

FCC PART 22, FCC PART 90

TEST REPORT

For

SHENZHEN COVALUE COMMUNICATIONS CO.,LTD.

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FCC ID: Y4GCS800D

Report Type: Original Report	Product Type: Mobile Radio
Report Number: RDG190511001-00A	
Report Date: 2019-06-22	
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GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

EUT Name:	Mobile Radio
EUT Model:	CS800D
Operation Frequency:	136-174 MHz 400-470 MHz
Output Power(Conducted):	136-174 MHz: High: 45W, Low: 25W 400-470 MHz: High:40W, Low: 25W
Modulation Type:	FM/4FSK
Channel Spacing:	12.5/25kHz
Rated Input Voltage:	DC13.8V from DC battery
External Dimension:	184mm(L)*159mm(W)*44mm(H)
Serial Number:	190511001
EUT Received Date:	2019/5/14

Objective

This test report is prepared on behalf of *SHENZHEN COVALUE COMMUNICATIONS CO.,LTD.* in accordance with Part 2, Part 22 and Part 90 of the Federal Communication Commissions rules.

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 90 – Private Land Mobile Radio Service

Applicable Standards: TIA 603-D.

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

Measurement Uncertainty

Parameter	Measurement Uncertainty
Occupied Channel Bandwidth	$\pm 5\%$
RF output power, conducted	$\pm 0.61\text{dB}$
Unwanted Emissions, radiated	30MHz ~ 1GHz: 5.85 dB 1G~26.5GHz: 5.23 dB
Unwanted Emissions, conducted	$\pm 1.5\text{ dB}$
Temperature	$\pm 1^\circ\text{C}$
Humidity	$\pm 5\%$
DC and low frequency voltages	$\pm 0.4\%$
Duty Cycle	1%

Test Facility

The Test site used by Bay Area Compliance Laboratories Corp. (Dongguan) to collect test data is located on the No.69 Pulongcun, Puxinhu Industry Area, Tangxia, Dongguan, Guangdong, China.

The lab has been recognized as the FCC accredited lab under the KDB 974614 D01 and is listed in the FCC Public Access Link (PAL) database, FCC Registration No. : 897218, the FCC Designation No. : CN1220.

The lab has been recognized by Innovation, Science and Economic Development Canada to test to Canadian radio equipment requirements, the CAB identifier: CN0022.

SYSTEM TEST CONFIGURATION

Description of Test Configuration

The frequencies were configured for testing in engineering mode, which was provided by manufacturer.

EUT Exercise Software

No EUT exercise software was used in test.

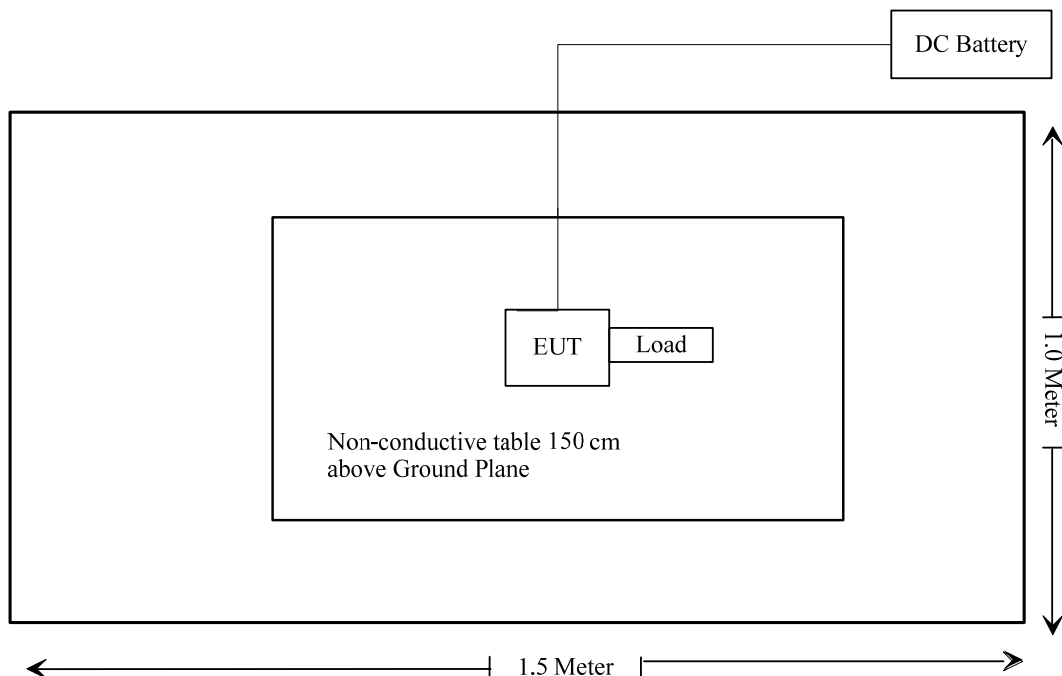
Equipment Modifications

No modification was made to the EUT tested.

Support Equipment List and Details

Manufacturer	Description	Model	Serial Number
Unknown	50 Load Teminal	100W	100W-1

Block Diagram of Test Setup



SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Results
§2.1046; § 22.727; §90.205	RF Output Power	Compliance
§2.1047;§90.207	Modulation Characteristic	Compliance
§2.1049;§22.357;§ 22.731; §90.209; §90.210	Occupied Bandwidth & Emission Mask	Compliance
§2.1051; §22.861; §90.210	Spurious Emission at Antenna Terminal	Compliance
§2.1053;§22.861;§90.210	Spurious Radiated Emissions	Compliance
§2.1055; § 22.355;§90.213	Frequency Stability	Compliance
§90.214	Transient Frequency Behavior	Compliance

TEST EQUIPMENT LIST

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Radiated Emission Test					
R&S	EMI Test Receiver	ESCI	100224	2018-12-10	2019-12-10
Sunol Sciences	Antenna	JB3	A060611-1	2017-11-10	2020-11-10
EMCO	Adjustable Dipole Antenna	3121C	9109-753	N/A	N/A
Unknown	Coaxial Cable	C-NJNJ-50	C-0400-01	2018-09-05	2019-09-05
Unknown	Coaxial Cable	C-NJNJ-50	C-0075-01	2018-09-05	2019-09-05
Unknown	Coaxial Cable	C-NJNJ-50	C-0200-02	2018-09-05	2019-09-05
HP	Amplifier	8447D	2727A05902	2018-09-05	2019-09-05
Agilent	Signal Generator	E8247C	MY43321350	2018-12-10	2019-12-10
R&S	Spectrum Analyzer	FSU 26	200256	2019-01-04	2020-01-04
TDK RF	Horn Antenna	HRN-0118	130 084	2018-10-12	2021-10-12
ETS-Lindgren	Horn Antenna	3115	000 527 35	2018-10-12	2021-10-12
MICRO-COAX	Coaxial Cable	UFA147-1-2362-100100	64639 231029-001	2019-02-24	2020-02-24
Mini	Pre-amplifier	ZVA-183-S+	5969001149	2018-09-05	2019-09-05
RF Conducted Test					
Rohde & Schwarz	Signal Analyzer	FSIQ26	831929/005	2018-08-03	2019-08-03
Unknown	Coaxial Cable	C-SJ00-0010	C0010/01	Each time	N/A
E-Microwave	Blocking Control	EMDCB-00036	0E01201047	Each time	N/A
Weinschel	Coaxial Attenuators	53-20-34	LN749	Each time	N/A
HP	RF Communications Test Set	8920A	3438A05201	2019-01-04	2020-01-04
ESPEC	Constant temperature and humidity Tester	ESX-4CA	018 463	2019-03-26	2020-03-26
UNI-T	Multimeter	UT39A	M130199938	2018-07-24	2019-07-24
Pro instrument	DC Power Supply	pps3300	3300012	N/A	N/A
LEADER	Millivoltmeter	LMV-181A	601788	2018-08-11	2019-08-10

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

FCC §2.1046 & § 22.727 & §90.205- RF OUTPUT POWER**Applicable Standard**

FCC §2.1046, § 22.727, and §90.205

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**

Temperature:	26.6 °C
Relative Humidity:	54 %
ATM Pressure:	101.3 kPa

The testing was performed by Blake Yang on 2019-06-13.

Test Mode: Transmitting

Test Result: Compliance. Please refer to following table.

136-174 MHz Band:

Modulation Mode	Channel Separation	f _c	Reading (W)		Note
		MHz	High Power Level	Low Power Level	
FM	12.5kHz	136.0125	47.206	25.235	FCC part 90
		155.7525	46.452	24.946	
		173.3875	46.026	22.491	
4FSK	12.5kHz	136.0125	46.559	24.491	
		155.7525	45.394	24.604	
		173.3875	46.238	22.699	
FM	12.5kHz	150.8125	46.989	25.119	FCC part 22
	25 kHz		46.559	25.235	
4FSK	12.5kHz		47.206	25.235	

Note: The high rated power level is 45W, and low rated power level is 25W.

400-470 MHz Band:

Modulation Mode	Channel Separation	f_c	Reading (W)		Note
		MHz	High Power Level	Low Power Level	
FM	12.5kHz	400.01250	38.194	24.491	FCC part 90
		453.21250	35.806	24.434	
		469.98750	40.738	25.527	
4FSK	12.5kHz	400.01250	37.844	24.099	
		453.21250	35.963	23.933	
		469.98750	39.994	25.003	
FM	12.5kHz	454.0125	35.674	24.831	FCC part 22
	25 kHz		36.729	24.378	
4FSK	12.5kHz		38.194	24.491	

Note: The high rated power level is 40W, and low rated power level is 25W.

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

Temperature:	26.6 °C
Relative Humidity:	54 %
ATM Pressure:	101.3 kPa

The testing was performed by Blake Yang on 2019-06-13.

Test Mode: Transmitting

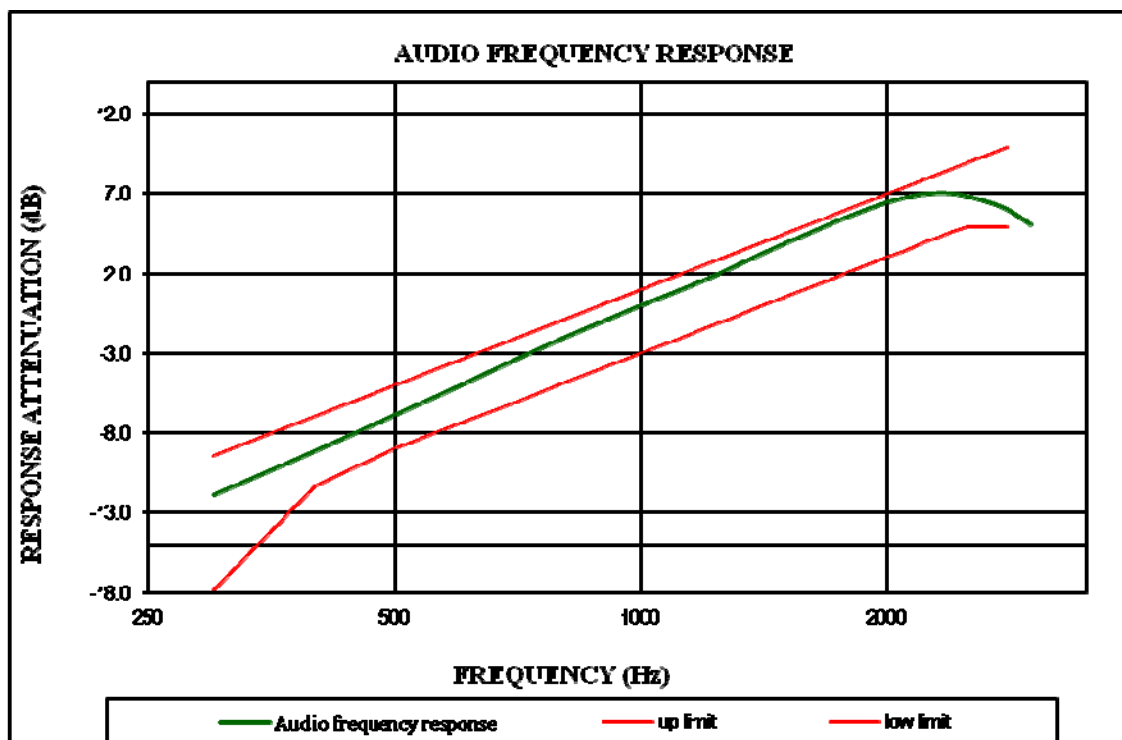
Result: Compliance.

136-174 MHz Band:

Audio Frequency Response – High Power,12.5kHz

Carrier Frequency: 155.7525 MHz

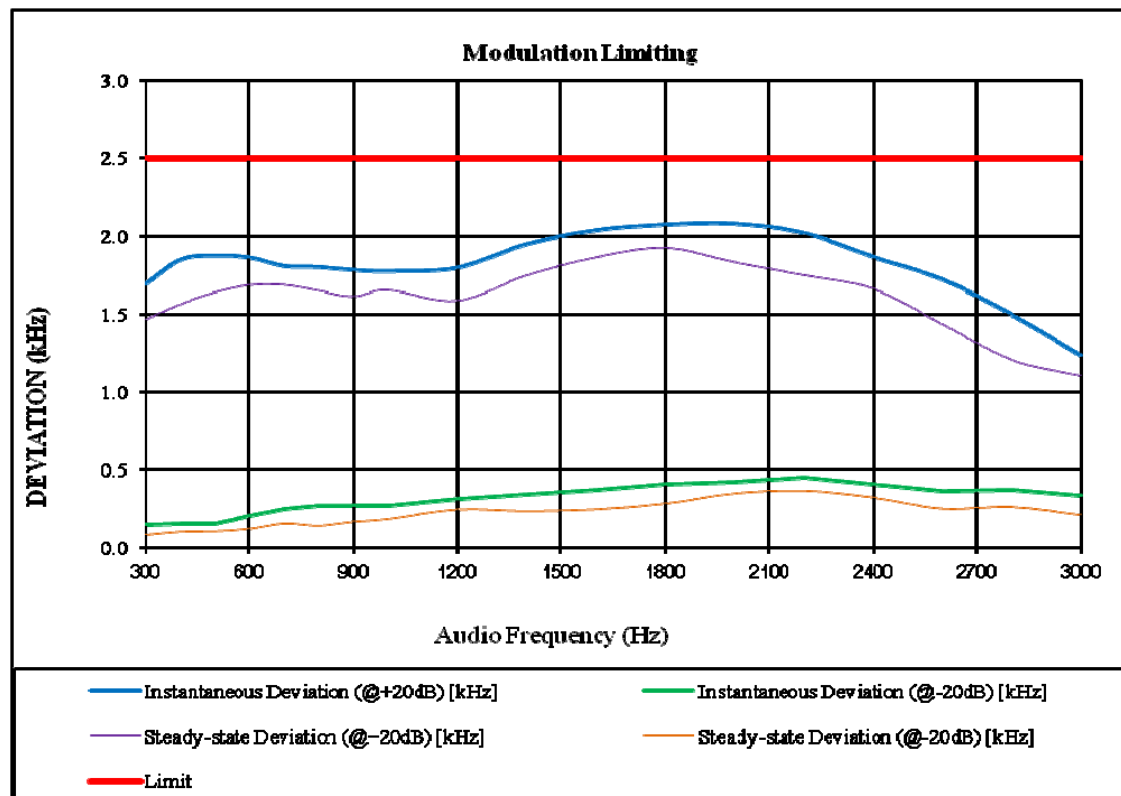
Modulation Frequency (Hz)	Response data (dB)
300	-11.89
400	-9.11
500	-6.87
600	-5.03
700	-3.43
800	-2.08
900	-0.98
1000	0.00
1200	1.63
1400	3.21
1600	4.51
1800	5.62
2000	6.46
2200	6.97
2400	7.03
2600	6.64
2800	6.04
3000	5.08



MODULATION LIMITING – High Power,12.5kHz

Carrier Frequency: 155.7525 MHz

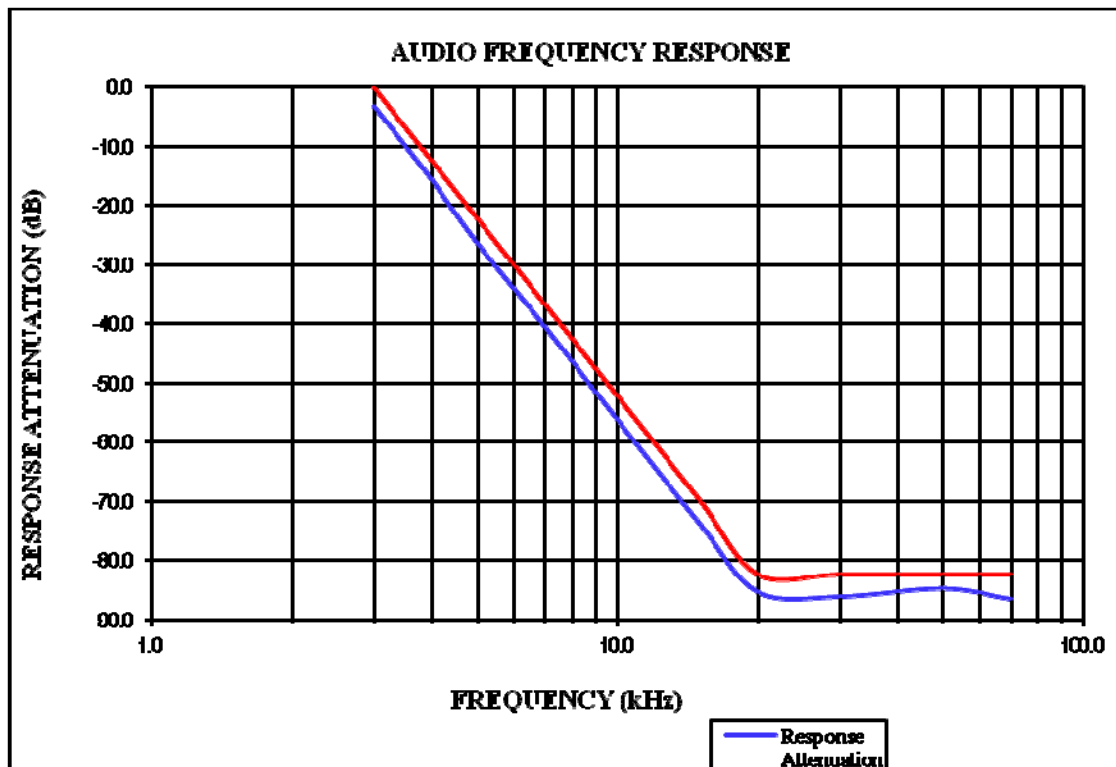
Audio Frequency (Hz)	Instantaneous		Steady-state		Limit [kHz]
	Deviation (@+20dB) [kHz]	Deviation (@-20dB) [kHz]	Deviation (@+20dB) [kHz]	Deviation (@-20dB) [kHz]	
300	1.688	0.146	1.462	0.081	2.5
400	1.850	0.156	1.564	0.102	2.5
500	1.878	0.155	1.641	0.106	2.5
600	1.866	0.207	1.687	0.121	2.5
700	1.811	0.251	1.690	0.156	2.5
800	1.804	0.271	1.652	0.142	2.5
900	1.785	0.268	1.614	0.167	2.5
1000	1.777	0.270	1.656	0.185	2.5
1200	1.799	0.312	1.587	0.246	2.5
1400	1.951	0.346	1.749	0.237	2.5
1600	2.043	0.370	1.865	0.248	2.5
1800	2.079	0.406	1.926	0.285	2.5
2000	2.085	0.426	1.834	0.351	2.5
2200	2.026	0.450	1.751	0.369	2.5
2400	1.869	0.410	1.664	0.325	2.5
2600	1.724	0.367	1.437	0.253	2.5
2800	1.498	0.374	1.205	0.264	2.5
3000	1.230	0.338	1.101	0.212	2.5



Audio Frequency Low Pass Filter Response – High Power, 12.5kHz

Carrier Frequency: 155.7525 MHz

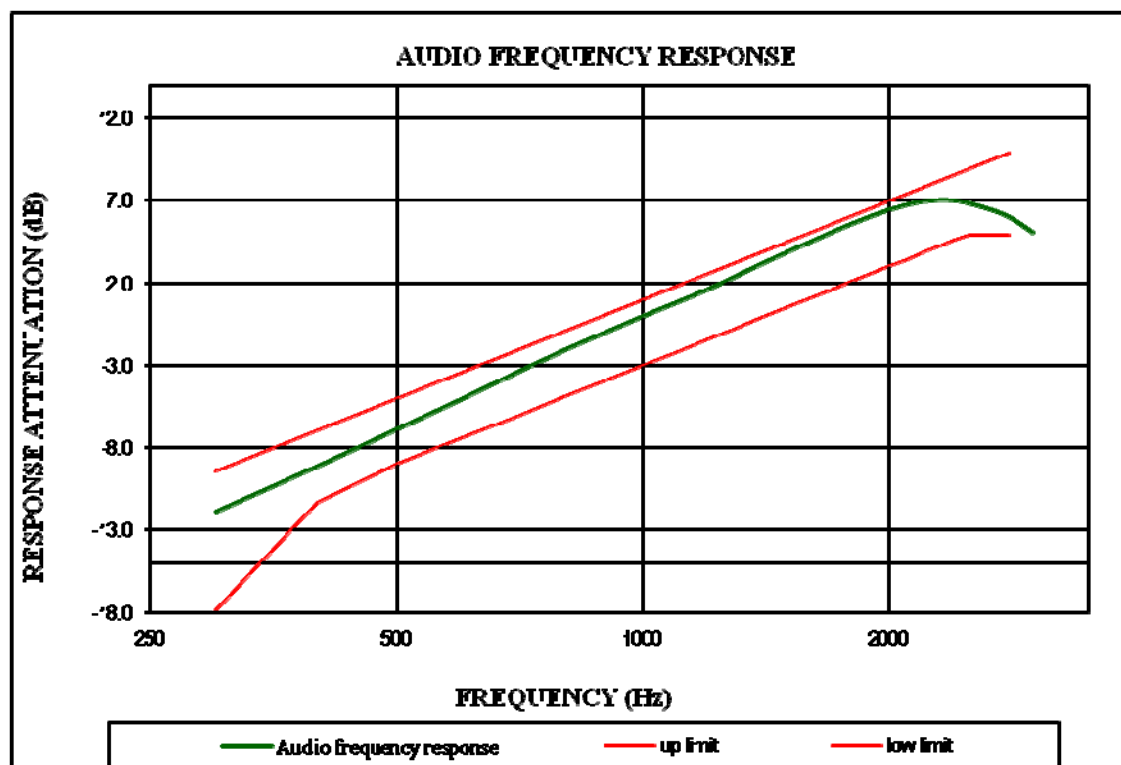
Audio Frequency	Response Attenuation	Limit
kHz	dB	dB
3.0	-3.3	0.0
3.5	-9.9	-6.7
4.0	-15.8	-12.5
5.0	-26.4	-22.2
7.0	-40.6	-36.8
10.0	-56.3	-52.3
15.0	-73.8	-69.9
20.0	-85.4	-82.5
30.0	-86.2	-82.5
50.0	-84.8	-82.5
70.0	-86.6	-82.5



Audio Frequency Response – High Power, 25kHz

Carrier Frequency: 150.8125 MHz

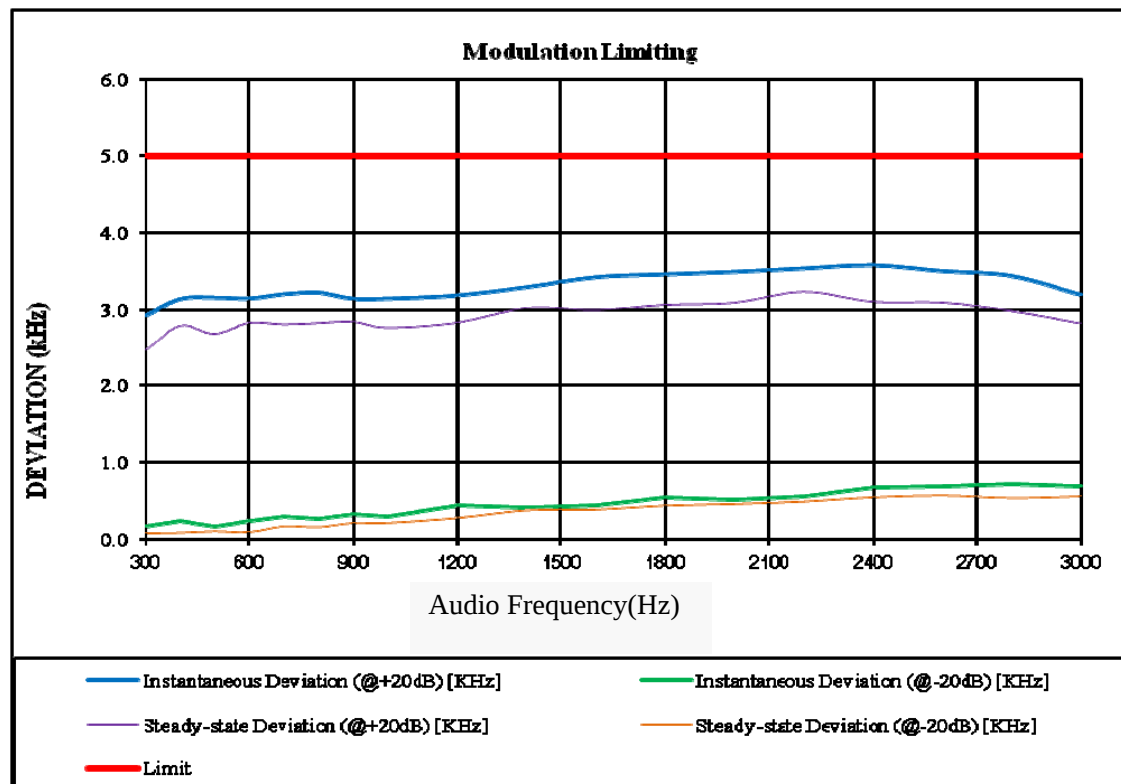
Modulation Frequency (Hz)	Response data (dB)
300	-12.01
400	-8.78
500	-7.03
600	-5.29
700	-3.51
800	-2.15
900	-1.25
1000	-0.15
1200	1.72
1400	3.20
1600	4.71
1800	5.76
2000	6.69
2200	7.07
2400	7.37
2600	6.92
2800	5.76
3000	5.28



MODULATION LIMITING – High Power, 25kHz

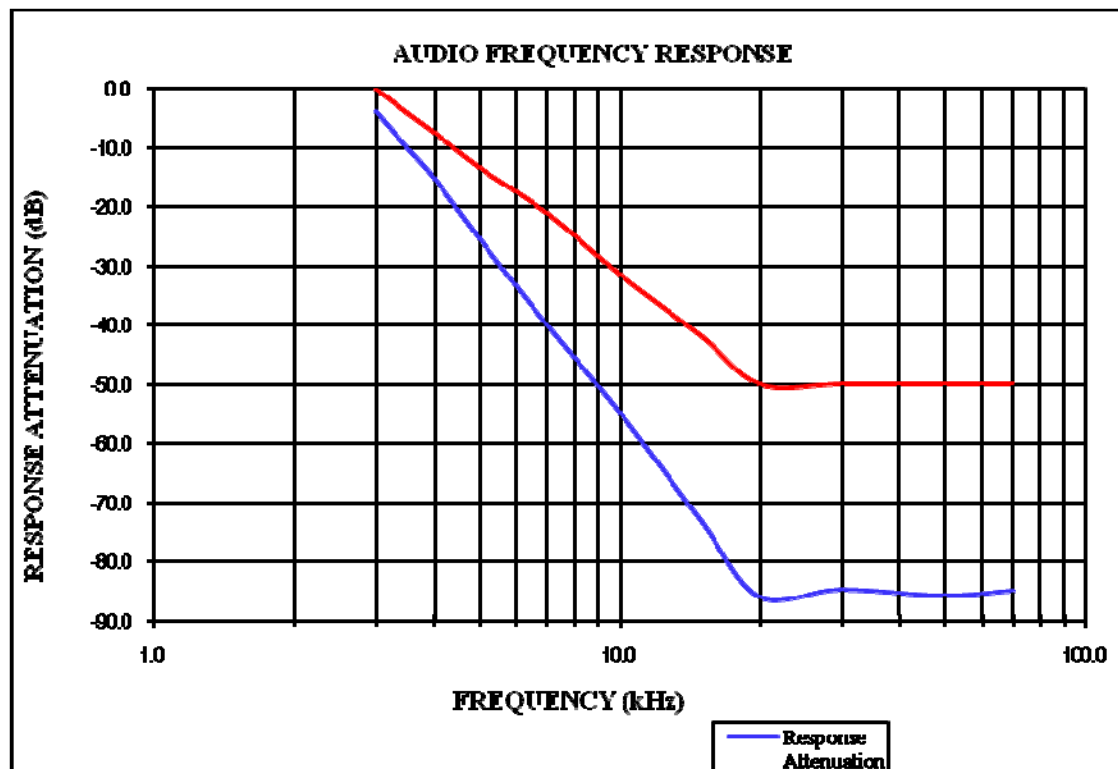
Carrier Frequency: 150.8125 MHz

Audio Frequency (Hz)	Instantaneous		Steady-state		Limit [kHz]
	Deviation (@+20dB) [kHz]	Deviation (@-20dB) [kHz]	Deviation (@+20dB) [kHz]	Deviation (@-20dB) [kHz]	
300	2.920	0.162	2.441	0.079	5.0
400	3.139	0.229	2.785	0.087	5.0
500	3.157	0.166	2.677	0.105	5.0
600	3.146	0.232	2.823	0.095	5.0
700	3.201	0.294	2.803	0.169	5.0
800	3.221	0.256	2.821	0.158	5.0
900	3.143	0.328	2.837	0.209	5.0
1000	3.144	0.287	2.759	0.212	5.0
1200	3.185	0.434	2.826	0.274	5.0
1400	3.291	0.415	3.018	0.373	5.0
1600	3.420	0.434	2.993	0.382	5.0
1800	3.456	0.535	3.059	0.432	5.0
2000	3.488	0.511	3.088	0.453	5.0
2200	3.532	0.561	3.232	0.484	5.0
2400	3.573	0.673	3.100	0.538	5.0
2600	3.498	0.684	3.090	0.561	5.0
2800	3.436	0.720	2.980	0.529	5.0
3000	3.193	0.689	2.815	0.550	5.0



Audio Frequency Low Pass Filter Response – High Power, 25kHz
Carrier Frequency: 150.8125 MHz

Audio Frequency	Response Attenuation	Limit
kHz	dB	dB
3.0	-3.9	0.0
3.5	-10.0	-4.0
4.0	-15.2	-7.5
5.0	-25.3	-13.3
7.0	-40.1	-21.1
10.0	-54.8	-31.4
15.0	-73.4	-41.9
20.0	-85.9	-50.0
30.0	-84.7	-50.0
50.0	-85.7	-50.0
70.0	-85.0	-50.0

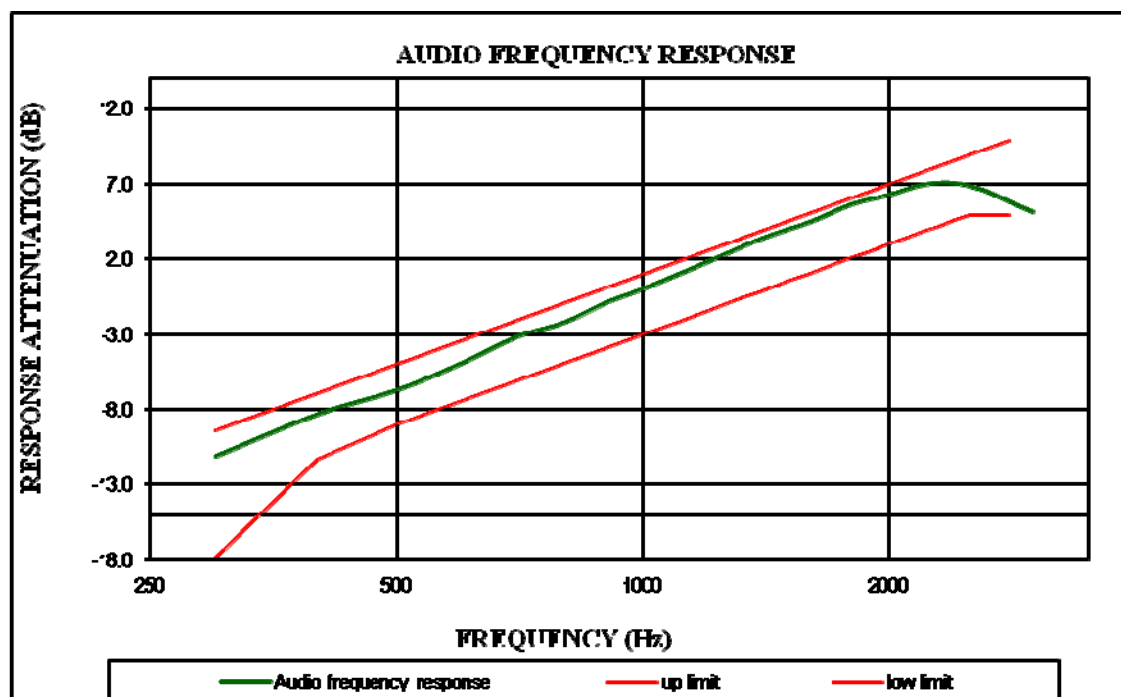


400-470 MHz Band:

Audio Frequency Response – High Power,12.5kHz

Carrier Frequency: 453.2125 MHz

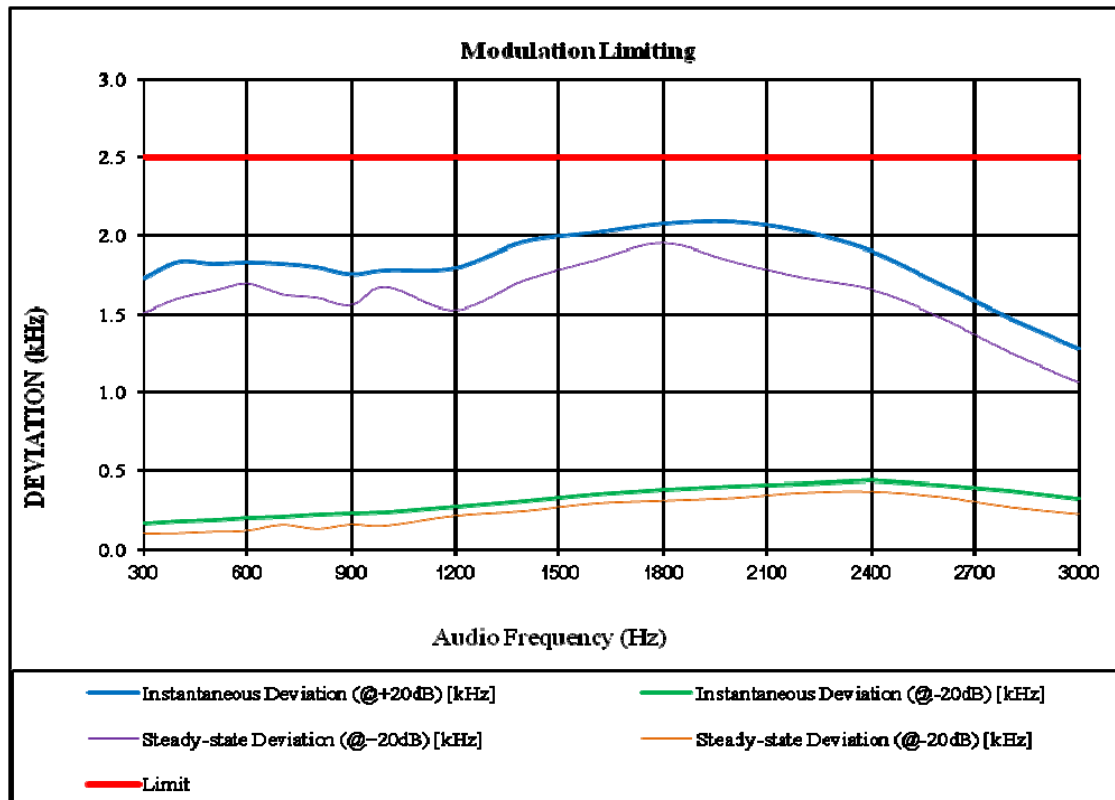
Modulation Frequency (Hz)	Response data (dB)
300	-11.12
400	-8.33
500	-6.73
600	-4.94
700	-3.20
800	-2.24
900	-0.93
1000	0.00
1200	1.80
1400	3.37
1600	4.44
1800	5.61
2000	6.25
2200	6.92
2400	7.03
2600	6.60
2800	5.81
3000	5.11



MODULATION LIMITING – High Power,12.5kHz

Carrier Frequency: 453.2125 MHz

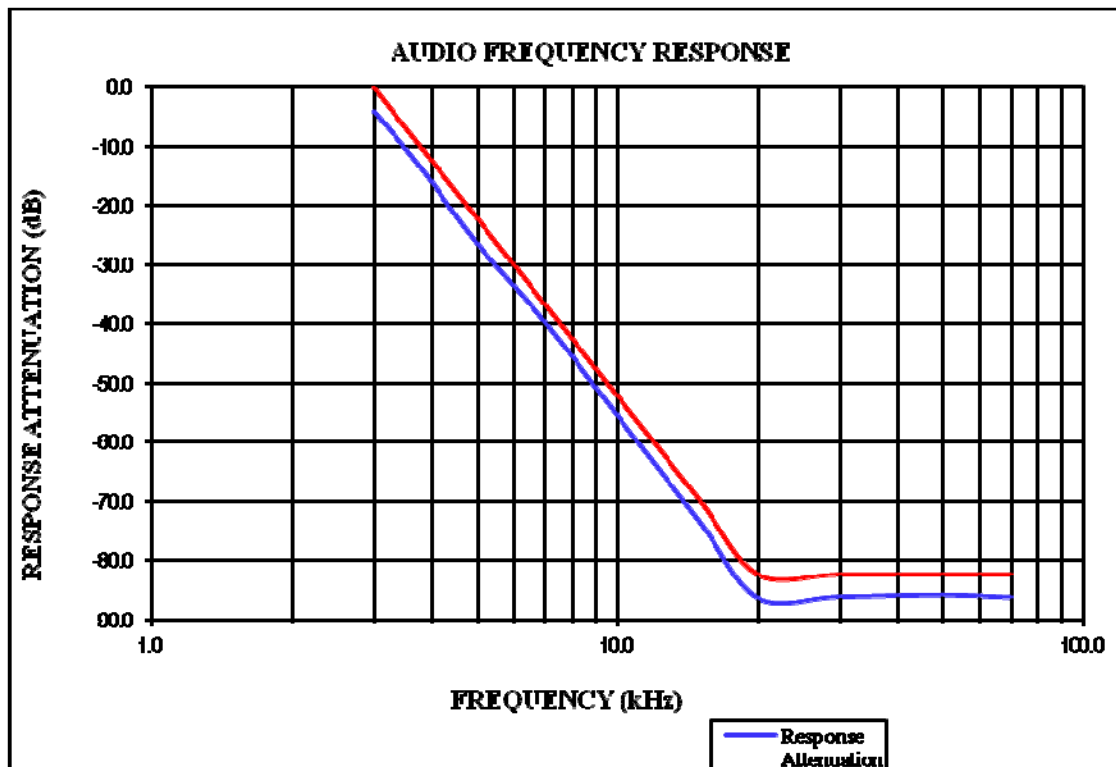
Audio Frequency (Hz)	Instantaneous		Steady-state		Limit [kHz]
	Deviation (@+20dB) [kHz]	Deviation (@-20dB) [kHz]	Deviation (@+20dB) [kHz]	Deviation (@-20dB) [kHz]	
300	1.724	0.164	1.504	0.094	2.5
400	1.836	0.173	1.596	0.098	2.5
500	1.824	0.182	1.644	0.107	2.5
600	1.832	0.194	1.692	0.114	2.5
700	1.824	0.203	1.624	0.153	2.5
800	1.802	0.221	1.602	0.126	2.5
900	1.755	0.229	1.555	0.154	2.5
1000	1.781	0.237	1.671	0.147	2.5
1200	1.795	0.272	1.525	0.212	2.5
1400	1.963	0.303	1.713	0.243	2.5
1600	2.020	0.348	1.840	0.293	2.5
1800	2.079	0.381	1.949	0.311	2.5
2000	2.093	0.403	1.833	0.328	2.5
2200	2.031	0.417	1.731	0.362	2.5
2400	1.905	0.435	1.655	0.370	2.5
2600	1.689	0.411	1.479	0.336	2.5
2800	1.475	0.369	1.255	0.269	2.5
3000	1.276	0.323	1.066	0.223	2.5



Audio Frequency Low Pass Filter Response – High Power, 12.5kHz

Carrier Frequency: 453.2125 MHz

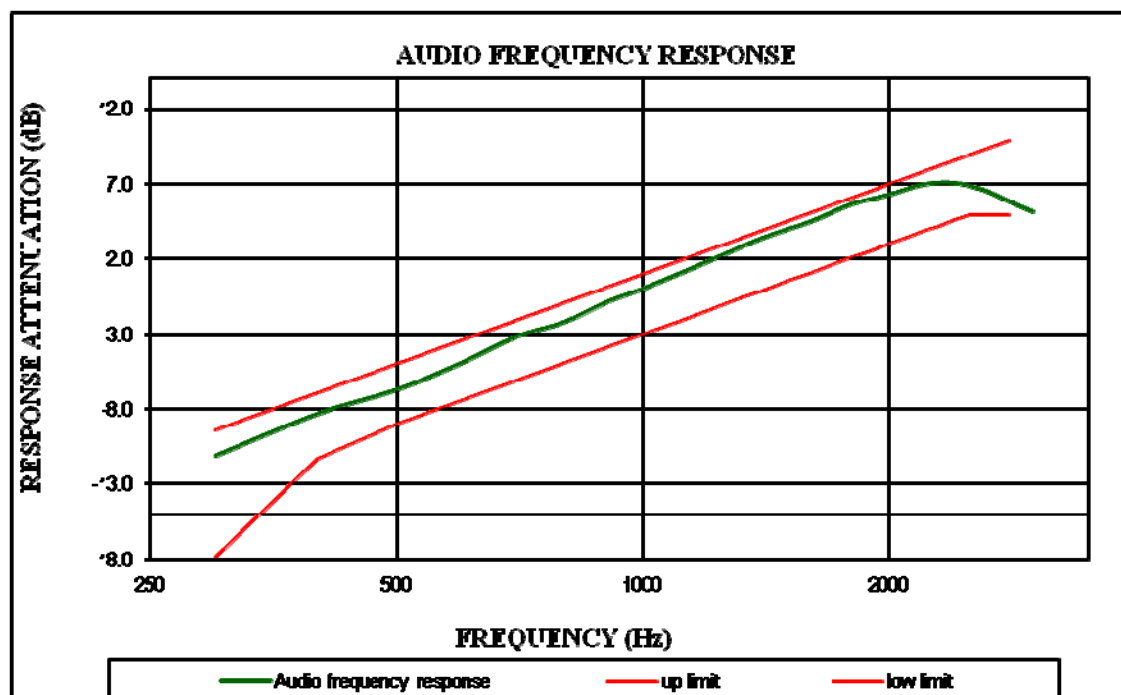
Audio Frequency	Response Attenuation	Limit
kHz	dB	dB
3.0	-4.1	0.0
3.5	-10.3	-6.7
4.0	-16.2	-12.5
5.0	-26.5	-22.2
7.0	-39.8	-36.8
10.0	-55.6	-52.3
15.0	-73.5	-69.9
20.0	-86.4	-82.5
30.0	-86.2	-82.5
50.0	-85.9	-82.5
70.0	-86.3	-82.5



Audio Frequency Response – High Power, 25kHz

Carrier Frequency: 454.0125 MHz

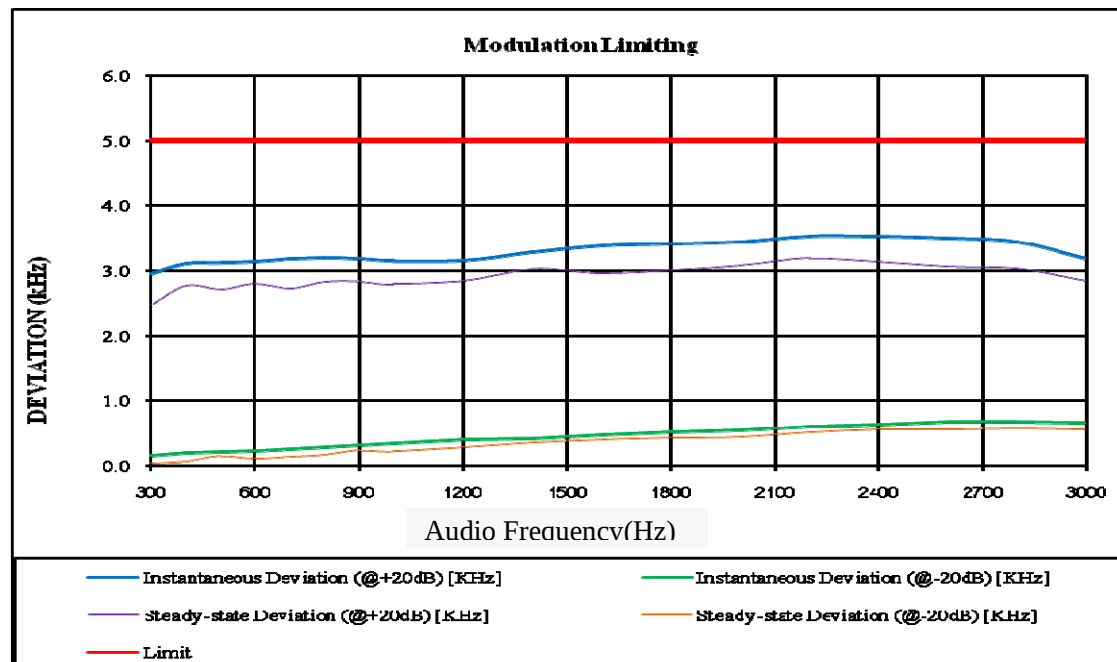
Modulation Frequency (Hz)	Response data (dB)
300	-12.66
400	2.93
500	-6.9
600	-5.33
700	-3.07
800	-2.15
900	-1.81
1000	0.09
1200	1.77
1400	3.32
1600	4.69
1800	5.72
2000	6.41
2200	7.03
2400	7.24
2600	6.83
2800	5.53
3000	5.19



MODULATION LIMITING – High Power, 25kHz

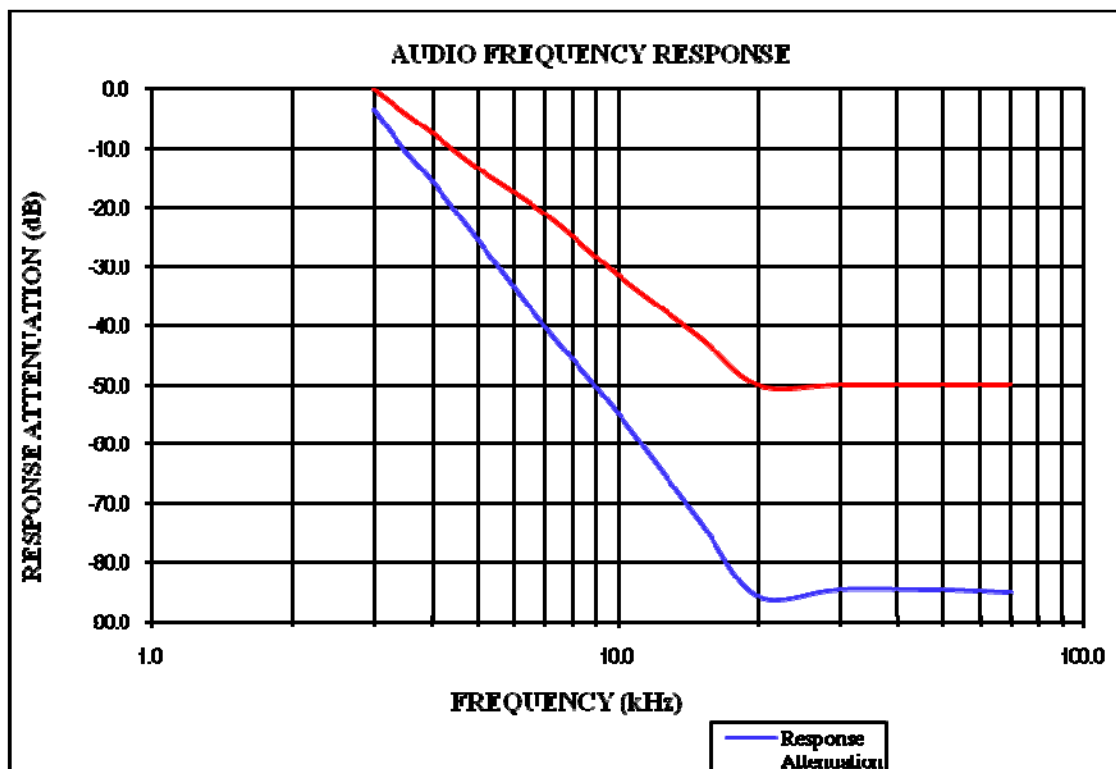
Carrier Frequency: 454.0125 MHz

Audio Frequency (Hz)	Instantaneous		Steady-state		Limit [kHz]
	Deviation (@+20dB) [kHz]	Deviation (@-20dB) [kHz]	Deviation (@+20dB) [kHz]	Deviation (@-20dB) [kHz]	
300	2.942	0.155	2.472	0.035	5
400	3.113	0.189	2.773	0.069	5
500	3.121	0.209	2.721	0.149	5
600	3.134	0.223	2.804	0.113	5
700	3.176	0.259	2.736	0.139	5
800	3.196	0.284	2.826	0.164	5
900	3.187	0.313	2.837	0.233	5
1000	3.146	0.335	2.796	0.225	5
1200	3.157	0.392	2.847	0.282	5
1400	3.276	0.413	3.026	0.353	5
1600	3.381	0.473	2.961	0.403	5
1800	3.409	0.511	3.009	0.421	5
2000	3.447	0.547	3.077	0.437	5
2200	3.532	0.602	3.192	0.512	5
2400	3.524	0.628	3.134	0.558	5
2600	3.504	0.679	3.064	0.559	5
2800	3.448	0.674	3.028	0.574	5
3000	3.177	0.657	2.847	0.557	5



Audio Frequency Low Pass Filter Response – High Power,25kHz
Carrier Frequency: 454.0125 MHz

Audio Frequency	Response Attenuation	Limit
kHz	dB	dB
3.0	-3.5	0.0
3.5	-10.4	-4.0
4.0	-15.6	-7.5
5.0	-25.3	-13.3
7.0	-40.3	-21.1
10.0	-54.7	-31.4
15.0	-73.2	-41.9
20.0	-85.7	-50.0
30.0	-84.7	-50.0
50.0	-84.8	-50.0
70.0	-85.1	-50.0



FCC §2.1049 & §22.357 & § 22.731 & §90.209 & §90.210 – OCCUPIED BANDWIDTH

Applicable Standard

FCC §2.1049, §22.357, § 22.731, §90.209 and §90.210

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.

Test Data**Environmental Conditions**

Temperature:	25.5 °C
Relative Humidity:	46 %
ATM Pressure:	100.8 kPa

The testing was performed by Andy Huang on 2019-06-04.

Test mode: transmitting

Modulation Mode	Channel Separation	f_c	99% Occupied Bandwidth	26 dB Bandwidth	Power Level	Note
		MHz	kHz	kHz		
FM	12.5kHz	155.7525	5.311	10.321	High	FCC part 90
			5.311	10.321	Low	
4FSK	12.5kHz		6.313	8.918	High	
			6.513	8.818	Low	
FM	12.5kHz	453.2125	5.210	10.321	High	
			5.311	10.321	Low	
4FSK	12.5kHz		6.513	8.216	High	
			6.112	8.116	Low	
FM	12.5kHz	150.8125	5.311	10.321	High	FCC part 22
			5.311	10.321	Low	
	25 kHz		15.832	10.621	High	
			15.832	10.621	Low	
4FSK	12.5kHz		6.313	8.617	High	
			5.912	8.317	Low	
FM	12.5kHz	454.0125	5.210	10.321	High	
			5.210	10.321	Low	
	25 kHz		15.832	10.421	High	
			15.832	10.421	Low	
4FSK	12.5kHz		6.814	8.717	High	
			6.513	8.918	Low	

Note: Emission bandwidth was based on calculation method instead of measurement.

Emission Designator

Per CFR 47 §2.201& §2.202, $BW = 2M + 2D$

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.

$$BW = 2(M+D) = 2*(3.0 \text{ kHz} + 2.5 \text{ kHz}) = 11 \text{ kHz} = 11K0$$

F3E portion of the designator represents an FM voice transmission

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

For FM Mode (Channel Spacing: 25 kHz)

Emission Designator 16K0F3E

In this case, the maximum modulating frequency is 3.0 kHz with a 5.0 kHz deviation.

$$BW = 2(M+D) = 2*(3.0 \text{ kHz} + 5.0 \text{ kHz}) = 16 \text{ kHz} = 16K0$$

F3E portion of the designator represents an FM voice transmission

Therefore, the entire designator for 25 kHz channel spacing FM mode is 16K0F3E.

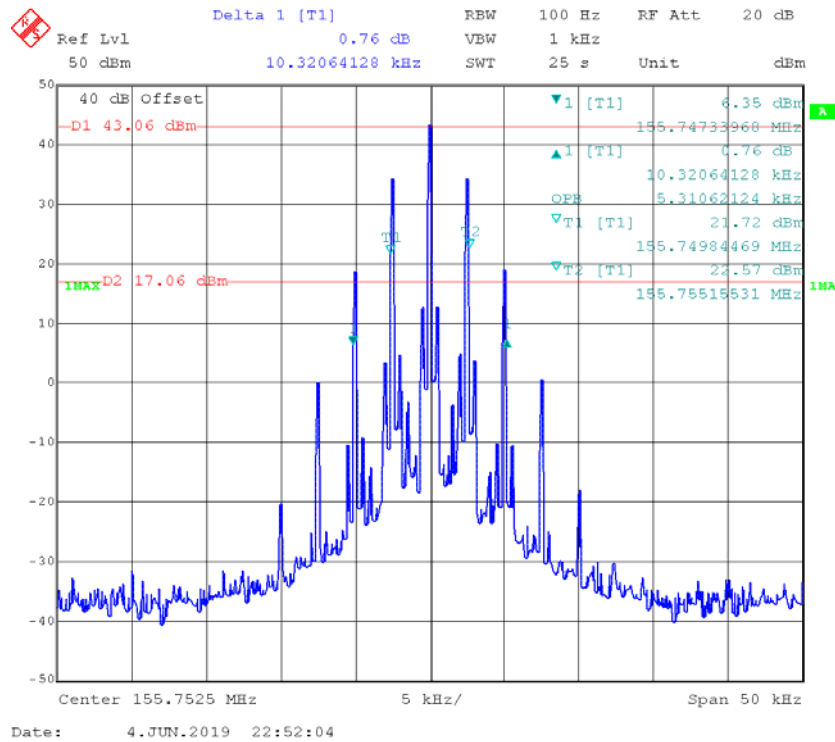
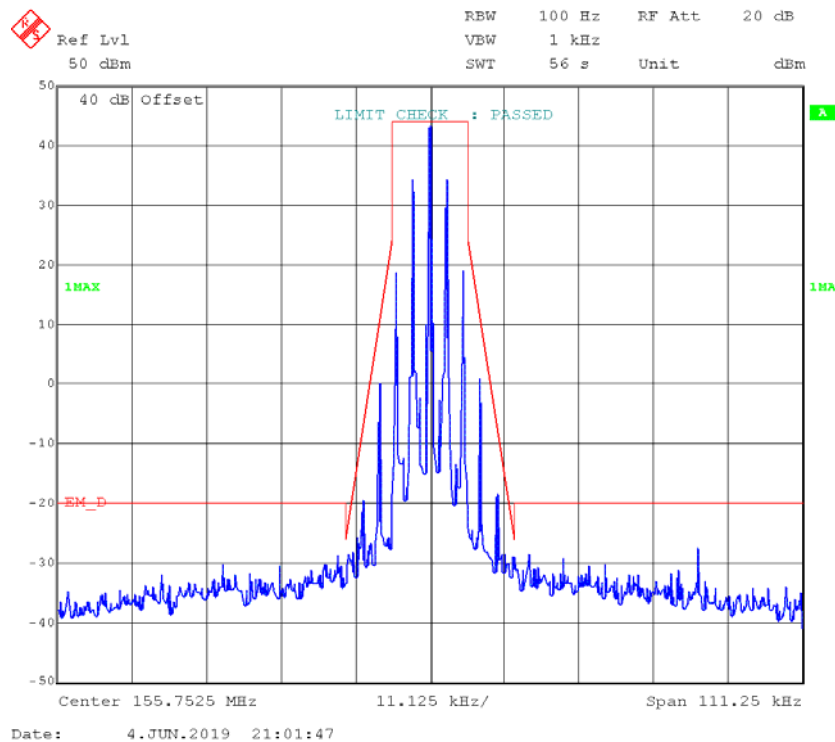
For Digital Mode (Channel Spacing: 12.5 kHz)

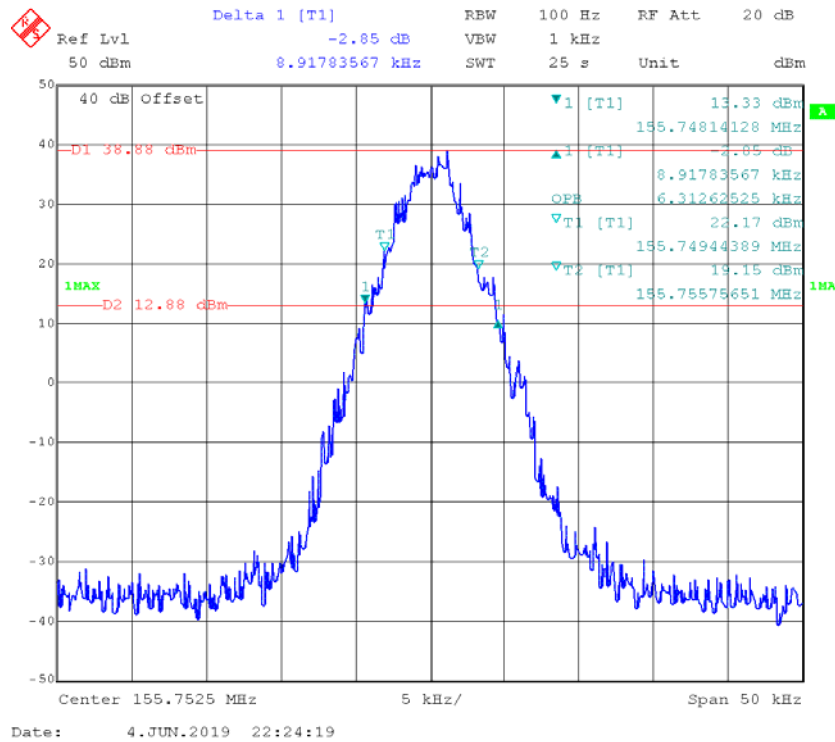
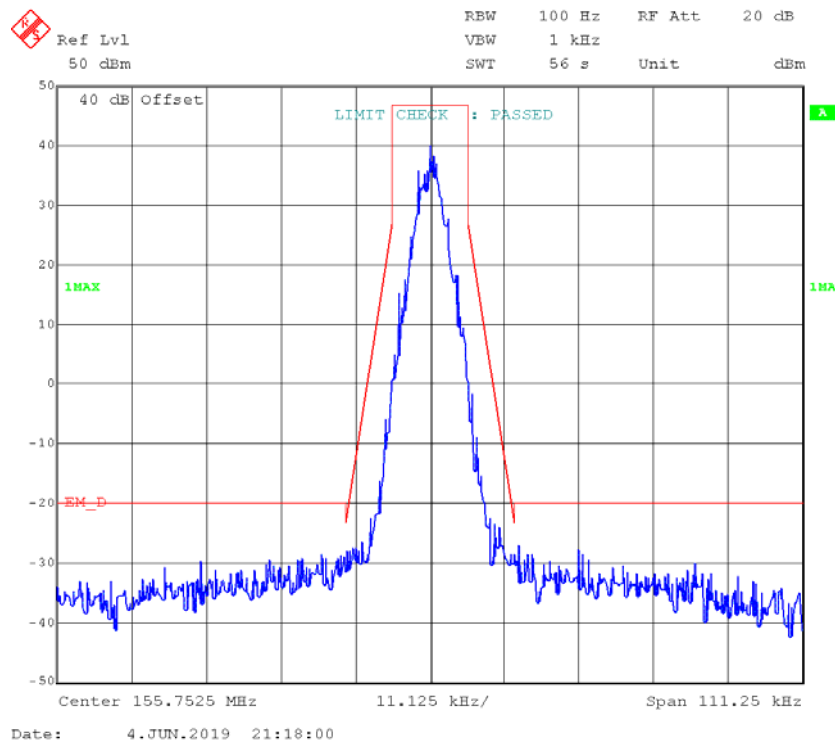
Emission Designator 7K60F1D and 7K60F1E

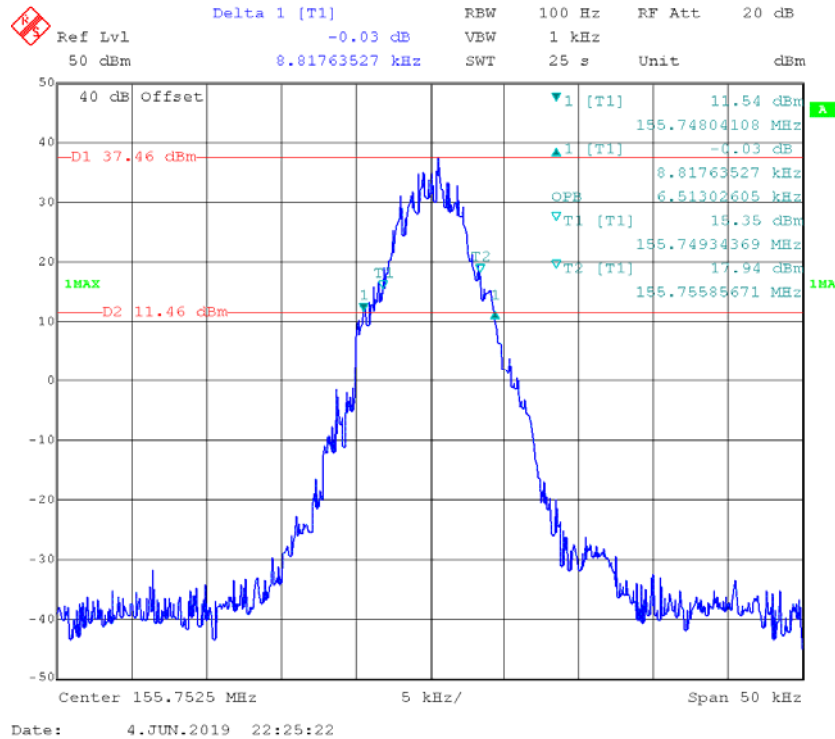
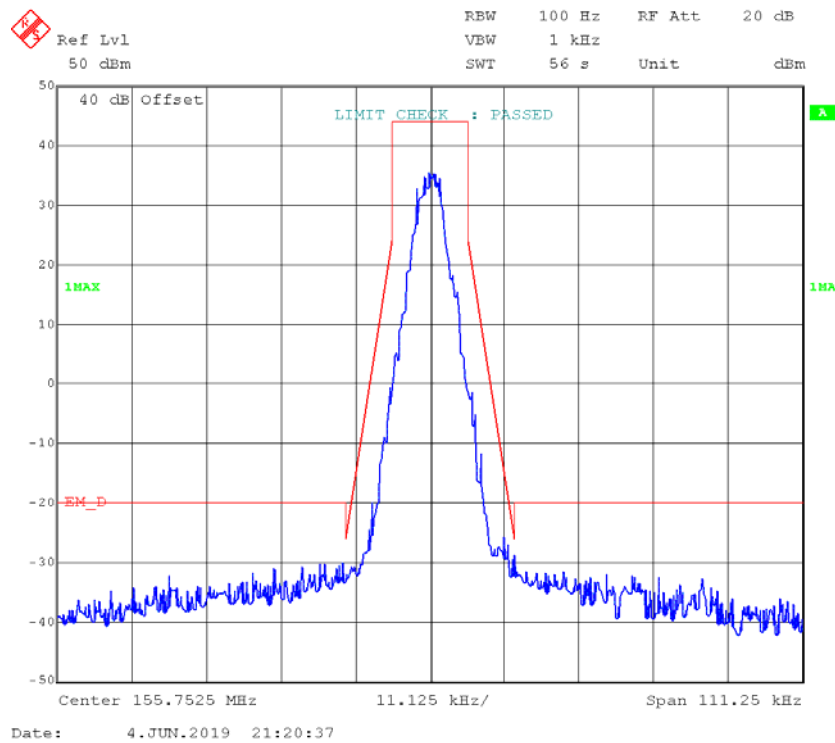
The 99% energy rule (title 47CFR 2.1049) was used for digital mode. It basically states that 99% of the modulation energy falls within X kHz, in this case, 7.60 kHz. The emission mask was obtained from 47CFR 90.210(d).

F1D and F1E portion of the designator indicates digital information.

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

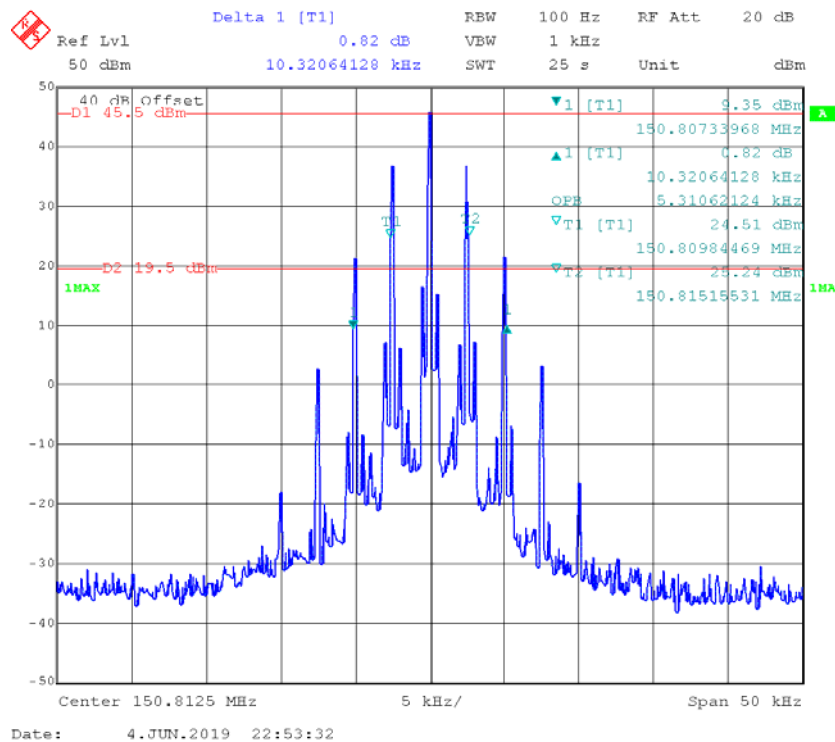
FM,12.5kHz,Low Power - Frequency 155.7525 MHz: 99% Occupied & 26 dB Bandwidth**Emission Mask D**

4FSK,12.5kHz,High Power - Frequency 155.7525 MHz: 99% Occupied & 26 dB Bandwidth**Emission Mask D**

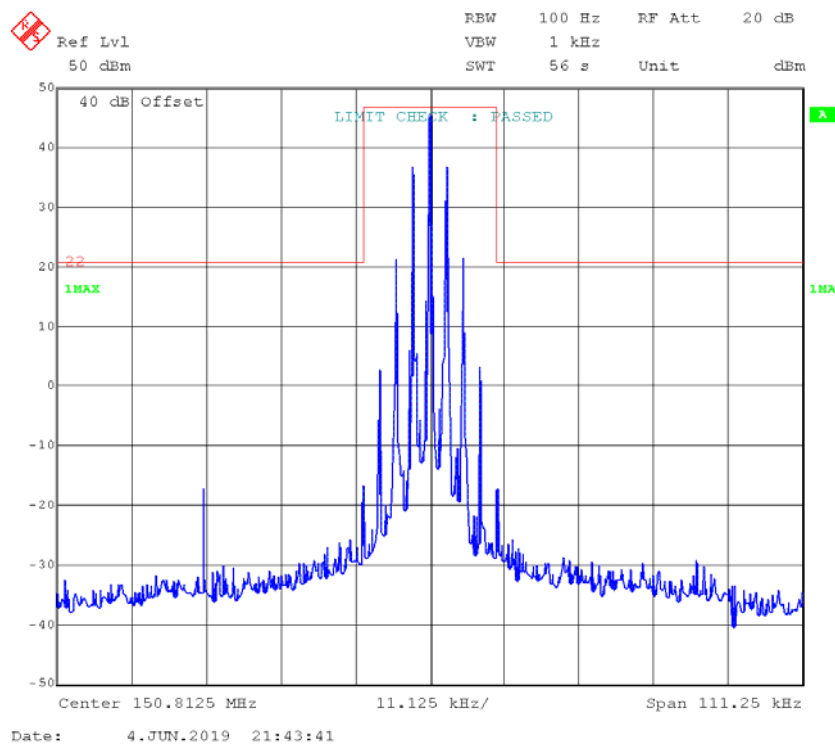
4FSK,12.5kHz,Low Power - Frequency 155.7525 MHz: 99% Occupied & 26 dB Bandwidth**Emission Mask D**

Part 22:

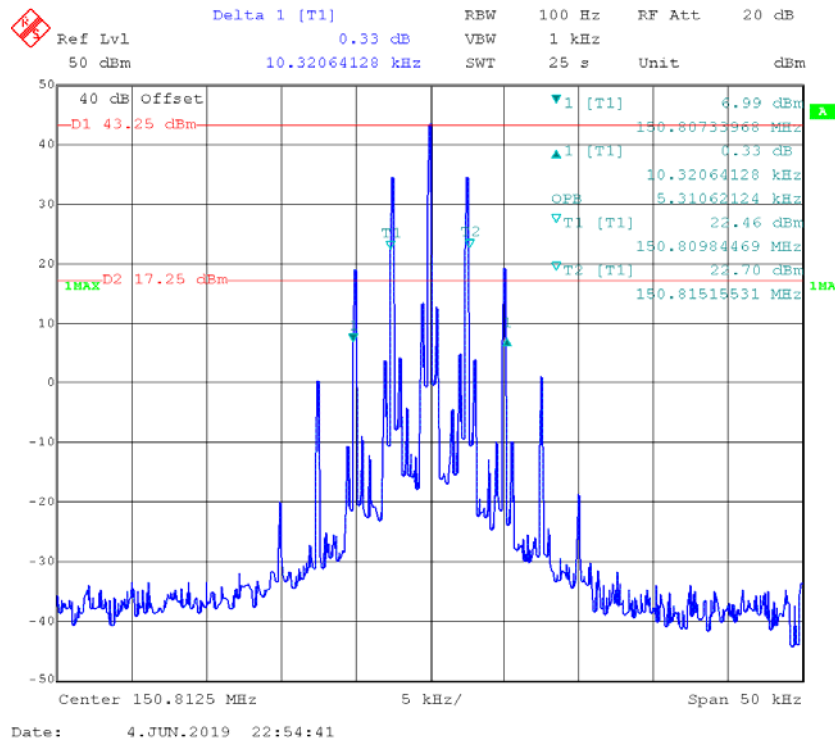
FM, 12.5kHz,High Power - Frequency 150.8125 MHz: 99% Occupied & 26 dB Bandwidth



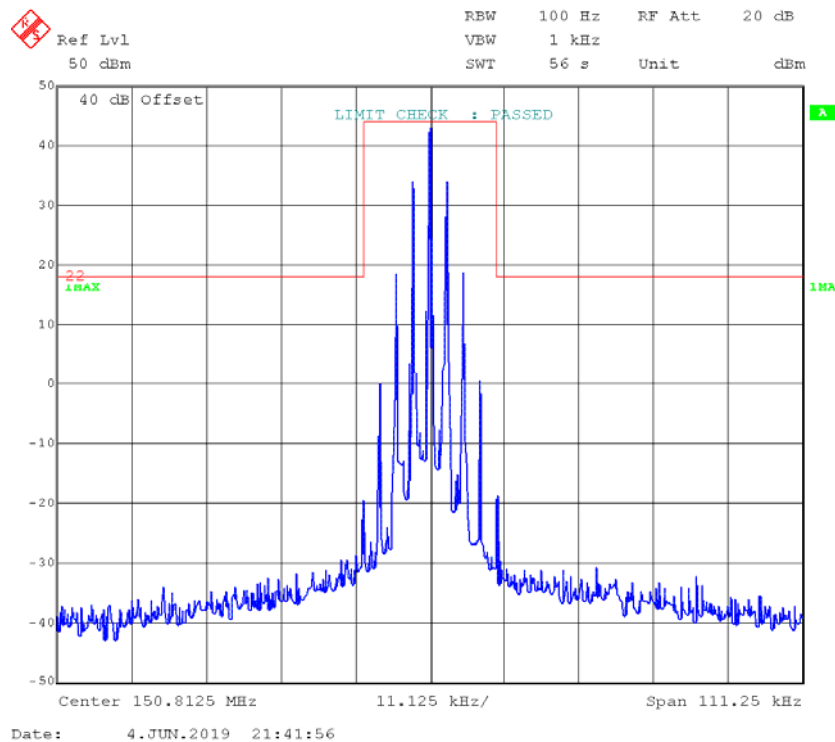
Emission Mask-§22.359

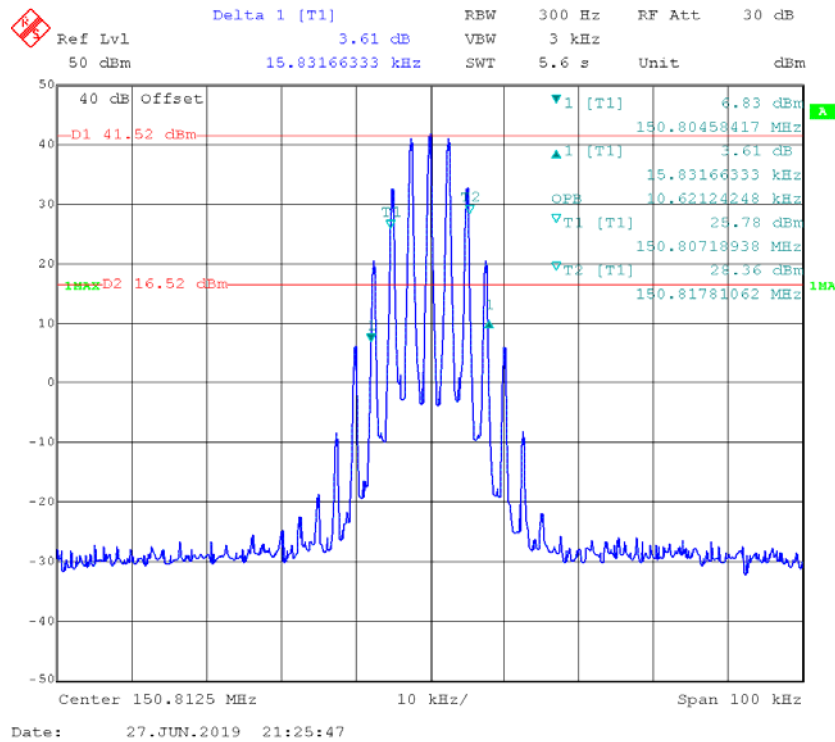
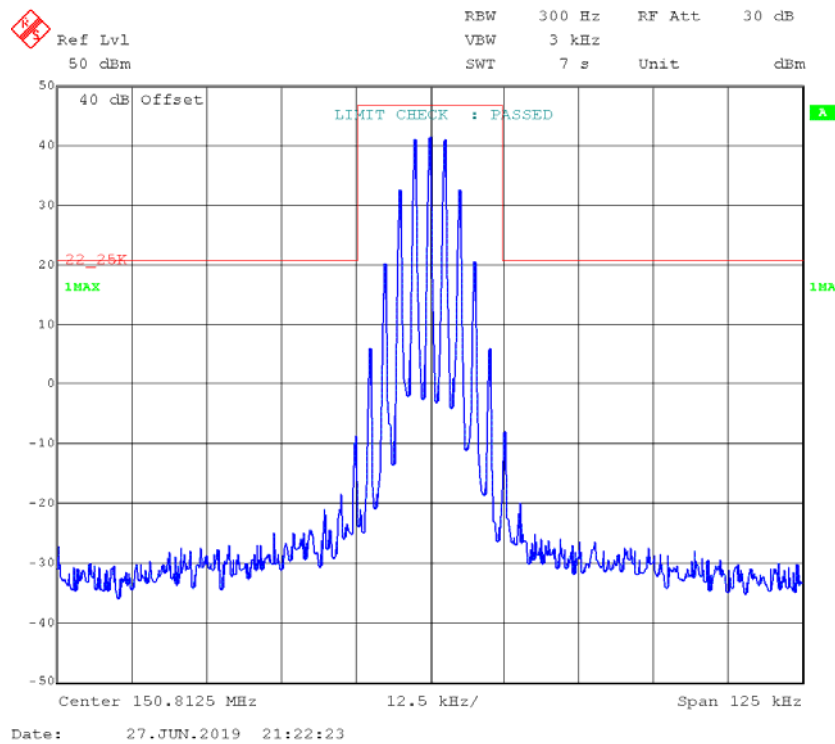


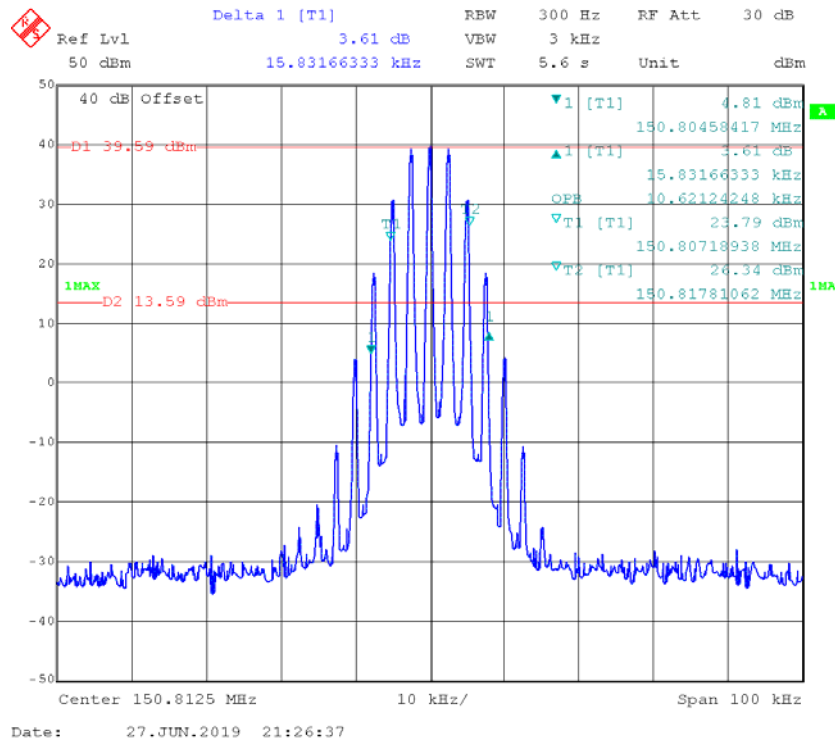
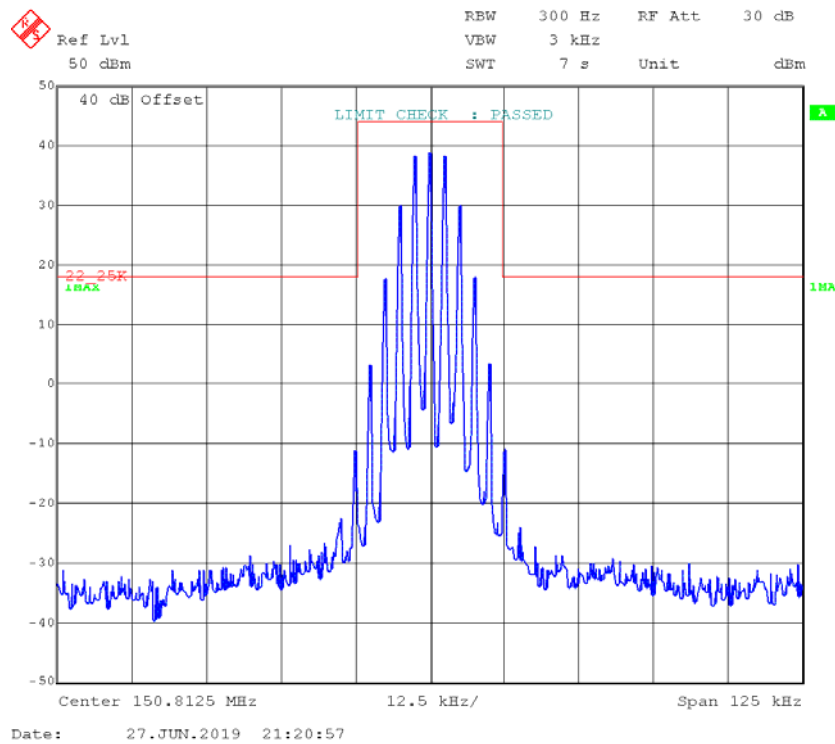
FM,12.5kHz,Low Power - Frequency 150.8125 MHz: 99% Occupied & 26 dB Bandwidth

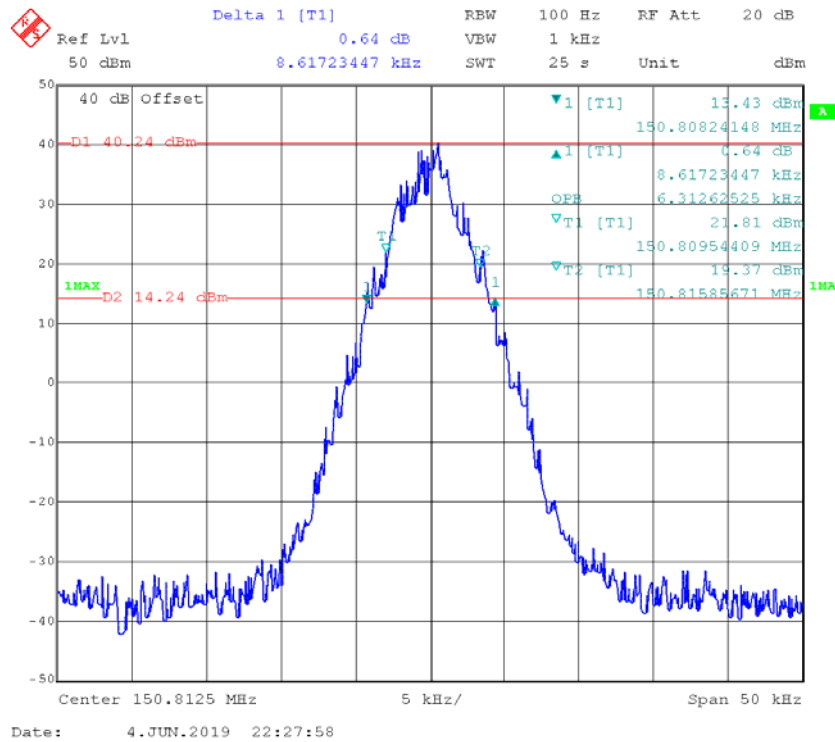
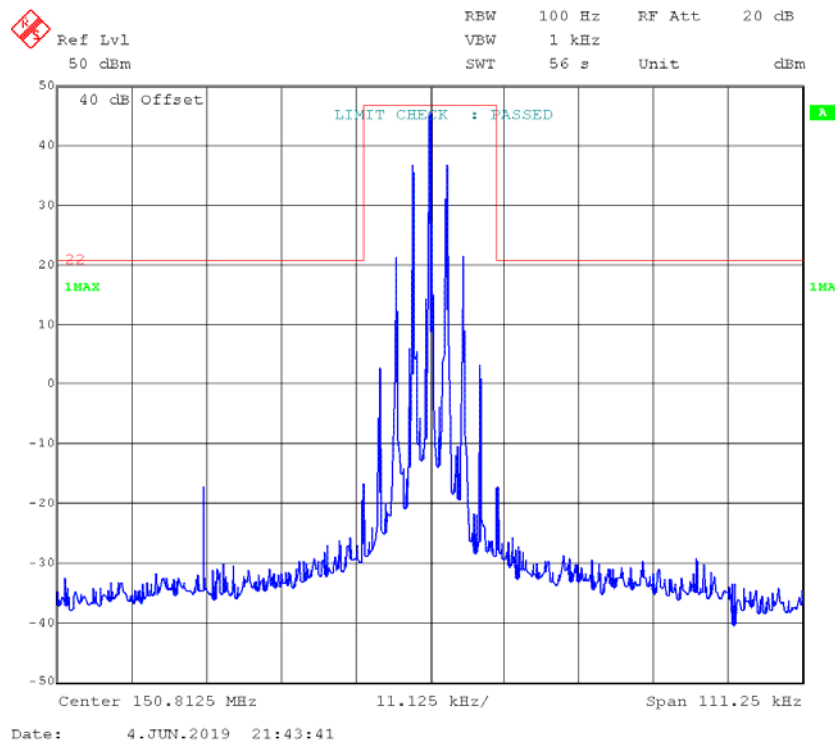


Emission Mask-§22.359

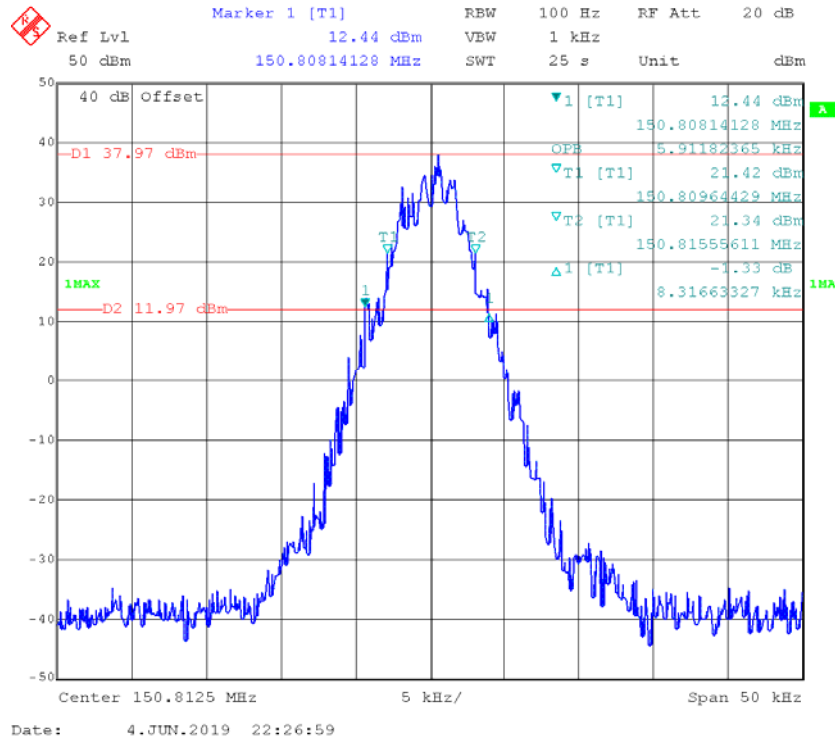


FM, 25 kHz, High Power - Frequency 150.8125 MHz: 99% Occupied & 26 dB Bandwidth**Emission Mask-§22.359**

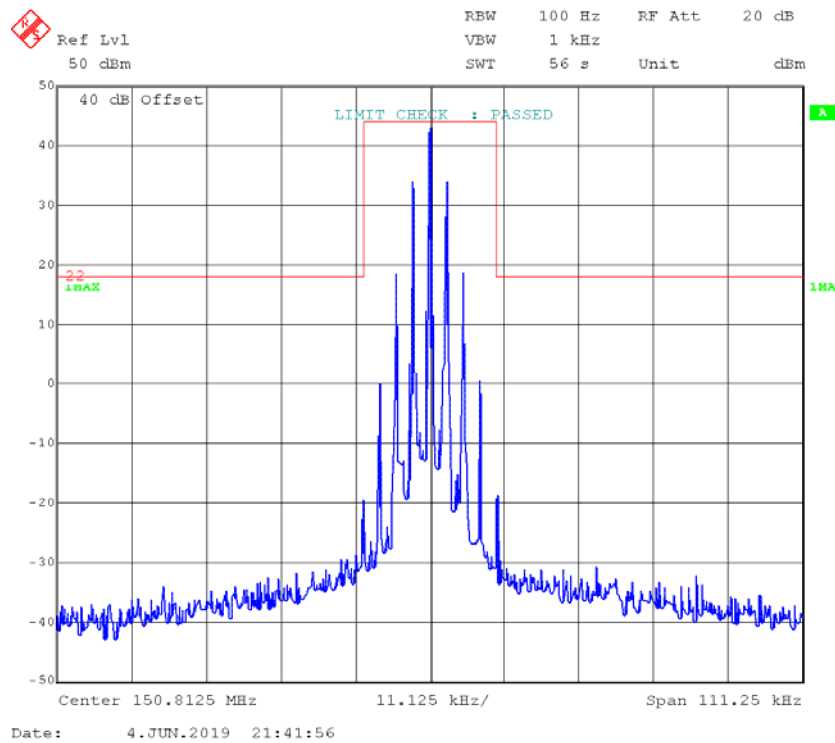
FM,25 kHz,Low Power - Frequency 150.8125 MHz: 99% Occupied & 26 dB Bandwidth**Emission Mask-§22.359**

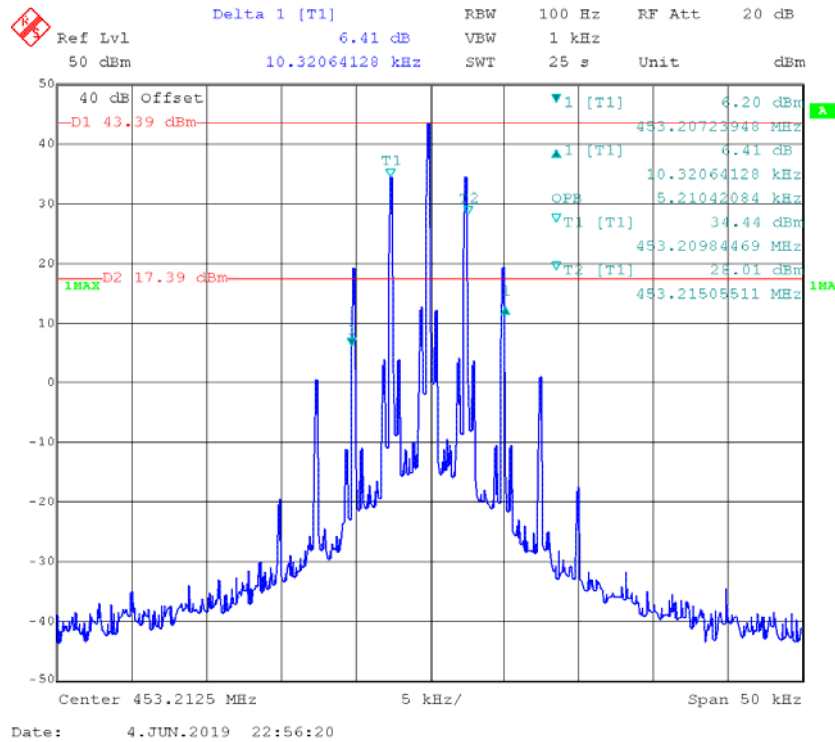
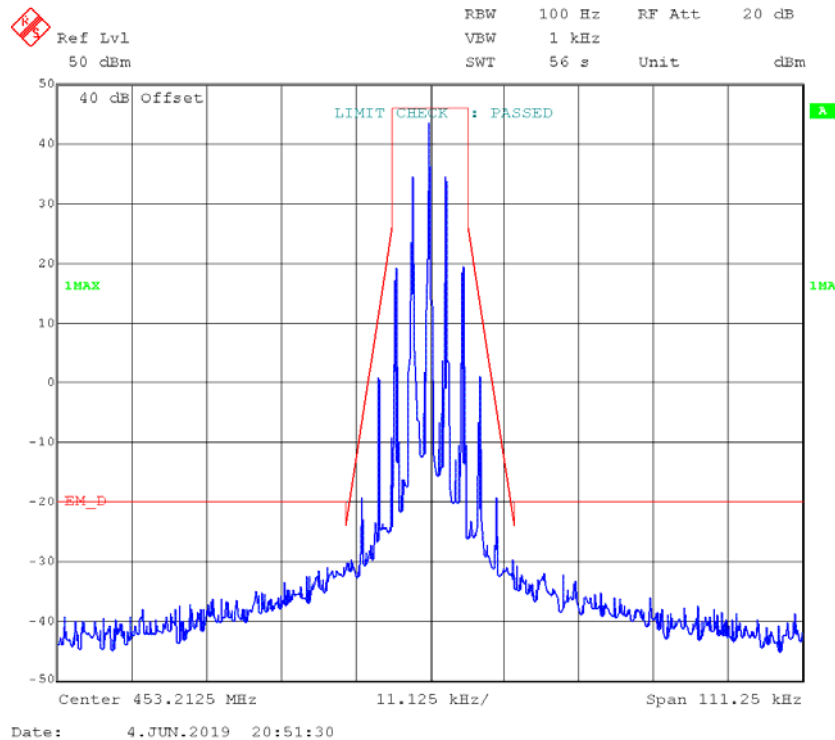
4FSK,12.5kHz,High Power - Frequency 150.8125 MHz: 99% Occupied & 26 dB Bandwidth**Emission Mask-§22.359**

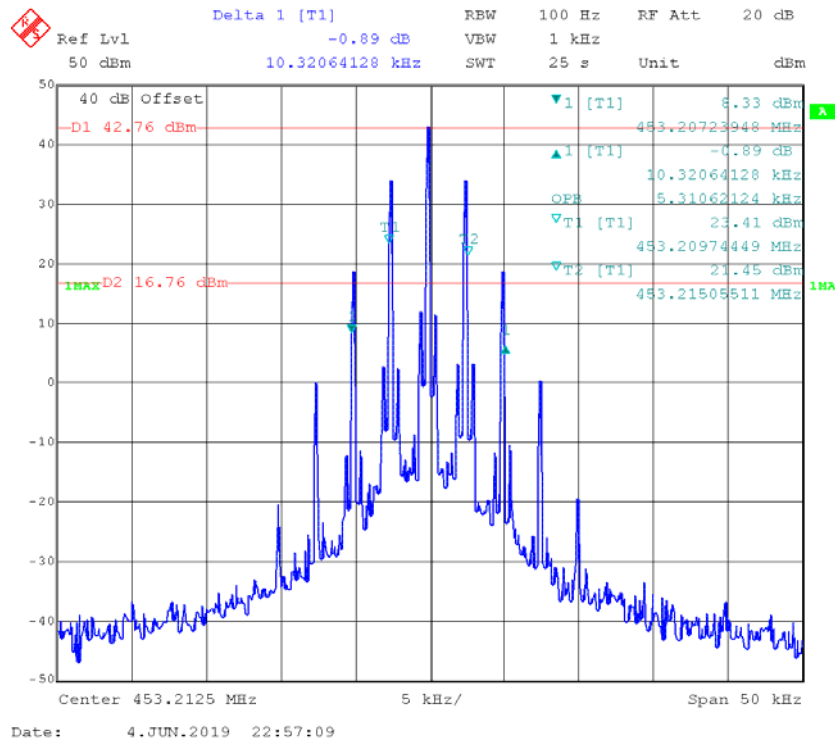
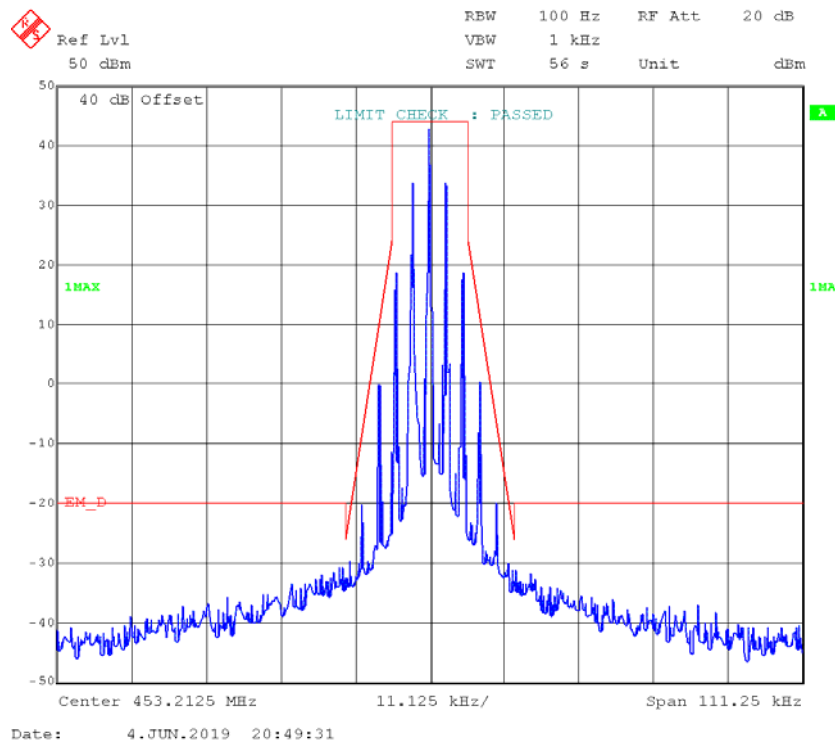
4FSK,12.5kHz,Low Power - Frequency 150.8125 MHz: 99% Occupied & 26 dB Bandwidth

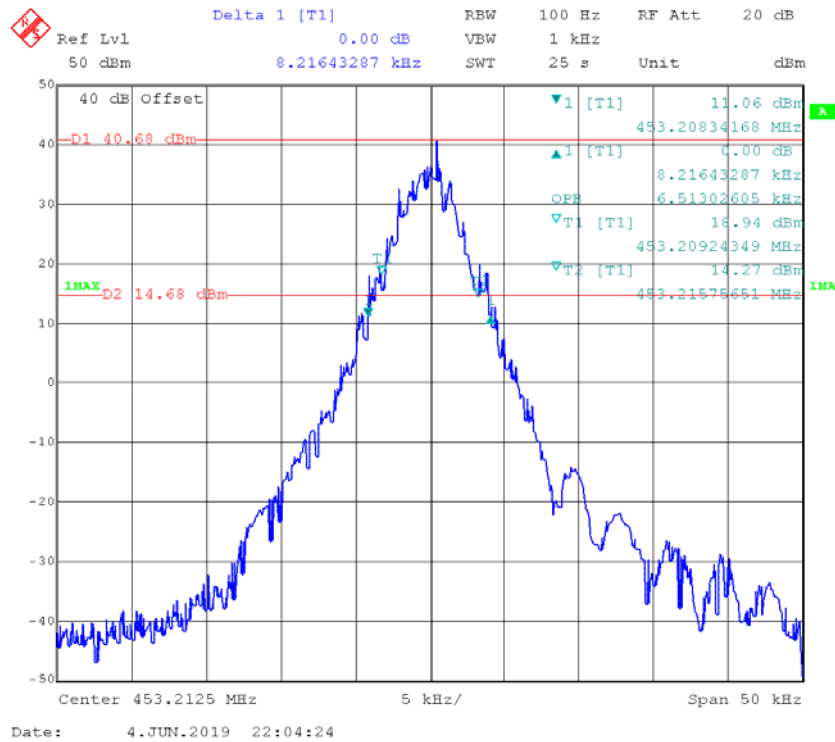
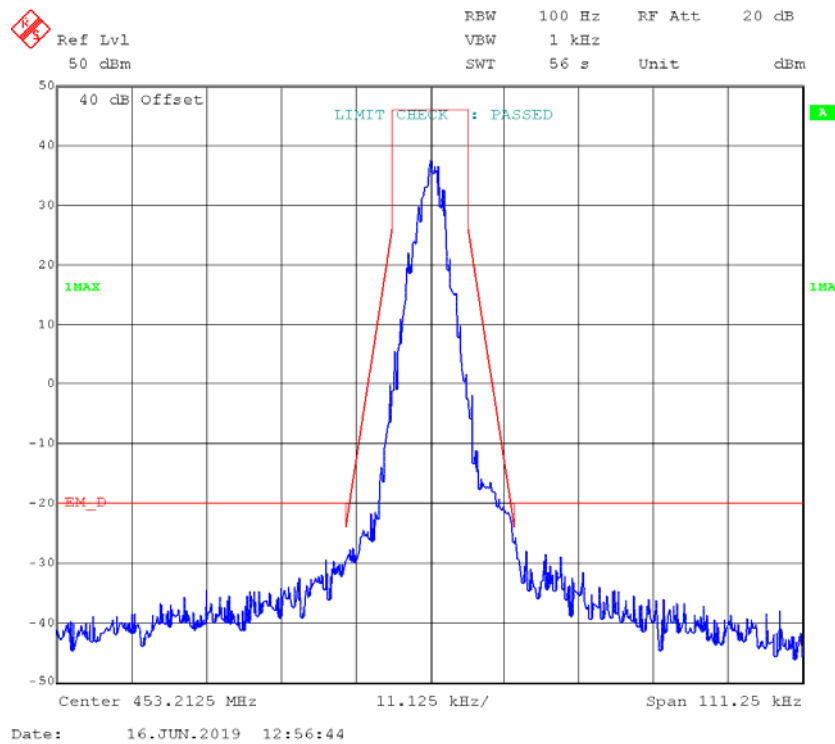


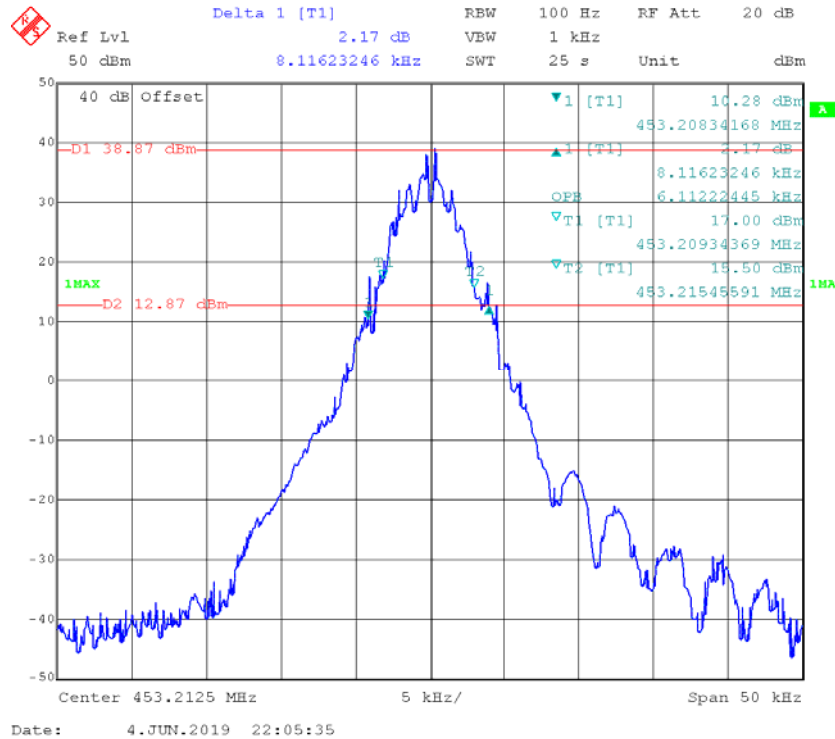
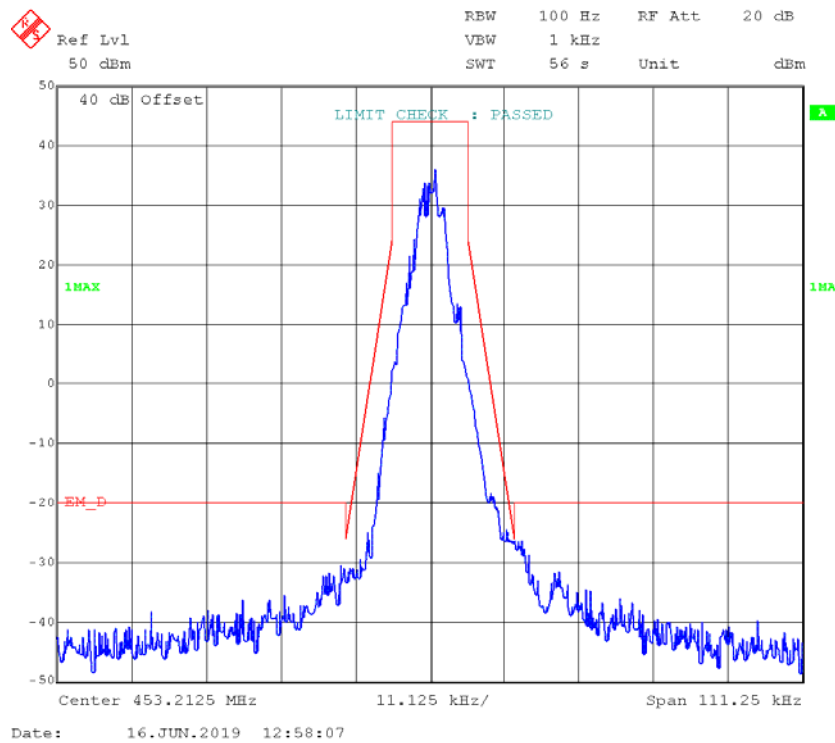
Emission Mask-§22.359

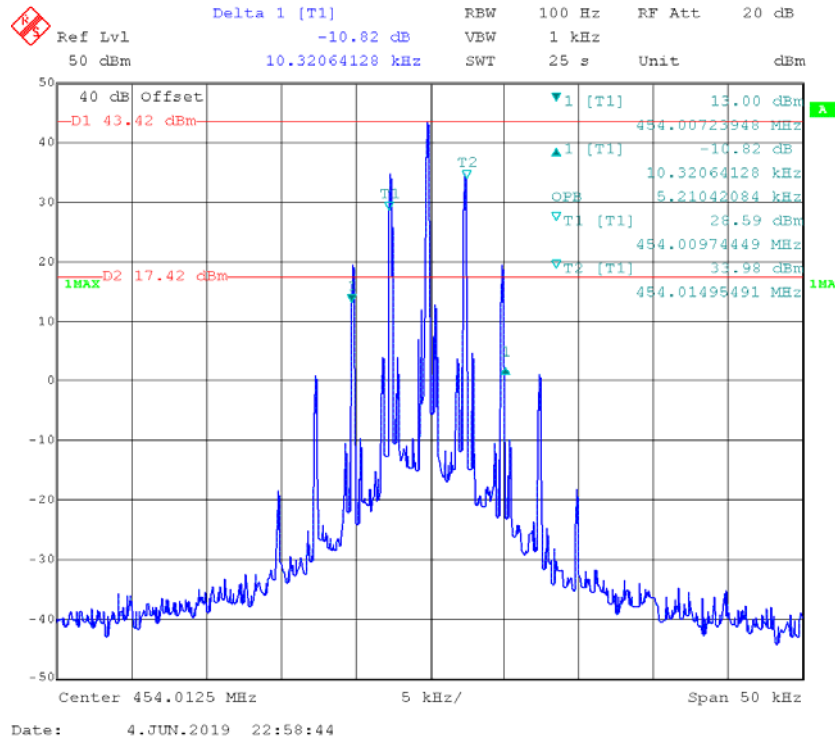
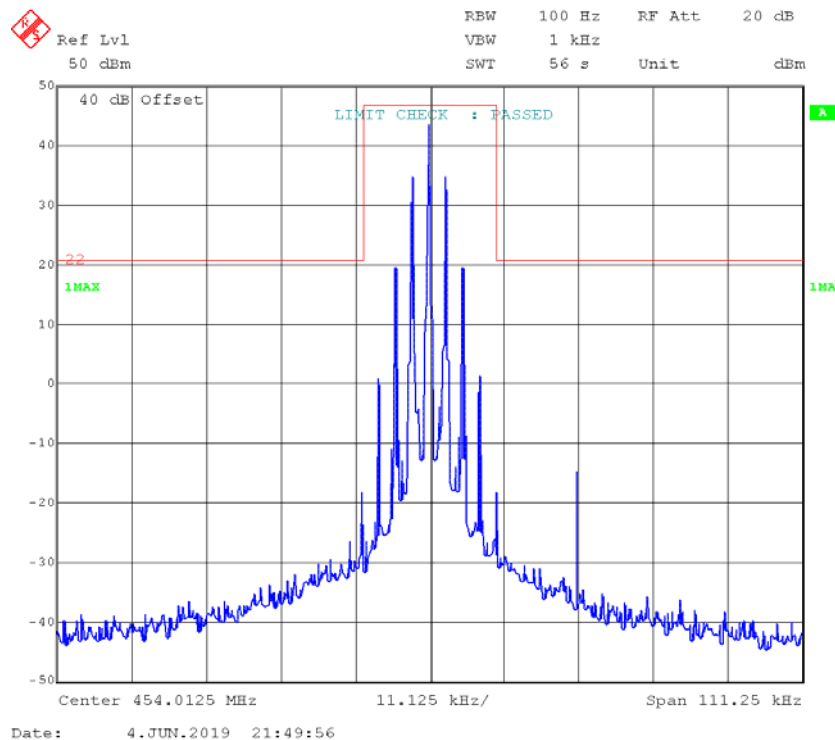


400-470 MHz band:**Part 90:****FM, 12.5kHz, High Power - Frequency 453.2125 MHz: 99% Occupied & 26 dB Bandwidth****Emission Mask D**

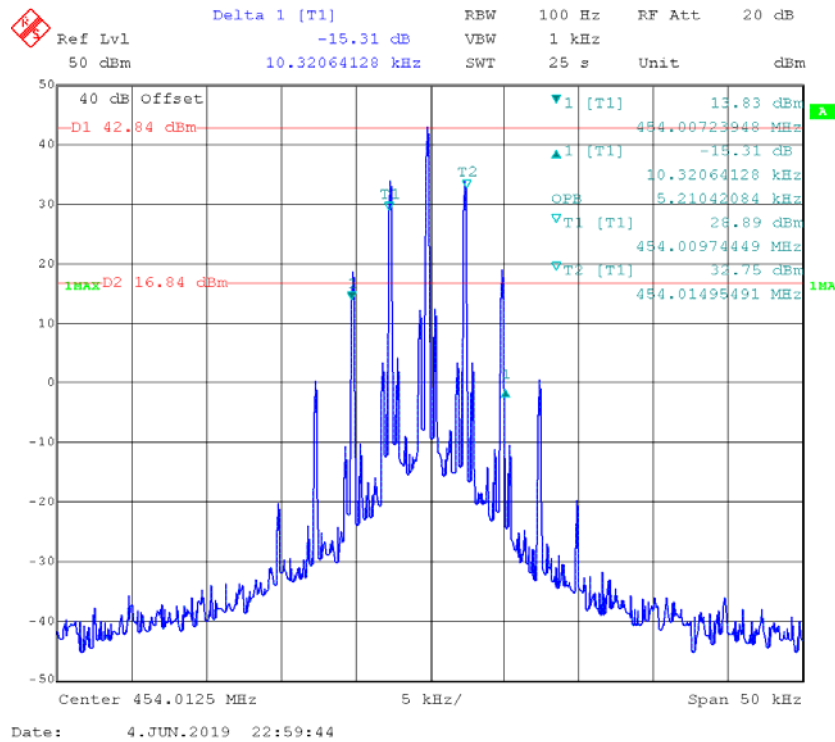
FM,12.5kHz,Low Power - Frequency 453.2125 MHz: 99% Occupied & 26 dB Bandwidth**Emission Mask D**

4FSK,12.5kHz,High Power - Frequency 453.2125MHz: 99% Occupied & 26 dB Bandwidth**Emission Mask D**

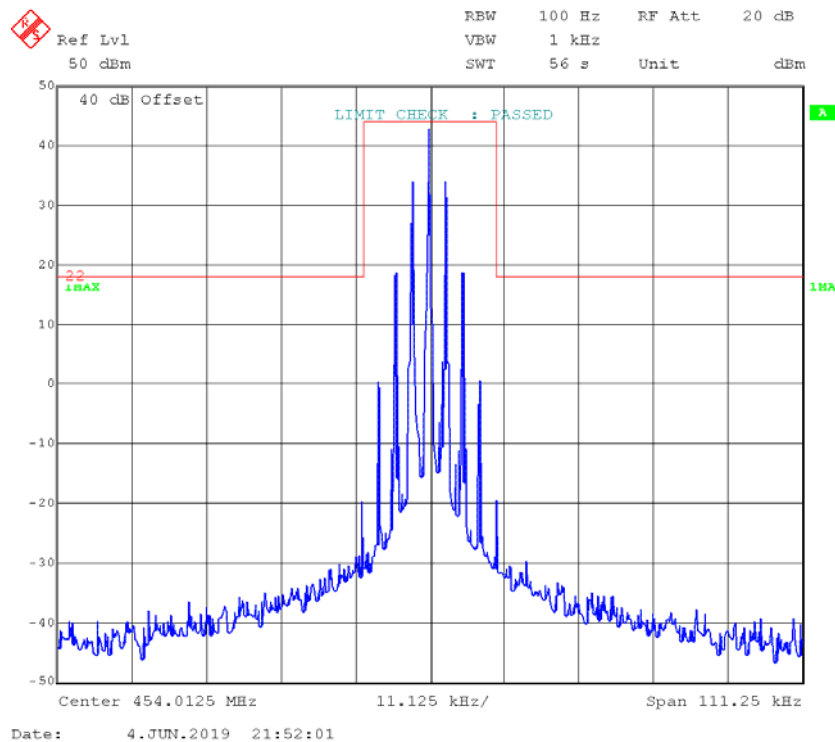
4FSK,12.5kHz,Low Power - Frequency 453.2125MHz: 99% Occupied & 26 dB Bandwidth**Emission Mask D**

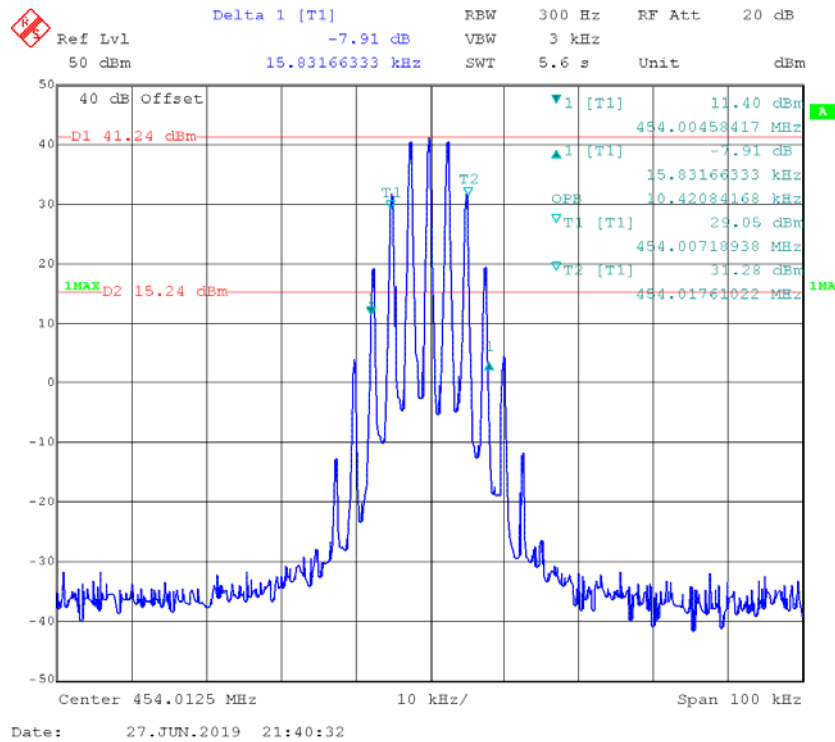
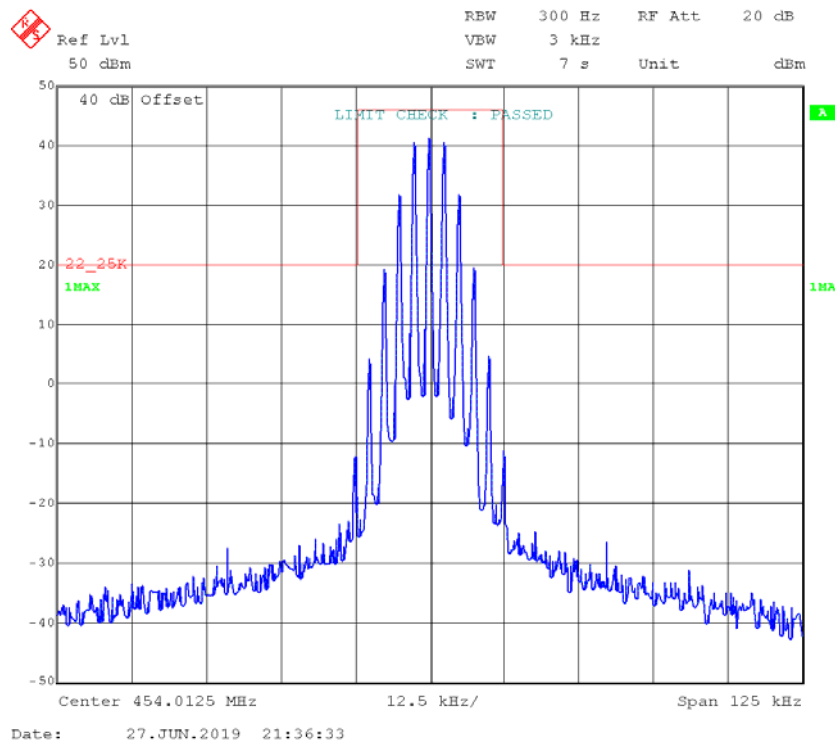
Part 22:**FM, 12.5kHz, High Power - Frequency 454.0125 MHz: 99% Occupied & 26 dB Bandwidth****Emission Mask-§22.359**

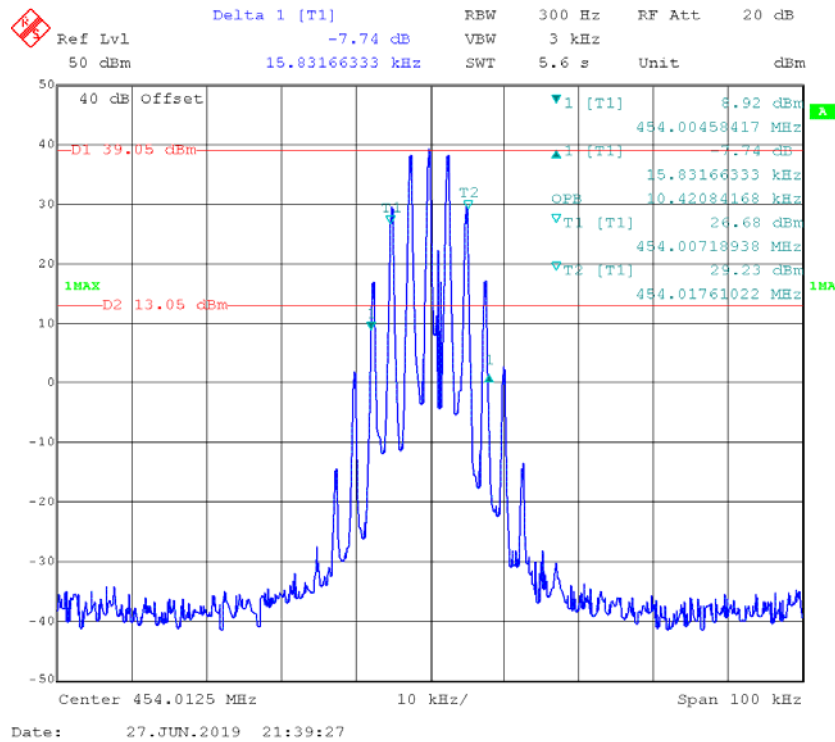
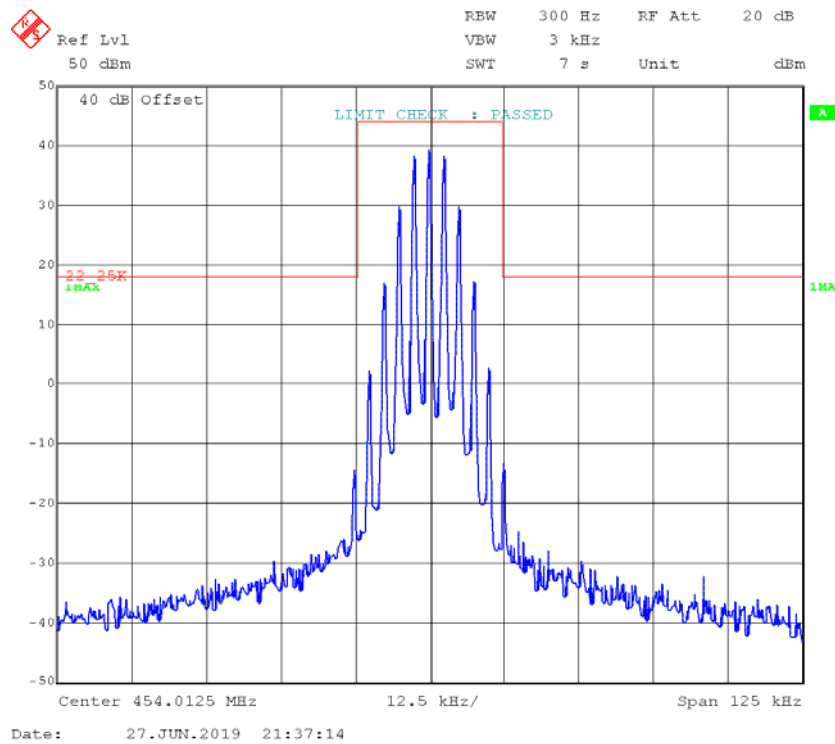
FM,12.5kHz,Low Power - Frequency 454.0125 MHz: 99% Occupied & 26 dB Bandwidth

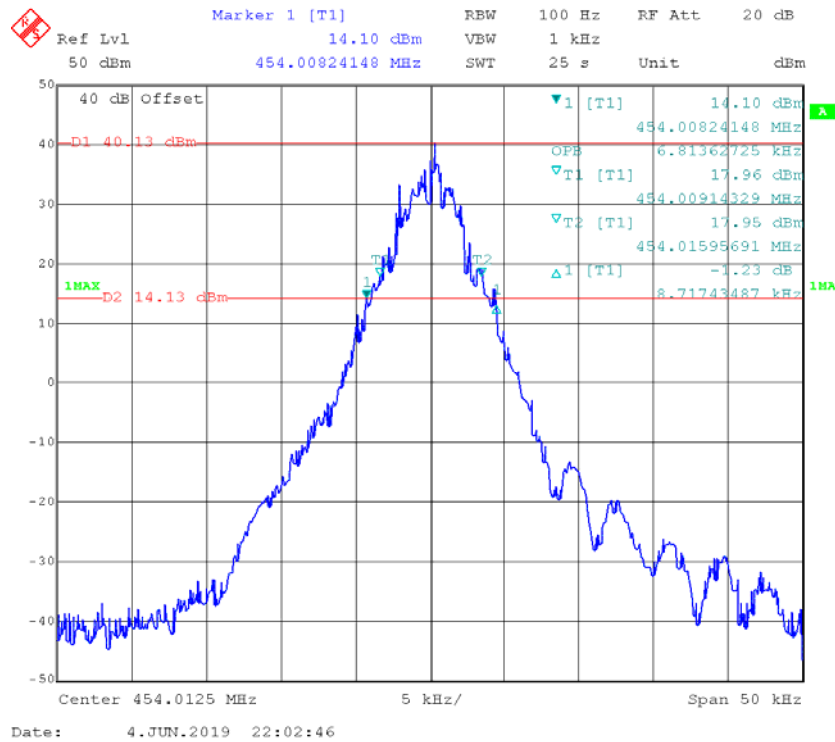
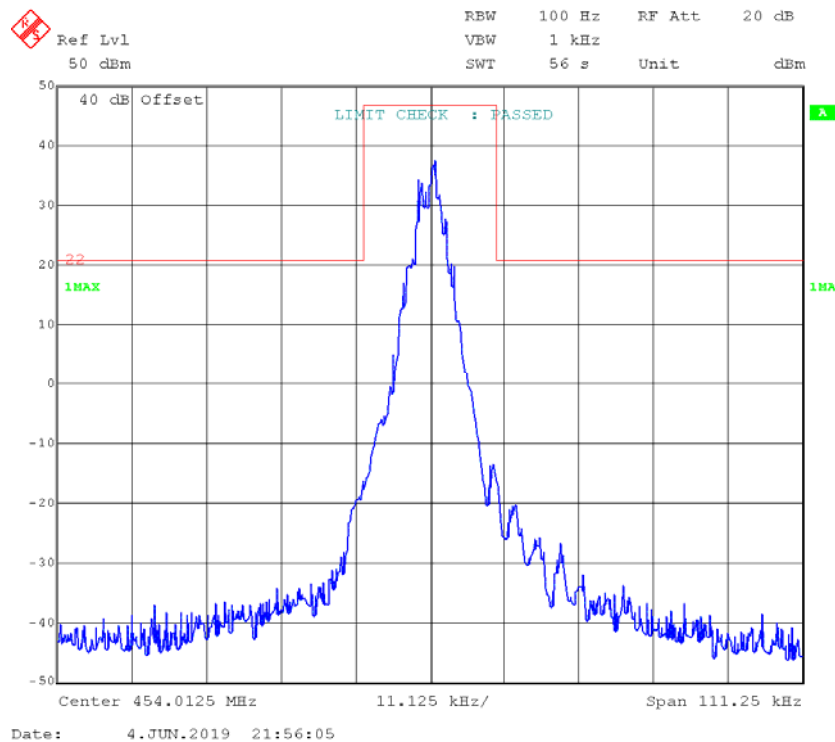


Emission Mask-§22.359

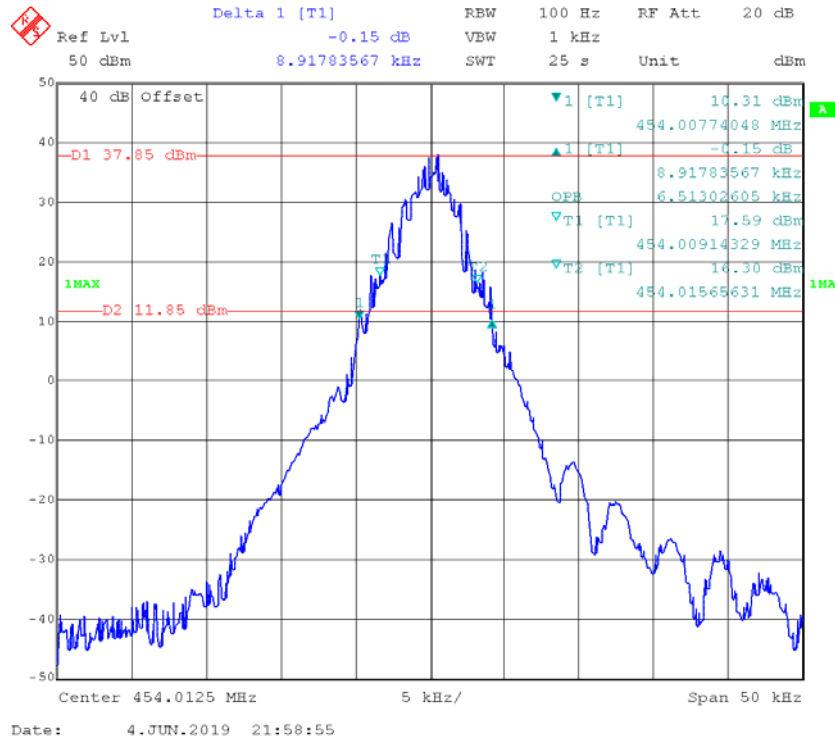


FM, 25kHz, High Power - Frequency 454.0125 MHz: 99% Occupied & 26 dB Bandwidth**Emission Mask-§22.359**

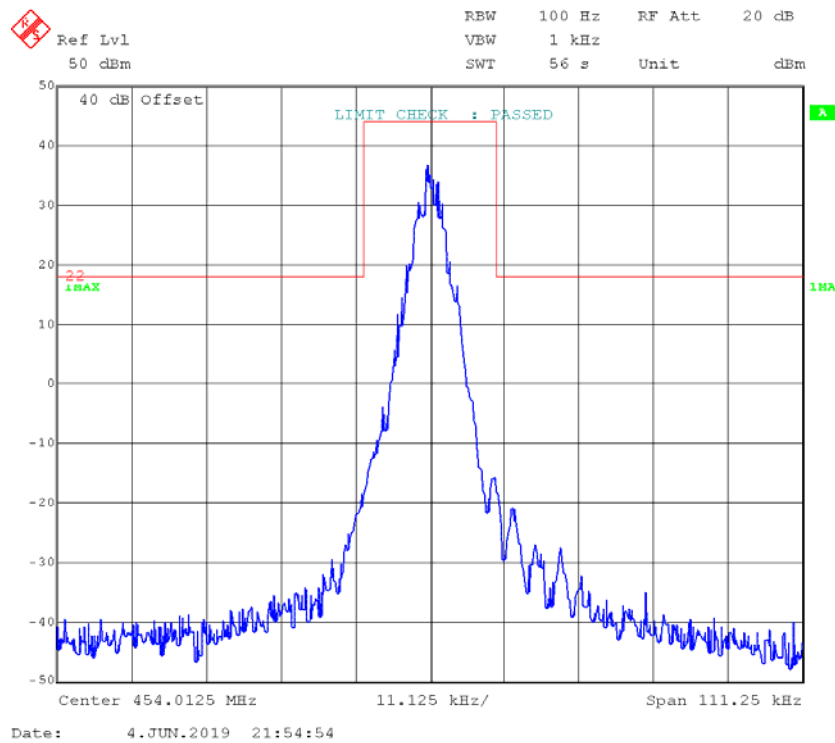
FM,25kHz,Low Power - Frequency 454.0125 MHz: 99% Occupied & 26 dB Bandwidth**Emission Mask-§22.359**

4FSK,12.5kHz,High Power - Frequency 454.0125MHz: 99% Occupied & 26 dB Bandwidth**Emission Mask-§22.359**

4FSK,12.5kHz,Low Power - Frequency 454.0125MHz: 99% Occupied & 26 dB Bandwidth



Emission Mask-§22.359



FCC §2.1051 & §22.861 & §90.210 - SPURIOUS EMISSIONS AT ANTENNA TERMINALS

Applicable Standard

FCC §2.1051, §22.861, and §90.210

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

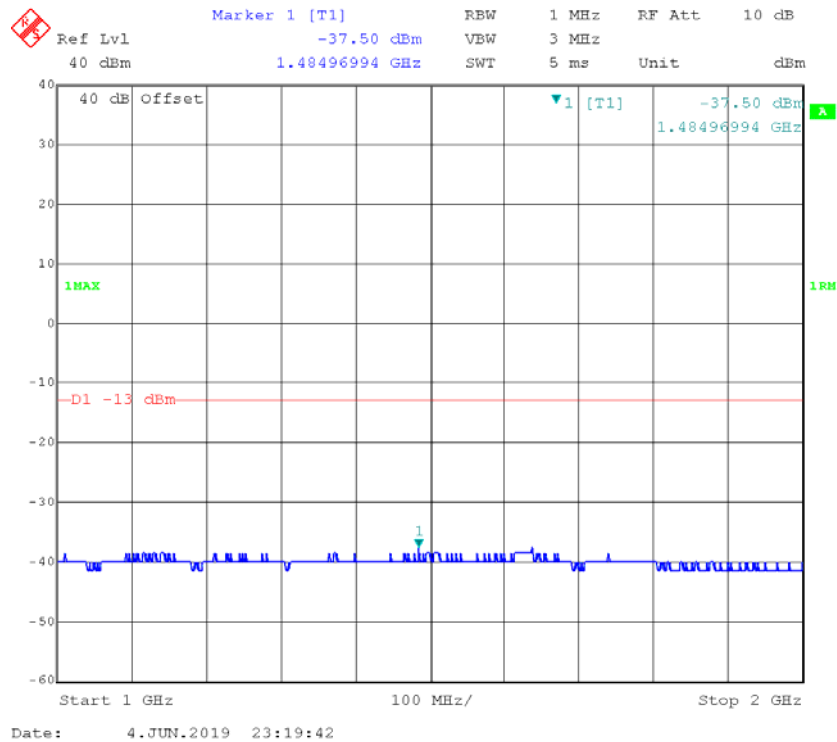
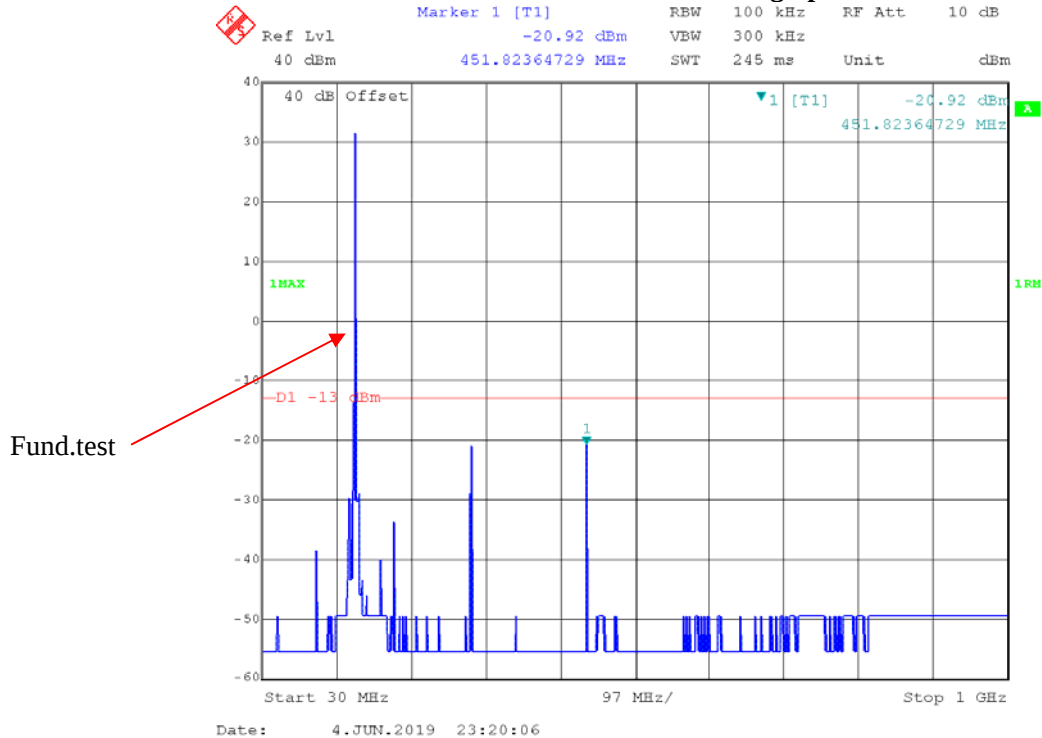
Test Data

Environmental Conditions

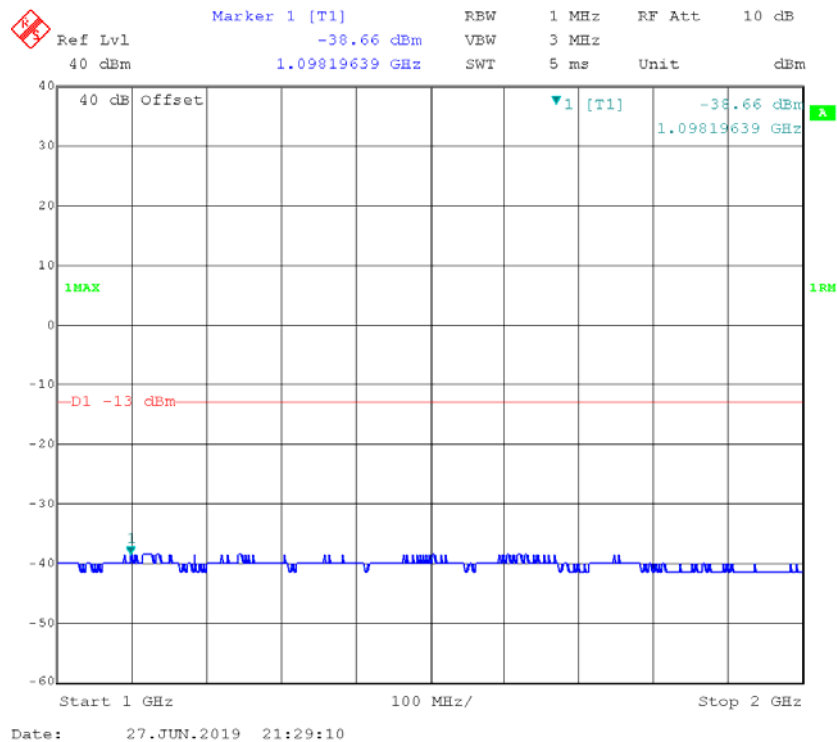
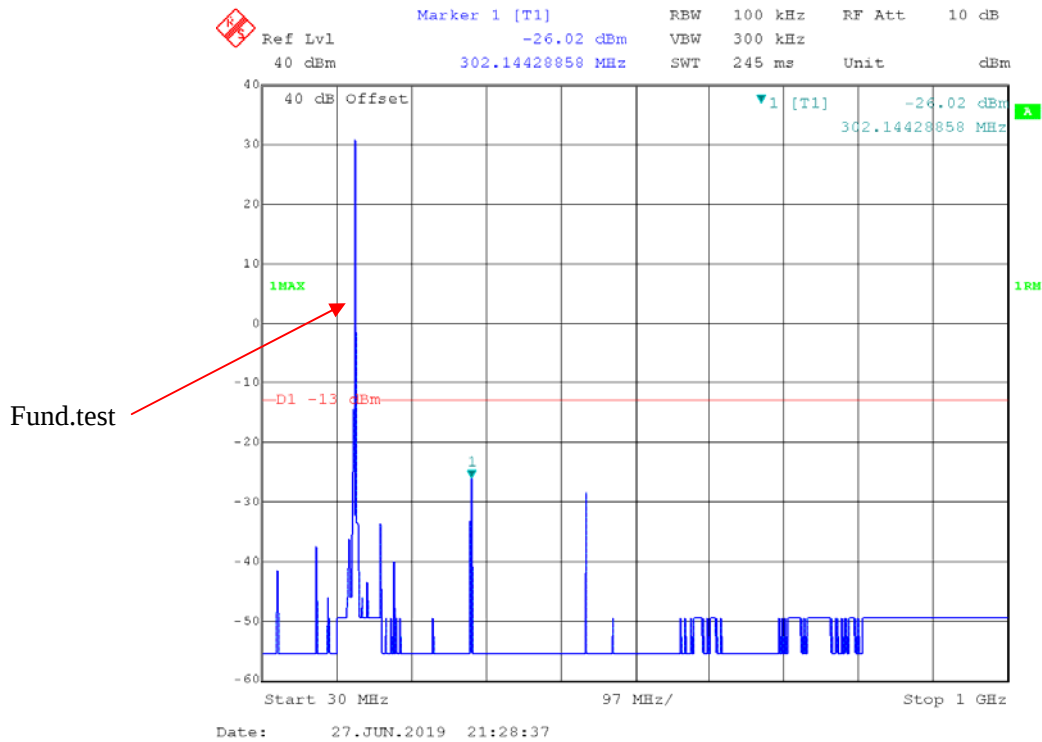
Temperature:	23.9~25.5 °C
Relative Humidity:	35~46 %
ATM Pressure:	100.6~100.8 kPa

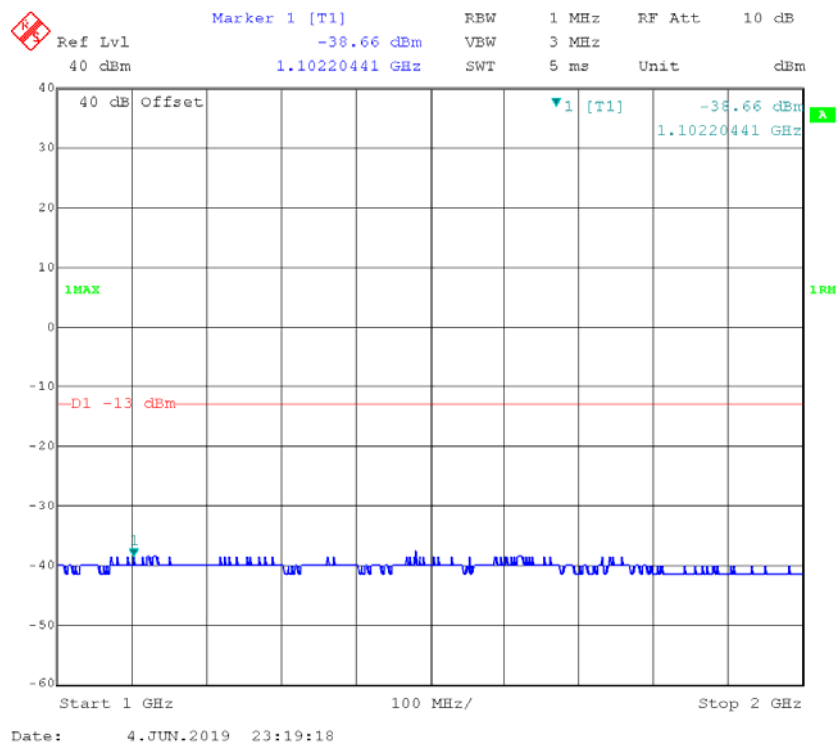
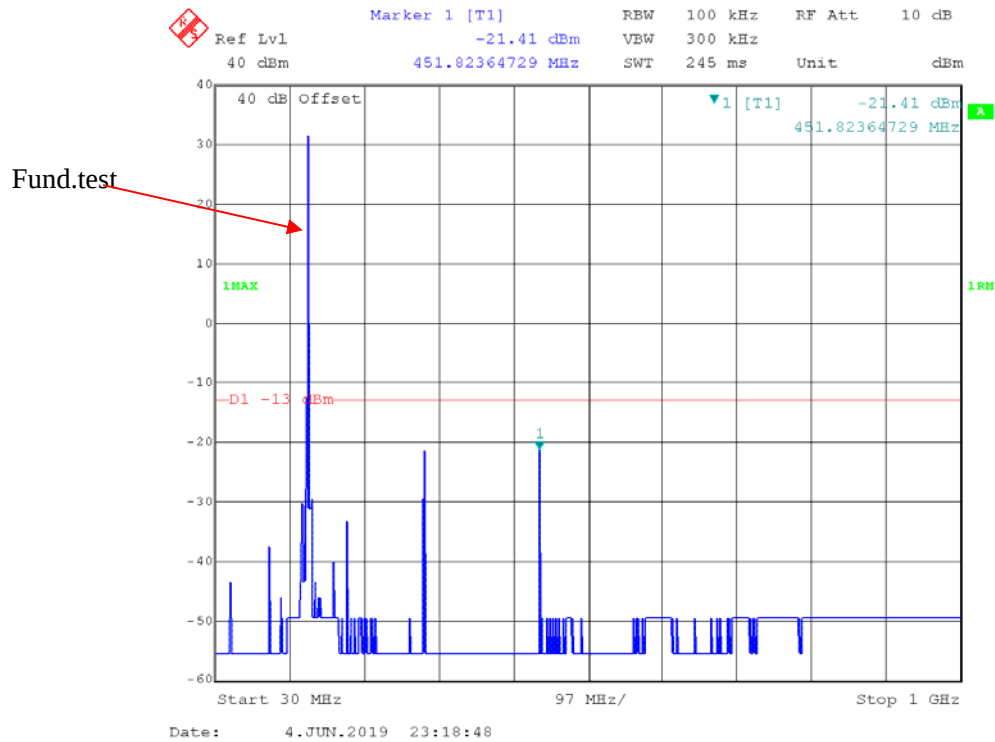
The testing was performed by Andy Huang on 2019-06-04 to 2019-06-13.

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

136-174 MHz band:**Part 22:****FM 12.5 kHz, 150.8125MHz, High power**

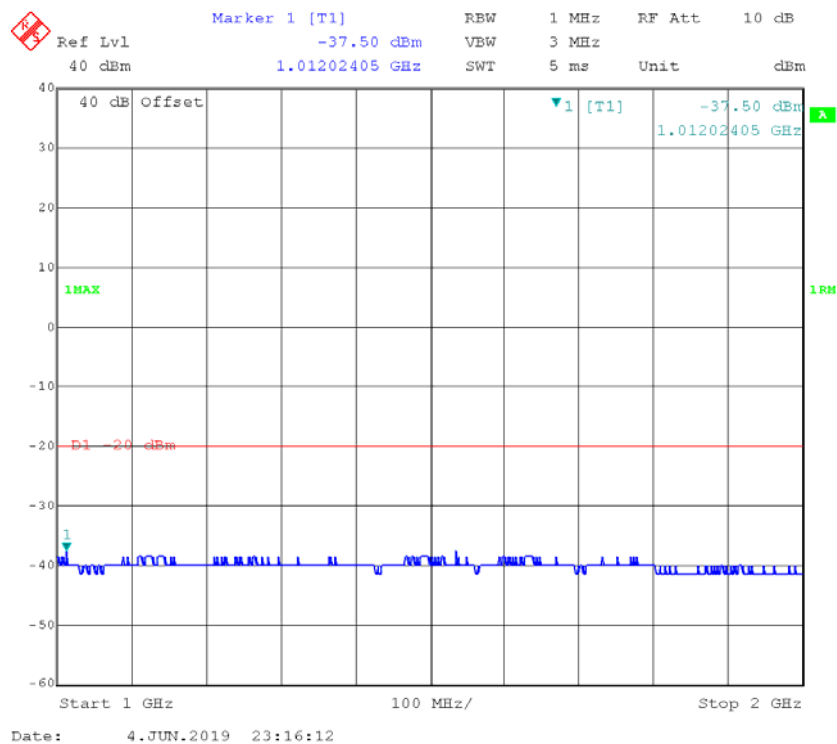
FM 25 kHz, 150.8125MHz, High power

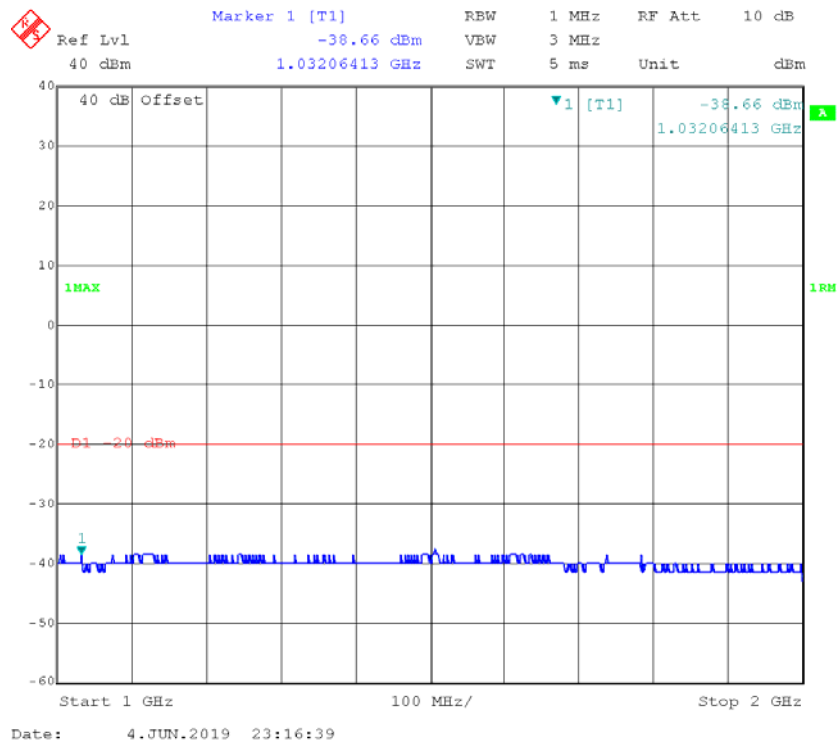


4FSK, 12.5kHz, 150.8125MHz, High power

Part 90:

FM 12.5 kHz, 155.7525MHz, High Power

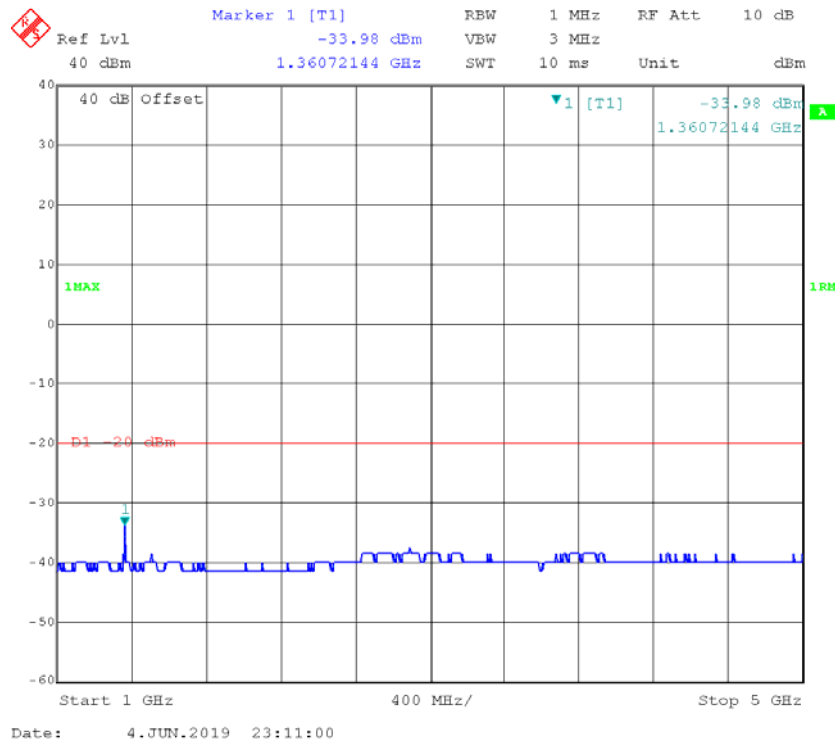
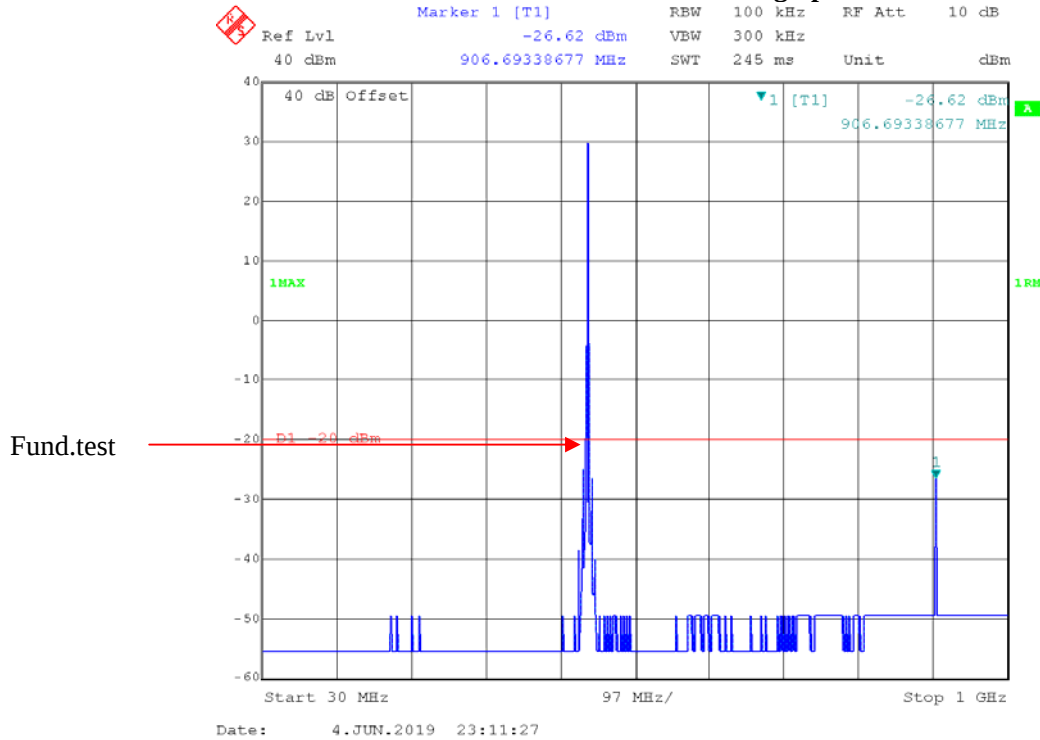


4FSK 12.5 kHz, 155.7525MHz, High Power

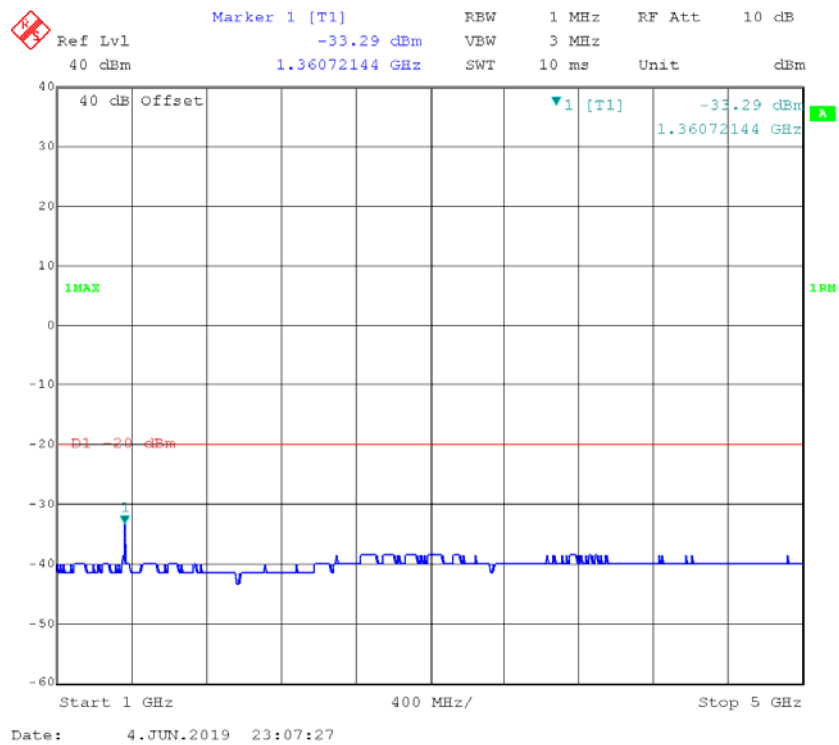
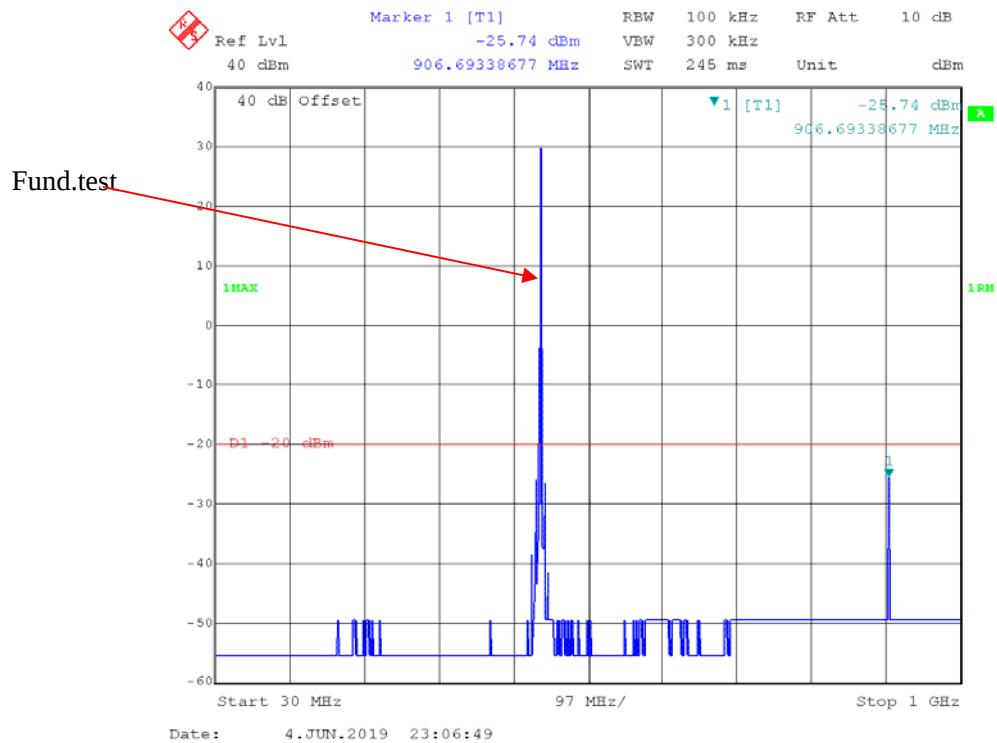
400-470 MHz Band:

Part 90:

FM, 12.5 kHz, 453.2125MHz, High power



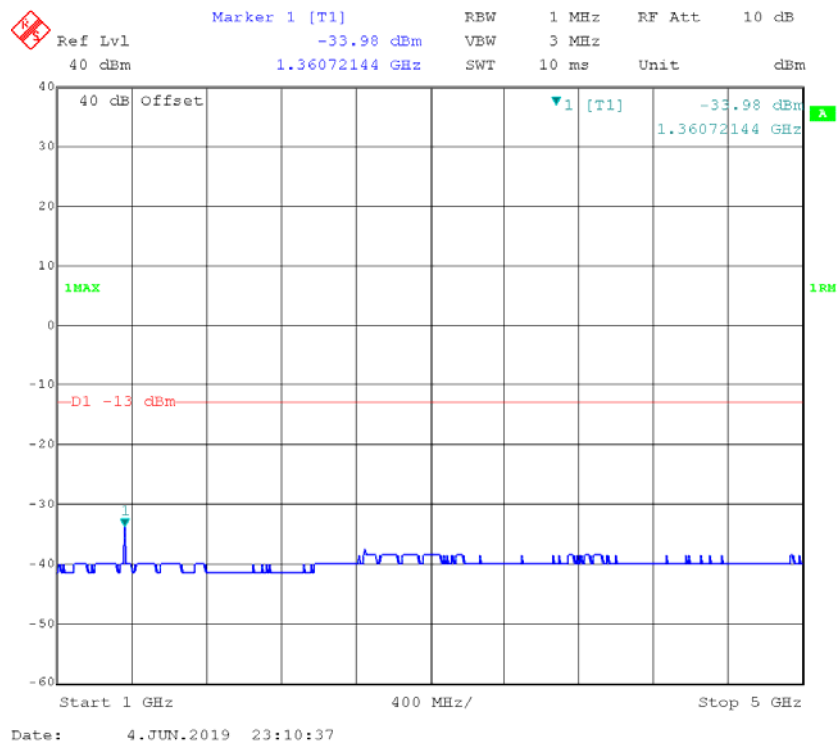
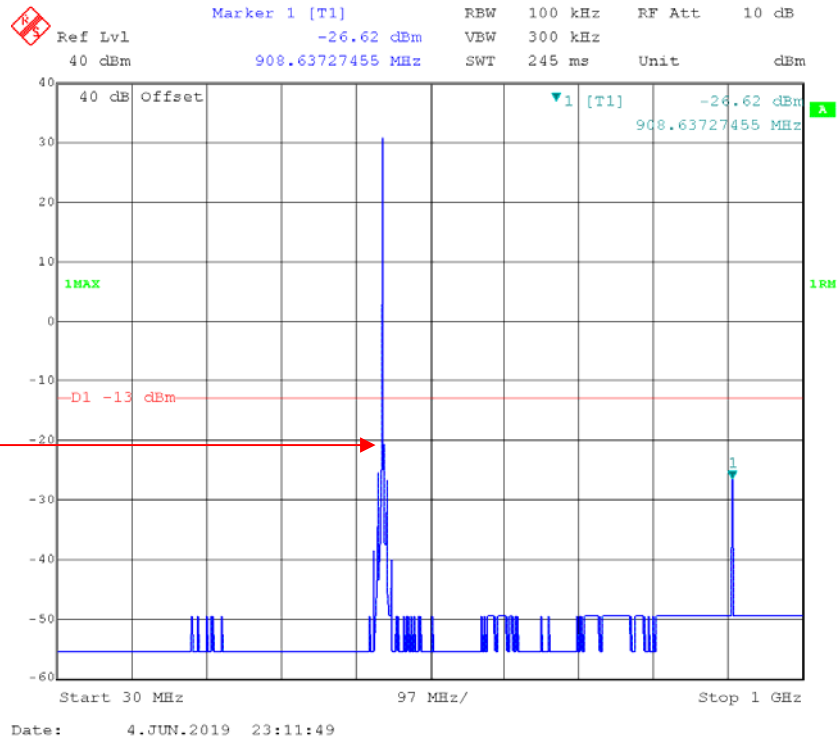
12.5kHz, 4FSK, 453.2125 MHz, High power:



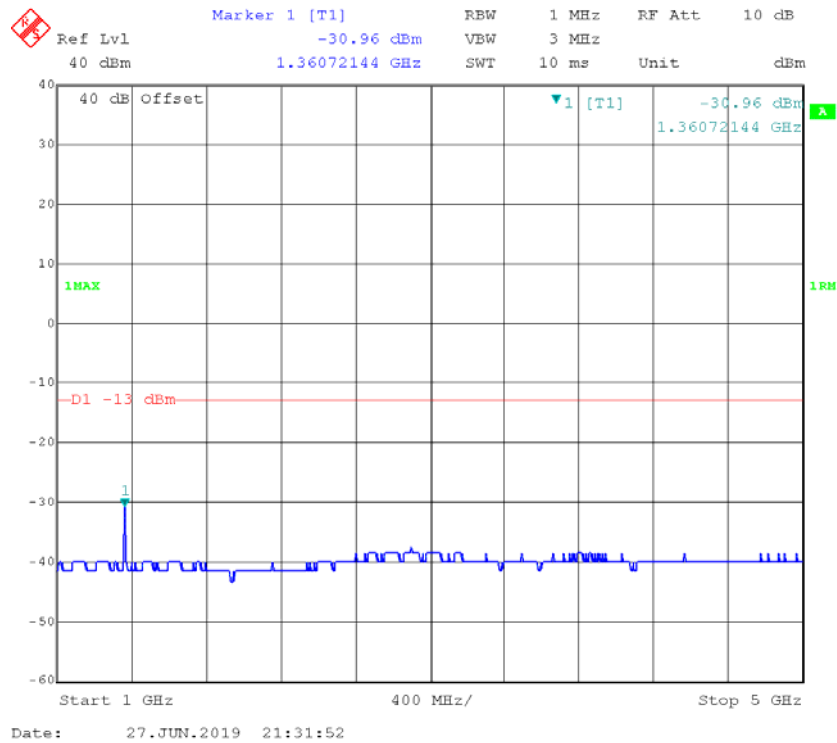
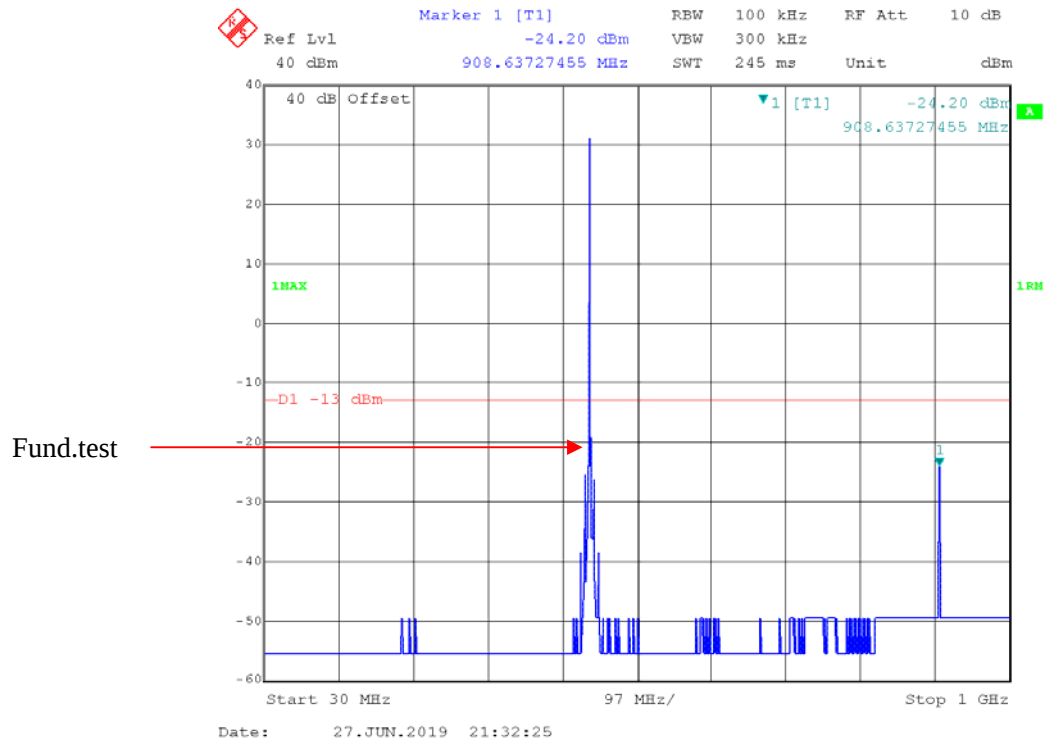
Part 22:

FM, 12.5 kHz, 454.0125 MHz, High power

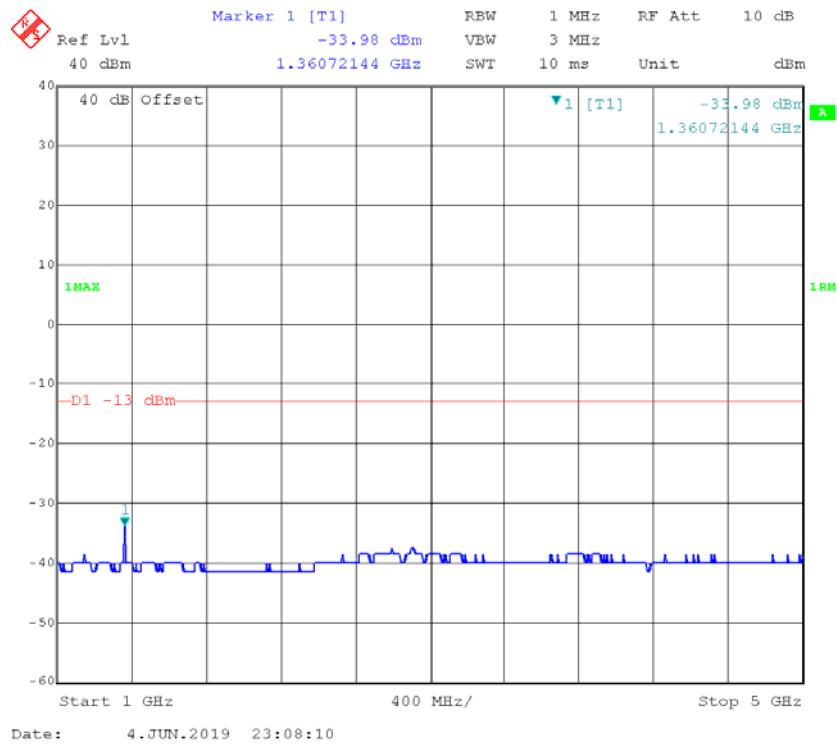
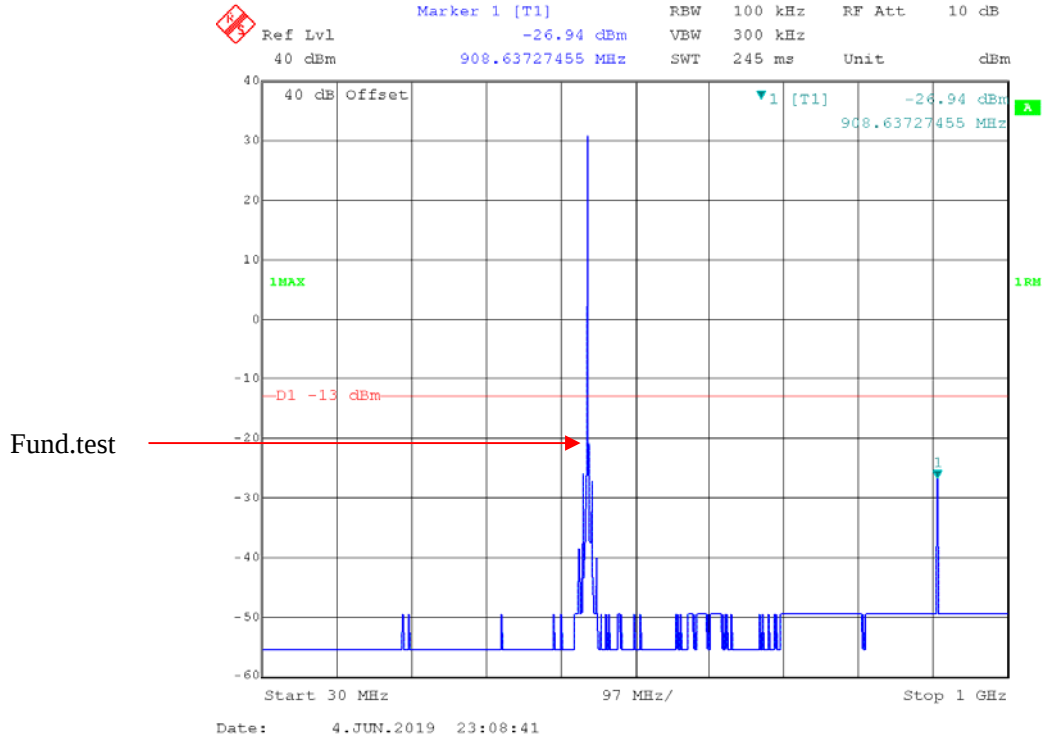
Fund.test



FM, 25 kHz, 454.0125 MHz, High power



4FSK, 12.5 kHz, 454.0125 MHz, High power



FCC §2.1053; §22.861 & §90.210 - RADIATED SPURIOUS EMISSIONS**Applicable Standard**

FCC §2.1053, §90.210, §22.861

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

Test Data**Environmental Conditions**

Temperature:	23.4~23.6 °C
Relative Humidity:	35~51 %
ATM Pressure:	100.3 kPa

The testing was performed by Vern Shen, Tyler Pan on 2019-01-16.

Test Mode: Transmitting(the device has two panel to selete, per pretest, the panel not effect the radio characteristics, panel 1 was test for this report)

**30MHz - 5GHz:
For Part 90:**

Frequency (MHz)	Polar (H/V)	Receiver Reading (dBμV)	Substituted Method			Absolute Level (dBm)	Limit (dBm)	Margin (dB)
			Substituted Level (dBm)	Antenna Gain (dBd/dBi)	Cable Loss (dB)			
FM,Frequency: 453.2125MHz-12.5 kHz								
906.4250	H	46.67	-26.39	0.00	0.51	-26.90	-20.00	6.90
906.4250	V	49.19	-20.67	0.00	0.51	-21.18	-20.00	1.18
1359.6375	H	65.80	-37.65	9.41	1.18	-29.42	-20.00	9.42
1359.6375	V	73.09	-30.52	9.41	1.18	-22.29	-20.00	2.29
1812.8500	H	67.30	-36.93	10.94	1.21	-27.20	-20.00	7.20
1812.8500	V	74.14	-30.03	10.94	1.21	-20.30	-20.00	0.30
2266.0625	H	63.74	-39.63	11.87	1.19	-28.95	-20.00	8.95
2266.0625	V	68.34	-35.76	11.87	1.19	-25.08	-20.00	5.08
2719.2750	H	62.48	-39.89	12.29	1.35	-28.95	-20.00	8.95
2719.2750	V	65.33	-37.79	12.29	1.35	-26.85	-20.00	6.85
3172.4875	H	61.82	-39.70	12.33	1.54	-28.91	-20.00	8.91
3172.4875	V	66.04	-34.89	12.33	1.54	-24.10	-20.00	4.10
3625.7000	H	54.61	-45.96	12.23	1.57	-35.30	-20.00	15.30
3625.7000	V	56.62	-43.03	12.23	1.57	-32.37	-20.00	12.37
4FSK,Frequency: 453.2125MHz-12.5 kHz								
906.4250	H	47.35	-25.71	0.00	0.51	-26.22	-20.00	6.22
906.4250	V	49.82	-20.04	0.00	0.51	-20.55	-20.00	0.55
1359.6375	H	62.42	-41.03	9.41	1.18	-32.80	-20.00	12.80
1359.6375	V	70.00	-33.61	9.41	1.18	-25.38	-20.00	5.38
1812.8500	H	68.08	-36.15	10.94	1.21	-26.42	-20.00	6.42
1812.8500	V	74.22	-29.95	10.94	1.21	-20.22	-20.00	0.22
2266.0625	H	67.27	-36.10	11.87	1.19	-25.42	-20.00	5.42
2266.0625	V	68.65	-35.45	11.87	1.19	-24.77	-20.00	4.77
2719.2750	H	61.39	-40.98	12.29	1.35	-30.04	-20.00	10.04
2719.2750	V	65.80	-37.32	12.29	1.35	-26.38	-20.00	6.38
3172.4875	H	63.72	-37.80	12.33	1.54	-27.01	-20.00	7.01
3172.4875	V	66.04	-34.89	12.33	1.54	-24.10	-20.00	4.10
3625.7000	H	53.86	-46.71	12.23	1.57	-36.05	-20.00	16.05
3625.7000	V	56.93	-42.72	12.23	1.57	-32.06	-20.00	12.06

Frequency (MHz)	Polar (H/V)	Receiver Reading (dBμV)	Substituted Method			Absolute Level (dBm)	Limit (dBm)	Margin (dB)
			Substituted Level (dBm)	Antenna Gain (dBd/dBi)	Cable Loss (dB)			
FM, Frequency: 155.7525MHz-12.5 kHz								
311.5050	H	47.21	-36.55	0.00	0.32	-36.87	-20.00	16.87
311.5050	V	42.35	-39.86	0.00	0.32	-40.18	-20.00	20.18
467.2575	H	44.23	-36.47	0.00	0.36	-36.83	-20.00	16.83
467.2575	V	44.85	-33.42	0.00	0.36	-33.78	-20.00	13.78
623.0100	H	39.57	-37.51	0.00	0.36	-37.87	-20.00	17.87
623.0100	V	39.89	-35.52	0.00	0.36	-35.88	-20.00	15.88
778.7625	H	41.23	-33.83	0.00	0.47	-34.30	-20.00	14.30
778.7625	V	42.16	-30.05	0.00	0.47	-30.52	-20.00	10.52
934.5150	H	39.21	-33.13	0.00	0.51	-33.64	-20.00	13.64
934.5150	V	39.57	-29.58	0.00	0.51	-30.09	-20.00	10.09
1090.2675	H	47.04	-54.28	8.28	0.85	-46.85	-20.00	26.85
1090.2675	V	46.85	-55.06	8.28	0.85	-47.63	-20.00	27.63
1246.0200	H	52.31	-50.24	8.93	1.04	-42.35	-20.00	22.35
1246.0200	V	52.94	-49.95	8.93	1.04	-42.06	-20.00	22.06
1401.7725	H	55.48	-48.30	9.59	1.23	-39.94	-20.00	19.94
1401.7725	V	59.24	-44.63	9.59	1.23	-36.27	-20.00	16.27
1557.5250	H	49.37	-55.13	10.17	1.32	-46.28	-20.00	26.28
1557.5250	V	52.94	-51.49	10.17	1.32	-42.64	-20.00	22.64
1713.2775	H	42.25	-62.09	10.64	1.26	-52.71	-20.00	32.71
1713.2775	V	47.82	-56.45	10.64	1.26	-47.07	-20.00	27.07
1869.0300	H	39.53	-64.65	11.11	1.19	-54.73	-20.00	34.73
4FSK, Frequency: 155.7525MHz-12.5 kHz								
311.5050	H	47.62	-36.14	0.00	0.32	-36.46	-20.00	16.46
311.5050	V	42.78	-39.43	0.00	0.32	-39.75	-20.00	19.75
467.2575	H	44.21	-36.49	0.00	0.36	-36.85	-20.00	16.85
467.2575	V	44.58	-33.69	0.00	0.36	-34.05	-20.00	14.05
623.0100	H	39.62	-37.46	0.00	0.36	-37.82	-20.00	17.82
623.0100	V	40.47	-34.94	0.00	0.36	-35.30	-20.00	15.30
778.7625	H	40.24	-34.82	0.00	0.47	-35.29	-20.00	15.29
778.7625	V	40.35	-31.86	0.00	0.47	-32.33	-20.00	12.33
934.5150	H	39.87	-32.47	0.00	0.51	-32.98	-20.00	12.98
934.5150	V	40.69	-28.46	0.00	0.51	-28.97	-20.00	8.97
1090.2675	H	48.10	-53.22	8.28	0.85	-45.79	-20.00	25.79
1090.2675	V	49.18	-52.73	8.28	0.85	-45.30	-20.00	25.30
1246.0200	H	52.29	-50.26	8.93	1.04	-42.37	-20.00	22.37
1246.0200	V	52.19	-50.70	8.93	1.04	-42.81	-20.00	22.81
1401.7725	H	56.88	-46.90	9.59	1.23	-38.54	-20.00	18.54
1401.7725	V	58.45	-45.42	9.59	1.23	-37.06	-20.00	17.06
1557.5250	H	52.10	-52.40	10.17	1.32	-43.55	-20.00	23.55
1557.5250	V	51.68	-52.75	10.17	1.32	-43.90	-20.00	23.90
1713.2775	H	47.84	-56.50	10.64	1.26	-47.12	-20.00	27.12
1713.2775	V	47.44	-56.83	10.64	1.26	-47.45	-20.00	27.45
1869.0300	H	40.74	-63.44	11.11	1.19	-53.52	-20.00	33.52
1869.0300	V	44.85	-59.26	11.11	1.19	-49.34	-20.00	29.34

For Part 22:

Frequency (MHz)	Polar (H/V)	Receiver Reading (dBμV)	Substituted Method			Absolute Level (dBm)	Limit (dBm)	Margin (dB)
			Substituted Level (dBm)	Antenna Gain (dBd/dBi)	Cable Loss (dB)			
FM12.5 kHz was the worst,Test Frequency: 454.0125MHz-								
908.0250	H	48.87	-24.15	0.00	0.51	-24.66	-13.00	11.66
908.0250	V	50.97	-18.85	0.00	0.51	-19.36	-13.00	6.36
1362.0375	H	65.51	-37.96	9.42	1.18	-29.72	-13.00	16.72
1362.0375	V	71.05	-32.57	9.42	1.18	-24.33	-13.00	11.33
1816.0500	H	75.70	-28.53	10.95	1.21	-18.79	-13.00	5.79
1816.0500	V	79.00	-25.17	10.95	1.21	-15.43	-13.00	2.43
2270.0625	H	61.82	-41.54	11.88	1.19	-30.85	-13.00	17.85
2270.0625	V	65.74	-38.36	11.88	1.19	-27.67	-13.00	14.67
2724.0750	H	60.83	-41.53	12.29	1.36	-30.60	-13.00	17.60
2724.0750	V	65.15	-37.95	12.29	1.36	-27.02	-13.00	14.02
3178.0875	H	61.72	-39.79	12.33	1.54	-29.00	-13.00	16.00
3178.0875	V	64.36	-36.54	12.33	1.54	-25.75	-13.00	12.75
3632.1000	H	52.75	-47.80	12.23	1.57	-37.14	-13.00	24.14
3632.1000	V	55.73	-43.93	12.23	1.57	-33.27	-13.00	20.27
4086.1125	H	54.50	-44.81	12.49	1.47	-33.79	-13.00	20.79
4086.1125	V	55.54	-44.50	12.49	1.47	-33.48	-13.00	20.48
4540.1250	H	56.40	-41.54	13.37	1.53	-29.70	-13.00	16.70
4FSK,Frequency: 454.0125MHz-12.5 kHz								
908.0250	H	48.67	-24.35	0.00	0.51	-24.86	-13.00	11.86
908.0250	V	50.92	-18.90	0.00	0.51	-19.41	-13.00	6.41
1362.0375	H	65.70	-37.77	9.42	1.18	-29.53	-13.00	16.53
1362.0375	V	72.78	-30.84	9.42	1.18	-22.60	-13.00	9.60
1816.0500	H	74.22	-30.01	10.95	1.21	-20.27	-13.00	7.27
1816.0500	V	81.04	-23.13	10.95	1.21	-13.39	-13.00	0.39
2270.0625	H	68.53	-34.83	11.88	1.19	-24.14	-13.00	11.14
2270.0625	V	68.85	-35.25	11.88	1.19	-24.56	-13.00	11.56
2724.0750	H	65.33	-37.03	12.29	1.36	-26.10	-13.00	13.10
2724.0750	V	63.37	-39.73	12.29	1.36	-28.80	-13.00	15.80
3178.0875	H	66.66	-34.85	12.33	1.54	-24.06	-13.00	11.06
3178.0875	V	65.51	-35.39	12.33	1.54	-24.60	-13.00	11.60
3632.1000	H	53.43	-47.12	12.23	1.57	-36.46	-13.00	23.46
3632.1000	V	54.86	-44.80	12.23	1.57	-34.14	-13.00	21.14
4086.1125	H	54.20	-45.11	12.49	1.47	-34.09	-13.00	21.09
4086.1125	V	55.40	-44.64	12.49	1.47	-33.62	-13.00	20.62
4540.1250	H	56.40	-41.54	13.37	1.53	-29.70	-13.00	16.70
4540.1250	V	57.54	-40.70	13.37	1.53	-28.86	-13.00	15.86

Frequency (MHz)	Polar (H/V)	Receiver Reading (dBμV)	Substituted Method			Absolute Level (dBm)	Limit (dBm)	Margin (dB)
			Substituted Level (dBm)	Antenna Gain (dBd/dBi)	Cable Loss (dB)			
FM12.5 kHz was the worst,Test Frequency: 150.8125MHz								
301.6250	H	42.22	-41.69	0.00	0.31	-42.00	-13.00	29.00
301.6250	V	43.21	-39.27	0.00	0.31	-39.58	-13.00	26.58
452.4375	H	45.71	-35.37	0.00	0.36	-35.73	-13.00	22.73
452.4375	V	46.81	-31.79	0.00	0.36	-32.15	-13.00	19.15
603.2500	H	39.62	-37.74	0.00	0.36	-38.10	-13.00	25.10
603.2500	V	40.11	-35.89	0.00	0.36	-36.25	-13.00	23.25
754.0625	H	39.71	-35.65	0.00	0.44	-36.09	-13.00	23.09
754.0625	V	41.24	-31.26	0.00	0.44	-31.70	-13.00	18.70
904.8750	H	39.60	-33.50	0.00	0.51	-34.01	-13.00	21.01
904.8750	V	42.81	-27.09	0.00	0.51	-27.60	-13.00	14.60
1055.7050	H	50.99	-50.06	8.13	0.81	-42.74	-13.00	29.74
1055.7050	V	53.86	-47.83	8.13	0.81	-40.51	-13.00	27.51
1206.5200	H	48.24	-54.00	8.77	0.99	-46.22	-13.00	33.22
1206.5200	V	47.17	-55.47	8.77	0.99	-47.69	-13.00	34.69
1357.3350	H	60.60	-42.83	9.40	1.18	-34.61	-13.00	21.61
1357.3350	V	62.10	-41.49	9.40	1.18	-33.27	-13.00	20.27
1508.1500	H	55.49	-49.06	10.02	1.35	-40.39	-13.00	27.39
1508.1500	V	58.05	-46.43	10.02	1.35	-37.76	-13.00	24.76
4FSK,Frequency: 150.8125MHz-12.5 kHz								
301.6250	H	41.58	-42.33	0.00	0.31	-42.64	-13.00	29.64
301.6250	V	43.82	-38.66	0.00	0.31	-38.97	-13.00	25.97
452.4375	H	44.52	-36.56	0.00	0.36	-36.92	-13.00	23.92
452.4375	V	46.94	-31.66	0.00	0.36	-32.02	-13.00	19.02
603.2500	H	39.62	-37.74	0.00	0.36	-38.10	-13.00	25.10
603.2500	V	42.66	-33.34	0.00	0.36	-33.70	-13.00	20.70
754.0625	H	41.14	-34.22	0.00	0.44	-34.66	-13.00	21.66
754.0625	V	42.71	-29.79	0.00	0.44	-30.23	-13.00	17.23
904.8750	H	40.14	-32.96	0.00	0.51	-33.47	-13.00	20.47
904.8750	V	40.87	-29.03	0.00	0.51	-29.54	-13.00	16.54
1055.7050	H	48.56	-52.49	8.13	0.81	-45.17	-13.0000	32.17
1055.7050	V	52.36	-49.33	8.13	0.81	-42.01	-13.00	29.01
1206.5200	H	45.59	-56.65	8.77	0.99	-48.87	-13.00	35.87
1206.5200	V	48.10	-54.54	8.77	0.99	-46.76	-13.00	33.76
1357.3350	H	57.28	-46.15	9.40	1.18	-37.93	-13.00	24.93
1357.3350	V	59.50	-44.09	9.40	1.18	-35.87	-13.00	22.87
1508.1500	H	56.83	-47.72	10.02	1.35	-39.05	-13.00	26.05
1508.1500	V	60.80	-43.68	10.02	1.35	-35.01	-13.00	22.01

Note:

Absolute Level = Substituted Level - Cable loss + Antenna Gain

Margin = Limit- Absolute Level

FCC §2.1055 & § 22.355 & §90.213- FREQUENCY STABILITY

Applicable Standard

FCC §2.1055, § 22.355, §90.213

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**

Temperature:	25.5 °C
Relative Humidity:	46 %
ATM Pressure:	100.8 kPa

The testing was performed by Andy Huang on 2019-06-04.

Test Mode: Transmitting

136-174 MHz band:

Part 90:

FM,12.5kHz, Reference Frequency: 155.7525 MHz, Limit: ± 5 ppm			
Temperature (°C)	Voltage Supplied (V _{DC})	Measured Frequency (MHz)	Frequency Error (ppm)
-30	13.8	155.752565	0.42
-20		155.752395	-0.67
-10		155.752436	-0.41
0		155.752532	0.21
10		155.752528	0.18
20		155.752495	-0.03
30		155.752434	-0.42
40		155.752576	0.49
50		155.752489	-0.07
20	11.73	155.752592	0.59
20	15.87	155.752548	0.31

4FSK, 12.5kHz, Reference Frequency:155.7525 MHz, Limit: ± 5 ppm			
Temperature (°C)	Voltage Supplied (V _{DC})	Measured Frequency (MHz)	Frequency Error (ppm)
-30	13.8	155.752408	-0.59
-20		155.752408	-0.59
-10		155.752396	-0.67
0		155.752547	0.30
10		155.752432	-0.44
20		155.752508	0.05
30		155.752429	-0.46
40		155.752416	-0.54
50		155.752588	0.56
20	11.73	155.752408	-0.59
20	15.87	155.752412	-0.56

Part 22:

FM,12.5kHz, Reference Frequency: 150.8125 MHz, Limit: ± 2.5 ppm			
Temperature (°C)	Voltage Supplied (V _{DC})	Measured Frequency (MHz)	Frequency Error (ppm)
-30	13.8	150.812477	-0.15
-20		150.812519	0.13
-10		150.812546	0.31
0		150.812494	-0.04
10		150.812459	-0.27
20		150.812504	0.03
30		150.812499	-0.01
40		150.812493	-0.05
50		150.812470	-0.20
20	11.73	150.812402	-0.65
20	15.87	150.812564	0.42

FM,25kHz, Reference Frequency: 150.8125 MHz, Limit: ± 2.5 ppm			
Temperature (°C)	Voltage Supplied (V _{DC})	Measured Frequency (MHz)	Frequency Error (ppm)
-30	13.8	150.812620	0.800
-20		150.812477	-0.150
-10		150.812577	0.510
0		150.812546	0.310
10		150.812398	-0.680
20		150.812528	0.190
30		150.812393	-0.710
40		150.812368	-0.880
50		150.812627	0.840
20	11.73	150.812368	-0.880
20	15.87	150.812499	-0.010

4FSK, 12.5kHz, Reference Frequency:150.8125 MHz, Limit: ± 2.5 ppm			
Temperature (°C)	Voltage Supplied (V _{DC})	Measured Frequency (MHz)	Frequency Error (ppm)
-30	13.8	150.812564	0.420
-20		150.812494	-0.040
-10		150.812492	-0.050
0		150.812455	-0.300
10		150.812424	-0.500
20		150.812495	-0.030
30		150.812407	-0.620
40		150.812421	-0.520
50		150.812579	0.520
20	11.73	150.812415	-0.560
20	15.87	150.812482	-0.120

400-470 MHz:

Part 90:

FM,12.5kHz, Reference Frequency: 453.2125 MHz, Limit: ± 2.5 ppm			
Temperature (°C)	Voltage Supplied (V _{DC})	Measured Frequency (MHz)	Frequency Error (ppm)
-30	13.8	453.212450	-0.11
-20		453.212448	-0.11
-10		453.212397	-0.23
0		453.212449	-0.11
10		453.212364	-0.30
20		453.212405	-0.21
30		453.212412	-0.19
40		453.212445	-0.12
50		453.212360	-0.31
20	11.73	453.212449	-0.11
20	15.87	453.212346	-0.34

4FSK, 12.5kHz, Reference Frequency:453.2125 MHz, Limit: ± 2.5 ppm			
Temperature (°C)	Voltage Supplied (V _{DC})	Measured Frequency (MHz)	Frequency Error (ppm)
-30	13.8	453.212455	-0.10
-20		453.212378	-0.27
-10		453.212402	-0.22
0		453.212347	-0.34
10		453.212483	-0.04
20		453.212485	-0.03
30		453.212351	-0.33
40		453.212361	-0.31
50		453.212485	-0.03
20	11.73	453.212503	0.01
20	15.87	453.212399	-0.22

For Part 22:

FM,12.5kHz, Reference Frequency: 454.0125 MHz, Limit: ± 2.5 ppm			
Temperature (°C)	Voltage Supplied (V _{DC})	Measured Frequency (MHz)	Frequency Error (ppm)
-30	13.8	454.012414	-0.19
-20		454.012391	-0.24
-10		454.012389	-0.24
0		454.012484	-0.04
10		454.012339	-0.35
20		454.012385	-0.25
30		454.012335	-0.36
40		454.012444	-0.12
50		454.012351	-0.33
20	11.73	454.012429	-0.16
20	15.87	454.012407	-0.20

FM,25kHz, Reference Frequency: 454.0125 MHz, Limit: ± 2.5 ppm			
Temperature (°C)	Voltage Supplied (V _{DC})	Measured Frequency (MHz)	Frequency Error (ppm)
-30	13.8	454.012355	-0.32
-20		454.012306	-0.43
-10		454.012333	-0.37
0		454.012431	-0.15
10		454.012325	-0.39
20		454.012482	-0.04
30		454.012251	-0.55
40		454.012509	0.02
50		454.012378	-0.27
20	11.73	454.012351	-0.33
20	15.87	454.012337	-0.36

FM,12.5kHz, Reference Frequency: 454.0125 MHz, Limit: ± 2.5 ppm			
Temperature (°C)	Voltage Supplied (V _{DC})	Measured Frequency (MHz)	Frequency Error (ppm)
-30	13.8	454.012290	-0.46
-20		454.012295	-0.45
-10		454.012429	-0.16
0		454.012403	-0.21
10		454.012315	-0.41
20		454.012444	-0.12
30		454.012320	-0.40
40		454.012399	-0.22
50		454.012342	-0.35
20	11.73	454.012291	-0.46
20	15.87	454.012395	-0.23

Note: the operation voltage is declared by manufacturer.

FCC §90.214 - TRANSIENT FREQUENCY BEHAVIOR

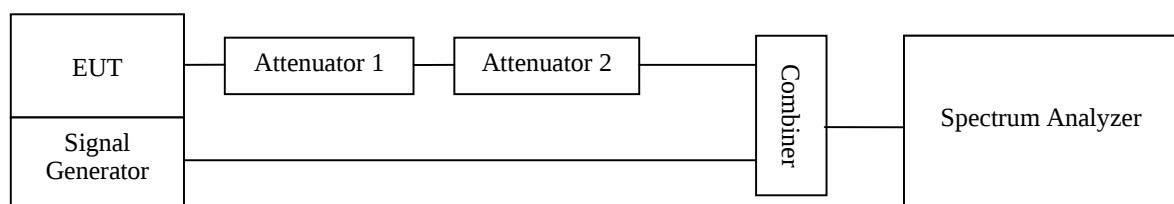
Applicable Standard

Regulations: FCC §90.214

Test method: ANSI/TIA-603-D 2010, section 2.2.19.3

Test Procedure

- Connect the EUT and test equipment as shown on the following block diagram.
- Set the Spectrum Analyzer to measure FM deviation, and tune the RF frequency to the transmitter assigned frequency.
- Set the signal generator to the assigned transmitter frequency and modulate it with a 1 kHz tone at ± 12.5 kHz deviation and set its output level to -100dBm.
- Turn on the transmitter.
- Supply sufficient attenuation via the RF attenuator to provide an input level to the Spectrum Analyzer that is 40 dB below the maximum allowed input power when the transmitter is operating at its rated power level. Note this power level on the Spectrum Analyzer as P_0 .
- Turn off the transmitter.
- Adjust the RF level of the signal generator to provide RF power equal to P_0 . This signal generator RF level shall be maintained throughout the rest of the measurement.
- Remove the attenuation 1, so the input power to the Spectrum Analyzer is increased by 30 dB when the transmitter is turned on.
- Adjust the vertical amplitude control of the spectrum analyzer to display the 1000 Hz at ± 4 divisions vertically centered on the display. Set trigger mode of the Spectrum Analyzer to "Video", and tune the "trigger level" on suitable level. Then set the "trigger offset" to -10ms for turn on and -15ms for turn off.
- Turn on the transmitter and the transient wave will be captured on the screen of Spectrum Analyzer. Observe the stored display. The instant when the 1 kHz test signal is completely suppressed is considered to be t_{on} . The trace should be maintained within the allowed divisions during the period t_1 and t_2 .
- Then turn off the transmitter, and another transient wave will be captured on the screen of Spectrum Analyzer. The trace should be maintained within the allowed divisions during the period t_3 .



Test Data**Environmental Conditions**

Temperature:	25.5 °C
Relative Humidity:	46 %
ATM Pressure:	100.8 kPa

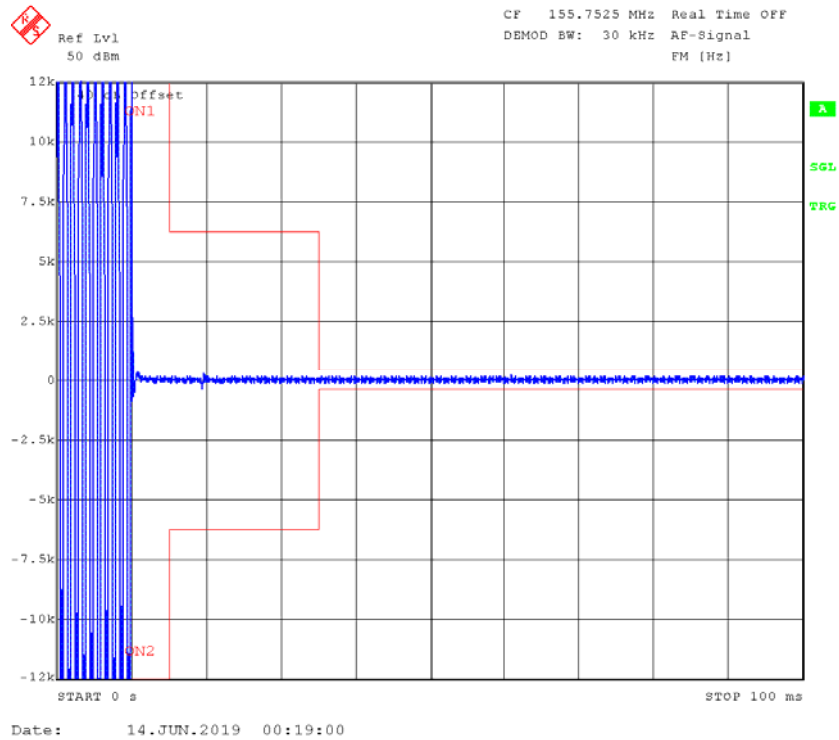
The testing was performed by Andy Huang on 2019-06-14.

Bands	Channel Spacing (kHz)	Transient Period (ms)	Transient Frequency	Result
136-174 MHz	12.5	<5(t ₁)	±12.5 kHz	Pass
		<20(t ₂)	±6.25 kHz	
		<5(t ₃)	±12.5 kHz	
400-470 MHz	12.5	<10(t ₁)	±12.5 kHz	Pass
		<25(t ₂)	±6.25 kHz	
		<10(t ₃)	±12.5 kHz	

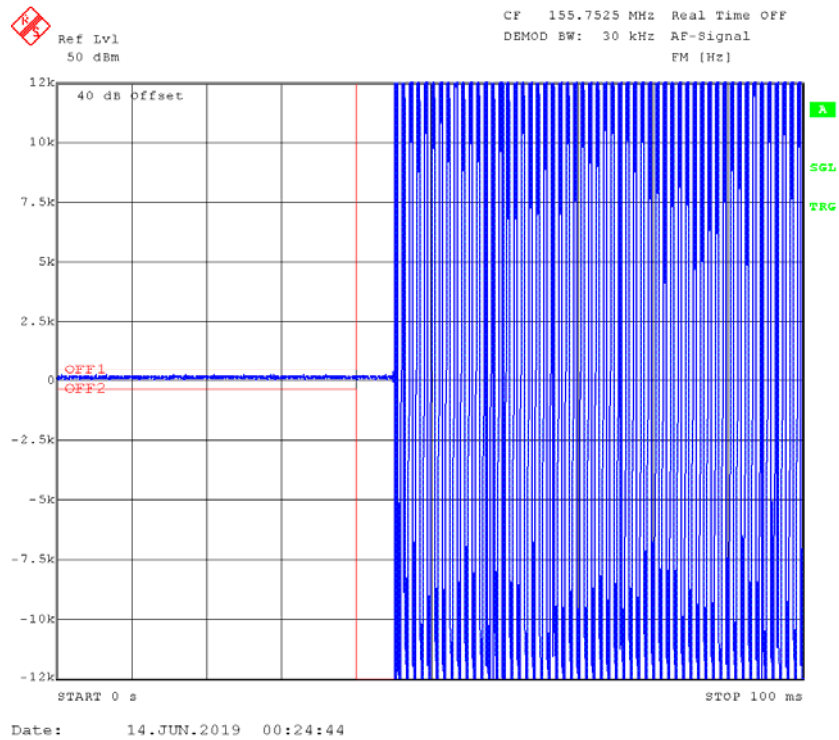
Please refer to the following plots.

FM, High Power Channel: 155.7525MHz, 12.5 kHz

Turn on

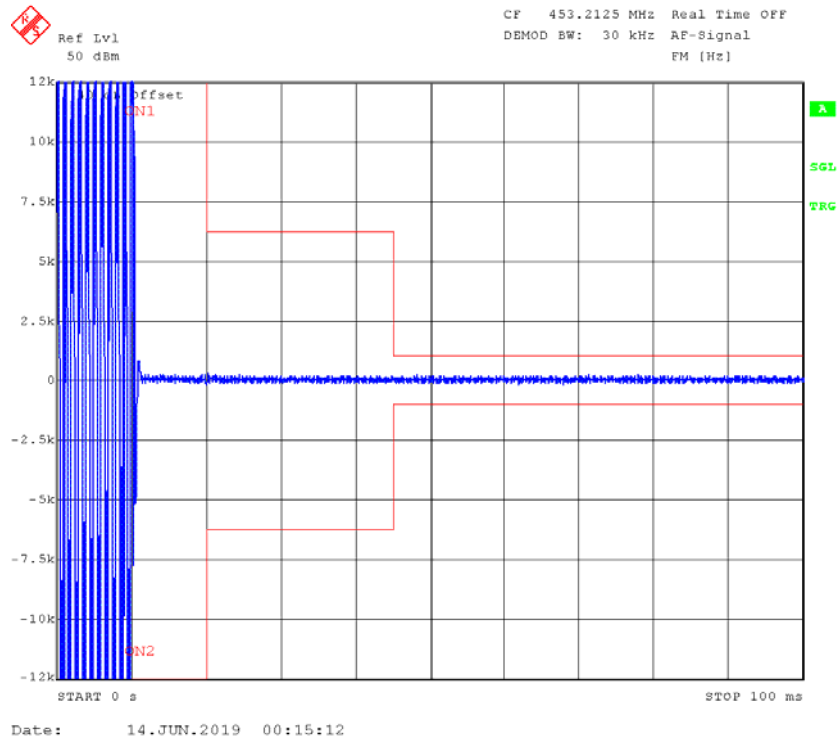


Turn off

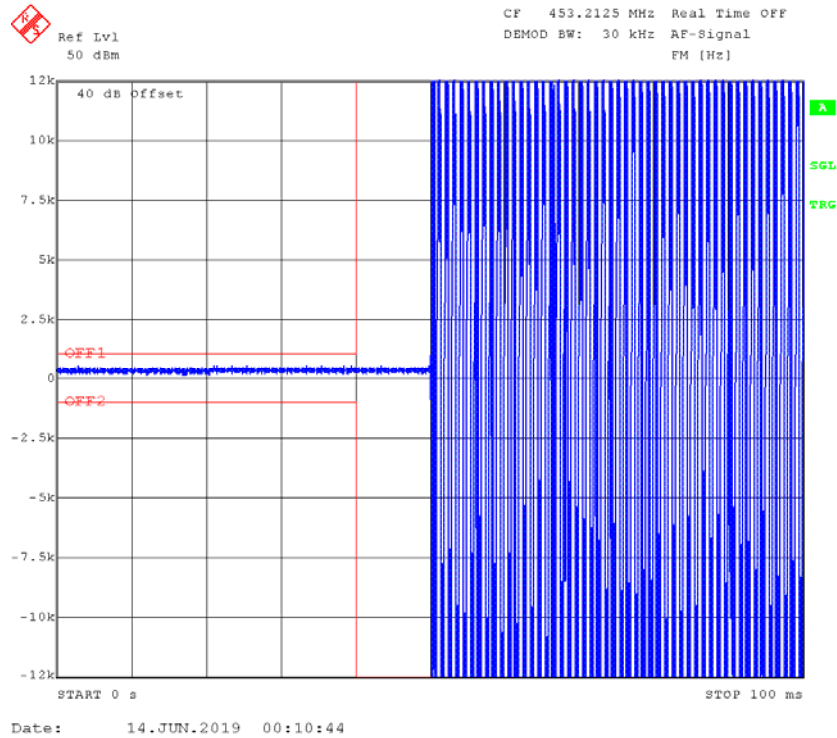


FM, High Power Channel: 453.2125 MHz, 12.5 kHz

Turn on



Turn off



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