




FCC PART 95
MEASUREMENT AND TEST REPORT

For

Cobra Electronics Corporation

6500 West Cortland Street, Chicago, Illinois, United States 60707

FCC ID: BBO29LTD

Report Type: Original Report	Product Type: CB Radio
Report Number: <u>RSZ210120005-00</u>	
Report Date: <u>2021-05-10</u>	
Reviewed By: <u>RF Engineer</u>	Jacob Kong 
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GENERAL INFORMATION

Product Description for Equipment Under Test (EUT)

Product	CB Radio
Tested Model	29 LTD
Frequency Range	26.965-27.405MHz
Rated Output Power	4 Watts
Modulation Technique	AM
Voltage Range	DC 10.8~15.6V
Date of Test	2021-01-26 to 2021-04-30
Sample serial number	RSZ210120005-RF-S1(Assigned by BAACL, Shenzhen)
Received date	2021-01-20
Sample/EUT Status	Good condition

Objective

This report is in accordance with Part 2 and Part 95, Subpart D of the Federal Communication Commissions rules.

Test Methodology

EIA/TIA-382-A:Minimum standards – Citizens Band Radio Service Amplitude Modulation (AM) Transceivers Operation in the 27MHz Band.

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. Each test item follows test standards and with no deviation.

Measurement Uncertainty

Parameter		Uncertainty
Occupied Channel Bandwidth		±5%
RF output power, conducted		±1.5dB
Unwanted Emission, conducted		±1.5dB
Emissions, radiated	Below 1GHz	±4.75dB
	Above 1GHz	±4.88dB
Temperature		±1 °C
Supply voltages		±0.4%

Note: The extended uncertainty given in this report is obtained by combining the standard uncertainty times the coverage factor K with the 95% confidence interval. Otherwise required by the applicant or Product Regulations, Decision Rule in this report did not consider the uncertainty.

Test Facility

The Test site used by Bay Area Compliance Laboratories Corp. (Shenzhen) to collect test data is located on the 5F(B-West) ,6F,7F,the 3rd Phase of Wan Li Industrial Building D,Shihua Rd, FuTian Free Trade Zone, Shenzhen, China.

The test site has been approved by the FCC under the KDB 974614 D01 and is listed in the FCC Public Access Link (PAL) database, FCC Registration No. : 342867,the FCC Designation No. : CN1221.

The test site has been registered with ISED Canada under ISED Canada Registration Number 3062B.

SYSTEM TEST CONFIGURATION

Description of Test Configuration

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

Channel List

Channel Number	Frequency (MHz)	Channel Number	Frequency (MHz)	Channel Number	Frequency (MHz)	Channel Number	Frequency (MHz)
1	26.965	11	27.085	21	27.215	31	27.315
2	26.975	12	27.105	22	27.225	32	27.325
3	26.985	13	27.115	23	27.255	33	27.335
4	27.005	14	27.125	24	27.235	34	27.345
5	27.015	15	27.135	25	27.245	35	27.355
6	27.025	16	27.155	26	27.265	36	27.365
7	27.035	17	27.165	27	27.275	37	27.375
8	27.055	18	27.175	28	27.285	38	27.385
9	27.065	19	27.185	29	27.295	39	27.395
10	27.075	20	27.205	30	27.305	40	27.405

Test at channel 1, 19, 40.

Equipment Modifications

No modification was made to the EUT tested.

Support Equipment List and Details

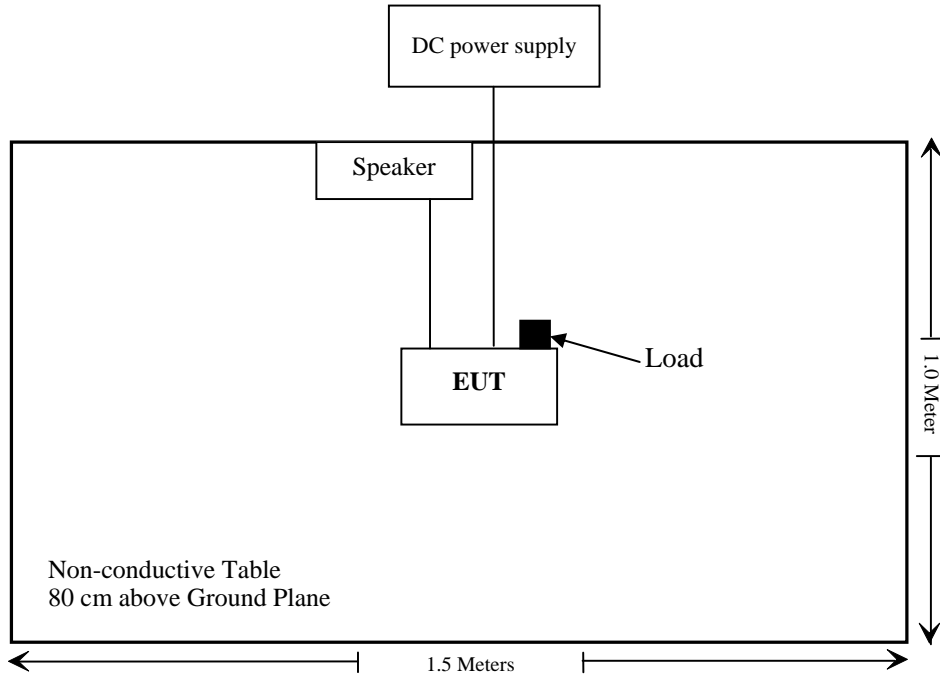
Manufacturer	Description	Model	Serial Number
Unknown	Load	50ohm/100W	Load0001
Unknown	Speaker	Unknown	Unknown
instek	DC Power Supply	GPS-3030DD	EM832096

External I/O Cable

Cable Description	Length (m)	From Port	To
Un-Shielding Detachable Audio Cable	1.0	EUT	Speaker
Un-Shielding Detachable DC Cable	1.2	DC Power Supply	EUT

Block Diagram of Test Setup

For Radiated Emissions:



SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Results
§1.1310, §2.1091	Maximum Permissible Exposure(MPE)	Compliance
§2.1046, §95.967	RF Output Power	Compliance
§2.1047, §95.975	Modulation Characteristic	Compliance
§2.1049, §95.973, §95.979	Occupied Bandwidth & Emission Mask	Compliance
§2.1053, §95.979	Spurious Radiation Emission	Compliance
§ 2.1051, § 95.979	Conducted Spurious at Antenna Terminals	Compliance
§2.1055, §95.965	Frequency Stability	Compliance

TEST EQUIPMENT LIST

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Radiated Emission Test					
R&S	EMI Test Receiver	ESR3	102455	2020/08/04	2021/08/03
Sonoma instrument	Pre-amplifier	310 N	186238	2020/08/04	2021/08/03
Sunol Sciences	Broadband Antenna	JB1	A040904-2	2020/12/22	2023/12/21
ETS	Passive Loop Antenna	6512	29604	2018/07/14	2021/07/13
COM-POWER	Dipole Antenna	AD-100	721027	NCR	NCR
Unknown	Cable 2	RF Cable 2	F-03-EM197	2020/11/29	2021/11/28
Unknown	Cable	Chamber Cable 1	F-03-EM236	2020/11/29	2021/11/28
Agilent	Signal Generator	N5183A	MY51040755	2020/12/29	2021/12/28
RF Conducted test					
Rohde & Schwarz	SPECTRUM ANALYZER	FSU26	200120	2020/04/02	2021/04/01
HP Agilent	RF Communication test set	8920A	3325UC0859	2020/08/01	2021/07/31
Unknown	30dB Attenuator	50FH-030-100 RF	1.7000672E11	2020/11/29	2021/11/28
Mini-Circuits	High Pass filter	NHP-50+	15542	2020/11/29	2021/11/28
instek	DC Power Supply	GPS-3030DD	EM832096	NCR	NCR
Fluke	Digital Multimeter	287	19000011	2020/07/23	2021/07/22
ESPEC	Temperature & Humidity Chamber	EL-10KA	9107726	2021/01/05	2022/01/05

* **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).

§1.1310, §2.1091- MAXIMUM PERMISSIBLE EXPOSURE (MPE)

According to subpart 1.1310, 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.

Limits for General Population/Uncontrolled Exposure

Limits for General Population/Uncontrolled Exposure				
Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm ²)	Averaging Time (Minutes)
0.3-1.34	614	1.63	*(100)	30
1.34-30	824/f	2.19/f	*(180/f ²)	30
30-300	27.5	0.073	0.2	30
300-1500	/	/	f/1500	30
1500-100,000	/	/	1.0	30

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)

Frequency Range (MHz)	Maximum Antenna Gain		Tune Up Conducted Power	MPE Limit (mW/cm ²)	Minimum Safe Distance (cm)
	(dBi)	(numeric)	(mW)		
26.965-27.405	0	1	4000	0.24	36.42

To maintain compliance with the FCC’s RF exposure guidelines, please place the equipment at least 36.42cm from nearby persons.

Result: Compliance

FCC §2.1046 & §95.967 - RF OUTPUT POWER

Applicable Standard

Per FCC §95.967: Each CBRS transmitter type must be designed such that the transmitter power can not exceed the following limits:

(a) When transmitting amplitude modulated (AM) voice signals, the mean carrier power must not exceed 4 Watts.

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
10 kHz	30 kHz

Test Data

Environmental Conditions

Temperature:	23 °C
Relative Humidity:	54 %
ATM Pressure:	101.0 kPa

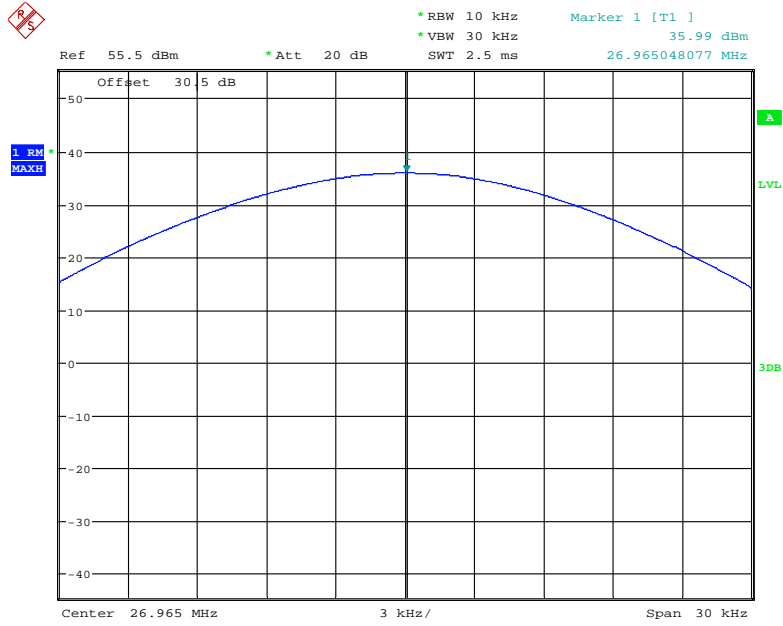
The testing was performed by Black Chen on 2021-02-18.

Test Mode: Transmitting

Fc (MHz)	Reading (dBm)	Power (Watt)	Limit (Watt)
26.965	35.99	3.97	4.0
27.185	35.94	3.93	
27.405	35.46	3.52	

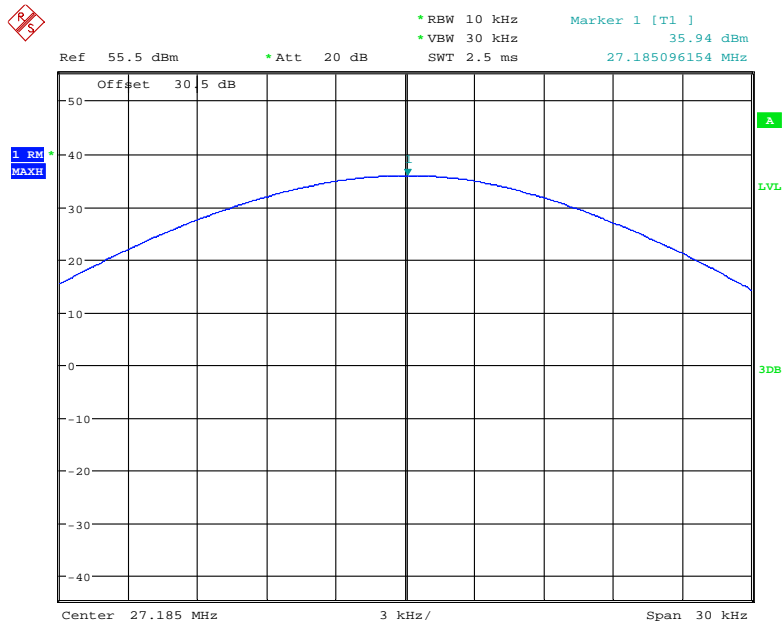
Test Result: Compliance.

Low Channel



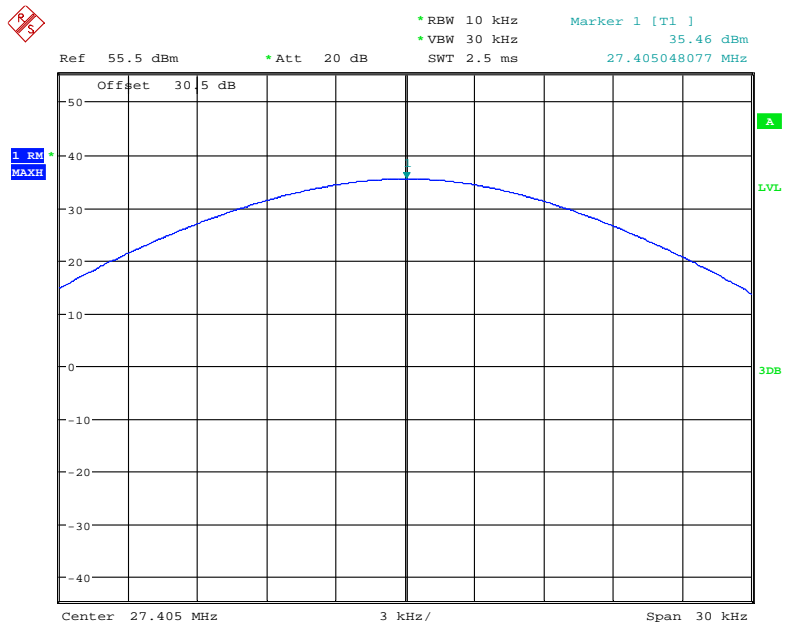
Date: 18.FEB.2021 09:45:20

Middle Channel



Date: 18.FEB.2021 09:45:44

High Channel



Date: 18.FEB.2021 09:43:22

FCC §2.1047 & §95.975 - MODULATION CHARACTERISTIC

Applicable Standard

Per FCC §95.975: Each CBRS transmitter type must be designed such that the modulation characteristics are in compliance with the rules in this section.

(a) When emission type A3E is transmitted with voice modulation, the modulation percentage must be at least 85%, but not more than 100%.

(b) When emission type A3E is transmitted by a CBRS transmitter having a transmitter output power of more than 2.5 W, the transmitter must contain a circuit that automatically prevents the modulation percentage from exceeding 100%.

Test Procedure

EIA/TIA-382-A Section 24.2 and section 25.2.

Test Data

Environmental Conditions

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

The testing was performed by Black Chen on 2021-02-18.

Please refer to the following tables and plots.

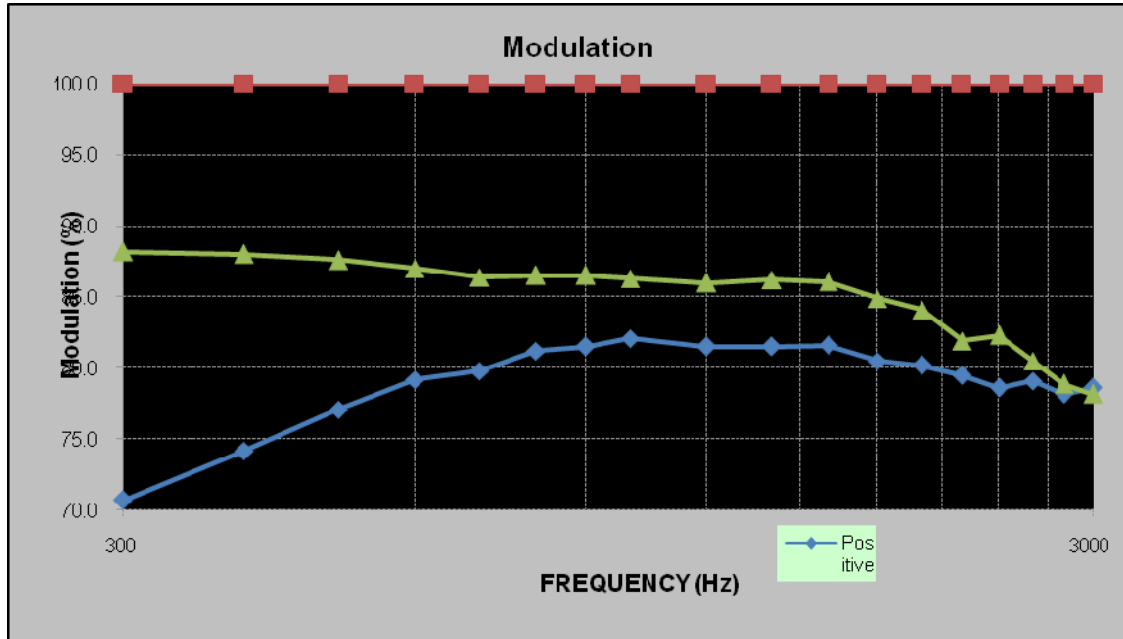
Test Mode: Transmitting

Modulation limiting

Carrier Frequency: 27.185MHz

Audio Frequency (Hz)	Modulation Level[%]		Limit [%]
	Positive	Negative	
300	70.700	88.200	100.00
400	74.200	88.000	100.00
500	77.100	87.600	100.00
600	79.200	87.000	100.00
700	79.800	86.400	100.00
800	81.200	86.500	100.00
900	81.500	86.500	100.00
1000	82.100	86.300	100.00
1200	81.500	86.000	100.00
1400	81.500	86.200	100.00
1600	81.600	86.100	100.00
1800	80.500	84.900	100.00
2000	80.200	84.100	100.00
2200	79.500	81.900	100.00
2400	78.600	82.300	100.00
2600	79.100	80.500	100.00
2800	78.200	78.900	100.00
3000	78.600	78.200	100.00

Note: Audio input level (the 40dB above 0dB reference): 100.4dBuV



FCC §2.1049 & §95.973 & §95.979- OCCUPIED BANDWIDTH AND EMISSION MASK

Applicable Standard

According to §95.973: Each CBRS transmitter type must be designed such that the occupied bandwidth does not exceed the authorized bandwidth for the emission type under test.

- (a) AM. The authorized bandwidth for emission type A3E is 8 kHz.
- (b) SSB. The authorized bandwidth for emission types J3E, R3E, and H3E is 4 kHz.

According to §95.979: Each CBRS transmitter type must be designed to comply with the applicable unwanted emissions limits in this section.

(a) Attenuation requirements. The power of unwanted emissions must be attenuated below the transmitter output power in Watts (P) as specified in the applicable paragraphs listed in the following table:

Emission type	Paragraph
A3E	(1), (3), (5), (6)
H3E, J3E, R3E	(2), (4), (5), (6)

- (1) 25 dB (decibels) in the frequency band 4 kHz to 8 kHz removed from the channel center frequency;
 - (2) 25 dB in the frequency band 2 kHz to 6 kHz removed from the channel center frequency;
 - (3) 35 dB in the frequency band 8 kHz to 20 kHz removed from the channel center frequency;
 - (4) 35 dB in the frequency band 6 kHz to 10 kHz removed from the channel center frequency;
 - (5) $53 + 10 \log (P)$ dB in any frequency band removed from the channel center frequency by more than 250% of the authorized bandwidth.
 - (6) 60 dB in any frequency band centered on a harmonic (*i.e.*, an integer multiple of two or more times) of the carrier frequency.
- (b) *Measurement bandwidths.* The power of unwanted emissions in the frequency bands specified in paragraphs (a)(1) through (4) of this section is measured with a reference bandwidth of 300 Hz. The power of unwanted emissions in the frequency ranges specified in paragraphs (a)(5) and (6) of this section is measured with a reference bandwidth of at least 30 kHz.
- (c) *Measurement conditions and procedures.* Subject to additional measurement standards and procedures established pursuant to part 2, subpart J, the following conditions and procedures must be used.
- (1) The unwanted emissions limits requirements in this section must be met both with and without the connection of permitted attachments, such as external speakers, microphones, power cords and/or antennas.
 - (2) Either mean power output or peak envelope power output may be used for measurements, as appropriate for the emission type under test, provided that the same type of power measurement is used for both the transmitter output power and the power of the unwanted emissions.

Test Procedure

EIA/TIA-382-A Section 23.2.

Test Data

Environmental Conditions

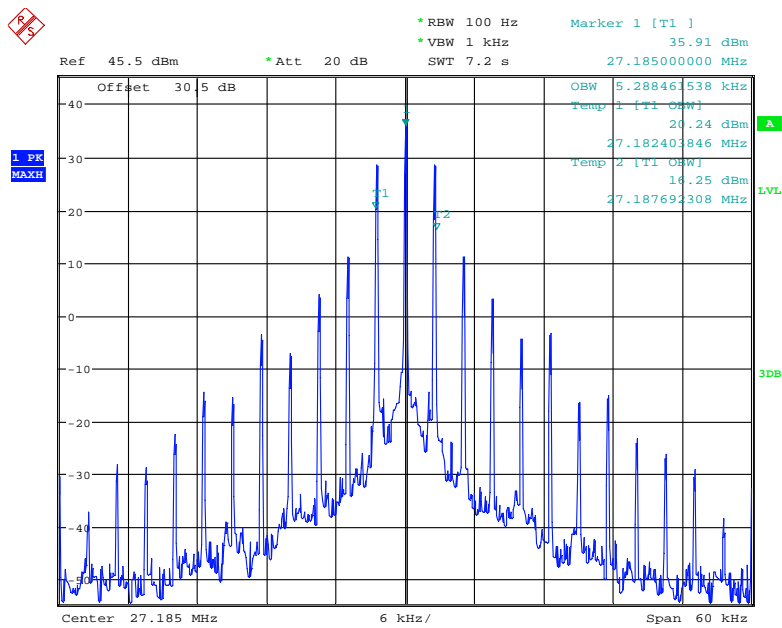
Temperature:	23 °C
Relative Humidity:	55 %
ATM Pressure:	101.0 kPa

The testing was performed by Black Chen on 2021-02-18.

Test Mode: Transmitting

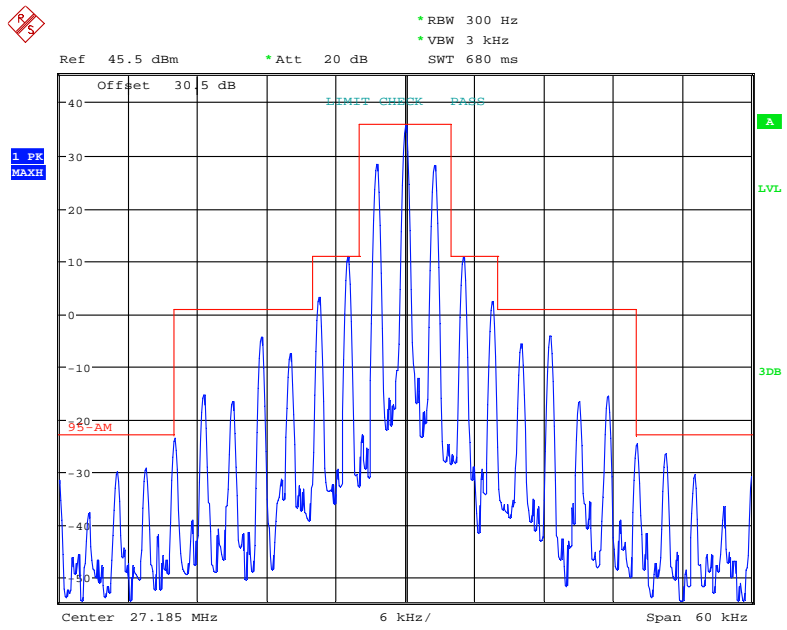
Fc (MHz)	99% Occupied Bandwidth (kHz)	Limit (kHz)
27.185	5.288	8.0

OBW



Date: 18.FEB.2021 15:00:14

Emission Mask



Date: 18.FEB.2021 14:57:49

FCC §2.1053 & §95.979- SPURIOUS RADIATION EMISSION

Applicable Standard

FCC §2.1053 and §95.979: Each CBRS transmitter type must be designed to comply with the applicable unwanted emissions limits in this section.

(a) *Attenuation requirements.* The power of unwanted emissions must be attenuated below the transmitter output power in Watts (P) as specified in the applicable paragraphs listed in the following table:

Emission type	Paragraph
A3E	(1), (3), (5), (6)
H3E, J3E, R3E	(2), (4), (5), (6)

- (1) 25 dB (decibels) in the frequency band 4 kHz to 8 kHz removed from the channel center frequency;
- (2) 25 dB in the frequency band 2 kHz to 6 kHz removed from the channel center frequency;
- (3) 35 dB in the frequency band 8 kHz to 20 kHz removed from the channel center frequency;
- (4) 35 dB in the frequency band 6 kHz to 10 kHz removed from the channel center frequency;
- (5) $53 + 10 \log (P)$ dB in any frequency band removed from the channel center frequency by more than 250% of the authorized bandwidth.
- (6) 60 dB in any frequency band centered on a harmonic (*i.e.*, an integer multiple of two or more times) of the carrier frequency.

(b) *Measurement bandwidths.* The power of unwanted emissions in the frequency bands specified in paragraphs (a)(1) through (4) of this section is measured with a reference bandwidth of 300 Hz. The power of unwanted emissions in the frequency ranges specified in paragraphs (a)(5) and (6) of this section is measured with a reference bandwidth of at least 30 kHz.

(c) *Measurement conditions and procedures.* Subject to additional measurement standards and procedures established pursuant to part 2, subpart J, the following conditions and procedures must be used.

- (1) The unwanted emissions limits requirements in this section must be met both with and without the connection of permitted attachments, such as external speakers, microphones, power cords and/or antennas.
- (2) Either mean power output or peak envelope power output may be used for measurements, as appropriate for the emission type under test, provided that the same type of power measurement is used for both the transmitter output power and the power of the unwanted emissions.

Test Procedure

EIA/TIA-382-A Section 22.2.

Test Data**Environmental Conditions**

Temperature:	26 °C
Relative Humidity:	63 %
ATM Pressure:	101.0 kPa

The testing was performed by Andy Yu on 2021-04-30.

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 (dBd)			
27.185MHz										
190.29	69.66	288	1.3	H	-39.5	0.85	0.0	-40.35	-24	16.35
190.29	60.17	181	1.2	V	-46.5	0.85	0.0	-47.35	-24	23.35
271.77	71.10	103	1.5	H	-39.9	0.90	0.0	-40.80	-24	16.80
271.77	69.45	99	1.6	V	-38.4	0.90	0.0	-39.30	-24	15.30
299.05	74.37	90	2.1	H	-33.6	0.94	0.0	-34.54	-24	10.54
299.05	77.34	128	1.5	V	-27.9	0.94	0.0	-28.84	-24	4.84
326.21	78.87	82	2.2	H	-29.1	0.94	0.0	-30.04	-24	6.04
326.21	74.74	229	1.2	V	-30.5	0.94	0.0	-31.44	-24	7.44
353.37	80.66	89	1.5	H	-26.2	0.98	0.0	-27.18	-24	3.18
353.37	74.74	87	2.3	V	-29.1	0.98	0.0	-30.08	-24	6.08
380.53	71.53	35	2.3	H	-35.0	1.00	0.0	-36.00	-24	12.00
380.53	70.38	280	2.2	V	-33.6	1.00	0.0	-34.60	-24	10.60
407.82	73.49	276	2.2	H	-33.0	1.00	0.0	-34.00	-24	10.00
407.82	72.22	265	2.1	V	-31.8	1.00	0.0	-32.80	-24	8.80
434.98	68.41	180	1.2	H	-38.1	1.00	0.0	-39.10	-24	15.10
434.98	63.49	30	1.8	V	-40.5	1.00	0.0	-41.50	-24	17.50
462.14	68.41	297	1.3	H	-37.3	1.05	0.0	-38.35	-24	14.35
462.14	64.33	149	1.9	V	-36.6	1.05	0.0	-37.65	-24	13.65
489.30	72.35	153	1.9	H	-31.0	1.07	0.0	-32.07	-24	8.07
489.30	66.59	55	2.4	V	-33.4	1.07	0.0	-34.47	-24	10.47
570.89	63.58	309	2.3	H	-37.7	1.10	0.0	-38.80	-24	14.80
570.89	67.76	259	1.1	V	-31.3	1.10	0.0	-32.40	-24	8.40

Note 1: The unit of antenna gain is dBd for frequency below 1GHz and is dBi for frequency above 1GHz.

Note 2: Absolute Level = SG Level - Cable loss + Antenna Gain

Margin = Limit - Absolute Level

Note 3: The limit = 60dB below the rated power = 36dBm-60dB=-24dBm

Note 4: No emission was detected in 9kHz~30MHz.

FCC§2.1051 & §95.979 - CONDUCTED SPURIOUS AT ANTENNA TERMINALS

Applicable Standard

FCC §2.1051 and §95.979: Each CBRS transmitter type must be designed to comply with the applicable unwanted emissions limits in this section.

(a) *Attenuation requirements.* The power of unwanted emissions must be attenuated below the transmitter output power in Watts (P) as specified in the applicable paragraphs listed in the following table:

Emission type	Paragraph
A3E	(1), (3), (5), (6)
H3E, J3E, R3E	(2), (4), (5), (6)

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- (2) 25 dB in the frequency band 2 kHz to 6 kHz removed from the channel center frequency;
- (3) 35 dB in the frequency band 8 kHz to 20 kHz removed from the channel center frequency;
- (4) 35 dB in the frequency band 6 kHz to 10 kHz removed from the channel center frequency;
- (5) $53 + 10 \log (P)$ dB in any frequency band removed from the channel center frequency by more than 250% of the authorized bandwidth.
- (6) 60 dB in any frequency band centered on a harmonic (*i.e.*, an integer multiple of two or more times) of the carrier frequency.

(b) *Measurement bandwidths.* The power of unwanted emissions in the frequency bands specified in paragraphs (a)(1) through (4) of this section is measured with a reference bandwidth of 300 Hz. The power of unwanted emissions in the frequency ranges specified in paragraphs (a)(5) and (6) of this section is measured with a reference bandwidth of at least 30 kHz.

(c) *Measurement conditions and procedures.* Subject to additional measurement standards and procedures established pursuant to part 2, subpart J, the following conditions and procedures must be used.

- (1) The unwanted emissions limits requirements in this section must be met both with and without the connection of permitted attachments, such as external speakers, microphones, power cords and/or antennas.
- (2) Either mean power output or peak envelope power output may be used for measurements, as appropriate for the emission type under test, provided that the same type of power measurement is used for both the transmitter output power and the power of the unwanted emissions.

Test Procedure

EIA/TIA-382-A Section 21.2.

Test Data

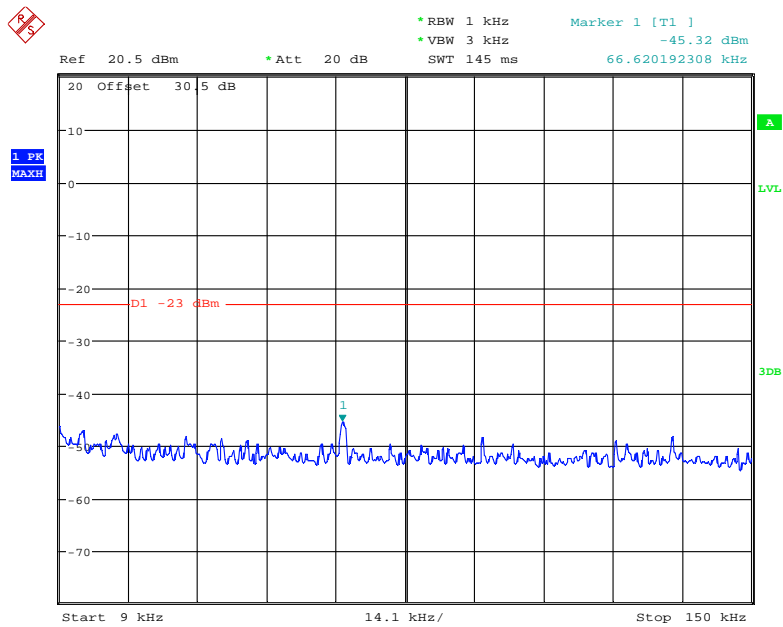
Environmental Conditions

Temperature:	23 °C
Relative Humidity:	55 %
ATM Pressure:	101.0 kPa

The testing was performed by Black Chen on 2021-01-26 and 2021-02-18.

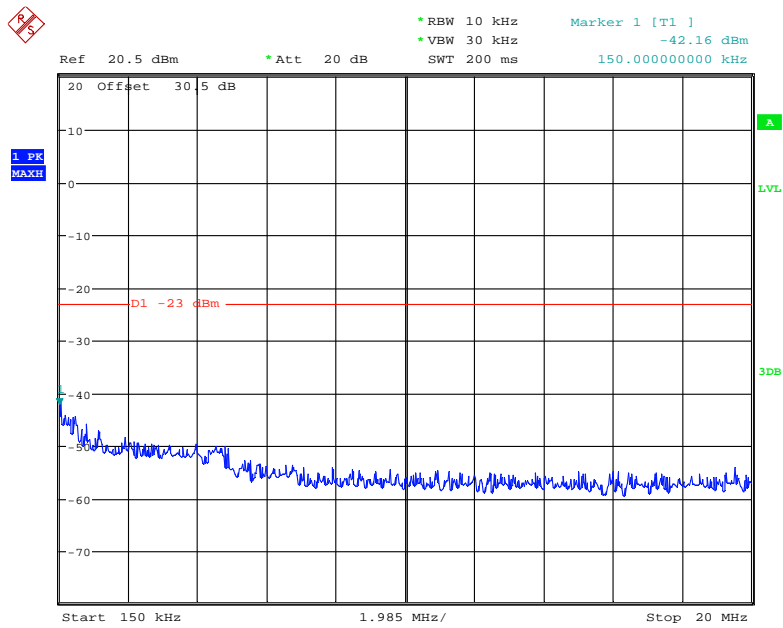
Test Mode: Transmitting

9 kHz -150 kHz



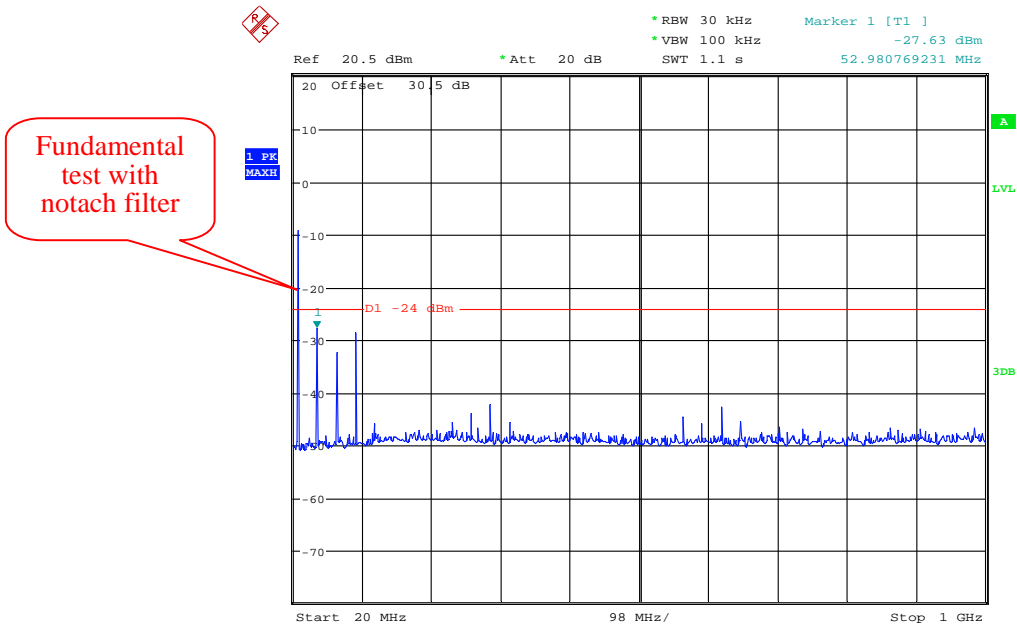
Date: 18.FEB.2021 11:04:01

150 kHz -20 MHz



Date: 18.FEB.2021 13:30:06

20 MHz -1 GHz



Date: 26.JAN.2021 09:10:23

FCC§2.1055& §95.965 - FREQUENCY STABILITY

Applicable Standard

§95.965: Each CBRS transmitter type must be designed such that the transmit carrier frequency (or in the case of SSB transmissions, the reference frequency) remains within 50 parts-per-million of the channel center frequencies specified in §95.963 under all normal operating conditions.

Test Procedure

Frequency Stability vs. Temperature: The equipment under test was connected to an external AC/DC power supply and the RF output was connected to communication test set via feed-through attenuators. The EUT was placed inside the temperature chamber. The power cable 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:	24 °C
Relative Humidity:	55 %
ATM Pressure:	101.0 kPa

The testing was performed by Black Chen on 2021-02-18.

Test Mode: Transmitting

Reference Frequency: 27.185 MHz				
Temperature (°C)	Voltage (V_{DC})	Reading (MHz)	Frequency Error (ppm)	Limit (ppm)
-30	13.8	27.185029	1.07	50
-20		27.185030	1.10	
-10		27.185037	1.36	
0		27.185035	1.29	
10		27.185033	1.21	
20		27.185037	1.36	
30		27.185041	1.51	
40		27.185043	1.58	
50		27.185042	1.54	
20		10.8	27.185039	
20	15.6	27.185045	1.66	

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