FCC/ISED - TEST REPORT

Report Number	:	**68.760.22.0603.01**	Date of Issue:	**2022-09-07**
Model	:	**MLN-00, MLN-01, MLN-02, MLN-03**		
Product Type	:	Bluetooth Earbuds		
Applicant	:	Cosonic Intelligent Technologies Co.,Ltd.		
Address	:	5th Floor,1st Building,No.6 South Industry Road, Songshan Lake Hi-tech Industrial, Development Zone, 523808 Dongguan, China		
Production Facility	:	Cosonic Electroacoustic Technology Co., Ltd.		
Address	:	No.151, Shipai Section, Dongyuan Avenue, Shipai Town, 523331 Dongguan City, Guangdong Province, PEOPLE'S REPUBLIC OF CHINA		
Test Result	:	■ **Positive** ☐ **Negative**		
Total pages including Appendices	:	**68**		

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2 Details about the Test Laboratory

Details about the Test Laboratory
Test Site 1

Company name:	TÜV SÜD Certification and Testing (China) Co., Ltd. Shenzhen Branch Building 12&13, Zhiheng Wisdomland Business Park, Guankou Erlu, Nantou, Nanshan District, Shenzhen, 518052 China
FCC Designation Number:	CN5009
FCC Registration No.:	514049
Telephone:	86 755 8828 6998
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3 Description of the Equipment Under Test

Product:	Bluetooth Earbuds
Model no.:	MLN-00
FCC ID:	2ALVK-MLN00
Trade Mark:	MOECEN, HONOR CHOICE
Rating:	5VDC, 0.5A
RF Transmission Frequency:	2402MHz-2480MHz
No. of Operated Channel:	79
Modulation:	GFSK, π/4-DQPSK, 8DPSK
Antenna Type:	FPC Antenna
Antenna Gain:	-3.0dBi max for 2.4GHz
Description of the EUT:	The equipment under test is a Bluetooth Earbuds supports with 2.4GHz BR/EDR and BLE functions.

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4 Summary of Test Standards

Test Standards	
FCC Part 15 Subpart C 10-1-2021 Edition	PART 15 - RADIO FREQUENCY DEVICES Subpart C - Intentional Radiators

All the test methods were according to Public Notice DA 00-705 -Frequency Hopper Spread Spectrum Test Procedure, KDB558074 D01 v05r02 and ANSI C63.10-2013.

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5 Summary of Test Results

Technical Requirements			
FCC Part 15 Subpart C			
Test Condition		Test Result	Test Site
§15.207	Conducted emission AC power port	Pass	Site 1
§15.247 (b) (3)	Conducted output power	Pass	Site 1
§15.247(e)	Power spectral density	N/A	--
§15.247(a)(2)	6dB bandwidth	N/A	--
§15.247(a)(1)	20dB Occupied bandwidth	Pass	Site 1
§15.247(a)(1)	Carrier frequency separation	Pass	Site 1
§15.247(a)(1)(iii)	Number of hopping frequencies	Pass	Site 1
§15.247(a)(1)(iii)	Dwell Time	Pass	Site 1
§15.247(d)	Spurious RF conducted emissions	Pass	Site 1
§15.247(d)	Band edge	Pass	Site 1
§15.247(d) & §15.209 & §15.205	Spurious radiated emissions for transmitter	Pass	Site 1
§15.203	Antenna requirement	Pass See note 1	--

Remark 1: N/A – Not Applicable.
Note 1: The EUT uses a FPC Antenna, which gain is -3.0dBi. In accordance to §15.203 and RSS-Gen 6.8, it is considered sufficiently to comply with the provisions of this section.

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6 General Remarks

Remarks

This submittal(s) (test report) is intended for FCC ID: 2ALVK-MLN00, complies with Section 15.207, 15.209, 15.205, 15.247 of the FCC Part 15, Subpart C.

Models MLN-01, MLN-02 and MLN-03 are identical with model MLN-00 except for model name, the left and right earbuds are identical in components, circuit, PCB layout and software version. Unless otherwise specified, the model MLN-00 (single earbuds) was chosen as the representative model to perform full tests, and other models are deemed to fulfil relevant requirements without further testing.

The TX and RX range is 2402MHz-2480MHz for Bluetooth.

Note: The report is for the BR+EDR part.

SUMMARY:

All tests according to the regulations cited on page 6 were

■ - Performed

☐ - **Not** Performed

The Equipment Under Test

■ - **Fulfills** the general approval requirements.

☐ - **Does not** fulfill the general approval requirements.

Sample Received Date:	2022-08-01
Testing Start Date:	2022-08-26
Testing End Date:	2022-09-06

- TÜV SÜD Certification and Testing (China) Co., Ltd. Shenzhen Branch

Reviewed by:	Prepared by:	Tested by:
Jessie He	Myron Yu	Garry Cai
Project Manager	Project Engineer	Test Engineer

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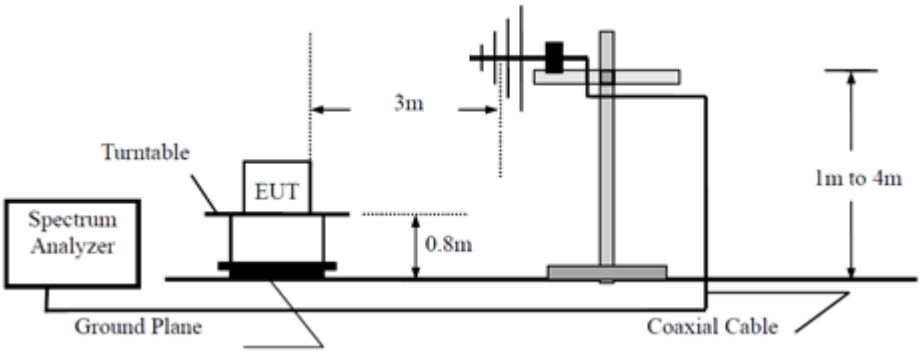
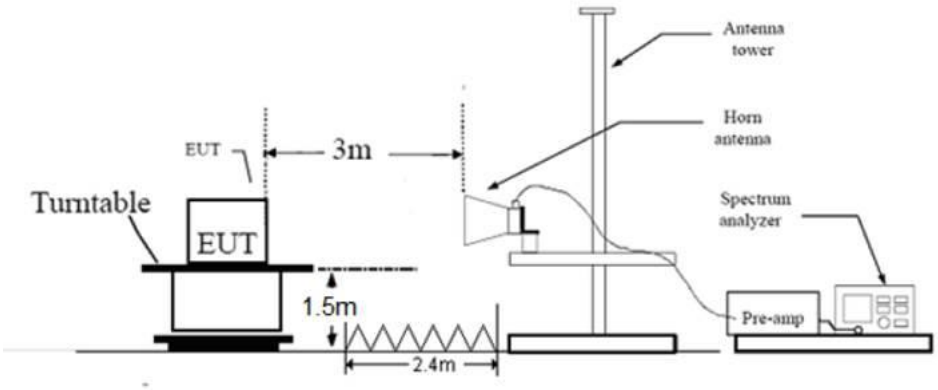
7 Test Setups

7.1 Radiated test setups

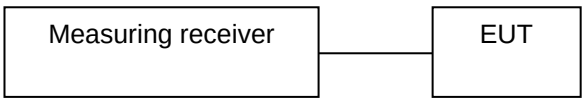
Below 1GHz



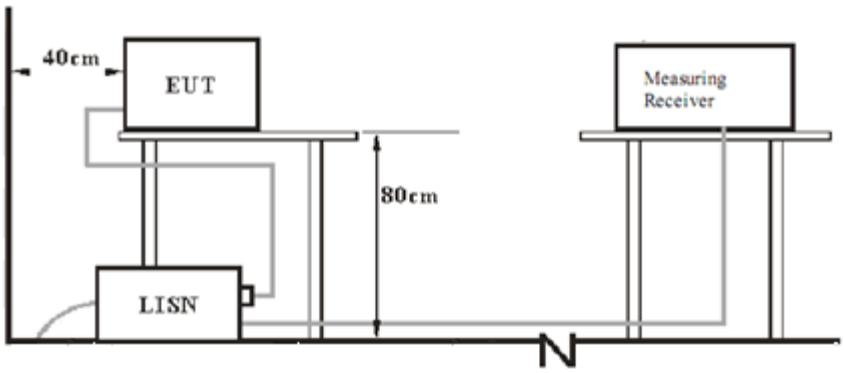
Above 1GHz



7.2 Conducted RF test setups



7.3 AC Power Line Conducted Emission test setups



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8 Systems test configuration

Auxiliary Equipment Used during Test:

DESCRIPTION	MANUFACTURER	MODEL NO.	S/N
LAPTOP	LENOVO	X220	429044C
ADAPTOR	APPLE	A1357	---

The system was configured to hopping mode and non-hopping mode.

Hopping mode: typical working mode (normal hopping status)

Non-hopping mode: The system was configured to operate at a signal channel transmitting.

Test Software Information:

Test Software Version	Qualcomm BlueSuite 3.3.2
Modulation	Setting TX Power
GFSK	6
π/4-DQPSK	6
8-DPSK	6

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9 Technical Requirement

9.1 Conducted Emission

Test Method

1. The EUT was placed 0.4 meter from the conducting wall of the shielding room was kept at least 80 centimeters from any other grounded conducting surface.
2. Connect EUT to the power mains through a line impedance stabilization network (LISN).
3. All the support units are connecting to the other LISN.
4. The LISN provides 50 ohm coupling impedance for the measuring instrument.
5. Both sides of AC line were checked for maximum conducted interference.
6. The frequency range from 150 kHz to 30 MHz was searched.
7. Set the test-receiver system to Peak Detect Function and specified bandwidth (IF Bandwidth = 9kHz) with Maximum Hold Mode. Then measurement is also conducted by Average Detector and Quasi-Peak Detector Function respectively.

Limit

According to §15.207, conducted emissions limit as below:

Frequency MHz	QP Limit dBµV	AV Limit dBµV
0.150-0.500	66-56*	56-46*
0.500-5	56	46
5-30	60	50

*Decreasing linearly with logarithm of the frequency

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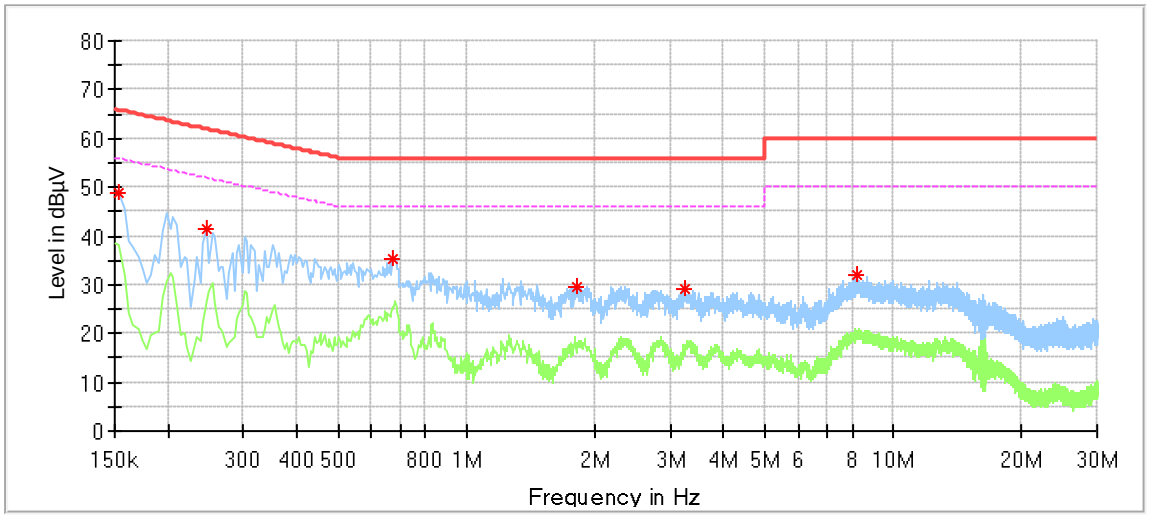
Conducted Emission

Product Type : Bluetooth Earbuds
M/N : MLN-00
Operating Condition : Charging + BT link
Test Specification : Power Line, Live
Comment : AC 120V/60Hz (External adapter)



Frequency (MHz)	MaxPeak (dBµV)	Average (dBµV)	Limit (dBµV)	Margin (dB)	Line	Corr. (dB)
0.154000	48.74	---	65.78	17.04	L1	9.25
0.246000	41.45	---	61.89	20.44	L1	9.23
0.670000	35.39	---	56.00	20.61	L1	9.20
1.814000	29.48	---	56.00	26.52	L1	9.22
3.254000	29.33	---	56.00	26.67	L1	9.26
8.198000	31.98	---	60.00	28.02	L1	9.38

Remark:
Level=Reading Level + Correction Factor
Correction Factor=Cable Loss + LISN Factor
(The Reading Level is recorded by software which is not shown in the sheet)

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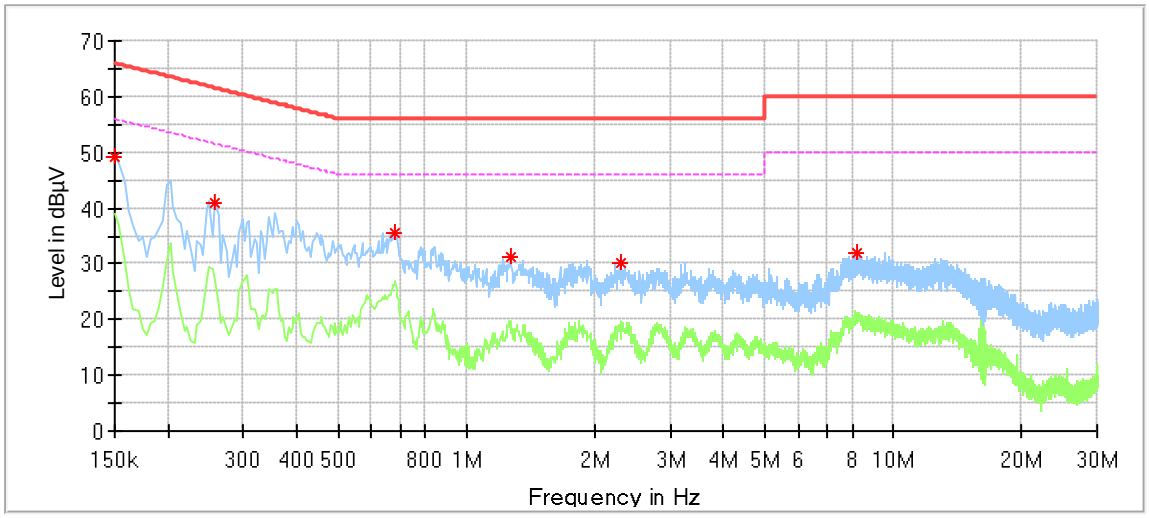
Conducted Emission

Product Type	:	Bluetooth Earbuds
M/N	:	MLN-00
Operating Condition	:	Charging + BT link
Test Specification	:	Power Line, Neutral
Comment	:	AC 120V/60Hz (External adapter)



Frequency (MHz)	MaxPeak (dBµV)	Average (dBµV)	Limit (dBµV)	Margin (dB)	Line	Corr. (dB)
0.150000	49.04	---	66.00	16.96	N	9.40
0.258000	41.04	---	61.50	20.45	N	9.39
0.682000	35.43	---	56.00	20.57	N	9.39
1.266000	31.11	---	56.00	24.89	N	9.40
2.290000	30.02	---	56.00	25.98	N	9.43
8.198000	31.91	---	60.00	28.09	N	9.59

Remark:
Level=Reading Level + Correction Factor
Correction Factor=Cable Loss + LISN Factor
(The Reading Level is recorded by software which is not shown in the sheet)

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9.2 Conducted output power

Test Method

1. The EUT was placed on 0.8m height table, the RF output of EUT was connected to the test receiver by RF cable. The path loss was compensated to the results for each measurement.
2. Use the following spectrum analyzer settings:
   Span = approximately 5 times the 20dB bandwidth, centered on a hopping channel
   RBW > the 20dB bandwidth of the emission being measured, VBW≥RBW,
   Sweep = auto, Detector function = peak, Trace = max hold
3. Allow the trace to stabilize. Use the marker-to-peak function to set the marker to the peak of the emission. The indicated level is the peak output power

Limits

According to §15.247 (b) (3), conducted output power limit as below:

Frequency Range MHz	Limit W	Limit dBm
2400-2483.5	≤1	≤30

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Conducted output power

Bluetooth Mode GFSK modulation Test Result

Frequency	Conducted Output Power	Result
MHz	dBm	
Low channel 2402MHz	3.53	Pass
Middle channel 2441MHz	3.23	Pass
High channel 2480MHz	3.09	Pass

Bluetooth Mode π/4-DQPSK modulation Test Result

Frequency	Conducted Output Power	Result
MHz	dBm	
Low channel 2402MHz	3.19	Pass
Middle channel 2441MHz	2.88	Pass
High channel 2480MHz	2.72	Pass

Bluetooth Mode 8DPSK modulation Test Result

Frequency	Conducted Output Power	Result
MHz	dBm	
Low channel 2402MHz	3.69	Pass
Middle channel 2441MHz	3.39	Pass
High channel 2480MHz	3.28	Pass

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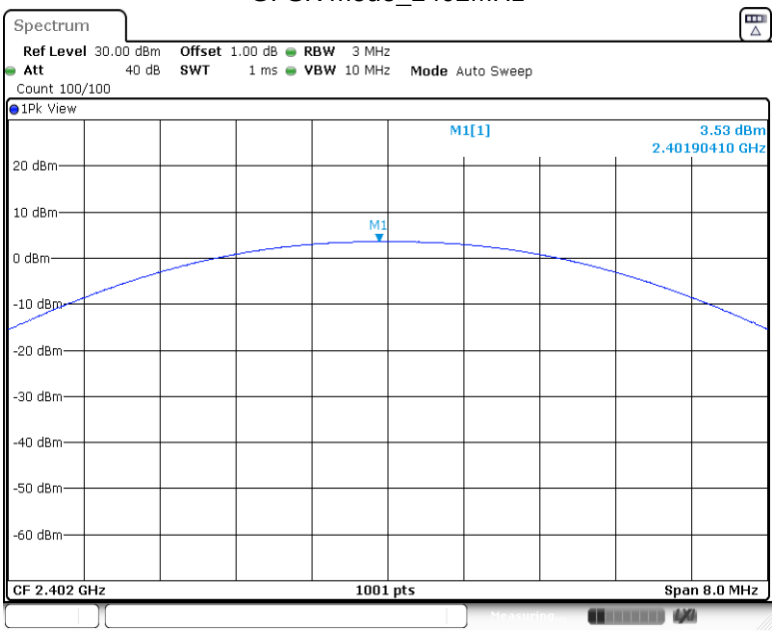
Conducted output power

GFSK mode_2402MHz



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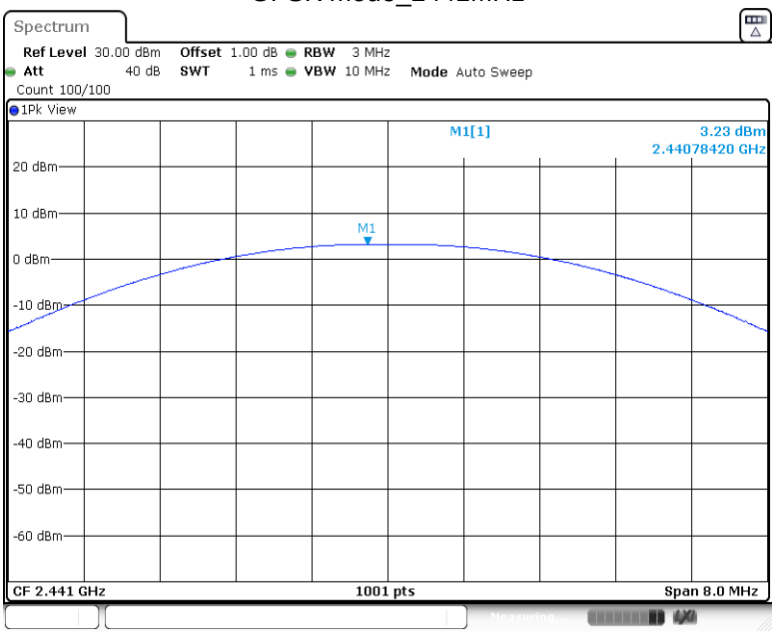
GFSK mode_2441MHz



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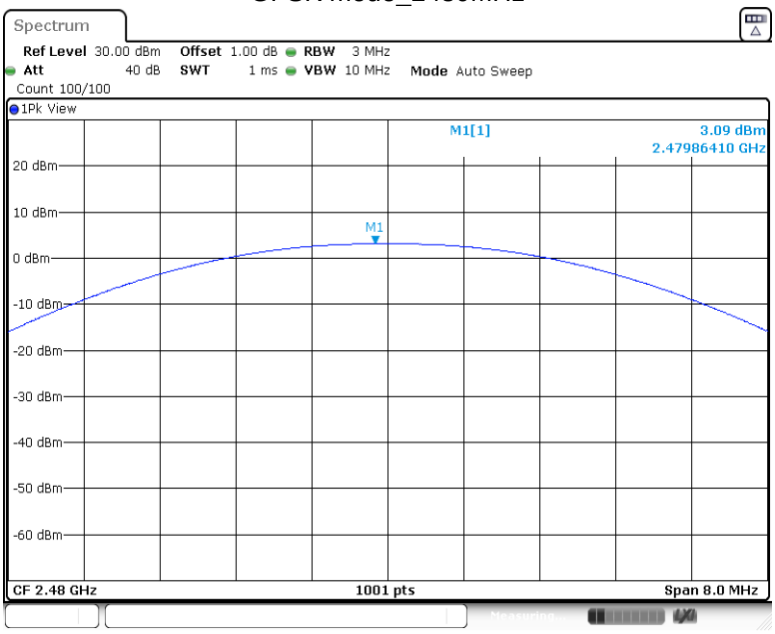
Conducted output power

GFSK mode_2480MHz



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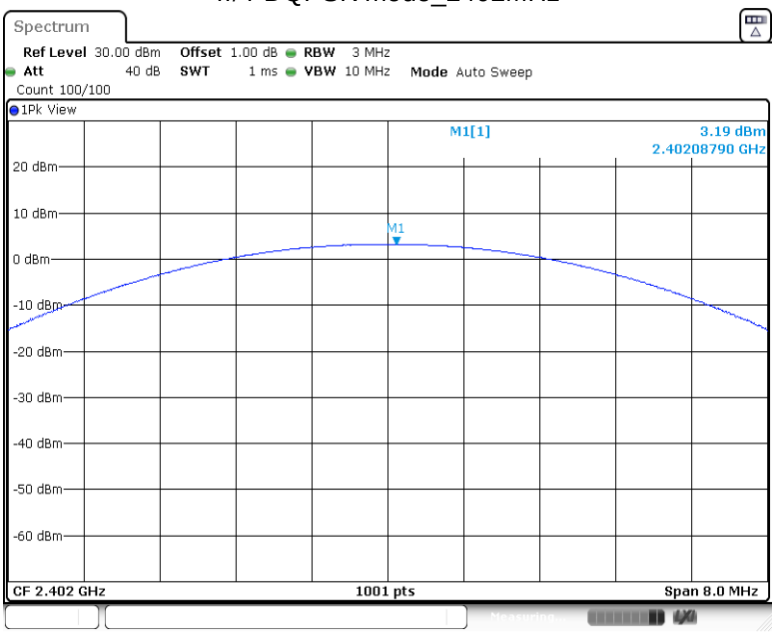
π/4-DQPSK mode_2402MHz



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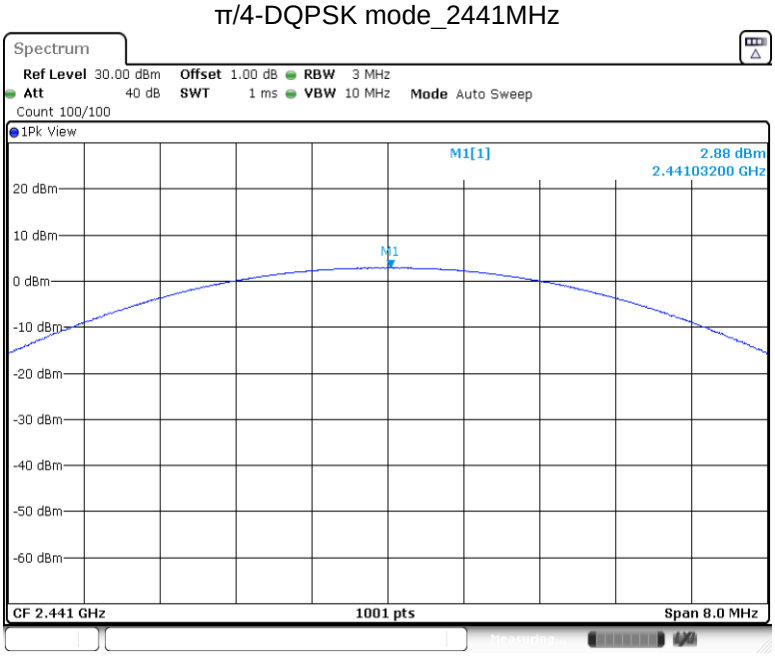
Conducted output power

π/4-DQPSK mode_2441MHz



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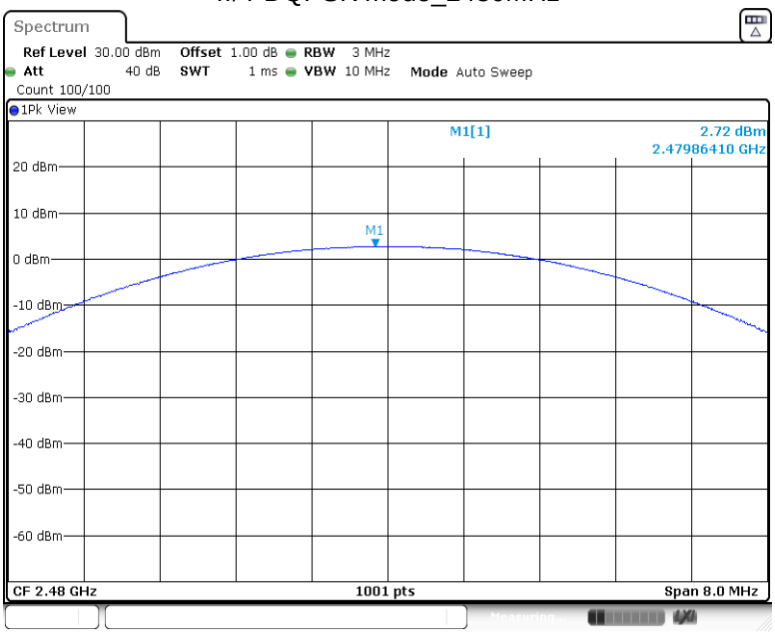
π/4-DQPSK mode_2480MHz



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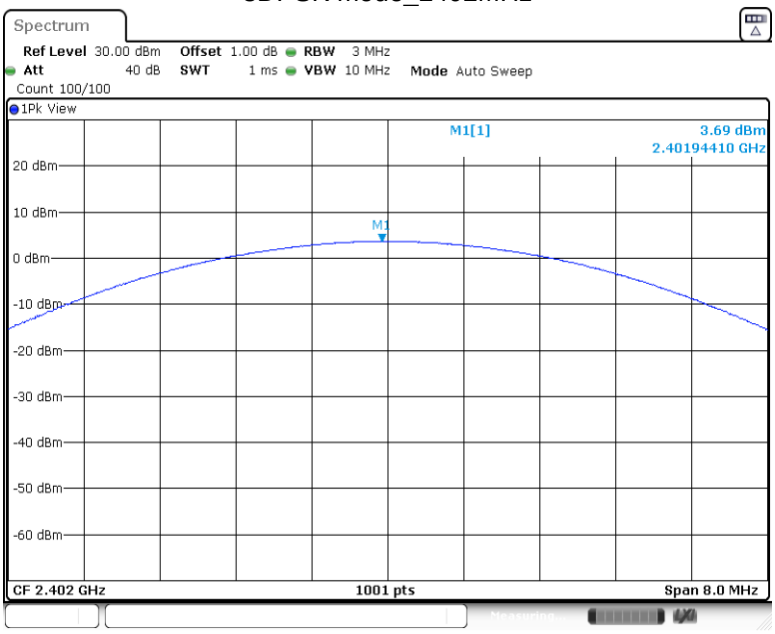
Conducted output power

8DPSK mode_2402MHz



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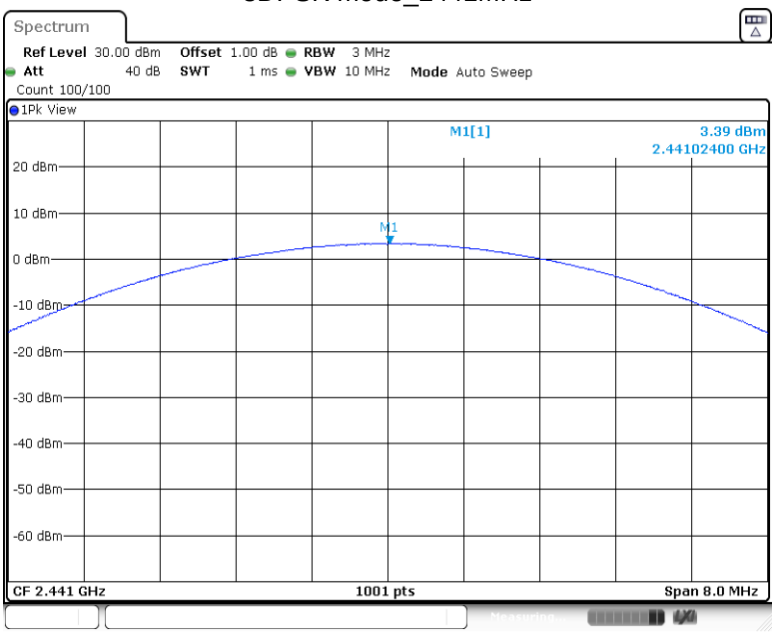
8DPSK mode_2441MHz



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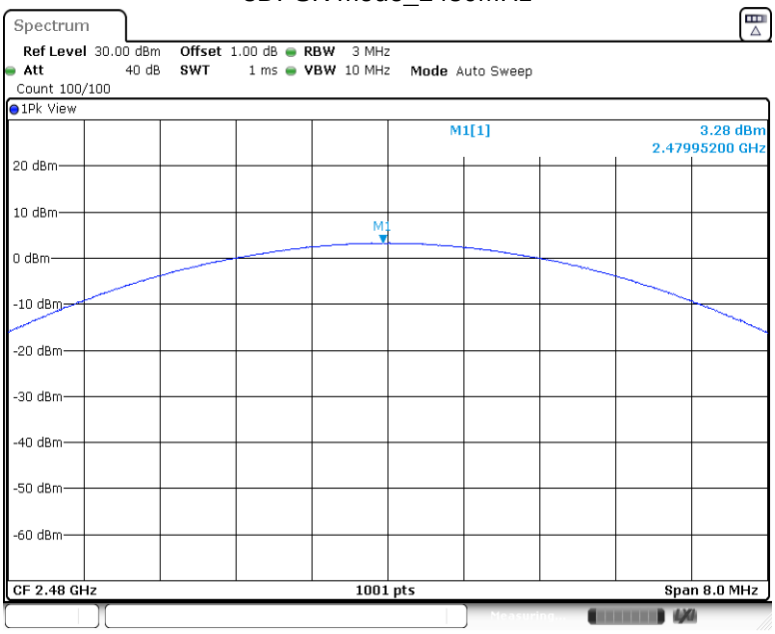
Conducted output power

8DPSK mode_2480MHz



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9.3 20 dB bandwidth

Test Method

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

Limit

Limit [kHz]
N/A

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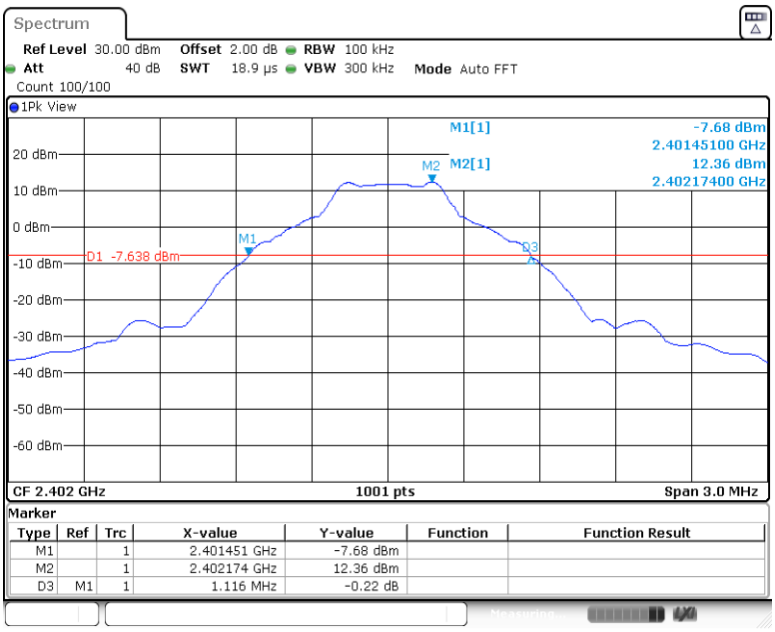
20 dB bandwidth

Bluetooth Mode GFSK Modulation test result

Frequency MHz	20 dB Bandwidth kHz	Limit kHz	Result
2402	1116	--	Pass
2441	1116	--	Pass
2480	1113	--	Pass

Low channel 2402MHz



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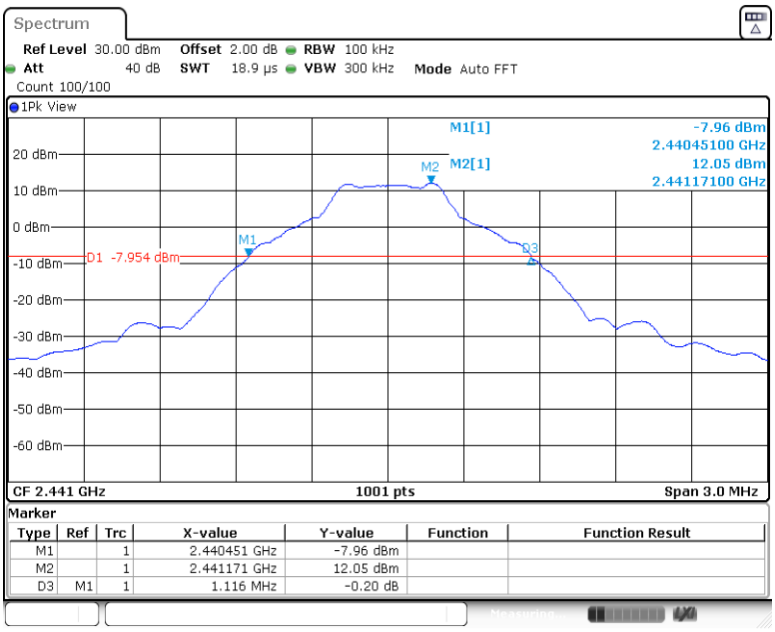
Middle channel 2441MHz



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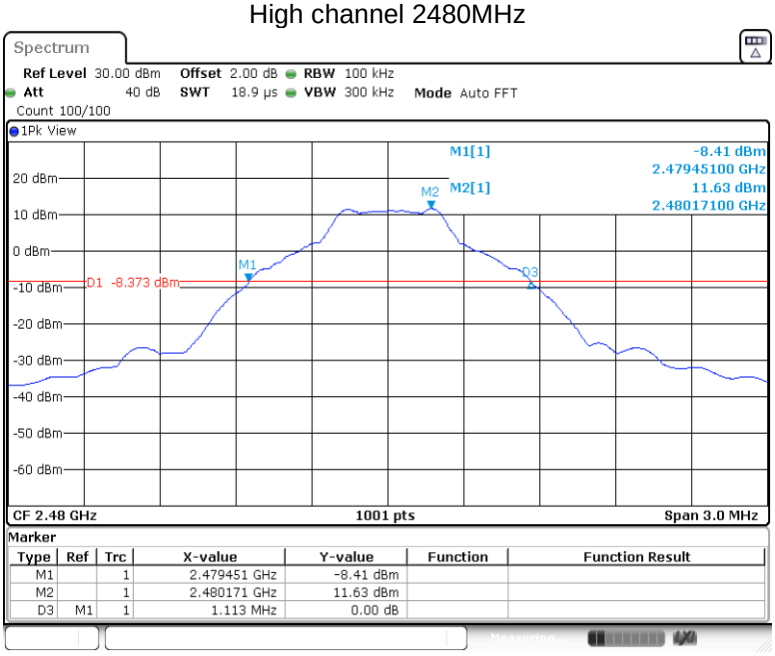
20 dB bandwidth

High channel 2480MHz



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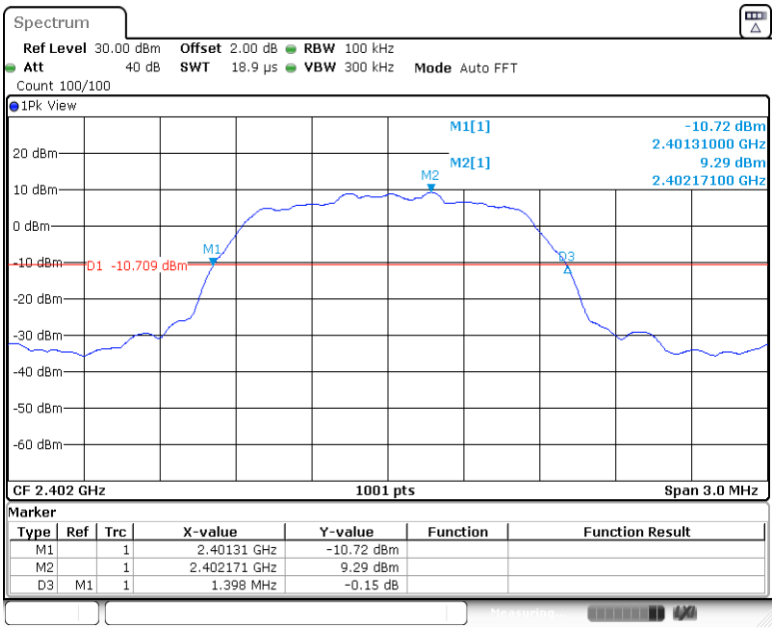
20 dB bandwidth

Bluetooth Mode π/4-DQPSK Modulation test result

Frequency MHz	20 dB Bandwidth kHz	Limit kHz	Result
2402	1398	--	Pass
2441	1401	--	Pass
2480	1401	--	Pass

Low channel 2402MHz



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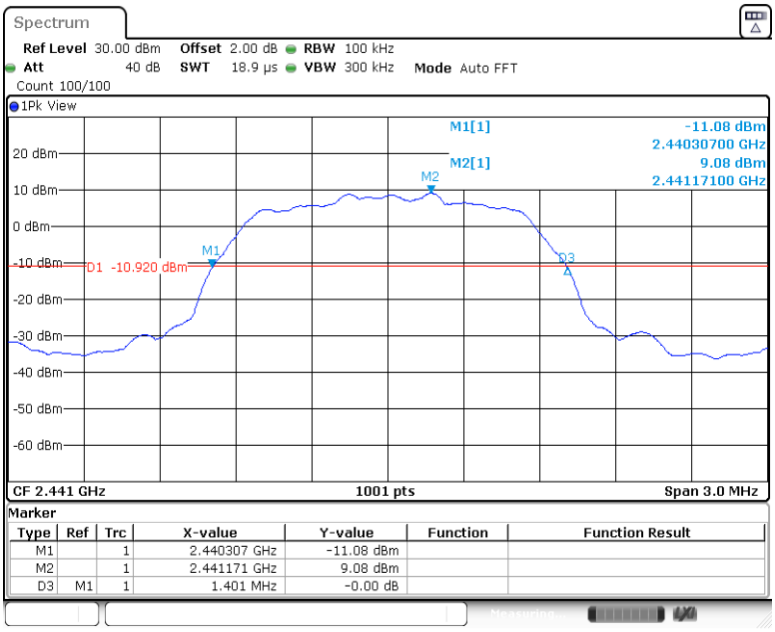
Middle channel 2441MHz



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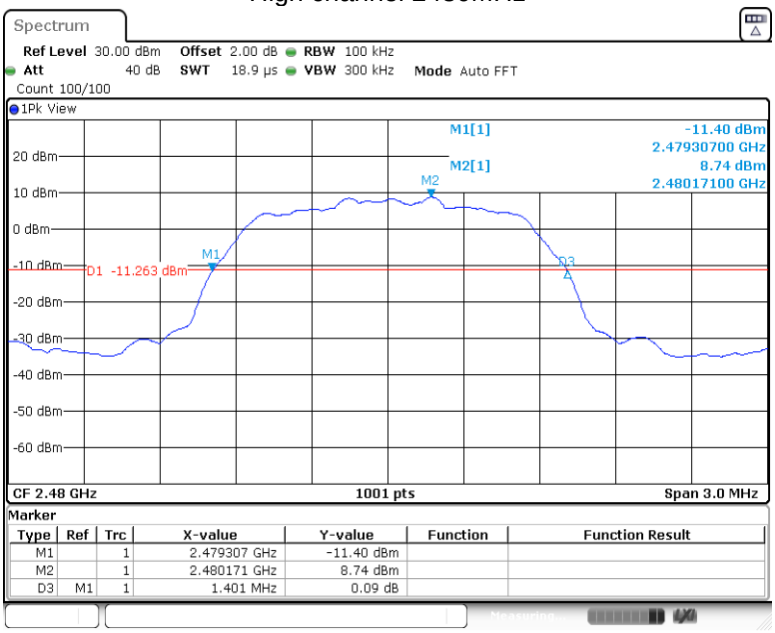
20 dB bandwidth

High channel 2480MHz



Date: 18.AUG.2022 15:53:53

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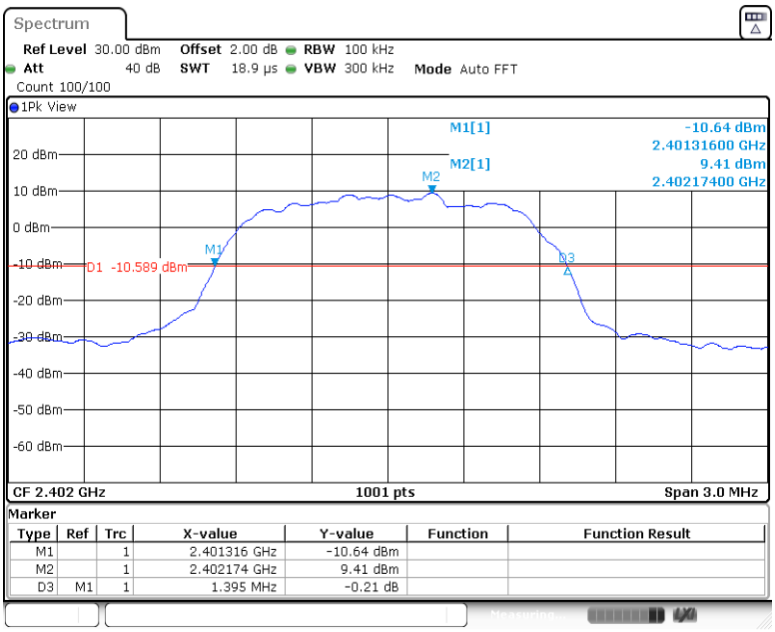
20 dB bandwidth

Bluetooth Mode 8DPSK Modulation test result

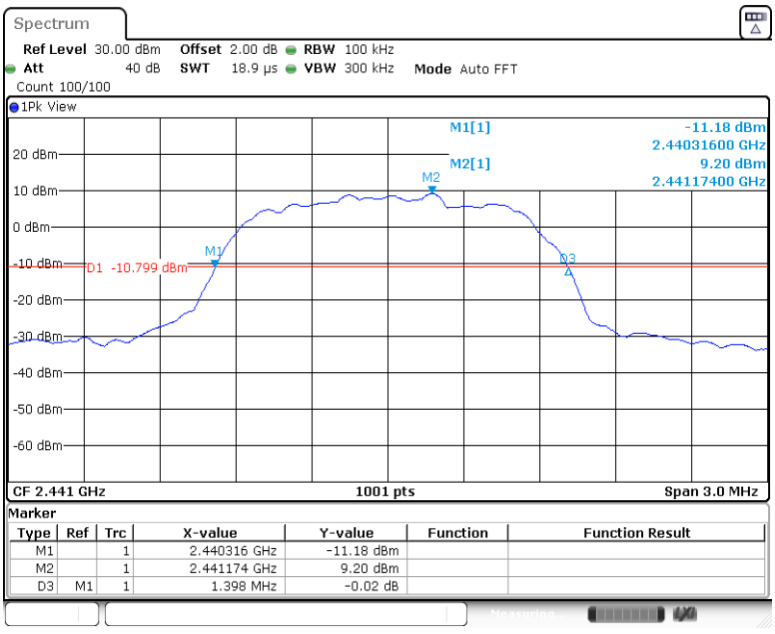
Frequency MHz	20 dB Bandwidth kHz	Limit kHz	Result
2402	1395	--	Pass
2441	1398	--	Pass
2480	1398	--	Pass

Low channel 2402MHz



Date: 18.AUG.2022 15:55:36

Middle channel 2441MHz



Date: 18.AUG.2022 15:57:07

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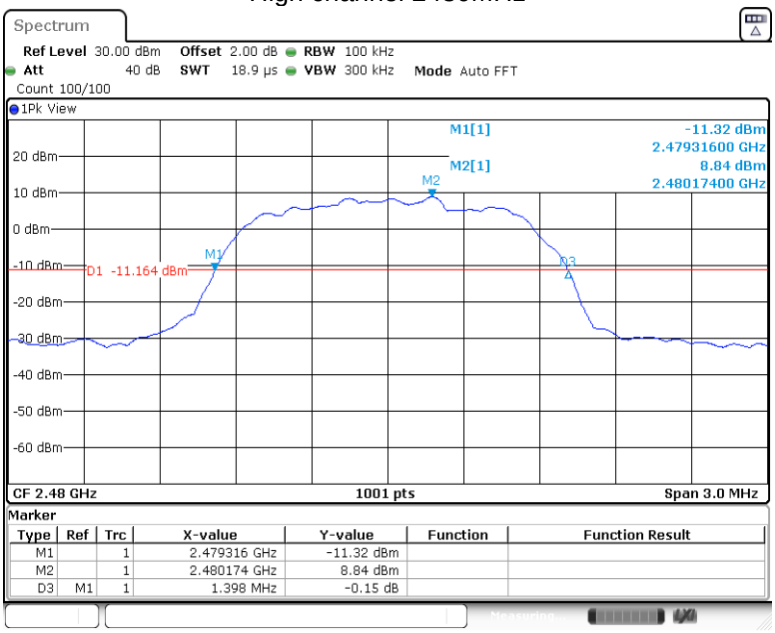
20 dB bandwidth

High channel 2480MHz



Date: 18.AUG.2022 15:59:21

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9.4 Carrier Frequency Separation

Test Method

1. Use the following spectrum analyzer settings:
   Span = wide enough to capture the peaks of two adjacent channels, RBW ≥ 1% of the span, VBW) ≥RBW, Sweep = auto, Detector function = peak
2. By using the Max-Hold function record the separation of two adjacent channels.
3. Measure the frequency difference of these two adjacent channels by spectrum analyzer marker function.
4. Repeat above procedures until all frequencies measured were complete.

Limit

Limit kHz
⩾25KHz or 2/3 of the 20 dB bandwidth which is greater

Frequency MHz	2/3 of 20 dB Bandwidth kHz
GFSK	744
π/4-DQPSK	934
8DPSK	932

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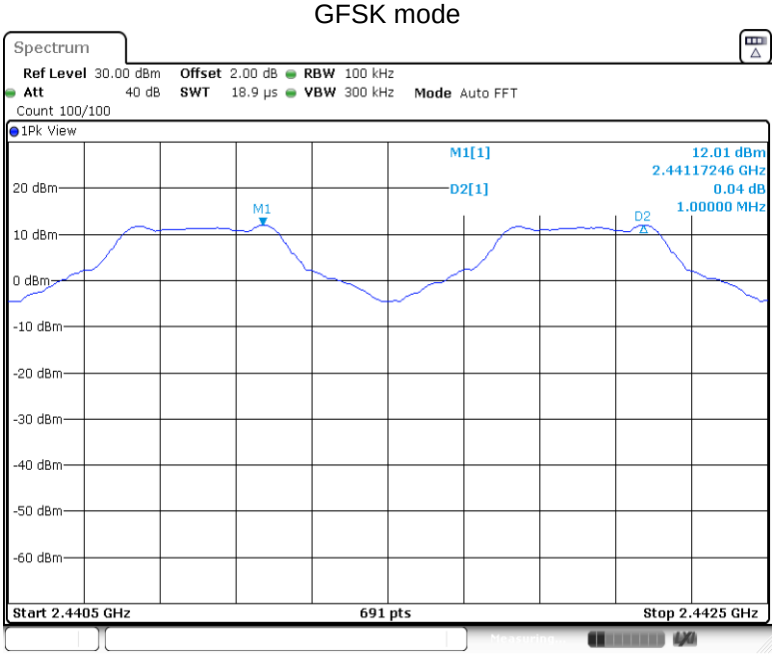
Carrier Frequency Separation

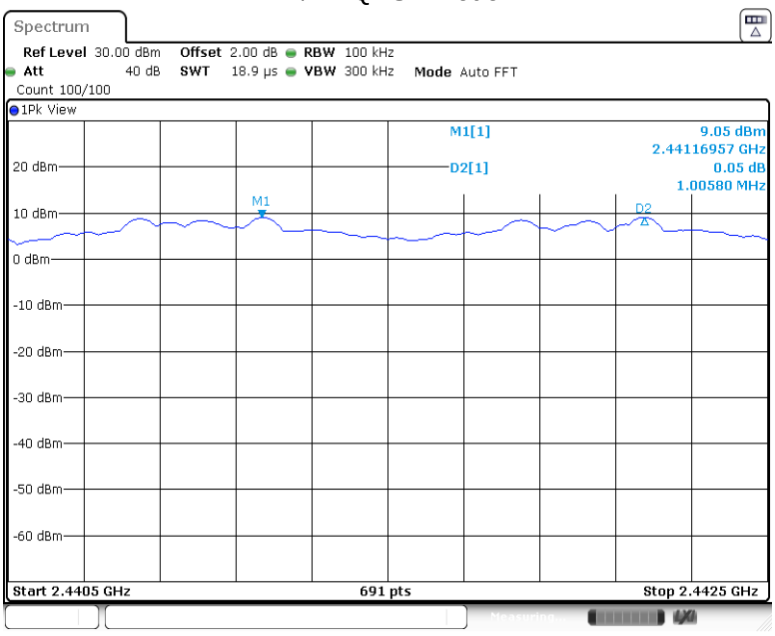
Test Mode	Antenna	Channel	Result [MHz]	Limit [MHz]	Verdict
GFSK	Ant1	Hop	1.000	>=0.744	PASS
π/4-DQPSK	Ant1	Hop	1.006	>=0.934	PASS
8DPSK	Ant1	Hop	1.003	>=0.932	PASS

GFSK mode



Date: 18.AUG.2022 16:01:20

π /4-DQPSK mode



Date: 18.AUG.2022 16:09:01

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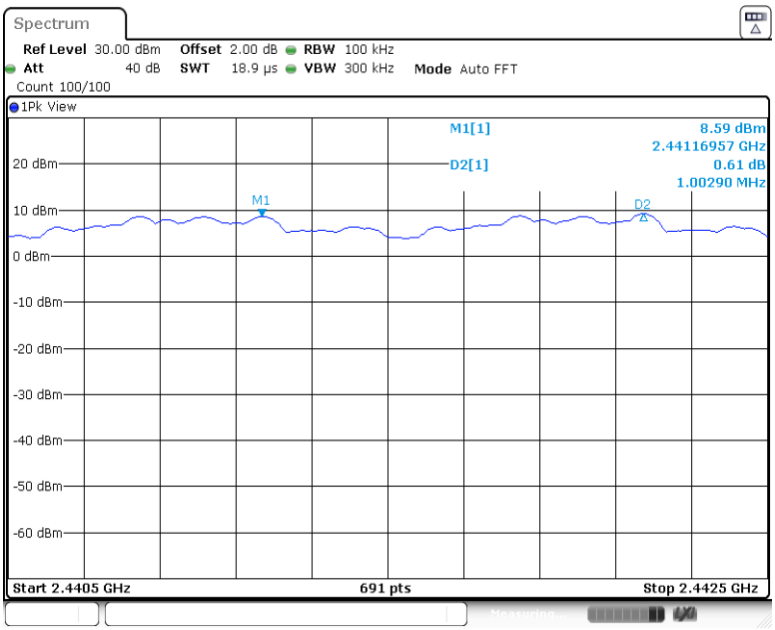
Carrier Frequency Separation

8DPSK mode



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9.5 Number of hopping frequencies

Test Method

1. Use the following spectrum analyzer settings:
   Span = wide enough to capture the peaks of two adjacent channels, RBW ≥ 1% of the span, VBW) ≥RBW, Sweep = auto, Detector function = peak
2. Set the spectrum analyzer on Max-Hold Mode, and then keep the EUT in hopping mode.
3. Record all the signals from each channel until each one has been recorded.
4. Repeat above procedures until all frequencies measured were complete.

Limit

Limit number
⩾15

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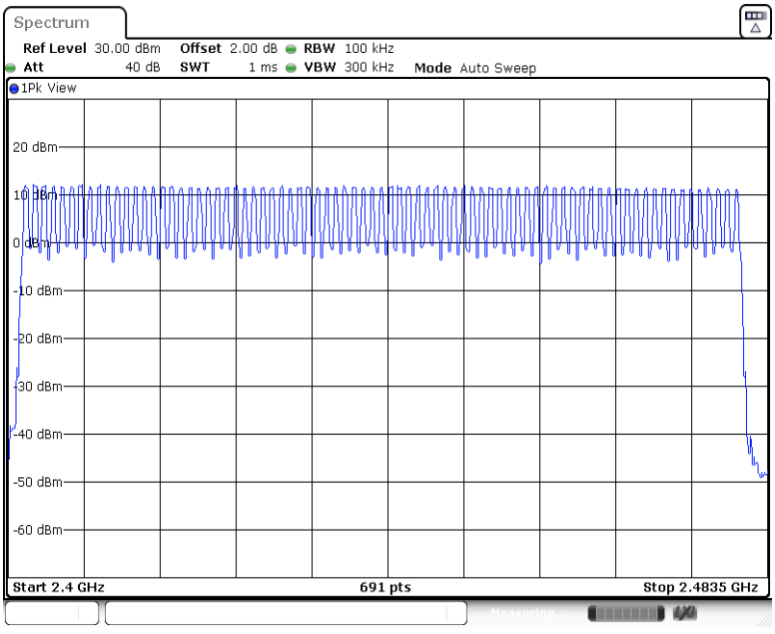
Number of hopping frequencies

Test result: The measurement was performed with the typical configuration (normal hopping status), and the total hopping channels is constant for the all modulation mode according with the Bluetooth Core Specification.

Number of hopping frequencies	Result
79	Pass

GFSK Mode



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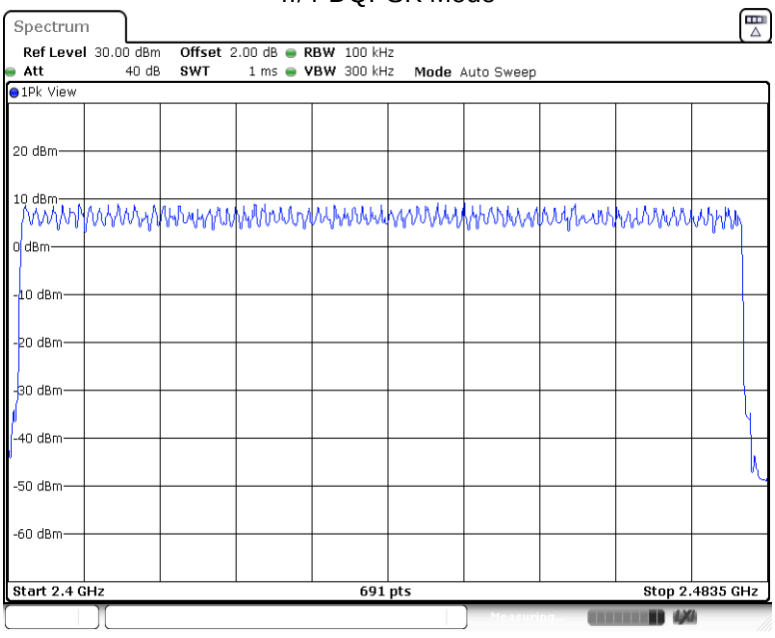
π/4-DQPSK Mode



Date: 18.AUG.2022 16:07:37

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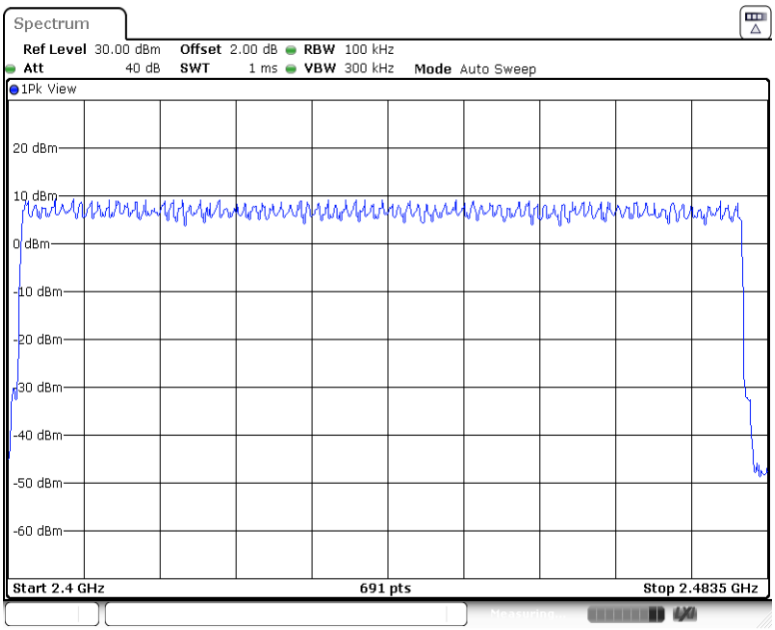
Number of hopping frequencies

8DPSK Mode



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9.6 Dwell Time

Test Method

1. The RF output of EUT was connected to the test receiver by RF cable. The path loss was compensated to the results for each measurement.
2. Set to the maximum power setting and enable the EUT transmit to hopping mode.
3. Use the following spectrum analyzer settings:
   RBW: 1MHz; VBW: 1MHz; SPAN: Zero Span
   Set the spectrum analyzer on Max-Hold Mode,
4. Adjust the center frequency of spectrum analyzer on any frequency be measured.
5. Measure the Dwell Time by spectrum analyzer Marker function. Record the results.
   Dwell Time = Burst Width * Total Hops
6. Repeat above procedures until all frequencies measured were complete.

Limit

The average time of occupancy on any frequency shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed.

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Dwell Time

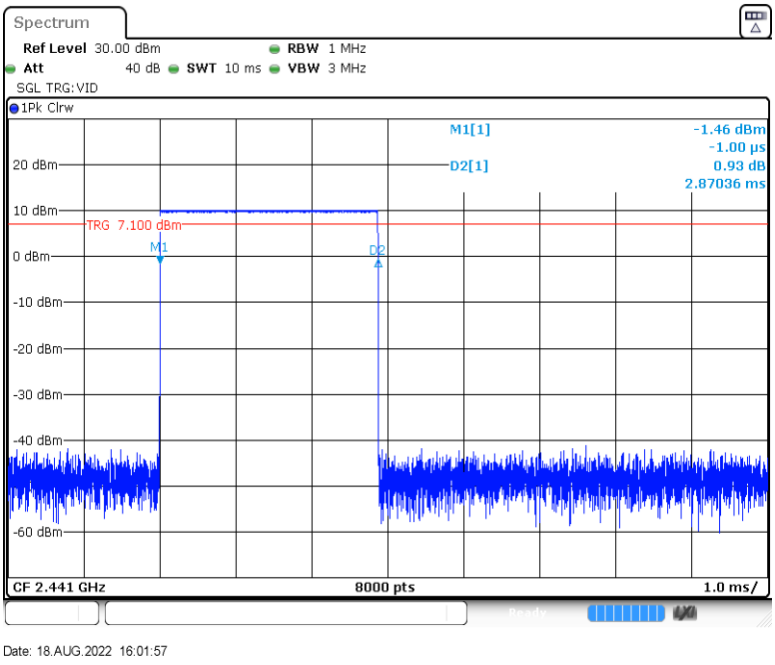
Dwell time

The maximum dwell time shall be 0.4 s.
The Dwell Time = Burst Width * Total Hops. The detailed calculations are showed as follows:
The duration for dwell time calculation: 0.4 [s] * hopping number = 0.4 [s] * 79 [ch] = 31.6 [s*ch];

Test Result

Test Mode	Antenna	Channel	Burst Width [ms]	Total Hops	Result [s]	Limit [s]	Verdict
GFSK	Ant1	Hop	2.87	110	0.316	<=0.4	PASS
π/4-DQPSK	Ant1	Hop	2.87	120	0.344	<=0.4	PASS
8DPSK	Ant1	Hop	2.87	120	0.345	<=0.4	PASS

GFSK mode



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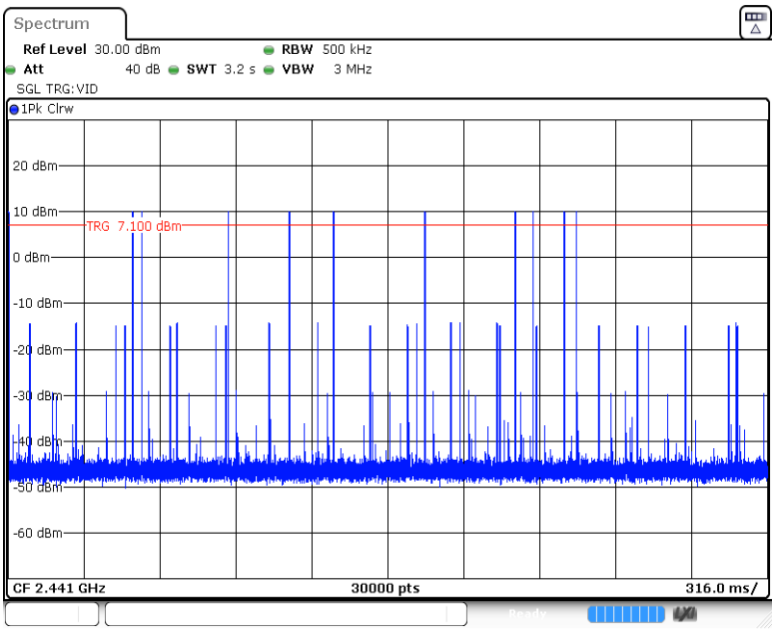
Dwell Time



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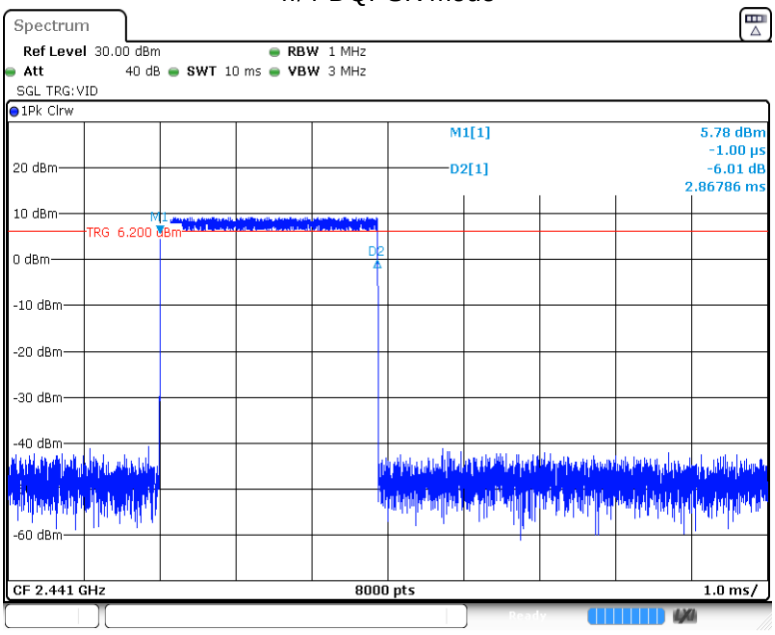
π/4-DQPSK mode



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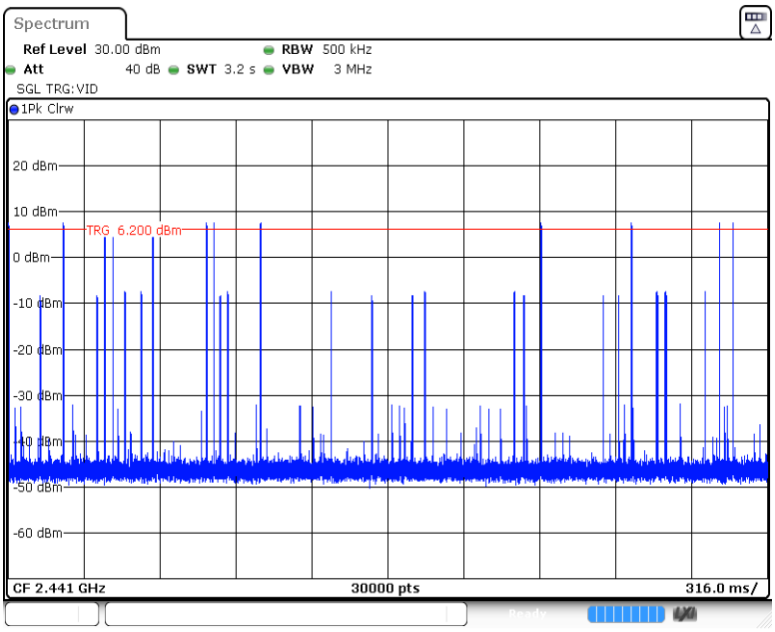
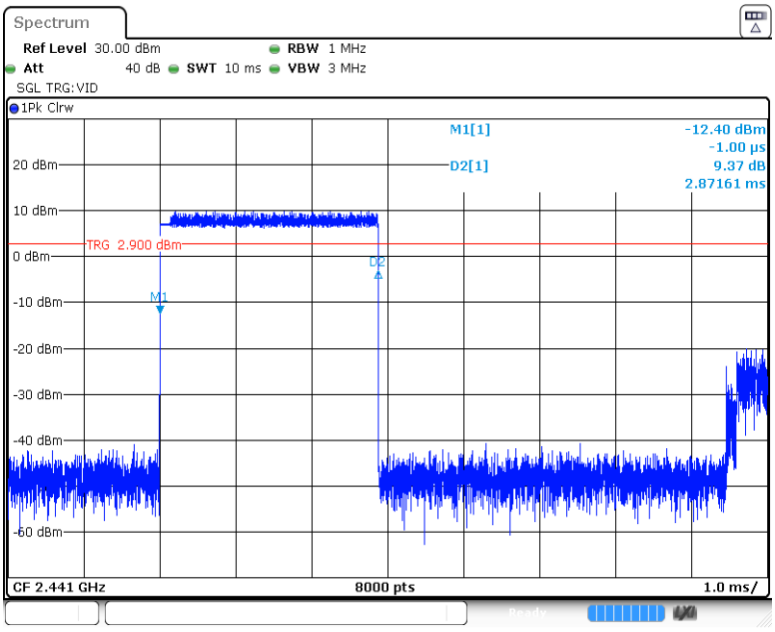
Dwell Time



Date: 18.AUG.2022 16:07:55

8DPSK mode



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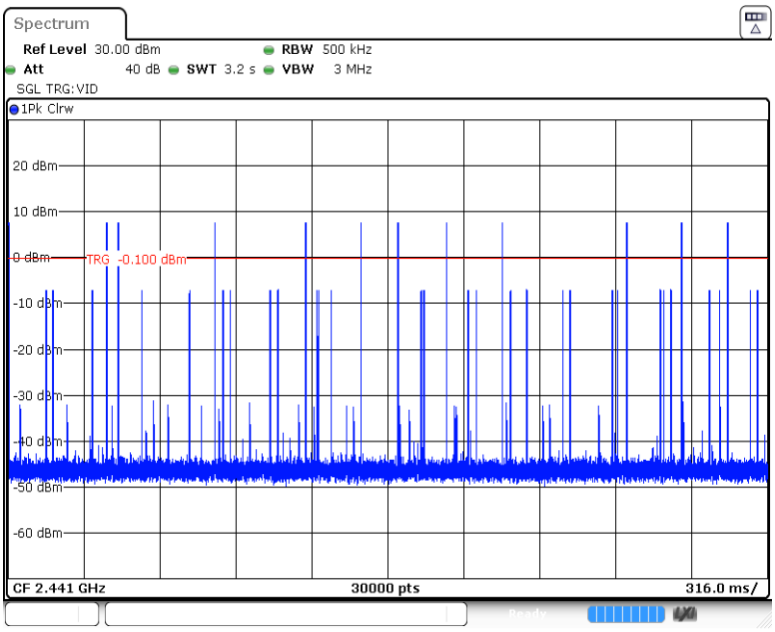
Dwell Time



Date: 18.AUG.2022 16:13:26

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9.7 Spurious RF conducted emissions

Test Method

1. Use the following spectrum analyzer settings:
   Span = wide enough to capture the peak level of the in-band emission and all spurious emissions (e.g., harmonics) from the lowest frequency generated in the EUT up through the 10th harmonic. Typically, several plots are required to cover this entire span.
   RBW = 100 kHz, VBW≥RBW, Sweep = auto, Detector function = peak, Trace = max hold
2. Allow the trace to stabilize. Set the marker on the peak of any spurious emission recorded.
3. The level displayed must comply with the limit specified in this Section. Submit these plots.
4. Repeat above procedures until all frequencies measured were complete.

Limit

Frequency Range MHz	Limit (dBc)
30-25000	-20

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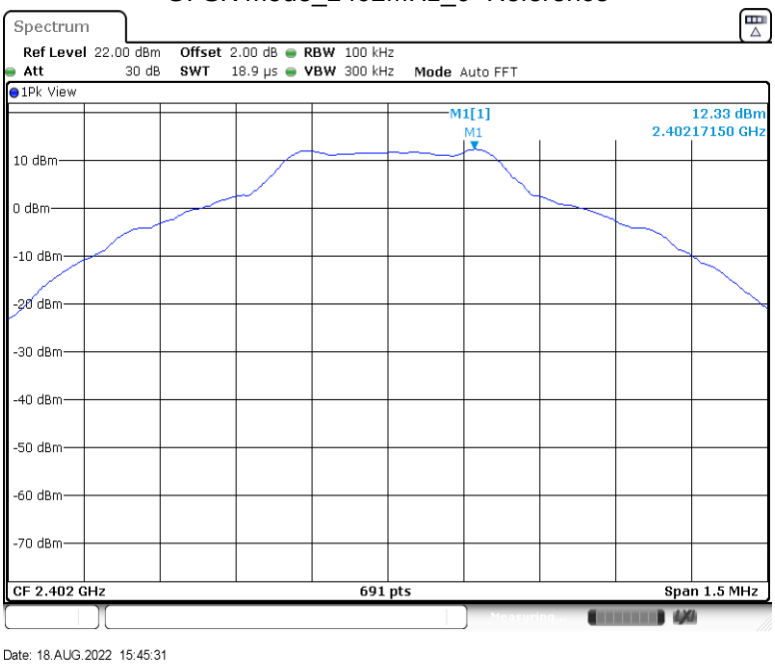
Spurious RF conducted emissions

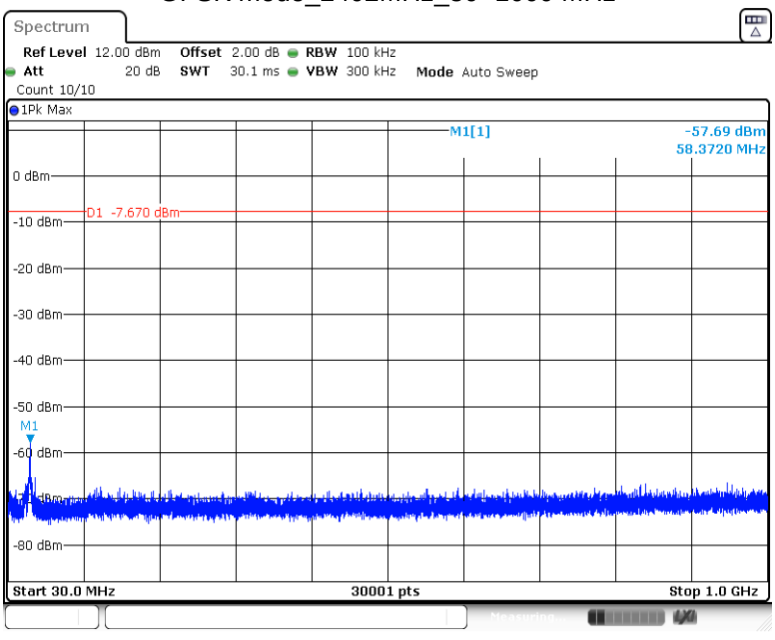
Remark: The emissions exceed limit is fundamental signal.

GFSK mode_2402MHz_0~Reference



Date: 18.AUG.2022 15:45:31

GFSK mode_2402MHz_30~1000 MHz



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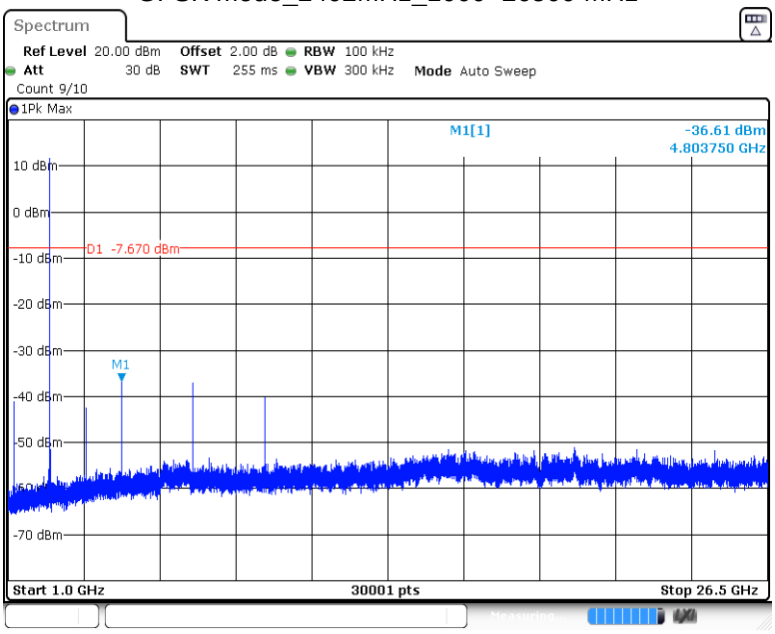
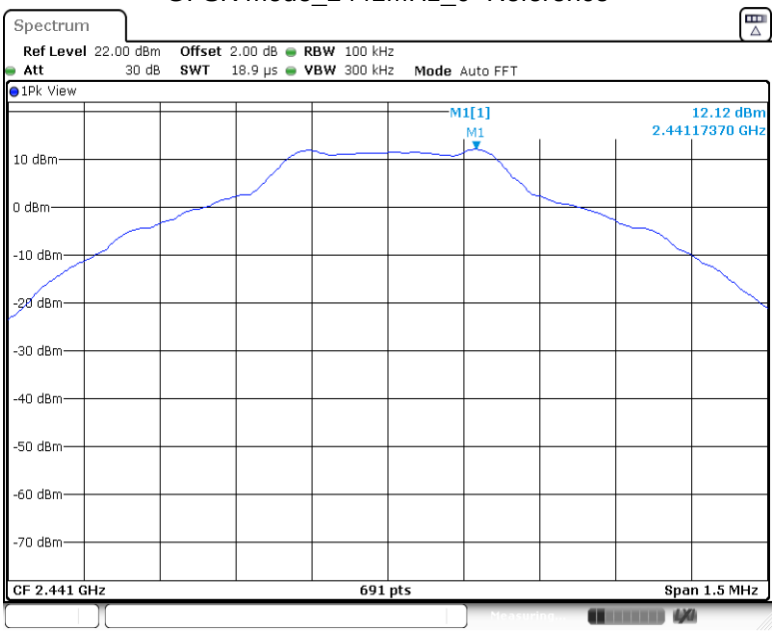
Spurious RF conducted emissions

GFSK mode_2402MHz_1000~26500 MHz



Date: 18.AUG.2022 15:45:45

GFSK mode_2441MHz_0~Reference



Date: 18.AUG.2022 15:47:31

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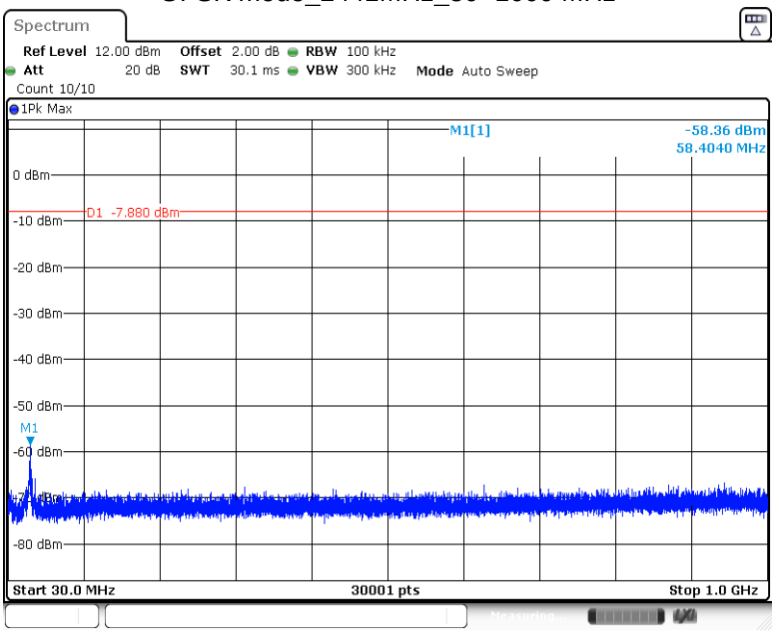
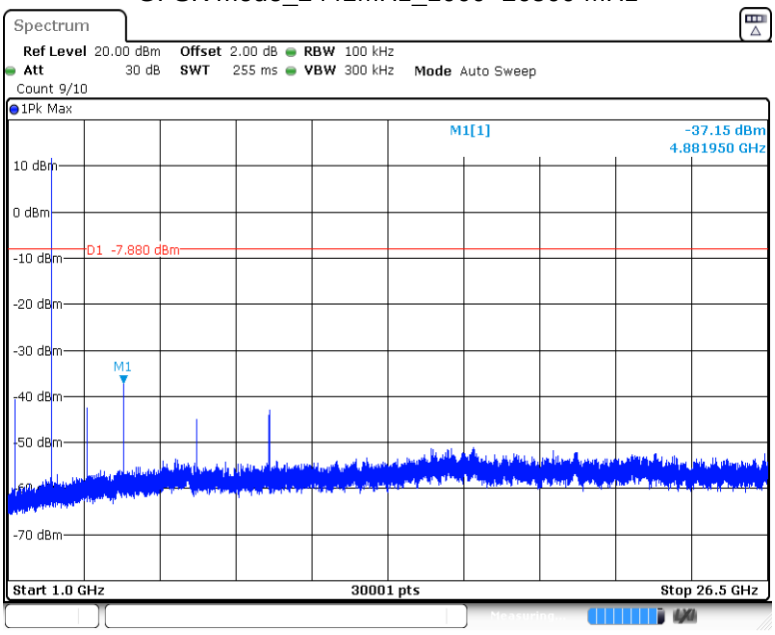
Spurious RF conducted emissions

GFSK mode_2441MHz_30~1000 MHz



Date: 18.AUG.2022 15:47:37

GFSK mode_2441MHz_1000~26500 MHz



Date: 18.AUG.2022 15:47:44

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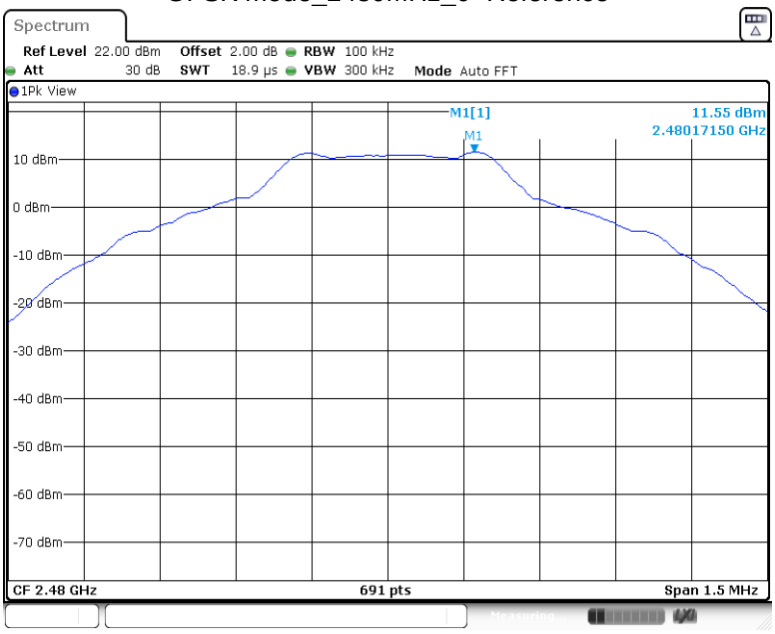
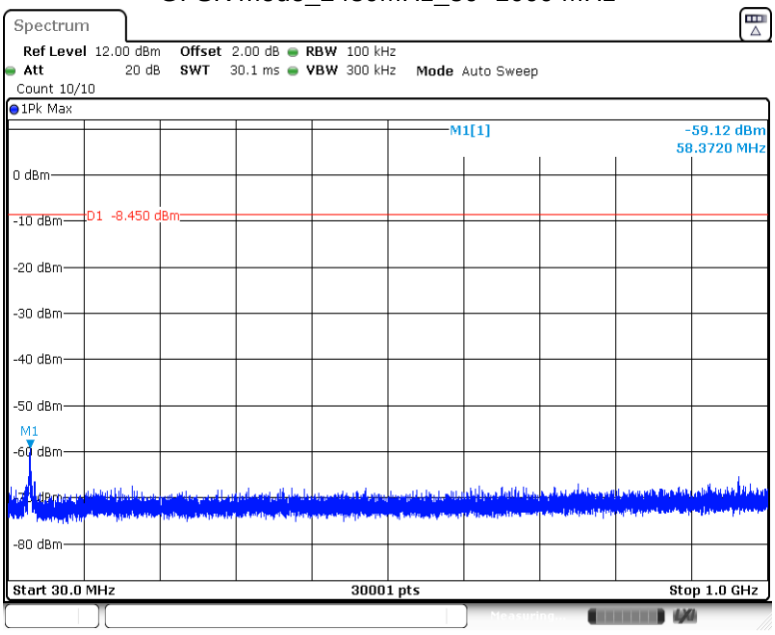
Spurious RF conducted emissions

GFSK mode_2480MHz_0~Reference



Date: 18.AUG.2022 15:49:10

GFSK mode_2480MHz_30~1000 MHz



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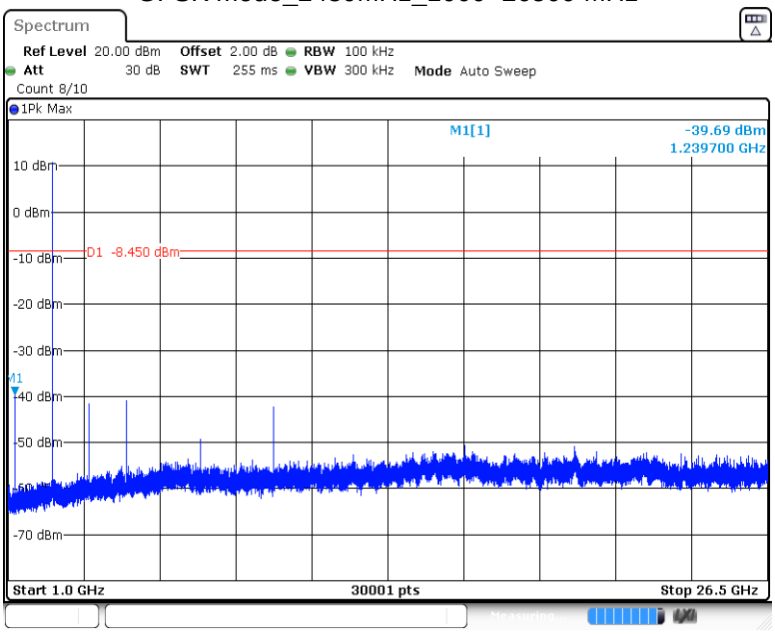
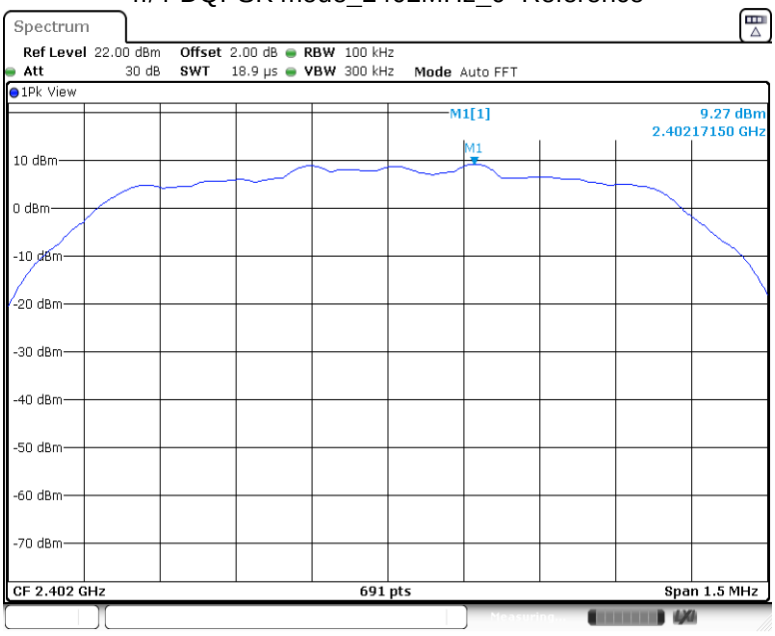
Spurious RF conducted emissions

GFSK mode_2480MHz_1000~26500 MHz



Date: 18.AUG.2022 15:49:24

π/4-DQPSK mode_2402MHz_0~Reference



Date: 18.AUG.2022 15:51:10

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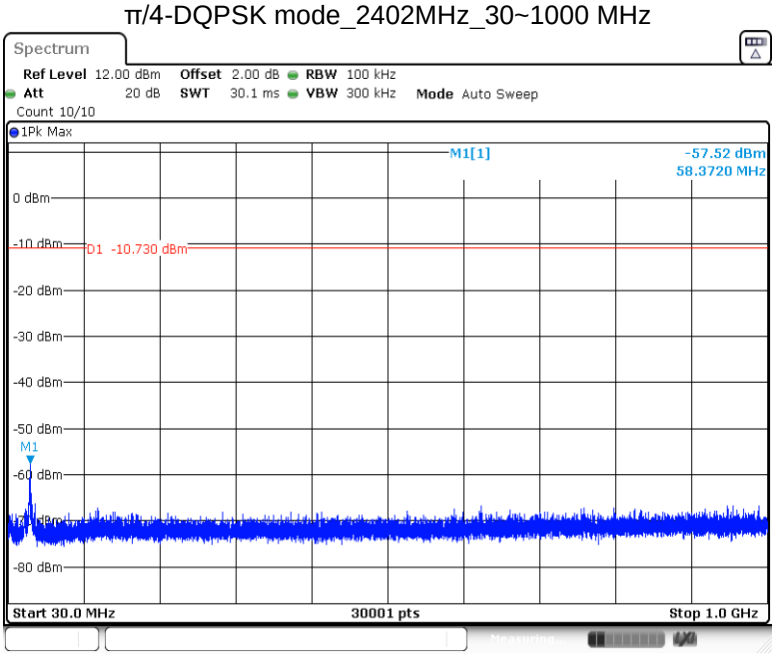
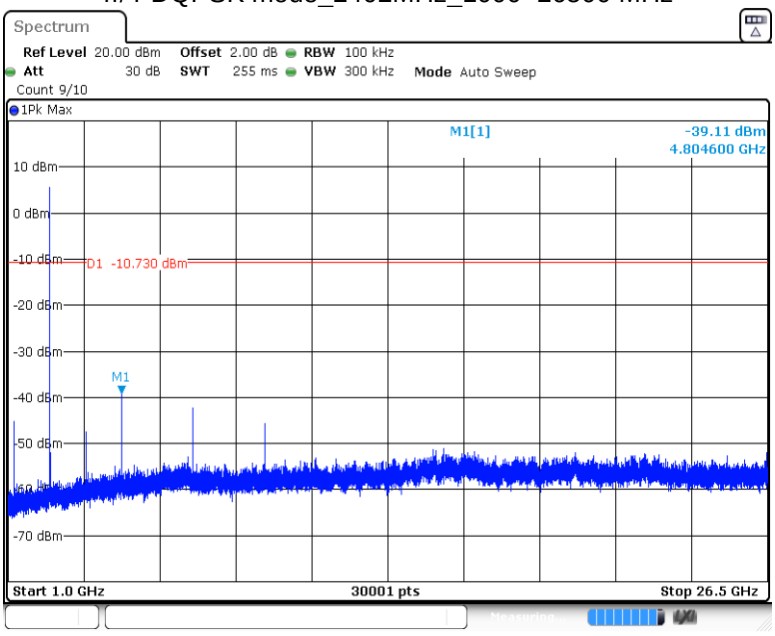
Spurious RF conducted emissions

π/4-DQPSK mode_2402MHz_30~1000 MHz



Date: 18.AUG.2022 15:51:16

π/4-DQPSK mode_2402MHz_1000~26500 MHz



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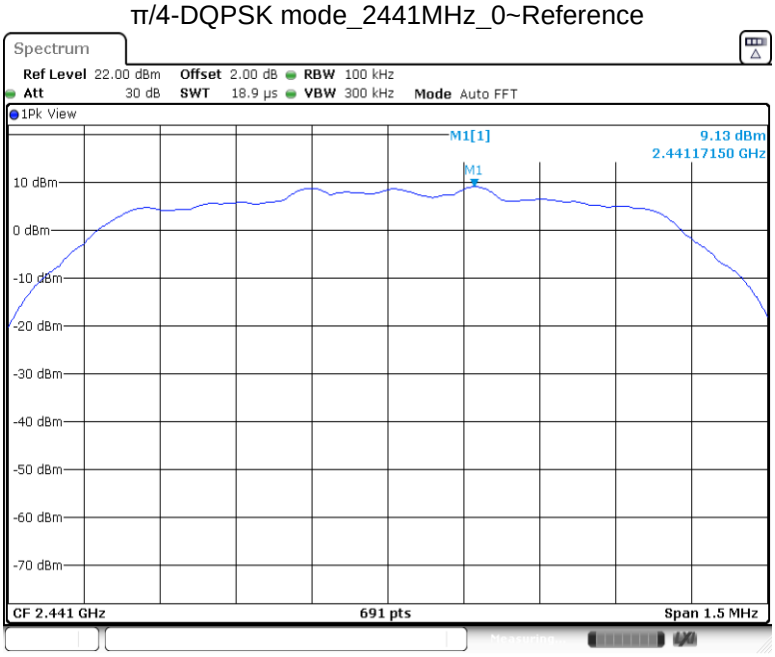
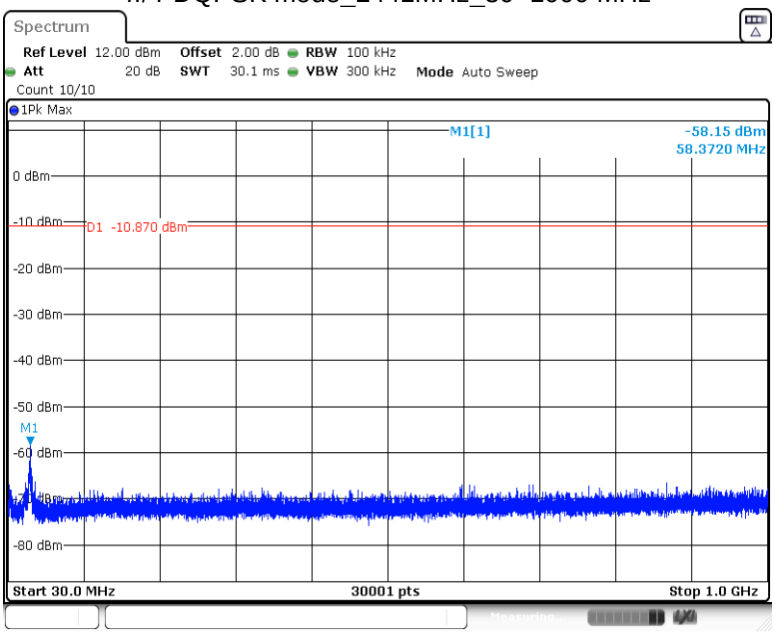
Spurious RF conducted emissions

π/4-DQPSK mode_2441MHz_0~Reference



Date: 18.AUG.2022 15:52:42

π/4-DQPSK mode_2441MHz_30~1000 MHz



Date: 18.AUG.2022 15:52:48

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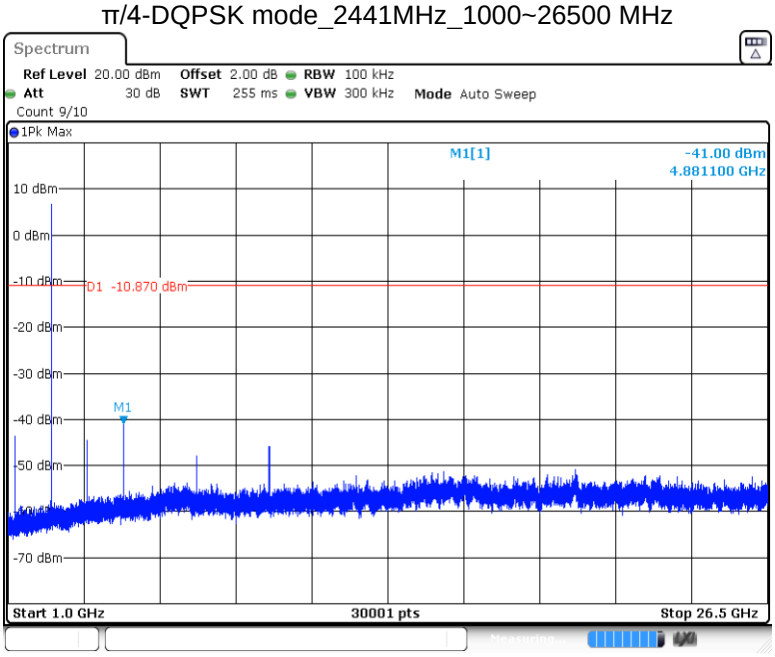
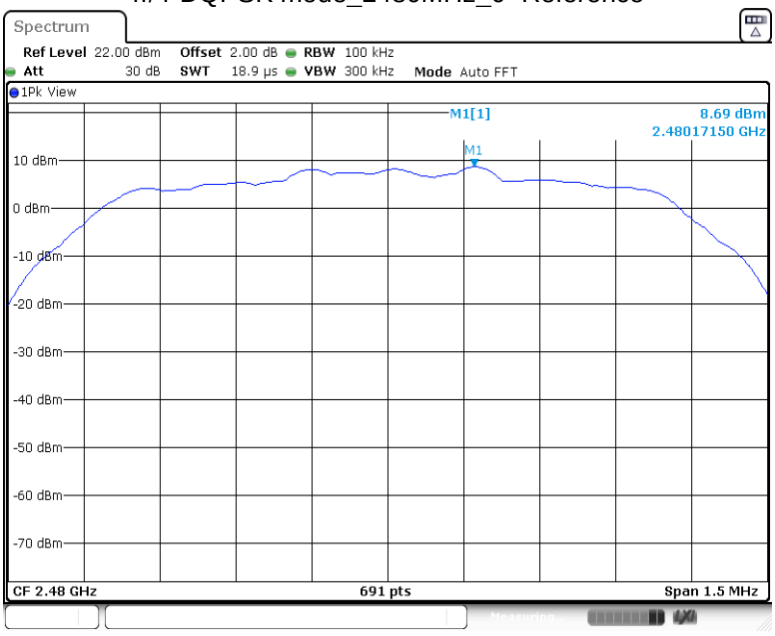
Spurious RF conducted emissions

π/4-DQPSK mode_2441MHz_1000~26500 MHz



Date: 18.AUG.2022 15:52:56

π/4-DQPSK mode_2480MHz_0~Reference



Date: 18.AUG.2022 15:54:19

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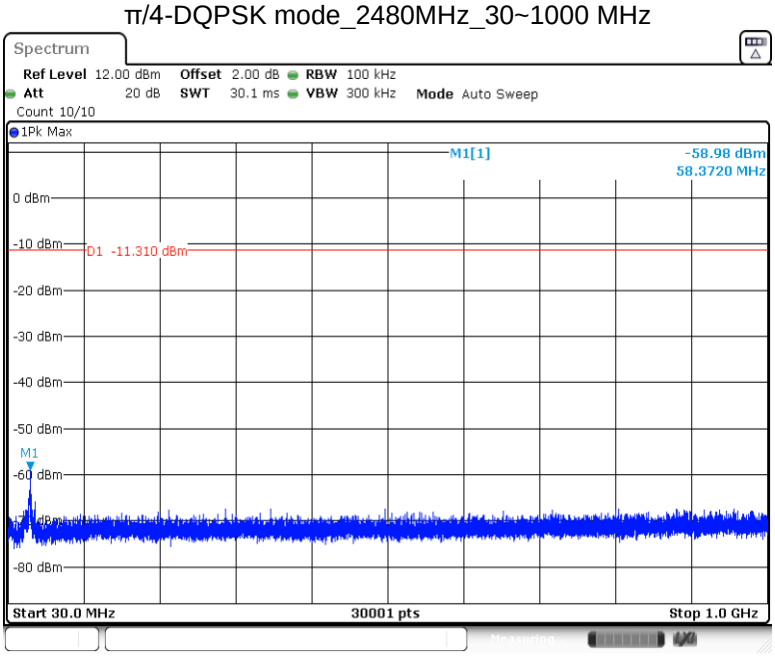
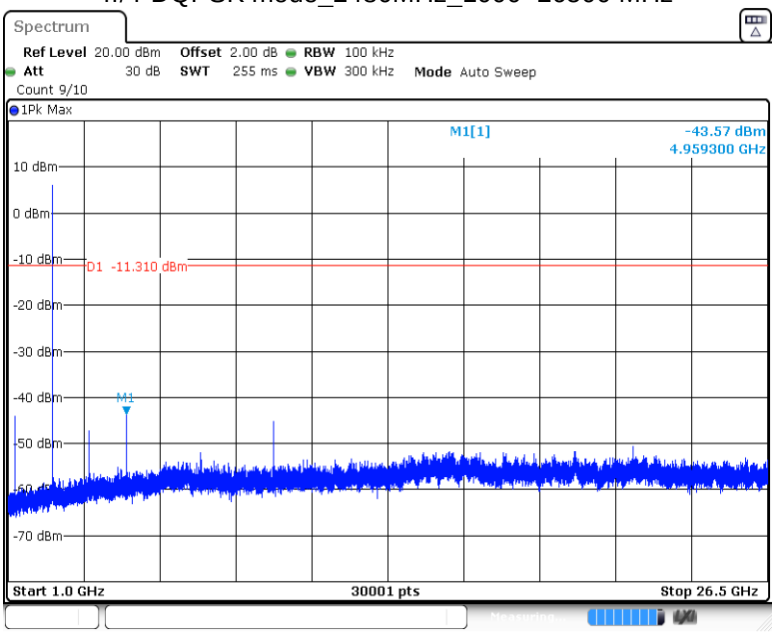
Spurious RF conducted emissions

π/4-DQPSK mode_2480MHz_30~1000 MHz



Date: 18.AUG.2022 15:54:25

π/4-DQPSK mode_2480MHz_1000~26500 MHz



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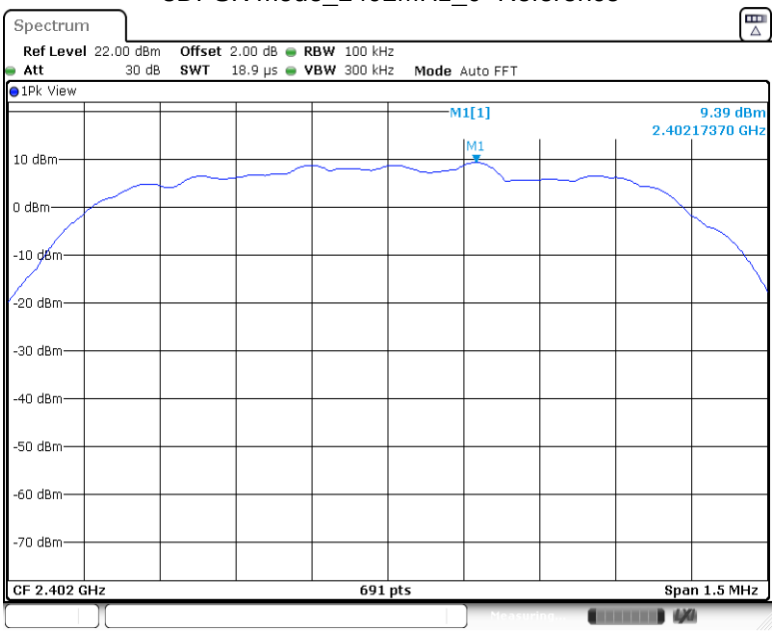
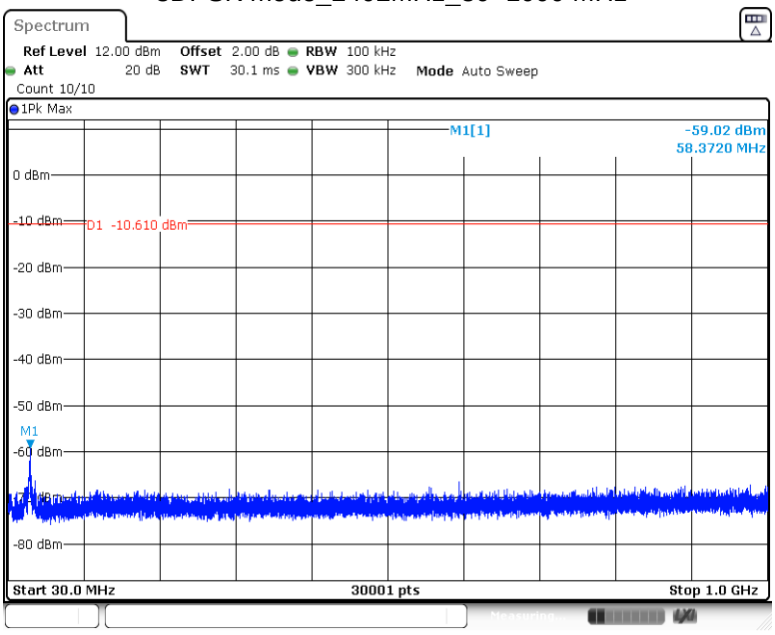
Spurious RF conducted emissions

8DPSK mode_2402MHz_0~Reference



Date: 18.AUG.2022 15:56:02

8DPSK mode_2402MHz_30~1000 MHz



Date: 18.AUG.2022 15:56:08

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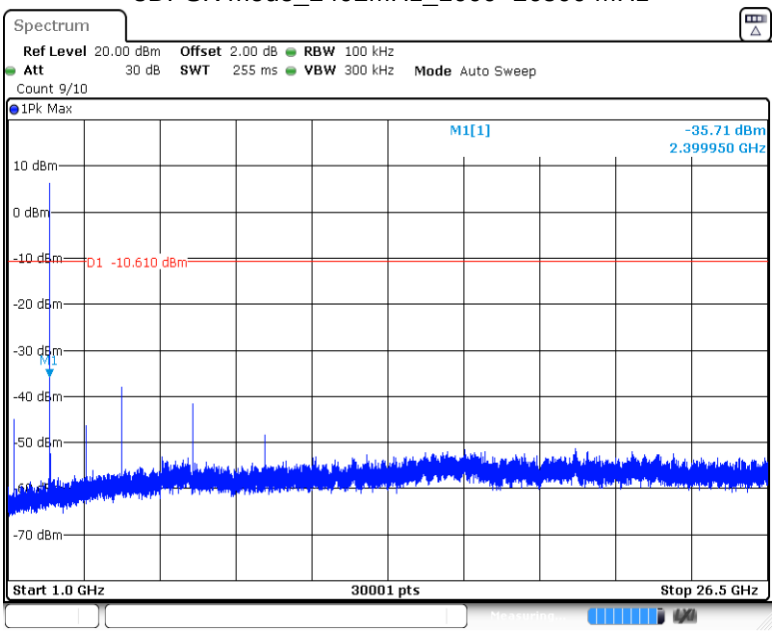
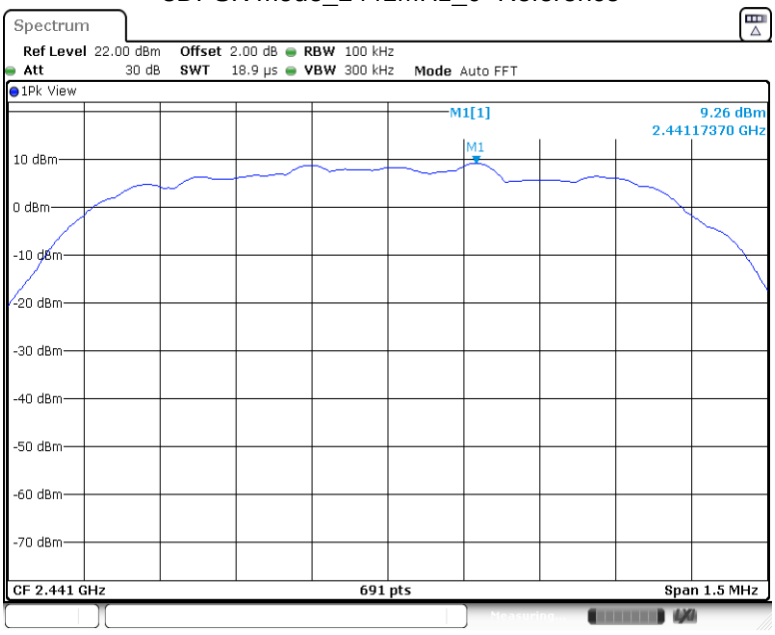
Spurious RF conducted emissions

8DPSK mode_2402MHz_1000~26500 MHz



Date: 18.AUG.2022 15:56:15

8DPSK mode_2441MHz_0~Reference



Date: 18.AUG.2022 15:57:24

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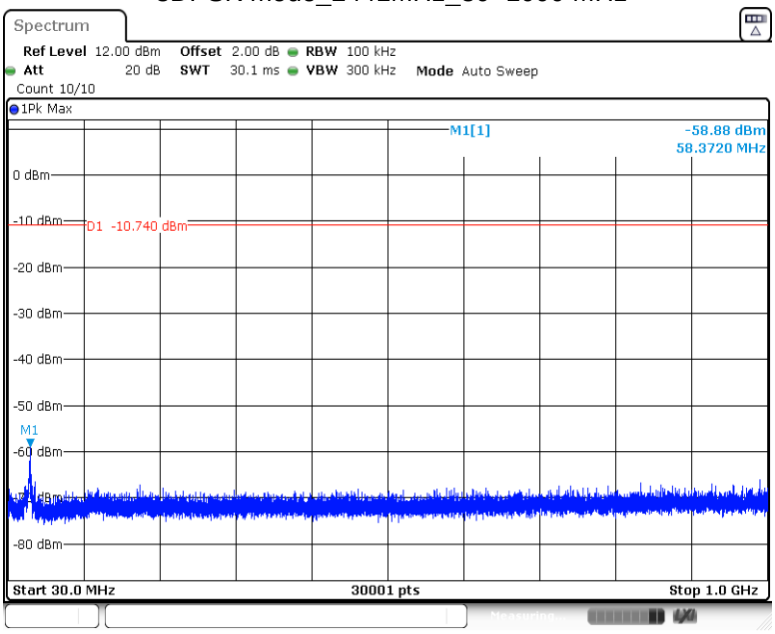
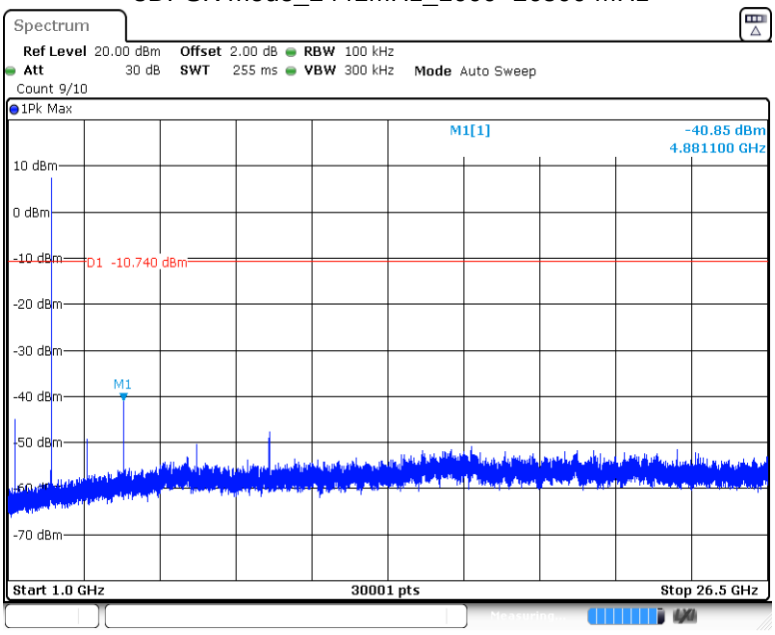
Spurious RF conducted emissions

8DPSK mode_2441MHz_30~1000 MHz



Date: 18.AUG.2022 15:57:30

8DPSK mode_2441MHz_1000~26500 MHz



Date: 18.AUG.2022 15:57:38

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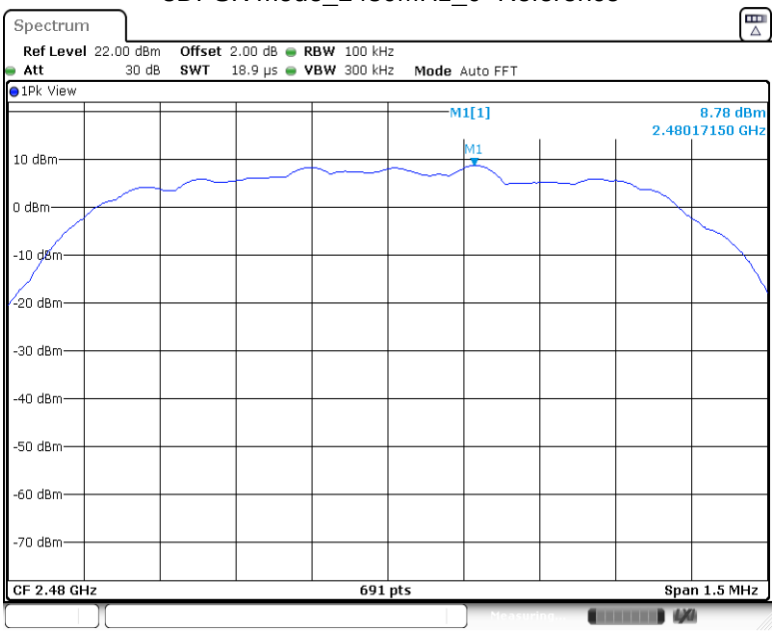
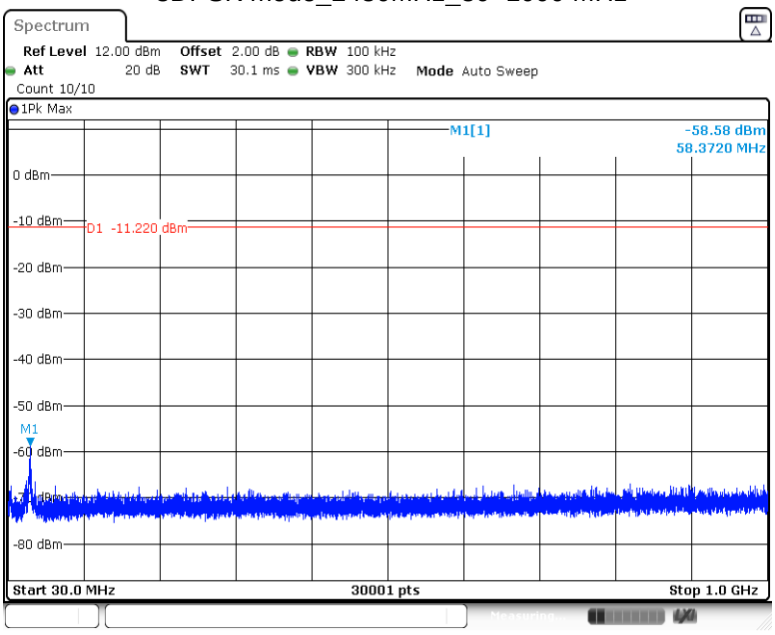
Spurious RF conducted emissions

8DPSK mode_2480MHz_0~Reference



Date: 18.AUG.2022 15:59:47

8DPSK mode_2480MHz_30~1000 MHz



Date: 18.AUG.2022 15:59:53

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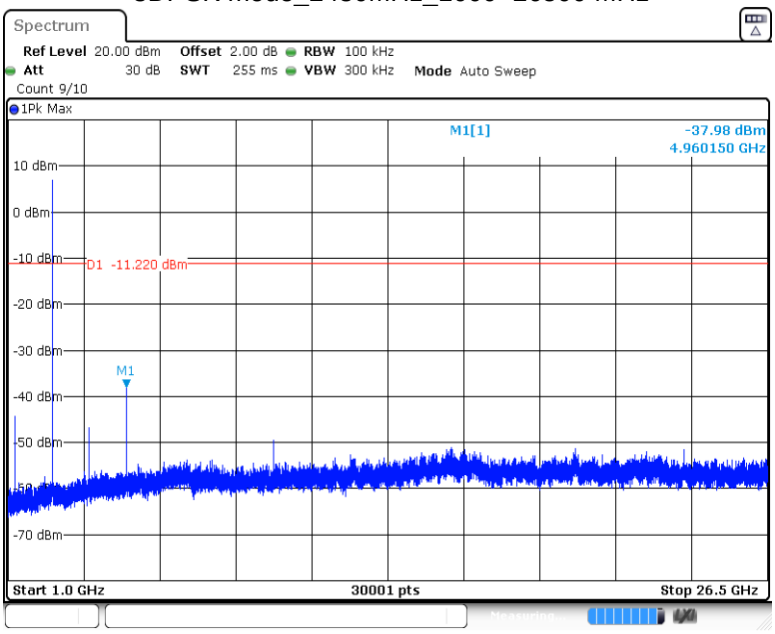
Spurious RF conducted emissions

8DPSK mode_2480MHz_1000~26500 MHz



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9.8 Band edge

Test Method

1 Use the following spectrum analyzer settings:
Span = wide enough to capture the peak level of the in-band emission and all spurious
RBW = 100 kHz, VBW≥RBW, Sweep = auto, Detector function = peak, Trace = max hold
2 Allow the trace to stabilize, use the peak and delta measurement to record the result.
3 The level displayed must comply with the limit specified in this Section.
4 Repeat the test at the hopping off and hopping on mode, submit all the plots.

Limit:

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the RF power that is produced shall be at least 20 dB below that in the100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided that the transmitter demonstrates compliance with the peak conducted power limits.

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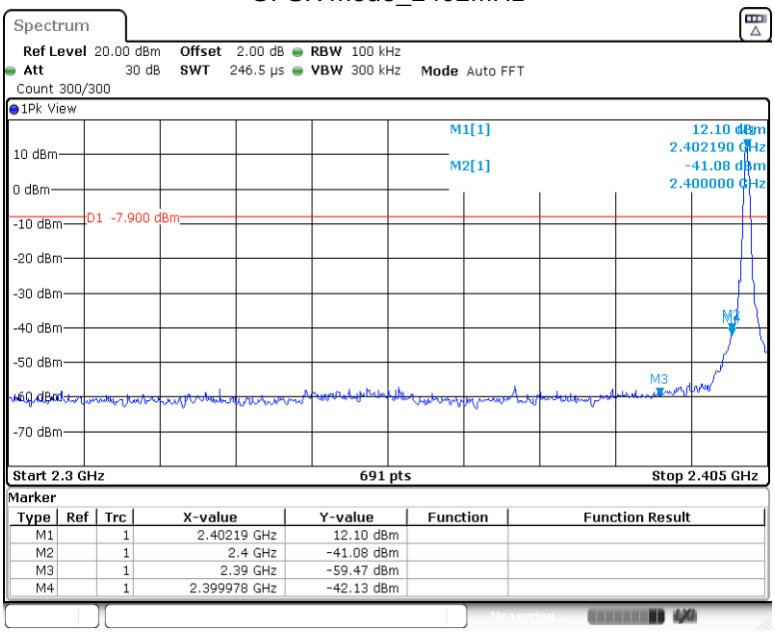
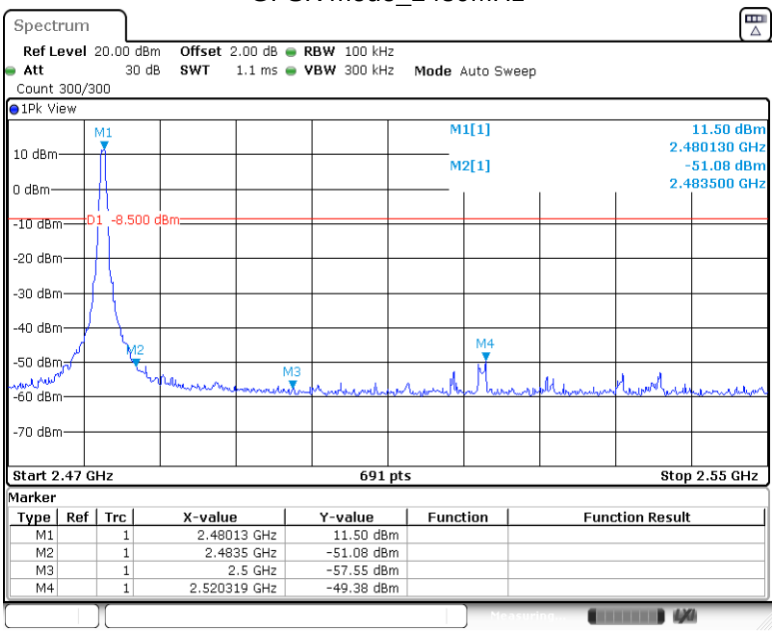
Band edge

GFSK mode_2402MHz



Date: 18.AUG.2022 15:45:25

GFSK mode_2480MHz



Date: 18.AUG.2022 15:49:04

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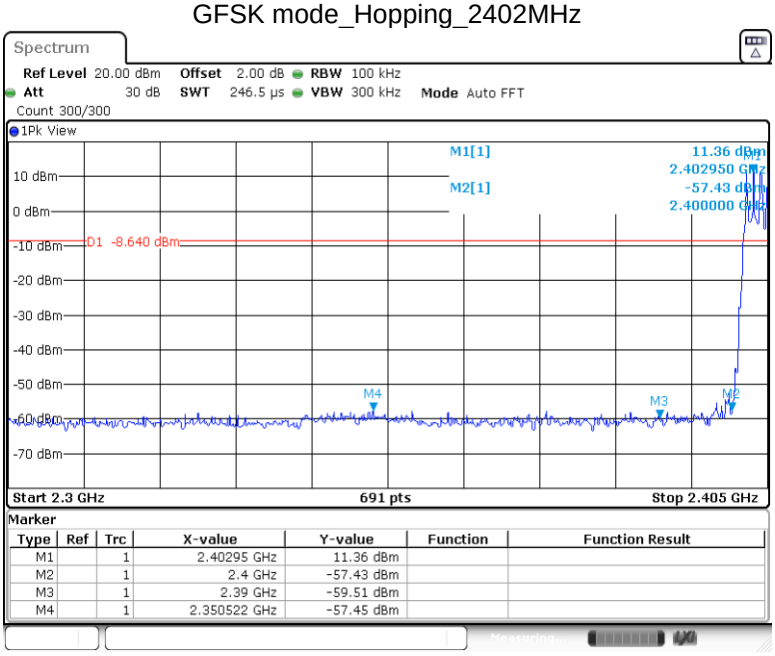
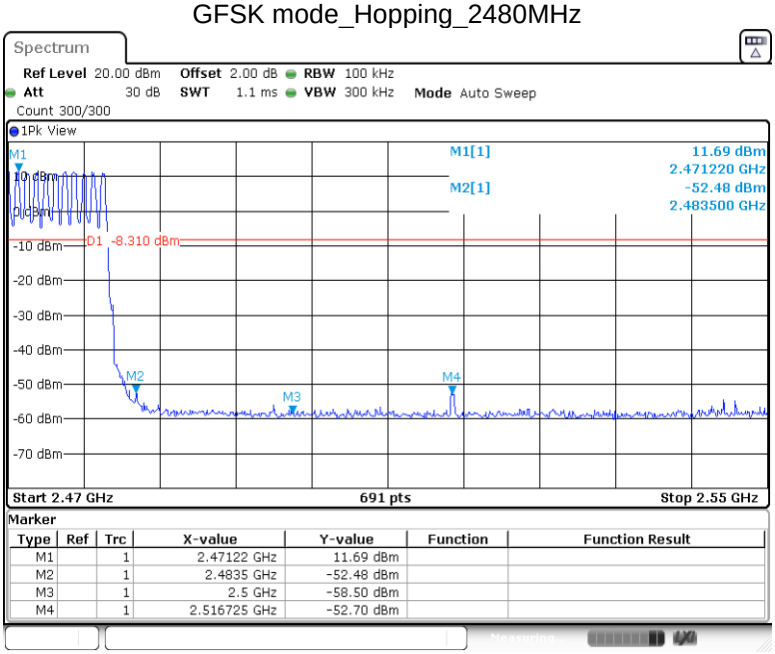
Band edge

GFSK mode_Hopping_2402MHz



Date: 18.AUG.2022 16:00:49

GFSK mode_Hopping_2480MHz



Date: 18.AUG.2022 16:05:19

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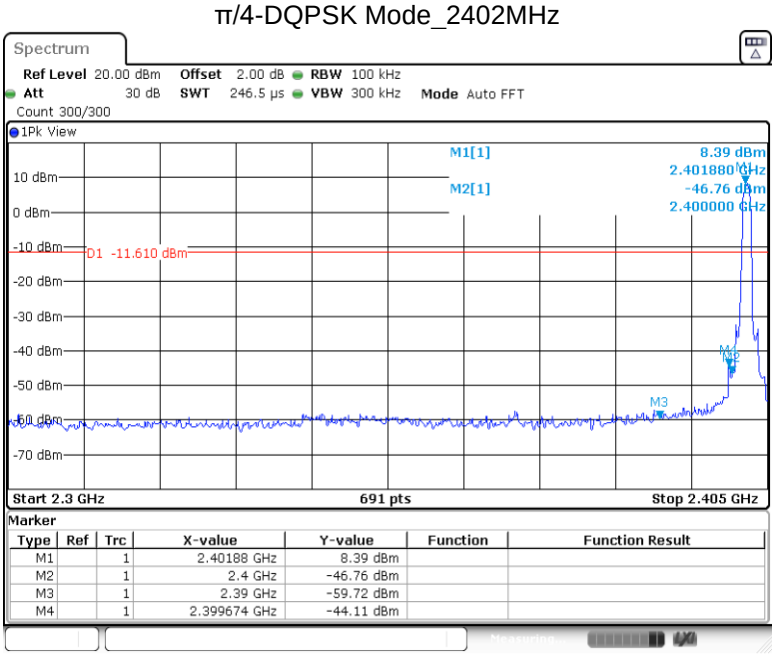
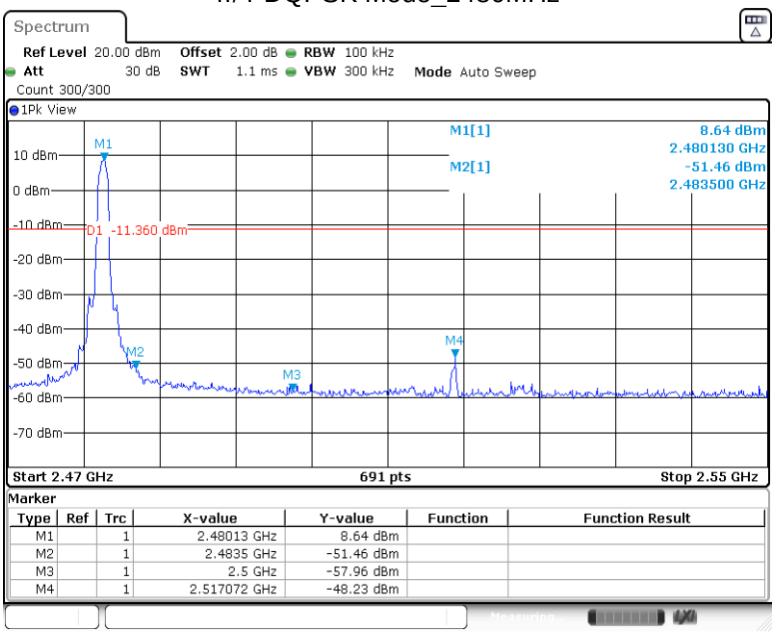
Band edge

π/4-DQPSK Mode_2402MHz



Date: 18.AUG.2022 15:51:05

π/4-DQPSK Mode_2480MHz



Date: 18.AUG.2022 15:54:13

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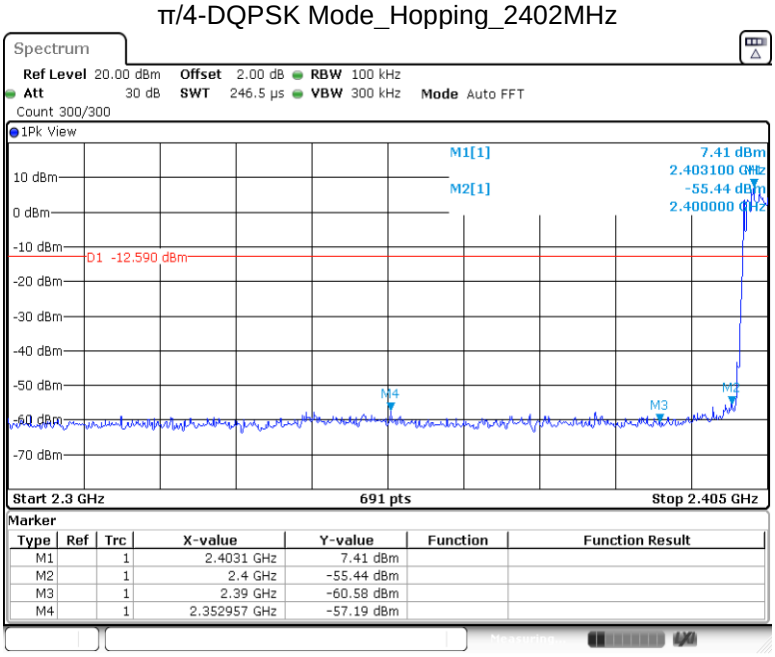
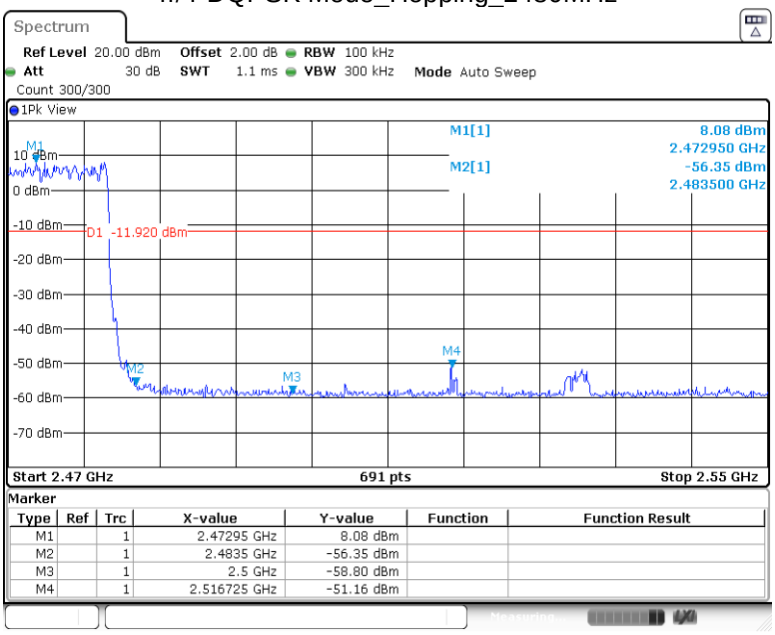
Band edge

π/4-DQPSK Mode_Hopping_2402MHz



Date: 18.AUG.2022 16:05:51

π/4-DQPSK Mode_Hopping_2480MHz



Date: 18.AUG.2022 16:11:00

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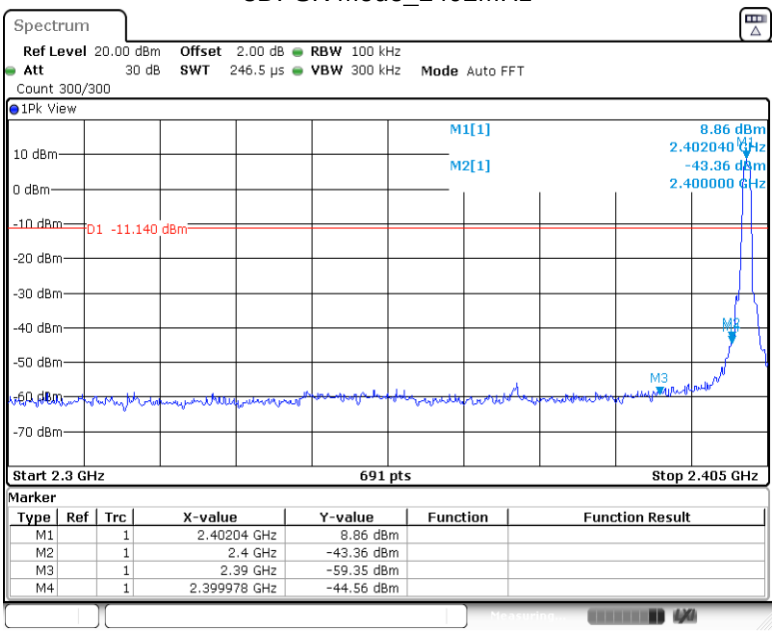
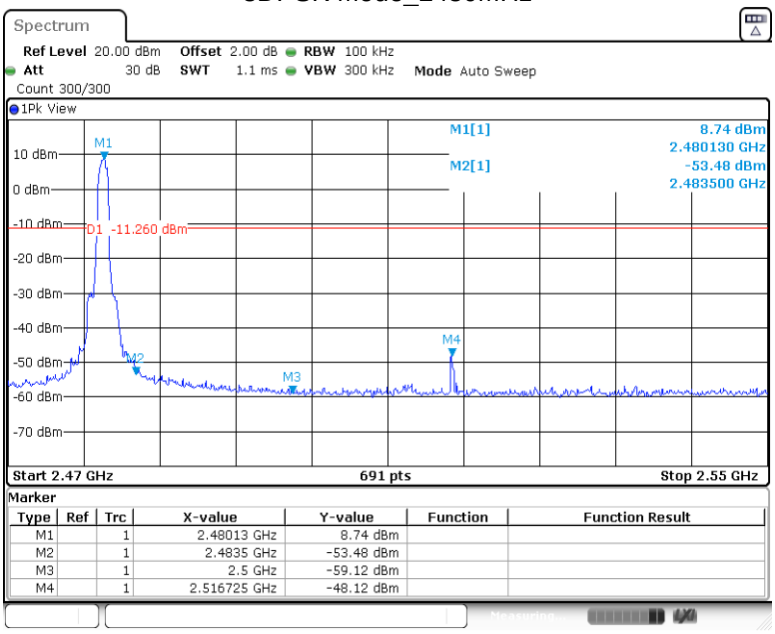
Band edge

8DPSK Mode_2402MHz



Date: 18.AUG.2022 15:55:56

8DPSK Mode_2480MHz



Date: 18.AUG.2022 15:59:41

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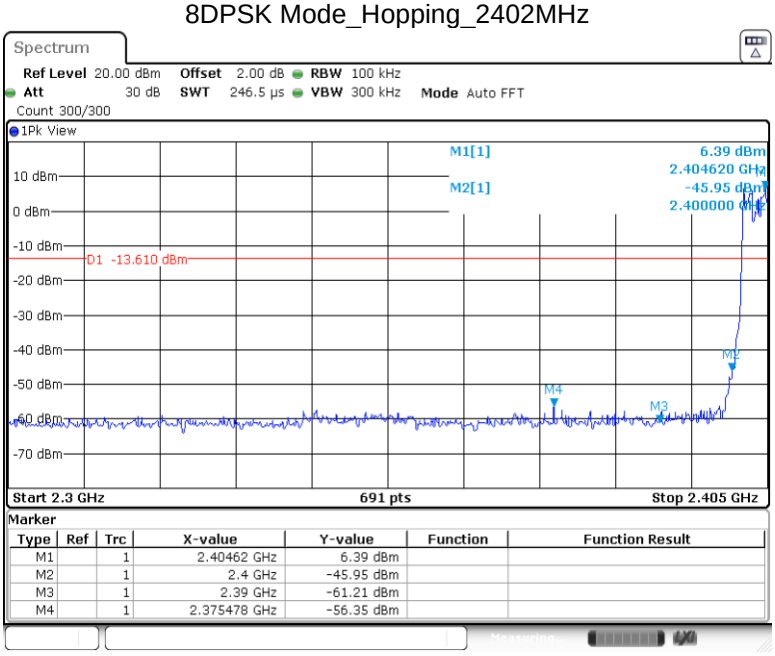
Band edge

8DPSK Mode_Hopping_2402MHz



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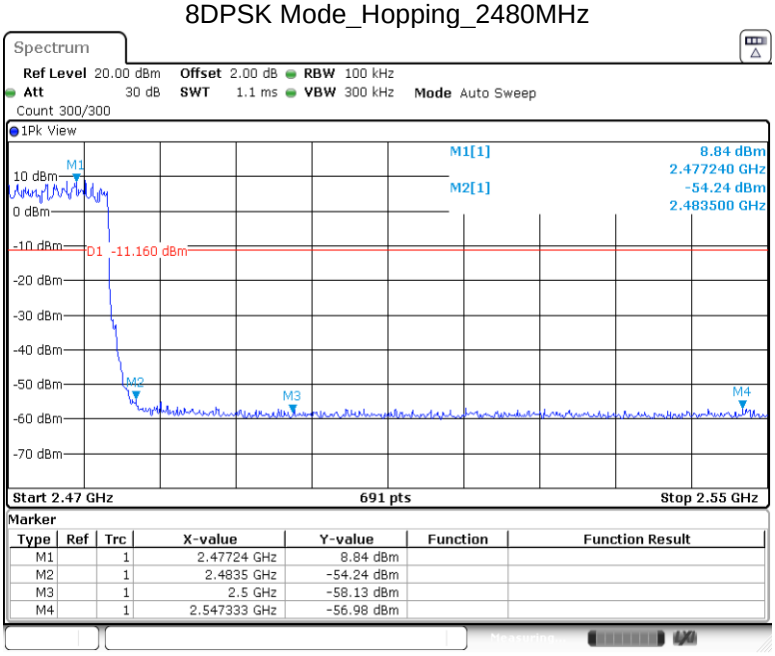
8DPSK Mode_Hopping_2480MHz



Date: 18.AUG.2022 16:15:13

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9.9 Spurious radiated emissions for transmitter

Test Method

1: The EUT was place on a turn table which is 1.5m above ground plane for above 1GHz and 0.8m above ground for below 1GHz at 3 meter chamber room for test. The table was rotated 360 degrees to determine the position of the highest radiation.
2: The EUT was set 3 meters away from the interference – receiving antenna, which was mounted on the top of a variable – height antenna tower.
3: The height of antenna 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.
4: 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 and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
5: Use the following spectrum analyzer settings According to C63.10:
For Below 1GHz
Use the following spectrum analyzer settings:

Span = wide enough to capture the peak level of the in-band emission and all spurious
RBW = 100 KHz to 120KHz, VBW≥RBW for peak measurement, Sweep = auto, Detector function = peak, Trace = max hold.

For Peak unwanted emissions Above 1GHz:

Span = wide enough to capture the peak level of the in-band emission and all spurious
RBW = 1MHz, VBW≥RBW for peak measurement ,Sweep = auto, Detector function = peak, Trace = max hold.

Procedures for average unwanted emissions measurements above 1000 MHz

a) RBW = 1 MHz.
b) VBW ≥[3 × RBW].
c) Detector = RMS (power averaging), if [span / (# of points in sweep)] \ RBW / 2. Satisfying this condition can require increasing the number of points in the sweep or reducing the span. If the condition is not satisfied, then the detector mode shall be set to peak.
d) Averaging type = power (i.e., rms) (As an alternative, the detector and averaging type may be set for linear voltage averaging. Some instruments require linear display mode to use linear voltage averaging. Log or dB averaging shall not be used.)
e) Sweep time = auto.
f) Perform a trace average of at least 100 traces if the transmission is continuous. If the transmission is not continuous, then the number of traces shall be increased by a factor of 1 / D,where D is the duty cycle. For example, with 50% duty cycle, at least 200 traces shall be averaged. (If a specific emission is demonstrated to be continuous—i.e., 100% duty cycle—then rather than turning ON and OFF with the transmit cycle, at least 100 traces shall be averaged.)
g) If tests are performed with the EUT transmitting at a duty cycle less than 98%, then a correction factor shall be added to the measurement results prior to comparing with the emission limit, to compute the emission level that would have been measured had the test been performed at 100% duty cycle. The correction factor is computed as follows:
1) If power averaging (rms) mode was used in the preceding step e), then the correction factor is [10 log (1 / D)], where D is the duty cycle. For example, if the transmit duty cycle was 50%, then 3 dB shall be added to the measured emission levels.
2) If linear voltage averaging mode was used in the preceding step e), then the correction

factor is [20 log (1 / D)], where D is the duty cycle. For example, if the transmit duty cycle was 50%, then 6 dB shall be added to the measured emission levels.
3) If a specific emission is demonstrated to be continuous (100% duty cycle) rather than turning ON and OFF with the transmit cycle, then no duty cycle correction is required for that emission.

Limit

The radio emission outside the operating frequency band 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. Radiated emissions which fall in the restricted bands, as defined in section15.205 and RSS-GEN 8.10, must comply with the radiated emission limits specified in section 15.209.

Frequency MHz	Field Strength uV/m	Field Strength dBµV/m	Detector
30-88	100	40	QP
88-216	150	43.5	QP
216-960	200	46	QP
960-1000	500	54	QP
Above 1000	500	54	AV
Above 1000	5000	74	PK

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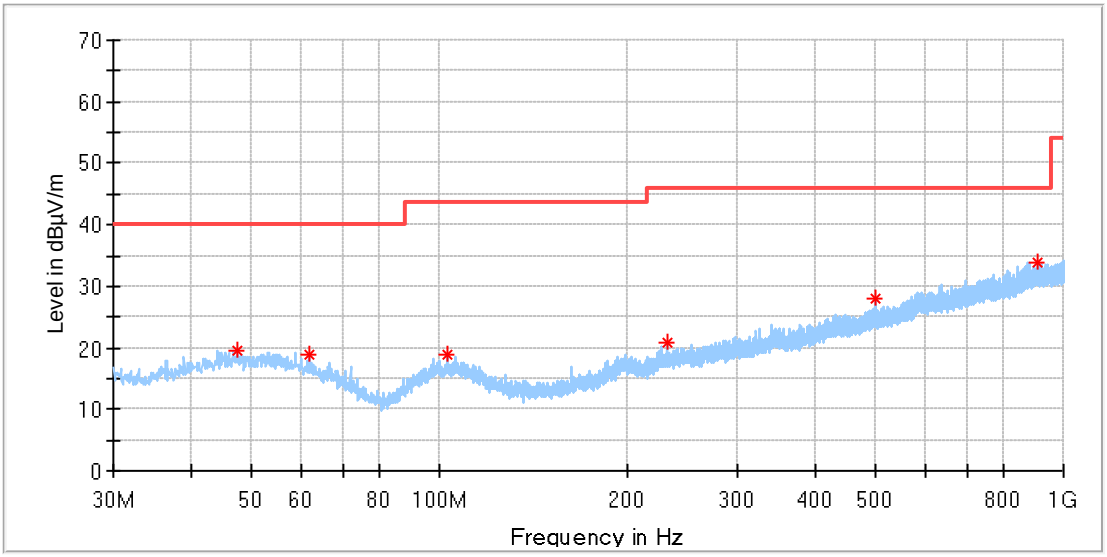
Spurious radiated emissions for transmitter

According to C63.10, if the peak (or quasi-peak) measured value complies with the average limit, it is unnecessary to perform an average measurement, so AV emission value did not show in below table if the peak value complies with average limit.
The only worse case (8DPSK mode) test result is listed in the report.

Transmitting spurious emission test result as below:

Below 1G:



Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
47.399375	19.66	40.00	20.34	100.0	H	0.0	20.76
61.828125	18.75	40.00	21.25	100.0	H	51.0	19.57
103.235000	18.79	43.50	24.71	100.0	H	180.0	19.41
231.032500	20.98	46.00	25.02	100.0	H	9.0	19.94
499.783125	27.99	46.00	18.01	100.0	H	331.0	26.14
906.091875	33.86	46.00	12.14	100.0	H	0.0	32.48

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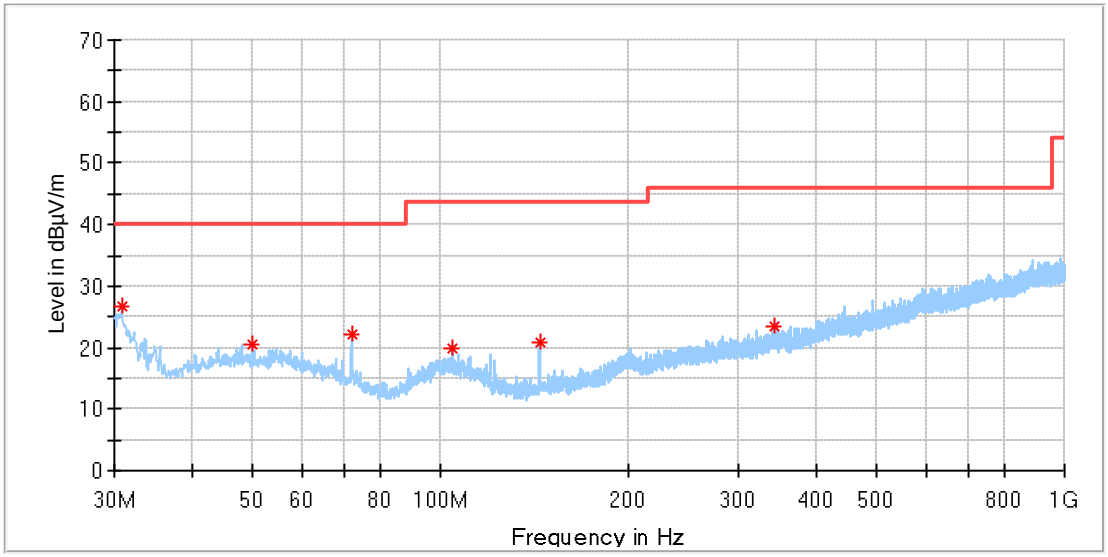
Spurious radiated emissions for transmitter



Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
30.848750	26.63	40.00	13.37	100.0	V	0.0	17.17
49.824375	20.62	40.00	19.38	100.0	V	116.0	21.02
71.952500	22.12	40.00	17.88	100.0	V	229.0	16.56
104.205000	19.73	43.50	23.77	100.0	V	58.0	19.34
144.035625	20.86	43.50	22.64	100.0	V	58.0	15.47
343.431250	23.54	46.00	22.46	200.0	V	0.0	23.30

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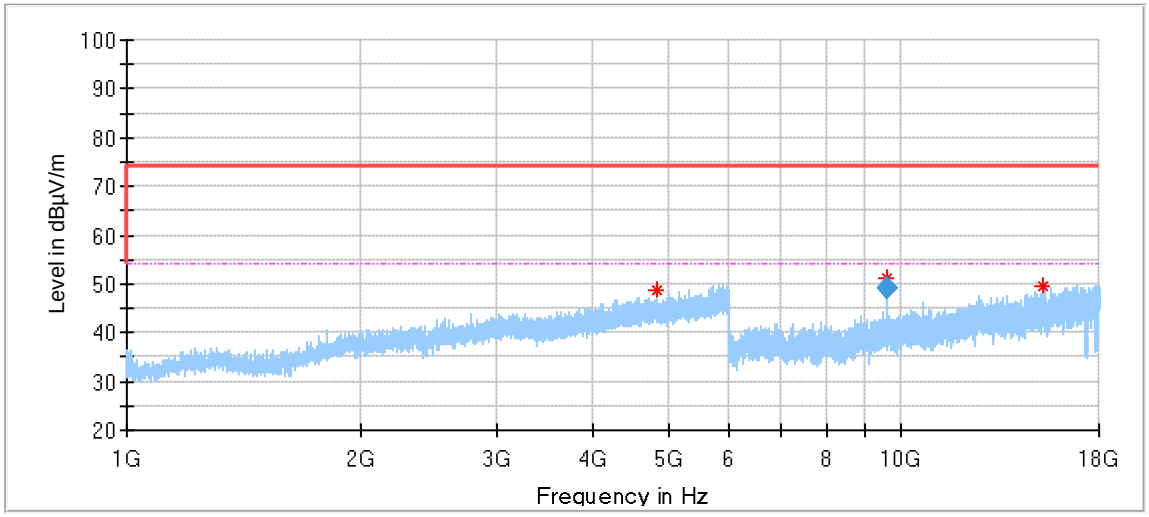
Spurious radiated emissions for transmitter

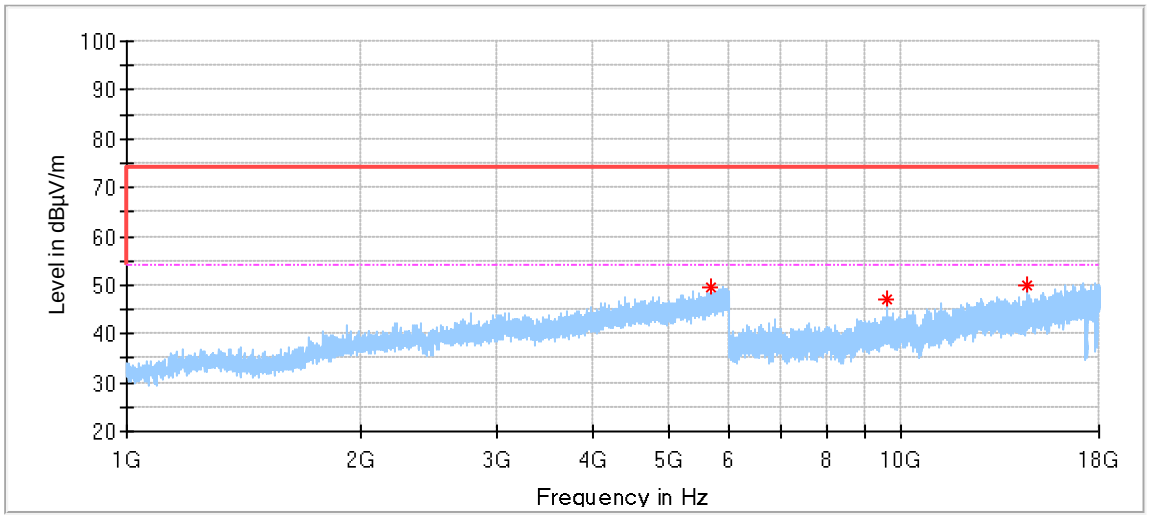
Low channel 2402MHz



Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
4845.500000	48.60	74.00	25.40	150.0	H	32.0	3.99
9609.000000	51.30	74.00	22.70	150.0	H	80.0	12.21
15257.500000	49.47	74.00	24.53	150.0	H	80.0	18.86

Final_Result

Frequency (MHz)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
9609.000000	49.30	54.00	4.70	150.0	H	80.0	12.21



Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
5685.500000	49.52	74.00	24.48	150.0	V	178.0	5.62
9609.000000	47.10	74.00	26.90	150.0	V	313.0	12.21
14546.500000	49.91	74.00	24.09	150.0	V	49.0	16.75

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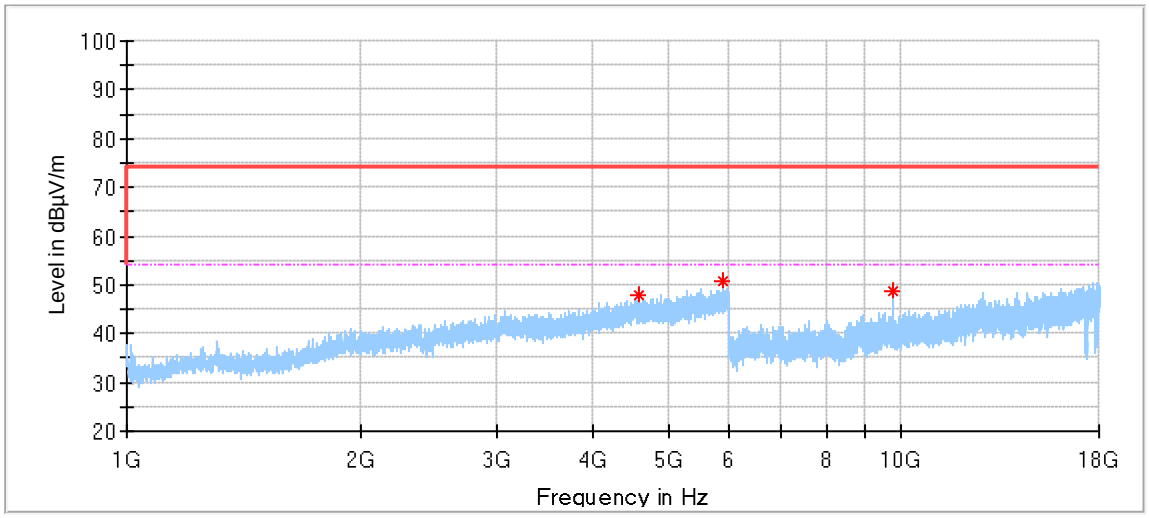
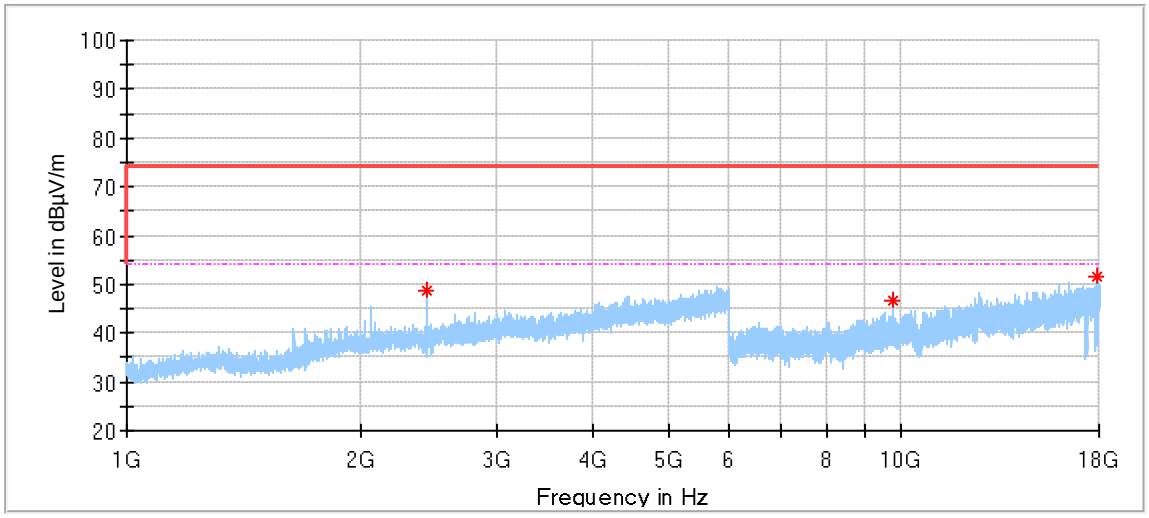
Spurious radiated emissions for transmitter

Middle channel 2441MHz



Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
4572.000000	47.96	74.00	26.04	150.0	H	115.0	3.18
5883.500000	50.61	74.00	23.39	150.0	H	95.0	6.53
9763.500000	48.67	74.00	25.33	150.0	H	85.0	12.55



Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
2443.000000	48.77	74.00	25.23	150.0	V	0.0	-2.54
9764.500000	46.81	74.00	27.19	150.0	V	269.0	12.55
17932.000000	51.68	74.00	22.32	150.0	V	26.0	22.28

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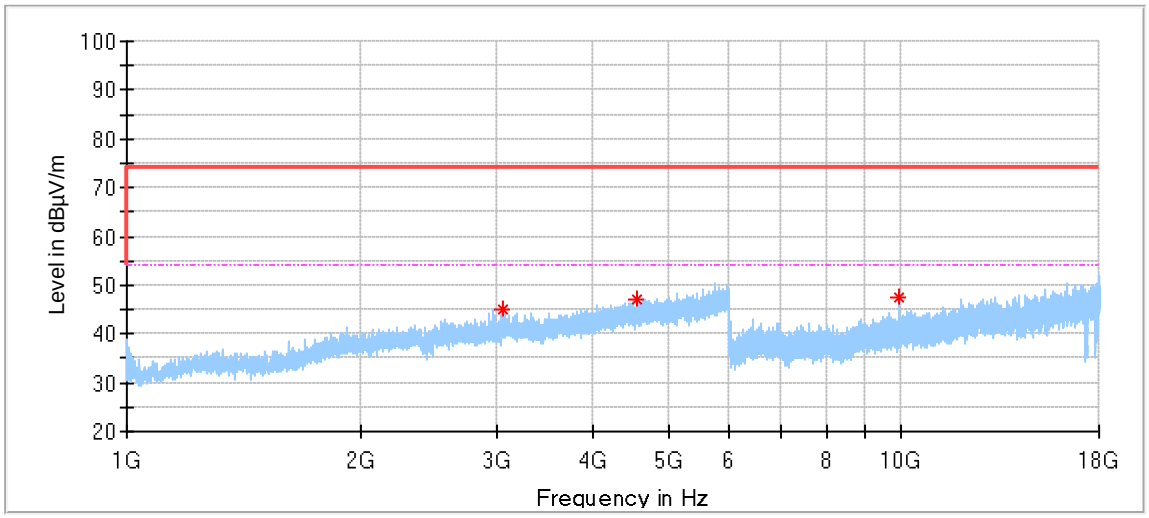
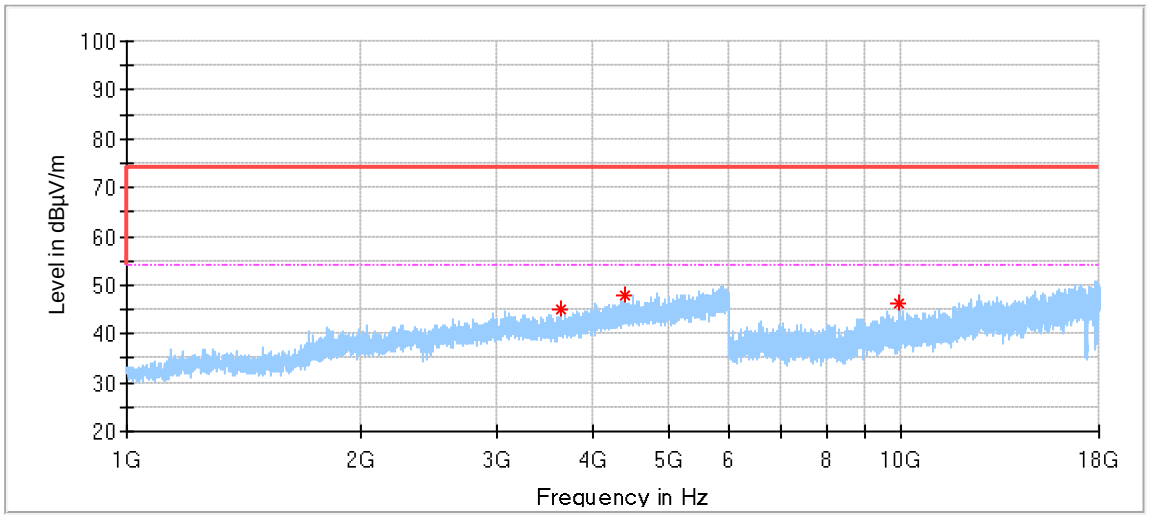
Spurious radiated emissions for transmitter

High channel 2480MHz



Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
3051.500000	44.85	74.00	29.15	150.0	H	4.0	-0.32
4564.000000	47.24	74.00	26.76	150.0	H	245.0	3.16
9920.500000	47.55	74.00	26.45	150.0	H	84.0	12.22



Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
3628.000000	45.11	74.00	28.89	150.0	V	0.0	0.20
4385.000000	48.04	74.00	25.96	150.0	V	171.0	2.79
9920.500000	46.23	74.00	27.77	150.0	V	269.0	12.22

Remark:

(1) Data of measurement within frequency range18-26GHz are the noise floor or attenuated more than 20dB below the permissible limits or the field strength is too small to be measured, so test data does not present in this report,

(2) Level= Reading Level + Correction Factor

(3) Above 1GHz: Corrector factor = Antenna Factor + Cable Loss- Amplifier Gain
Below 1GHz: Corrector factor = Antenna Factor + Cable Loss
(The Reading Level is recorded by software which is not shown in the sheet)

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10 Test Equipment List

Conducted Emission Test

Description	Manufacturer	Model no.	Equipment ID	Serial no.	Cal interval (year)	Cal. due date
EMI Test Receiver	Rohde & Schwarz	ESR 3	68-4-74-14-001	101782	1	2023-5-27
LISN	Rohde & Schwarz	ENV432	68-4-87-16-001	101318	1	2023-5-27
Attenuator	Shanghai Huaxiang	TS2-26-3	68-4-81-16-003	080928189	1	2023-5-27
Test software	Rohde & Schwarz	EMC32	68-4-90-14-003-A10	Version 9.15.00	N/A	N/A
Shielding Room	TDK	CSR #1	68-4-90-19-004	----	1	2022-11-07

Radiated Emission Test 1#

Description	Manufacturer	Model no.	Equipment ID	Serial no.	Cal interval (year)	Cal. due date
EMI Test Receiver	Rohde & Schwarz	ESR 7	68-4-74-19-001	102176	1	2023-5-27
Trilog Super Broadband Test Antenna	Schwarzbeck	VULB 9163	68-4-80-14-002	707	1	2022-7-23
Pre-amplifier	Rohde & Schwarz	SCU 18	68-4-29-14-001	102230	1	2023-5-28
Attenuator	Mini-circuits	UNAT-6+	68-4-81-21-001	15542	1	2023-5-27
3m Semi-anechoic chamber	TDK	SAC-3 #1	68-4-90-14-001	----	2	2023-5-28
Test software	Rohde & Schwarz	EMC32	68-4-90-14-001-A10	Version 10.35.02	N/A	N/A

Radiated Emission Test 2#

Description	Manufacturer	Model no.	Equipment ID	Serial no.	Cal interval (year)	Cal. due date
EMI Test Receiver	Rohde & Schwarz	ESR 26	68-4-74-14-002	101269	1	2023-5-28
Wave Guide Antenna	ETS	3117	68-4-80-19-001	00218954	1	2023-5-9
Pre-amplifier	Rohde & Schwarz	SCU 18F	68-4-29-19-001	100745	1	2023-5-28
Pre-amplifier	Rohde & Schwarz	SCU 18F	68-4-29-19-002	100746	1	2023-5-28
Sideband Horn Antenna	Q-PAR	QWH-SL-18-40-K-SG	68-4-80-14-008	12827	1	2023-7-12
Pre-amplifier	Rohde & Schwarz	SCU 40A	68-4-29-14-002	100432	1	2023-7-27
Attenuator	Mini-circuits	UNAT-6+	68-4-81-21-002	15542	1	2023-5-27
3m Semi-anechoic chamber	TDK	SAC-3 #2	68-4-90-19-006	----	2	2023-5-28
Test software	Rohde & Schwarz	EMC32	68-4-90-19-006-A01	Version 10.35.02	N/A	N/A

RF Conducted Test

Description	Manufacturer	Model no.	Equipment ID	Serial no.	Cal interval (year)	Cal. due date
Signal Analyzer	Rohde & Schwarz	FSV40	68-4-74-14-004	101030	1	2023-5-27

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11 System Measurement Uncertainty

For a 95% confidence level, the measurement expanded uncertainties for defined systems, in accordance with the recommendations of ISO 17025 were:

System Measurement Uncertainty	
Test Items	Extended Uncertainty
Uncertainty for Conducted Emission 150kHz-30MHz (for test using AMN ENV432)	3.71dB
Uncertainty for Radiated Emission in 3m chamber (68-4-90-14-001)30MHz-1000MHz	Horizontal: 4.68dB; Vertical: 4.65dB;
Uncertainty for Radiated Emission in new 3m chamber (68-4-90-19-006) 1000MHz-18000MHz	Horizontal: 4.76dB; Vertical: 4.75dB;
Uncertainty for Radiated Emission 18000MHz-40000MHz	Horizontal: 4.51dB; Vertical: 4.50dB
Uncertainty for Conducted RF test with TS 8997	RF Power Conducted: 1.27dB Frequency test involved: 0.6×10^{-7} or 1%

Measurement Uncertainty Decision Rule

Determination of conformity with the specification limits is based on the decision rule according to IEC Guide 115:2021, clause 4.4.3 and 4.5.1.

---THE END OF REPORT---

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