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BACL
Bay Area Compliance Labs Corp.

FCC PART 95

MEASUREMENT AND TEST REPORT

For

HENAN ESHOW ELECTRONIC COMMERCE CO., LTD

Room 722, Sanjiang Building, No.170 Nanyang Road, Huiji District, Zhengzhou, Henan, China

FCC ID: 2AAR8RETEVISRT21

Report Type:	**Product Type:**
Original Report	Two Way Radio

Report Number:	RSZ171229002-00
Report Date:	2018-03-21
Reviewed By:	Rocky Kang RF Engineer
Test Laboratory:	Bay Area Compliance Laboratories Corp. (Shenzhen) 6/F., West Wing, Third 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)

Equipment Name	Two Way Radio
Tested Model Number	RT21
Modulation Type	FM
Frequency Range	462.5500-462.7250 MHz
Testing Bandwidth	10.02kHz
Power (ERP)	29.90 dBm
Nominal Voltage Supply	DC 3.7V by rechargeable Li-ion battery
External Dimension	Main EUT: 61 mm (L) x 37 mm (W) x 229 mm (H) Charger: 73 mm (L) x 85 mm (W) x 42 mm (H)
Serial Number	1702918
Received Date	2017-12-29

Objective

This report is prepared on behalf of *HENAN ESHOW ELECTRONIC COMMERCE CO., LTD* in accordance with Part 2 and Part 95, Subpart A & Subpart B 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 Part 95 Subpart A, Subpart B of the Federal Communication Commissions rules with TIA-603-D, Land Mobile FM or PM-Communications Equipment-Measurement and Performance Standards.

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

Measurement Uncertainty

Parameter		uncertainty
Occupied Channel Bandwidth		±5%
RF Output Power with Power meter		±0.5dB
RF conducted test with spectrum		±1.5dB
Emissions, Radiated	Below 1GHz	±4.75dB
	Above 1GHz	±4.88dB
Temperature		±3℃
Humidity		±6%
Supply voltages		±0.4%

SYSTEM TEST CONFIGURATION

Description of Test Configuration

The system was configured for testing in a typical fashion (as normally used by a typical user).

Description of Channel List

Channel No.	Channel Frequency (MHz)	Channel No.	Channel Frequency (MHz)
1	462.5625	9	462.7125
2	462.5875	10	462.5500
3	462.6125	11	462.5750
4	462.6375	12	462.6000
5	462.6625	13	462.6500
6	462.6250	14	462.6750
7	462.7250	15	462.7000
8	462.6875	/	/

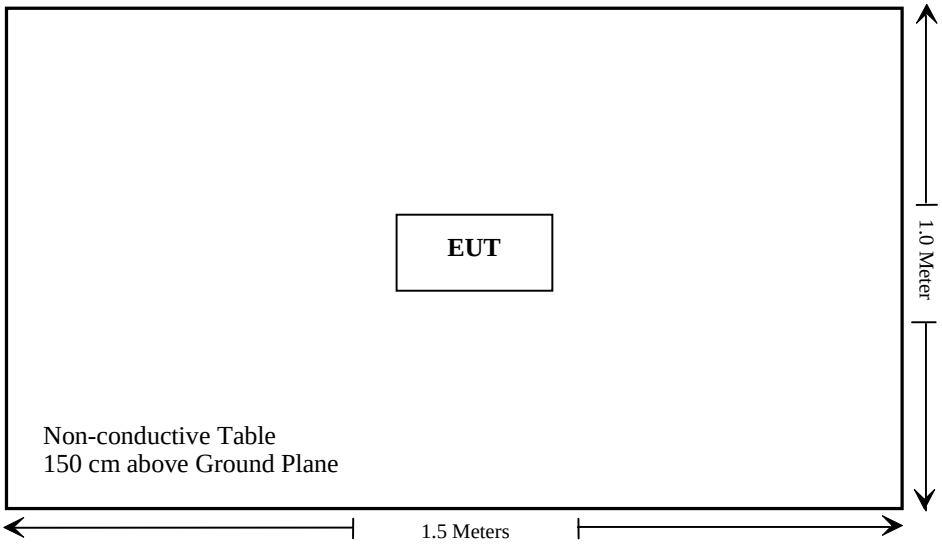
Equipment Modifications

No modification was made to the EUT tested.

Support Equipment List and Details

Manufacturer	Description	Model	Serial Number
/	/	/	/

Block Diagram of Test Setup



SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Results
§2.1093	RF Exposure	Compliance
§95.587(b)(1)	Antenna Requirement	Compliance
§2.1046, §95.567	RF Output Power	Compliance
§2.1047, §95.575	Modulation Characteristic	Compliance
§2.1049, §95.573	Authorized Bandwidth & Emission Mask	Compliance
§2.1053, §95.579	Spurious Radiated Emissions	Compliance
§2.1055(d), §95.565	Frequency Stability	Compliance

TEST EQUIPMENT LIST

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Radiated Emission Test					
Sunol Sciences	Horn Antenna	DRH-118	A052604	2017-12-22	2020-12-21
Rohde & Schwarz	Signal Analyzer	FSIQ26	8386001028	2017-04-24	2018-04-24
Mini	Pre-amplifier	ZVA-183-S+	5969001149	2017-05-21	2018-05-21
HP	Amplifier	HP8447E	1937A01046	2017-11-19	2018-05-21
Anritsu	Signal Generator	68369B	004114	2017-12-05	2018-12-05
Sunol Sciences	Bi-log Antenna	JB1	A040904-2	2017-12-17	2020-12-16
COM POWER	Dipole Antenna	AD-100	41000	NCR	NCR
A.H. System	Horn Antenna	SAS-200/571	135	2015-08-18	2018-08-17
Rohde & Schwarz	EMI Test Receiver	ESCI	101120	2018-01-11	2019-01-11
Ducommun technologies	RF Cable	UFA210A-1-4724-30050U	MFR64369 223410-001	2017-11-19	2018-05-21
Ducommun technologies	RF Cable	104PEA	218124002	2017-11-19	2018-05-21
Ducommun technologies	RF Cable	RG-214	1	2017-11-19	2018-05-21
Ducommun technologies	RF Cable	RG-214	2	2017-11-22	2018-05-22
Ducommun technologies	Pre-amplifier	ALN-22093530-01	991373-01	2017-08-03	2018-08-03
RF Conducted test					
WEINSCHEL	30dB Attenuator	N/A	N/A	2017-11-23	2018-05-22
HP	RF Communication Test Set	HP8920A	3438A05201	N/A	N/A
HP	Microwave Frequency Counter	5343A	2232A00827	2016-08-29	2019-08-29
Fluke	Digital Multimeter	287	19000011	2017-04-09	2018-04-09
ESPEC	Temperature & Humidity Chamber	EL-10KA	09107726	2017-12-21	2018-12-21
Long Wei	DC Power Supply	TPR-6420D	398363	NCR	NCR
N/A	Notch Filter	SKU 5G3	ATR0205-04-13	N/A	N/A
Rohde & Schwarz	SPECTRUM ANALYZER	FSU26	200120	2017-12-24	2018-12-24
Ducommun Technologies	RF Cable	RG-214	3	2017-11-22	2018-05-22

*** Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Shenzhen) 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(b) & §2.1093 - RF EXPOSURE

Applicable Standard

According to FCC §1.1307(b) and §2.1093, protable device operates Part 95 should be subjected to rountine environmental evaluation for RF exposure prior or equipment authorization or use.

Result: Compliance.

Please refer to SAR Report Number: RSZ171229002-20.

FCC §95.587(b)(1) – ANTENNA REQUIREMENT

Applicable Standard

According to FCC § 95.587, (b) Antenna. The antenna of each FRS transmitter type must meet the following requirements.
(1) The antenna must be a non-removable integral part of the FRS transmitter type.

Antenna Connector Construction

The EUT has an integral antenna arrangement, fulfill the requirement of this section. Please refer to the EUT photos.

Result: Compliance.

FCC §2.1046 & §95.567 - RF OUTPUT POWER

Applicable Standard

Per FCC §2.1046, and §95.567, Each FRS transmitter type must be designed such that the effective radiated power (ERP) on channels 8 through 14 does not exceed 0.5 Watts and the ERP on channels 1 through 7 and 15 through 22 does not exceed 2.0 Watts.

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.

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 emissions were measured by the substitution.

Test Data

Environmental Conditions

Temperature:	24 °C
Relative Humidity:	50 %
ATM Pressure:	101.0 kPa

The testing was performed by Xiangguang Kong on 2018-03-06.

Test Mode: Transmitting

Indicated		Table Angle Degree	Test Ant.		Substituted			Absolute Level (dBm)	FCC Part 95	
Frequency (MHz)	S.A. Reading (dBµV)		Height (m)	Polar (H/V)	Substituted level (dBm)	Cable Loss (dB)	Ant. Gain (dB)		Limit (dBm)	Margin (dB)
462.6375MHz FRS										
462.6375	90.2	109	1.4	H	15.0	0.3	0.0	14.70	33	18.30
462.6375	101.14	352	1.3	V	30.2	0.3	0.0	29.90	33	3.10

Test Result: Compliance.

FCC §2.1047 & §95.575 - MODULATION CHARACTERISTIC

Applicable Standard

Per FCC §2.1047 and §95.575: Each FRS transmitter type must be designed such that the peak frequency deviation does not exceed 2.5 kHz, and the highest audio frequency contributing substantially to modulation must not exceed 3.125 kHz.

Test Procedure

Test Method: TIA/EIA-603-D

Test Data

Environmental Conditions

Temperature:	24 °C
Relative Humidity:	50 %
ATM Pressure:	101.0 kPa

The testing was performed by Xiangguang Kong on 2018-03-08.

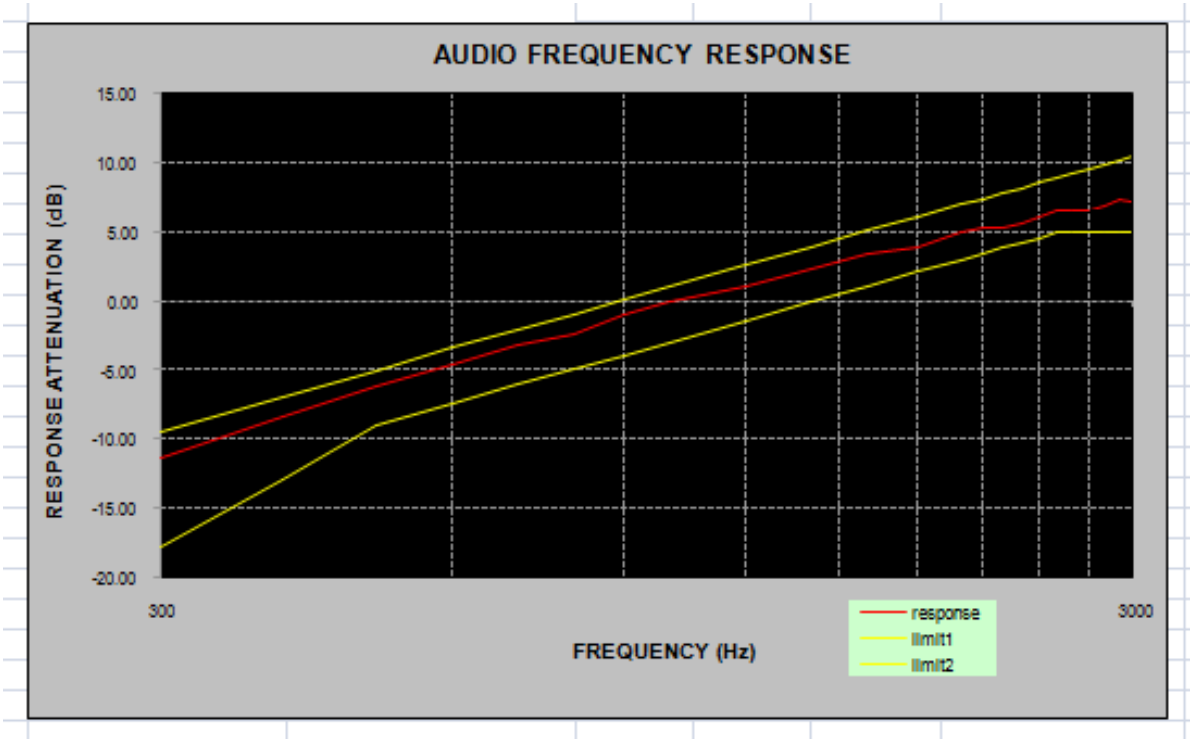
Please refer to the following tables and plots.

Test Mode: Transmitting

Audio Frequency Response

Carrier Frequency: 462.6375 MHz

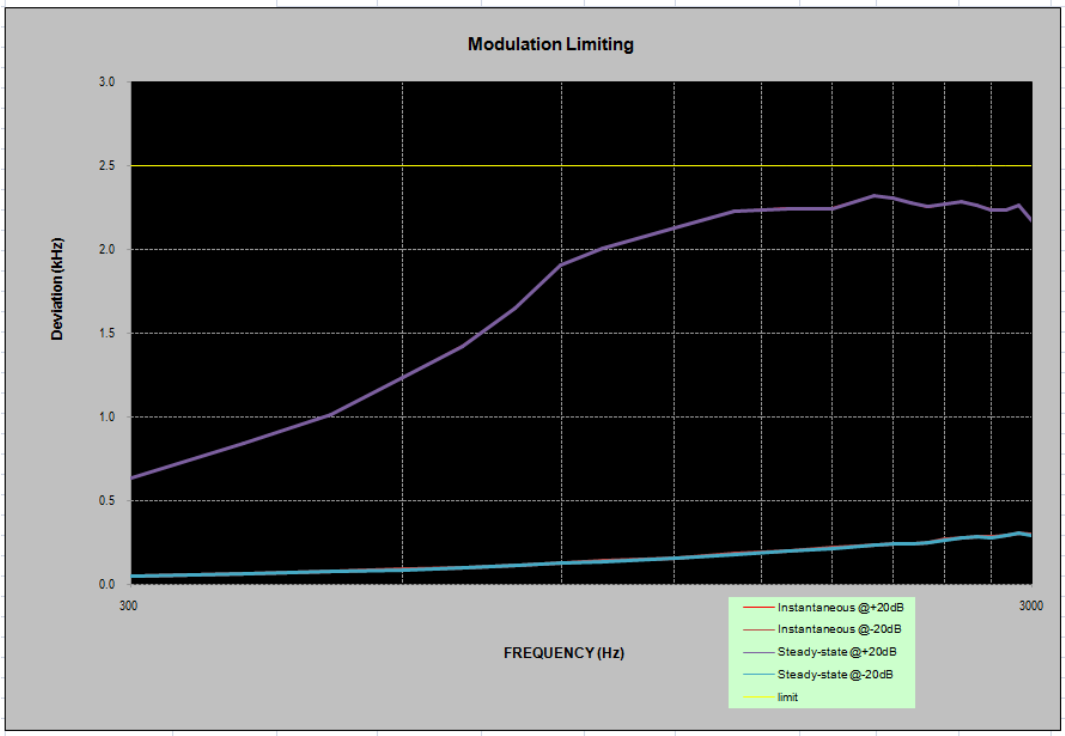
Audio Frequency (Hz)	Response Attenuation (dB)
300	-11.31
400	-8.45
500	-6.16
600	-4.67
700	-3.15
800	-2.34
900	-0.97
1000	0.00
1200	1.05
1400	2.36
1600	3.39
1800	3.88
2000	5.00
2100	5.23
2200	5.26
2300	5.57
2400	6.07
2500	6.52
2600	6.58
2700	6.61
2800	6.90
2900	7.41
3000	7.11


AUDIO FREQUENCY RESPONSE
RESPONSE ATTENUATION (dB)
15.00
10.00
5.00
0.00
-5.00
-10.00
-15.00
-20.00
300
3000
FREQUENCY (Hz)
response
limit1
limit2

MODULATION LIMITING

Carrier Frequency: 462.6375MHz

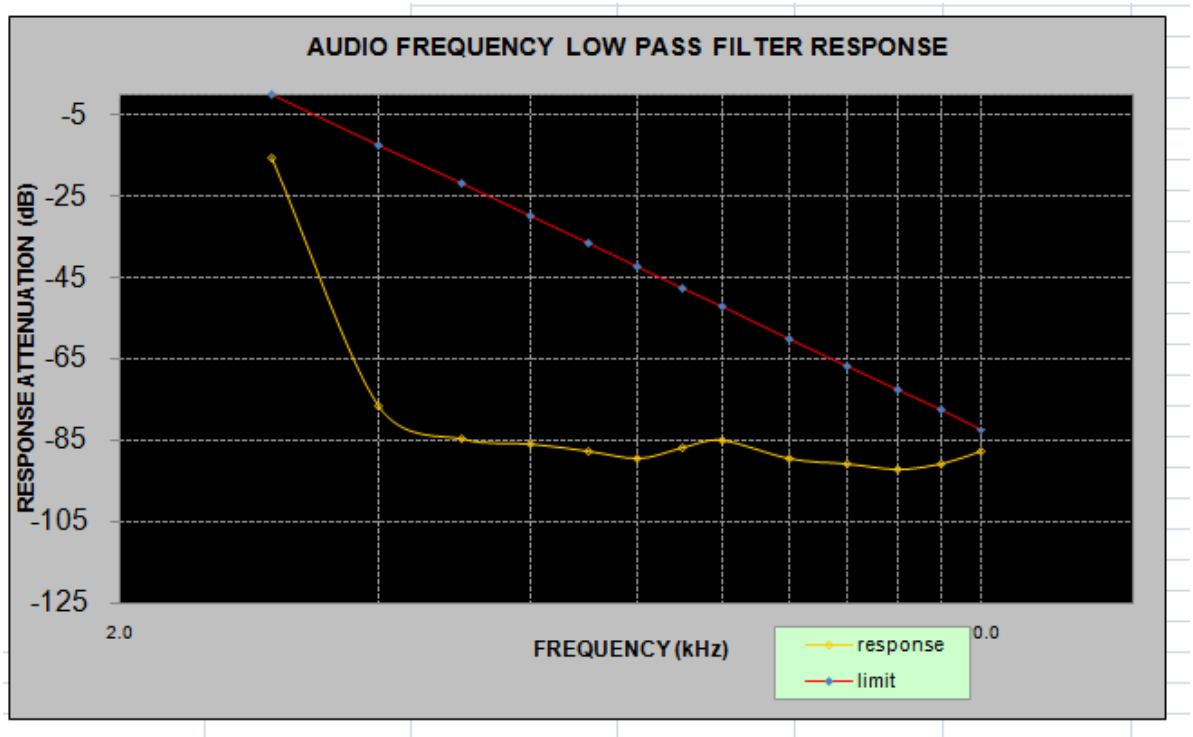
Audio Frequency (Hz)	Instantaneous		Steady-state		FCC Limit [kHz]
	DEVIATION (@+20dB) [kHz]	DEVIATION (@-20dB) [kHz]	DEVIATION (@+20dB) [kHz]	DEVIATION (@-20dB) [kHz]	
300	0.635	0.054	0.635	0.052	2.5
400	0.846	0.067	0.846	0.063	2.5
500	1.016	0.080	1.016	0.077	2.5
600	1.237	0.092	1.234	0.089	2.5
700	1.426	0.102	1.424	0.099	2.5
800	1.649	0.118	1.648	0.115	2.5
900	1.907	0.128	1.906	0.126	2.5
1000	2.006	0.142	2.004	0.138	2.5
1200	2.130	0.160	2.128	0.157	2.5
1400	2.227	0.184	2.224	0.182	2.5
1600	2.248	0.201	2.244	0.198	2.5
1800	2.247	0.220	2.242	0.216	2.5
2000	2.324	0.240	2.322	0.237	2.5
2100	2.304	0.245	2.305	0.242	2.5
2200	2.281	0.245	2.280	0.243	2.5
2300	2.252	0.254	2.253	0.251	2.5
2400	2.272	0.269	2.268	0.266	2.5
2500	2.285	0.282	2.282	0.279	2.5
2600	2.267	0.286	2.265	0.284	2.5
2700	2.240	0.283	2.234	0.280	2.5
2800	2.234	0.293	2.234	0.290	2.5
2900	2.264	0.310	2.260	0.307	2.5
3000	2.170	0.299	2.169	0.296	2.5


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
Steady-state @-20dB
limit

Audio frequency lows pass filter response

Carrier Frequency: 462.6375 MHz, Channel Separation=12.5 kHz

Audio Frequency (kHz)	Response Attenuation (dB)	Limit (dB)
1.0	0.0	/
3.0	-15.75	0.0
4.0	-76.55	-12.5
5.0	-84.85	-22.2
6.0	-86.05	-30.1
7.0	-87.65	-36.8
8.0	-89.75	-42.6
9.0	-87.15	-47.7
10.0	-85.05	-52.3
12.0	-89.55	-60.2
14.0	-90.75	-66.9
16.0	-92.35	-72.7
18.0	-90.75	-77.8
20.0	-87.95	-82.5



FCC §2.1049 & §95.573 - AUTHOURIZED BANDWIDTH AND EMISSION MASK

Applicable Standard

According to §95.573. Each FRS transmitter type must be designed such that the occupied bandwidth does not exceed 12.5 kHz.

Test Procedure

TIA-603-D, section 2.2.11

Test Data

Environmental Conditions

Temperature:	24 °C
Relative Humidity:	50 %
ATM Pressure:	101.0 kPa

The testing was performed by Xiangguang Kong on 2018-03-16.

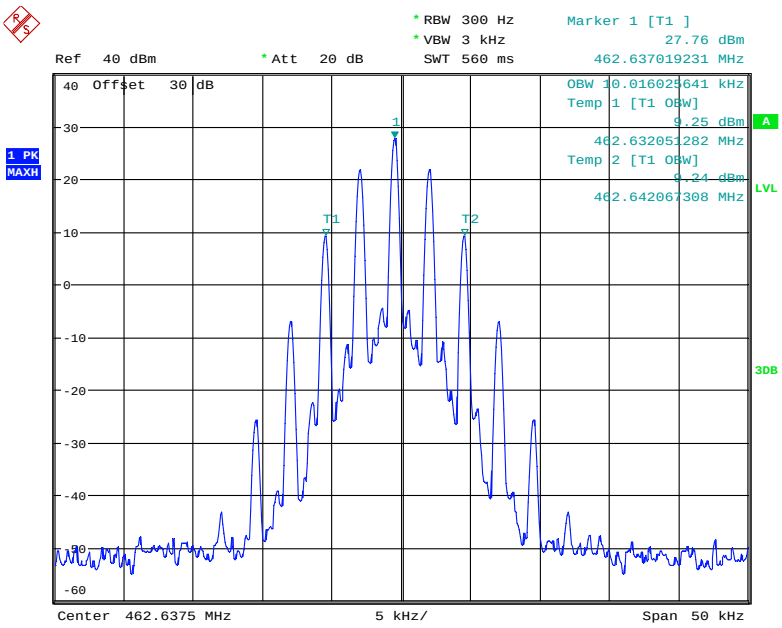
Test Mode: Transmitting

Item	Frequency (MHz)	OBW (kHz)	Limit (kHz)	Result
FRS	462.6375	10.02	12.5	Pass

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

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.

OBW, 462.6375 MHz



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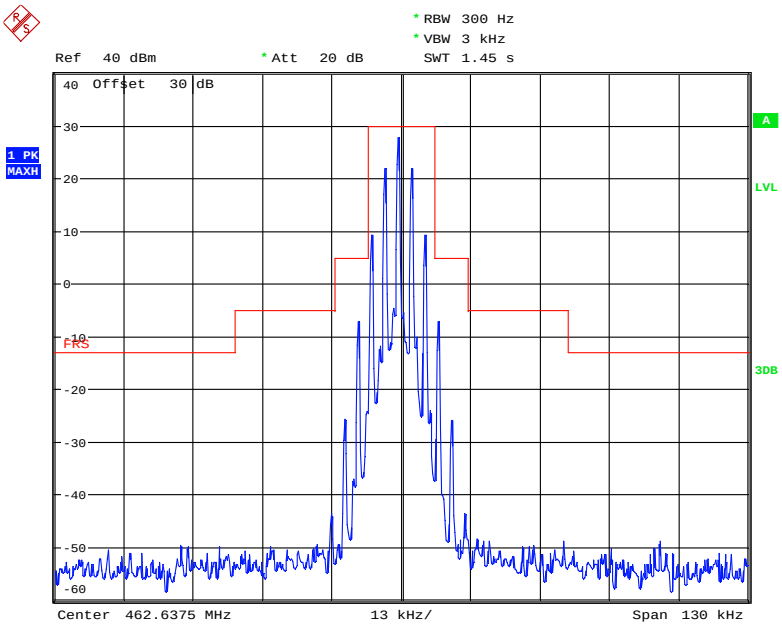
Emission Mask, 462.6375 MHz



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FCC §2.1053 & §95.579- RADIATED SPURIOUS EMISSION

Applicable Standard

FCC §2.1053 and §95.579. Each FRS transmitter type must be designed to satisfy the applicable unwanted emissions limits in this paragraph.

(a) *Attenuation requirements.* The power of unwanted emissions must be attenuated below the carrier power output in Watts (P) by at least:
(1) 25 dB (decibels) in the frequency band 6.25 kHz to 12.5 kHz removed from the channel center frequency.
(2) 35 dB in the frequency band 12.5 kHz to 31.25 kHz removed from the channel center frequency.
(3) 43 + 10 log (P) dB in any frequency band removed from the channel center frequency by more than 31.25 kHz.

(b) *Measurement bandwidths.* The power of unwanted emissions in the frequency bands specified in paragraphs (a)(1) and (2) of this section is measured with a reference bandwidth of 300 Hz. The power of unwanted emissions in the frequency range specified in paragraph (a)(3) is measured with a reference bandwidth of at least 30 kHz.

(c) *Measurement conditions.* The requirements in this section apply to each FRS transmitter type both with and without the connection of permitted attachments, such as an external speaker, microphone and/or power cord.

Test Procedure

The transmitter was placed on a wooden 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 tenth 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 = 43+10 Log_{10} (power out in Watts)

Test Data

Environmental Conditions

Temperature:	24 °C
Relative Humidity:	50 %
ATM Pressure:	101.0 kPa

The testing was performed by Xiangguang Kong on 2018-03-19.

Test Mode: Transmitting

Indicated		Table Angle Degree	Test Antenna		Substituted			Absolute Level (dBm)	Limit (dBm)	Margin (dB)
Frequency (MHz)	Receiver Reading (dBuV)		Height (m)	Polar (H/V)	Level (dBm)	Cable Loss (dB)	Antenna Gain (dB)			
FRS 462.6375MHz										
925.275	60.35	18	1.4	H	-36.6	0.70	0	-37.30	-13	24.30
925.275	71.48	152	2.1	V	-25.5	0.70	0	-26.20	-13	13.20
1387.9125	77.37	205	1.5	H	-30.6	1.60	7.90	-24.30	-13	11.30
1387.9125	73.77	359	2.4	V	-34.4	1.60	7.90	-28.10	-13	15.10
1850.55	70.51	328	2.3	H	-33.9	1.30	9.40	-25.80	-13	12.80
1850.55	65.27	160	1.1	V	-39.4	1.30	9.40	-31.30	-13	18.30
3238.4625	62.33	13	1.4	H	-37.5	1.60	11.50	-27.60	-13	14.60
3238.4625	63.15	353	1.2	V	-36.9	1.60	11.50	-27.00	-13	14.00
4163.7375	57.97	184	2.4	H	-43.6	1.50	11.80	-33.30	-13	20.30
4163.7375	64.93	101	2.4	V	-35.9	1.50	11.80	-25.60	-13	12.60
4626.375	65.05	150	2.1	H	-36.3	1.60	12.00	-25.90	-13	12.90
4626.375	60.31	217	2.4	V	-39.9	1.60	12.00	-29.50	-13	16.50

Note:
1) Absolute Level = Substituted Level - Cable loss + Antenna Gain
2) Margin = Limit- Absolute Level

FCC§2.1055 (d) & §95.565 - FREQUENCY STABILITY

Applicable Standard

According to FCC §2.1055(a) (1), the frequency stability shall be measured with variation of ambient temperature from –30 ºC to +50 ºC, and according to FCC 2.1055(d) (2), the frequency stability shall be measured with reducing primary supply voltage to the battery operating end point which is specified by the manufacturer.

According to FCC §95.565, Each FRS transmitter type must be designed such that the carrier frequencies remain within ±2.5 parts-per-million of the channel center frequencies specified in §95.563 during normal operating conditions.

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 Frequency Counter.

Frequency Stability vs. Voltage (item 1or item 2 will be chosen according to different condition) :

☐1) Vary primary supply voltage from 85 to 115 percent of the nominal value for other than hand carried battery equipment.

☒2) For hand carried, battery powered equipment, reduce primary supply voltage to the battery operating end point which shall be specified by the manufacturer.

The output frequency was recorded for each voltage.

Test Data

Environmental Conditions

Temperature:	24 °C
Relative Humidity:	50 %
ATM Pressure:	101.0 kPa

The testing was performed by Xiangguang Kong on 2018-03-08.

Test Mode: Transmitting

FRS

Reference Frequency: 462.6375 MHz, Limit: ±2.5 ppm			
Environment Temperature (℃)	**Power Supplied (V_{DC})**	**Measurement Frequency (MHz)**	**Frequency Error (ppm)**
Frequency Stability Ver. Temperature			
50	3.7	462.63702	-1.0397
40	3.7	462.63697	-1.1478
30	3.7	462.63704	-0.9965
20	3.7	462.63706	-0.9532
10	3.7	462.63701	-1.0613
0	3.7	462.63700	-1.0829
-10	3.7	462.63706	-0.9532
-20	3.7	462.63699	-1.1045
-30	3.7	462.63706	-0.9532
Frequency Stability Ver. Input Voltage			
20	3.0	462.63702	-1.0397
20	4.2	462.63697	-1.1478

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