TEST REPORT

Applicant Name:	Shenzhen Neutop Optoelectronics Co., Ltd
Address:	502, BLDG 4, Pingshan minQi Technology Park, No. 65 Lishan Road, Pingshan Community,Taoyuan Street, Nanshan District,Shenzhen China
Report Number:	2401A25033E-RF-00A
FCC ID:	2BEGB-A01A11

Test Standard (s)

FCC PART 15.247

Sample Description

Product Type:	Projector
Model No.:	A01A11
Multiple Model(s) No.:	A**A11("**" =01-99 , indicates for different market or business purposes)
Trade Mark:	N/A
Date Received:	2024-12-27
Issue Date:	2025-06-13

Test Result:	Pass▲

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

Prepared and Checked By:

Allen. Bai

Allen Bai
RF Engineer

Approved By:

Nancy Wang

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 cannot be reproduced except in full, without prior written approval of the Company. Unless otherwise stated the results shown in this test report refer only to the sample(s) tested. This report is valid only with a valid digital signature. The digital signature may be available only under the Adobe software above version 7.0.
This report must not be used by the customer to claim product certification, approval, or endorsement by NVLAP or any agency of the U.S. Government.
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 **3**
GENERAL INFORMATION **4**
PRODUCT DESCRIPTION FOR EQUIPMENT UNDER TEST (EUT) 4
OBJECTIVE 4
TEST METHODOLOGY 4
MEASUREMENT UNCERTAINTY 5
TEST FACILITY 5
SYSTEM TEST CONFIGURATION **6**
SUMMARY OF TEST RESULTS **9**
TEST EQUIPMENT LIST **10**
REQUIREMENTS AND TEST PROCEDURES **12**
AC LINE CONDUCTED EMISSIONS 12
RADIATED EMISSIONS 14
20 DB EMISSION BANDWIDTH 17
CHANNEL SEPARATION TEST 19
QUANTITY OF HOPPING CHANNEL TEST 20
TIME OF OCCUPANCY (DWELL TIME) 21
PEAK OUTPUT POWER MEASUREMENT 22
BAND EDGES 23
ANTENNA REQUIREMENT **24**
TEST DATA AND RESULTS **25**
AC LINE CONDUCTED EMISSIONS 25
RADIATED EMISSIONS 28
20 DB EMISSION BANDWIDTH 46
99% OCCUPIED BANDWIDTH 50
CHANNEL SEPARATION 54
NUMBER OF HOPPING FREQUENCY 56
MAXIMUM CONDUCTED OUTPUT POWER 58
100 KHZ BANDWIDTH OF FREQUENCY BAND EDGE 62
TIME OF OCCUPANCY (DWELL TIME) 65
RF EXPOSURE EVALUATION **69**
EUT PHOTOGRAPHS **71**
TEST SETUP PHOTOGRAPHS **72**

DOCUMENT REVISION HISTORY

Revision Number	Report Number	Description of Revision	Date of Revision
0	2401A25033E-RF-00A	Original Report	2025-06-13

GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

Product	Projector
Tested Model	A01A11
Multiple Model(s)	A**A11("**"=01-99，indicates for different market or business purposes)
Frequency Range	2402~2480MHz
Transmit Peak Power	9.72dBm
Modulation Technique	Bluetooth: GFSK, π/4-DQPSK, 8DPSK
Antenna Specification#	2.72dBi (provided by the applicant)
Voltage Range	AC 120V
Sample serial number	2WQQ-5 for Conducted and Radiated Emissions Test 2WQQ-9 for RF Conducted Test (Assigned by BACL, Shenzhen)
Sample/EUT Status	Good condition
Adapter Information	N/A
Note: The Multiple models are electrically identical with the test model except for model number and sales channel. Please refer to the declaration letter# for more detail, which was provided by manufacturer.	

Objective

This test report is in accordance with Part 2-Subpart J, Part 15-Subparts A and C of the Federal Communication Commission rules.

The tests were performed in order to determine compliance with FCC Part 15, Subpart C, section 15.203, 15.207, 15.205, 15.209 and 15.247 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 KDB 558074 D01 15.247 Meas Guidance v05r02.

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.

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#	MP Tool /RTLBTAPP
Power Level#	Default

Special Accessories

No special accessory.

Equipment Modifications

No modification was made to the EUT tested.

Support Equipment List and Details

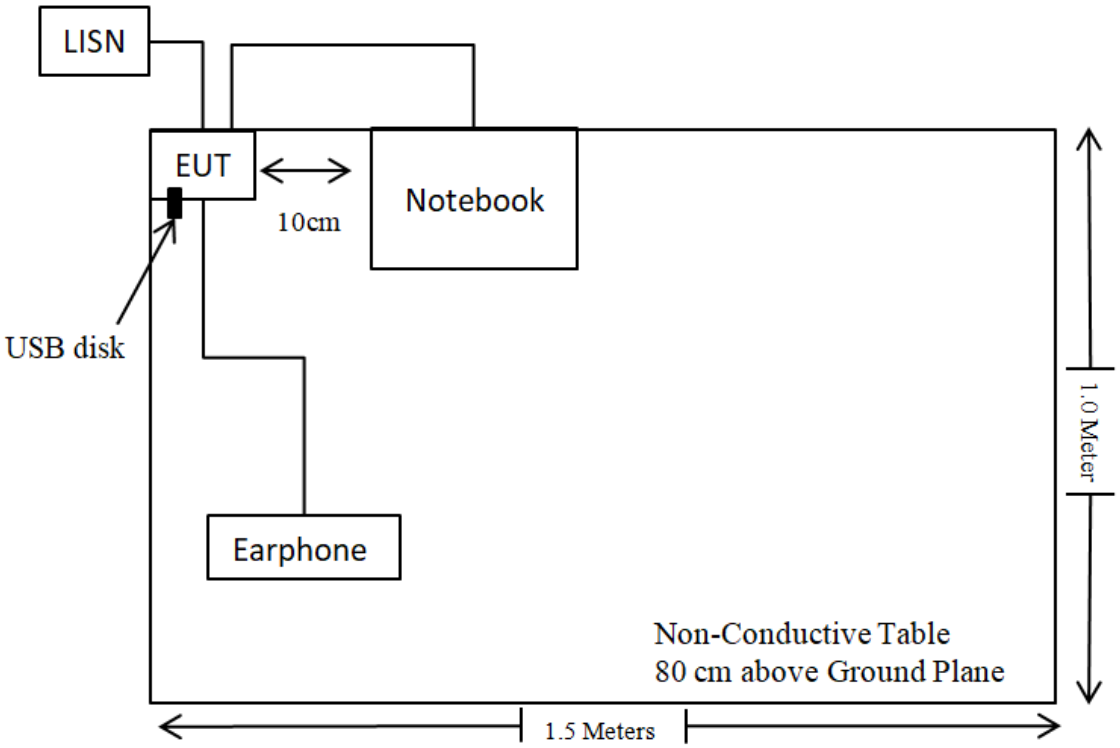
Manufacturer	Description	Model	Serial Number
OUPU	Receptacle	PDU-OP1606K	6971041358020
Sandisk	USB disk	CZ73-64G	Unknown
Vivo	Earphone(white)	XE160	Unknown
CRDC	Earphone(black)	YXEJ-01Z	Unknown
Lenono	Notebook	DESKTOP 9V9AN6E	1062222901869

External I/O Cable

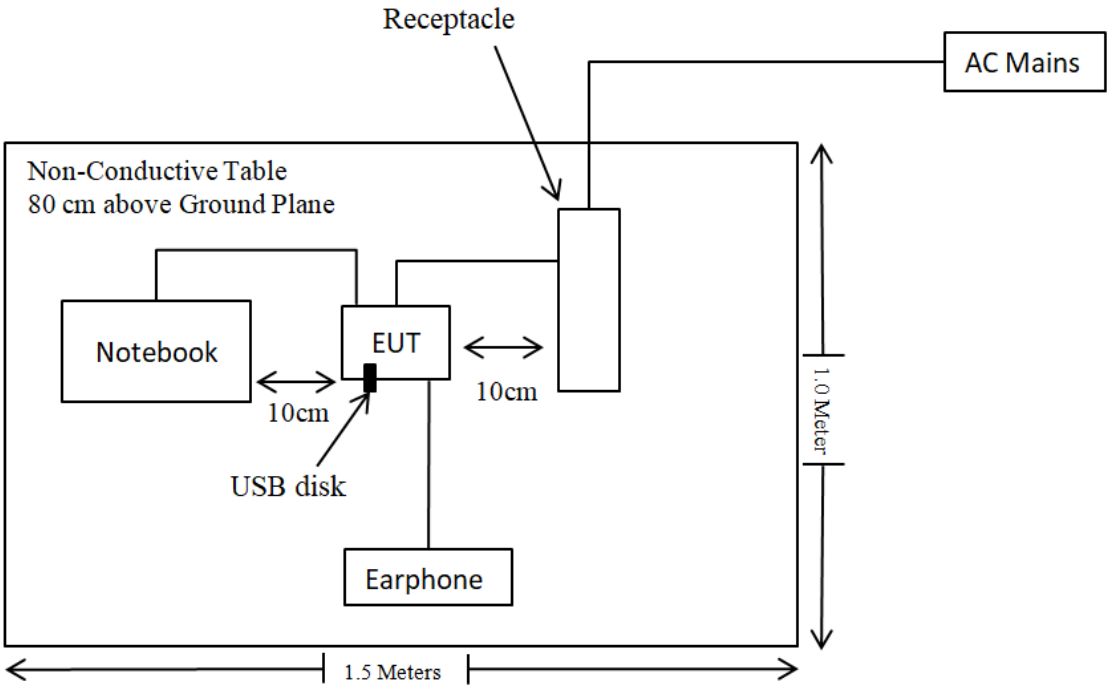
Cable Description	Length (m)	From Port	To
Unshielded Un-Detachable AC Cable	1.5	Receptacle	AC Mains
Unshielded Detachable AC Cable	1.2	EUT	LISN/Receptacle
Unshielded Un-detachable Audio Cable	1.0	EUT	Earphone(white)
Unshielded Un-detachable Audio Cable	1.0	EUT	Earphone(black)
Unshielded Detachable HDMI Cable	2.0	EUT	Notebook

Block Diagram of Test Setup

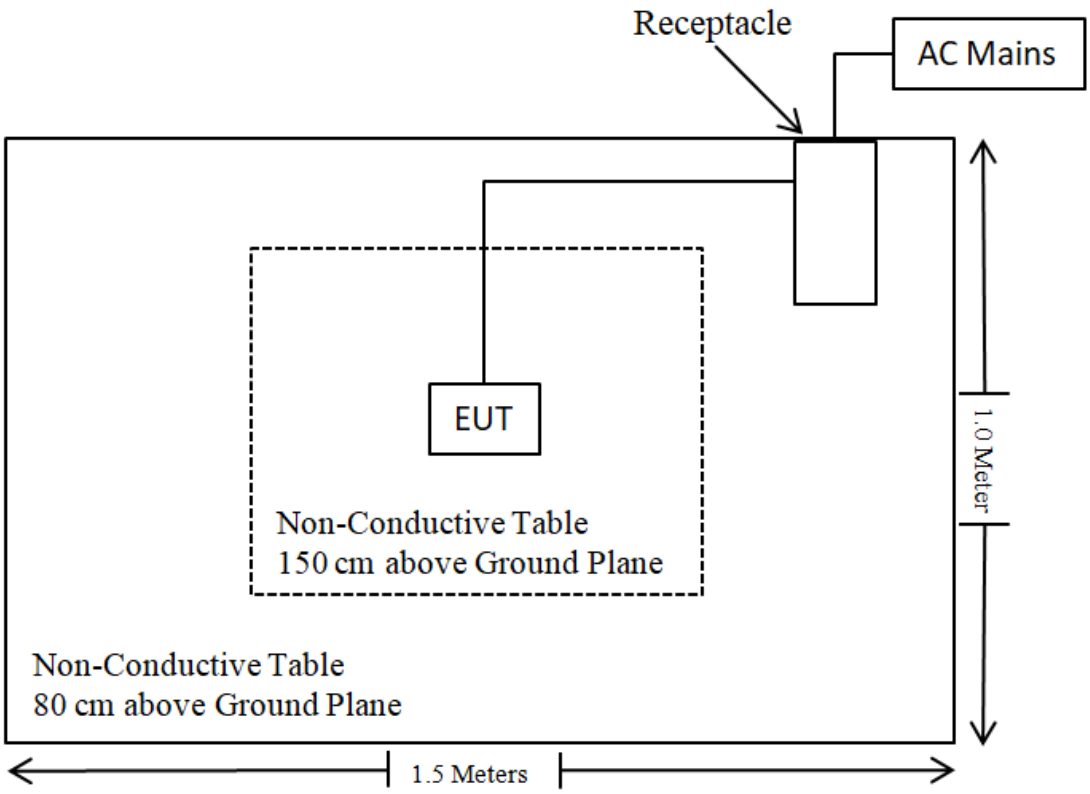
For Conducted Emissions:



For Radiated Emissions below 1GHz:



For Radiated Emissions above 1GHz:



SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Result
FCC §15.203	Antenna Requirement	Compliant
FCC §15.207(a)	AC Line Conducted Emissions	Compliant
FCC §15.205, §15.209, §15.247(d)	Radiated Spurious Emission	Compliant
FCC §15.247(a)(1)	20 dB Emission Bandwidth	Compliant
FCC §15.247(a)(1)	Channel Separation	Compliant
FCC §15.247(a)(1)(iii)	Number of Hopping Frequency	Compliant
FCC §15.247(a)(1)(iii)	Time of Occupancy (dwell time)	Compliant
FCC §15.247(b)(1)	Maximum Conducted Output Power	Compliant
FCC §15.247(d)	100 kHz Bandwidth of Frequency Band Edge	Compliant
FCC §1.1307 (b) (3) & §2.1091	MPE-Based Exemption	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
Rohde & Schwarz	Transient Limiter	ESH3Z2	DE25985	2024/05/21	2025/05/20
Unknown	CE Cable	Unknown	UF A210B-1-0720-504504	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
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	Multiplex Switch Test Control Set	DT7220FSU	DQ77926	2024/06/18	2025/06/17
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					
Rohde&Schwarz	Spectrum Analyzer	FSV40-N	102259	2024/12/04	2025/12/03
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).

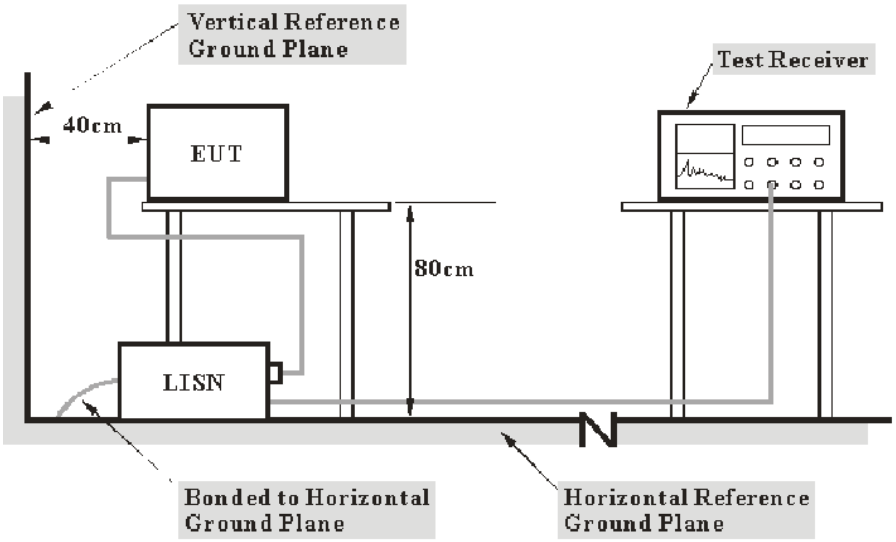
REQUIREMENTS AND TEST PROCEDURES

AC Line Conducted Emissions

Applicable Standard

FCC §15.207(a)

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.

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	RBW
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).

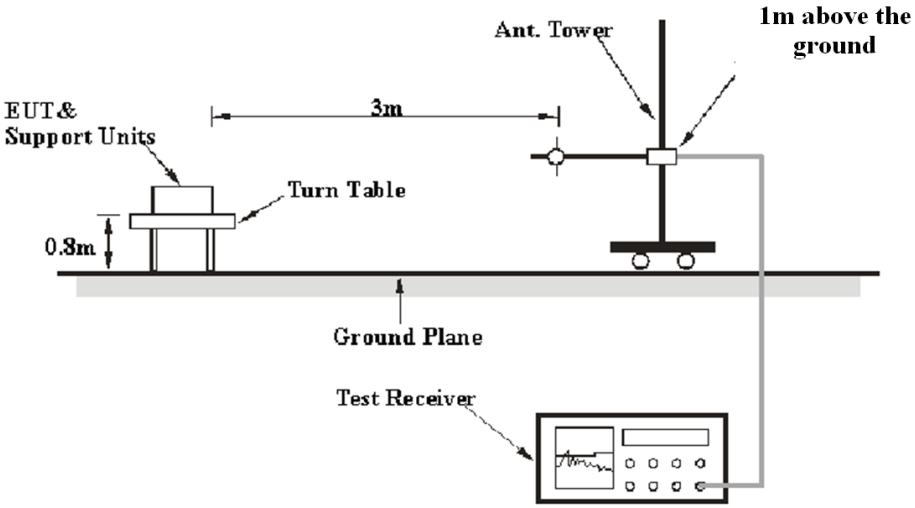
Radiated Emissions

Applicable Standard

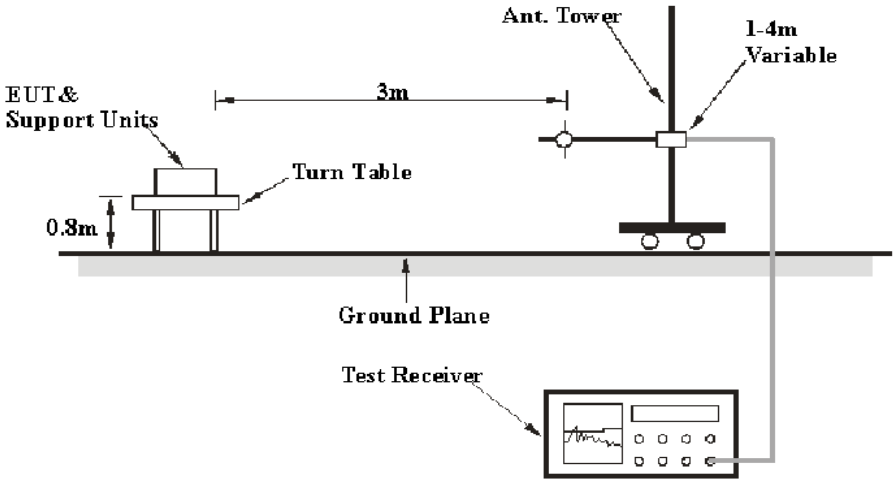
FCC §15.205; §15.209; §15.247(d)

EUT Setup

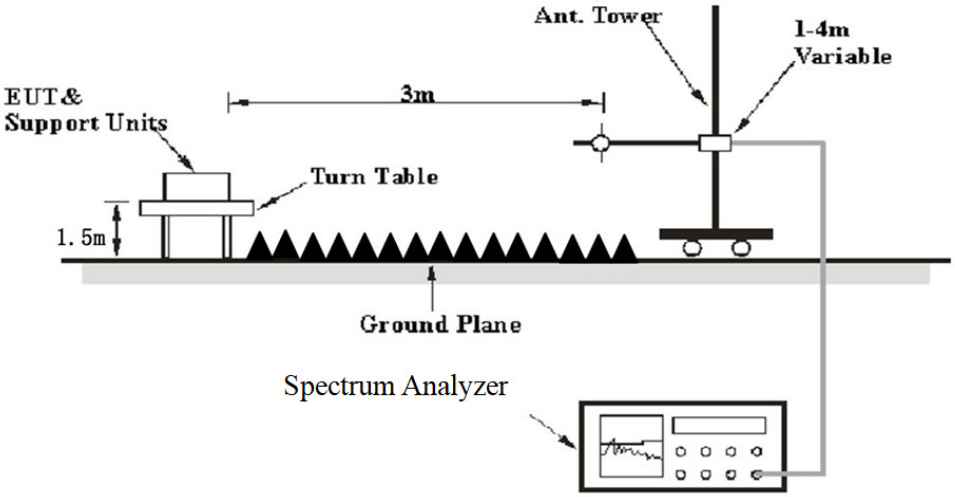
9 kHz-30MHz:



30MHz-1GHz:



Above 1GHz:



The radiated emission tests were performed in the 3 meters, using the setup accordance with the ANSI C63.10-2013. The specification used was the FCC 15.209 and FCC 15.247 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

Applicable Standard

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.

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).

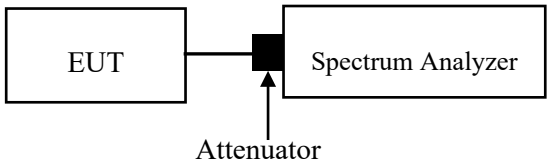
h) Determine the "−xx dB down amplitude" using [(reference value) − xx]. Alternatively, this calculation may be made by using the marker-delta function of the instrument.

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

Applicable Standard

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.

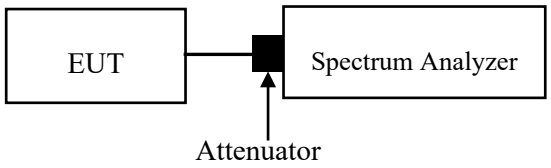
Test Procedure

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

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.

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.

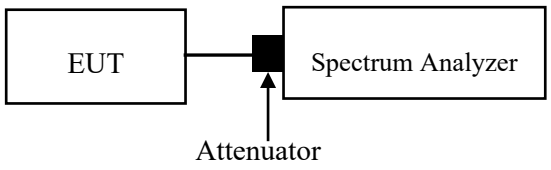
c) VBW ≥ RBW.

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

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.

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.

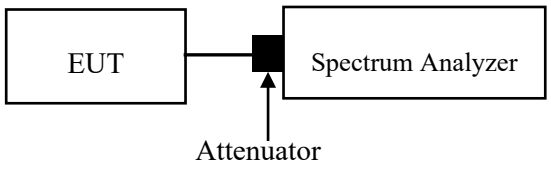
Use the marker-delta function to determine the transmit time per hop. If this value varies with different modes of operation (data rate, modulation format, number of hopping channels, etc.), then repeat this test for each variation in transmit time.

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 §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.

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:

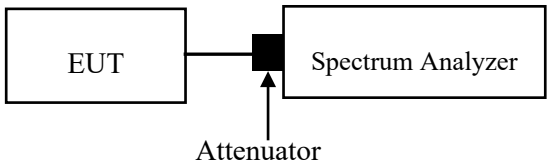
a) Use the following spectrum analyzer settings:

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

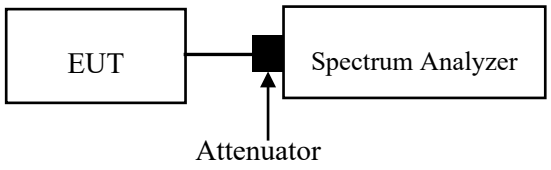
Applicable Standard

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)).

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.

Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with § 15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this part are not exceeded.

Antenna Connector Construction

The EUT has an internal antenna arrangement, which was permanently attached, the antenna gain# is 2.72dBi, fulfill the requirement of this section. Please refer to the EUT photos.

Result: Compliant

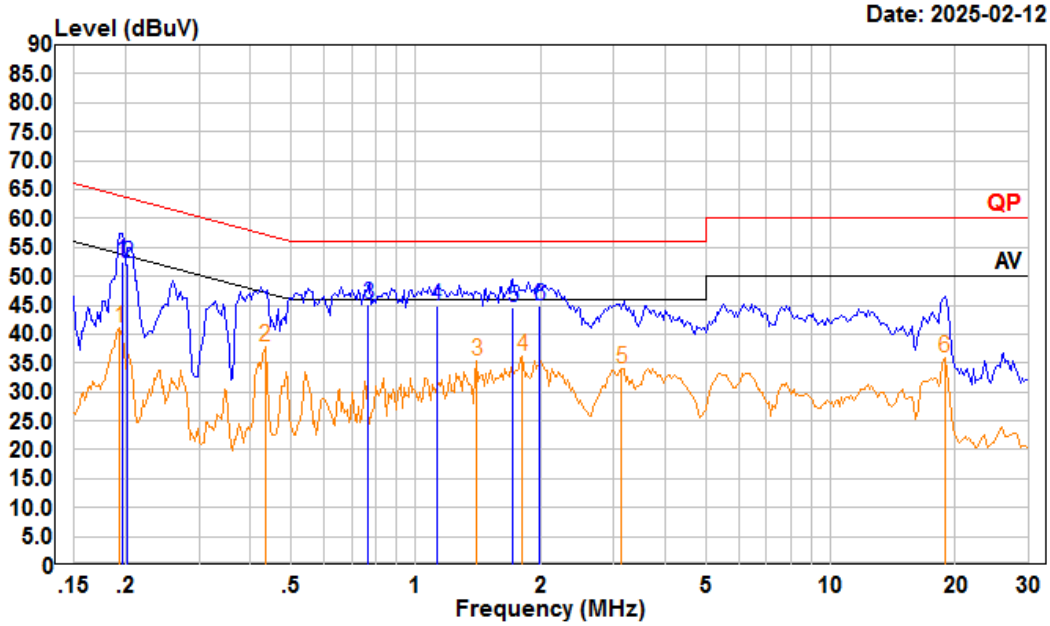
TEST DATA AND RESULTS

AC Line Conducted Emissions

Environmental Conditions

Temperature (°C)	23.5	**Relative Humidity (%)**	44
ATM Pressure (kPa)	101	**Test engineer**	Macy shi
Test date	2025/2/12		
EUT operation mode	Transmitting (Maximum output power mode, EDR (8DPSK) 2402MHz)		

AC 120V 60 Hz, Line



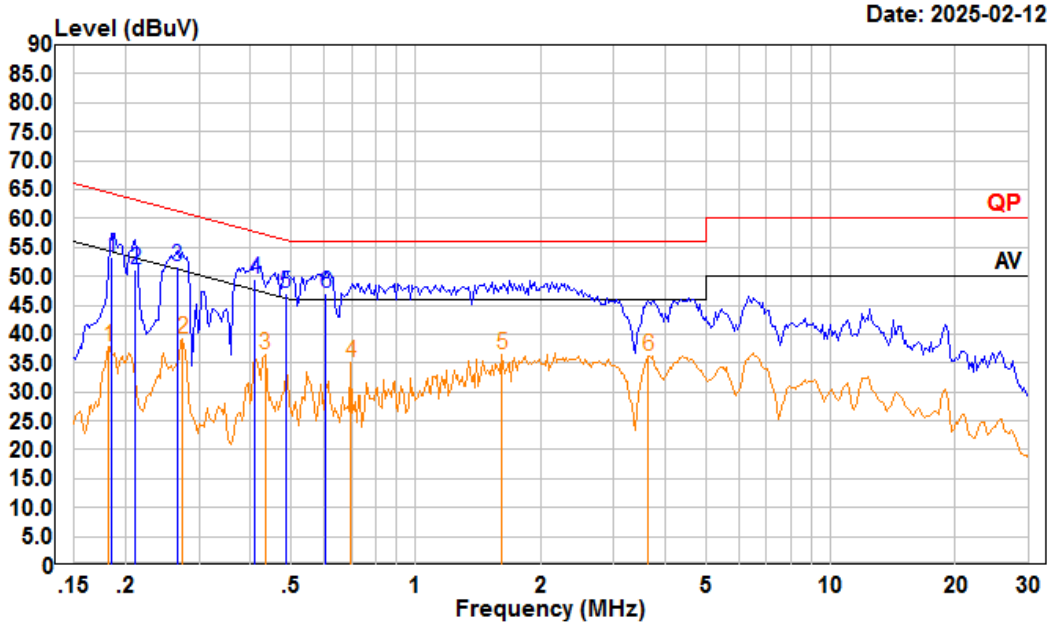
Trace: 1

Condition: Line
Project : 2401A25033E-RF
tester : Macy.shi Note:Transmitting
Setting : RBW:9kHz

	Freq	Read Level	Level	LISN Factor	Cable Loss	Limit Line	Over Limit	Remark
	MHz	dBuV	dBuV	dB	dB	dBuV	dB	
1	0.195	32.41	52.42	9.92	10.09	63.80	-11.38	QP
2	0.202	32.10	52.10	9.91	10.09	63.54	-11.44	QP
3	0.767	24.40	45.20	10.67	10.13	56.00	-10.80	QP
4	1.123	24.10	44.78	10.55	10.13	56.00	-11.22	QP
5	1.716	24.00	44.54	10.37	10.17	56.00	-11.46	QP
6	1.991	24.30	44.79	10.30	10.19	56.00	-11.21	QP

	Freq	Read Level	Level	LISN Factor	Cable Loss	Limit Line	Over Limit	Remark
	MHz	dBuV	dBuV	dB	dB	dBuV	dB	
1	0.193	21.05	41.07	9.93	10.09	53.89	-12.82	Average
2	0.433	17.20	37.72	10.41	10.11	47.20	-9.48	Average
3	1.403	14.75	35.35	10.45	10.15	46.00	-10.65	Average
4	1.810	15.65	36.17	10.34	10.18	46.00	-9.83	Average
5	3.140	13.77	34.05	10.10	10.18	46.00	-11.95	Average
6	18.820	15.29	35.83	10.36	10.18	50.00	-14.17	Average

AC 120V 60 Hz, Neutral



Trace: 1

Condition: Neutral
Project : 2401A25033E-RF
tester : Macy.shi Note:Transmitting
Setting : RBW:9kHz

	Freq	Read Level	LISN Level	Factor	Cable Loss	Limit Line	Over Limit	Remark
	MHz	dBuV	dBuV	dB	dB	dBuV	dB	
1	0.185	33.11	53.35	10.15	10.09	64.24	-10.89	QP
2	0.211	30.80	51.02	10.13	10.09	63.18	-12.16	QP
3	0.266	31.19	51.54	10.26	10.09	61.25	-9.71	QP
4	0.410	28.81	49.40	10.49	10.10	57.64	-8.24	QP
5	0.486	26.41	47.12	10.58	10.13	56.23	-9.11	QP
6	0.608	26.30	46.96	10.54	10.12	56.00	-9.04	QP

	Freq	Read Level	LISN Level	Factor	Cable Loss	Limit Line	Over Limit	Remark
	MHz	dBuV	dBuV	dB	dB	dBuV	dB	
1	0.182	17.49	37.76	10.17	10.10	54.42	-16.66	Average
2	0.274	18.89	39.25	10.27	10.09	50.98	-11.73	Average
3	0.433	15.83	36.46	10.52	10.11	47.20	-10.74	Average
4	0.697	14.54	35.19	10.50	10.15	46.00	-10.81	Average
5	1.610	15.88	36.48	10.43	10.17	46.00	-9.52	Average
6	3.642	15.88	36.21	10.13	10.20	46.00	-9.79	Average

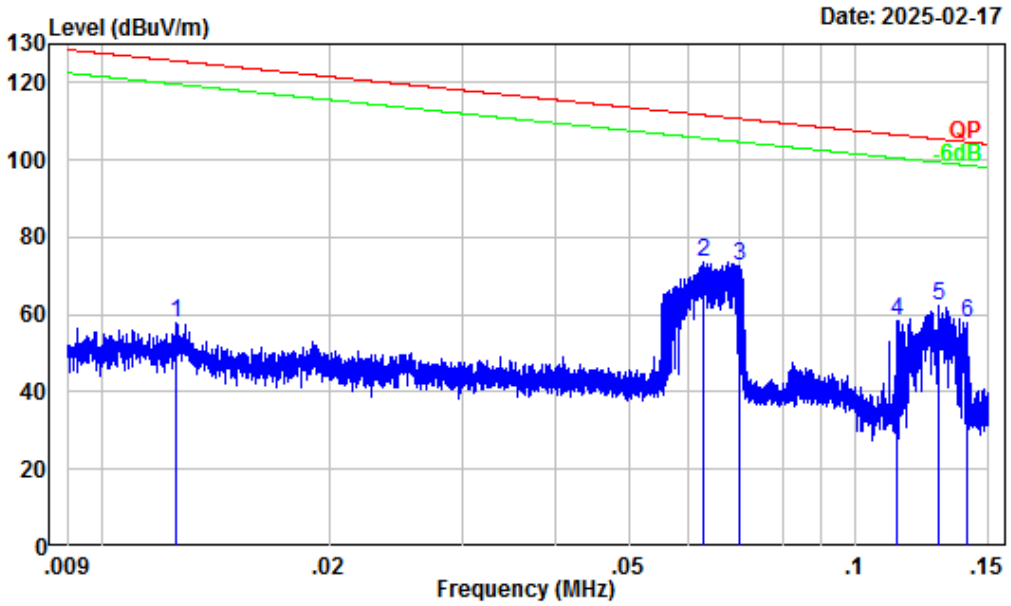
Radiated Emissions

Environmental Conditions

Temperature (°C)	22.1-24.3	**Relative Humidity (%)**	35-50
ATM Pressure (kPa):	101	**Test engineer:**	Anson Su&Zenos Qiao
Test date:	2025/02/17-2025/02/18		
EUT operation mode:	Below 1GHz: Transmitting (Maximum output power mode, 8DPSK 2402MHz) 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.		

Below 1GHz:

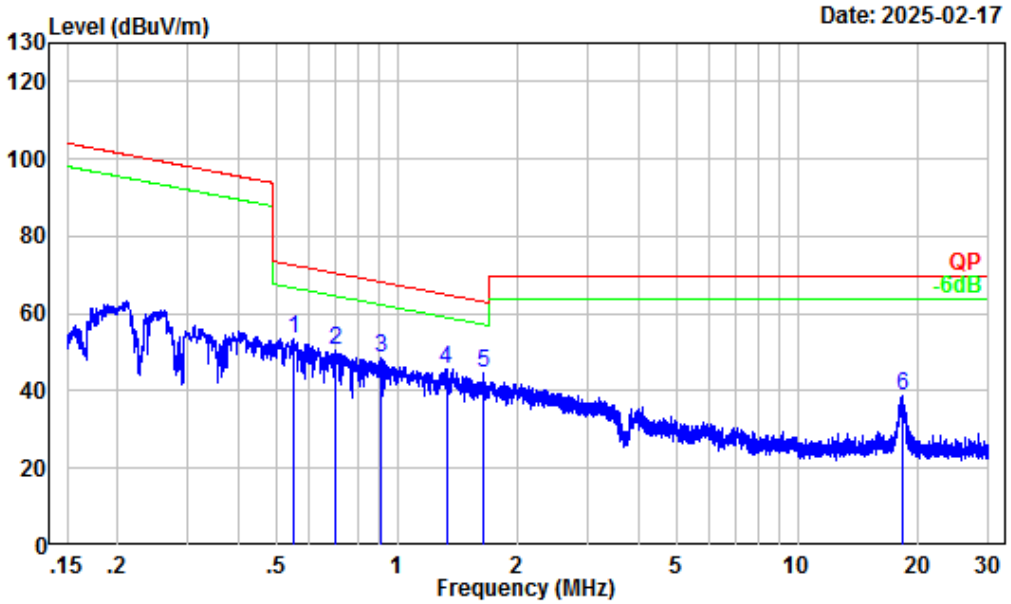
9kHz-150kHz



Site : Chamber A
Condition : 3m
Project Number : 2501Q43366E-RF
Test Mode : BT Transmitting
Detector: Peak RBW/VBW: 0.3/1kHz
Tester : Anson Su

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	0.01	31.81	26.15	57.96	125.61	-67.65	Peak
2	0.06	25.12	48.53	73.65	111.65	-38.00	Peak
3	0.07	24.39	48.24	72.63	110.69	-38.06	Peak
4	0.11	21.19	37.21	58.40	106.49	-48.09	Peak
5	0.13	20.31	41.94	62.25	105.42	-43.17	Peak
6	0.14	19.60	38.39	57.99	104.64	-46.65	Peak

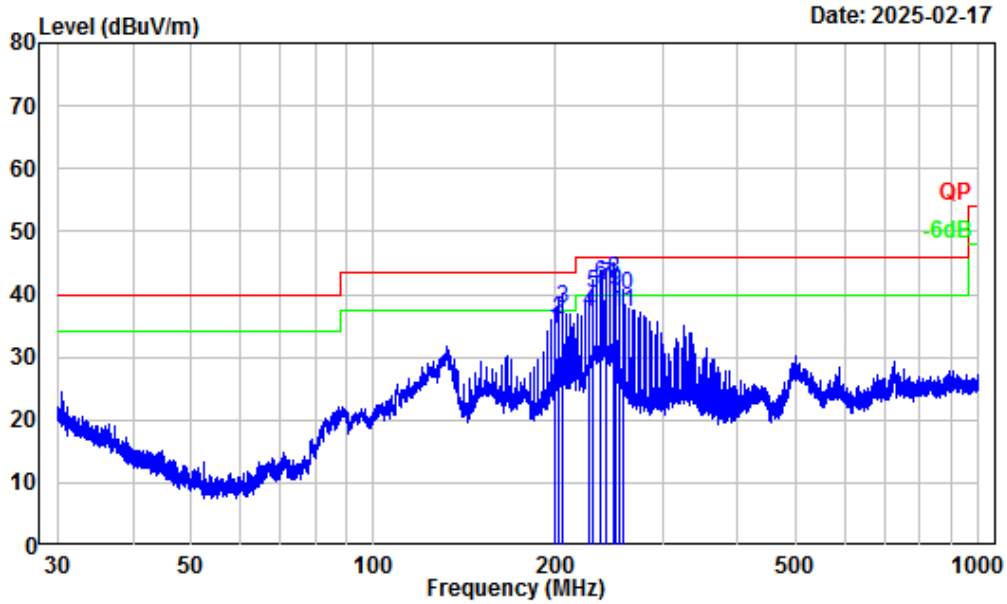
150kHz-30MHz



Site : Chamber A
Condition : 3m
Project Number : 2501Q43366E-RF
Test Mode : BT Transmitting
Detector: Peak RBW/VBW: 10/30kHz
Tester : Anson Su

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	0.55	5.76	47.65	53.41	72.74	-19.33	Peak
2	0.70	3.92	46.47	50.39	70.62	-20.23	Peak
3	0.92	1.83	46.90	48.73	68.26	-19.53	Peak
4	1.33	0.28	45.14	45.42	64.96	-19.54	Peak
5	1.64	-0.59	45.05	44.46	63.08	-18.62	Peak
6	18.27	-2.93	41.65	38.72	69.54	-30.82	Peak

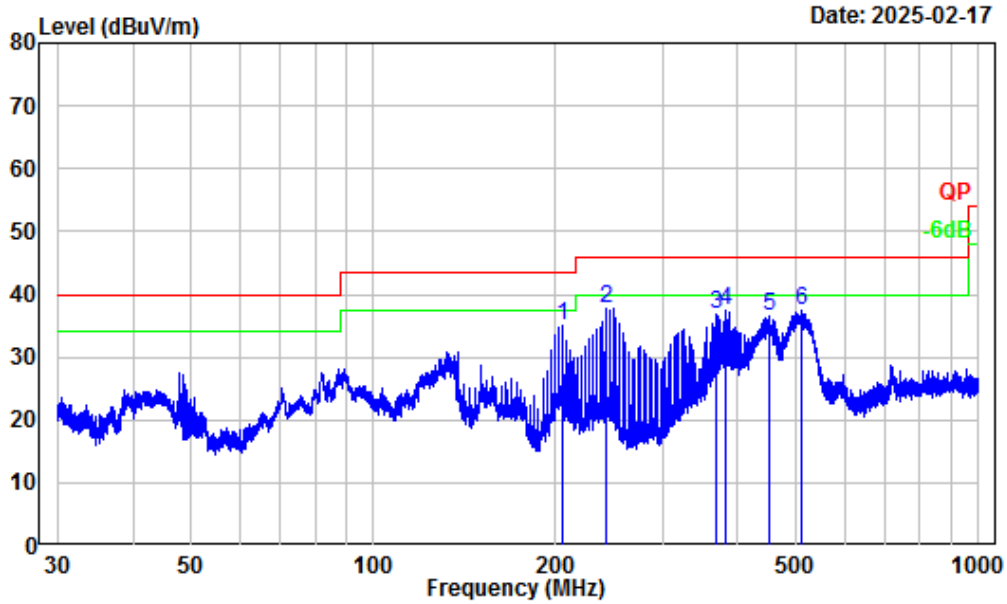
30MHz-1GHz_Horizontal



Site : Chamber A
Condition : 3m Horizontal
Project Number : 2501Q43366E-RF
Test Mode : BT Transmitting
Detector: Peak RBW/VBW: 100/300kHz
Tester : Anson Su

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	199.72	-13.08	47.50	34.42	43.50	-9.08	QP
2	202.72	-13.27	49.30	36.03	43.50	-7.47	QP
3	205.86	-13.54	51.30	37.76	43.50	-5.74	QP
4	227.29	-13.98	51.10	37.12	46.00	-8.88	QP
5	230.40	-13.83	54.00	40.17	46.00	-5.83	QP
6	236.54	-13.48	55.01	41.53	46.00	-4.47	QP
7	242.74	-13.26	54.60	41.34	46.00	-4.66	QP
8	248.88	-13.11	55.29	42.18	46.00	-3.82	QP
9	251.95	-13.08	53.49	40.41	46.00	-5.59	QP
10	254.95	-13.08	53.00	39.92	46.00	-6.08	QP
11	258.10	-12.89	50.10	37.21	46.00	-8.79	QP

30MHz-1GHz_Vertical



Site : Chamber A
Condition : 3m Vertical
Project Number : 2501Q43366E-RF
Test Mode : BT Transmitting
Detector: Peak RBW/VBW: 100/300kHz
Tester : Anson Su

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	205.86	-13.54	48.47	34.93	43.50	-8.57	Peak
2	242.74	-13.26	50.95	37.69	46.00	-8.31	Peak
3	368.76	-9.55	46.40	36.85	46.00	-9.15	Peak
4	380.91	-9.13	46.49	37.36	46.00	-8.64	Peak
5	451.93	-7.44	43.85	36.41	46.00	-9.59	Peak
6	508.48	-5.77	43.06	37.29	46.00	-8.71	Peak

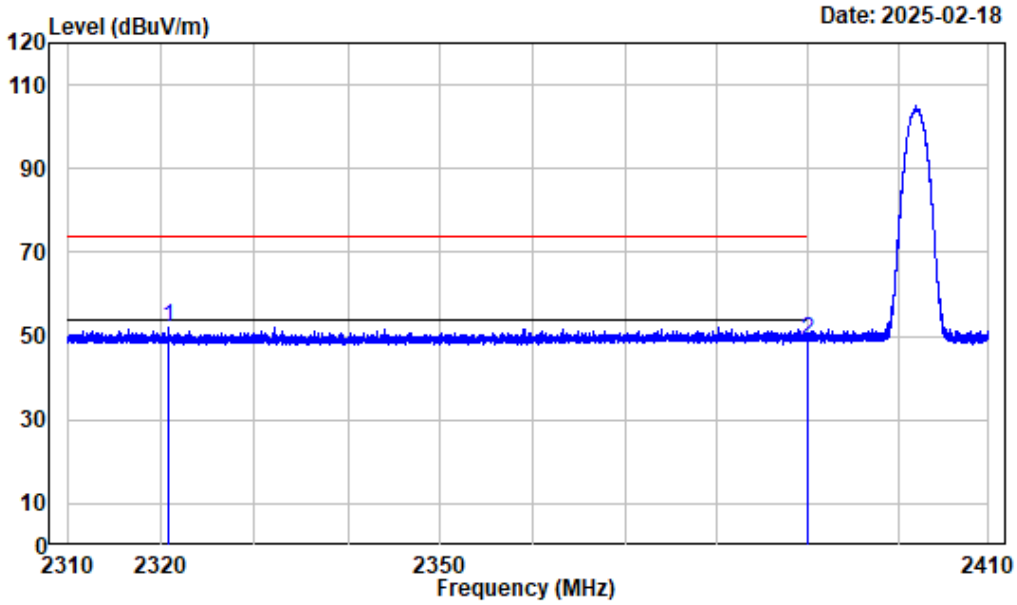
Above 1GHz:

Frequency (MHz)	Receiver		Polar (H/V)	Factor (dB/m)	Corrected Amplitude (dBμV/m)	Limit (dBμV/m)	Margin (dB)
	Reading (dBμV)	PK/Ave					
8DPSK							
Low Channel							
4804	52.21	PK	H	-7.79	44.42	74	-29.58
4804	52.68	PK	V	-7.79	44.89	74	-29.11
Middle Channel							
4882	52.87	PK	H	-7.58	45.29	74	-28.71
4882	53.39	PK	V	-7.58	45.81	74	-28.19
High Channel							
4960	52.54	PK	H	-7.56	44.98	74	-29.02
4960	53.06	PK	V	-7.56	45.50	74	-28.50

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

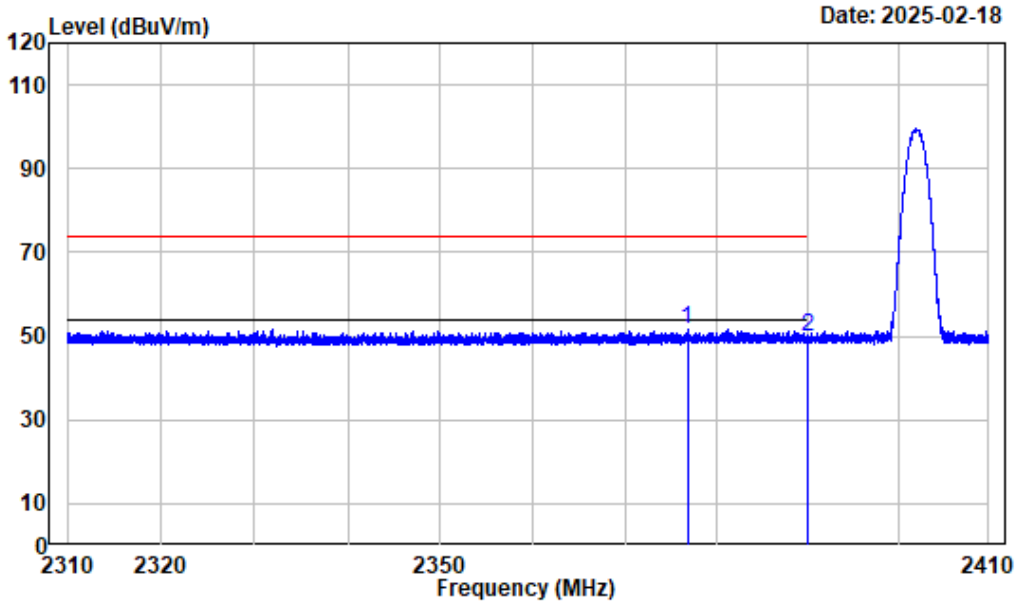
Left Band edge_Horizontal



Condition : Horizontal
Project No. : 2401A25033E-RF
Tester : Zenos Qiao
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	2320.826	-10.81	62.85	52.04	74.00	-21.96	Peak
2	2390.000	-10.98	59.99	49.01	74.00	-24.99	Peak

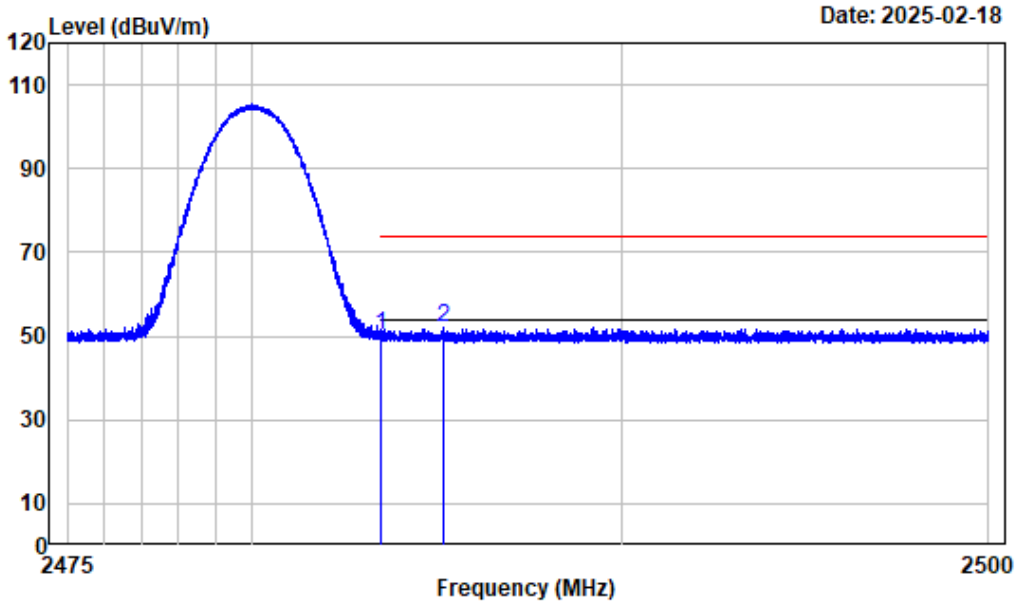
Left Band edge_Vertical



Condition : Vertical
Project No. : 2401A25033E-RF
Tester : Zenos Qiao
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	2376.833	-10.95	62.69	51.74	74.00	-22.26	Peak
2	2390.000	-10.98	60.63	49.65	74.00	-24.35	Peak

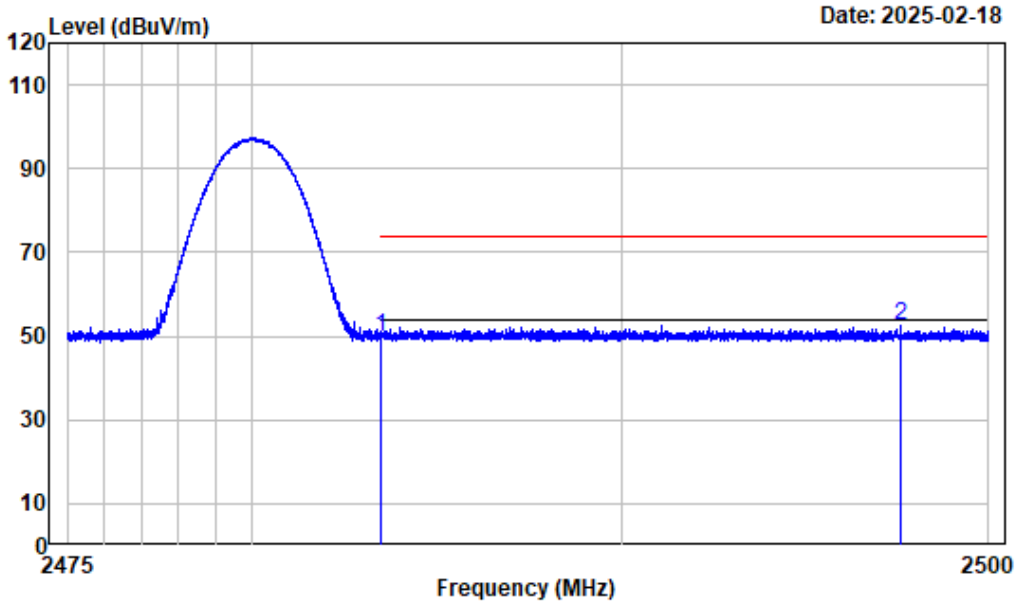
Right Band edge_Horizontal



Condition : Horizontal
Project No. : 2401A25033E-RF
Tester : Zenos Qiao
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	61.25	50.28	74.00	-23.72	Peak
2	2485.170	-10.97	63.23	52.26	74.00	-21.74	Peak

Right Band edge_Vertical

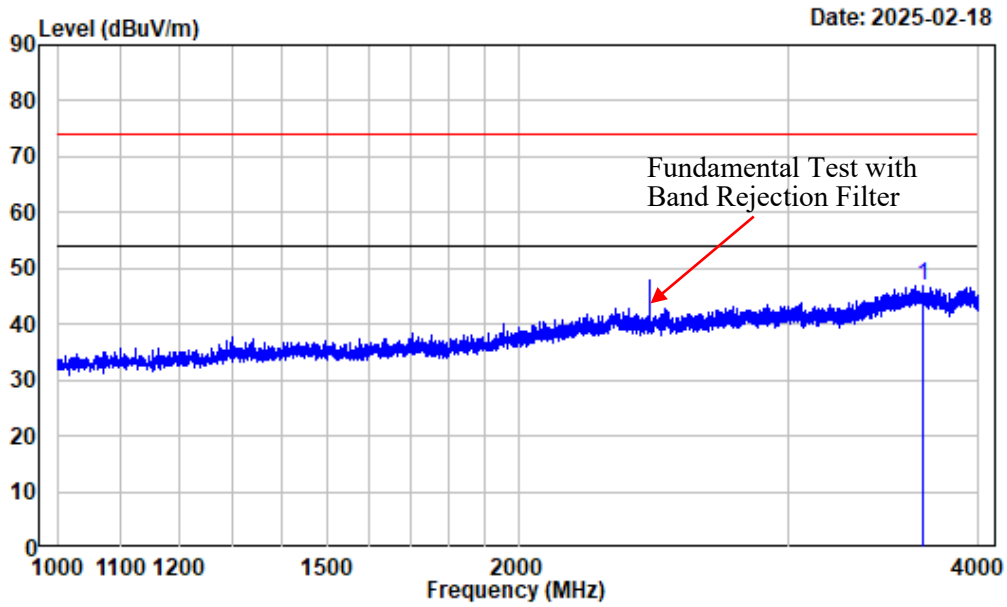


Condition : Vertical
Project No. : 2401A25033E-RF
Tester : Zenos Qiao
Spectrum setting: Peak reading:RBW:1MHz VBW:3MHz Detector:Peak
Note : BT-3DH5-2480

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	2483.500	-10.97	60.95	49.98	74.00	-24.02	Peak
2	2497.597	-11.00	63.64	52.64	74.00	-21.36	Peak

Listed with the worst harmonic margin test plot

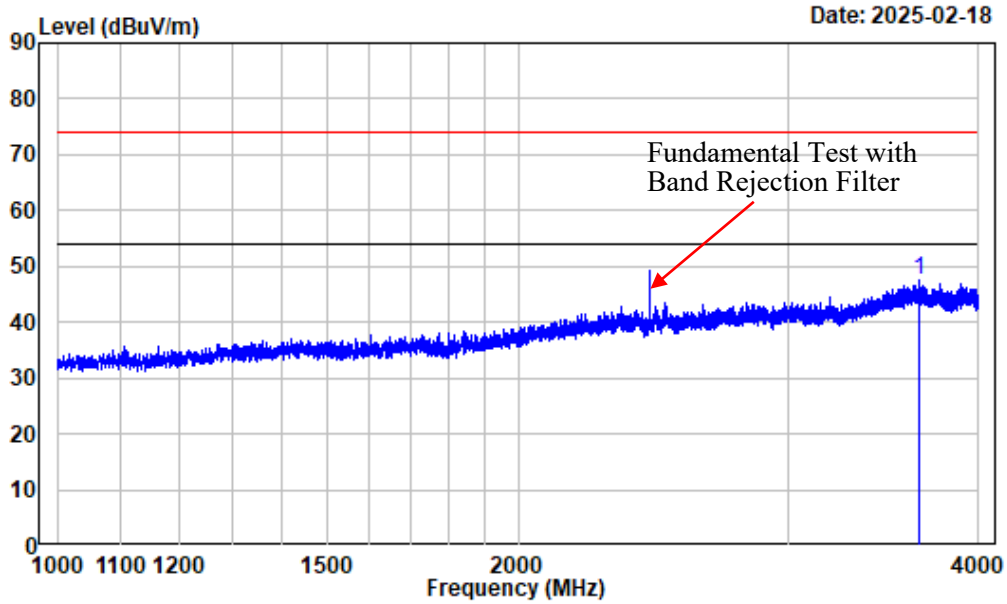
1-4GHz_Horizontal



Condition : Horizontal
Project No. : 2401A25033E-RF
Tester : Zenos Qiao
Spectrum setting: Peak reading:RBW:1MHz VBW:3MHz Detector:Peak
Note : BT-3DH5-2441

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	3676.334	-9.61	56.52	46.91	74.00	-27.09	Peak

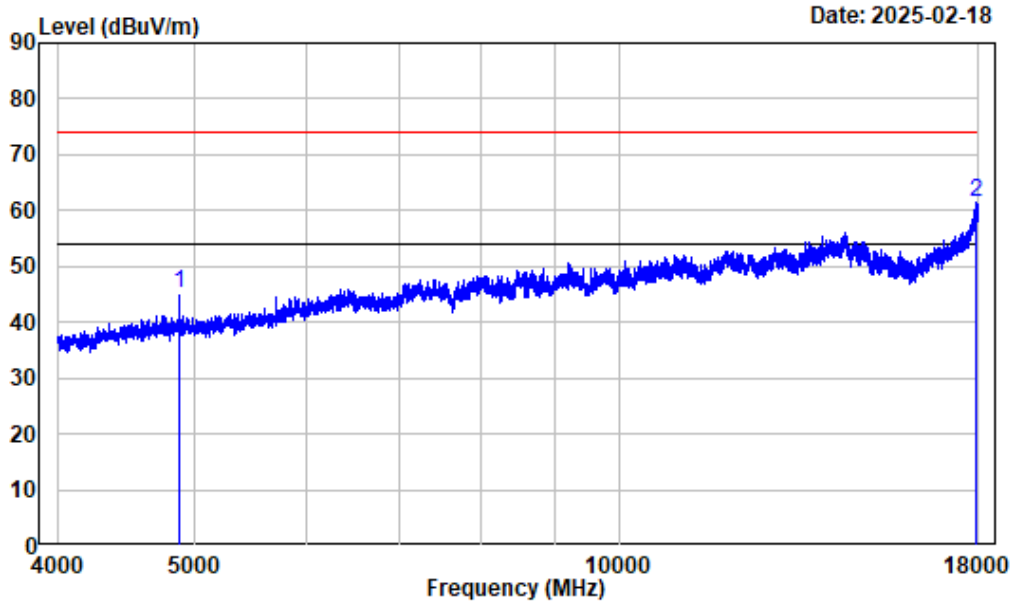
1-4GHz_Vertical



Condition : Vertical
Project No. : 2401A25033E-RF
Tester : Zenos Qiao
Spectrum setting: Peak reading:RBW:1MHz VBW:3MHz Detector:Peak
Note : BT-3DH5-2441

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	3656.457	-9.73	57.11	47.38	74.00	-26.62	Peak

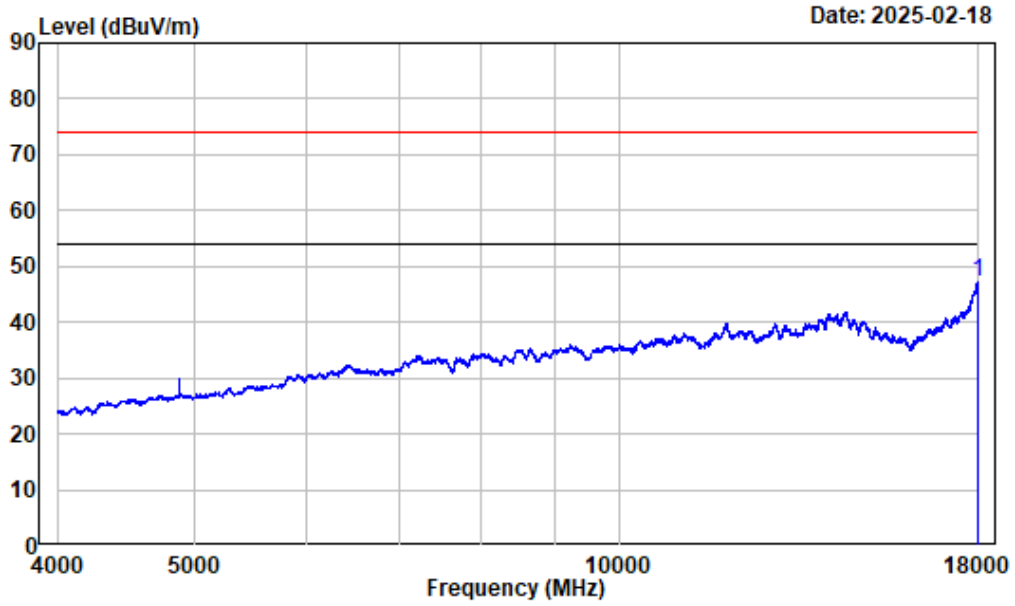
4-18GHz_Horizontal_Peak



Condition : Horizontal
Project No. : 2401A25033E-RF
Tester : Zenos Qiao
Spectrum setting: Peak reading:RBW:1MHz VBW:3MHz Detector:Peak
Note : BT-3DH5-2441

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	4882.000	-7.58	52.87	45.29	74.00	-28.71	Peak
2	17936.990	12.89	48.70	61.59	74.00	-12.41	Peak

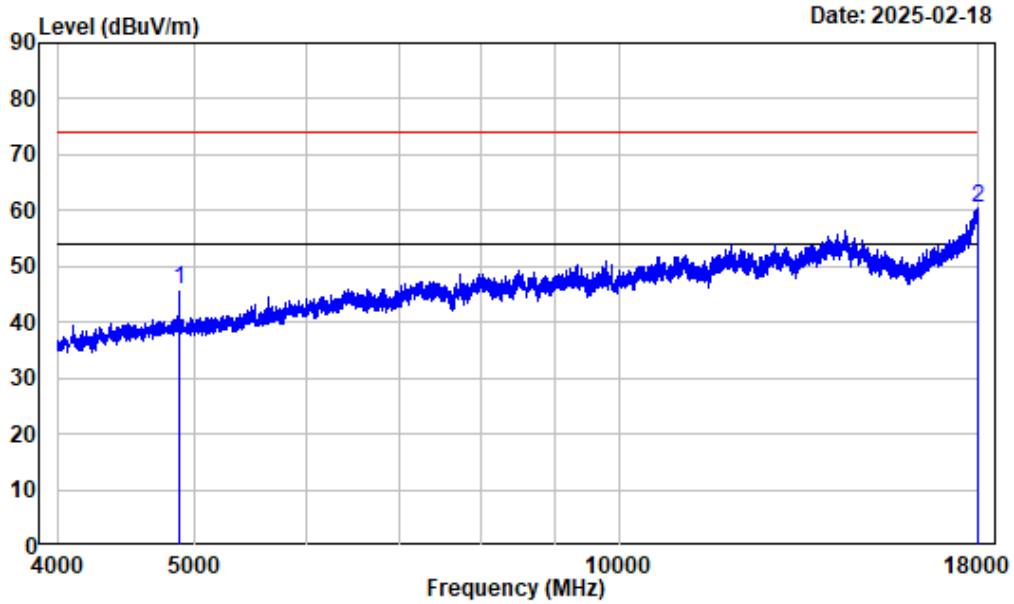
4-18GHz_Horizontal_Average



Condition : Horizontal
Project No. : 2401A25033E-RF
Tester : Zenos Qiao
Spectrum setting: Average reading:RBW:1MHz VBW:1kHz Detector:Peak
Note : BT-3DH5-2441

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	17994.750	13.17	34.12	47.29	54.00	-6.71	Average

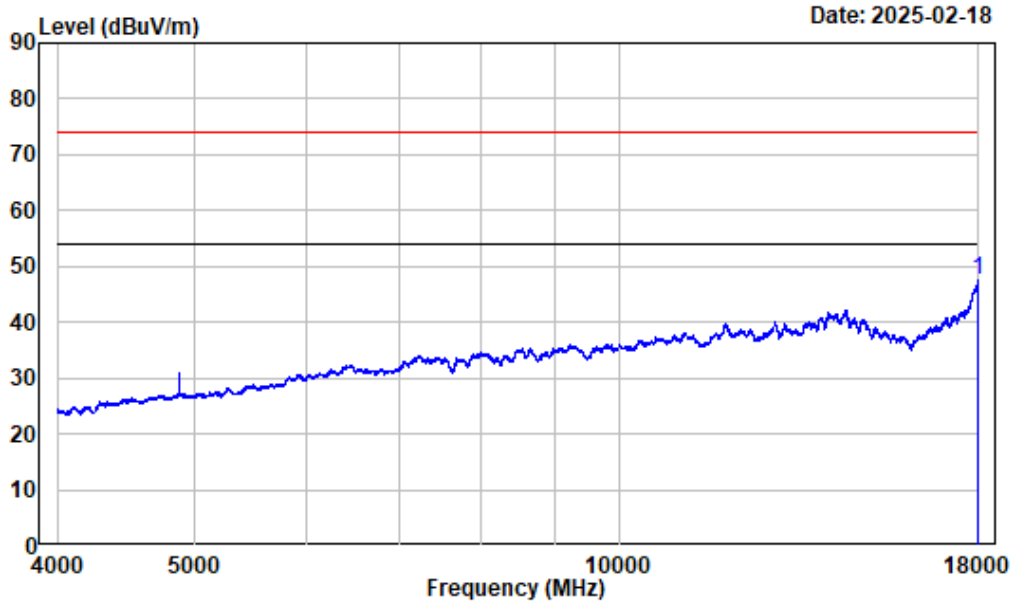
4-18GHz_Vertical_Peak



Condition : Vertical
Project No. : 2401A25033E-RF
Tester : Zenos Qiao
Spectrum setting: Peak reading:RBW:1MHz VBW:3MHz Detector:Peak
Note : BT-3DH5-2441

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	4882.000	-7.58	53.39	45.81	74.00	-28.19	Peak
2	17987.750	13.13	47.36	60.49	74.00	-13.51	Peak

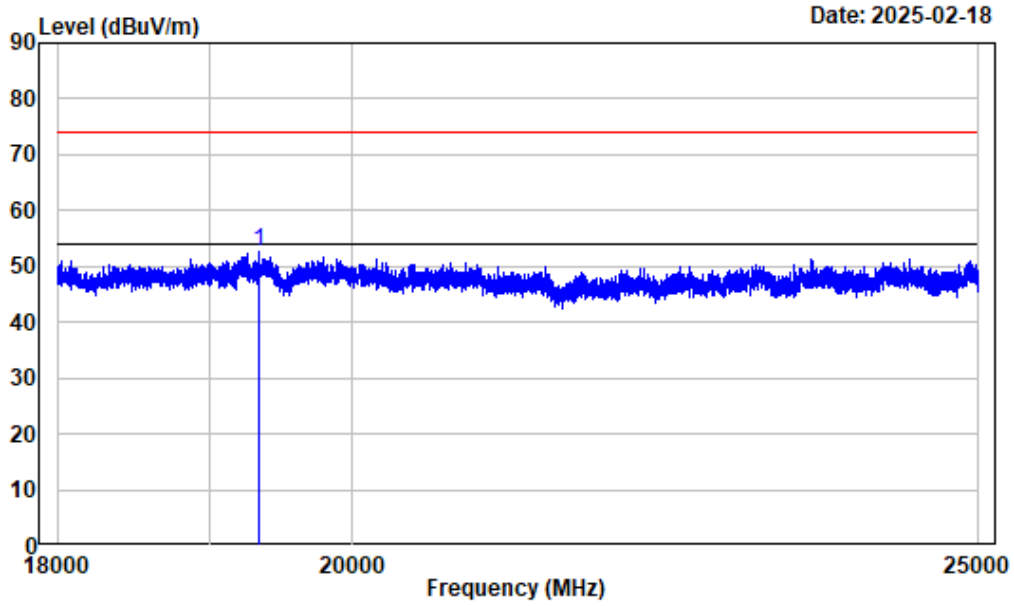
4-18GHz_Vertical_Average



Condition : Vertical
Project No. : 2401A25033E-RF
Tester : Zenos Qiao
Spectrum setting: Average reading:RBW:1MHz VBW:1kHz Detector:Peak
Note : BT-3DH5-2441

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	17998.250	13.19	34.34	47.53	54.00	-6.47	Average

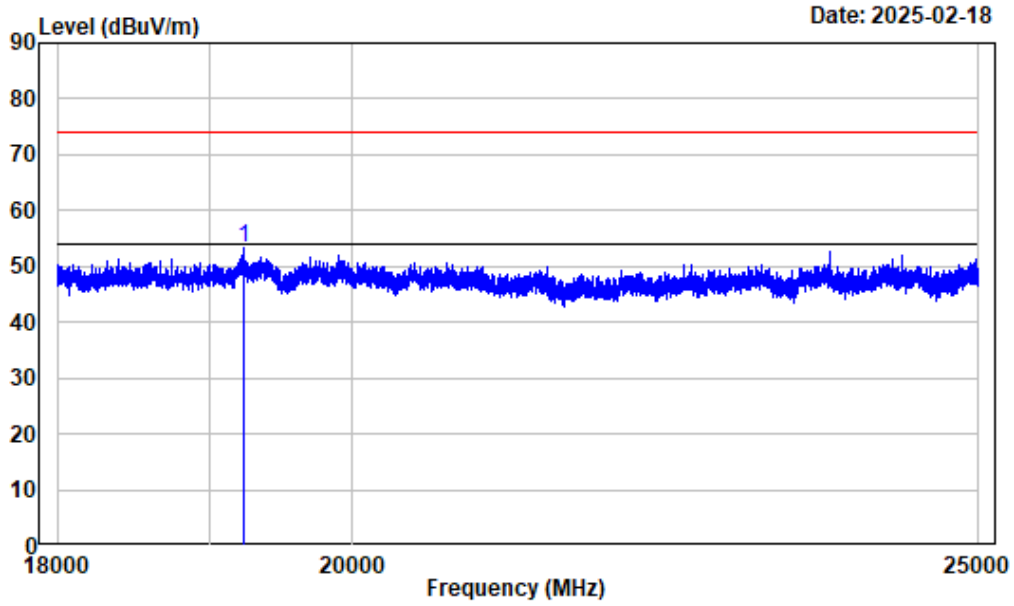
18-25GHz_Horizontal



Condition : Horizontal
Project No. : 2401A25033E-RF
Tester : Zenos Qiao
Spectrum setting: Peak reading:RBW:1MHz VBW:3MHz Detector:Peak
Note : BT-3DH5-2441

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	19342.420	15.15	37.47	52.62	74.00	-21.38	Peak

18-25GHz_Vertical



Condition : Vertical
Project No. : 2401A25033E-RF
Tester : Zenos Qiao
Spectrum setting: Peak reading:RBW:1MHz VBW:3MHz Detector:Peak
Note : BT-3DH5-2441

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	19232.150	15.29	37.91	53.20	74.00	-20.80	Peak

20 dB Emission Bandwidth

Test Information:

Sample No.:	2WQQ-9	**Test Date:**	2025/02/16
Test Site:	RF	**Test Mode:**	Transmitting
Tester:	Kungfumaster Liang	**Test Result:**	N/A

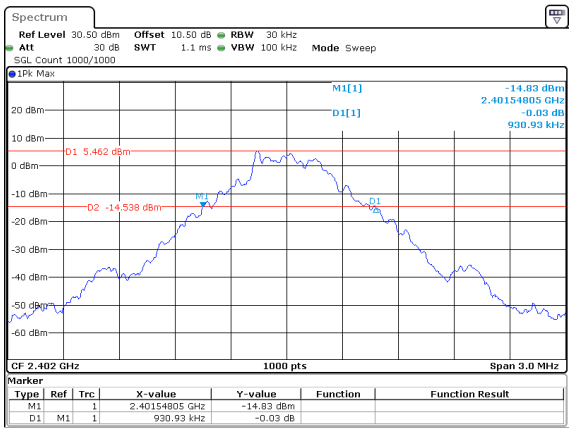
Environmental Conditions:

Temperature: (°C)	23.8	**Relative Humidity: (%)**	47	**ATM Pressure: (kPa)**	101

Test Data:

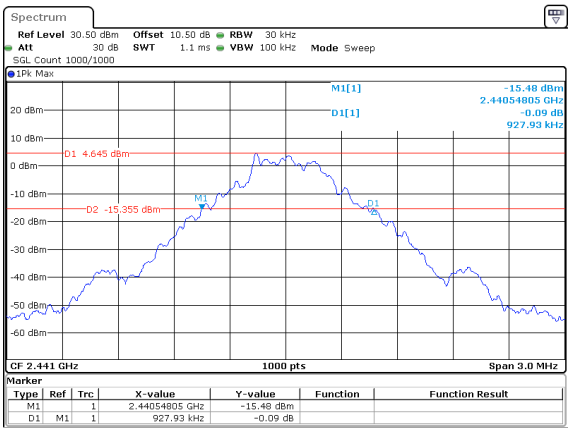
Mode	Channel	Result (MHz)
DH1	Low Channel	0.931
	Middle Channel	0.928
	High Channel	0.928
2DH1	Low Channel	1.228
	Middle Channel	**1.231**
	High Channel	**1.231**
3DH1	Low Channel	1.213
	Middle Channel	1.216
	High Channel	1.219

DH1_Low 0.931MHz



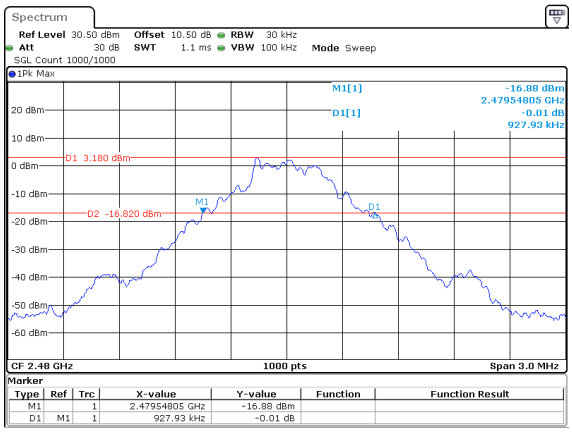
ProjectNo.:2401A25033E-RF Tester:Kungfumaster Liang
Date: 16.FEB.2025 15:23:52

DH1_Middle 0.928MHz



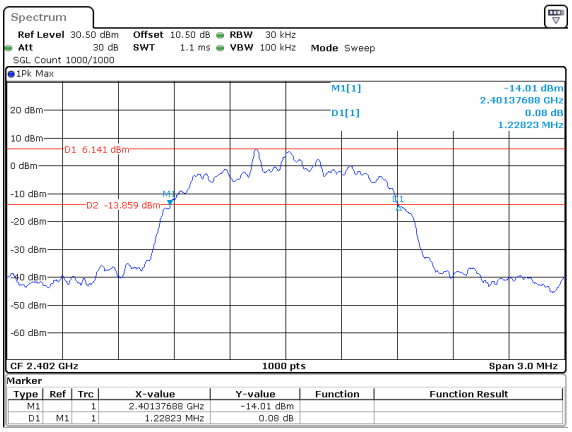
ProjectNo.:2401A25033E-RF Tester:Kungfumaster Liang
Date: 16.FEB.2025 15:25:13

DH1_High 0.928MHz



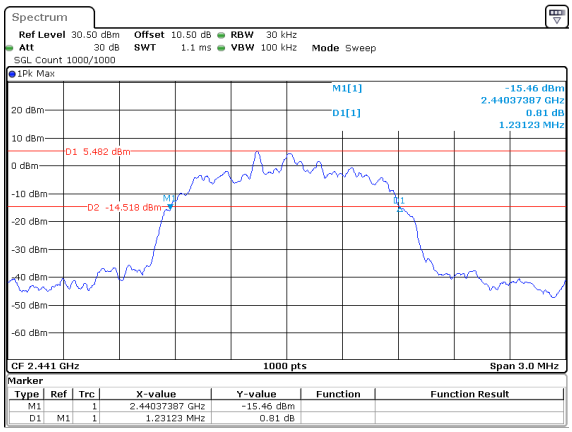
ProjectNo.:2401A25033E-RF Tester:Kungfumaster Liang
Date: 16.FEB.2025 15:26:17

2DH1_Low 1.228MHz



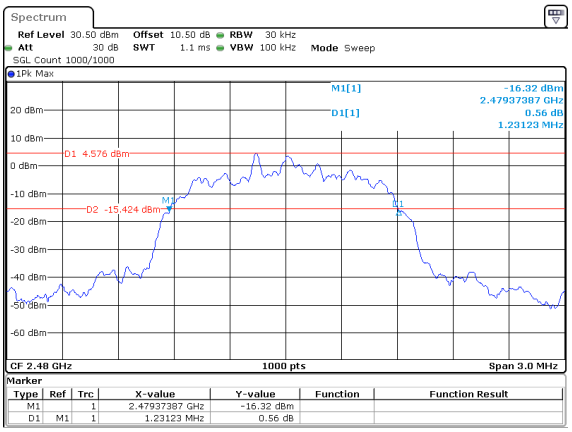
ProjectNo.:2401A25033E-RF Tester:Kungfumaster Liang
Date: 16.FEB.2025 15:32:10

2DH1_Middle 1.231MHz



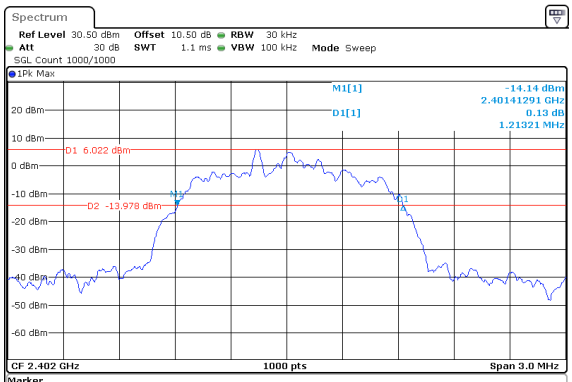
ProjectNo.:2401A25033E-RF Tester:Kungfumaster Liang
Date: 16.FEB.2025 15:34:30

2DH1_High 1.231MHz



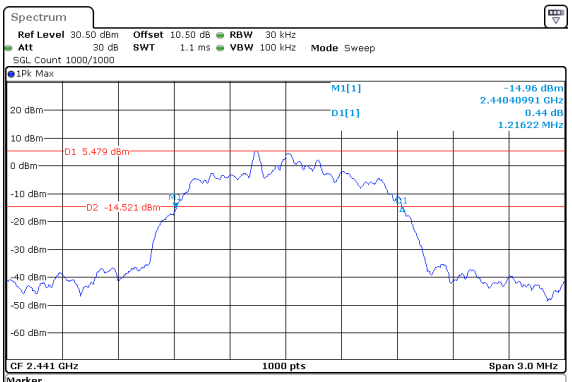
ProjectNo.:2401A25033E-RF Tester:Kungfumaster Liang
Date: 16.FEB.2025 15:35:29

3DH1_Low 1.213MHz



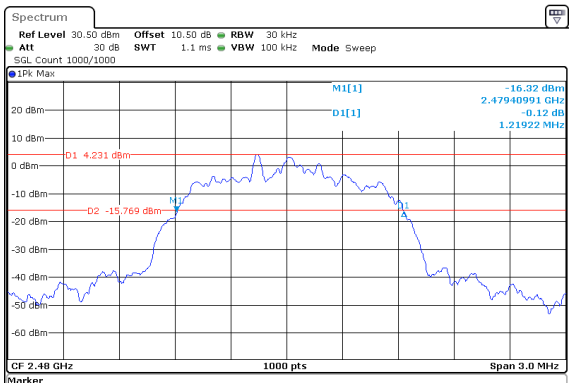
ProjectNo.:2401A25033E-RF Tester:Kungfumaster Liang
Date: 16.FEB.2025 15:36:26

3DH1_Middle 1.216MHz



ProjectNo.:2401A25033E-RF Tester:Kungfumaster Liang
Date: 16.FEB.2025 15:37:20

3DH1_High 1.219MHz



ProjectNo.:2401A25033E-RF Tester:Kungfumaster Liang
Date: 16.FEB.2025 15:38:17

99% Occupied Bandwidth

Test Information:

Sample No.:	2WQQ-9	**Test Date:**	2025/02/16
Test Site:	RF	**Test Mode:**	Transmitting
Tester:	Kungfumaster Liang	**Test Result:**	N/A

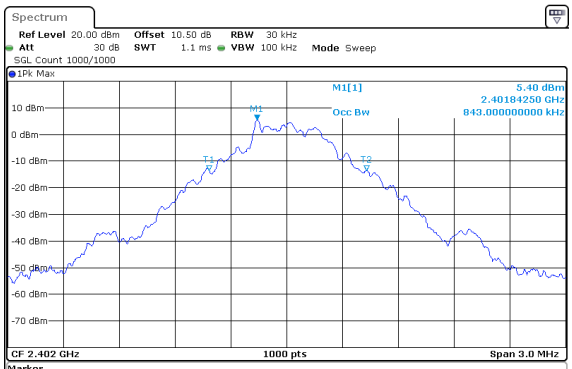
Environmental Conditions:

Temperature: (°C)	23.8	**Relative Humidity: (%)**	47	**ATM Pressure: (kPa)**	101

Test Data:

Mode	Channel	99% OBW (MHz)
DH1	Low Channel	0.843
	Middle Channel	0.849
	High Channel	0.846
2DH1	Low Channel	1.152
	Middle Channel	**1.155**
	High Channel	1.152
3DH1	Low Channel	1.134
	Middle Channel	1.134
	High Channel	1.134

DH1_Low 0.843MHz

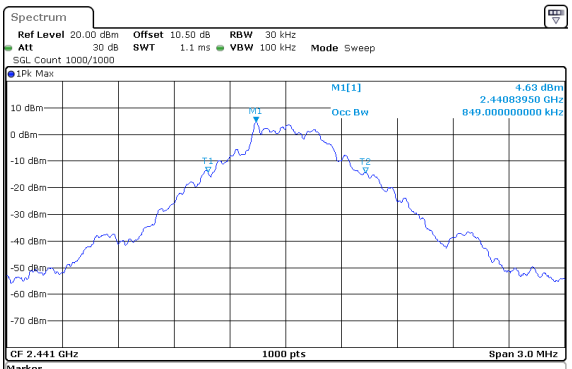


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.4018425 GHz	5.40 dBm		
T1		1	2.4015845 GHz	-13.56 dBm	Occ Bw	843.0 kHz
T2		1	2.4024275 GHz	-13.53 dBm		

ProjectNo.:2401A25033E-RF Tester:Kungfumaster Liang
Date: 16.FEB.2025 15:24:07

DH1_Middle 0.849MHz

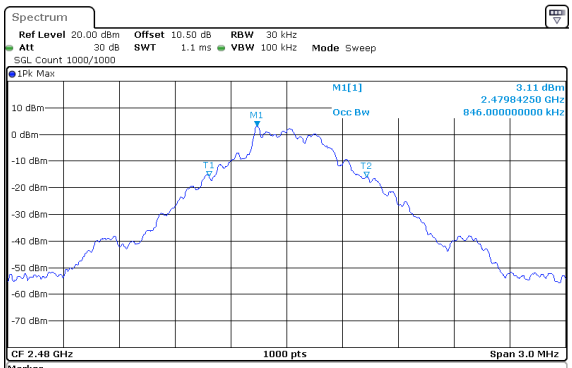


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.4408395 GHz	4.63 dBm		
T1		1	2.4405815 GHz	-14.11 dBm	Occ Bw	849.0 kHz
T2		1	2.4414305 GHz	-14.37 dBm		

ProjectNo.:2401A25033E-RF Tester:Kungfumaster Liang
Date: 16.FEB.2025 15:25:27

DH1_High 0.846MHz

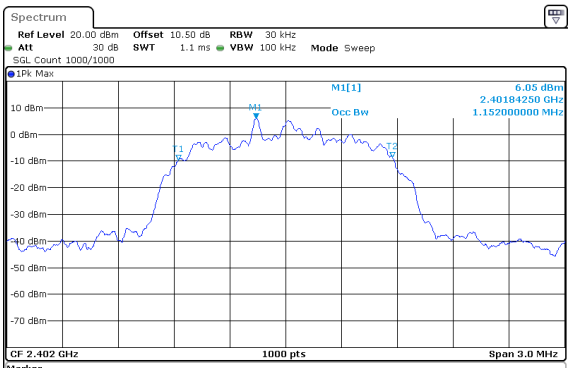


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.4798425 GHz	3.11 dBm		
T1		1	2.4795815 GHz	-15.81 dBm	Occ Bw	846.0 kHz
T2		1	2.4804275 GHz	-16.03 dBm		

ProjectNo.:2401A25033E-RF Tester:Kungfumaster Liang
Date: 16.FEB.2025 15:26:32

2DH1_Low 1.152MHz

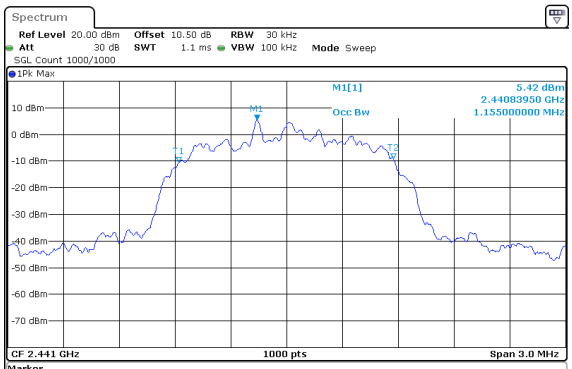


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.4018425 GHz	6.05 dBm		
T1		1	2.4014225 GHz	-9.54 dBm	Occ Bw	1.152 MHz
T2		1	2.4025745 GHz	-8.57 dBm		

ProjectNo.:2401A25033E-RF Tester:Kungfumaster Liang
Date: 16.FEB.2025 15:32:25

2DH1_Middle 1.155MHz

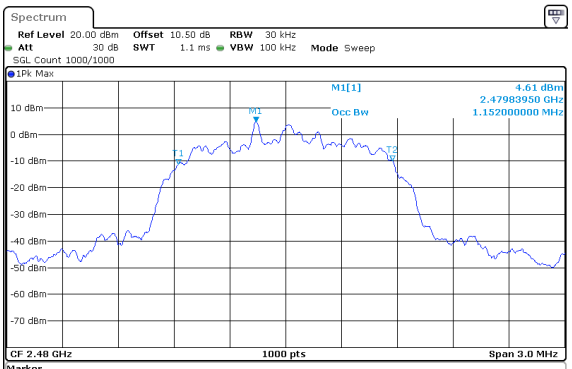


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.4408395 GHz	5.42 dBm		
T1		1	2.4404195 GHz	-10.49 dBm	Occ Bw	1.155 MHz
T2		1	2.4415745 GHz	-9.13 dBm		

ProjectNo.:2401A25033E-RF Tester:Kungfumaster Liang
Date: 16.FEB.2025 15:34:46

2DH1_High 1.152MHz

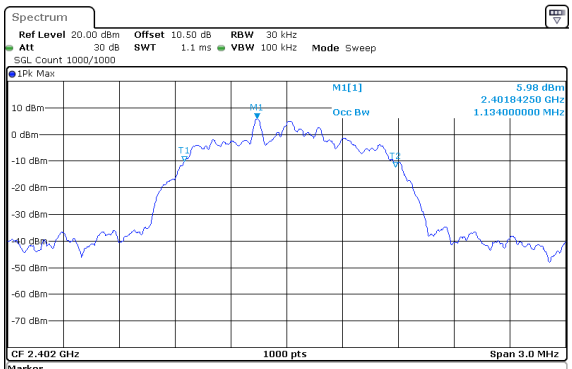


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.4798395 GHz	4.61 dBm		
T1		1	2.4794225 GHz	-11.18 dBm	Occ Bw	1.152 MHz
T2		1	2.4805745 GHz	-9.79 dBm		

ProjectNo.:2401A25033E-RF Tester:Kungfumaster Liang
Date: 16.FEB.2025 15:35:44

3DH1_Low 1.134MHz

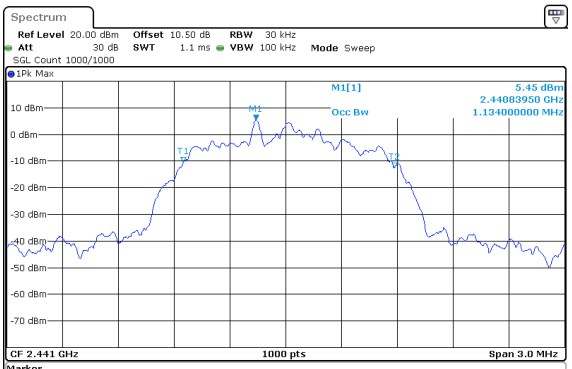


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.4018425 GHz	5.98 dBm		
T1		1	2.4014495 GHz	-10.09 dBm	Occ Bw	1.134 MHz
T2		1	2.4025835 GHz	-12.17 dBm		

ProjectNo.:2401A25033E-RF Tester:Kungfumaster Liang
Date: 16.FEB.2025 15:36:41

3DH1_Middle 1.134MHz

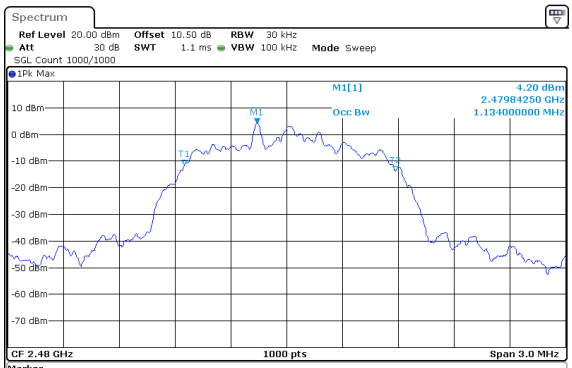


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.4408395 GHz	5.45 dBm		
T1		1	2.4404495 GHz	-10.47 dBm	Occ Bw	1.134 MHz
T2		1	2.4415835 GHz	-12.57 dBm		

ProjectNo.:2401A25033E-RF Tester:Kungfumaster Liang
Date: 16.FEB.2025 15:37:35

3DH1_High 1.134MHz



Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.4798425 GHz	4.20 dBm		
T1		1	2.4794495 GHz	-11.56 dBm	Occ Bw	1.134 MHz
T2		1	2.4805835 GHz	-13.80 dBm		

ProjectNo.:2401A25033E-RF Tester:Kungfumaster Liang
Date: 16.FEB.2025 15:38:32

Channel Separation

Test Information:

Sample No.:	2WQQ-9	**Test Date:**	2025/03/05
Test Site:	RF	**Test Mode:**	Transmitting
Tester:	Kungfumaster Liang	**Test Result:**	Pass

Environmental Conditions:

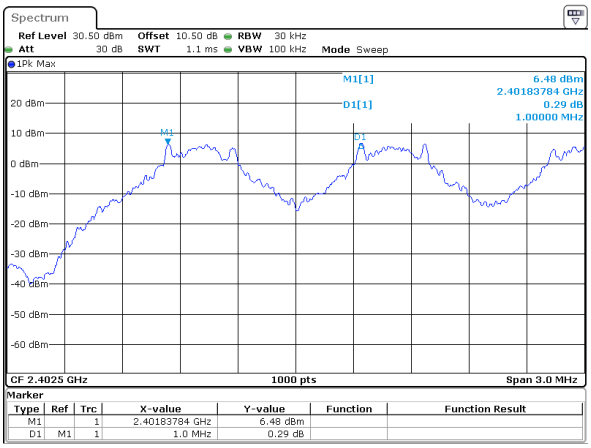
Temperature: (°C)	24.7	**Relative Humidity: (%)**	50	**ATM Pressure: (kPa)**	103

Test Data:

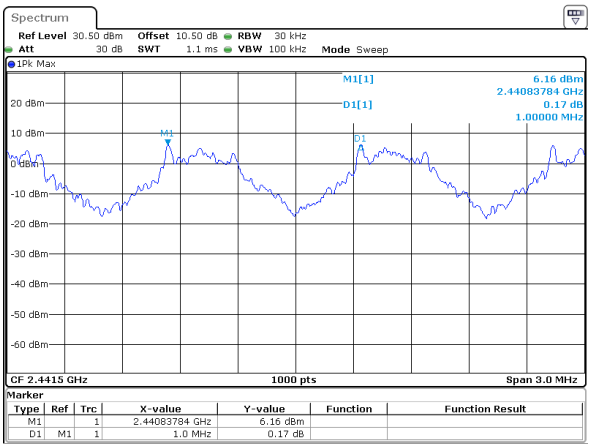
Mode	Channel	Result (MHz)	Limit (MHz)	Verdict
DH1	Low Channel	1.000	0.819	Pass
	Middle Channel	1.000	0.821	Pass
	High Channel	**1.003**	0.821	Pass

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

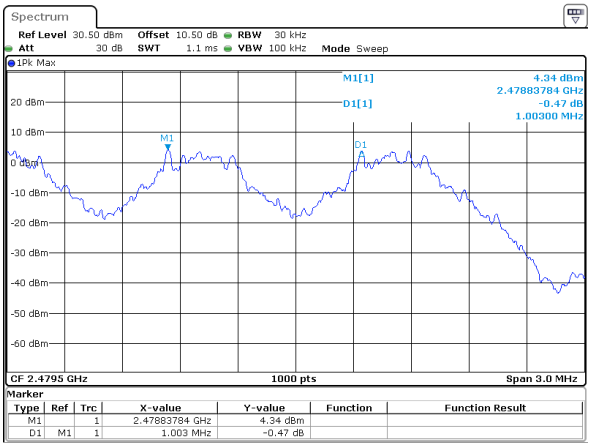
DH1_Low



DH1_Middle



DH1_High



Number of Hopping Frequency

Test Information:

Sample No.:	2WQQ-9	**Test Date:**	2025/03/05
Test Site:	RF	**Test Mode:**	Transmitting
Tester:	Kungfumaster Liang	**Test Result:**	Pass

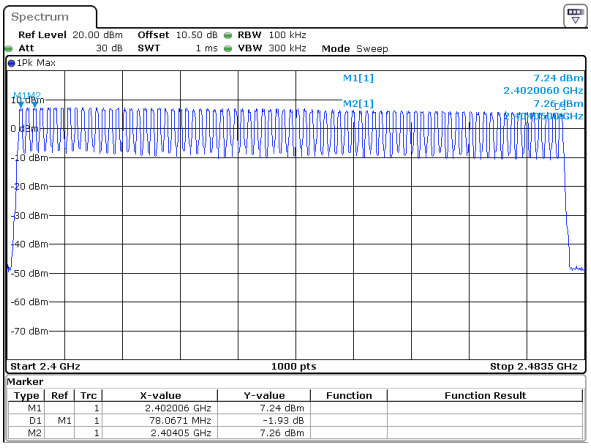
Environmental Conditions:

Temperature: (°C)	24.7	**Relative Humidity: (%)**	50	**ATM Pressure: (kPa)**	103

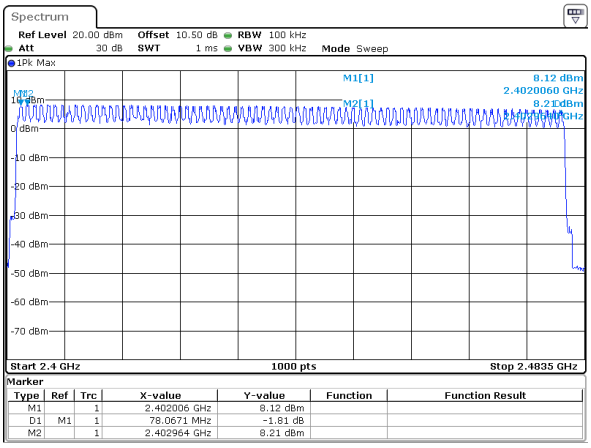
Test Data:

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

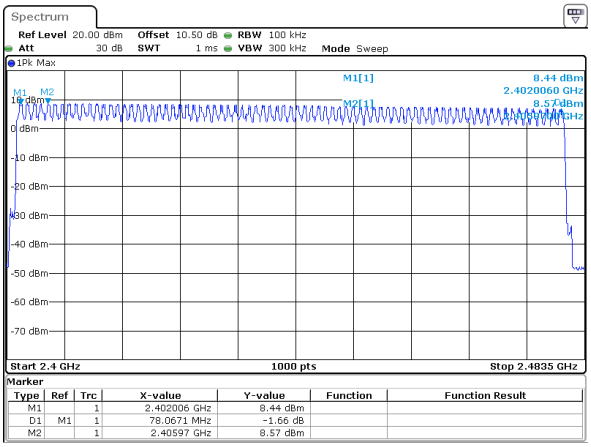
DH1_Hopping 79



2DH1_Hopping 79



3DH1_Hopping 79



Maximum Conducted Output Power

Test Information:

Sample No.:	2WQQ-9	**Test Date:**	2025/02/16
Test Site:	RF	**Test Mode:**	Transmitting
Tester:	Kungfumaster Liang	**Test Result:**	Pass

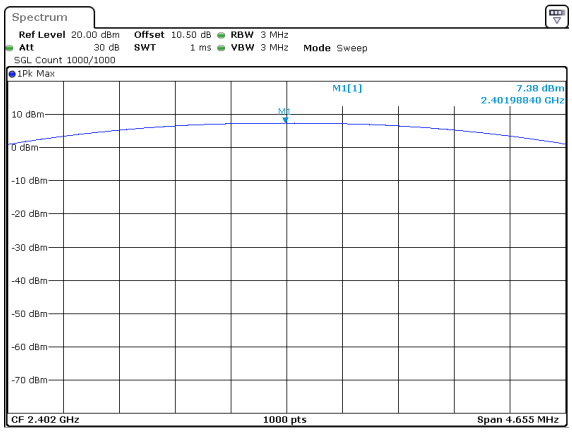
Environmental Conditions:

Temperature: (°C)	23.8	**Relative Humidity: (%)**	47	**ATM Pressure: (kPa)**	101

Test Data:

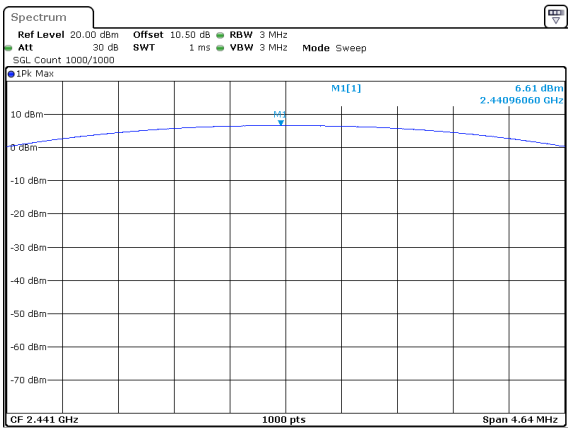
Mode	Channel	Frequency (MHz)	Result (dBm)	Limit (dBm)	Verdict
DH1	Low Channel	2402	7.38	21.00	Pass
	Middle Channel	2441	6.61	21.00	Pass
	High Channel	2480	5.14	21.00	Pass
2DH1	Low Channel	2402	9.16	21.00	Pass
	Middle Channel	2441	8.56	21.00	Pass
	High Channel	2480	7.76	21.00	Pass
3DH1	Low Channel	2402	**9.72**	21.00	Pass
	Middle Channel	2441	9.20	21.00	Pass
	High Channel	2480	8.01	21.00	Pass

DH1_Low 7.38dBm



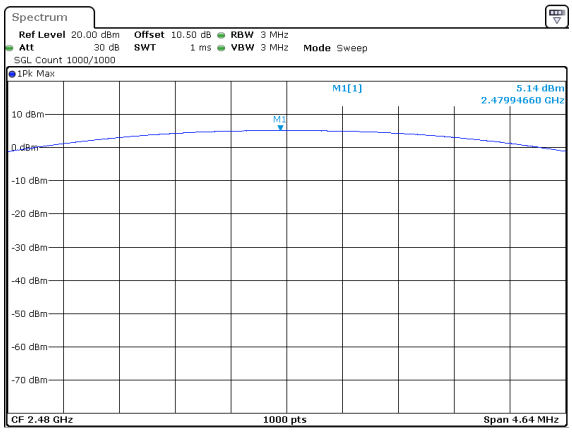
ProjectNo.:2401A25033E-RF Tester:Kungfumaster Liang
Date: 16.FEB.2025 15:24:43

DH1_Middle 6.61dBm



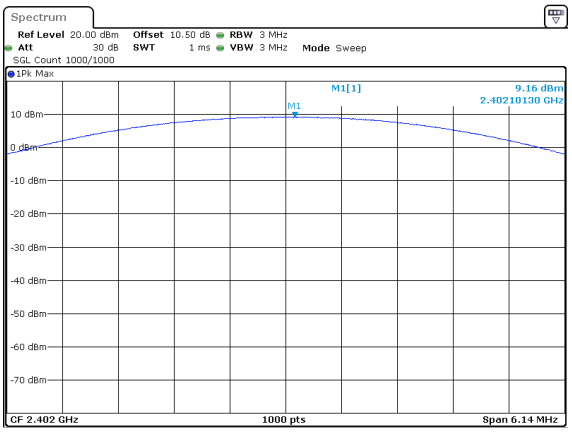
ProjectNo.:2401A25033E-RF Tester:Kungfumaster Liang
Date: 16.FEB.2025 15:25:47

DH1_High 5.14dBm



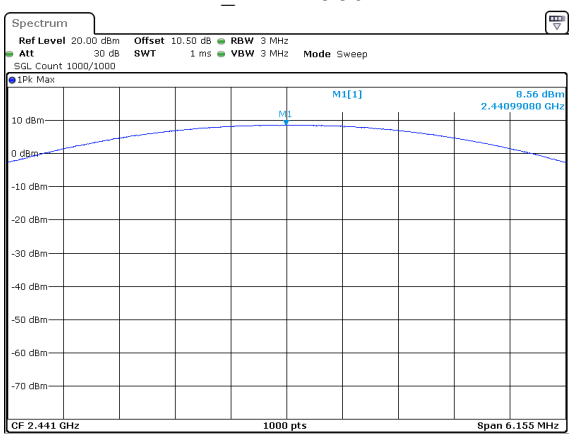
ProjectNo.:2401A25033E-RF Tester:Kungfumaster Liang
Date: 16.FEB.2025 15:26:59

2DH1_Low 9.16dBm



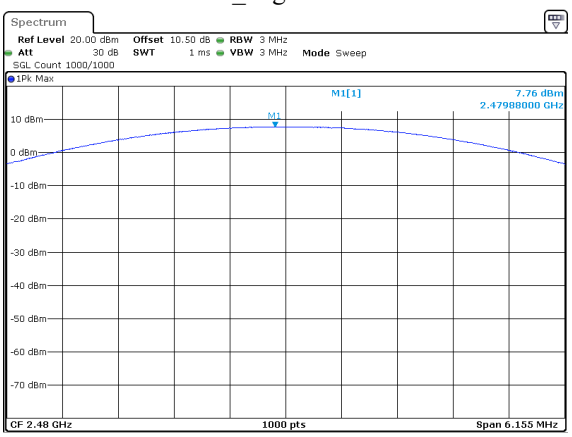
ProjectNo.:2401A25033E-RF Tester:Kungfumaster Liang
Date: 16.FEB.2025 15:34:02

2DH1_Middle 8.56dBm



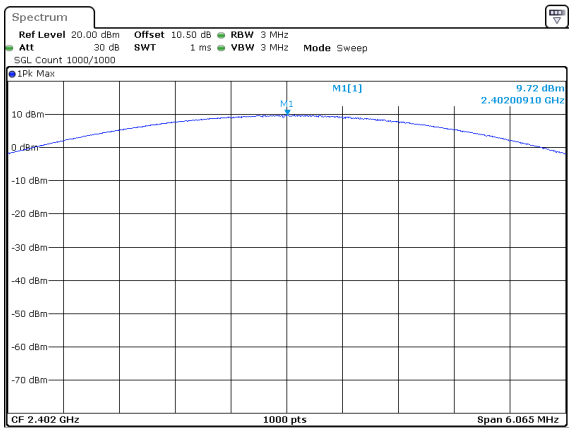
ProjectNo.:2401A25033E-RF Tester:Kungfumaster Liang
Date: 16.FEB.2025 15:34:59

2DH1_High 7.76dBm



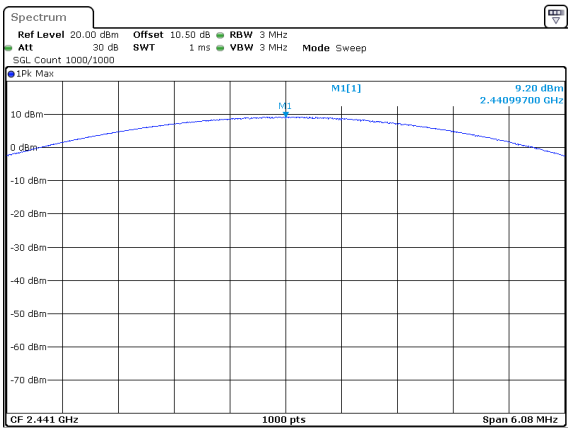
ProjectNo.:2401A25033E-RF Tester:Kungfumaster Liang
Date: 16.FEB.2025 15:35:57

3DH1_Low 9.72dBm



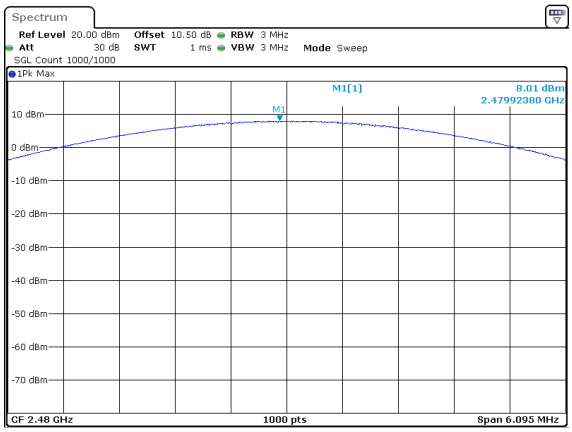
ProjectNo.:2401A25033E-RF Tester:Kungfumaster Liang
Date: 16.FEB.2025 15:36:54

3DH1_Middle 9.20dBm



ProjectNo.:2401A25033E-RF Tester:Kungfumaster Liang
Date: 16.FEB.2025 15:37:50

3DH1_High 8.01dBm



ProjectNo.:2401A25033E-RF Tester:Kungfumaster Liang
Date: 16.FEB.2025 15:38:45

100 kHz Bandwidth of Frequency Band Edge

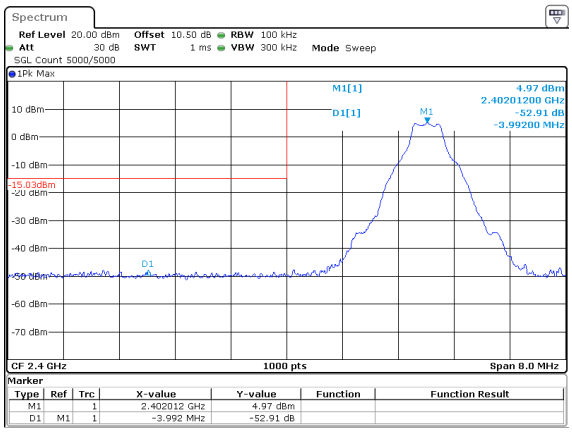
Test Information:

Sample No.:	2WQQ-9	**Test Date:**	2025/02/16
Test Site:	RF	**Test Mode:**	Transmitting
Tester:	Kungfumaster Liang	**Test Result:**	Pass

Environmental Conditions:

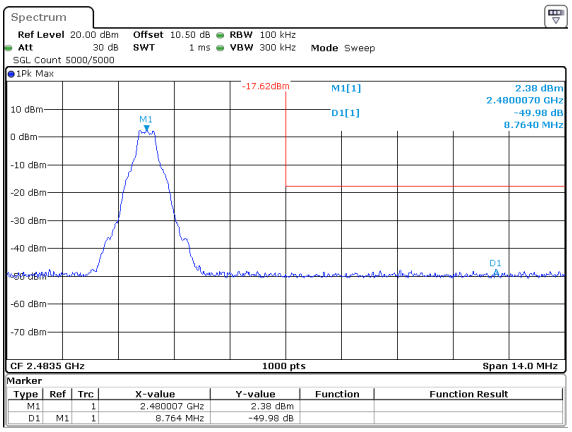
Temperature: (°C)	23.8	**Relative Humidity: (%)**	47	**ATM Pressure: (kPa)**	101

DH1_Low



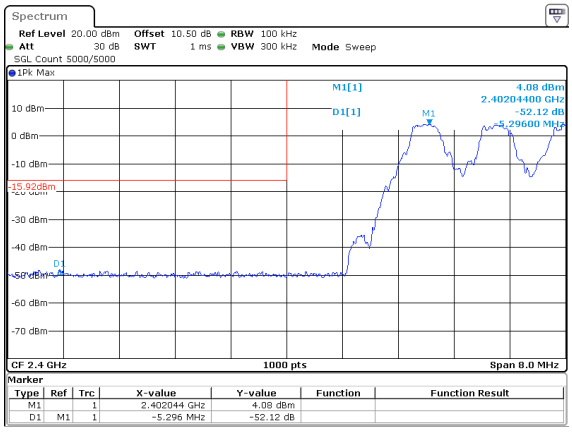
ProjectNo.:2401A25033E-RF Tester:Kungfumaster Liang
Date: 16.FEB.2025 16:36:53

DH1_High



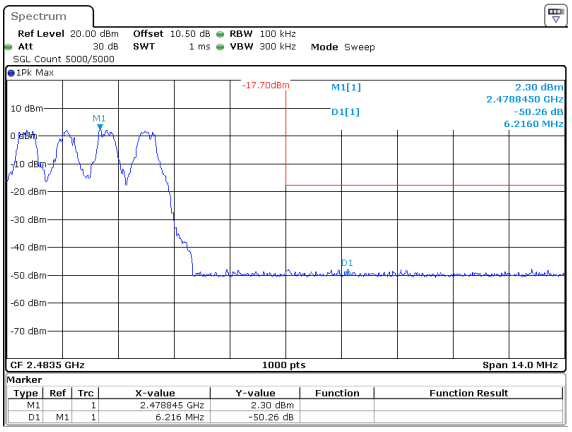
ProjectNo.:2401A25033E-RF Tester:Kungfumaster Liang
Date: 16.FEB.2025 16:38:27

DH1_Hopping_Lower



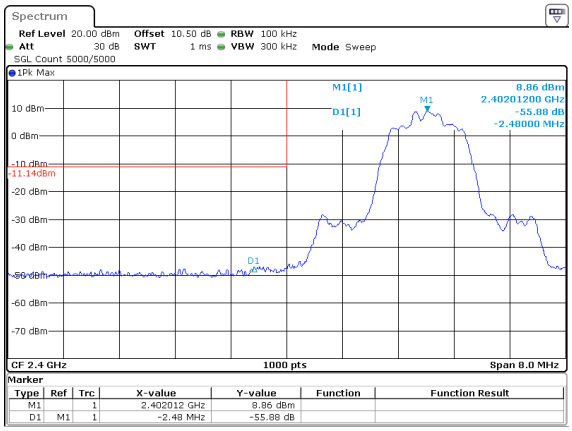
ProjectNo.:2401A25033E-RF Tester:Kungfumaster Liang
Date: 16.FEB.2025 16:51:30

DH1_Hopping_Upper



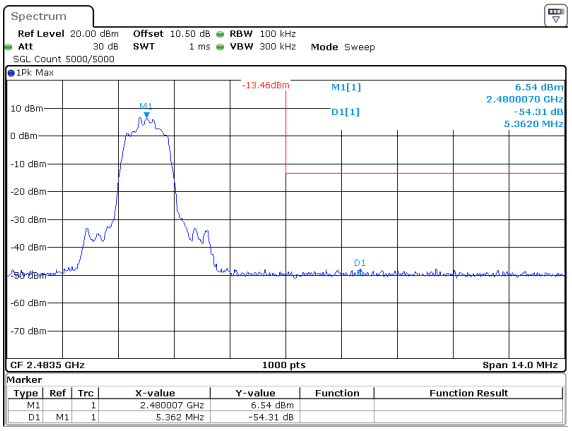
ProjectNo.:2401A25033E-RF Tester:Kungfumaster Liang
Date: 16.FEB.2025 16:52:55

2DH1_Low



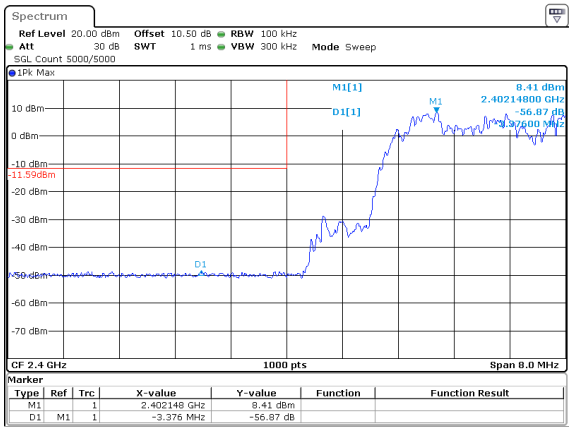
ProjectNo.:2401A25033E-RF Tester:Kungfumaster Liang
Date: 16.FEB.2025 16:40:42

2DH1_High



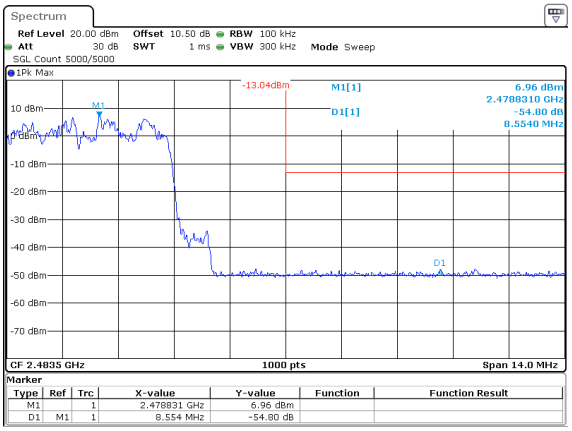
ProjectNo.:2401A25033E-RF Tester:Kungfumaster Liang
Date: 16.FEB.2025 16:42:12

2DH1_Hopping_Lower



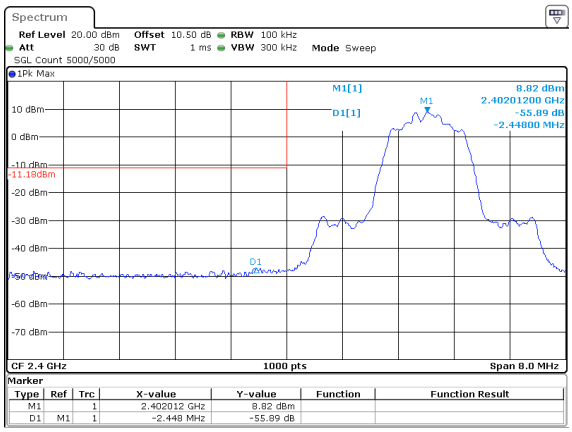
ProjectNo.:2401A25033E-RF Tester:Kungfumaster Liang
Date: 16.FEB.2025 16:56:21

2DH1_Hopping_Upper



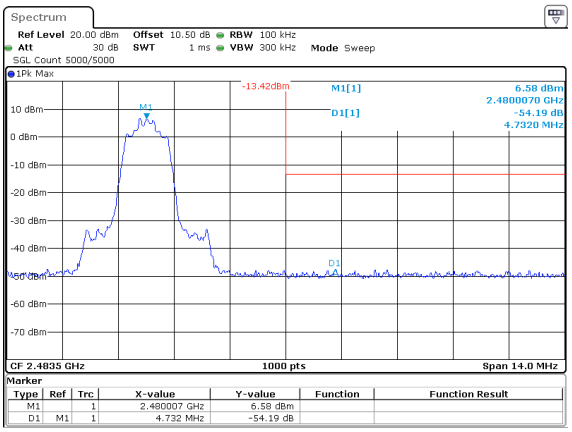
ProjectNo.:2401A25033E-RF Tester:Kungfumaster Liang
Date: 16.FEB.2025 16:57:40

3DH1_Low



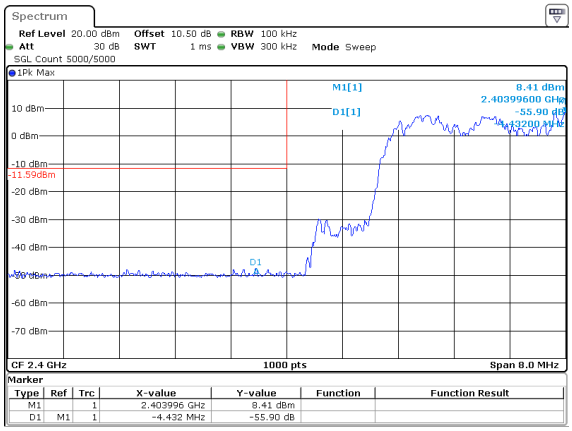
ProjectNo.:2401A25033E-RF Tester:Kungfumaster Liang
Date: 16.FEB.2025 16:45:13

3DH1_High



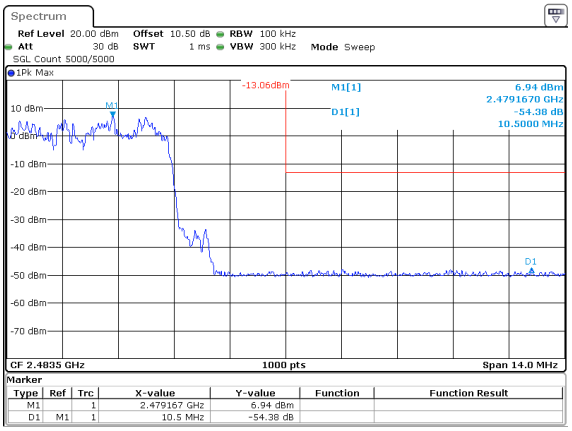
ProjectNo.:2401A25033E-RF Tester:Kungfumaster Liang
Date: 16.FEB.2025 16:46:47

3DH1_Hopping_Lower



ProjectNo.:2401A25033E-RF Tester:Kungfumaster Liang
Date: 16.FEB.2025 16:59:28

3DH1_Hopping_Upper



ProjectNo.:2401A25033E-RF Tester:Kungfumaster Liang
Date: 16.FEB.2025 17:00:53

Time of Occupancy (dwell time)

Test Information:

Sample No.:	2WQQ-9	**Test Date:**	2025/02/16
Test Site:	RF	**Test Mode:**	Transmitting
Tester:	Kungfumaster Liang	**Test Result:**	Pass

Environmental Conditions:

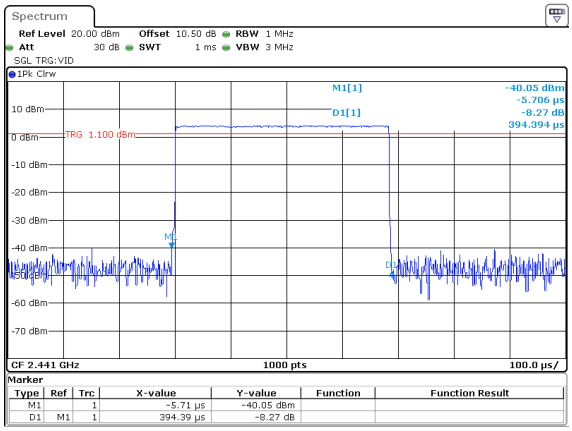
Temperature: (°C)	23.8	**Relative Humidity: (%)**	47	**ATM Pressure: (kPa)**	101

Test Data:

Mode	Channel	Pulse width (ms)	Dwell time (s)	Limit (s)	Verdict
DH1	Hopping Channel	0.394	0.126	0.400	Pass
DH3	Hopping Channel	1.655	0.265	0.400	Pass
DH5	Hopping Channel	2.908	0.310	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	**2.918**	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

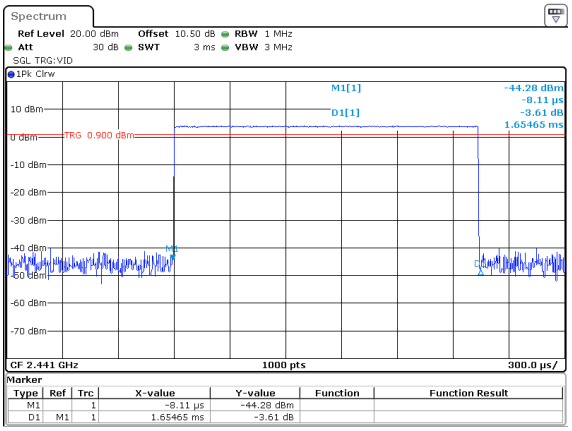
Note:
DH1:Dwell time=Pulse width (ms) × (1600/2/79) ×31.6 s
DH3:Dwell time=Pulse width (ms) × (1600/4/79) ×31.6 s
DH5:Dwell time=Pulse width (ms) × (1600/6/79) ×31.6 s
2DH1: Dwell time=Pulse width (ms) × (1600/2/79) ×31.6 s
2DH3: Dwell time=Pulse width (ms) × (1600/4/79) ×31.6 s
2DH5: Dwell time=Pulse 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 0.394ms



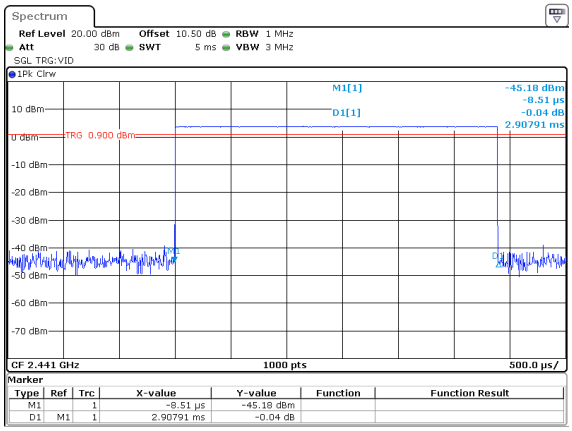
ProjectNo.:2401A25033E-RF Tester:Kungfumaster Liang
Date: 16.FEB.2025 17:03:22

DH3_Hopping 1.655ms



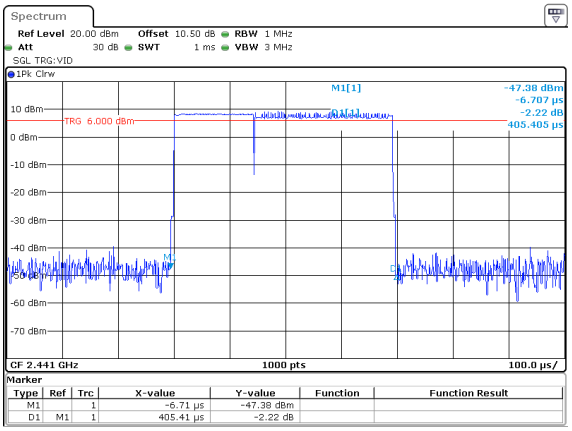
ProjectNo.:2401A25033E-RF Tester:Kungfumaster Liang
Date: 16.FEB.2025 17:04:05

DH5_Hopping 2.908ms



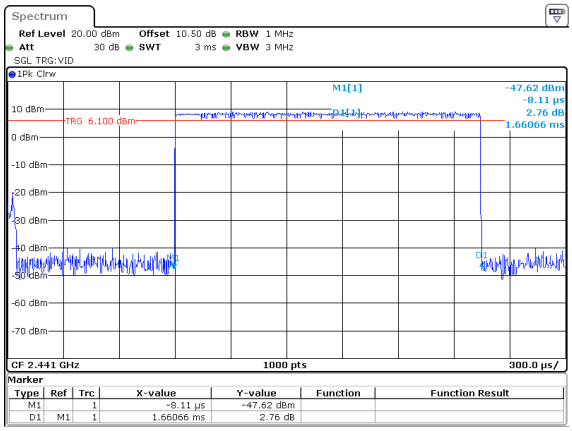
ProjectNo.:2401A25033E-RF Tester:Kungfumaster Liang
Date: 16.FEB.2025 17:05:05

2DH1_Hopping 0.405ms



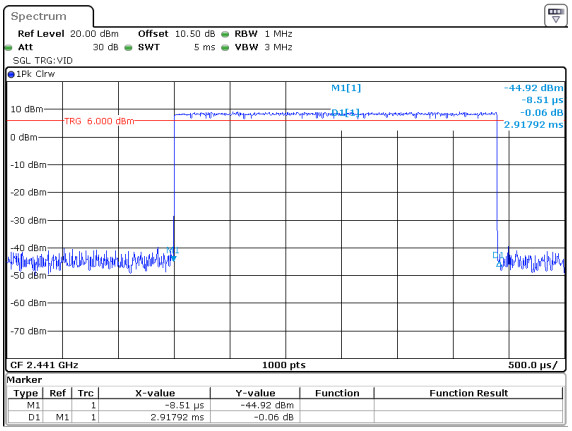
ProjectNo.:2401A25033E-RF Tester:Kungfumaster Liang
Date: 16.FEB.2025 17:05:51

2DH3_Hopping 1.661ms



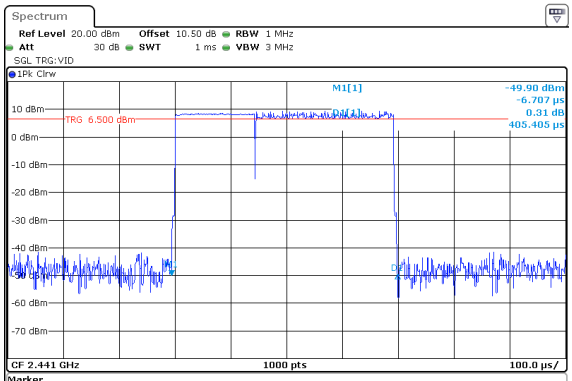
ProjectNo.:2401A25033E-RF Tester:Kungfumaster Liang
Date: 16.FEB.2025 17:06:44

2DH5_Hopping 2.918ms



ProjectNo.:2401A25033E-RF Tester:Kungfumaster Liang
Date: 16.FEB.2025 17:07:42

3DH1_Hopping 0.405ms

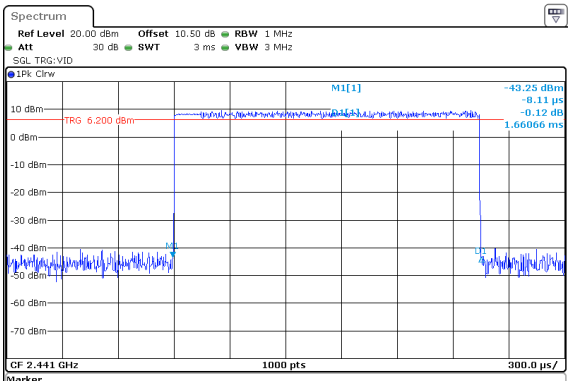


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	-6.71 µs	-49.90 dBm		
D1	M1	1	405.41 µs	0.31 dB		

ProjectNo.:2401A25033E-RF Tester:Kungfumaster Liang
Date: 16.FEB.2025 17:08:34

3DH3_Hopping 1.661ms

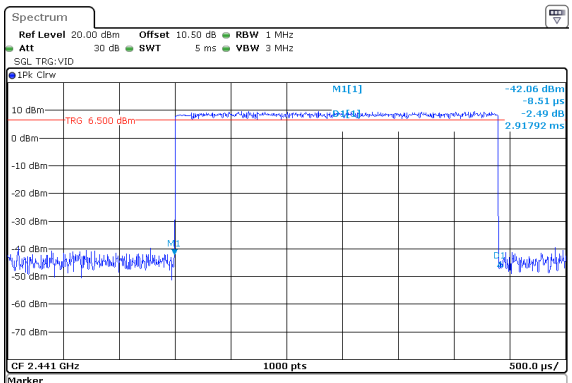


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	-8.11 µs	-43.25 dBm		
D1	M1	1	1.66066 ms	-0.12 dB		

ProjectNo.:2401A25033E-RF Tester:Kungfumaster Liang
Date: 16.FEB.2025 17:09:16

3DH5_Hopping 2.918ms



Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	-8.51 µs	-42.06 dBm		
D1	M1	1	2.91792 ms	-2.49 dB		

ProjectNo.:2401A25033E-RF Tester:Kungfumaster Liang
Date: 16.FEB.2025 17:09:57

RF EXPOSURE EVALUATION

MPE-Based Exemption

Applicable Standard

According to 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	10.0	2.72	0.57	10.57	11.40	0.2	768
BLE	2402-2480	8.0	2.72	0.57	8.57	7.19	0.2	768
2.4G Wi-Fi	2412-2462	21.5	4.54	2.39	23.89	244.91	0.2	768
5G Wi-Fi	5180-5240	15.0	4.19	2.04	17.04	50.58	0.2	768
	5260-5320	15.0	4.19	2.04	17.04	50.58	0.2	768
	5500-5720	16.0	4.19	2.04	18.04	63.68	0.2	768
	5745-5825	15.5	4.19	2.04	17.54	56.75	0.2	768

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

Simultaneous transmitting consideration (worst case):

The ratio= ERP_{BT}/limit + $ERP_{2.4G\ Wi\text{-}Fi}$/limit = 11.40/768+ 244.91/768 =0.33<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

EUT PHOTOGRAPHS

Please refer to the attachment 2401A25033E-RF External photo and 2401A25033E-RF Internal photo.

TEST SETUP PHOTOGRAPHS

Please refer to the attachment 2401A25033E-RFA Test Setup photo.

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