



EMC Test Report for DOT 4459 B48 (KRY 901 516/1) and DOT 4469 B48 (KRY 901 516/2) - Introduction of NR10 and NR 15

Tested to: **FCC Part 15 Subpart B**
FCC Part 96 (Section – 96.41 e) 2))

Test Result summary

FCC Section	Description	Specification/Method	Pass or Fail	Results in section
15.109	Radiated Emissions (RE)	FCC Part 15 / ICES 003 / ANSI C63.4	Pass	3.2
15.107	Conducted Emissions (CE) for AC Power	FCC Part 15 / ICES 003 / ANSI C63.4	Not applicable	
96.41 e) 2)	Additional protection levels (RE)	FCC Part 96 / ANSI C63.26	Pass	3.2

Document number: 7169013364-TR-EMC-01-01-F15

Release date: 29 August, 2023

Prepared for: Ericsson Canada



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Release control record

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

Issue	Reason for change	Date released
01	initial release	29 August, 2023


Approvals

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



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Test lab information

Lab name	TÜV SÜD Canada Inc
Company name	TÜV SÜD Canada Inc
Mailing or shipping address	1280 Teron Road, Ottawa, Ontario, K2K 2C1, Canada
Primary technical contact	Scott Drysdale
Title	Canada Wireless Manager
Phone	613-218-1841

Customer information

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



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1. Executive summary

This document reports the Electromagnetic Compatibility (EMC) testing performed on the product called DOT 4459 B48 (KRY 901 516/1) and DOT 4469 B48 (KRY 901 516/2) for Ericsson Canada per project number 7169013364. The objective of the test activities is to evaluate compliance of the product to following EMC regulatory standards.

The DOT 4459 B48 (KRY 901 516/1) and DOT 4469 B48 (KRY 901 516/2) are verified to comply with the Emissions requirements of these standards:

- FCC Part 15 Subpart B [5] (Class B)
- FCC Part 96 [7] (Additional protection levels, Section - 96.41e) 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 4459 B48 (KRY 901 516/1) and DOT 4469 B48 (KRY 901 516/2).

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	Not applicable EUT is POE powered	

Table 2: Summary of test results for the USA; FCC Part 96.41 e) 2)

FCC Section	Description	Specification/Method	Pass or Fail	Results in section
96.41 e) 2)	Additional protection levels - CBSD	FCC Part 96/ 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 4459 B48 - Equipped with 4 internal antennas	KRY 901 516/1
DOT 4469 B48 - Equipped with 4 external antenna ports	KRY 901 516/2
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. Therefore all EMC tests were done only on the external antenna ports variant.	

2.2 Product overview

The product trade name is DOT 4459 B48 (KRY 901 516/1) and DOT 4469 B48 (KRY 901 516/2). The DOT 4459 & DOT 4469 products are indoor wireless telecommunication products. They transmit and receives the cellular signals for 4G and 5G wireless systems; and operates from POE (56 VDC). This DOTs come in 2 variants as mentioned above in [Table 3: Assessed hardware](#).

Figure 1: The EUT with External antenna (DOT 4469)

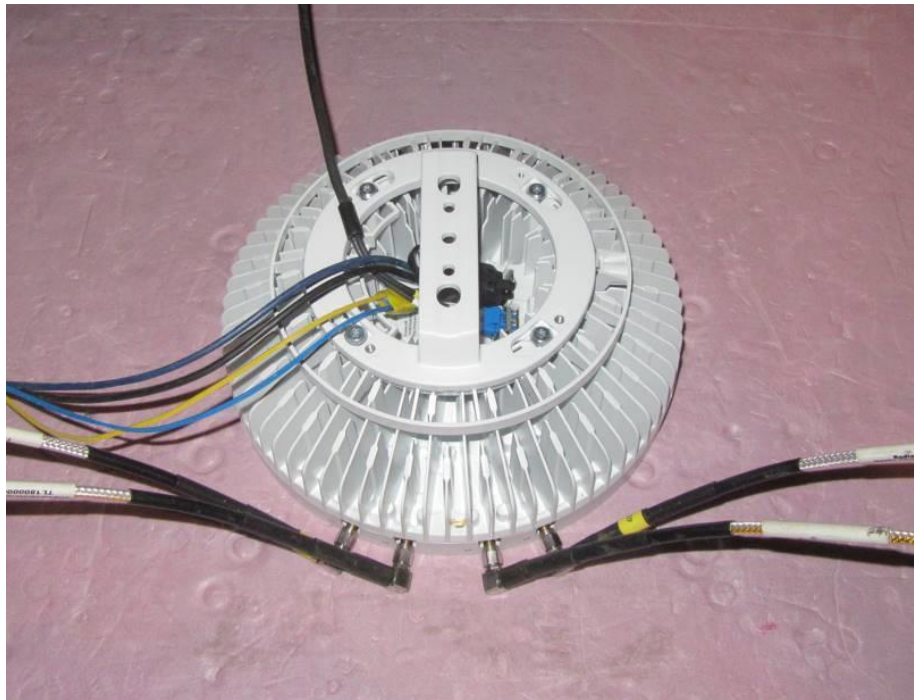




Table 4: Product specifications – Tested DOT 4469

Product data	DOT 4469 B48
Product	Single-band Dot, 4T4R
P/N	KRY 901 516/2
HW Rev	R1A
Nominal Voltage	56Vdc (CAT6A POE or Hybrid cable)
Operating Temperature	+5°C to +40°C
Bands	B48
Antennas	4T4R B48
Output Power per band	400mW (26dBm) (B48, TDD) / branch
Maximum IBW	B48: 200MHz
Contig. / Non-contig	Contig. & Non-Contig
Single RAT (SRO) support	B48: NR-TDD, LTE-TDD
Mixed RAT (MRO) support	B48: NR-TDD + LTE-TDD
Channel Bandwidth B48	NR: 10, 15, 20, 30, 40, 50, 60, 70, 80, 90, 100MHz
	LTE: 5, 10, 15, 20MHz
Nominal O/P per TDD Antenna Port	Single Carrier: 1 x ~250mW (26dBm)
	Multi-Carrier: 2 x 200mW (23dBm)
	Multi-Carrier: 3 x 133.3mW (21.49dBm)
	Multi-Carrier: 4 x 100mW (20dBm)
	Multi-Carrier: 5 x 80mW (19dBm)
Multi-Carrier: 6 x 66.7mW (18.23dBm)	
Max carriers / Branch	B48: Max 12 carriers
CPRI line rate	10.1 Gbps
Compatible IRU	IRU 1648/1649 & 8848
Modulation:	NR: QPSK, 16QAM, 64QAM, 256 QAM
dRDI Interface:	Digital, dRDI compression rev = ATC
SFP Interface:	Optical SFP+, 10.1 Gbps
Mounting	ceiling or wall

The configurations of the tested DOT 4469 B48 (KRY 901 516/2) are shown in the section [Configurations of the EUT](#).

2.3 Clocks, oscillators, or switching frequencies

The maximum clock frequency used to determine the Radiated Emissions (RE) frequency range to test is 3.6975 GHz. The maximum frequency (40 GHz) used for the Radiated Emissions (RE) frequency range was obtained from the 10th harmonic of the highest transmit frequency.

2.4 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 Name	Port Description	Port Type	Interface Detail	Plug-Cable Type
RJ45	Digital RDI / DC Power Input	Telecom / DC Power	ethernet	RJ-45, CAT6A
SFP+	Digital RDI, Optical SFP+	Optical SFP	optical fiber, LC	SFP+, RDH 102 65/2,
3A, 3B, 4A, 4B	RF to antenna B48	Antenna	RF	SMA, Coax >3m

2.5 Configurations of the EUT

Two EUT configurations were used for Radiated Emissions test. [Figure 2](#) and [Figure 3](#) show the configurations of the EUT. All configurations were defined by customer.

Figure 2: Test configuration 1 (DOT 4469 with IRU 1648)

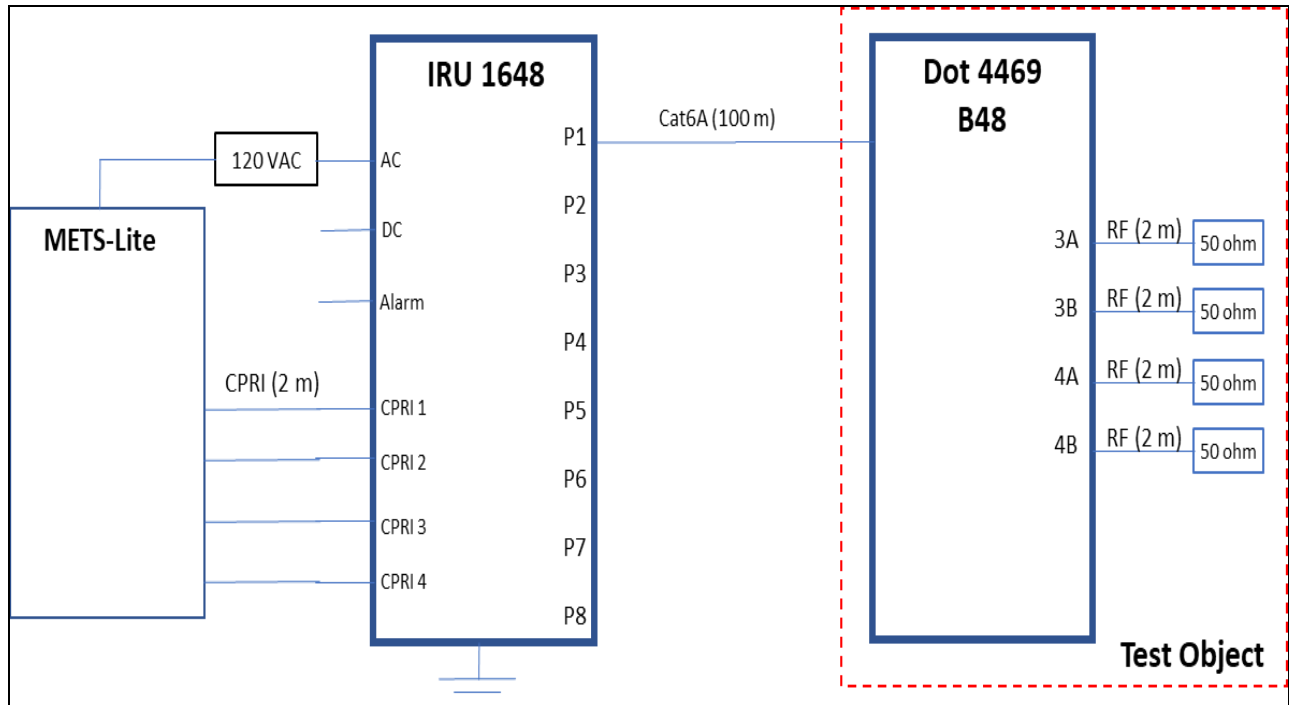
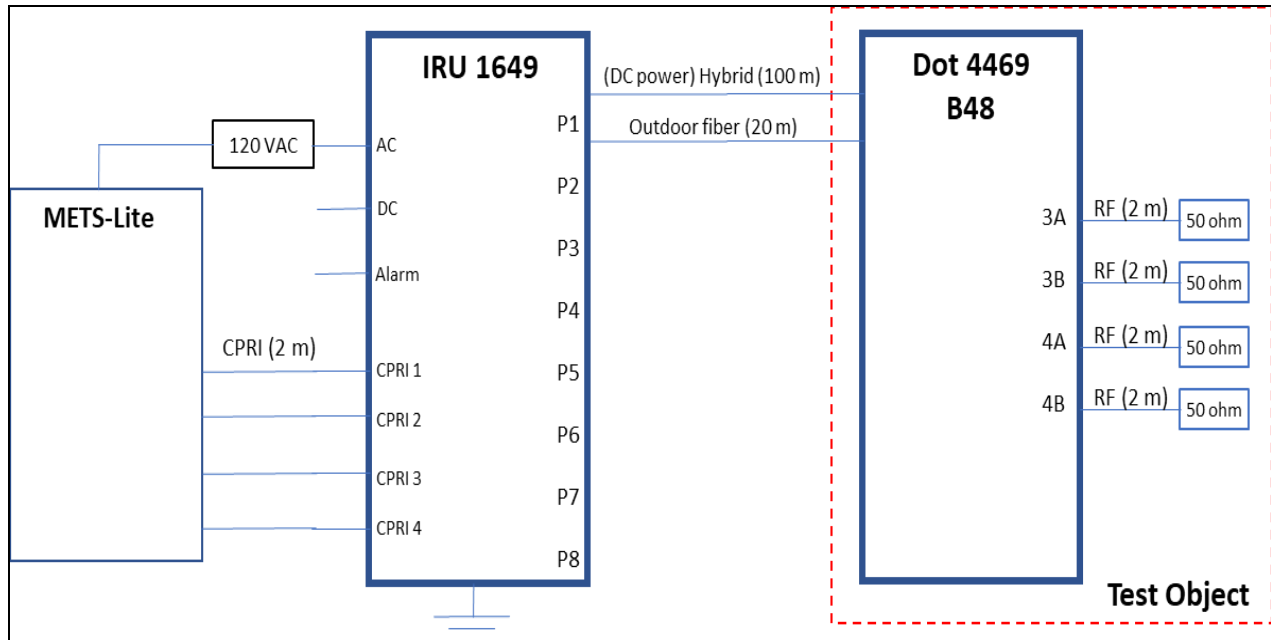


Figure 3: Test configuration 2 (DOT 4469 with IRU 1649)



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

- Radiated Emissions - Single RAT / Single Carrier Configurations (IRU 1648)
- Radiated Emissions - Single RAT / Multi Carrier Configs - Contiguous (IRU 1648)
- Radiated Emissions - Multiple RAT/Multi Carrier Configs-contiguous (IRU 1648)
- Radiated Emissions Single RAT / Single Carrier Configs (IRU 1649)
- Radiated Emissions Single RAT / Multi Carriers - Non-Contiguous Configs (IRU 1649)
- Radiated Emissions Multi RAT/Multi Carriers - Non-Contiguous Configs (IRU 1649)



2.5.1 Radiated Emissions - Single RAT / Single Carrier Configurations (IRU 1648)

Limited Scans:

B48 PORT (3A, 3B, 4A, 4B)
B48 NR TDD Carrier BWs (Center frequency 3625 MHz):
10 MHz
15 MHz

Note: Radiated Emissions measurements were compared between all the above carrier setups. B48 10 MHz NR TDD was found to be the worst case among the above-mentioned carrier setups to perform full/formal scans.

Formal Scans:

Single RAT, Single Carrier – NR TDD B48 Ports 3A, 3B, 4A, 4B – Bottom / Middle / Top (IRU 1648) Center Frequencies		
Bottom 10 MHz Carrier	Middle 10 MHz Carrier	Top 10 MHz Carrier
3555 MHz	3625 MHz	3695 MHz

Note: The overall Single RAT, Single Carrier worst case was deemed to be: 10 MHz NR TDD in B48, which was therefore the preferred configuration for testing the above Bottom/Top Single RAT, Single Carrier cases for formal scans.

Recorded data in the 30 MHz - 1 GHz and 18 GHz - 40 GHz ranges show that they do not contain any channel specific emissions in the Single RAT, Single Carrier, Middle Channel test case. Therefore, 1 GHz - 18 GHz RE sweep was deemed to be sufficient for demonstrating compliance in the Single RAT, Single Carrier, Bottom/Top Channel test case.



2.5.2 Radiated Emissions - Single RAT / Multi Carrier Configs - Contiguous (IRU 1648)

Single RAT, Multiple Carriers – NR TDD B48 Ports 3A, 3B, 4A, 4B – 2 or 12 Carriers, Contiguous (IRU 1648) Center Frequencies	
12 NR TDD 10 MHz Carriers	2 NR TDD 10 MHz Carriers
3570 MHz	
3580 MHz	
3590 MHz	
3600 MHz	
3610 MHz	
3620 MHz	3620 MHz
3630 MHz	3630 MHz
3640 MHz	
3650 MHz	
3660 MHz	
3670 MHz	
3680 MHz	

Note: After performing Limited Scans of the above configurations, the overall Single RAT, Multiple Carriers worst case was deemed to be: two 10 MHz NR carriers in B48, for which formal scans were performed.

Recorded data in the 30 MHz - 1 GHz and 18 GHz - 40 GHz ranges show that they do not contain any channel specific emissions in the Multiple RATs, Multiple Carriers test case. Therefore, 1 GHz - 18 GHz RE sweep was deemed to be sufficient for demonstrating compliance in the Single RAT, Multiple Carriers test case.



2.5.3 Radiated Emissions - Multiple RAT/Multi Carrier Configs-contiguous (IRU 1648)

Multiple RATs, Multiple Carriers – LTE/NR TDD B48 Ports 3A, 3B, 4A, 4B – 2 or 12 Carriers, Contiguous (IRU 1648) Center Frequencies	
6 NR TDD 10 MHz + 6 LTE TDD 5 MHz Carriers	1 NR TDD 10 MHz + 1 LTE TDD 5 MHz Carriers
NR: 3570 MHz NR: 3580 MHz NR: 3590 MHz NR: 3600 MHz NR: 3610 MHz NR: 3620 MHz LTE: 3627.5 MHz LTE: 3632.5 MHz LTE: 3637.5 MHz LTE: 3642.5 MHz LTE: 3647.5 MHz LTE: 3652.5 MHz	NR: 3620 MHz LTE: 3627.5 MHz

Note: After performing Limited Scans of the above configurations, the overall Multiple RATs, Multiple Carriers worst case was deemed to be: one 10 MHz NR TDD carrier and one 5 MHz LTE TDD carrier in B48, for which full/formal scans were performed.

Multiple RAT full scans included the worst case B48 LTE TDD 5 MHz BW Carrier previously evaluated.



2.5.4 Radiated Emissions Single RAT / Single Carrier Configs (IRU 1649)

Single RAT, Single Carrier – NR TDD B48 Ports 3A, 3B, 4A, 4B – Middle (IRU 1649) Center Frequencies Middle 10 MHz Carrier 3625 MHz
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Note: The overall Single RAT, Single Carrier worst case using IRU 1648 was deemed to be: 10 MHz NR TDD in B48, which was therefore the preferred configuration for performing a full/formal scan for Single RAT, Single Carrier case with IRU 1649.

2.5.5 Radiated Emissions Single RAT / Multi Carriers - Non-Contiguous Configs (IRU 1649)

Single RAT, Multiple Carriers – NR TDD B48 Ports 3A, 3B, 4A, 4B – 2 or 12 Carriers, NonContiguous (IRU 1649) Center Frequencies	
12 NR TDD 10 MHz Carriers	2 NR TDD 10 MHz Carriers
3555 MHz	
3565 MHz	
3575 MHz	
3585 MHz	
3595 MHz	
3605 MHz	3555 MHz
3645 MHz	3695 MHz
3655 MHz	
3665 MHz	
3675 MHz	
3685 MHz	
3695 MHz	

Note: After performing Limited Scans of the above configurations, the overall Single RAT, Multiple Carriers worst case was deemed to be: two 10 MHz NR TDD carriers in B48, for which full scans were performed.

Recorded data in the 30 MHz - 1 GHz and 18 GHz - 40 GHz ranges show that they do not contain any channel specific emissions in the Multiple RATs, Multiple Carriers test case. Therefore, 1 GHz - 18 GHz RE sweep was deemed to be sufficient for demonstrating compliance in the Single RAT, Multiple Carriers test case.



2.5.6 Radiated Emissions Multi RAT/Multi Carriers - Non-Contiguous Configs (IRU 1649)

Multiple RATs, Multiple Carriers – LTE/NR TDD B48 Ports 3A, 3B, 4A, 4B – 2 or 12 Carriers, NonContiguous (IRU 1649) Center Frequencies	
6 NR TDD 10 MHz + 6 LTE TDD 5 MHz Carriers	1 NR TDD 10 MHz + 1 LTE TDD 5 MHz Carriers
NR: 3555 MHz NR: 3565 MHz NR: 3575 MHz NR: 3585 MHz NR: 3595 MHz NR: 3605 MHz LTE: 3672.5 MHz LTE: 3677.5 MHz LTE: 3682.5 MHz LTE: 3687.5 MHz LTE: 3692.5 MHz LTE: 3697.5 MHz	NR: 3555 MHz LTE: 3697.5 MHz

Note: After performing Limited Scans of the above configurations, the overall Multiple RATs, Multiple Carriers worst case was deemed to be: one 10 MHz NR TDD carrier and one 5 MHz LTE TDD carrier in B48, for which full scans were performed.

2.6 Modifications of the EUT during testing

The EUT was not modified prior to or during testing.



2.7 Inventory of the EUT and support equipments

The following tables identifies the inventory of the EUT.

Table 6: Inventory of the EUT (IRU 1648)

Equipment Role	Product Name	Model	Release	Product Serial#
EUT	DOT 4469 B48	KRY 901 516/2	R1A	TD3W213286
SUPPORT	IRU 1648	KRC 161 842/1	R1E	TD3F117342
SFP+ module	Optical Transceiver Module (CPRI & 10GBASE-LR Lite)	Ericsson RDH10265/2	na	na
Cable	IRU CPRI, Fiber, LC, SM, 2 m	na	na	na
Cable	dRDI cable, 100 m	Schnieder, F/FTP	na	na
Cable	RF, SMA, 2 m, qty=4	na	na	na
TEST SET	METS-Lite (RUX + CT-DU25)	LPC 102 500/1	R3B	T01G525056
RUX software version	IRU load: CXP2030045%26_R17B483 RUX rev: R9T_Release2_Package RUX testDef: _RRUS_DOT_Ph4_B48_V22_R9L Tester: Naga, Avul			

Table 7: Inventory of the EUT (IRU 1649)

Equipment Role	Product Name	Product Number	Release	Serial#
EUT	DOT 4469 B48	KRY 901 516/2	R1A	TD3W213286
SUPPORT	IRU 1649	KRC 161 842/2	R1E	TD3F109016
SFP+ module	Optical Transceiver Module (CPRI & 10GBASE-LR Lite)	Ericsson RDH10265/2	na	na
Cable	IRU CPRI, Fiber, LC, SM, 2 m	na	na	na
Cable	IRU to Dot, DC Power, 2-wire, 100 m	na	na	na
Cable	IRU to Dot, dRDI-optical, Outdoor Fiber, LC, SM, 20 m	na	na	na
Cable	RF, SMA, 2 m, qty=4	na	na	na
TEST SET	METS-Lite (RUX + CT-DU25)	LPC 102 500/1	R3B	T01G525056
RUX software version	IRU load: CXP2030045%26_R17B483 RUX rev: R9T_Release2_Package RUX testDef: _RRUS_DOT_Ph4_B48_V22_R9L Tester: Naga, Avul			



3. Detailed test results of Emissions

Emissions from systems manifest themselves in two forms: conducted emissions on cables and radiated emissions from the entire system (i.e. electronic modules, hardware, and cables). Regulatory standards restrict these different forms of emissions generated by the system.

The temperature and humidity in the test facilities are controlled. The temperature is maintained between 20 °C and 25 °C, with a relative humidity between 30 % and 60 %. Levels are recorded and any exceptions are included in the detailed test results sections of this report.

3.1 Measurement instrumentation

The measurement instrumentation conforms to the relevant standards in this report: ANSI C63.2, CISPR 16, CISPR 22, and CISPR 32. Calibration of the measurement instrumentation is maintained in accordance with the supplier's recommendations, or as necessary to ensure its accuracy.

3.2 Radiated Emissions, E-field (RE)

This test verifies that the EUT does not produce excess amounts of E-field Radiated Emissions (RE) that could interfere with licensed radiators.

3.2.1 Test specification and limits

The testing requirements are as follows.

Table 8: RE test requirements

Requirement	Method	Country of application
FCC Part 15, Subpart B	FCC Part 15 / ANSI C63.4	USA
FCC Part 96 (Section 96.41 e) 2))	ANSI C63.26	USA

The limits of the RE tests are as follows.

Table 9: RE limits at 10 m for Class B of FCC Part 15

Frequency range (MHz)	FCC Part 15 (dB μ V/m)	Detector
30 to 88	29.5	Quasi-Peak
88 to 216	33.0	Quasi-Peak
216 to 960	35.5	Quasi-Peak
960 to 1000	43.5	Quasi-Peak
1000 to 40000	43.5	Average

Table 10: Emission limits for FCC Part 96 e) 2)

Frequency range (MHz)	FCC Part 96 EIRP Limit Section 96.41 e) 2) (dBm)	Calculated EIRP Limit in dB μ V/m
Below 3540 MHz or above 3710 MHz	-25	70.23
Below 3530 MHz or above 3720 MHz	-40	55.23

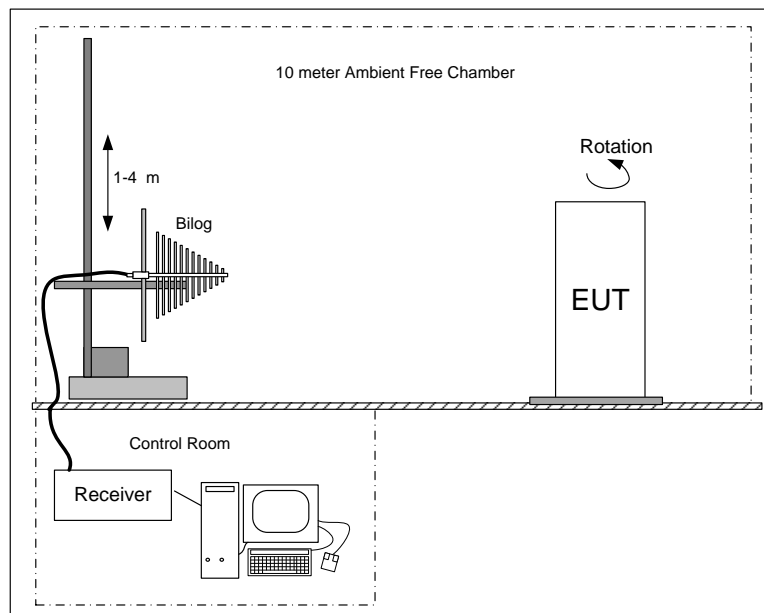
3.2.2 Test procedure

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 4: Setup of Radiated Emissions



3.2.3 Calculation of the compliance margin

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

The rows in these tables are defined as follows.

Meter Reading (dB μ V) = Voltage measured using the spectrum analyzer with the proper detector

Correction (dB) = Cumulative gain or loss of pre-amplifier and cables used in the measurement path (dB) + Antenna Factor (dB)

Level (dB μ V/m) = Corrected value or field strength, that is, the parameter of interest that is compared to the limit

Margin (dB) = Level with respect to the appropriate limit (a negative Margin indicates that the Level is below the limit and that the measurement is a Pass)

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

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

3.2.4 Measurement uncertainties

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

- ± 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 Radiated Emissions test ranges

As per customer request following test ranges were tested on each test configuration.

Table 11: Radiated Emissions test range selection - by customer

EUT Configurations/Setup	Test result	30 – 1000 (MHz)	1 – 10 (GHz)	10 – 18 (GHz)	18 – 26.5 (GHz)	26.5 – 40 (GHz)
Single RAT / Single carrier - NR - Middle channel with IRU 1648 - Section 2.5.1	3.2.6	Yes	Yes	Yes	Yes	Yes
Single RAT / Single carrier - NR - Bottom channel with IRU 1648 - Section 2.5.1	3.2.7	No	Yes	Yes	No	No
Single RAT / Single carrier - NR - Top channel with IRU 1648 - Section 2.5.1	3.2.8	No	Yes	Yes	No	No
Single RAT / Multiple Carriers – Contiguous with IRU 1648 – Section 2.5.2	3.2.9	No	Yes	Yes	No	No
Multiple RATs / Multiple Carriers – Contiguous with IRU 1648 - Section 2.5.3	3.2.10	Yes	Yes	Yes	Yes	Yes
Single RAT / Single Carrier – Middle with IRU 1649 – Section 2.5.4	3.2.11	Yes	Yes	Yes	Yes	Yes
Single RAT / Multiple Carriers – Non-Contiguous with IRU 1649 - Section 0	3.2.12	No	Yes	Yes	No	No
Multiple RATs / Multiple Carriers – Non-Contiguous with IRU 1649 – Section 0	3.2.13	Yes	Yes	Yes	Yes	Yes



3.2.6 Test results of RE (Single RAT/Single carrier – NR - Mid channel) with IRU 1648

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

Date tested: 20 - 26 July 2023

Tested by: Nour El Masri

Test configurations are identified in sections [Configurations of the EUT & Radiated Emissions - Single RAT / Single Carrier Configurations \(IRU 1648\)](#).

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

Figure 5: Plot of RE at 3 m – 30 to 1000 MHz (S.RAT/ S Carrier – NR- Mid ch) - IRU 1648

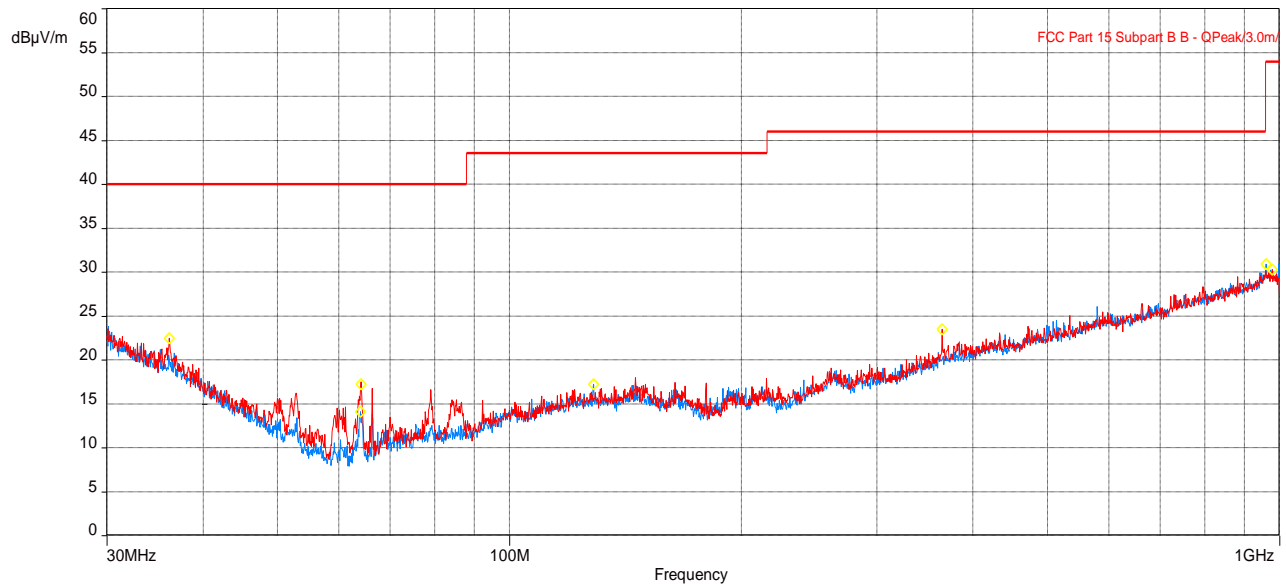


Table 12: RE test results from 30 to 1000 MHz for FCC Part 15 (S.RAT/S.Carrier – Mid ch – IRU 1648)

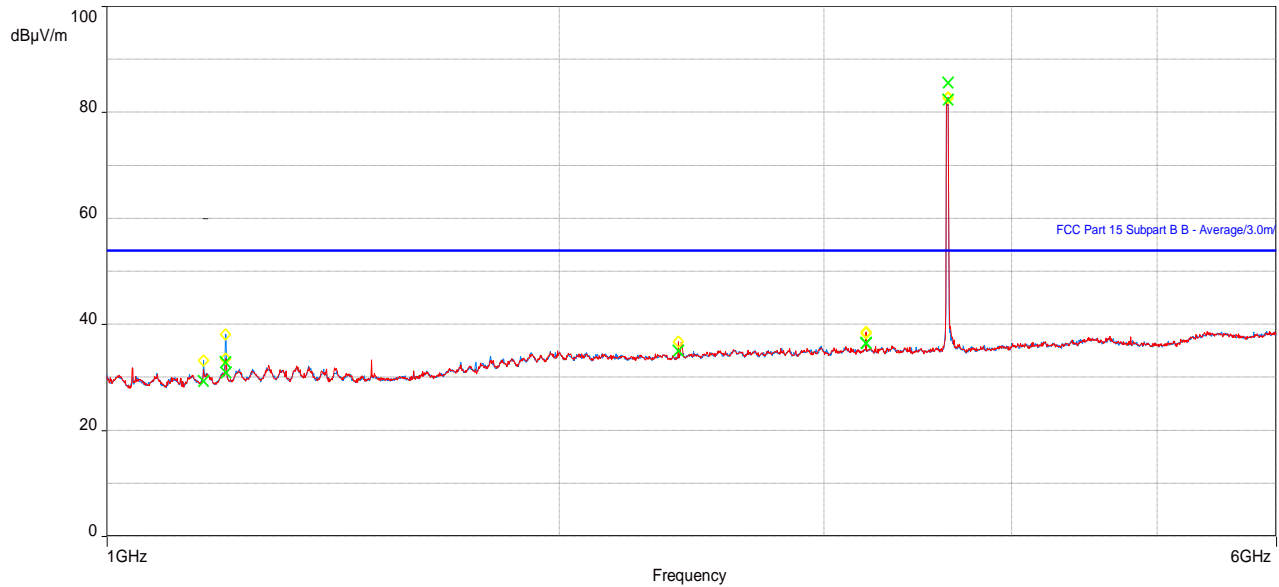
Frequency (MHz)	Level Quasi Peak (dBµV/m)	Limit Quasi-peak (dBµV/m)	Margin to FCC part 15 Class B (dB)	Height (m)	Azimuth (deg)	Polarization	Correction (dB)
36.18800674	18.52	40.00	-21.48	1.00	126.25	Vertical	-6.15
364.4331251	17.45	46.02	-28.57	1.34	239.00	Vertical	-4.76
979.0886633	23.98	53.98	-30.00	1.86	237.75	Vertical	6.04
960.1153718	24.29	53.98	-29.69	2.39	70.50	Horizontal	6.02

Table 13: RE test results from 30 to 1000 MHz for FCC Part 96 (S.RAT/S.Carrier – Mid ch – IRU 1648)

Frequency (MHz)	Level (dBµV/m)	EIRP Limit (dBµV/m)	Margin to (dB)	Height (m)	Azimuth (deg)	Polarization	Correction (dB)
36.18800674	18.52	55.23	-36.71	1.00	126.25	Vertical	-6.15
364.4331251	17.45	55.23	-37.78	1.34	239.00	Vertical	-4.76
979.0886633	23.98	55.23	-31.25	1.86	237.75	Vertical	6.04
960.1153718	24.29	55.23	-30.94	2.39	70.50	Horizontal	6.02

Note: In the table/Plot above, no emissions exceed the Part 96 radiated spurious emissions limit when converted to dBuV/m. For final spurious emissions measurements to FCC Part 96, see antenna port conducted emissions in applicable test report.

Figure 6: Plot of RE at 3m from 1 to 6 GHz (S.RAT/ S.Carrier – NR- Mid ch – IRU 1648)



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

Table 14: RE test results from 1 to 6 GHz for FCC Part 15 (S.RAT/S.Carrier – Mid ch – IRU 1648)

Frequency (MHz)	Level Average (dBµV/m)	Limit Average (dBµV/m)	Margin to FCC part 15 Class B (dB)	Height (m)	Azimuth (degrees)	Polarization	Correction (dB)
2399.998364	34.98	53.96	-18.98	2.23	297.50	Vertical	1.71
3200.001603	36.47	53.96	-17.49	2.08	91.50	Vertical	3.26
1199.639456	32.86	53.96	-21.10	2.08	268.25	Horizontal	-3.76

Table 15: RE test results from 1 to 6 GHz for Part 96 (S.RAT/S.Carrier – Mid ch – IRU 1648)

Frequency (MHz)	Level (dBµV/m)	EIRP Limit (dBµV/m)	Margin to (dB)	Height (m)	Azimuth (degrees)	Polarization	Correction (dB)
2399.998364	34.98	55.23	-20.25	2.23	297.50	Vertical	1.71
3200.001603	36.47	55.23	-18.76	2.08	91.50	Vertical	3.26
1199.639456	32.86	55.23	-22.37	2.08	268.25	Horizontal	-3.76

Note: In the table/Plot above, no emissions exceed the Part 96 radiated spurious emissions limit when converted to dBuV/m, except for the fundamentals. For final spurious emissions measurements to FCC Part 96, see antenna port conducted emissions in applicable test report.



Figure 7: Plot of RE at 3m from 6 to 10 GHz (S.RAT/ S.Carrier – NR- Mid ch – IRU 1648)

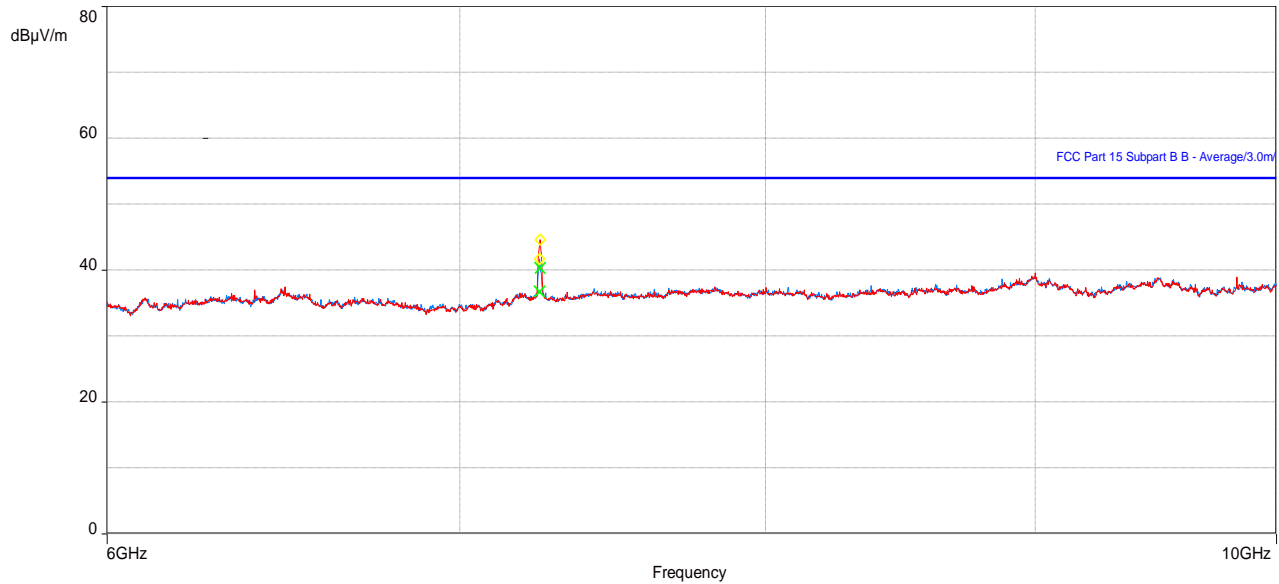


Table 16: RE test results from 6 to 10 GHz for FCC Part 15 (S.RAT/S.Carrier – Mid ch – IRU 1648)

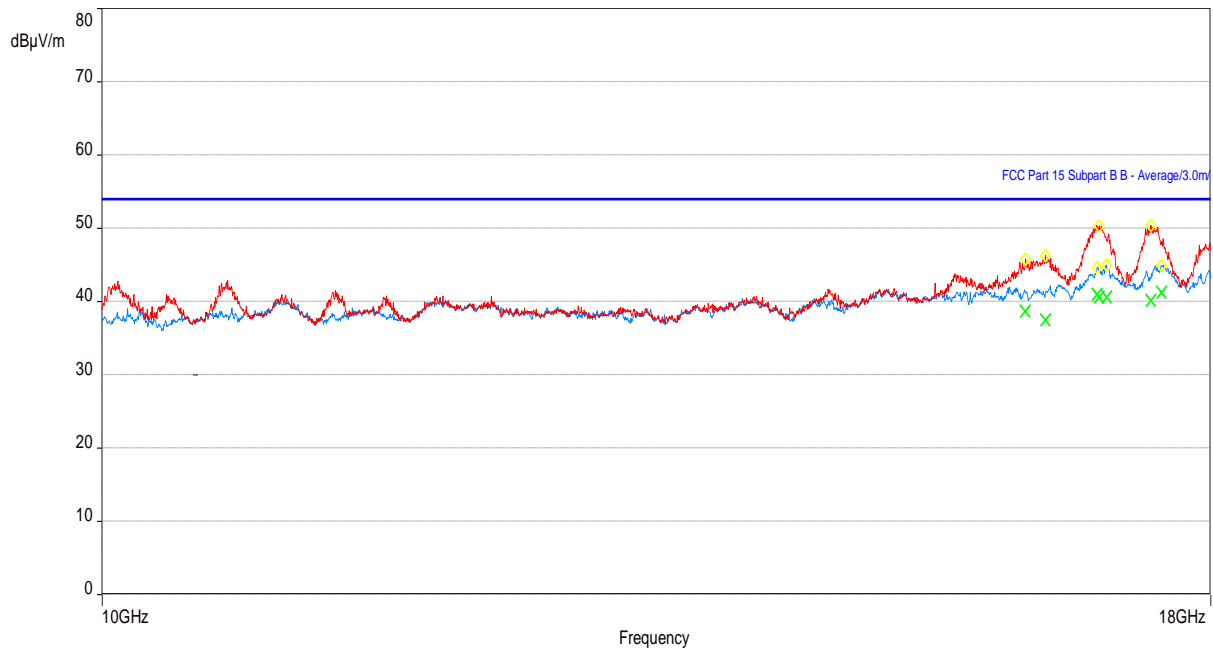
Frequency (MHz)	Level Average (dBµV/m)	Limit Average (dBµV/m)	Margin to FCC part 15 Class B (dB)	Height (m)	Azimuth (degrees)	Polarization	Correction (dB)
7250.415738	40.31	53.96	-13.65	2.74	104.75	Vertical	2.83
7248.545833	36.67	53.96	-17.29	2.12	30.75	Horizontal	2.84

Table 17: RE test results from 6 to 10 GHz for Part 96 (S.RAT/S.Carrier – Mid ch – IRU 1648)

Frequency (MHz)	Level (dBµV/m)	EIRP Limit (dBµV/m)	Margin to (dB)	Height (m)	Azimuth (degrees)	Polarization	Correction (dB)
7250.415738	40.31	55.23	-14.92	2.74	104.75	Vertical	2.83
7248.545833	36.67	55.23	-18.56	2.12	30.75	Horizontal	2.84

Note: In the table/Plot above, no emissions exceed the Part 96 radiated spurious emissions limit when converted to dBuV/m, except for the fundamentals. For final spurious emissions measurements to FCC Part 96, see antenna port conducted emissions in applicable test report.

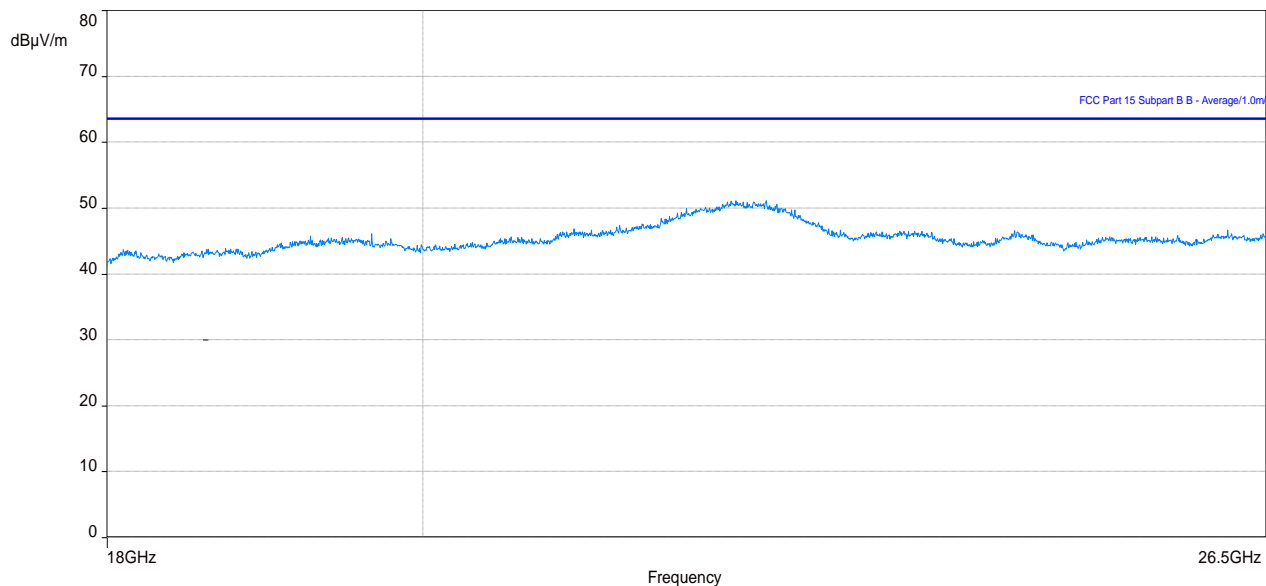
Figure 8: Plot of RE at 3m from 10 to 18 GHz (S.RAT/S.Carrier – NR - Mid ch – IRU 1648)



Note 1: In the Plot above, no emissions exceed the FCC Part 15 radiated emissions limit.

Note 2: In the Plot above, no emissions exceed the Part 96 radiated spurious emissions limit when converted to dBuV/m. For final spurious emissions measurements to FCC Part 96, see antenna port conducted emissions in applicable test report.

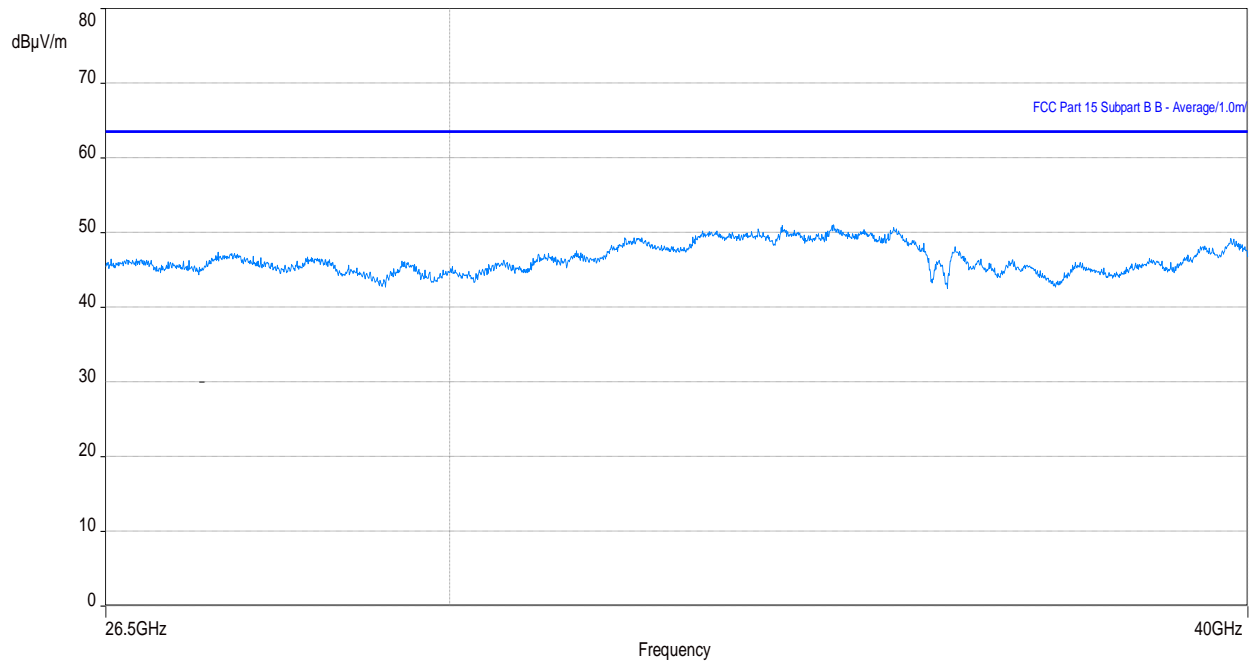
Figure 9: Plot of RE at 1m from 18 to 26.5 GHz (S.RAT/S.Carrier – NR - Mid ch – IRU 1648)



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 96 radiated spurious emissions limit when converted to dBuV/m. For final spurious emissions measurements to FCC Part 96, see antenna port conducted emissions in applicable test report.

Figure 10: Plot of RE at 1m from 26.5 to 40 GHz (S.RAT/S.Carrier – NR - Mid ch – IRU 1648)



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 96 radiated spurious emissions limit when converted to dBuV/m. For final spurious emissions measurements to FCC Part 96, see antenna port conducted emissions in applicable test report.



3.2.7 Test results of RE (Single RAT/Single carrier–NR - Bot ch) with IRU 1648

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

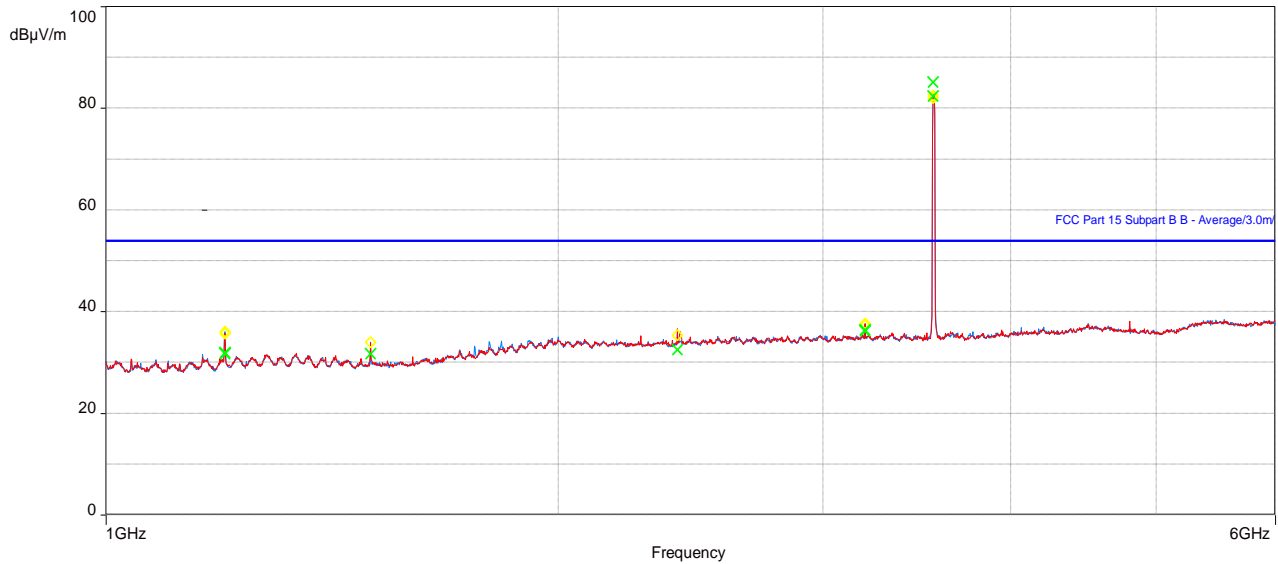
Date tested: 20 - 26 July 2023

Tested by: Nour El Masri

Test configurations are identified in sections [Configurations of the EUT & Radiated Emissions - Single RAT / Single Carrier Configurations \(IRU 1648\)](#).

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

Figure 11: Plot of RE at 3m from 1 to 6 GHz (S.RAT/ S.Carrier – NR - Bot ch – IRU 1648)



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

Table 18: RE test results from 1 to 6 GHz for FCC Part 15 (S.RAT/S.Carrier – Bot ch – IRU 1648)

Frequency (MHz)	Level Average (dBµV/m)	Limit Average (dBµV/m)	Margin to FCC part 15 Class B (dB)	Height (m)	Azimuth (degrees)	Polarization	Correction (dB)
3199.998397	36.41	53.96	-17.55	2.08	91.50	Vertical	3.26
1200.115351	31.87	53.96	-22.09	1.64	84.25	Horizontal	-3.75
2400.001636	32.50	53.96	-21.46	1.98	98.75	Horizontal	1.71

Table 19: RE test results from 1 to 6 GHz for Part 96 (S.RAT/S.Carrier – Bot ch – IRU 1648)

Frequency (MHz)	Level (dBµV/m)	EIRP Limit (dBµV/m)	Margin to (dB)	Height (m)	Azimuth (degrees)	Polarization	Correction (dB)
3199.998397	36.41	55.23	-18.82	2.08	91.50	Vertical	3.26
1200.115351	31.87	55.23	-23.36	1.64	84.25	Horizontal	-3.75
2400.001636	32.50	55.23	-22.73	1.98	98.75	Horizontal	1.71

Note: In the table/Plot above, no emissions exceed the Part 96 radiated spurious emissions limit when converted to dBuV/m, except for the fundamentals. For final spurious emissions measurements to FCC Part 96, see antenna port conducted emissions in applicable test report.



Figure 12: Plot of RE at 3m from 6 to 10 GHz (S.RAT/ S.Carrier – NR - Bot ch – IRU 1648)

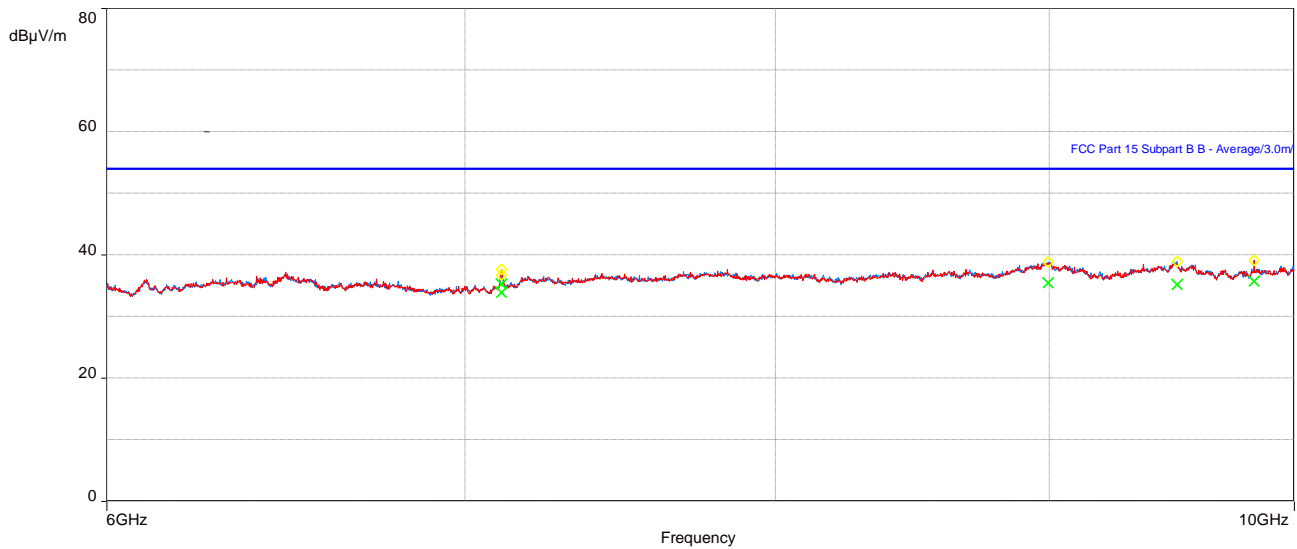


Table 20: RE test results from 6 to 10 GHz for FCC Part 15 (S.RAT/S.Carrier – Bot ch – IRU 1648)

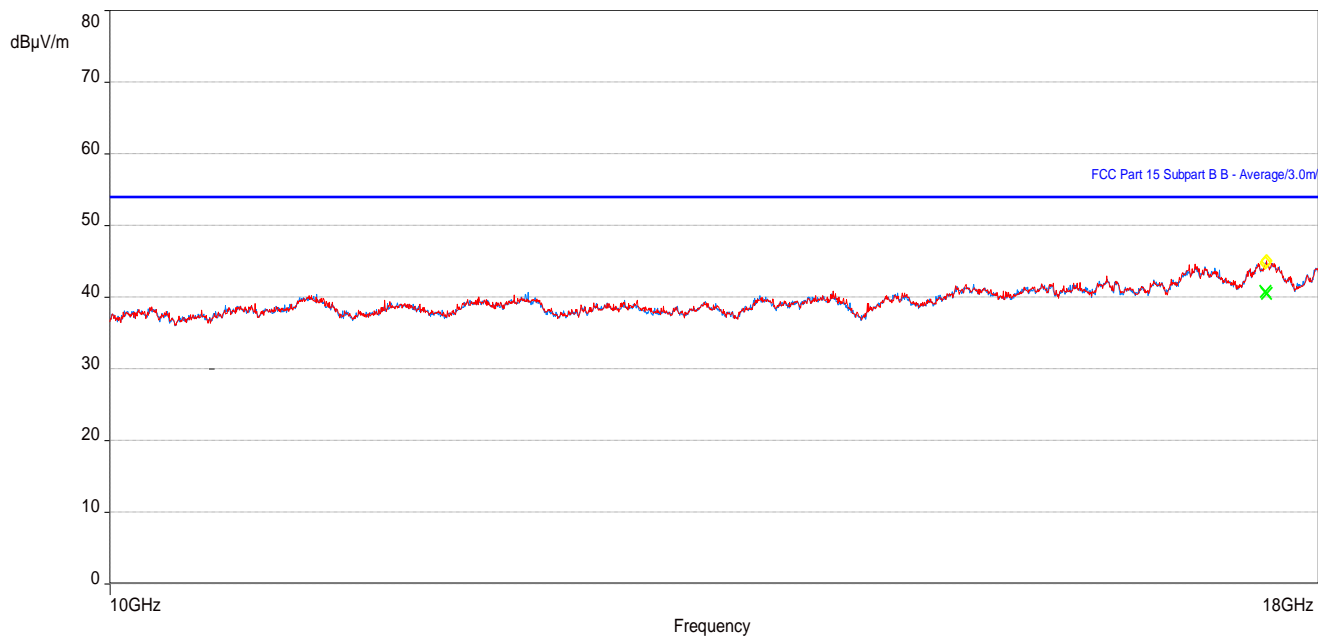
Frequency (MHz)	Level Average (dBµV/m)	Limit Average (dBµV/m)	Margin to FCC part 15 Class B (dB)	Height (m)	Azimuth (degrees)	Polarization	Correction (dB)
7110.566667	35.28	53.96	-18.68	1.98	170.75	Vertical	2.54
9830.401603	35.74	53.96	-18.22	1.00	268.75	Vertical	3.96
8996.313749	35.40	53.96	-18.56	1.00	322.50	Horizontal	5.54

Table 21: RE test results from 6 to 10 GHz for Part 96 (S.RAT/S.Carrier – Bot ch – IRU 1648)

Frequency (MHz)	Level (dBµV/m)	EIRP Limit (dBµV/m)	Margin to (dB)	Height (m)	Azimuth (degrees)	Polarization	Correction (dB)
7110.566667	35.28	55.23	-19.95	1.98	170.75	Vertical	2.54
9830.401603	35.74	55.23	-19.49	1.00	268.75	Vertical	3.96
8996.313749	35.40	55.23	-19.83	1.00	322.50	Horizontal	5.54

Note: In the table/Plot above, no emissions exceed the Part 96 radiated spurious emissions limit when converted to dBuV/m, except for the fundamentals. For final spurious emissions measurements to FCC Part 96, see antenna port conducted emissions in applicable test report.

Figure 13: Plot of RE at 3m from 10 to 18 GHz (S.RAT/S.Carrier – NR - Bot ch – IRU 1648)



Note 1: In the Plot above, no emissions exceed the FCC Part 15 radiated emissions limit.

Note 2: In the Plot above, no emissions exceed the Part 96 radiated spurious emissions limit when converted to dBuV/m. For final spurious emissions measurements to FCC Part 96, see antenna port conducted emissions in applicable test report.



3.2.8 Test results of RE (Single RAT/Single carrier– NR – Top ch) with IRU 1648)

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

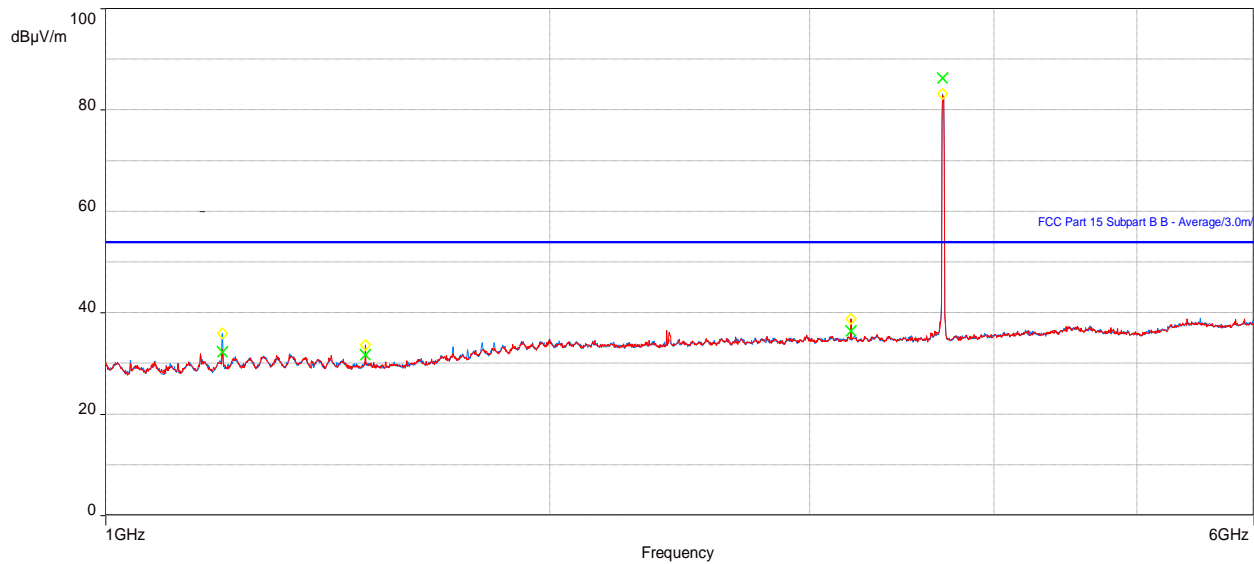
Date tested: 20 - 26 July 2023

Tested by: Nour El Masri

Test configurations are identified in sections [Configurations of the EUT & Radiated Emissions - Single RAT / Single Carrier Configurations \(IRU 1648\)](#).

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

Figure 14: Plot of RE at 3m from 1 to 6 GHz (S.RAT/ S.Carrier – NR - Top ch – IRU 1648)



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

Table 22: RE test results from 1 to 6 GHz for FCC Part 15 (S.RAT/S.Carrier – Top ch – IRU 1648)

Frequency (MHz)	Level Average (dBµV/m)	Limit Average (dBµV/m)	Margin to FCC part 15 Class B (dB)	Height (m)	Azimuth (degrees)	Polarization	Correction (dB)
3200.001603	36.36	53.96	-17.60	2.08	91.50	Vertical	3.26
1199.998364	32.23	53.96	-21.73	1.73	268.25	Horizontal	-3.76

Table 23: RE test results from 1 to 6 GHz for Part 96 (S.RAT/S.Carrier – Top ch – IRU 1648)

Frequency (MHz)	Level (dBµV/m)	EIRP Limit (dBµV/m)	Margin to (dB)	Height (m)	Azimuth (degrees)	Polarization	Correction (dB)
3200.001603	36.36	55.23	-18.87	2.08	91.50	Vertical	3.26
1199.998364	32.23	55.23	-23.00	1.73	268.25	Horizontal	-3.76

Note: In the table/Plot above, no emissions exceed the Part 96 radiated spurious emissions limit when converted to dBuV/m, except for the fundamentals. For final spurious emissions measurements to FCC Part 96, see antenna port conducted emissions in applicable test report.



Figure 15: Plot of RE at 3m from 6 to 10 GHz (S.RAT/ S.Carrier – NR - Top ch – IRU 1648)

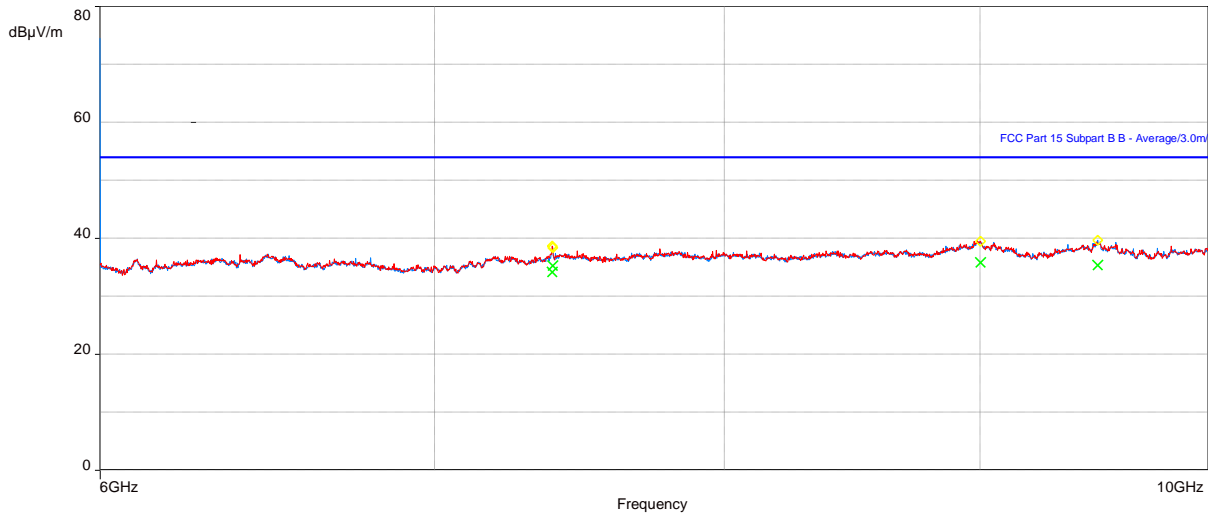


Table 24: RE test results from 6 to 10 GHz for FCC Part 15 (S.RAT/S.Carrier – Top ch – IRU 1648)

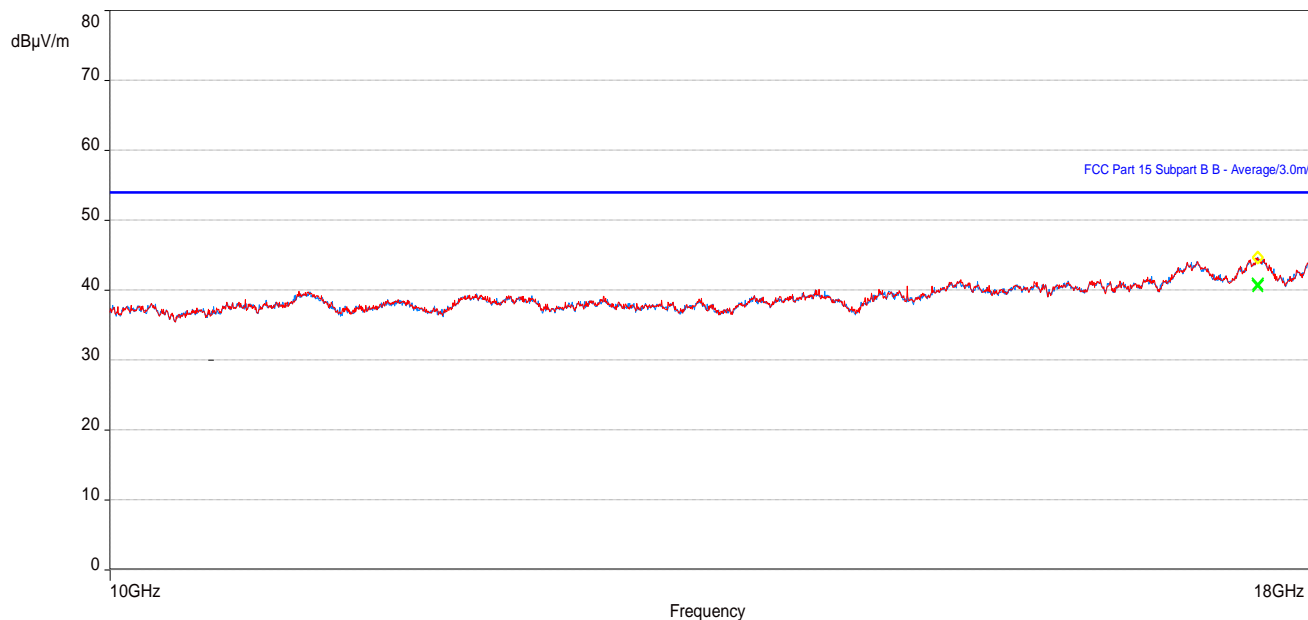
Frequency (MHz)	Level Average (dBµV/m)	Limit Average (dBµV/m)	Margin to FCC part 15 Class B (dB)	Height (m)	Azimuth (degrees)	Polarization	Correction (dB)
9003.087533	35.75	53.96	-18.21	1.00	357.00	Vertical	5.65
7391.347723	35.26	53.96	-18.70	2.22	0.00	Horizontal	2.34
9502.075033	35.33	53.96	-18.63	1.00	306.75	Horizontal	6.69

Table 25: RE test results from 6 to 10 GHz for Part 96 (S.RAT/S.Carrier – Top ch – IRU 1648)

Frequency (MHz)	Level (dBµV/m)	EIRP Limit (dBµV/m)	Margin to (dB)	Height (m)	Azimuth (degrees)	Polarization	Correction (dB)
9003.087533	35.75	55.23	-19.48	1.00	357.00	Vertical	5.65
7391.347723	35.26	55.23	-19.97	2.22	0.00	Horizontal	2.34
9502.075033	35.33	55.23	-19.90	1.00	306.75	Horizontal	6.69

Note: In the table/Plot above, no emissions exceed the Part 96 radiated spurious emissions limit when converted to dBuV/m, except for the fundamentals. For final spurious emissions measurements to FCC Part 96, see antenna port conducted emissions in applicable test report.

Figure 16: Plot of RE at 3m from 10 to 18 GHz (S.RAT/S.Carrier – NR - Top ch – IRU 1648)



Note 1: In the Plot above, no emissions exceed the FCC Part 15 radiated emissions limit.

Note 2: In the Plot above, no emissions exceed the Part 96 radiated spurious emissions limit when converted to dBuV/m. For final spurious emissions measurements to FCC Part 96, see antenna port conducted emissions in applicable test report.



3.2.9 Test results of RE (Single RAT/ Multi carrier, Contiguous – Mid ch) with IRU 1648

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

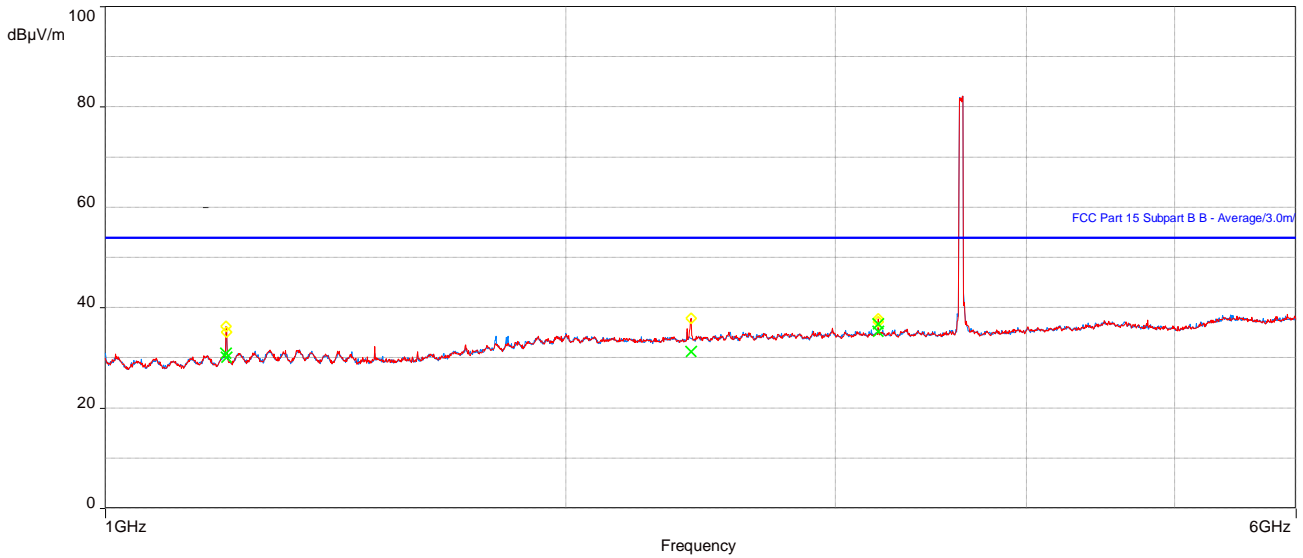
Date tested: 20 - 26 July 2023

Tested by: Nour El Masri

Test configurations are identified in sections [Configurations of the EUT & Radiated Emissions - Single RAT / Multi Carrier Configs - Contiguous \(IRU 1648\)](#).

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

Figure 17: Plot of RE at 3m from 1 to 6 GHz (S.RAT/Multi Carrier – Mid ch – IRU 1648)



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

Table 26: RE test results from 1 to 6 GHz for FCC Part 15 (S.RAT/Multi Carrier – Mid ch – IRU 1648)

Frequency (MHz)	Level Average (dBµV/m)	Limit Average (dBµV/m)	Margin to FCC part 15 Class B (dB)	Height (m)	Azimuth (degrees)	Polarization	Correction (dB)
2414.708367	31.17	53.96	-22.79	1.31	103.25	Vertical	1.79
3199.998397	36.66	53.96	-17.30	2.08	91.25	Vertical	3.26
1199.903846	30.11	53.96	-23.85	3.00	40.75	Horizontal	-3.76
3199.998397	35.27	53.96	-18.69	2.49	163.50	Horizontal	3.26

Table 27: RE test results from 1 to 6 GHz for Part 96 (S.RAT/Multi Carrier – Mid ch – IRU 1648)

Frequency (MHz)	Level (dBµV/m)	EIRP Limit (dBµV/m)	Margin to (dB)	Height (m)	Azimuth (degrees)	Polarization	Correction (dB)
2414.708367	31.17	55.23	-24.06	1.31	103.25	Vertical	1.79
3199.998397	36.66	55.23	-18.57	2.08	91.25	Vertical	3.26
1199.903846	30.11	55.23	-25.12	3.00	40.75	Horizontal	-3.76
3199.998397	35.27	55.23	-19.96	2.49	163.50	Horizontal	3.26

Note: In the table/Plot above, no emissions exceed the Part 96 radiated spurious emissions limit when converted to dBuV/m, except for the fundamentals. For final spurious emissions measurements to FCC Part 96, see antenna port conducted emissions in applicable test report.

Figure 18: Plot of RE at 3m from 6 to 10 GHz (S.RAT/Multi Carrier – Mid ch – IRU 1648)

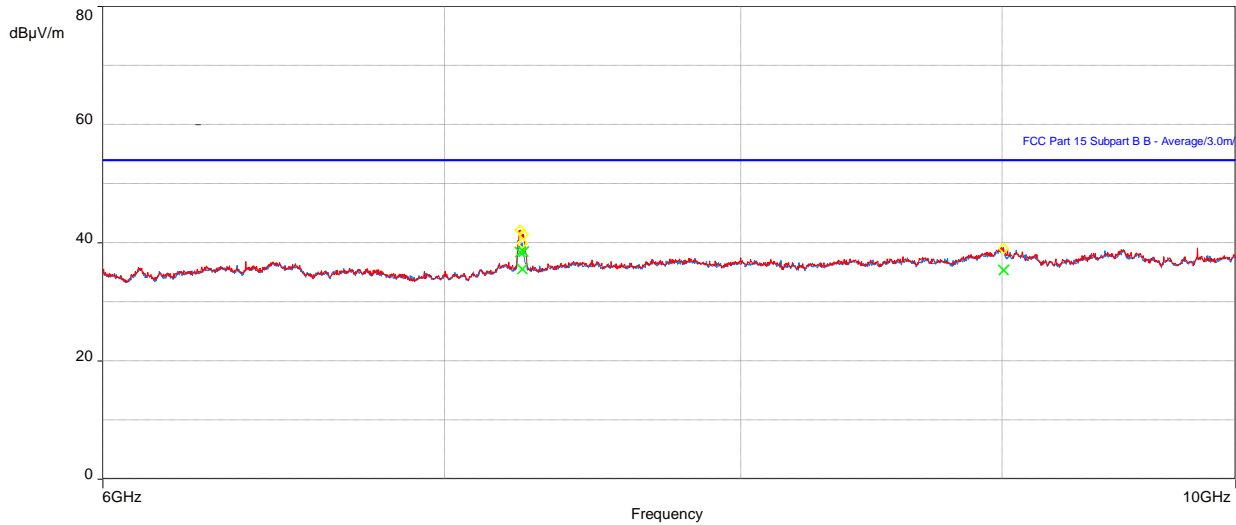


Table 28: RE test results from 6 to 10 GHz for FCC Part 15 (S.RAT/Multi Carrier – Mid ch – IRU 1648)

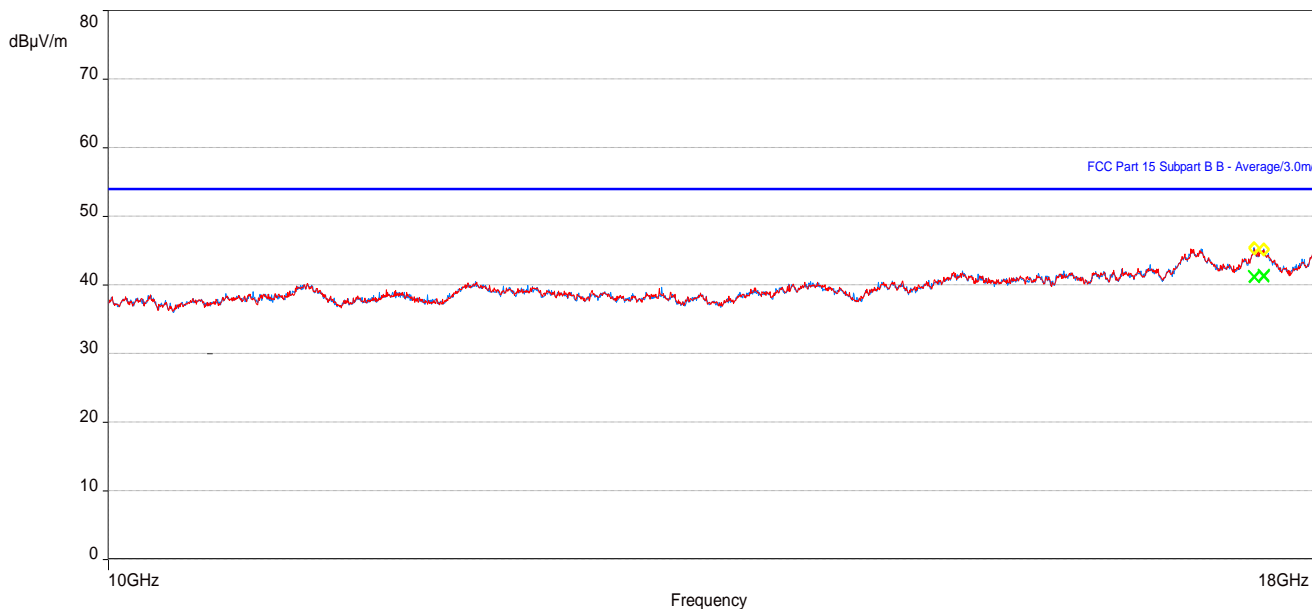
Frequency (MHz)	Level Average (dBµV/m)	Limit Average (dBµV/m)	Margin to FCC part 15 Class B (dB)	Height (m)	Azimuth (degrees)	Polarization	Correction (dB)
7243.383367	38.35	53.96	-15.61	3.00	105.50	Vertical	2.87
7252.970546	38.41	53.96	-15.55	3.00	105.75	Vertical	2.81

Table 29: RE test results from 6 to 10 GHz for Part 96 (S.RAT/Multi Carrier – Mid ch – IRU 1648)

Frequency (MHz)	Level (dBµV/m)	EIRP Limit (dBµV/m)	Margin to (dB)	Height (m)	Azimuth (degrees)	Polarization	Correction (dB)
7243.383367	38.35	55.23	-16.88	3.00	105.50	Vertical	2.87
7252.970546	38.41	55.23	-16.82	3.00	105.75	Vertical	2.81

Note: In the table/Plot above, no emissions exceed the Part 96 radiated spurious emissions limit when converted to dBuV/m, except for the fundamentals. For final spurious emissions measurements to FCC Part 96, see antenna port conducted emissions in applicable test report.

Figure 19: Plot of RE at 3m from 10 to 18 GHz (S.RAT/Multi Carrier – Mid ch – IRU 1648)



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 96 radiated spurious emissions limit when converted to dBuV/m. For final spurious emissions measurements to FCC Part 96, see antenna port conducted emissions in applicable test report.



3.2.10 Test results of RE (Multi RAT / Multi carrier - Mid channel) with IRU 1648

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

Date tested: 20 - 26 July 2023

Tested by: Nour El Masri

Test configurations are identified in the sections [Configurations of the EUT & Radiated Emissions - Multiple RAT/Multi Carrier Configs-contiguous \(IRU 1648\)](#).

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

Figure 20: Plot of RE at 3 m – 30 to 1000 MHz (M.RAT/M.Carrier – Mid ch – IRU 1648)

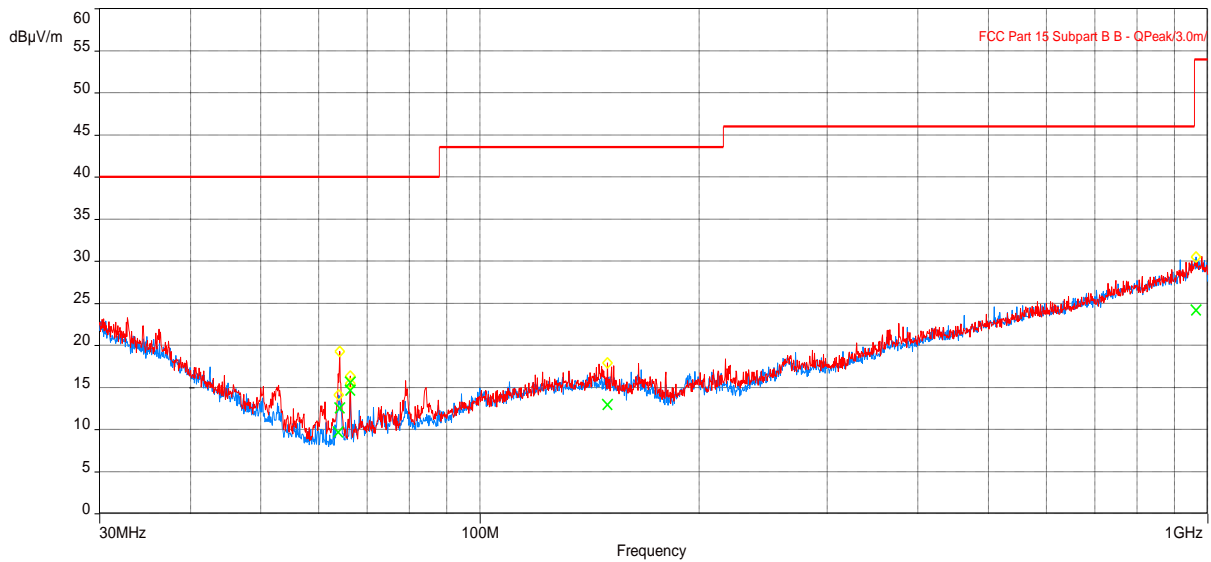


Table 30: RE test results from 30 to 1000 MHz for FCC Part 15 (M.RAT/M.Carrier – Mid ch – IRU 1648)

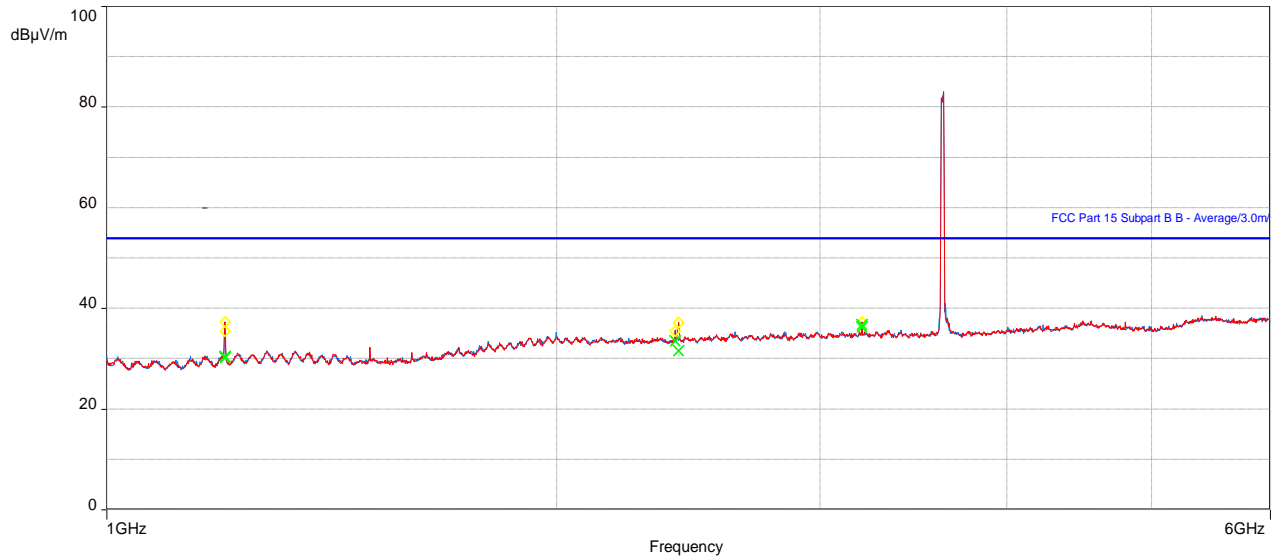
Frequency (MHz)	Level Quasi Peak (dBµV/m)	Limit Quasi-peak (dBµV/m)	Margin to FCC part 15 Class B (dB)	Height (m)	Azimuth (deg)	Polarization	Correction (dB)
66.35676956	15.60	40.00	-24.40	1.85	149.00	Vertical	-16.35
66.35696762	14.65	40.00	-25.35	2.60	334.00	Horizontal	-16.35
963.4142149	24.12	53.98	-29.86	3.13	322.25	Horizontal	6.00

Table 31: RE test results from 30 to 1000 MHz for FCC Part 96 (M.RAT/M.Carrier – Mid ch – IRU 1648)

Frequency (MHz)	Level (dBµV/m)	EIRP Limit (dBµV/m)	Margin to (dB)	Height (m)	Azimuth (deg)	Polarization	Correction (dB)
66.35676956	15.60	55.23	-39.63	1.85	149.00	Vertical	-16.35
66.35696762	14.65	55.23	-40.58	2.60	334.00	Horizontal	-16.35
963.4142149	24.12	55.23	-31.11	3.13	322.25	Horizontal	6.00

Note: In the table/Plot above, no emissions exceeded the Part 96 radiated spurious emissions limit when converted to dBuV/m. For final spurious emissions measurements to FCC Part 96, see antenna port conducted emissions in applicable test report.

Figure 21: Plot of RE at 3m from 1 to 6 GHz (M.RAT/ M.Carrier – Mid ch – IRU 1648)



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

Table 32: RE test results from 1 to 6 GHz for FCC Part 15 (M.RAT/M.Carrier – Mid ch – IRU 1648)

Frequency (MHz)	Level Average (dBµV/m)	Limit Average (dBµV/m)	Margin to FCC part 15 Class B (dB)	Height (m)	Azimuth (degrees)	Polarization	Correction (dB)
3199.998397	36.70	53.96	-17.26	2.08	91.50	Vertical	3.26
2400.001603	33.54	53.96	-20.42	2.91	120.00	Horizontal	1.71
3199.998397	36.26	53.96	-17.70	1.59	149.00	Horizontal	3.26

Table 33: RE test results from 1 to 6 GHz for Part 96 (M.RAT/M.Carrier – Mid ch – IRU 1648)

Frequency (MHz)	Level (dBµV/m)	EIRP Limit (dBµV/m)	Margin to (dB)	Height (m)	Azimuth (degrees)	Polarization	Correction (dB)
3199.998397	36.70	55.23	-18.53	2.08	91.50	Vertical	3.26
2400.001603	33.54	55.23	-21.69	2.91	120.00	Horizontal	1.71
3199.998397	36.26	55.23	-18.97	1.59	149.00	Horizontal	3.26

Note: In the table/Plot above, no emissions exceed the Part 96 radiated spurious emissions limit when converted to dBuV/m, except for the fundamentals. For final spurious emissions measurements to FCC Part 96, see antenna port conducted emissions in applicable test report.



Figure 22: Plot of RE at 3m from 6 to 10 GHz (M.RAT/ M.Carrier – Mid ch – IRU 1648)

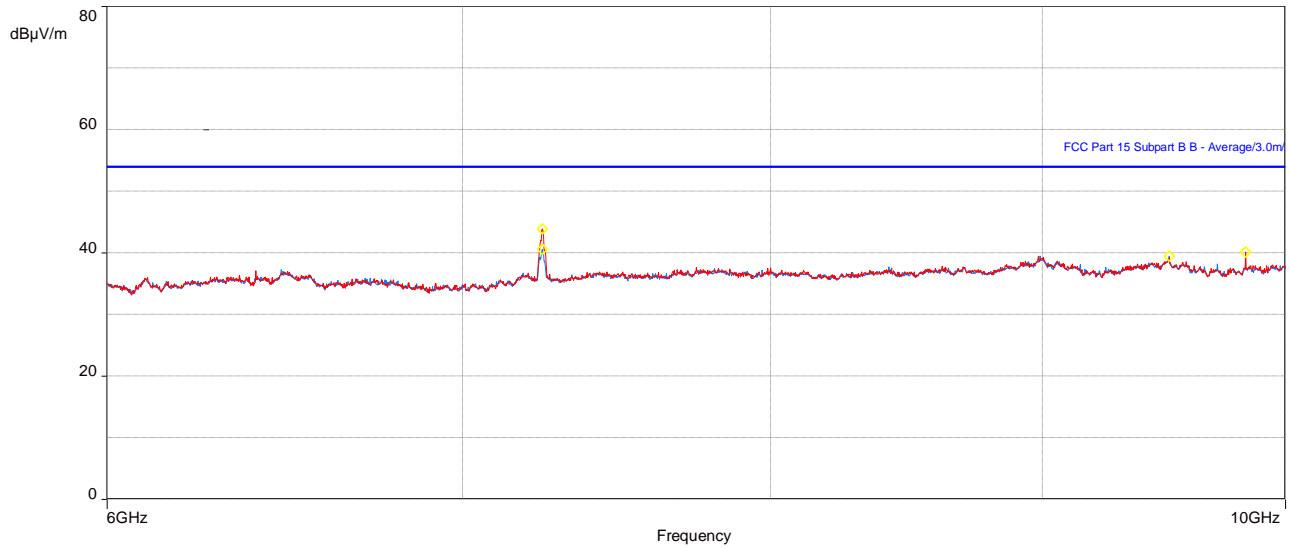


Table 34: RE test results from 6 to 10 GHz for FCC Part 15 (M.RAT/M.Carrier – Mid ch – IRU 1648)

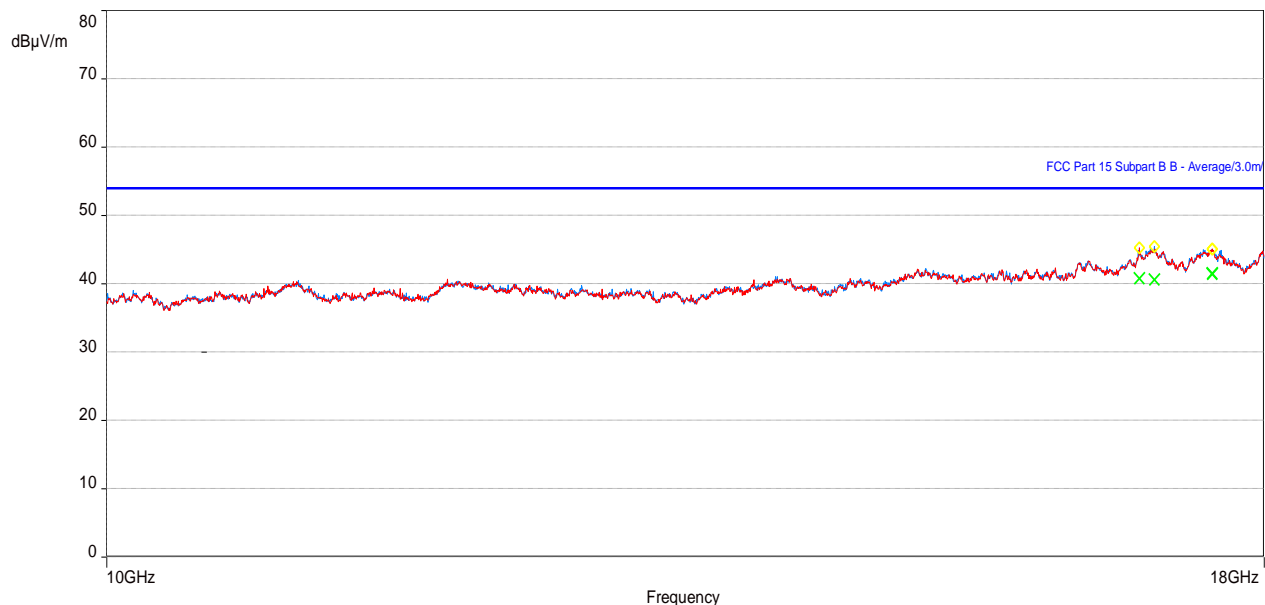
Frequency (MHz)	Level Average (dBµV/m)	Limit Average (dBµV/m)	Margin to FCC part 15 Class B (dB)	Height (m)	Azimuth (degrees)	Polarization	Correction (dB)
7246.228879	39.74	53.96	-14.22	3.00	105.50	Vertical	2.85
9830.401315	37.27	53.96	-16.69	1.00	210.75	Vertical	3.96
7246.350321	36.33	53.96	-17.63	2.33	18.75	Horizontal	2.85
9508.438174	35.63	53.96	-18.33	3.00	206.75	Horizontal	6.69

Table 35: RE test results from 6 to 10 GHz for Part 96 (M.RAT/M.Carrier – Mid ch – IRU 1648)

Frequency (MHz)	Level (dBµV/m)	EIRP Limit (dBµV/m)	Margin to (dB)	Height (m)	Azimuth (degrees)	Polarization	Correction (dB)
7246.228879	39.74	55.23	-15.49	3.00	105.50	Vertical	2.85
9830.401315	37.27	55.23	-17.96	1.00	210.75	Vertical	3.96
7246.350321	36.33	55.23	-18.90	2.33	18.75	Horizontal	2.85
9508.438174	35.63	55.23	-19.60	3.00	206.75	Horizontal	6.69

Note: In the table/Plot above, no emissions exceed the Part 96 radiated spurious emissions limit when converted to dBuV/m, except for the fundamentals. For final spurious emissions measurements to FCC Part 96, see antenna port conducted emissions in applicable test report.

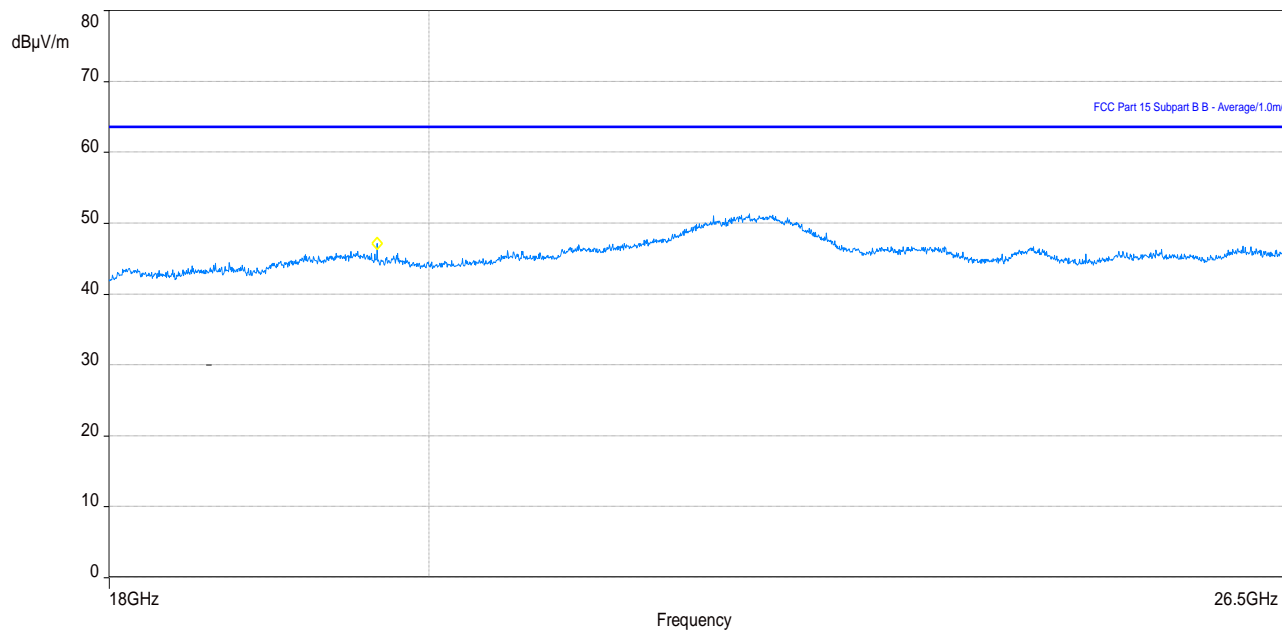
Figure 23: Plot of RE at 3m from 10 to 18 GHz (M.RAT/M.Carrier – Mid ch – IRU 1648)



Note 1: In the Plot above, no emissions exceed the FCC Part 15 radiated emissions limit.

Note 2: In the Plot above, no emissions exceed the Part 96 radiated spurious emissions limit when converted to dBuV/m. For final spurious emissions measurements to FCC Part 96, see antenna port conducted emissions in applicable test report.

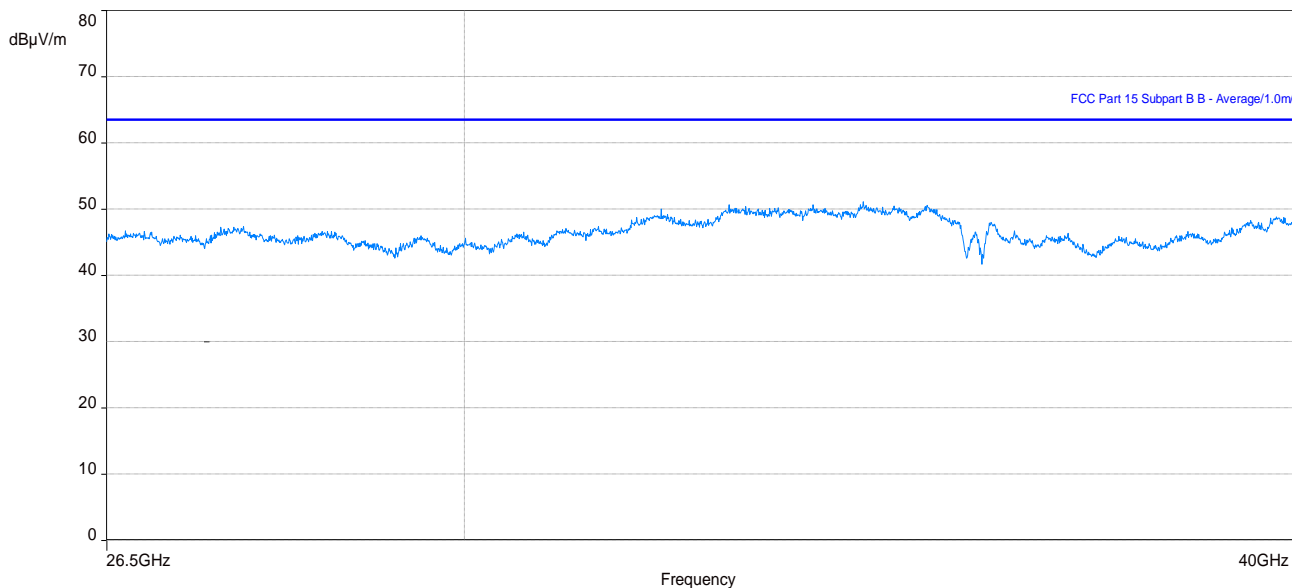
Figure 24: Plot of RE at 1m from 18 to 26.5 GHz (M.RAT/M.Carrier – Mid ch – IRU 1648)



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 96 radiated spurious emissions limit when converted to dBuV/m. For final spurious emissions measurements to FCC Part 96, see antenna port conducted emissions in applicable test report.

Figure 25: Plot of RE at 1m from 26.5 to 40 GHz (M.RAT/M.Carrier – Mid ch – IRU 1648)



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 96 radiated spurious emissions limit when converted to dBuV/m. For final spurious emissions measurements to FCC Part 96, see antenna port conducted emissions in applicable test report.



3.2.11 Test results of RE (Single RAT/Single carrier - Middle channel) with IRU 1649

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

Date tested: 20 - 26 July 2023

Tested by: Nour El Masri

Test configurations are identified in the sections [Configurations of the EUT & Radiated Emissions Single RAT / Single Carrier Configs \(IRU 1649\)](#).

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

Figure 26: Plot of RE at 3 m – 30 to 1000 MHz (S.RAT/S.Carrier – Mid ch – IRU 1649)

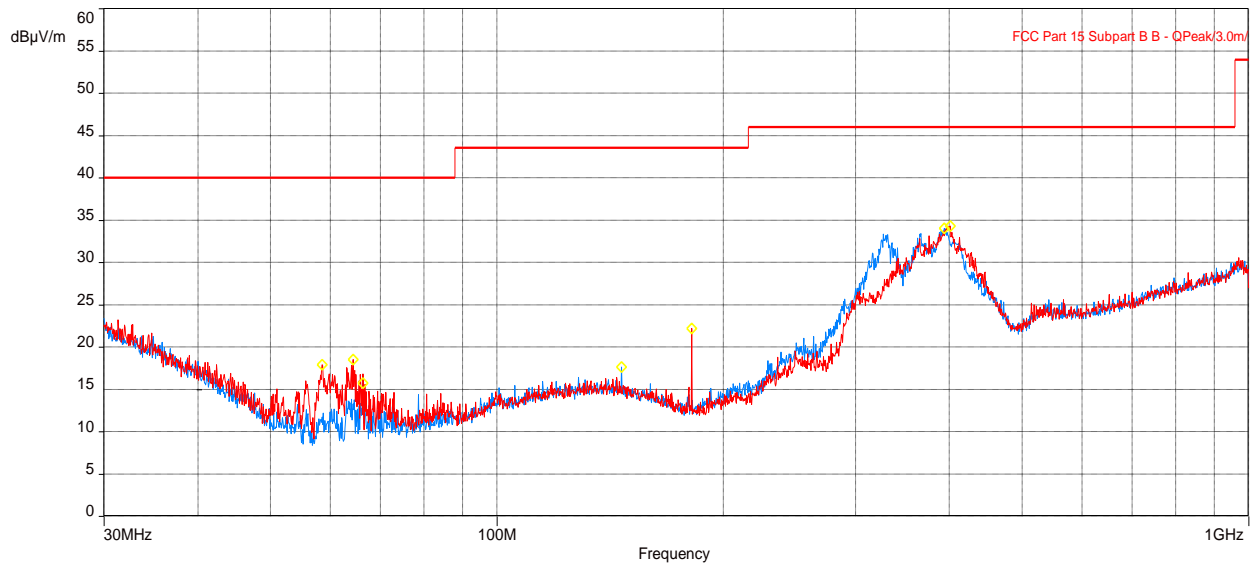


Table 36: RE test results from 30 to 1000 MHz for FCC Part 15 (S.RAT/S.Carrier – Mid ch – IRU 1649)

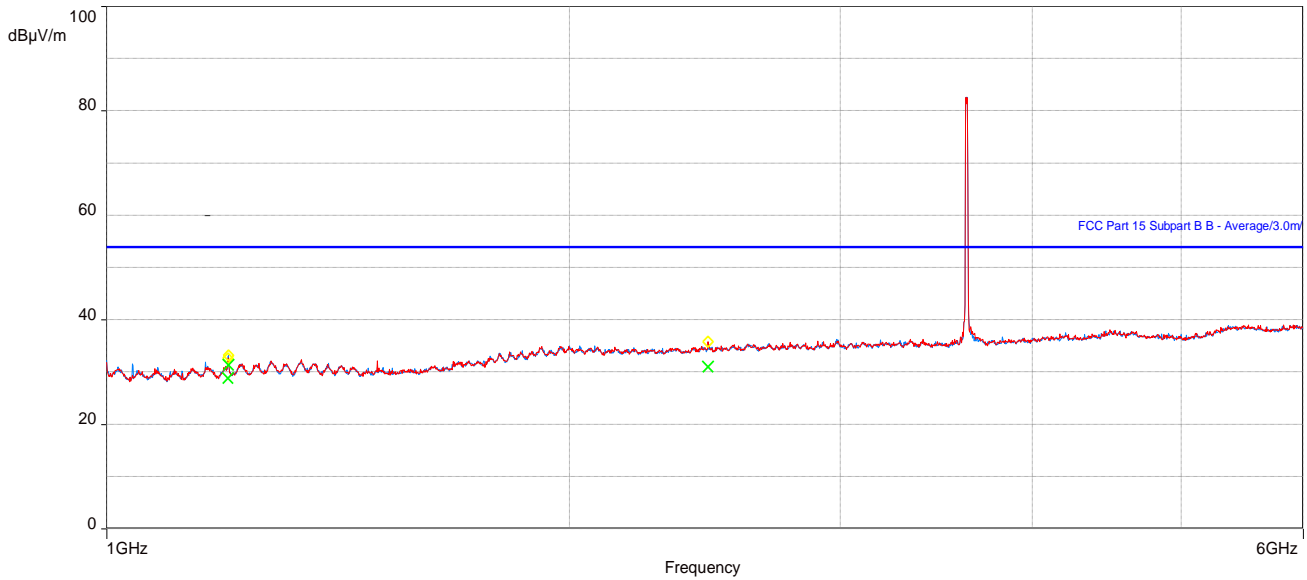
Frequency (MHz)	Level Quasi Peak (dBµV/m)	Limit Quasi-peak (dBµV/m)	Margin to FCC part 15 Class B (dB)	Height (m)	Azimuth (deg)	Polarization	Correction (dB)
64.3490189	15.71	40.00	-24.29	1.00	355.50	Vertical	-16.57
400.7423333	31.42	46.02	-14.60	2.12	185.00	Vertical	-4.19
66.35689103	14.21	40.00	-25.79	1.64	304.75	Horizontal	-16.35
393.8044454	32.64	46.02	-13.38	2.89	283.50	Horizontal	-4.36

Table 37: RE test results from 30 to 1000 MHz for FCC Part 96 (S.RAT/S.Carrier – Mid ch – IRU 1649)

Frequency (MHz)	Level (dBµV/m)	EIRP Limit (dBµV/m)	Margin to (dB)	Height (m)	Azimuth (deg)	Polarization	Correction (dB)
64.3490189	15.71	55.23	-39.52	1.00	355.50	Vertical	-16.57
400.7423333	31.42	55.23	-23.81	2.12	185.00	Vertical	-4.19
66.35689103	14.21	55.23	-41.02	1.64	304.75	Horizontal	-16.35
393.8044454	32.64	55.23	-22.59	2.89	283.50	Horizontal	-4.36

Note: In the table/Plot above, no emissions exceed the Part 96 radiated spurious emissions limit when converted to dBuV/m. For final spurious emissions measurements to FCC Part 96, see antenna port conducted emissions in applicable test report.

Figure 27: Plot of RE at 3m from 1 to 6 GHz (S.RAT/ S.Carrier – Mid ch – IRU 1649)



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

Table 38: RE test results from 1 to 6 GHz for FCC Part 15 (S.RAT/S.Carrier – Mid ch – IRU 1649)

Frequency (MHz)	Level Average (dBµV/m)	Limit Average (dBµV/m)	Margin to FCC part 15 Class B (dB)	Height (m)	Azimuth (degrees)	Polarization	Correction (dB)
1199.512854	28.78	53.96	-25.18	2.12	32.50	Vertical	-3.76
2461.141059	30.95	53.96	-23.01	2.33	124.25	Vertical	1.99
1199.838141	31.36	53.96	-22.60	1.88	334.00	Horizontal	-3.76

Table 39: RE test results from 1 to 6 GHz for Part 96 (S.RAT/S.Carrier – Mid ch – IRU 1649)

Frequency (MHz)	Level (dBµV/m)	EIRP Limit (dBµV/m)	Margin to (dB)	Height (m)	Azimuth (degrees)	Polarization	Correction (dB)
1199.512854	28.78	55.23	-26.45	2.12	32.50	Vertical	-3.76
2461.141059	30.95	55.23	-24.28	2.33	124.25	Vertical	1.99
1199.838141	31.36	55.23	-23.87	1.88	334.00	Horizontal	-3.76

Note: In the table/Plot above, no emissions exceed the Part 96 radiated spurious emissions limit when converted to dBuV/m, except for the fundamentals. For final spurious emissions measurements to FCC Part 96, see antenna port conducted emissions in applicable test report.

Figure 28: Plot of RE at 3m from 6 to 10 GHz (S.RAT/ S.Carrier – Mid ch – IRU 1649)

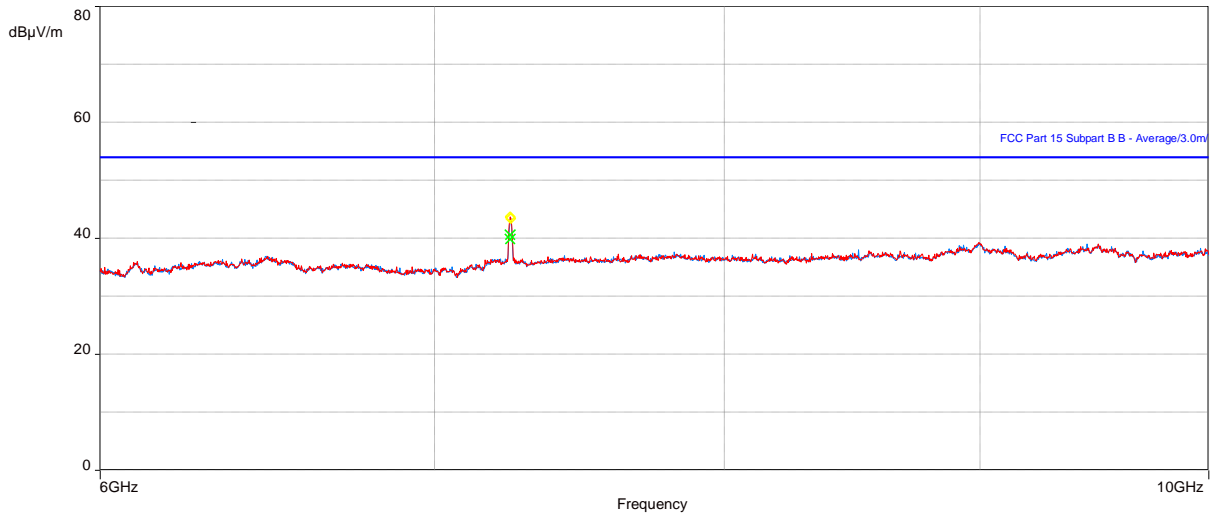


Table 40: RE test results from 6 to 10 GHz for FCC Part 15 (S.RAT/S.Carrier – Mid ch – IRU 1649)

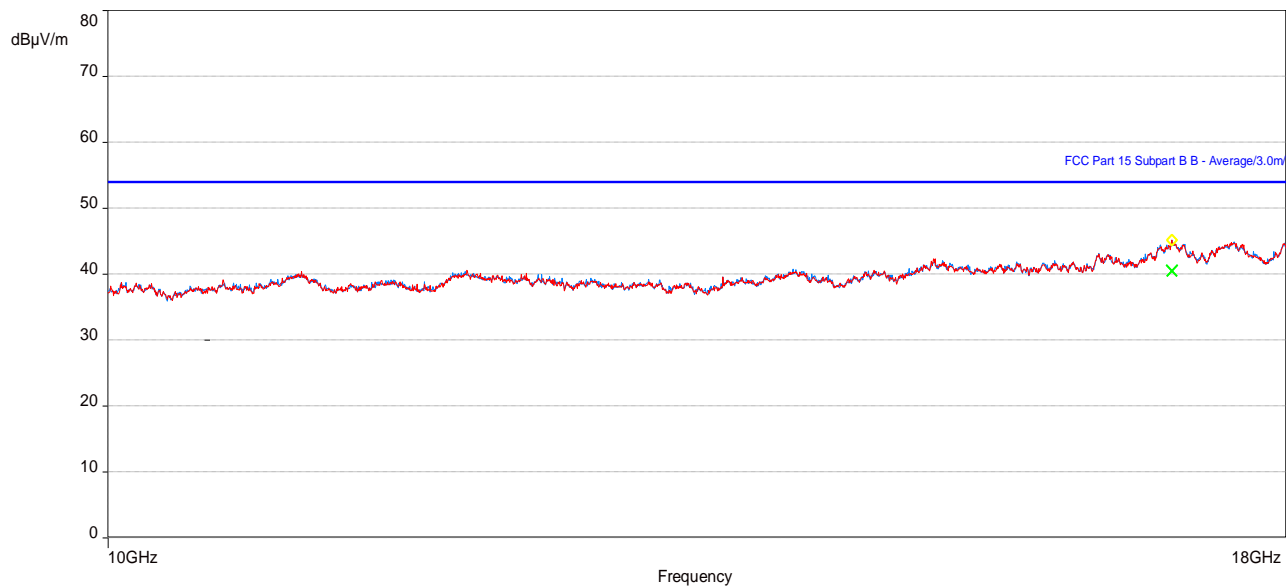
Frequency (MHz)	Level Average (dBµV/m)	Limit Average (dBµV/m)	Margin to FCC part 15 Class B (dB)	Height (m)	Azimuth (degrees)	Polarization	Correction (dB)
7248.973364	40.52	53.96	-13.44	2.79	105.50	Vertical	2.83
7249.249967	39.81	53.96	-14.15	2.13	348.25	Horizontal	2.83

Table 41: RE test results from 6 to 10 GHz for Part 96 (S.RAT/S.Carrier – Mid ch – IRU 1649)

Frequency (MHz)	Level (dBµV/m)	EIRP Limit (dBµV/m)	Margin to (dB)	Height (m)	Azimuth (degrees)	Polarization	Correction (dB)
7248.973364	40.52	55.23	-14.71	2.79	105.50	Vertical	2.83
7249.249967	39.81	55.23	-15.42	2.13	348.25	Horizontal	2.83

Note: In the table/Plot above, no emissions exceed the Part 96 radiated spurious emissions limit when converted to dBuV/m, except for the fundamentals. For final spurious emissions measurements to FCC Part 96, see antenna port conducted emissions in applicable test report.

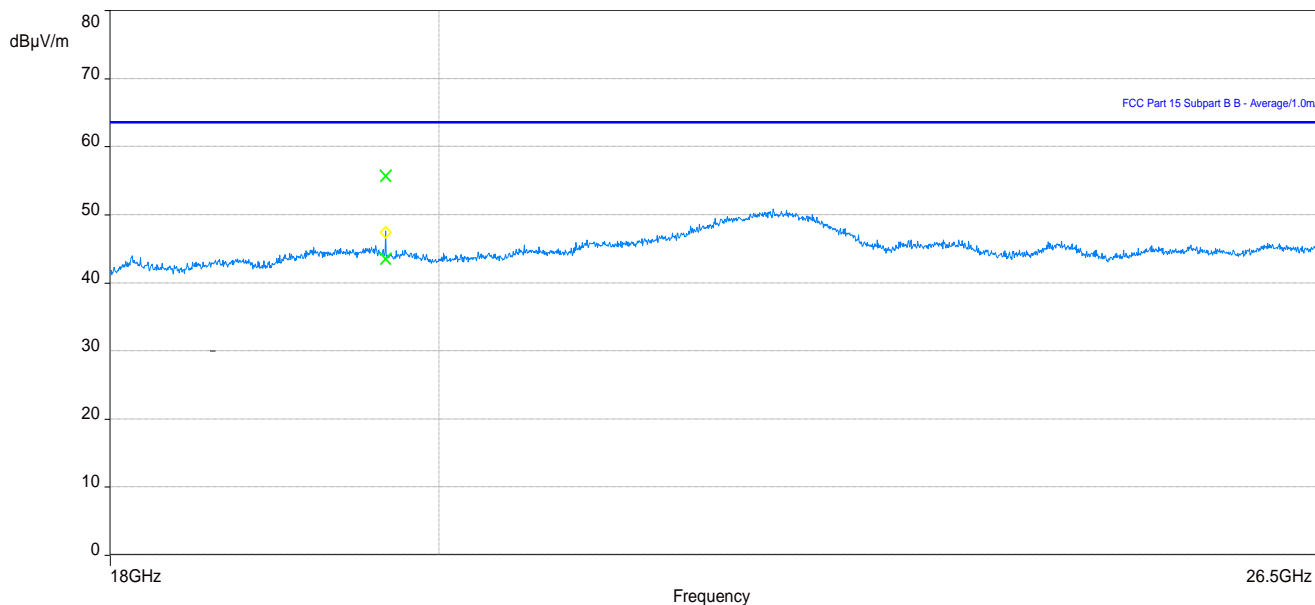
Figure 29: Plot of RE at 3m from 10 to 18 GHz (S.RAT/S.Carrier – Mid ch – IRU 1649)



Note 1: In the Plot above, no emissions exceed the FCC Part 15 radiated emissions limit.

Note 2: In the Plot above, no emissions exceed the Part 96 radiated spurious emissions limit when converted to dBuV/m. For final spurious emissions measurements to FCC Part 96, see antenna port conducted emissions in applicable test report.

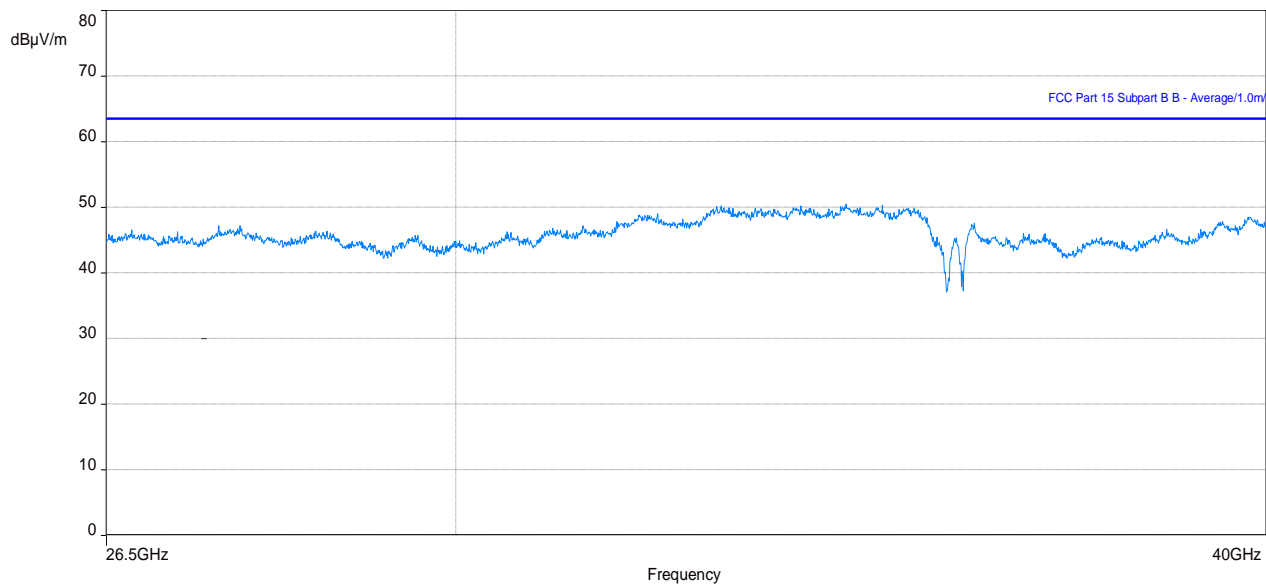
Figure 30: Plot of RE at 1m from 18 to 26.5 GHz (S.RAT/S.Carrier – Mid ch – IRU 1649)



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 96 radiated spurious emissions limit when converted to dBuV/m. For final spurious emissions measurements to FCC Part 96, see antenna port conducted emissions in applicable test report.

Figure 31: Plot of RE at 1m from 26.5 to 40 GHz (S.RAT/S.Carrier – Mid ch – IRU 1649)



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 96 radiated spurious emissions limit when converted to dBuV/m. For final spurious emissions measurements to FCC Part 96, see antenna port conducted emissions in applicable test report.



3.2.12 Test results of RE (Single RAT/Multi carrier – Middle Channel) with IRU 1649

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

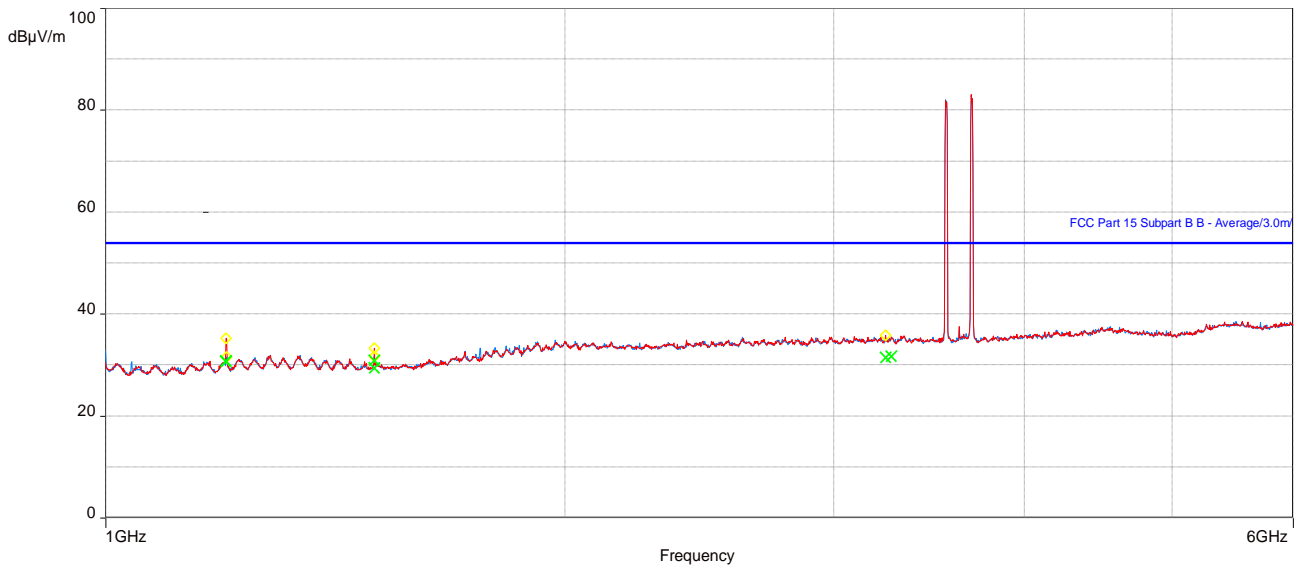
Date tested: 20 - 26 July 2023

Tested by: Nour El Masri

Test configurations are identified in the sections [Configurations of the EUT & Radiated Emissions Single RAT / Multi Carriers - Non-Contiguous Configs \(IRU 1649\)](#).

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

Figure 32: Plot of RE at 3m from 1 to 6 GHz (S.RAT/ M.Carrier – Mid ch – IRU 1649)



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

Table 42: RE test results from 1 to 6 GHz for FCC Part 15 (S.RAT/ M.Carrier – Mid ch – IRU 1649)

Frequency (MHz)	Level Average (dBµV/m)	Limit Average (dBµV/m)	Margin to FCC part 15 Class B (dB)	Height (m)	Azimuth (degrees)	Polarization	Correction (dB)
1499.999967	30.88	53.96	-23.08	2.03	16.25	Vertical	-3.36
1199.711505	30.73	53.96	-23.23	2.28	214.25	Horizontal	-3.76
3271.940705	31.67	53.96	-22.29	2.07	271.25	Horizontal	3.35

Table 43: RE test results from 1 to 6 GHz for Part 96 (S.RAT/M.Carrier – Mid ch – IRU 1649)

Frequency (MHz)	Level (dBµV/m)	EIRP Limit (dBµV/m)	Margin to (dB)	Height (m)	Azimuth (degrees)	Polarization	Correction (dB)
1499.999967	30.88	55.23	-24.35	2.03	16.25	Vertical	-3.36
1199.711505	30.73	55.23	-24.5	2.28	214.25	Horizontal	-3.76
3271.940705	31.67	55.23	-23.56	2.07	271.25	Horizontal	3.35

Note: In the table/Plot above, no emissions exceed the Part 96 radiated spurious emissions limit when converted to dBuV/m, except for the fundamentals. For final spurious emissions measurements to FCC Part 96, see antenna port conducted emissions in applicable test report.



Figure 33: Plot of RE at 3m from 6 to 10 GHz (S.RAT/ M.Carrier – Mid ch – IRU 1649)

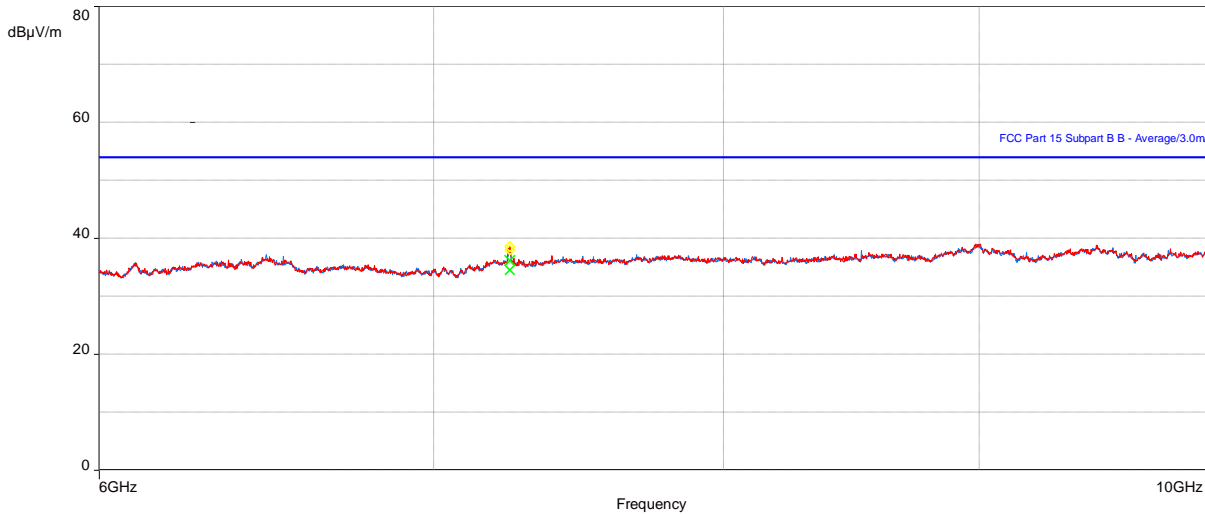


Table 44: RE test results from 6 to 10 GHz for FCC Part 15 (S.RAT/ M.Carrier – Mid ch – IRU 1649)

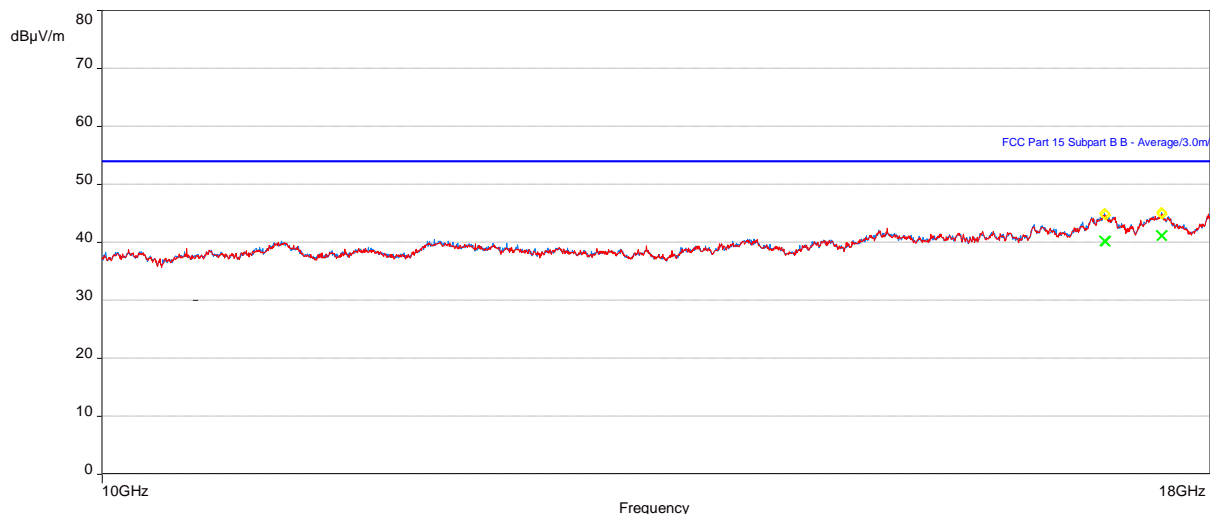
Frequency (MHz)	Level Average (dBµV/m)	Limit Average (dBµV/m)	Margin to FCC part 15 Class B (dB)	Height (m)	Azimuth (degrees)	Polarization	Correction (dB)
7249.544838	34.47	53.96	-19.49	1.00	133.75	Vertical	2.83
7250.571762	36.13	53.96	-17.83	1.79	54.00	Horizontal	2.82

Table 45: RE test results from 6 to 10 GHz for Part 96 (S.RAT/M.Carrier – Mid ch – IRU 1649)

Frequency (MHz)	Level (dBµV/m)	EIRP Limit (dBµV/m)	Margin to (dB)	Height (m)	Azimuth (degrees)	Polarization	Correction (dB)
7249.544838	34.47	55.23	-20.76	1.00	133.75	Vertical	2.83
7250.571762	36.13	55.23	-19.10	1.79	54.00	Horizontal	2.82

Note: In the table/Plot above, no emissions exceed the Part 96 radiated spurious emissions limit when converted to dBuV/m, except for the fundamentals. For final spurious emissions measurements to FCC Part 96, see antenna port conducted emissions in applicable test report.

Figure 34: Plot of RE at 3m from 10 to 18 GHz (S.RAT/ M.Carrier – Middle ch – IRU 1649)



Note 1: In the Plot above, no emissions exceed the FCC Part 15 radiated emissions limit.

Note 2: In the Plot above, no emissions exceed the Part 96 radiated spurious emissions limit when converted to dBuV/m. For final spurious emissions measurements to FCC Part Part 96, see antenna port conducted emissions in applicable test report.



3.2.13 Test results of RE (Multi RAT/Multi carrier - Middle channel) with IRU 1649

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

Date tested: 20 - 26 July 2023

Tested by: Nour El Masri

Test configurations are identified in the sections [Configurations of the EUT & Radiated Emissions Multi RAT/Multi Carriers - Non-Contiguous Configs \(IRU 1649\)](#).

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

Figure 35: Plot of RE at 3 m – 30 to1000 MHz (M.RAT / M.Carrier – Mid ch – IRU 1649)

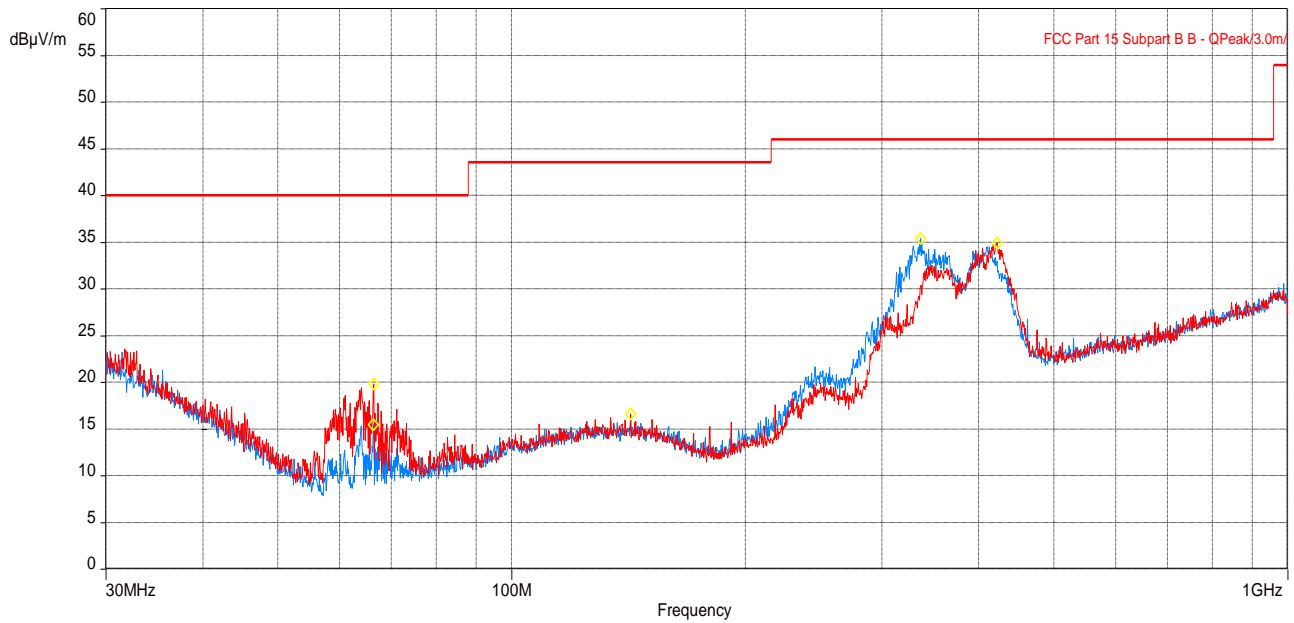


Table 46: RE test results from 30 to 1000 MHz for FCC Part 15 (M.RAT/M.Carrier–Mid ch–IRU 1649)

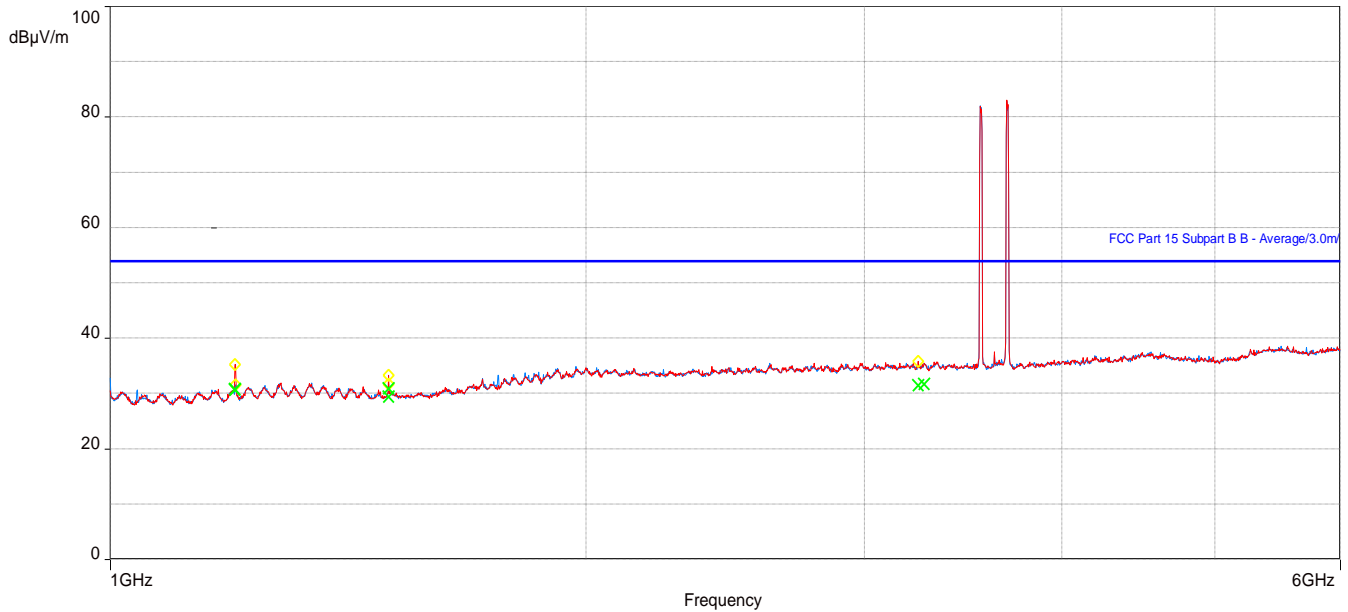
Frequency (MHz)	Level Quasi Peak (dBµV/m)	Limit Quasi-peak (dBµV/m)	Margin to FCC part 15 Class B (dB)	Height (m)	Azimuth (deg)	Polarization	Correction (dB)
66.42079454	17.91	40.00	-22.09	1.07	11.50	Vertical	-16.34
422.5092338	33.06	46.02	-12.96	2.69	203.75	Vertical	-3.48
66.35689103	14.45	40.00	-25.55	2.16	305.25	Horizontal	-16.35
336.8095577	32.75	46.02	-13.27	1.08	189.75	Horizontal	-5.67

Table 47: RE test results from 30 to 1000 MHz for FCC Part 96 (M.RAT/M.Carrier–Mid ch–IRU 1649)

Frequency (MHz)	Level (dBµV/m)	EIRP Limit (dBµV/m)	Margin to (dB)	Height (m)	Azimuth (deg)	Polarization	Correction (dB)
66.42079454	17.91	55.23	-37.32	1.07	11.50	Vertical	-16.34
422.5092338	33.06	55.23	-22.17	2.69	203.75	Vertical	-3.48
66.35689103	14.45	55.23	-40.78	2.16	305.25	Horizontal	-16.35
336.8095577	32.75	55.23	-22.48	1.08	189.75	Horizontal	-5.67

Note: In the table/Plot above, no emissions exceeded the Part 96 radiated spurious emissions limit when converted to dBuV/m. For final spurious emissions measurements to FCC Part 96, see antenna port conducted emissions in applicable test report.

Figure 36: Plot of RE at 3m from 1 to 6 GHz (M.RAT/ M.Carrier – Mid ch – IRU 1649)



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

Table 48: RE test results from 1 to 6 GHz for FCC Part 15 (M.RAT/M.Carrier–Mid ch–IRU 1649)

Frequency (MHz)	Level Average (dBµV/m)	Limit Average (dBµV/m)	Margin to FCC part 15 Class B (dB)	Height (m)	Azimuth (degrees)	Polarization	Correction (dB)
1499.999967	30.88	53.96	-23.08	2.03	16.25	Vertical	-3.36
1199.711505	30.73	53.96	-23.23	2.28	214.25	Horizontal	-3.76
3271.940705	31.67	53.96	-22.29	2.07	271.25	Horizontal	3.35

Table 49: RE test results from 1 to 6 GHz for Part 96 (M.RAT/M.Carrier – Mid ch – IRU 1649)

Frequency (MHz)	Level (dBµV/m)	EIRP Limit (dBµV/m)	Margin to (dB)	Height (m)	Azimuth (degrees)	Polarization	Correction (dB)
1499.999967	30.88	55.23	-24.35	2.03	16.25	Vertical	-3.36
1199.711505	30.73	55.23	-24.50	2.28	214.25	Horizontal	-3.76
3271.940705	31.67	55.23	-23.56	2.07	271.25	Horizontal	3.35

Note: In the table/Plot above, no emissions exceeded the Part 96 radiated spurious emissions limit when converted to dBuV/m, except for the fundamentals. For final spurious emissions measurements to FCC Part 96, see antenna port conducted emissions in applicable test report.

Figure 37: Plot of RE at 3m from 6 to 10 GHz (M.RAT/ M.Carrier – Mid ch – IRU 1649)

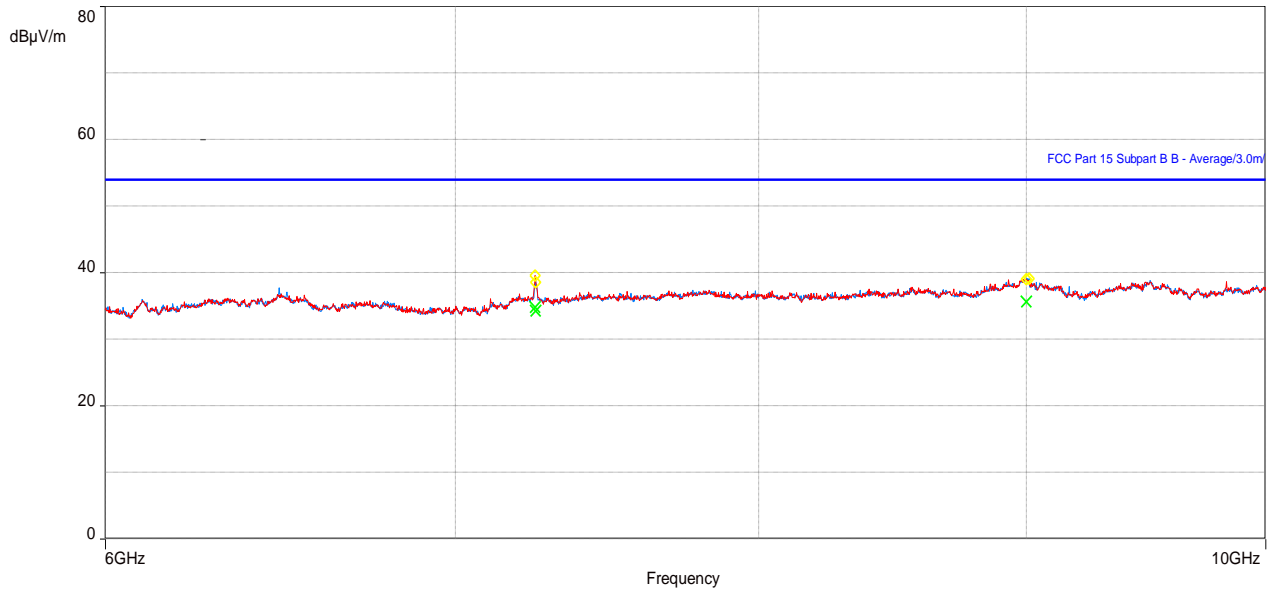


Table 50: RE test results from 6 to 10 GHz for FCC Part 15 (M.RAT/M.Carrier–Mid ch–IRU 1649)

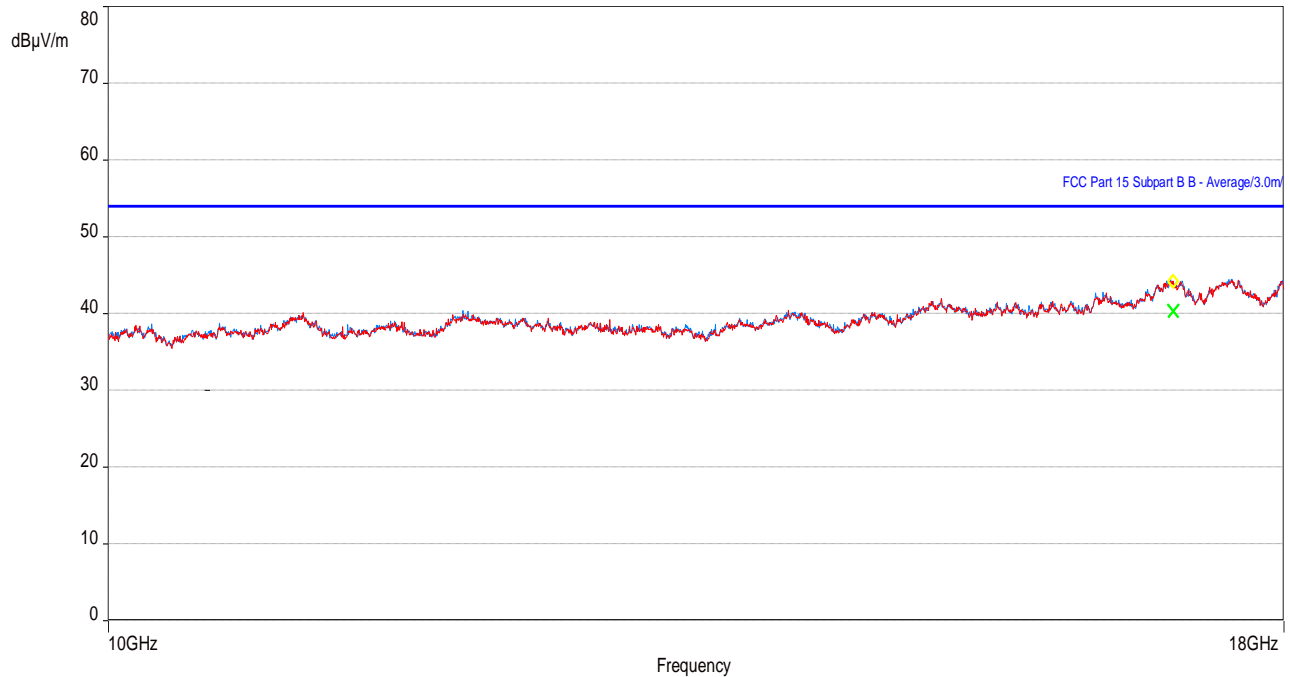
Frequency (MHz)	Level Average (dBµV/m)	Limit Average (dBµV/m)	Margin to FCC part 15 Class B (dB)	Height (m)	Azimuth (degrees)	Polarization	Correction (dB)
7250.60221	34.75	53.96	-19.21	2.38	91.50	Vertical	2.82
9001.100354	35.56	53.96	-18.40	1.00	45.50	Vertical	5.65

Table 51: RE test results from 6 to 10 GHz for Part 96 (M.RAT/M.Carrier – Mid ch – IRU 1649)

Frequency (MHz)	Level (dBµV/m)	EIRP Limit (dBµV/m)	Margin to (dB)	Height (m)	Azimuth (degrees)	Polarization	Correction (dB)
7250.60221	34.75	55.23	-20.48	2.38	91.50	Vertical	2.82
9001.100354	35.56	55.23	-19.67	1.00	45.50	Vertical	5.65

Note: In the table/Plot above, no emissions exceed the Part 96 radiated spurious emissions limit when converted to dBuV/m, except for the fundamentals. For final spurious emissions measurements to FCC Part 96, see antenna port conducted emissions in applicable test report.

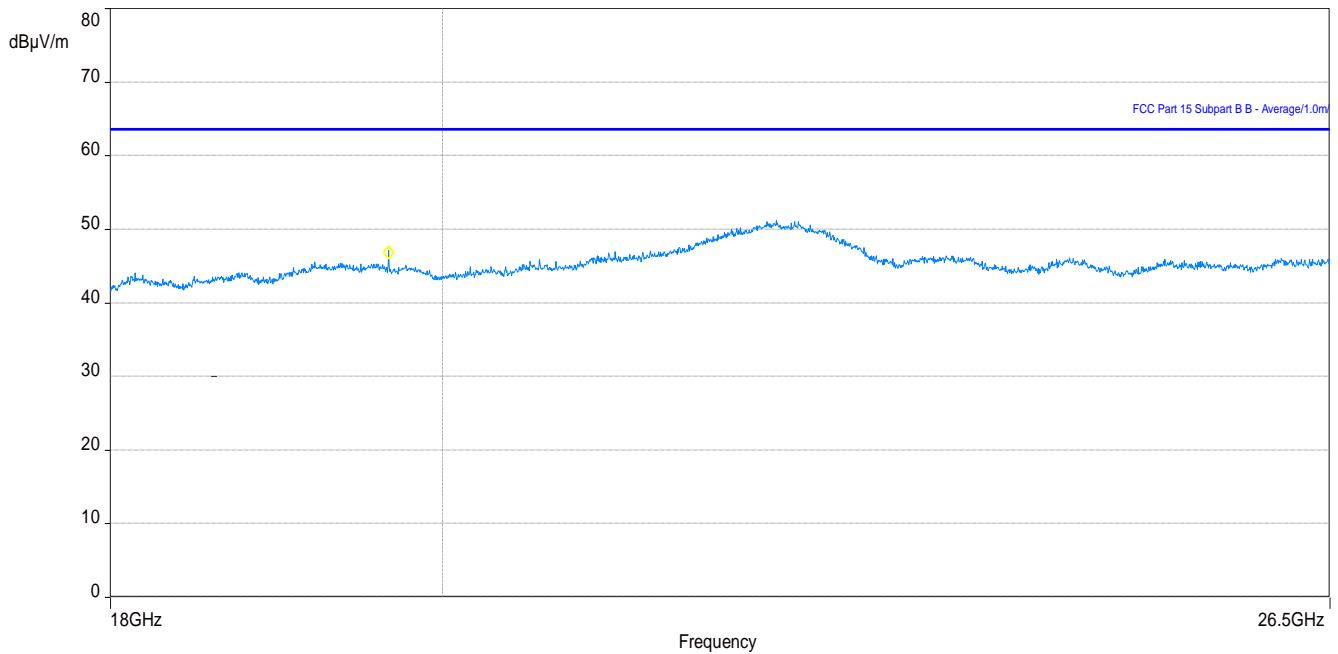
Figure 38: Plot of RE at 3m from 10 to 18 GHz (M.RAT/M.Carrier – Mid ch – IRU 1649)



Note 1: In the Plot above, no emissions exceed the FCC Part 15 radiated emissions limit.

Note 2: In the Plot above, no emissions exceed the Part 96 radiated spurious emissions limit when converted to dBuV/m. For final spurious emissions measurements to FCC Part 96, see antenna port conducted emissions in applicable test report.

Figure 39: Plot of RE at 1m from 18 to 26.5 GHz (M.RAT/M.Carrier – Mid ch – IRU 1649)

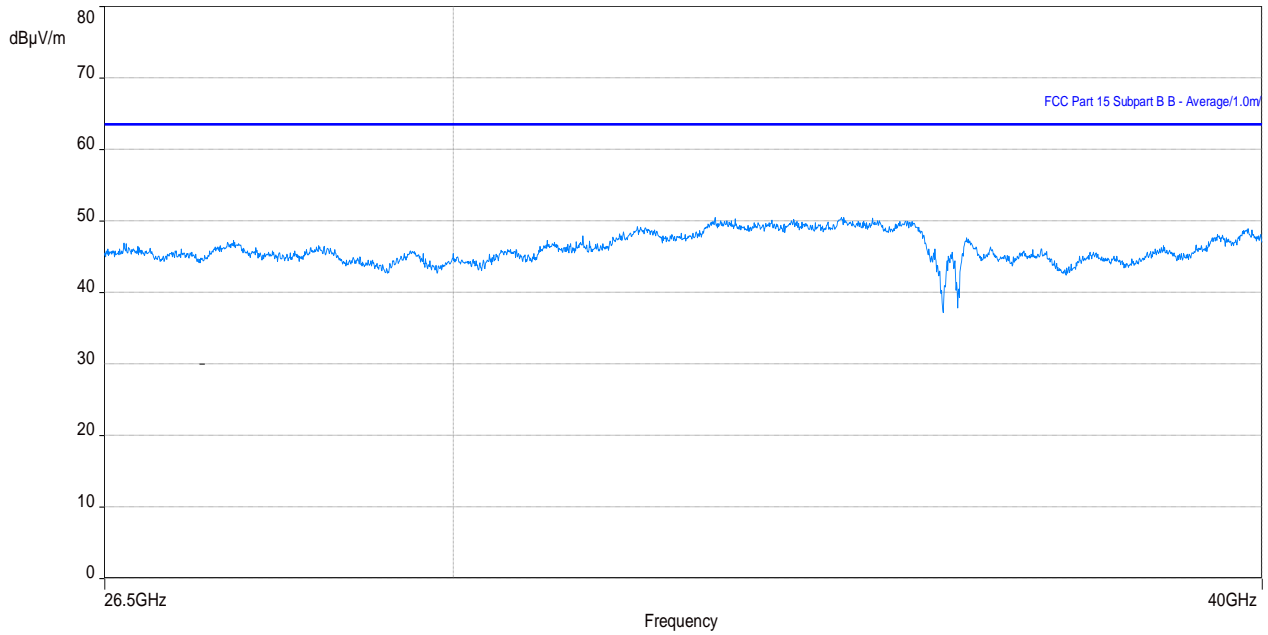


Note 1: In the plot above No Emissions exceeds the FCC Part 15 limit.

Note 2: In the plot above, no emissions exceed the Part 96 radiated spurious emissions limit when converted to dBuV/m. For final spurious emissions measurements to FCC Part 96, see antenna port conducted emissions in applicable test report.



Figure 40: Plot of RE at 1m from 26.5 to 40 GHz (M.RAT/M.Carrier – Mid ch – IRU 1649)



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 96 radiated spurious emissions limit when converted to dBuV/m. For final spurious emissions measurements to FCC Part 96, see antenna port conducted emissions in applicable test report.

3.2.14 Radiated Emissions test setup pictures

Figure 41: EUT Setup for RE tests (Closeup) – (Configuration 1 - with IRU 1648)

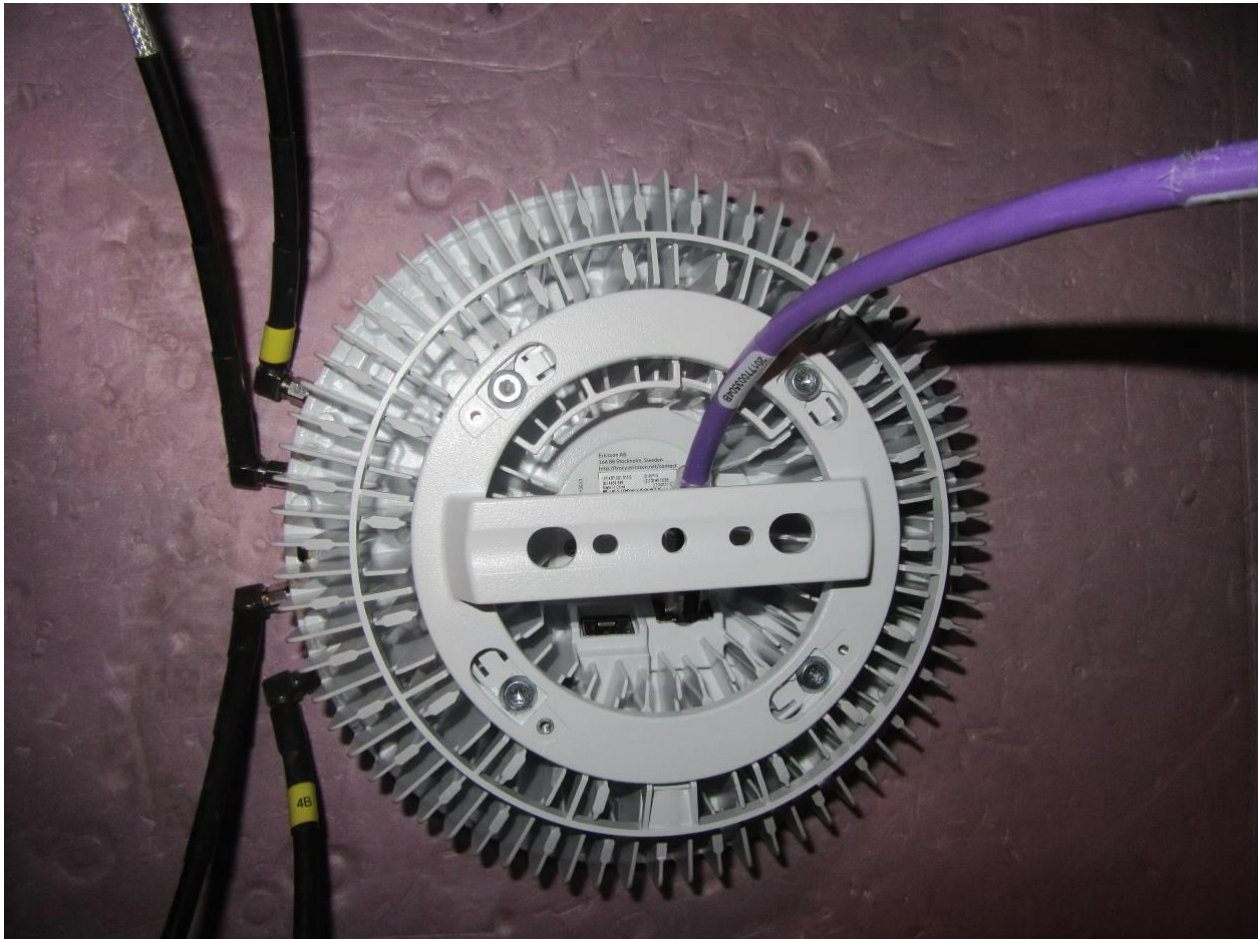


Figure 42: EUT Setup for RE tests (Closeup) – (Configuration 2 - with IRU 1649)

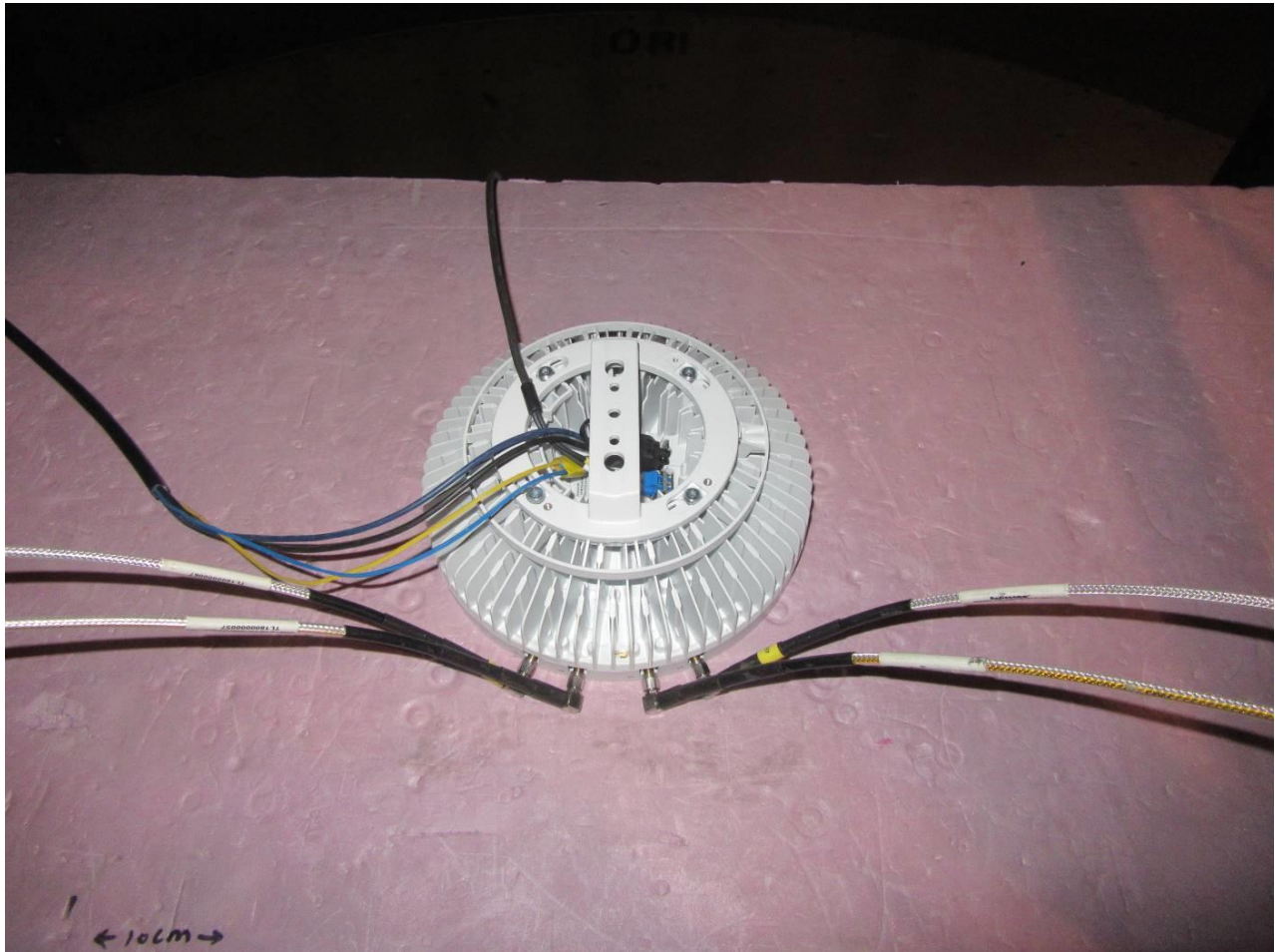


Figure 43: EUT Setup for RE tests at 30 MHz to 1 GHz

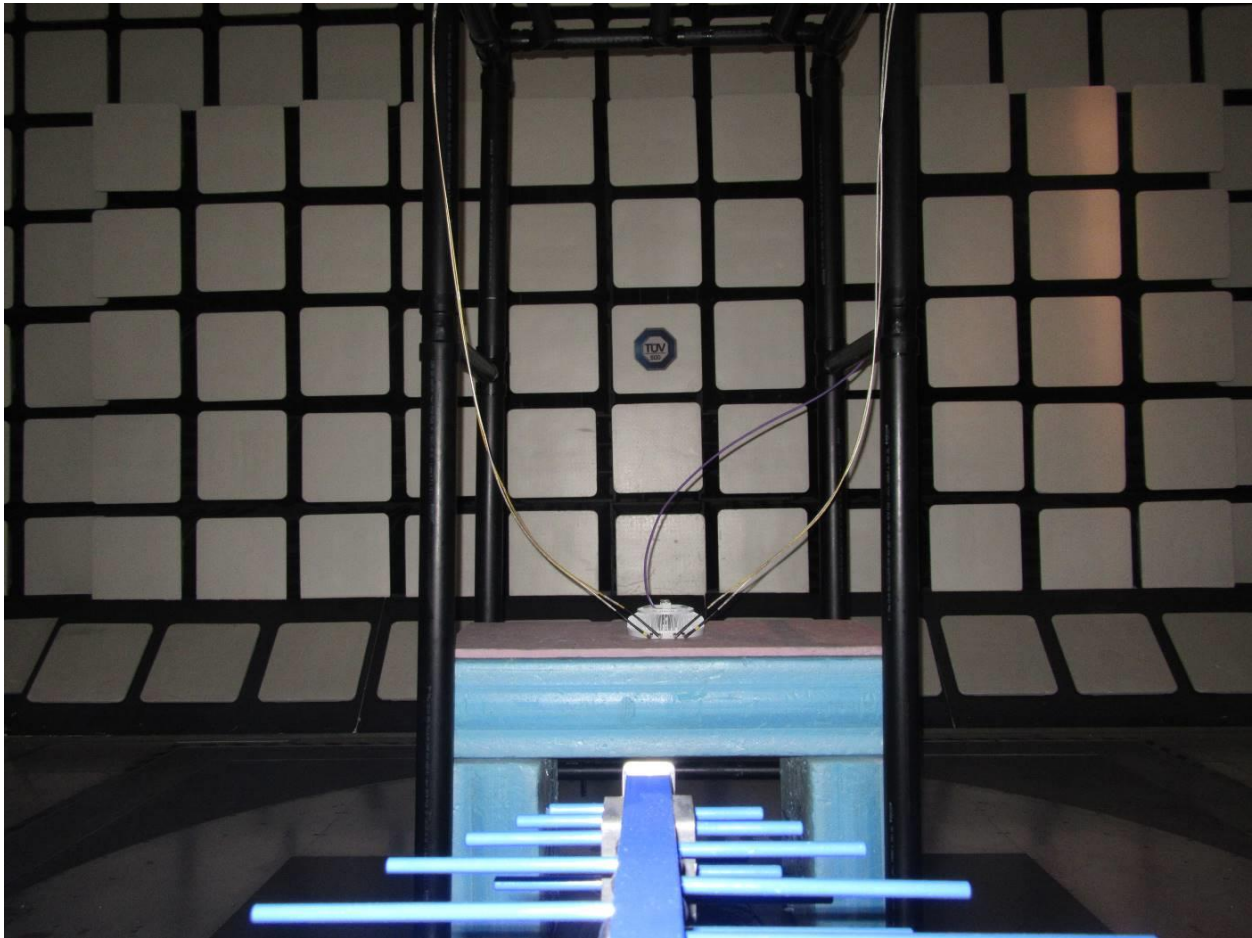
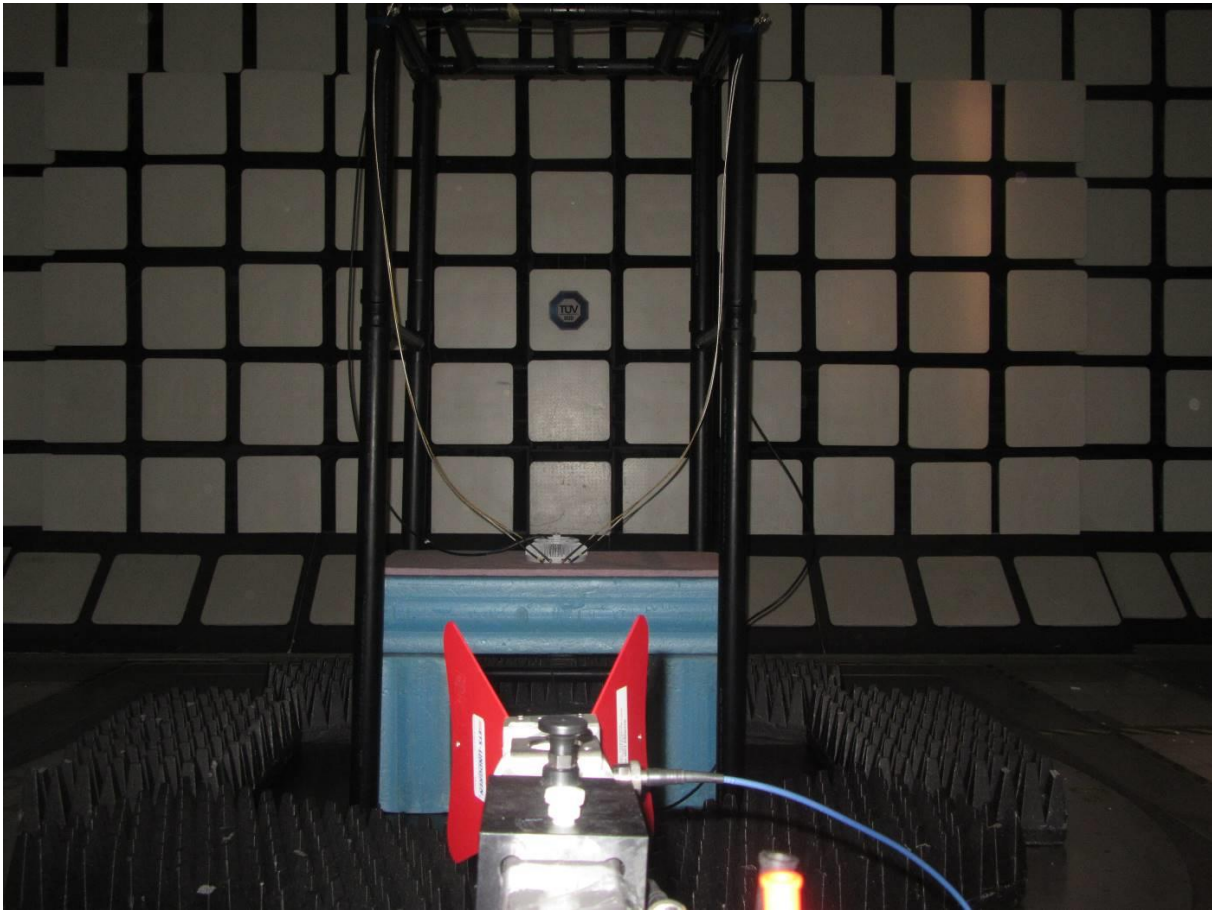


Figure 44: EUT Setup for RE tests for above 1 GHz



3.2.15 Test equipment

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

Table 52: 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	
EMI Receiver	Rohde & Schwarz	ESU26	SSG013729	2022-05-02	2024-05-02
EMI Receiver	Rohde & Schwarz	ESU40	SSG013672	2023-01-14	2024-01-14
Coaxial Cable	Huber & Suhner	104PEA	SSG012041	2023-01-24	2024-01-24
Coaxial Cable (18-40 GHz)	Huber & Suhner	101 PEA, Sucoflex	SSG012290	2023-01-27	2024-01-27
Coaxial Cable (1-18 GHz)	Micro-Coax	UFA 210B-1-1500-504504	SSG012376	2023-01-27	2024-01-27
Coaxial Cable (1-18 GHz)	Huber & Suhner In.c	ST18/Nm/Nm/36	SSG012786	2023-01-27	2024-01-27
Bilog Antenna	Teseq	59119	SSG013965	2023-01-24	2024-01-24
Horn Antenna 3MCH 00003	ETS-Lindgren	3117	LAVE04211	2022-05-05	2024-05-11
Pre-amp (18-40GHz)	microComp Nordie	MCN-40-18004000-3.3-10P	SSG014000	2021-11-04	2023-11-04
Pre-Amplifier (1-18GHz)	BNR	LNA	SSG012594	2023-04-25	2025-04-25
RF Amplifier (30-1000MHz)	Hewlett Packard	8447D	SSG013045	2023-04-26	2025-04-26

3.2.16 Test conclusion

The DOT 4459 B48 (KRY 901 516/1) and DOT 4469 B48 (KRY 901 516/2) have passed the E-field Radiated Emission (RE) tests with respect to the standards/sections listed in section [Executive summary](#).

4. References

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

1. ANSI C63.2-2009, American National Standards Institute for Electromagnetic Noise and Field Strength Instrumentation, 10 Hz to 40 GHz – Specifications.
2. ANSI C63.4-2014, American National Standards Institute for Methods of Measurement of Radio-Noise Emission from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz.
3. CISPR 16 Publications (all parts and sections), Specification for Radio Disturbance and Immunity Measuring Apparatus and Methods - Part 1: Radio Disturbance and Immunity Measuring Apparatus.
4. CISPR 22 (2008, +IS 1, + IS 2, + IS 3: 2012), Information technology equipment - Radio disturbance characteristics - Limits and methods of measurement.
5. FCC Rules for Radio Frequency Devices, Title 47 of the Code of Federal Regulations, Part 2, U.S. Federal Communications Commission.
6. FCC Rules for Radio Frequency Devices, Title 47 of the Code of Federal Regulations, Part 15 Radio Frequency Devices, U.S. Federal Communications Commission.
7. FCC Rules for Radio Frequency Devices, Title 47 of the Code of Federal Regulations, Part 96 Citizens Broadband Radio Service, 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
ANSI	American National Standards Institute
AVG	Average detector
BiLog	Biconical Log-Periodic Hybrid antenna (a registered trademark of Schaffner-Chase EMC Limited, 1993)
CDN	Coupling-decoupling Network
CE	Conducted Emissions
CISPR	Comité International Spécial Perturbation Radioélectrique (International Special Committee on Radio Interference)
CSA	Canadian Standards Association
DN/P	Decoupling / Protection Network
EMC	Electromagnetic Compatibility
EMI	Electromagnetic Interference
ETSI	European Telecommunications Standards Institute
EUT	equipment under test
GND	Ground
HCP	Horizontal Coupling Plane
HME	Harmonics Measurement Equipment
HV	High Voltage
HVP	High Voltage Probe
h/w	hardware
IC	Industry Canada
ICES	Canadian Specification: ICES-003, Issue 3, "Spectrum Management: Interference-causing equipment standard (Digital Apparatus)
IEC	International Electro Technical Association
ISN	Impedance Stabilization Network
LISN	Line Impedance Stabilization Network
ms	millisecond, unless otherwise specified
NA, na	not applicable



Term	Definition
PA	Broadband Power Amplifier
PK	Peak Detector
PS	Power Supply
QP	Quasi-peak Detector
QPA	Quasi-peak Adapter (for the Spectrum Analyzer)
R	100-ohm Injection Resistor (Conducted Immunity)
RBW	Resolution Bandwidth
RE	Radiated Emissions
RF	Radio-Frequency
RI	Radiated Immunity
RMS	Root-mean-square
s/w	software
SA	Spectrum Analyzer, the CISPR 16, ANSI C63.2 Compliant EMI meter
STP	Shielded Twisted Pair
T	50-ohm Coaxial Termination (Conducted Emissions / Immunity)
TL	Transient Limiter
UFA	Uniform field Area
VBW	Video Bandwidth



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