

TEST REPORT

Product Name: Bluetooth FM Transmitter
Trade Mark: INSIGNIA, DYNEX, MODAL
HVIN: NS-MBTfmt-C
FCC ID: 2AEI7MBTFMT
IC: 9697A-MBTfmt
Report Number: 190605007RFC-3
Test Standards: FCC 47 CFR Part 15 Subpart C
RSS-210 Issue 9
RSS-Gen Issue 5
Test Result: PASS
Date of Issue: July 16, 2019

Prepared for:

Anfair Electronics Plastic Factory
182 Qingzhang Road Chang Shan Tou, QingXi Town, Dong Guan,
China

Prepared by:

Shenzhen UnionTrust Quality and Technology Co., Ltd.
16/F, Block A, Building 6, Baoneng Science and Technology Park,
Qingxiang Road No.1, Longhua New District, Shenzhen, China
TEL: +86-755-2823 0888
FAX: +86-755-2823 0886

Prepared by:


Tony Kang
Project Engineer

Billy Li
Technical Director

Reviewed by:


Kevin Liang
Assistant Manager

Approved by:

Date: July 16, 2019

Shenzhen UnionTrust Quality and Technology Co., Ltd.

Address: 16/F, Block A, Building 6, Baoneng Science and Technology Park, Qingxiang Road No.1, Longhua New District, Shenzhen, China

Tel: +86-755-28230888

Fax: +86-755-28230886

E-mail: info@uttlab.com

[Http://www.uttlab.com](http://www.uttlab.com)

Version

Version No.	Date	Description
V1.0	July 16, 2019	Original



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1. GENERAL INFORMATION

1.1 CLIENT INFORMATION

Applicant:	Anfair Electronics Plastic Factory
Address of Applicant:	182 Qingzhang Road Chang Shan Tou, QingXi Town, Dong Guan, China
Manufacturer:	Anfair Electronics Plastic Factory
Address of Manufacturer:	182 Qingzhang Road Chang Shan Tou, QingXi Town, Dong Guan, China

1.2 EUT INFORMATION

1.2.1 General Description of EUT

Product Name:	Bluetooth FM Transmitter
HVIN:	NS-MBTFMT-C
Model No.:	NS-MBTFMT-C, NS-MBTFxxxxxxx, DX- MBTFxxxxxxx, MD- MBTFxxxxxxx ("x"=0-9, A-Z, a-z, - or blank, for market purpose only, all models are identical except the model number or color) (For trademark: INSIGNIA, DYNEX, MODAL)
Trade Mark:	INSIGNIA, DYNEX, MODAL
DUT Stage:	Identical Prototype
Power Supply:	Powered by 12-24Vdc
Highest Internal Frequency:	107.9 MHz
Sample Received Date:	June 10, 2019
Sample Tested Date:	June 10, 2019 to July 16, 2019

1.2.2 Description of Accessories

N/A

1.3 PRODUCT SPECIFICATION SUBJECTIVE TO THIS STANDARD

Frequency Band:	88 MHz to 108 MHz
Frequency Range:	88.1 MHz to 107.9 MHz
Modulation:	FM
Channel Separation:	200KHz
Antenna Type:	PCB Antenna
Antenna Gain:	-1.0 dBi
Normal Test Voltage:	24 Vdc

1.4 OTHER INFORMATION

Operation Frequency Each of Channel	
$f = (88.1 + k \cdot 0.2) \text{MHz}, k = 0, \dots, 99$	
Note:	
f	is the operating frequency (MHz);
k	is the operating channel.

1.5 DESCRIPTION OF SUPPORT UNITS

The EUT has been tested with associated equipment below.

1) Support Equipment

Description	Manufacturer	Model No.	Serial Number	Supplied by
Camel Storage Battery	Camel	6-QWLZ-48	--	Union Trust

2) Support Cable

Cable No.	Description	Connector	Length	Supplied by
--	--	--	--	--

1.6 TEST LOCATION

Shenzhen UnionTrust Quality and Technology Co., Ltd.

Address: 16/F, Block A, Building 6, Baoneng Science and Technology Park, Qingxiang Road No.1, Longhua New District, Shenzhen, China 518109

Telephone: +86 (0) 755 2823 0888

Fax: +86 (0) 755 2823 0886

1.7 TEST FACILITY

The test facility is recognized, certified, or accredited by the following organizations:

CNAS-Lab Code: L9069

The measuring equipment utilized to perform the tests documented in this report has been calibrated once a year or in accordance with the manufacturer's recommendations, and is traceable under the ISO/IEC/EN 17025 to international or national standards. Equipment has been calibrated by accredited calibration laboratories.

A2LA-Lab Certificate No.: 4312.01

Shenzhen UnionTrust Quality and Technology Co., Ltd. has been accredited by A2LA for technical competence in the field of electrical testing, and proved to be in compliance with ISO/IEC 17025: 2005 General Requirements for the Competence of Testing and Calibration Laboratories and any additional program requirements in the identified field of testing.

ISED Wireless Device Testing Laboratories

CAB identifier: CN0032

FCC Accredited Lab.

Designation Number: CN1194

Test Firm Registration Number: 259480

1.8 DEVIATION FROM STANDARDS

None.

1.9 ABNORMALITIES FROM STANDARD CONDITIONS

None.

1.10 OTHER INFORMATION REQUESTED BY THE CUSTOMER

None.

1.11 MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the Product as specified in CISPR 16-4-2. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of $k=2$.

No.	Item	Measurement Uncertainty
1	Conducted emission 9KHz-150KHz	± 3.8 dB
2	Conducted emission 150KHz-30MHz	± 3.4 dB
3	Radiated emission 9KHz-30MHz	± 4.9 dB
4	Radiated emission 30MHz-1GHz	± 4.7 dB
5	Radiated emission 1GHz-18GHz	± 5.1 dB
6	Radiated emission 18GHz-26GHz	± 5.2 dB
7	Radiated emission 26GHz-40GHz	± 5.2 dB

2. TEST SUMMARY

FCC 47 CFR Part 15 Subpart C Test Cases			
Test Item	Test Requirement	Test Method	Result
Antenna Requirement	FCC 47 CFR Part 15.203 RSS-Gen Issue 5, Section 6.8	ANSI C63.10-2013	PASS
Field Strength of the Fundamental Signal	FCC 47 CFR Part 15.239(b) RSS-210 Issue 9, Annex B.9(b)	ANSI C63.10-2013	PASS
20dB Bandwidth	FCC 47 CFR Part 15.239(a) RSS-210 Issue 9, Annex B.9(a)	ANSI C63.10-2013	PASS
Radiated Emission	FCC 47 CFR Part 15.209 FCC 47 CFR Part 15.239(c) RSS-210 Issue 9, Annex B.9(c)	ANSI C63.10-2013 ANSI C63.4-2014	PASS
Conducted Emission	FCC 47 CFR Part 15.207 RSS-Gen Issue 5, Section 8.8	ANSI C63.10-2013 ANSI C63.4-2014	N/A ^(Note1,2)
Note: 1) N/A: In this whole report not applicable. 2) This EUT is powered by DC source. According to FCC 47 CFR Part 15.107, there is no limit applies to DC power input product.			

3. EQUIPMENT LIST

Radiated Emission Test Equipment List						
Used	Equipment	Manufacturer	Model No.	Serial Number	Cal. date (mm dd, yyyy)	Cal. Due date (mm dd, yyyy)
<input checked="" type="checkbox"/>	3M Chamber & Accessory Equipment	ETS-LINDGREN	3M	N/A	Dec. 03, 2018	Dec. 03, 2021
<input checked="" type="checkbox"/>	Receiver	R&S	ESIB26	100114	Nov. 24, 2018	Nov. 24, 2019
<input checked="" type="checkbox"/>	Loop Antenna	ETS-LINDGREN	6502	00202525	Dec. 03, 2018	Dec. 03, 2019
<input checked="" type="checkbox"/>	Broadband Antenna	ETS-LINDGREN	3142E	00201566	Dec. 08, 2018	Dec. 08, 2019
<input checked="" type="checkbox"/>	6dB Attenuator	Talent	RA6A5-N-18	18103001	Dec. 08, 2018	Dec. 08, 2019
<input checked="" type="checkbox"/>	Preamplifier	HP	8447F	2805A02960	Nov. 24, 2018	Nov. 24, 2019
<input checked="" type="checkbox"/>	Multi device Controller	ETS-LINDGREN	7006-001	00160105	N/A	N/A
<input checked="" type="checkbox"/>	Test Software	Audix	e3	Software Version: 9.160333		

Conducted RF test Equipment List						
Used	Equipment	Manufacturer	Model No.	Serial Number	Cal. date (mm dd, yyyy)	Cal. Due date (mm dd, yyyy)
<input checked="" type="checkbox"/>	Spectrum Analyzer	R&S	FSP 13	1164.4391.13	May 14, 2019	May 14, 2020

4. TEST CONFIGURATION

4.1 ENVIRONMENTAL CONDITIONS FOR TESTING

4.1.1 Normal or Extreme Test Conditions

Environment Parameter	Selected Values During Tests		
Test Condition	Ambient		
	Temperature (°C)	Voltage (V)	Relative Humidity (%)
NT/NV	+15 to +35	12	20 to 75
Remark: 1) NV: Normal Voltage; NT: Normal Temperature			

4.1.2 Record of Normal Environment

Test Item	Temperature (°C)	Relative Humidity (%)	Pressure (kPa)	Tested by
Radiated Emission	25.5	55	100.05	Andy Liu
Field Strength of the Fundamental Signal				
20dB Occupied Bandwidth	24.7	51	100.01	Hank Wu

4.2 TEST CHANNELS

Type of Modulation	Tx/Rx Frequency	Test RF Channel Lists		
FM	88.1 MHz to 107.9 MHz	Lowest(L)	Middle(M)	Highest(H)
		Channel 0	Channel 50	Channel 99
		88.1 MHz	98.1 MHz	107.9 MHz

4.3 EUT TEST STATUS

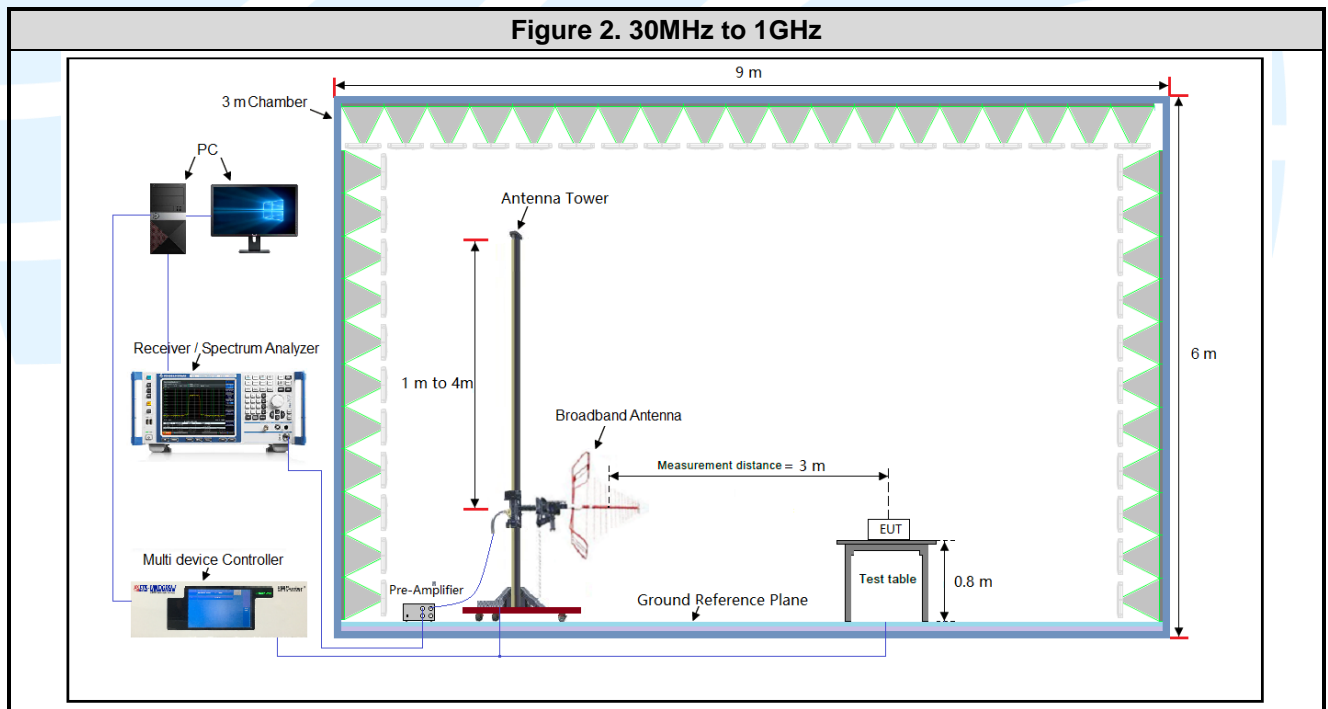
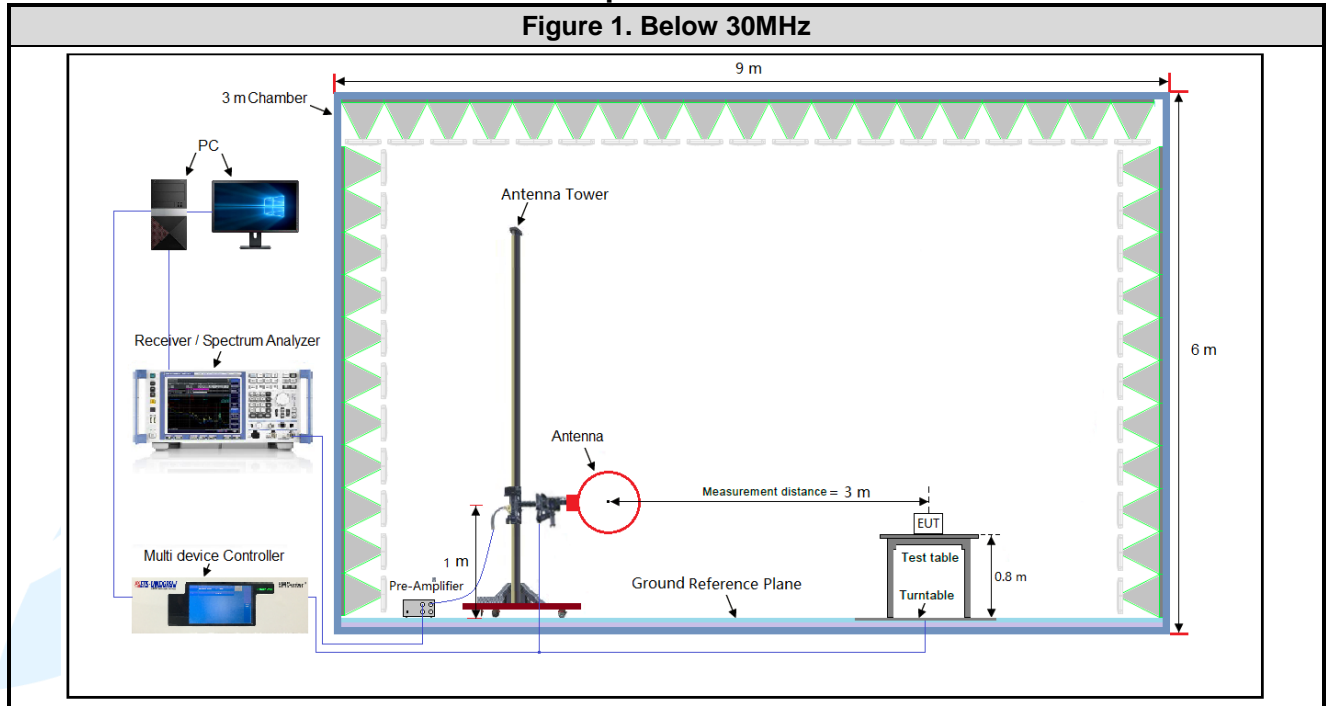
Modulation Mode	Tx Function	Description
FM	1Tx	Keep the EUT in continuously transmitting with modulation test single.

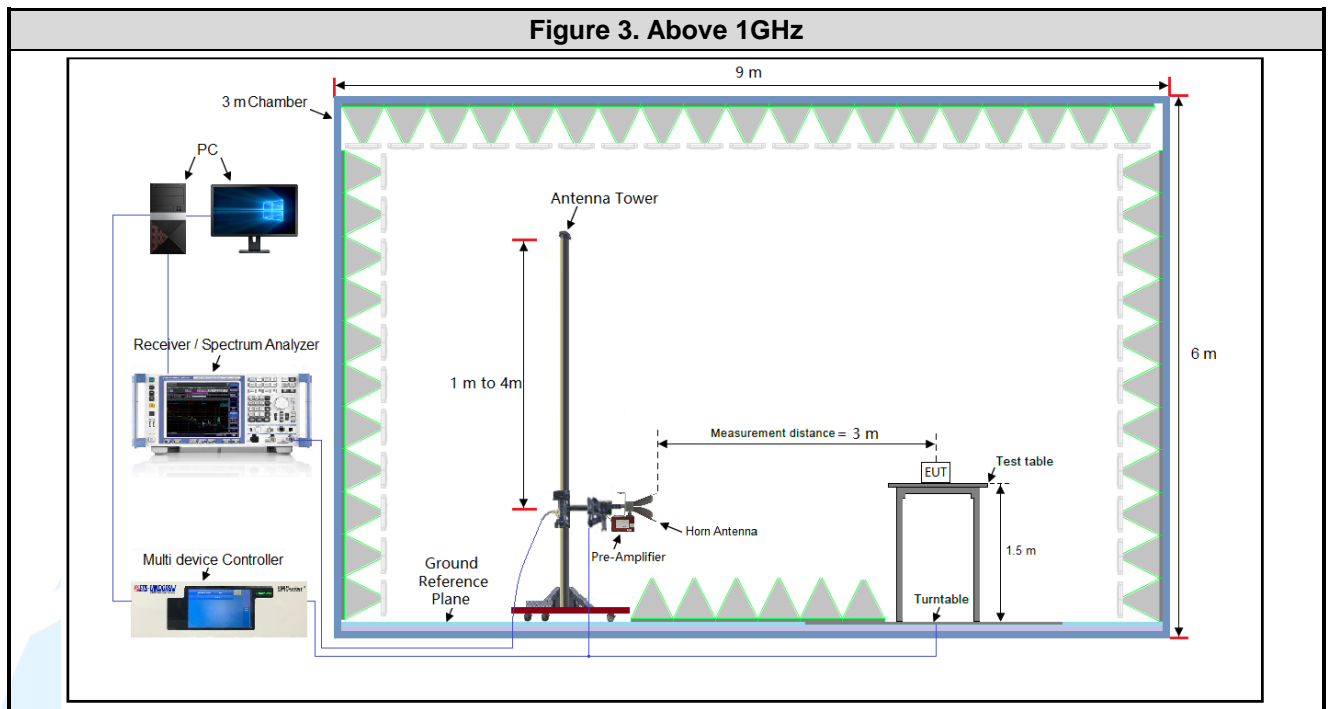
Power Setting
Power Setting: not applicable, test used software default power level.

Test Software
None

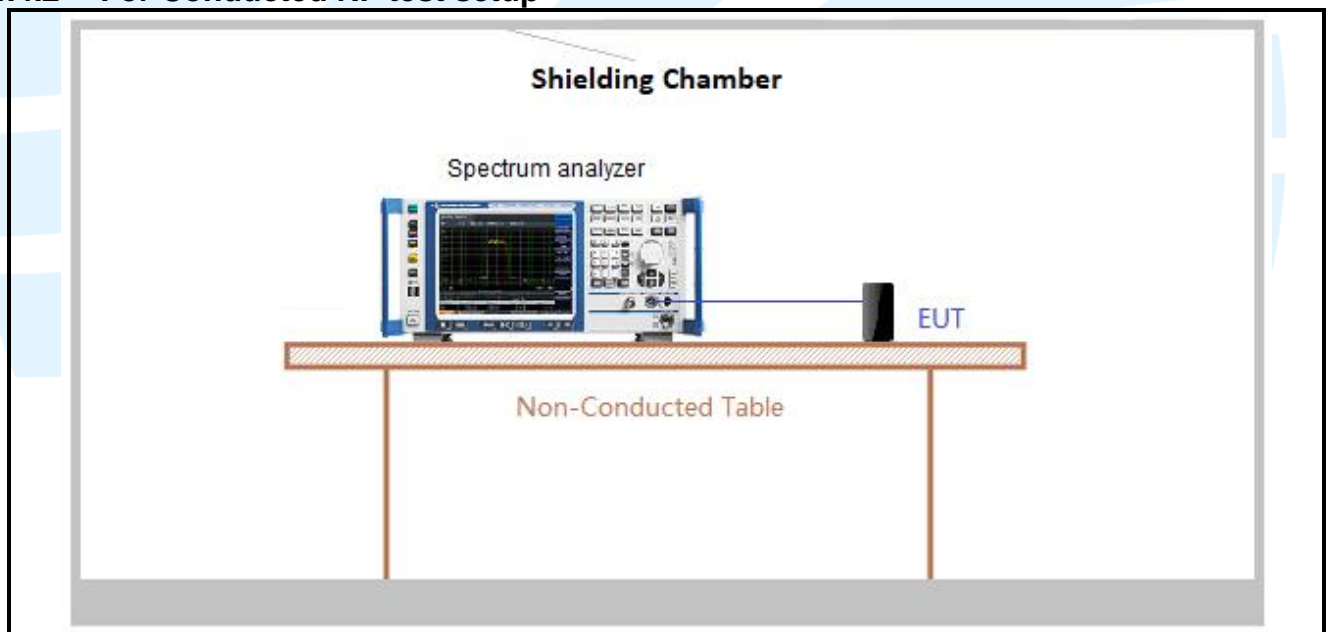
4.4 TEST SETUP

4.4.1 For Radiated Emissions test setup





4.4.2 For Conducted RF test setup



4.5 SYSTEM TEST CONFIGURATION

For emissions testing, the equipment under test (EUT) setup to transmit continuously to simplify the measurement methodology. Care was taken to ensure proper power supply voltages during testing. During testing, radiated emission were performed with the EUT set to transmit at the channel with highest output power as worst-case scenario. Only the worst case data were recorded in this test report.

The signal is maximized through rotation and placement in the three orthogonal axes. The antenna height and polarization are varied during the search for maximum signal level. The antenna height is varied from 1 to 4 meters. Radiated emissions are taken at three meters unless the signal level is too low for measurement at that distance. If necessary, a pre-amplifier is used and/or the test is conducted at a closer distance. Therefore, all final radiated testing was performed with the EUT in (see table below) orientation.

Frequency	Mode	Antenna Port	Worst-case axis positioning
Below 1GHz	1TX	Chain 0	Z axis

All readings are extrapolated back to the equivalent three meter reading using inverse scaling with distance. Analyzer resolution is 100 kHz or greater for frequencies below 1000 MHz. The resolution is 1 MHz or greater for frequencies above 1000 MHz. The spurious emissions more than 20 dB below the permissible value are not reported.

Radiated emission measurement were performed from the lowest radio frequency signal generated in the device which is greater than 9 kHz to the tenth harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower.

5. REFERENCE DOCUMENTS FOR TESTING

5.1 REFERENCE DOCUMENTS FOR TESTING

No.	Identity	Document Title
1	FCC 47 CFR Part15 Subpart C	Intentional Radiators
2	ANSI C63.4-2014	American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz
3	ANSI C63.10-2013	American National Standard for Testing Unlicensed Wireless Devices
4	RSS-210 Issue 9	Licence-Exempt Radio Apparatus: Category I Equipment

5.2 ANTENNA REQUIREMENT

Standard Requirement
15.203 Requirement: 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. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator, the manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.
EUT Antenna: Antenna in the interior of the equipment and no consideration of replacement. The gain of the antenna is -1 dBi.

5.3 RADIATED EMISSION

Test Requirement: FCC 47 CFR Part 15.209 and 15.239(b)
RSS-210 Issue 9 Annex B.9(a)

Test Method: ANSI C63.10-2013

Receiver Setup:

Frequency	Detector	Remark
0.009 MHz-0.090 MHz	Peak	Peak
	Average	Average
0.090 MHz-0.110 MHz	Quasi-peak	Quasi-peak
0.110 MHz-0.490 MHz	Peak	Peak
	Average	Average
0.490 MHz -30 MHz	Quasi-peak	Quasi-peak
30 MHz-1 GHz	Quasi-peak	Quasi-peak
Above 1 GHz	Peak	Peak
	Average	Average

Frequency	RBW
9KHz-150KHz	200/300Hz
150KHz-30MHz	9/10kHz
30MHz-1GHz	100kHz

Limits:
Restricted Frequency Band

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			

Spurious Emissions

Frequency	Field strength (microvolt/meter)	Limit (dBμV/m)	Remark	Measurement distance (m)
0.009 MHz-0.490 MHz	2400/F(kHz)	--	--	300
0.490 MHz-1.705 MHz	24000/F(kHz)	--	--	30
1.705 MHz-30 MHz	30	--	--	30
30 MHz-88 MHz	100	40.0	Quasi-peak	3
88 MHz-216 MHz	150	43.5	Quasi-peak	3
216 MHz-960 MHz	200	46.0	Quasi-peak	3
960MHz-1GHz	500	54.0	Quasi-peak	3
Above 1 GHz	500	54.0	Average	3

Field strength of the fundamental signal

Frequency	Limit (dBμV/m @3m)	Remark
88 MHz-108 MHz	48.0	Average
	68.0	Peak

Remark:

1. The lower limit shall apply at the transition frequencies.
2. Emission level (dBuV/m) = 20 log Emission level (uV/m).
3. For frequencies above 1000 MHz, the field strength limits are based on average detector, however, the peak field strength of any emission shall not exceed the maximum permitted average limits, specified above by more than 20 dB under any condition of modulation.

Test Setup: Refer to section 4.4.1 for details.

Test Procedures:

1. From 30 MHz to 1GHz test procedure as below:
 - 1) The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
 - 2) The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
 - 3) The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the

Shenzhen UnionTrust Quality and Technology Co., Ltd.

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Tel: +86-755-28230888

Fax: +86-755-28230886

E-mail: info@uttlab.com

[Http://www.uttlab.com](http://www.uttlab.com)

- measurement.
- 4) For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters (for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter) and the rota table table was turned from 0 degrees to 360 degrees to find the maximum reading.
 - 5) The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
 - 6) If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.
2. Above 1GHz test procedure as below:
- 1) Different between above is the test site, change from Semi- Anechoic Chamber to fully Anechoic Chamber and change form table 0.8 meter to 1.5 meter(Above 18GHz the distance is 1 meter and table is 1.5 meter).
 - 2) Test the EUT in the lowest channel ,middle channel, the Highest channel
 - 3) The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, and found the Z axis positioning which it is worse case.
 - 4) Repeat above procedures until all frequencies measured was complete.

Equipment Used: Refer to section 3 for details.

Test Result: Pass

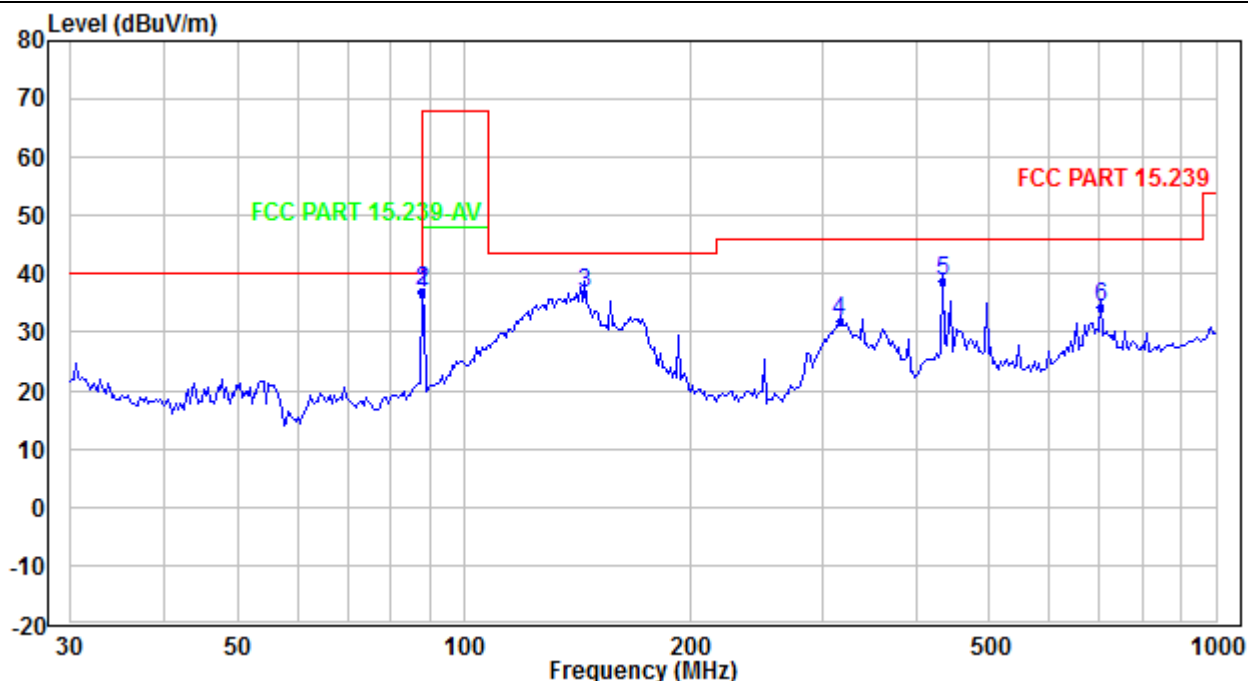
The measurement data as follows:

Field Strength of the Fundamental Signal

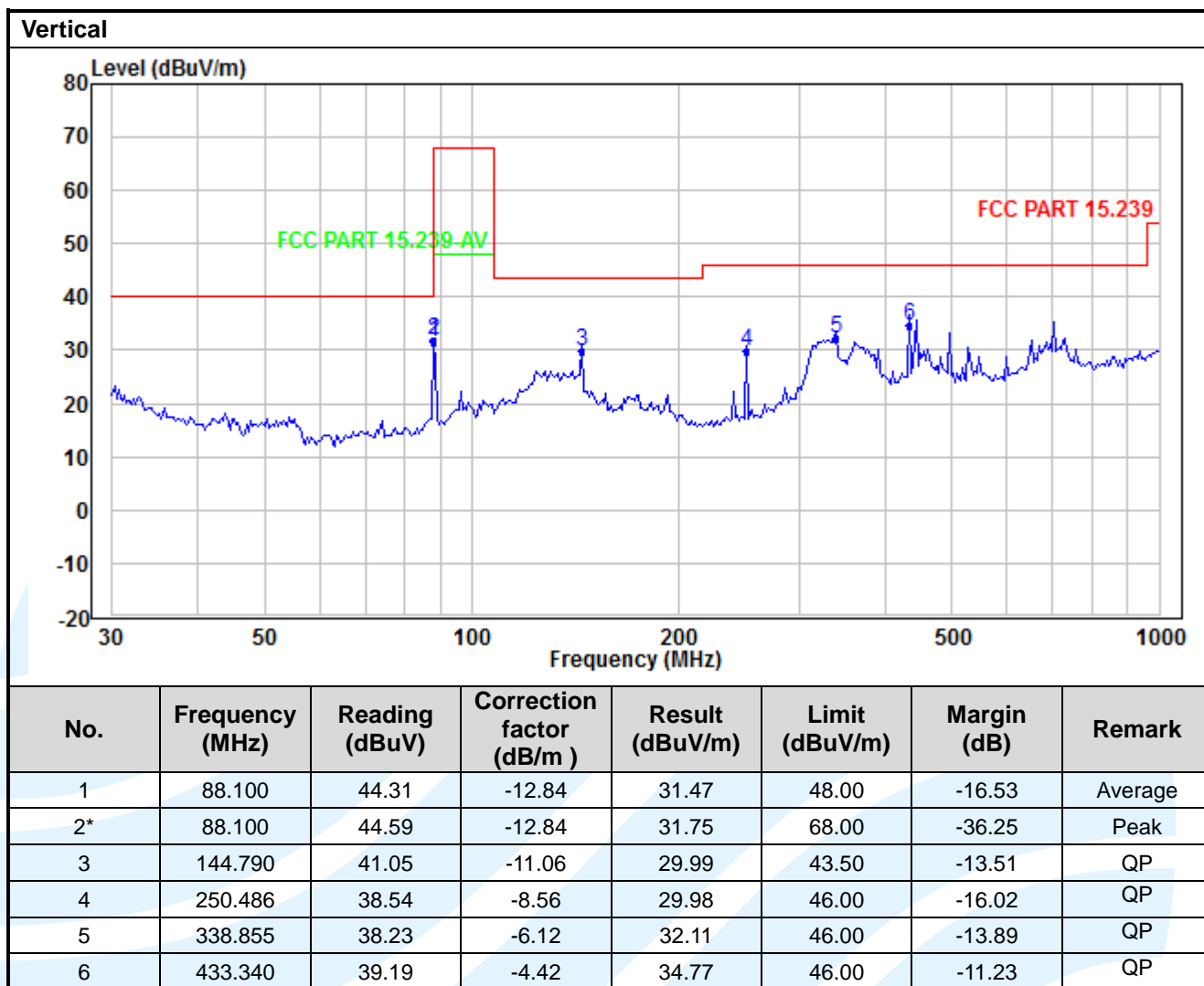
Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark	Antenna Polaxis	Pass/Fail
Lowest Channel					
36.75	48.00	-11.25	Average	Horizontal	Pass
36.92	68.00	-31.08	Peak	Horizontal	Pass
31.47	48.00	-16.53	Average	Vertical	Pass
31.75	68.00	-36.25	Peak	Vertical	Pass
Middle Channel					
40.74	48.00	-7.26	Average	Horizontal	Pass
41.88	68.00	-26.12	Peak	Horizontal	Pass
35.11	48.00	-12.89	Average	Vertical	Pass
35.84	68.00	-32.16	Peak	Vertical	Pass
Highest Channel					
46.14	48.00	-1.86	Average	Horizontal	Pass
47.59	68.00	-20.41	Peak	Horizontal	Pass
37.84	48.00	-10.16	Average	Vertical	Pass
38.08	68.00	-29.92	Peak	Vertical	Pass

Radiated Emission Test Data (9 KHz ~ 30 MHz):

The amplitude of spurious emissions attenuated more than 20 dB below the permissible value is not required to be report.

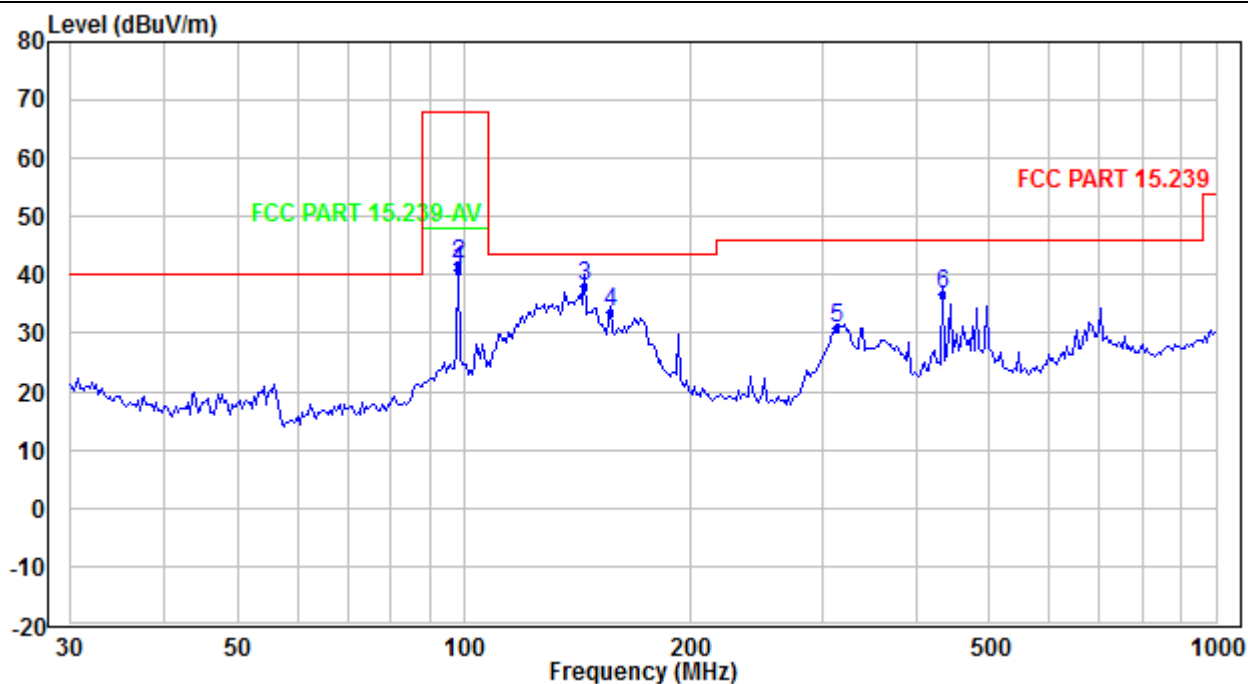
Radiated Emission Test Data (30 MHz ~ 1 GHz):
Lowest Channel
Horizontal


No.	Frequency (MHz)	Reading (dBuV)	Correction factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	88.100	49.59	-12.84	36.75	48.00	-11.25	Average
2*	88.100	49.76	-12.84	36.92	68.00	-31.08	Peak
3	144.790	47.91	-11.06	36.85	43.50	-6.65	QP
4	315.860	38.94	-7.09	31.85	46.00	-14.15	QP
5	433.340	43.16	-4.42	38.74	46.00	-7.26	QP
6	703.731	34.09	0.24	34.33	46.00	-11.67	QP

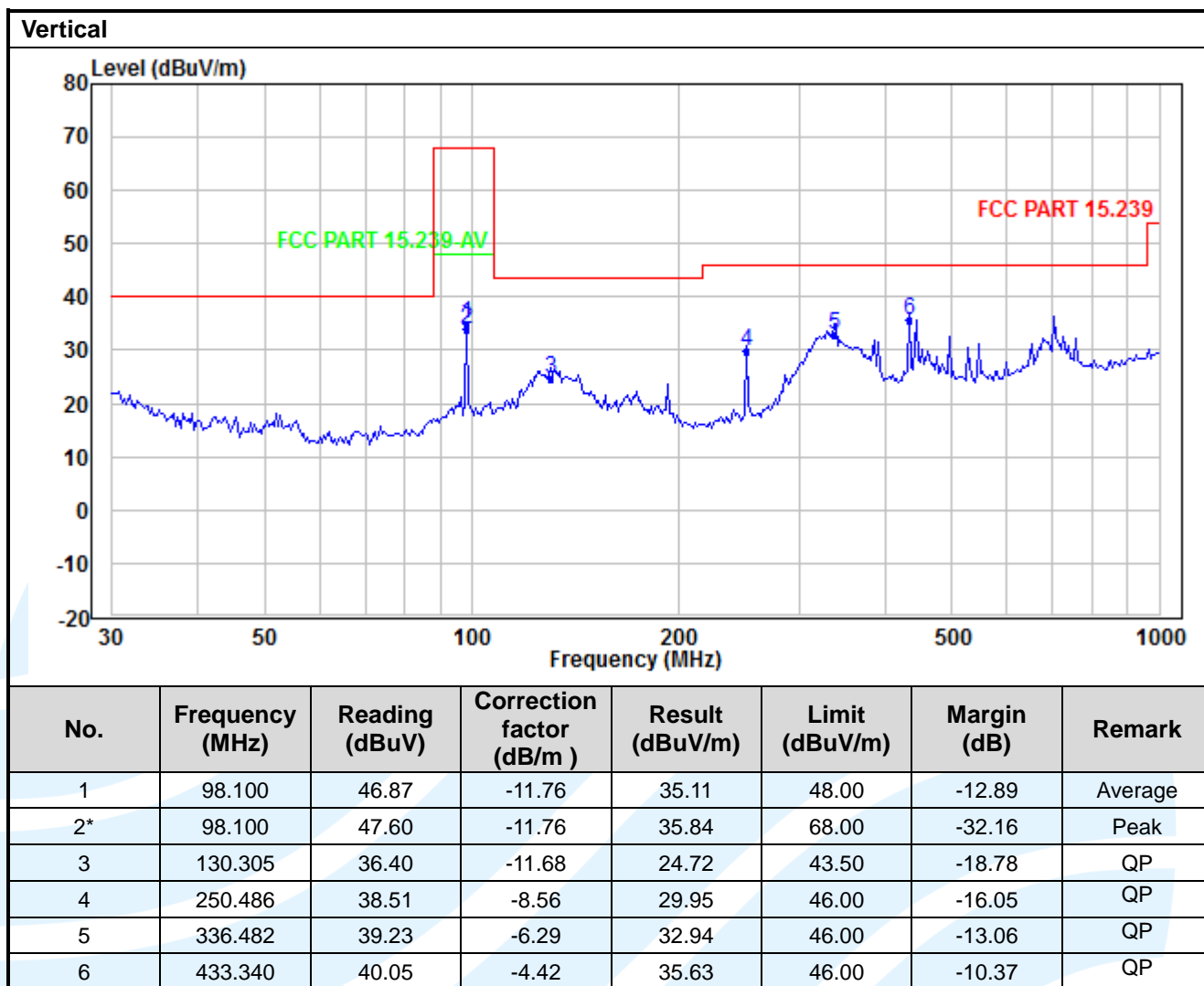


Middle Channel

Horizontal

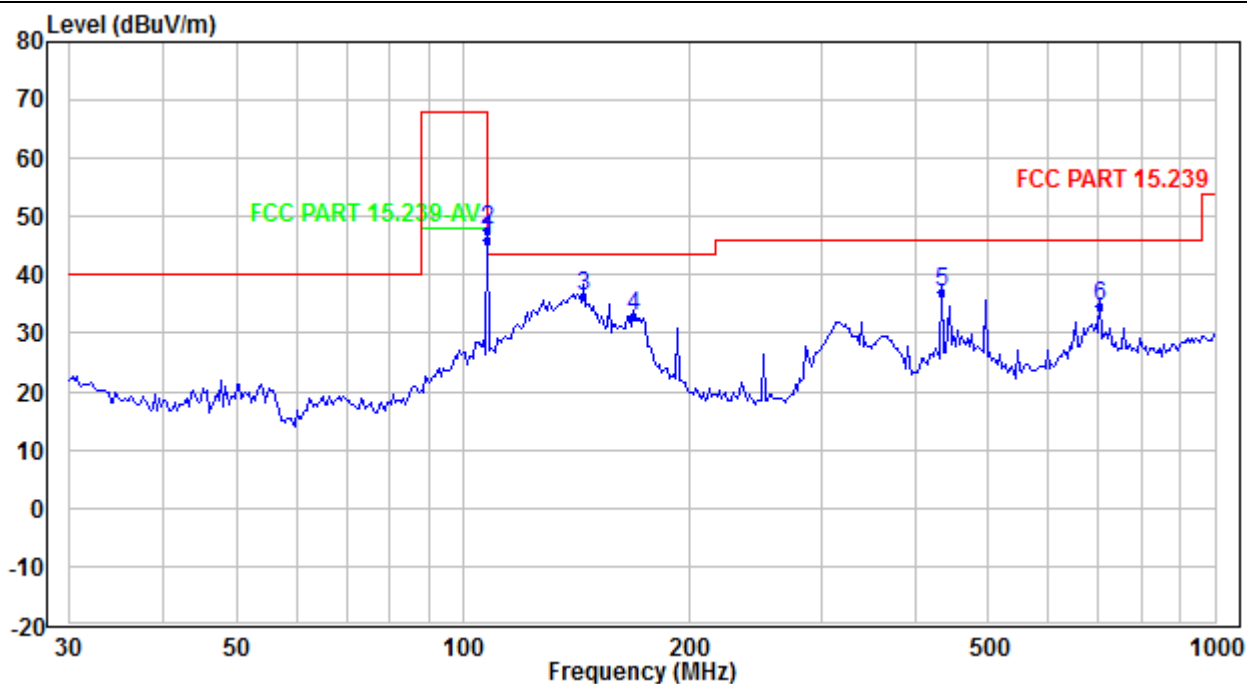


No.	Frequency (MHz)	Reading (dBuV)	Correction factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	98.100	52.50	-11.76	40.74	48.00	-7.26	Average
2*	98.100	53.64	-11.76	41.88	68.00	-26.12	Peak
3	144.790	49.14	-11.06	38.08	43.50	-5.42	QP
4	156.426	44.31	-10.68	33.63	43.50	-9.87	QP
5	313.648	37.85	-7.15	30.70	46.00	-15.30	QP
6	433.340	41.19	-4.42	36.77	46.00	-9.23	QP

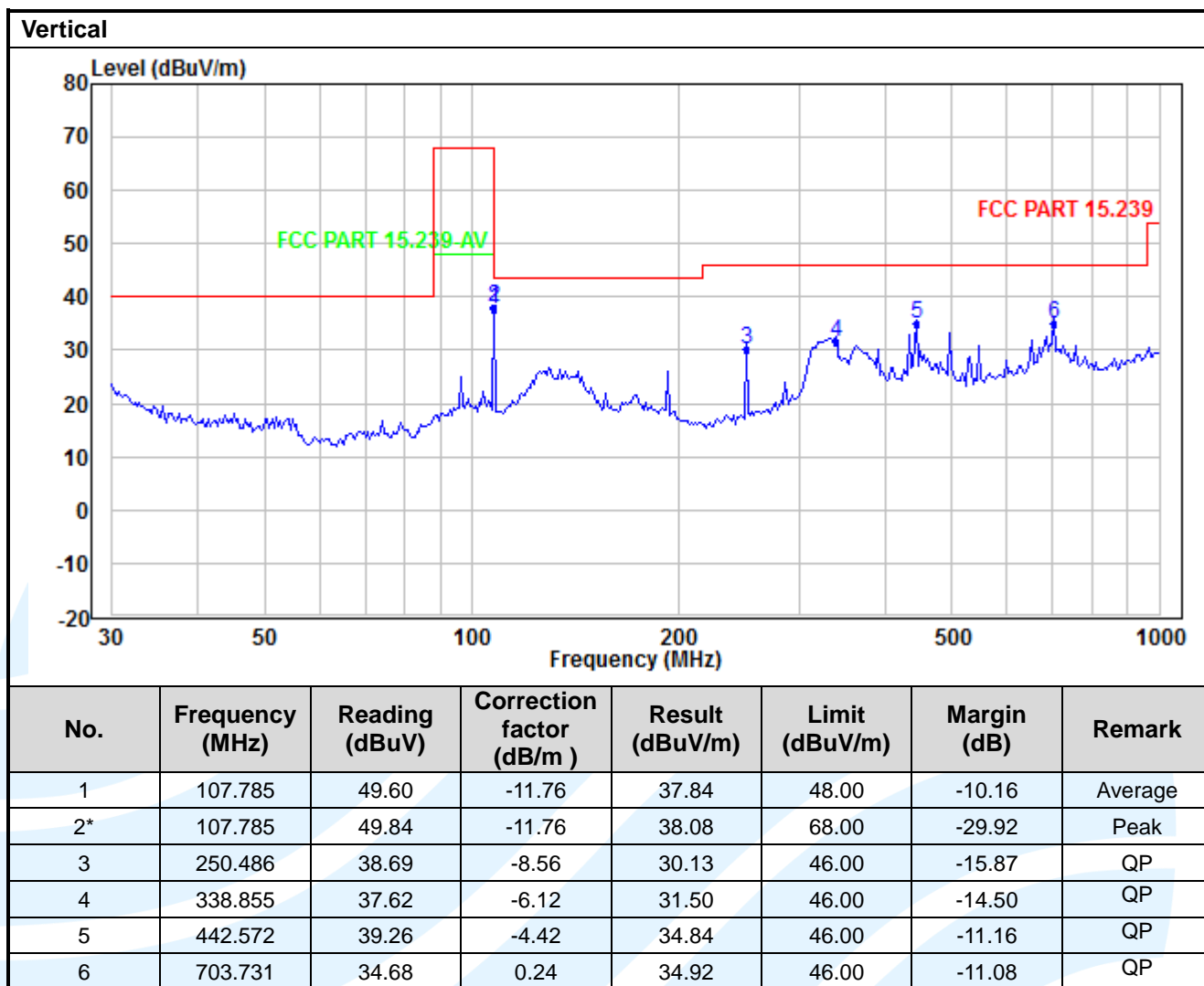


Highest Channel

Horizontal



No.	Frequency (MHz)	Reading (dBuV)	Correction factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	107.900	57.90	-11.76	46.14	48.00	-1.86	Average
2*	107.900	59.35	-11.76	47.59	68.00	-20.41	Peak
3	144.790	47.56	-11.06	36.50	43.50	-7.00	QP
4	168.997	43.58	-10.56	33.02	43.50	-10.48	QP
5	433.340	41.42	-4.42	37.00	46.00	-9.00	QP
6	703.731	34.38	0.24	34.62	46.00	-11.38	QP



Radiated Emission Test Data (Above 1GHz):

The EUT works the highest frequency of 107.9MHz under FM transmitting mode, therefore the test is performed up to 1GHz.

5.4 20DB BANDWIDTH & OCCUPIED BANDWIDTH

Test Requirement:	FCC 47 CFR Part 15.239(a) RSS-210 Issue 9, Annex B.9(a)
Test Method:	ANSI C63.10-2013
Test Setup:	Refer to section 4.4.3 for details.
Limits:	Emissions from the intentional radiator shall be confined within a band 200 kHz wide centered on the operating frequency.
Equipment Used:	Refer to section 3 for details.
Test Result:	Pass

The measurement procedure shall be as follows:

Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.

Use the following spectrum analyzer settings:

- Span = approximately 2 to 3 times the 20 dB bandwidth, centered on a hopping channel
- RBW \geq 1% of the 20 dB bandwidth
- VBW \geq RBW
- Sweep = auto;
- Detector function = peak
- Trace = max hold
- All the trace to stabilize, use the marker-to-peak function to set the marker to the peak of the emission, use the marker-delta function to measure and record the 20dB down bandwidth of the emission.

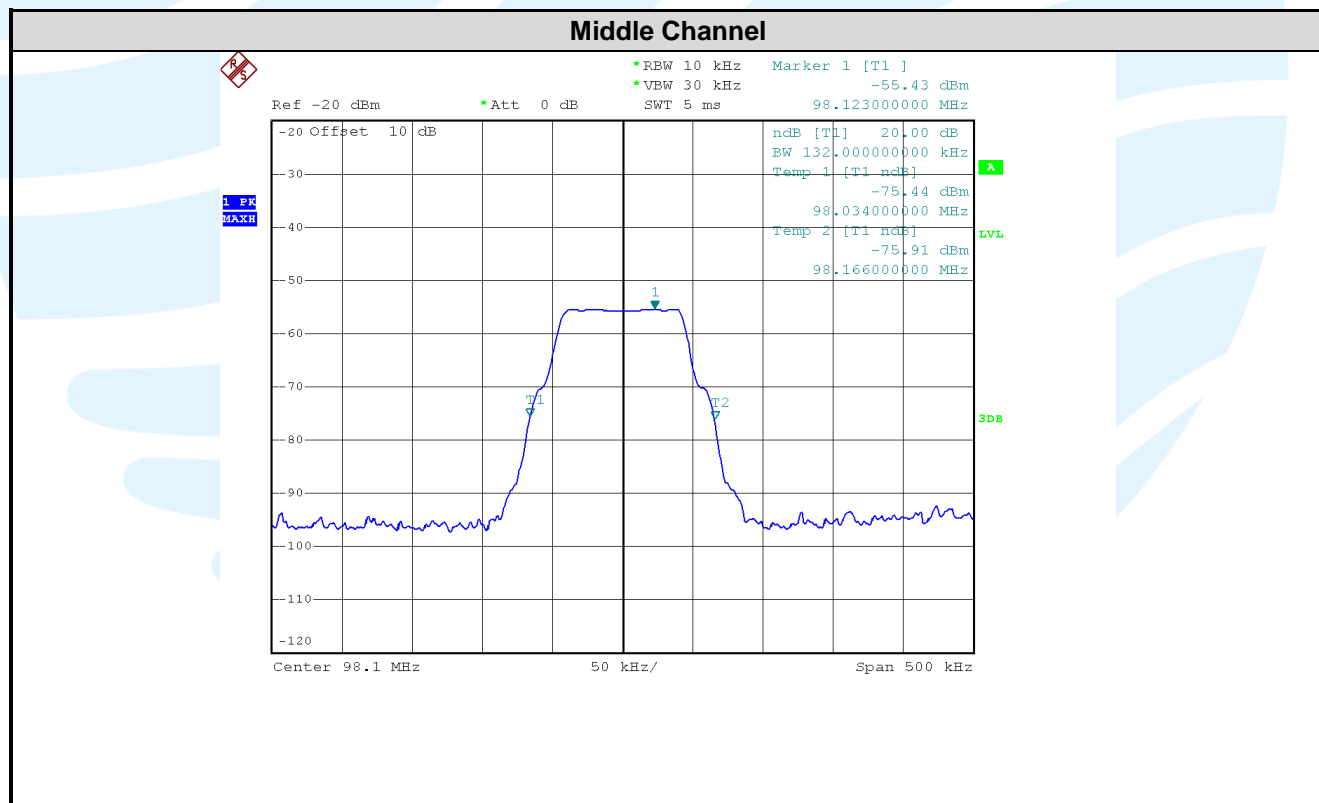
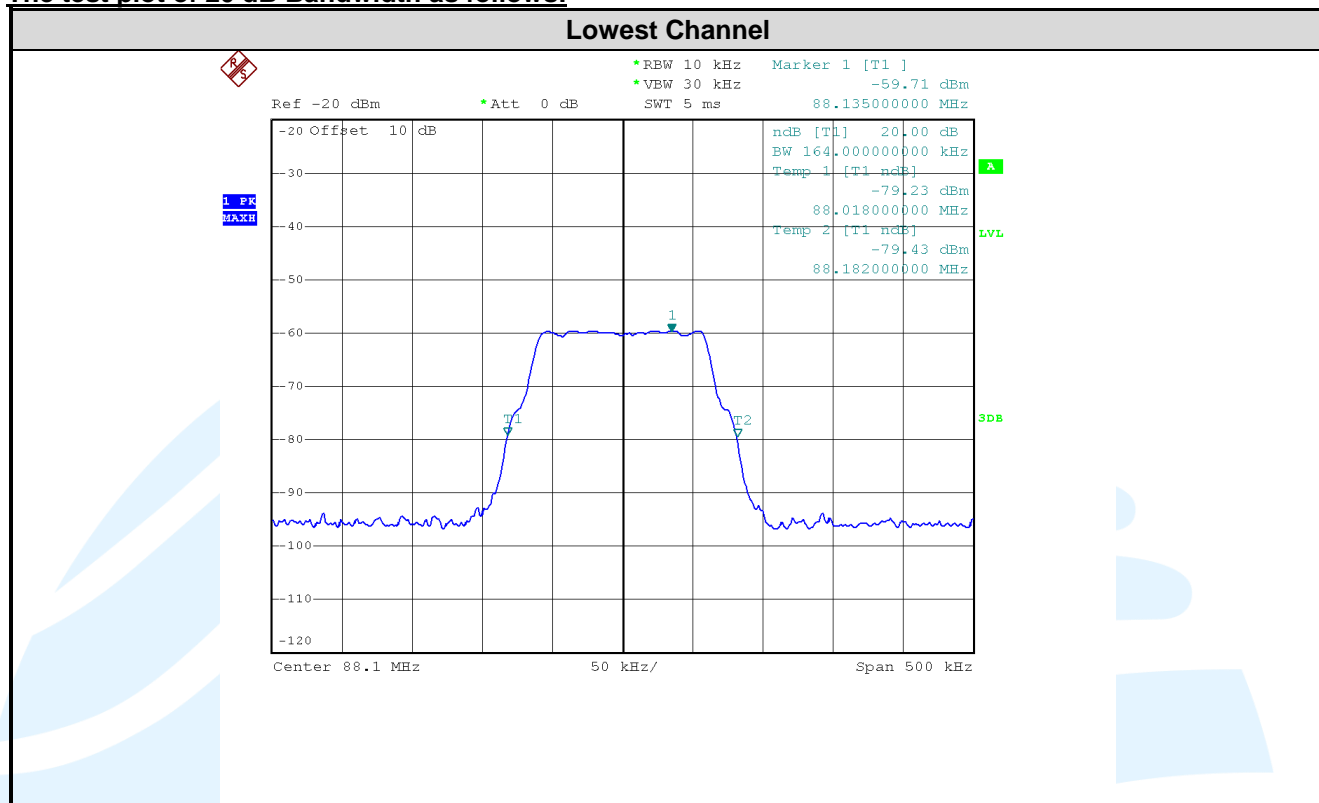
Note: The cable loss and attenuator loss were offset into measure device as an amplitude offset.

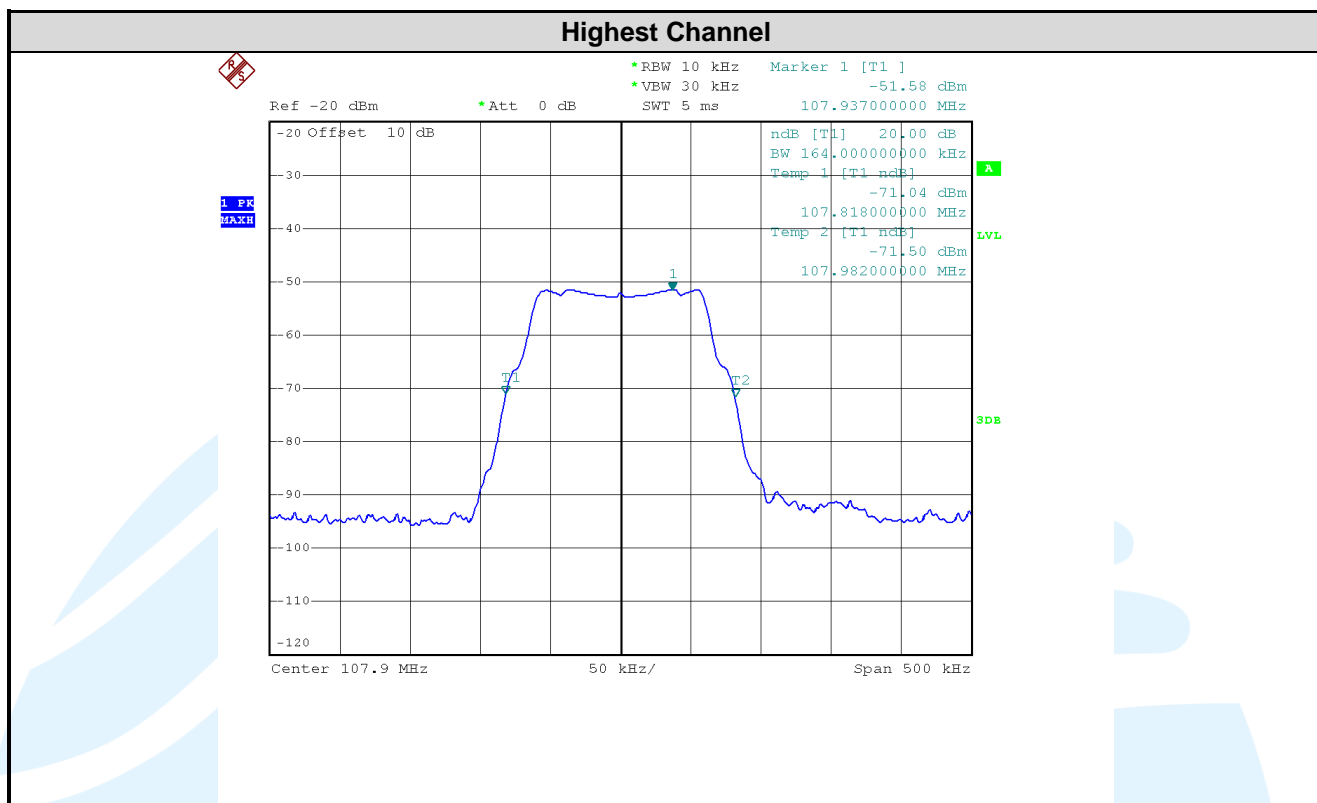
Test Result: Pass

The measurement data as follows:

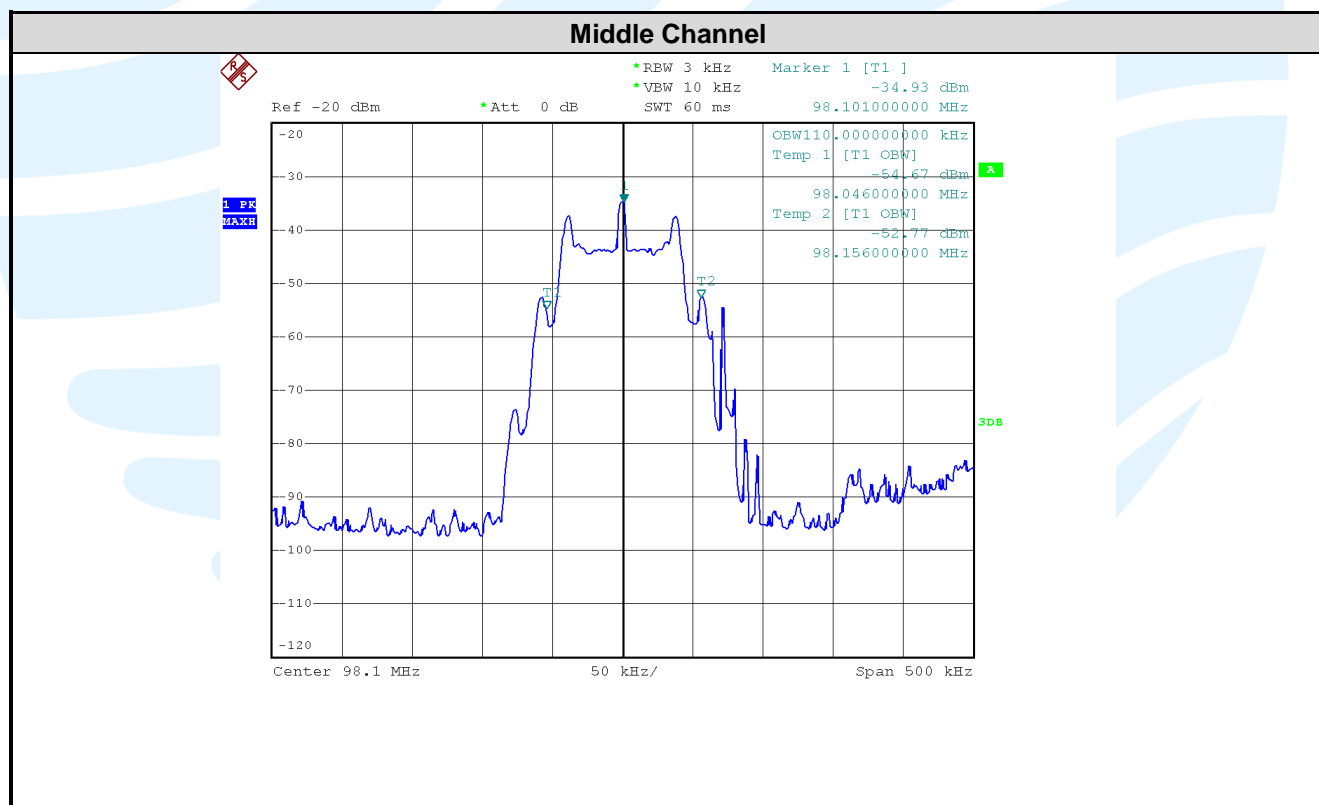
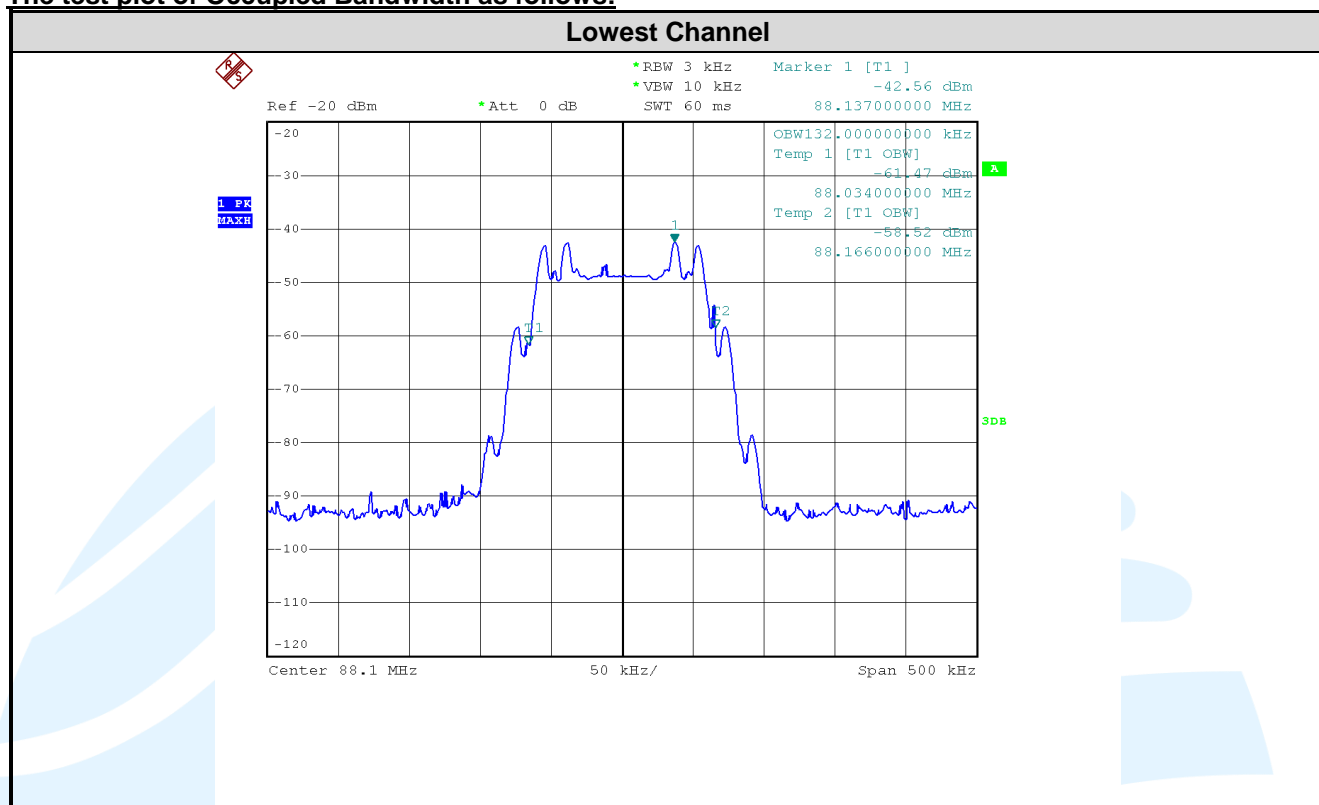
Test Channel	20 dB Bandwidth (kHz)	99% Bandwidth (kHz)	20dB Bandwidth Limit(KHz)
Lowest	164.000	132.000	<200
Middle	132.000	110.000	<200
Highest	164.000	125.000	<200

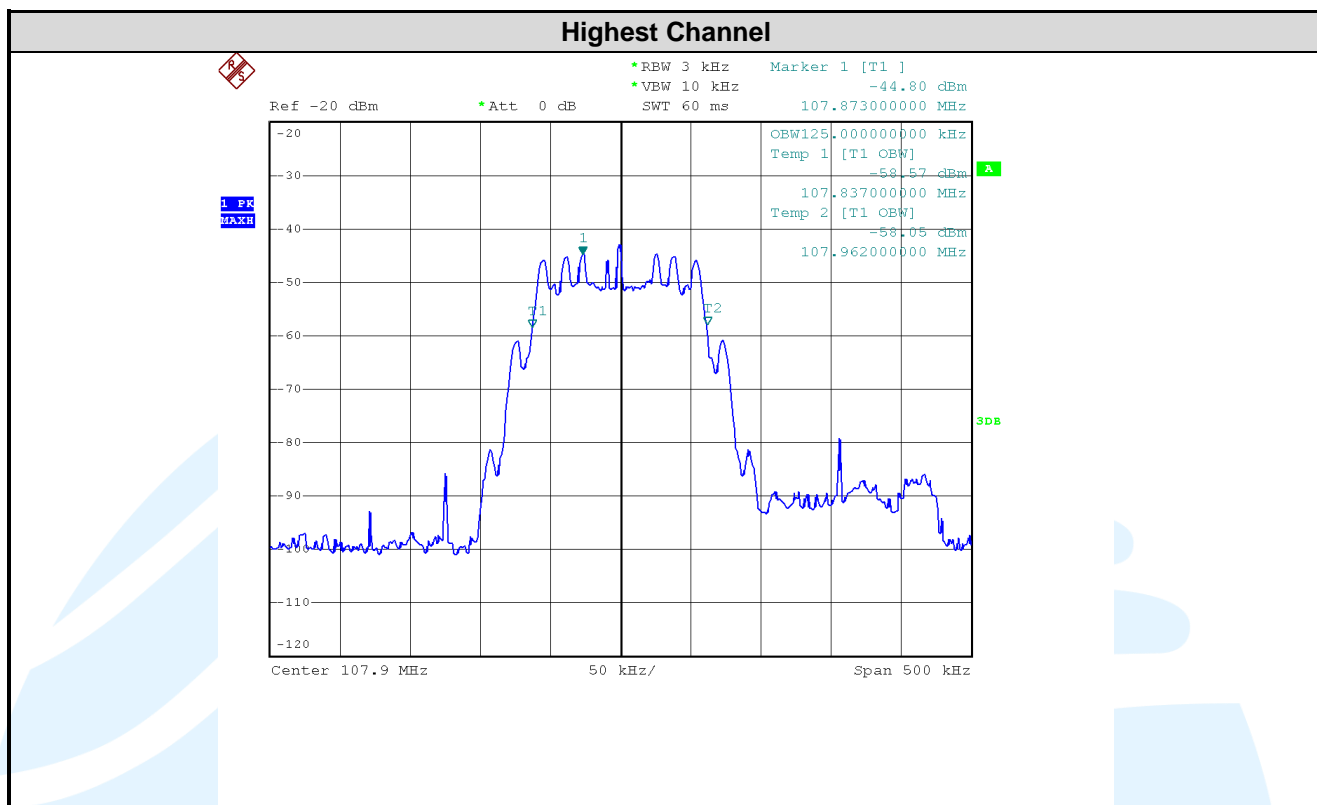
The test plot of 20 dB Bandwidth as follows:





The test plot of Occupied Bandwidth as follows:





APPENDIX 2 PHOTOS OF EUT CONSTRUCTIONAL DETAILS

Refer to Appendix 2 for EUT external and internal photos.

***** End of Report *****

The test report is effective only with both signature and specialized stamp. The result(s) shown in this report refer only to the sample(s) tested. Without written approval of UnionTrust, this report can't be reproduced except in full.
