FCC PART 90

TEST REPORT

For

Fujian Beifeng Telecom Technology Co., Ltd.

A15 Huaqiao Economic Development Zone, Shuangyang, Luojiang, Quanzhou, Fujian, China

FCC ID: 2AARFBFTD82101

Report Type:	**Product Type:**
Original Report	DIGITAL TRANSCEIVER

Test Engineer:	Simon Wang
Report Number:	RSZ160329005-00
Report Date:	2016-04-26
Reviewed By:	Bell Hu 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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GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

The *Fujian Beifeng Telecom Technology Co., Ltd.*'s product, model number: *BF-TD821 (FCC ID: 2AARFBFTD82101)* or the "EUT" in this report was a *DIGITAL TRANSCEIVER*, which was measured approximately: 110 mm (L) x 59 mm (W) x 33 mm (H), rated with input voltage: DC 7.4 V rechargeable battery or DC 9 V charge from adapter.

Adapter Information:
Model: RSF-DY009-0901000
Input: AC 100-240V, 50/60 Hz, 0.35A
Output: 9V, 1.0A

** All measurement and test data in this report was gathered from production sample serial number: 1601791 (Assigned by BACL, Shenzhen). The EUT supplied by the applicant was received on 2016-03-29.*

Objective

This test report is prepared on behalf of *Fujian Beifeng Telecom Technology Co., Ltd.* in accordance with Part 2 and Part 90 of the Federal Communication Commissions rules.

Related Submittal(s)/Grant(s)

No related submittal(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 90 – Private Land Mobile Radio Service

Applicable Standards: TIA-603-D and ANSI 63.4-2014.

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.

Equipment Modifications

No modification was made to the EUT tested.

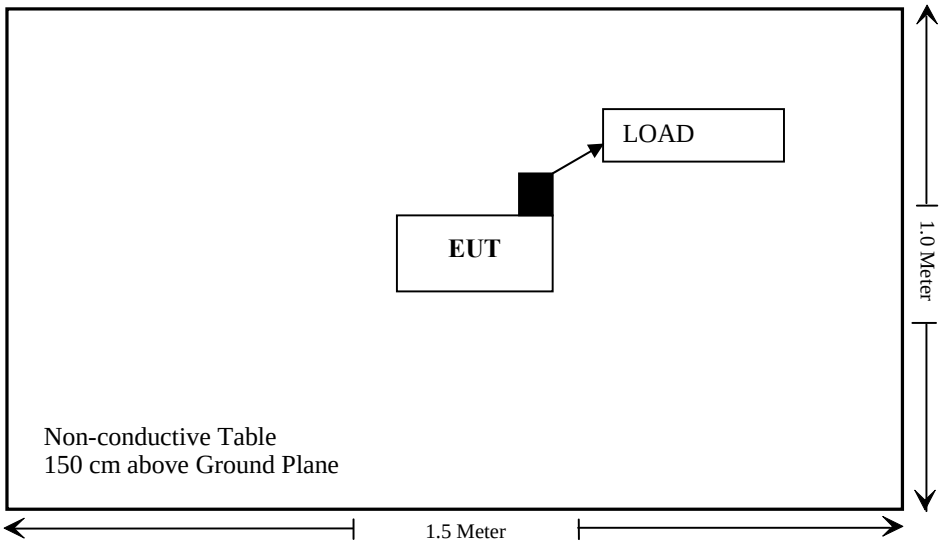
Support Equipment List and Details

Manufacturer	Description	Model	Serial Number
N/A	50 ohm Load	N/A	N/A

External I/O Cable

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

Block Diagram of Test Setup



SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Results
§1.1307(b);§2.1093	RF Exposure	Compliance
§90.205	RF Output Power	Compliance
§2.1047;§90.207	Modulation Characteristic	Not applicable
§2.1049;§90.209; §90.210	Occupied Bandwidth & Emission Mask	Compliance
§2.1051;§90.210	Spurious Emission at Antenna Terminal	Compliance
§2.1053;§90.210	Spurious Radiated Emissions	Compliance
§2.1055;§90.213	Frequency Stability	Compliance

Not applicable: this device uses digital modulation.

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: RSZ160329005-20A.

FCC §90.205 - RF OUTPUT POWER

Applicable Standard

FCC §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	2015-12-11	2016-12-11
Ducommun technologies	RF Cable	RG-214	3	2015-06-15	2016-06-15
JFW	30dB Attenuator	50FH-030-100 RF	170006716507	2015-06-12	2016-06-12

*** 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:	26 ℃
Relative Humidity:	49 %
ATM Pressure:	101.0 kPa

The testing was performed by Simon Wang on 2016-04-26.

Test Mode: Transmitting

Test Result: Compliance. Please refer to following table.

Modulation	Channel Separation (kHz)	Frequency (MHz)	Power Level	Output Power (dBm)	Output Power (W)	Power limit (W)	Remark
Digital	12.5	400.0125	High	36.85	4.84	5.4	For federal
			Low	35.28	3.37	3.6	
		425.0125	High	37.14	5.18	5.4	For part 90
			Low	35.40	3.47	3.6	
		450.0125	High	37.07	5.09	5.4	
			Low	35.46	3.52	3.6	
		479.9875	High	37.12	5.15	5.4	
			Low	35.03	3.18	3.6	

Note：The rated high power is 4.5W.
The rated low power is 3.0W.

FCC §2.1047 & §90.207 - MODULATION CHARACTERISTIC

According to FCC § 2.1047(d), Part 90.207, there is no specific requirement for digital modulation, therefore modulation characteristic is not presented.

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

Applicable Standard

FCC §2.1049, §90.209 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 50 + 10 log (P) dB or 70 dB, whichever is the lesser attenuation.

(4) The reference level for showing compliance with the emission mask shall be established using a resolution bandwidth sufficiently wide (usually two or three times the channel bandwidth) to capture the true peak emission of the equipment under test. In order to show compliance with the emission mask up to and including 50 kHz removed from the edge of the authorized bandwidth, adjust the resolution bandwidth to 100 Hz with the measuring instrument in a peak hold mode. A sufficient number of sweeps must be measured to insure that the emission profile is developed. If video filtering is used, its bandwidth must not be less than the instrument resolution bandwidth. For emissions beyond 50 kHz from the edge of the authorized bandwidth, see paragraph (o) of this section. If it can be shown that use of the above instrumentation settings do not accurately represent the true interference potential of the equipment under test, an alternate procedure may be used provided prior Commission approval is obtained.

Test Equipment List and Details

Manufacturer	Description	Model No.	Serial No.	Calibration Date	Calibration Due Date
Rohde & Schwarz	Signal Analyzer	FSIQ26	8386001028	2015-12-11	2016-12-11
Ducommun technologies	RF Cable	RG-214	3	2015-06-15	2016-06-15
JFW	30dB Attenuator	50FH-030-100 RF	170006716507	2015-06-12	2016-06-12

*** 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:	24 ℃
Relative Humidity:	52 %
ATM Pressure:	101.0 kPa

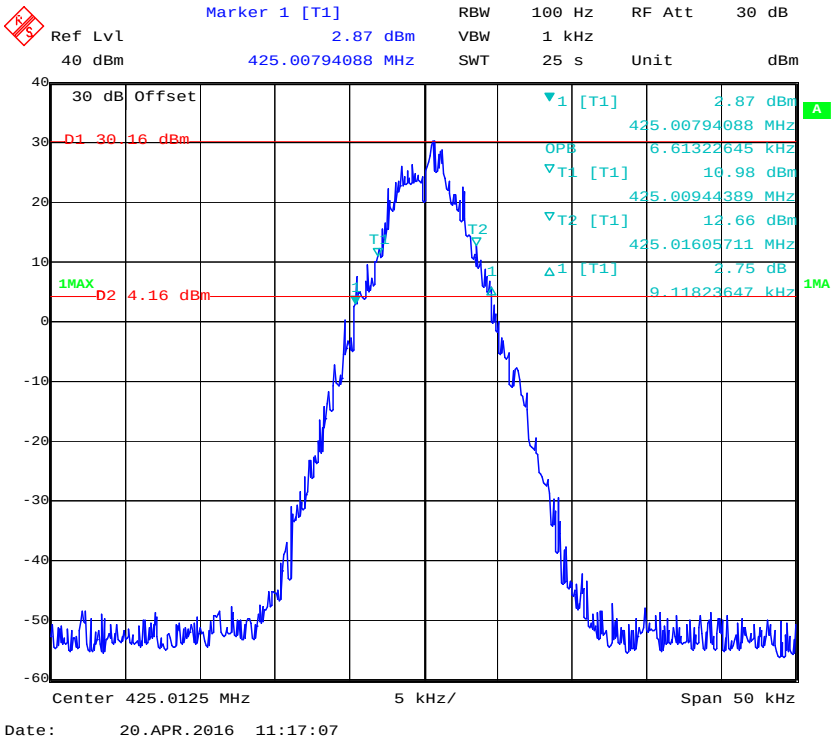
The testing was performed by Simon Wang on 2016-04-20

Test Mode: Transmitting

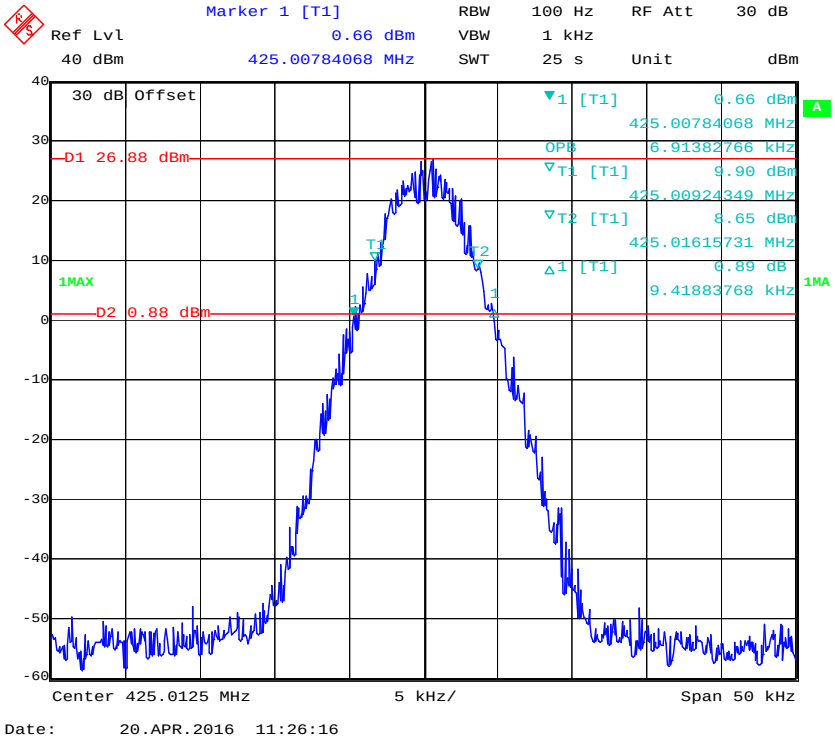
Modulation	Frequency (MHz)	Channel space (kHz)	Power Level	99% Occupied Bandwidth (kHz)	26 dB Emissions Bandwidth (kHz)
Digital	425.0125	12.5	High	6.61	9.12
			Low	6.91	9.42
	450.0125		High	7.31	9.52
			Low	7.21	9.52

Digital Modulation:

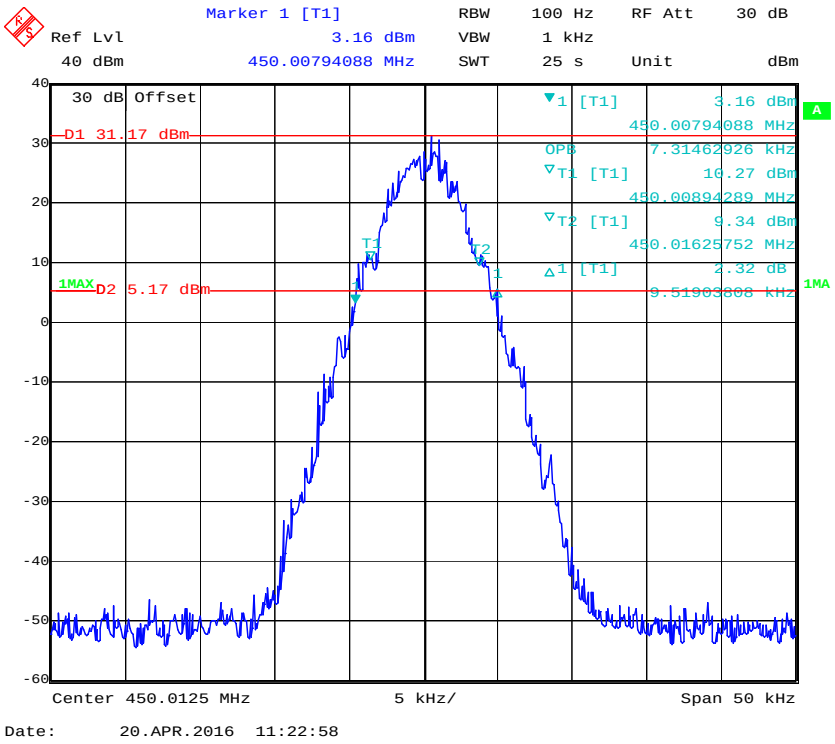
99% Occupied Bandwidth & 26 dB Emissions Bandwidth 12.5 kHz, 425.0125 MHz (High Power)



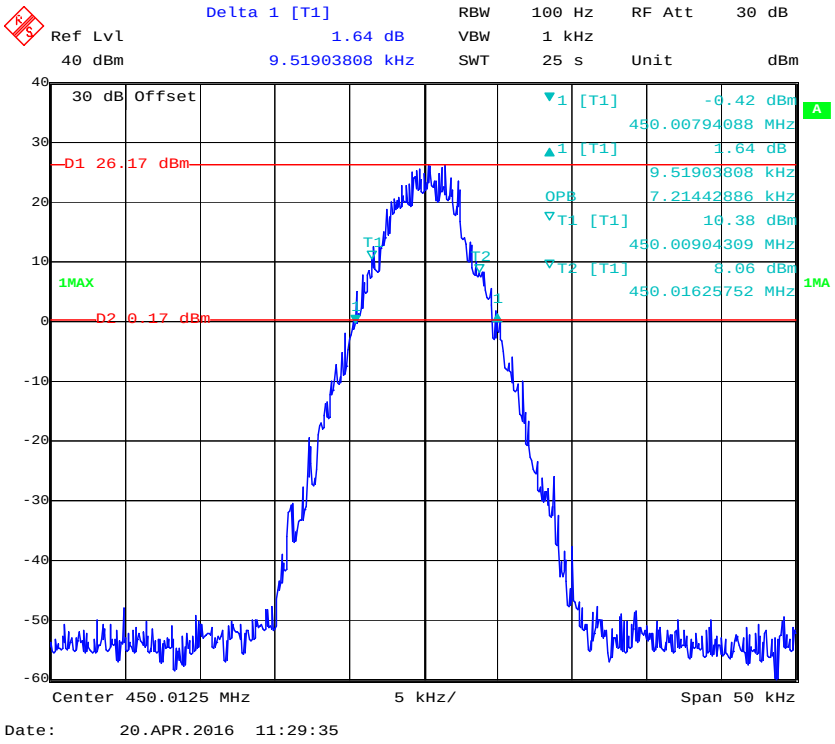
99% Occupied Bandwidth & 26 dB Emissions Bandwidth 12.5 kHz, 425.0125 MHz (Low Power)



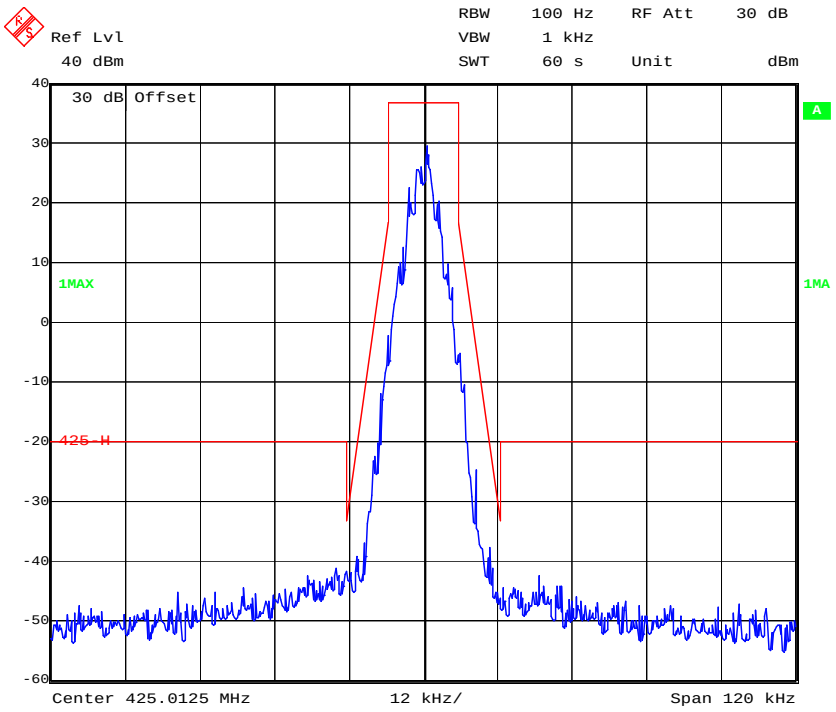
99% Occupied Bandwidth & 26 dB Emissions Bandwidth 12.5 kHz, 450.0125 MHz (High Power)



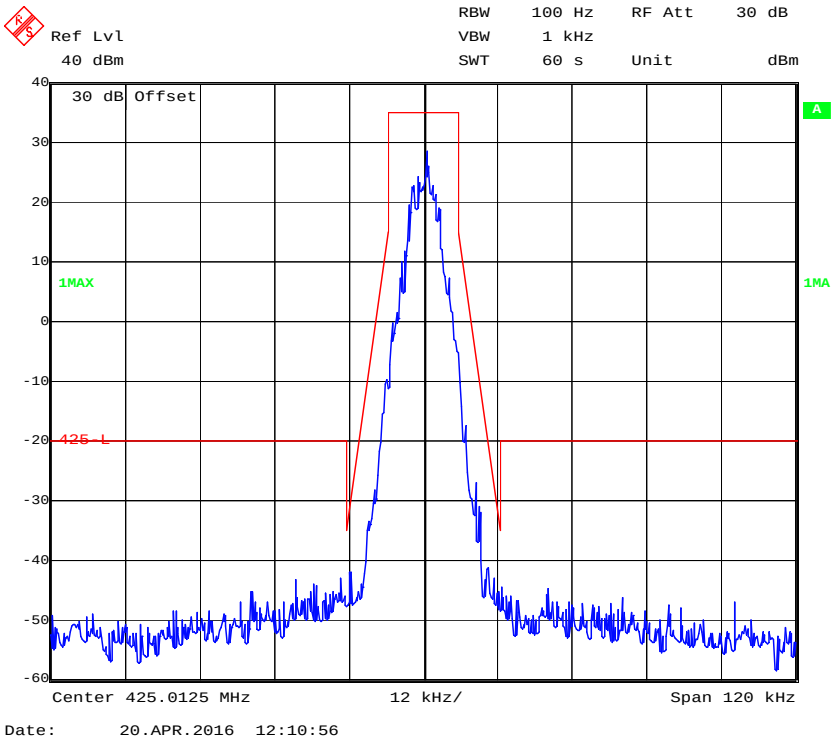
99% Occupied Bandwidth & 26 dB Emissions Bandwidth 12.5 kHz, 450.0125 MHz (Low Power)



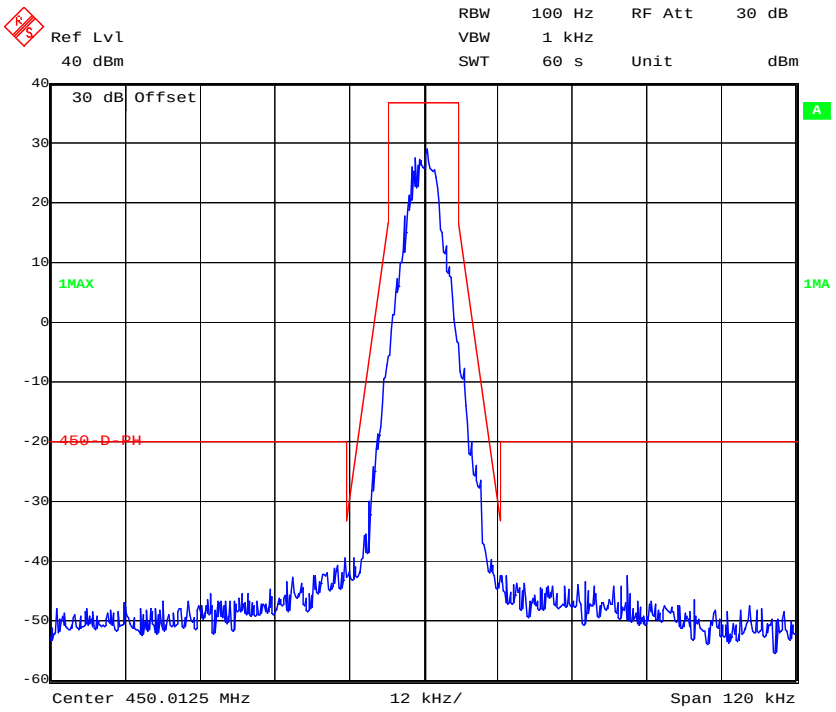
Emission Mask D with High Power 12.5 kHz, 425.0125 MHz



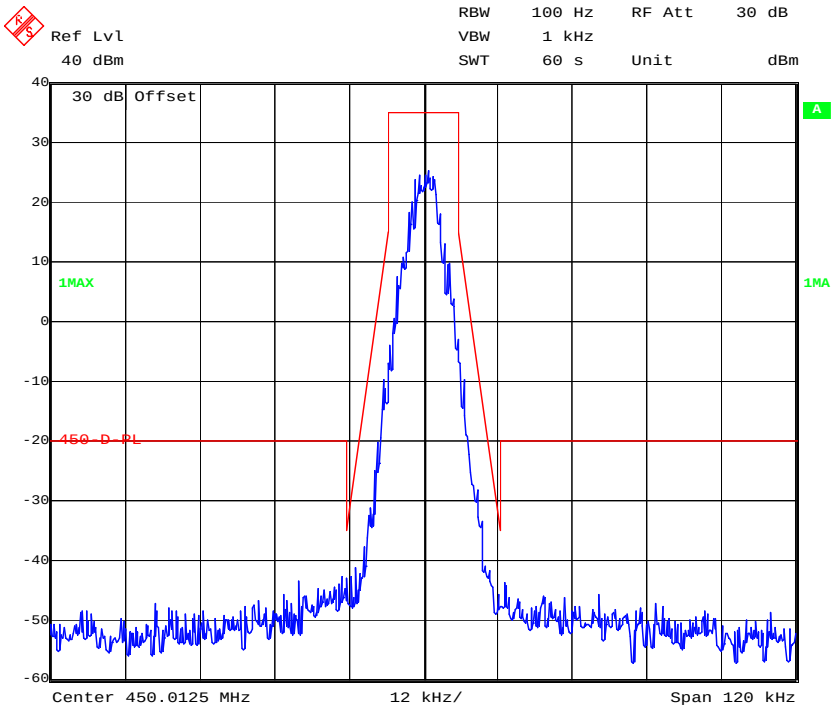
Emission Mask D with Low Power 12.5 kHz, 425.0125 MHz



Emission Mask D with High Power 12.5 kHz, 450.0125 MHz



Emission Mask D with Low Power 12.5 kHz, 450.0125 MHz



FCC §2.1051 & §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.

4) The reference level for showing compliance with the emission mask shall be established using a resolution bandwidth sufficiently wide (usually two or three times the channel bandwidth) to capture the true peak emission of the equipment under test. In order to show compliance with the emission mask up to and including 50 kHz removed from the edge of the authorized bandwidth, adjust the resolution bandwidth to 100 Hz with the measuring instrument in a peak hold mode. A sufficient number of sweeps must be measured to insure that the emission profile is developed. If video filtering is used, its bandwidth must not be less than the instrument resolution bandwidth. For emissions beyond 50 kHz from the edge of the authorized bandwidth, see paragraph (o) of this section. If it can be shown that use of the above instrumentation settings do not accurately represent the true interference potential of the equipment under test, an alternate procedure may be used provided prior Commission approval is obtained.

Test Equipment List and Details

Manufacturer	Description	Model No.	Serial No.	Calibration Date	Calibration Due Date
Rohde & Schwarz	Signal Analyzer	FSIQ26	8386001028	2015-12-11	2016-12-11
Ducommun technologies	RF Cable	RG-214	3	2015-06-15	2016-06-15
JFW	30dB Attenuator	50FH-030-100 RF	170006716507	2015-06-12	2016-06-12

*** 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 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:	24 ℃
Relative Humidity:	52 %
ATM Pressure:	101.0 kPa

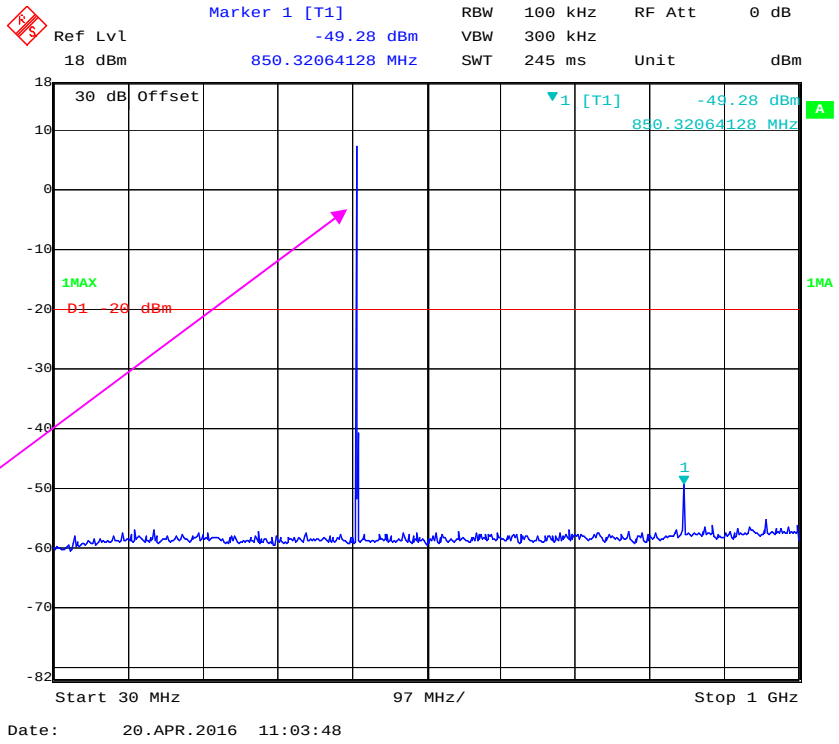
The testing was performed by Simon Wang on 2016-04-20.

Test Mode: Transmitting

Please refer to the following plots.

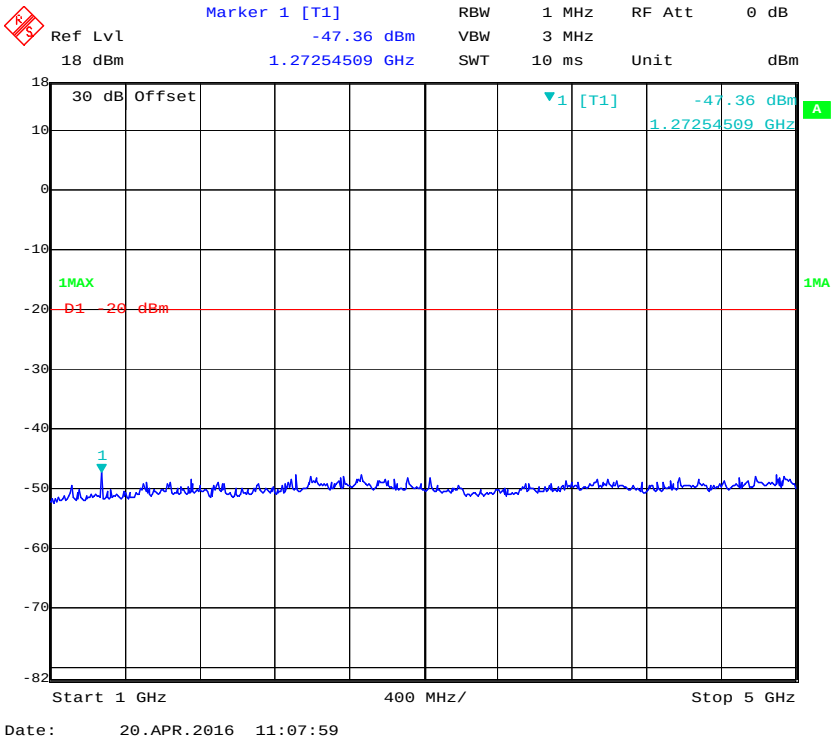
Digital Modulation:

30 MHz – 1 GHz, Spacing Channel 12.5 kHz, 425.0125 MHz

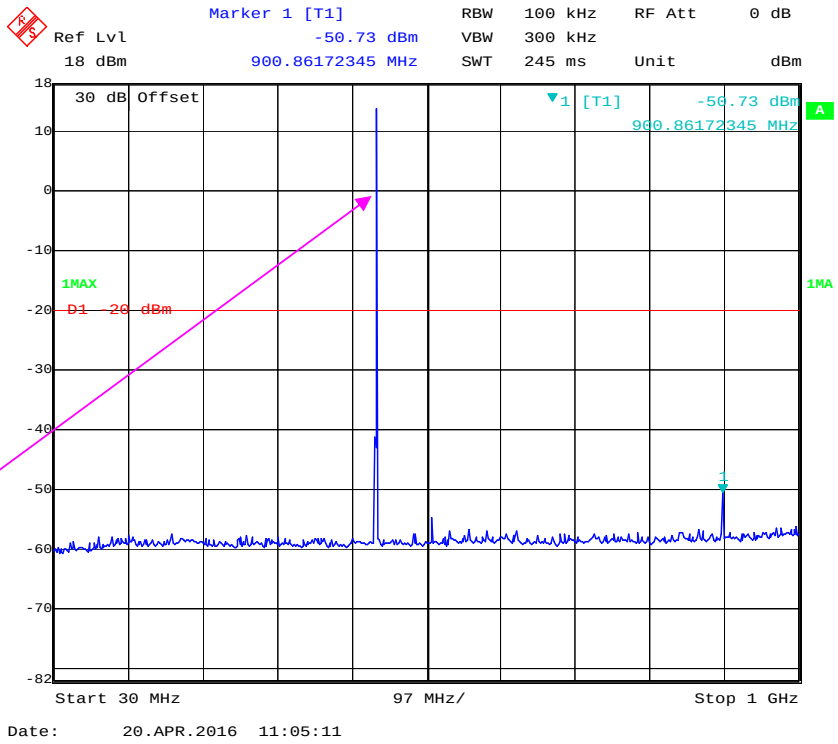


Fund.test with notch filter

1 GHz – 5GHz, Spacing Channel 12.5 kHz, 425.0125 MHz

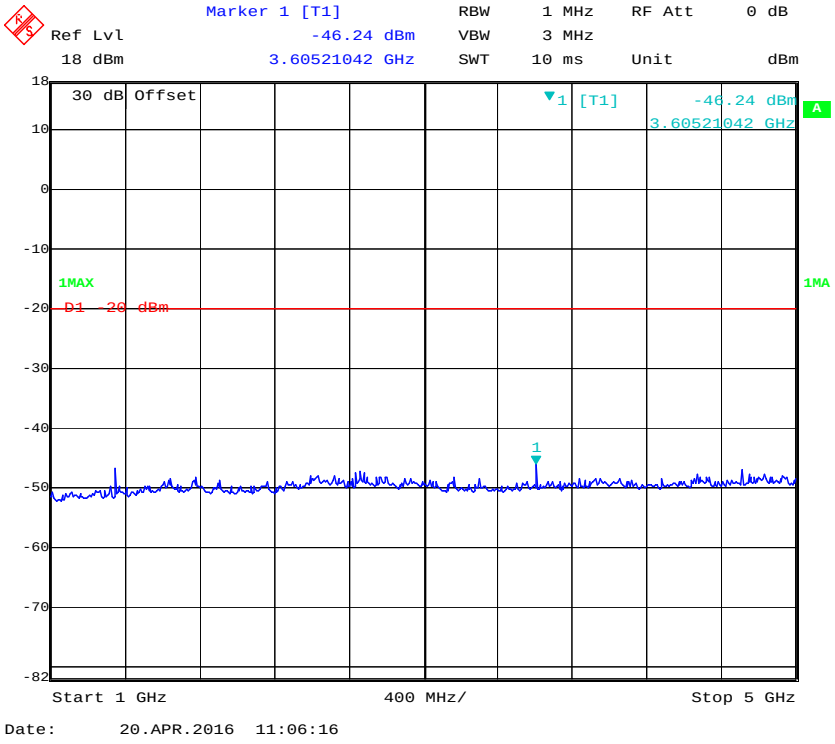


30 MHz – 1 GHz, Spacing Channel 12.5 kHz, 450.0125 MHz



Fund.test with notch filter

1 GHz – 5GHz, Spacing Channel 12.5 kHz, 450.0125 MHz



FCC §2.1053 & §90.210 - RADIATED SPURIOUS EMISSIONS

Applicable Standard

FCC §2.1053 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	2016-12-15
HP	Amplifier	HP8447E	1937A01046	2015-05-06	2016-05-05
Sunol Sciences	Bi-log Antenna	JB1	A040904-2	2014-12-07	2017-12-06
Rohde & Schwarz	Signal Analyzer	FSIQ26	8386001028	2015-12-11	2016-12-11
Sunol Sciences	Horn Antenna	DRH-118	A052604	2014-12-29	2017-12-28
HP	Synthesized Sweeper	HP 8341B	2624A00116	2015-07-02	2016-07-01
Mini	Amplifier	ZVA-183-S+	5969001149	2015-04-23	2016-04-22
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	2015-06-15	2016-06-15
Ducommun technologies	RF Cable	104PEA	218124002	2015-06-15	2016-06-15
Ducommun technologies	RF Cable	RG-214	1	2015-06-15	2016-06-15
Ducommun technologies	RF Cable	RG-214	2	2015-06-15	2016-06-15
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:	26 ℃
Relative Humidity:	49 %
ATM Pressure:	101.0 kPa

The testing was performed by Simon Wang on 2016-04-26.

Test Mode: Transmitting

30 MHz – 5 GHz:

Frequency (MHz)	Receiver Reading (dBμV)	Turn Table Angle Degree	Rx Antenna		Substituted			Absolute Level (dBm)	FCC Part 90	
			Height (m)	Polar (H/V)	SG Level (dBm)	Cable Loss (dB)	Antenna Gain (dB)		Limit (dBm)	Margin (dB)
Digital Modulation 425.0125MHz, Channel Spacing 12.5k										
850.025	41.21	176	1.1	H	-55.8	0.70	0	-56.5	-20	36.5
850.025	40.85	4	1.9	V	-56.1	0.70	0	-56.8	-20	36.8
1275.04	40.98	181	2.1	H	-67.8	1.30	6.30	-62.8	-20	42.8
1275.04	40.57	239	2.4	V	-69.1	1.30	6.30	-64.1	-20	44.1
Digital Modulation 450.0125MHz, Channel Spacing 12.5k										
900.025	40.32	28	1.4	H	-56.7	0.70	0	-57.4	-20	37.4
900.025	41.57	93	1.0	V	-55.4	0.70	0	-56.1	-20	36.1
1350.04	40.45	170	1.9	H	-69.2	1.20	6.40	-64.0	-20	44.0
1350.04	39.86	18	1.2	V	-69.8	1.20	6.40	-64.6	-20	44.6

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

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FCC §2.1055 & §90.213- FREQUENCY STABILITY

Applicable Standard

FCC §2.1055 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	2013-05-09	2016-05-08
ESPEC	Temperature & Humidity Chamber	EL-10KA	09107726	2015-11-01	2016-10-31
Ducommun technologies	RF Cable	RG-214	3	2015-06-15	2016-06-15
JFW	30dB Attenuator	50FH-030-100 RF	170006716507	2015-06-12	2016-06-12
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:	23 ℃
Relative Humidity:	50 %
ATM Pressure:	101.0 kPa

The testing was performed by Simon Wang on 2016-04-23.

Test Mode: Transmitting

For Digital Modulation

Reference Frequency: 425.0125 MHz, Limit: ±2.5 ppm			
Test Environment		**Frequency Measure with Time Elapsed**	
Temperature (℃)	**Power Supplied (V_{DC})**	**Measured Frequency (MHz)**	**Frequency Error (ppm)**
Frequency Stability versus Input Temperature			
50	7.4	425.01268	0.42
40	7.4	425.0127	0.47
30	7.4	425.01273	0.54
20	7.4	425.01281	0.73
10	7.4	425.01269	0.45
0	7.4	425.01285	0.82
-10	7.4	425.01263	0.31
-20	7.4	425.01262	0.28
-30	7.4	425.01264	0.33
Frequency Stability versus Input Voltage			
20	6.3	425.01263	0.31

Reference Frequency: 450.0125 MHz, Limit: ±2.5 ppm			
Test Environment		**Frequency Measure with Time Elapsed**	
Temperature (℃)	**Power Supplied (V_{DC})**	**Measured Frequency (MHz)**	**Frequency Error (ppm)**
Frequency Stability versus Input Temperature			
50	7.4	450.01259	0.20
40	7.4	450.01275	0.56
30	7.4	450.01276	0.58
20	7.4	450.01281	0.69
10	7.4	450.01288	0.84
0	7.4	450.0127	0.44
-10	7.4	450.01274	0.53
-20	7.4	450.01276	0.58
-30	7.4	450.01279	0.64
Frequency Stability versus Input Voltage			
20	6.3	450.01272	0.49

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