TEST REPORT

Applicant Name:	YEALINK(XIAMEN) NETWORK TECHNOLOGY CO.,LTD.
Address:	No.666 Hu'an Rd. Huli District Xiamen City, Fujian, P.R. China
Report Number:	2401Z42777E-RFB
FCC ID:	T2C-RPPE2
IC:	10741A-RPPE2

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:	Room Scheduling Panel
Model No.:	RoomPanel Plus E2
Multiple Model(s) No.:	N/A
Trade Mark:	Yealink
Date Received:	2024-11-28
Issue Date:	2025-03-14

Test Result:	Pass▲

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

Prepared and Checked By:

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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.
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DOCUMENT REVISION HISTORY

Revision Number	Report Number	Description of Revision	Date of Revision
0	2401Z42777E-RFB	Original Report	2025-03-14

GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

HVIN	RoomPanel Plus E2
FVIN	RoomPanel Plus E2
Frequency Range	2402~2480MHz
Transmit Peak Power	7.44dBm
Modulation Technique	Bluetooth: GFSK, π/4-DQPSK, 8DPSK
Antenna Specification#	2.39dBi (provided by the applicant)
Voltage Range	DC 12V from adapter or DC 48V from POE
Sample serial number	2V6V-3 for Conducted and Radiated Emissions Test 2V6V-1 for RF Conducted Test (Assigned by BACL, Shenzhen)
Sample/EUT Status	Good condition
Adapter Information	Manufacturer: Shenzhen JingQuanHua & Everrise Intelligent Electric Co., Ltd. Model:YLPS121250C1-US Input: AC 100-240V, 50/60Hz 0.5A Output: DC 12.0, 1.25A 15.0W
Note: The EUT powered by adapter or POE, the worst case power supply (POE) was selected to test for AC line conducted and radiated emission below 1GHz according to 2.4G Wi-Fi 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)
Dwell Time		±1%(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#	AuthenticationTool.exe
Power Level#	default

Special Accessories

No special accessory.

Equipment Modifications

No modification was made to the EUT tested.

Support Equipment List and Details

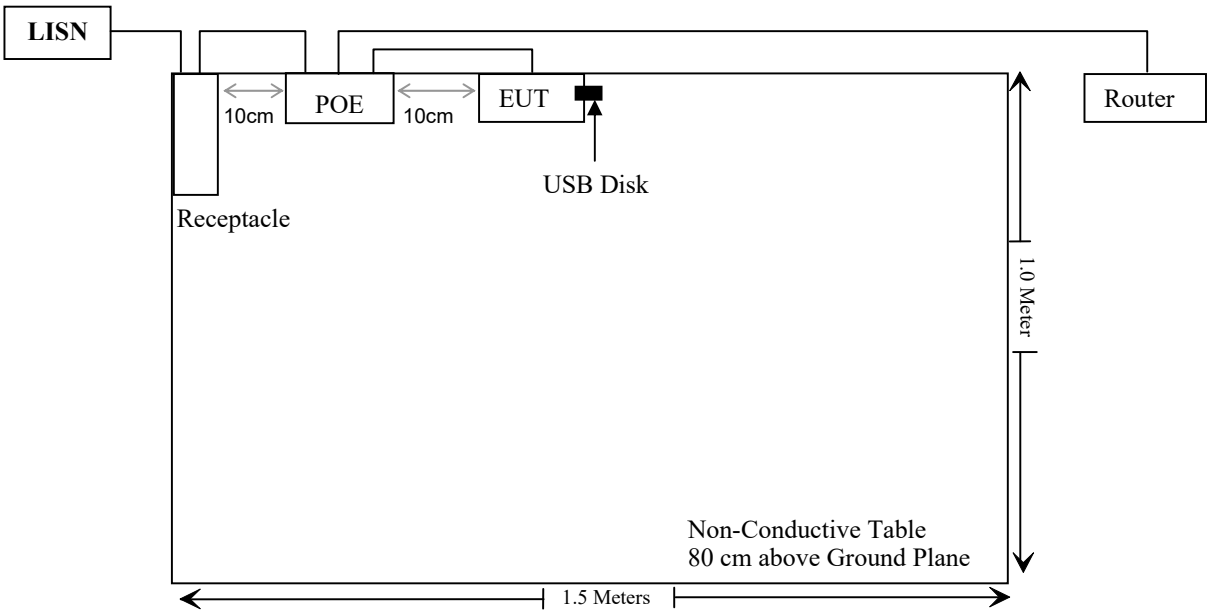
Manufacturer	Description	Model	Serial Number
Kingston	USB Disk	Unknown	Unknown
TPLINK	POE	TL-POE4824G	Unknown
Grandstream	Router	GWN7664	20VXSV2M7262C104

External I/O Cable

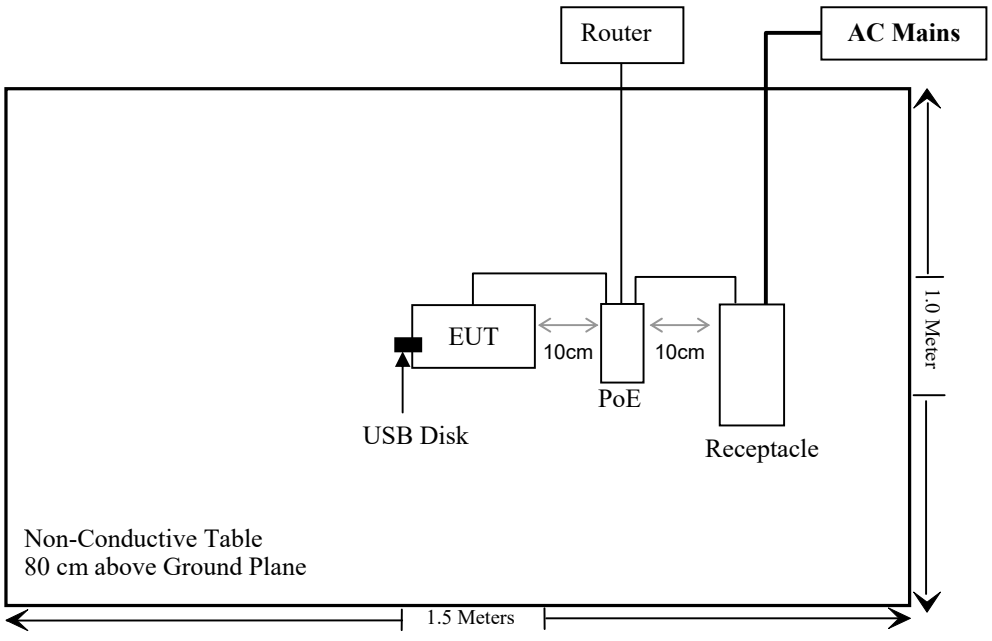
Cable Description	Length (m)	From Port	To
Unshielded Un-detachable AC cable	1.8	Receptacle	LISN/AC Mains
Unshielded Detachable AC cable	0.5	Receptacle	POE
Unshielded Detachable RJ45 cable	0.5	EUT	POE
Unshielded Detachable RJ45 cable	1.5	EUT	POE
Unshielded Detachable RJ45 cable	8.0	Router	POE
Unshielded Un-detachable DC cable	2.0	EUT	Adapter

Block Diagram of Test Setup

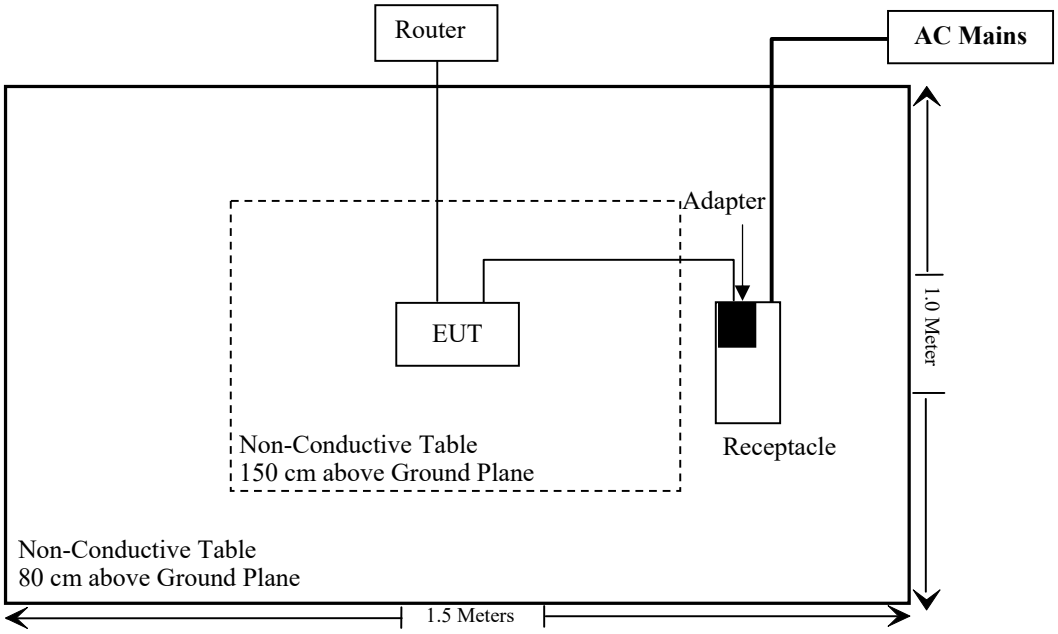
For Conducted Emissions:



For Radiated Emissions below 1GHz



For Radiated Emissions above1GHz



SUMMARY OF TEST RESULTS

FCC Rules	RSS Rules	Description of Test	Result
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 Spurious Emission	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	Compliant
FCC §15.247(a)(1)(iii)	RSS-247 § 5.1 (d)	Number of Hopping Frequency	Compliant
FCC §15.247(a)(1)(iii)	RSS-247 § 5.1 (d)	Time of Occupancy (dwell time)	Compliant
FCC §15.247(b)(1)	RSS-247 § 5.1(b) &§ 5.4(b)	Maximum Conducted Output Power	Compliant
FCC §15.247(d)	RSS-247 § 5.5	100 kHz Bandwidth of Frequency Band Edge	Compliant
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

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	XH500C	J-10M-A	2024/06/18	2025/06/17
Unknown	Cable	Chamber Cable 1	F-03-EM236	2024/06/18	2025/06/17
BACL	Active Loop Antenna	1313-1A	4031911	2024/05/14	2027/05/13
Unknown	Cable	PNG214	1354	2024/12/04	2025/12/03
Unknown	Cable	2Y194	0735	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
JD	Filter Switch Unit	DT7220FSU	DS79906	2024/09/09	2025/09/08
JD	Multiplex Switch Test Control Set	DT7220SCU	DS79903	2024/09/09	2025/09/08
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					
R&S	Spectrum Analyzer	FSV40	101942	2024/09/20	2025/09/19
MARCONI	10dB Attenuator	6534/3	2942	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).

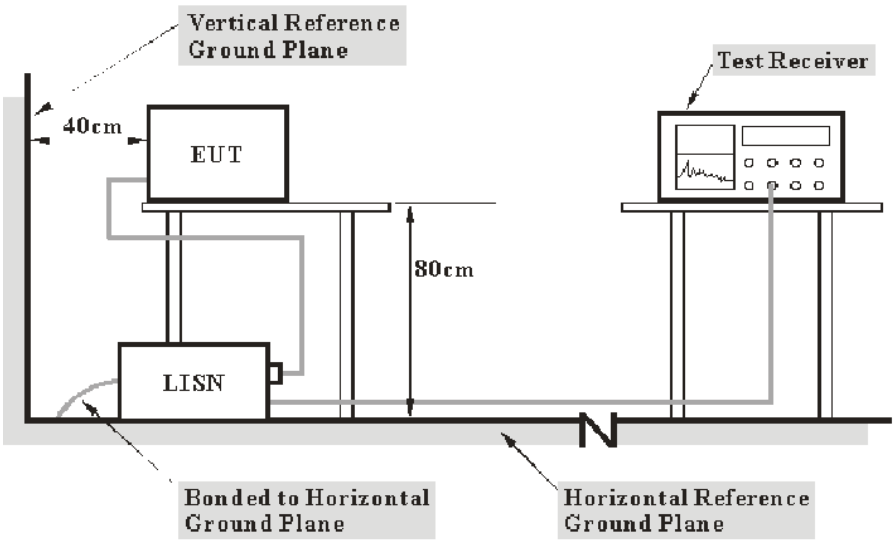
REQUIREMENTS AND TEST PROCEDURES

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).

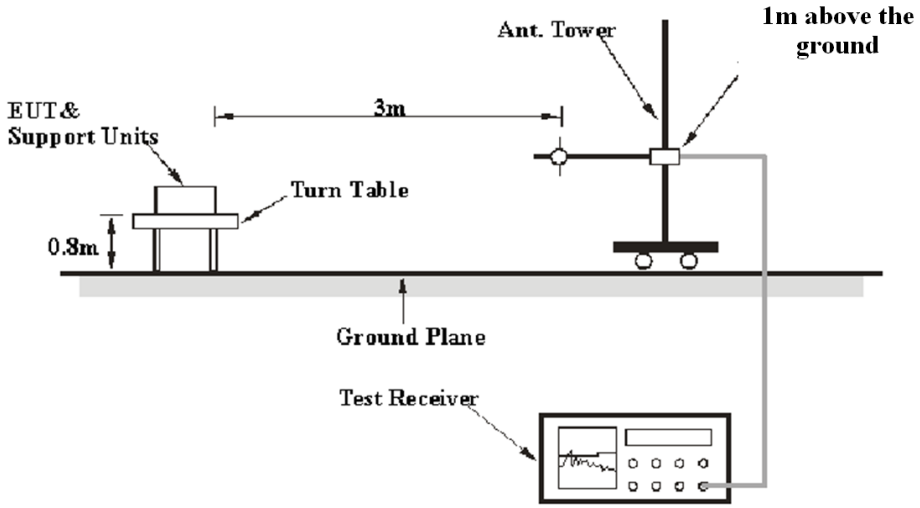
Radiated Emissions

Applicable Standard

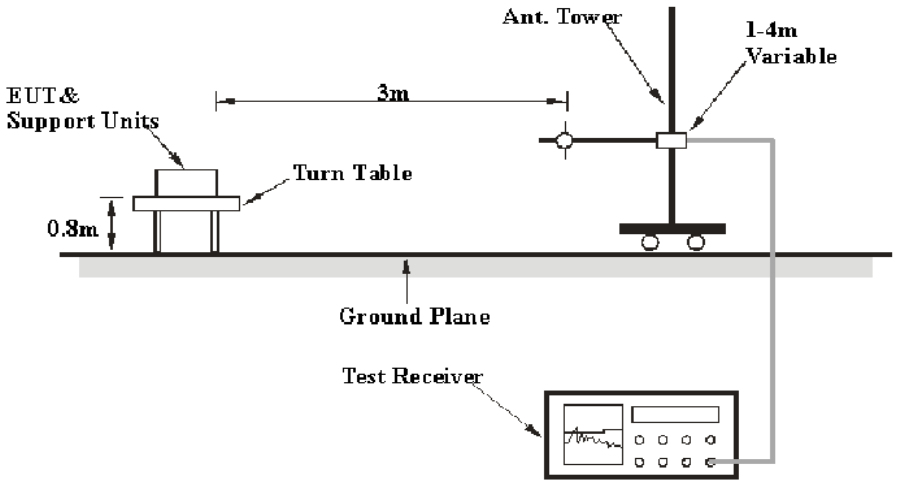
FCC §15.205; §15.209; §15.247(d); RSS-247§ 5.5; RSS-GEN § 8.10

EUT Setup

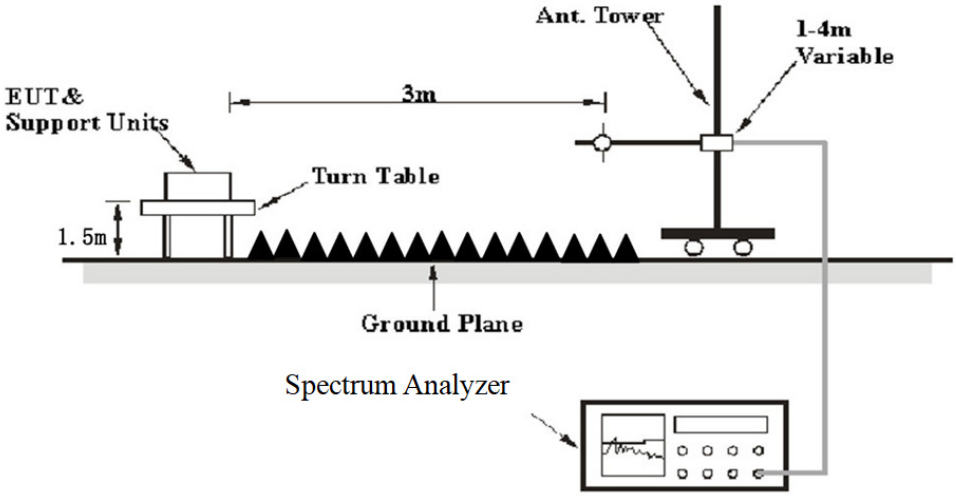
9 kHz-30MHz:



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

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

a) The spectrum analyzer center frequency is set to the nominal EUT channel center frequency. The span range for the EMI receiver or spectrum analyzer shall be between two times and five times the OBW.

b) The nominal IF filter bandwidth (3 dB RBW) shall be in the range of 1% to 5% of the OBW and video bandwidth (VBW) shall be approximately three times RBW, unless otherwise specified by the applicable requirement.

c) Set the reference level of the instrument as required, keeping the signal from exceeding the maximum input mixer level for linear operation. In general, the peak of the spectral envelope shall be more than [10 log (OBW/RBW)] below the reference level.

d) Steps a) through c) might require iteration to adjust within the specified tolerances.

e) The dynamic range of the instrument at the selected RBW shall be more than 10 dB below the target "−xx dB down" requirement; that is, if the requirement calls for measuring the −20 dB OBW, the instrument noise floor at the selected RBW shall be at least 30 dB below the reference value.

f) Set detection mode to peak and trace mode to max hold.

g) Determine the reference value: Set the EUT to transmit an un-modulated carrier or modulated signal, as applicable. Allow the trace to stabilize. Set the spectrum analyzer marker to the highest level of the displayed trace (this is the reference value).

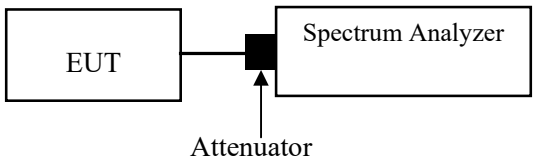
h) Determine the "−xx dB down amplitude" using [(reference value) − xx]. Alternatively, this calculation may be made by using the marker-delta function of the instrument.

i) If the reference value is determined by an un-modulated carrier, then turn the EUT modulation on, and either clear the existing trace or start a new trace on the spectrum analyzer and allow the new trace to stabilize. Otherwise, the trace from step g) shall be used for step j).

j) Place two markers, one at the lowest frequency and the other at the highest frequency of the envelope of the spectral display, such that each marker is at or slightly below the "−xx dB down amplitude" determined in step h). If a marker is below this "−xx dB down amplitude" value, then it shall be as close as possible to this value. The occupied bandwidth is the frequency difference between the two markers. Alternatively, set a marker at the lowest frequency of the envelope of the

spectral display, such that the marker is at or slightly below the "−xx dB down amplitude" determined in step h). Reset the marker-delta function and move the marker to the other side of the emission until the delta marker amplitude is at the same level as the reference marker amplitude. The marker-delta frequency reading at this point is the specified emission bandwidth.

k) The occupied bandwidth shall be reported by providing plot(s) of the measuring instrument display; the plot axes and the scale units per division shall be clearly labeled. Tabular data may be reported in addition to the plot(s).



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.

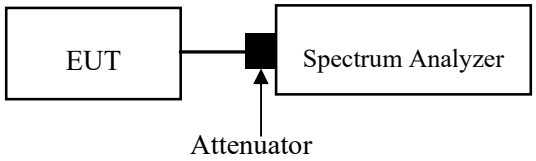
Test Procedure

Test Method: ANSI C63.10-2013 Clause 7.8.2

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) ≥ 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.



Note: The limit is 2/3*20 dB bandwidth

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

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.

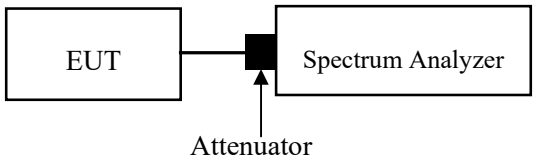
c) VBW ≥ RBW.

d) Sweep: Auto.

e) Detector function: Peak.

f) Trace: Max hold.

It might prove necessary to break the span up into sub ranges 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.



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

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

a) Span: Zero span, centered on a hopping channel.
b) RBW shall be ⩽ channel spacing and where possible RBW should be set >> 1 / T, where T is the expected dwell time per channel.
c) Sweep: As necessary to capture the entire dwell time per hopping channel; where possible use a video trigger and trigger delay so that the transmitted signal starts a little to the right of the start of the plot. The trigger level might need slight adjustment to prevent triggering when the system hops on an adjacent channel; a second plot might be needed with a longer sweep time to show two successive hops on a channel.
d) Detector function: Peak.
e) Trace: Max hold.

Use the marker-delta function to determine the transmit time per hop. If this value varies with different modes of operation (data rate, modulation format, number of hopping channels, etc.), then repeat this test for each variation in transmit time.

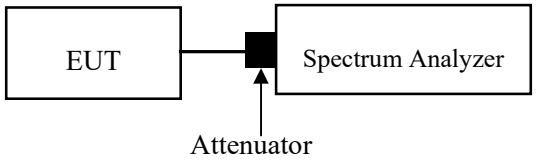
Repeat the measurement using a longer sweep time to determine the number of hops over the period specified in the requirements. The sweep time shall be equal to, or less than, the period specified in the requirements. Determine the number of hops over the sweep time and calculate the total number of hops in the period specified in the requirements, using the following equation:

(Number of hops in the period specified in the requirements) =(number of hops on spectrum analyzer) × (period specified in the requirements / analyzer sweep time)

The average time of occupancy is calculated from the transmit time per hop multiplied by the number of hops in the period specified in the requirements. If the number of hops in a specific time varies with different modes of operation (data rate, modulation format, number of hopping channels, etc.), then repeat

this test for each variation.

The measured transmit time and time between hops shall be consistent with the values described in the operational description for the EUT.



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

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. The hopping shall be disabled for this test:

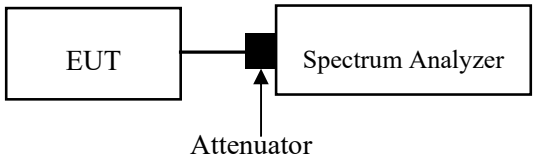
a) Use the following spectrum analyzer settings:

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 ⩾ 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.



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)).

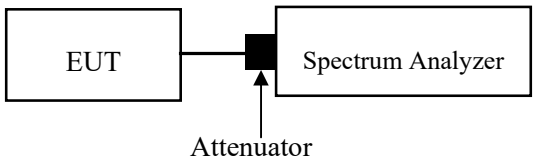
According to RSS-247 § 5.5.

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 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.

According to FCC § 15.203, 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 2.39dBi, fulfill the requirement of this section. Please refer to the EUT photos.

Type	Antenna Gain[#]	Impedance	Frequency Range
FPC	2.39Bi	50Ω	2400-2500MHz

Result: Compliant

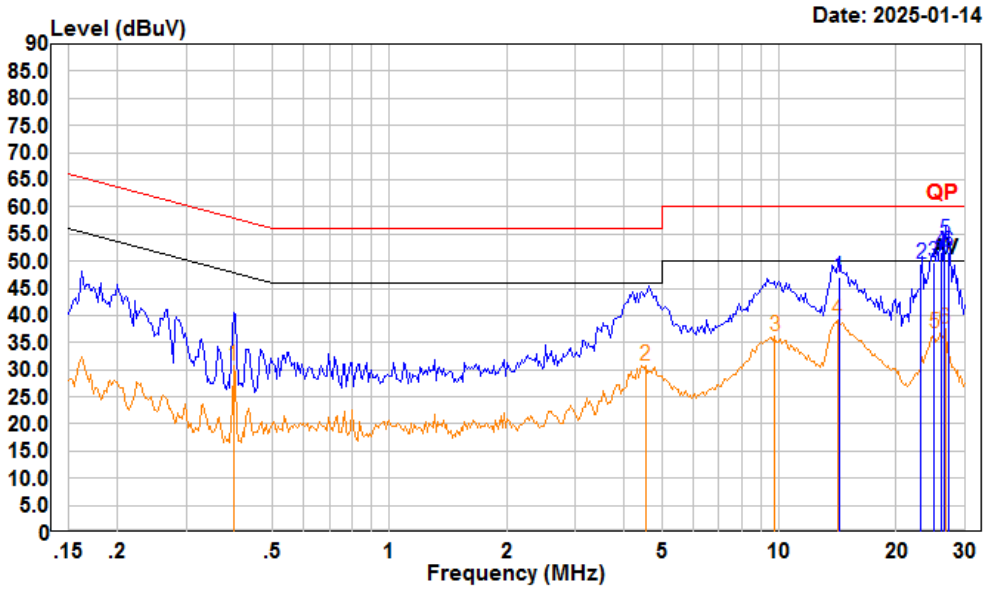
TEST DATA AND RESULTS

AC Line Conducted Emissions

Environmental Conditions

Temperature (℃)	27	**Relative Humidity (%)**	55
ATM Pressure (kPa)	101	**Test engineer**	Macy Shi
Test date	2025/1/14		
EUT operation mode	Transmitting (Maximum output power mode, EDR(8DPSK) Low Channel)		

AC 120V 60 Hz, Line POE



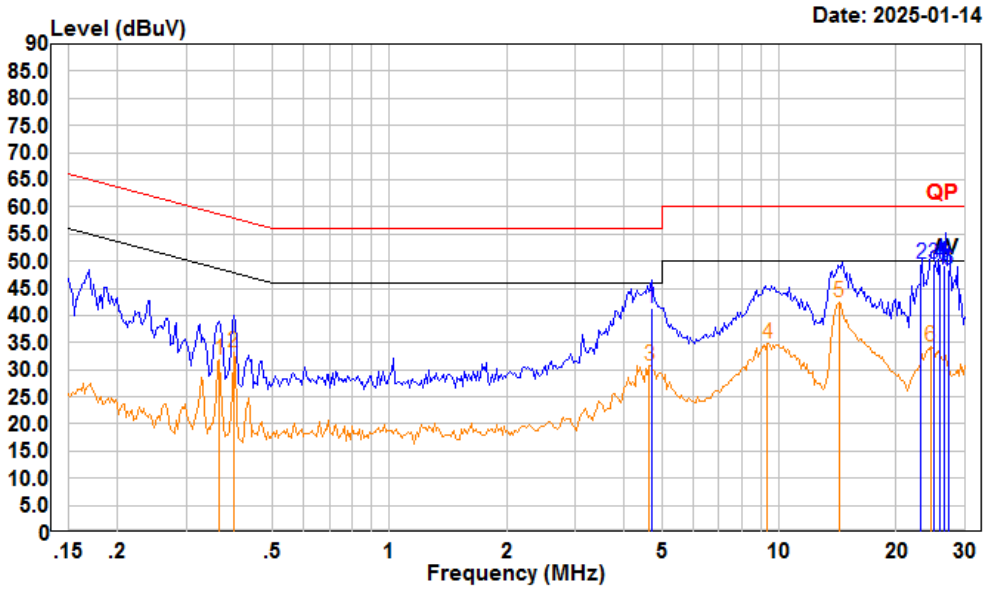
Trace: 1

Condition: Line
Project : 2401Z42777E-RF
tester : Macy.shi Note:Transmitting
Setting : RBW:9kHz VBW:Auto SWT:Auto

	Freq	Read Level	LISN Level	Factor	Cable Loss	Limit Line	Over Limit	Remark
	MHz	dBuV	dBuV	dB	dB	dBuV	dB	
1	14.288	26.50	47.02	10.30	10.22	60.00	-12.98	QP
2	23.129	28.40	49.40	10.82	10.18	60.00	-10.60	QP
3	24.900	28.80	49.72	10.73	10.19	60.00	-10.28	QP
4	25.998	30.79	51.67	10.68	10.20	60.00	-8.33	QP
5	26.607	33.00	53.85	10.65	10.20	60.00	-6.15	QP
6	27.157	30.81	51.63	10.62	10.20	60.00	-8.37	QP

	Freq	Read Level	LISN Level	Factor	Cable Loss	Limit Line	Over Limit	Remark
	MHz	dBuV	dBuV	dB	dB	dBuV	dB	
1	0.398	10.17	30.82	10.55	10.10	47.90	-17.08	Average
2	4.549	9.76	30.78	10.83	10.19	46.00	-15.22	Average
3	9.757	15.76	36.29	10.32	10.21	50.00	-13.71	Average
4	14.138	18.62	39.14	10.30	10.22	50.00	-10.86	Average
5	25.055	15.92	36.83	10.72	10.19	50.00	-13.17	Average
6	26.699	16.79	37.63	10.64	10.20	50.00	-12.37	Average

AC 120V 60 Hz, Neutral POE



Trace: 1

Condition: Neutral
Project : 2401Z42777E-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	4.696	20.29	41.37	10.89	10.19	56.00	-14.63	QP
2	23.128	28.40	49.54	10.96	10.18	60.00	-10.46	QP
3	24.897	28.30	49.37	10.88	10.19	60.00	-10.63	QP
4	25.994	28.50	49.54	10.84	10.20	60.00	-10.46	QP
5	26.548	28.10	49.12	10.82	10.20	60.00	-10.88	QP
6	27.159	27.40	48.40	10.80	10.20	60.00	-11.60	QP

	Freq	Read Level	Level	LISN Factor	Cable Loss	Limit Line	Over Limit	Remark
	MHz	dBuV	dBuV	dB	dB	dBuV	dB	
1	0.365	11.14	31.85	10.60	10.11	48.61	-16.76	Average
2	0.398	12.50	33.18	10.58	10.10	47.90	-14.72	Average
3	4.647	9.62	30.70	10.89	10.19	46.00	-15.30	Average
4	9.352	14.11	34.84	10.52	10.21	50.00	-15.16	Average
5	14.288	21.90	42.44	10.32	10.22	50.00	-7.56	Average
6	24.529	13.19	34.28	10.90	10.19	50.00	-15.72	Average

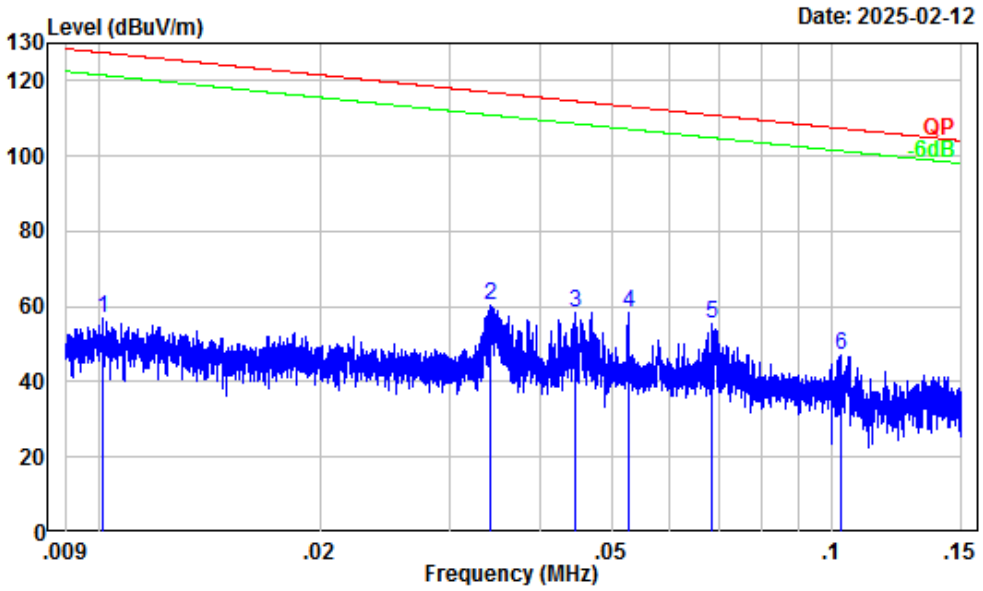
Radiated Emissions

Environmental Conditions

Temperature (ºC)	22.9-23.8	**Relative Humidity (%)**	63-65
ATM Pressure (kPa):	101.3	**Test engineer:**	Alex Yan & Visen Wu
Test date:	2025/2/12-2025/2/19		
EUT operation mode:	Below 1GHz: Transmitting (Maximum output power mode, 8DPSK Low Channel) Above 1GHz: Transmitting (Maximum output power mode, EDR(8DPSK))		
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. After pre-scan in the X, Y and Z axes of orientation, the worst case z-axis of orientation were recorded. 4.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:

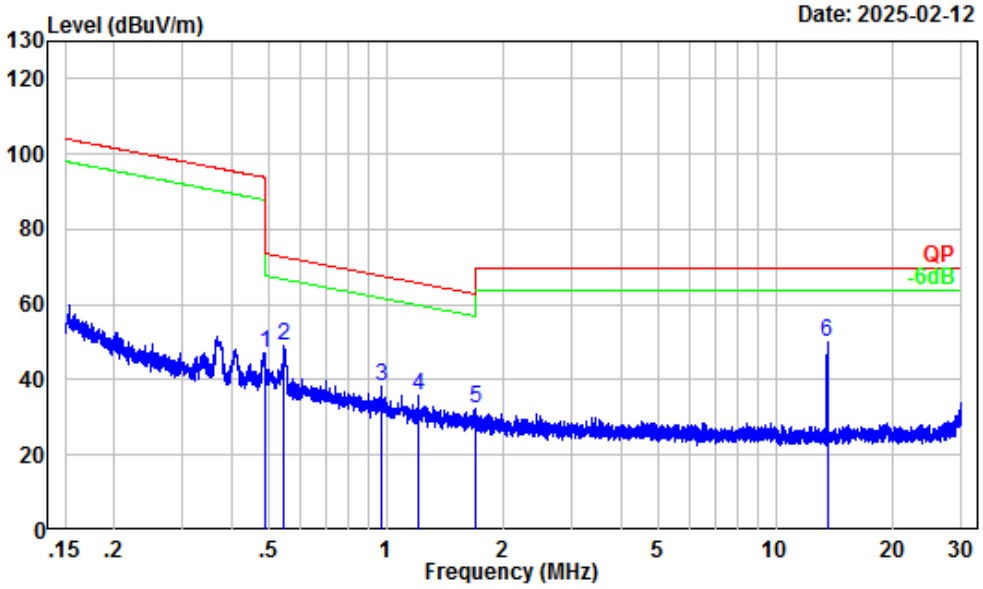
9kHz-150kHz-POE



Site : Chamber A
Condition : 3m
Project Number : 2401Z42777E-RF
Test Mode : Transmitting
Detector: Peak RBW/VBW: 0.3/1kHz
Tester : Alex Yan

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	0.01	32.27	24.47	56.74	127.48	-70.74	Peak
2	0.03	28.06	32.26	60.32	116.93	-56.61	Peak
3	0.04	26.98	31.35	58.33	114.63	-56.30	Peak
4	0.05	26.13	32.10	58.23	113.16	-54.93	Peak
5	0.07	24.56	30.69	55.25	110.90	-55.65	Peak
6	0.10	21.85	25.34	47.19	107.39	-60.20	Peak

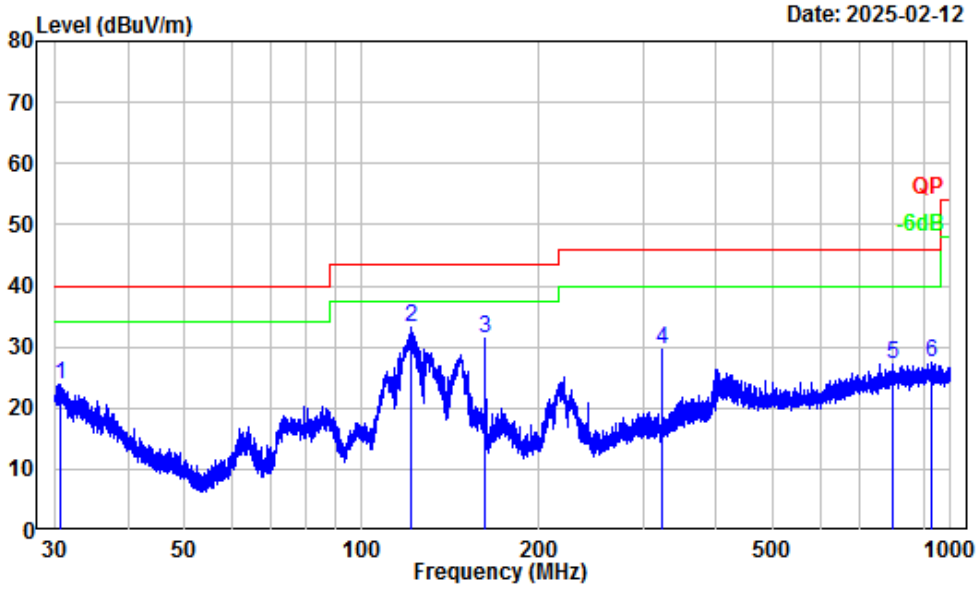
150kHz-30MHz-POE



Site : Chamber A
Condition : 3m
Project Number : 2401Z42777E-RF
Test Mode : Transmitting
Detector: Peak RBW/VBW: 10/30kHz
Tester : Alex Yan

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	0.49	6.65	40.63	47.28	93.86	-46.58	Peak
2	0.55	5.81	43.04	48.85	72.81	-23.96	Peak
3	0.97	1.40	36.90	38.30	67.72	-29.42	Peak
4	1.21	0.62	34.96	35.58	65.81	-30.23	Peak
5	1.69	-0.73	33.19	32.46	62.83	-30.37	Peak
6	13.56	-2.72	52.96	50.24	69.54	-19.30	Peak

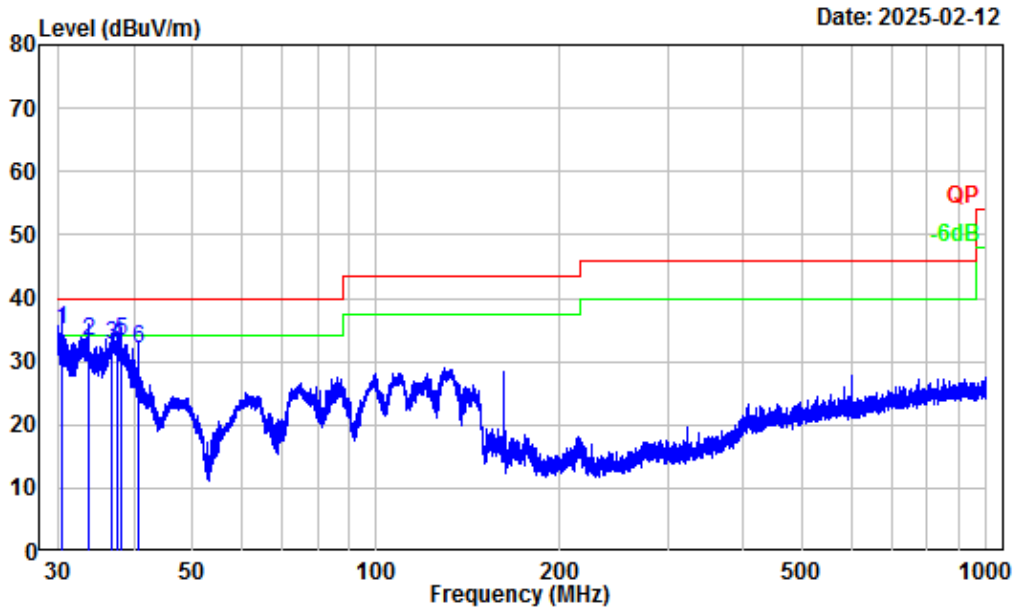
30MHz-1GHz_Horizontal-POE



Site : Chamber A
Condition : 3m Horizontal
Project Number : 2401Z42777E-RF
Test Mode : Transmitting
Detector: Peak RBW/VBW: 100/300kHz
Tester : Alex Yan

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	30.65	-6.30	30.27	23.97	40.00	-16.03	Peak
2	121.44	-11.31	44.67	33.36	43.50	-10.14	Peak
3	161.90	-12.72	44.06	31.34	43.50	-12.16	Peak
4	323.60	-10.71	40.32	29.61	46.00	-16.39	Peak
5	795.49	-2.23	29.37	27.14	46.00	-18.86	Peak
6	926.16	-1.11	28.70	27.59	46.00	-18.41	Peak

30MHz-1GHz_Vertical-POE



Site : Chamber A
Condition : 3m Vertical
Project Number : 2401Z42777E-RF
Test Mode : Transmitting
Detector: Peak RBW/VBW: 100/300kHz
Tester : Alex Yan

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	30.45	-6.19	41.11	34.92	40.00	-5.08	QP
2	33.74	-8.10	41.16	33.06	40.00	-6.94	QP
3	36.72	-10.05	42.52	32.47	40.00	-7.53	QP
4	37.51	-10.64	43.20	32.56	40.00	-7.44	QP
5	38.08	-11.03	44.35	33.32	40.00	-6.68	QP
6	40.67	-12.84	44.73	31.89	40.00	-8.11	QP

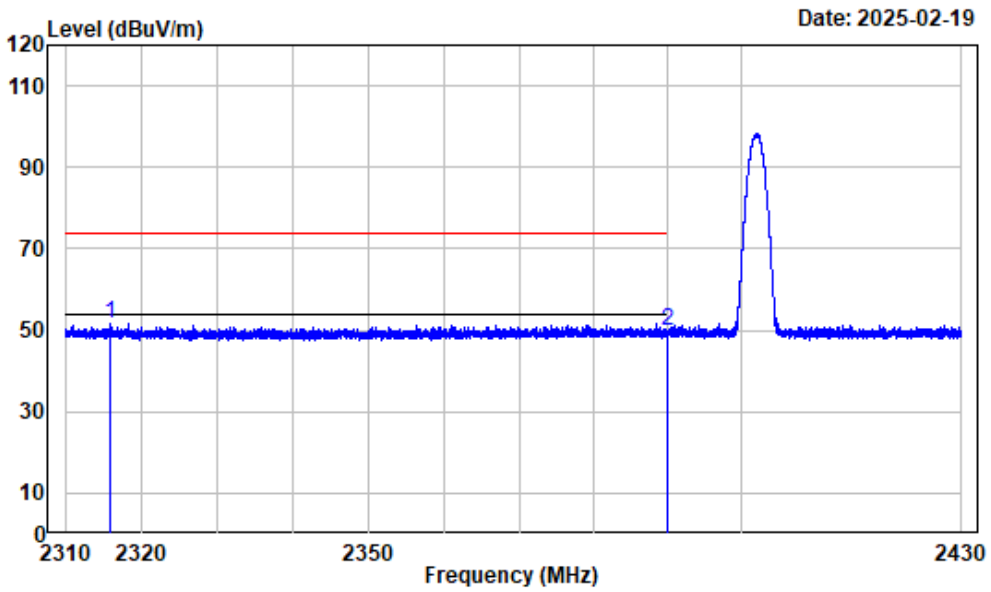
Above 1GHz:

Frequency (MHz)	Receiver		Polar (H/V)	Factor (dB/m)	Corrected Amplitude (dBµV/m)	Limit (dBµV/m)	Margin (dB)
	Reading (dBµV)	PK/Ave					
8DPSK							
Low Channel							
4804	60.78	PK	H	-7.79	52.99	74	-21.01
4804	58.14	PK	V	-7.79	50.35	74	-23.65
Middle Channel							
4882	59.17	PK	H	-7.58	51.59	74	-22.41
4882	57.98	PK	V	-7.58	50.4	74	-23.60
High Channel							
4960	58.46	PK	H	-7.56	50.9	74	-23.10
4960	56.73	PK	V	-7.56	49.17	74	-24.83

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

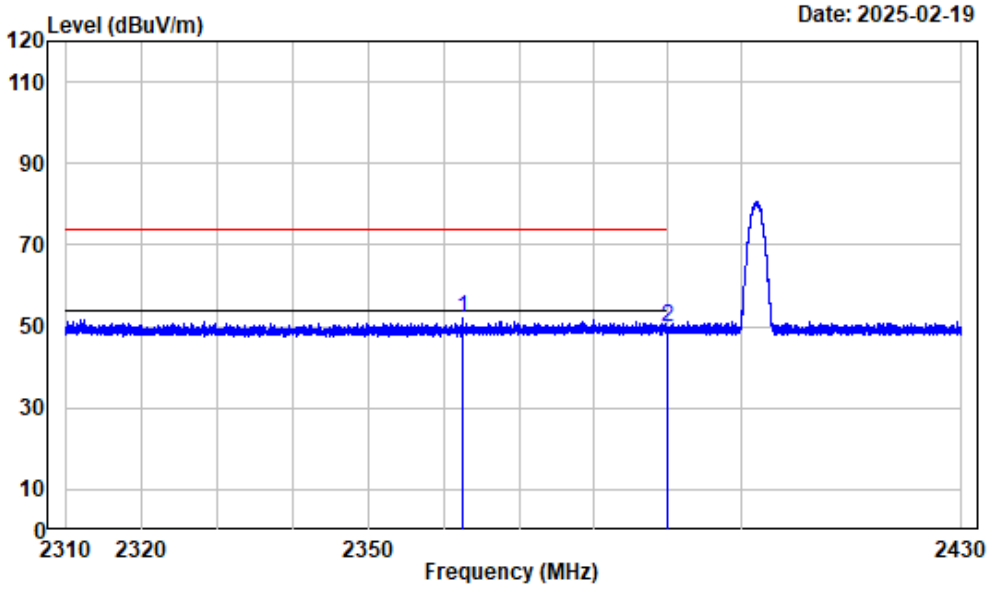
Left Band edge_Horizontal



Condition : Horizontal
Project No. : 2401Z42777E-RF
Tester : Visen Wu
Spectrum setting: Peak reading: RBW:1MHz VBW:3MHz Detector:Peak
Note : BT_3DH5_2402

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	2315.896	-10.81	62.22	51.41	74.00	-22.59	Peak
2	2390.000	-10.98	60.64	49.66	74.00	-24.34	Peak

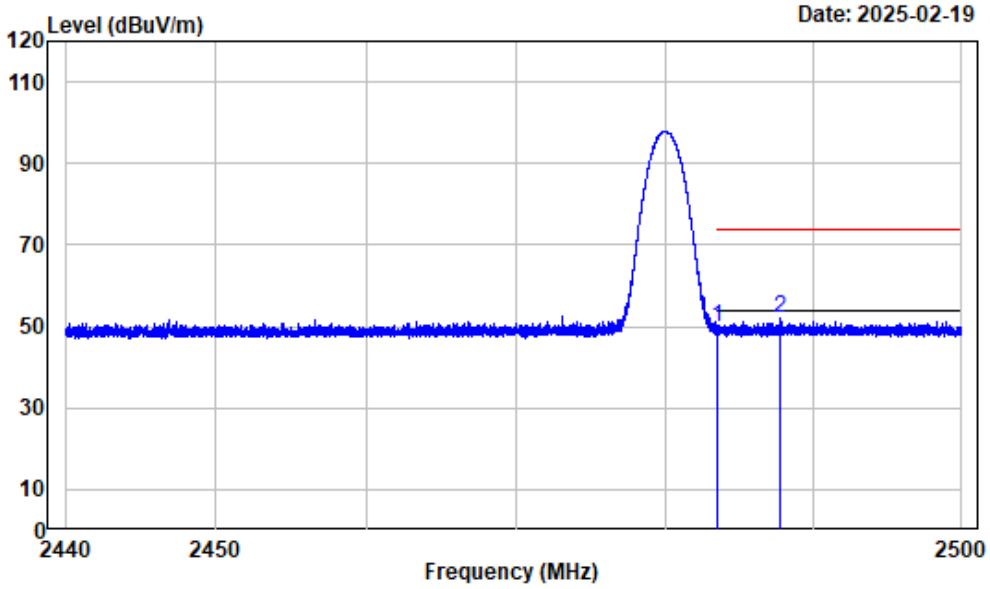
Left Band edge_Vertical



Condition : Vertical
Project No. : 2401Z42777E-RF
Tester : Visen Wu
Spectrum setting: Peak reading: RBW:1MHz VBW:3MHz Detector:Peak
Note : BT_3DH5_2402

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	2362.386	-10.91	62.78	51.87	74.00	-22.13	Peak
2	2390.000	-10.98	60.62	49.64	74.00	-24.36	Peak

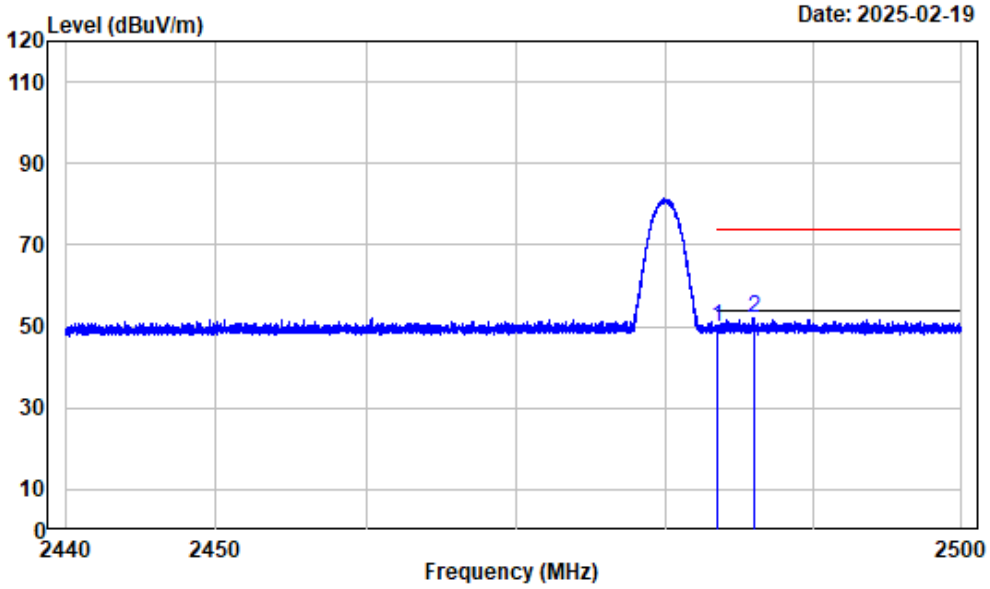
Right Band edge_Horizontal



Condition : Horizontal
Project No. : 2401Z42777E-RF
Tester : Visen Wu
Spectrum setting: Peak reading: RBW:1MHz VBW:3MHz Detector:Peak
Note : BT_3DH5_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	60.62	49.65	74.00	-24.35	Peak
2	2487.759	-10.98	63.03	52.05	74.00	-21.95	peak

Right Band edge_Vertical

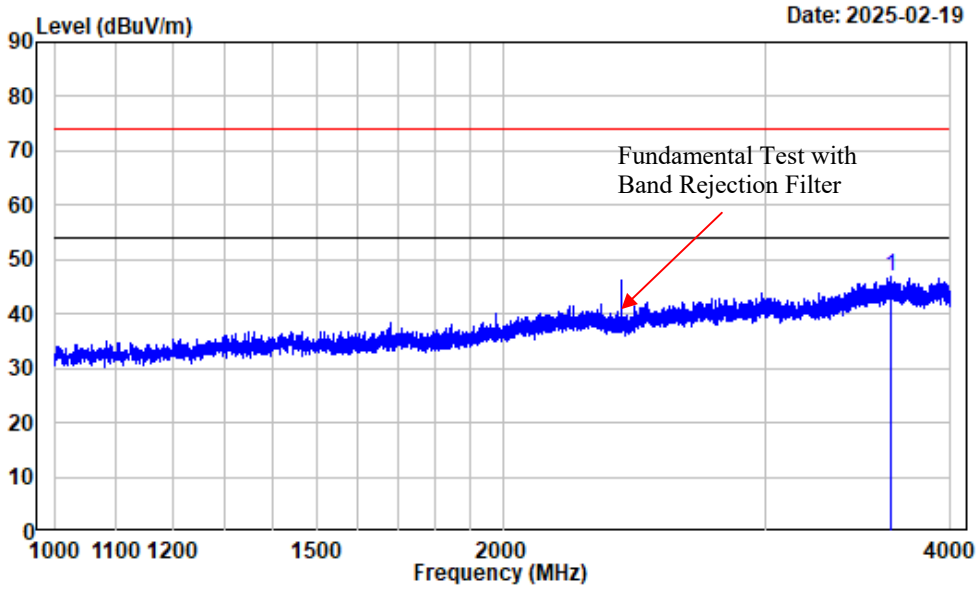


Condition : Vertical
Project No. : 2401Z42777E-RF
Tester : Visen Wu
Spectrum setting: Peak reading: RBW:1MHz VBW:3MHz Detector:Peak
Note : BT_3DH5_2480

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	2483.500	-10.97	60.66	49.69	74.00	-24.31	Peak
2	2486.033	-10.97	63.13	52.16	74.00	-21.84	Peak

Listed with the worst harmonic margin test plot

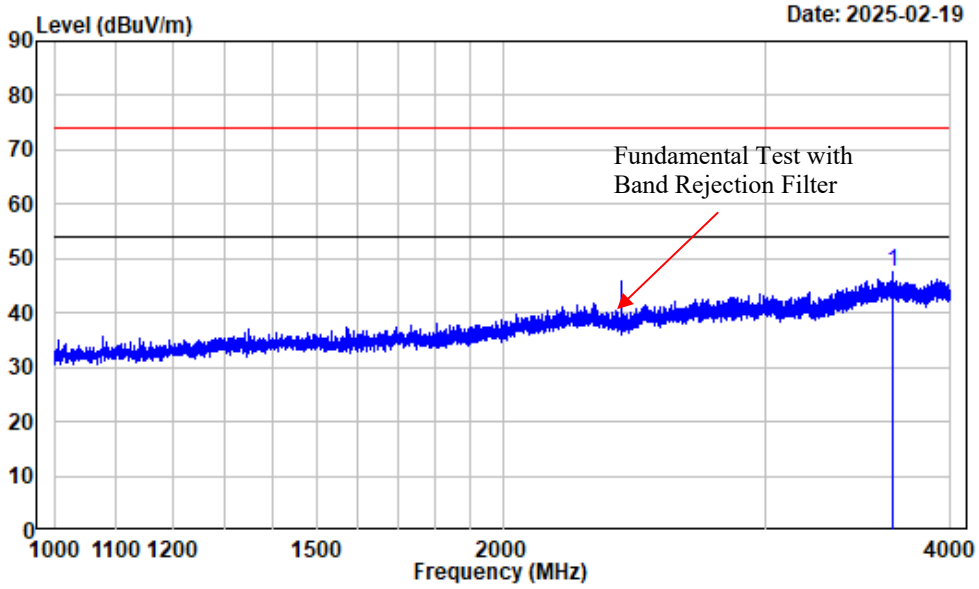
1-4GHz_Horizontal




```
Condition       : Horizontal
Project No.     : 2401Z42777E-RF
Tester          : Visen Wu
Spectrum setting: Peak reading: RBW:1MHz VBW:3MHz Detector:Peak
Note            : BT_3DH5_2402
```

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	3649.331	-9.78	56.56	46.78	74.00	-27.22	Peak

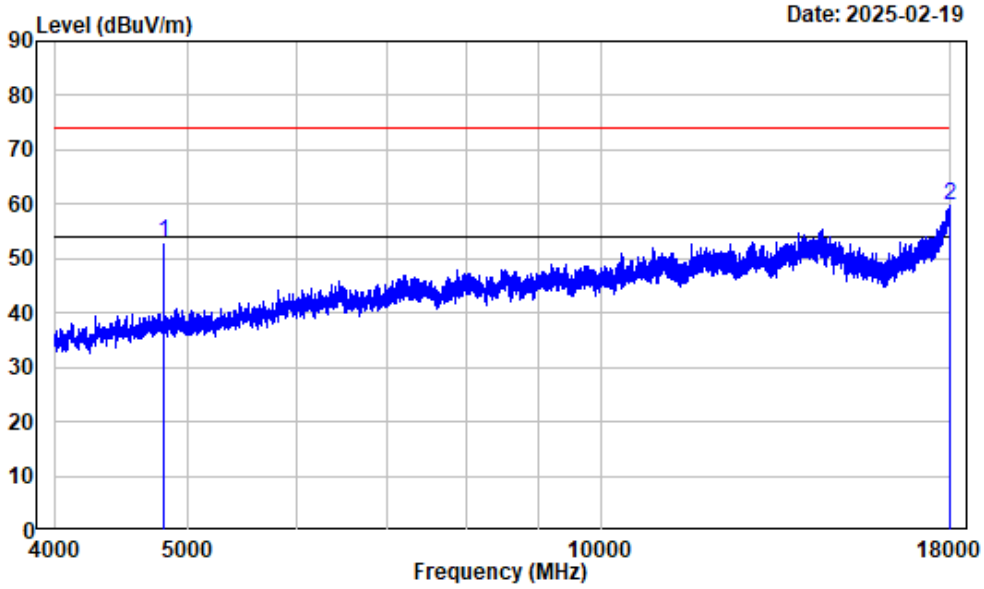
1-4GHz_Vertical



Condition : Vertical
Project No. : 2401Z42777E-RF
Tester : Visen Wu
Spectrum setting: Peak reading: RBW:1MHz VBW:3MHz Detector:Peak
Note : BT_3DH5_2402

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	3658.707	-9.73	57.23	47.50	74.00	-26.50	Peak

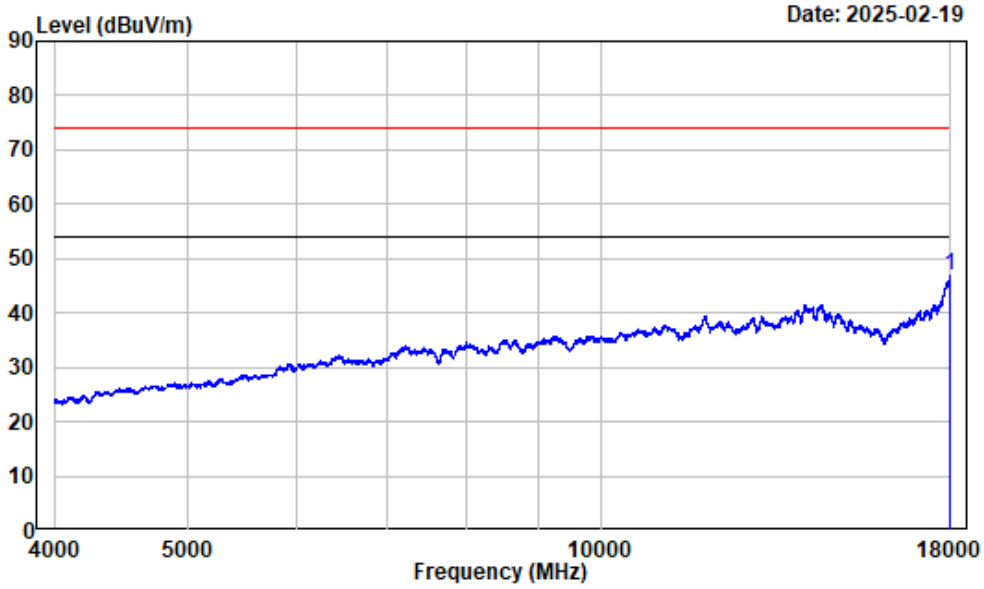
4-18GHz_Horizontal_Peak BT_3DH5_2402_004



Condition : Horizontal
Project No. : 2401Z42777E-RF
Tester : Visen Wu
Spectrum setting: Peak reading: RBW:1MHz VBW:3MHz Detector:Peak
Note : BT_3DH5_2402

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	4804.000	-7.79	60.78	52.99	74.00	-21.01	Peak
2	17989.500	13.16	46.58	59.74	74.00	-14.26	Peak

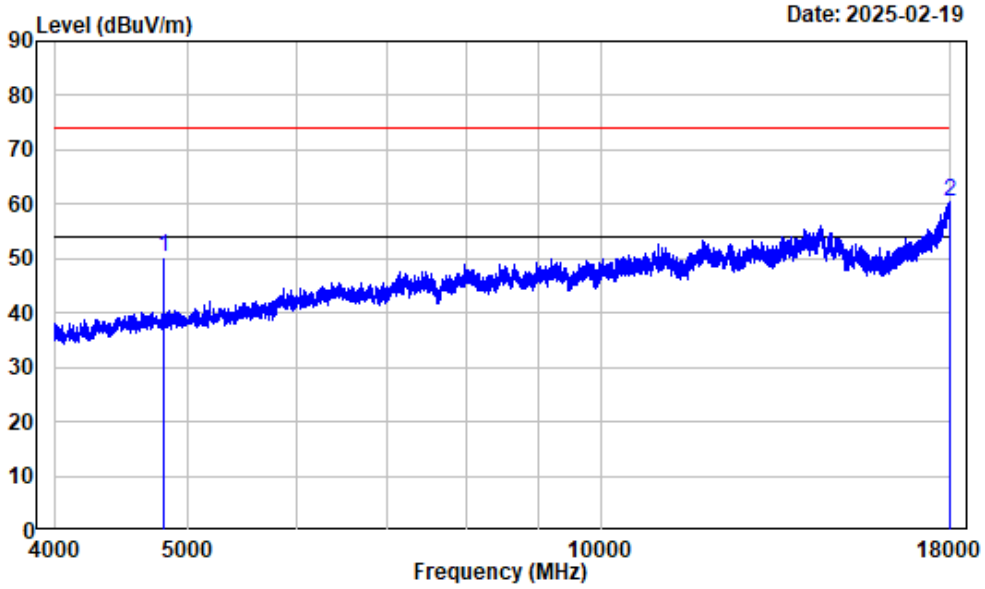
4-18GHz_Horizontal_Average BT_3DH5_2402_005



Condition : Horizontal
Project No. : 2401Z42777E-RF
Tester : Visen Wu
Spectrum setting: Average reading: RBW:1MHz VBW:1kHz Detector:Peak
Note : BT_3DH5_2402

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	17989.500	13.16	33.87	47.03	54.00	-6.97	Average

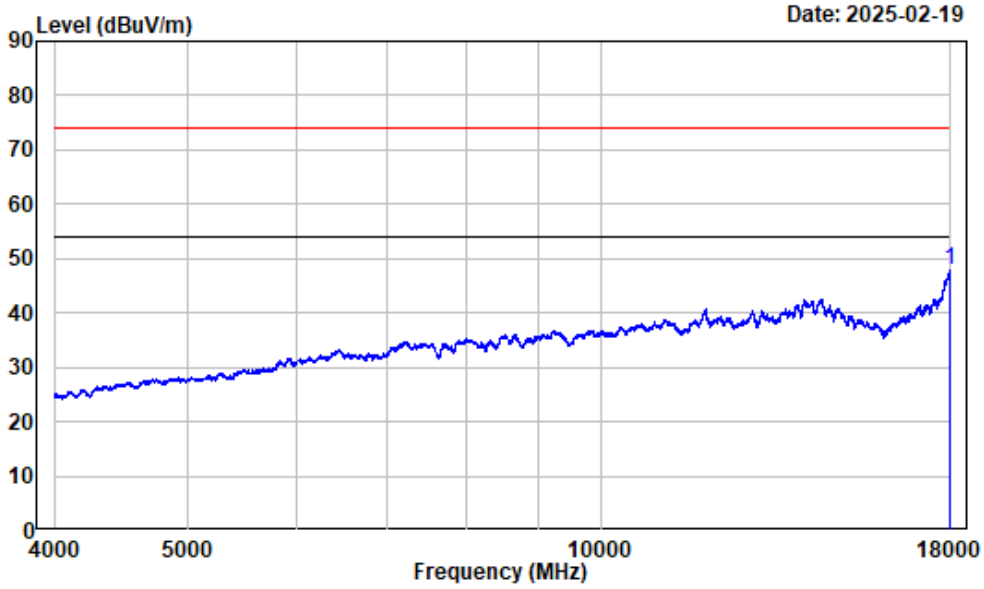
4-18GHz_Vertical_Peak BT_3DH5_2402_003



Condition : Vertical
Project No. : 2401Z42777E-RF
Tester : Visen Wu
Spectrum setting: Peak reading: RBW:1MHz VBW:3MHz Detector:Peak
Note : BT_3DH5_2402

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	4804.000	-7.79	58.14	50.35	74.00	-23.65	Peak
2	17998.250	13.19	47.15	60.34	74.00	-13.66	Peak

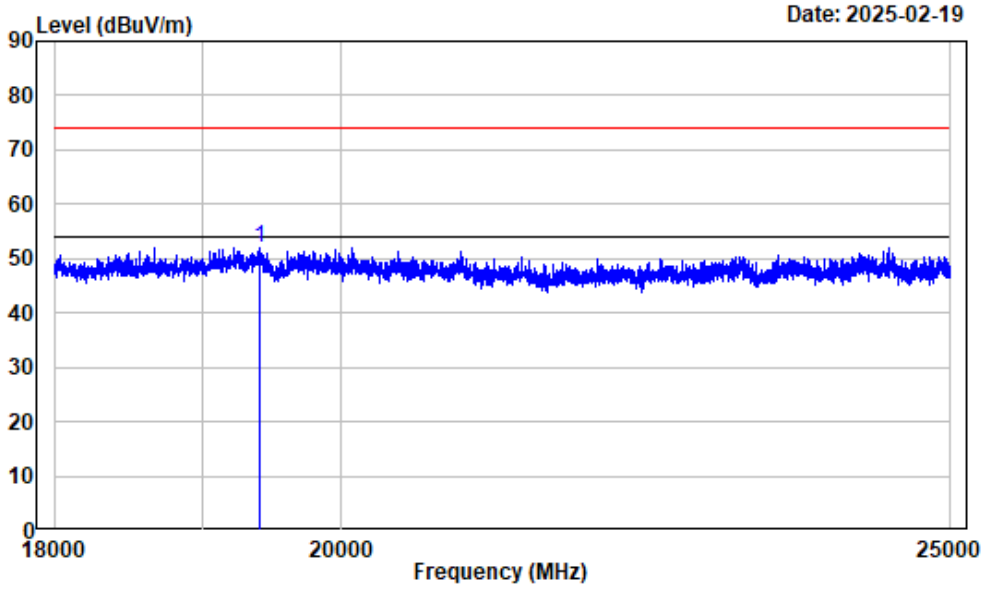
4-18GHz_Vertical_Average BT_3DH5_2402_006



Condition : Vertical
Project No. : 2401Z42777E-RF
Tester : Visen Wu
Spectrum setting: Average reading: RBW:1MHz VBW:1kHz Detector:Peak
Note : BT_3DH5_2402

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	17987.750	13.13	34.73	47.86	54.00	-6.14	Average

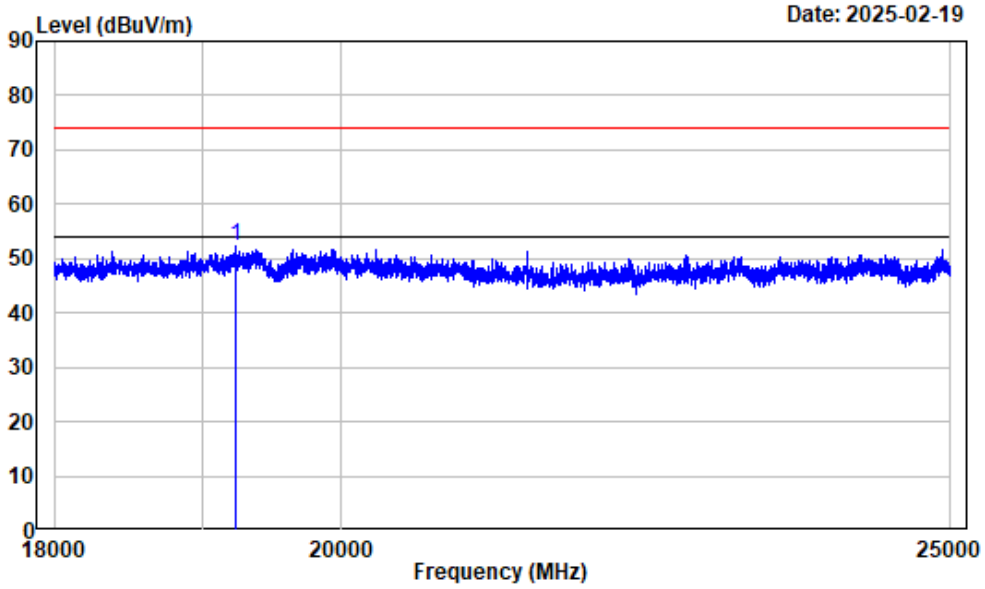
18-25GHz_Horizontal BT_3DH5_2402_007



Condition : Vertical
Project No. : 2401Z42777E-RF
Tester : Visen Wu
Spectrum setting: Peak reading: RBW:1MHz VBW:3MHz Detector:Peak
Note : BT_3DH5_2402

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	19405.680	15.09	36.90	51.99	74.00	-22.01	Peak

18-25GHz_Vertical BT_3DH5_2402_008



Condition : Horizontal
Project No. : 2401Z42777E-RF
Tester : Visen Wu
Spectrum setting: Peak reading: RBW:1MHz VBW:3MHz Detector:Peak
Note : BT_3DH5_2402

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	19233.150	15.29	36.89	52.18	74.00	-21.82	Peak

20 dB Emission Bandwidth

Test Information:

Sample No.:	2V6V-1	**Test Date:**	2024/12/14
Test Site:	RF	**Test Mode:**	Transmitting
Tester:	Rainbow Zhu	**Test Result:**	N/A

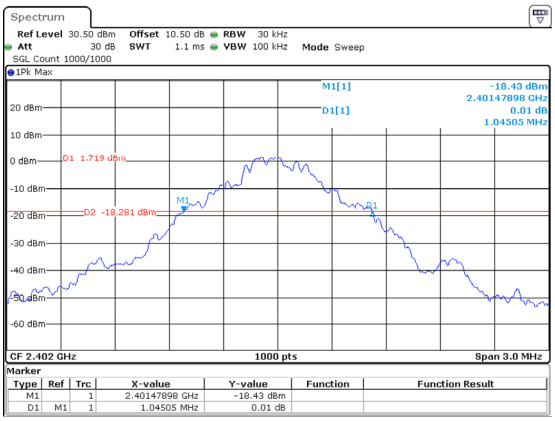
Environmental Conditions:

Temperature: (°C)	24.5	**Relative Humidity: (%)**	46	**ATM Pressure: (kPa)**	101.3

Test Data:

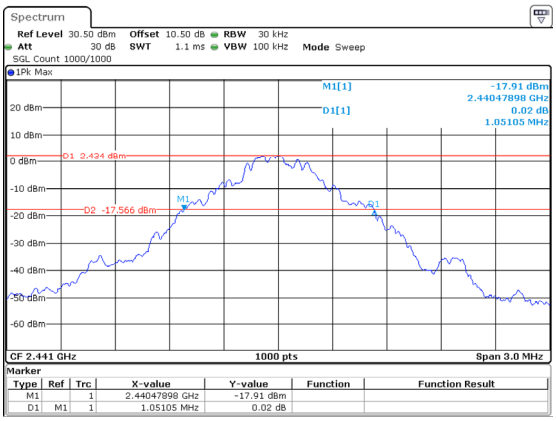
Mode	Channel	Result (MHz)
DH1	Low Channel	1.045
	Middle Channel	1.051
	High Channel	1.048
2DH1	Low Channel	1.354
	Middle Channel	1.360
	High Channel	1.357
3DH1	Low Channel	1.315
	Middle Channel	1.312
	High Channel	1.312

DH1_Low 1.045MHz



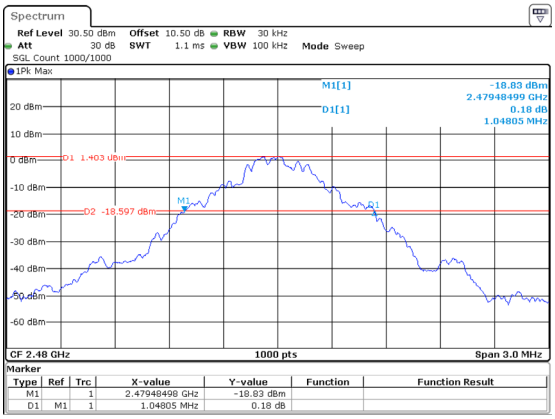
ProjectNo.:2401Z42777E-RF Tester:Rainbow Zhu
Date: 14.DEC.2024 18:55:36

DH1_Middle 1.051MHz



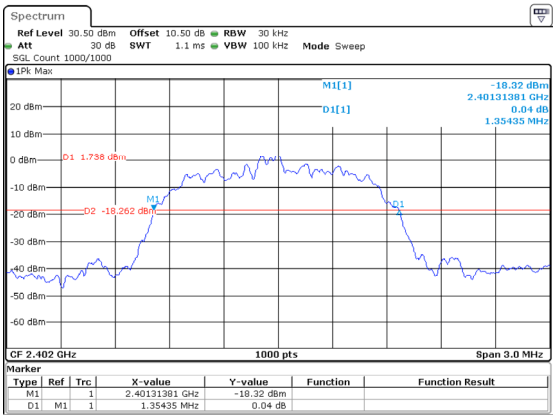
ProjectNo.:2401Z42777E-RF Tester:Rainbow Zhu
Date: 14.DEC.2024 18:58:45

DH1_High 1.048MHz



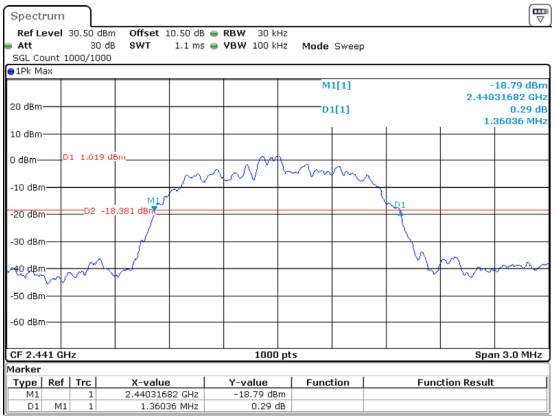
ProjectNo.:2401Z42777E-RF Tester:Rainbow Zhu
Date: 14.DEC.2024 19:00:47

2DH1_Low 1.354MHz



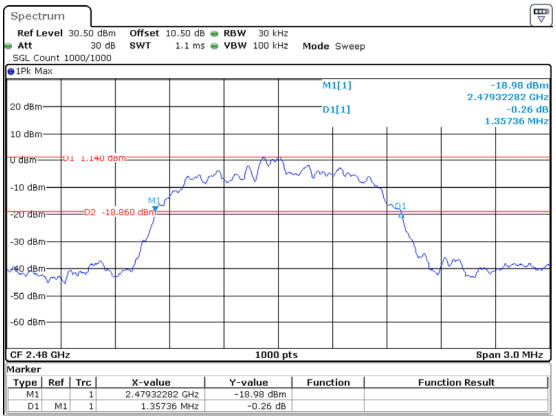
ProjectNo.:2401Z42777E-RF Tester:Rainbow Zhu
Date: 14.DEC.2024 19:03:46

2DH1_Middle 1.360MHz



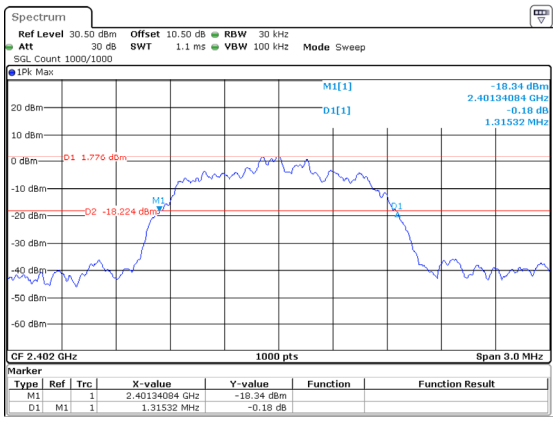
ProjectNo.:2401Z42777E-RF Tester:Rainbow Zhu
Date: 14.DEC.2024 19:06:51

2DH1_High 1.357MHz



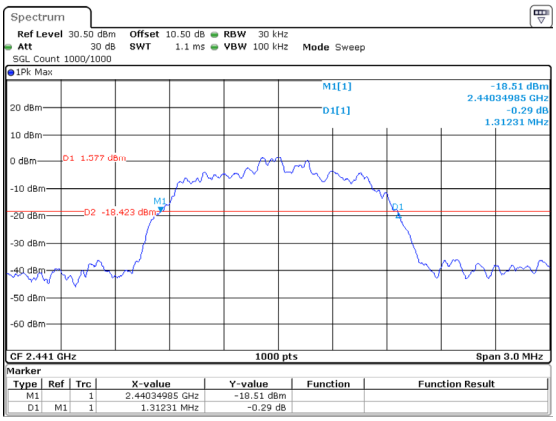
ProjectNo.:2401Z42777E-RF Tester:Rainbow Zhu
Date: 14.DEC.2024 19:07:58

3DH1_Low 1.315MHz



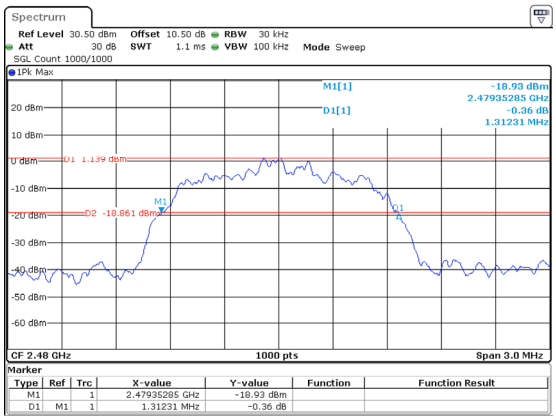
ProjectNo.:2401Z42777E-RF Tester:Rainbow Zhu
Date: 14.DEC.2024 19:10:37

3DH1_Middle 1.312MHz



ProjectNo.:2401Z42777E-RF Tester:Rainbow Zhu
Date: 14.DEC.2024 19:13:38

3DH1_High 1.312MHz



ProjectNo.:2401Z42777E-RF Tester:Rainbow Zhu
Date: 14.DEC.2024 19:14:54

99% Occupied Bandwidth

Test Information:

Sample No.:	2V6V-1	**Test Date:**	2024/12/14
Test Site:	RF	**Test Mode:**	Transmitting
Tester:	Rainbow Zhu	**Test Result:**	N/A

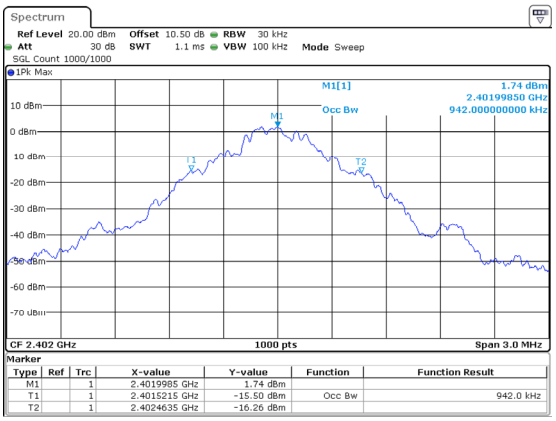
Environmental Conditions:

Temperature: (°C)	24.5	**Relative Humidity: (%)**	46	**ATM Pressure: (kPa)**	101.3

Test Data:

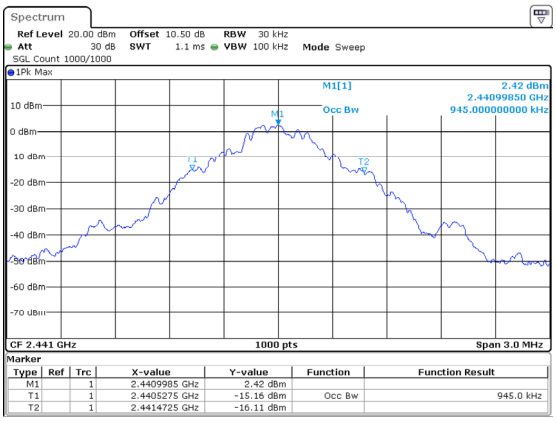
Mode	Channel	99% OBW (MHz)
DH1	Low Channel	0.942
	Middle Channel	0.945
	High Channel	0.945
2DH1	Low Channel	1.197
	Middle Channel	1.197
	High Channel	1.197
3DH1	Low Channel	1.179
	Middle Channel	1.182
	High Channel	1.179

DH1_Low 0.942MHz



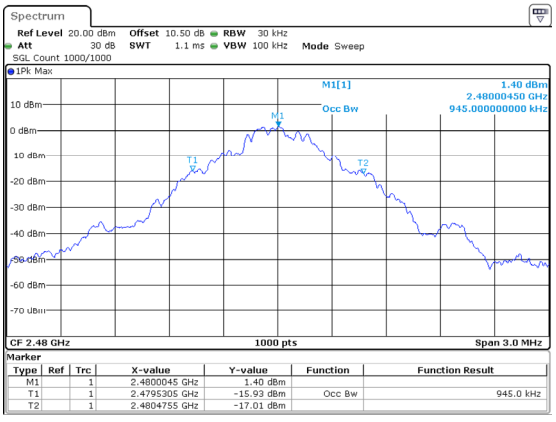
ProjectNo.:2401Z42777E-RF Tester:Rainbow Zhu
Date: 14.DEC.2024 18:57:36

DH1_Middle 0.945MHz



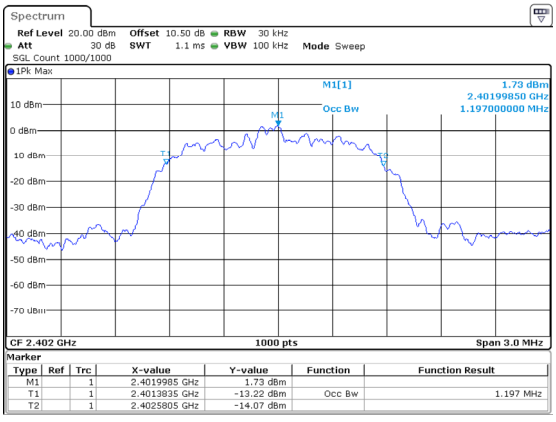
ProjectNo.:2401Z42777E-RF Tester:Rainbow Zhu
Date: 14.DEC.2024 18:59:04

DH1_High 0.945MHz



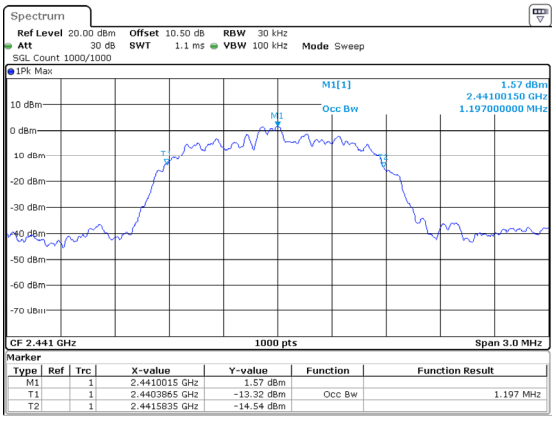
ProjectNo.:2401Z42777E-RF Tester:Rainbow Zhu
Date: 14.DEC.2024 19:02:27

2DH1_Low 1.197MHz



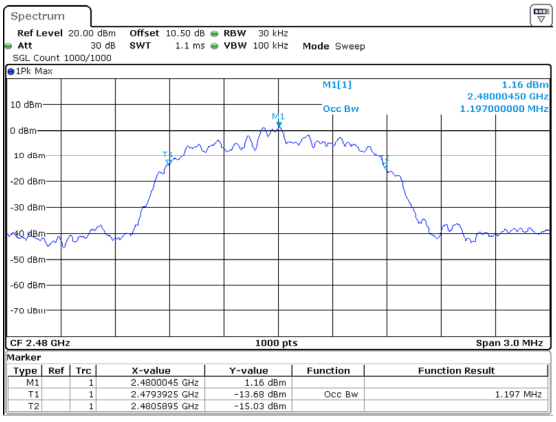
ProjectNo.:2401Z42777E-RF Tester:Rainbow Zhu
Date: 14.DEC.2024 19:05:46

2DH1_Middle 1.197MHz



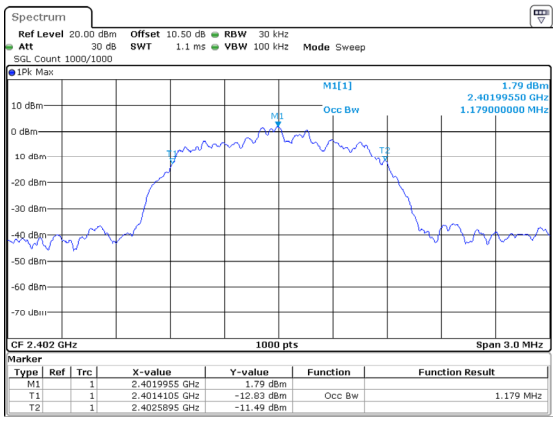
ProjectNo.:2401Z42777E-RF Tester:Rainbow Zhu
Date: 14.DEC.2024 19:07:09

2DH1_High 1.197MHz



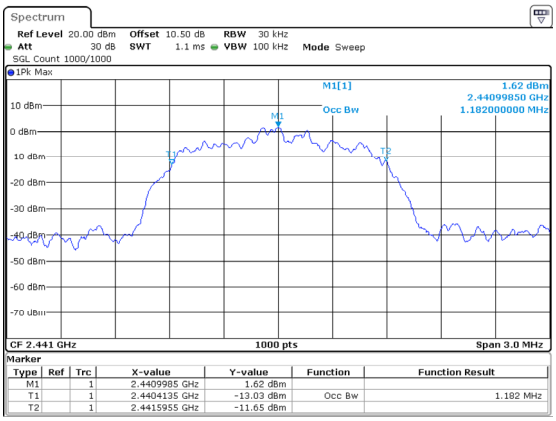
ProjectNo.:2401Z42777E-RF Tester:Rainbow Zhu
Date: 14.DEC.2024 19:09:35

3DH1_Low 1.179MHz



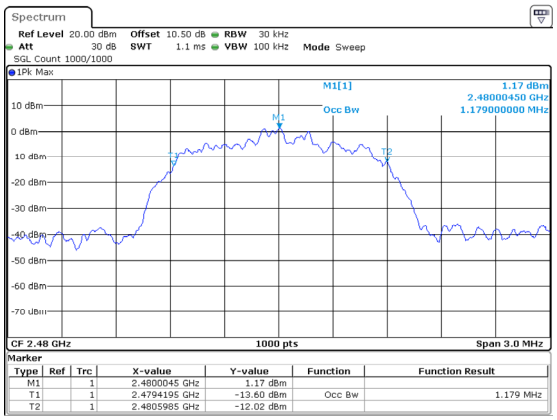
ProjectNo.:2401Z42777E-RF Tester:Rainbow Zhu
Date: 14.DEC.2024 19:12:36

3DH1_Middle 1.182MHz



ProjectNo.:2401Z42777E-RF Tester:Rainbow Zhu
Date: 14.DEC.2024 19:13:56

3DH1_High 1.179MHz



ProjectNo.:2401Z42777E-RF Tester:Rainbow Zhu
Date: 14.DEC.2024 19:16:33

Channel Separation

Test Information:

Sample No.:	2V6V-1	**Test Date:**	2024/12/14
Test Site:	RF	**Test Mode:**	Transmitting
Tester:	Rainbow Zhu	**Test Result:**	Pass

Environmental Conditions:

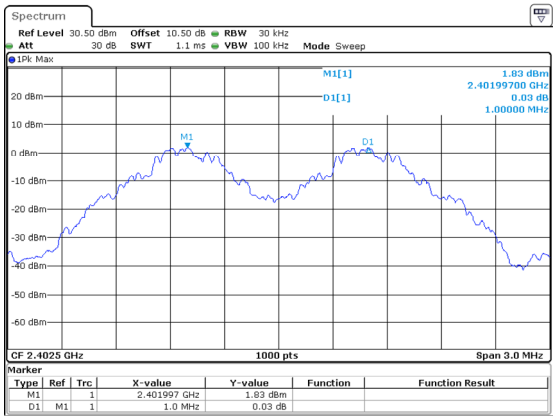
Temperature: (°C)	24.5	**Relative Humidity: (%)**	46	**ATM Pressure: (kPa)**	101.3

Test Data:

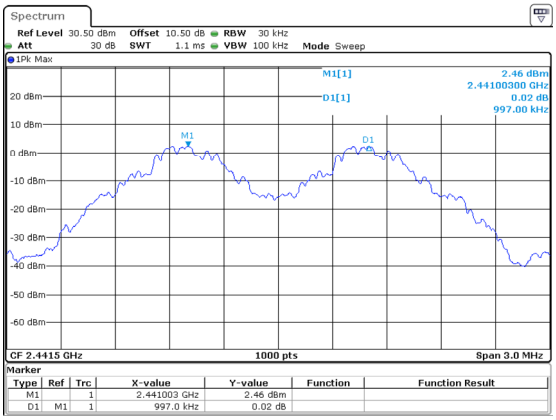
Mode	Channel	Result (MHz)	Limit (MHz)	Verdict
DH1	Low Channel	1	0.903	Pass
	Middle Channel	0.997	0.907	Pass
	High Channel	1.003	0.905	Pass

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

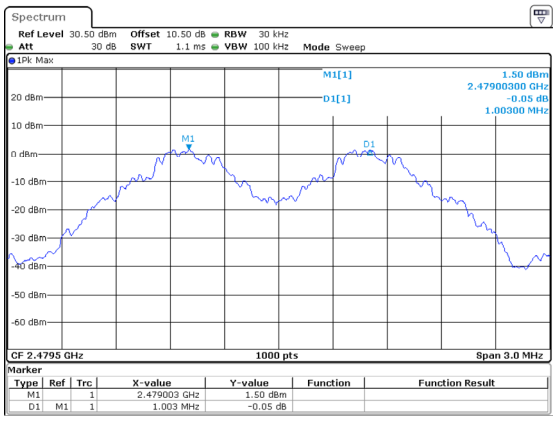
DH1_Low 1MHz



DH1_Middle 0.997MHz



DH1_High 1.003MHz



Number of Hopping Frequency

Test Information:

Sample No.:	2V6V-1	**Test Date:**	2024/12/14
Test Site:	RF	**Test Mode:**	Transmitting
Tester:	Rainbow Zhu	**Test Result:**	Pass

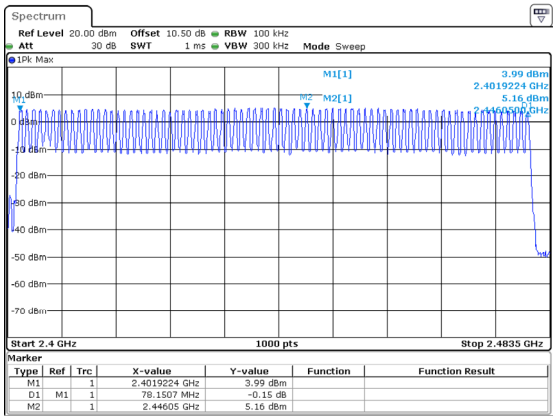
Environmental Conditions:

Temperature: (°C)	24.5	**Relative Humidity: (%)**	46	**ATM Pressure: (kPa)**	101.3

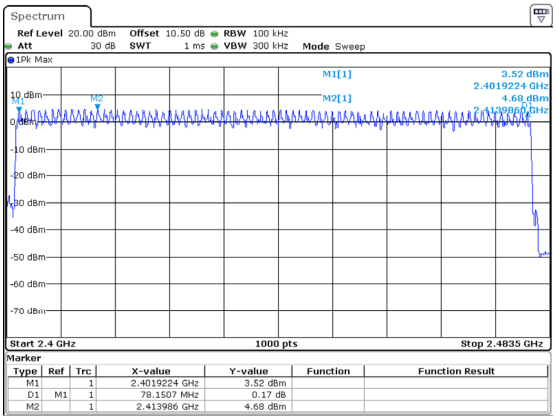
Test Data:

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

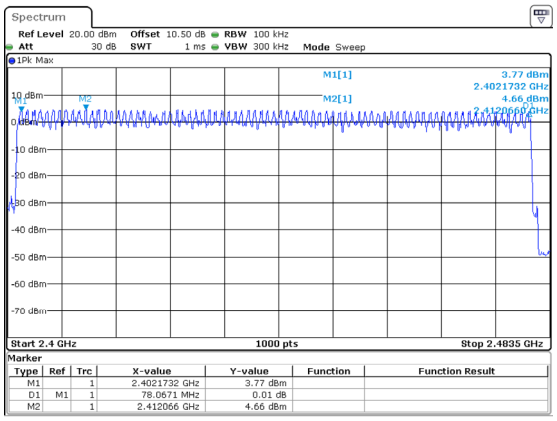
DH1_Hopping 79



2DH1_Hopping 79



3DH1_Hopping 79



Maximum Conducted Output Power

Test Information:

Sample No.:	2V6V-1	**Test Date:**	2024/12/14
Test Site:	RF	**Test Mode:**	Transmitting
Tester:	Rainbow Zhu	**Test Result:**	Pass

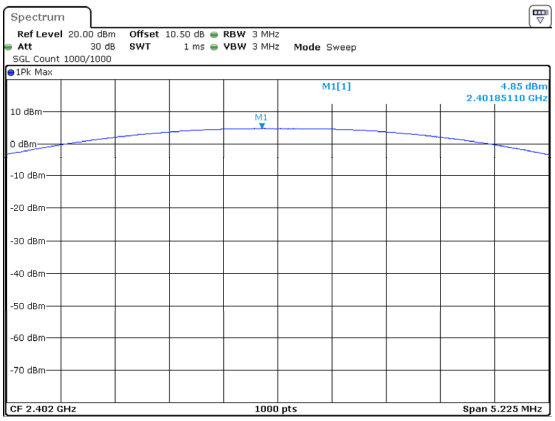
Environmental Conditions:

Temperature: (°C)	24.5	**Relative Humidity: (%)**	46	**ATM Pressure: (kPa)**	101.3

Test Data:

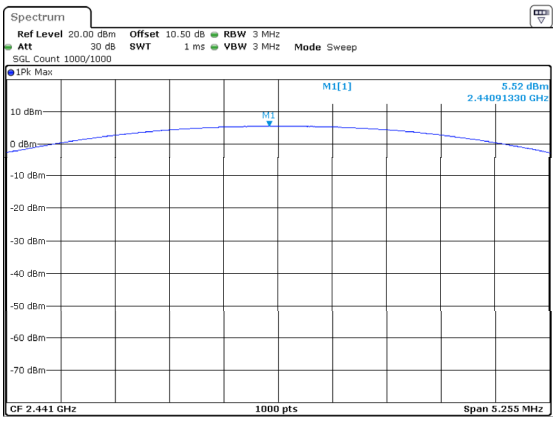
Mode	Channel	Peak Output Power(dBm)	Limit (dBm)	EIRP(dBm)	EIRP Limit (dBm)	Verdict
DH1	Low Channel	4.85	21.00	7.24	36	Pass
	Middle Channel	5.52	21.00	7.91	36	Pass
	High Channel	4.51	21.00	6.90	36	Pass
2DH1	Low Channel	6.95	21.00	9.34	36	Pass
	Middle Channel	6.75	21.00	9.14	36	Pass
	High Channel	6.22	21.00	8.61	36	Pass
3DH1	Low Channel	7.44	21.00	9.83	36	Pass
	Middle Channel	7.27	21.00	9.66	36	Pass
	High Channel	6.66	21.00	9.05	36	Pass

DH1_Low 4.85dBm



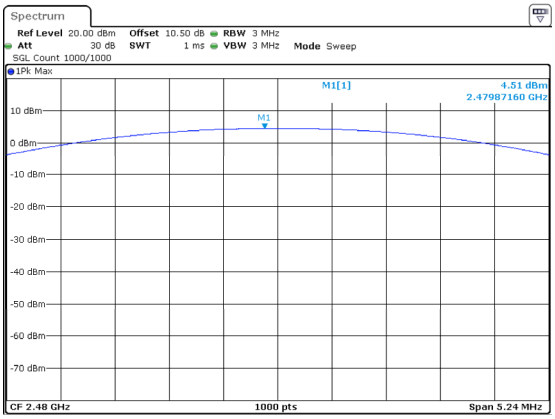
ProjectNo.:2401Z42777E-RF Tester:Rainbow Zhu
Date: 14.DEC.2024 19:18:48

DH1_Middle 5.52dBm



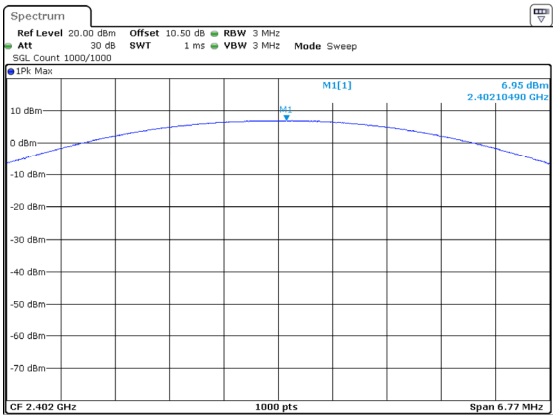
ProjectNo.:2401Z42777E-RF Tester:Rainbow Zhu
Date: 14.DEC.2024 19:19:25

DH1_High 4.51dBm



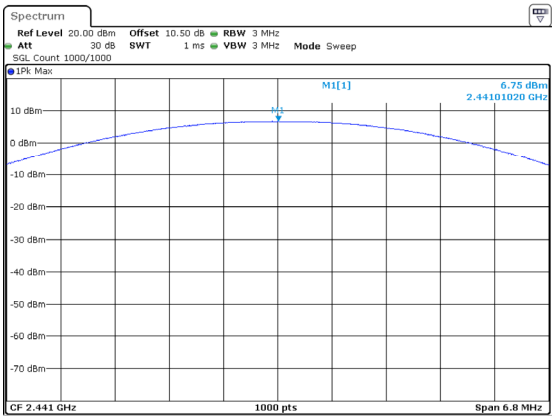
ProjectNo.:2401Z42777E-RF Tester:Rainbow Zhu
Date: 14.DEC.2024 19:19:57

2DH1_Low 6.95dBm



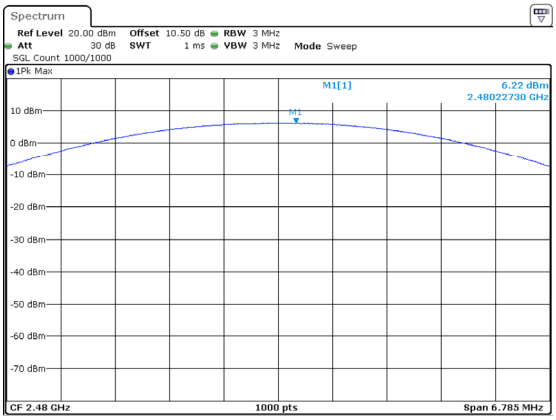
ProjectNo.:2401Z42777E-RF Tester:Rainbow Zhu
Date: 14.DEC.2024 19:06:03

2DH1_Middle 6.75dBm



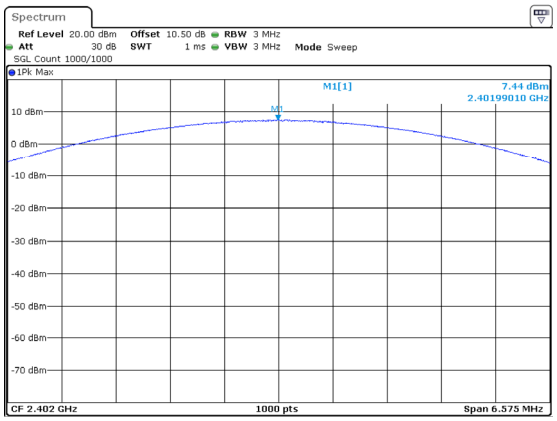
ProjectNo.:2401Z42777E-RF Tester:Rainbow Zhu
Date: 14.DEC.2024 19:07:26

2DH1_High 6.22dBm



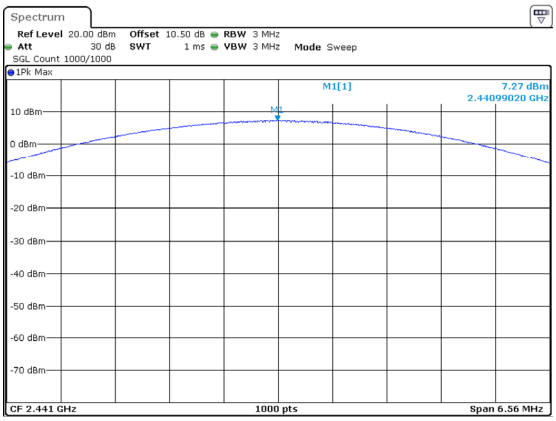
ProjectNo.:2401Z42777E-RF Tester:Rainbow Zhu
Date: 14.DEC.2024 19:09:52

3DH1_Low 7.44dBm



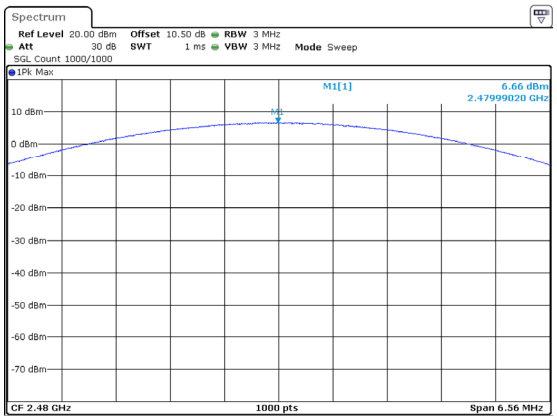
ProjectNo.:2401Z42777E-RF Tester:Rainbow Zhu
Date: 14.DEC.2024 19:12:53

3DH1_Middle 7.27dBm



ProjectNo.:2401Z42777E-RF Tester:Rainbow Zhu
Date: 14.DEC.2024 19:14:13

3DH1_High 6.66dBm



ProjectNo.:2401Z42777E-RF Tester:Rainbow Zhu
Date: 14.DEC.2024 19:16:50

100 kHz Bandwidth of Frequency Band Edge

Test Information:

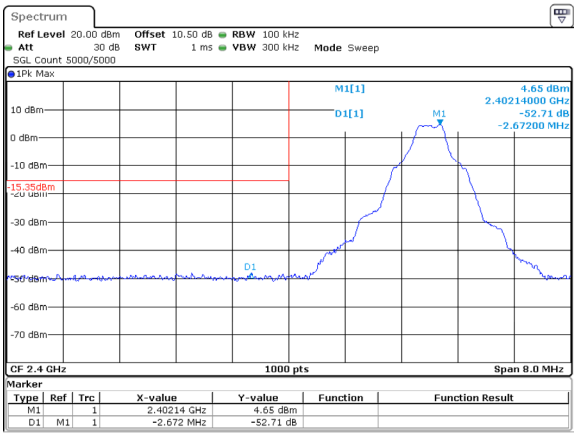
Sample No.:	2V6V-1	**Test Date:**	2024/12/14~2025/03/04
Test Site:	RF	**Test Mode:**	Transmitting
Tester:	Rainbow Zhu	**Test Result:**	Pass

Environmental Conditions:

Temperature: (°C)	24.5~25.8	**Relative Humidity: (%)**	42~46	**ATM Pressure: (kPa)**	101.3~101.5

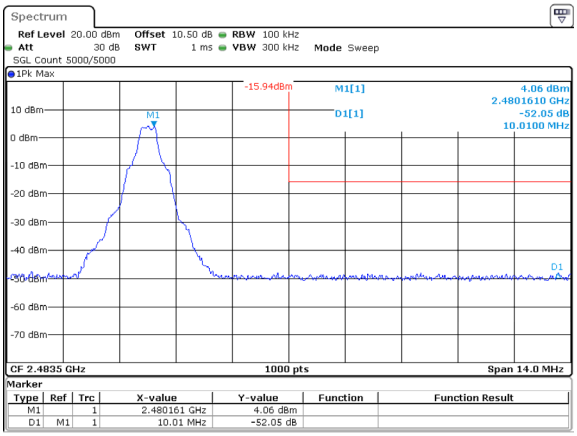
Test Data:

DH1_Low



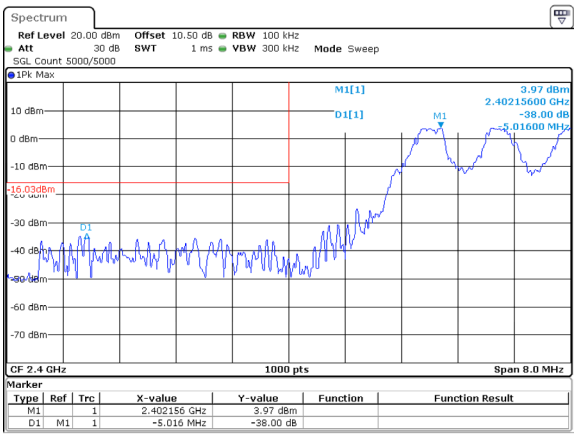
ProjectNo.:2401Z42777E-RF Tester:Rainbow Zhu
Date: 14.DEC.2024 18:57:17

DH1_High



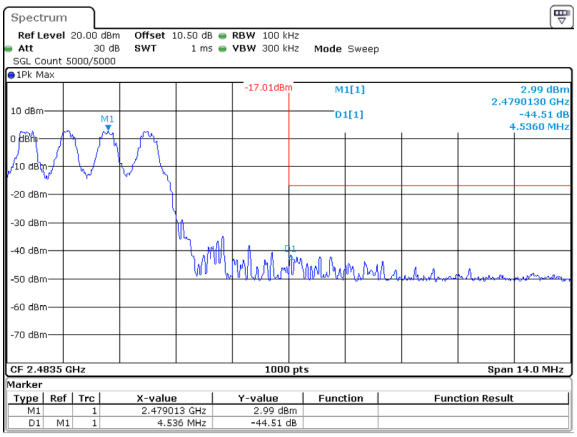
ProjectNo.:2401Z42777E-RF Tester:Rainbow Zhu
Date: 14.DEC.2024 19:02:08

DH1_Hopping_Lower



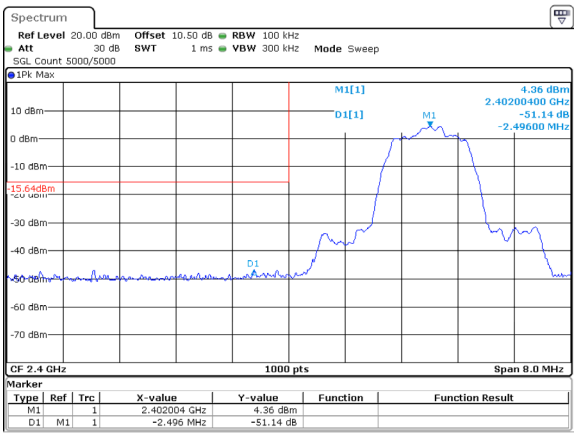
ProjectNo.:2401Z42777E-RF Tester:Rainbow Zhu
Date: 4.MAR.2025 14:20:51

DH1_Hopping_Upper



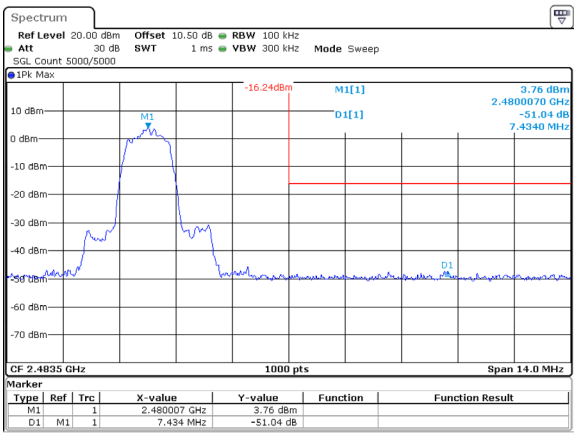
ProjectNo.:2401Z42777E-RF Tester:Rainbow Zhu
Date: 4.MAR.2025 14:22:08

2DH1_Low



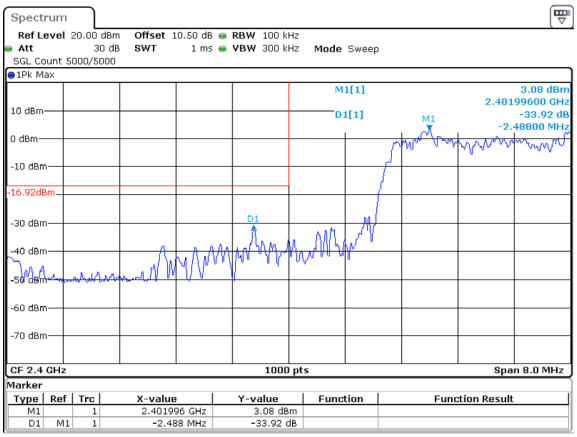
ProjectNo.:2401Z42777E-RF Tester:Rainbow Zhu
Date: 14.DEC.2024 19:05:26

2DH1_High



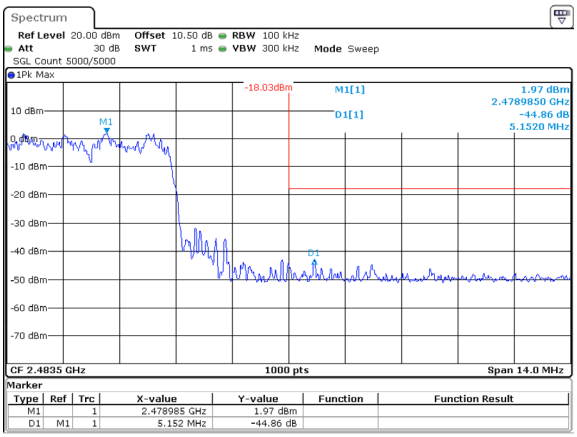
ProjectNo.:2401Z42777E-RF Tester:Rainbow Zhu
Date: 14.DEC.2024 19:09:16

2DH1_Hopping_Lower



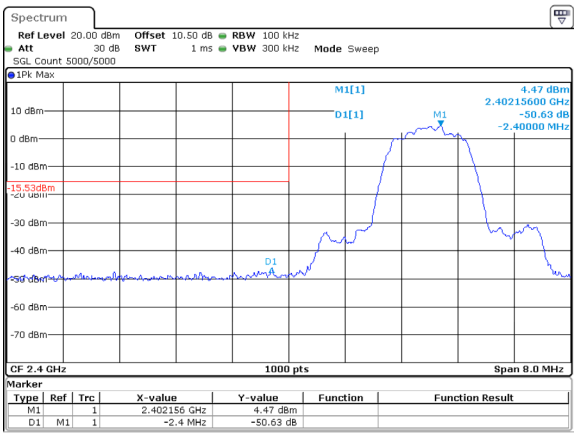
ProjectNo.:2401Z42777E-RF Tester:Rainbow Zhu
Date: 4.MAR.2025 15:21:12

2DH1_Hopping_Upper



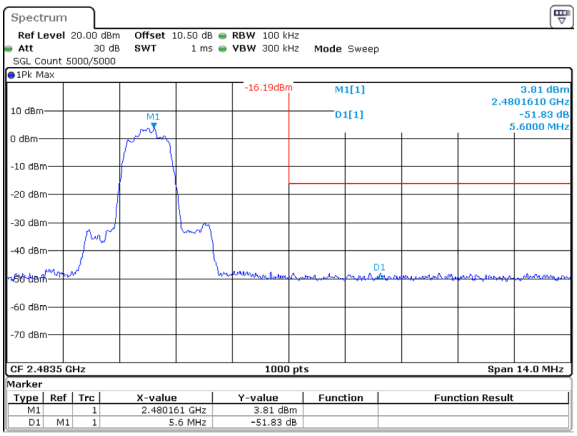
ProjectNo.:2401Z42777E-RF Tester:Rainbow Zhu
Date: 4.MAR.2025 15:22:27

3DH1_Low



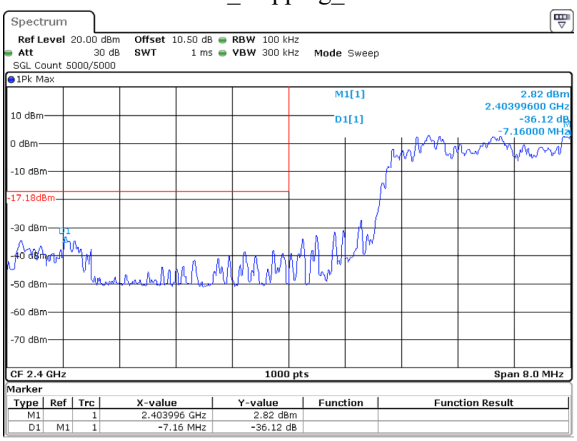
ProjectNo.:2401Z42777E-RF Tester:Rainbow Zhu
Date: 14.DEC.2024 19:12:17

3DH1_High



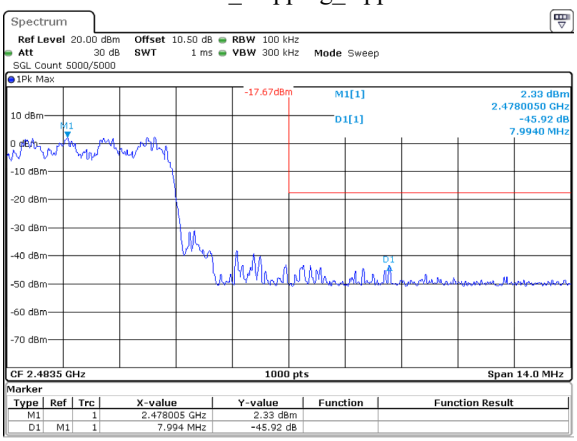
ProjectNo.:2401Z42777E-RF Tester:Rainbow Zhu
Date: 14.DEC.2024 19:16:14

3DH1_Hopping_Lower



ProjectNo.:2401Z42777E-RF Tester:Rainbow Zhu
Date: 4.MAR.2025 15:24:32

3DH1_Hopping_Upper



ProjectNo.:2401Z42777E-RF Tester:Rainbow Zhu
Date: 4.MAR.2025 15:25:48

Time of Occupancy (dwell time)

Test Information:

Sample No.:	2V6V-1	**Test Date:**	2024/12/14
Test Site:	RF	**Test Mode:**	Transmitting
Tester:	Rainbow Zhu	**Test Result:**	Pass

Environmental Conditions:

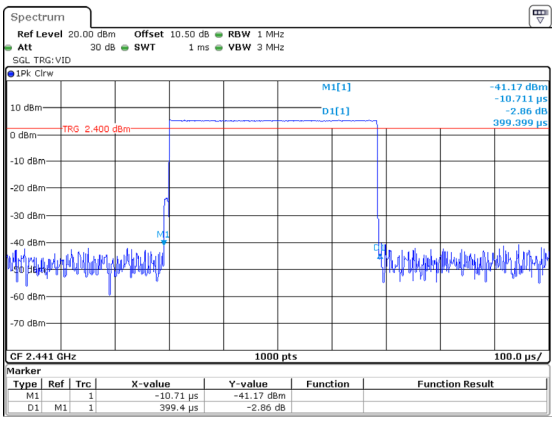
Temperature: (°C)	24.5	**Relative Humidity: (%)**	46	**ATM Pressure: (kPa)**	101.3

Test Data:

Mode	Channel	Pulse width (ms)	Dwell time (s)	Limit (s)	Verdict
DH1	Hopping Channel	0.399	0.128	0.400	Pass
DH3	Hopping Channel	1.658	0.265	0.400	Pass
DH5	Hopping Channel	2.913	0.311	0.400	Pass
2DH1	Hopping Channel	0.405	0.130	0.400	Pass
2DH3	Hopping Channel	1.661	0.266	0.400	Pass
2DH5	Hopping Channel	2.913	0.311	0.400	Pass
3DH1	Hopping Channel	0.405	0.130	0.400	Pass
3DH3	Hopping Channel	1.661	0.266	0.400	Pass
3DH5	Hopping Channel	2.918	0.311	0.400	Pass

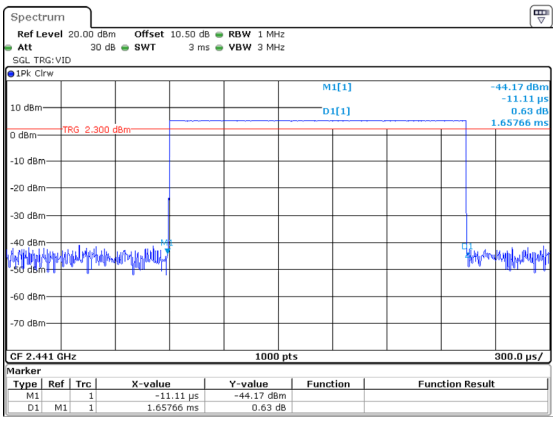
Note:
DH1:Dwell time=Pulse width (ms) × (1600/2/79) ×31.6 s
DH3:Dwell time=Pulse width (ms) × (1600/4/79) ×31.6 s
DH5:Dwell time=Pulse width (ms) × (1600/6/79) ×31.6 s
2DH1: Dwell time=Pulse width (ms) × (1600/2/79) ×31.6 s
2DH3: Dwell time=Pulse width (ms) × (1600/4/79) ×31.6 s
2DH5: Dwell time=Pulse 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 0.399ms



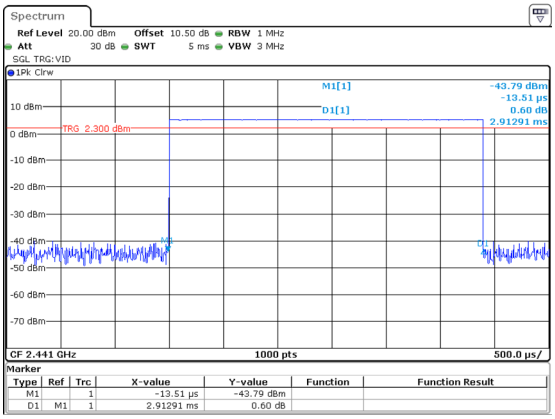
ProjectNo.:2401Z42777E-RF Tester:Rainbow Zhu
Date: 14.DEC.2024 19:32:50

DH3_Hopping 1.658ms



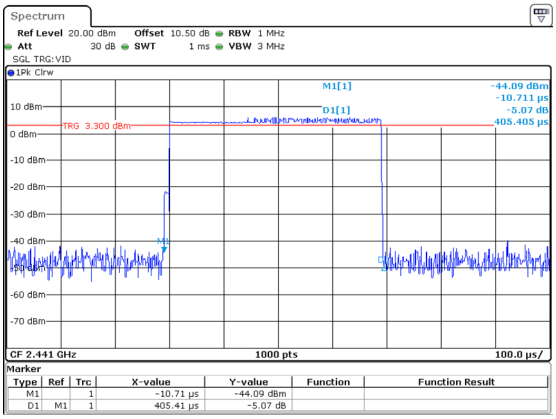
ProjectNo.:2401Z42777E-RF Tester:Rainbow Zhu
Date: 14.DEC.2024 19:34:24

DH5_Hopping 2.913ms



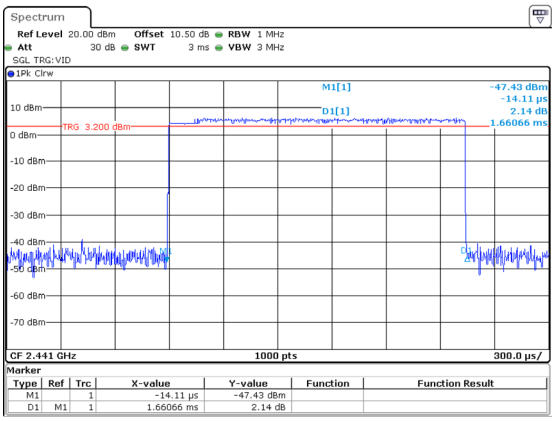
ProjectNo.:2401Z42777E-RF Tester:Rainbow Zhu
Date: 14.DEC.2024 19:35:31

2DH1_Hopping 0.405ms



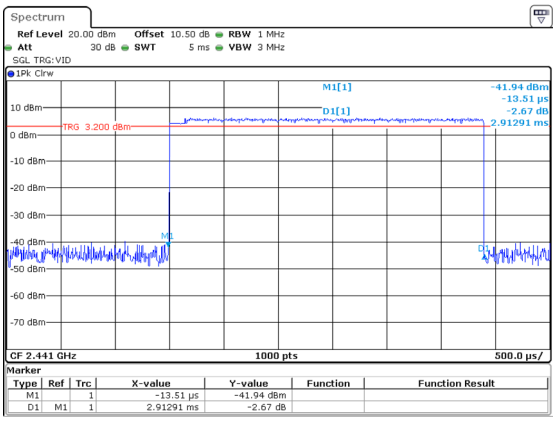
ProjectNo.:2401Z42777E-RF Tester:Rainbow Zhu
Date: 14.DEC.2024 19:37:26

2DH3_Hopping 1.661ms



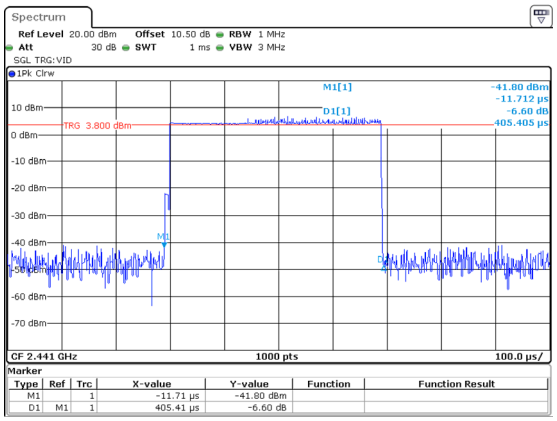
ProjectNo.:2401Z42777E-RF Tester:Rainbow Zhu
Date: 14.DEC.2024 19:38:39

2DH5_Hopping 2.913ms



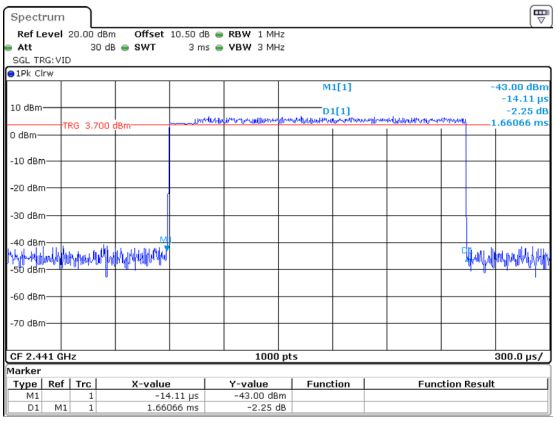
ProjectNo.:2401Z42777E-RF Tester:Rainbow Zhu
Date: 14.DEC.2024 19:40:50

3DH1_Hopping 0.405ms



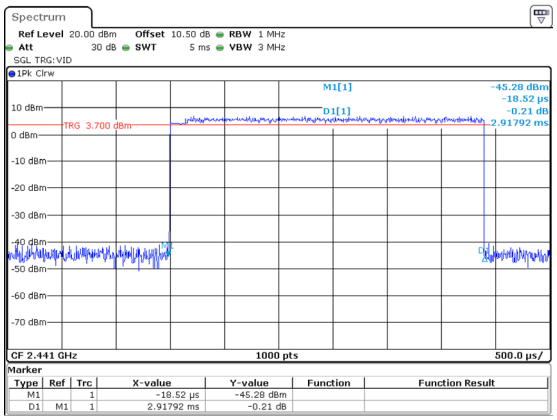
ProjectNo.:2401Z42777E-RF Tester:Rainbow Zhu
Date: 14.DEC.2024 19:42:07

3DH3_Hopping 1.661ms



ProjectNo.:2401Z42777E-RF Tester:Rainbow Zhu
Date: 14.DEC.2024 19:43:11

3DH5_Hopping 2.918ms



ProjectNo.:2401Z42777E-RF Tester:Rainbow Zhu
Date: 14.DEC.2024 19:44:16

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

For multiple RF sources: Multiple RF sources are exempt if:

in the case of fixed RF sources operating in the same time-averaging period, or of multiple mobile or portable RF sources within a device operating in the same time averaging period, if the sum of the fractional contributions to the applicable thresholds is less than or equal to 1 as indicated in the following equation:

$$\sum_{i=1}^{a} \frac{P_i}{P_{th,i}} + \sum_{j=1}^{b} \frac{ERP_j}{ERP_{th,j}} + \sum_{k=1}^{c} \frac{Evaluated_k}{Exposure\ Limit_k} \leq 1$$

Result

Mode	Frequency (MHz)	Tune up conducted power#(dBm)	Antenna Gain#		ERP		Evaluation Distance (m)	ERP Limit (mW)
			(dBi)	(dBd)	(dBm)	(mW)		
BT	2402-2480	7.5	2.39	0.24	7.74	5.94	0.2	768
BLE	2402-2480	5.0	2.39	0.24	5.24	3.34	0.2	768
2.4G Wi-Fi	2412-2462	22.0	2.39	0.24	22.24	167.49	0.2	768
5.2G Wi-Fi	5180-5240	14.0	3.47	1.32	15.32	34.04	0.2	768
5.3G Wi-Fi	5260-5320	14.5	3.47	1.32	15.82	38.19	0.2	768
5.6G Wi-Fi	5500-5700	14.0	3.47	1.32	15.32	34.04	0.2	768
5.8G Wi-Fi	5745-5825	14.5	3.47	1.32	15.82	38.19	0.2	768

Note: 1. The tune up conducted power and antenna gain was declared by the applicant.
2. The BT, 2.4G Wi-Fi and 5G Wi-Fi cannot transmit at same time.
3. 0dBd=2.15dBi

NFC:

Mode	Frequency (MHz)	Maximum E-Field (dBuV/m@3m)	Maximum EIRP (dBm)	ERP		Evaluation Distance (m)	ERP Limit (mW)
				(dBm)	(mW)		
NFC	13.56	68.82	-26.38	-28.53	0.0014	0.2	751

Note: EIRP = E-Field – 95.2 @3m, ERP = EIRP-2.15

Simultaneous transmitting consideration (worst case):

The ratio= $ERP_{2.4G\ Wi\text{-}Fi}$/limit + ERP_{NFC}/limit = 167.49/768+ 0.0014/751 =0.218<1.0

So simultaneous exposure is compliant.

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):

6.6 Field reference level exposure exemption limits

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.

Result

For worst case:

Mode	Frequency (MHz)	Maximum tune-up conducted power[#]	Antenna Gain[#]	Maximum tune-up EIRP		Evaluation Distance (cm)	Limit (mW)
		(dBm)	(dBi)	(dBm)	(mW)		
BT	2402-2480	7.5	2.39	9.89	9.75	20	2676
BLE	2402-2480	5.0	2.39	7.39	5.48	20	2676
2.4G Wi-Fi	2412-2462	22.0	2.39	24.39	274.79	20	2684
5.2G Wi-Fi	5180-5240	14.0	3.47	17.47	55.85	20	4525
5.3G Wi-Fi	5260-5320	14.5	3.47	17.97	62.66	20	4573
5.6G Wi-Fi	5500-5700	14.0	3.47	17.47	55.85	20	4714
5.8G Wi-Fi	5745-5825	14.5	3.47	17.97	62.66	20	4857

Note: 1. The tune up conducted power and antenna gain was declared by the applicant.
2. The BT, 2.4G Wi-Fi and 5G Wi-Fi cannot transmit at same time.

NFC:

Mode	Frequency (MHz)	Maximum E-Field (dBuV/m@3m)	Maximum EIRP		Evaluation Distance (m)	Limit (mW)
			(dBm)	(mW)		
NFC	13.56	68.82	-26.38	0.0023	0.2	1000

Note: EIRP = E-Field – 95.2 @3m

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

Result: The RF Exposure evaluation can be exempted.

EUT PHOTOGRAPHS

Please refer to the attachment 2401Z42777E-RF External photo and 2401Z42777E-RF Internal photo.

TEST SETUP PHOTOGRAPHS

Please refer to the attachment 2401Z42777E-RFB Test Setup photo.

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