



EMC Test Report for DOT 4455 B77DB77GB41 (KRY 901 551/1) and DOT 4465 B77DB77GB41 (KRY 901 551/2)

Tested to: **FCC Part 15 Subpart B**
FCC Part 27 (Section - 27.53(h))

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	
27.53(l), (m), & (n)	Transmitter Spurious Emissions (RE)	FCC Part 27 / ANSI C63.26	Pass	3.2

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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 4455 B77DB77GB41 (KRY 901 551/1) and DOT 4465 B77DB77GB41 (KRY 901 551/2) for Ericsson Canada per project number 7169013436. The objective of the test activities is to evaluate compliance of the product to following EMC regulatory standards.

The DOT 4455 B77DB77GB41 (KRY 901 551/1) and DOT 4465 B77DB77GB41 (KRY 901 551/2) are verified to comply with the Emissions requirements of these standards:

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

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 4455 B77DB77GB41 (KRY 901 551/1) and DOT 4465 B77DB77GB41 (KRY 901 551/2).

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 27 subpart C

FCC Section	Description	Specification/Method	Pass or Fail	Results in section
27.53 (l), (m), & (n)	3.45 GHz service, 3.7 GHz service, and BRS emission limits	FCC Part 27 / ANSI C63.26	Pass	3.2

2. Details of the equipment under test

This section describes the equipment under test (EUT).

2.1 Assessed hardware

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

Table 3: Assessed hardware

Hardware component ¹	Part number
DOT 4455 B77DB77GB41 - Equipped with 8 internal antennas	KRY 901 551/1
DOT 4465 B77DB77GB41- Equipped with 8 external antenna ports	KRY 901 551/2
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 4455 B77DB77GB41 (KRY 901 551/1) and DOT 4465 B77DB77GB41 (KRY 901 551/2). The DOT 4455 & DOT 4465 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 4465)

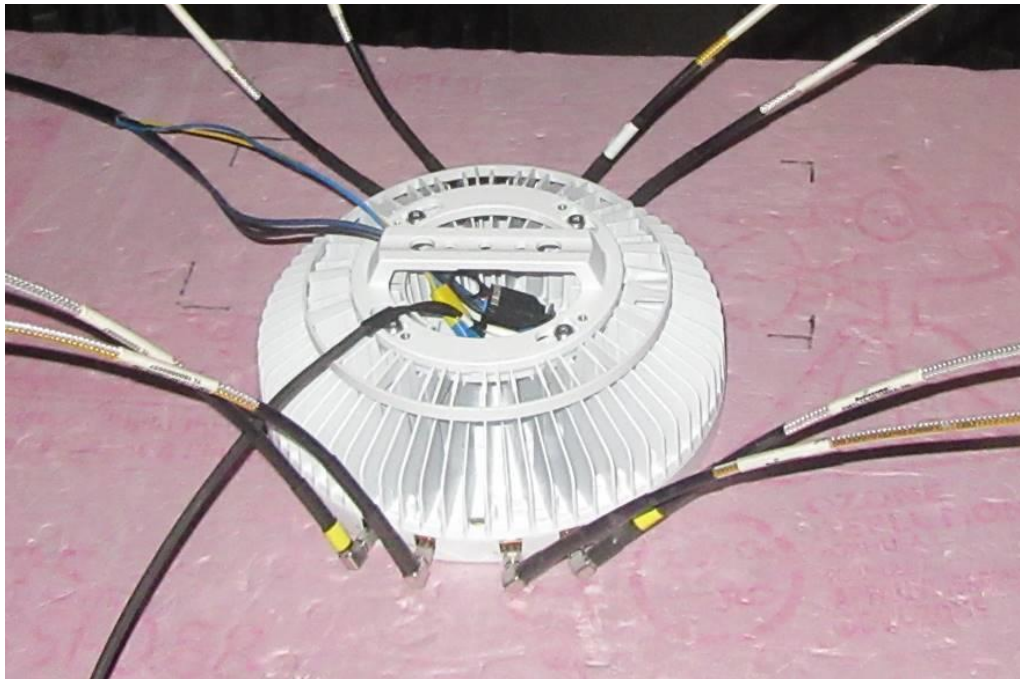




Table 4: Product specifications – Tested DOT 4465

Product Description	Radio Dot
Product Name	DOT 4465 B77DB77GB41
Part Number	KRY 901 551/2
Serial Number	E96A10243J
Hardware Version	R1A
Software Version	CXP 203 0045/26 - R17B569
Nominal Voltage	56Vdc (CAT6A POE or Hybrid cable)
Operating Temperature	+5°C to +40°C
Transmitter Operating Range	B77D: 3700-3980 MHz
	B77G: 3450-3550 MHz
	B41: 2496-2690 MHz
Receiver Operating Range	B77D: 3700-3980 MHz
	B77G: 3450-3550 MHz
	B41: 2496-2690 MHz
Antenna Ports	4T4R B77D, 2T2R B77G, 2T2R B41
Max Output Power	26 dBm per branch
Contig / Non-contig	Contig & Non-Contig
Single RAT (SRO) Support	B77D: NR (TDD)
	B77G: NR (TDD)
	B41: NR, LTE (TDD)
Mixed RAT (MRO) Support	B41: NR + LTE (TDD)
Channel Bandwidth B77D	NR: 10, 15, 20, 30, 40, 50, 60, 70, 80, 90, 100 MHz
Channel Bandwidth B77G	NR: 10, 20, 30, 40, 50, 60, 70, 80, 90, 100 MHz
Channel Bandwidth B41	NR: 10, 15, 20, 30, 40, 50, 60, 70, 80, 90, 100 MHz
	LTE: 5, 10, 15, 20 MHz
Nominal O/P per Antenna Port per Band	Single Carrier: 1 x ~400 mW (24 dBm)
	2-Carrier: 2 x 200 mW (23 dBm)
	3-Carrier: 3 x 133.3 mW (21.49 dBm)
	4-Carrier: 4 x 100 mW (20 dBm)
	5-Carrier: 5 x 80 mW (19 dBm)
	6-Carrier: 6 x 66.7 mW (18.23 dBm)
Max Number of Carriers per Branch	Max 6 carriers by dual Xenon IRU Max 3 carriers by single Xenon IRU
CPRI Line Rate	10.1 Gbps
Modulation	NR/LTE: QPSK, 16QAM, 64QAM, 256QAM
dRDI Interface	Digital, dRDI compression rev = ATC
SFP Interface	Optical SFP+, 10.1 Gbps
Mounting	Ceiling or Wall

The configurations of the tested DOT 4465 B77DB77GB41 (KRY 901 551/2) 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 3.98 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 (3.98 GHz).

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 B77D	Antenna	RF	SMA, Coax >3m
2A, 2B	RF to antenna B77G	Antenna	RF	SMA, Coax >3m
1A, 1B	RF to antenna B41	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 the customer.

Figure 2: Test configuration 1 (DOT 4465 with IRU 1648)

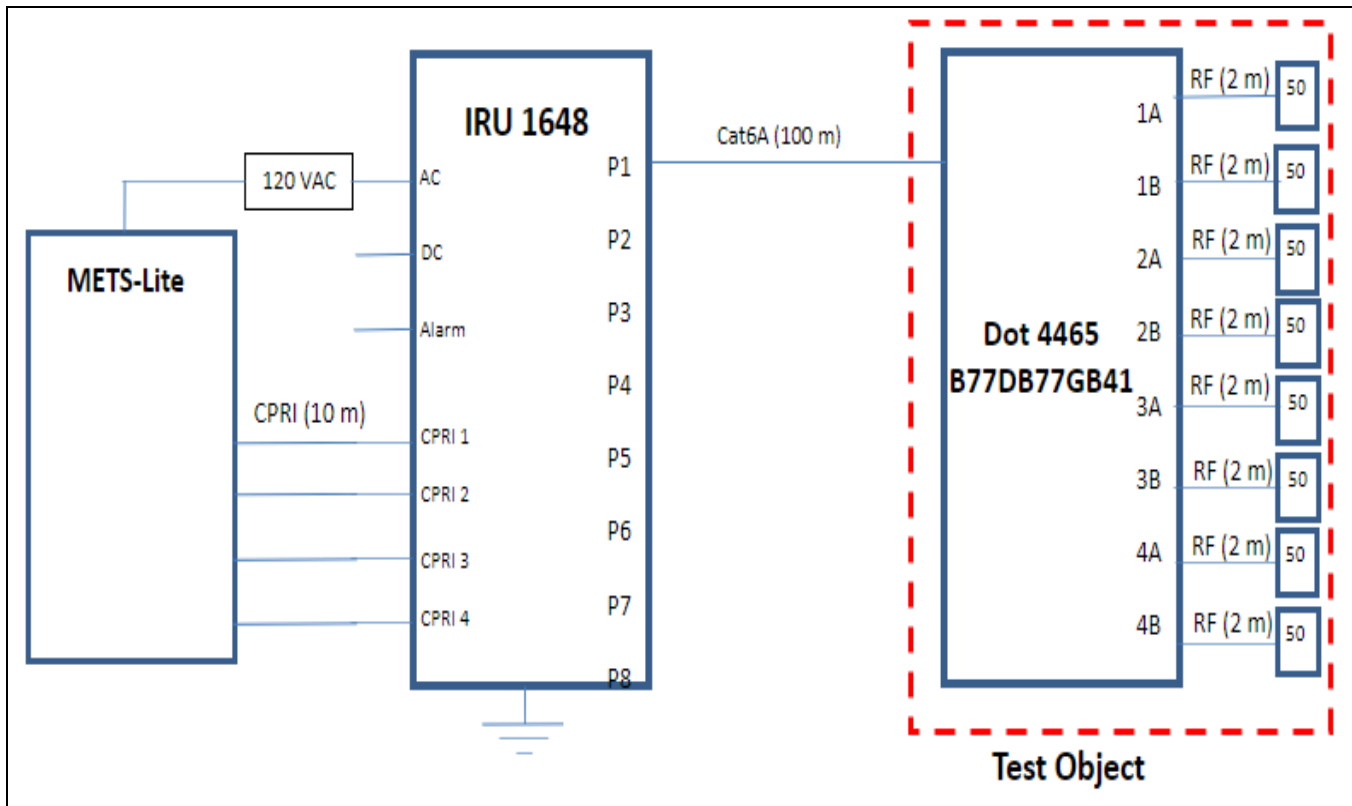
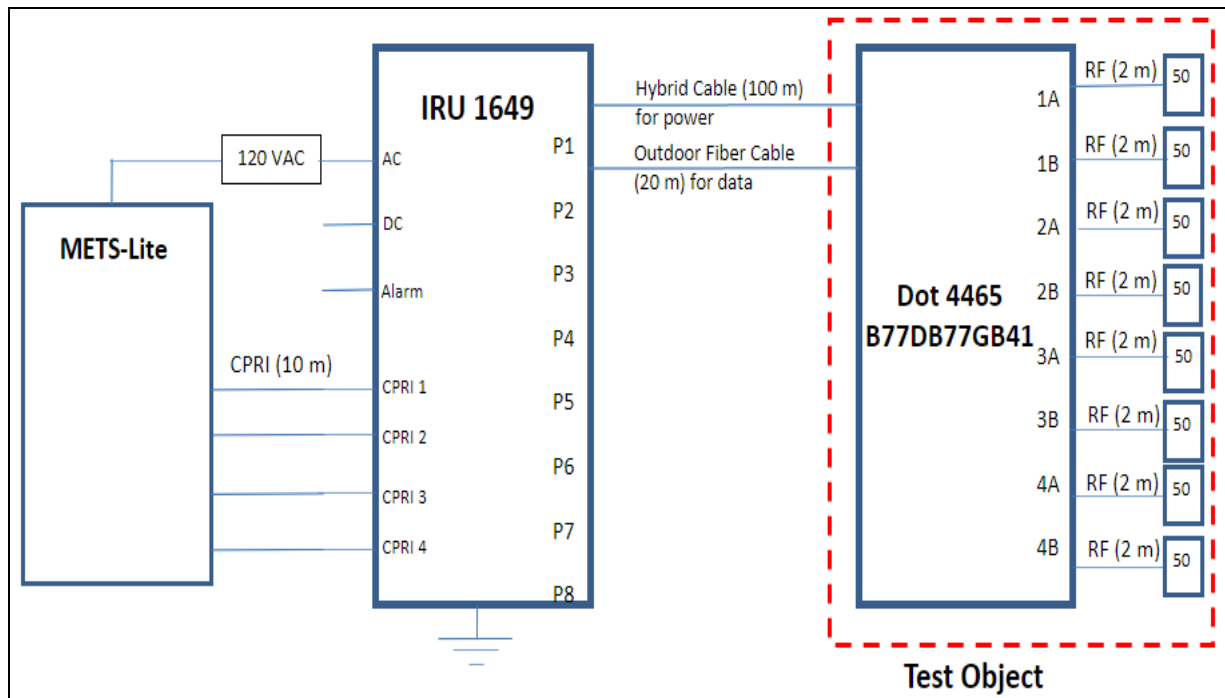


Figure 3: Test configuration 2 (DOT 4465 with IRU 1649)



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:

B41 NR TDD (Ports 1A, 1B) B77G NR TDD (Ports 2A, 2B)	
B41 Carrier BWs (Center frequency 2593 MHz):	B77G Carrier BWs (Center frequency 3500 MHz):
10 MHz	10 MHz
15 MHz	10 MHz
20 MHz	20 MHz
30 MHz	30 MHz
40 MHz	40 MHz
50 MHz	50 MHz
60 MHz	60 MHz
70 MHz	70 MHz
80 MHz	80 MHz
90 MHz	90 MHz
100 MHz	100 MHz

B41 LTE TDD (Ports 1A, 1B) B77G NR TDD (Ports 2A, 2B)	
B41 Carrier BWs (Center frequency 2593 MHz):	B77G Carrier BWs (Center frequency 3500 MHz):
5 MHz	10 MHz
10 MHz	10 MHz
15 MHz	10 MHz
20 MHz	10 MHz

Note: Radiated Emissions measurements were compared between all the above carrier setups. Among the B41 NR TDD with B77G NR TDD configurations: B41 10 MHz NR TDD with B77G 10 MHz NR TDD was found to be the worst case to perform a full/formal scan. Similarly, among the B41 LTE TDD with B77G NR TDD configurations: B41 5 MHz LTE TDD with B77G 10 MHz NR TDD was found to be the worst case to perform a full/formal scan.

Full scans included the B77D 10 MHz NR TDD worst case, which was previously evaluated.



Formal Scans:

Single RAT, Single Carrier – B41 10 MHz NR TDD (Ports 1A, 1B), B77G 10 MHz NR TDD (Ports 2A, 2B), B77D 10 MHz NR TDD (Ports 3A, 3B, 4A, 4B) – Middle (IRU 1648) Center Frequencies		
B41	B77G	B77D
2593 MHz	3500 MHz	3840 MHz

Single RAT, Single Carrier – B41 5 MHz LTE TDD (Ports 1A, 1B), B77G 10 MHz NR TDD (Ports 2A, 2B), B77D 10 MHz NR TDD (Ports 3A, 3B, 4A, 4B) – Middle (IRU 1648) Center Frequencies		
B41	B77G	B77D
2593 MHz	3500 MHz	3840 MHz

Note: The overall Single RAT, Single Carrier worst case was deemed to be: B41 5 MHz LTE TDD, B77G 10 MHz NR TDD, B77D 10 MHz NR TDD, which was therefore the preferred configuration for testing the Bottom/Top Single RAT, Single Carrier cases.

Single RAT, Single Carrier – B41 5 MHz LTE TDD (Ports 1A, 1B), B77G 10 MHz NR TDD (Ports 2A, 2B), B77D 10 MHz NR TDD (Ports 3A, 3B, 4A, 4B) – Bottom/Top (IRU 1648) Center Frequencies		
B41	B77G	B77D
2498.5 MHz	3455 MHz	3705 MHz
2687.5 MHz	3545 MHz	3975 MHz

Note: 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 - 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)

Limited Scans:

Single RAT, Multiple Carriers – LTE TDD (B41), NR TDD (B77G), NR TDD (B77D) – 6 Carriers, Contiguous (IRU 1648)	
B41 (Ports 1A, 1B)	B77G (Ports 2A, 2B)
6 LTE TDD 5 MHz BW Carriers (Center frequencies):	6 NR TDD 10 MHz BW Carriers (Center frequencies):
2580.5 MHz	3475 MHz
2585.5 MHz	3485 MHz
2590.5 MHz	3495 MHz
2595.5 MHz	3505 MHz
2600.5 MHz	3515 MHz
2605.5 MHz	3525 MHz

Single RAT, Multiple Carriers – LTE TDD (B41), NR TDD (B77G), NR TDD (B77D) – 2 Carriers, Contiguous (IRU 1648)	
B41 (Ports 1A, 1B)	B77G (Ports 2A, 2B)
2 LTE TDD 5 MHz BW Carriers (Center frequencies):	2 NR TDD 10 MHz BW Carriers (Center frequencies):
2590.5 MHz	3495 MHz
2595.5 MHz	3505 MHz

Formal Scans:

Single RAT, Multiple Carriers – LTE TDD (B41), NR TDD (B77G), NR TDD (B77D) – 2 Carriers, Contiguous (IRU 1648)		
B41 (Ports 1A, 1B)	B77G (Ports 2A, 2B)	B77D (3A, 3B, 4A, 4B) [Worst Case]
2 LTE TDD 5 MHz BW Carriers (Center frequencies):	2 NR TDD 10 MHz BW Carriers (Center frequencies):	2 NR TDD 10 MHz BW Carriers (Center frequencies):
2590.5 MHz 2595.5 MHz	3495 MHz 3505 MHz	3835 MHz 3845 MHz

Note: The overall Single RAT, Multiple Carriers worst case was deemed to be: two 5 MHz LTE TDD carriers in B41, two 10 MHz NR TDD carriers in B77G, and two 10 MHz NR TDD carriers in B77D, 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)

Limited Scans:

Multiple RATs, Multiple Carriers – LTE/NR TDD (B41), NR TDD (B77G), NR TDD (B77D) – 6 Carriers, Contiguous (IRU 1648)	
B41 (Ports 1A, 1B)	B77G (Ports 2A, 2B)
3 LTE TDD 5 MHz BW Carriers + 3 NR TDD 10 MHz BW Carriers (Center frequencies):	6 NR TDD 10 MHz BW Carriers (Center frequencies):
LTE: 2580.5 MHz LTE: 2585.5 MHz LTE: 2590.5 MHz NR: 2598 MHz NR: 2608 MHz NR: 2618 MHz	3475 MHz 3485 MHz 3495 MHz 3505 MHz 3515 MHz 3525 MHz

Multiple RATs, Multiple Carriers – LTE/NR TDD (B41), NR TDD (B77G), NR TDD (B77D) – 2 Carriers, Contiguous (IRU 1648)	
B41 (Ports 1A, 1B)	B77G (Ports 2A, 2B)
1 LTE TDD 5 MHz BW Carriers + 1 NR TDD 10 MHz BW Carriers (Center frequencies):	2 NR TDD 10 MHz BW Carriers (Center frequencies):
LTE: 2590.5 MHz NR: 2595.5 MHz	3495 MHz 3505 MHz

Formal Scans:

Multiple RATs, Multiple Carriers – LTE/NR TDD (B41), NR TDD (B77G), NR TDD (B77D) – 2 Carriers, Contiguous (IRU 1648)		
B41 (Ports 1A, 1B)	B77G (Ports 2A, 2B)	B77D (3A, 3B, 4A, 4B) [Worst Case]
1 LTE TDD 5 MHz BW Carriers + 1 NR TDD 10 MHz BW Carriers (Center frequencies):	2 NR TDD 10 MHz BW Carriers (Center frequencies):	2 NR TDD 10 MHz BW Carriers (Center frequencies):
LTE: 2590.5 MHz NR: 2595.5 MHz	3495 MHz 3505 MHz	3835 MHz 3845 MHz

Note: The overall Multiple RATs, Multiple Carriers worst case was deemed to be: one 5 MHz LTE TDD carrier and one 10 MHz NR TDD carrier in B41, two 10 MHz NR TDD carriers in B77G, and two 10 MHz NR TDD carriers in B77D, for which full/formal scans were performed.



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

Single RAT, Single Carrier – B41 5 MHz LTE TDD (Ports 1A, 1B), B77G 10 MHz NR TDD (Ports 2A, 2B), B77D 10 MHz NR TDD (Ports 3A, 3B, 4A, 4B) – Middle (IRU 1649) Center Frequencies		
B41	B77G	B77D
2593 MHz	3500 MHz	3840 MHz

Note: The overall Single RAT, Single Carrier worst case using IRU 1648 was deemed to be: 10 MHz NR TDD in B77G, 5 MHz LTE TDD in B41, and 10 MHz NR TDD in B77D, 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)

Limited Scans:

Single RAT, Multiple Carriers – LTE TDD (B41), NR TDD (B77G), NR TDD (B77D) – 6 Carriers, Non-Contiguous (IRU 1649)	
B41 (Ports 1A, 1B)	B77G (Ports 2A, 2B)
6 LTE TDD 5 MHz BW Carriers (Center frequencies):	6 NR TDD 10 MHz BW Carriers (Center frequencies):
2545.5 MHz 2550.5 MHz 2555.5 MHz 2630.5 MHz 2635.5 MHz 2640.5 MHz	3455 MHz 3465 MHz 3475 MHz 3525 MHz 3535 MHz 3545 MHz

Single RAT, Multiple Carriers – LTE TDD (B41), NR TDD (B77G), NR TDD (B77D) – 2 Carriers, Non-Contiguous (IRU 1649)	
B41 (Ports 1A, 1B)	B77G (Ports 2A, 2B)
2 LTE TDD 5 MHz BW Carriers (Center frequencies):	2 NR TDD 10 MHz BW Carriers (Center frequencies):
2545.5 MHz 2640.5 MHz	3455 MHz 3545 MHz

Formal Scans:

Single RAT, Multiple Carriers – LTE TDD (B41), NR TDD (B77G), NR TDD (B77D) – 2 Carriers, Non-Contiguous (IRU 1649)		
B41 (Ports 1A, 1B)	B77G (Ports 2A, 2B)	B77D (3A, 3B, 4A, 4B) [Worst Case]
2 LTE TDD 5 MHz BW Carriers (Center frequencies):	2 NR TDD 10 MHz BW Carriers (Center frequencies):	2 NR TDD 10 MHz BW Carriers (Center frequencies):
2545.5 MHz 2640.5 MHz	3455 MHz 3545 MHz	3795 MHz 3885 MHz

Note: The overall Single RAT, Multiple Carriers worst case was deemed to be: two 5 MHz LTE TDD carriers in B41, two 10 MHz NR TDD carriers in B77G, and two 10 MHz NR TDD carriers in B77D, 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.



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

Limited Scans:

Multiple RATs, Multiple Carriers – LTE/NR TDD (B41), NR TDD (B77G), NR TDD (B77D) – 6 Carriers, NonContiguous (IRU 1649)	
B41 (Ports 1A, 1B)	B77G (Ports 2A, 2B)
3 LTE TDD 5 MHz BW Carriers + 3 NR TDD 10 MHz BW Carriers (Center frequencies):	6 NR TDD 10 MHz BW Carriers (Center frequencies):
LTE: 2545.5 MHz LTE: 2550.5 MHz LTE: 2555.5 MHz NR: 2618 MHz NR: 2628 MHz NR: 2638 MHz	3455 MHz 3465 MHz 3475 MHz 3525 MHz 3535 MHz 3545 MHz

Multiple RATs, Multiple Carriers – LTE/NR TDD (B41), NR TDD (B77G), NR TDD (B77D) – 2 Carriers, NonContiguous (IRU 1649)	
B41 (Ports 1A, 1B)	B77G (Ports 2A, 2B)
1 LTE TDD 5 MHz BW Carriers + 1 NR TDD 10 MHz BW Carriers (Center frequencies):	2 NR TDD 10 MHz BW Carriers (Center frequencies):
LTE: 2545.5 MHz NR: 2638 MHz	3455 MHz 3545 MHz

Formal Scans:

Multiple RATs, Multiple Carriers – LTE/NR TDD (B41), NR TDD (B77G), NR TDD (B77D) – 2 Carriers, NonContiguous (IRU 1649)		
B41 (Ports 1A, 1B)	B77G (Ports 2A, 2B)	B77D (3A, 3B, 4A, 4B) [Worst Case]
1 LTE TDD 5 MHz BW Carriers + 1 NR TDD 10 MHz BW Carriers (Center frequencies):	2 NR TDD 10 MHz BW Carriers (Center frequencies):	2 NR TDD 10 MHz BW Carriers (Center frequencies):
LTE: 2545.5 MHz NR: 2638 MHz	3455 MHz 3545 MHz	3795 MHz 3885 MHz

Note: The overall Multiple RATs, Multiple Carriers worst case was deemed to be: one 5 MHz LTE TDD and one 10 MHz NR TDD carriers in B41, two 10 MHz NR TDD carriers in B77G, and two 10 MHz NR TDD carriers in B77D, for which full/formal 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 4465 B77D B77G B41	KRY 901 551/2	R1A	E96A 10243J
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_R17B569 RUX rev: R9T_Release2_Package RUX testDef: _RRUS_Dot4455_B77DB77GB41_V9 Tester: Naga, Avul			



Table 7: Inventory of the EUT (IRU 1649)

Equipment Role	Product Name	Product Number	Release	Product Serial#
EUT	DOT 4465 B77D B77G B41	KRY 901 551/2	R1A	E96A 10243J
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_R17B569 RUX rev: R9T_Release2_Package RUX testDef: _RRUS_Dot4455_B77DB77GB41_V9 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 27 (Section 27.53(l), (m), & (n))	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: 3.45 GHz service, 3.7 GHz service, and BRS emission limits for FCC Part 27

Requirement	Frequency range (MHz)	EIRP Limit (dBm)	Calculated EIRP Limit in dB μ V/m
FCC Part 27 (Section 27.53(l), & (m))	30 - 40000	-13	82.2
FCC Part 27 (Section 27.53 (n))	30 - 40000	- 40	55.2

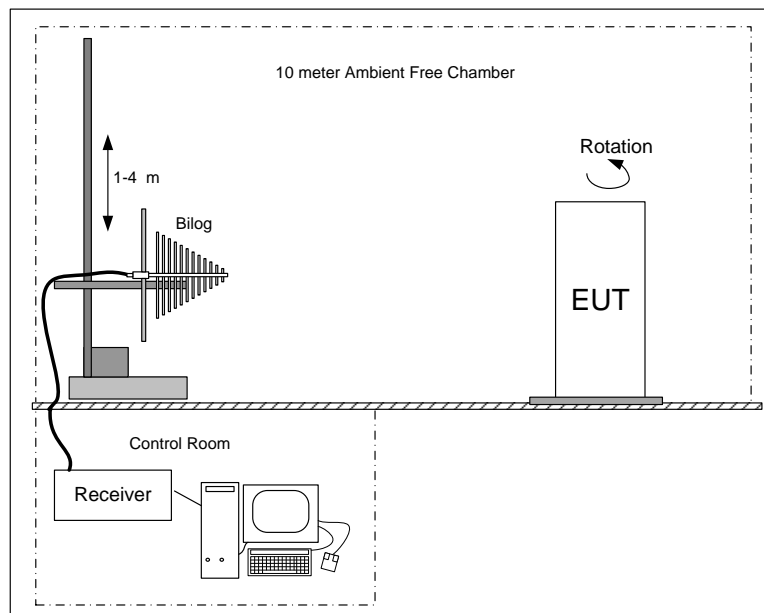
3.2.2 Test procedure

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 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 - LTE Middle channel with IRU 1648 - Section 2.5.1	3.2.7	Yes	Yes	Yes	Yes	Yes
Single RAT / Single carrier - Worst case (LTE & NR) - Bottom channel with IRU 1648 - Section 2.5.1	3.2.8	No	Yes	Yes	No	No
Single RAT / Single carrier - Worst case (LTE & NR) - Top channel with IRU 1648 - Section 2.5.1	3.2.9	No	Yes	Yes	No	No
Single RAT / Multiple Carriers – Contiguous with IRU 1648 – Section 2.5.2	3.2.10	No	Yes	Yes	No	No
Multiple RATs / Multiple Carriers – Contiguous with IRU 1648 - Section 2.5.3	3.2.11	Yes	Yes	Yes	Yes	Yes
Single RAT / Single Carrier – Middle with IRU 1649 – Section 2.5.4	3.2.12	Yes	Yes	Yes	Yes	Yes
Single RAT / Multiple Carriers – Non-Contiguous with IRU 1649 - Section 2.5.5	3.2.13	No	Yes	Yes	No	No
Multiple RATs / Multiple Carriers – Non-Contiguous with IRU 1649 – Section 2.5.6	3.2.14	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: July 31 – August 03, 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

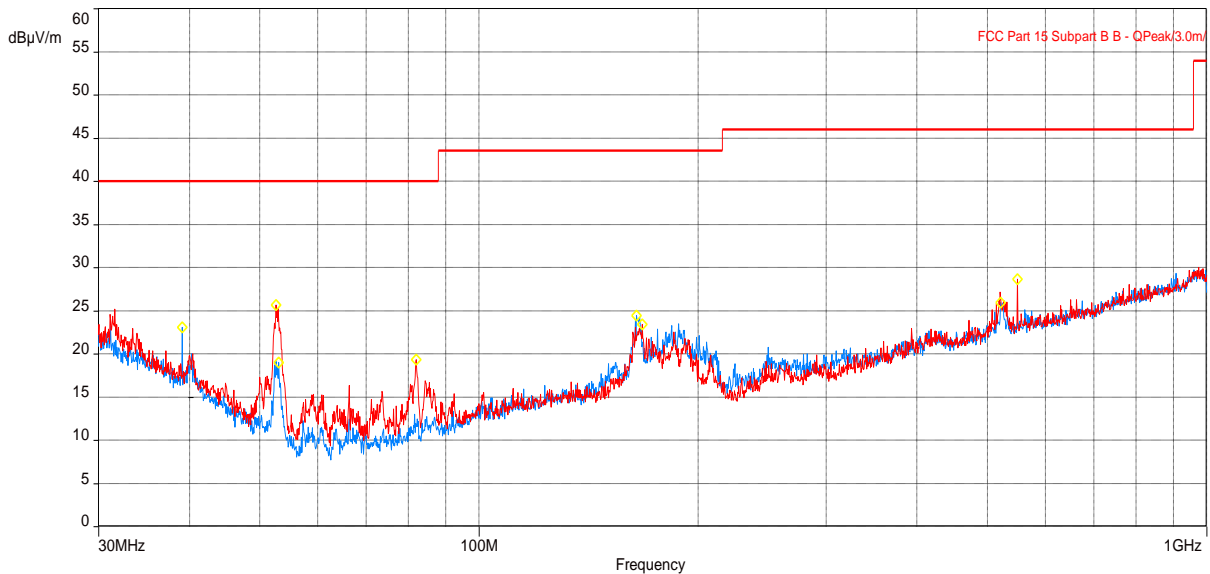


Table 12: RE test results from 30 to 1000 MHz for FCC Part 15 (S.RAT/S.Carrier – Mid ch – IRU 1648)

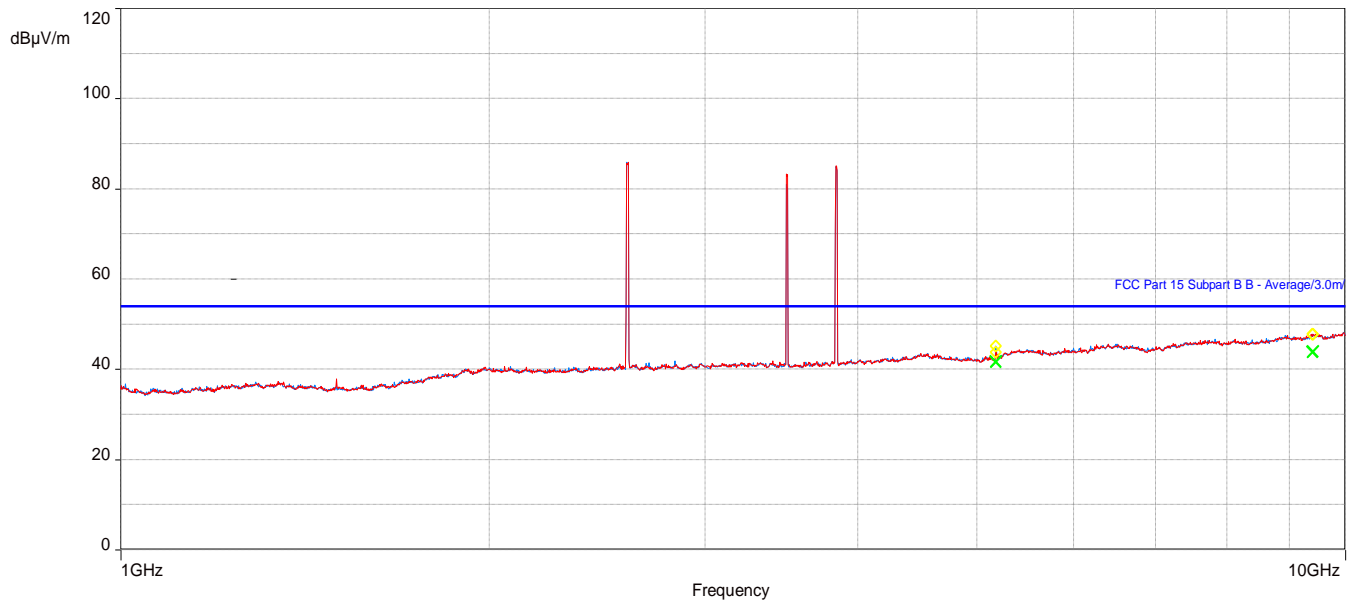
Frequency (MHz)	Level Quasi Peak (dBµV/m)	Limit Quasi-peak (dBµV/m)	Margin to FCC part 15 Class B (dB)	Height (m)	Azimuth (deg)	Polarization	Correction (dB)
52.69178879	21.87	40.00	-18.13	1.46	156.25	Vertical	-14.93
82.05798685	16.19	40.00	-23.81	1.17	55.25	Vertical	-14.21
53.02165351	16.24	40.00	-23.76	3.00	11.75	Horizontal	-15.06
164.5689262	21.73	43.52	-21.79	2.30	55.00	Horizontal	-10.60
521.2171346	24.63	46.02	-21.39	1.30	254.25	Horizontal	-2.16

Table 13: RE test results from 30 to 1000 MHz for FCC Part 27 (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)
52.69178879	21.87	55.2	-33.33	1.46	156.25	Vertical	-14.93
82.05798685	16.19	55.2	-39.01	1.17	55.25	Vertical	-14.21
53.02165351	16.24	55.2	-38.96	3.00	11.75	Horizontal	-15.06
164.5689262	21.73	55.2	-33.47	2.30	55.00	Horizontal	-10.60
521.2171346	24.63	55.2	-30.57	1.30	254.25	Horizontal	-2.16

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 Part 27, see antenna port conducted emissions in applicable test report.

Figure 6: Plot of RE at 3m from 1 to 10GHz (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 10 GHz for FCC Part 15 (S.RAT/S.Carrier – Mid ch – IRU 1648)

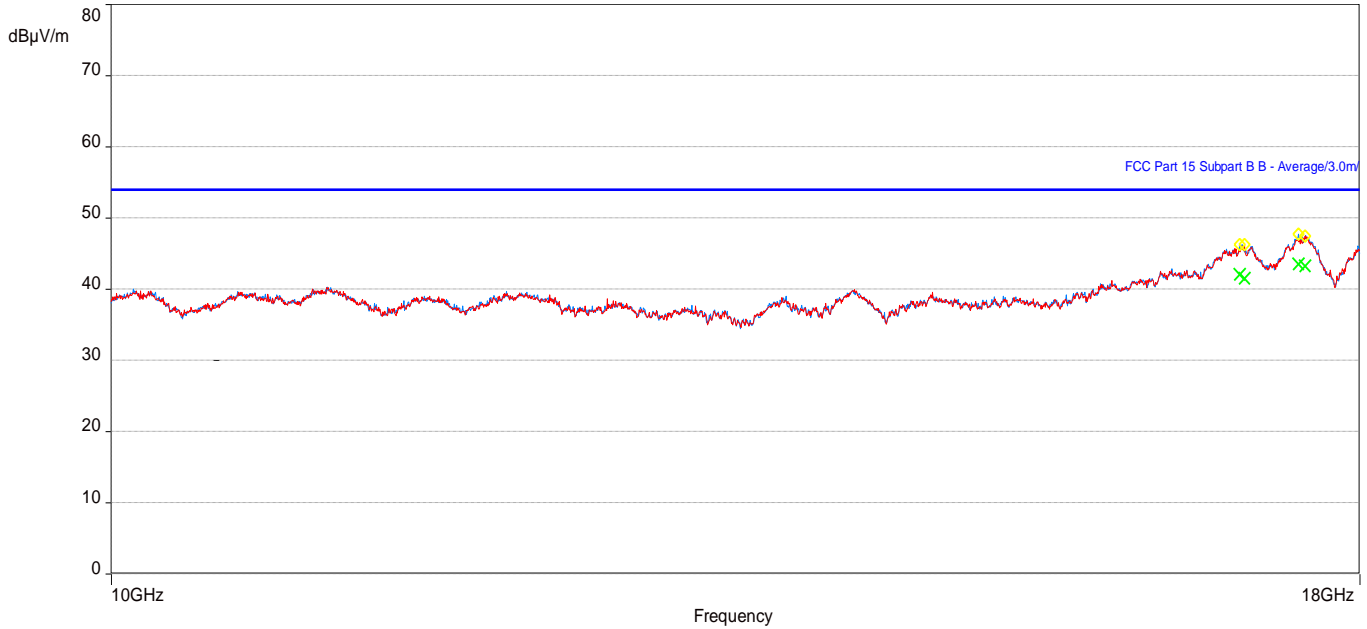
Frequency (MHz)	Level Average (dBµV/m)	Limit Average (dBµV/m)	Margin to FCC part 15 Class B (dB)	Height (m)	Azimuth (degrees)	Polarization	Correction (dB)
5184.090064	41.70	53.96	-12.26	2.90	98.25	Vertical	11.31
9409.71859	43.95	53.96	-10.01	1.97	232.50	Vertical	15.34

Table 15: RE test results from 1 to 10 GHz for Part 27 (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)
5184.090064	41.70	55.2	-13.5	2.90	98.25	Vertical	11.31
9409.71859	43.95	55.2	-11.25	1.97	232.50	Vertical	15.34

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

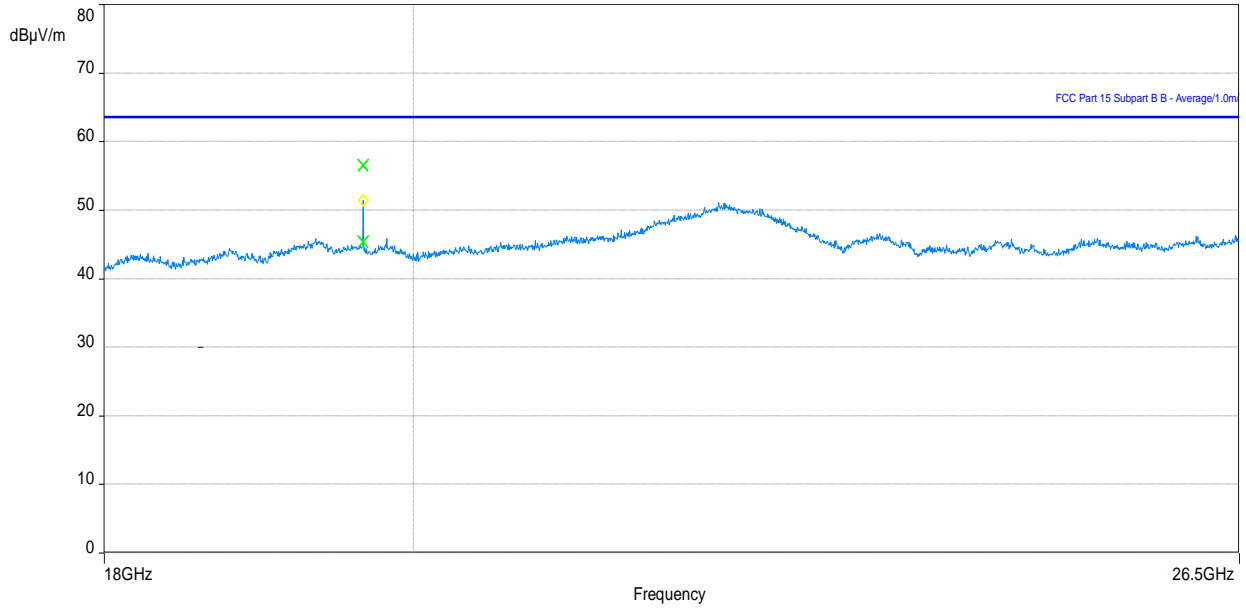
Figure 7: Plot of RE at 3m from 10 to 18 GHz (S.RAT/S.Carrier – NR - Mid ch – IRU 1648)



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 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.

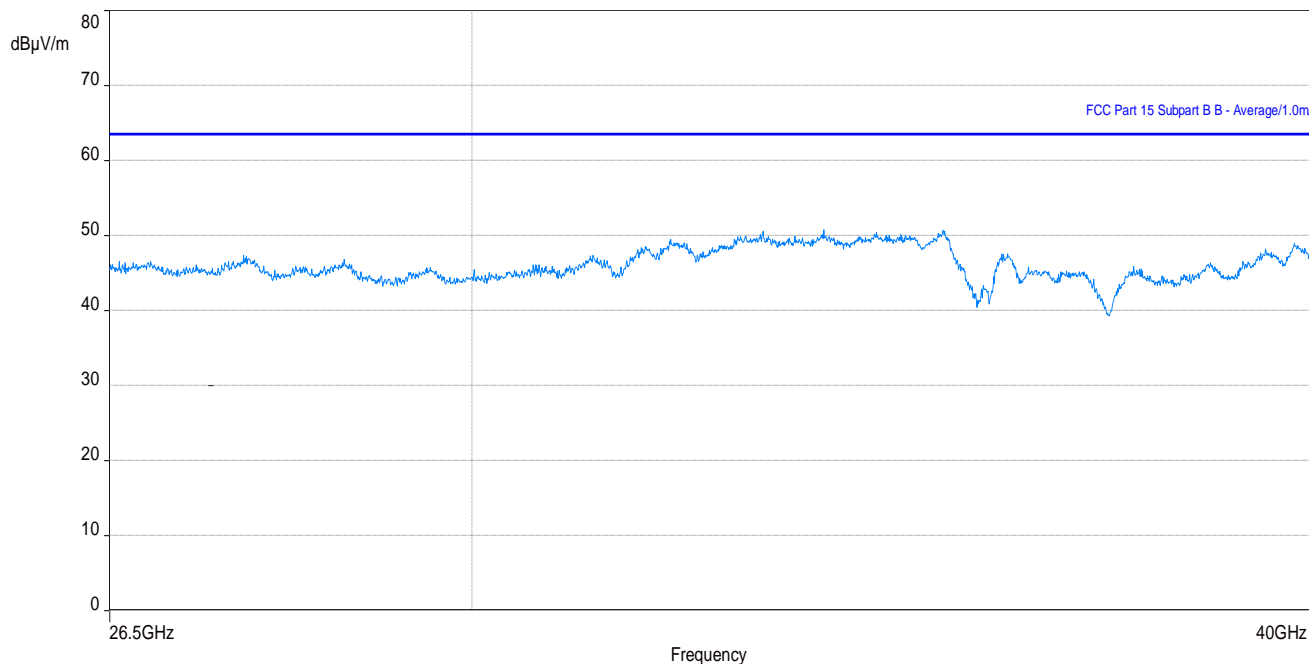
Figure 8: Plot of RE at 1m from 18 to 26.5 GHz (S.RAT/S.Carrier – NR - Mid ch – IRU 1648)



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

Figure 9: Plot of RE at 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 27 radiated spurious emissions limit when converted to dBuV/m. For final spurious emissions measurements to FCC Part 27, see antenna port conducted emissions in applicable test report.



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

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

Date tested: July 31 – August 03, 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 10: Plot of RE at 3 m – 30 to 1000 MHz (S.RAT/ S Carrier – LTE- Mid ch) - IRU 1648

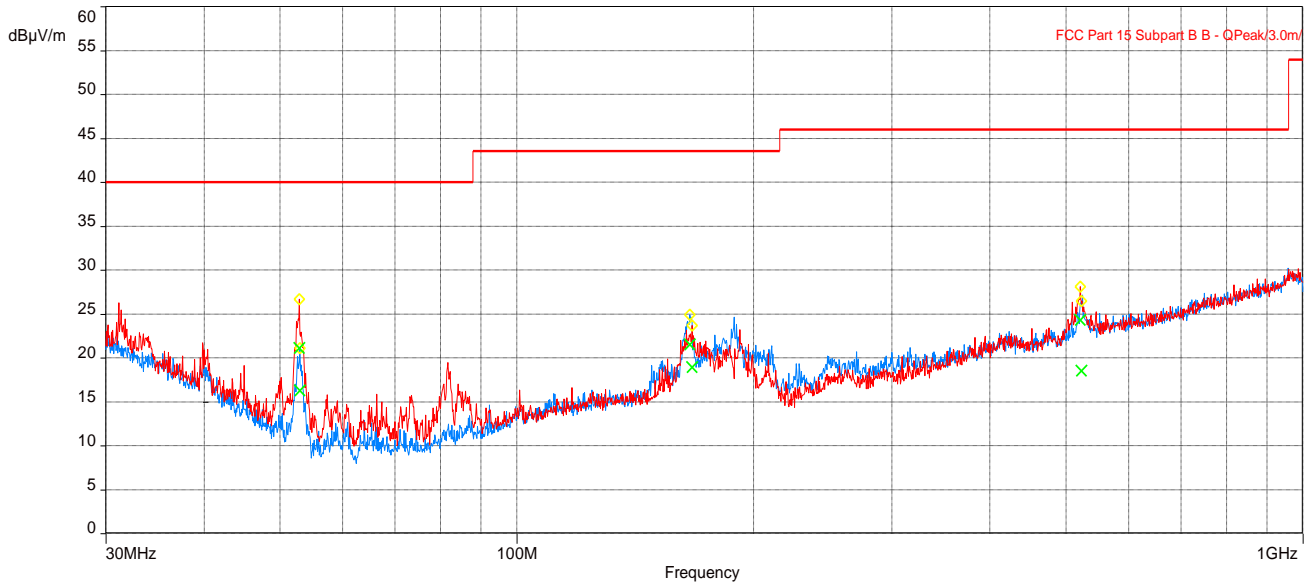


Table 16: RE test results from 30 to 1000 MHz for FCC Part 15 (S.RAT/S.Carrier – Mid ch – IRU 1648)

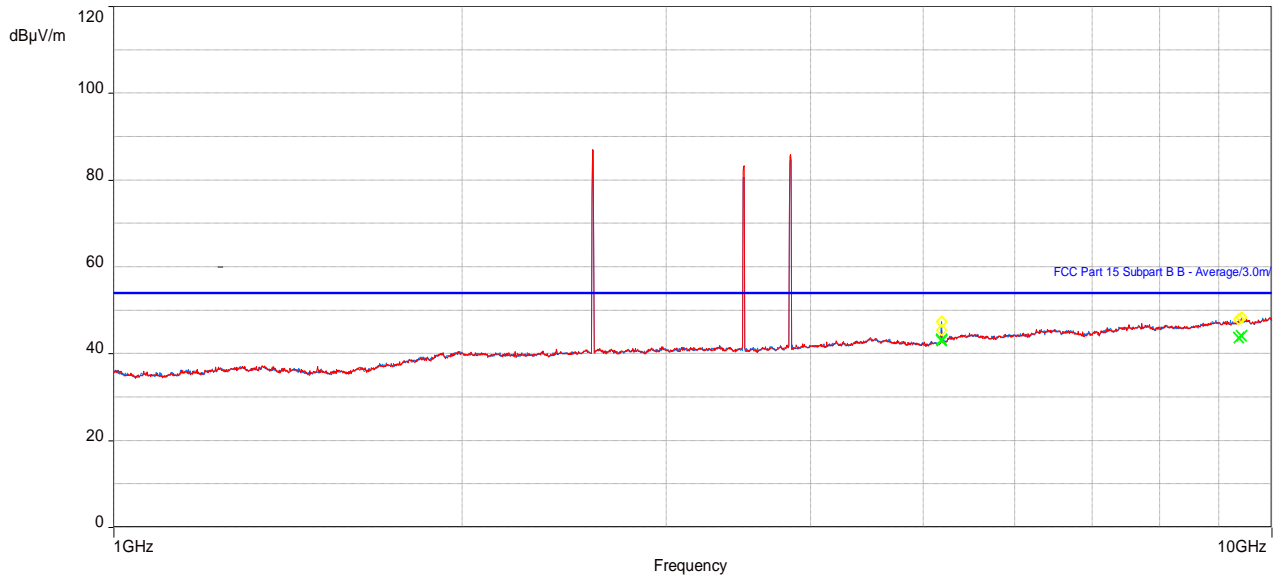
Frequency (MHz)	Level Quasi Peak (dBµV/m)	Limit Quasi-peak (dBµV/m)	Margin to FCC part 15 Class B (dB)	Height (m)	Azimuth (deg)	Polarization	Correction (dB)
52.92994197	21.11	40.00	-18.89	1.66	155.00	Vertical	-15.02
167.21533	18.92	43.52	-24.60	3.00	305.00	Vertical	-10.84
52.97457692	16.26	40.00	-23.74	2.77	11.50	Horizontal	-15.04
523.0634582	18.48	46.02	-27.54	2.05	312.25	Horizontal	-2.09

Table 17: RE test results from 30 to 1000 MHz for FCC Part 27 (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)
52.92994197	21.11	55.2	-34.09	1.66	155.00	Vertical	-15.02
167.21533	18.92	55.2	-36.28	3.00	305.00	Vertical	-10.84
52.97457692	16.26	55.2	-38.94	2.77	11.50	Horizontal	-15.04
523.0634582	18.48	55.2	-36.72	2.05	312.25	Horizontal	-2.09

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

Figure 11: Plot of RE at 3m from 1 to 10GHz (S.RAT/ S.Carrier – LTE - Mid 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 10 GHz for FCC Part 15 (S.RAT/S.Carrier – Mid ch – IRU 1648)

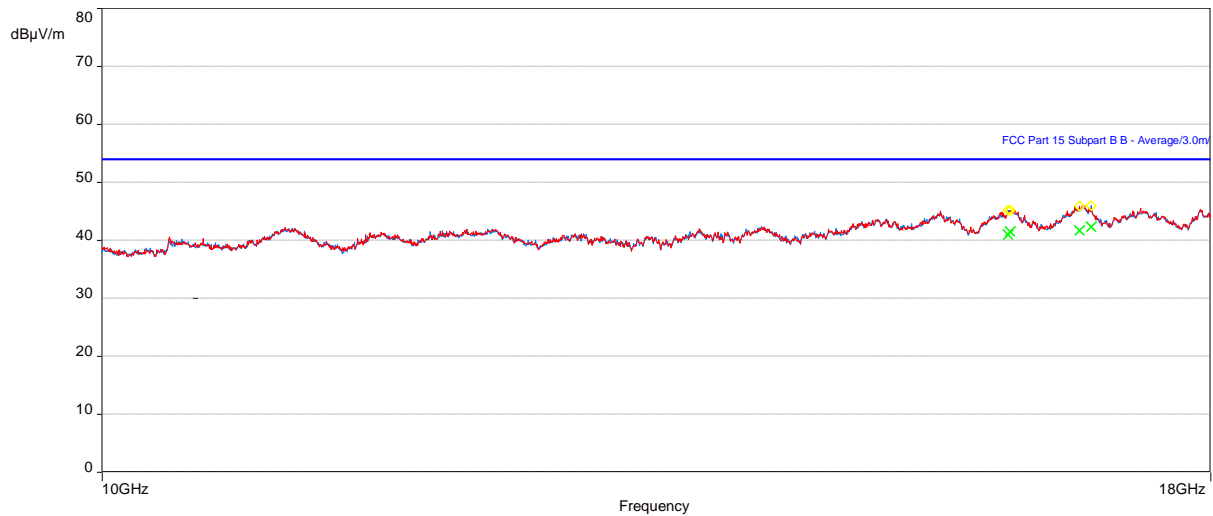
Frequency (MHz)	Level Average (dBµV/m)	Limit Average (dBµV/m)	Margin to FCC part 15 Class B (dB)	Height (m)	Azimuth (degrees)	Polarization	Correction (dB)
5186.150321	43.16	53.96	-10.80	3.00	263.25	Vertical	11.32
9418.362821	44.09	53.96	-9.87	2.96	4.75	Horizontal	15.36

Table 19: RE test results from 1 to 10 GHz for Part 27 (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)
5186.150321	43.16	55.2	-12.04	3.00	263.25	Vertical	11.32
9418.362821	44.09	55.2	-11.11	2.96	4.75	Horizontal	15.36

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

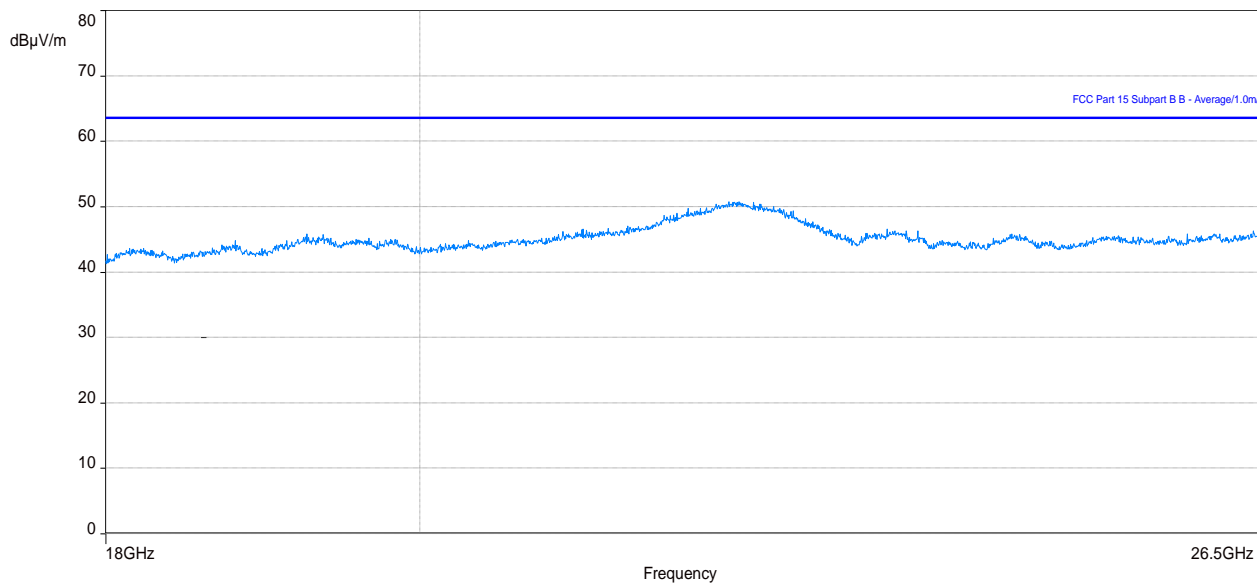
Figure 12: Plot of RE at 3m from 10 to 18 GHz (S.RAT/S.Carrier – LTE - Mid ch – IRU 1648)



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 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.

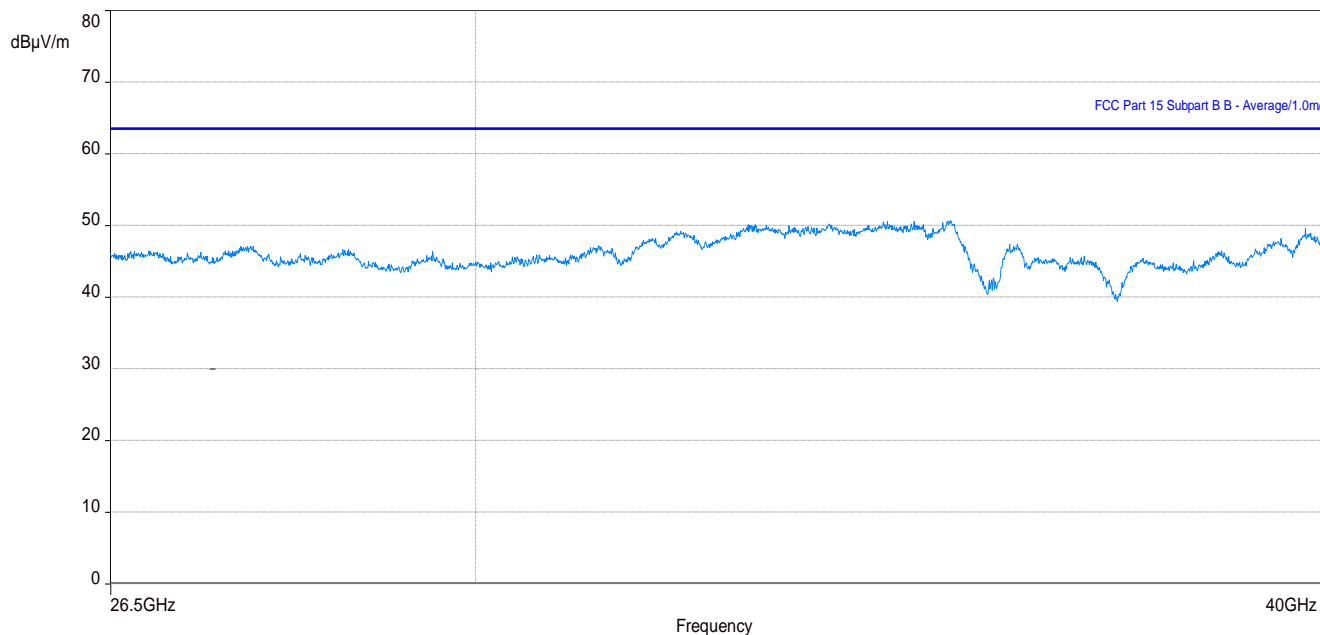
Figure 13: Plot of RE at 1m from 18 to 26.5 GHz (S.RAT/S.Carrier – LTE- Mid ch – IRU 1648)



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



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

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

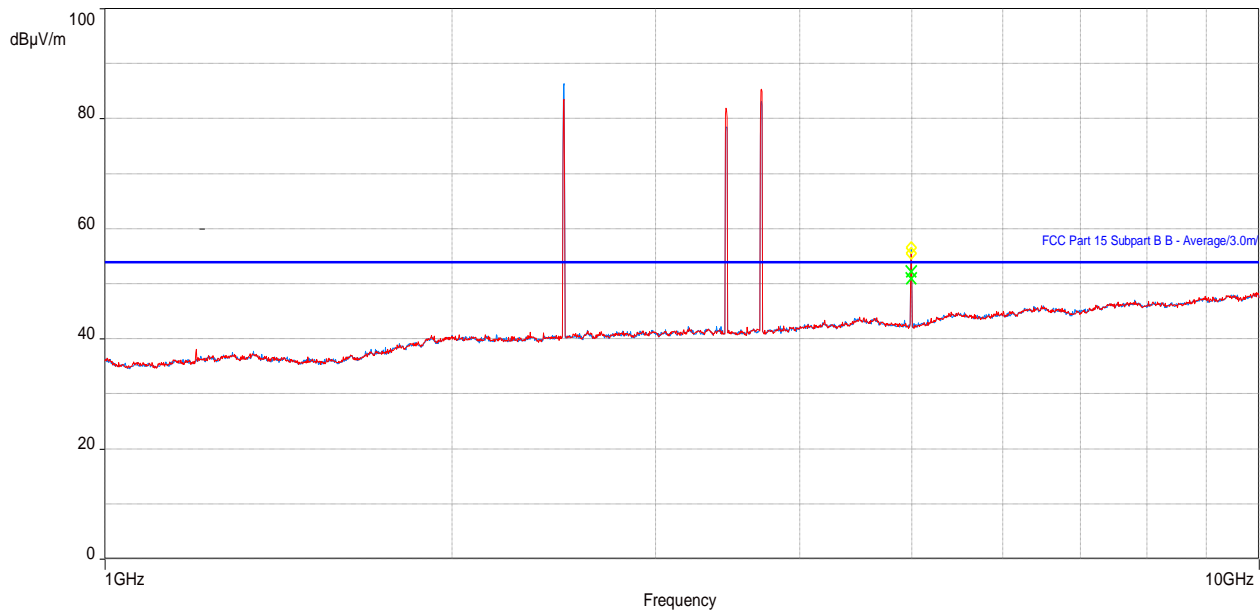
Date tested: July 31 – August 03, 2023

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 15: Plot of RE at 3m from 1 to 10GHz (S.RAT/ S.Carrier – LTE & NR - Bot ch – IRU 1648)



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

Table 20: RE test results from 1 to 10 GHz for FCC Part 15 (S.RAT/S.Carrier – Bot ch – IRU 1648)

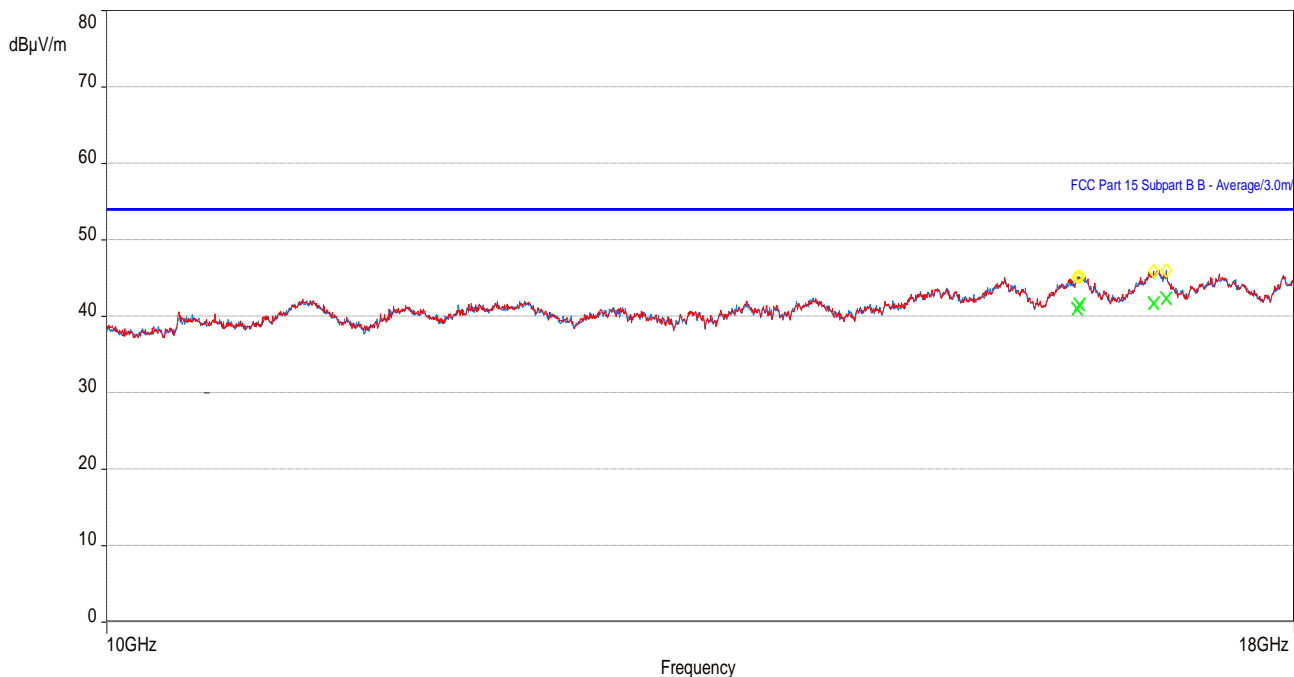
Frequency (MHz)	Level Average (dBµV/m)	Limit Average (dBµV/m)	Margin to FCC part 15 Class B (dB)	Height (m)	Azimuth (degrees)	Polarization	Correction (dB)
4997.678205	52.20	53.96	-1.76	2.75	190.50	Horizontal	10.95

Table 21: RE test results from 1 to 10 GHz for Part 27 (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)
4997.678205	52.20	55.2	- 3.0	2.75	190.50	Horizontal	10.95

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



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

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

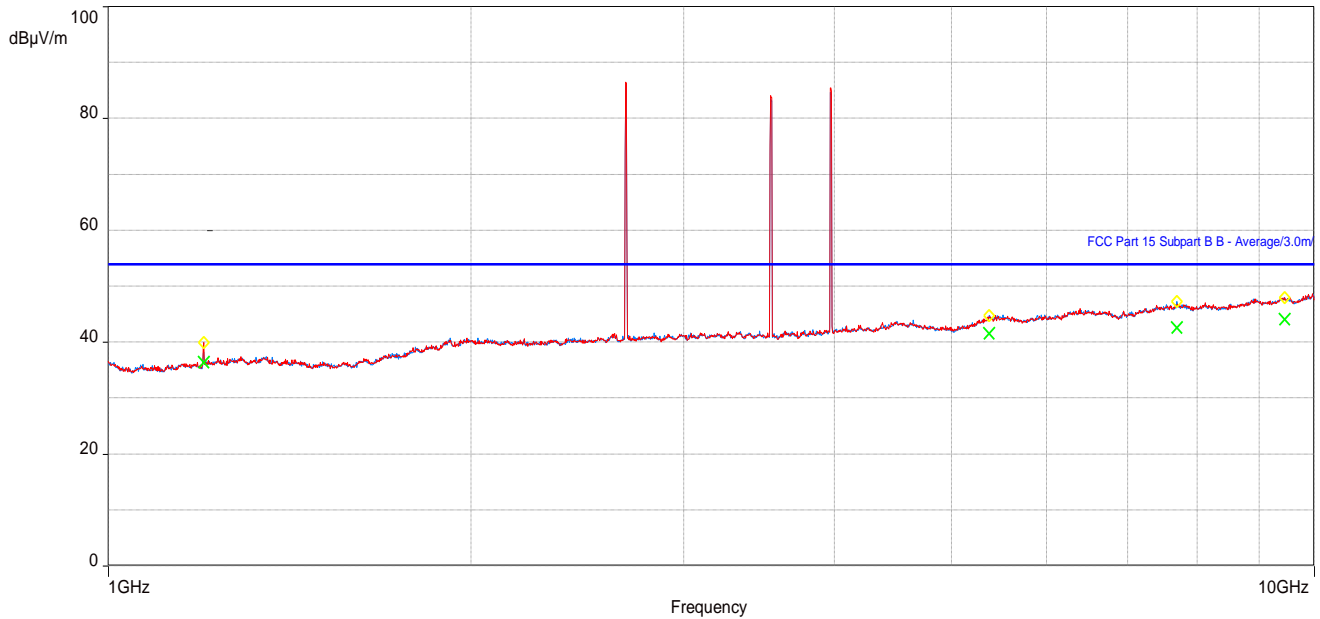
Date tested: July 31 – August 03, 2023

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 17: Plot of RE at 3m from 1 to 10GHz (S.RAT/ S.Carrier – LTE & 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 10 GHz for FCC Part 15 (S.RAT/S.Carrier – Top ch – IRU 1648)

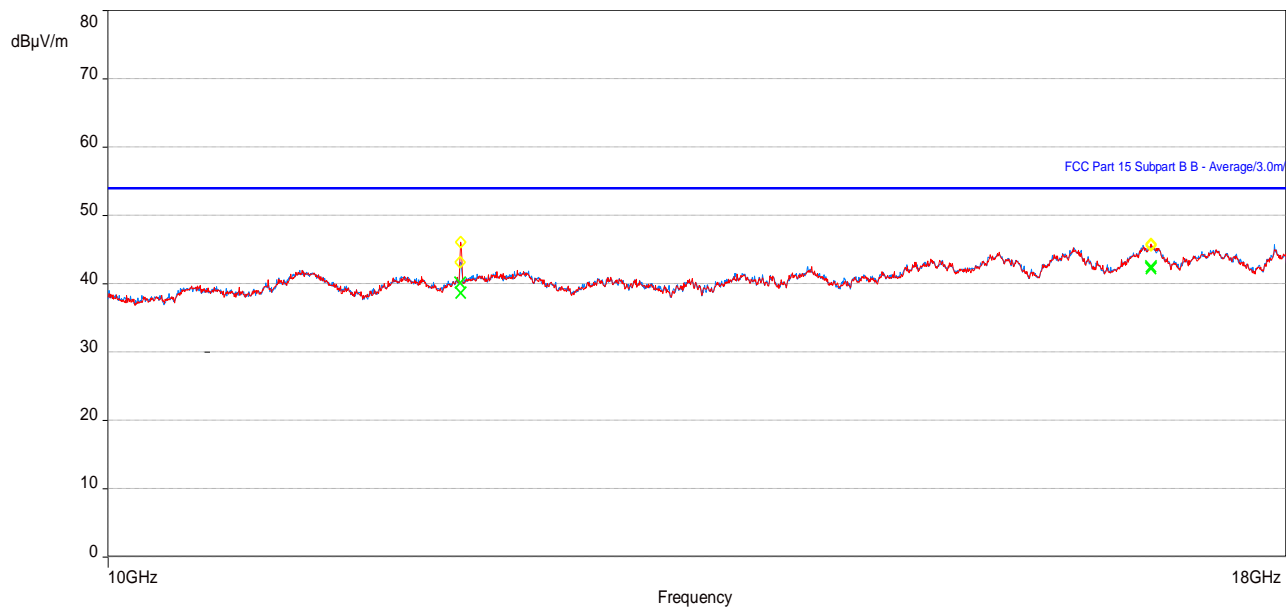
Frequency (MHz)	Level Average (dBµV/m)	Limit Average (dBµV/m)	Margin to FCC part 15 Class B (dB)	Height (m)	Azimuth (degrees)	Polarization	Correction (dB)
9446.965385	44.03	53.96	-9.93	1.54	0.00	Vertical	15.44
5377.158974	41.53	53.96	-12.43	2.49	119.75	Horizontal	12.18
7693.946474	42.59	53.96	-11.37	1.31	300.00	Horizontal	14.14

Table 23: RE test results from 1 to 10 GHz for Part 27 (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)
9446.965385	44.03	55.2	-11.17	1.54	0.00	Vertical	15.44
5377.158974	41.53	55.2	-13.67	2.49	119.75	Horizontal	12.18
7693.946474	42.59	55.2	-12.61	1.31	300.00	Horizontal	14.14

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

Figure 18: Plot of RE at 3m from 10 to 18 GHz (S.RAT/S.Carrier –LTE & 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 27 radiated spurious emissions limit when converted to dBuV/m. For final spurious emissions measurements to FCC Part 27, see antenna port conducted emissions in applicable test report.



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

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

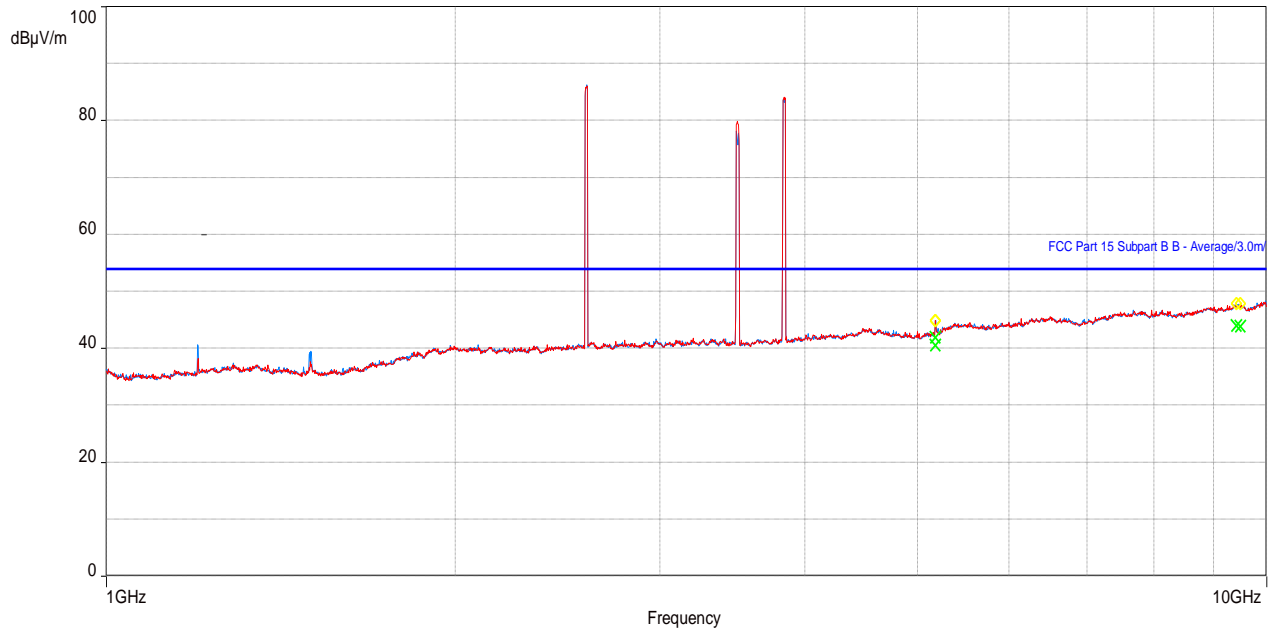
Date tested: July 31 – August 03, 2023

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 19: Plot of RE at 3m from 1 to 10GHz (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 24: RE test results from 1 to 10 GHz for FCC Part 15 (S.RAT/Multi Carrier – Mid ch – IRU 1648)

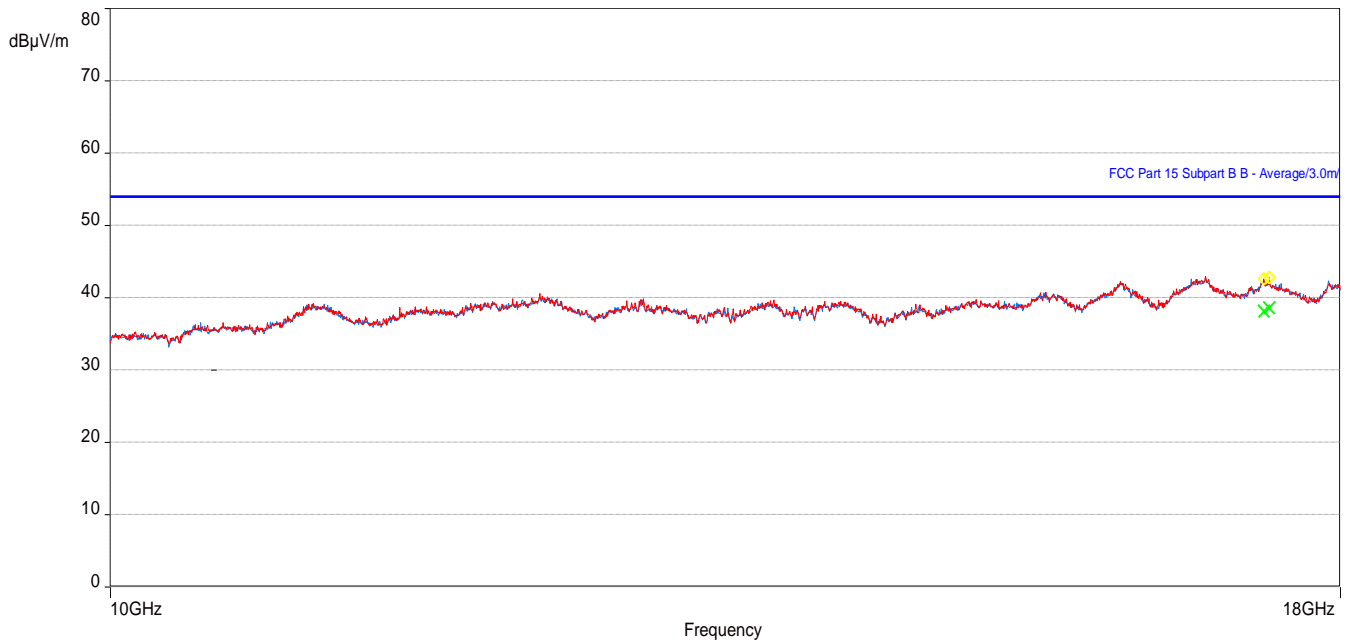
Frequency (MHz)	Level Average (dBµV/m)	Limit Average (dBµV/m)	Margin to FCC part 15 Class B (dB)	Height (m)	Azimuth (degrees)	Polarization	Correction (dB)
5184.504167	41.91	53.96	-12.05	2.03	211.75	Horizontal	11.31
9417.966346	43.91	53.96	-10.05	1.74	17.25	Horizontal	15.36

Table 25: RE test results from 1 to 10 GHz for Part 27 (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)
5184.504167	41.91	55.2	-13.29	2.03	211.75	Horizontal	11.31
9417.966346	43.91	55.2	-11.29	1.74	17.25	Horizontal	15.36

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



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

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

Date tested: July 31 – August 03, 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 21: Plot of RE at 3 m – 30 to 1000 MHz (M.RAT/M.Carrier – Mid ch – IRU 1648)

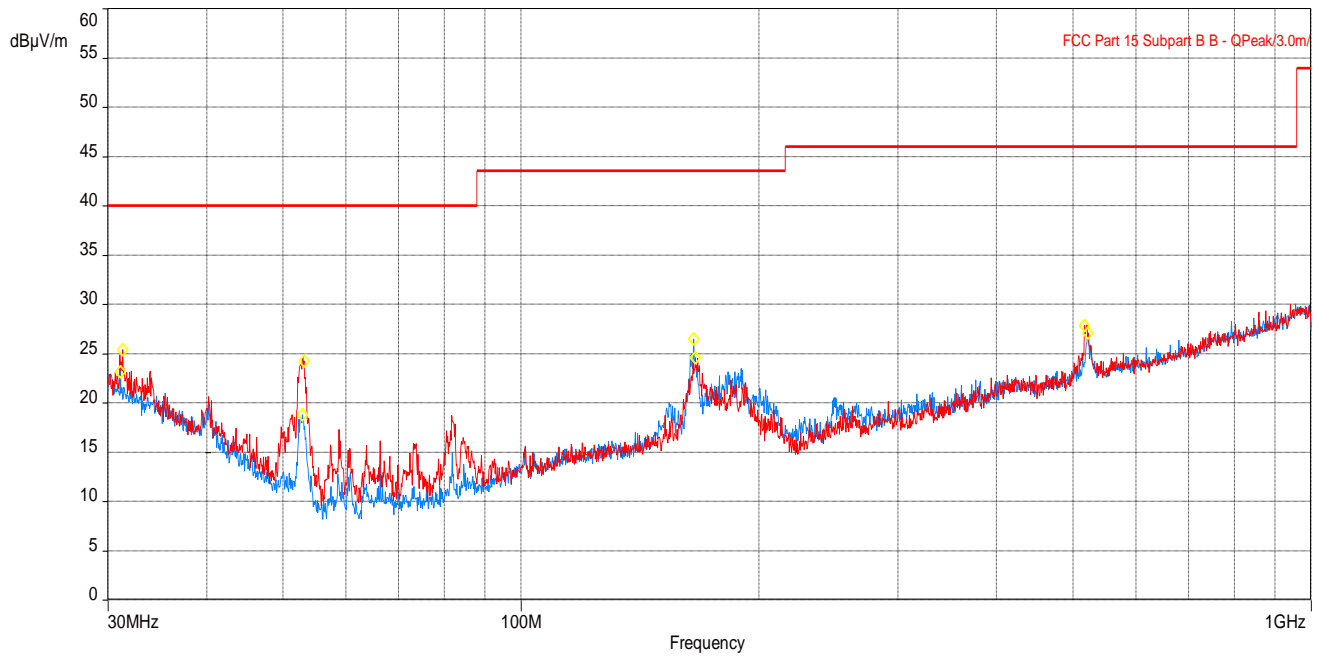


Table 26: RE test results from 30 to 1000 MHz for FCC Part 15 (M.RAT/M.Carrier – Mid ch – IRU 1648)

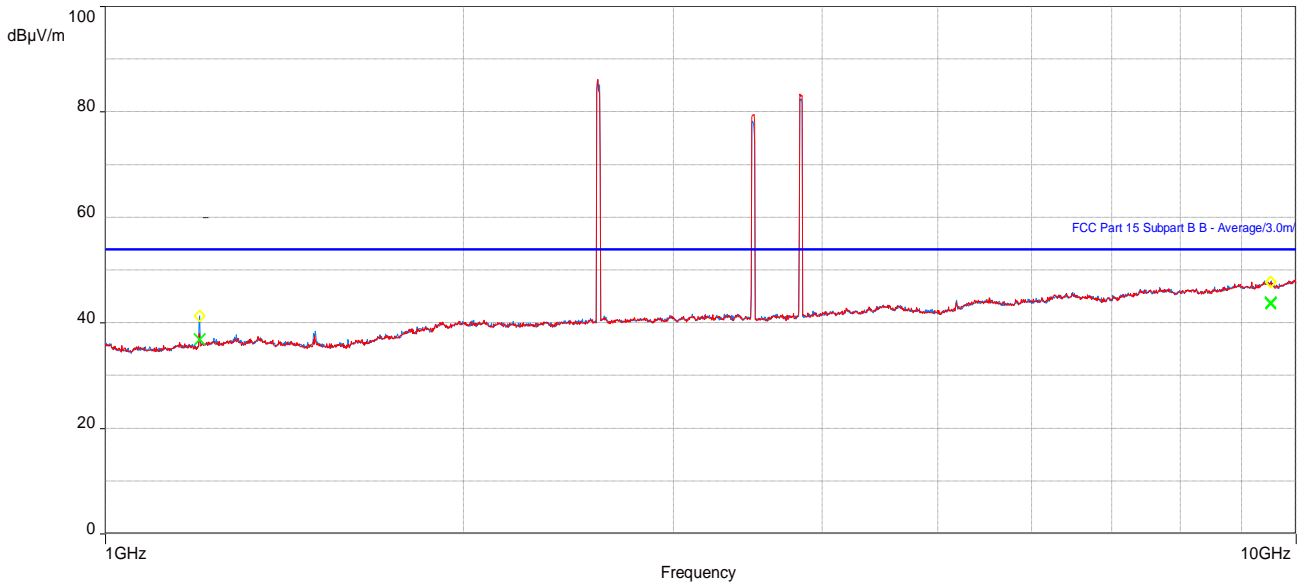
Frequency (MHz)	Level Quasi Peak (dBµV/m)	Limit Quasi-peak (dBµV/m)	Margin to FCC part 15 Class B (dB)	Height (m)	Azimuth (deg)	Polarization	Correction (dB)
31.30050674	20.39	40.00	-19.61	1.04	224.50	Vertical	-3.49
53.13756377	20.61	40.00	-19.39	1.24	156.00	Vertical	-15.10
166.1458944	20.29	43.52	-23.23	4.00	355.25	Vertical	-10.74
516.4421795	25.17	46.02	-20.85	1.00	233.00	Vertical	-2.20

Table 27: RE test results from 30 to 1000 MHz for FCC Part 27 (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)
31.30050674	20.39	55.2	-34.81	1.04	224.50	Vertical	-3.49
53.13756377	20.61	55.2	-34.59	1.24	156.00	Vertical	-15.10
166.1458944	20.29	55.2	-34.91	4.00	355.25	Vertical	-10.74
516.4421795	25.17	55.2	-30.03	1.00	233.00	Vertical	-2.20

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 3m from 1 to 10GHz (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 28: RE test results from 1 to 10 GHz for FCC Part 15 (M.RAT/M.Carrier – Mid ch – IRU 1648)

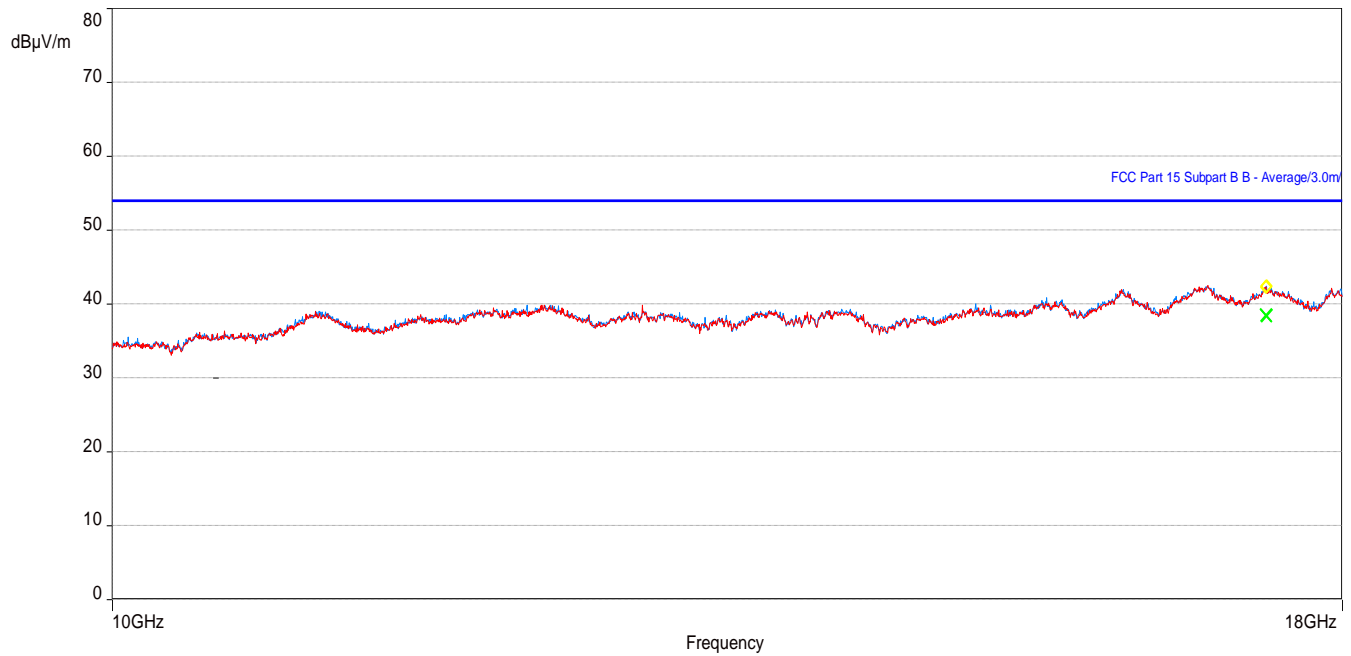
Frequency (MHz)	Level Average (dBµV/m)	Limit Average (dBµV/m)	Margin to FCC part 15 Class B (dB)	Height (m)	Azimuth (degrees)	Polarization	Correction (dB)
9528.711218	43.61	53.96	-10.35	1.83	329.75	Vertical	15.33
1199.888141	36.86	53.96	-17.10	2.70	95.75	Horizontal	2.24
9530.203205	43.84	53.96	-10.12	1.23	360.25	Horizontal	15.32

Table 29: RE test results from 1 to 10 GHz for Part 27 (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)
9528.711218	43.61	55.2	-11.59	1.83	329.75	Vertical	15.33
1199.888141	36.86	55.2	-18.34	2.70	95.75	Horizontal	2.24
9530.203205	43.84	55.2	-11.36	1.23	360.25	Horizontal	15.32

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

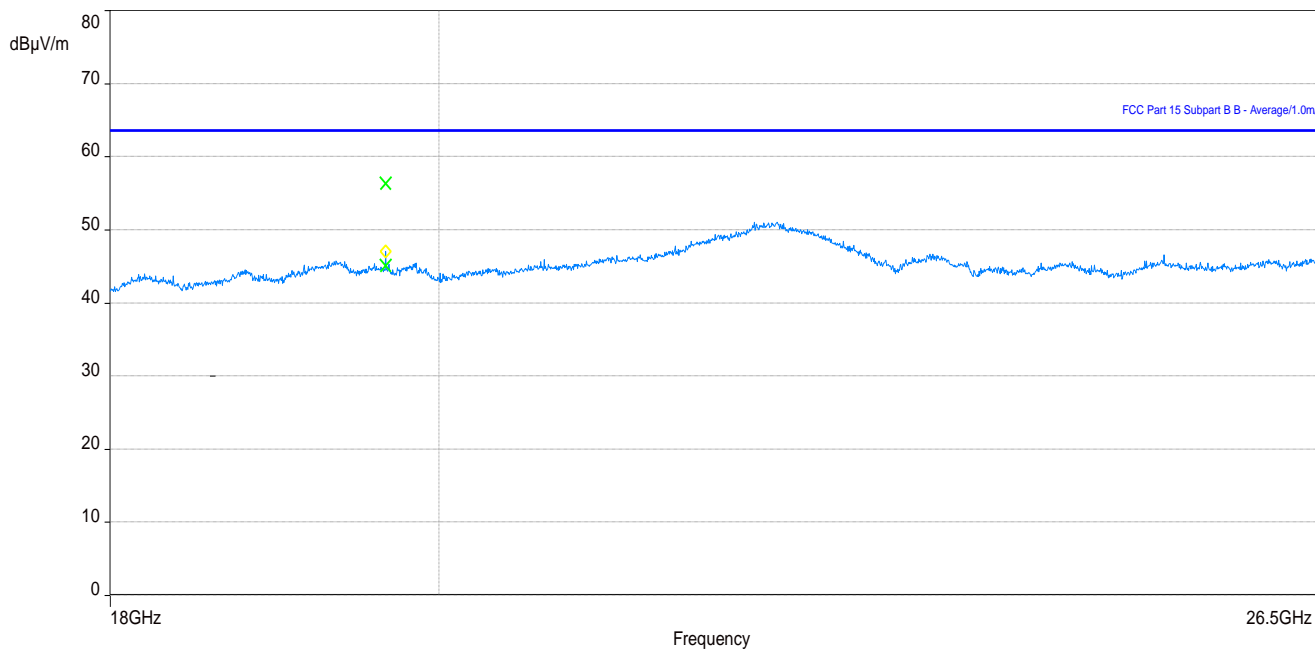
Figure 23: Plot of RE at 3m from 10 to 18 GHz (M.RAT/M.Carrier – Mid ch – IRU 1648)



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 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.

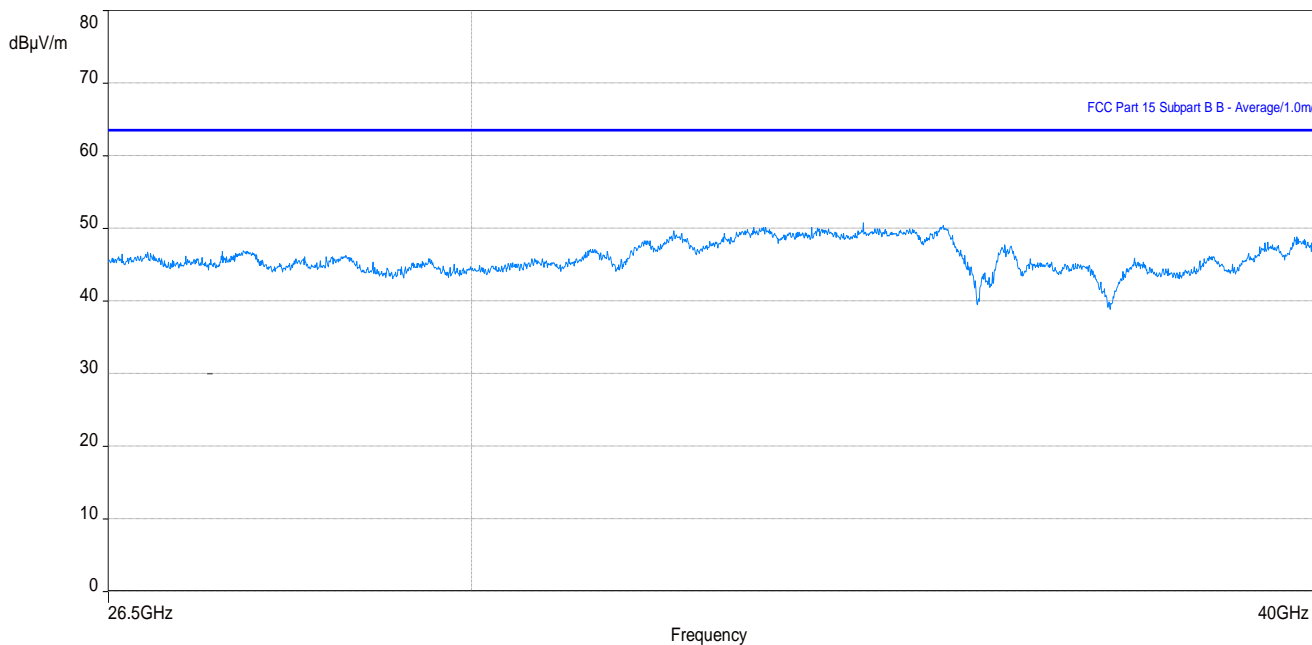
Figure 24: Plot of RE at 1m from 18 to 26.5 GHz (M.RAT/M.Carrier – Mid ch – IRU 1648)



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 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 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 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.



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

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

Date tested: July 31 – August 03, 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)

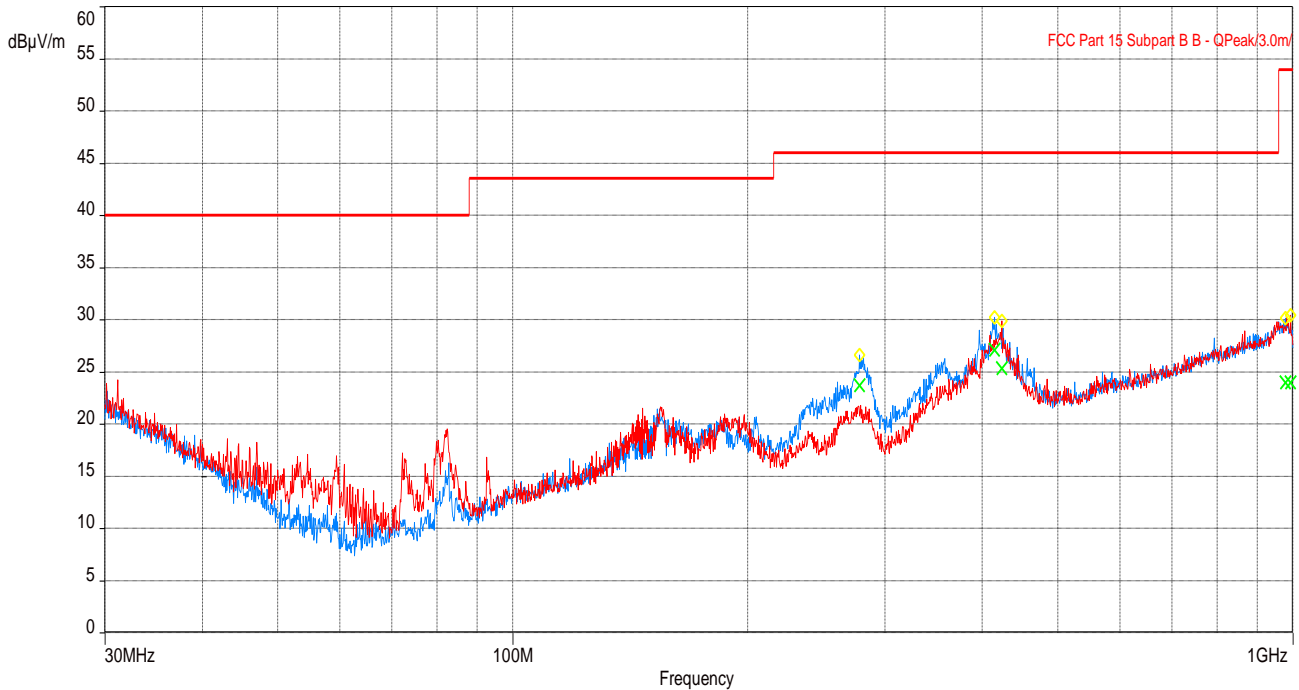


Table 30: RE test results from 30 to 1000 MHz for FCC Part 15 (S.RAT/S.Carrier – Mid ch – IRU 1649)

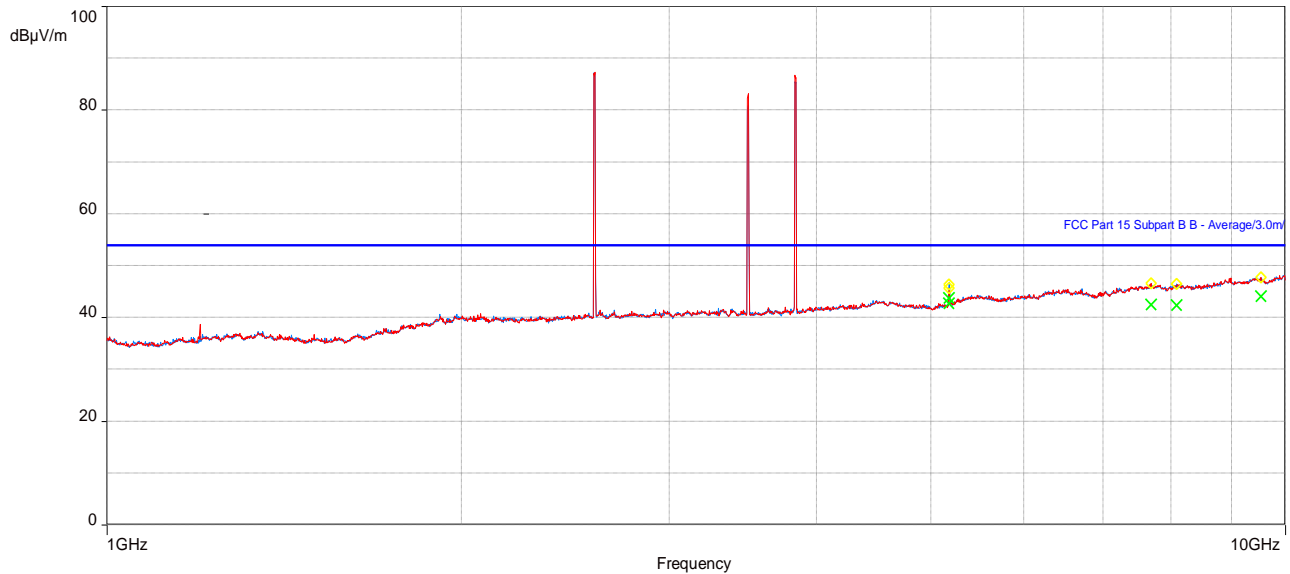
Frequency (MHz)	Level Quasi Peak (dBµV/m)	Limit Quasi-peak (dBµV/m)	Margin to FCC part 15 Class B (dB)	Height (m)	Azimuth (deg)	Polarization	Correction (dB)
278.4992982	23.70	46.02	-22.32	1.08	297.50	Horizontal	-7.11
414.6123718	27.11	46.02	-18.91	2.27	283.25	Horizontal	-3.71
979.1344231	23.95	53.98	-30.03	1.86	124.75	Horizontal	6.04

Table 31: RE test results from 30 to 1000 MHz for FCC Part 27 (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)
278.4992982	23.70	55.2	-31.5	1.08	297.50	Horizontal	-7.11
414.6123718	27.11	55.2	-28.09	2.27	283.25	Horizontal	-3.71
979.1344231	23.95	55.2	-31.25	1.86	124.75	Horizontal	6.04

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 27: Plot of RE at 3m from 1 to 10GHz (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 32: RE test results from 1 to 10 GHz for FCC Part 15 (S.RAT/S.Carrier – Mid ch – IRU 1649)

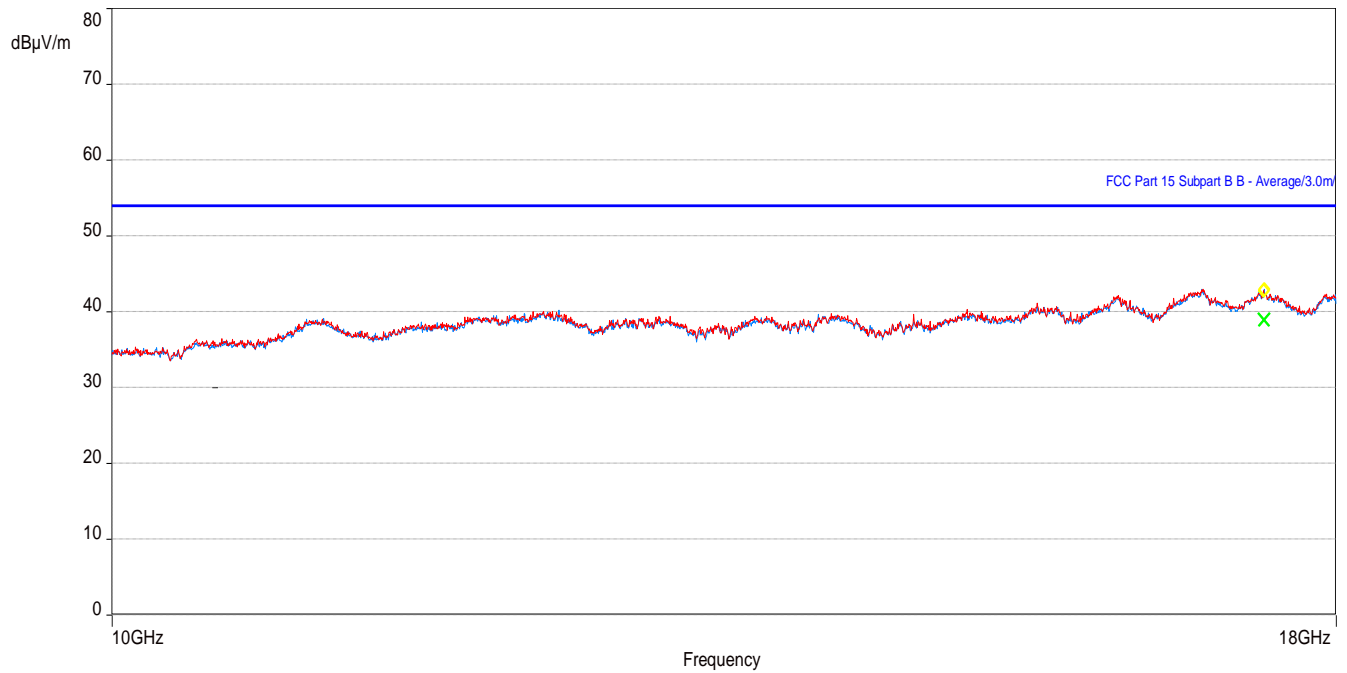
Frequency (MHz)	Level Average (dBµV/m)	Limit Average (dBµV/m)	Margin to FCC part 15 Class B (dB)	Height (m)	Azimuth (degrees)	Polarization	Correction (dB)
9531.914744	44.06	53.96	-9.90	2.85	250.00	Vertical	15.31
5185.216667	43.65	53.96	-10.31	2.81	189.50	Horizontal	11.32
8086.046474	42.35	53.96	-11.61	1.13	98.50	Horizontal	14.19

Table 33: RE test results from 1 to 10 GHz for Part 27 (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)
9531.914744	44.06	55.2	-11.14	2.85	250.00	Vertical	15.31
5185.216667	43.65	55.2	-11.55	2.81	189.50	Horizontal	11.32
8086.046474	42.35	55.2	-12.85	1.13	98.50	Horizontal	14.19

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

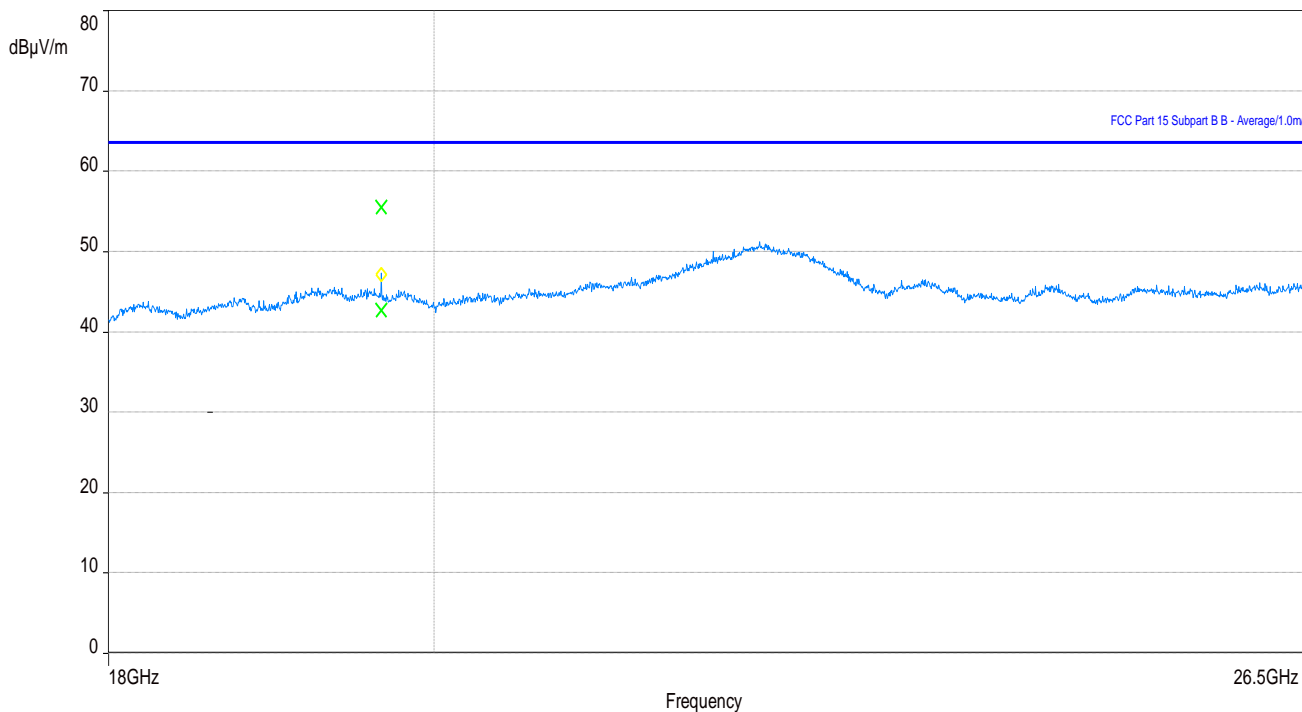
Figure 28: Plot of RE at 3m from 10 to 18 GHz (S.RAT/S.Carrier – Mid ch – IRU 1649)



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

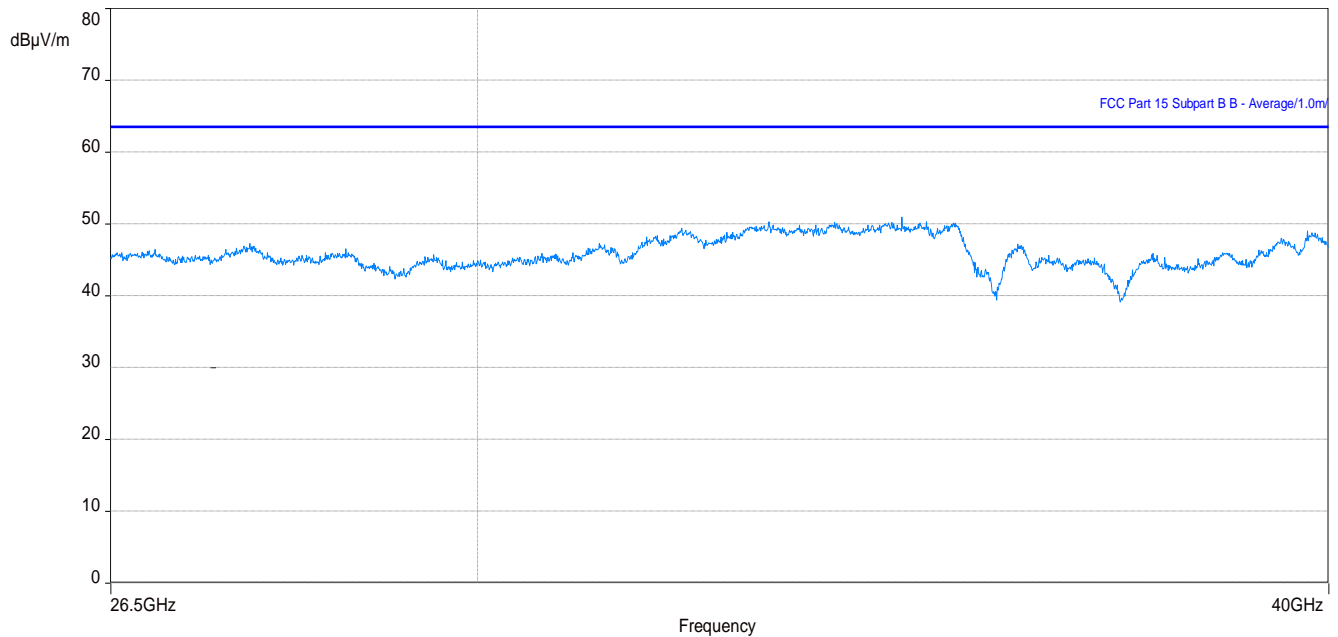
Figure 29: Plot of RE at 1m from 18 to 26.5 GHz (S.RAT/S.Carrier – Mid ch – IRU 1649)



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 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 30: 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 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.



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

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

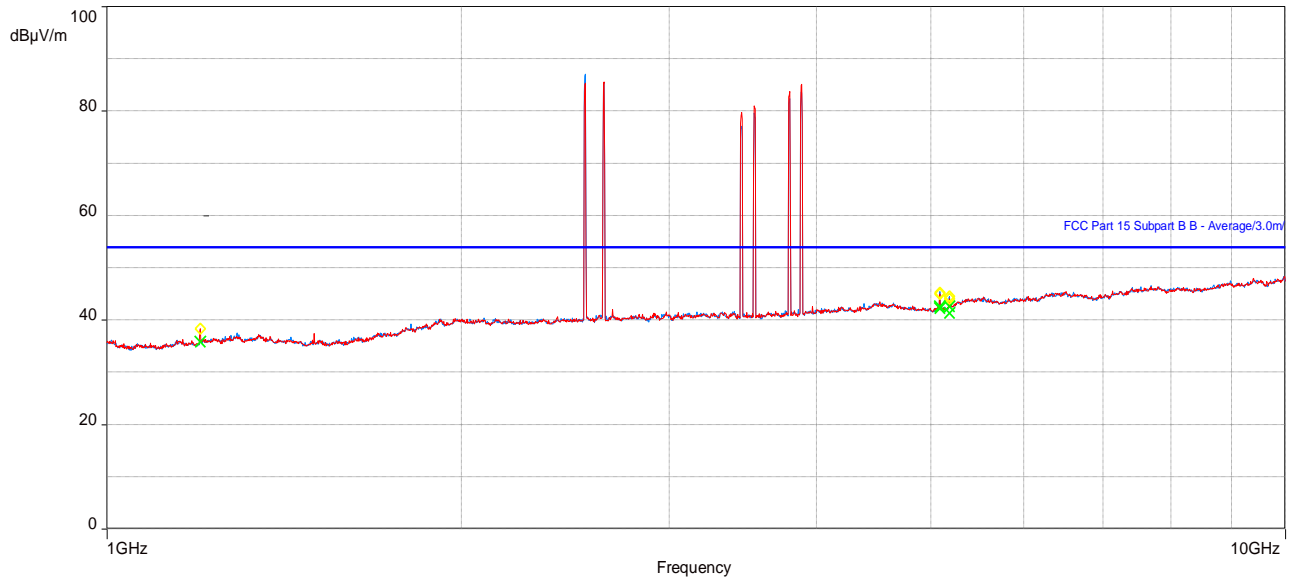
Date tested: July 31 – August 03, 2023

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 31: Plot of RE at 3m from 1 to 10GHz (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 34: RE test results from 1 to 10 GHz for FCC Part 15 (S.RAT/ M.Carrier – Mid ch – IRU 1649)

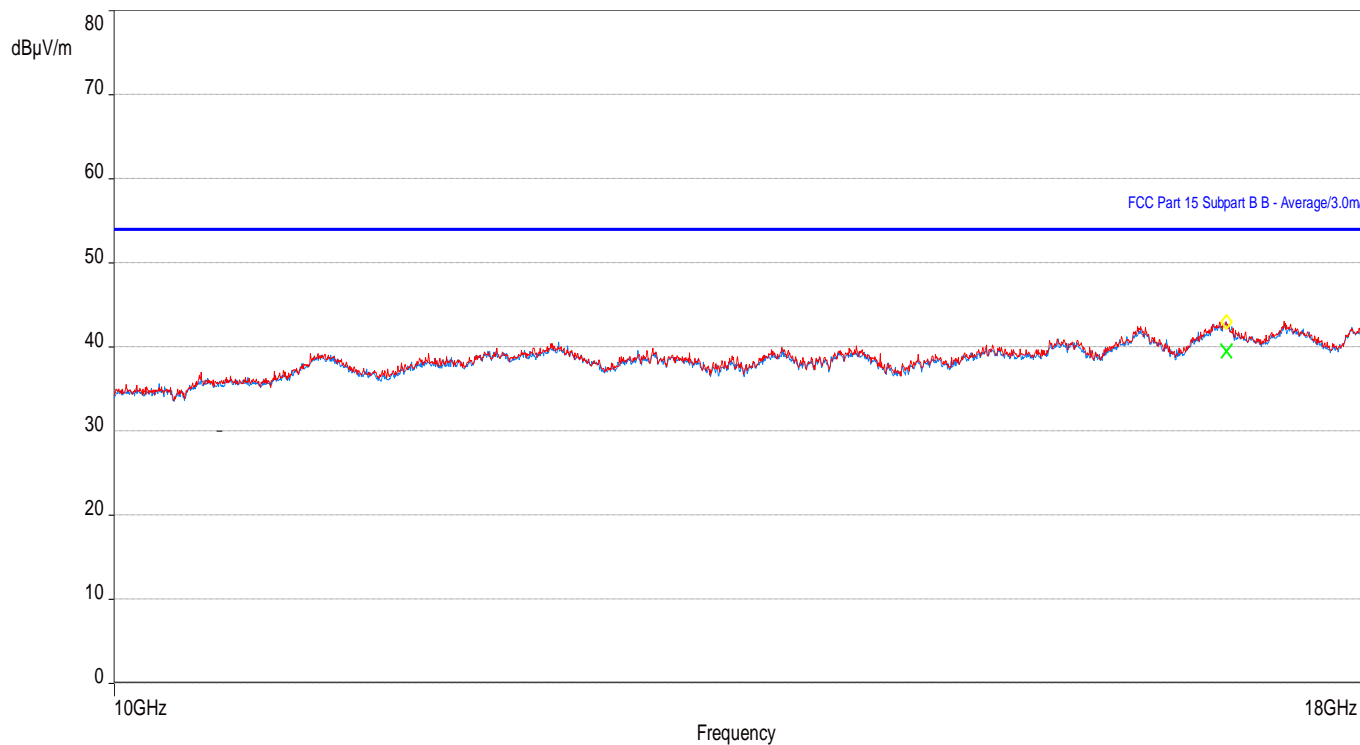
Frequency (MHz)	Level Average (dBµV/m)	Limit Average (dBµV/m)	Margin to FCC part 15 Class B (dB)	Height (m)	Azimuth (degrees)	Polarization	Correction (dB)
5090.608974	42.53	53.96	-11.43	3.00	98.50	Vertical	11.12
5185.799038	42.51	53.96	-11.45	2.54	189.50	Horizontal	11.32

Table 35: RE test results from 1 to 10 GHz for Part 27 (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)
5090.608974	42.53	55.2	-12.67	3.00	98.50	Vertical	11.12
5185.799038	42.51	55.2	-12.69	2.54	189.50	Horizontal	11.32

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

Figure 32: Plot of RE at 3m from 10 to 18 GHz (S.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 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.



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

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

Date tested: July 31 – August 03, 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 33: Plot of RE at 3 m – 30 to 1000 MHz (M.RAT / M.Carrier – Mid ch – IRU 1649)

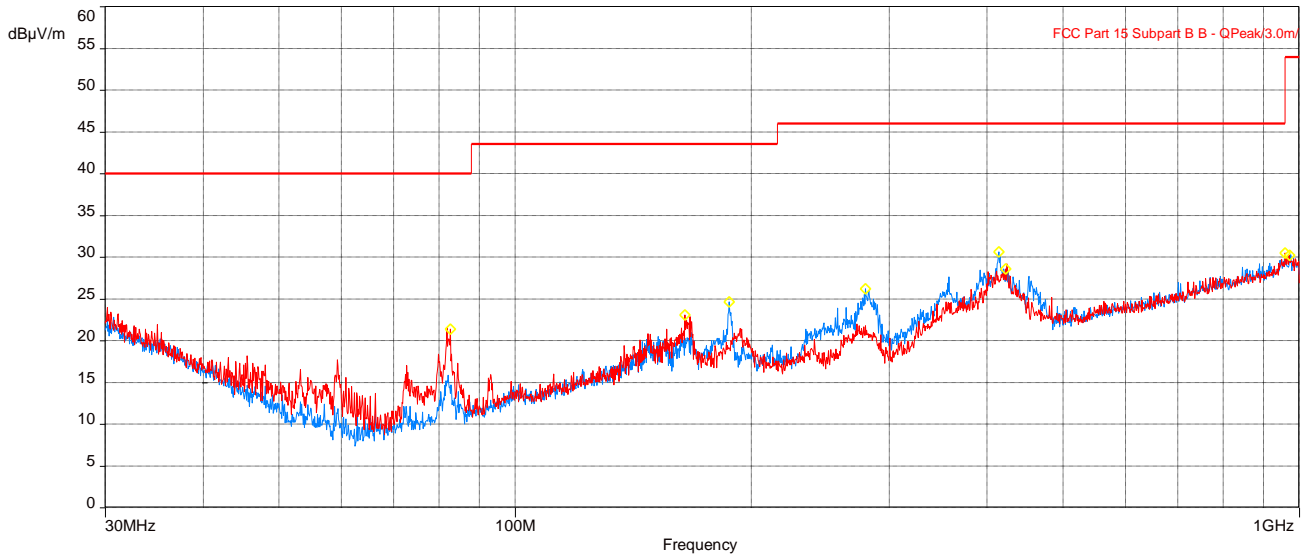


Table 36: RE test results from 30 to 1000 MHz for FCC Part 15 (M.RAT/M.Carrier–Mid ch–IRU 1649)

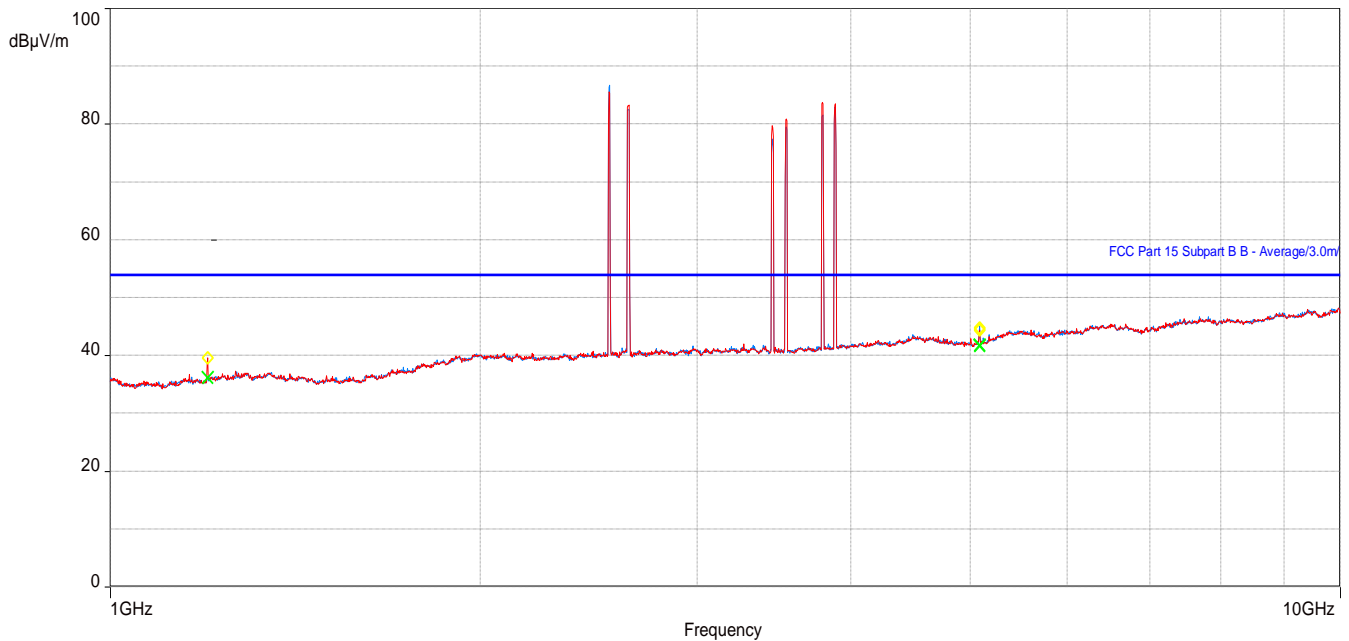
Frequency (MHz)	Level Quasi Peak (dBµV/m)	Limit Quasi-peak (dBµV/m)	Margin to FCC part 15 Class B (dB)	Height (m)	Azimuth (deg)	Polarization	Correction (dB)
959.8042213	24.29	46.02	-21.73	1.35	96.25	Vertical	6.00
187.4126123	18.03	43.52	-25.49	1.50	297.75	Horizontal	-11.90
279.8784103	22.55	46.02	-23.47	1.00	297.75	Horizontal	-7.10
413.6281508	26.81	46.02	-19.21	2.07	283.25	Horizontal	-3.77

Table 37: RE test results from 30 to 1000 MHz for FCC Part 27 (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)
959.8042213	24.29	55.2	-30.91	1.35	96.25	Vertical	6.00
187.4126123	18.03	55.2	-37.17	1.50	297.75	Horizontal	-11.90
279.8784103	22.55	55.2	-32.65	1.00	297.75	Horizontal	-7.10
413.6281508	26.81	55.2	-28.39	2.07	283.25	Horizontal	-3.77

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

Figure 34: Plot of RE at 3m from 1 to 10GHz (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 38: RE test results from 1 to 10 GHz for FCC Part 15 (M.RAT/M.Carrier–Mid ch–IRU 1649)

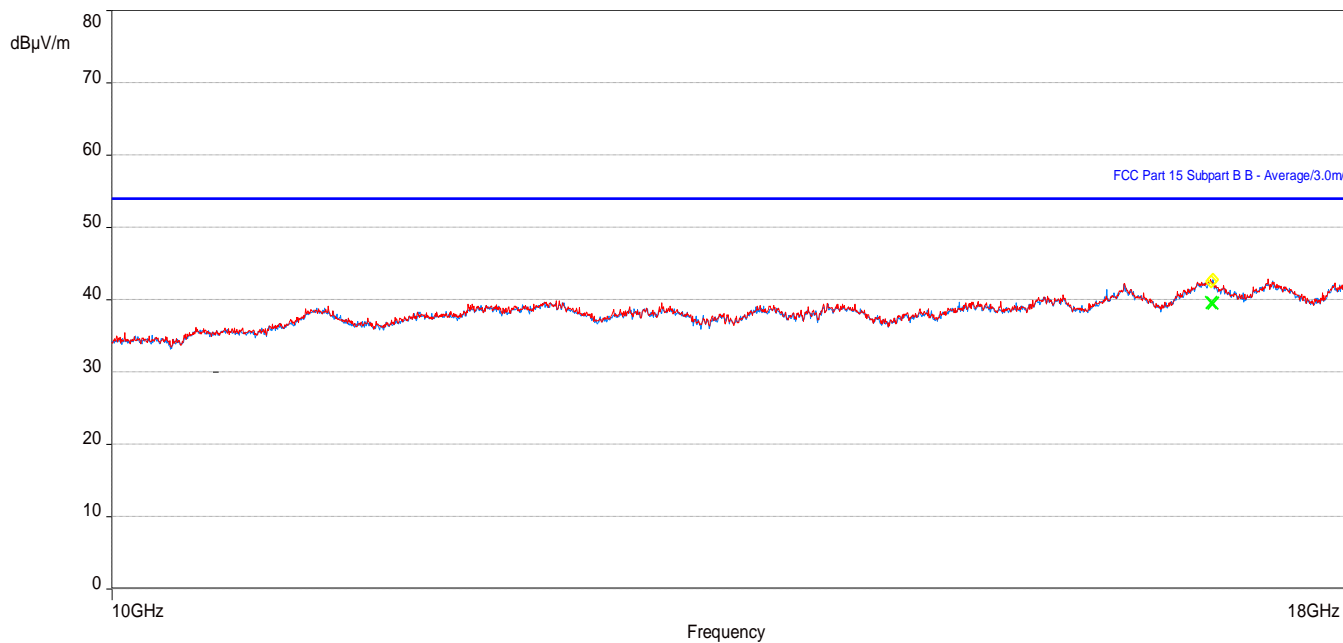
Frequency (MHz)	Level Average (dBµV/m)	Limit Average (dBµV/m)	Margin to FCC part 15 Class B (dB)	Height (m)	Azimuth (degrees)	Polarization	Correction (dB)
1200.005128	36.10	53.96	-17.86	2.38	132.25	Vertical	2.24
5090.410256	41.74	53.96	-12.22	2.46	98.50	Horizontal	11.12

Table 39: RE test results from 1 to 10 GHz for Part 27 (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)
1200.005128	36.10	55.2	-19.10	2.38	132.25	Vertical	2.24
5090.410256	41.74	55.2	-13.46	2.46	98.50	Horizontal	11.12

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

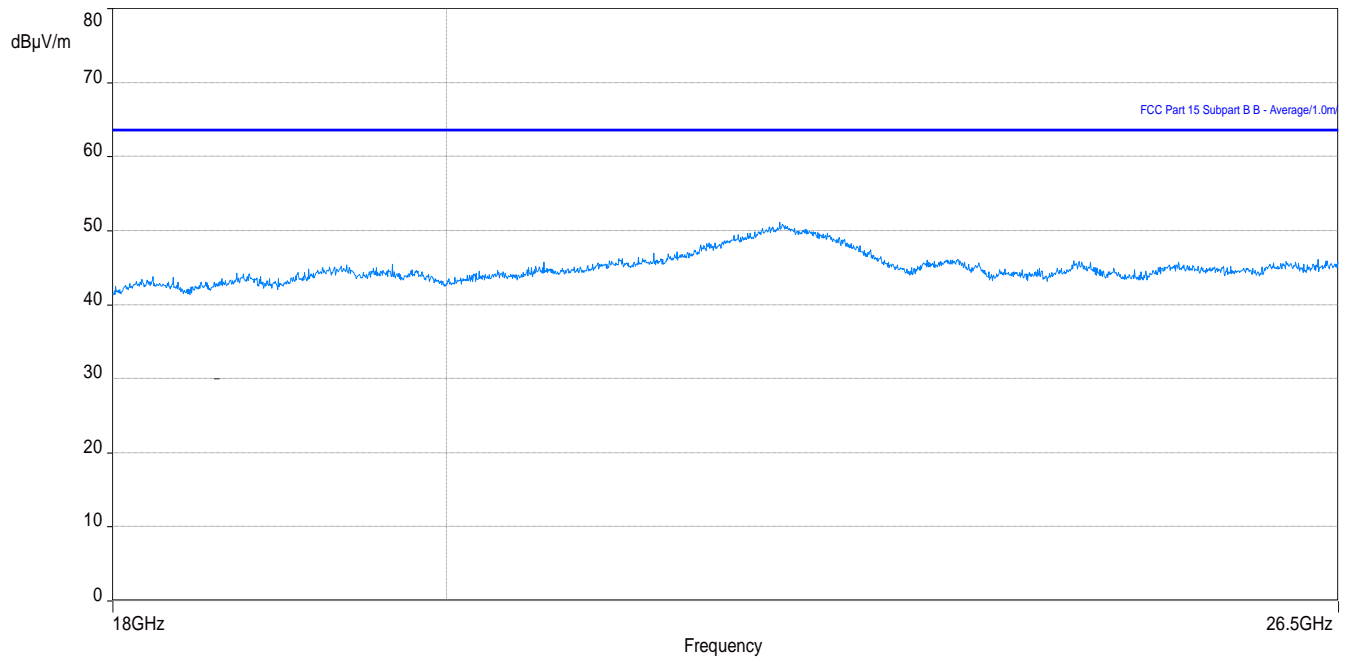
Figure 35: Plot of RE at 3m from 10 to 18 GHz (M.RAT/M.Carrier – Mid ch – IRU 1649)



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

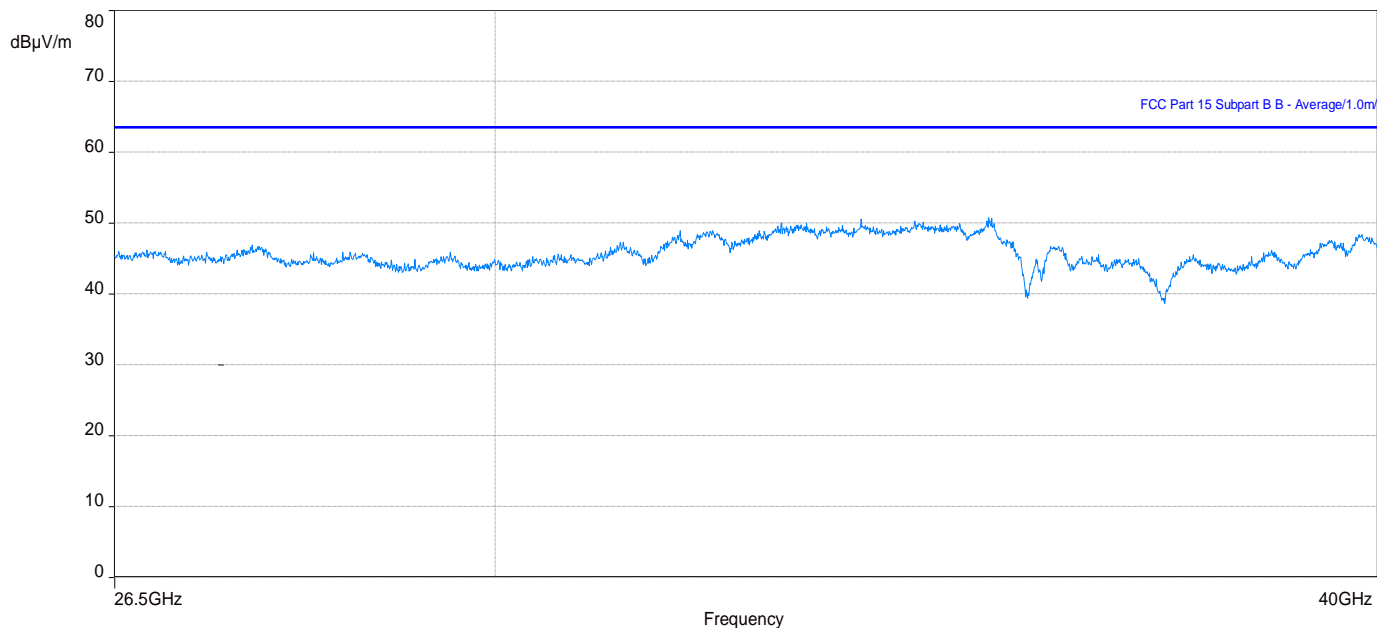
Figure 36: Plot of RE at 1m from 18 to 26.5 GHz (M.RAT/M.Carrier – Mid ch – IRU 1649)



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

Figure 37: Plot of RE at 1m from 26.5 to 40 GHz (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 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.

3.2.15 Radiated Emissions test setup pictures

Figure 38: EUT Setup for RE tests (Closeup) – (Configuration 1 - with IRU 1648)



Figure 39: EUT Setup for RE tests (Closeup) – (Configuration 2 - with IRU 1649)

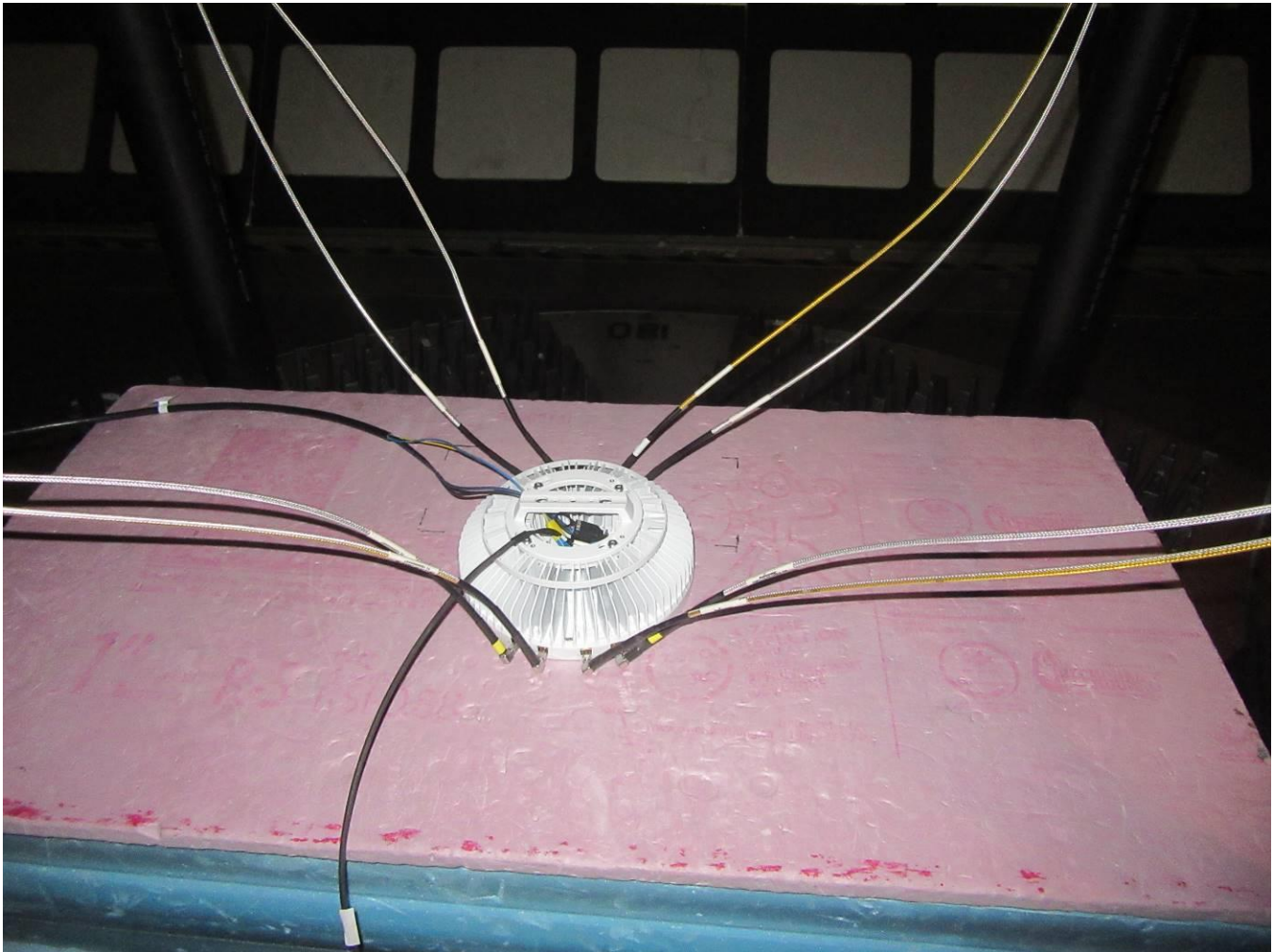


Figure 40: EUT Setup for RE tests at 30 MHz to 1 GHz

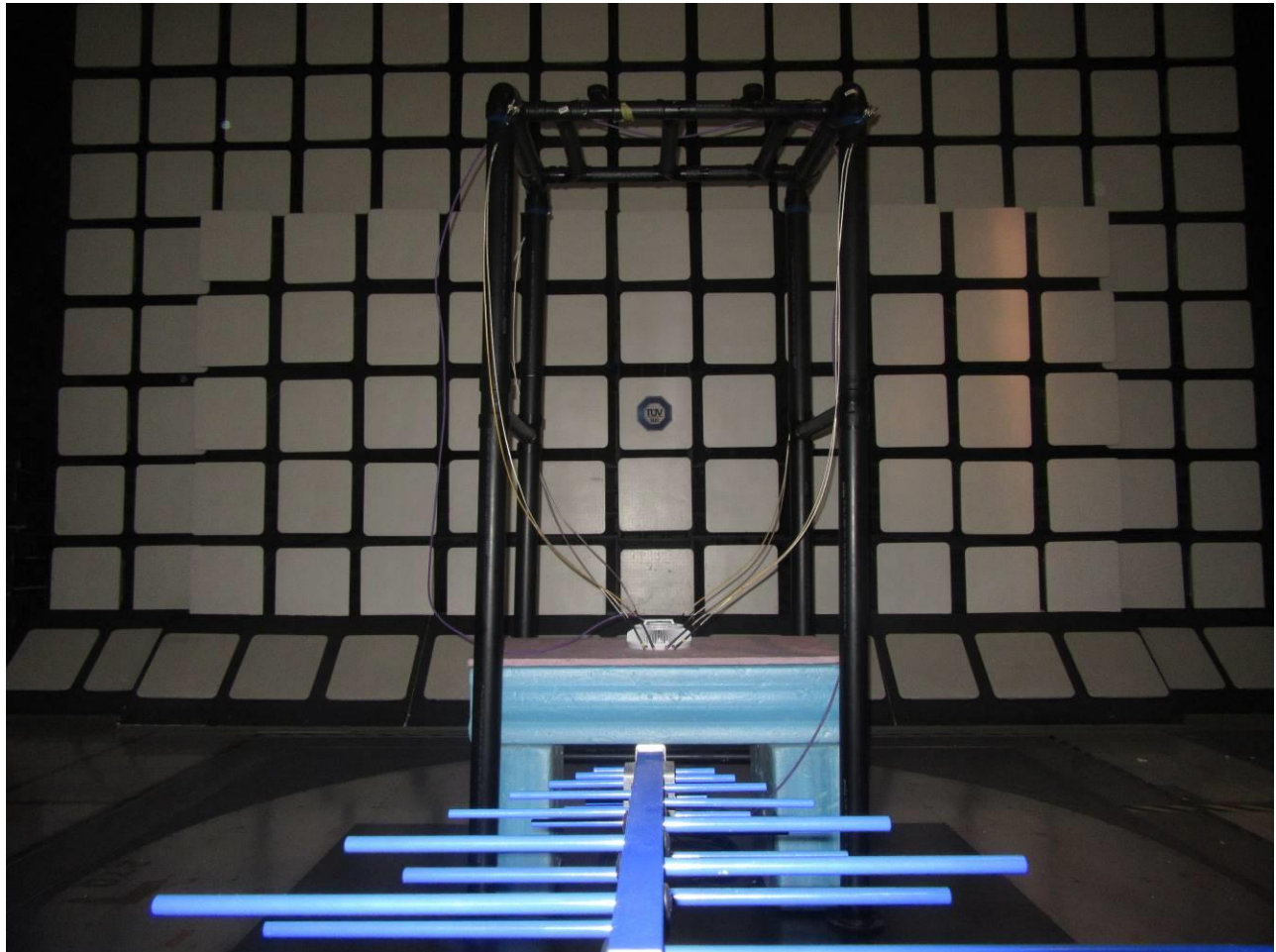
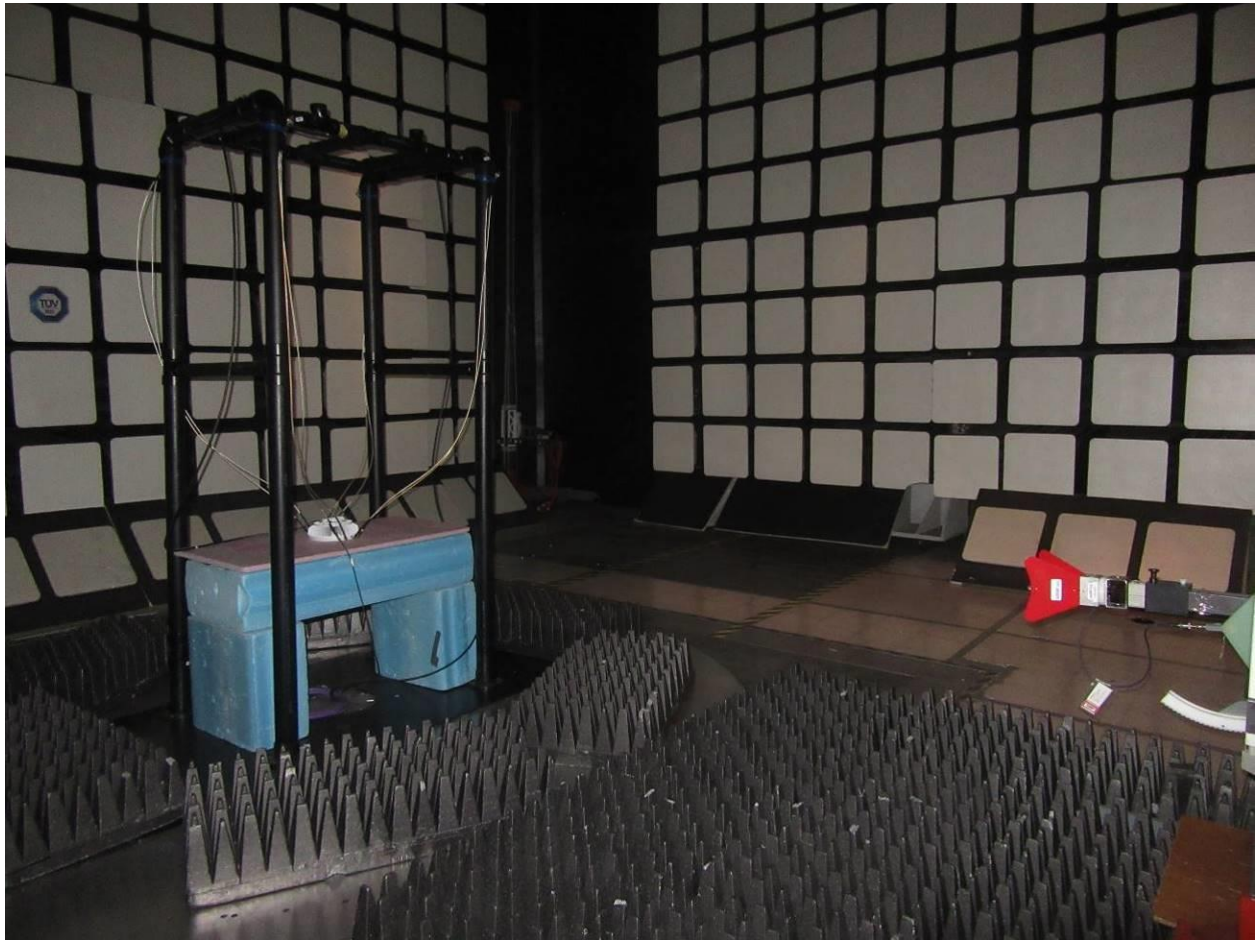


Figure 41: EUT Setup for RE tests for above 1 GHz



3.2.16 Test equipment

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

Table 40: 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

3.2.17 Test conclusion

The DOT 4455 B77DB77GB41 (KRY 901 551/1) and DOT 4465 B77DB77GB41 (KRY 901 551/2) 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 27 Miscellaneous Wireless Communications Services, U.S. Federal Communications Commission.

4.1 Appendix A: Abbreviations

The abbreviations of terms used in this document are as follows.

Term	Definition
A	6 dB Coaxial Attenuator (Conducted Immunity)
AAN	Asymmetric Artificial Network (ISN)
AE	Auxiliary equipment
AFC	Ambient Free Chamber
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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