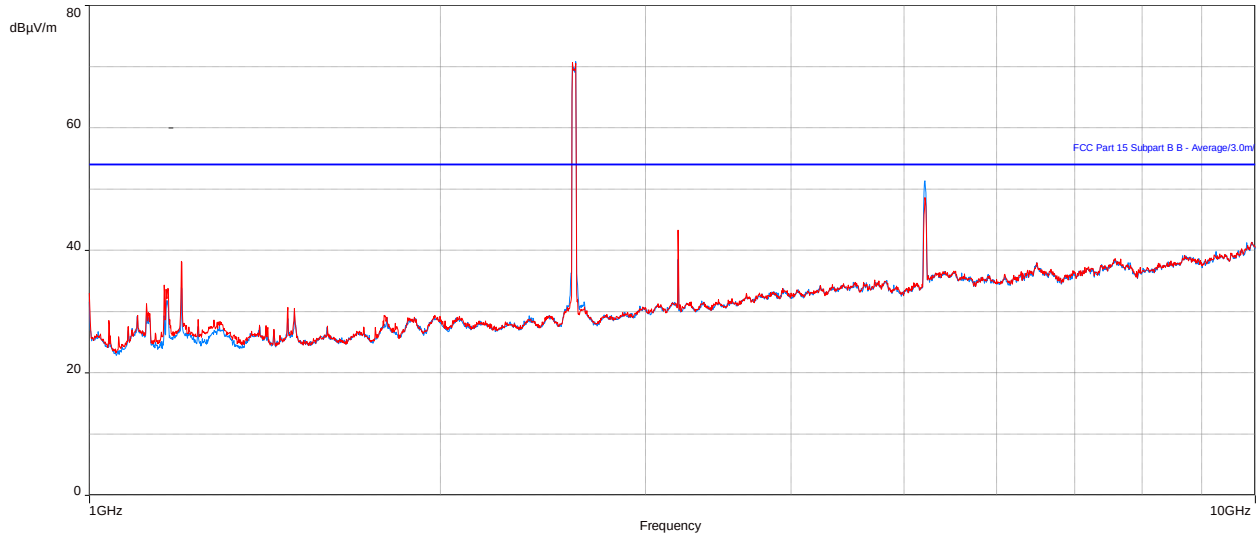
Frequency (MHz)	Level (dBµV)	Limit Quasi-peak (dBµV)	Margin to FCC part 15 Class B (dB)	Height (m)	Azimuth (deg)	Polarization	Correction (dB)
30.12536538	18.58	40.00	-21.42	3.18	40.50	Vertical	-2.60
76.12219905	17.41	40.00	-22.59	1.00	69.25	Vertical	-13.72
105.2808141	11.67	43.52	-31.85	1.91	74.50	Vertical	-9.86

Table 12: RE test results from 30 to 1000 MHz for FCC Part 27 (LTE – Middle channel)

Frequency (MHz)	Level (dBµV)	Limit Quasi-peak (dBµV)	Margin to FCC part 27 (dB)	Height (m)	Azimuth (deg)	Polarization	Correction (dB)
30.12536538	18.58	82.2	-63.62	3.18	40.50	Vertical	-2.60
76.12219905	17.41	82.2	-64.79	1.00	69.25	Vertical	-13.72
105.2808141	11.67	82.2	-70.53	1.91	74.50	Vertical	-9.86

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



Note 1: Peaks between 2515 - 2675MHz are leakage of the EUT's fundamental from the 50-ohm terminations.

Table 13: RE test results from 1 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)
3199.978526	42.46	53.96	-11.50	2.44	348.25	Vertical	-6.93
5210.485577	43.54	53.96	-10.42	1.39	4.50	Vertical	-1.57
5211.294231	45.43	53.96	-8.53	2.01	11.50	Horizontal	-1.56

Table 14: RE test results from 1 to 10 GHz for FCC Part 27 (LTE – Middle channel)

Frequency (MHz)	Level Average (dBµV)	Limit Average (dBµV)	Margin to FCC part 27 (dB)	Height (m)	Azimuth (degrees)	Polarization	Correction (dB)
3199.978526	42.46	82.2	-39.74	2.44	348.25	Vertical	-6.93
5210.485577	43.54	82.2	-38.66	1.39	4.50	Vertical	-1.57
5211.294231	45.43	82.2	-36.77	2.01	11.50	Horizontal	-1.56

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

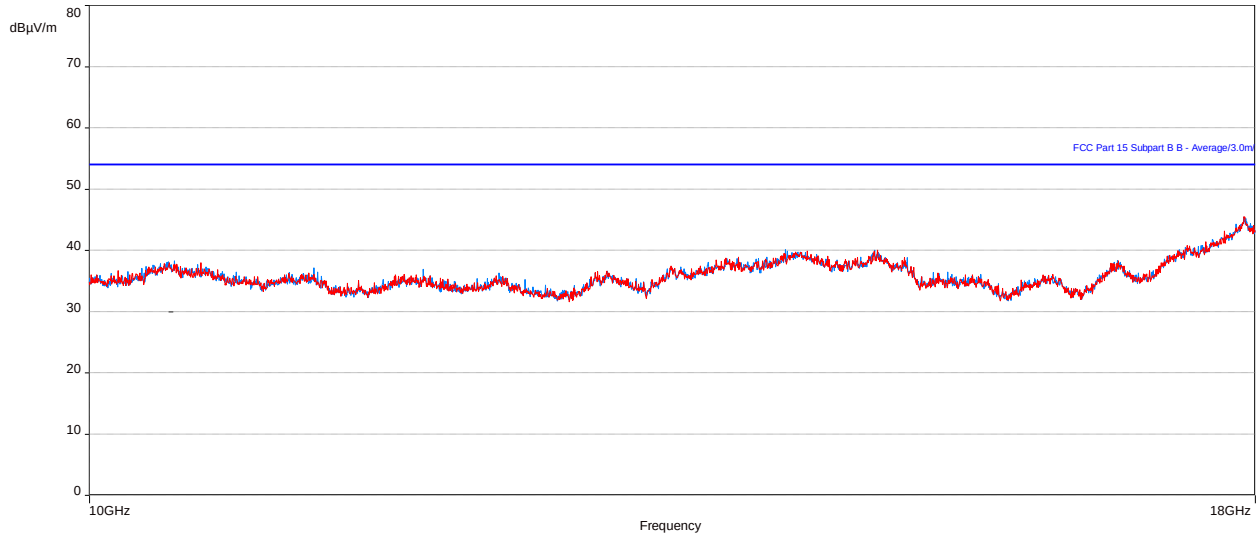


Table 15: RE test results from 10 to 18 GHz for FCC Part 15 (LTE – Middle channel)

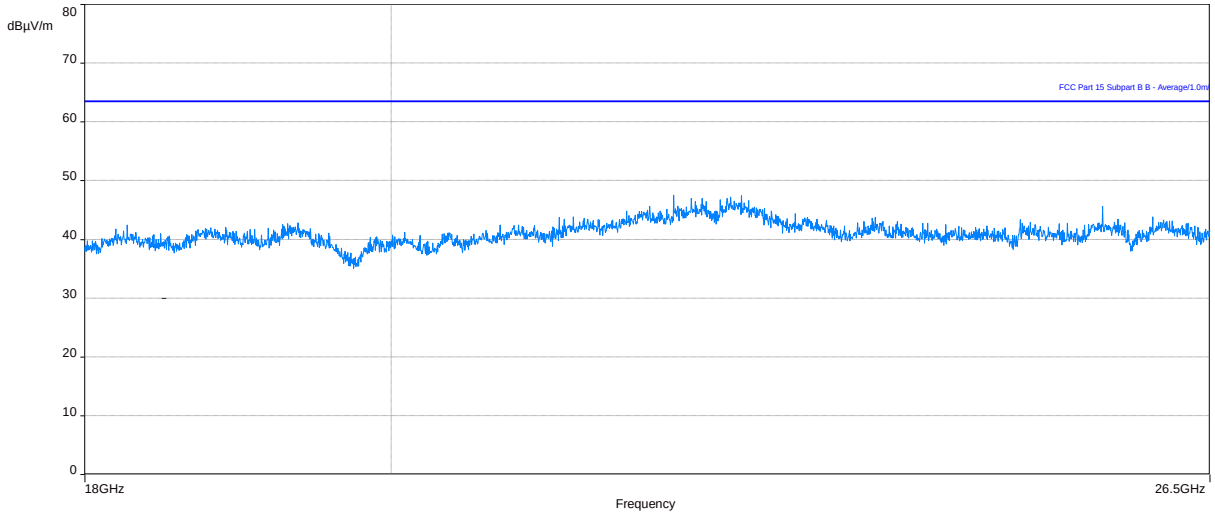
Frequency (MHz)	Level Average (dBµV)	Limit Average (dBµV)	Margin to FCC part 15 Class B (dB)	Height (m)	Azimuth (degrees)	Polarization	Correction (dB)
17899.20962	36.88	53.96	-17.08	4.00	360.00	Horizontal	20.46

Table 16: RE test results from 10 to 18 GHz (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)
17899.20962	36.88	82.2	-45.32	4.00	360.00	Horizontal	20.46

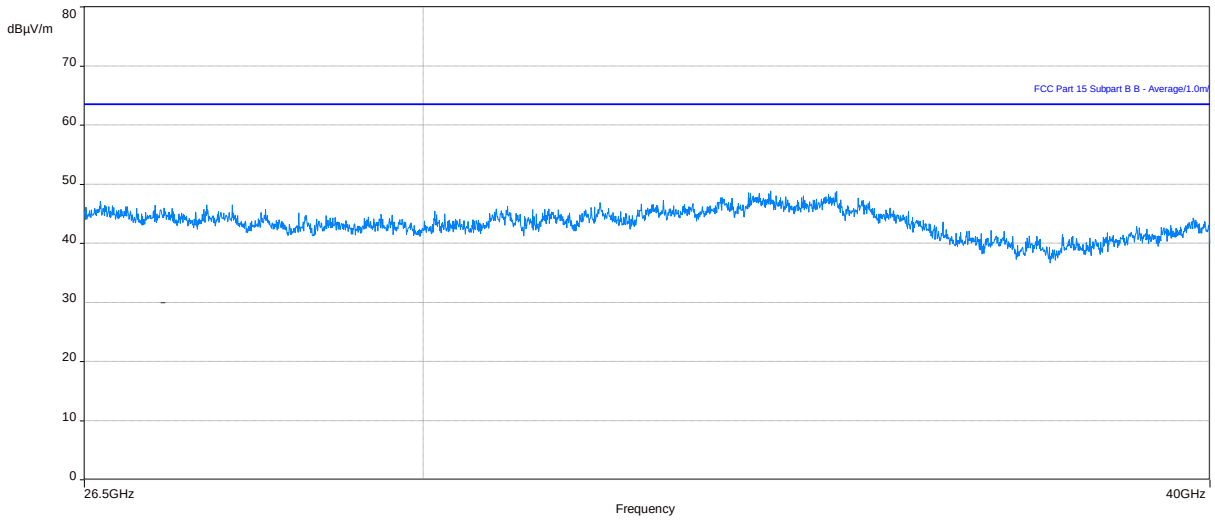
Note: In the table/Plot above, no emissions exceed the Part 27 radiated spurious emissions limit when converted to dBuV/m. For final spurious emissions measurements to FCC Part 27, see antenna port conducted emissions in applicable test report.

Figure 7: 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 8: 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.

3.2.6 Test results of Radiated Emissions – (Single carrier, NR - Bottom chanel)

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

Date tested: 1, August 2019

Tested by: Nikolai Viktorov

Test configurations are identified in the section Configurations of the EUT.

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

Figure 9: Plot of RE at 3 m – 30 to1000 MHz (NR – Bottom channel)

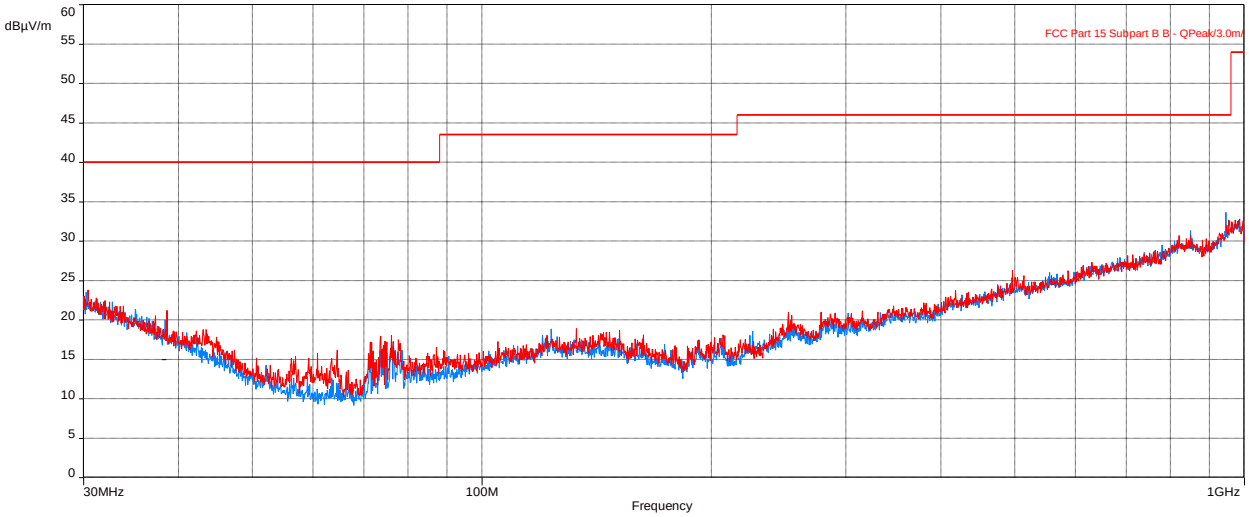


Table 17: RE test results from 30 to 1000 MHz for FCC Part 15 (NR – Bottom channel)

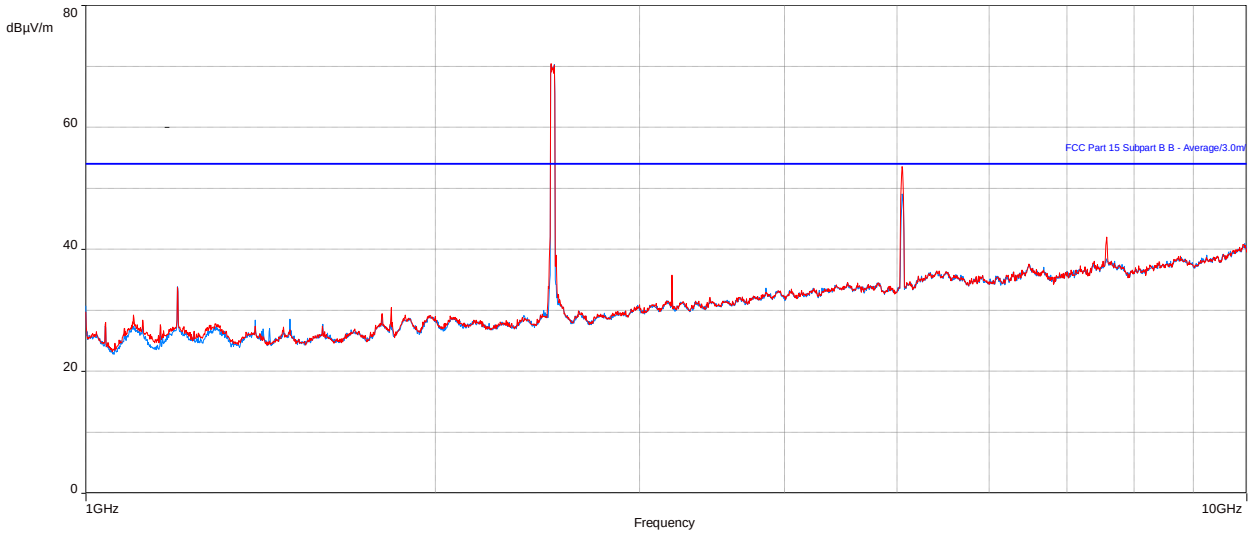
Frequency (MHz)	Level (dBµV)	Limit Quasi-peak (dBµV)	Margin to FCC part 15 Class B (dB)	Height (m)	Azimuth (deg)	Polarization	Correction (dB)
953.7391313	26.08	46.02	-19.94	1.29	139.00	Vertical	7.81
946.2691697	25.86	46.02	-20.16	3.14	81.75	Horizontal	7.48

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

Frequency (MHz)	Level (dBµV)	Limit Quasi-peak	Margin to (dB)	Height (m)	Azimuth (deg)	Polarization	Correction (dB)
953.7391313	26.08	82.2	-56.12	1.29	139.00	Vertical	7.81
946.2691697	25.86	82.2	-56.34	3.14	81.75	Horizontal	7.48

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 10: Plot of RE at 3m from 1 to 10 GHz (NR – Bottom channel)



Note 1: Peaks between 2515 - 2675MHz are leakage of the EUT's fundamental from the 50-ohm terminations.

Table 19: RE test results from 1 to 10 GHz for Part 15 (NR – 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)
5047.483013	44.75	53.96	-9.21	3.47	297.50	Vertical	-2.51
5049.157692	42.37	53.96	-11.59	2.99	4.50	Horizontal	-2.50

Table 20: RE test results from 1 to 10 GHz for Part 27 (NR – Bottom channel)

Frequency (MHz)	Level Average (dBµV)	Limit Average (dBµV)	Margin to FCC part 27 (dB)	Height (m)	Azimuth (degrees)	Polarization	Correction (dB)
5047.483013	44.75	82.2	-37.45	3.47	297.50	Vertical	-2.51
5049.157692	42.37	82.2	-39.83	2.99	4.50	Horizontal	-2.50

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

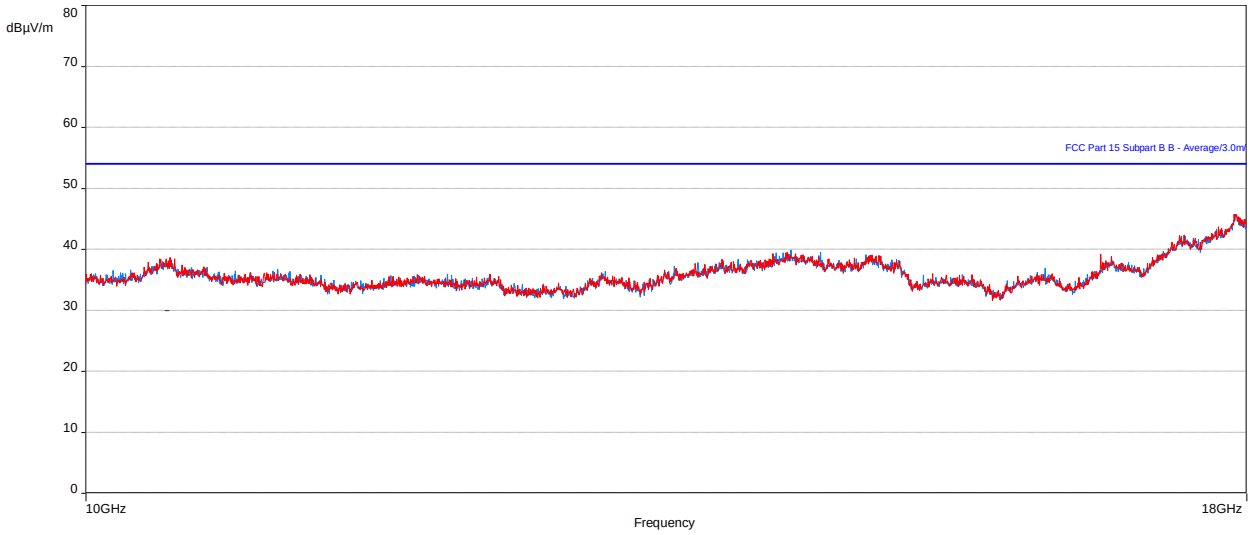


Table 21: RE test results from 10 to 18 GHz for FCC Part 15(NR – Bottom channel)

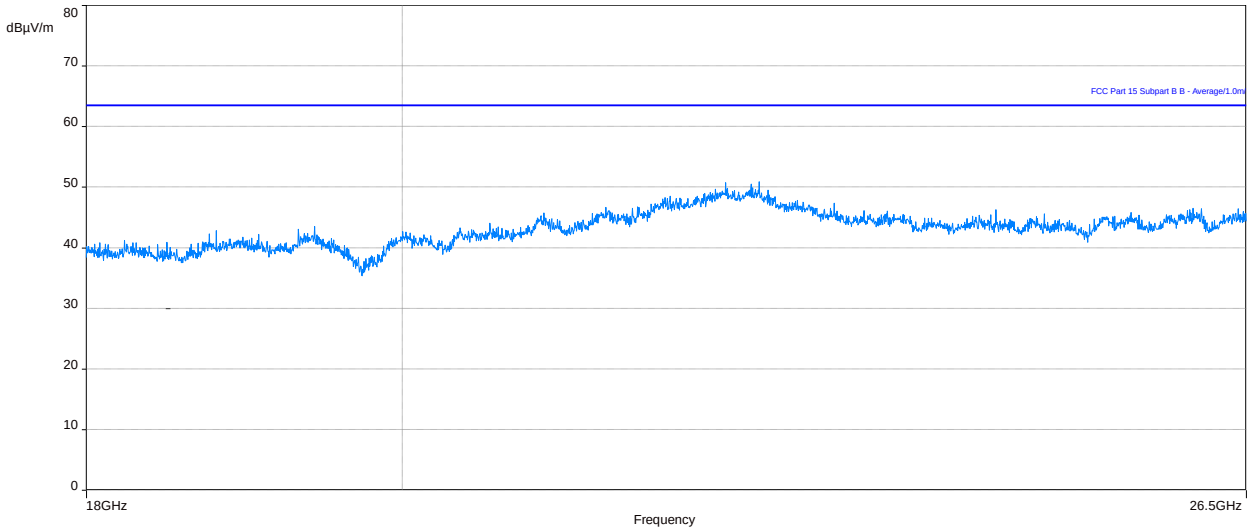
Frequency (MHz)	Level Average (dBµV)	Limit Average (dBµV)	Margin to FCC part 15 Class B (dB)	Height (m)	Azimuth (degrees)	Polarization	Correction (dB)
10436.53877	29.64	53.96	-24.32	1.00	16.75	Vertical	10.01
17885.58782	36.17	53.96	-17.79	1.00	146.50	Vertical	20.10
17898.14887	36.67	53.96	-17.29	4.00	117.75	Horizontal	20.44

Table 22: RE test results from 10 to 18 GHz for FCC Part 27 (NR – Bottom channel)

Frequency (MHz)	Level Average (dBµV)	Limit Average (dBµV)	Margin to FCC part 27 (dB)	Height (m)	Azimuth (degrees)	Polarization	Correction (dB)
10436.53877	29.64	82.2	-52.56	1.00	16.75	Vertical	10.01
17885.58782	36.17	82.2	-46.03	1.00	146.50	Vertical	20.10
17898.14887	36.67	82.2	-45.53	4.00	117.75	Horizontal	20.44

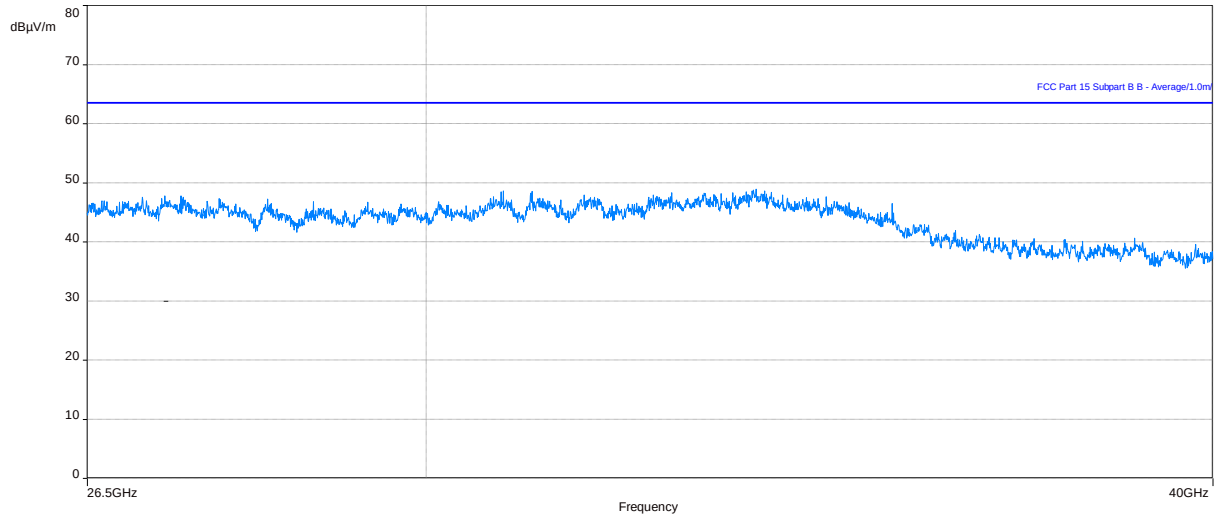
Note: In the table/Plot above, no emissions exceed the Part 27 radiated spurious emissions limit when converted to dBuV/m. For final spurious emissions measurements to FCC Part 27, see antenna port conducted emissions in applicable test report.

Figure 12: Plot of RE at 1m from 18 to 26.5 GHz (NR – 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 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 1m from 26.5 to 40 GHz (NR – 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 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 Radiated Emissions – (Single carrier, NR – Middle channel)

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

Date tested: 2, August 2019

Tested by: Nikolai Viktorov

Test configurations are identified in the section Configurations of the EUT.

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

Figure 14: Plot of RE at 3 m – 30 to 1000 MHz (NR – Middle channel)

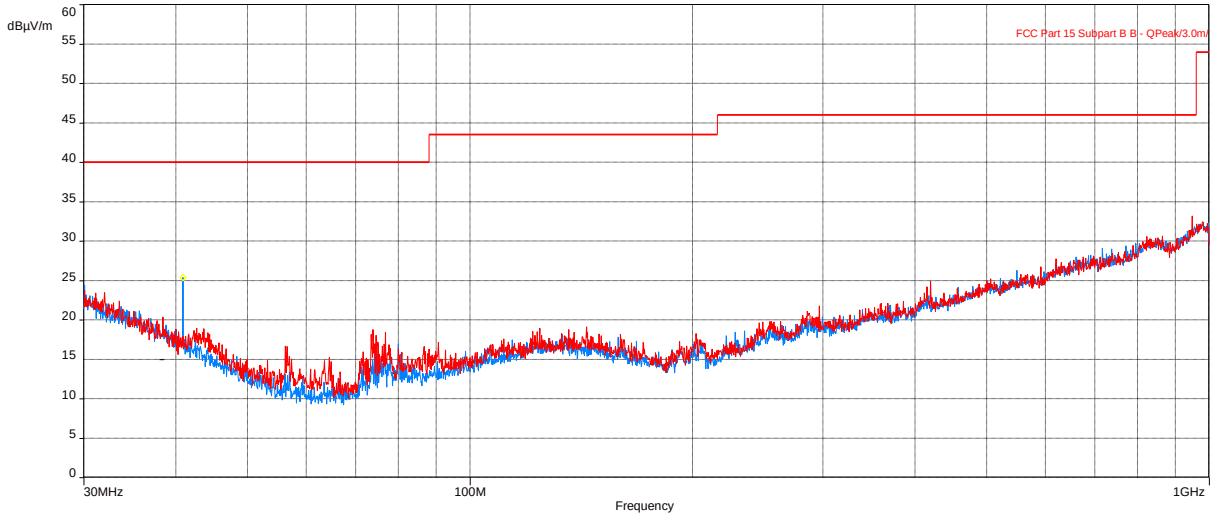


Table 23: RE test results from 30 to 1000 MHz for FCC part 15 (NR – Middle channel)

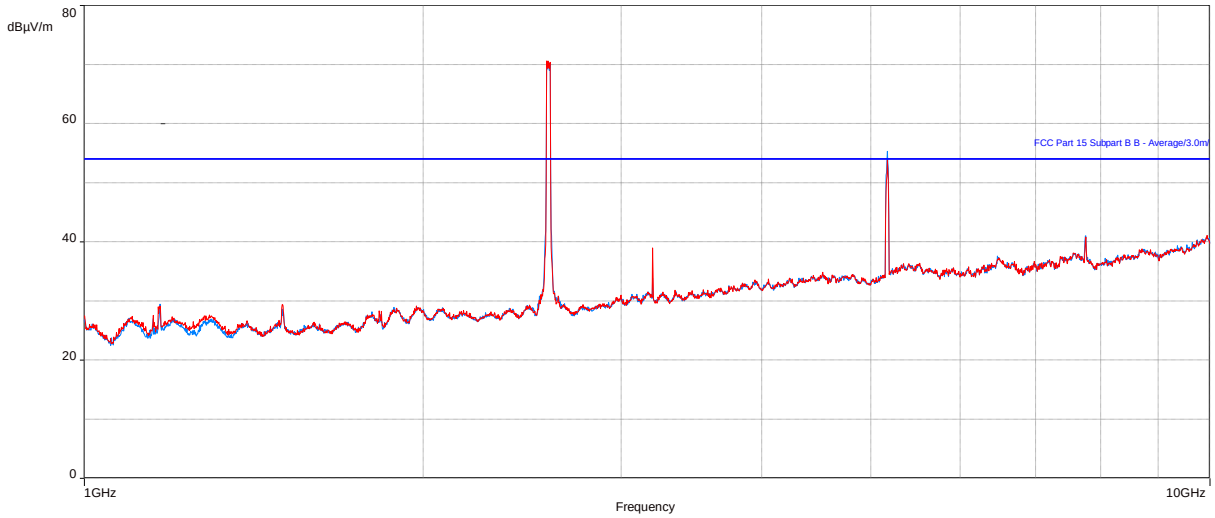
Frequency (MHz)	Level (dBµV)	Limit Quasi-peak (dBµV)	Margin to FCC part 15 Class B (dB)	Height (m)	Azimuth (deg)	Polarization	Correction (dB)
948.3213941	25.77	46.02	-20.25	3.72	336.00	Vertical	7.58
40.84685256	12.95	40.00	-27.05	2.40	62.25	Horizontal	-7.89

Table 24: RE test results from 30 to 1000 MHz for Part 27 (NR – Middle channel)

Frequency (MHz)	Level (dBµV)	Limit Quasi-peak (dBµV)	Margin to FCC part 27 (dB)	Height (m)	Azimuth (deg)	Polarization	Correction (dB)
948.3213941	25.77	82.2	-56.43	3.72	336.00	Vertical	7.58
40.84685256	12.95	82.2	-69.25	2.40	62.25	Horizontal	-7.89

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 15: Plot of RE at 3m from 1 to 10 GHz (NR – Middle channel)



Note 1: Peaks between 2515 - 2675MHz are leakage of the EUT's fundamental from the 50-ohm terminations.

Table 25: RE test results from 1 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)
5170.154167	48.43	53.96	-5.53	2.01	3.75	Horizontal	-1.76

Table 26: RE test results from 1 to 10 GHz for FCC Part 27 (NR – Middle channel)

Frequency (MHz)	Level Average (dBµV)	Limit Average (dBµV)	Margin to FCC part 27 (dB)	Height (m)	Azimuth (degrees)	Polarization	Correction (dB)
5170.154167	48.43	82.2	-33.77	2.01	3.75	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 16: Plot of RE at 3m from 10 to 18 GHz (NR – Middle channel)

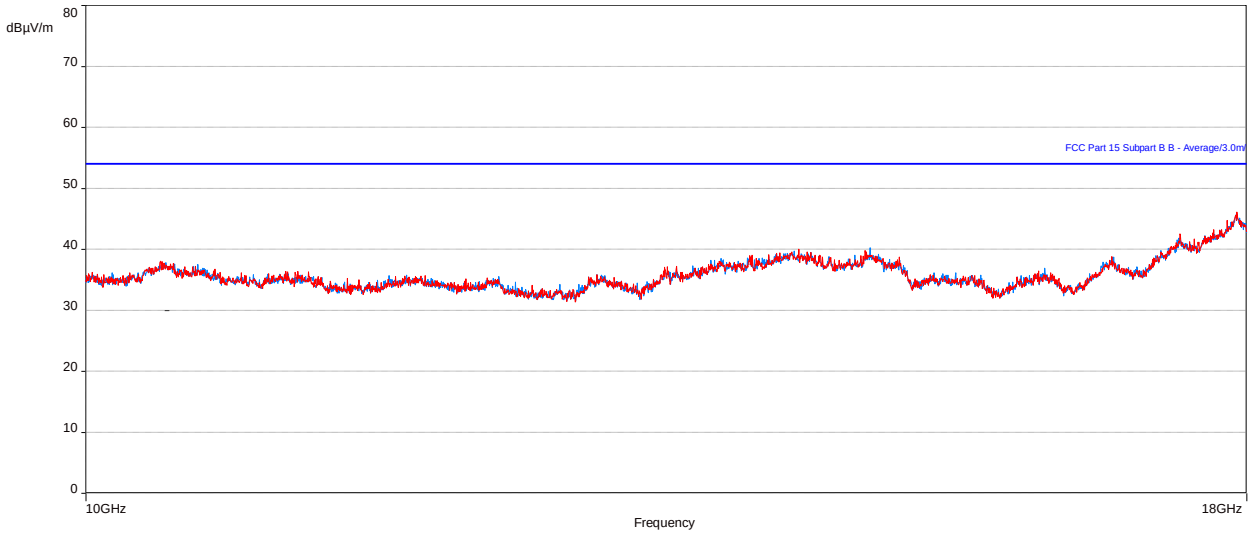


Table 27: RE test results from 10 to 18 GHz for FCC Part 15 (NR – Middle channel)

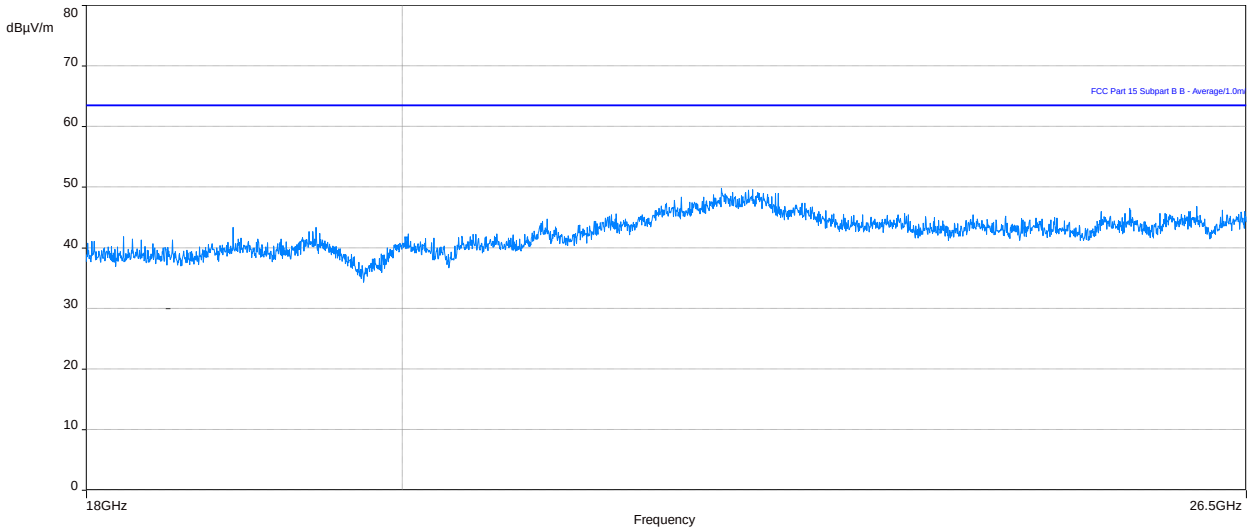
Frequency (MHz)	Level Average (dBµV)	Limit Average (dBµV)	Margin to FCC part 15 Class B (dB)	Height (m)	Azimuth (degrees)	Polarization	Correction (dB)
17912.7891	37.37	53.96	-16.59	3.73	0.00	Vertical	20.41

Table 28: RE test results from 10 to 18 GHz for FCC Part 27 (NR – Middle channel)

Frequency (MHz)	Level Average (dBµV)	Limit Average (dBµV)	Margin to FCC part 27 (dB)	Height (m)	Azimuth (degrees)	Polarization	Correction (dB)
17912.7891	37.37	82.2	-44.83	3.73	0.00	Vertical	20.41

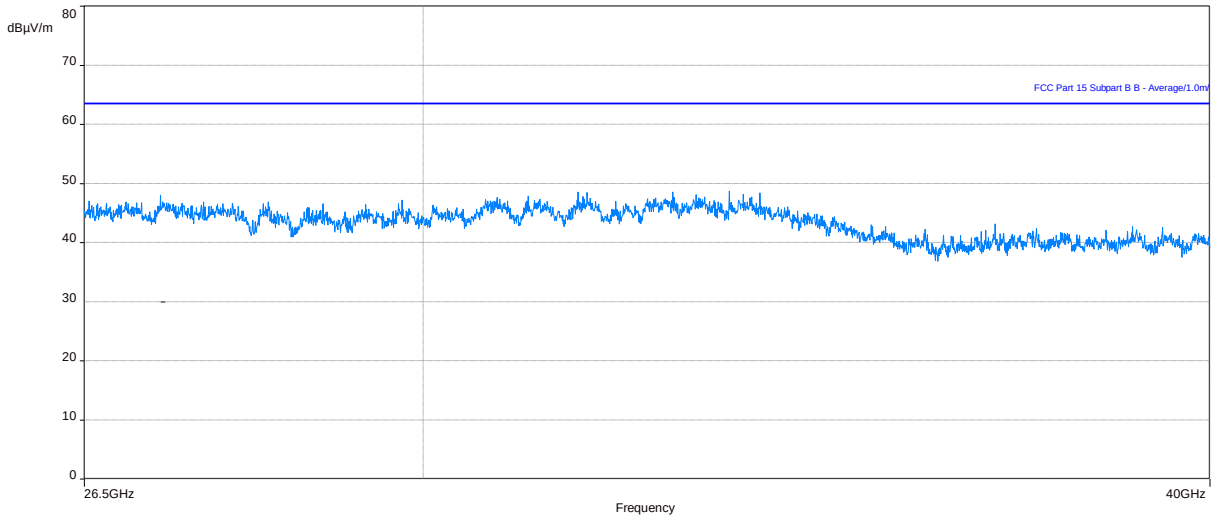
Note: In the table/Plot above, no emissions exceed the Part 27 radiated spurious emissions limit when converted to dBuV/m. For final spurious emissions measurements to FCC Part 27, see antenna port conducted emissions in applicable test report.

Figure 17: 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 18: 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.

3.2.8 Test results of Radiated Emissions – (Single carrier, NR - TOP chanel)

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

Date tested: 5, August 2019

Tested by: Nikolai Viktorov

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 19: Plot of RE at 3 m – 30 to1000 MHz (NR – Top channel)

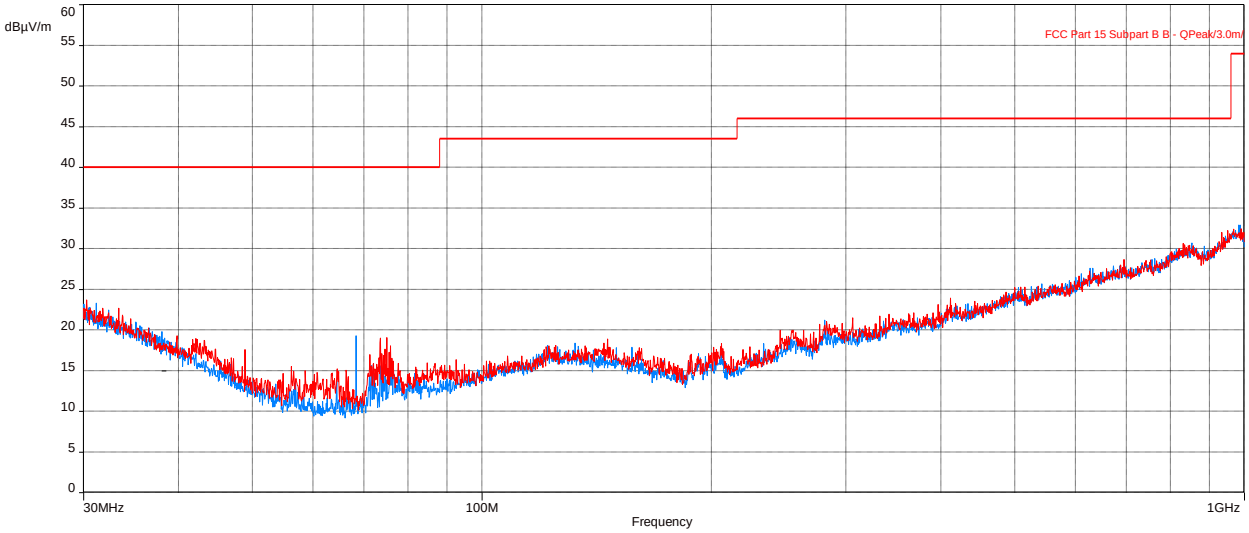


Table 29: RE test results from 30 to 1000 MHz for FCC Part 15 (NR – Top channel)

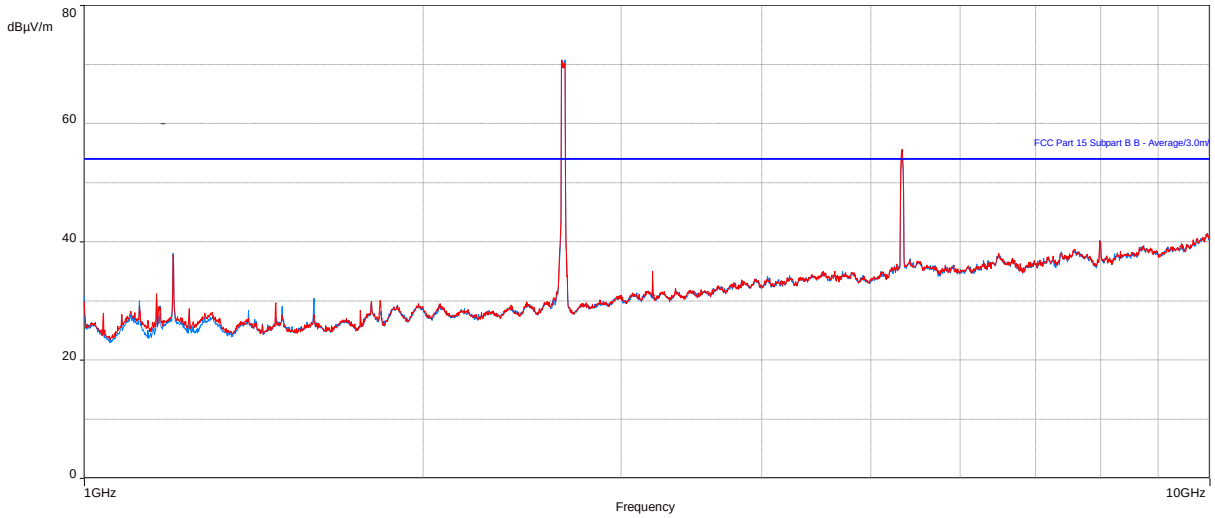
Frequency (MHz)	Level (dBµV)	Limit Quasi-peak (dBµV)	Margin to FCC part 15 Class B (dB)	Height (m)	Azimuth (deg)	Polarization	Correction (dB)
831.9459133	24.38	46.02	-21.64	1.88	220.75	Vertical	5.73
934.7295351	25.34	46.02	-20.68	1.24	84.00	Vertical	6.93

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

Frequency (MHz)	Level (dBµV)	Limit Quasi-peak	Margin to FCC part 27	Height (m)	Azimuth (deg)	Polarization	Correction (dB)
831.9459133	24.38	82.2	-57.82	1.88	220.75	Vertical	5.73
934.7295351	25.34	82.2	-56.86	1.24	84.00	Vertical	6.93

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 20: Plot of RE at 3m from 1 to 10 GHz (NR – Top channel)



Note 1: Peaks between 2515 - 2675MHz are leakage of the EUT's fundamental from the 50-ohm terminations.

Table 31: RE test results from 1 to 10 GHz for FCC Part 15 (NR – 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)
1199.730769	31.18	53.96	-22.78	2.30	197.75	Vertical	-14.13
3199.978526	35.44	53.96	-18.52	2.70	349.25	Vertical	-6.93
5329.723397	49.23	53.96	-4.73	2.22	177.75	Horizontal	-1.20

Table 32: RE test results from 1 to 10 GHz for FCC Part 27 (NR – Top channel)

Frequency (MHz)	Level Average (dBµV)	Limit Average (dBµV)	Margin to FCC part 27 (dB)	Height (m)	Azimuth (degrees)	Polarization	Correction (dB)
1199.730769	31.18	82.2	-51.02	2.30	197.75	Vertical	-14.13
3199.978526	35.44	82.2	-46.76	2.70	349.25	Vertical	-6.93
5329.723397	49.23	82.2	-32.97	2.22	177.75	Horizontal	-1.20

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 (NR – Top channel)

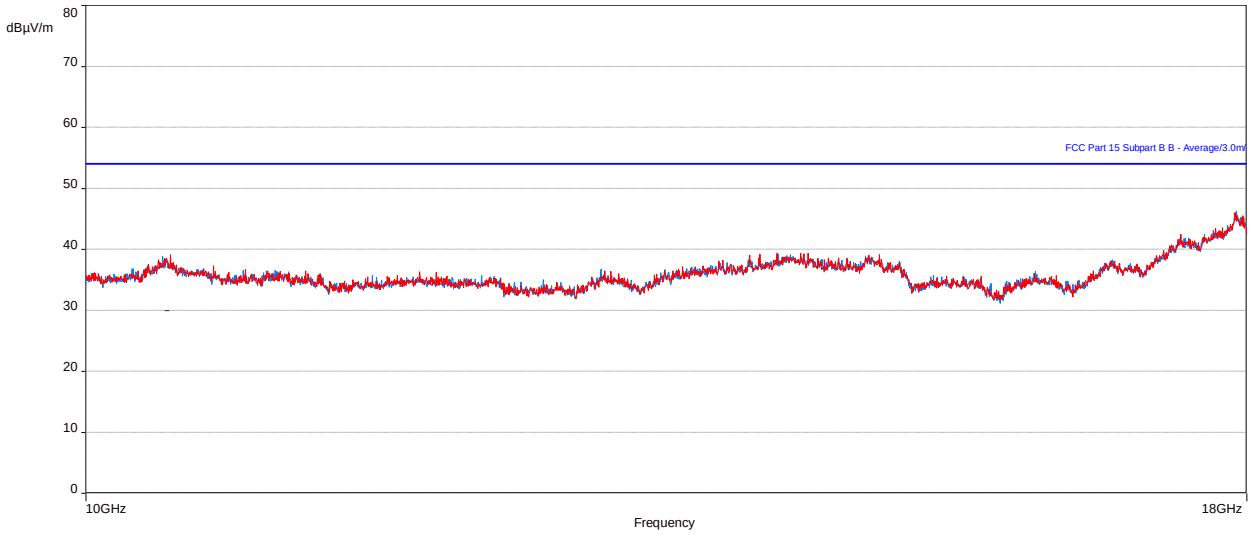


Table 33: RE test results from 10 to 18 GHz for FCC Part 15 (NR – Top channel)

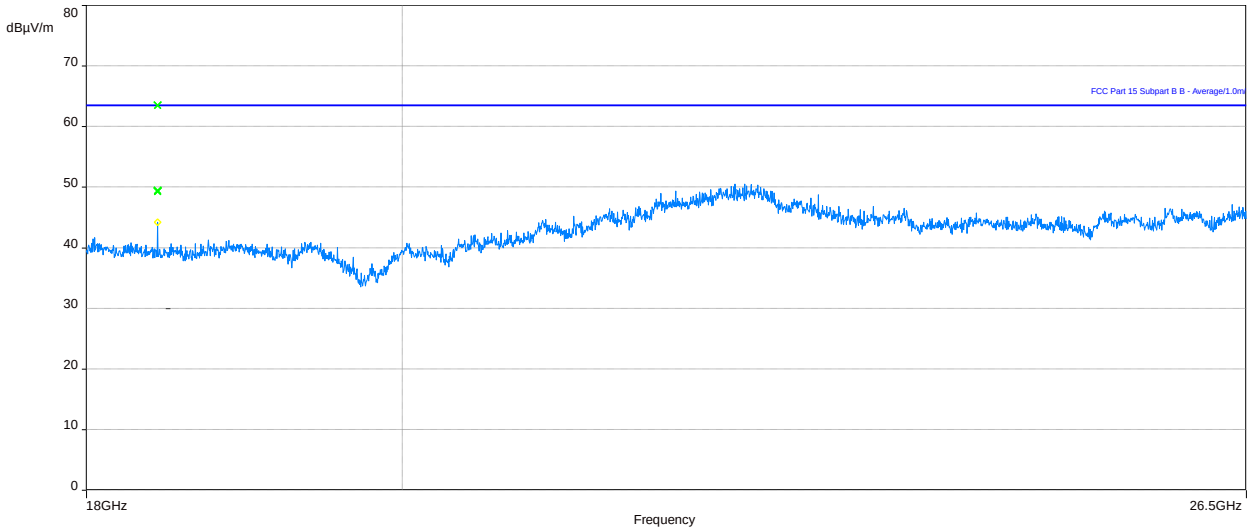
Frequency (MHz)	Level Peak (dBµV)	Limit Average (dBµV)	Margin to FCC part 15 Class B (dB)	Height (m)	Azimuth (degrees)	Polarization	Correction (dB)
17896.8	46.05	53.96	-7.91	1.01	211.00	Vertical	20.40
17908.53333	46.22	53.96	-7.74	3.00	359.75	Horizontal	20.43

Table 34: RE test results from 10 to 18 GHz for FCC Part 27 (NR – Top channel)

Frequency (MHz)	Level Peak (dBµV)	Limit Average (dBµV)	Margin to FCC part 27 (dB)	Height (m)	Azimuth (degrees)	Polarization	Correction (dB)
17896.8	46.05	82.2	-36.15	1.01	211.00	Vertical	20.40
17908.53333	46.22	82.2	-35.98	3.00	359.75	Horizontal	20.43

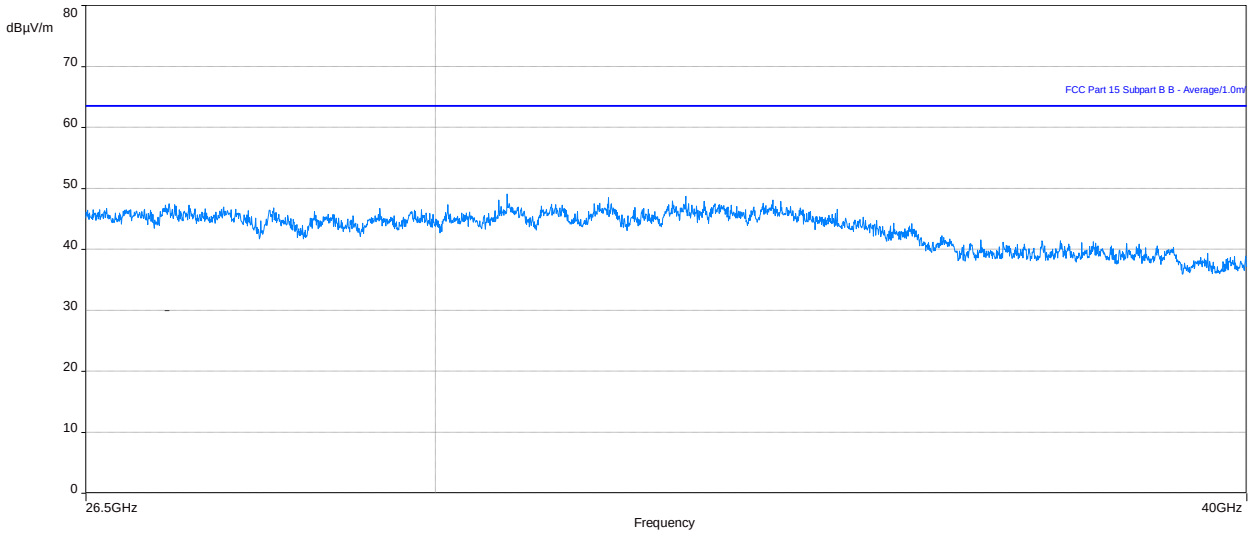
Note: In the table/Plot above, no emissions exceed the Part 27 radiated spurious emissions limit when converted to dBuV/m. For final spurious emissions measurements to FCC Part 27, see antenna port conducted emissions in applicable test report.

Figure 22: Plot of RE at 1m from 18 to 26.5 GHz (NR – 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 27 radiated spurious emissions limit when converted to dBuV/m. For final spurious emissions measurements to FCC Part 27, see antenna port conducted emissions in applicable test report.

Figure 23: Plot of RE at 1m from 26.5 to 40 GHz (NR – 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 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 Radiated Emissions – 3xLTE20MHz + 1xNR20MHz – bottom chanel

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

Date tested: 7, August 2019

Tested by: Nikolai Viktorov

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 24: Plot of RE at 3 m – 30 to1000 MHz (3xLTE20MHz + 1xNR20MHz – bot chanel)

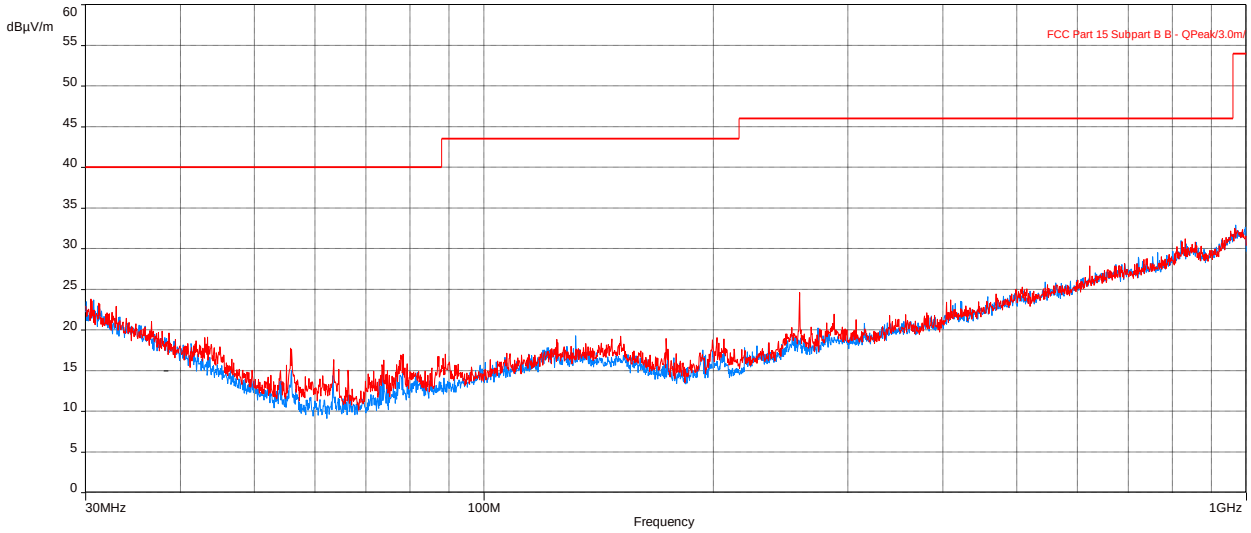


Table 35: RE test results from 30 to 1000 MHz for FCC Part 15 (3xLTE20MHz + 1xNR20MHz – bot chanel)

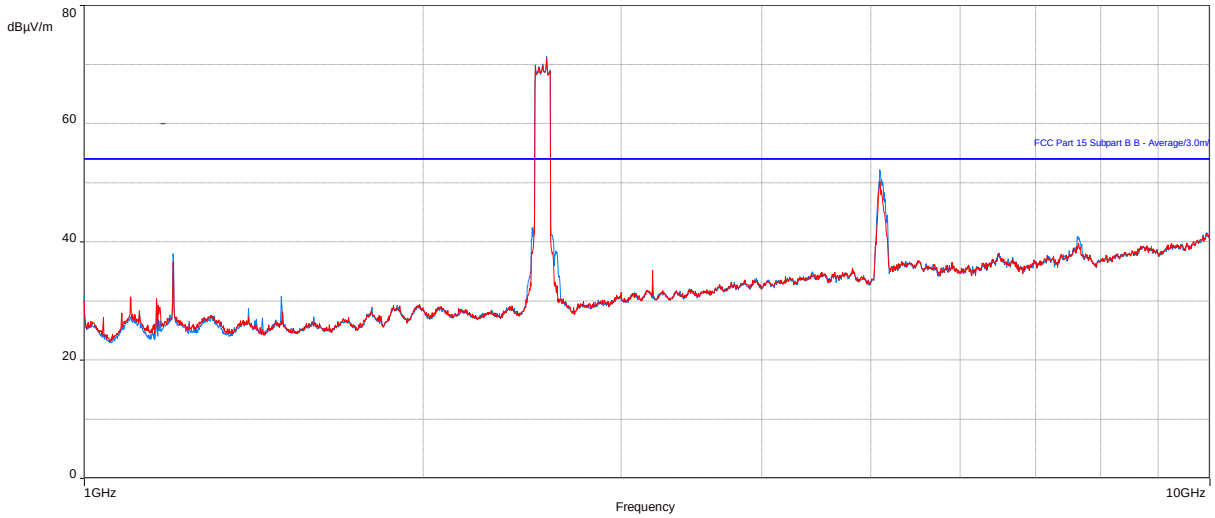
Frequency (MHz)	Level (dBµV)	Limit Quasi-peak	Margin to Class B (dB)	Height (m)	Azimuth (deg)	Polarization	Correction (dB)
32.96156377	17.39	40.00	-22.61	1.04	9.75	Vertical	-3.97
55.73380736	13.38	40.00	-26.62	1.63	4.50	Vertical	-14.41

Table 36: RE test results from 30 to 1000 MHz for FCC Part 27 (3xLTE20MHz + 1xNR20MHz – bot chanel)

Frequency (MHz)	Level (dBµV)	Limit Quasi-peak	Margin to (dB)	Height (m)	Azimuth (deg)	Polarization	Correction (dB)
32.96156377	17.39	82.2	-64.81	1.04	9.75	Vertical	-3.97
55.73380736	13.38	82.2	-68.82	1.63	4.50	Vertical	-14.41

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 25: Plot of RE at 3m from 1 to 10 GHz (3xLTE20MHz + 1xNR20MHz – bottom chanel)



Note 1: Peaks between 2515 - 2675MHz are leakage of the EUT's fundamental from the 50-ohm terminations.

Table 37: RE test results from 1 to 10 GHz for FCC Part 15 (3xLTE20MHz+1xNR20MHz–bot chanel)

Frequency (MHz)	Level Average (dBµV)	Limit Average (dBµV)	Margin to FCC part 15 Class B (dB)	Height (m)	Azimuth (degrees)	Polarization	Correction (dB)
5089.802244	43.63	53.96	-10.33	3.95	283.50	Vertical	-2.21
5099.838462	45.69	53.96	-8.27	2.37	0.00	Horizontal	-2.14

Table 38: RE test results from 1 to 10 GHz for FCC Part 27 (3xLTE20MHz+1xNR20MHz–bot chanel)

Frequency (MHz)	Level Average (dBµV)	Limit Average (dBµV)	Margin to FCC part 27 (dB)	Height (m)	Azimuth (degrees)	Polarization	Correction (dB)
5089.802244	43.63	82.2	-38.57	3.95	283.50	Vertical	-2.21
5099.838462	45.69	82.2	-36.51	2.37	0.00	Horizontal	-2.14

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 26: Plot of RE at 3m from 10 to 18 GHz (3xLTE20MHz+1xNR20MHz – bot chanel)

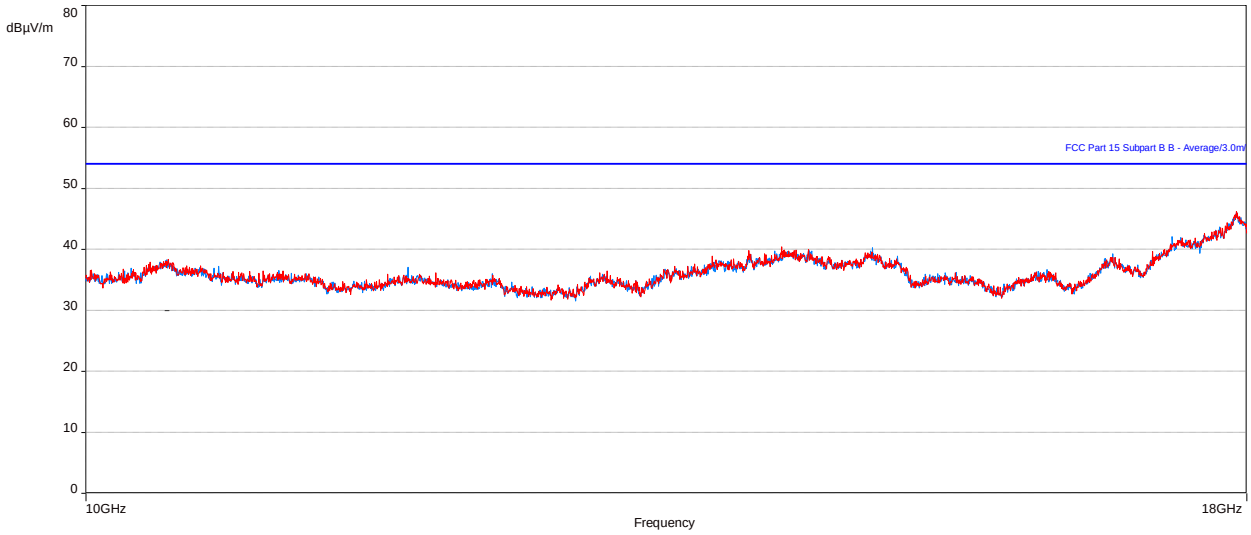


Table 39: RE test results from 10 to 18 GHz for FCC Part 15 (3xLTE20MHz+1xNR20MHz – bot chanel)

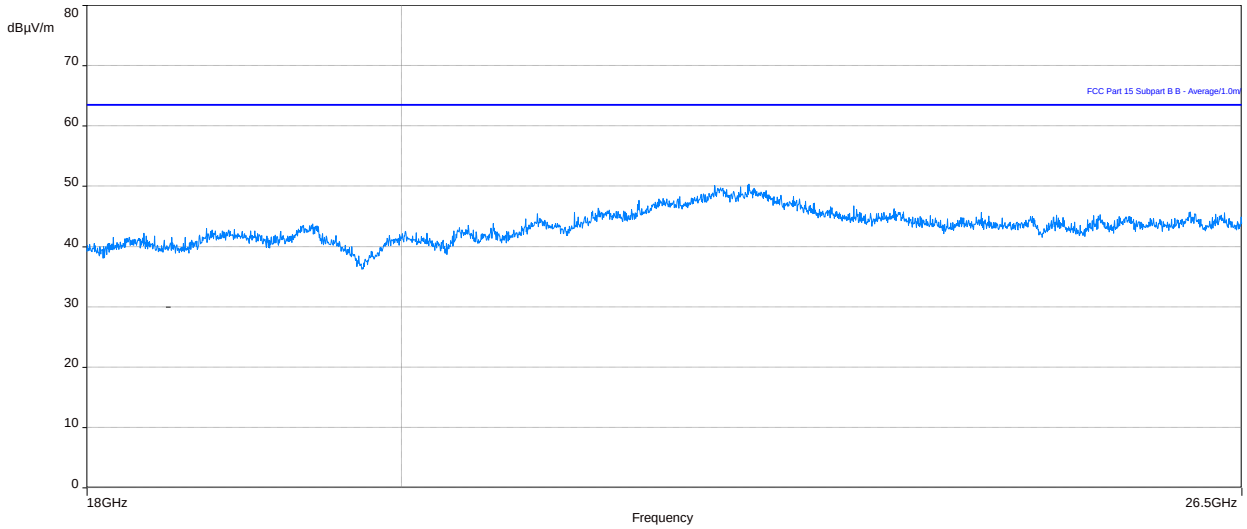
Frequency (MHz)	Level Average (dBµV)	Limit Average (dBµV)	Margin to FCC part 15 Class B (dB)	Height (m)	Azimuth (degrees)	Polarization	Correction (dB)
17906.92915	36.82	53.96	-17.14	1.00	45.75	Vertical	20.44
17914.39535	36.54	53.96	-17.42	3.81	59.75	Horizontal	20.40

Table 40: RE test results from 10 to 18 GHz for FCC Part 27 (3xLTE20MHz+1xNR20MHz – bot chanel)

Frequency (MHz)	Level Average (dBµV)	Limit Average (dBµV)	Margin to FCC part 27 Class B (dB)	Height (m)	Azimuth (degrees)	Polarization	Correction (dB)
17906.92915	36.82	82.2	-45.38	1.00	45.75	Vertical	20.44
17914.39535	36.54	82.2	-45.66	3.81	59.75	Horizontal	20.40

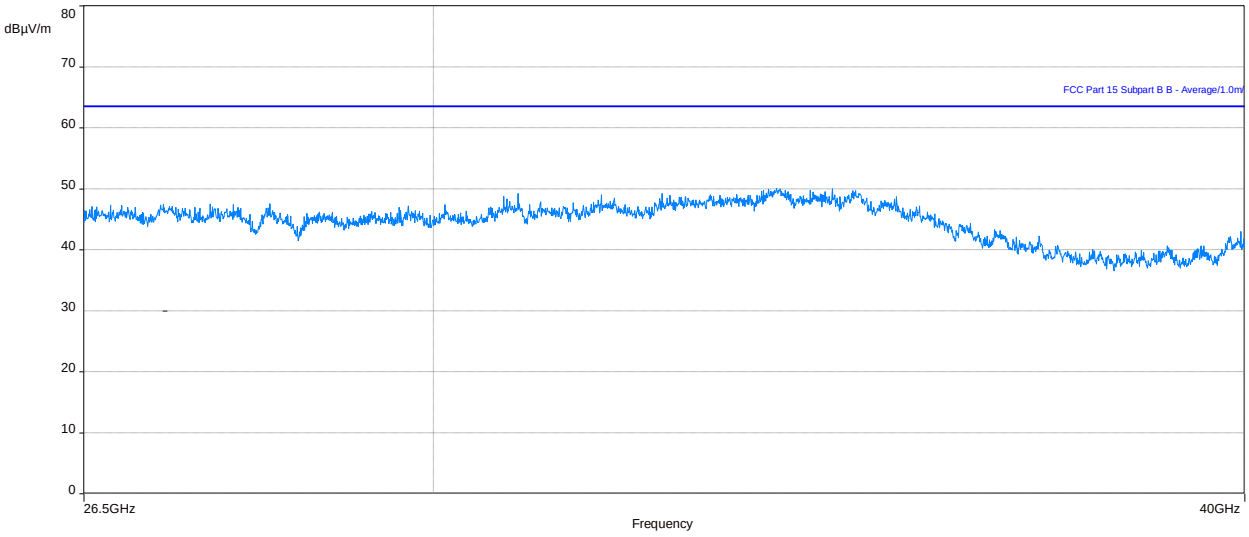
Note 2: In the plot above, no emissions exceed the Part 27 radiated spurious emissions limit when converted to dBuV/m. For final spurious emissions measurements to FCC Part 27, see antenna port conducted emissions in applicable test report.

Figure 27: Plot of RE at 1m from 18 to 26.5 GHz (3xLTE20MHz + 1xNR20MHz – bottom chanel)



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 28: Plot of RE at 1m from 26.5 to 40 GHz (3xLTE20MHz + 1xNR20MHz – bottom chanel)



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.

3.2.10 Radiated Emissions test setup pictures

Figure 29: Setup for RE tests at 30 MHz to 1 GHz

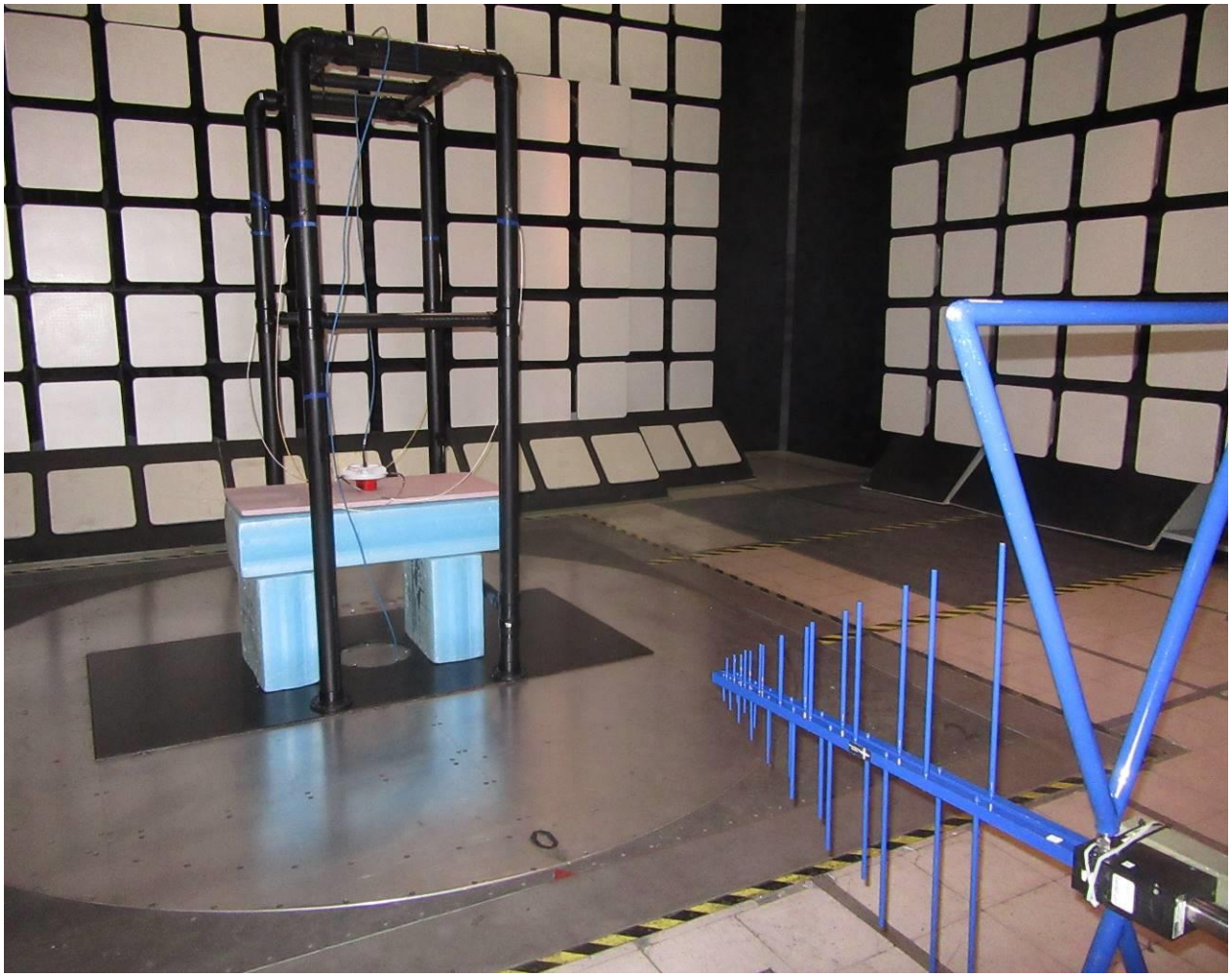
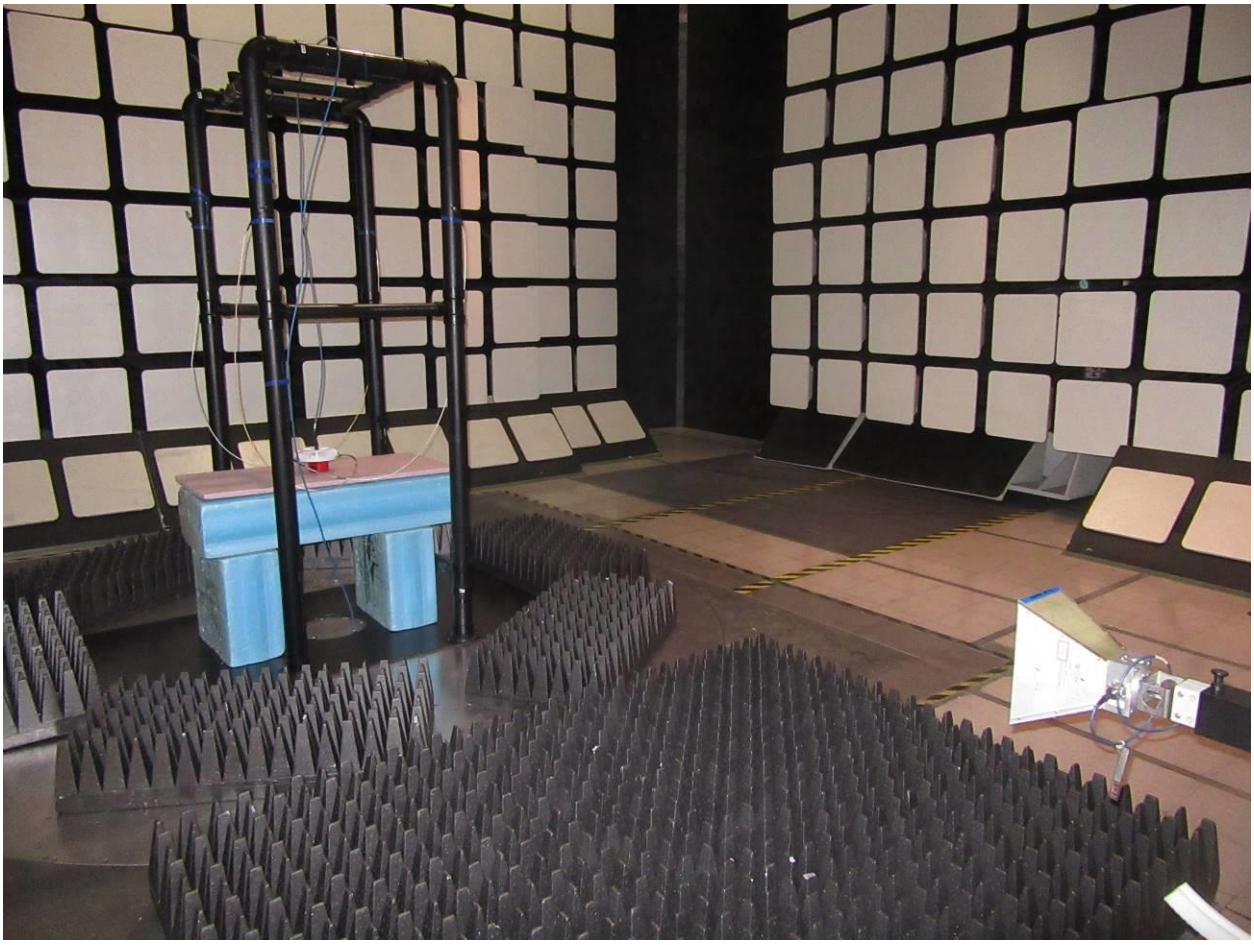


Figure 30: Setup for RE tests for above 1 GHz



3.2.11 Test equipment

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

Table 41: Test equipment used for RE

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

3.2.12 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 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 27 Miscellaneous Wireless Communications Services, U.S. Federal Communications Commission.
8. ICES-003 Issue 6 (2016), Spectrum Management and Telecommunications, Interference-Causing Equipment Standard: Information Technology Equipment (ITE) – Limits and methods of measurement.

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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EMC Test Report

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