中认信通
CHINA CERTIFICATION ICT CO., LTD (DONGGUAN)

ACCREDITED
TESTING LABORATORY
CERTIFICATE # 6356.01

TEST REPORT

Applicant: **ABELL INDUSTRIES CO.,LTD.**

Address: 701-702, 7/F, D Bldg, Qianwan Hard Technology Industrial Park, Nanchang community, Xixiang Rd., Bao An Dist., Shenzhen.

FCC ID: **TEYR-80**

Product Name: **Two Way Radio**

Model Number: **R-80**

Standard(s): **47 CFR Part 2**
47 CFR Part 90
ANSI C63.26-2015
ANSI/TIA 603-E-2016

The above equipment has been tested and found compliant with the requirement of the relative standards by China Certification ICT Co., Ltd (Dongguan)

Report Number: **CR21110033-00B**

Date Of Issue: **2021-03-05**

Reviewed By: **Sun Zhong** Sun Zhong

Title: Manager

Test Laboratory: **China Certification ICT Co., Ltd (Dongguan)**
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Test Facility

The Test site used by China Certification ICT Co., Ltd (Dongguan) to collect test data is located on the No. 113, Pingkang Road, Dalang Town, Dongguan, Guangdong, China.

The lab has been recognized as the FCC accredited lab under the KDB 974614 D01 and is listed in the FCC Public Access Link (PAL) database, FCC Registration No. : 442868, the FCC Designation No. : CN1314.

The lab has been recognized by Innovation, Science and Economic Development Canada to test to Canadian radio equipment requirements, the CAB identifier: CN0123.

Declarations

China Certification ICT Co., Ltd (Dongguan) is not responsible for the authenticity of any test data provided by the applicant. Data included from the applicant that may affect test results are marked with a triangle symbol "▲". Customer model name, addresses, names, trademarks etc. are not considered data.

Unless otherwise stated the results shown in this test report refer only to the sample(s) tested.

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CONTENTS

TEST FACILITY 2

DECLARATIONS 2

1. GENERAL INFORMATION 5

1.1 PRODUCT DESCRIPTION FOR EQUIPMENT UNDER TEST (EUT) 5

1.2 DESCRIPTION OF TEST CONFIGURATION 6

1.2.2 Support Equipment List and Details 6
1.2.3 Support Cable List and Details 6
1.2.4 Block Diagram of Test Setup 6

1.3 MEASUREMENT UNCERTAINTY 7

2. SUMMARY OF TEST RESULTS 8

3. REQUIREMENTS AND TEST PROCEDURES 9

3.1 TRANSMITTER FREQUENCY STABILITY 9

3.1.1 Applicable Standard 9
3.1.2 Test Procedure 9

3.2 TRANSMITTER OUTPUT POWER 9

3.2.1 Applicable Standard 9
3.1.2 Test Procedure 10

3.3 OCCUPIED BANDWIDTH & EMISSION MASK 10

3.3.1 Applicable Standard 10
3.3.2 Test Procedure 11

3.4 TRANSMITTER UNWANTED EMISSIONS(CONDUCTED) 12

3.4.1 Applicable Standard 12
3.4.2 Test Procedure 13

3.5 TRANSMITTER UNWANTED EMISSIONS(RADIATED) 14

3.5.1 Applicable Standard 14
3.5.2 Test Procedure 15

3.6 TRANSIENT FREQUENCY BEHAVIOR 16

3.6.1 Applicable Standard 16
3.6.2 Test Procedure 16

3.7 MODULATION CHARACTERISTICS. 17

3.7.1 Applicable Standard 17
3.7.2 Test Procedure 17

4. Test DATA AND RESULTS 18

4.1 TRANSMITTER FREQUENCY STABILITY 18

4.2 TRANSMITTER OUTPUT POWER 20

4.3 OCCUPIED BANDWIDTH & EMISSION MASK 23

4.4 TRANSMITTER UNWANTED EMISSIONS (CONDUCTED) 29

4.5 TRANSIENT FREQUENCY BEHAVIOR 32

4.6 MODULATION CHARACTERISTIC 34

4.7 TRANSMITTER UNWANTED EMISSIONS (RADIATED) 37

5. RF EXPOSURE EVALUATION 41

5.1 FCC MAXIMUM PERMISSIBLE EXPOSURE (MPE) 41

5.1.1 Applicable Standard 41
5.1.2 Limits 41
5.1.3 Calculated Formulary: 41
5.1.4 Calculated Data 41

1. GENERAL INFORMATION

1.1 Product Description for Equipment under Test (EUT)

EUT Name:	Two Way Radio
EUT Model:	R-80
Operation Frequency:	400-470 MHz
Modulation Type:	FM, 4FSK
Channel Spacing:	12.5 kHz
Rated Output Power: (Conducted)	High Power Level: 50W Low Power Level: 5W
Rated Input Voltage:	AC 100~240V
Serial Number:	CR21110033-RF
EUT Received Date:	2021.12.15
EUT Received Status:	Good

Antenna Information Detail▲:

Antenna Manufacturer	Antenna Type	input impedance (Ohm)	Antenna Gain /Frequency Range
/	/	50	5.0 dBi/400-470MHz
Note: No antenna shipped with the product, the maximum allowed antenna gain is 5.0dBi. Installer should follow the install manual requirements.			

Accessory Information:

Accessory Description	Manufacturer	Model	Parameters
/	/	/	/

Test Frequency Detail:

Per C63.26-2015, section 5.1, the lowest frequency, middle frequency, and highest frequency was performed the test as below:

Modulation/ Channel Bandwidth	Test Channel	Frequency (MHz)	Rule Part
FM 12.5kHz	Lowest	400.0125	For Federal
	Middle	453.2125	For Part 90
	Highest	469.9875	For Part 90
4FSK 12.5kHz	Lowest	400.0125	For Federal
	Middle	453.2125	For Part 90
	Highest	469.9875	For Part 90

1.2 Description of Test Configuration

1.2.1 EUT Operation Condition:

EUT Operation Mode:	The system was configured for testing in Engineering Mode, which was provided by the manufacturer.
Equipment Modifications:	No
EUT Exercise Software:	No

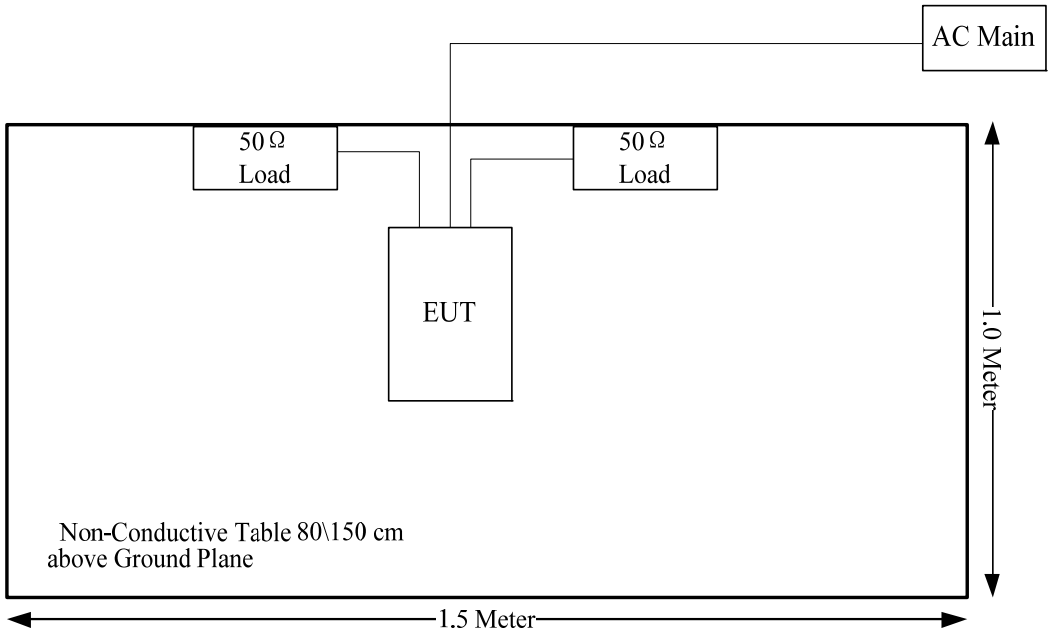
1.2.2 Support Equipment List and Details

Manufacturer	Description	Model	Serial Number
WEINSCHEL Corp	Load	50oml	50oml Load-1
WEINSCHEL Corp	Load	50oml	50oml Load-2

1.2.3 Support Cable List and Details

Cable Description	Shielding Type	Ferrite Core	Length (m)	From Port	To
RF Cable*2	Yes	No	0.2	EUT	Load/Attenuator

1.2.4 Block Diagram of Test Setup



1.3 Measurement Uncertainty

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

Parameter	Measurement Uncertainty
Occupied Channel Bandwidth	±5 %
RF output power, conducted	±0.61dB
Power Spectral Density, conducted	±0.61 dB
Unwanted Emissions, radiated	30M~200MHz: 4.15 dB,200M~1GHz: 5.61 dB,1G~6GHz: 5.14 dB, 6G~18GHz: 5.93 dB,18G~26.5G:5.47 dB,26.5G~40G:5.63 dB
Unwanted Emissions, conducted	±1.26 dB
Temperature	±1℃
Humidity	±5%
DC and low frequency voltages	±0.4%
Duty Cycle	1%
RF Frequency	$\pm 0.082 \times 10^{-6}$
Audio Frequency/Low Pass Filter Response	4.02%
Modulation Limiting	1.19%

2. SUMMARY OF TEST RESULTS

Standard/Rule(s)	Description of Test	Results
§2.1055; §90.213	Frequency Stability	Compliant
§2.1046; §90.205	RF Output Power	Compliant
§2.1049; §90.209; §90.210	Occupied Bandwidth & Emission Mask	Compliant
§2.1051;§90.210	Spurious Emission at Antenna Terminal	Compliant
§2.1053;§90.210	Spurious Radiated Emissions	Compliant
§90.214	Transient Frequency Behavior	Compliant
§2.1047	Modulation Characteristic	Compliant
§1.1310 & §2.1091	Maximum Permissible Exposure (MPE)	Compliant

3. REQUIREMENTS AND TEST PROCEDURES

3.1 Transmitter Frequency Stability

3.1.1 Applicable Standard

FCC §90.213

In the 421-512 MHz band, mobile stations designed to operate with a 12.5 kHz channel bandwidth must have a frequency stability of 2.5 ppm. Mobile stations designed to operate with a 6.25 kHz channel bandwidth must have a frequency stability of 1.0 ppm.

3.1.2 Test Procedure

Frequency Stability vs. Temperature: The equipment under test was connected to an external 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 or AC 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.

3.2 Transmitter Output Power

3.2.1 Applicable Standard

FCC §90.205

(h) 450-470 MHz.
(1) The maximum allowable station effective radiated power (ERP) is dependent upon the station's antenna HAAT and required service area and will be authorized in accordance with table 2. Applicants requesting an ERP in excess of that listed in table 2 must submit an engineering analysis based upon generally accepted engineering practices and standards that includes coverage contours to demonstrate that the requested station parameters will not produce coverage in excess of that which the applicant requires.

(2) Applications for stations where special circumstances exist that make it necessary to deviate from the ERP and antenna heights in Table 2 will be submitted to the frequency coordinator accompanied by a technical analysis, based upon generally accepted engineering practices and standards, that demonstrates that the requested station parameters will not produce a signal strength in excess of 39 dBu at any point along the edge of the requested service area. The coordinator may then recommend any ERP appropriate to meet this condition.

(3) An applicant for a station with a service area radius greater than 32 km (20 mi) must justify the requested service area radius, which may be authorized only in accordance with table 2, note 4. For base stations with service areas greater than 80 km, all operations 80 km or less from the base station will be on a primary basis and all operations outside of 80 km from the base station will be on a secondary basis and will be entitled to no protection from primary operations.

3.1.2 Test Procedure

Before performing this measurement, the power of the EUT shall be set or controlled to the maximum rating of the range for which equipment certification or verification is sought.

Except where otherwise specified, tests shall be performed at the ambient temperature, at the manufacturer's rated supply voltage, and with the transmitter modulating signal representative (i.e. typical) of those encountered in a real system operation.

The spectrum analyzer shall be configured with a resolution bandwidth that encompasses the entire occupied bandwidth (see section 6.7) of the EUT. If the spectrum analyzer's largest available resolution bandwidth is smaller than the occupied bandwidth of the EUT, it is permitted to use a narrower resolution bandwidth plus numerical integration, in linear power terms, over the occupied bandwidth of the transmitter in order to measure its output power, except when the emission is a wideband noise-like signal and being measured for peak power. For transmitters with constant envelope modulation, RF output power and field strength measurements performed on the fundamental frequency can be carried out with an unmodulated carrier. The method used shall be described in the test report.

3.3 Occupied Bandwidth & Emission Mask

3.3.1 Applicable Standard

FCC §90.209

(a) Each authorization issued to a station licensed under this part will show an emission designator representing the class of emission authorized. The designator will be prefixed by a specified necessary bandwidth. This number does not necessarily indicate the bandwidth occupied by the emission at any instant. In those cases where §2.202 of this chapter does not provide a formula for the computation of necessary bandwidth, the occupied bandwidth, as defined in part 2 of this chapter, may be used in lieu of the necessary bandwidth.

(b) (5)Unless specified elsewhere, channel spacings and bandwidths that will be authorized in the following frequency bands are given in the following table: STANDARD CHANNEL SPACING/BANDWIDTH

FCC §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) On any frequency from the center of the authorized bandwidth f0 to 5.625 kHz removed from f0: Zero dB.

(2) On any frequency removed from the center of the authorized bandwidth by a displacement frequency (fd in kHz) of more than 5.625 kHz but no more than 12.5 kHz: At least 7.27(fd−2.88 kHz) dB.

(3) On any frequency removed from the center of the authorized bandwidth by a displacement frequency (fd 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 instrumentresolution 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.

3.3.2 Test Procedure

The occupied bandwidth or the "99% emission bandwidth" is defined as the frequency range between two points, one above and the other below the carrier frequency, within which 99% of the total transmitted power of the fundamental transmitted emission is contained. The occupied bandwidth shall be reported for all equipment in addition to the specified bandwidth required in the applicable RSSs.
In some cases, the "x dB bandwidth" is required, which is defined as the frequency range between two points, one at the lowest frequency below and one at the highest frequency above the carrier frequency, at which the maximum power level of the transmitted emission is attenuated x dB below the maximum in-band power level of the modulated signal, where the two points are on the outskirts of the in-band emission.
The following conditions shall be observed for measuring the occupied bandwidth and x dB bandwidth:
• The transmitter shall be operated at its maximum carrier power measured under normal test conditions.

• The span of the spectrum analyzer shall be set large enough to capture all products of the modulation process, including the emission skirts, around the carrier frequency, but small enough to avoid having other emissions (e.g. on adjacent channels) within the span.

• The detector of the spectrum analyzer shall be set to "Sample". However, a peak, or peak hold, may be used in place of the sampling detector since this usually produces a wider bandwidth than the actual bandwidth (worst-case measurement). Use of a peak hold (or "Max Hold") may be necessary to determine the occupied / x dB bandwidth if the device is not transmitting continuously.

• The resolution bandwidth (RBW) shall be in the range of 1% to 5% of the actual occupied / x dB bandwidth and the video bandwidth (VBW) shall not be smaller than three times the RBW value. Video averaging is not permitted.

Note: It may be necessary to repeat the measurement a few times until the RBW and VBW are in compliance with the above requirement.

For the 99% emission bandwidth, the trace data points are recovered and directly summed in linear

power level terms. The recovered amplitude data points, beginning at the lowest frequency, are placed in a running sum until 0.5% of the total is reached, and that frequency recorded. The process is repeated for the highest frequency data points (starting at the highest frequency, at the right side of the span, and going down in frequency). This frequency is then recorded. The difference between the two recorded frequencies is the occupied bandwidth (or the 99% emission bandwidth).

Emission Mask D for Transmitters Equipped With or Without an Audio Low-Pass Filter

The power of any emission shall be attenuated below the transmitter output power P (dBW) as specified in Table.

Displacement Frequency, f_d (kHz)	Minimum Attenuation (dB)	Resolution Bandwidth (Hz)
$5.625 < f_d \leq 12.5$	$7.27(f_d - 2.88)$	Specified in Section 4.2.2
$f_d > 12.5$	Whichever is the lesser: 70 or $50 + 10 \log_{10}(p)$	Specified in Section 4.2.2

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 mode. For emissions beyond 50 kHz from the edge of the authorized bandwidth, the resolution bandwidth shall be 100 kHz for frequencies at or below 1 GHz, and 1 MHz for frequencies above 1 GHz. However, for emission mask F, at a displacement frequency of less than 3.75 kHz, the resolution bandwidth shall be 30 Hz.

3.4 Transmitter Unwanted Emissions(Conducted)

3.4.1 Applicable Standard

FCC §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:

(5) On any frequency from the center of the authorized bandwidth f0 to 5.625 kHz removed from f0: Zero dB.

(6) On any frequency removed from the center of the authorized bandwidth by a displacement frequency (fd in kHz) of more than 5.625 kHz but no more than 12.5 kHz: At least 7.27(fd−2.88 kHz) dB.

(7) On any frequency removed from the center of the authorized bandwidth by a displacement frequency (fd in kHz) of more than 12.5 kHz: At least 50 + 10 log (P) dB or 70 dB, whichever is the lesser attenuation.

(8) 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 instrumentresolution 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.

3.4.2 Test Procedure

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 mode. For emissions beyond 50 kHz from the edge of the authorized bandwidth, the resolution bandwidth shall be 100 kHz for frequencies at or below 1 GHz, and 1 MHz for frequencies above 1 GHz. However, for emission mask F, at a displacement frequency of less than 3.75 kHz, the resolution bandwidth shall be 30 Hz.

In measuring unwanted emissions, the spectrum shall be investigated from 30 MHz or the lowest radio frequency signal generated or used in the equipment, whichever is lower, without going below 9 kHz, up to at least the applicable frequency given below:
(a) If the equipment operates below 10 GHz: to the tenth harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower.

(b) If the equipment operates at or above 10 GHz and below 30 GHz: to the fifth harmonic of the highest fundamental frequency or to 100 GHz, whichever is lower.

(c) If the equipment operates at or above 30 GHz: to the fifth harmonic of the highest fundamental frequency or to 200 GHz, whichever is lower, unless specified otherwise in the applicable RSS.

(d) If the equipment contains a digital device that is exclusively used for enabling the operation of the radio apparatus: the spectrum shall be investigated according to the conditions specified in paragraphs (a) through (c) of this section or the range applicable to the digital device, as shown in table 2, whichever is the higher frequency range of investigation.

Table 2 – Frequency range for radiated measurement for equipment with a digital device

Highest frequency generated, operated or used in the equipment (MHz)	Upper frequency limit of measurement range (MHz)
< 1.705	30
1.705-108	1000
108-500	2000
500-1000	5000
> 1000	5th harmonic of the highest frequency or 40 GHz, whichever is lower

It is not necessary to report the amplitude of spurious emissions attenuated more than 20 dB below the permissible value

3.5 Transmitter Unwanted Emissions(Radiated)

3.5.1 Applicable Standard

FCC §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:

(9) On any frequency from the center of the authorized bandwidth f0 to 5.625 kHz removed from f0: Zero dB.

(10) On any frequency removed from the center of the authorized bandwidth by a displacement frequency (fd in kHz) of more than 5.625 kHz but no more than 12.5 kHz: At least 7.27(fd−2.88 kHz) dB.

(11) On any frequency removed from the center of the authorized bandwidth by a displacement frequency (fd in kHz) of more than 12.5 kHz: At least 50 + 10 log (P) dB or 70 dB, whichever is the lesser attenuation.

(12) 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 instrumentresolution 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.

3.5.2 Test Procedure

In measuring unwanted emissions, the spectrum shall be investigated from 30 MHz or the lowest radio frequency signal generated or used in the equipment, whichever is lower, without going below 9 kHz, up to at least the applicable frequency given below:
(a) If the equipment operates below 10 GHz: to the tenth harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower.

(b) If the equipment operates at or above 10 GHz and below 30 GHz: to the fifth harmonic of the highest fundamental frequency or to 100 GHz, whichever is lower.

(c) If the equipment operates at or above 30 GHz: to the fifth harmonic of the highest fundamental frequency or to 200 GHz, whichever is lower, unless specified otherwise in the applicable RSS.

(d) If the equipment contains a digital device that is exclusively used for enabling the operation of the radio apparatus: the spectrum shall be investigated according to the conditions specified in paragraphs (a) through (c) of this section or the range applicable to the digital device, as shown in table 2, whichever is the higher frequency range of investigation.

Table 2 – Frequency range for radiated measurement for equipment with a digital device

Highest frequency generated, operated or used in the equipment (MHz)	Upper frequency limit of measurement range (MHz)
< 1.705	30
1.705-108	1000
108-500	2000
500-1000	5000
> 1000	5^{th} harmonic of the highest frequency or 40 GHz, whichever is lower

It is not necessary to report the amplitude of spurious emissions attenuated more than 20 dB below the permissible value

3.6 Transient Frequency Behavior

3.6.1 Applicable Standard

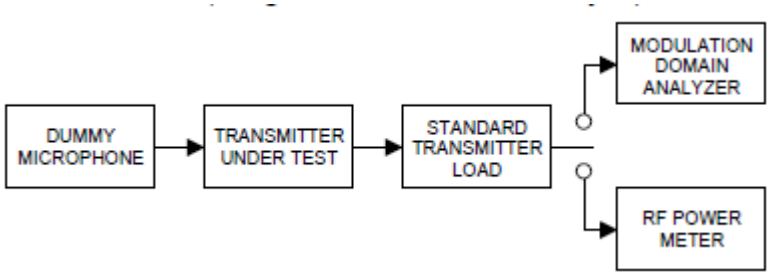
FCC §90.214

Transmitters designed to operate in the 150-174 MHz and 421-512 MHz frequency bands must maintain transient frequencies within the maximum frequency difference limits during the time intervals indicated:

Time intervals[1 2]	Maximum frequency difference[3]	All equipment	
		150 to 174 MHz	421 to 512 MHz
Transient Frequency Behavior for Equipment Designed to Operate on 12.5 kHz Channels			
t_1[4]	±12.5 kHz	5.0 ms	10.0 ms
t_2	±6.25 kHz	20.0 ms	25.0 ms
t_3[4]	±12.5 kHz	5.0 ms	10.0 ms

3.6.2 Test Procedure

TIA-603-E Clause 2.2.19



a) Connect the equipment as illustrated.
b) Connect the output of the standard transmitter load to the RF power meter. Supply sufficient attenuation via the RF attenuator to provide a level that is approximately 40 dB below the maximum allowable input to the modulation domain analyzer.
c) Unkey the transmitter.
d) Disconnect the RF power meter and connect the modulation domain analyzer in its place. Set the envelope trigger of the modulation domain analyzer to the minimum level that will trigger when the transmitter is keyed.
e) Reduce the attenuation of the RF attenuator so that the input to the to the modulation domain analyzer is increased by 30 dB when the transmitter is keyed.
f) Set the modulation domain analyzer to trigger on the rising edge of the waveform in order to capture a single-shot turn-on of the transmitter signal.
g) Adjust the display of the modulation domain analyzer for proper viewing of the transmitter transient behavior. Set the timebase reference to the left for observing the transmitter turn-on transient.
h) Key the transmitter.
i) Observe the stored display of the modulation domain analyzer. The signal trace shall be maintained within the allowable limits during the periods t_1 and t_2, and shall also remain within limits following t_2.
j) Adjust the modulation domain analyzer to trigger on the falling edge of the transmitter waveform in order to capture a single-shot turn-off transient of the transmitter signal.
k) Adjust the display of the modulation domain analyzer for proper viewing of the transmitter

transient behavior. Set the timebase reference to the right for observing the transmitter turn-off transient.
l) Unkey the transmitter.
m) Observe the stored display of the modulation domain analyzer. The signal trace shall be maintained within the allowable limits during the period t_3.

3.7 Modulation characteristics.

3.7.1 Applicable Standard

FCC §2.1047

(a) Voice modulated communication equipment. A curve or equivalent data showing the frequency response of the audio modulating circuit over a range of 100 to 5000 Hz shall be submitted. For equipment required to have an audio low-pass filter, a curve showing the frequency response of the filter, or of all circuitry installed between the modulation limiter and the modulated stage shall be submitted.
(b) Equipment which employs modulation limiting. A curve or family of curves showing the percentage of modulation versus the modulation input voltage shall be supplied. The information submitted shall be sufficient to show modulation limiting capability throughout the range of modulating frequencies and input modulating signal levels employed.
(c) Single sideband and independent sideband radiotelephone transmitters which employ a device or circuit to limit peak envelope power. A curve showing the peak envelope power output versus the modulation input voltage shall be supplied. The modulating signals shall be the same in frequency as specified in paragraph (c) of §2.1049 for the occupied bandwidth tests.
(d) Other types of equipment. A curve or equivalent data which shows that the equipment will meet the modulation requirements of the rules under which the equipment is to be licensed.

3.7.2 Test Procedure

Test Method: TIA-603-E 2.2.3

4. Test DATA AND RESULTS

4.1 Transmitter Frequency Stability

Serial Number:	CR21110033-RF	Test Date:	2022-02-26
Test Site:	RF	Test Mode:	Transmitting
Tester:	Rinka Li	Test Result:	Pass

Environmental Conditions:					
Temperature: (℃)	26	Relative Humidity: (%)	51	ATM Pressure: (kPa)	101.8

Test Equipment List and Details:

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
zhuoxiang	Coaxial Cable	SMA-178	211002	Each time	N/A
YINSAIGE	Coaxial Cable	SS402	SJ0100003	Each time	N/A
Mini-Circuits	DC Block	BLK-18-S+	1554404	Each time	N/A
Weinschel	Coaxial Attenuators	53-20-34	LN751	Each time	N/A
BEW	Coaxial Attenuator	TS300-6-40	213311	Each time	N/A
HP	RF Communications Test Set	8920A	3438A05209	2021-07-22	2022-07-21
BACL	TEMP&HUMI Test Chamber	BTH-150	30026	2021-07-22	2022-07-21
UNI-T	Multimeter	UT39A+	C210582554	2021-09-30	2022-09-29
Weinschel	Power splitter	1515	RA915	Each time	N/A

** Statement of Traceability: China Certification ICT Co., Ltd (Dongguan) attests that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).*

Test Data:

12.5kHz, f_c = 453.2125 MHz,				
Temperature	**Voltage**	**Measured**	**Frequency Error**	**Limit**
℃	**V_{AC}**	**MHz**	**ppm**	**ppm**
-30	120	453.21287162	0.82	1.5
-20		453.21287157	0.82	
-10		453.21287162	0.82	
0		453.21287165	0.82	
10		453.21287165	0.82	
20		453.21287103	0.82	
30		453.21287564	0.83	
40		453.21287632	0.83	
50		453.21287621	0.83	
20	138	453.21287621	0.83	
20	102	453.21287612	0.83	

4FSK, f_c =453.2125 MHz,				
Temperature	**Voltage**	**Measured**	**Frequency Error**	**Limit**
℃	**V_{AC}**	**MHz**	**ppm**	**ppm**
-30	120	453.21282621	0.72	1.5
-20		453.21282637	0.72	
-10		453.21282651	0.72	
0		453.21282621	0.72	
10		453.21282668	0.72	
20		453.21282610	0.72	
30		453.21282670	0.72	
40		453.21282687	0.72	
50		453.21282621	0.72	
20	138	453.21282780	0.72	
20	102	453.21282564	0.72	

4.2 Transmitter Output Power

Serial Number:	CR21110033-RF	Test Date:	2022-01-04
Test Site:	RF	Test Mode:	Transmitting
Tester:	Rinka Li	Test Result:	Pass

Environmental Conditions:					
Temperature: (℃)	26	Relative Humidity: (%)	51	Temperature: (℃)	101.8

Test Equipment List and Details:

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
R&S	Spectrum Analyzer	FSU26	200256	2021-07-22	2022-07-21
zhuoxiang	Coaxial Cable	SMA-178	211002	Each time	N/A
Weinschel	Coaxial Attenuators	53-20-34	LN751	Each time	N/A
BEW	Coaxial Attenuator	TS300-6-40	213311	Each time	N/A
HP	RF Communications Test Set	8920A	3438A05209	2021-07-22	2022-07-21
Weinschel	Power splitter	1515	RA915	Each time	N/A

** Statement of Traceability: China Certification ICT Co., Ltd (Dongguan) attests that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).*

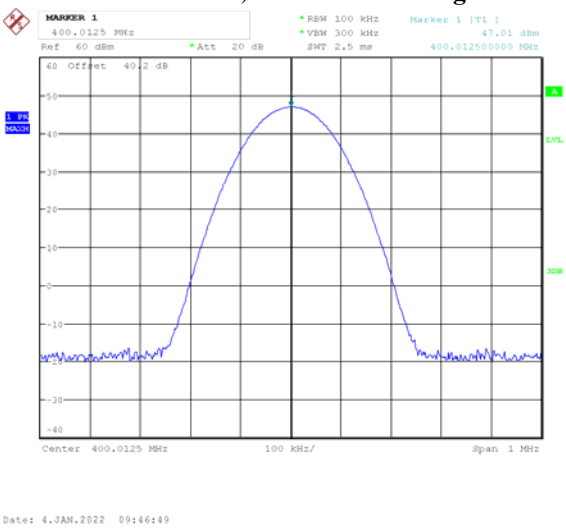
Test Data:

Channel Separation	Test Modulation	Test Channel	Test Frequency (MHz)	Conducted Output Power (dBm)		Limit (dBm)	
				High Power Level	Low Power Level	High Power Level	Low Power Level
12.5kHz	FM	Low	400.0125	47.01	36.92	47.78	37.78
		Middle	453.2125	46.80	36.76	47.78	37.78
		High	469.9875	47.07	37.04	47.78	37.78
	4FSK	Low	400.0125	47.04	36.93	47.78	37.78
		Middle	453.2125	46.86	36.78	47.78	37.78
		High	469.9875	47.11	37.04	47.78	37.78

Note: The high rated power level is 50W(47dBm), and low rated power level is 5W(37dBm).
The output power shall not exceed by more than 20 percent the manufacturer's rated output power for the particular transmitter specifically listed on the authorization.

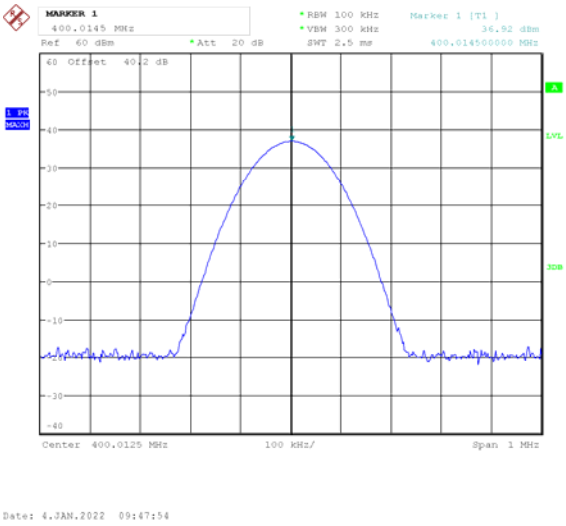
FM, 12.5kHz:

Low Channel, 400.0125 MHz High Power



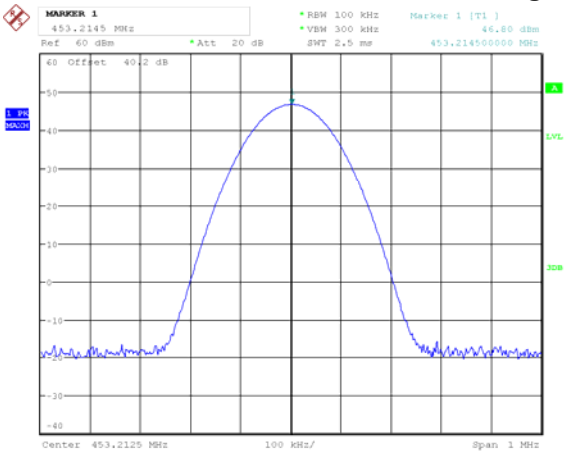
Date: 4.JAN.2022 09:46:49

Low Channel, 400.0125 MHz Low Power



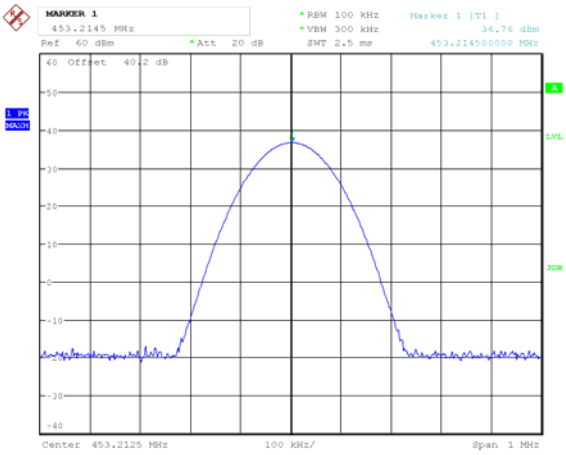
Date: 4.JAN.2022 09:47:54

Part 90, Middle Channel, 453.2125 MHz High Power



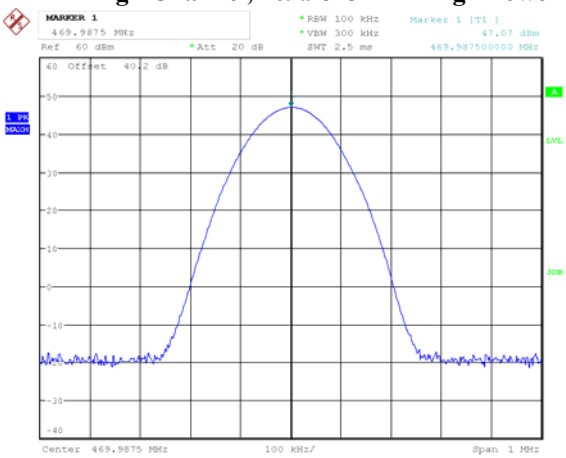
Date: 4.JAN.2022 09:48:58

Part 90, Middle Channel, 453.2125 MHz Low Power



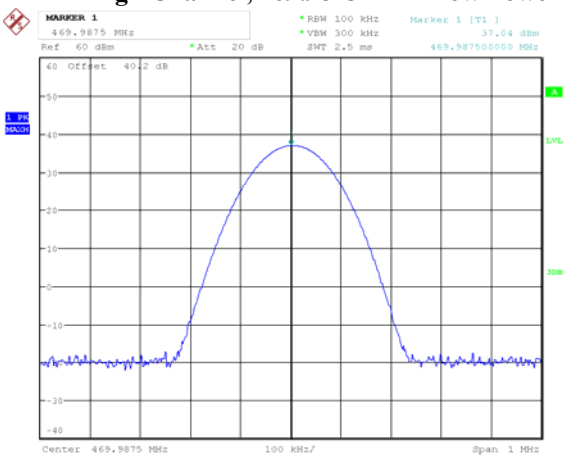
Date: 4.JAN.2022 09:49:53

High Channel, 469.9875MHz High Power



Date: 4.JAN.2022 09:51:30

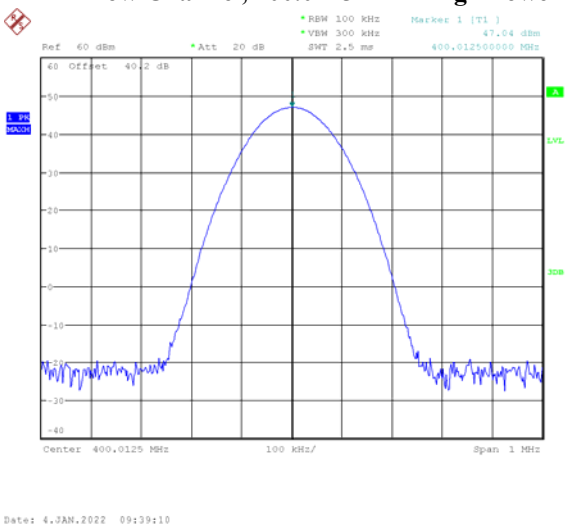
High Channel, 469.9875 MHz Low Power



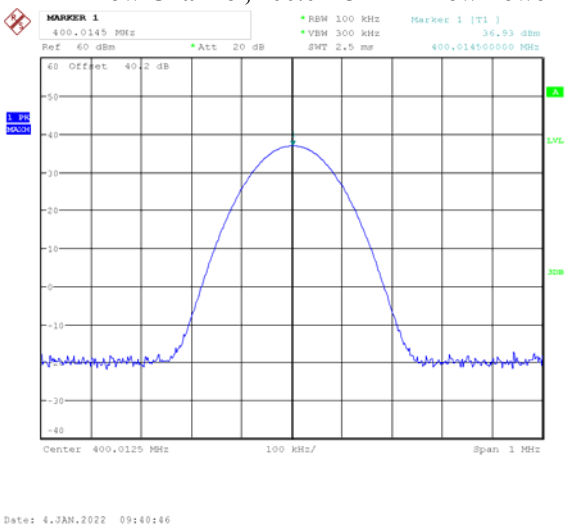
Date: 4.JAN.2022 09:52:06

4FSK, 12.5kHz:

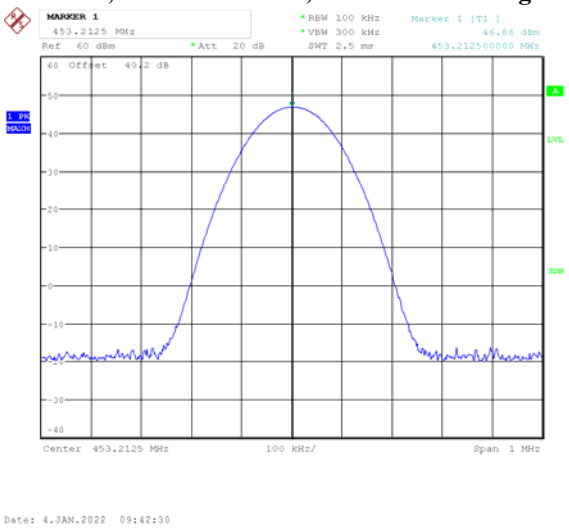
Low Channel, 400.0125 MHz High Power



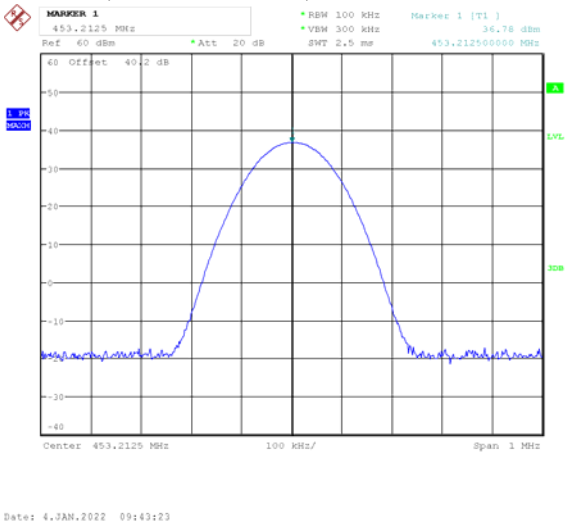
Low Channel, 400.0125 MHz Low Power



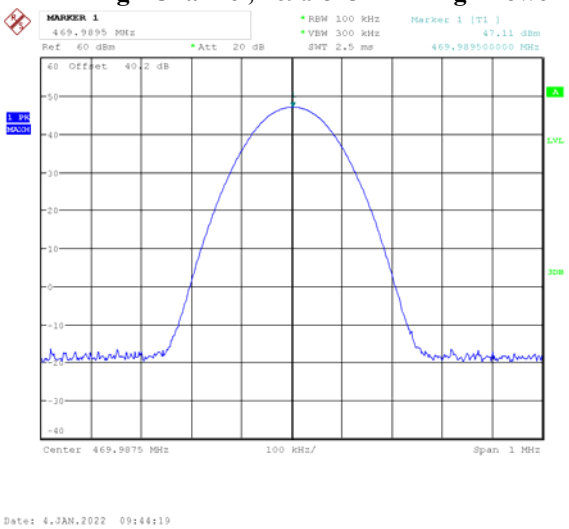
Part 90, Middle Channel, 453.2125 MHz High Power



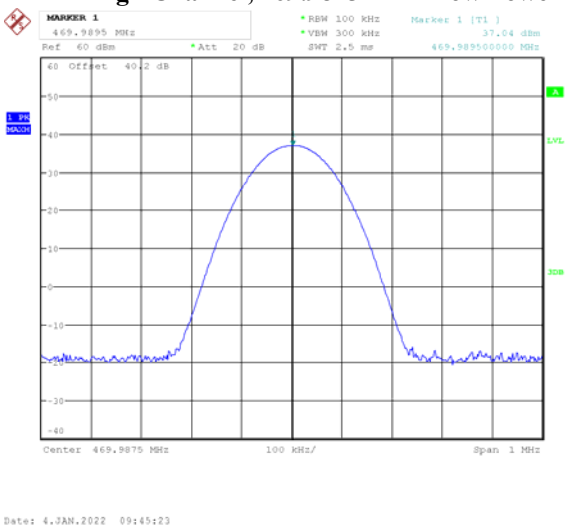
Part 90, Middle Channel, 453.2125 MHz Low Power



High Channel, 469.9875MHz High Power



High Channel, 469.9875 MHz Low Power



4.3 Occupied Bandwidth & Emission Mask

Serial Number:	CR21110033-RF	Test Date:	2022-01-28
Test Site:	RF	Test Mode:	Transmitting
Tester:	Rinka Li	Test Result:	Pass

Environmental Conditions:					
Temperature: (℃)	26	Relative Humidity: (%)	51	Temperature: (℃)	101.8

Test Equipment List and Details:

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
R&S	Signal Analyzer	FSIQ26	831929/006	2021-07-22	2022-07-21
zhuoxiang	Coaxial Cable	SMA-178	211002	Each time	N/A
Weinschel	Coaxial Attenuators	53-20-34	LN751	Each time	N/A
BEW	Coaxial Attenuator	TS300-6-40	213311	Each time	N/A
HP	RF Communications Test Set	8920A	3438A05209	2021-07-22	2022-07-21
Weinschel	Power splitter	1515	RA915	Each time	N/A

** Statement of Traceability: China Certification ICT Co., Ltd (Dongguan) attests that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).*

Test Data:

Test Mode	Test Channel	Test Frequency (MHz)	High Power Level		Low Power Level	
			99% Occupied Bandwidth (kHz)	26dB Emission Bandwidth (kHz)	99% Occupied Bandwidth (kHz)	26dB Emission Bandwidth (kHz)
FM 12.5kHz	Low	400.0125	5.17	10.34	5.17	10.34
	Middle	453.2125	5.29	10.34	5.29	10.34
	High	469.9875	5.29	10.34	5.29	10.34
4FSK 12.5kHz	Low	400.0125	7.09	9.74	7.33	9.86
	Middle	453.2125	7.45	9.62	7.45	9.50
	High	469.9875	7.70	9.62	7.45	10.10

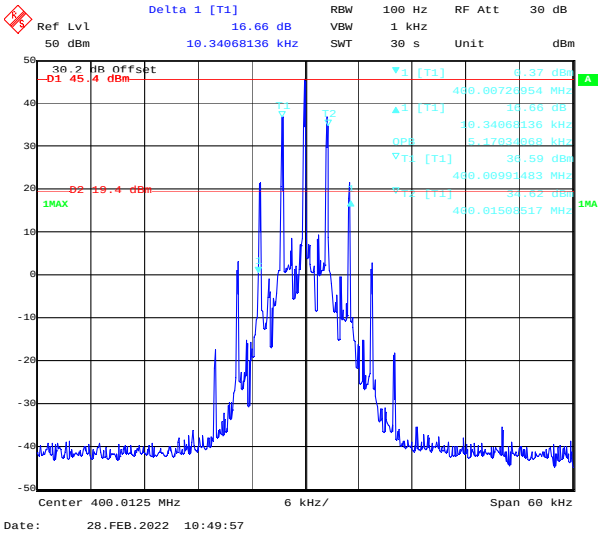
Note: Emission bandwidth was based on calculation method instead of measurement.
Emission Designator: Per CFR 47 §2.201& §2.202, BW = 2M + 2D

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.

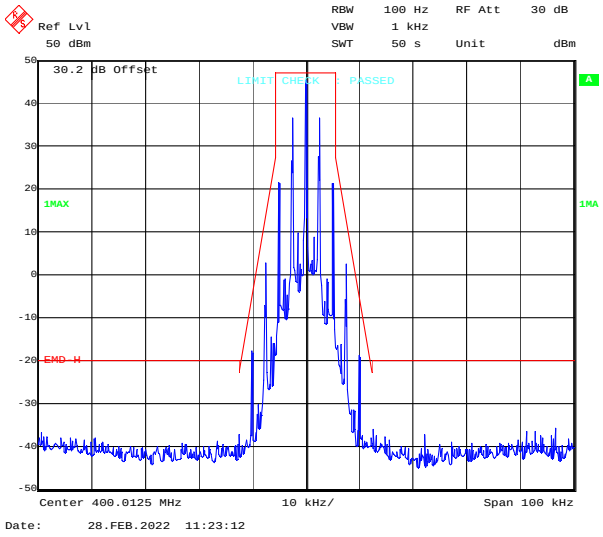
For Digital Mode (Channel Spacing: 12.5 kHz)
Emission Designator: 7K60F1D and 7K60F1E
The 99% energy rule (title 47CFR 2.1049) was used for digital mode. It basically states that 99% of the modulation energy falls within X kHz, in this case, 7.60 kHz. The emission mask was obtained from 47CFR 90.210(d).
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.

FM, 12.5kHz, High Power:

Low Channel

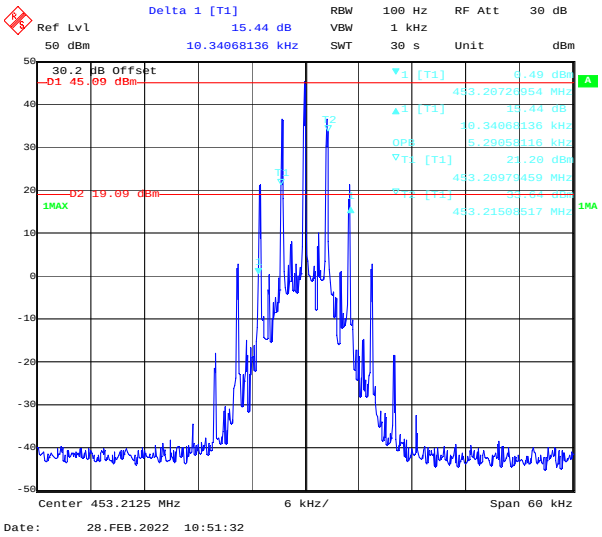


Date: 28.FEB.2022 10:49:57

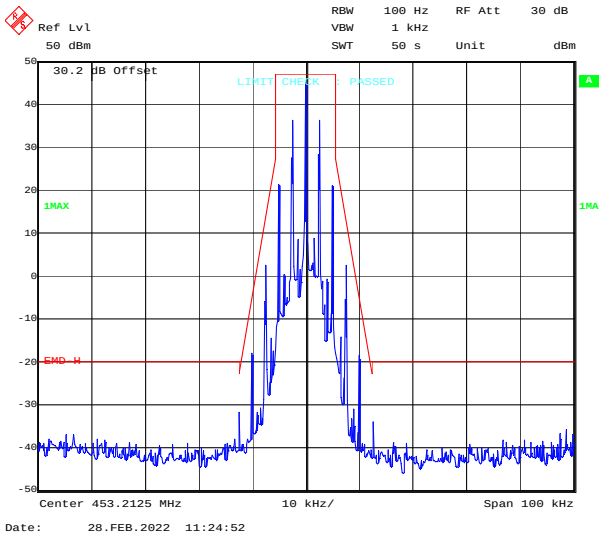


Date: 28.FEB.2022 11:23:12

Middle Channel

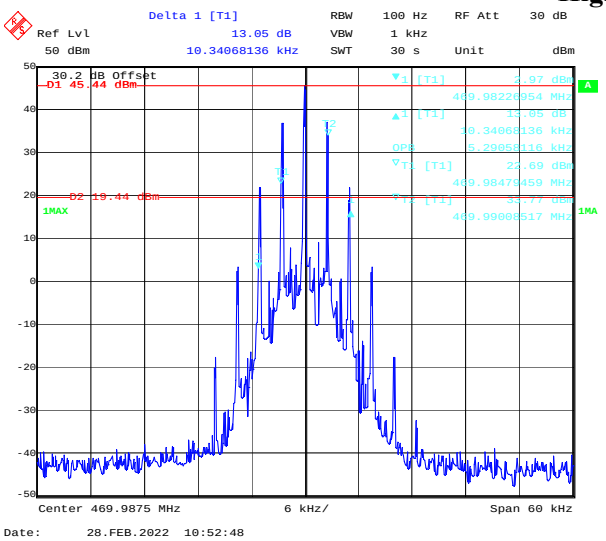


Date: 28.FEB.2022 10:51:32

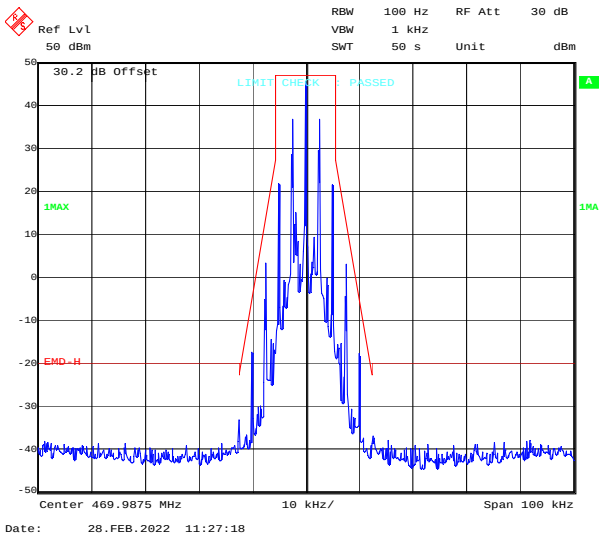


Date: 28.FEB.2022 11:24:52

High Channel



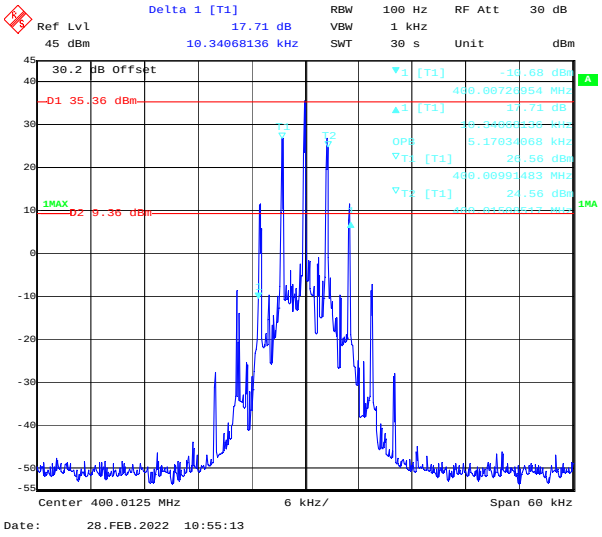
Date: 28.FEB.2022 10:52:48

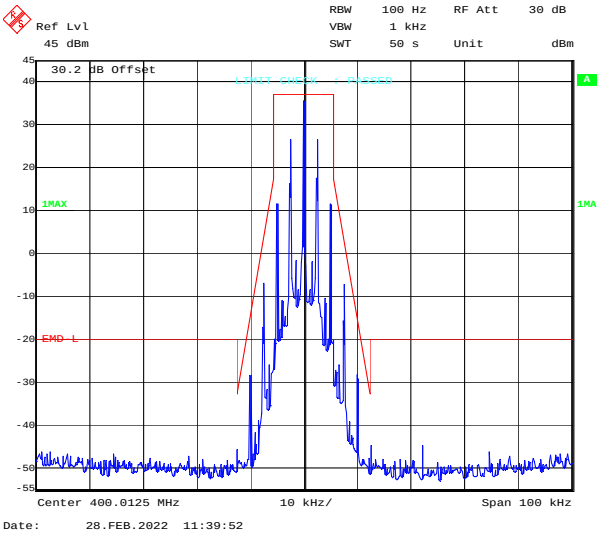


Date: 28.FEB.2022 11:27:18

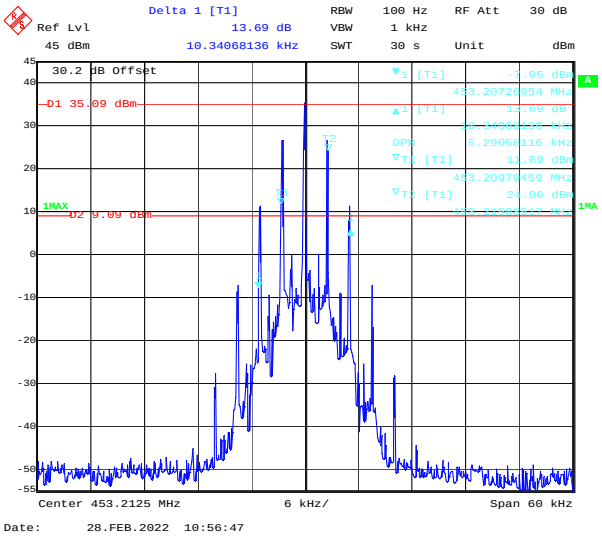
FM, 12.5kHz, Low Power:

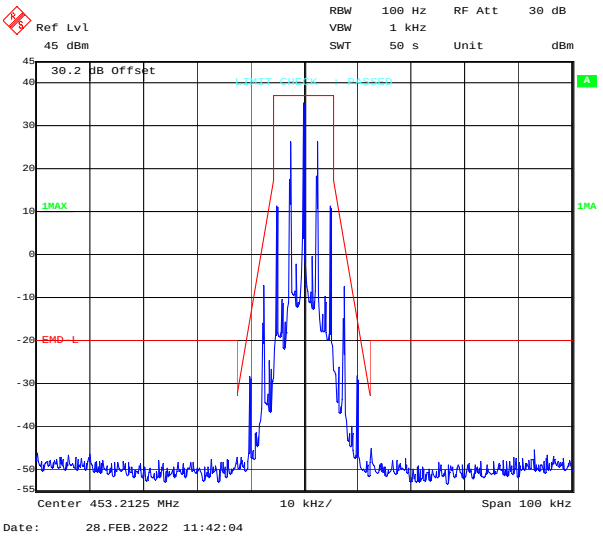
Low Channel



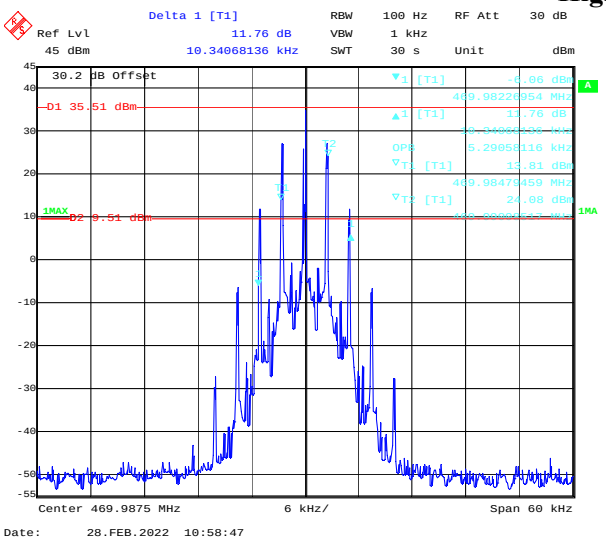


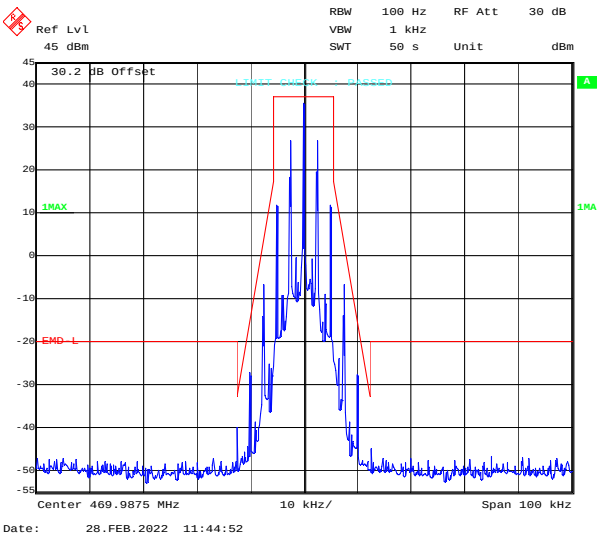
Middle Channel





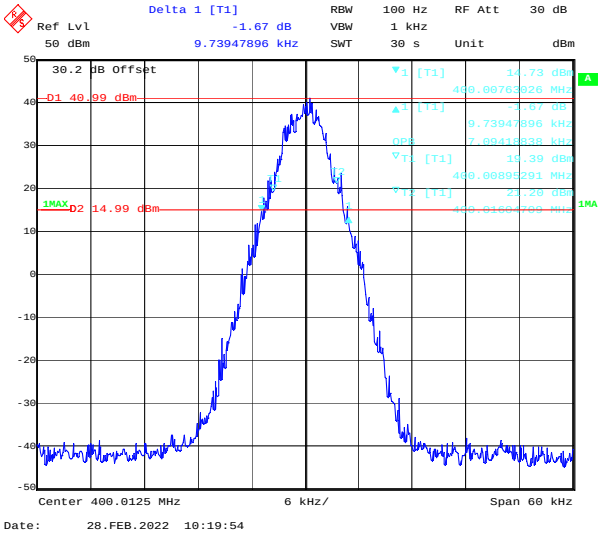
High Channel

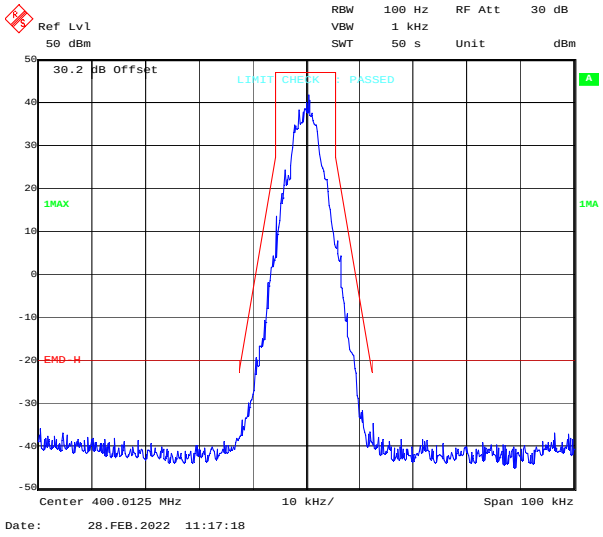




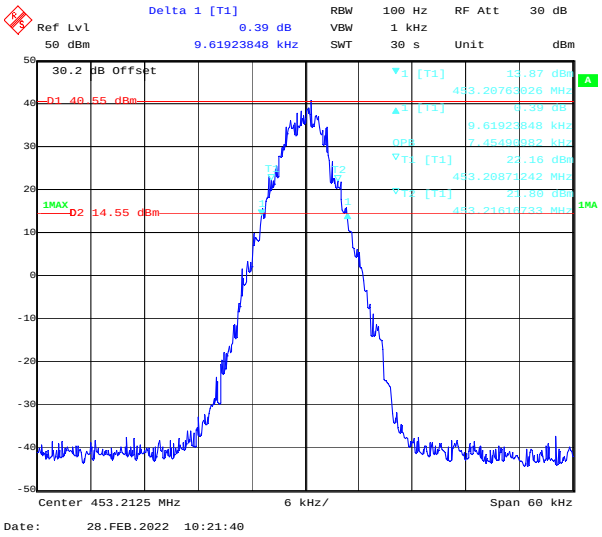
4FSK, 12.5kHz, High Power:

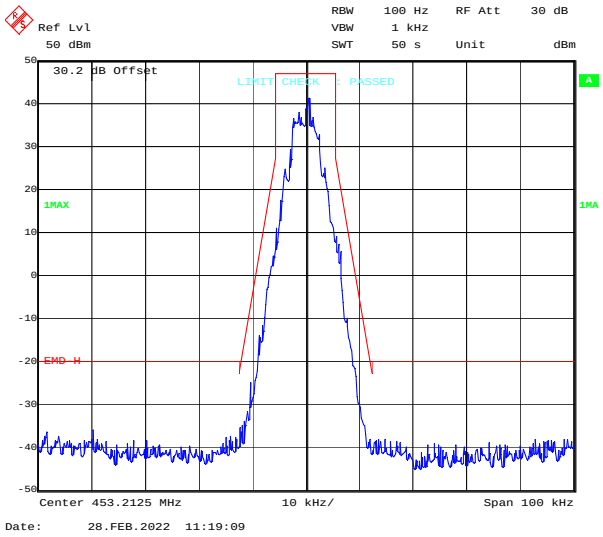
Low Channel



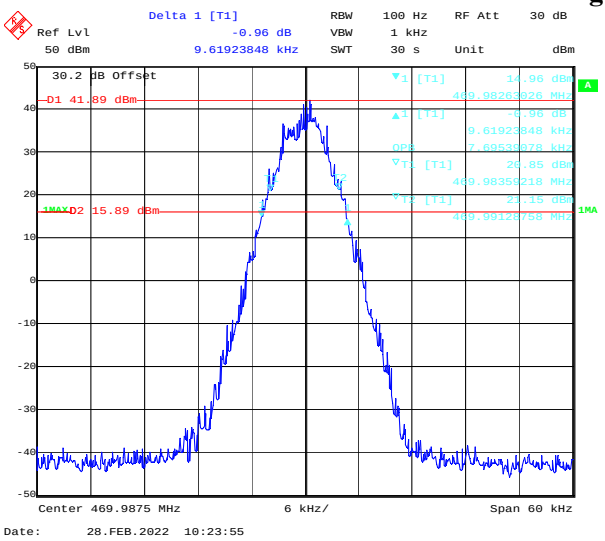


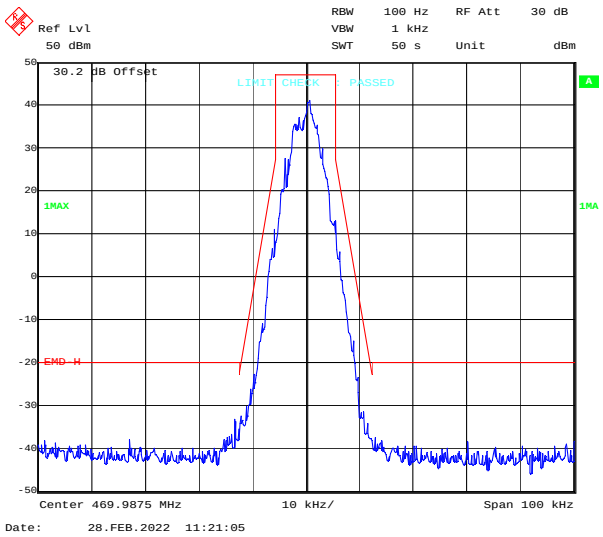
Middle Channel





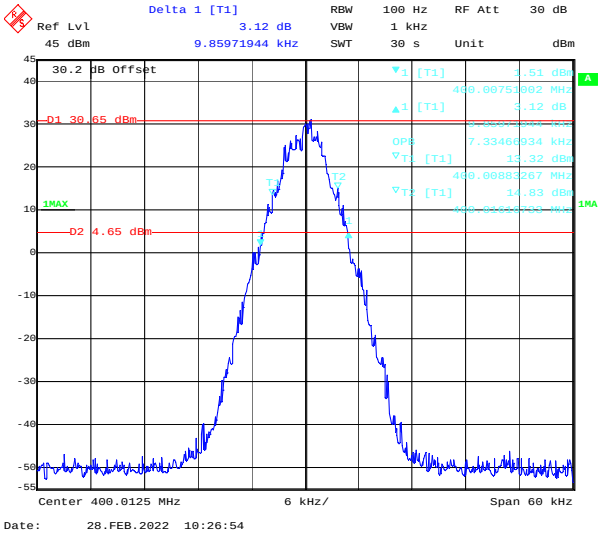
High Channel

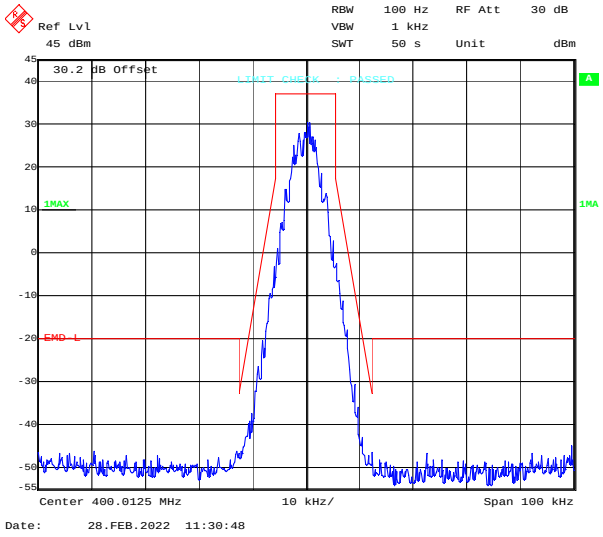




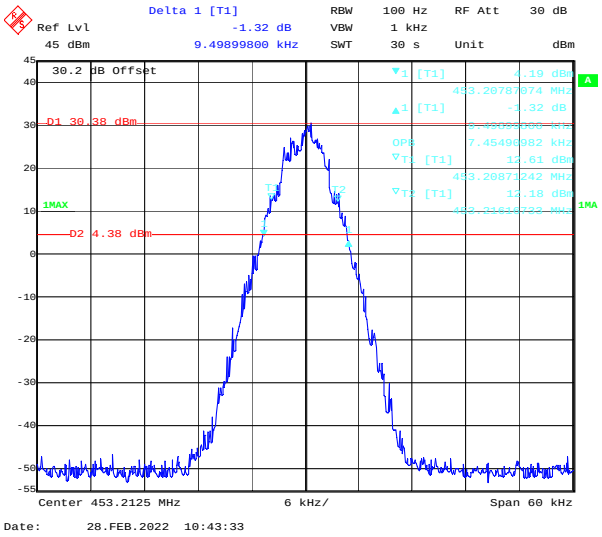
4FSK, 12.5kHz, Low Power:

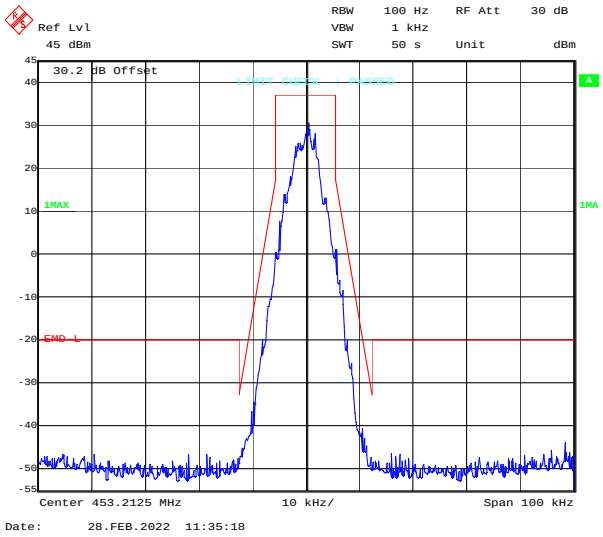
Low Channel



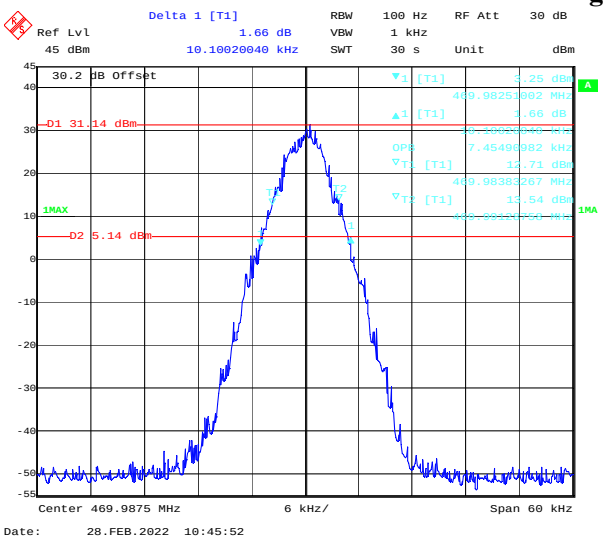


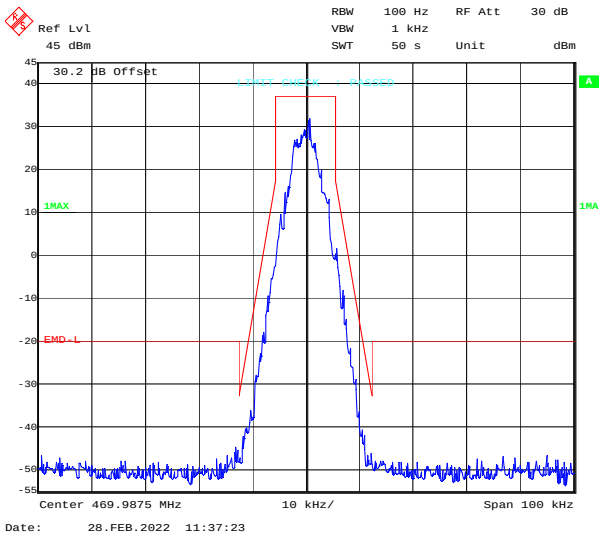
Middle Channel





High Channel





4.4 Transmitter Unwanted Emissions (Conducted)

Serial Number:	CR21110033-RF	Test Date:	2022-01-04
Test Site:	RF	Test Mode:	Transmitting
Tester:	Rinka Li	Test Result:	Pass

Environmental Conditions:					
Temperature: (℃)	26	Relative Humidity: (%)	51	Temperature: (℃)	101.8

Test Equipment List and Details:

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
R&S	Spectrum Analyzer	FSU26	200256	2021-07-22	2022-07-21
zhuoxiang	Coaxial Cable	SMA-178	211002	Each time	N/A
Weinschel	Coaxial Attenuators	53-20-34	LN751	Each time	N/A
BEW	Coaxial Attenuator	TS300-6-40	213311	Each time	N/A
HP	RF Communications Test Set	8920A	3438A05209	2021-07-22	2022-07-21
E-Microwave	Band Rejector Filter	OBF-ZP-400-470-NF	OE01201051	2021-01-23	2022-01-22
Weinschel	Power splitter	1515	RA915	Each time	N/A

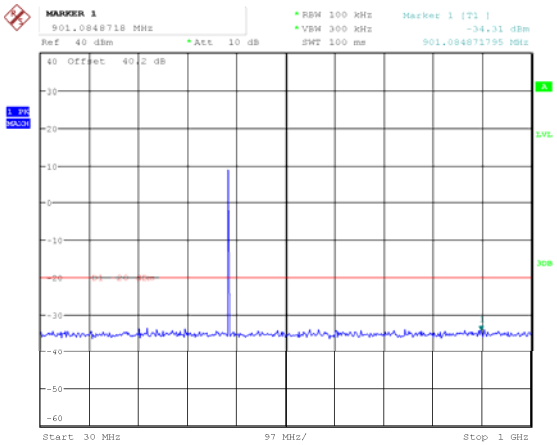
** Statement of Traceability: China Certification ICT Co., Ltd (Dongguan) attests that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).*

Test Data:

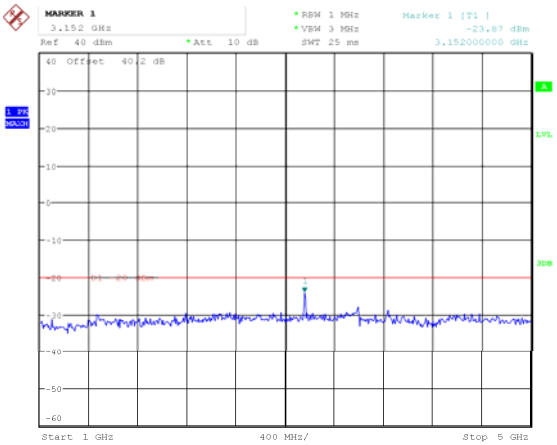
Note: Test only was performed at high power level.

FM, 12.5kHz:

Low Channel

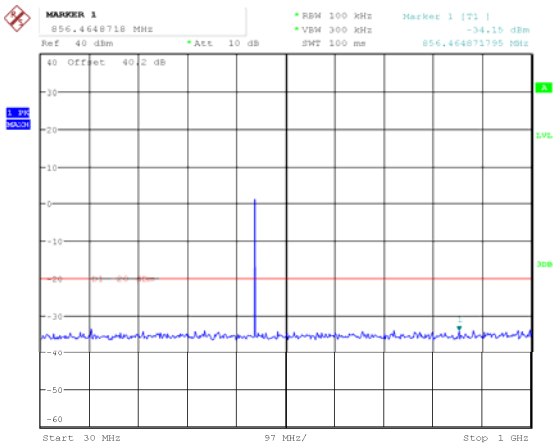


Date: 4.JAN.2022 10:35:24

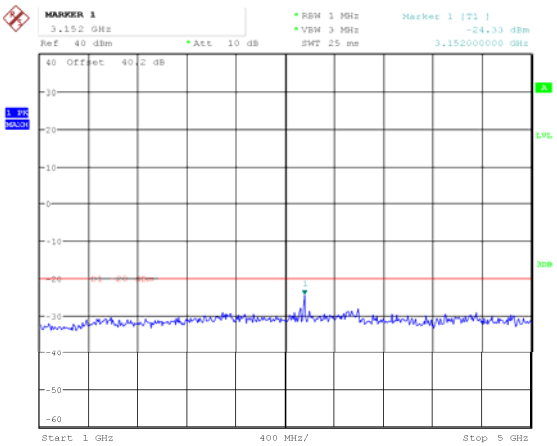


Date: 4.JAN.2022 10:33:11

Middle Channel

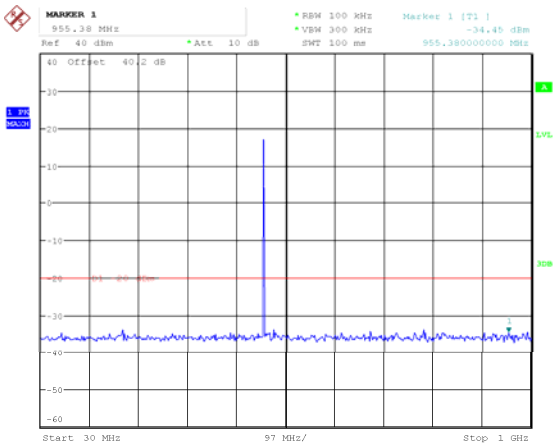


Date: 4.JAN.2022 10:36:50

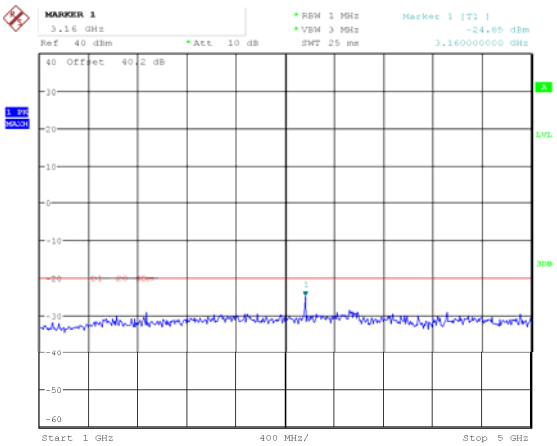


Date: 4.JAN.2022 10:37:23

High Channel



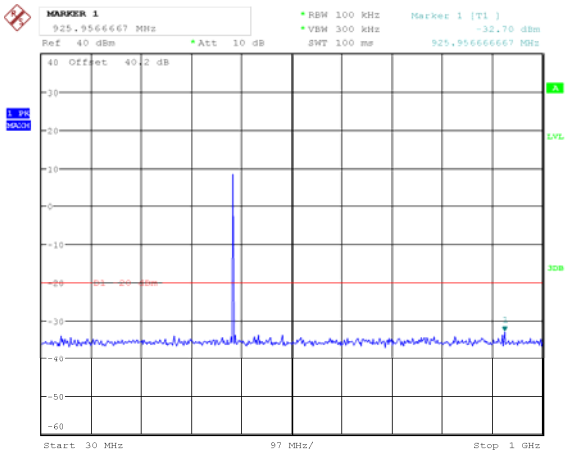
Date: 4.JAN.2022 10:38:44



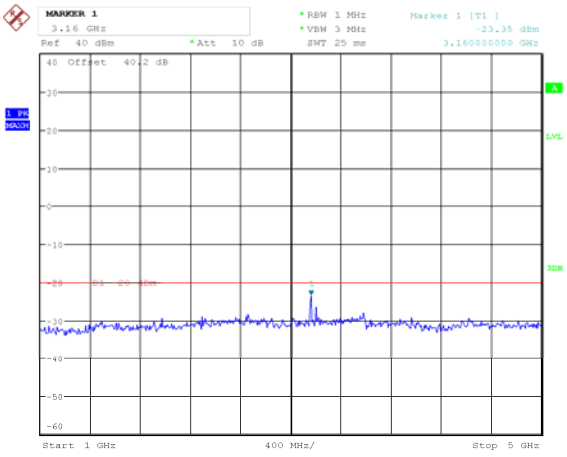
Date: 4.JAN.2022 10:38:06

4FSK, 12.5kHz:

Low Channel

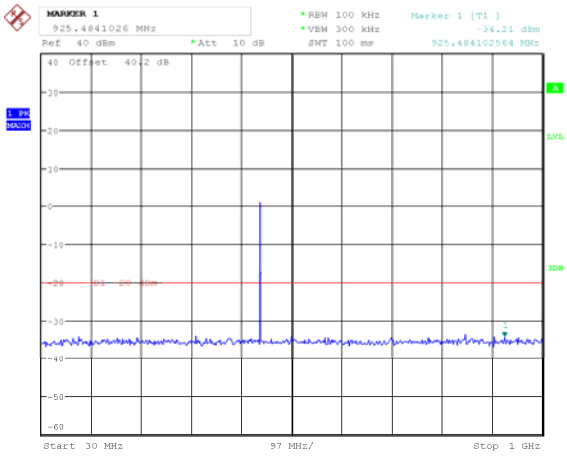


Date: 4.JAN.2022 10:22:50

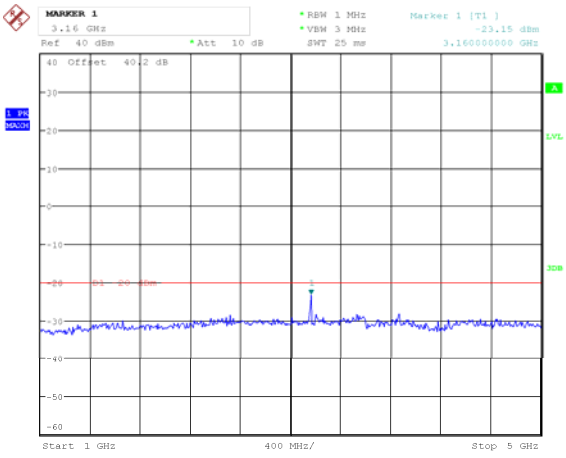


Date: 4.JAN.2022 10:24:08

Middle Channel

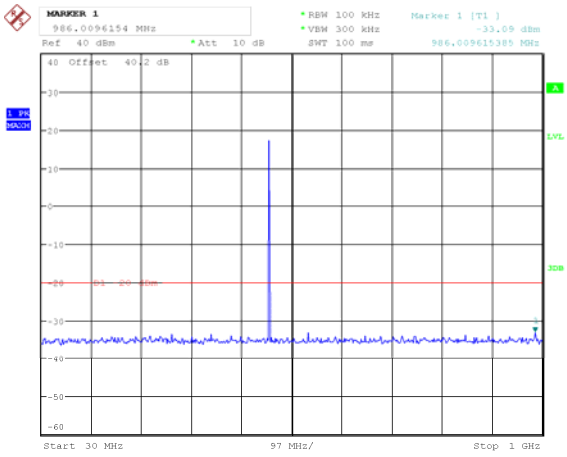


Date: 4.JAN.2022 10:28:44

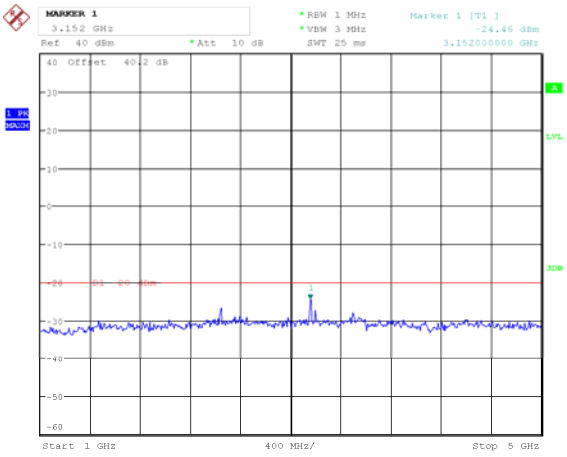


Date: 4.JAN.2022 10:27:43

High Channel



Date: 4.JAN.2022 10:31:12



Date: 4.JAN.2022 10:31:57

4.5 Transient Frequency Behavior

Serial Number:	CR21110033-RF	Test Date:	2022-01-28
Test Site:	RF	Test Mode:	Transmitting
Tester:	Rinka Li	Test Result:	Pass

Environmental Conditions:					
Temperature: (℃)	26	Relative Humidity: (%)	51	Temperature: (℃)	101.8

Test Equipment List and Details:

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
R&S	Signal Analyzer	FSIQ26	831929/006	2021-07-22	2022-07-21
zhuoxiang	Coaxial Cable	SMA-178	211002	Each time	N/A
YINSAIGE	Coaxial Cable	SS402	SJ0100003	Each time	N/A
Weinschel	Coaxial Attenuators	53-20-34	LN751	Each time	N/A
BEW	Coaxial Attenuator	TS300-6-40	213311	Each time	N/A
HP	RF Communications Test Set	8920A	3438A05209	2021-07-22	2022-07-21
Weinschel	Power splitter	1515	RA915	Each time	N/A

** Statement of Traceability: China Certification ICT Co., Ltd (Dongguan) attests that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).*

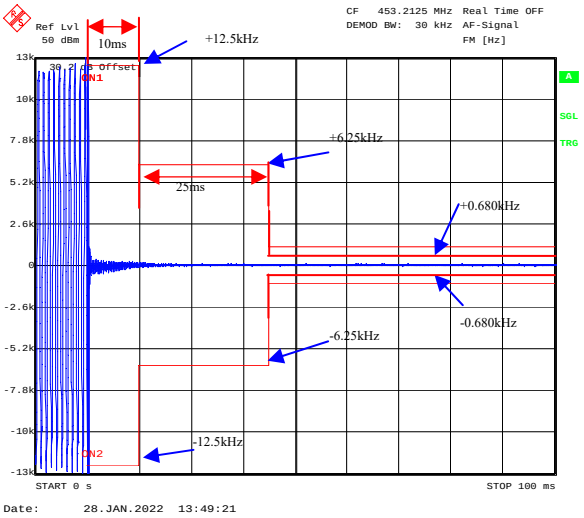
Test Data:

Note: Test only was performed at high power level.

Channel Spacing (kHz)	Transient Period (ms)	Transient Frequency	Result
12.5	10(t_1)	±12.5 kHz	Pass
	25(t_2)	±6.25 kHz	
	10(t_3)	±12.5 kHz	

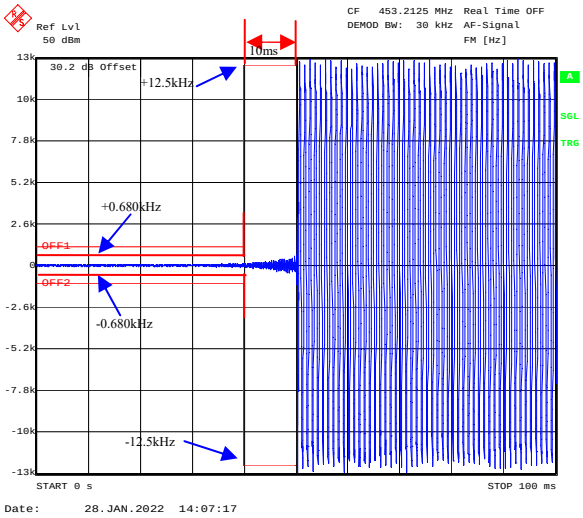
Note: During the time from the end of t2 to the beginning of t3, the frequency difference must not exceed the limits specified in§90.213:
For 453.2125 MHz 12.5kHz mode, limit is: 453.2125 MHz* 1.5ppm = 0.680kHz

Tune ON



Date: 28.JAN.2022 13:49:21

Tune OFF



Date: 28.JAN.2022 14:07:17

4.6 Modulation Characteristic

Serial Number:	CR21110033-RF	Test Date:	2022-02-26
Test Site:	RF	Test Mode:	Transmitting
Tester:	Rinka Li	Test Result:	Pass

Environmental Conditions:					
Temperature: (℃)	26	Relative Humidity: (%)	51	Temperature: (℃)	101.8

Test Equipment List and Details:

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
zhuoxiang	Coaxial Cable	SMA-178	211002	Each time	N/A
YINSAIGE	Coaxial Cable	SS402	SJ0100003	Each time	N/A
Weinschel	Coaxial Attenuators	53-20-34	LN751	Each time	N/A
BEW	Coaxial Attenuator	TS300-6-40	213311	Each time	N/A
HP	RF Communications Test Set	8920A	3438A05209	2021-07-22	2022-07-21

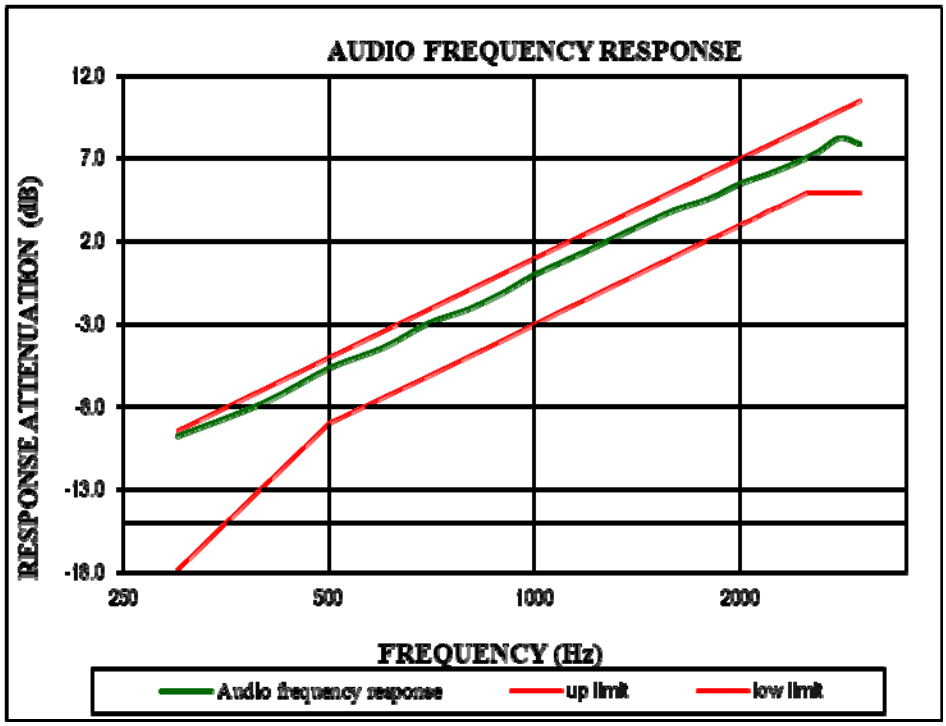
** Statement of Traceability: China Certification ICT Co., Ltd (Dongguan) attests that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).*

Test Data:

Audio Frequency Response – High Power

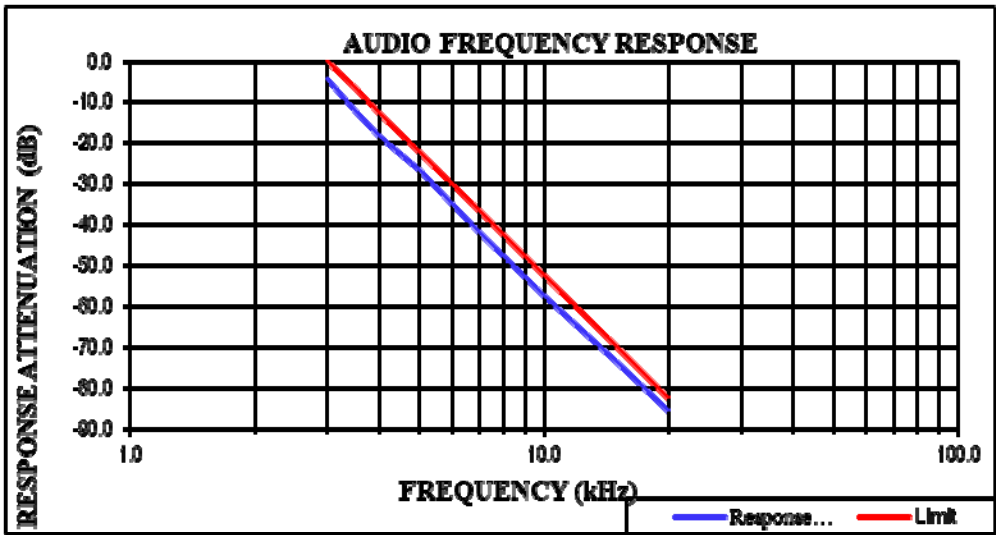
Channel Spacing: 12.5kHz	Carrier Frequency: 453.2125 MHz

Modulation Frequency (Hz)	Response data (dB)
300	-9.75
400	-7.75
500	-5.65
600	-4.40
700	-2.92
800	-2.08
900	-1.08
1000	0.00
1200	1.50
1400	2.81
1600	3.90
1800	4.58
2000	5.50
2200	6.09
2400	6.72
2600	7.40
2800	8.27
3000	7.90



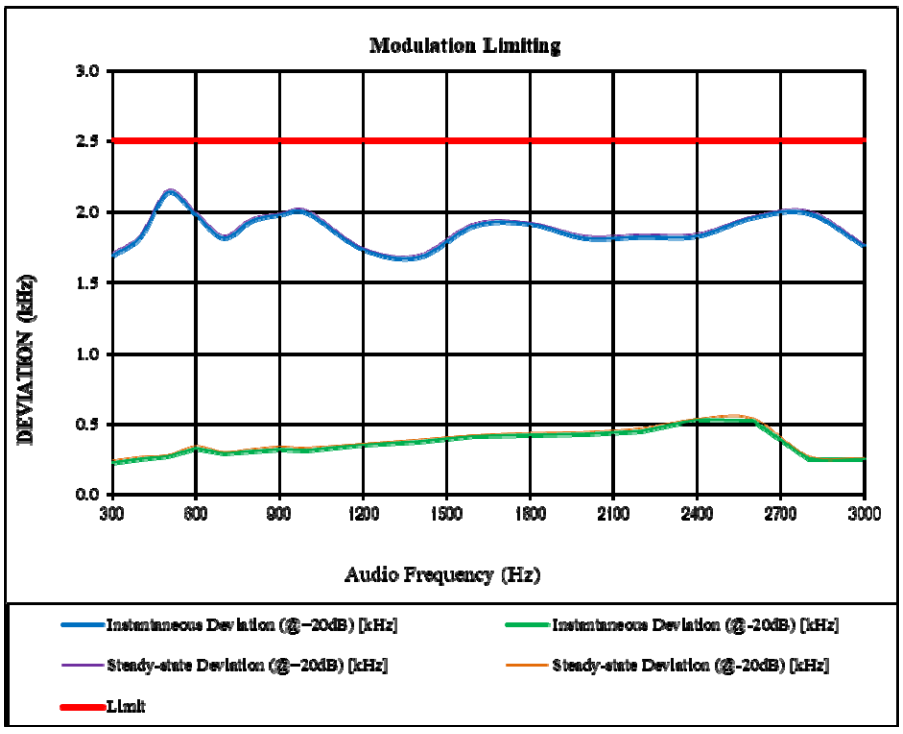
Audio Frequency Low Pass Filter Response – High Power

Channel Spacing: 12.5kHz		
Carrier Frequency: 453.2125 MHz		
Audio Frequency (kHz)	Response Attenuation (dB)	Limit (dB)
3.0	-4.4	0.0
3.5	-12.1	-6.7
4.0	-18.2	-12.5
5.0	-26.7	-22.2
7.0	-42.1	-36.8
10.0	-57.2	-52.3
15.0	-73.6	-69.9
20.0	-85.5	-82.5



Modulation Limiting – High Power

Channel Spacing: 12.5kHz	Carrier Frequency: 453.2125 MHz				
Audio Frequency (Hz)	Instantaneous		Steady-state		Limit [kHz]
	Deviation (@+20dB) [kHz]	Deviation (@-20dB) [kHz]	Deviation (@+20dB) [kHz]	Deviation (@-20dB) [kHz]	
300	1.687	0.221	1.707	0.241	2.5
400	1.818	0.247	1.838	0.267	2.5
500	2.137	0.270	2.157	0.280	2.5
600	1.980	0.323	2.000	0.343	2.5
700	1.814	0.291	1.834	0.301	2.5
800	1.935	0.302	1.955	0.322	2.5
900	1.979	0.319	1.989	0.339	2.5
1000	1.993	0.313	2.013	0.333	2.5
1200	1.735	0.349	1.745	0.359	2.5
1400	1.677	0.369	1.697	0.389	2.5
1600	1.901	0.411	1.921	0.421	2.5
1800	1.915	0.417	1.925	0.437	2.5
2000	1.813	0.424	1.833	0.444	2.5
2200	1.823	0.450	1.843	0.470	2.5
2400	1.828	0.526	1.848	0.536	2.5
2600	1.960	0.520	1.970	0.540	2.5
2800	1.991	0.252	2.011	0.272	2.5
3000	1.760	0.249	1.770	0.259	2.5



4.7 Transmitter Unwanted Emissions (Radiated)

Serial Number:	CR21110033-RF	Test Date:	2021-12-23~2021-12-24
Test Site:	966-2,966-1	Test Mode:	Transmitting
Tester:	Great Qiao,Carl Liang	Test Result:	Pass

Environmental Conditions:					
Temperature: (℃)	22.7~24.2	Relative Humidity: (%)	53~56	ATM Pressure: (kPa)	101.1

Test Equipment List and Details:

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Sunol Sciences	Antenna	JB6	A082520-5	2020-10-19	2023-10-18
R&S	EMI Test Receiver	ESR3	102724	2021-07-22	2022-07-21
TIMES MICROWAVE	Coaxial Cable	LMR-600-UltraFlex	C-0470-02	2021-07-18	2022-07-17
TIMES MICROWAVE	Coaxial Cable	LMR-600-UltraFlex	C-0780-01	2021-07-18	2022-07-17
Sonoma	Amplifier	310N	186165	2021-07-18	2022-07-17
EMCO	Adjustable Dipole Antenna	3121C	9109-756	N/A	N/A
MICRO-COAX	Coaxial Cable	UFA210B-0-0720-300300	99G1448	2021-07-25	2022-07-24
Agilent	Signal Generator	E8247C	MY43321352	2021-04-25	2022-04-24
ETS-Lindgren	Horn Antenna	3115	9912-5985	2020-10-13	2023-10-12
R&S	Spectrum Analyzer	FSV40	101591	2021-07-22	2022-07-21
MICRO-COAX	Coaxial Cable	UFA210A-1-1200-70U300	217423-008	2021-08-08	2022-08-07
MICRO-COAX	Coaxial Cable	UFA210A-1-2362-300300	235780-001	2021-08-08	2022-08-07
Mini	Pre-amplifier	ZVA-183-S+	5969001149	2021-11-10	2022-11-09
AH	Double Ridge Guide Horn Antenna	SAS-571	1396	2021-10-18	2024-10-17
E-Microwave	Band Rejector Filter	OBF-ZP-400-470-NF	OE01201051	2021-01-23	2022-01-22

** Statement of Traceability: China Certification ICT Co., Ltd (Dongguan) attests that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).*

Test Data:

Note:

Test only performed with High power level. The device can be mounted in multiple orientations, test was performed with X,Y, Z Axis according to C63.26 Figure 5, the worst orientation was photographed and it`s data was recorded.

30MHz - 5GHz:

Frequency (MHz)	Polar (H/V)	Receiver Reading (dBμV)	Substituted Method			Absolute Level (dBm)	Limit (dBm)	Margin (dB)
			Substituted Level (dBm)	Antenna Gain (dBd/dBi)	Cable Loss (dB)			
FM, Frequency: 400.0125MHz-12.5 kHz								
800.03	H	18.82	-52.48	0.00	0.58	-53.06	-20.00	33.06
800.03	V	18.68	-49.06	0.00	0.58	-49.64	-20.00	29.64
1200.04	H	36.60	-66.26	7.66	0.69	-59.29	-20.00	39.29
1200.04	V	37.20	-66.40	7.66	0.69	-59.43	-20.00	39.43
1600.05	H	35.49	-68.88	8.62	0.83	-61.09	-20.00	41.09
1600.05	V	36.52	-67.88	8.62	0.83	-60.09	-20.00	40.09
2000.06	H	35.49	-66.64	9.10	0.89	-58.43	-20.00	38.43
2000.06	V	36.48	-65.02	9.10	0.89	-56.81	-20.00	36.81
2400.08	H	36.12	-64.93	9.34	0.98	-56.57	-20.00	36.57
2400.08	V	37.73	-63.06	9.34	0.98	-54.70	-20.00	34.70
2800.09	H	33.52	-66.41	9.88	1.04	-57.57	-20.00	37.57
2800.09	V	33.47	-66.33	9.88	1.04	-57.49	-20.00	37.49
3200.10	H	34.43	-62.69	10.28	1.11	-53.52	-20.00	33.52
3200.10	V	35.31	-61.56	10.28	1.11	-52.39	-20.00	32.39
3600.11	H	35.28	-62.27	10.50	1.24	-53.01	-20.00	33.01
3600.11	V	35.54	-61.87	10.50	1.24	-52.61	-20.00	32.61
4000.13	H	36.40	-59.36	10.90	1.29	-49.75	-20.00	29.75
4000.13	V	35.48	-60.08	10.90	1.29	-50.47	-20.00	30.47
4FSK, Frequency: 400.0125MHz-12.5 kHz								
800.03	H	18.65	-52.65	0.00	0.58	-53.23	-20.00	33.23
800.03	V	18.93	-48.81	0.00	0.58	-49.39	-20.00	29.39
1200.04	H	36.59	-66.27	7.66	0.69	-59.30	-20.00	39.30
1200.04	V	37.35	-66.25	7.66	0.69	-59.28	-20.00	39.28
1600.05	H	37.30	-67.07	8.62	0.83	-59.28	-20.00	39.28
1600.05	V	35.71	-68.69	8.62	0.83	-60.90	-20.00	40.90
2000.06	H	34.73	-67.40	9.10	0.89	-59.19	-20.00	39.19
2000.06	V	34.22	-67.28	9.10	0.89	-59.07	-20.00	39.07
2400.08	H	36.58	-64.47	9.34	0.98	-56.11	-20.00	36.11
2400.08	V	36.72	-64.07	9.34	0.98	-55.71	-20.00	35.71
2800.09	H	33.79	-66.14	9.88	1.04	-57.30	-20.00	37.30
2800.09	V	34.07	-65.73	9.88	1.04	-56.89	-20.00	36.89
3200.10	H	35.01	-62.11	10.28	1.11	-52.94	-20.00	32.94
3200.10	V	34.92	-61.95	10.28	1.11	-52.78	-20.00	32.78
3600.11	H	35.35	-62.20	10.50	1.24	-52.94	-20.00	32.94
3600.11	V	36.29	-61.12	10.50	1.24	-51.86	-20.00	31.86
4000.13	H	35.80	-59.96	10.90	1.29	-50.35	-20.00	30.35
4000.13	V	35.61	-59.95	10.90	1.29	-50.34	-20.00	30.34

Frequency (MHz)	Polar (H/V)	Receiver Reading (dBμV)	Substituted Method			Absolute Level (dBm)	Limit (dBm)	Margin (dB)
			Substituted Level (dBm)	Antenna Gain (dBd/dBi)	Cable Loss (dB)			
FM, Frequency: 453.0125MHz-12.5 kHz								
906.03	H	19.62	-49.00	0.00	0.55	-49.55	-20.00	29.55
906.03	V	20.59	-45.42	0.00	0.55	-45.97	-20.00	25.97
1359.64	H	35.90	-67.41	8.11	0.77	-60.07	-20.00	40.07
1359.64	V	38.00	-65.52	8.11	0.77	-58.18	-20.00	38.18
1812.85	H	34.90	-68.53	8.88	0.90	-60.55	-20.00	40.55
1812.85	V	35.54	-68.01	8.88	0.90	-60.03	-20.00	40.03
2266.06	H	34.01	-68.06	9.26	0.95	-59.75	-20.00	39.75
2266.06	V	33.87	-68.09	9.26	0.95	-59.78	-20.00	39.78
2719.28	H	35.38	-64.59	9.75	1.05	-55.89	-20.00	35.89
2719.28	V	33.82	-66.09	9.75	1.05	-57.39	-20.00	37.39
3172.49	H	35.17	-62.07	10.27	1.13	-52.93	-20.00	32.93
3172.49	V	34.75	-62.28	10.27	1.13	-53.14	-20.00	33.14
3625.70	H	35.22	-62.27	10.53	1.22	-52.96	-20.00	32.96
3625.70	V	35.72	-61.66	10.53	1.22	-52.35	-20.00	32.35
4078.91	H	36.86	-59.10	10.85	1.29	-49.54	-20.00	29.54
4078.91	V	36.07	-59.82	10.85	1.29	-50.26	-20.00	30.26
4532.13	H	35.40	-60.27	10.64	1.37	-51.00	-20.00	31.00
4532.13	V	36.78	-58.66	10.64	1.37	-49.39	-20.00	29.39
4FSK, Frequency:453.0125MHz-12.5 kHz								
906.03	H	20.17	-48.46	0.00	0.55	-49.01	-20.00	29.01
906.03	V	18.94	-47.07	0.00	0.55	-47.62	-20.00	27.62
1359.64	H	36.49	-66.82	8.11	0.77	-59.48	-20.00	39.48
1359.64	V	38.09	-65.43	8.11	0.77	-58.09	-20.00	38.09
1812.85	H	35.41	-68.02	8.88	0.90	-60.04	-20.00	40.04
1812.85	V	36.63	-66.92	8.88	0.90	-58.94	-20.00	38.94
2266.06	H	33.79	-68.28	9.26	0.95	-59.97	-20.00	39.97
2266.06	V	34.21	-67.75	9.26	0.95	-59.44	-20.00	39.44
2719.28	H	33.26	-66.71	9.75	1.05	-58.01	-20.00	38.01
2719.28	V	34.71	-65.20	9.75	1.05	-56.50	-20.00	36.50
3172.49	H	34.75	-62.49	10.27	1.13	-53.35	-20.00	33.35
3172.49	V	35.10	-61.93	10.27	1.13	-52.79	-20.00	32.79
3625.70	H	35.86	-61.63	10.53	1.22	-52.32	-20.00	32.32
3625.70	V	35.78	-61.60	10.53	1.22	-52.29	-20.00	32.29
4078.91	H	37.24	-58.72	10.85	1.29	-49.16	-20.00	29.16
4078.91	V	36.51	-59.38	10.85	1.29	-49.82	-20.00	29.82
4532.13	H	36.21	-59.46	10.64	1.37	-50.19	-20.00	30.19
4532.13	V	36.18	-59.26	10.64	1.37	-49.99	-20.00	29.99

Frequency (MHz)	Polar (H/V)	Receiver Reading (dBμV)	Substituted Method			Absolute Level (dBm)	Limit (dBm)	Margin (dB)
			Substituted Level (dBm)	Antenna Gain (dBd/dBi)	Cable Loss (dB)			
FM, Frequency: 469.9875MHz-12.5 kHz								
939.98	H	20.68	-47.11	0.00	0.64	-47.75	-20.00	27.75
939.98	V	19.68	-45.67	0.00	0.64	-46.31	-20.00	26.31
1409.96	H	36.52	-67.16	8.25	0.72	-59.63	-20.00	39.63
1409.96	V	35.56	-68.17	8.25	0.72	-60.64	-20.00	40.64
1879.95	H	34.73	-68.35	8.96	0.88	-60.27	-20.00	40.27
1879.95	V	35.12	-67.72	8.96	0.88	-59.64	-20.00	39.64
2349.94	H	34.17	-67.32	9.31	0.97	-58.98	-20.00	38.98
2349.94	V	33.67	-67.58	9.31	0.97	-59.24	-20.00	39.24
2819.93	H	35.36	-64.48	9.91	1.05	-55.62	-20.00	35.62
2819.93	V	34.42	-65.34	9.91	1.05	-56.48	-20.00	36.48
3289.91	H	34.63	-62.09	10.32	1.15	-52.92	-20.00	32.92
3289.91	V	36.22	-60.25	10.32	1.15	-51.08	-20.00	31.08
3759.90	H	35.87	-60.54	10.66	1.24	-51.12	-20.00	31.12
3759.90	V	35.45	-60.84	10.66	1.24	-51.42	-20.00	31.42
4229.89	H	36.42	-59.62	10.76	1.32	-50.18	-20.00	30.18
4229.89	V	36.38	-59.60	10.76	1.32	-50.16	-20.00	30.16
4FSK, Frequency:469.9875MHz-12.5 kHz								
939.98	H	20.34	-47.45	0.00	0.64	-48.09	-20.00	28.09
939.98	V	20.13	-45.22	0.00	0.64	-45.86	-20.00	25.86
1409.96	H	39.24	-64.44	8.25	0.72	-56.91	-20.00	36.91
1409.96	V	36.15	-67.58	8.25	0.72	-60.05	-20.00	40.05
1879.95	H	34.95	-68.13	8.96	0.88	-60.05	-20.00	40.05
1879.95	V	34.56	-68.28	8.96	0.88	-60.20	-20.00	40.20
2349.94	H	35.00	-66.49	9.31	0.97	-58.15	-20.00	38.15
2349.94	V	33.45	-67.80	9.31	0.97	-59.46	-20.00	39.46
2819.93	H	33.63	-66.21	9.91	1.05	-57.35	-20.00	37.35
2819.93	V	35.83	-63.93	9.91	1.05	-55.07	-20.00	35.07
3289.91	H	35.08	-61.64	10.32	1.15	-52.47	-20.00	32.47
3289.91	V	35.72	-60.75	10.32	1.15	-51.58	-20.00	31.58
3759.90	H	35.10	-61.31	10.66	1.24	-51.89	-20.00	31.89
3759.90	V	35.47	-60.82	10.66	1.24	-51.40	-20.00	31.40
4229.89	H	35.70	-60.34	10.76	1.32	-50.90	-20.00	30.90
4229.89	V	36.19	-59.79	10.76	1.32	-50.35	-20.00	30.35

Note 1:The unit of antenna gain is dBd for frequency below 1GHz and is dBi for frequency above 1GHz.
Note 2:
Absolute Level = Substituted Level - Cable loss + Antenna Gain
Margin = Limit- Absolute Level

5. RF EXPOSURE EVALUATION

5.1 FCC Maximum Permissible Exposure (MPE)

5.1.1 Applicable Standard

According to subpart §1.1310, systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy level in excess of the Commission's guidelines.

5.1.2 Limits

Maximum Permissible Exposure (MPE) (§1.1310, §2.1091)

Limits for Occupational/Controlled Exposure				
Frequency Range (MHz)	**Electric Field Strength (E) (V/m)**	**Magnetic Field Strength (H) (A/m)**	**Power Density (S) (mW/cm^2)**	**Averaging Time |E|, |H| or S (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
300-1500	/	/	f/300	6
1500-100,000	/	/	5	6

f = frequency in MHz; * = Plane-wave equivalent power density;

According to §1.1310 and §2.1091 RF exposure is calculated.

5.1.3 Calculated Formulary:

Predication of MPE limit at a given distance
$S = PG/4\pi R^2$ = power density (in appropriate units, e.g. mW/cm^2);
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);

5.1.4 Calculated Data

Frequency Band (MHz)	Maximum Tune-up Conducted Power (dBm)	Antenna Gain (dBi)	Evaluation Distance (cm)	Power Density (mW/cm^2)	MPE Limit (mW/cm^2)
400-470	47.5	5.0	110	1.17	1.33

Result: Compliant, The device meet MPE requirement at 110 cm distance.

===== END OF REPORT =====