TEST REPORT

Application No.:	SHCR2205000961AT
FCC ID:	2A2K9-MIL-BTREC
Applicant:	PROSPEC ELECTRONICS of SC, Inc.
Address of Applicant:	3325 SOUTH MORGANS POINT ROAD ,Mt. PLEASANT.Mt. South Carolina 29466 United States
Equipment Under Test (EUT):	
EUT Name:	BT RECEIVER
Model No.:	MIL - BTREC
Trade Mark:	Milennia
Standard(s) :	47 CFR Part 15, Subpart C 15.247
Date of Receipt:	2022-05-13
Date of Test:	2022-05-20 to 2022-05-25
Date of Issue:	2022-06-04
Test Result:	**Pass***

* In the configuration tested, the EUT complied with the standards specified above.

Parlam Zhan

Parlam Zhan
Laboratory Manager

Revision Record			
Version	**Description**	**Date**	**Remark**
00	Original	2022-06-04	/

Authorized for issue by:				
		Bill Wu **Bill Wu/Project Engineer**		
		Parlam Zhan **Parlam Zhan/Reviewer**		

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2 Test Summary

Radio Spectrum Technical Requirement				
Item	**Standard**	**Method**	**Requirement**	**Result**
Antenna Requirement	47 CFR Part 15, Subpart C 15.247	N/A	47 CFR Part 15, Subpart C 15.203 & 15.247(b)(4)	Pass
Other requirements Frequency Hopping Spread Spectrum System Hopping Sequence		N/A	47 CFR Part 15, Subpart C 15.247(a)(1),(g),(h)	Pass

Radio Spectrum Matter Part				
Item	**Standard**	**Method**	**Requirement**	**Result**
Conducted Peak Output Power	47 CFR Part 15, Subpart C 15.247	ANSI C63.10 (2013) Section 7.8.5	47 CFR Part 15, Subpart C 15.247(b)(1)	Pass
20dB Bandwidth		ANSI C63.10 (2013) Section 7.8.7	47 CFR Part 15, Subpart C 15.247(a)(1)	Pass
Carrier Frequencies Separation		ANSI C63.10 (2013) Section 7.8.2	47 CFR Part 15, Subpart C 15.247a(1)	Pass
Hopping Channel Number		ANSI C63.10 (2013) Section 7.8.3	47 CFR Part 15, Subpart C 15.247a(1)(iii)	Pass
Dwell Time		ANSI C63.10 (2013) Section 7.8.4	47 CFR Part 15, Subpart C 15.247a(1)(iii)	Pass
Conducted Band Edges Measurement		ANSI C63.10 (2013) Section 7.8.6	47 CFR Part 15, Subpart C 15.247(d)	Pass
Conducted Spurious Emissions		ANSI C63.10 (2013) Section 7.8.8	47 CFR Part 15, Subpart C 15.247(d)	Pass
Radiated Emissions which fall in the restricted bands		ANSI C63.10 (2013) Section 6.10.5	47 CFR Part 15, Subpart C 15.205 & 15.209	Pass
Radiated Spurious Emissions Below 1GHz		ANSI C63.10 (2013) Section 6.4,6.5	47 CFR Part 15, Subpart C 15.205 & 15.209	Pass
Radiated Spurious Emissions Above 1GHz		ANSI C63.10 (2013) Section 6.6	47 CFR Part 15, Subpart C 15.205 & 15.209	Pass

3 Contents

4 General Information

4.1 Details of E.U.T.

Power supply:	DC 12V
Test Voltage:	DC 12V
Operation Frequency:	2402MHz to 2480MHz
Modulation Type:	GFSK, pi/4DQPSK, 8DPSK
Number of Channels:	79
Channel Spacing:	1MHz
Spectrum Spread Technology:	Frequency Hopping Spread Spectrum(FHSS)
Antenna Type:	PCB Antenna
Antenna Gain:	0dBi (Provided by manufacturer)
Bluetooth Version:	V5.0

4.2 Power level setting using in test:

Channel	Level
2402	3
2441	3
2480	3

4.3 Description of Support Units

Description	Manufacturer	Model No.	Serial No.
Laptop	Lenovo	ThinkPad X100e	/
Serial port adapter plate	/	Test Plate 3	/
DC Source	/	/	/

4.4 Measurement Uncertainty & Decision Rule

No.	Item	Measurement Uncertainty
1	Radio Frequency	8.4 x 10-8
2	Timeout	2s
3	Duty cycle	0.4%
4	Occupied Bandwidth	3%
5	RF conducted power	0.6dB
6	RF power density	2.9dB
7	Conducted Spurious emissions	0.75dB
8	RF Radiated power	5.2dB (Below 1GHz)
		5.9dB (Above 1GHz)
9	Radiated Spurious emission test	4.2dB (Below 30MHz)
		4.5dB (30MHz-1GHz)
		5.1dB (1GHz-6GHz)
		5.4dB (6GHz-18GHz)
10	Temperature test	1°C
11	Humidity test	3%
12	Supply voltages	1.5%
13	Time	3%

Note: The measurement uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

4.5 Test Location

All tests were performed at:

SGS-CSTC Standards Technical Services (Shanghai) Co., Ltd. E&E Lab

588 West Jindu Road, Xinqiao, Songjiang, 201612 Shanghai, China

Tel: +86 21 6191 5666 Fax: +86 21 6191 5678

No tests were sub-contracted.

4.6 Test Facility

The test facility is recognized, certified, or accredited by the following organizations:

• CNAS (No. CNAS L0599)

CNAS has accredited SGS-CSTC Standards Technical Services (Shanghai) Co., Ltd. to ISO/IEC 17025:2017 General Requirements for the Competence of Testing and Calibration Laboratories (CNAS-CL01 Accreditation Criteria for the Competence of Testing and Calibration Laboratories) for the competence in the field of testing.

• A2LA (Certificate No. 6332.01)

SGS-CSTC Standards Technical Services (Shanghai) Co., Ltd. is accredited by the American Association for Laboratory Accreditation(A2LA).

• FCC (Designation Number: CN1301)

SGS-CSTC Standards Technical Services (Shanghai) Co., Ltd. has been recognized as an accredited testing laboratory.

• ISED (CAB Identifier: CN0020)

SGS-CSTC Standards Technical Services (Shanghai) Co., Ltd. EMC Laboratory has been recognized by Innovation, Science and Economic Development Canada (ISED) as an accredited testing laboratory. Company Number: 8617A

• VCCI (Member No.: 3061)

The 3m Semi-anechoic chamber and Shielded Room of SGS-CSTC Standards Technical Services (Shanghai) Co., Ltd. has been registered in accordance with the Regulations for Voluntary Control Measures with Registration No.: R-13868, C-14336, T-12221, G-10830 respectively.

4.7 Deviation from Standards

None

4.8 Abnormalities from Standard Conditions

None

5 Equipment List

Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date
RF Conducted Test					
Spectrum Analyzer	R&S	FSP-30	SHEM002-1	2021-12-20	2022-12-19
Spectrum Analyzer	Keysight	N9020B	SHEM241-1	2021-08-30	2022-08-29
Spectrum Analyzer	Agilent	N9020A	SHEM181-1	2021-08-13	2022-08-12
Signal Generator	R&S	SMR20	SHEM006-1	2021-08-13	2022-08-12
Signal Generator	Agilent	N5182A	SHEM182-1	2021-08-13	2022-08-12
Communication Tester	R&S	CMW270	SHEM183-1	2021-07-28	2022-07-27
Communication Tester	R&S	CMW500	SHEM183-2	2022-04-01	2023-03-31
Switcher	Tonscend	JS0806	SHEM184-1	2021-08-13	2022-08-12
Power Sensor	Keysight	U2021XA * 4	SHEM184-1	2021-08-13	2022-08-12
Splitter	Anritsu	MA1612A	SHEM185-1	/	/
Coupler	e-meca	803-S-1	SHEM186-1	/	/
High-low Temp Cabinet	Suzhou Zhihe	TL-40	SHEM087-1	2020-04-15	2023-04-14
AC Power Stabilizer	APC	KDF-31020T-V0-F0	SHEM216-1	2021-12-20	2022-12-19
DC Power Supply	MCH	MCH-303A	SHEM210-1	2021-12-20	2022-12-19
Conducted test Cable	/	RF01~RF04	/	2021-12-20	2022-12-19
Test software	Tonscend	JS Tonscend BT/WIFI System	Version: 2.6	/	/
RF Radiated Test					
EMI test Receiver	R&S	ESU40	SHEM051-1	2021-12-20	2022-12-19
Spectrum Analyzer	R&S	FSP-30	SHEM002-1	2021-12-20	2022-12-19
Communication Tester	R&S	CMW500	SHEM183-2	2022-04-01	2023-03-31
Loop Antenna (9kHz-30MHz)	Schwarzbeck	FMZB1519	SHEM135-1	2021-12-20	2022-12-19
Antenna (25MHz-2GHz)	Schwarzbeck	VULB9168	SHEM048-1	2021-09-11	2023-09-10
Antenna (25MHz-2GHz)	Schwarzbeck	VULB9168	SHEM202-1	2021-05-07	2023-05-06
Horn Antenna (1-18GHz)	Schwarzbeck	HF906	SHEM009-1	2020-06-09	2022-06-08
Horn Antenna (1-18GHz)	Schwarzbeck	BBHA9120D	SHEM050-1	2021-09-18	2023-09-17
Horn Antenna (14-40GHz)	Schwarzbeck	BBHA 9170	SHEM049-1	2021-09-18	2023-09-17
Pre-Amplifier	HP	8447D	SHEM236-1	2021-05-27	2022-05-26
Pre-Amplifier	PANSHAN	LNA 1-18G	SHEM235-1	2021-05-27	2022-05-26
High-amplifier (14-40GHz)	Schwarzbeck	10001	SHEM049-2	2021-12-20	2022-12-19
Band Filter	LORCH	9BRX-875/X150	SHEM156-1	/	/
Band Filter	LORCH	13BRX-1950/X500	SHEM083-2	/	/
Band Filter	LORCH	5BRX-2400/X200	SHEM155-1	/	/
Band Filter	LORCH	5BRX-5500/X1000	SHEM157-2	/	/
High pass Filter	Wainwright	WHK3.0/18G	SHEM157-1	/	/
High pass Filter	Wainwright	WHKS1700	SHEM157-3	/	/
Semi/Fully Anechoic	ST	11*6*6M	SHEM078-2	2020-05-25	2023-05-24
RE test Cable	/	RE01, RE02, RE06	/	2022-01-07	2023-01-06
Test software	ESE	E3	Version: 6.111221a	/	/

6 Radio Spectrum Technical Requirement

6.1 Antenna Requirement

6.1.1 Test Requirement:

47 CFR Part 15, Subpart C 15.203 & 15.247(b)(4)

6.1.2 Conclusion

Standard Requirement:

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, 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.

15.247(b) (4) requirement:

The conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

EUT Antenna:

The antenna is integrated on the main PCB and no consideration of replacement. The best case gain of the antenna is 0 dBi.

Antenna location: Refer to internal photo.

6.2 Other requirements Frequency Hopping Spread Spectrum System Hopping Sequence

6.2.1 Test Requirement:

47 CFR Part 15, Subpart C 15.247(a)(1),(g),(h)

6.2.2 Conclusion

Standard Requirement:

The system shall hop to channel frequencies that are selected at the system hopping rate from a Pseudorandom 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.

Frequency hopping spread spectrum systems are not required to employ all available hopping channels during each transmission. However, the system, consisting of both the transmitter and the receiver, must be designed to comply with all of the regulations in this section should the transmitter be presented with a continuous data (or information) stream. In addition, a system employing short transmission bursts must comply with the definition of a frequency hopping system and must distribute its transmissions over the minimum number of hopping channels specified in this section.

The incorporation of intelligence within a frequency hopping spread spectrum system that permits the system to recognize other users within the spectrum band so that it individually and independently chooses and adapts its hopsets to avoid hopping on occupied channels is permitted. The coordination of frequency hopping systems in any other manner for the express purpose of avoiding the simultaneous occupancy of individual hopping frequencies by multiple transmitters is not permitted.

Compliance for section 15.247(a)(1):

According to Technical Specification, the pseudorandom sequence may be generated in a nine-stage shift register whose 5th and 9th stage outputs are added in a modulo-two addition stage. And the result is fed back to the input of the first stage. The sequence begins with the first ONE of 9 consecutive ONEs; i.e. the shift register is initialized with nine ones.

> Number of shift register stages: 9

> Length of pseudo-random sequence: 29 -1 = 511 bits

> Longest sequence of zeros: 8 (non-inverted signal)

Linear Feedback Shift Register for Generation of the PRBS sequence

An example of Pseudorandom Frequency Hopping Sequence as follow:

Each frequency used equally on the average by each transmitter.

According to Technical Specification, the receivers are designed to have input and IF bandwidths that match the hopping channel bandwidths of any transmitters and shift frequencies in synchronization with the transmitted signals.

Compliance for section 15.247(g):

According to Technical Specification, the system transmits the packet with the pseudorandom hopping frequency with a continuous data and the short burst transmission from the Bluetooth system is also transmitted under the frequency hopping system with the pseudorandom hopping frequency system.

Compliance for section 15.247(h):

According to Technical specification, the system incorporates with an adaptive system to detect other user within the spectrum band so that it individually and independently to avoid hopping on the occupied channels.

The system is designed not have the ability to coordinated with other FHSS System in an effort to avoid the simultaneous occupancy of individual hopping frequencies by multiple transmitter.

7 Radio Spectrum Matter Test Results

7.1 Conducted Peak Output Power

Test Requirement 47 CFR Part 15, Subpart C 15.247(b)(1)

Test Method: ANSI C63.10 (2013) Section 7.8.5

Limit:

Frequency range(MHz)	Output power of the intentional radiator(watt)
902-928	1 for ≥50 hopping channels
	0.25 for 25≤ hopping channels <50
	1 for digital modulation
2400-2483.5	1 for ≥75 non-overlapping hopping channels
	0.125 for all other frequency hopping systems
	1 for digital modulation
5725-5850	1 for frequency hopping systems and digital modulation

7.1.1 E.U.T. Operation

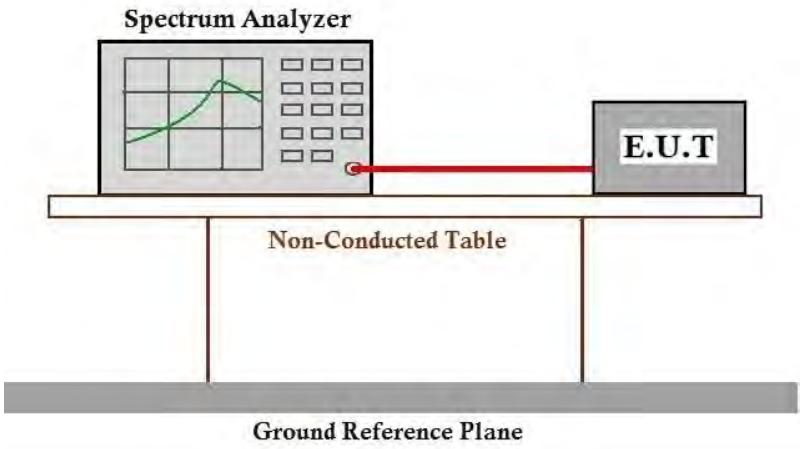
Operating Environment:

Temperature: 24.8 °C Humidity: 65.2 % RH Atmospheric Pressure: 1010 mbar

7.1.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	00	TX_non-Hop mode_Keep the EUT in continuously transmitting mode with GFSK modulation, Pi/4DQPSK modulation, 8DPSK modulation. All modes have been tested and only the data of worst case is recorded in the report.

7.1.3 Test Setup Diagram



7.1.4 Measurement Procedure and Data

Please Refer to Appendix for Details

7.2 20dB Bandwidth

Test Requirement 47 CFR Part 15, Subpart C 15.247(a)(1)
Test Method: ANSI C63.10 (2013) Section 7.8.7

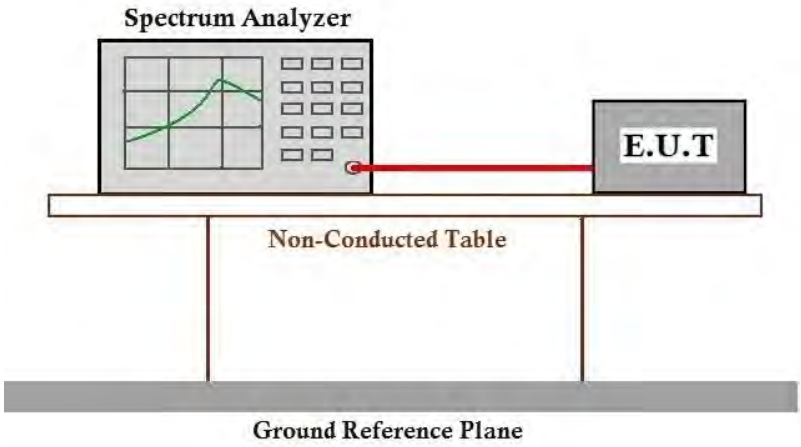
7.2.1 E.U.T. Operation

Operating Environment:
Temperature: 24.7 °C Humidity: 65.1 % RH Atmospheric Pressure: 1010 mbar

7.2.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	00	TX_non-Hop mode_Keep the EUT in continuously transmitting mode with GFSK modulation, Pi/4DQPSK modulation, 8DPSK modulation. All modes have been tested and only the data of worst case is recorded in the report.

7.2.3 Test Setup Diagram



7.2.4 Measurement Procedure and Data

Please Refer to Appendix for Details

7.3 Carrier Frequencies Separation

Test Requirement 47 CFR Part 15, Subpart C 15.247a(1)

Test Method: ANSI C63.10 (2013) Section 7.8.2

Limit:

Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW.

7.3.1 E.U.T. Operation

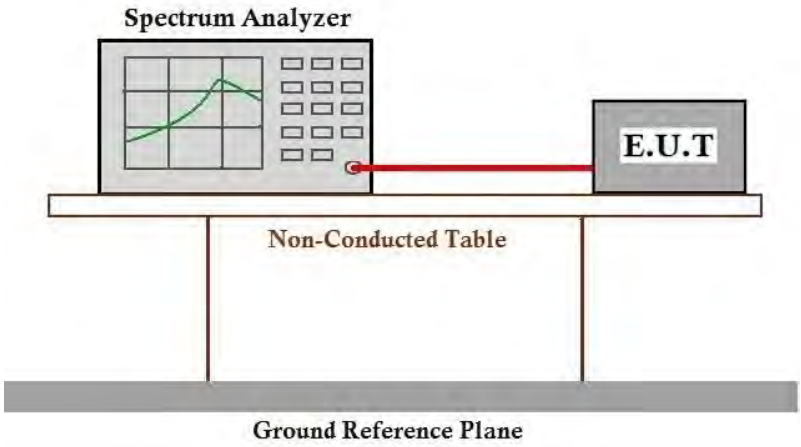
Operating Environment:

Temperature: 24.8 °C Humidity: 65.2 % RH Atmospheric Pressure: 1010 mbar

7.3.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	01	TX_Hop mode_Keep the EUT in frequency hopping mode with GFSK modulation, Pi/4DQPSK modulation, 8DPSK modulation. All modes have been tested and only the data of worst case is recorded in the report.

7.3.3 Test Setup Diagram



7.3.4 Measurement Procedure and Data

Please Refer to Appendix for Details

7.4 Hopping Channel Number

Test Requirement 47 CFR Part 15, Subpart C 15.247a(1)(iii)

Test Method: ANSI C63.10 (2013) Section 7.8.3

Limit:

Frequency range(MHz)	Number of hopping channels (minimum)
902-928	50 for 20dB bandwidth <250kHz
	25 for 20dB bandwidth ≥250kHz
2400-2483.5	15
5725-5850	75

7.4.1 E.U.T. Operation

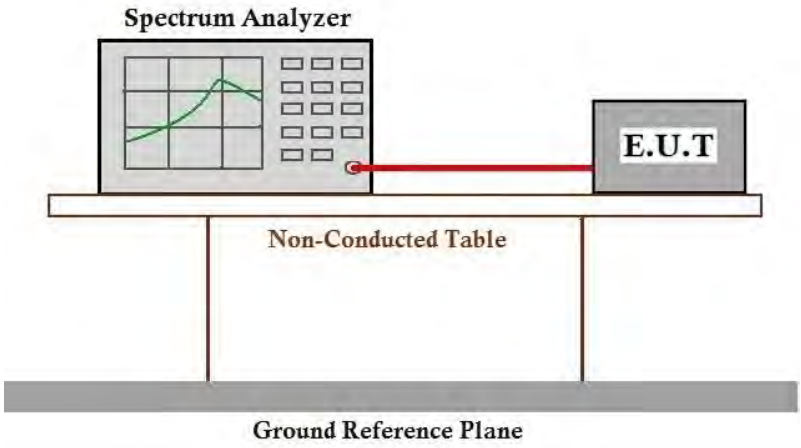
Operating Environment:

Temperature: 24.8 °C Humidity: 65.1 % RH Atmospheric Pressure: 1010 mbar

7.4.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	01	TX_Hop mode_Keep the EUT in frequency hopping mode with GFSK modulation, Pi/4DQPSK modulation, 8DPSK modulation. All modes have been tested and only the data of worst case is recorded in the report.

7.4.3 Test Setup Diagram



7.4.4 Measurement Procedure and Data

Please Refer to Appendix for Details

7.5 Dwell Time

Test Requirement 47 CFR Part 15, Subpart C 15.247a(1)(iii)
Test Method: ANSI C63.10 (2013) Section 7.8.4
Limit:

Frequency(MHz)	Limit
902-928	0.4S within a 20S period(20dB bandwidth<250kHz)
	0.4S within a 10S period(20dB bandwidth≥250kHz)
2400-2483.5	0.4S within a period of 0.4S multiplied by the number of hopping channels
5725-5850	0.4S within a 30S period

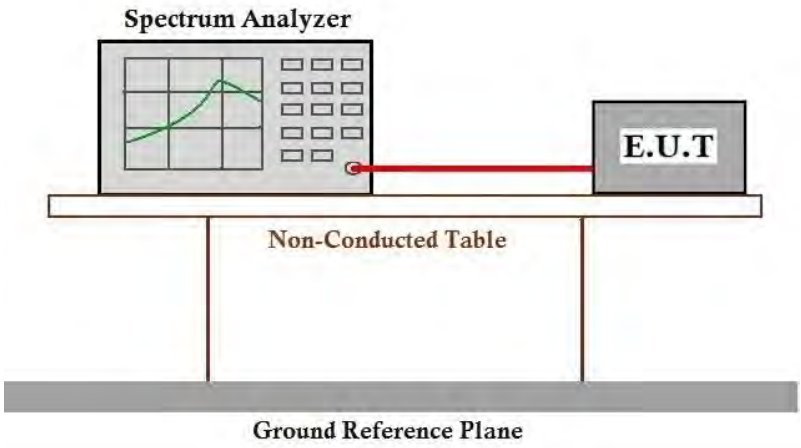
7.5.1 E.U.T. Operation

Operating Environment:
Temperature: 24.8 °C Humidity: 65.0 % RH Atmospheric Pressure: 1010 mbar

7.5.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	01	TX_Hop mode_Keep the EUT in frequency hopping mode with GFSK modulation, Pi/4DQPSK modulation, 8DPSK modulation. All modes have been tested and only the data of worst case is recorded in the report.

7.5.3 Test Setup Diagram



7.5.4 Measurement Procedure and Data

Please Refer to Appendix for Details

7.6 Conducted Band Edges Measurement

Test Requirement 47 CFR Part 15, Subpart C 15.247(d)

Test Method: ANSI C63.10 (2013) Section 7.8.6

Limit:

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).

7.6.1 E.U.T. Operation

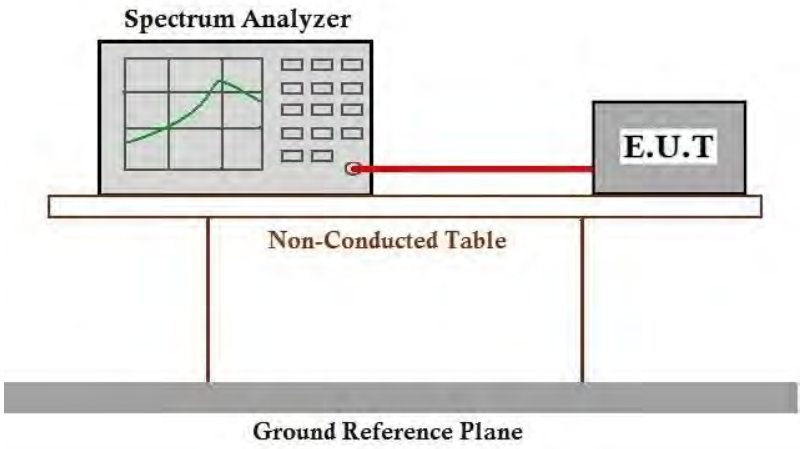
Operating Environment:

Temperature: 24.8 °C Humidity: 64.9 % RH Atmospheric Pressure: 1010 mbar

7.6.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	00	TX_non-Hop mode_Keep the EUT in continuously transmitting mode with GFSK modulation, Pi/4DQPSK modulation, 8DPSK modulation. All modes have been tested and only the data of worst case is recorded in the report.
Final test	01	TX_Hop mode_Keep the EUT in frequency hopping mode with GFSK modulation, Pi/4DQPSK modulation, 8DPSK modulation. All modes have been tested and only the data of worst case is recorded in the report.

7.6.3 Test Setup Diagram



7.6.4 Measurement Procedure and Data

Please Refer to Appendix for Details

7.7 Conducted Spurious Emissions

Test Requirement 47 CFR Part 15, Subpart C 15.247(d)

Test Method: ANSI C63.10 (2013) Section 7.8.8

Limit:

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).

7.7.1 E.U.T. Operation

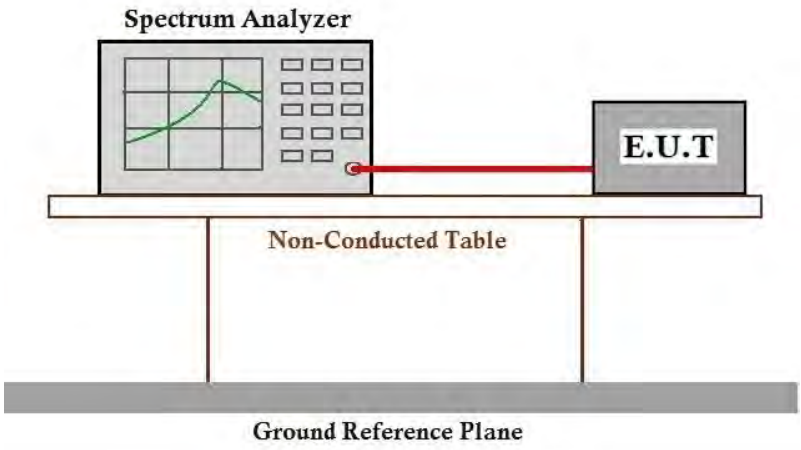
Operating Environment:

Temperature: 24.8 °C Humidity: 65.0 % RH Atmospheric Pressure: 1010 mbar

7.7.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	00	TX_non-Hop mode_Keep the EUT in continuously transmitting mode with GFSK modulation, Pi/4DQPSK modulation, 8DPSK modulation. All modes have been tested and only the data of worst case is recorded in the report.

7.7.3 Test Setup Diagram



7.7.4 Measurement Procedure and Data

Please Refer to Appendix for Details

7.8 Radiated Emissions which fall in the restricted bands

Test Requirement 47 CFR Part 15, Subpart C 15.205 & 15.209

Test Method: ANSI C63.10 (2013) Section 6.10.5

Limit:

Frequency(MHz)	Field strength(microvolts/meter)	Measurement distance(meters)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30.0	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3
Remark: The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90kHz, 110-490kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation.		

7.8.1 E.U.T. Operation

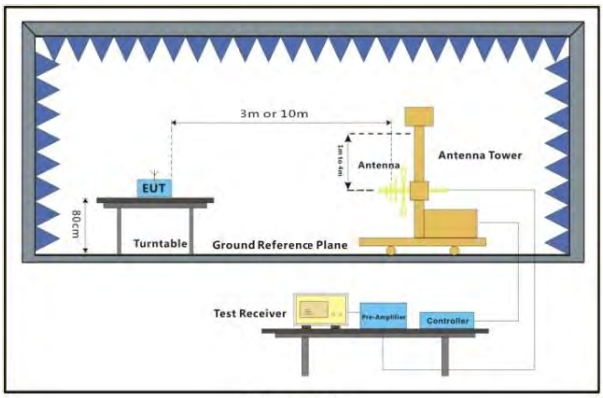
Operating Environment:

Temperature: 24.7 °C Humidity: 65.1 % RH Atmospheric Pressure: 1010 mbar

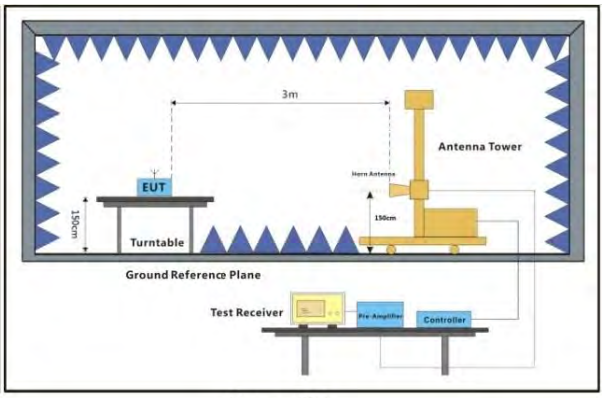
7.8.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	00	TX_non-Hop mode_Keep the EUT in continuously transmitting mode with GFSK modulation, Pi/4DQPSK modulation, 8DPSK modulation. All modes have been tested and only the data of worst case is recorded in the report.

7.8.3 Test Setup Diagram



30MHz-1GHz



Above 1GHz

7.8.4 Measurement Procedure and Data

a. For below 1GHz, the EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 or 10 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.

b. For above 1GHz, the EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter fully-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.

c. The EUT was set 3 or 10 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.

d. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.

e. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters (for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter) and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.

f. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

g. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

h. Test the EUT in the lowest channel, the middle channel, the Highest channel.

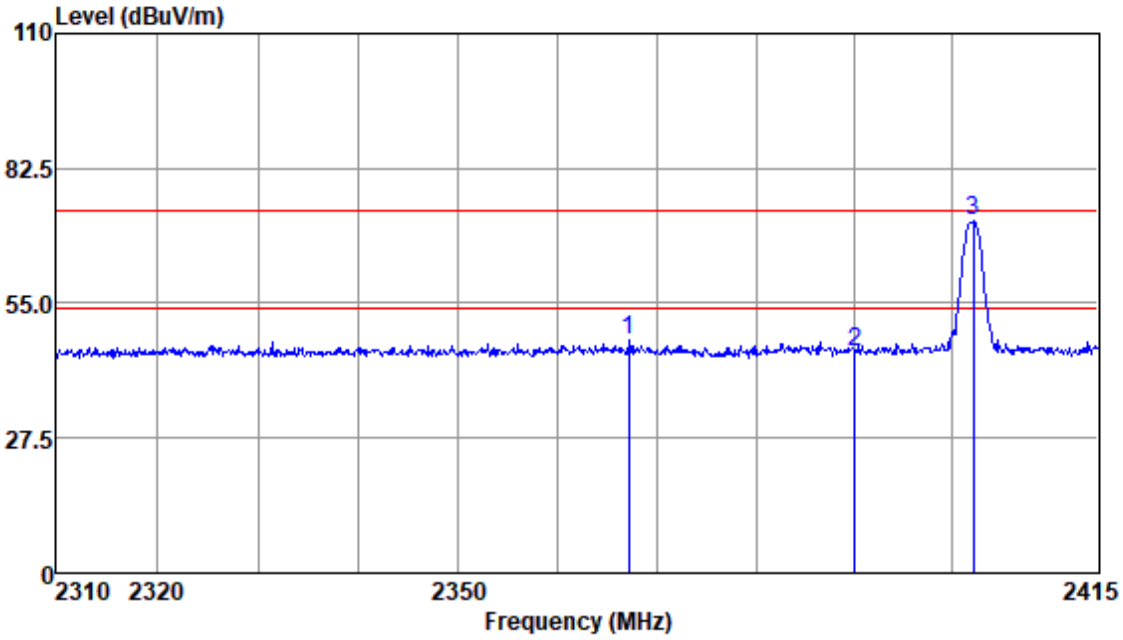
i. The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, and found the X axis positioning which it is the worst case.

j. Repeat above procedures until all frequencies measured was complete.

Remark 1: Level= Read Level+ Cable Loss+ Antenna Factor- Preamp Factor

Remark 2: For frequencies above 1GHz, the field strength limits are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation. For the emissions whose peak level is lower than the average limit, only the peak measurement is shown in the report.

Test Mode: 00; Polarity: Horizontal; Modulation:GFSK; Channel:Low

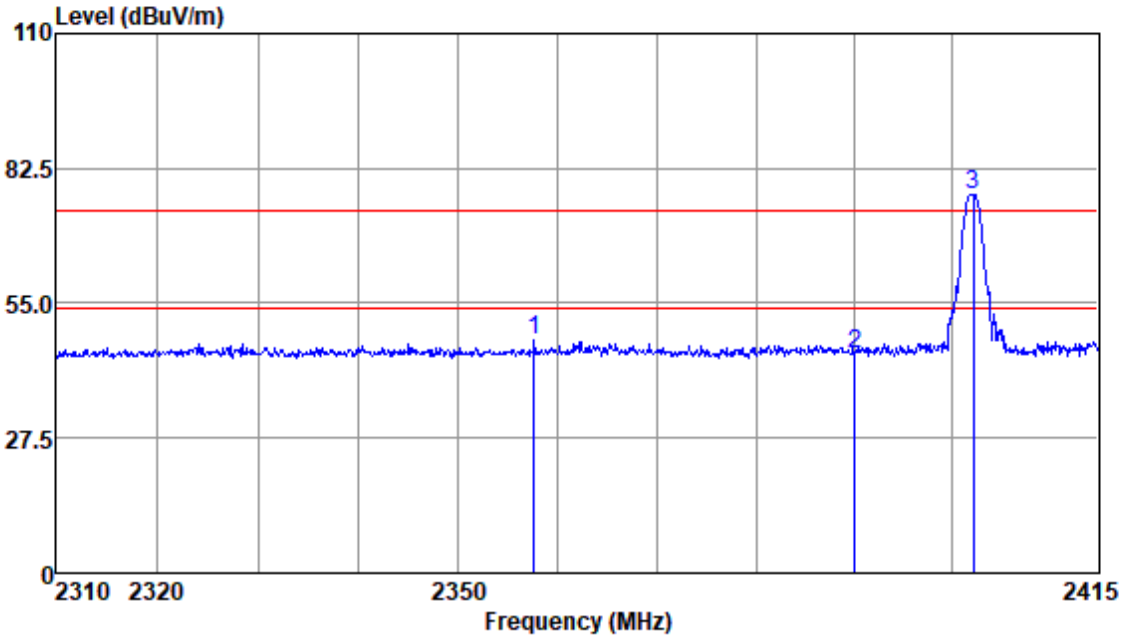


Antenna Polarity :HORIZONTAL

Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Emission Level	Limit Line	Over Limit	Remark
MHz	dBuv	dB/m	dB	dB	dBuv/m	dBuv/m	dB	
2367.07	50.48	28.94	3.17	35.16	47.43	74.00	-26.57	Peak
2390.00	48.28	28.97	3.15	35.18	45.22	74.00	-28.78	Peak
2402.15	74.68	29.01	3.14	35.19	71.64	74.00	-2.36	Peak

Note:Emission Level=Read Level+Antenna Factor+Cable loss-Preamp Factor

Test Mode: 00; Polarity: Vertical; Modulation:GFSK; Channel:Low

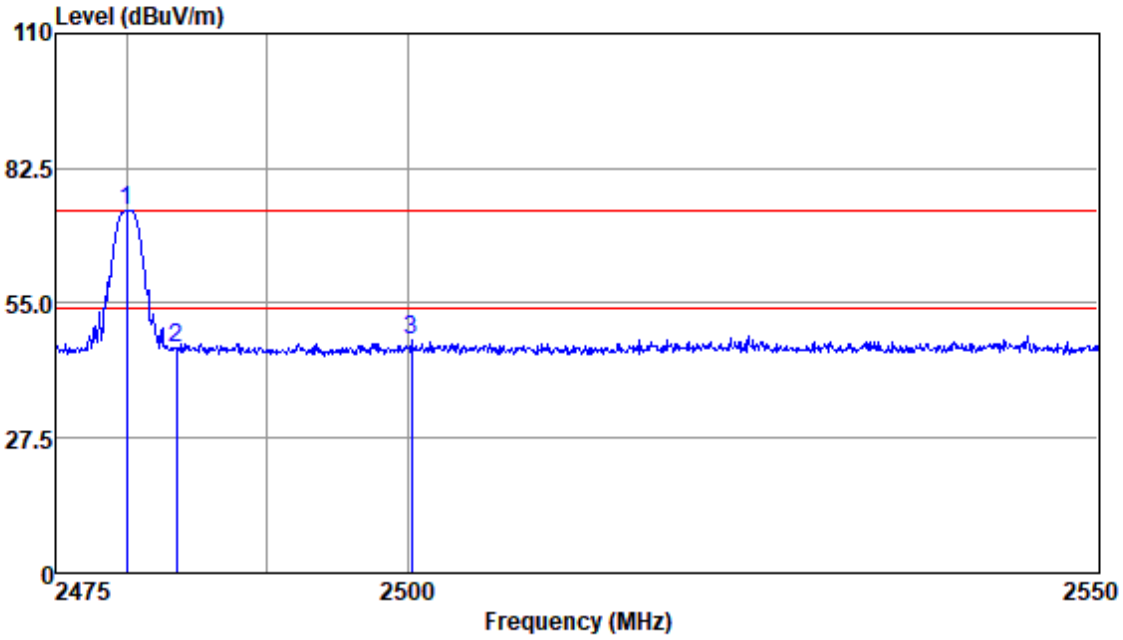


Antenna Polarity :VERTICAL

Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Emission Level	Limit Line	Over Limit	Remark
MHz	dBuv	dB/m	dB	dB	dBuv/m	dBuv/m	dB	
2357.51	50.42	28.92	3.12	35.16	47.30	74.00	-26.70	Peak
2390.00	47.81	28.97	3.15	35.18	44.75	74.00	-29.25	Peak
2402.15	80.31	29.01	3.14	35.19	77.27	74.00	3.27	Peak

Note:Emission Level=Read Level+Antenna Factor+Cable loss-Preamp Factor

Test Mode: 00; Polarity: Horizontal; Modulation:GFSK; Channel:High

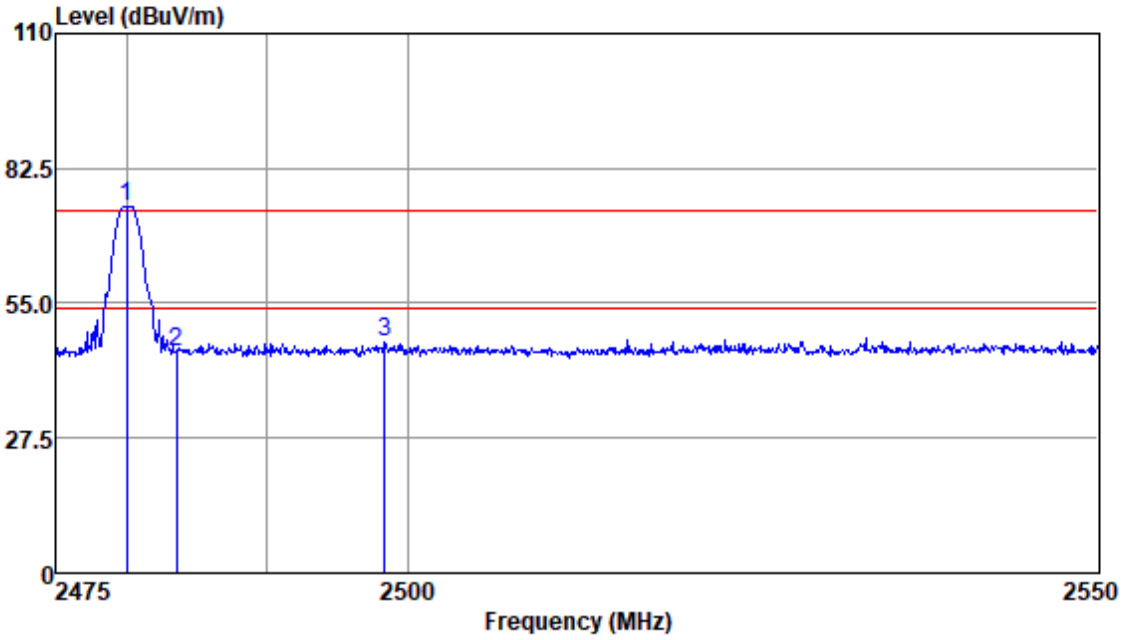


Antenna Polarity :HORIZONTAL

Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Emission Level	Limit Line	Over Limit	Remark
MHz	dBuv	dB/m	dB	dB	dBuv/m	dBuv/m	dB	
2479.96	77.04	29.10	3.14	35.25	74.03	74.00	0.03	Peak
2483.50	48.97	29.11	3.14	35.26	45.96	74.00	-28.04	Peak
2500.32	50.45	29.14	3.15	35.27	47.47	74.00	-26.53	Peak

Note:Emission Level=Read Level+Antenna Factor+Cable loss-Preamp Factor

Test Mode: 00; Polarity: Vertical; Modulation:GFSK; Channel:High

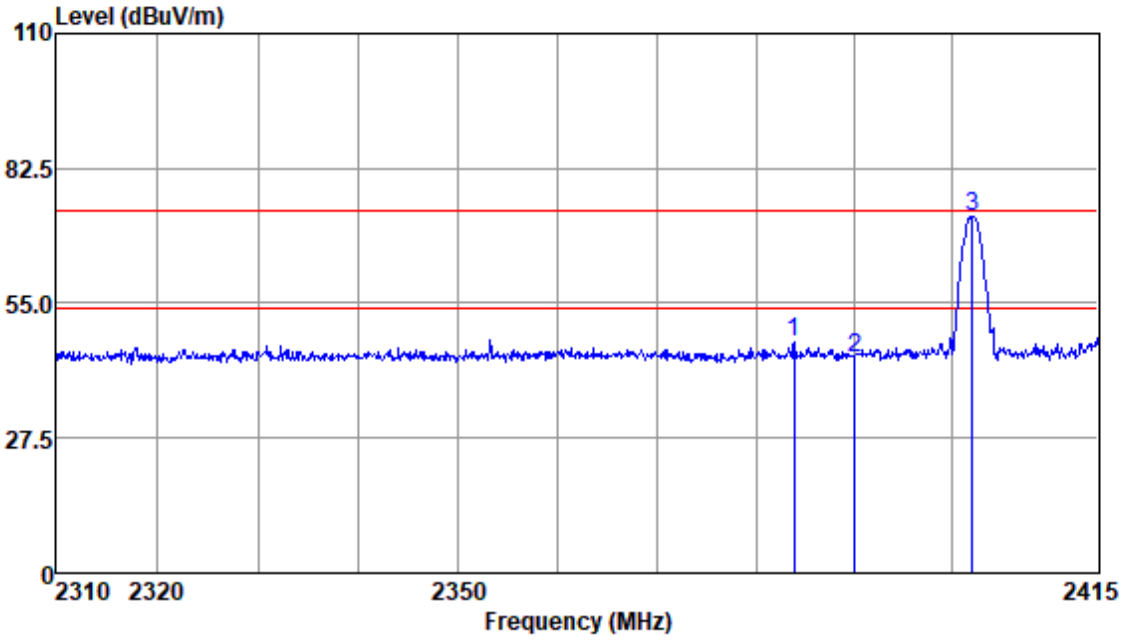


Antenna Polarity :VERTICAL

Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Emission Level	Limit Line	Over Limit	Remark
MHz	dBuv	dB/m	dB	dB	dBuv/m	dBuv/m	dB	
2479.96	77.85	29.10	3.14	35.25	74.84	74.00	0.84	Peak
2483.50	47.93	29.11	3.14	35.26	44.92	74.00	-29.08	Peak
2498.38	49.88	29.14	3.15	35.27	46.90	74.00	-27.10	Peak

Note:Emission Level=Read Level+Antenna Factor+Cable loss-Preamp Factor

Test Mode: 00; Polarity: Horizontal; Modulation:8DPSK; Channel:Low

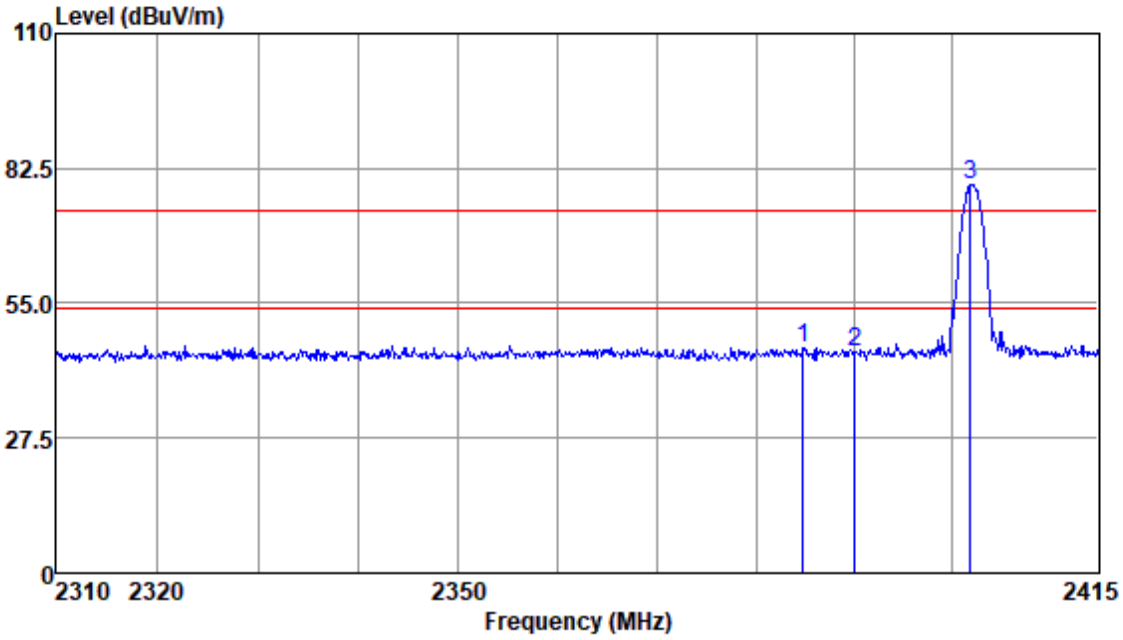


Antenna Polarity :HORIZONTAL

Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Emission Level	Limit Line	Over Limit	Remark
MHz	dBuv	dB/m	dB	dB	dBuv/m	dBuv/m	dB	
2383.86	50.08	28.97	3.16	35.18	47.03	74.00	-26.97	Peak
2390.00	46.74	28.97	3.15	35.18	43.68	74.00	-30.32	Peak
2402.05	75.85	29.01	3.14	35.19	72.81	74.00	-1.19	Peak

Note:Emission Level=Read Level+Antenna Factor+Cable loss-Preamp Factor

Test Mode: 00; Polarity: Vertical; Modulation:8DPSK; Channel:Low

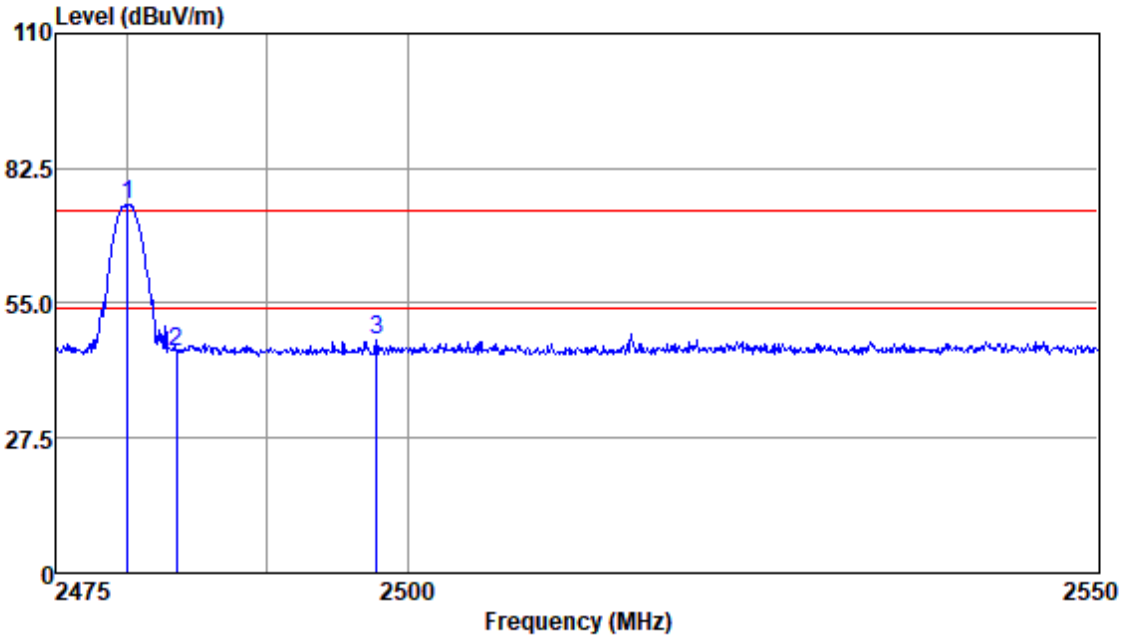


Antenna Polarity :VERTICAL

Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Emission Level	Limit Line	Over Limit	Remark
MHz	dBuv	dB/m	dB	dB	dBuv/m	dBuv/m	dB	
2384.81	49.08	28.97	3.16	35.18	46.03	74.00	-27.97	Peak
2390.00	48.29	28.97	3.15	35.18	45.23	74.00	-28.77	Peak
2401.83	82.18	29.01	3.15	35.19	79.15	74.00	5.15	Peak

Note:Emission Level=Read Level+Antenna Factor+Cable loss-Preamp Factor

Test Mode: 00; Polarity: Horizontal; Modulation:8DPSK; Channel:High

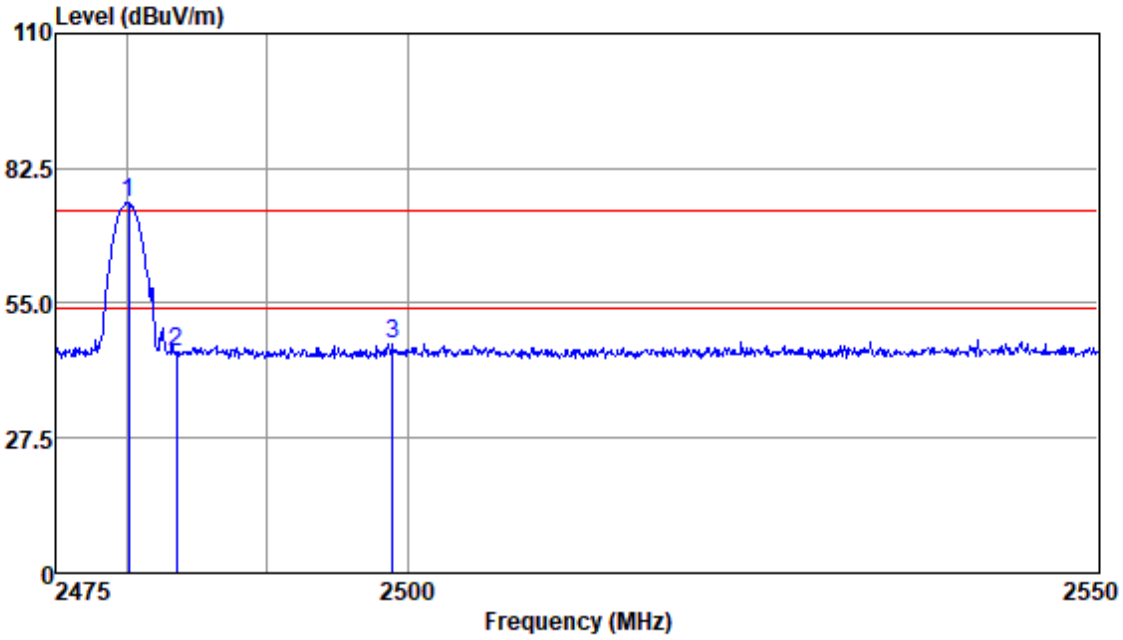


Antenna Polarity :HORIZONTAL

Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Emission Level	Limit Line	Over Limit	Remark
MHz	dBuv	dB/m	dB	dB	dBuv/m	dBuv/m	dB	
2480.03	78.17	29.10	3.14	35.25	75.16	74.00	1.16	Peak
2483.50	48.14	29.11	3.14	35.26	45.13	74.00	-28.87	Peak
2497.79	50.63	29.14	3.15	35.27	47.65	74.00	-26.35	Peak

Note:Emission Level=Read Level+Antenna Factor+Cable loss-Preamp Factor

Test Mode: 00; Polarity: Vertical; Modulation:8DPSK; Channel:High

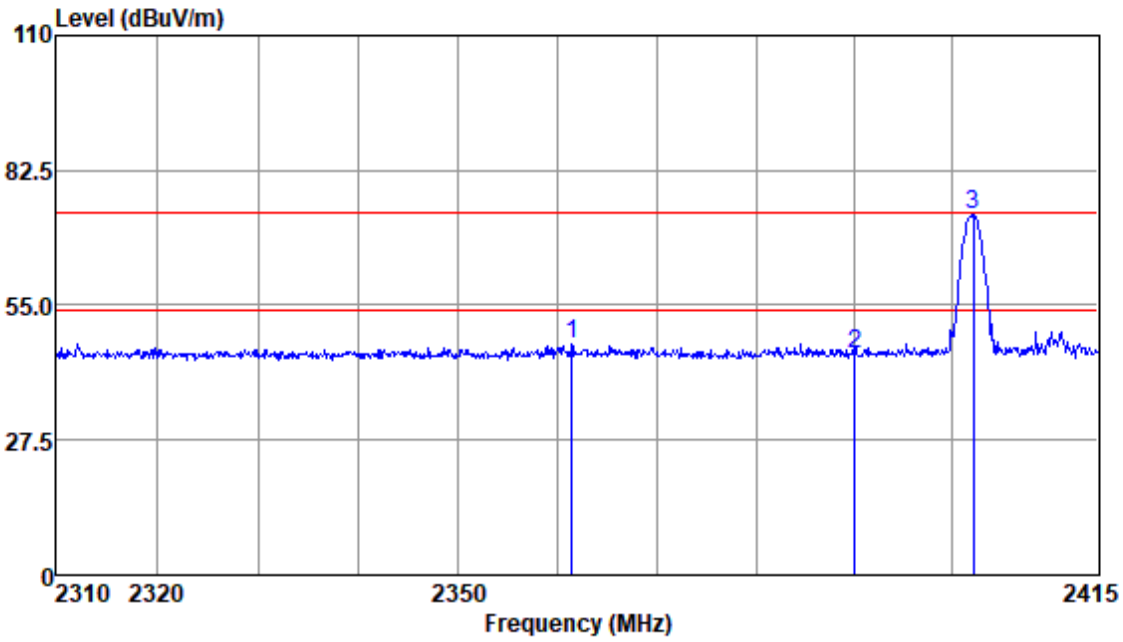


Antenna Polarity :VERTICAL

Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Emission Level	Limit Line	Over Limit	Remark
MHz	dBuv	dB/m	dB	dB	dBuv/m	dBuv/m	dB	
2480.10	78.50	29.10	3.14	35.25	75.49	74.00	1.49	Peak
2483.50	48.23	29.11	3.14	35.26	45.22	74.00	-28.78	Peak
2498.98	49.85	29.14	3.15	35.27	46.87	74.00	-27.13	Peak

Note:Emission Level=Read Level+Antenna Factor+Cable loss-Preamp Factor

Test Mode: 00; Polarity: Horizontal; Modulation:π/4 DQPSK; Channel:Low

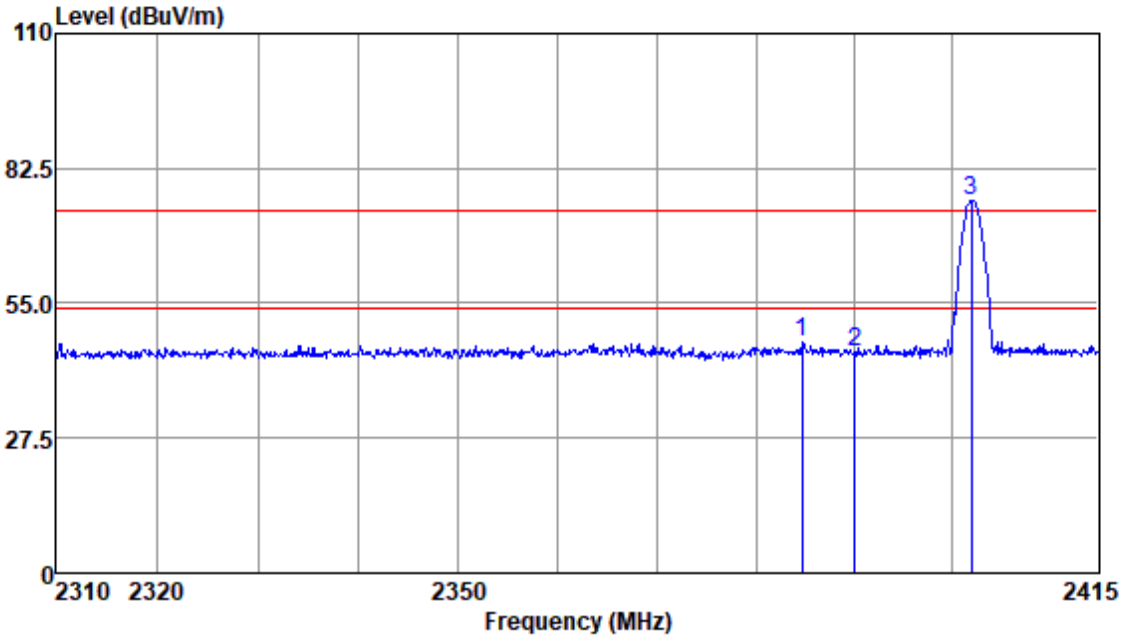


Antenna Polarity :HORIZONTAL

Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Emission Level	Limit Line	Over Limit	Remark
MHz	dBuv	dB/m	dB	dB	dBuv/m	dBuv/m	dB	
2361.39	50.02	28.92	3.15	35.16	46.93	74.00	-27.07	Peak
2390.00	48.25	28.97	3.15	35.18	45.19	74.00	-28.81	Peak
2402.15	76.55	29.01	3.14	35.19	73.51	74.00	-0.49	Peak

Note:Emission Level=Read Level+Antenna Factor+Cable loss-Preamp Factor

Test Mode: 00; Polarity: Vertical; Modulation:8DPSK; Channel:Low

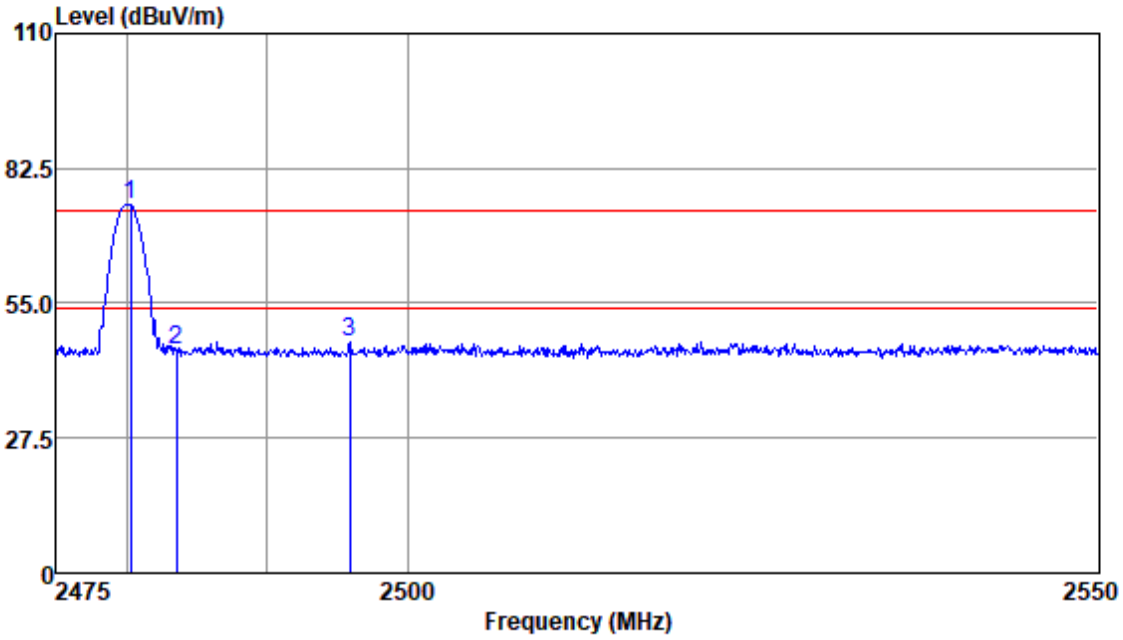


Antenna Polarity :VERTICAL

Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Emission Level	Limit Line	Over Limit	Remark
MHz	dBuv	dB/m	dB	dB	dBuv/m	dBuv/m	dB	
2384.70	50.03	28.97	3.16	35.18	46.98	74.00	-27.02	Peak
2390.00	48.07	28.97	3.15	35.18	45.01	74.00	-28.99	Peak
2401.94	78.93	29.01	3.14	35.19	75.89	74.00	1.89	Peak

Note:Emission Level=Read Level+Antenna Factor+Cable loss-Preamp Factor

Test Mode: 00; Polarity: Horizontal; Modulation:8DPSK; Channel:High

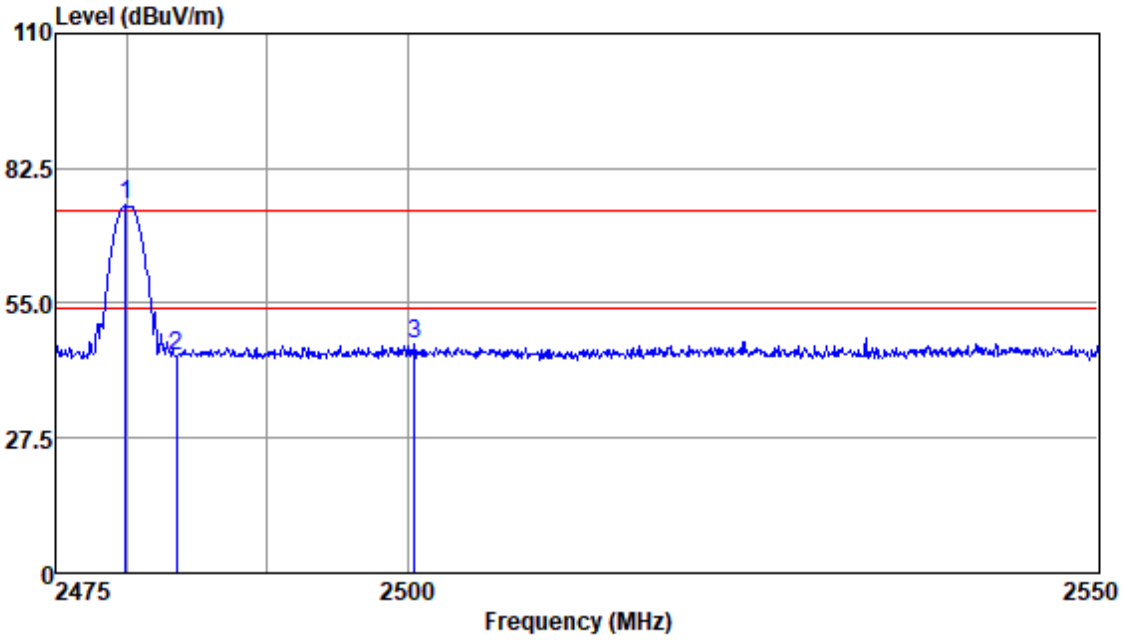


Antenna Polarity :HORIZONTAL

Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Emission Level	Limit Line	Over Limit	Remark
MHz	dBuv	dB/m	dB	dB	dBuv/m	dBuv/m	dB	
2480.25	78.07	29.10	3.14	35.25	75.06	74.00	1.06	Peak
2483.50	48.45	29.11	3.14	35.26	45.44	74.00	-28.56	Peak
2495.92	50.12	29.13	3.15	35.26	47.14	74.00	-26.86	Peak

Note:Emission Level=Read Level+Antenna Factor+Cable loss-Preamp Factor

Test Mode: 00; Polarity: Vertical; Modulation:8DPSK; Channel:High



Antenna Polarity :VERTICAL

Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Emission Level	Limit Line	Over Limit	Remark
MHz	dBuv	dB/m	dB	dB	dBuv/m	dBuv/m	dB	
2479.88	78.11	29.10	3.14	35.25	75.10	74.00	1.10	Peak
2483.50	47.12	29.11	3.14	35.26	44.11	74.00	-29.89	Peak
2500.55	49.72	29.14	3.15	35.27	46.74	74.00	-27.26	Peak

Note:Emission Level=Read Level+Antenna Factor+Cable loss-Preamp Factor

7.9 Radiated Spurious Emissions Below 1GHz

Test Requirement 47 CFR Part 15, Subpart C 15.205 & 15.209

Test Method: ANSI C63.10 (2013) Section 6.4,6.5

Limit:

Frequency(MHz)	Field strength(microvolts/meter)	Measurement distance(meters)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30.0	30	30
30-88	100	3
88-216	150	3
216-960	200	3
960-1000	500	3

7.9.1 E.U.T. Operation

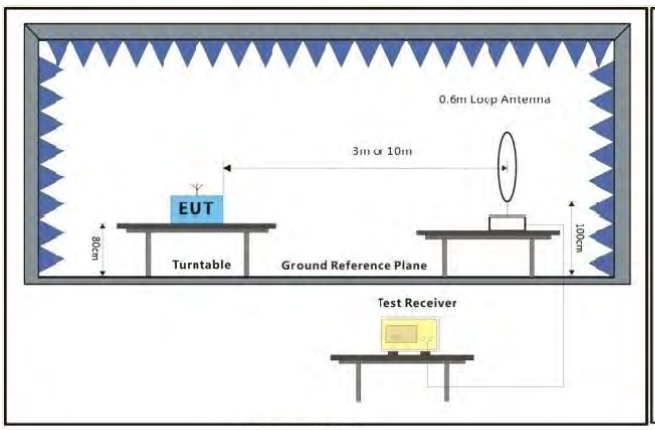
Operating Environment:

Temperature: 24.8 °C Humidity: 65.1 % RH Atmospheric Pressure: 1010 mbar

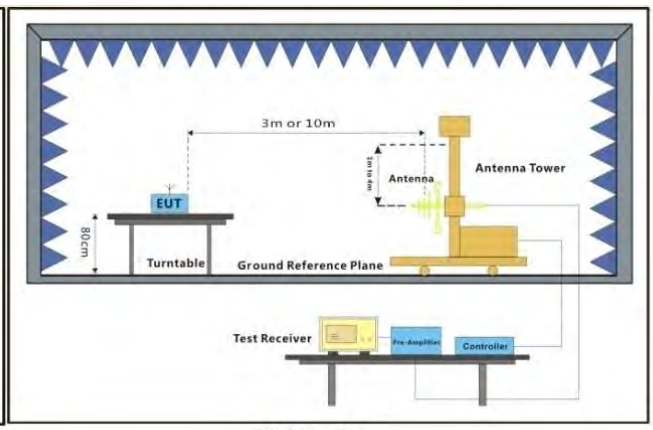
7.9.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	00	TX_non-Hop mode_Keep the EUT in continuously transmitting mode with GFSK modulation, Pi/4DQPSK modulation, 8DPSK modulation. All modes have been tested and only the data of worst case is recorded in the report.

7.9.3 Test Setup Diagram



Below 30MHz



30MHz-1GHz

7.9.4 Measurement Procedure and Data

a. For below 1GHz, the EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 or 10 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.

b. The EUT was set 3 or 10 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.

c. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.

d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters (for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter) and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.

e. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

f. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using quasi-peak method as specified and then reported in a data sheet.

g. Test the EUT in the lowest channel, the middle channel, the Highest channel.

h. The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, and found the X axis positioning which it is the worst case.

i. Repeat above procedures until all frequencies measured was complete.

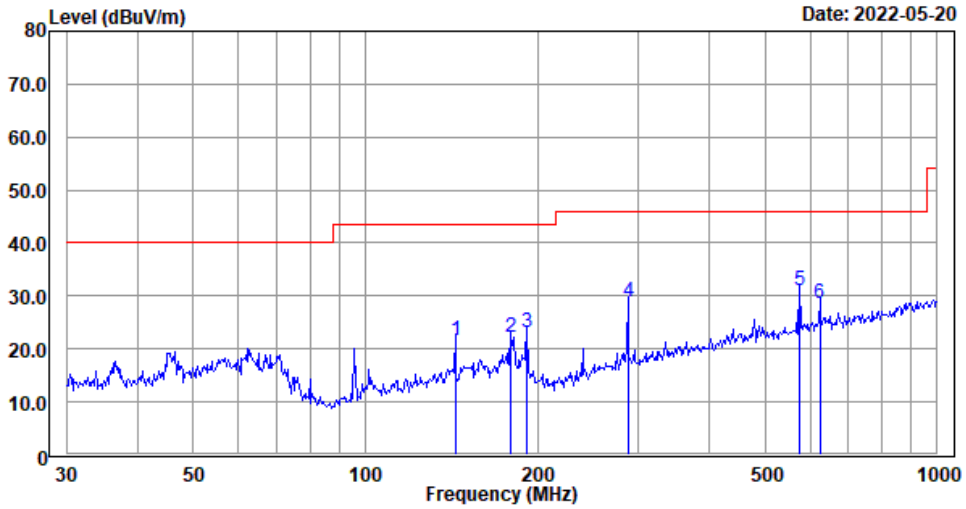
Remark:

1. Level= Read Level+ Cable Loss+ Antenna Factor- Preamp Factor

2. Scan from 9kHz to 30MHz, the disturbance below 30MHz was very low. The points marked on above plots are the highest emissions could be found when testing, so only above points had been displayed. The amplitude of spurious emissions from the radiator which are attenuated more than 20dB below the limit need not be reported.

3. The disturbance below 1GHz was very low and the harmonics were the highest point could be found when testing, so only the above harmonics had been displayed.

Test Mode: 00; Polarity: Horizontal

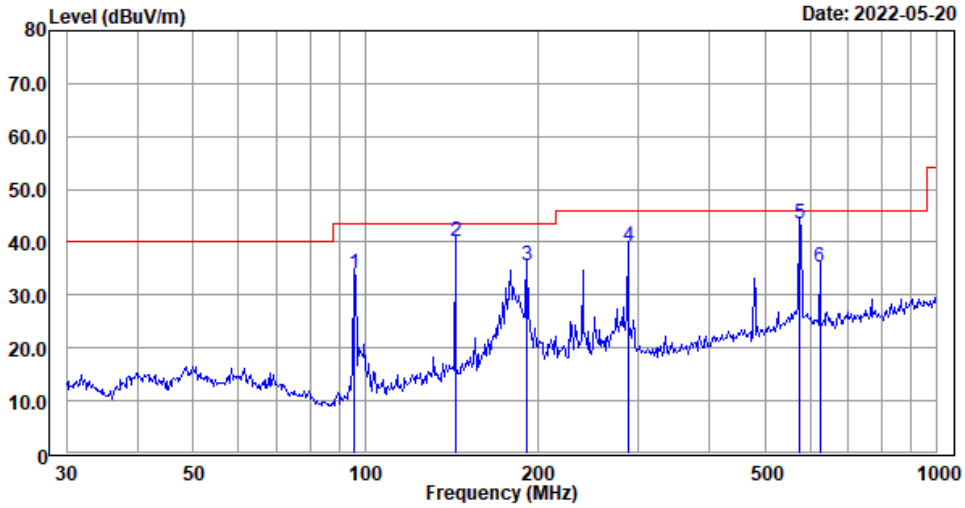


Antenna Polarity :Horizontal
EUT/Project :0961AT
Test mode :00
Remark :
Remark :

	Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Emission Level	Limit Line	Over Limit	Remark
	MHz	dBuv	dB/m	dB	dB	dBuv/m	dBuv/m	dB	
1	143.52	31.79	13.09	2.87	26.00	21.75	43.50	-21.75	QP
2	179.48	33.17	11.70	3.21	25.88	22.20	43.50	-21.30	QP
3	191.74	35.34	10.30	3.36	25.83	23.17	43.50	-20.33	QP
4	287.92	37.10	13.30	4.27	25.72	28.95	46.00	-17.05	QP
5	574.68	32.71	19.13	6.02	26.95	30.91	46.00	-15.09	QP
6	623.37	29.01	20.42	6.30	27.10	28.63	46.00	-17.37	QP

Note: Emission Level=Read Level+Antenna Factor+Cable loss-Preamp Factor

Test Mode: 00; Polarity: Vertical



Antenna Polarity :Vertical
EUT/Project :0961AT
Test mode :00
Remark :
Remark :

	Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Emission Level	Limit Line	Over Limit	Remark
	MHz	dBuv	dB/m	dB	dB	dBuv/m	dBuv/m	dB	
1	95.57	49.45	8.41	2.30	26.04	34.12	43.50	-9.38	QP
2	143.52	50.29	13.09	2.87	26.00	40.25	43.50	-3.25	QP
3	191.74	47.88	10.30	3.36	25.83	35.71	43.50	-7.79	QP
4	287.92	47.24	13.30	4.27	25.72	39.09	46.00	-6.91	QP
5	574.68	45.29	19.13	6.02	26.95	43.49	46.00	-2.51	QP
6	623.37	35.66	20.42	6.30	27.10	35.28	46.00	-10.72	QP

Note: Emission Level=Read Level+Antenna Factor+Cable loss-Preamp Factor

7.10 Radiated Spurious Emissions Above 1GHz

Test Requirement 47 CFR Part 15, Subpart C 15.205 & 15.209
Test Method: ANSI C63.10 (2013) Section 6.6

Limit:

Frequency(MHz)	Field strength(microvolts/meter)	Measurement distance(meters)
Above 1000	500	3

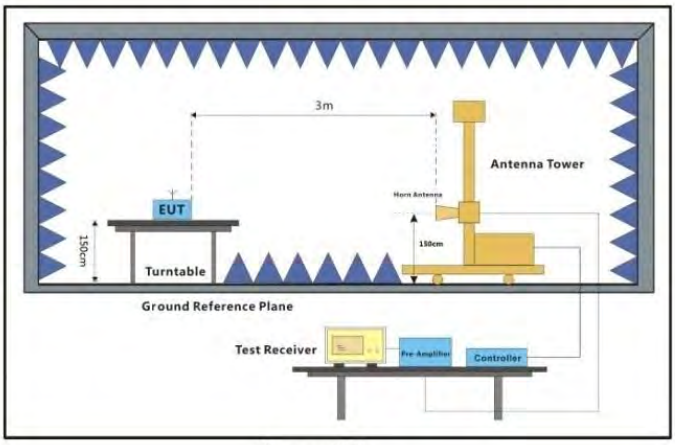
7.10.1 E.U.T. Operation

Operating Environment:
Temperature: 24.8 °C Humidity: 65.1 % RH Atmospheric Pressure: 1010 mbar

7.10.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	00	TX_non-Hop mode_Keep the EUT in continuously transmitting mode with GFSK modulation, Pi/4DQPSK modulation, 8DPSK modulation. All modes have been tested and only the data of worst case is recorded in the report.

7.10.3 Test Setup Diagram



Above 1GHz

7.10.4 Measurement Procedure and Data

a. For above 1GHz, the EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter fully-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.

b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.

c. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.

d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters (for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter) and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.

e. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

f. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak or average method as specified and then reported in a data sheet.

g. Test the EUT in the lowest channel, the middle channel, the Highest channel.

h. The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, and found the X axis positioning which it is the worst case.

i. Repeat above procedures until all frequencies measured was complete.

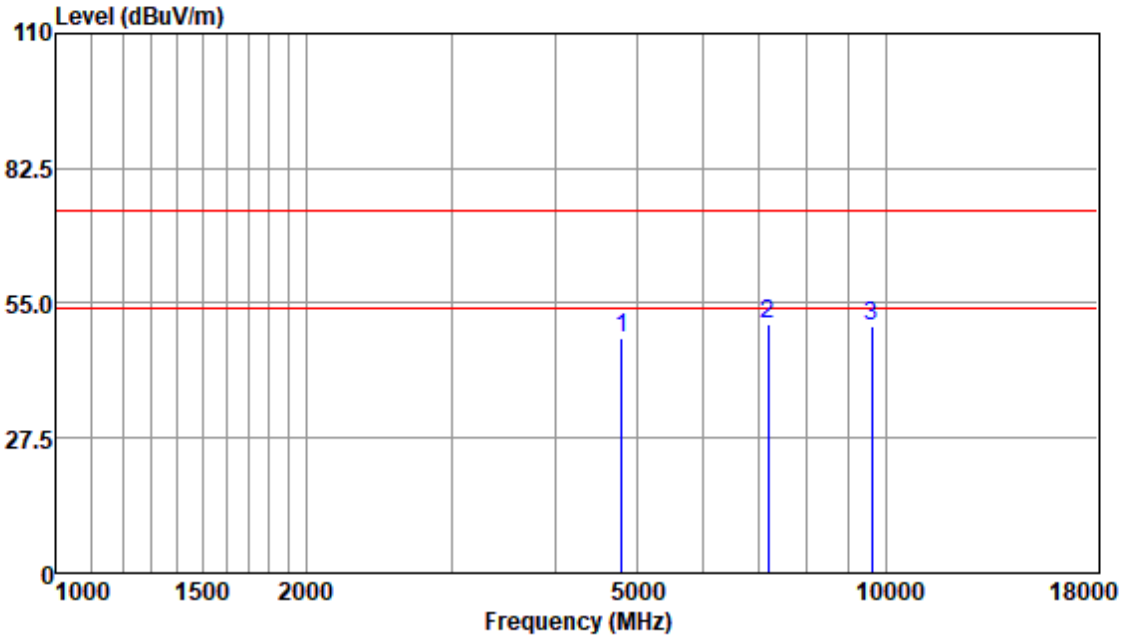
Remark:

1. Level= Read Level+ Cable Loss+ Antenna Factor- Preamp Factor

2. Scan from 1GHz to 25GHz, the disturbance above 18GHz was very low. The points marked on above plots are the highest emissions could be found when testing, so only above points had been displayed. The amplitude of spurious emissions from the radiator which are attenuated more than 20dB below the limit need not be reported.

3. As shown in this section, for frequencies above 1GHz, the field strength limits are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation. For the emissions whose peak level is lower than the average limit, only the peak measurement is shown in the report.

Test Mode: 00; Polarity: Horizontal; Modulation:8DPSK; Channel:Low

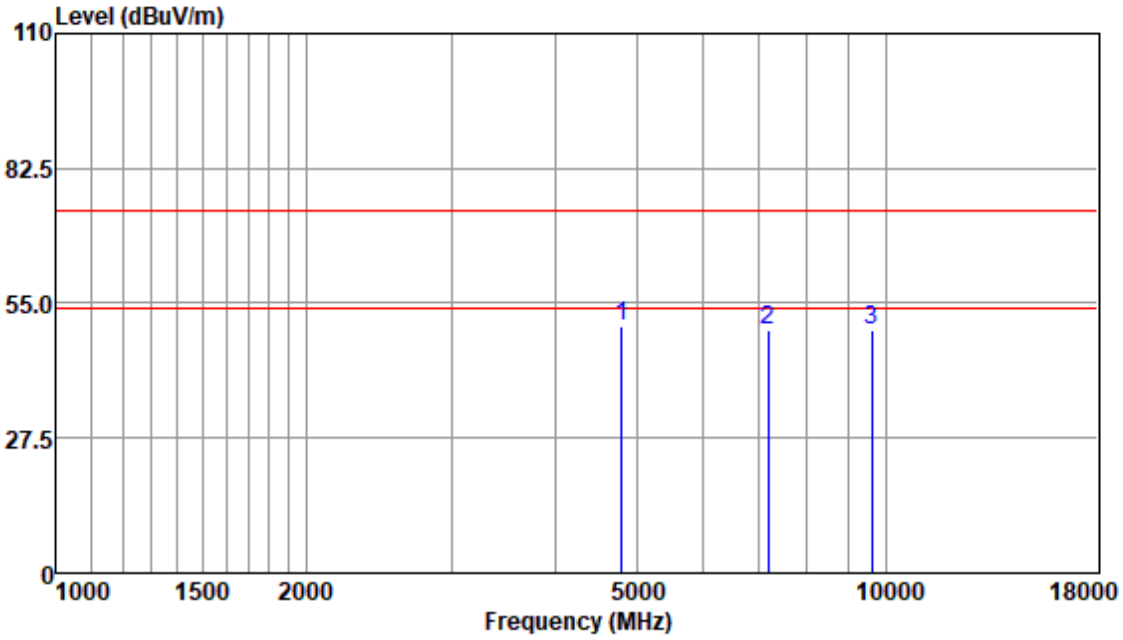


Antenna Polarity :HORIZONTAL

Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Emission Level	Limit Line	Over Limit	Remark
MHz	dBuv	dB/m	dB	dB	dBuv/m	dBuv/m	dB	
4804.00	47.65	33.72	5.09	38.71	47.75	74.00	-26.25	Peak
7206.00	45.80	36.28	5.75	37.18	50.65	74.00	-23.35	Peak
9608.00	40.22	37.70	6.78	34.18	50.52	74.00	-23.48	Peak

Note:Emission Level=Read Level+Antenna Factor+Cable loss-Preamp Factor

Test Mode: 00; Polarity: Horizontal; Modulation:GFSK; Channel:Low

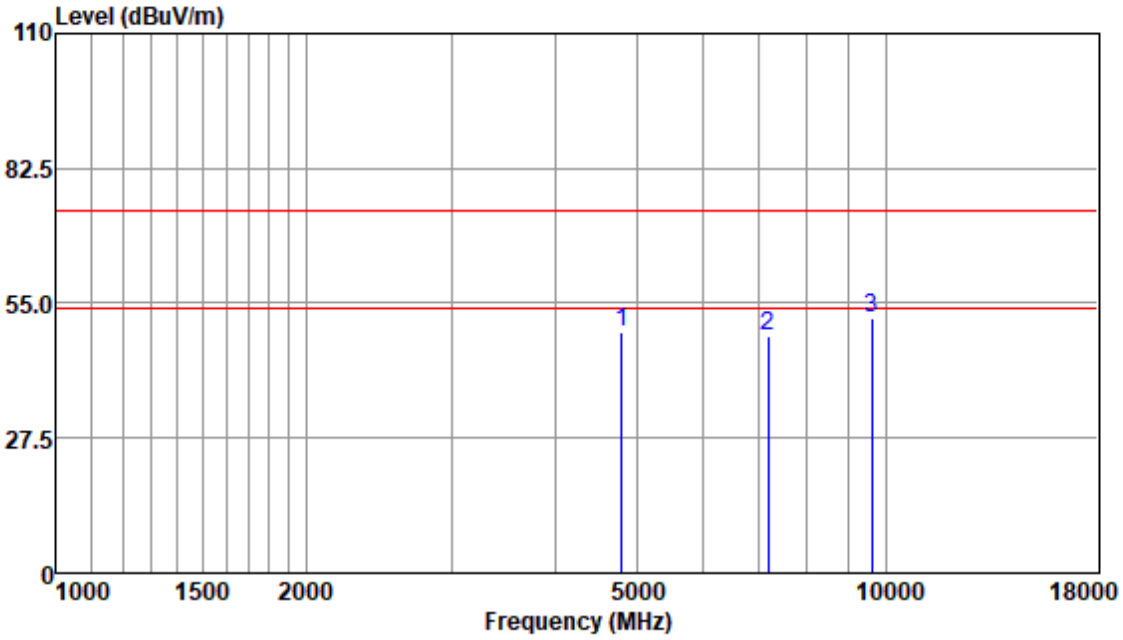


Antenna Polarity :HORIZONTAL

Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Emission Level	Limit Line	Over Limit	Remark
MHz	dBuv	dB/m	dB	dB	dBuv/m	dBuv/m	dB	
4804.00	50.16	33.72	5.09	38.71	50.26	74.00	-23.74	Peak
7206.00	44.67	36.28	5.75	37.18	49.52	74.00	-24.48	Peak
9608.00	39.28	37.70	6.78	34.18	49.58	74.00	-24.42	Peak

Note:Emission Level=Read Level+Antenna Factor+Cable loss-Preamp Factor

Test Mode: 00; Polarity: Horizontal; Modulation:π/4 DQPSK; Channel:Low

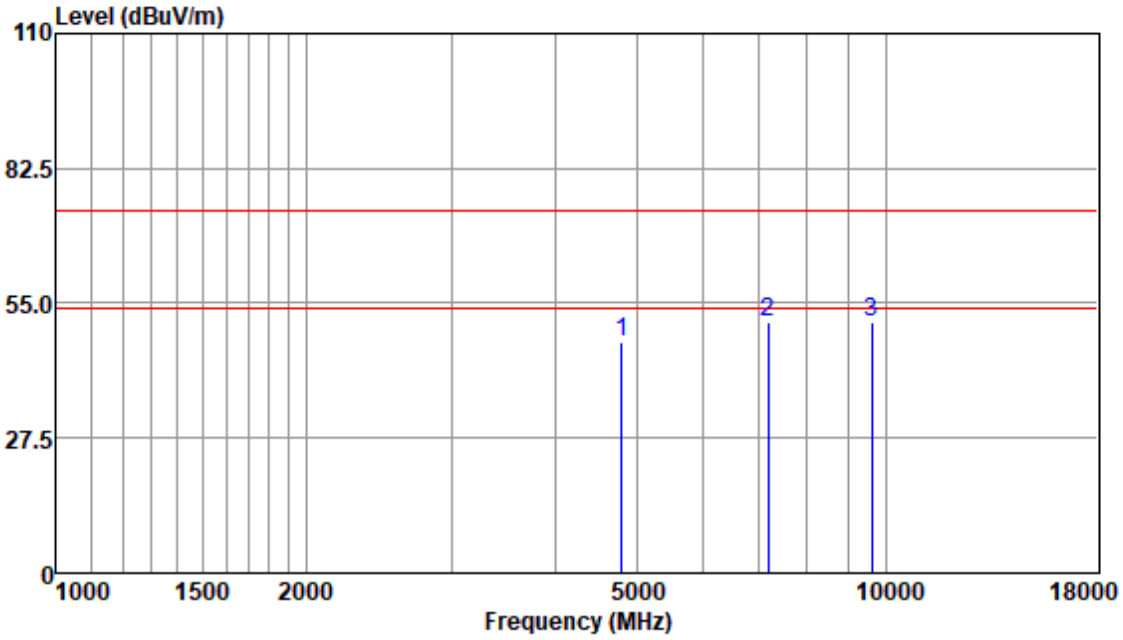


Antenna Polarity :HORIZONTAL

Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Emission Level	Limit Line	Over Limit	Remark
MHz	dBuv	dB/m	dB	dB	dBuv/m	dBuv/m	dB	
4804.00	49.16	33.72	5.09	38.71	49.26	74.00	-24.74	Peak
7206.00	43.41	36.28	5.75	37.18	48.26	74.00	-25.74	Peak
9608.00	41.59	37.70	6.78	34.18	51.89	74.00	-22.11	Peak

Note:Emission Level=Read Level+Antenna Factor+Cable loss-Preamp Factor

Test Mode: 00; Polarity: Vertical; Modulation:8DPSK; Channel:Low

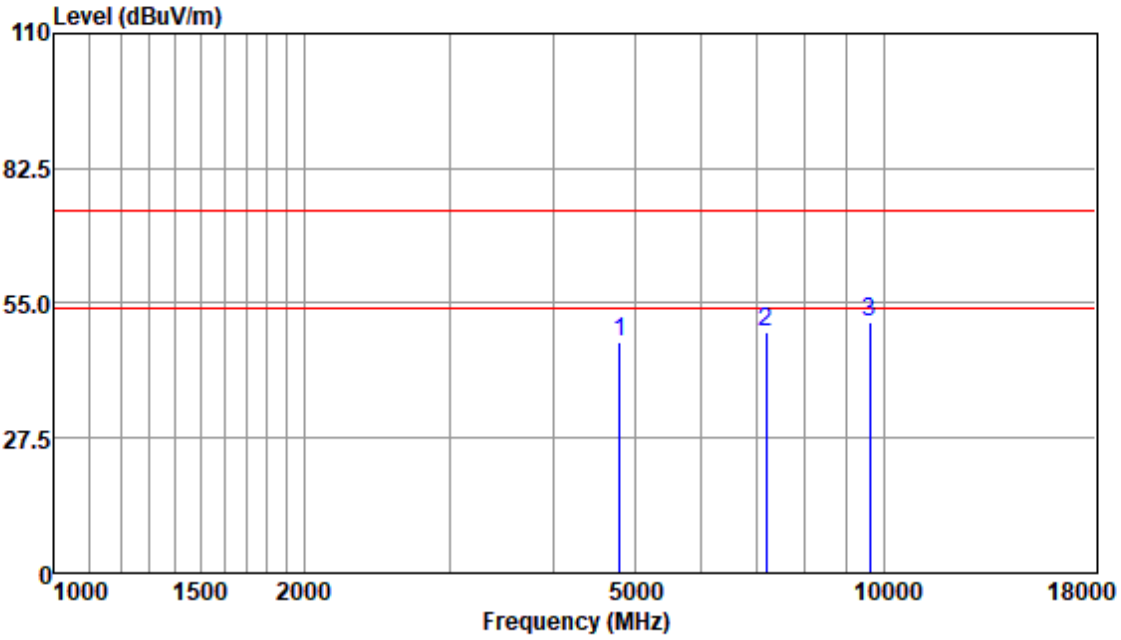


Antenna Polarity :VERTICAL

Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Emission Level	Limit Line	Over Limit	Remark
MHz	dBuv	dB/m	dB	dB	dBuv/m	dBuv/m	dB	
4804.00	47.14	33.72	5.09	38.71	47.24	74.00	-26.76	Peak
7206.00	46.10	36.28	5.75	37.18	50.95	74.00	-23.05	Peak
9608.00	41.03	37.70	6.78	34.18	51.33	74.00	-22.67	Peak

Note:Emission Level=Read Level+Antenna Factor+Cable loss-Preamp Factor

Test Mode: 00; Polarity: Vertical; Modulation:GFSK; Channel:Low

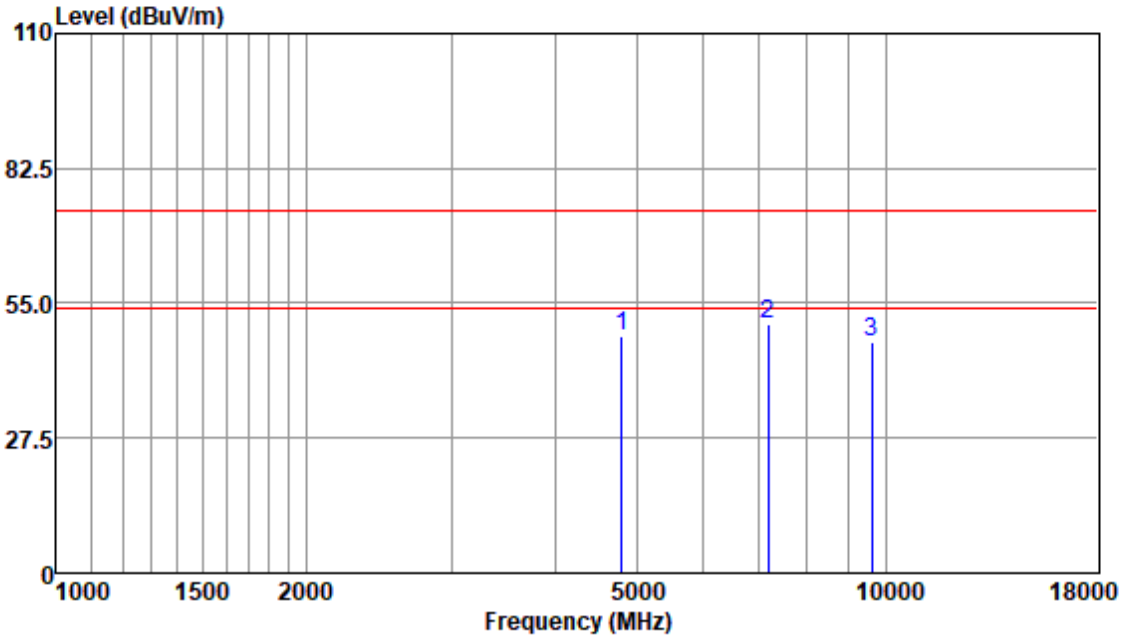


Antenna Polarity :VERTICAL

Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Emission Level	Limit Line	Over Limit	Remark
MHz	dBuv	dB/m	dB	dB	dBuv/m	dBuv/m	dB	
4804.00	47.16	33.72	5.09	38.71	47.26	74.00	-26.74	Peak
7206.00	44.41	36.28	5.75	37.18	49.26	74.00	-24.74	Peak
9608.00	40.96	37.70	6.78	34.18	51.26	74.00	-22.74	Peak

Note:Emission Level=Read Level+Antenna Factor+Cable loss-Preamp Factor

Test Mode: 00; Polarity: Vertical; Modulation:π/4 DQPSK; Channel:Low

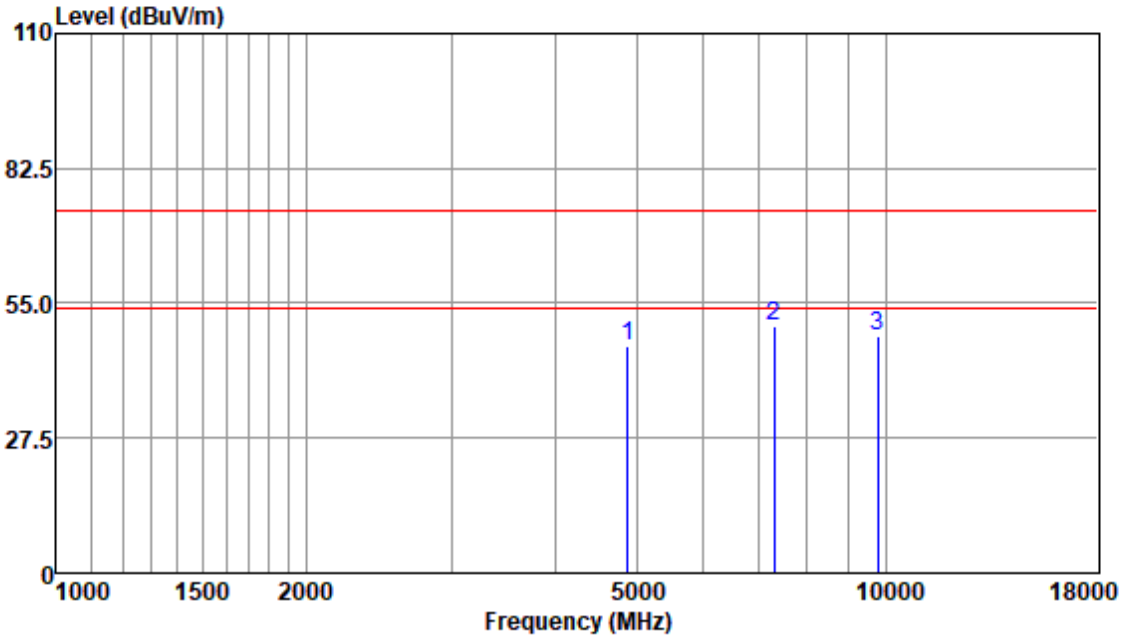


Antenna Polarity :VERTICAL

Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Emission Level	Limit Line	Over Limit	Remark
MHz	dBuv	dB/m	dB	dB	dBuv/m	dBuv/m	dB	
4804.00	48.16	33.72	5.09	38.71	48.26	74.00	-25.74	Peak
7206.00	46.07	36.28	5.75	37.18	50.92	74.00	-23.08	Peak
9608.00	36.65	37.70	6.78	34.18	46.95	74.00	-27.05	Peak

Note:Emission Level=Read Level+Antenna Factor+Cable loss-Preamp Factor

Test Mode: 00; Polarity: Horizontal; Modulation:8DPSK; Channel:middle

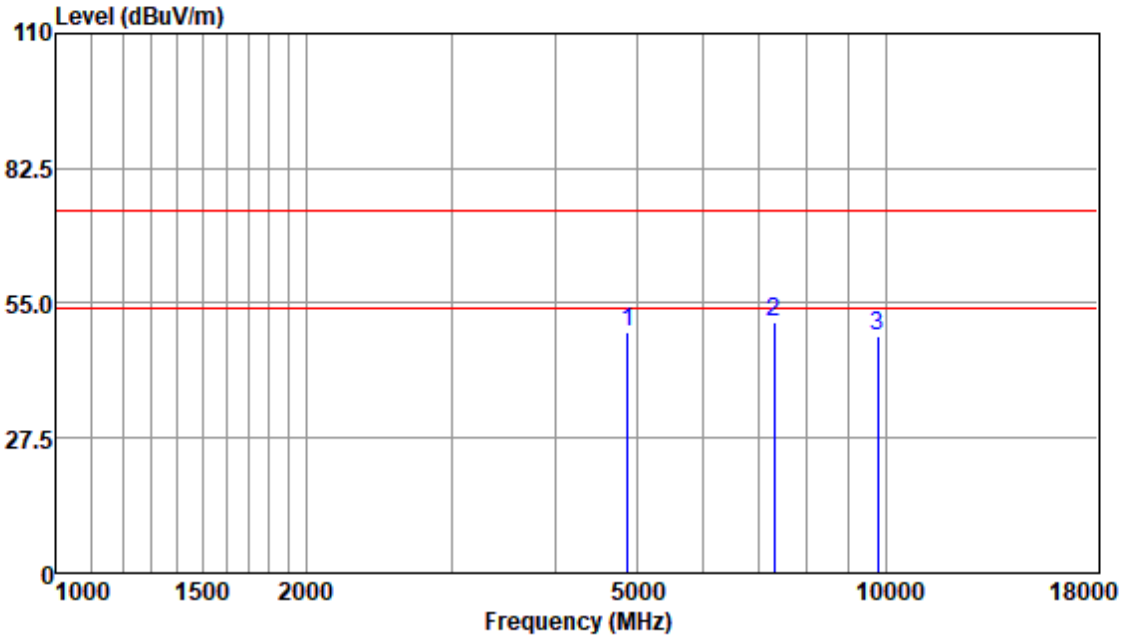


Antenna Polarity :HORIZONTAL

Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Emission Level	Limit Line	Over Limit	Remark
MHz	dBuv	dB/m	dB	dB	dBuv/m	dBuv/m	dB	
4882.00	46.46	33.95	4.48	38.78	46.11	74.00	-27.89	Peak
7323.00	44.94	36.47	5.98	37.10	50.29	74.00	-23.71	Peak
9764.00	38.14	37.68	6.48	34.14	48.16	74.00	-25.84	Peak

Note:Emission Level=Read Level+Antenna Factor+Cable loss-Preamp Factor

Test Mode: 00; Polarity: Horizontal; Modulation:GFSK; Channel:middle

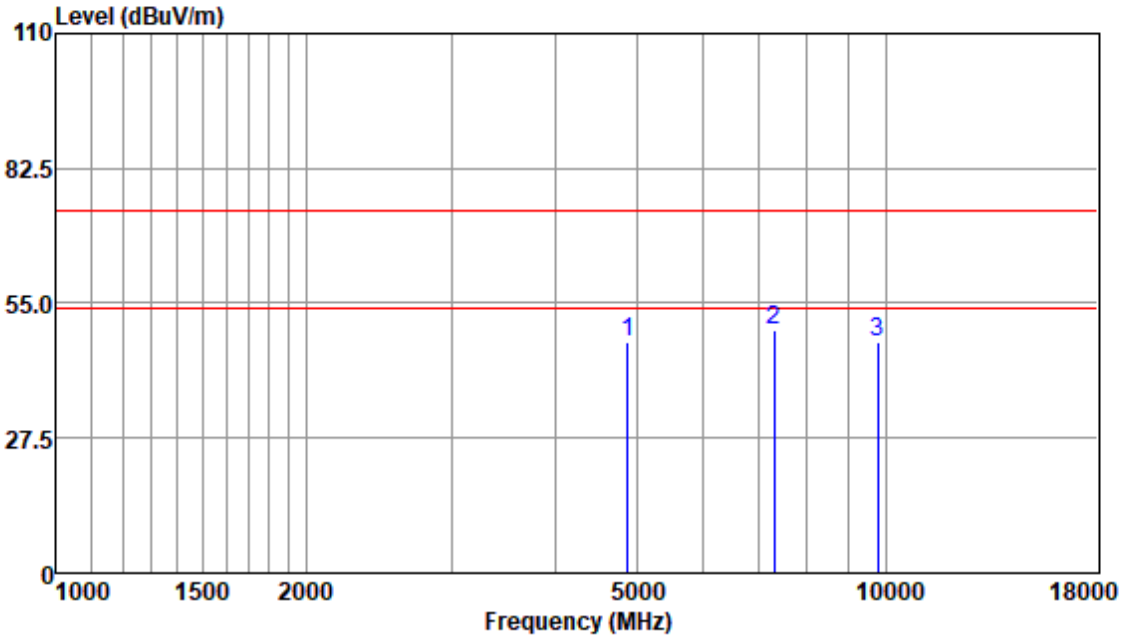


Antenna Polarity :HORIZONTAL

Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Emission Level	Limit Line	Over Limit	Remark
MHz	dBuv	dB/m	dB	dB	dBuv/m	dBuv/m	dB	
4882.00	49.63	33.95	4.48	38.78	49.28	74.00	-24.72	Peak
7323.00	45.66	36.47	5.98	37.10	51.01	74.00	-22.99	Peak
9764.00	38.26	37.68	6.48	34.14	48.28	74.00	-25.72	Peak

Note:Emission Level=Read Level+Antenna Factor+Cable loss-Preamp Factor

Test Mode: 00; Polarity: Horizontal; Modulation:π/4 DQPSK; Channel:middle

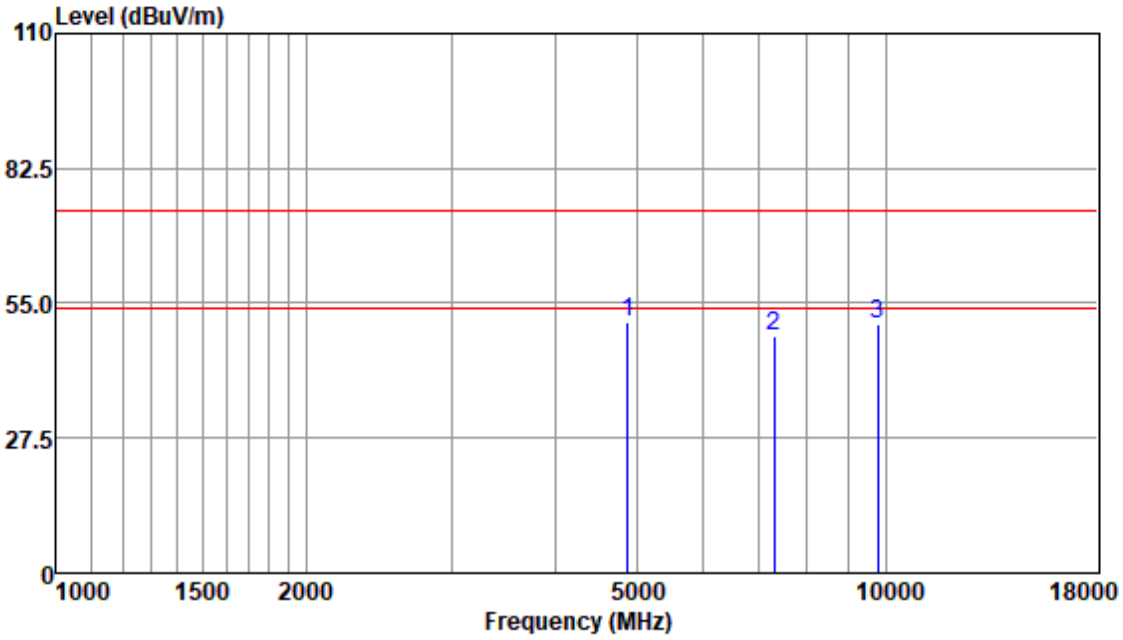


Antenna Polarity :HORIZONTAL

Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Emission Level	Limit Line	Over Limit	Remark
MHz	dBuv	dB/m	dB	dB	dBuv/m	dBuv/m	dB	
4882.00	47.61	33.95	4.48	38.78	47.26	74.00	-26.74	Peak
7323.00	44.23	36.47	5.98	37.10	49.58	74.00	-24.42	Peak
9764.00	36.90	37.68	6.48	34.14	46.92	74.00	-27.08	Peak

Note:Emission Level=Read Level+Antenna Factor+Cable loss-Preamp Factor

Test Mode: 00; Polarity: Vertical; Modulation:8DPSK; Channel:middle

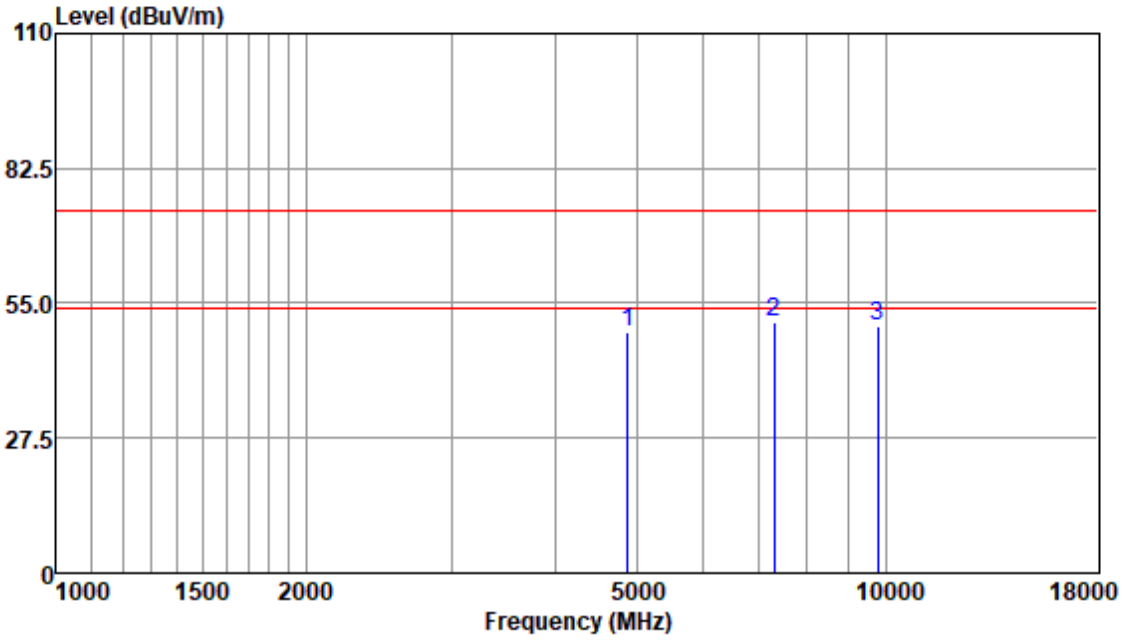


Antenna Polarity :VERTICAL

Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Emission Level	Limit Line	Over Limit	Remark
MHz	dBuv	dB/m	dB	dB	dBuv/m	dBuv/m	dB	
4882.00	51.49	33.95	4.48	38.78	51.14	74.00	-22.86	Peak
7323.00	43.13	36.47	5.98	37.10	48.48	74.00	-25.52	Peak
9764.00	40.53	37.68	6.48	34.14	50.55	74.00	-23.45	Peak

Note:Emission Level=Read Level+Antenna Factor+Cable loss-Preamp Factor

Test Mode: 00; Polarity: Vertical; Modulation:GFSK; Channel:middle

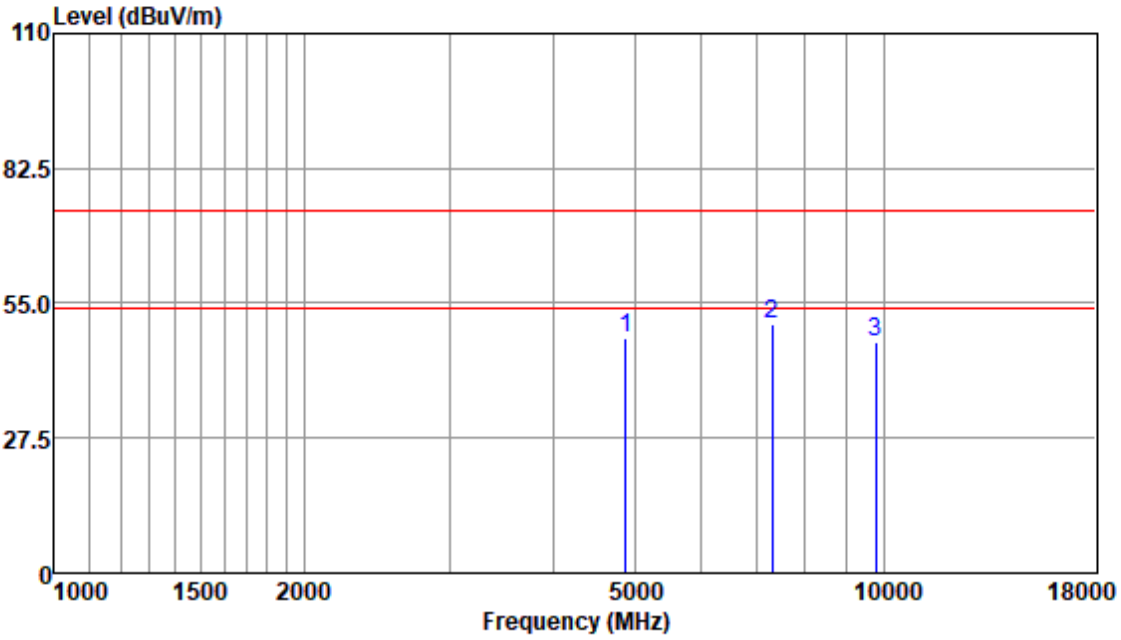


Antenna Polarity :VERTICAL

Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Emission Level	Limit Line	Over Limit	Remark
MHz	dBuv	dB/m	dB	dB	dBuv/m	dBuv/m	dB	
4882.00	49.62	33.95	4.48	38.78	49.27	74.00	-24.73	Peak
7323.00	45.89	36.47	5.98	37.10	51.24	74.00	-22.76	Peak
9764.00	40.24	37.68	6.48	34.14	50.26	74.00	-23.74	Peak

Note:Emission Level=Read Level+Antenna Factor+Cable loss-Preamp Factor

Test Mode: 00; Polarity: Vertical; Modulation:π/4 DQPSK; Channel:middle

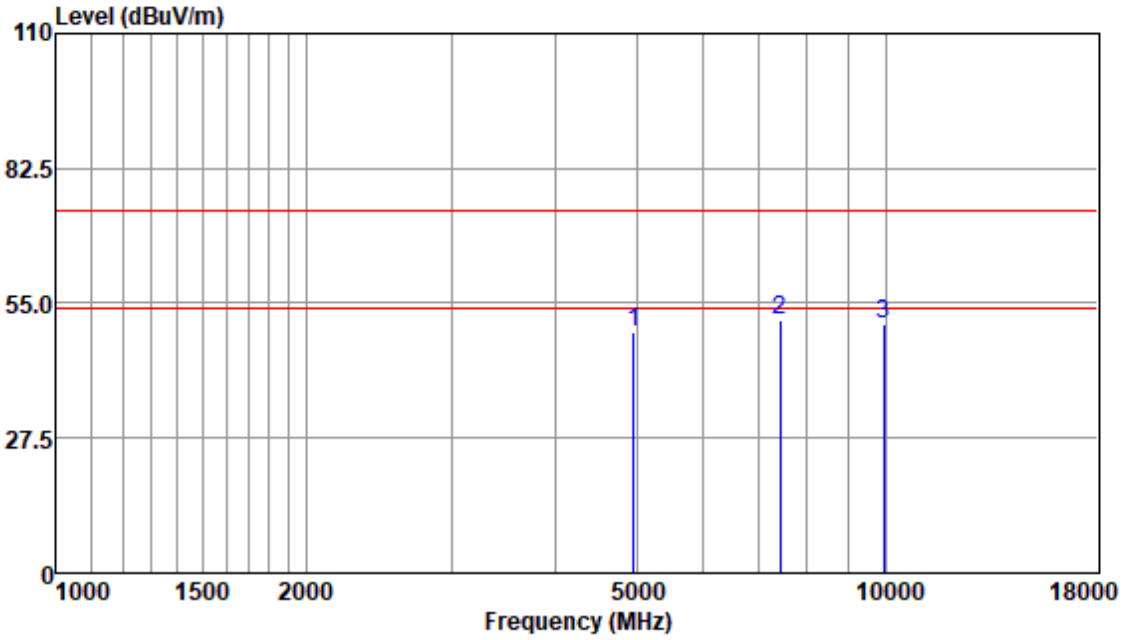


Antenna Polarity :VERTICAL

Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Emission Level	Limit Line	Over Limit	Remark
MHz	dBuv	dB/m	dB	dB	dBuv/m	dBuv/m	dB	
4882.00	48.22	33.95	4.48	38.78	47.87	74.00	-26.13	Peak
7323.00	45.47	36.47	5.98	37.10	50.82	74.00	-23.18	Peak
9764.00	37.26	37.68	6.48	34.14	47.28	74.00	-26.72	Peak

Note:Emission Level=Read Level+Antenna Factor+Cable loss-Preamp Factor

Test Mode: 00; Polarity: Horizontal; Modulation:8DPSK; Channel:High

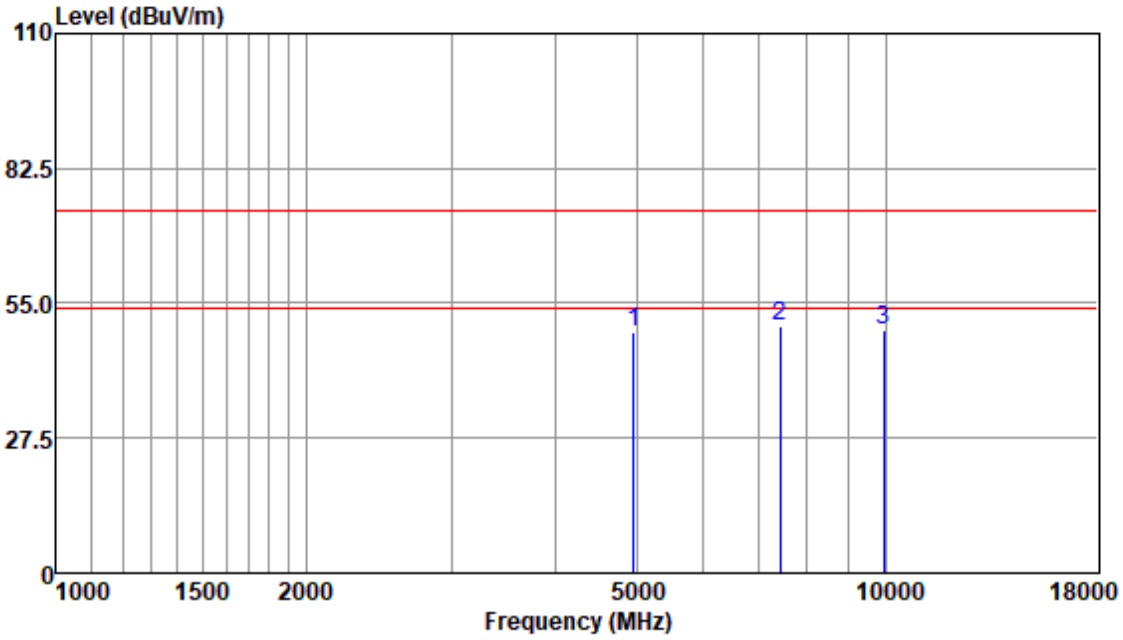


Antenna Polarity :HORIZONTAL

Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Emission Level	Limit Line	Over Limit	Remark
MHz	dBuv	dB/m	dB	dB	dBuv/m	dBuv/m	dB	
4960.00	49.10	33.98	5.04	38.87	49.25	74.00	-24.75	Peak
7440.00	46.19	36.40	6.09	37.03	51.65	74.00	-22.35	Peak
9920.00	40.33	37.81	6.53	34.11	50.56	74.00	-23.44	Peak

Note:Emission Level=Read Level+Antenna Factor+Cable loss-Preamp Factor

Test Mode: 00; Polarity: Horizontal; Modulation:GFSK; Channel:High

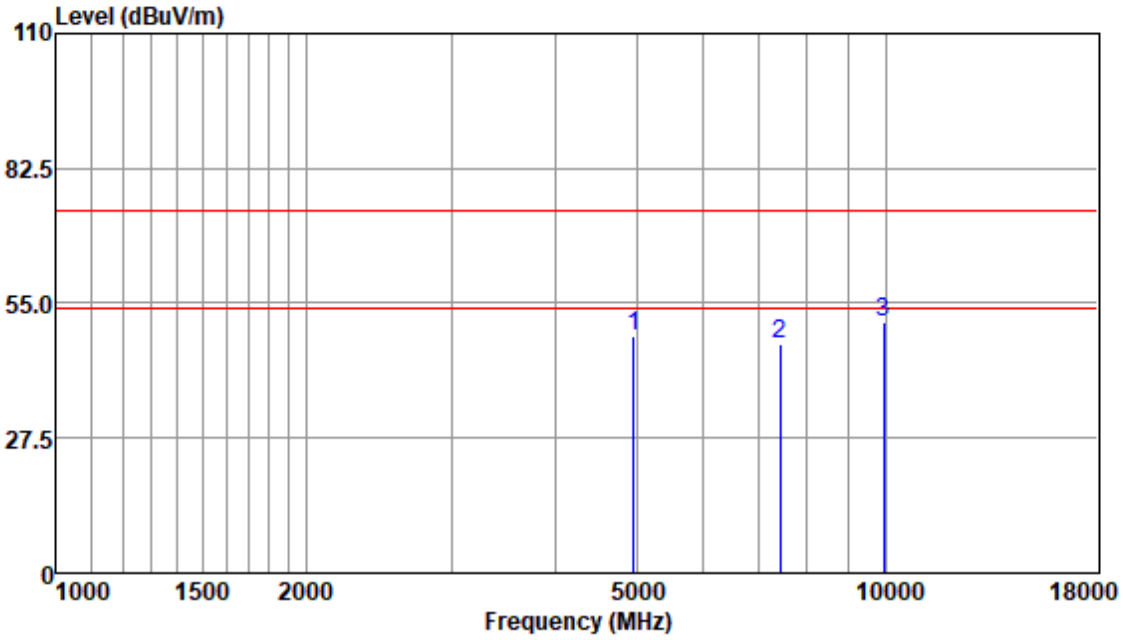


Antenna Polarity :HORIZONTAL

Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Emission Level	Limit Line	Over Limit	Remark
MHz	dBuv	dB/m	dB	dB	dBuv/m	dBuv/m	dB	
4960.00	49.11	33.98	5.04	38.87	49.26	74.00	-24.74	Peak
7440.00	44.80	36.40	6.09	37.03	50.26	74.00	-23.74	Peak
9920.00	39.10	37.81	6.53	34.11	49.33	74.00	-24.67	Peak

Note:Emission Level=Read Level+Antenna Factor+Cable loss-Preamp Factor

Test Mode: 00; Polarity: Horizontal; Modulation:π/4 DQPSK; Channel:High

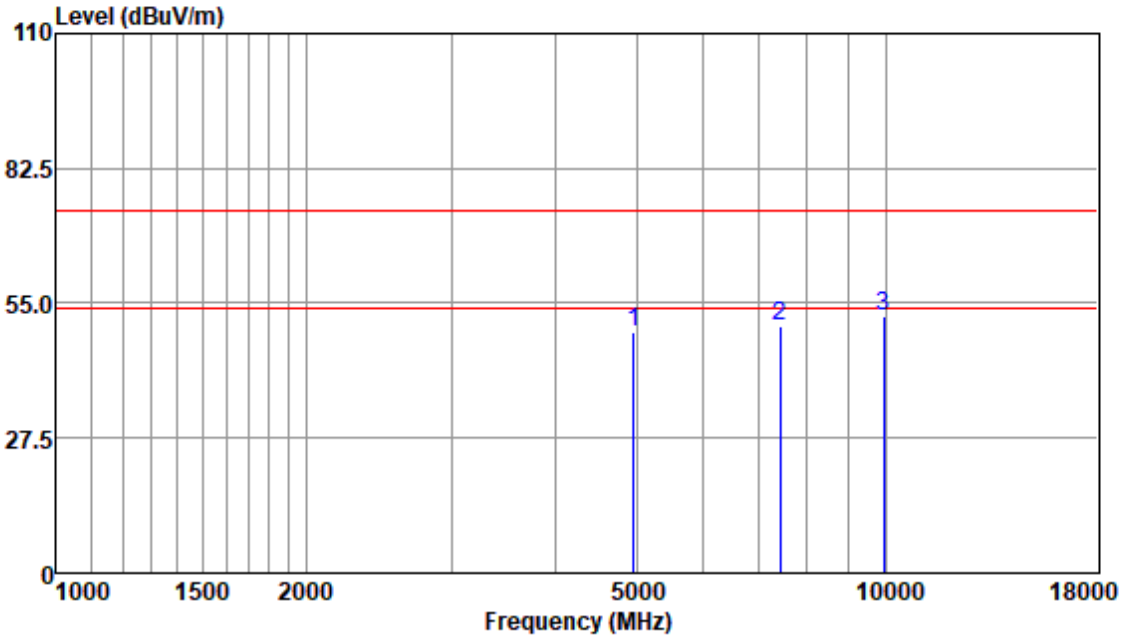


Antenna Polarity :HORIZONTAL

Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Emission Level	Limit Line	Over Limit	Remark
MHz	dBuv	dB/m	dB	dB	dBuv/m	dBuv/m	dB	
4960.00	48.11	33.98	5.04	38.87	48.26	74.00	-25.74	Peak
7440.00	41.16	36.40	6.09	37.03	46.62	74.00	-27.38	Peak
9920.00	40.91	37.81	6.53	34.11	51.14	74.00	-22.86	Peak

Note:Emission Level=Read Level+Antenna Factor+Cable loss-Preamp Factor

Test Mode: 00; Polarity: Vertical; Modulation:8DPSK; Channel:High

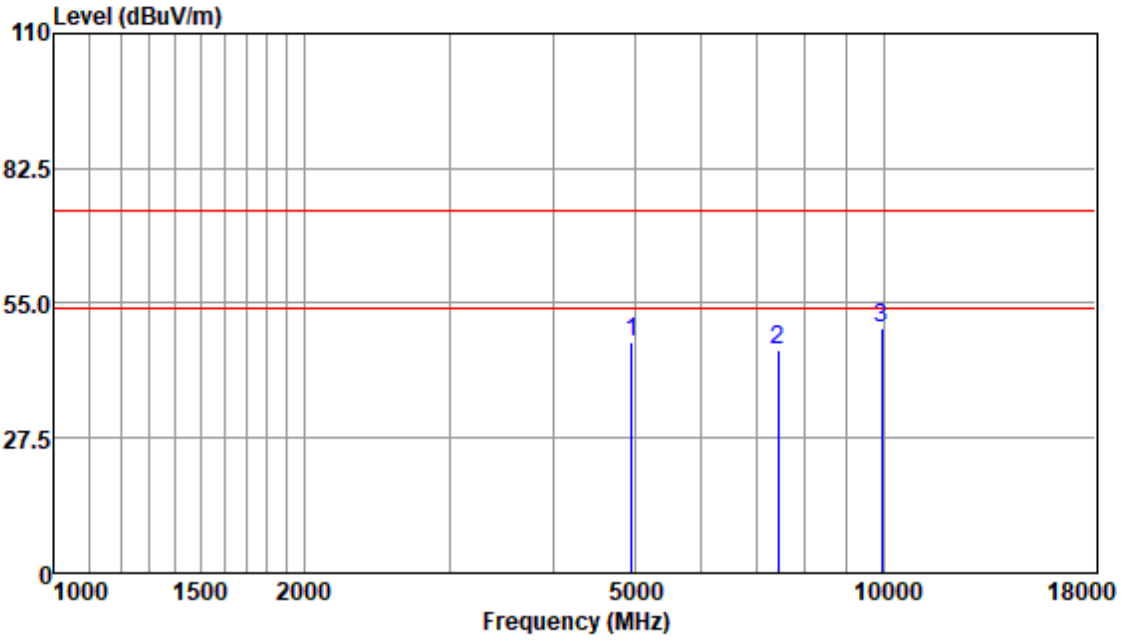


Antenna Polarity :VERTICAL

Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Emission Level	Limit Line	Over Limit	Remark
MHz	dBuv	dB/m	dB	dB	dBuv/m	dBuv/m	dB	
4960.00	49.13	33.98	5.04	38.87	49.28	74.00	-24.72	Peak
7440.00	44.82	36.40	6.09	37.03	50.28	74.00	-23.72	Peak
9920.00	42.22	37.81	6.53	34.11	52.45	74.00	-21.55	Peak

Note:Emission Level=Read Level+Antenna Factor+Cable loss-Preamp Factor

Test Mode: 00; Polarity: Vertical; Modulation:GFSK; Channel:High

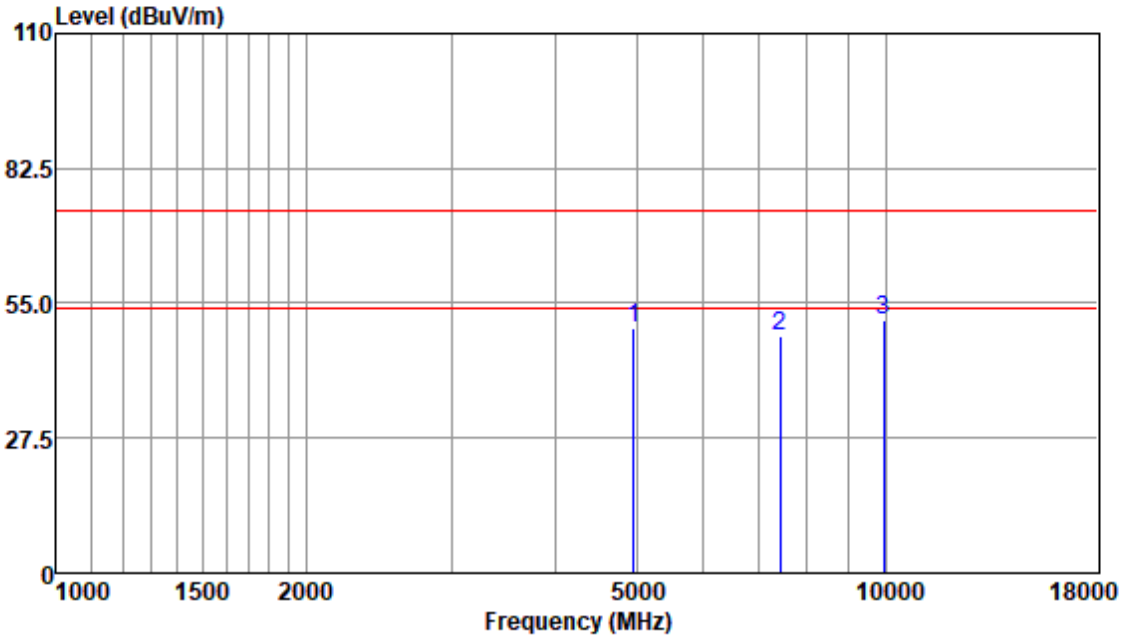


Antenna Polarity :VERTICAL

Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Emission Level	Limit Line	Over Limit	Remark
MHz	dBuv	dB/m	dB	dB	dBuv/m	dBuv/m	dB	
4960.00	47.11	33.98	5.04	38.87	47.26	74.00	-26.74	Peak
7440.00	40.06	36.40	6.09	37.03	45.52	74.00	-28.48	Peak
9920.00	39.84	37.81	6.53	34.11	50.07	74.00	-23.93	Peak

Note:Emission Level=Read Level+Antenna Factor+Cable loss-Preamp Factor

Test Mode: 00; Polarity: Vertical; Modulation:π/4 DQPSK; Channel:High



Antenna Polarity :VERTICAL

Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Emission Level	Limit Line	Over Limit	Remark
MHz	dBuv	dB/m	dB	dB	dBuv/m	dBuv/m	dB	
4960.00	49.60	33.98	5.04	38.87	49.75	74.00	-24.25	Peak
7440.00	42.79	36.40	6.09	37.03	48.25	74.00	-25.75	Peak
9920.00	41.42	37.81	6.53	34.11	51.65	74.00	-22.35	Peak

Note:Emission Level=Read Level+Antenna Factor+Cable loss-Preamp Factor

8 Test Setup Photographs

Refer to the < Test Setup photos-FCC>.

9 EUT Constructional Details

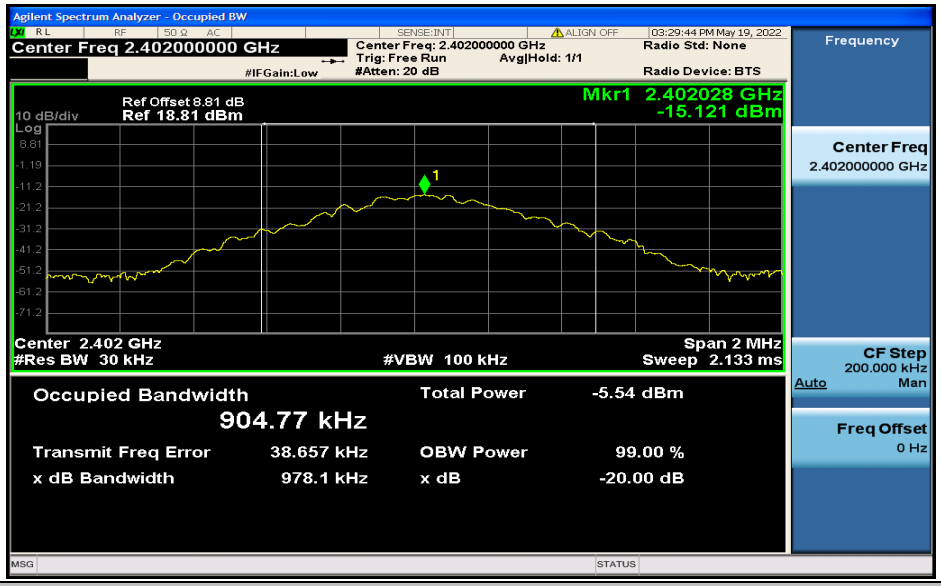
Refer to the < External Photos > & < Internal Photos >.

10 Appendix

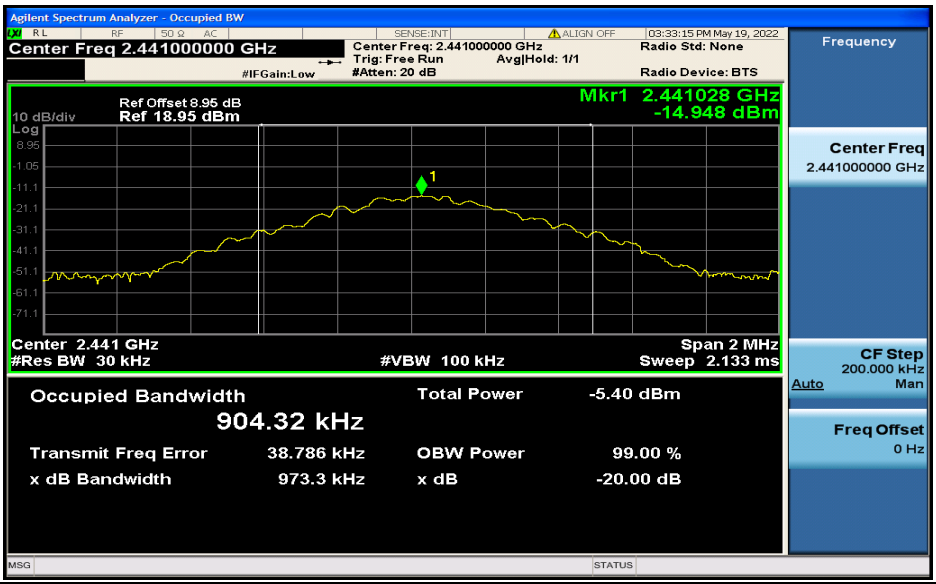
1.20 dB Bandwidth

Test Mode	Test Channel	EBW[MHz]	Limit[MHz]	Verdict
DH5	2402	0.98	---	PASS
DH5	2441	0.97	---	PASS
DH5	2480	1.02	---	PASS
2DH5	2402	1.37	---	PASS
2DH5	2441	1.36	---	PASS
2DH5	2480	1.37	---	PASS
3DH5	2402	1.35	---	PASS
3DH5	2441	1.35	---	PASS
3DH5	2480	1.35	---	PASS

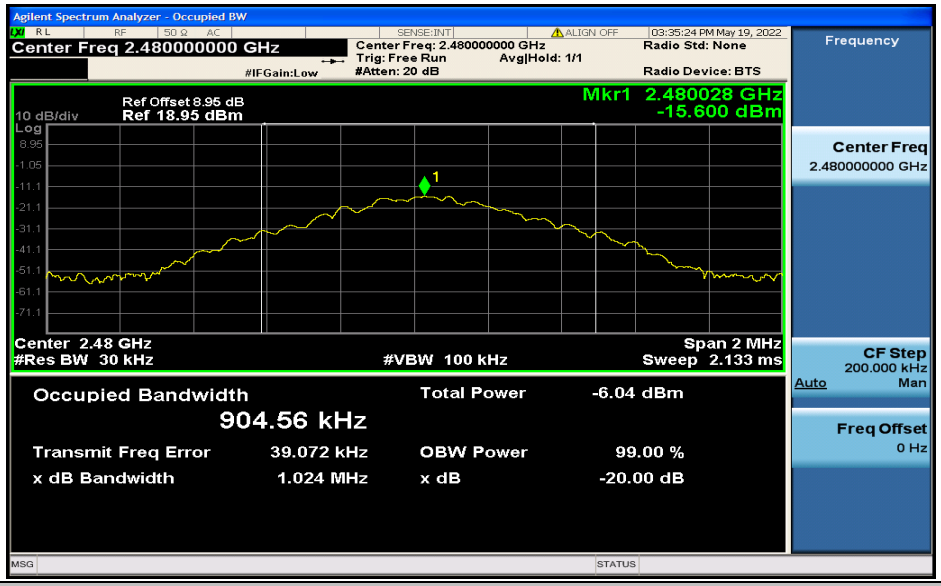
20 dB Bandwidth_DH5_2402



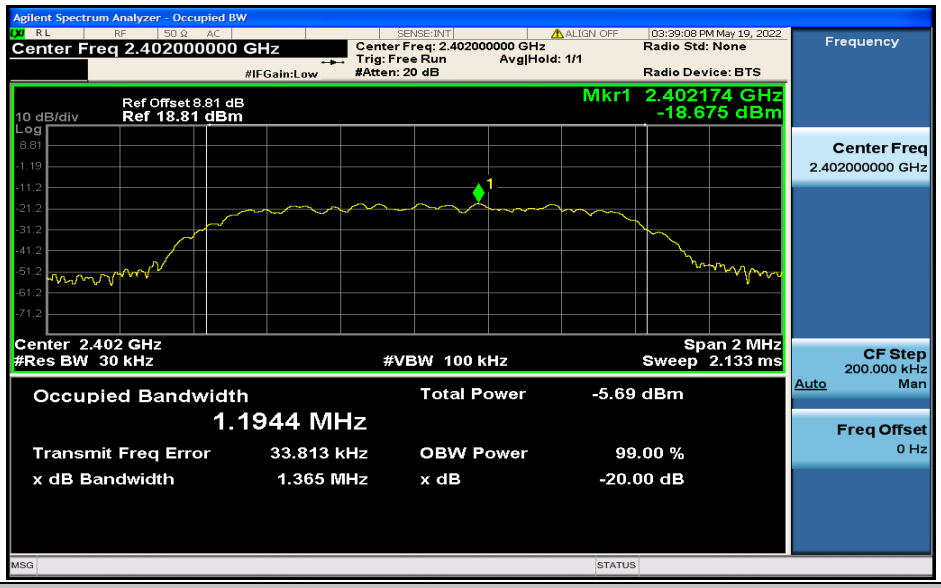
20 dB Bandwidth_DH5_2441



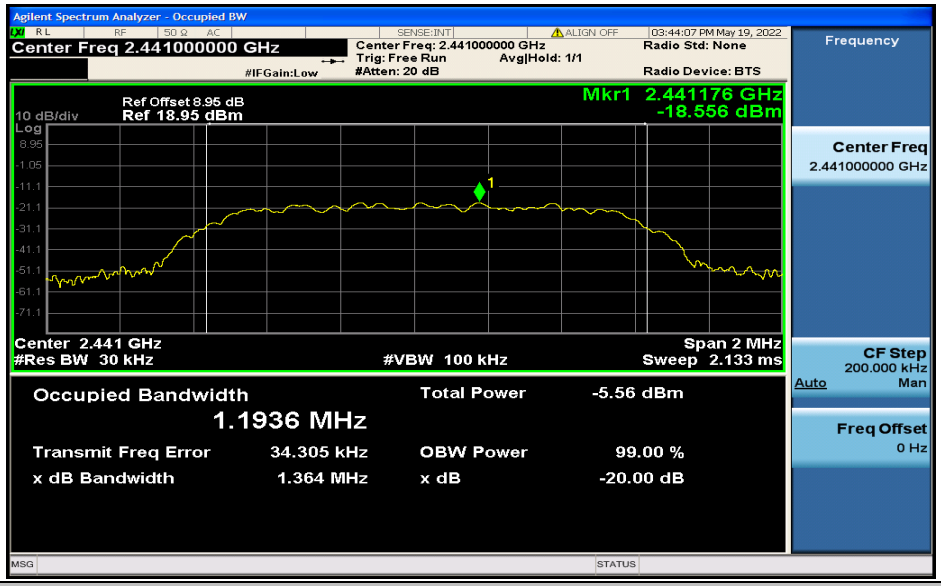
20 dB Bandwidth_DH5_2480



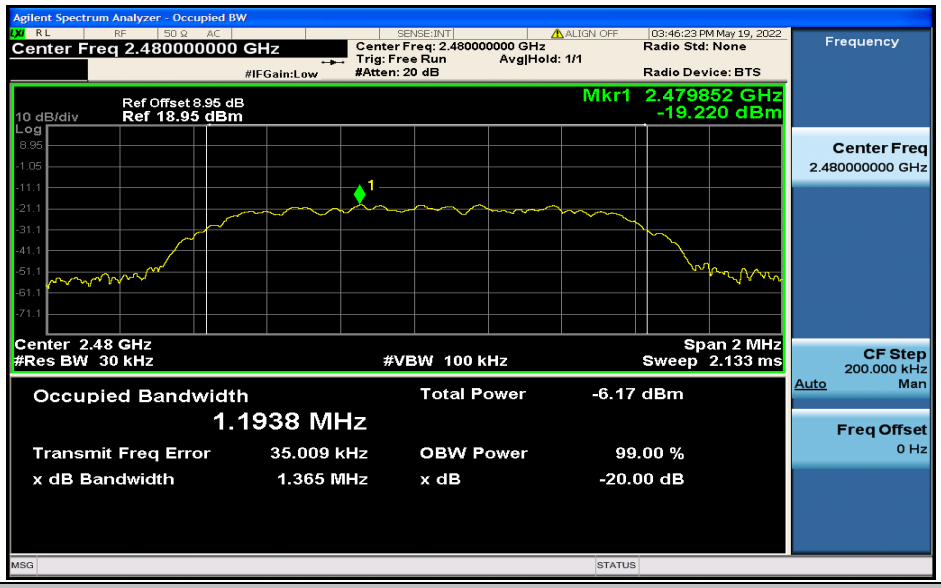
20 dB Bandwidth_2DH5_2402



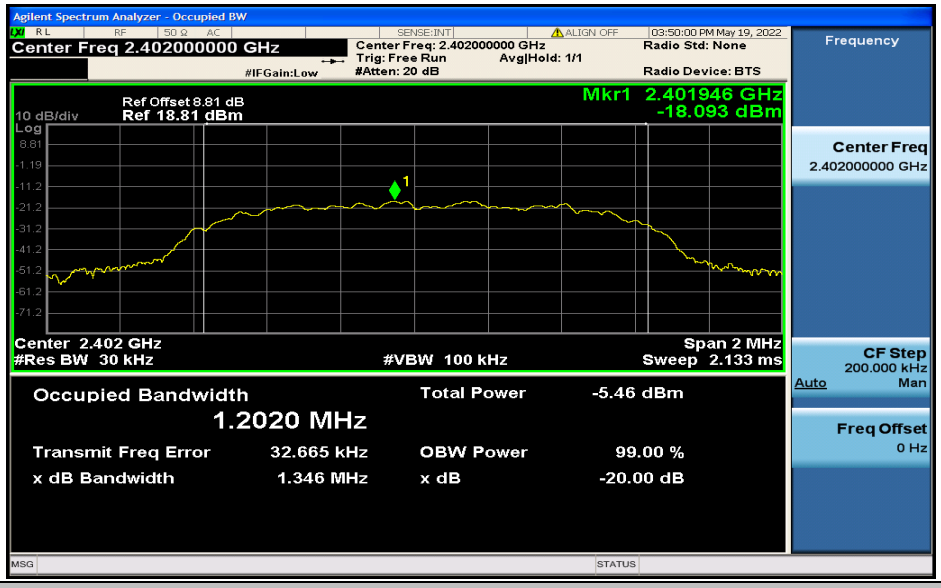
20 dB Bandwidth_2DH5_2441



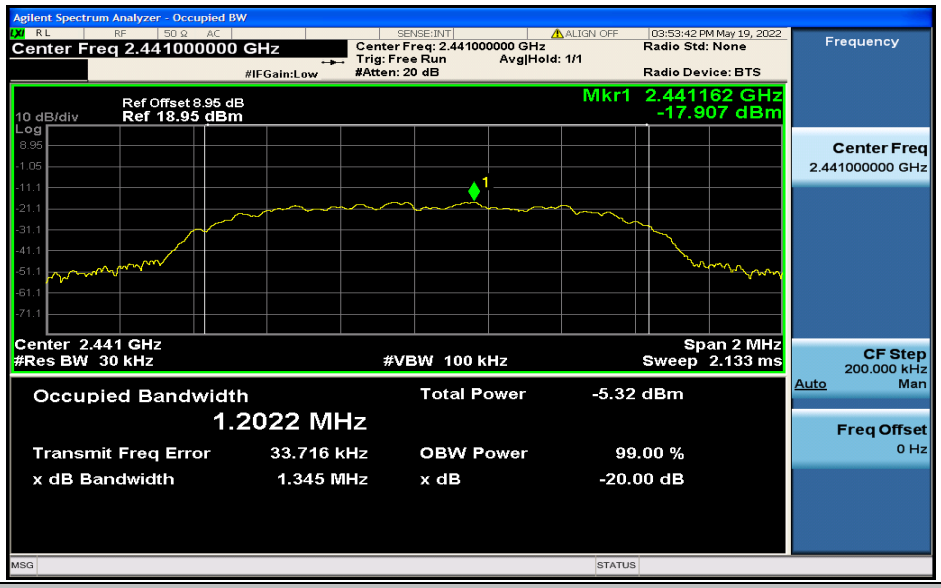
20 dB Bandwidth_2DH5_2480



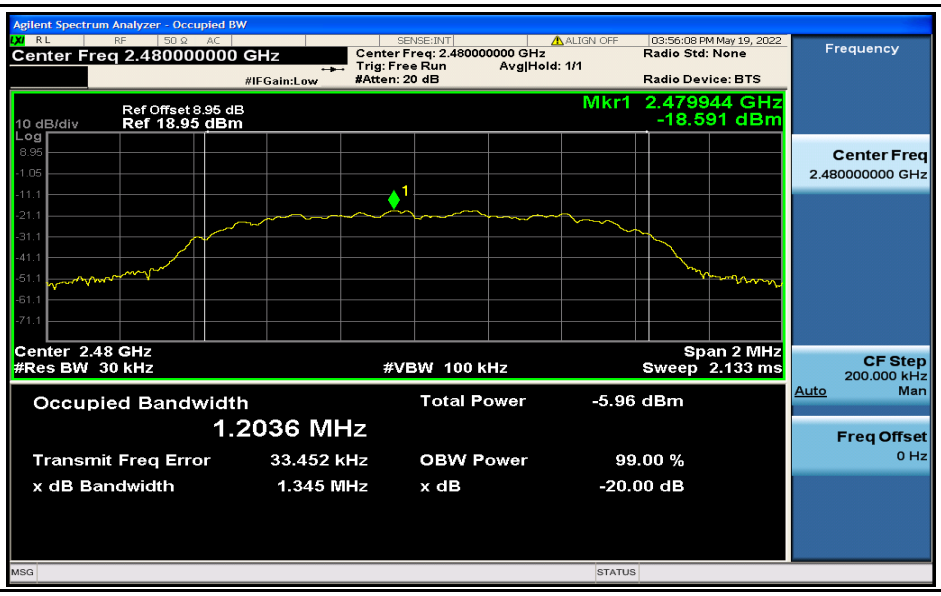
20 dB Bandwidth_3DH5_2402



20 dB Bandwidth_3DH5_2441



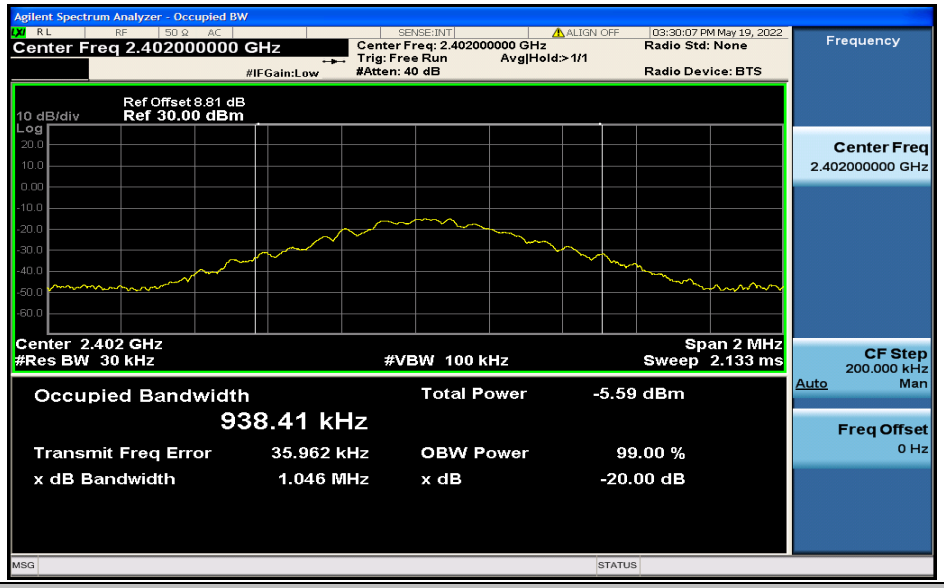
20 dB Bandwidth_3DH5_2480



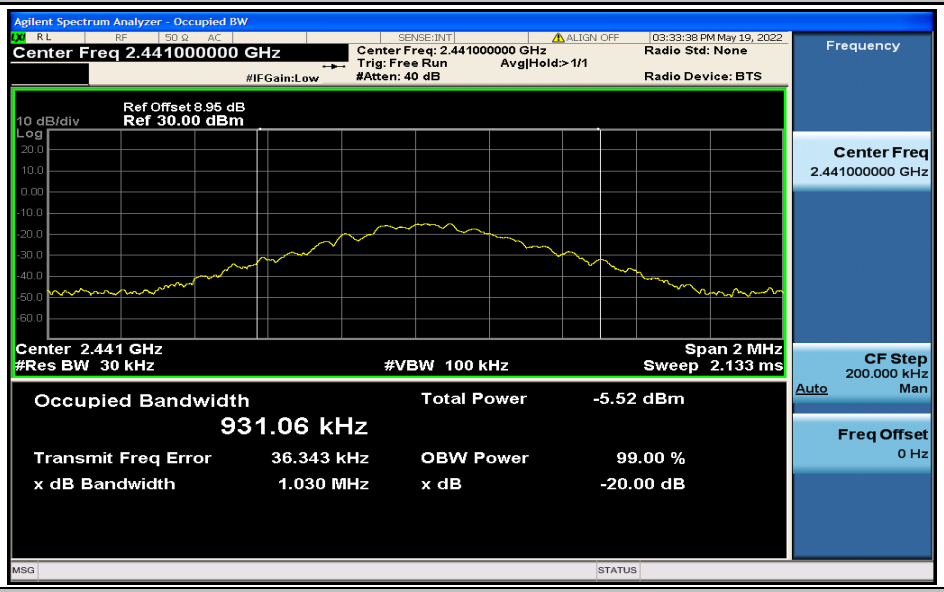
2.Occupied Bandwidth

Test Mode	Test Channel	OBW[MHz]	Limit[MHz]	Verdict
DH5	2402	0.94	---	PASS
DH5	2441	0.93	---	PASS
DH5	2480	0.94	---	PASS
2DH5	2402	1.20	---	PASS
2DH5	2441	1.21	---	PASS
2DH5	2480	1.21	---	PASS
3DH5	2402	1.21	---	PASS
3DH5	2441	1.21	---	PASS
3DH5	2480	1.22	---	PASS

Occupied Bandwidth_DH5_2402

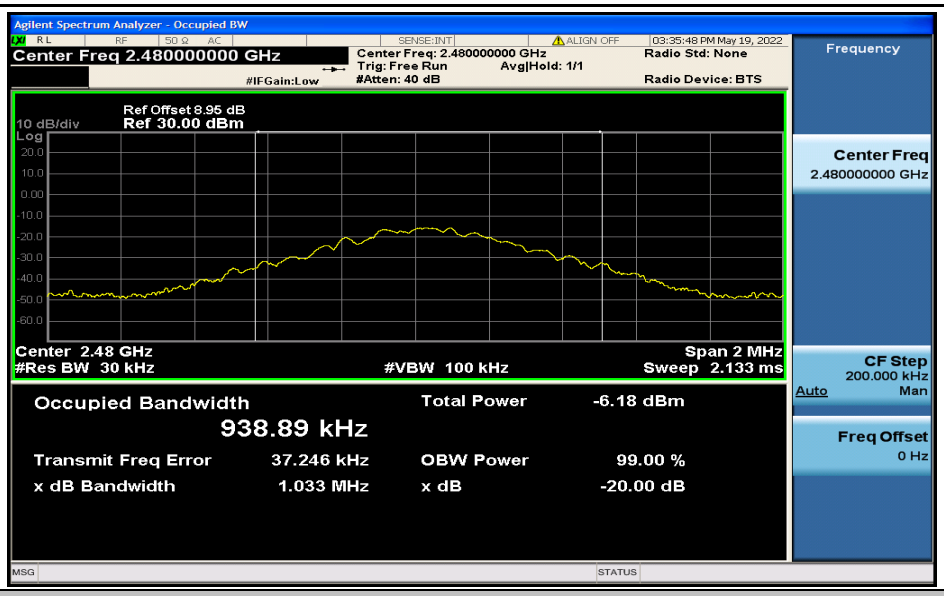


Occupied Bandwidth_DH5_2441

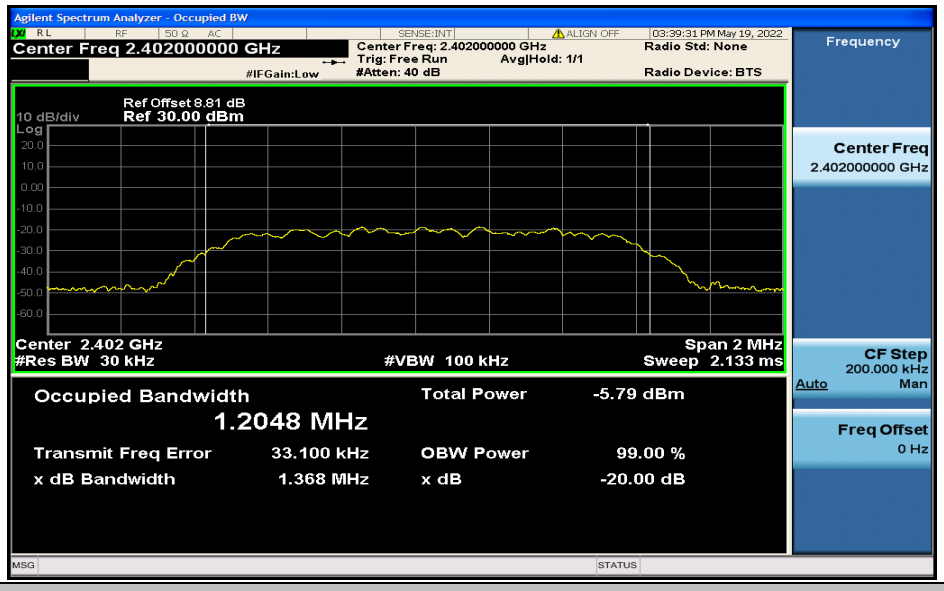


Occupied Bandwidth_DH5_2480

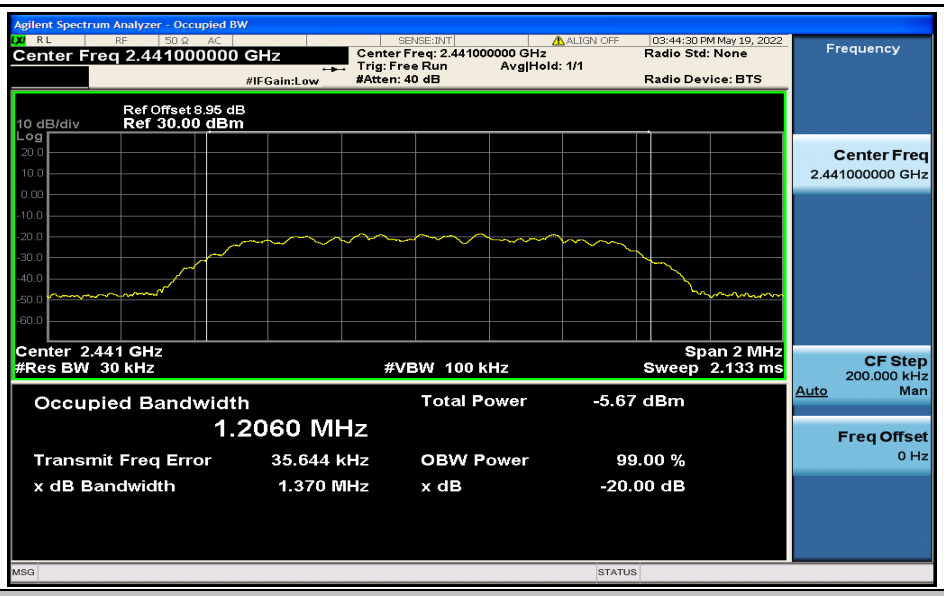
NO.588 West Jindu Road,Songjiang District,Shanghai,China 201612 t(86-21)61915666 f(86-21)61915678 www.sgsgroup.com.cn
中国·上海·松江区金都西路588号 邮编: 201612 t(86-21)61915666 f(86-21)61915678 e sgs.china@sgs.com



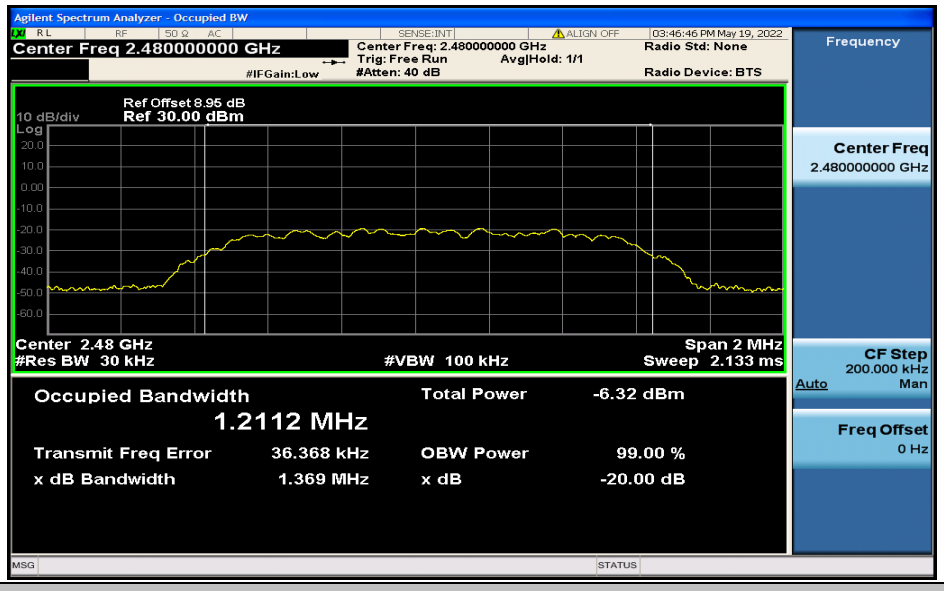
Occupied Bandwidth_2DH5_2402



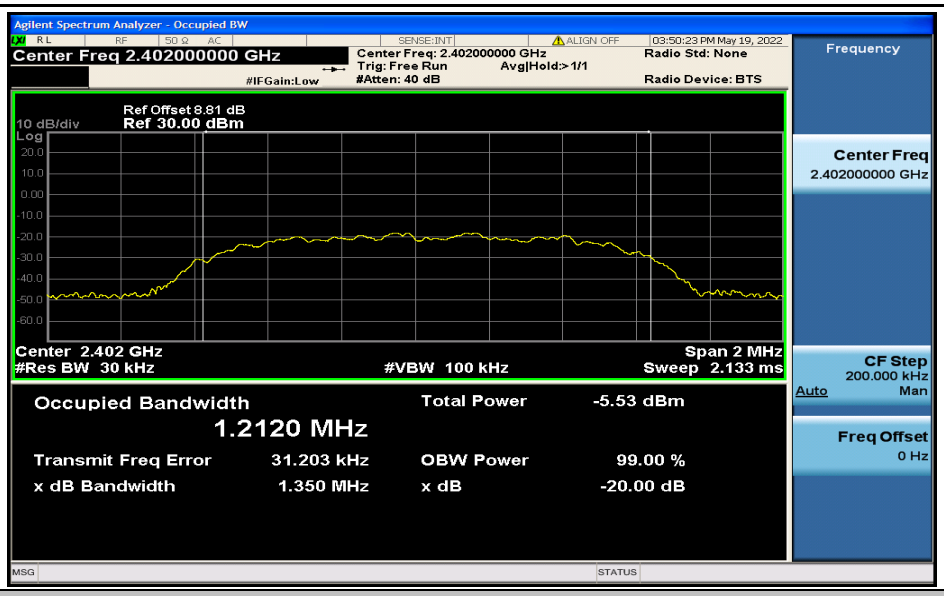
Occupied Bandwidth_2DH5_2441



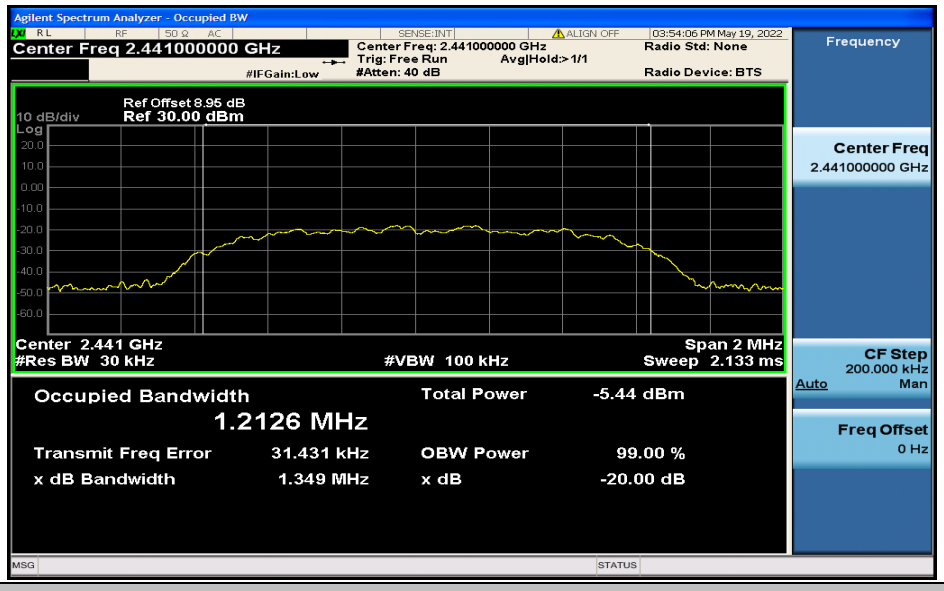
Occupied Bandwidth_2DH5_2480



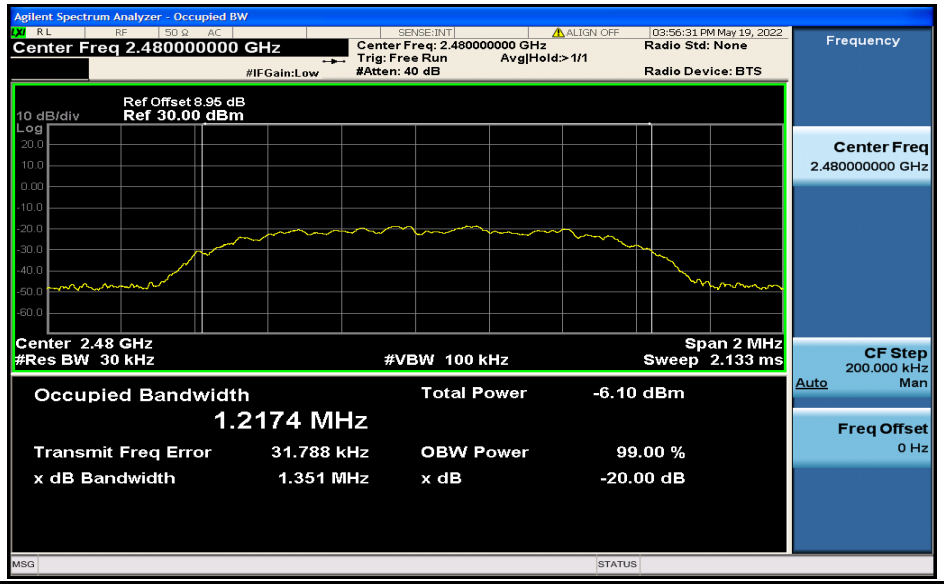
Occupied Bandwidth_3DH5_2402



Occupied Bandwidth_3DH5_2441



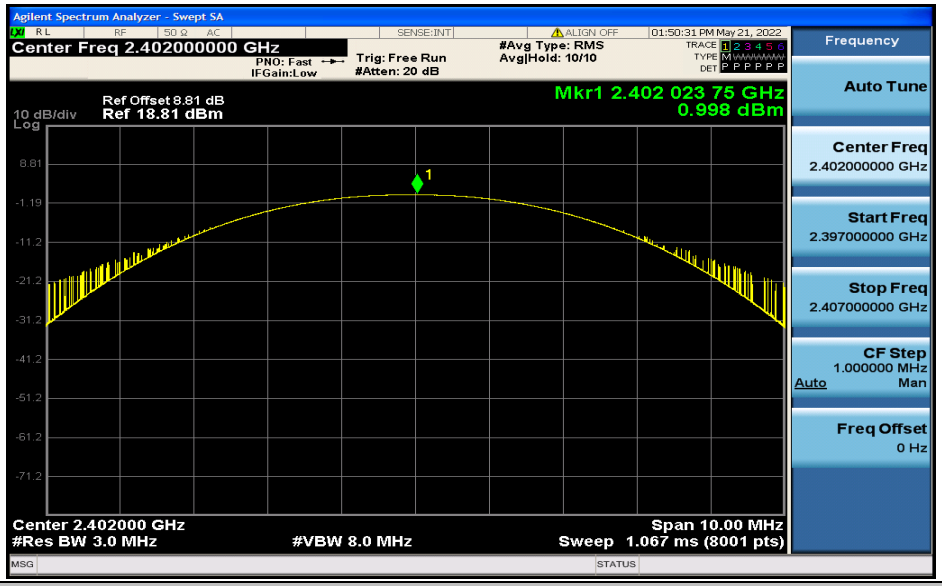
Occupied Bandwidth_3DH5_2480



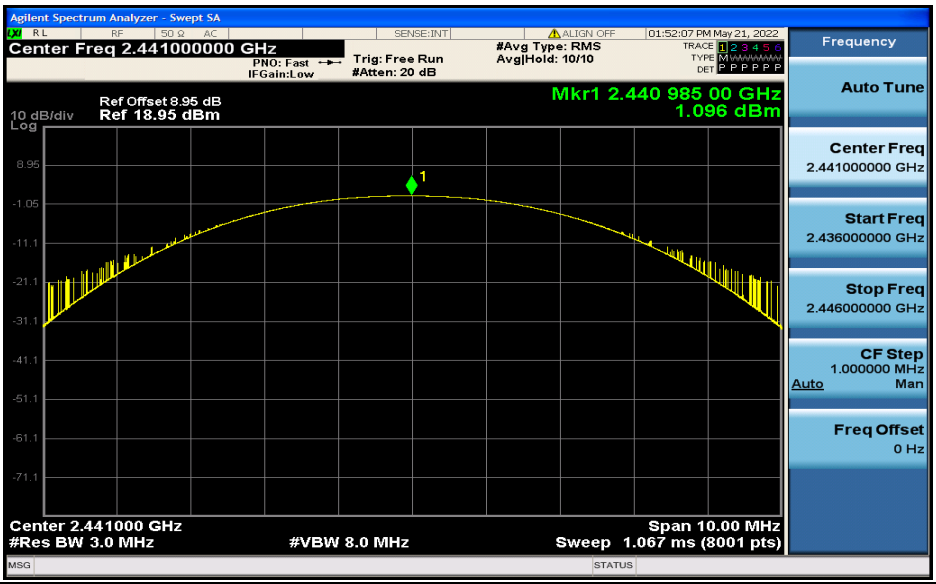
3.Conducted Peak Output Power

Test Mode	Test Channel	Power[dBm]	Limit[dBm]	Verdict
DH5	2402	1.00	30	PASS
DH5	2441	1.10	30	PASS
DH5	2480	0.45	30	PASS
2DH5	2402	3.03	30	PASS
2DH5	2441	3.15	30	PASS
2DH5	2480	2.53	30	PASS
3DH5	2402	3.42	30	PASS
3DH5	2441	3.52	30	PASS
3DH5	2480	2.99	30	PASS

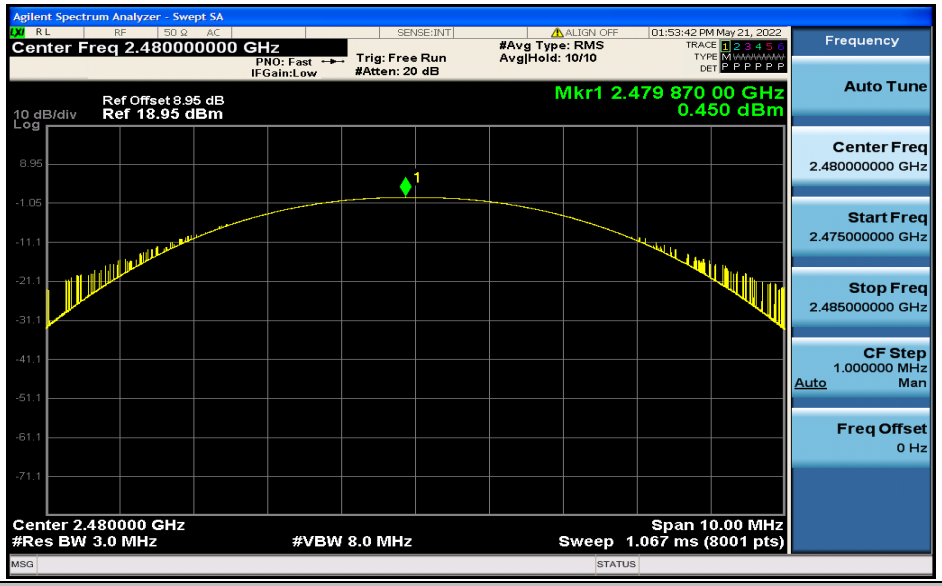
Conducted Peak Output Power_DH5_2402



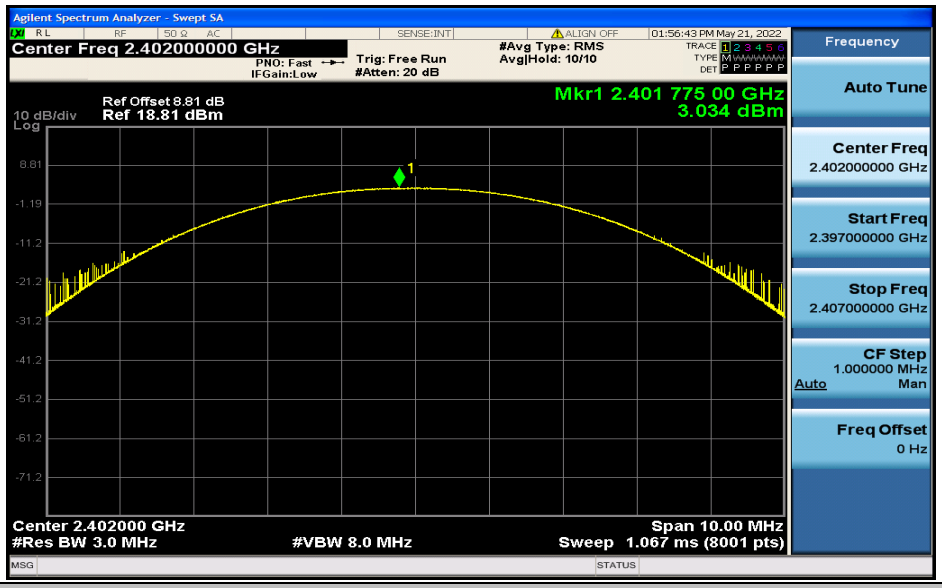
Conducted Peak Output Power_DH5_2441



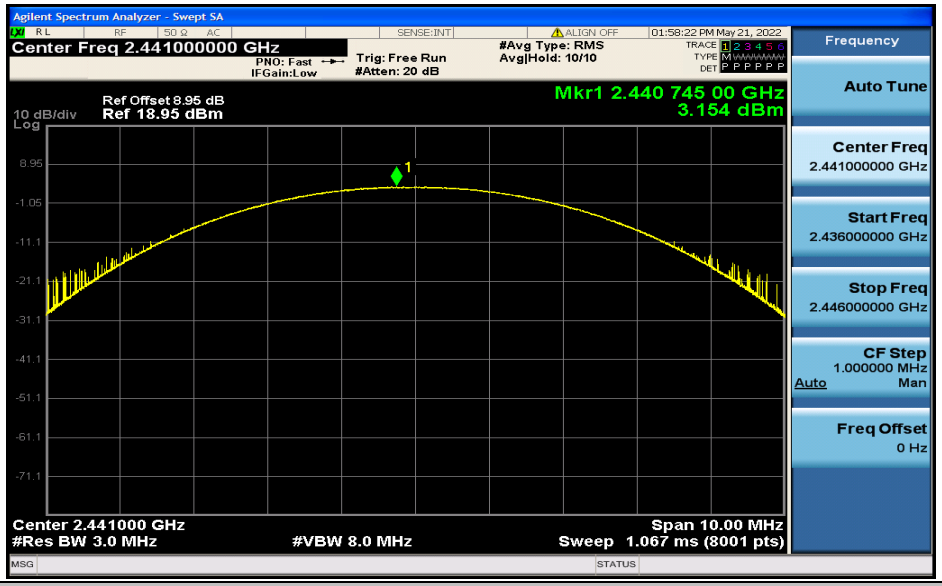
Conducted Peak Output Power_DH5_2480



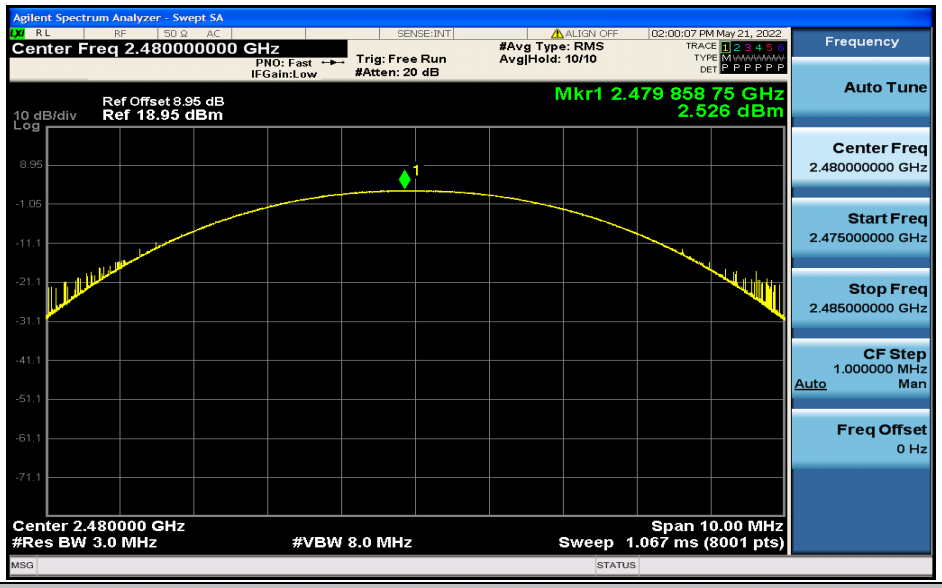
Conducted Peak Output Power_2DH5_2402



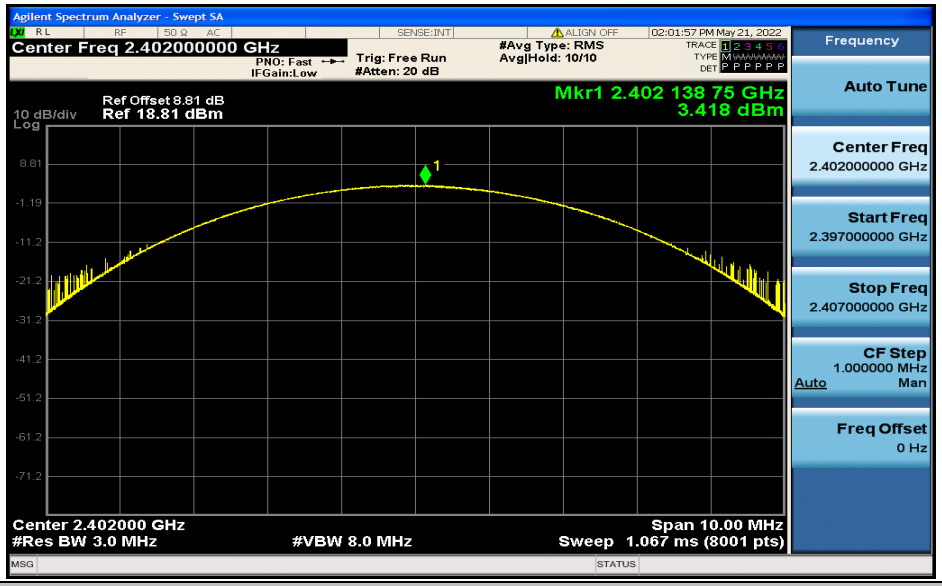
Conducted Peak Output Power_2DH5_2441



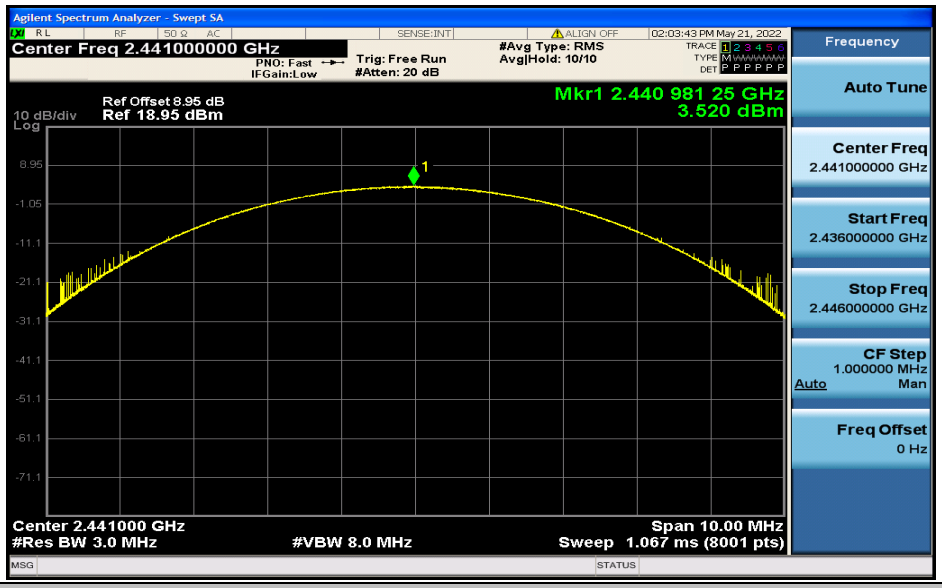
Conducted Peak Output Power_2DH5_2480



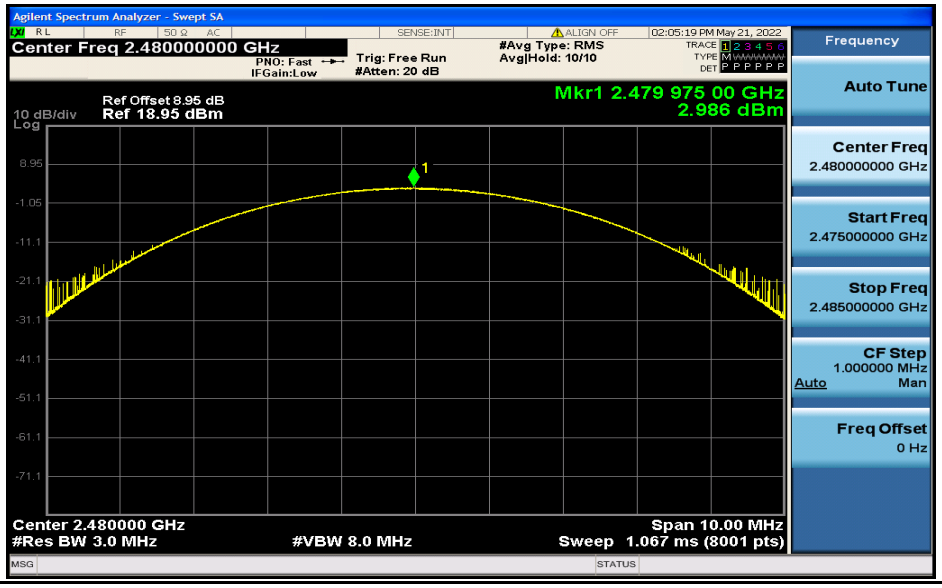
Conducted Peak Output Power_3DH5_2402



Conducted Peak Output Power_3DH5_2441



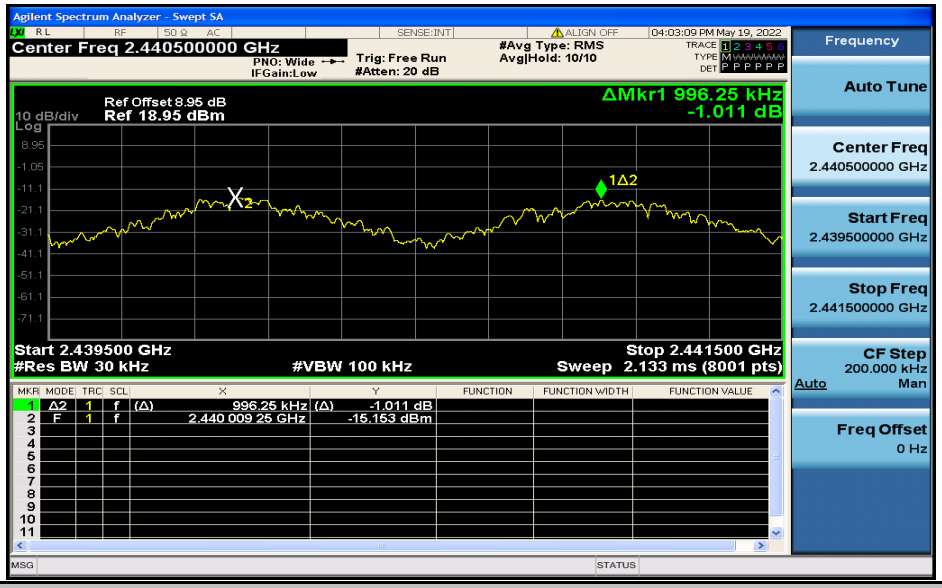
Conducted Peak Output Power_3DH5_2480



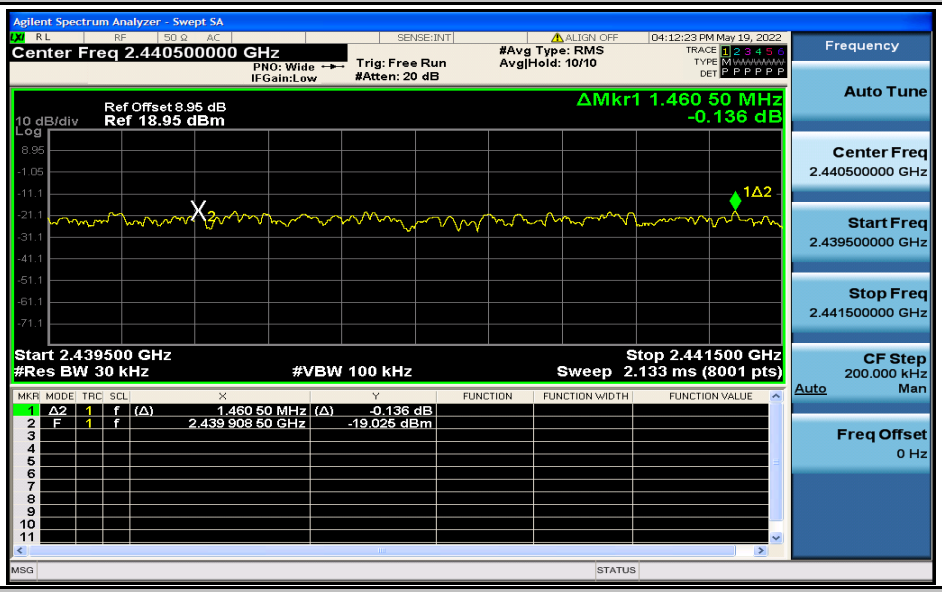
4.Carrier Frequency Separation

Test Mode	Test Channel	Result[MHz]	Limit[MHz]	Verdict
DH5	2441	1.00	0.648866666666667	PASS
2DH5	2441	1.46	0.909333333333333	PASS
3DH5	2441	1.22	0.896666666666667	PASS

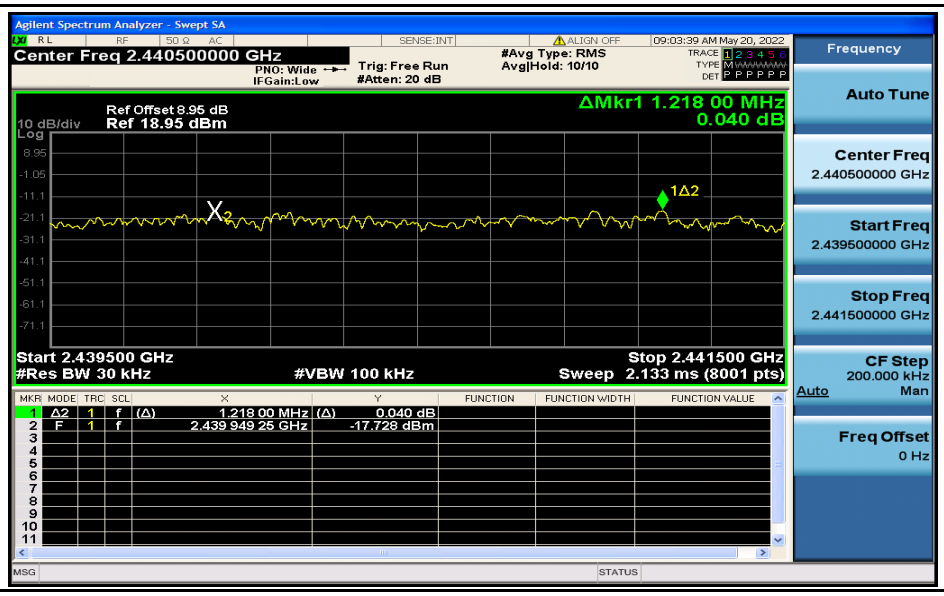
Carrier Frequency Separation_DH5_2441



Carrier Frequency Separation_2DH5_2441

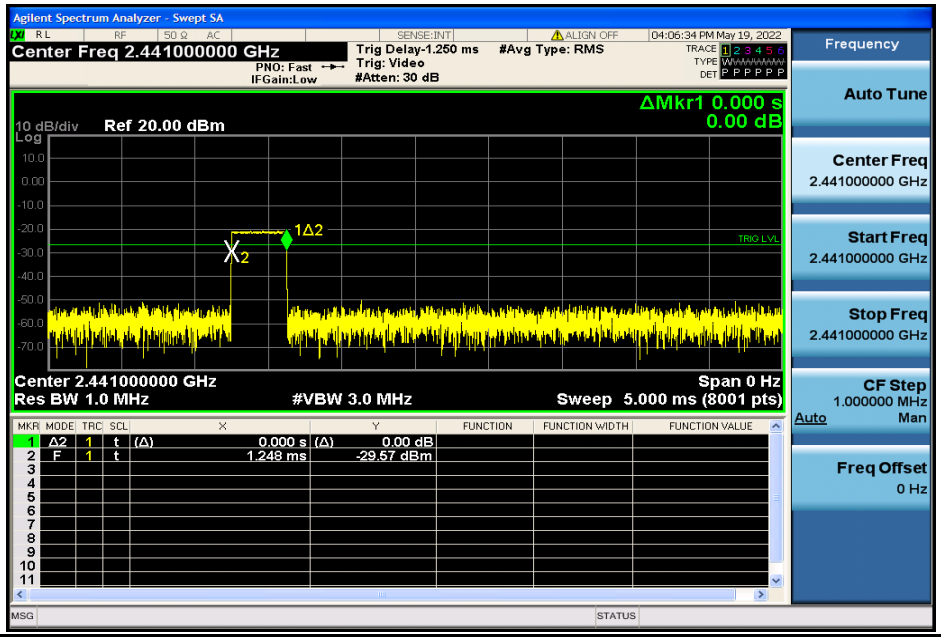
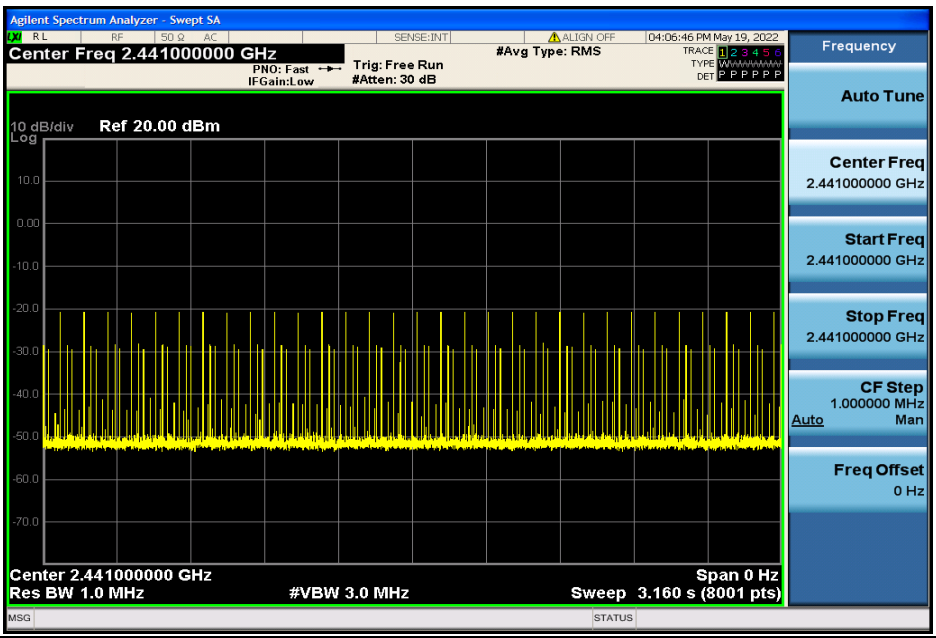


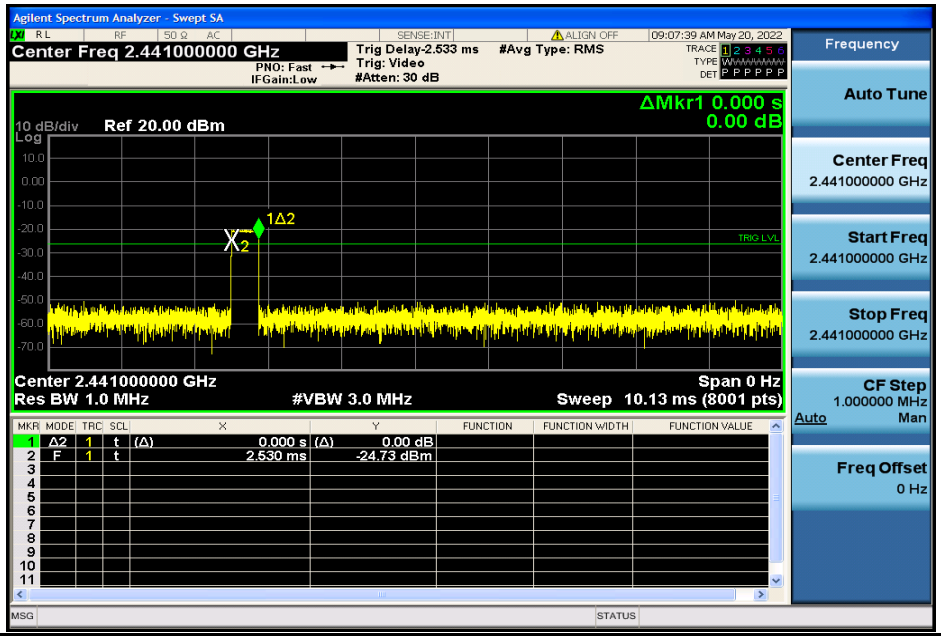
Carrier Frequency Separation_3DH5_2441

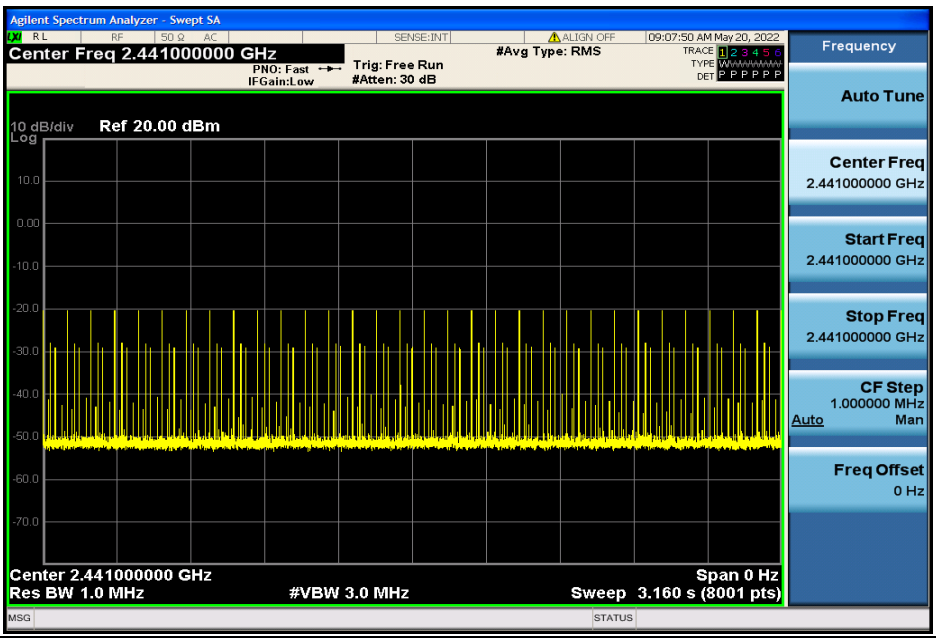


5.Dwell Time

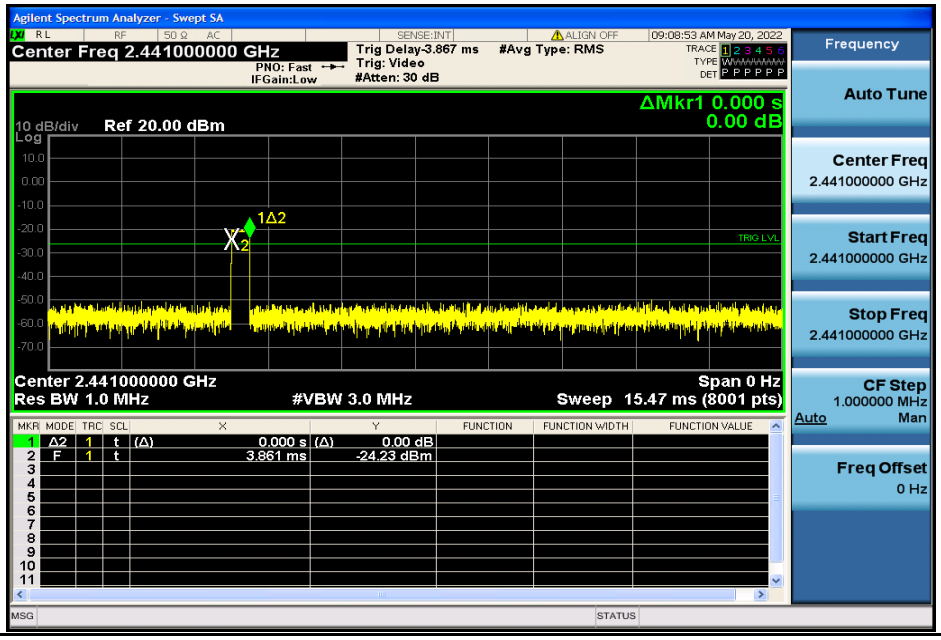
Test Mode	Test Channel	Burst Width[ms/hop/ch]	Total Hops[hop*ch]	Dwell Time[s]	Limit[s]	Verdict
DH1	2441	0.38	940	0.36	0.4	PASS
DH3	2441	0.38	940	0.36	0.4	PASS
DH5	2441	0.38	930	0.35	0.4	PASS
2DH1	2441	0.40	930	0.37	0.4	PASS
2DH3	2441	0.38	930	0.35	0.4	PASS
2DH5	2441	0.38	940	0.36	0.4	PASS
3DH1	2441	0.38	940	0.36	0.4	PASS
3DH3	2441	0.40	930	0.37	0.4	PASS
3DH5	2441	0.38	930	0.35	0.4	PASS

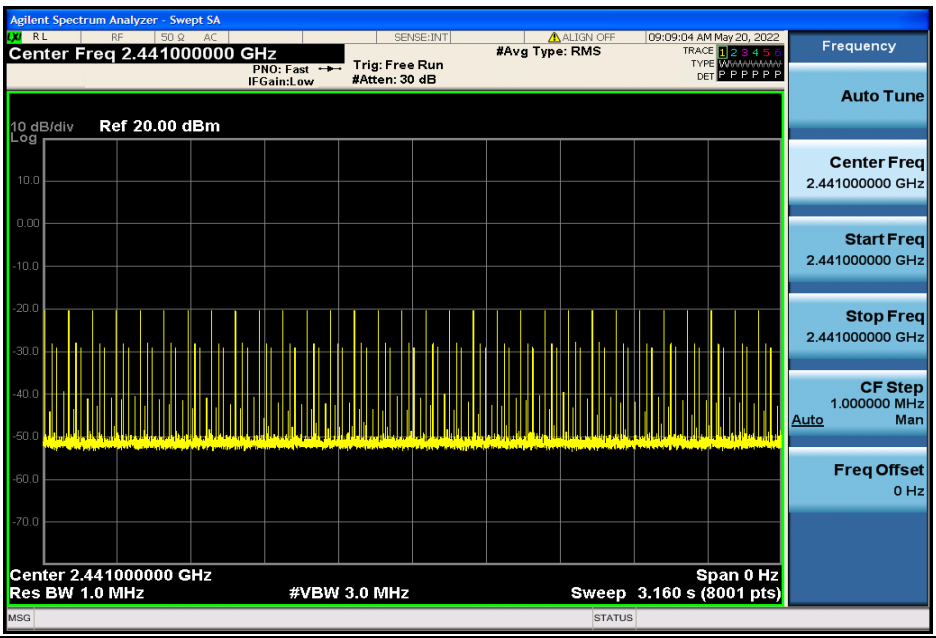
Dwell Time_DH1_2441


Dwell Time_DH3_2441



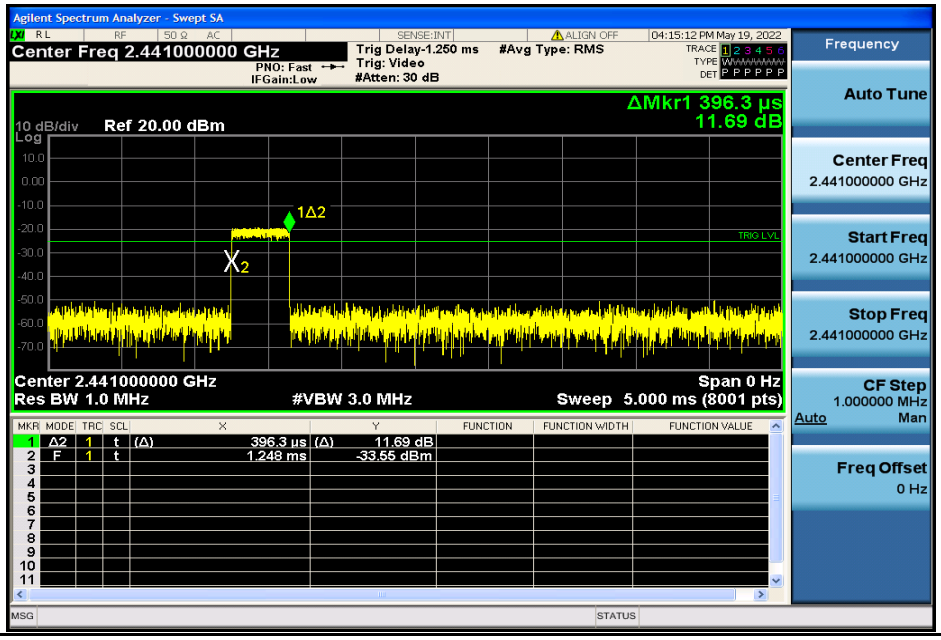


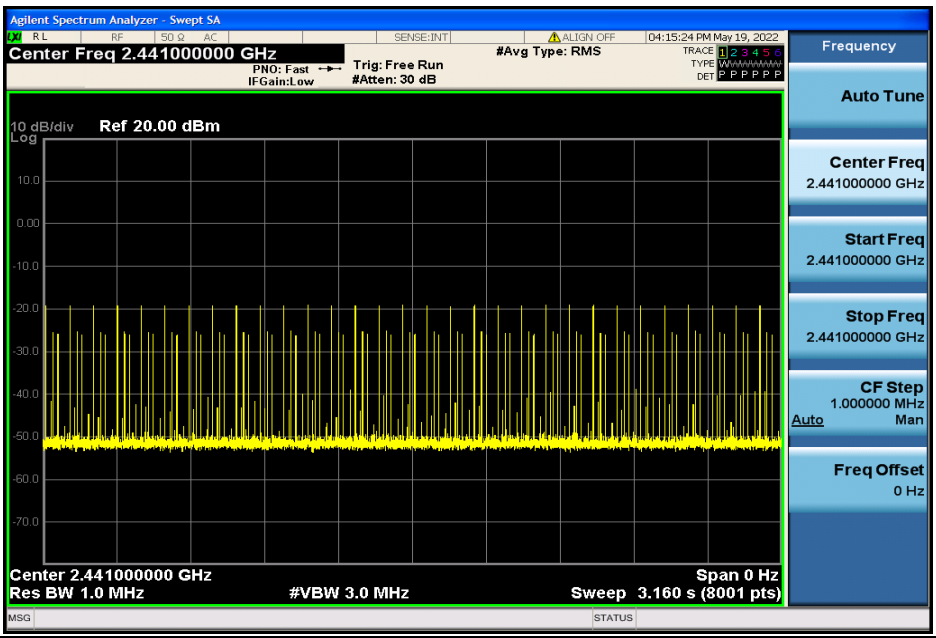
Dwell Time_DH5_2441



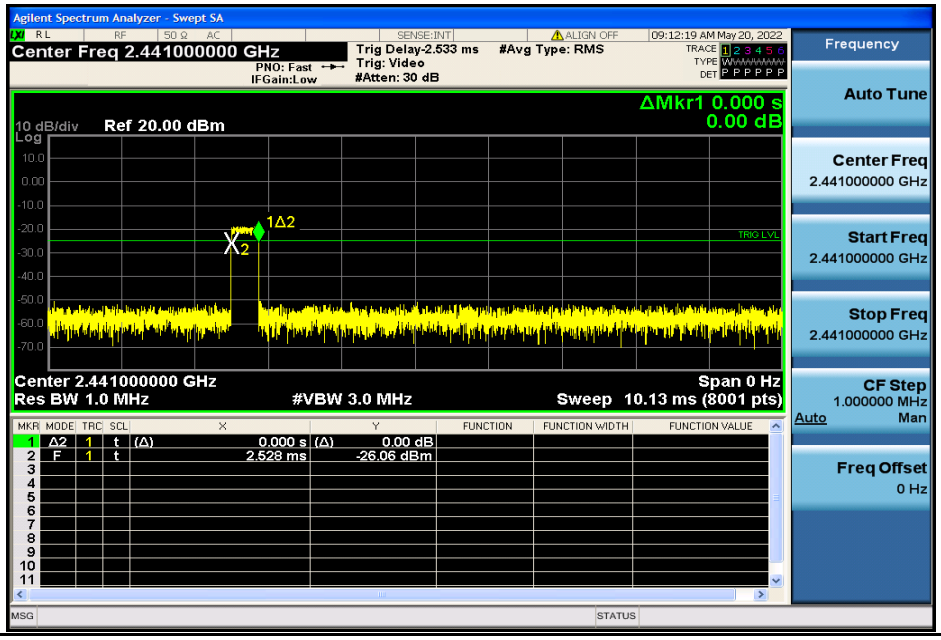


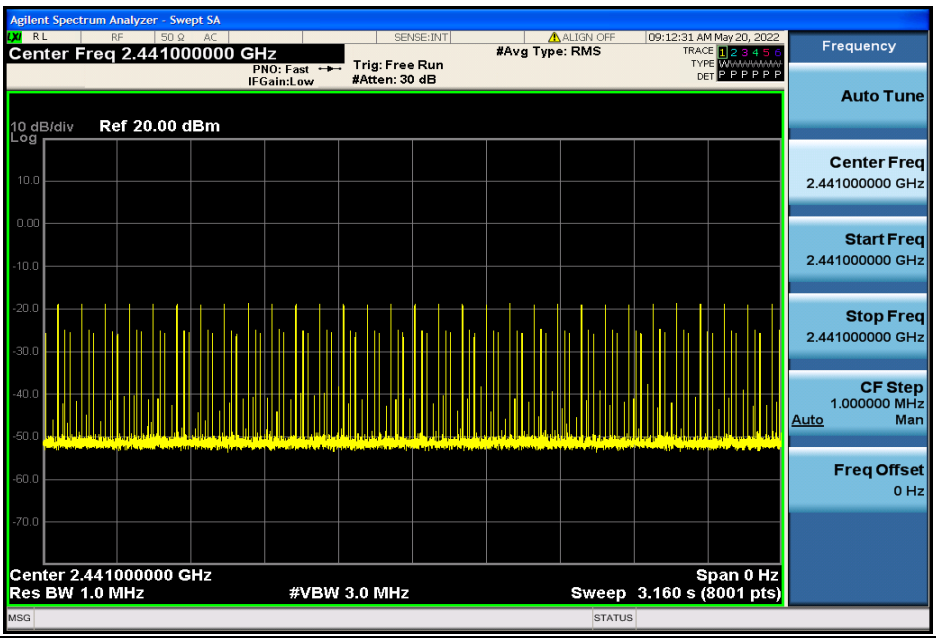
Dwell Time_2DH1_2441



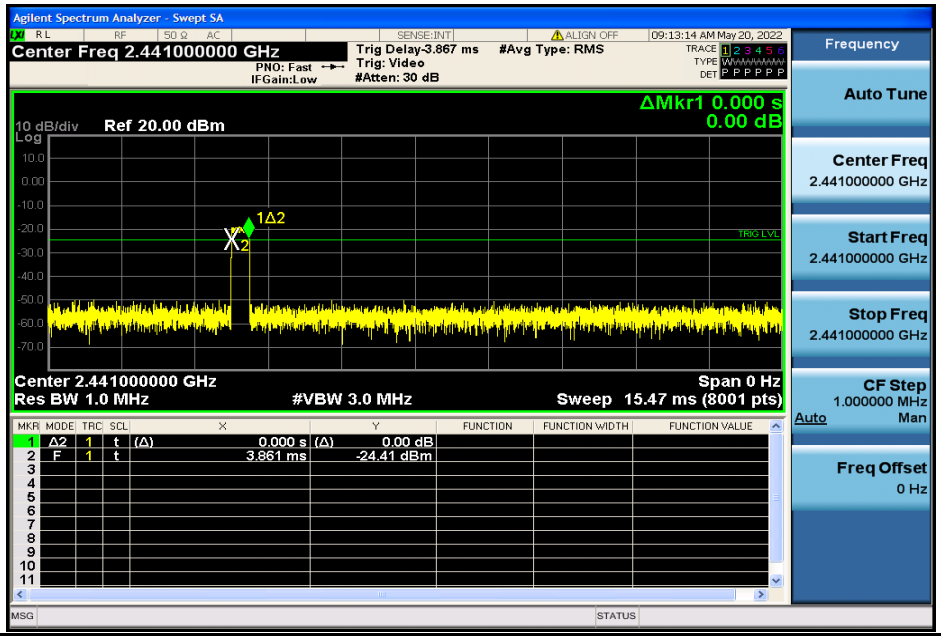


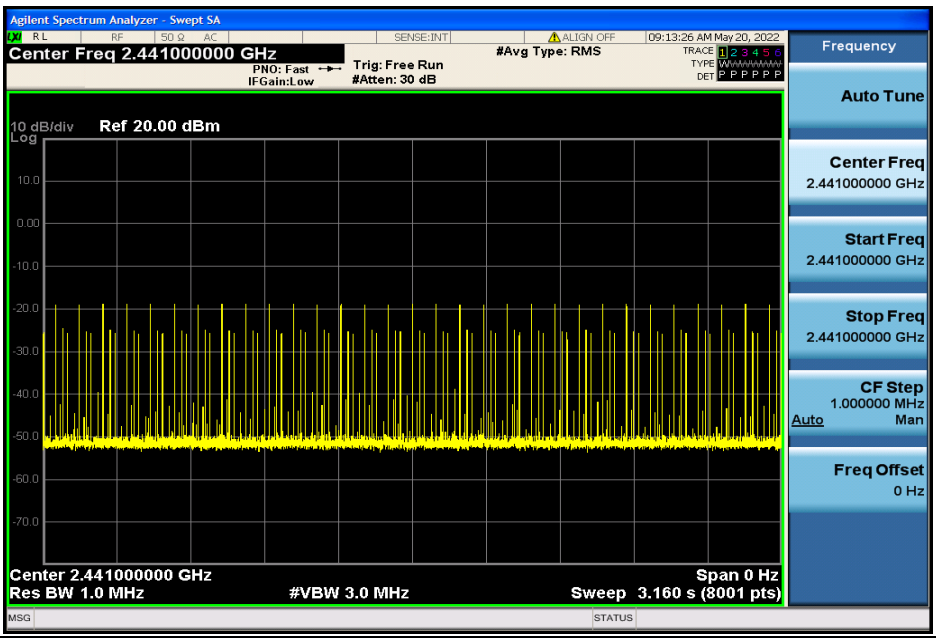
Dwell Time_2DH3_2441



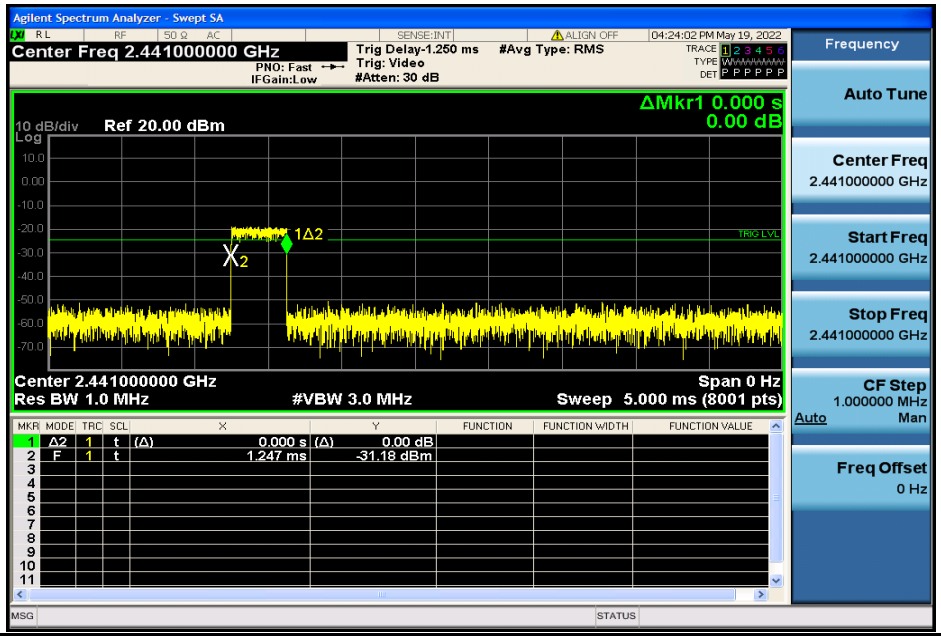


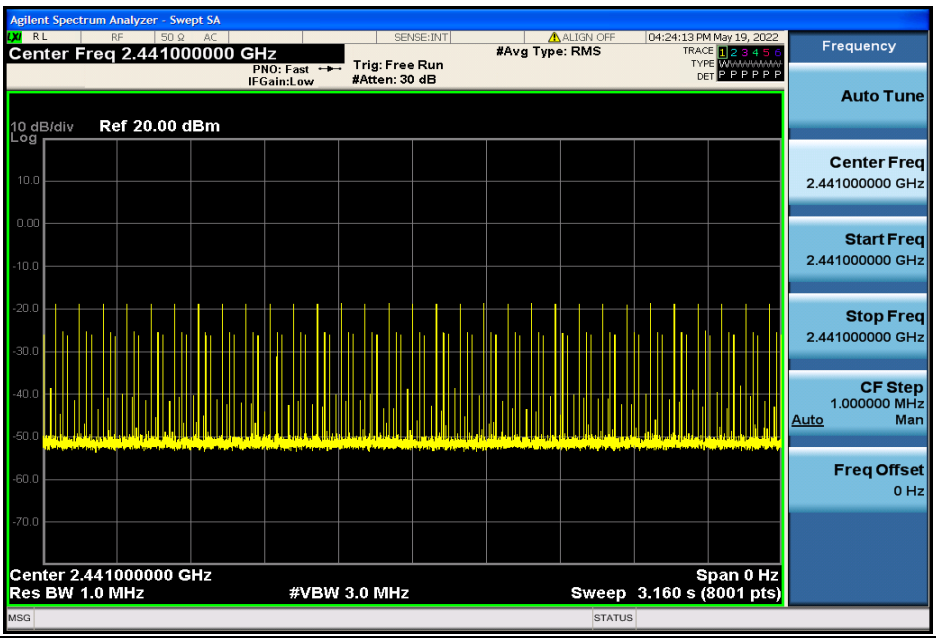
Dwell Time_2DH5_2441



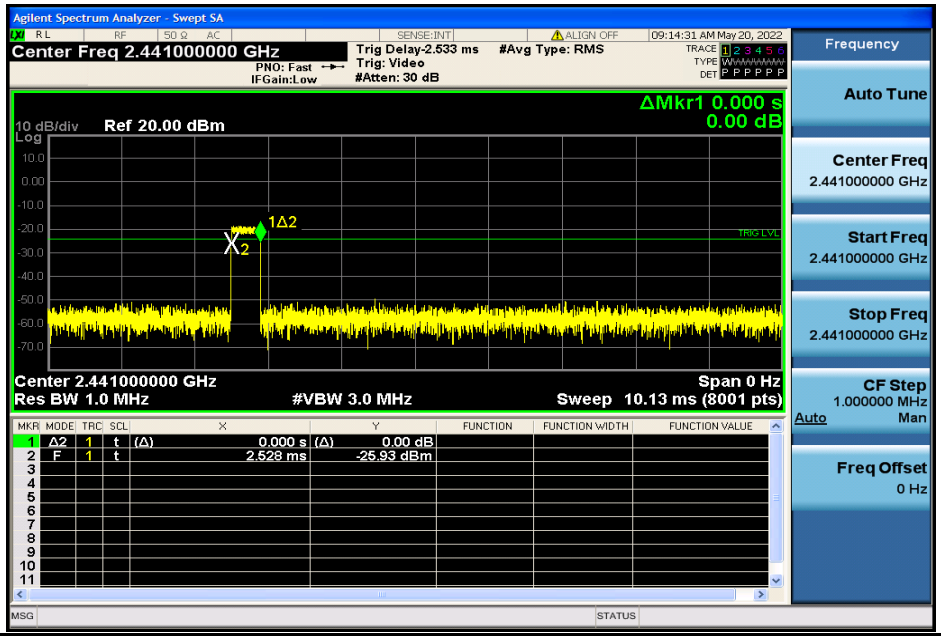


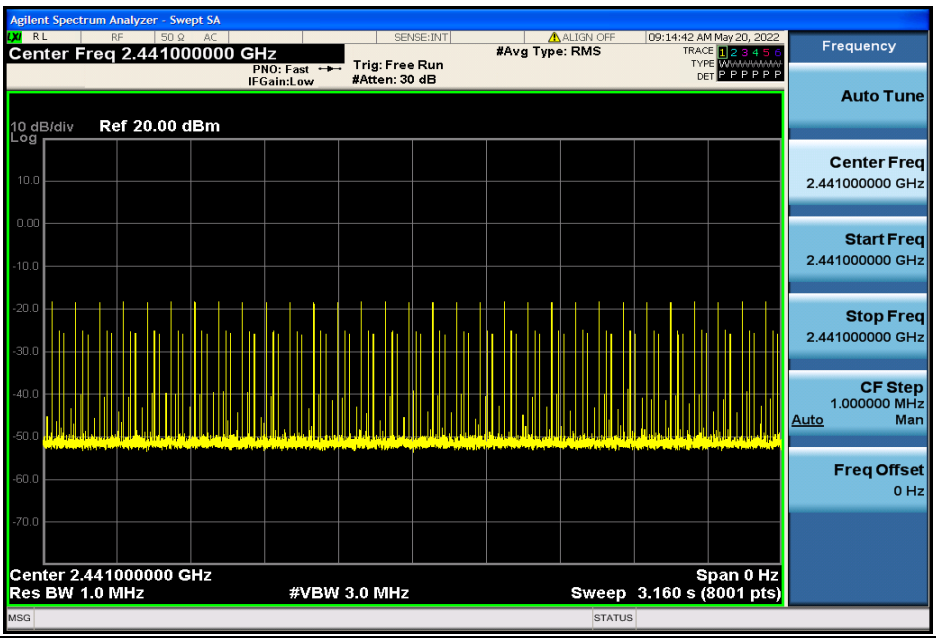
Dwell Time_3DH1_2441



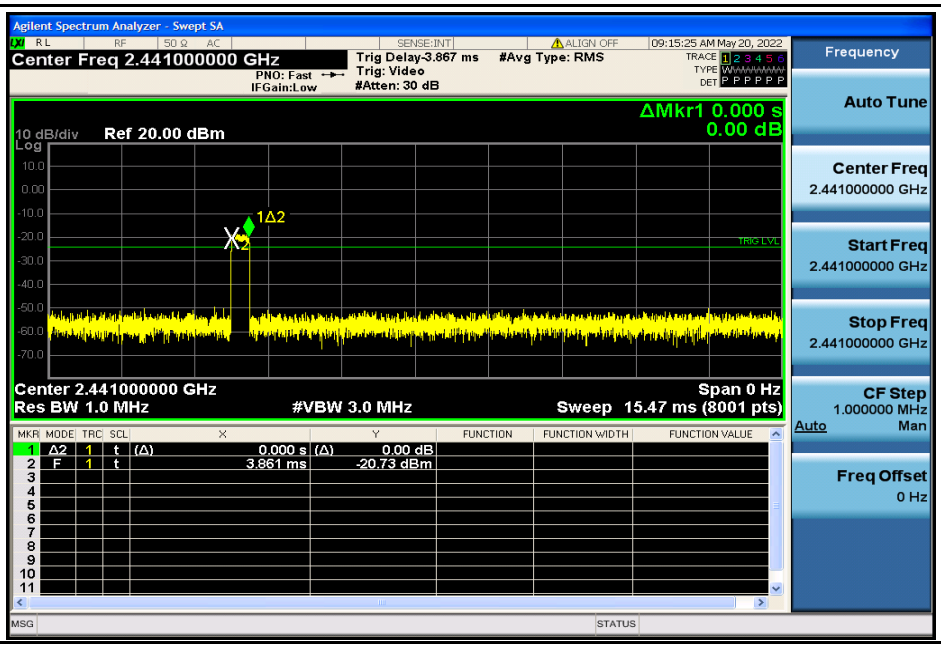


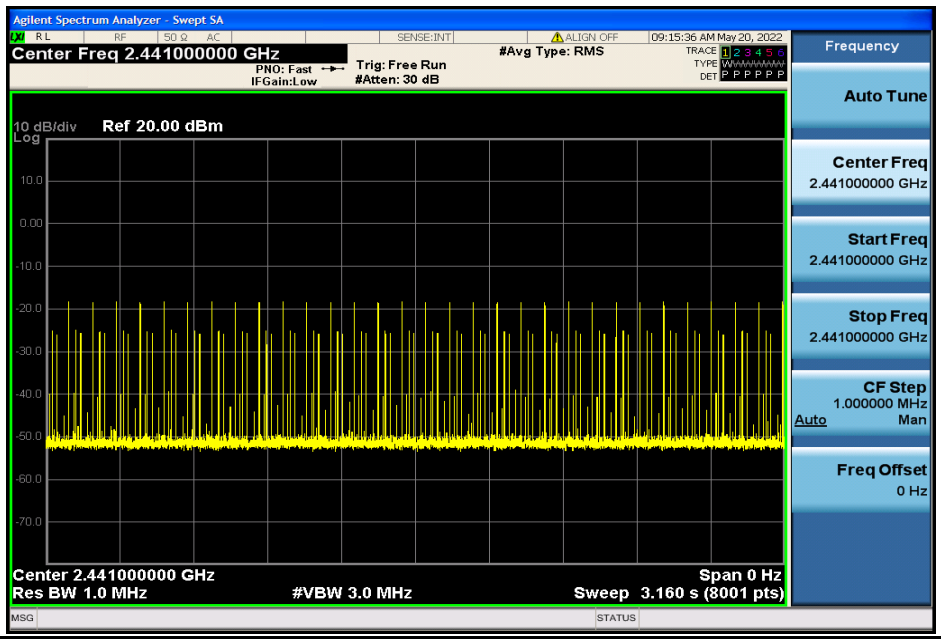
Dwell Time_3DH3_2441





Dwell Time_3DH5_2441

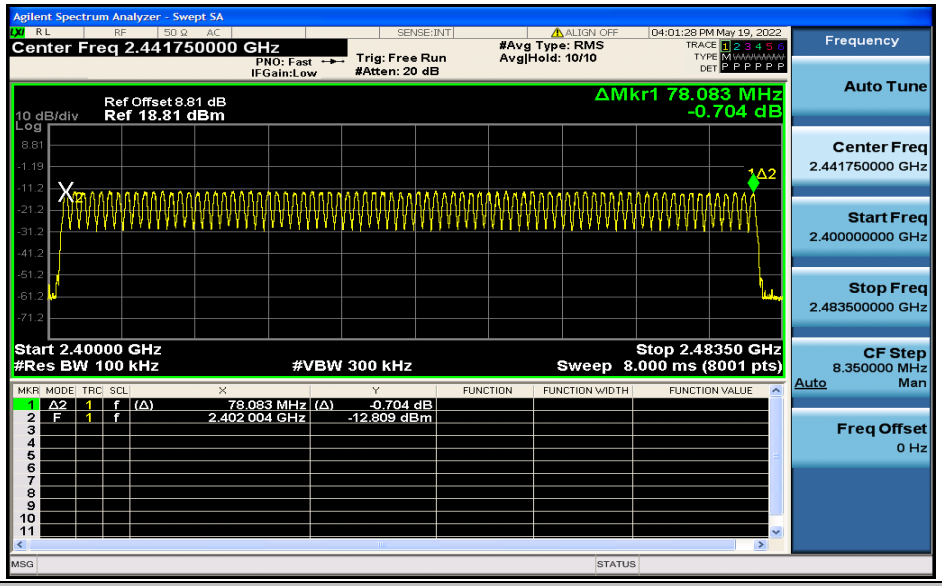




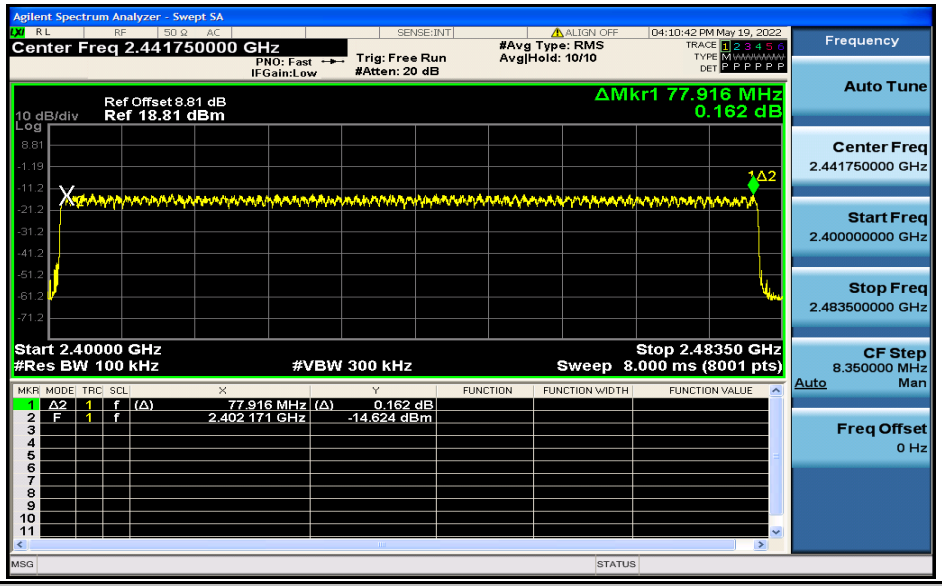
6.Hopping Channel Number

Test Mode	Number of Hopping Channel[N]	Limit[N]	Verdict
DH5	79	>=15	PASS
2DH5	79	>=15	PASS
3DH5	79	>=15	PASS

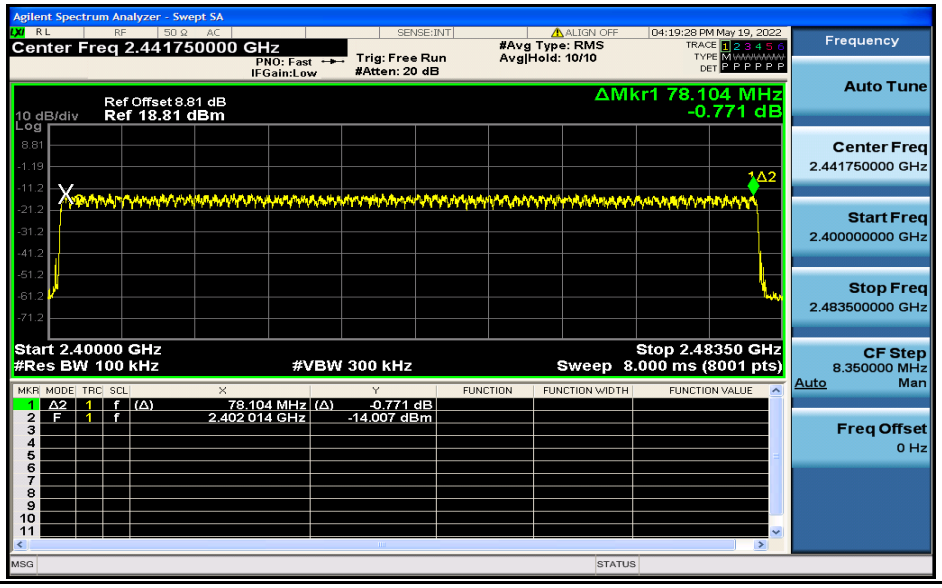
Hopping Channel Number_DH5



Hopping Channel Number_2DH5



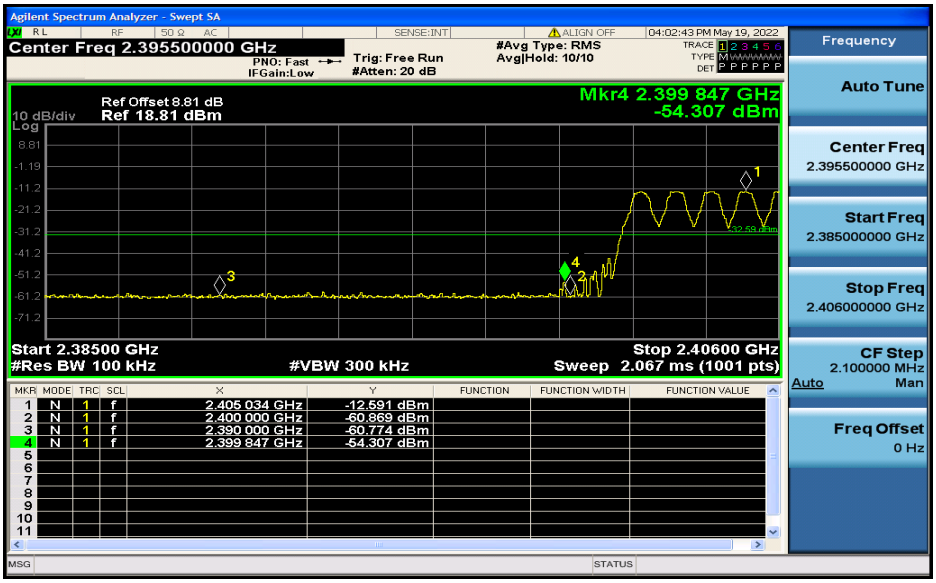
Hopping Channel Number_3DH5



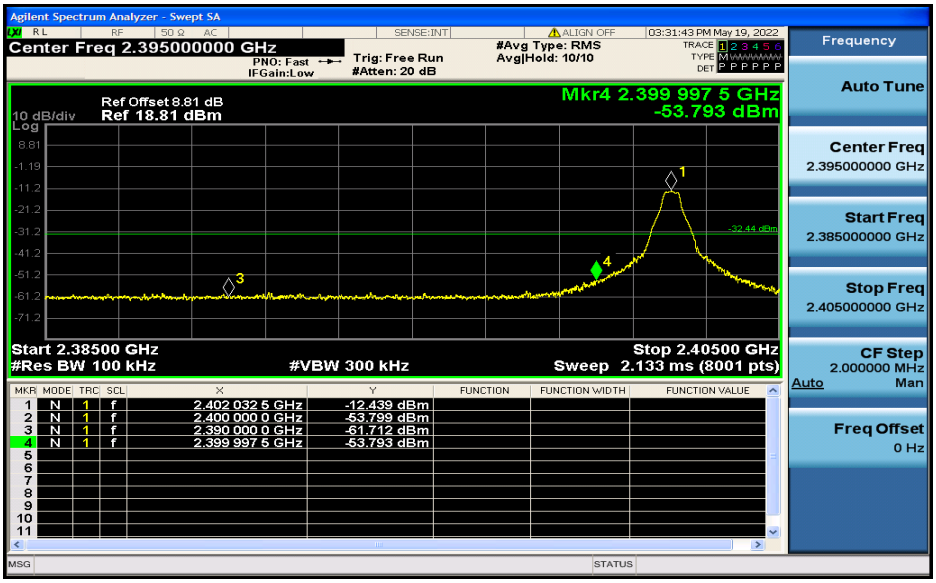
7.Band-edge for RF Conducted Emissions

Test Mode	Test Channel	Hopping	Carrier Power[dBm]	Max. Spurious Level [dBm]	Limit[dBm]	Verdict
DH5	2402	On	-12.59	-54.31	-32.59	PASS
DH5	2402	Off	-12.44	-53.79	-32.44	PASS
DH5	2480	On	-12.84	-58.62	-32.84	PASS
DH5	2480	Off	-12.96	-59.05	-32.96	PASS
2DH5	2402	On	-13.78	-54.73	-33.78	PASS
2DH5	2402	Off	-13.64	-52.86	-33.64	PASS
2DH5	2480	On	-14.19	-59.02	-34.19	PASS
2DH5	2480	Off	-14.19	-57.91	-34.19	PASS
3DH5	2402	On	-13.68	-56.36	-33.68	PASS
3DH5	2402	Off	-13.55	-52.31	-33.55	PASS
3DH5	2480	On	-14.06	-58.98	-34.06	PASS
3DH5	2480	Off	-14.13	-56.97	-34.13	PASS

Band-edge for RF Conducted Emissions_DH5_2402_Hopping On

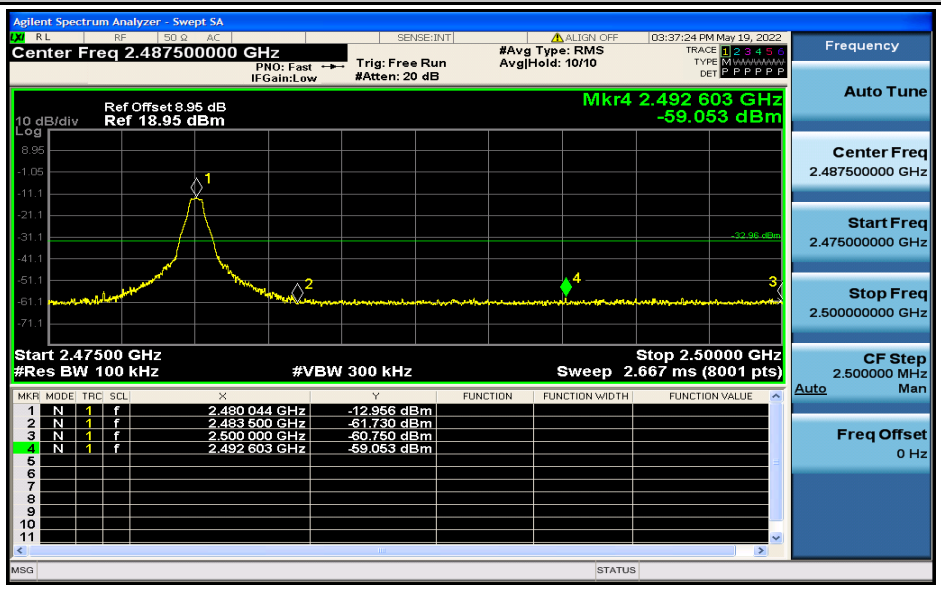


Band-edge for RF Conducted Emissions_DH5_2402_Hopping Off



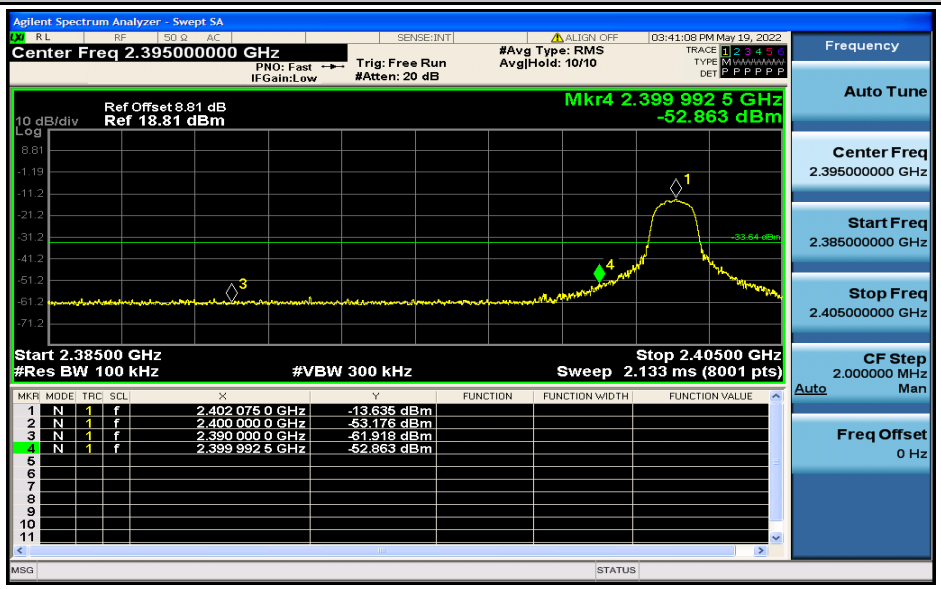
Band-edge for RF Conducted Emissions_DH5_2480_Hopping On

Band-edge for RF Conducted Emissions_DH5_2480_Hopping Off



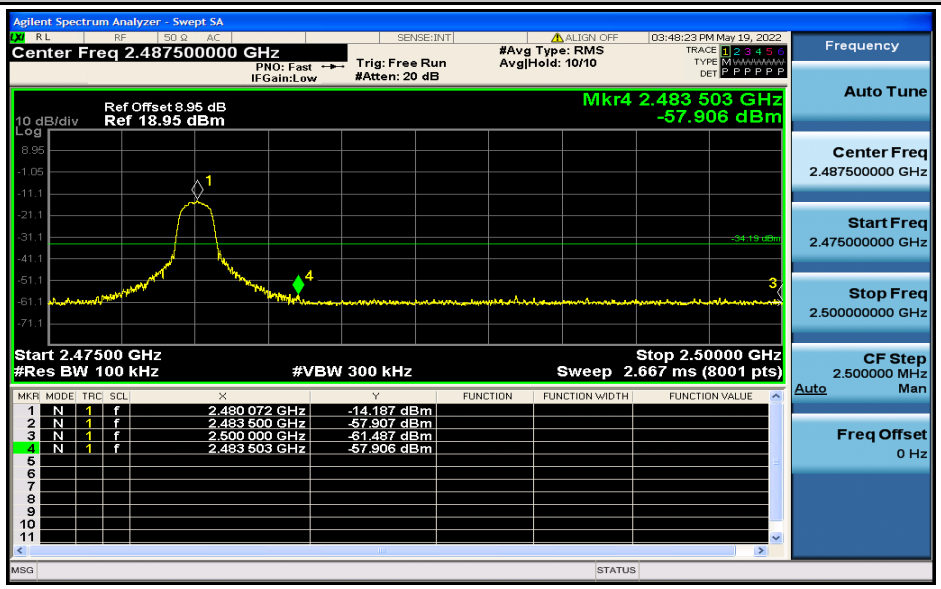
Band-edge for RF Conducted Emissions_2DH5_2402_Hopping On

Band-edge for RF Conducted Emissions_2DH5_2402_Hopping Off

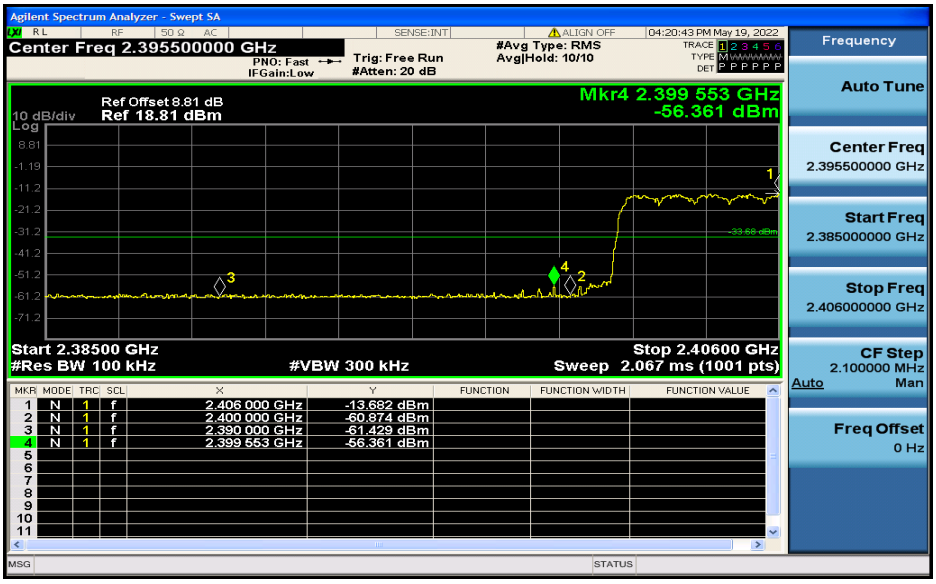


Band-edge for RF Conducted Emissions_2DH5_2480_Hopping On

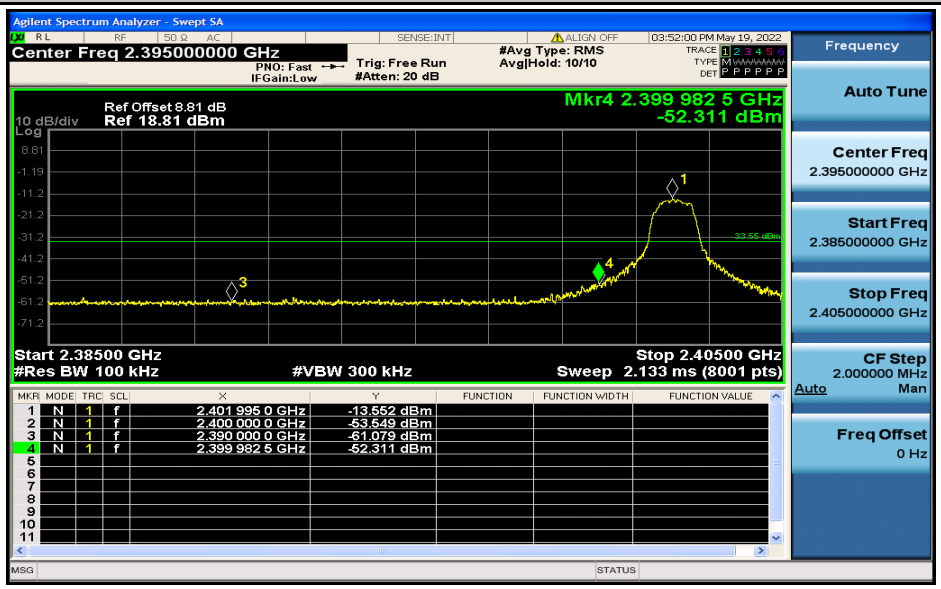
Band-edge for RF Conducted Emissions_2DH5_2480_Hopping Off



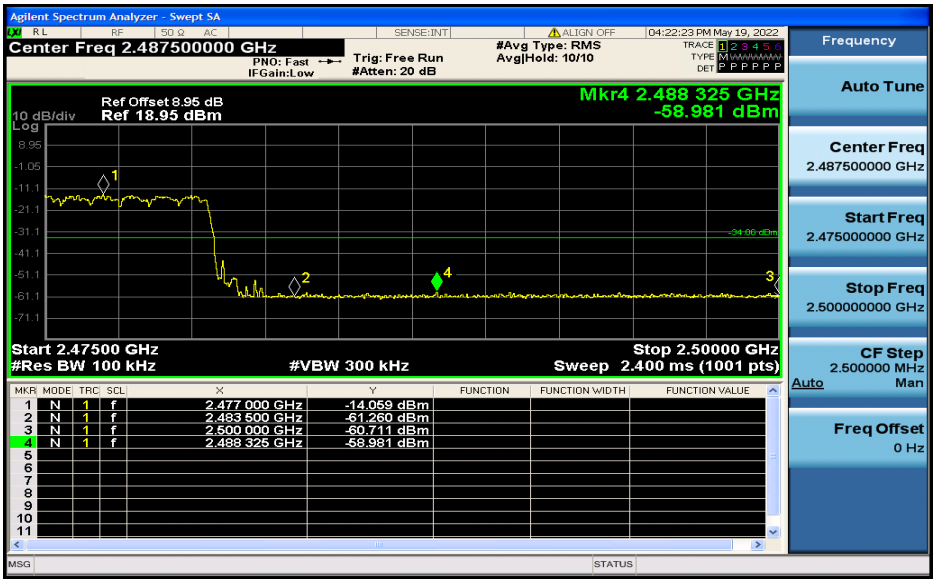
Band-edge for RF Conducted Emissions_3DH5_2402_Hopping On



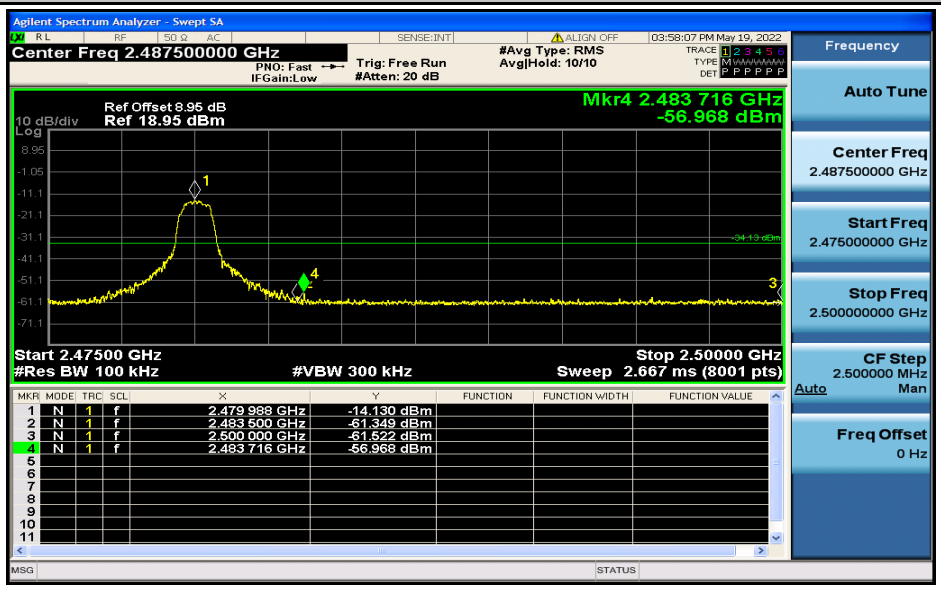
Band-edge for RF Conducted Emissions_3DH5_2402_Hopping Off



Band-edge for RF Conducted Emissions_3DH5_2480_Hopping On



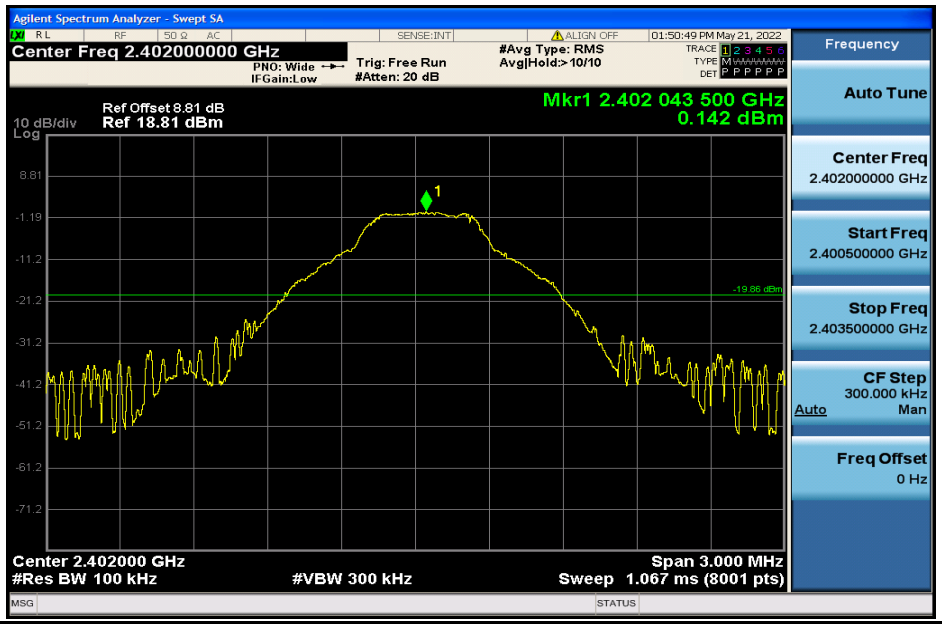
Band-edge for RF Conducted Emissions_3DH5_2480_Hopping Off

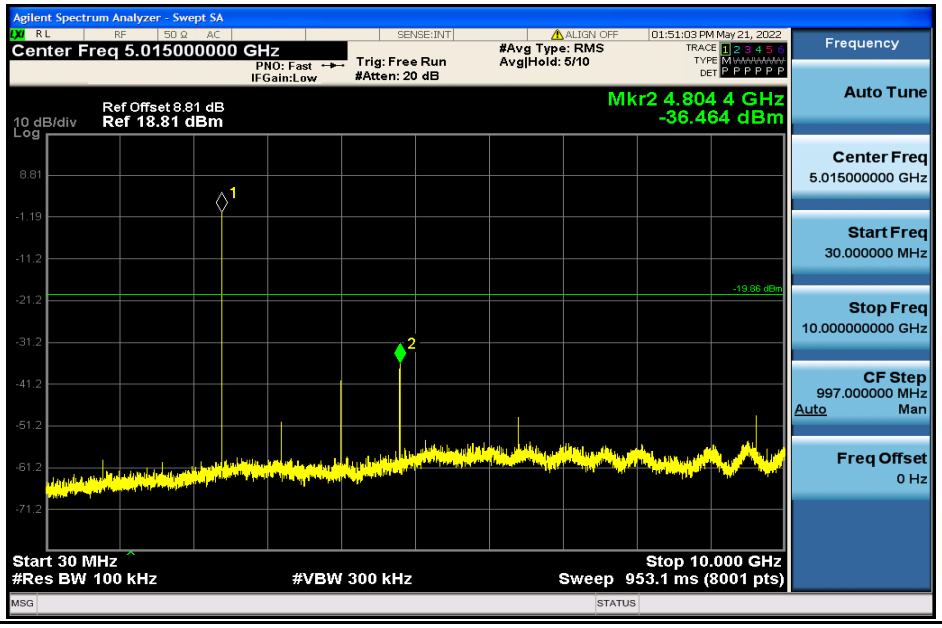


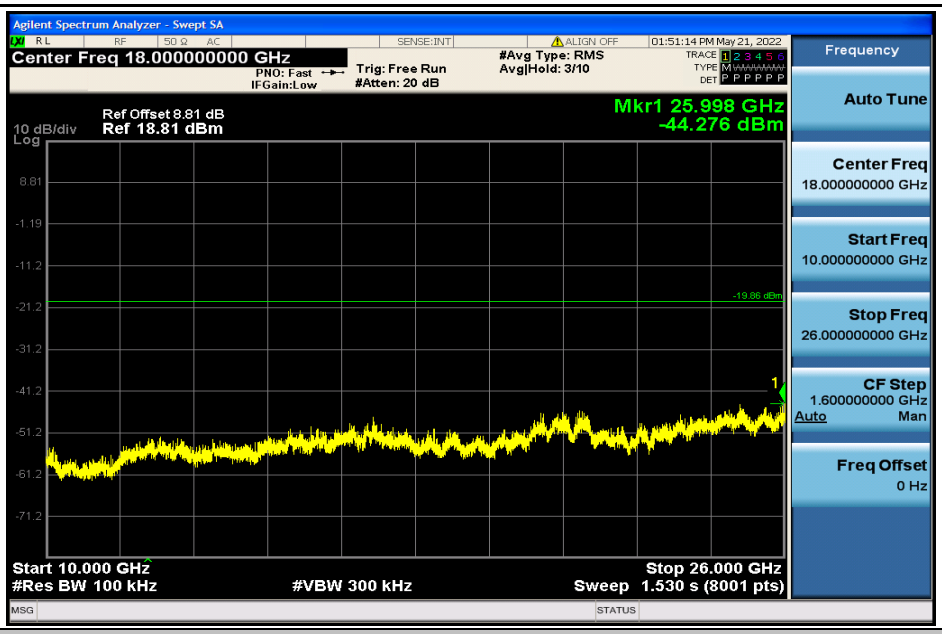
8.RF Conducted Spurious Emissions

Test Mode	Test Channel	StartFre [MHz]	StopFre [MHz]	RBW [kHz]	VBW [kHz]	Pref[dBm]	Max. Level [dBm]	Limit [dBm]	Verdict
DH5	2402	30	10000	100	300	0.14	-36.46	<-19.86	PASS
DH5	2402	10000	26000	100	300	0.142	-44.276	<-19.858	PASS
DH5	2441	30	10000	100	300	0.11	-37.20	<-19.89	PASS
DH5	2441	10000	26000	100	300	0.114	-44.181	<-19.886	PASS
DH5	2480	30	10000	100	300	-0.25	-37.52	<-20.25	PASS
DH5	2480	10000	26000	100	300	-0.253	-44.480	<-20.253	PASS
2DH5	2402	30	10000	100	300	-1.27	-38.33	<-21.27	PASS
2DH5	2402	10000	26000	100	300	-1.265	-44.727	<-21.265	PASS
2DH5	2441	30	10000	100	300	-0.96	-40.23	<-20.96	PASS
2DH5	2441	10000	26000	100	300	-0.958	-44.249	<-20.958	PASS
2DH5	2480	30	10000	100	300	-1.61	-39.01	<-21.61	PASS
2DH5	2480	10000	26000	100	300	-1.614	-45.034	<-21.614	PASS
3DH5	2402	30	10000	100	300	-1.14	-36.86	<-21.14	PASS
3DH5	2402	10000	26000	100	300	-1.141	-44.561	<-21.141	PASS
3DH5	2441	30	10000	100	300	-1.05	-39.56	<-21.05	PASS
3DH5	2441	10000	26000	100	300	-1.049	-44.029	<-21.049	PASS
3DH5	2480	30	10000	100	300	-1.60	-41.58	<-21.60	PASS
3DH5	2480	10000	26000	100	300	-1.598	-44.341	<-21.598	PASS

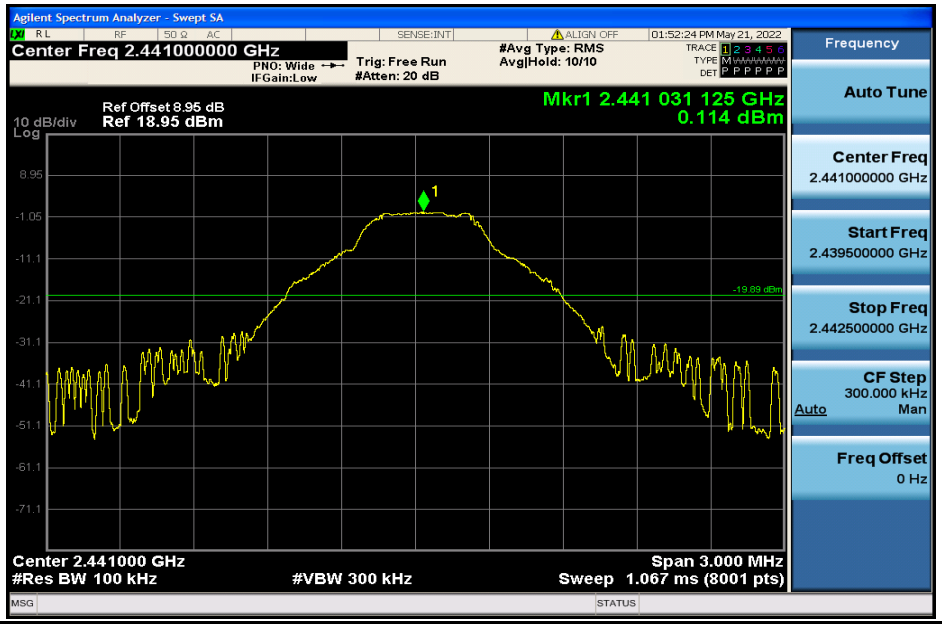
RF Conducted Spurious Emissions_DH5_2402

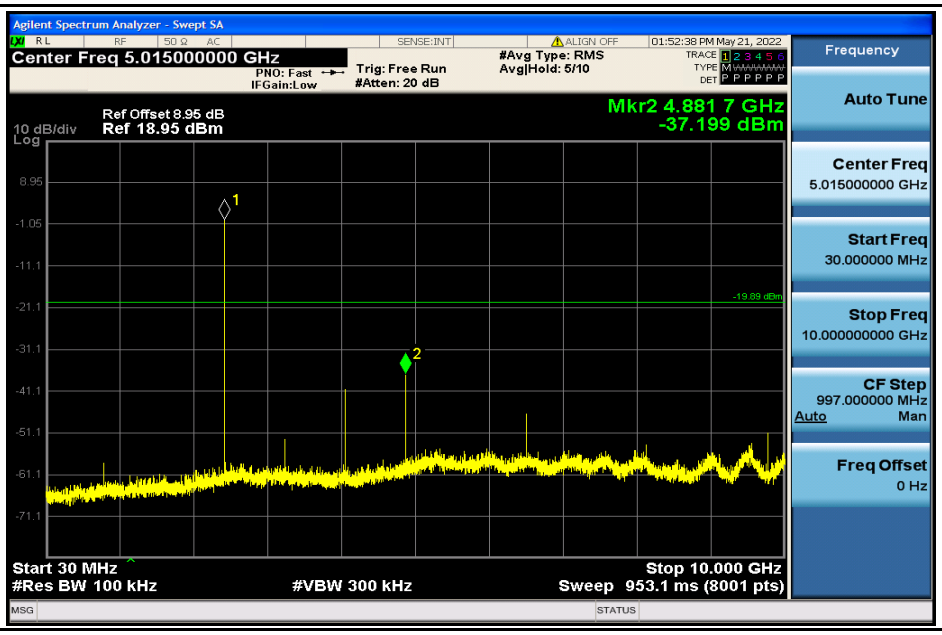


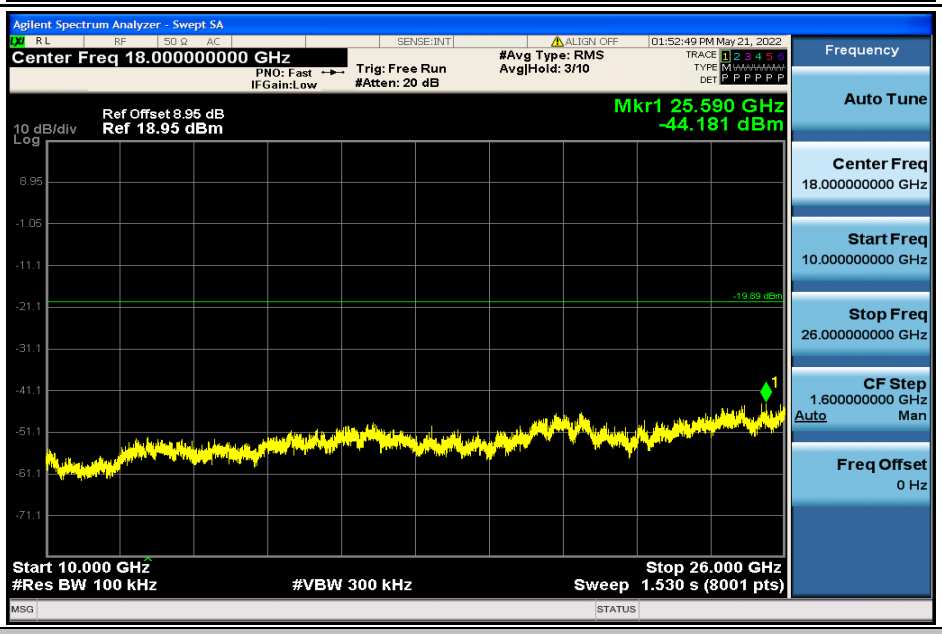




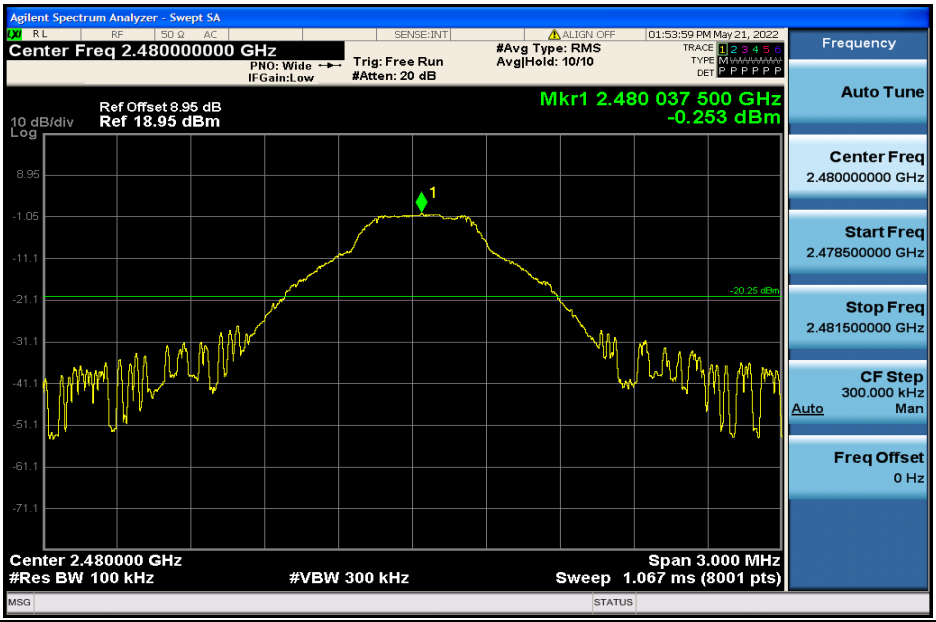
RF Conducted Spurious Emissions_DH5_2441

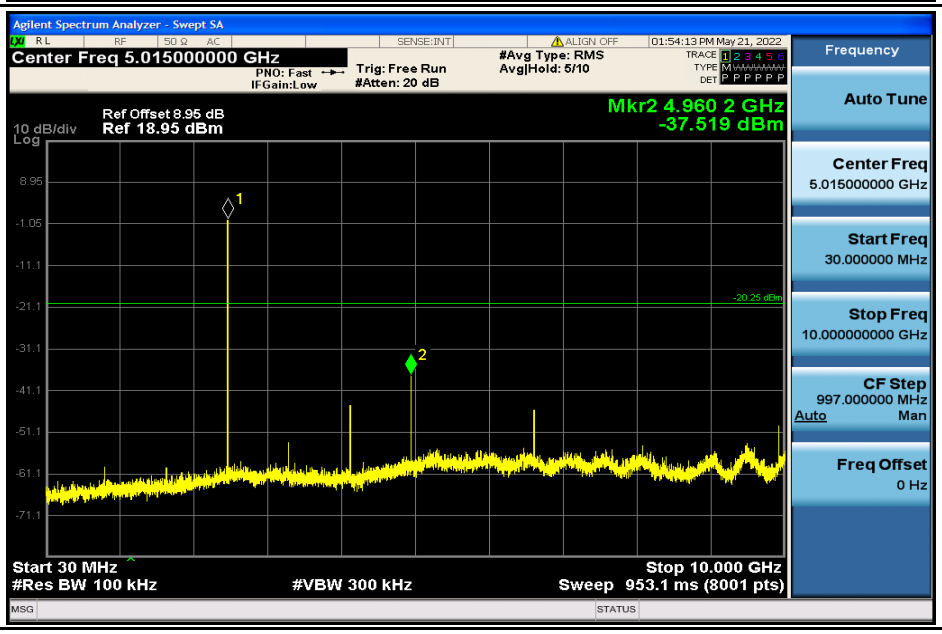






RF Conducted Spurious Emissions_DH5_2480





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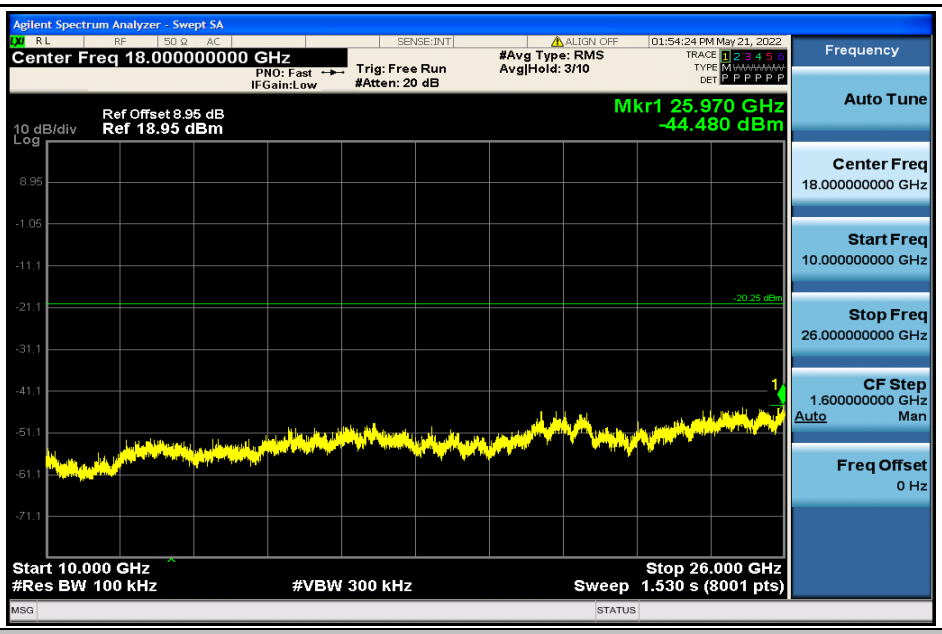
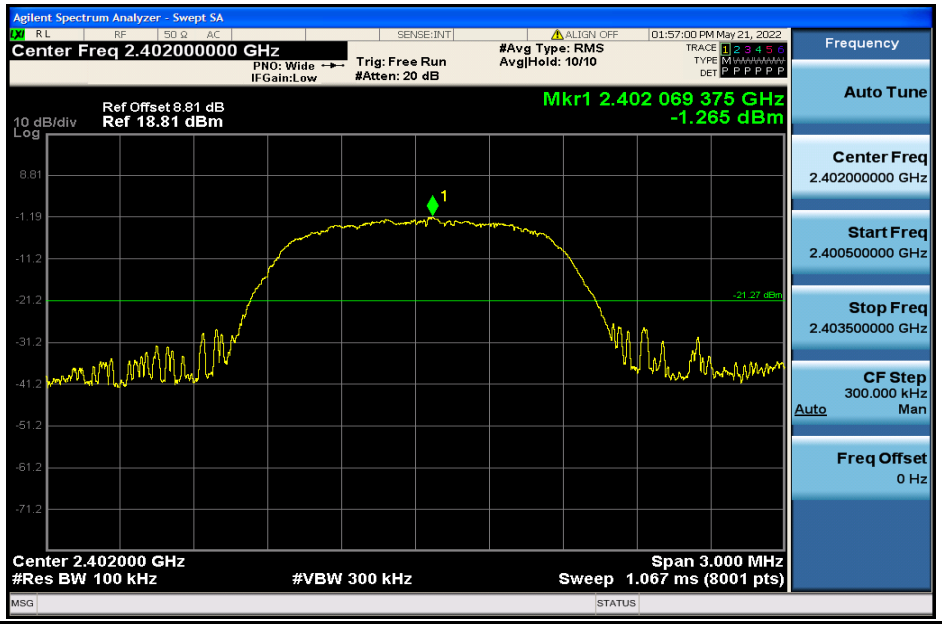
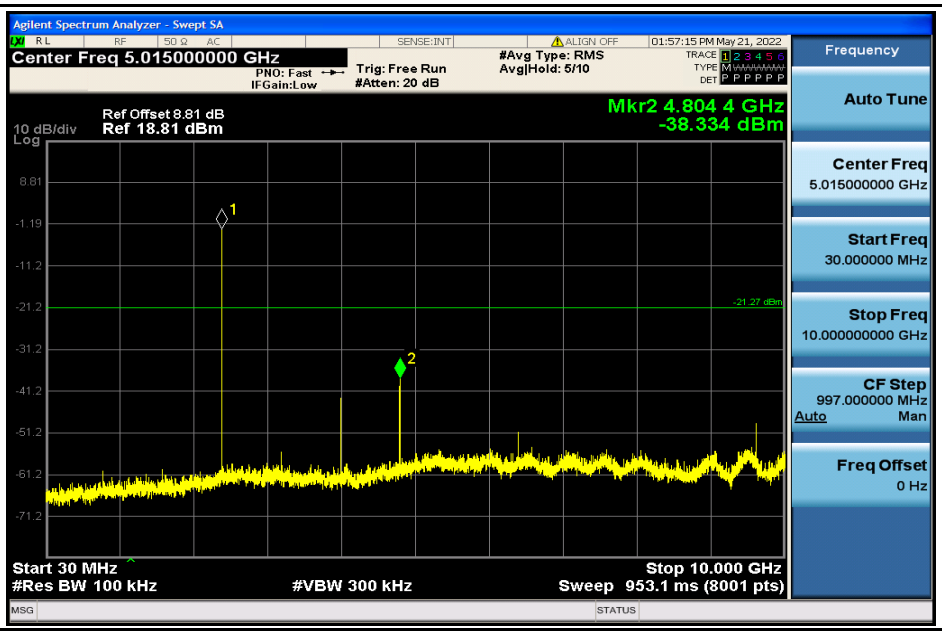
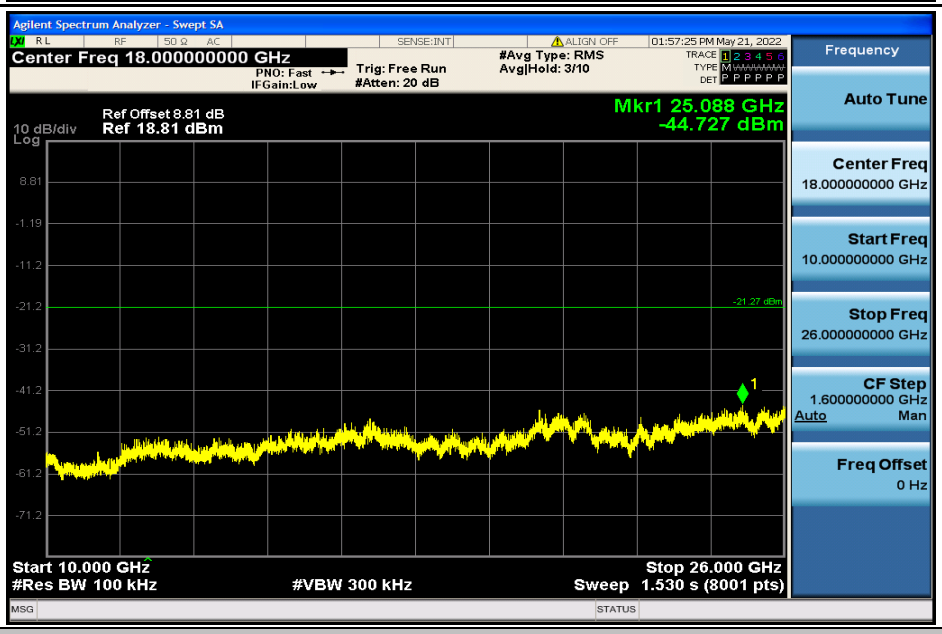


RF Conducted Spurious Emissions_2DH5_2402







RF Conducted Spurious Emissions_2DH5_2441

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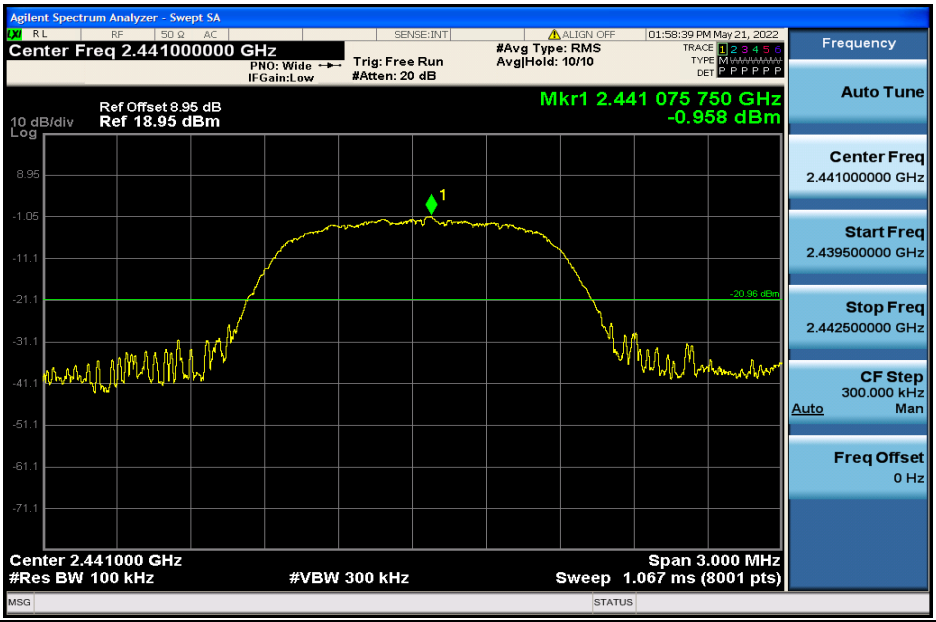

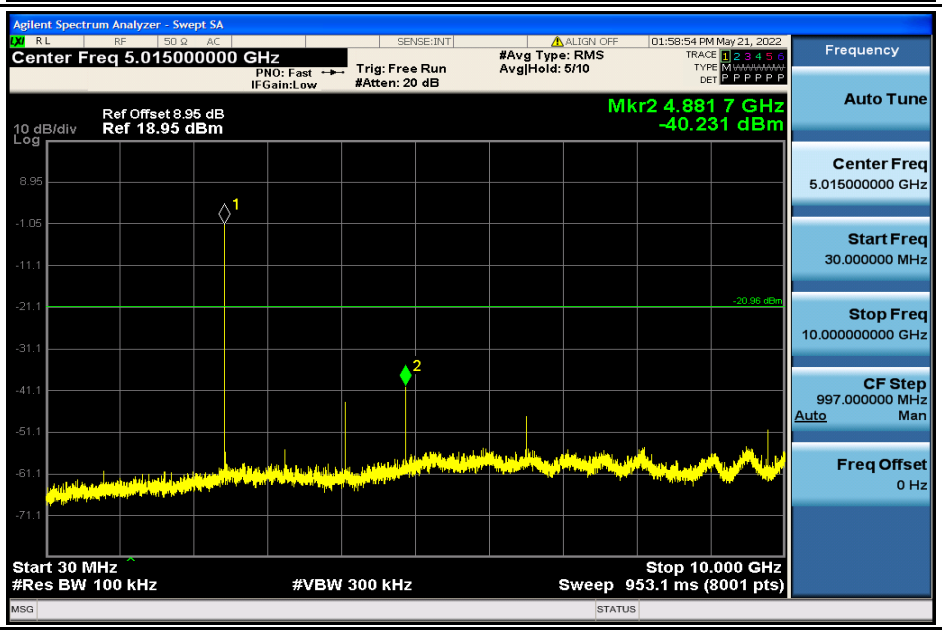

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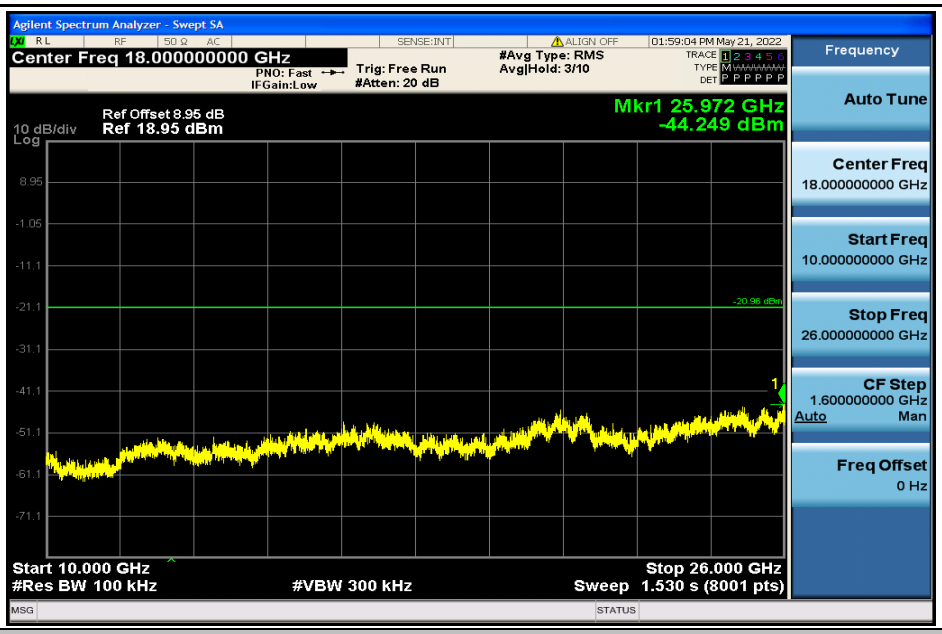
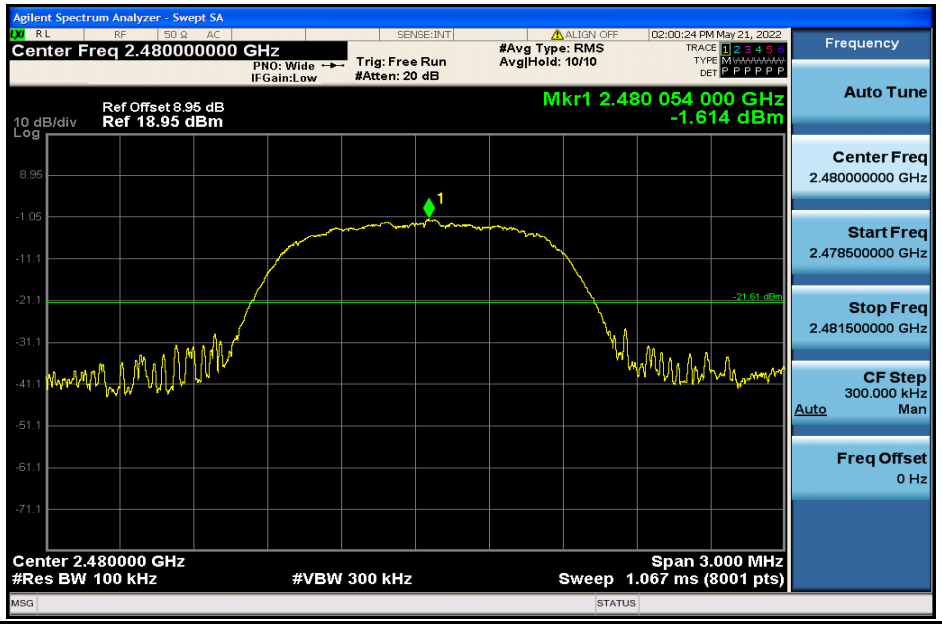
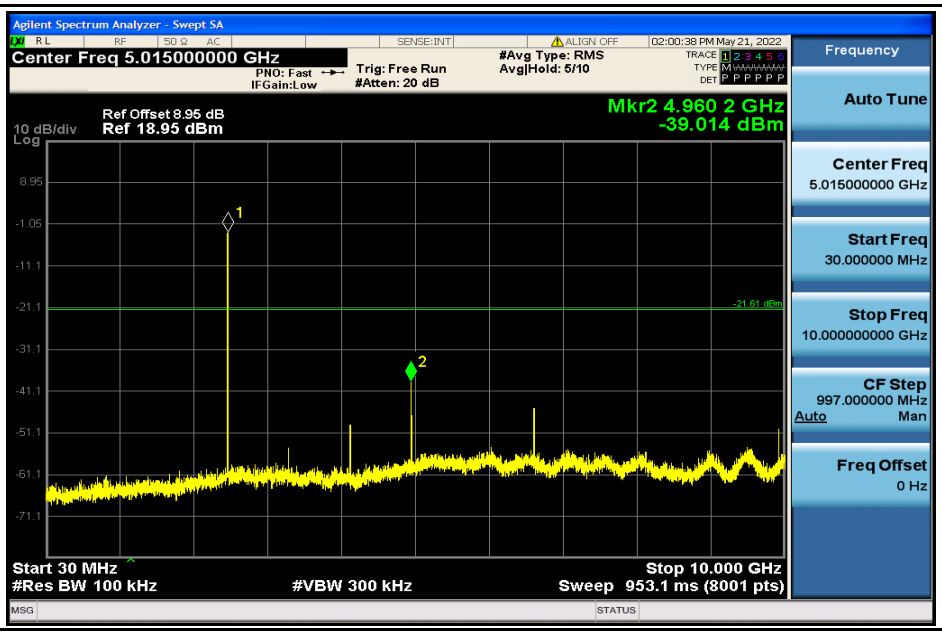
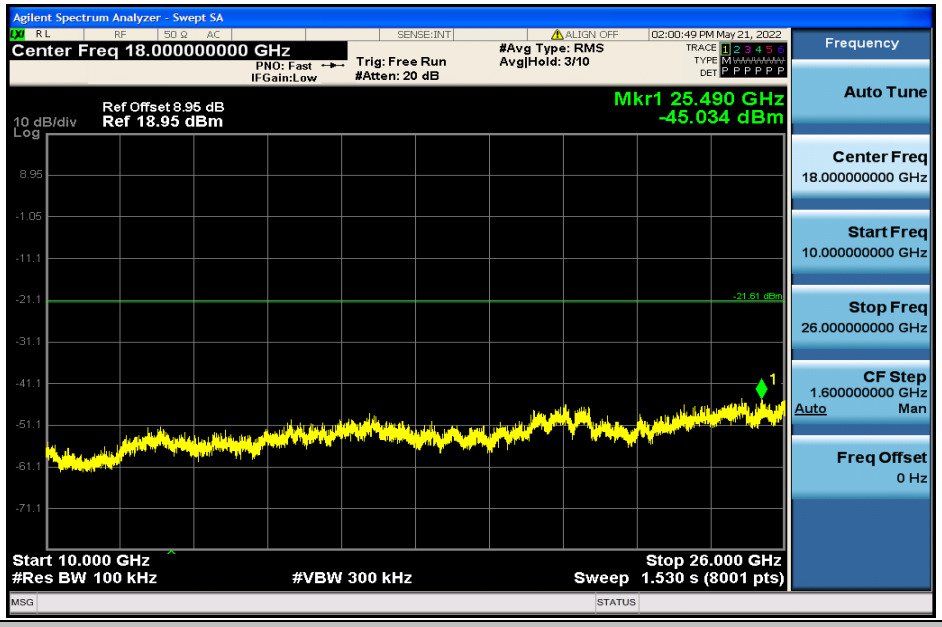


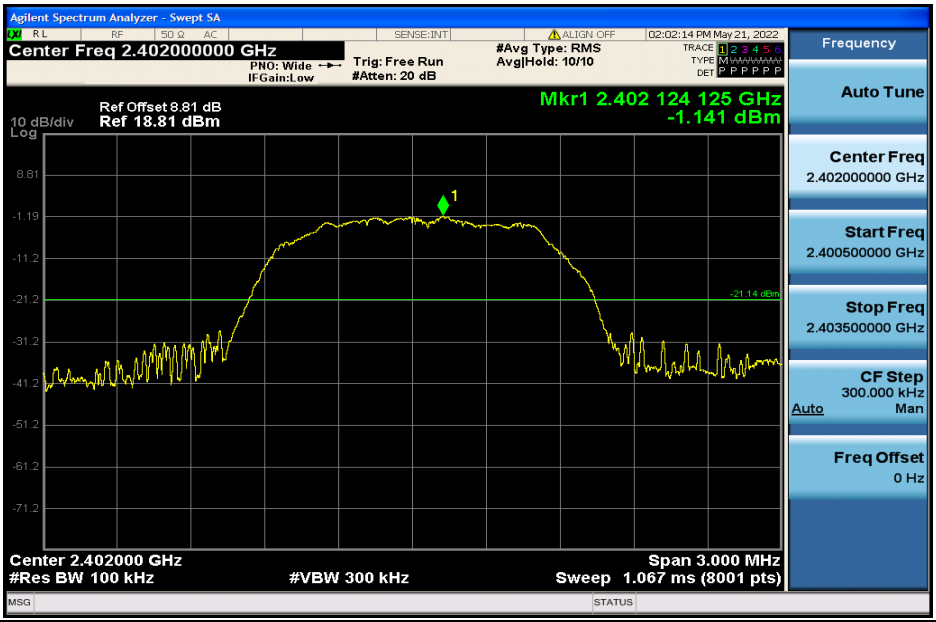
RF Conducted Spurious Emissions_2DH5_2480

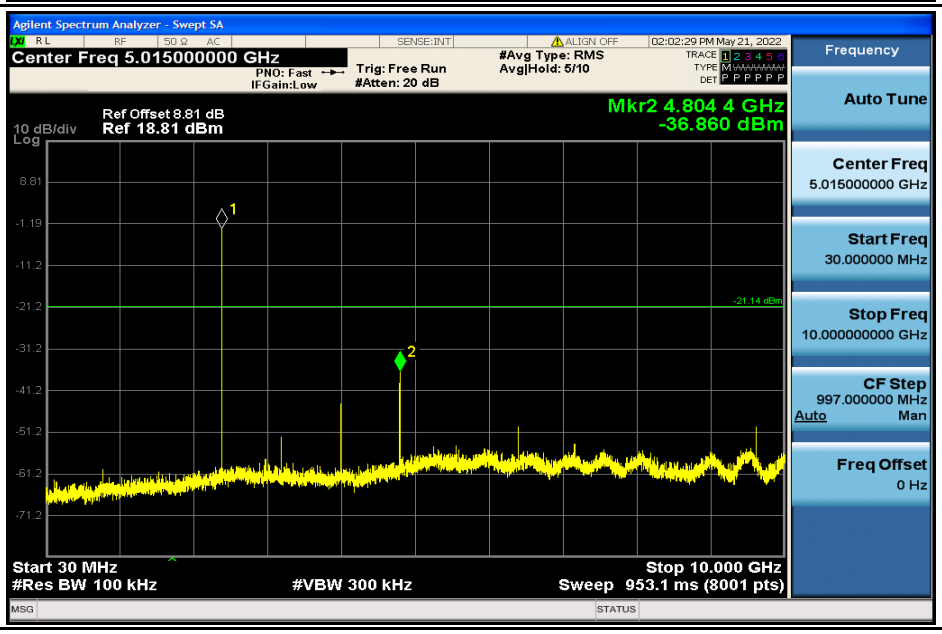


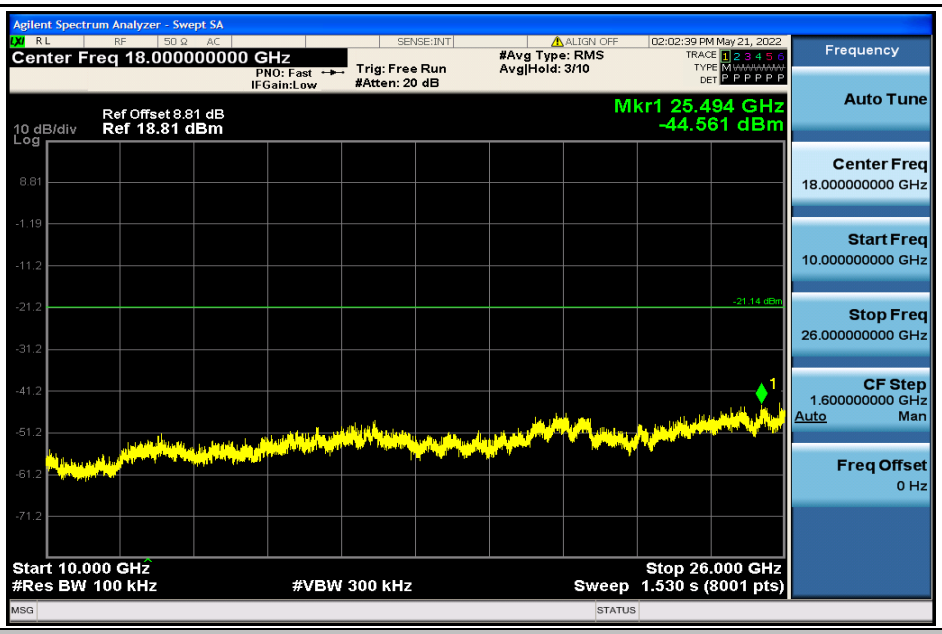




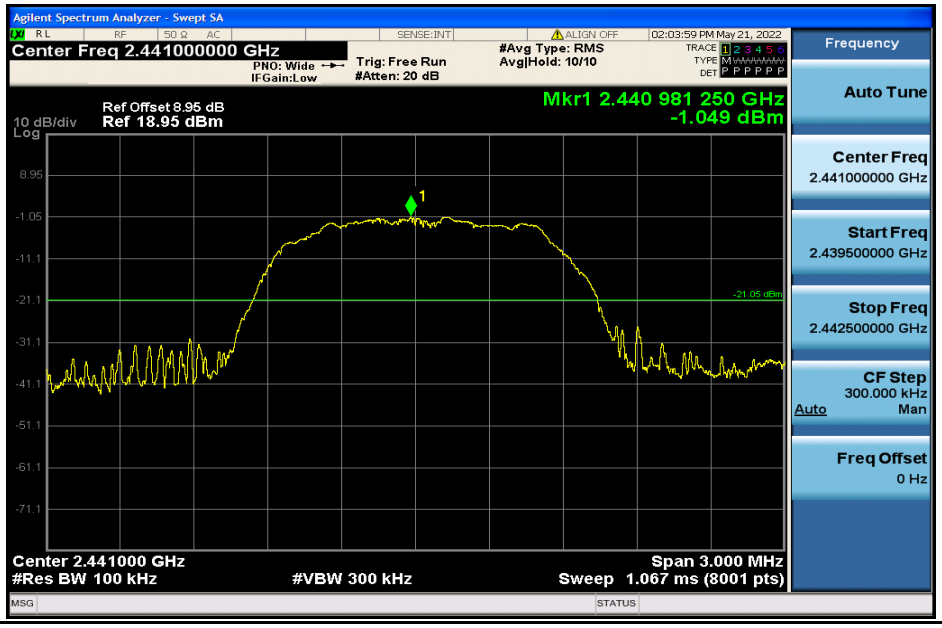
RF Conducted Spurious Emissions_3DH5_2402

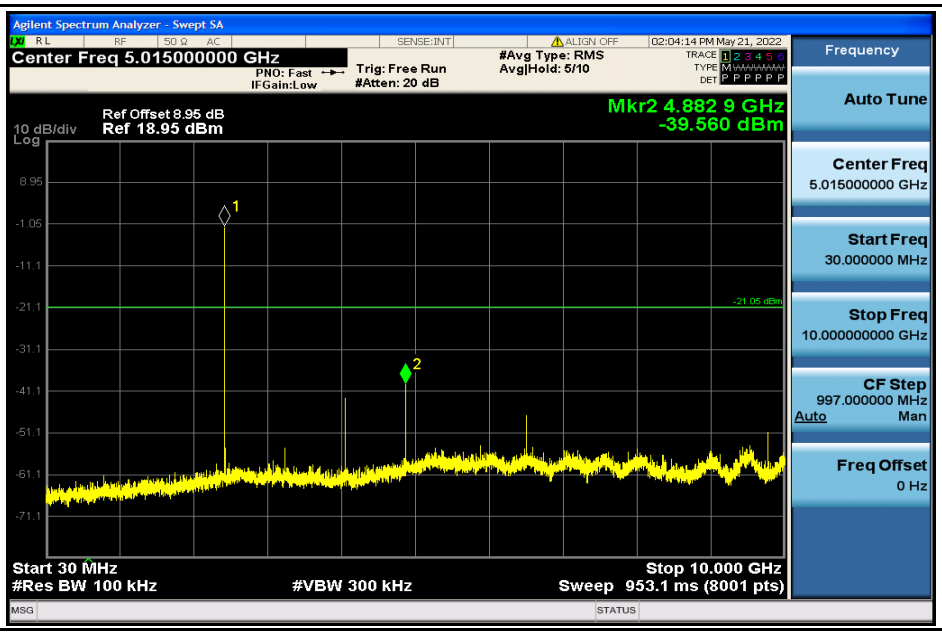


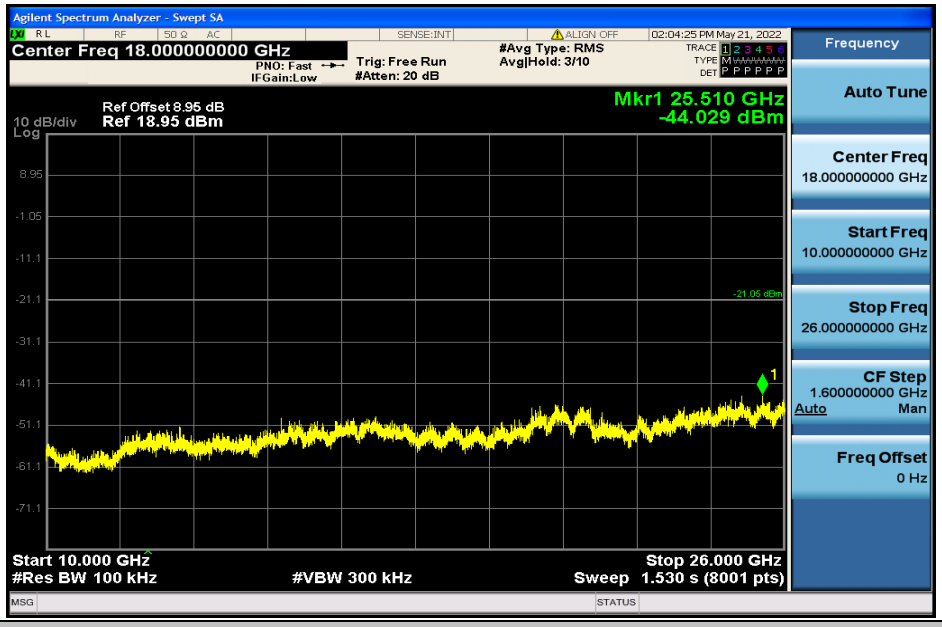




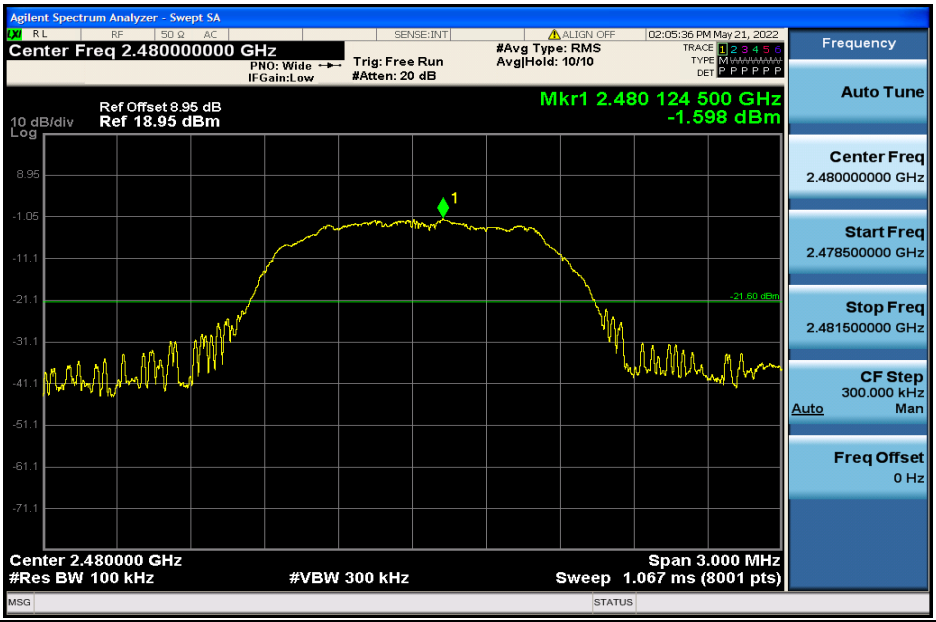
RF Conducted Spurious Emissions_3DH5_2441

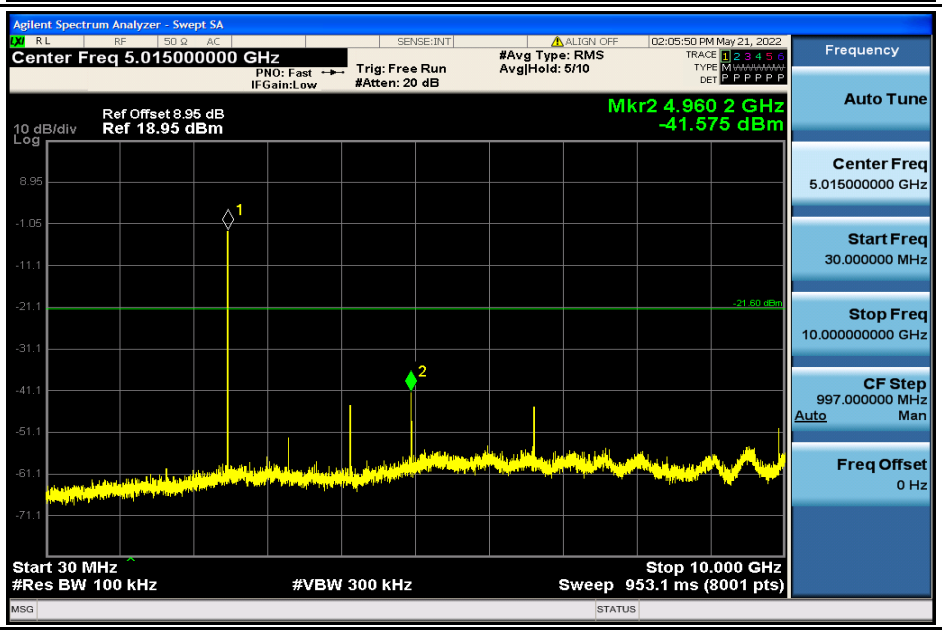


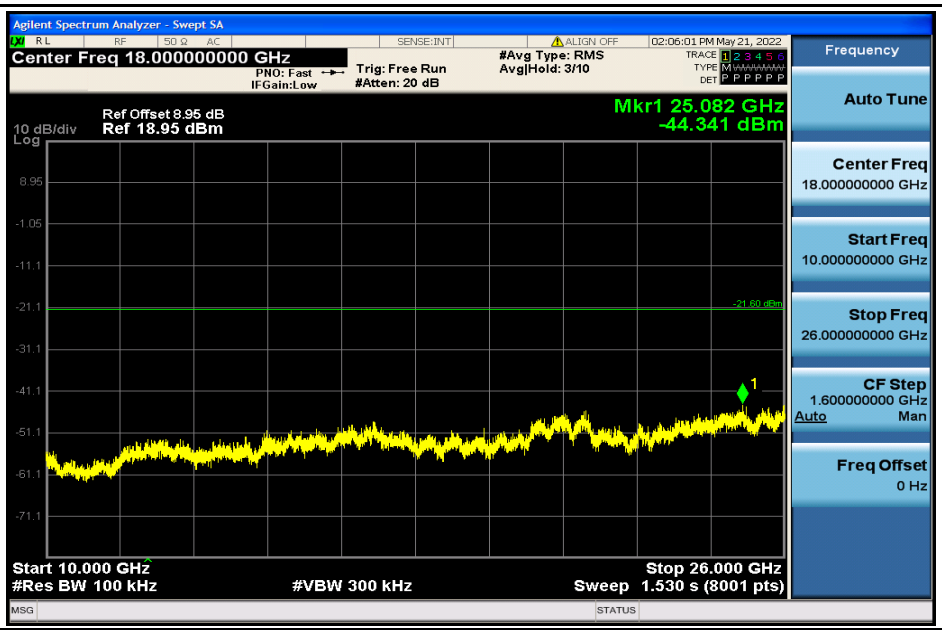




RF Conducted Spurious Emissions_3DH5_2480







-- End of the Report --