

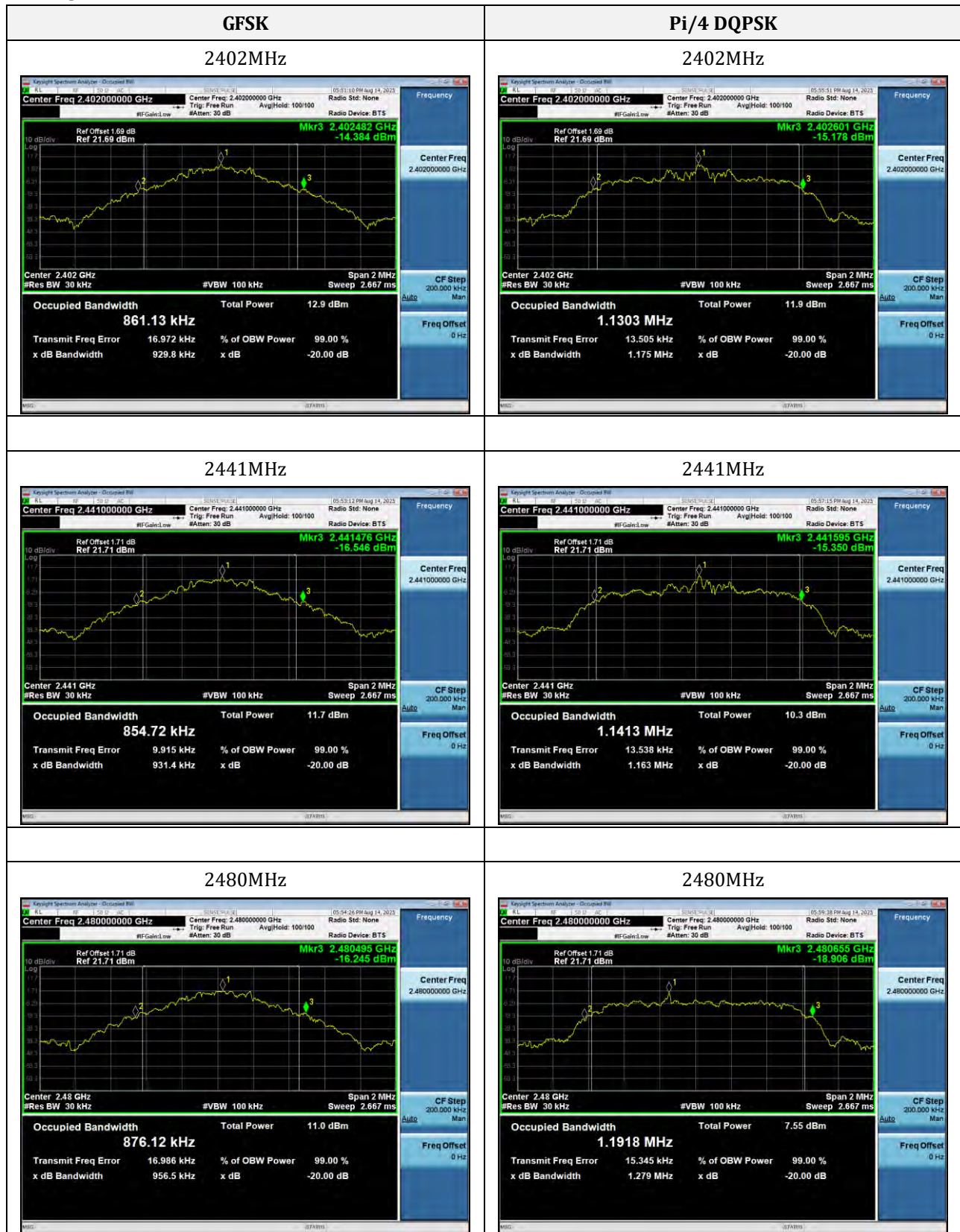
Left earphone:

Test Mode	Test Channel (MHz)	20dB Bandwidth (MHz)	99% Bandwidth (kHz)
GFSK	2402	0.93	861.13
	2441	0.931	854.72
	2480	0.956	876.12
Pi/4 DQPSK	2402	1.175	1130.3
	2441	1.163	1141.3
	2480	1.279	1191.8
8DPSK	2402	1.182	1166.5
	2441	1.237	1141
	2480	1.259	1159.4

Right earphone:

Test Mode	Test Channel (MHz)	20dB Bandwidth (MHz)	99% Bandwidth (kHz)
GFSK	2402	0.928	857.21
	2441	0.936	849.33
	2480	0.944	853.84
Pi/4 DQPSK	2402	1.274	1162.3
	2441	1.178	1146.3
	2480	1.253	1157.6
8DPSK	2402	1.182	1143.5
	2441	1.186	1127
	2480	1.192	1150.8

Left earphone:



8DPSK

2402MHz



2441MHz



2480MHz



GFSK

2402MHz

Center Freq: 2.402000000 GHz
#F: 1000000
#VBW: 100 kHz
Span: 2 MHz
Sweep: 2.667 ms
CF Step: 200.000 kHz
Man

Occupied Bandwidth	Total Power
857.21 kHz	10.3 dBm

Transmit Freq Error	% of OBW Power
6.874 kHz	99.00 %

x dB Bandwidth	x dB
928.3 kHz	-20.00 dB

Pi/4 DQPSK

2402MHz

Center Freq: 2.402000000 GHz
#F: 1000000
#VBW: 100 kHz
Span: 2 MHz
Sweep: 2.667 ms
CF Step: 200.000 kHz
Man

Occupied Bandwidth	Total Power
1.1623 MHz	7.61 dBm

Transmit Freq Error	% of OBW Power
4.541 kHz	99.00 %

x dB Bandwidth	x dB
1.274 MHz	-20.00 dB

GFSK

2441MHz

Center Freq: 2.441000000 GHz
#F: 1000000
#VBW: 100 kHz
Span: 2 MHz
Sweep: 2.667 ms
CF Step: 200.000 kHz
Man

Occupied Bandwidth	Total Power
849.33 kHz	9.18 dBm

Transmit Freq Error	% of OBW Power
4.237 kHz	99.00 %

x dB Bandwidth	x dB
935.6 kHz	-20.00 dB

Pi/4 DQPSK

2441MHz

Center Freq: 2.441000000 GHz
#F: 1000000
#VBW: 100 kHz
Span: 2 MHz
Sweep: 2.667 ms
CF Step: 200.000 kHz
Man

Occupied Bandwidth	Total Power
1.1463 MHz	7.60 dBm

Transmit Freq Error	% of OBW Power
8.115 kHz	99.00 %

x dB Bandwidth	x dB
1.178 MHz	-20.00 dB

GFSK

2480MHz

Center Freq: 2.480000000 GHz
#F: 1000000
#VBW: 100 kHz
Span: 2 MHz
Sweep: 2.667 ms
CF Step: 200.000 kHz
Man

Occupied Bandwidth	Total Power
853.84 kHz	9.27 dBm

Transmit Freq Error	% of OBW Power
6.295 kHz	99.00 %

x dB Bandwidth	x dB
944.5 kHz	-20.00 dB

Pi/4 DQPSK

2480MHz

Center Freq: 2.480000000 GHz
#F: 1000000
#VBW: 100 kHz
Span: 2 MHz
Sweep: 2.667 ms
CF Step: 200.000 kHz
Man

Occupied Bandwidth	Total Power
1.1576 MHz	6.95 dBm

Transmit Freq Error	% of OBW Power
7.728 kHz	99.00 %

x dB Bandwidth	x dB
1.253 MHz	-20.00 dB

8DPSK

2402MHz



2441MHz



2480MHz



11. Carrier Frequencies Separation

11.1 Standard and Limit

According to FCC 15.247(a)(1), 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, and frequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 channels.

11.2 Test Procedure

- 1) Remove the antenna from the EUT and connect to the spectrum analyzer via a low loss RF cable.
- 2) Set the spectrum analyzer to any one measured frequency within its operating range.
- 3) Set RBW = 30kHz, VBW = 100kHz, Sweep = Auto, Detector = Peak.
- 4) By using the Max Hold function, record the separation of two adjacent channels.
- 5) Measure the frequency difference of these two adjacent channels by spectrum analyzer mark function. and then plot the result on the screen of the spectrum analyzer.
- 6) Repeat above procedures until all frequencies measured were complete.



Test Setup Block Diagram

11.3 Test Data and Results

Left earphone:

Test Mode	Test Channel	Test Freq. 1 (MHz)	Test Freq. 2 (MHz)	CFS (MHz)	Limit (MHz)
GFSK	Lowest	2402.028	2403.018	0.99	0.62
	Middle	2441.184	2442.076	0.892	0.621
	Highest	2479.012	2480.03	1.018	0.637
Pi/4 DQPSK	Lowest	2402.046	2403.012	0.966	0.783
	Middle	2441.012	2441.97	0.958	0.775
	Highest	2479.17	2480.154	0.984	0.853
8DPSK	Lowest	2402.012	2403.028	1.016	0.788
	Middle	2440.984	2442.04	1.056	0.825
	Highest	2479.002	2480.204	1.202	0.839

Right earphone:

Test Mode	Test Channel	Test Freq. 1 (MHz)	Test Freq. 2 (MHz)	CFS (MHz)	Limit (MHz)
GFSK	Lowest	2401.846	2403.174	1.328	0.619
	Middle	2441.028	2442.004	0.976	0.624
	Highest	2479.006	2480.058	1.052	0.629
Pi/4 DQPSK	Lowest	2401.998	2403.004	1.006	0.849
	Middle	2441.172	2442.03	0.858	0.785
	Highest	2478.998	2480.014	1.016	0.835
8DPSK	Lowest	2402.17	2403.016	0.846	0.788
	Middle	2441.004	2441.932	0.928	0.791
	Highest	2478.854	2479.858	1.004	0.795

Note: CFS(Channel Frequency Separation) = Test Freq. 2 - Test Freq. 1

Left earphone:

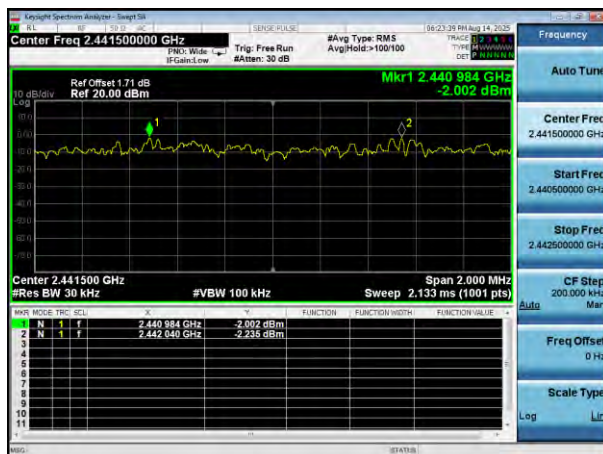


8DPSK

Lowest



Middle



Highest

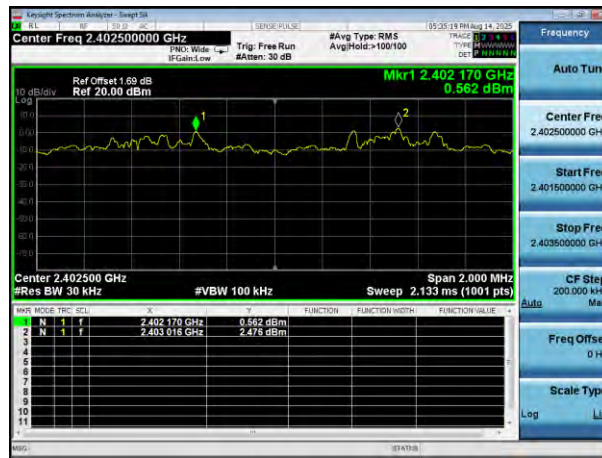


Right earphone:

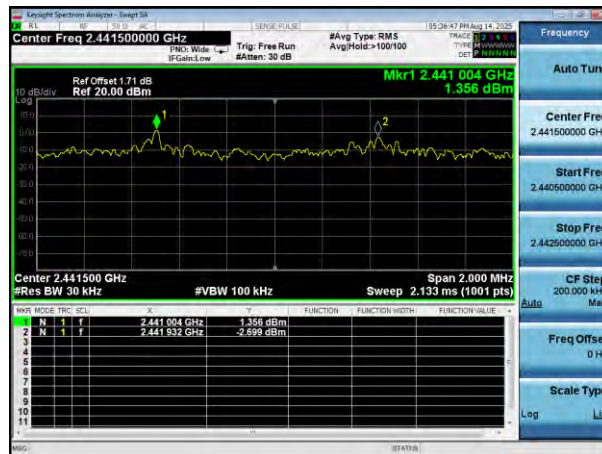


8DPSK

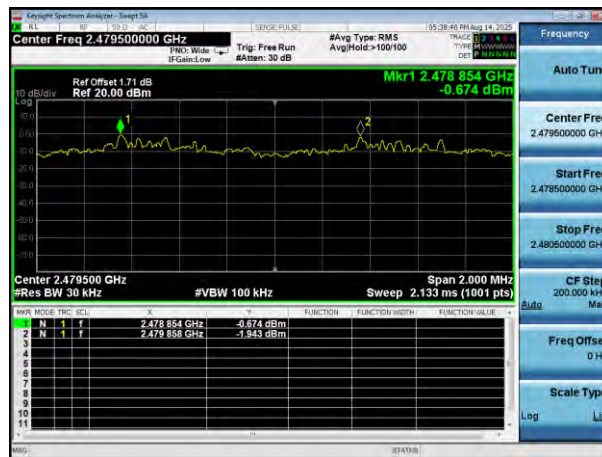
Lowest



Middle



Highest



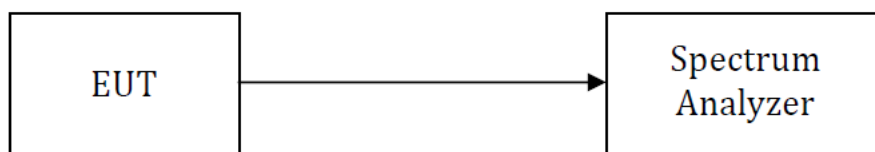
12. Number of Hopping Channel

12.1 Standard and Limit

According to FCC 15.247(a)(1), 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, and frequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 channels.

12.2 Test Procedure

- 1) Remove the antenna from the EUT and connect to the spectrum analyzer via a low loss RF cable.
- 2) Set the spectrum analyzer to any one measured frequency within its operating range.
- 3) Set RBW = 100kHz, VBW = 300kHz, Sweep = Auto, Detector = Peak.
- 4) Set the spectrum analyzer on Max hold mode, and then keep the EUT in hopping mode. Record all the signals from each channel until each one has been recorded.
- 5) Set the spectrum analyzer on View mode and then plot the result on the screen of the spectrum analyzer.
- 6) Repeat the above procedures until all frequencies measured were complete.



Test Setup Block Diagram

12.3 Test Data and Results

Left earphone:

Test Mode	Number of Hopping Channel	Limit	Test Result
GFSK	79	15	Pass
Pi/4 DQPSK	79	15	Pass
8DPSK	79	15	Pass

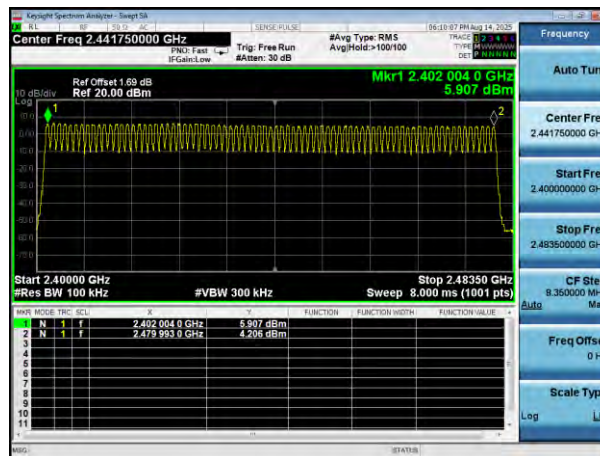
Right earphone:

Test Mode	Number of Hopping Channel	Limit	Test Result
GFSK	79	15	Pass
Pi/4 DQPSK	79	15	Pass
8DPSK	79	15	Pass

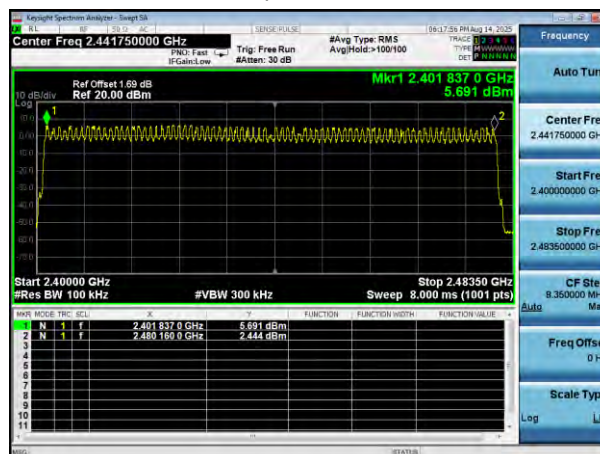
Left earphone:

Number of Hopping Channel

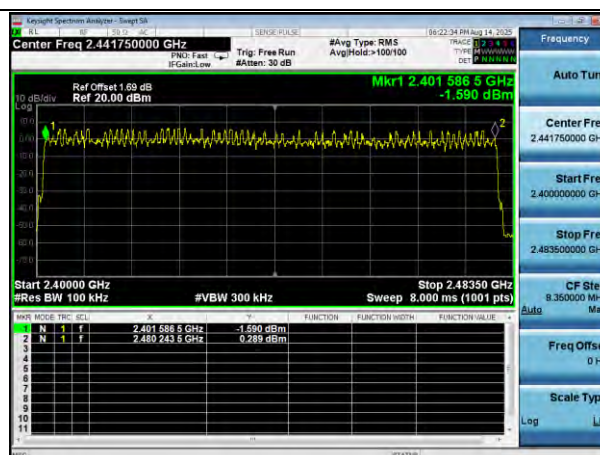
GFSK



Pi/4 DQPSK



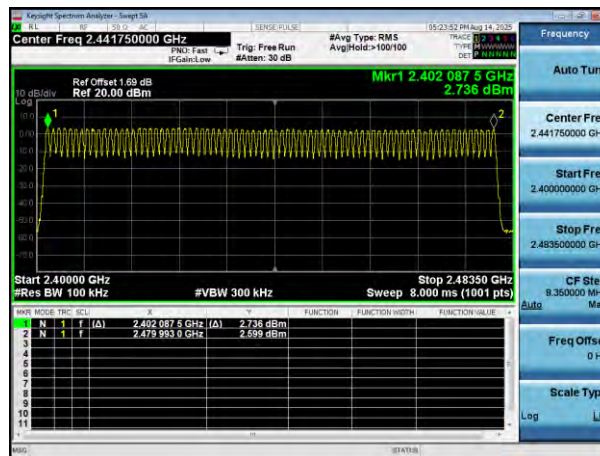
8DPSK



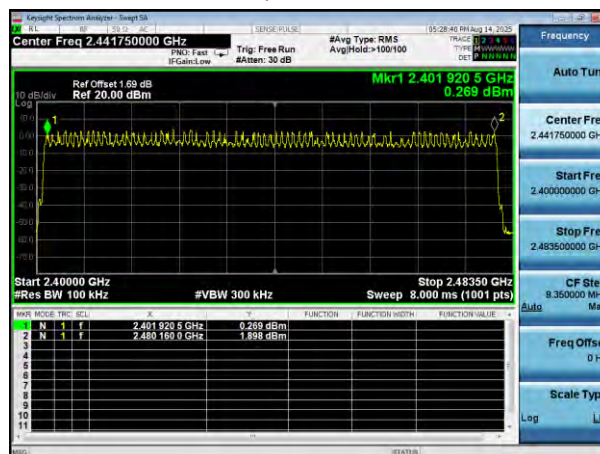
Right earphone:

Number of Hopping Channel

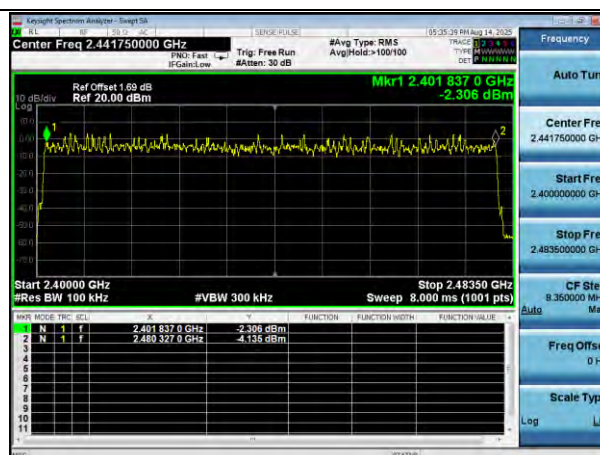
GFSK



Pi/4 DQPSK



8DPSK



13. Band-edge Emission(Conducted)

13.1 Standard and Limit

According to §15.247(d), In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in § 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in § 15.205(a), must also comply with the radiated emission limits specified in § 15.209(a) (see § 15.205(c)).

13.2 Test Procedure

Test is conducting under the description of ANSI C63.10 - 2013 section 6.10.

- 1) Remove the antenna from the EUT and connect to the spectrum analyzer via a low loss RF cable.
- 2) Set the spectrum analyzer to any one measured frequency within its operating range.
- 3) Set RBW = 100kHz, VBW = 300kHz, Sweep = Auto, Detector = Peak.
- 4) Measure the highest amplitude appearing on spectral display and set it as a reference level.
- 5) Set a convenient frequency span including 100 kHz bandwidth from band edge.
- 6) Measure the emission and marking the edge frequency.
- 7) Repeat above procedures until all frequencies measured were complete.



Test Setup Block Diagram

13.3 Test Data and Results

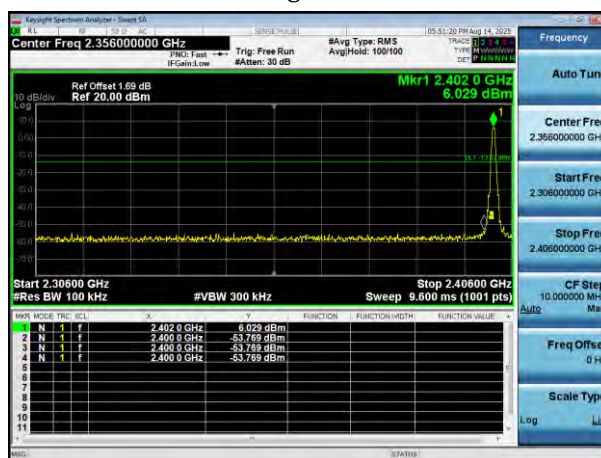
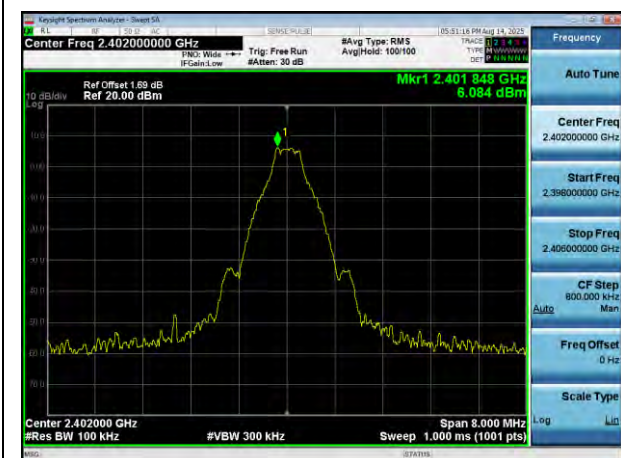
Left earphone:

Test Mode	Band-edge	Test Channel (MHz)	Max. Value (dBc)	Limit (dBc)	Test Result
No-Hopping					
GFSK	Lowest	2402	-59.84	-20	Pass
	Highest	2480	-59.09	-20	Pass
Pi/4 DQPSK	Lowest	2402	-55.67	-20	Pass
	Highest	2480	-60.41	-20	Pass
8DSK	Lowest	2402	-53.86	-20	Pass
	Highest	2480	-59.54	-20	Pass
Hopping					
GFSK	Lowest	2402	-59.87	-20	Pass
	Highest	2480	-58.53	-20	Pass
Pi/4 DQPSK	Lowest	2402	-45.71	-20	Pass
	Highest	2480	-58.46	-20	Pass
8DSK	Lowest	2402	-60.34	-20	Pass
	Highest	2480	-58.28	-20	Pass

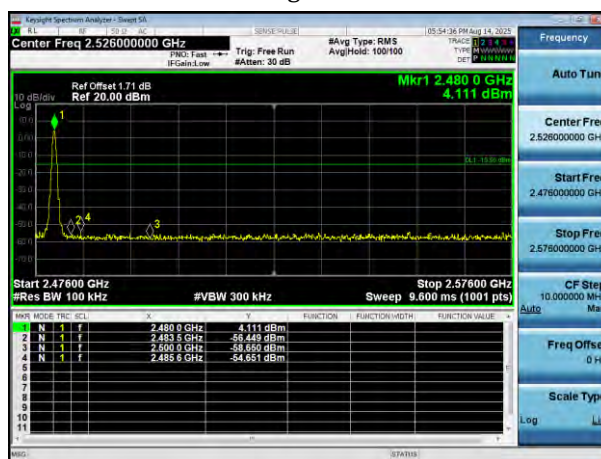
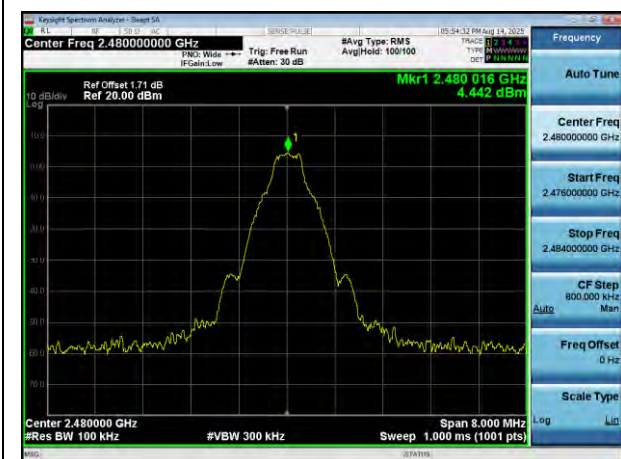
Right earphone:

Test Mode	Band-edge	Test Channel (MHz)	Max. Value (dBc)	Limit (dBc)	Test Result
No-Hopping					
GFSK	Lowest	2402	-56.59	-20	Pass
	Highest	2480	-57.82	-20	Pass
Pi/4 DQPSK	Lowest	2402	-56.51	-20	Pass
	Highest	2480	-57.9	-20	Pass
8DSK	Lowest	2402	-57.74	-20	Pass
	Highest	2480	-57.98	-20	Pass
Hopping					
GFSK	Lowest	2402	-57.44	-20	Pass
	Highest	2480	-56.17	-20	Pass
Pi/4 DQPSK	Lowest	2402	-58.13	-20	Pass
	Highest	2480	-56.34	-20	Pass
8DSK	Lowest	2402	-57.17	-20	Pass
	Highest	2480	-56.18	-20	Pass

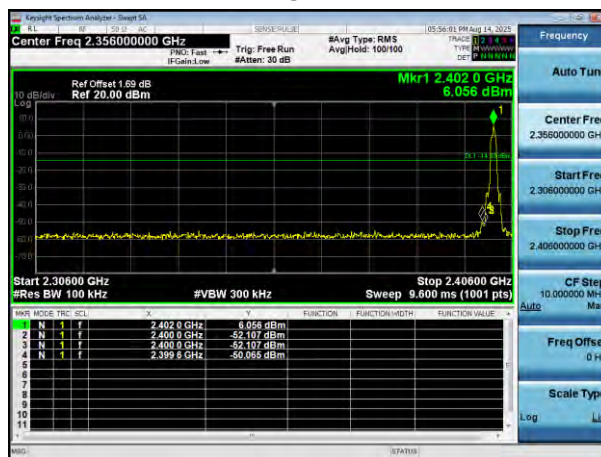
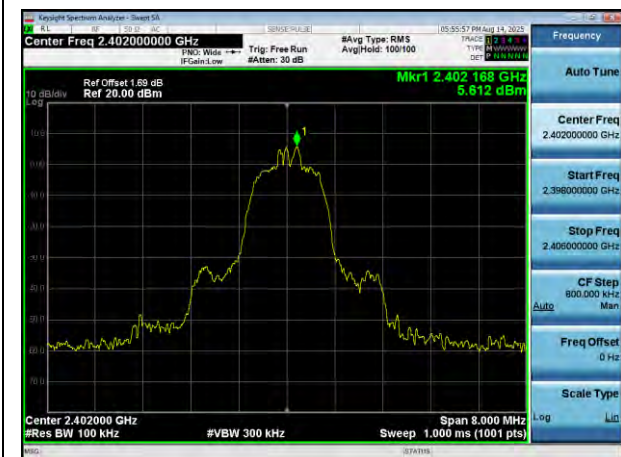
No-Hopping GFSK Lowest



Reference Power

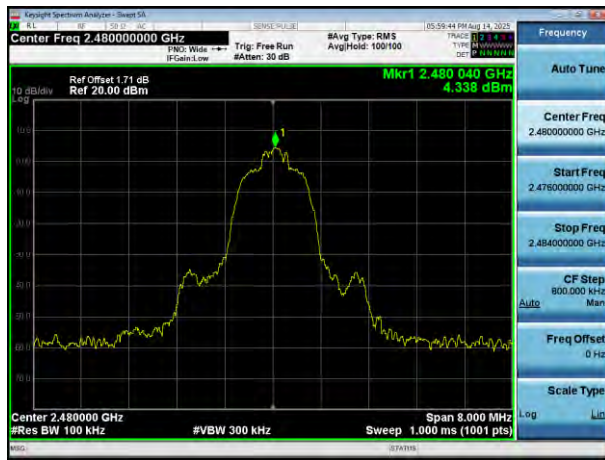


Reference Power

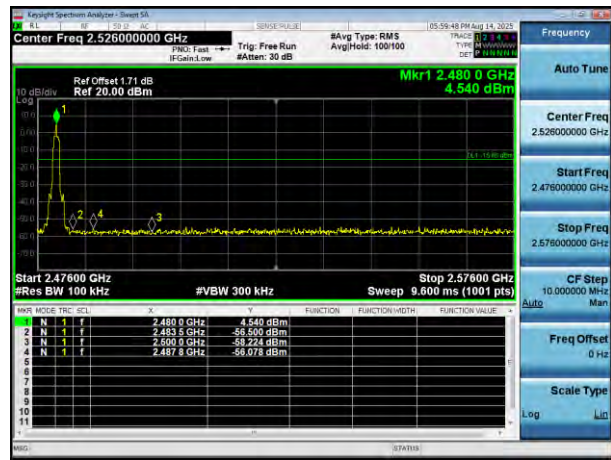


No-Hopping Pi/4 DQPSK Highest

Reference Power

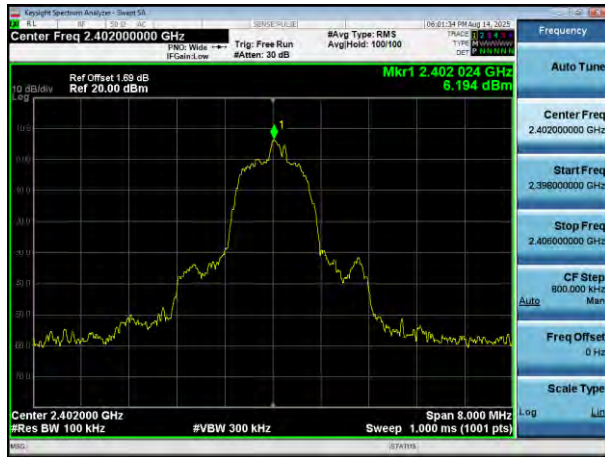


Band-edge Emission

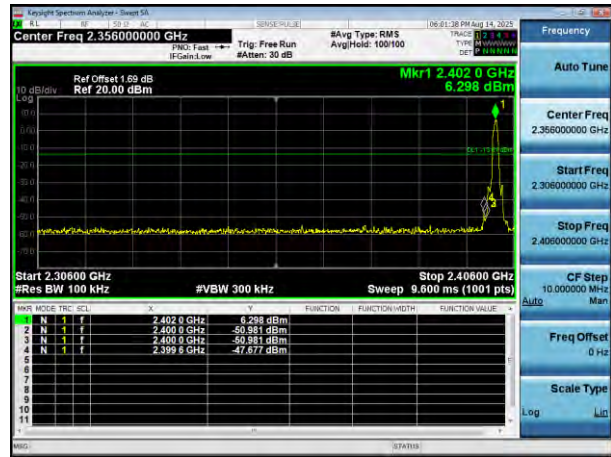


No-Hopping 8DPSK Lowest

Reference Power

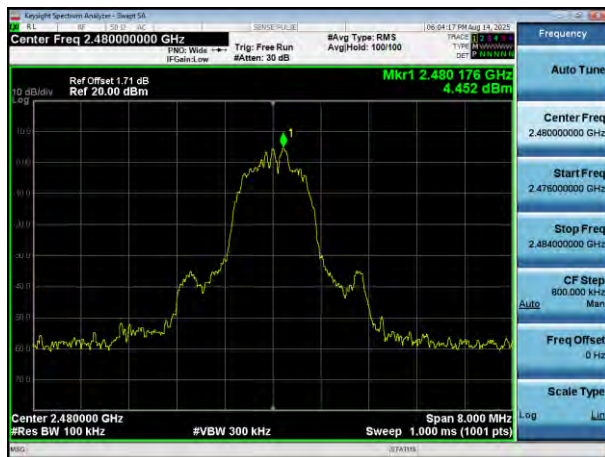


Band-edge Emission

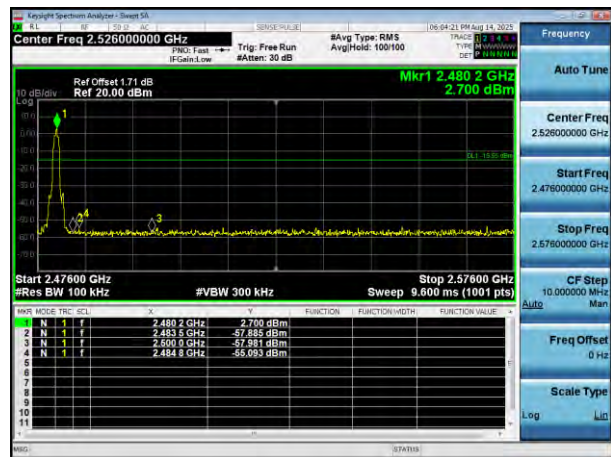


No-Hopping 8DPSK Highest

Reference Power

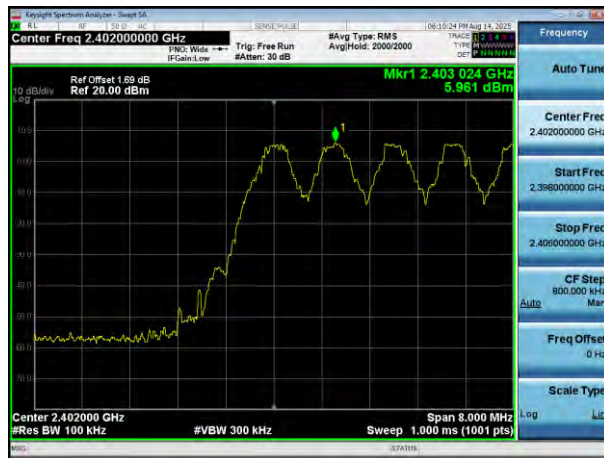


Band-edge Emission

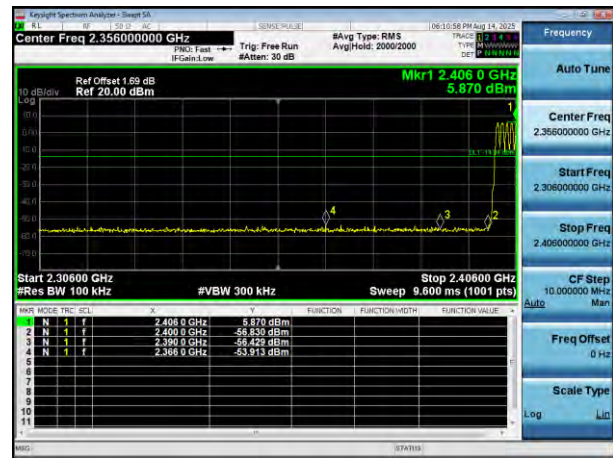


Hopping GFSK Lowest

Reference Power



Band-edge Emission

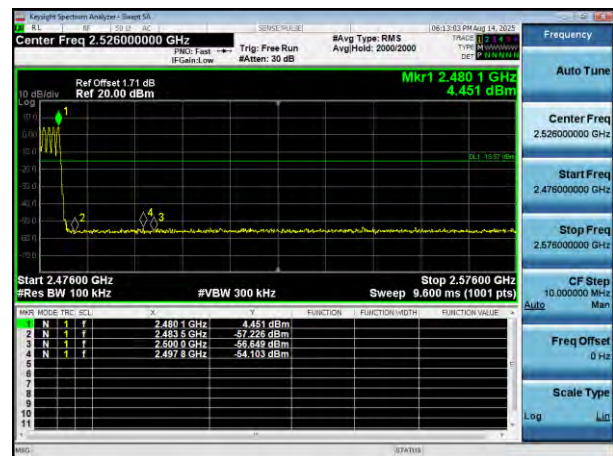


Hopping GFSK Highest

Reference Power

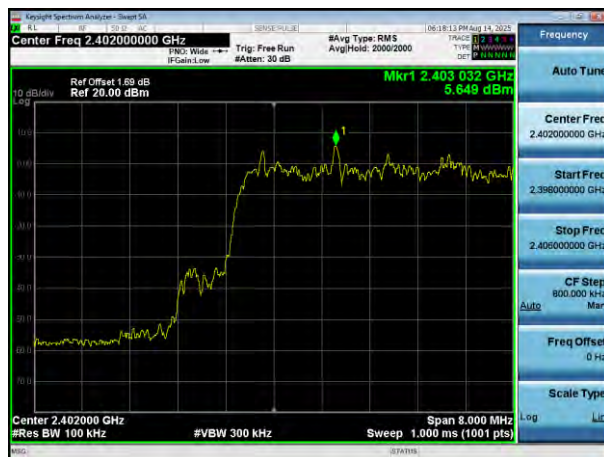


Band-edge Emission

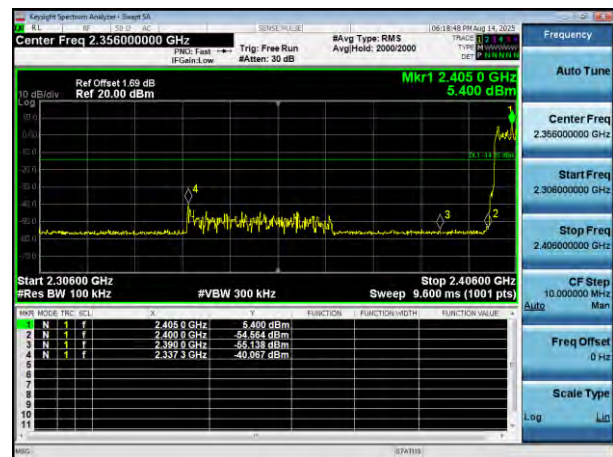


Hopping Pi/4 DQPSK Lowest

Reference Power



Band-edge Emission

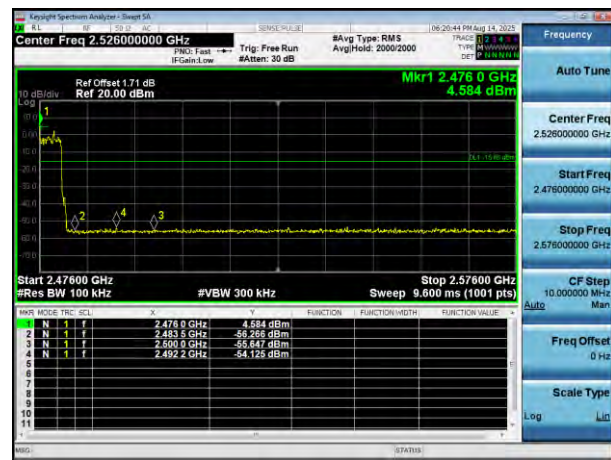


Hopping Pi/4 DQPSK Highest

Reference Power

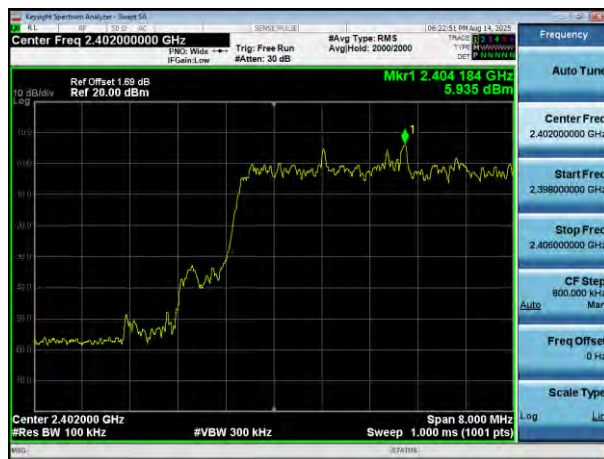


Band-edge Emission

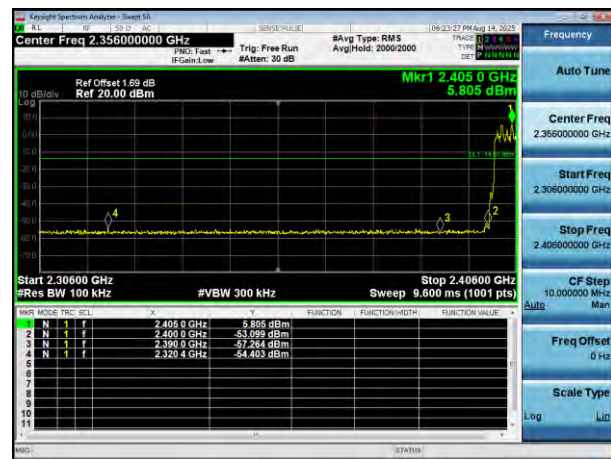


Hopping 8DPSK Lowest

Reference Power

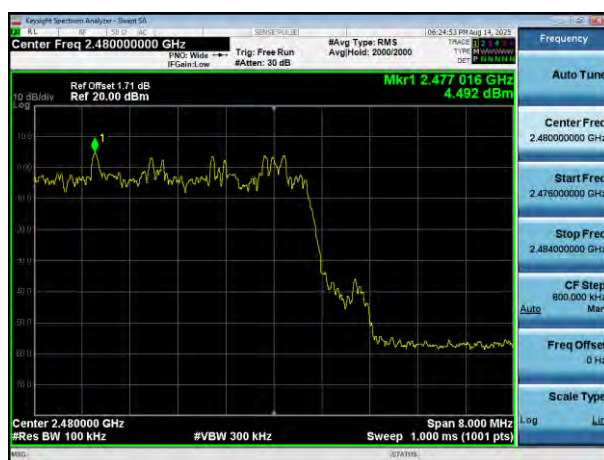


Band-edge Emission

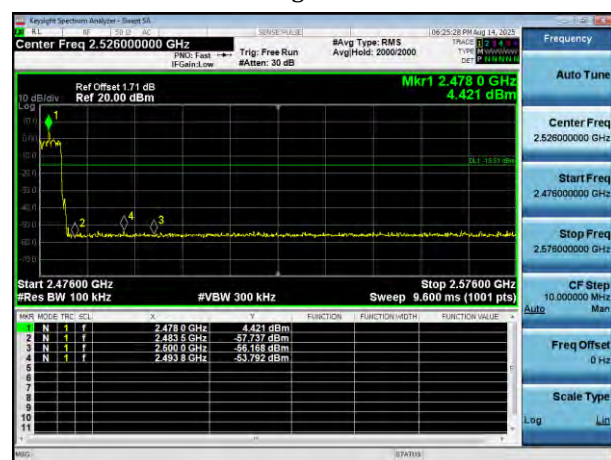


Hopping 8DPSK Highest

Reference Power



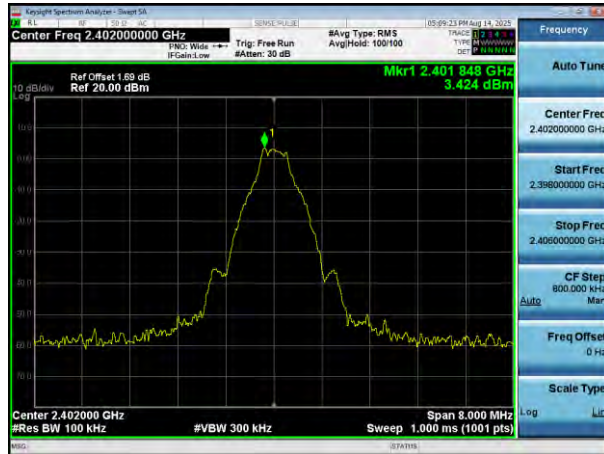
Band-edge Emission



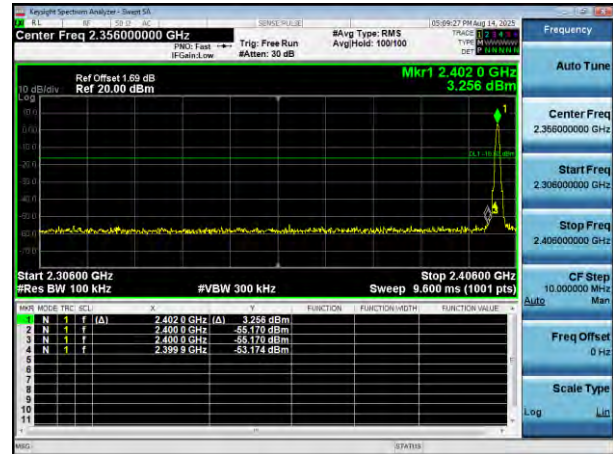
Right earphone:

No-Hopping GFSK Lowest

Reference Power

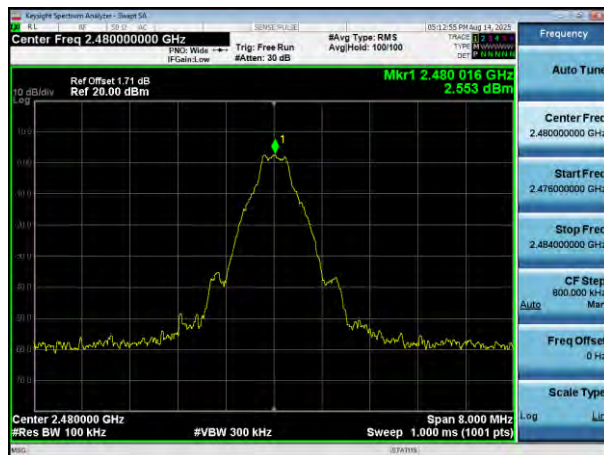


Band-edge Emission

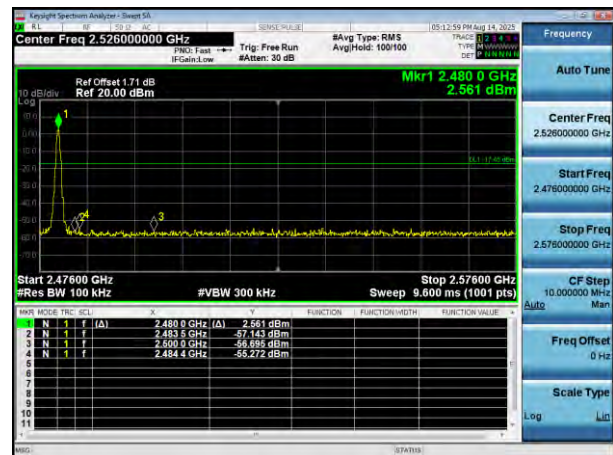


No-Hopping GFSK Highest

Reference Power

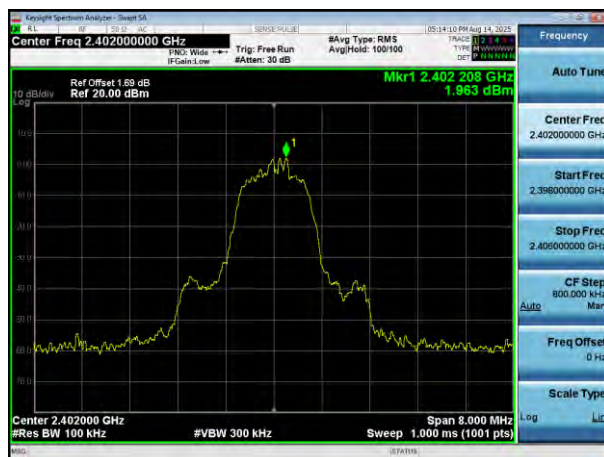


Band-edge Emission

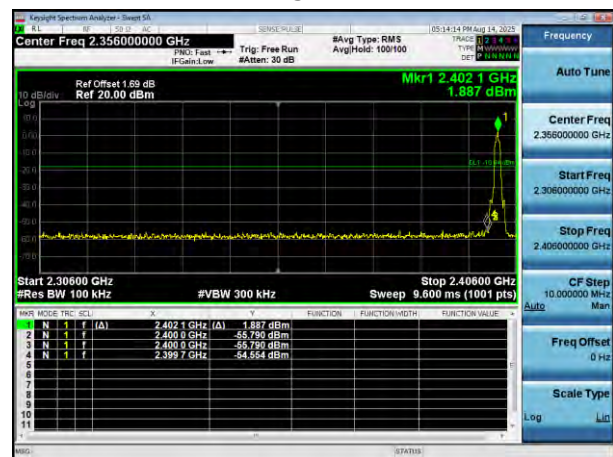


No-Hopping Pi/4 DQPSK Lowest

Reference Power



Band-edge Emission

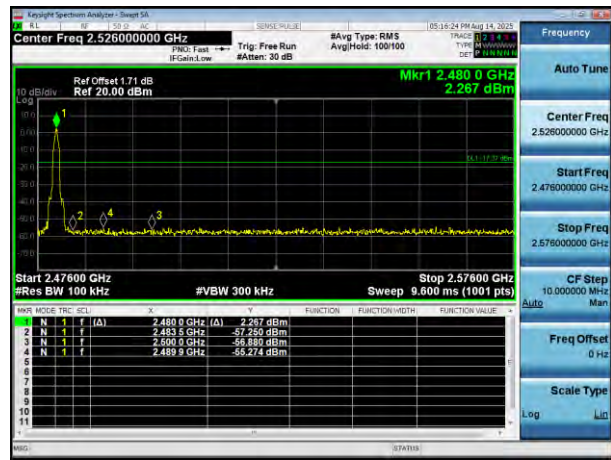


No-Hopping Pi/4 DQPSK Highest

Reference Power

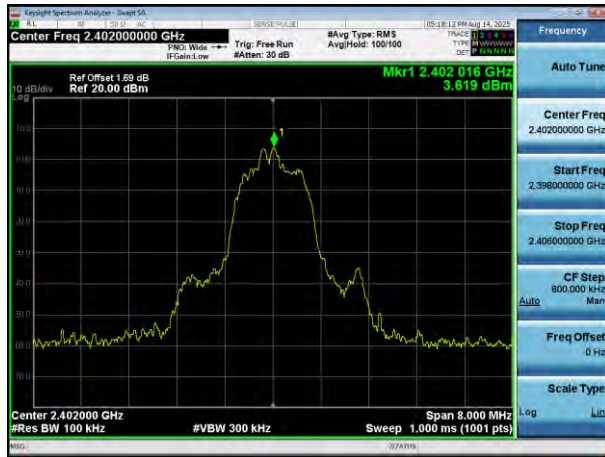


Band-edge Emission

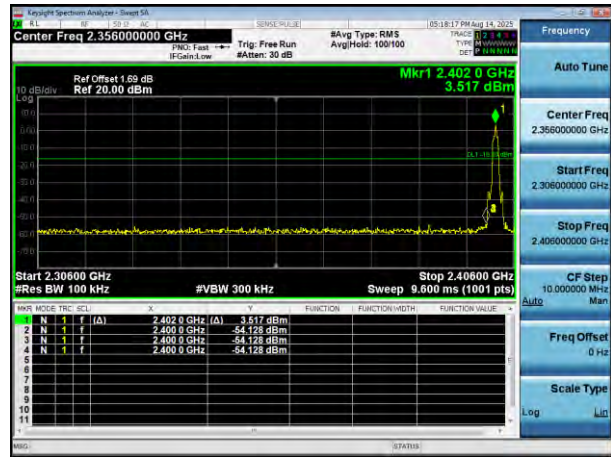


No-Hopping 8DPSK Lowest

Reference Power

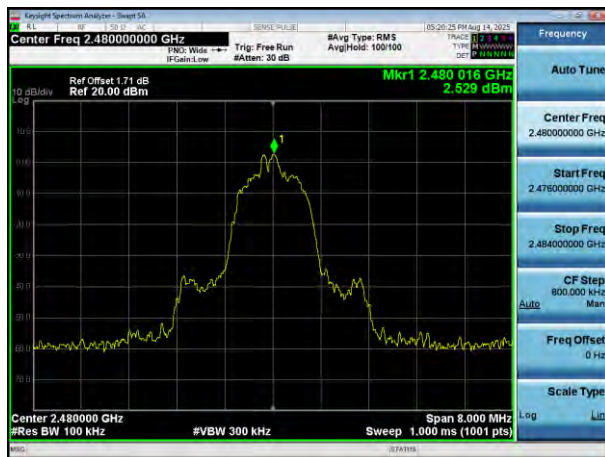


Band-edge Emission

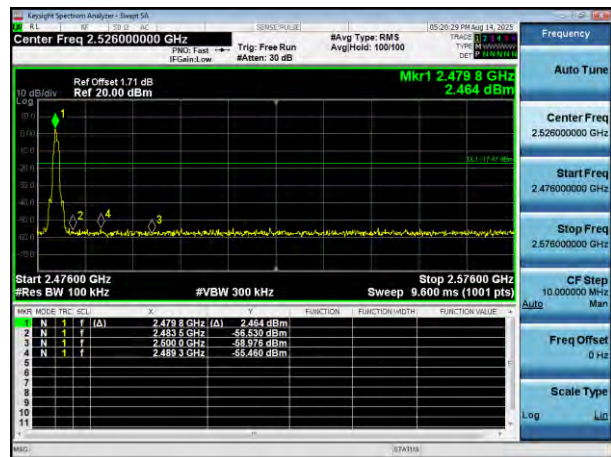


No-Hopping 8DPSK Highest

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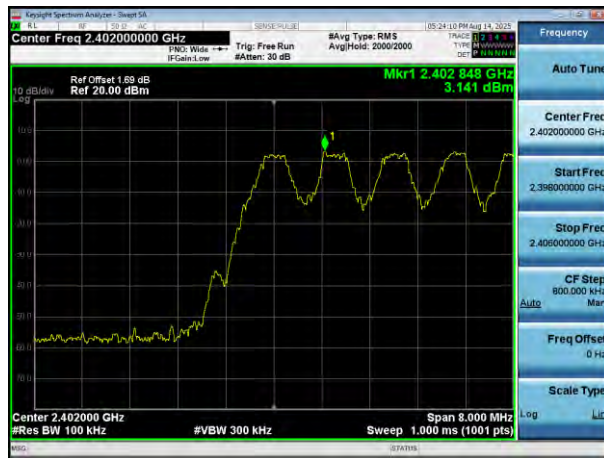


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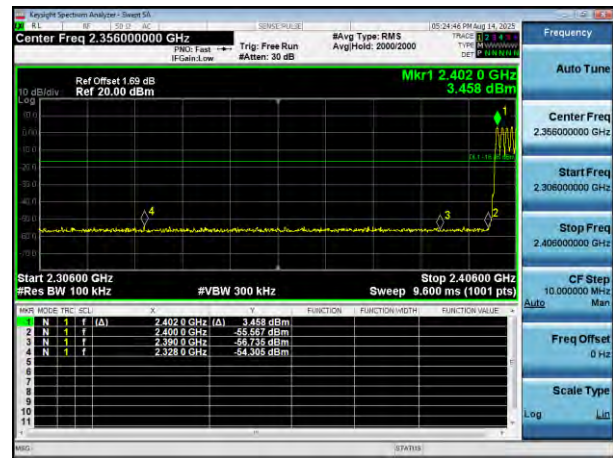


Hopping GFSK Lowest

Reference Power

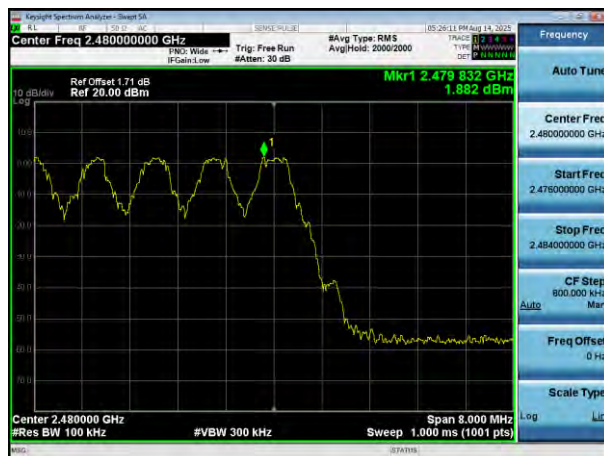


Band-edge Emission

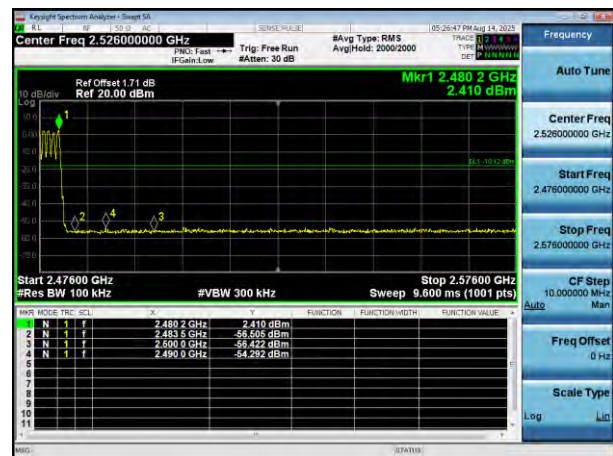


Hopping GFSK Highest

Reference Power

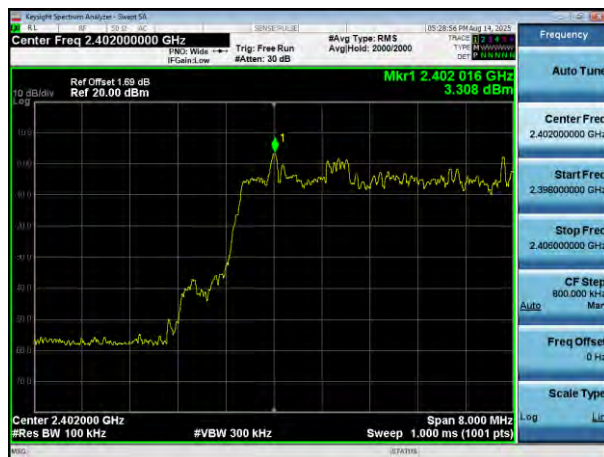


Band-edge Emission

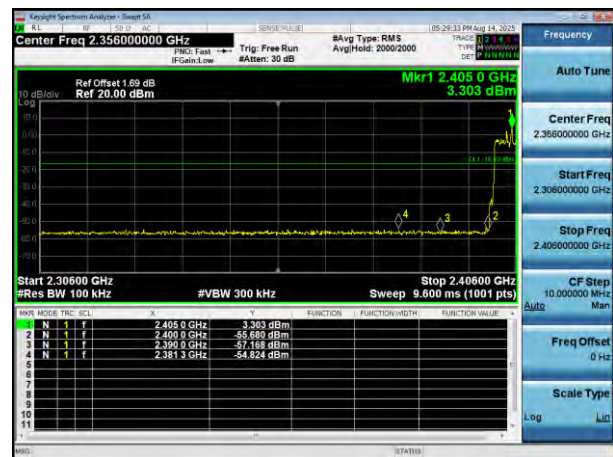


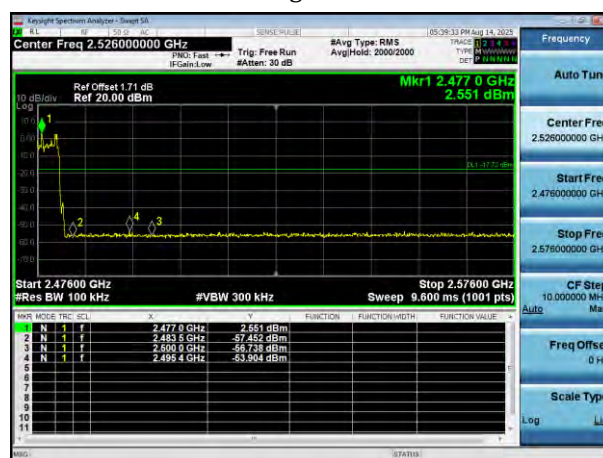
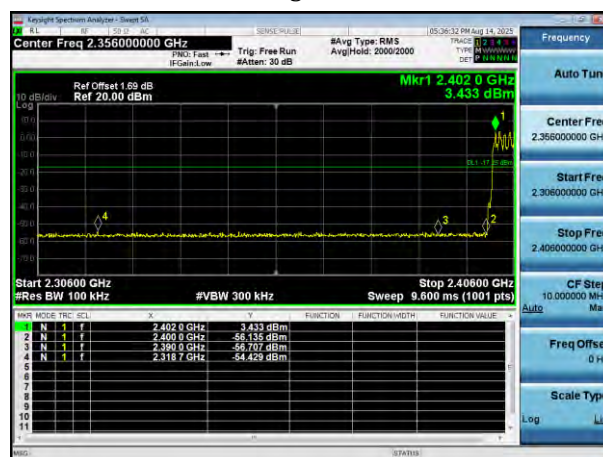
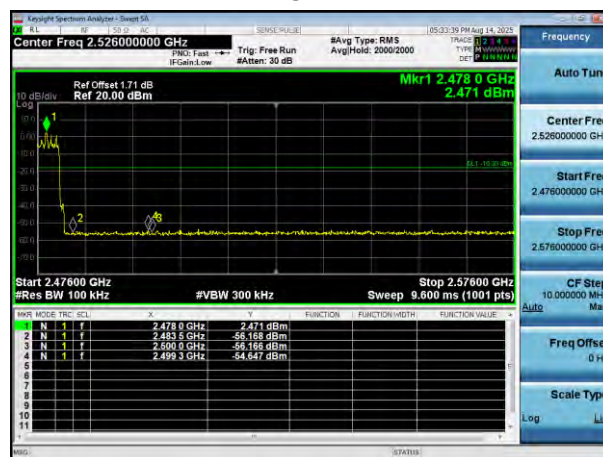
Hopping Pi/4 DQPSK Lowest

Reference Power



Band-edge Emission





14. Conducted RF Spurious Emissions

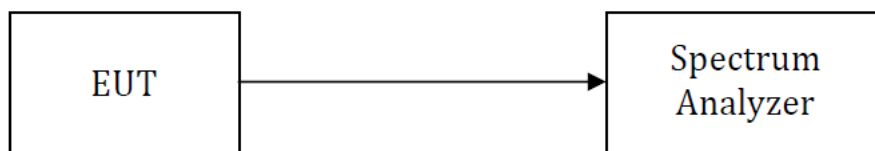
14.1 Standard and Limit

According to §15.247(d), In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in § 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in § 15.205(a), must also comply with the radiated emission limits specified in § 15.209(a) (see § 15.205(c)).

14.2 Test Procedure

Test is conducting under the description of ANSI C63.10 - 2013 section 6.7.

- 1) Remove the antenna from the EUT and connect to the spectrum analyzer via a low loss RF cable.
- 2) Set the spectrum analyzer to any one measured frequency within its operating range.
- 3) Set RBW = 100kHz, VBW = 300kHz, Sweep = Auto, Detector = Peak.
- 4) Measure the highest amplitude appearing on spectral display and set it as a reference level.
- 5) Measure the spurious emissions with frequency range from 9kHz to 26.5GHz.
- 6) Repeat above procedures until all measured frequencies were complete.



Test Setup Block Diagram

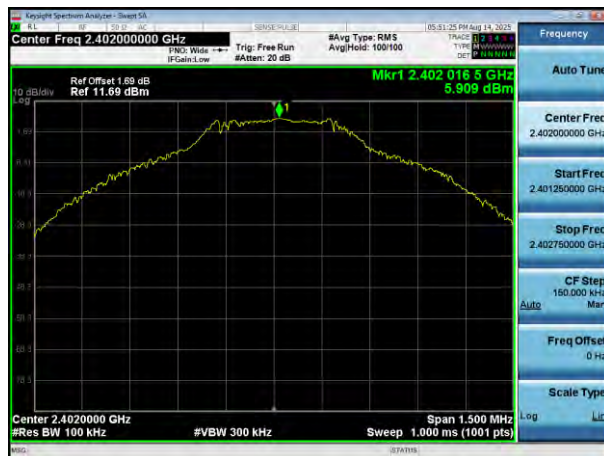
14.3 Test Data and Results

Note: The measurement frequency range is from 9kHz to the 10th harmonic of the fundamental frequency. The lowest, middle and highest channels are tested to verify the spurious emissions measurement data.

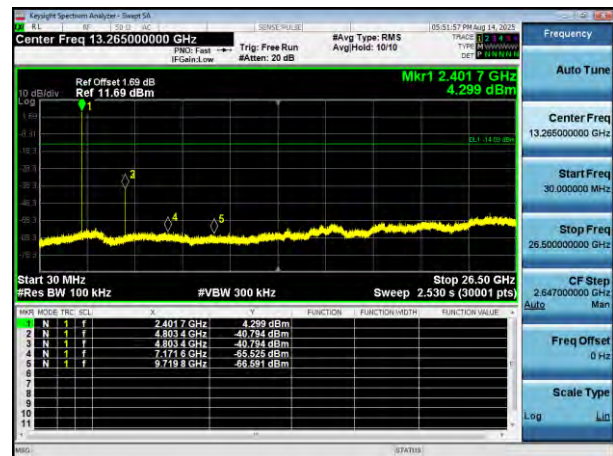
Left earphone:

GFSK Lowest

Reference Power



Spurious Emissions

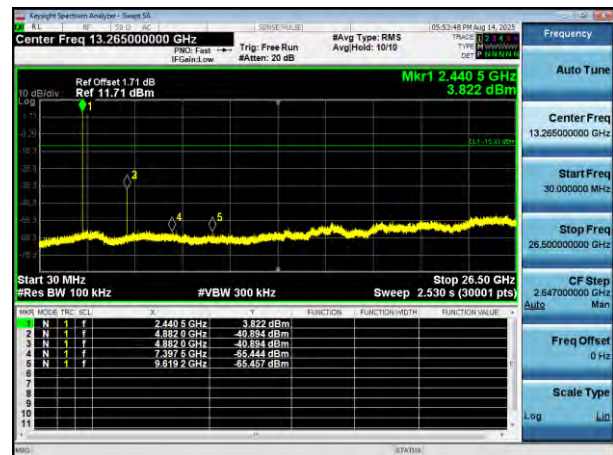


GFSK Middle

Reference Power



Spurious Emissions

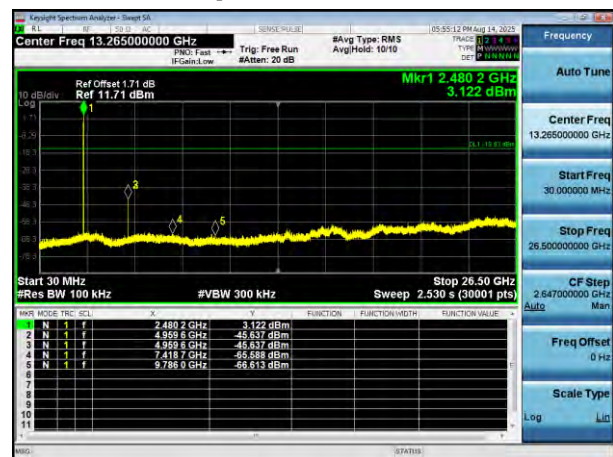


GFSK Highest

Reference Power



Spurious Emissions

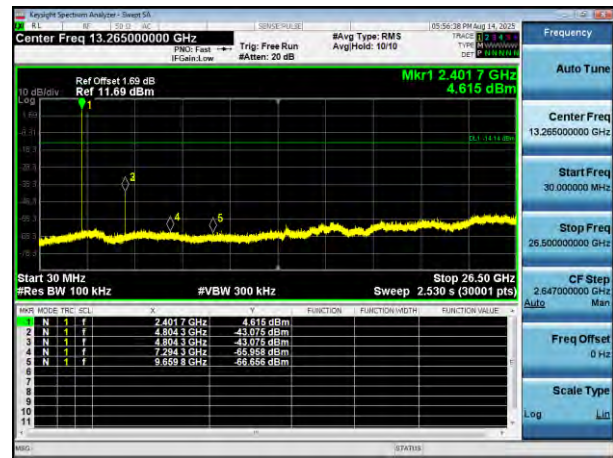


Pi/4 DQPSK Lowest

Reference Power

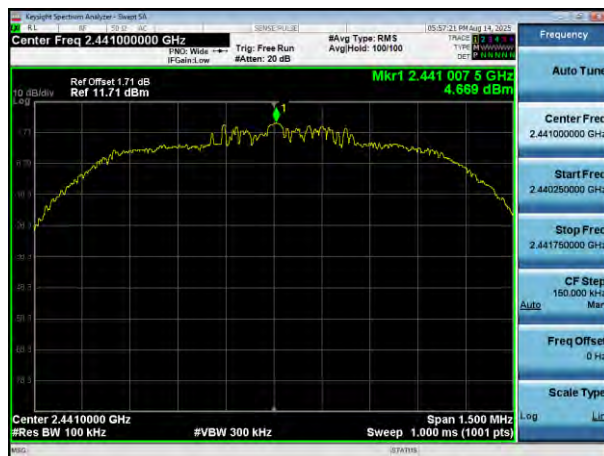


Spurious Emissions

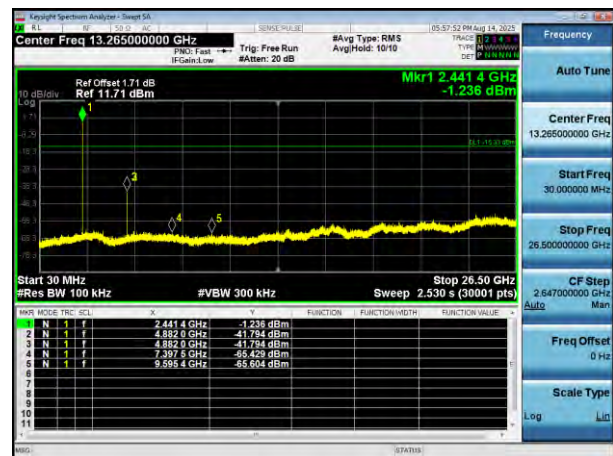


Pi/4 DQPSK Middle

Reference Power



Spurious Emissions

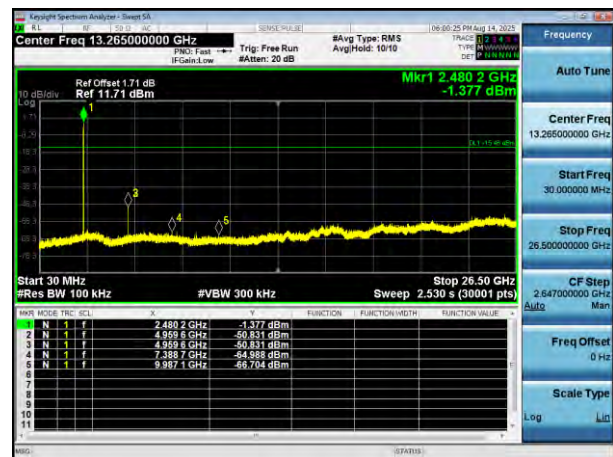


Pi/4 DQPSK Highest

Reference Power

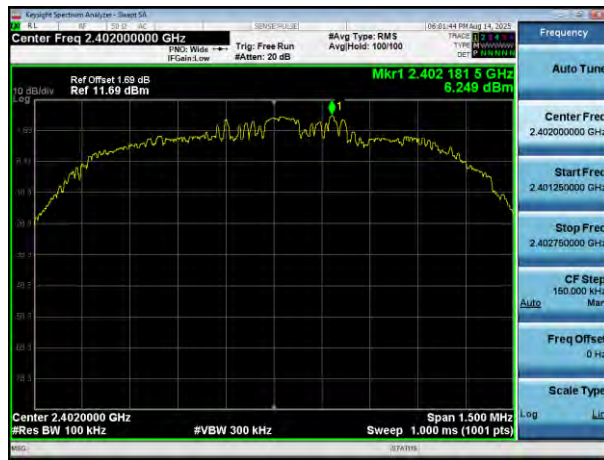


Spurious Emissions

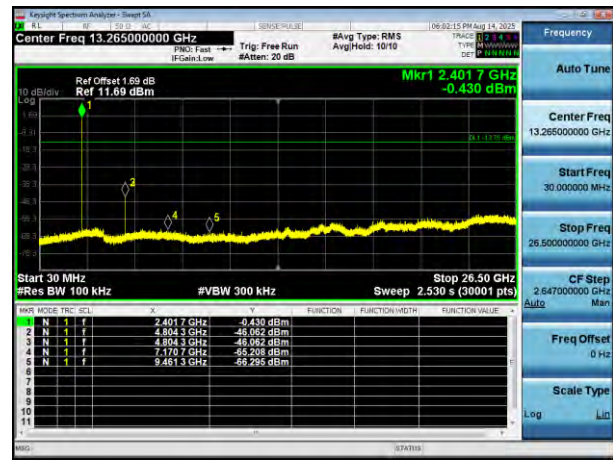


8DPSK Lowest

Reference Power



Spurious Emissions

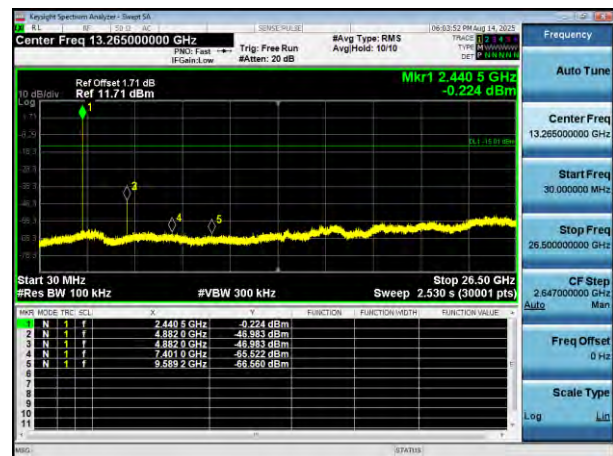


8DPSK Middle

Reference Power



Spurious Emissions

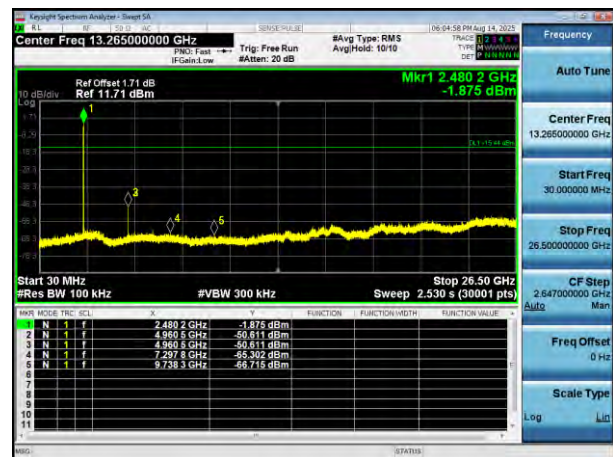


8DPSK Highest

Reference Power



Spurious Emissions



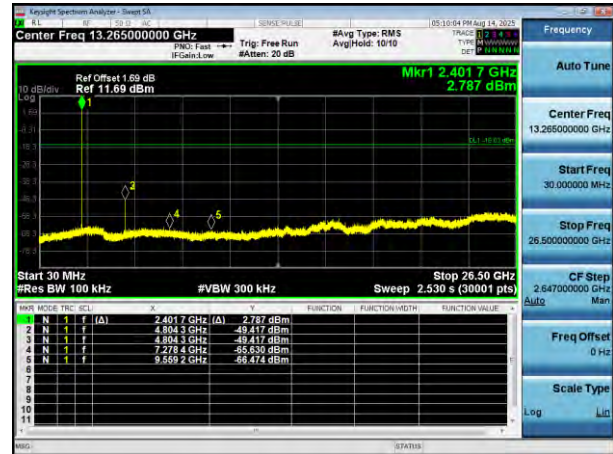
Right earphone:

GFSK Lowest

Reference Power



Spurious Emissions

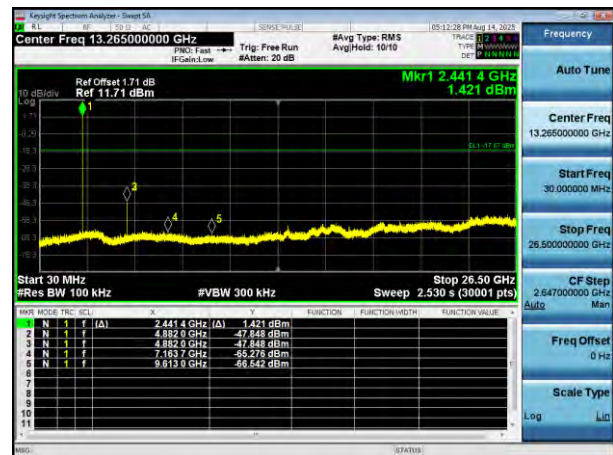


GFSK Middle

Reference Power



Spurious Emissions

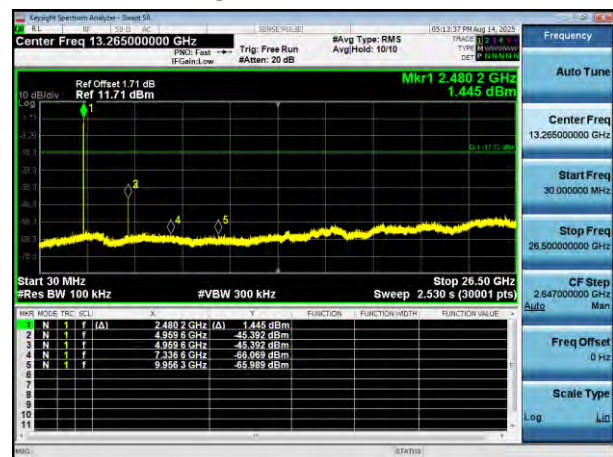


GFSK Highest

Reference Power



Spurious Emissions

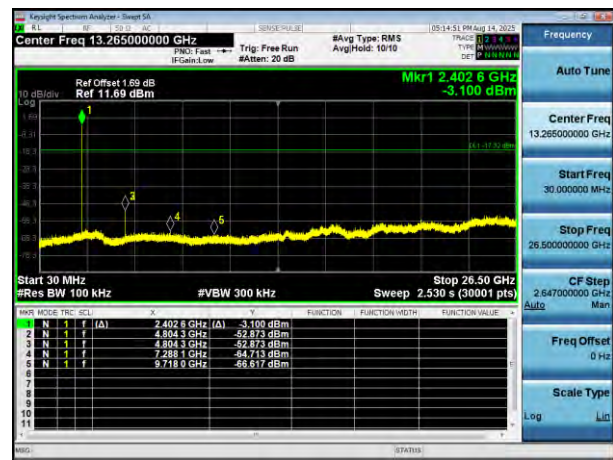


Pi/4 DQPSK Lowest

Reference Power



Spurious Emissions

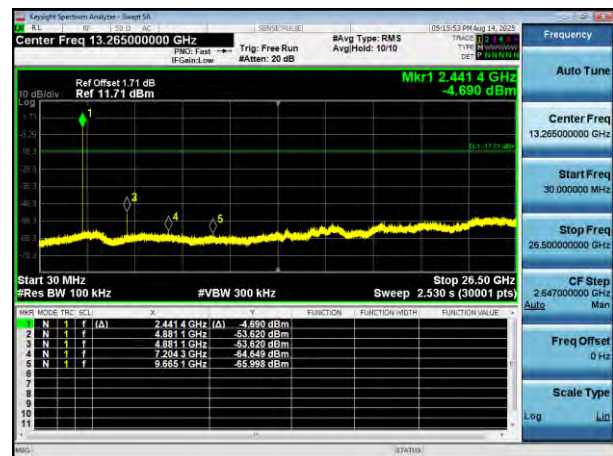


Pi/4 DQPSK Middle

Reference Power



Spurious Emissions

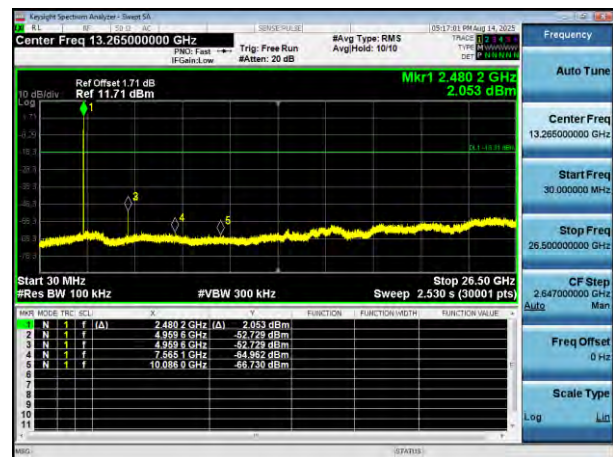


Pi/4 DQPSK Highest

Reference Power



Spurious Emissions

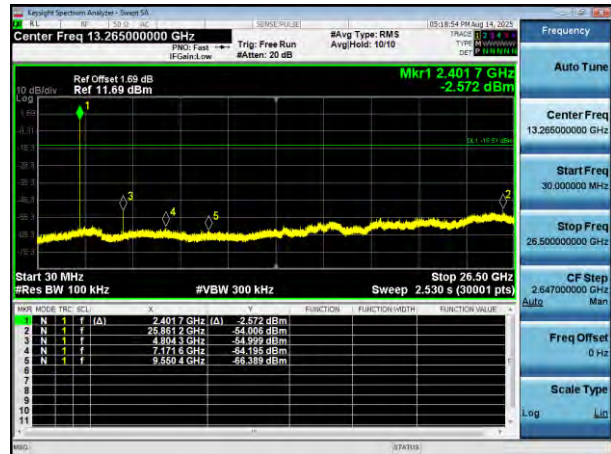


8DPSK Lowest

Reference Power



Spurious Emissions

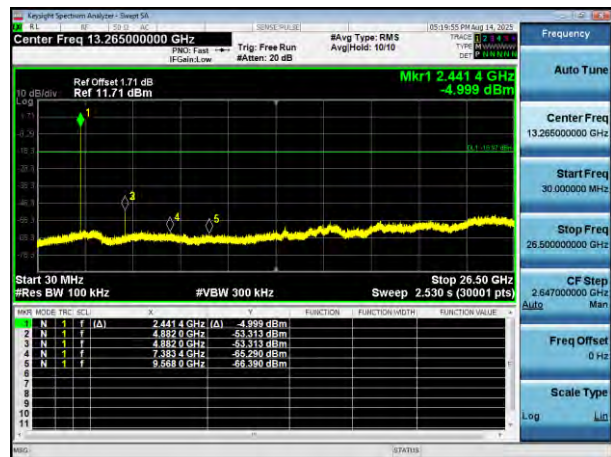


8DPSK Middle

Reference Power

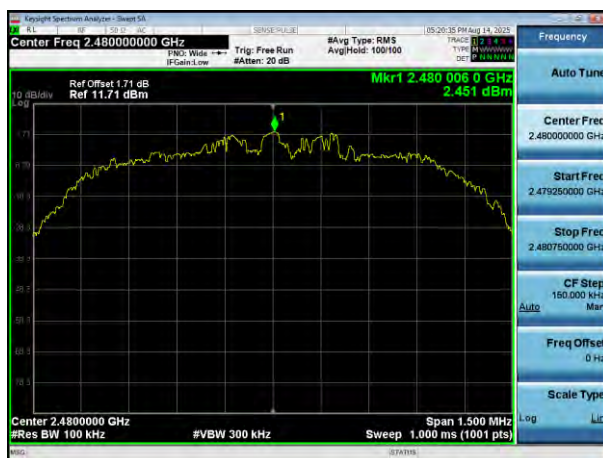


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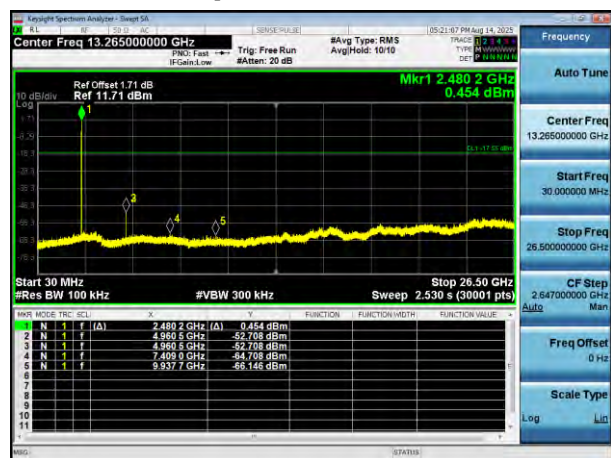


8DPSK Highest

Reference Power



Spurious Emissions



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