

Orthotics and Prosthetics One, Inc. **TEST REPORT**

SCOPE OF WORK

EMISSIONS TESTING – OPOS1

REPORT NUMBER

105232834BOX-001

ISSUE DATE

12/30/2022

[REVISED DATE]

01/18/2023

DOCUMENT CONTROL NUMBER

Non-Specific Radio Report Shell Rev. October 2022
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EMISSIONS TEST REPORT (FULL COMPLIANCE)

Report Number: 105232834BOX-001

Project Number: G105232834

Report Issue Date: 12/30/2022

Report Revision Date: 01/18/2023

Model(s) Tested: 053-A-2001 Rev B

Model(s) Partially Tested: None


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

Standards: CFR47 FCC Part 15.247 Subpart C: 05/2022,
CFR47 FCC Part 15 Subpart B: 05/2022,
KDB 558074 D01 15.247 Meas Guidance v05r02: 04/2019

Tested by:
Intertek
70 Codman Hill Road
Boxborough, MA 01719
USA

Client:
Orthotics and Prosthetics One, Inc.
527 Park Lane
Waterloo, IA 50702
USA

Report prepared by reviewer



Vathana Ven / Senior Staff Engineer, EMC

Report reviewed by reviewer



Kouma Sinn / Senior Staff Engineer, EMC

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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 and Human RF exposure CFR47 FCC Part 15 Subpart C: 12/2022, Section 15.247 (b)(3)	Pass
7	6 dB Bandwidth and Occupied Bandwidth CFR47 FCC Part 15 Subpart C: 12/2022, Section 15.247 (a)(2)	Pass
8	Maximum Power Spectral Density CFR47 FCC Part 15 Subpart C: 12/2022, Section 15.247 (e)	Pass
9	Band Edge Compliance CFR47 FCC Part 15 Subpart C: 12/2022, Section 15.247 (d)	Pass
10	Transmitter spurious emissions CFR47 FCC Part 15 Subpart C: 12/2022, Section 15.247 (d)	Pass
11	Digital Device and Receiver Radiated Spurious Emissions CFR47 FCC Part 15 Subpart B 15.109: 12/2022	Pass
12	Revision History	--

3 Client Information**This EUT was tested at the request of:**

Client: Orthotics and Prosthetics One, Inc.
527 Park Lane
Waterloo, IA 50702
USA

Contact: Clark Dennis
Telephone: 1-800-408-3598
Fax: None
Email: clarkdennise@gmail.com

4 Description of Equipment Under Test and Variant Models

Manufacturer: Orthotics and Prosthetics One, Inc.
527 Park Lane
Waterloo, IA 50702
USA

Equipment Under Test			
Description	Manufacturer	Model Number	Serial Number
OPOS1	Orthotics and Prosthetics One, Inc.	053-A-2001 Rev B	22K08-058 (Sample used for radiated measurements)
OPOS1	Orthotics and Prosthetics One, Inc.	053-A-2001 Rev B	22K08-110 (Sample used for antenna port measurements)

Receive Date:	12/07/2022
Received Condition:	Good
Type:	Production

Description of Equipment Under Test (provided by client)

The OPOS1 sensor is part of a system used by clinicians in the field of orthotics and prosthetics to track the amount of time that an orthotic or prosthetic device is worn by a patient. The sensor itself is a low power wearable device that monitors activity data and other metrics and uploads this data to a paired smart phone using the Bluetooth Low Energy (BLE) 5 protocol. Time-averaged data rate is kept low to extend battery life from a small coin cell watch battery, and does not include any voice/audio data transmission capability. Lowest clock frequency is 32 MHz.

Equipment Under Test Power Configuration			
Rated Voltage	Rated Current	Rated Frequency	Number of Phases
Battery Powered	N/A	DC	N/A

Operating modes of the EUT:

No.	Descriptions of EUT Exercising
1	Transmit continuously at Low, Mid, and High channels
2	Receive mode

Software used by the EUT:

No.	Descriptions of EUT Exercising
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1	N/A
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Radio/Receiver Characteristics	
Frequency Band(s)	2402-2480 MHz
Modulation Type(s)	GFSK
Maximum Output Power (Conducted)	Low Channel (2402 MHz): 3.91 dBm Mid Channel (2442 MHz): 4.13 dBm High Channel (2480 MHz): 4.09 dBm
Test Channels	Low Channel (2402 MHz) Mid Channel (2442 MHz) High Channel (2480 MHz)
Occupied Bandwidth	Low Channel (2402 MHz): 1.08 MHz Mid Channel (2442 MHz): 1.08 MHz High Channel (2480 MHz): 1.08 MHz
6 dB Bandwidth	Low Channel (2402 MHz): 789.20 kHz Mid Channel (2442 MHz): 789.20 kHz High Channel (2480 MHz): 804.20 kHz
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)	N/A
Equipment Type	Standalone
Antenna Type and Gain	Integral antenna, -0.5 dBi

Variant Models:

The following variant models were not tested as part of this evaluation and are not eligible for certification; 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

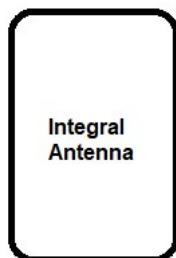
5 System Setup and Method

Cables					
ID	Description	Length (m)	Shielding	Ferrites	Termination
--	None	--	--	--	--

Support Equipment			
Description	Manufacturer	Model Number	Serial Number
None	--	--	--

5.1 Method:

Configuration as required by ANSI C63.10:2013, ANSI C63.4:2014, and KDB 558074 D01 15.247 Meas Guidance v05r02: 04/2019.

5.2 EUT Block Diagram:

6 Maximum Peak Output Power**6.1 Method**

Antenna port conducted measurements were performed according to the FCC documents "Guidance for Performing Compliance Measurement on Digital Transmission Systems (DTS) Operating under §15.247" (KDB 558074 D01 DTS Meas Guidance v05r02).

TEST SITE: 10m Chamber Building

6.2 Test Equipment Used:

Asset	Description	Manufacturer	Model	Serial	Cal Date	Cal Due
DAV007	Weather Station	Davis	6250	MS191218083	02/11/2022	02/11/2023
CEN001	DC-40GHz attenuator 20dB	Centric RF	C411-20	CEN001	01/26/2022	01/26/2023
ROS005-1	Signal and Spectrum Analyzer	Rohde and Shwartz	FSW43	100646	11/15/2022	11/15/2023

Software Utilized:

Name	Manufacturer	Version
None	N/A	N/A

6.3 Results:

The sample tested was found to Comply.

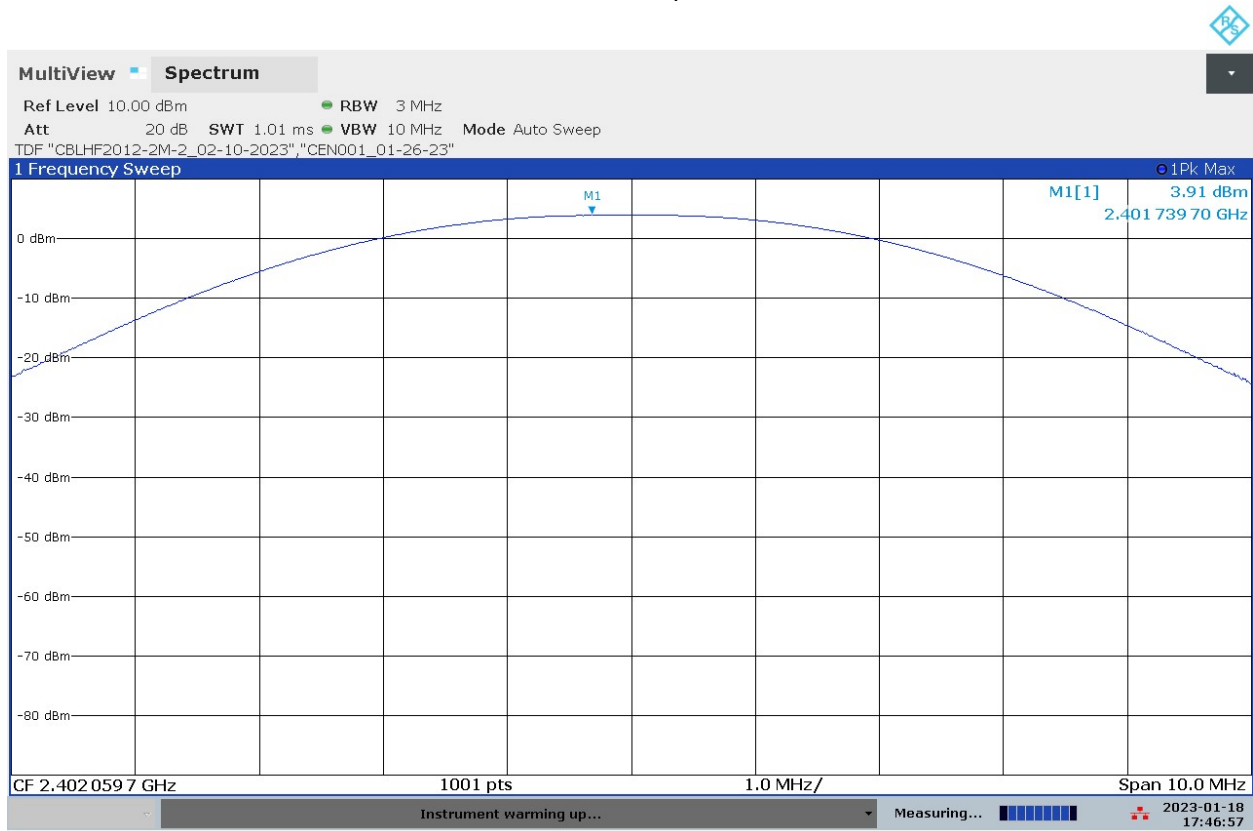
Limits – FCC Part §15.247 (b) (3) For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands: 1 Watt or 30 dBm.

6.4 Setup Photograph:



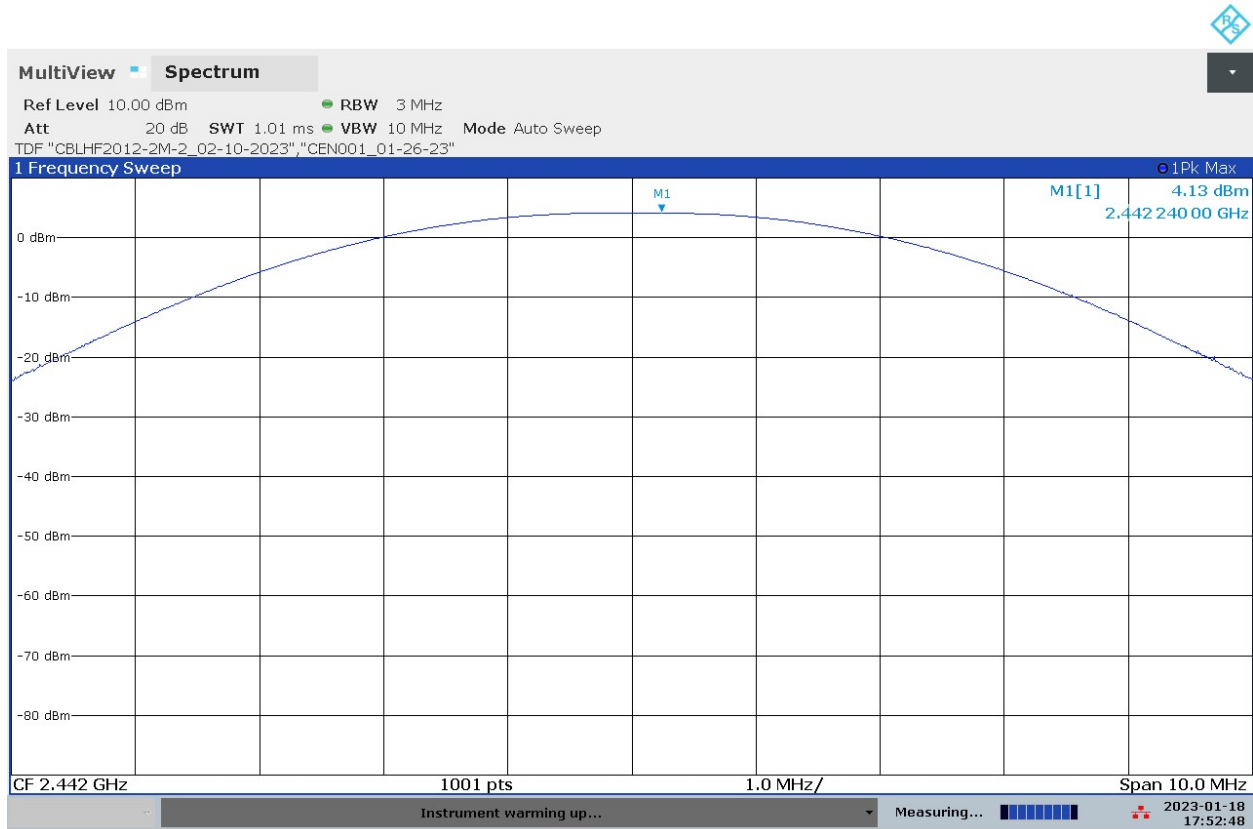
6.5 Plots/Data:

Low Channel Output Power



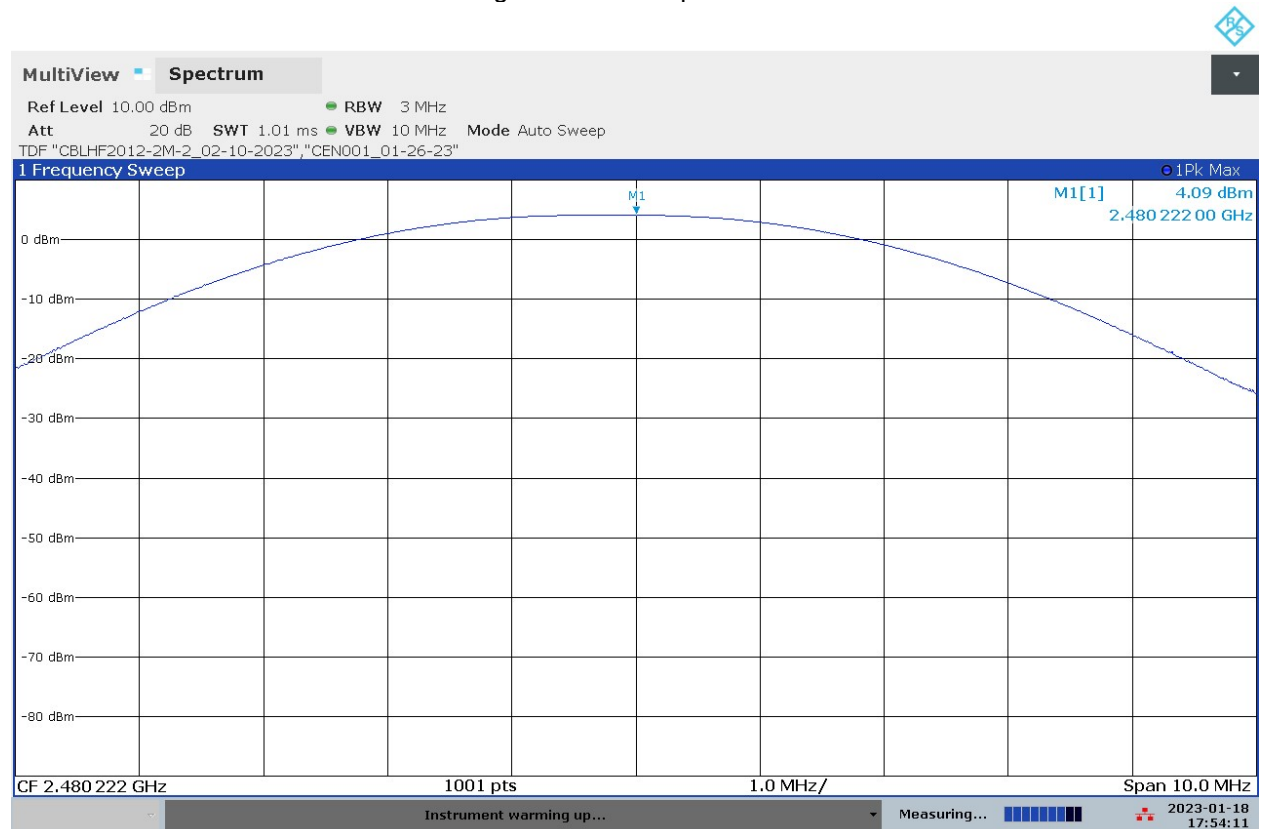
05:46:58 PM 01/18/2023

Mid Channel Output Power



05:52:48 PM 01/18/2023

High Channel Output Power



05:54:11 PM 01/18/2023

Frequency (MHz)	Conducted Output Power (dBm)	Antenna Gain (dBi)	EIRP (dBm)	Limit, Conducted (dBm)	Margin (dB)
2402	3.91	-0.5	3.41	30	-26.59
2442	4.13	-0.5	3.63	30	-26.37
2480	4.09	-0.5	3.59	30	-26.41

Note: See plots above. Attenuator was internally compensated as TDF.

Product Standard: FCC Part 15.247				Limit applied: See Report Section 6.5 Pretest Verification w/BB source: N/A			
Test Date	Test Personnel/ Initials	Supervising Engineer/ Initials	Input Voltage	Mode	Atmospheric Data		
					Temp C°	Relative Humidity %	Atmospheric Pressure mbar
01/18/2023	Vathana Ven <i>VSV</i>	Kouma Sinn <i>KPS</i>	Battery powered	Tx Low, Mid, High Channels	24	19	1014

Deviations, Additions, or Exclusions: None

7 6 dB Bandwidth and Occupied Bandwidth**7.1 Method**

Antenna port conducted measurements were performed according to the FCC documents "Guidance for Performing Compliance Measurement on Digital Transmission Systems (DTS) Operating under §15.247" (KDB 558074 D01 DTS Meas Guidance v05r02).

TEST SITE: 10m Chamber Building

7.2 Test Equipment Used:

Asset	Description	Manufacturer	Model	Serial	Cal Date	Cal Due
DAV007'	Weather Station	Davis	6250	MS191218083	02/11/2022	02/11/2023
CEN001'	DC-40GHz attenuator 20dB	Centric RF	C411-20	CEN001	01/26/2022	01/26/2023
ROS005-1'	Signal and Spectrum Analyzer	Rohde and Shwartz	FSW43	100646	11/15/2022	11/15/2023

Software Utilized:

Name	Manufacturer	Version
None	N/A	N/A

7.3 Results:

The sample tested was found to Comply.

Limits – 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.

7.4 Setup Photograph:



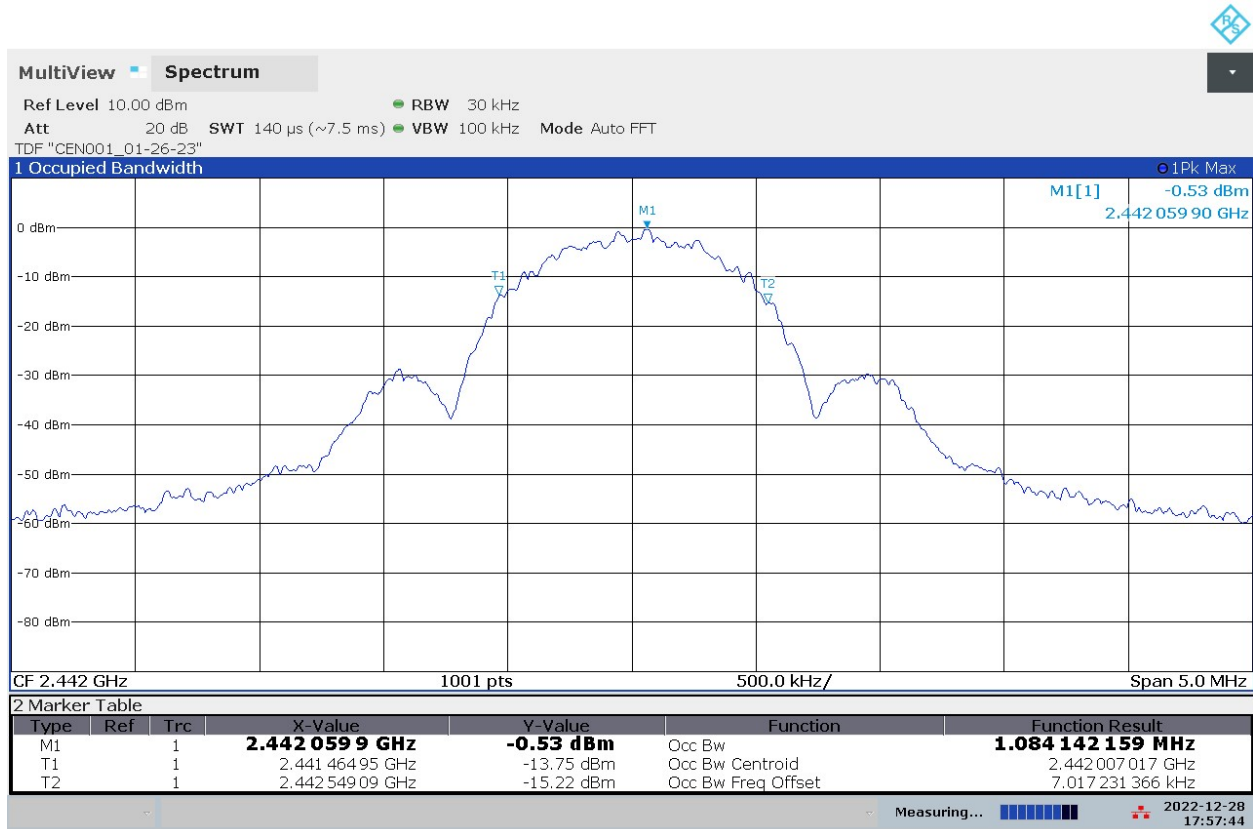
7.5 Plots/Data:

Low Channel Occupied Bandwidth



05:54:37 PM 12/28/2022

Mid Channel Occupied Bandwidth



05:57:45 PM 12/28/2022

High Channel Occupied Bandwidth



06:01:34 PM 12/28/2022

Low Channel 6 dB Bandwidth



05:55:14 PM 12/28/2022

Mid Channel 6 dB Bandwidth



05:57:01 PM 12/28/2022

High Channel 6 dB Bandwidth



06:02:15 PM 12/28/2022

DTS Bandwidth (6 dB Bandwidth)

Frequency (MHz)	DTS Bandwidth (6 dB Bandwidth) (kHz)	DTS Bandwidth Limit (kHz)	Results
2402	789.20	≥ 500	Compliance
2442	789.20	≥ 500	Compliance
2480	804.20	≥ 500	Compliance

Note: See plots above. Attenuator was internally compensated as TDF.

Occupied Bandwidth (OBW)

Frequency (MHz)	Occupied Bandwidth (MHz)	Occupied Bandwidth Limit	Results
2402	1.08	Upper and Lower Edges of OBW within 2400-2483.5 MHz	Compliance
2442	1.08	Upper and Lower Edges of OBW within 2400-2483.5 MHz	Compliance
2480	1.08	Upper and Lower Edges of OBW within 2400-2483.5 MHz	Compliance

Note: See plots above. Attenuator was internally compensated as TDF.

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	Product Standard: FCC Part 15.247			Limit applied: See Report Section 7.3 Pretest Verification w/BB source: N/A			
Test Date	Test Personnel/ Initials	Supervising Engineer/ Initials	Input Voltage	Mode	Atmospheric Data		
					Temp C°	Relative Humidity %	Atmospheric Pressure mbar
12/28/2022	Vathana Ven <i>VSV</i>	Kouma Sinn <i>KPS</i>	Battery powered	Tx Low, Mid, High Channels	24	19	1014

Deviations, Additions, or Exclusions: None

8 Maximum Power Spectral Density

8.1 Method

Antenna port conducted measurements were performed according to the FCC documents "Guidance for Performing Compliance Measurement on Digital Transmission Systems (DTS) Operating under §15.247" (KDB 558074 D01 DTS Meas Guidance v05r02).

TEST SITE: 10m Chamber Building

8.2 Test Equipment Used:

Asset	Description	Manufacturer	Model	Serial	Cal Date	Cal Due
DAV007'	Weather Station	Davis	6250	MS191218083	02/11/2022	02/11/2023
CEN001'	DC-40GHz attenuator 20dB	Centric RF	C411-20	CEN001	01/26/2022	01/26/2023
ROS005-1'	Signal and Spectrum Analyzer	Rohde and Shwartz	FSW43	100646	11/15/2022	11/15/2023

Software Utilized:

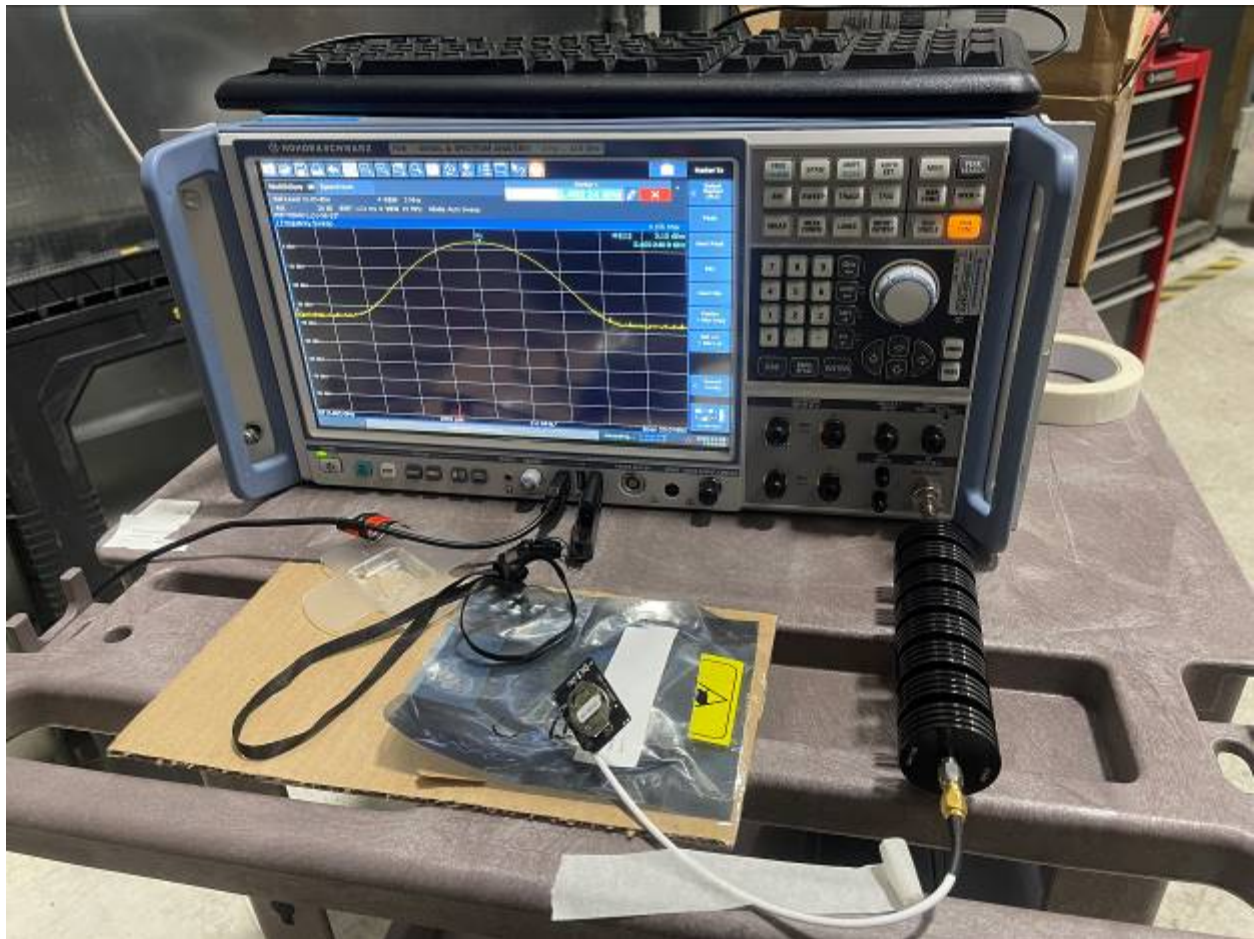
Name	Manufacturer	Version
N/A		

8.3 Results:

The sample tested was found to Comply.

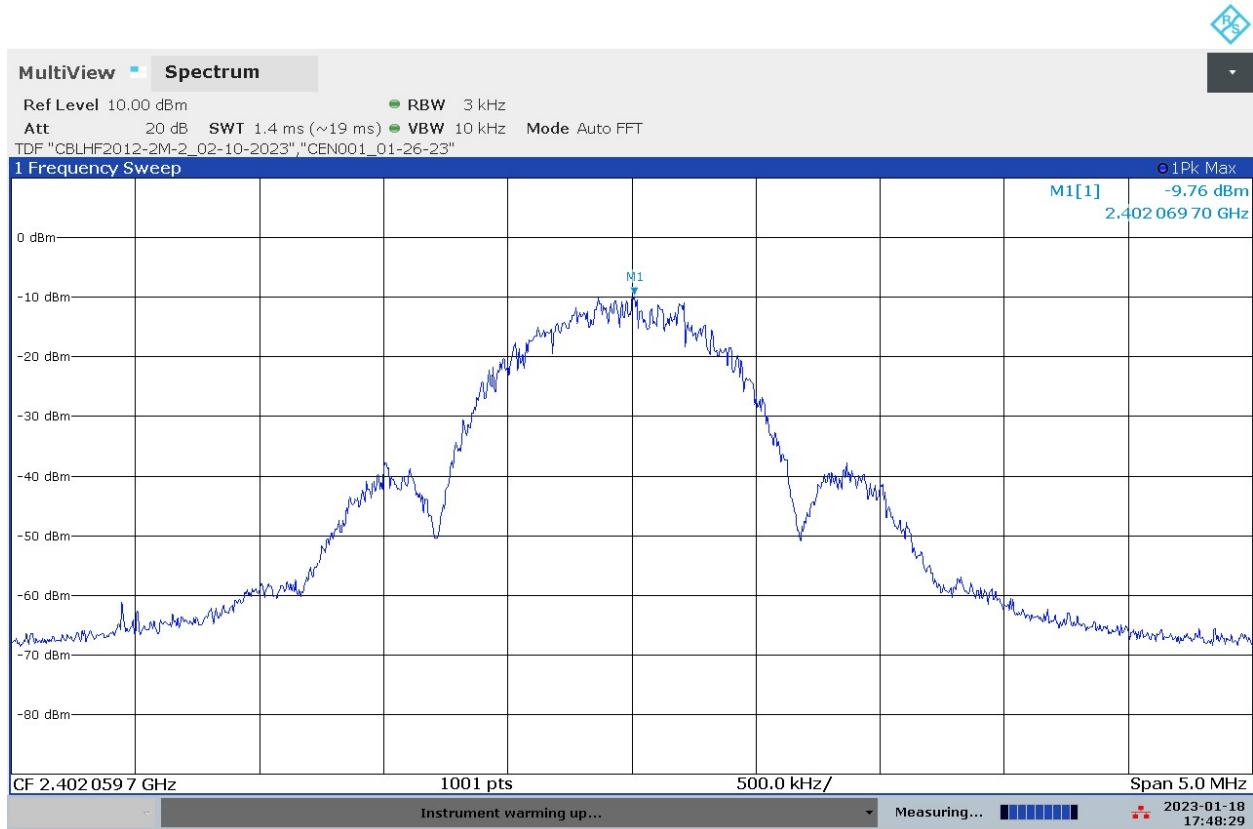
Limits – FCC Part §15.247 (e) For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

8.4 Setup Photograph:



8.5 Plots/Data:

Low Channel Power Spectral Density



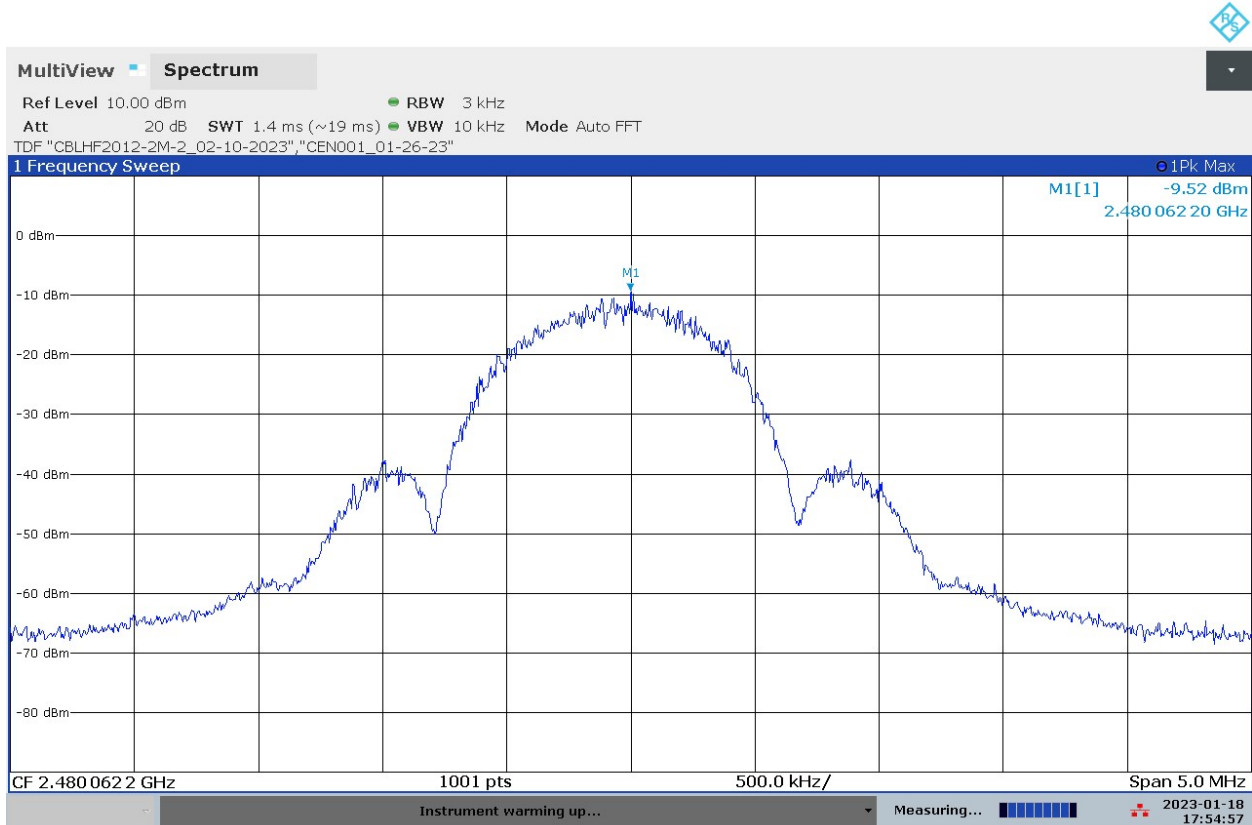
05:48:29 PM 01/18/2023

Mid Channel Power Spectral Density



05:52:09 PM 01/18/2023

High Channel Power Spectral Density



05:54:58 PM 01/18/2023

Frequency (MHz)	Power Spectral Density (dBm)	Limit (dBm)	Margin (dB)
2402	-9.76	8	-17.76
2442	-9.48	8	-17.48
2480	-9.52	8	-17.52

Note: See plots above. Attenuator was internally compensated as TDF.

Product Standard: FCC Part 15.247				Limit applied: See Report Section 8.3 Pretest Verification w/BB source: N/A			
Test Date	Test Personnel/ Initials	Supervising Engineer/ Initials	Input Voltage	Mode	Atmospheric Data		
					Temp C°	Relative Humidity %	Atmospheric Pressure mbar
01/18/2023	Vathana Ven <i>VSV</i>	Kouma Sinn <i>KPS</i>	Battery powered	Tx Low, Mid, High Channels	24	19	1014

Deviations, Additions, or Exclusions: None

9 Band Edge Compliance

9.1 Method

Tests are performed in accordance with FCC Part 15 Subpart C 15.247, ANSI C 63.10, 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)	Ucisp
Radiated Emissions, 10m	30-1000 MHz	5.0 dB	6.3 dB
Radiated Emissions, 3m	30-1000 MHz	4.6 dB	6.3 dB
Radiated Emissions, 3m	1-6 GHz	4.9 dB	5.2 dB
Radiated Emissions, 3m	6-15 GHz	5.1 dB	5.5 dB
Radiated Emissions, 3m	15-18 GHz	4.7 dB	5.5 dB
Radiated Emissions, 3m	18-40 GHz	4.7 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 μ V/m
 RA = Receiver Amplitude (including preamplifier) in dB μ 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 dB μ V
 AF = 7.4 dB/m
 CF = 1.6 dB
 AG = 29.0 dB
 FS = 32 dB μ V/m

To convert from dB μ V to μ V 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.

9.2 Test Equipment Used:

Asset	Description	Manufacturer	Model	Serial	Cal Date	Cal Due
DAV007'	Weather Station Vantage Vue	Davis	6250	MS191212003	03/08/2022	03/08/2023
IW006'	DC-18GHz cable 8.4m long	Insulated Wire	2800-NPS	IW006	07/14/2022	07/14/2023
145-420'	Receiver to floor cable	Utiflex	UFB311A-2-0591-70070	145-420	02/21/2022	02/21/2023
145-423'	Pre-amp to under floor	Huber and Suhner	SF106A/11N/11N/1.5m	145-423	02/15/2022	02/15/2023
145108'	EMI Test Receiver (20Hz - 40GHz)	Rohde & Schwarz	ESIB40	100209	06/23/2022	06/23/2023
IW006'	DC-18GHz cable 8.4m long	Insulated Wire	2800-NPS	IW006	07/14/2022	07/14/2023
ETS002'	1-18GHz DRG Horn Antenna	ETS Lindgren	3117	00143260	09/06/2022	09/06/2023

Software Utilized:

Name	Manufacturer	Version
EMI Boxborough.xls	Intertek	08/27/2010

9.3 Results:

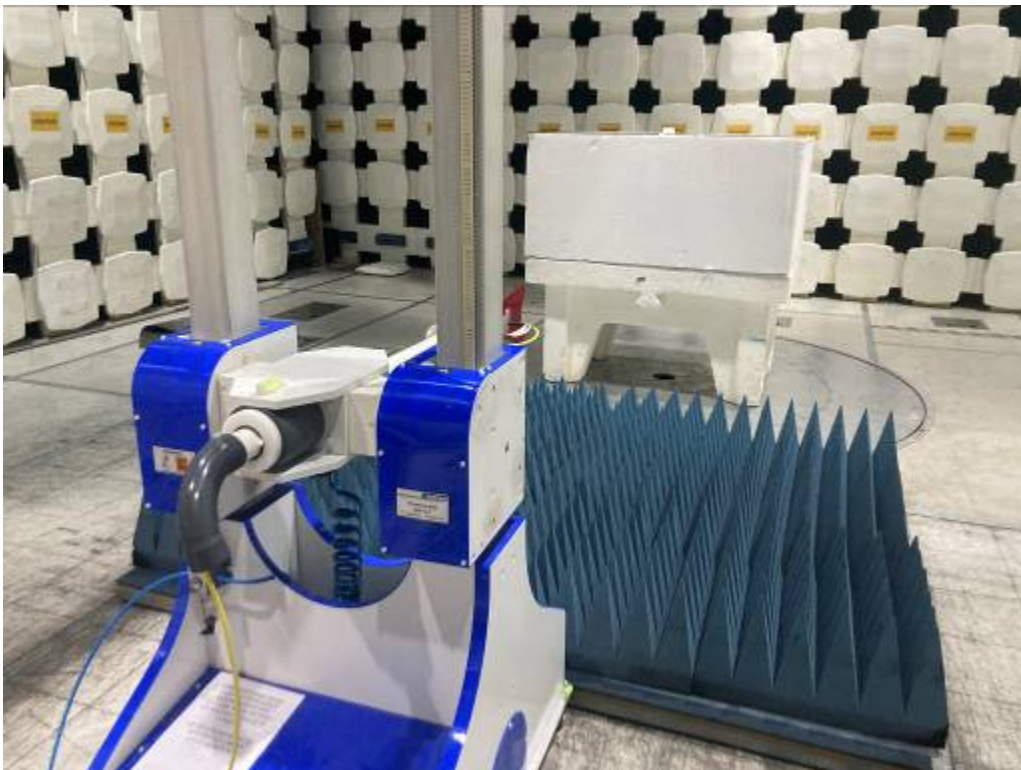
The sample tested was found to Comply.

Limits – FCC Part §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)).

Radiated measurements were performed on the X, Y and Z orientation of the EUT with vertical and horizontal antenna polarizations. Data is presented with the worst-case configuration (the configuration which resulted in the highest emission levels).

9.4 Setup Photographs:

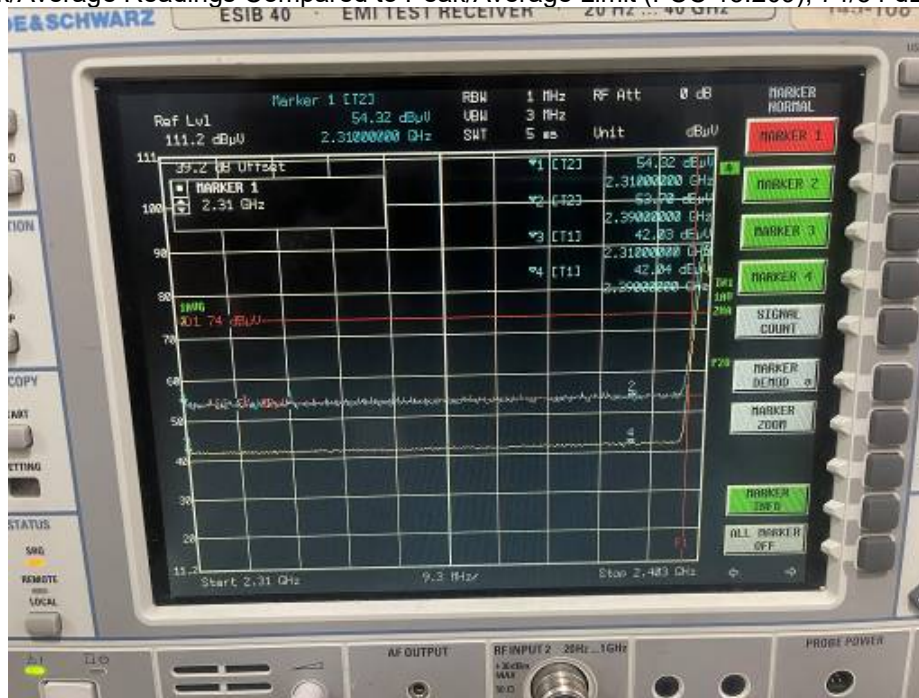
Radiated Emissions Test Setup (Worst-case)



9.5 Plots / Data:

Lower Band Edge

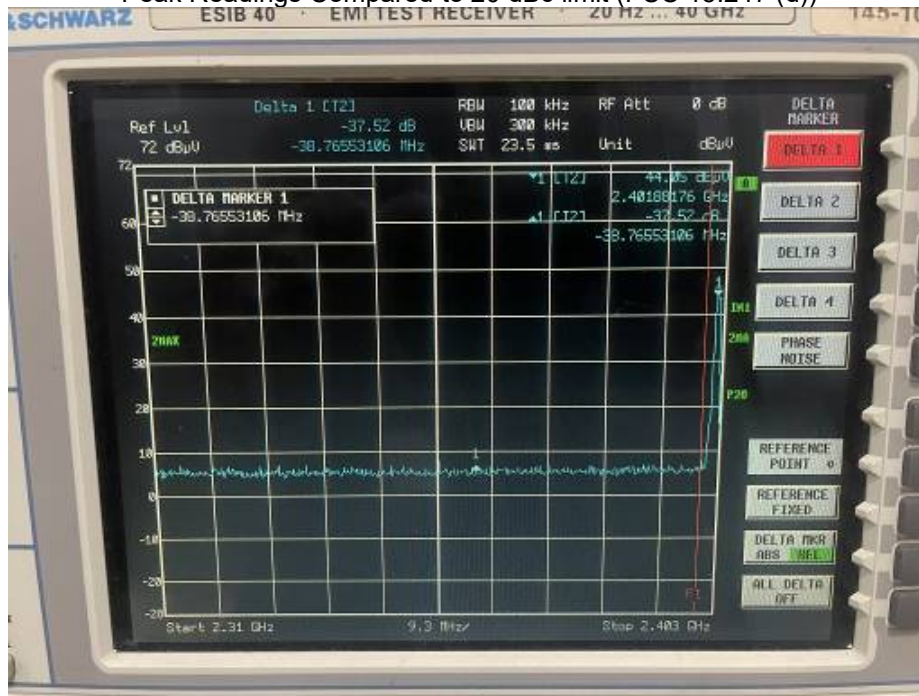
Peak/Average Readings Compared to Peak/Average Limit (FCC 15.209), 74/54 dBuV/m



Note: Also see tabular test results below

Lower Band Edge

Peak Readings Compared to 20 dBc limit (FCC 15.247 (d))

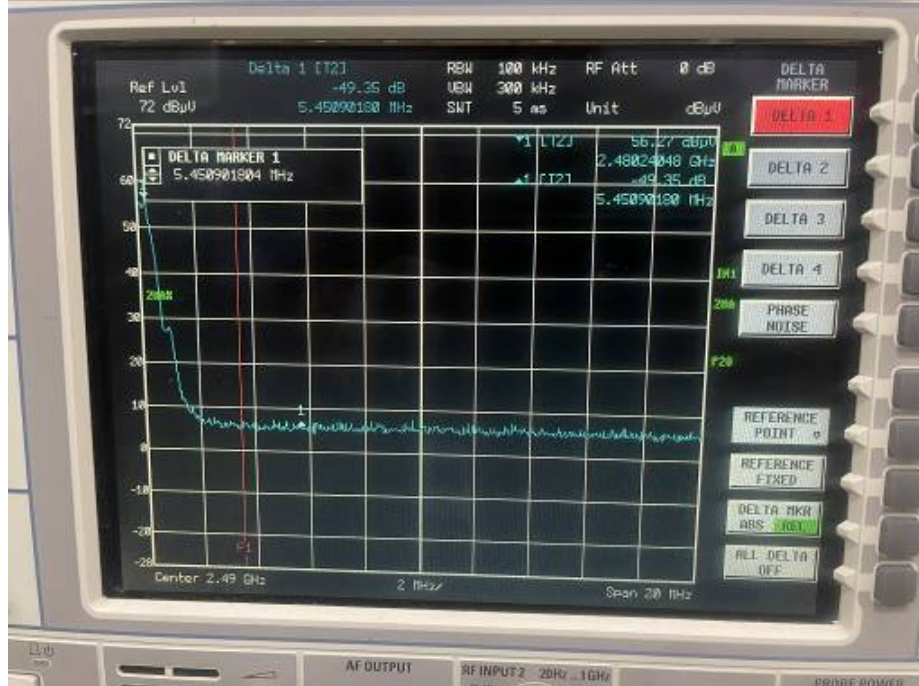


Upper Band Edge
Peak/Average Readings Compared to Peak/Average Limit (FCC 15.209), 74/54 dBuV/m



Note: Also see tabular test results below

Upper Band Edge – Peak Readings Compared to 20 dBc limit (FCC 15.247 (d))



Intertek

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Issued: 12/30/2022
Revised: 01/18/2023

Radiated Emissions

Company: O & P1
Model #: 053-A-2001 Rev B
Serial #: 0
Engineers: Vathana Ven
Project #: G105232834
Standard: FCC Part 15 Subpart C 15.209
Receiver: R&S ESI (145-128) 10-01-2014
PreAmp: NONE
Antenna & Cables: N
Antenna: ETS002
Cable(s): IW006, 145-423, 145-414, 145-420
Location: 10M Chamber
Barometer: DAV007
Filter: NONE
Temp/Humidity/Pressure: 24 deg C 19% 1014 mB
Limit Distance (m): 3
Test Distance (m): 3
PreAmp Used? (Y or N): N
Voltage/Frequency: Battery power
Frequency Range: See below
Net = Reading (dBuV/m) + Antenna Factor (dB1/m) + Cable Loss (dB) - Preamp Factor (dB) - Distance Factor (dB)
Peak: PK Quasi-Peak: QP Average: AVG RMS: RMS; NF = Noise Floor, RB = Restricted Band; Bandwidth denoted as RBW/VBW

Detector Type	Ant. Pol. (V/H)	Frequency MHz	Reading dB(uV)	Antenna Factor dB(1/m)	Cable Loss dB	Pre-amp Factor dB	Distance Factor dB	Net dB(uV/m)	Limit dB(uV/m)	Margin dB	Bandwidth	FCC	IC
Note: Lower BEC, Tx mode, 2402 MHz, Worst-case othorgonal axes, worst-case antenna polarity													
PK	H	2310.000	14.60	31.86	7.38	0.00	0.00	53.84	74.00	-20.16	1/3 MHz	RB	RB
AVG	H	2310.000	2.68	31.86	7.38	0.00	0.00	41.92	54.00	-12.08	1/3 MHz	RB	RB
PK	H	2390.000	14.92	31.86	7.38	0.00	0.00	54.16	74.00	-19.84	1/3 MHz	RB	RB
AVG	H	2390.000	2.92	31.86	7.38	0.00	0.00	42.16	54.00	-11.84	1/3 MHz	RB	RB
Note: Upper BEC, Tx mode, 2483.5 MHz, Worst-case othorgonal axes, worst-case antenna polarity													
PK	H	2483.500	17.42	32.43	7.38	0.00	0.00	57.23	74.00	-16.77	1/3 MHz	RB	
AVG	H	2483.500	7.31	32.43	7.38	0.00	0.00	47.12	54.00	-6.88	1/3 MHz	RB	
PK	H	2500.000	14.28	32.43	7.38	0.00	0.00	54.09	74.00	-19.91	1/3 MHz	RB	RB
AVG	H	2500.000	2.92	32.43	7.38	0.00	0.00	42.73	54.00	-11.27	1/3 MHz	RB	RB

Product Standard: FCC Part 15.247, FCC Part 15.209				Limit applied: See Report Section 9.3 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
12/28/2022	Vathana Ven <i>VSV</i>	Kouma Sinn <i>KPS</i>	Battery powered	Tx Low, Mid, High Channel	24	19	1014

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, ANSI C 63.10, 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)	Ucisp
Radiated Emissions, 10m	30-1000 MHz	5.0 dB	6.3 dB
Radiated Emissions, 3m	30-1000 MHz	4.6 dB	6.3 dB
Radiated Emissions, 3m	1-6 GHz	4.9 dB	5.2 dB
Radiated Emissions, 3m	6-15 GHz	5.1 dB	5.5 dB
Radiated Emissions, 3m	15-18 GHz	4.7 dB	5.5 dB
Radiated Emissions, 3m	18-40 GHz	4.7 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 μ V/m
- RA = Receiver Amplitude (including preamplifier) in dB μ 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.

$$RA = 52.0 \text{ dB}\mu\text{V}$$

$$AF = 7.4 \text{ dB/m}$$

$$CF = 1.6 \text{ dB}$$

$$AG = 29.0 \text{ dB}$$

$$FS = 32 \text{ dB}\mu\text{V/m}$$

To convert from dB μ V to μ V or mV the following was used:

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

$$NF = \text{Net Reading in dB}\mu\text{V}$$

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.

10.2 Test Equipment Used:

Asset	Description	Manufacturer	Model	Serial	Cal Date	Cal Due
DAV007'	Weather Station Vantage Vue	Davis	6250	MS191212003	03/08/2022	03/08/2023
PRE10'	30-1000MHz pre-amp	ITS	PRE10	PRE10	02/15/2022	02/15/2023
145-424'	9kHz to 40GHz Cable	Huber and Suhner	Sucoflex	145-424	02/15/2022	02/15/2023
145-422'	10Amp Pre-amp to under floor	Utiflex	UFB311A-0-2756-70070	145-422	02/21/2022	02/21/2023
HS003'	10m under floor cable	Huber-Schuner	10m-1	HS003	02/15/2022	02/15/2023
145-420'	Receiver to floor cable	Utiflex	UFB311A-2-0591-70070	145-420	02/21/2022	02/21/2023
145145'	Broadband Hybrid Antenna 30 MHz - 3 GHz	Sunol Sciences Corp.	JB3	A122313	06/16/2022	06/16/2023
145108'	EMI Test Receiver (20Hz - 40GHz)	Rohde & Schwarz	ESIB40	100209	06/23/2022	06/23/2023
ETS002'	1-18GHz DRG Horn Antenna	ETS Lindgren	3117	00143260	09/27/2022	09/27/2023
145-414'	Cable 145-414	Huber + Suhner	3m Track A cable	145-414	01/14/2022	01/14/2023
145-423'	Pre-amp to under floor	Huber and Suhner	SF106A/11N/11N/1.5m	145-423	02/15/2022	02/15/2023
IW006'	DC-18GHz cable 8.4m long	Insulated Wire	2800-NPS	IW006	07/14/2022	07/14/2023
BONN001'	1-18GHz low noise pre-amp	Bonn	BLMA 0118-M	1811749	07/19/2022	07/19/2023
REA004'	3GHz High Pass Filter	Reactel, Inc	7HSX-3G/18G-S11	06-1	02/09/2022	02/09/2023
REA008'	band reject filter 2.4GHz	Reactel, Inc	12RX7-2441.75-x140 S	17-01	07/19/2022	07/19/2023
CBLHF2012-5M-2'	5m 9kHz-40GHz Coaxial Cable - SET2	Huber & Suhner	SF102	252676002	02/16/2022	02/16/2023
CBLSHF202'	Cable, SMA - SMA, 9kHz-40GHz	Sucoflex (Huber Suhn	104PE	CBLSHF202	01/21/2022	02/21/2023
PRE8'	PREAMPLIFIER 1- 40 GHz	MITEQ	NSP4000-NF	507145	12/27/2021	12/27/2022
EMC04'	ANTENNA, RIDGED GUIDE, 18-40 GHZ	EMCO	3116	2090	02/08/2022	02/08/2023

10.3 Results:

The sample tested was found to Comply.

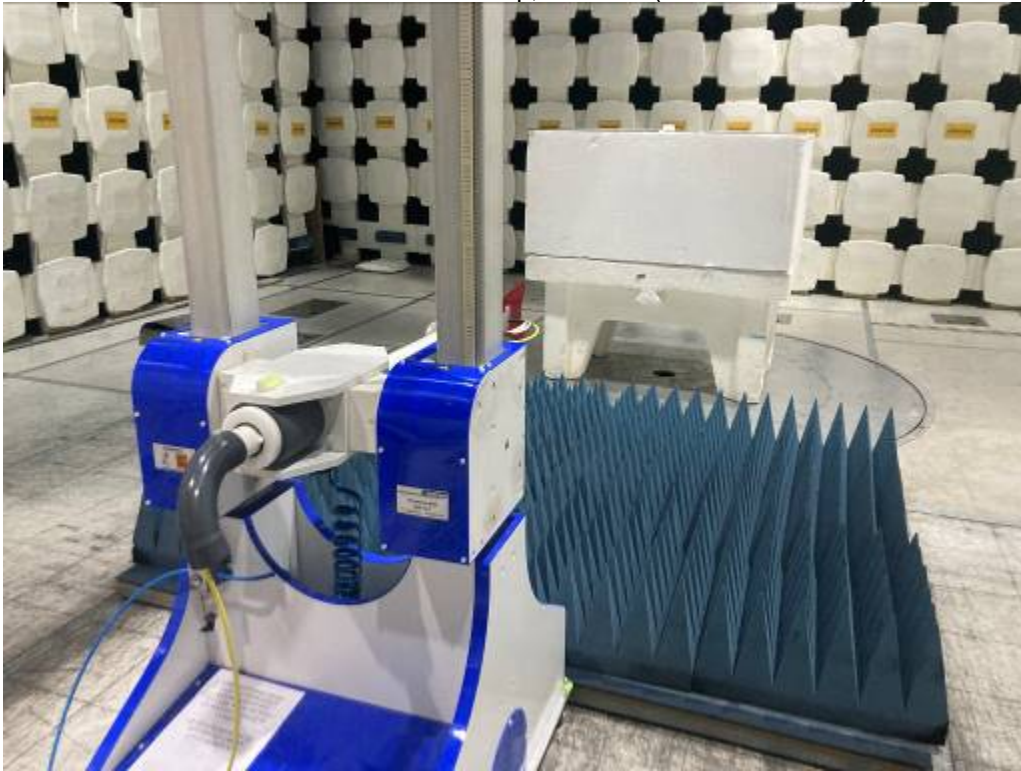
Limits – FCC Part §15.247 (d) In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within 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:

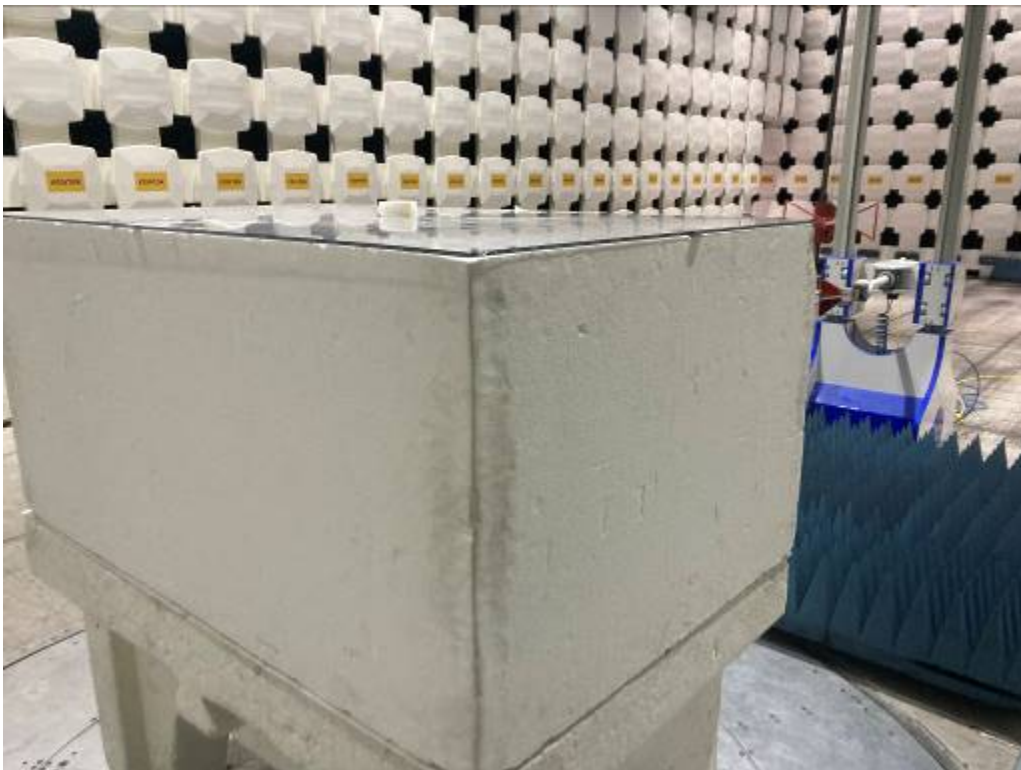
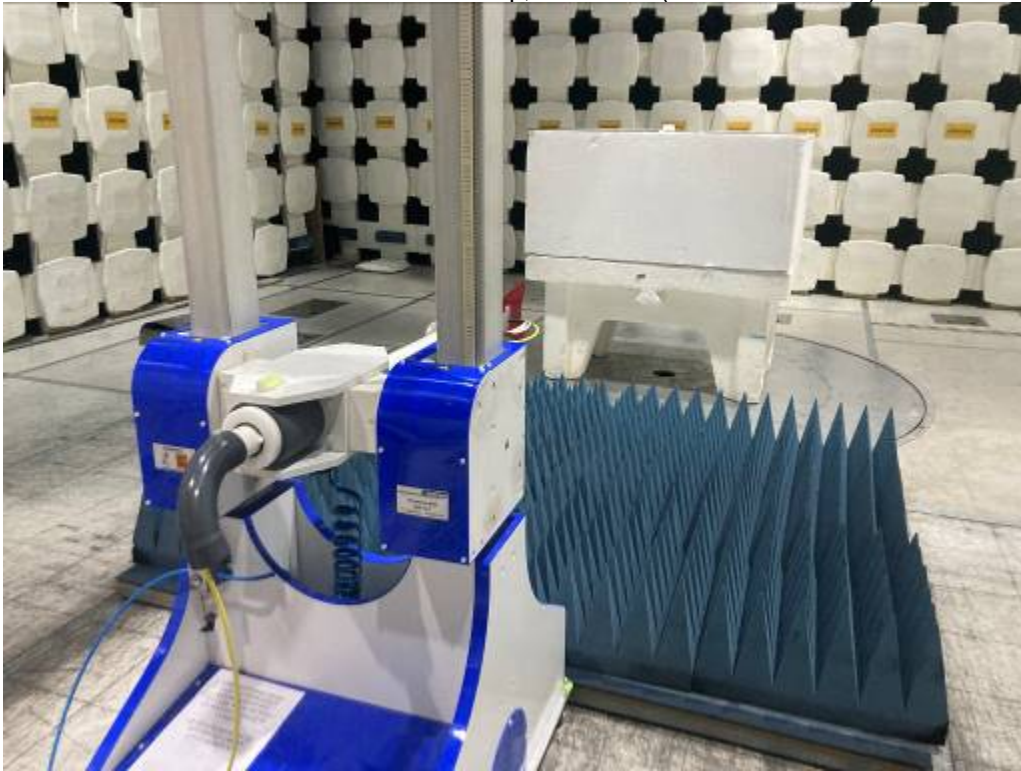
Radiated Emissions Test Setup (Worst-case axes), 30-1000 MHz



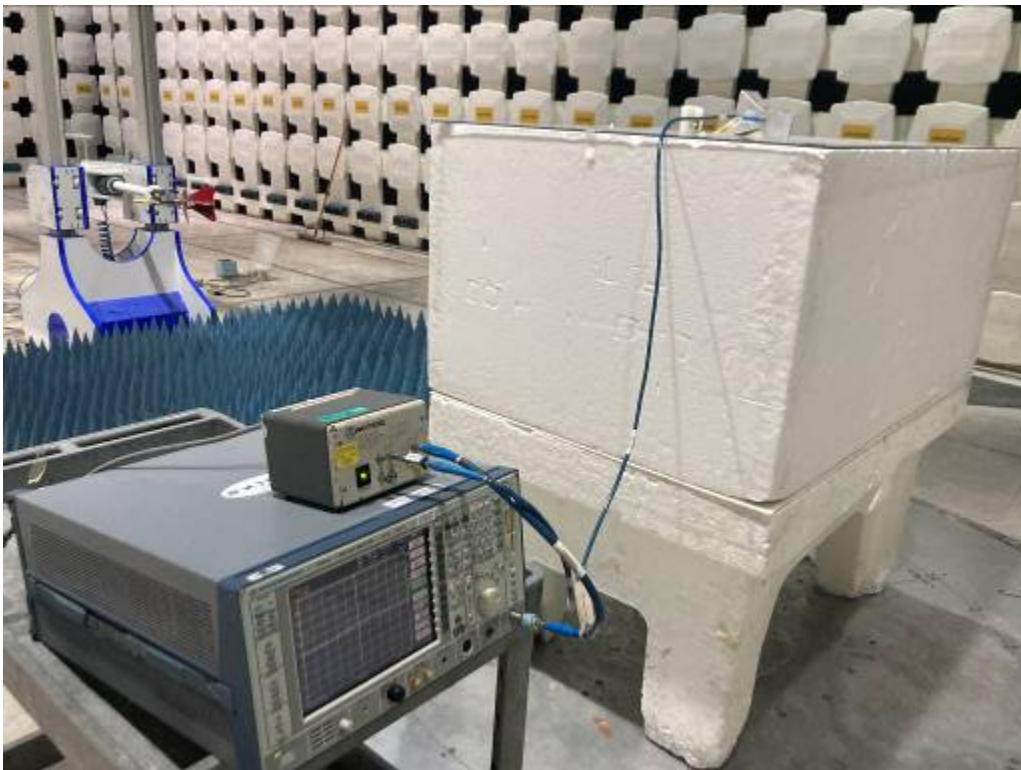
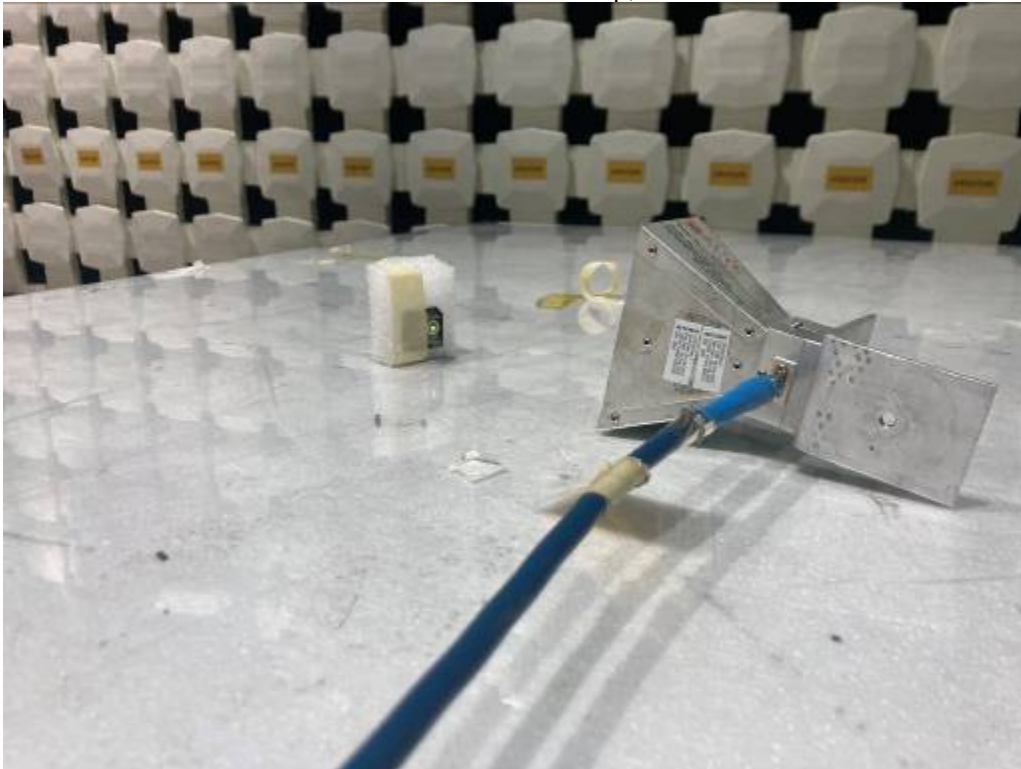
Radiated Emissions Test Setup, 1-3 GHz (Worst-case axes)



Radiated Emissions Test Setup, 1-18 GHz (Worst-case axes)



Radiated Emissions Test Setup, 18-25 GHz



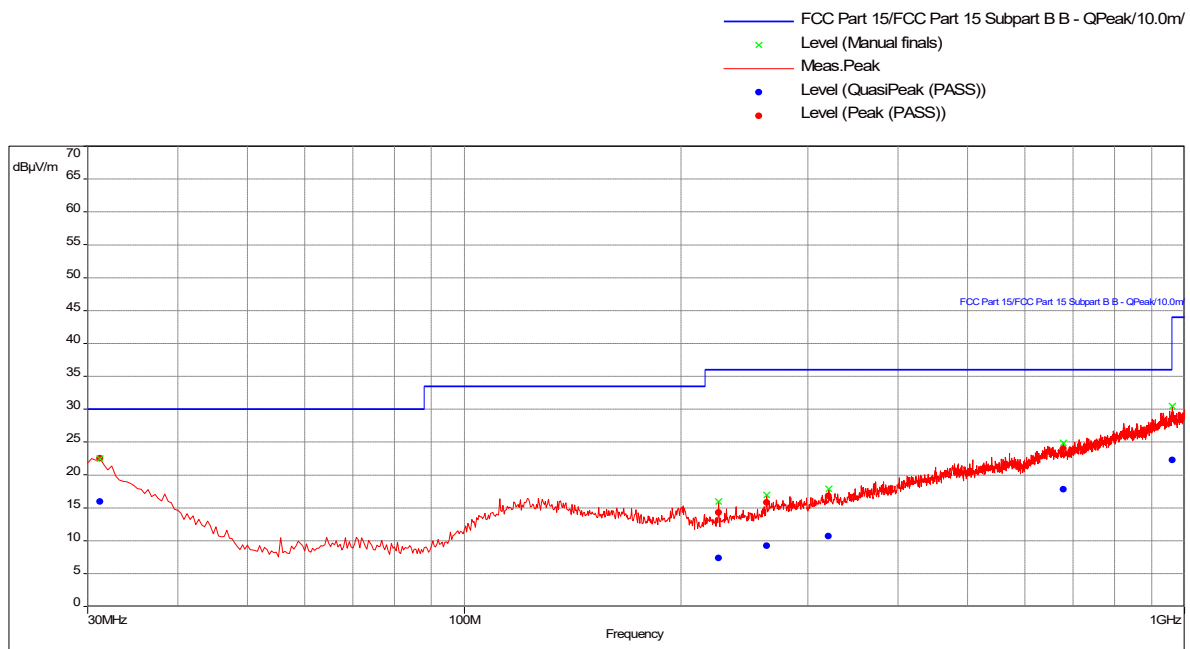
10.5 Plots / Data:

Low Channel, 2402 MHz, Radiated Emissions From 30-1000 MHz (EUT on its back, worst-case axis)

Test Information:

Date and Time	12/14/2022 1:03:28 PM
Client and Project Number	Simbex
Engineer	Kouma Sinn
Temperature	22 C
Humidity	15 %
Atmospheric Pressure	1005 mbar
Comments	Scan 1: EUT on its back, RE 30-1000MHz SA mode Quick Prescan (Antenna height fixed at 1m during pre-scan)

Graph:



Results:

QuasiPeak (PASS) (6)

Frequency (MHz)	Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Azimuth (°)	Height (m)	Pol.	RBW (Hz)	Correction (dB)
31.2	15.99	30.00	-14.01	219.00	3.38	Vertical	120000.00	-13.21
225.4736842	7.38	36.00	-28.62	4.00	1.30	Horizontal	120000.00	-20.64
262.7052632	9.28	36.00	-26.72	176.00	3.48	Horizontal	120000.00	-18.79
320.4526316	10.75	36.00	-25.25	110.00	3.19	Vertical	120000.00	-17.21
678.3052632	17.82	36.00	-18.18	292.00	1.00	Horizontal	120000.00	-9.34
961.3789474	22.29	44.00	-21.71	256.00	1.84	Horizontal	120000.00	-4.29

Notes: No emission was detected. Readings above are noise floor signals.

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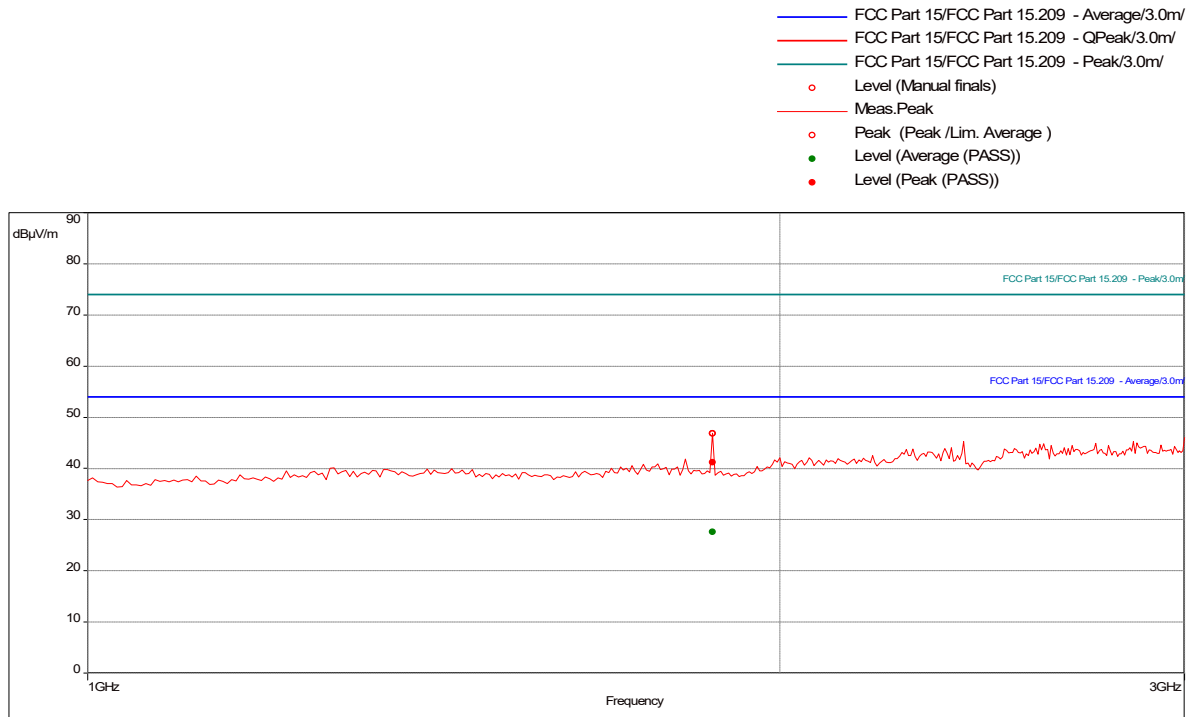
Revised: 01/18/2023

Transmit at low channel (EUT sits on its back), 2402 MHz, 1-3 GHz

Test Information:

Date and Time	12/15/2022 12:52:46 PM
Client and Project Number	Simbex
Engineer	Kouma Sinn
Temperature	22 C
Humidity	19 %
Atmospheric Pressure	1016 mbar
Comments	Scan 12: Low Ch, EUT on its back, RE 1-3 GHz SA mode

Graph:



Results:

Peak (PASS) (1)

Frequency (MHz)	Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Azimuth (°)	Height (m)	Pol.	RBW (Hz)	Correction (dB)
1870.263158	41.25	74.00	-32.75	326.00	3.54	Horizontal	1000000.00	-16.32

Average (PASS) (1)

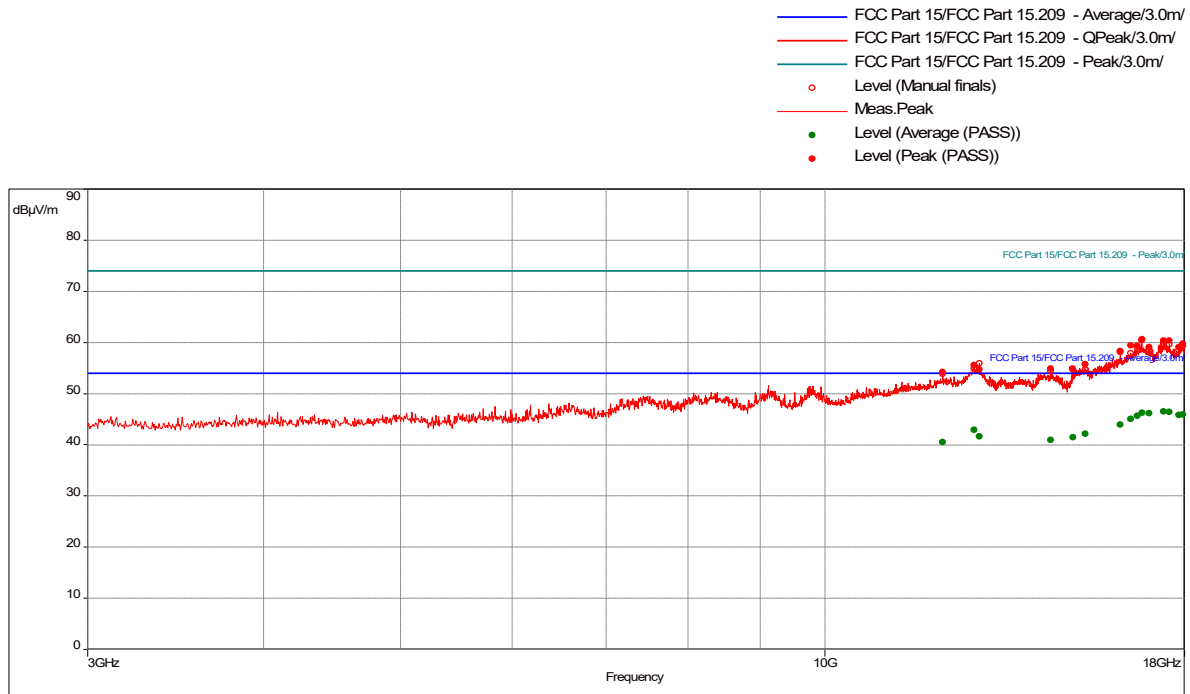
Frequency (MHz)	Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Azimuth (°)	Height (m)	Pol.	RBW (Hz)	Correction (dB)
1870.263158	27.61	54.00	-26.39	326.00	3.54	Horizontal	1000000.00	-16.32

Transmit at low channel (EUT sits on its back), 2402 MHz, 3-25 GHz

Test Information:

Date and Time	12/16/2022 5:23:43 PM
Client and Project Number	Simbex G105232834
Engineer	Vathana Ven
Temperature	22 deg
Humidity	32%
Atmospheric Pressure	995 mB
Comments	RE 3 to 18 GHz Battery power Tx Low CH Axis

Graph:



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Revised: 01/18/2023

Results:

Peak (PASS) (15)

Frequency (MHz)	Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Azimuth (°)	Height (m)	Pol.	RBW (Hz)	Correction (dB)
12125.78947	54.22	74.00	-19.78	153.00	3.20	Vertical	1000000.00	2.41
12761.57895	55.65	74.00	-18.35	191.00	2.25	Vertical	1000000.00	5.21
12873.42105	54.76	74.00	-19.24	146.00	1.90	Vertical	1000000.00	4.46
14466.31579	54.92	74.00	-19.08	359.00	1.60	Vertical	1000000.00	4.03
14997.63158	54.73	74.00	-19.27	25.00	1.80	Vertical	1000000.00	5.27
15305	55.77	74.00	-18.23	132.00	2.10	Vertical	1000000.00	5.33
16205.26316	58.35	74.00	-15.65	23.00	1.00	Vertical	1000000.00	7.00
16484.73684	59.48	74.00	-14.52	31.00	1.60	Vertical	1000000.00	7.52
16660	59.37	74.00	-14.63	335.00	2.35	Horizontal	1000000.00	8.32
16788.15789	60.66	74.00	-13.34	9.00	3.79	Vertical	1000000.00	8.70
16986.57895	59.14	74.00	-14.86	146.00	1.00	Horizontal	1000000.00	8.85
17392.63158	60.43	74.00	-13.57	118.00	1.00	Vertical	1000000.00	8.62
17561.31579	60.42	74.00	-13.58	213.00	1.55	Vertical	1000000.00	8.92
17828.94737	59.10	74.00	-14.90	359.00	1.90	Vertical	1000000.00	9.26
17948.94737	59.80	74.00	-14.20	256.00	1.15	Horizontal	1000000.00	9.21

Average (PASS) (15)

Frequency (MHz)	Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Azimuth (°)	Height (m)	Pol.	RBW (Hz)	Correction (dB)
12125.78947	40.56	54.00	-13.44	153.00	3.20	Vertical	1000000.00	2.41
12761.57895	42.95	54.00	-11.05	191.00	2.25	Vertical	1000000.00	5.21
12873.42105	41.67	54.00	-12.33	146.00	1.90	Vertical	1000000.00	4.46
14466.31579	40.99	54.00	-13.01	359.00	1.60	Vertical	1000000.00	4.03
14997.63158	41.48	54.00	-12.52	25.00	1.80	Vertical	1000000.00	5.27
15305	42.21	54.00	-11.79	132.00	2.10	Vertical	1000000.00	5.33
16205.26316	43.94	54.00	-10.06	23.00	1.00	Vertical	1000000.00	7.00
16484.73684	45.06	54.00	-8.94	31.00	1.60	Vertical	1000000.00	7.52
16660	45.72	54.00	-8.28	335.00	2.35	Horizontal	1000000.00	8.32
16788.15789	46.30	54.00	-7.70	9.00	3.79	Vertical	1000000.00	8.70
16986.57895	46.21	54.00	-7.79	146.00	1.00	Horizontal	1000000.00	8.85
17392.63158	46.52	54.00	-7.48	118.00	1.00	Vertical	1000000.00	8.62
17561.31579	46.50	54.00	-7.50	213.00	1.55	Vertical	1000000.00	8.92
17828.94737	45.89	54.00	-8.11	359.00	1.90	Vertical	1000000.00	9.26
17948.94737	45.99	54.00	-8.01	256.00	1.15	Horizontal	1000000.00	9.21

Note 1: Readings above were from noise floor.

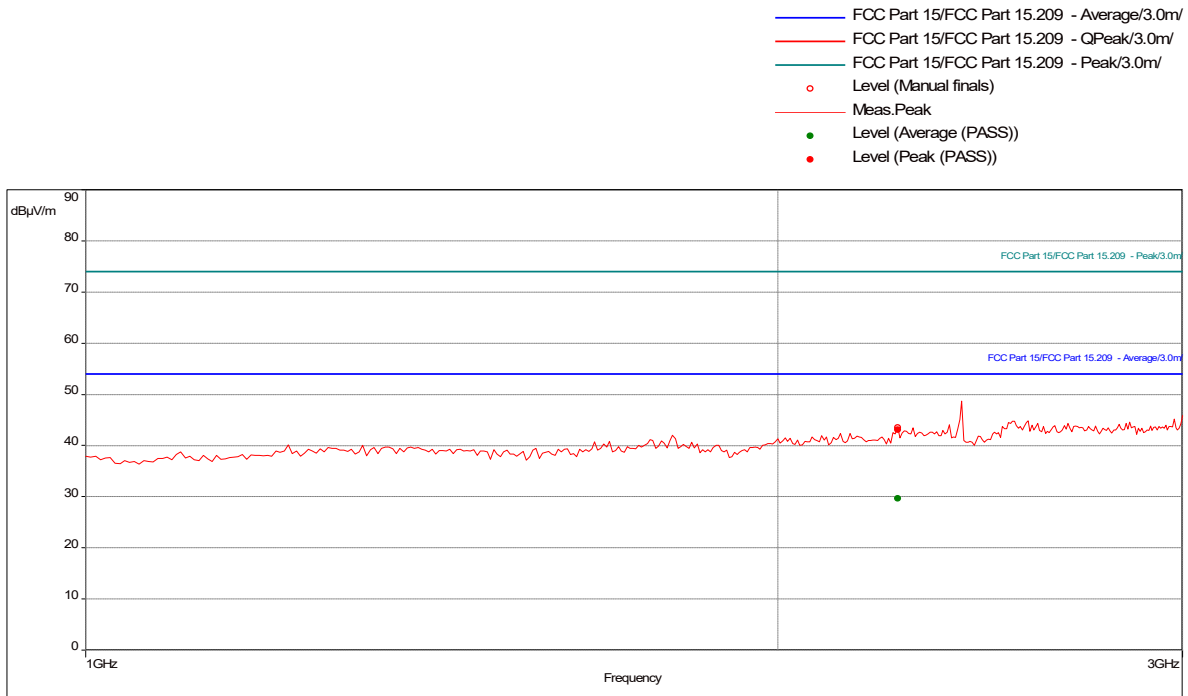
Note 2: Manual scan was performed from 18-25 GHz at a distance < 1m. No emissions were detected above the measuring equipment noise floor.

Transmit at low channel (EUT sits on its short side), 2402 MHz, 1-3 GHz

Test Information:

Date and Time	12/15/2022 1:00:02 PM
Client and Project Number	Simbex
Engineer	Kouma Sinn
Temperature	22 C
Humidity	19 %
Atmospheric Pressure	1016 mbar
Comments	Scan 13: Low Ch, EUT on its short side, RE 1-3 GHz SA mode

Graph:



Results:

Peak (PASS) (1)

Frequency (MHz)	Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Azimuth (°)	Height (m)	Pol.	RBW (Hz)	Correction (dB)
2254.210526	43.10	74.00	-30.90	342.00	1.35	Horizontal	1000000.00	-15.49

Average (PASS) (1)

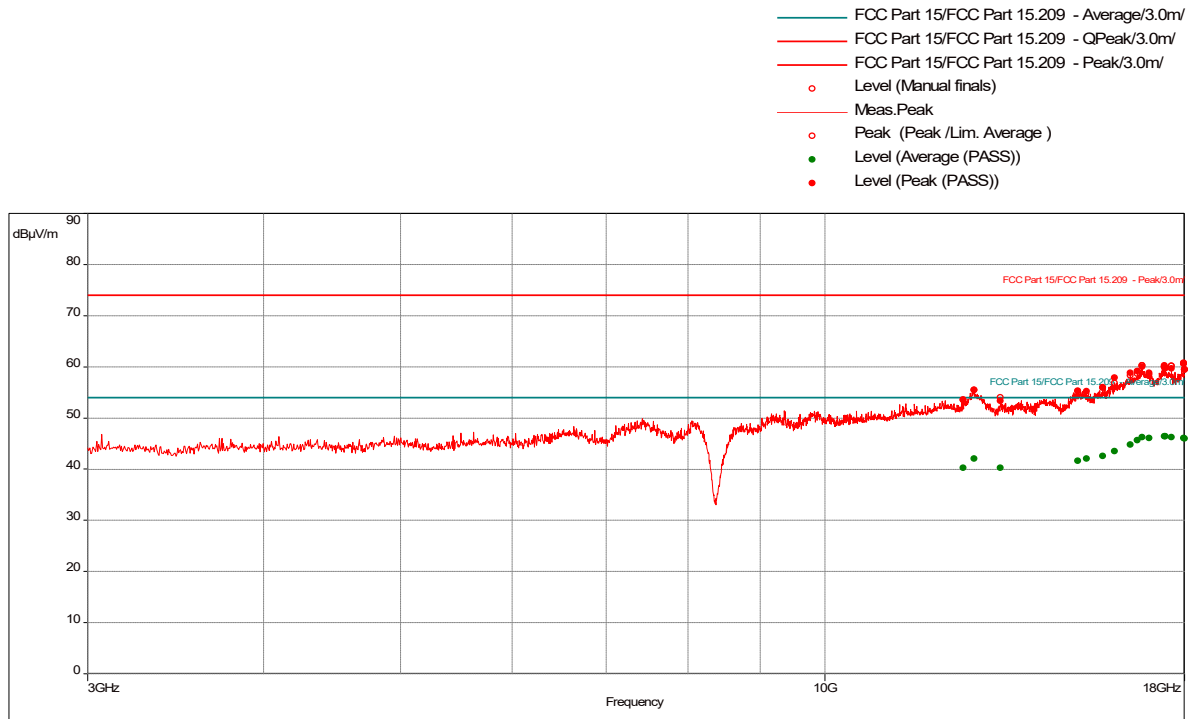
Frequency (MHz)	Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Azimuth (°)	Height (m)	Pol.	RBW (Hz)	Correction (dB)
2254.210526	29.68	54.00	-24.32	342.00	1.35	Horizontal	1000000.00	-15.49

Transmit at low channel (EUT sits on its short side), 2405 MHz, 3-25 GHz

Test Information:

Date and Time	12/16/2022 5:28:21 PM
Client and Project Number	Simbex G105232834
Engineer	Vathana Ven
Temperature	22 deg
Humidity	32%
Atmospheric Pressure	995 mB
Comments	RE 3 to 18 GHz Battery power Tx Low CH_Y-Axis

Graph:



Intertek

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Revised: 01/18/2023

Results:

Peak (PASS) (16)

Frequency (MHz)	Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Azimuth (°)	Height (m)	Pol.	RBW (Hz)	Correction (dB)
12541.84211	53.54	74.00	-20.46	314.00	1.85	Vertical	1000000.00	3.52
12760.26316	55.51	74.00	-18.49	4.00	2.50	Horizontal	1000000.00	5.22
13325.26316	53.43	74.00	-20.57	300.00	2.15	Vertical	1000000.00	3.59
15118.42105	55.28	74.00	-18.72	31.00	1.01	Vertical	1000000.00	5.26
15332.89474	55.29	74.00	-18.71	118.00	1.21	Horizontal	1000000.00	5.36
15748.68421	56.07	74.00	-17.93	75.00	2.70	Horizontal	1000000.00	5.93
16057.89474	57.95	74.00	-16.05	183.00	1.20	Horizontal	1000000.00	6.91
16468.42105	58.83	74.00	-15.17	271.00	2.25	Horizontal	1000000.00	7.48
16664.73684	59.23	74.00	-14.77	0.00	3.20	Horizontal	1000000.00	8.34
16788.94737	60.06	74.00	-13.94	191.00	2.15	Vertical	1000000.00	8.71
16990.78947	58.88	74.00	-15.12	75.00	1.10	Horizontal	1000000.00	8.85
17420.78947	60.34	74.00	-13.66	118.00	1.05	Horizontal	1000000.00	8.69
17445.52632	59.80	74.00	-14.20	300.00	1.15	Vertical	1000000.00	8.76
17616.31579	59.73	74.00	-14.27	17.00	1.80	Horizontal	1000000.00	8.99
17968.42105	60.84	74.00	-13.16	10.00	1.25	Vertical	1000000.00	9.18
17995.65789	59.43	74.00	-14.57	330.00	2.75	Horizontal	1000000.00	9.14

Average (PASS) (16)

Frequency (MHz)	Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Azimuth (°)	Height (m)	Pol.	RBW (Hz)	Correction (dB)
12541.84211	40.31	54.00	-13.69	314.00	1.85	Vertical	1000000.00	3.52
12760.26316	42.14	54.00	-11.86	4.00	2.50	Horizontal	1000000.00	5.22
13325.26316	40.30	54.00	-13.70	300.00	2.15	Vertical	1000000.00	3.59
15118.42105	41.65	54.00	-12.35	31.00	1.01	Vertical	1000000.00	5.26
15332.89474	42.09	54.00	-11.91	118.00	1.21	Horizontal	1000000.00	5.36
15748.68421	42.58	54.00	-11.42	75.00	2.70	Horizontal	1000000.00	5.93
16057.89474	43.56	54.00	-10.44	183.00	1.20	Horizontal	1000000.00	6.91
16468.42105	44.84	54.00	-9.16	271.00	2.25	Horizontal	1000000.00	7.48
16664.73684	45.66	54.00	-8.34	0.00	3.20	Horizontal	1000000.00	8.34
16788.94737	46.28	54.00	-7.72	191.00	2.15	Vertical	1000000.00	8.71
16990.78947	46.12	54.00	-7.88	75.00	1.10	Horizontal	1000000.00	8.85
17420.78947	46.45	54.00	-7.55	118.00	1.05	Horizontal	1000000.00	8.69
17445.52632	46.43	54.00	-7.57	300.00	1.15	Vertical	1000000.00	8.76
17616.31579	46.30	54.00	-7.70	17.00	1.80	Horizontal	1000000.00	8.99
17968.42105	46.14	54.00	-7.86	10.00	1.25	Vertical	1000000.00	9.18
17995.65789	46.04	54.00	-7.96	330.00	2.75	Horizontal	1000000.00	9.14

Note 1: Readings above were from noise floor.

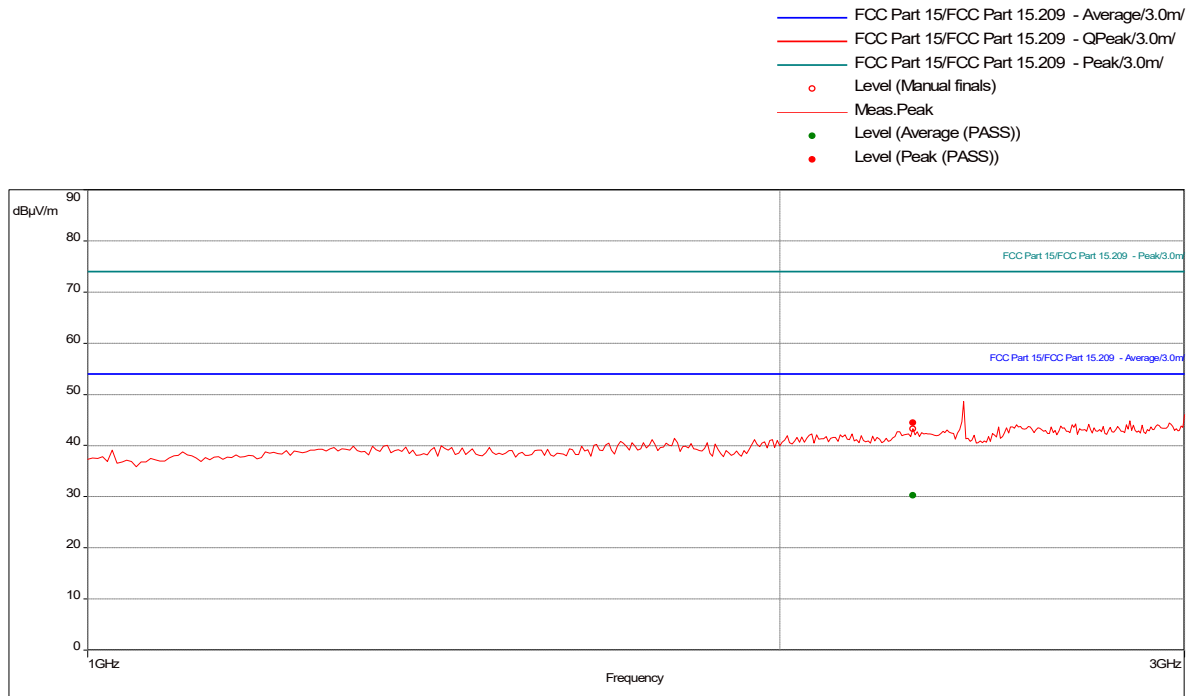
Note 2: Manual scan was performed from 18-25 GHz at a distance < 1m. No emissions were detected above the measuring equipment noise floor.

Transmit at low channel (EUT sits on its long side), 2402 MHz, 1-3 GHz

Test Information:

Date and Time	12/15/2022 1:11:26 PM
Client and Project Number	Simbex
Engineer	Kouma Sinn
Temperature	22 C
Humidity	19 %
Atmospheric Pressure	1016 mbar
Comments	Scan 14: Low Ch, EUT on its long side, RE 1-3 GHz SA mode

Graph:



Results:

Peak (PASS) (1)

Frequency (MHz)	Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Azimuth (°)	Height (m)	Pol.	RBW (Hz)	Correction (dB)
2282.894737	44.53	74.00	-29.47	184.00	2.65	Horizontal	1000000.00	-15.38

Average (PASS) (1)

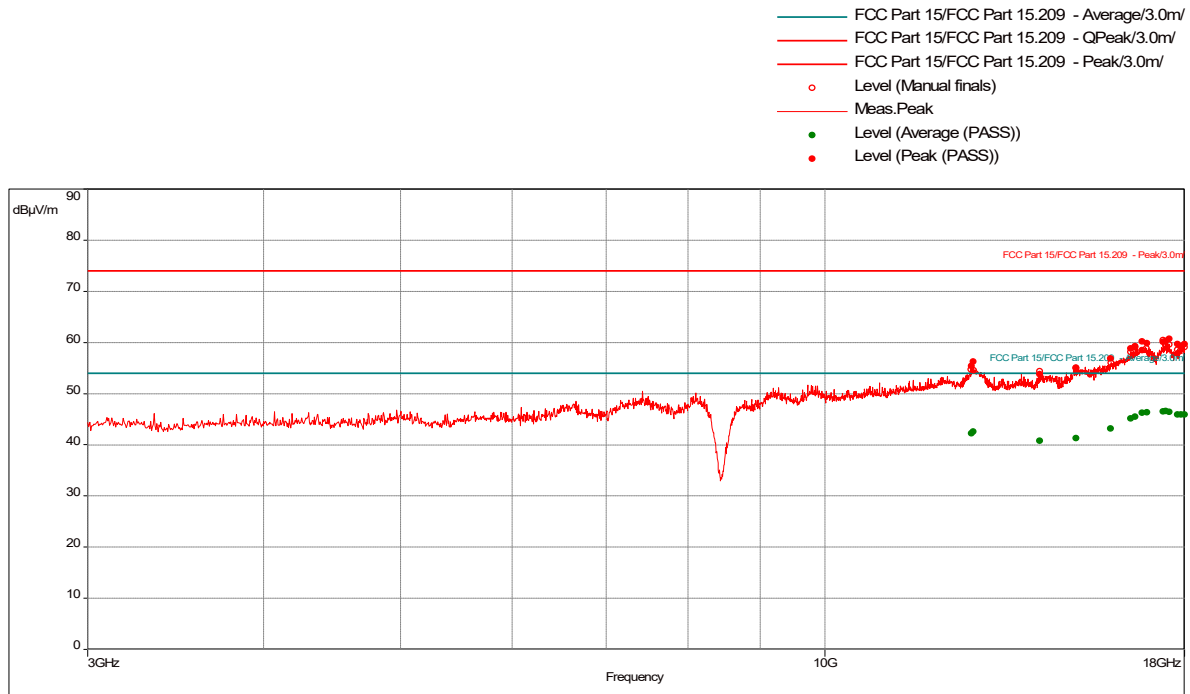
Frequency (MHz)	Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Azimuth (°)	Height (m)	Pol.	RBW (Hz)	Correction (dB)
2282.894737	30.27	54.00	-23.73	184.00	2.65	Horizontal	1000000.00	-15.38

Transmit at low channel (EUT sits on its long side), 2402 MHz, 3-25 GHz

Test Information:

Date and Time	12/16/2022 6:39:24 PM
Client and Project Number	Simbex G105232834
Engineer	Vathana Ven
Temperature	22 deg
Humidity	32%
Atmospheric Pressure	995 mB
Comments	RE 3 to 18 GHz Battery power Tx Low CH Z-Axis

Graph:



Intertek

Report Number: 105232834BOX-001

Issued: 12/30/2022
Revised: 01/18/2023

Results:

Peak (PASS) (15)

Frequency (MHz)	Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Azimuth (°)	Height (m)	Pol.	RBW (Hz)	Correction (dB)
12704.73684	55.48	74.00	-18.52	359.00	1.55	Vertical	1000000.00	4.89
12751.05263	56.32	74.00	-17.68	105.00	3.69	Horizontal	1000000.00	5.28
14205.78947	53.83	74.00	-20.17	351.00	3.10	Horizontal	1000000.00	3.99
15076.57895	55.08	74.00	-18.92	337.00	1.35	Vertical	1000000.00	5.24
15957.10526	56.93	74.00	-17.07	104.00	2.30	Vertical	1000000.00	6.64
16484.73684	58.87	74.00	-15.13	264.00	3.10	Vertical	1000000.00	7.52
16609.21053	59.26	74.00	-14.74	351.00	1.70	Horizontal	1000000.00	8.07
16797.89474	60.22	74.00	-13.78	18.00	3.25	Horizontal	1000000.00	8.72
16923.42105	59.85	74.00	-14.15	53.00	3.89	Horizontal	1000000.00	8.81
17384.21053	60.11	74.00	-13.89	154.00	1.01	Vertical	1000000.00	8.61
17457.89474	60.28	74.00	-13.72	31.00	1.02	Vertical	1000000.00	8.78
17551.31579	60.72	74.00	-13.28	126.00	2.35	Horizontal	1000000.00	8.91
17791.57895	59.70	74.00	-14.30	339.00	3.00	Horizontal	1000000.00	9.26
17899.21053	59.28	74.00	-14.72	162.00	1.45	Horizontal	1000000.00	9.26
17994.86842	59.73	74.00	-14.27	251.00	2.55	Horizontal	1000000.00	9.14

Average (PASS) (15)

Frequency (MHz)	Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Azimuth (°)	Height (m)	Pol.	RBW (Hz)	Correction (dB)
12704.73684	42.29	54.00	-11.71	359.00	1.55	Vertical	1000000.00	4.89
12751.05263	42.62	54.00	-11.38	105.00	3.69	Horizontal	1000000.00	5.28
14205.78947	40.82	54.00	-13.18	351.00	3.10	Horizontal	1000000.00	3.99
15076.57895	41.34	54.00	-12.66	337.00	1.35	Vertical	1000000.00	5.24
15957.10526	43.20	54.00	-10.80	104.00	2.30	Vertical	1000000.00	6.64
16484.73684	45.21	54.00	-8.79	264.00	3.10	Vertical	1000000.00	7.52
16609.21053	45.53	54.00	-8.47	351.00	1.70	Horizontal	1000000.00	8.07
16797.89474	46.30	54.00	-7.70	18.00	3.25	Horizontal	1000000.00	8.72
16923.42105	46.37	54.00	-7.63	53.00	3.89	Horizontal	1000000.00	8.81
17384.21053	46.56	54.00	-7.44	154.00	1.01	Vertical	1000000.00	8.61
17457.89474	46.66	54.00	-7.34	31.00	1.02	Vertical	1000000.00	8.78
17551.31579	46.47	54.00	-7.53	126.00	2.35	Horizontal	1000000.00	8.91
17791.57895	45.93	54.00	-8.07	339.00	3.00	Horizontal	1000000.00	9.26
17899.21053	45.91	54.00	-8.09	162.00	1.45	Horizontal	1000000.00	9.26
17994.86842	45.98	54.00	-8.02	251.00	2.55	Horizontal	1000000.00	9.14

Note 1: Readings above were from noise floor.

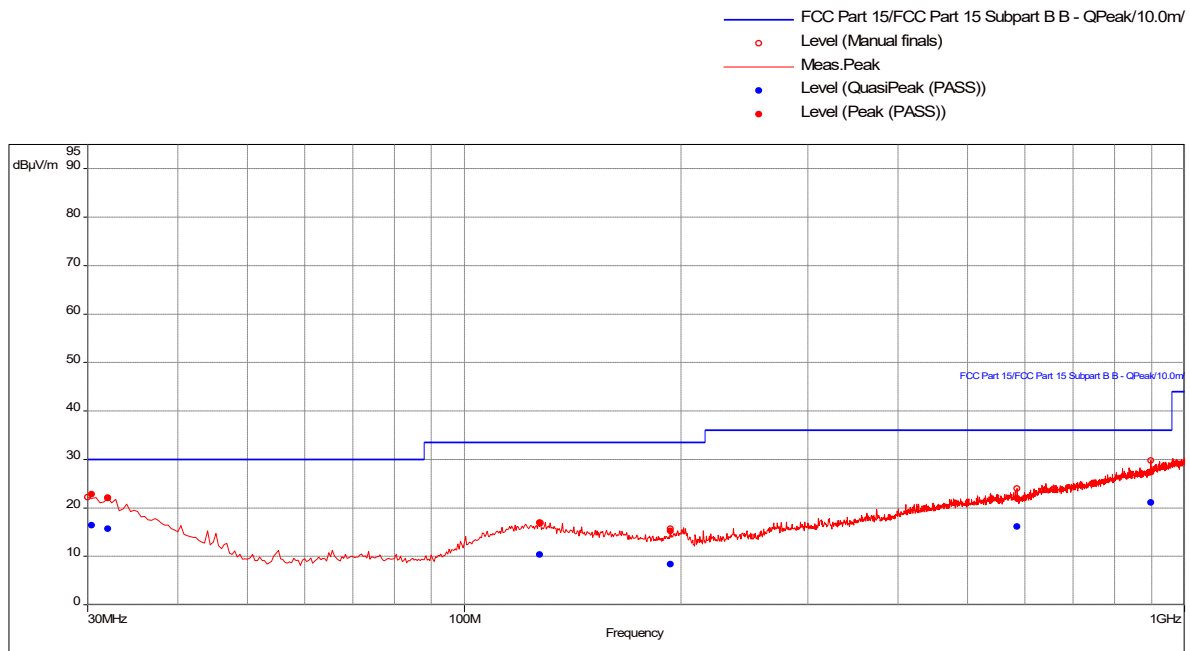
Note 2: Manual scan was performed from 18-25 GHz at a distance < 1m. No emissions were detected above the measuring equipment noise floor.

Transmit at Mid channel (EUT sits on its back, worst-case axis), 2442 MHz, 30-1000 MHz

Test Information:

Date and Time	12/14/2022 2:29:47 PM
Client and Project Number	Simbex
Engineer	Kouma Sinn
Temperature	22 C
Humidity	15 %
Atmospheric Pressure	1005 mbar
Comments	Scan 4: Mid Ch, EUT on its back, RE 30-1000MHz SA mode

Graph:



Results:

QuasiPeak (PASS) (6)

Frequency (MHz)	Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Azimuth (°)	Height (m)	Pol.	RBW (Hz)	Correction (dB)
30.48947368	16.47	30.00	-13.53	213.00	3.11	Vertical	120000.00	-12.77
32	15.69	30.00	-14.31	126.00	3.90	Vertical	120000.00	-13.51
127.3789474	10.35	33.50	-23.15	185.00	2.41	Vertical	120000.00	-18.22
193.2631579	8.38	33.50	-25.12	0.00	1.63	Horizontal	120000.00	-20.02
585.3789474	16.16	36.00	-19.84	255.00	2.39	Horizontal	120000.00	-11.44
897.6947368	21.14	36.00	-14.86	287.00	3.25	Horizontal	120000.00	-5.57

Notes: No emission was detected. Readings above are noise floor signals.

Intertek

Report Number: 105232834BOX-001

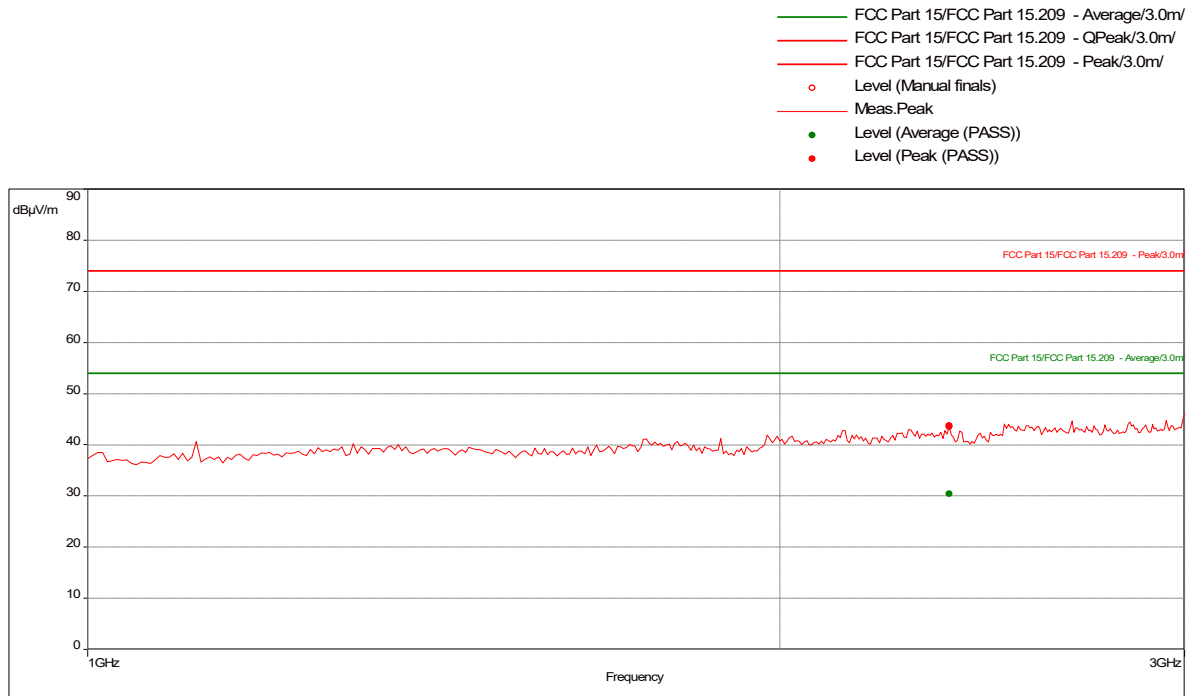
Issued: 12/30/2022
Revised: 01/18/2023

Transmit at Mid channel (EUT sits on back), 2442 MHz, 1-3 GHz

Test Information:

Date and Time	12/15/2022 1:36:17 PM
Client and Project Number	Simbex
Engineer	Kouma Sinn
Temperature	22 C
Humidity	19 %
Atmospheric Pressure	1016 mbar
Comments	Scan 17: Mid Ch, EUT on its back, RE 1-3 GHz SA mode

Graph:



Results:

Peak (PASS) (1)

Frequency (MHz)	Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Azimuth (°)	Height (m)	Pol.	RBW (Hz)	Correction (dB)
2370	43.80	74.00	-30.20	4.00	1.01	Vertical	1000000.00	-14.92

Average (PASS) (1)

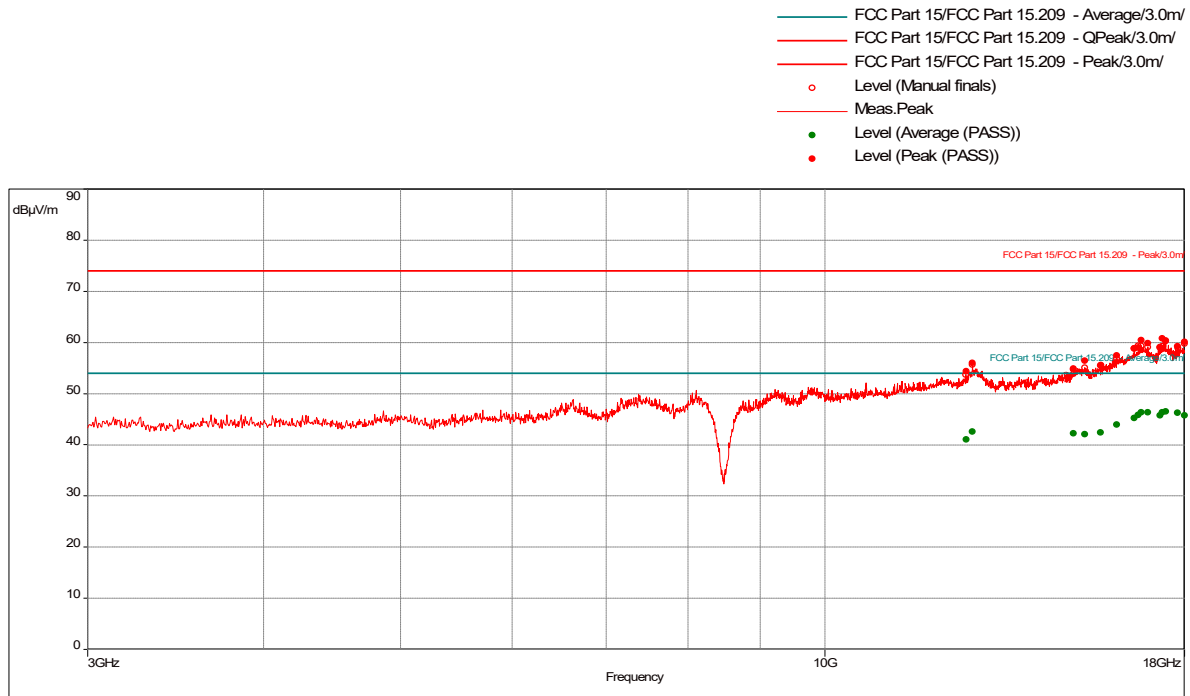
Frequency (MHz)	Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Azimuth (°)	Height (m)	Pol.	RBW (Hz)	Correction (dB)
2370	30.44	54.00	-23.56	4.00	1.01	Vertical	1000000.00	-14.92

Transmit at Mid channel (EUT sits on its back), 2442 MHz, 3-25 GHz

Test Information:

Date and Time	12/16/2022 7:45:23 PM
Client and Project Number	Simbex G105232834
Engineer	Vathana Ven
Temperature	22 deg
Humidity	32%
Atmospheric Pressure	995 mB
Comments	RE 3 to 18 GHz Battery power Tx Mid CH X-Axis

Graph:



Intertek

Report Number: 105232834BOX-001

Issued: 12/30/2022
Revised: 01/18/2023

Results:

Peak (PASS) (15)

Frequency (MHz)	Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Azimuth (°)	Height (m)	Pol.	RBW (Hz)	Correction (dB)
12597.89474	54.40	74.00	-19.60	359.00	2.60	Horizontal	1000000.00	3.96
12731.57895	56.01	74.00	-17.99	272.00	3.10	Vertical	1000000.00	5.12
15014.21053	54.91	74.00	-19.09	206.00	1.85	Vertical	1000000.00	5.26
15287.63158	56.50	74.00	-17.50	198.00	1.75	Horizontal	1000000.00	5.31
15695.26316	55.49	74.00	-18.51	156.00	1.00	Horizontal	1000000.00	5.84
16113.42105	57.53	74.00	-16.47	278.00	3.39	Horizontal	1000000.00	6.93
16580.78947	58.83	74.00	-15.17	33.00	1.75	Horizontal	1000000.00	7.94
16691.84211	59.04	74.00	-14.96	119.00	2.15	Horizontal	1000000.00	8.45
16776.84211	60.49	74.00	-13.51	97.00	3.44	Vertical	1000000.00	8.69
16956.05263	59.85	74.00	-14.15	38.00	1.45	Horizontal	1000000.00	8.81
17301.31579	59.02	74.00	-14.98	4.00	3.25	Vertical	1000000.00	8.57
17356.05263	60.84	74.00	-13.16	162.00	1.10	Vertical	1000000.00	8.58
17455.26316	60.28	74.00	-13.72	126.00	3.74	Horizontal	1000000.00	8.78
17801.05263	59.29	74.00	-14.71	103.00	3.59	Horizontal	1000000.00	9.26
17993.81579	60.18	74.00	-13.82	300.00	1.10	Horizontal	1000000.00	9.14

Average (PASS) (15)

Frequency (MHz)	Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Azimuth (°)	Height (m)	Pol.	RBW (Hz)	Correction (dB)
12597.89474	41.06	54.00	-12.94	359.00	2.60	Horizontal	1000000.00	3.96
12731.57895	42.62	54.00	-11.38	272.00	3.10	Vertical	1000000.00	5.12
15014.21053	42.26	54.00	-11.74	206.00	1.85	Vertical	1000000.00	5.26
15287.63158	42.08	54.00	-11.92	198.00	1.75	Horizontal	1000000.00	5.31
15695.26316	42.46	54.00	-11.54	156.00	1.00	Horizontal	1000000.00	5.84
16113.42105	44.02	54.00	-9.98	278.00	3.39	Horizontal	1000000.00	6.93
16580.78947	45.28	54.00	-8.72	33.00	1.75	Horizontal	1000000.00	7.94
16691.84211	45.87	54.00	-8.13	119.00	2.15	Horizontal	1000000.00	8.45
16776.84211	46.38	54.00	-7.62	97.00	3.44	Vertical	1000000.00	8.69
16956.05263	46.35	54.00	-7.65	38.00	1.45	Horizontal	1000000.00	8.81
17301.31579	45.74	54.00	-8.26	4.00	3.25	Vertical	1000000.00	8.57
17356.05263	46.40	54.00	-7.60	162.00	1.10	Vertical	1000000.00	8.58
17455.26316	46.54	54.00	-7.46	126.00	3.74	Horizontal	1000000.00	8.78
17801.05263	46.30	54.00	-7.70	103.00	3.59	Horizontal	1000000.00	9.26
17993.81579	45.81	54.00	-8.19	300.00	1.10	Horizontal	1000000.00	9.14

Note 1: Readings above were from noise floor.

Note 2: Manual scan was performed from 18-25 GHz at a distance < 1m. No emissions were detected above the measuring equipment noise floor.

Intertek

Report Number: 105232834BOX-001

Issued: 12/30/2022

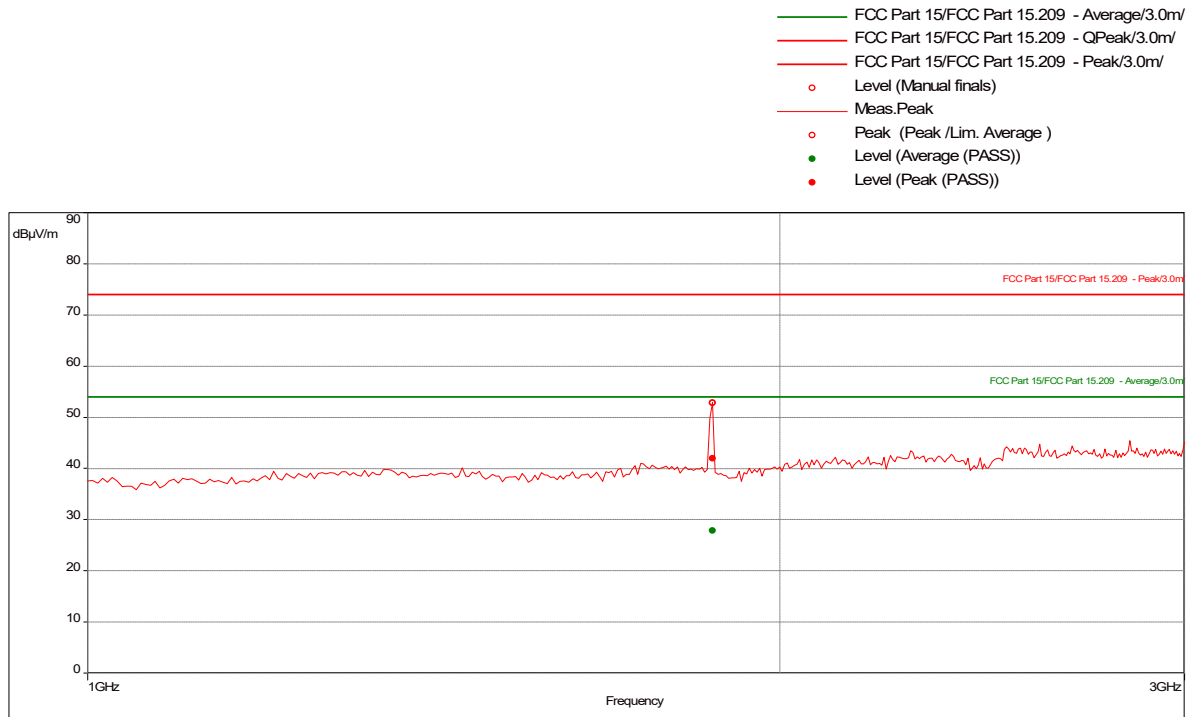
Revised: 01/18/2023

Transmit at Mid channel (EUT sits on its short side), 2442 MHz, 1-3 GHz

Test Information:

Date and Time	12/15/2022 1:28:03 PM
Client and Project Number	Simbex
Engineer	Kouma Sinn
Temperature	22 C
Humidity	19 %
Atmospheric Pressure	1016 mbar
Comments	Scan 16: Mid Ch, EUT on its short side, RE 1-3 GHz SA mode

Graph:



Results:

Peak (PASS) (1)

Frequency (MHz)	Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Azimuth (°)	Height (m)	Pol.	RBW (Hz)	Correction (dB)
1869.473684	42.01	74.00	-31.99	352.00	2.90	Vertical	1000000.00	-16.33

Average (PASS) (1)

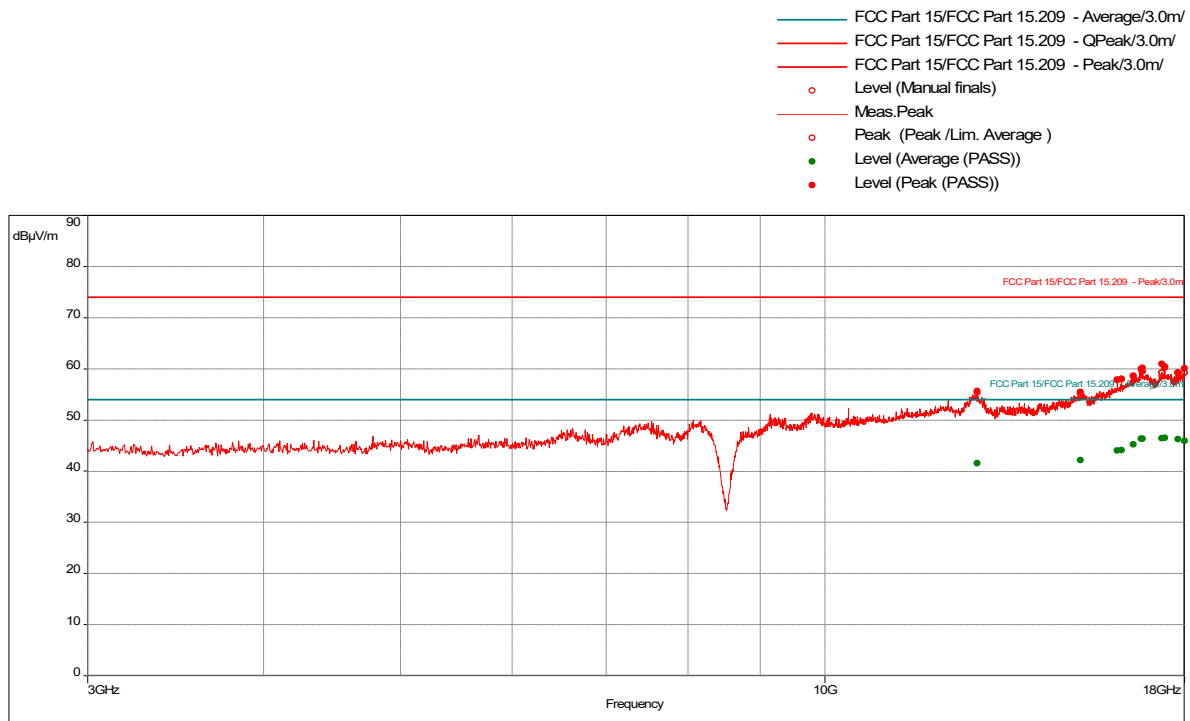
Frequency (MHz)	Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Azimuth (°)	Height (m)	Pol.	RBW (Hz)	Correction (dB)
1869.473684	27.91	54.00	-26.09	352.00	2.90	Vertical	1000000.00	-16.33

Transmit at Mid channel (EUT sits on its short side), 2442 MHz, 3-25 GHz

Test Information:

Date and Time	12/16/2022 9:51:53 PM
Client and Project Number	Simbex G105232834
Engineer	Vathana Ven
Temperature	22 deg
Humidity	32%
Atmospheric Pressure	995 mB
Comments	RE 3 to 18 GHz Battery power Tx Mid CH Z-Axis

Graph:



Intertek

Report Number: 105232834BOX-001

Issued: 12/30/2022
Revised: 01/18/2023

Results:

Peak (PASS) (11)

Frequency (MHz)	Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Azimuth (°)	Height (m)	Pol.	RBW (Hz)	Correction (dB)
12824.73684	55.68	74.00	-18.32	126.00	3.20	Vertical	1000000.00	4.79
15183.15789	55.57	74.00	-18.43	142.00	2.40	Vertical	1000000.00	5.28
16126.05263	57.83	74.00	-16.17	46.00	1.20	Horizontal	1000000.00	6.94
16237.10526	58.07	74.00	-15.93	331.00	1.90	Vertical	1000000.00	7.03
16560.26316	58.60	74.00	-15.40	88.00	2.25	Vertical	1000000.00	7.86
16777.36842	60.04	74.00	-13.96	264.00	1.85	Horizontal	1000000.00	8.69
16808.42105	60.24	74.00	-13.76	235.00	1.00	Vertical	1000000.00	8.74
17341.31579	60.98	74.00	-13.02	0.00	1.75	Horizontal	1000000.00	8.57
17432.36842	60.53	74.00	-13.47	139.00	3.59	Horizontal	1000000.00	8.72
17809.73684	59.19	74.00	-14.81	0.00	1.01	Vertical	1000000.00	9.26
17996.31579	60.18	74.00	-13.82	17.00	1.00	Horizontal	1000000.00	9.14

Average (PASS) (11)

Frequency (MHz)	Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Azimuth (°)	Height (m)	Pol.	RBW (Hz)	Correction (dB)
12824.73684	41.60	54.00	-12.40	126.00	3.20	Vertical	1000000.00	4.79
15183.15789	42.20	54.00	-11.80	142.00	2.40	Vertical	1000000.00	5.28
16126.05263	44.06	54.00	-9.94	46.00	1.20	Horizontal	1000000.00	6.94
16237.10526	44.15	54.00	-9.85	331.00	1.90	Vertical	1000000.00	7.03
16560.26316	45.30	54.00	-8.70	88.00	2.25	Vertical	1000000.00	7.86
16777.36842	46.38	54.00	-7.62	264.00	1.85	Horizontal	1000000.00	8.69
16808.42105	46.39	54.00	-7.61	235.00	1.00	Vertical	1000000.00	8.74
17341.31579	46.47	54.00	-7.53	0.00	1.75	Horizontal	1000000.00	8.57
17432.36842	46.52	54.00	-7.48	139.00	3.59	Horizontal	1000000.00	8.72
17809.73684	46.32	54.00	-7.68	0.00	1.01	Vertical	1000000.00	9.26
17996.31579	45.95	54.00	-8.05	17.00	1.00	Horizontal	1000000.00	9.14

Note 1: Readings above were from noise floor.

Note 2: Manual scan was performed from 18-25 GHz at a distance < 1m. No emissions were detected above the measuring equipment noise floor.

Intertek

Report Number: 105232834BOX-001

Issued: 12/30/2022

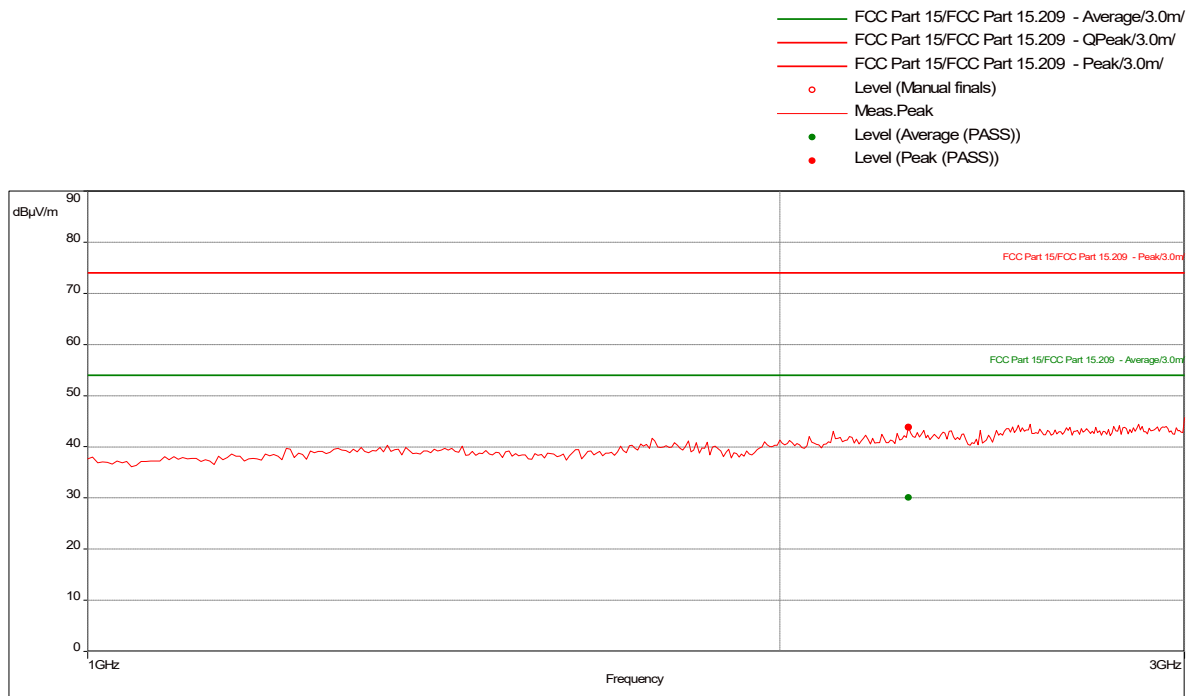
Revised: 01/18/2023

Transmit at Mid channel (EUT sits on its long side), 2442 MHz, 1-3 GHz

Test Information:

Date and Time	12/15/2022 1:19:23 PM
Client and Project Number	Simbex
Engineer	Kouma Sinn
Temperature	22 C
Humidity	19 %
Atmospheric Pressure	1016 mbar
Comments	Scan 15: Mid Ch, EUT on its long side, RE 1-3 GHz SA mode

Graph:



Results:

Peak (PASS) (1)

Frequency (MHz)	Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Azimuth (°)	Height (m)	Pol.	RBW (Hz)	Correction (dB)
2275.263158	43.84	74.00	-30.16	0.00	1.01	Horizontal	1000000.00	-15.43

Average (PASS) (1)

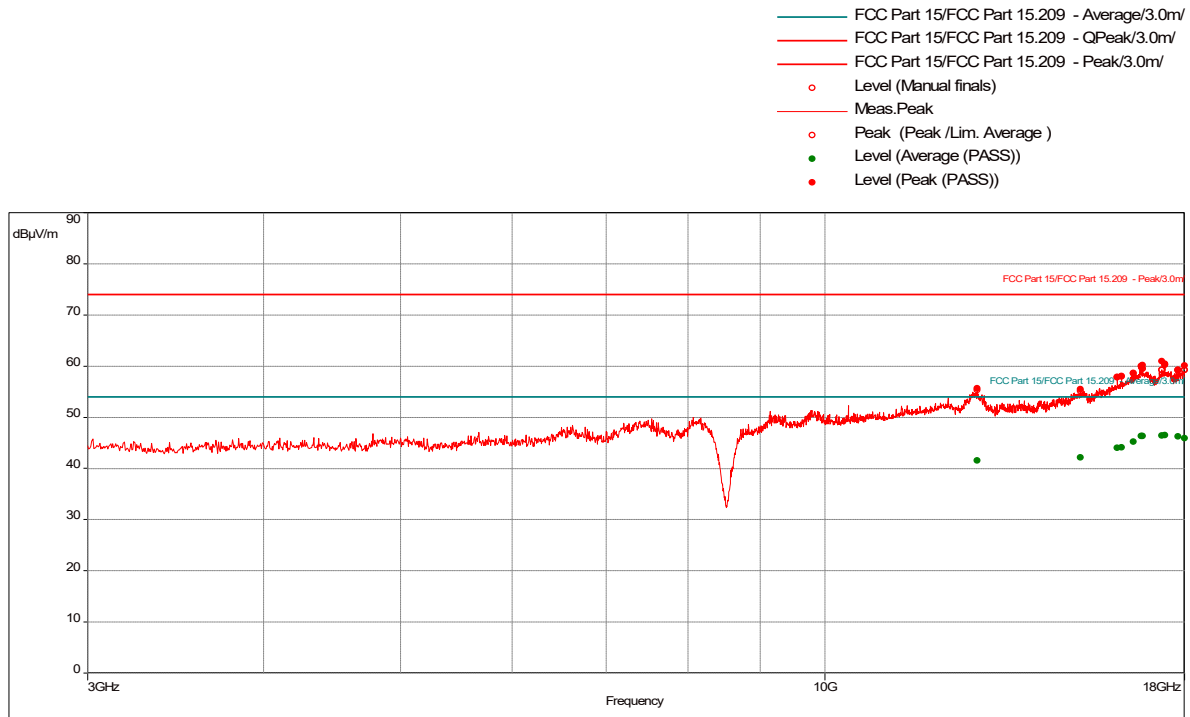
Frequency (MHz)	Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Azimuth (°)	Height (m)	Pol.	RBW (Hz)	Correction (dB)
2275.263158	30.08	54.00	-23.92	0.00	1.01	Horizontal	1000000.00	-15.43

Transmit at Mid channel (EUT sits on its long side), 2442 MHz, 3-25 GHz

Test Information:

Date and Time	12/16/2022 9:51:53 PM
Client and Project Number	Simbex G105232834
Engineer	Vathana Ven
Temperature	22 deg
Humidity	32%
Atmospheric Pressure	995 mB
Comments	RE 3 to 18 GHz Battery power Tx Mid CH Z-Axis

Graph:



Intertek

Report Number: 105232834BOX-001

Issued: 12/30/2022
Revised: 01/18/2023

Results:

Peak (PASS) (11)

Frequency (MHz)	Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Azimuth (°)	Height (m)	Pol.	RBW (Hz)	Correction (dB)
12824.73684	55.68	74.00	-18.32	126.00	3.20	Vertical	1000000.00	4.79
15183.15789	55.57	74.00	-18.43	142.00	2.40	Vertical	1000000.00	5.28
16126.05263	57.83	74.00	-16.17	46.00	1.20	Horizontal	1000000.00	6.94
16237.10526	58.07	74.00	-15.93	331.00	1.90	Vertical	1000000.00	7.03
16560.26316	58.60	74.00	-15.40	88.00	2.25	Vertical	1000000.00	7.86
16777.36842	60.04	74.00	-13.96	264.00	1.85	Horizontal	1000000.00	8.69
16808.42105	60.24	74.00	-13.76	235.00	1.00	Vertical	1000000.00	8.74
17341.31579	60.98	74.00	-13.02	0.00	1.75	Horizontal	1000000.00	8.57
17432.36842	60.53	74.00	-13.47	139.00	3.59	Horizontal	1000000.00	8.72
17809.73684	59.19	74.00	-14.81	0.00	1.01	Vertical	1000000.00	9.26
17996.31579	60.18	74.00	-13.82	17.00	1.00	Horizontal	1000000.00	9.14

Average (PASS) (11)

Frequency (MHz)	Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Azimuth (°)	Height (m)	Pol.	RBW (Hz)	Correction (dB)
12824.73684	41.60	54.00	-12.40	126.00	3.20	Vertical	1000000.00	4.79
15183.15789	42.20	54.00	-11.80	142.00	2.40	Vertical	1000000.00	5.28
16126.05263	44.06	54.00	-9.94	46.00	1.20	Horizontal	1000000.00	6.94
16237.10526	44.15	54.00	-9.85	331.00	1.90	Vertical	1000000.00	7.03
16560.26316	45.30	54.00	-8.70	88.00	2.25	Vertical	1000000.00	7.86
16777.36842	46.38	54.00	-7.62	264.00	1.85	Horizontal	1000000.00	8.69
16808.42105	46.39	54.00	-7.61	235.00	1.00	Vertical	1000000.00	8.74
17341.31579	46.47	54.00	-7.53	0.00	1.75	Horizontal	1000000.00	8.57
17432.36842	46.52	54.00	-7.48	139.00	3.59	Horizontal	1000000.00	8.72
17809.73684	46.32	54.00	-7.68	0.00	1.01	Vertical	1000000.00	9.26
17996.31579	45.95	54.00	-8.05	17.00	1.00	Horizontal	1000000.00	9.14

Note 1: Readings above were from noise floor.

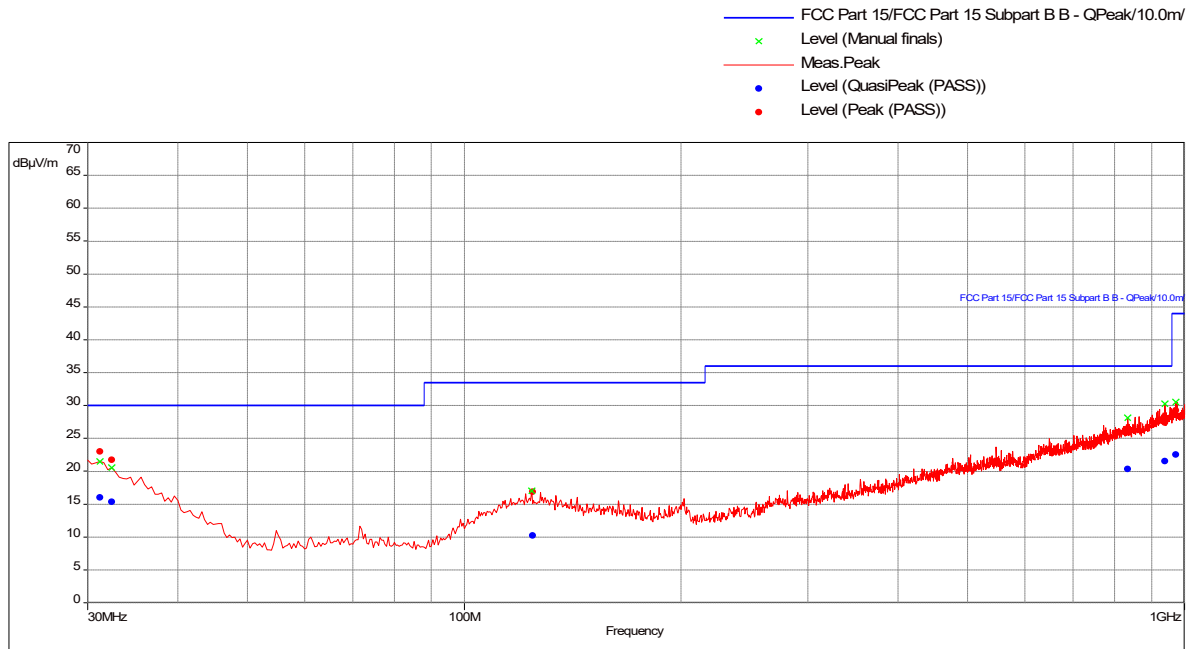
Note 2: Manual scan was performed from 18-25 GHz at a distance < 1m. No emissions were detected above the measuring equipment noise floor.

Transmit at High channel (EUT sits on its back, worst-case axes), 2480 MHz, 30-1000 MHz

Test Information:

Date and Time	12/15/2022 10:24:22 AM
Client and Project Number	Simbex
Engineer	Kouma Sinn
Temperature	22 C
Humidity	19 %
Atmospheric Pressure	1016 mbar
Comments	Scan 9: High Ch, EUT on its back, RE 30-1000MHz SA mode Quick Prescan (1m)

Graph:



Results:

QuasiPeak (PASS) (6)

Frequency (MHz)	Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Azimuth (°)	Height (m)	Pol.	RBW (Hz)	Correction (dB)
31.16842105	16.05	30.00	-13.95	184.00	3.35	Vertical	120000.00	-13.20
32.36842105	15.37	30.00	-14.63	190.00	3.40	Vertical	120000.00	-13.82
124.3157895	10.27	33.50	-23.23	308.00	1.35	Horizontal	120000.00	-18.25
834.2736842	20.35	36.00	-15.65	185.00	3.07	Horizontal	120000.00	-6.43
939.4105263	21.59	36.00	-14.41	308.00	1.57	Horizontal	120000.00	-4.92
972.8	22.55	44.00	-21.45	32.00	3.62	Horizontal	120000.00	-4.02

Intertek

Report Number: 105232834BOX-001

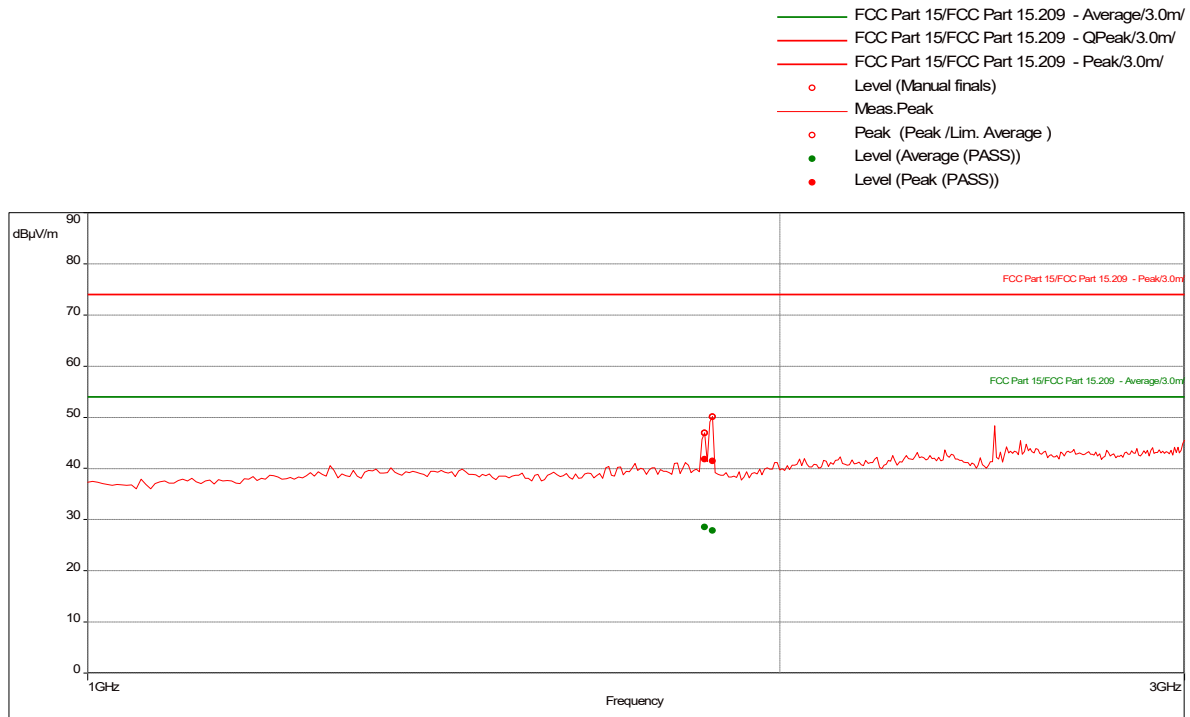
Issued: 12/30/2022
Revised: 01/18/2023

Transmit at High channel (EUT sits on its back), 2480 MHz, 1-3 GHz

Test Information:

Date and Time	12/15/2022 1:46:28 PM
Client and Project Number	Simbex
Engineer	Kouma Sinn
Temperature	22 C
Humidity	19 %
Atmospheric Pressure	1016 mbar
Comments	Scan 18: High Ch, EUT on its back, RE 1-3 GHz SA mode

Graph:



Results:

Peak (PASS) (2)

Frequency (MHz)	Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Azimuth (°)	Height (m)	Pol.	RBW (Hz)	Correction (dB)
1853.421053	41.88	74.00	-32.12	147.00	1.90	Vertical	1000000.00	-16.59
1871.315789	41.52	74.00	-32.48	197.00	2.45	Vertical	1000000.00	-16.32

Average (PASS) (2)

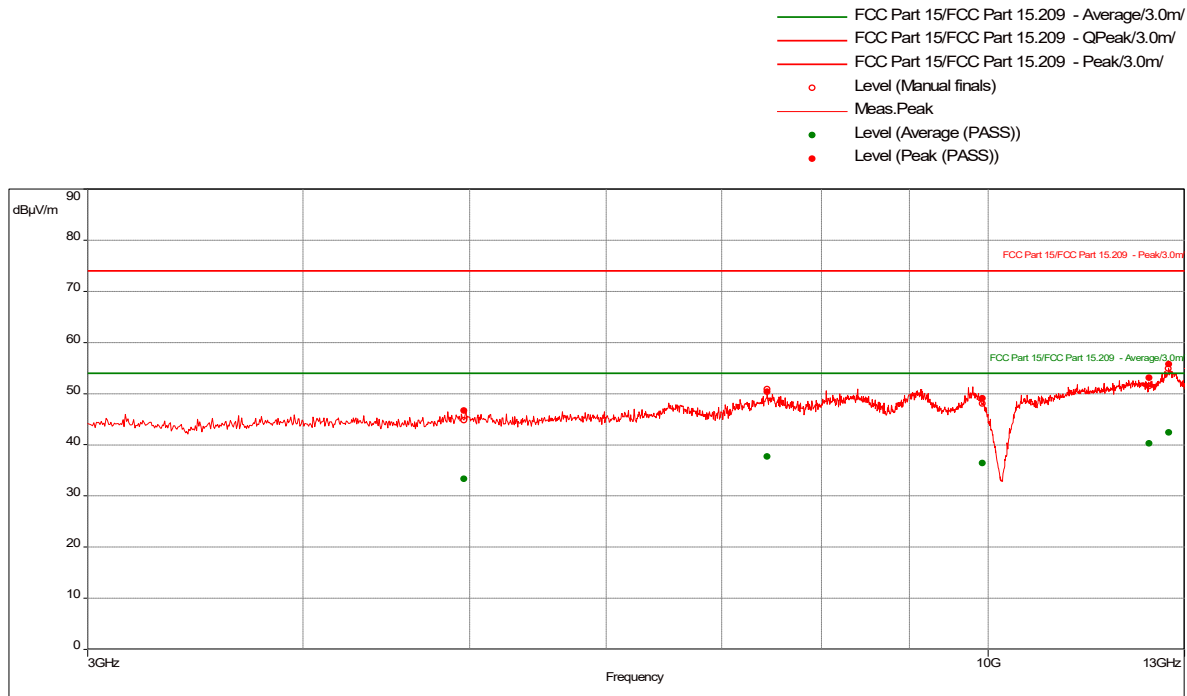
Frequency (MHz)	Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Azimuth (°)	Height (m)	Pol.	RBW (Hz)	Correction (dB)
1853.421053	28.59	54.00	-25.41	147.00	1.90	Vertical	1000000.00	-16.59
1871.315789	27.88	54.00	-26.12	197.00	2.45	Vertical	1000000.00	-16.32

Transmit at High channel (EUT sits on its back), 2480 MHz, 3-25 GHz

Test Information:

Date and Time	12/15/2022 3:24:57 PM
Client and Project Number	Simbex
Engineer	Kouma Sinn
Temperature	22 C
Humidity	19 %
Atmospheric Pressure	1016 mbar
Comments	Scan 24: High Ch, EUT on its back, RE 3-13 GHz SA mode

Graph:



Results:

Peak (PASS) (5)

Frequency (MHz)	Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Azimuth (°)	Height (m)	Pol.	RBW (Hz)	Correction (dB)
4960	46.75	74.00	-27.25	132.00	2.45	Vertical	1000000.00	-9.39
7438.684211	50.41	74.00	-23.59	286.00	1.05	Vertical	1000000.00	-4.87
9917.631579	49.14	74.00	-24.86	292.00	3.25	Vertical	1000000.00	-1.76
12400.26316	53.10	74.00	-20.90	133.00	1.45	Vertical	1000000.00	2.96
12727.63158	55.83	74.00	-18.17	177.00	2.40	Vertical	1000000.00	5.09

Average (PASS) (5)

Frequency (MHz)	Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Azimuth (°)	Height (m)	Pol.	RBW (Hz)	Correction (dB)
4960	33.34	54.00	-20.66	132.00	2.45	Vertical	1000000.00	-9.39
7438.684211	37.75	54.00	-16.25	286.00	1.05	Vertical	1000000.00	-4.87
9917.631579	36.47	54.00	-17.53	292.00	3.25	Vertical	1000000.00	-1.76
12400.26316	40.32	54.00	-13.68	133.00	1.45	Vertical	1000000.00	2.96
12727.63158	42.43	54.00	-11.57	177.00	2.40	Vertical	1000000.00	5.09

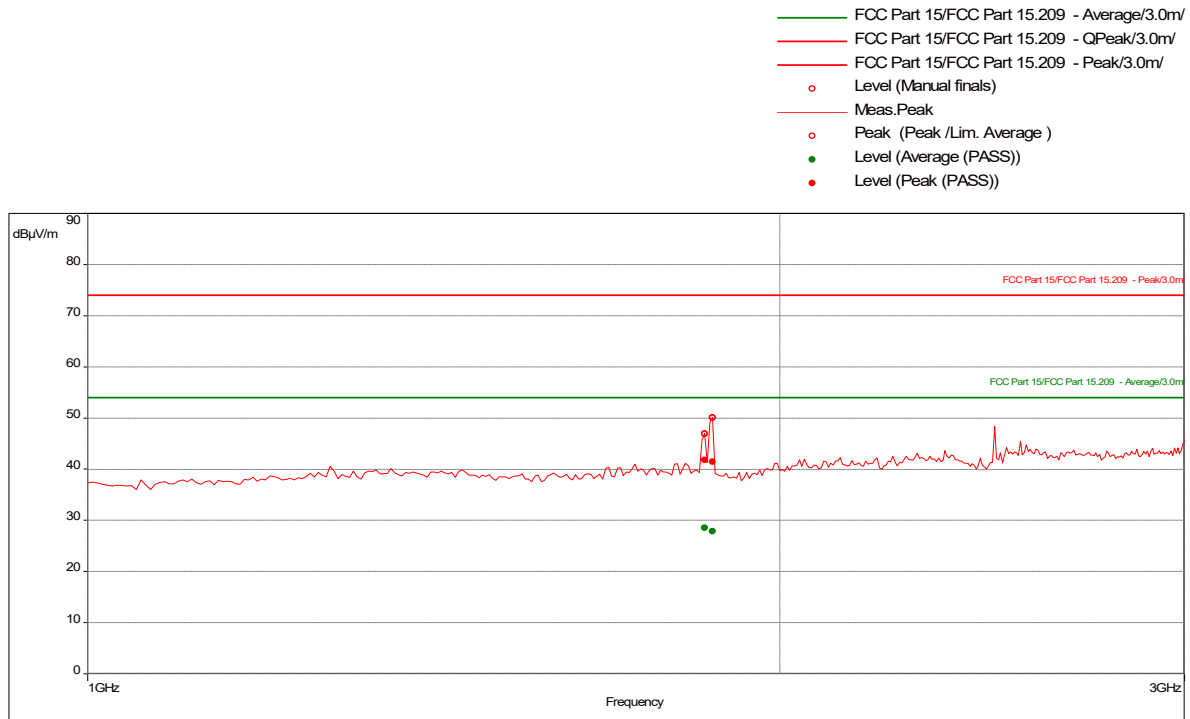
Notes: From 13-25 GHz, manual scan was performed at 10 cm from the EUT with no emission was detected above the measuring instrument noise floor.

Transmit at High channel (EUT sits on its short side), 2480 MHz, 1-3 GHz

Test Information:

Date and Time	12/15/2022 1:46:28 PM
Client and Project Number	Simbex
Engineer	Kouma Sinn
Temperature	22 C
Humidity	19 %
Atmospheric Pressure	1016 mbar
Comments	Scan 18: High Ch, EUT on its back, RE 1-3 GHz SA mode

Graph:



Results:

Peak (PASS) (2)

Frequency (MHz)	Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Azimuth (°)	Height (m)	Pol.	RBW (Hz)	Correction (dB)
1853.421053	41.88	74.00	-32.12	147.00	1.90	Vertical	1000000.00	-16.59
1871.315789	41.52	74.00	-32.48	197.00	2.45	Vertical	1000000.00	-16.32

Average (PASS) (2)

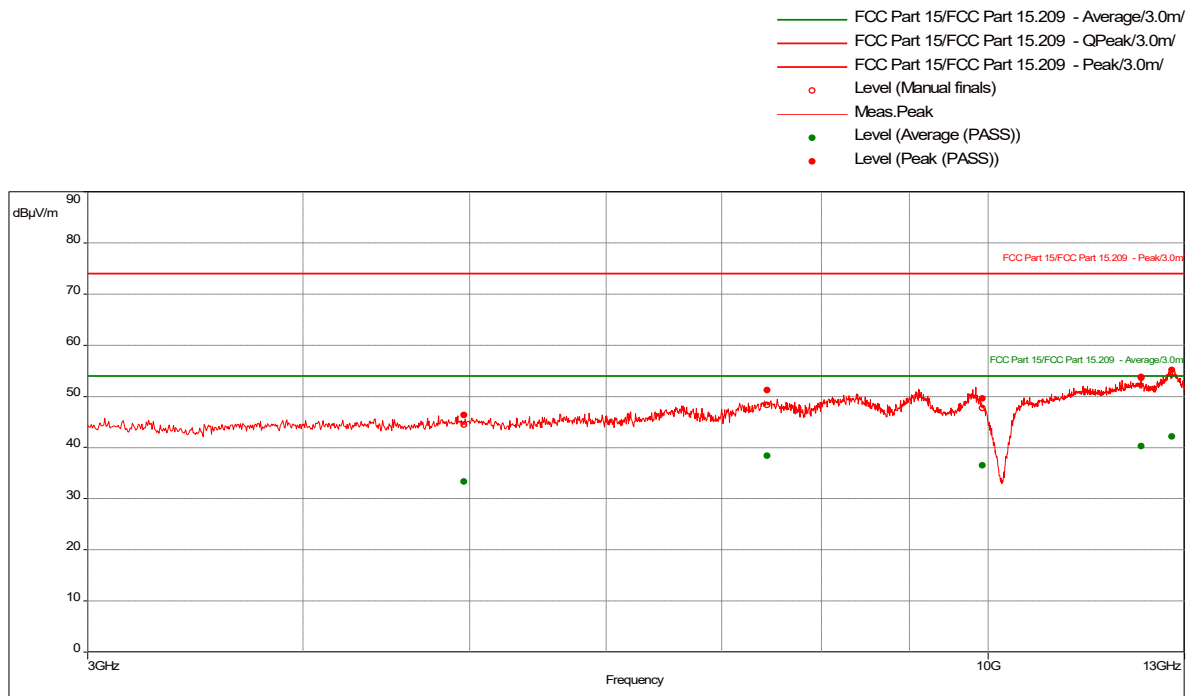
Frequency (MHz)	Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Azimuth (°)	Height (m)	Pol.	RBW (Hz)	Correction (dB)
1853.421053	28.59	54.00	-25.41	147.00	1.90	Vertical	1000000.00	-16.59
1871.315789	27.88	54.00	-26.12	197.00	2.45	Vertical	1000000.00	-16.32

Transmit at High channel (EUT sits on its short side), 2480 MHz, 3-25 GHz

Test Information:

Date and Time	12/15/2022 2:55:49 PM
Client and Project Number	Simbex
Engineer	Kouma Sinn
Temperature	22 C
Humidity	19 %
Atmospheric Pressure	1016 mbar
Comments	Scan 23: High Ch, EUT on its short side, RE 3-13 GHz SA mode

Graph:



Results:

Peak (PASS) (5)

Frequency (MHz)	Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Azimuth (°)	Height (m)	Pol.	RBW (Hz)	Correction (dB)
4961.578947	46.33	74.00	-27.67	0.00	2.95	Vertical	1000000.00	-9.38
7439.473684	51.28	74.00	-22.72	226.00	3.15	Horizontal	1000000.00	-4.86
9917.894737	49.59	74.00	-24.41	83.00	3.15	Vertical	1000000.00	-1.76
12267.89474	53.65	74.00	-20.35	75.00	1.15	Vertical	1000000.00	2.76
12787.36842	55.18	74.00	-18.82	96.00	3.39	Vertical	1000000.00	5.04

Average (PASS) (5)

Frequency (MHz)	Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Azimuth (°)	Height (m)	Pol.	RBW (Hz)	Correction (dB)
4961.578947	33.33	54.00	-20.67	0.00	2.95	Vertical	1000000.00	-9.38
7439.473684	38.44	54.00	-15.56	226.00	3.15	Horizontal	1000000.00	-4.86
9917.894737	36.52	54.00	-17.48	83.00	3.15	Vertical	1000000.00	-1.76
12267.89474	40.32	54.00	-13.68	75.00	1.15	Vertical	1000000.00	2.76
12787.36842	42.20	54.00	-11.80	96.00	3.39	Vertical	1000000.00	5.04

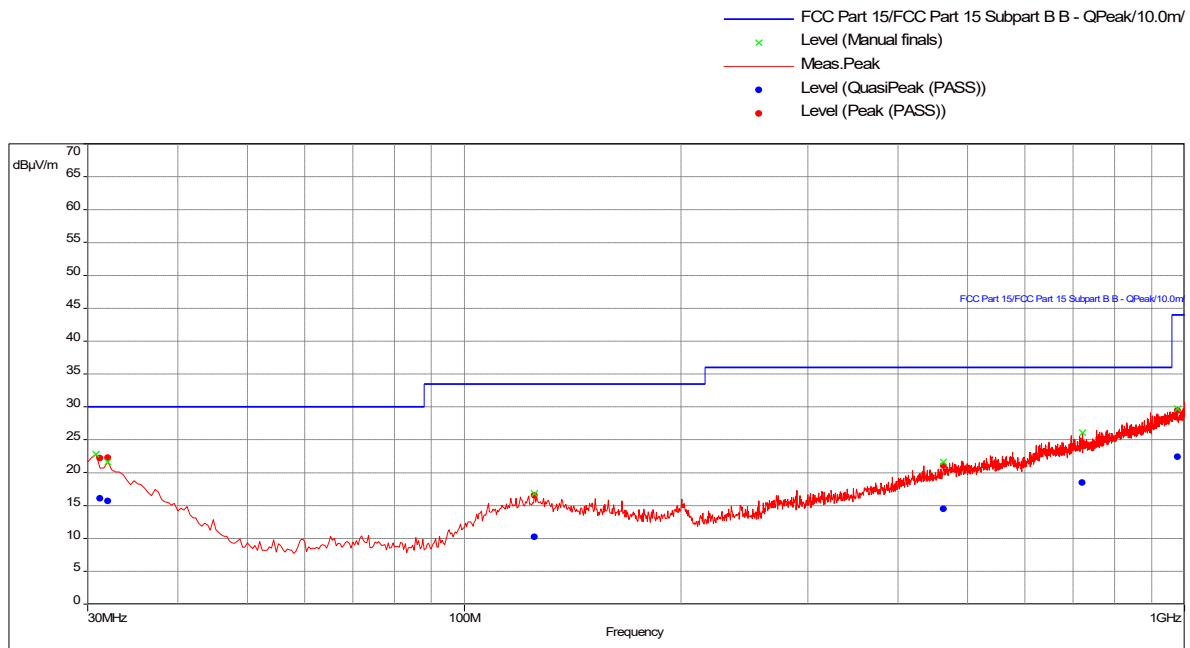
Notes: From 13-25 GHz, manual scan was performed at 10 cm from the EUT with no emission was detected above the measuring instrument noise floor.

Transmit at High channel (EUT sits on its long side, worst-case axis), 2480 MHz, 30-1000 MHz

Test Information:

Date and Time	12/15/2022 8:54:09 AM
Client and Project Number	Simbex
Engineer	Kouma Sinn
Temperature	22 C
Humidity	19 %
Atmospheric Pressure	1016 mbar
Comments	Scan 7: High Ch, EUT on its long side, RE 30-1000MHz SA mode Quick Prescan (1m)

Graph:



Results:

QuasiPeak (PASS) (6)

Frequency (MHz)	Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Azimuth (°)	Height (m)	Pol.	RBW (Hz)	Correction (dB)
31.02105263	16.1	30.00	-13.90	44.00	3.19	Horizontal	120000.00	-13.14
32.06315789	15.69	30.00	-14.31	211.00	3.46	Vertical	120000.00	-13.56
125.2947368	10.22	33.50	-23.28	169.00	3.01	Vertical	120000.00	-18.24
462.4	14.49	36.00	-21.51	45.00	2.84	Vertical	120000.00	-13.30
721.3473684	18.48	36.00	-17.52	234.00	3.61	Vertical	120000.00	-8.50
977.9684211	22.42	44.00	-21.58	112.00	1.67	Horizontal	120000.00	-4.09

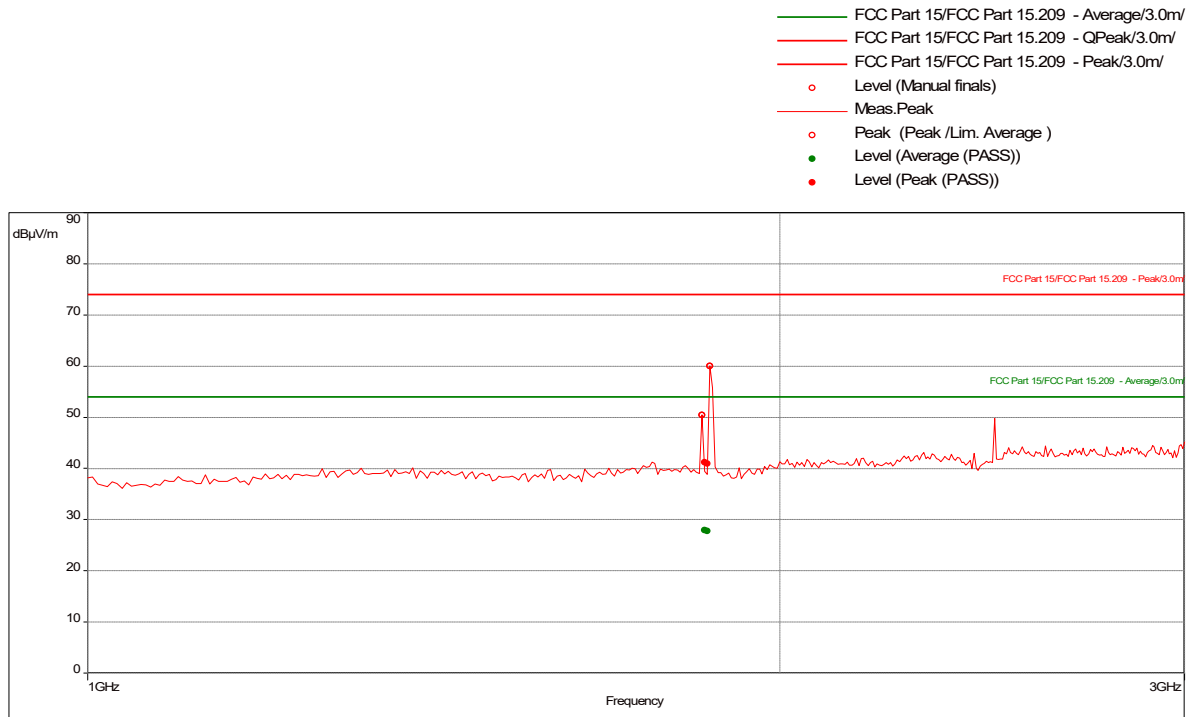
Notes: No emission was detected. Readings above are noise floor signals.

Transmit at High channel (EUT sits on its long side), 2480 MHz, 1-3 GHz

Test Information:

Date and Time	12/15/2022 2:09:33 PM
Client and Project Number	Simbex
Engineer	Kouma Sinn
Temperature	22 C
Humidity	19 %
Atmospheric Pressure	1016 mbar
Comments	Scan 21: High Ch, EUT on its long side, RE 1-3 GHz SA mode

Graph:



Results:

Peak (PASS) (2)

Frequency (MHz)	Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Azimuth (°)	Height (m)	Pol.	RBW (Hz)	Correction (dB)
1852.631579	41.24	74.00	-32.76	140.00	2.50	Vertical	1000000.00	-16.60
1860.263158	40.97	74.00	-33.03	53.00	2.75	Vertical	1000000.00	-16.47

Average (PASS) (2)

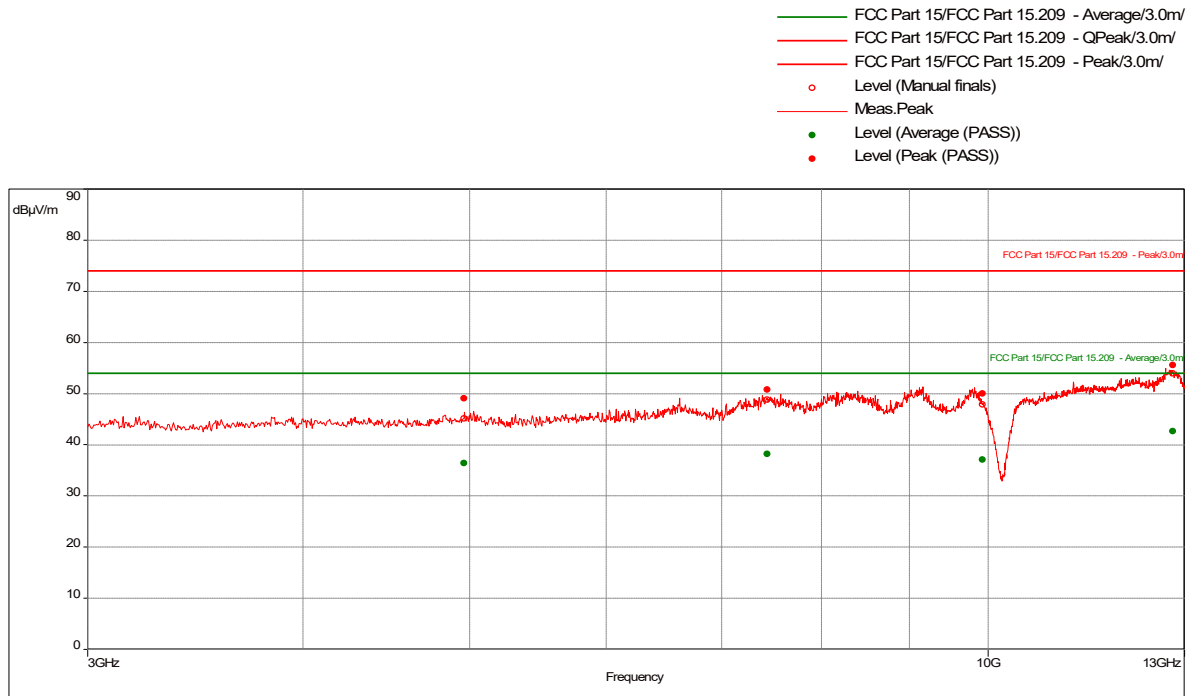
Frequency (MHz)	Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Azimuth (°)	Height (m)	Pol.	RBW (Hz)	Correction (dB)
1852.631579	27.96	54.00	-26.04	140.00	2.50	Vertical	1000000.00	-16.60
1860.263158	27.78	54.00	-26.22	53.00	2.75	Vertical	1000000.00	-16.47

Transmit at High channel (EUT sits on its long side), 2480 MHz, 3-25 GHz

Test Information:

Date and Time	12/15/2022 2:31:03 PM
Client and Project Number	Simbex
Engineer	Kouma Sinn
Temperature	22 C
Humidity	19 %
Atmospheric Pressure	1016 mbar
Comments	Scan 22: High Ch, EUT on its long side, RE 3-13 GHz SA mode

Graph:



Results:

Peak (PASS) (4)

Frequency (MHz)	Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Azimuth (°)	Height (m)	Pol.	RBW (Hz)	Correction (dB)
4959.473684	49.08	74.00	-24.92	190.00	1.10	Vertical	1000000.00	-9.39
7437.631579	50.85	74.00	-23.15	0.00	2.95	Vertical	1000000.00	-4.87
9919.210526	50.06	74.00	-23.94	0.00	2.55	Horizontal	1000000.00	-1.75
12794.73684	55.58	74.00	-18.42	343.00	1.65	Vertical	1000000.00	4.99

Average (PASS) (4)

Frequency (MHz)	Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Azimuth (°)	Height (m)	Pol.	RBW (Hz)	Correction (dB)
4959.473684	36.44	54.00	-17.56	190.00	1.10	Vertical	1000000.00	-9.39
7437.631579	38.25	54.00	-15.75	0.00	2.95	Vertical	1000000.00	-4.87
9919.210526	37.13	54.00	-16.87	0.00	2.55	Horizontal	1000000.00	-1.75
12794.73684	42.72	54.00	-11.28	343.00	1.65	Vertical	1000000.00	4.99

Notes: From 13-25 GHz, manual scan was performed at 10 cm from the EUT with no emission was detected above the measuring instrument noise floor.

Intertek

Report Number: 105232834BOX-001	Issued: 12/30/2022 Revised: 01/18/2023
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Product Standard: FCC Part 15.247, FCC Part 15.209		Limit applied: See Report Section 10.3 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
12/14/2022	Kouma Sinn <i>KPS</i>	Vathana Ven <i>VSV</i>	Battery powered	Tx Low, Mid, High Channels	22	15	1005
12/15/2022	Kouma Sinn <i>KPS</i>	Vathana Ven <i>VSV</i>	Battery powered	Tx Low, Mid, High Channels	22	19	1016
12/16/2022	Vathana Ven <i>VSV</i>	Kouma Sinn <i>KPS</i>	Battery powered	Tx Low, Mid, High Channels	22	32	995

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, 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)	Ucisp
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 μ V/m
 RA = Receiver Amplitude (including preamplifier) in dB μ 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 dB μ V
 AF = 7.4 dB/m
 CF = 1.6 dB
 AG = 29.0 dB
 FS = 32 dB μ V/m

To convert from dB μ V to μ V 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 Test Equipment Used:

Asset	Description	Manufacturer	Model	Serial	Cal Date	Cal Due
DAV007'	Weather Station Vantage Vue	Davis	6250	MS191212003	03/08/2022	03/08/2023
PRE10'	30-1000MHz pre-amp	ITS	PRE10	PRE10	02/15/2022	02/15/2023
145-424'	9kHz to 40GHz Cable	Huber and Suhner	Sucoflex	145-424	02/15/2022	02/15/2023
145-422'	10Amp Pre-amp to under floor	Utiflex	UFB311A-0-2756-70070	145-422	02/21/2022	02/21/2023
HS003'	10m under floor cable	Huber-Schuner	10m-1	HS003	02/15/2022	02/15/2023
145-420'	Receiver to floor cable	Utiflex	UFB311A-2-0591-70070	145-420	02/21/2022	02/21/2023
145145'	Broadband Hybrid Antenna 30 MHz - 3 GHz	Sunol Sciences Corp.	JB3	A122313	06/16/2022	06/16/2023
145108'	EMI Test Receiver (20Hz - 40GHz)	Rohde & Schwarz	ESIB40	100209	06/23/2022	06/23/2023
ETS002'	1-18GHz DRG Horn Antenna	ETS Lindgren	3117	00143260	09/27/2022	09/27/2023
145-414'	Cable 145-414	Huber + Suhner	3m Track A cable	145-414	01/14/2022	01/14/2023
145-423'	Pre-amp to under floor	Huber and Suhner	SF106A/11N/11N/1.5 m	145-423	02/15/2022	02/15/2023
IW006'	DC-18GHz cable 8.4m long	Insulated Wire	2800-NPS	IW006	07/14/2022	07/14/2023

Software Utilized:

Name	Manufacturer	Version
BAT-EMC	Nexio	3.17.0.3

11.3 Results:

The sample tested was found to Comply.

Limits – FCC Part §15.109 The field strength of radiated emissions from unintentional radiators at a distance of 3 meters shall not exceed the following values.

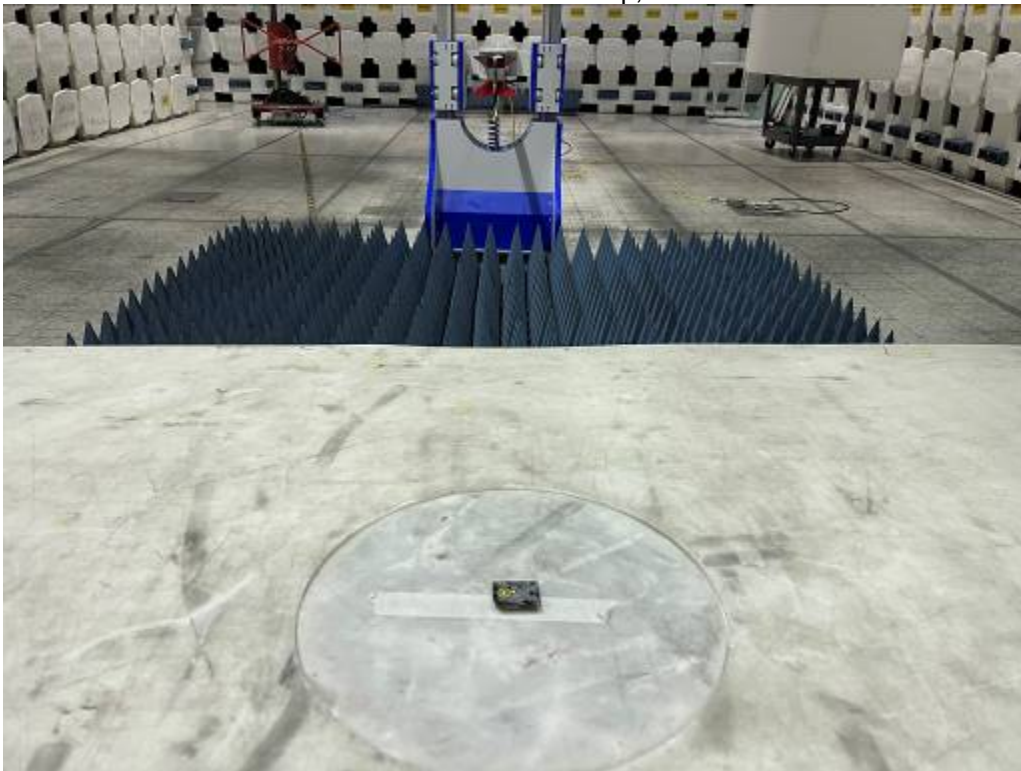
Frequency of emission (MHz)	Field strength (microvolts/meter)	Field strength (dBµV/m)
30-88	100	40.00
88-216	150	43.52
216-960	200	46.02
Above 960	500	54.00

11.4 Setup Photographs:

Radiated Emissions Test Setup, 30-1000 MHz



Radiated Emissions Test Setup, 1-13 GHz



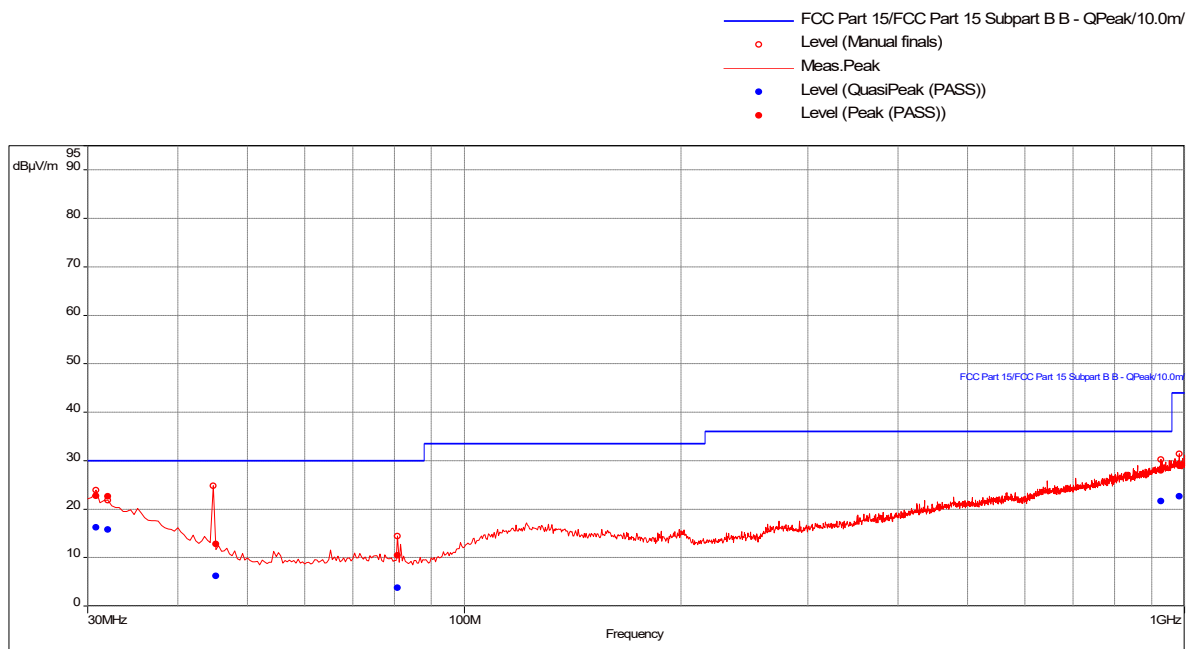
11.5 Plots/Data:

Radiated Emissions, 30-1000 MHz

Test Information:

Date and Time	12/15/2022 11:01:33 AM
Client and Project Number	Simbex
Engineer	Kouma Sinn
Temperature	22 C
Humidity	19 %
Atmospheric Pressure	1016 mbar
Comments	Scan 10: Receive Mode RE 30-1000MHz SA mode

Graph:



Results:

Peak (PASS) (6)

Frequency (MHz)	Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Azimuth (°)	Height (m)	Pol.	RBW (Hz)	Correction (dB)
30.8	22.74	30.00	-7.26	236.00	2.24	Horizontal	120000.00	-12.99
31.87368421	22.71	30.00	-7.29	200.00	3.55	Vertical	120000.00	-13.46
45.24210526	12.82	30.00	-17.18	338.00	1.45	Vertical	120000.00	-22.90
80.86315789	10.51	30.00	-19.49	40.00	3.18	Vertical	120000.00	-25.07
927.0736842	27.96	36.00	-8.04	17.00	1.46	Horizontal	120000.00	-4.88
982.8	29.24	44.00	-14.76	359.00	2.28	Horizontal	120000.00	-4.07

QuasiPeak (PASS) (6)

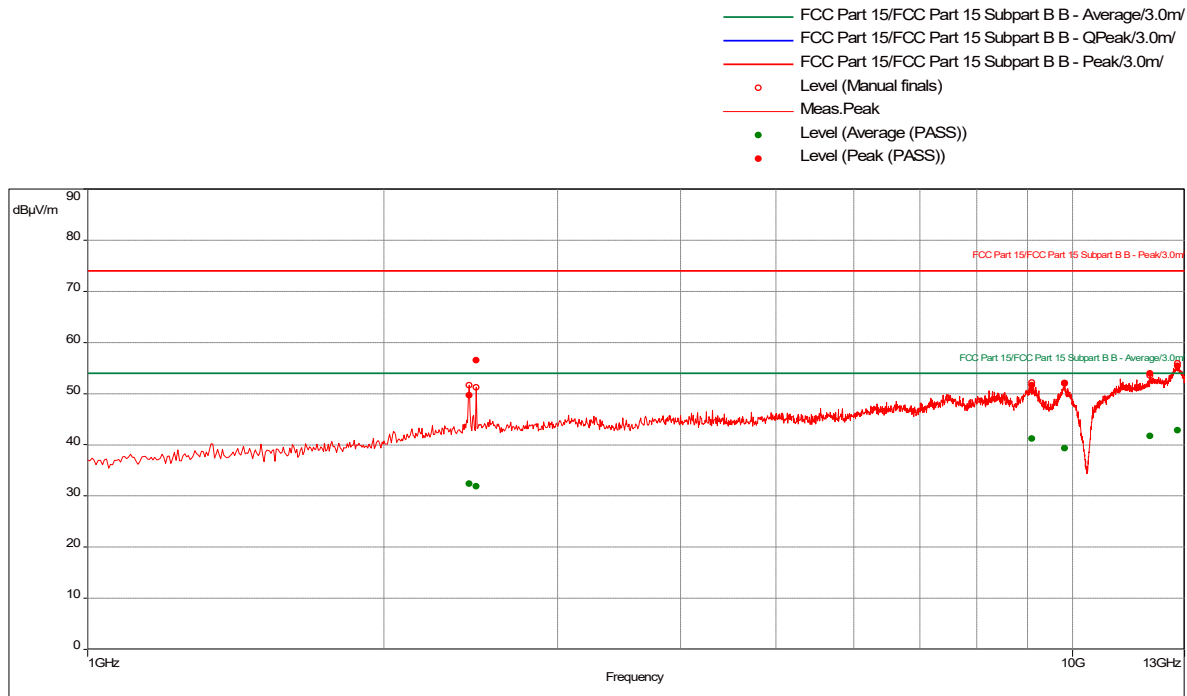
Frequency (MHz)	Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Azimuth (°)	Height (m)	Pol.	RBW (Hz)	Correction (dB)
30.8	16.30	30.00	-13.70	236.00	2.24	Horizontal	120000.00	-12.99
31.87368421	15.79	30.00	-14.21	200.00	3.55	Vertical	120000.00	-13.46
45.24210526	6.24	30.00	-23.76	338.00	1.45	Vertical	120000.00	-22.90
80.86315789	3.76	30.00	-26.24	40.00	3.18	Vertical	120000.00	-25.07
927.0736842	21.70	36.00	-14.30	17.00	1.46	Horizontal	120000.00	-4.88
982.8	22.64	44.00	-21.36	359.00	2.28	Horizontal	120000.00	-4.07

Radiated Emissions, 1-13 GHz

Test Information:

Date and Time	12/15/2022 12:09:51 PM
Client and Project Number	Simbex
Engineer	Kouma Sinn
Temperature	22 C
Humidity	19 %
Atmospheric Pressure	1016 mbar
Comments	Scan 11: Receive Mode RE 1-13 GHz SA mode

Graph:



Results:

Peak (PASS) (6)

Frequency (MHz)	Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Azimuth (°)	Height (m)	Pol.	RBW (Hz)	Correction (dB)
2438.421053	49.70	74.00	-24.30	197.00	3.35	Vertical	1000000.00	-14.57
2479.736842	56.52	74.00	-17.48	155.00	3.25	Vertical	1000000.00	-14.13
9100.526316	51.71	74.00	-22.29	61.00	3.59	Horizontal	1000000.00	-3.00
9825.526316	52.14	74.00	-21.86	110.00	3.74	Horizontal	1000000.00	-1.86
11994.73684	53.99	74.00	-20.01	76.00	1.75	Vertical	1000000.00	2.03
12788.15789	55.48	74.00	-18.52	212.00	2.55	Horizontal	1000000.00	5.03

Average (PASS) (6)

Frequency (MHz)	Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Azimuth (°)	Height (m)	Pol.	RBW (Hz)	Correction (dB)
2438.421053	32.44	54.00	-21.56	197.00	3.35	Vertical	1000000.00	-14.57
2479.736842	31.93	54.00	-22.07	155.00	3.25	Vertical	1000000.00	-14.13
9100.526316	41.27	54.00	-12.73	61.00	3.59	Horizontal	1000000.00	-3.00
9825.526316	39.36	54.00	-14.64	110.00	3.74	Horizontal	1000000.00	-1.86
11994.73684	41.79	54.00	-12.21	76.00	1.75	Vertical	1000000.00	2.03
12788.15789	42.91	54.00	-11.09	212.00	2.55	Horizontal	1000000.00	5.03

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Revised: 01/18/2023

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	Product Standard: FCC Part 15.247, FCC Part 15.209			Limit applied: See Report Section 11.3 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
12/15/2022	Kouma Sinn <i>KPS</i>	Vathana Ven <i>VSV</i>	Battery powered	Rx mode	22	19	1016

Intertek

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12 Revision History

Revision Level	Date	Report Number	Prepared By	Reviewed By	Notes
0	12/30/2022	105232834BOX-001	VFV <i>VFV</i>	KPS <i>KPS</i>	Original Issue
1	01/18/2022	105232834BOX-001	VFV <i>VFV</i>	KPS <i>KPS</i>	Corrected typo on page 5, added remeasured output power and PSD