FCC TEST REPORT

Report No: STS1710103W01

Issued for

Fujian Wanhua Electron & Technology Co., Ltd.

No.926 Nanhuan Road Licheng District
Quanzhou Fujian, China

Product Name:	Digital Two-way Radio
Brand Name:	Olywiz
Model Name:	ATS-200
Series Model:	ATS-100
FCC ID:	2AMMP-ATS-200
Test Standard:	FCC Part 90 Rules

Shenzhen STS Test Services Co., Ltd.
1/F., Building B, Zhuoke Science Park, No.190, Chongqing Road,
Fuyong Street, Bao'an District, Shenzhen, Guangdong, China
TEL: +86-755 3688 6288 FAX: +86-755 3688 6277 E-mail:sts@stsapp.com

TEST RESULT CERTIFICATION

Applicant's name..... Fujian Wanhua Electron & Technology Co., Ltd.

Address ..... No.926 Nanhuan Road Licheng District Quanzhou Fujian, China

Manufacture's Name ..... Fujian Wanhua Electron & Technology Co., Ltd.

Address ..... No.926 Nanhuan Road Licheng District Quanzhou Fujian, China

Product description

Product Name ..... Digital Two-way Radio

Brand Name ..... Olywiz

Model Name..... ATS-200

Series Model ATS-100

Test Standards ..... FCC Part 90 Rules

Test procedure..... ANSI C 63.4: 2014

This device described above has been tested by STS, the test results show that the equipment under test (EUT) is in compliance with the FCC requirements. And it is applicable only to the tested sample identified in the report.

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Date of Test .....

Date of performance of tests..... 18 Oct.2017 ~20 Nov. 2017

Date of Issue ..... 21 Nov. 2017

Test Result..... Pass

Testing Engineer : Sean She

(Sean she)

Technical Manager : Hakim. hou

(Hakim.hou)

Authorized Signatory : Vita Li

(Vita Li)

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Revision History

Rev.	Issue Date	Report NO.	Effect Page	Contents
00	21 Nov. 2017	STS1710103W01	ALL	Initial Issue

1. SUMMARY OF TEST RESULTS

Test procedures according to the technical standards:

Emission			
Standard	Item	Result	Remarks
FCC Part 90.205	Maximum Transmitter Power	PASS	
FCC Part 90.209	Occupied Bandwidth	PASS	
FCC Part 90.210	Emission Mask	PASS	
FCC Part 90.210	Transmitter Radiated Spurious Emssion	PASS	
FCC Part 90.210	Spurious Emssion on Antenna Port	PASS	
FCC Part 90.213	Frequency Stability Test	PASS	
FCC Part 90.210	Transmitter Frequency Behavior	PASS	
FCC Part 90.207	Modulation Characteristic	N/A	

NOTE:

(1)" N/A" denotes test is not applicable in this Test Report

1.1 TEST FACILITY

Shenzhen STS Test Services Co., Ltd.
Add.: 1/F, Building 2, Zhuoke Science Park, Chongqing Road, Fuyong, Baoan District, Shenzhen, China.
CNAS Registration No.: L7649; FCC Registration No.: 625569
IC Registration No.: 12108A; A2LA Certificate No.: 4338.01;

1.2 MEASUREMENT UNCERTAINTY

The reported uncertainty of measurement y ± U，where expended uncertainty U is based on a standard uncertainty multiplied by a coverage factor of k=2，providing a level of confidence of approximately 95 %。

No.	Item	Uncertainty
1	RF power,conducted	±0.70dB
2	Spurious emissions,conducted	±1.19dB
3	Spurious emissions,radiated((>1G)	±2.83dB
4	Spurious emissions,radiated(<1G)	±3.01dB
5	Temperature	±0.5°C
6	Humidity	±2%

2. GENERAL INFORMATION

2.1 GENERAL DESCRIPTION OF EUT

Product Name:	Digital Two-way Radio
Brand Name:	Olywiz
Model Name:	ATS-200
Series Model:	ATS-100
Model Difference description:	Only different are appearance and model name
Operation Frequency Range	Frequency Range: 406.1MHz ~ 470MHz
Maximum Transmitter Power:	36.323 dBm
Channel Separation:	12.5KHz
Modulation type:	4FSK
Adapter	Power supply and ADP(rating): Input: AC 100V-240V, 50/60Hz, 250mA Output: DC 12V, 500mA
Battery	Battery(rating): Rated Voltage: 7.4V Charge Limit: 8.4V Capacity :1400mAh
Temperature Range:	-30℃-50℃
Test frequency list:	See Note 5
Software version number:	ATS200U1
Hardware version number:	ATS200-DCDC-170405.hex

Note:

1. For a more detailed features description, please refer to the manufacturer's specifications or the User's Manual.
2. Note: The product has the same digital working characters when operating in both two digitized voice/data mode. So only one set of test results for digital modulation modes are provided in this test report.
3. Please refer to Appendix B for the photographs of the EUT. For more details, please refer to the User's manual of the EUT.

4. Table for Filed Antenna

Ant	Brand	Model Name	Antenna Type	Connector	Gain (dBi)	NOTE
1	Olywiz	ATS-200	External	NA	3	Antenna

The EUT antenna is External Antenna. No antenna other than that furnished by the responsible party shall be used with the device.

5. frequency list

Test frequency list

Test Channel	Test Frequency (MHz)
CH01	406.5
CH02	435.0
CH03	469.5

Note:
In section 15.31(m), regards to the operating frequency range over 10 MHz, the Lowest frequency, the middle frequency, and the highest frequency of channel were selected to perform the test,please see the above listed frequency for testing.

2.2 EUT OPERATION MODE

The EUT has been tested under typical operating condition and The Transmitter was operated in the normal operating mode. The TX frequency was fixed which was for the purpose of the measurements..

2.3 DESCRIPTION OF TEST MODES

To investigate the maximum EMI emission characteristics generates from EUT, the test system was pre-scanning tested base on the consideration of following EUT operation mode or test configuration mode which possible have effect on EMI emission level. Each of these EUT operation mode(s) or test configuration mode(s) mentioned above was evaluated respectively.

For Radiated Emission	
Final Test Mode	Description
Model 1	Low Channel
	Middle Channel
	High Channel
Model 2	Low Channel
	Middle Channel
	High Channel

Model 1:
The equipment is set with 4FSK modulation and 12.5KHz bandwidth at maximum rated power for transmitter,powered by DC 13.60V.

Model 2:
The equipment is set with 4FSK modulation and 12.5KHz bandwidth at minimum rated power for transmitter,powered by DC 13.60V.

Note:

(1) Due to the different configuration and test, in this list only some worse mode. The worst test data of the worse modeis reported by this report.

2.4 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.

Item	Equipment	Mfr/Brand	Model/Type No.	Series No.	Note

Item	Shielded Type	Ferrite Core	Length	Note
C-1	USB Cable (FTP)	NO	90cm	N/A

Note:

(1) The support equipment was authorized by Declaration of Confirmation.
(2) For detachable type I/O cable should be specified the length in cm in『Length』column.
(3) “YES” is means “shielded” “with core”; “NO” is means “unshielded” “without core”.

2.6 EQUIPMENTS LIST FOR ALL TEST ITEMS

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.

2.7 TEST EQUIPMENT

Kind of Equipment	Manufacturer	Type No.	Serial No.	Last calibration	Calibrated until
Signal Analyzer	Agilent	N9020A	MY49100060	2017.06.15	2018.06.14
Signal Generator	Agilent	N5182A	MY46240556	2017.10.15	2018.10.14
Audio Generator	TRONSON	TAG-101	20030212	2017.10.15	2018.10.14
Bilog Antenna	TESEQ	CBL6111D	34678	2017.03.24	2018.03.23
Horn Antenna	Schwarzbeck	BBHA 9120D	9120D-1343	2017.03.06	2018.03.05
50Ω Coaxial Switch	Anritsu	MP59B	6200264416	2017.10.15	2018.10.14
Pre-mplifier (0.1M-3GHz)	EM	EM330	60538	2017.03.12	2018.03.11
PreAmplifier (1G-26.5GHz)	Agilent	8449B	60538	2017.10.15	2018.10.14
Attenuator	HP	8494B	DC-18G	2017.10.15	2018.10.14
programmable power supply	Agilent	3642A	STS-S095	N.C.R	N.C.R
AC Power Source	APC	KDF-11010G	F214050035	N.C.R	N.C.R
Audio analyzer	R&S	UPL	N/A	2017.06.15	2018.06.14
RF COMMUNICATION TEST SET	HP	N8920A	348A05658	2017.10.15	2018.10.14

3. MAXIMUM TRANSMITTER POWER

3.1 LIMITS

Per FCC Part 2.1046 and Part 90.205: Maximum ERP is dependent upon the station's antenna HAAT and required service area.

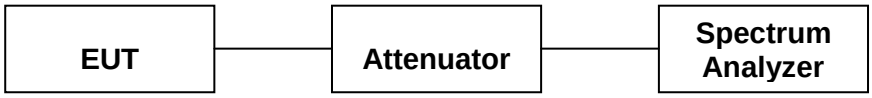
3.2 TEST PROCEDURE

Measurements shall be made to establish the radio frequency power delivered by the transmitter the standard output termination. The power output shall be monitored and recorded and no adjustment shall be made to the transmitter after the test has begun, except as noted bellow:
If the power output is adjustable, measurements shall be made for the highest and lowest power levels. The EUT connect to the Spectrum Analyzer through 20 dB attenuator.

3.3 DEVIATION FROM TEST STANDARD

No deviation

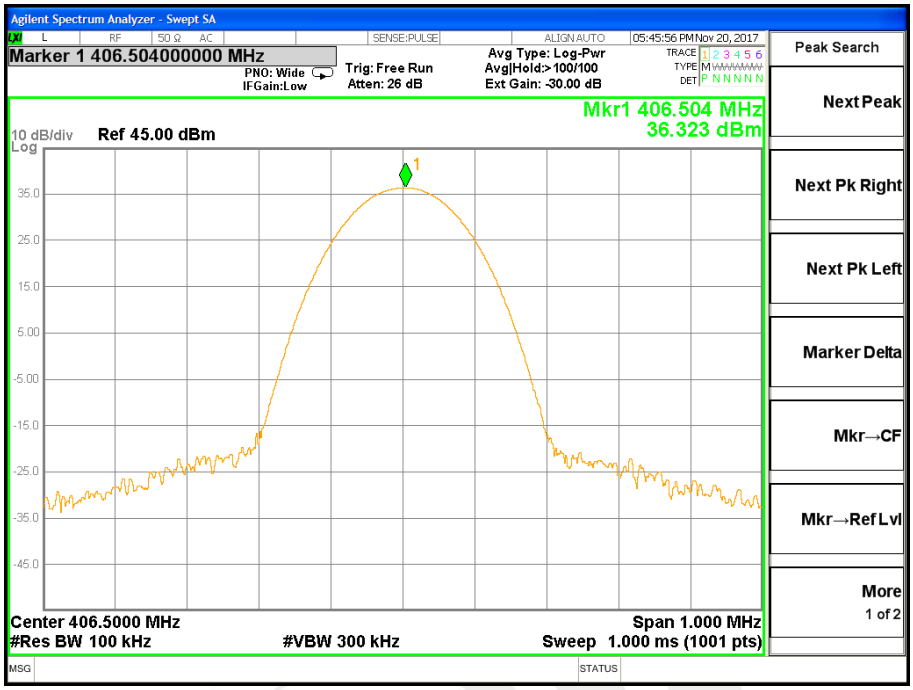
3.4 TEST SETUP BLOCK DIAGRAM



3.5 TEST RESULT

Modulation Type	Channel Sparation	Operation Mode	Test Channel	Test Frequency (MHz)	Test Results (dBm)
4FSK	12.5KHz	Mode 1	CH1	406.5	36.323
			CH2	435.0	36.021
			CH3	469.5	36.073
		Mode 2	CH1	406.5	26.178
			CH2	435.0	25.910
			CH3	469.5	26.056

CH 1 Model 1



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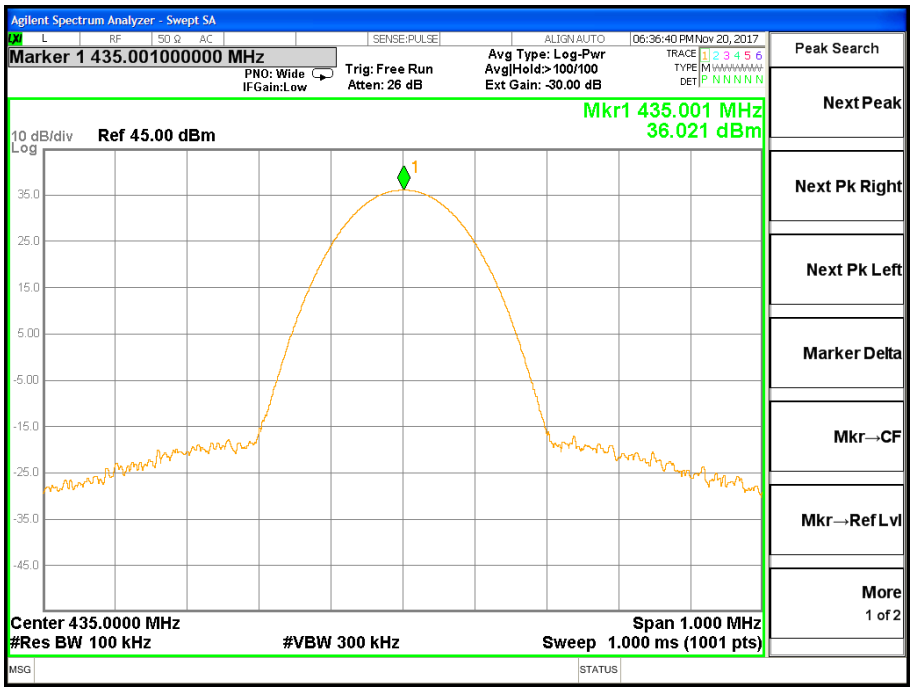
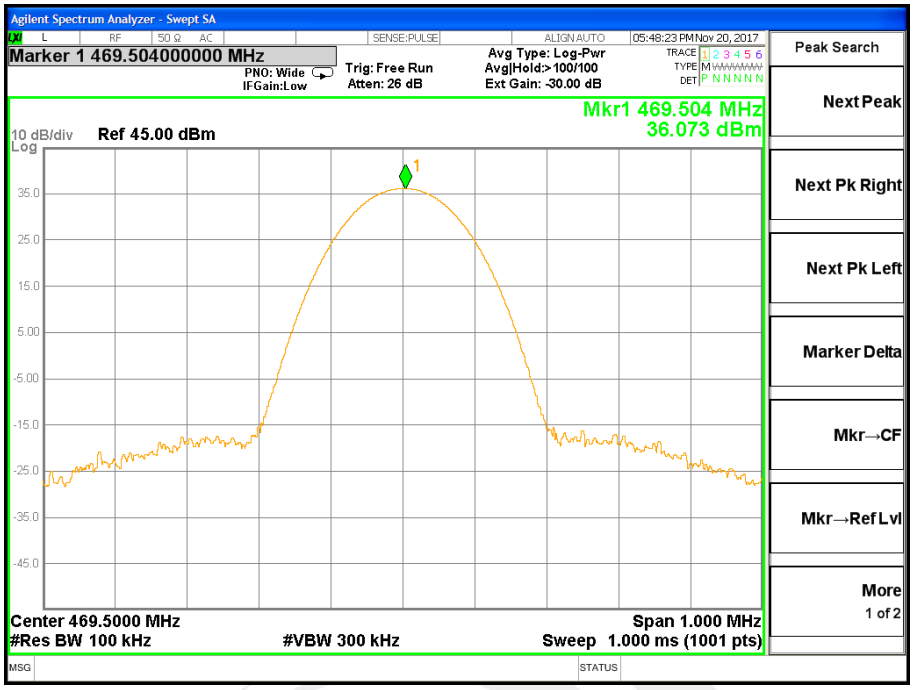
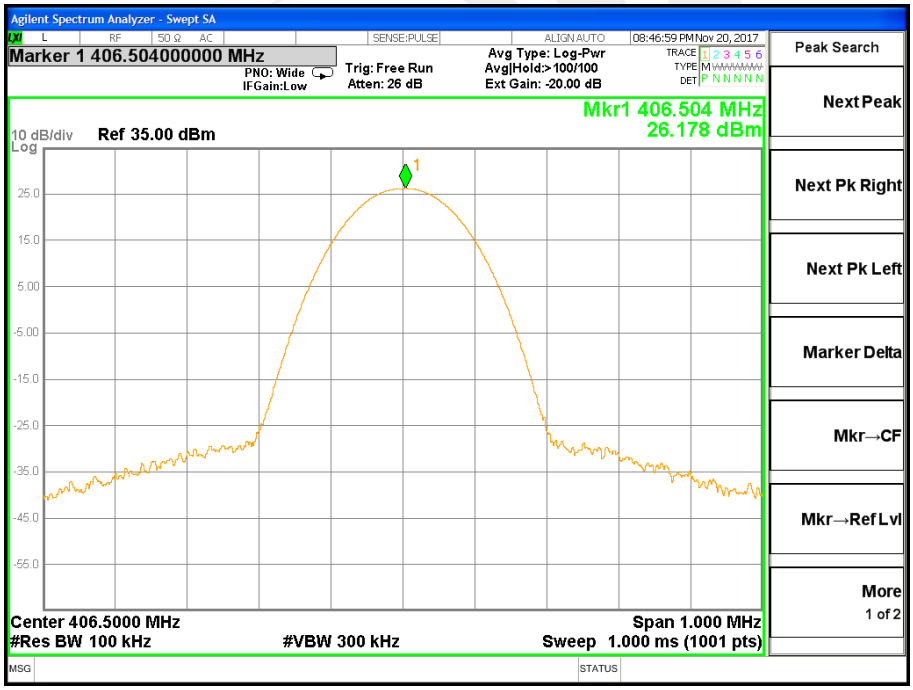


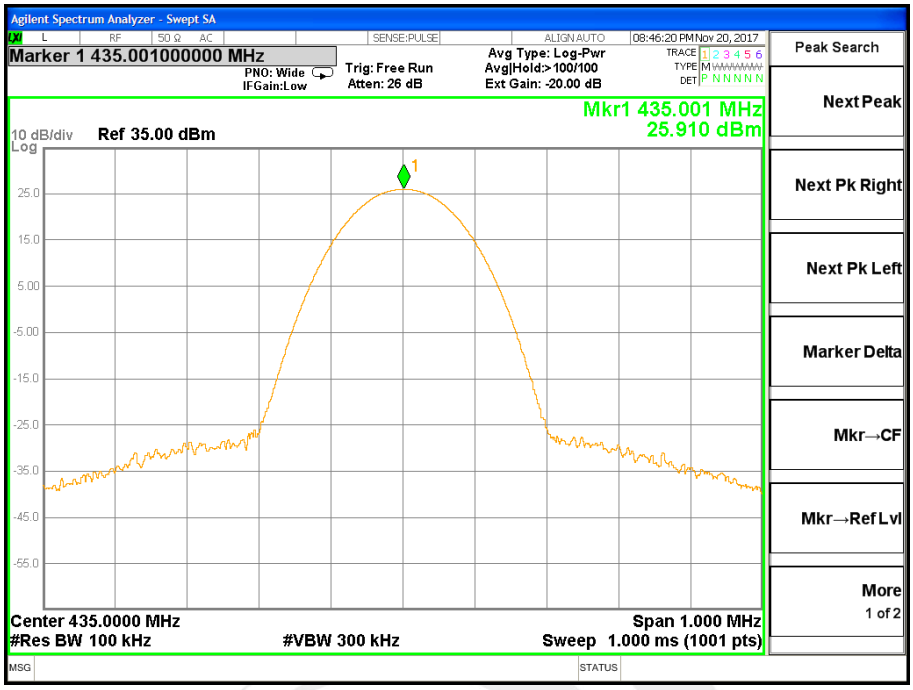
CH 3 Model 1



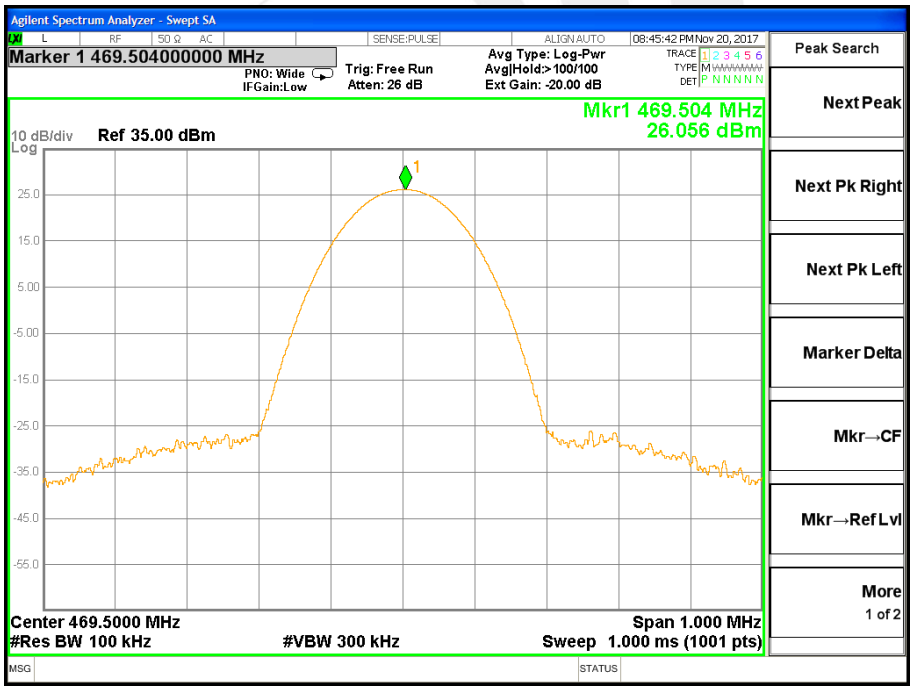
CH 1 Model 2



CH 2 Model 2



CH 3 Model 2



4. OCCUPIED BANDWIDTH

4.1 LIMIT

The bandwidths expressed are channel BW (channel spacing), which is not to be confused with authorized BW; § 90.209(b)(5)(footnote 3 of the table) shows the relevant definitions.

Channel BW	Authorized BW (maximum BW on grant)
25 kHz	20 kHz
12.5 kHz	11.25 kHz
6.25 kHz	6 kHz

4.2 MEASUREMENT PROCEDURE

a. The EUT was connected to the Spectrum Analyzer.

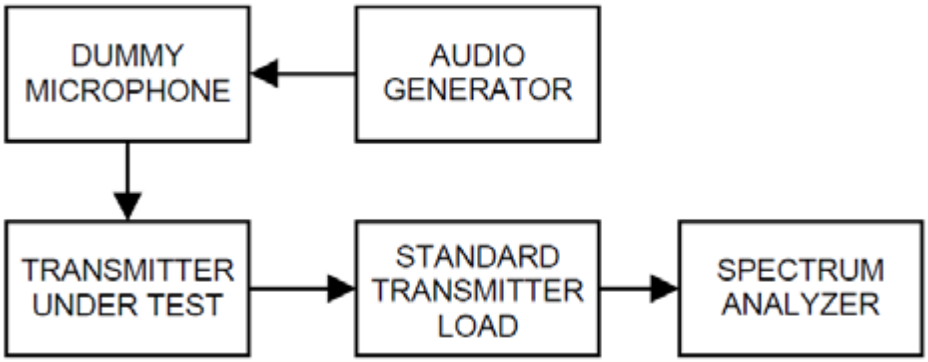
b. The EUT was modulated by 2.5KHz Sine wave audio signal; the level of the audio signal employed is 16dB greater than that necessary to produce 50% of rated system deviation. Rated system deviation is 2.5kHz (12.5kHz channel spacing) and 5kHz(25kHz channel spacing)

c. Set EUT as normal operation.

d. Set SPA Center Frequency=fundamental frequency, RBW=300Hz, VBW=3KHz, span =50KHz.

e Set SPA Max hold. Mark peak, Set 99% Occupied Bandwidth and 26dB Occupied Bandwidth.

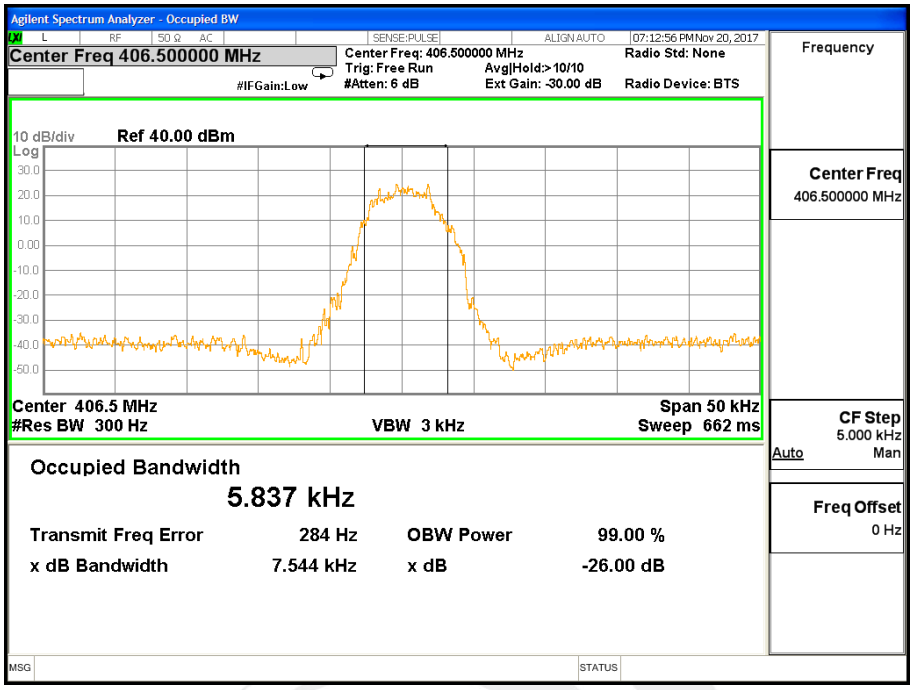
4.3 TEST SETUP BLOCK DIAGRAM



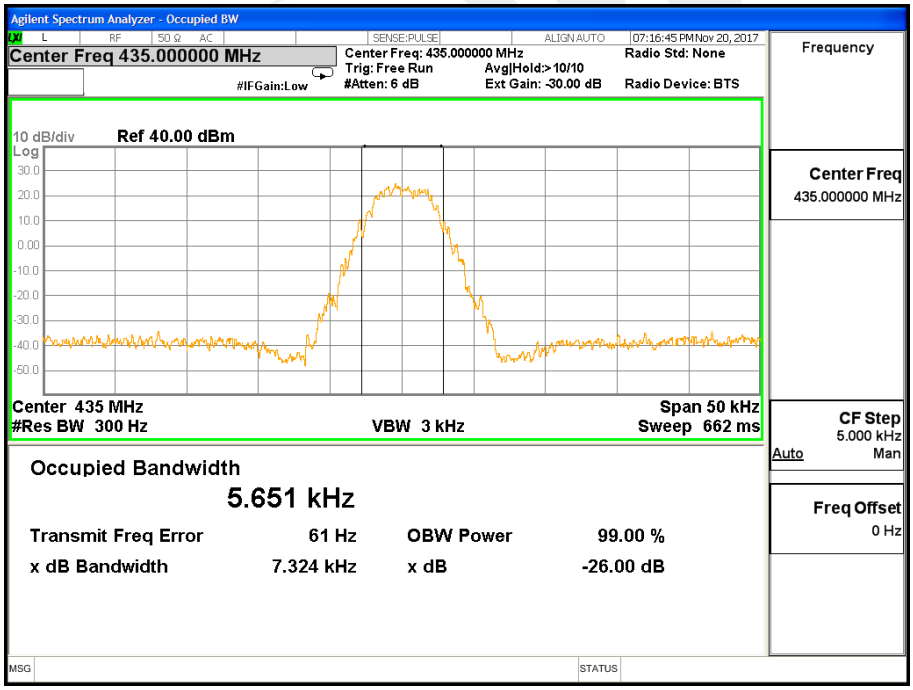
4.4 TEST RESULT

Modulation Type	Channel Sparation	Operation Mode	Test Channel	Test Frequency (MHz)	Occupied Bandwidth (KHz)		Limit (KHz)
					99%	26dB	
4FSK	12.5KHz	Mode 1	CH1	406.5	5.837	7.544	11.25
			CH2	435.0	5.651	7.324	11.25
			CH3	469.5	5.320	7.362	11.25

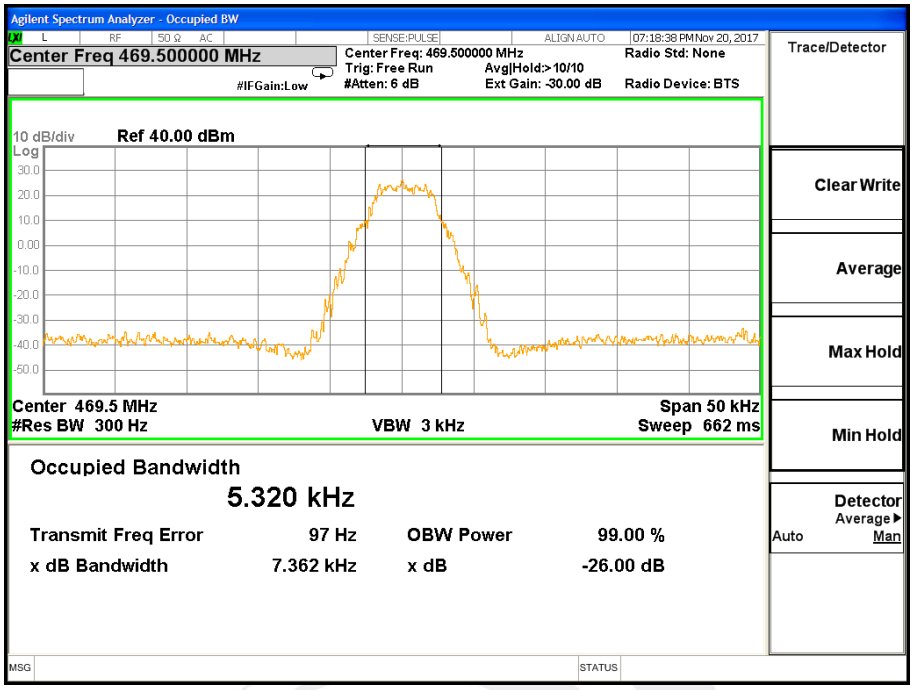
CH 1 Model 1



CH 2 Model 1

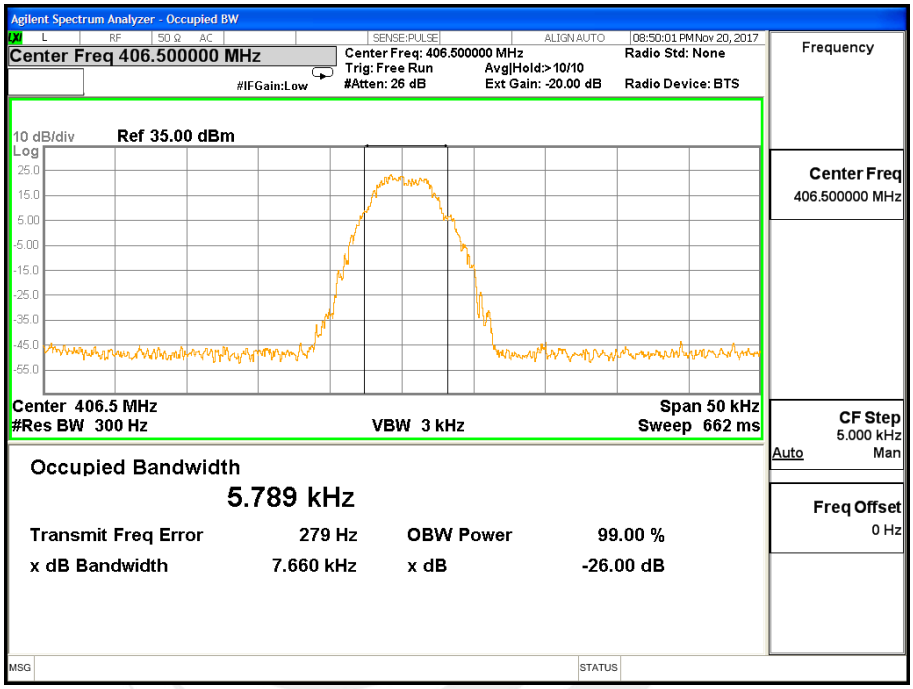


CH 3 Model 1

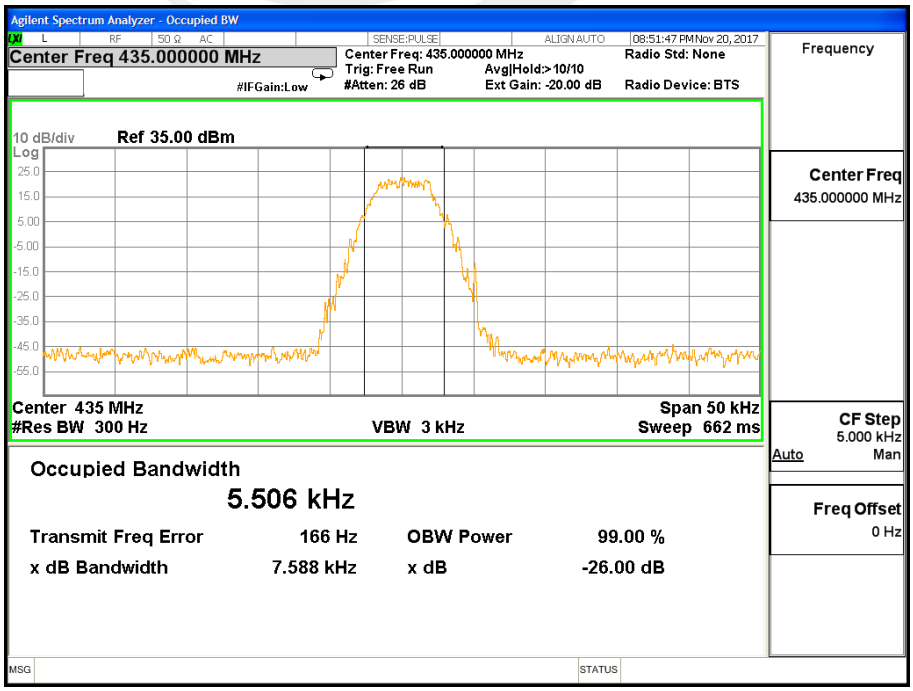

Agilent Spectrum Analyzer - Occupied BW
Center Freq 469.500000 MHz
Center Freq: 469.500000 MHz
Trig: Free Run
Avg|Hold:>10/10
#Atten: 6 dB
Ext Gain: -30.00 dB
Radio Std: None
Radio Device: BTS
#IFGain:Low
07:18:38 PM Nov 20, 2017
10 dB/div
Log
Ref 40.00 dBm
30.0
20.0
10.0
0.00
-10.0
-20.0
-30.0
-40.0
-50.0
Center 469.5 MHz
#Res BW 300 Hz
VBW 3 kHz
Span 50 kHz
Sweep 662 ms
Occupied Bandwidth
5.320 kHz
Transmit Freq Error 97 Hz
OBW Power 99.00 %
x dB Bandwidth 7.362 kHz
x dB -26.00 dB
Trace/Detector
Clear Write
Average
Max Hold
Min Hold
Detector
Average
Auto
Man
MSG
STATUS

Modulation Type	Channel Sparation	Operation Mode	Test Channel	Test Frequency (MHz)	Occupied Bandwidth (KHz)		Limit (KHz)
					99%	26dB	
4FSK	12.5KHz	Mode 2	CH1	406.5	5.789	7.660	11.25
			CH2	435.0	5.506	7.588	11.25
			CH3	469.5	5.681	7.144	11.25

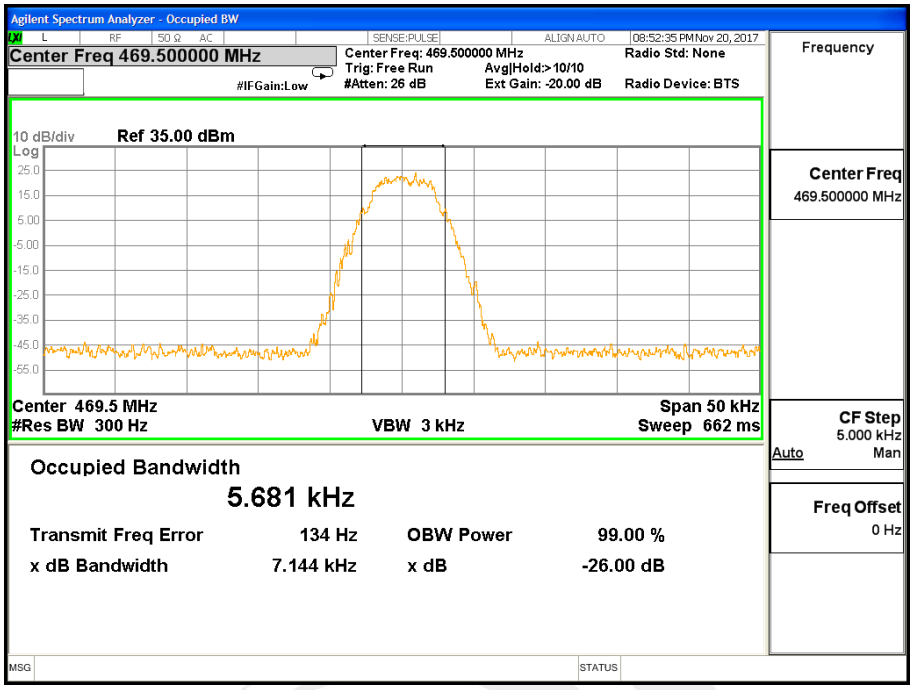
CH 1 Model 2



CH 2 Model 2



CH 3 Model 2


Agilent Spectrum Analyzer - Occupied BW
Center Freq 469.500000 MHz
Center Freq: 469.500000 MHz
Trig: Free Run
Avg|Hold:>10/10
#Atten: 26 dB
Ext Gain: -20.00 dB
Radio Std: None
Radio Device: BTS
#IFGain:Low
08:52:35 PM Nov 20, 2017
Frequency
10 dB/div
Log
Ref 35.00 dBm
25.0
15.0
5.00
-5.00
-15.0
-25.0
-35.0
-45.0
-55.0
Center 469.5 MHz
#Res BW 300 Hz
VBW 3 kHz
Span 50 kHz
Sweep 662 ms
Center Freq
469.500000 MHz
CF Step
5.000 kHz
Auto
Man
Freq Offset
0 Hz
Occupied Bandwidth
5.681 kHz
Transmit Freq Error 134 Hz
OBW Power 99.00 %
x dB Bandwidth 7.144 kHz
x dB -26.00 dB
MSG
STATUS

5. EMISSION MASK

5.1 PROVISIONS APPLICABLE

Emission Mask B: For transmitters that are equipped with an audio low-pass filter pursuant to §90.211(a), the power of any emission must be below the unmodulated carrier power (P) as follows:

(1) On any frequency removed from the assigned frequency by more than 50 percent, but not
a more than 100 percent of the authorized bandwidth: At least 25 dB.

(2) On any frequency removed from the assigned frequency by more than 100 percent, but not more than 250 percent of the authorized bandwidth: At least 35 dB.

(3) On any frequency removed from the assigned frequency by more than 250 percent of the authorized bandwidth: At least 43 + 10 log (P) dB.

Emission Mask D, 12.5 kHz channel bandwidth equipment: For transmitters designed to operate with a 12.5 kHz channel bandwidth, any emission must be attenuated below the power (P) of the highest emission contained within the authorized bandwidth as follows:

(1) On any frequency from the center of the authorized bandwidth f0 to 5.625 kHz removed from f_0: Zero dB.

b (2) On any frequency removed from the center of the authorized bandwidth by a displacement frequency (fd in kHz) of more than 5.625 kHz but no more than 12.5 kHz: At least 7.27(fd -2.88 kHz) dB.

(3) On any frequency removed from the center of the authorized bandwidth by a displacement frequency (fd in kHz) of more than 12.5 kHz: At least 50 + 10 log (P) dB or 70 dB, whichever is the lesser attenuation.

5.2 MEASUREMENT PROCEDURE

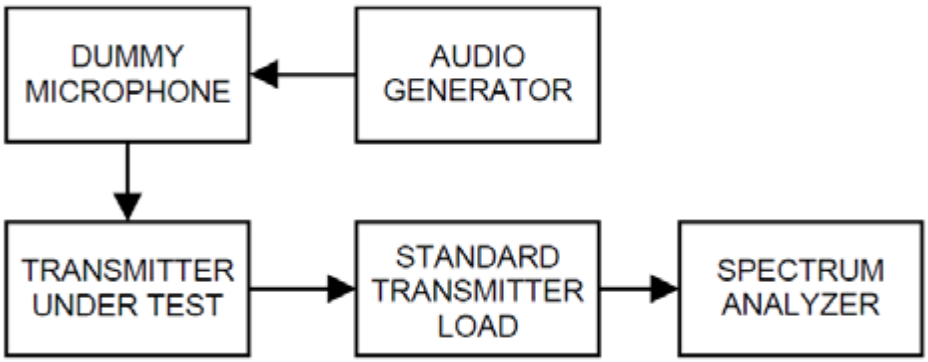
a. The EUT was connected to the Spectrum Analyzer.

The EUT was modulated by 2.5KHz Sine wave audio signal; the level of the audio signal
b. employed is 16dB greater than that necessary to produce 50% of rated system deviation. Rated system deviation is 2.5kHz (12.5kHz channel spacing) and 5kHz(25kHz channel spacing)

c. Set EUT as normal operation.

d Set SPA Center Frequency=fundamental frequency, RBW=300Hz, VBW=3KHz, span =50KHz.

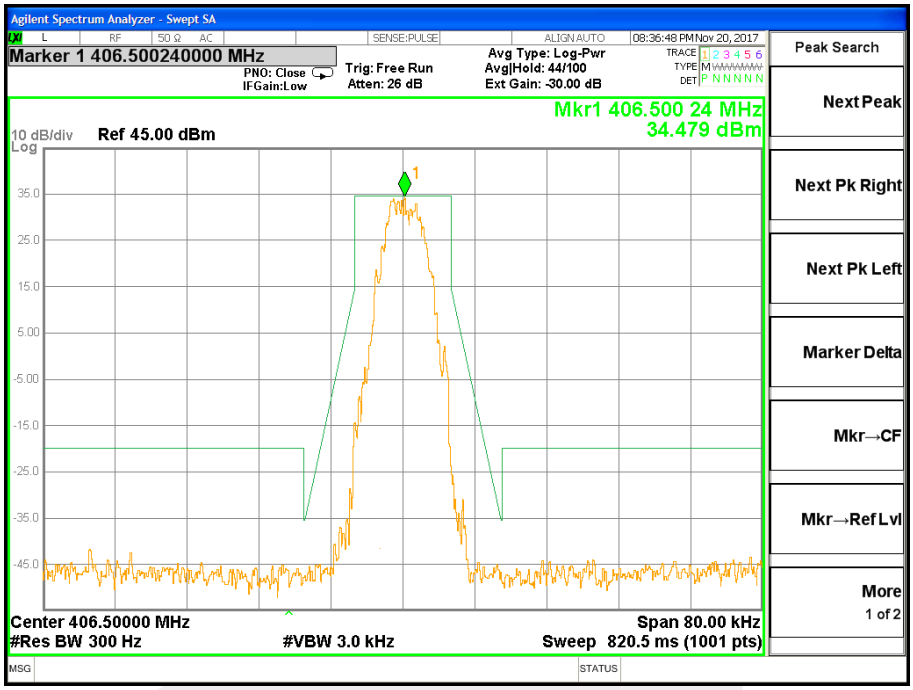
5.3 TEST SETUP BLOCK DIAGRAM



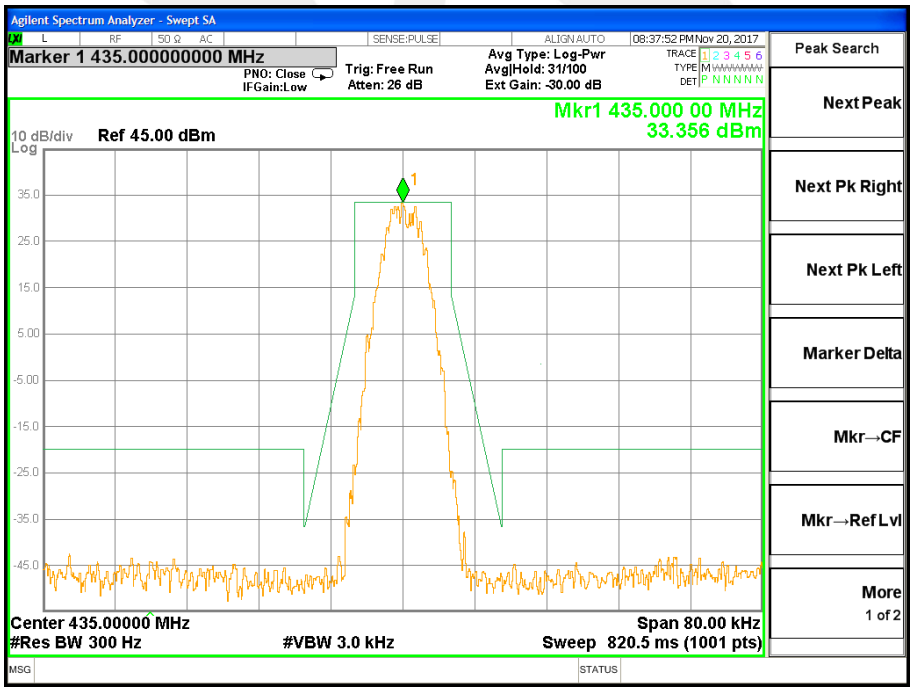
5.4 MEASUREMENT RESULT:

Note: The test complice Mask b

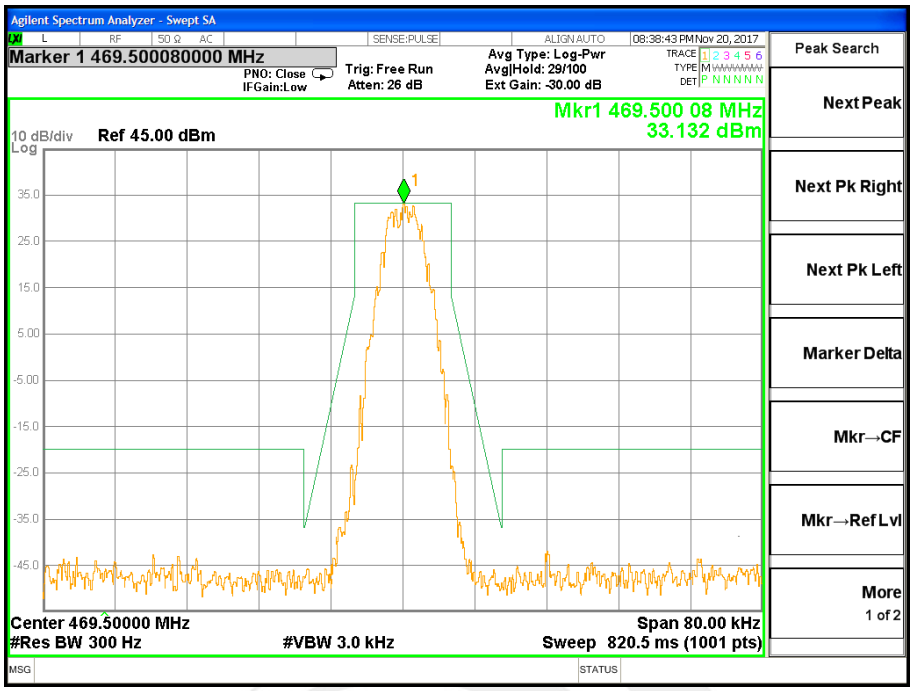
CH 1 Model 1



CH 2 Model 1



CH 3 Model 1


Agilent Spectrum Analyzer - Swept SA
Marker 1 469.500080000 MHz
PNO: Close
IFGain:Low
Trig: Free Run
Atten: 26 dB
Avg Type: Log-Pwr
Avg|Hold: 29/100
Ext Gain: -30.00 dB
08:38:43 PM Nov 20, 2017
Mkr1 469.500 08 MHz
33.132 dBm
10 dB/div
Log
Ref 45.00 dBm
35.0
25.0
15.0
5.00
-5.00
-15.0
-25.0
-35.0
-45.0
Center 469.50000 MHz
#Res BW 300 Hz
#VBW 3.0 kHz
Span 80.00 kHz
Sweep 820.5 ms (1001 pts)
Peak Search
Next Peak
Next Pk Right
Next Pk Left
Marker Delta
Mkr→CF
Mkr→Ref Lvl
More
1 of 2

6. TRANSMITTER RADIATED SPURIOUS EMSSION

6.1 PROVISIONS APPLICABLE

According to the TIA/EIA 603 test method, and according to Section 90.210, the power of each unwanted emission shall be less than Transmitted Power as specified below for transmitters designed to operate with 12.5 KHz channel bandwidth:

1. On any frequency removed from the center of the authorized bandwidth fo to 5.625 KHz removed from fo: Zero dB
2. On any frequency removed from the center of the authorized bandwidth by a displacement frequency (fd in KHz) fo of more than 5.625 KHz but no more than 12.5 KHz: At least 7.27dB
3. On any frequency removed from the center of the authorized bandwidth by a displacement frequency (fd in KHz) fo of more than 12.5 KHz: At least 50+10 log (P) dB or 70 dB, which ever is lesser attenuation.

For transmitters designed to transmit with 25 KHz channel separation and equipped with an audio low-pass filter, the power of any emission must be attenuated below the unmodulated carrier power (P) as following:

1. On any frequency removed from the assigned frequency by more than 50 percent, but no more than 100 percent of the authorized bandwidth: At least 25 dB.
2. On any frequency removed from the assigned frequency by more than 100 percent, but no more than 250 percent of the authorized bandwidth: At least 35 dB.
3. On any frequency removed from the assigned frequency by more than 250 percent of the authorized bandwidth: At least 43+10Log (P) dB.

6.2TEST PROCEDURE

a. EUT was placed on a 1.50 meter high non-conductive stand at a 3 meter test distance from the receive antenna. A receiving antenna was placed on the antenna mast 3 meters from the EUT. for emission measurements. The height of receiving antenna is 1.50 m. Detected emissions were maximized at each frequency by rotating the EUT through 360° and adjusting the receiving antenna polarization. The radiated emission measurements of all transmit frequencies in six channels were measured with peak detector.

b. A log-periodic antenna or double-ridged waveguide horn antenna shall be substituted in place of the EUT. The log-periodic antenna will be driven by a signal generator and the level will be adjusted till the same power value on the spectrum analyzer or receiver. The level of the spurious emissions can be calculated through the level of the signal generator, cable loss, the gain of the substitution antenna and the reading of the spectrum analyzer or receiver.

c. The EUT is then put into continuously transmitting mode at its maximum power level during the test.Set Test Receiver or Spectrum RBW=1MHz,VBW=3MHz for above 1GHz and RBW=100KHz,VBW=300KHz for 30MHz to 1GHz, And the maximum value of the receiver should be recorded as (P_r).

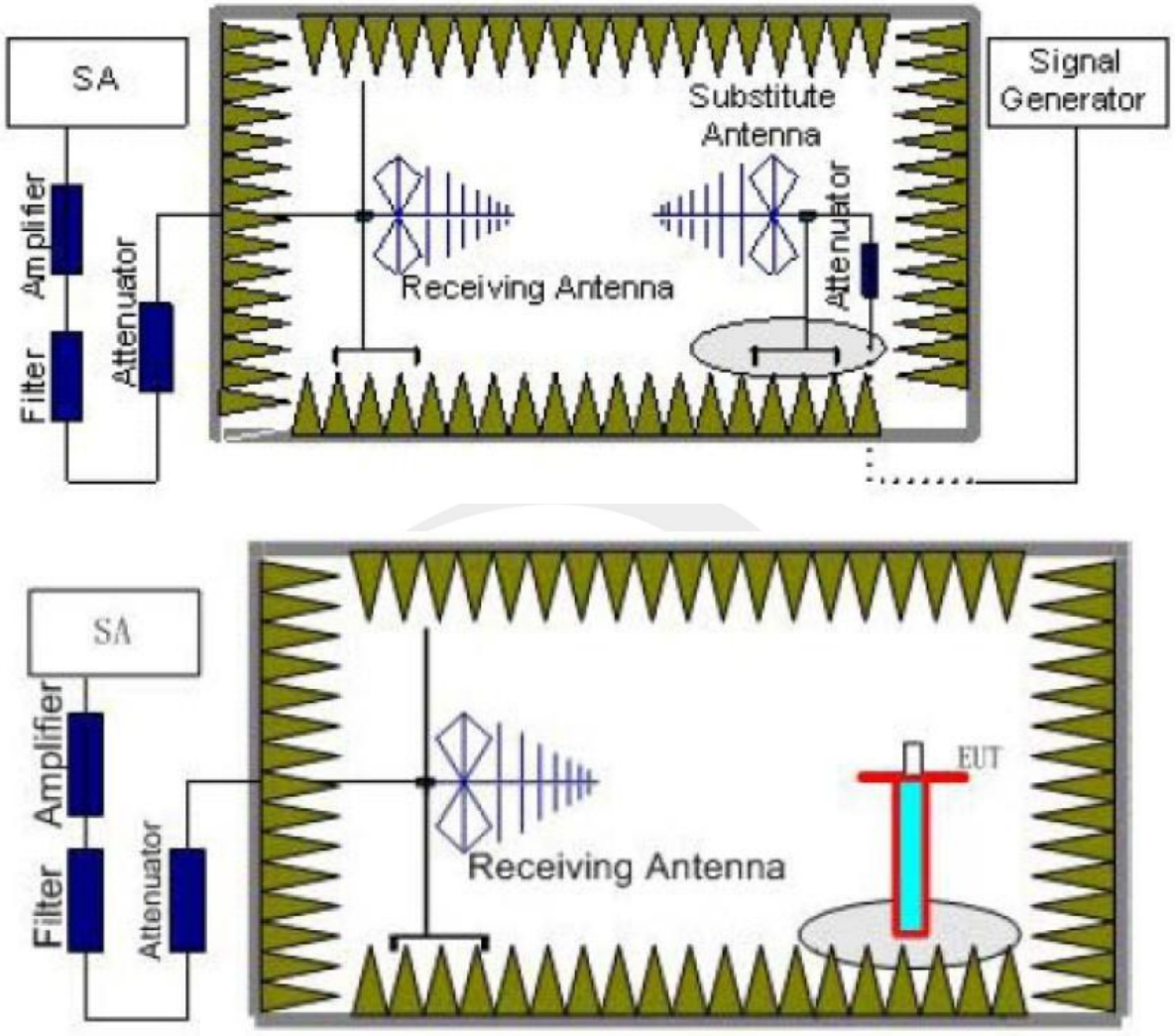
d. The EUT shall be replaced by a substitution antenna. In the chamber, an substitution antenna for the frequency band of interest is placed at the reference point of the chamber. An RF Signal source for the frequency band of interest is connected to the substitution antenna with a cable that has been constructed to not interfere with the radiation pattern of the antenna. A power (PMea) is applied to the input of the substitution antenna, and adjust the level of the signal generator output until the value of the receiver reach the previously recorded (Pr). The power of signal source (PMea) is recorded. The test should be performed by rotating the test item and adjusting the receiving antenna polarization.

e. A amplifier should be connected to the Signal Source output port. And the cable should be connect between the Amplifier and the Substitution Antenna. The cable loss (P_{cl}) ,the Substitution Antenna Gain (G_a) and the Amplifier Gain (P_{Ag}) should be recorded after test.
The measurement results are obtained as described below:
Power(EIRP)=P_{Mea}- P_{Ag} - P_{cl} - G_a
We used micowave signal generator which signal level can up to 37dBm,so we not used power.
Amplifier for substituation test; The measurement results are amend as described below:
Power(EIRP)=P_{Mea}- P_{cl} - G_a

f. This value is EIRP since the measurement is calibrated using an antenna of known gain (2.15 dBi) and known input power.

g ERP can be calculated from EIRP by subtracting the gain of the dipole, ERP = EIRP-2.15dBi.

6.3 TEST CONFIGURATION



6.4 TEST RESULT

CH 1					Model 1		
Frequency	Result					Limit (dBm)	Conclusion
	P_{meas} (dBm)	Cable loss	Antenna Gain(dBi)	P_{Meas} E.R.P(dBm)	Polarization Of Max. ERP		
813.00	-32.54	0.44	6.40	-28.73	Horizontal	-20.00	Pass
1925.12	-35.56	1.02	8.63	-30.10	Horizontal	-20.00	Pass
3256.02	-32.04	1.52	10.20	-25.51	Horizontal	-20.00	Pass
813.00	-35.39	0.44	6.40	-31.58	Vertical	-20.00	Pass
1925.12	-32.03	1.02	8.63	-26.57	Vertical	-20.00	Pass
3256.02	-35.39	1.52	10.20	-28.86	Vertical	-20.00	Pass

CH 2					Model 1		
Frequency	Result					Limit (dBm)	Conclusion
	P_{meas} (dBm)	Cable loss	Antenna Gain(dBi)	P_{Meas} E.R.P(dBm)	Polarization Of Max. ERP		
870.00	-34.45	0.44	6.40	-30.64	Horizontal	-20.00	Pass
1970.12	-37.45	1.13	8.63	-32.10	Horizontal	-20.00	Pass
3241.23	-33.83	1.57	10.20	-27.35	Horizontal	-20.00	Pass
870.00	-37.33	0.44	6.40	-33.52	Vertical	-20.00	Pass
1970.12	-33.83	1.13	8.63	-28.48	Vertical	-20.00	Pass
3241.23	-37.18	1.57	10.20	-30.70	Vertical	-20.00	Pass

CH 3					Model 1		
Frequency	Result					Limit (dBm)	Conclusion
	P_{meas} (dBm)	Cable loss	Antenna Gain(dBi)	P_{Meas} E.R.P(dBm)	Polarization Of Max. ERP		
939.00	-33.46	0.46	6.40	-29.67	Horizontal	-20.00	Pass
1981.41	-36.56	1.17	8.63	-31.25	Horizontal	-20.00	Pass
3250.43	-32.58	1.63	10.20	-26.16	Horizontal	-20.00	Pass
939.00	-36.19	0.46	6.40	-32.40	Vertical	-20.00	Pass
1981.41	-32.97	1.17	8.63	-27.66	Vertical	-20.00	Pass
3250.43	-35.97	1.63	10.20	-29.55	Vertical	-20.00	Pass

Note: Both Mode 1 and Mode 2 was tested, only worst case at Mode 1 was recorded.

$EIRP=P_{Mea}(dBm)-P_{cl}(dB)+G_a(dBi)$

ERP= EIRP- Correction (dB)

We were not recorded other points as values lower than limits

7. SPURIOUS EMSSION ON ANTENNA PORT

7.1 PROVISIONS APPLICABLE

According to the TIA/EIA 603 test method, and according to Section 90.210, the power of each unwanted emission shall be less than Transmitted Power as specified below for transmitters designed to operate with 12.5 KHz channel bandwidth:

1. On any frequency removed from the center of the authorized bandwidth fo to 5.625 KHz removed from fo: Zero dB
2. On any frequency removed from the center of the authorized bandwidth by a displacement frequency (fd in KHz) fo of more than 5.625 KHz but no more than 12.5 KHz: At least 7.27dB
3. On any frequency removed from the center of the authorized bandwidth by a displacement frequency (fd in KHz) fo of more than 12.5 KHz: At least 50+10 log (P) dB or 70 dB, which ever is lesser attenuation.

For transmitters designed to transmit with 25 KHz channel separation and equipped with an audio low-pass filter, the power of any emission must be attenuated below the unmodulated carrier power (P) as following:

1. On any frequency removed from the assigned frequency by more than 50 percent, but no more than 100 percent of the authorized bandwidth: At least 25 dB.
2. On any frequency removed from the assigned frequency by more than 100 percent, but no more than 250 percent of the authorized bandwidth: At least 35 dB.
3. On any frequency removed from the assigned frequency by more than 250 percent of the authorized bandwidth: At least 43+10Log (P) dB.

7.2 MEASUREMENT PROCEDURE

a. The EUT was connected to the Spectrum Analyzer.

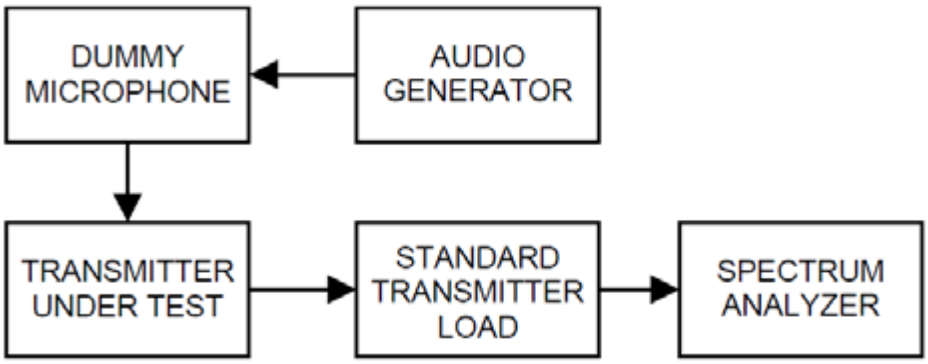
b. Sufficient scans were taken to show any out of band emission up to 10th. Harmonic for the lower and the highest frequency range.

c. Set EUT as normal operation.

d Set RBW 100kHz, VBW 300 kHz in the frequency band 30MHz to 1GHz,while set RBW=1MHz. VBW=3MHz from the 1GHz to 10th Harmonic.

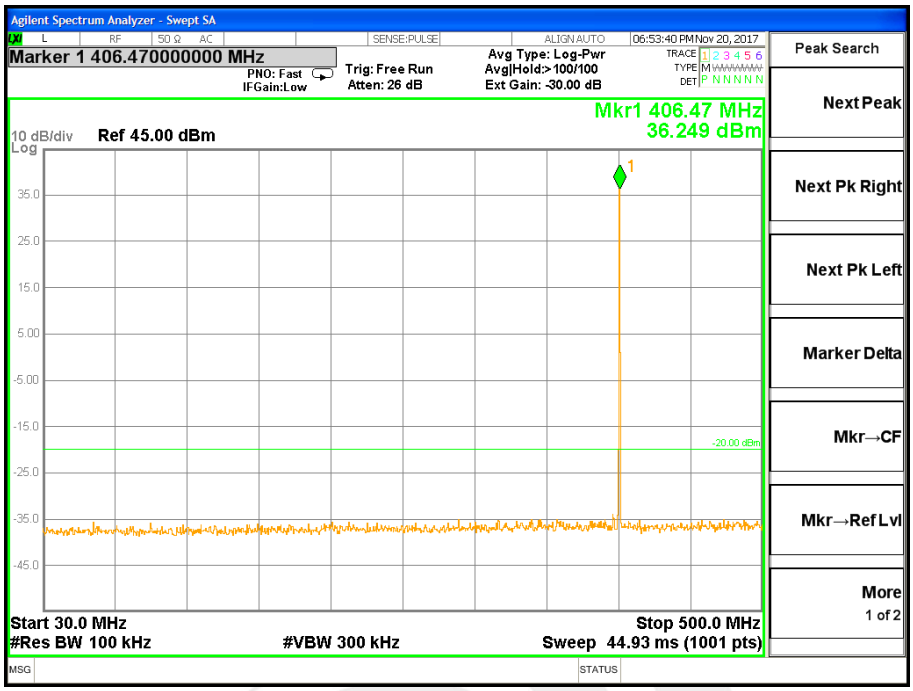
e The audio input was set to 0 to get the unmodulated carrier, the resulting picture is print out for each channel separation.

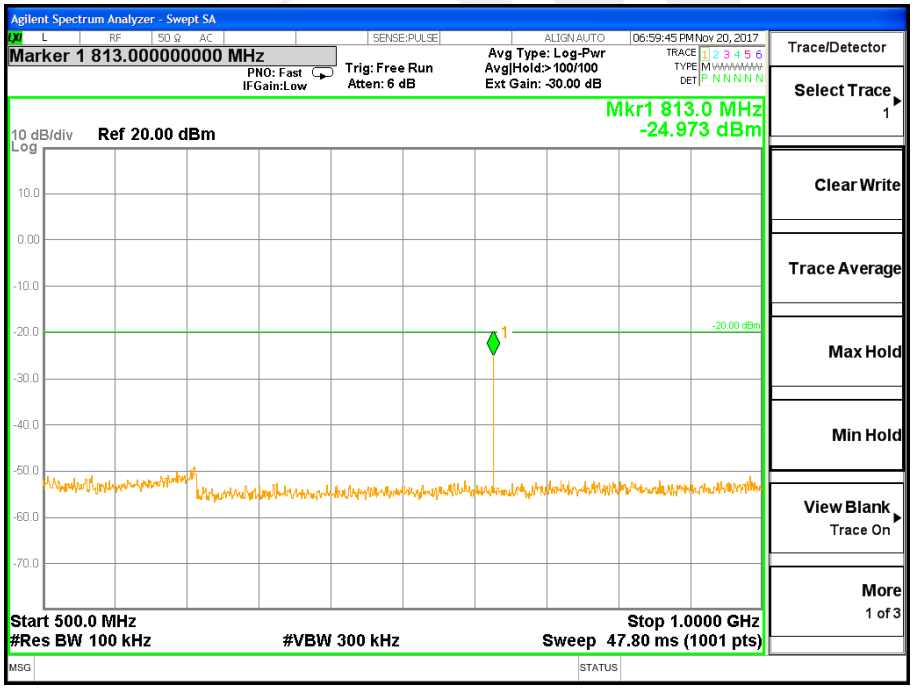
7.3 TEST SETUP BLOCK DIAGRAM

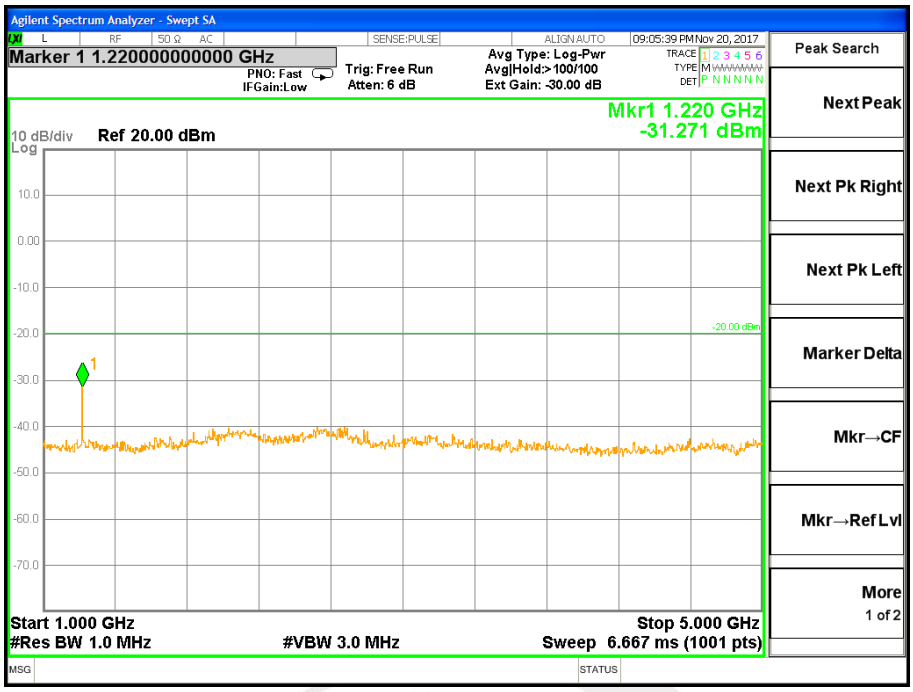


7.4 TEST RESULT

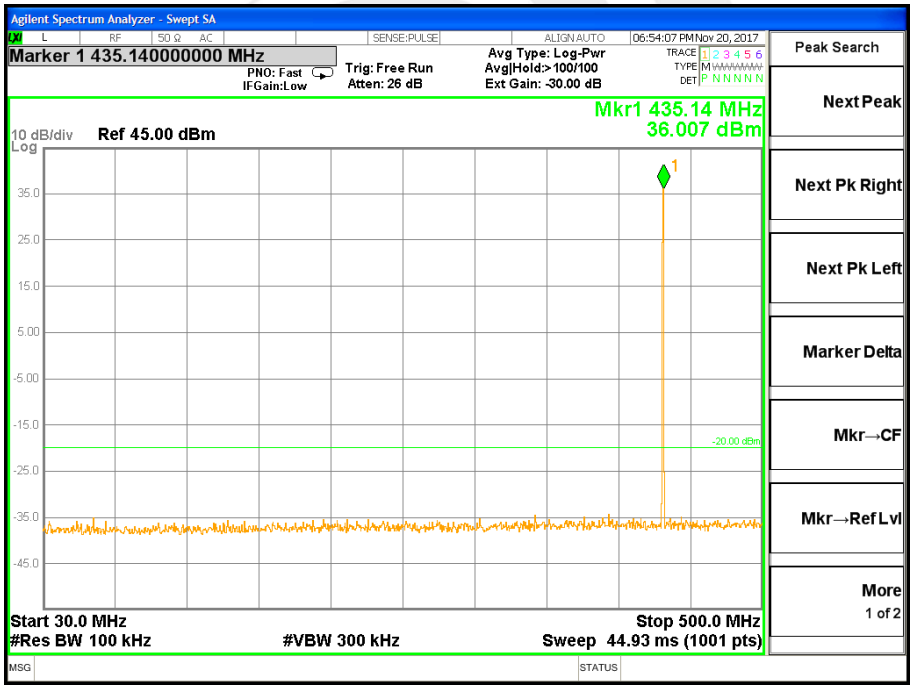
CH 1 Model 1

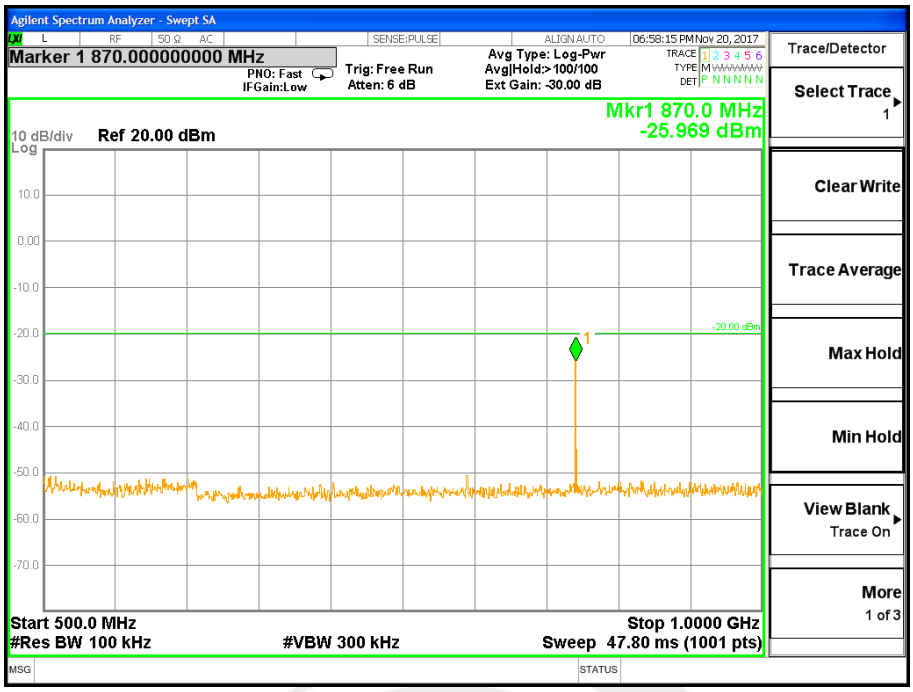


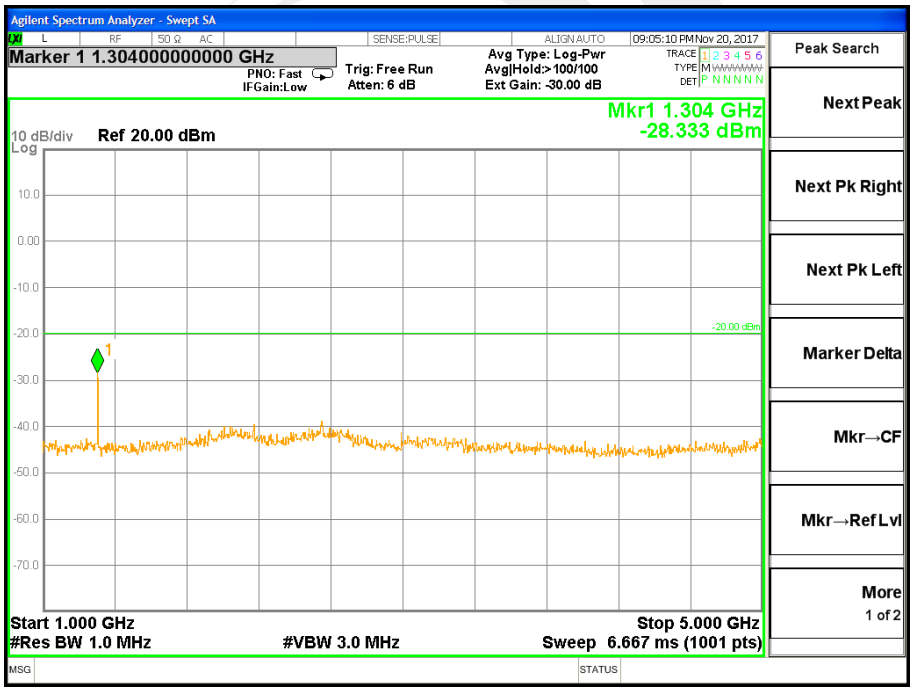



Agilent Spectrum Analyzer - Swept SA
Marker 1 1.220000000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
Atten: 6 dB
Avg Type: Log-Pwr
Avg|Hold:>100/100
Ext Gain: -30.00 dB
09:05:39 PM Nov 20, 2017
Mkr1 1.220 GHz
-31.271 dBm
10 dB/div
Log
Ref 20.00 dBm
-20.00 dBm
Start 1.000 GHz
#Res BW 1.0 MHz
#VBW 3.0 MHz
Stop 5.000 GHz
Sweep 6.667 ms (1001 pts)
Peak Search
Next Peak
Next Pk Right
Next Pk Left
Marker Delta
Mkr→CF
Mkr→Ref Lvl
More
1 of 2

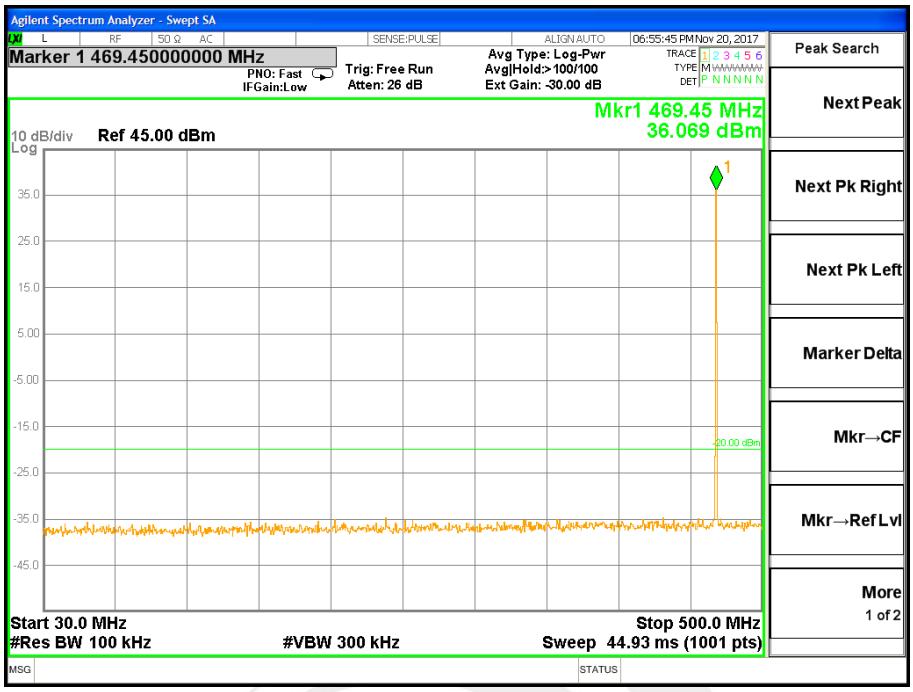
CH 2 Model 1

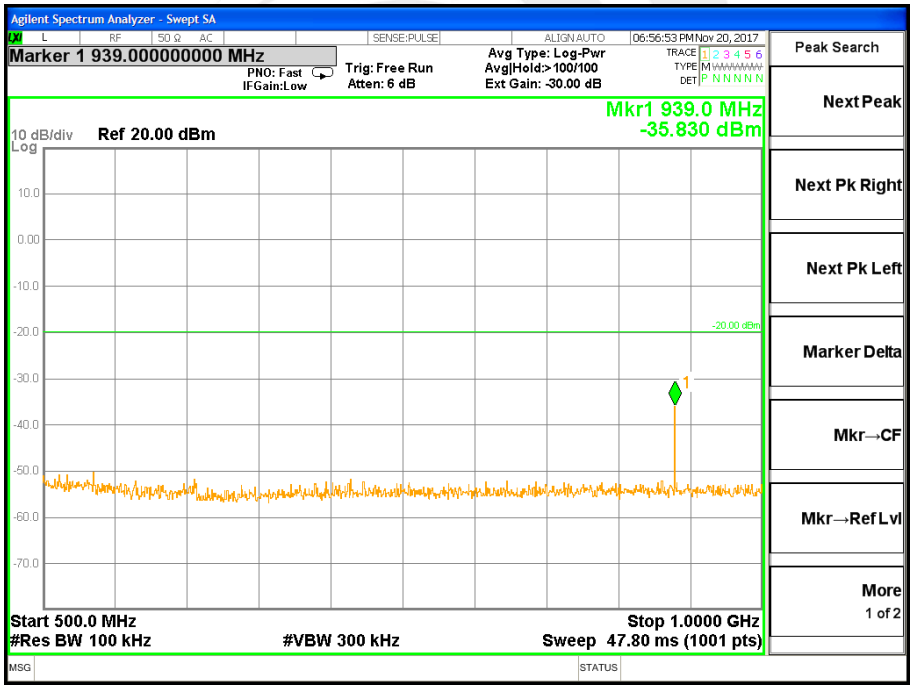

Agilent Spectrum Analyzer - Swept SA
Marker 1 435.140000000 MHz
PNO: Fast
IFGain:Low
Trig: Free Run
Atten: 26 dB
Avg Type: Log-Pwr
Avg|Hold:>100/100
Ext Gain: -30.00 dB
06:54:07 PM Nov 20, 2017
Mkr1 435.14 MHz
36.007 dBm
10 dB/div
Log
Ref 45.00 dBm
-20.00 dBm
Start 30.0 MHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 500.0 MHz
Sweep 44.93 ms (1001 pts)
Peak Search
Next Peak
Next Pk Right
Next Pk Left
Marker Delta
Mkr→CF
Mkr→Ref Lvl
More
1 of 2

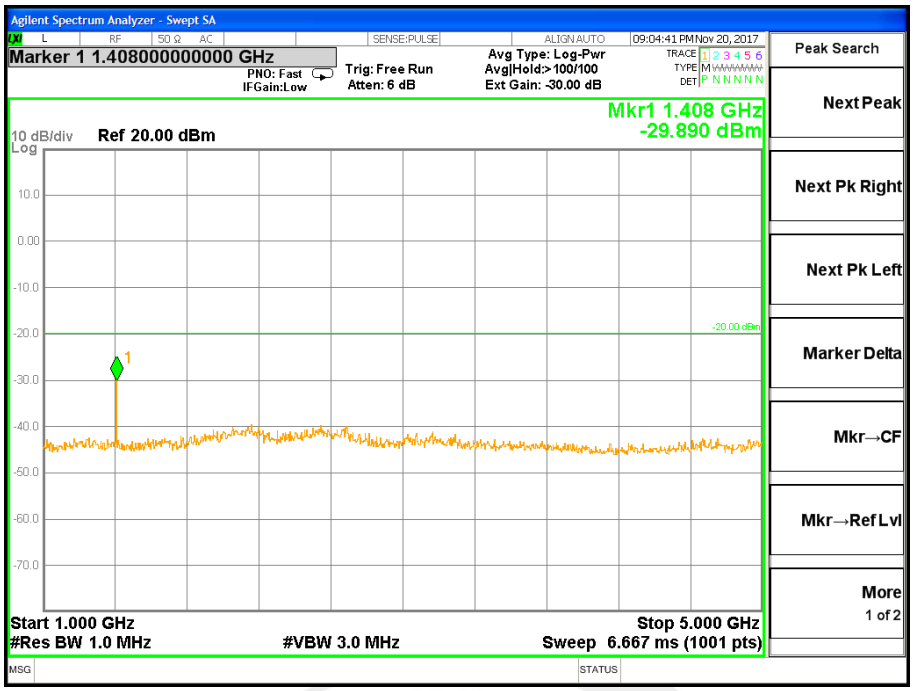

Agilent Spectrum Analyzer - Swept SA
Marker 1 870.000000000 MHz
PNO: Fast
IFGain:Low
Trig: Free Run
Atten: 6 dB
Avg Type: Log-Pwr
Avg|Hold:>100/100
Ext Gain: -30.00 dB
06:58:15 PM Nov 20, 2017
Mkr1 870.0 MHz
-25.969 dBm
10 dB/div
Log
Ref 20.00 dBm
-20.00 dBm
Start 500.0 MHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 1.0000 GHz
Sweep 47.80 ms (1001 pts)
Trace/Detector
Select Trace 1
Clear Write
Trace Average
Max Hold
Min Hold
View Blank Trace On
More 1 of 3
MSG
STATUS


Agilent Spectrum Analyzer - Swept SA
Marker 1 1.304000000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
Atten: 6 dB
Avg Type: Log-Pwr
Avg|Hold:>100/100
Ext Gain: -30.00 dB
09:05:10 PM Nov 20, 2017
Mkr1 1.304 GHz
-28.333 dBm
10 dB/div
Log
Ref 20.00 dBm
-20.00 dBm
Start 1.000 GHz
#Res BW 1.0 MHz
#VBW 3.0 MHz
Stop 5.000 GHz
Sweep 6.667 ms (1001 pts)
Peak Search
Next Peak
Next Pk Right
Next Pk Left
Marker Delta
Mkr→CF
Mkr→Ref Lvl
More 1 of 2
MSG
STATUS

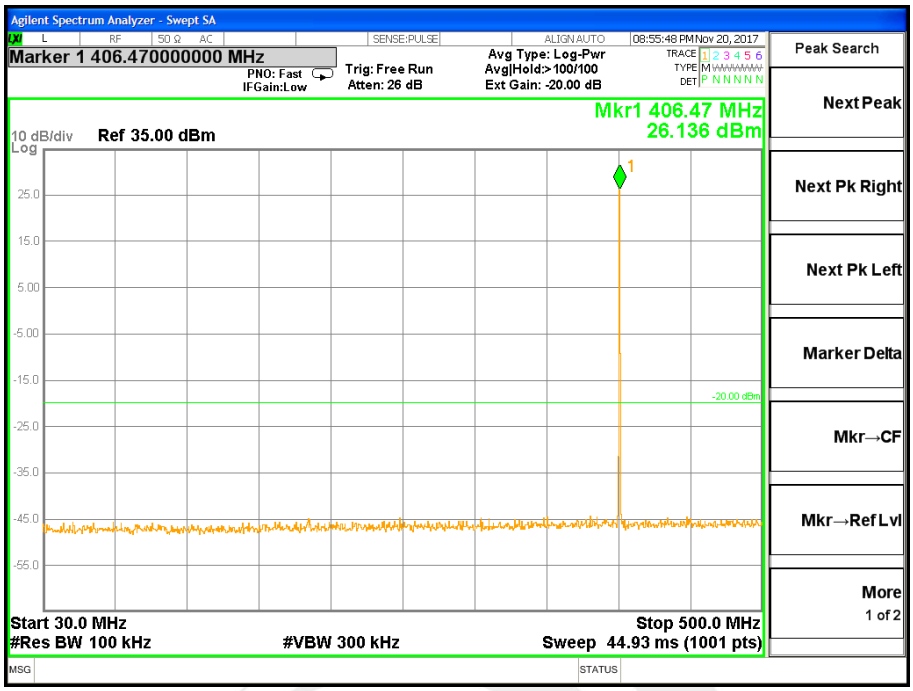
CH 3 Model 1

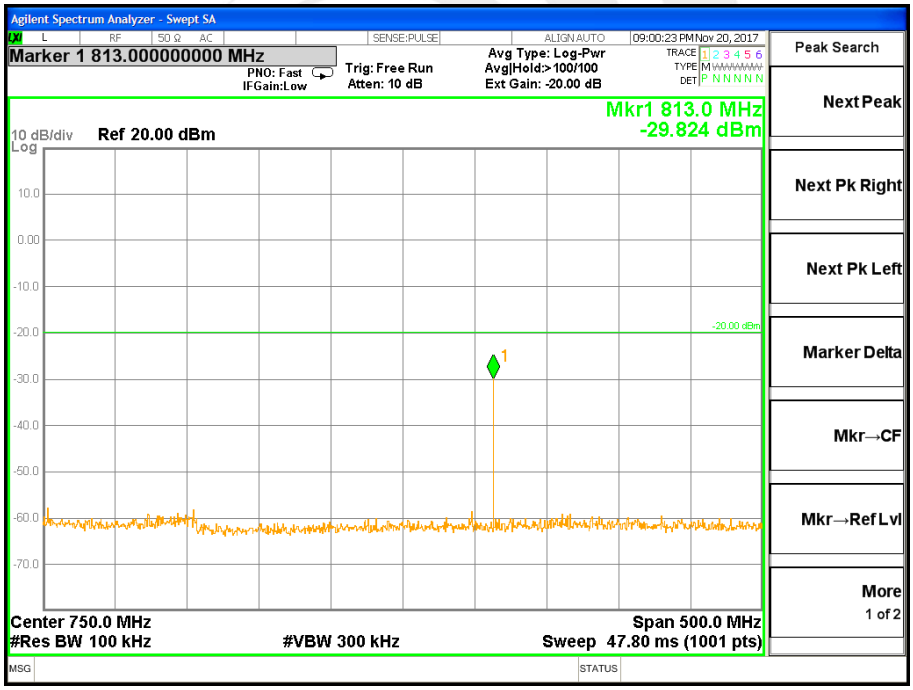

Agilent Spectrum Analyzer - Swept SA
Marker 1 469.450000000 MHz
PNO: Fast
IFGain:Low
Trig: Free Run
Atten: 26 dB
Avg Type: Log-Pwr
Avg|Hold:>100/100
Ext Gain: -30.00 dB
06:55:45 PM Nov 20, 2017
Mkr1 469.45 MHz
36.069 dBm
10 dB/div
Log
Ref 45.00 dBm
-20.00 dBm
Start 30.0 MHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 500.0 MHz
Sweep 44.93 ms (1001 pts)
Peak Search
Next Peak
Next Pk Right
Next Pk Left
Marker Delta
Mkr→CF
Mkr→Ref Lvl
More
1 of 2
MSG
STATUS

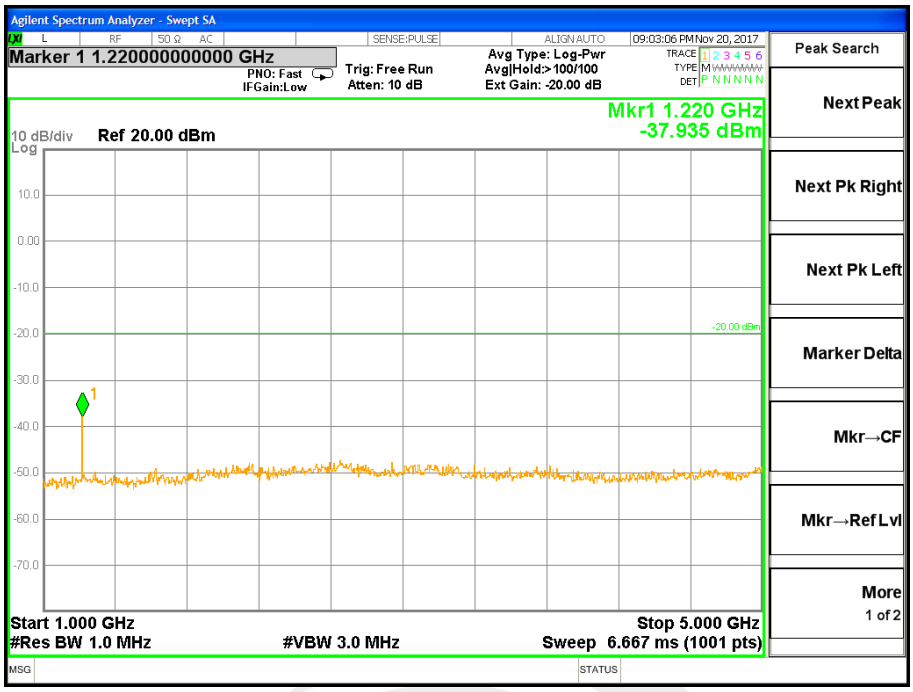

Agilent Spectrum Analyzer - Swept SA
Marker 1 939.000000000 MHz
PNO: Fast
IFGain:Low
Trig: Free Run
Atten: 6 dB
Avg Type: Log-Pwr
Avg|Hold:>100/100
Ext Gain: -30.00 dB
06:56:53 PM Nov 20, 2017
Mkr1 939.0 MHz
-35.830 dBm
10 dB/div
Log
Ref 20.00 dBm
-20.00 dBm
Start 500.0 MHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 1.0000 GHz
Sweep 47.80 ms (1001 pts)
Peak Search
Next Peak
Next Pk Right
Next Pk Left
Marker Delta
Mkr→CF
Mkr→Ref Lvl
More
1 of 2
MSG
STATUS


Agilent Spectrum Analyzer - Swept SA
Marker 1 1.408000000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
Atten: 6 dB
Avg Type: Log-Pwr
Avg|Hold:>100/100
Ext Gain: -30.00 dB
09:04:41 PM Nov 20, 2017
Mkr1 1.408 GHz
-29.890 dBm
10 dB/div
Log
Ref 20.00 dBm
-20.00 dBm
Start 1.000 GHz
#Res BW 1.0 MHz
#VBW 3.0 MHz
Stop 5.000 GHz
Sweep 6.667 ms (1001 pts)
Peak Search
Next Peak
Next Pk Right
Next Pk Left
Marker Delta
Mkr→CF
Mkr→Ref Lvl
More
1 of 2

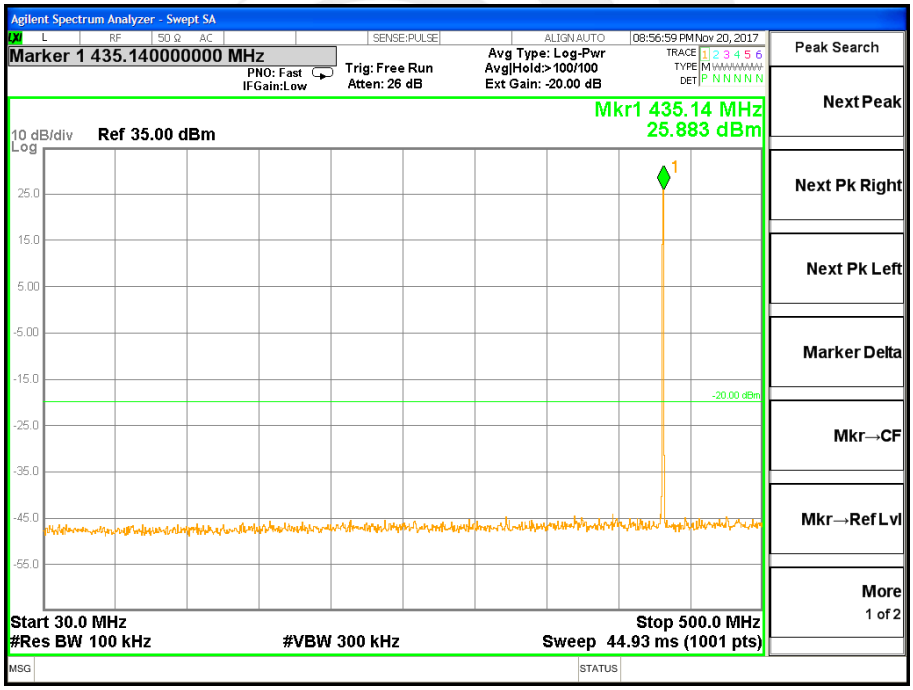
CH 1 Model 2

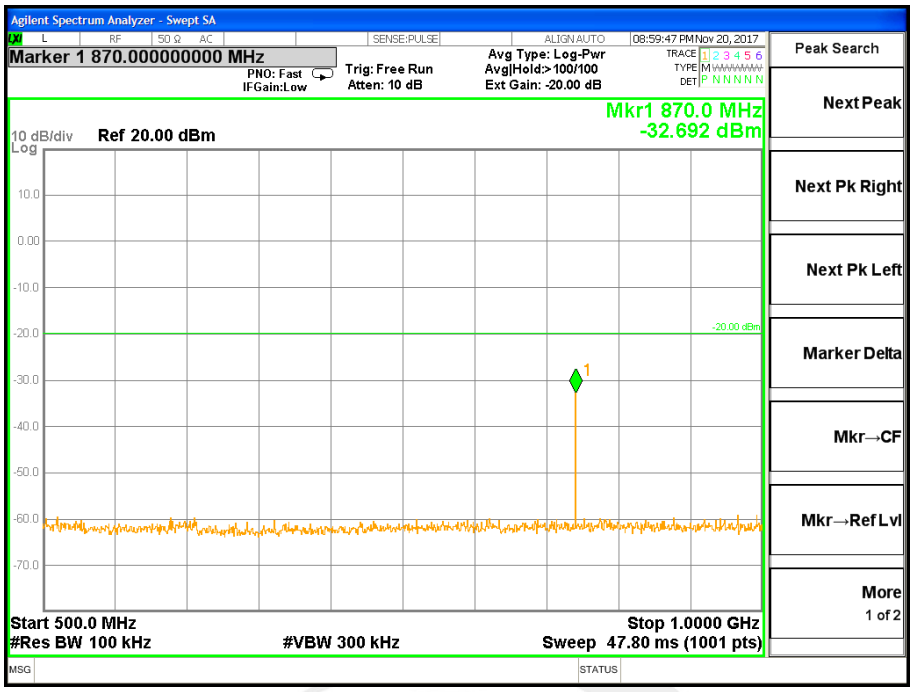

Agilent Spectrum Analyzer - Swept SA
Marker 1 406.470000000 MHz
PNO: Fast
IFGain:Low
Trig: Free Run
Atten: 26 dB
Avg Type: Log-Pwr
Avg|Hold:>100/100
Ext Gain: -20.00 dB
08:55:48 PM Nov 20, 2017
Mkr1 406.47 MHz
26.136 dBm
10 dB/div
Log
Ref 35.00 dBm
-20.00 dBm
Start 30.0 MHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 500.0 MHz
Sweep 44.93 ms (1001 pts)
Peak Search
Next Peak
Next Pk Right
Next Pk Left
Marker Delta
Mkr→CF
Mkr→Ref Lvl
More
1 of 2

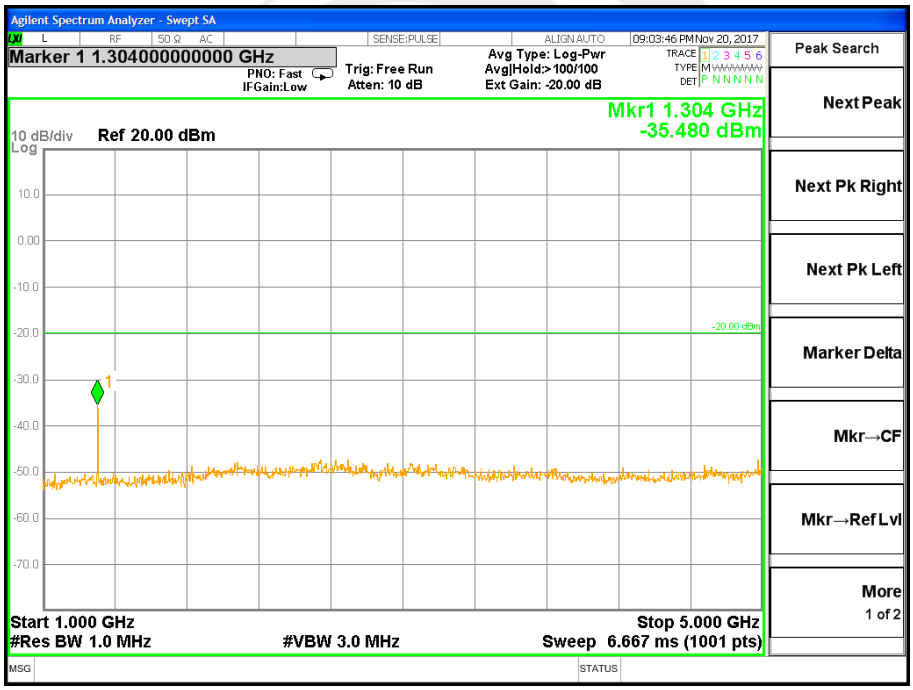

Agilent Spectrum Analyzer - Swept SA
Marker 1 813.000000000 MHz
PNO: Fast
IFGain:Low
Trig: Free Run
Atten: 10 dB
Avg Type: Log-Pwr
Avg|Hold:>100/100
Ext Gain: -20.00 dB
09:00:23 PM Nov 20, 2017
Mkr1 813.0 MHz
-29.824 dBm
10 dB/div
Log
Ref 20.00 dBm
-20.00 dBm
Center 750.0 MHz
#Res BW 100 kHz
#VBW 300 kHz
Span 500.0 MHz
Sweep 47.80 ms (1001 pts)
Peak Search
Next Peak
Next Pk Right
Next Pk Left
Marker Delta
Mkr→CF
Mkr→Ref Lvl
More
1 of 2


Agilent Spectrum Analyzer - Swept SA
Marker 1 1.220000000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
Atten: 10 dB
Avg Type: Log-Pwr
Avg|Hold:>100/100
Ext Gain: -20.00 dB
09:03:06 PM Nov 20, 2017
Mkr1 1.220 GHz
-37.935 dBm
10 dB/div
Log
Ref 20.00 dBm
-20.00 dBm
Start 1.000 GHz
#Res BW 1.0 MHz
#VBW 3.0 MHz
Stop 5.000 GHz
Sweep 6.667 ms (1001 pts)
Peak Search
Next Peak
Next Pk Right
Next Pk Left
Marker Delta
Mkr→CF
Mkr→Ref Lvl
More
1 of 2
MSG
STATUS

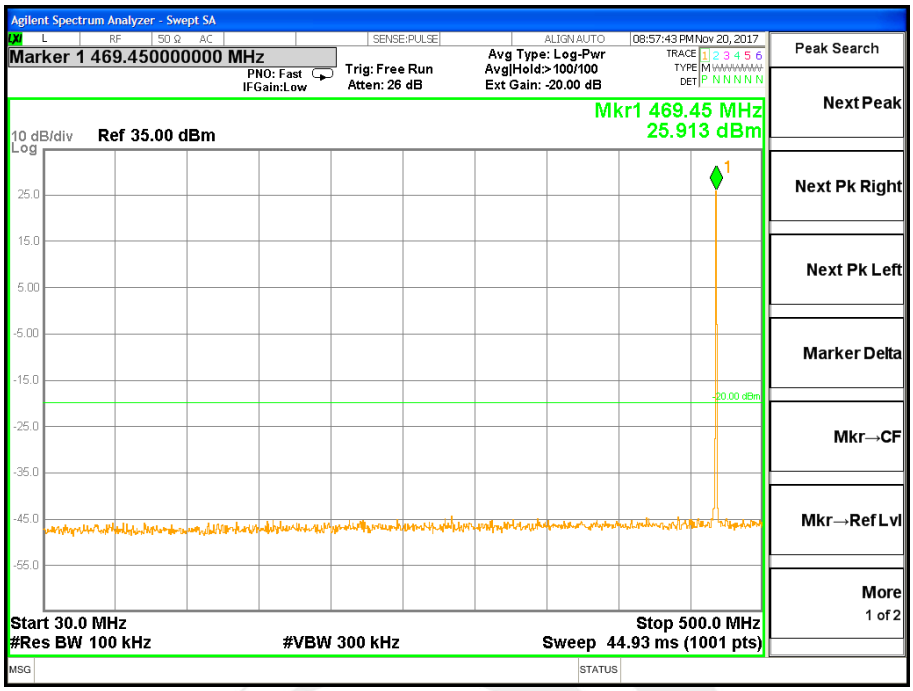
CH 2 Model 2

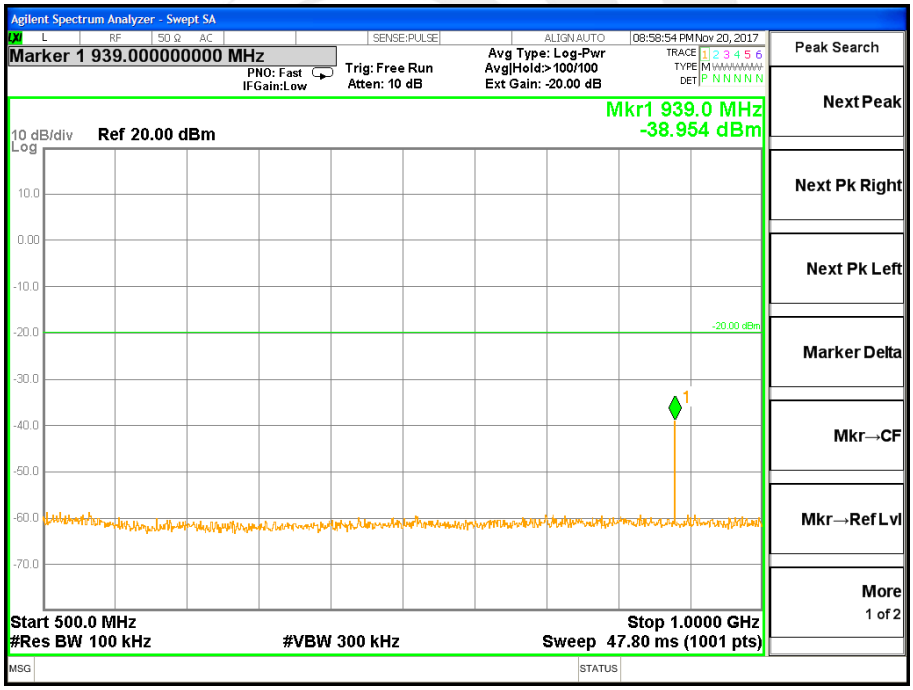

Agilent Spectrum Analyzer - Swept SA
Marker 1 435.140000000 MHz
PNO: Fast
IFGain:Low
Trig: Free Run
Atten: 26 dB
Avg Type: Log-Pwr
Avg|Hold:>100/100
Ext Gain: -20.00 dB
08:56:59 PM Nov 20, 2017
Mkr1 435.14 MHz
25.883 dBm
10 dB/div
Log
Ref 35.00 dBm
-20.00 dBm
Start 30.0 MHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 500.0 MHz
Sweep 44.93 ms (1001 pts)
Peak Search
Next Peak
Next Pk Right
Next Pk Left
Marker Delta
Mkr→CF
Mkr→Ref Lvl
More
1 of 2
MSG
STATUS

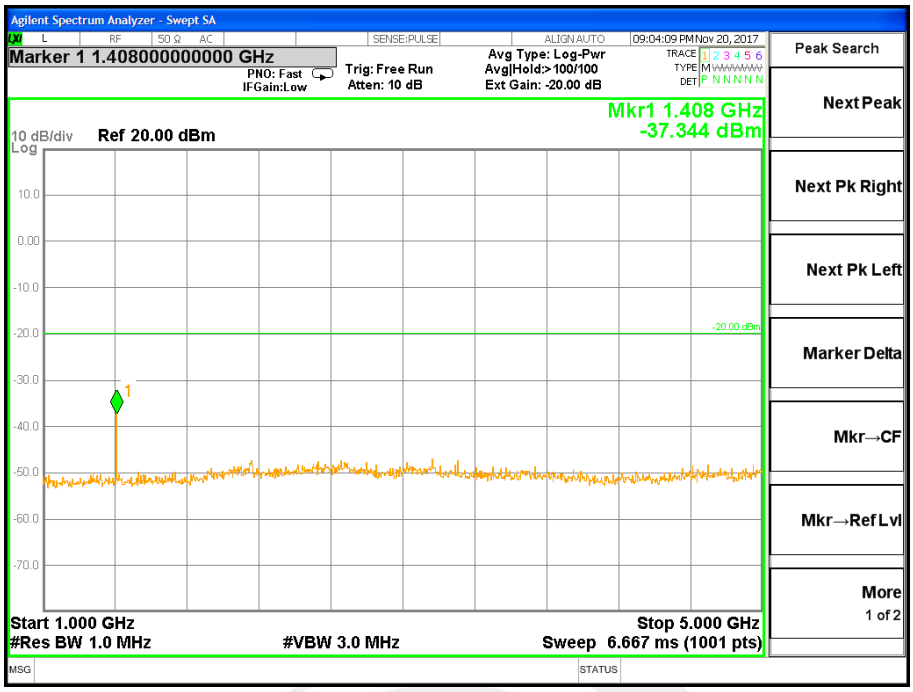

Agilent Spectrum Analyzer - Swept SA
Marker 1 870.000000000 MHz
PNO: Fast
IFGain:Low
Trig: Free Run
Atten: 10 dB
Avg Type: Log-Pwr
Avg|Hold:>100/100
Ext Gain: -20.00 dB
08:59:47 PM Nov 20, 2017
Mkr1 870.0 MHz
-32.692 dBm
10 dB/div
Log
Ref 20.00 dBm
-20.00 dBm
Start 500.0 MHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 1.0000 GHz
Sweep 47.80 ms (1001 pts)
Peak Search
Next Peak
Next Pk Right
Next Pk Left
Marker Delta
Mkr→CF
Mkr→Ref Lvl
More
1 of 2
MSG
STATUS


Agilent Spectrum Analyzer - Swept SA
Marker 1 1.304000000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
Atten: 10 dB
Avg Type: Log-Pwr
Avg|Hold:>100/100
Ext Gain: -20.00 dB
09:03:46 PM Nov 20, 2017
Mkr1 1.304 GHz
-35.480 dBm
10 dB/div
Log
Ref 20.00 dBm
-20.00 dBm
Start 1.000 GHz
#Res BW 1.0 MHz
#VBW 3.0 MHz
Stop 5.000 GHz
Sweep 6.667 ms (1001 pts)
Peak Search
Next Peak
Next Pk Right
Next Pk Left
Marker Delta
Mkr→CF
Mkr→Ref Lvl
More
1 of 2
MSG
STATUS

CH 3 Model 2


Agilent Spectrum Analyzer - Swept SA
Marker 1 469.450000000 MHz
PNO: Fast
IFGain:Low
Trig: Free Run
Atten: 26 dB
Avg Type: Log-Pwr
Avg|Hold:>100/100
Ext Gain: -20.00 dB
08:57:43 PM Nov 20, 2017
Mkr1 469.45 MHz
25.913 dBm
10 dB/div
Log
Ref 35.00 dBm
-20.00 dBm
Start 30.0 MHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 500.0 MHz
Sweep 44.93 ms (1001 pts)
Peak Search
Next Peak
Next Pk Right
Next Pk Left
Marker Delta
Mkr→CF
Mkr→Ref Lvl
More
1 of 2
MSG
STATUS


Agilent Spectrum Analyzer - Swept SA
Marker 1 939.000000000 MHz
PNO: Fast
IFGain:Low
Trig: Free Run
Atten: 10 dB
Avg Type: Log-Pwr
Avg|Hold:>100/100
Ext Gain: -20.00 dB
08:58:54 PM Nov 20, 2017
Mkr1 939.0 MHz
-38.954 dBm
10 dB/div
Log
Ref 20.00 dBm
-20.00 dBm
Start 500.0 MHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 1.0000 GHz
Sweep 47.80 ms (1001 pts)
Peak Search
Next Peak
Next Pk Right
Next Pk Left
Marker Delta
Mkr→CF
Mkr→Ref Lvl
More
1 of 2
MSG
STATUS


Agilent Spectrum Analyzer - Swept SA
Marker 1 1.408000000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
Atten: 10 dB
Avg Type: Log-Pwr
Avg|Hold:>100/100
Ext Gain: -20.00 dB
09:04:09 PM Nov 20, 2017
Mkr1 1.408 GHz
-37.344 dBm
10 dB/div
Log
Ref 20.00 dBm
-20.00 dBm
Start 1.000 GHz
#Res BW 1.0 MHz
#VBW 3.0 MHz
Stop 5.000 GHz
Sweep 6.667 ms (1001 pts)
Peak Search
Next Peak
Next Pk Right
Next Pk Left
Marker Delta
Mkr→CF
Mkr→Ref Lvl
More
1 of 2

8. FREQUENCY STABILITY

8.1 PROVISIONS APPLICABLE

1) According to FCC Part 2 Section 2.1055 (a)(1), the frequency stability shall be measured with variation of ambient temperature from -30℃ to +60℃ centigrade.

2) According to FCC Part 2 Section 2.1055 (a) (2), for battery powered equipment, the frequency stability shall be measured with reducing primary supply voltage to the battery operating end point, which is specified by the manufacture.

3) Vary primary supply voltage from 85 to 115 percent of the nominal value.

4) According to §90.213, the frequency stability limit is 1.5 ppm for 12.5KHz channel separation

Frequency Range (MHz)	Channel Bandwidth (KHz)	Frequency Tolerance (ppm)		
		Fixed and Base Stations	Mobile Stations	
			> 2 W	≤ 2 W
150-174 MHz	6.25 12.5 25	1.0 2.5 5.0	2.0 5.0 5.0	2.0 5.0 50.0*
421-512 MHz	6.25 12.5 25	0.5 1.5 2.5	1.0 2.5 5.0	1.0 2.5 5.0

- Stations operating in the 154.45 to 154.49 MHz or the 173.2 to 173.4 MHz bands must have a frequency stability of 5 ppm.
- Paging transmitters operating on paging-only frequencies must operate with frequency stability of 5 ppm in the 150-174 MHz band and 2.5 ppm in the 421-512 MHz band.

8.2 MEASUREMENT PROCEDURE

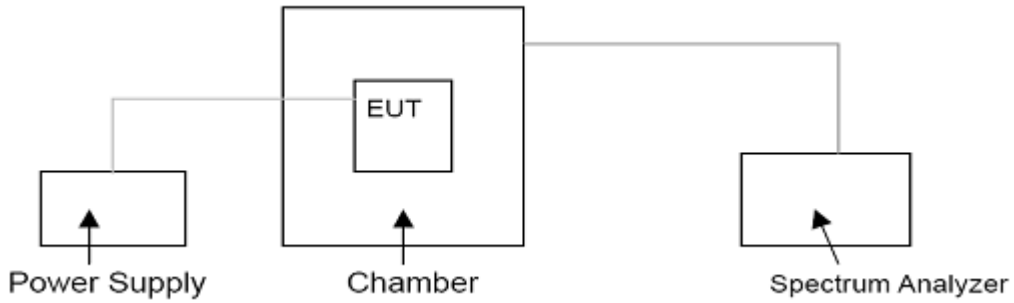
a. The EUT was connected to the Spectrum Analyzer.

b. The EUT was set in the climate chamber and connected to an external DC power supply

c. After temperature stabilization (approx. 20 min for each stage), the frequency for the lower, the middle and the highest frequency range was recorded.

d For Frequency stability Vs. Voltage the EUT was connected to a DC power supply and the voltage was adjusted in the required ranges. The result was recorded.

8.3 TEST SETUP BLOCK DIAGRAM



8.4 TEST RESULT

Operation Mode	Channel Separation	Test conditions		Frequency error (ppm)		
		Voltage(V)	Temp(℃)	406.5	435	469.5
Mode1	12.5KHz	7.40	-30	0.492	0.230	0.213
			-20	1.722	1.379	1.491
			-10	1.230	0.920	1.065
			0	1.230	0.690	0.639
			10	0.738	0.460	0.639
			20	0.738	0.460	0.426
			30	0.984	0.690	0.426
			40	1.230	1.149	1.065
			50	1.476	1.379	1.278
		6.29 (85% Rated)	20	0.492	0.230	0.213
		8.51(115% Rated)	20	1.722	1.379	1.491
Limit			2.5 ppm			
Test Results			PASS			

9. TRANSMITTER FREQUENCY BEHAVIOR

9.1 PROVISIONS APPLICABLE

Section 90.214

Transient frequencies must be within the maximum frequency difference limits during the time intervals indicated:

Time intervals [1, 2]	Maximum frequency difference [3]	All equipment	
		150 to 174 MHz	421 to 512MHz
Transient Frequency Behavior for Equipment Designed to Operate on 25 KHz Channels			
t_1 [4]	± 25.0 KHz	5.0 ms	10.0 ms
t_2	± 12.5 KHz	20.0 ms	25.0 ms
t_3 [4]	± 25.0 KHz	5.0 ms	10.0 ms
Transient Frequency Behavior for Equipment Designed to Operate on 12.5 KHz Channels			
t_1 [4]	± 12.5 KHz	5.0 ms	10.0 ms
t_2	± 6.25 KHz	20.0 ms	25.0 ms
t_3 [4]	± 12.5 KHz	5.0 ms	10.0 ms
Transient Frequency Behavior for Equipment Designed to Operate on 6.25 KHz Channels			
t_1 [4]	±6.25 KHz	5.0 ms	10.0 ms
t_2	±3.125 KHz	20.0 ms	25.0 ms
t_3 [4]	±6.25 KHz	5.0 ms	10.0 ms

1. t_{on} is the instant when a 1 KHz test signal is completely suppressed, including any capture time due to phasing.
   t_1 is the time period immediately following t_{on}.
   t_2 is the time period immediately following t_1.
   t_3 is the time period from the instant when the transmitter is turned off until t_{off}.
   t_{off} is the instant when the 1 KHz test signal starts to rise.
2. During the time from the end of t_2 to the beginning of t_3, the frequency difference must not exceed the limits specified in § 90.213.
3. Difference between the actual transmitter frequency and the assigned transmitter frequency.
4. If the transmitter carrier output power rating is 6 watts or less, the frequency difference during this time period may exceed the maximum frequency difference for this time period.

9.2 MEASUREMENT PROCEDURE

Use Digital portable radio which manufactured by VictelGlobal Communications Corporation

a. Limited which uses same protocol as the DUT connect to RX antenna by 20Att in order to avoid damaging DUT;

b. Connect DUT into Test discriminator and Storage Oscilloscope and keep DUT stats ON;

c. Inut 1KHz signal into digital portable radio;

d Set the modulation domain analyzer to trigger on the rising edge of the waveform in order to capture a single-shot turn-on of the transmitter signals;

e Keep the digital protable radio in OFF state and Key the PTT of digital portable radio;

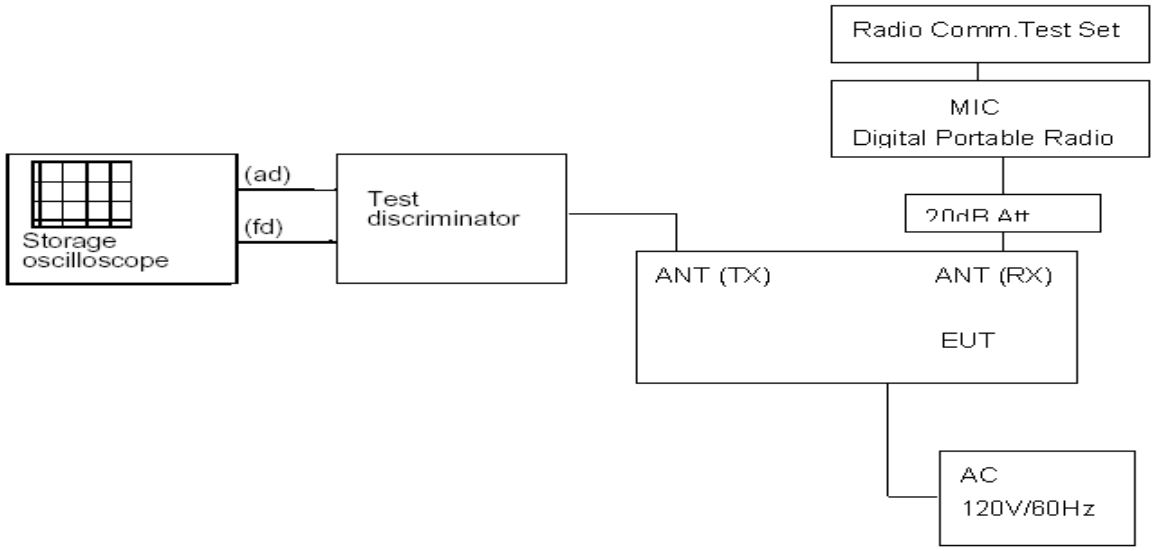
f Observe the stored oscilloscope of modulation domain analyzer.The signal trace shall be maintained within the allowable limits during the periods t_1 and t_2,and shall also remain within limits following t_2;

g Adjust the modulation domain anzlyzer to trigger on the falling edge of the transmitter waveform in order to capture a single-shot turn-off transmitter of the transmitter signal.

h Keep the digital portable radio in ON state and Unkey the PTT of digital portable radio;

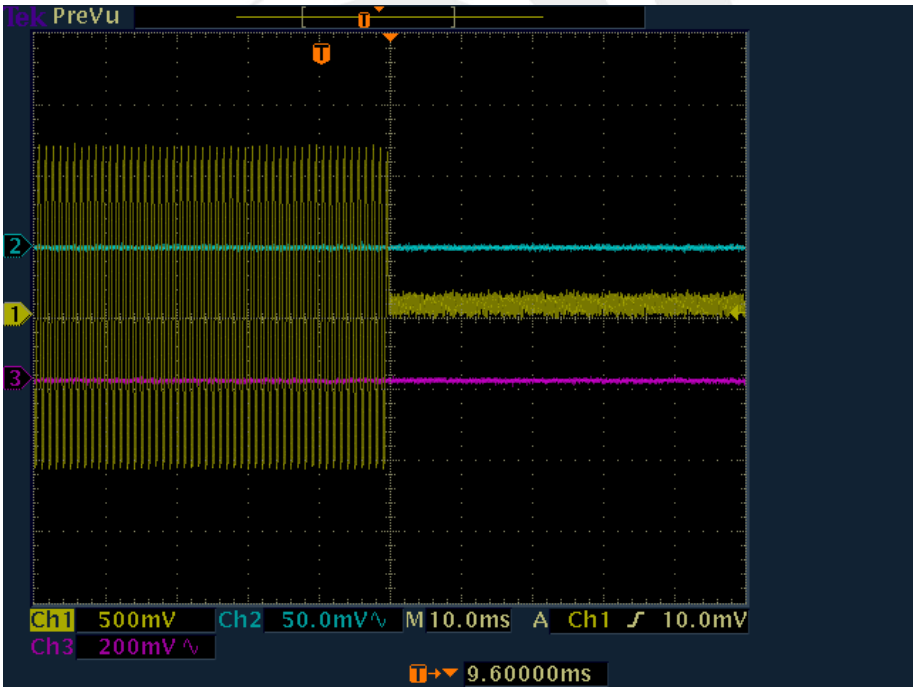
f Observe the stored oscilloscope of modulation domain analyzer.The signal trace shall be maintained within the allowable limits during the period t_3

9.3 TEST SETUP BLOCK DIAGRAM

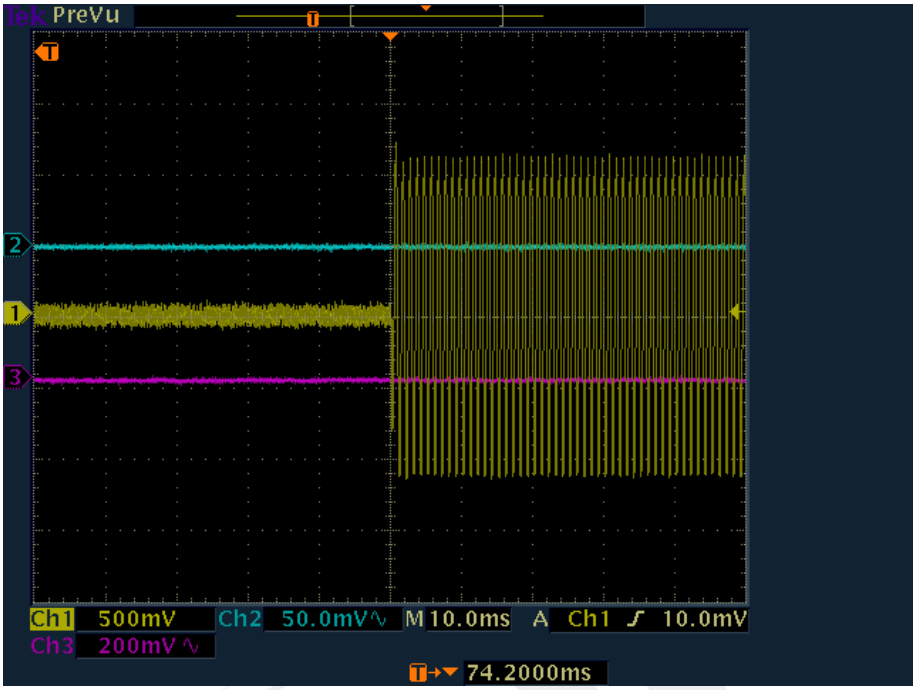


9.4 TEST RESULT

Transmitter Frequency Behaviour @ 12.5 KHz Channel Separation------Off – On



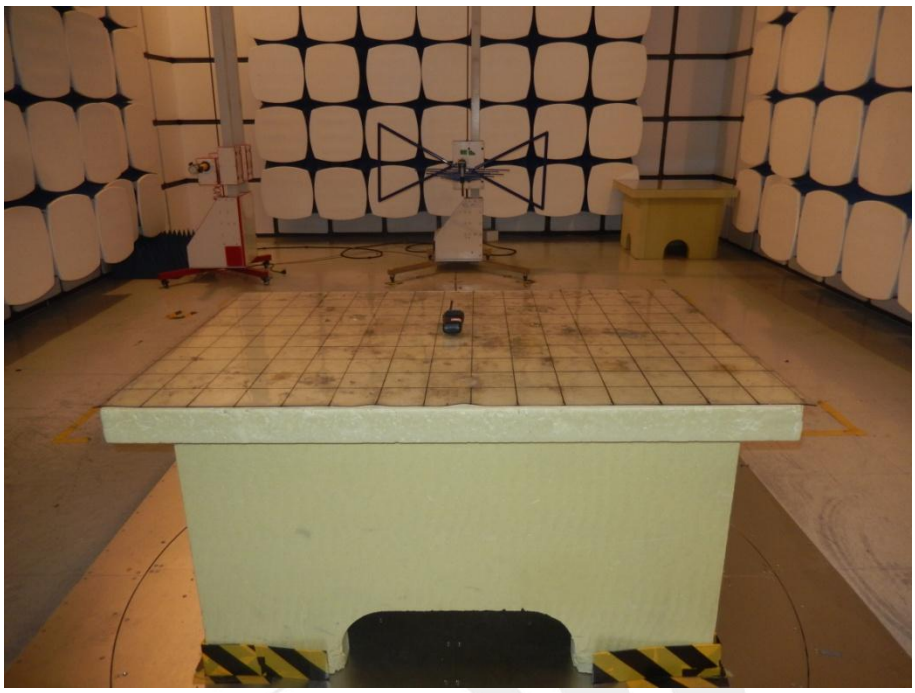
Transmitter Frequency Behaviour @ 12.5 KHz Channel Separation------On – Off



10. PHOTOS OF TEST SETUP

Radiated Measurement Photos

30MHz- 1GHz



Above 1GHz

※※※※※END OF THE REPORT※※※※※