



FCC PART 22, 74, 80

TEST REPORT

For

**Hytera Communications Corporation Limited**

Hytera Tower, Hi-Tech Industrial Park North, 9108# Beihuan Road, Nanshan District, Shenzhen,  
518057 China

**FCC ID: YAMPD78XU1**

<b>Report Type:</b> Class II Permissive Change	<b>Product Type:</b> Digital Portable Radio
<b>Report Number:</b> RDG170907008-00A1	
<b>Report Date:</b> 2017-11-06	
<b>Reviewed By:</b> RF Engineer	Rocky Kang <i>Rocky Kang</i>
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**Note:** This test report is prepared for the customer shown above and for the equipment described herein. It may not be duplicated or used in part without prior written consent from Bay Area Compliance Laboratories Corp.

## TABLE OF CONTENTS

<b>GENERAL INFORMATION.....</b>	<b>3</b>
PRODUCT DESCRIPTION FOR EQUIPMENT UNDER TEST (EUT).....	3
OBJECTIVE .....	3
RELATED SUBMITTAL(S)/GRANT(S).....	3
TEST METHODOLOGY .....	3
MEASUREMENT UNCERTAINTY .....	4
TEST FACILITY .....	4
<b>SYSTEM TEST CONFIGURATION.....</b>	<b>5</b>
DESCRIPTION OF TEST CONFIGURATION .....	5
EUT EXERCISE SOFTWARE .....	5
SPECIAL ACCESSORIES.....	5
EQUIPMENT MODIFICATIONS .....	5
SUPPORT EQUIPMENT LIST AND DETAILS .....	5
EXTERNAL I/O CABLE.....	5
BLOCK DIAGRAM OF TEST SETUP .....	6
<b>SUMMARY OF TEST RESULTS .....</b>	<b>7</b>
<b>TEST EQUIPMENT LIST .....</b>	<b>8</b>
<b>FCC §1.1307(b) &amp; §2.1093 - RF EXPOSURE.....</b>	<b>9</b>
APPLICABLE STANDARD .....	9
<b>FCC §2.1046 &amp; § 22.727 &amp; §74.461 &amp; §80.215 - RF OUTPUT POWER .....</b>	<b>10</b>
APPLICABLE STANDARD .....	10
TEST PROCEDURE .....	10
TEST DATA .....	10
<b>FCC §2.1047 - MODULATION CHARACTERISTIC .....</b>	<b>11</b>
APPLICABLE STANDARD .....	11
TEST PROCEDURE .....	11
TEST DATA .....	11
<b>FCC §2.1049 &amp; §22.357 &amp; § 22.731 &amp; §74.462 &amp; § 80.205 &amp; § 80.207&amp; § 80.211 – OCCUPIED BANDWIDTH &amp; EMISSION MASK.....</b>	<b>32</b>
APPLICABLE STANDARD .....	32
TEST PROCEDURE .....	33
TEST DATA .....	33
<b>FCC §2.1051 &amp; §22.861 &amp; §74.462 &amp; § 80.211 - SPURIOUS EMISSIONS AT ANTENNA TERMINALS.....</b>	<b>42</b>
APPLICABLE STANDARD .....	42
TEST PROCEDURE .....	42
TEST DATA .....	42
<b>FCC §2.1053 &amp; §22.861 &amp; §74.462 &amp; § 80.211 - RADIATED SPURIOUS EMISSIONS.....</b>	<b>49</b>
APPLICABLE STANDARD .....	49
TEST PROCEDURE .....	49
TEST DATA .....	49
<b>FCC §2.1055 &amp; § 22.355 &amp; §74.464 &amp; § 80.209 - FREQUENCY STABILITY .....</b>	<b>52</b>
APPLICABLE STANDARD .....	52
TEST PROCEDURE .....	52
TEST DATA .....	52

## GENERAL INFORMATION

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### Product Description for Equipment under Test (EUT)

The *Hytera Communications Corporation Limited's* product, model number: *PD752 U(1)* (*FCC ID: YAMPD78XU1*) in this report is a *Digital Portable Radio* which was measured approximately: 140 mm (L) x 65 mm (W) x 40 mm (H), rated input voltage: DC 7.4V battery.

*\* All measurement and test data in this report was gathered from production sample serial number: 170907008 (Assigned by BACL, Shenzhen). The EUT supplied by the applicant was received on 2017-09-07.*

### Objective

This test report is prepared on behalf of *Hytera Communications Corporation Limited* in accordance with Part 2, and Part 22, 74, 80 of the Federal Communication Commissions rules.

This is a CIIPC application of the device; the differences between the original device and the current one are as follows:

- (1) Adding standards FCC Part 22, 74, 80;
- (2) Changing the model number to "PD752 U(1)".

### Related Submittal(s)/Grant(s)

No Related Submittal(s)/Grant(s).

### Test Methodology

All tests and measurements indicated in this document were performed in accordance with the Code of federal Regulations Title 47 Part 2, Sub-part J as well as the following individual parts:

Part 22 – Public Mobile Service

Part 74 – Experimental Radio, Auxiliary, Special Broadcast and other Program Distributonal Service

Part 80 – Stantions in the Maritme Service

Applicable Standards: TIA 603-D.

All emissions measurement was performed at Bay Area Compliance Laboratories Corp. (Shenzhen). The radiated testing was performed at an antenna-to-EUT distance of 3 meters.

**Measurement Uncertainty**

Parameter	uncertainty
Occupied Channel Bandwidth	±5%
RF output power, conducted	±1.5dB
Unwanted Emission, conducted	±1.5dB
All emissions, radiated	±4.88dB
Temperature	±1 °C
Supply voltages	±0.4%

**Test Facility**

The test site used by Bay Area Compliance Laboratories Corp. (Shenzhen) to collect test data is located on the 6/F., West Wing, Third Phase of Wanli Industrial Building, Shihua Road, Futian Free Trade Zone, Shenzhen, Guangdong, China.

Bay Area Compliance Laboratories Corp. (Shenzhen) has been accredited to ISO/IEC 17025 by CNAS (Lab code: L2408). And accredited to ISO/IEC 17025 by NVLAP (Lab code: 200707-0), the FCC Designation No. CN5001 under the KDB 974614 D01.

The Federal Communications Commission has the reports on file and is listed under FCC Registration No.: 382179. The test site has been approved by the FCC for public use and is listed in the FCC Public Access Link (PAL) database.

Bay Area Compliance Laboratories Corp. (Shenzhen) was registered with ISED Canada under ISED Canada Registration Number 3062B.

## SYSTEM TEST CONFIGURATION

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### Description of Test Configuration

The system was configured for testing in a test mode which has been done in the factory.

### EUT Exercise Software

No exercise software was used.

### Special Accessories

No special accessory was used.

### Equipment Modifications

No modification was made to the EUT tested.

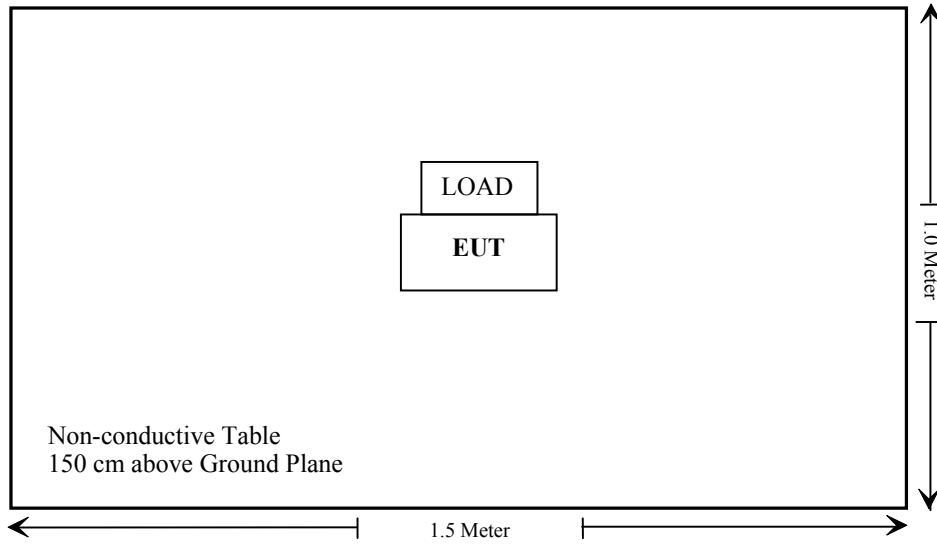
### Support Equipment List and Details

Manufacturer	Description	Model	Serial Number
N/A	Load	N/A	N/A

### External I/O Cable

Cable Description	Length (m)	From Port	To
N/A	N/A	N/A	N/A

**Block Diagram of Test Setup**



**SUMMARY OF TEST RESULTS**

<b>FCC Rules</b>	<b>Description of Test</b>	<b>Results</b>
FCC §1.1307(b) & §2.1093	RF Exposure	Compliance
§2.1046; § 22.727; §74.461; § 80.215	RF Output Power	Compliance
§2.1047	Modulation Characteristic	Compliance
§2.1049; §22.357; § 22.731; §74.462; § 80.205; § 80.207; § 80.211	Occupied Bandwidth & Emission Mask	Compliance
§2.1051; §22.861; §74.462; § 80.211	Spurious Emission at Antenna Terminal	Compliance
§2.1053; §22.861; §74.462; § 80.211	Spurious Radiated Emissions	Compliance
§2.1055; § 22.355; §74.464; § 80.209	Frequency Stability	Compliance

**TEST EQUIPMENT LIST**

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
<b>Radiated Emission Test</b>					
Sunol Sciences	Horn Antenna	DRH-118	A052604	2014-12-29	2017-12-28
Rohde & Schwarz	Signal Generator	FSIQ26	8386001028	2017-04-24	2018-04-24
Sunol Sciences	Bi-log Antenna	JB1	A040904-2	2014-12-17	2017-12-16
Mini	Pre-amplifier	ZVA-183-S+	5969001149	2017-02-14	2018-02-14
HP	Amplifier	HP8447E	1937A01046	2017-05-21	2017-11-19
Anritsu	Signal Generator	68369B	004114	2016-12-05	2017-12-05
Rohde & Schwarz	EMI Test Receiver	ESCI	101120	2016-12-07	2017-12-07
COM POWER	Dipole Antenna	AD-100	041000	NCR	NCR
A.H. System	Horn Antenna	SAS-200/571	135	2015-08-18	2018-08-17
Ducommun technologies	RF Cable	UFA210A-1-4724-30050U	MFR64369 223410-001	2017-05-21	2017-11-19
Ducommun technologies	RF Cable	104PEA	218124002	2017-05-21	2017-11-19
Ducommun technologies	RF Cable	RG-214	1	2017-05-21	2017-11-19
Ducommun technologies	RF Cable	RG-214	2	2017-05-22	2017-11-22
<b>RF Conducted Test</b>					
Rohde & Schwarz	SPECTRUM ANALYZER	FSU26	200120	2016-12-05	2017-12-05
ESPEC	Temperature & Humidity Chamber	EL-10KA	09107726	2016-11-22	2017-11-22
Long Wei	DC Power Supply	TPR-6420D	398363	NCR	NCR
HP Agilent	RF Communication Test Set	HP8920	3325U00859	2017-05-07	2018-05-07
Ducommun technologies	RF Cable	RG-214	3	2017-05-22	2017-11-22
WEINSCHEL	30dB Attenuator	53-30-43	PG633	2017-05-22	2017-11-22

\* **Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Shenzhen) attests that all calibrations have been performed in accordance to requirements that traceable to National Primary Standards and International System of Units (SI).



**FCC §1.1307(b) & §2.1093 - RF EXPOSURE**

**Applicable Standard**

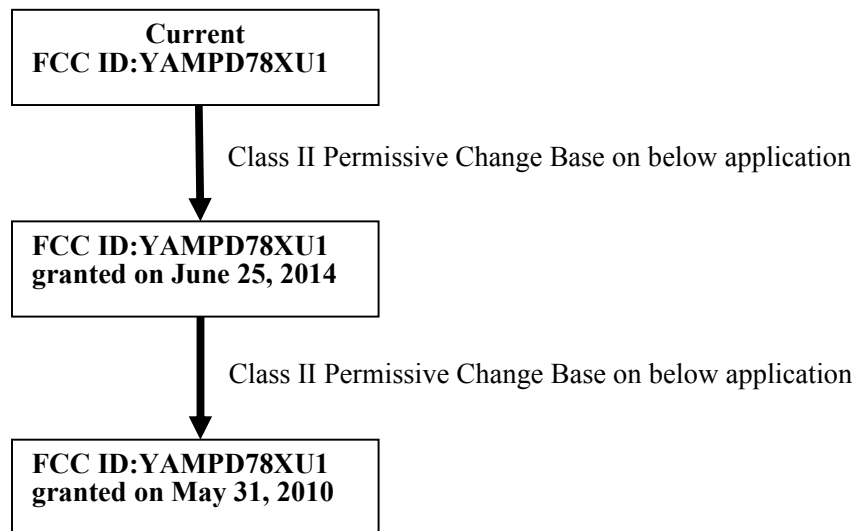
According to FCC §1.1307(b) and §2.1093, portable device operates Part 90 should be subjected to routine environmental evaluation for RF exposure prior or equipment authorization or use.

**Result:** Compliance.

Please refer to original SAR report number: RZA2010-0444, which is tested by TA Technology (Shanghai) Co., Ltd. issued on April 6th, 2010. FCC ID: YAMPD78XU1, granted on May 31th, 2010.

Because current report,RF output power is not higher than original report and the original SAR report already tested with FM mode@12.5 kHz/25 kHz channel bandwidth and 4FSK mode@12.5 kHz bandwidth of the frequency range 400-470 MHz. Additional SAR testing is not necessary.

Please refer to below chart for current report and original SAR report relationship



## **FCC §2.1046 & § 22.727 & §74.461 & §80.215 - RF OUTPUT POWER**

### **Applicable Standard**

FCC §2.1046, § 22.727, §74.461, § 80.215

### **Test Procedure**

Conducted RF Output Power:

The RF output of the transmitter was connected to the input of the spectrum analyzer through sufficient attenuation.

Spectrum Analyzer Setting:

R B/W	Video B/W
100 kHz	300 kHz

### **Test Data**

#### **Environmental Conditions**

<b>Temperature:</b>	25 °C
<b>Relative Humidity:</b>	56 %
<b>ATM Pressure:</b>	101.0 kPa

*The testing was performed by Simon Wang on 2017-11-06*

*Test Mode: Transmitting*

**Test Result:** Compliance. Please refer to following table.

<b>Modulation</b>	<b>Channel Separation (kHz)</b>	<b>Frequency (MHz)</b>	<b>Conducted Output Power (dBm)</b>	<b>Conducted Output Power (W)</b>	<b>Note</b>
Digital	12.5	453.2125	35.52	3.564	For Part 74
		456.0125	35.51	3.556	For Part 22
Analog	12.5	453.2125	35.50	3.548	For Part 74
		456.0125	35.49	3.540	For Part 22
	25	453.2125	35.40	3.467	For Part 74
		456.0125	35.42	3.483	For Part 22 & For Part 80

Note: The high rated power is 4W

## **FCC §2.1047 - MODULATION CHARACTERISTIC**

### **Applicable Standard**

FCC§2.1047:

- (a) Equipment which utilizes voice modulated communication shall show the frequency response of the audio modulating circuit over a range of 100 to 5000 Hz. for equipment which is required to have a low pass filter, the frequency response of the filter, or all of the circuitry installed between the modulation limited and the modulated stage shall be supplied.
- (b) Equipment which employs modulation limiting, a curve showing the percentage of modulation versus the modulation input voltage shall be supplied.

### **Test Procedure**

Test Method: TIA/EIA-603 2.2.3

### **Test Data**

#### **Environmental Conditions**

<b>Temperature:</b>	25 °C
<b>Relative Humidity:</b>	56 %
<b>ATM Pressure:</b>	101.0 kPa

*The testing was performed by Simon Wang on 2017-09-15.*

*Test Mode: Transmitting*

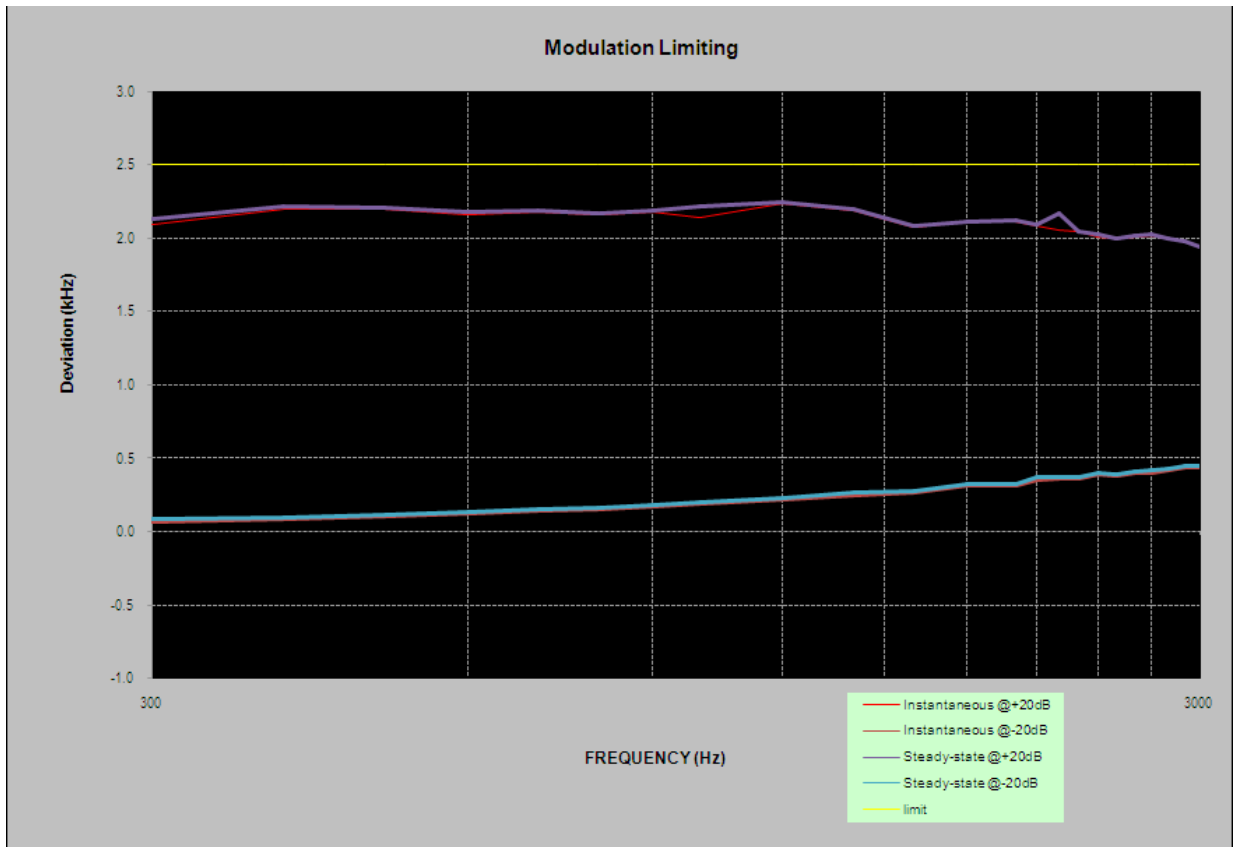
**Result:** Compliance.

**Analog Modulation:**

**MODULATION LIMITING**

Carrier Frequency: 453.2125MHz, Channel Separation=12.5 kHz

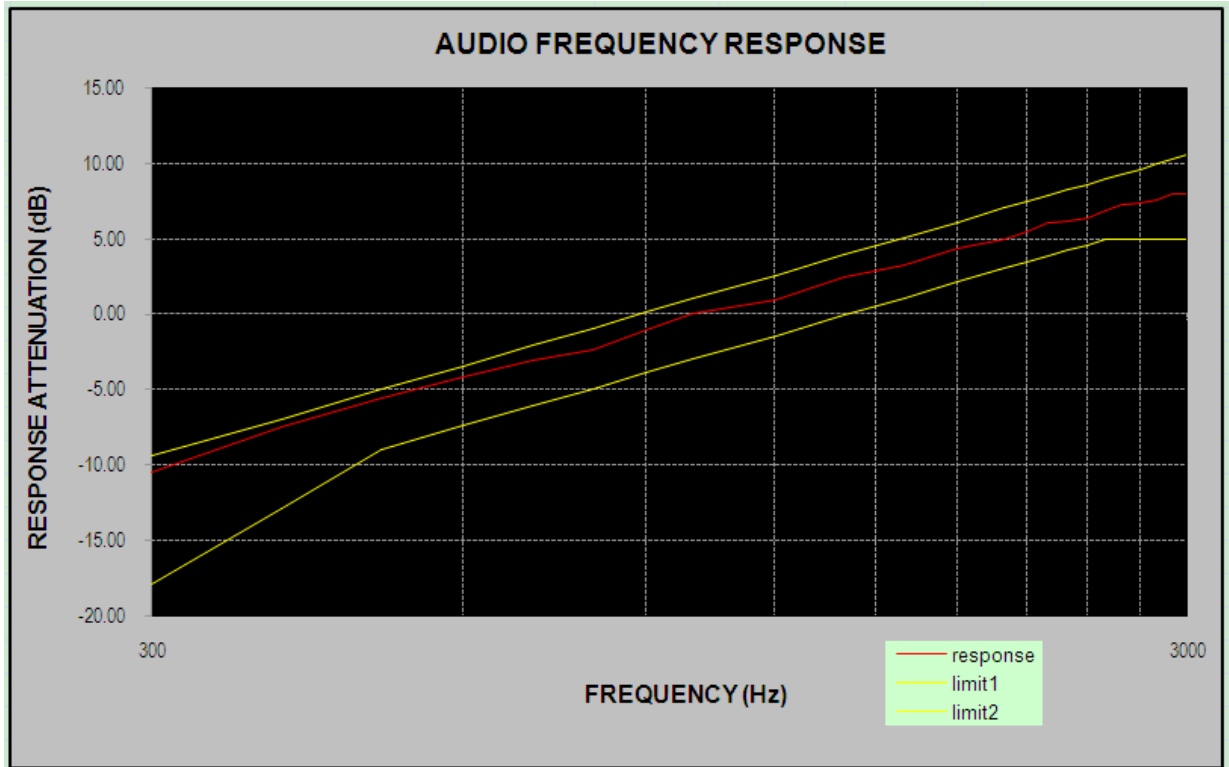
Audio Frequency (Hz)	Instantaneous		Steady-state		FCC Limit [kHz]
	DEVIATION (@+20dB) [kHz]	DEVIATION (@-20dB) [kHz]	DEVIATION (@+20dB) [kHz]	DEVIATION (@-20dB) [kHz]	
300	2.094	0.071	2.134	0.084	2.5
400	2.202	0.086	2.216	0.096	2.5
500	2.194	0.103	2.205	0.111	2.5
600	2.162	0.123	2.177	0.134	2.5
700	2.180	0.143	2.192	0.153	2.5
800	2.156	0.156	2.168	0.163	2.5
900	2.178	0.172	2.190	0.180	2.5
1000	2.140	0.192	2.216	0.199	2.5
1200	2.237	0.215	2.245	0.224	2.5
1400	2.192	0.251	2.202	0.263	2.5
1600	2.075	0.267	2.084	0.278	2.5
1800	2.110	0.310	2.114	0.319	2.5
2000	2.110	0.316	2.126	0.327	2.5
2100	2.083	0.355	2.094	0.367	2.5
2200	2.058	0.358	2.171	0.371	2.5
2300	2.043	0.361	2.049	0.374	2.5
2400	2.012	0.386	2.025	0.396	2.5
2500	1.994	0.382	2.002	0.394	2.5
2600	2.010	0.401	2.020	0.413	2.5
2700	2.014	0.404	2.023	0.417	2.5
2800	1.995	0.415	2.001	0.427	2.5
2900	1.976	0.437	1.984	0.446	2.5
3000	1.938	0.438	1.945	0.449	2.5



**Audio Frequency Response**

Carrier Frequency: 453.2125 MHz, Channel Separation=12.5 kHz

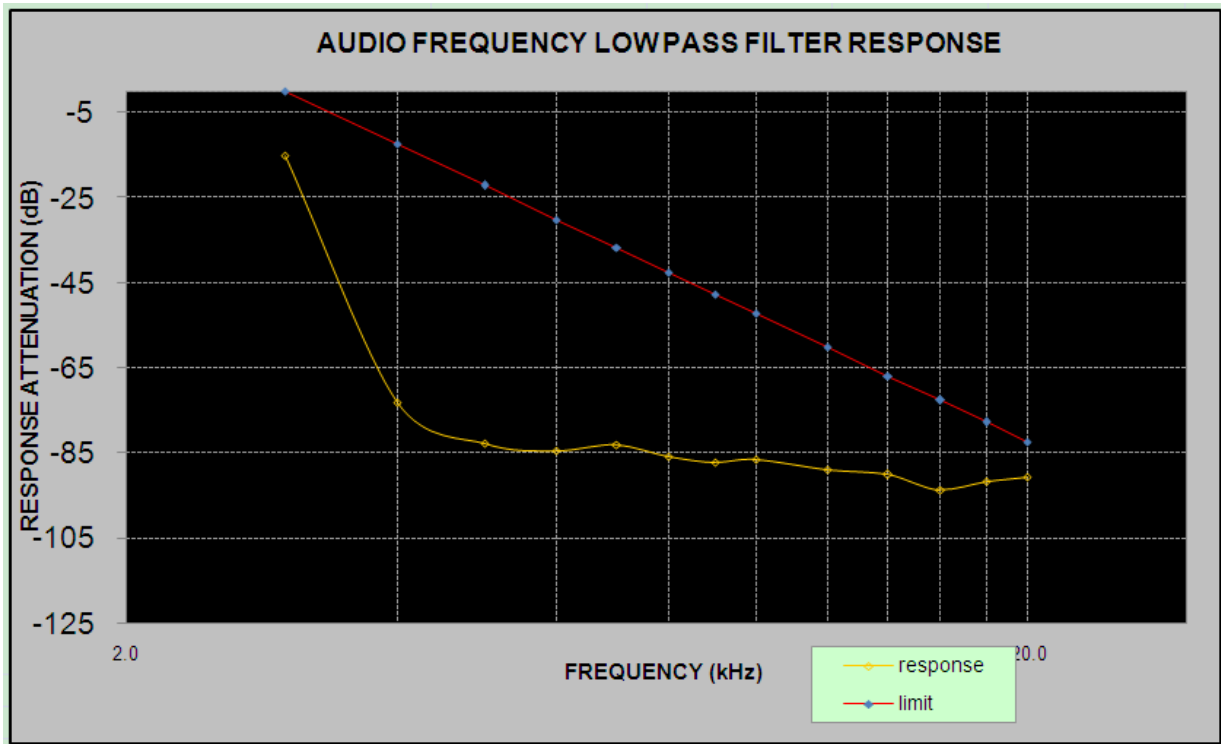
<b>Audio Frequency (Hz)</b>	<b>Response Attenuation (dB)</b>
300	-10.46
400	-7.45
500	-5.58
600	-4.18
700	-3.10
800	-2.34
900	-1.03
1000	0.00
1200	0.94
1400	2.42
1600	3.20
1800	4.36
2000	4.94
2100	5.49
2200	6.00
2300	6.18
2400	6.37
2500	6.86
2600	7.25
2700	7.35
2800	7.51
2900	7.92
3000	7.97



**Audio frequency lows pass filter response**

Carrier Frequency: 453.2125 MHz, Channel Separation=12.5 kHz

Audio Frequency (kHz)	Response Attenuation (dB)	Limit (dB)
1.0	0.0	/
3.0	-15	0.0
4.0	-73.1	-12.5
5.0	-82.9	-22.2
6.0	-84.5	-30.1
7.0	-83.1	-36.8
8.0	-85.9	-42.6
9.0	-87.3	-47.7
10.0	-86.7	-52.3
12.0	-88.9	-60.2
14.0	-90.2	-66.9
16.0	-93.7	-72.7
18.0	-91.8	-77.8
20.0	-90.6	-82.5

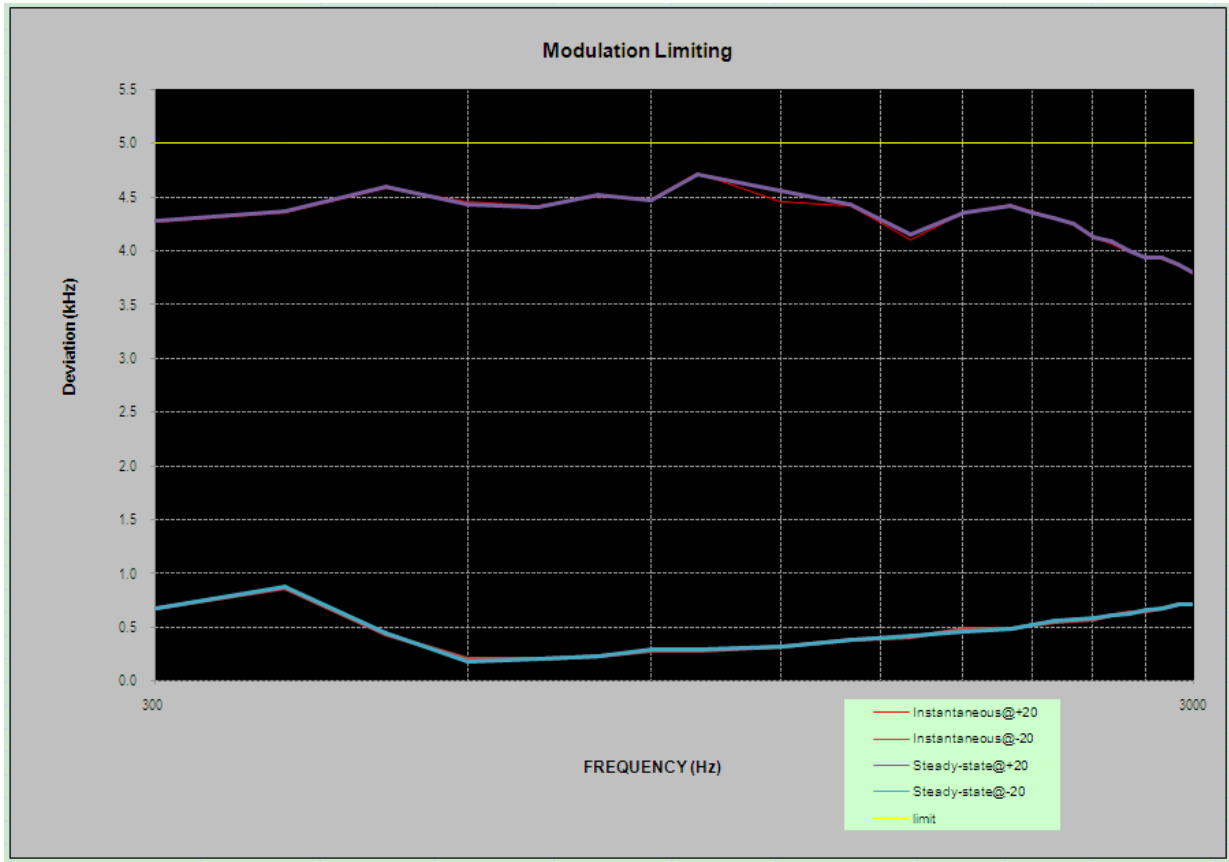




**MODULATION LIMITING**

Carrier Frequency: 453.2125 MHz, Channel Separation= 25 kHz

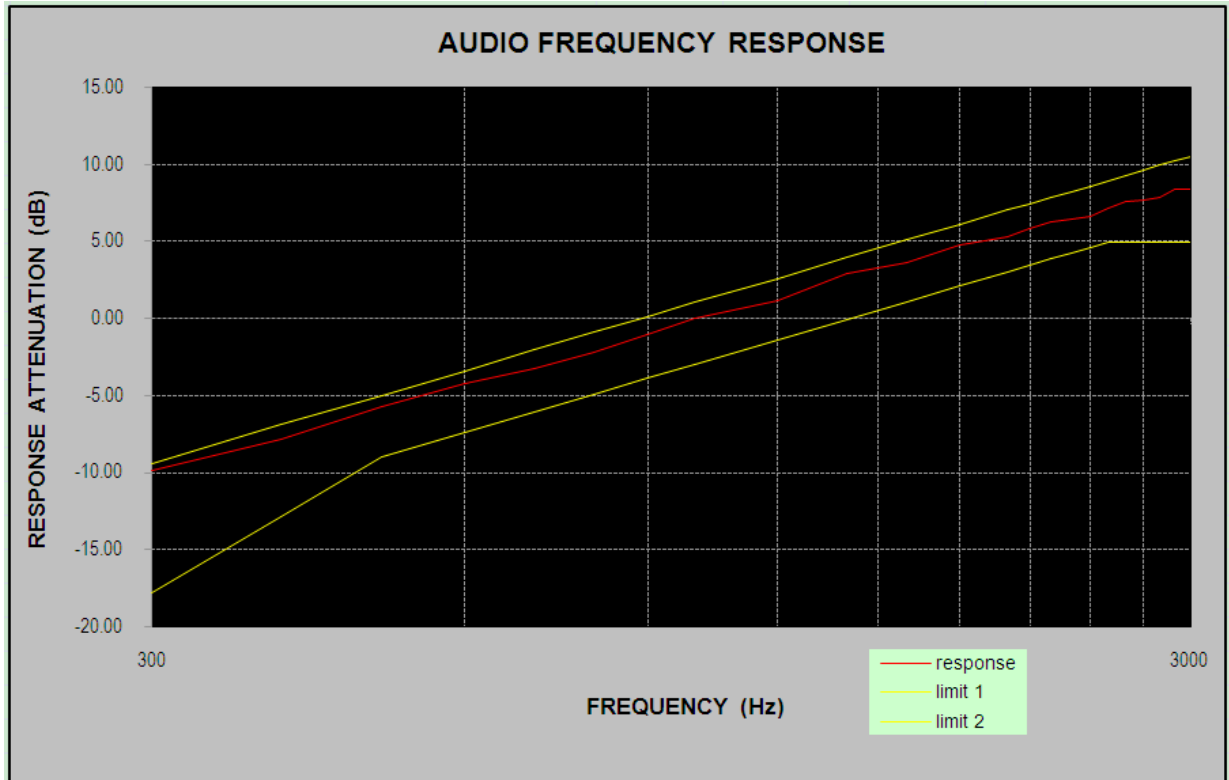
Audio Frequency (Hz)	Instantaneous		Steady-state		FCC Limit [kHz]
	DEVIATION (@+20dB) [kHz]	DEVIATION (@-20dB) [kHz]	DEVIATION (@+20dB) [kHz]	DEVIATION (@-20dB) [kHz]	
300	4.271	0.672	4.284	0.681	5.000
400	4.351	0.867	4.368	0.875	5.000
500	4.582	0.431	4.593	0.444	5.000
600	4.458	0.202	4.432	0.185	5.000
700	4.421	0.204	4.404	0.211	5.000
800	4.512	0.227	4.519	0.232	5.000
900	4.484	0.287	4.476	0.294	5.000
1000	4.721	0.284	4.711	0.291	5.000
1200	4.454	0.321	4.565	0.328	5.000
1400	4.425	0.385	4.431	0.379	5.000
1600	4.103	0.415	4.156	0.418	5.000
1800	4.352	0.487	4.357	0.463	5.000
2000	4.432	0.491	4.425	0.487	5.000
2100	4.367	0.523	4.358	0.529	5.000
2200	4.302	0.554	4.310	0.562	5.000
2300	4.247	0.561	4.260	0.571	5.000
2400	4.123	0.571	4.134	0.583	5.000
2500	4.067	0.609	4.094	0.613	5.000
2600	3.991	0.634	4.001	0.628	5.000
2700	3.934	0.652	3.940	0.667	5.000
2800	3.927	0.672	3.941	0.680	5.000
2900	3.860	0.710	3.873	0.719	5.000
3000	3.783	0.712	3.796	0.720	5.000



**Audio Frequency Response**

Carrier Frequency: 453.2125 MHz, Channel Separation= 25 kHz

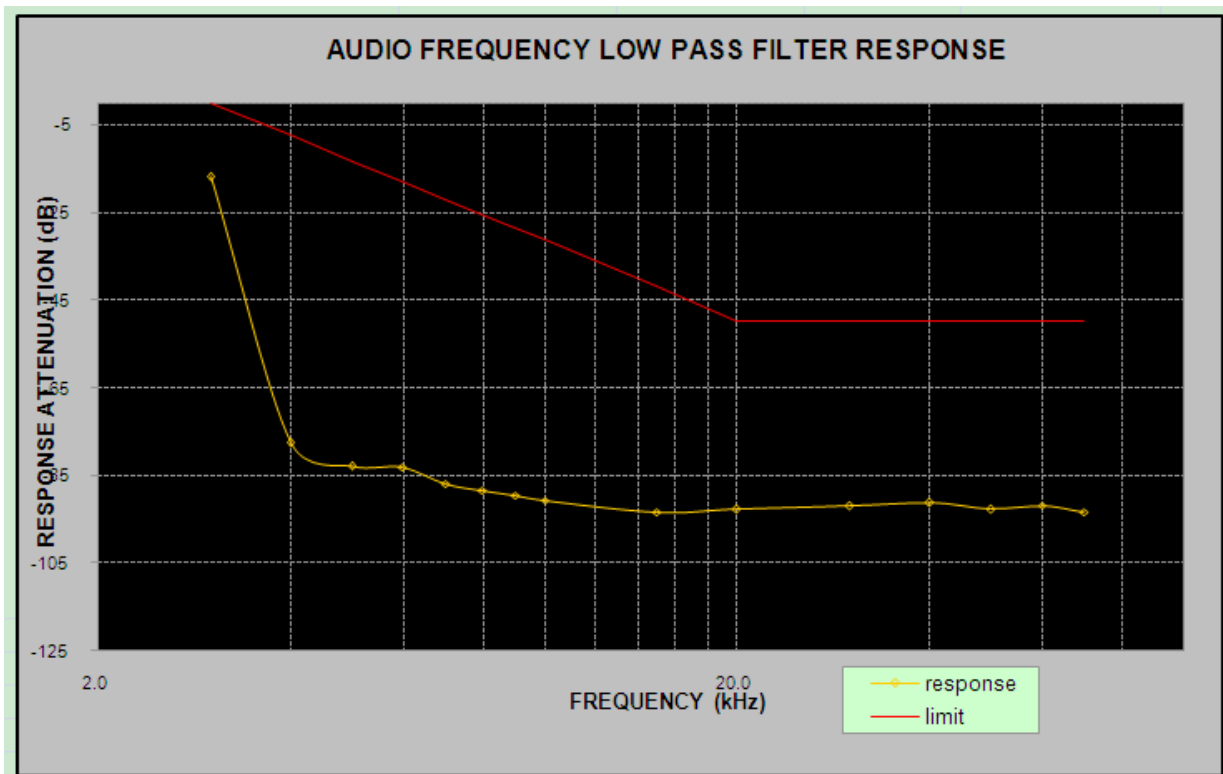
<b>Audio Frequency (Hz)</b>	<b>Response Attenuation (dB)</b>
300	-9.92
400	-7.89
500	-5.76
600	-4.28
700	-3.24
800	-2.25
900	-1.07
1000	0.00
1200	1.15
1400	2.85
1600	3.56
1800	4.78
2000	5.28
2100	5.81
2200	6.27
2300	6.43
2400	6.61
2500	7.12
2600	7.57
2700	7.69
2800	7.88
2900	8.36
3000	8.32



**Audio frequency lows pass filter response**

Carrier Frequency: 453.2125 MHz, Channel Separation= 25 kHz

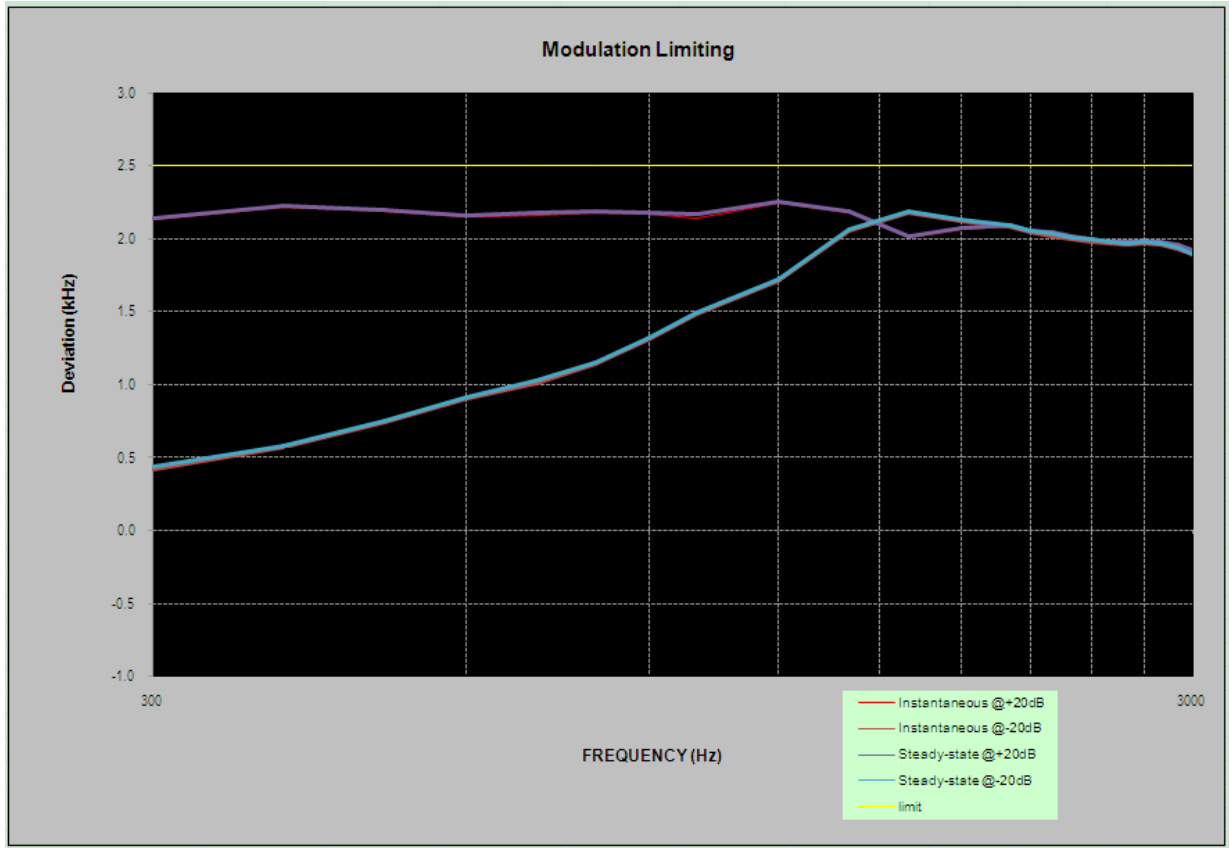
Audio Frequency (kHz)	Response Attenuation (dB)	Limit (dB)
1.0	0.0	/
3.0	-16.8	0.0
4.0	-77.5	-7.5
5.0	-82.9	-13.3
6.0	-83.1	-18.1
7.0	-86.9	-22.1
8.0	-88.4	-25.6
9.0	-89.6	-28.6
10.0	-90.7	-31.4
15.0	-93.4	-41.9
20.0	-92.8	-50.0
30.0	-92.1	-50.0
40.0	-91.3	-50.0
50.0	-92.7	-50.0



**MODULATION LIMITING**

Carrier Frequency: 456.0125MHz, Channel Separation=12.5 kHz

Audio Frequency (Hz)	Instantaneous		Steady-state		FCC Limit [kHz]
	DEVIATION (@+20dB) [kHz]	DEVIATION (@-20dB) [kHz]	DEVIATION (@+20dB) [kHz]	DEVIATION (@-20dB) [kHz]	
300	2.131	0.422	2.143	0.434	2.5
400	2.220	0.571	2.231	0.583	2.5
500	2.189	0.742	2.194	0.753	2.5
600	2.155	0.900	2.164	0.913	2.5
700	2.162	1.012	2.176	1.024	2.5
800	2.182	1.142	2.190	1.154	2.5
900	2.166	1.312	2.183	1.322	2.5
1000	2.145	1.484	2.166	1.496	2.5
1200	2.242	1.713	2.259	1.722	2.5
1400	2.183	2.052	2.192	2.063	2.5
1600	2.012	2.181	2.022	2.189	2.5
1800	2.067	2.123	2.077	2.133	2.5
2000	2.084	2.086	2.093	2.094	2.5
2100	2.045	2.045	2.053	2.057	2.5
2200	2.032	2.022	2.043	2.034	2.5
2300	2.004	1.998	2.016	2.004	2.5
2400	1.982	1.983	2.003	1.996	2.5
2500	1.972	1.972	1.984	1.980	2.5
2600	1.963	1.963	1.977	1.971	2.5
2700	1.973	1.971	1.984	1.982	2.5
2800	1.966	1.958	1.975	1.966	2.5
2900	1.942	1.933	1.956	1.940	2.5
3000	1.911	1.894	1.921	1.897	2.5

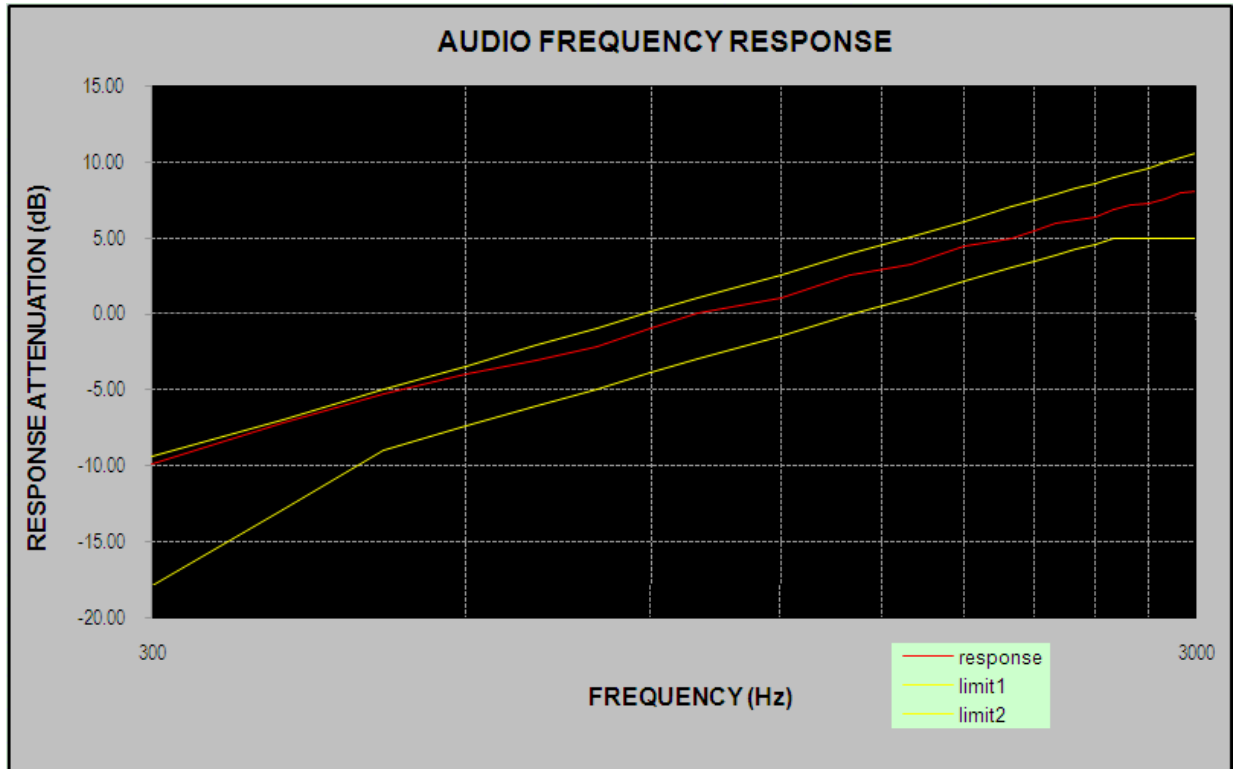


**Audio Frequency Response**

Carrier Frequency: 456.0125 MHz, Channel Separation=12.5 kHz

<b>Audio Frequency (Hz)</b>	<b>Response Attenuation (dB)</b>
300	-9.90
400	-7.17
500	-5.32
600	-3.93
700	-3.02
800	-2.18
900	-0.95
1000	0.00
1200	1.06
1400	2.58
1600	3.25
1800	4.41
2000	4.92
2100	5.41
2200	5.99
2300	6.12
2400	6.29
2500	6.81
2600	7.14
2700	7.22
2800	7.54
2900	7.91
3000	8.03

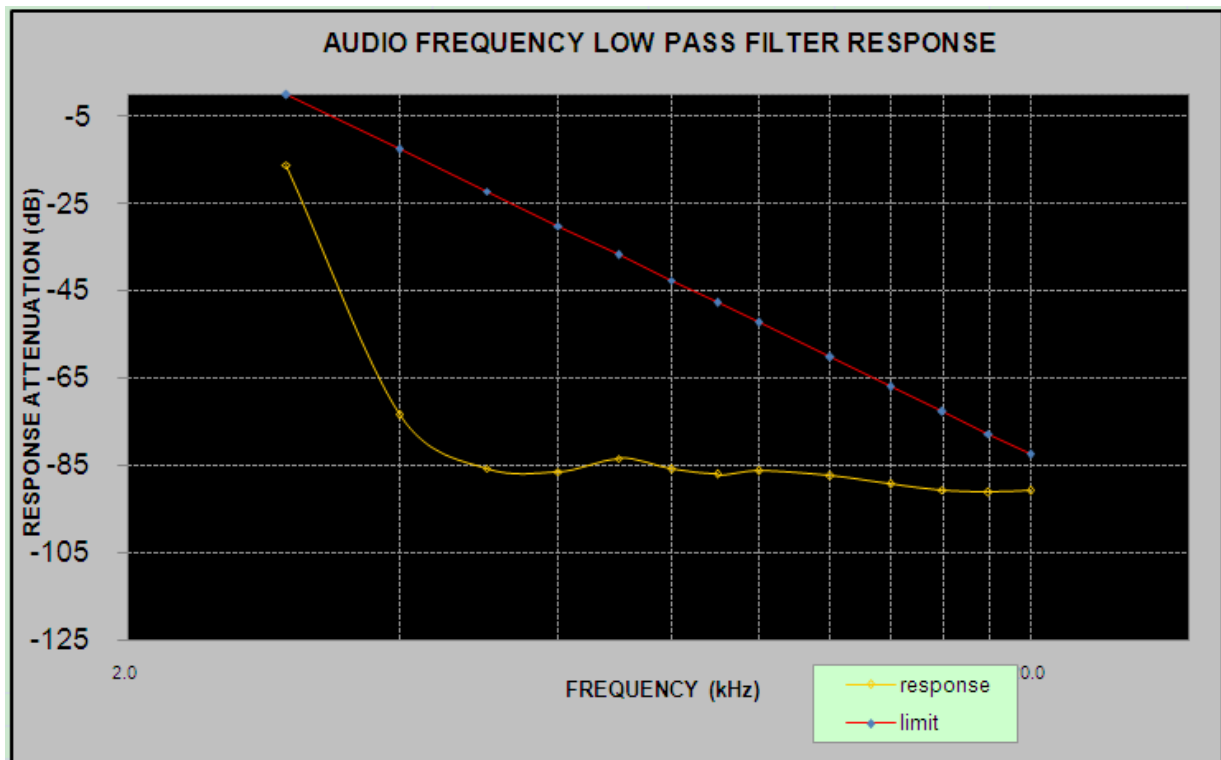




**Audio frequency lows pass filter response**

Carrier Frequency: 456.0125 MHz, Channel Separation=12.5 kHz

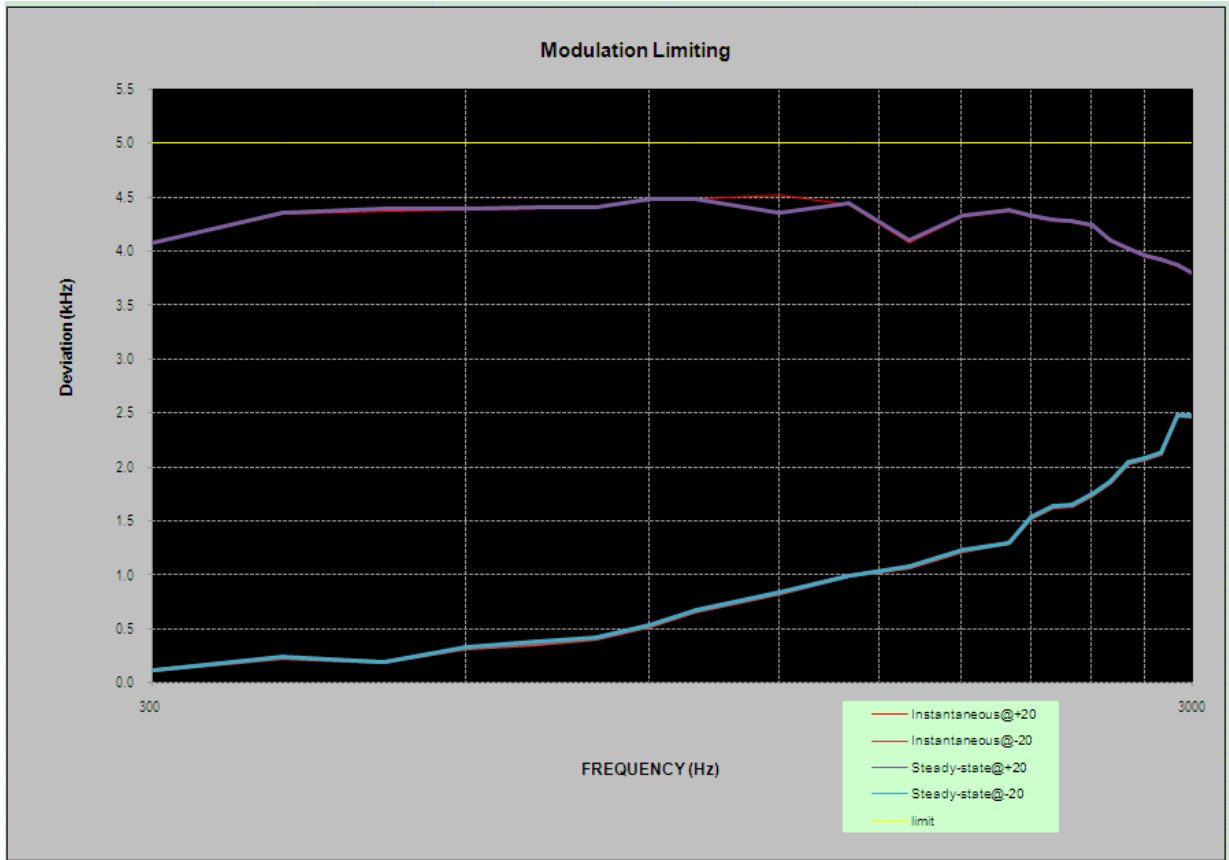
Audio Frequency (kHz)	Response Attenuation (dB)	Limit (dB)
1.0	0.0	/
3.0	-16.2	0.0
4.0	-73.5	-12.5
5.0	-85.7	-22.2
6.0	-86.4	-30.1
7.0	-83.4	-36.8
8.0	-85.9	-42.6
9.0	-87.1	-47.7
10.0	-86.3	-52.3
12.0	-87.4	-60.2
14.0	-89.4	-66.9
16.0	-90.6	-72.7
18.0	-91.2	-77.8
20.0	-90.9	-82.5



**MODULATION LIMITING**

Carrier Frequency: 456.0125 MHz, Channel Separation= 25 kHz

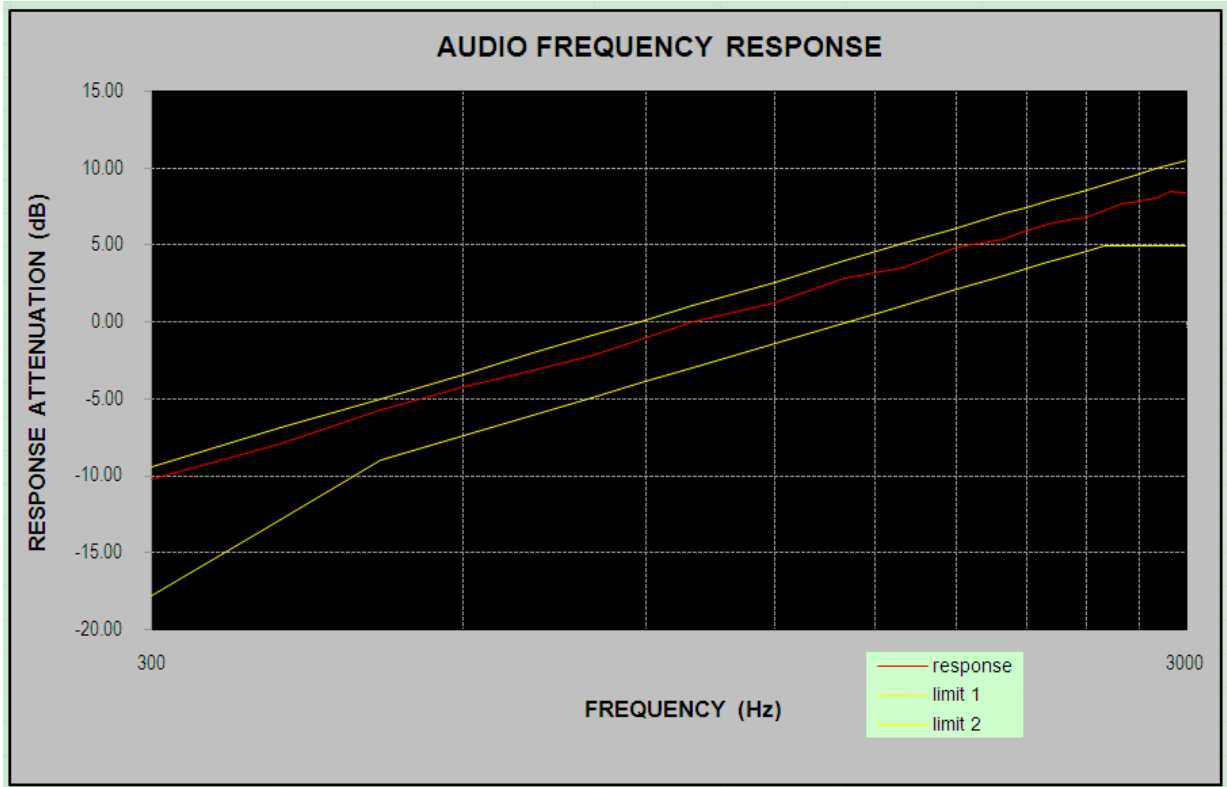
Audio Frequency (Hz)	Instantaneous		Steady-state		FCC Limit [kHz]
	DEVIATION (@+20dB) [kHz]	DEVIATION (@-20dB) [kHz]	DEVIATION (@+20dB) [kHz]	DEVIATION (@-20dB) [kHz]	
300	4.072	0.116	4.081	0.124	5.000
400	4.343	0.234	4.354	0.240	5.000
500	4.374	0.191	4.392	0.199	5.000
600	4.386	0.323	4.397	0.333	5.000
700	4.395	0.361	4.401	0.379	5.000
800	4.402	0.410	4.412	0.419	5.000
900	4.475	0.523	4.484	0.534	5.000
1000	4.481	0.666	4.489	0.674	5.000
1200	4.527	0.832	4.353	0.844	5.000
1400	4.432	0.995	4.441	0.999	5.000
1600	4.075	1.074	4.101	1.089	5.000
1800	4.316	1.228	4.327	1.237	5.000
2000	4.373	1.299	4.385	1.304	5.000
2100	4.320	1.533	4.329	1.543	5.000
2200	4.284	1.623	4.295	1.635	5.000
2300	4.272	1.641	4.279	1.653	5.000
2400	4.234	1.747	4.245	1.751	5.000
2500	4.096	1.851	4.103	1.867	5.000
2600	4.019	2.031	4.030	2.041	5.000
2700	3.954	2.067	3.960	2.081	5.000
2800	3.912	2.122	3.925	2.130	5.000
2900	3.864	2.474	3.879	2.484	5.000
3000	3.783	2.467	3.794	2.477	5.000



**Audio Frequency Response**

Carrier Frequency: 456.0125 MHz, Channel Separation= 25 kHz

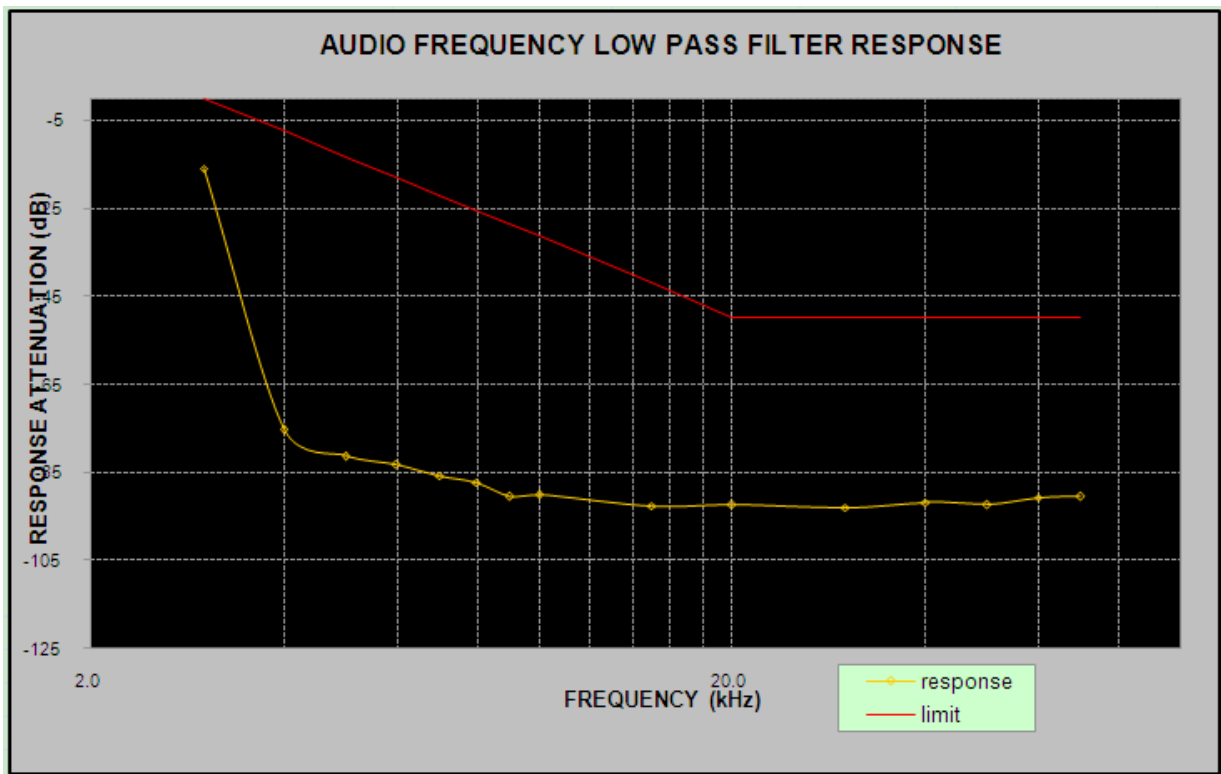
<b>Audio Frequency (Hz)</b>	<b>Response Attenuation (dB)</b>
300	-10.23
400	-7.94
500	-5.75
600	-4.25
700	-3.22
800	-2.24
900	-1.04
1000	0.00
1200	1.18
1400	2.81
1600	3.53
1800	4.86
2000	5.33
2100	5.88
2200	6.34
2300	6.56
2400	6.73
2500	7.24
2600	7.69
2700	7.83
2800	7.97
2900	8.44
3000	8.34



**Audio frequency lows pass filter response**

Carrier Frequency: 456.0125 MHz, Channel Separation= 25 kHz

Audio Frequency (kHz)	Response Attenuation (dB)	Limit (dB)
1.0	0.0	/
3.0	-15.9	0.0
4.0	-75.4	-7.5
5.0	-81.3	-13.3
6.0	-83.4	-18.1
7.0	-85.7	-22.1
8.0	-87.2	-25.6
9.0	-90.6	-28.6
10.0	-90.1	-31.4
15.0	-92.6	-41.9
20.0	-92.3	-50.0
30.0	-93	-50.0
40.0	-91.8	-50.0
50.0	-92.3	-50.0



## **FCC §2.1049 & §22.357 & § 22.731 & §74.462 & § 80.205 & § 80.207 & § 80.211 – OCCUPIED BANDWIDTH & EMISSION MASK**

### **Applicable Standard**

FCC §2.1049, §22.357, § 22.731, §74.462, § 80.205, § 80.207, § 80.211

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) For any frequency removed from the center of the authorized bandwidth  $f_0$  to 5.625 kHz removed from  $f_0$ , 0dB.
- 2) On any frequency removed from the center of the authorized bandwidth by a displacement frequency ( $f_d$  in kHz) of more than 5.626 kHz but no more than 12.5 kHz, at least  $7.27 (f_d - 2.88 \text{ kHz})$  dB.
- 3) 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: At least  $50 + 10 \log (P)$  dB or 70 dB, whichever is the lesser attenuation.

Emission Mask B - 25 kHz channel bandwidth equipment. For transmitters that are equipped with an audio low-pass filter, the power of any emission must be attenuated 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 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.

Measurement procedure. Compliance with these rules is based on the use of measurement instrumentation employing a resolution bandwidth of 30 kHz or more. In the 60 kHz bands immediately outside and adjacent to the authorized frequency range or channel, a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. A narrower resolution bandwidth is permitted in all cases to improve measurement accuracy provided the measured power is integrated over the full required measurement bandwidth (i.e., 30 kHz or 1 percent of emission bandwidth, as specified). The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power.



## Test Procedure

The RF output of the transmitter was connected to the input of the spectrum analyzer through sufficient attenuation.

The resolution bandwidth of the spectrum analyzer was set at 100 Hz or 300 Hz and the spectrum was recorded in the frequency band  $\pm 50$  kHz from the carrier frequency.

## Test Data

### Environmental Conditions

<b>Temperature:</b>	27 °C
<b>Relative Humidity:</b>	57 %
<b>ATM Pressure:</b>	101.0 kPa

The testing was performed by Simon Wang on 2017-09-15.

Modulation	Channel Separation (kHz)	Frequency (MHz)	99% Occupied Bandwidth (kHz)	26 dB Emissions Bandwidth (kHz)	Note
Digital	12.5	453.2125	7.21	9.46	For Part 74
	12.5	456.0125	6.97	7.93	For Part 22

### **For Digital Mode (Channel Spacing: 12.5 kHz)**

Emission Designator 7K60FXD and 7K60FXW

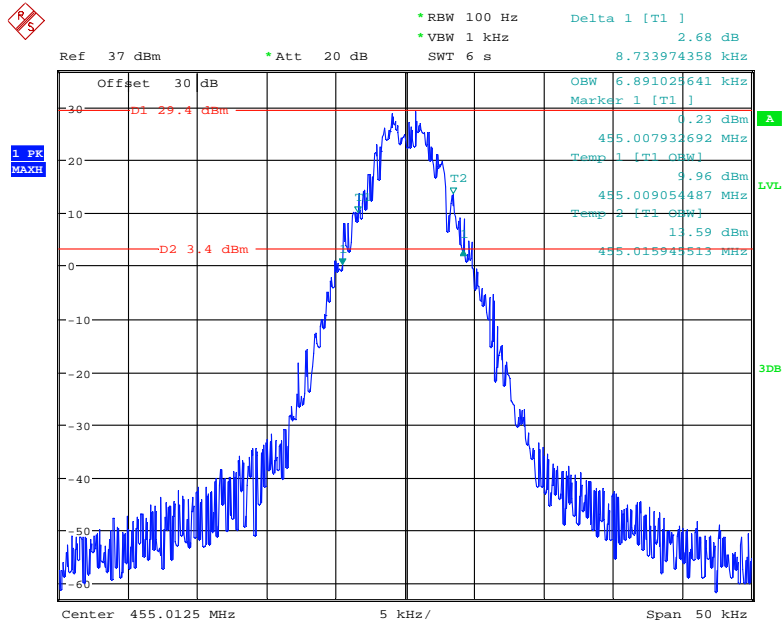
The 99% energy rule (title 47CFR 2.1049) was used for digital mode. It basically states that 99% of the modulation energy falls within X kHz, in this case, 7.21 kHz. The emission mask was obtained from 47CFR 90.210(d).

FXD and FXW portion of the designator indicates digital information.

Therefore, the entire designator for 12.5 kHz channel spacing digital mode is 7K60FXD and 7K60FXW.

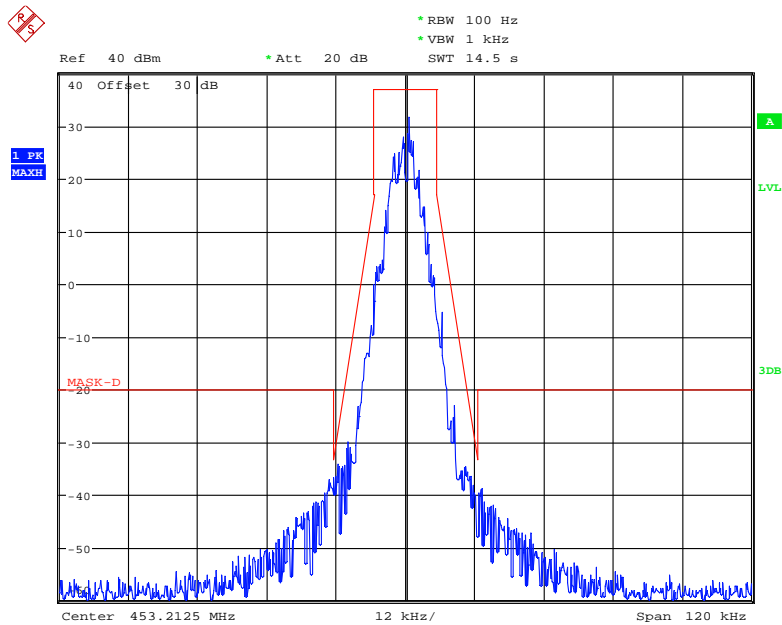
**Digital Modulation:**

**Frequency 453.2125 MHz: 99% Occupied & 26 dB Bandwidth**



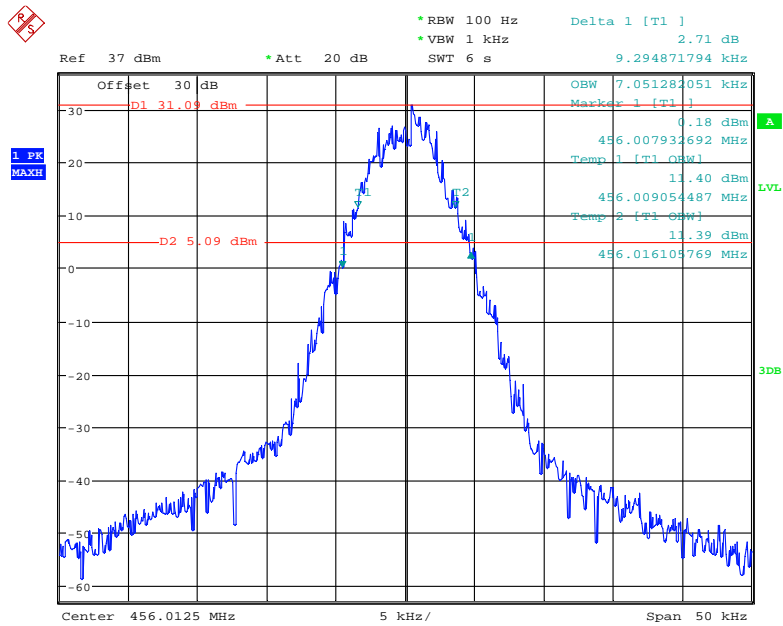
Date: 15.SEP.2017 09:53:23

**Frequency 453.2125 MHz: Emission Mask D, FCC part 74.462**



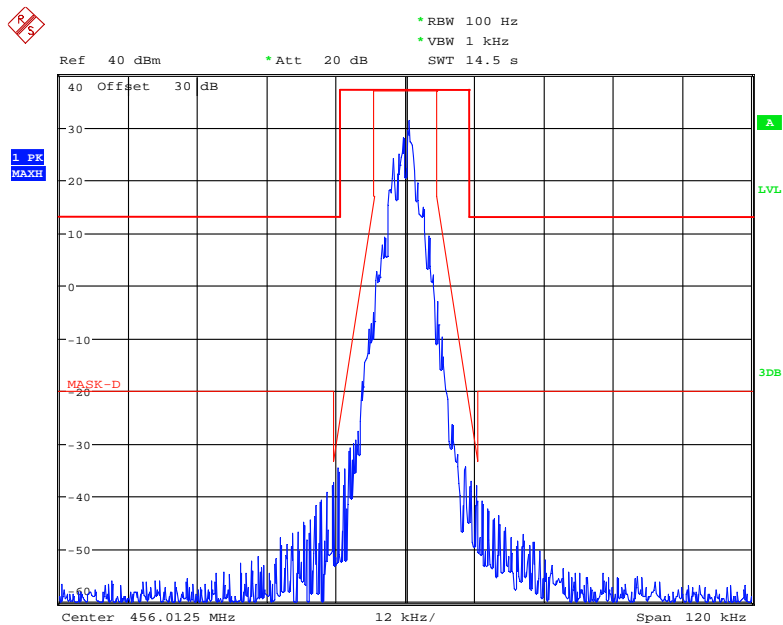
Date: 15.SEP.2017 12:00:44

**Frequency 456.0125 MHz: 99% Occupied & 26 dB Bandwidth**



Date: 15.SEP.2017 09:47:41

**Frequency 456.0125 MHz: Emission Mask, FCC part 22.359**



Date: 15.SEP.2017 11:52:16

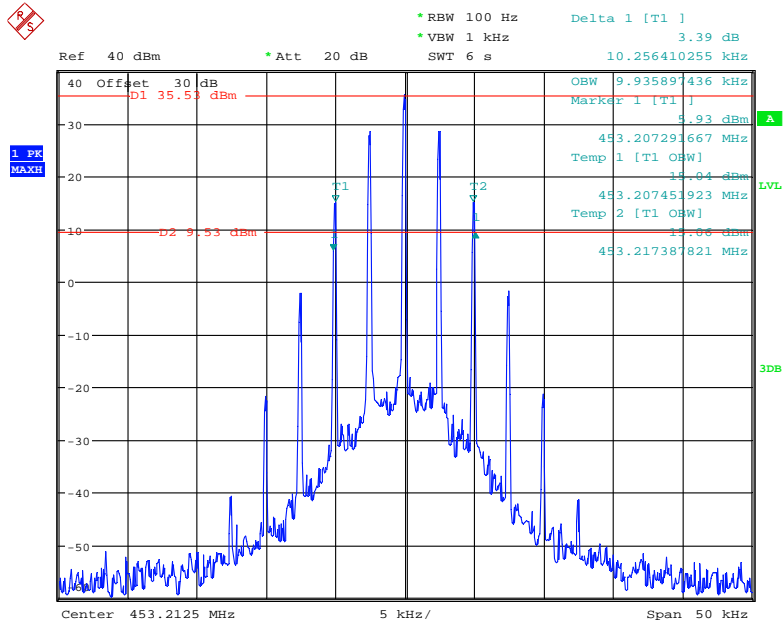
Modulation	Channel Separation (kHz)	Frequency (MHz)	99% Occupied Bandwidth (kHz)	26 dB Emissions Bandwidth (kHz)	Note
Analog	12.5	453.2125	9.94	10.26	For Part 74
	12.5	456.0125	9.94	10.26	For Part 22

**For FM Mode (Channel Spacing: 12.5 kHz)**

*Emission Designator 11K0F3E In this case, the maximum modulating frequency is 3.0 kHz with a 2.5 kHz deviation.  $BW = 2(M+D) = 2*(3.0\text{ kHz} + 2.5\text{ kHz}) = 11\text{ kHz} \rightarrow 11K0$   
 F3E portion of the designator represents an FM voice transmission Therefore, the entire designator for 12.5 kHz channel spacing FM mode is 11K0F3E.*

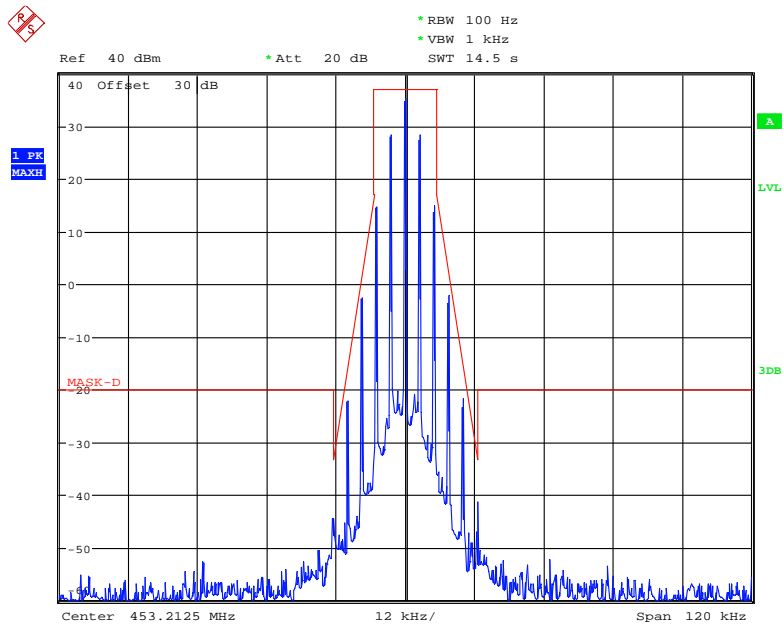
**Analog Modulation 12.5 kHz:**

**Frequency 453.2125 MHz: 99% Occupied & 26 dB Bandwidth**



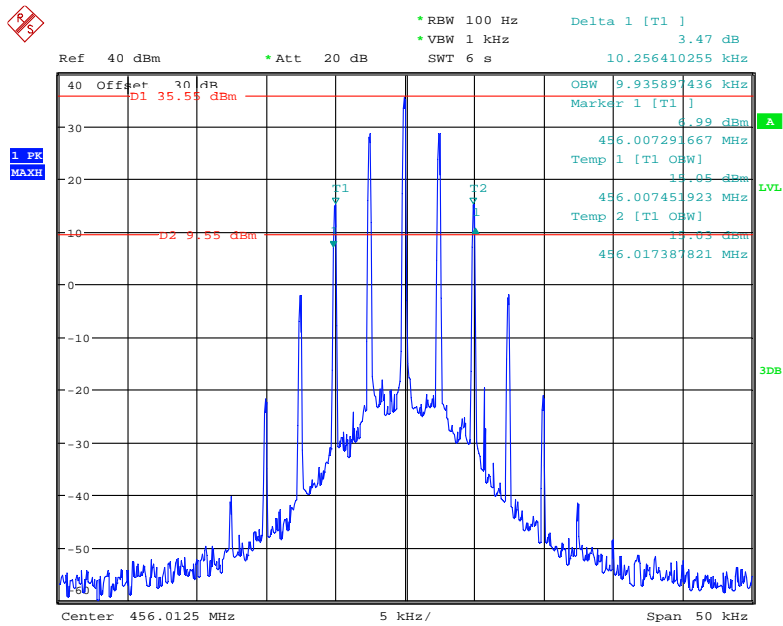
Date: 15.SEP.2017 10:06:56

**Frequency 453.2125 MHz: Emission Mask D, FCC part 74.462**



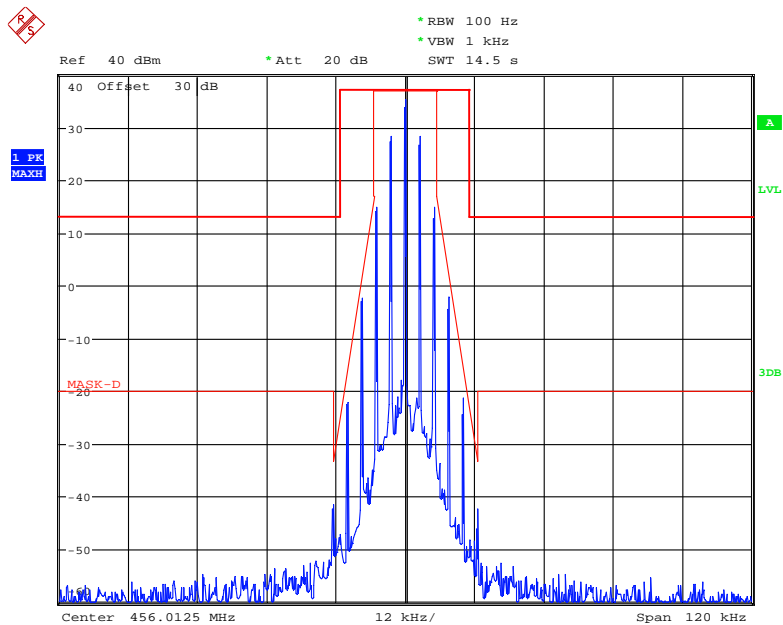
Date: 15.SEP.2017 11:41:40

**Frequency 456.0125 MHz: 99% Occupied & 26 dB Bandwidth**



Date: 15.SEP.2017 10:15:53

**Frequency 456.0125 MHz: Emission Mask, FCC part 22.359**



Date: 15.SEP.2017 11:48:58

Modulation	Channel Separation (kHz)	Frequency (MHz)	99% Occupied Bandwidth (kHz)	26 dB Emissions Bandwidth (kHz)	Note
Analog	25	453.2125	14.82	15.63	For Part 74
	25	456.0125	14.82	15.62	For Part 22& For Part 80

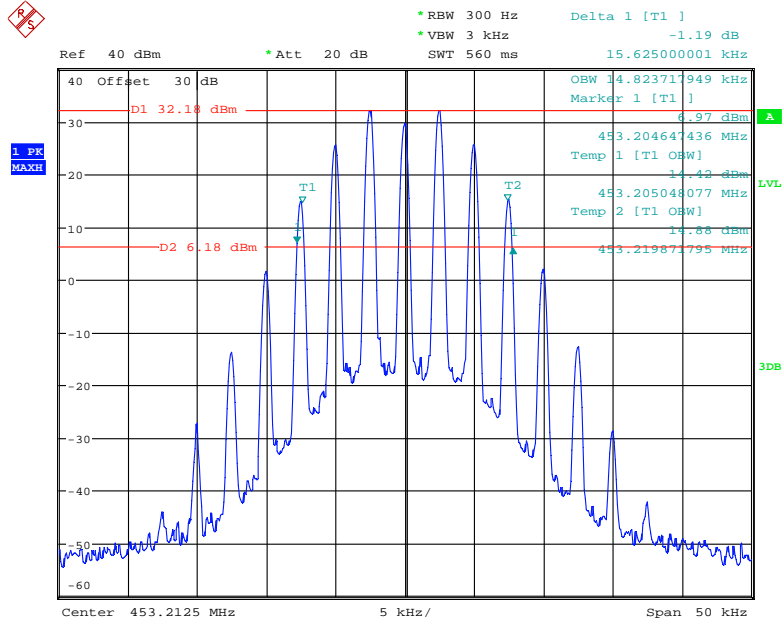
**For FM Mode (Channel Spacing: 25 kHz)**

*Emission Designator 16K0F3E* In this case, the maximum modulating frequency is 5.0 kHz with a 3.0 kHz deviation.  $BW = 2(M+D) = 2*(5.0\text{ kHz} + 3.0\text{ kHz}) = 16\text{ kHz} \rightarrow 16K0$

*F3E* portion of the designator represents an FM voice transmission Therefore, the entire designator for 25 kHz channel spacing FM mode is 16K0F3E.

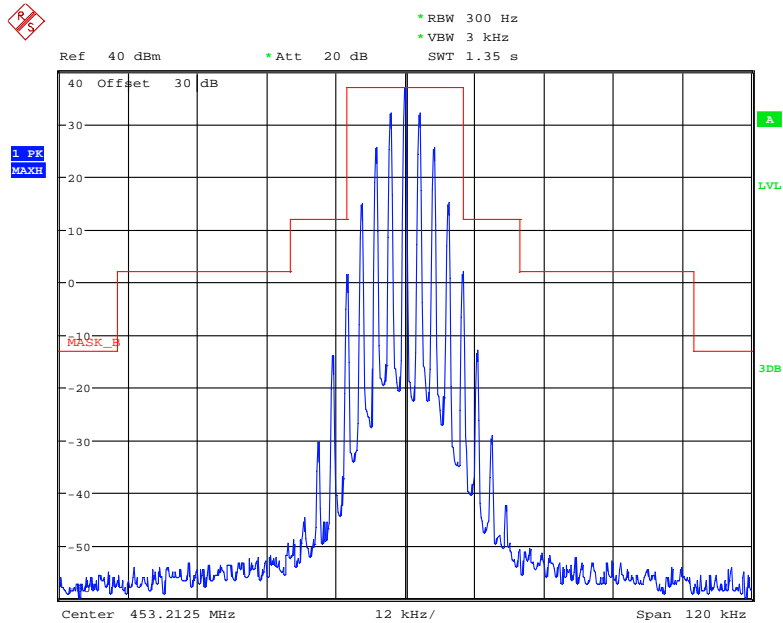
Analog Modulation 25 kHz:

Frequency 453.2125 MHz: 99% Occupied & 26 dB Bandwidth



Date: 15.SEP.2017 10:26:51

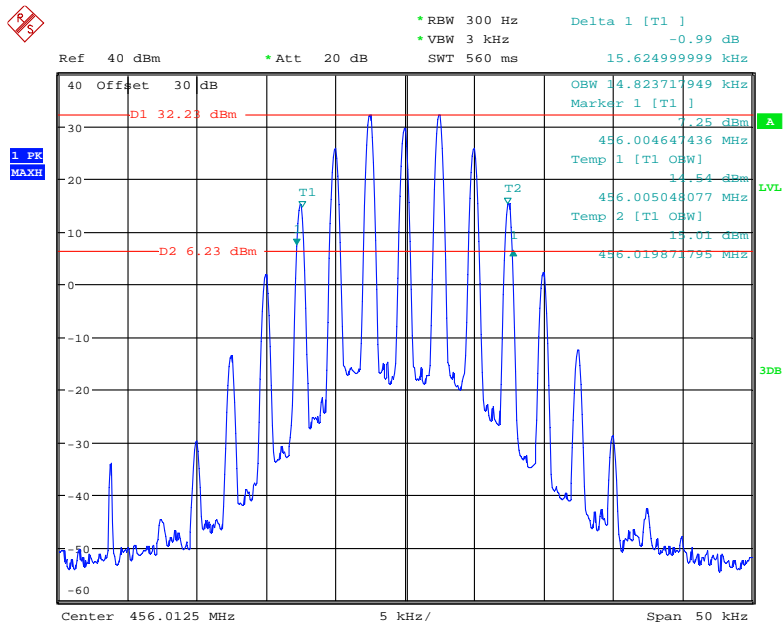
Frequency 453.2125 MHz: Emission Mask B,FCC Part 74.462



Date: 15.SEP.2017 10:51:23

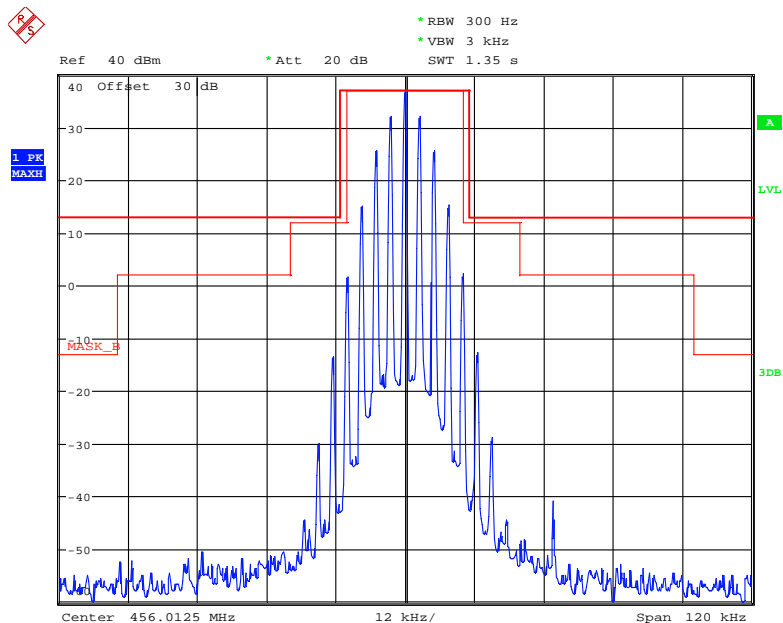


**Frequency 456.0125 MHz: 99% Occupied & 26 dB Bandwidth**



Date: 15.SEP.2017 10:19:23

**Frequency 456.0125 MHz: Emission Mask B FCC part 80.211(f), and FCC part 22.359**



Date: 15.SEP.2017 10:56:33

## FCC §2.1051 & §22.861 & §74.462 & § 80.211 - SPURIOUS EMISSIONS AT ANTENNA TERMINALS

### Applicable Standard

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) For any frequency removed from the center of the authorized bandwidth  $f_0$  to 5.625 kHz removed from  $f_0$ , 0 dB.
- 2) On any frequency removed from the center of the authorized bandwidth by a displacement frequency ( $f_d$  in kHz) of more than 5.626 kHz but no more than 12.5 kHz, at least  $7.27 (f_d - 2.88 \text{ kHz})$  dB.
- 3) 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  $50 + 10 \log (P)$  dB or 70 dB, whichever is the lesser attenuation.

Emission Mask B - 25 kHz channel bandwidth equipment. For transmitters that are equipped with an audio low-pass filter, the power of any emission must be attenuated 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 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.

### 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 at 100kHz for below 1GHz, and 1MHz for above 1GHz. Sufficient scans were taken to show any out of band emissions up to 10<sup>th</sup> harmonic.

### Test Data

#### Environmental Conditions

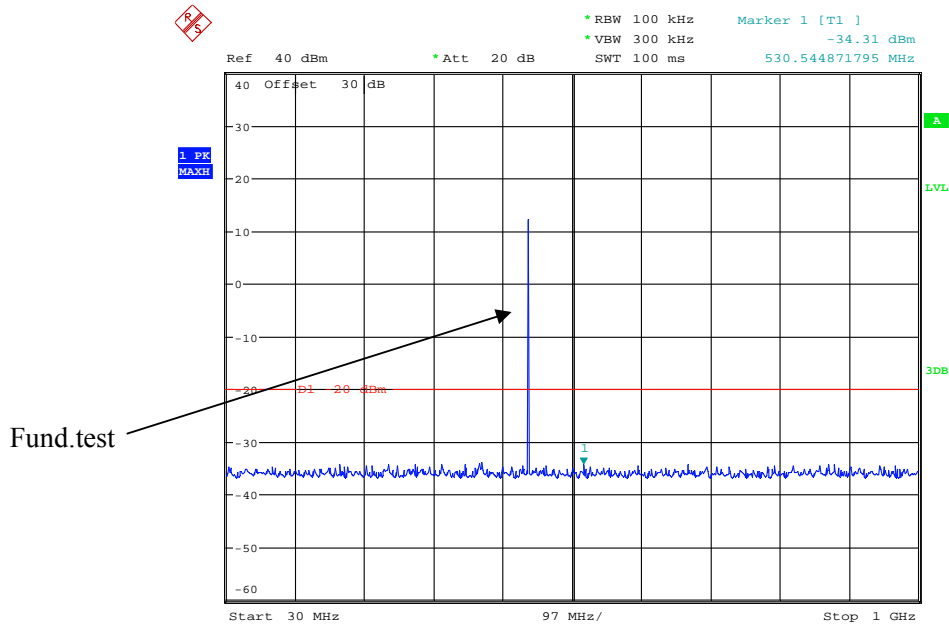
Temperature:	26 °C
Relative Humidity:	56 %
ATM Pressure:	101.0 kPa

*The testing was performed by Simon Wang on 2017-09-15.*

*Test Mode: Transmitting, please refer to the following plots.*

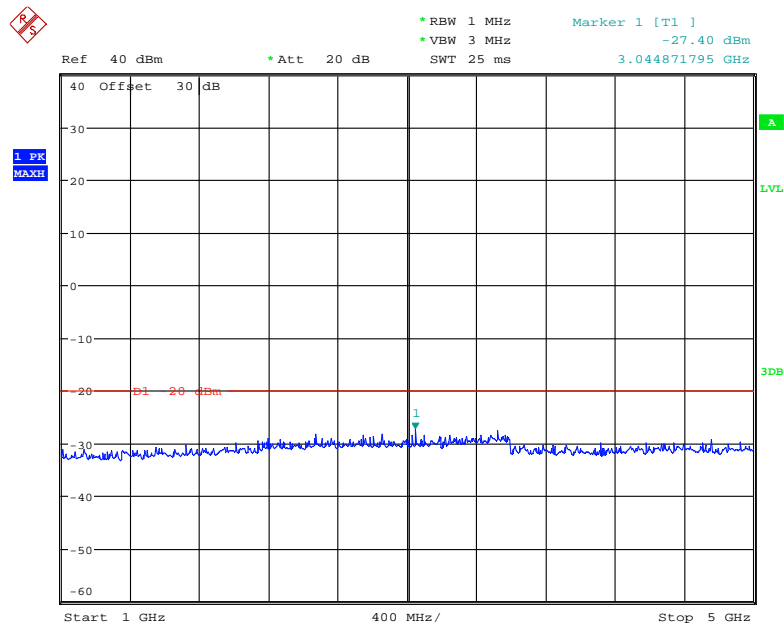
**Digital Modulation:**

**30MHz – 1 GHz, Channel Spacing 12.5 kHz, 453.2125 MHz**



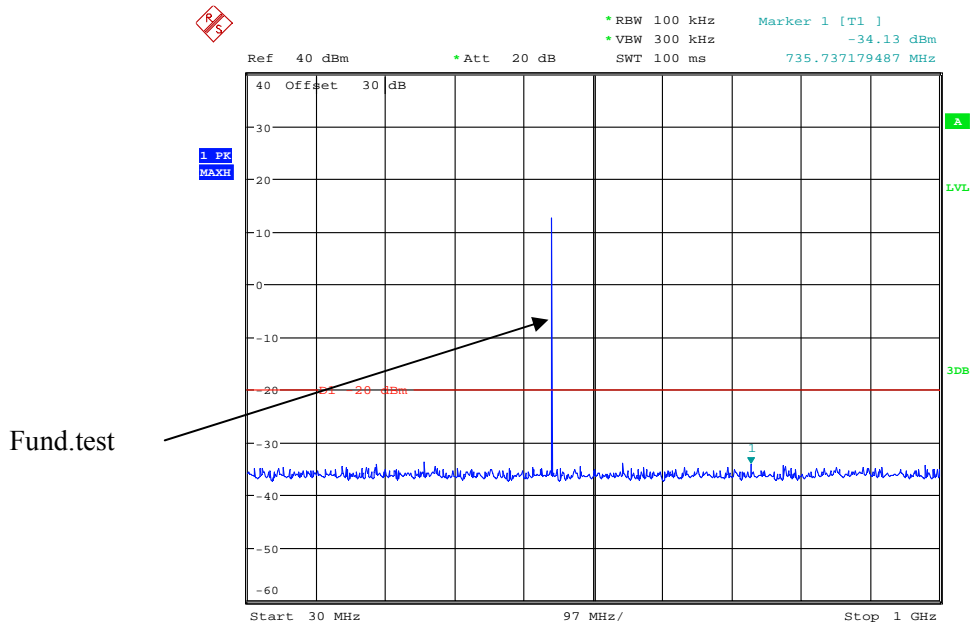
Date: 15.SEP.2017 13:34:37

**1 GHz – 5 GHz, Channel Spacing 12.5 kHz, 453.2125 MHz**



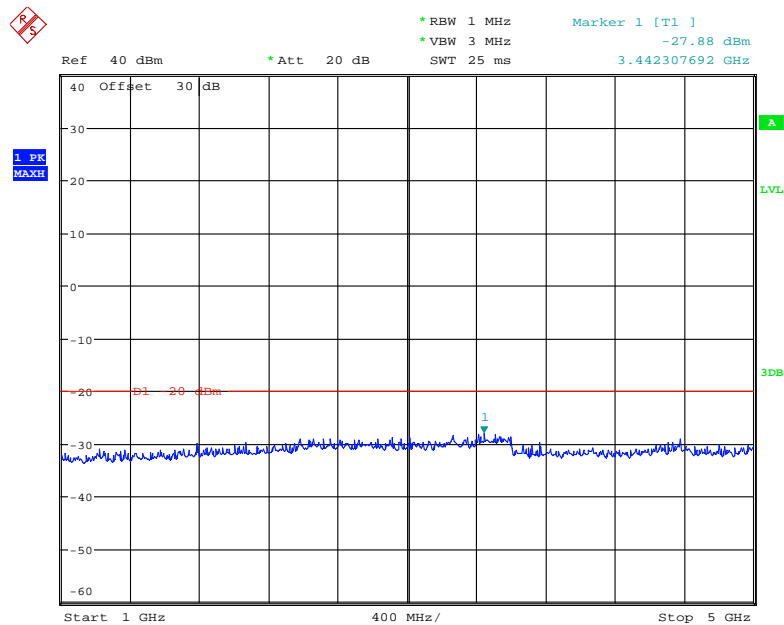
Date: 15.SEP.2017 13:37:28

### 30MHz – 1 GHz, Channel Spacing 12.5 kHz, 456.0125 MHz



Date: 15.SEP.2017 13:35:44

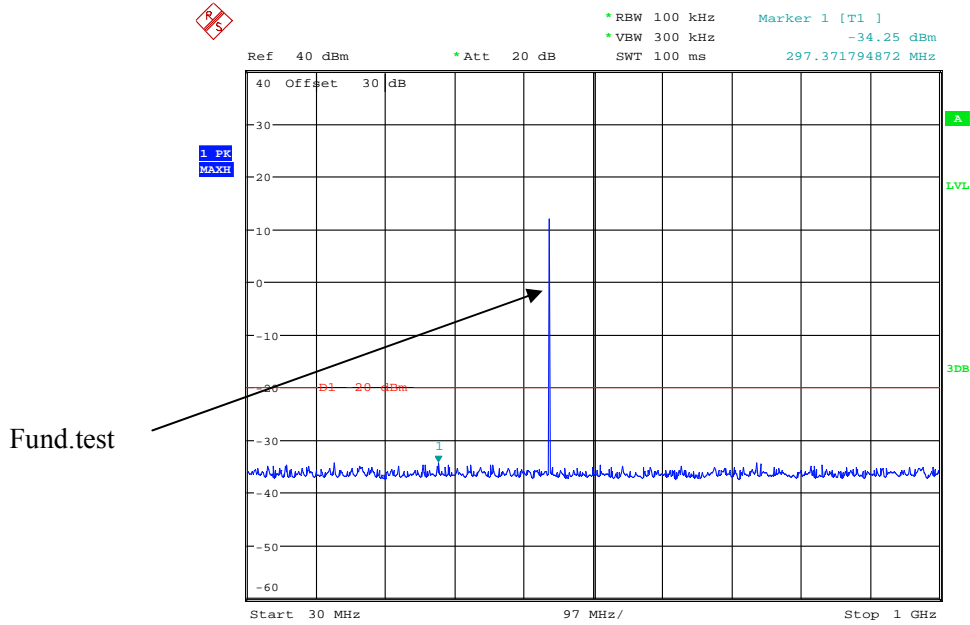
### 1 GHz – 5 GHz, Channel Spacing 12.5 kHz, 456.0125 MHz



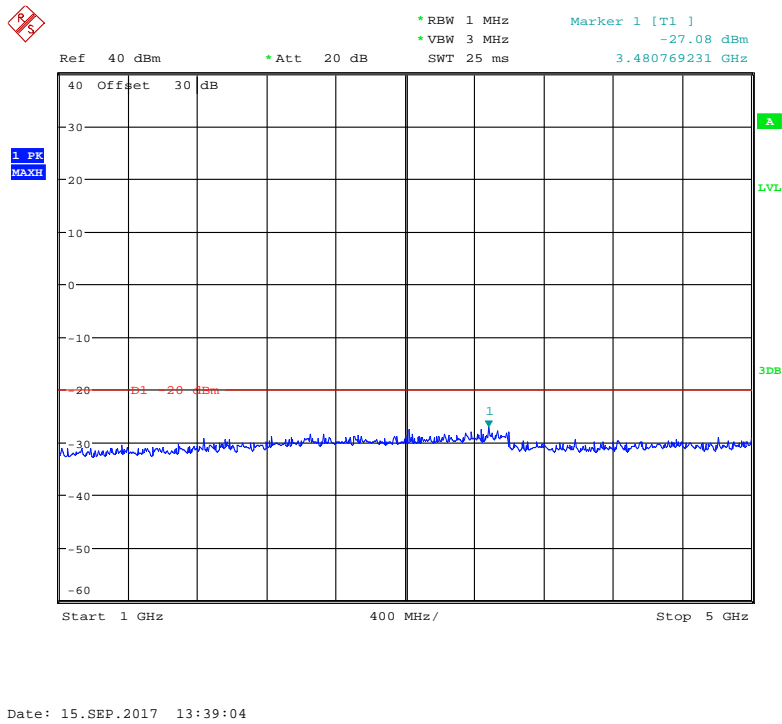
Date: 15.SEP.2017 13:36:45

**Analog Modulation:**

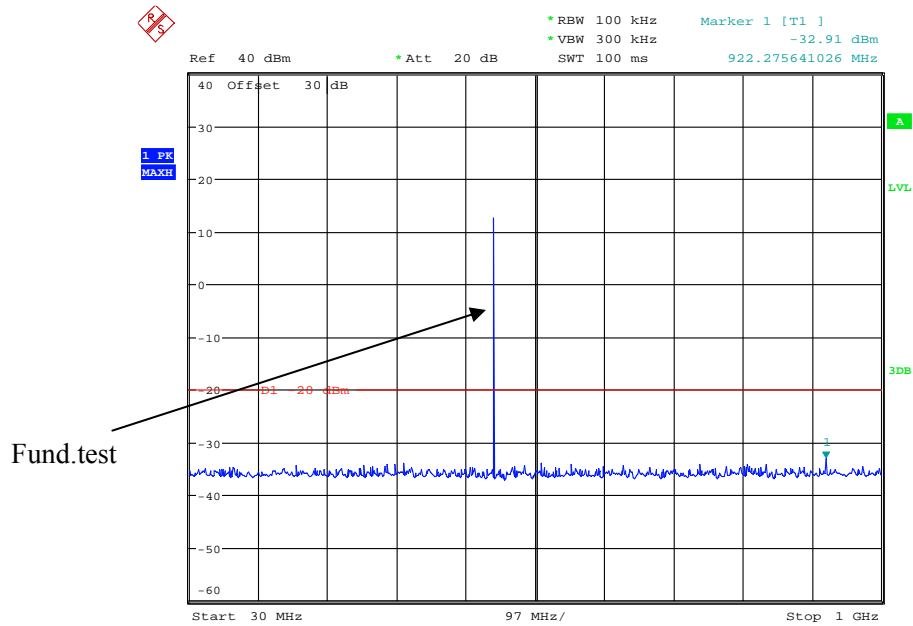
**30MHz – 1 GHz, Channel Spacing 12.5 kHz, 453.2125 MHz**



**1 GHz – 5 GHz, Channel Spacing 12.5 kHz, 453.2125 MHz**

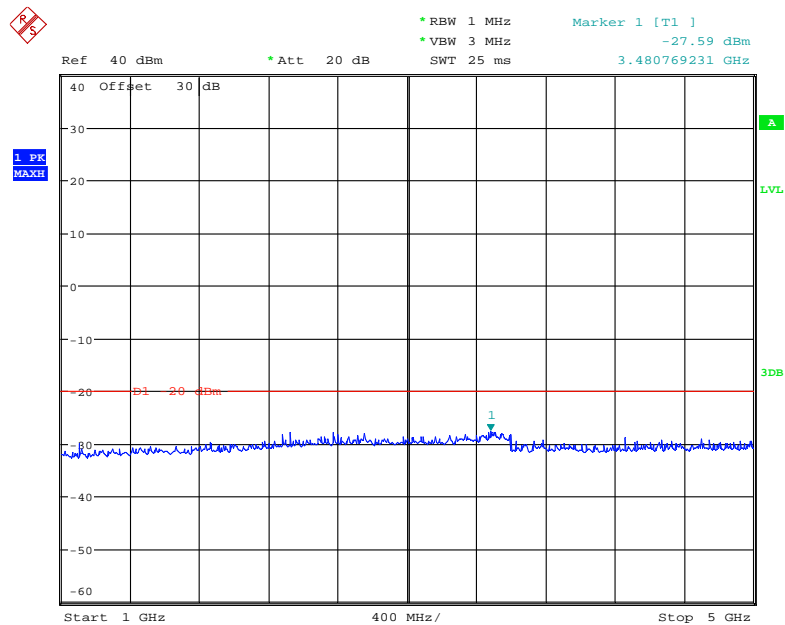


**30MHz – 1 GHz, Channel Spacing 12.5 kHz, 456.0125 MHz**



Date: 15.SEP.2017 13:33:14

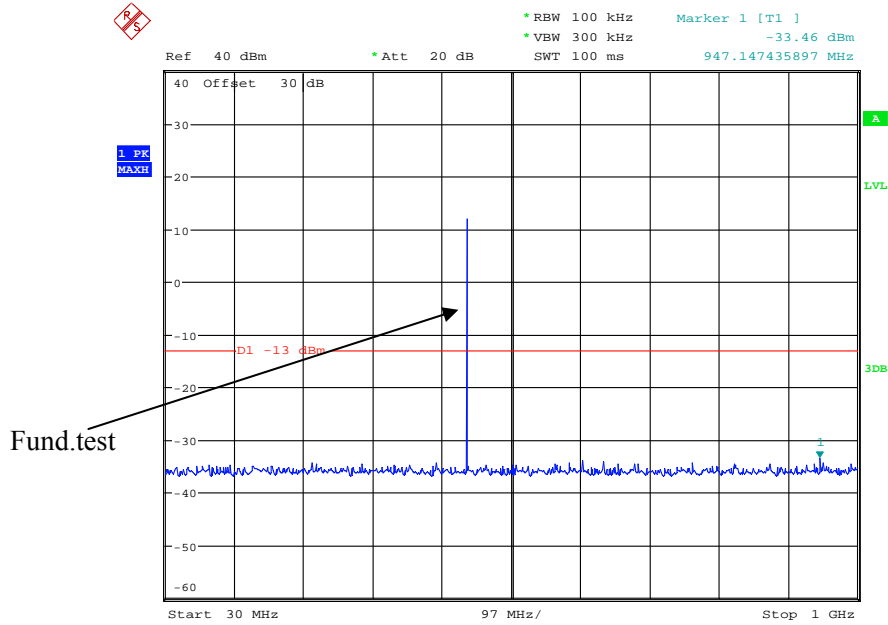
**1 GHz – 5 GHz, Channel Spacing 12.5 kHz, 456.0125 MHz**



Date: 15.SEP.2017 13:40:47

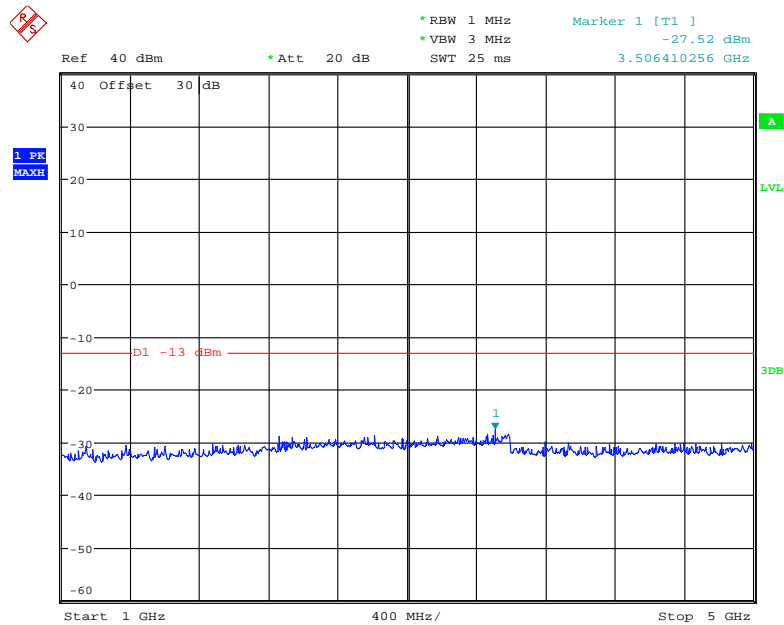
**Analog Modulation:**

**30MHz – 1 GHz, Channel Spacing 25 kHz, 453.2125 MHz**



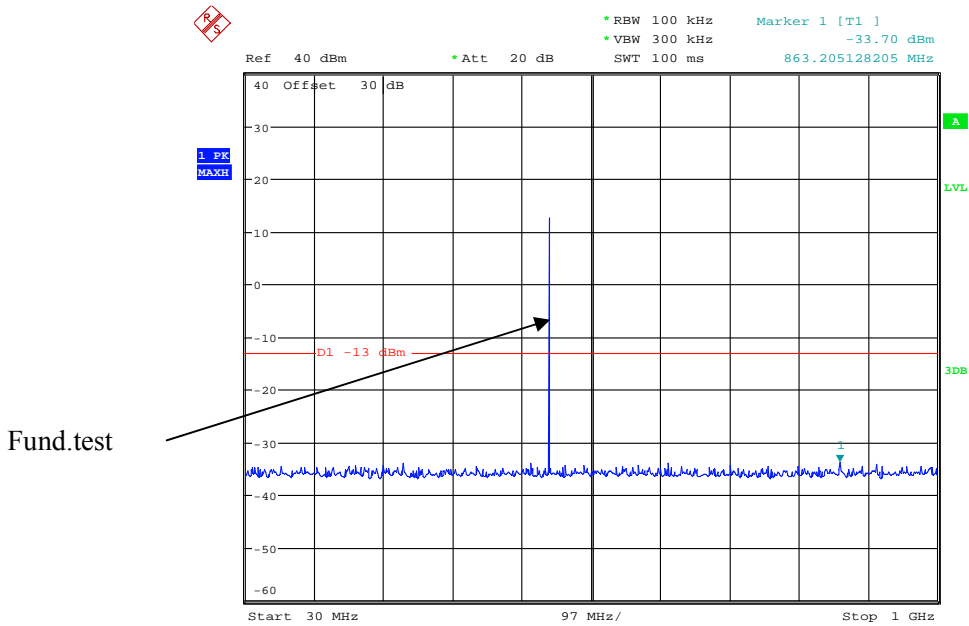
Date: 15.SEP.2017 13:45:42

**1 GHz – 5 GHz, Channel Spacing 25 kHz, 453.2125 MHz**



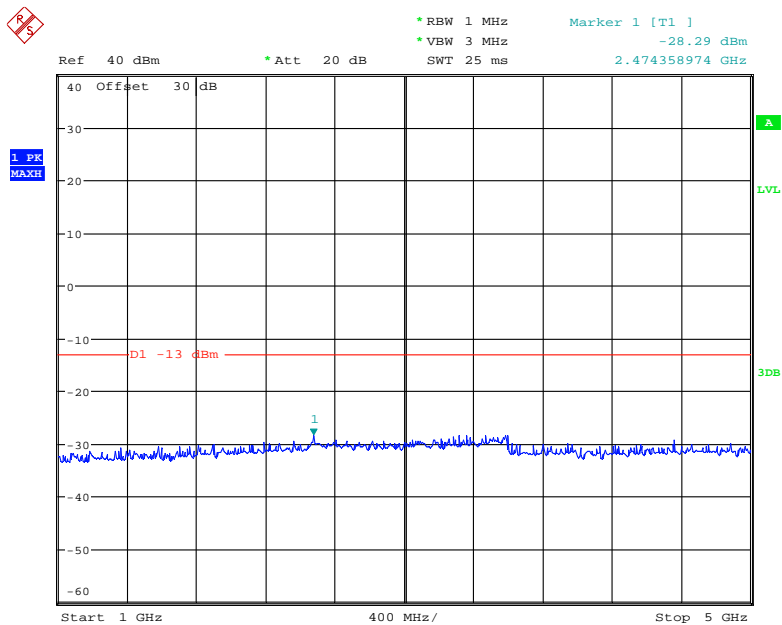
Date: 15.SEP.2017 13:42:12

### 30MHz – 1 GHz, Channel Spacing 25 kHz, 456.0125 MHz



Date: 15.SEP.2017 13:44:13

### 1 GHz – 5 GHz, Channel Spacing 25 kHz, 456.0125 MHz



Date: 15.SEP.2017 13:42:56



## **FCC §2.1053 & §22.861 & §74.462 & § 80.211 - RADIATED SPURIOUS EMISSIONS**

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### **Applicable Standard**

FCC §2.1053, §22.861, §74.462, § 80.211

### **Test Procedure**

The transmitter was placed on a wooden turntable, and it was transmitting into a non-radiating load, which was also placed on the turntable.

The measurement antenna was placed at a distance of 3 meters from the EUT. During the tests, the antenna height and polarization as well as EUT azimuth were varied in order to identify the maximum level of emissions from the EUT. The test was performed by placing the EUT on 3-orthogonal axis.

The frequency range up to teeth harmonic of the fundamental frequency was investigated.

Remove the EUT and replace it with substitution antenna. A signal generator was connected to the substitution antenna by a non-radiating cable. The absolute levels of the spurious emissions were measured by the substitution.

Spurious emissions in dB =10 lg (TXpwr in Watts/0.001)-the absolute level

Spurious attenuation limit in dB =50+10 Log<sub>10</sub> (power out in Watts) for EUT with a 12.5 kHz channel bandwidth.

Spurious attenuation limit in dB =43+10 Log<sub>10</sub> (power out in Watts) for EUT with a 25 kHz channel bandwidth.

### **Test Data**

#### **Environmental Conditions**

<b>Temperature:</b>	25 °C
<b>Relative Humidity:</b>	56 %
<b>ATM Pressure:</b>	101.0 kPa

*The testing was performed by Simon Wang on 2017-09-16.*

*Test Mode: Transmitting*

**30MHz - 5GHz:**

Frequency (MHz)	Receiver Reading (dBµV)	Turn Table Angle Degree	Rx Antenna		Substituted			Absolute Level (dBm)	Limit (dBm)	Margin (dB)
			Height (m)	Polar (H/V)	Level (dBm)	Cable Loss (dB)	Antenna Gain (dB)			
Analog 453.2125MHz-12.5 kHz										
906.43	42.87	284	1.7	H	-54.1	0.7	0	-54.8	-20	34.8
906.43	42.51	78	1.3	V	-54.5	0.7	0	-55.2	-20	35.2
1359.64	57.53	107	1.5	H	-50.3	1.60	8.30	-43.60	-20	23.60
1359.64	59.52	308	1.8	V	-48.6	1.60	8.30	-41.90	-20	21.90
1812.85	47.05	333	1.8	H	-59.0	1.30	8.50	-51.80	-20	31.80
1812.85	46.92	325	2.4	V	-58.8	1.30	8.50	-51.60	-20	31.60
2266.06	49.97	143	2.2	H	-54.5	1.30	9.10	-46.70	-20	26.70
2266.06	50.12	157	1.2	V	-54.3	1.30	9.10	-46.50	-20	26.50
Analog 456.0125MHz-12.5 kHz										
912.03	43.61	234	2.1	H	-53.4	0.71	0	-54.11	-20	34.11
912.03	42.71	277	2.3	V	-54.3	0.71	0	-55.01	-20	35.01
1368.04	57.69	203	1.5	H	-50.1	1.60	8.30	-43.40	-20	23.40
1368.04	59.44	309	1.4	V	-48.7	1.60	8.30	-42.00	-20	22.00
1824.05	48.64	60	1.4	H	-57.4	1.30	8.50	-50.20	-20	30.20
1824.05	47.88	246	1.9	V	-57.8	1.30	8.50	-50.60	-20	30.60
2280.06	49.02	32	1.4	H	-55.5	1.30	9.10	-47.70	-20	27.70
2280.06	51.36	211	2.0	V	-53.0	1.30	9.10	-45.20	-20	25.20
Analog 453.2125MHz-25 kHz										
906.43	41.8	25	1.3	H	-55.2	0.7	0	-55.9	-13	42.9
906.43	41.76	240	1.12	V	-55.3	0.7	0	-56	-13	43.0
1359.64	57.89	77	2.3	H	-49.9	1.60	8.30	-43.20	-13	30.2
1359.64	60.5	333	2.4	V	-47.6	1.60	8.30	-40.90	-13	27.9
1812.85	48.75	344	1.5	H	-57.3	1.30	8.50	-50.10	-13	37.1
1812.85	47.25	167	1.3	V	-58.4	1.30	8.50	-51.20	-13	38.2
2266.06	49.83	129	2.1	H	-54.7	1.30	9.10	-46.90	-13	33.9
2266.06	50.74	284	1.4	V	-53.7	1.30	9.10	-45.90	-13	32.9
Analog 456.0125MHz-25 kHz										
912.03	43.58	44	2.0	H	-53.4	0.71	0	-54.11	-13	41.11
912.03	43.81	157	1.0	V	-53.2	0.71	0	-53.91	-13	40.91
1368.04	56.33	121	1.9	H	-51.5	1.60	8.30	-44.80	-13	31.8
1368.04	58.12	92	1.9	V	-50.0	1.60	8.30	-43.30	-13	30.3
1824.05	48.35	53	2.0	H	-57.7	1.30	8.50	-50.50	-13	37.5
1824.05	46.72	1	1.5	V	-59.0	1.30	8.50	-51.80	-13	38.8
2280.06	48.4	127	1.8	H	-56.1	1.30	9.10	-48.30	-13	35.3
2280.06	50.24	347	1.7	V	-54.2	1.30	9.10	-46.40	-13	33.4

Frequency (MHz)	Receiver Reading (dBµV)	Turn Table Angle Degree	Rx Antenna		Substituted			Absolute Level (dBm)	Limit (dBm)	Margin (dB)
			Height (m)	Polar (H/V)	Level (dBm)	Cable Loss (dB)	Antenna Gain (dB)			
Digital 453.2125MHz-12.5 kHz										
906.43	42.62	284	2.1	H	-54.4	0.7	0	-55.1	-20	35.1
906.43	42.3	100	1.4	V	-54.7	0.7	0	-55.4	-20	35.4
1359.64	58.09	255	2.2	H	-49.7	1.60	8.30	-43.00	-20	23.00
1359.64	57.66	195	2.1	V	-50.4	1.60	8.30	-43.70	-20	23.70
1812.85	49.99	204	1.8	H	-56.1	1.30	8.50	-48.90	-20	28.90
1812.85	46.43	96	2.4	V	-59.3	1.30	8.50	-52.10	-20	32.10
2266.06	54.17	313	2.0	H	-50.3	1.30	9.10	-42.50	-20	22.50
2266.06	50.57	266	2.2	V	-53.8	1.30	9.10	-46.00	-20	26.00
Digital 456.0125MHz-12.5 kHz										
912.03	43.29	73	2.0	H	-53.7	0.71	0	-54.41	-20	34.41
912.03	43.41	23	1.2	V	-53.6	0.71	0	-54.31	-20	34.31
1368.04	60.91	185	1.5	H	-46.9	1.60	8.30	-40.20	-20	20.20
1368.04	61.01	50	2.3	V	-47.1	1.60	8.30	-40.40	-20	20.40
1824.05	47.61	144	1.4	H	-58.5	1.30	8.50	-51.30	-20	31.30
1824.05	46.72	4	1.3	V	-59.0	1.30	8.50	-51.80	-20	31.80
2280.06	48.88	306	1.2	H	-55.6	1.30	9.10	-47.80	-20	27.80
2280.06	52.39	142	2.2	V	-52.0	1.30	9.10	-44.20	-20	24.20

**Note:**

Absolute Level = Substituted Level - Cable loss + Antenna Gain

Margin = Limit- Absolute Level

**FCC §2.1055 & § 22.355 & §74.464 & § 80.209 - FREQUENCY STABILITY****Applicable Standard**

FCC §2.1055, § 22.355, §74.464, § 80.209

**Test Procedure**

Frequency Stability vs. Temperature: The equipment under test was connected to an external DC power supply and the RF output was connected to a frequency counter via feed-through attenuators. The EUT was placed inside the temperature chamber. The DC leads and RF output cable exited the chamber through an opening made for the purpose.

After the temperature stabilized for approximately 20 minutes, the frequency output was recorded from the counter.

**Test Data****Environmental Conditions**

<b>Temperature:</b>	25 °C
<b>Relative Humidity:</b>	56 %
<b>ATM Pressure:</b>	101.0 kPa

*The testing was performed by Simon Wang on 2017-09-16.*

*Test Mode: Transmitting*

<b>Digital Modulation, Reference Frequency: 453.2125 MHz, Limit: ±5.0 ppm,12.5 kHz</b>			
<b>Test Environment</b>		<b>Frequency Measure with Time Elapsed</b>	
<b>Temperature (°C)</b>	<b>Voltage Supplied (V<sub>DC</sub>)</b>	<b>Measured Frequency (MHz)</b>	<b>Frequency Error (ppm)</b>
Frequency Stability versus Input Temperature			
50	7.40	453.212499	-0.00221
40	7.40	453.212483	-0.03751
30	7.40	453.212450	-0.11032
20	7.40	453.212476	-0.05296
10	7.40	453.212461	-0.08605
0	7.40	453.212470	-0.06619
-10	7.40	453.212488	-0.02648
-20	7.40	453.212475	-0.05516
-30	7.40	453.212471	-0.06399
Frequency Stability versus Input Voltage			
20	6.40	453.212489	-0.02427

<b>Digital Modulation, Reference Frequency: 456.0125 MHz, Limit: ±5.0 ppm,12.5 kHz</b>			
<b>Test Environment</b>		<b>Frequency Measure with Time Elapsed</b>	
<b>Temperature (°C)</b>	<b>Voltage Supplied (V<sub>DC</sub>)</b>	<b>Measured Frequency (MHz)</b>	<b>Frequency Error (ppm)</b>
Frequency Stability versus Input Temperature			
50	7.40	456.012488	-0.02632
40	7.40	456.012482	-0.03947
30	7.40	456.012467	-0.07237
20	7.40	456.012479	-0.04605
10	7.40	456.012458	-0.0921
0	7.40	456.012480	-0.04386
-10	7.40	456.012495	-0.01096
-20	7.40	456.012491	-0.01974
-30	7.40	456.012486	-0.0307
Frequency Stability versus Input Voltage			
20	6.40	456.012481	-0.04167

<b>Analog Modulation, Reference Frequency: 453.2125 MHz, Limit: ±5.0 ppm,12.5 kHz</b>			
<b>Test Environment</b>		<b>Frequency Measure with Time Elapsed</b>	
<b>Temperature (°C)</b>	<b>Voltage Supplied (V<sub>DC</sub>)</b>	<b>Measured Frequency (MHz)</b>	<b>Frequency Error (ppm)</b>
Frequency Stability versus Input Temperature			
50	7.40	453.212479	-0.04634
40	7.40	453.212492	-0.01765
30	7.40	453.212465	-0.07723
20	7.40	453.212471	-0.06399
10	7.40	453.212480	-0.04413
0	7.40	453.212472	-0.06178
-10	7.40	453.212496	-0.00883
-20	7.40	453.212482	-0.03972
-30	7.40	453.212473	-0.05957
Frequency Stability versus Input Voltage			
20	6.40	453.212477	-0.00883

<b>Analog Modulation, Reference Frequency: 456.0125 MHz, Limit: ±5.0 ppm,12.5 kHz</b>			
<b>Test Environment</b>		<b>Frequency Measure with Time Elapsed</b>	
<b>Temperature (°C)</b>	<b>Voltage Supplied (V<sub>DC</sub>)</b>	<b>Measured Frequency (MHz)</b>	<b>Frequency Error (ppm)</b>
Frequency Stability versus Input Temperature			
50	7.40	456.012492	-0.01754
40	7.40	456.012429	-0.15570
30	7.40	456.012487	-0.02851
20	7.40	456.012464	-0.07895
10	7.40	456.012433	-0.14693
0	7.40	456.012457	-0.09430
-10	7.40	456.012477	-0.05044
-20	7.40	456.012486	-0.03070
-30	7.40	456.012444	-0.12280
Frequency Stability versus Input Voltage			
20	6.40	456.012479	-0.04605

<b>Analog Modulation, Reference Frequency: 453.2125 MHz, Limit: ±5.0 ppm, 25 kHz</b>			
<b>Test Environment</b>		<b>Frequency Measure with Time Elapsed</b>	
<b>Temperature (°C)</b>	<b>Voltage Supplied (V<sub>DC</sub>)</b>	<b>Measured Frequency (MHz)</b>	<b>Frequency Error (ppm)</b>
Frequency Stability versus Input Temperature			
50	7.40	453.212439	-0.13459
40	7.40	453.212444	-0.12356
30	7.40	453.212467	-0.07281
20	7.40	453.212458	-0.09267
10	7.40	453.212480	-0.04413
0	7.40	453.212496	-0.00883
-10	7.40	453.212490	-0.02206
-20	7.40	453.212483	-0.03751
-30	7.40	453.212472	-0.06178
Frequency Stability versus Input Voltage			
20	6.40	453.212499	-0.00221

<b>Analog Modulation, Reference Frequency: 456.0125 MHz, Limit: ±5.0 ppm, 25 kHz</b>			
<b>Test Environment</b>		<b>Frequency Measure with Time Elapsed</b>	
<b>Temperature (°C)</b>	<b>Voltage Supplied (V<sub>DC</sub>)</b>	<b>Measured Frequency (MHz)</b>	<b>Frequency Error (ppm)</b>
Frequency Stability versus Input Temperature			
50	7.40	456.012477	-0.05044
40	7.40	456.012485	-0.03289
30	7.40	456.012490	-0.02193
20	7.40	456.012450	-0.10965
10	7.40	456.012466	-0.07456
0	7.40	456.012481	-0.04167
-10	7.40	456.012493	-0.01535
-20	7.40	456.012449	-0.11184
-30	7.40	456.012476	-0.05263
Frequency Stability versus Input Voltage			
20	6.40	456.012485	-0.03289

**\*\*\*\*\* END OF REPORT \*\*\*\*\***