



FCC TEST REPORT

Test report
On Behalf of
BCS Automotive Interface Solutions U.S. LLC
For
RF Hub Module
Model No.: RFHM

FCC ID: 2BG8H-55TV2

Prepared for : BCS Automotive Interface Solutions U.S. LLC
33737 W, 12 Mile Rd, Farmington Hills, Michigan, United States

Prepared By : Shenzhen Tongzhou Testing Co.,Ltd.
1st Floor, Building 1, Haomai High-tech Park, Huating Road 387, Dalang Street,
Longhua, Shenzhen, China

Date of Test: 2024/9/18 ~ 2024/10/9
Date of Report: 2024/10/10
Report Number: TZ0029240904FRF16

The test report apply only to the specific sample(s) tested under stated test conditions
It is not permitted to copy extracts of these test result without the written permission of the test laboratory.



TEST RESULT CERTIFICATION


Applicant's name : BCS Automotive Interface Solutions U.S. LLC

Address : 33737 W, 12 Mile Rd, Farmington Hills, Michigan, United States

Manufacture's Name : BCS Automotive Interface Solutions U.S. LLC

Address : 33737 W, 12 Mile Rd, Farmington Hills, Michigan, United States

Product description

Trade Mark : 

Product name : RF Hub Module

Model : RFHM

Standards : FCC Rules and Regulations Part 15 Subpart C (Section 15.209),
ANSI C63.10: 2013

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Date of Test :

Date (s) of performance of tests : 2024/9/18 ~ 2024/10/9

Date of Issue : 2024/10/10

Test Result : **Pass**

Testing Engineer

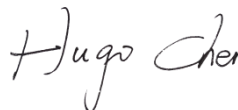
:



(Allen Lai)

Technical Manager

:



(Hugo Chen)

Authorized Signatory

:



(Andy Zhang)



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1. GENERAL INFORMATION

1.1. Description of Device (EUT)

EUT	: RF Hub Module
Model Number	: RFHM
Model Declaration	: N/A
Test Model	: RFHM
Power Supply	: DC 12V
Hardware version	: V1.0
Software version	: V1.0

1.2. Wireless Function Tested in this Report

SRD	
Operation Frequency	: 125 kHz
Channel Number	: 1
Modulation Technology	: ASK
Antenna Type And Gain	: Integral Antenna, 0.0dBi (Max.)

Note 1: Antenna position refer to EUT Photos.

Note 2: the above information was supplied by the applicant.

1.3. Description of Test Facility

FCC

Designation Number: CN1275

Test Firm Registration Number: 167722

Shenzhen Tongzhou Testing Co.,Ltd. has been listed on the US Federal Communications Commission list of test facilities recognized to perform electromagnetic emissions measurements.

A2LA

Certificate Number: 5463.01

Shenzhen Tongzhou Testing Co.,Ltd. has been listed by American Association for Laboratory Accreditation to perform electromagnetic emission measurement.

IC

ISED#: 22033

CAB identifier: CN0099

Shenzhen Tongzhou Testing Co.,Ltd. has been listed by Innovation, Science and Economic Development Canada to perform electromagnetic emission measurement.



1.4. Statement of the Measurement Uncertainty

The data and results referenced in this document are true and accurate. The reader is cautioned that there may be errors within the calibration limits of the equipment and facilities. The measurement uncertainty was calculated for all measurements listed in this test report acc. To CISPR 16 – 4 “Specification for radio disturbance and immunity measuring apparatus and methods – Part 4: Uncertainty in EMC Measurements” and is documented in the Shenzhen Tongzhou Testing Co.,Ltd. quality system acc. To DIN EN ISO/IEC 17025. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.

Test Item		Frequency Range	Uncertainty	Note
Radiation Uncertainty	:	9KHz~30MHz	±3.08dB	(1)
		30MHz~1000MHz	±3.92dB	(1)
		1GHz~40GHz	±4.28dB	(1)
Conduction Uncertainty	:	150kHz~30MHz	±2.71dB	(1)

(1). This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

1.5. Operation of EUT during testing

Test Modes:		
Mode 1	Normal working	Record

2. SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Test Sample	Result
§15.207	Conducted Emissions Test	TZ0029240904-1#	Not Applicable
§15.209	Radiated Emission Test	TZ0029240904-1#	Compliant
§15.215	20db Bandwidth Measurement	TZ0029240904-1#	Compliant
§15.203	Antenna Requirement	TZ0029240904-1#	Compliant

Note 1: only for report purpose.

Remark: The measurement uncertainty is not included in the test result.



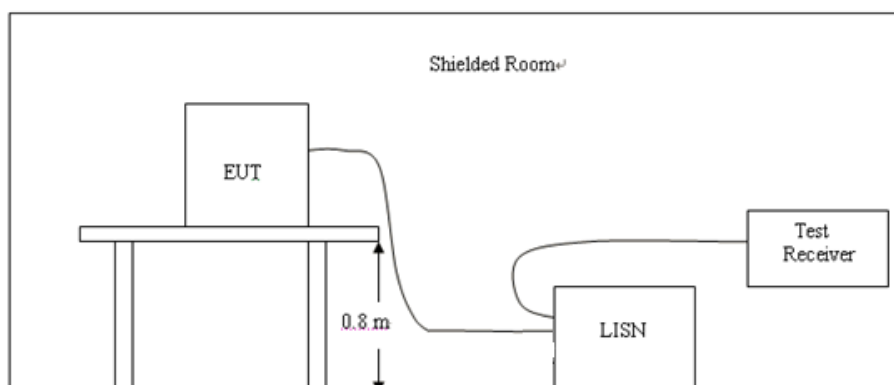
3. Measurement Instruments List

Item	Test Equipment	Manufacturer	Model No.	Serial No.	Calibration Date	Calibration Due Date
1	Wideband Antenna	schwarzbeck	VULB 9163	958	2022/11/13	2025/11/12
2	EMI Test Receiver	R&S	ESCI	100849/003	2024/1/4	2025/1/3
3	Controller	MF	MF7802	N/A	N/A	N/A
4	RF Cable(below 1GHz)	HUBER+SUHNER	RG214	N/A	2024/1/4	2025/1/3
5	RF Cable(above 1GHz)	HUBER+SUHNER	RG214	N/A	2024/1/4	2025/1/3
6	RE test software	Tonscend	JS32-RE	V5.0.0.0	N/A	N/A
7	Loop Antenna	schwarzbeck	FMZB 1519 B	00023	2022/11/13	2025/11/12
8	Artificial Mains	ROHDE & SCHWARZ	ENV 216	101333-IP	2024/1/4	2025/1/3
9	EMI Test Software	ROHDE & SCHWARZ	ESK1	V1.71	N/A	N/A
10	MXA Signal Analyzer	Keysight	N9020A	MY52091623	2024/1/4	2025/1/3



4. CONDUCTED EMISSION TEST

4.1. Block Diagram of Test Setup



4.2. Conducted Power Line Emission Limit

According to FCC Part 15.207(a)

Frequency (MHz)	Maximum RF Line Voltage (dB μ V)			
	CLASS A		CLASS B	
	Q.P.	Ave.	Q.P.	Ave.
0.15 - 0.50	79	66	66-56*	56-46*
0.50 - 5.00	73	60	56	46
5.00 - 30.0	73	60	60	50

* Decreasing linearly with the logarithm of the frequency

For intentional device, according to §15.207 Line Conducted Emission Limit is same as above table.

4.3. Test Procedure

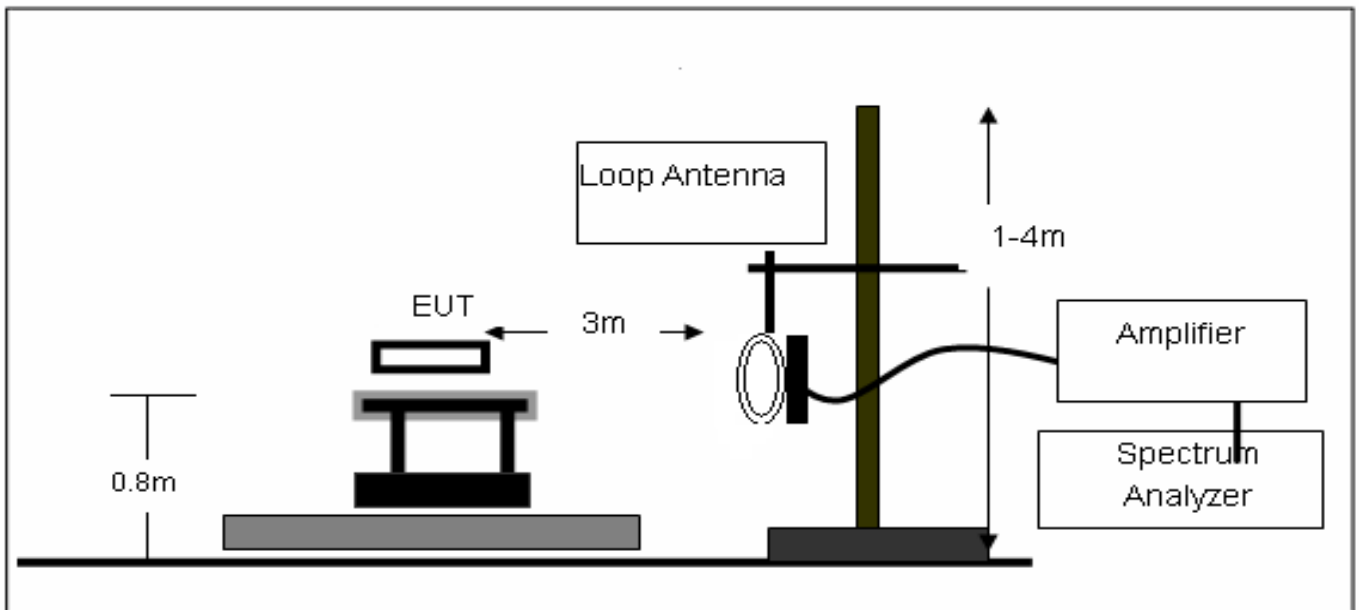
- 1, The equipment was set up as per the test configuration to simulate typical actual usage per the user's manual. The EUT is a tabletop system, a wooden table with a height of 0.8 meters is used and is placed on the ground plane as per ANSI C63.10.
- 2, Support equipment, if needed, was placed as per ANSI C63.10.
- 3, All I/O cables were positioned to simulate typical actual usage as per ANSI C63.10.
- 4, If a EUT received DC power from the USB Port of Notebook PC, the PC's adapter received AC120V/60Hz power through a Line Impedance Stabilization Network (LISN) which supplied power source and was grounded to the ground plane.
- 5, All support equipment received AC power from a second LISN, if any.
- 6, The EUT test program was started. Emissions were measured on each current carrying line of the EUT using a spectrum Analyzer / Receiver connected to the LISN powering the EUT. The LISN has two monitoring points: Line 1 (Hot Side) and Line 2 (Neutral Side). Two scans were taken: one with Line 1 connected to Analyzer / Receiver and Line 2 connected to a 50 ohm load; the second scan had Line 1 connected to a 50 ohm load and Line 2 connected to the Analyzer / Receiver.
- 7, Analyzer / Receiver scanned from 150 KHz to 30MHz for emissions in each of the test modes

4.4. Test Result

N/A

5. 20dB Bandwidth

5.1. Block Diagram of Test Setup



5.2. Rules and specifications

CFR 47 Part 15.215(c)
ANSI C63.10-2013

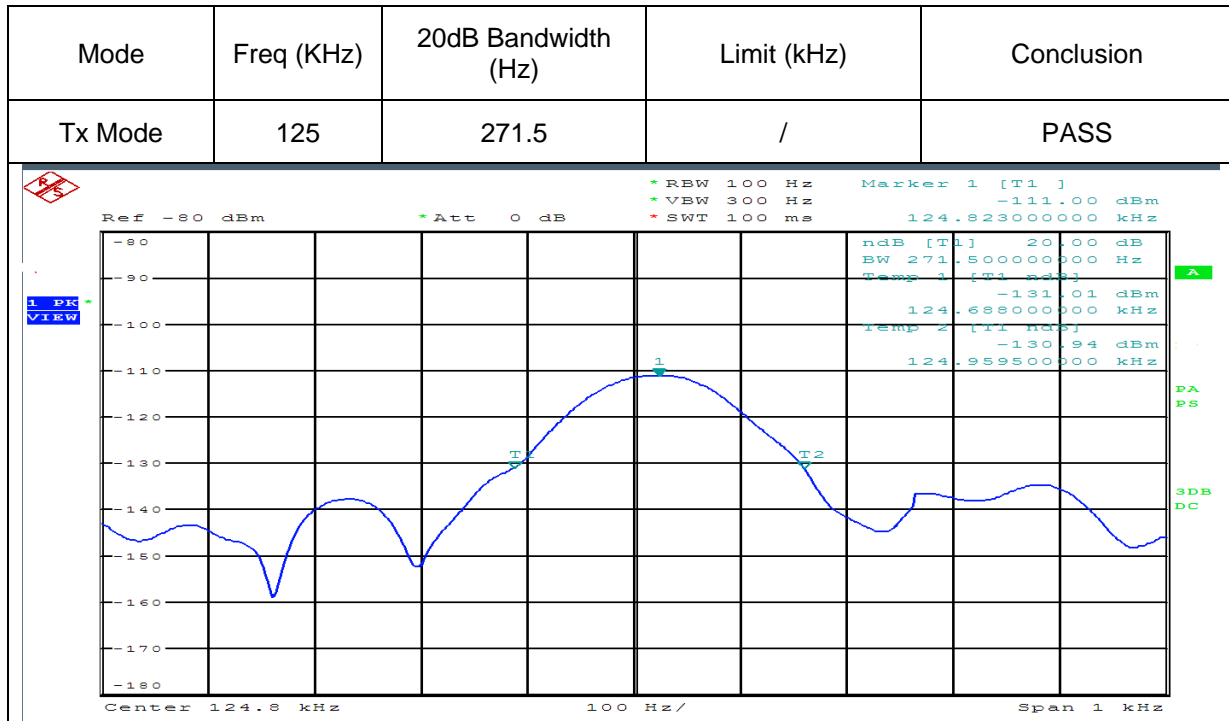
5.3. Test Procedure

Intentional radiators operating under the alternative provisions to the general emission limits, as contained in §§15.217 through 15.257 and in subpart E of this part, must be designed to ensure that 20dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equip compliance with the 20dB attenuation specification may base on measurement at the intentional radiator's antenna output terminal unless the intentional radiator uses a permanently attached antenna, in which case compliance shall be demonstrated by measuring the radiated emissions.



5.4. Test Result

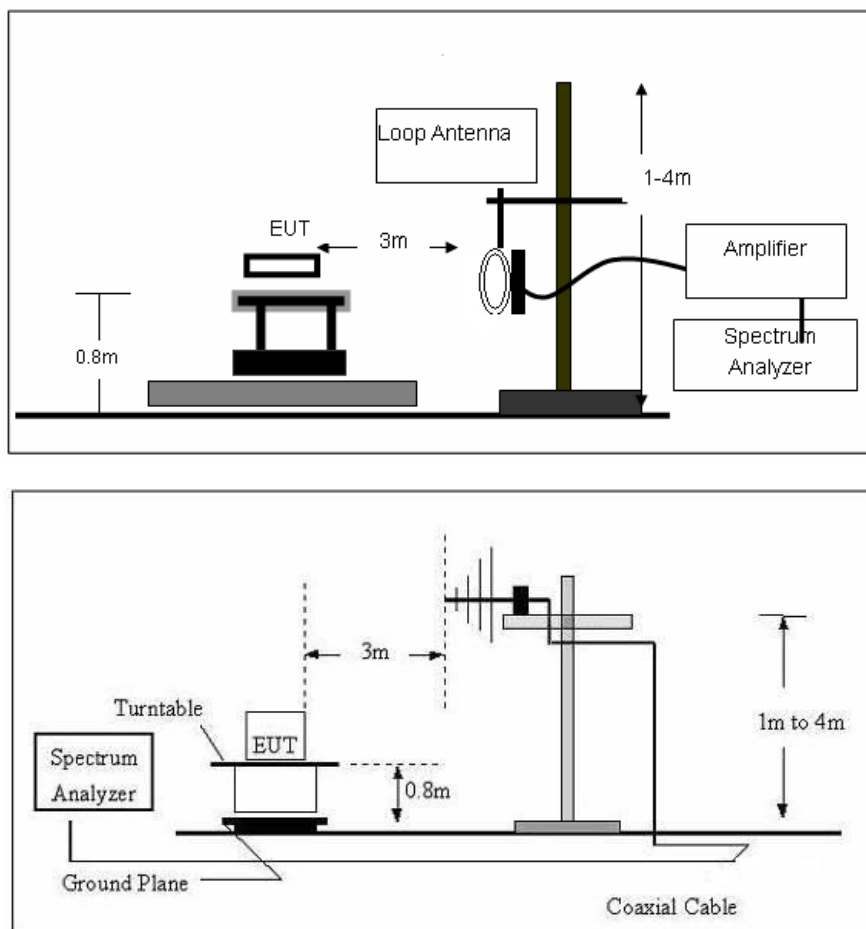
Temperature	22.8℃	Humidity	55%
Test Engineer	Tony Luo	Configurations	Mode 1





6. RADIATED EMISSIONS

6.1. Block Diagram of Test Setup



6.2. Rules and specifications

CFR 47 Part 15, section 15.205

Only spurious emissions are permitted in any of the frequency bands listed the tables in these sections.

MHz	MHz	MHz	GHz
0.090-0.110	16.42-16.423	399.9-410	4.5-5.15
1\ 0.495-0.505	16.69475-16.69525	608-614	5.35-5.46
2.1735-2.1905	16.80425-16.80475	960-1240	7.25-7.75
4.125-4.128	25.5-25.67	1300-1427	8.025-8.5
4.17725-4.17775	37.5-38.25	1435-1626.5	9.0-9.2
4.20725-4.20775	73-74.6	1645.5-1646.5	9.3-9.5
6.215-6.218	74.8-75.2	1660-1710	10.6-12.7
6.26775-6.26825	108-121.94	1718.8-1722.2	13.25-13.4
6.31175-6.31225	123-138	2200-2300	14.47-14.5
8.291-8.294	149.9-150.05	2310-2390	15.35-16.2
8.362-8.366	156.52475-156.52525	2483.5-2500	17.7-21.4
8.37625-8.38675	156.7-156.9	2690-2900	22.01-23.12
8.41425-8.41475	162.0125-167.17	3260-3267	23.6-24.0
12.29-12.293	167.72-173.2	3332-3339	31.2-31.8
12.51975-12.52025	240-285	3345.8-3358	36.43-36.5
12.57675-12.57725	322-335.4	3600-4400	(\2\)
13.36-13.41			

CFR 47 Part 15, section 15.209

The emissions from an intentional radiator shall not exceed the limits in the tables in these sections using an average detector



Frequency (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

Limit calculation and transfer to 3m distance as showed in the following table:

Frequency (MHz)	Limit (dBuV/m)	Distance (m)
0.009-0.490	$20\log(2400/F(KHz))+40\log(300/3)$	3
0.490-1.705	$20\log(24000/F(KHz))+40\log(30/3)$	3
1.705-30.0	69.5	3
30-88	40.0	3
88-216	43.5	3
216-960	46.0	3
Above 960	54.0	3

CFR 47 Part 15, section 15.35

When average radiated emission measurements are specified, the limit on the peak level of the radio Frequency emission is 20dB above the maximum permitted average emission limit.

Transmitter Spurious Emissions 9KHz-30MHz			
	9-150KHz	150-490KHz	490KHz-30MHz
Resolution Bandwidth	200Hz	9KHz	9KHz
Video Bandwidth	2KHz	100KHz	100KHz
Detector	Peak	Peak	Peak
Trace Mode	Max Hold	Max Hold	Max Hold
Sweep Time	Auto	Auto	Auto

6.3. Test Procedure

Measurement distance 3m

For the measurement range up to 30MHz in the following plots the field strength result from 3m Distance measurement are extrapolated to 300m and 30m distance respectively, by 40dB/decade, According to part 15.31(f)(2), per antenna factor scaling.

Measurements below 1000MHz are performed with a peak detector and compared to quasi-peak limits,

Measurements with quasi-peak detector are not required.

Note:

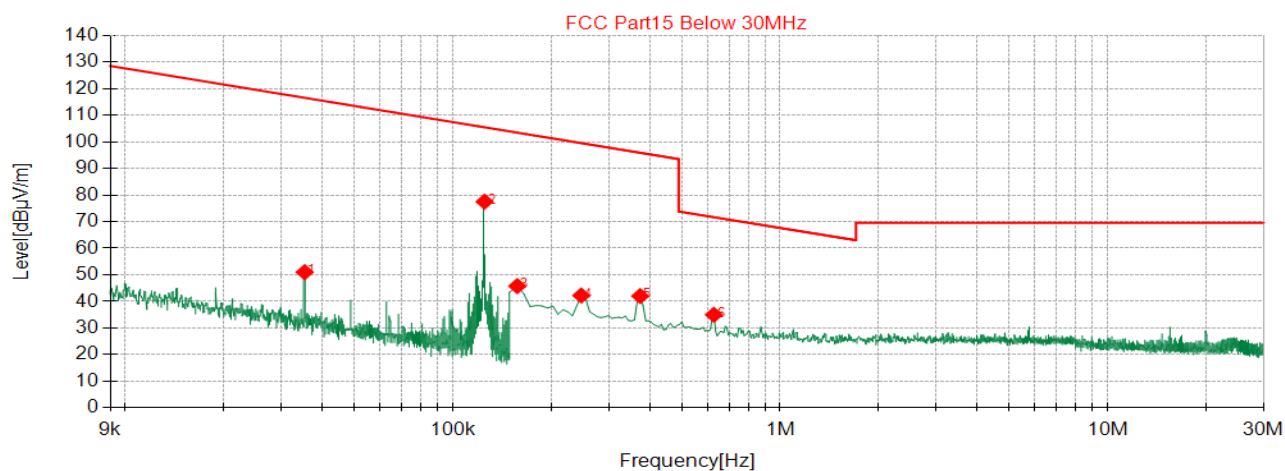
For battery operated equipment, the equipment tests shall be performed using a new battery.

6.4. Test Result

Temperature	22.8°C	Humidity	55%
Test Engineer	Tony Luo	Configurations	Mode 1



For 9kHz-30MHz

Coaxial

◆ QP Detector

NO.	Freq. [MHz]	Reading [dBμV]	Factor [dB/m]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Polarity
1	0.0353	30.85	20.15	51.00	116.54	65.54	Coaxial
2	0.1251	57.6	19.90	77.50	105.46	27.96	Coaxial
3	0.1575	25.85	19.91	45.76	103.44	57.68	Coaxial
4	0.247	22.22	20.01	42.23	99.50	57.27	Coaxial
5	0.3739	21.85	20.16	42.01	95.87	53.86	Coaxial
6	0.6276	14.68	20.30	34.98	71.66	36.68	Coaxial

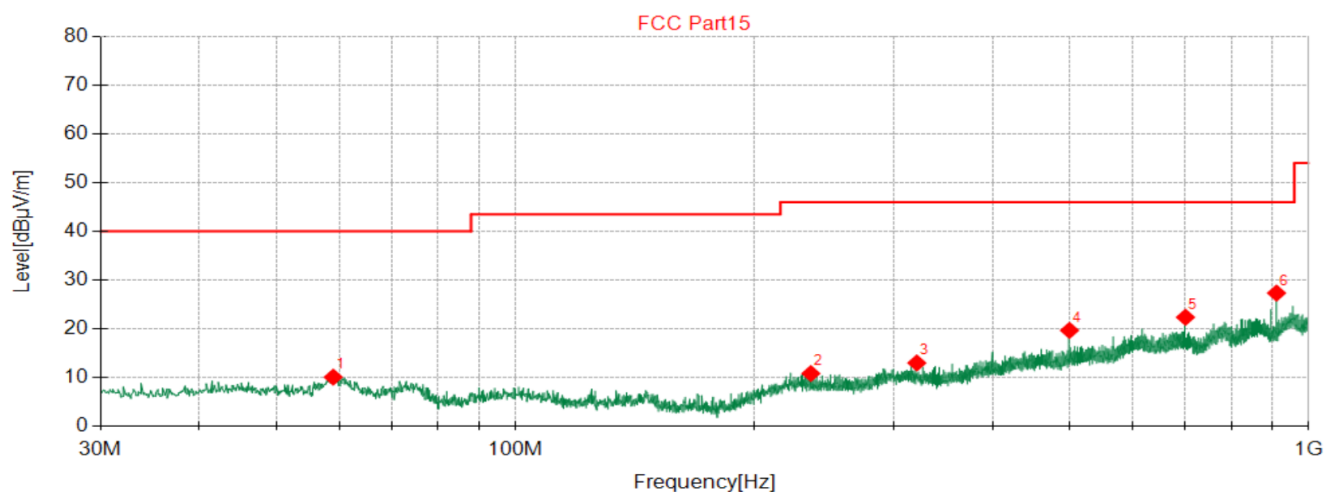
***Note:

1. Level [dBμV/m] = Reading [dBμV] + Factor [dB/m]
2. Margin [dB] = Limit [dBμV/m] - Level [dBμV/m]
3. Test was perform at Coaxial and Coplanar, list the worst case Coaxial.



For 30MHz-1000MHz

Vertical



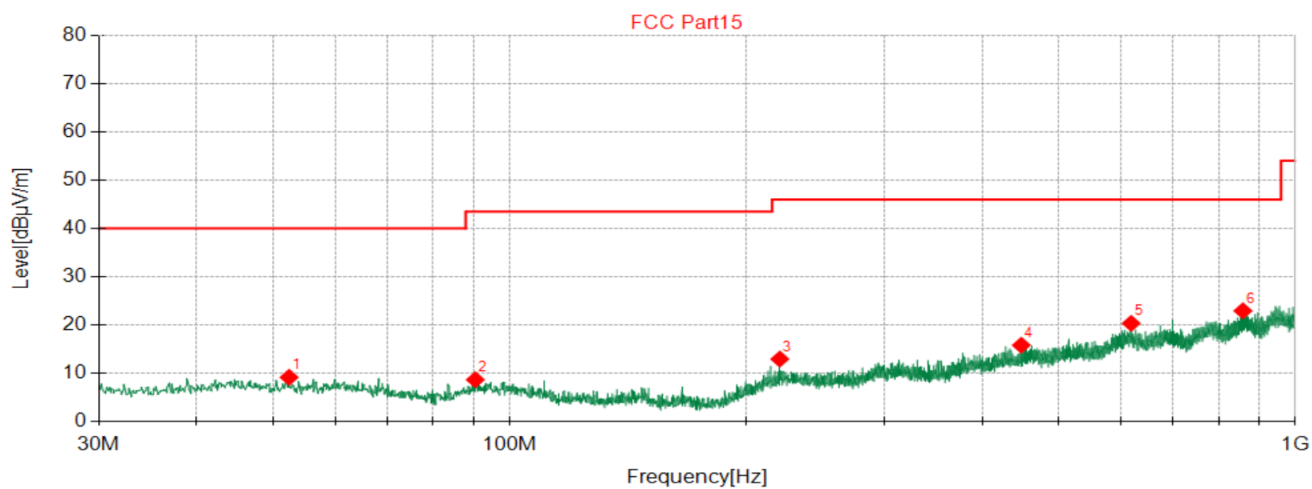
Suspected Data List

NO.	Freq. [MHz]	Reading [dBμV]	Factor [dB/m]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	58.97	25.64	-15.50	10.14	40.00	29.86	100	155	Vertical
2	236.0	25.18	-14.30	10.88	46.00	35.12	100	347	Vertical
3	321	25.28	-12.24	13.04	46.00	32.96	100	344	Vertical
4	499.9	27.77	-8.06	19.71	46.00	26.29	100	328	Vertical
5	700.0	26.76	-4.35	22.41	46.00	23.59	100	253	Vertical
6	911.85	28.26	-0.90	27.36	46.00	18.64	100	313	Vertical

***Note:

1. Level [dBμV/m] = Reading [dBμV] + Factor [dB/m]

2. Margin [dB] = Limit [dBμV/m] - Level [dBμV/m]

**Horizontal****Suspected Data List**

NO.	Freq. [MHz]	Reading [dBμV]	Factor [dB/m]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	52.43	23.74	-14.53	9.21	40.00	30.79	100	115	Horizontal
2	90.50	26.31	-17.59	8.72	43.50	34.78	100	134	Horizontal
3	220.9	27.78	-14.78	13.00	46.00	33.00	100	118	Horizontal
4	448.4	24.94	-9.09	15.85	46.00	30.15	100	239	Horizontal
5	618.91	25.74	-5.36	20.38	46.00	25.62	100	182	Horizontal
6	858.6	24.78	-1.81	22.97	46.00	23.03	100	312	Horizontal

***Note:

1. Level [dBμV/m] = Reading [dBμV] + Factor [dB/m]

2. Margin [dB] = Limit [dBμV/m] - Level [dBμV/m]

Conclusion: PASS

7. ANTENNA REQUIREMENT

Standard Applicable

For intentional device, according to FCC 47 CFR Section 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device.

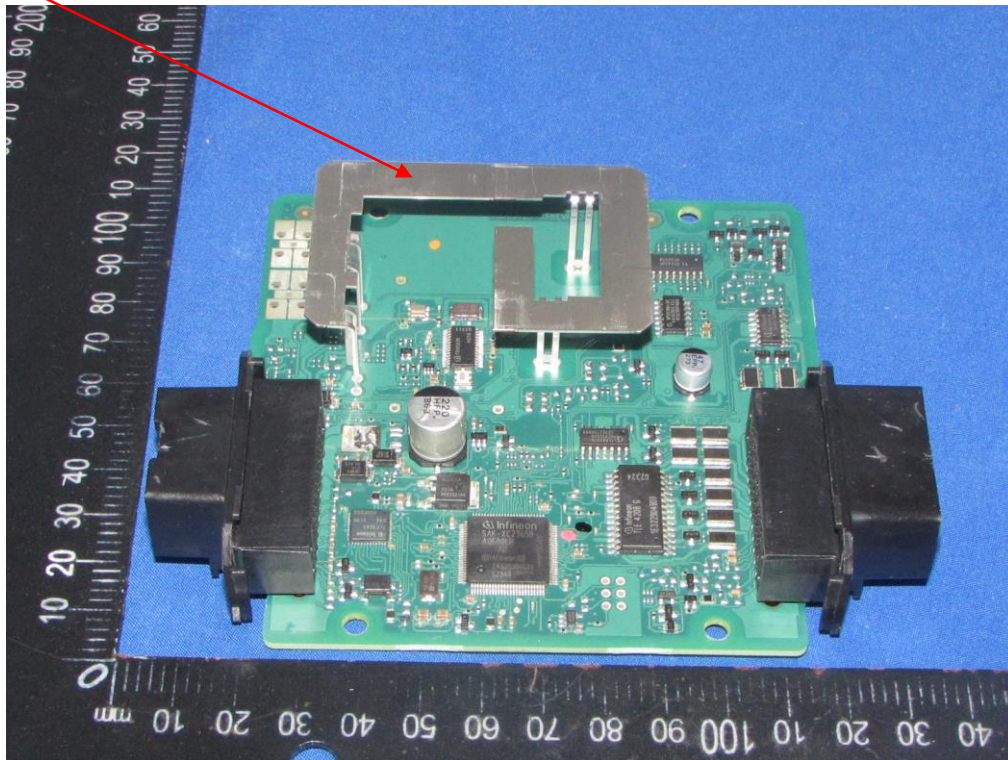
Refer to statement below for compliance.

The manufacturer may design the unit so that the user can replace a broken antenna, but the use of a standard antenna jack or electrical connector is prohibited. Further, this requirement does not apply to intentional radiators that must be professionally installed.

Antenna Connected Construction

The antenna used in this product is an Integral Antenna, the directional gains of antenna used for transmitting is 0dBi.

ANTENNA





7. TEST SETUP PHOTOGRAPHS OF EUT

Please refer to separated files for Test Setup Photos of the EUT.

8. EXTERIOR PHOTOGRAPHS OF THE EUT

Please refer to separated files for External Photos of the EUT.

9. INTERIOR PHOTOGRAPHS OF THE EUT

Please refer to separated files for Internal Photos of the EUT.

-----THE END OF REPORT-----