TESTING LABORATORY
CERTIFICATE #4820.01

FCC PART 22, AND PART 90

TEST REPORT

For

SHENZHEN COVALUE COMMUNICATIONS CO.,LTD.

2/F., Bldg. 24, XiLi Industrial Park, No.119 Xinguang Rd, Xili, Nanshan Shenzhen China

FCC ID: Y4GDR5810-2

Report Type:	Product Type:
Original Report	Two way radio

Report Number:	RDG190724003-00A
Report Date:	2019-08-31
Reviewed By:	Jerry Zhang EMC Manager
Test Laboratory:	Bay Area Compliance Laboratories Corp. (Dongguan) No.69 Pulongcun, Puxinhu Industrial Zone, Tangxia, Dongguan, Guangdong, China Tel: +86-769-86858888 Fax: +86-769-86858891 www.baclcorp.com.cn

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GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

EUT Name:		Two way radio
EUT Model:		DR5810-2
Multiple Model:		DR5610-2;DR5510-2;DR5800-2;DR5600-2;DR5500-2
Operation Frequency:		400-480 MHz
Output Power(Conducted):		High: 4W Low: 1W
Modulation Type:		FM/4FSK
Channel Spacing:		12.5/25kHz
Rated Input Voltage:		7.4V DC from battery or 12V DC from charger
Adapter Information	**Model:**	MR-1200500US
	Input:	100-240V 50/60Hz 0.3A
	Output:	12V 0.5A
External Dimension:		11cm(L)*5.5cm(W)*3cm(H)
Serial Number:		190724003-1(*DR5810-2*) 190724003-2(*DR5610-2*) 190724003-3(*DR5510-2*)
EUT Received Date:		2019/7/30

Note: The series products models DR5810-2, DR5610-2;DR5510-2;DR5800-2;DR5600-2;DR5500-2 are electrically identical, we selected DR5810-2 for fully testing, and DR5810-2, DR5610-2;DR5510-2 for radiation emission test, the details of the difference between them were explained in the attached declaration letter.

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 Commission 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 and 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	±5 %
RF output power, conducted	±0.61dB
Unwanted Emissions, radiated	30MHz ~ 1GHz:5.85 dB 1G~26.5GHz: 5.23 dB
Unwanted Emissions, conducted	±1.5 dB
Temperature	±1℃
Humidity	±5%
DC and low frequency voltages	±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 system was configured for testing in a test mode which has been done in the factory.

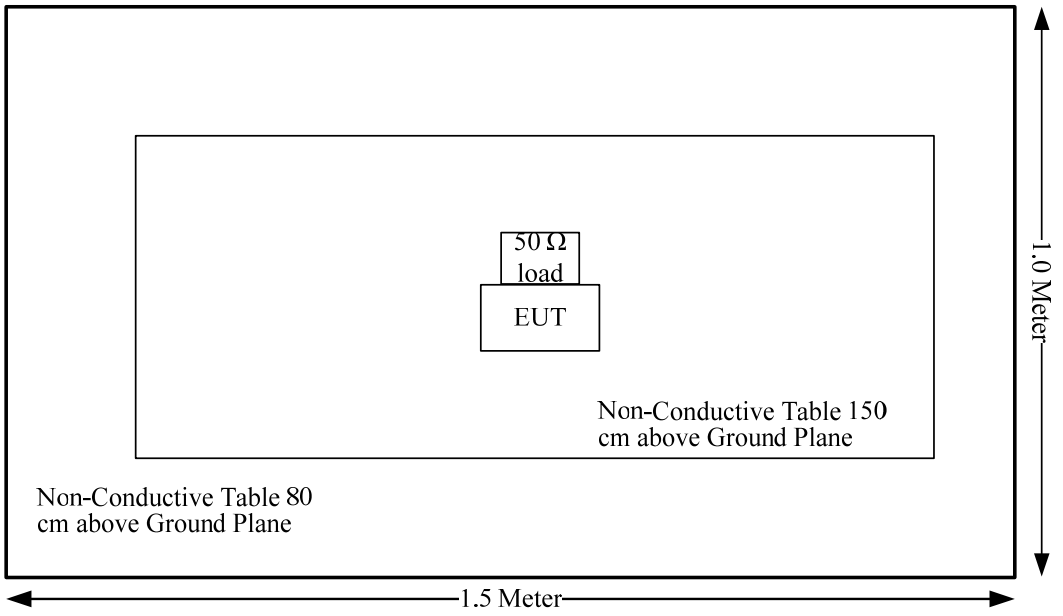
Equipment Modifications

No modification was made to the EUT tested.

Support Equipment List and Details

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

Block Diagram of Test Setup



SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Results
§1.1310 and §2.1093	RF Exposure	Compliance
§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	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	ESR3	102453	2019-06-26	2020-06-26
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-1400-01	2019-05-06	2020-05-06
HP	Amplifier	8447D	2727A05902	2018-09-05	2019-09-05
Agilent	Signal Generator	E8247C	MY43321350	2018-12-10	2019-12-10
Agilent	Spectrum Analyzer	E4440A	SG43360054	2019-05-09	2020-05-09
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
Unknown	Coaxial Cable	C-SJSJ-50	C-0800-01	2018-09-05	2019-09-05
Unknown	Coaxial Cable	C-NJNJ-50	C-0200-02	2018-09-05	2019-09-05
MITEQ	Amplifier	AFS42-00101800-25-S-42	2001271	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
OuLi	Band Rejector Filter	400-470	003	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	2019-07-24	2020-07-24
Pro instrument	DC Power Supply	pps3300	3300012	N/A	N/A
LEADER	Millivoltmeter	LMV-181A	601788	2019-08-10	2020-08-09

*** 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 §1.1310 & §2.1093 - RF EXPOSURE

Applicable Standard

FCC§1.1310 and §2.1093.

Test Result

Compliance, please refer to the SAR report: RDG190724003-20A.

FCC §2.1046 & § 22.727 & §74.461 & §90.205- RF OUTPUT POWER

Applicable Standard

FCC §2.1046, § 22.727, §74.461 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:

RBW	VBW
100 kHz	300 kHz

Test Data

Environmental Conditions

Temperature:	24.5℃
Relative Humidity:	67 %
ATM Pressure:	100.2 kPa
Tester:	Blake Yang
Test Date:	2019-08-11

Test Mode: Transmitting

Test Result: Compliance. Please refer to following table.

Modulation Mode	Channel Separation	f_c	Reading (W)		Note
		MHz	High Power Level	Low Power Level	
FM	12.5kHz	400.1125	4.560	1.135	FCC part 90
		453.2125	4.385	0.971	
		479.9875	4.487	1.035	
4FSK	12.5kHz	400.1125	4.406	1.172	
		453.2125	4.508	1.026	
		479.9875	4.710	1.059	
FM	12.5kHz	454.0125	4.395	0.959	FCC part 22
	25kHz	454.0125	4.375	1.016	
4FSK	12.5kHz	454.0125	4.246	1.028	

Note:
The high rated power level is 4W, and low rated power level is 1W.
(Limit: <4.8W for high power level, < 1.2W for low power level)

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:	24.5℃
Relative Humidity:	67 %
ATM Pressure:	100.2 kPa
Tester:	Blake Yang
Test Date:	2019-08-11

Test Mode: Transmitting

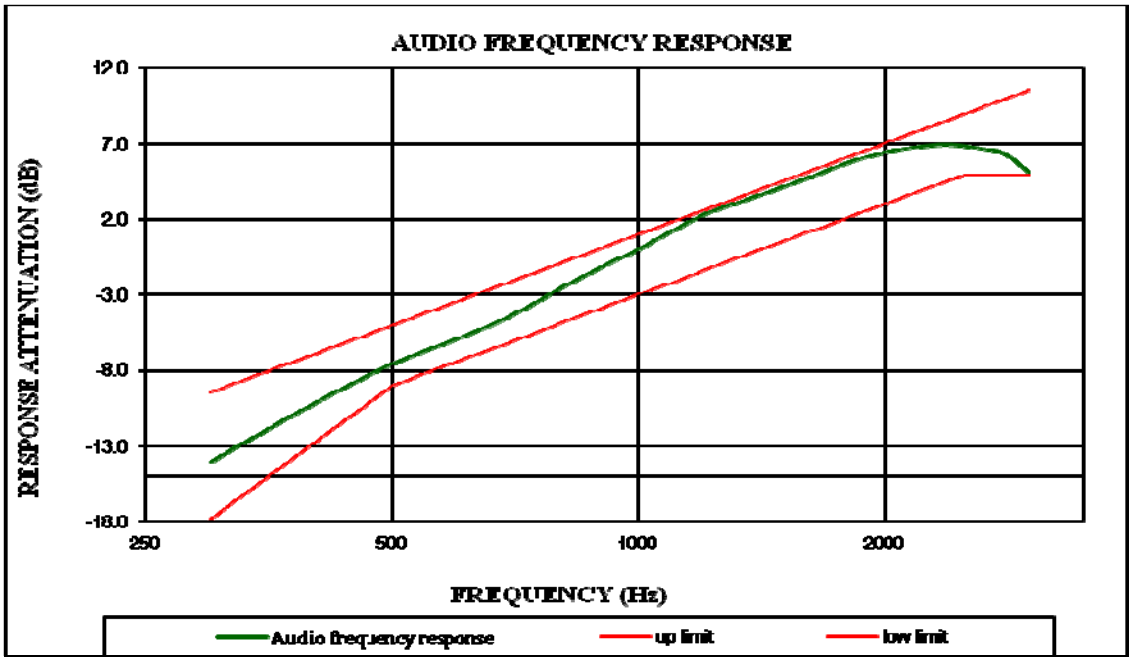
Result: Compliance.

12.5 kHz:

Audio Frequency Response – High Power

Carrier Frequency: 453.2125 MHz

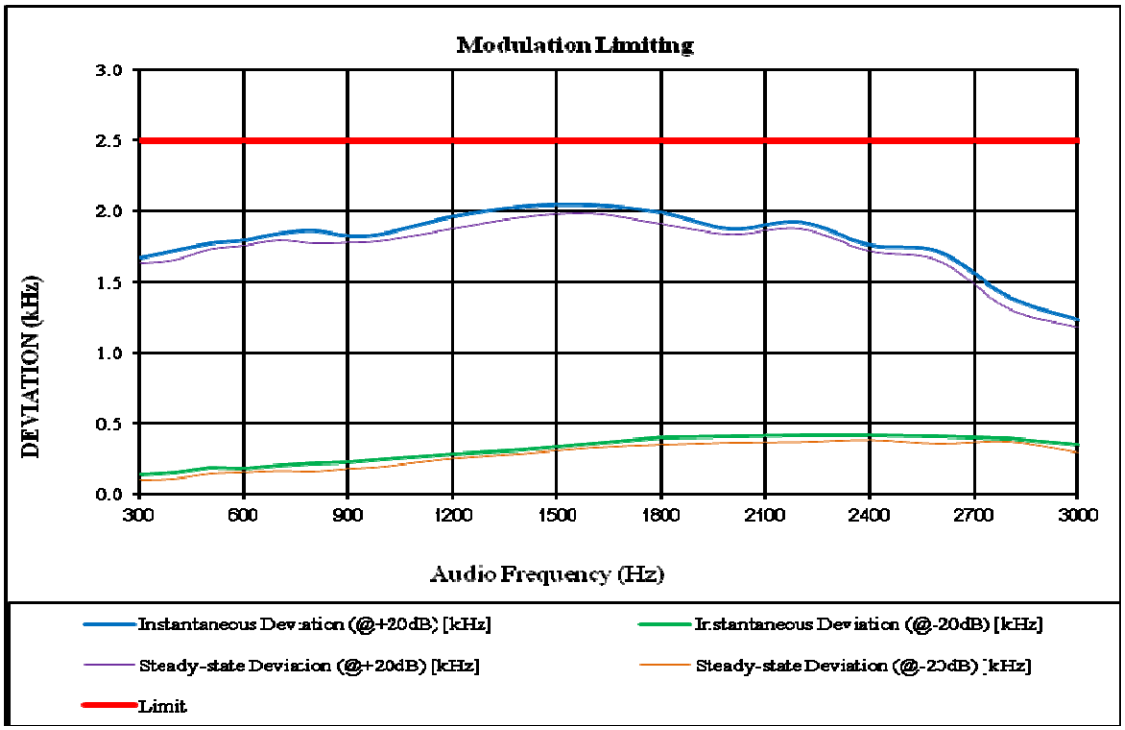
Modulation Frequency (Hz)	Response data (dB)
300	-14.07
400	-10.25
500	-7.60
600	-5.93
700	-4.38
800	-2.63
900	-1.18
1000	0.00
1200	2.26
1400	3.55
1600	4.66
1800	5.72
2000	6.41
2200	6.80
2400	6.94
2600	6.71
2800	6.34
3000	5.10



MODULATION LIMITING – High Power

Carrier Frequency: 453.2125 MHz

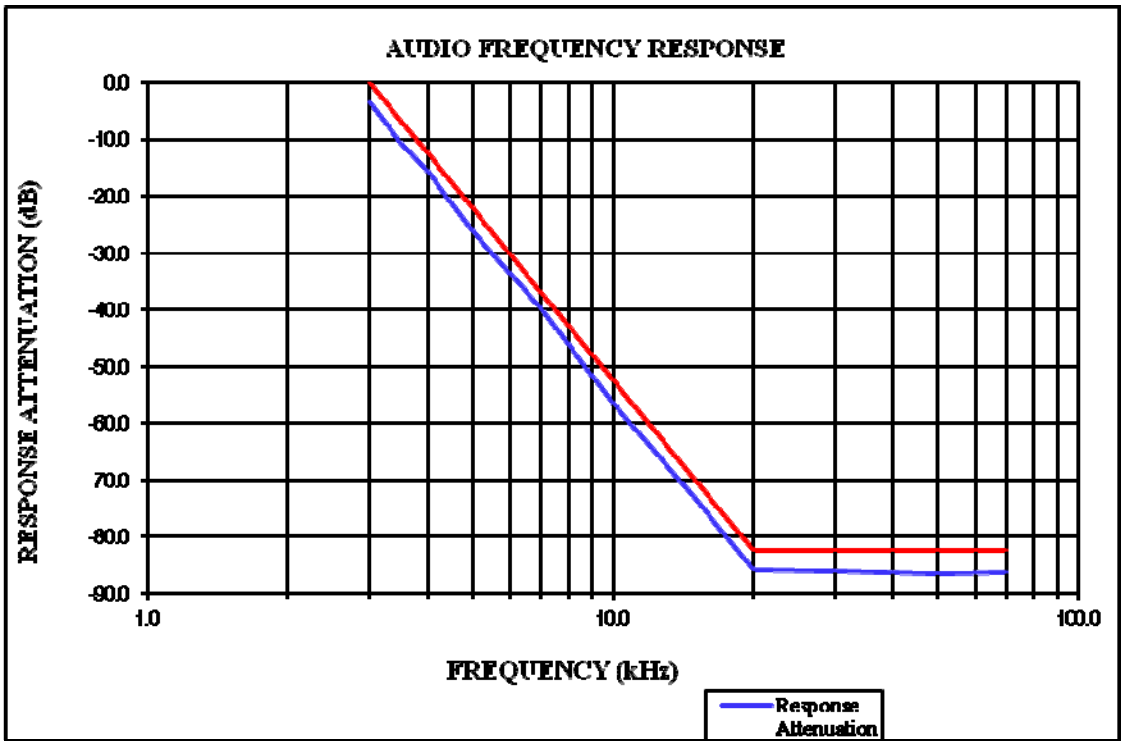
Audio Frequency (Hz)	Instantaneous		Steady-state		Limit [kHz]
	Deviation (@+20dB) [kHz]	Deviation (@-20dB) [kHz]	Deviation (@+20dB) [kHz]	Deviation (@-20dB) [kHz]	
300	1.669	0.137	1.633	0.101	2.5
400	1.721	0.152	1.656	0.110	2.5
500	1.772	0.186	1.731	0.144	2.5
600	1.795	0.176	1.759	0.154	2.5
700	1.843	0.201	1.795	0.164	2.5
800	1.863	0.214	1.774	0.160	2.5
900	1.826	0.227	1.778	0.179	2.5
1000	1.842	0.245	1.793	0.195	2.5
1200	1.962	0.283	1.876	0.250	2.5
1400	2.035	0.314	1.957	0.284	2.5
1600	2.045	0.358	1.984	0.324	2.5
1800	1.992	0.399	1.910	0.346	2.5
2000	1.875	0.405	1.838	0.361	2.5
2200	1.925	0.415	1.876	0.366	2.5
2400	1.761	0.416	1.718	0.380	2.5
2600	1.713	0.404	1.649	0.354	2.5
2800	1.392	0.392	1.311	0.368	2.5
3000	1.227	0.345	1.180	0.291	2.5



Audio Frequency Low Pass Filter Response – High Power

Carrier Frequency: 453.2125 MHz

Audio Frequency (kHz)	Response Attenuation (dB)	Limit (dB)
3.0	-3.5	0.0
3.5	-10.6	-6.7
4.0	-15.8	-12.5
5.0	-26.4	-22.2
7.0	-39.7	-36.8
10.0	-56.4	-52.3
15.0	-73.2	-69.9
20.0	-85.9	-82.5
30.0	-86.1	-82.5
50.0	-86.4	-82.5
70.0	-86.3	-82.5

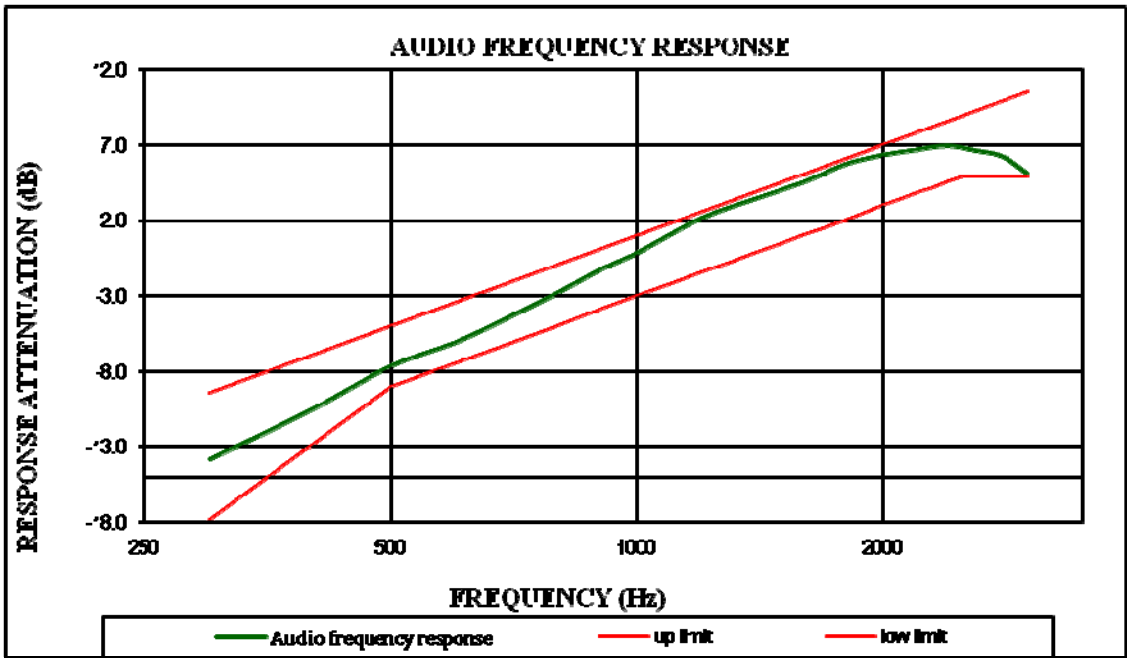


25 kHz:

Audio Frequency Response – High Power

Carrier Frequency: 454.0125 MHz

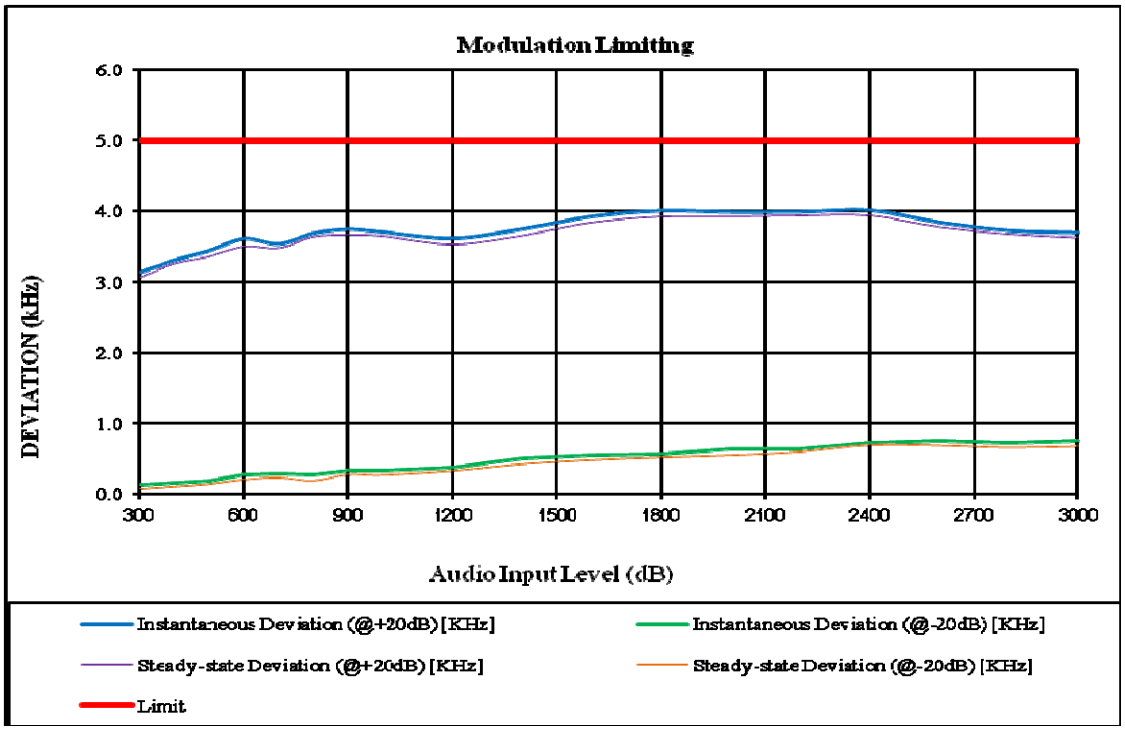
Modulation Frequency (Hz)	Response data (dB)
300	-13.82
400	-10.50
500	-7.63
600	-6.05
700	-4.34
800	-2.76
900	-1.26
1000	0.0
1200	2.19
1400	3.49
1600	4.57
1800	5.76
2000	6.36
2200	6.71
2400	6.96
2600	6.65
2800	6.26
3000	5.14



MODULATION LIMITING – High Power

Carrier Frequency: 454.0125 MHz

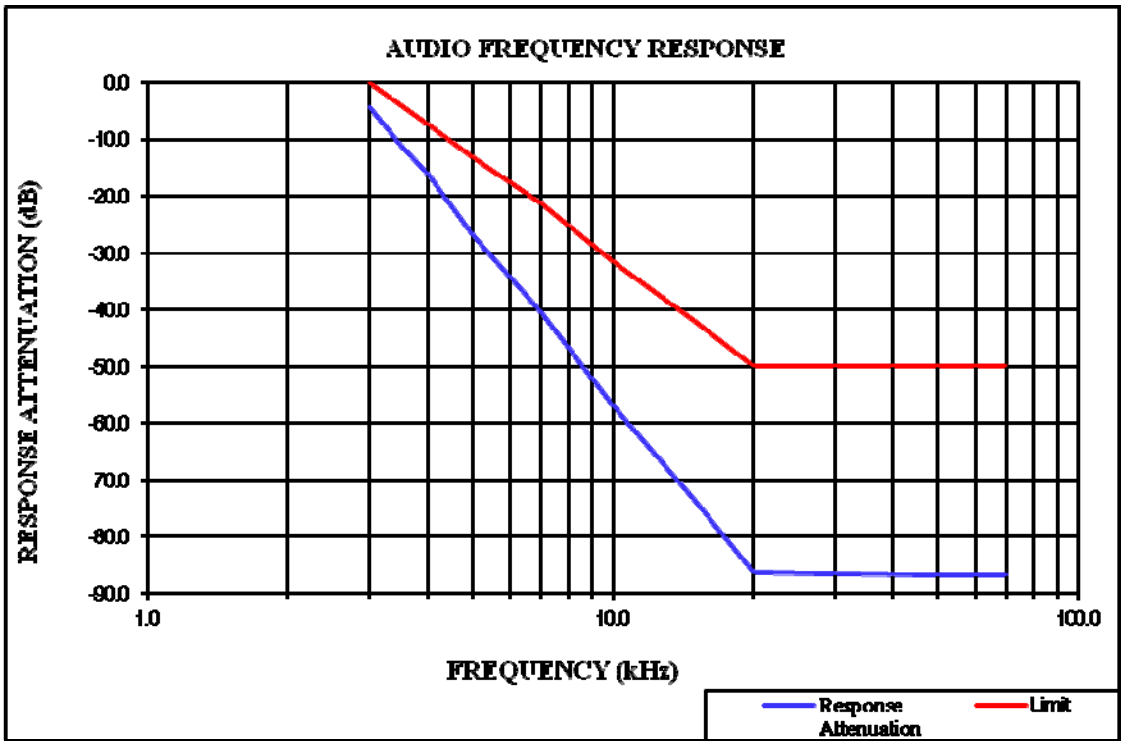
Audio Frequency (Hz)	Instantaneous		Steady-state		Limit [kHz]
	Deviation (@+20dB) [kHz]	Deviation (@-20dB) [kHz]	Deviation (@+20dB) [kHz]	Deviation (@-20dB) [kHz]	
300	3.138	0.117	3.054	0.064	5
400	3.310	0.154	3.254	0.099	5
500	3.445	0.184	3.355	0.136	5
600	3.612	0.273	3.497	0.201	5
700	3.539	0.286	3.474	0.227	5
800	3.688	0.272	3.632	0.186	5
900	3.742	0.326	3.656	0.274	5
1000	3.704	0.337	3.640	0.266	5
1200	3.617	0.368	3.524	0.325	5
1400	3.747	0.511	3.650	0.422	5
1600	3.924	0.550	3.835	0.479	5
1800	4.007	0.561	3.919	0.517	5
2000	3.988	0.633	3.923	0.546	5
2200	3.991	0.644	3.935	0.594	5
2400	4.013	0.729	3.935	0.692	5
2600	3.840	0.751	3.769	0.687	5
2800	3.725	0.732	3.670	0.658	5
3000	3.696	0.750	3.618	0.674	5



Audio Frequency Low Pass Filter Response – High Power

Carrier Frequency: 454.0125 MHz

Audio Frequency (kHz)	Response Attenuation (dB)	Limit (dB)
3.0	-4.4	0.0
3.5	-11.0	-4.0
4.0	-16.3	-7.5
5.0	-26.9	-13.3
7.0	-40.3	-21.1
10.0	-56.9	-31.4
15.0	-73.5	-41.9
20.0	-86.2	-50.0
30.0	-86.4	-50.0
50.0	-86.8	-50.0
70.0	-86.8	-50.0



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

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 shall be in the range of 1% to 5% of the anticipated OBW, and the VBW shall be set ≥ 3 × RBW.

Test Data

Environmental Conditions

Temperature:	28.5~29.1℃
Relative Humidity:	44~49%
ATM Pressure:	100.2~100.3 kPa
Tester:	Blake Yang
Test Date:	2019-08-11~2019-08-16

Test Mode: Transmitting

Result: Compliance.

Modulation Mode	Channel Separation	f_c	99% Occupied Bandwidth	26 dB Bandwidth	Power Level	Note
		MHz	kHz	kHz		
FM	12.5kHz	453.2125	5.110	10.321	High	FCC part 90
			5.110	10.321	Low	
4FSK	12.5kHz		6.814	8.818	High	
			6.713	9.118	Low	
FM	12.5kHz	454.0125	5.210	10.321	High	FCC part 22
			5.210	10.321	Low	
	25kHz		10.421	15.431	High	
			10.421	15.431	Low	
4FSK	12.5kHz		6.713	9.118	High	
			6.713	9.018	Low	

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

BW = 2M + 2D

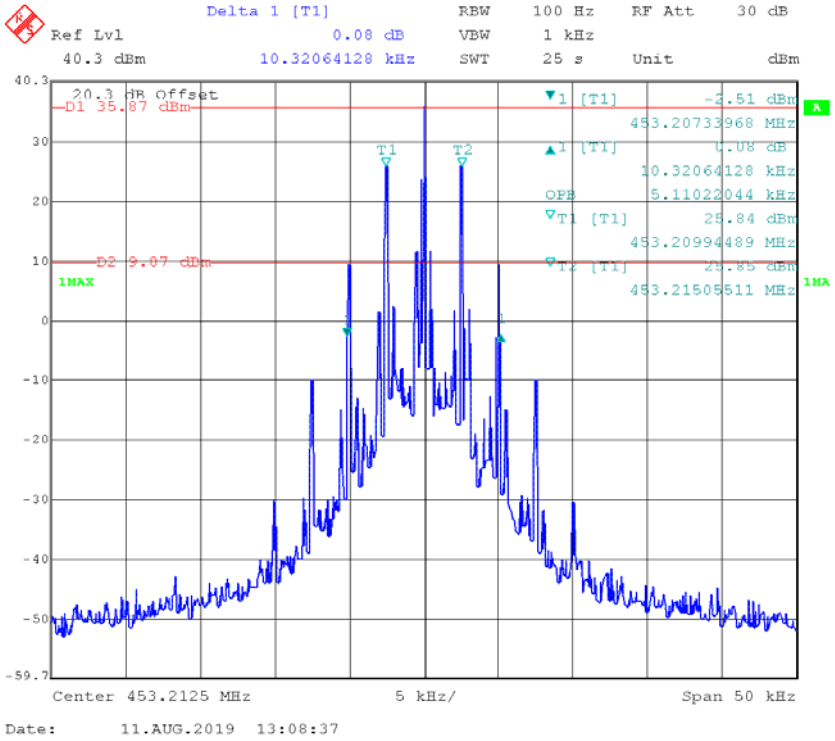
For FM Mode (Channel Spacing: 12.5 kHz)
Emission Designator 11K0F3E
In this case, the maximum modulating frequency is 3.0 kHz with a 2.5 kHz deviation.
BW = 2(M+D) = 2*(3.0 kHz + 2.5 kHz) = 11 kHz = 11K0
F3E portion of the designator represents an FM voice transmission
Therefore, the entire designator 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 kHz + 5.0 kHz) = 16 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.

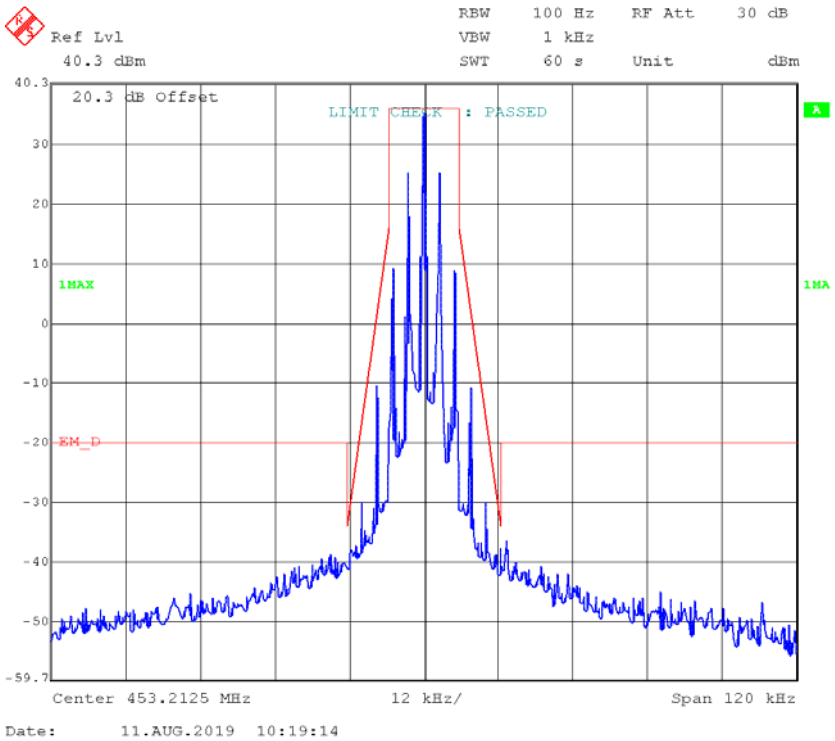
For Digital Mode (Channel Spacing: 12.5 kHz)
Emission Designator 7K60F1D and 7K60F1E
The 99% energy rule was used for digital mode. It basically states that 99% of the modulation energy falls within X kHz, in this case, 7.60 kHz.
F1D and F1E portion of the designator indicates digital information.
Therefore, the entire designator for 12.5 kHz channel spacing digital mode is 7K60F1D and 7K60F1E.

Part 90:
FM,12.5kHz, High Power - Frequency 453.2125 MHz:

99% Occupied& 26 dB Bandwidth

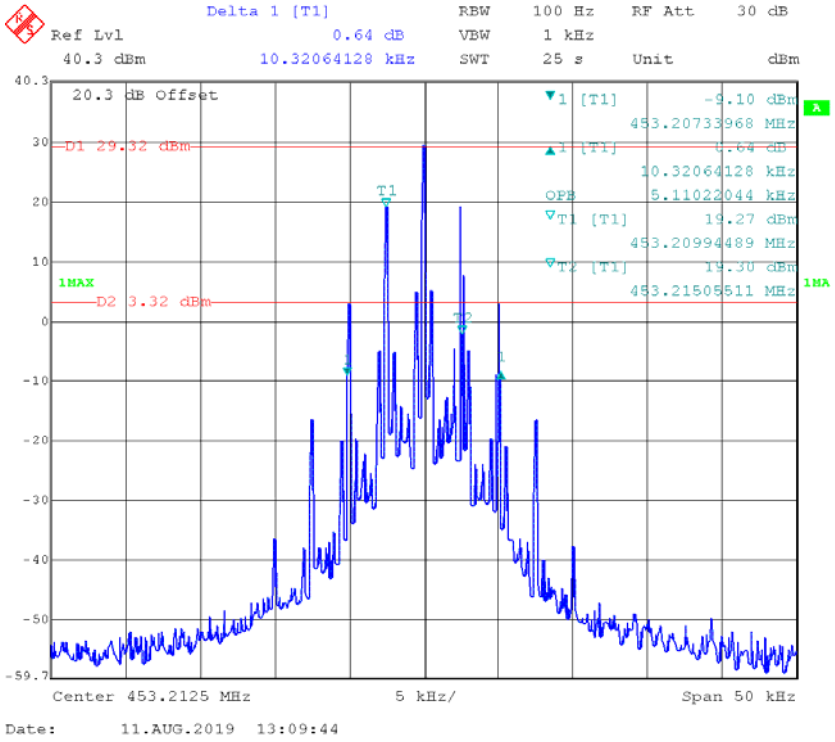


Emission Mask D



FM,12.5kHz, Low Power - Frequency 453.2125 MHz:

99% Occupied& 26 dB Bandwidth



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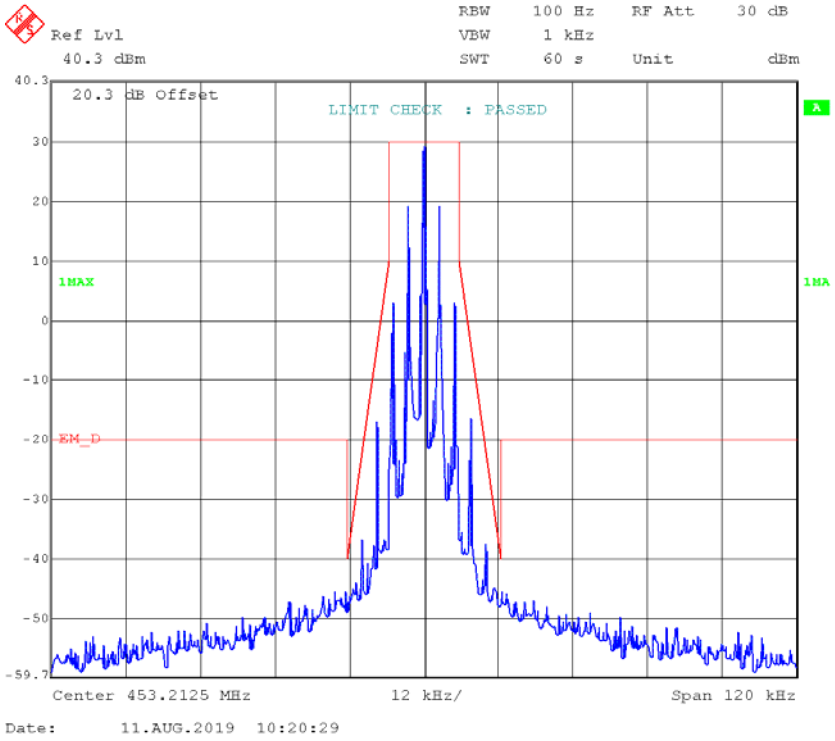
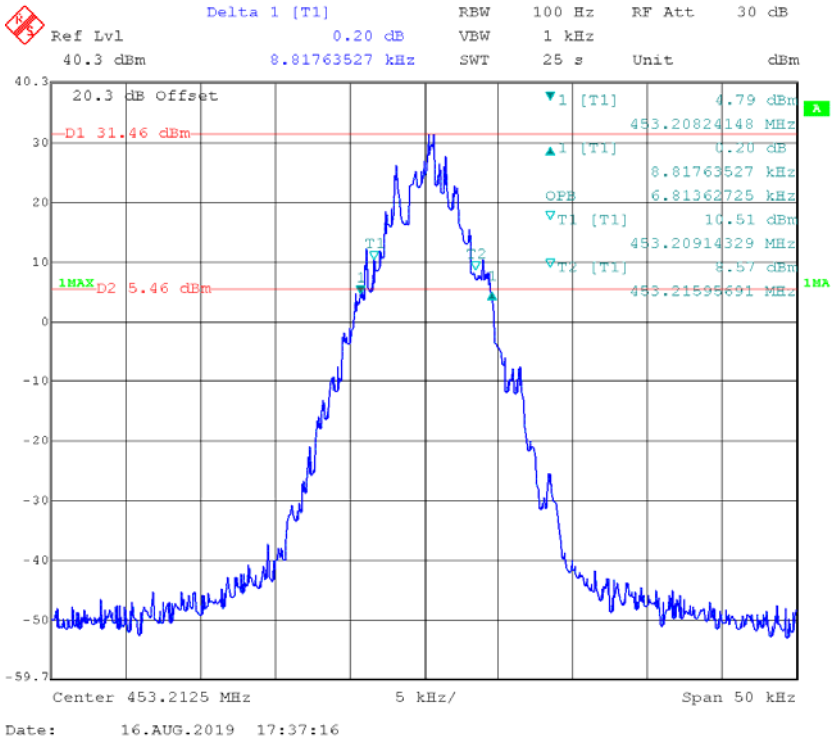


4FSK,12.5kHz, High Power - Frequency 453.2125 MHz:

99% Occupied& 26 dB Bandwidth



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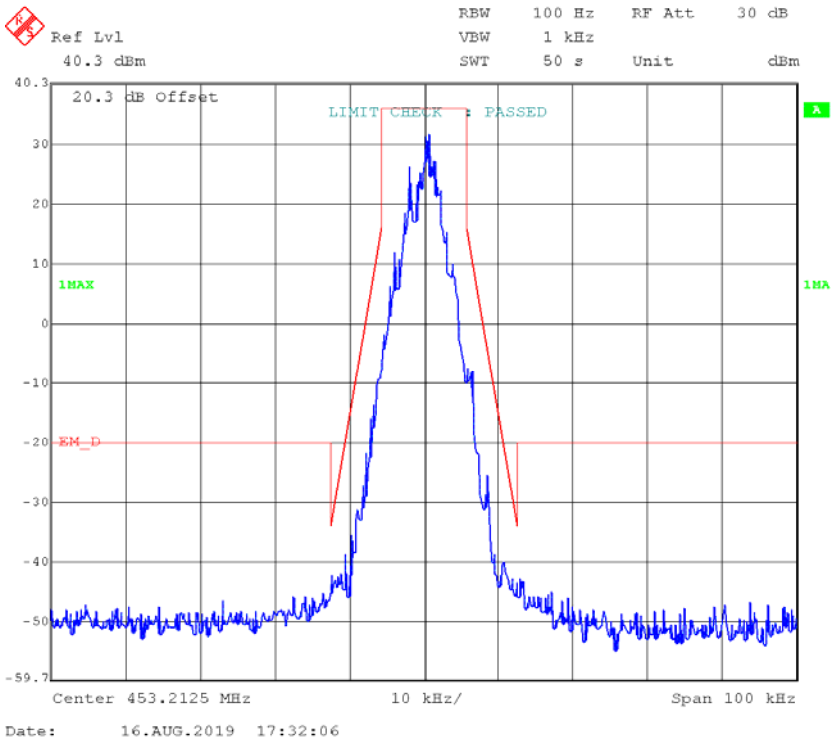
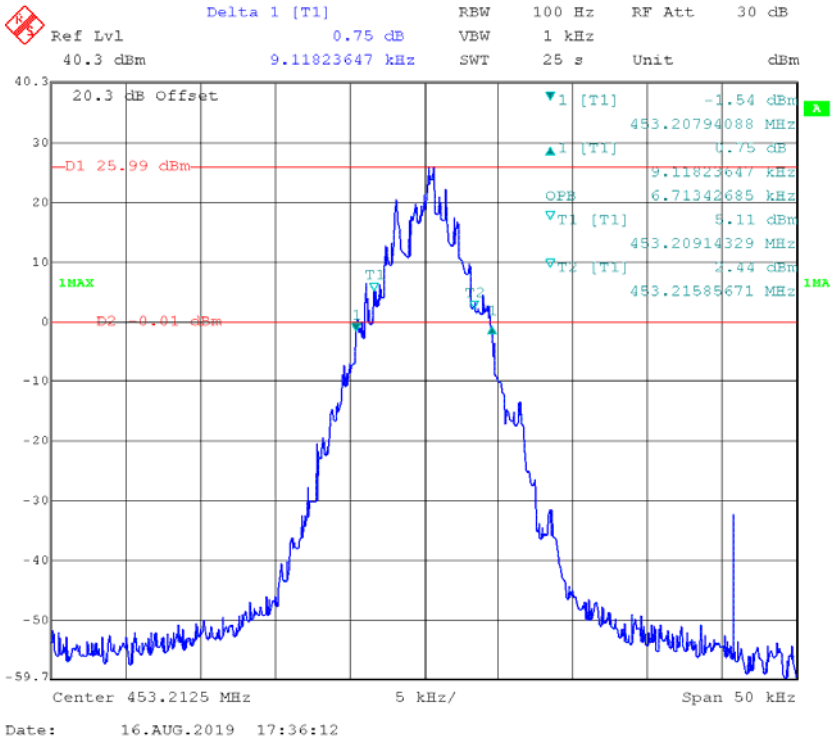


4FSK,12.5kHz, Low Power - Frequency 453.2125 MHz:

99% Occupied& 26 dB Bandwidth



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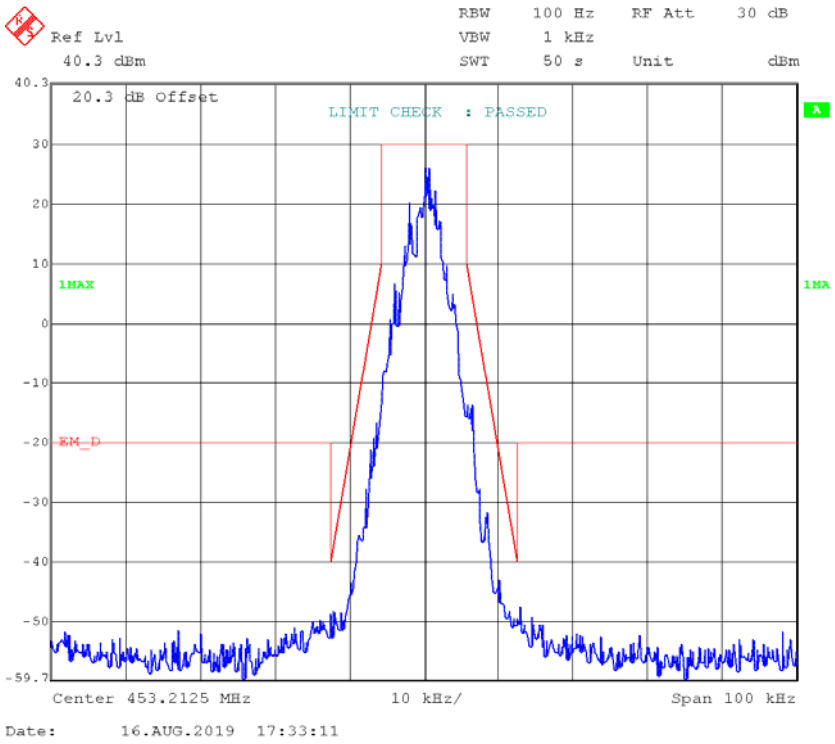
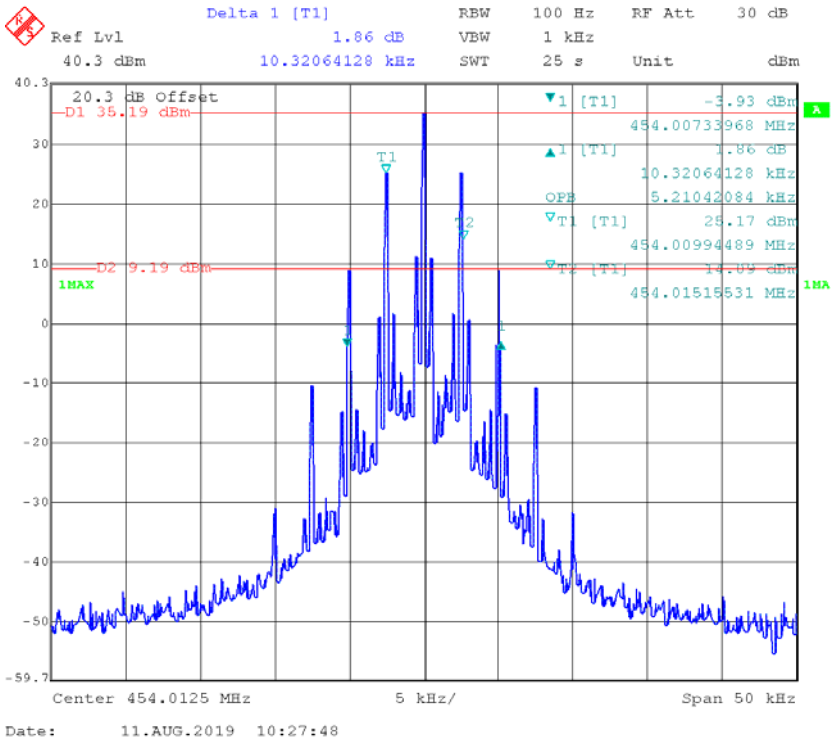
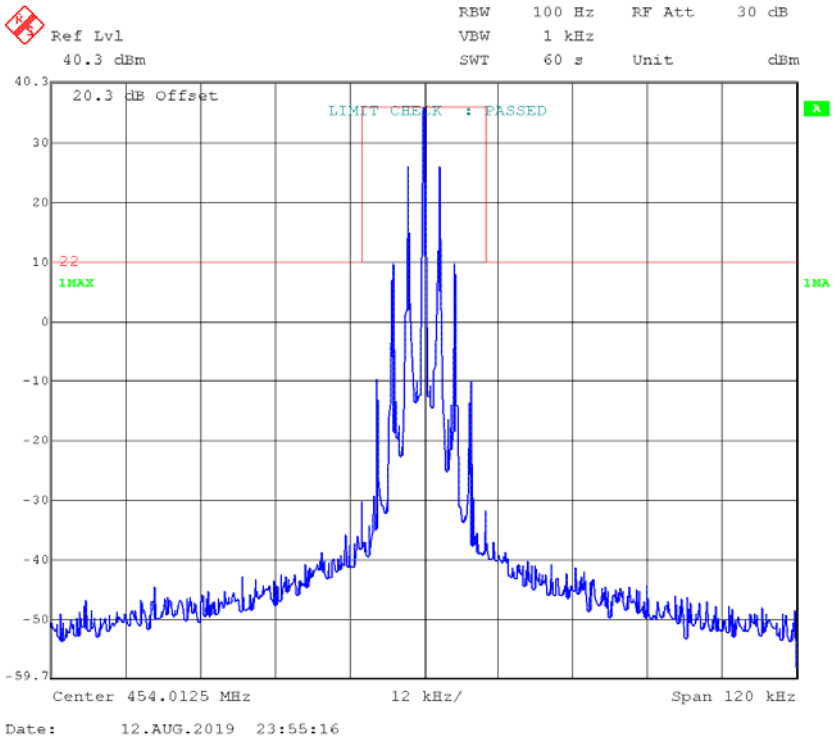


Part 22
FM,12.5kHz, High Power - Frequency 454.0125 MHz:

99% Occupied& 26 dB Bandwidth

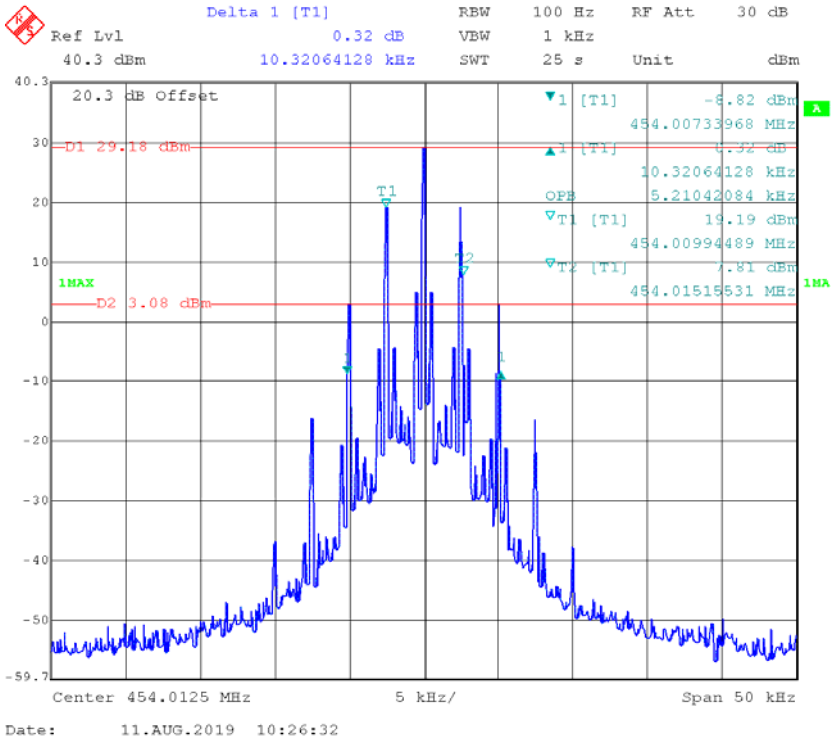


Emission Mask-§22.359

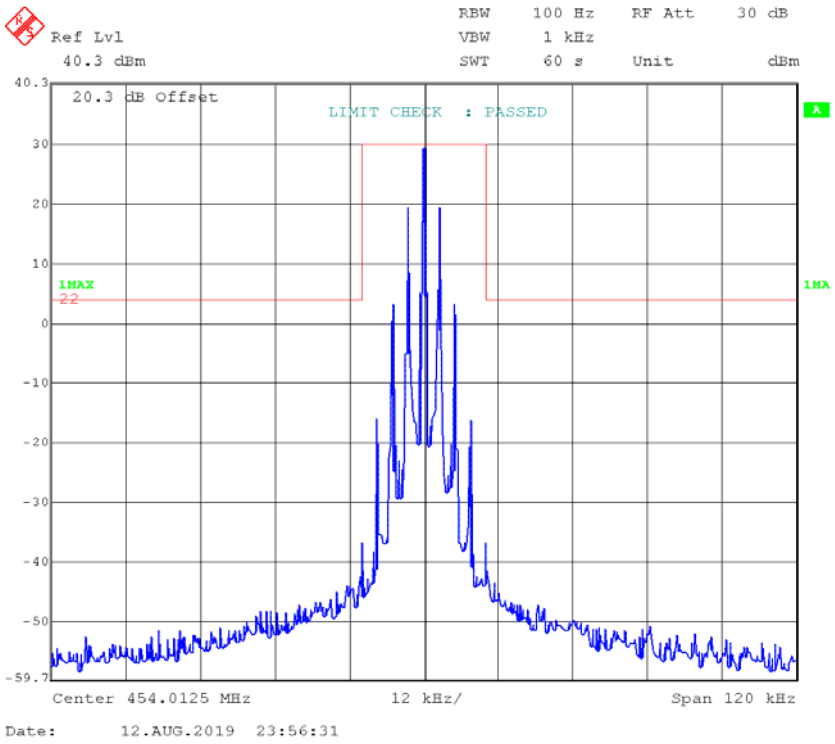


FM,12.5kHz, Low Power – Frequency 454.0125 MHz:

99% Occupied& 26 dB Bandwidth

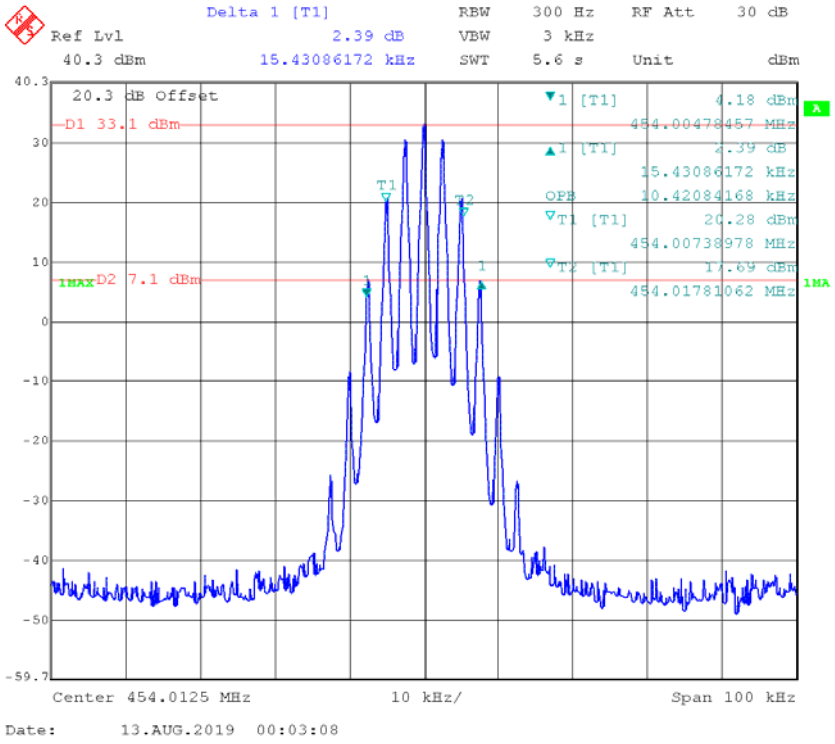


Emission Mask-§22.359

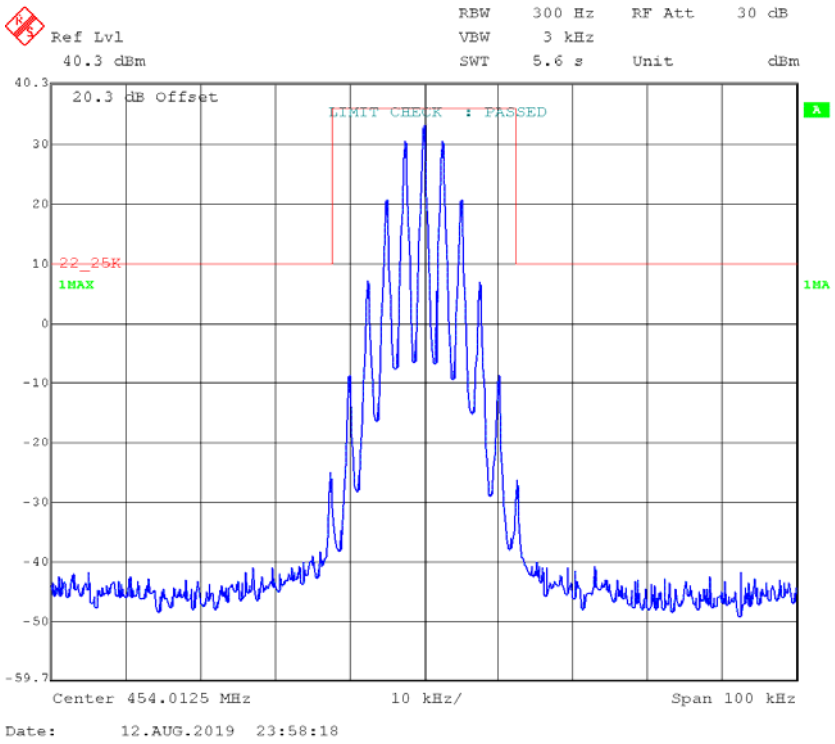


FM,25kHz, High Power - Frequency 454.0125 MHz:

99% Occupied& 26 dB Bandwidth

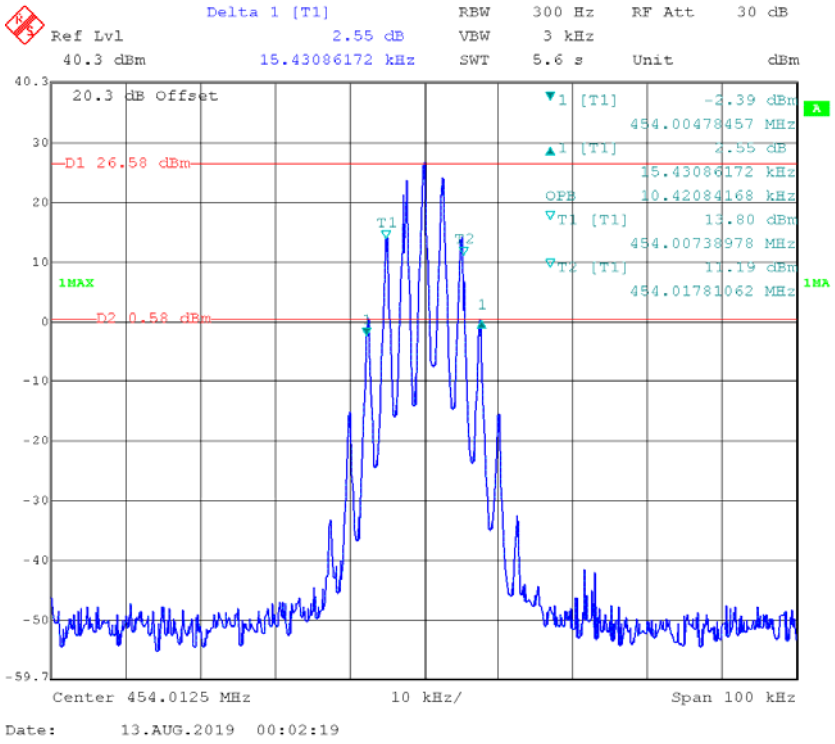


Emission Mask-§22.359

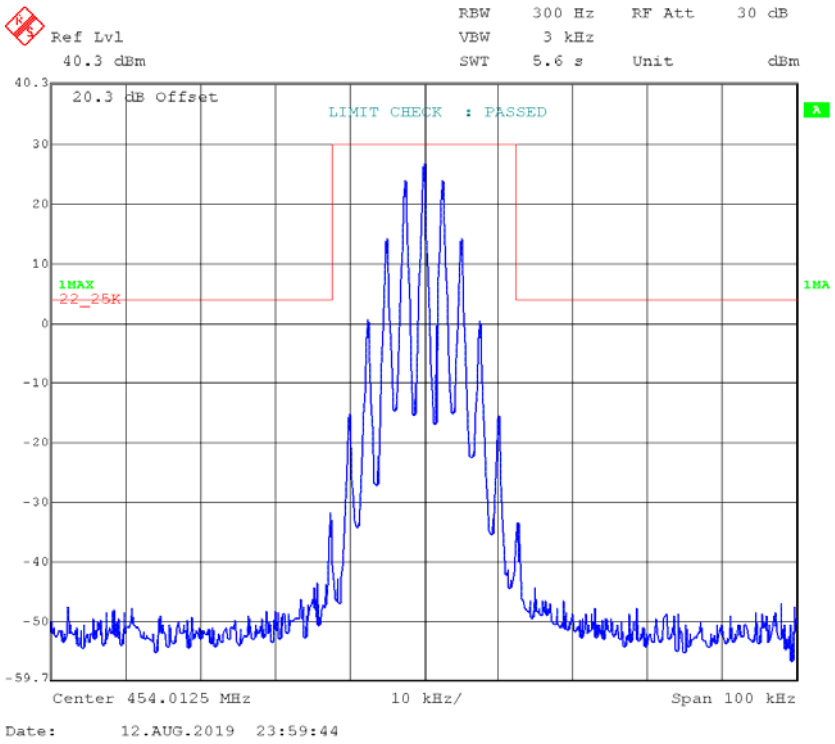


FM, 25 kHz, Low Power – Frequency 454.0125 MHz:

99% Occupied& 26 dB Bandwidth

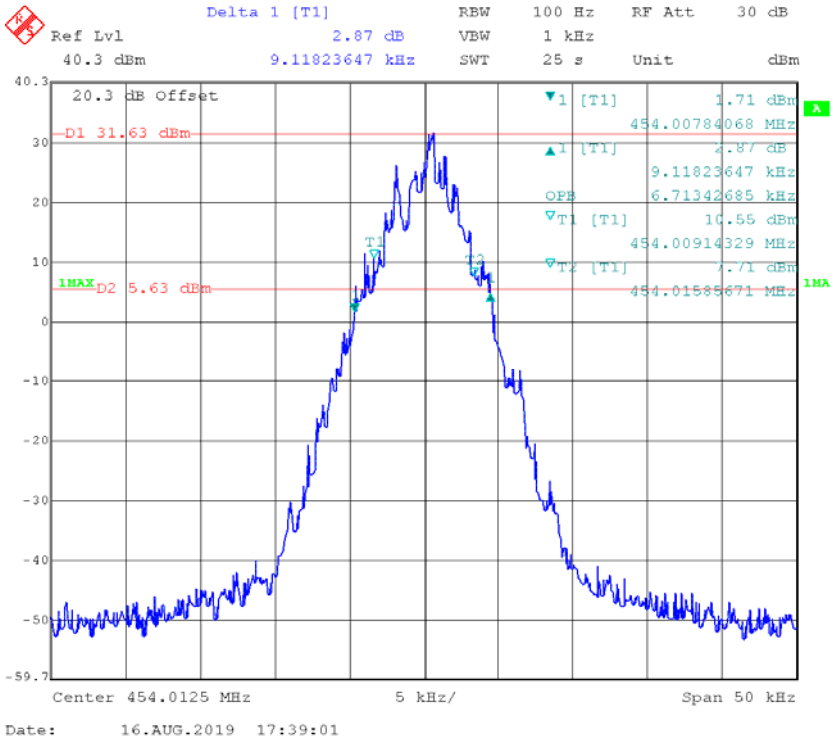


Emission Mask-§22.359

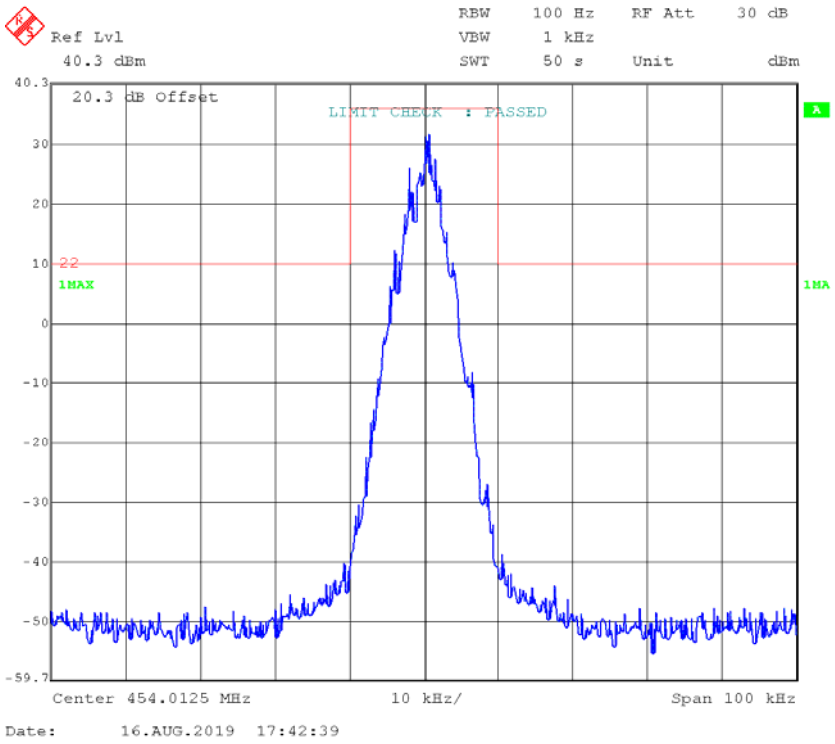


4FSK,12.5 kHz, High Power - Frequency 454.0125 MHz:

99% Occupied& 26 dB Bandwidth

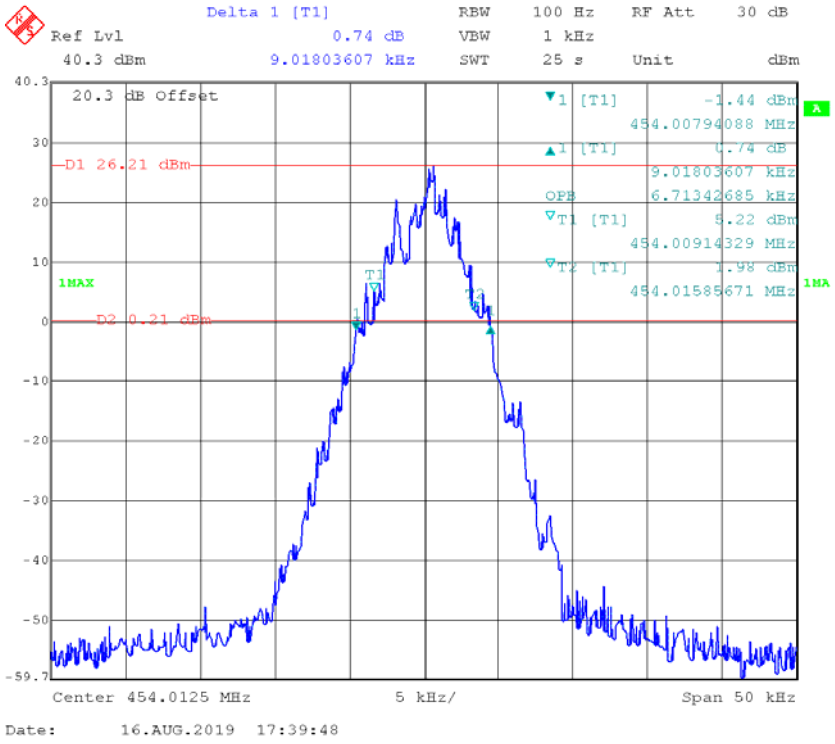


Emission Mask-§22.359

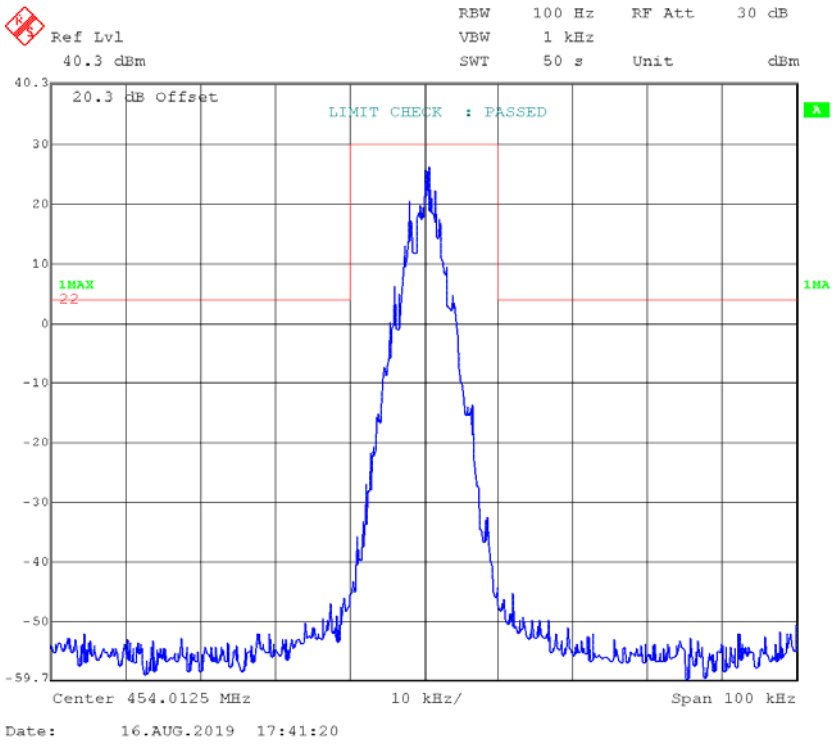


4FSK,12.5 kHz, Low Power - Frequency 454.0125 MHz:

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

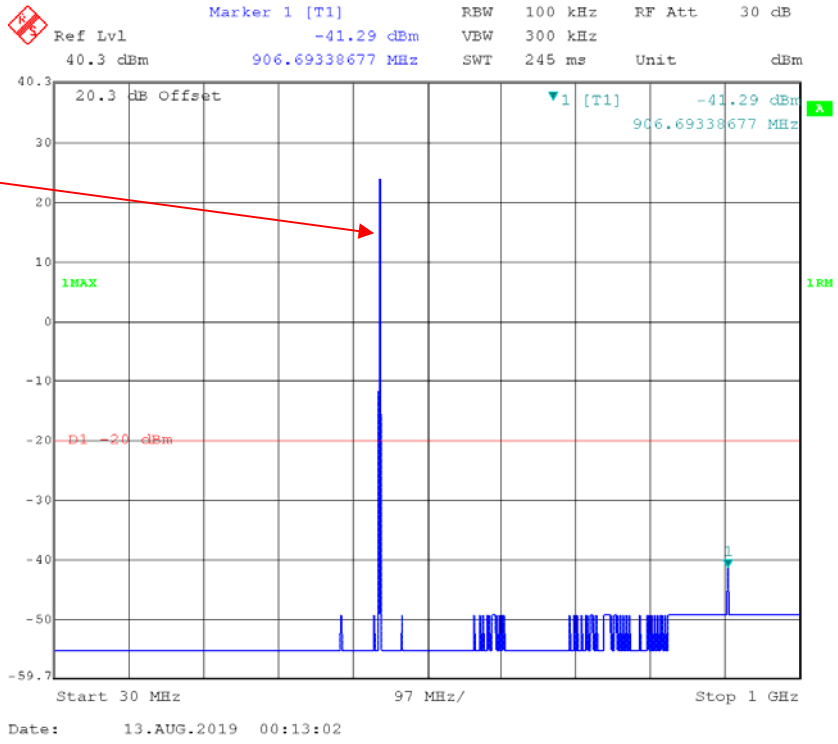
Temperature:	29.5℃
Relative Humidity:	64 %
ATM Pressure:	100.2 kPa
Tester:	Blake Yang
Test Date:	2019-08-13

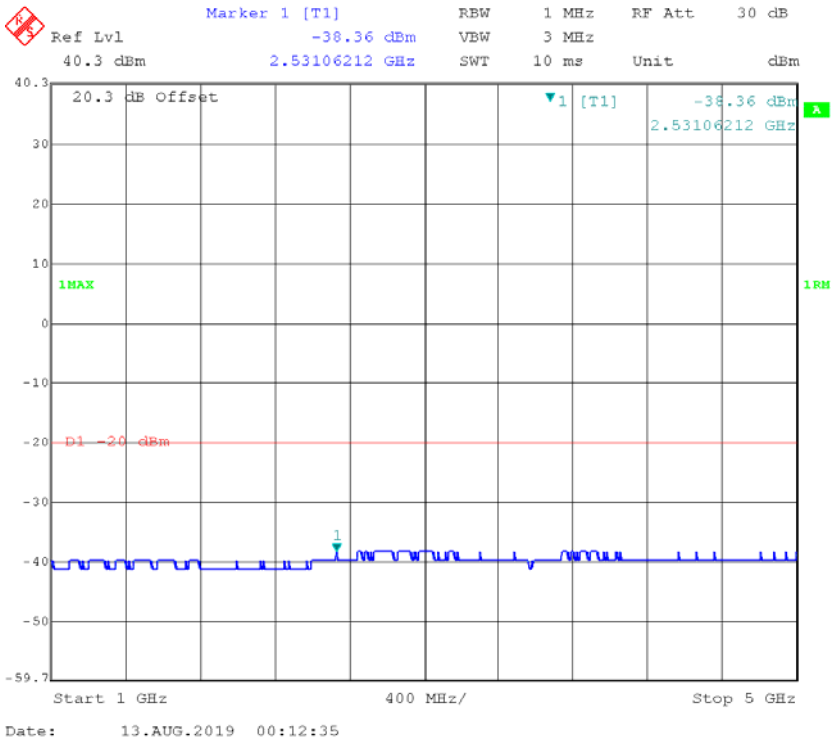
Test Mode: Transmitting

Part 90

453.2125 MHz,12.5kHz,FM, High power

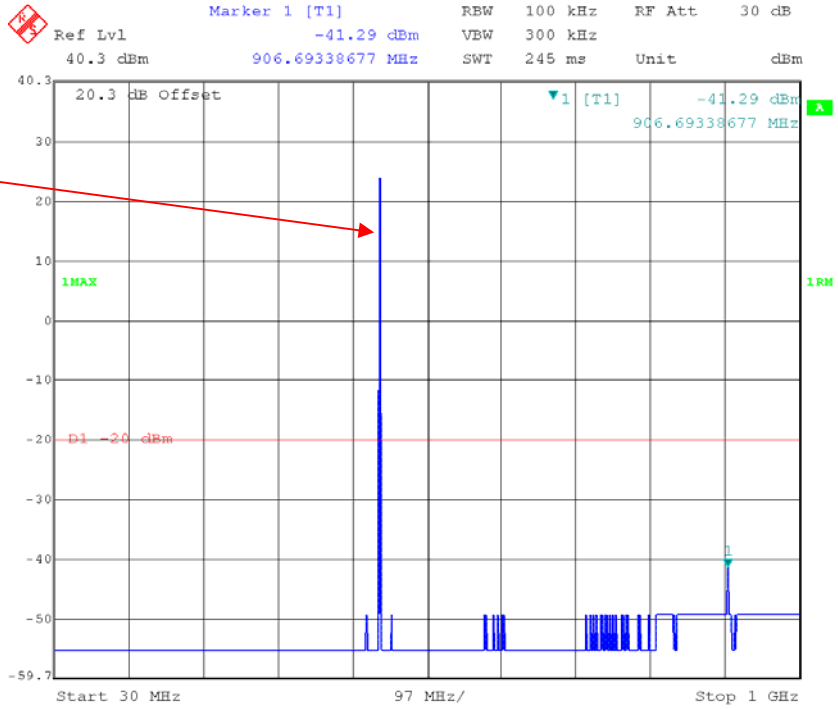
Fund.test with Filter

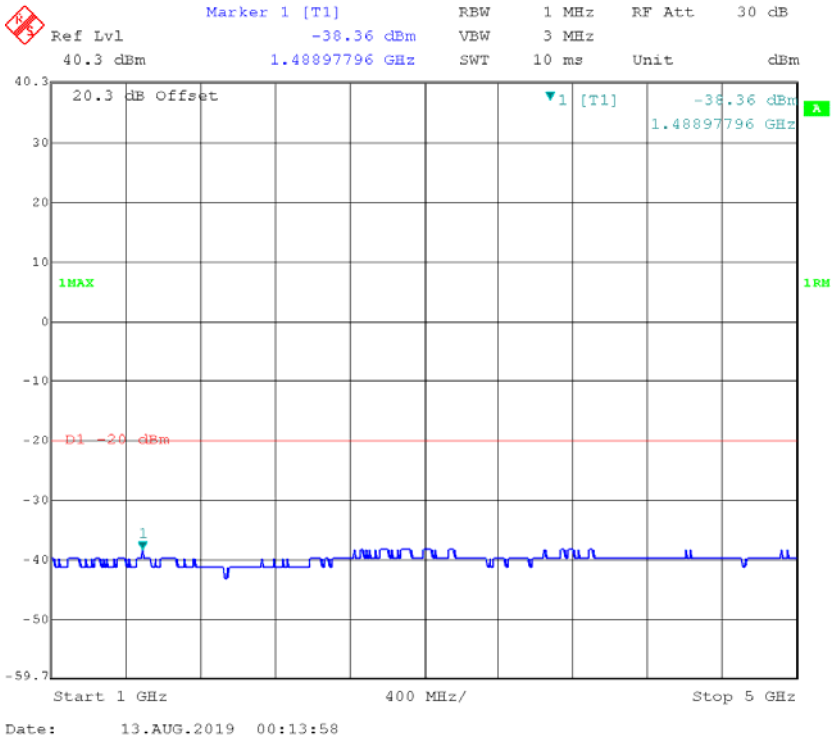




453.2125 MHz,12.5kHz, 4FSK, High power

Fund.test with Filter

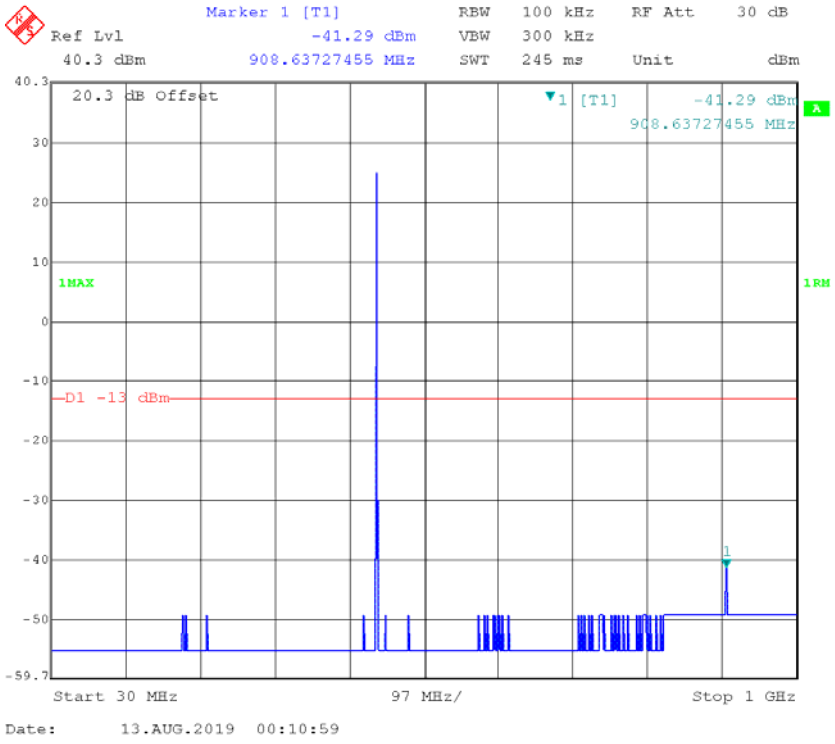


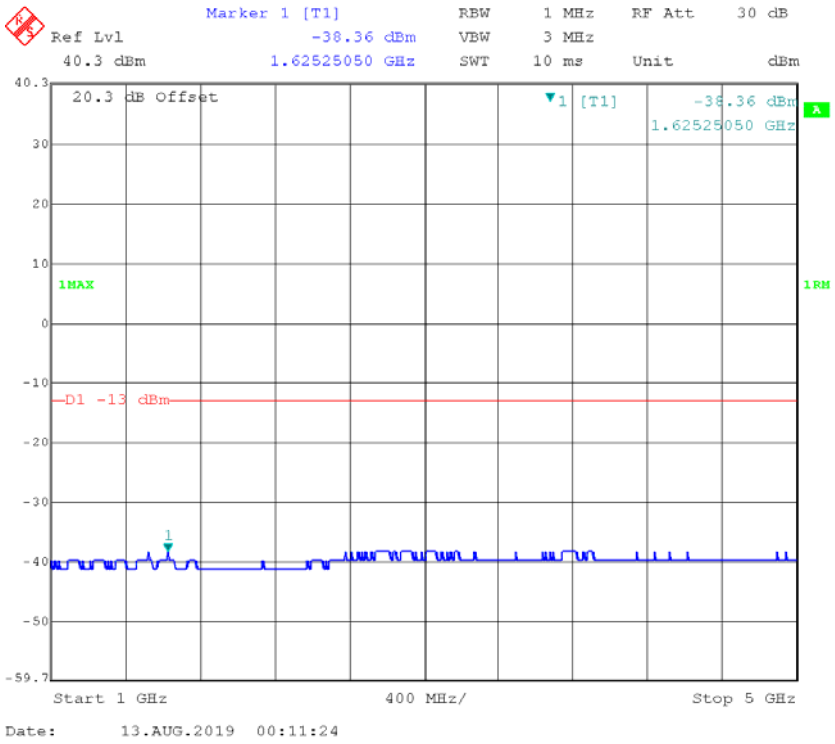


Part 22:

454.0125 MHz,12.5kHz,FM, High power

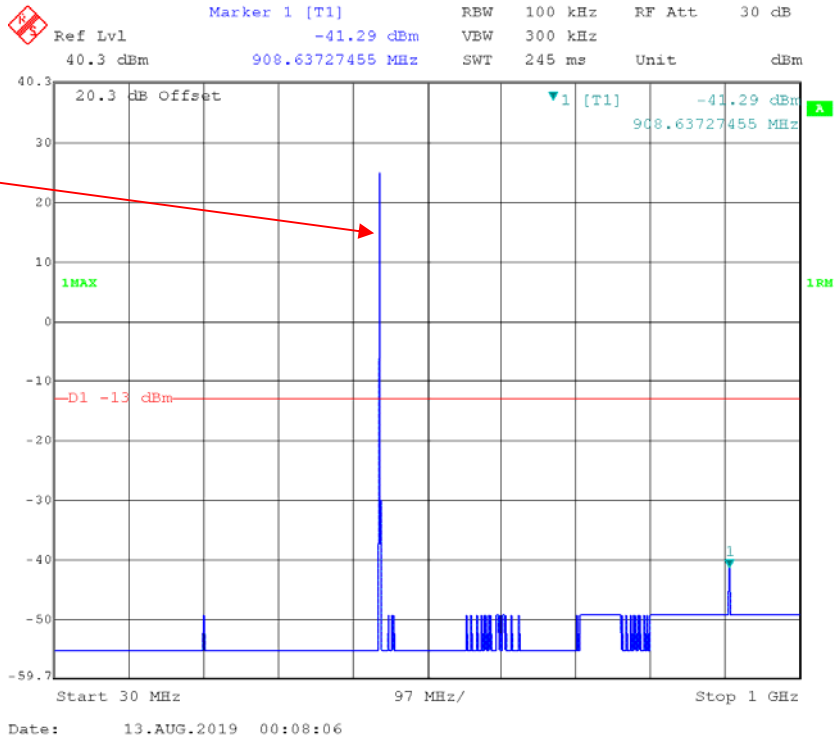
Fund.test with Filter

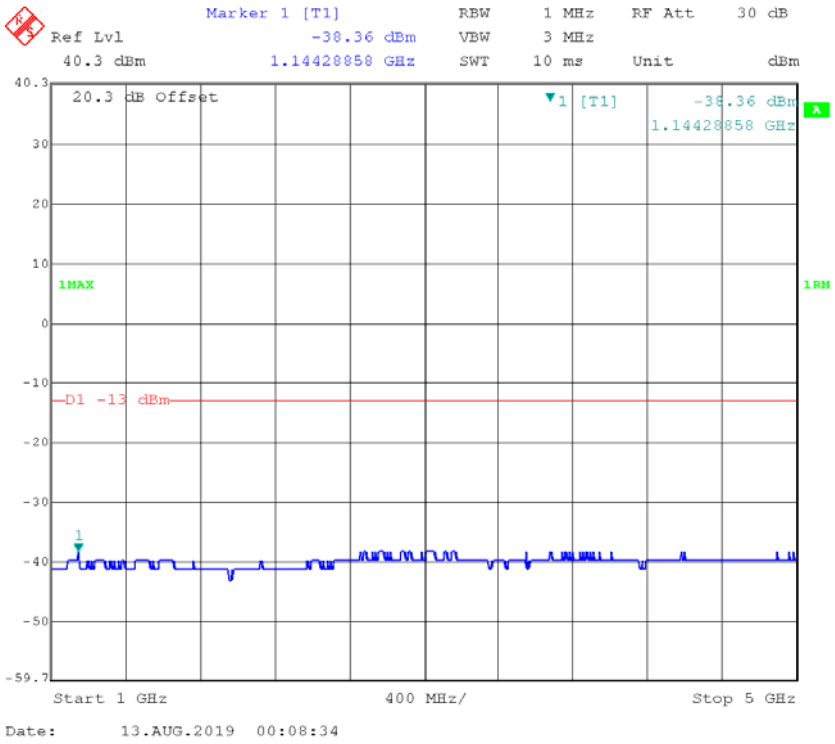




454.0125 MHz,25 kHz,FM, High power

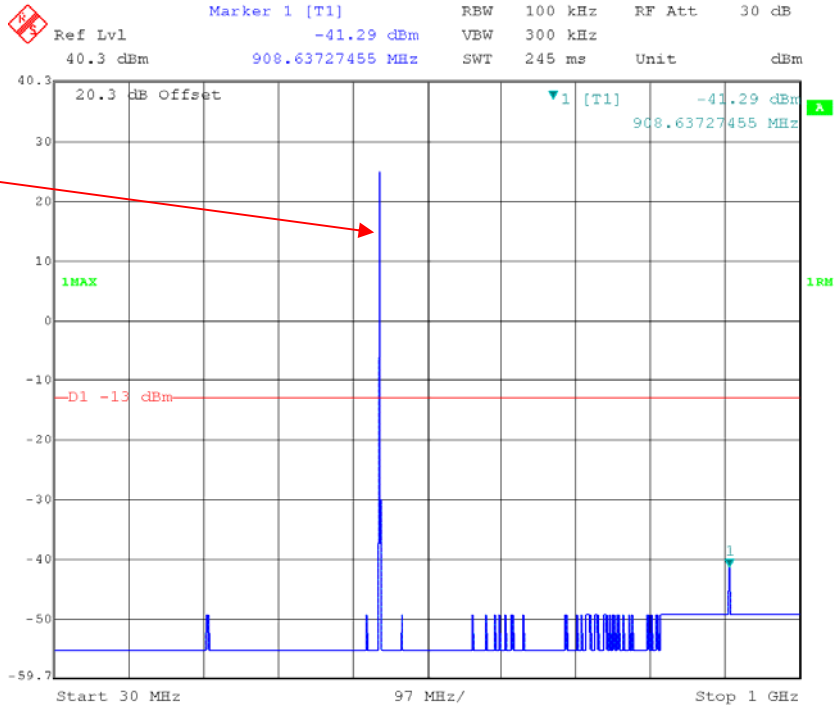
Fund.test with Filter

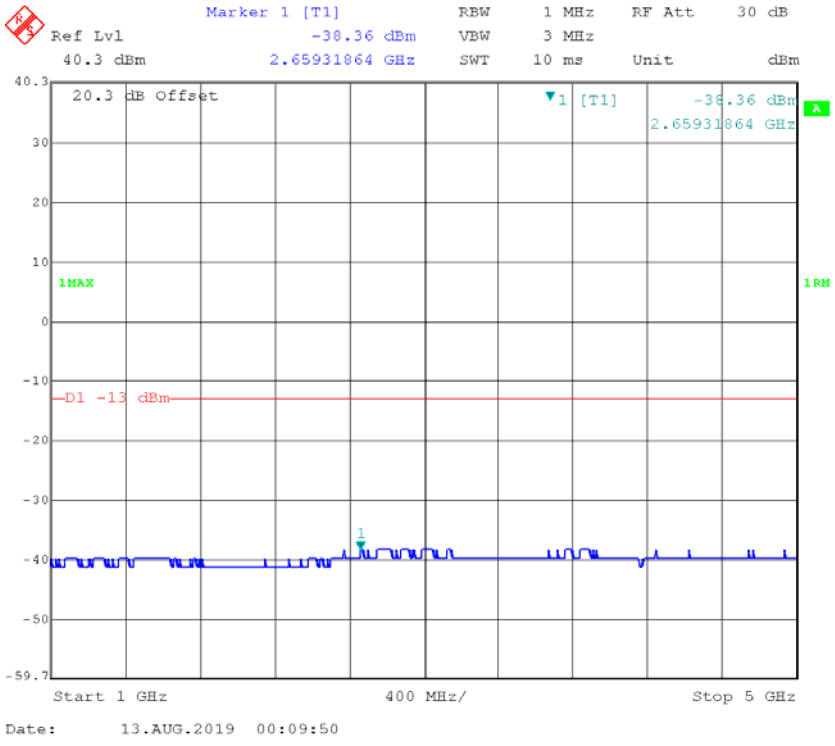




454.0125 MHz,12.5kHz, 4FSK, High power

Fund.test with Filter





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.

Test Data

Environmental Conditions

Test Item:	Radiated Spurious Emissions Below 1GHz	Radiated Spurious Emissions Above 1GHz
Temperature:	30.1℃	27 ℃
Relative Humidity:	55 %	45 %
ATM Pressure:	100.1 kPa	100.1 kPa
Tester:	Tyler Pan	Lucy Lu
Test Date:	2019-08-12	2019-08-12

*Test Mode: Transmitting(*DR5810-2 was the worst and reported*)*

30MHz - 5GHz:

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, High Power								
906.43	H	36.67	-60.20	0.00	1.03	-61.23	-20.00	41.23
906.43	V	38.65	-60.19	0.00	1.03	-61.22	-20.00	41.22
1359.64	H	46.54	-56.91	9.41	1.18	-48.68	-20.00	28.68
1359.64	V	53.70	-49.91	9.41	1.18	-41.68	-20.00	21.68
1812.85	H	50.32	-53.91	10.94	1.21	-44.18	-20.00	24.18
1812.85	V	46.83	-57.34	10.94	1.21	-47.61	-20.00	27.61
2266.06	H	56.10	-47.27	11.87	1.19	-36.59	-20.00	16.59
2266.06	V	56.25	-47.85	11.87	1.19	-37.17	-20.00	17.17
2719.28	H	53.29	-49.08	12.29	1.35	-38.14	-20.00	18.14
2719.28	V	52.68	-50.44	12.29	1.35	-39.50	-20.00	19.50
3172.49	H	54.09	-47.43	12.33	1.54	-36.64	-20.00	16.64
3172.49	V	51.88	-49.05	12.33	1.54	-38.26	-20.00	18.26
3625.70	H	54.90	-45.67	12.23	1.57	-35.01	-20.00	15.01
3625.70	V	51.34	-48.31	12.23	1.57	-37.65	-20.00	17.65
4FSK,Frequency: 453.2125MHz-12.5 kHz, High Power								
906.43	H	36.90	-59.97	0.00	1.03	-61.00	-20.00	41.00
906.43	V	37.45	-61.39	0.00	1.03	-62.42	-20.00	42.42
1359.64	H	53.15	-50.30	9.41	1.18	-42.07	-20.00	22.07
1359.64	V	61.49	-42.12	9.41	1.18	-33.89	-20.00	13.89
1812.85	H	57.08	-47.15	10.94	1.21	-37.42	-20.00	17.42
1812.85	V	51.80	-52.37	10.94	1.21	-42.64	-20.00	22.64
2266.06	H	52.20	-51.17	11.87	1.19	-40.49	-20.00	20.49
2266.06	V	53.66	-50.44	11.87	1.19	-39.76	-20.00	19.76
2719.28	H	60.76	-41.61	12.29	1.35	-30.67	-20.00	10.67
2719.28	V	63.03	-40.09	12.29	1.35	-29.15	-20.00	9.15
3172.49	H	58.18	-43.34	12.33	1.54	-32.55	-20.00	12.55
3172.49	V	56.10	-44.83	12.33	1.54	-34.04	-20.00	14.04
3625.70	H	52.27	-48.30	12.23	1.57	-37.64	-20.00	17.64
3625.70	V	54.27	-45.38	12.23	1.57	-34.72	-20.00	14.72

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)			
FM, Frequency:454.0125MHz-12.5 kHz, High Power								
908.03	H	36.96	-59.85	0.00	1.03	-60.88	-13.00	47.88
908.03	V	37.85	-60.91	0.00	1.03	-61.94	-13.00	48.94
1362.04	H	65.32	-38.15	9.42	1.18	-29.91	-13.00	16.91
1362.04	V	77.76	-25.86	9.42	1.18	-17.62	-13.00	4.62
1816.05	H	53.25	-50.98	10.95	1.21	-41.24	-13.00	28.24
1816.05	V	47.90	-56.27	10.95	1.21	-46.53	-13.00	33.53
2270.06	H	58.36	-45.00	11.88	1.19	-34.31	-13.00	21.31
2270.06	V	57.56	-46.54	11.88	1.19	-35.85	-13.00	22.85
2724.08	H	56.58	-45.78	12.29	1.36	-34.85	-13.00	21.85
2724.08	V	51.30	-51.80	12.29	1.36	-40.87	-13.00	27.87
4FSK,Frequency: 454.0125MHz-12.5 kHz, High Power								
908.03	H	35.90	-60.91	0.00	1.03	-61.94	-13.00	48.94
908.03	V	37.66	-61.10	0.00	1.03	-62.13	-13.00	49.13
1362.04	H	46.40	-57.07	9.42	1.18	-48.83	-13.00	35.83
1362.04	V	46.70	-56.92	9.42	1.18	-48.68	-13.00	35.68
1816.05	H	46.64	-57.59	10.95	1.21	-47.85	-13.00	34.85
1816.05	V	47.45	-56.72	10.95	1.21	-46.98	-13.00	33.98
2270.06	H	51.34	-52.02	11.88	1.19	-41.33	-13.00	28.33
2270.06	V	54.52	-49.58	11.88	1.19	-38.89	-13.00	25.89
FM, Frequency: 454.0125MHz-25 kHz, High Power								
908.03	H	36.28	-60.53	0.00	1.03	-61.56	-13.00	48.56
908.03	V	37.41	-61.35	0.00	1.03	-62.38	-13.00	49.38
1362.04	H	49.16	-54.31	9.42	1.18	-46.07	-13.00	33.07
1362.04	V	49.88	-53.74	9.42	1.18	-45.50	-13.00	32.50
1816.05	H	58.61	-45.62	10.95	1.21	-35.88	-13.00	22.88
1816.05	V	54.16	-50.01	10.95	1.21	-40.27	-13.00	27.27
2270.06	H	55.67	-47.69	11.88	1.19	-37.00	-13.00	24.00
2270.06	V	54.72	-49.38	11.88	1.19	-38.69	-13.00	25.69

Note:
Absolute Level = SG Level - Cable loss + Antenna Gain
Margin = Limit- Absolute Level

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

Applicable Standard

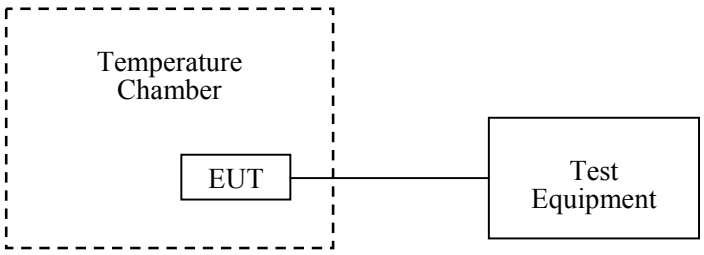
FCC §2.1055, § 22.355,§90.213

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 communication test set via feed-through attenuators. The EUT was placed inside the temperature chamber. The 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 communication test set.

Frequency Stability vs. Voltage: An external variable DC power supply was connected to the battery terminals of the equipment under test. The voltage was set from 85% to 115% of the nominal value and was then decreased until the transmitter light no longer illuminated; i.e., the battery end point. The output frequency was recorded for each battery voltage.



Test Data

Environmental Conditions

Temperature:	24.5℃
Relative Humidity:	67 %
ATM Pressure:	100.4 kPa
Tester:	Blake Yang
Test Date:	2019-08-11

Test Mode: Transmitting(the worst is high power level)

FCC Part 90:

FM,12.5kHz, Reference Frequency: 453.2125 MHz, Limit: ±2.5 ppm			
Temperature (℃)	**Voltage Supplied (V_{DC})**	**Measured Frequency (MHz)**	**Frequency Error (ppm)**
-30	7.4	453.212630	0.29
-20	7.4	453.212554	0.12
-10	7.4	453.212572	0.16
0	7.4	453.212534	0.08
10	7.4	453.212609	0.24
20	7.4	453.212550	0.11
30	7.4	453.212477	-0.05
40	7.4	453.212553	0.12
50	7.4	453.212588	0.19
20	6.3	453.212582	0.18
20	8.4	453.212580	0.18

4FSK, 12.5kHz, Reference Frequency: 453.21255 MHz, Limit: ±2.5 ppm			
Temperature (℃)	**Voltage Supplied (V_{DC})**	**Measured Frequency (MHz)**	**Frequency Error (ppm)**
-30	7.4	453.212529	0.06
-20	7.4	453.212520	0.04
-10	7.4	453.212494	-0.01
0	7.4	453.212650	0.33
10	7.4	453.212578	0.17
20	7.4	453.212463	-0.08
30	7.4	453.212499	0.00
40	7.4	453.212554	0.12
50	7.4	453.212474	-0.06
20	6.3	453.212461	-0.09
20	8.4	453.212555	0.12

FCC Part 22:

FM, 12.5kHz, Reference Frequency: 454.0125 MHz, Limit: ±5 ppm			
Temperature (℃)	**Voltage Supplied (V_{DC})**	**Measured Frequency (MHz)**	**Frequency Error (ppm)**
-30	7.4	454.012632	0.290
-20	7.4	454.012459	-0.090
-10	7.4	454.012644	0.320
0	7.4	454.012608	0.240
10	7.4	454.012512	0.030
20	7.4	454.012550	0.110
30	7.4	454.012570	0.150
40	7.4	454.012576	0.170
50	7.4	454.012610	0.240
20	6.3	454.012587	0.190
20	8.4	454.012496	-0.010

4FSK, 12.5kHz, Reference Frequency: 454.0125 MHz, Limit: ±5 ppm			
Temperature (℃)	**Voltage Supplied (V_{DC})**	**Measured Frequency (MHz)**	**Frequency Error (ppm)**
-30	7.4	454.012603	0.23
-20	7.4	454.012632	0.29
-10	7.4	454.012608	0.24
0	7.4	454.012531	0.07
10	7.4	454.012451	-0.11
20	7.4	454.012541	0.09
30	7.4	454.012610	0.24
40	7.4	454.012571	0.16
50	7.4	454.012514	0.03
20	6.3	454.012585	0.19
20	8.4	454.012610	0.24

FM, 25kHz, Reference Frequency: 454.0125 MHz, Limit: ±5 ppm			
Temperature (℃)	**Voltage Supplied (V_{DC})**	**Measured Frequency (MHz)**	**Frequency Error (ppm)**
-30	7.4	454.012491	-0.02
-20	7.4	454.012599	0.22
-10	7.4	454.012544	0.10
0	7.4	454.012501	0.00
10	7.4	454.012454	-0.10
20	7.4	454.012644	0.32
30	7.4	454.012567	0.15
40	7.4	454.012597	0.21
50	7.4	454.012576	0.17
20	6.3	454.012500	0.00
20	8.4	454.012604	0.23

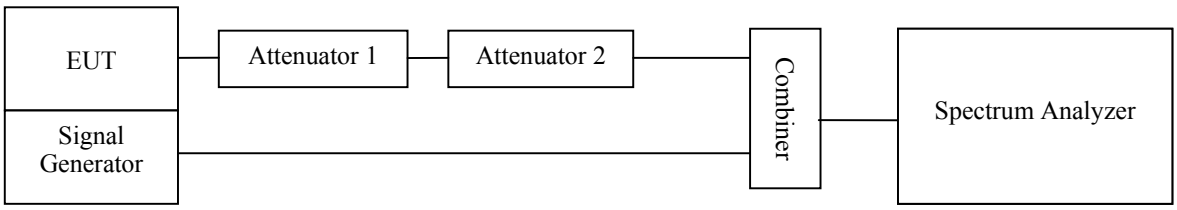
FCC §90.214 - TRANSIENT FREQUENCY BEHAVIOR

Applicable Standard

Regulations: FCC §90.214
Test method: ANSI/TIA-603-D 2010, section 2.2.19.3

Test Procedure

a) Connect the EUT and test equipment as shown on the following block diagram.
b) Set the Spectrum Analyzer to measure FM deviation, and tune the RF frequency to the transmitter assigned frequency.
c) 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.
d) Turn on the transmitter.
e) 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.
f) Turn off the transmitter.
g) 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.
h) Remove the attenuation 1, so the input power to the Spectrum Analyzer is increased by 30 dB when the transmitter is turned on.
i) 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 "tiger offset" to -10ms for turn on and -15ms for turn off.
j) 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.
k) 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

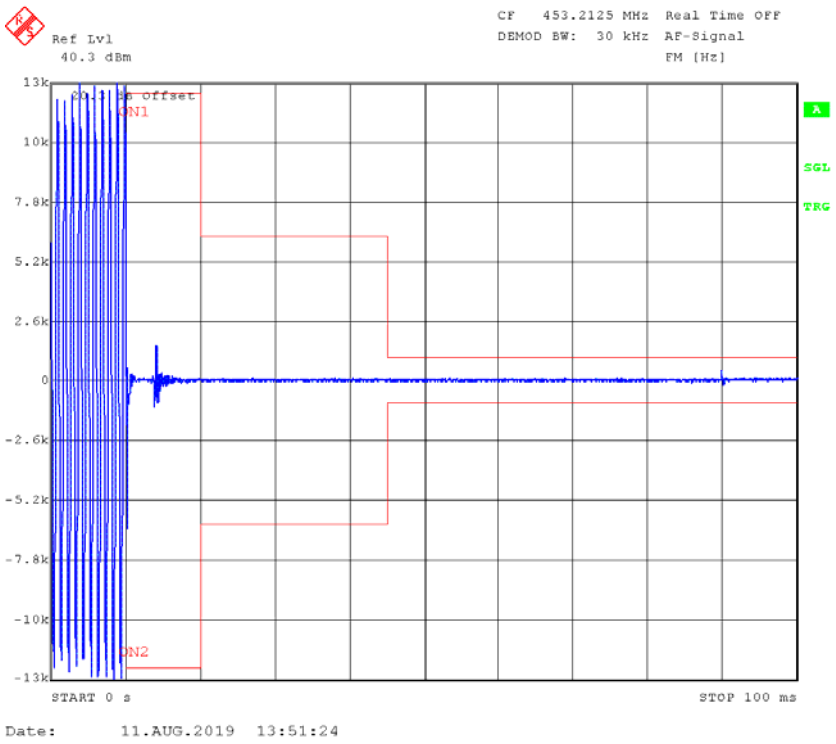
Temperature:	28.5℃
Relative Humidity:	56%
ATM Pressure:	100.2 kPa
Tester:	Blake Yang
Test Date:	2019-08-11

Channel Spacing (kHz)	Transient Period (ms)	Transient Frequency	Result
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.

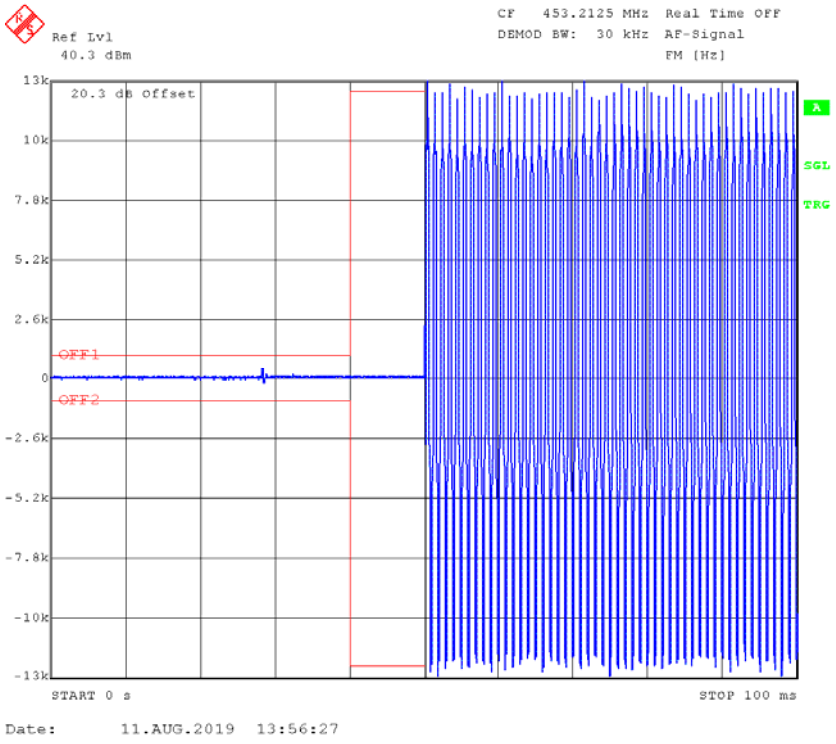
High Power

Turn on



Date: 11.AUG.2019 13:51:24

Turn off



Date: 11.AUG.2019 13:56:27

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