

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 © 2022 INTERTEK





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:C033Model(s) Partially Tested:NoneModel(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

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Kouma Sinn / Senior Staff Engineer

Report reviewed by

Vathana Ven / Senior Staff Engineer

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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	

¹Emission testing sample.

²Antenna 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

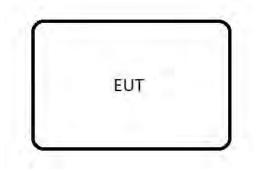
¹Not part of EUT, used to accommodate the testing only.

Support Equipment				
Description Manufacturer Model Number Serial Numb				
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:



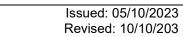
6.6 Test Data:

Output Power								
Channels	Conducted Power	Power Antenna Gain EIRP Power Conducted Power Limit		EIRP Power Limit				
	(dBm)	(dBi)	(dBm)	(dBm)	(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			

MultiView Spectrum × Spectrum 2 × Spectrum 3 × Ref Level 10.34 dBm Offset 0.34 dB RBW 1 MHz Att 20 dB SWT 1.01 ms VBW 3 MHz Mode Auto Sweep TDF"CBLI#2012-SM-2_02-25-2024","CEN001_02-28-24" I I I I M1[1] 4.24 dBr 2 02 000 00 GH n dBr -10 dBm -20 dBr when and marked any me 30 de mannon Milarahadi in -40 dBr -SU dBm -60 dBr -70 dB -BO dBm CF 2,402 GHz 1001 pts 900.0 kHz/ Span 9.0 MHz BERRENESS. 2023-05-09 18:13:00 iring...

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Low Channel Conducted Power



Mid Channel Conducted Power

Intertek

Snectrum 2 Sne	trum 3	*
RBW 1 MHz VBW 3 MHz Mode Auto Sweep		
		D1Pk Max.
	MI	M1[1] 4.08 dBn 2.440 000 00 GH
and a second sec		
_		
	Spectrum 2 X Spec RBW 1 MHz VBW 3 MHz Mode Auto Sweep V001_02-28-24"	BBW 1 MHz VBW 3 MHz Mode Auto Sweep V001_02-28-24*********************************

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Frequency Sweep	2024","CEN001_0			-				a 1Pk Max
		1	-	MI			M1[1]	4.25 dBr 480 000 00 GF
dBro		/				-	-	
10 dBm		/						
		/				1		
20 dBm-	1	(man -	1	
30 dBm	- marine				-	- mark	and a shale do many survey of	Marganile , L.
30 dBm- Mm-Manghydan-walawanalarainaa 40 dBm-						0.000		
50 dBm-								
60 dBm					-		-	
70 dBm								
00 dBm								
F 2,48 GHz	-	1001 p	ts		900.0 kHz/			Span 9.0 MH
						Measuring	RUNNAMENT	* 2023-05-0 18:16:2

Product Standard: CFR47 FCC Part 15.247, RSS-247				Limit applied: See Report Section 6.2				
Test Date	Test Personnel/	Supervising Engineer/	Input			Atmospheric Data		
	Initials	Initials	Voltage	Input Mode		Relative	Atmospheric	
	iniudis		vollage		C°	Humidity %	Pressure mbar	
05/09/2023	Kouma Sinn 445	Vathana F. Ven	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

<u>The EMC Lab</u> 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

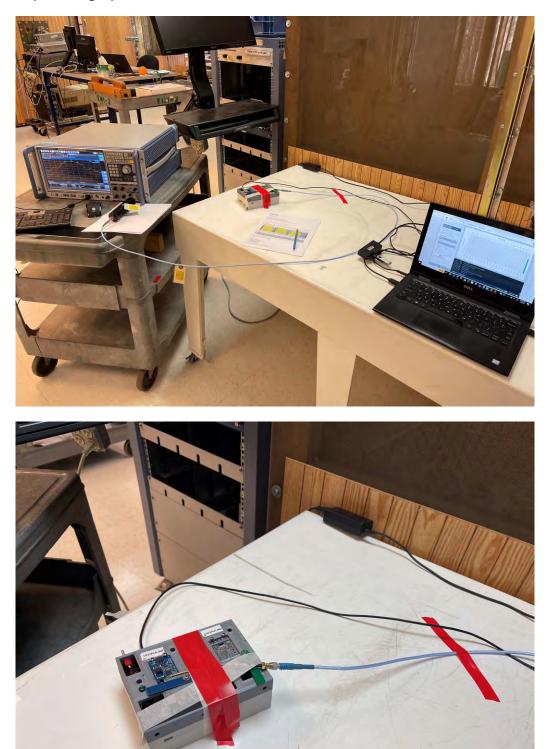
Software Utilized:

Name	Manufacturer	Version	
None	N/A	N/A	

7.4 Results:

The sample tested was found to Comply.

7.5 Setup Photographs:



intertek

7.6 Test Data:

DTS Bandwidth

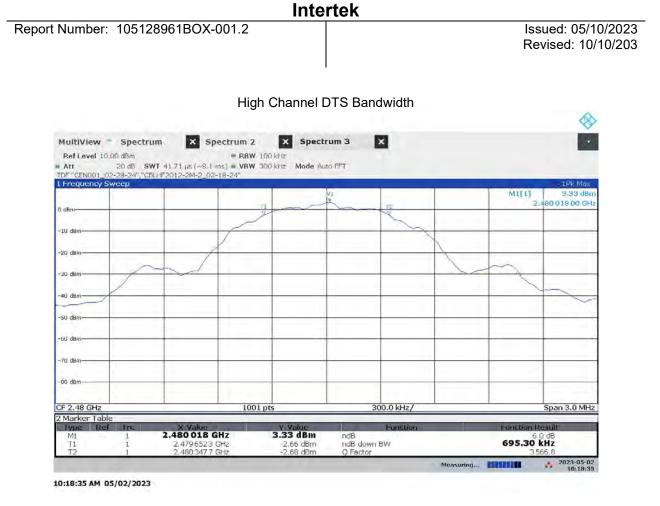
Frequency (MHz)	DTS Bandwidth (6 dB Bandwidth) (kHz)	DTS Bandwidth Limit (kHz)	Results
2402	686.30	≥ 500	Compliance
2440	674.30	≥ 500	Compliance
2480	695.30	≥ 500	Compliance

Occupied Bandwidth (OBW)

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



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Non-Specific Radio Report Shell Rev. October 2022 Client: Otodata Wireless Network, Inc. / Model: C033

Mid Channel Occupied Bandwidth

MultiView	Spectrum	× Spectrum 2	×			~
Ref Level 10		= RBW				
Att	20 d8 SWT	140 µs (~7.0 ms) = VBW 1		ক		
DF "CEN001_0 Occupied Ba		F2012-2M-2_02-18-24"				a 1Pk Max
			M		MILI] 2.87 dBi
dBm-			A	\		2,440 000 00 GH
			A	how		
1U dBm-	-	N.	$\wedge \sim$	M. Al		-
20 dBm			_	VI		
20 0000					m in	
30 dBm-	A					
	IV	mar -			LYY Y	
40 dBm	1	X I			Y Y	5
U, dBm	1					- ma
4 m					a de como de la presente	
60 dBm	1		-			-
70 dBm			_			
Yu ubiir	1					
60 dBm						
	•					
F 2.44 GHz		100	l pts	300.0 kHz/		Span 3.0 MH
Marker Tab		X Value	Y-Value	Function	Transitio	n Result
M1	1	2.44 GHz	2.87 dBm	Occ Bw	1.053 39	0 916 MHz
T1 T2	1	2.439 488 03 GHz 2.440 541 42 GHz	-12.63 dBm -14.87 dBm	Occ By Centroid Occ By Freq Offset		0 014 724 GHz 3 896 727 kHz
		an 10 set 11 - 16 - 58 16	19.07 0011	see on they enad	Measuring	2023-05-02

09:45:32 AM 05/02/2023



Product Standard: CFR47 FCC Part 15.247, RSS-247				Limit applied: See Report Section 7.2				
Test Date	Test Personnel/	Supervising Engineer/	vising Engineer/			Atmospheric	oheric Data	
			Input Voltage		Mode	Temp	Relative	Atmospheric
	Initials Initials	Initials			C°	Humidity %	Pressure mbar	
05/02/2023	Kouma Sinn	Vathana F. Ven 🎢	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'	EN001' DC-40GHz attenuator 20dB		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:

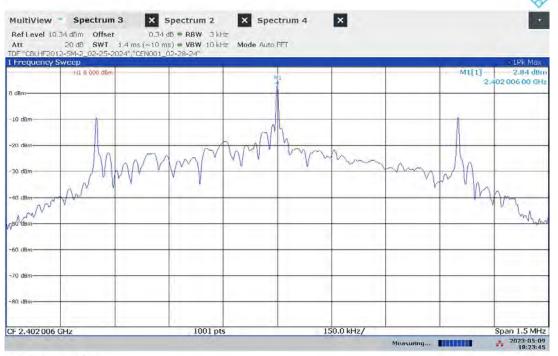
The sample tested was found to Comply.

8.5 Setup Photograph:



8.6 Test Data:

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

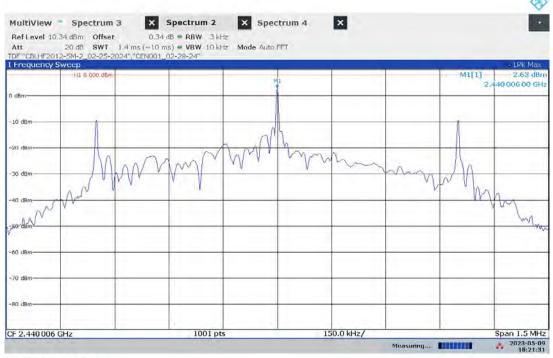


Low Channel Peak Power Spectral Density

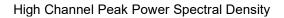
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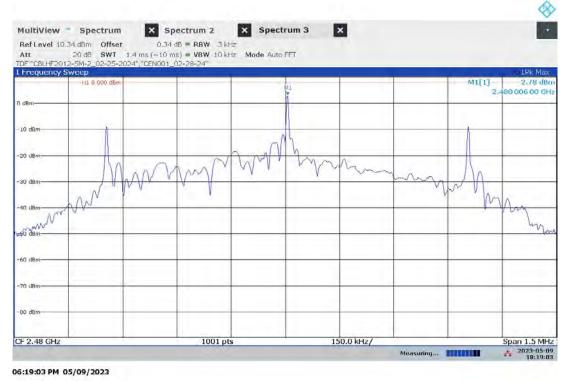


Mid Channel Peak Power Spectral Density



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Product Stand	lard: CFR47 FCC Par	t 15.247, RSS-247	Limit applied: See Report Section 8.2					
Test Date	Test Personnel/	Supervising Engineer/	Input		Atmospheric Data			
		Initials		Mode	Temp	Relative	Atmospheric	
	Initials	Initials	Voltage		C°	Humidity %	Pressure mbar	
05/09/2023	Kouma Sinn 445	Vathana F. Ven 🗥	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:

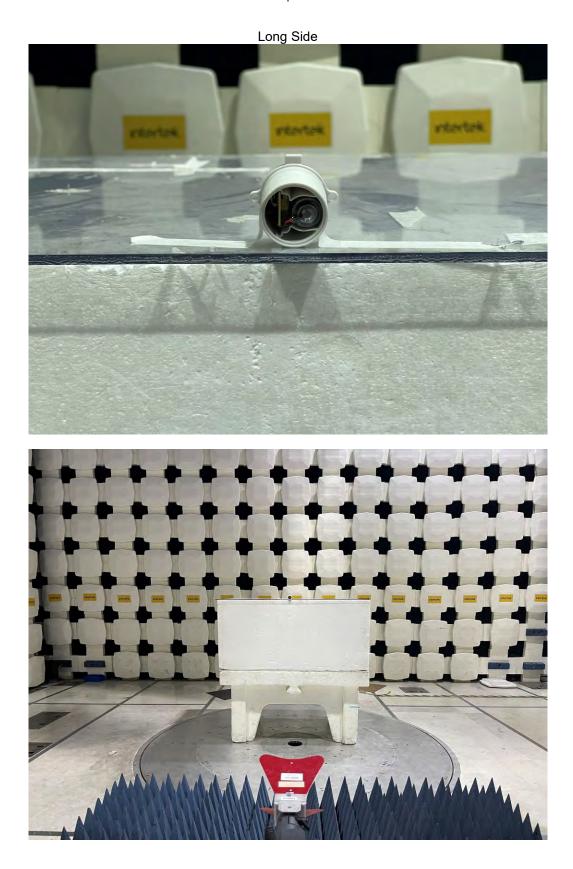
The sample tested was found to Comply.

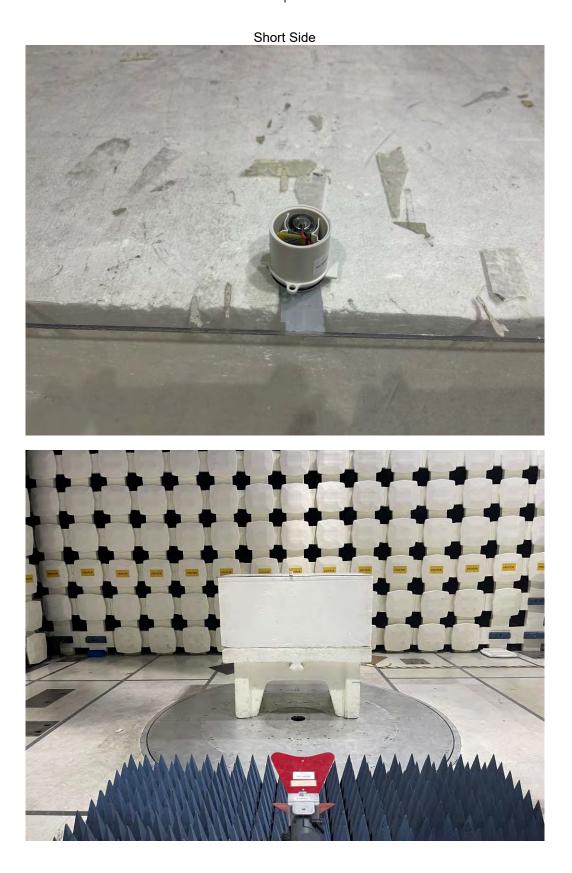
9.5 Setup Photographs:



Intertek

Intertek





9.6 Test Data:

Ref Level 118.4 Att Input Preamp Frequency Swe		Sur 1	orun on	_			_		• 1Pk Max
chrequency ow	cep				1		1	M2[1]	58.74 dBp
110 dBµV		_						MILLI	2,4004400 GH 41,89 dBu
	Les anno 110 anno 1							willi	2.3415000 GH
100 dBµV	Lation it	_							1 1
уцар ое									
		+12.02.740	dèuv		20 dBc L	Imit		_	
ao dBµ∨									1 1
70 d8uV									
70 dbpv									
50 dBuV								1	13
10.000									1
50 d8µV							-		
			41		in and the			and the second s	server P
40 dBuV		and have	trans and the	s - le martin -	meldin		a color	and the second se	
1.1									
ID dBµV									
G. (1997)									No. of Concession, Name
20 dBµV			1001 pt			0.0 MHz/			pan 100.0 MH

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

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

Preamp I Frequency Sweep		12					• 1Pk Max	ZAV AVGPV
							1954[1]	\$3,46 dB
10 dBµV								2.390000.0
							WILL	50.58 dB
Vuldb V								2.200000 0
0 dBµV								
o dop v								
двил — Айври		_	Peakli	imit Line				
-	THE DOLL HE WAS A REAL FOR THE PARTY OF THE	-	T Out L					
O dBhA					-			
o deuv								
Peak Trace	H2 54.0	UDD deuv		-	Average	Limit Line	•	March
o dayy	- the shade	-			and and the l			LINK Y
and the second second		Contract	and the second s	1			Average	Trace
BrgBHAmal of the subscript	hered a star a start a	Particular Standard and and	a share the couple as	A SHOWN AND	and the second states and the	and a man and and	All & why to work	and a support of the
0 dBµV								
- usp -				_				-
о авру-								
F 2.28 GHz Marker Table		1001 pts		24	.9 MHz/		Sp	an 249.0 M
Type Ref Tr	c X-Value		V-Value		Function		Function Re	sult
MI 1	2.2 GHz 2.3 GHz		0.58 dBµV	-				
M2 1	2.31 GHz		0.78 dBµV 0.97 dBµV					

07:06:50 PM 10/07/2023

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

0 dBuV	-la mi	yaman I (<u> </u>	 		1 <u>4</u>		
о авил	*							
0 авру-	_							
0 d8µV		H2 83 62/	ილი	20 c	Bc Limit			
10 dBµV	par telt son p de rège						MILI	2.607930 Gi 51.78 dBj 2.483500 Gi

07:53:38 PM 10/07/2023

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

Type Ref Ml	Trc 1	X-Value 2.4835 GHz 2.5 GHz		V-Value 68.52 dBμV 52.41 dBμV		Function	Function	Result
Marker Table			1001	015	4,	A MHZ		span 479.0 MHz
F 2.71416 GH			1001	1	1	7.9 MHz/		Span 479.0 MHz
0 dBµV				1				
depy	part of the second	Harris proton	manun	and the second second second	-provingence	Mary Mary Mary Mary	Avera	age Trace
а авру	-	112 54.00	d dep v	and the second s	whether and		man baland	-
вру Реа	k Trace	H2 54.00	danu -	NO.		Aver	age Limit Line	-
dBuV-	10 10 000 M	2						
авил	_				Peak Lim	t Line		-
9 dBµ∨								
DO dBuV							metal	2.500000 GH
10 dBµV				-	-		M2[1]	2.483500 GH
Frequency Sv	veep	1	1	1			MI[1]	ax • 2Av AvgPwr 68.52 dBµ

07:50:51 PM 10/07/2023

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

Product Stand	lard: CFR47 FCC Par	t 15.247, RSS-247	Limit applied: See Report Section 9.2					
Test Date	Test Personnel/	Supervising Engineer/	Input			Atmospheric Data		
	Initials	Initials	Voltage	Mode	Temp	Relative	Atmospheric	
	Initials	Initials	voltage		C°	Humidity %	Pressure mbar	
10/07/2023	Kouma Sinn 445	Vathana F. Ven	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 $dB\mu V/m$
	RA = Receiver Amplitude (including preamplifier) in $dB\mu V$
	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 dB μ V 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 dB μ V/m. This value in dB μ V/m was converted to its corresponding level in μ V/m.

RA = $52.0 \text{ dB}\mu\text{V}$ AF = 7.4 dB/mCF = 1.6 dBAG = 29.0 dBFS = $32 \text{ dB}\mu\text{V/m}$

To convert from $dB\mu V$ to μV or mV the following was used:

UF = $10^{(NF/20)}$ where UF = Net Reading in μV NF = Net Reading in $dB\mu V$

Example:

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

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
	Broadband Hybrid Antenna 30					
145145'	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:

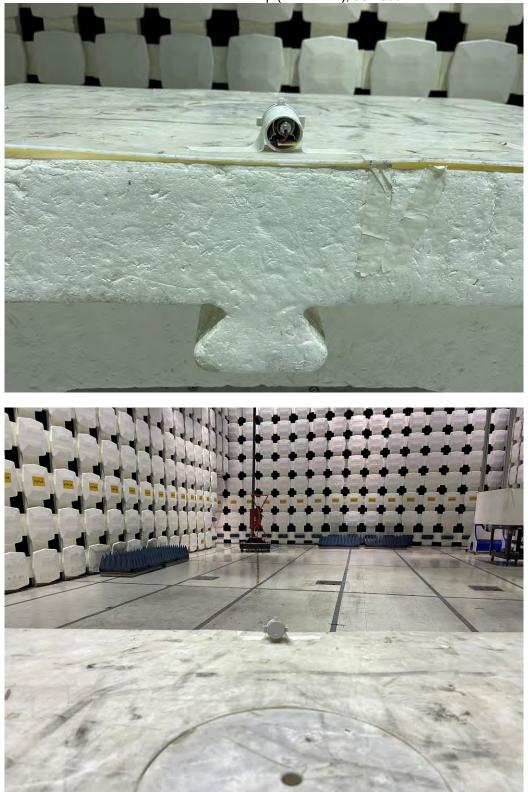
The sample tested was found to Comply.

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))

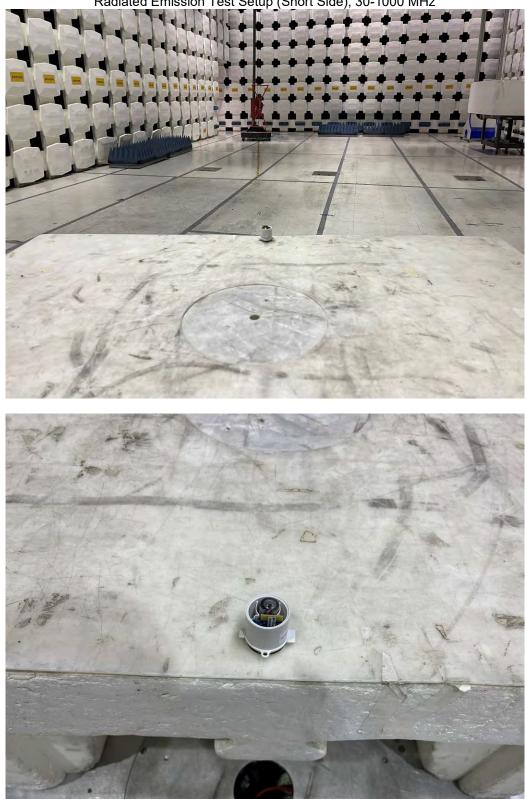
10.4 Setup Photographs:

Antenna Port Conducted Emission Test Setup





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



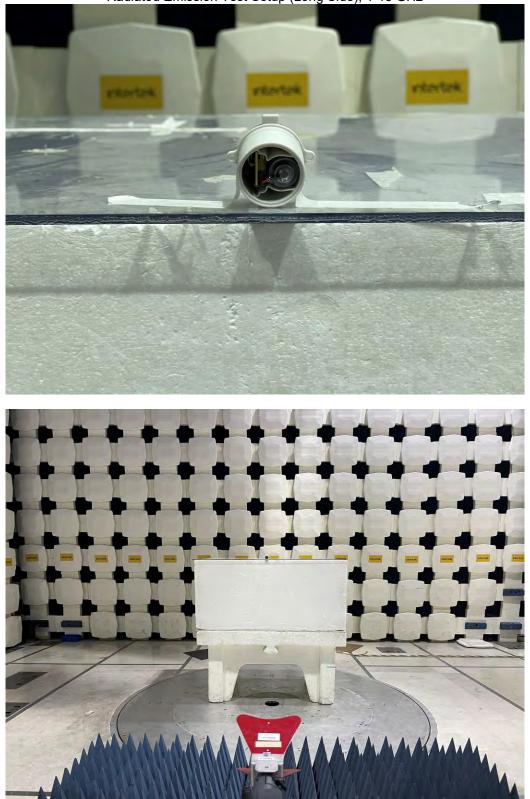
Radiated Emission Test Setup (Short Side), 30-1000 MHz



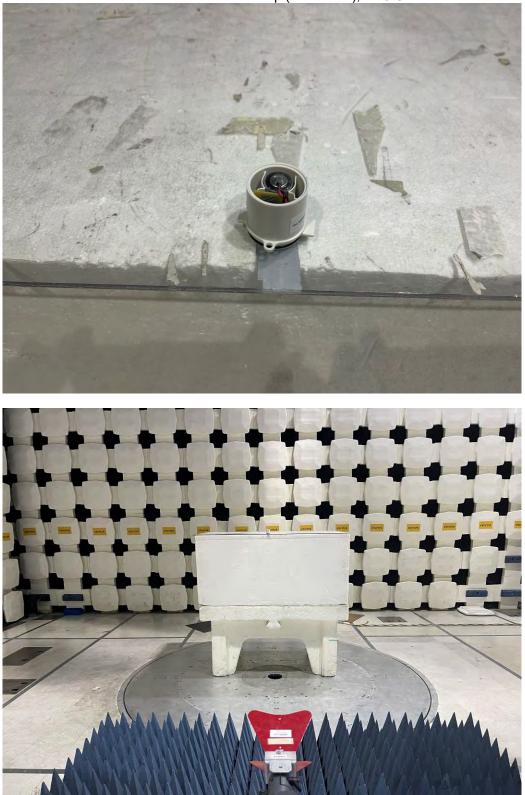
Radiated Emission Test Setup (Long Side), 30-1000 MHz



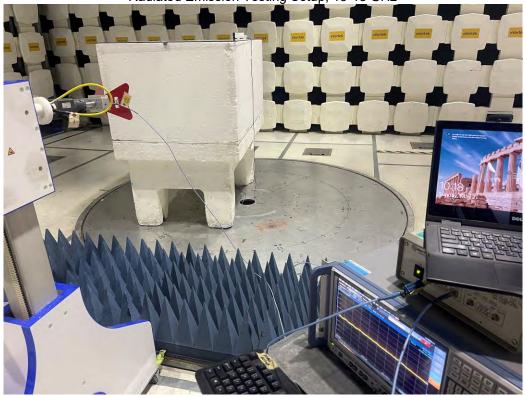
Radiated Emission Test Setup (Back Side), 1-13 GHz



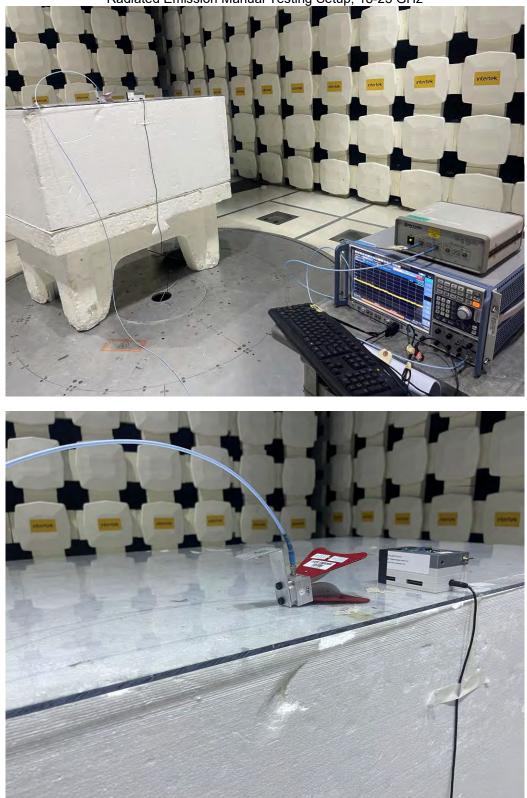
Radiated Emission Test Setup (Long Side), 1-13 GHz



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

MultiView Sp	ectrum 3	× Spectrum 2 ×	Spectrum 4	×		*
Ref Level 10.34 dBm	Offset	0.34 dB = RBW 100 kHz (~11 ms) = VBW 300 kHz				
TDF "CBLHF2012-5M-2 1 Frequency Sweep	_02-25-2024","CEN	001_02-28-24"				3 1 Pk Max
	3/090 tBm-		MI		M1[1]	3,99 dBn 2,402 015 00 GHa
0 dBm	/				_	
-10 dBm	\square				-	
-20 dBm-	H2	-16.010 dBm				X
J0 dBm						
-40 dBm-						
-SO dBm-						-
-60 dBm						-
-70 dBm						-
-80 dBm-						
0F 0.400.006 CI -		1001 pts		50.0 kHz/		Span 1.5 MHz
CF 2.402 006 GHz		1001 pts	1	a contraction of the second seco	suring	2023-05-09 18:28:17

06:28:17 PM 05/09/2023

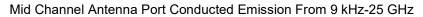
Low Channel Antenna Port Conducted Emission From 9 kHz-25 GHz

	34 dBm Offset	0.34 dB . RBW		_		×			
Att DF "CBU (F201	2-5M-2_02-25-2	250 ms - VBW 024","CEN001_0		le Auto Sweep					_
Frequency S	Sweep				1	-	1	M2[1]	01Pk Ma -38,37 de
								Contrat.	7.206 21 6
JBm-								M1[1]	36,49 d
									4.804 51 0
dBm	-								
	H2 -16.010 GB	m						20 0	dBc limit
0 dBm-									
0 d8m	-						-		
	MI	Mp.						1.00	
0 dBm-		T					the summer of the	- Horizontown	- Burgerson
		- Aller	Mar marine	المتجريفة فالمار والمرقا	Alasher Michaeland	فليها المستحد المحاصر والم			-
democrato	A STATISTICS AND	Sale and the second second	the formation of the second		1000				
a succession of the	1.000								
0 dBm-	-					-			
	1								
n dBm-						-			-
0 dBm									

Mid Channel 20 dBc Conducted Limit

MultiView Spect	um 3 🗙	Spectrum 2 X	Spectrum 4	×	
Ref Level 10.34 dBm O Att 20 dB S ¹ TDF "CBLHF2012-5M-2_02-	WT 41.71 µs (-	0.34 dB = RBW 100 kHz 11 ms) = VBW 300 kHz		7	
1 Frequency Sweep	23-2024 , GENU	11_02-28-24			o 1Pk Max
H1 3.900	dBm		11 ×		M1[1] 3.80 dBn 2.440 016 50 GH
0 dBm-	-				~
-10 dBm					-
-20 dBm	H2 -	16.200 dBm			
-30 dBm					
	1				
-40 dBm-					
-SU dBm					
-60 dBm-					
-70 dBm	_				
-80 dBm-			_		
CF 2,440 006 GHz		1001 pts		50.0 kHz/	Span 1.5 MHz

06:35:06 PM 05/09/2023



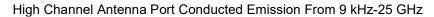
				IPk Mar
				M2[1] -39.53 dB
Bm				7.31871 G
Bm				4.877 51 6
i dBm				
				20 dBc limi
H2 -16,200 (Bm				20 000 1111
dem-				
I dBm				
adm				
I dBm	M2		and reading the second	Holes and which
UBI0	A Standard	المسيلي المستعد المستعد المحالية والعرائل المحالية	and the second	
here and the second second	and a second and the second seco			
and the second sec				
dBm-				
d8m-				
l dBm-				

~

High Channel 20 dBc Conducted Limit

AultiView Spectrum 3	Spectrum 2 X S	pectrum 4 🗙	
Ref Level 10.34 dBm Offset Att 20 dB SWT 41.71 µs (~ DF "CBLHF2012-5M-2_02-25-2024", "CEN0	0.34 dB = RBW 100 kHz -11 ms) = VBW 300 kHz Mode		
Frequency Sweep	02-28-24		0 1Pk Max
H1 4,100 dBm-	_	NI N	M1[1] 4.10 dBr 2.480 007 50 GH
dBm			
10 dBm			
20 dBm	15.900 dBm		
30 dBm-			
+0 dBm			
SU dBm			
60 dBm			
70 dBm-			
00 dBm			

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Frequency	Sweep	EN001_02-28-24"				a strate	11Pk Max
						M1[1]	-42.69 dB 4.957 51 G
dBm-						M2[1]	-40.91 df
							7.43781 G
0 dBm							
	H2 -15.900 c8m-					20	dBc limi
0 dBm	HS -12,900 GBM						
0 d8m							
						1 1.50	
dBm	Ma	M2	_		and the second second second	and a state of the	It II will be and
		and the second	a a second and the second	And Maintainer	Wanter and the second		
dam.	With the state of the section of	A Street and the Markey way				-	
a bite a second							
0 dBm-							
a dBm							
0 dBm							
			-				
70 dBm		100	00 pts	2.5 GH	Iz/		25.0 0

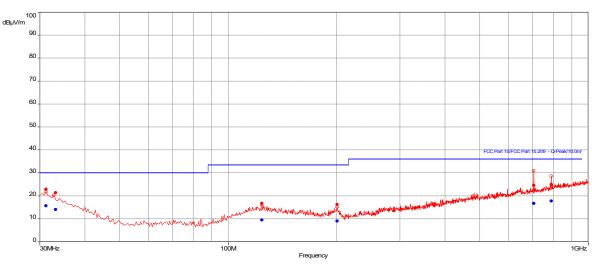
A

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:

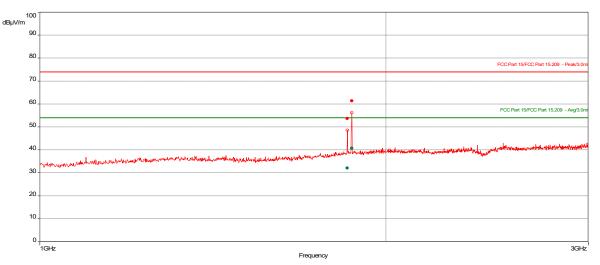
Frequency	Level	Limit	Margin	Azimuth	Height (m)	Pol.	RBW	RBW	Correction
(MHz)	(dBµV/m)	(dBµV/m)	(dB)	(°)					(dB)
31.308	15.70	30.00	-14.30	245.60	2.95	Vertical	120000.00	120k	-13.17
33.286	14.11	30.00	-15.89	287.60	1.67	Vertical	120000.00	120k	-14.60
123.892	9.53	33.50	-23.97	162.50	4.00	Vertical	120000.00	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

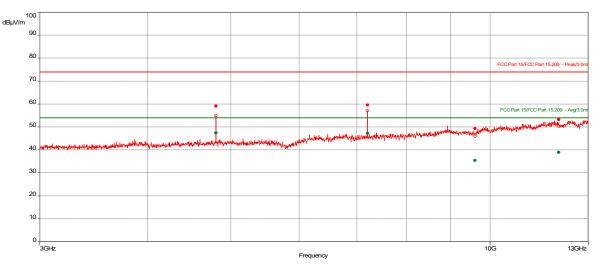
Frequency	Lével	Limit	Margin	Azimuth	Height (m)	Pol.	RBW	RBW	Correction
(MHz)	(dBµV/m)	(dBµV/m)	(dB)	(°)					(dB)
1851.4	32.12	54.00	-21.88	269.30	1.44	Vertical	1000000.00	1M	-5.39
1867.55	40.75	54.00	-13.25	74.20	1.00	Vertical	1000000.00	1M	-5.16

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

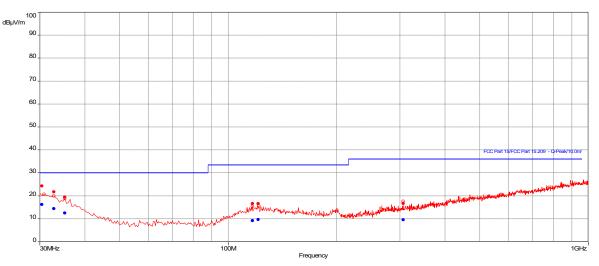
Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Azimuth (°)	Height (m)	Pol.	RBW	RBW	Correction (dB)
4804.55	47.40	54.00	-6.60	176.80	1.00	Vertical	1000000.00	1M	0.01
7206	47.29	54.00	-6.71	0.00	3.44	Horizontal	1000000.00	1M	4.32
9605.05	35.48	54.00	-18.52	360.00	4.00	Horizontal	1000000.00	1M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

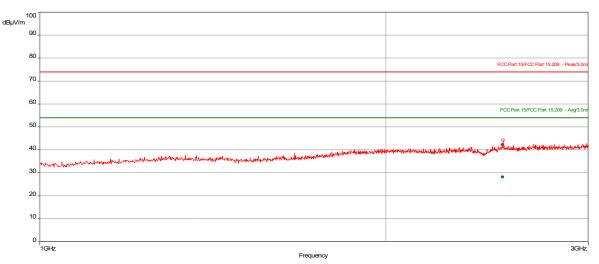
QuasiPeak (PASS) (6)								
Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Azimuth (°)	Height (m)	Pol.	RBW	RBW	Correction (dB)
30.446	16.24	30.00	-13.76	121.00	3.36	Horizontal	120000.00	120k	-12.68
32.752	14.50	30.00	-15.50	224.80	1.67	Vertical	120000.00	120k	-14.23
35.224	12.56	30.00	-17.44	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

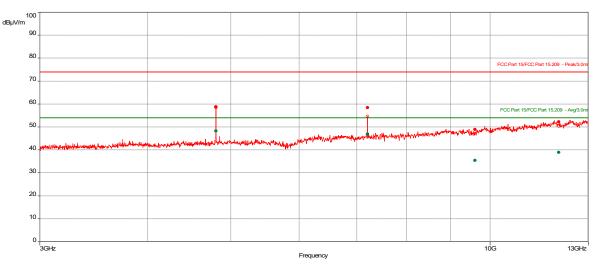
Frequency (MHz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Azimuth (°)	Height (m)	Pol.	RBW	RBW	Correction (dB)
2526.75	28.29	54.00	-25.71	347.70	3.58	Vertical	1000000.00	1M	-3.52

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 (dBuV/m)	Limit (dBuV/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	100000.00	1M	10.67

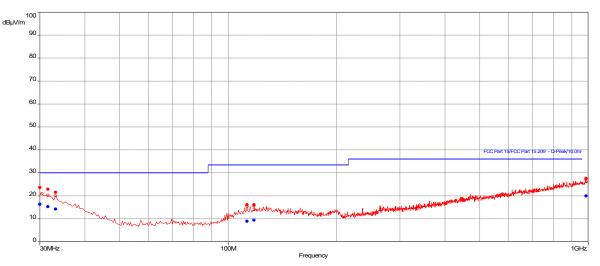
Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Azimuth (°)	Height (m)	Pol.	RBW	RBW	Correction (dB)
4803.5	48.30	54.00	-5.70	357.30	1.00	Vertical	1000000.00	1M	0.01
7205.25	46.94	54.00	-7.06	357.70	4.00	Horizontal	1000000.00	1M	4.32
9604.25	35.51	54.00	-18.49	0.00	4.00	Vertical	1000000.00	1M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

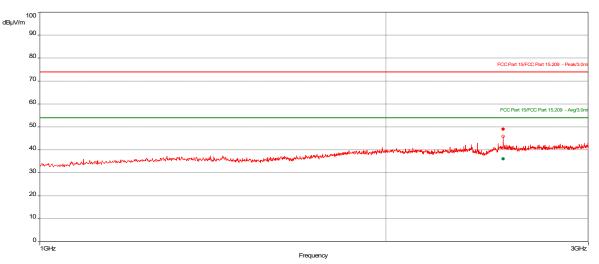
QuasiPeak ((PASS) (6)								
Frequency	Level	Limit	Margin	Azimuth	Height (m)	Pol.	RBW	RBW	Correction
(MHz)	(dBµV/m)	(dBµV/m)	(dB)	(°)					(dB)
30.108	16.36	30.00	-13.64	16.60	1.00	Horizontal	120000.00	120k	-12.56
31.726	15.32	30.00	-14.68	79.00	4.00	Vertical	120000.00	120k	-13.54
33.122	14.27	30.00	-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

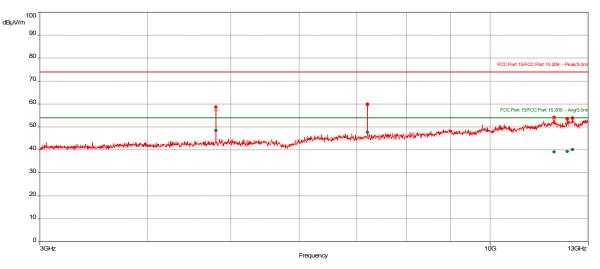
Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Azimuth (°)	Height (m)	Pol.	RBW	RBW	Correction (dB)
2530	36.14	54.00	-17.86	269.40	1.44	Horizontal	1000000.00	1M	-3.53

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	Level	Limit	Margin	Azimuth	Height (m)	Pol.	RBW	RBW	Correction
(MHz)	(dBµV/m)	(dBµV/m)	(dB)	(°)					(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

Frequency	Level	Limit	Margin	Azimuth	Height (m)	Pol.	RBW	RBW	Correction
(MHz)	(dBµV/m)	(dBµV/m)	(dB)	(°)					(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

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10:00:15 AM 05/07/2023

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13.0 GHz

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

10000 pts

500.0 MHz/

Measuring..

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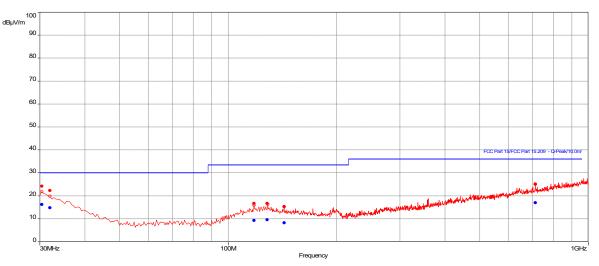
18.0 GHz

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:

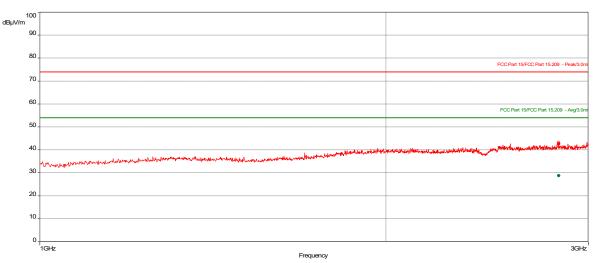
Frequency	Level	Limit	Margin	Azimuth	Height (m)	Pol.	RBW	RBW	Correction
(MHz)	(dBµV/m)	(dBµV/m)	(dB)	(°)					(dB)
30.502	16.24	30.00	-13.76	350.50	1.00	Vertical	120000.00	120k	-12.71
32.138	14.86	30.00	-15.14	308.90	2.51	Horizontal	120000.00	120k	-13.87
118.168	9.36	33.50	-24.14	203.70	1.00	Horizontal	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

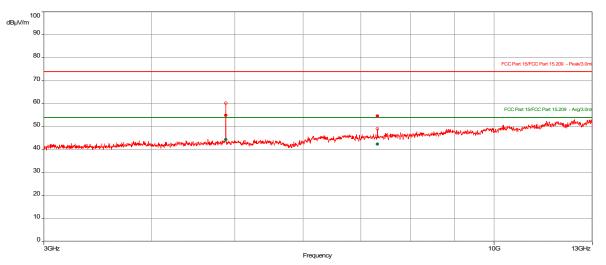
Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Azimuth (°)	Height (m)	Pol.	RBW	RBW	Correction (dB)
2828.4	28.78	54.00	-25.22	34.90	2.51	Vertical	100000.00	1M	-3.32

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	Level	Limit	Margin	Azimuth	Height (m)	Pol.	RBW	RBW	Correction
(MHz)	(dBµV/m)	(dBµV/m)	(dB)	(°)					(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

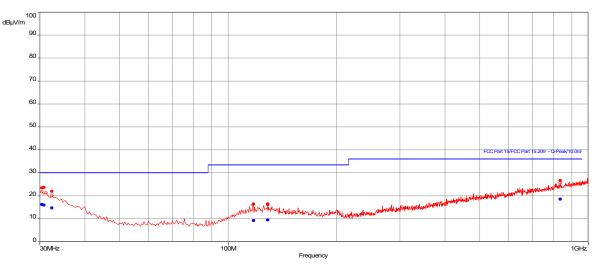
/ monugo (i /									
Frequency	Level	Limit	Margin	Azimuth	Height (m)	Pol.	RBW	RBW	Correction
(MHz)	(dBµV/m)	(dBµV/m)	(dB)	(°)					(dB)
4879.55	44.42	54.00	-9.58	176.90	3.44	Horizontal	1000000.00	1M	0.17
7319.3	42.36	54.00	-11.64	360.00	4.00	Horizontal	1000000.00	1M	4.46

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:

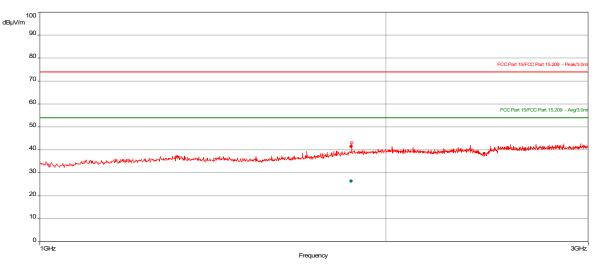
QuasiPeak ((PASS) (6)								
Frequency	Level	Limit	Margin	Azimuth	Height (m)	Pol.	RBW	RBW	Correction
(MHz)	(dBµV/m)	(dBµV/m)	(dB)	(°)					(dB)
30.298	16.24	30.00	-13.76	16.50	3.79	Vertical	120000.00	120k	-12.63
30.996	15.93	30.00	-14.07	308.80	2.52	Vertical	120000.00	120k	-12.90
32.334	14.72	30.00	-15.28	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 Limit Margin (dBμV/m) Azimuth (dB) Height (m) Pol. RBW RBW Correction (dB) 1865.95 41.51 74.00 -32.49 347.90 4.00 Vertical 100000.00 1M -5.18	T Cak (T AOO	<u>//י/</u>								
	Frequency	Level	Limit	Margin	Azimuth	Height (m)	Pol.	RBW	RBW	Correction
1865.95 41.51 74.00 -32.49 347.90 4.00 Vertical 100000.00 1M -5.18	(MHz)	(dBµV/m)	(dBµV/m)	(dB)	(°)					(dB)
	1865.95	41.51	74.00	-32.49	347.90	4.00	Vertical	1000000.00	1M	-5.18

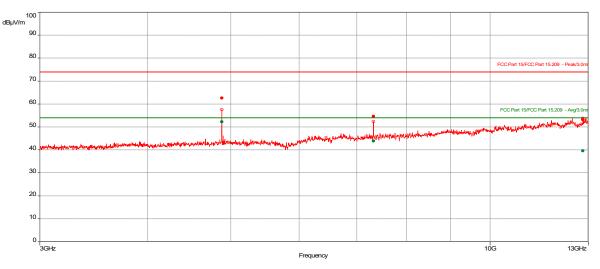
Average (17	(00)(1)								
Frequency	Level	Limit	Margin	Azimuth	Height (m)	Pol.	RBW	RBW	Correction
(MHz)	(dBµV/m)	(dBµV/m)	(dB)	(°)					(dB)
1865.95	26.42	54.00	-27.58	347.90	4.00	Vertical	100000.00	1M	-5.18

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

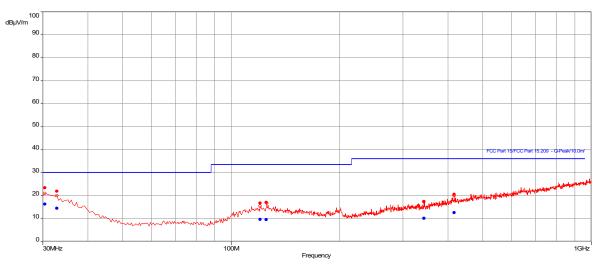
Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Azimuth (°)	Height (m)	Pol.	RBW	RBW	Correction (dB)
4879.5	52.30	54.00	-1.70	176.80	3.44	Horizontal	1000000.00	1M	0.17
7320.15	43.90	54.00	-10.10	357.20	3.44	Horizontal	1000000.00	1M	4.46
12814.35	39.65	54.00	-14.35	0.00	4.00	Vertical	1000000.00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

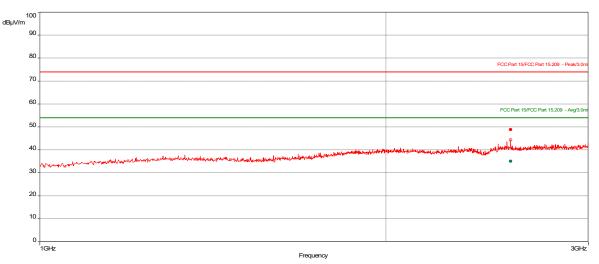
Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Azimuth (°)	Height (m)	Pol.	RBW	RBW	Correction (dB)
30.454	16.24	30.00	-13.76	100.10	1.66	Horizontal	120000.00	120k	-12.69
32.77	14.50	30.00	-15.50	203.70	4.00	Vertical	120000.00	120k	-14.24
120.592	9.61	33.50	-23.89	120.80	4.00	Horizontal	120000.00	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)

1 641 (17100	<u> </u>								
Frequency	Level	Limit	Margin	Azimuth	Height (m)	Pol.	RBW	RBW	Correction
(MHz)	(dBµV/m)	(dBµV/m)	(dB)	(°)					(dB)
2568.05	48.84	74.00	-25.16	269.20	1.44	Horizontal	1000000.00	1M	-3.61

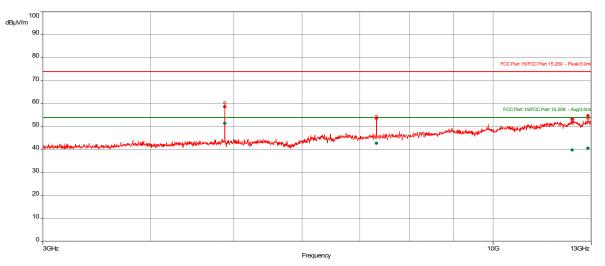
Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Azimuth (°)	Height (m)	Pol.	RBW	RBW	Correction (dB)
2568.05	35.06	54.00	-18.94	269.20	1.44	Horizontal	1000000.00	1M	-3.61

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	Level	Limit	Margin	Azimuth	Height (m)	Pol.	RBW	RBW	Correction
(MHz)	(dBµV/m)	(dBµV/m)	(dB)	(°)					(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

Frequency (MHz)	Level (dBuV/m)	Limit (dBuV/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

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MultiView	- Spectrum	× Sp	ectrum 2	×					
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90 dBµV								M1[1]	48.29 dBµV 15.833 250 GHz
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70 dBµV	H1 74 000 dBuy								
i o oopr									
60 dBµV	-		-			-		-	-
		H2 54.00	dBµV.		M1			·	
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40 dBpV-	Chinese and the last							Alexandra and a second	C. Marganeter Williamster
30 dBpV									
20 dBµV		-							-
10 d8µV									
10 0004									
0 dBµV					-				-
			10000 p	tio.	-	00.0 MHz/		-	18.0 GHz

10:01:42 AM 05/07/2023

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

MultiView	 Spectrum 	× Spe	ectrum 2	×					
	3.80 dBµV Offse		dB . RBW 1N						
Att		23.1 ms (~12	s) = VBW 31	1Hz Mode Auto	FFT				the plants
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10 dBµV									
o depy	1 Second							1	-
	HI 74.000 dBpA	·		1				-	
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and the	· · · · · · · · · · · · · · · · · · ·							1	
18.0 GHz	1		10000 p	te	0	00.0 MHz/	1		26.0 GH

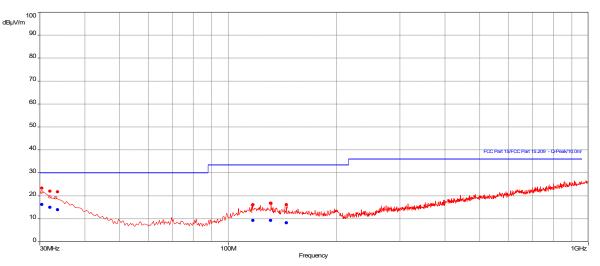
09:19:28 AM 05/07/2023

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:

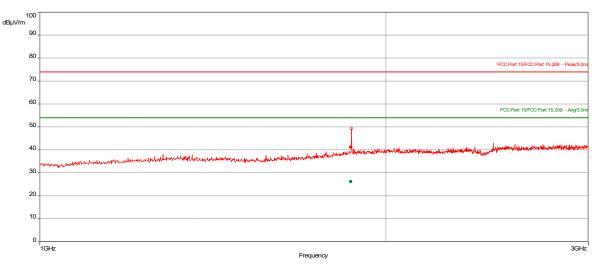
QuasiPeak (//*/					l = .			
Frequency	Level	Limit	Margin	Azimuth	Height (m)	Pol.	RBW	RBW	Correction
(MHz)	(dBµV/m)	(dBµV/m)	(dB)	(°)					(dB)
30.484	16.27	30.00	-13.73	16.60	4.00	Vertical	120000.00	120k	-12.70
32.012	15.00	30.00	-15.00	349.90	1.00	Horizontal	120000.00	120k	-13.80
33.44	14.03	30.00	-15.97	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

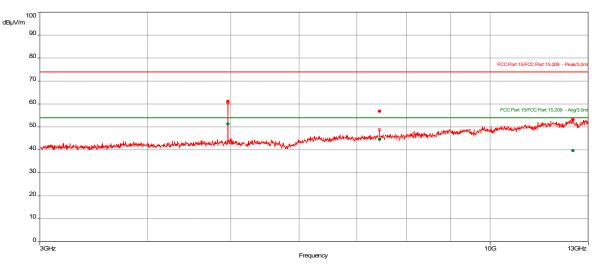
Average (i P	(00)(1)								
Frequency	Level	Limit	Margin	Azimuth	Height (m)	Pol.	RBW	RBW	Correction
(MHz)	(dBµV/m)	(dBµV/m)	(dB)	(°)					(dB)
1863.6	26.27	54.00	-27.73	113.10	1.00	Vertical	100000.00	1M	-5.21

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	Level	Limit	Margin	Azimuth	Height (m)	Pol.	RBW	RBW	Correction
(MHz)	(dBµV/m)	(dBµV/m)	(dB)	(°)					(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

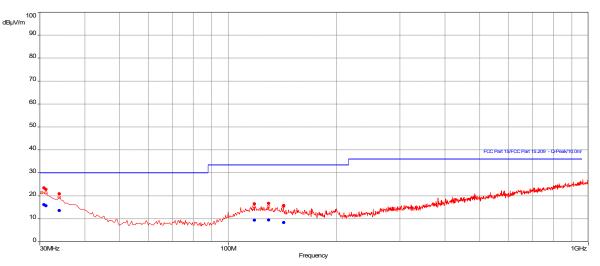
Frequency	Level	Limit	Margin	Azimuth	Height (m)	Pol.	RBW	RBW	Correction
(MHz)	(dBµV/m)	(dBµV/m)	(dB)	(°)					(dB)
4959.55	51.32	54.00	-2.68	357.90	1.00	Horizontal	1000000.00	1M	0.39
7440.75	44.59	54.00	-9.41	357.70	4.00	Horizontal	1000000.00	1M	4.68
12476.35	39.77	54.00	-14.23	0.00	1.00	Vertical	1000000.00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

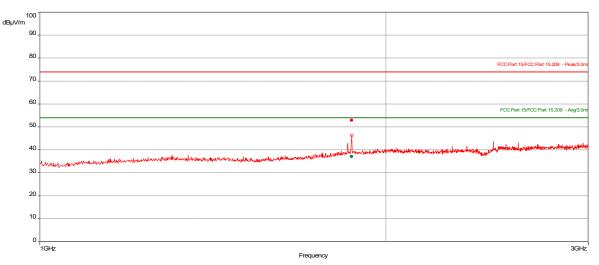
Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Azimuth (°)	Height (m)	Pol.	RBW	RBW	Correction (dB)
30.634	16.20	30.00	-13.80	328.80	2.53	Vertical	120000.00	120k	-12.76
31.35	15.72	30.00	-14.28	329.20	1.67	Vertical	120000.00	120k	-13.20
33.916	13.61	30.00	-16.39	360.00	4.00	Horizontal	120000.00	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

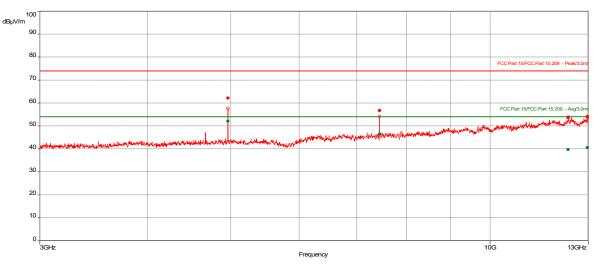
Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Azimuth (°)	Height (m)	Pol.	RBW	RBW	Correction (dB)
1867.35	37.18	54.00	-16.82	152.10	3.05	Horizontal	1000000.00	1M	-5.16

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 (dBuV/m)	Limit (dBuV/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)

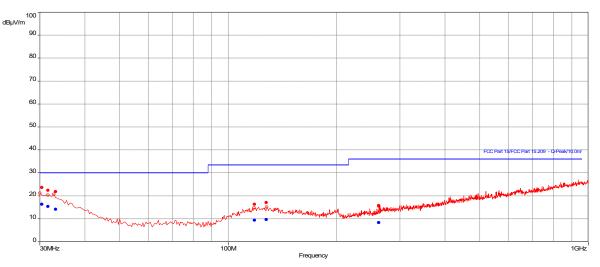
Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Azimuth (°)	Height (m)	Pol.	RBW	RBW	Correction (dB)
4960.5	52.11	54.00	-1.89	360.00	3.44	Horizontal	1000000.00	1M	0.39
7440.05	46.53	54.00	-7.47	0.00	3.44	Horizontal	1000000.00	1M	4.68
12323.25	39.76	54.00	-14.24	360.00	1.00	Horizontal	1000000.00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

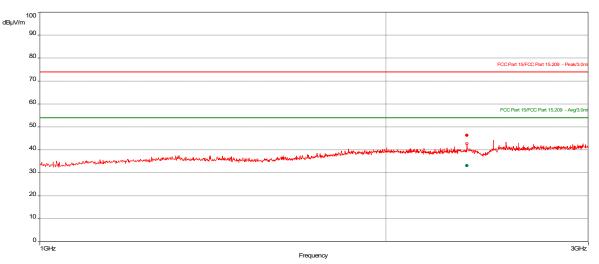
Frequency	Level	Limit	Margin	Azimuth	Height (m)	Pol.	RBW	RBW	Correction
(MHz)	(dBµV/m)	(dBµV/m)	(dB)	(°)					(dB)
30.294	16.33	30.00	-13.67	287.40	3.79	Vertical	120000.00	120k	-12.63
31.636	15.39	30.00	-14.61	183.30	4.00	Vertical	120000.00	120k	-13.46
33.232	14.20	30.00	-15.80	266.30	1.00	Horizontal	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)

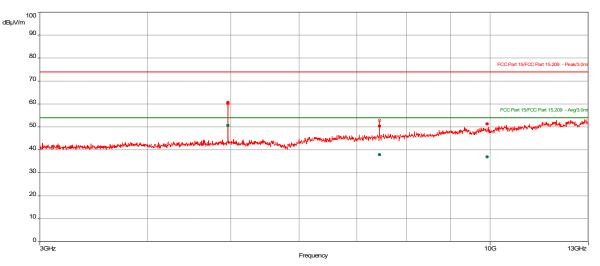
Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Azimuth (°)	Height (m)	Pol.	RBW	RBW	Correction (dB)
2351.95	33.17	54.00	-20.83	113.10	1.44	Horizontal	1000000.00	1M	-4.38

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	Limit	Margin	Azimuth	Height (m)	Pol.	RBW	RBW	Correction
(IVI⊓Z)	(dBµV/m)	(dBµV/m)	(dB)						(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	Level	Limit	Margin	Azimuth	Height (m)	Pol.	RBW	RBW	Correction
(MHz)	(dBµV/m)	(dBµV/m)	(dB)	(°)					(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

				Inte	rtek				
rt Number:	1051289)61BOX-(001.2						sued: 05/10/20 evised: 10/10/2
	High Ch	annel Ra	idiated E	missions,	13-18 G	Hz [EUT	on all axis	s] at 2 m	-
MultiView Ref Level 97	Spectrum	at 10.26 dB = F		Mode Auto Sweet	2				
1 Frequency S	weep		-	1	1	-	1	M1[1]	o 1Pk Max 48.29 dBpV
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70 авµу-	H1 74 000 dB)A	/							
60 dBµV		- 4.5						-	
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0 dBµV				6					
13.0 GHz			10000	pts	5	00.0 MHz/	Measuring	RORSPORTS	18.0 GHz 2023-05-07 10:02:23





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	1.1.0							1	
	HI 74.000 dBp	V						-	
70 dBµV									
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		H2 54.000	dBuV					1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-	
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09:19:28 AM 05/07/2023

10:02:23 AM 05/07/2023

Product Stand	lard: CFR47 FCC Par	t 15.247, RSS-247	Limit applied: See Report Section 10.2					
Test Date	Test Personnel/	Supervising Engineer/	Input		Atmospheric Data			
	Initials	Initials	Voltage	Mode	Temp	Relative	Atmospheric	
			Ŭ		C°	Humidity %	Pressure mbar	
05/07/2023	Vathana F. Ven	Kouma Sinn	USB Powered	Mode 1	24	27	1005	
05/09/2023	Kouma Sinn 445	Vathana F. Ven	USB Powered	Mode 1	25	20	1004	
10/01/2023	Kouma Sinn 445	Vathana F. Ven 🎢	Battery Powered	Mode 1	24	45	1013	
10/07/2023	Kouma Sinn 445	Vathana F. Ven	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 $\,U_{_{\it lab}}\,$ is less than the corresponding $\,U_{_{\it CISPR}}\,$

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:

 $\begin{array}{ll} FS = RA + AF + CF - AG \\ Where & FS = Field Strength in dB \mu V/m \\ RA = Receiver Amplitude (including preamplifier) in dB \mu V \\ CF = Cable Attenuation Factor in dB \\ AF = Antenna Factor in dB \\ AG = Amplifier Gain in dB \end{array}$

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 dB $_{\mu}$ V 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 dB μ V/m. This value in dB μ V/m was converted to its corresponding level in μ V/m.

RA = $52.0 \text{ dB}\mu\text{V}$ AF = 7.4 dB/mCF = 1.6 dBAG = 29.0 dBFS = $32 \text{ dB}\mu\text{V/m}$

To convert from $dB\mu V$ to μV or mV the following was used:

UF = $10^{(NF/20)}$ where UF = Net Reading in μ V NF = Net Reading in dB μ V

Example:

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

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
	Broadband Hybrid Antenna 30					
145145'	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	Manufacturer Model		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

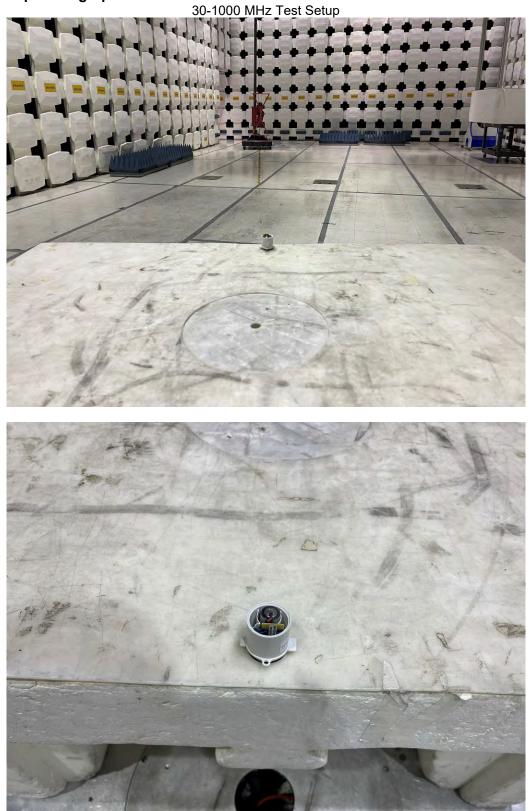
Software Utilized:

Name	Manufacturer	Version
BAT-EMC	Nexio	2022.0.27.0

11.4 Results:

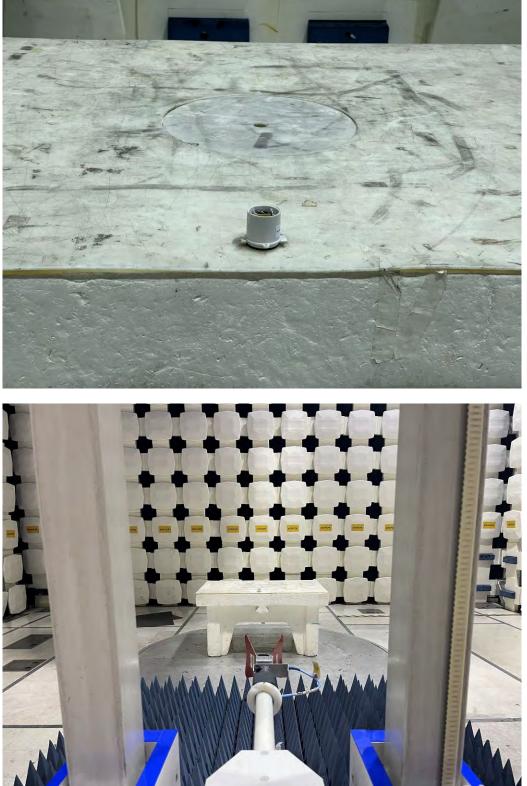
The sample tested was found to Comply.

11.5 Setup Photographs:



Intertek

1-13 GHz Test Setup



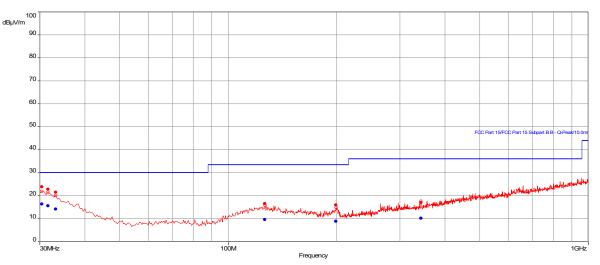
11.6 Plots/Data:

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)

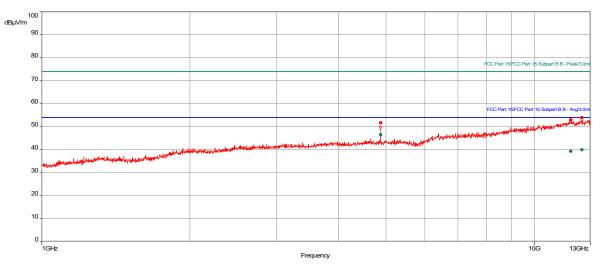
Frequency	Level	Limit	Margin	Azimuth	Height (m)	Pol.	RBW	RBW	Correction
(MHz)	(dBµV/m)	(dBµV/m)	(dB)	(°)					(dB)
30.358	16.34	30.00	-13.66	120.30	4.00	Horizontal	120000.00	120k	-12.65
31.45	15.61	30.00	-14.39	120.80	3.81	Horizontal	120000.00	120k	-13.29
33.296	14.17	30.00	-15.83	204.30	1.67	Vertical	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	Level	Limit	Margin	Azimuth	Height (m)	Pol.	RBW	RBW	Correction
(MHz)	(dBµV/m)	(dBµV/m)	(dB)	(°)					(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/	Supervising Engineer/ Initials	Input Voltage	Mode	Atmospheric Data			
	Initials				Temp	Relative	Atmospheric	
	initiais	Initialo	Voltage		C°	Humidity %	Pressure mbar	
10/01/2023	Kouma Sinn 445	Vathana F. Ven 🗥	Battery Powered	Mode 2	24	45	1013	
10/01/2023	Kouma Sinn	Vathana F. Ven	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 45	VEV	Original Issue
1	07/24/2023	105128961BOX-001.1	KPS 43	VFV	Added notes in block in EUT block diagram section
2	10/10/2023	105128961BOX-001.2	KPS 43	VFV	Re-tested radiated emissions without the test fixture