June 13, 2023

Trackonomy Systems
Saurabh Sanghai
214 Devcon Drive
San Jose, CA 95112

Dear Saurabh Sanghai

Enclosed is the Wireless test report compliance testing of the Trackonomy Systems, Asset Tracking as tested to the requirements of Title 47 of the CFR, , Part 15 Subpart C, RSS 247 for Intentional Radiators.

Thank you for using the services of Eurofins Electrical and Electronic Testing NA, Inc. If you have any questions regarding these results or if Eurofins Electrical and Electronic Testing NA, Inc. can be of further service to you, please feel free to contact me.

Gary Chou

Documentation Department
Eurofins Electrical and Electronic Testing NA, Inc.

Reference: WIR127154-Track_FCC_ISED-LORA

ilac-MRA A2LA ACCREDITED CERT #591.02

Eurofins Electrical and Electronic Testing NA, Inc. is part of the Eurofins Electrical & Electronics (E&E) global compliance network.

FCC/ ISED Test Report

Applicant name: Trackonomy Systems

Product: Asset Tracking

Report: WIR127154-Track_FCC_ISED-LORA

Applicant Address:

1828 Bering Drive
San Jose, CA

Manufacturer Address:

1828 Bering Drive
San Jose, CA

Prepared By:
Eurofins Electrical and Electronic Testing NA, Inc.
3162 Belick St.
Santa Clara CA, 95054

FCC/ ISED Test Report

Applicant name: Trackonomy Systems

Product: Asset Tracking

Standard
47 CFR FCC Part 15, Subpart C (Section 15.247)
558074 D01 15.247 Meas Guidance v05r02
RSS 247 Issue2, February 2017
RSS Gen Issue5, March 2019
ANSI C63.10: 2013

Christopher Martin
Christopher Martin
Test Engineer, Wireless Laboratory

Engineering Statement: The measurements shown in this report were made in accordance with the procedures indicated, and the emissions from this equipment were found to be within the limits applicable. I assume full responsibility for the accuracy and completeness of these measurements, and for the qualifications of all persons taking them. It is further stated that upon the basis of the measurements made, the equipment tested is capable of operation in accordance with the requirements FCC Rules under normal use and maintenance.

Gary Chou
Gary Chou
Wireless Engineering Manager, Wireless Laboratory

Report Status Sheet

Revision	Report Date	Reason for Revision
∅	June 13, 2023	Initial Issue.

Table of Contents

I. Executive Summary

A. Executive Summary

47 CFR FCC Part 15, Subpart C (SECTION 15.247) RSS 247 Issue2, RSS Gen Issue5				
FCC/ IC Cluse	ISED	Test Item	Result	Remarks
15.207	RSS Gen 8.8	AC Power Conducted Emission	N/A	Powered by battery so test is not required.
15.205 &15.209 & 15.247(d)	RSS Gen 8.8	Radiated Emissions and Band Edge Measurement	PASS	Meet the requirement of limit.
15.247(a)(2)	RSS 247 5.5C	6dB bandwidth & 99% bandwidth	PASS	Meet the requirement of limit.
15.247(b)	RSS 247 5.2.1 RSS Gen 6.7	Conducted power	PASS	Meet the requirement of limit.
15.247(e)	RSS 247 5.4.4	Power Spectral Density	PASS	Meet the requirement of limit.
15.203	RSS 247 5.2.2	Antenna Requirement	PASS	FPCB Antenna (with U.FL connector) meet the requirement.

Note:

1.Determining compliance based on the results of the compliance measurement, not taking into account measurement instrumentation uncertainty.

II. Equipment Information

A. Overview

EUT Summary Table

Product:	Asset Tracking	
Brand:	Trackonomy Systems	
Model(s) Tested:	FBG-2007	
Series Model:	N/A	
Sample Status:	Original	
EUT Specifications:	Primary Power:	3.6 Vdc battery powered
	Voltage Frequency:	N/A
	Technology / Type of Modulations:	DTS
	Operating Frequency :	903 ~ 927 MHz
	FCC ID:	2AXA8-FBG-2007
	ISED ID:	27299-FGB2007
	Antenna Brand/ Model	Molex/ 2111400100
	Antenna Type: Flexible Antenna with Cable	Antenna Gain: 1 dBi
	Antenna connector:	U.FL
Analysis:	The results obtained relate only to the item(s) tested.	
Environmental Test Conditions:	Temperature: 20.3° C	
	Relative Humidity: 47.5%	
	Barometric Pressure: 860-1060 mbar	
Evaluated by:	Christopher Martin	
Issue Date(s):	May 26, 2023	

NOTE: The following modules can be chosen to be configured in the EUT.

	Model No.	FCC ID	Note
-	-	-	-
-	-	-	-

FCC/IC RF Testing Units Setting

Model	Hardware (FW) Rev.	Firmware (FW) Rev.	FW operation verification and Instruction
FBG-2007	Nominal HW V2	Nominal FW V2	Verify by Spectrum Analyzer & Laptop

B. Description of Operator Modes

Channel List:

Channel	Frequency (MHz)	Channel	Frequency
3	903	16	916
4	904	17	917
5	905	18	918
6	906	19	919
7	907	20	920
8	908	21	921
9	909	22	922
10	910	23	923
11	911	24	924
12	912	25	925
13	913	26	926
14	914	27	927
15	915		

Power setting is as below:

Lora	Power Setting
Channel	
3	8
14	8
27	8

C. Description of Support Units

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

ID	Product	Brand	Model No.	Serial No.	FCC ID	Remarks
-	-	-	-	-	-	-

Note: (Describe the outline of a simulator, if used for the tests, as a note under the table.)

Insert Cable Connections to/from EUT provided by test team.

ID	Descriptions	Qty.	Length (m)	Shielding (Yes/No)	Cores (Qty.)	Remarks
	-	-	-	-	0	-

Note: The core(s) is(are) originally attached to the cable(s).

General Description of Applied Standards

D. References

The EUT is a RF Product. According to the specifications of the manufacturer, it must comply with the requirements of the following standards:

- **47 CFR FCC Part 15, Subpart C (Section 15.247)**
- **558074 D01 15.247 Meas Guidance v05r02**
- **RSS 247 Issue2**
- **RSS Gen Issue5**
- **ANSI C63.10:2013**

E. Test Site

All testing was performed at Eurofins Electrical and Electronic Testing NA, Inc., 3162 Belick St. Santa Clara, CA 95054. All equipment used in making physical determinations is accurate and bears recent traceability to the National Institute of Standards and Technology.

Eurofins Electrical and Electronic Testing NA, Inc. has been accredited by the American Association for Laboratory Accreditation (A2LA) (Certificate #: 0591.02) in accordance with ISO/IEC 17025:2017.

Eurofins Electrical and Electronic Testing NA, Inc. is part of the Eurofins Electrical & Electronics (E&E) global compliance network.

F. Measurement Uncertainty

Test Method	Typical Expanded Uncertainty	K	Confidence Level
RF Frequencies	±4.52 Hz	2	95%
RF Power Conducted Emissions	±2.32 dB	2	95%
RF Power Conducted Spurious Emissions	±2.25 dB	2	95%
RF Power Radiated Emissions	±3.01 dB	2	95%

Uncertainty Calculations Summary

G. Modifications

a) Modifications to EUT

No modifications were made to the EUT.

b) Modifications to Test Standard

No modifications were made to the test standard.

H. Disposition of EUT

The test sample including all support equipment (if any), submitted to the Electromagnetic Compatibility Lab for testing was returned to Rooster.LLC upon completion of testing.

III. Electromagnetic Compatibility Criteria for Intentional Radiators

Radiated Emission and Bandage Measurement

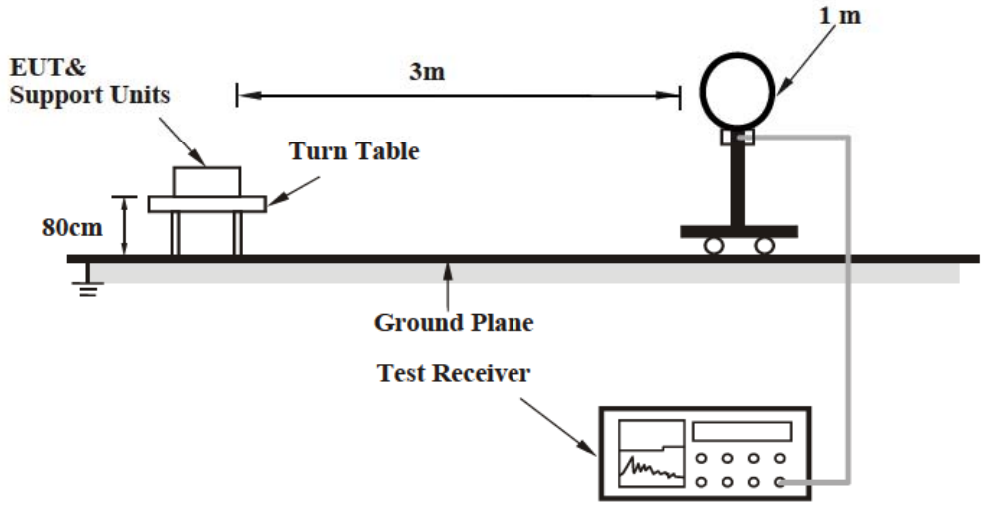
Limits of Radiated Emission and Bandage Measurement:
Radiated emissions which fall in the restricted bands must comply with the radiated emission limits specified as below table. Other emissions shall be at least 20dB below the highest level of the desired power:

Frequencies (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
0.009 ~ 0.490	2400/F(kHz)	300
0.490 ~ 1.705	24000/F(kHz)	30
1.705 ~ 30.0	30	30
30 ~ 88	100	3
88 ~ 216	150	3
216 ~ 960	200	3
Above 960	500	3

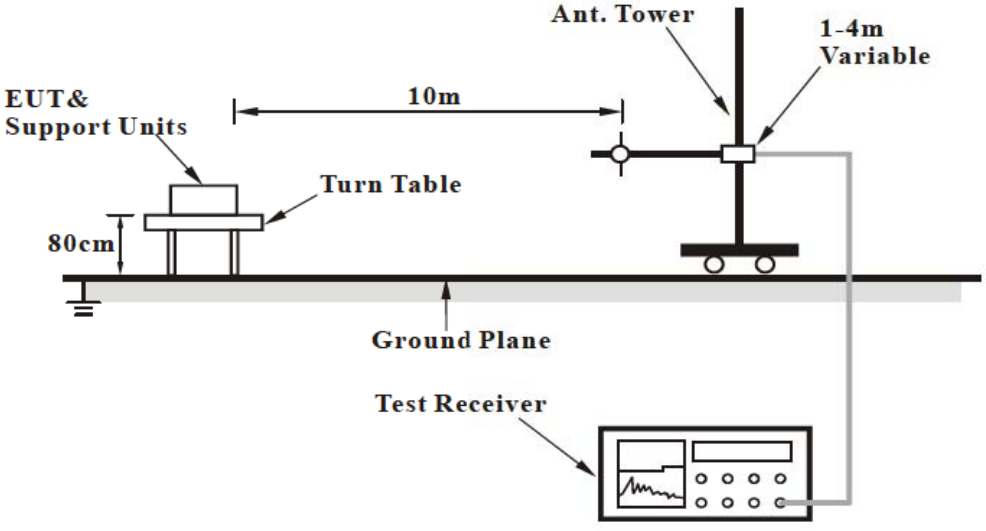
Test Procedures: The transmitter was turned on. Measurements were performed of the low, mid and high Channels. The EUT was rotated orthogonally through all three axes. Plots shown are corrected for both antenna correction factor and distance and compared to a 3 m limit line. Only noise floor was measured above 18 GHz.

Test Setup

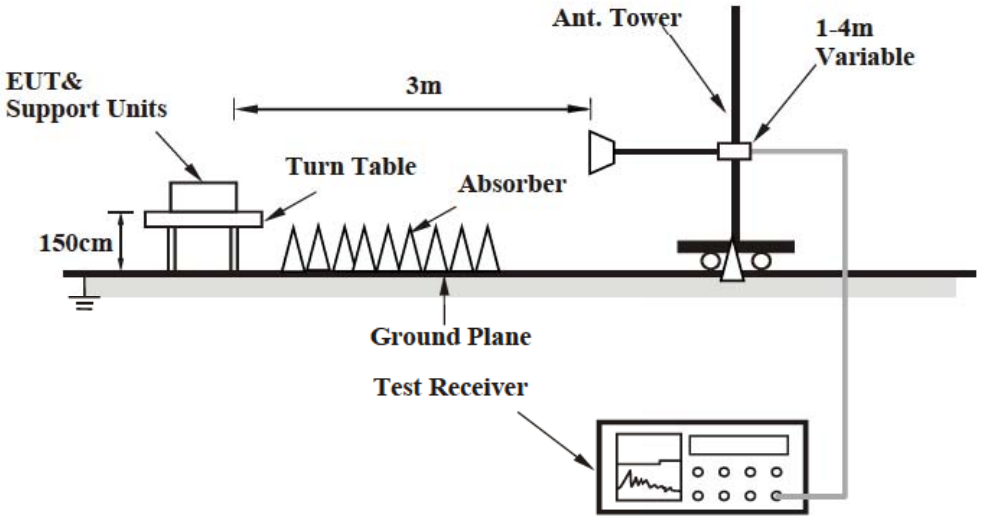
For Radiated Emission Below 30MHz



For Radiated emission 30 MHz to 1GHz



For Radiated emission 1GHz to 40GHz



Test Results: The EUT was tested is **compliant** with Radiated Spurious Emissions Requirements.

Test Equipment List

Calibrated test equipment utilized during testing was maintained in a current state of calibration per the requirements of ISO/IEC 17025:2017.

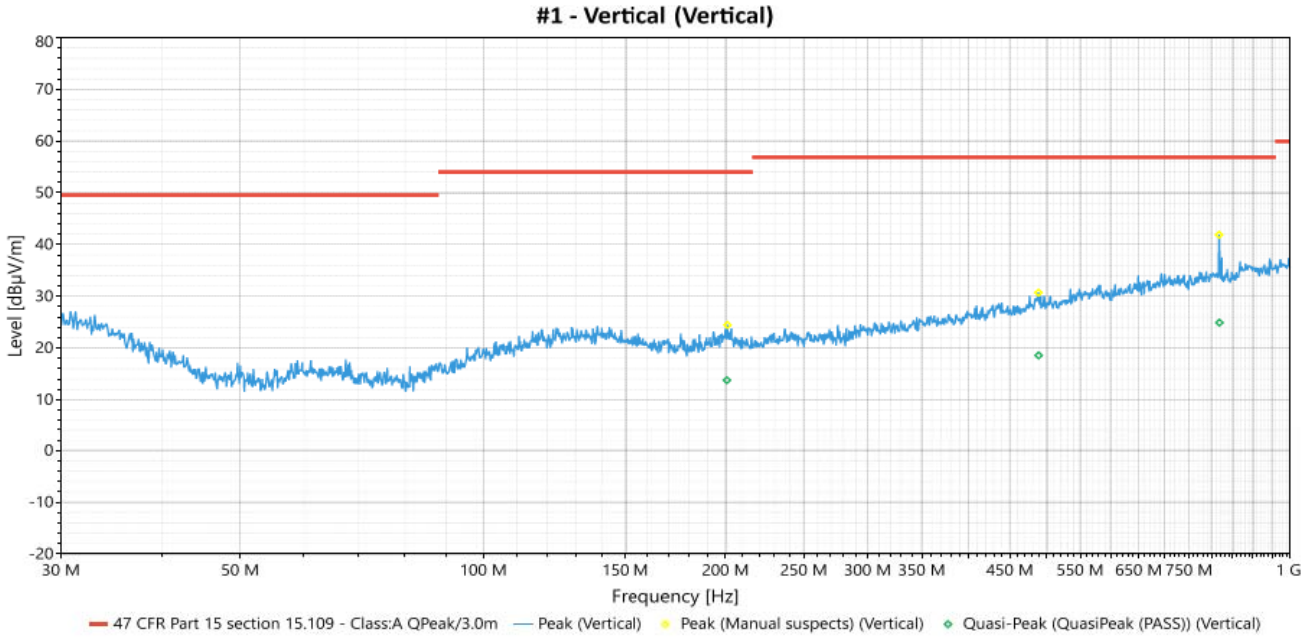
Asset #	Equipment	Manufacturer	Model	Last Cal Date	Cal Due Date
1S2003	EMI Test Receiver	Keysight	N9030B	11/01/2022	11/01/2023
1S2399	Turntable Controller	SUNOL SCIENCE	SC99V	Not Required	Not Required
1S2486	5 Meter Chamber Control Room	Panashield	5 Meter Control Room	Not Required	Not Required
1S3826	Horn Antenna	ETS-LINDGREN	3117	04/06/2023	04/06/2025
1S4802	Preamplifier	EMC Instrument	EMC118A45SE	Note 1	Note 1
1S2668	Preamplifier	Sonoma Instrument	310N	Note 1	Note 1
1S2600	Antenna	Sunol Sciences Corp	JB3	04/ 11/ 2023	04/ 11/ 2025
1S3983	Loop Antenna	ETS-LINDGREN	6512	10/ 14 /2021	10/ 14 /2023
Note 1: Verified by calibrated instrumentation at the time of testing					

Test Engineer: Christopher Martin

Test Date(s): 04/22/2023

Test Data
Radiated Emissions (30 MHz~1000 MHz)

EUT Test Condition		Measurement Detail	
Input Power	3.6Vdc	Frequency Range	30MHz-1GHz
Environmental Conditions	25 deg. C, 70% RH	Tested By	Christopher Martin
Test Mode	TX MODE 915 MHz		

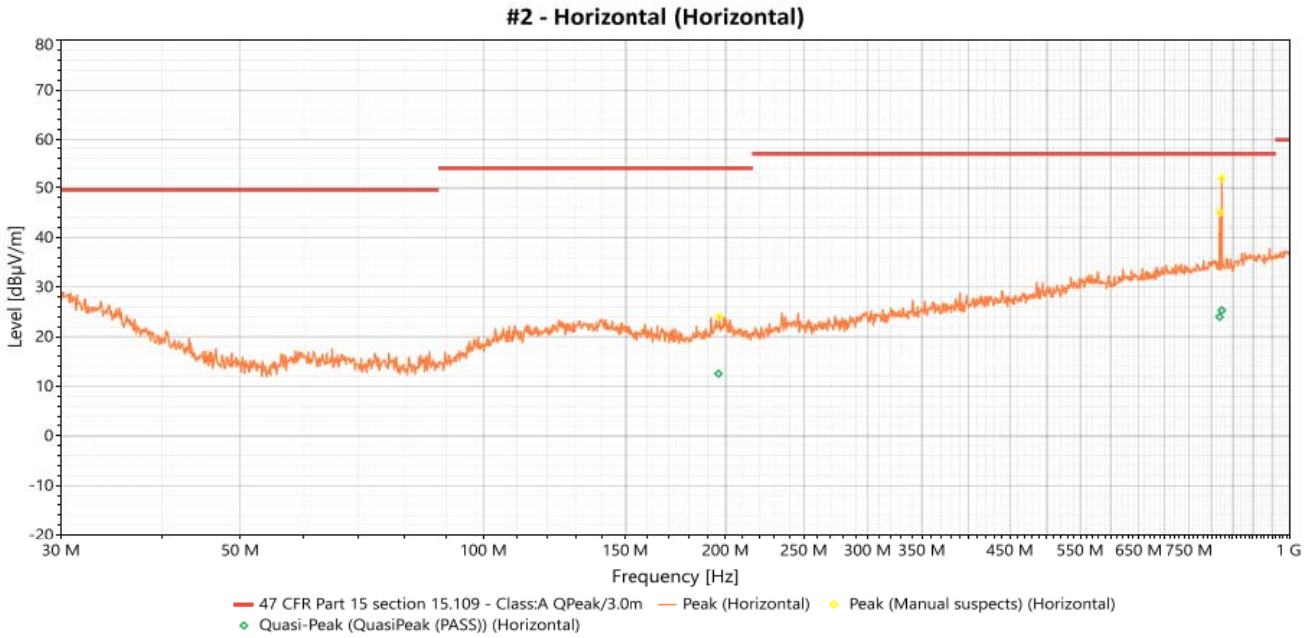


Antenna Polarity & Test Distance: Vertical at 3m									
No.	Frequency (MHz)	Polarization	Level [dB(uV/m)]	Limit dB(uV/m)	Margin [dB]	Height (cm)	Angle (Deg)	Factor [dB(1/m)]	Pass/ Fail
1	200.74	Vertical	13.756	53.96	-40.204	3.99	0	23.46	Pass
2	488.468	Vertical	18.556	56.86	-38.304	3.99	0	28.12	Pass
3	817.864	Vertical	24.888	56.86	-31.972	2	0	32.68	Pass

REMARKS:

1. Level (dBuV) = Reading (dBuV) + Factor (dB(1/m)).
2. Factor (dB(1/m)) = Antenna Factor(AF) (dB(1/m)) + Cable Loss (dB) +Preamplifier
3. Margin value = Emission level – Limit value.
4. The emission levels of other frequencies were less than 20dB margin against the limit.

EUT Test Condition		Measurement Detail	
Input Power	3.6Vdc	Frequency Range	30MHz-1GHz
Environmental Conditions	25 deg. C, 70% RH	Tested By	Christopher Martin
Test Mode	TX MODE 915MHz		



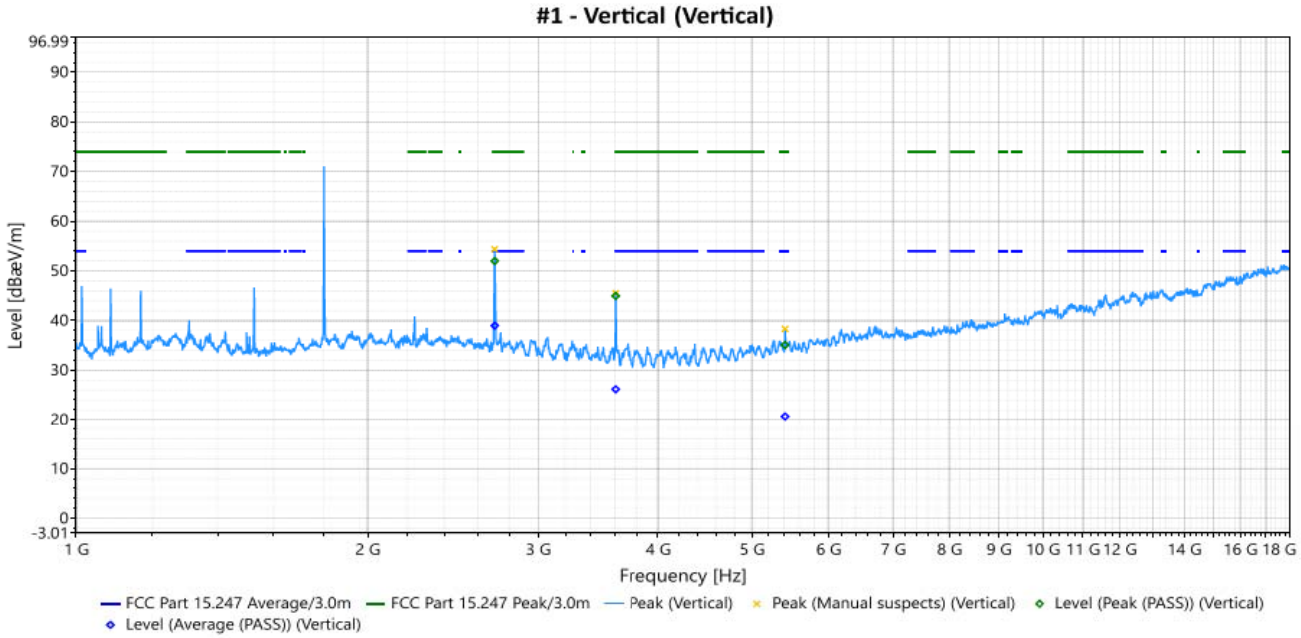
Antenna Polarity & Test Distance: Horizontal at 3m									
No.	Frequency (MHz)	Polarization	Level Peak[dB(uV/m)]	Limit Peak dB(uV/m)	Margin Peak [dB]	Height (cm)	Angle (Deg)	Factor [dB(1/m)]	Pass/ Fail
1	196.022	Horizontal	12.535	53.96	-41.425	1	0	22.92	Pass
2	818.462	Horizontal	23.982	56.86	-32.878	2.99	0	33.26	Pass
3	823.52	Horizontal	25.307	56.86	-31.553	1	0	33.24	Pass

REMARKS:

1. Level (dBuV) = Reading (dBuV) + Factor (dB(1/m)).
2. Factor (dB(1/m)) = Antenna Factor(AF) (dB(1/m)) + Cable Loss (dB) +Preamplifier
3. Margin value = Emission level – Limit value.
4. The emission levels of other frequencies were less than 20dB margin against the limit.

Radiated Emissions (Above 1GHz)

EUT Test Condition		Measurement Detail	
Input Power	3.6Vdc	Frequency Range	1GHz-18GHz
Environmental Conditions	25 deg. C, 70% RH	Tested By	Christopher Martin
Test Mode	TX MODE 903 MHz		

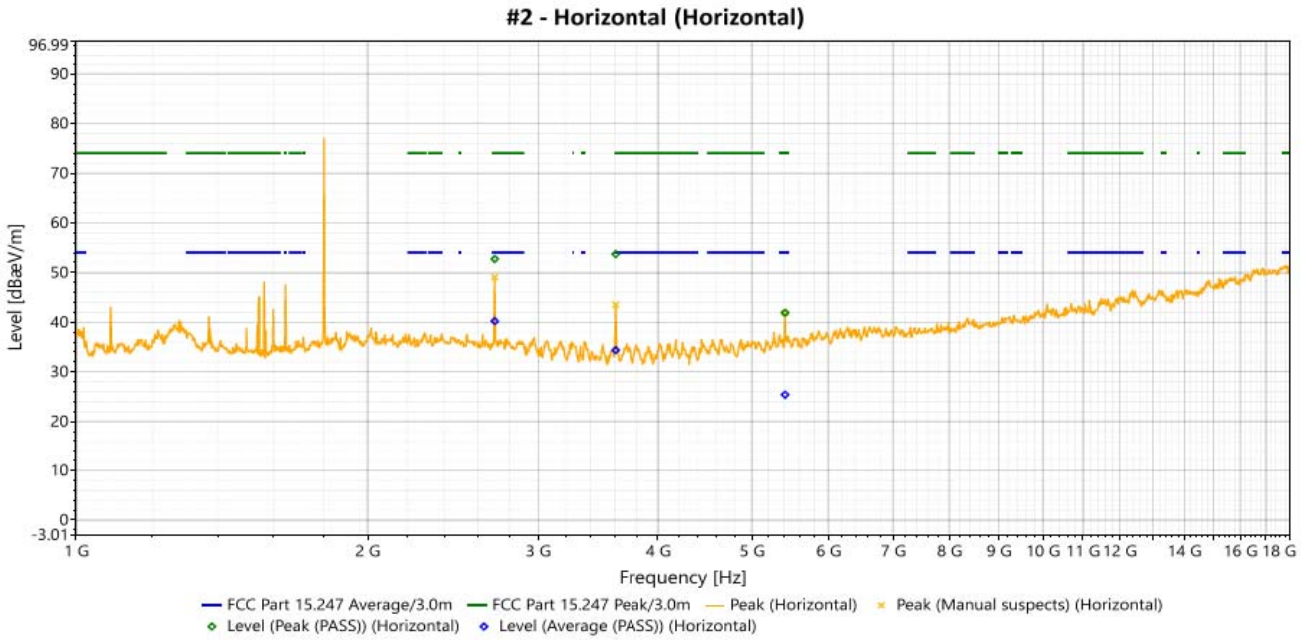


Antenna Polarity & Test Distance: Vertical at 3m									
No.	Frequency (MHz)	Polarization	Level [dB(uV/m)]	Limit dB(uV/m)	Margin [dB]	Height (m)	Angle (Deg)	Factor [dB(1/m)]	Measure Type/ Result
1	2706.55	Vertical	51.992	74	-22.008	3.5	360	2.3	Peak (PASS)
2	2706.55	Vertical	38.979	54	-15.021	3.5	360	2.3	Average (PASS)
3	3607.94	Vertical	44.947	74	-29.053	3.5	360	3.05	Peak (PASS)
4	3607.94	Vertical	26.171	54	-27.829	3.5	360	3.05	Average (PASS)
5	5412.27	Vertical	35.093	74	-38.907	1	61	4.49	Peak (PASS)
6	5412.27	Vertical	20.688	54	-33.312	1	61	4.49	Average (PASS)

REMARKS:

1. Level (dBuV) = Reading (dBuV) + Factor (dB(1/m)).
2. Factor (dB(1/m)) = Antenna Factor(AF) (dB(1/m)) + Cable Loss (dB) +Preamplifier
3. Margin value = Emission level – Limit value.
4. The emission levels of other frequencies were less than 20dB margin against the limit.

EUT Test Condition		Measurement Detail	
Input Power	3.6Vdc	Frequency Range	1GHz-18GHz
Environmental Conditions	25 deg. C, 70% RH	Tested By	Christopher Martin
Test Mode	TX MODE 903 MHz		

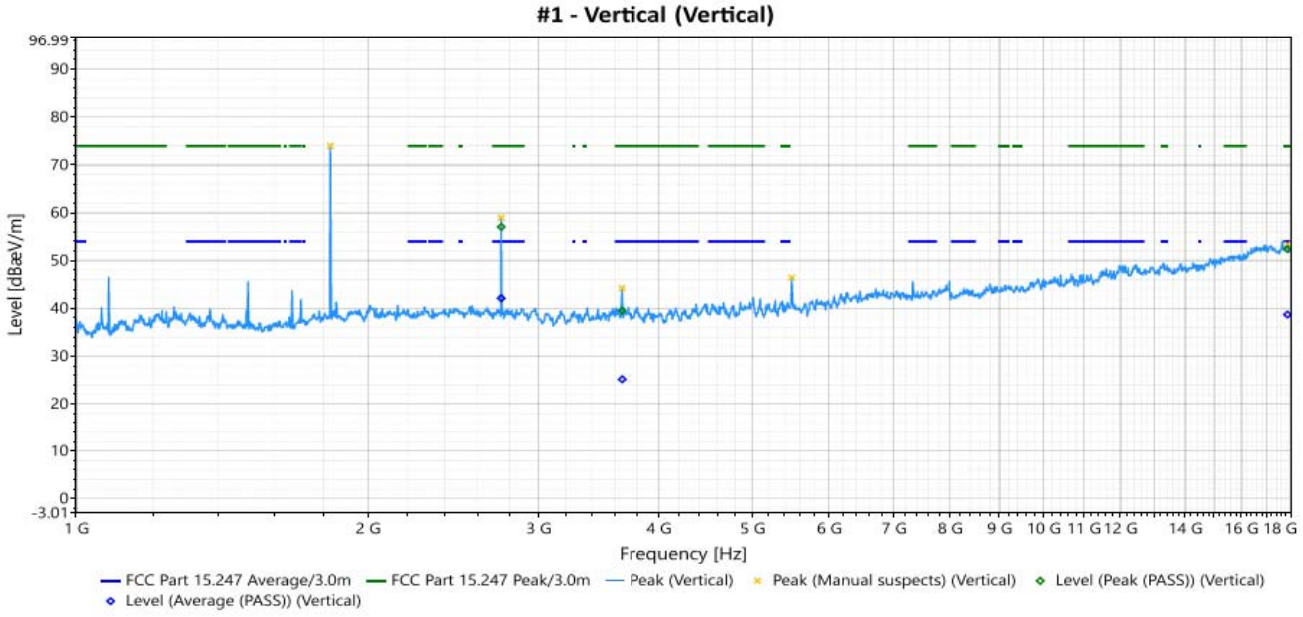


Antenna Polarity & Test Distance: Horizontal at 3m									
No.	Frequency (MHz)	Polarization	Level Peak[dB(uV/m)]	Limit Peak dB(uV/m)	Margin Peak [dB]	Height (m)	Angle (Deg)	Factor [dB(1/m)]	Measure Type/ Result
1	2706.49	Horizontal	52.753	74	-21.247	3.5	236	2.22	Peak (PASS)
2	2706.49	Horizontal	40.244	54	-13.756	3.5	236	2.22	Average (PASS)
3	3608.03	Horizontal	53.707	74	-20.293	1.4	224	3	Peak (PASS)
4	3608.03	Horizontal	34.392	54	-19.608	1.4	224	3	Average (PASS)
5	5411.73	Horizontal	41.912	74	-32.088	1	145	4.48	Peak (PASS)
6	5411.73	Horizontal	25.4	54	-28.6	1	145	4.48	Average (PASS)

REMARKS:

1. Level (dBuV) = Reading (dBuV) + Factor (dB(1/m)).
2. Factor (dB(1/m)) – Antenna Factor(AF) (dB(1/m)) + Cable Loss (dB) +Preamplifier
3. Margin value = Emission level – Limit value.
4. The emission levels of other frequencies were less than 20dB margin against the limit.

EUT Test Condition		Measurement Detail	
Input Power	3.6Vdc	Frequency Range	1GHz-18GHz
Environmental Conditions	25 deg. C, 70% RH	Tested By	Christopher Martin
Test Mode	TX MODE 915 MHz		

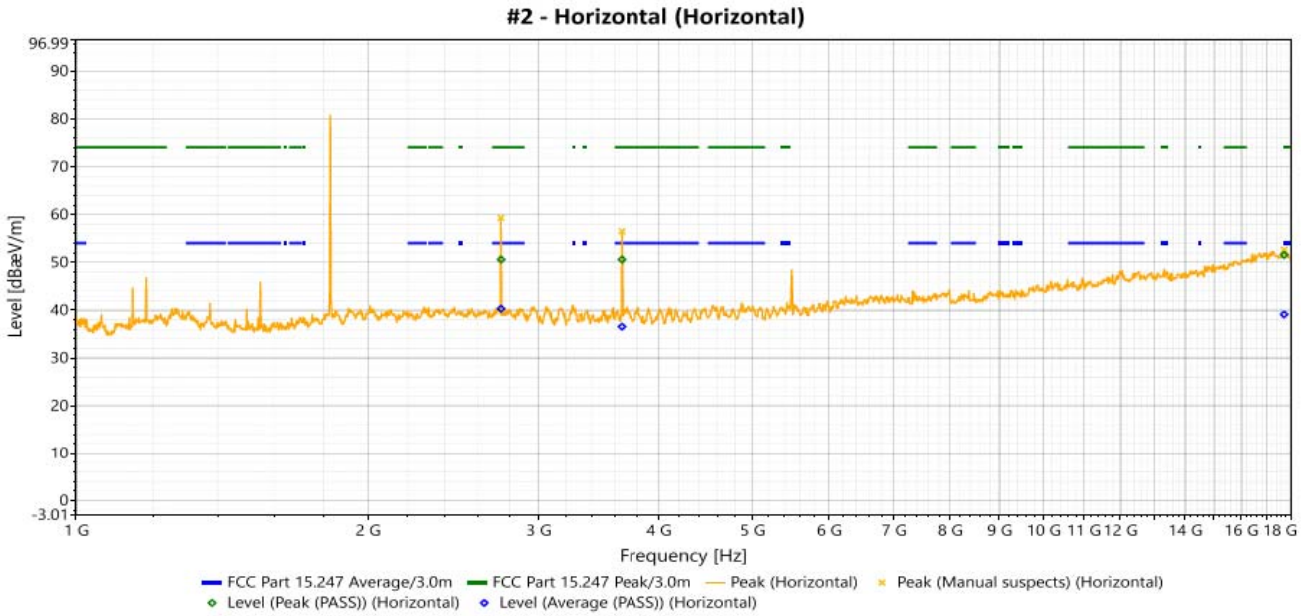


Antenna Polarity & Test Distance: Vertical at 3m									
No.	Frequency (MHz)	Polarization	Level [dB(uV/m)]	Limit dB(uV/m)	Margin [dB]	Height (m)	Angle (Deg)	Factor [dB(1/m)]	Measure Type/ Result
1	2745.72	Vertical	57.032	74	-16.968	3.5	357	2.2	Peak (PASS)
2	2745.72	Vertical	42.122	54	-11.878	3.5	357	2.2	Average (PASS)
3	3660.72	Vertical	39.528	74	-34.472	1.09	200	3.02	Peak (PASS)
4	3660.72	Vertical	25.148	54	-28.852	1.09	200	3.02	Average (PASS)
5	17856.58	Vertical	52.382	74	-21.618	1.4	173	6.98	Peak (PASS)
6	17856.58	Vertical	38.701	54	-15.299	1.4	173	6.98	Average (PASS)

REMARKS:

1. Level (dBuV) = Reading (dBuV) + Factor (dB(1/m)).
2. Factor (dB(1/m)) = Antenna Factor(AF) (dB(1/m)) + Cable Loss (dB) +Preamplifier
3. Margin value = Emission level – Limit value.
4. The emission levels of other frequencies were less than 20dB margin against the limit.

EUT Test Condition		Measurement Detail	
Input Power	3.6Vdc	Frequency Range	1GHz-18GHz
Environmental Conditions	25 deg. C, 70% RH	Tested By	Christopher Martin
Test Mode	TX MODE 915 MHz		

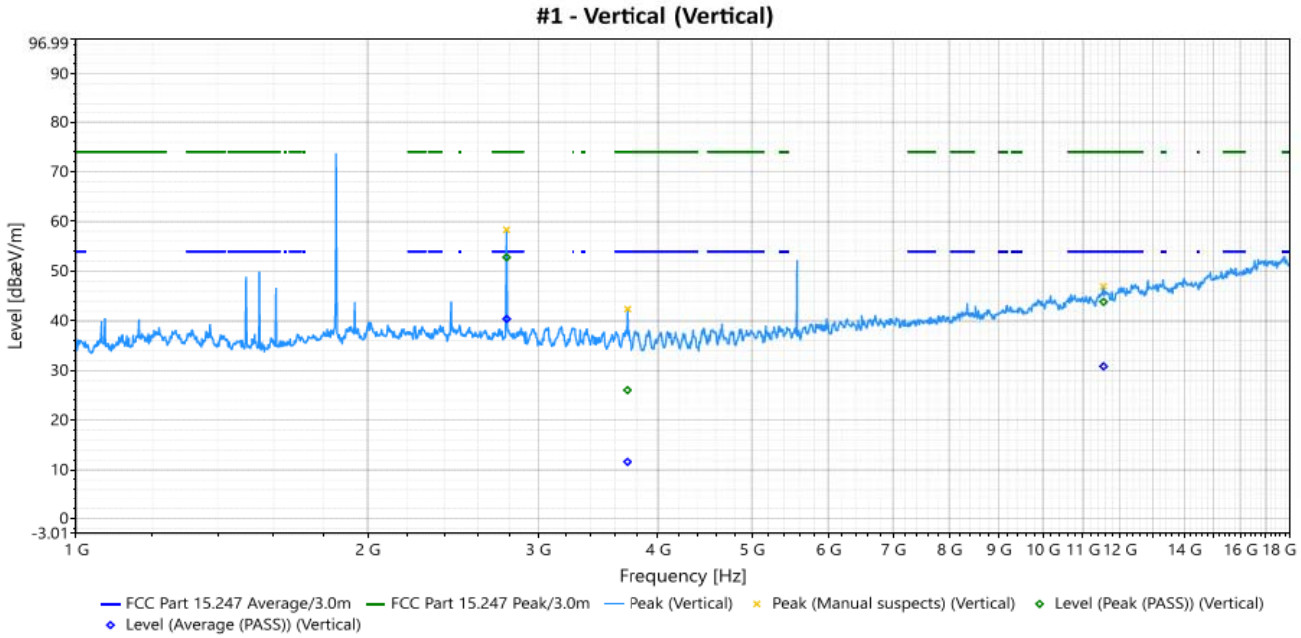


Antenna Polarity & Test Distance: Horizontal at 3m									
No.	Frequency (MHz)	Polarization	Level Peak[dB(uV/m)]	Limit Peak dB(uV/m)	Margin Peak [dB]	Height (m)	Angle (Deg)	Factor [dB(1/m)]	Measure Type/ Result
1	2745.04	Horizontal	50.591	74	-23.409	1.09	357	2.24	Peak (PASS)
2	2745.04	Horizontal	40.308	54	-13.692	1.09	357	2.24	Average (PASS)
3	3660.04	Horizontal	50.578	74	-23.422	1.9	315	3.04	Peak (PASS)
4	3660.04	Horizontal	36.559	54	-17.441	1.9	315	3.04	Average (PASS)
5	17717.57	Horizontal	51.552	74	-22.448	1.4	0	6.88	Peak (PASS)
6	17717.57	Horizontal	39.106	54	-14.894	1.4	0	6.88	Average (PASS)

REMARKS:

1. Level (dBuV) = Reading (dBuV) + Factor (dB(1/m)).
2. Factor (dB(1/m)) = Antenna Factor(AF) (dB(1/m)) + Cable Loss (dB) +Preamplifier
3. Margin value = Emission level – Limit value.
4. The emission levels of other frequencies were less than 20dB margin against the limit.

EUT Test Condition		Measurement Detail	
Input Power	3.6Vdc	Frequency Range	1GHz-18GHz
Environmental Conditions	25 deg. C, 70% RH	Tested By	Christopher Martin
Test Mode	TX MODE 927 MHz		

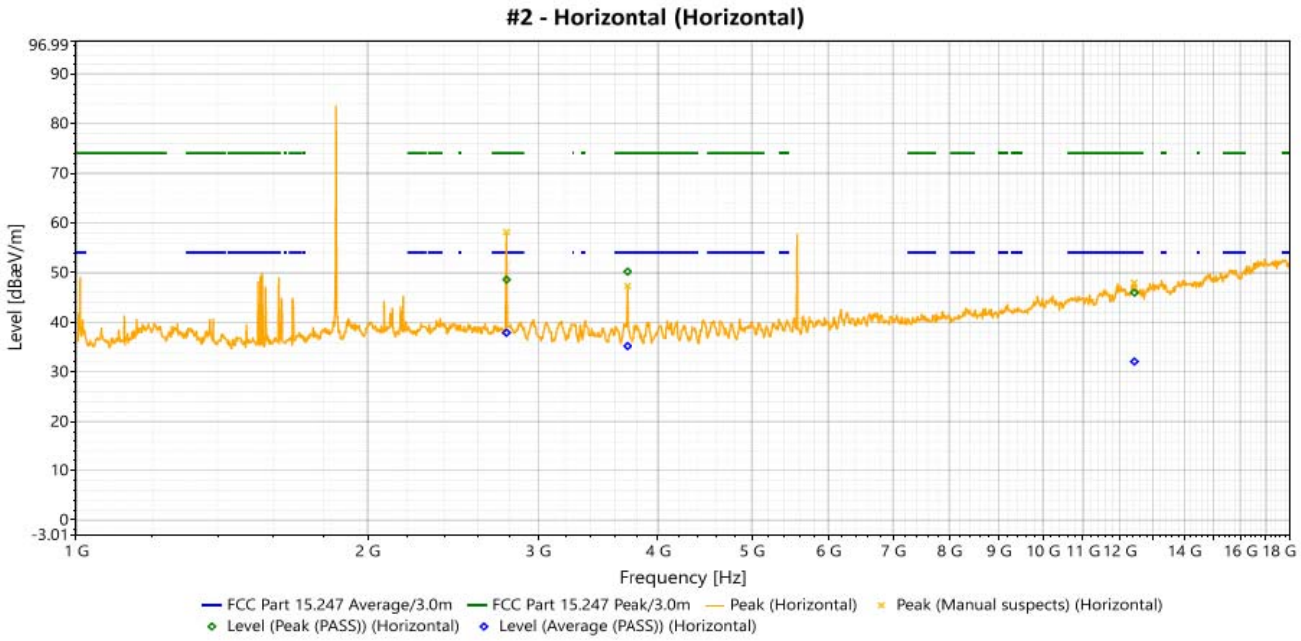


Antenna Polarity & Test Distance: Vertical at 3m									
No.	Frequency (MHz)	Polarization	Level [dB(uV/m)]	Limit dB(uV/m)	Margin [dB]	Height (m)	Angle (Deg)	Factor [dB(1/m)]	Measure Type/ Result
1	2784.51	Vertical	52.793	74	-21.207	2.09	360	2.14	Peak (PASS)
2	2784.51	Vertical	40.378	54	-13.622	2.09	360	2.14	Average (PASS)
3	3711.85	Vertical	26.047	74	-47.953	2.59	289	3.05	Peak (PASS)
4	3711.85	Vertical	11.608	54	-42.392	2.59	289	3.05	Average (PASS)
5	11553.52	Vertical	43.821	74	-30.179	1.59	207	6.8	Peak (PASS)
6	11553.52	Vertical	30.838	54	-23.162	1.59	207	6.8	Average (PASS)

REMARKS:

1. Level (dBuV) = Reading (dBuV) + Factor (dB(1/m)).
2. Factor (dB(1/m)) = Antenna Factor(AF) (dB(1/m)) + Cable Loss (dB) +Preamplifier
3. Margin value = Emission level – Limit value.
4. The emission levels of other frequencies were less than 20dB margin against the limit.

EUT Test Condition		Measurement Detail	
Input Power	3.6Vdc	Frequency Range	1GHz-18GHz
Environmental Conditions	25 deg. C, 70% RH	Tested By	Christopher Martin
Test Mode	TX MODE 927 MHz		



Antenna Polarity & Test Distance: Horizontal at 3m									
No.	Frequency (MHz)	Polarization	Level Peak[dB(uV/m)]	Limit Peak dB(uV/m)	Margin Peak [dB]	Height (m)	Angle (Deg)	Factor [dB(1/m)]	Measure Type/ Result
1	2783.8	Horizontal	48.582	74	-25.418	1.09	357	2.22	Peak (PASS)
2	2783.8	Horizontal	37.891	54	-16.109	1.09	357	2.22	Average (PASS)
3	3712.79	Horizontal	50.186	74	-23.814	1.4	313	3.08	Peak (PASS)
4	3712.79	Horizontal	35.204	54	-18.796	1.4	313	3.08	Average (PASS)
5	12432.8	Horizontal	45.944	74	-28.056	1.09	360	7.42	Peak (PASS)
6	12432.8	Horizontal	32.113	54	-21.887	1.09	360	7.42	Average (PASS)

REMARKS:

1. Level (dBuV) = Reading (dBuV) + Factor (dB(1/m)).
2. Factor (dB(1/m)) – Antenna Factor(AF) (dB(1/m)) + Cable Loss (dB) +Preamplifier
3. Margin value = Emission level – Limit value.
4. The emission levels of other frequencies were less than 20dB margin against the limit.

Conducted Emission Measurement

Limits of Conducted Emission Measurement :

The following standards specified below are covered in the scope of this section of the test report:

Frequency (MHz)	Conducted Limit (dBuV)	
	Quasi-peak	Average
0.15 - 0.5	66 - 56	56 - 46
0.50 - 5.0	56	46
5.0 - 30.0	60	50

Note: 1. The lower limit shall apply at the transition frequencies.
2. The limit decreases in line with the logarithm of the frequency in the range of 0.15 to 0.50MHz.

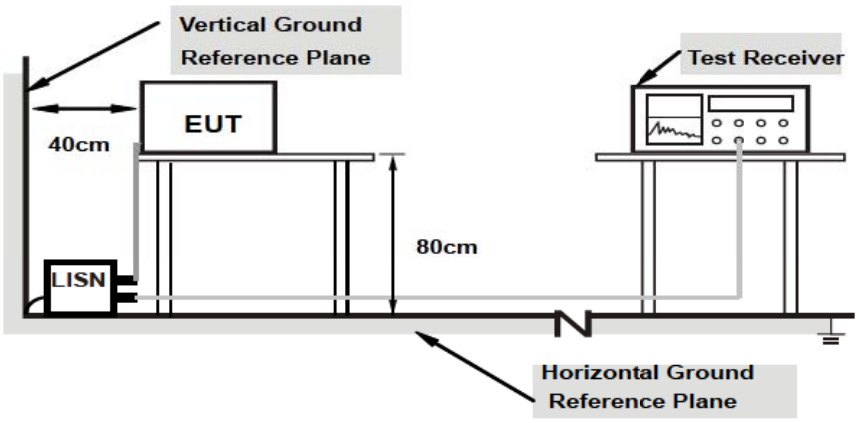
Conducted Emissions - Test Procedure

a. The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/ 50uH of coupling impedance for the measuring instrument.

b. Both lines of the power mains connected to the EUT were checked for maximum conducted interference.

c. The frequency ranges from 150 kHz to 30MHz was searched. Emission levels under (Limit - 20dB) was not recorded.

Conducted Emissions - Test Setup



Note: 1.Support units were connected to second LISN.

For the actual test configuration, please refer to the attached file (Test Setup Photo)

Test Results: N/A

6dB Bandwidth Measurement & 99% Bandwidth Measurement

Limits of Conducted Emission Measurement :

The minimum of 6dB Bandwidth Measurement is 0.5 MHz.

Test Procedure

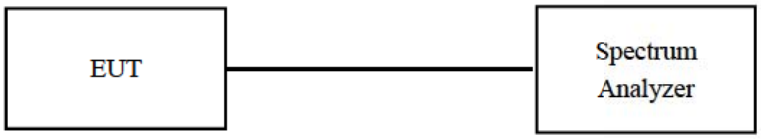
99% Bandwidth Measurement

Refer to ANSI C63.10 section 6.9.3

-6dB Bandwidth Measurement

a. Set resolution bandwidth (RBW) = 100kHz
b. Set the video bandwidth (VBW) ≥ 3 x RBW, Detector = Peak.
c. Trace mode = max hold.
d. Sweep = auto couple.
e. Measure the maximum width of the emission that is constrained by the frequencies associated with the two amplitude points (upper and lower) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission

Conducted Emissions - Test Setup



For the actual test configuration, please refer to the attached file (Test Setup Photo)

Test Equipment

Calibrated test equipment utilized during testing was maintained in a current state of calibration per the requirements of ISO/IEC 17025:2017.

Note: Functionally tested equipment is verified using calibrated instrumentation at the time of testing.

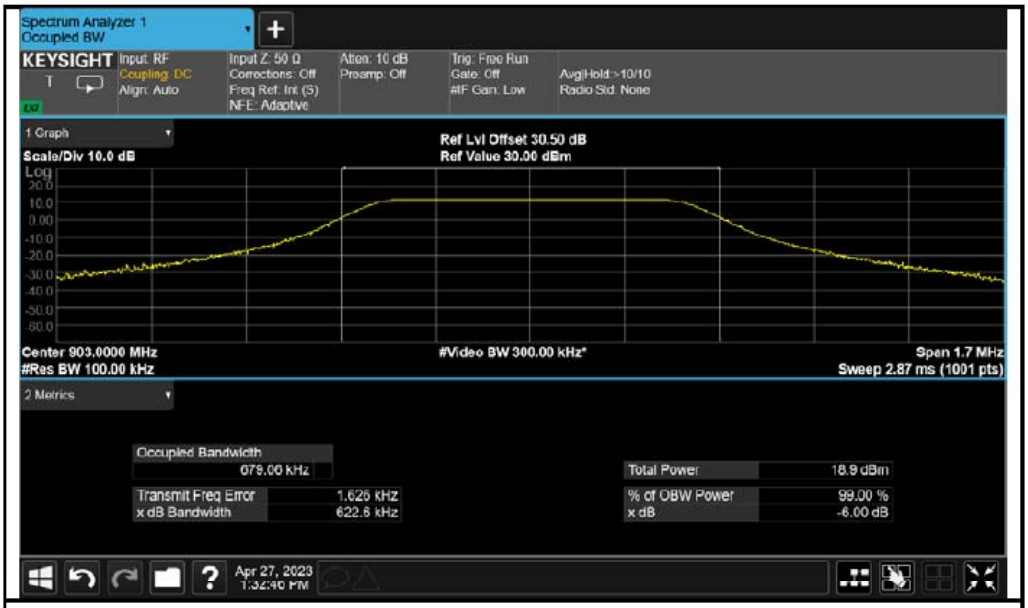
Test Name: 6dB Bandwidth Measurement & 99% Bandwidth Measurement			**Test Date(s):** 04/27/2023		
MET Asset #	**Equipment**	**Manufacturer**	**Model**	**Last Cal Date**	**Cal Due Date**
1S2003	EMI Test Receiver	Keysight	N9030B	11/01/2022	11/01/2023
Note: Functionally tested equipment is verified using calibrated instrumentation at the time of testing.					

Test Result:

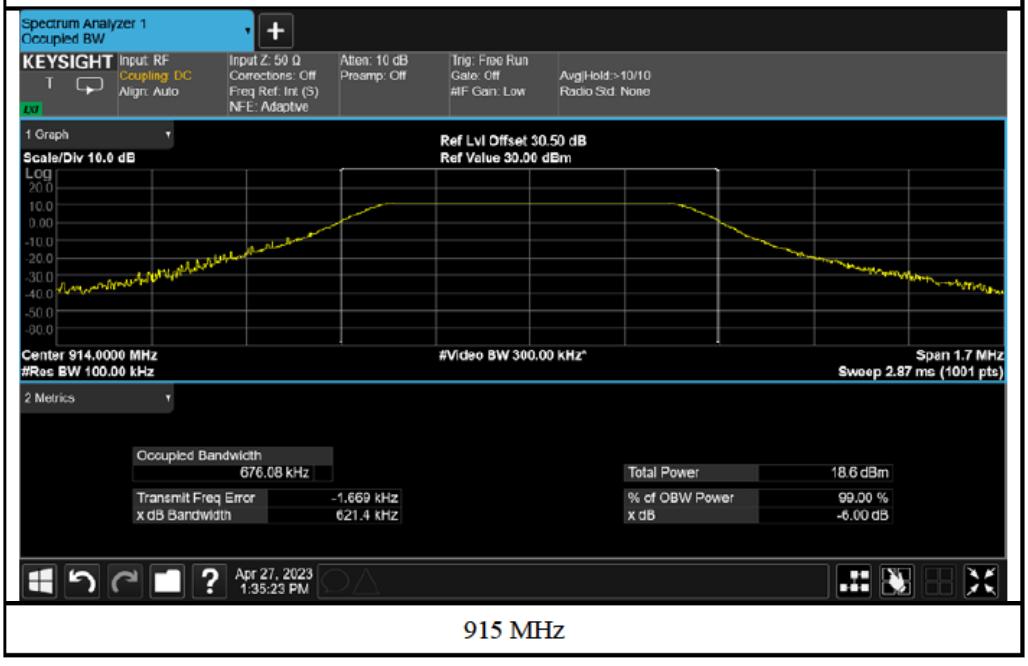
Channel	Frequency (MHz)	6dB Bandwidth (MHz)	99% Bandwidth (MHz)	Minimum Limit (MHz)	Pass / Fail
1	903	0.6226	0.67650	0.5	PASS
6	914	0.6214	0.67608	0.5	PASS
11	927	0.6216	0.67465	0.5	PASS

Test Plots:

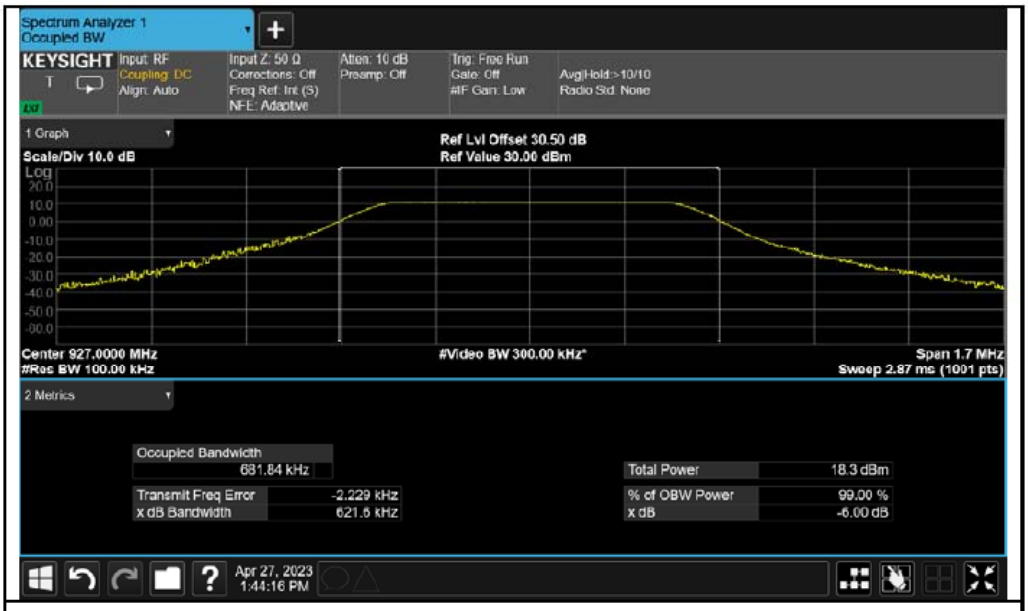
-6dB Bandwidth:



903 MHz

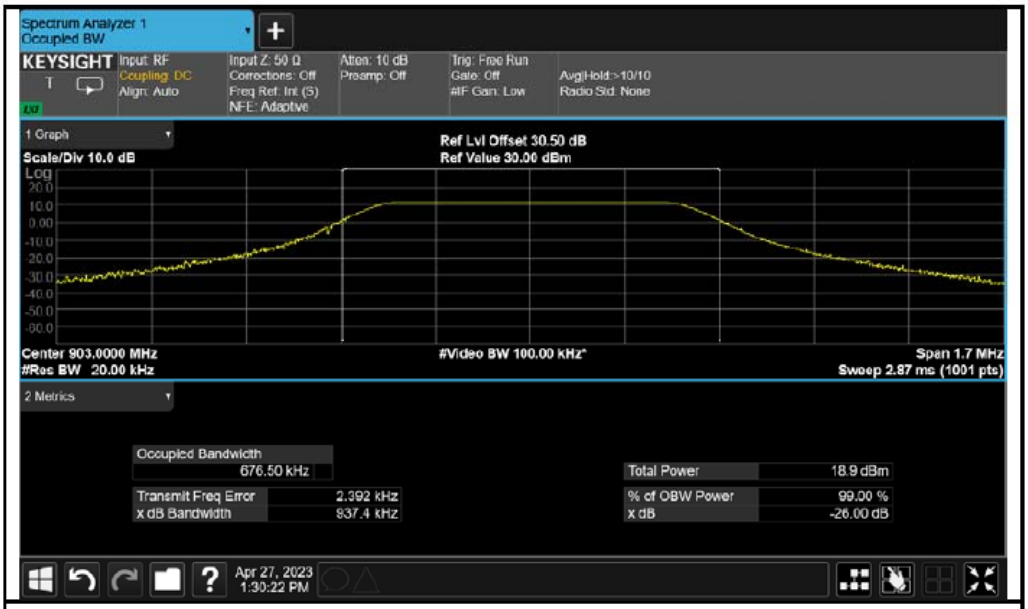


915 MHz

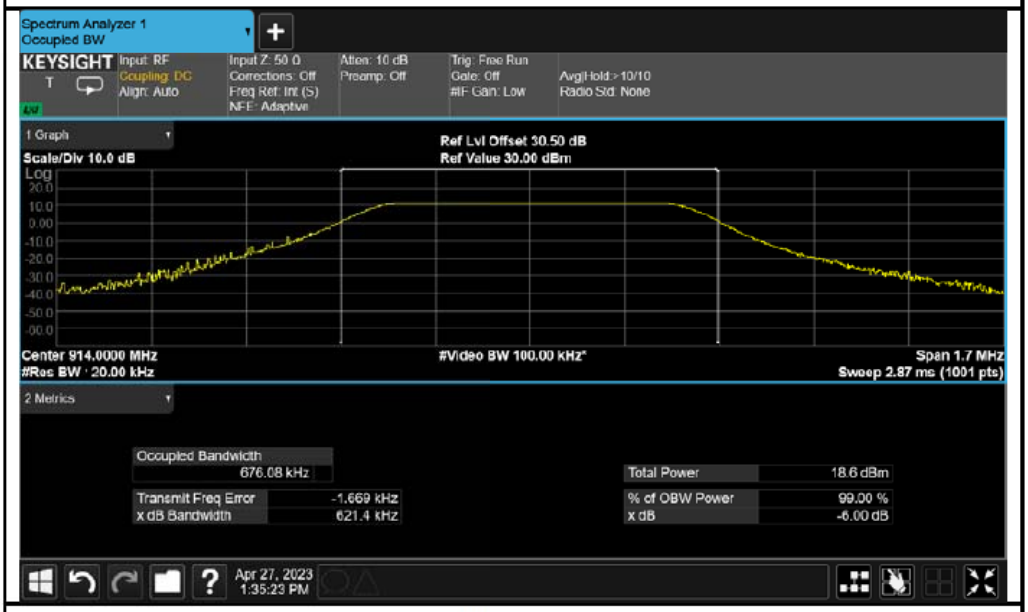

Spectrum Analyzer 1
Occupied BW
KEYSIGHT
Input: RF
Coupling: DC
Align: Auto
Input Z: 50 Ω
Corrections: Off
Freq Ref: Int (S)
NFE: Adaptive
Atten: 10 dB
Preamp: Off
Trig: Free Run
Gate: Off
#IF Gain: Low
Avg|Hold:>10/10
Radio Std: None
1 Graph
Scale/Div 10.0 dB
Ref Lvl Offset 30.50 dB
Ref Value 30.00 dBm
Log
20.0
10.0
0.00
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
Center 927.0000 MHz
#Res BW 100.00 kHz
#Video BW 300.00 kHz*
Span 1.7 MHz
Sweep 2.87 ms (1001 pts)
2 Metrics
Occupied Bandwidth
681.84 kHz
Transmit Freq Error
-2.229 kHz
x dB Bandwidth
621.5 kHz
Total Power
18.3 dBm
% of OBW Power
99.00 %
x dB
-6.00 dB
Apr 27, 2023
1:44:16 PM

927 MHz

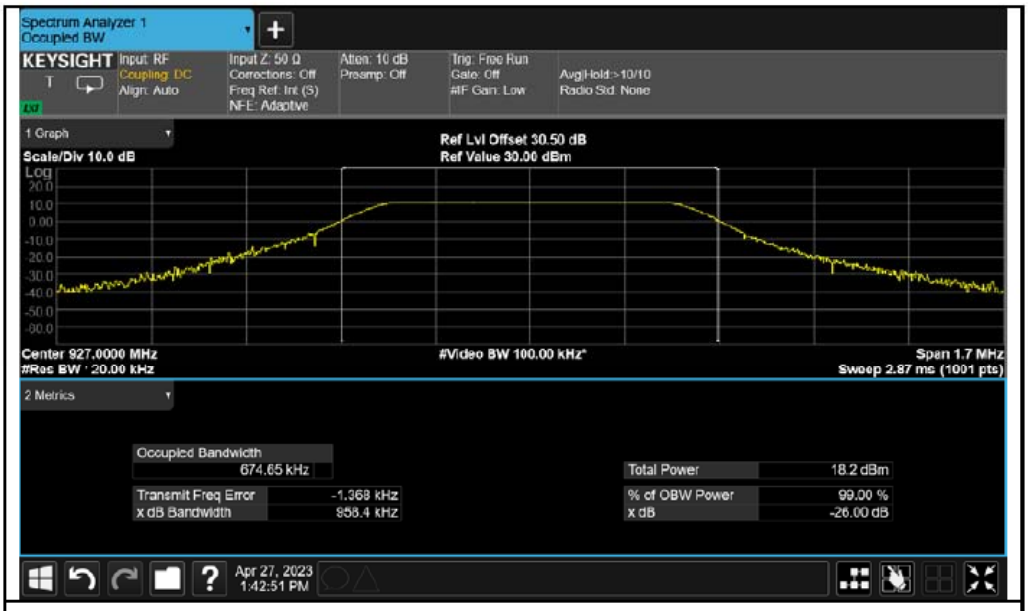
99% Bandwidth:



903 MHz



915 MHz


Spectrum Analyzer 1
Occupied BW
KEYSIGHT
Input: RF
Coupling: DC
Align: Auto
Input Z: 50 Ω
Corrections: Off
Freq Ref: Int (S)
NFE: Adaptive
Atten: 10 dB
Preamp: Off
Trig: Free Run
Gate: Off
#IF Gain: Low
Avg|Hold:>10/10
Radio Std: None
1 Graph
Scale/Div 10.0 dB
Ref Lvl Offset 30.50 dB
Ref Value 30.00 dBm
Log
20.0
10.0
0.00
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
Center 927.0000 MHz
#Res BW 20.00 kHz
#Video BW 100.00 kHz*
Span 1.7 MHz
Sweep 2.87 ms (1001 pts)
2 Metrics
Occupied Bandwidth
674.65 kHz
Transmit Freq Error
-1.368 kHz
x dB Bandwidth
858.4 kHz
Total Power
18.2 dBm
% of OBW Power
99.00 %
x dB
-26.00 dB
Apr 27, 2023
1:42:51 PM

927 MHz

Conducted Output Power Measurement

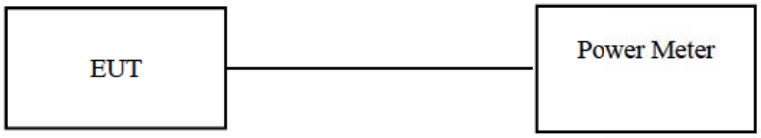
Limits of Output Power Measurement :

For systems using digital modulation in the 908–928 MHz bands: 1 Watt (30dBm)

Test Procedure

A power meter sensor was used on the output port of the EUT. A power meter was used to read the response of the power sensor. Record the power level.

Test Setup



For the actual test configuration, please refer to the attached file (Test Setup Photo)

Test Equipment

Calibrated test equipment utilized during testing was maintained in a current state of calibration per the requirements of ISO/IEC 17025:2017.

Note: Functionally tested equipment is verified using calibrated instrumentation at the time of testing.

Test Name: Conducted Output Power Measurement			**Test Date(s):** 04/27/2023		
Asset #	**Equipment**	**Manufacturer**	**Model**	**Last Cal Date**	**Cal Due Date**
N/A	Power Meter	ROHDE & SCHWARZ	NRQ6	06/22/2022	06/22/2023

Test Result:

LORA

Frequency (MHz)	Conducted Power (dBm)	Limit (dBm)	Pass/Fail
903	7.8	30	Pass
915	7.5	30	Pass
927	7.1	30	Pass

Power Spectral Density Measurement

Limits of Power Spectral Measurement :

The Maximum of Power Spectral Density Measurement is 8dBm in any 3 kHz.

Test Procedure

a. Set analyzer center frequency to DTS channel center frequency.

b. Set the span to 1.5 times the DTS bandwidth.

c. Set the RBW to: 3 kHz ≤ RBW ≤ 100 kHz.

d. Set the VBW ≥ 3 × RBW.

e. Detector = peak.

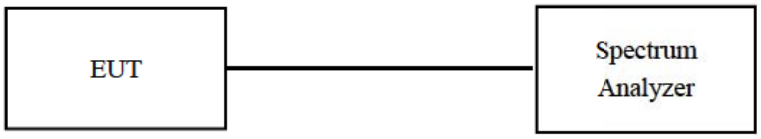
f. Sweep time = auto couple.

g. Trace mode = max hold.

h. Allow trace to fully stabilize.

i. Use the peak marker function to determine the maximum amplitude level within the RBW.

Test Setup



For the actual test configuration, please refer to the attached file (Test Setup Photo)

Test Equipment

Calibrated test equipment utilized during testing was maintained in a current state of calibration per the requirements of ISO/IEC 17025:2017.

Note: Functionally tested equipment is verified using calibrated instrumentation at the time of testing.

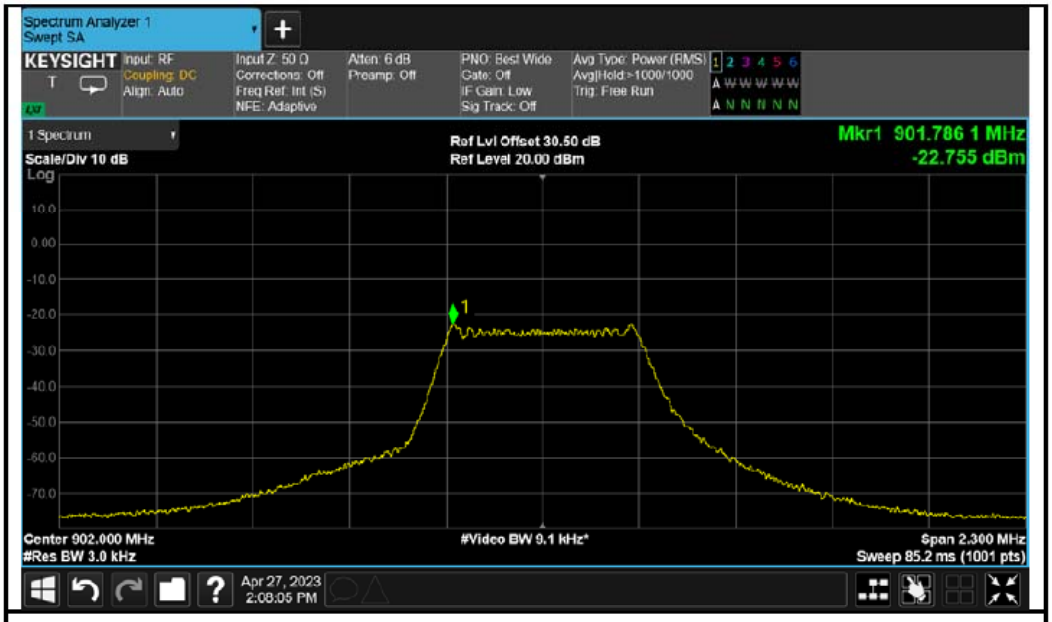
Test Name: Power Spectral Density Measurement			**Test Date(s):** 04/27/2023		
MET Asset #	**Equipment**	**Manufacturer**	**Model**	**Last Cal Date**	**Cal Due Date**
1S2003	EMI Test Receiver	Keysight	N9030B	11/01/2022	11/01/2023
Note: Functionally tested equipment is verified using calibrated instrumentation at the time of testing.					

Test Result:

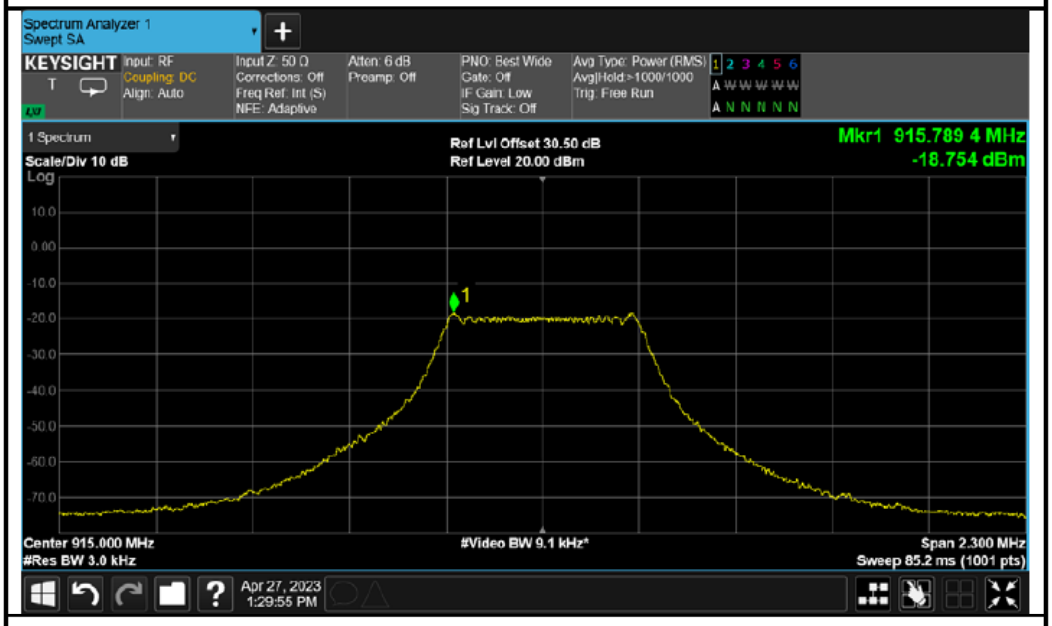
Lora:

Frequency (MHz)	PSD (dBm/3kHz)	Limit (dBm/3kHz)	Pass/Fail
903	-22.755	8	Pass
915	-18.754	8	Pass
927	-18.351	8	Pass

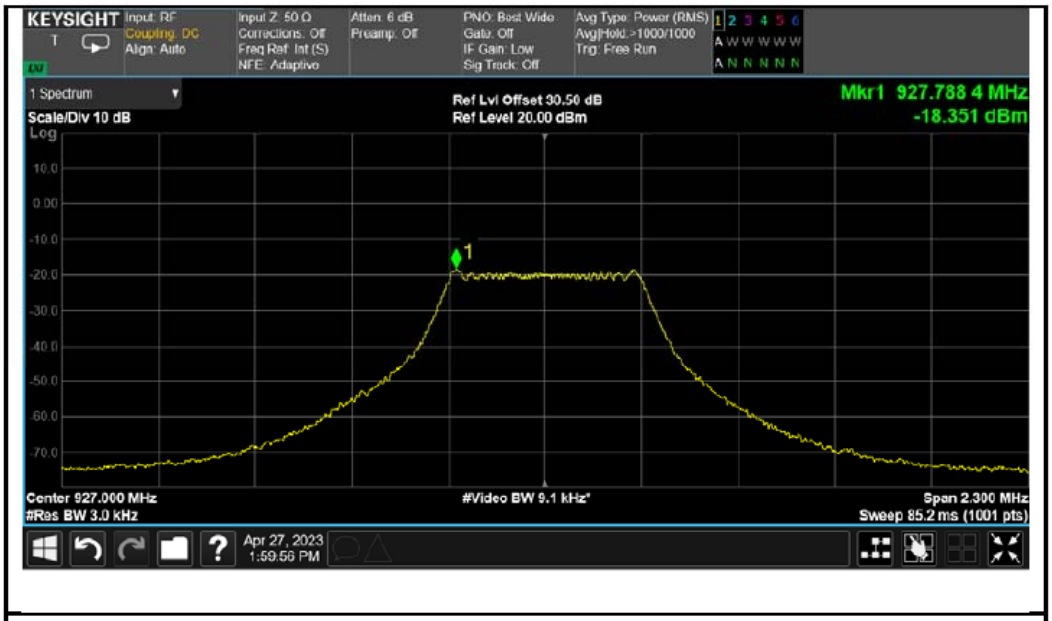
Test Plots:



TX 903 MHz



TX 915 MHz


KEYSIGHT
Input: RF
Coupling: DC
Align: Auto
Input Z: 50 Ω
Corrections: Off
Freq Ref: Int (S)
NFE: Adaptive
Atten: 6 dB
Preamp: Off
PNO: Best Wide
Gate: Off
IF Gain: Low
Sig Track: Off
Avg Type: Power (RMS)
Avg|Hold:>1000/1000
Trig: Free Run
1 Spectrum
Scale/Div 10 dB
Ref Lvl Offset 30.50 dB
Ref Level 20.00 dBm
Mkr1 927.788 4 MHz
-18.351 dBm
Log
10.0
0.00
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
Center 927.000 MHz
#Res BW 3.0 kHz
#Video BW 9.1 kHz*
Span 2.300 MHz
Sweep 85.2 ms (1001 pts)
Apr 27, 2023
1:59:56 PM

TX 927MHz

Conducted Out of Band Emission Measurement

Limits of Conducted Out of Band Emission Measurement:

Below 20dB of the highest emission level of operating band (in 100kHz Resolution Bandwidth)

Test Procedure

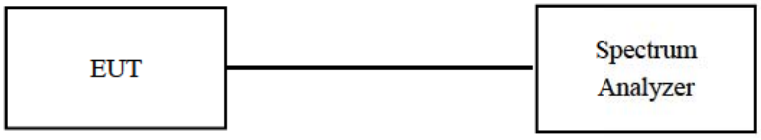
MEASUREMENT PROCEDURE REF

1. Set the RBW = 100 kHz.
2. Set the VBW ≥ 300 kHz.
3. Detector = peak.
4. Sweep time = auto couple.
5. Trace mode = max hold.
6. Allow trace to fully stabilize.
7. Use the peak marker function to determine the maximum power level in any 100 kHz band segment within the fundamental EBW.

MEASUREMENT PROCEDURE OOBE

1. Set RBW = 100 kHz.
2. Set VBW ≥ 300 kHz.
3. Detector = peak.
4. Sweep = auto couple.
5. Trace Mode = max hold.
6. Allow trace to fully stabilize.
7. Use the peak marker function to determine the maximum amplitude level.

Test Setup



For the actual test configuration, please refer to the attached file (Test Setup Photo)

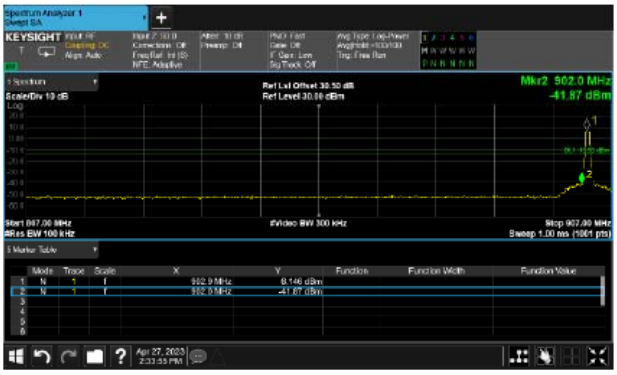
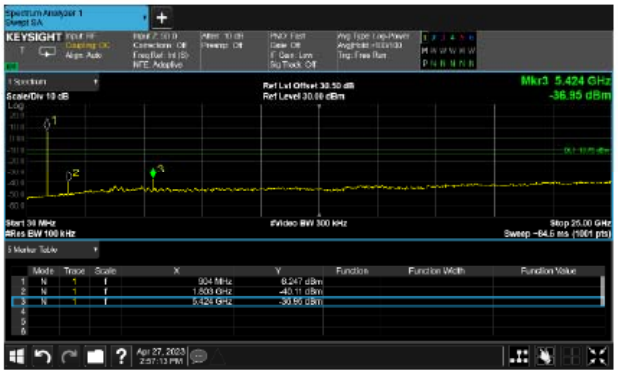
Test Equipment

Calibrated test equipment utilized during testing was maintained in a current state of calibration per the requirements of ISO/IEC 17025:2017.

Note: Functionally tested equipment is verified using calibrated instrumentation at the time of testing.

Test Name: Conducted Out of Band Emission Measurement			**Test Date(s):** 04/27/2023		
MET Asset #	**Equipment**	**Manufacturer**	**Model**	**Last Cal Date**	**Cal Due Date**
1S2003	EMI Test Receiver	Keysight	N9030B	11/01/2022	11/01/2023
Note: Functionally tested equipment is verified using calibrated instrumentation at the time of testing.					

Test Result:

Low Channel 807MHz-907MHz	Low Channel 30 MHz-25 GHz
	
High Channel 920MHz-1020MHz	**High Channel 30 MHz-25 GHz**
	

IV. Pictures of test Arrangements

Please see setup photo file

END OF REPORT