FCC TEST REPORT

For

ABELL INDUSTRIES CO.,LTD

Two Way Radio

Test Model: A420T

Additional Model No.: Please Refer to Page 7

Prepared for	:	ABELL INDUSTRIES CO.,LTD
Address	:	701-702, 7/F, D Bldg, Qianwan Hard Technology Industrial Park, Nanchang community, Xixiang Rd., Bao An Dist., Shenzhen.
Prepared by	:	Shenzhen LCS Compliance Testing Laboratory Ltd.
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Date of receipt of test sample	:	February 20, 2025
Number of tested samples	:	2
Sample No.	:	A250218015-1, A250218015-2
Serial number	:	Prototype
Date of Test	:	February 20, 2025 ~ March 20, 2025
Date of Report	:	March 20, 2025

FCC TEST REPORT
FCC Part 90

Report Reference No.	:	**LCSA02205003EA**
Date of Issue.....	:	March 20, 2025
Testing Laboratory Name.....	:	**Shenzhen LCS Compliance Testing Laboratory Ltd.**
Address.....	:	101, 201 Bldg A & 301 Bldg C, Juji Industrial Park Yabianxueziwei, Shajing Street, Baoan District, Shenzhen, 518000, China
Testing Location/ Procedure.....	:	Full application of Harmonised standards ■ Partial application of Harmonised standards □ Other standard testing method □
Applicant's Name.....	:	**ABELL INDUSTRIES CO.,LTD**
Address.....	:	701-702, 7/F, D Bldg, Qianwan Hard Technology Industrial Park, Nanchang community, Xixiang Rd., Bao An Dist., Shenzhen.
Test Specification		
Standard.....	:	FCC CFR Title 47 Part 2, Part 90
Test Report Form No.	:	LCSEMC-1.0
TRF Originator.....	:	Shenzhen LCS Compliance Testing Laboratory Ltd.
Master TRF.....	:	Dated 2011-03

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Test Item Description.....	:	**Two Way Radio**
Trade Mark.....	:	ABELL
Test Model.....	:	A420T
Ratings	:	Please Refer to Page 7
Result	:	**Positive**

Compiled by:	**Supervised by:**	**Approved by:**
Diamond Lu/ Administrator	Jack Liu/ Technique principal	Gavin Liang/ Manager

RADIO -- TEST REPORT

Test Report No. : LCSA02205003EA	March 20, 2025 Date of issue

Test Model.....	: A420T
EUT.....	: Two Way Radio
Applicant.....	**: ABELL INDUSTRIES CO.,LTD**
Address.....	: 701-702, 7/F, D Bldg, Qianwan Hard Technology Industrial Park, Nanchang community, Xixiang Rd., Bao An Dist., Shenzhen.
Manufacturer.....	**: ABELL INDUSTRIES CO.,LTD**
Address.....	: 701-702, 7/F, D Bldg, Qianwan Hard Technology Industrial Park, Nanchang community, Xixiang Rd., Bao An Dist., Shenzhen.
Factory.....	**: ABELL INDUSTRIES CO.,LTD**
Address.....	: 701-702, 7/F, D Bldg, Qianwan Hard Technology Industrial Park, Nanchang community, Xixiang Rd., Bao An Dist., Shenzhen.

Test Result	**Positive**

The test report merely corresponds to the test sample.

It is not permitted to copy extracts of these test result without the written permission of the test laboratory.

Revision History

Report Version	Issue Date	Revision Content	Revised By
000	March 20, 2025	Initial Issue	--

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1. GENERAL INFORMATION

1.1. Description of Device (EUT)

EUT	: Two Way Radio
Test Model	: A420T
Additional Model No.	: A420T(Ex), A430T, A450T, A480T, DPMR
Model Declaration	: PCB board, structure and internal of these model(s) are the same, So no additional models were tested
Ratings	: Desk Intelligent & Rapid Charger: Input: DC 12V/1000mA Output: DC 600mA For Switching Adapter: Input: 100-240V~ 50/60Hz 0.4A Max Ouput: 12V⎓1.0A DC 7.4V by Rechargeable Li-ion Battery, 1600mAh
Hardware Version	: V1.02
Software Version	: V1.0.1.1
PMR	:
Operating Frequency	: 400MHz-480MHz
Channel Separation	: Analog Voice 12.5KHz Digital Voice/Data 12.5KHz
Modulation Type	: FM for Analog Voice 4FSK for Digital Voice/Digital Data
rated power	: 4Watts(High Power)/1.5Watts(Low Power)
Antenna Description	: External Antenna, 0dBi (Max.)
Extreme temp. Tolerance	: -30°C to +50°C
Extreme vol. Limits	: DC 7.4V±15%

Note: For a more detailed antenna description, please refer to the antenna specifications or the antenna report provided by the customer.

1.2. Support Equipment List

Manufacturer	Description	Model	Serial Number	Certificate
Dong Guan City GangQi Electronic Co.,Ltd	Switching Adapter	GQ12-120100-HU	---	FCC

1.3. External I/O Cable

I/O Port Description	Quantity	Cable
Power Por	1	N/A
Headset Por	1	N/A
MIC Port	1	N/A
Antenna Port	1	N/A

1.4. Description of Test Facility

NVLAP Accreditation Code is 600167-0.

FCC Designation Number is CN5024.

CAB identifier is CN0071.

CNAS Registration Number is L4595.

Test Firm Registration Number: 254912.

The sites are constructed in conformance with the requirements of ANSI C63.4 (2014) and CISPR Publication 22.

1.5. 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 ETSI TR 100 028 " Electromagnetic compatibility and Radio spectrum Matters (ERM); Uncertainties in the measurement of mobile radio equipment characteristics" and is documented in the
Shenzhen LCS Compliance Testing Laboratory 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.

1.6. Measurement Uncertainty

Test Item	Uncertainty	Note
Frequency error	30 Hz	(1)
Transmitter power conducted	0.62 dB	(1)
Transmitter power Radiated	2.67 dB	(1)
Conducted spurious emission 9KHz-12.75 GHz	1.22 dB	(1)
Conducted Emission 9KHz-30MHz	1.63 dB	(1)
Radiated spurious emission 30~1000MHz	3.10 dB	(1)
Radiated spurious emission 1~18GHz	3.80 dB	(1)
Radiated spurious emission 18-40GHz	3.90 dB	(1)
Occupied Bandwidth	35Hz	(1)
Emission Mask	1.25dB	(1)
Transmitter Frequency Behavior	6.8%	(1)

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

1.7. Description of Test Modes

The EUT operation within the bands as follow:

Frequency Range (MHz)	Modulation	Frequency Separation
406.1-450	FM/4FSK	12.5kHz
450-454		
456-460		
460-462.5375		
462.7375-467.5375		
467.7375-470		
470-480		

Modulation/Frequency Separation	Test Channel	Frequency(MHz)	Rule Part
FM/12.5kHz	lowest	406.1125	For Part 90
	middle	453.2125	For Part 90
	highest	479.9875	For Part 90
4FSK/12.5kHz	lowest	406.1125	For Part 90
	middle	453.2125	For Part 90
	highest	479.9875	For Part 90

Note: In section KDB 634817 D01 Sections Ⅱ)(f)(1) and (2):
Test at least one frequency in each band for each rule part applied under and ensure the device is capable of operating on the frequency under each rule part. This requirement may result in testing on multiple frequencies. Testing on one frequency may be acceptable if multiple listed bands for a rule part with a continuous frequency range are split to remove a conflict with other rules and the technical requirements in the split bands are the same. Additional requirements for RF exposure may apply.

2. SYSTEM TEST CONFIGURATION

2.1. TEST STANDARDS

The tests were performed according to following standards:
FCC Rules Part 90: PRIVATE LAND MOBILE RADIO SERVICES.
ANSI/TIA-603-E-2016: Land Mobile FM or PM Communications Equipment Measurement and Performance Standards.
47 CFR FCC Part 15 Subpart B: Unintentional Radiators
FCC Part 2: FREQUENCY ALLOCA-TIONS AND RADIO TREATY MAT-TERS; GENERAL RULES AND REG-ULATIONS
ANSI C63.26:2015: American National Standard for Compliance Testing of Transmitters Used in Licensed Radio Services.
ANSI C63.4:2014: Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz

2.2. EUT Configuration

The EUT configuration for testing is installed on RF field strength measurement to meet the Commissions requirement and operating in a manner that intends to maximize its emission characteristics in a continuous normal application.

2.3. EUT Exercise

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.

2.4. Test Sample

The application provides 1 samples to meet requirement;

Sample Number	Description
Sample 1	continuous transmit

3. SYSTEM TEST CONFIGURATION

3.1. Justification

The system was configured for testing in a continuous transmits condition.

3.2. EUT Exercise Software

N/ A

3.3. Special Accessories

N/ A

3.4. Block Diagram/Schematics

Please refer to the related document

3.5. Equipment Modifications

Shenzhen LCS Compliance Testing Laboratory Ltd. has not done any modification on the EUT.

3.6. Test Setup

Please refer to the test setup photo.

4. SUMMARY OF TEST RESULT

Transmitter Requirements				
FCC General Rules Part (47CFR)	Description of Test	Test Sample	Result	Remark
2.1046 90.205	Maximum Transmitter Power	Sample 1	Compliant	Note 1
2.1047 (a) 90.207	Modulation Characteristics - Audio Frequency Response	Sample 1	Compliant	Note 2
2.1047 (b) 90.207	Modulation Characteristics - Modulation Limiting	Sample 1	Compliant	Note 2
2.1049 90.210	Occupied Bandwidth Tests; Emission Mask	Sample 1	Compliant	Note 1
2.1055 90.213	Frequency Stability	Sample 1	Compliant	Note 1
90.214	Transient Frequency Behavior	Sample 1	Compliant	Note 1
2.1053 90.210	Transmitter Radiated Spurious Emission	Sample 1	Compliant	Note 1
2.1051 90.210	Spurious Emission On Antenna Port	Sample 1	Compliant	Note 1

Remark:
1. Note 1 – Test results inside test report;
2. Note 2 – N/A - Not Applicable for this device.*

5. TEST CONDITIONS AND RESULTS

5.1. Maximum Transmitter Power

5.1.1 Test Applicable

Per FCC Part 2.1046 and Part 90.205(s): The output power shall not exceed by more than 20 percent either the output power shown in the Radio Equipment List [available in accordance with § 90.203(a)(1)] for transmitters included in this list or when not so listed, the manufacturer's rated output power for the particular transmitter specifically listed on the authorization.

5.1.2 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 Receiver through 20 dB attenuator.

5.1.3 Test Configuration

5.1.4 Test Results

Temperature	23.8℃	Humidity	52.1%
Test Engineer	Paddi Chen	Test Voltage	Normal Voltage

Modulation/Channel Bandwidth	Frequency (MHz)	Conducted Output Power(dBm)		Limit (dBm)		Result
		High Power Level	Low Power Level	High Power Level	Low Power Level	
FM 12.5kHz	406.1125	35.71	32.28	35.05-36.82	30.79-32.55	Pass
	453.2125	35.70	31.15	35.05-36.82	30.79-32.55	Pass
	479.9875	36.00	32.36	35.05-36.82	30.79-32.55	Pass
4FSK 12.5kHz(Digital Data Mode)	406.1125	35.79	31.62	35.05-36.82	30.79-32.55	Pass
	453.2125	35.64	31.29	35.05-36.82	30.79-32.55	Pass
	479.9875	35.96	31.39	35.05-36.82	30.79-32.55	Pass
4FSK 12.5kHz(Digital voice Mode)	406.1125	35.87	31.26	35.05-36.82	30.79-32.55	Pass
	453.2125	35.76	31.09	35.05-36.82	30.79-32.55	Pass
	479.9875	35.69	32.04	35.05-36.82	30.79-32.55	Pass
4FSK 12.5kHz(Digital Data+voice Mode)	406.1125	35.73	31.30	35.05-36.82	30.79-32.55	Pass
	453.2125	35.68	31.22	35.05-36.82	30.79-32.55	Pass
	479.9875	35.66	31.27	35.05-36.82	30.79-32.55	Pass

Note: The high rated power level is 4W(36.02dBm), and low rated power level is 1.5W(31.76dBm).

5.2. Occupied Bandwidth and Emission Mask Test

5.2.1 Test Applicable

(a). Occupied Bandwidth: The EUT was connected to the audio signal generator and the spectrum analyser via the main RF connector, and through an appropriate attenuator. The EUT was controlled to transmit its maximum power. Then the bandwidth of 99% power can be measured by the spectrum analyser.

According to FCC part 90.209 & FCC part 2.1049:

Operations using equipment designed to operate with a 12.5 kHz channel bandwidth will be authorized a 11.25 kHz bandwidth. Operations using equipment designed to operate with a 6.25 kHz channel bandwidth will be authorized a 6 kHz bandwidth.

(b). 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 more than 100 percent of the authorized bandwidth: At least 25dB.

(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 35dB.

(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.

(c). 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 centre of the authorized bandwidth f_0 to 5.625 kHz removed from f_0: Zero dB.

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

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

For FM mode (Channel Spacing: 12.5kHz)

Emission Designator: 11K0F3E

In this case, the maximum modulating frequency is 3.0kHz with 0 2.5kHz deviation.

BW = 2(M + D) = 2*(3.0kHz + 2.5kHz) =11kHz =11K0

F3E portion of the designator represents an FM voice transmission

Therefore, the entire designator for 12.5kHz channel spacing FM mode is 11K0F3E.

For Digital mode (Channel Spacing: 12.5kHz)

Emission Designator: 7K60F1D and 7K60F1E

The 99% energy rule (title 47CFR 2.1049) was used for digital mode.

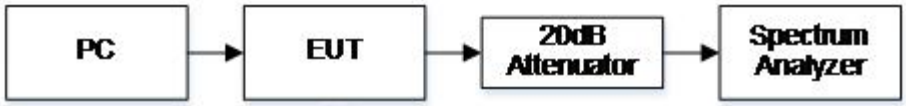
It basically states that 99% of the modulation energy falls within XkHz, in the case, 7.6kHz.

The emission mask was obtained from 47CFR 90.210(d).

F1D and F1E portion of the designator indicates digital information.

Therefore, the entire designator for 12.5kHz channel spacing digital mode is 7K60F1D and 7K60F1E.

5.2.2 Test Configuration



5.2.3 Test Procedure

1 Set EUT as normal operation.
2 Set SPA Centre Frequency = fundamental frequency, RBW=100Hz, VBW= 3*RBW, span =Auto .
3 Set SPA Max hold. Mark peak, Set 99% Occupied Bandwidth and 26dB Occupied Bandwidth.

5.2.4 Test Results

Temperature	23.8℃	Humidity	52.1%
Test Engineer	Paddi Chen	Test Voltage	Normal Voltage

Occupied Bandwidth

Modulation Type/ Channel Bandwidth	Test Channel	Test Frequency (MHz)	High Power Level		Low Power Level		Limits (kHz)	Result
			99% Occupied Bandwidth (kHz)	26dB Emission Bandwidth (kHz)	99% Occupied Bandwidth (kHz)	26dB Emission Bandwidth (kHz)		
FM 12.5kHz	Low	406.1125	5.942	6.160	6.024	6.202	11.25	Pass
	Middle	453.2125	5.893	6.173	6.022	6.200	11.25	Pass
	High	479.9875	6.028	6.206	6.023	6.200	11.25	Pass
4FSK 12.5kHz	Low	406.1125	7.090	8.876	7.042	8.826	11.25	Pass
	Middle	453.2125	7.121	9.908	7.198	9.364	11.25	Pass
	High	479.9875	7.680	9.920	7.408	9.934	11.25	Pass

Emission Mask

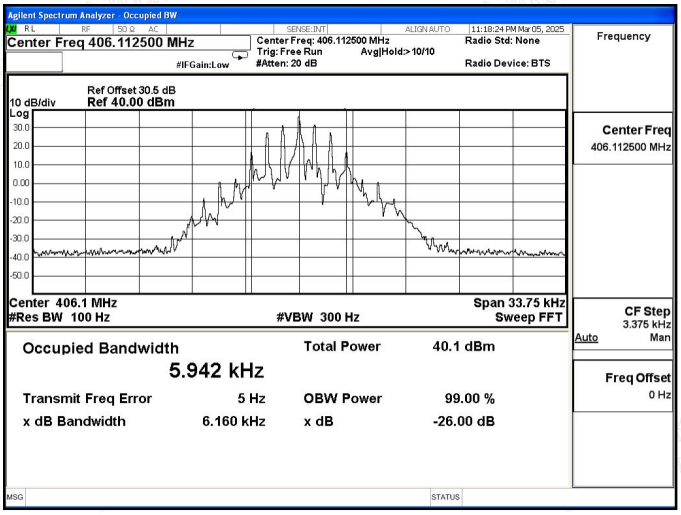
Modulation Type/ Channel Bandwidth	Test Channel	Test Frequency (MHz)	High Power Level	Low Power Level	RBW (Hz)	Result
			Applicable Mask	Applicable Mask		
FM 12.5kHz	Low	406.1125	D	D	100	Pass
	Middle	453.2125	D	D	100	Pass
	High	479.9875	D	D	100	Pass
4FSK 12.5kHz	Low	406.1125	D	D	100	Pass
	Middle	453.2125	D	D	100	Pass
	High	479.9875	D	D	100	Pass

Remark:

1. Please refer to following plots.

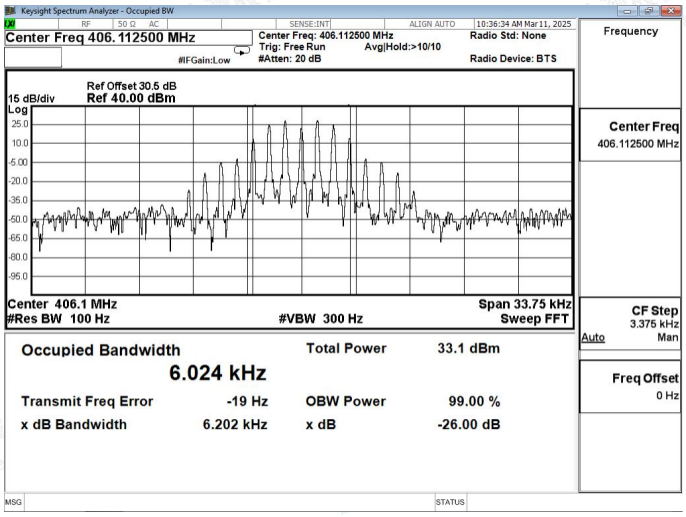
2. Pre-scan all Digital modes and recorded the worst case results in this report (Digital Data+voice Mode).

OBW_High Power Level FM 12.5kHz

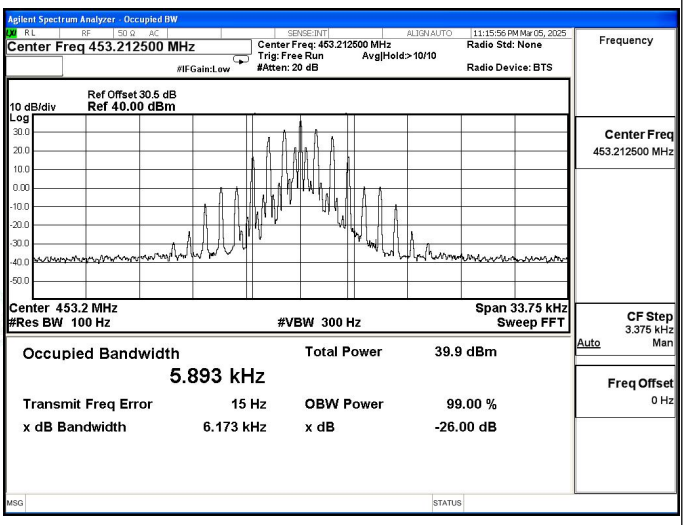


406.1125MHz

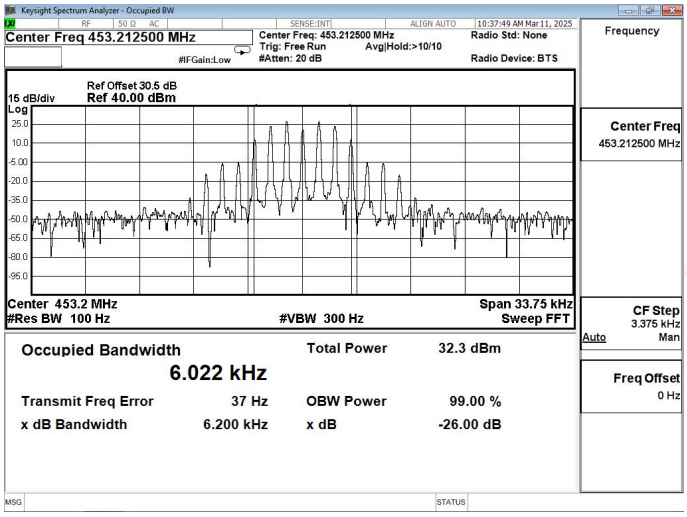
OBW_Low Power Level FM 12.5kHz



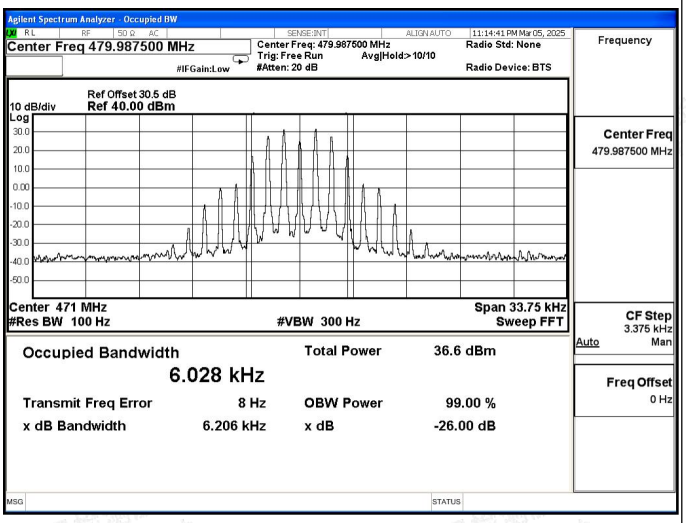
406.1125MHz



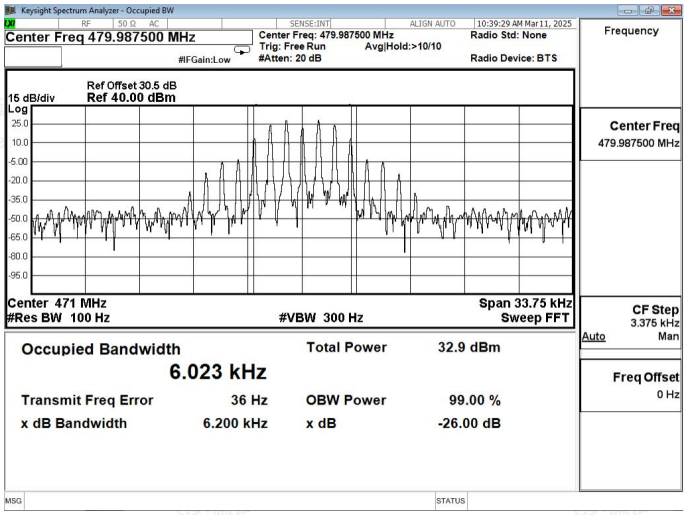
453.2125MHz



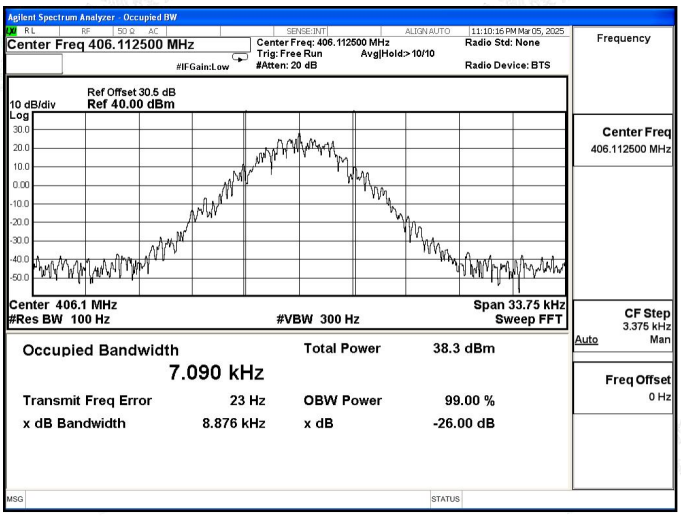
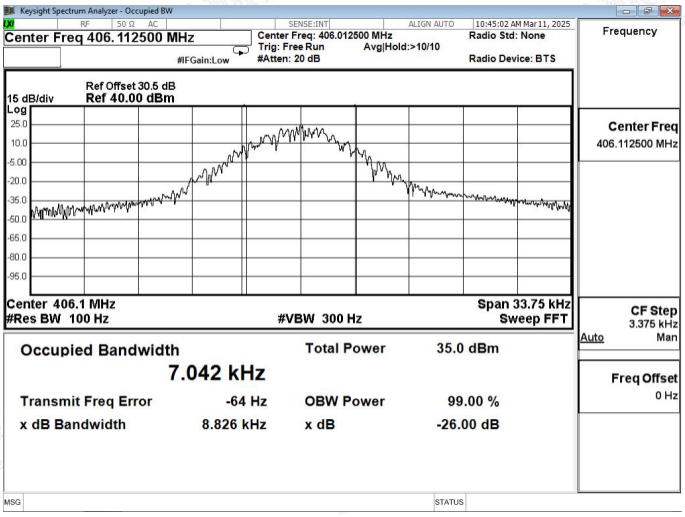
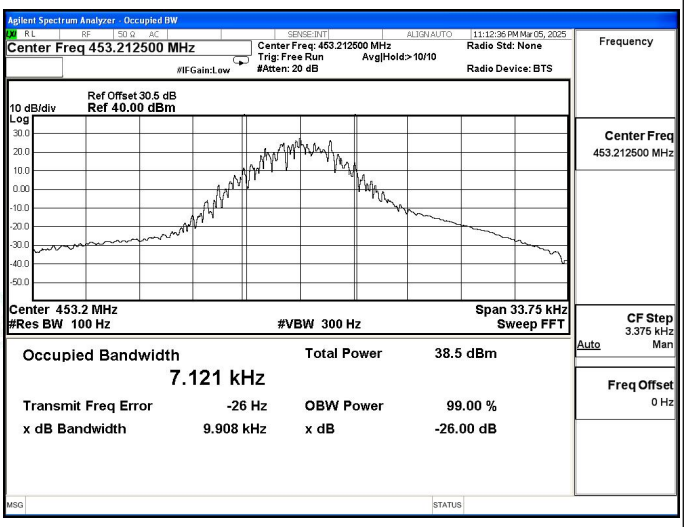
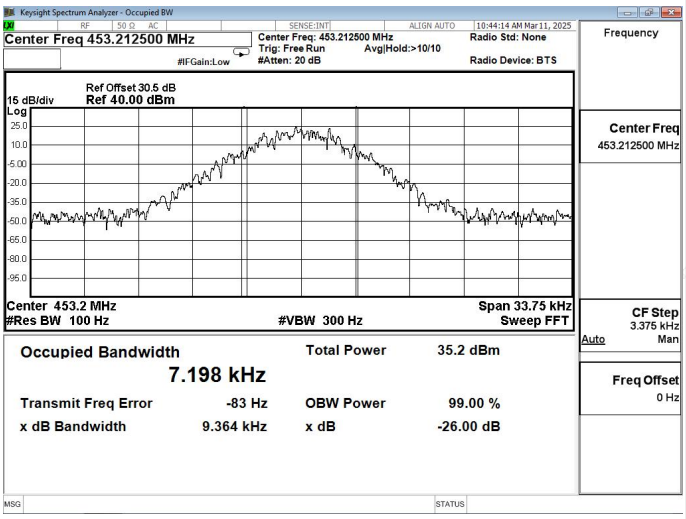
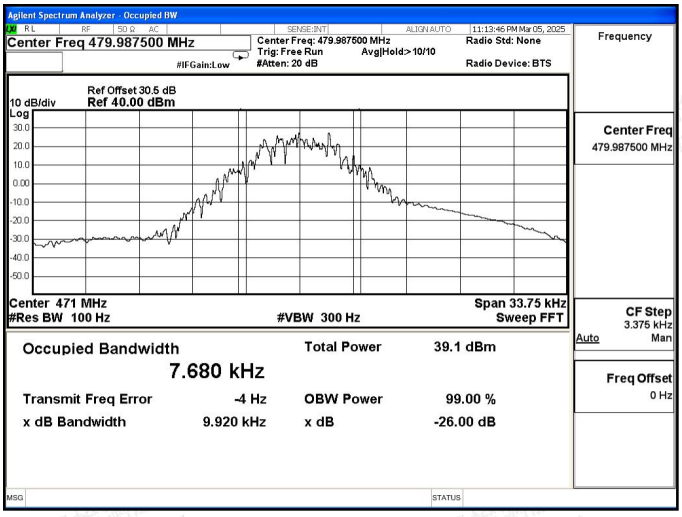
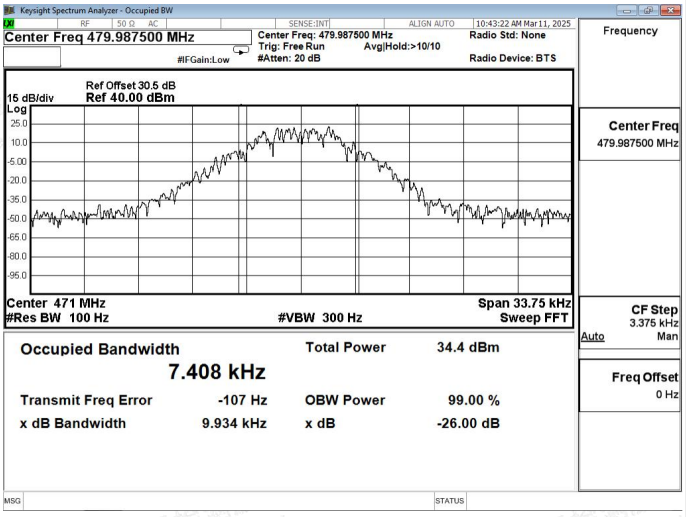
453.2125MHz

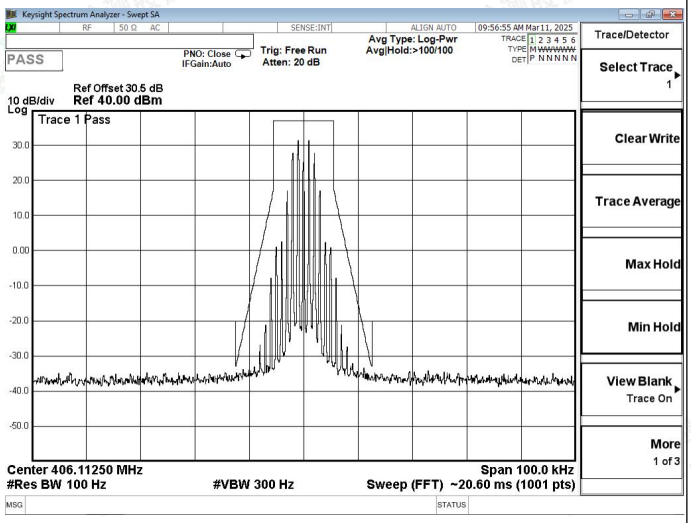
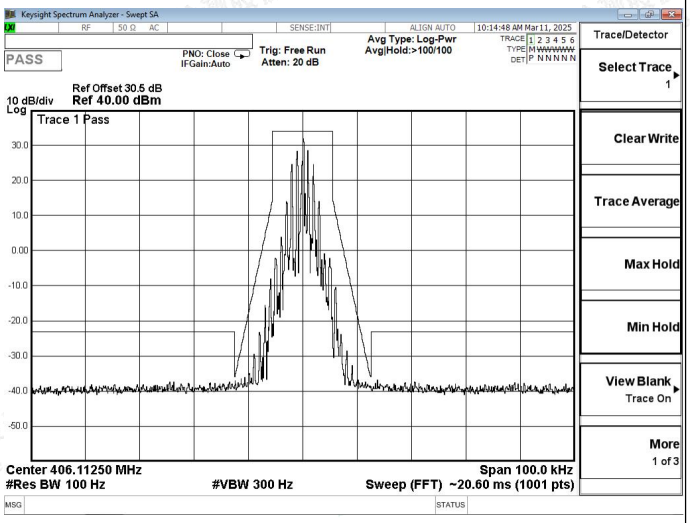


479.9875MHz



479.9875MHz

OBW_High Power Level 4FSK 12.5kHz	OBW_Low Power Level 4FSK 12.5kHz
	
406.1125MHz	406.1125MHz
	
453.2125MHz	453.2125MHz
	
479.9875MHz	479.9875MHz

Mask_High Power Level FM 12.5kHz	Mask_Low Power Level FM 12.5kHz
	
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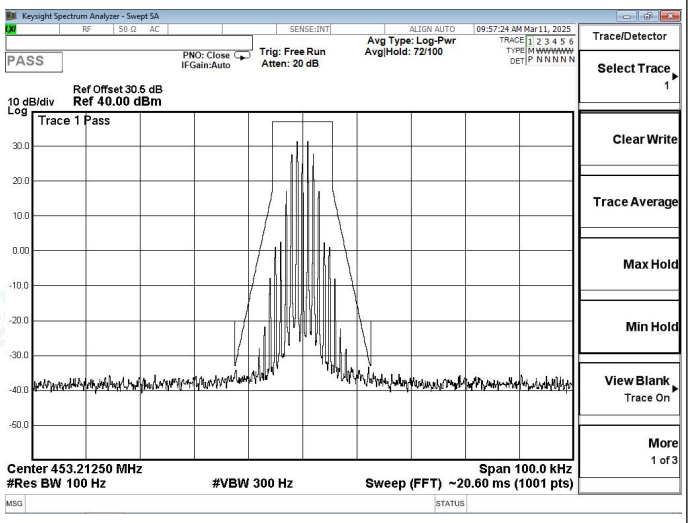
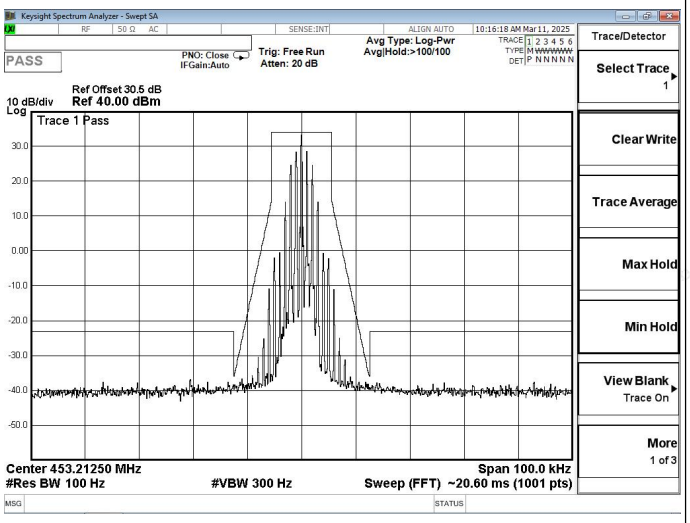
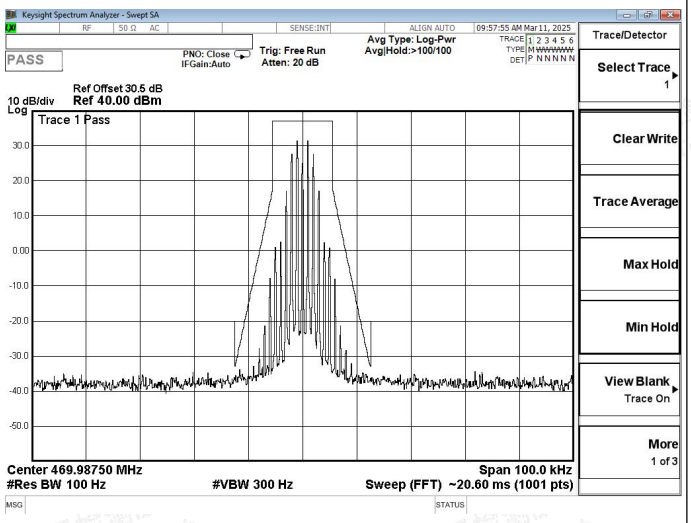
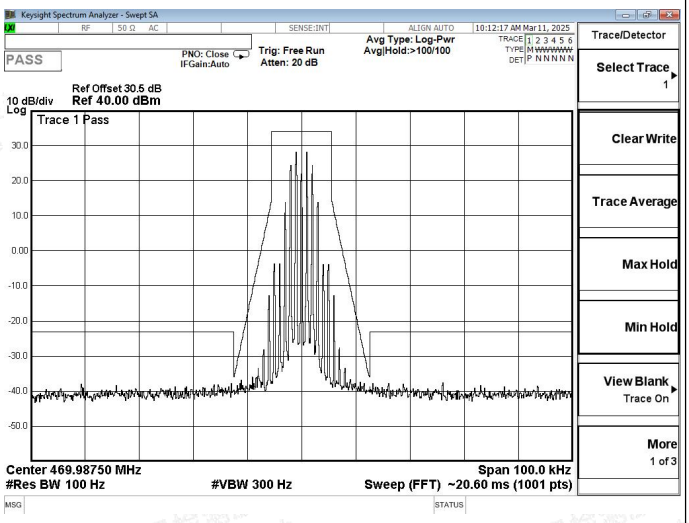
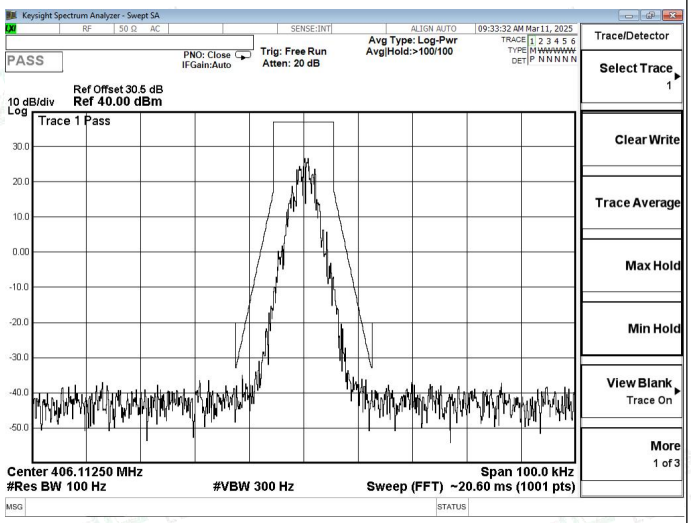
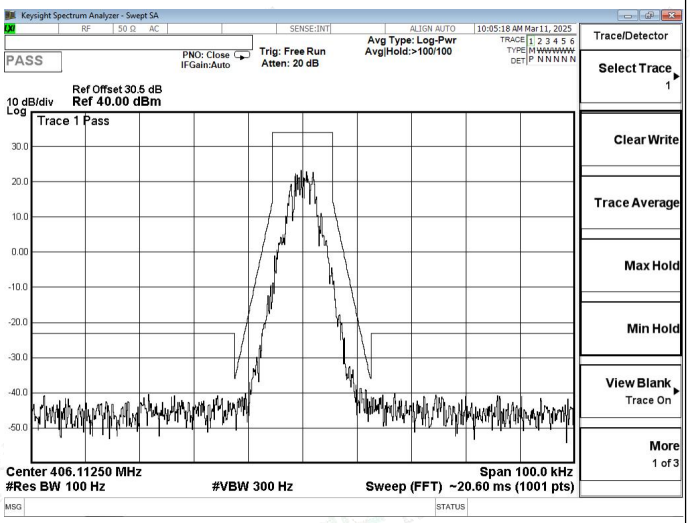
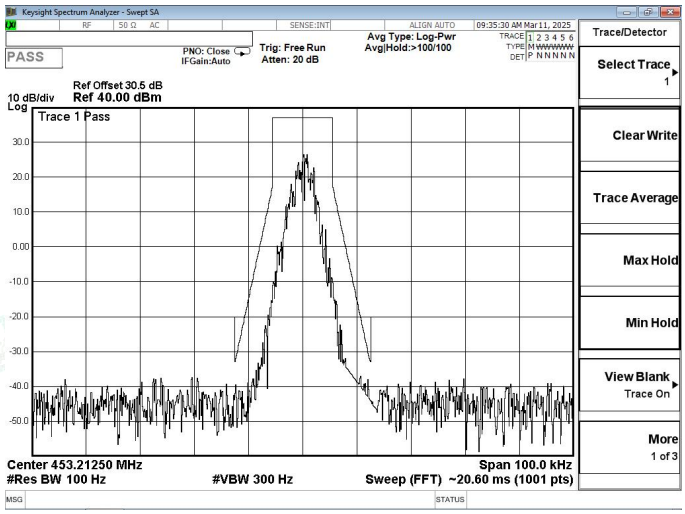
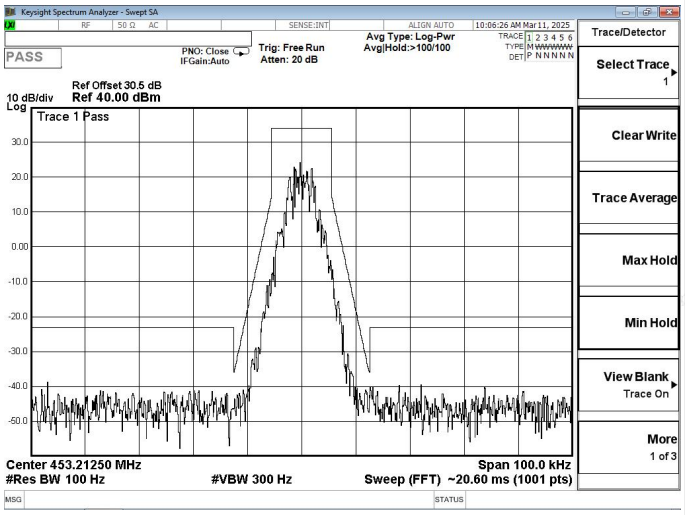
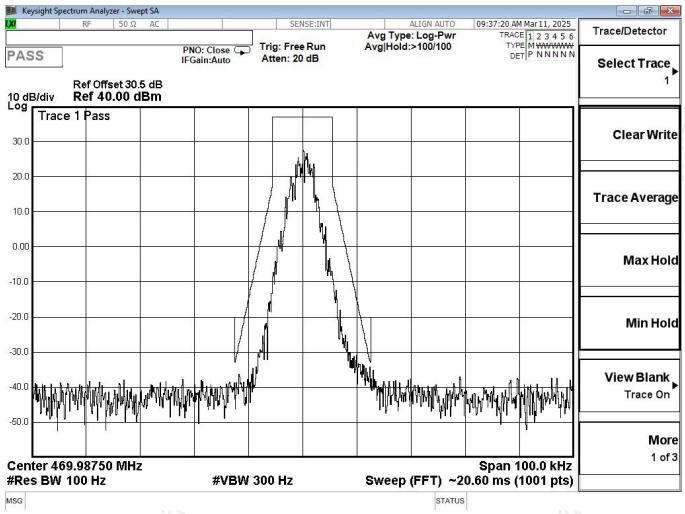
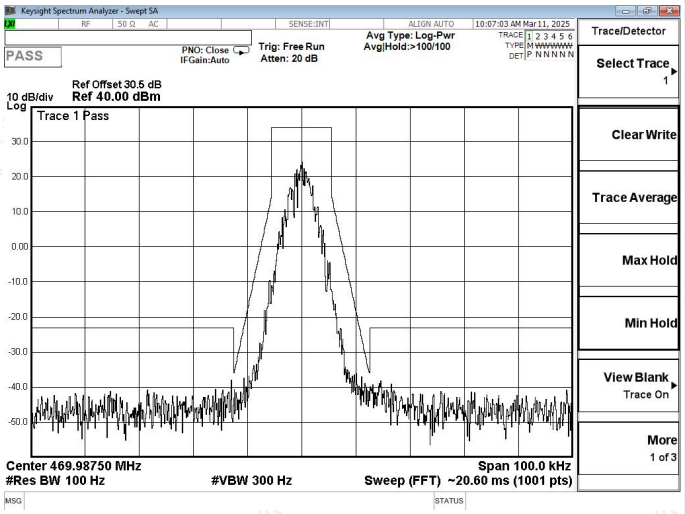
	
453.2125MHz	453.2125MHz
	
479.9875MHz	479.9875MHz

Mask_High Power Level 4FSK 12.5kHz	Mask_Low Power Level 4FSK 12.5kHz
	
406.1125MHz	406.1125MHz
	
453.2125MHz	453.2125MHz
	
479.9875MHz	479.9875MHz

5.3. Transmitter Radiated Spurious Emission

5.3.1 Test Applicable

According to the ANSI C63.26:2015 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 centre of the authorized bandwidth f_o to 5.625 KHz removed from f_o: Zero dB

2 On any frequency removed from the centre of the authorized bandwidth by a displacement frequency (f_d in KHz) f_o of more than 5.625 KHz but no more than 12.5 KHz: At least 7.27dB

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

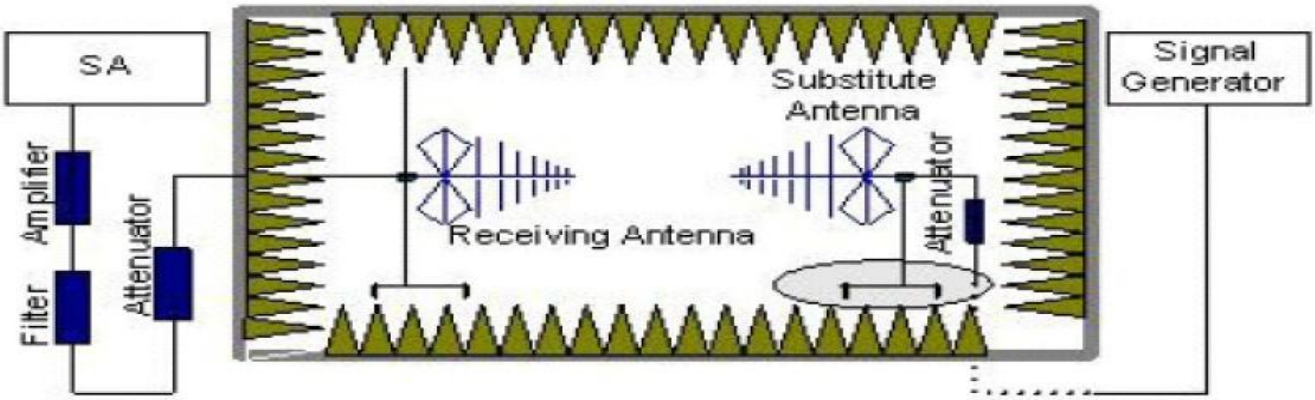
For transmitters designed to transmit with 25 KHz channel separation and equipped with an audio low-pass filter, the power of any emission must be attenuated below the unmodulated carrier power (P) as following:

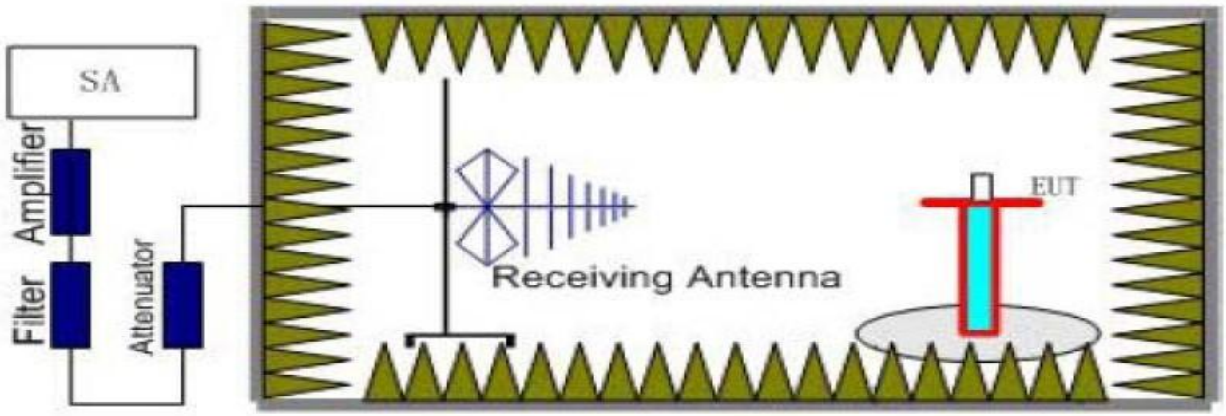
1 On any frequency removed from the assigned frequency by more than 50 percent, but no more than 100 percent of the authorized bandwidth: At least 25 dB.

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.

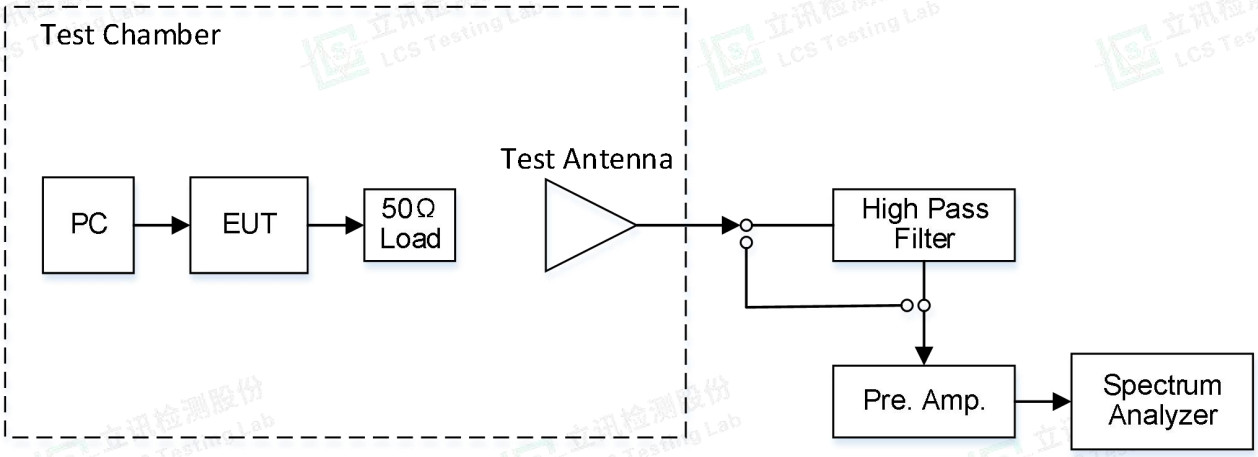
3 On any frequency removed from the assigned frequency by more than 250 percent of the authorized bandwidth: At least 43+10log (P) dB.

5.3.2 Test Configuration





5.3.3 Test Arrangement



5.3.4 Test Procedure

1. 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.
2. 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.
3. 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=100 KHz, VBW=300 KHz for 30MHz to 1GHz, and the maximum value of the receiver should be recorded as (P_r).
4. The EUT shall be replaced by a substitution antenna. In the chamber, a 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 (P_{Mea}) is applied to the input of the substitution antenna, and adjusts the level of the signal generator output until the value of the receiver reach the previously recorded (P_r). The power of signal source (P_{Mea}) is recorded. The test should be performed by rotating the test item and adjusting the receiving antenna polarization.
5. An amplifier should be connected to the Signal Source output port. And the cable should be connecting 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

The measurement results are amending as described below:

Power (EIRP) = P_{Mea}- P_{cl} - G_a

6. This value is EIRP since the measurement is calibrated using an antenna of known gain (2.15 dBi) and known input power.
7. ERP can be calculated from EIRP by subtracting the gain of the dipole, ERP = EIRP-2.15dBi.

5.3.5 Limit

FCC Part 90.210:

For 12.5 kHz bandwidth:

On any frequency removed from the center of the authorized bandwidth by a displacement frequency (f_d in kHz) of more than 12.5 kHz at least:

Calculation: Limit (dBm) =EL-50-10log (TP) = -20 dBm

Notes: EL is the emission level of the Output Power expressed in dBm.

5.3.5 Test Results

Temperature	23.8℃	Humidity	52.1%
Test Engineer	Paddi Chen	Test Voltage	Normal Voltage

Remark:

1. Test only was performed at high power level;

2. Please refer to following page.

3. Pre-scan all Digital modes and recorded the worst case results in this report (Digital Data+voice Mode).

Modulation Type/ Channel Bandwidth: FM 12.5kHz							
Test Channel: Low				Test Frequency:406.1125MHz			
Frequency (MHz)	P_{Mea} (dBm)	Path Loss	Antenna Gain	Correction (dB)	Peak EIRP (dBm)	Limit (dBm)	Polarization
800.05	-42.21	5.26	9.88	2.15	-35.44	-20.00	H
1200.04	-52.61	6.11	11.36	2.15	-45.21	-20.00	H
1600.13	-48.39	7.01	11.42	2.15	-41.83	-20.00	H
800.06	-48.34	5.26	9.88	2.15	-41.57	-20.00	V
1200.05	-50.65	6.11	11.36	2.15	-43.25	-20.00	V
1600.07	-57.64	7.01	11.42	2.15	-51.08	-20.00	V

Modulation Type/ Channel Bandwidth: FM 12.5kHz							
Test Channel: Middle				Test Frequency: 453.2125MHz			
Frequency (MHz)	P_{Mea} (dBm)	Path Loss	Antenna Gain	Correction (dB)	Peak EIRP (dBm)	Limit (dBm)	Polarization
906.47	-41.79	5.39	9.38	2.15	-35.65	-20.00	H
1359.68	-53.44	5.67	11.02	2.15	-45.94	-20.00	H
1812.92	-47.52	6.59	10.98	2.15	-40.98	-20.00	H
906.48	-49.71	5.39	9.38	2.15	-43.57	-20.00	V
1359.64	-51.95	5.67	11.02	2.15	-44.45	-20.00	V
1812.88	-57.67	6.59	10.98	2.15	-51.13	-20.00	V

Modulation Type/ Channel Bandwidth: FM 12.5kHz							
Test Channel: High				Test Frequency: 479.9875MHz			
Frequency (MHz)	P_{Mea} (dBm)	Path Loss	Antenna Gain	Correction (dB)	Peak EIRP (dBm)	Limit (dBm)	Polarization
940.02	-41.82	5.28	9.37	2.15	-35.58	-20.00	H
1409.97	-53.08	5.62	10.90	2.15	-45.65	-20.00	H
1876.03	-45.81	6.73	10.83	2.15	-39.56	-20.00	H
940.05	-49.29	5.28	9.31	2.15	-43.11	-20.00	V
1410.01	-51.10	5.84	11.01	2.15	-43.78	-20.00	V
1876.02	-56.19	6.75	11.06	2.15	-49.73	-20.00	V

Modulation Type/ Channel Bandwidth: 4FSK 12.5kHz							
Test Channel: Low				Test Frequency:406.1125MHz			
Frequency (MHz)	P_{Mea} (dBm)	Path Loss	Antenna Gain	Correction (dB)	Peak EIRP (dBm)	Limit (dBm)	Polarization
800.11	-42.38	5.26	9.88	2.15	-35.61	-20.00	H
1200.08	-52.05	6.11	11.36	2.15	-44.65	-20.00	H
1600.10	-47.49	7.01	11.42	2.15	-40.93	-20.00	H
800.11	-48.58	5.26	9.88	2.15	-41.81	-20.00	V
1200.11	-50.80	6.11	11.36	2.15	-43.40	-20.00	V
1600.08	-57.59	7.01	11.42	2.15	-51.03	-20.00	V

Modulation Type/ Channel Bandwidth: 4FSK 12.5kHz							
Test Channel: Middle				Test Frequency: 453.2125MHz			
Frequency (MHz)	P_{Mea} (dBm)	Path Loss	Antenna Gain	Correction (dB)	Peak EIRP (dBm)	Limit (dBm)	Polarization
906.51	-41.84	5.39	9.38	2.15	-35.70	-20.00	H
1359.72	-53.73	5.67	11.02	2.15	-46.23	-20.00	H
1812.92	-48.02	6.59	10.98	2.15	-41.48	-20.00	H
906.52	-50.08	5.39	9.38	2.15	-43.94	-20.00	V
1359.64	-52.02	5.67	11.02	2.15	-44.52	-20.00	V
1812.94	-57.38	6.59	10.98	2.15	-50.84	-20.00	V

Modulation Type/ Channel Bandwidth: 4FSK 12.5kHz							
Test Channel: High				Test Frequency: 479.9875MHz			
Frequency (MHz)	P_{Mea} (dBm)	Path Loss	Antenna Gain	Correction (dB)	Peak EIRP (dBm)	Limit (dBm)	Polarization
940.08	-42.40	5.28	9.37	2.15	-36.16	-20.00	H
1409.99	-53.07	5.62	10.90	2.15	-45.64	-20.00	H
1876.04	-45.55	6.73	10.83	2.15	-39.30	-20.00	H
940.08	-49.09	5.28	9.31	2.15	-42.91	-20.00	V
1409.98	-51.44	5.84	11.01	2.15	-44.12	-20.00	V
1876.02	-55.72	6.75	11.06	2.15	-49.26	-20.00	V

Notes:

1). Measuring frequencies from 9 KHz~10th harmonic (ex. 26GHz), No emission found between lowest internal used/generated frequency to 30MHz;

2). Radiated emissions measured in frequency range from 9 KHz~10th harmonic (ex. 26GHz) were made with an instrument using Peak detector mode;

3). Peak EIRP = P_{Mea} + Path Loss + Antenna Gain + Correction Value (2.15).

5.4. Spurious Emission on Antenna Port

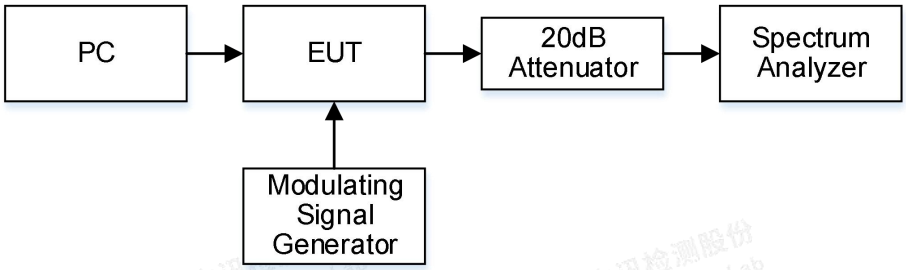
5.4.1 Test Applicable

The same as Section 5.3

5.4.2 Test Procedure

The RF output of the EUT was connected to a spectrum analyzer through appropriate attenuation. The resolution bandwidth of the spectrum analyzer was set to 100 kHz. Sufficient scans were taken to show any out of band emission up to 10th. Harmonic for the lower and the highest frequency range. Set RBW 1KHz, VBW 3KHz in the frequency band 9KHz to 150KHz, set RBW 10KHz, VBW 30 KHz in the frequency band 150KHz to 30 MHz, set RBW 100 kHz, VBW 300 kHz in the frequency band 30MHz to 1GHz,while set RBW=1MHz.VBW=3MHz from the 1GHz to 10th Harmonic.
The audio input was set to 0 to get the unmodulated carrier, the resulting picture is print out for each channel separation.

5.4.3 Test Configuration



5.4.4 Limit

FCC Part and 90.210:

For 12.5 kHz bandwidth:
On any frequency removed from the center of the authorized bandwidth by a displacement frequency (f_d in kHz) of more than 12.5 kHz at least:
Calculation: Limit (dBm) =EL-50-10log (TP) = -20 dBm

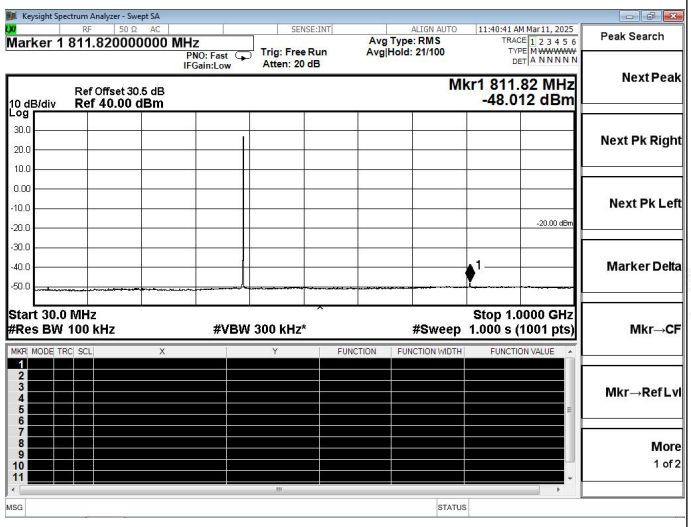
Note: 1. In general, the worst case attenuation requirement shown above was applied.
2. The measurement frequency range from 9 KHz to 6GHz.
3. Test only was performed at high power level.
4. list the worst result in this item

5.4.5 Test Results

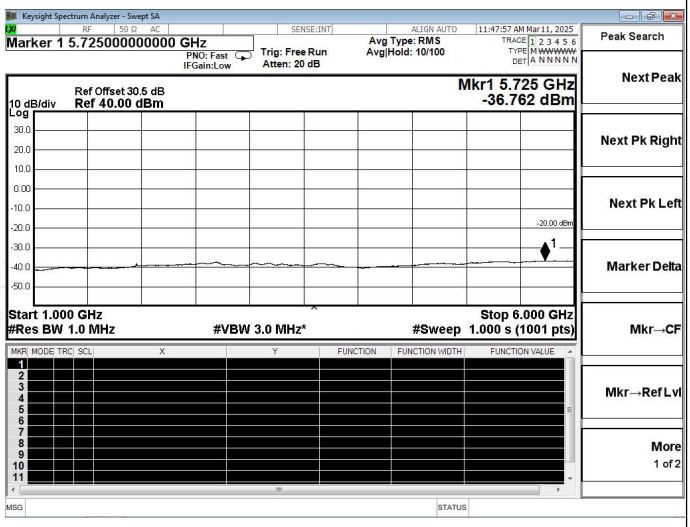
Temperature	23.8℃	Humidity	52.1%
Test Engineer	Paddi Chen	Test Voltage	Normal Voltage

Spurious Emission on Antenna Port

Analog FM 12.5kHz / 406.1125 MHz



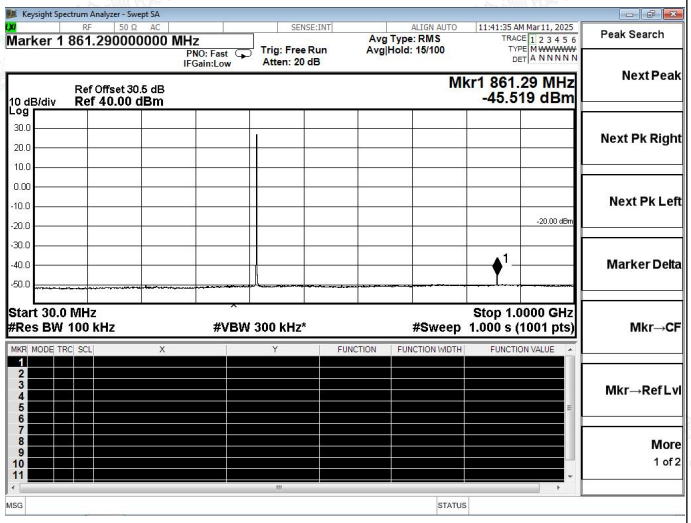
30MHz – 1.0GHz



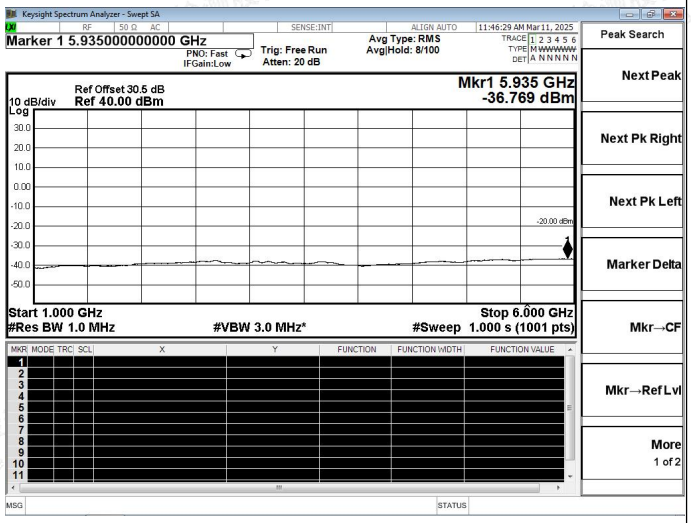
1.0GHz – 6GHz

Spurious Emission on Antenna Port

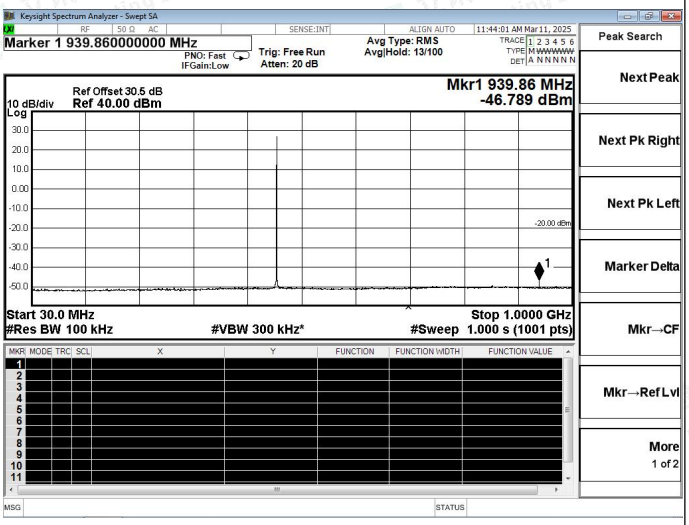
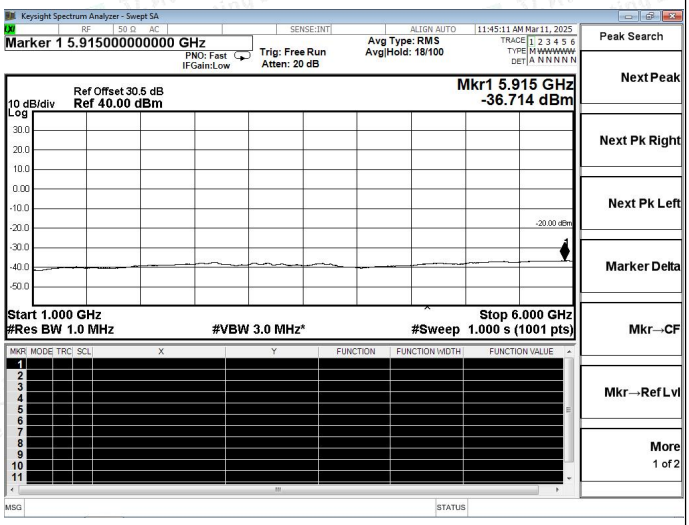
Analog FM 12.5kHz / 453.2125MHz



30MHz – 1.0GHz



1.0GHz – 6GHz

Spurious Emission on Antenna Port Analog FM 12.5kHz / 479.9875 MHz	
	
30MHz – 1.0GHz	1.0GHz – 6GHz

5.5. Frequency Stability Test

5.5.1 Test 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 +50℃ centigrade.

2 According to FCC Part 2 Section 2.1055 (e) (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.

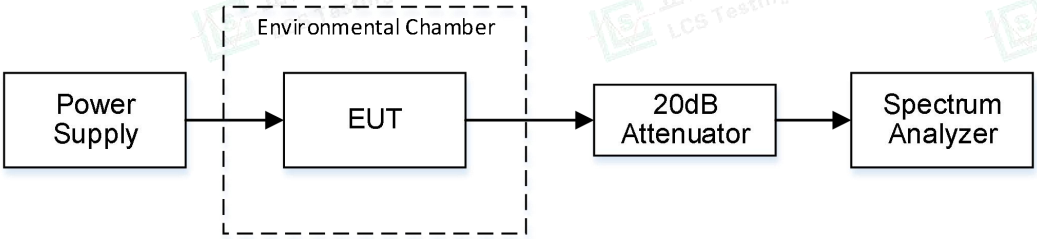
3 Vary primary supply voltage from 85 to 115 percent of the nominal value.

4 According to §90.213, mobile stations designed to operate with a 12.5 kHz channel bandwidth must have a frequency stability of 2.5 ppm.

5.5.2 Test Procedure

The EUT was set in the climate chamber and connected to an external DC power supply and AC power supply. The RF output was directly connected to Spectrum Analyzer ESCI3. The coupling loss of the additional cables was recorded and taken in account for all the measurements. After temperature stabilization (approx. 20 min for each stage), the frequency for the lower, the middle and the highest frequency range was recorded. For Frequency stability Vs. Voltage the EUT was connected to a DC power supply or AC power supply and the voltage was adjusted in the required ranges. The result was recorded.

5.5.3 Test Configuration



5.5.4 Test Limits

According to 90.213, Transmitters used must have minimum frequency stability as specified in the following table.

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

* Stations operating in the 154.45 MHz or the 173.2 to 173.4 MHz bands must have a frequency stability of 5 ppm.
* In the 421-512 MHz band, mobile stations designed to operate with a 12.5 kHz channel bandwidth must have a frequency stability of 2.5 ppm. Mobile stations designed to operate with a 6.25 kHz channel bandwidth must have a frequency stability of 1.0 ppm.

5.5.5 Test Results

Temperature	23.8℃	Humidity	52.1%
Test Engineer	Paddi Chen	Test Voltage	Normal Voltage

Modulation Type/ Channel Bandwidth	Test conditions		Frequency error (ppm)		
	Voltage(V)	Temp(℃)	406.1125 MHz	453.2125 MHz	479.9875 MHz
FM 12.5kHz	7.4V	-30	0.0176	0.0057	0.0085
		-20	-0.0135	-0.0078	0.0097
		-10	-0.0111	0.0020	-0.0082
		0	-0.0015	-0.0054	-0.0040
		10	-0.0173	0.0150	0.0011
		20	-0.0127	-0.0185	-0.0073
		30	-0.0049	-0.0053	-0.0172
		40	0.0170	-0.0072	0.0072
		50	-0.0121	-0.0061	0.0150
	6.29 (-15% Rated)	20	0.0035	0.0044	0.0068
	8.51(+15% Rated)	20	-0.0012	-0.0040	0.0017
Limit		2.5ppm			
Test Results		PASS			

Note:

1. *Test only was performed at high power level.*
2. *List the worst result in this item.*

5.6. Transmitter Frequency Behavior

5.6.1 Test Applicable

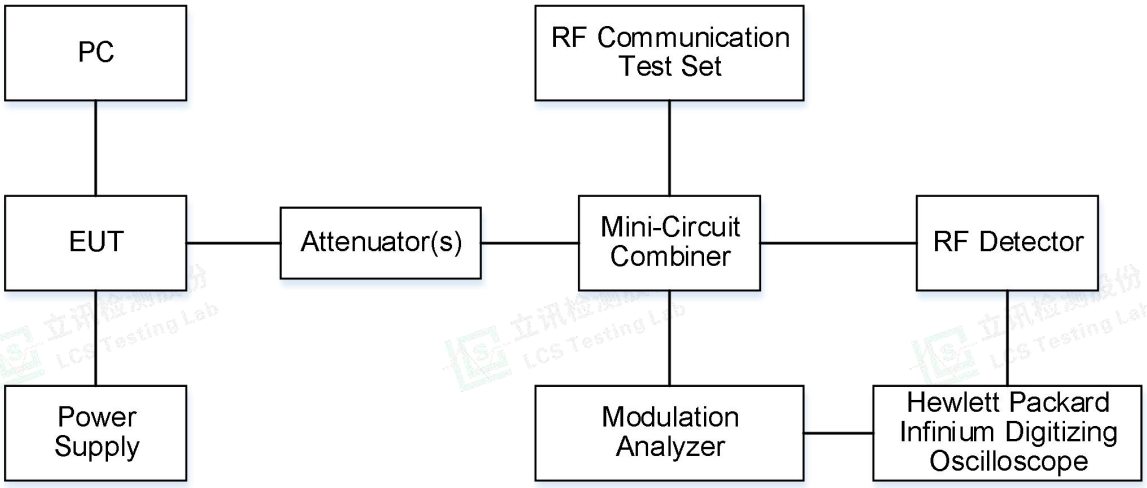
Section 90.214

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	
		1500 to 174 MHz	421 to 512 MHz
Transient Frequency Behavior for Equipment Designed to Operate on 25KHz Channels			
t_1 [4]……....	± 25.0KHz	5.0ms	10.0ms
t_1 ……....	± 12.5KHz	20.0ms	25.0ms
t_3 [4]……..	± 25.0KHz	5.0ms	10.0ms
Transient Frequency Behavior for Equipment Designed to Operate on 12.5KHz Channels			
t_1 [4]……....	±12.5KHz	5.0ms	10.0ms
t_1 ……....	± 6.25KHz	20.0ms	25.0ms
t_3 [4]……..	± 12.5KHz	5.0ms	10.0ms
Transient Frequency Behavior for Equipment Designed to Operate on 6.25KHz Channels			
t_1 [4]……....	±6.25KHz	5.0ms	10.0ms
t_1 ……....	± 3.125KHz	20.0ms	25.0ms
t_3 [4]……..	± 6.25KHz	5.0ms	10.0ms

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 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 for this time period.

5.6.2 Test Configuration



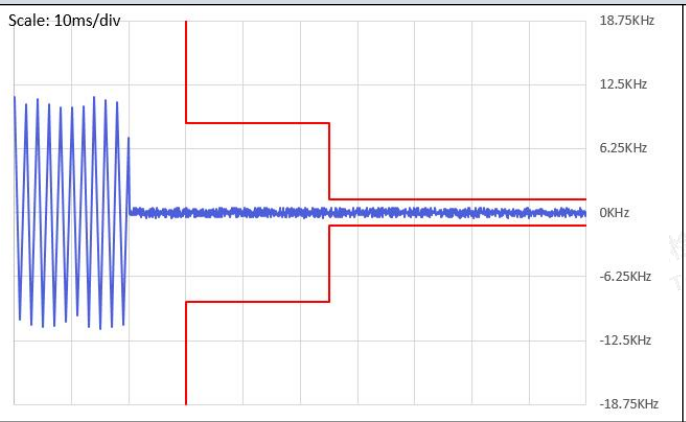
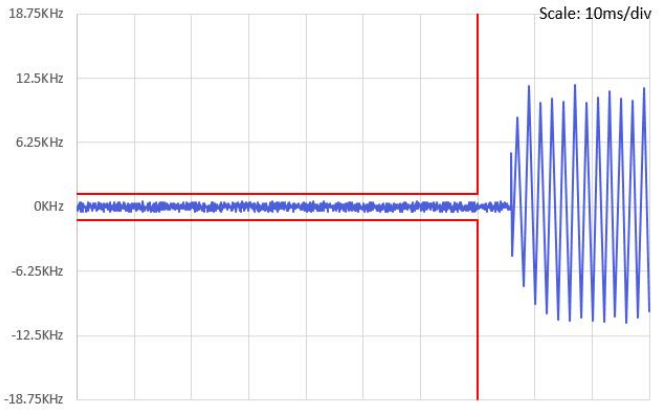
5.6.3 Test Procedure

According to TIA/EIA-603 2.2.19 requirement.

5.6.4 Test Results

Temperature	23.8℃	Humidity	52.1%
Test Engineer	Paddi Chen	Test Voltage	Normal Voltage

Note: test only was performed at high power level

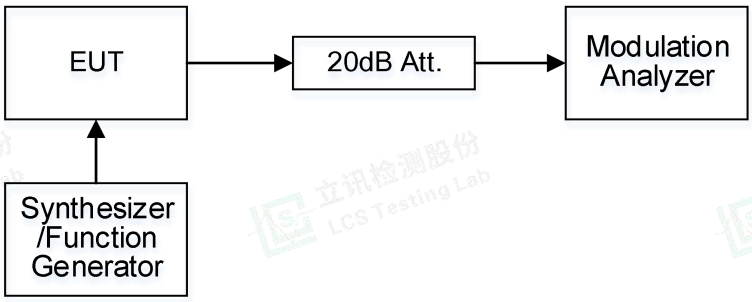
Transmitter Frequency Behavior (406.1125MHz FM)	
	
12.5 KHz Channel Separation------Off – On	*12.5 KHz Channel Separation------On – Off*

5.7. Modulation Characteristics

5.7.1 Limit

According to CFR47 section 2.1047(a), for Voice Modulation Communication Equipment, the frequency response of the audio modulation circuit over a range of 100 to 5000Hz shall be measured.

5.7.2 Block Diagram of Test Setup



5.7.3 Test Procedure

According to ANSI/TIA-603-E-2016

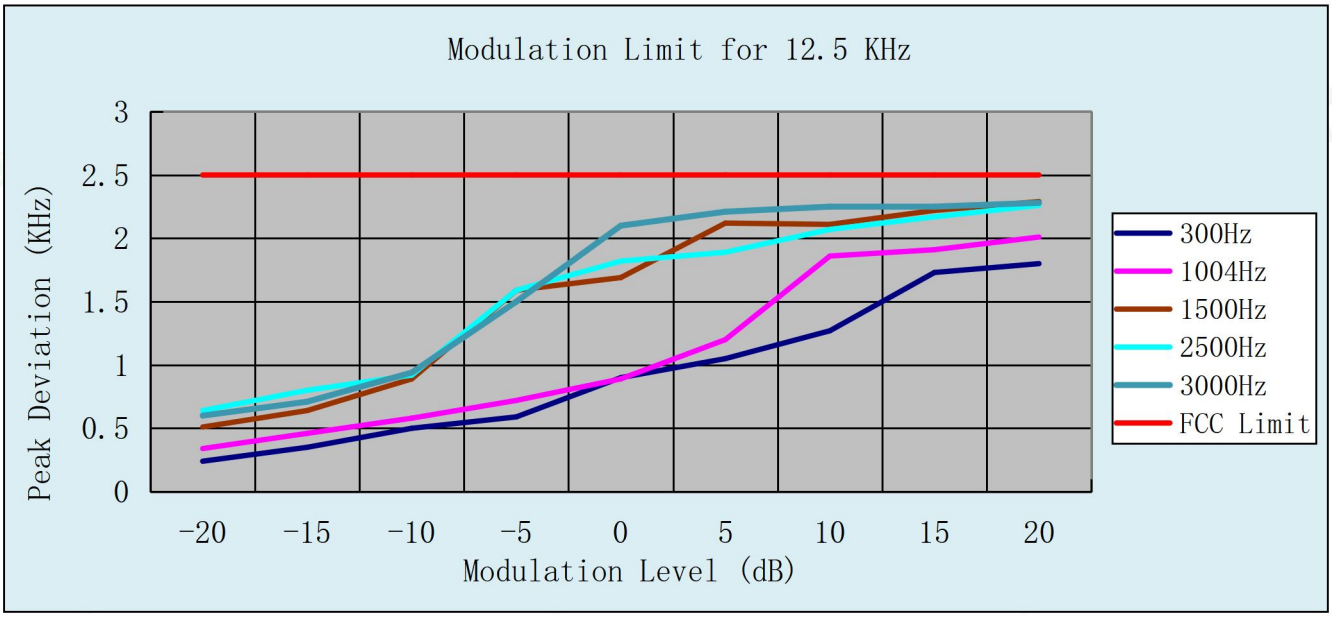
5.7.4 Test Results

Temperature	23.8℃	Humidity	52.1%
Test Engineer	Paddi Chen	Test Voltage	Normal Voltage

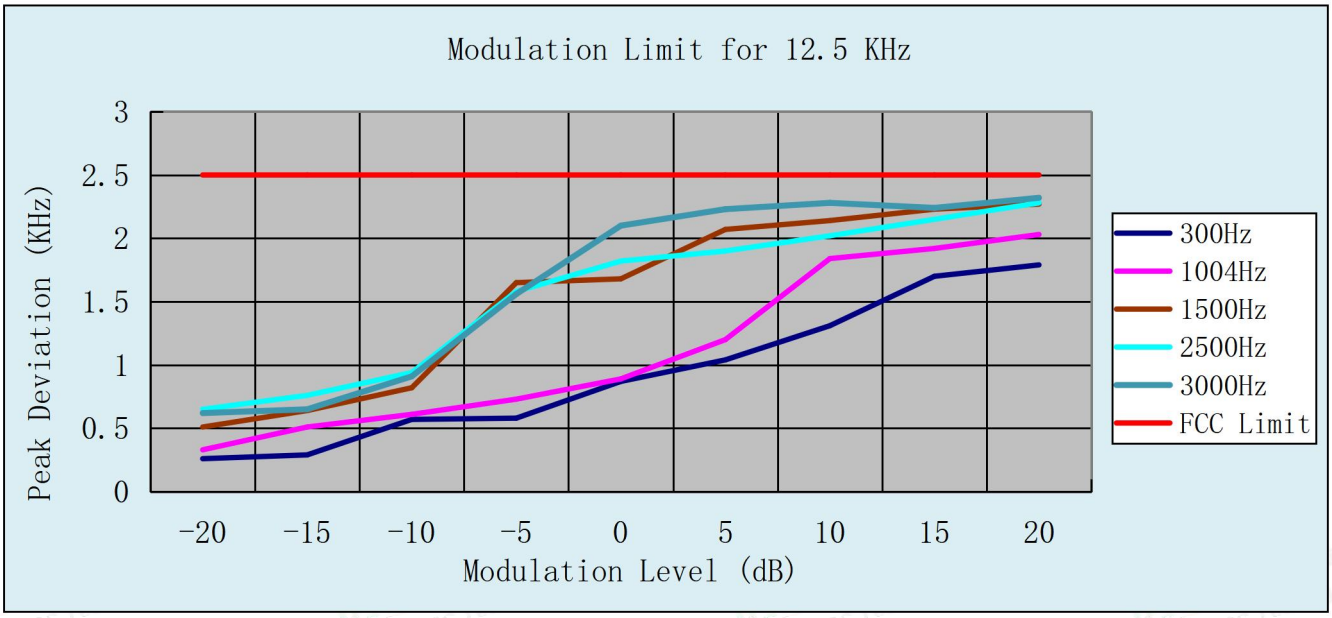
Note:

1. Test only was performed at high power level
2. Pre-scan all Digital modes and recorded the worst case results in this report (Digital Data+voice Mode).

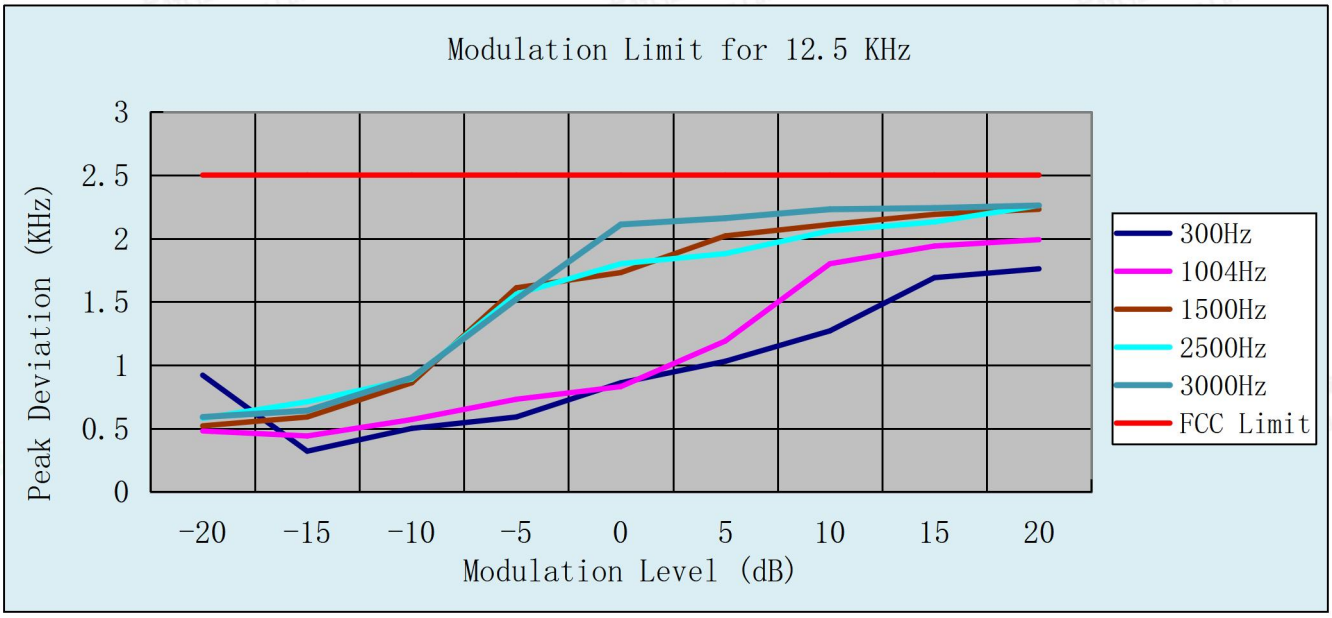
406.1125MHz@ 12.5 KHz Channel Separation					
Modulation Level (dB)	Peak Freq. Deviation At 300Hz (KHz)	Peak Freq. Deviation At 1004Hz (KHz)	Peak Freq. Deviation At 1500Hz (KHz)	Peak Freq. Deviation At 2500Hz (KHz)	Peak Freq. Deviation At 3000Hz (KHz)
-20	0.24	0.34	0.51	0.64	0.60
-15	0.35	0.46	0.64	0.80	0.71
-10	0.50	0.58	0.89	0.92	0.94
-5	0.59	0.72	1.59	1.59	1.50
0	0.90	0.89	1.69	1.82	2.10
+5	1.05	1.20	2.12	1.89	2.21
+10	1.27	1.86	2.11	2.07	2.25
+15	1.73	1.91	2.22	2.17	2.25
+20	1.80	2.01	2.29	2.26	2.28



453.2125MHz@ 12.5 KHz Channel Separation					
Modulation Level (dB)	Peak Freq. Deviation At 300Hz (KHz)	Peak Freq. Deviation At 1004Hz (KHz)	Peak Freq. Deviation At 1500Hz (KHz)	Peak Freq. Deviation At 2500Hz (KHz)	Peak Freq. Deviation At 3000Hz (KHz)
-20	0.26	0.33	0.51	0.65	0.62
-15	0.29	0.51	0.64	0.76	0.65
-10	0.57	0.61	0.82	0.94	0.91
-5	0.58	0.73	1.65	1.58	1.56
0	0.87	0.89	1.68	1.82	2.10
+5	1.04	1.20	2.07	1.90	2.23
+10	1.31	1.84	2.14	2.02	2.28
+15	1.70	1.92	2.23	2.15	2.24
+20	1.79	2.03	2.27	2.28	2.32

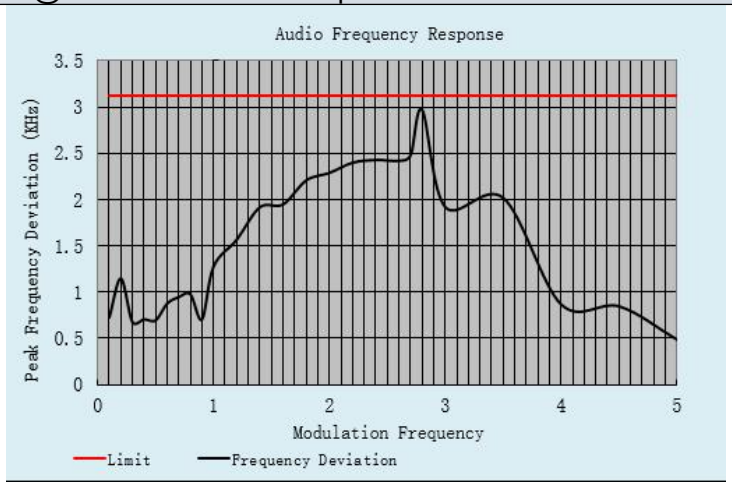


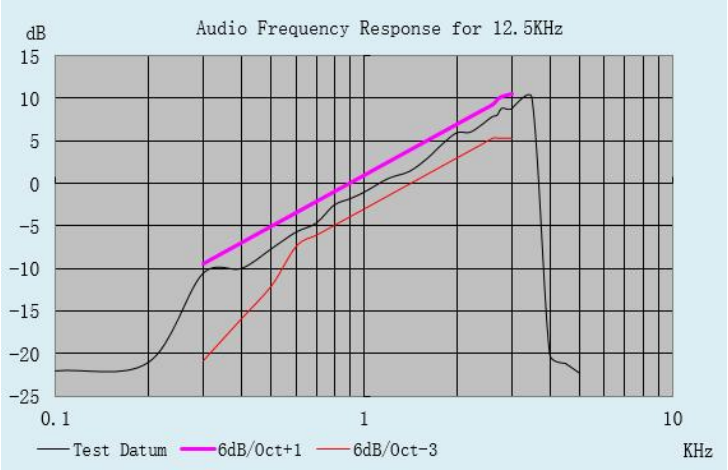
479.9875MHz@ 12.5 KHz Channel Separation					
Modulation Level (dB)	Peak Freq. Deviation At 300Hz (KHz)	Peak Freq. Deviation At 1004Hz (KHz)	Peak Freq. Deviation At 1500Hz (KHz)	Peak Freq. Deviation At 2500Hz (KHz)	Peak Freq. Deviation At 3000Hz (KHz)
-20	0.92	0.48	0.52	0.58	0.59
-15	0.32	0.44	0.59	0.71	0.64
-10	0.50	0.57	0.86	0.89	0.90
-5	0.59	0.73	1.61	1.56	1.52
0	0.86	0.83	1.73	1.80	2.11
+5	1.03	1.19	2.02	1.88	2.16
+10	1.27	1.80	2.11	2.06	2.23
+15	1.69	1.94	2.19	2.13	2.24
+20	1.76	1.99	2.23	2.26	2.26



Audio Frequency Response:

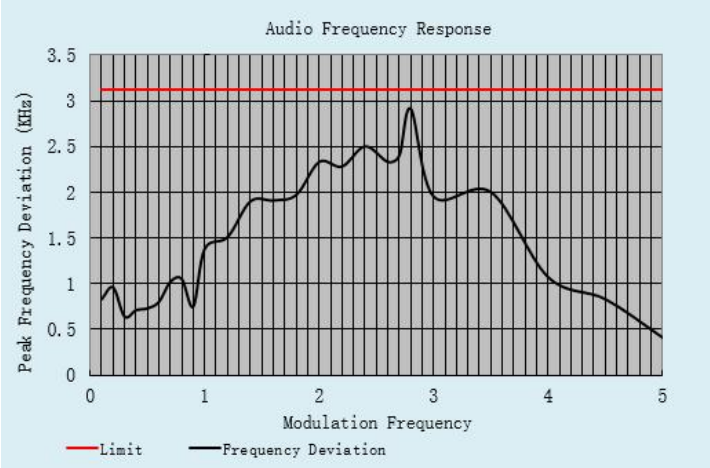
406.1125MHz@ 12.5 KHz Channel Separation			
Modulation Frequency (Hz)	Peak Freq. Deviation (KHz)	Audio Frequency Response (dB)	Limit (KHz)
100	0.72	-22.07	3.125
200	1.14	-21.09	3.125
300	0.67	-10.68	3.125
400	0.70	-10.06	3.125
500	0.69	-7.76	3.125
600	0.87	-5.81	3.125
700	0.94	-4.72	3.125
800	0.97	-2.61	3.125
900	0.70	-1.86	3.125
1000	1.27	-1.09	3.125
1200	1.56	0.53	3.125
1400	1.91	1.34	3.125
1600	1.94	2.85	3.125
1800	2.20	4.61	3.125
2000	2.28	5.90	3.125
2200	2.39	5.94	3.125
2400	2.42	6.80	3.125
2600	2.41	7.77	3.125
2700	2.47	7.96	3.125
2800	2.96	8.79	3.125
3000	1.91	8.68	3.125
3500	2.01	10.00	3.125
4000	0.86	-20.13	3.125
4500	0.84	-21.20	3.125
5000	0.48	-22.34	3.125

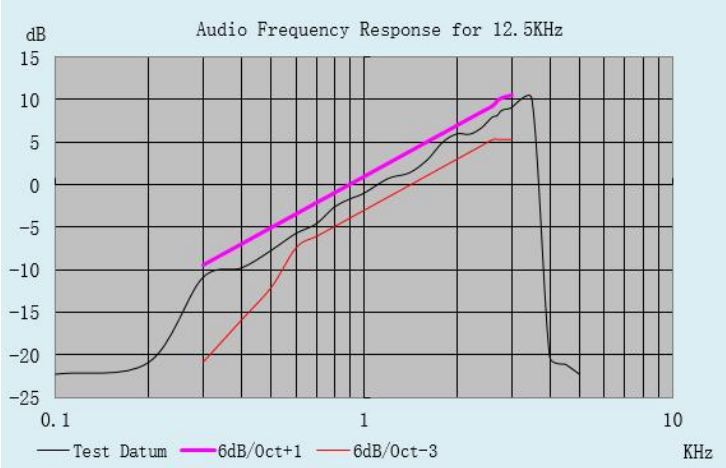




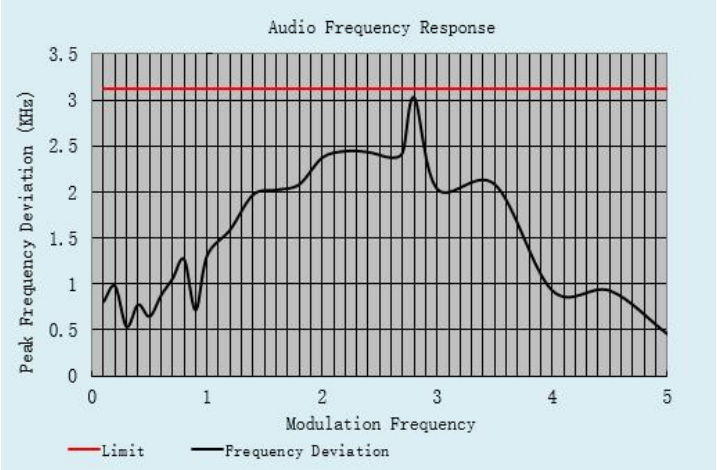
453.2125MHz@ 12.5 KHz Channel Separation

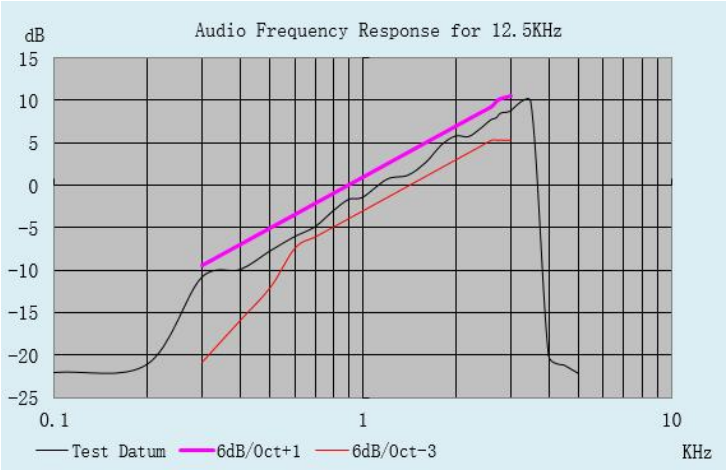
Modulation Frequency (Hz)	Peak Freq. Deviation (KHz)	Audio Frequency Response (dB)	Limit (KHz)
100	0.83	-22.26	3.125
200	0.96	-20.91	3.125
300	0.64	-10.98	3.125
400	0.71	-9.83	3.125
500	0.73	-7.77	3.125
600	0.80	-5.80	3.125
700	1.02	-4.65	3.125
800	1.05	-2.71	3.125
900	0.75	-1.73	3.125
1000	1.38	-1.06	3.125
1200	1.51	0.68	3.125
1400	1.90	1.31	3.125
1600	1.91	2.81	3.125
1800	1.97	4.92	3.125
2000	2.33	5.90	3.125
2200	2.28	5.85	3.125
2400	2.50	6.58	3.125
2600	2.33	7.84	3.125
2700	2.40	8.02	3.125
2800	2.91	8.67	3.125
3000	1.95	8.94	3.125
3500	2.00	10.02	3.125
4000	1.07	-20.23	3.125
4500	0.83	-21.10	3.125
5000	0.41	-22.29	3.125





479.9875MHz@ 12.5 KHz Channel Separation			
Modulation Frequency (Hz)	Peak Freq. Deviation (KHz)	Audio Frequency Response (dB)	Limit (KHz)
100	0.81	-22.10	3.125
200	0.98	-21.14	3.125
300	0.54	-10.91	3.125
400	0.78	-9.95	3.125
500	0.65	-7.76	3.125
600	0.88	-6.07	3.125
700	1.06	-4.89	3.125
800	1.27	-3.03	3.125
900	0.72	-1.66	3.125
1000	1.31	-1.39	3.125
1200	1.59	0.74	3.125
1400	1.97	1.20	3.125
1600	2.02	2.72	3.125
1800	2.08	4.80	3.125
2000	2.37	5.84	3.125
2200	2.44	5.76	3.125
2400	2.43	6.70	3.125
2600	2.37	7.75	3.125
2700	2.43	7.96	3.125
2800	3.02	8.54	3.125
3000	2.03	8.76	3.125
3500	2.08	9.85	3.125
4000	0.93	-20.14	3.125
4500	0.93	-21.24	3.125
5000	0.46	-22.22	3.125





6. LIST OF MEASURING EQUIPMENT

Item	Equipment	Manufacturer	Model No.	Serial No.	Cal Date	Due Date
1	Power Meter	R&S	NRVS	100444	2024-06-06	2025-06-05
2	Power Sensor	R&S	NRV-Z81	100458	2024-06-06	2025-06-05
3	Power Sensor	R&S	NRV-Z32	10057	2024-06-06	2025-06-05
4	Test Software	Tonscend	JS1120-2	/	N/A	N/A
5	RF Control Unit	Tonscend	JS0806-2	N/A	2024-11-08	2025-11-07
6	MXA Signal Analyzer	Agilent	N9020A	MY50510140	2024-10-08	2025-10-07
7	DC Power Supply	Agilent	E3642A	N/A	2024-10-08	2025-10-07
8	EMI Test Software	AUDIX	E3	/	N/A	N/A
9	3m Semi Anechoic Chamber	SIDT FRANKONIA	SAC-3M	03CH03-HY	2024-06-06	2025-06-05
10	Positioning Controller	Max-Full	MF7802BS	MF780208586	N/A	N/A
11	Active Loop Antenna	SCHWARZBECK	FMZB 1519B	00005	2024-07-13	2027-07-12
12	By-log Antenna	SCHWARZBECK	VULB9163	9163-470	2024-08-03	2027-08-02
13	Horn Antenna	SCHWARZBECK	BBHA 9120D	9120D-1925	2024-07-13	2027-07-12
14	Broadband Horn Antenna	SCHWARZBECK	BBHA 9170	791	2024-07-13	2027-07-12
15	Broadband Preamplifier	SCHWARZBECK	BBV9719	9719-025	2024-07-30	2025-07-29
16	EMI Test Receiver	R&S	ESR 7	101181	2024-06-06	2025-06-05
17	RS SPECTRUM ANALYZER	R&S	FSP40	100503	2024-06-06	2025-06-05
18	Low-frequency amplifier	SchwarzZBECK	BBV9745	00253	2024-10-08	2025-10-07
19	High-frequency amplifier	JS Denki Pte	PA0118-43	JSPA21009	2024-10-08	2025-10-07
20	6dB Attenuator	/	100W/6dB	1172040	2024-06-06	2025-06-05
21	3dB Attenuator	/	2N-3dB	/	2024-10-08	2025-10-07
22	EMI Test Receiver	R&S	ESPI	101940	2024-06-06	2025-06-05
23	Artificial Mains	R&S	ENV216	101288	2024-06-06	2025-06-05
24	10dB Attenuator	SCHWARZBECK	MTS-IMP-136	261115-001-0032	2024-06-06	2025-06-05
25	EMI Test Software	Farad	EZ	/	N/A	N/A
26	Antenna Mast	Max-Full	MFA-515BSN	1308572	N/A	N/A
27	Pulse Limiter	R&S	ESH3-Z2	102750-NB	2024-06-06	2025-06-05

7. TEST SETUP PHOTOGRAPHS OF EUT

Pleaserefer 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----------