TEST REPORT

Applicant Name:	FCC: VTech Telecommunications Ltd IC: VTECH TELECOMMUNICATIONS LIMITED
Address:	FCC: 23/F Tai Ping Ind Center Block 1 57 Ting Kok Rd Tai Po NT, Hong Kong IC: BL.1 23/F Tai Ping Industr Ctr. 57 Ting Kok Road Tai Po, NT Hongkong
Report Number:	2401A109372E-RFA
FCC ID:	EW780-3676-00
IC:	1135B-80367600

Test Standard (s)

FCC PART 15.247; RSS-GEN ISSUE 5, FEBRUARY 2021 AMENDMENT 2;
RSS-247 ISSUE 3, AUGUST 2023

Sample Description

Product Type:	DECT 6.0 cordless phone
Model No.:	EL1105-2
Multiple Model(s) No.:	FCC: EL1105, EL1105-3, EL1105-4, EL1105-5, EL1105-XY IC: EL1105, EL1105-3, EL1105-4, EL1105-5
Trade Mark:	AT&T
Date Received:	2024-12-09
Issue Date:	2025-04-01

Test Result:	Pass▲

▲ In the configuration tested, the EUT complied with the standards above.

Prepared and Checked By:

Ekko Wu
RF Engineer

Approved By:

Nancy Wang
RF Supervisor

Note: The information marked # is provided by the applicant, the laboratory is not responsible for its authenticity and this information can affect the validity of the result in the test report. Customer model name, addresses, names, trademarks etc. are included.

This report may contain data that are not covered by the NVLAP accreditation and are marked with an asterisk "▼".

TABLE OF CONTENTS

DOCUMENT REVISION HISTORY

Revision Number	Report Number	Description of Revision	Date of Revision
0	2401A109372E-RFA	Original Report	2025-04-01

GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

HVIN	35-202463BS
FVIN	4610Be4109
Product	DECT 6.0 cordless phone
Tested Model	EL1105-2
Multiple Model(s)	FCC: EL1105, EL1105-3, EL1105-4, EL1105-5, EL1105-XY IC: EL1105, EL1105-3, EL1105-4, EL1105-5
Frequency Range	2402~2480MHz
Transmit Peak Power	2.86dBm
Modulation Technique	Bluetooth: GFSK, π/4-DQPSK, 8DPSK
Antenna Specification#	0dBi (provided by the applicant)
Voltage Range	DC 6V from adapter
Sample serial number	2VR5-5 for Conducted and Radiated Emissions Test 2VR5-3 for RF Conducted Test (Assigned by BACL, Shenzhen)
Sample/EUT Status	Good condition
Adapter Information	Adapter 1 Model: A318-060040W-US1 Input: AC 100-120V, 50-60Hz, 0.15A Output: DC 6.0V, 0.4A Adapter 2 Model: GQ06-060040-ZU Input: AC 100-120V, 50-60Hz, 0.15A Output: DC 6.0V, 0.4A Adapter 3 Model: VT05UUS06040 Input: AC 100-120V, 60Hz, 150mA Output: DC 6V, 400mA
Note: 1. The Multiple models are electrically identical with the test model except for model number, package type, no. of Handset and Charger. Please refer to the declaration letter# for more detail, which was provided by manufacturer. 2. Note: The EUT powered by three adapters, the worst case adapter 2 was selected to test for AC line conducted emission according to 2401A109372E-RFB report test result.	

Objective

This test report is in accordance with Part 2-Subpart J, Part 15-Subparts A and C of the Federal Communication Commissions rules and RSS-247 Issue 3, August 2023, RSS-GEN Issue 5, Feb. 2021Amendment 2 of the Innovation, Science and Economic Development Canada rules.

Test Methodology

All measurements contained in this report were conducted with ANSI C63.10-2013, American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices and RSS-247 Issue 3, August 2023, RSS-GEN Issue 5, Feb. 2021Amendment 2 of the Innovation, Science and Economic Development Canada rules.

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

Each test item follows test standards and with no deviation.

Measurement Uncertainty

Parameter		Uncertainty
Occupied Channel Bandwidth		109.2kHz(k=2, 95% level of confidence)
RF output power, conducted		0.86dB(k=2, 95% level of confidence)
AC Power Lines Conducted Emissions	9kHz-150kHz	3.63dB(k=2, 95% level of confidence)
	150kHz-30MHz	3.66dB(k=2, 95% level of confidence)
Radiated Emissions	0.009MHz~30MHz	3.60dB(k=2, 95% level of confidence)
	30MHz~200MHz (Horizontal)	5.32dB(k=2, 95% level of confidence)
	30MHz~200MHz (Vertical)	5.43dB(k=2, 95% level of confidence)
	200MHz~1000MHz (Horizontal)	5.77dB(k=2, 95% level of confidence)
	200MHz~1000MHz (Vertical)	5.73dB(k=2, 95% level of confidence)
	1GHz - 6GHz	5.34dB(k=2, 95% level of confidence)
	6GHz - 18GHz	5.40dB(k=2, 95% level of confidence)
	18GHz - 40GHz	5.64dB(k=2, 95% level of confidence)
Temperature		±1℃
Humidity		±1%
Supply voltages		±0.4%

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

Test Facility

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

The 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. : 715558, the FCC Designation No. : CN5045.

The lab has been recognized by Innovation, Science and Economic Development Canada to test to Canadian radio equipment requirements, the CAB identifier: CN0023.

SYSTEM TEST CONFIGURATION

Description of Test Configuration

The system was configured for testing in an engineering mode.

Channel	Frequency (MHz)	Channel	Frequency (MHz)
0	**2402**	40	2442
1	2403	41	2443
2	2404	42	2444
…	…	…	…
…	…	…	…
36	2438	75	2477
37	2439	76	2478
38	2440	77	2479
39	**2441**	**78**	**2480**
EUT was tested with Channel 0, 39 and 78.			

EUT Exercise Software

Exercise Software#	commTone.exe
Power Level#	8

Special Accessories

No special accessory.

Equipment Modifications

No modification was made to the EUT tested.

Support Equipment List and Details

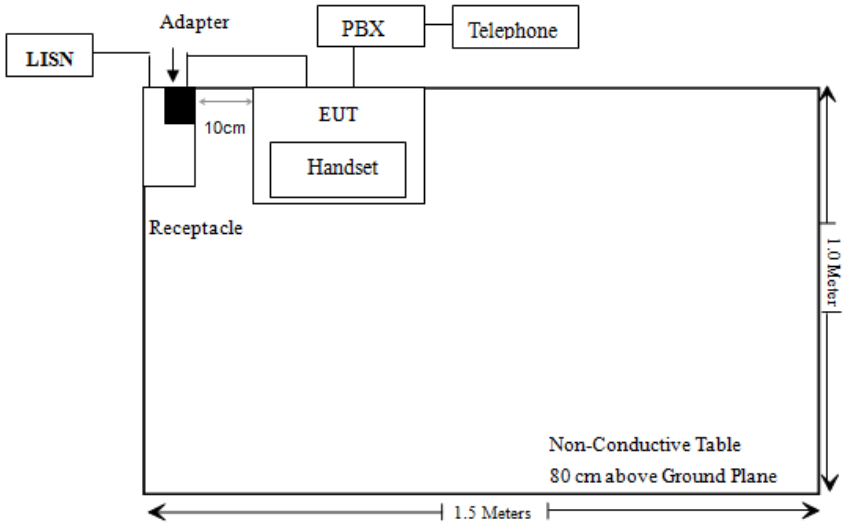
Manufacturer	Description	Model	Serial Number
Vtech	Handset	Unknown	Unknown
YIKE	PBX	TC-208	Unknown
Kinhao	Telephone	KT86AS	Unknown

External I/O Cable

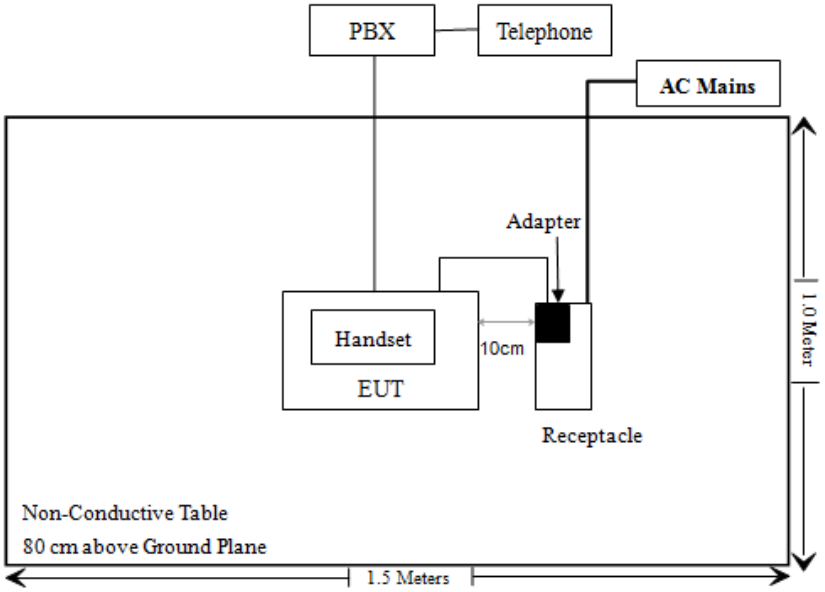
Cable Description	Length (m)	From Port	To
Unshielded Un-detachable AC cable	1.2	Receptacle	LISN/AC Mains
Unshielded Un-detachable DC cable	1.5	EUT	Adapter
Unshielded Detachable RJ11 cable	3.0	EUT	PBX
Unshielded Detachable RJ11 cable	1.0	Telephone	PBX

Block Diagram of Test Setup

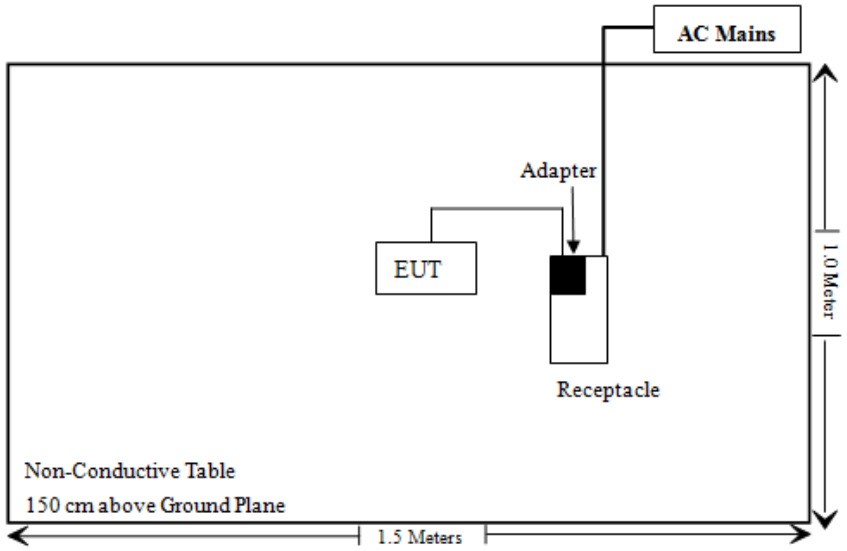
For Conducted Emissions:



For Radiated Emissions below 1GHz:



For Radiated Emissions above 1GHz:



SUMMARY OF TEST RESULTS

FCC Rules	RSS Rules	Description of Test	Result
FCC §15.247 (i), §1.1307 (b) (3) & §2.1091	/	MPE-Based Exemption	Compliant
/	RSS-102 § 6.6	Field reference level exposure exemption limits	Compliant
FCC §15.203	RSS-Gen §6.8	Antenna Requirement	Compliant
FCC §15.207(a)	RSS-Gen §8.8	AC Line Conducted Emissions	Compliant
FCC §15.205, §15.209, §15.247(d)	RSS-247 § 5.5, RSS-GEN § 8.10	Radiated Emissions	Compliant
FCC §15.247(a)(1)	RSS-247 § 5.1(a), RSS-GEN § 6.7	20 dB Emission Bandwidth & 99% Occupied Bandwidth	Compliant
FCC §15.247(a)(1)	RSS-247 § 5.1 (b)	Channel Separation Test	Compliant
FCC §15.247(a)(1)(iii)	RSS-247 § 5.1 (d)	Time of Occupancy (Dwell Time)	Compliant
FCC §15.247(a)(1)(iii)	RSS-247 § 5.1 (d)	Quantity of hopping channel Test	Compliant
FCC §15.247(b)(1)	RSS-247 § 5.1(b) &§ 5.4(b)	Peak Output Power Measurement	Compliant
FCC §15.247(d)	RSS-247 § 5.5	Band edges	Compliant

TEST EQUIPMENT LIST

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Conducted Emission Test					
Rohde & Schwarz	EMI Test Receiver	ESCI	101120	2024/12/04	2025/12/03
Rohde & Schwarz	LISN	ENV216	101613	2024/12/04	2025/12/03
Unknown	CE Cable	Unknown	UF A210B-1-0720-504504	2024/05/21	2025/05/20
Rohde & Schwarz	Transient Limiter	ESH3Z2	DE25985	2024/05/21	2025/05/20
Audix	EMI Test software	E3	191218(V9)	NCR	NCR
Radiated Emission Test					
Rohde & Schwarz	EMI Test Receiver	ESR3	102455	2024/12/04	2025/12/03
Sonoma instrument	Pre-amplifier	310N	186238	2024/05/21	2025/05/20
Sunol Sciences	Broadband Antenna	JB1	A040904-1	2023/07/20	2026/07/19
Unknown	Cable	Chamber Cable 1	F-03-EM236	2024/06/18	2025/06/17
Unknown	Cable	XH500C	J-10M-A	2024/06/18	2025/06/17
BACL	Active Loop Antenna	1313-1A	4031911	2024/05/14	2027/05/13
Unknown	Cable	2Y194	0735	2024/12/04	2025/12/03
Unknown	Cable	PNG214	1354	2024/12/04	2025/12/03
Audix	EMI Test software	E3	19821b(V9)	NCR	NCR
Rohde&Schwarz	Spectrum Analyzer	FSV40	101605	2024/03/27	2025/03/26
A.H.System	Preamplifier	PAM-0118P	489	2024/11/15	2025/11/14
Schwarzbeck	Horn Antenna	BBHA9120D(1201)	1143	2023/07/26	2026/07/25
Unknown	RF Cable	KMSE	0735	2024/12/06	2025/12/05
Unknown	RF Cable	UFA147	219661	2024/12/06	2025/12/05
Unknown	RF Cable	XH750A-N	J-10M	2024/12/06	2025/12/05
JD	Filter Switch Unit	DT7210FSU	DQ77930	2024/09/09	2025/09/08
JD	Multiplex Switch Test Control Set	DT7220FSU	DQ77926	2024/06/18	2025/06/17
A.H.System	Pre-amplifier	PAM-1840VH	190	2024/06/18	2025/06/17
Electro-Mechanics Co	Horn Antenna	3116	9510-2270	2023/09/18	2026/09/17
UTIFLEX	RF Cable	NO. 13	232308-001	2024/12/18	2025/12/17
Audix	EMI Test software	E3	191218(V9)	NCR	NCR

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
RF Conducted Test					
Rohde & Schwarz	Spectrum Analyze	FSU26	200982	2024/09/20	2025/09/19
Unknown	10dB Attenuator	Unknown	F-03-EM190	2024/06/27	2025/06/26

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

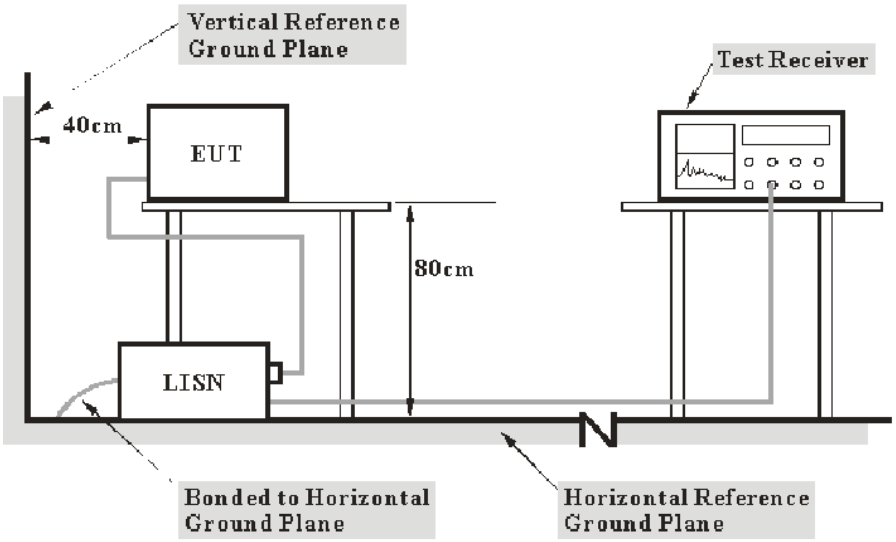
REQUIREMENTS AND TEST PROCEDURES

AC Line Conducted Emissions

Applicable Standard

FCC §15.207(a), RSS-GEN § 8.8

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 measurement procedure of EUT setup is according with ANSI C63.10-2013. The related limit was specified in FCC Part 15.207 & RSS-Gen.

The spacing between the peripherals was 10 cm.

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

Test Procedure

Maximizing procedure was performed on the six (6) highest emissions of the EUT.

All final data was recorded in the Quasi-peak and average detection mode.

Factor & Over Limit Calculation

The factor is calculated by adding LISN VDF (Voltage Division Factor) and Cable Loss. The basic equation is as follows:

Factor = LISN VDF + Cable Loss

The "**Over limit**" column of the following data tables indicates the degree of compliance with the applicable limit. For example, an Over limit of -7 dB means the emission is 7 dB below the limit. The equation for calculation is as follows:

Over Limit = Level – Limit
Level = Read Level + Factor

Note: The term "cable loss" refers to the combination of a cable and a 10dB transient limiter (attenuator).

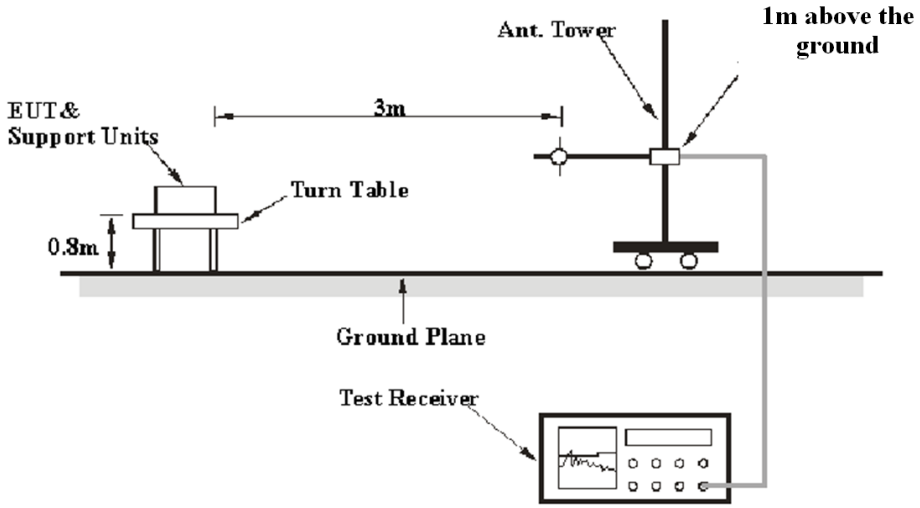
Radiated Emissions

Applicable Standard

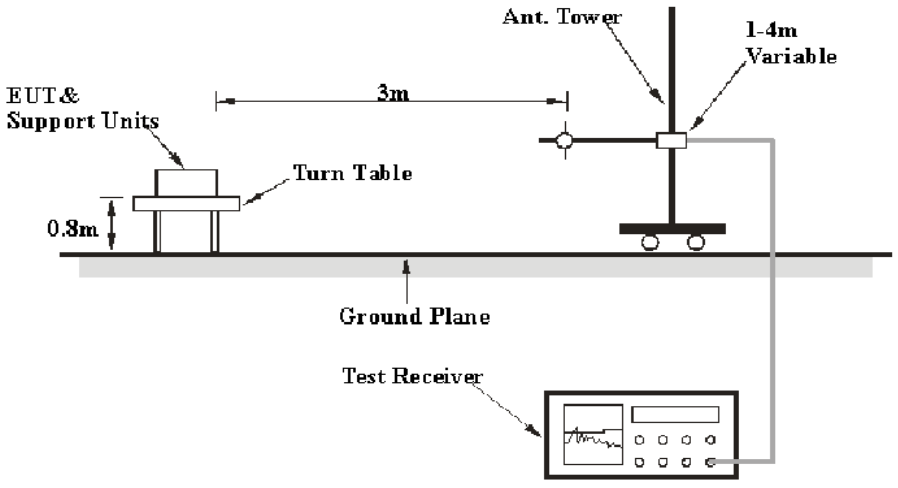
FCC §15.205; §15.209; §15.247(d); RSS-247§ 5.5; RSS-GEN § 8.10

EUT Setup

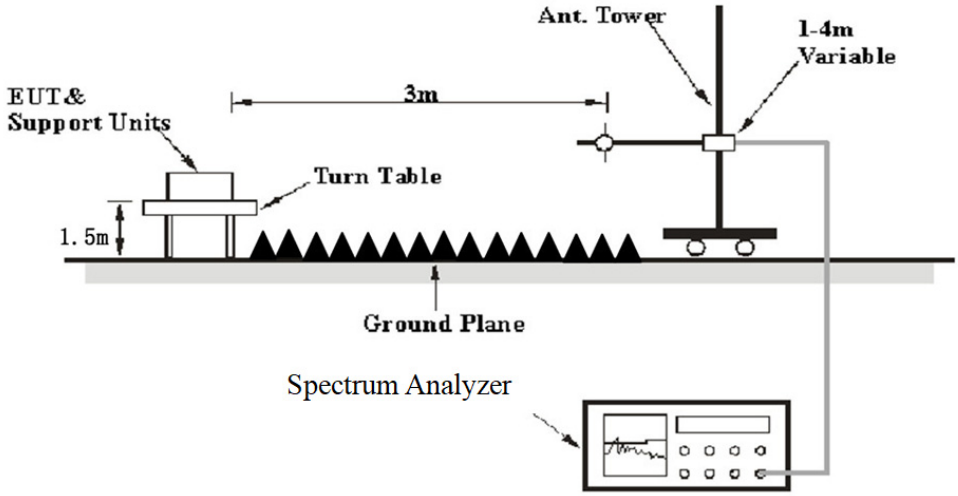
9 kHz-30MHz:



30MHz-1GHz:



Above 1GHz:



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

EMI Test Receiver & Spectrum Analyzer Setup

The EMI test receiver & Spectrum Analyzer Setup were set with the following configurations:

Frequency Range	RBW	Video B/W	IF B/W	Measurement	Detector
9 kHz – 150 kHz	/	/	200 Hz	QP	QP
	300 Hz	1 kHz	/	PK	Peak
150 kHz – 30 MHz	/	/	9 kHz	QP	QP
	10 kHz	30 kHz	/	PK	Peak
30 MHz – 1000 MHz	/	/	120 kHz	QP	QP
	100 kHz	300 kHz	/	PK	Peak
Above 1 GHz	Harmonics				
	1MHz	3 MHz	/	PK	Peak
	Average Emission Level=Peak Emission Level+20*log(Duty cycle)				
	Band Edge & Other Emissions				
	1MHz	3 MHz	/	PK	Peak
	1MHz	≥10 Hz	/	Average	Peak

For Duty cycle measurement:

Use the duty cycle factor correction factor method per 15.35(c).
Duty cycle=On time/100milliseconds, On time=N1*L1+N2*L2+…Nn-1*Ln-1+Nn*Ln,
Where N1 is number of type 1 pulses, L1 is length of type 1 pulse, etc.

Test Procedure

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

All final data was recorded in Quasi-peak detection mode except for the frequency bands 9–90 kHz, 110–490 kHz and above 1000 MHz, average detection modes for frequency bands 9–90 kHz and 110–490 kHz, peak and average detection modes for frequencies above 1 GHz.

For 9 kHz-30MHz, the report shall list the six emissions with the smallest margin relative to the limit, for each of the three antenna orientations (parallel, perpendicular, and ground-parallel) unless the margin is greater than 20 dB.

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.

All emissions under the average limit and under the noise floor have not recorded in the report.

Factor & Over Limit/Margin Calculation

The Factor is calculated by adding the Antenna Factor and Cable Loss, and subtracting the Amplifier Gain. The basic equation is as follows:

Factor = Antenna Factor + Cable Loss - Amplifier Gain

The "**Over Limit/Margin**" column of the following data tables indicates the degree of compliance with the applicable limit. For example, an Over Limit/margin of -7dB means the emission is 7dB below the limit. The equation for calculation is as follows:

Over Limit/Margin = Level/Corrected Amplitude – Limit
Level / Corrected Amplitude = Read Level + Factor

20 dB Emission Bandwidth & 99% Occupied Bandwidth

According to FCC §15.247(a) (1):

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.

According to RSS-247 § 5.1 (a), RSS-GEN § 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 "20 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 20 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.

Test Procedure

Test Method: ANSI C63.10-2013 Clause 7.8.7 & Clause 6.9.2

The following conditions shall be observed for measuring the occupied bandwidth and 20 dB bandwidth:

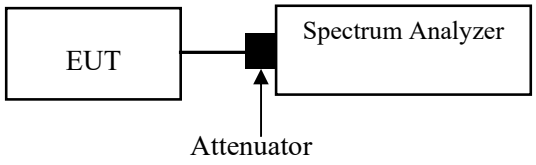
• The transmitter shall be operated at its maximum carrier power measured under normal test conditions.

• 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 / 20 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 / 20 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).



Channel Separation Test

According to FCC §15.247(a) (1):

Frequency hopping systems shall have hoping 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.

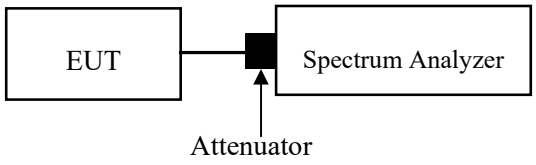
According to RSS-247 § 5.1 (b):

Frequency hopping systems (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. 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.

Test Procedure

Test Method: ANSI C63.10-2013 Clause 7.8.2

1. Set the EUT in transmitting mode, max hold the channel.
2. Set the adjacent channel of the EUT and max hold another trace.
3. Measure the channel separation.



Quantity of Hopping Channel Test

Applicable Standard

According to 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.

According to RSS-247 § 5.1 (d):

Frequency hopping systems (FHSS) operating in the band 2400-2483.5 MHz shall use at least 15 hopping 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. Transmissions on particular hopping frequencies may be avoided or suppressed provided that at least 15 hopping channels are used.

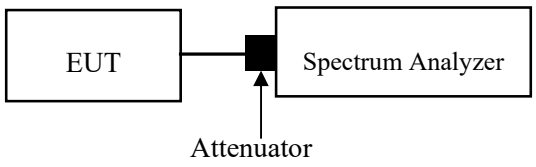
Test Procedure

Test Method: ANSI C63.10-2013 Clause 7.8.3

1. Check the calibration of the measuring instrument (SA) using either an internal calibrator or a known signal from an external generator.

2. Set the EUT in hopping mode from first channel to last.

3. By using the max-hold function record the quantity of the channel.



Time of Occupancy (Dwell Time)

Applicable Standard

According to 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.

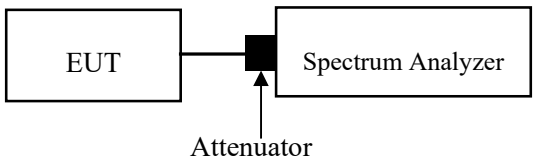
According to RSS-247 § 5.1 (d):

Frequency hopping systems (FHSs) operating in the band 2400-2483.5 MHz shall use at least 15 hopping 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. Transmissions on particular hopping frequencies may be avoided or suppressed provided that at least 15 hopping channels are used.

Test Procedure

Test Method: ANSI C63.10-2013 Clause 7.8.4

1. The EUT was worked in channel hopping.
2. Set the RBW to: 1MHz.
3. Set the VBW ≥ 3×RBW.
4. Set the span to 0Hz.
5. Detector = peak.
6. Sweep time = auto couple.
7. Trace mode = max hold.
8. Allow trace to fully stabilize.
9. Recorded the time of single pulses



Peak Output Power Measurement

Applicable Standard

According to 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. And for all other frequency hopping systems in the 2400–2483.5 MHz band: 0.125 watts.

According to RSS-247§ 5.1(b) &§ 5.4(b):

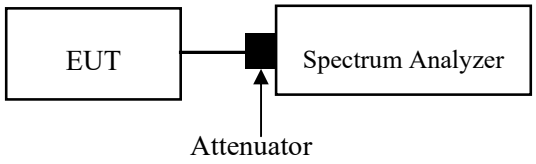
For frequency hopping systems (FHSs) operating in the band 2400-2483.5 MHz, the maximum peak conducted output power shall not exceed 1.0 W if the hopset uses 75 or more hopping channels; the maximum peak conducted output power shall not exceed 0.125 W if the hopset uses less than 75 hopping channels. The e.i.r.p. shall not exceed 4 W (see Section 5.4(e) for exceptions).

Frequency hopping systems (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.

Test Procedure

Test Method: ANSI C63.10-2013 Clause 7.8.5

1. Place the EUT on a bench and set in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to one test equipment.
3. Add a correction factor to the display.



Note: A short RF cable with low cable loss connected to the EUT antenna port,which was provided by client or lab, the cable loss was add with offset into test equipment, the total offset consists of attenuator and/or RF cable loss

Band Edges

Applicable Standard

According to 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)).

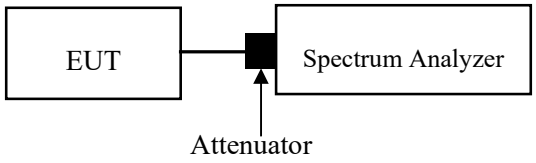
According to RSS-247 § 5.5.

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(e), 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.

Test Procedure

Test Method: ANSI C63.10-2013 Clause 7.8.6 & Clause 6.10

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Remove the antenna from the EUT and then connect to a low loss RF cable from the antenna port to a EMI test receiver, then turn on the EUT and make it operate in transmitting mode. Then set it to Low Channel and High Channel within its operating range, and make sure the instrument is operated in its linear range.
3. Set RBW of spectrum analyzer to 100 kHz with a convenient frequency span including 100 kHz bandwidth from band edge.
4. Measure the highest amplitude appearing on spectral display and set it as a reference level. Plot the graph with marking the highest point and edge frequency.
5. Repeat above procedures until all measured frequencies were complete.



ANTENNA REQUIREMENT

Applicable Standard

According to § 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 user of a standard antenna jack or electrical connector is prohibited.

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 res ponsible for ensuring that the proper antenna is employed so that the limits in this part are not exceeded.

The structure and application of the EUT were analyzed to determine compliance with section §15.203 of the rules. §15.203 state that the subject device must meet the following criteria:

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

And according to FCC 47 CFR section 15.247 (b), if the transmitting antennas of directional gain greater than 6dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

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.

Antenna Connector Construction

The EUT has an internal antenna arrangement, which was permanently attached, the antenna gain# is 0dBi, fulfill the requirement of this section. Please refer to the EUT photos.

Antenna Type	Antenna Gain#	Impedance	Frequency Range
Monopole	0dBi	50Ω	2.4~2.5GHz

Result: Compliant

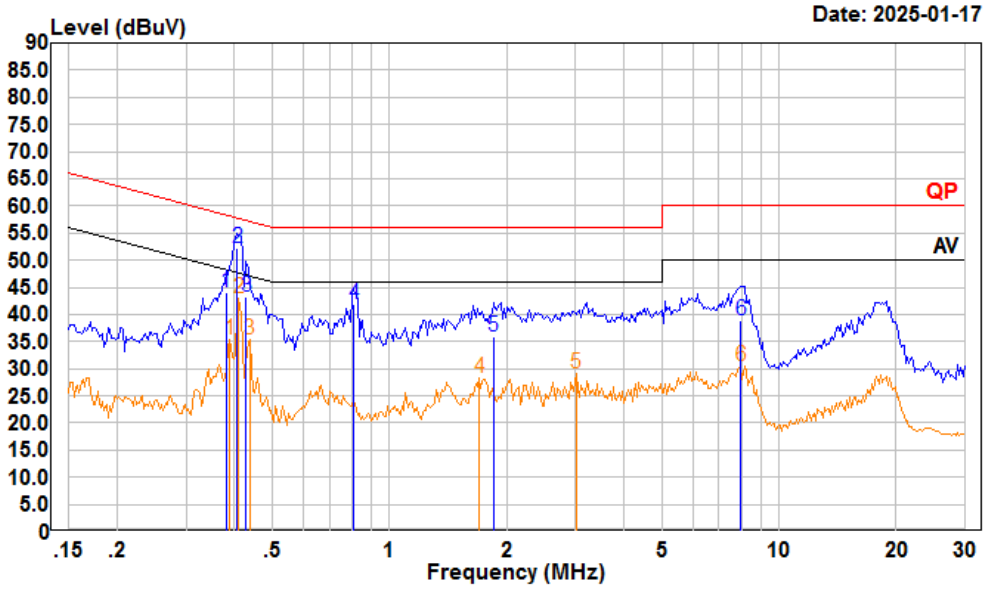
TEST DATA AND RESULTS

AC Line Conducted Emissions

Environmental Conditions

Temperature (°C)	20-49	**Relative Humidity (%)**	25-49
ATM Pressure (kPa)	101-103	**Test engineer**	Macy Shi
Test date	2025.1.17		
EUT operation mode	Transmitting (Maximum output power mode, π/4-DQPSK Middle Channel)		

AC 120V 60 Hz, Line



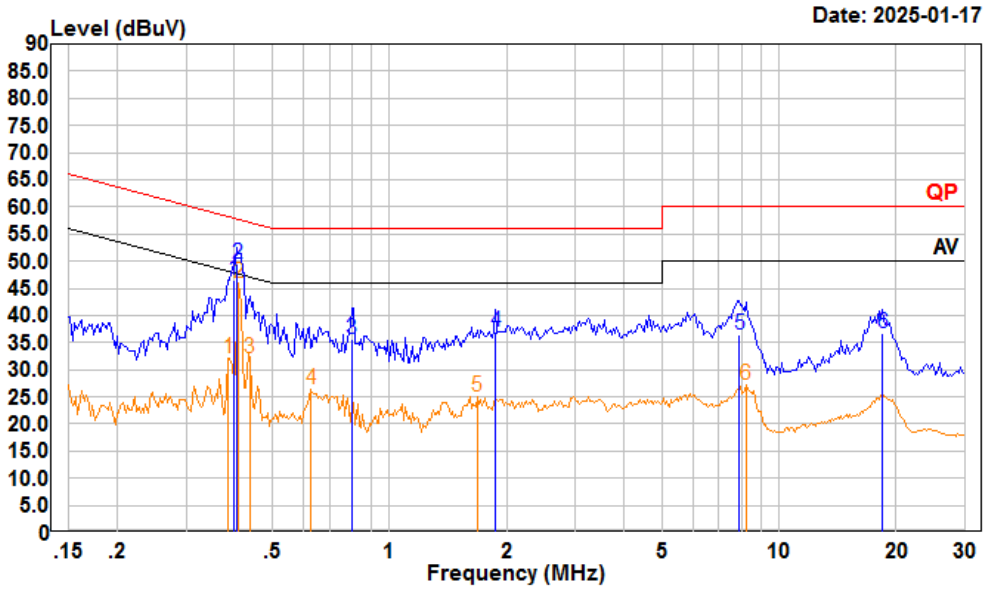
Trace: 1

Condition: Line
Project : 2401A109372E-RF
tester : Macy.shi Note:Transmitting
Setting : RBW:9kHz VBW:Auto SWT:Auto

	Freq	Read Level	LISN Level	Cable Factor	Loss	Limit Line	Over Limit	Remark
	MHz	dBuV	dBuV	dB	dB	dBuV	dB	
1	0.381	23.50	44.17	10.56	10.11	58.25	-14.08	QP
2	0.406	31.50	52.15	10.55	10.10	57.73	-5.58	QP
3	0.428	22.71	43.35	10.53	10.11	57.29	-13.94	QP
4	0.809	21.10	42.00	10.78	10.12	56.00	-14.00	QP
5	1.848	14.70	35.92	11.04	10.18	56.00	-20.08	QP
6	7.977	18.20	38.89	10.49	10.20	60.00	-21.11	QP

	Freq	Read Level	LISN Level	Cable Factor	Loss	Limit Line	Over Limit	Remark
	MHz	dBuV	dBuV	dB	dB	dBuV	dB	
1	0.389	14.75	35.40	10.55	10.10	48.08	-12.68	Average
2	0.410	22.31	42.95	10.54	10.10	47.64	-4.69	Average
3	0.437	14.76	35.40	10.53	10.11	47.11	-11.71	Average
4	1.698	7.14	28.29	10.98	10.17	46.00	-17.71	Average
5	3.009	8.04	29.20	10.98	10.18	46.00	-16.80	Average
6	7.977	9.71	30.40	10.49	10.20	50.00	-19.60	Average

AC 120V 60 Hz, Neutral



Trace: 1

Condition: Neutral
Project : 2401A109372E-RF
tester : Macy.shi Note:Transmitting
Setting : RBW:9kHz VBW:Auto SWT:Auto

	Freq	Read Level	Level	LISN Factor	Cable Loss	Limit Line	Over Limit	Remark
	MHz	dBuV	dBuV	dB	dB	dBuV	dB	
1	0.398	25.90	46.58	10.58	10.10	57.90	-11.32	QP
2	0.406	28.90	49.57	10.57	10.10	57.73	-8.16	QP
3	0.800	14.89	35.69	10.68	10.12	56.00	-20.31	QP
4	1.868	16.20	37.09	10.71	10.18	56.00	-18.91	QP
5	7.893	15.59	36.36	10.57	10.20	60.00	-23.64	QP
6	18.426	15.60	36.66	10.87	10.19	60.00	-23.34	QP

	Freq	Read Level	Level	LISN Factor	Cable Loss	Limit Line	Over Limit	Remark
	MHz	dBuV	dBuV	dB	dB	dBuV	dB	
1	0.385	11.41	32.11	10.59	10.11	48.17	-16.06	Average
2	0.410	25.18	45.84	10.56	10.10	47.64	-1.80	Average
3	0.437	11.49	32.14	10.54	10.11	47.11	-14.97	Average
4	0.627	5.73	26.43	10.57	10.13	46.00	-19.57	Average
5	1.680	4.20	25.10	10.73	10.17	46.00	-20.90	Average
6	8.235	6.33	27.08	10.55	10.20	50.00	-22.92	Average

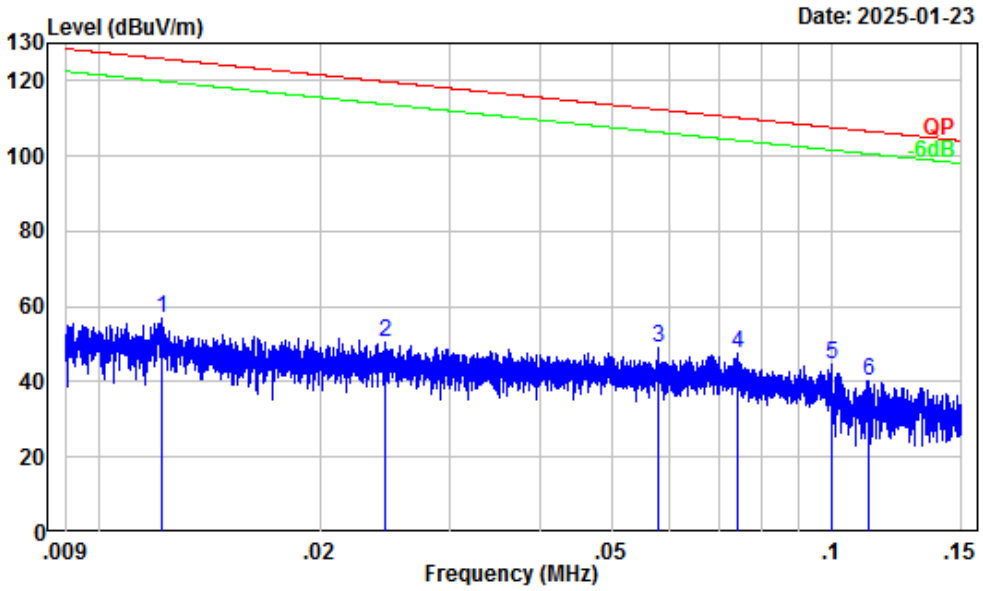
Radiated Emissions

Environmental Conditions

Temperature (℃)	23.7&23.2	**Relative Humidity (%)**	45&47
ATM Pressure (kPa):	101.3&101	**Test engineer:**	Jack Liu&Visen Wu
Test date:	2025.1.22~2025.1.23		
EUT operation mode:	Below 1GHz: Transmitting (Maximum output power mode, π/4-DQPSK Middle Channel) Above 1GHz: Transmitting(Maximum output power mode, π/4-DQPSK)		
Note:	1. For the radiated spurious emission below 30MHz, only the worst case (parallel) was recorded. 2. When the test result of peak was less than the limit of QP/Average more than 6dB, just peak value were recorded. 3.The spurious emission from 9 kHz-30MHz of IC RSS-GEN standard, the unit of final result on the test plots are dBμV/m, so the limit should be added by 51,5 dB from dBμA/m to dBμV/m.		

Below 1GHz:

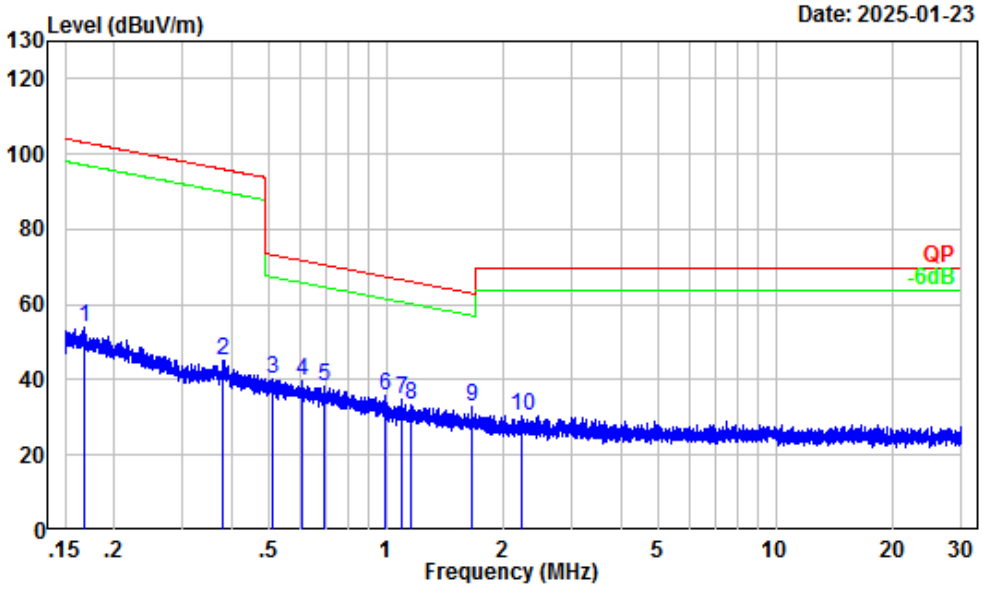
9kHz-150kHz_Adapter1



Site : Chamber A
Condition : 3m
Project Number : 2401A109372E-RF
Test Mode : Transmitting
Detector: Peak RBW/VBW: 0.3/1kHz
Tester : Jack Liu

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	0.01	31.88	25.01	56.89	125.87	-68.98	Peak
2	0.02	29.53	21.01	50.54	119.80	-69.26	Peak
3	0.06	25.60	23.25	48.85	112.34	-63.49	Peak
4	0.07	23.98	23.76	47.74	110.20	-62.46	Peak
5	0.10	22.03	22.48	44.51	107.64	-63.13	Peak
6	0.11	21.28	18.96	40.24	106.60	-66.36	Peak

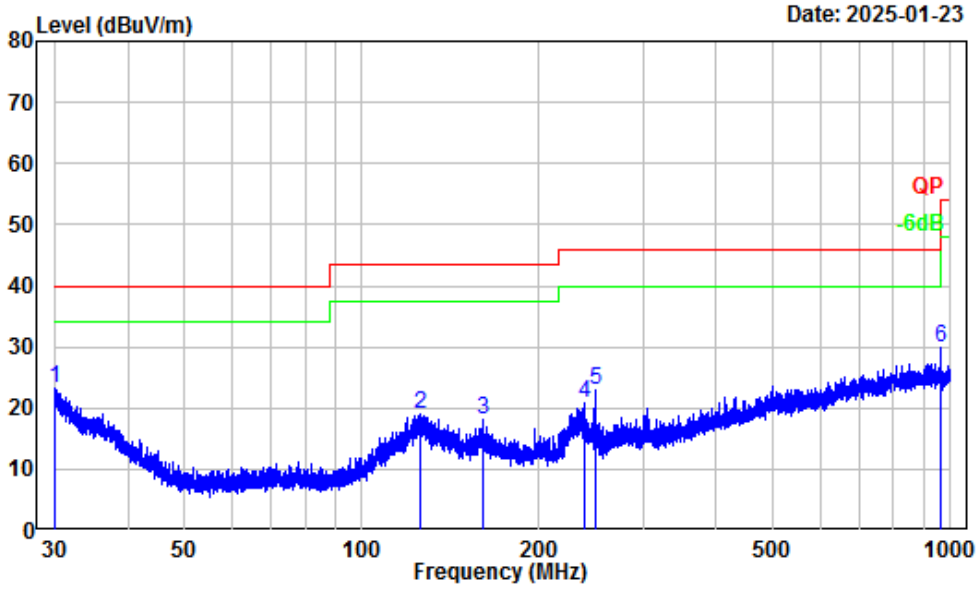
150kHz-30MHz_Adapter1



Site : Chamber A
Condition : 3m
Project Number : 2401A109372E-RF
Test Mode : Transmitting
Detector: Peak RBW/VBW: 10/30kHz
Tester : Jack Liu

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	0.17	18.01	35.89	53.90	103.12	-49.22	Peak
2	0.38	8.68	36.29	44.97	96.01	-51.04	Peak
3	0.51	6.30	34.00	40.30	73.47	-33.17	Peak
4	0.61	5.07	34.48	39.55	71.89	-32.34	Peak
5	0.70	3.97	34.29	38.26	70.68	-32.42	Peak
6	1.00	1.22	34.51	35.73	67.50	-31.77	Peak
7	1.10	0.93	33.68	34.61	66.66	-32.05	Peak
8	1.16	0.75	32.61	33.36	66.16	-32.80	Peak
9	1.65	-0.63	33.34	32.71	63.01	-30.30	Peak
10	2.22	-1.72	32.38	30.66	69.54	-38.88	Peak

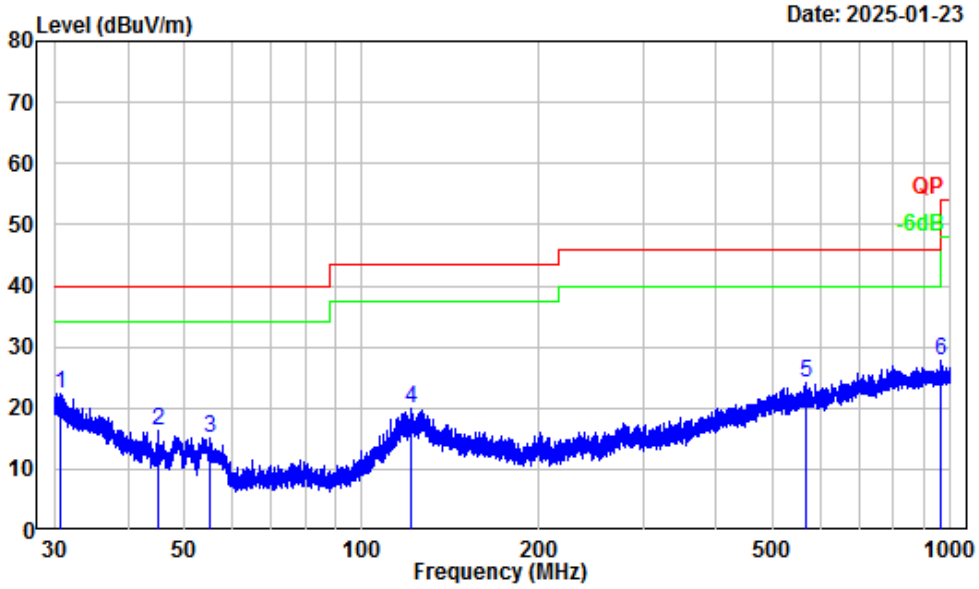
30MHz-1GHz_Horizontal_Adapter1



Site : Chamber A
Condition : 3m Horizontal
Project Number : 2401A109372E-RF
Test Mode : Transmitting
Detector: Peak RBW/VBW: 100/300kHz
Tester : Jack Liu

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	30.12	-6.02	29.15	23.13	40.00	-16.87	Peak
2	125.39	-11.12	30.17	19.05	43.50	-24.45	Peak
3	160.70	-12.72	30.69	17.97	43.50	-25.53	Peak
4	238.62	-13.39	34.17	20.78	46.00	-25.22	Peak
5	248.77	-13.12	35.97	22.85	46.00	-23.15	Peak
6	963.01	-0.87	30.81	29.94	54.00	-24.06	Peak

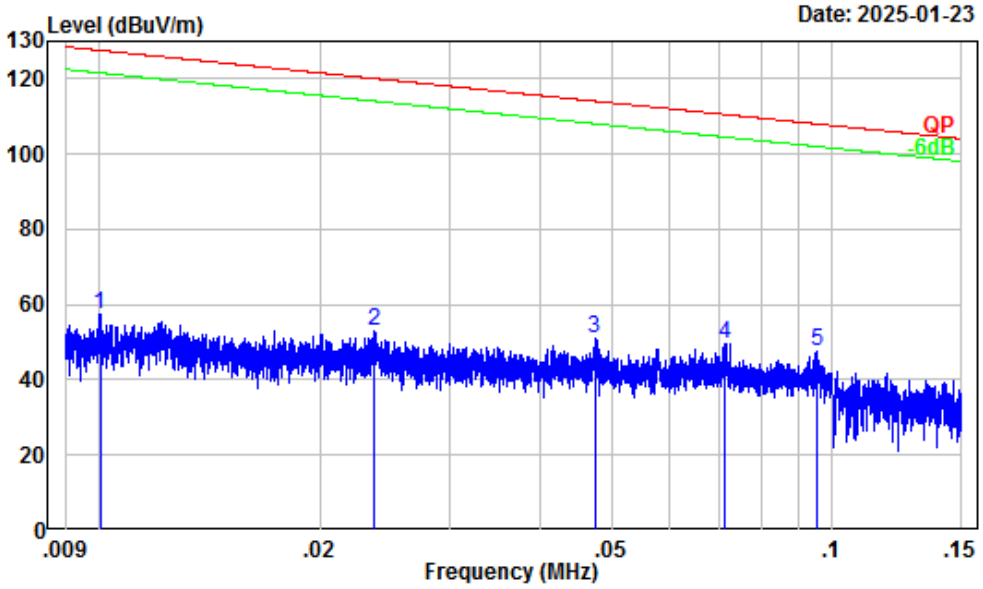
30MHz-1GHz_Vertical_Adapter1



Site : Chamber A
Condition : 3m Vertical
Project Number : 2401A109372E-RF
Test Mode : Transmitting
Detector: Peak RBW/VBW: 100/300kHz
Tester : Jack Liu

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	30.62	-6.28	28.75	22.47	40.00	-17.53	Peak
2	44.94	-15.84	32.14	16.30	40.00	-23.70	Peak
3	55.32	-18.32	33.28	14.96	40.00	-25.04	Peak
4	121.44	-11.31	31.11	19.80	43.50	-23.70	Peak
5	569.61	-5.25	29.46	24.21	46.00	-21.79	Peak
6	964.27	-0.87	28.55	27.68	54.00	-26.32	Peak

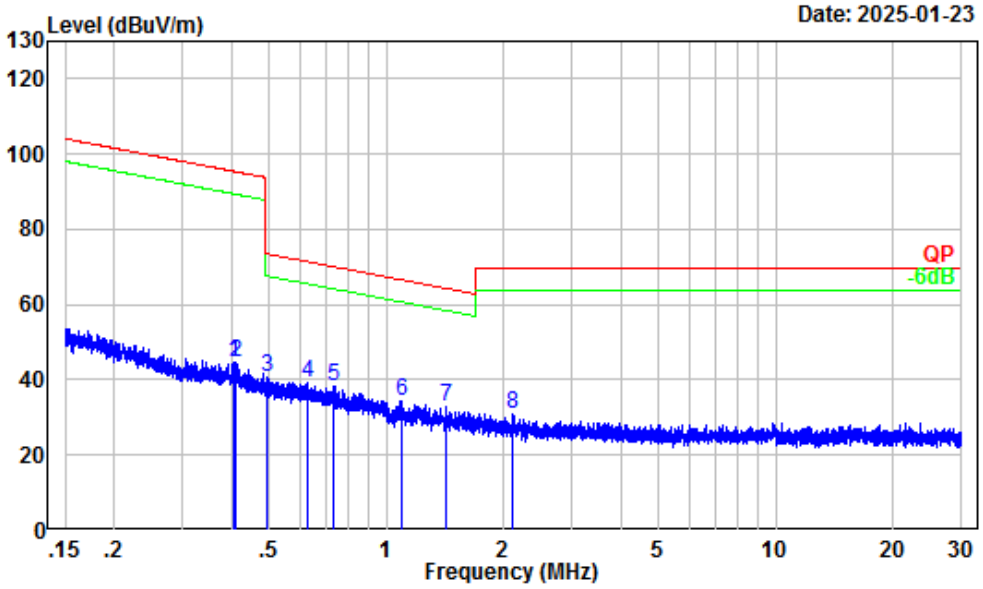
9kHz-150kHz_Adapter2



Site : Chamber A
Condition : 3m
Project Number : 2401A109372E-RF
Test Mode : Transmitting
Detector: Peak RBW/VBW: 0.3/1kHz
Tester : Jack Liu

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	0.01	32.29	25.13	57.42	127.57	-70.15	Peak
2	0.02	29.70	23.25	52.95	120.12	-67.17	Peak
3	0.05	26.67	24.46	51.13	114.09	-62.96	Peak
4	0.07	24.26	25.28	49.54	110.53	-60.99	Peak
5	0.10	22.32	25.17	47.49	108.01	-60.52	Peak

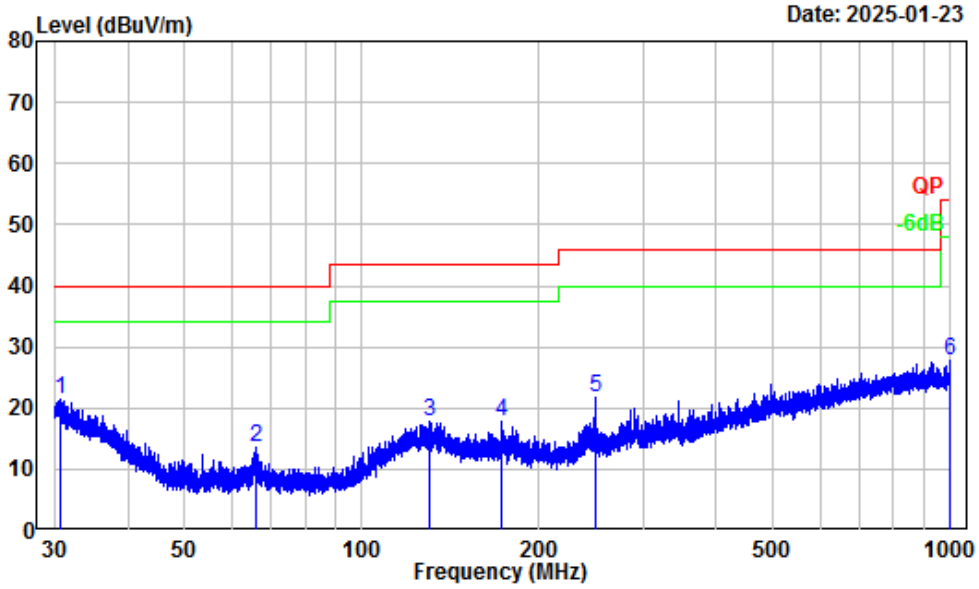
150kHz-30MHz_Adapter2



Site : Chamber A
Condition : 3m
Project Number : 2401A109372E-RF
Test Mode : Transmitting
Detector: Peak RBW/VBW: 10/30kHz
Tester : Jack Liu

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	0.41	8.20	36.60	44.80	95.45	-50.65	Peak
2	0.41	8.11	36.54	44.65	95.35	-50.70	Peak
3	0.49	6.52	34.08	40.60	73.74	-33.14	Peak
4	0.63	4.84	34.23	39.07	71.62	-32.55	Peak
5	0.73	3.51	34.64	38.15	70.21	-32.06	Peak
6	1.09	0.95	33.37	34.32	66.70	-32.38	Peak
7	1.42	0.02	32.92	32.94	64.36	-31.42	Peak
8	2.11	-1.66	32.54	30.88	69.54	-38.66	Peak

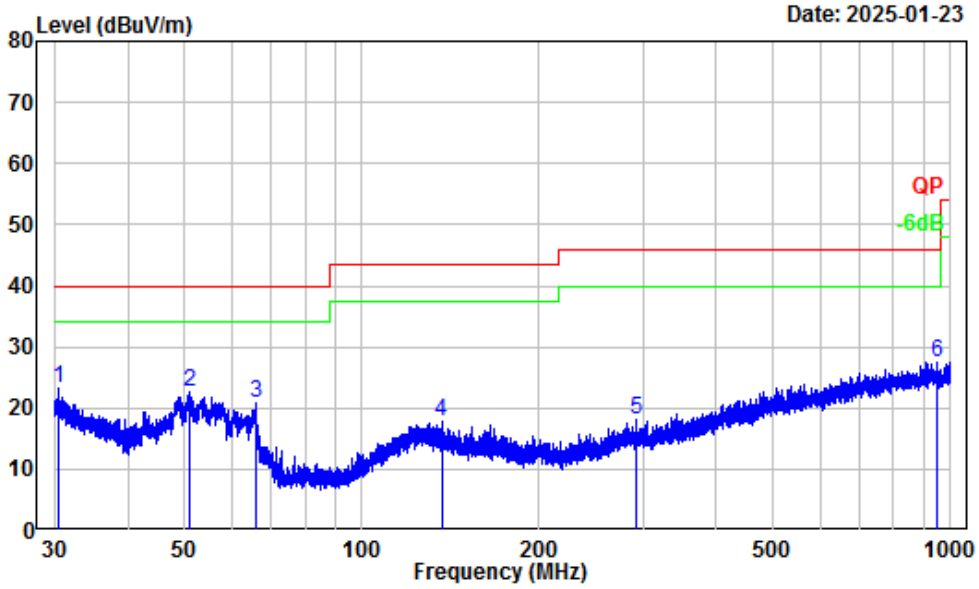
30MHz-1GHz_Horizontal_Adapter2



Site : Chamber A
Condition : 3m Horizontal
Project Number : 2401A109372E-RF
Test Mode : Transmitting
Detector: Peak RBW/VBW: 100/300kHz
Tester : Jack Liu

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	30.77	-6.36	27.83	21.47	40.00	-18.53	Peak
2	66.09	-17.89	31.38	13.49	40.00	-26.51	Peak
3	129.87	-11.21	28.95	17.74	43.50	-25.76	Peak
4	172.15	-13.20	30.89	17.69	43.50	-25.81	Peak
5	249.43	-13.10	34.97	21.87	46.00	-24.13	Peak
6	997.37	-0.45	28.23	27.78	54.00	-26.22	Peak

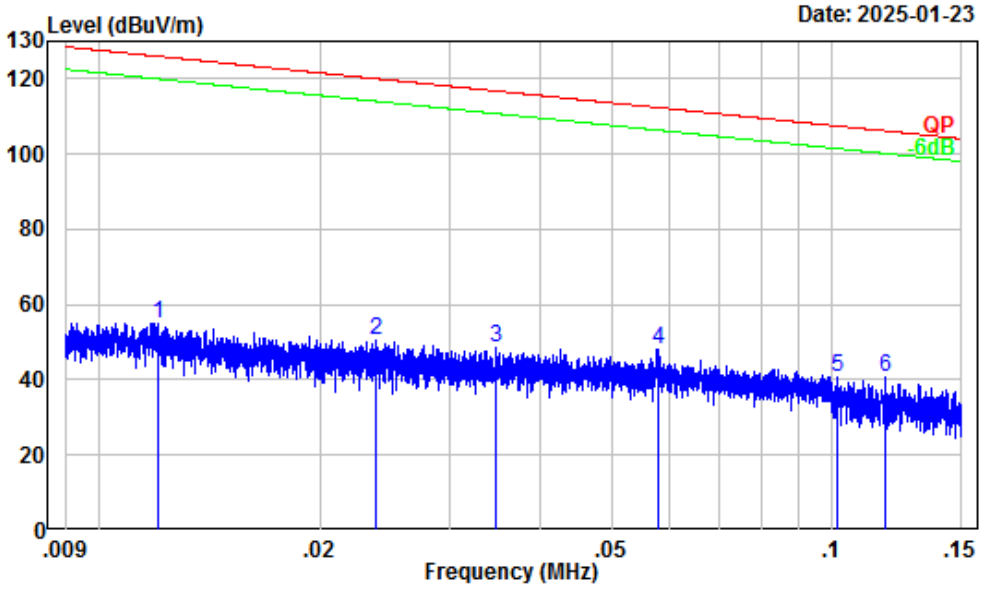
30MHz-1GHz_Vertical_Adapter2



Site : Chamber A
Condition : 3m Vertical
Project Number : 2401A109372E-RF
Test Mode : Transmitting
Detector: Peak RBW/VBW: 100/300kHz
Tester : Jack Liu

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	30.45	-6.19	29.50	23.31	40.00	-16.69	Peak
2	51.05	-18.13	40.68	22.55	40.00	-17.45	Peak
3	65.92	-17.90	38.66	20.76	40.00	-19.24	Peak
4	136.52	-11.60	29.33	17.73	43.50	-25.77	Peak
5	291.80	-11.21	29.39	18.18	46.00	-27.82	Peak
6	949.18	-0.98	28.55	27.57	46.00	-18.43	Peak

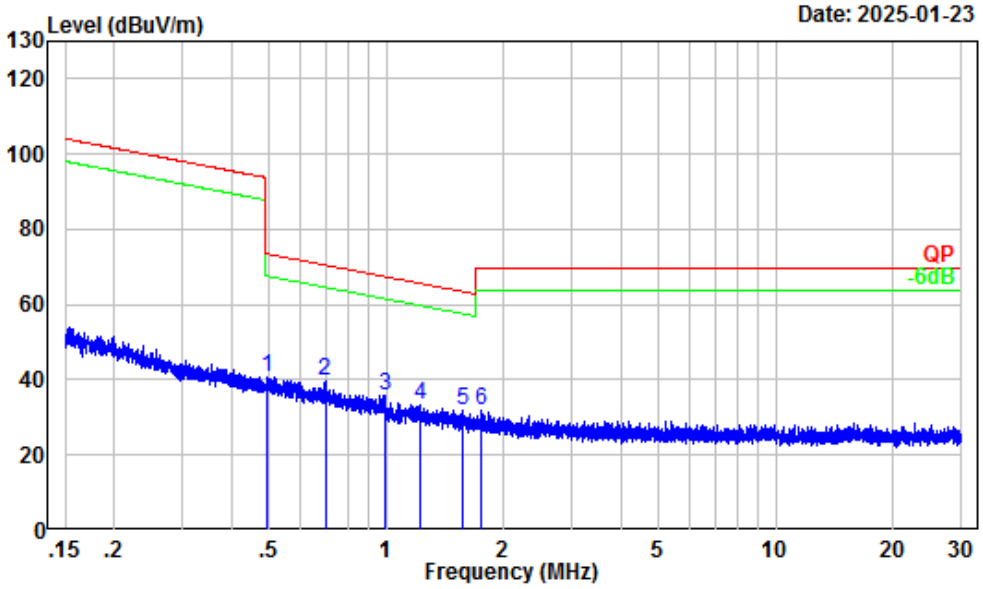
9kHz-150kHz_Adapter3



Site : Chamber A
Condition : 3m
Project Number : 2401A109372E-RF
Test Mode : Transmitting
Detector: Peak RBW/VBW: 0.3/1kHz
Tester : Jack Liu

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	0.01	31.91	23.28	55.19	125.98	-70.79	Peak
2	0.02	29.67	20.99	50.66	120.06	-69.40	Peak
3	0.03	27.99	20.36	48.35	116.77	-68.42	Peak
4	0.06	25.62	22.65	48.27	112.36	-64.09	Peak
5	0.10	21.90	18.81	40.71	107.46	-66.75	Peak
6	0.12	20.94	19.67	40.61	106.17	-65.56	Peak

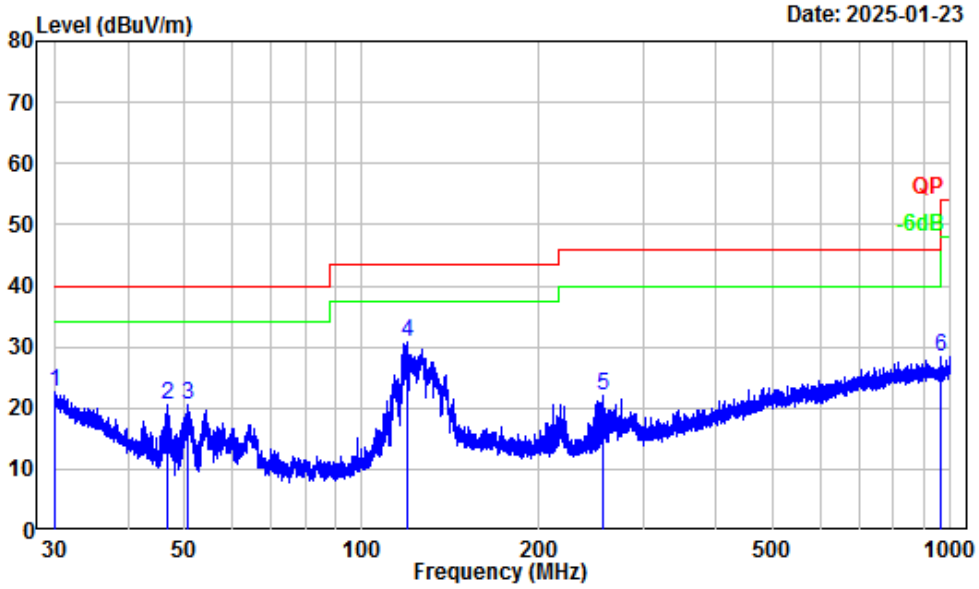
150kHz-30MHz_Adapter3



Site : Chamber A
Condition : 3m
Project Number : 2401A109372E-RF
Test Mode : Transmitting
Detector: Peak RBW/VBW: 10/30kHz
Tester : Jack Liu

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	0.50	6.47	34.24	40.71	73.69	-32.98	Peak
2	0.70	3.97	35.64	39.61	70.67	-31.06	Peak
3	1.00	1.23	34.77	36.00	67.51	-31.51	Peak
4	1.22	0.58	32.69	33.27	65.70	-32.43	Peak
5	1.58	-0.42	32.54	32.12	63.42	-31.30	Peak
6	1.76	-0.92	32.96	32.04	69.54	-37.50	Peak

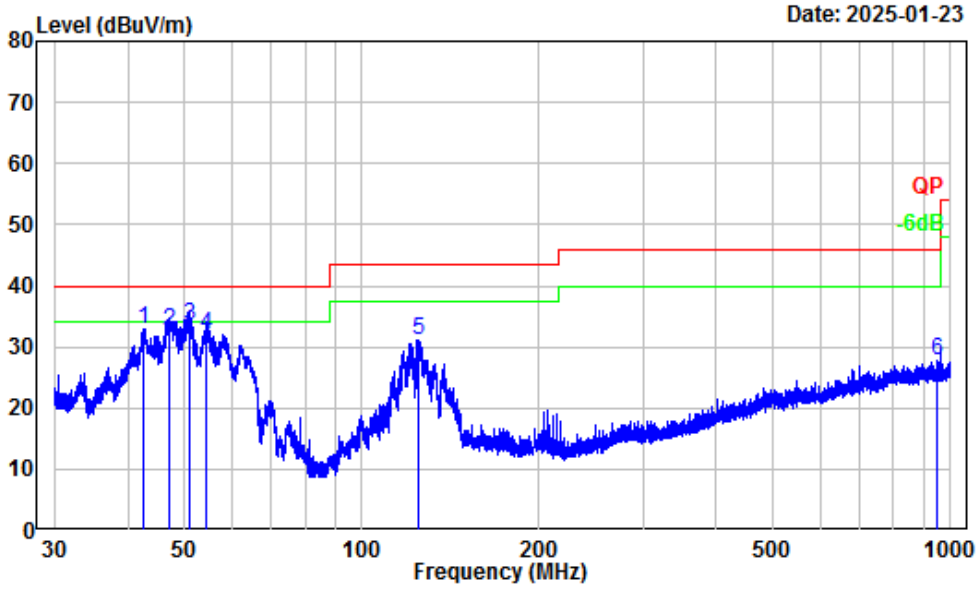
30MHz-1GHz_Horizontal_Adapter3



Site : Chamber A
Condition : 3m Horizontal
Project Number : 2401A109372E-RF
Test Mode : Transmitting
Detector: Peak RBW/VBW: 100/300kHz
Tester : Jack Liu

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	30.01	-5.97	28.52	22.55	40.00	-17.45	Peak
2	46.58	-16.75	37.28	20.53	40.00	-19.47	Peak
3	50.65	-18.04	38.47	20.43	40.00	-19.57	Peak
4	119.44	-11.52	42.34	30.82	43.50	-12.68	Peak
5	255.96	-13.01	34.91	21.90	46.00	-24.10	Peak
6	960.90	-0.87	29.29	28.42	54.00	-25.58	Peak

30MHz-1GHz_Vertical_Adapter3



Site : Chamber A
Condition : 3m Vertical
Project Number : 2401A109372E-RF
Test Mode : Transmitting
Detector: Peak RBW/VBW: 100/300kHz
Tester : Jack Liu

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	42.62	-14.31	47.16	32.85	40.00	-7.15	Peak
2	46.95	-16.93	49.65	32.72	40.00	-7.28	QP
3	50.92	-18.09	51.59	33.50	40.00	-6.50	QP
4	54.28	-18.32	50.46	32.14	40.00	-7.86	QP
5	124.30	-11.14	42.23	31.09	43.50	-12.41	Peak
6	947.51	-1.01	28.91	27.90	46.00	-18.10	Peak

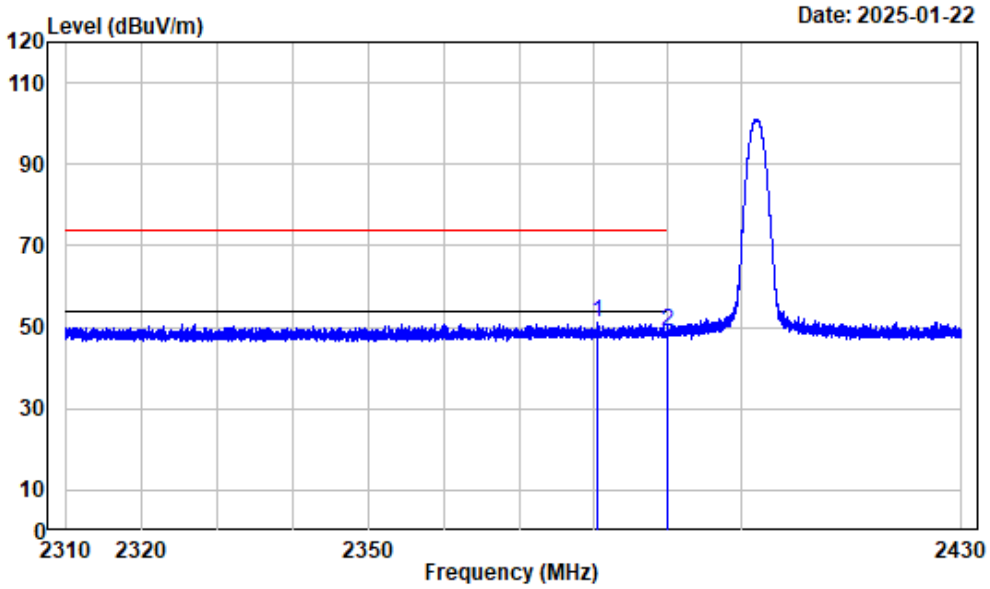
Above 1GHz:

Frequency (MHz)	Receiver		Polar (H/V)	Factor (dB/m)	Corrected Amplitude (dBμV/m)	Limit (dBμV/m)	Margin (dB)
	Reading (dBμV)	PK/Ave					
π/4-DQPSK							
Low Channel							
4804	48.09	PK	H	-7.79	40.3	74	-33.70
4804	48.41	PK	V	-7.79	40.62	74	-33.38
Middle Channel							
4882	48.18	PK	H	-7.58	40.6	74	-33.40
4882	48.65	PK	V	-7.58	41.07	74	-32.93
High Channel							
4960	48.53	PK	H	-7.56	40.97	74	-33.03
4960	48.98	PK	V	-7.56	41.42	74	-32.58

Note:
Factor = Antenna factor (RX) + Cable Loss – Amplifier Factor
Corrected Amplitude = Factor + Reading
Margin = Corrected. Amplitude - Limit
The other spurious emission which is in the noise floor level was not recorded.
The test result of peak was less than the limit of average, so just peak values were recorded.

Test plots

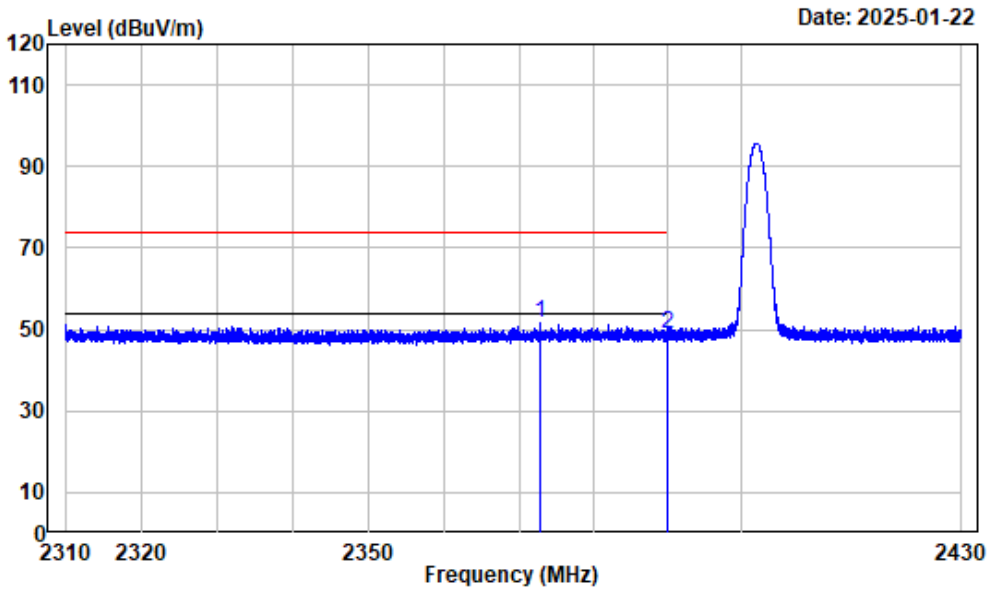
Left Band edge_Horizontal_Peak



Condition : Horizontal
Project No. : 2401A109372E-RF
Tester : Visen Wu
Spectrum setting: Peak reading: RBW:1MHz VBW:3MHz Detector:Peak
Note : BT_2402

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	2380.494	-10.96	62.17	51.21	74.00	-22.79	peak
2	2390.000	-10.98	60.02	49.04	74.00	-24.96	Peak

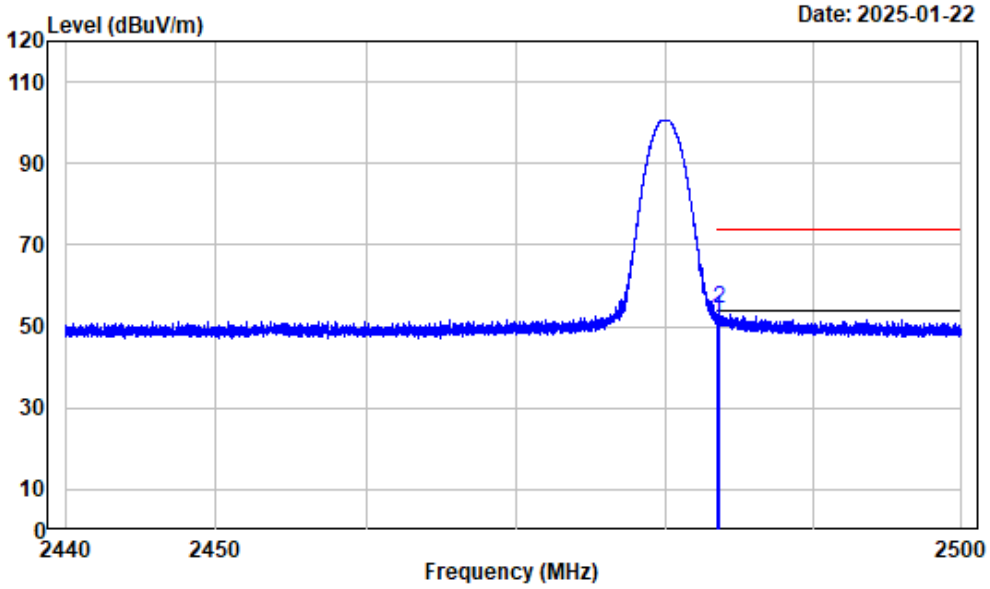
Left Band edge_Vertical_Peak



Condition : Vertical
Project No. : 2401A109372E-RF
Tester : Visen Wu
Spectrum setting: Peak reading: RBW:1MHz VBW:3MHz Detector:Peak
Note : BT_2402

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	2372.798	-10.95	62.47	51.52	74.00	-22.48	peak
2	2390.000	-10.98	59.86	48.88	74.00	-25.12	Peak

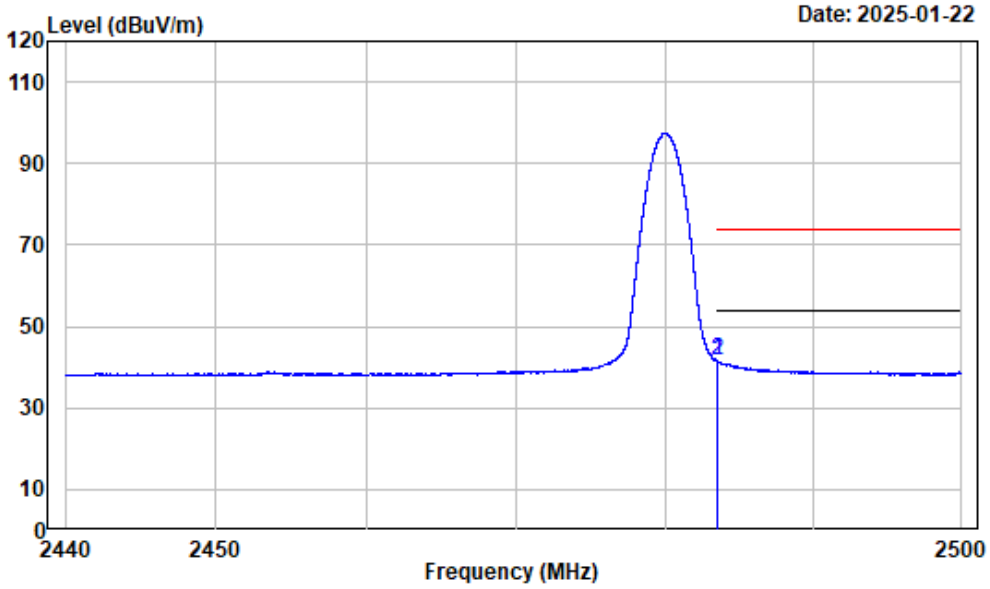
Right Band edge_Horizontal_Peak



Condition : Horizontal
Project No. : 2401A109372E-RF
Tester : Visen Wu
Spectrum setting: Peak reading: RBW:1MHz VBW:3MHz Detector:Peak
Note : BT_2480

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	2483.500	-10.97	62.90	51.93	74.00	-22.07	Peak
2	2483.640	-10.97	65.43	54.46	74.00	-19.54	peak

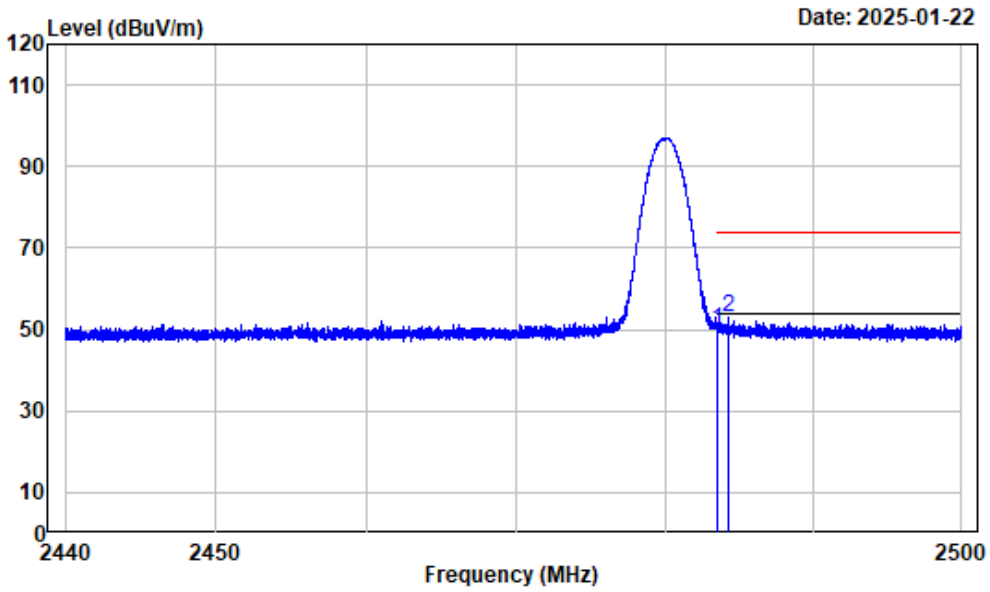
Right Band edge_Horizontal_Average



Condition : Horizontal
Project No. : 2401A109372E-RF
Tester : Visen Wu
Spectrum setting: Average reading: RBW:1MHz VBW:1kHz Detector:Peak
Note : BT_2480

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	2483.500	-10.97	52.54	41.57	54.00	-12.43	Average
2	2483.543	-10.97	52.55	41.58	54.00	-12.42	Average

Right Band edge_Vertical_Peak

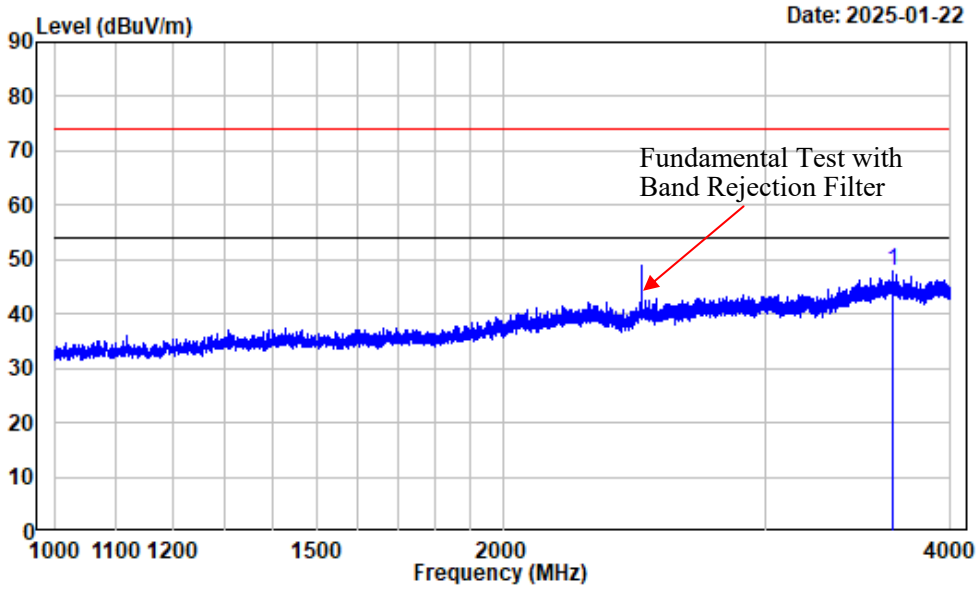


Condition : Vertical
Project No. : 2401A109372E-RF
Tester : Visen Wu
Spectrum setting: Peak reading: RBW:1MHz VBW:3MHz Detector:Peak
Note : BT_2480

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	2483.500	-10.97	60.59	49.62	74.00	-24.38	Peak
2	2484.240	-10.97	63.75	52.78	74.00	-21.22	peak

Listed with the worst harmonic margin test plot

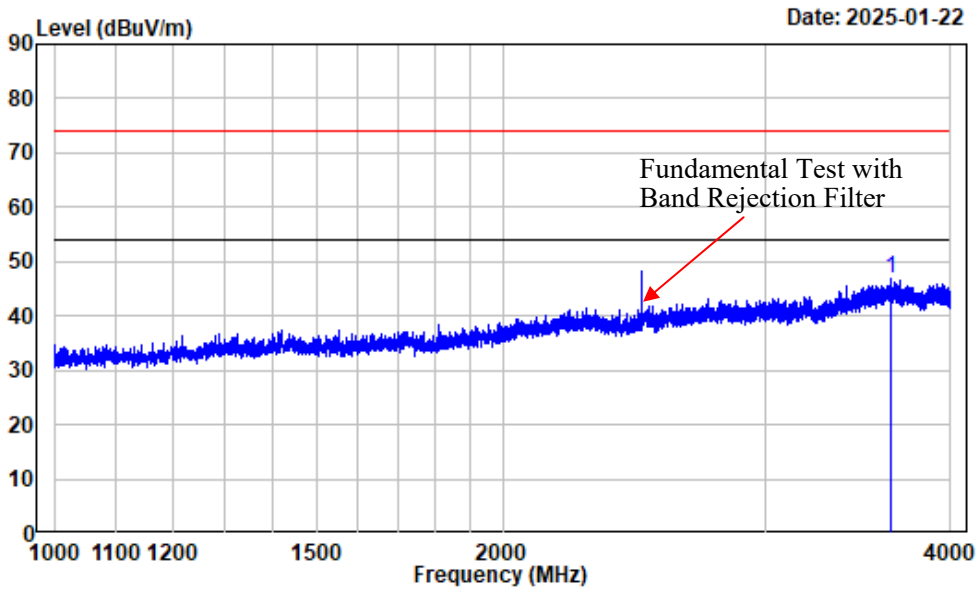
1-4GHz_Horizontal




```
Condition         : Horizontal
Project No.       : 2401A109372E-RF
Tester            : Visen Wu
Spectrum setting: Peak reading: RBW:1MHz VBW:3MHz Detector:Peak
Note              : BT_2480
```

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	3654.957	-9.75	57.49	47.74	74.00	-26.26	Peak

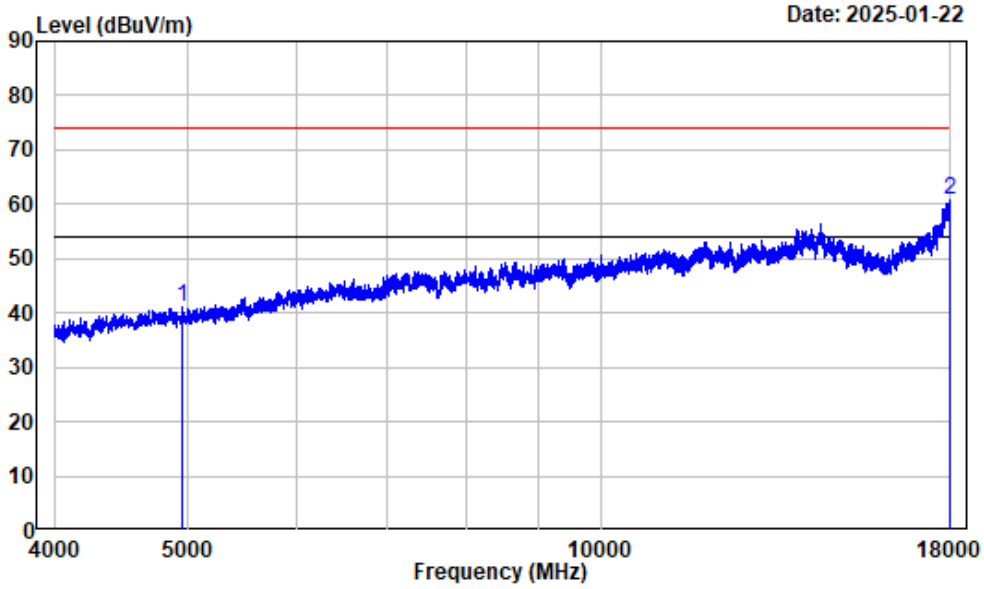
1-4GHz_Vertical



Condition : Vertical
Project No. : 2401A109372E-RF
Tester : Visen Wu
Spectrum setting: Peak reading: RBW:1MHz VBW:3MHz Detector:Peak
Note : BT_2480

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	3644.831	-9.81	56.57	46.76	74.00	-27.24	Peak

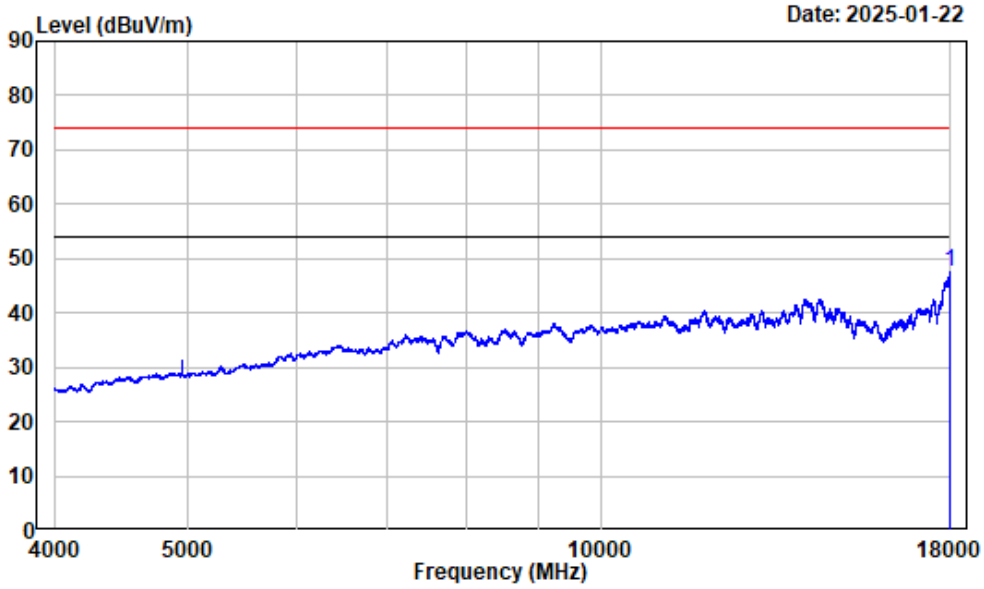
4-18GHz_Horizontal_Peak



Condition : Horizontal
Project No. : 2401A109372E-RF
Tester : Visen Wu
Spectrum setting: Peak reading: RBW:1MHz VBW:3MHz Detector:Peak
Note : BT_2480

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	4960.000	-7.56	48.53	40.97	74.00	-33.03	Peak
2	17984.250	13.12	47.69	60.81	74.00	-13.19	Peak

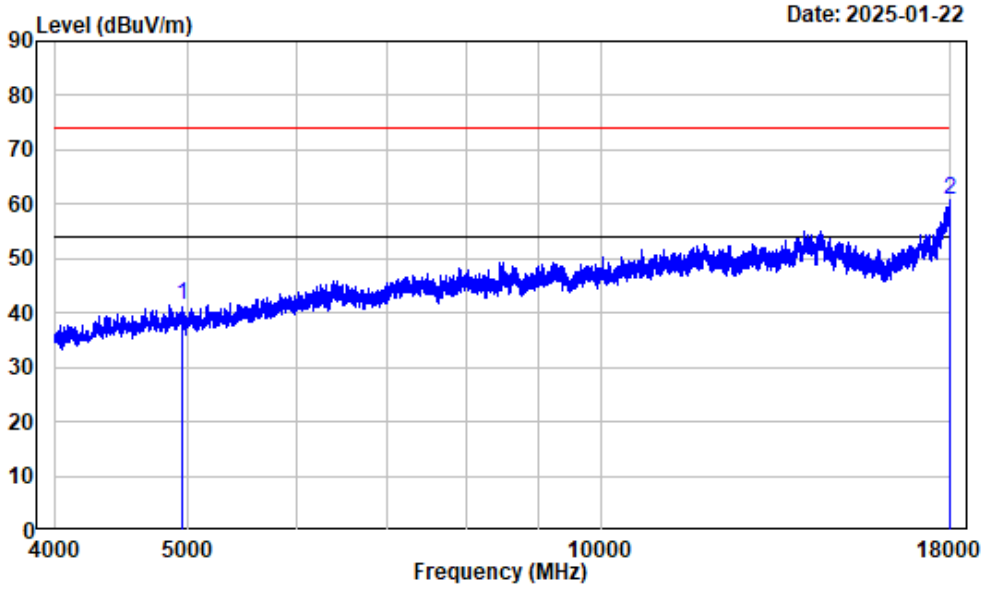
4-18GHz_Horizontal_Average



Condition : Horizontal
Project No. : 2401A109372E-RF
Tester : Visen Wu
Spectrum setting: Average reading: RBW:1MHz VBW:1kHz Detector:Peak
Note : BT_2480

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	17994.750	13.17	34.26	47.43	54.00	-6.57	Average

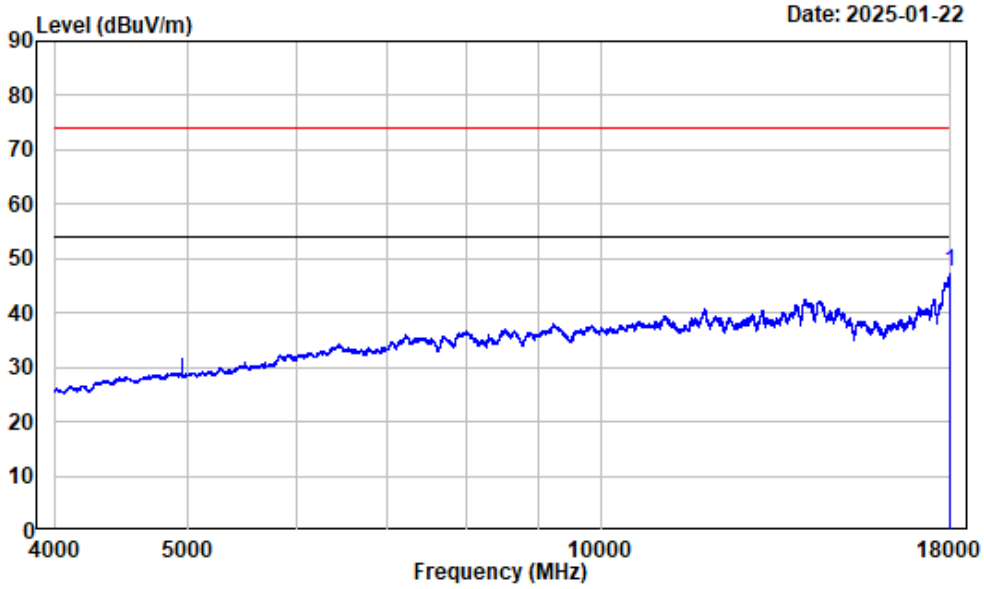
4-18GHz_Vertical_Peak



Condition : Vertical
Project No. : 2401A109372E-RF
Tester : Visen Wu
Spectrum setting: Peak reading: RBW:1MHz VBW:3MHz Detector:Peak
Note : BT_2480

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	4960.000	-7.56	48.98	41.42	74.00	-32.58	Peak
2	17991.250	13.16	47.53	60.69	74.00	-13.31	Peak

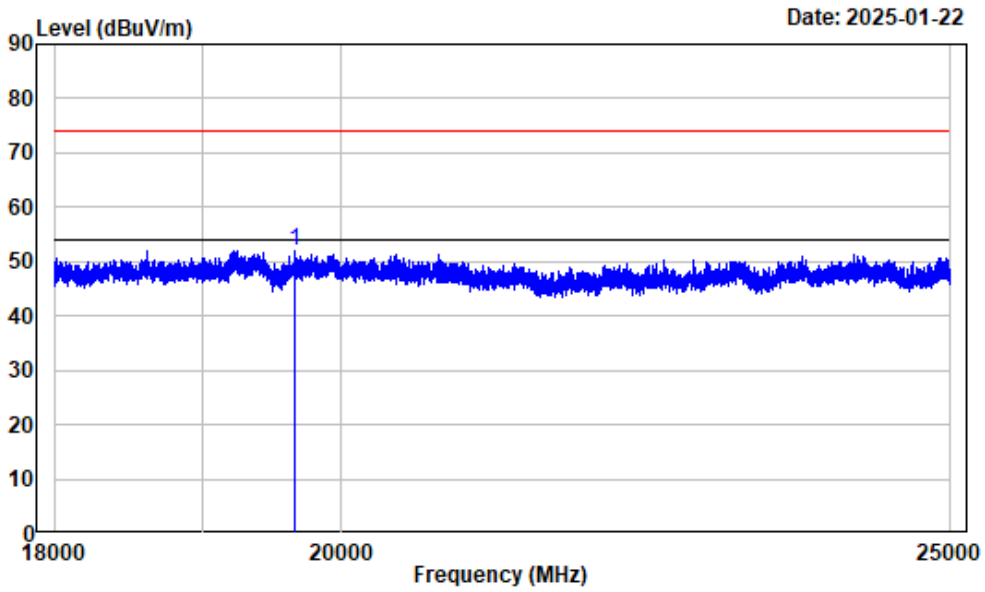
4-18GHz_Vertical_Average



Condition : Vertical
Project No. : 2401A109372E-RF
Tester : Visen Wu
Spectrum setting: Average reading: RBW:1MHz VBW:1kHz Detector:Peak
Note : BT_2480

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	17998.250	13.19	34.36	47.55	54.00	-6.45	Average

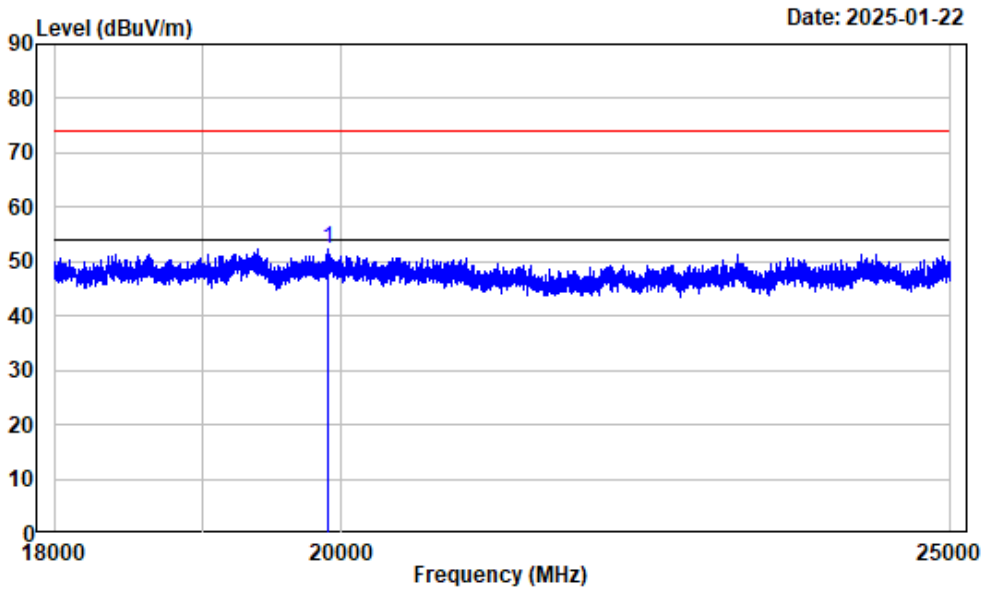
18-25GHz_Horizontal



Condition : Horizontal
Project No. : 2401A109372E-RF
Tester : Visen Wu
Spectrum setting: Peak reading: RBW:1MHz VBW:3MHz Detector:Peak
Note : BT_2480

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	19653.080	15.40	36.72	52.12	74.00	-21.88	Peak

18-25GHz_Vertical



Condition : Vertical
Project No. : 2401A109372E-RF
Tester : Visen Wu
Spectrum setting: Peak reading: RBW:1MHz VBW:3MHz Detector:Peak
Note : BT_2480

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	19902.490	15.42	36.95	52.37	74.00	-21.63	Peak

20 dB Emission Bandwidth

Test Information:

Sample No.:	2VR5-3	**Test Date:**	2025/01/20
Test Site:	RF	**Test Mode:**	Transmitting
Tester:	Rainbow Zhu	**Test Result:**	Pass

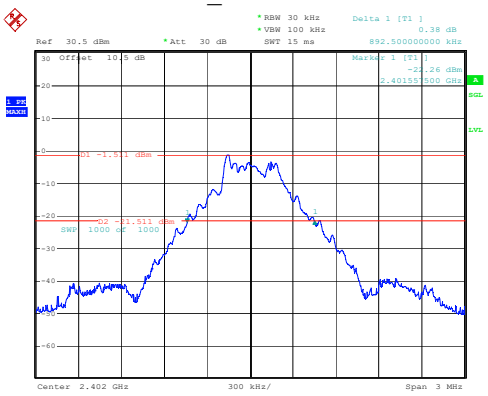
Environmental Conditions:

Temperature: (°C):	45~47	**Relative Humidity: (%)**	25.6~26.1	**ATM Pressure: (kPa)**	101.1~101.4

Test Data:

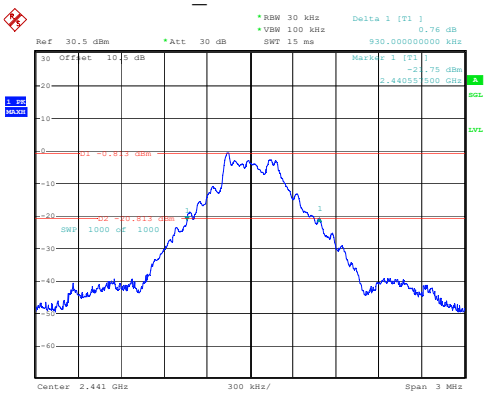
Mode	Channel	Result (MHz)
DH1	Low Channel	0.893
	Middle Channel	0.930
	High Channel	0.934
2DH1	Low Channel	1.264
	Middle Channel	1.260
	High Channel	1.264
3DH1	Low Channel	**1.268**
	Middle Channel	1.238
	High Channel	1.234

DH1_Low 0.893MHz



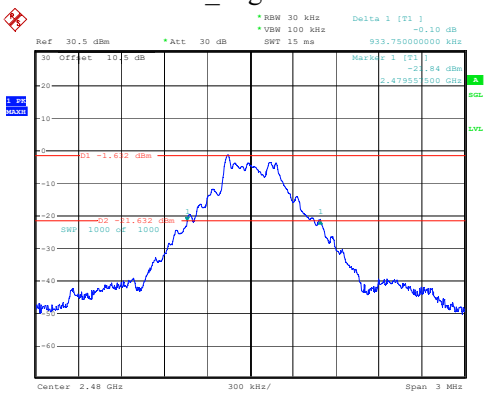
ProjectNo.:2401A109372E-RF Tester:Rainbow Zhu
Date: 20.JAN.2025 07:42:18

DH1_Middle 0.930MHz



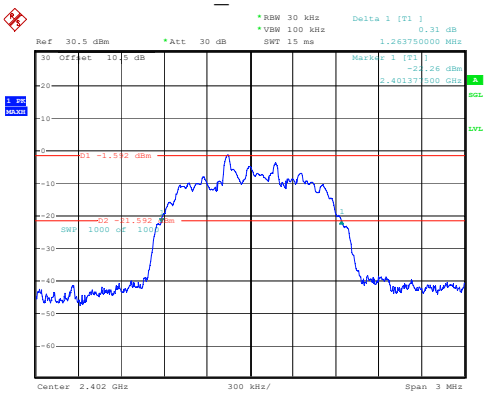
ProjectNo.:2401A109372E-RF Tester:Rainbow Zhu
Date: 20.JAN.2025 07:45:26

DH1_High 0.934MHz



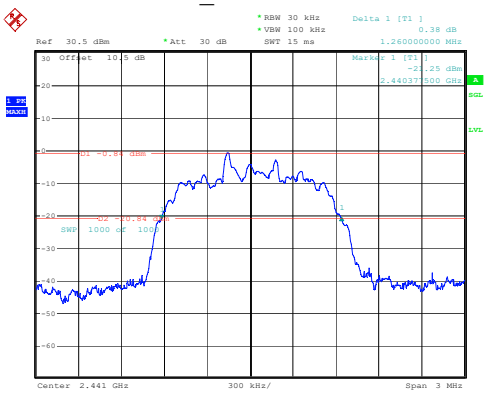
ProjectNo.:2401A109372E-RF Tester:Rainbow Zhu
Date: 20.JAN.2025 07:47:21

2DH1_Low 1.264MHz



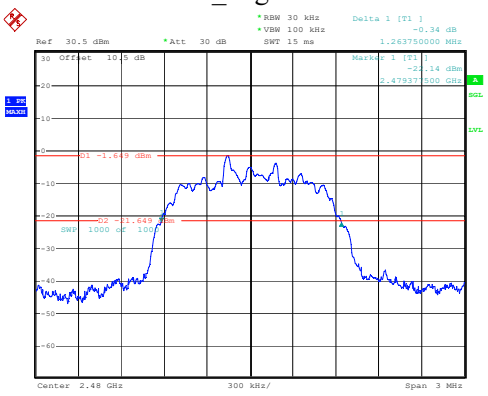
ProjectNo.:2401A109372E-RF Tester:Rainbow Zhu
Date: 20.JAN.2025 07:51:24

2DH1_Middle 1.260MHz



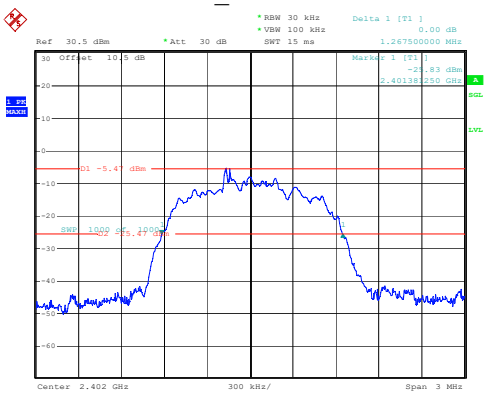
ProjectNo.:2401A109372E-RF Tester:Rainbow Zhu
Date: 20.JAN.2025 07:54:26

2DH1_High 1.264MHz



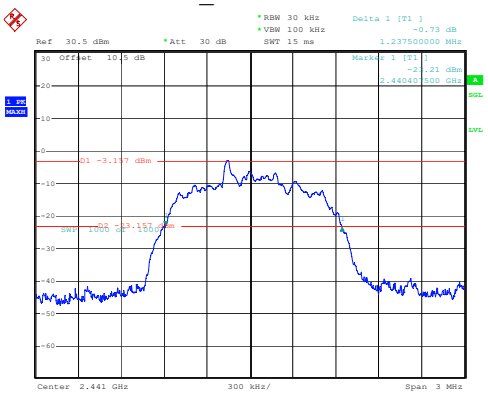
ProjectNo.:2401A109372E-RF Tester:Rainbow Zhu
Date: 20.JAN.2025 07:56:49

3DH1_Low 1.268MHz



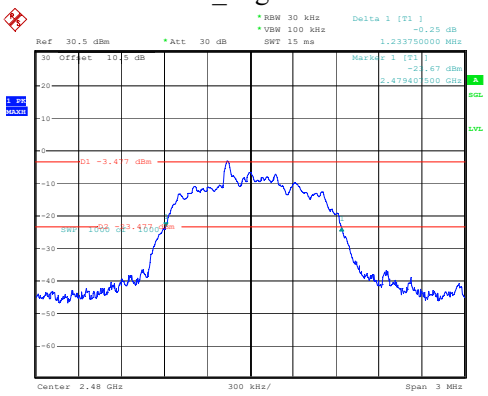
ProjectNo.:2401A109372E-RF Tester:Rainbow Zhu
Date: 20.JAN.2025 08:01:20

3DH1_Middle 1.238MHz



ProjectNo.:2401A109372E-RF Tester:Rainbow Zhu
Date: 20.JAN.2025 08:04:13

3DH1_High 1.234MHz



ProjectNo.:2401A109372E-RF Tester:Rainbow Zhu
Date: 20.JAN.2025 08:06:35

99% Occupied Bandwidth

Test Information:

Sample No.:	2VR5-3	**Test Date:**	2025/01/20
Test Site:	RF	**Test Mode:**	Transmitting
Tester:	Rainbow Zhu	**Test Result:**	Pass

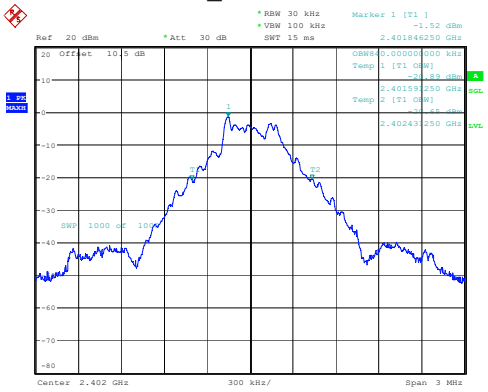
Environmental Conditions:

Temperature: (°C):	45~47	**Relative Humidity: (%)**	25.6~26.1	**ATM Pressure: (kPa)**	101.1~101.4

Test Data:

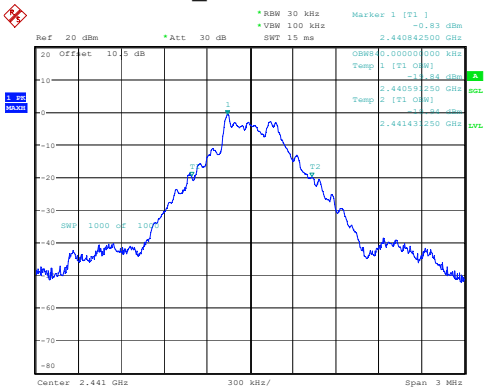
Mode	Channel	99% OBW (MHz)
DH1	Low Channel	0.840
	Middle Channel	0.840
	High Channel	0.848
2DH1	Low Channel	**1.170**
	Middle Channel	**1.170**
	High Channel	**1.170**
3DH1	Low Channel	1.163
	Middle Channel	1.163
	High Channel	1.166

DH1_Low 0.840MHz



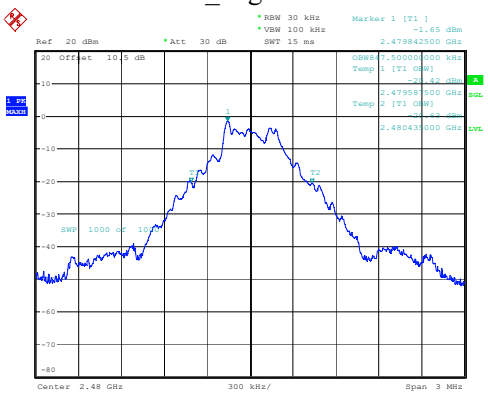
ProjectNo.:2401A109372E-RF Tester:Rainbow Zhu
Date: 20.JAN.2025 07:43:47

DH1_Middle 0.840MHz



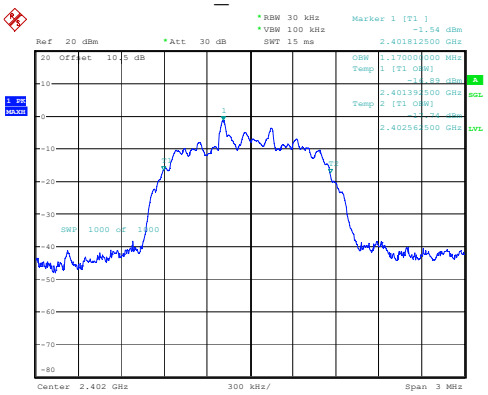
ProjectNo.:2401A109372E-RF Tester:Rainbow Zhu
Date: 20.JAN.2025 07:46:00

DH1_High 0.848MHz



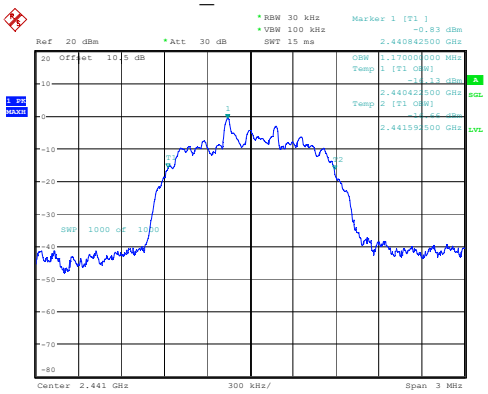
ProjectNo.:2401A109372E-RF Tester:Rainbow Zhu
Date: 20.JAN.2025 07:49:28

2DH1_Low 1.170MHz



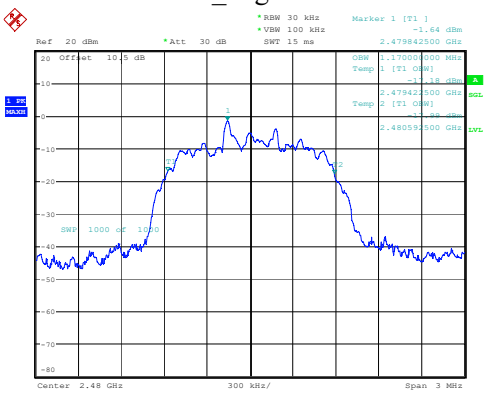
ProjectNo.:2401A109372E-RF Tester:Rainbow Zhu
Date: 20.JAN.2025 09:27:49

2DH1_Middle 1.170MHz



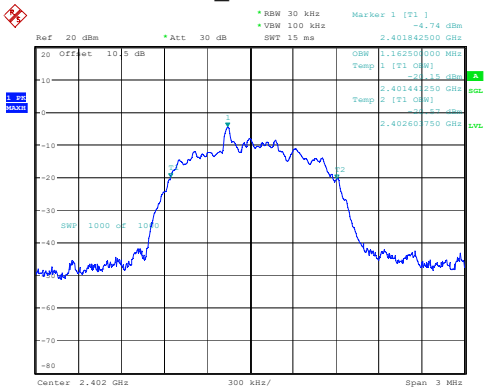
ProjectNo.:2401A109372E-RF Tester:Rainbow Zhu
Date: 20.JAN.2025 07:55:01

2DH1_High 1.170MHz



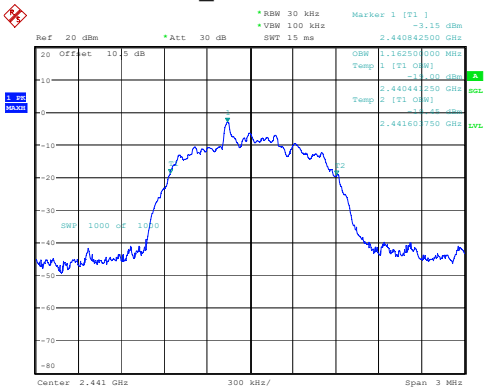
ProjectNo.:2401A109372E-RF Tester:Rainbow Zhu
Date: 20.JAN.2025 07:58:58

3DH1_Low 1.163MHz



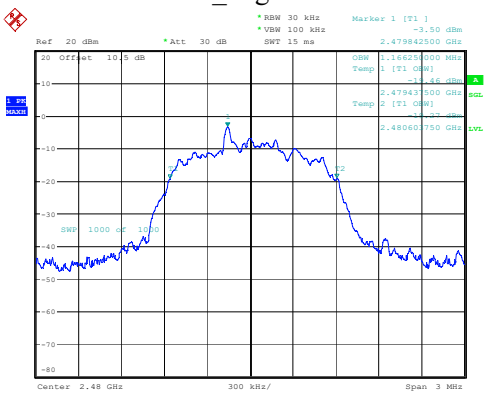
ProjectNo.:2401A109372E-RF Tester:Rainbow Zhu
Date: 20.JAN.2025 08:02:49

3DH1_Middle 1.163MHz



ProjectNo.:2401A109372E-RF Tester:Rainbow Zhu
Date: 20.JAN.2025 08:04:47

3DH1_High 1.166MHz



ProjectNo.:2401A109372E-RF Tester:Rainbow Zhu
Date: 20.JAN.2025 08:08:41

Channel Separation

Test Information:

Sample No.:	2VR5-3	**Test Date:**	2025/01/20
Test Site:	RF	**Test Mode:**	Transmitting
Tester:	Rainbow Zhu	**Test Result:**	Pass

Environmental Conditions:

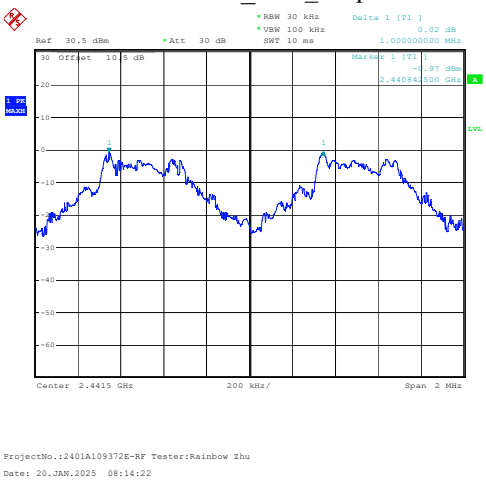
Temperature: (°C):	45~47	**Relative Humidity: (%)**	25.6~26.1	**ATM Pressure: (kPa)**	101.1~101.4

Test Data:

Mode	Channel	Result (MHz)	Limit (MHz)	Verdict
DH1	Mid_ Hop	**1**	0.845	Pass

Note: Only the BDR (GFSK) mode result is reported since EDR (π/4-DQPSK) and EDR (8DPSK) modes have the exact same channel plan, and the limit is the maximum 20dB bandwidth *2/3

DH1_ Mid_ Hop



Number of Hopping Frequency

Test Information:

Sample No.:	2VR5-3	**Test Date:**	2025/01/20
Test Site:	RF	**Test Mode:**	Transmitting
Tester:	Rainbow Zhu	**Test Result:**	Pass

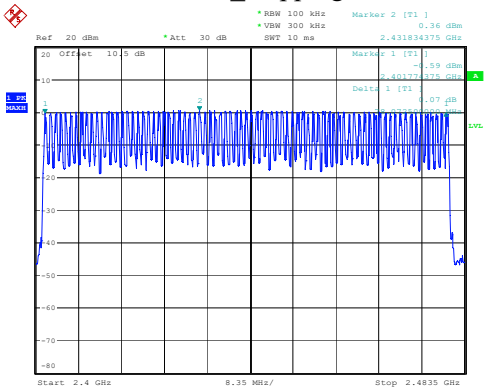
Environmental Conditions:

Temperature: (°C):	45~47	**Relative Humidity: (%)**	25.6~26.1	**ATM Pressure: (kPa)**	101.1~101.4

Test Data:

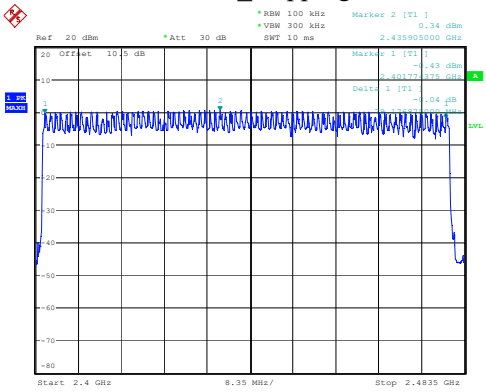
Mode	Channel	Result	Limit	Verdict
DH1	Hopping Channel	**79**	15	Pass
2DH1	Hopping Channel	**79**	15	Pass
3DH1	Hopping Channel	**79**	15	Pass

DH1_Hopping 79



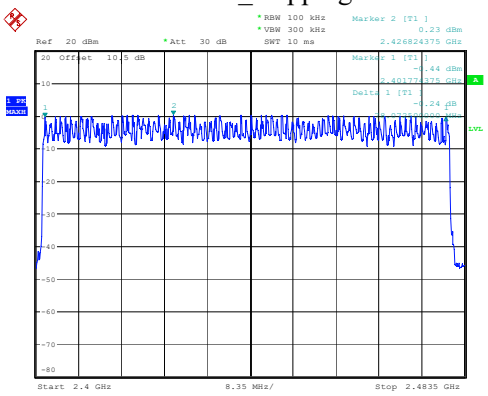
ProjectNo.:2401A109372E-RF Tester:Rainbow Zhu
Date: 20.JAN.2025 09:30:38

2DH1_Hopping 79



ProjectNo.:2401A109372E-RF Tester:Rainbow Zhu
Date: 20.JAN.2025 08:24:34

3DH1_Hopping 79



ProjectNo.:2401A109372E-RF Tester:Rainbow Zhu
Date: 20.JAN.2025 08:32:39

Maximum Conducted Output Power

Test Information:

Sample No.:	2VR5-3	**Test Date:**	2025/01/20
Test Site:	RF	**Test Mode:**	Transmitting
Tester:	Rainbow Zhu	**Test Result:**	Pass

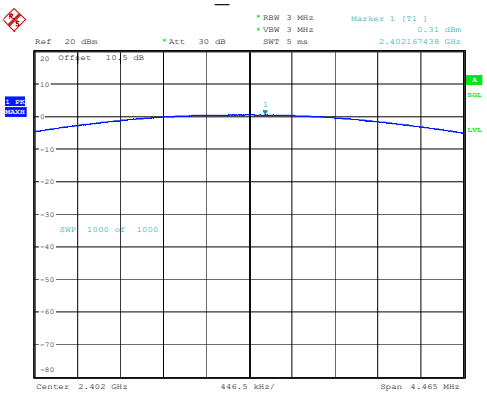
Environmental Conditions:

Temperature: (°C):	45~47	**Relative Humidity: (%)**	25.6~26.1	**ATM Pressure: (kPa)**	101.1~101.4

Test Data:

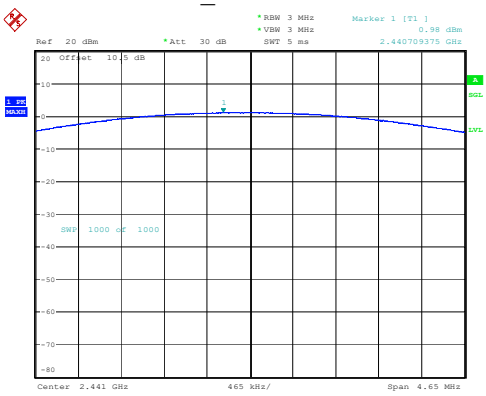
Mode	Channel	Result (dBm)	Limit (dBm)	EIRP(dBm)	EIRP Limit (dBm)	Verdict
DH1	Low Channel	0.31	21.00	0.31	36.00	Pass
	Middle Channel	0.98	21.00	0.98	36.00	Pass
	High Channel	1.03	21.00	1.03	36.00	Pass
2DH1	Low Channel	2.27	21.00	2.27	36.00	Pass
	Middle Channel	**2.86**	21.00	**2.86**	36.00	Pass
	High Channel	2.11	21.00	2.11	36.00	Pass
3DH1	Low Channel	-0.29	21.00	-0.29	36.00	Pass
	Middle Channel	1.01	21.00	1.01	36.00	Pass
	High Channel	0.75	21.00	0.75	36.00	Pass

DH1_Low 0.31dBm



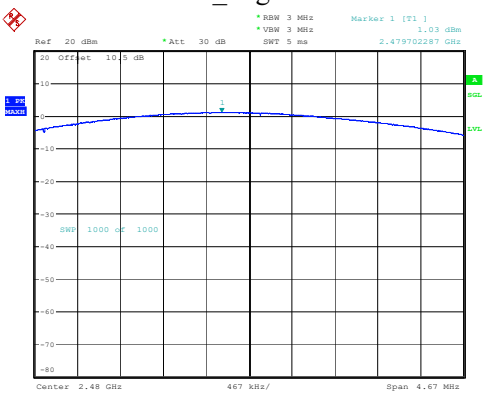
ProjectNo.:2401A109372E-RF Tester:Rainbow Zhu
Date: 20.JAN.2025 07:44:07

DH1_Middle 0.98dBm



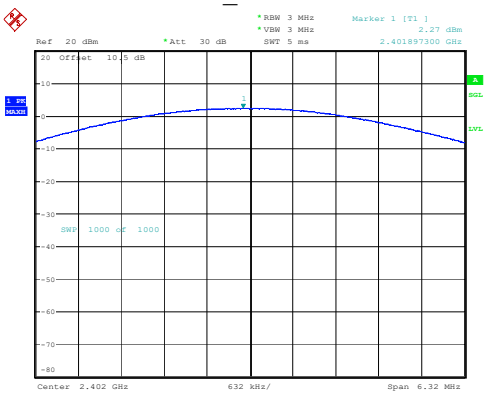
ProjectNo.:2401A109372E-RF Tester:Rainbow Zhu
Date: 20.JAN.2025 07:46:20

DH1_High 1.03dBm



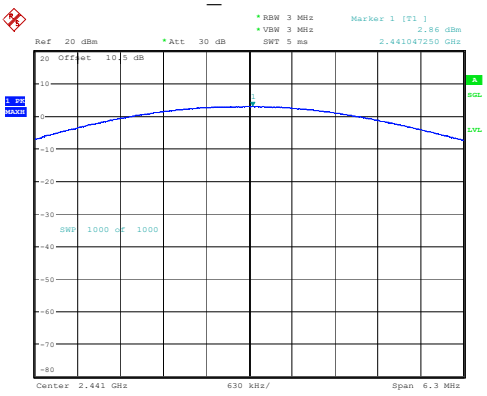
ProjectNo.:2401A109372E-RF Tester:Rainbow Zhu
Date: 20.JAN.2025 07:49:48

2DH1_Low 2.27dBm



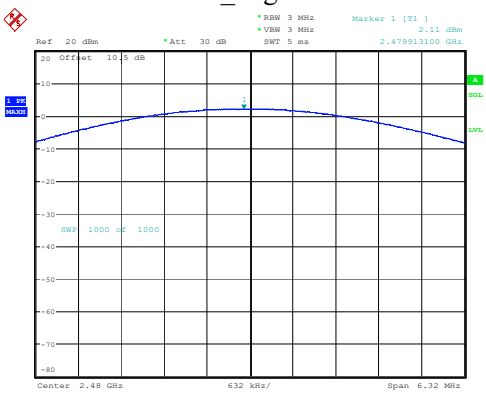
ProjectNo.:2401A109372E-RF Tester:Rainbow Zhu
Date: 20.JAN.2025 07:53:25

2DH1_Middle 2.86dBm



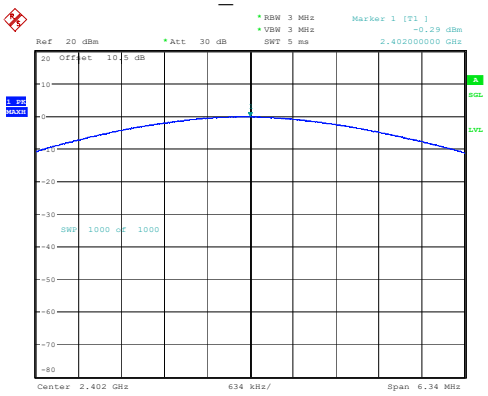
ProjectNo.:2401A109372E-RF Tester:Rainbow Zhu
Date: 20.JAN.2025 07:55:22

2DH1_High 2.11dBm



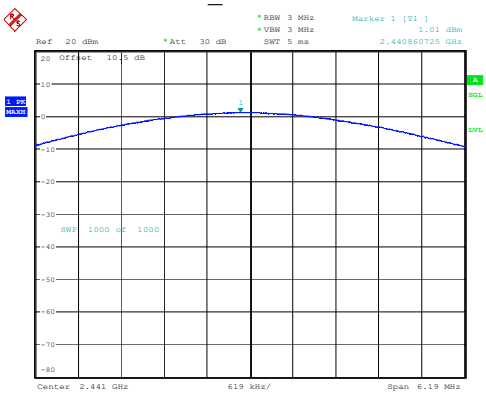
ProjectNo.:2401A109372E-RF Tester:Rainbow Zhu
Date: 20.JAN.2025 07:59:18

3DH1_Low -0.29dBm



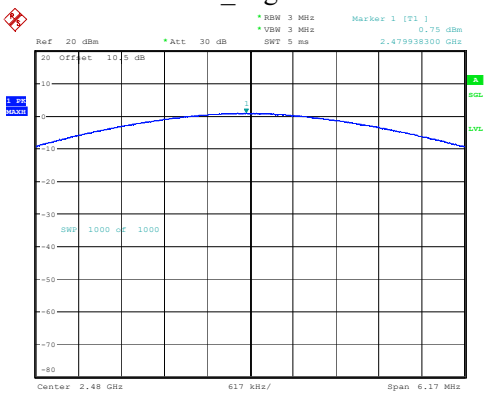
ProjectNo.:2401A109372E-RF Tester:Rainbow Zhu
Date: 20.JAN.2025 08:03:09

3DH1_Middle 1.01dBm



ProjectNo.:2401A109372E-RF Tester:Rainbow Zhu
Date: 20.JAN.2025 08:05:25

3DH1_High 0.75dBm



ProjectNo.:2401A109372E-RF Tester:Rainbow Zhu
Date: 20.JAN.2025 08:09:01

100 kHz Bandwidth of Frequency Band Edge

Test Information:

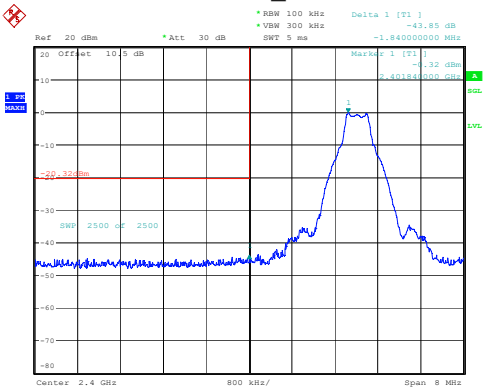
Sample No.:	2VR5-3	**Test Date:**	2025/01/20
Test Site:	RF	**Test Mode:**	Transmitting
Tester:	Rainbow Zhu	**Test Result:**	Pass

Environmental Conditions:

Temperature: (°C):	45~47	**Relative Humidity: (%)**	25.6~26.1	**ATM Pressure: (kPa)**	101.1~101.4

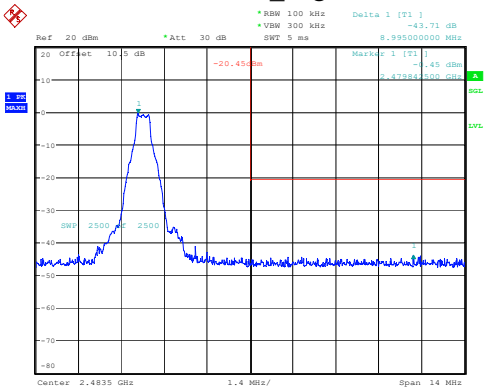
Test Data:

DH1_Low



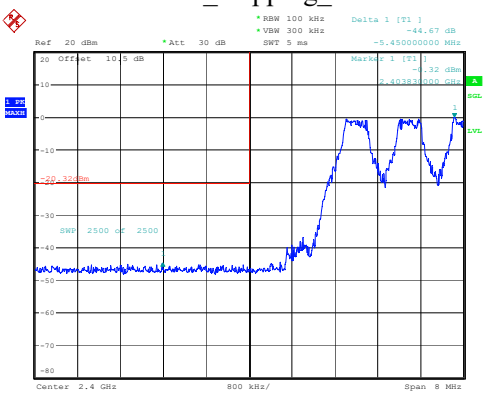
ProjectNo.:2401A109372E-RF Tester:Rainbow Zhu
Date: 20.JAN.2025 07:43:11

DH1_High



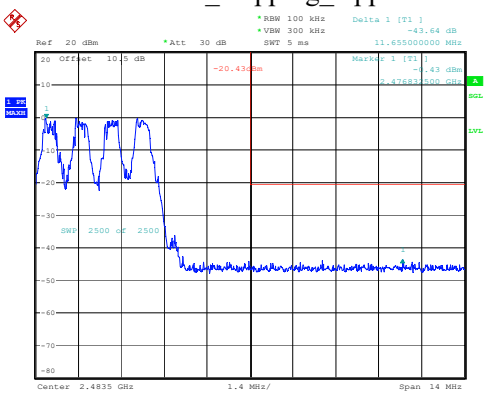
ProjectNo.:2401A109372E-RF Tester:Rainbow Zhu
Date: 20.JAN.2025 07:48:54

DH1_Hopping_Lower



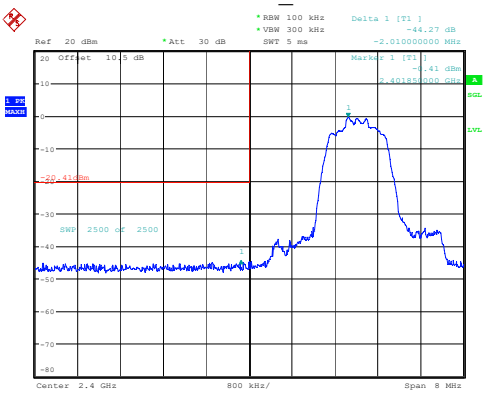
ProjectNo.:2401A109372E-RF Tester:Rainbow Zhu
Date: 20.JAN.2025 08:34:06

DH1_Hopping_Upper



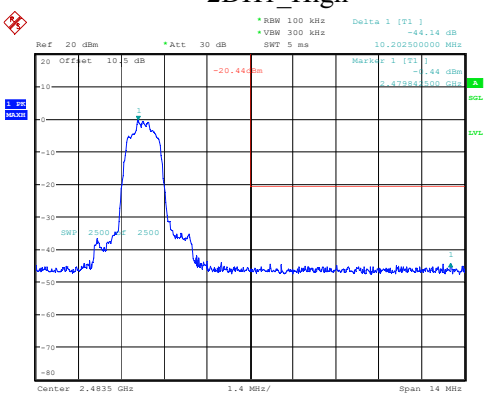
ProjectNo.:2401A109372E-RF Tester:Rainbow Zhu
Date: 20.JAN.2025 08:35:42

2DH1_Low



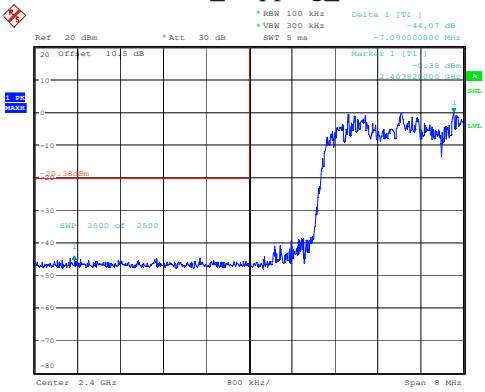
ProjectNo.:2401A109372E-RF Tester:Rainbow Zhu
Date: 20.JAN.2025 07:52:18

2DH1_High



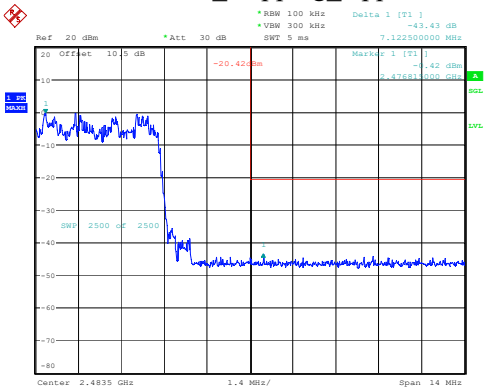
ProjectNo.:2401A109372E-RF Tester:Rainbow Zhu
Date: 20.JAN.2025 07:58:24

2DH1_Hopping_Lower



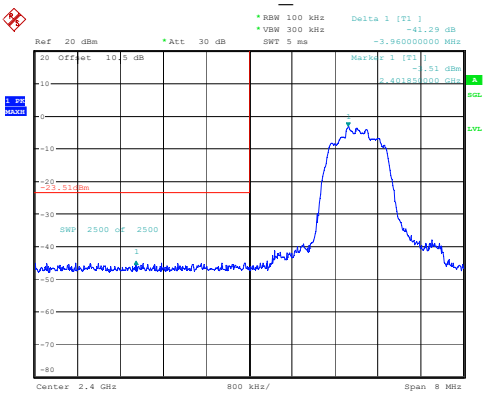
ProjectNo.:2401A109372E-RF Tester:Rainbow Zhu
Date: 20.JAN.2025 08:37:04

2DH1_Hopping_Upper



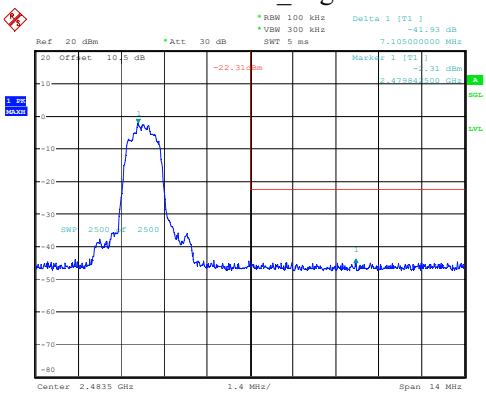
ProjectNo.:2401A109372E-RF Tester:Rainbow Zhu
Date: 20.JAN.2025 08:42:57

3DH1_Low



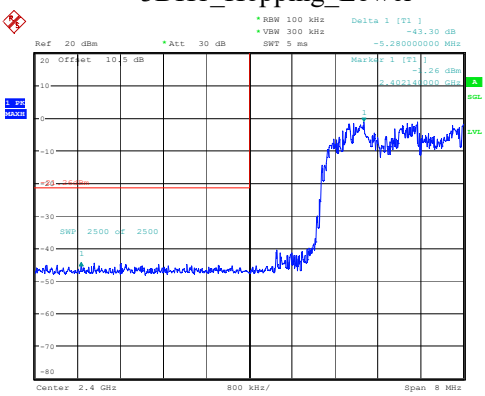
ProjectNo.:2401A109372E-RF Tester:Rainbow Zhu
Date: 20.JAN.2025 08:02:13

3DH1_High



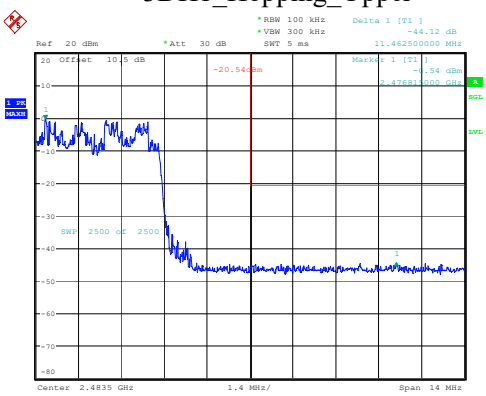
ProjectNo.:2401A109372E-RF Tester:Rainbow Zhu
Date: 20.JAN.2025 08:08:07

3DH1_Hopping_Lower



ProjectNo.:2401A109372E-RF Tester:Rainbow Zhu
Date: 20.JAN.2025 08:44:17

3DH1_Hopping_Upper



ProjectNo.:2401A109372E-RF Tester:Rainbow Zhu
Date: 20.JAN.2025 08:45:58

Time of Occupancy (dwell time)

Test Information:

Sample No.:	2VR5-3	**Test Date:**	2025/01/20
Test Site:	RF	**Test Mode:**	Transmitting
Tester:	Rainbow Zhu	**Test Result:**	Pass

Environmental Conditions:

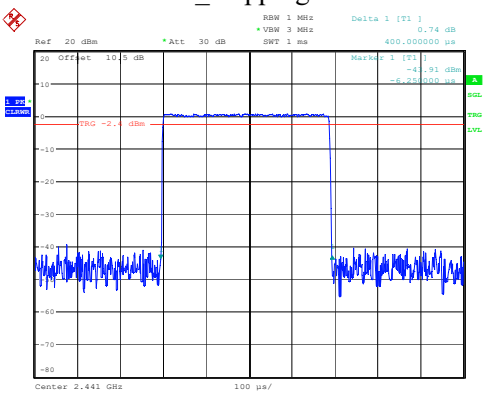
Temperature: (°C):	45~47	**Relative Humidity: (%)**	25.6~26.1	**ATM Pressure: (kPa)**	101.1~101.4

Test Data:

Mode	Channel	Pulse width (ms)	Dwell time (s)	Limit (s)	Verdict
DH1	Hopping Channel	0.400	0.128	0.400	Pass
DH3	Hopping Channel	1.661	0.266	0.400	Pass
DH5	Hopping Channel	**2.931**	0.313	0.400	Pass
2DH1	Hopping Channel	0.398	0.127	0.400	Pass
2DH3	Hopping Channel	1.658	0.265	0.400	Pass
2DH5	Hopping Channel	2.925	0.312	0.400	Pass
3DH1	Hopping Channel	0.396	0.127	0.400	Pass
3DH3	Hopping Channel	1.658	0.265	0.400	Pass
3DH5	Hopping Channel	**2.931**	0.313	0.400	Pass

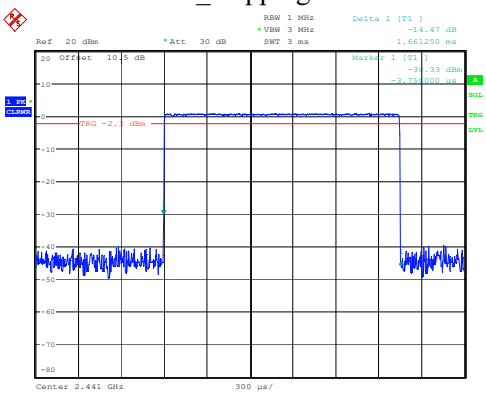
Note:
DH1:Dwell time=Pulse width (ms) × (1600/2/79) ×31.6 s
DH3:Dwell time=Pulse width (ms) × (1600/4/79) ×31.6 s
DH5:Dwell time=Pulse width (ms) × (1600/6/79) ×31.6 s
2DH1: Dwell time=Pulse width (ms) × (1600/2/79) ×31.6 s
2DH3: Dwell time=Pulse width (ms) × (1600/4/79) ×31.6 s
2DH5: Dwell time=Pulse width (ms) × (1600/6/79) ×31.6 s
3DH1: Dwell time=Pulse width (ms) × (1600/2/79) ×31.6 s
3DH3: Dwell time=Pulse width (ms) × (1600/4/79) ×31.6 s
3DH5: Dwell time=Pulse width (ms) × (1600/6/79) ×31.6 s

DH1_Hopping 0.400ms



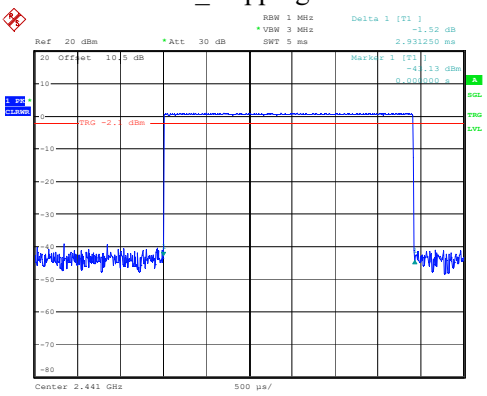
ProjectNo.:2401A109372E-RF Tester:Rainbow Zhu
Date: 20.JAN.2025 08:48:08

DH3_Hopping 1.661ms



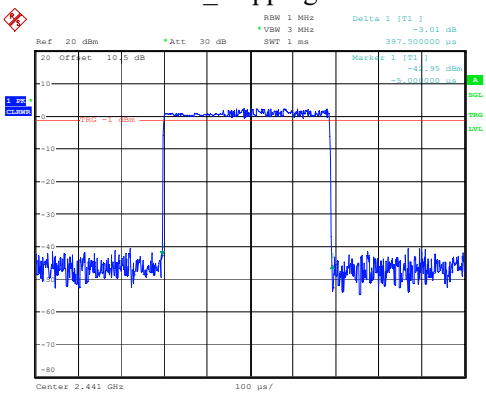
ProjectNo.:2401A109372E-RF Tester:Rainbow Zhu
Date: 20.JAN.2025 08:49:54

DH5_Hopping 2.931ms



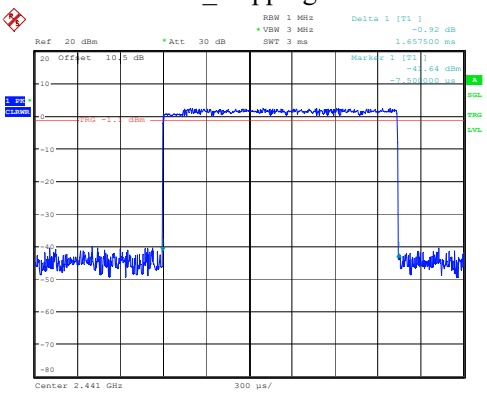
ProjectNo.:2401A109372E-RF Tester:Rainbow Zhu
Date: 20.JAN.2025 08:51:07

2DH1_Hopping 0.398ms



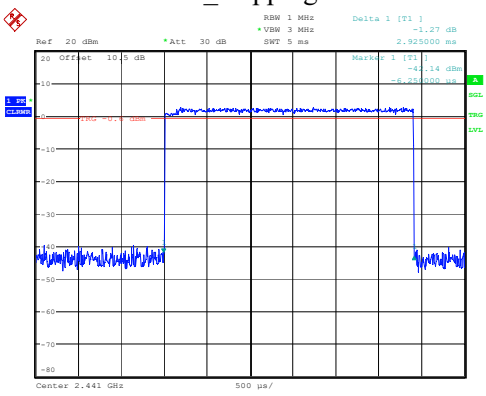
ProjectNo.:2401A109372E-RF Tester:Rainbow Zhu
Date: 20.JAN.2025 08:52:49

2DH3_Hopping 1.658ms



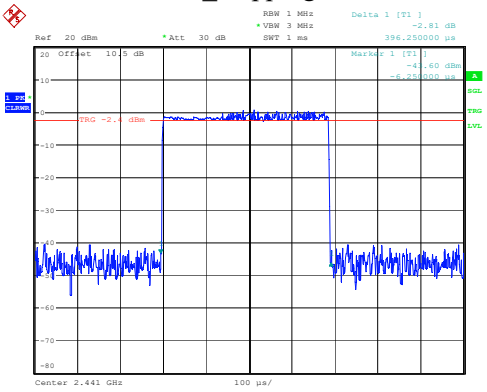
ProjectNo.:2401A109372E-RF Tester:Rainbow Zhu
Date: 20.JAN.2025 08:54:11

2DH5_Hopping 2.925ms



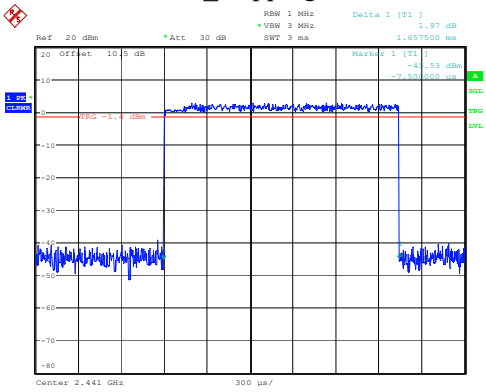
ProjectNo.:2401A109372E-RF Tester:Rainbow Zhu
Date: 20.JAN.2025 08:55:28

3DH1_Hopping 0.396ms



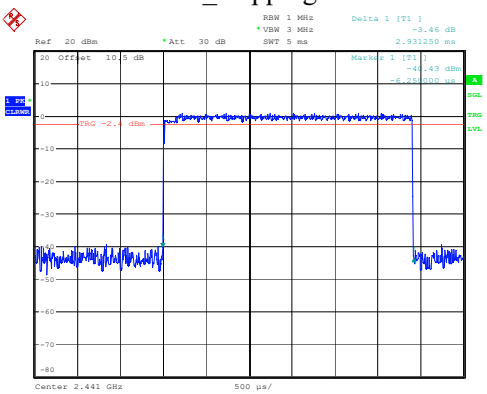
ProjectNo.:2401A109372E-RF Tester:Rainbow Zhu
Date: 20.JAN.2025 08:57:09

3DH3_Hopping 1.658ms



ProjectNo.:2401A109372E-RF Tester:Rainbow Zhu
Date: 20.JAN.2025 08:58:40

3DH5_Hopping 2.931ms



ProjectNo.:2401A109372E-RF Tester:Rainbow Zhu
Date: 20.JAN.2025 09:00:10

RF EXPOSURE EVALUATION

MPE-BASED EXEMPTION

Applicable Standard

According to subpart 15.247 (i) and subpart 2.1091 systems operating under the provisions of this section shall be operated in a manner that ensures the public is not exposed to RF energy level in excess of the communication guidelines.

According to KDB 447498 D04 Interim General RF Exposure Guidance

MPE-Based Exemption:
General frequency and separation-distance dependent MPE-based effective radiated power(ERP) thresholds are in Table B.1 [Table 1 of § 1.1307(b)(3)(i)(C)] to support an exemption from further evaluation from 300 kHz through 100 GHz.

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^2f.
1,500-100,000	19.2R^2.

R is the minimum separation distance in meters
f = frequency in MHz

Result

Mode	Frequency (MHz)	Tune up conducted power#(dBm)	Antenna Gain#		ERP		Evaluation Distance (m)	ERP Limit (W)
			(dBi)	(dBd)	(dBm)	(W)		
BT	2402-2480	3.5	0	-2.15	1.35	0.001	0.2	0.768

Note: 1. The tune up conducted power# and antenna gain# was declared by the applicant.
2. The BT and DECT cannot transmit at same time.

To maintain compliance with the FCC's RF exposure guidelines, place the equipment at least 20cm from nearby persons.

Result: Compliant

FIELD REFERENCE LEVEL EXPOSURE EXEMPTION LIMITS

Applicable Standard

According to RSS-102 Issue 6§6.6:

Field reference level (FRL) 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 (i.e. mobile devices), except when the device operates as follows:

• below 20 MHz and the source-based, time-averaged maximum EIRP 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 EIRP 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 EIRP 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 EIRP 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 EIRP 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 EIRP was derived.

Calculated Data:

Mode	Frequency (MHz)	Maximum tune-up conducted power# (dBm)	Antenna Gain#	Maximum tune-up EIRP		Evaluation Distance (m)	Limit (mW)
			(dBi)	(dBm)	(mW)		
BT	2402-2480	3.5	0	3.50	2.24	0.2	2676

Note: 1. The tune up conducted power# and antenna gain# was declared by the applicant.
2. The BT and DECT cannot transmit at same time.

Result: Compliant

EUT PHOTOGRAPHS

Please refer to the attachment 2401A109372E-RF External photo and 2401A109372E-RF Internal photo.

TEST SETUP PHOTOGRAPHS

Please refer to the attachment 2401A109372E-RFA Test Setup photo.

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