



FCC PART 90

TEST REPORT

For

ZTE TRUNKING TECHNOLOGY CORPORATION

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FCC ID: 2AEKCSDR-R8881S4200

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Note: This test report is prepared for the customer shown above and for the equipment described herein. It may not be duplicated or used in part without prior written consent from Bay Area Compliance Laboratories Corp.

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GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

The *ZTE TRUNKING TECHNOLOGY CORPORATION* 's product, model number: *ZXSDR R8881 S4200* (*FCC ID: 2AEKCSR-R8881S4200*) or the "EUT" in this report was a *ZXSDR R8881 S4200* , which was measured approximately: 370 mm (L) x 320 mm (W) x 215 mm (H), rated with input voltage: DC -48 V .

** All measurement and test data in this report was gathered from production sample serial number: 1603322. (Assigned by BACL, Kunshan). The EUT supplied by the applicant was received on 2016-09-26.*

Objective

This test report is prepared on behalf of *ZTE TRUNKING TECHNOLOGY CORPORATION* 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 at Bay Area Compliance Laboratories Corp. (Kunshan). The radiated testing was performed at an antenna-to-EUT distance of 3 meters.

Measurement Uncertainty

Item	Uncertainty
AC Power Lines Conducted Emissions	±3.26 dB
RF conducted test with spectrum	±0.9dB
RF Output Power with Power meter	±0.5dB
Radiated emission	30MHz~1GHz
	Above 1G
Occupied Bandwidth	±0.5kHz
Temperature	±1.0 °C
Humidity	±6%

Test Facility

The test site used by Bay Area Compliance Laboratories Corp. (Kunshan) to collect test data is located on the Chenghu Lake Road, Kunshan Development Zone No.248, Kunshan, Jiangsu, China

Test site at Bay Area Compliance Laboratories Corp. (Kunshan) 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 November 06, 2014. 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.: 815570. 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.

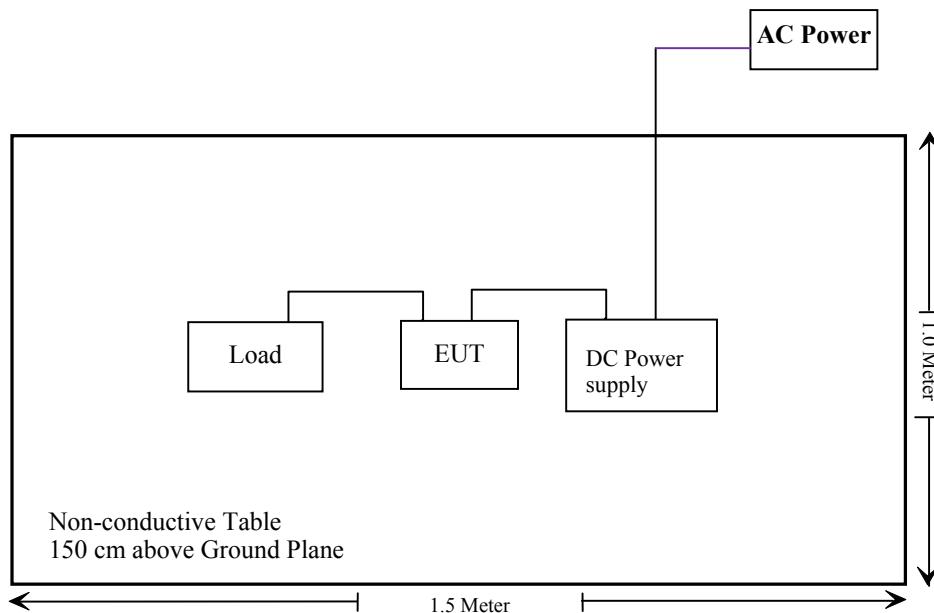
Support Equipment List and Details

Manufacturer	Description	Model	Serial Number
ZTE	50ohm Load	/	/
VAPEL	DC Power Supply	PPC33	N/A

External I/O Cable

Cable Description	Length (m)	From Port	To
Un-Shielding Un-Detachable DC Cable	1.2	AC Power	DC Power Supply
Un-Shielding Detachable DC Cable	1.2	EUT	DC Power Supply
Un-Shielding Detachable RF Cable	0.6	EUT	Load

Block Diagram of Test Setup



SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Results
§ 2.1091	Maximum Permissible exposure (MPE)	Compliance
§2.1046;§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
§90.214	Transient Frequency Behavior	Compliance

TEST EQUIPMENT LIST

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Radiated Emission Test					
Sonoma Instrunent	Amplifier	330	171377	2016-09-16	2017-09-16
Rohde & Schwarz	EMI Test Receiver	ESCI	100195	2015-11-12	2016-11-11
Sunol Sciences	Broadband Antenna	JB3	A090314-2	2016-01-09	2019-01-08
Sunol Sciences	Broadband Antenna	JB3	A090314-1	2016-01-09	2019-01-08
Narda	Pre-amplifier	AFS42-00101800	2001270	2016-09-08	2017-09-08
EMCO	Horn Antenna	3116	9510-2384	2015-11-07	2018-11-06
Rohde & Schwarz	Signal Analyzer	FSIQ26	100048	2015-11-12	2016-11-11
ETS	Horn Antenna	3115	6229	2016-01-11	2017-01-10
ETS	Horn Antenna	3115	9311-4159	2016-01-11	2017-01-10
R&S	Auto test Software	EMC32	V 09.10.0	NCR	NCR
BACL	RF cable	KS-LAB-012	KS-LAB-012	2015-12-15	2016-12-15
Ducommun technologies	RF Cable	104PEA	218124002	2016-04-22	2017-04-22
HP	Signal Generator	E4421B	US38440505	2015-11-12	2016-11-11
RF Conducted test					
BACL	TS 8997 Cable-01	T-KS-EMC086	T-KS-EMC086	2015-12-10	2016-12-09
BACL	TS 8997 Cable-01	T-KS-EMC086	T-KS-EMC086	2016-12-09	2017-12-09
BACL	RF cable	KS-LAB-012	KS-LAB-012	2015-12-16	2016-12-15
BACL	RF cable	KS-LAB-012	KS-LAB-012	2016-12-15	2017-12-15
WEINSCHEL	3dB Attenuator	5326	N/A	2016-06-18	2017-06-18
Rohde & Schwarz	OSP120 BASE UNIT	OSP120	101247	2016-07-04	2017-07-03
Rohde & Schwarz	Signal Analyzer	FSIQ26	836131	2016-09-21	2017-09-21
HEWLETT PACKARD	RF Communications Test SET	8920A	3438A05201	2016-09-21	2017-09-21
HONOVA	Power Splitter	ZFRSC-14-S+	019411452	2016-06-12	2017-06-12
N/A	30dB Attenuator	100W 30dB	N/A	2016-06-18	2017-06-18

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

FCC §1.1307 & §2.1091 - MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Applicable Standard

According to subpart 1.1307 (b)(1), 2.1091 systems operating under the provisions of this section shall be operated in a manner that ensures the public is not exposed to RF energy level in excess of the communication guidelines.

(A) Limits for Occupational/Controlled Exposure

Limits for Occupational/Controlled Exposure				
Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm ²)	Averaging Time (Minutes)
0.3-3.0	614	1.63	*100	6
3.0-30	1842/f	4.89/f	*900/f ²	6
30-300	61.4	0.163	1.0	6
300-1,500	/	/	f/300	6
1,500-100,000	/	/	5	6

f = frequency in MHz

* = Plane-wave equivalent power density

Result

Calculated Formulary:

Predication of MPE limit at a given distance

$$S = \frac{PG}{4\pi R^2}$$

S = power density (in appropriate units, e.g. mW/cm²)

P = power input to the antenna (in appropriate units, e.g., mW).

G = power gain of the antenna in the direction of interest relative to an isotropic radiator, the power gain factor, is normally numeric gain.

R = distance to the center of radiation of the antenna (appropriate units, e.g., cm)

For worst case:

Frequency (MHz)	Target power (dBm)	Target power (mW)	Antenna Gain		Evaluation Distance (cm)	Power Density (mW/cm ²)	MPE Limit (mW/cm ²)
			(dBi)	(numeric)			
420-425	47.16	52000	7.8	6.03	300	0.28	1.33

The maximum antenna gain is 7.8 dBi

Note: To maintain compliance with the FCC's RF exposure guidelines, place the equipment at least 300cm from nearby persons.

Result: Compliance

FCC §2.1046 & §90.205 - RF OUTPUT POWER

Applicable Standard

FCC §2.1046 and §90.205

Test Procedure

Conducted RF Output Power:

TIA-603-D section 2.2.1

Spectrum Analyzer Setting:

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

Test Data

Environmental Conditions

Temperature:	27 °C
Relative Humidity:	52 %
ATM Pressure:	101.0 kPa

The testing was performed by Chris Wang on 2016-10-12.

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)	Result
Digital	12.5	422.225	High	47.03	50.47	Pass

Note: the manufacturer's rated power is 50 Watts.

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 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.

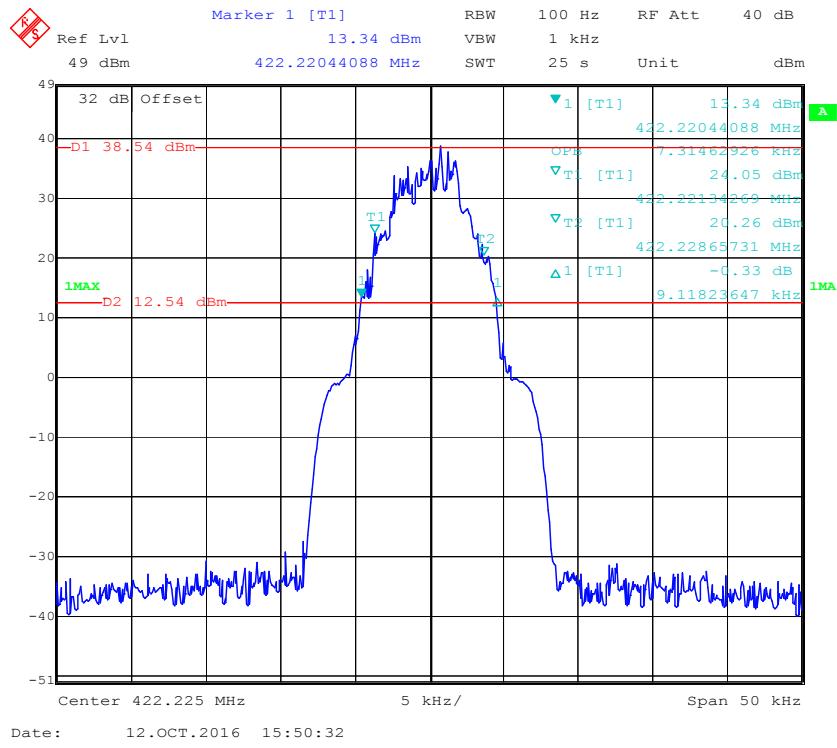
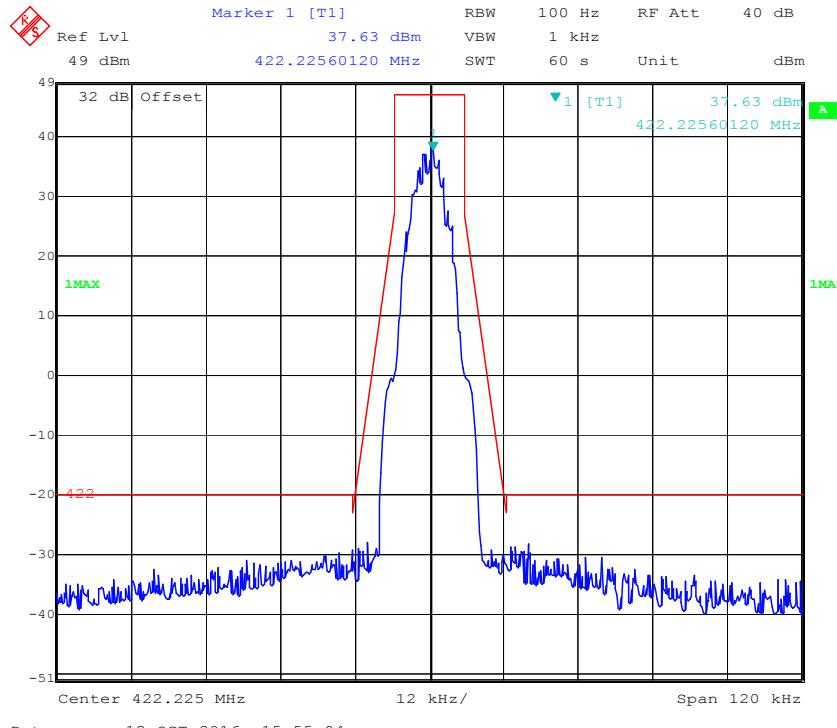
Test Data**Environmental Conditions**

Temperature:	27 °C
Relative Humidity:	52 %
ATM Pressure:	101.0 kPa

The testing was performed by Chris Wang on 2016-10-12.

Test Mode: Transmitting

Modulation	Frequency (MHz)	Channel space (kHz)	Power Level	99% Occupied Bandwidth (kHz)	26 dB Emissions Bandwidth (kHz)
Digital	422.225	12.5	High	7.31	9.12

Digital Modulation:**99% Occupied Bandwidth & 26 dB Emissions Bandwidth 12.5 kHz, 422.225 MHz (High Power)****Emission Mask D with High Power 12.5 kHz, 422.225 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.

Emission Mask E—6.25 kHz or less channel bandwidth equipment. For transmitters designed to operate with a 6.25 kHz or less bandwidth, any emission must be attenuated below the power (P) of the highest emission contained within the authorized bandwidth as follows:

- (1) On any frequency from the center of the authorized bandwidth f_0 to 3.0 kHz removed from f_0 : Zero dB.
- (2) On any frequency removed from the center of the authorized bandwidth by a displacement frequency (f_d in kHz) of more than 3.0 kHz but no more than 4.6 kHz: At least $30 + 16.67(f_d - 3$ kHz) or $55 + 10 \log (P)$ or 65 dB, whichever is the lesser attenuation.
- (2) On any frequency removed from the center of the authorized bandwidth by more than 4.6 kHz: At least $55 + 10 \log (P)$ or 65 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 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

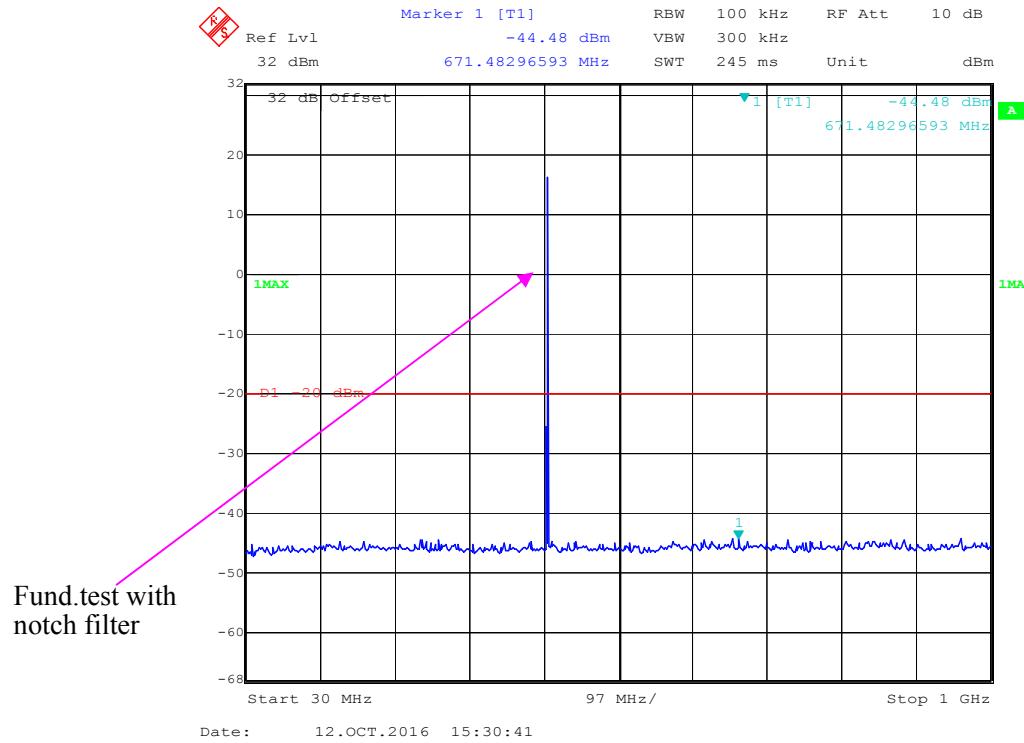
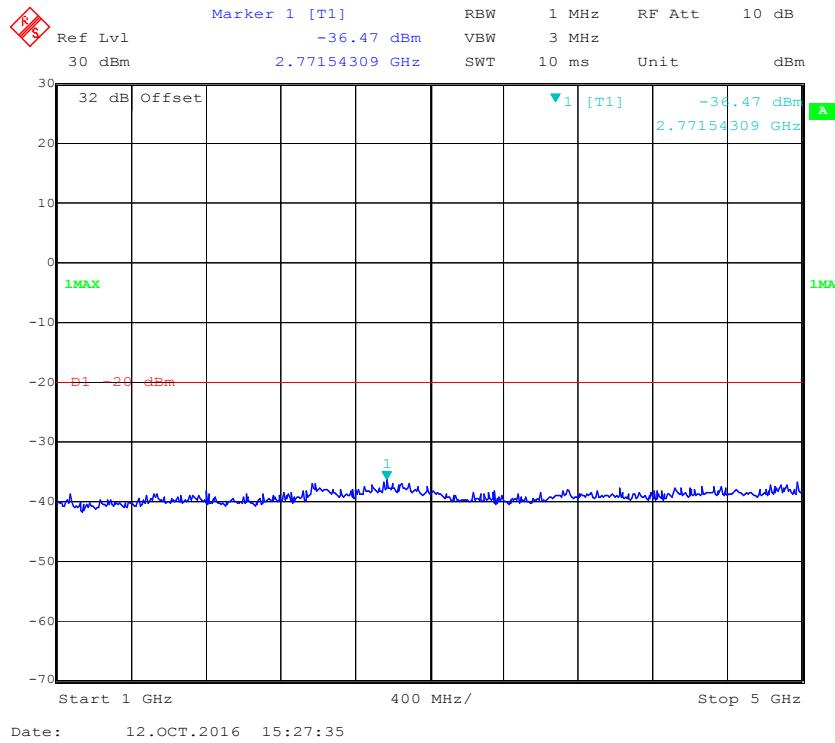
Environmental Conditions

Temperature:	27 °C
Relative Humidity:	52 %
ATM Pressure:	101.0 kPa

The testing was performed by Chris Wang on 2016-10-12.

Test Mode: Transmitting

Please refer to the following plots.

30 MHz – 1 GHz, Spacing Channel 12.5 kHz, 422.225 MHz**1 GHz – 2GHz, Spacing Channel 12.5 kHz, 422.225 MHz**

FCC §2.1053 & §90.210 - RADIATED SPURIOUS EMISSIONS

Applicable Standard

FCC §2.1053 and §90.210

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 = $10 \log_{10} (\text{TXpwr in Watts} / 0.001)$ - the absolute level

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

Test Data

Environmental Conditions

Temperature:	27 °C
Relative Humidity:	52 %
ATM Pressure:	101.0 kPa

The testing was performed by Layne Li on 2016-10-12.

Test Mode: Transmitting

30 MHz – 5 GHz:

Frequency (MHz)	Receiver Reading (dB μ V)	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 422.225MHz, Channel Spacing 12.5k										
844.45	39.75	158	1.0	H	-57.2	0.46	4.75	-52.91	-20	32.91
844.45	38.91	56	1.3	V	-58.1	0.46	4.75	-53.81	-20	33.81
1266.68	54.04	208	1.5	H	-47.2	0.27	7.50	-39.97	-20	19.97
1266.68	46.93	225	1.2	V	-61.5	0.27	7.50	-54.27	-20	34.27

Note:

Absolute Level = SG Level - Cable loss + Antenna Gain

Margin = Limit- Absolute Level

,

FCC §2.1055 & §90.213- FREQUENCY STABILITY

Applicable Standard

FCC §2.1055 and §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:	27 °C
Relative Humidity:	52 %
ATM Pressure:	101.0 kPa

The testing was performed by Chris Wang on 2016-11-14.

Test Mode: Transmitting

For Digital Modulation

Reference Frequency: 422.225 MHz, Limit: ± 1.5 ppm, 12.5 kHz			
Test Environment		Frequency Measure with Time Elapsed	
Temperature (°C)	Power Supplied (V _{DC})	Measured Frequency (MHz)	Frequency Error (ppm)
Frequency Stability versus Input Temperature			
50	-48	422.22529	0.687
40	-48	422.22536	0.853
30	-48	422.22534	0.805
20	-48	422.22530	0.711
10	-48	422.22531	0.734
0	-48	422.22525	0.592
-10	-48	422.22532	0.758
-20	-48	422.22538	0.900
-30	-48	422.22530	0.711
Frequency Stability versus Input Voltage			
20	-37	422.22539	0.924
20	-62	422.22536	0.853

FCC §90.214 - TRANSIENT FREQUENCY BEHAVIOR

Applicable Standard

Regulations: FCC §90.214

Test Procedure

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

Test Data

Environmental Conditions

Temperature:	24 °C
Relative Humidity:	54 %
ATM Pressure:	101.0 kPa

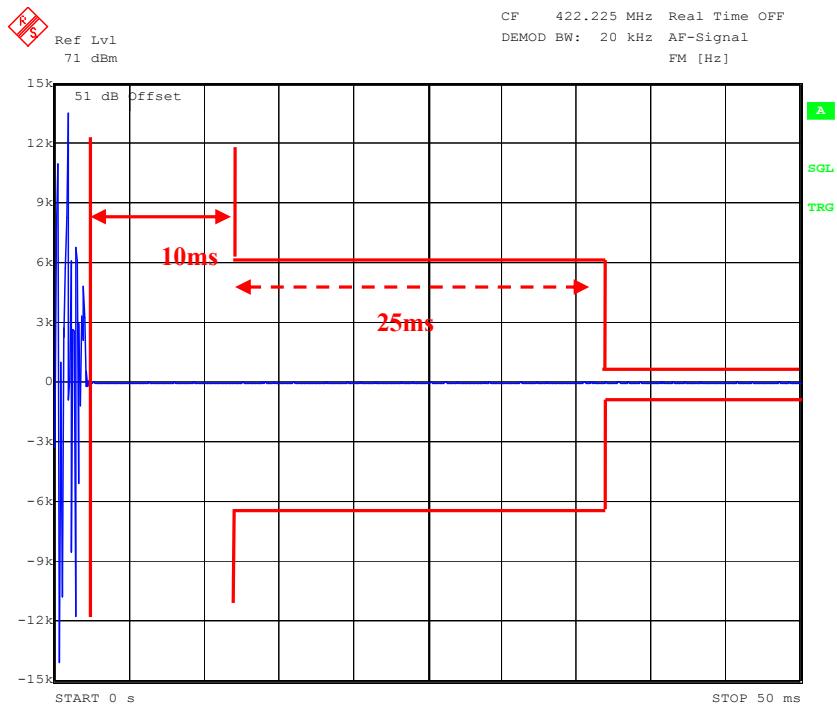
The testing was performed by Chris Wang on 2017-05-28.

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	

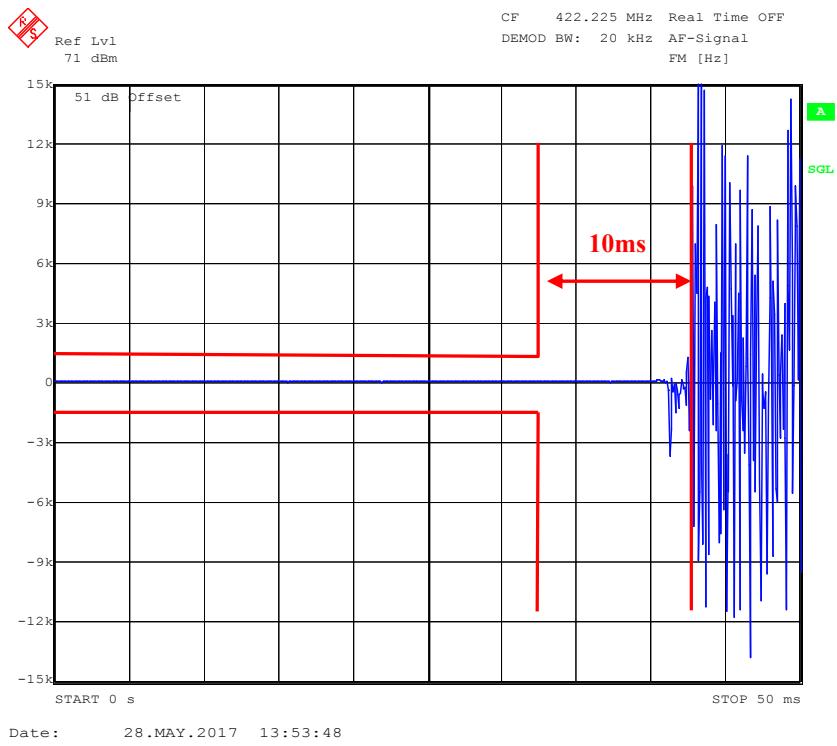
Please refer to the following plots.

Channel Spacing 12.5 kHz

Turn on, 422.225 MHz



Turn off, 422.225 MHz



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