



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



TEST REPORT

Applicant: YEALINK (XIAMEN) NETWORK TECHNOLOGY CO.,LTD.

Address: No.666 Hu'an Rd. Huli District Xiamen City, Fujian, P.R. China

FCC ID: T2C-OPSA001

IC: 10741A-OPSA001

HVIN: OPSA001

Product Name: Android OPS Module

Model Number: OPS-A001

**Standard(s): 47 CFR Part 15, Subpart C(15.247)
RSS-247 Issue 2, February 2017
RSS-Gen, Issue 5, February 2021 Amendment 2
ANSI C63.10-2013
KDB 558074 D01 15.247 Meas Guidance v05r02**

The above equipment has been tested and found compliant with the requirement of the relative standards by 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.

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DOCUMENT REVISION HISTORY

Revision Number	Report Number	Description of Revision	Date of Revision
1.0	CR221259082-00B	Original Report	2023/7/21

1. GENERAL INFORMATION

1.1 Product Description for Equipment under Test (EUT)

EUT Name:	Android OPS Module
EUT Model:	OPS-A001
Operation Frequency:	2402-2480MHz
Maximum Peak Output Power (Conducted):	5.76dBm
Modulation Type:	GFSK, $\pi/4$ -DQPSK, 8DPSK
Rated Input Voltage:	24Vdc
Serial Number:	1TRF
EUT Received Date:	2022/12/14
EUT Received Status:	Good

Operation Frequency Detail:

Channel	Frequency (MHz)	Channel	Frequency (MHz)
0	2402	40	2442
1	2403	41	2443
...
...
..	...	78	2480
39	2441	/	/

Per section 15.31(m)/RSS-Gen, the below frequencies were performed the test:

Test Channel	Frequency (MHz)
Lowest	2402
Middle	2441
Highest	2480

Antenna Information Detail ▲ :

Antenna Type	input impedance (Ohm)	Frequency Range	Antenna Gain	RSS-Gen Requirement
dipole	50	2.4~2.5GHz	2.9 dBi	Compliance

The Method of §15.203 Compliance:

- Antenna must be permanently attached to the unit.
 Antenna must use a unique type of connector to attach to the EUT.
 Unit must be professionally installed, and installer shall be responsible for verifying that the correct antenna is employed with the unit.

Accessory Information:

Accessory Description	Manufacturer	Model	Parameters
/	/	/	/

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:	QRCT		
The software was provided by manufacturer. The maximum power was configured as below, that was provided by the manufacturer ▲:			
Test Modes	Power Level Setting		
	Lowest	Middle	Highest
GFSK	6	6	6
$\pi/4$ -DQPSK	6	6	6
8DPSK	6	6	6

1.2.2 Support Equipment List and Details

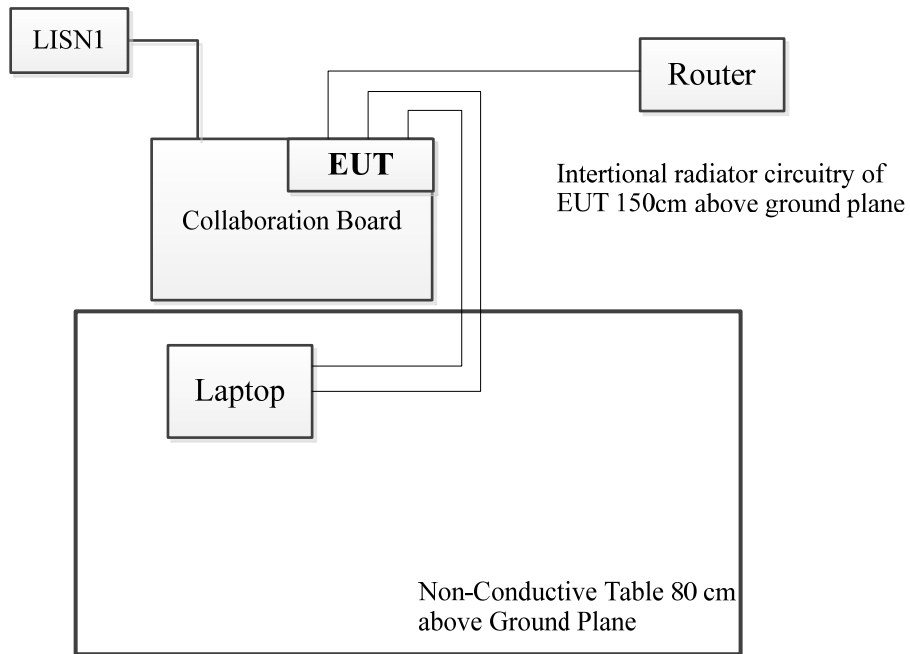
Manufacturer	Description	Model	Serial Number
Lenovo	Laptop	T460S	60PDTEK8
Yealink	Collaboration Board	MeetingBoard 86	1QHS
TOTO LINK	Router	X5000R	X5000RK9T0560

1.2.3 Support Cable List and Details

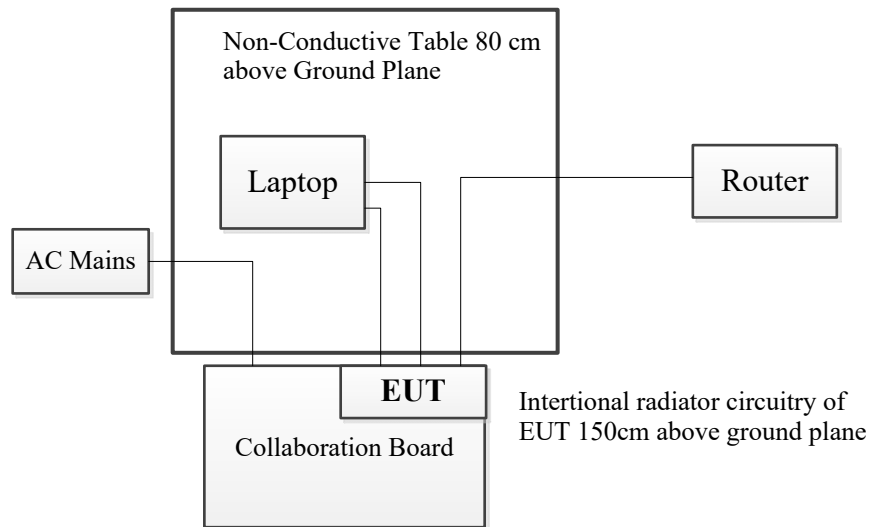
Cable Description	Shielding Type	Ferrite Core	Length (m)	From Port	To
Power Cable	No	No	1.5	Collaboration Board	LISN
RJ45 Cable	No	No	3	EUT	Router
USB Cable	No	No	1.5	EUT	Laptop
HDMI Cable	No	No	1.5	EUT	Laptop

1.2.4 Block Diagram of Test Setup

AC line conducted emissions:



Spurious Emissions:



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°C
Humidity	±5%
DC and low frequency voltages	±0.4%
Duty Cycle	1%
AC Power Lines Conducted Emission	2.8 dB (150 kHz to 30 MHz)

2. SUMMARY OF TEST RESULTS

Standard/Rule(s)	Description of Test	Result
FCC §15.207(a) RSS-Gen Clause 8.8	AC line conducted emissions	Compliant
FCC §15.205, §15.209, §15.247(d) RSS-Gen Clause 8.10	Spurious emissions	Compliant
FCC §15.247(a)(1) RSS-247 Clause 5.1 b)	20 dB bandwidth	Compliant
RSS-Gen Clause 6.7	99% Occupied Bandwidth	Compliant
FCC §15.247(a)(1) RSS-247 Clause 5.1 b)	Channel separation	Compliant
FCC §15.247(a)(1)(iii) RSS-247 Clause 5.1 d)	Number of hopping Frequency	Compliant
FCC §15.247(a)(1)(iii) RSS-247 Clause 5.1 d)	Time of occupancy (dwell time)	Compliant
FCC §15.247(b)(1) RSS-247 Clause 5.4 b)	Peak output power measurement	Compliant
FCC §15.247(d) RSS-247 Clause 5.5	Band edges	Compliant
FCC §15.203 RSS-GEN Clause 6.8	Antenna requirement	Compliant
FCC §1.1307 RSS-102 Clause 2.5.2	RF Exposure Evaluation	Compliant

3. REQUIREMENTS AND TEST PROCEDURES

3.1 AC Line Conducted Emissions

3.1.1 Applicable Standard

FCC§15.207(a).

(a) Except as shown in paragraphs (b) and (c) of this section, for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 kHz to 30 MHz, shall not exceed the limits in the following table, as measured using a 50 μ H/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequency ranges.

Frequency of emission (MHz)	Conducted limit (dB μ V)	
	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

*Decreases with the logarithm of the frequency.

(b) The limit shown in paragraph (a) of this section shall not apply to carrier current systems operating as intentional radiators on frequencies below 30 MHz. In lieu thereof, these carrier current systems shall be subject to the following standards:

(1) For carrier current system containing their fundamental emission within the frequency band 535-1705 kHz and intended to be received using a standard AM broadcast receiver: no limit on conducted emissions.

(2) For all other carrier current systems: 1000 μ V within the frequency band 535-1705 kHz, as measured using a 50 μ H/50 ohms LISN.

(3) Carrier current systems operating below 30 MHz are also subject to the radiated emission limits in §15.205, §15.209, §15.221, §15.223, or §15.227, as appropriate.

(c) Measurements to demonstrate compliance with the conducted limits are not required for devices which only employ battery power for operation and which do not operate from the AC power lines or contain provisions for operation while connected to the AC power lines. Devices that include, or make provisions for, the use of battery chargers which permit operating while charging, AC adapters or battery eliminators or that connect to the AC power lines indirectly, obtaining their power through another device which is connected to the AC power lines, shall be tested to demonstrate compliance with the conducted limits.

RSS-Gen Clause 8.8

Unless stated otherwise in the applicable RSS, for radio apparatus that are designed to be connected to the public utility AC power network, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the range 150 kHz to 30 MHz shall not exceed the limits in table 4, as measured using a 50 μ H / 50 Ω line impedance stabilization network. This requirement applies for the radio frequency voltage measured between each power line and the ground terminal of each AC power-line mains cable of the EUT.

For an EUT that connects to the AC power lines indirectly, through another device, the requirement for compliance with the limits in table 4 shall apply at the terminals of the AC power-line mains cable of a representative support device, while it provides power to the EUT. The lower limit applies at the

boundary between the frequency ranges. The device used to power the EUT shall be representative of typical applications.

Table 4 – AC power-line conducted emissions limits

Frequency (MHz)	Conducted limit (dB μ V)	
	Quasi-peak	Average
0.15 - 0.5	66 to 56 ¹	56 to 46 ¹
0.5 – 5	56	46
5 – 30	60	50

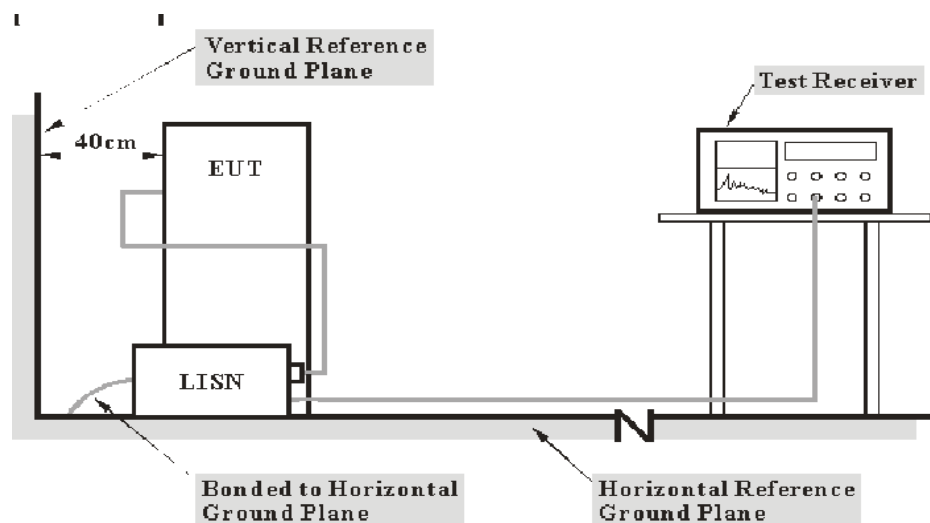
Note 1: The level decreases linearly with the logarithm of the frequency.

For an EUT with a permanent or detachable antenna operating between 150 kHz and 30 MHz, the AC power-line conducted emissions must be measured using the following configurations:

(a) Perform the AC power-line conducted emissions test with the antenna connected to determine compliance with the limits of table 4 outside the transmitter's fundamental emission band.

(b) Retest with a dummy load instead of the antenna to determine compliance with the limits of table 4 within the transmitter's fundamental emission band. For a detachable antenna, remove the antenna and connect a suitable dummy load to the antenna connector. For a permanent antenna, remove the antenna and terminate the RF output with a dummy load or network that simulates the antenna in the fundamental frequency band.

3.1.2 EUT Setup



- Note: 1. Support units were connected to second LISN.
 2. Both of LISNs (AMN) 80 cm from EUT and at the least 80 cm from other units and other metal planes support units.

The setup of EUT is according with per ANSI C63.10-2013 measurement procedure. The specification used was with the FCC Part 15.207,RSS-Gen limits.

The spacing between the peripherals was 10 cm.

The adapter or EUT was connected to the main LISN with a 120 V/60 Hz AC power source.

3.1.3 EMI Test Receiver Setup

The EMI test receiver was set to investigate the spectrum from 150 kHz to 30 MHz.

During the conducted emission test, the EMI test receiver was set with the following configurations:

Frequency Range	IF B/W
150 kHz – 30 MHz	9 kHz

3.1.4 Test Procedure

The frequency and amplitude of the six highest ac power-line conducted emissions relative to the limit, measured over all the current-carrying conductors of the EUT power cords, and the operating frequency or frequency to which the EUT is tuned (if appropriate), should be reported, unless such emissions are more than 20 dB below the limit. AC power-line conducted emissions measurements are to be separately carried out only on each of the phase (“hot”) line(s) and (if used) on the neutral line(s), but not on the ground [protective earth] line(s). If less than six emission frequencies are within 20 dB of the limit, then the noise level of the measuring instrument at representative frequencies should be reported. The specific conductor of the power-line cord for each of the reported emissions should be identified. Measure the six highest emissions with respect to the limit on each current-carrying conductor of each power cord associated with the EUT (but not the power cords of associated or peripheral equipment that are part of the test configuration). Then, report the six highest emissions with respect to the limit from among all the measurements identifying the frequency and specific current-carrying conductor identified with the emission. The six highest emissions should be reported for each of the current-carrying conductors, or the six highest emissions may be reported over all the current-carrying conductors.

3.1.5 Corrected Amplitude & Margin Calculation

The basic equation is as follows:

Result = Reading + Factor

Factor = attenuation caused by cable loss + voltage division factor of AMN

The “**Margin**” column of the following data tables indicates the degree of compliance within the applicable limit. The equation for margin calculation is as follows:

Margin = Limit – Result

3.2 Radiation Spurious Emissions

3.2.1 Applicable Standard

FCC §15.247 (d);

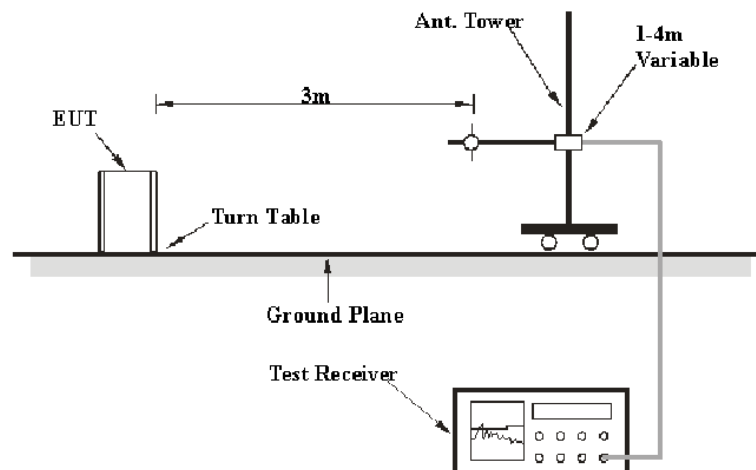
In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

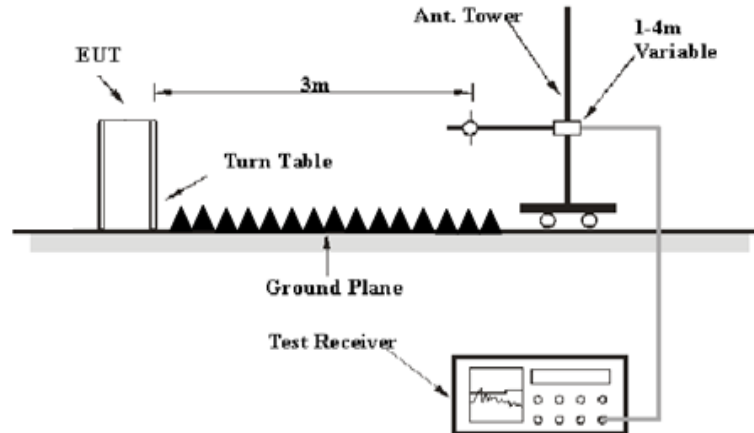
RSS-247 Clause 5.5

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the RF power that is produced shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided that the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of root-mean-square averaging over a time interval, as permitted under section 5.4(d), the attenuation required shall be 30 dB instead of 20 dB. Attenuation below the general field strength limits specified in RSS-Gen is not required

3.2.2 EUT Setup

Below 1GHz:



Above 1GHz:

The radiated emissions were performed in the 3 meters distance, using the setup accordance with the ANSI C63.10-2013. The specification used was the FCC 15.209, and FCC 15.247, RSS-247, RSS-Gen limits.

The external I/O cables were draped along the test table and formed a bundle 30 to 40 cm long in the middle.

The spacing between the peripherals was 10 cm.

3.2.3 EMI Test Receiver & Spectrum Analyzer Setup

The system was investigated from 30 MHz to 25 GHz.

During the radiated emission test, the EMI test receiver & Spectrum Analyzer Setup were set with the following configurations:

Frequency Range	RBW	Video B/W	IF B/W	Measurement
30 MHz – 1000 MHz	120 kHz	300 kHz	120 kHz	QP
Above 1 GHz	1MHz	3 MHz	/	PK
	1MHz	10 Hz	/	AV

If the maximized peak measured value complies with under the QP/Average limit more than 6dB, then it is unnecessary to perform an QP/Average measurement.

3.2.4 Test Procedure

Maximizing procedure was performed on the highest emissions to ensure that the EUT complied with all installation combinations.

Data was recorded in Quasi-peak detection mode for frequency range of 30 MHz-1 GHz, peak and Average detection modes for frequencies above 1 GHz.

3.2.5 Corrected Amplitude & Margin Calculation

The basic equation is as follows:

$$\text{Result} = \text{Reading} + \text{Factor}$$

$$\text{Factor} = \text{Antenna Factor} + \text{Cable Loss} - \text{Amplifier Gain}$$

The “**Margin**” column of the following data tables indicates the degree of compliance within the applicable limit. The equation for margin calculation is as follows:

$$\text{Margin} = \text{Limit} - \text{Result}$$

3.3 20 dB Bandwidth

3.3.1 Applicable Standard

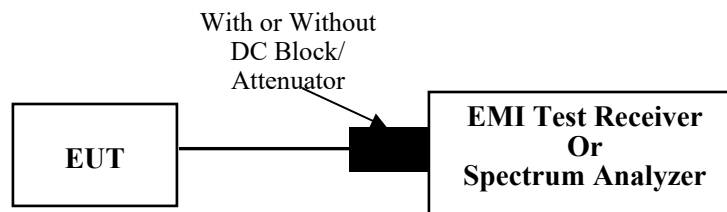
FCC §15.247 (a)(1)

Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW. The system shall hop to channel frequencies that are selected at the system hopping rate from a pseudo randomly ordered list of hopping frequencies. Each frequency must be used equally on the average by each transmitter. The system receivers shall have input bandwidths that match the hopping channel bandwidths of their corresponding transmitters and shall shift frequencies in synchronization with the transmitted signals.

RSS-247 Clause 5.1 b)

- b) FHSs shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. Alternatively, FHSs operating in the band 2400-2483.5 MHz may have hopping channel carrier frequencies that are separated by 25 kHz or two thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided that the systems operate with an output power no greater than 0.125 W.

3.3.2 EUT Setup



3.3.3 Test Procedure

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT on the test table without connection to measurement instrument. Turn on the EUT. Then set it to any one convenient frequency within its operating range. Set a reference level on the measuring instrument equal to the highest peak value.
3. Measure the frequency difference of two frequencies that were attenuated 20 dB from the reference level. Record the frequency difference as the emission bandwidth.
4. Repeat above procedures until all frequencies measured were complete.

3.4 99% Occupied Bandwidth:

3.4.1 Applicable Standard

RSS-Gen Clause 6.7

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.

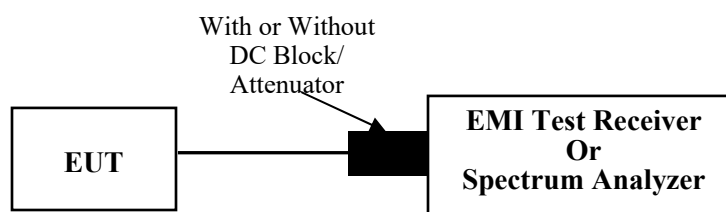
The following conditions shall be observed for measuring the occupied bandwidth and x dB bandwidth:

- 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).

3.4.2 EUT Setup



3.4.3 Test Procedure

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT on the test table without connection to measurement instrument. Turn on the EUT. Then set it to any one convenient frequency within its operating range. Set a reference level on the measuring instrument equal to the highest peak value.
3. Measure the frequency difference of two frequencies that were attenuated 20 dB from the reference level. Record the frequency difference as the emission bandwidth.
4. Use Occupied bandwidth test function, measure the 99% Occupied bandwidth.
5. Repeat above procedures until all frequencies measured were complete.

3.5 Channel Separation

3.5.1 Applicable Standard

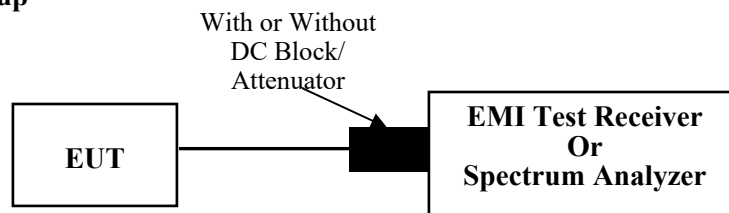
FCC §15.247 (a)(1)

Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW. The system shall hop to channel frequencies that are selected at the system hopping rate from a pseudo randomly ordered list of hopping frequencies. Each frequency must be used equally on the average by each transmitter. The system receivers shall have input bandwidths that match the hopping channel bandwidths of their corresponding transmitters and shall shift frequencies in synchronization with the transmitted signals.

RSS-247 Clause 5.1 b)

Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20dB bandwidth of the hopping channel, whichever is greater. Alternatively, frequency hopping systems operating in the 2400-2483.50 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20dB bandwidth of the hopping channel, whichever is greater provided the systems operate with an output power no greater than 125 mW.

3.5.2 EUT Setup



3.5.3 Test Procedure

According to ANSI C63.10-2013 Section 7.8.2

The EUT shall have its hopping function enabled. Use the following spectrum analyzer settings:

- a) Span: Wide enough to capture the peaks of two adjacent channels.
- b) RBW: Start with the RBW set to approximately 30% of the channel spacing; adjust as necessary to best identify the center of each individual channel.
- c) Video (or average) bandwidth (VBW) \geq RBW.
- d) Sweep: Auto.
- e) Detector function: Peak.
- f) Trace: Max hold.
- g) Allow the trace to stabilize.

Use the marker-delta function to determine the separation between the peaks of the adjacent channels. Compliance of an EUT with the appropriate regulatory limit shall be determined. A plot of the data shall be included in the test report.

3.6 Number Of Hopping Frequency

3.6.1 Applicable Standard

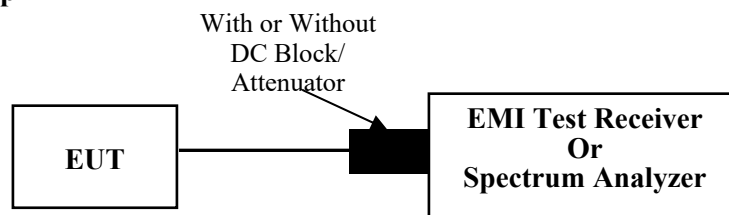
FCC §15.247 (a)(1)(iii)

Frequency hopping systems in the 2400–2483.5 MHz band shall use at least 15 channels. The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed. Frequency hopping systems may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 channels are used.

RSS-247 Clause 5.1 d)

Frequency hopping systems in the 2400–2483.5 MHz band shall use at least 15 channels. The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed. Frequency hopping systems may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 channels are used.

3.6.2 EUT Setup



3.6.3 Test Procedure

According to ANSI C63.10-2013 Section 7.8.3

The EUT shall have its hopping function enabled. Use the following spectrum analyzer settings:

- a) Span: The frequency band of operation. Depending on the number of channels the device supports, it may be necessary to divide the frequency range of operation across multiple spans, to allow the individual channels to be clearly seen.
- b) RBW: To identify clearly the individual channels, set the RBW to less than 30% of the channel spacing or the 20 dB bandwidth, whichever is smaller.
- c) VBW \geq RBW.
- d) Sweep: Auto.
- e) Detector function: Peak.
- f) Trace: Max hold.
- g) Allow the trace to stabilize

It might prove necessary to break the span up into subranges to show clearly all of the hopping frequencies. Compliance of an EUT with the appropriate regulatory limit shall be determined for the number of hopping channels. A plot of the data shall be included in the test report.

3.7 Time Of Occupancy(Dwell Time)

3.7.1 Applicable Standard

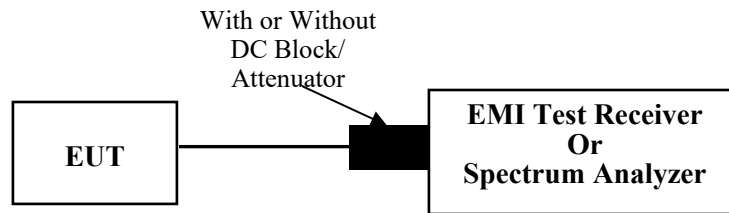
FCC §15.247 (a)(1)(iii)

Frequency hopping systems in the 2400-2483.5 MHz shall use at least 15 channels. The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed. Frequency hopping systems may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 channels are used.

RSS-247 Clause 5.1 d)

Frequency hopping systems in the 2400–2483.5 MHz band shall use at least 15 channels. The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed. Frequency hopping systems may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 channels are used.

3.7.2 EUT Setup



3.7.3 Test Procedure

The EUT was worked in channel hopping; the time of single pulses was tested.

3.8 Peak Output Power

3.8.1 Applicable Standard

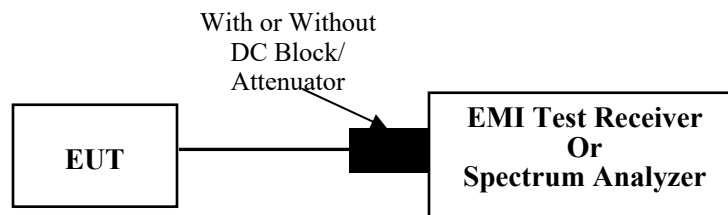
FCC §15.247 (b)(1)

For frequency hopping systems operating in the 2400–2483.5 MHz band employing at least 75 non-overlapping hopping channels, and all frequency hopping systems in the 5725-5850 MHz band: 1 watt. For all other frequency hopping systems in the 2400–2483.5 MHz band: 0.125 watts

According to RSS-247 Clause 5.4 b)

- b) For FHSs operating in the band 2400-2483.5 MHz, the maximum peak conducted output power shall not exceed 1.0 W if the hopset uses 75 or more hopping channels; the maximum peak conducted output power shall not exceed 0.125 W if the hopset uses less than 75 hopping channels. The e.i.r.p. shall not exceed 4 W, except as provided in section 5.4(e).

3.8.2 EUT Setup



3.7.3 Test Procedure

According to ANSI C63.10-2013 Section 7.8.5

This is an RF-conducted test to evaluate maximum peak output power. Use a direct connection between the antenna port of the unlicensed wireless device and the spectrum analyzer, through suitable attenuation, Offset the Insertion loss of the RF cable, DC Block/ Attenuator into the spectrum analyzer. The hopping shall be disabled for this test:

- a) Use the following spectrum analyzer settings:
 - 1) Span: Approximately five times the 20 dB bandwidth, centered on a hopping channel.
 - 2) RBW > 20 dB bandwidth of the emission being measured.
 - 3) VBW \geq RBW.
 - 4) Sweep: Auto.
 - 5) Detector function: Peak.
 - 6) Trace: Max hold.
- b) Allow trace to stabilize.
- c) Use the marker-to-peak function to set the marker to the peak of the emission.
- d) The indicated level is the peak output power, after any corrections for external attenuators and cables.
- e) A plot of the test results and setup description shall be included in the test report.

3.9 100 kHz Bandwidth of Frequency Band Edge

3.9.1 Applicable Standard

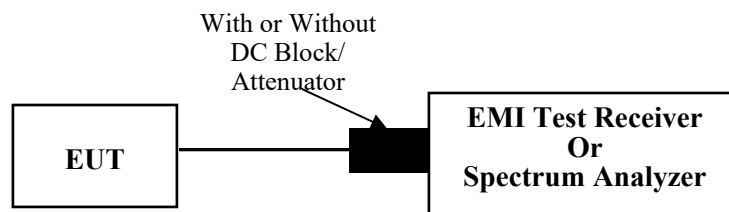
FCC §15.247 (d);

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

According to RSS-247 Clause 5.5

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the RF power that is produced shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided that the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of root-mean-square averaging over a time interval, as permitted under section 5.4(d), the attenuation required shall be 30 dB instead of 20 dB. Attenuation below the general field strength limits specified in RSS-Gen is not required.

3.9.2 EUT Setup



3.9.3 Test Procedure

- a) Set the center frequency and span to encompass frequency range to be measured.
- b) Set the RBW = 100 kHz.
- c) Set the VBW $\geq [3 \times \text{RBW}]$.
- d) Detector = peak.
- e) Sweep time = auto couple.
- f) Trace mode = max hold.
- g) Allow trace to fully stabilize.
- h) Use the peak marker function to determine the maximum amplitude level.

Ensure that the amplitude of all unwanted emissions outside of the authorized frequency band (excluding restricted frequency bands) is attenuated by at least the minimum requirements specified in 11.11. Report the three highest emissions relative to the limit.

3.10 Antenna Requirement

3.10.1 Applicable Standard

FCC §15.203

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited. This requirement does not apply to carrier current devices or to devices operated under the provisions of §§15.211, 15.213, 15.217, 15.219, 15.221, or §15.236. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with §15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this part are not exceeded.

RSS-Gen §6.8

The applicant for equipment certification shall provide a list of all antenna types that may be used with the transmitter, where applicable (i.e. for transmitters with detachable antenna), indicating the maximum permissible antenna gain (in dBi) and the required impedance for each antenna. The test report shall demonstrate the compliance of the transmitter with the limit for maximum equivalent isotropically radiated power (e.i.r.p.) specified in the applicable RSS, when the transmitter is equipped with any antenna type, selected from this list.

For expediting the testing, measurements may be performed using only the antenna with highest gain of each combination of transmitter and antenna type, with the transmitter output power set at the maximum level. However, the transmitter shall comply with the applicable requirements under all operational conditions and when in combination with any type of antenna from the list provided in the test report (and in the notice to be included in the user manual, provided below).

When measurements at the antenna port are used to determine the RF output power, the effective gain of the device's antenna shall be stated, based on a measurement or on data from the antenna's manufacturer. The test report shall state the RF power, output power setting and spurious emission measurements with each antenna type that is used with the transmitter being tested.

For licence-exempt equipment with detachable antennas, the user manual shall also contain the following notice in a conspicuous location:

This radio transmitter [enter the device's ISED certification number] has been approved by Innovation, Science and Economic Development Canada to operate with the antenna types listed below, with the maximum permissible gain indicated. Antenna types not included in this list that have a gain greater than the maximum gain indicated for any type listed are strictly prohibited for use with this device.

Immediately following the above notice, the manufacturer shall provide a list of all antenna types which can be used with the transmitter, indicating the maximum permissible antenna gain (in dBi) and the required impedance for each antenna type.

3.10.2 Judgment

Compliant. Please refer to the Antenna Information detail in Section 1.

4. TEST DATA AND RESULTS

4.1 AC Line Conducted Emissions

Serial Number:	ITRF	Test Date:	2022/12/20
Test Site:	CE	Test Mode:	Transmitting (maximum output power mode (BDR middle channel))
Tester:	Vic Du	Test Result:	Pass

Environmental Conditions:

Temperature: (°C)	18.9	Relative Humidity: (%)	40	ATM Pressure: (kPa)	101.4
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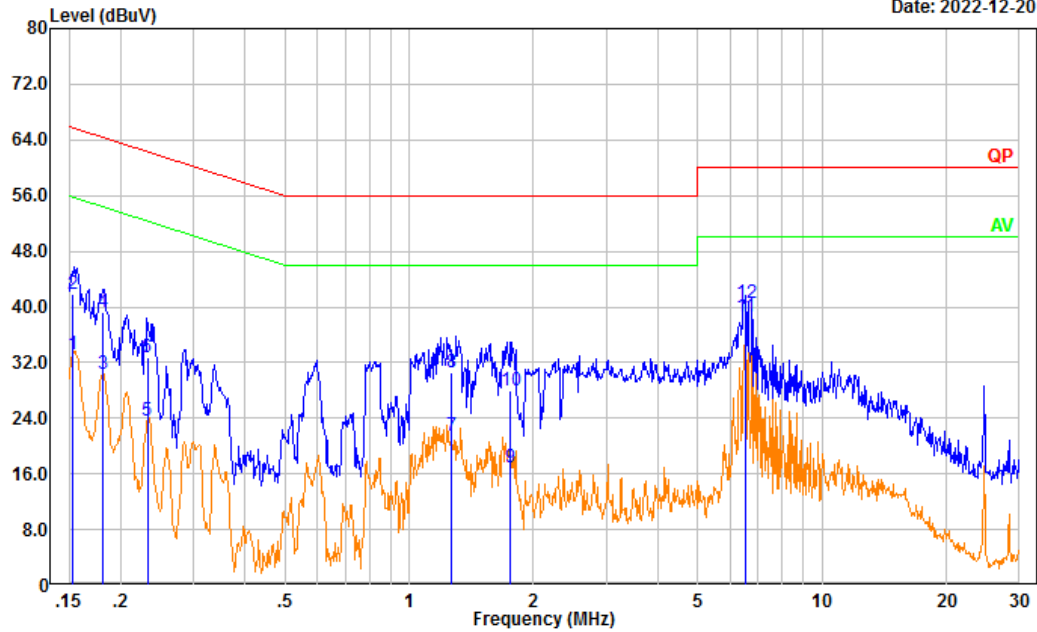
Test Equipment List and Details:

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
R&S	LISN	ENV216	101134	2022/04/01	2023/03/31
R&S	EMI Test Receiver	ESR3	102726	2022/07/15	2023/07/14
MICRO-COAX	Coaxial Cable	UTIFLEX	C-0200-01	2022/08/07	2023/08/06
Audix	Test Software	E3	190306 (V9)	N/A	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 Mode: Transmitting
 Port: Line
 Note:

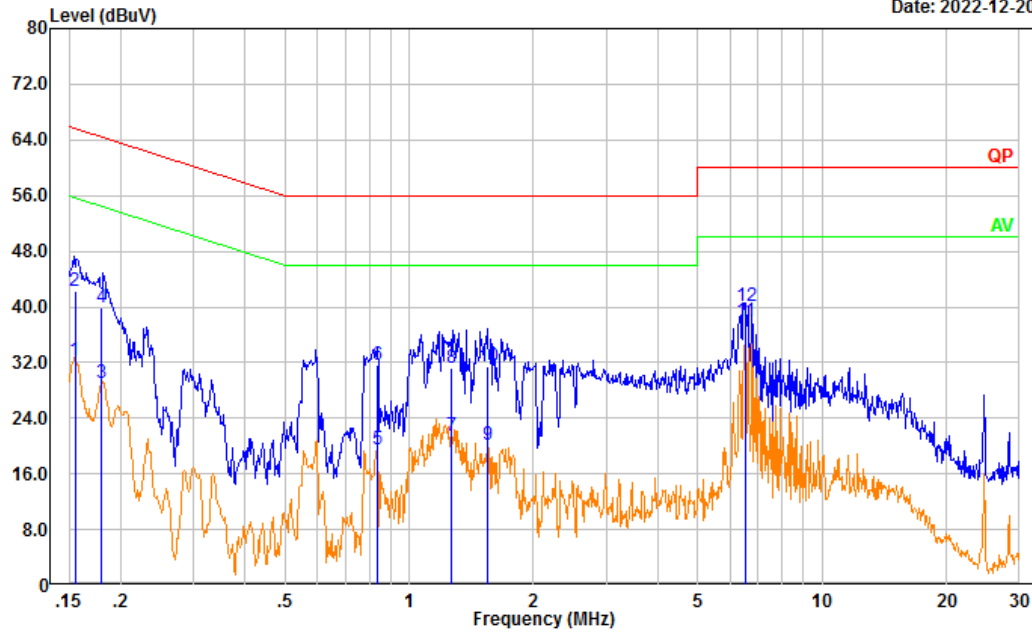
Date: 2022-12-20



No.	Frequency (MHz)	Reading (dBμV)	Factor (dB)	Result (dBμV)	Limit (dBμV)	Margin (dB)	Detector
1	0.154	23.51	9.61	33.12	55.80	22.68	Average
2	0.154	32.28	9.61	41.89	65.80	23.91	QP
3	0.182	20.70	9.61	30.31	54.41	24.10	Average
4	0.182	29.58	9.61	39.19	64.41	25.22	QP
5	0.232	14.12	9.61	23.73	52.37	28.64	Average
6	0.232	23.18	9.61	32.79	62.37	29.58	QP
7	1.264	11.74	9.62	21.36	46.00	24.64	Average
8	1.264	20.90	9.62	30.52	56.00	25.48	QP
9	1.752	7.34	9.63	16.97	46.00	29.03	Average
10	1.752	18.42	9.63	28.05	56.00	27.95	QP
11	6.508	28.90	9.66	38.56	50.00	11.44	Average
12	6.508	30.81	9.66	40.47	60.00	19.53	QP

Test Mode: Transmitting
 Port: neutral
 Note:

Date: 2022-12-20



No.	Frequency (MHz)	Reading (dBμV)	Factor (dB)	Result (dBμV)	Limit (dBμV)	Margin (dB)	Detector
1	0.155	22.61	9.61	32.22	55.73	23.51	Average
2	0.155	32.59	9.61	42.20	65.73	23.53	QP
3	0.180	19.48	9.61	29.09	54.47	25.38	Average
4	0.180	30.25	9.61	39.86	64.47	24.61	QP
5	0.839	9.91	9.62	19.53	46.00	26.47	Average
6	0.839	21.93	9.62	31.55	56.00	24.45	QP
7	1.260	11.77	9.62	21.39	46.00	24.61	Average
8	1.260	21.59	9.62	31.21	56.00	24.79	QP
9	1.554	10.57	9.63	20.20	46.00	25.80	Average
10	1.554	21.85	9.63	31.48	56.00	24.52	QP
11	6.507	28.27	9.66	37.93	50.00	12.07	Average
12	6.507	30.36	9.66	40.02	60.00	19.98	QP

4.2 Radiation Spurious Emissions

Serial Number:	1 TRF	Test Date:	2022/12/27~2023/03/17
Test Site:	966-2, 966-1	Test Mode:	Transmitting
Tester:	Carl Xue, coco Tian	Test Result:	Pass

Environmental Conditions:					
Temperature: (°C)	21.4~22.8	Relative Humidity: (%)	40~48	ATM Pressure: (kPa)	101.1~101.7

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	2022/07/15	2023/07/14
TIMES MICROWAVE	Coaxial Cable	LMR-600-UltraFlex	C-0470-02	2022/07/17	2023/07/16
TIMES MICROWAVE	Coaxial Cable	LMR-600-UltraFlex	C-0780-01	2022/07/17	2023/07/16
Sonoma	Amplifier	310N	186165	2022/07/17	2023/07/16
ETS-Lindgren	Horn Antenna	3115	9912-5985	2020/10/13	2023/10/12
R&S	Spectrum Analyzer	FSV40	101591	2022/07/15	2023/07/14
MICRO-COAX	Coaxial Cable	UFA210A-1-1200-70U300	217423-008	2022/08/07	2023/08/06
MICRO-COAX	Coaxial Cable	UFA210A-1-2362-300300	235780-001	2022/08/07	2023/08/06
Mini	Pre-amplifier	ZVA-183-S+	5969001149	2022/11/09	2023/11/08
Audix	Test Software	E3	201021 (V9)	N/A	N/A
PASTERNAK	Horn Antenna	PE9852/2F-20	112002	2021/02/05	2024/02/04
Quinstar	Preamplifier	QLW-18405536-JO	15964001005	2022/9/16	2023/9/15
MICRO-COAX	Coaxial Cable	UFB142A-1-2362-200200	235772-001	2022/08/07	2023/08/06
E-Microwave	Band Rejection Filter	2400-2483.5MHz	OE01902424	2022/08/07	2023/08/06
Mini Circuits	High Pass Filter	VHF-6010+	31119	2022/08/07	2023/08/06

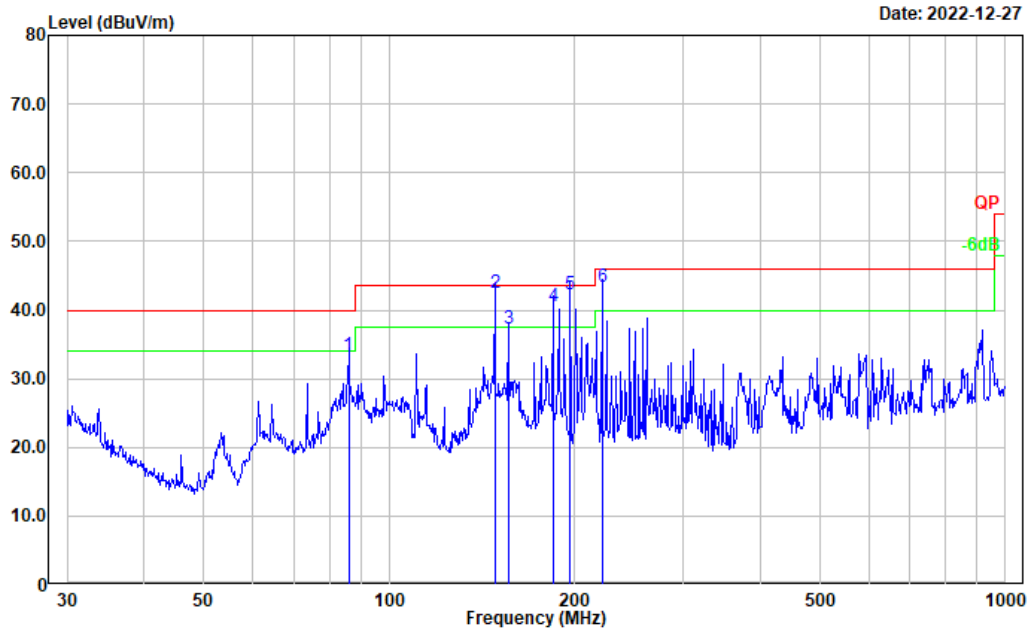
* Statement of Traceability: China Certification ICT Co., Ltd (Dongguan) attests that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).

Test Data:

Please refer to the below table and plots.

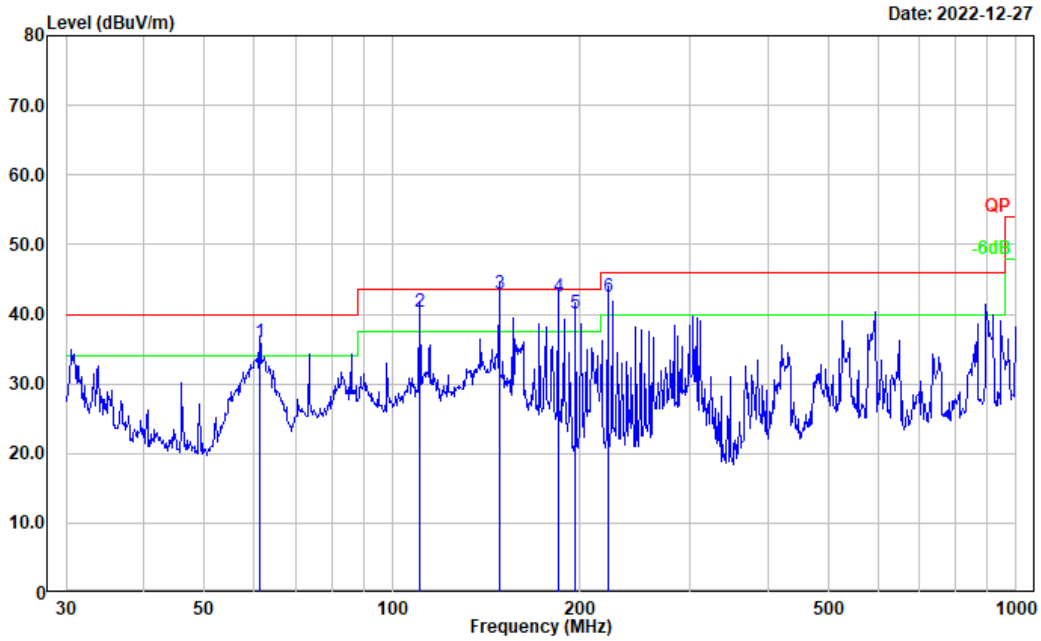
1) 30MHz-1GHz (maximum output power mode (BDR middle channel))

Test Mode: Transmitting
 Polarization: horizontal
 Note:



No.	Frequency (MHz)	Reading (dBμV)	Factor (dB/m)	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector
1	85.898	50.46	-17.15	33.31	40.00	6.69	QP
2	148.441	54.49	-12.00	42.49	43.50	1.01	QP
3	155.910	49.25	-12.04	37.21	43.50	6.29	QP
4	184.490	54.14	-13.58	40.56	43.50	2.94	QP
5	196.510	54.88	-12.60	42.28	43.50	1.22	QP
6	221.392	56.17	-12.84	43.33	46.00	2.67	QP

Test Mode: Transmitting
 Polarization: vertical
 Note:

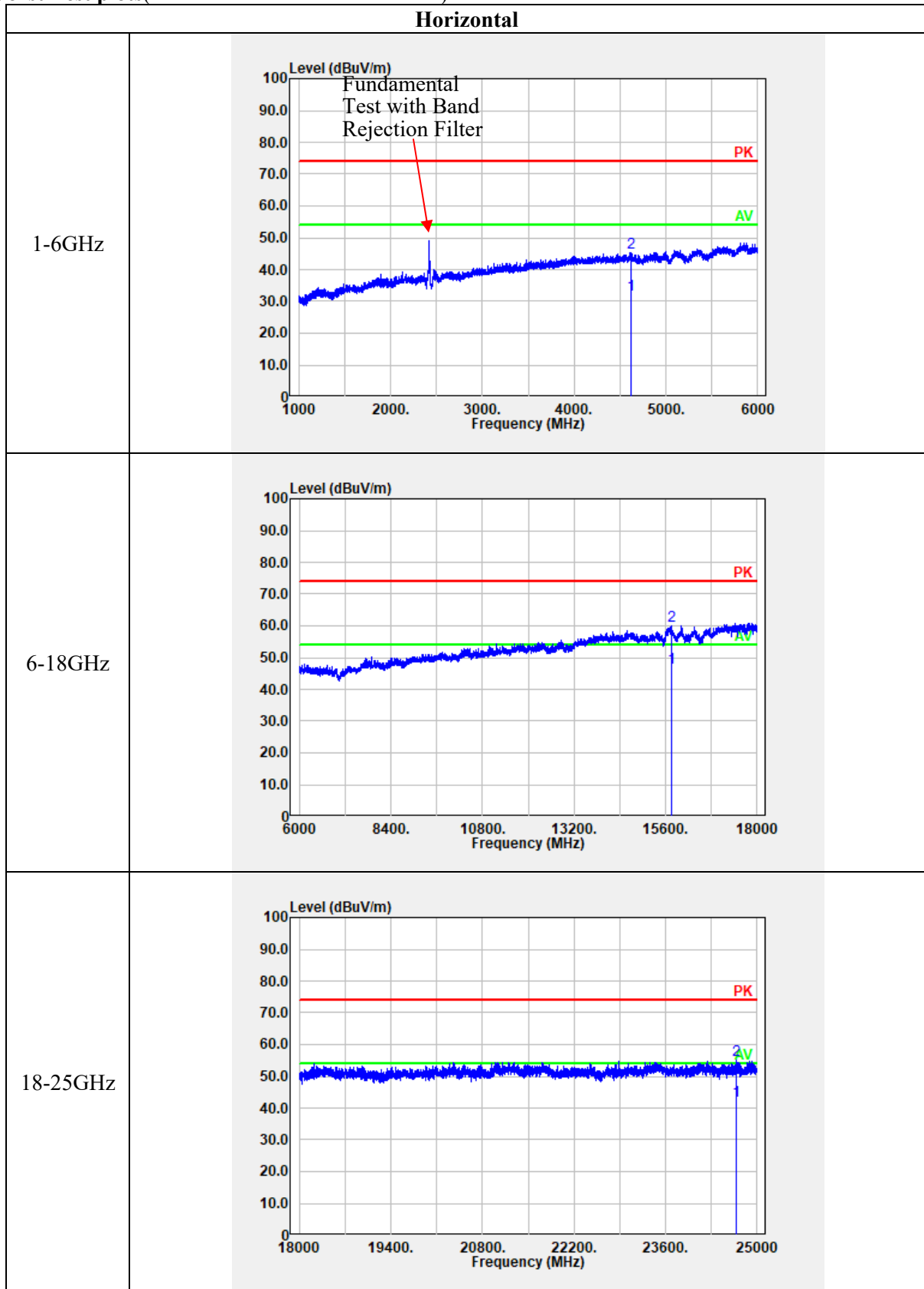


No.	Frequency (MHz)	Reading (dBμV)	Factor (dB/m)	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector
1	61.346	53.21	-17.32	35.89	40.00	4.11	QP
2	110.569	52.54	-12.28	40.26	43.50	3.24	QP
3	148.441	54.93	-12.00	42.93	43.50	0.57	QP
4	184.490	56.06	-13.58	42.48	43.50	1.02	QP
5	196.510	52.68	-12.60	40.08	43.50	3.42	QP
6	221.392	55.32	-12.84	42.48	46.00	3.52	QP

2) 1-25GHz(Model:*BDR Mode(GFSK)was the worst:*

Frequency (MHz)	Receiver		Polar (H/V)	Factor (dB/m)	Result (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)
	Reading (dB μ V)	Detector					
Low Channel: 2402 MHz							
2402.000	67.50	PK	H	31.51	99.01	N/A	N/A
2402.000	56.19	AV	H	31.51	87.70	N/A	N/A
2402.000	59.64	PK	V	31.51	91.15	N/A	N/A
2402.000	48.38	AV	V	31.51	79.89	N/A	N/A
2390.000	26.51	PK	H	31.46	57.97	74.00	16.03
2390.000	13.76	AV	H	31.46	45.22	54.00	8.78
4804.000	32.46	PK	H	10.91	43.37	74.00	30.63
4804.000	19.36	AV	H	10.91	30.27	54.00	23.73
7206.000	34.42	PK	H	14.22	48.64	74.00	25.36
7206.000	21.46	AV	H	14.22	35.68	54.00	18.32
Middle Channel: 2441 MHz							
2441.000	66.44	PK	H	31.61	98.05	N/A	N/A
2441.000	55.24	AV	H	31.61	86.85	N/A	N/A
2441.000	58.51	PK	V	31.61	90.12	N/A	N/A
2441.000	47.17	AV	V	31.61	78.78	N/A	N/A
4882.000	32.45	PK	H	11.07	43.52	74.00	30.48
4882.000	19.64	AV	H	11.07	30.71	54.00	23.29
7323.000	33.16	PK	H	14.80	47.96	74.00	26.04
7323.000	20.27	AV	H	14.80	35.07	54.00	18.93
High Channel: 2480 MHz							
2480.000	67.37	PK	H	31.64	99.01	N/A	N/A
2480.000	56.02	AV	H	31.64	87.66	N/A	N/A
2480.000	59.48	PK	V	31.64	91.12	N/A	N/A
2480.000	48.77	AV	V	31.64	80.41	N/A	N/A
2483.500	27.08	PK	H	31.64	58.72	74.00	15.28
2483.500	14.16	AV	H	31.64	45.80	54.00	8.20
4960.000	32.64	PK	H	11.23	43.87	74.00	30.13
4960.000	19.46	AV	H	11.23	30.69	54.00	23.31
7440.000	33.15	PK	H	15.26	48.41	74.00	25.59
7440.000	20.32	AV	H	15.26	35.58	54.00	18.42

Worst Test plots(BDR low channel was the worst)



Vertical

<p>1-6GHz</p>	
<p>6-18GHz</p>	
<p>18-25GHz</p>	

4.3 20 dB Emission Bandwidth:

Serial Number:	1TRF	Test Date:	2023/7/19
Test Site:	RF	Test Mode:	Transmitting
Tester:	Claire Liu	Test Result:	N/A

Environmental Conditions:

Temperature: (°C)	24.5	Relative Humidity: (%)	52	ATM Pressure: (kPa)	99.8
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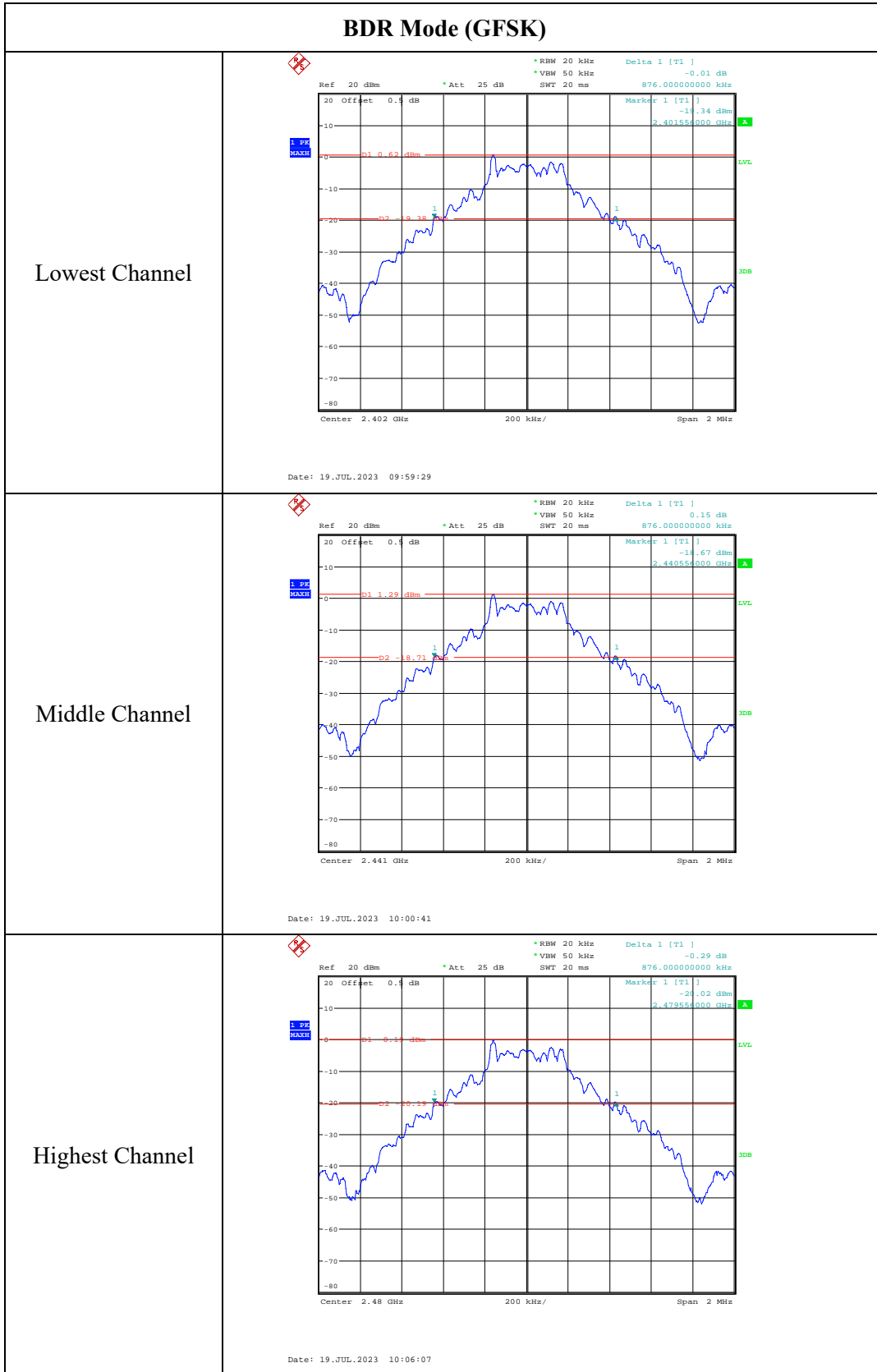
Test Equipment List and Details:

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
R&S	Spectrum Analyzer	FSU26	200256	2023/3/31	2024/3/30
zhuoxiang	Coaxial Cable	SMA-178	211003	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).

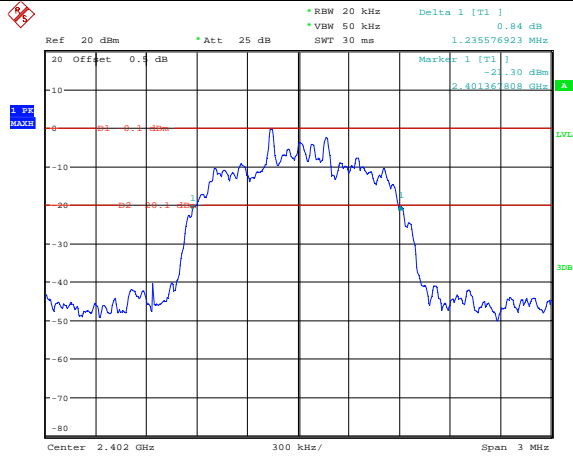
Test Data:

Test Modes	Test Channel	Test Frequency (MHz)	20 dB Bandwidth (MHz)
BDR Mode (GFSK)	Lowest	2402	0.876
	Middle	2441	0.876
	Highest	2480	0.876
EDR Mode ($\pi/4$ -DQPSK)	Lowest	2402	1.236
	Middle	2441	1.236
	Highest	2480	1.240
EDR Mode (8DPSK)	Lowest	2402	1.221
	Middle	2441	1.218
	Highest	2480	1.227



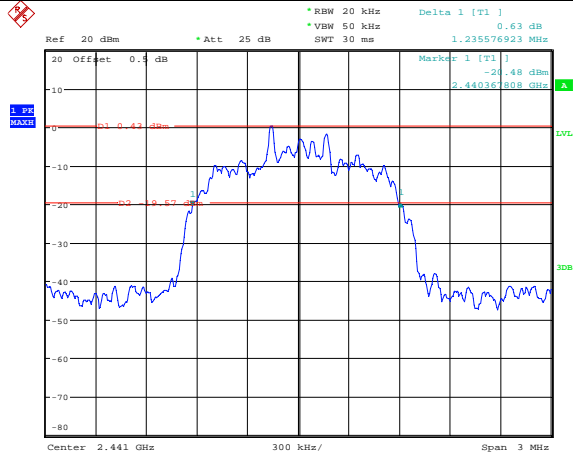
EDR Mode ($\pi/4$ -DQPSK)

Lowest Channel



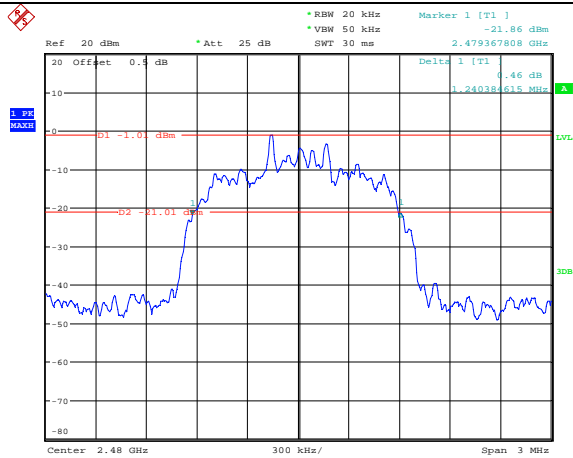
Date: 19.JUL.2023 10:17:14

Middle Channel



Date: 19.JUL.2023 10:15:46

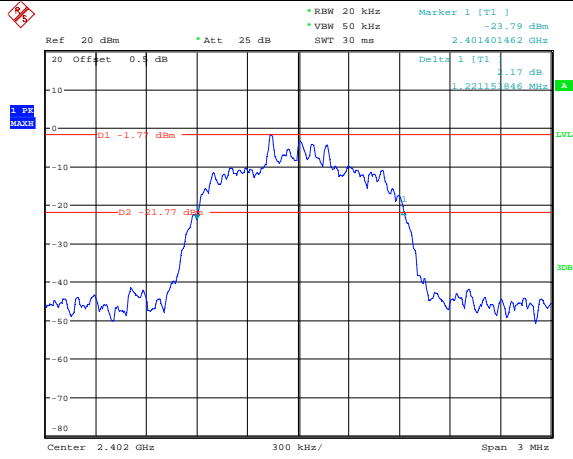
Highest Channel



Date: 19.JUL.2023 10:13:38

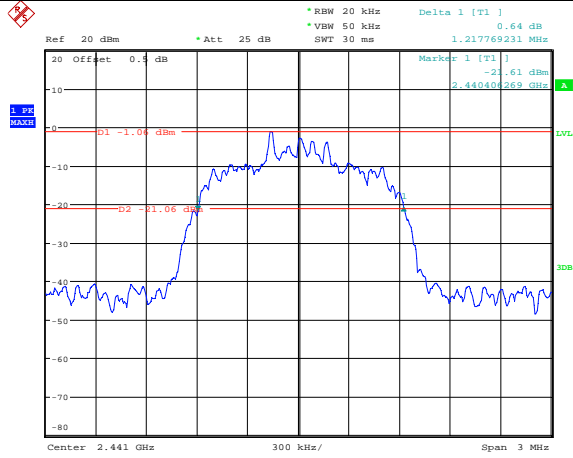
EDR Mode (8DPSK)

Lowest Channel



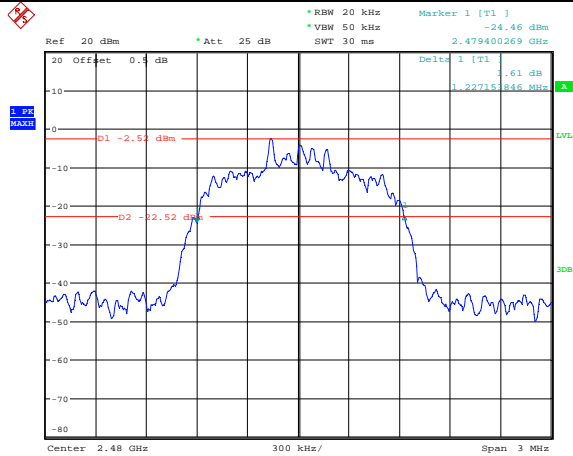
Date: 19.JUL.2023 10:21:14

Middle Channel



Date: 19.JUL.2023 10:22:43

Highest Channel



Date: 19.JUL.2023 10:24:15

4.4 99% Occupied Bandwidth:

Serial Number:	1TRF	Test Date:	2023/7/19
Test Site:	RF	Test Mode:	Transmitting
Tester:	Claire Liu	Test Result:	Pass

Environmental Conditions:

Temperature: (°C)	24.5	Relative Humidity: (%)	52	ATM Pressure: (kPa)	99.8
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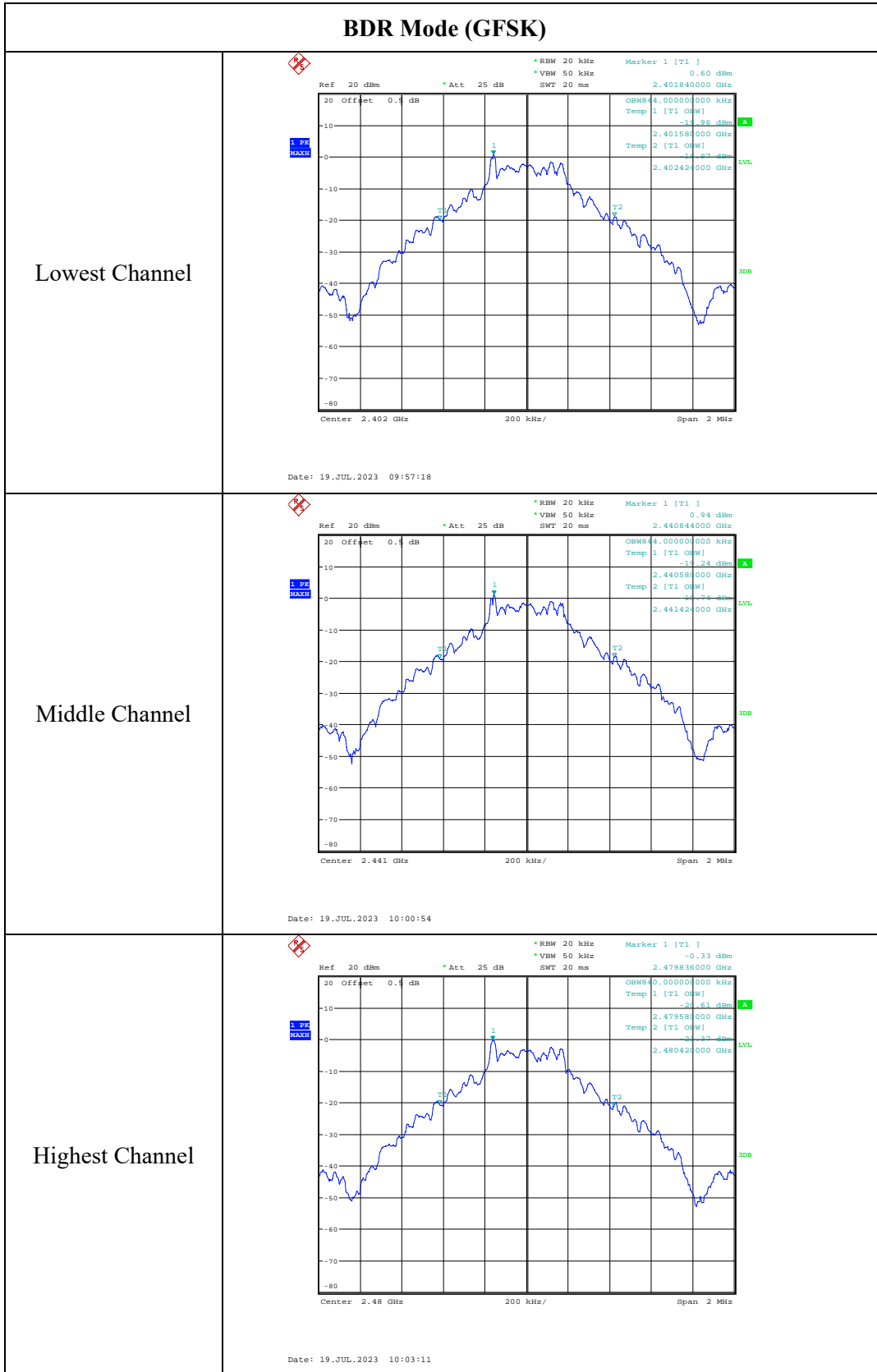
Test Equipment List and Details:

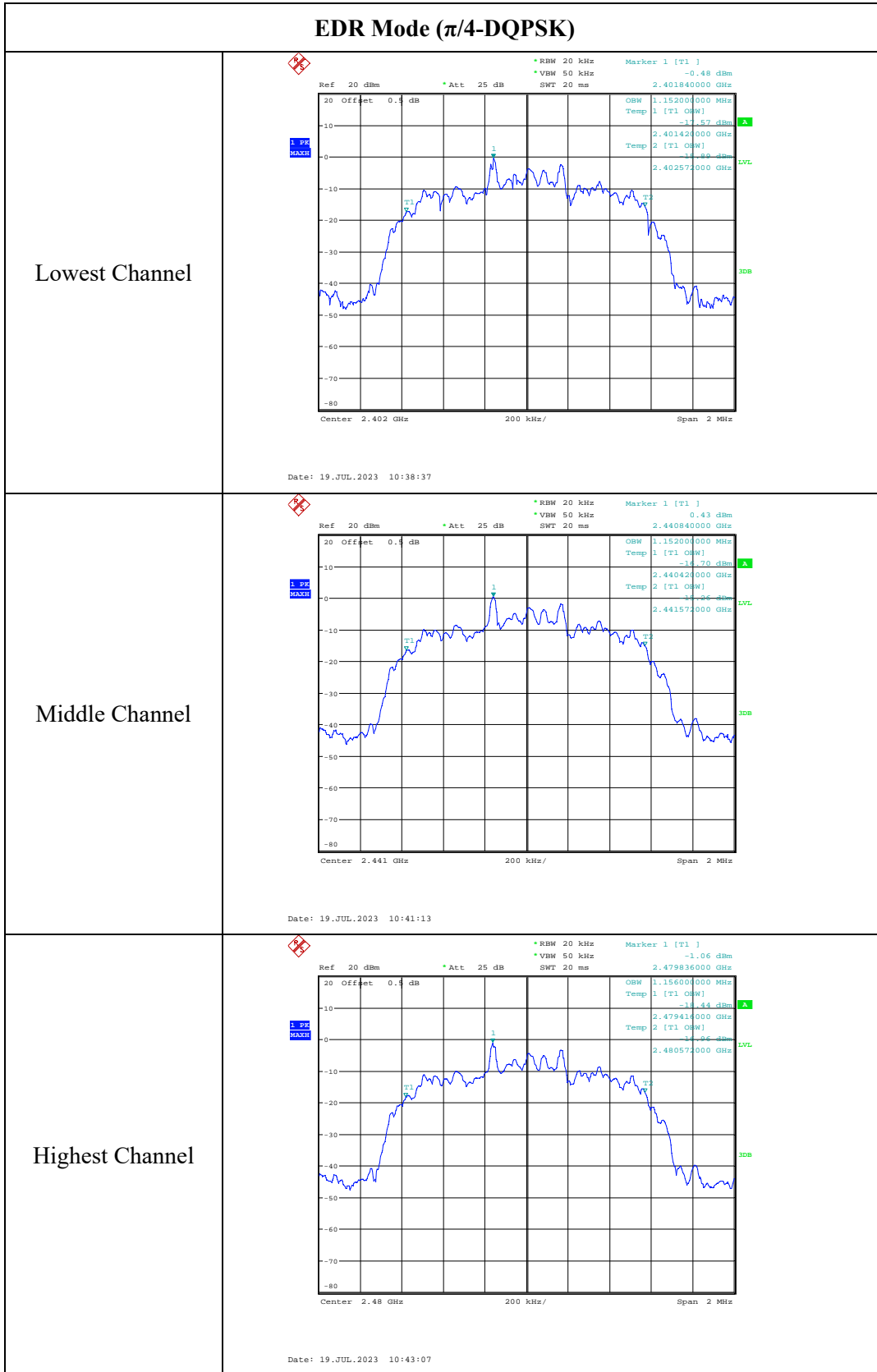
Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
R&S	Spectrum Analyzer	FSU26	200256	2023/3/31	2024/3/30
zhuoxiang	Coaxial Cable	SMA-178	211003	Each time	N/A

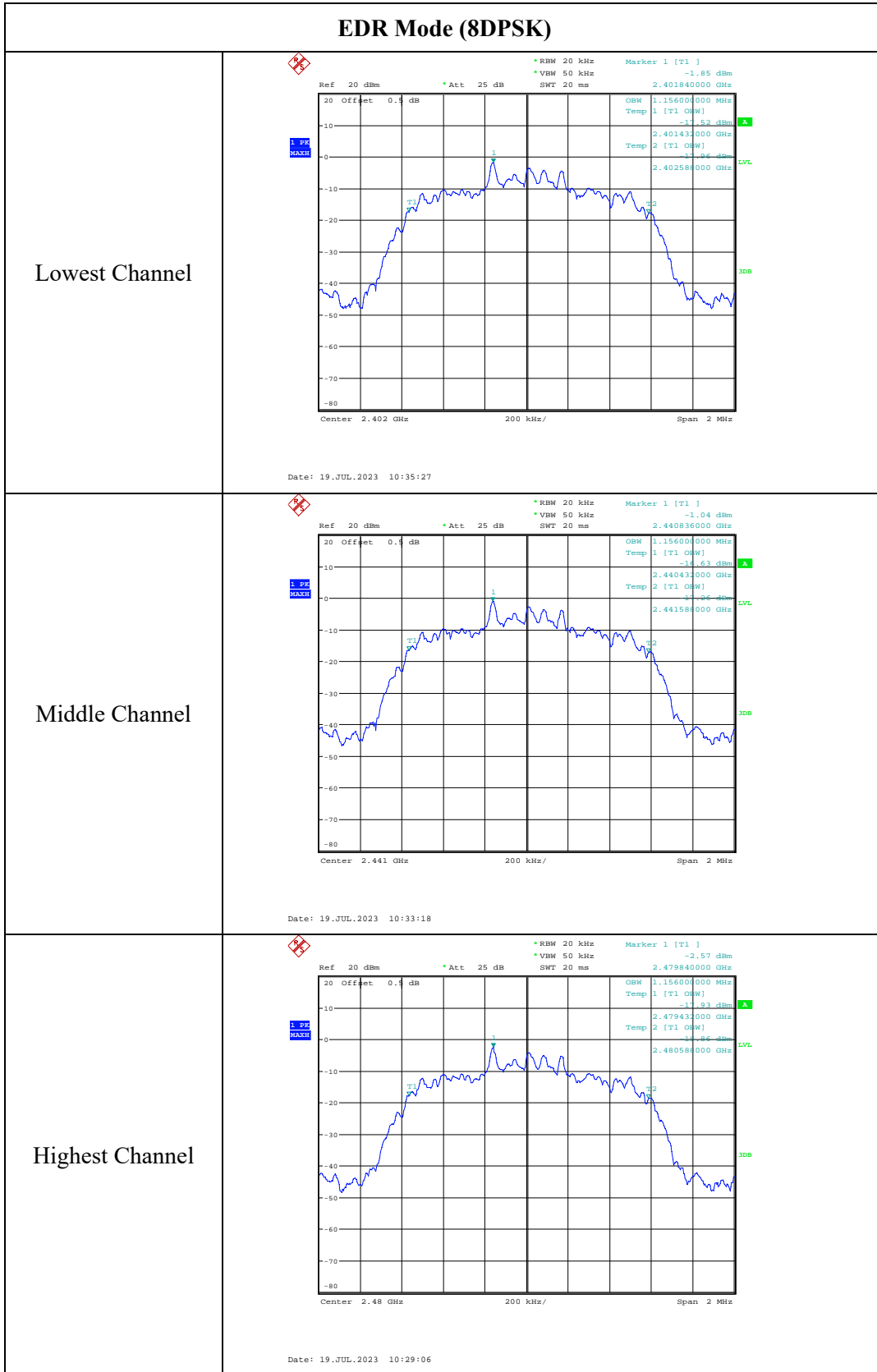
* Statement of Traceability: China Certification ICT Co., Ltd (Dongguan) attests that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).

Test Data:

Test Modes	Test Channel	Test Frequency (MHz)	99% Occupied Bandwidth (MHz)
BDR Mode (GFSK)	Lowest	2402	0.844
	Middle	2441	0.848
	Highest	2480	0.84
EDR Mode ($\pi/4$ -DQPSK)	Lowest	2402	1.152
	Middle	2441	1.152
	Highest	2480	1.156
EDR Mode (8DPSK)	Lowest	2402	1.156
	Middle	2441	1.156
	Highest	2480	1.156







4.5 Channel Separation:

Serial Number:	ITRF	Test Date:	2023/7/19
Test Site:	RF	Test Mode:	Transmitting
Tester:	Claire Liu	Test Result:	Pass

Environmental Conditions:

Temperature: (°C)	24.5	Relative Humidity: (%)	52	ATM Pressure: (kPa)	99.8
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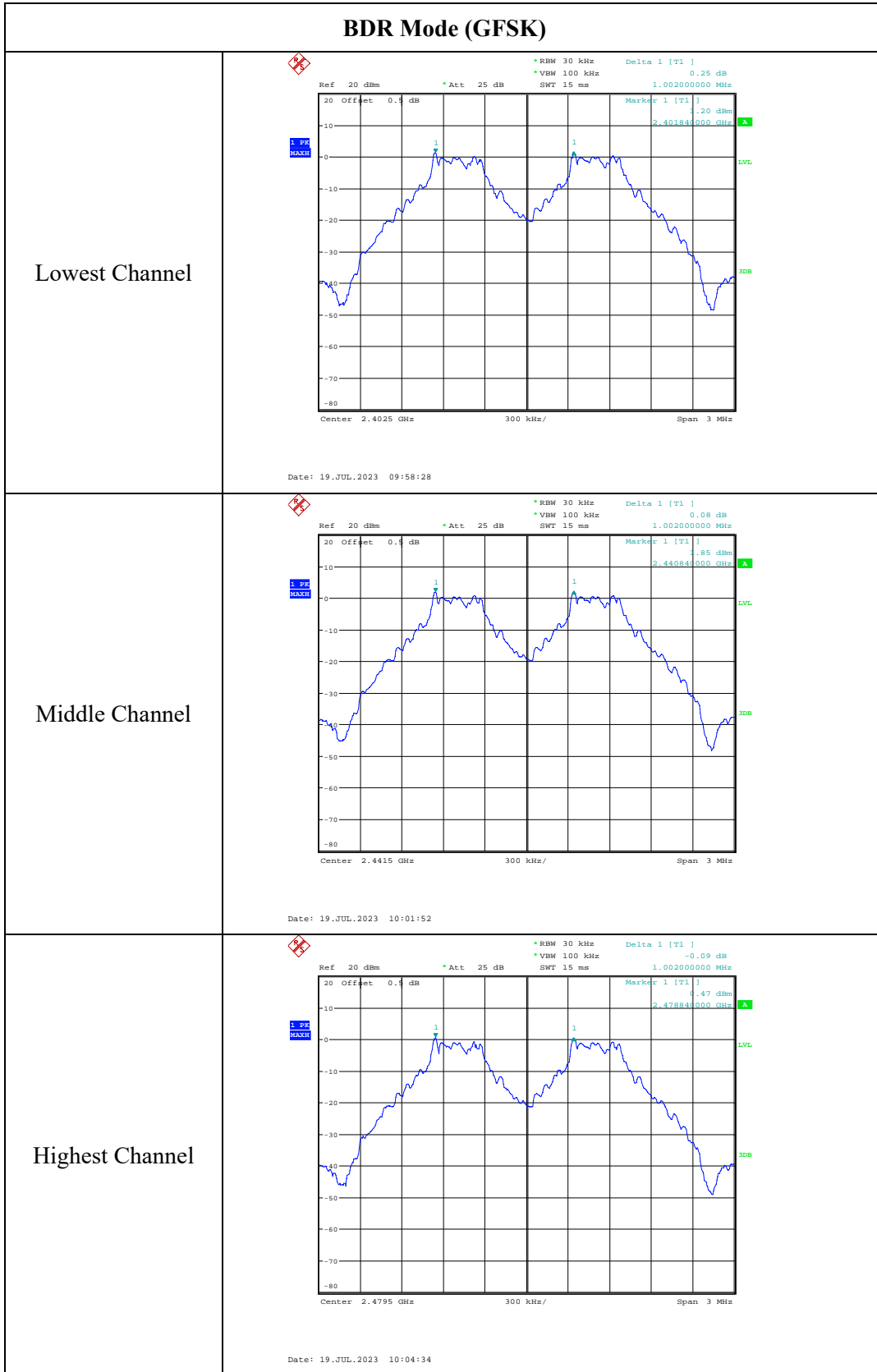
Test Equipment List and Details:

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
R&S	Spectrum Analyzer	FSU26	200256	2023/3/31	2024/3/30
zhuoxiang	Coaxial Cable	SMA-178	211003	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).

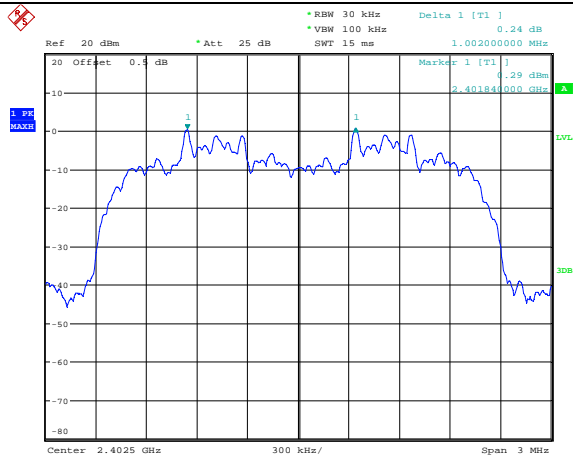
Test Data:

Test Modes	Test Frequency (MHz)	Channel Separation (MHz)	Limits (MHz)
BDR Mode (GFSK)	2402	1.002	0.584
	2441	1.002	0.584
	2480	1.002	0.584
EDR Mode ($\pi/4$ -DQPSK)	2402	1.002	0.824
	2441	0.996	0.824
	2480	1.008	0.827
EDR Mode (8DPSK)	2402	0.996	0.814
	2441	0.996	0.812
	2480	1.008	0.818



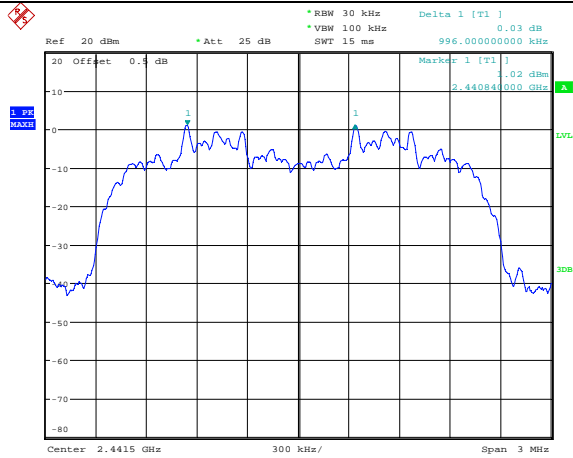
EDR Mode ($\pi/4$ -DQPSK)

Lowest Channel



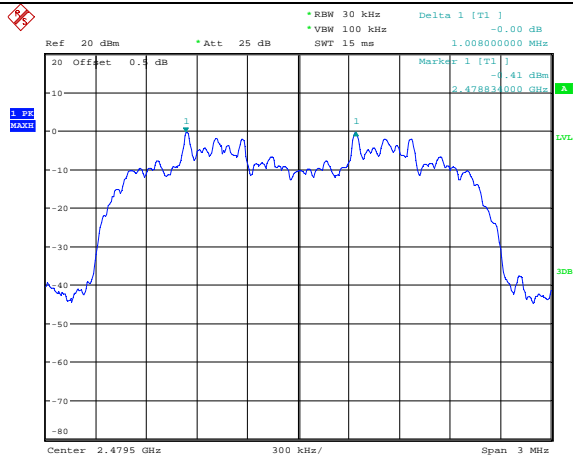
Date: 19.JUL.2023 10:40:45

Middle Channel



Date: 19.JUL.2023 10:42:38

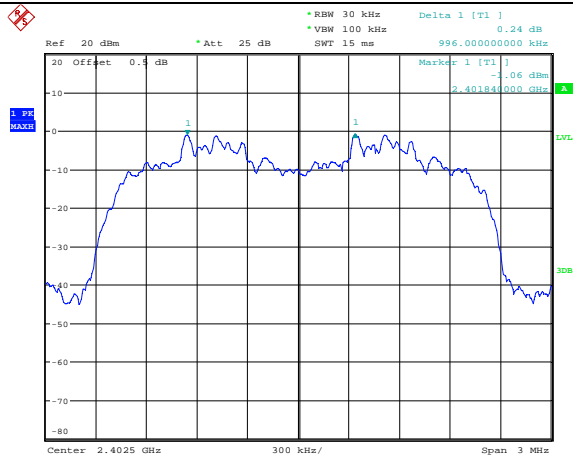
Highest Channel



Date: 19.JUL.2023 10:44:48

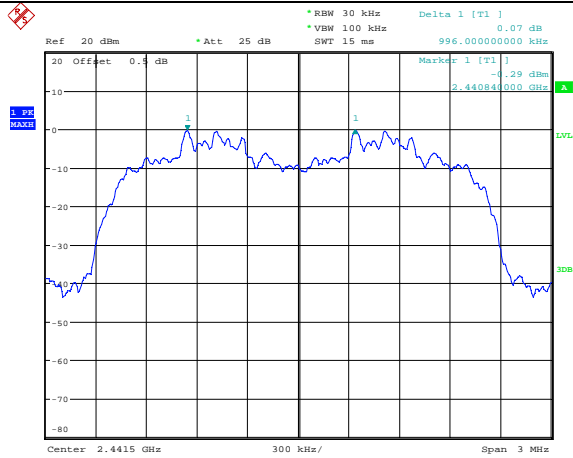
EDR Mode (8DPSK)

Lowest Channel



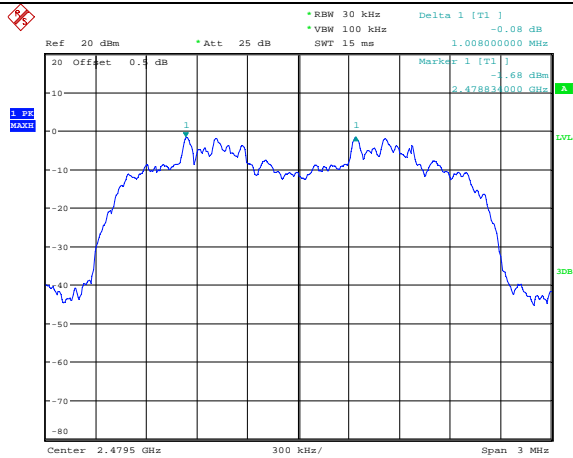
Date: 19.JUL.2023 10:36:59

Middle Channel



Date: 19.JUL.2023 10:34:18

Highest Channel



Date: 19.JUL.2023 10:30:33

4.6 Number Of Hopping Frequency:

Serial Number:	1TRF	Test Date:	2023/7/19
Test Site:	RF	Test Mode:	Transmitting
Tester:	Claire Liu	Test Result:	Pass

Environmental Conditions:

Temperature: (°C)	24.5	Relative Humidity: (%)	52	ATM Pressure: (kPa)	99.8
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Test Equipment List and Details:

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
R&S	Spectrum Analyzer	FSU26	200256	2023/3/31	2024/3/30
zhuoxiang	Coaxial Cable	SMA-178	211003	Each time	N/A

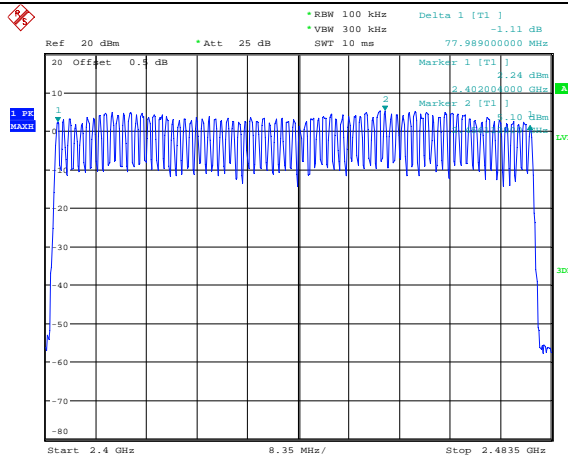
* Statement of Traceability: China Certification ICT Co., Ltd (Dongguan) attests that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).

Test Data:

Test Modes	Frequency Range (MHz)	Number of Hopping Channel	Limits
GFSK	2400-2483.5	79	≥15
$\pi/4$ -DQPSK	2400-2483.5	79	≥15
8DPSK	2400-2483.5	79	≥15

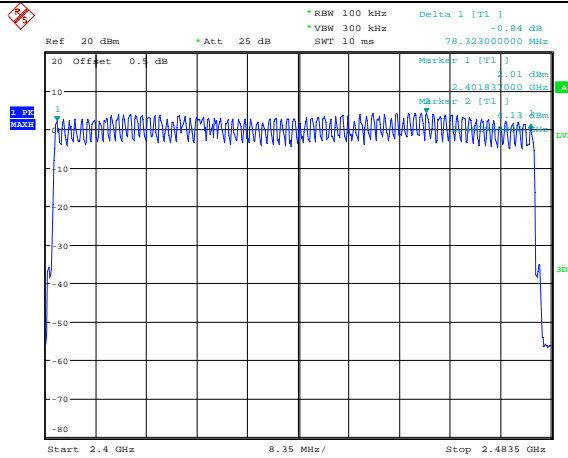
Number Of Hopping Frequency

**BDR Mode
(GFSK)**



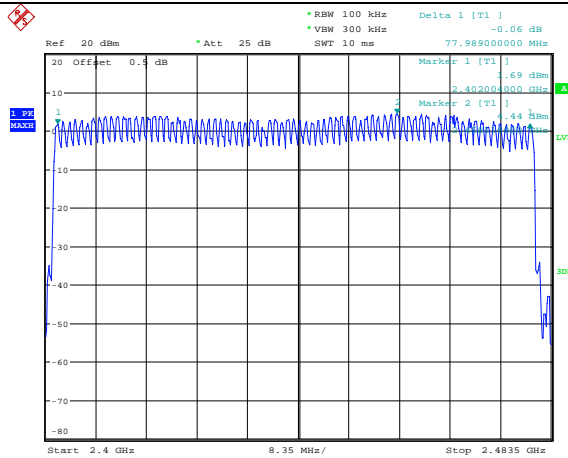
Date: 19.JUL.2023 13:15:49

**EDR Mode
($\pi/4$ -DQPSK)**



Date: 19.JUL.2023 13:13:01

**EDR Mode
(8DPSK)**



Date: 19.JUL.2023 13:05:29

4.7 Time Of Occupancy(Dwell Time):

Serial Number:	ITRF	Test Date:	2023/7/19
Test Site:	RF	Test Mode:	Transmitting
Tester:	Claire Liu	Test Result:	Pass

Environmental Conditions:

Temperature: (°C)	24.5	Relative Humidity: (%)	52	ATM Pressure: (kPa)	99.8
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Test Equipment List and Details:

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
R&S	Spectrum Analyzer	FSU26	200256	2023/3/31	2024/3/30
zhuoxiang	Coaxial Cable	SMA-178	211003	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:

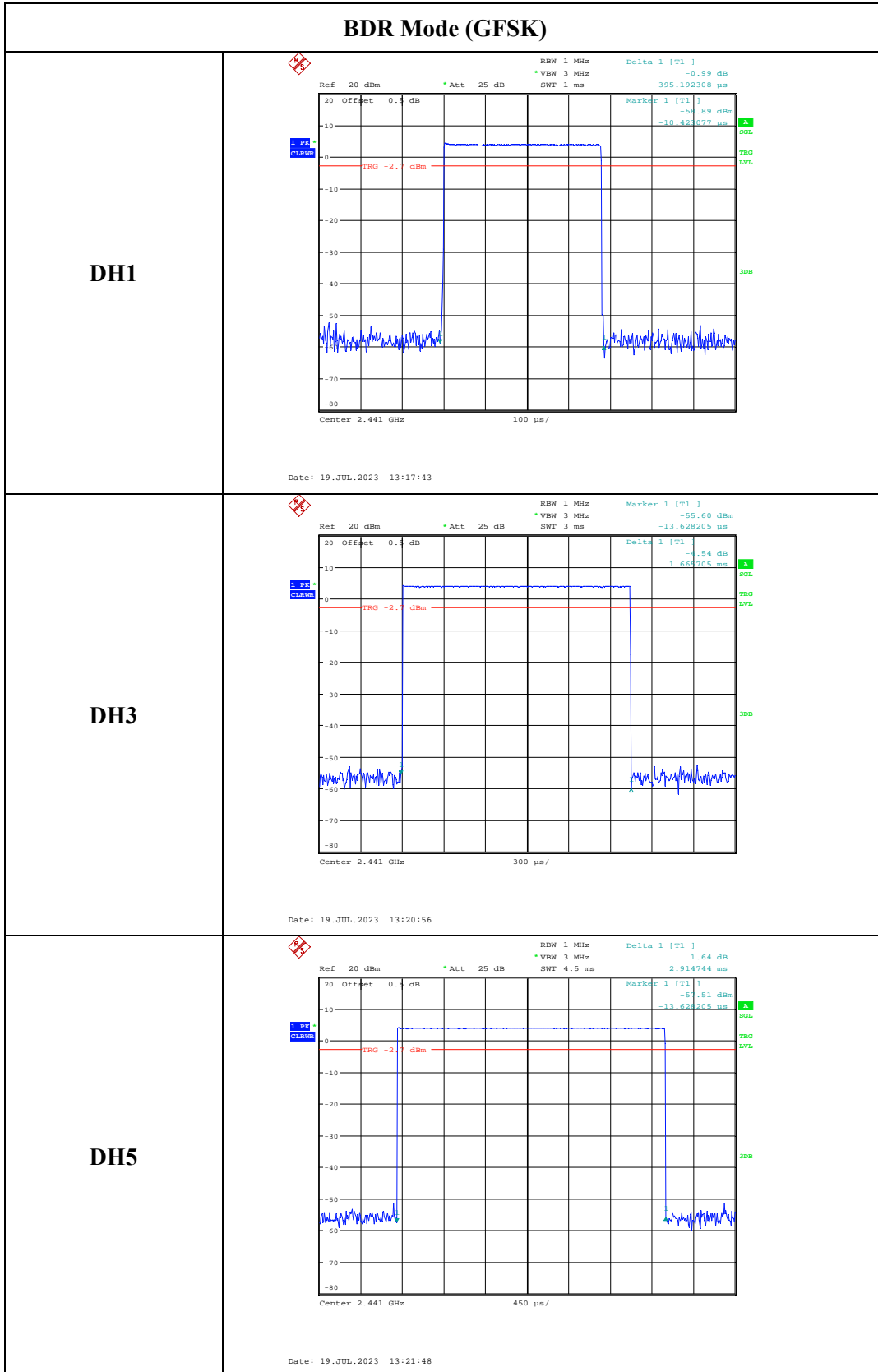
Test Modes	Packet Type	Test Frequency (MHz)	Pulse width (ms)	Result (s)	Limit (s)
BDR Mode (GFSK)	DH1	2441	0.395	0.126	0.400
	DH3	2441	1.666	0.267	0.400
	DH5	2441	2.915	0.311	0.400
EDR Mode ($\pi/4$ -DQPSK)	2DH1	2441	0.395	0.126	0.400
	2DH3	2441	1.675	0.268	0.400
	2DH5	2441	2.936	0.313	0.400
EDR Mode (8DPSK)	3DH1	2441	0.398	0.127	0.400
	3DH3	2441	1.666	0.267	0.400
	3DH5	2441	2.922	0.312	0.400

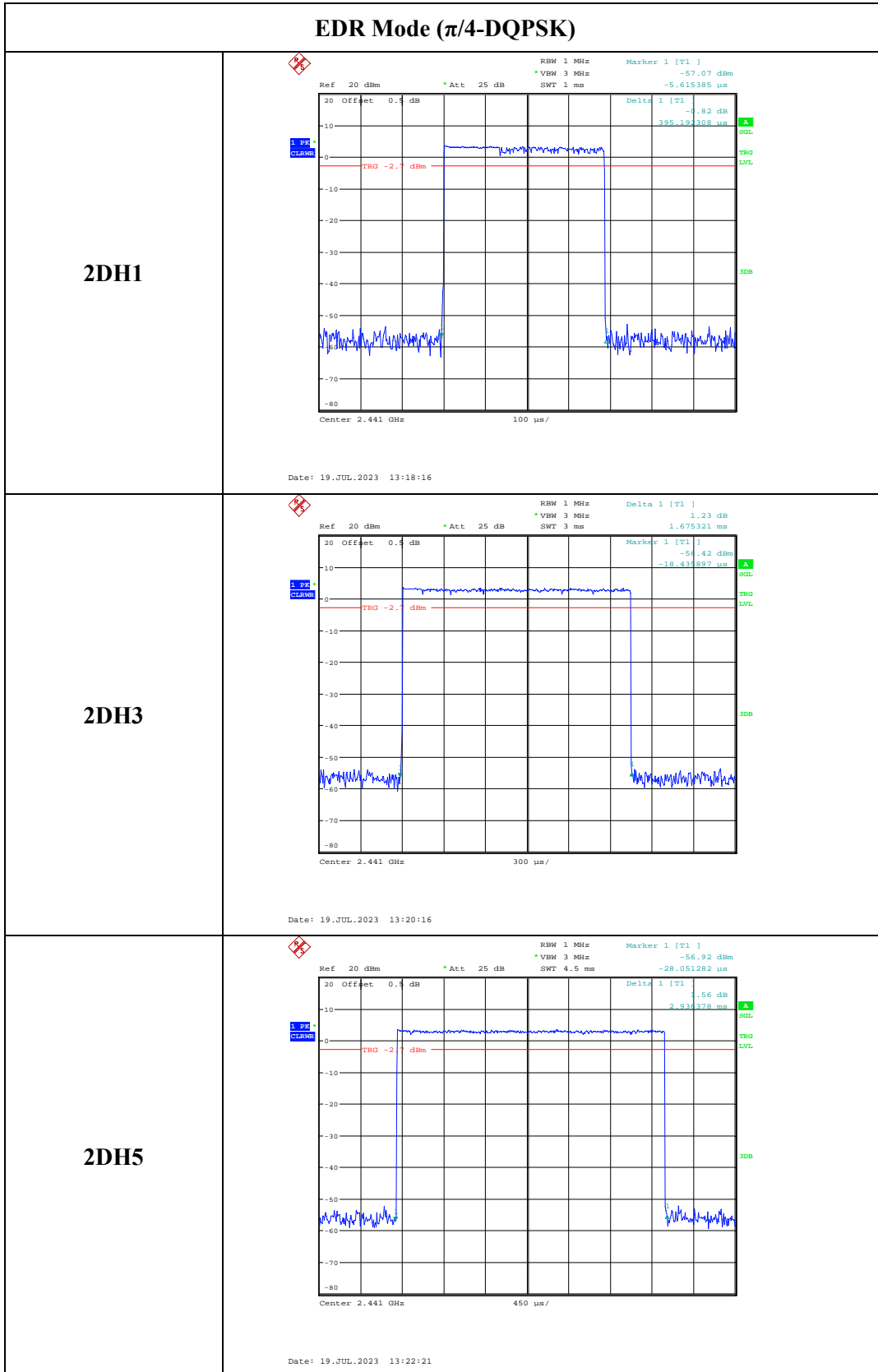
Note:

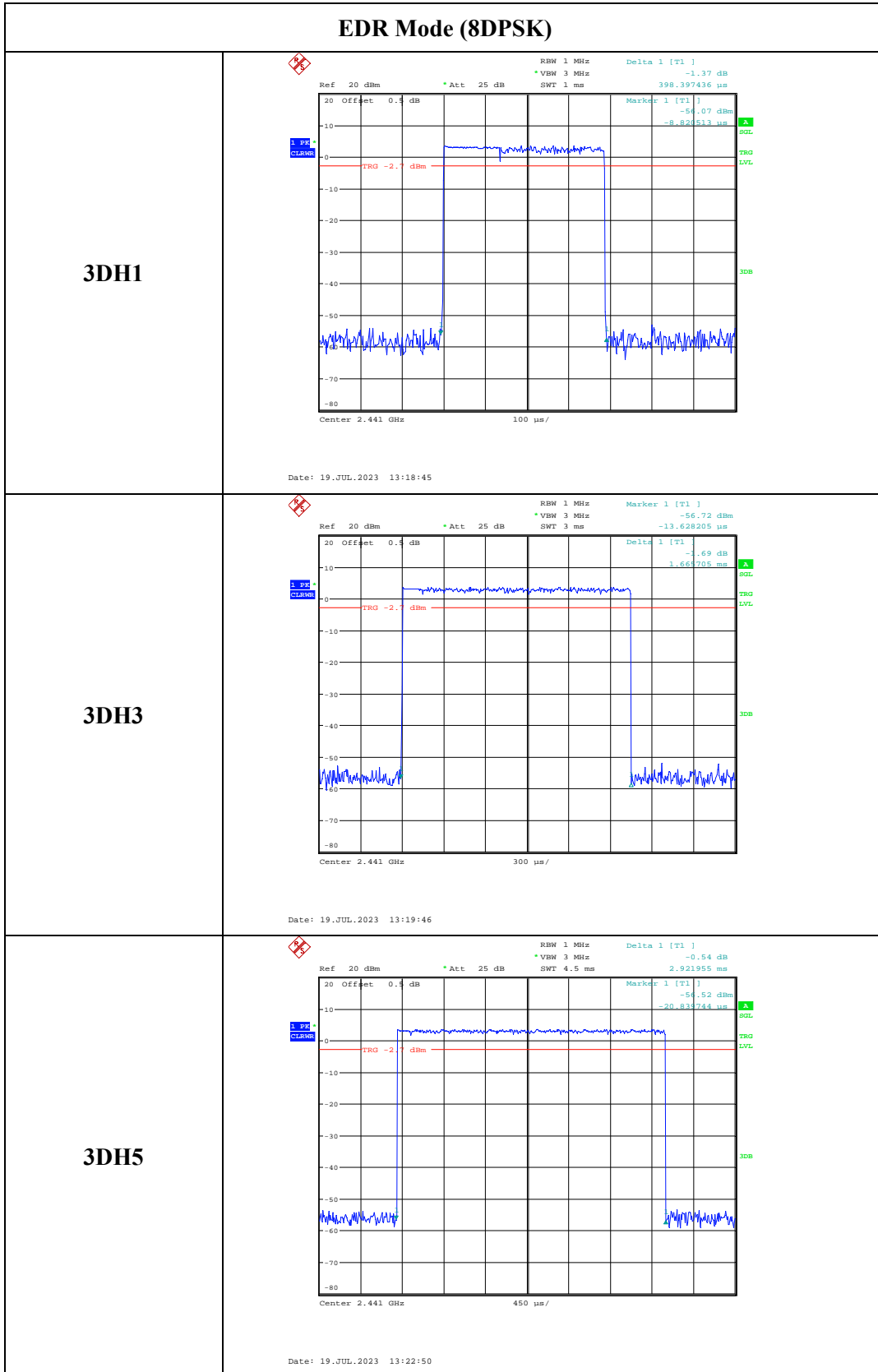
DH1:Dwell time=Pulse time (ms) \times (1600/2/79) \times 31.6 s

DH3:Dwell time=Pulse time (ms) \times (1600/4/79) \times 31.6 s

DH5:Dwell time=Pulse time (ms) \times (1600/6/79) \times 31.6 s







4.8 Maximum Conducted Output Power:

Serial Number:	ITRF	Test Date:	2023/7/19
Test Site:	RF	Test Mode:	Transmitting
Tester:	Claire Liu	Test Result:	Pass

Environmental Conditions:					
Temperature: (°C)	24.5	Relative Humidity: (%)	52	ATM Pressure: (kPa)	99.8

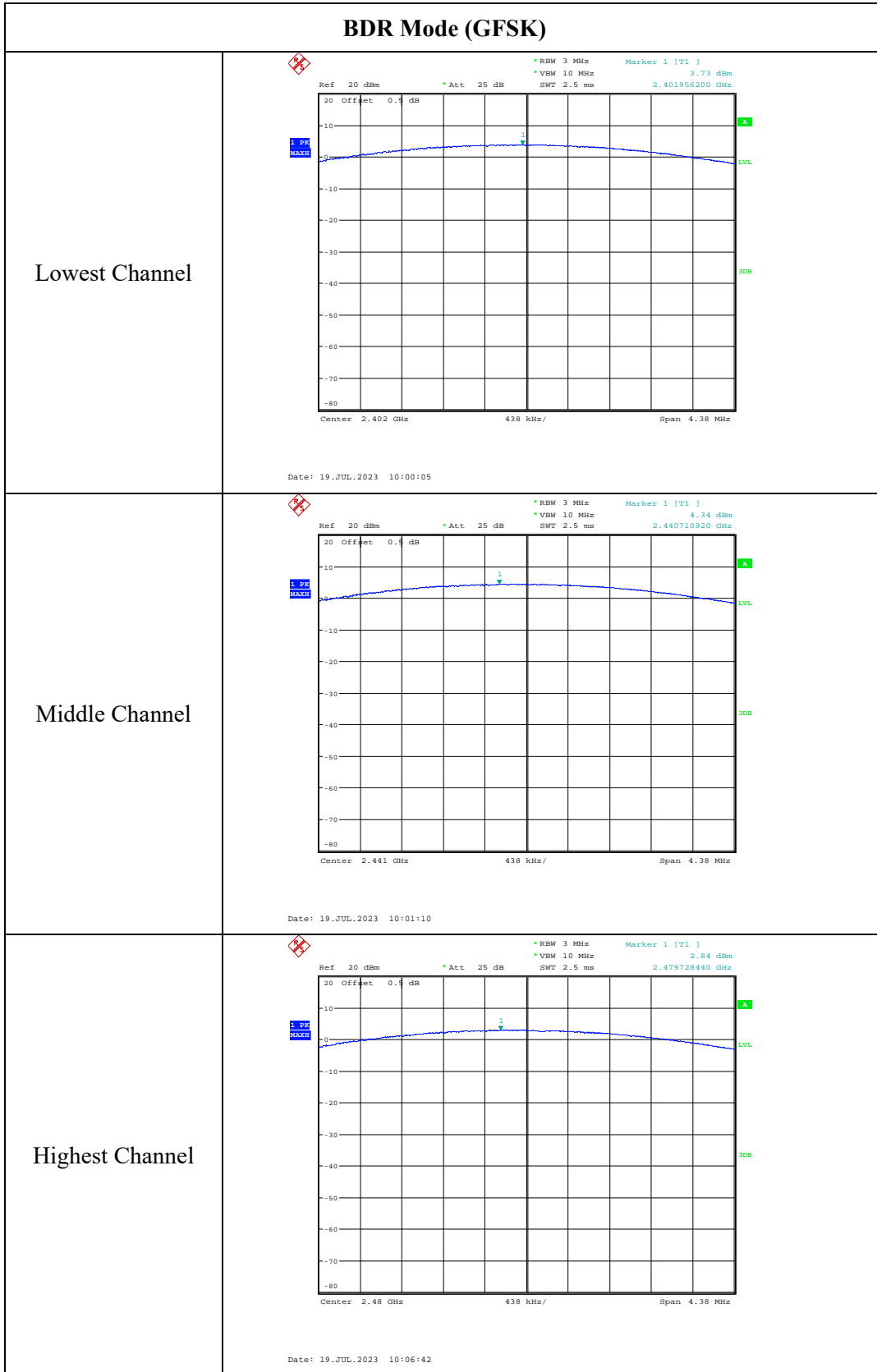
Test Equipment List and Details:

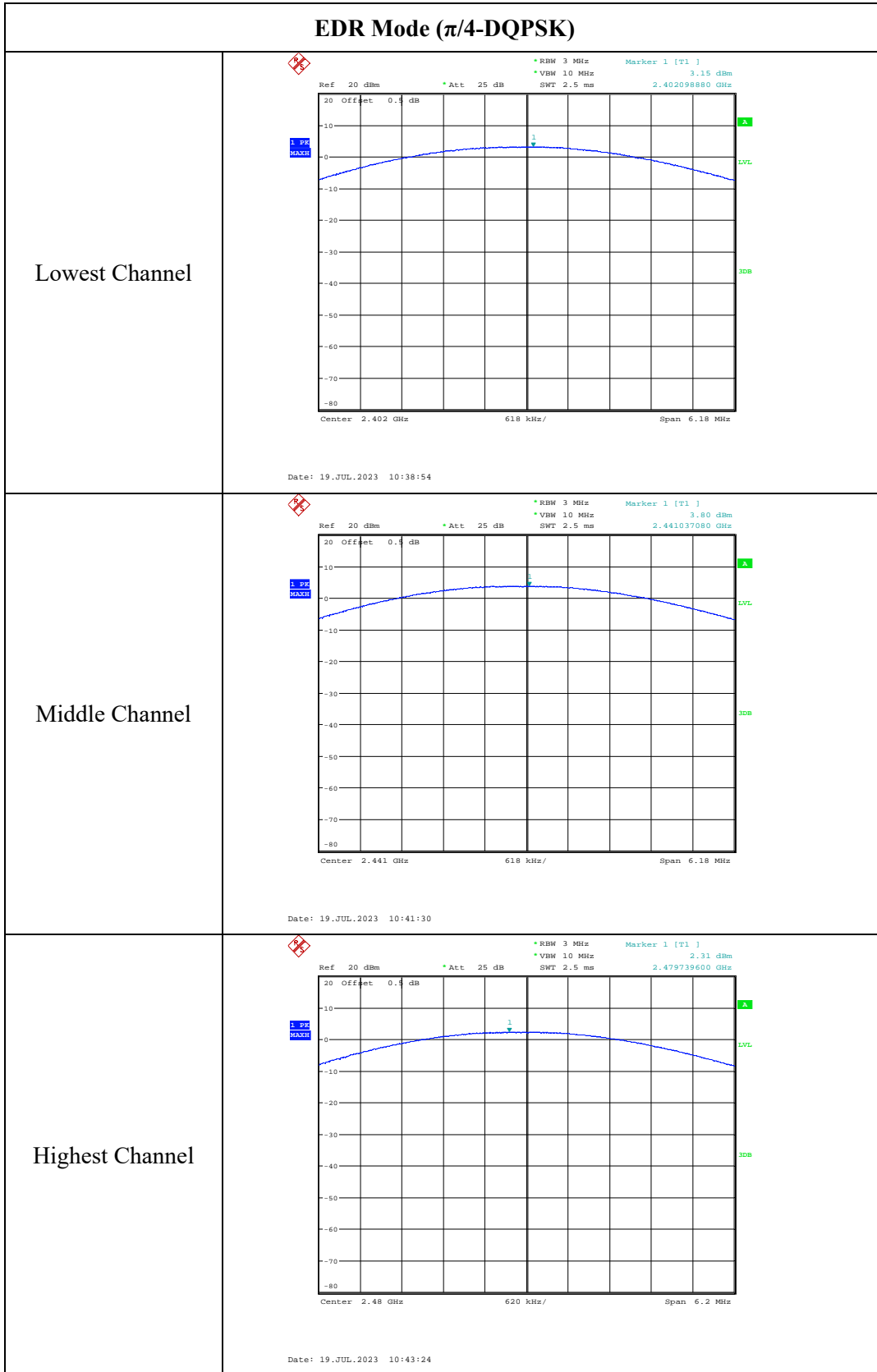
Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
R&S	Spectrum Analyzer	FSU26	200256	2023/3/31	2024/3/30
zhuoxiang	Coaxial Cable	SMA-178	211003	Each time	N/A

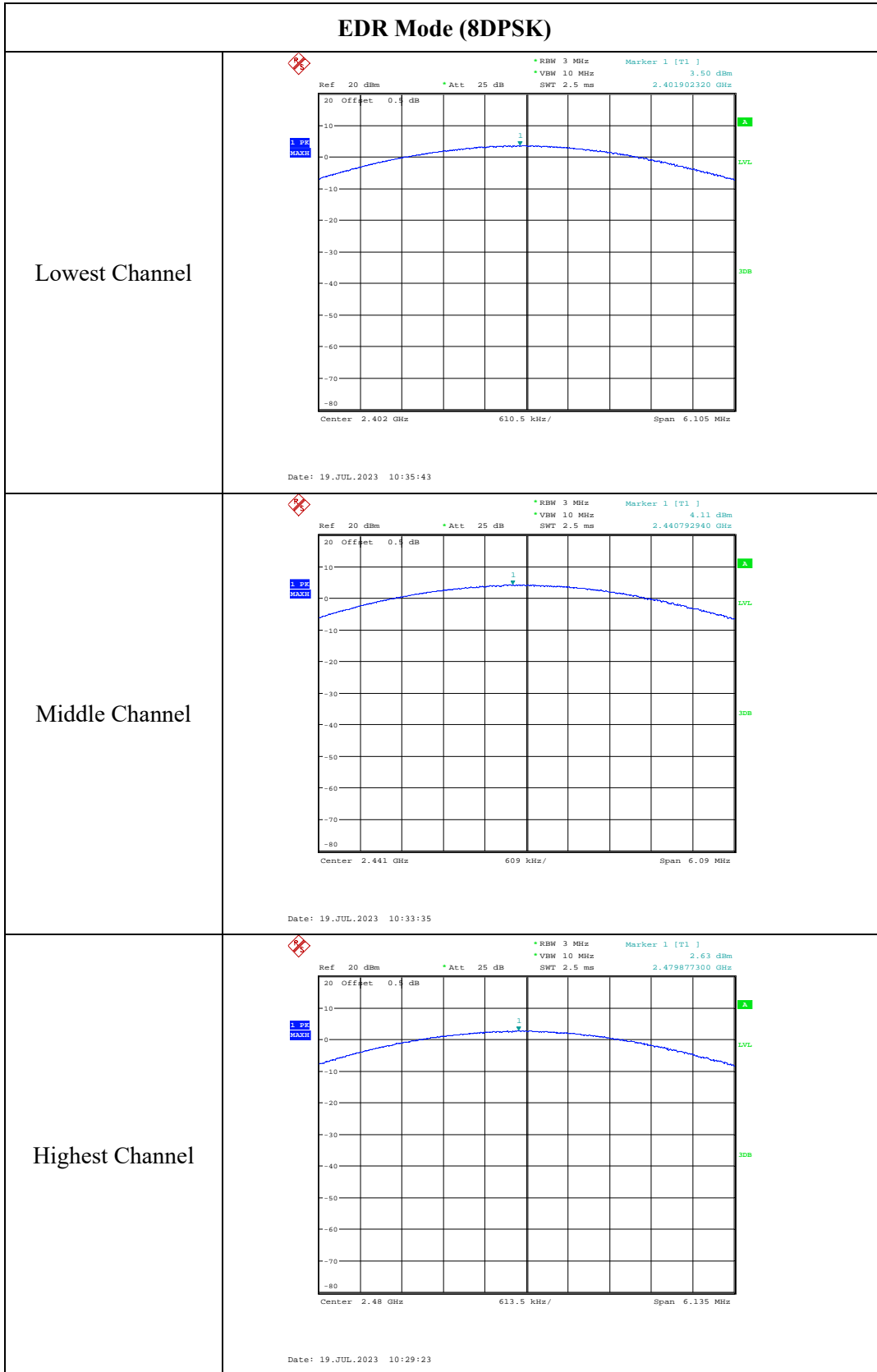
* Statement of Traceability: China Certification ICT Co., Ltd (Dongguan) attests that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).

Test Data:

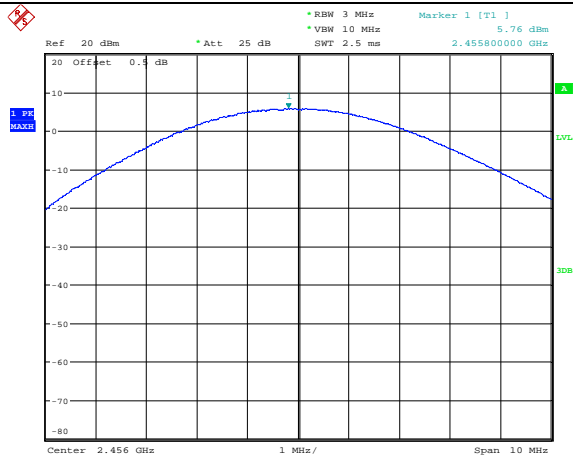
Test Modes	Test Frequency (MHz)	Peak Conducted Output Power (dBm)	Limits (dBm)
BDR Mode (GFSK)	2402	3.73	21
	2441	4.34	21
	2480	2.84	21
	2456	5.76	21
EDR Mode ($\pi/4$ -DQPSK)	2402	3.15	21
	2441	3.8	21
	2480	2.31	21
	2463	5.15	21
EDR Mode (8DPSK)	2402	3.50	21
	2441	4.11	21
	2480	2.63	21
	2458	5.68	21
Antenna Gain(dBi):	2.9	Max.EIRP(dBm):	8.66
EIRP Limit for RSS-247:36 dBm			





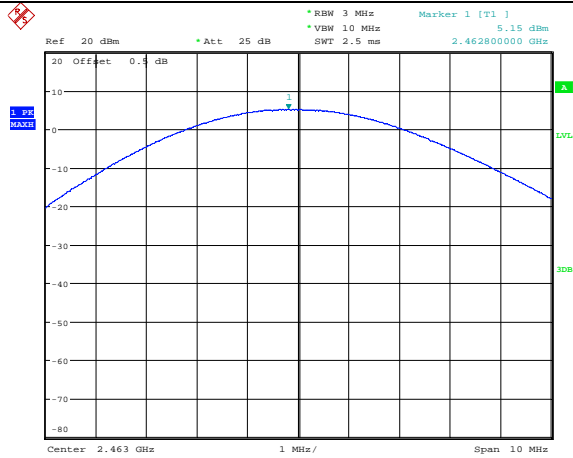


BDR Mode
(GFSK)
2456MHz



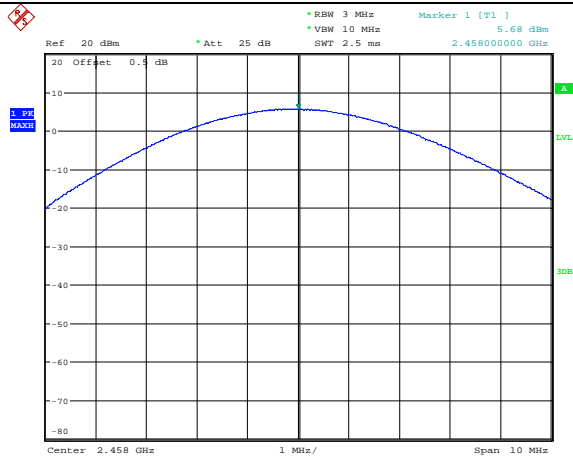
Date: 19.JUL.2023 13:25:58

EDR Mode
($\pi/4$ -DQPSK)
2463MHz



Date: 19.JUL.2023 13:30:39

EDR Mode
(8DPSK)
2458MHz



Date: 19.JUL.2023 13:28:56

4.9 100 kHz Bandwidth of Frequency Band Edge:

Serial Number:	1TRF	Test Date:	2023/7/19
Test Site:	RF	Test Mode:	Transmitting
Tester:	Claire Liu	Test Result:	Pass

Environmental Conditions:					
Temperature: (°C)	24.5	Relative Humidity: (%)	52	ATM Pressure: (kPa)	99.8

Test Equipment List and Details:

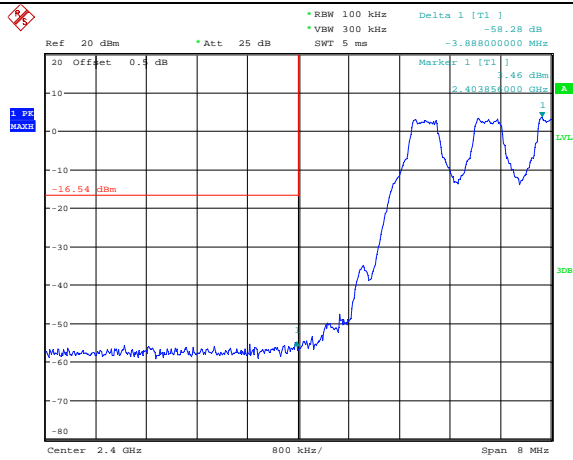
Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
R&S	Spectrum Analyzer	FSU26	200256	2023/3/31	2024/3/30
zhuoxiang	Coaxial Cable	SMA-178	211003	Each time	N/A

* 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:

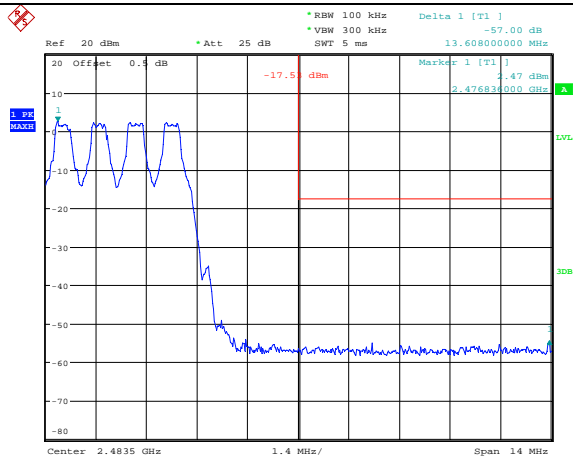
Hopping Mode, BDR Mode (GFSK)

**Band Edge,
Left Side**



Date: 19.JUL.2023 10:51:28

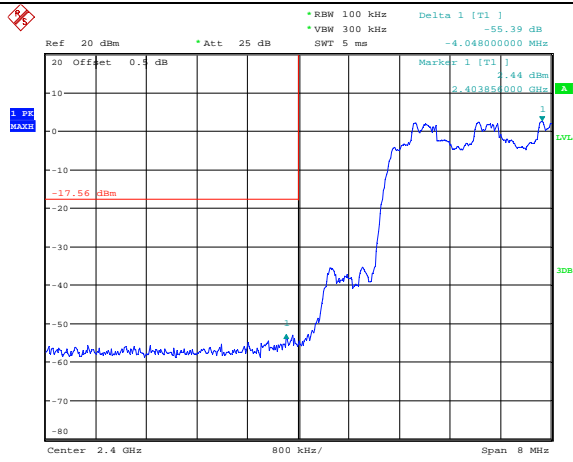
**Band Edge,
Right Side**



Date: 19.JUL.2023 10:53:31

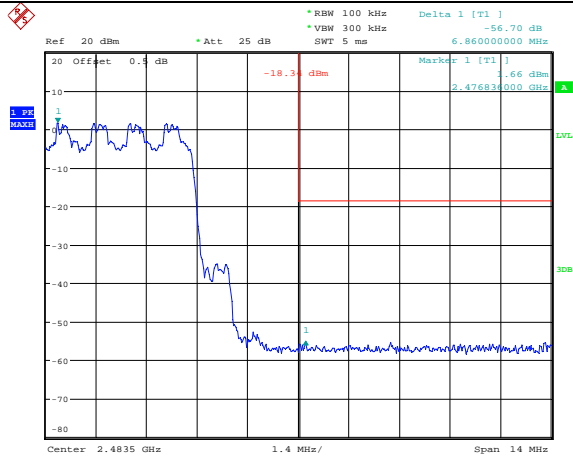
Hopping Mode, EDR Mode ($\pi/4$ -DQPSK)

**Band Edge,
Left Side**



Date: 19.JUL.2023 10:54:57

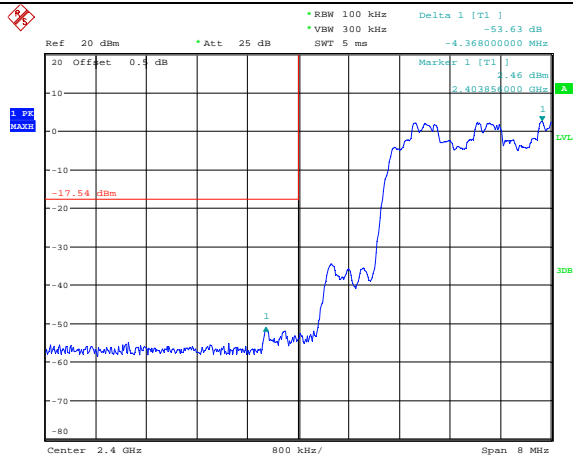
**Band Edge,
Right Side**



Date: 19.JUL.2023 10:48:32

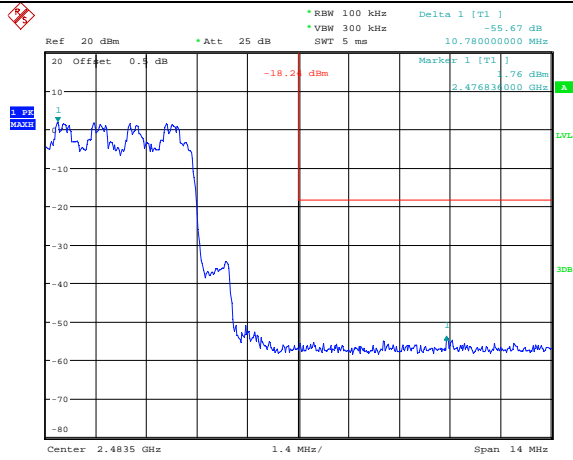
Hopping Mode, EDR Mode (8DPSK)

**Band Edge,
Left Side**



Date: 19.JUL.2023 10:56:36

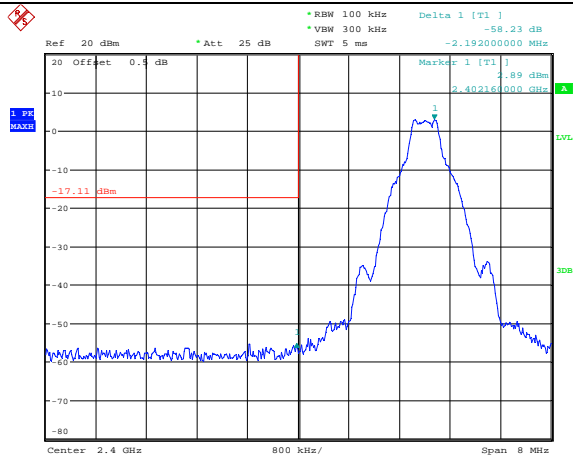
**Band Edge,
Right Side**



Date: 19.JUL.2023 10:59:16

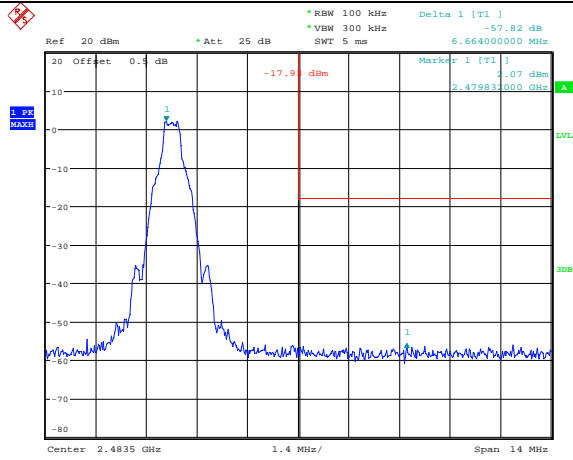
BDR Mode (GFSK)

**Band Edge,
Left Side**

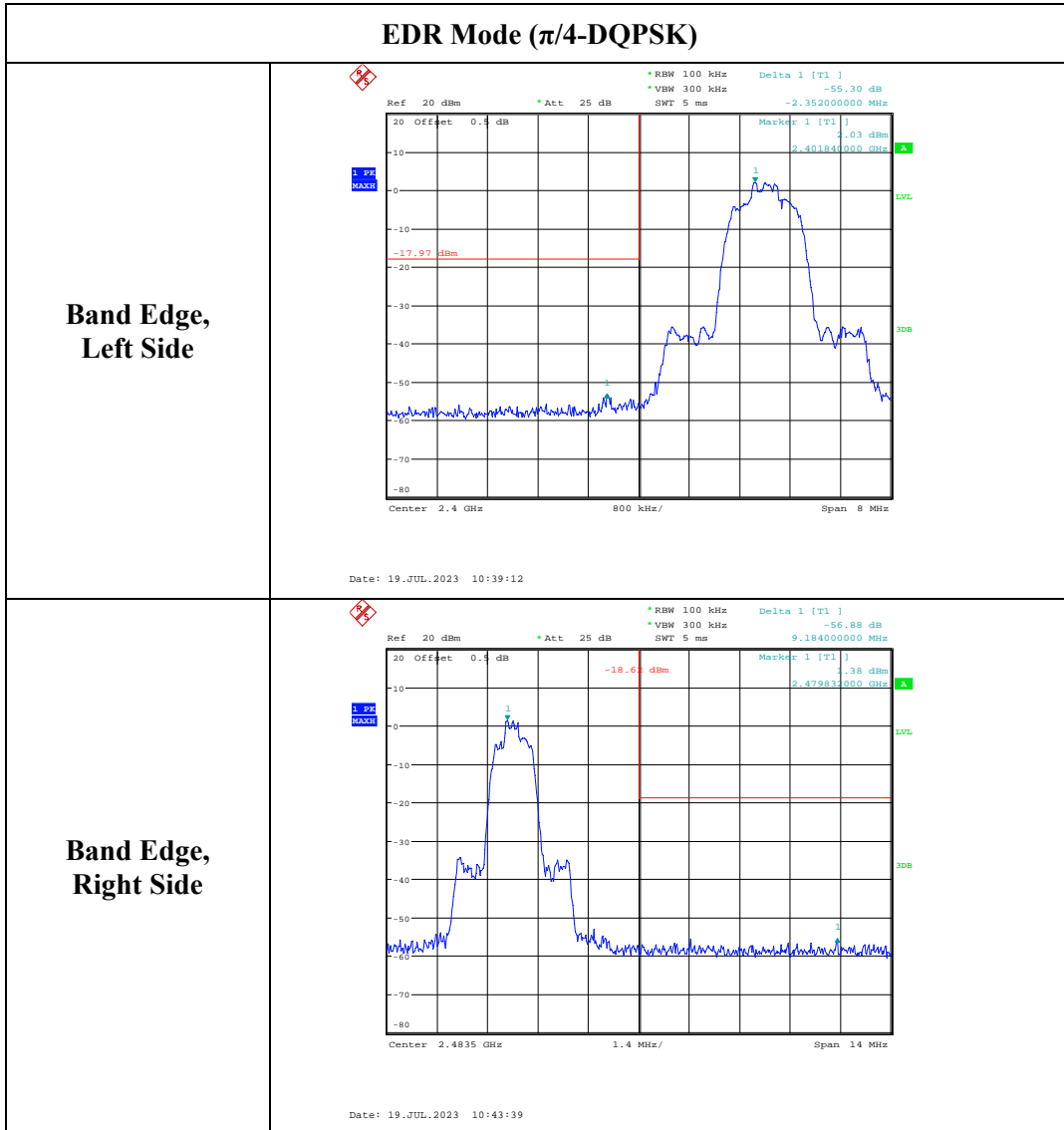


Date: 19.JUL.2023 09:57:47

**Band Edge,
Right Side**

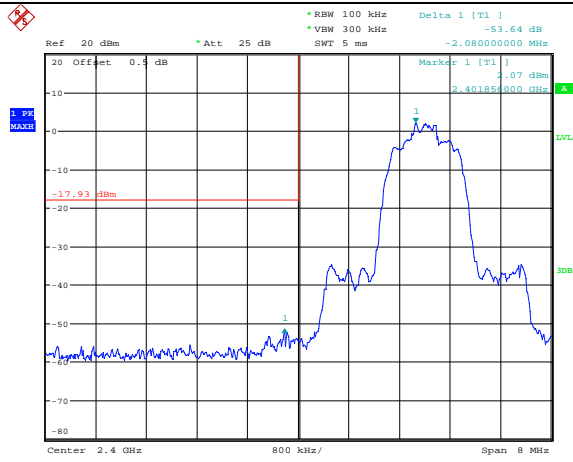


Date: 19.JUL.2023 10:03:43



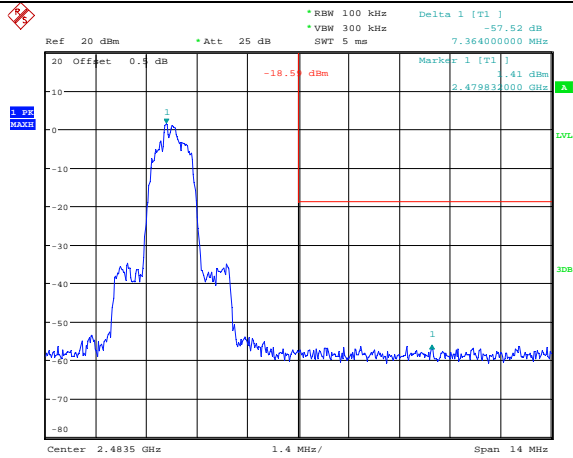
EDR Mode (8DPSK)

**Band Edge,
Left Side**



Date: 19.JUL.2023 10:36:01

**Band Edge,
Right Side**



Date: 19.JUL.2023 10:29:38

5. RF EXPOSURE EVALUATION

5.1 MPE-Based Exemption

5.1.1 Applicable Standard

According to §1.1307(b)(3)(i)

(C) Or using Table 1 and the minimum separation distance (R in meters) from the body of a nearby person for the frequency (f in MHz) at which the source operates, the ERP (watts) is no more than the calculated value prescribed for that frequency. For the exemption in Table 1 to apply, R must be at least $\lambda/2\pi$, where λ is the free-space operating wavelength in meters. If the ERP of a single RF source is not easily obtained, then the available maximum time-averaged power may be used in lieu of ERP if the physical dimensions of the radiating structure(s) do not exceed the electrical length of $\lambda/4$ or if the antenna gain is less than that of a half-wave dipole (1.64 linear value).

Table 1 to § 1.1307(b)(3)(i)(C) - Single RF Sources Subject to Routine Environmental Evaluation

RF Source frequency (MHz)	Threshold ERP (watts)
0.3-1.34	$1,920 R^2$.
1.34-30	$3,450 R^2/f^2$.
30-300	$3.83 R^2$.
300-1,500	$0.0128 R^2 f$.
1,500-100,000	$19.2R^2$.

5.1.2 Measurement Result

Radio	Frequency (MHz)	$\lambda/2$ Π (mm)	Distance (mm)	Exemption ERP (mW)	Maximum Conducted Power including Tune-up Tolerance (dBm)	Antenna Gain (dBi)	ERP		MPE-Based Exemption
							dBm	mW	
2.4G WLAN	2412-2462	19.80	200	768	18	2.90	18.75	74.99	Compliant
BLE	2402-2480	19.88	200	768	5.5	2.90	6.25	4.22	Compliant
BDR/EDR	2402-2480	19.88	200	768	6	2.90	6.75	4.73	Compliant
5.2G WLAN	5180-5240	9.22	200	768	17	0.70	15.55	35.89	Compliant
5.3G WLAN	5260-5320	9.08	200	768	18	1.90	17.75	59.57	Compliant
5.6G WLAN	5500-5720	8.68	200	768	19	3.00	19.85	96.61	Compliant
5.8G WLAN	5745-5825	8.31	200	768	19	2.80	19.65	92.26	Compliant

Note:

The Maximum Conducted Power including Tune-up Tolerance was declared by manufacturer.
The Bluetooth, WLAN 2.4G, 5G can't transmission simutenuously.

Result: The device compliant the MPE-Based Exemption at 20cm distances.

5.2 Exemption Limits for Routine Evaluation – RF Exposure Evaluation

5.2.1 Applicable Standard

According to RSS-102 Clause 2.5.2

RF exposure evaluation is required if the separation distance between the user and/or bystander and the device's radiating element is greater than 20 cm, except when the device operates as follows:

- below 20 MHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 1 W (adjusted for tune-up tolerance);
- at or above 20 MHz and below 48 MHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than $4.49/f^{0.5}$ W (adjusted for tune-up tolerance), where f is in MHz;
- at or above 48 MHz and below 300 MHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 0.6 W (adjusted for tune-up tolerance);
- at or above 300 MHz and below 6 GHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than $1.31 \times 10^{-2} f^{0.6834}$ W (adjusted for tune-up tolerance), where f is in MHz;
- at or above 6 GHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 5 W (adjusted for tune-up tolerance).

In these cases, the information contained in the RF exposure technical brief may be limited to information that demonstrates how the e.i.r.p. was derived.

Calculated Data:

Mode	Frequency (MHz)	Antenna Gain	Conducted output power including Tune-up Tolerance	EIRP		Exemption limits (mW)
		(dBi)	(dBm)	(dBm)	(mW)	
Wi-Fi	2412-2462	2.9	18	20.9	123.03	2684
BLE	2402-2480	2.9	5.5	8.4	6.92	2676
BDR/EDR	2402-2480	2.9	6	8.9	7.76	2676
WLAN 5.2G	5180-5240	0.7	17	17.7	58.88	4525
WLAN 5.3G	5260-5320	1.9	18	19.9	97.72	4573
WLAN 5.6G	5500-5580 5660-5720	3	19	22	158.49	4714
WLAN 5.8G	5745-5825	2.8	19	21.8	151.36	4909

Note:

The Maximum Conducted Power including Tune-up Tolerance was declared by manufacturer.

The Bluetooth, WLAN 2.4G, 5G can't transmission simutenuously.

So the device is compliance exemption from Routine Evaluation Limits –RF exposure Evaluation.

Result: Compliance

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