FCC PART 22, and 90

TEST REPORT

For

Hytera Communications Corporation Limited

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

FCC ID: YAMPD98XUHF

Report Type:	**Product Type:**
Original Report	Digital Portable Radio

Test Engineer:	Sonia Zhou
Report Number:	RDG160630002-00A Rev
Report Date:	2016-10-20
Reviewed By:	Rocky Kang RF Engineer
Prepared By:	Bay Area Compliance Laboratories Corp. (Shenzhen) 6/F, the 3rd Phase of WanLi Industrial Building, ShiHua Road, FuTian Free Trade Zone Shenzhen, Guangdong, China Tel: +86-755-33320018 Fax: +86-755-33320008 www.baclcorp.com.cn

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DOCUMENT REVISION HISTORY

Revision Number	Report Number	Description of Revision	Date of Revision
0	RDG160630002-00A	Original Report	2016-07-27
1	RDG160630002-00A Rev	Updated note	2016-10-20

GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

The *Hytera Communications Corporation Limited*'s product, model number: *PD985 Ux (FCC ID: YAMPD98XUHF)* or the "EUT" in this report was a *Digital Portable Radio,* which was measured approximately: 14.1 cm (L) x6.2 cm (W) x 3.9 cm (H), rated input voltage: DC 7.2V rechargeable Li-ion battery or DC 12.0 V from adapter.

Adapter Information:
Model: HKA01212010-XQ
Input: AC 100-240V, 50/60 Hz, 0.5A
Output: DC 12V, 1.0A

Note: The series product, model PD982 Ux, PD986 Ux, PD988 Ux and model E PD985 Ux, they are electrically identical and the differences between them are the model number and screen. Model PD985 Ux was selected for fully testing, which was explained in the attached product similarity declaration letter.

** All measurement and test data in this report was gathered from production sample serial number: 160630001 (Assigned by BACL, Shenzhen). The EUT supplied by the applicant was received on 2016-06-30.*

Objective

This test report is prepared on behalf of *Hytera Communications Corporation Limited* in accordance with Part 2, and Part 90 of the Federal Communication Commissions rules.

Related Submittal(s)/Grant(s)

FCC Part 15.247 DSS and DTS submissions with FCC ID: YAMPD98XUHF.

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 and ANSI C63.4-2014.

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

Measurement uncertainty with radiated emission is 5.81 dB for 30MHz-1GHz.and 4.88 dB for above 1GHz, 1.95dB for conducted measurement.

Test Facility

The test site used by Bay Area Compliance Laboratories Corp. (Shenzhen) to collect test data is located on the 6/F, the 3rd Phase of WanLi Industrial Building, ShiHua Road, FuTian Free Trade Zone Shenzhen, Guangdong, China.

Test site at Bay Area Compliance Laboratories Corp. (Shenzhen) has been fully described in reports submitted to the Federal Communication Commission (FCC). The details of these reports have been found to be in compliance with the requirements of Section 2.948 of the FCC Rules on October 31, 2013. The facility also complies with the radiated and AC line conducted test site criteria set forth in ANSI C63.4-2014.

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.

SYSTEM TEST CONFIGURATION

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.

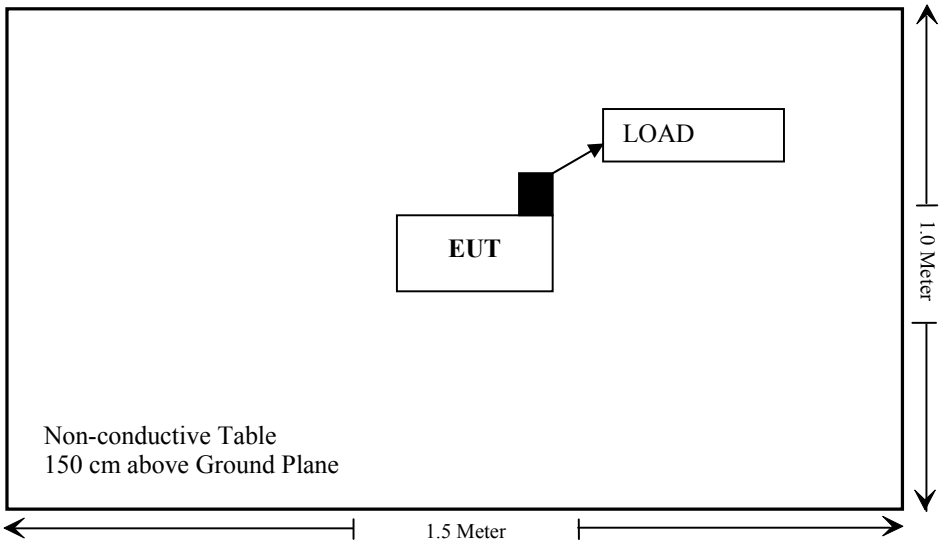
Special Accessories

No special accessory was used.

Equipment Modifications

No modification was made to the EUT tested.

Block Diagram of Test Setup



SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Results
§1.1307(b), §2.1093	RF Exposure	Compliance
§2.1046; § 22.565; §90.205	RF Output Power	Compliance
§2.1047; §90.207	Modulation Characteristic	Compliance
§2.1049;§22.359; §90.210	Occupied Bandwidth & Emission Mask	Compliance
§2.1051; §22.359;§90.210	Spurious Emission at Antenna Terminal	Compliance
§2.1053; 359;§90.210	Spurious Radiated Emissions	Compliance
§2.1055; § 22.355;§90.213	Frequency Stability	Compliance
§90.214	Transient Frequency Behavior	Compliance

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

Applicable Standard

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

Result: Compliance.

Please refer to SAR Report Number: RDG160630002-20A.

FCC §2.1046 & § 22.565 & §90.205 - RF OUTPUT POWER

Applicable Standard

FCC §2.1046, § 22.565 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 Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	Signal Analyzer	FSIQ26	8386001028	2016-04-14	2017-04-14
HP Agilent	RF Communication test set	8920A	3325U00859	2016-05-07	2017-05-07
Ducommun technologies	RF Cable	RG-214	3	2016-05-06	2017-05-06
JFW	30dB Attenuator	50FH-030-100 RF	170006716507	2016-07-18	2017-07-18

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

Test Data

Environmental Conditions

Temperature:	25 ℃
Relative Humidity:	55 %
ATM Pressure:	101.0 kPa

The testing was performed by Sonia Zhou on 2016-07-20.

Test Mode: Transmitting

Test Result: Compliance. Please refer to following table.

Mode	Frequency Spacing (kHz)	Frequency (MHz)	Power level	Output (dBm)	Output Power(W)	Note
Analog	12.5	350.0125	High	36.04	4.02	For Federal
			Low	30.37	1.09	
		450.0125	High	36.25	4.22	For Part 90
			Low	30.58	1.14	
		453.2125	High	36.49	4.46	For Part 90
			Low	30.77	1.19	
		454.0125	High	36.47	4.44	For Part 22
			Low	30.73	1.18	
		526.9875	High	36.46	4.43	Not for FCC review
			Low	30.24	1.06	
Digital	12.5	350.0125	High	36.06	4.04	For Federal
			Low	30.31	1.07	
		450.0125	High	36.45	4.42	For Part 90
			Low	30.72	1.18	
		453.2125	High	36.55	4.52	For Part 90
			Low	30.61	1.15	
		454.0125	High	36.53	4.50	For Part 22
			Low	30.68	1.17	
		526.9875	High	36.75	4.73	Not for FCC review
			Low	30.42	1.10	

Note: The high rated power is 4.0W.
The low rated power is 1.0W.

FCC §2.1047 & §90.207 - MODULATION CHARACTERISTIC

Applicable Standard

FCC§2.1047 and §90.207:

(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 Equipment List and Details

Manufacturer	Description	Model No.	Serial No.	Calibration Date	Calibration Due Date
HP	RF Communication Test Set	8920A	3438A05201	2016-06-14	2017-06-13
LEADER	MILLIVOLTMETER	LMV-181A	6041126	2016-07-02	2017-07-01
Ducommun technologies	RF Cable	RG-214	3	2016-05-06	2017-05-06
JFW	30dB Attenuator	50FH-030-100 RF	170006716507	2016-07-18	2017-07-18

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

Test Procedure

Test Method: TIA-603D 2.2.3

Test Data

Environmental Conditions

Temperature:	25 ℃
Relative Humidity:	55 %
ATM Pressure:	101.0 kPa

The testing was performed by Sonia Zhou on 2016-07-20.

Test Mode: Transmitting

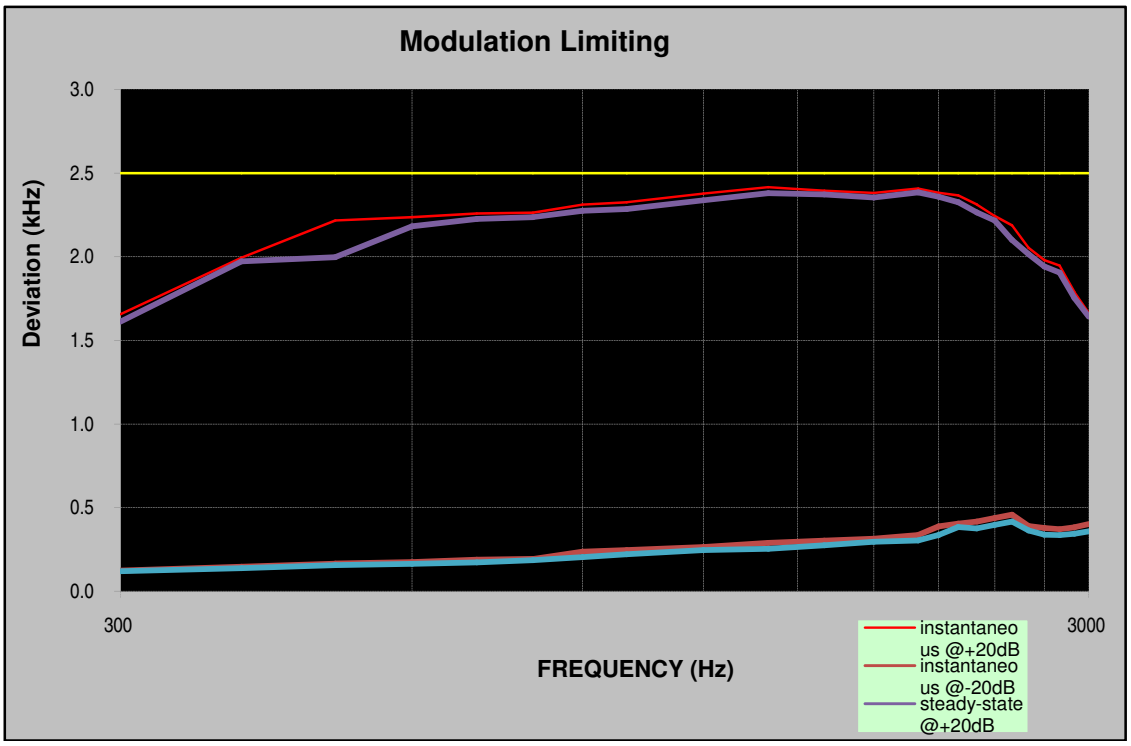
Result: Compliance.

Analog Modulation:

MODULATION LIMITING

Carrier Frequency: 450.0125 MHz, Channel Separation=12.5 kHz

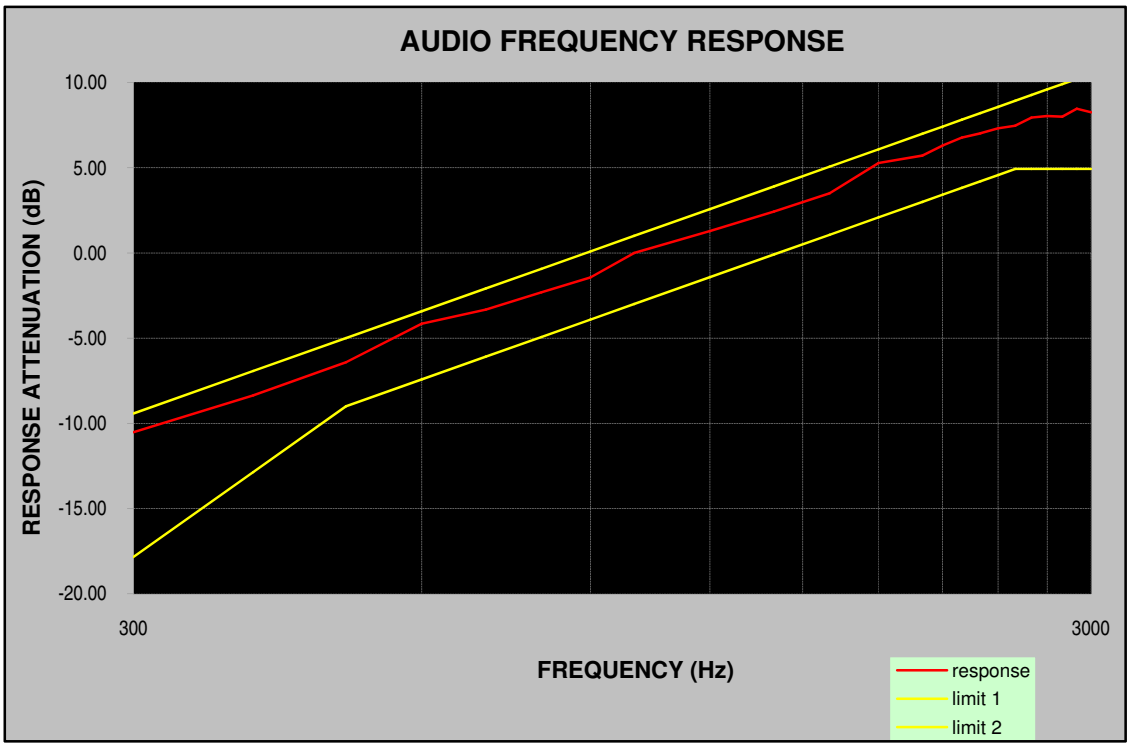
Audio Frequency (Hz)	Instantaneous		Steady-state		FCC Limit [kHz]
	DEVIATION (@+20dB) [kHz]	DEVIATION (@-20dB) [kHz]	DEVIATION (@+20dB) [kHz]	DEVIATION (@-20dB) [kHz]	
300	1.657	0.123	1.612	0.119	2.500
400	1.994	0.146	1.973	0.138	2.500
500	2.217	0.165	1.998	0.156	2.500
600	2.236	0.174	2.182	0.163	2.500
700	2.259	0.188	2.226	0.172	2.500
800	2.263	0.193	2.237	0.185	2.500
900	2.312	0.237	2.275	0.204	2.500
1000	2.326	0.246	2.285	0.221	2.500
1200	2.378	0.264	2.337	0.246	2.500
1400	2.416	0.289	2.380	0.253	2.500
1600	2.395	0.303	2.373	0.275	2.500
1800	2.382	0.314	2.354	0.295	2.500
2000	2.408	0.336	2.385	0.304	2.500
2100	2.383	0.387	2.359	0.336	2.500
2200	2.367	0.404	2.326	0.384	2.500
2300	2.312	0.416	2.265	0.375	2.500
2400	2.243	0.438	2.216	0.397	2.500
2500	2.188	0.457	2.100	0.416	2.500
2600	2.054	0.389	2.015	0.363	2.500
2700	1.980	0.378	1.942	0.338	2.500
2800	1.947	0.371	1.905	0.335	2.500
2900	1.789	0.382	1.754	0.344	2.500
3000	1.663	0.401	1.642	0.358	2.500


Modulation Limiting
Deviation (kHz)
3.0
2.5
2.0
1.5
1.0
0.5
0.0
300
3000
FREQUENCY (Hz)
instantaneous @+20dB
instantaneous @-20dB
steady-state @+20dB

Audio Frequency Response

Carrier Frequency: 450.0125 MHz, Channel Separation=12.5 kHz

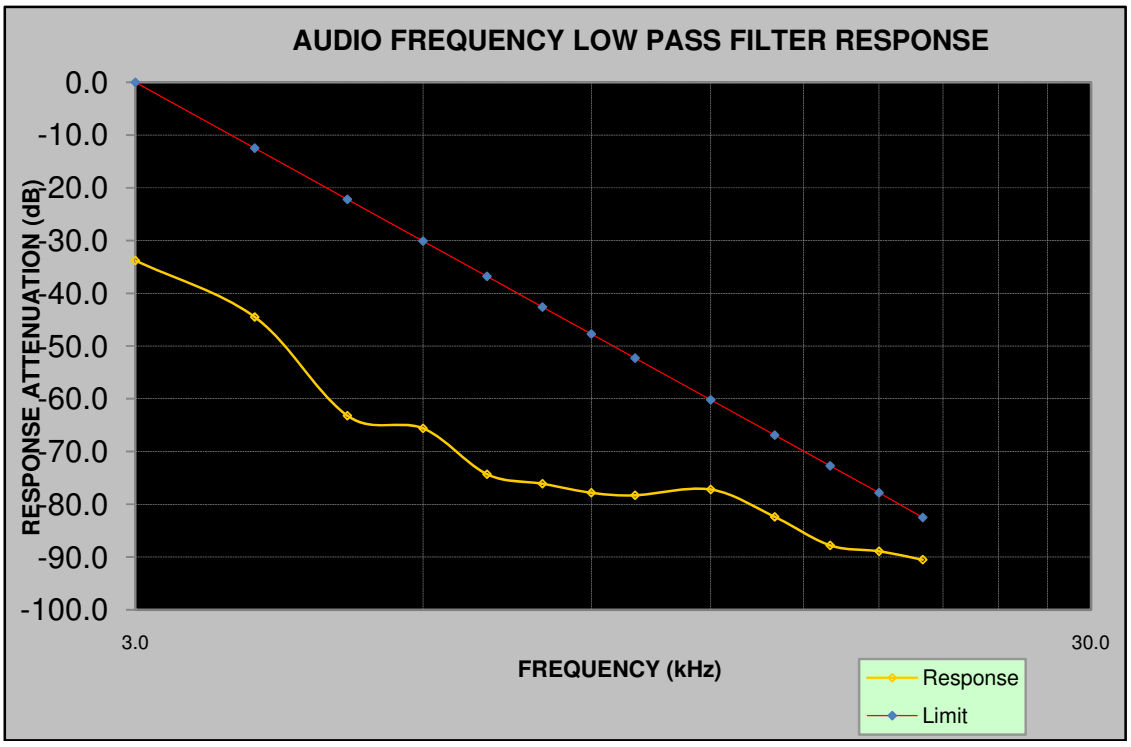
Audio Frequency (Hz)	Response Attenuation (dB)
300	-10.52
400	-8.36
500	-6.41
600	-4.15
700	-3.32
800	-2.32
900	-1.43
1000	0.00
1200	1.29
1400	2.44
1600	3.51
1800	5.28
2000	5.72
2100	6.31
2200	6.78
2300	7.03
2400	7.32
2500	7.47
2600	7.94
2700	8.03
2800	8.00
2900	8.47
3000	8.26


AUDIO FREQUENCY RESPONSE
10.00
5.00
0.00
-5.00
-10.00
-15.00
-20.00
RESPONSE ATTENUATION (dB)
300
3000
FREQUENCY (Hz)
response
limit 1
limit 2

Audio frequency lows pass filter response

Carrier Frequency: 450.0125 MHz, Channel Separation=12.5 kHz

Audio Frequency (kHz)	Response Attenuation (dB)	Limit (dB)
1.0	0.0	/
3.0	-33.8	0.0
4.0	-44.5	-12.5
5.0	-63.2	-22.2
6.0	-65.6	-30.1
7.0	-74.3	-36.8
8.0	-76.1	-42.6
9.0	-77.8	-47.7
10.0	-78.3	-52.3
12.0	-77.2	-60.2
14.0	-82.4	-66.9
16.0	-87.8	-72.7
18.0	-88.9	-77.8
20.0	-90.5	-82.5



FCC §2.1049 & §22.359 & §90.210 – OCCUPIED BANDWIDTH & EMISSION MASK

Applicable Standard

FCC §2.1049, §22.359 and §90.210

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 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.

Test Equipment List and Details

Manufacturer	Description	Model No.	Serial No.	Calibration Date	Calibration Due Date
Rohde & Schwarz	Signal Analyzer	FSIQ26	8386001028	2016-04-14	2017-04-14
HP	RF Communication Test Set	8920A	3325U00859	2016-05-07	2017-05-07
Ducommun technologies	RF Cable	RG-214	3	2016-05-06	2017-05-06
JFW	30dB Attenuator	50FH-030-100 RF	170006716507	2015-07-18	2016-07-18
JFW	30dB Attenuator	50FH-030-100 RF	170006716507	2016-07-18	2017-07-18

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

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 and the spectrum was recorded in the frequency band ±50 kHz from the carrier frequency.

Test Data

Environmental Conditions

Temperature:	23~25 ℃
Relative Humidity:	50~55 %
ATM Pressure:	100.0~101.0 kPa

The testing was performed by Sonia Zhou from 2016-07-16 to 2016-07-27.

Modulation	Channel Separation (kHz)	Frequency (MHz)	Power Level	99% Occupied Bandwidth (kHz)	26 dB Emissions Bandwidth (kHz)	Note
Analog	12.5	450.0125	High	10.02	10.32	For Part 90
	12.5		Low	10.02	10.32	
	12.5	453.2125	High	10.02	10.32	For Part 90.203（j）
	12.5		Low	10.02	10.32	
	12.5	454.0125	High	10.02	10.32	For Part 22
	12.5		Low	10.02	10.32	
Digital	12.5	450.0125	High	7.92	10.02	For Part 90
	12.5		Low	7.72	9.02	
	12.5	454.0125	High	7.72	9.62	For Part 22
	12.5		Low	7.82	9.72	

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

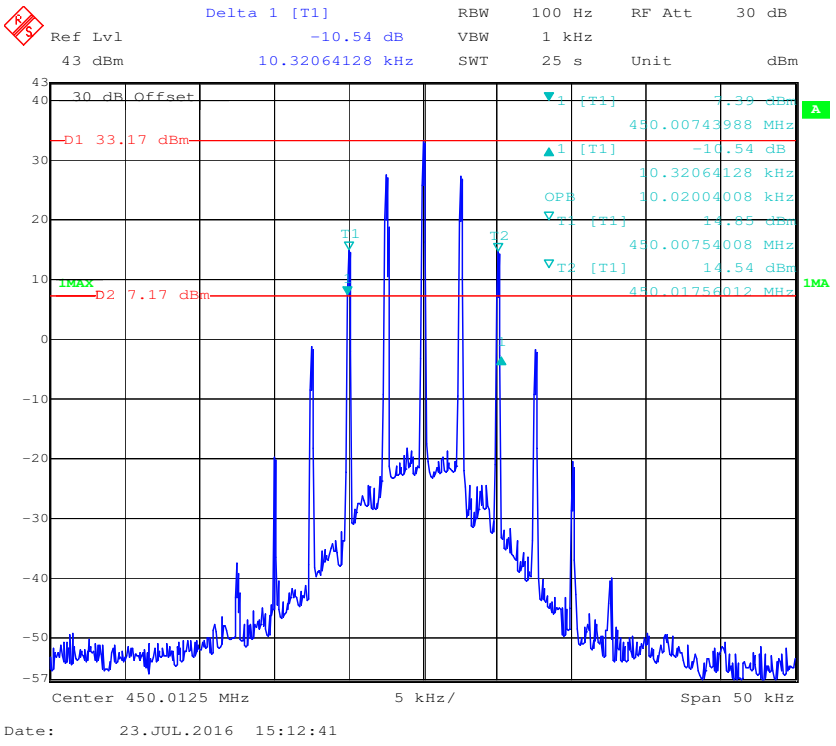
Emission Designator Per CFR 47 §2.201& §2.202&, Bn = 2M + 2D

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.

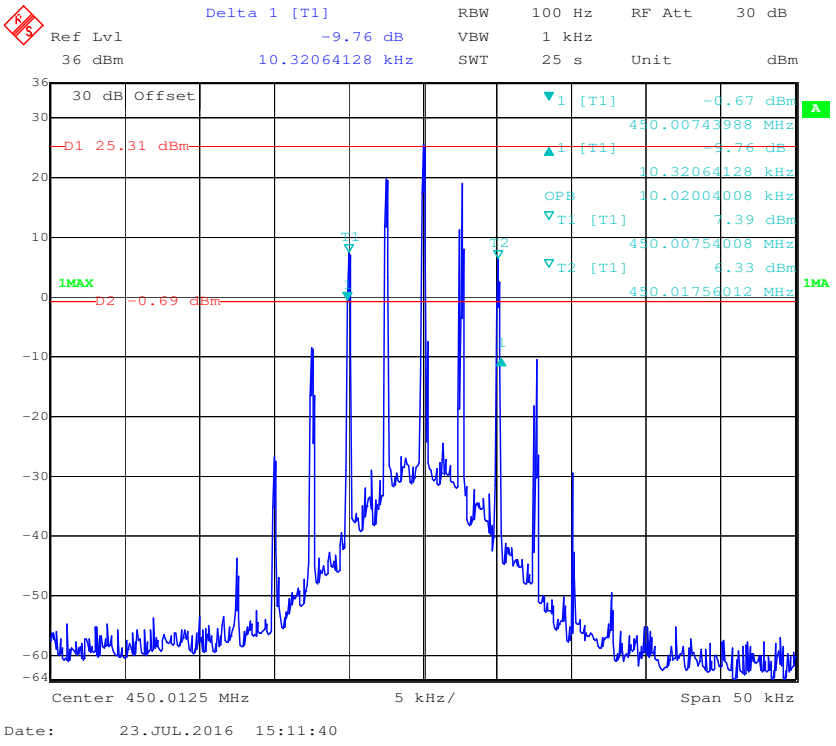
For Digital Mode (Channel Spacing: 12.5 kHz)
Emission Designator 7K60F1D and 7K60F1E
The 99% energy rule (title 47CFR 2.1049) was used for digital mode. It basically states that 99% of the modulation energy falls within X kHz, in this case, 7.10 kHz. The emission mask was obtained from 47CFR 90.210(d).
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.

Analog Modulation:

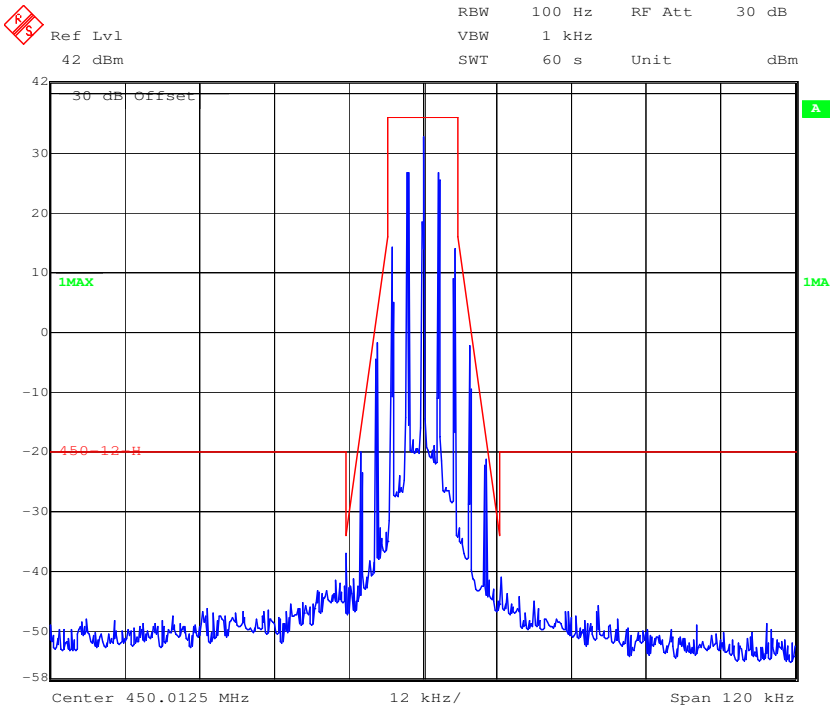
Frequency 450.0125 MHz: 99% Occupied & 26 dB Bandwidth, High Power



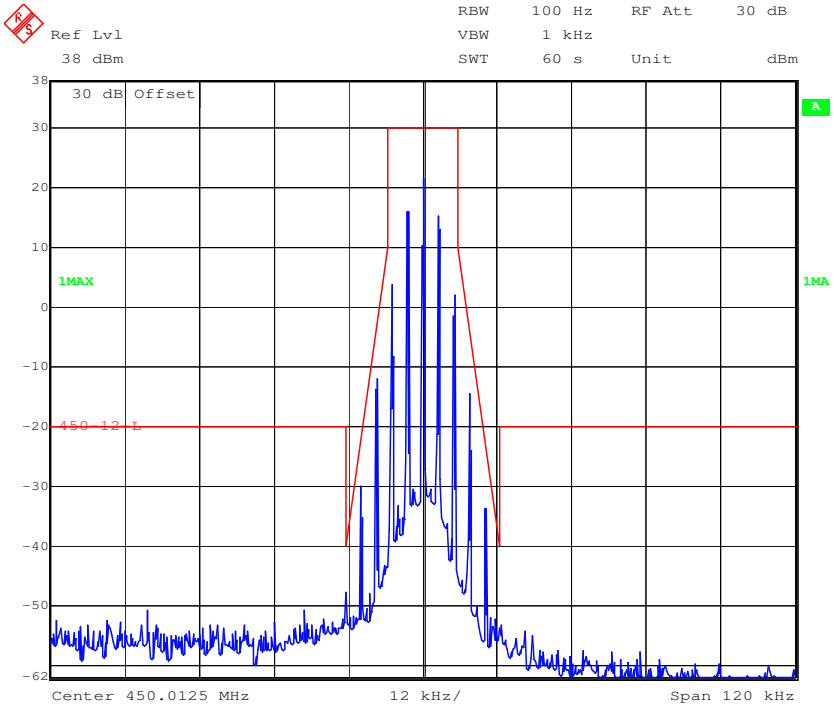
Frequency 450.0125 MHz: 99% Occupied & 26 dB Bandwidth, Low Power



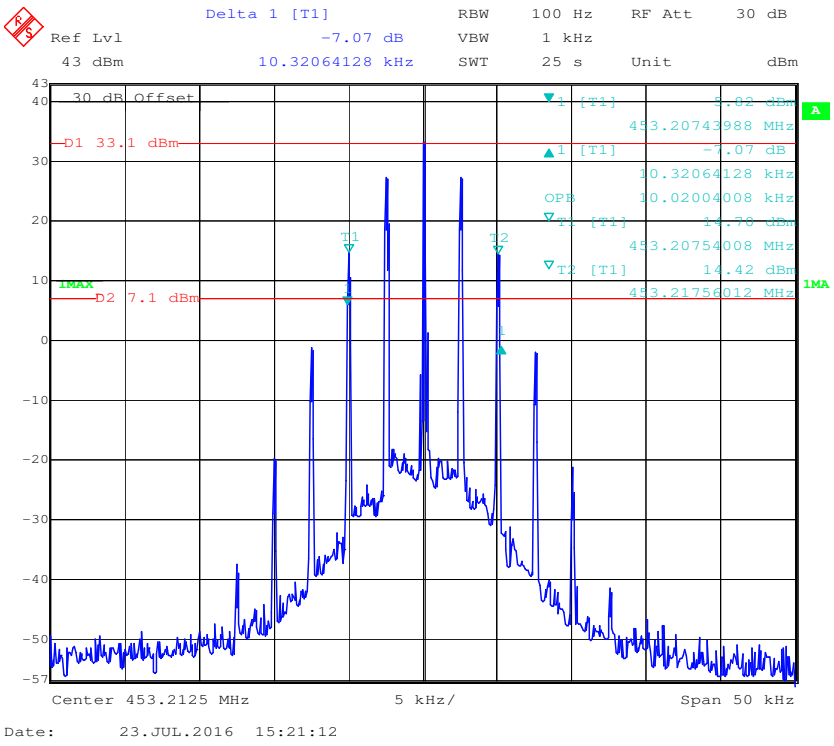
Frequency 450.0125 MHz: Emission Mask, High Power



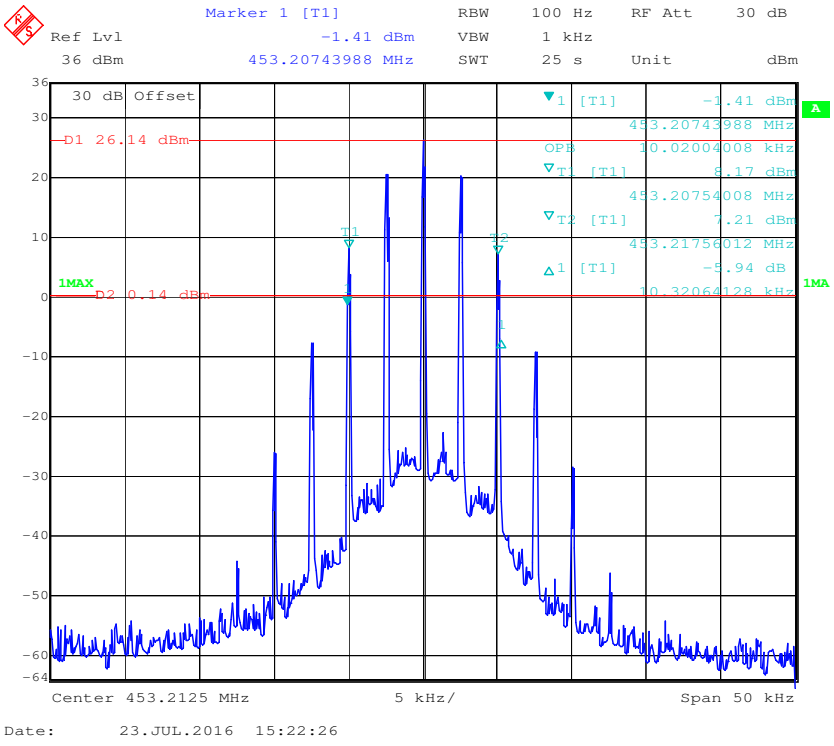
Frequency 450.0125 MHz: Emission Mask, Low Power



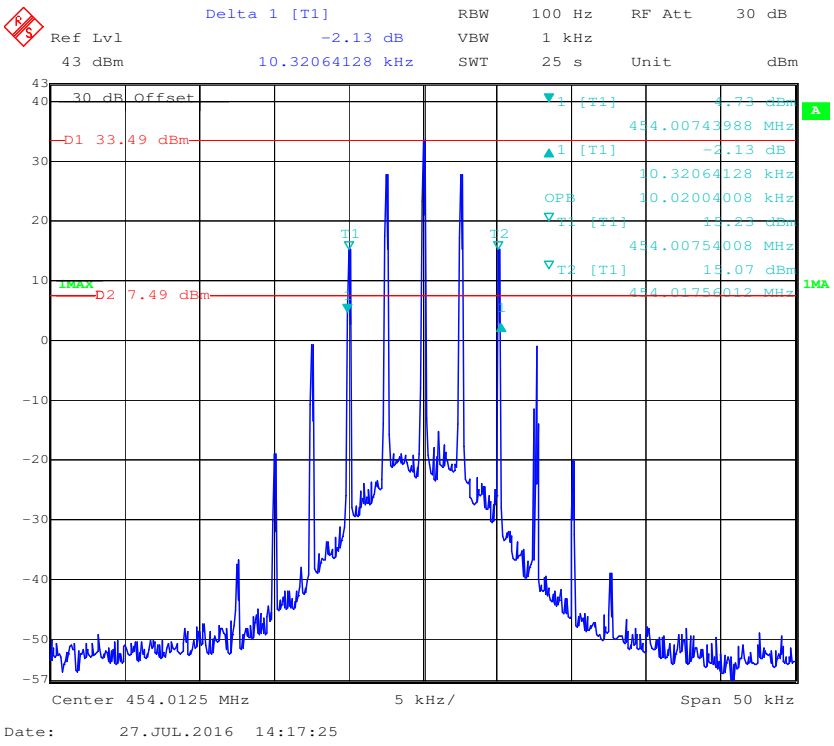
Frequency 453.2125 MHz: 99% Occupied & 26 dB Bandwidth, High Power



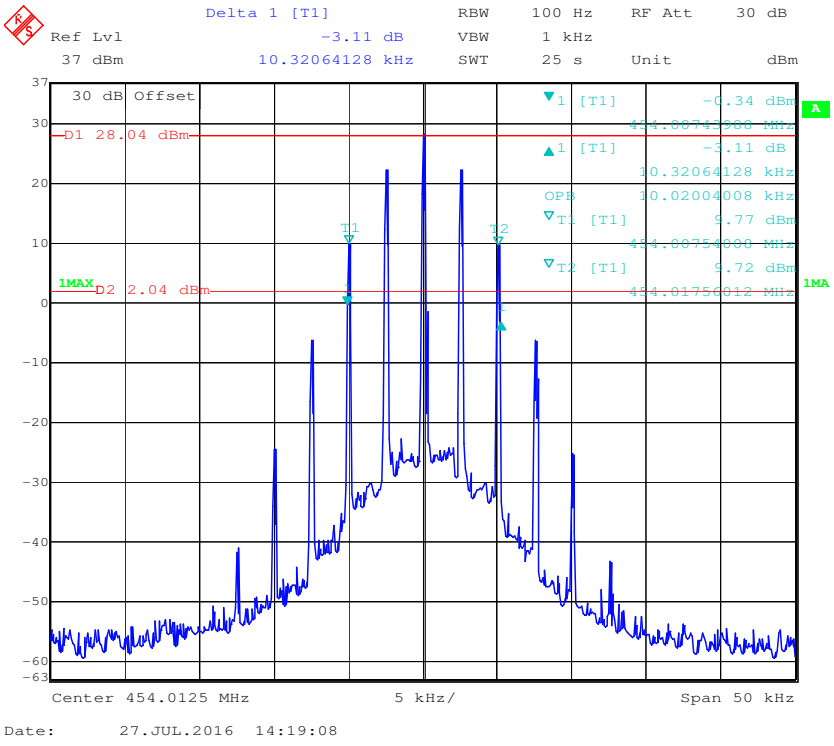
Frequency 453.2125 MHz: 99% Occupied & 26 dB Bandwidth, Low Power



Frequency 454.0125 MHz: 99% Occupied & 26 dB Bandwidth, High Power

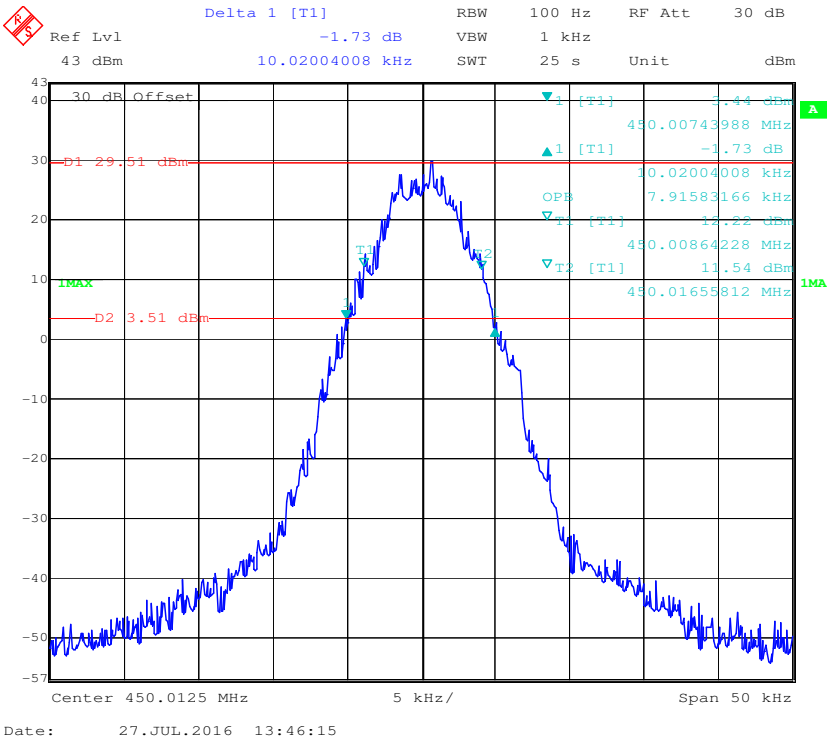


Frequency 454.0125 MHz: 99% Occupied & 26 dB Bandwidth, Low Power

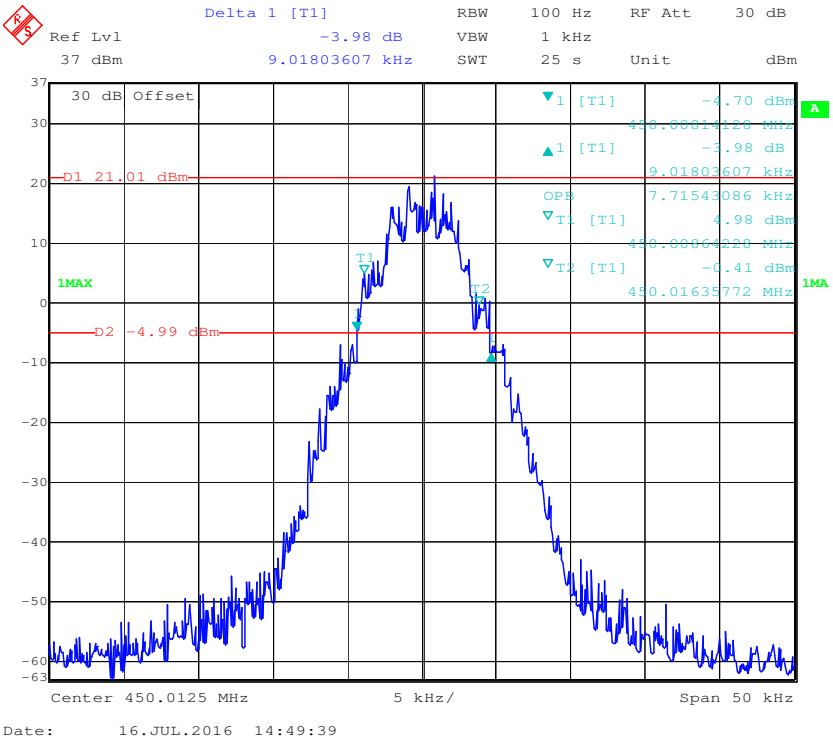


Digital Modulation:

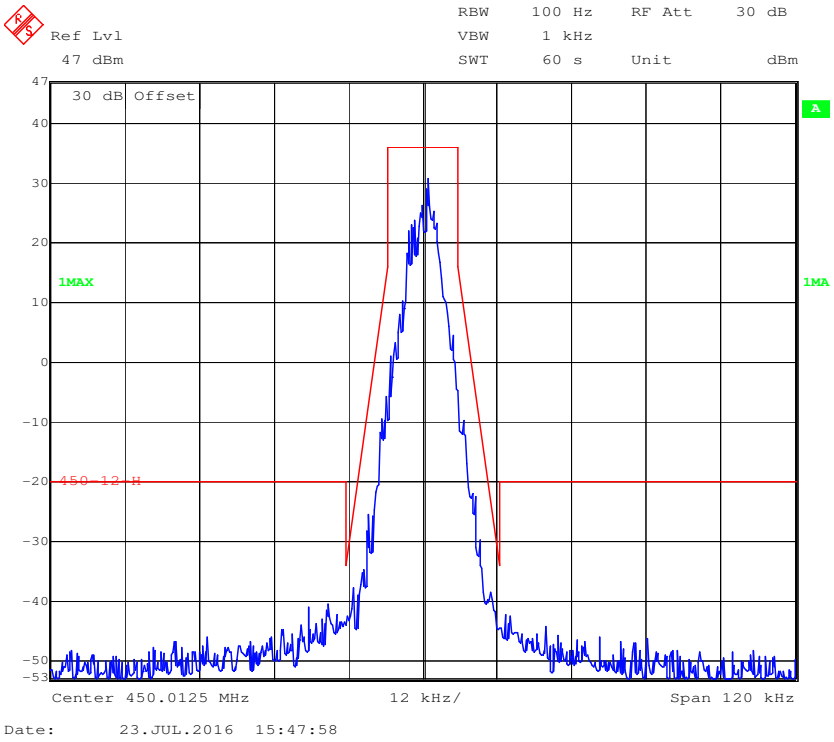
Frequency 450.0125 MHz: 99% Occupied & 26 dB Bandwidth, High Power



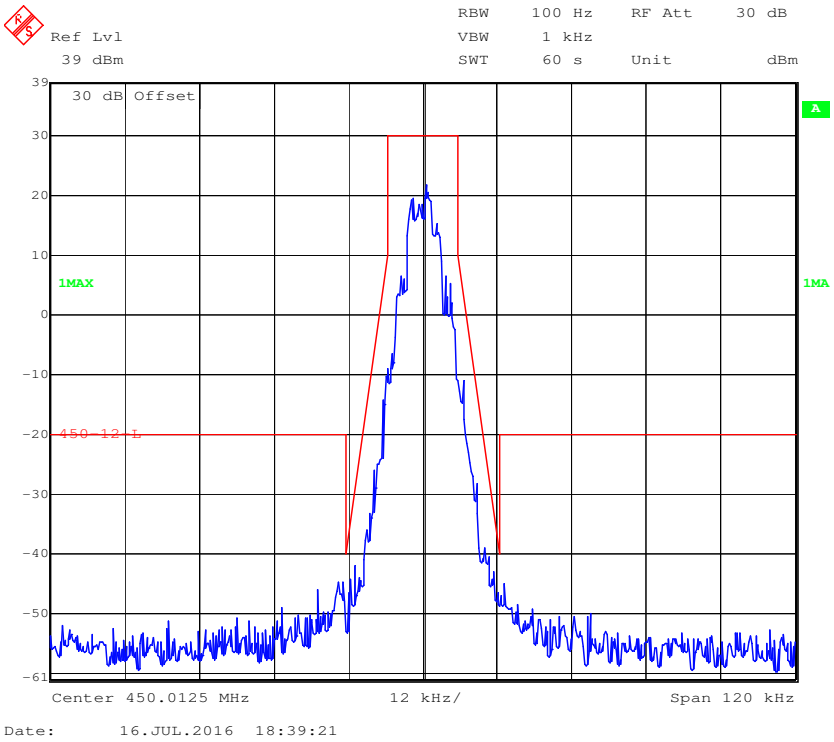
Frequency 450.0125 MHz: 99% Occupied & 26 dB Bandwidth, Low Power



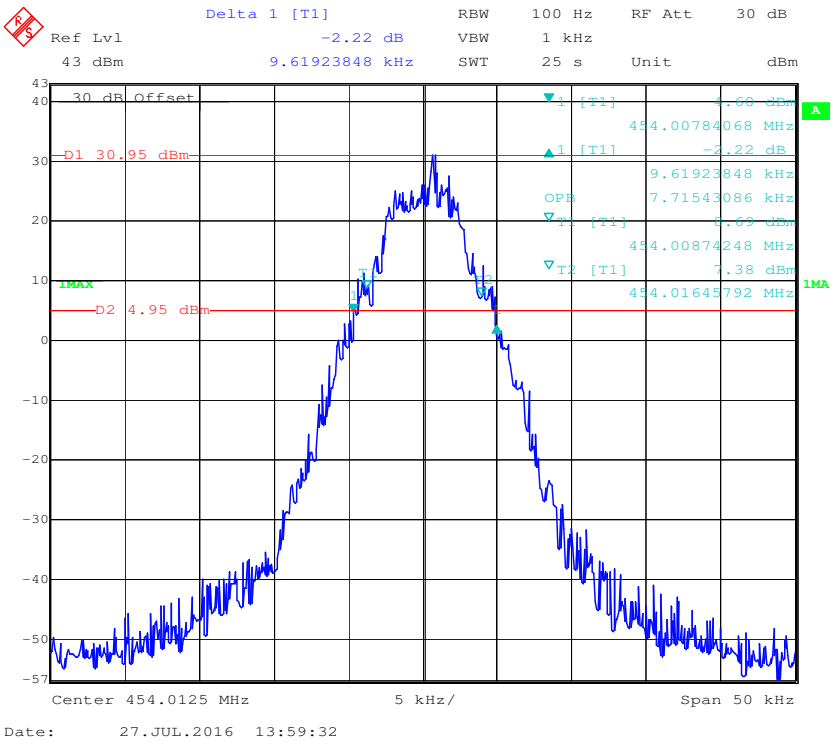
Frequency 450.0125 MHz: Emission Mask, High Power



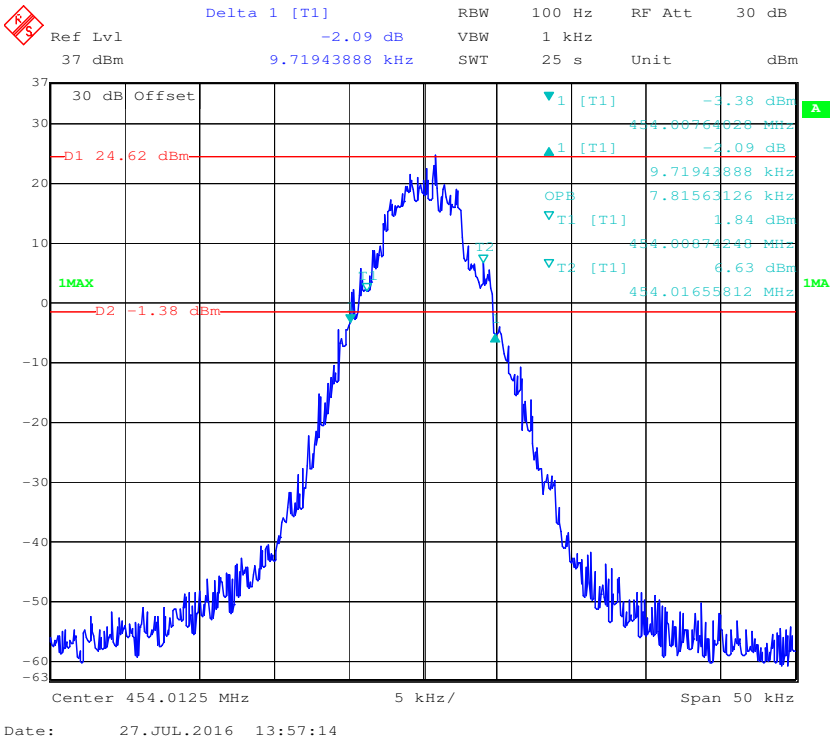
Frequency 450.0125 MHz: Emission Mask, Low Power



Frequency 454.0125 MHz: 99% Occupied & 26 dB Bandwidth, High Power



Frequency 454.0125 MHz: 99% Occupied & 26 dB Bandwidth, Low Power



FCC §2.1051 & §22.359 & §90.210 - 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 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.

Test Equipment List and Details

Manufacturer	Description	Model No.	Serial No.	Calibration Date	Calibration Due Date
Rohde & Schwarz	Signal Analyzer	FSIQ26	8386001028	2016-04-14	2017-04-14
Ducommun technologies	RF Cable	RG-214	3	2016-05-06	2017-05-06
JFW	30dB Attenuator	50FH-030-100 RF	170006716507	2016-07-18	2017-07-18

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

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 10th harmonic.

Test Data

Environmental Conditions

Temperature:	25 ℃
Relative Humidity:	55 %
ATM Pressure:	101.0 kPa

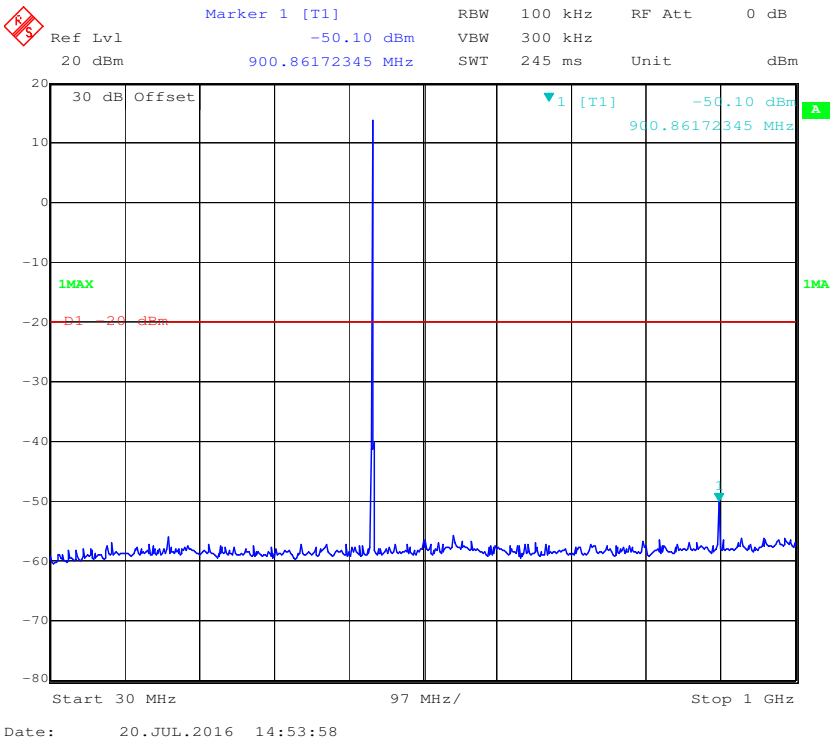
The testing was performed by Sonia Zhou on 2016-07-20.

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

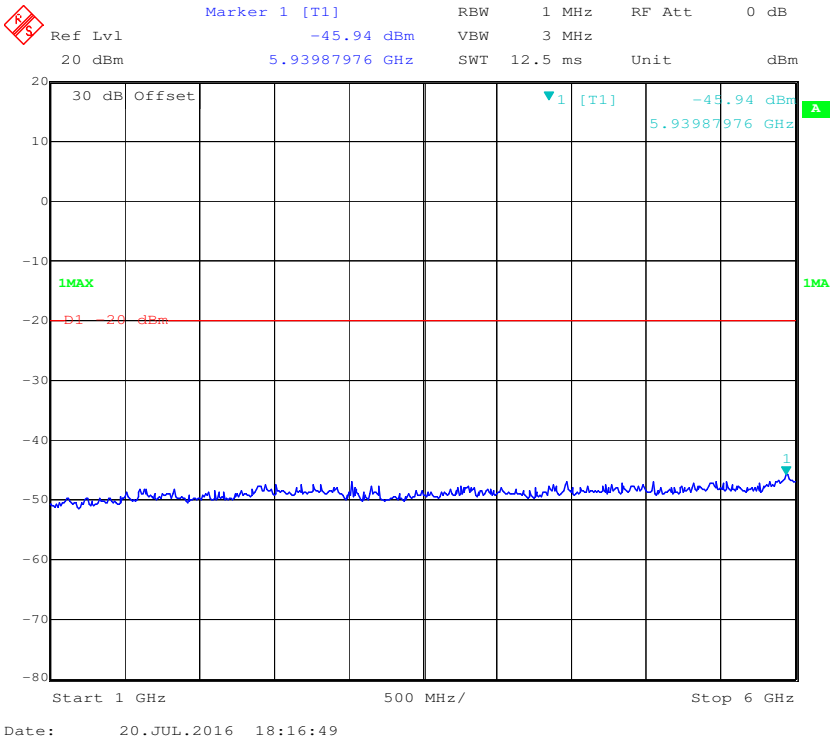
Analog Modulation:

30MHz – 1 GHz, Spacing Channel 12.5 kHz, 450.0125 MHz

Fund.test with notch filter



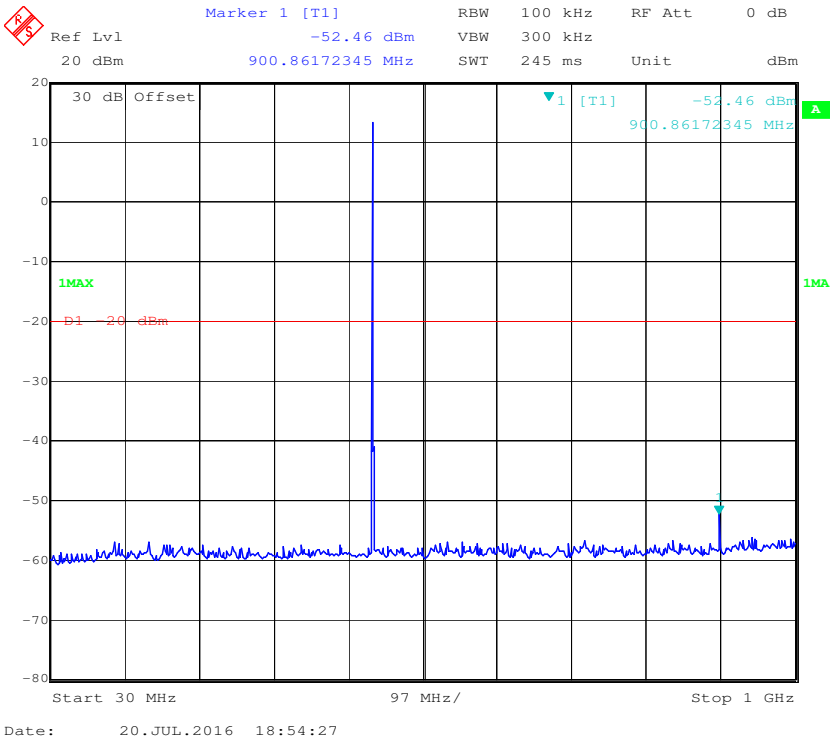
1 GHz – 2 GHz, Spacing Channel 12.5 kHz, 450.0125 MHz



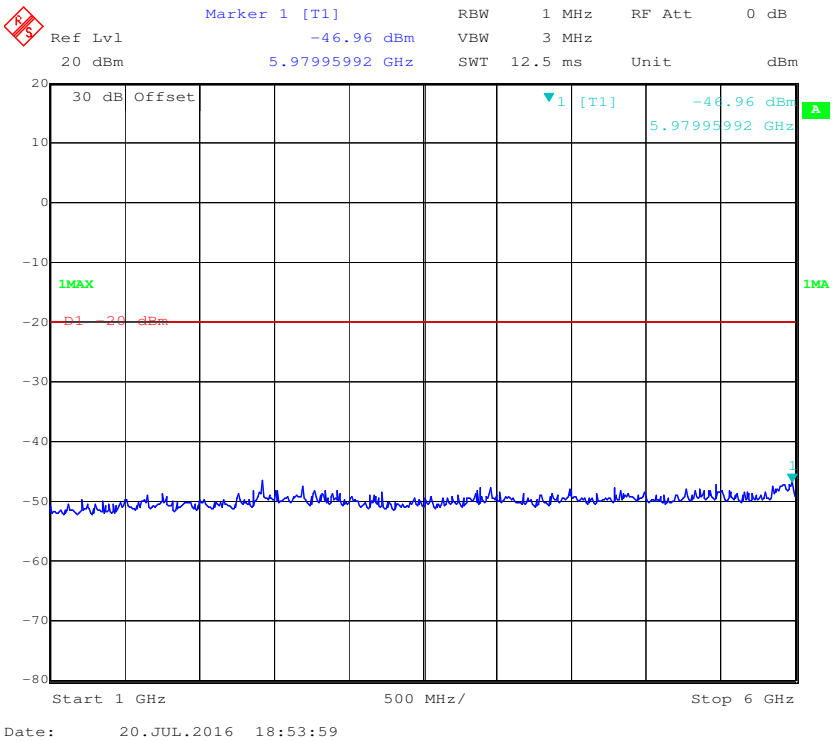
Digital Modulation:

30MHz - 1 GHz, 450.0125MHz

Fund.test with notch filter



1 GHz – 2 GHz, 450.0125MHz



FCC §2.1053 & §22.359 & §90.210 - RADIATED SPURIOUS EMISSIONS

Applicable Standard

FCC §2.1053, §22.359 and §90.210

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	EMI Test Receiver	ESCI	101120	2015-12-15	2016-12-14
HP	Amplifier	HP8447E	1937A01046	2016-05-06	2017-05-06
Sunol Sciences	Bi-log Antenna	JB1	A040904-2	2014-12-07	2017-12-06
Rohde & Schwarz	Signal Analyzer	FSIQ26	8386001028	2016-04-14	2017-04-14
Sunol Sciences	Horn Antenna	DRH-118	A052604	2014-12-29	2017-12-28
HP	Synthesized Sweeper	HP 8341B	2624A00116	2016-07-02	2017-07-01
Mini	Amplifier	ZVA-183-S+	5969001149	2016-04-23	2017-04-23
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	2015-10-22	2016-10-22
Ducommun technologies	RF Cable	104PEA	218124002	2015-10-22	2016-10-22
Ducommun technologies	RF Cable	RG-214	1	2016-05-06	2017-05-06
COM POWER	Dipole Antenna	AD-100	041000	2015-08-18	2016-08-18

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

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 1g (TXpwr in Watts/0.001)-the absolute level

Spurious attenuation limit in dB =50+10 Log_{10} (power out in Watts) for EUT with a 12.5 kHz channel bandwidth.

Test Data

Environmental Conditions

Temperature:	25 ℃
Relative Humidity:	55 %
ATM Pressure:	101.0 kPa

The testing was performed by Sonia Zhou on 2016-07-20.

Test Mode: Transmitting

30MHz - 6GHz:

Frequency (MHz)	Receiver Reading (dBμV)	Turn Table Angle Degree	Rx Antenna		Substituted			Absolute Level (dBm)	Limit (dBm)	Margin (dB)
			Height (m)	Polar (H/V)	SG Level (dBm)	Cable Loss (dB)	Antenna Gain (dB)			
Analog Modulation 450.0125MHz										
900.03	34.43	250	1.8	H	-62.6	0.70	0	-63.30	-20	43.30
900.03	34.17	150	2.5	V	-62.8	0.70	0	-63.50	-20	43.50
1350.04	35.21	7	2.0	H	-61.4	1.20	6.40	-56.20	-20	36.20
1350.04	35.75	306	2.0	V	-60.9	1.20	6.40	-55.70	-20	35.70
1800.05	33.79	273	2.4	H	-61.2	1.40	7.10	-55.50	-20	35.50
1800.05	34.28	148	2.0	V	-59.5	1.40	7.10	-53.80	-20	33.80
Digital Modulation 450.0125MHz										
900.03	34.32	272	1.6	H	-62.7	0.70	0	-63.40	-20	43.40
900.03	33.48	318	1.4	V	-63.5	0.70	0	-64.20	-20	44.20
1350.0375	35.38	229	1.4	H	-61.3	1.20	6.40	-56.10	-20	36.10
1350.0375	35.94	134	1.7	V	-60.7	1.20	6.40	-55.50	-20	35.50
1800.0500	34.84	145	2.1	H	-60.1	1.40	7.10	-54.40	-20	34.40
1800.0500	35.13	183	2.3	V	-58.7	1.40	7.10	-53.00	-20	33.00

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 and §90.213

Test Equipment List and Details

Manufacturer	Description	Model No.	Serial No.	Calibration Date	Calibration Due Date
Hewlett-Packard	Frequency Counter	5343A	2232A00827	2016-05-09	2019-05-08
ESPEC	Temperature & Humidity Chamber	EL-10KA	09107726	2015-11-01	2016-10-31
Ducommun technologies	RF Cable	RG-214	3	2016-05-06	2017-05-06
JFW	30dB Attenuator	50FH-030-100 RF	170006716507	2016-07-18	2017-07-18
Long Wei	DC Power Supply	TPR-6420D	398363	NCR	NCR

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

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 ℃
Relative Humidity:	55 %
ATM Pressure:	101.0 kPa

The testing was performed by Sonia Zhou on 2016-07-20.

Test Mode: Transmitting

For Analog Modulation

Reference Frequency: 450.0125MHz, Limit: 2.5 ppm			
Test Environment		**Frequency Measure with Time Elapsed**	
Temperature (℃)	**Power Supplied (V_{DC})**	**Measured Frequency error (MHz)**	**Frequency Error (ppm)**
Frequency Stability versus Input Temperature			
50	7.2	450.012487	-0.03
40	7.2	450.012465	-0.08
30	7.2	450.012449	-0.11
20	7.2	450.012488	-0.03
10	7.2	450.012458	-0.09
0	7.2	450.012459	-0.09
-10	7.2	450.012428	-0.16
-20	7.2	450.012459	-0.09
-30	7.2	450.012413	-0.19
Frequency Stability versus Input Voltage			
20	6.8	450.012482	-0.04

For Digital Modulation

Reference Frequency: 450.0125 MHz, Limit: ±2.5 ppm, 12.5 kHz			
Test Environment		**Frequency Measure with Time Elapsed**	
Temperature (℃)	**Power Supplied (V_{DC})**	**Measured Frequency (MHz)**	**Frequency Error (ppm)**
Frequency Stability versus Input Temperature			
50	7.2	450.012450	-0.11
40	7.2	450.012427	-0.16
30	7.2	450.012422	-0.17
20	7.2	450.012495	-0.01
10	7.2	450.012488	-0.03
0	7.2	450.012476	-0.05
-10	7.2	450.012413	-0.19
-20	7.2	450.012482	-0.04
-30	7.2	450.012456	-0.10
Frequency Stability versus Input Voltage			
20	6.8	450.012403	-0.21

FCC §90.214 - TRANSIENT FREQUENCY BEHAVIOR

Applicable Standard

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

Test Equipment List and Details

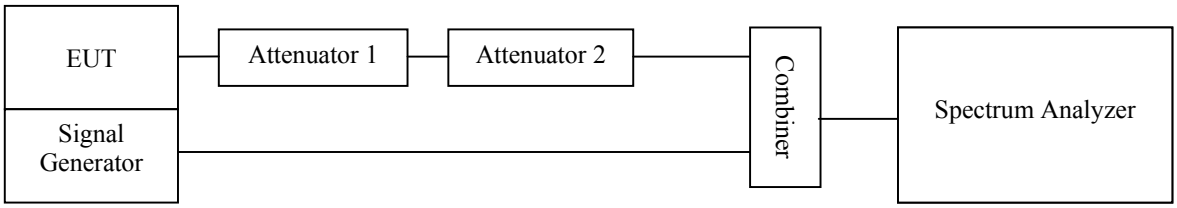
Manufacturer	Description	Model No.	Serial No.	Calibration Date	Calibration Due Date
Rohde & Schwarz	Signal Analyzer	FSIQ26	8386001028	2016-04-14	2017-04-14
HP	RF Communication Test Set	8920A	3325U00859	2016-05-07	2017-05-07
Ducommun technologies	RF Cable	RG-214	3	2016-05-06	2017-05-06
JFW	30dB Attenuator	50FH-030-100 RF	170006716507	2016-07-18	2017-07-18

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

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

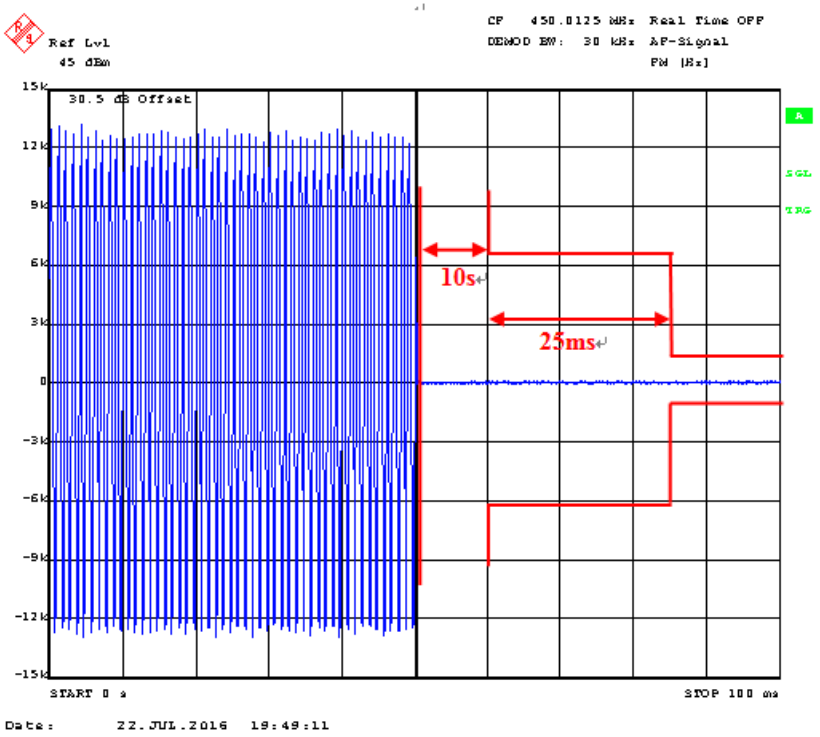
Temperature:	26-27 ℃
Relative Humidity:	55-56 %
ATM Pressure:	100.5-101.0 kPa

The testing was performed by Sonia Zhou on 2016-07-22 and 2016-07-25.

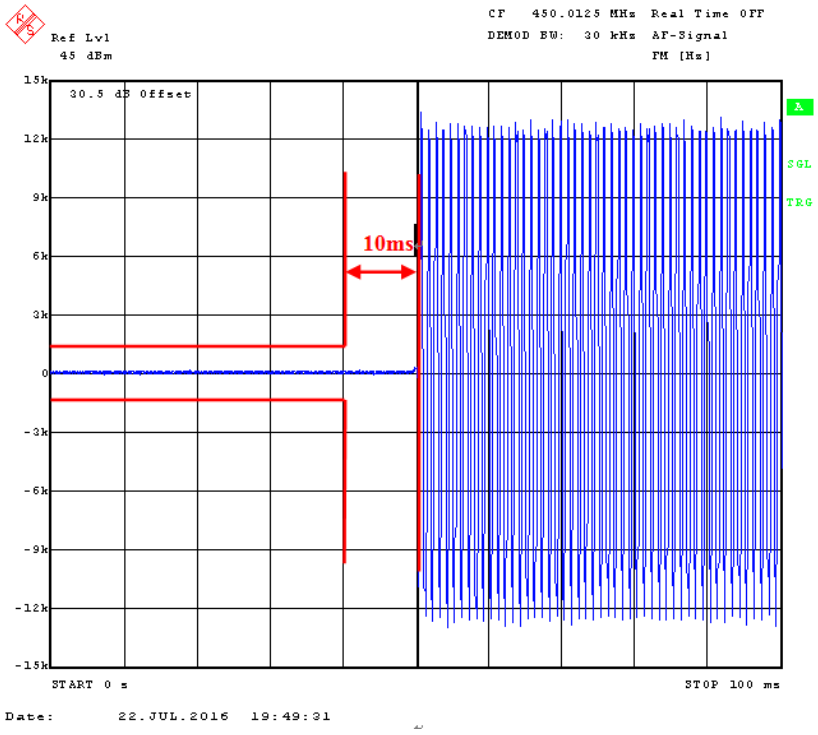
Channel Separation (kHz)	Transient Period (ms)	Transient Frequency	Result
12.5	10 (t1)	<+/-12.5 kHz	Pass
	25(t2)	<+/-6.25 kHz	
	10 (t3)	<+/-12.5 kHz	

Please refer to the following plots.

Turn on



Turn off



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