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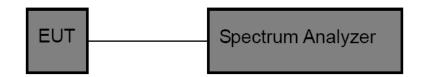


3.4. Band edge and Spurious Emissions (Conducted)

Limit

FCC CFR Title 47 Part 15 Subpart C Section 15.247 (d):In any 100 kHz bandwidth outside the frequency band in which the spread spectrum 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.

Test Configuration



Test Procedure

- 1. The transmitter output was connected to the spectrum analyzer through an attenuator, the path loss was compensated to the results for each measurement.
- 2. Set to the maximum power setting and enable the EUT transmit continuously
- Use the following spectrum analyzer settings: RBW = 100 kHz, VBW ≥ RBW, scan up through 10th harmonic. Sweep = auto, Detector function = peak, Trace = max hold
- 4. Measure and record the results in the test report.

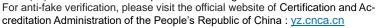
Test Mode

Please refer to the clause 2.4.

Test Results

(1) Band edge Conducted Test

Test Mode	Frequency[MHz]	Ref Level[dBm]	Result[dBm]	Limit[dBm]	Verdict
	2402	8.53	-58.24	<=-11.47	PASS
GFSK	2480	9.82	-57.24	<=-10.18	PASS
GFSK	Hop_2402	4.88	-58.72	-15.12	PASS
	Hop_2480	5.27	-59.09	-14.73	PASS
-/4 DODGK	2402	3.10	-53.59	<=-16.9	PASS
	2480	5.55	-59.08	<=-14.45	PASS
π/4-DQPSK	Hop_2402	0.49	-59.16	-19.51	PASS
	Hop_2480	5.29	-59.29	-14.71	PASS
	2402	3.53	-52.6	<=-16.47	PASS
8-DPSK	2480	3.92	-58.62	<=-16.08	PASS
8-DP3K	Hop_2402	-2.39	-59.44	-22.39	PASS
	Hop_2480	4.94	-59.24	-15.06	PASS



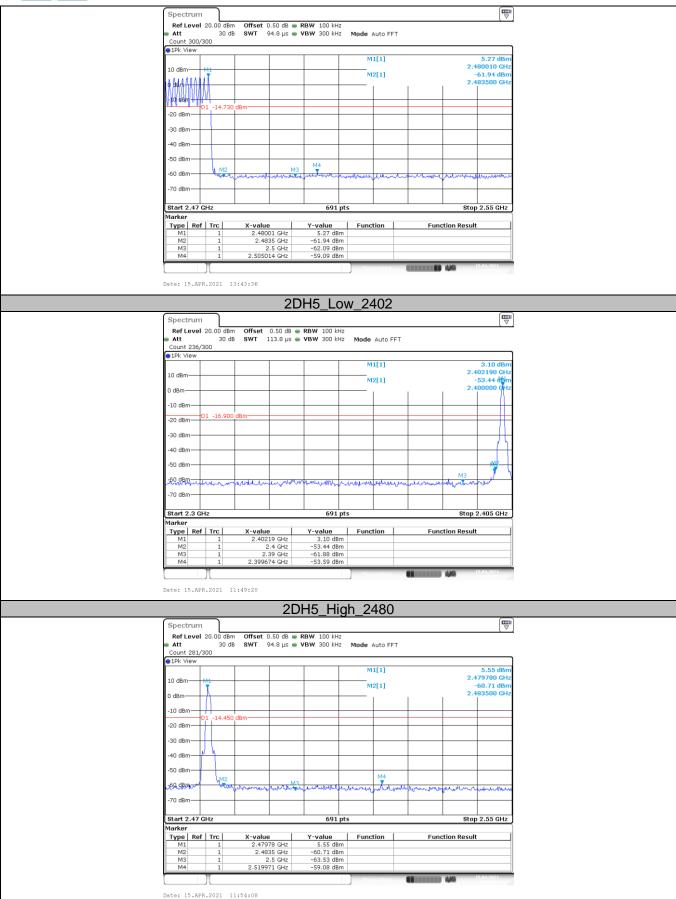




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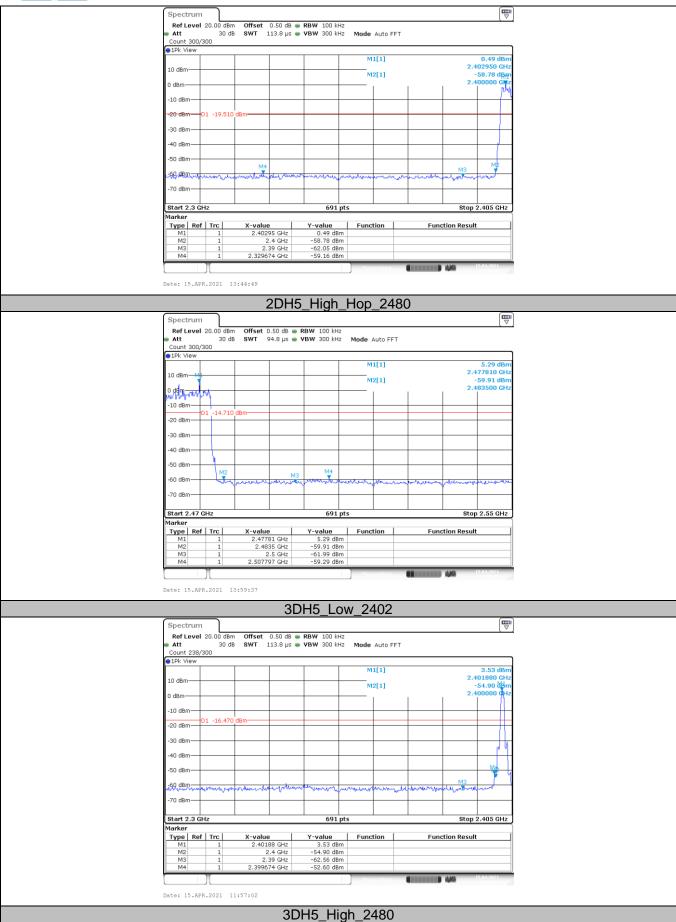


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2DH5_Low_Hop_2402

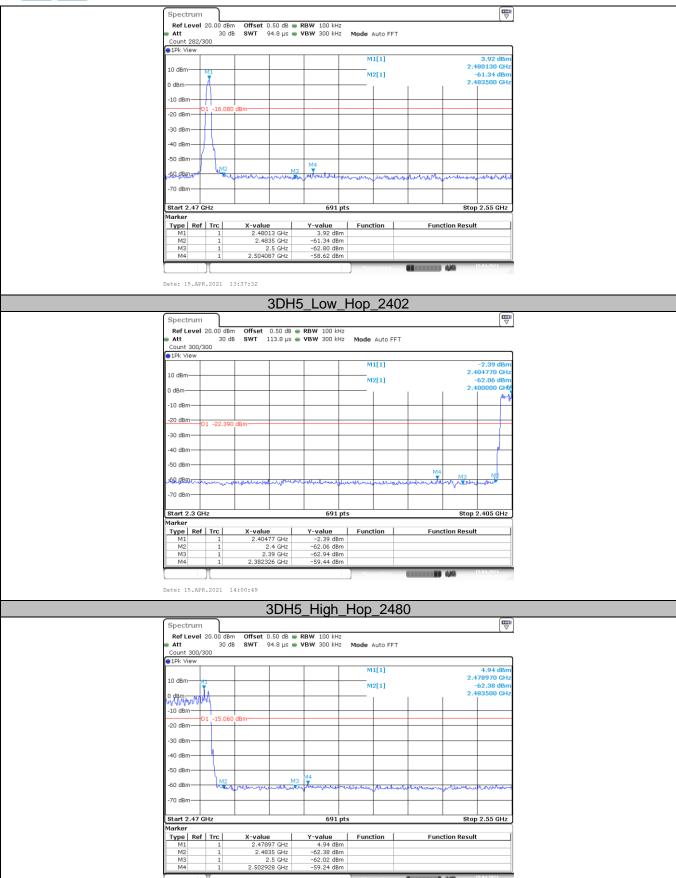




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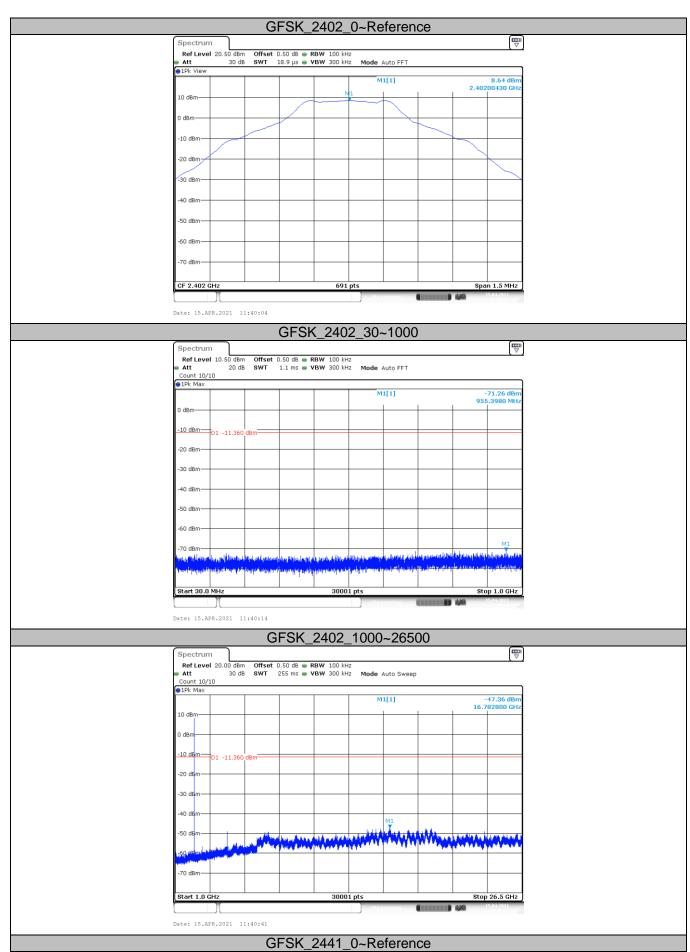
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(2) Conducted Spurious Emissions Test

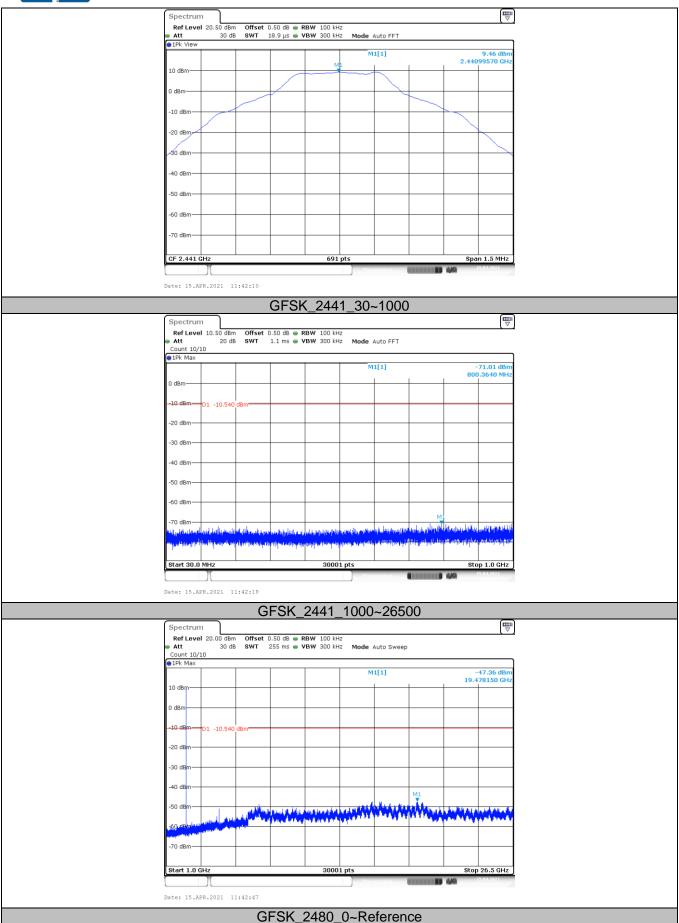
Test Mode	Frequency[MHz]	Freq Range [MHz]	Ref Level [dBm]	Result [dBm]	Limit [dBm]	Verdict
		Reference	8.64	8.64		PASS
	2402	30~1000	30~1000	-71.26	<=-11.36	PASS
		1000~26500	1000~26500	-47.36	<=-11.36	PASS
		Reference	9.46	9.46		PASS
GFSK	2441	30~1000	30~1000	-71.01	<=-10.54	PASS
		1000~26500	1000~26500	-47.36	<=-10.54	PASS
		Reference	10.08	10.08		PASS
	2480	30~1000	30~1000	-71.18	<=-9.92	PASS
		1000~26500	1000~26500	-46.57	<=-9.92	PASS
		Reference	4.06	4.06		PASS
	2402	30~1000	30~1000	-70.58	<=-15.94	PASS
		1000~26500	1000~26500	-40.8	<=-15.94	PASS
	2441	Reference	6.13	6.13		PASS
π		30~1000	30~1000	-70.99	<=-13.87	PASS
/4-DQPSK		1000~26500	1000~26500	-46.53	<=-13.87	PASS
		Reference	6.36	6.36		PASS
	2480	30~1000	30~1000	-70.27	<=-13.64	PASS
		1000~26500	1000~26500	-46.02	<=-13.64	PASS
		Reference	4.13	4.13		PASS
	2402	30~1000	30~1000	-71.13	<=-15.87	PASS
		1000~26500	1000~26500	-35.91	<=-15.87	PASS
		Reference	5.74	5.74		PASS
8-DPSK	2441	30~1000	30~1000	-70.51	<=-14.26	PASS
		1000~26500	1000~26500	-46.45	<=-14.26	PASS
		Reference	5.10	5.10		PASS
	2480	30~1000	30~1000	-71.47	<=-14.9	PASS
		1000~26500	1000~26500	-46.72	<=-14.9	PASS







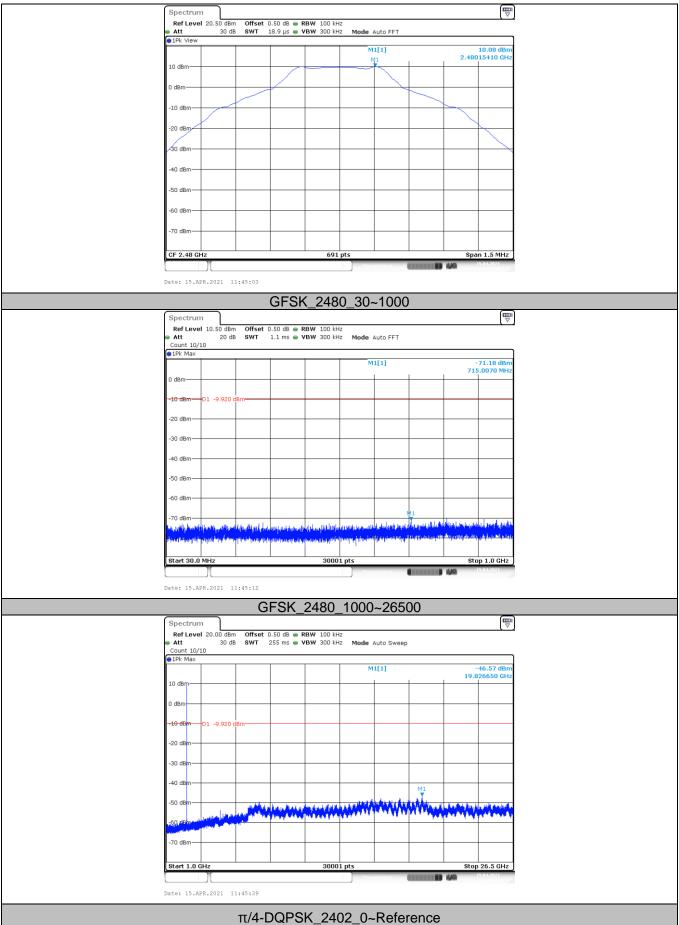




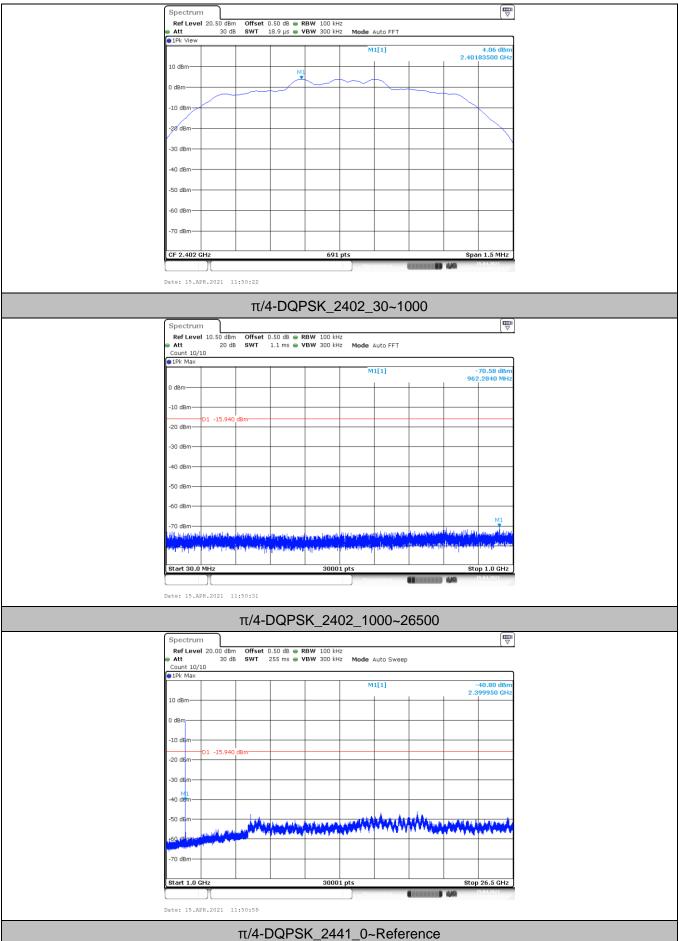
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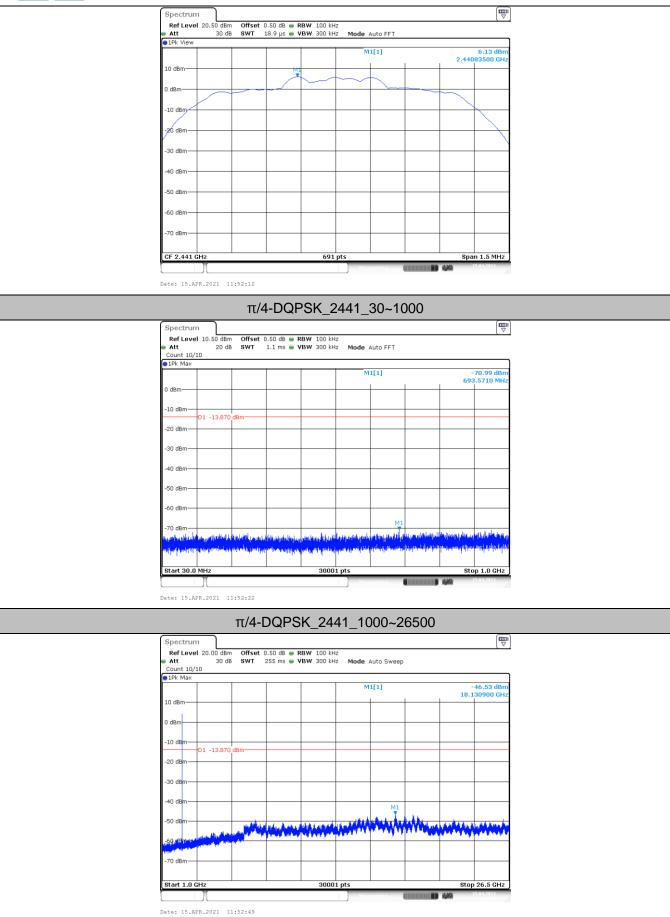






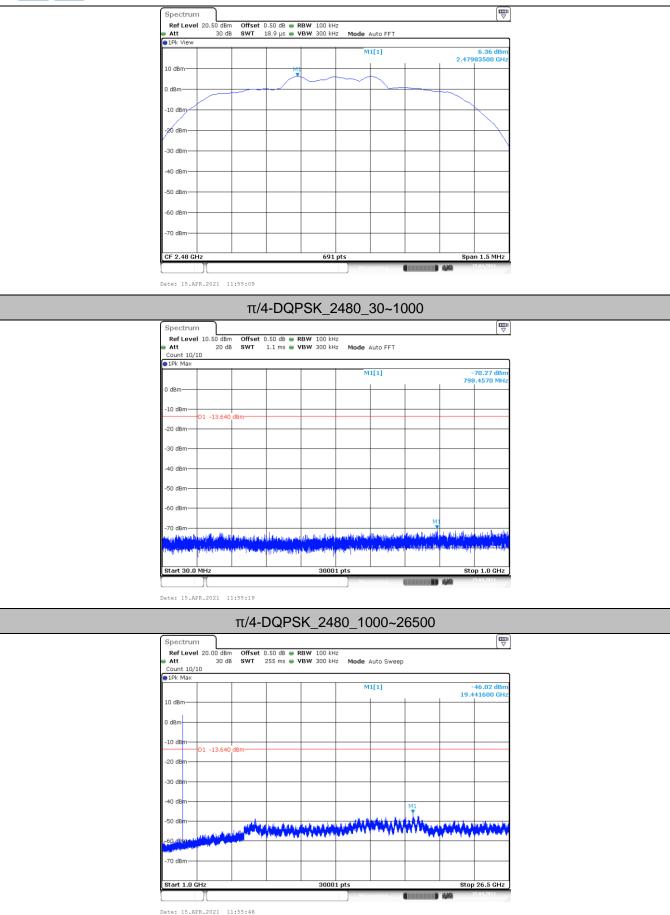






 $\pi/4$ -DQPSK_2480_0~Reference



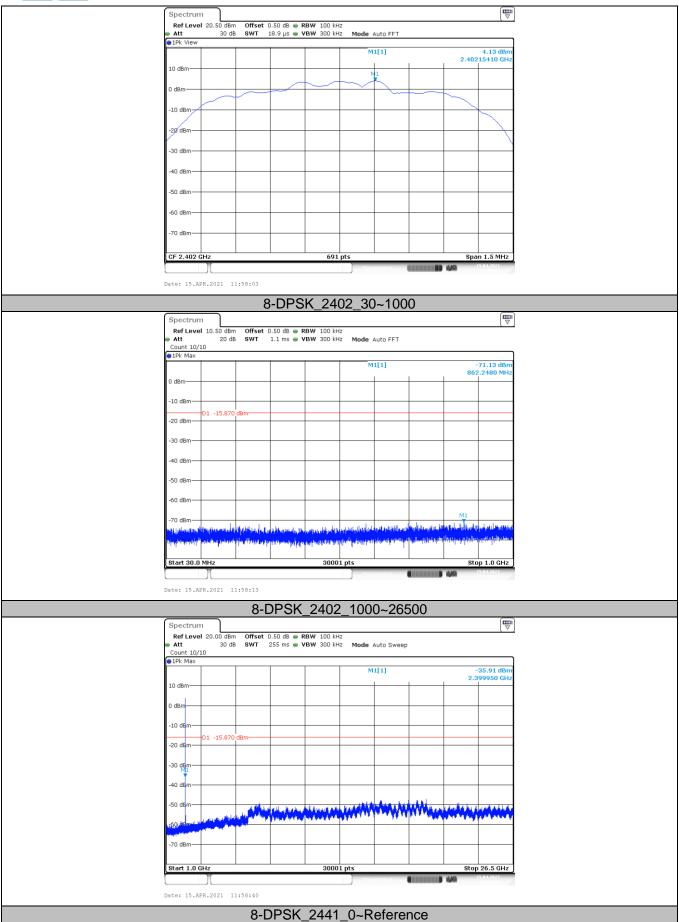


8-DPSK_2402_0~Reference

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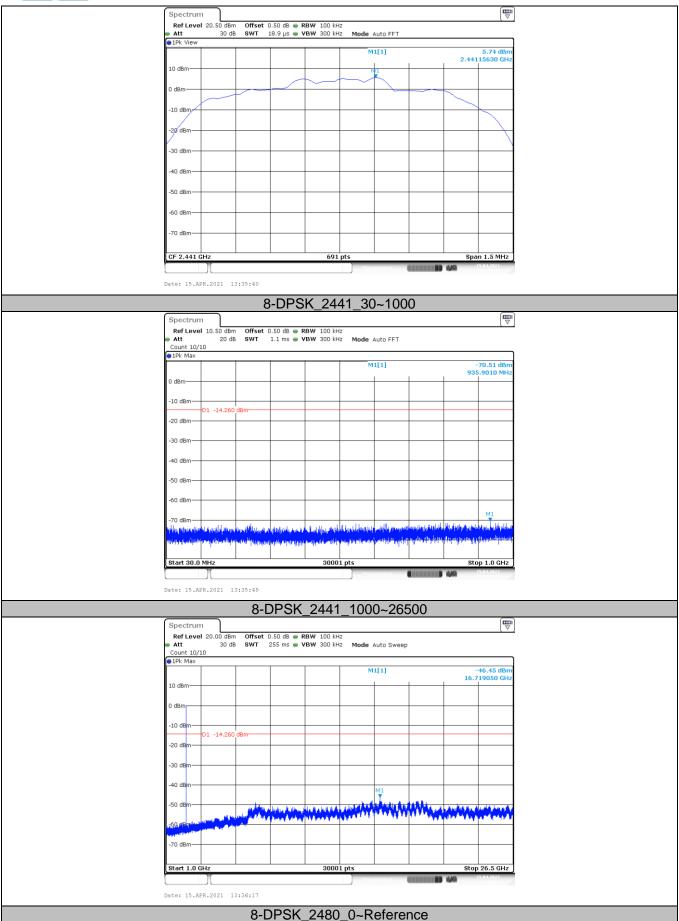




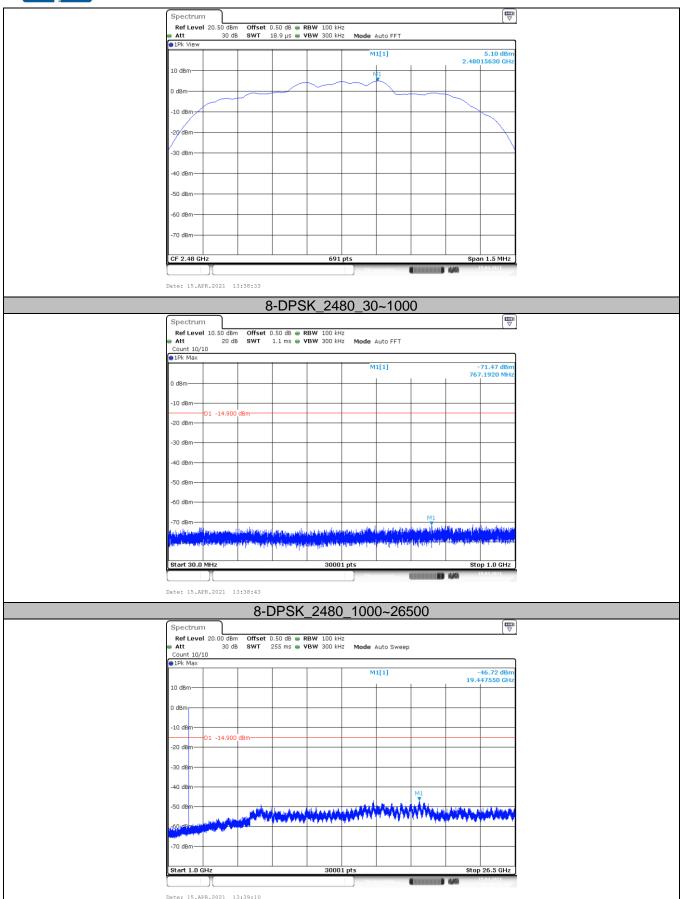
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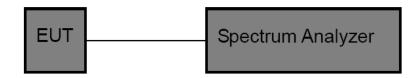


3.5. 20DB Bandwidth

Limit

N/A

Test Configuration



Test Procedure

- 5. The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram above.
- 6. OCB and 20dB Spectrum Setting:
 - (1) Set RBW = $1\% \sim 5\%$ occupied bandwidth.
 - (2) Set the video bandwidth (VBW) ≥ 3 RBW.
 - (3) Detector = Peak.
 - (4) Trace mode = Max hold.
 - (5) Sweep = Auto couple.

Note: The EUT was set to continuously transmitting in each mode and low, Middle and high channel for the test.

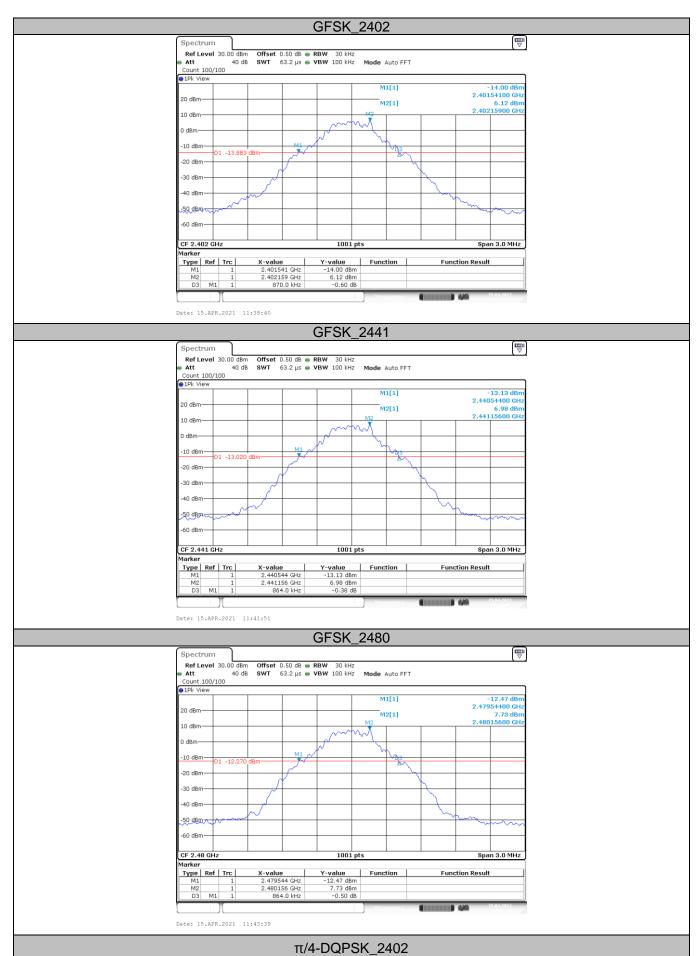
Test Mode

Please refer to the clause 2.4.

Test Results

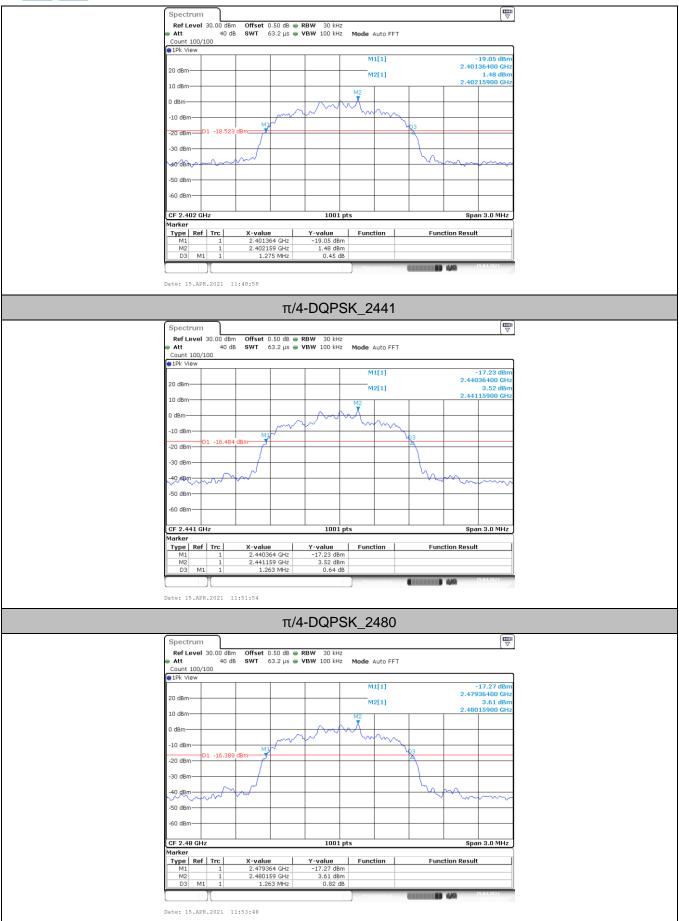
Test Mode	Frequency[MHz]	20db EBW[MHz]	20dB Bandwidth *2/3 (kHz)	Verdict
	2402	0.870	580.00	PASS
GFSK	2441	0.864	576.00	PASS
	2480	0.864	576.00	PASS
	2402	1.275	850.00	PASS
π/4-DQPSK	2441	1.263	842.00	PASS
	2480	1.263	842.00	PASS
	2402	1.269	846.00	PASS
8-DPSK	2441	1.254	836.00	PASS
	2480	1.254	836.00	PASS





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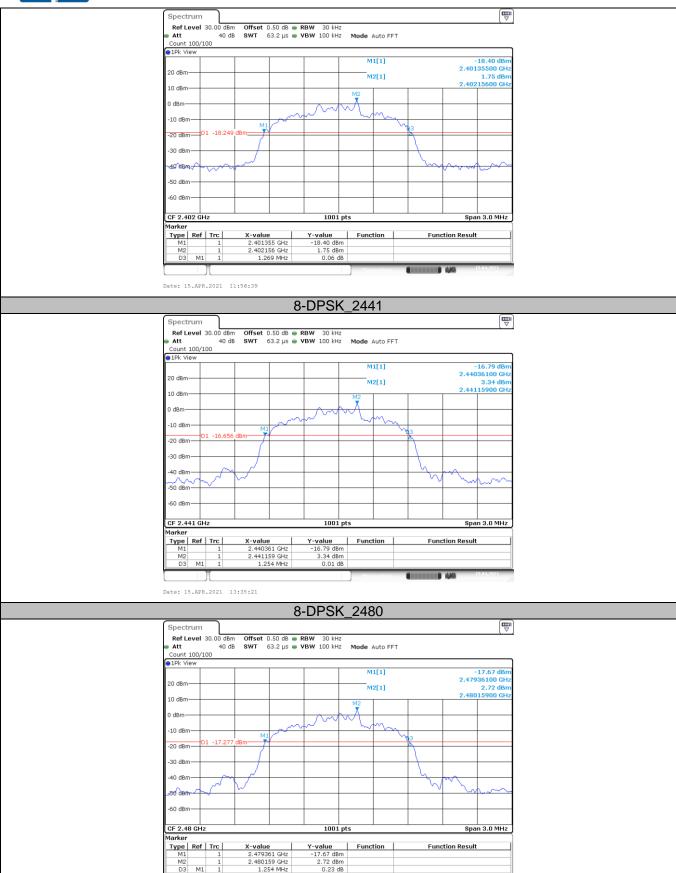




8-DPSK_2402

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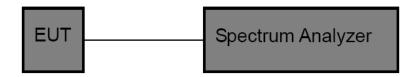
3.6. Channel Separation

Limit

FCC CFR Title 47 Part 15 Subpart C Section 15.247 (a)(1)/ RSS-247 5.1 b:

Test Item	Limit	Frequency Range(MHz)	
Channel Separation	>25KHz or >two-thirds of the 20 dB bandwidth Which is greater	2400~2483.5	

Test Configuration

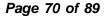


Test Procedure

- 7. The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram above.
- 8. Spectrum Setting:
 - (1) Set RBW = 100 kHz.
 - (2) Set the video bandwidth (VBW) ≥ 3 RBW.
 - (3) Detector = Peak.
 - (4) Trace mode = Max hold.
 - (5) Sweep = Auto couple.

Test Mode

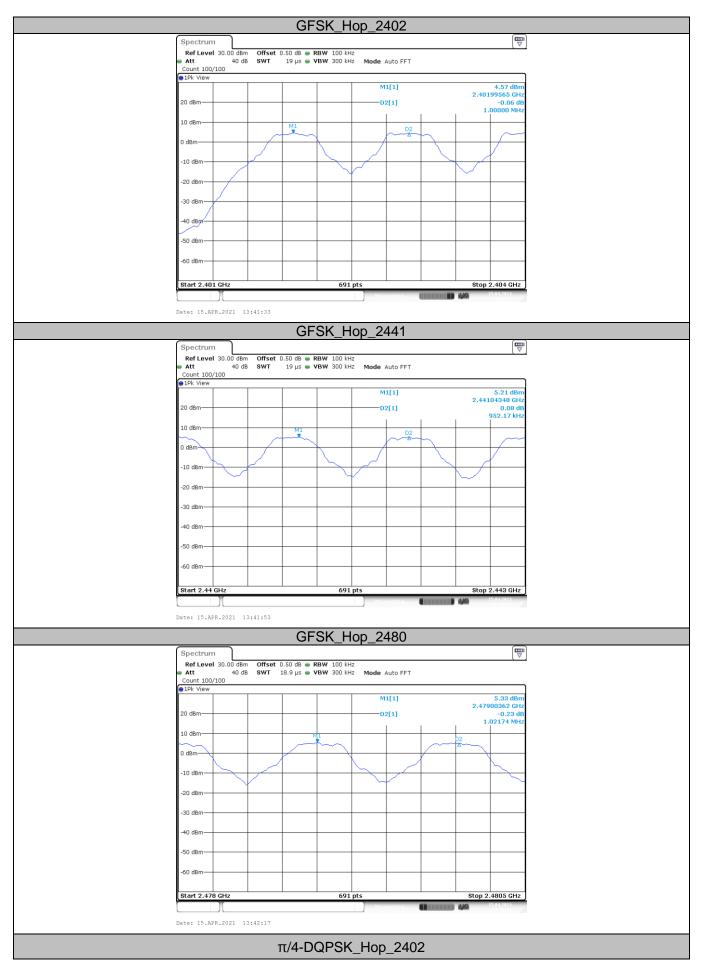
Please refer to the clause 2.4.



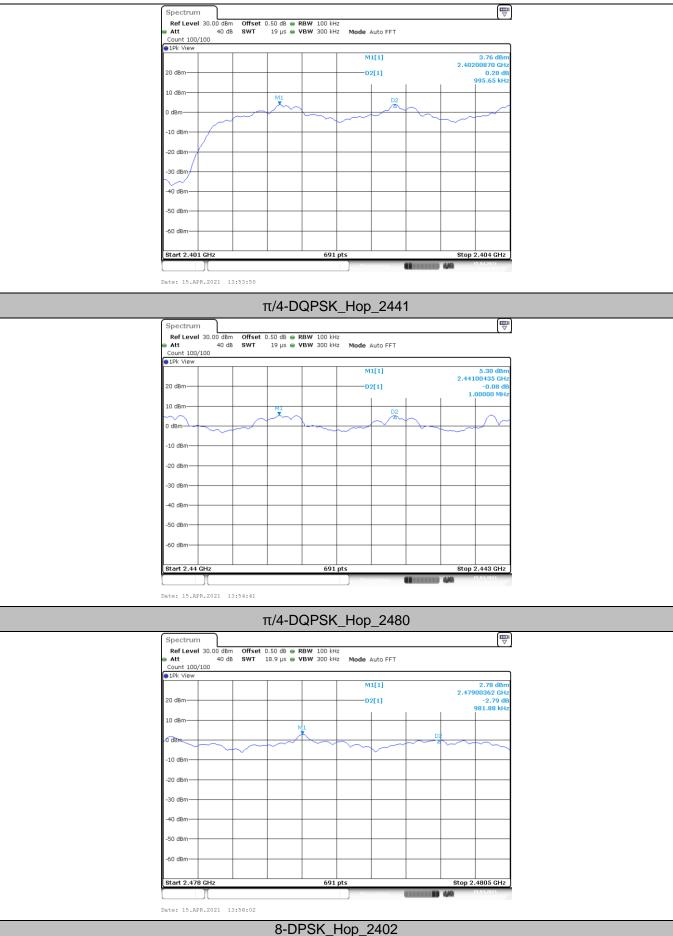


Test Mode	Frequency[MHz]	Result[MHz]	Limit[MHz]	Verdict
	Hop_2402	1.000	>580.00	PASS
GFSK	Hop_2441	0.952	>576.00	PASS
	Hop_2480	1.022	>576.00	PASS
	Hop_2402	0.996	>850.00	PASS
π/4-DQPSK	Hop_2441	1.000	>842.00	PASS
	Hop_2480	0.982	>842.00	PASS
	Hop_2402	1.000	>846.00	PASS
8-DPSK	Hop_2441	1.004	>836.00	PASS
	Hop_2480	1.007	>836.00	PASS

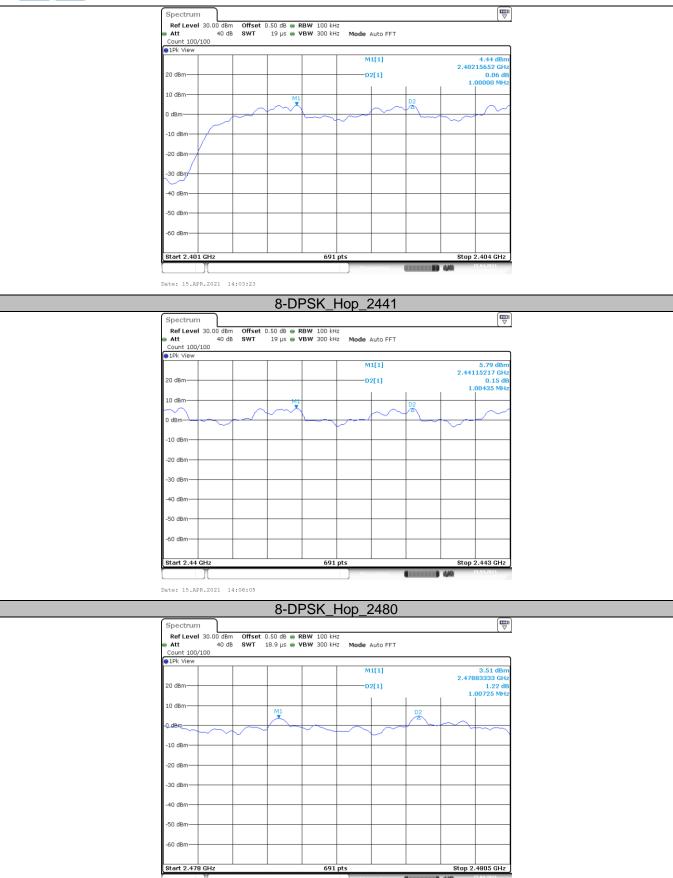












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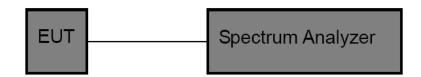
3.7. Number of Hopping Channel

Limit

FCC CFR Title 47 Part 15 Subpart C Section 15.247 (a)(iii)/ RSS-247 5.1 d:

Section	Test Item	Limit
15.247 (a)(iii)/ RSS-247 5.1 d:	Number of Hopping Channel	>15

Test Configuration



Test Procedure

- 1. The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram above.
- 2. Spectrum Setting:
 - (1) Peak Detector: RBW=100 kHz, VBW≥RBW, Sweep time= Auto.

Test Mode

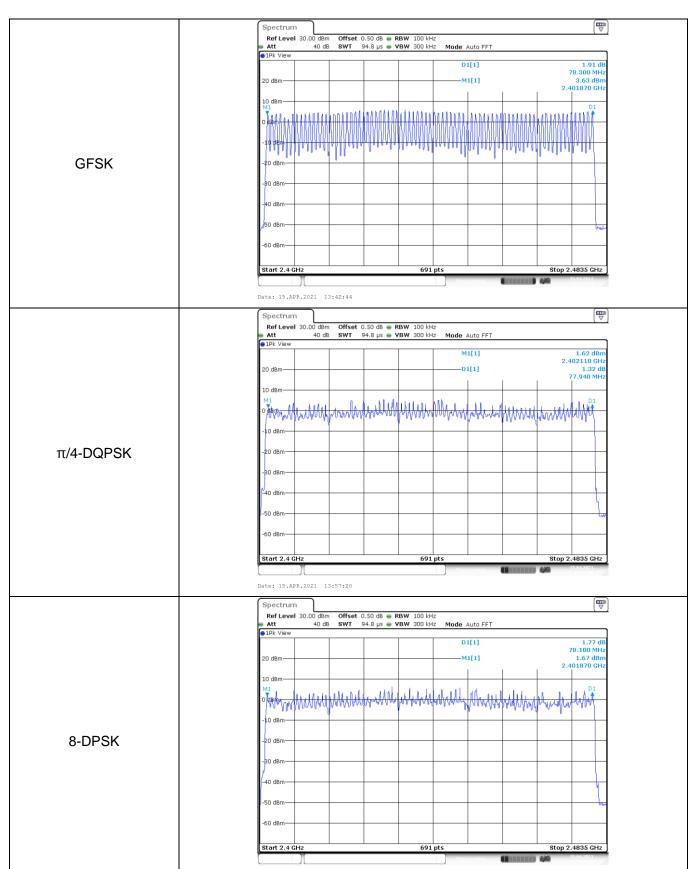
Please refer to the clause 2.4.

Test Result

Modulation type	Channel number	Limit	Result
GFSK	79		
π/4-DQPSK	79	≥15.00	Pass
8DPSK	79		

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Date: 15.APR.2021 14:11:24



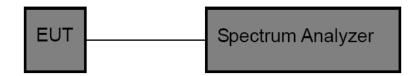


3.8. Dwell Time

Limit

Section	Test Item	Limit
15.247(a)(iii)/ RSS-247 5.1 d	Average Time of Occupancy	0.4 sec

Test Configuration



Test Procedure

- 1. The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram above.
- 2. Spectrum Setting:
 - (1) Spectrum Setting: RBW=1MHz, VBW≥RBW.
 - (2) Use video trigger with the trigger level set to enable triggering only on full pulses.
 - (3) Sweep Time is more than once pulse time.
- (4) Set the center frequency on any frequency would be measure and set the frequency span to zero.
 - (5) Measure the maximum time duration of one single pulse.
 - (6) Set the EUT for packet transmitting.

Test Mode

Please refer to the clause 2.4.



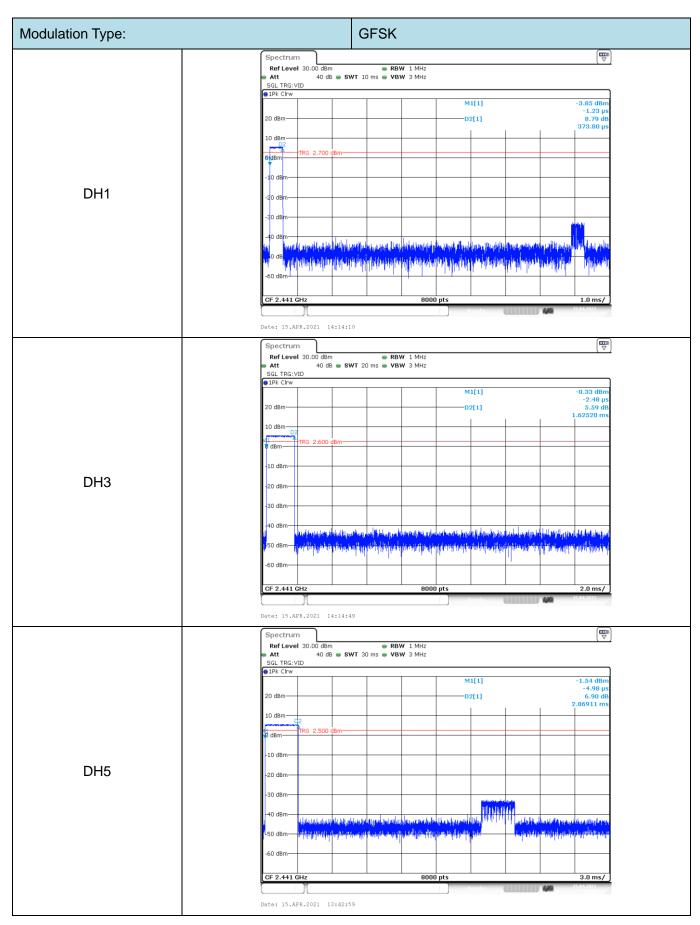


Test Result

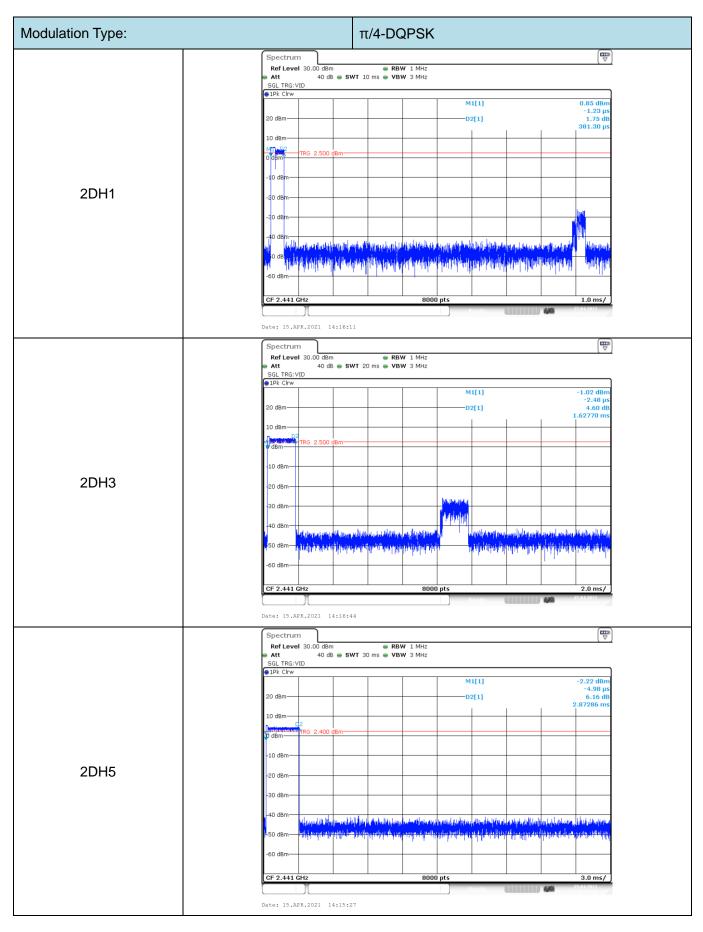
Modulation type	Channel	Frequency [MHz]	Pulse Time (ms)	Total of Dwell (ms)	Period Time (ms)	Limit (Second)	Result
	DH1	2441	0.37	118.40	31.60		
GFSK	DH3	2441	1.63	260.80	31.60	≤ 0.40	Pass
	DH5	2441	2.87	306.13	31.60		
	2DH1	2441	0.38	121.60	31.60		
π/4-DQPSK	2DH3	2441	1.63	260.80	31.60	≤ 0.40	Pass
	2DH5	2441	2.87	306.13	31.60		
	3DH1	2441	0.38	121.60	31.60		
8-DPSK	3DH3	2441	1.63	260.80	31.60	≤ 0.40	Pass
	3DH5	2441	2.88	307.20	31.60		

Note: 1DH1/2DH1/3DH1Total of Dwell= Pulse Time*(1600/2)*31.6/79 1DH3/2DH3/3DH3 Total of Dwell= Pulse Time*(1600/4)*31.6/79 1DH5/2DH5/3DH5 Total of Dwell= Pulse Time*(1600/6)*31.6/79

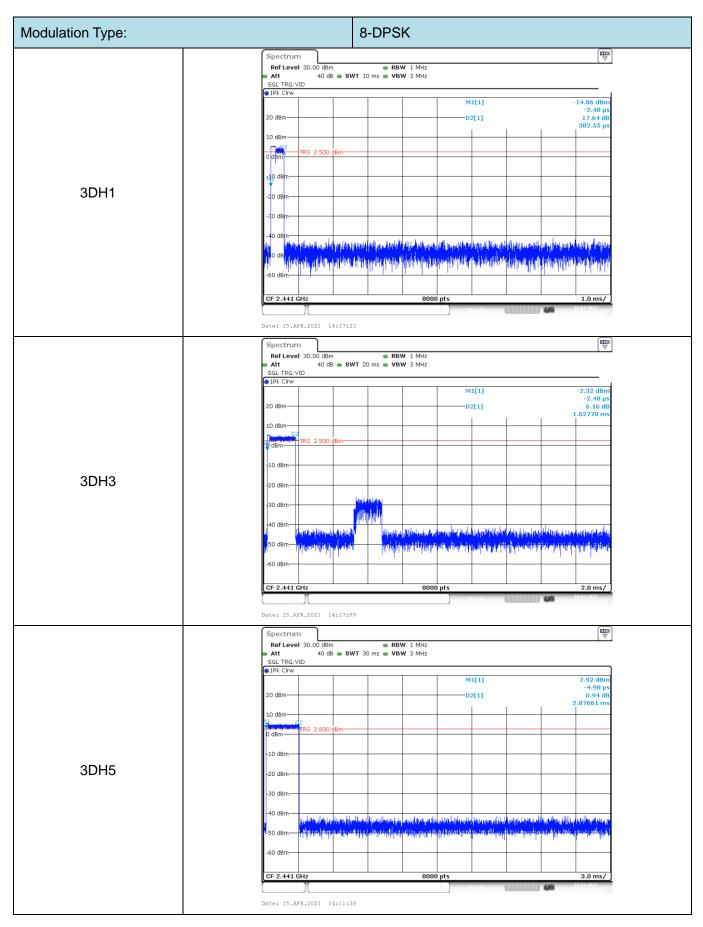












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3.9. Peak Output Power

Limit

FCC CFR Title 47 Part 15 Subpart C Section 15.247 (b)(1) / RSS-247 5.4 b:

Test Item	Limit	Frequency Range(MHz)	
Peak Output Power	Hopping Channels>75 Pow- er<1W(30dBm) Other <125mW(21dBm)	2400~2483.5	

Test Configuration



Test Procedure

- 1. The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram above.
- 2. Spectrum Setting:
 - (1) Set RBW> 20DB Bandwidth.
 - (2) Set the video bandwidth (VBW) ≥ RBW.
 - (3) Detector = Peak.
 - (4) Trace mode = Max hold.
 - (5) Sweep = Auto couple.

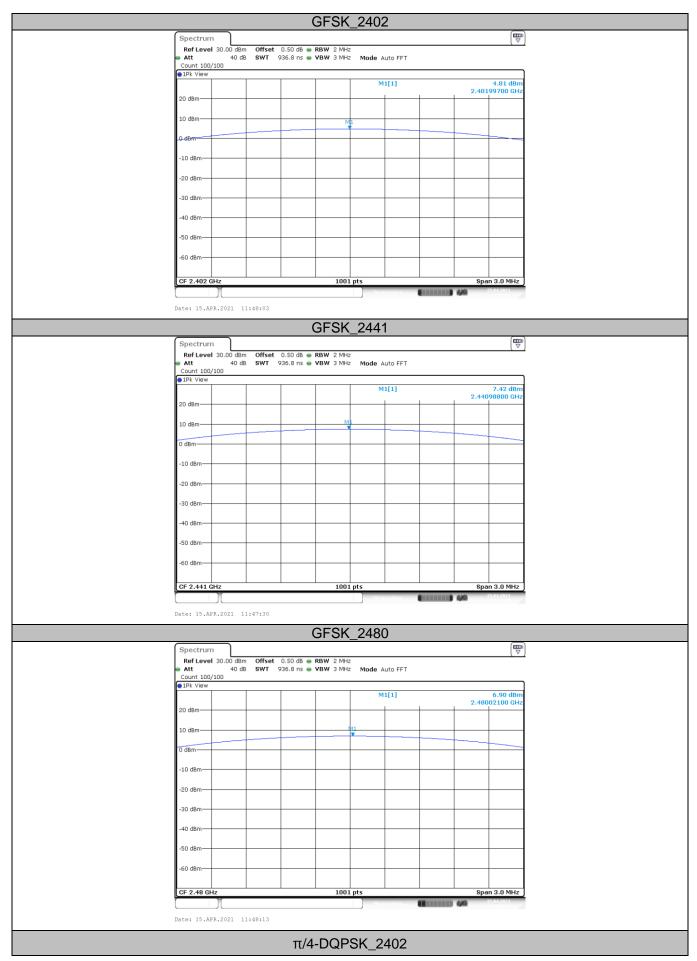
Test Mode

Please refer to the clause 2.4.

Test Result

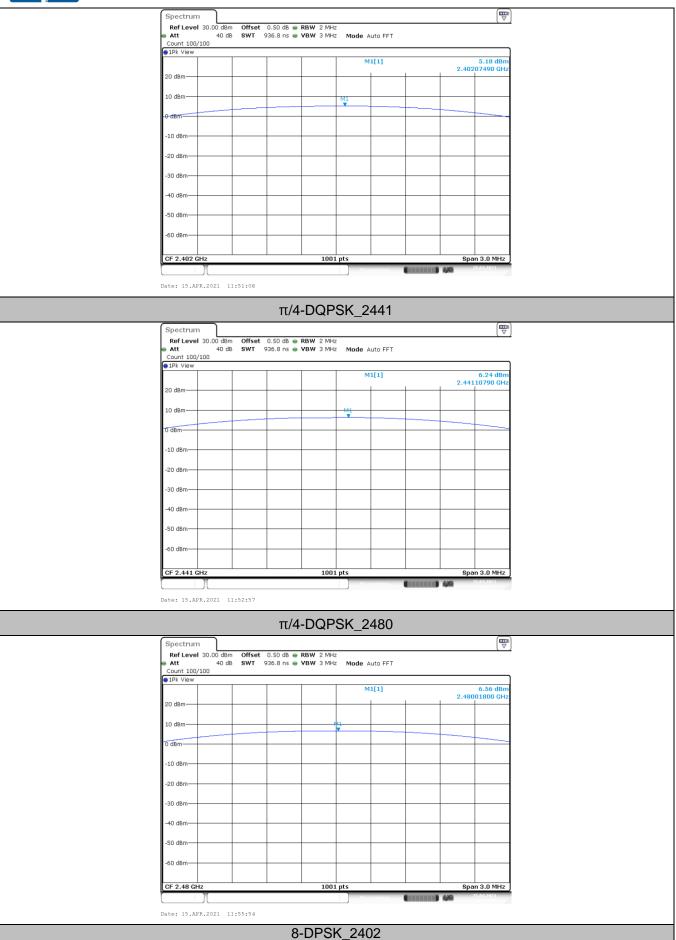
Test Mode	Frequency[MHz]	Result[dBm]	Limit[dBm]	Verdict
	2402	4.81	<=30	PASS
GFSK	2441	7.42	<=30	PASS
	2480	6.90	<=30	PASS
	2402	5.18	<=30	PASS
π/4-DQPSK	2441	6.24	<=30	PASS
	2480	6.56	<=30	PASS
	2402	4.60	<=30	PASS
8-DPSK	2441	5.85	<=30	PASS
	2480	5.21	<=30	PASS



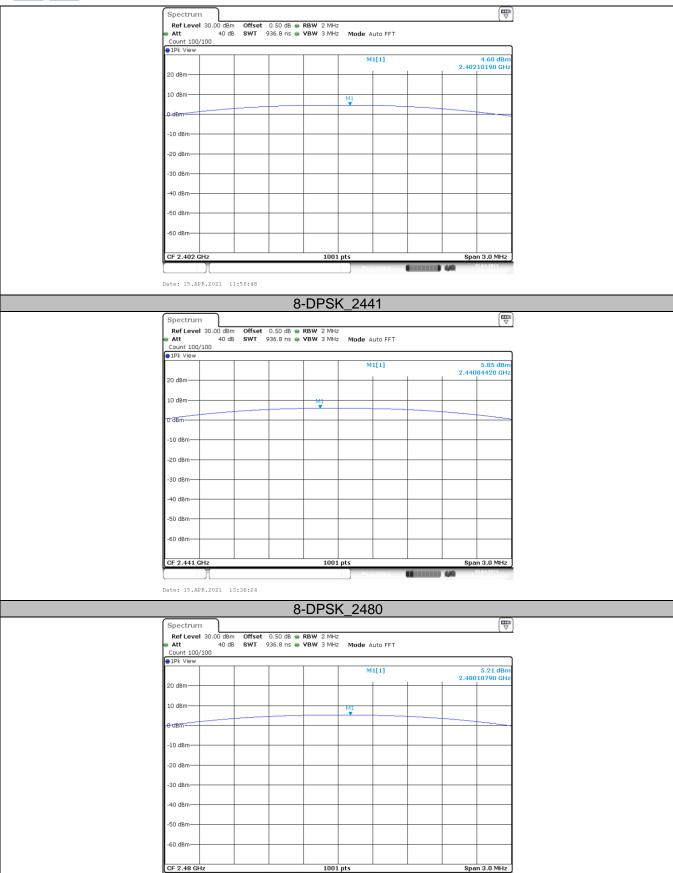


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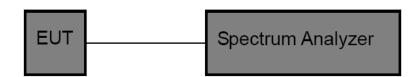


3.10. Duty Cycle

Limit

None, for report purposes only.

Test Configuration



Test Procedure

- 1. The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram above.
- 2. The EUT was directly connected to the Spectrum Analyzer and antenna output port as show in the block diagram above. The measurement according to section 10.2 of KDB 558074 D01 DTS Meas Guidance v05r02.
- 3. Spectrum Setting:

Set analyzer center frequency to test channel center frequency.

Set the span to 0Hz Set the RBW to 10MHz Set the VBW to 10MHz

Detector: Peak Sweep time: Auto

Allow trace to fully stabilize. Then use the peak marker function to determine the maximum amplitude level.

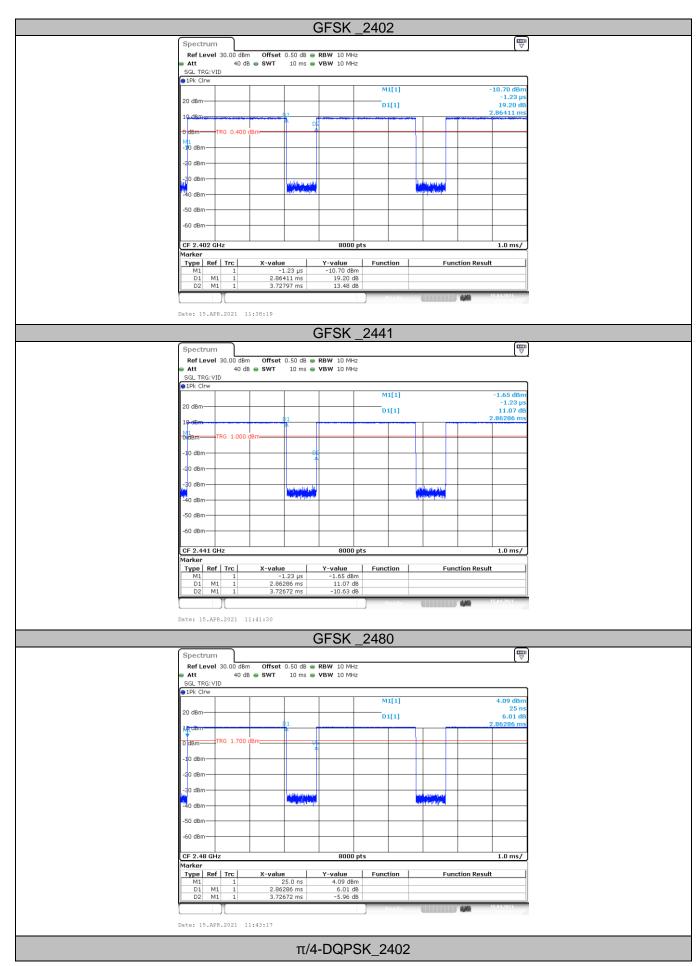
Test Mode

Please refer to the clause 2.4.

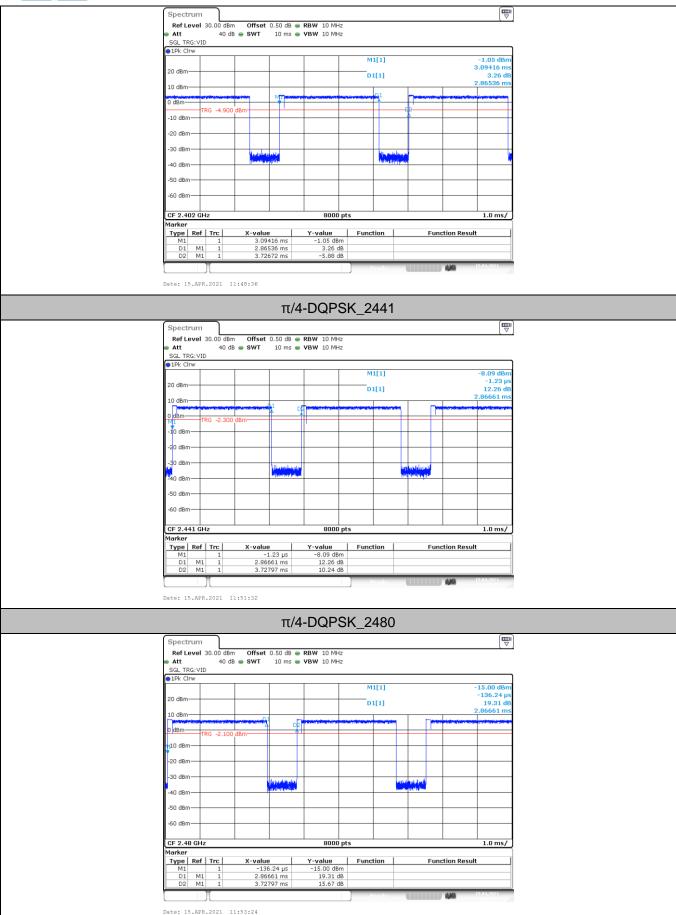
Test Result

Test Mode	Frequency [MHz]	Transmission Duration [ms]	Transmission Period [ms]	Duty Cycle [%]	1/T Minimum VBW (kHz)	Final setting For VBW (kHz)
	2402	2.86	3.73	76.83	0.35	1
GFSK	2441	2.86	3.73	76.82	0.35	1
	2480	2.86	3.73	76.82	0.35	1
	2402	2.87	3.73	76.89	0.35	1
π/4-DQPSK	2441	2.87	3.73	76.89	0.35	1
	2480	2.87	3.73	76.89	0.35	1
	2402	2.87	3.73	76.95	0.35	1
8-DPSK	2441	2.87	3.73	76.95	0.35	1
	2480	2.87	3.73	76.95	0.35	1



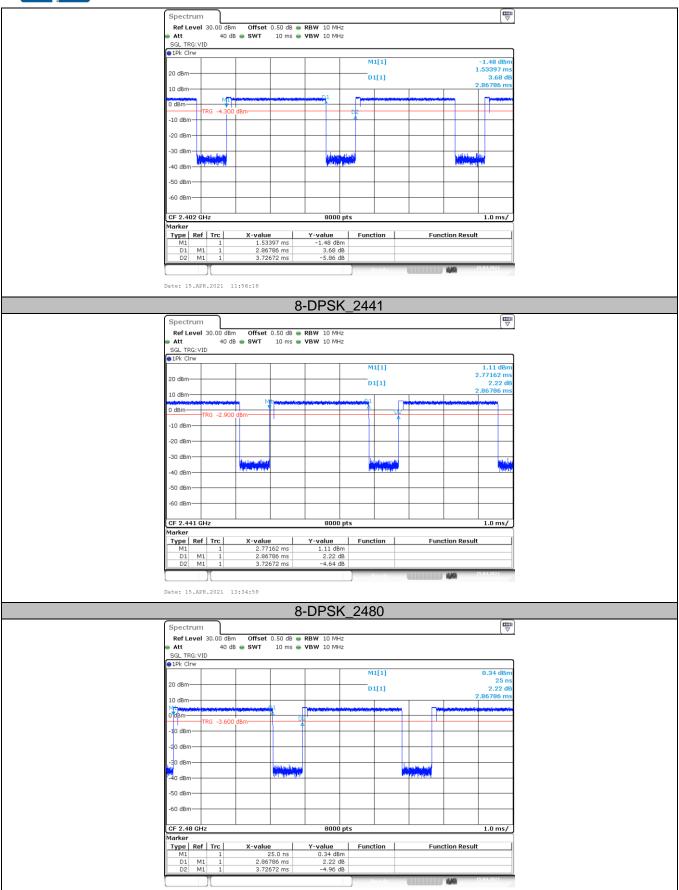






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3.11. Antenna requirement

Requirement

FCC CFR Title 47 Part 15 Subpart C Section 15.203:

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of 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.

FCC CFR Title 47 Part 15 Subpart C Section 15.247(c) (1)(i):

(i) Systems operating in the 2400~2483.5 MHz band that is used exclusively for fixed. Point-to-point operations may employ transmitting antennas with directional gain greater than 6dBi provided the maximum conducted output power of the intentional radiator is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6dBi.

Test Result

The directional gain of the antenna less than 6dBi, please refer to the EUT internal photographs antenna photo.



For anti-fake verification, please visit the official website of Certification and Ac-