Otodata Wireless Network, Inc.

TEST REPORT

SCOPE OF WORK
Emissions Testing on Propane Monitoring Device, Model C033

REPORT NUMBER
105128961BOX-001.2

ISSUE DATE
May 10, 2023

[REVISED DATE]
October 10, 2023

DOCUMENT CONTROL NUMBER
Non-Specific Radio Report Shell Rev. October 2022

EMISSIONS TEST REPORT

(FULL COMPLIANCE)

Report Number: 105128961BOX-001.2
Project Number: G105128961

Report Issue Date: May 10, 2023
Report Revision Date: October 10, 2023

Model(s) Tested: C033
Model(s) Partially Tested: None
Model(s) Not Tested but declared equivalent by the client: None

Standards: CFR47 FCC Part 15.247 Subpart C: 05/2023,
CFR47 FCC Part 15 Subpart B: 05/2023,
RSS-247 Issue 2 February 2017,
ISED ICES-003 Issue 7 October 2020,
RSS-Gen Issue 5 April 2018 +Amendment 1 March 2019

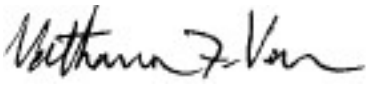
Tested by:
Intertek Testing Services NA, Inc.
70 Codman Hill Road
Boxborough, MA 01719
USA

Client:
Otodata Wireless Network, Inc.
1180 De Louvain Street
West Montreal, QC H4N 1G5
Canada

Report prepared by

Kouma Sinn / Senior Staff Engineer

Report reviewed by



Vathana Ven / Senior Staff Engineer

Table of Contents

1 Introduction and Conclusion

The tests indicated in section 2.0 were performed on the product constructed as described in section 4.0. The remaining test sections are the verbatim text from the actual data sheets used during the investigation. These test sections include the test name, the specified test Method, a list of the actual Test Equipment Used, documentation Photos, Results and raw Data. No additions, deviations, or exclusions have been made from the standard(s) unless specifically noted.

Based on the results of our investigation, we have concluded the product tested **complies** with the requirements of the standard(s) indicated. The results obtained in this test report pertain only to the item(s) tested. Intertek does not make any claims of compliance for samples or variants which were not tested.

2 Test Summary

Section	Test full name	Result
3	Client Information	--
4	Description of Equipment Under Test and Variant Models	--
5	System Setup and Method	--
6	Maximum Peak Output Power CFR47 FCC Part 15 Subpart C:05/2023, Section 15.247 (b)(3) RSS-247 Issue 2 February 2017	Pass
7	6 dB Bandwidth and Occupied Bandwidth CFR47 FCC Part 15 Subpart C: 05/2022, Section 15.247 (a)(2) RSS-247 Issue 2 February 2017	Pass
8	Maximum Power Spectral Density CFR47 FCC Part 15 Subpart C: 05/2023, Section 15.247 (e) RSS-247 Issue 2 February 2017	Pass
9	Band Edge Compliance CFR47 FCC Part 15 Subpart C: 05/2023, Section 15.247 (d) RSS-247 Issue 2: 02/2017)	Pass
10	Transmitter spurious emissions CFR47 FCC Part 15 Subpart C: 05/2023, Section 15.247 (d) RSS-247 Issue 2 February 2017	Pass
11	Digital Device and Receiver Radiated Spurious Emissions CFR47 FCC Part 15 Subpart B 15.109: 05/2023, ISED ICES-003 Issue 7 October 2020	Pass
---	AC Mains Conducted Emissions FCC 47CFR Part 15.107: 05/2023 ISED ICES-003 Issue 7 October 2020	N/A[1]
12	Revision History	--

[1]N/A – The EUT is battery powered.

3 Client Information

This EUT was tested at the request of:

Client: Otodata Wireless Network, Inc.
1180 De Louvain Street
West Montreal, QC H4N 1G5
Canada

Contact: Julien Renaud
Telephone: 514-673-0244
Email: jrenaud@otodata.ca

4 Description of Equipment Under Test and Variant Models

Manufacturer: Otodata Wireless Network, Inc.
1180 De Louvain Street
West Montreal, QC H4N 1G5
Canada

Equipment Under Test			
Description	Manufacturer	Model Number	Serial Number
Propane Monitoring Device	Otodata Wireless Network Inc.	C033	55[1]
Propane Monitoring Device	Otodata Wireless Network Inc.	C033	57[2]

[1]Emission testing sample.
[2]Antenna port conducted emission sample.

Receive Date:	04/24/2023 & 09/29/2023
Received Condition:	Good
Type:	Production

Description of Equipment Under Test (provided by client)
The EUT is battery powered propane monitoring device that communicates via Bluetooth (BLE, 2.4 GHz).

Equipment Under Test Power Configuration			
Rated Voltage	Rated Current	Rated Frequency	Number of Phases
3.6V Battery	2.1 Ah	DC	N/A

Operating modes of the EUT:

No.	Descriptions of EUT Exercising
1	The EUT was set to transmit at Low, Mid, and High channel continuous with modulation at 100 % duty cycle.
2	The EUT was set to receive mode.

Software used by the EUT:

No.	Descriptions of EUT Exercising
1	nrfconnect-setup-4.1.1-x64.exe

Radio/Receiver Characteristics	
Frequency Band(s)	2402-2480 MHz
Modulation Type(s)	GFSK
Maximum Output Power	4.25 dBm
Test Channels	Low Channel (2402 MHz) Mid Channel (2440 MHz) High Channel (2480 MHz)
Frequency Hopper: Number of Hopping Channels	N/A
Frequency Hopper: Channel Dwell Time	N/A
Frequency Hopper: Max interval between two instances of use of the same channel	N/A
MIMO Information (# of Transmit and Receive antenna ports)	1
Equipment Type	Standalone
Antenna Type and Gain	Meander line antenna gain of 2.31 dBi.

Variant Models:

The following variant models were not tested as part of this evaluation, but have been identified by the manufacturer as being electrically identical models, depopulated models, or with reasonable similarity to the model(s) tested. Intertek does not make any claims of compliance for samples or variants which were not tested.

None

5 System Setup and Method

Cables					
ID	Description	Length (m)	Shielding	Ferrites	Termination
--	None	--	--	--	--
--	USB Cable[1]	2.00	Shielded	--	Laptop

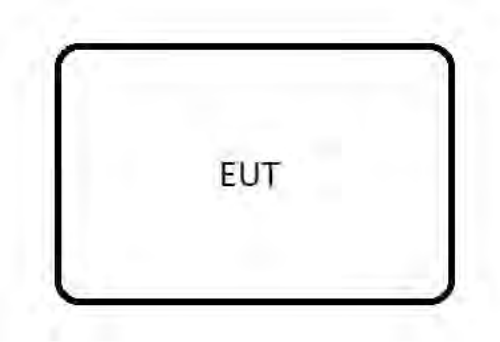
[1]Not part of EUT, used to accommodate the testing only.

Support Equipment			
Description	Manufacturer	Model Number	Serial Number
Test Fixture	Otodata Wireless Network Inc.	C033PLA-001	None
Laptop	Toshiba	Satellite Pro C870	4C480038R

5.1 Method:

Configuration as required by Configuration as required by FCC Part 15 Subpart C 15.247: 05/2023, FCC Part 15 Subpart B: 05/2023, RSS 247 Issue 2: 04/2023, ISED ICES-003 Issue 7 October 2020, RSS-Gen Issue 5 April 2018 +Amendment 1 March 2019, ANSI C 63.10: 2013, ANSI C 63.4: 2014, and 558074 D0115.247Meas Guidancev05r02.

5.2 EUT Block Diagram:



6 Maximum Peak Output Power

6.1 Method

Tests are performed in accordance with CFR47 FCC Part 15.247, RSS-247, ANSI C63.10, and KDB 558074 D0115.247 Meas Guidancev05r02.

TEST SITE: Safety Lab

6.2 Limit:

§15.247 (b) (3) For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands: 1 Watt or 30 dBm or 36 dBm EIRP.

6.3 Test Equipment Used:

Asset	Description	Manufacturer	Model	Serial	Cal Date	Cal Due
SAF1504'	Weather Station	Davis	Vantage Vue	MR200526013	01/31/2023	01/31/2024
CBLHF2012-5M-2'	5m 9kHz-40GHz Coaxial Cable - SET2	Huber & Suhner	SF102	252676002	02/25/2023	02/25/2024
CEN001'	DC-40GHz attenuator 20dB	cblhf201-5-2	C411-20	CEN001	02/28/2023	02/28/2024
ROS005-1'	Signal and Spectrum Analyzer	Rohde and Shwartz	FSW43	100646	11/18/2022	11/18/2023

Software Utilized:

Name	Manufacturer	Version
None	N/A	N/A

6.4 Results:

The sample tested was found to Comply.

6.5 Setup Photograph:

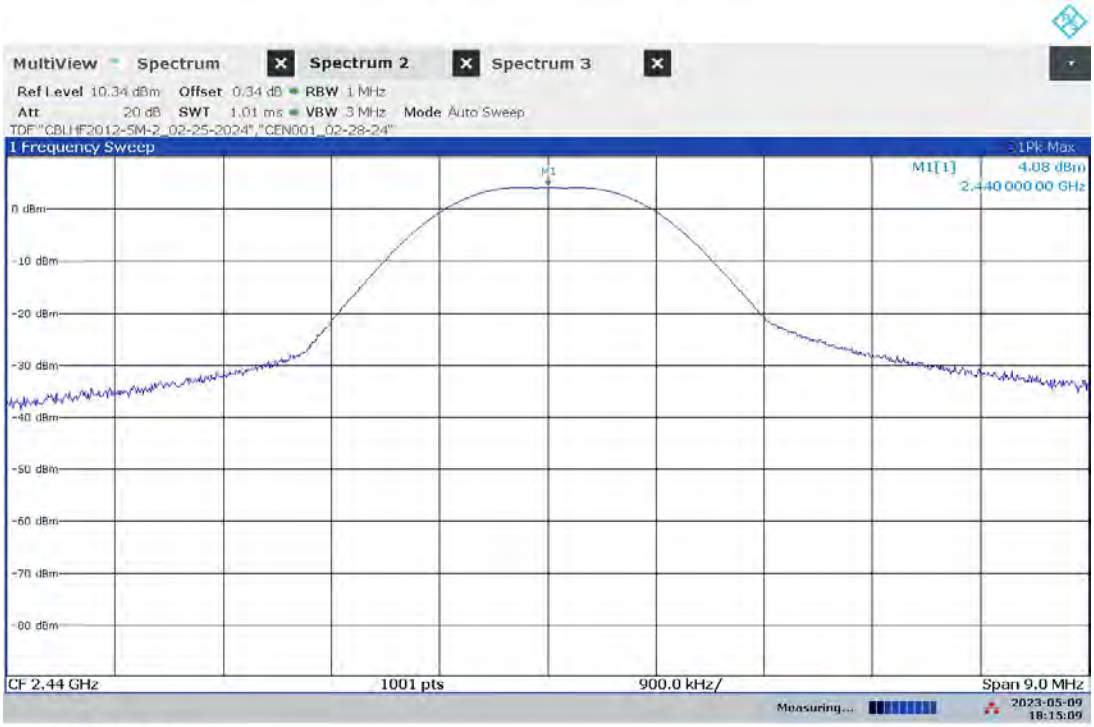
6.6 Test Data:

Output Power

Channels	Conducted Power (dBm)	Antenna Gain (dBi)	EIRP Power (dBm)	Conducted Power Limit (dBm)	EIRP Power Limit (dBm)
Low: 2402 MHz	4.24	2.14	6.38	30	36
Mid: 2440 MHz	4.08	2.14	6.22	30	36
High: 2480 MHz	4.25	2.14	6.39	30	36

Low Channel Conducted Power

Mid Channel Conducted Power



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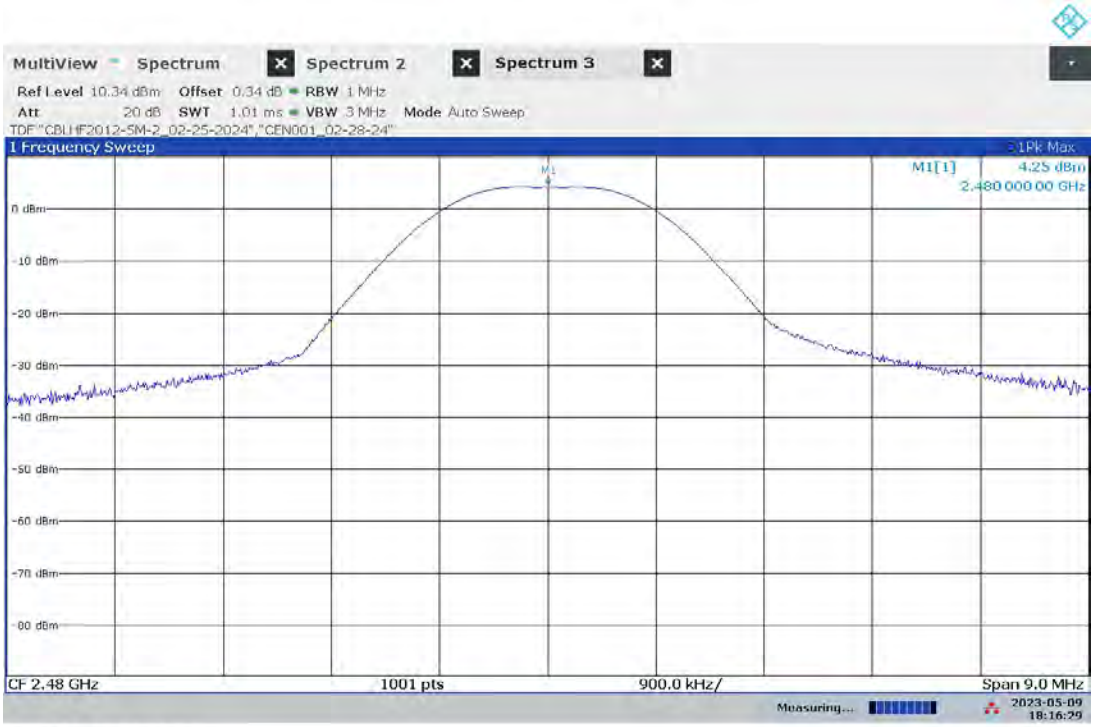
High Channel Conducted Power



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Product Standard: CFR47 FCC Part 15.247, RSS-247				Limit applied: See Report Section 6.2			
Test Date	Test Personnel/ Initials	Supervising Engineer/ Initials	Input Voltage	Mode	Atmospheric Data		
					Temp C°	Relative Humidity %	Atmospheric Pressure mbar
05/09/2023	Kouma Sinn KPS	Vathana F. Ven VFV	USB Powered	Mode 1	25	20	1004

Deviations, Additions, or Exclusions: None

7 6 dB Bandwidth and Occupied Bandwidth

7.1 Method

Tests are performed in accordance with CFR47 FCC Part 15.247, RSS-247, and ANSI C63.10.

TEST SITE: EMC Lab

The EMC Lab has one Semi-anechoic Chamber and one Shielded Chamber. AC Mains Power is available at 120, 230, and 277 Single Phase; 208, 400, and 480 3-Phase. Large reference ground-planes are installed in the general lab area to facilitate EMC work not requiring a shielded environment.

7.2 Limit

FCC Part §15.247 (a) (2) Systems using digital modulation techniques may operate in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz.

7.3 Test Equipment Used:

Asset	Description	Manufacturer	Model	Serial	Cal Date	Cal Due
DAV009'	weather station	Davis Instruments	6351 Vantage VUE	DAV009	03/27/2023	03/27/2024
CBLHF2012-2M-2'	2m 9kHz-40GHz Coaxial Cable - SET2	Huber & Suhner	SF102	252675002	02/18/2023	02/18/2024
CEN001'	DC-40GHz attenuator 20dB	cblhf201-5-2	C411-20	CEN001	02/28/2023	02/28/2024
ROS005-1'	Signal and Spectrum Analyzer	Rohde and Shwartz	FSW43	100646	11/18/2022	11/18/2023

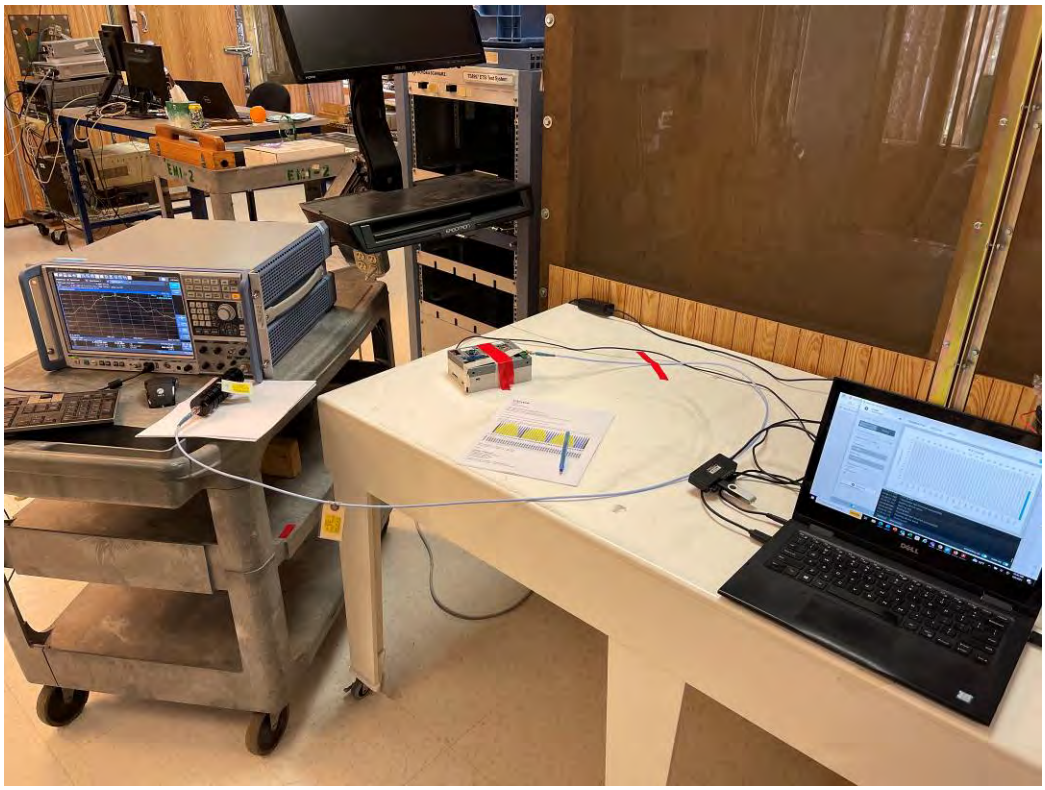
Software Utilized:

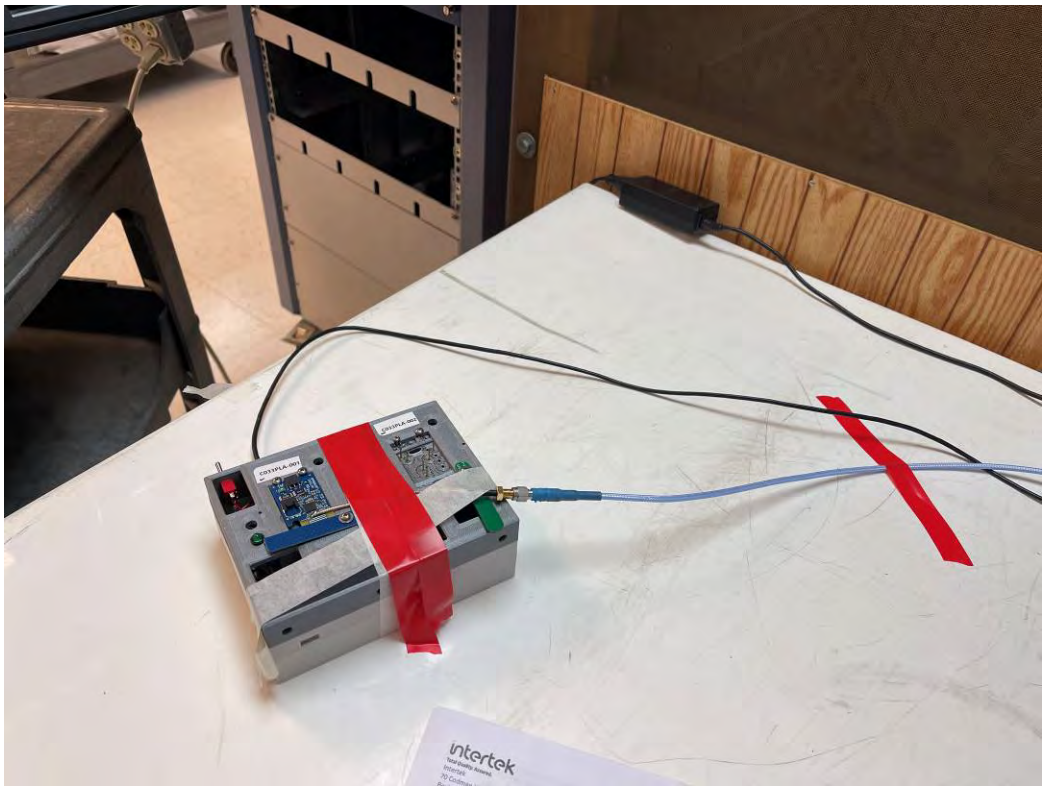
Name	Manufacturer	Version
None	N/A	N/A

7.4 Results:

The sample tested was found to Comply.

7.5 Setup Photographs:





7.6 Test Data:

DTS Bandwidth

Frequency (MHz)	DTS Bandwidth (6 dB Bandwidth) (kHz)	DTS Bandwidth Limit (kHz)	Results
2402	686.30	≥ 500	Compliance
2440	674.30	≥ 500	Compliance
2480	695.30	≥ 500	Compliance

Occupied Bandwidth (OBW)

Frequency (MHz)	Occupied Bandwidth (MHz)	Occupied Bandwidth Limit	Results
2402	1.053	Upper and Lower Edges of OBW within 2400-2483.5 MHz	Compliance
2440	1.053	Upper and Lower Edges of OBW within 2400-2483.5 MHz	Compliance
2480	1.056	Upper and Lower Edges of OBW within 2400-2483.5 MHz	Compliance

Low Channel DTS Bandwidth

10:15:45 AM 05/02/2023

Mid Channel DTS Bandwidth

10:17:33 AM 05/02/2023

High Channel DTS Bandwidth

10:18:35 AM 05/02/2023

Low Channel Occupied Bandwidth

09:36:35 AM 05/02/2023

Mid Channel Occupied Bandwidth

09:45:32 AM 05/02/2023

High Channel Occupied Bandwidth

09:47:04 AM 05/02/2023

Product Standard: CFR47 FCC Part 15.247, RSS-247				Limit applied: See Report Section 7.2			
Test Date	Test Personnel/ Initials	Supervising Engineer/ Initials	Input Voltage	Mode	Atmospheric Data		
					Temp C°	Relative Humidity %	Atmospheric Pressure mbar
05/02/2023	Kouma Sinn KPS	Vathana F. Ven VFV	USB Powered	Mode 1	25	33	997

Deviations, Additions, or Exclusions: None

8 Maximum Power Spectral Density

8.1 Method

Tests are performed in accordance with CFR47 FCC Part 15.247, RSS-247, and ANSI C63.10, and KDB 558074 D0115.247Meas Guidancev05r02.

TEST SITE: Safety Lab

8.2 Limit

§15.247 (e) For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

8.3 Test Equipment Used:

Asset	Description	Manufacturer	Model	Serial	Cal Date	Cal Due
SAF1504'	Weather Station	Davis	Vantage Vue	MR200526013	01/31/2023	01/31/2024
CBLHF2012-5M-2'	5m 9kHz-40GHz Coaxial Cable - SET2	Huber & Suhner	SF102	252676002	02/25/2023	02/25/2024
CEN001'	DC-40GHz attenuator 20dB	cblhf201-5-2	C411-20	CEN001	02/28/2023	02/28/2024
ROS005-1'	Signal and Spectrum Analyzer	Rohde and Shwartz	FSW43	100646	11/18/2022	11/18/2023

Software Utilized:

Name	Manufacturer	Version
None	N/A	N/A

8.4 Results:

The sample tested was found to Comply.

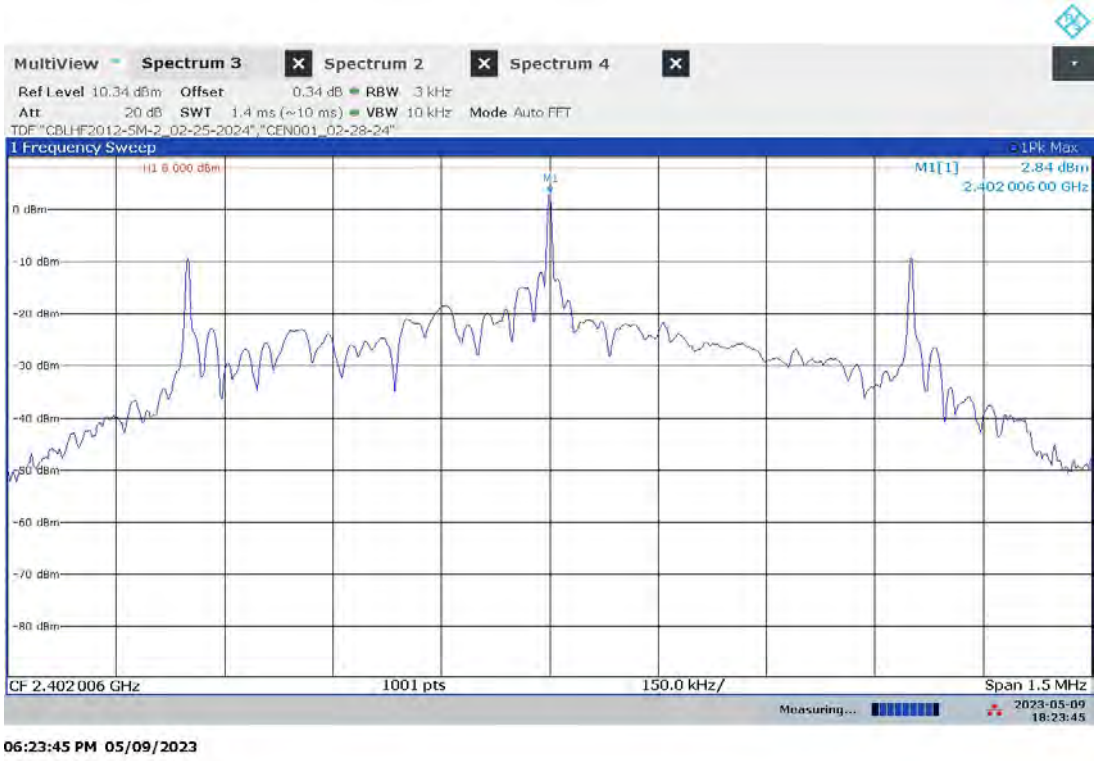
8.5 Setup Photograph:

8.6 Test Data:

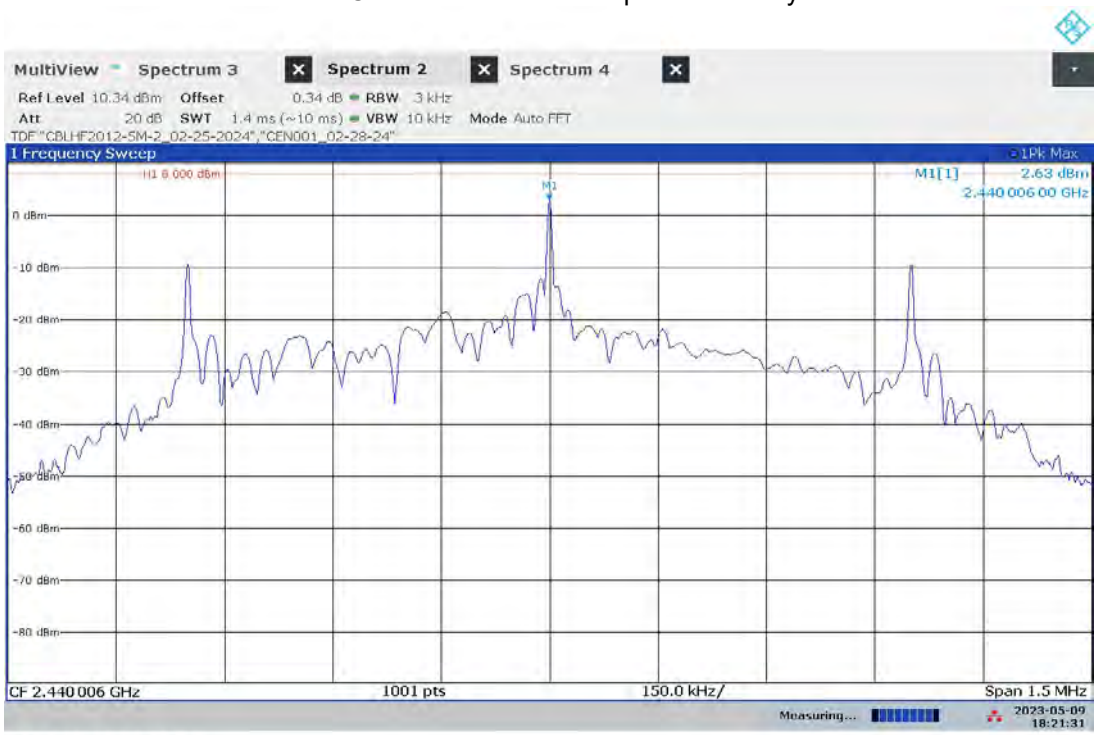
Peak Power Spectral Density

Channels	Peak Power Spectral Density (dBm)	Limit (dBm)
Low: 2402 MHz	2.84	8
Mid: 2440 MHz	2.63	8
High: 2480 MHz	2.78	8

Low Channel Peak Power Spectral Density



Mid Channel Peak Power Spectral Density



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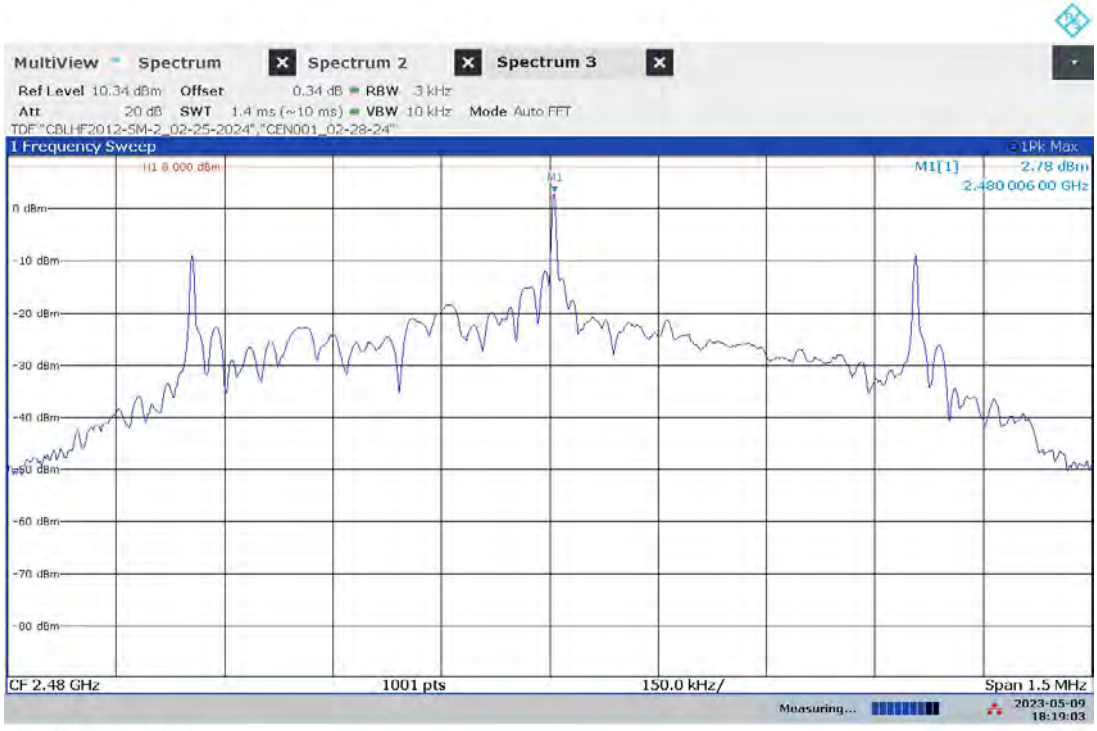
High Channel Peak Power Spectral Density



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Product Standard: CFR47 FCC Part 15.247, RSS-247				Limit applied: See Report Section 8.2			
Test Date	Test Personnel/ Initials	Supervising Engineer/ Initials	Input Voltage	Mode	Atmospheric Data		
					Temp C°	Relative Humidity %	Atmospheric Pressure mbar
05/09/2023	Kouma Sinn KPS	Vathana F. Ven VFV	USB Powered	Mode 1	25	20	1004

9 Band Edge Compliance

9.1 Method

Tests are performed in accordance with FCC Part 15 Subpart C 15.247, RSS 247, and ANSI C 63.10.

TEST SITE: 10m ALSE

The 10m ALSE is 13m (Length) x 21m (Depth) x 10m (Height) with the effective size in terms of space from the tips of the absorber is 12m (Length) x 20m (Depth) x 8.5m (Height). This chamber achieves broadband performance using a unique arrangement of hybrid and ferrite tile absorber. This chamber has a built in 3m diameter turntable (Embedded type). The metal structure of the table makes electrical connection around the entire circumference of the turntable to the ground plane with a metal brush type connection. The turntable is located on one end of the chamber and the antennas are mounted 3 and 10 meters away at the other end of the chamber on the adjustable an Antenna Mast. The antenna mast is a non-conductive bore sighted type with remote control of antenna height and polarization. The Antenna Mast and the turntable can be remotely controlled through the controller located in the adjacent Control room. A Styrofoam table 80 cm high is used for table-top equipment.

9.2 Limit

15.247 (d) In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c))

9.3 Test Equipment Used:

Asset	Description	Manufacturer	Model	Serial	Cal Date	Cal Due
145-420'	Receiver to floor cable	Utiflex	UFB311A-2-0591-70070	145-420	02/18/2023	02/18/2024
145-422'	10Amp Pre-amp to under floor	Utiflex	UFB311A-0-2756-70070	145-422	02/18/2023	02/18/2024
145-408'	10m Chamber - 3m Track B In-floor Cable	Huber + Suhner	sucoflex 106-11000mm	001	07/19/2023	07/19/2024
IW002'	2 meter Armored cable	Insulated Wire	2800-NPS	002	10/11/2022	10/11/2023
DAV006'	Weather Station	Davis	6250	MS191218071	02/21/2022	02/21/2024
ETS005'	1-18GHz horn antenna	ETS-Lindgren	3117	00218279	10/12/2023	10/12/2023
ROS011'	EMI Test Receiver	Rohde & Schwartz	ESW44	103296	06/28/2023	06/28/2024

Software Utilized:

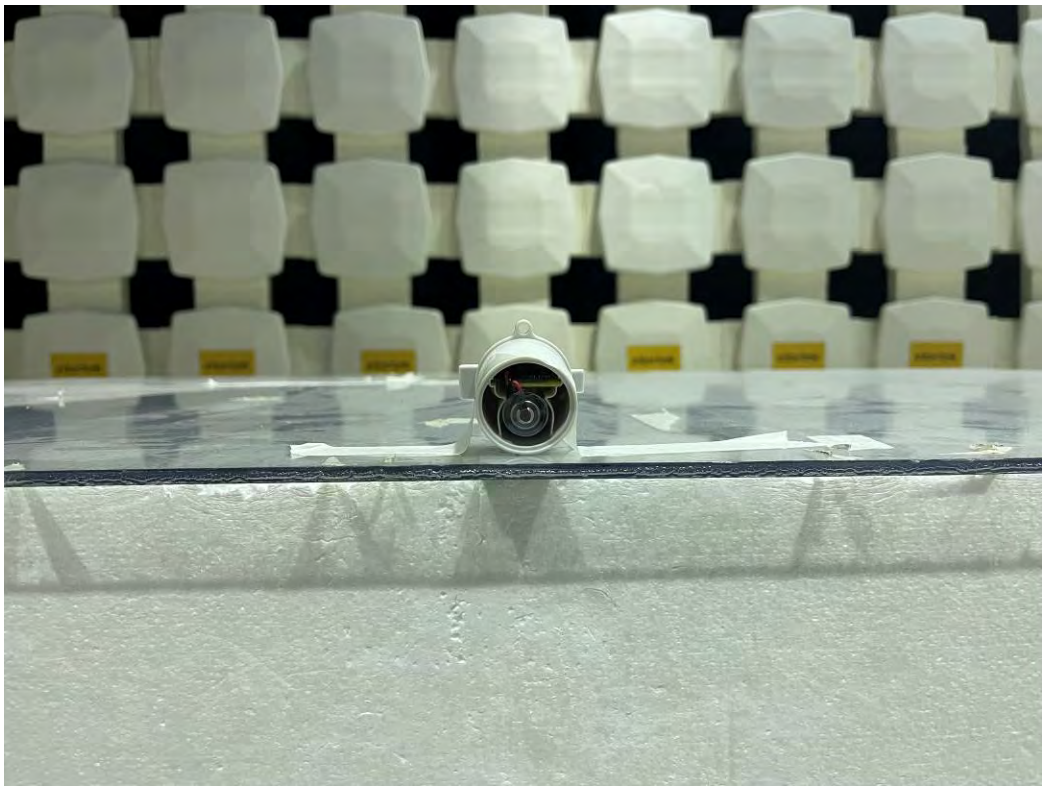
Name	Manufacturer	Version
None	--	--

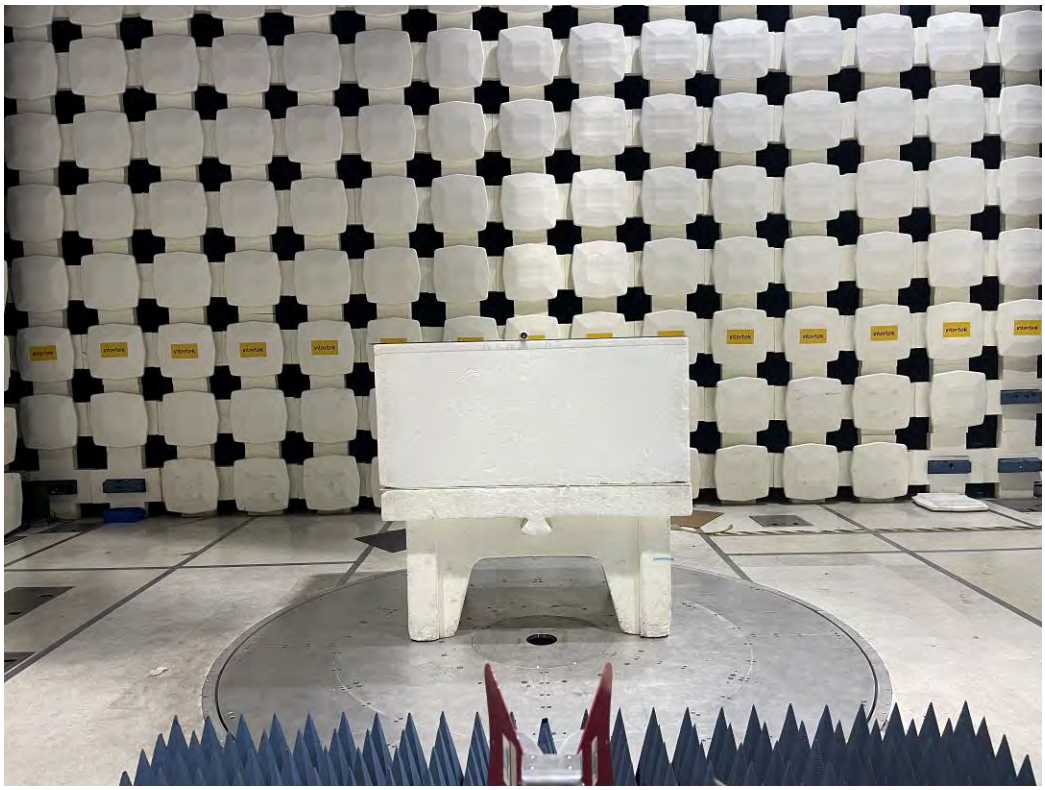
9.4 Results:

The sample tested was found to Comply.

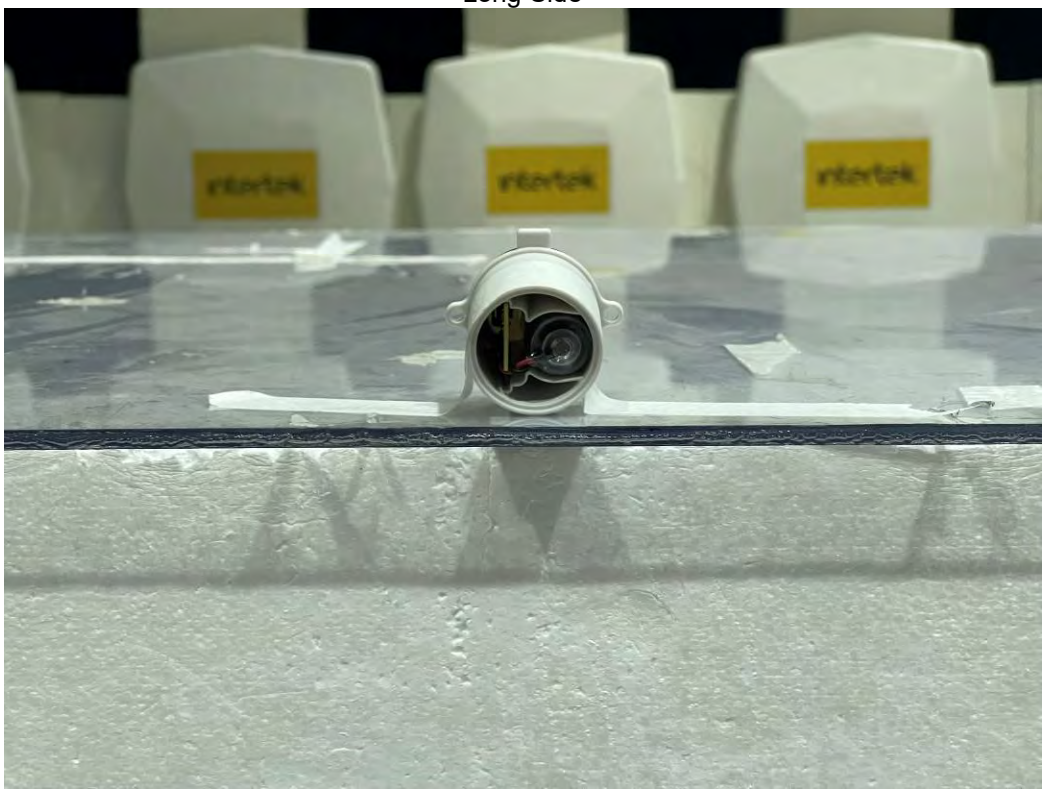
9.5 Setup Photographs:

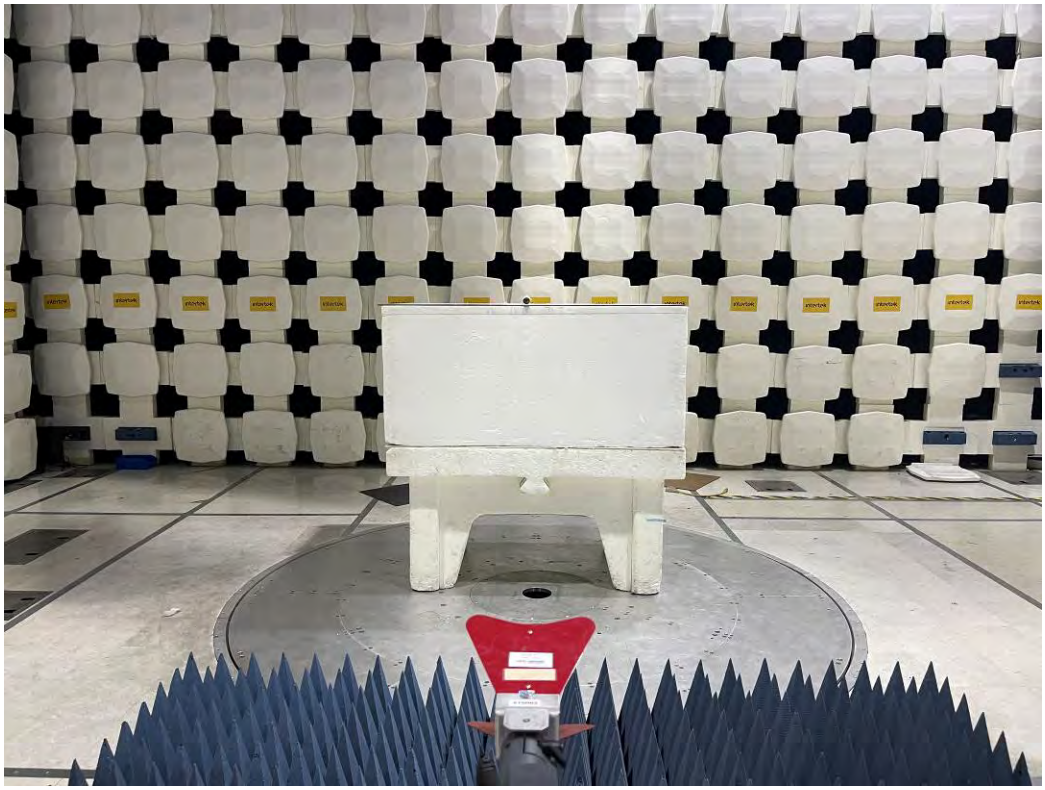
Back side



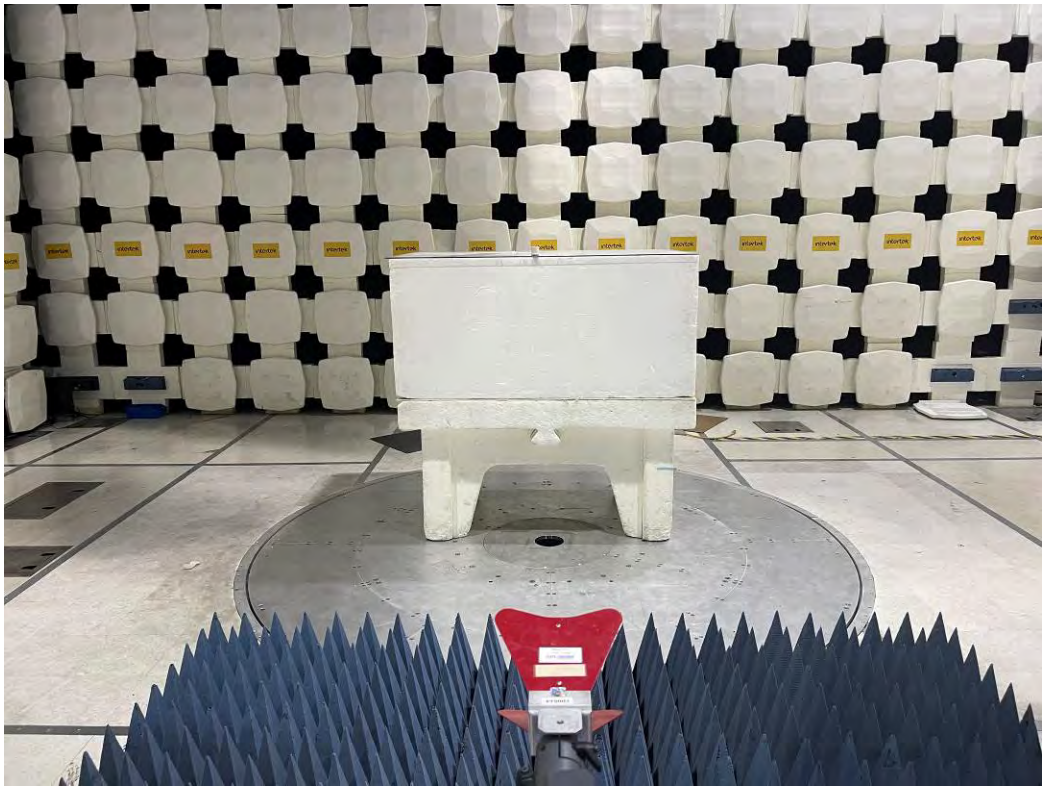


Long Side



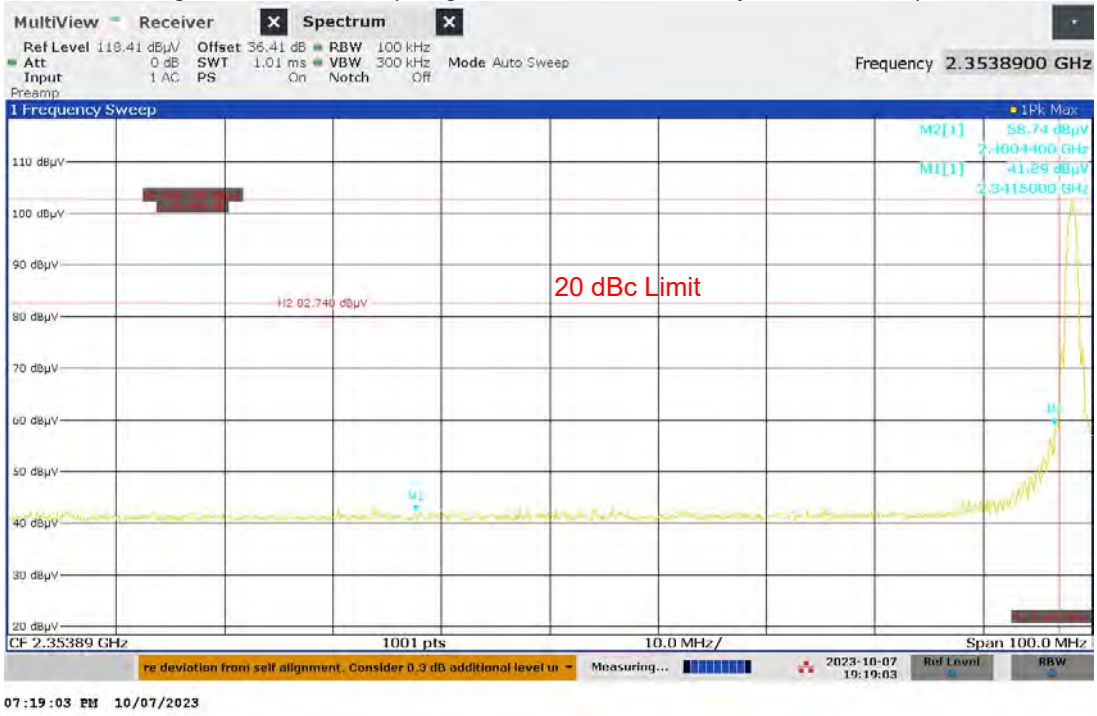


Short Side

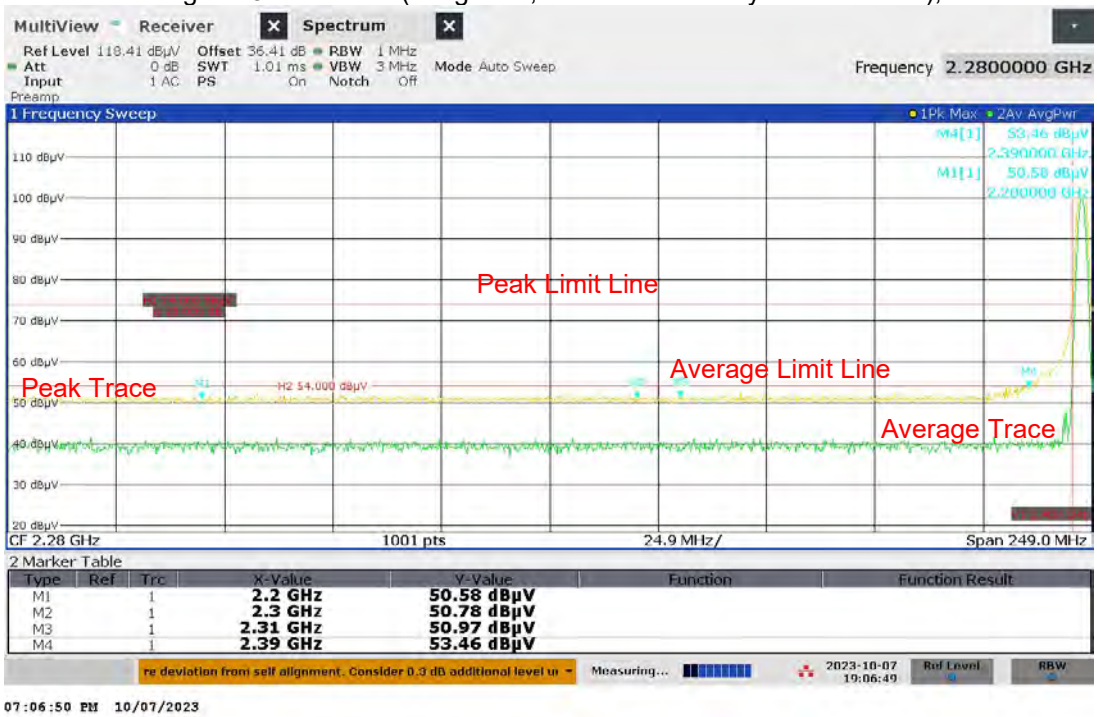


9.6 Test Data:

Lower Band Edge at 3m distance (Long Side, Horizontal Polarity – Worst-case), 100 kHz RBW

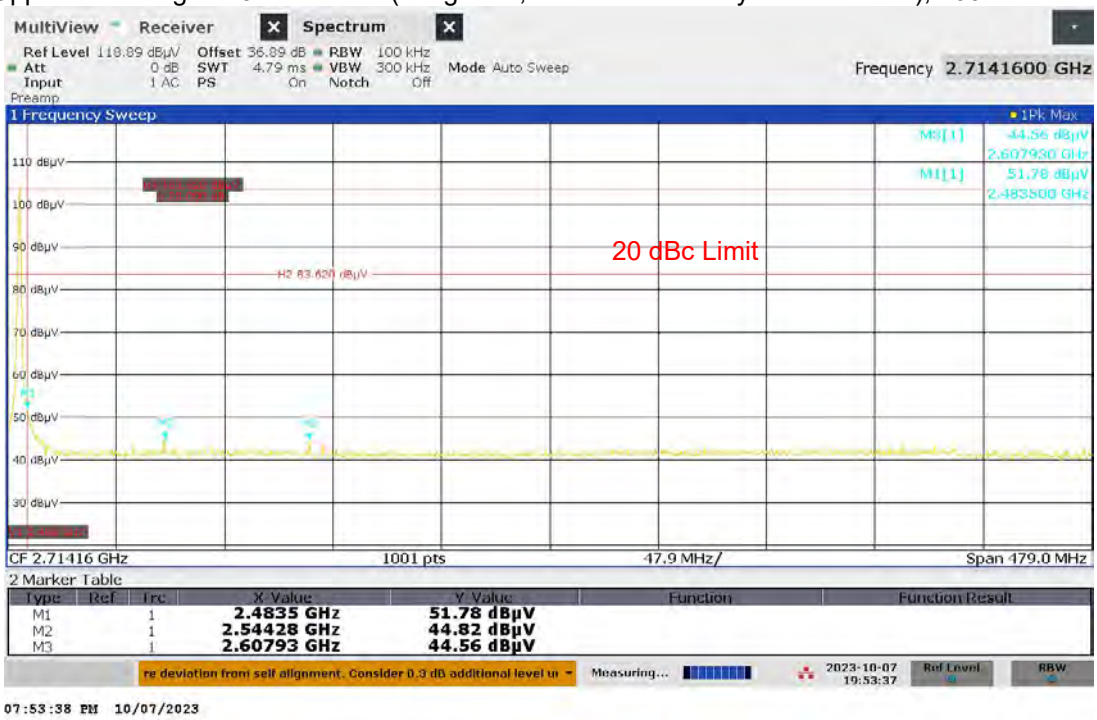


Lower Band Edge at 3m distance (Long Side, Horizontal Polarity – Worst-case), 1 MHz RBW



Notes: Antenna factor and cable loss compensate internally as dB off-set.

Upper Band Edge at 3m distance (Long Side, Horizontal Polarity – Worst-case), 100 kHz RBW



Upper Band Edge at 3m distance (Long Side, Horizontal Polarity – Worst-case), 1 MHz RBW

Notes: Antenna factor and cable loss compensate internally as dB off-set.

Product Standard: CFR47 FCC Part 15.247, RSS-247				Limit applied: See Report Section 9.2			
Test Date	Test Personnel/ Initials	Supervising Engineer/ Initials	Input Voltage	Mode	Atmospheric Data		
					Temp C°	Relative Humidity %	Atmospheric Pressure mbar
10/07/2023	Kouma Sinn KPS	Vathana F. Ven VFV	USB Powered	Mode 1	24	49	1001

Deviations, Additions, or Exclusions: None

10 Transmitter spurious emissions

10.1 Method

Tests are performed in accordance with FCC Part 15 Subpart C 15.247, FCC Part 15 Subpart B, RSS 247, ISED ICES 003, ANSI C 63.10, and ANSI C 63.4.

TEST SITE: Safety Lab and 10m ALSE

The 10m ALSE is 13m (Length) x 21m (Depth) x 10m (Height) with the effective size in terms of space from the tips of the absorber is 12m (Length) x 20m (Depth) x 8.5m (Height). This chamber achieves broadband performance using a unique arrangement of hybrid and ferrite tile absorber. This chamber has a built in 3m diameter turntable (Embedded type). The metal structure of the table makes electrical connection around the entire circumference of the turntable to the ground plane with a metal brush type connection. The turntable is located on one end of the chamber and the antennas are mounted 3 and 10 meters away at the other end of the chamber on the adjustable an Antenna Mast. The antenna mast is a non-conductive bore sighted type with remote control of antenna height and polarization. The Antenna Mast and the turntable can be remotely controlled through the controller located in the adjacent Control room. A Styrofoam table 80 cm high is used for table-top equipment.

Measurement Uncertainty

Measurement	Frequency Range	Expanded Uncertainty (k=2)	Ucispr
Radiated Emissions, 10m	30-1000 MHz	4.6dB	6.3 dB
Radiated Emissions, 3m	30-1000 MHz	5.3 dB	6.3 dB
Radiated Emissions, 3m	1-6 GHz	4.5 dB	5.2 dB
Radiated Emissions, 3m	6-15 GHz	5.2 dB	5.5 dB
Radiated Emissions, 3m	15-18 GHz	5.0 dB	5.5 dB
Radiated Emissions, 3m	18-40 GHz	5.0 dB	5.5 dB

As shown in the table above our radiated emissions U_{lab} is less than the corresponding U_{CISPR} reference value in CISPR 16-4-2 Table 1, hence the compliance of the product is only based on the measured value, and no measurement uncertainty correction is required, based on CISPR 22 and CISPR 11 (for 2006 and later revisions) Clause 11.

Sample Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain (if any) from the measured reading. The basic equation with a sample calculation is as follows:

FS = RA + AF + CF - AG
Where FS = Field Strength in dBμV/m
RA = Receiver Amplitude (including preamplifier) in dBμV
CF = Cable Attenuation Factor in dB
AF = Antenna Factor in dB
AG = Amplifier Gain in dB

In the following table(s), the reading shown on the data table reflects the preamplifier gain. An example for the calculations in the following table is as follows.

Assume a receiver reading of 52.0 dBμV is obtained. The antenna factor of 7.4 dB and cable factor of 1.6 dB is added. The amplifier gain of 29 dB is subtracted, giving a field strength of 32 dBμV/m. This value in dBμV/m was converted to its corresponding level in μV/m.

RA = 52.0 dBμV
AF = 7.4 dB/m
CF = 1.6 dB
AG = 29.0 dB
FS = 32 dBμV/m

To convert from dBμV to μV or mV the following was used:

$UF = 10^{(NF / 20)}$ where UF = Net Reading in μV
NF = Net Reading in dBμV

Example:

FS = RA + AF + CF – AG = 52.0 + 7.4 + 1.6 – 29.0 = 32.0
$UF = 10^{(32\ dB\mu V / 20)}$ = 39.8 μV/m

Alternately, when BAT-EMC Emission Software is used, the “Level” includes all losses and gains and is compared directly in the “Margin” column to the “Limit”. The “Correction” includes Antenna Factor, Preamp, and Cable Loss. These are already accounted for in the “Level” column.

TEST SITE: EMC Lab

The EMC Lab has one Semi-anechoic Chamber and one Shielded Chamber. AC Mains Power is available at 120, 230, and 277 Single Phase; 208, 400, and 480 3-Phase. Large reference ground-planes are installed in the general lab area to facilitate EMC work not requiring a shielded environment.

10.2 Test Equipment Used:

Test equipment used for antenna port conducted measurement

Asset	Description	Manufacturer	Model	Serial	Cal Date	Cal Due
SAF1504'	Weather Station	Davis	Vantage Vue	MR200526013	01/31/2023	01/31/2024
CBLHF2012-5M-2'	5m 9kHz-40GHz Coaxial Cable - SET2	Huber & Suhner	SF102	252676002	02/25/2023	02/25/2024
CEN001'	DC-40GHz attenuator 20dB	cblhf201-5-2	C411-20	CEN001	02/28/2023	02/28/2024
ROS005-1'	Signal and Spectrum Analyzer	Rohde and Shwartz	FSW43	100646	11/18/2022	11/18/2023

Test equipment used for radiated emissions from 30-1000 MHz

Asset	Description	Manufacturer	Model	Serial	Cal Date	Cal Due
DAV006'	Weather Station	Davis	6250	MS191218071	02/21/2023	02/21/2024
ROS011'	EMI Test Receiver	Rohde & Schwartz	ESW44	103296	06/28/2023	06/28/2024
PRE10'	30-1000MHz pre-amp	ITS	PRE10	PRE10	02/17/2023	02/17/2024
145145'	Broadband Hybrid Antenna 30 MHz - 3 GHz	Sunol Sciences Corp.	JB3	A122313	06/23/2023	06/23/2024
HS003'	10m under floor cable	Huber-Schuner	10m-1	HS003	02/18/2023	02/18/2024
145-424'	9kHz to 40GHz Cable	Huber and Suhner	Sucoflex	145-424	02/18/2023	02/18/2024
HS001'	DC-18GHz cable 1.5m long	Huber & Suhner	SucoFlex 106A	HS001	01/25/2023	01/25/2024
145-420'	Receiver to floor cable	Utiflex	UFB311A-2-0591-70070	145-420	02/18/2023	02/18/2024

Software Utilized:

Name	Manufacturer	Version
BAT-EMC	Nexio	2022.0.27.0

Test equipment used for radiated emissions from 1-13 GHz

Asset	Description	Manufacturer	Model	Serial	Cal Date	Cal Due
145-420'	Receiver to floor cable	Utiflex	UFB311A-2-0591-70070	145-420	02/18/2023	02/18/2024
145-422'	10Amp Pre-amp to under floor	Utiflex	UFB311A-0-2756-70070	145-422	02/18/2023	02/18/2024
145-408'	10m Chamber - 3m Track B In-floor Cable	Huber + Suhner	sucoflex 106-11000mm	001	07/19/2023	07/19/2024
IW002'	2 meter Armored cable	Insulated Wire	2800-NPS	002	10/11/2022	10/11/2023
DAV006'	Weather Station	Davis	6250	MS191218071	02/21/2022	02/21/2024
ETS005'	1-18GHz horn antenna	ETS-Lindgren	3117	00218279	10/12/2023	10/12/2023
ROS011'	EMI Test Receiver	Rohde & Schwartz	ESW44	103296	06/28/2023	06/28/2024
PRE12'	Pre-amplifier	Com Power	PAM-118A	18040117	12/17/2022	12/17/2023
REA004'	3GHz High Pass Filter	Reactel, Inc	7HSX-3G/18G-S11	06-1	02/14/2023	02/14/2024
REA008'	band reject filter 2.4GHz	Reactel, Inc	12RX7-2441.75-x140 S	17-01	07/19/2023	07/19/2024

Test equipment used for radiated emissions from 13-25 GHz

Asset	Description	Manufacturer	Model	Serial	Cal Date	Cal Due
CBLHF2012-5M-2'	5m 9kHz-40GHz Coaxial Cable - SET2	Huber & Suhner	SF102	252676002	02/25/2023	02/25/2024
CBLHF2012-2M-2'	2m 9kHz-40GHz Coaxial Cable - SET2	Huber & Suhner	SF102	252675002	02/18/2023	02/18/2024
145108'	EMI Test Receiver (20Hz - 40GHz)	Rohde & Schwarz	ESIB40	100209	06/23/2022	06/23/2023
ETS004'	18-40GHZ horn antenna	ets004	3116C	00218579	02/23/2023	02/23/2024
DAV006'	Weather Station	Davis	6250	MS191218071	02/21/2022	02/21/2024
ETS002'	1-18GHz DRG Horn Antenna	ETS Lindgren	3117	00143260	09/27/2022	09/27/2023
ROS005-1'	Signal and Spectrum Analyzer	Rohde and Shwartz	FSW43	100646	11/18/2022	11/18/2023
PRE9'	100MHz-40GHz Preamp	MITEQ	NSP4000-NFG	1260417	09/23/2022	09/23/2023

Software Utilized:

Name	Manufacturer	Version
EMI Boxborough.xls	Intertek	08/27/2010
BAT-EMC	Nexio	2022.0.27.0

10.3 Results:

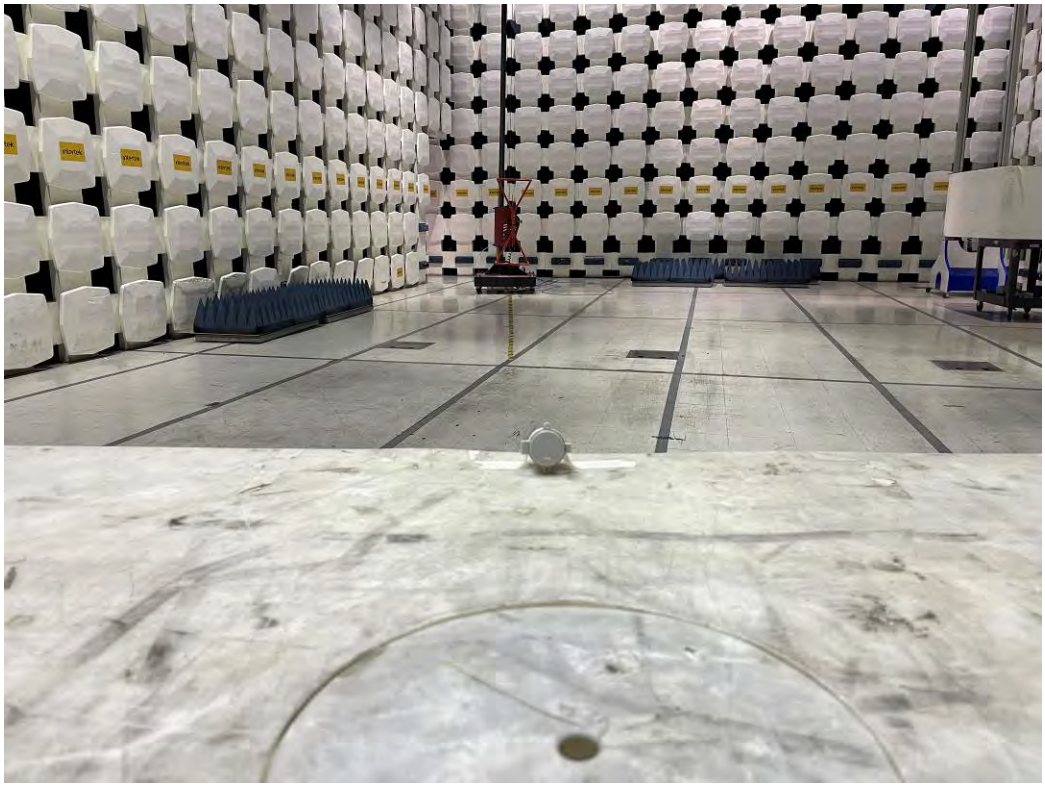
The sample tested was found to Comply.

15.247 (d) In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c))

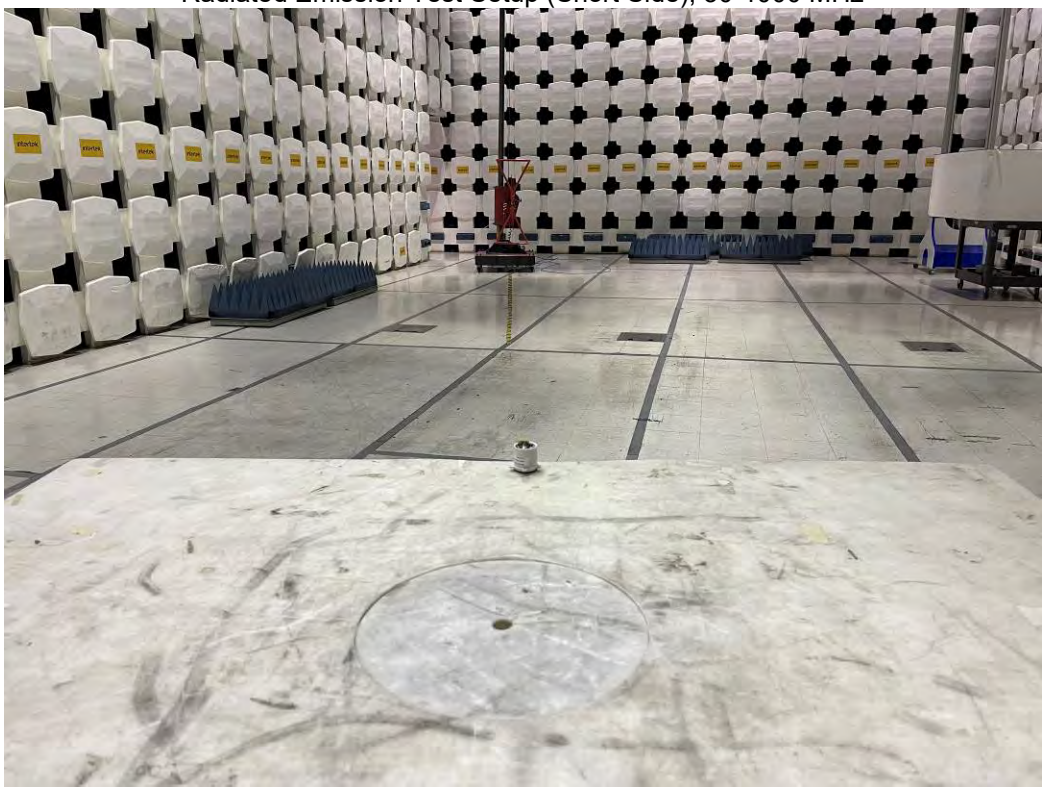
10.4 Setup Photographs:

Antenna Port Conducted Emission Test Setup

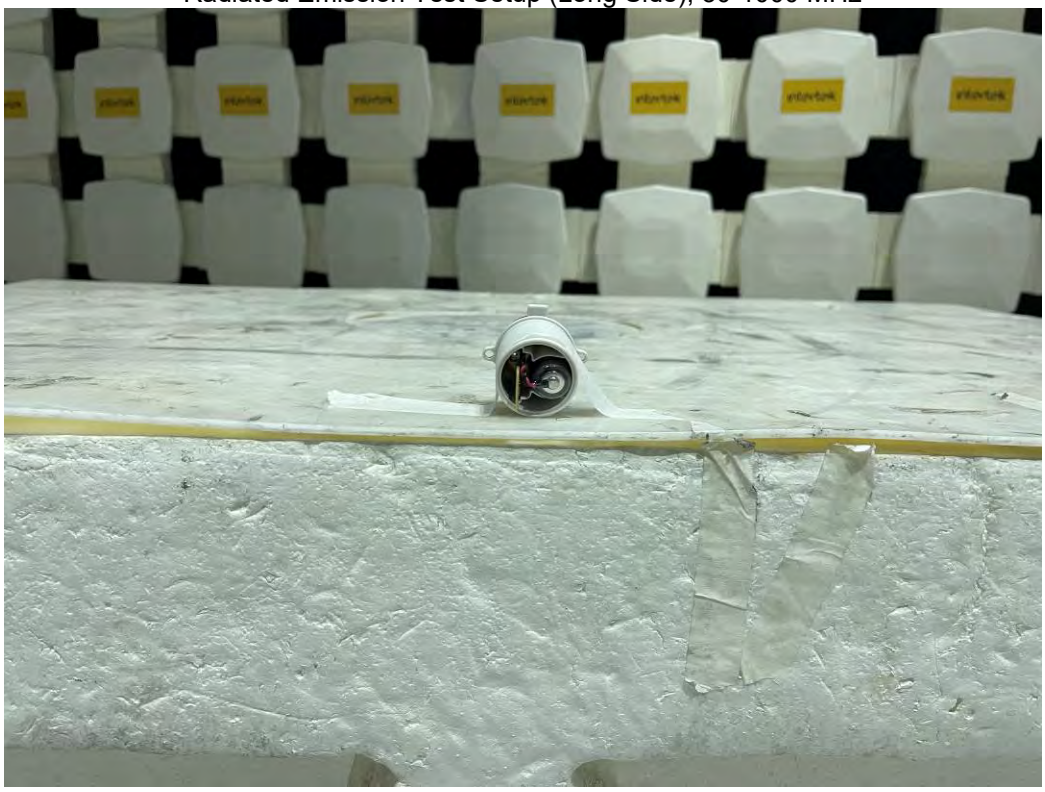
Radiated Emission Test Setup (Back Side), 30-1000 MHz

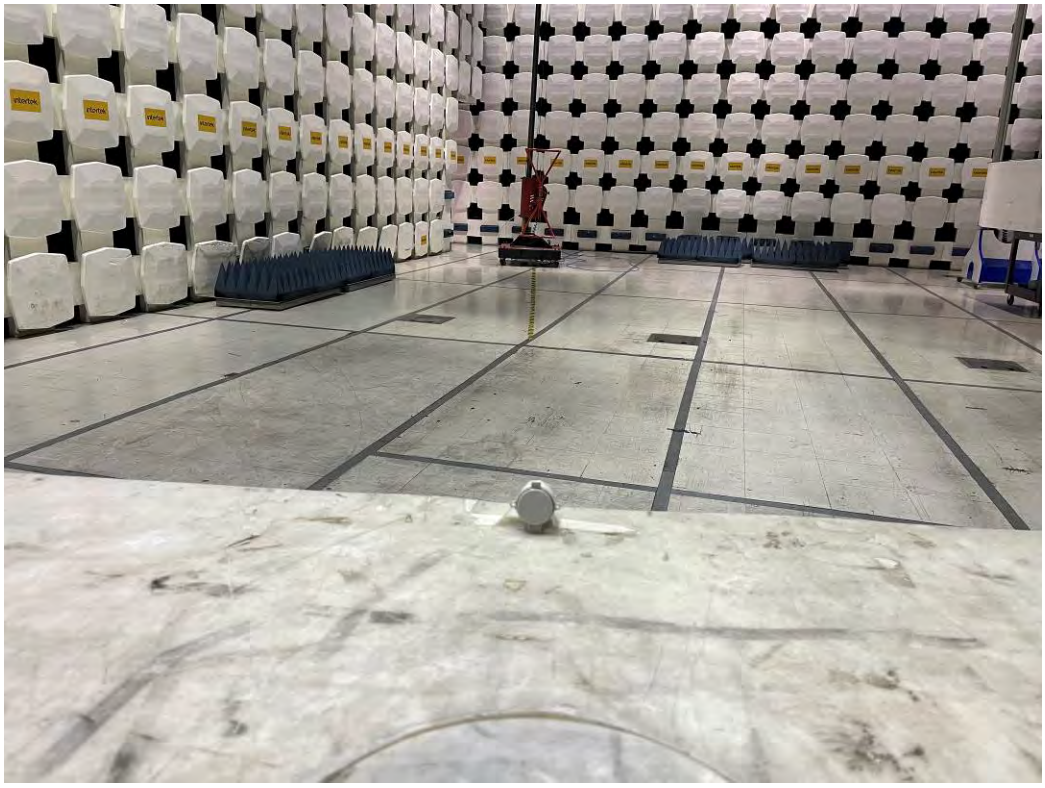


Radiated Emission Test Setup (Short Side), 30-1000 MHz

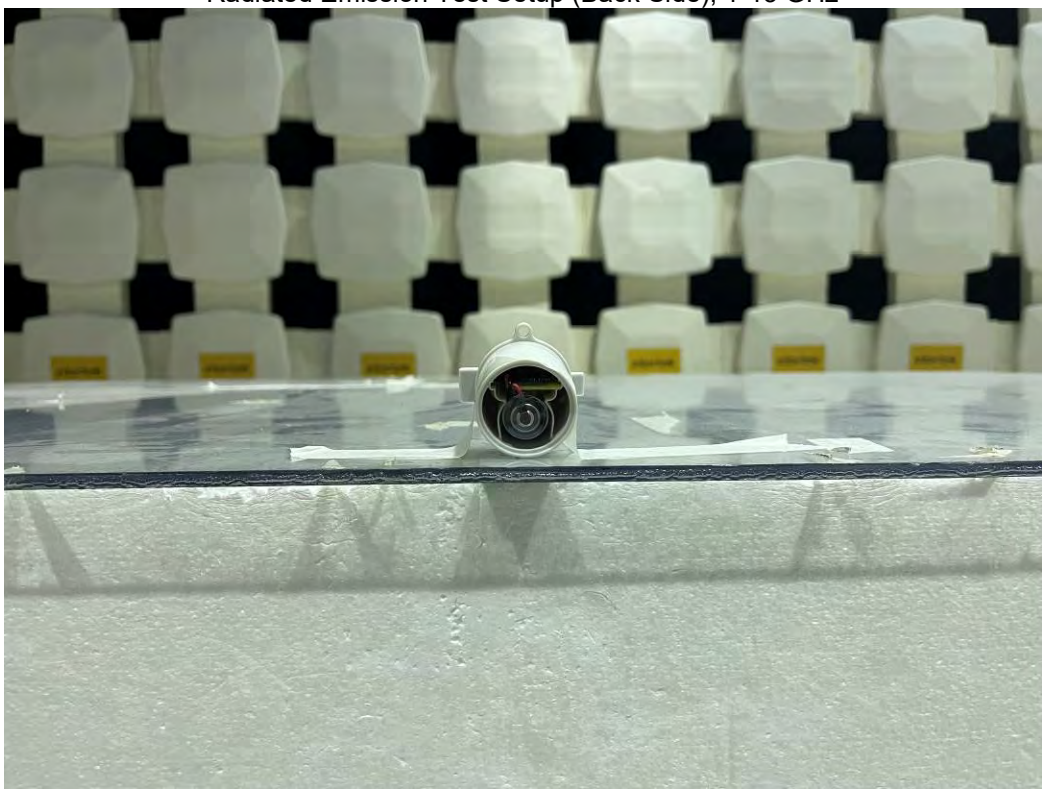


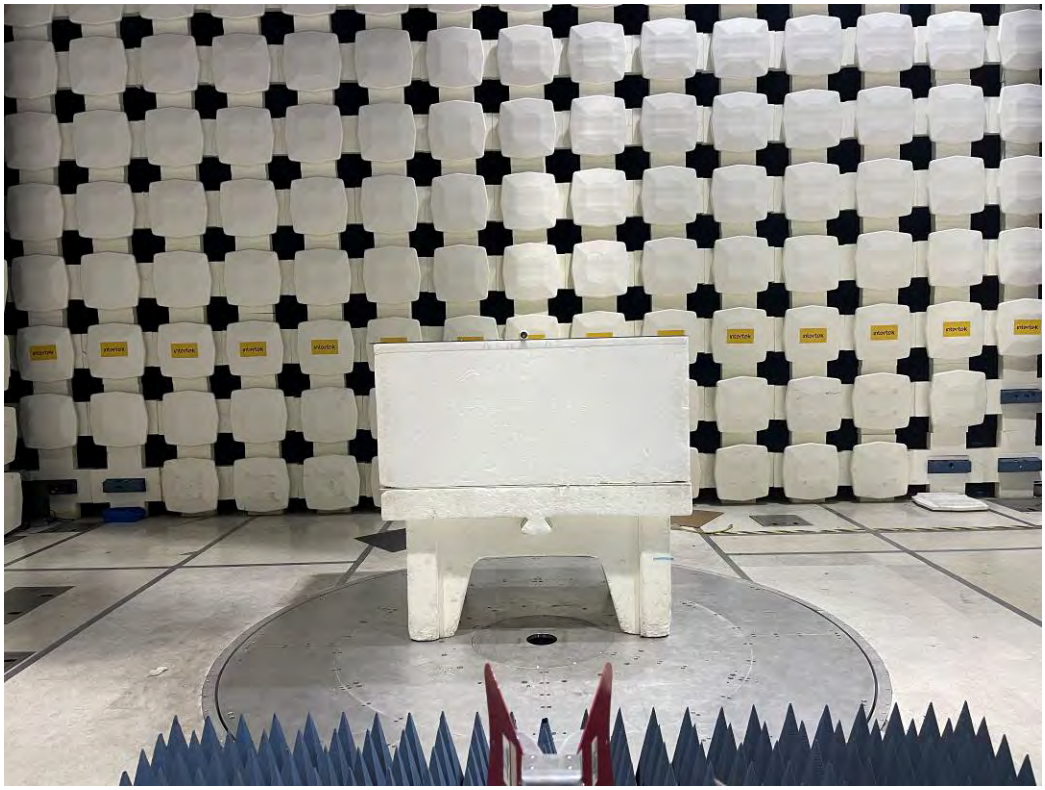
Radiated Emission Test Setup (Long Side), 30-1000 MHz



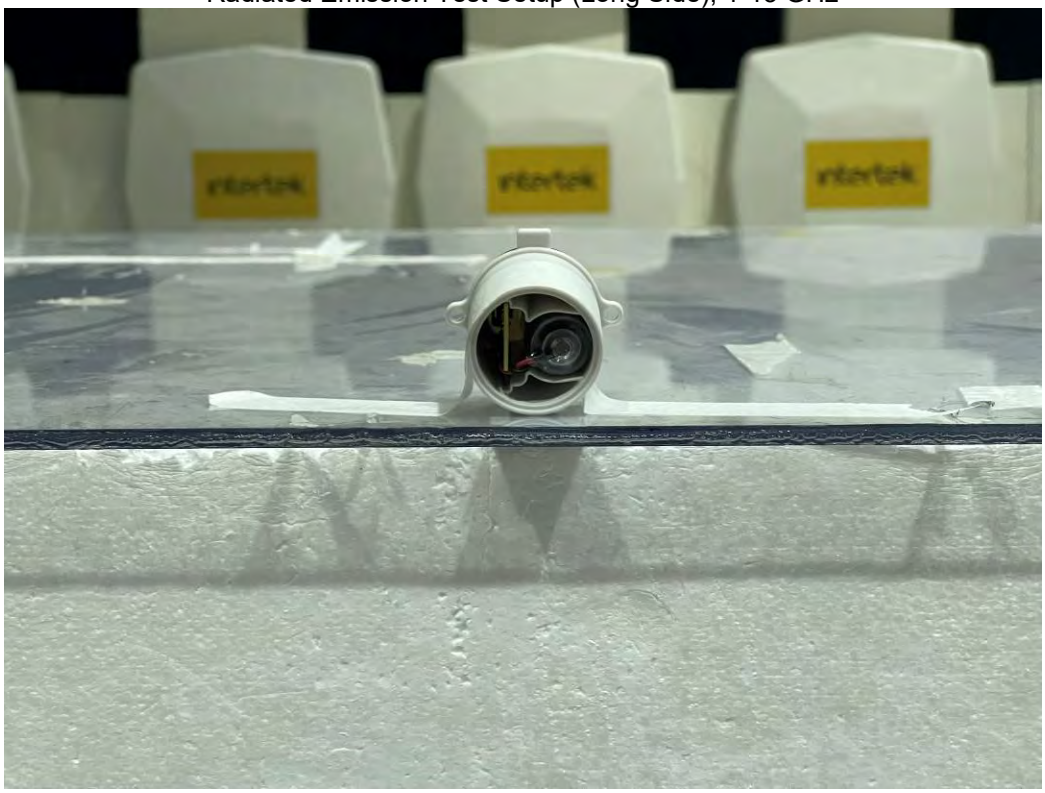


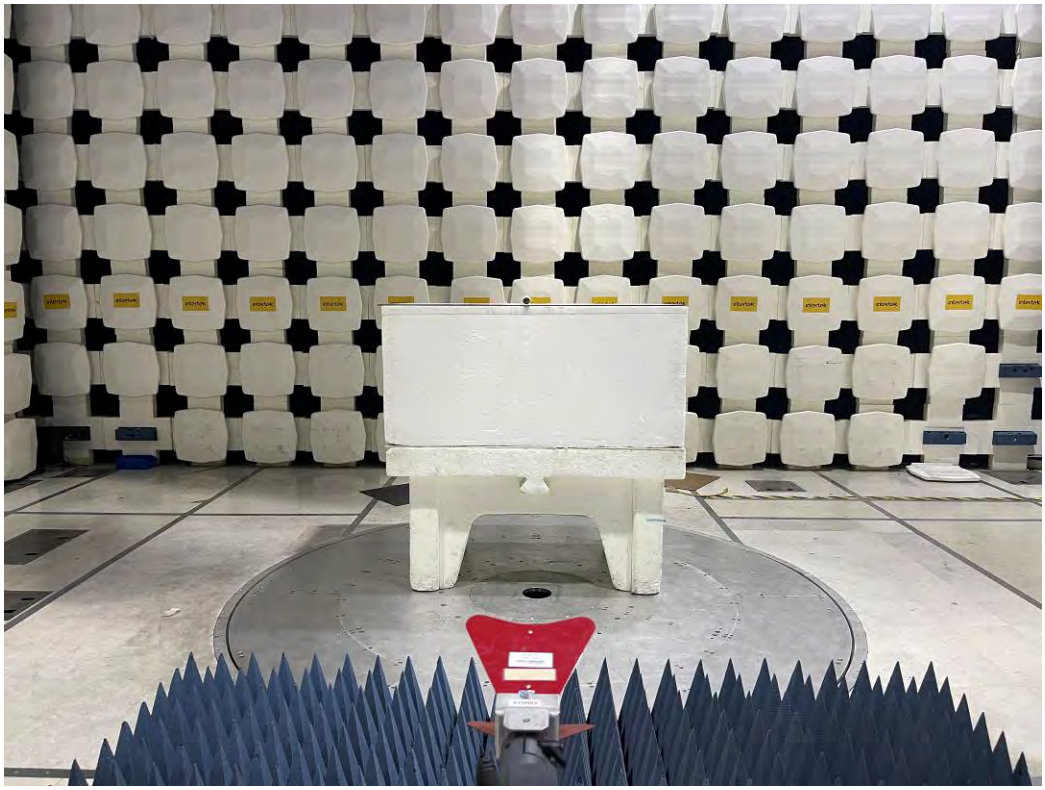
Radiated Emission Test Setup (Back Side), 1-13 GHz



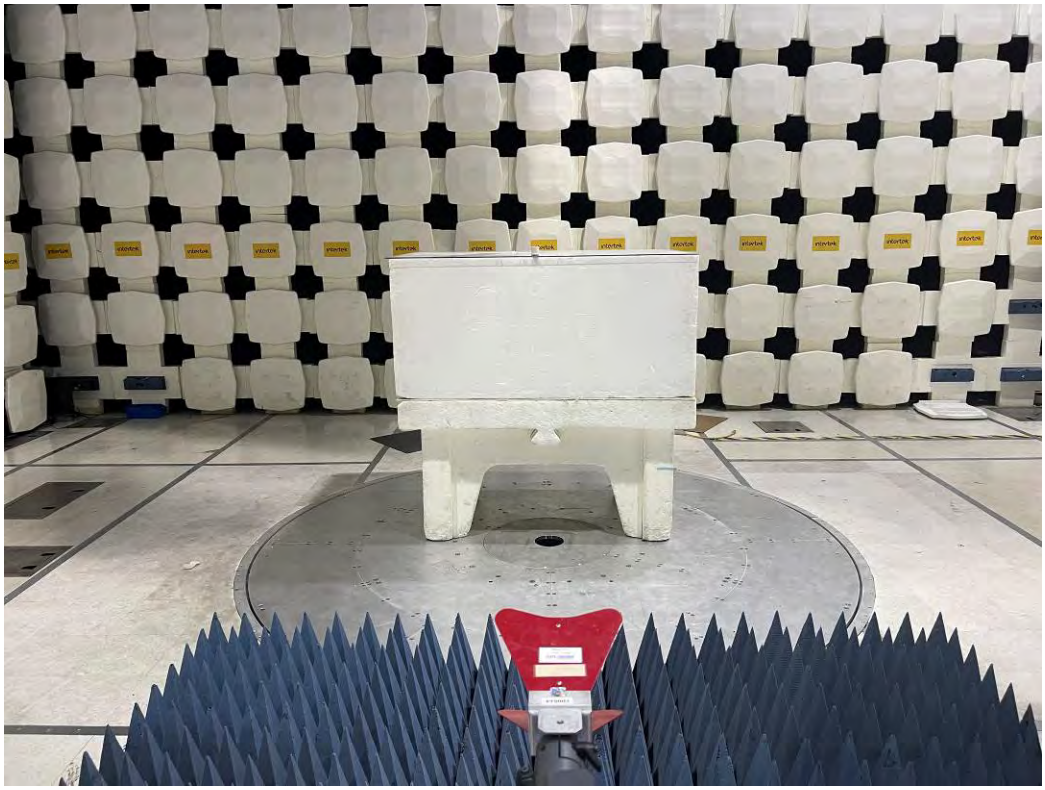


Radiated Emission Test Setup (Long Side), 1-13 GHz

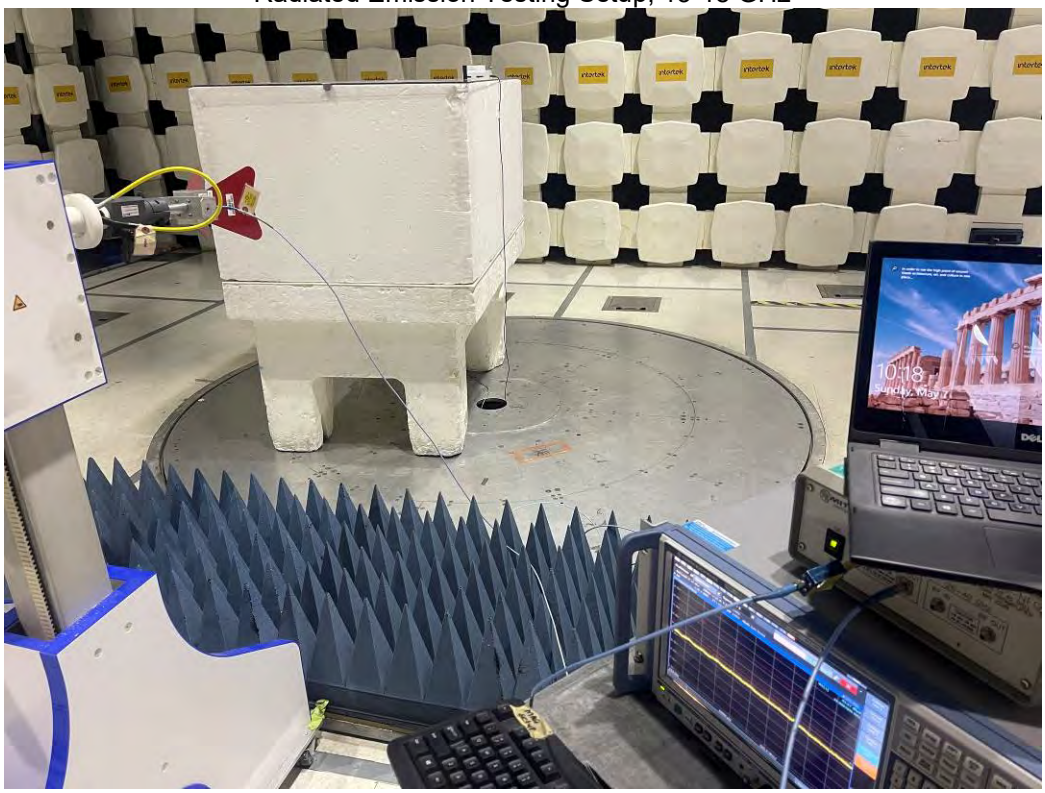




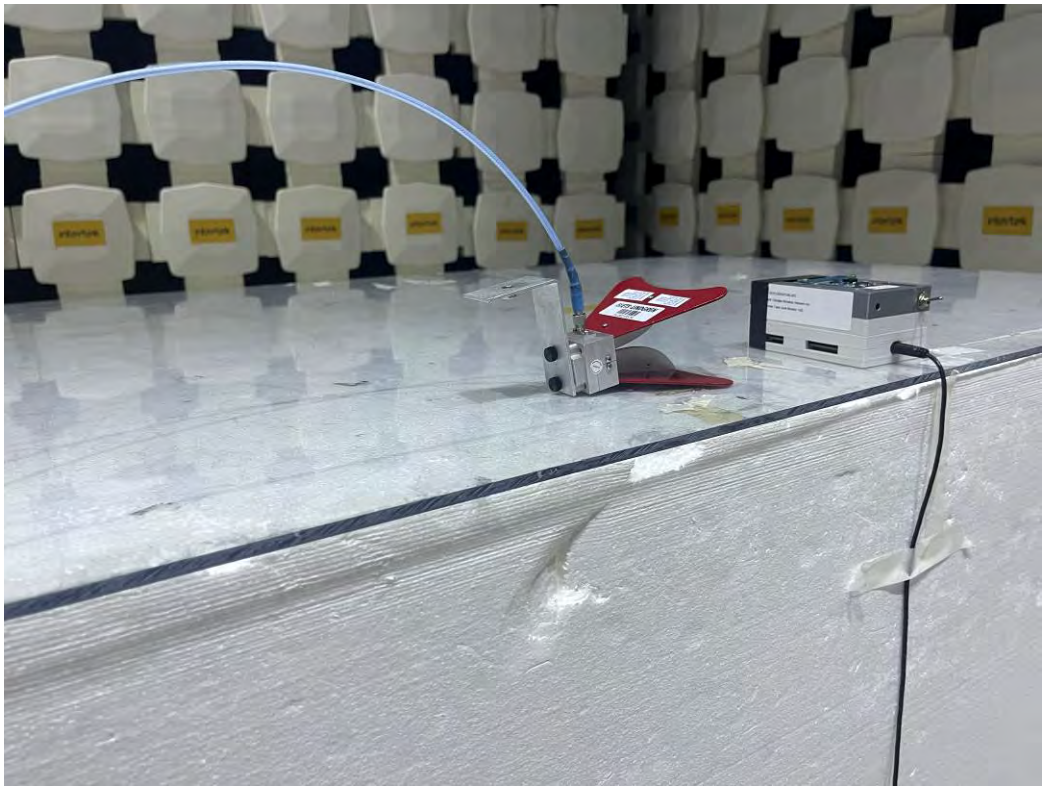
Radiated Emission Test Setup (Short Side), 1-13 GHz



Radiated Emission Testing Setup, 13-18 GHz

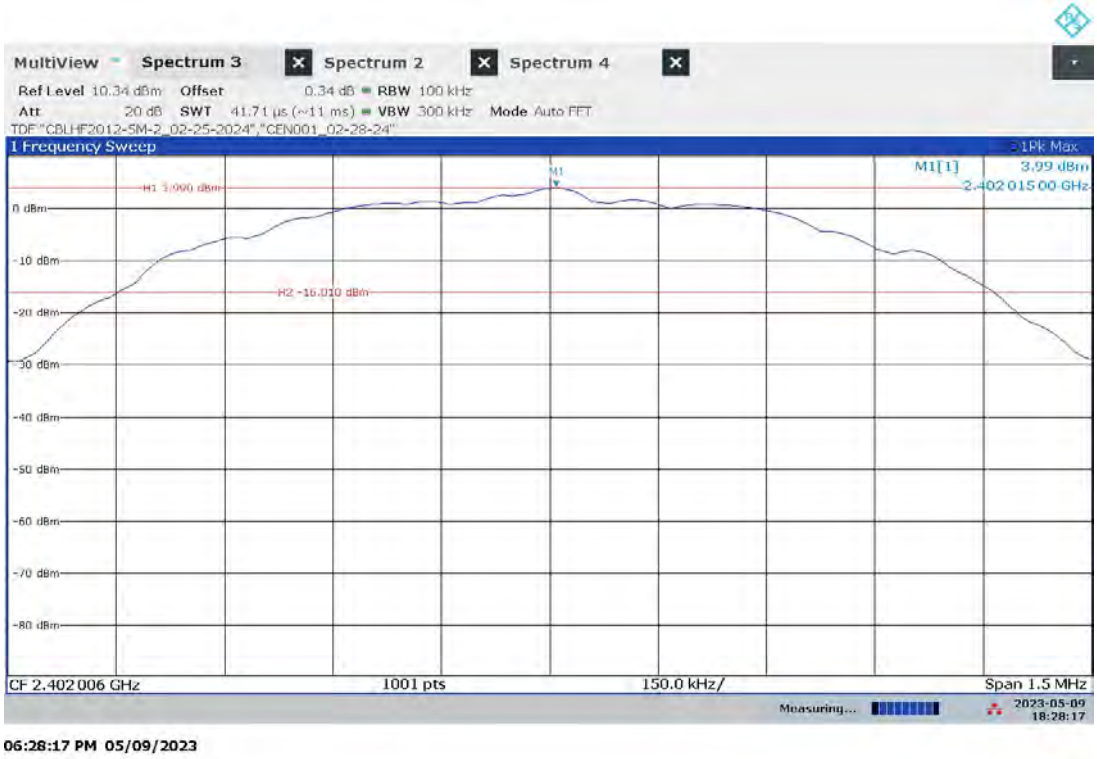


Radiated Emission Manual Testing Setup, 18-25 GHz

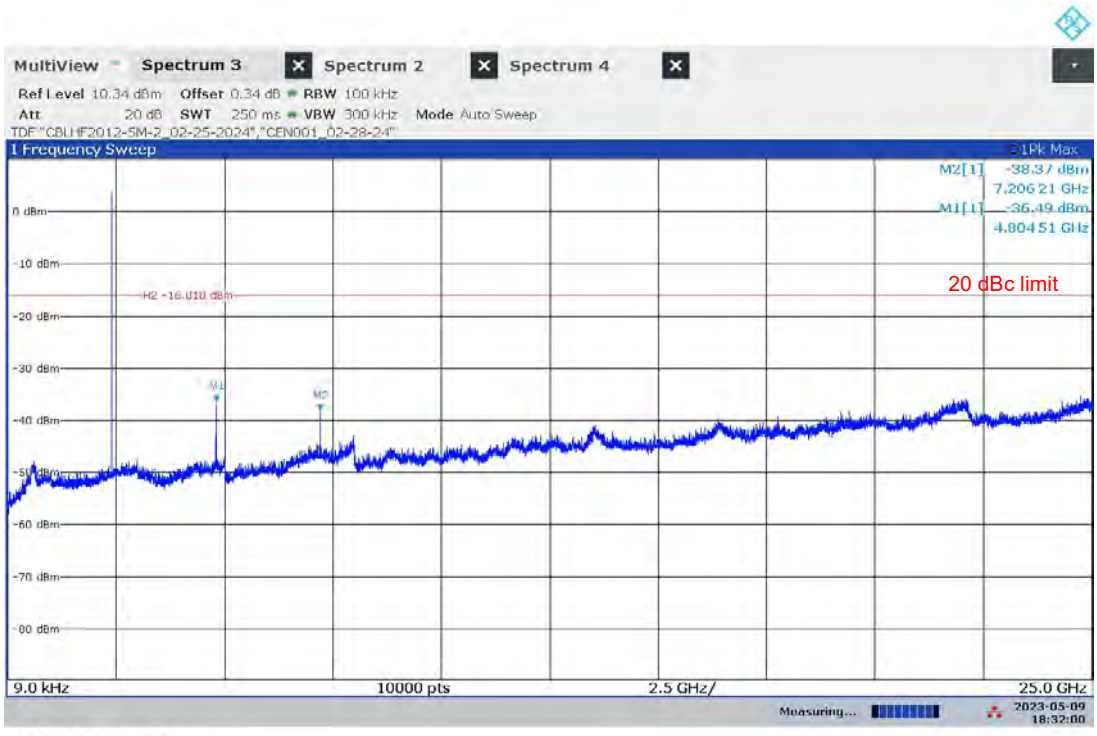


10.5 Plots/Data:

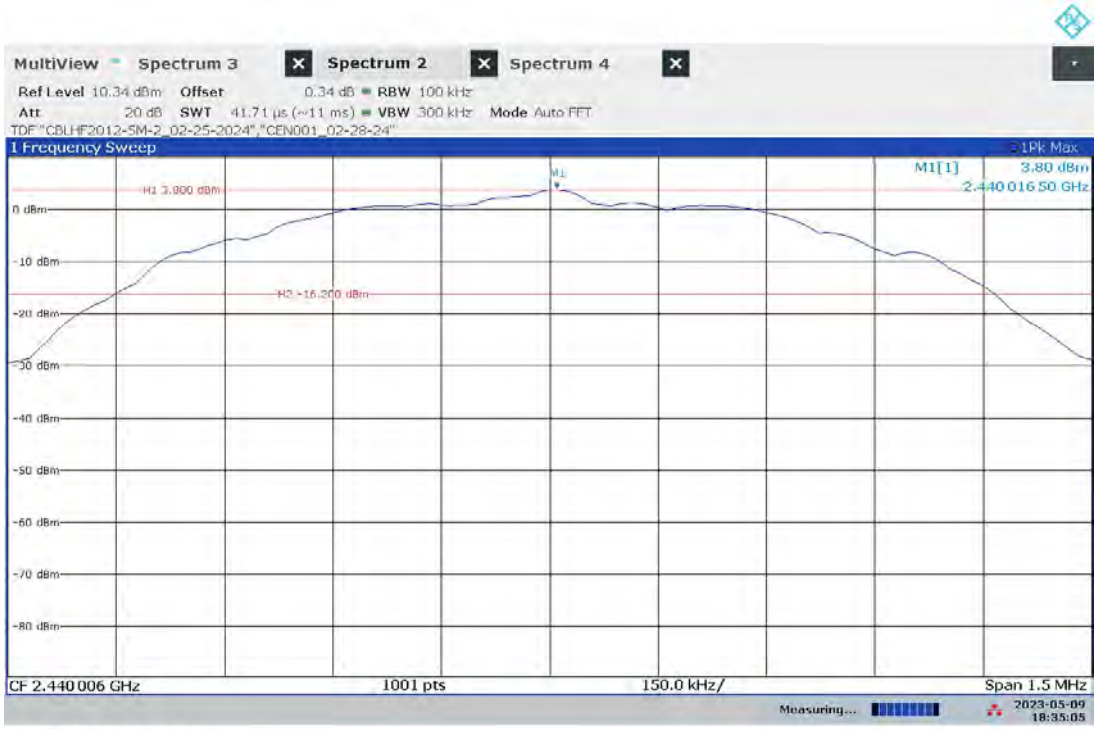
Low Channel 20 dBc Conducted Limit



Low Channel Antenna Port Conducted Emission From 9 kHz-25 GHz

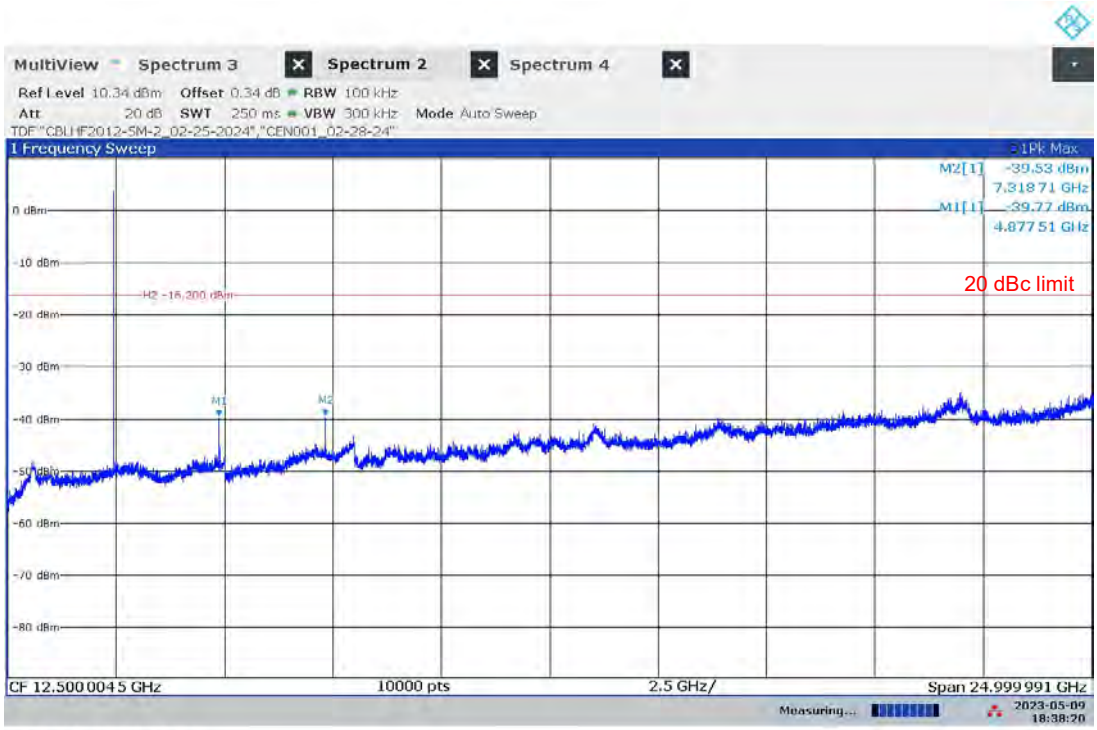


Mid Channel 20 dBc Conducted Limit



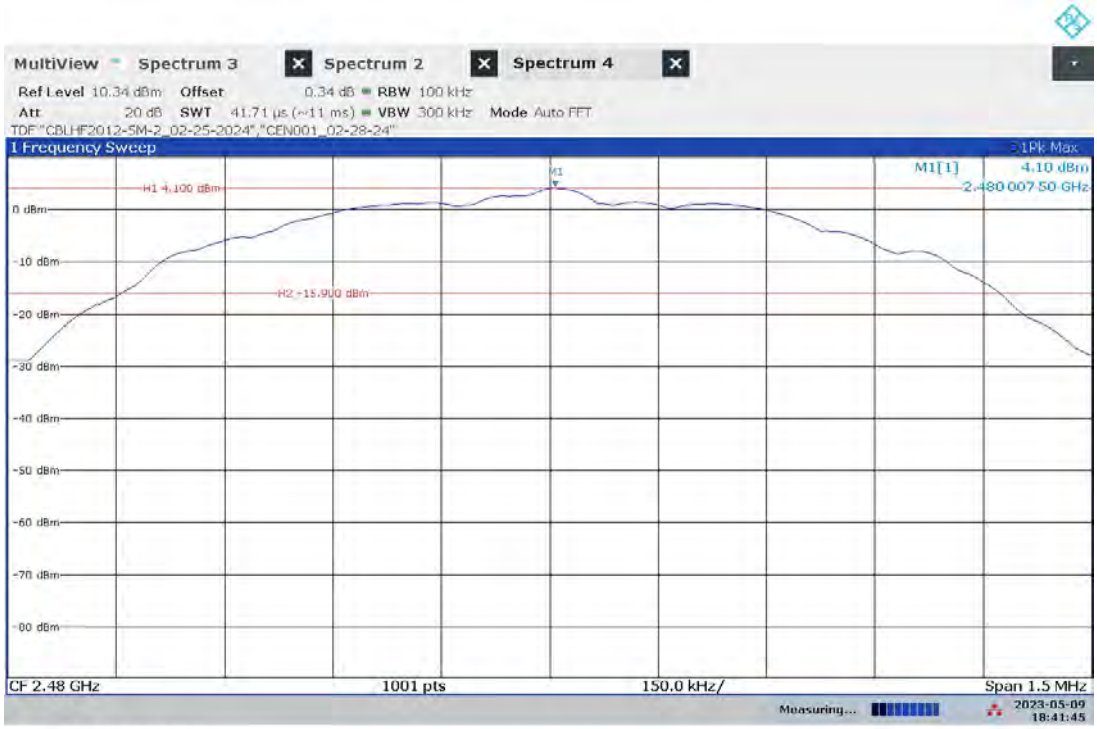
06:35:06 PM 05/09/2023

Mid Channel Antenna Port Conducted Emission From 9 kHz-25 GHz



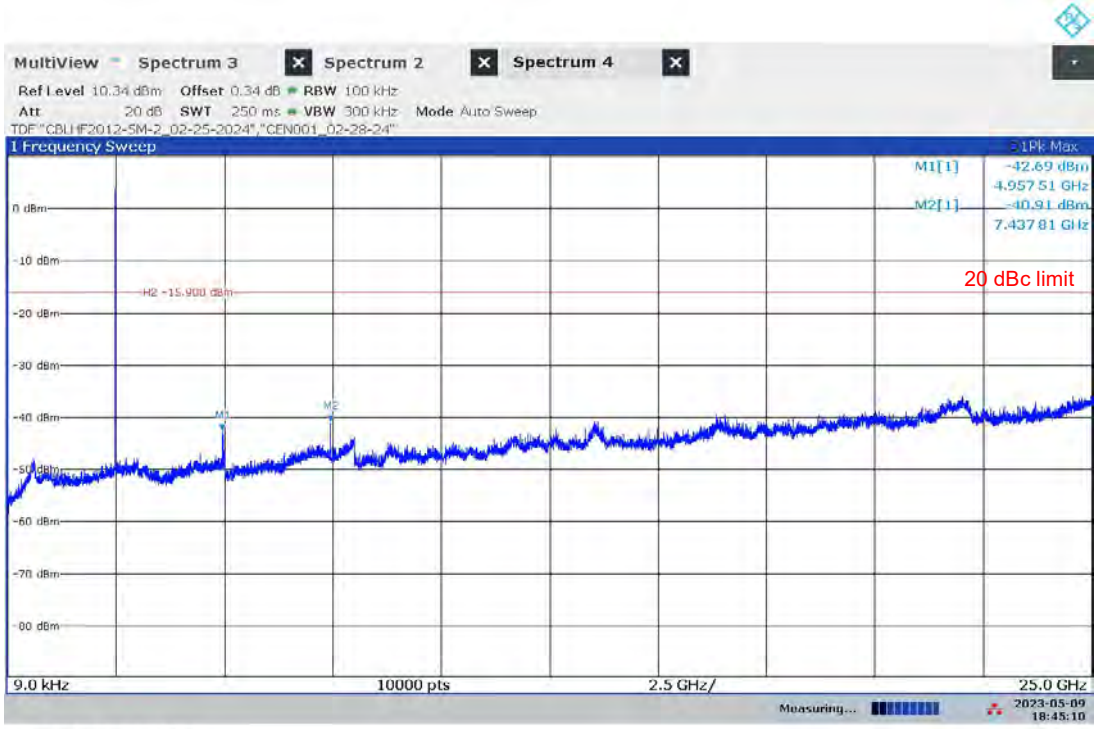
06:38:20 PM 05/09/2023

High Channel 20 dBc Conducted Limit



06:41:45 PM 05/09/2023

High Channel Antenna Port Conducted Emission From 9 kHz-25 GHz



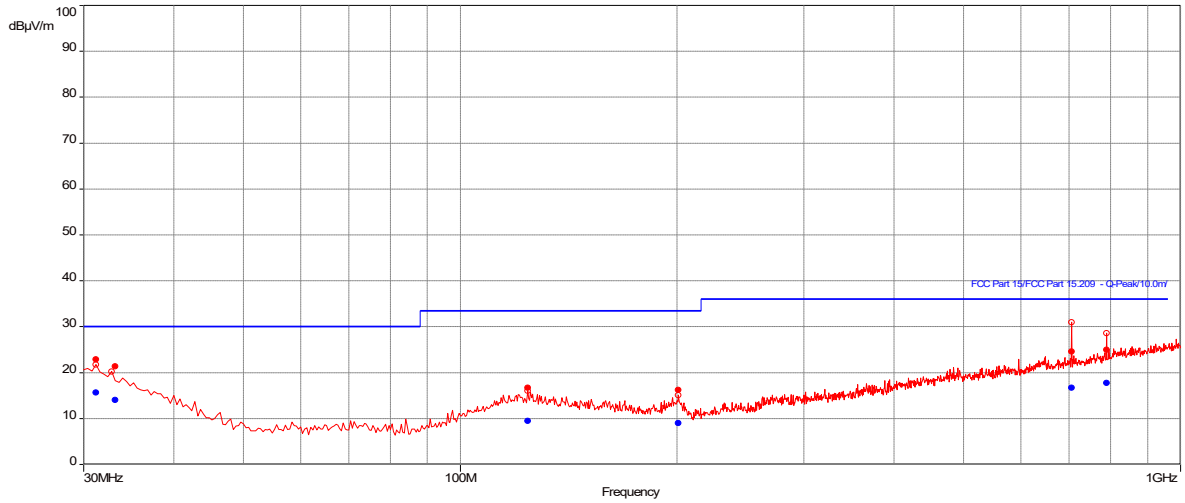
06:45:10 PM 05/09/2023

Low Channel Radiated Emissions, 30-1000 MHz [EUT on its back]

Test Information:

Date and Time	10/1/2023 11:00:33 AM
Client and Project Number	Otodata
Engineer	Kouma Sinn
Temperature	24 C
Humidity	45 %
Atmospheric Pressure	1013 mbar
Comments	Scan 5: Low Channel (Back Side), RE 30-1000MHz

Graph:



Results:

QuasiPeak (PASS) (6)

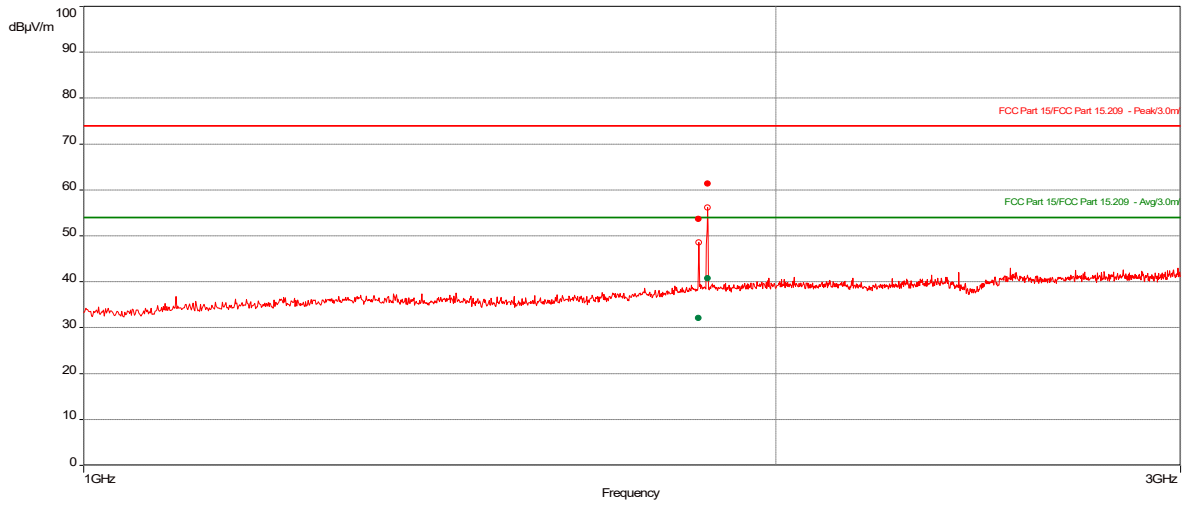
Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Azimuth (°)	Height (m)	Pol.	RBW	RBW	Correction (dB)
31.308	15.70	30.00	-14.30	245.60	2.95	Vertical	120000.00	120k	-13.17
33.286	14.11	30.00	-15.89	287.60	1.67	Vertical	120000.00	120k	-14.60
123.892	9.53	33.50	-23.97	162.50	4.00	Vertical	120000.00	120k	-18.27
200.944	9.02	33.50	-24.48	120.90	1.67	Vertical	120000.00	120k	-19.19
706.028	16.77	36.00	-19.23	329.10	2.53	Vertical	120000.00	120k	-8.87
789.146	17.81	36.00	-18.19	79.30	3.36	Horizontal	120000.00	120k	-7.46

Low Channel Radiated Emissions, 1-3 GHz [EUT on its back]

Test Information:

Date and Time	10/7/2023 11:32:52 AM
Client and Project Number	Otodata
Engineer	Kouma Sinn
Temperature	24 C
Humidity	49 %
Atmospheric Pressure	1001 mbar
Comments	Scan 26: Tx Low (Back Side), RE 1 to 3 GHz

Graph:



Results:

Peak (PASS) (2)

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Azimuth (°)	Height (m)	Pol.	RBW	RBW	Correction (dB)
1851.4	53.69	74.00	-20.31	269.30	1.44	Vertical	1000000.00	1M	-5.39
1867.55	61.45	74.00	-12.55	74.20	1.00	Vertical	1000000.00	1M	-5.16

Average (PASS) (2)

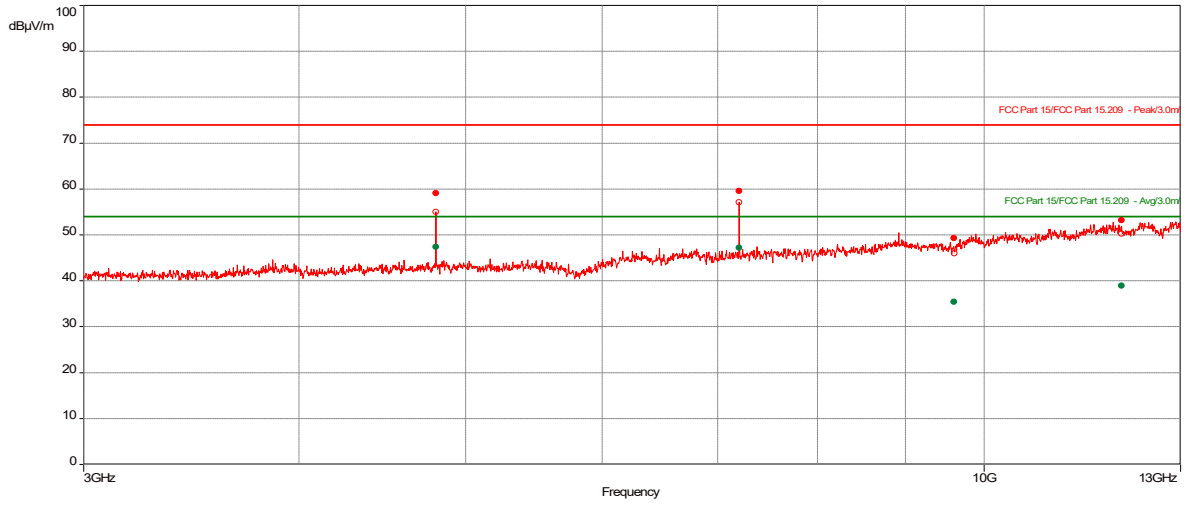
Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Azimuth (°)	Height (m)	Pol.	RBW	RBW	Correction (dB)
1851.4	32.12	54.00	-21.88	269.30	1.44	Vertical	1000000.00	1M	-5.39
1867.55	40.75	54.00	-13.25	74.20	1.00	Vertical	1000000.00	1M	-5.16

Low Channel Radiated Emissions, 3-13 GHz [EUT on its back]

Test Information:

Date and Time	10/1/2023 2:29:32 PM
Client and Project Number	Otodata
Engineer	Kouma Sinn
Temperature	24 C
Humidity	45 %
Atmospheric Pressure	1013 mbar
Comments	Scan 12: Tx Low (Back Side), RE 3 to 13 GHz

Graph:



Results:

Peak (PASS) (4)

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Azimuth (°)	Height (m)	Pol.	RBW	RBW	Correction (dB)
4804.55	59.09	74.00	-14.91	176.80	1.00	Vertical	1000000.00	1M	0.01
7206	59.59	74.00	-14.41	0.00	3.44	Horizontal	1000000.00	1M	4.32
9605.05	49.37	74.00	-24.63	360.00	4.00	Horizontal	1000000.00	1M	6.77
12012.4	53.23	74.00	-20.77	0.00	1.00	Vertical	1000000.00	1M	10.67

Average (PASS) (4)

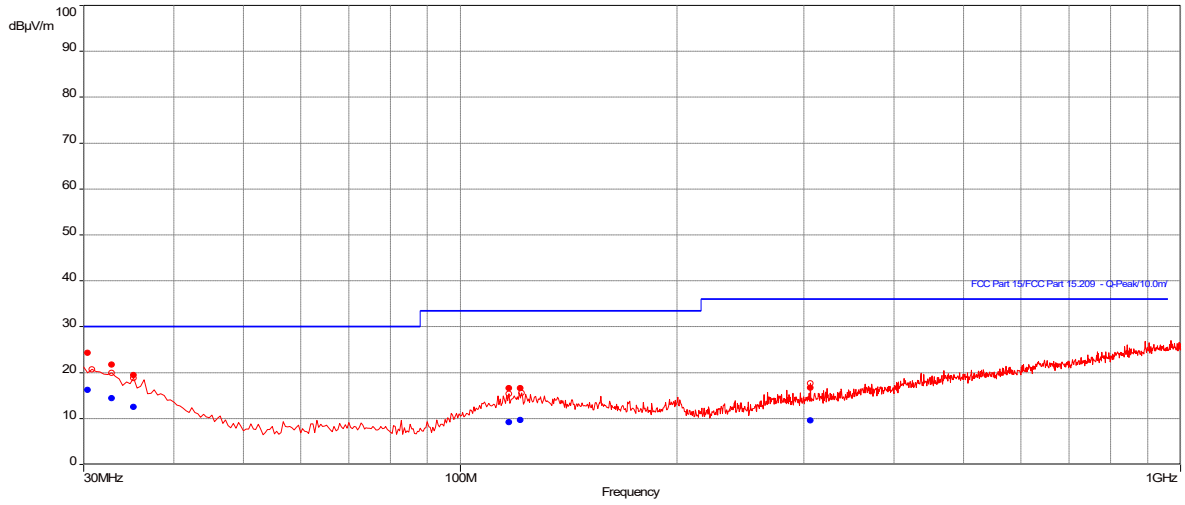
Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Azimuth (°)	Height (m)	Pol.	RBW	RBW	Correction (dB)
4804.55	47.40	54.00	-6.60	176.80	1.00	Vertical	1000000.00	1M	0.01
7206	47.29	54.00	-6.71	0.00	3.44	Horizontal	1000000.00	1M	4.32
9605.05	35.48	54.00	-18.52	360.00	4.00	Horizontal	1000000.00	1M	6.77
12012.4	38.98	54.00	-15.02	0.00	1.00	Vertical	1000000.00	1M	10.67

Low Channel Radiated Emissions, 30-1000 MHz [EUT on its short side]

Test Information:

Date and Time	10/1/2023 10:34:33 AM
Client and Project Number	Otodata
Engineer	Kouma Sinn
Temperature	24 C
Humidity	45 %
Atmospheric Pressure	1013 mbar
Comments	Scan 4: Low Channel (Short Side), RE 30-1000MHz

Graph:



Results:

QuasiPeak (PASS) (6)

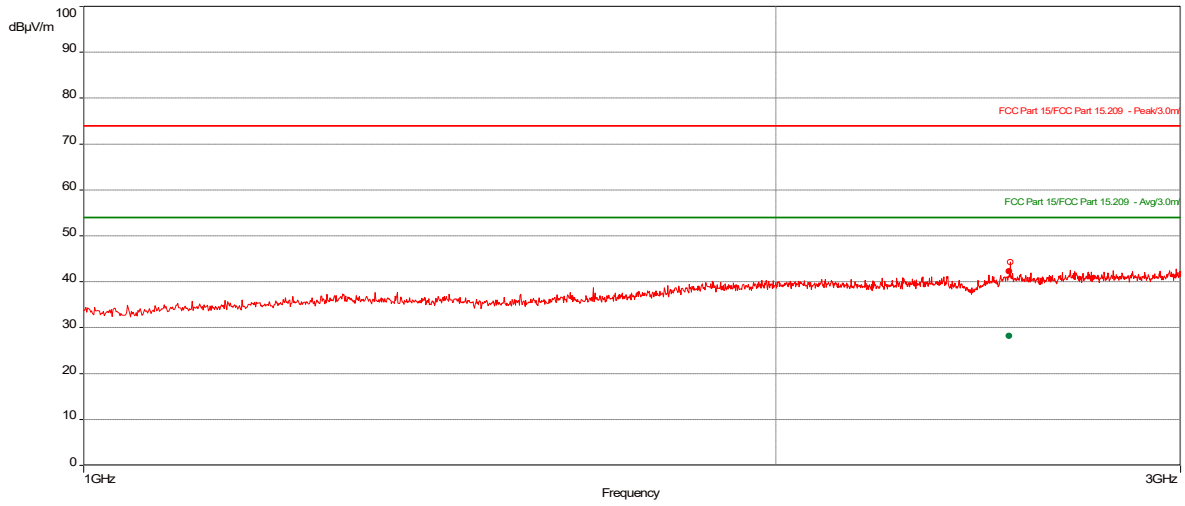
Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Azimuth (°)	Height (m)	Pol.	RBW	RBW	Correction (dB)
30.446	16.24	30.00	-13.76	121.00	3.36	Horizontal	120000.00	120k	-12.68
32.752	14.50	30.00	-15.50	224.80	1.67	Vertical	120000.00	120k	-14.23
35.224	12.56	30.00	-17.44	225.30	4.00	Vertical	120000.00	120k	-16.02
116.776	9.22	33.50	-24.28	204.30	3.79	Vertical	120000.00	120k	-18.64
121.288	9.67	33.50	-23.83	121.00	4.00	Horizontal	120000.00	120k	-18.38
306.58	9.60	36.00	-26.40	328.90	4.00	Vertical	120000.00	120k	-17.60

Low Channel Radiated Emissions, 1-3 GHz [EUT on its short side]

Test Information:

Date and Time	10/7/2023 11:57:24 AM
Client and Project Number	Otodata
Engineer	Kouma Sinn
Temperature	24 C
Humidity	49 %
Atmospheric Pressure	1001 mbar
Comments	Scan 28: Tx Low (Short Side), RE 1 to 3 GHz

Graph:



Results:

Peak (PASS) (1)

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Azimuth (°)	Height (m)	Pol.	RBW	RBW	Correction (dB)
2526.75	42.34	74.00	-31.66	347.70	3.58	Vertical	1000000.00	1M	-3.52

Average (PASS) (1)

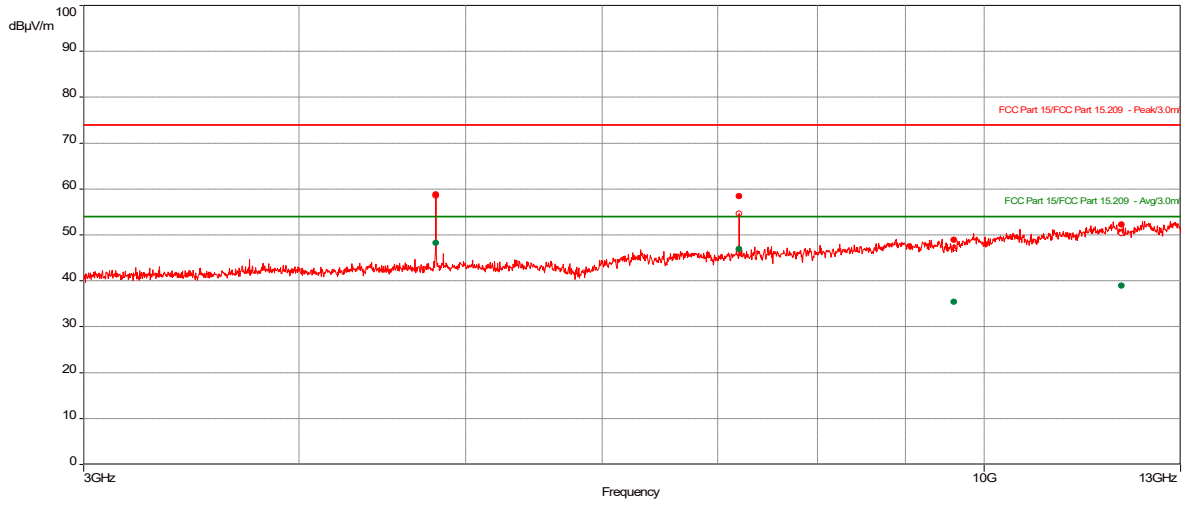
Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Azimuth (°)	Height (m)	Pol.	RBW	RBW	Correction (dB)
2526.75	28.29	54.00	-25.71	347.70	3.58	Vertical	1000000.00	1M	-3.52

Low Channel Radiated Emissions, 3-13 GHz [EUT on its short side]

Test Information:

Date and Time	10/1/2023 2:01:36 PM
Client and Project Number	Otodata
Engineer	Kouma Sinn
Temperature	24 C
Humidity	45 %
Atmospheric Pressure	1013 mbar
Comments	Scan 11: Tx Low (Short Side), RE 3 to 13 GHz

Graph:



Results:

Peak (PASS) (4)

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Azimuth (°)	Height (m)	Pol.	RBW	RBW	Correction (dB)
4803.5	58.88	74.00	-15.12	357.30	1.00	Vertical	1000000.00	1M	0.01
7205.25	58.51	74.00	-15.49	357.70	4.00	Horizontal	1000000.00	1M	4.32
9604.25	48.95	74.00	-25.05	0.00	4.00	Vertical	1000000.00	1M	6.77
12013.25	52.34	74.00	-21.66	176.90	3.44	Horizontal	1000000.00	1M	10.67

Average (PASS) (4)

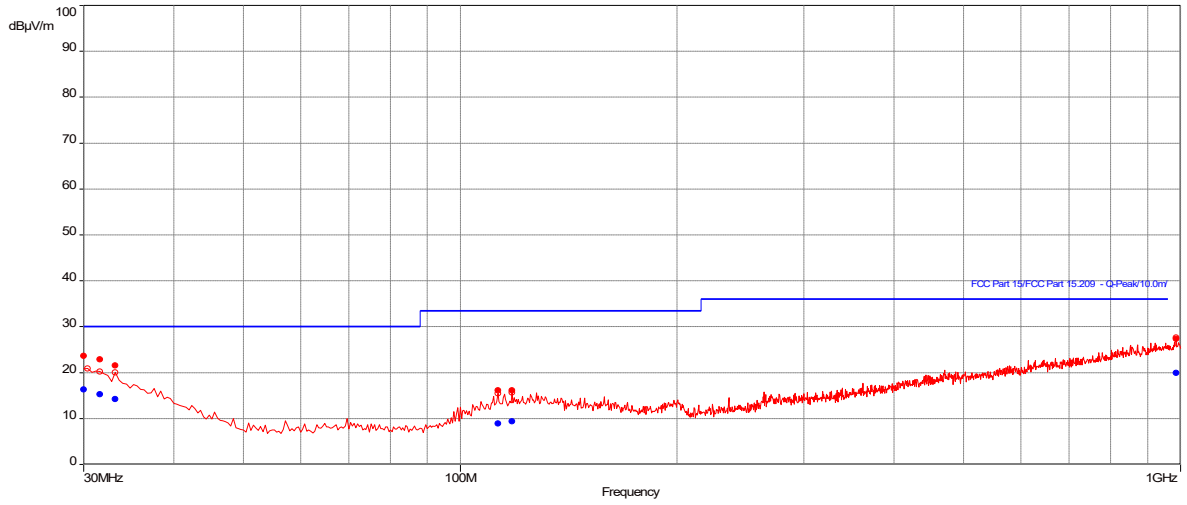
Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Azimuth (°)	Height (m)	Pol.	RBW	RBW	Correction (dB)
4803.5	48.30	54.00	-5.70	357.30	1.00	Vertical	1000000.00	1M	0.01
7205.25	46.94	54.00	-7.06	357.70	4.00	Horizontal	1000000.00	1M	4.32
9604.25	35.51	54.00	-18.49	0.00	4.00	Vertical	1000000.00	1M	6.77
12013.25	38.94	54.00	-15.06	176.90	3.44	Horizontal	1000000.00	1M	10.67

Low Channel Radiated Emissions, 30-1000 MHz [EUT on its long side]

Test Information:

Date and Time	10/1/2023 11:26:14 AM
Client and Project Number	Otodata
Engineer	Kouma Sinn
Temperature	24 C
Humidity	45 %
Atmospheric Pressure	1013 mbar
Comments	Scan 6: Low Channel (Long Side), RE 30-1000MHz

Graph:



Results:

QuasiPeak (PASS) (6)

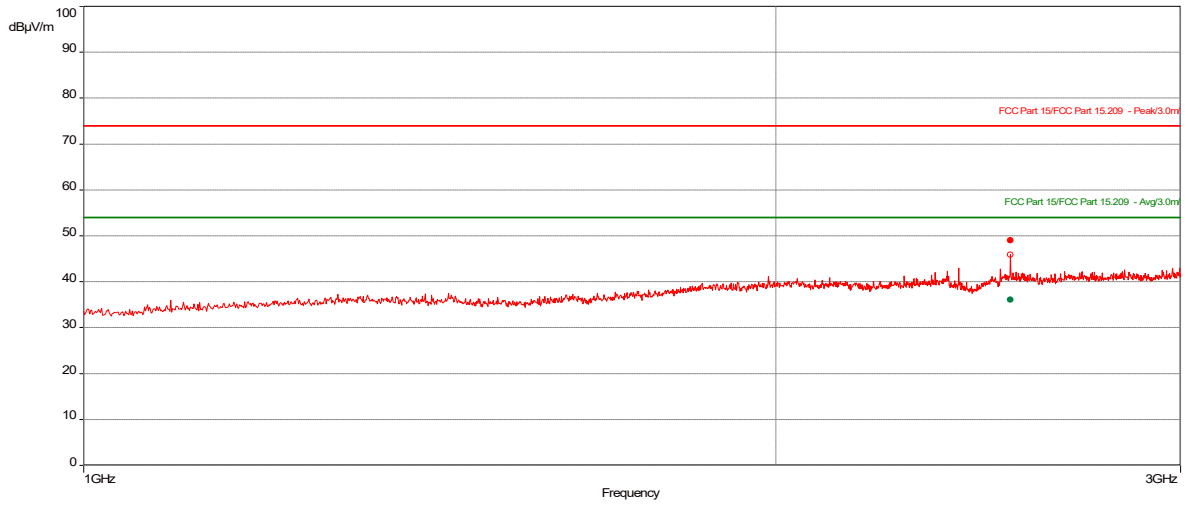
Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Azimuth (°)	Height (m)	Pol.	RBW	RBW	Correction (dB)
30.108	16.36	30.00	-13.64	16.60	1.00	Horizontal	120000.00	120k	-12.56
31.726	15.32	30.00	-14.68	79.00	4.00	Vertical	120000.00	120k	-13.54
33.122	14.27	30.00	-15.73	350.00	1.67	Vertical	120000.00	120k	-14.47
112.818	8.92	33.50	-24.58	183.60	1.00	Vertical	120000.00	120k	-19.18
118.138	9.38	33.50	-24.12	141.80	1.00	Vertical	120000.00	120k	-18.49
986.776	20.00	43.48	-23.48	308.00	1.00	Horizontal	120000.00	120k	-4.18

Low Channel Radiated Emissions, 1-3 GHz [EUT on its long side]

Test Information:

Date and Time	10/7/2023 11:47:24 AM
Client and Project Number	Otodata
Engineer	Kouma Sinn
Temperature	24 C
Humidity	49 %
Atmospheric Pressure	1001 mbar
Comments	Scan 27: Tx Low (Long Side), RE 1 to 3 GHz

Graph:



Results:

Peak (PASS) (1)

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Azimuth (°)	Height (m)	Pol.	RBW	RBW	Correction (dB)
2530	49.09	74.00	-24.91	269.40	1.44	Horizontal	1000000.00	1M	-3.53

Average (PASS) (1)

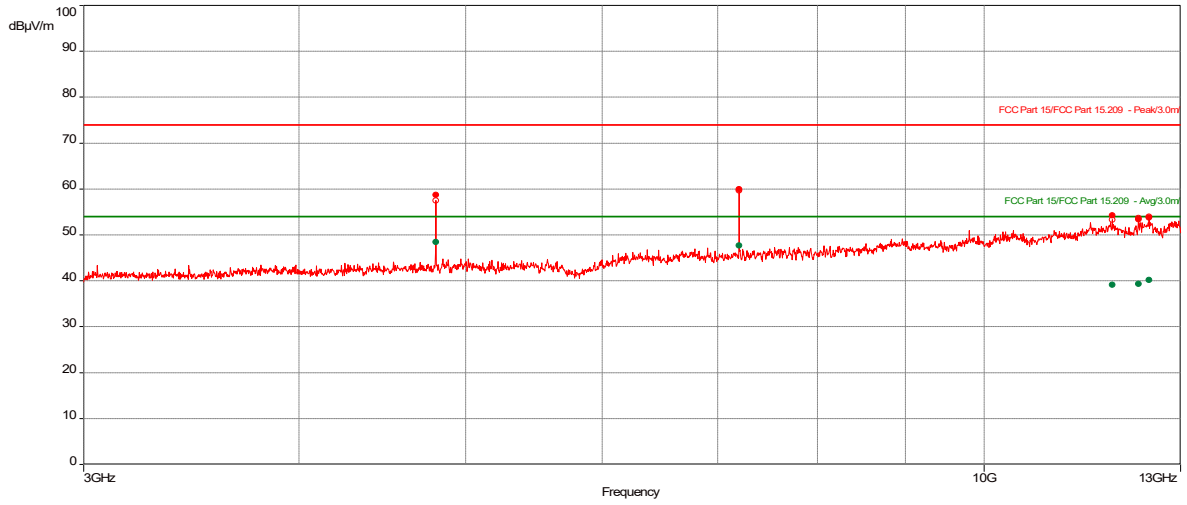
Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Azimuth (°)	Height (m)	Pol.	RBW	RBW	Correction (dB)
2530	36.14	54.00	-17.86	269.40	1.44	Horizontal	1000000.00	1M	-3.53

Low Channel Radiated Emissions, 3-13 GHz [EUT on its long side]

Test Information:

Date and Time	10/1/2023 2:59:53 PM
Client and Project Number	Otodata
Engineer	Kouma Sinn
Temperature	24 C
Humidity	45 %
Atmospheric Pressure	1013 mbar
Comments	Scan 13: Tx Low (long Side), RE 3 to 13 GHz

Graph:



Results:

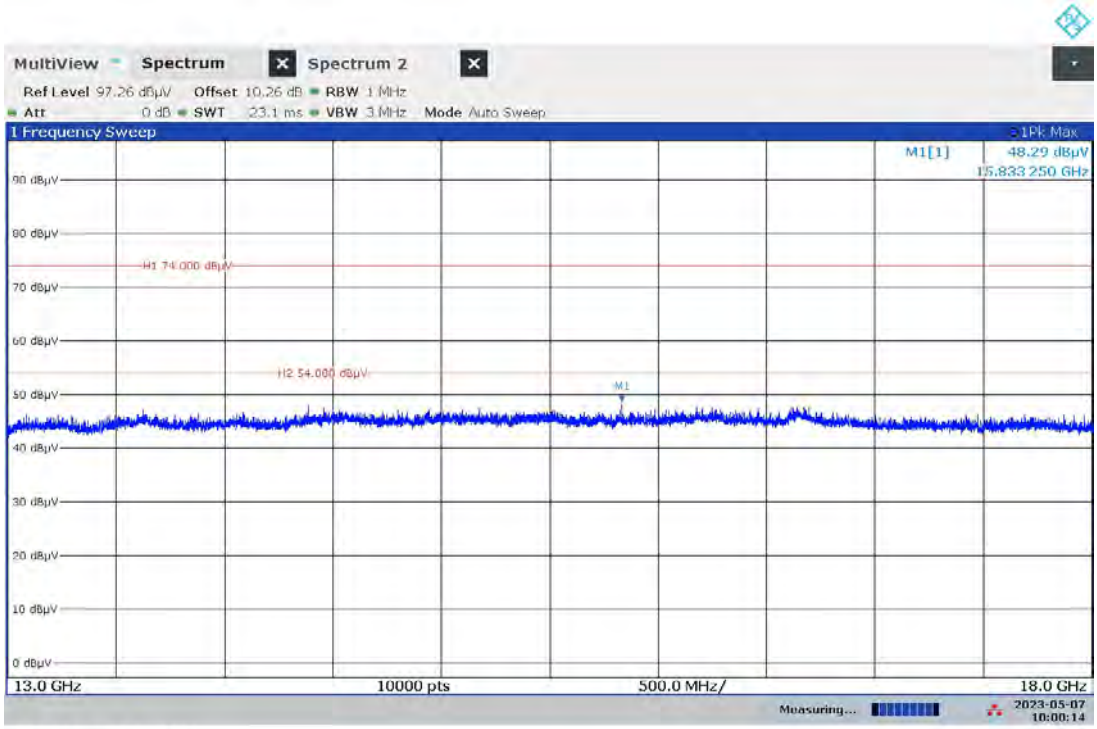
Peak (PASS) (5)

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Azimuth (°)	Height (m)	Pol.	RBW	RBW	Correction (dB)
4804.45	58.73	74.00	-15.27	0.00	1.00	Vertical	1000000.00	1M	0.01
7205.2	59.97	74.00	-14.03	357.50	1.00	Vertical	1000000.00	1M	4.32
11866	54.27	74.00	-19.73	0.00	3.44	Horizontal	1000000.00	1M	10.82
12291.5	53.46	74.00	-20.54	357.60	3.44	Horizontal	1000000.00	1M	11.44
12461.2	53.81	74.00	-20.19	360.00	3.44	Horizontal	1000000.00	1M	11.66

Average (PASS) (5)

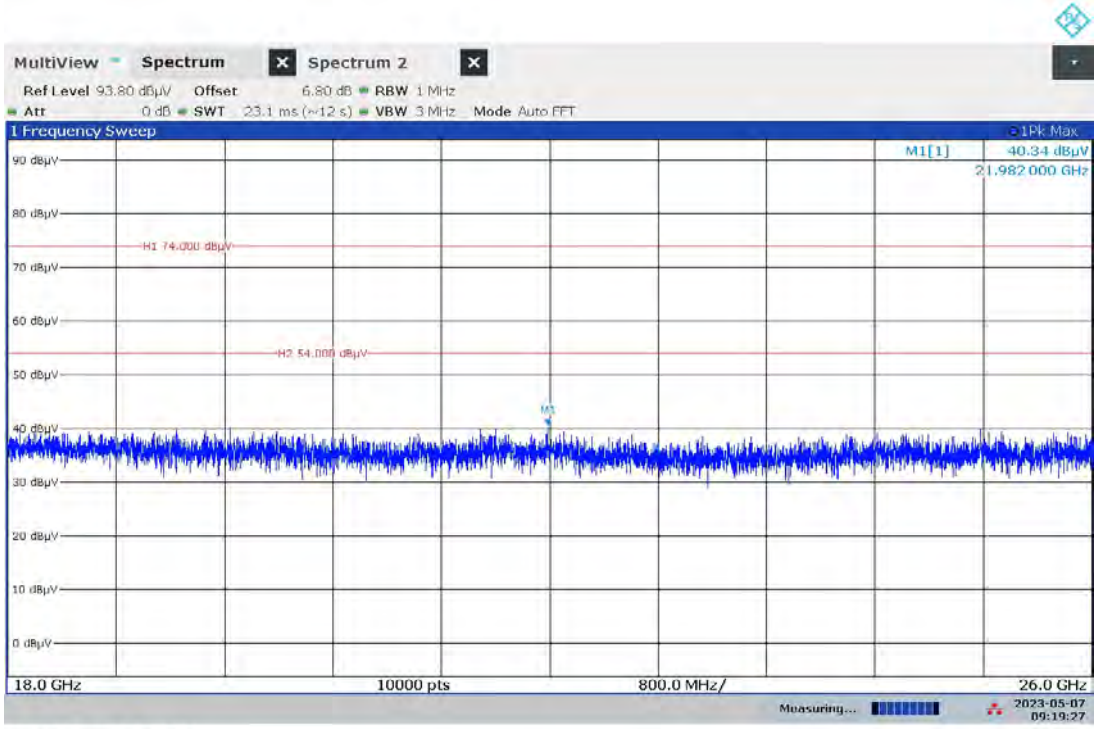
Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Azimuth (°)	Height (m)	Pol.	RBW	RBW	Correction (dB)
4804.45	48.49	54.00	-5.51	0.00	1.00	Vertical	1000000.00	1M	0.01
7205.2	47.68	54.00	-6.32	357.50	1.00	Vertical	1000000.00	1M	4.32
11866	39.21	54.00	-14.79	0.00	3.44	Horizontal	1000000.00	1M	10.82
12291.5	39.40	54.00	-14.60	357.60	3.44	Horizontal	1000000.00	1M	11.44
12461.2	40.22	54.00	-13.78	360.00	3.44	Horizontal	1000000.00	1M	11.66

Low Channel Radiated Emissions, 13-18 GHz [EUT on all axis] at 2m



10:00:15 AM 05/07/2023

Low Channel Radiated Emissions, 18-26 GHz [EUT on all axis] at 10cm



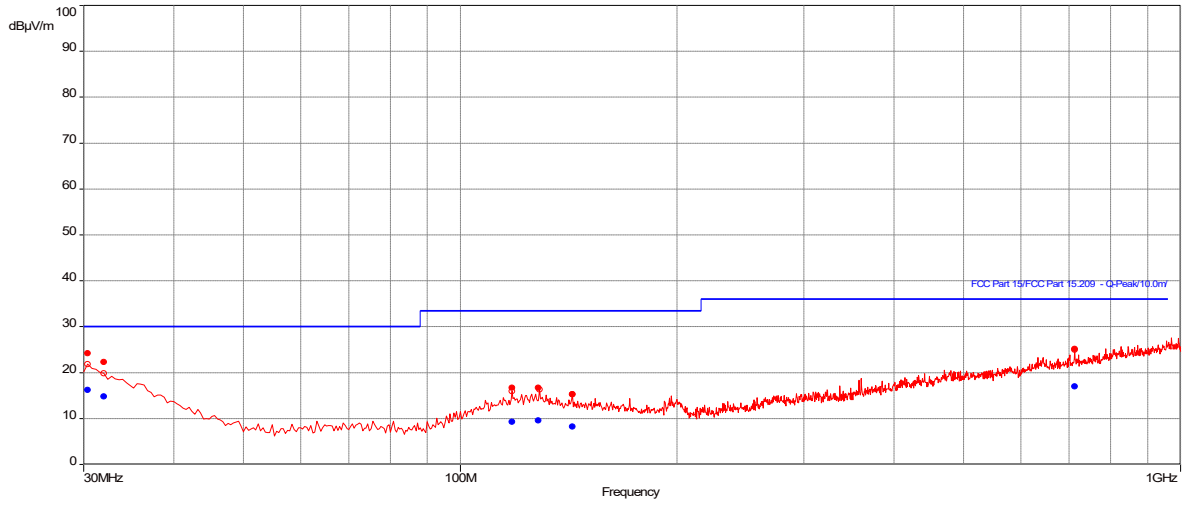
09:19:28 AM 05/07/2023

Mid Channel Radiated Emissions, 30-1000 MHz [EUT on its back]

Test Information:

Date and Time	10/1/2023 9:40:04 AM
Client and Project Number	Otodata
Engineer	Kouma Sinn
Temperature	24 C
Humidity	45 %
Atmospheric Pressure	1013 mbar
Comments	Scan 2: Mid Channel (Back Side), RE 30-1000MHz

Graph:



Results:

QuasiPeak (PASS) (6)

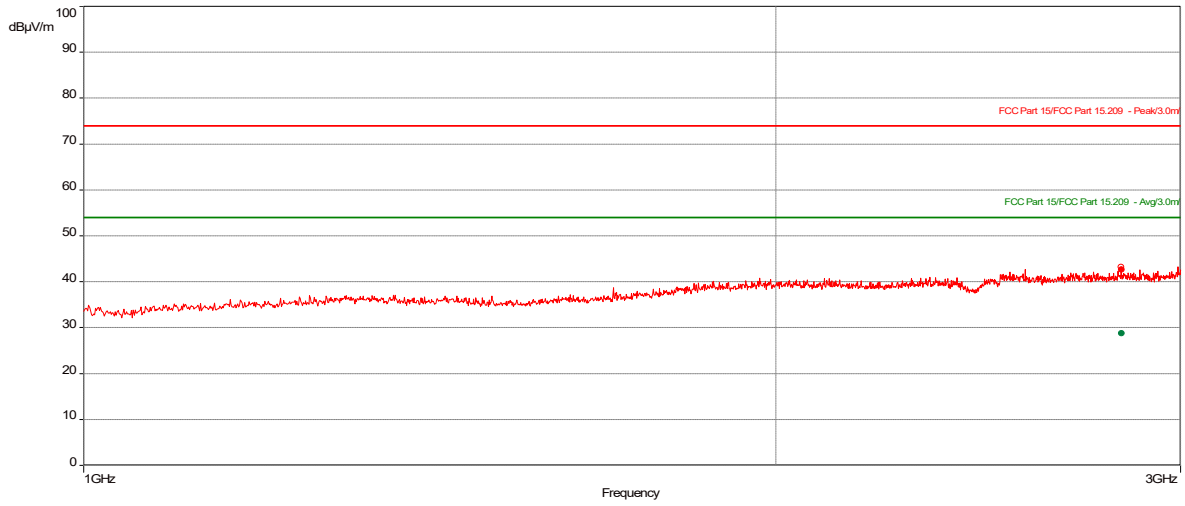
Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Azimuth (°)	Height (m)	Pol.	RBW	RBW	Correction (dB)
30.502	16.24	30.00	-13.76	350.50	1.00	Vertical	120000.00	120k	-12.71
32.138	14.86	30.00	-15.14	308.90	2.51	Horizontal	120000.00	120k	-13.87
118.168	9.36	33.50	-24.14	203.70	1.00	Horizontal	120000.00	120k	-18.49
128.572	9.58	33.50	-23.92	0.00	3.35	Horizontal	120000.00	120k	-18.37
143.302	8.31	33.50	-25.19	79.30	1.67	Vertical	120000.00	120k	-19.53
713.02	17.00	36.00	-19.00	225.20	3.80	Vertical	120000.00	120k	-8.74

Mid Channel Radiated Emissions, 1-3 GHz [EUT on its back]

Test Information:

Date and Time	10/7/2023 11:16:38 AM
Client and Project Number	Otodata
Engineer	Kouma Sinn
Temperature	24 C
Humidity	49 %
Atmospheric Pressure	1001 mbar
Comments	Scan 25: Tx Mid (Back Side), RE 1 to 3 GHz

Graph:



Results:

Peak (PASS) (1)

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Azimuth (°)	Height (m)	Pol.	RBW	RBW	Correction (dB)
2828.4	42.73	74.00	-31.27	34.90	2.51	Vertical	1000000.00	1M	-3.32

Average (PASS) (1)

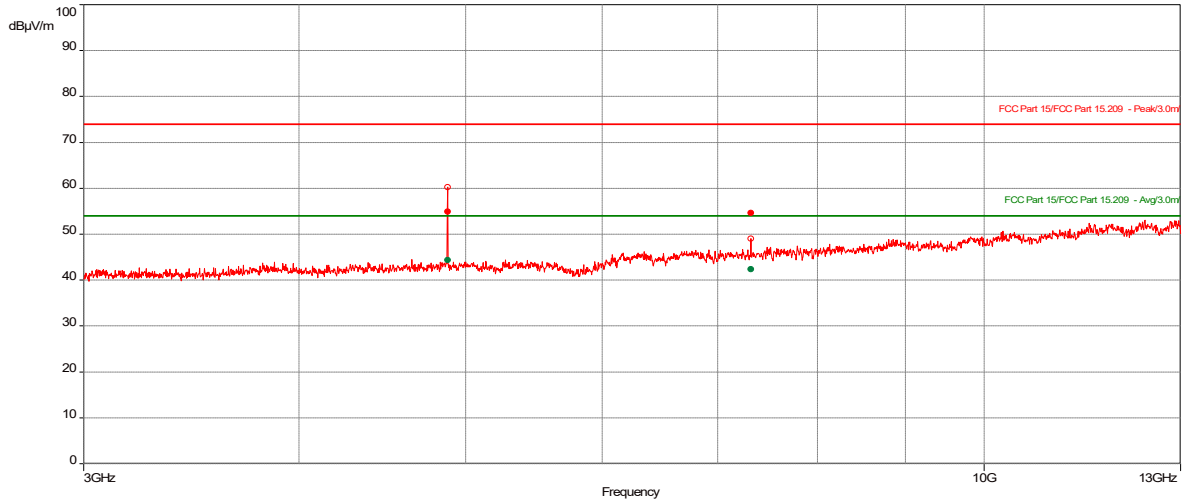
Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Azimuth (°)	Height (m)	Pol.	RBW	RBW	Correction (dB)
2828.4	28.78	54.00	-25.22	34.90	2.51	Vertical	1000000.00	1M	-3.32

Mid Channel Radiated Emissions, 3-13 GHz [EUT on its back]

Test Information:

Date and Time	10/1/2023 3:59:06 PM
Client and Project Number	Otodata
Engineer	Kouma Sinn
Temperature	24 C
Humidity	45 %
Atmospheric Pressure	1013 mbar
Comments	Scan 15: Tx Mid (Back Side), RE 3 to 13 GHz

Graph:



Results:

Peak (PASS) (2)

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Azimuth (°)	Height (m)	Pol.	RBW	RBW	Correction (dB)
4879.55	54.93	74.00	-19.07	176.90	3.44	Horizontal	1000000.00	1M	0.17
7319.3	54.63	74.00	-19.37	360.00	4.00	Horizontal	1000000.00	1M	4.46

Average (PASS) (2)

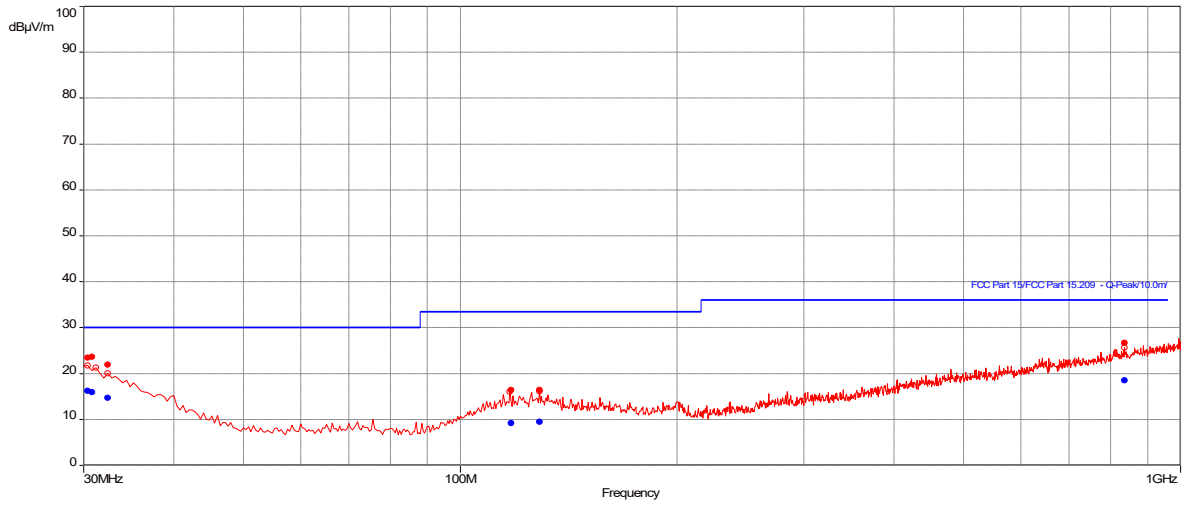
Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Azimuth (°)	Height (m)	Pol.	RBW	RBW	Correction (dB)
4879.55	44.42	54.00	-9.58	176.90	3.44	Horizontal	1000000.00	1M	0.17
7319.3	42.36	54.00	-11.64	360.00	4.00	Horizontal	1000000.00	1M	4.46

Mid Channel Radiated Emissions, 30-1000 MHz [EUT on its short side]

Test Information:

Date and Time	10/1/2023 9:12:00 AM
Client and Project Number	Otodata
Engineer	Kouma Sinn
Temperature	24 C
Humidity	45 %
Atmospheric Pressure	1013 mbar
Comments	Scan 1: Mid Channel (Short Side), RE 30-1000MHz

Graph:



Results:

QuasiPeak (PASS) (6)

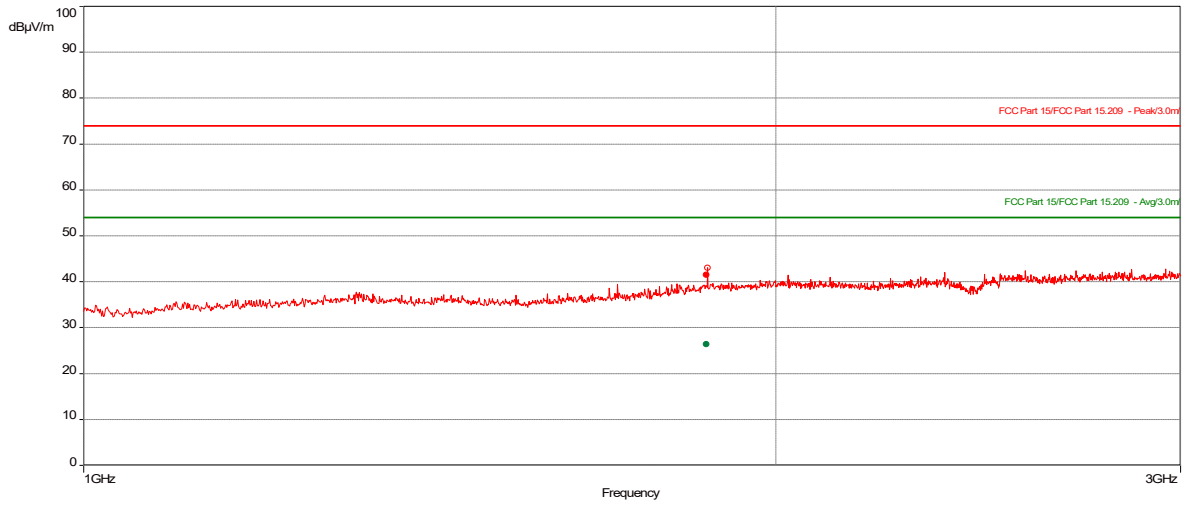
Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Azimuth (°)	Height (m)	Pol.	RBW	RBW	Correction (dB)
30.298	16.24	30.00	-13.76	16.50	3.79	Vertical	120000.00	120k	-12.63
30.996	15.93	30.00	-14.07	308.80	2.52	Vertical	120000.00	120k	-12.90
32.334	14.72	30.00	-15.28	37.50	3.80	Horizontal	120000.00	120k	-13.98
117.518	9.22	33.50	-24.28	162.10	4.00	Horizontal	120000.00	120k	-18.56
128.818	9.55	33.50	-23.95	350.10	2.09	Horizontal	120000.00	120k	-18.40
836.168	18.58	36.00	-17.42	16.60	1.00	Vertical	120000.00	120k	-6.57

Mid Channel Radiated Emissions, 1-3 GHz [EUT on its short side]

Test Information:

Date and Time	10/7/2023 10:56:01 AM
Client and Project Number	Otodata
Engineer	Kouma Sinn
Temperature	24 C
Humidity	49 %
Atmospheric Pressure	1001 mbar
Comments	Scan 23: Tx Mid (Short Side), RE 1 to 3 GHz

Graph:



Results:

Peak (PASS) (1)

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Azimuth (°)	Height (m)	Pol.	RBW	RBW	Correction (dB)
1865.95	41.51	74.00	-32.49	347.90	4.00	Vertical	1000000.00	1M	-5.18

Average (PASS) (1)

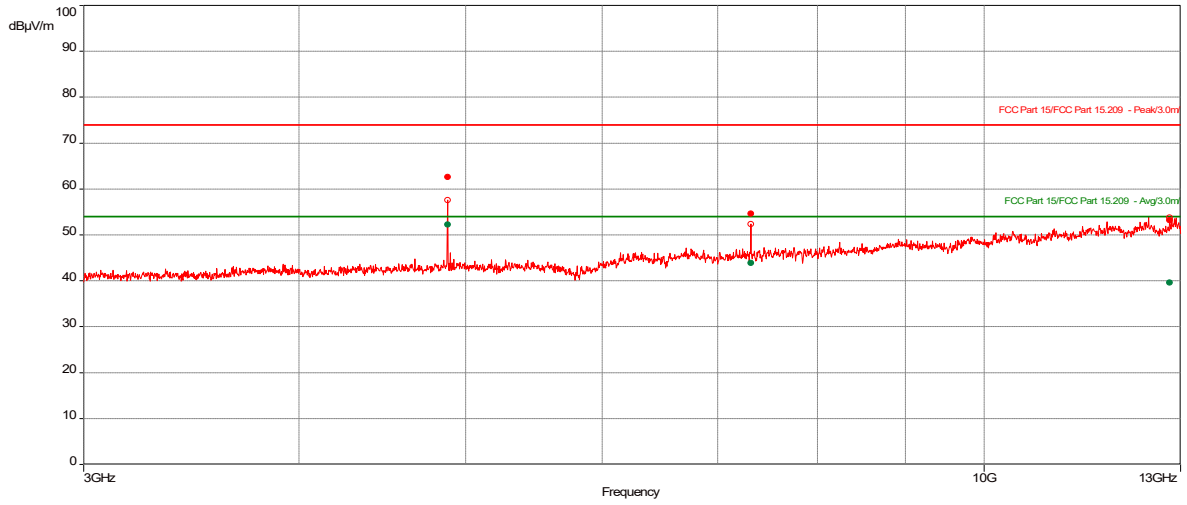
Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Azimuth (°)	Height (m)	Pol.	RBW	RBW	Correction (dB)
1865.95	26.42	54.00	-27.58	347.90	4.00	Vertical	1000000.00	1M	-5.18

Mid Channel Radiated Emissions, 3-13 GHz [EUT on its short side]

Test Information:

Date and Time	10/1/2023 4:15:16 PM
Client and Project Number	Otodata
Engineer	Kouma Sinn
Temperature	24 C
Humidity	45 %
Atmospheric Pressure	1013 mbar
Comments	Scan 16: Tx Mid (Short Side), RE 3 to 13 GHz

Graph:



Results:

Peak (PASS) (3)

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Azimuth (°)	Height (m)	Pol.	RBW	RBW	Correction (dB)
4879.5	62.62	74.00	-11.38	176.80	3.44	Horizontal	1000000.00	1M	0.17
7320.15	54.65	74.00	-19.35	357.20	3.44	Horizontal	1000000.00	1M	4.46
12814.35	53.22	74.00	-20.78	0.00	4.00	Vertical	1000000.00	1M	12.57

Average (PASS) (3)

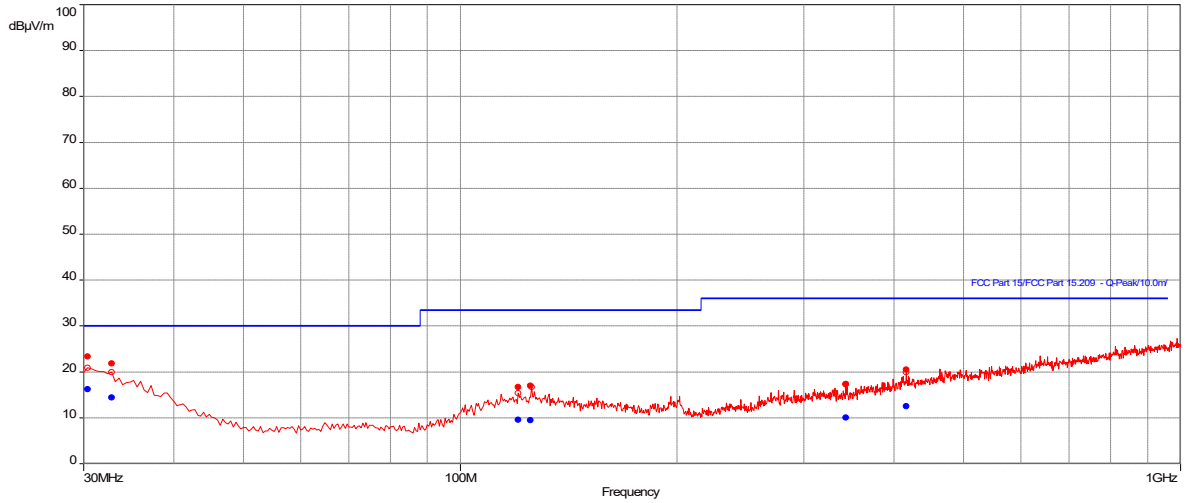
Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Azimuth (°)	Height (m)	Pol.	RBW	RBW	Correction (dB)
4879.5	52.30	54.00	-1.70	176.80	3.44	Horizontal	1000000.00	1M	0.17
7320.15	43.90	54.00	-10.10	357.20	3.44	Horizontal	1000000.00	1M	4.46
12814.35	39.65	54.00	-14.35	0.00	4.00	Vertical	1000000.00	1M	12.57

Mid Channel Radiated Emissions, 30-1000 MHz [EUT on its long side]

Test Information:

Date and Time	10/1/2023 10:05:08 AM
Client and Project Number	Otodata
Engineer	Kouma Sinn
Temperature	24 C
Humidity	45 %
Atmospheric Pressure	1013 mbar
Comments	Scan 3: Mid Channel (Long Side), RE 30-1000MHz

Graph:



Results:

QuasiPeak (PASS) (6)

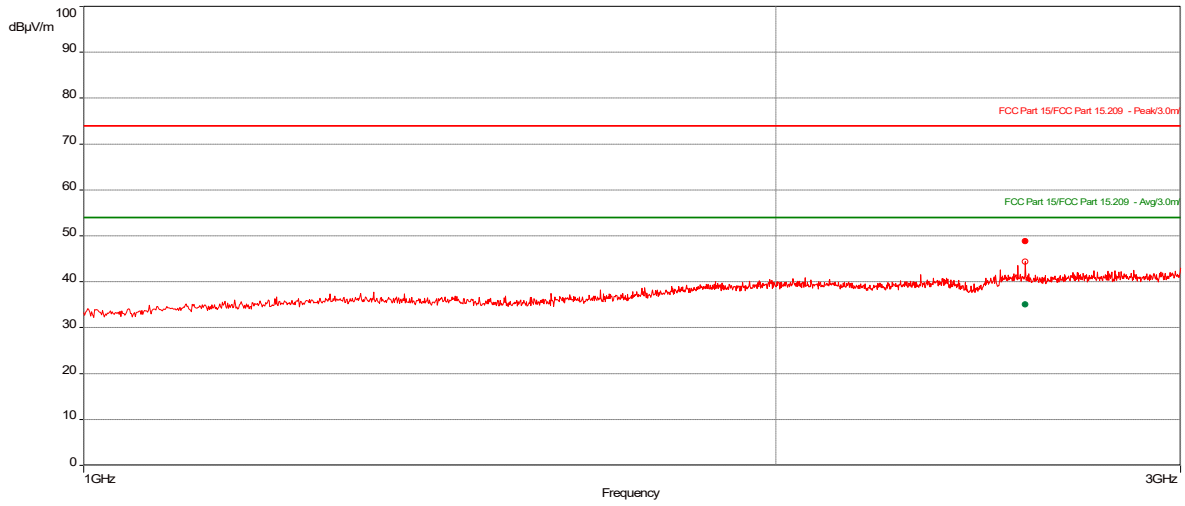
Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Azimuth (°)	Height (m)	Pol.	RBW	RBW	Correction (dB)
30.454	16.24	30.00	-13.76	100.10	1.66	Horizontal	120000.00	120k	-12.69
32.77	14.50	30.00	-15.50	203.70	4.00	Vertical	120000.00	120k	-14.24
120.592	9.61	33.50	-23.89	120.80	4.00	Horizontal	120000.00	120k	-18.38
125.288	9.53	33.50	-23.97	120.80	4.00	Vertical	120000.00	120k	-18.24
343.238	10.09	36.00	-25.91	100.10	2.52	Vertical	120000.00	120k	-17.12
416.12	12.59	36.00	-23.41	287.70	2.95	Vertical	120000.00	120k	-14.59

Mid Channel Radiated Emissions, 1-3 GHz [EUT on its long side]

Test Information:

Date and Time	10/7/2023 11:06:20 AM
Client and Project Number	Otodata
Engineer	Kouma Sinn
Temperature	24 C
Humidity	49 %
Atmospheric Pressure	1001 mbar
Comments	Scan 24: Tx Mid (Long Side), RE 1 to 3 GHz

Graph:



Results:

Peak (PASS) (1)

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Azimuth (°)	Height (m)	Pol.	RBW	RBW	Correction (dB)
2568.05	48.84	74.00	-25.16	269.20	1.44	Horizontal	1000000.00	1M	-3.61

Average (PASS) (1)

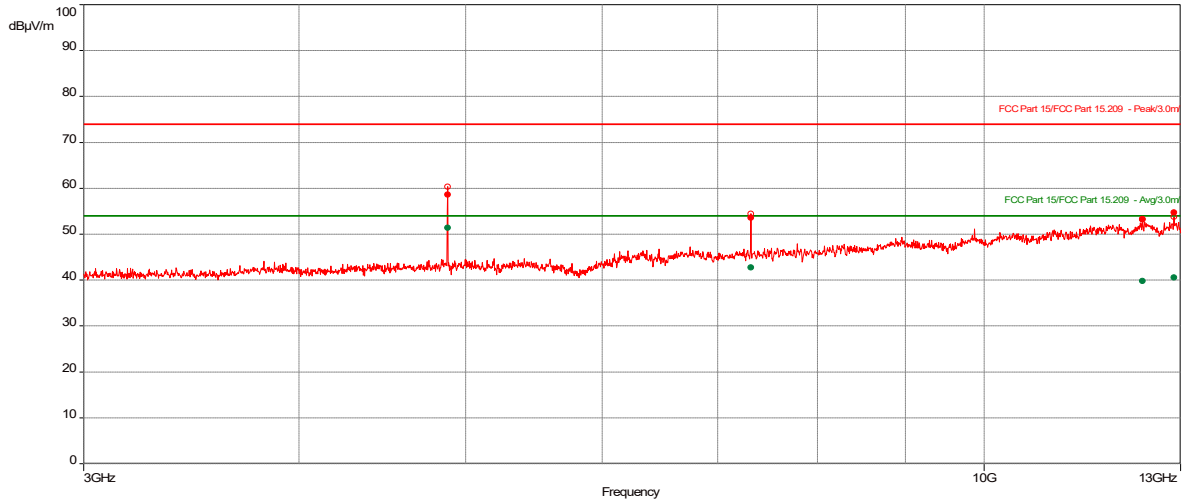
Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Azimuth (°)	Height (m)	Pol.	RBW	RBW	Correction (dB)
2568.05	35.06	54.00	-18.94	269.20	1.44	Horizontal	1000000.00	1M	-3.61

Mid Channel Radiated Emissions, 3-13 GHz [EUT on its long side]

Test Information:

Date and Time	10/1/2023 3:32:34 PM
Client and Project Number	Otodata
Engineer	Kouma Sinn
Temperature	24 C
Humidity	45 %
Atmospheric Pressure	1013 mbar
Comments	Scan 14: Tx Mid (long Side), RE 3 to 13 GHz

Graph:



Results:

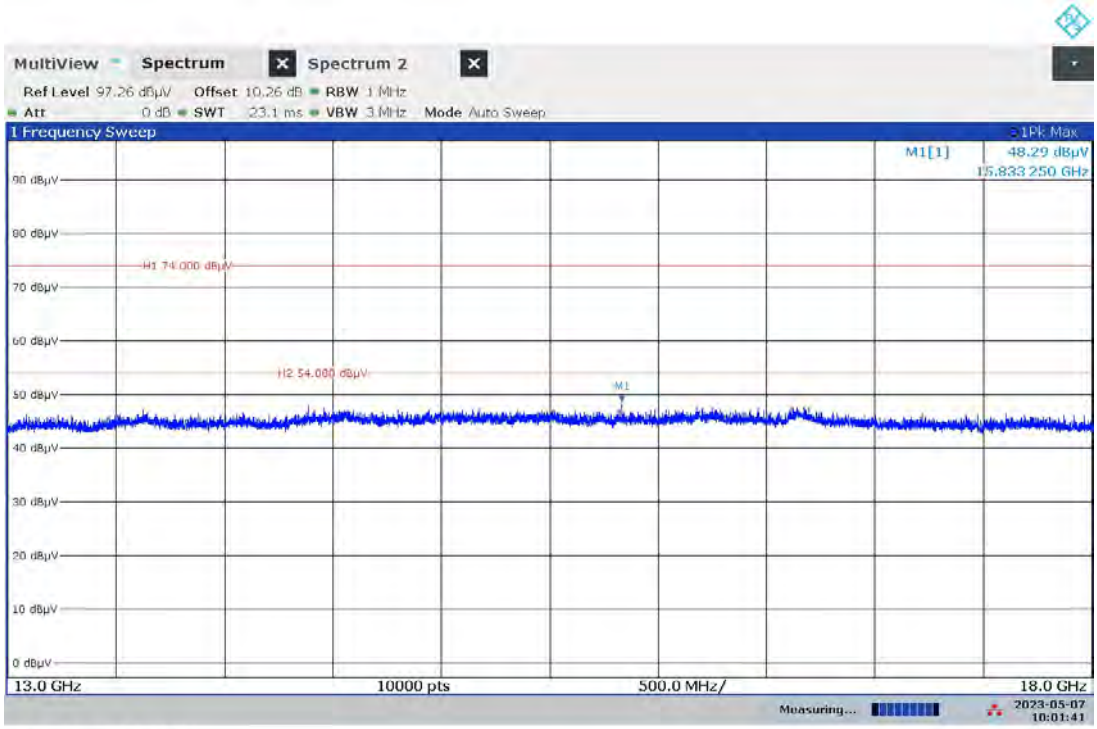
Peak (PASS) (4)

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Azimuth (°)	Height (m)	Pol.	RBW	RBW	Correction (dB)
4880.1	58.66	74.00	-15.34	176.60	3.44	Vertical	1000000.00	1M	0.17
7319.55	53.66	74.00	-20.34	357.30	1.00	Vertical	1000000.00	1M	4.46
12356.85	53.24	74.00	-20.76	0.00	3.44	Vertical	1000000.00	1M	11.54
12890.5	54.78	74.00	-19.22	360.00	4.00	Vertical	1000000.00	1M	12.84

Average (PASS) (4)

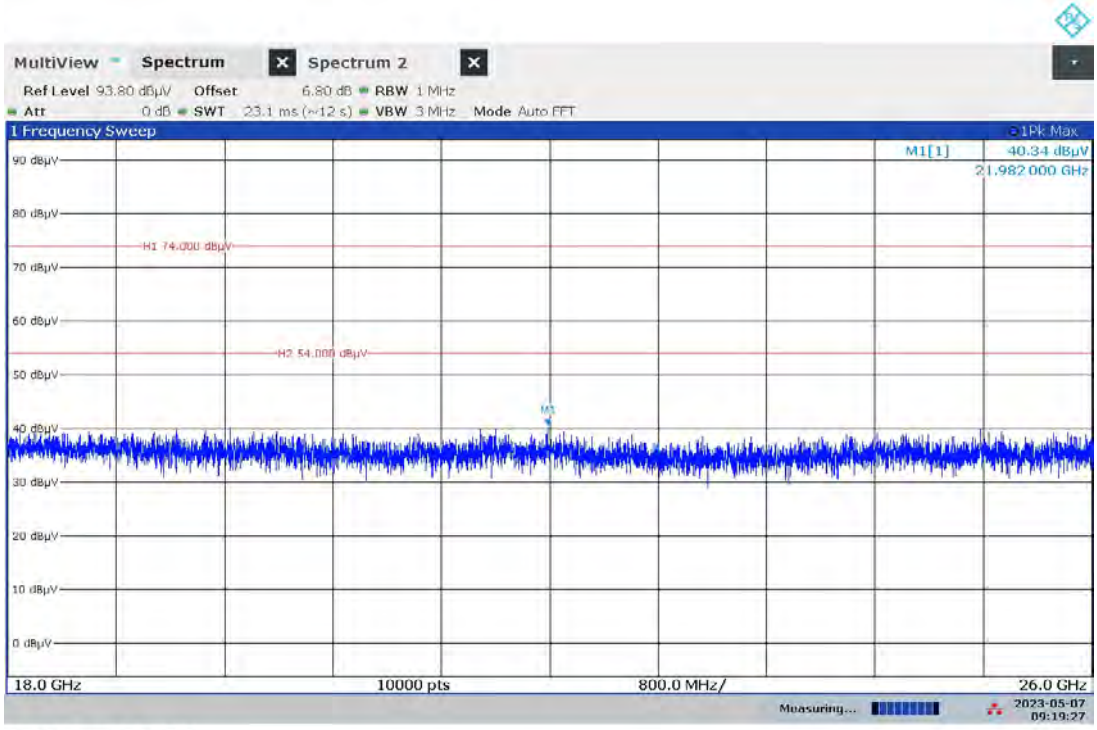
Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Azimuth (°)	Height (m)	Pol.	RBW	RBW	Correction (dB)
4880.1	51.45	54.00	-2.55	176.60	3.44	Vertical	1000000.00	1M	0.17
7319.55	42.74	54.00	-11.26	357.30	1.00	Vertical	1000000.00	1M	4.46
12356.85	39.80	54.00	-14.20	0.00	3.44	Vertical	1000000.00	1M	11.54
12890.5	40.58	54.00	-13.42	360.00	4.00	Vertical	1000000.00	1M	12.84

Mid Channel Radiated Emissions, 13-18 GHz [EUT on all axis] at 2 m



10:01:42 AM 05/07/2023

Mid Channel Radiated Emissions, 18-26 GHz [EUT on all axis] at 10 cm



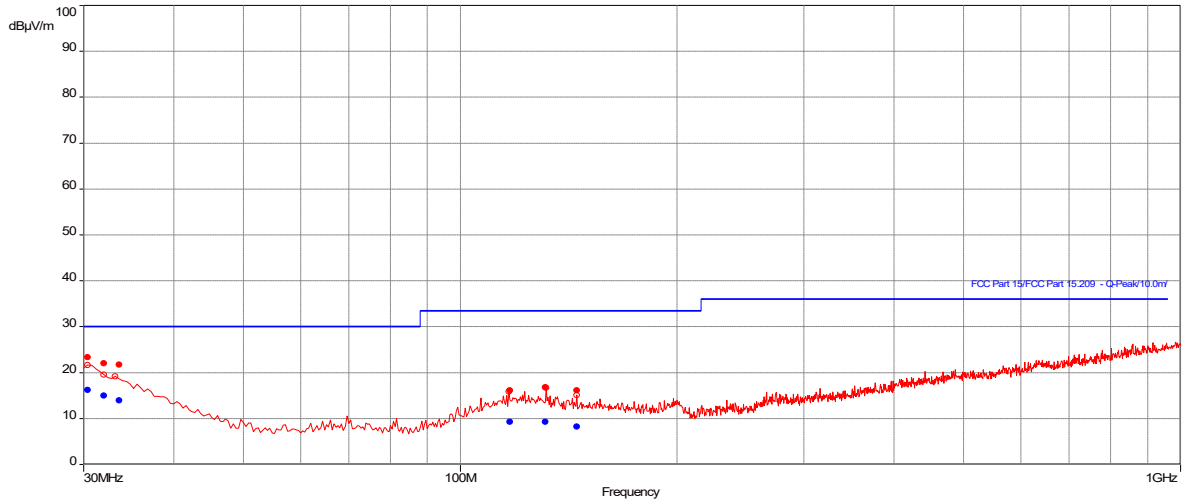
09:19:28 AM 05/07/2023

High Channel Radiated Emissions, 30-1000 MHz [EUT on its back]

Test Information:

Date and Time	10/1/2023 12:23:30 PM
Client and Project Number	Otodata
Engineer	Kouma Sinn
Temperature	24 C
Humidity	45 %
Atmospheric Pressure	1013 mbar
Comments	Scan 8: High Channel (Back Side), RE 30-1000MHz

Graph:



Results:

QuasiPeak (PASS) (6)

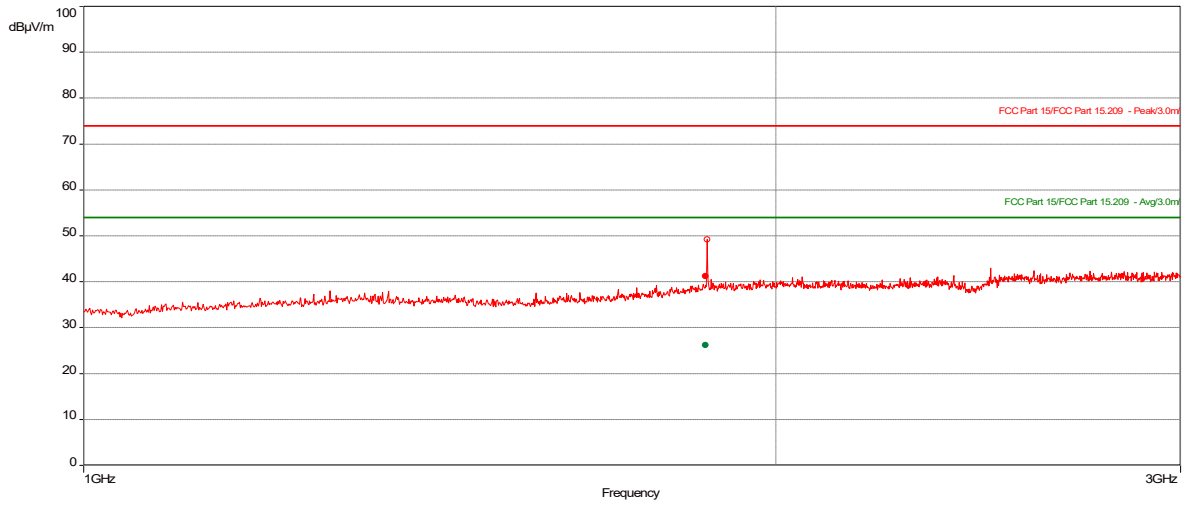
Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Azimuth (°)	Height (m)	Pol.	RBW	RBW	Correction (dB)
30.484	16.27	30.00	-13.73	16.60	4.00	Vertical	120000.00	120k	-12.70
32.012	15.00	30.00	-15.00	349.90	1.00	Horizontal	120000.00	120k	-13.80
33.44	14.03	30.00	-15.97	360.00	3.36	Horizontal	120000.00	120k	-14.72
117.172	9.28	33.50	-24.22	246.10	3.79	Vertical	120000.00	120k	-18.59
131.366	9.36	33.50	-24.14	79.20	3.37	Horizontal	120000.00	120k	-18.43
145.284	8.24	33.50	-25.26	79.30	4.00	Vertical	120000.00	120k	-19.61

High Channel Radiated Emissions, 1-3 GHz [EUT on its back]

Test Information:

Date and Time	10/7/2023 10:18:12 AM
Client and Project Number	Otodata
Engineer	Kouma Sinn
Temperature	24 C
Humidity	49 %
Atmospheric Pressure	1001 mbar
Comments	Scan 20: Tx High (Back Side), RE 1 to 3 GHz

Graph:



Results:

Peak (PASS) (1)

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Azimuth (°)	Height (m)	Pol.	RBW	RBW	Correction (dB)
1863.6	41.23	74.00	-32.77	113.10	1.00	Vertical	1000000.00	1M	-5.21

Average (PASS) (1)

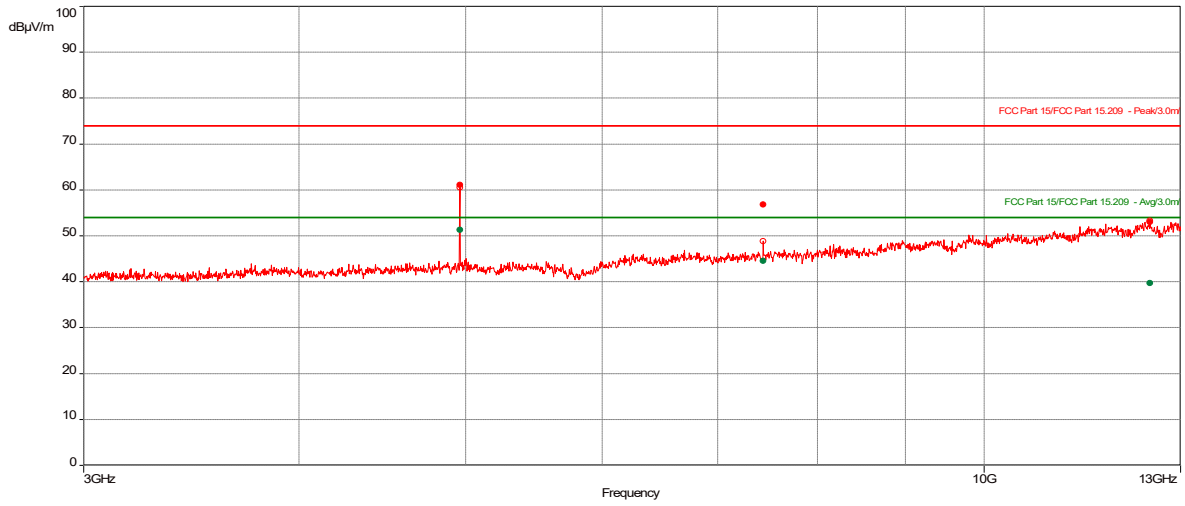
Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Azimuth (°)	Height (m)	Pol.	RBW	RBW	Correction (dB)
1863.6	26.27	54.00	-27.73	113.10	1.00	Vertical	1000000.00	1M	-5.21

High Channel Radiated Emissions, 3-13 GHz [EUT on its back]

Test Information:

Date and Time	10/7/2023 9:49:14 AM
Client and Project Number	Otodata
Engineer	Kouma Sinn
Temperature	24 C
Humidity	49 %
Atmospheric Pressure	1001 mbar
Comments	Scan 19: Tx High (Back Side), RE 3 to 13 GHz

Graph:



Results:

Peak (PASS) (3)

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Azimuth (°)	Height (m)	Pol.	RBW	RBW	Correction (dB)
4959.55	61.10	74.00	-12.90	357.90	1.00	Horizontal	1000000.00	1M	0.39
7440.75	56.86	74.00	-17.14	357.70	4.00	Horizontal	1000000.00	1M	4.68
12476.35	53.07	74.00	-20.93	0.00	1.00	Vertical	1000000.00	1M	11.68

Average (PASS) (3)

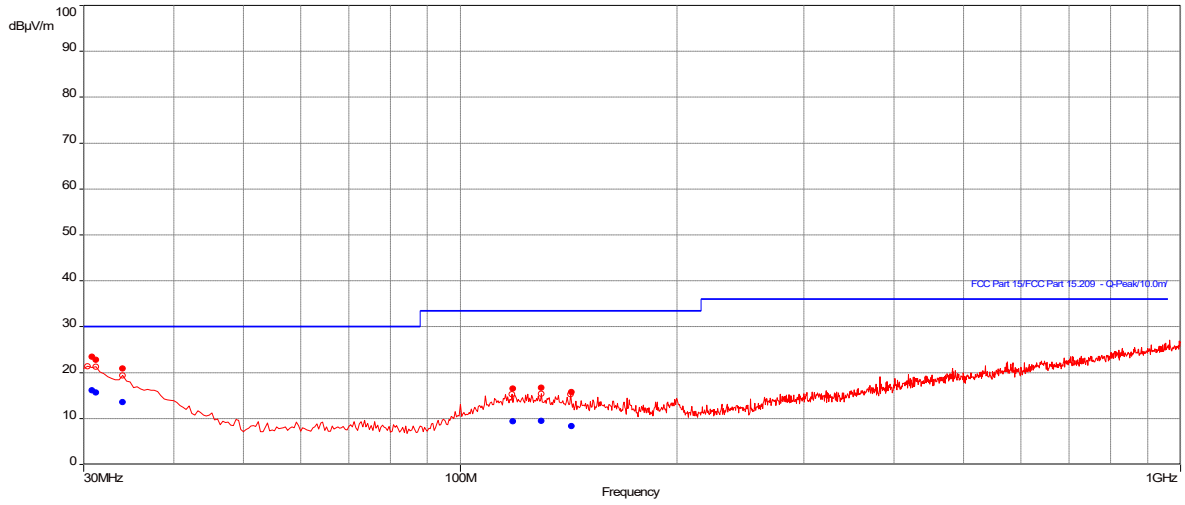
Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Azimuth (°)	Height (m)	Pol.	RBW	RBW	Correction (dB)
4959.55	51.32	54.00	-2.68	357.90	1.00	Horizontal	1000000.00	1M	0.39
7440.75	44.59	54.00	-9.41	357.70	4.00	Horizontal	1000000.00	1M	4.68
12476.35	39.77	54.00	-14.23	0.00	1.00	Vertical	1000000.00	1M	11.68

High Channel Radiated Emissions, 30-1000 MHz [EUT on its short side]

Test Information:

Date and Time	10/1/2023 11:53:49 AM
Client and Project Number	Otodata
Engineer	Kouma Sinn
Temperature	24 C
Humidity	45 %
Atmospheric Pressure	1013 mbar
Comments	Scan 7: High Channel (Short Side), RE 30-1000MHz

Graph:



Results:

QuasiPeak (PASS) (6)

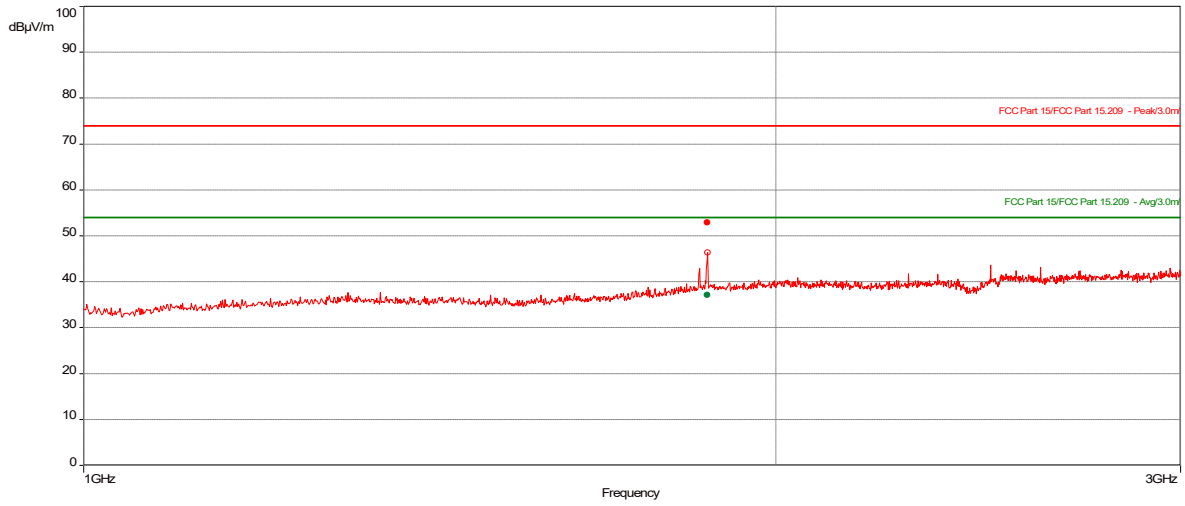
Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Azimuth (°)	Height (m)	Pol.	RBW	RBW	Correction (dB)
30.634	16.20	30.00	-13.80	328.80	2.53	Vertical	120000.00	120k	-12.76
31.35	15.72	30.00	-14.28	329.20	1.67	Vertical	120000.00	120k	-13.20
33.916	13.61	30.00	-16.39	360.00	4.00	Horizontal	120000.00	120k	-15.10
118.258	9.39	33.50	-24.11	183.30	4.00	Horizontal	120000.00	120k	-18.48
129.798	9.55	33.50	-23.95	245.90	3.80	Vertical	120000.00	120k	-18.41
142.814	8.39	33.50	-25.11	225.30	3.38	Horizontal	120000.00	120k	-19.48

High Channel Radiated Emissions, 1-3 GHz [EUT on its short side]

Test Information:

Date and Time	10/7/2023 10:42:38 AM
Client and Project Number	Otodata
Engineer	Kouma Sinn
Temperature	24 C
Humidity	49 %
Atmospheric Pressure	1001 mbar
Comments	Scan 22: Tx High (Short Side), RE 1 to 3 GHz

Graph:



Results:

Peak (PASS) (1)

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Azimuth (°)	Height (m)	Pol.	RBW	RBW	Correction (dB)
1867.35	52.98	74.00	-21.02	152.10	3.05	Horizontal	1000000.00	1M	-5.16

Average (PASS) (1)

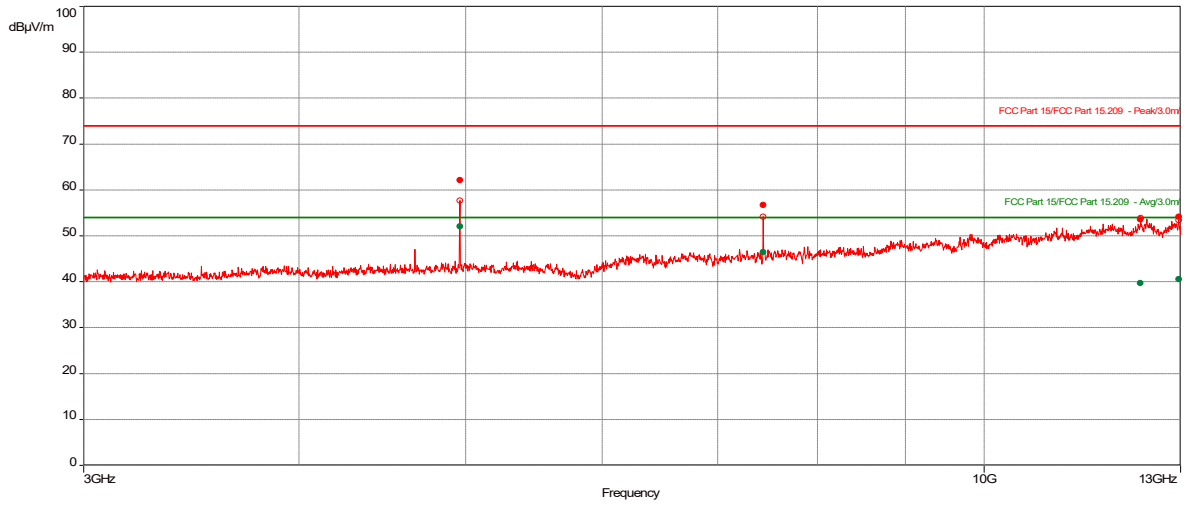
Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Azimuth (°)	Height (m)	Pol.	RBW	RBW	Correction (dB)
1867.35	37.18	54.00	-16.82	152.10	3.05	Horizontal	1000000.00	1M	-5.16

High Channel Radiated Emissions, 3-13 GHz [EUT on its short side]

Test Information:

Date and Time	10/7/2023 8:55:39 AM
Client and Project Number	Otodata
Engineer	Kouma Sinn
Temperature	24 C
Humidity	49 %
Atmospheric Pressure	1001 mbar
Comments	Scan 17: Tx High (Short Side), RE 3 to 13 GHz

Graph:



Results:

Peak (PASS) (4)

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Azimuth (°)	Height (m)	Pol.	RBW	RBW	Correction (dB)
4960.5	62.20	74.00	-11.80	360.00	3.44	Horizontal	1000000.00	1M	0.39
7440.05	56.78	74.00	-17.22	0.00	3.44	Horizontal	1000000.00	1M	4.68
12323.25	53.61	74.00	-20.39	360.00	1.00	Horizontal	1000000.00	1M	11.48
12967.5	54.23	74.00	-19.77	176.80	4.00	Vertical	1000000.00	1M	13.07

Average (PASS) (4)

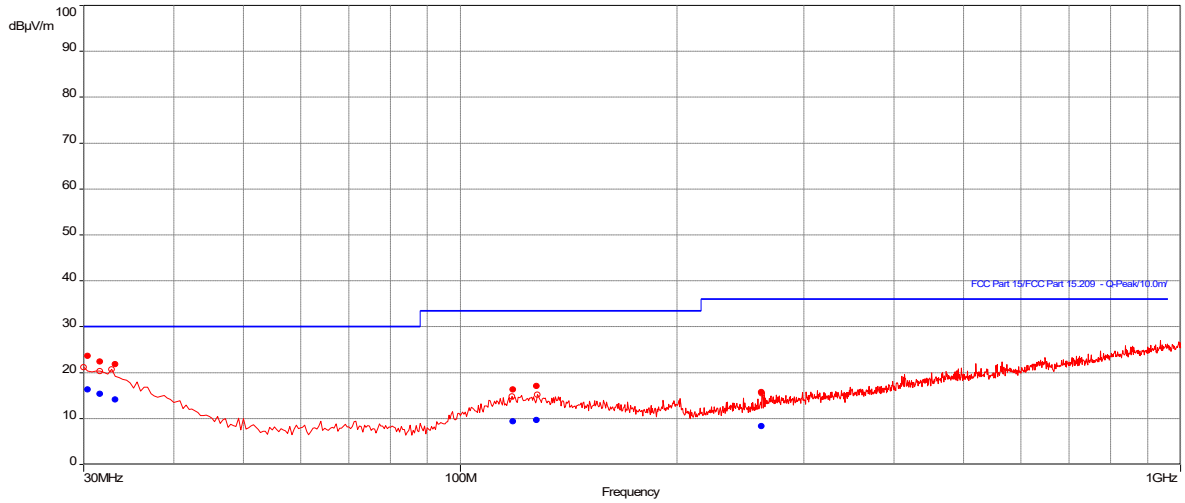
Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Azimuth (°)	Height (m)	Pol.	RBW	RBW	Correction (dB)
4960.5	52.11	54.00	-1.89	360.00	3.44	Horizontal	1000000.00	1M	0.39
7440.05	46.53	54.00	-7.47	0.00	3.44	Horizontal	1000000.00	1M	4.68
12323.25	39.76	54.00	-14.24	360.00	1.00	Horizontal	1000000.00	1M	11.48
12967.5	40.55	54.00	-13.45	176.80	4.00	Vertical	1000000.00	1M	13.07

High Channel Radiated Emissions, 30-1000 MHz [EUT on its long side]

Test Information:

Date and Time	10/1/2023 12:47:07 PM
Client and Project Number	Otodata
Engineer	Kouma Sinn
Temperature	24 C
Humidity	45 %
Atmospheric Pressure	1013 mbar
Comments	Scan 9: High Channel (Long Side), RE 30-1000MHz

Graph:



Results:

QuasiPeak (PASS) (6)

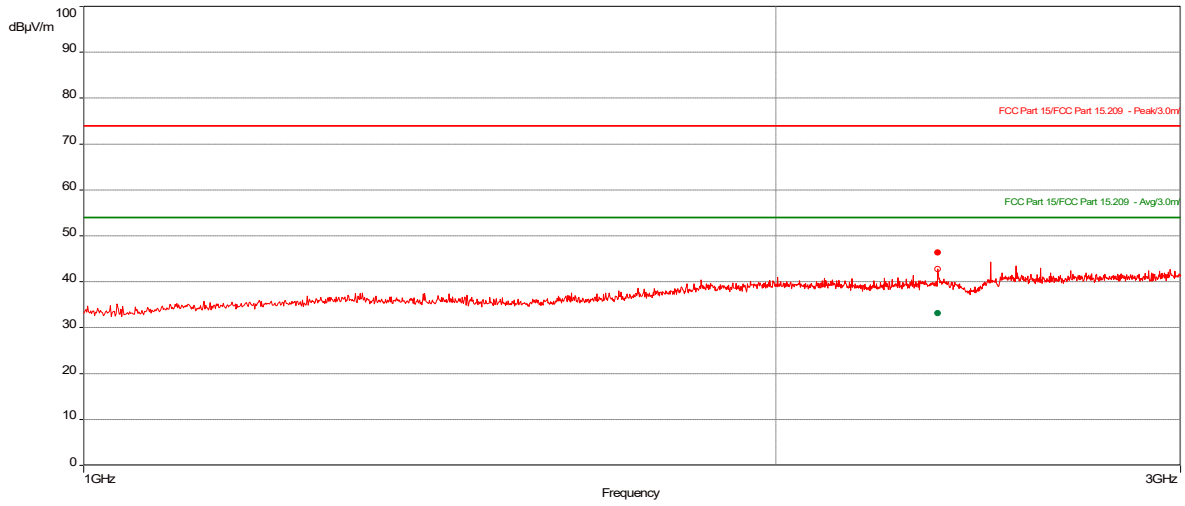
Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Azimuth (°)	Height (m)	Pol.	RBW	RBW	Correction (dB)
30.294	16.33	30.00	-13.67	287.40	3.79	Vertical	120000.00	120k	-12.63
31.636	15.39	30.00	-14.61	183.30	4.00	Vertical	120000.00	120k	-13.46
33.232	14.20	30.00	-15.80	266.30	1.00	Horizontal	120000.00	120k	-14.55
118.27	9.40	33.50	-24.10	308.00	2.93	Vertical	120000.00	120k	-18.47
127.604	9.66	33.50	-23.84	360.00	2.08	Horizontal	120000.00	120k	-18.33
262.1	8.36	36.00	-27.64	79.30	3.38	Horizontal	120000.00	120k	-19.04

High Channel Radiated Emissions, 1-3 GHz [EUT on its long side]

Test Information:

Date and Time	10/7/2023 10:32:29 AM
Client and Project Number	Otodata
Engineer	Kouma Sinn
Temperature	24 C
Humidity	49 %
Atmospheric Pressure	1001 mbar
Comments	Scan 21: Tx High (Long Side), RE 1 to 3 GHz

Graph:



Results:

Peak (PASS) (1)

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Azimuth (°)	Height (m)	Pol.	RBW	RBW	Correction (dB)
2351.95	46.42	74.00	-27.58	113.10	1.44	Horizontal	1000000.00	1M	-4.38

Average (PASS) (1)

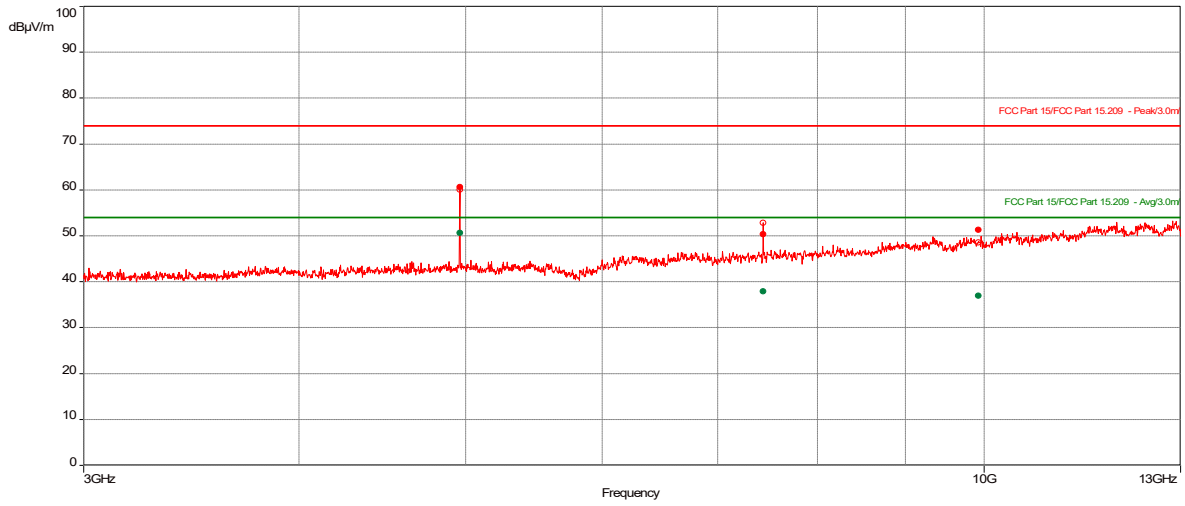
Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Azimuth (°)	Height (m)	Pol.	RBW	RBW	Correction (dB)
2351.95	33.17	54.00	-20.83	113.10	1.44	Horizontal	1000000.00	1M	-4.38

High Channel Radiated Emissions, 3-13 GHz [EUT on its long side]

Test Information:

Date and Time	10/7/2023 9:25:28 AM
Client and Project Number	Otodata
Engineer	Kouma Sinn
Temperature	24 C
Humidity	49 %
Atmospheric Pressure	1001 mbar
Comments	Scan 18: Tx High (Long Side), RE 3 to 13 GHz

Graph:



Results:

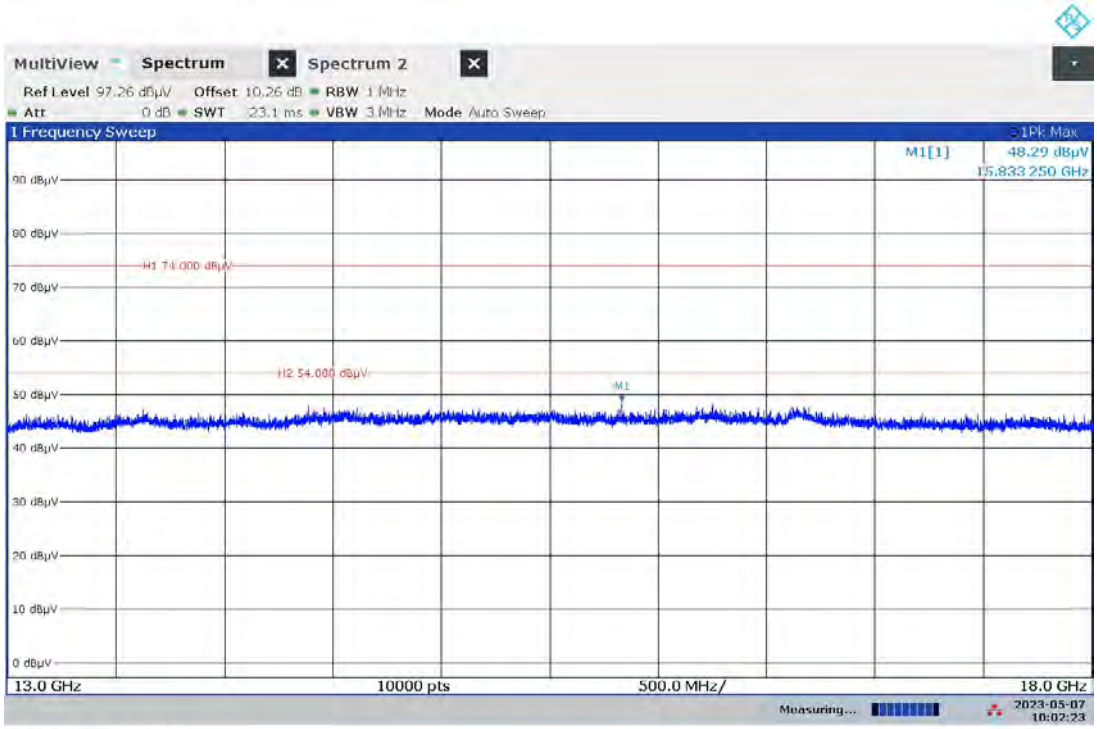
Peak (PASS) (3)

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Azimuth (°)	Height (m)	Pol.	RBW	RBW	Correction (dB)
4959.55	60.62	74.00	-13.38	360.00	1.00	Vertical	1000000.00	1M	0.39
7439.8	50.41	74.00	-23.59	357.50	3.44	Vertical	1000000.00	1M	4.68
9922.95	51.34	74.00	-22.66	0.00	4.00	Vertical	1000000.00	1M	7.43

Average (PASS) (3)

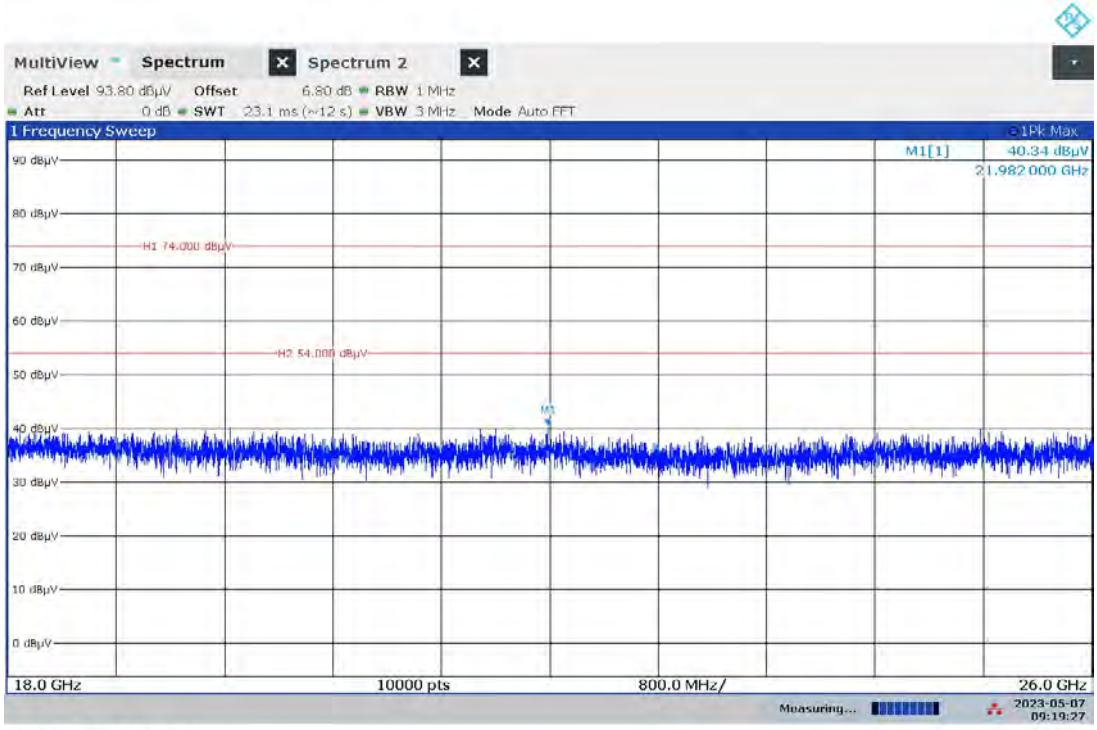
Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Azimuth (°)	Height (m)	Pol.	RBW	RBW	Correction (dB)
4959.55	50.71	54.00	-3.29	360.00	1.00	Vertical	1000000.00	1M	0.39
7439.8	37.98	54.00	-16.02	357.50	3.44	Vertical	1000000.00	1M	4.68
9922.95	36.95	54.00	-17.05	0.00	4.00	Vertical	1000000.00	1M	7.43

High Channel Radiated Emissions, 13-18 GHz [EUT on all axis] at 2 m



10:02:23 AM 05/07/2023

High Channel Radiated Emissions, 18-26 GHz [EUT on all axis] at 10 cm



09:19:28 AM 05/07/2023

Product Standard: CFR47 FCC Part 15.247, RSS-247				Limit applied: See Report Section 10.2			
Test Date	Test Personnel/ Initials	Supervising Engineer/ Initials	Input Voltage	Mode	Atmospheric Data		
					Temp C°	Relative Humidity %	Atmospheric Pressure mbar
05/07/2023	Vathana F. Ven VFV	Kouma Sinn KPS	USB Powered	Mode 1	24	27	1005
05/09/2023	Kouma Sinn KPS	Vathana F. Ven VFV	USB Powered	Mode 1	25	20	1004
10/01/2023	Kouma Sinn KPS	Vathana F. Ven VFV	Battery Powered	Mode 1	24	45	1013
10/07/2023	Kouma Sinn KPS	Vathana F. Ven VFV	Battery Powered	Mode 1	24	49	1001

Deviations, Additions, or Exclusions: None

11 Digital Device and Receiver Radiated Spurious Emissions

11.1 Method

Tests are performed in accordance with FCC Part 15 Subpart B, ISED ICES-003, and ANSI C 63.4.

TEST SITE: 10m ALSE

The 10m ALSE is 13m (Length) x 21m (Depth) x 10m (Height) with the effective size in terms of space from the tips of the absorber is 12m (Length) x 20m (Depth) x 8.5m (Height). This chamber achieves broadband performance using a unique arrangement of hybrid and ferrite tile absorber. This chamber has a built in 3m diameter turntable (Embedded type). The metal structure of the table makes electrical connection around the entire circumference of the turntable to the ground plane with a metal brush type connection. The turntable is located on one end of the chamber and the antennas are mounted 3 and 10 meters away at the other end of the chamber on the adjustable an Antenna Mast. The antenna mast is a non-conductive bore sighted type with remote control of antenna height and polarization. The Antenna Mast and the turntable can be remotely controlled through the controller located in the adjacent Control room. A Styrofoam table 80 cm high is used for table-top equipment.

Measurement Uncertainty

Measurement	Frequency Range	Expanded Uncertainty (k=2)	Ucispr
Radiated Emissions, 10m	30-1000 MHz	4.6dB	6.3 dB
Radiated Emissions, 3m	30-1000 MHz	5.3 dB	6.3 dB
Radiated Emissions, 3m	1-6 GHz	4.5 dB	5.2 dB
Radiated Emissions, 3m	6-15 GHz	5.2 dB	5.5 dB
Radiated Emissions, 3m	15-18 GHz	5.0 dB	5.5 dB
Radiated Emissions, 3m	18-40 GHz	5.0 dB	5.5 dB

As shown in the table above our radiated emissions U_{lab} is less than the corresponding U_{CISPR} reference value in CISPR 16-4-2 Table 1, hence the compliance of the product is only based on the measured value, and no measurement uncertainty correction is required, based on CISPR 22 and CISPR 11 (for 2006 and later revisions) Clause 11.

Sample Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain (if any) from the measured reading. The basic equation with a sample calculation is as follows:

FS = RA + AF + CF - AG
Where FS = Field Strength in dBμV/m
RA = Receiver Amplitude (including preamplifier) in dBμV
CF = Cable Attenuation Factor in dB
AF = Antenna Factor in dB
AG = Amplifier Gain in dB

In the following table(s), the reading shown on the data table reflects the preamplifier gain. An example for the calculations in the following table is as follows.

Assume a receiver reading of 52.0 dBμV is obtained. The antenna factor of 7.4 dB and cable factor of

1.6 dB is added. The amplifier gain of 29 dB is subtracted, giving a field strength of 32 dBμV/m. This value in dBμV/m was converted to its corresponding level in μV/m.

RA = 52.0 dBμV
AF = 7.4 dB/m
CF = 1.6 dB
AG = 29.0 dB
FS = 32 dBμV/m

To convert from dBμV to μV or mV the following was used:

UF = $10^{(NF / 20)}$ where UF = Net Reading in μV
NF = Net Reading in dBμV

Example:

FS = RA + AF + CF – AG = 52.0 + 7.4 + 1.6 – 29.0 = 32.0
UF = $10^{(32\ dB\mu V / 20)}$ = 39.8 μV/m

Alternately, when BAT-EMC Emission Software is used, the “Level” includes all losses and gains and is compared directly in the “Margin” column to the “Limit”. The “Correction” includes Antenna Factor, Preamp, and Cable Loss. These are already accounted for in the “Level” column.

11.2 Limit

§15.109 Radiated emission limits.

The field strength of radiated emissions form unintentional radiators at a distance of 3 meters shall not exceed the following values.

Frequency of emission (MHz)	Field strength (microvolts/meter)	Field strength (dBμV/m)
30-88	100	40.00
88-216	150	43.52
216-960	200	46.02
Above 960	500	54.00

11.3 Test Equipment Used:

Test equipment used for radiated emissions from 30-1000 MHz

Asset	Description	Manufacturer	Model	Serial	Cal Date	Cal Due
DAV006'	Weather Station	Davis	6250	MS191218071	02/21/2023	02/21/2024
ROS011'	EMI Test Receiver	Rohde & Schwartz	ESW44	103296	06/28/2023	06/28/2024
PRE10'	30-1000MHz pre-amp	ITS	PRE10	PRE10	02/17/2023	02/17/2024
145145'	Broadband Hybrid Antenna 30 MHz - 3 GHz	Sunol Sciences Corp.	JB3	A122313	06/23/2023	06/23/2024
HS003'	10m under floor cable	Huber-Schuner	10m-1	HS003	02/18/2023	02/18/2024
145-424'	9kHz to 40GHz Cable	Huber and Suhner	Sucoflex	145-424	02/18/2023	02/18/2024
HS001'	DC-18GHz cable 1.5m long	Huber & Suhner	SucoFlex 106A	HS001	01/25/2023	01/25/2024
145-420'	Receiver to floor cable	Utiflex	UFB311A-2-0591-70070	145-420	02/18/2023	02/18/2024

Software Utilized:

Name	Manufacturer	Version
BAT-EMC	Nexio	2022.0.27.0

Test equipment used for radiated emissions from 1-13 GHz

Asset	Description	Manufacturer	Model	Serial	Cal Date	Cal Due
145-420'	Receiver to floor cable	Utiflex	UFB311A-2-0591-70070	145-420	02/18/2023	02/18/2024
145-422'	10Amp Pre-amp to under floor	Utiflex	UFB311A-0-2756-70070	145-422	02/18/2023	02/18/2024
145-408'	10m Chamber - 3m Track B In-floor Cable	Huber + Suhner	sucoflex 106-11000mm	001	07/19/2023	07/19/2024
IW002'	2 meter Armored cable	Insulated Wire	2800-NPS	002	10/11/2022	10/11/2023
DAV006'	Weather Station	Davis	6250	MS191218071	02/21/2022	02/21/2024
ETS005'	1-18GHz horn antenna	ETS-Lindgren	3117	00218279	10/12/2023	10/12/2023
ROS011'	EMI Test Receiver	Rohde & Schwartz	ESW44	103296	06/28/2023	06/28/2024
PRE12'	Pre-amplifier	Com Power	PAM-118A	18040117	12/17/2022	12/17/2023

Software Utilized:

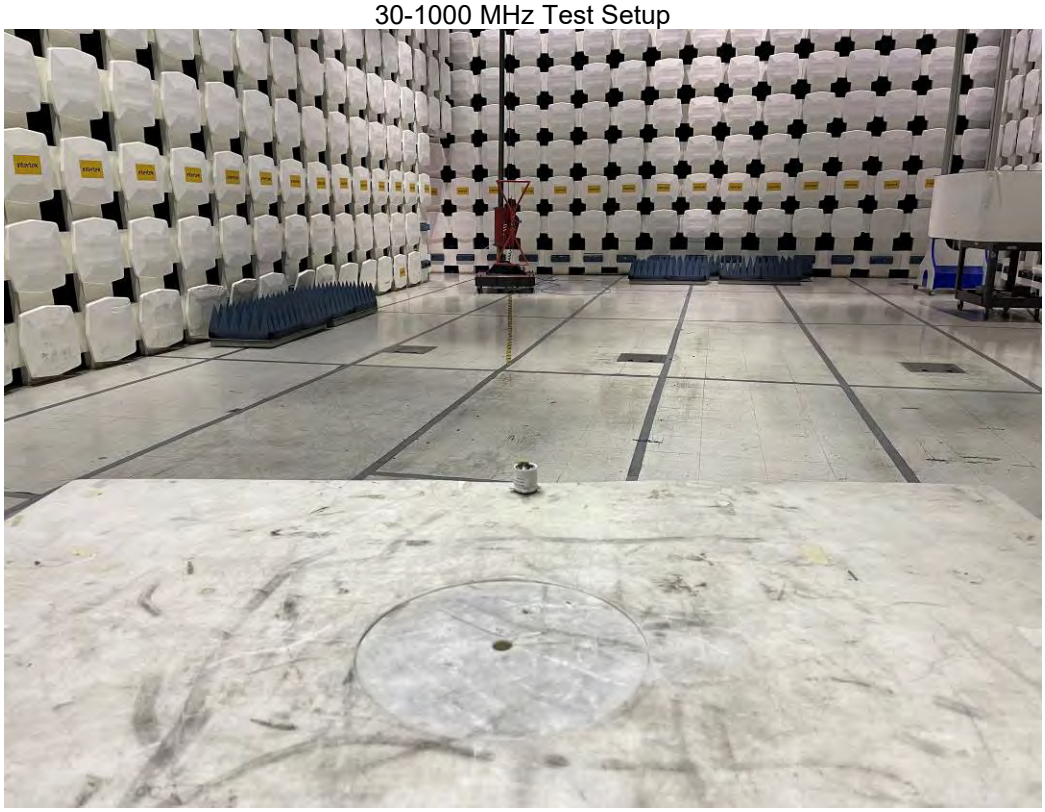
Name	Manufacturer	Version
BAT-EMC	Nexio	2022.0.27.0

11.4 Results:

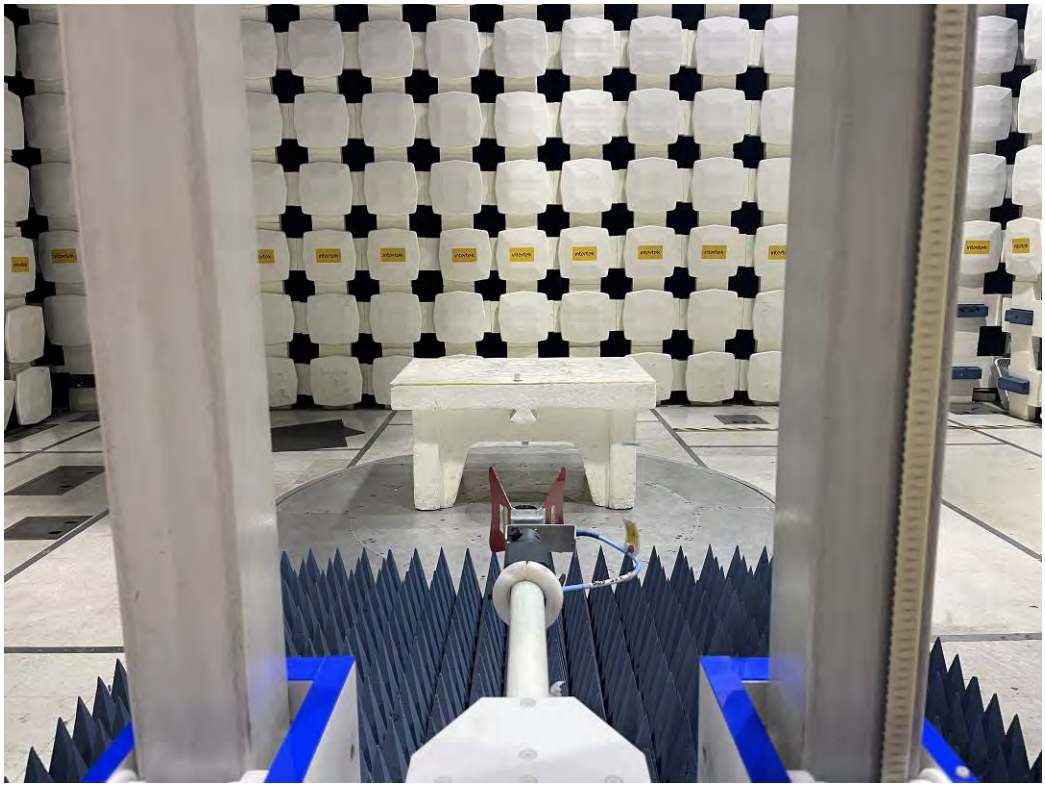
The sample tested was found to Comply.

11.5 Setup Photographs:

30-1000 MHz Test Setup



1-13 GHz Test Setup



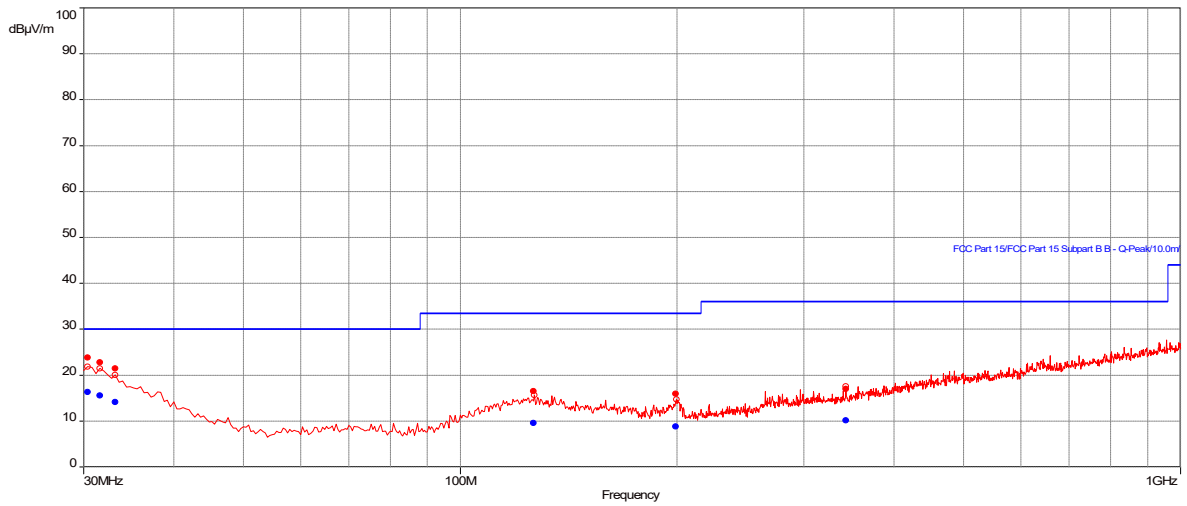
11.6 Plots/Data:

Radiated Emissions From 30-1000 MHz in Receive Mode

Test Information:

Date and Time	10/1/2023 1:16:26 PM
Client and Project Number	Otodata
Engineer	Kouma Sinn
Temperature	24 C
Humidity	45 %
Atmospheric Pressure	1013 mbar
Comments	Scan 10: Rx Mid Channel Short Side), RE 30-1000MHz

Graph:



Results:

QuasiPeak (PASS) (6)

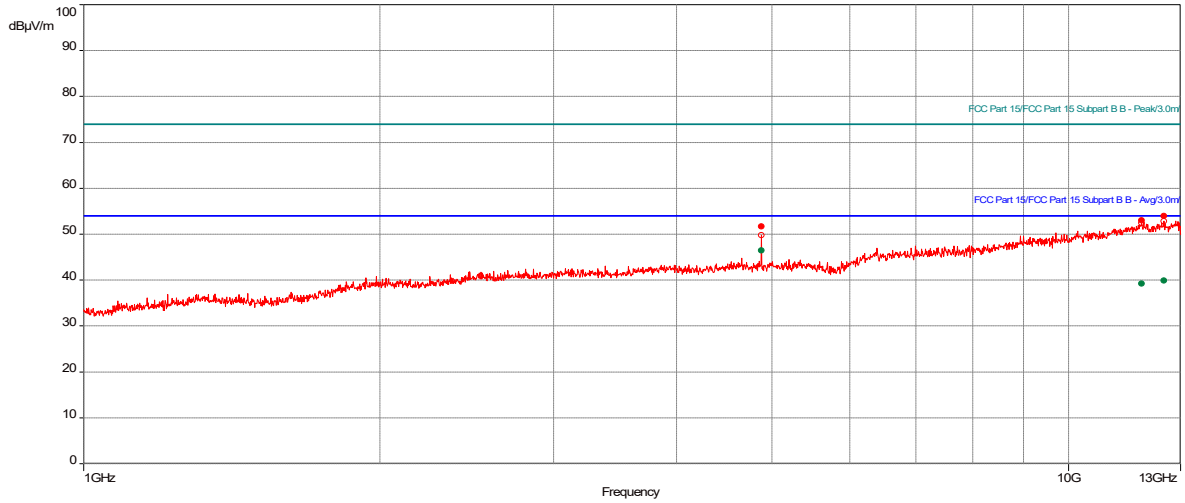
Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Azimuth (°)	Height (m)	Pol.	RBW	RBW	Correction (dB)
30.358	16.34	30.00	-13.66	120.30	4.00	Horizontal	120000.00	120k	-12.65
31.45	15.61	30.00	-14.39	120.80	3.81	Horizontal	120000.00	120k	-13.29
33.296	14.17	30.00	-15.83	204.30	1.67	Vertical	120000.00	120k	-14.60
126.404	9.61	33.50	-23.89	183.30	4.00	Vertical	120000.00	120k	-18.28
199.366	8.86	33.50	-24.64	350.20	1.67	Vertical	120000.00	120k	-19.10
343.044	10.17	36.00	-25.83	141.90	3.36	Horizontal	120000.00	120k	-17.12

Radiated Emissions From 1-13 GHz in Receive Mode

Test Information:

Date and Time	10/7/2023 2:02:02 PM
Client and Project Number	Otodata
Engineer	Kouma Sinn
Temperature	24 C
Humidity	49 %
Atmospheric Pressure	1001 mbar
Comments	Scan 29: Rx Mid (Short Side), RE 1 to 13 GHz

Graph:



Results:

Peak (PASS) (3)

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Azimuth (°)	Height (m)	Pol.	RBW	RBW	Correction (dB)
4878.05	51.73	74.00	-22.27	0.00	3.94	Horizontal	1000000.00	1M	0.17
11873.85	53.02	74.00	-20.98	0.00	1.00	Vertical	1000000.00	1M	10.80
12505.65	54.00	74.00	-20.00	360.00	1.00	Vertical	1000000.00	1M	11.72

Average (PASS) (3)

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Azimuth (°)	Height (m)	Pol.	RBW	RBW	Correction (dB)
4878.05	46.49	54.00	-7.51	0.00	3.94	Horizontal	1000000.00	1M	0.17
11873.85	39.27	54.00	-14.73	0.00	1.00	Vertical	1000000.00	1M	10.80
12505.65	39.98	54.00	-14.02	360.00	1.00	Vertical	1000000.00	1M	11.72

Product Standard: FCC Part 15 Subpart B, ISED ICES-003				Limit applied: All Class B Pretest Verification w/BB source: Yes			
Test Date	Test Personnel/ Initials	Supervising Engineer/ Initials	Input Voltage	Mode	Atmospheric Data		
					Temp C°	Relative Humidity %	Atmospheric Pressure mbar
10/01/2023	Kouma Sinn KPS	Vathana F. Ven VFV	Battery Powered	Mode 2	24	45	1013
10/01/2023	Kouma Sinn KPS	Vathana F. Ven VFV	Battery Powered	Mode 2	24	49	1001

Deviations, Additions, or Exclusions: None

12 Revision History

Revision Level	Date	Report Number	Prepared By	Reviewed By	Notes
0	05/10/2023	105128961BOX-001	KPS	VFV	Original Issue
1	07/24/2023	105128961BOX-001.1	KPS	VFV	Added notes in block in EUT block diagram section
2	10/10/2023	105128961BOX-001.2	KPS	VFV	Re-tested radiated emissions without the test fixture