5.7 Time of Occupancy (Dwell Time)

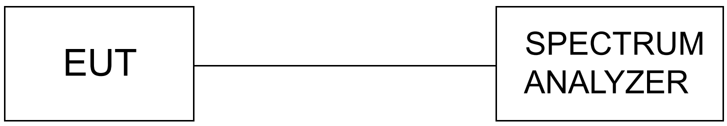
Limit

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

Test Procedure

The transmitter output was connected to the spectrum analyzer through an attenuator. Set center frequency of spectrum analyzer=operating frequency with 1MHz RBW and 1MHz VBW, Span 0Hz.

Test Configuration

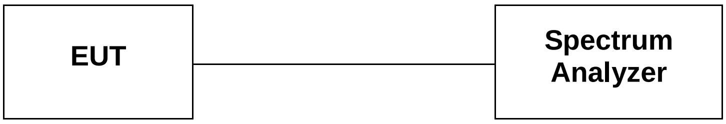


Test Results

See Appendix V

5.8 Spurious RF Conducted Emission

TEST CONFIGURATION



TEST PROCEDURE

The Spurious RF conducted emissions compliance of RF radiated emission should be measured by following the guidance in ANSI C63.10-2013 with respect to maximizing the emission by rotating the EUT, measuring the emission while the EUT is situated in three orthogonal planes (if appropriate), adjusting the measurement antenna height and polarization etc. Set RBW=100kHz and VBW= 300KHz to measure the peak field strength , and mwasure frequeny range from 9KHz to 25GHz.

LIMIT

1. Below -20dB of the highest emission level in operating band.
2. Fall in the restricted bands listed in section 15.205. The maximum permitted average field strength is listed in section 15.209.

Test Results

See Appendix IV

5.9 Pseudorandom Frequency Hopping Sequence

TEST APPLICABLE

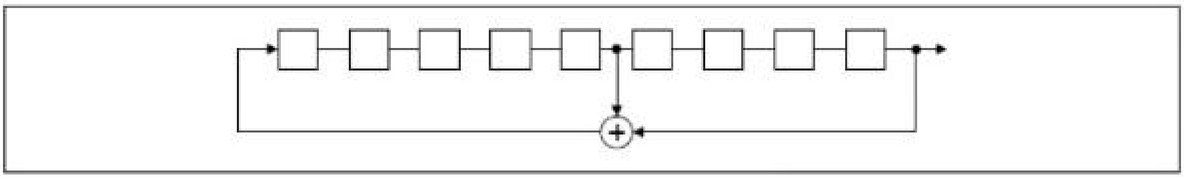
For 47 CFR Part 15C section 15.247 (a) (1) requirement:

Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hop-ping channel, whichever is greater. Alternatively, frequency hopping systems operating in the 2400–2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW. The system shall hop to channel frequencies that are selected at the system hopping rate from a pseudo randomly ordered list of hopping frequencies. Each frequency must be used equally on the average by each transmitter. The system receivers shall have input bandwidths that match the hop-ping channel bandwidths of their corresponding transmitters and shall shift frequencies in synchronization with the transmitted signals.

EUT Pseudorandom Frequency Hopping Sequence Requirement

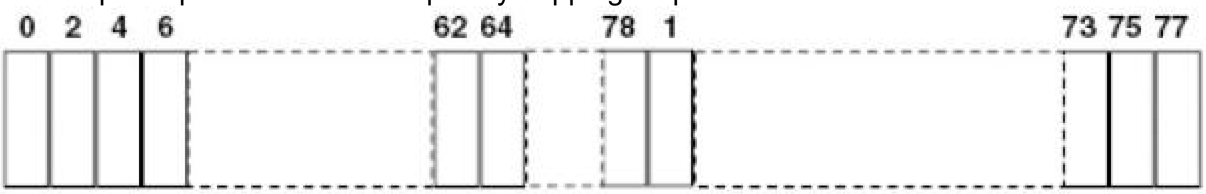
The pseudorandom frequency hopping sequence may be generated in a nice-stage shift register whose 5th and 9th stage outputs are added in a modulo-two addition stage. And the result is fed back to the input of the first stage. The sequence begins with the first one of 9 consecutive ones, for example: the shift register is initialized with nine ones.

- Number of shift register stages:9
- Length of pseudo-random sequence:29-1=511 bits
- Longest sequence of zeros:8(non-inverted signal)



Linear Feedback Shift Register for Generation of the PRBS sequence

An example of pseudorandom frequency hopping sequence as follows:



Each frequency used equally one the average by each transmitter.

The system receiver have input bandwidths that match the hopping channel bandwidths of their corresponding transmitter and shift frequencies in synchronization with the transmitted signals.

5.10 Antenna Requirement

Standard Applicable

For intentional device, according to FCC 47 CFR 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.

And according to FCC 47 CFR Section 15.247 (c), if transmitting antennas of directional gain greater than 6dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

Refer to statement below for compliance

The manufacturer may design the unit so that the user can replace a broken antenna, but the use of a standard antenna jack or electrical connector is prohibited. Further, this requirement does not apply to intentional radiators that must be professionally installed.

Antenna Connected Construction

The directional gains of antenna used for transmitting is 4.54dBi, and the antenna is a FPC Antenna connect to PCB board and no consideration of replacement. Please see EUT photo for details.

Results: Compliance.

6 Test Setup Photos of the EUT

(HK5910(second display: 15.6 inch))
CE TEST SETUP

(Adapter:FSP060-DAAN3)

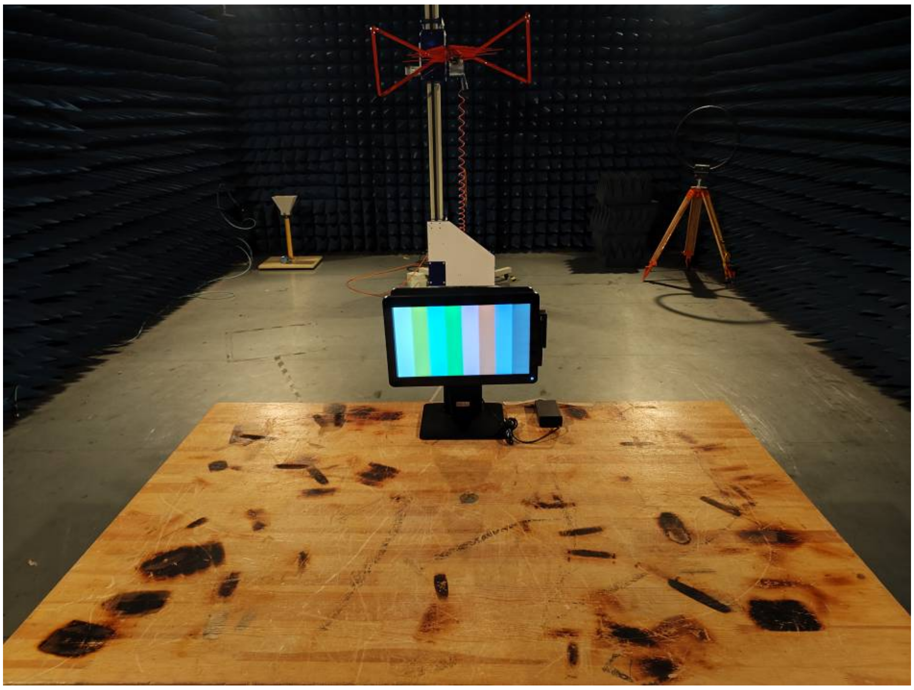
CE TEST SETUP

(Adapter:GM60-240250-F)

CE TEST SETUP

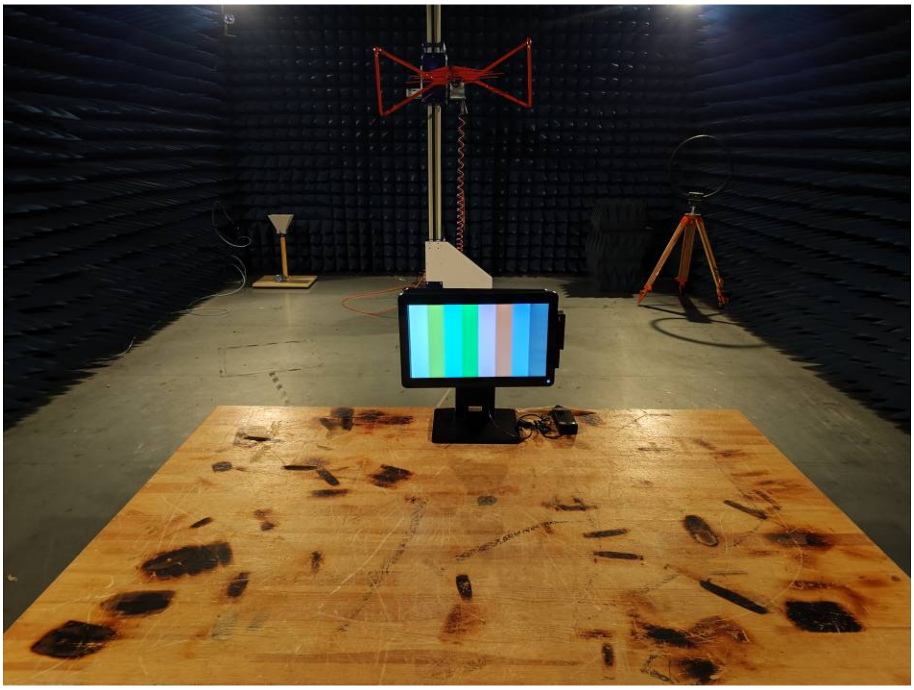
(Adapter:FSP120-AAAN3)

RE TEST SETUP



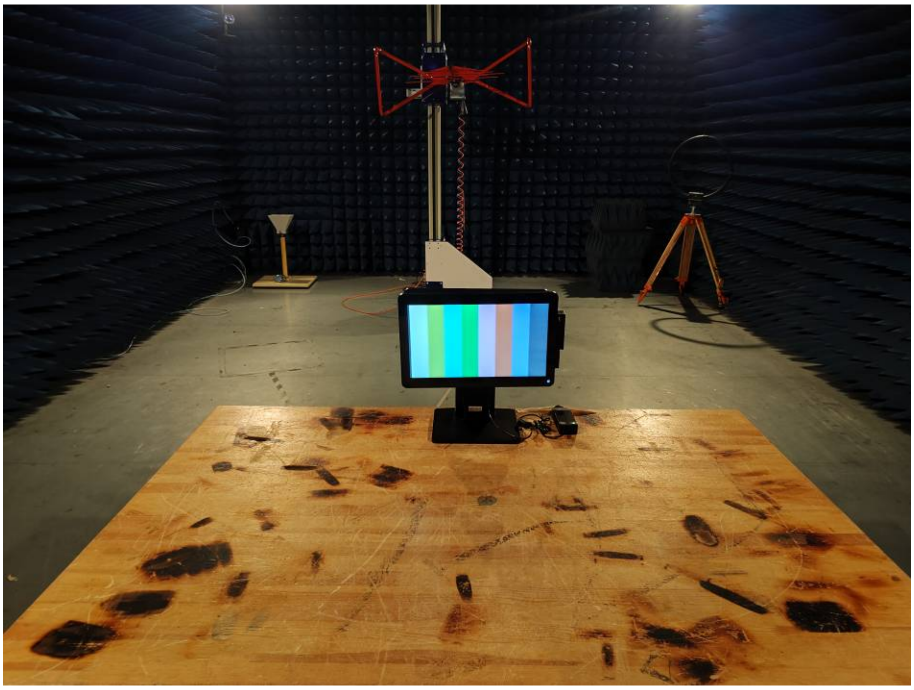
(Adapter:FSP060-DAAN3)

RE TEST SETUP



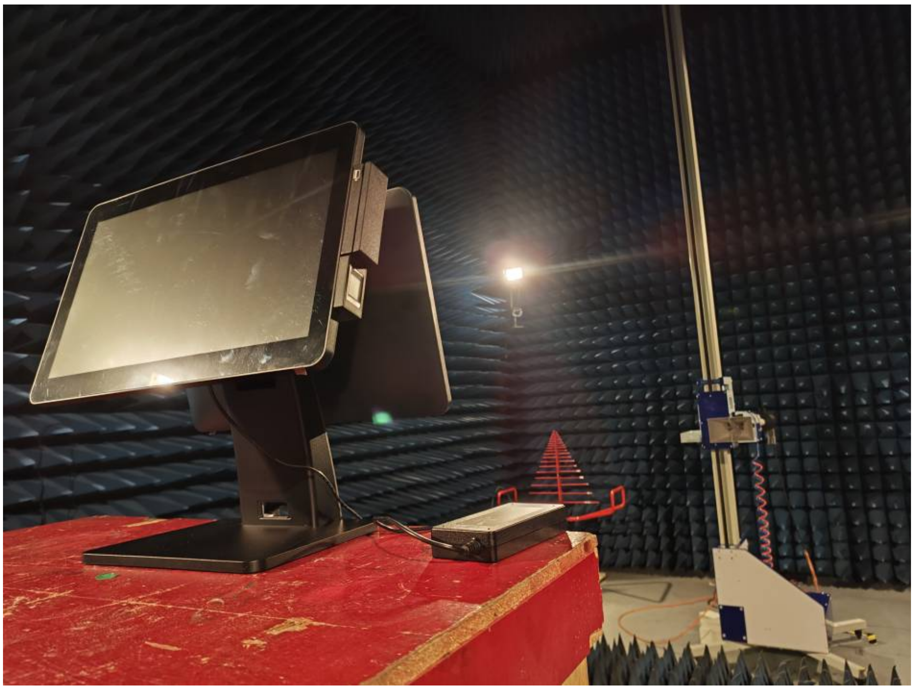
(Adapter:GM60-240250-F)

RE TEST SETUP



(Adapter:FSP120-AAAN3)

RE TEST SETUP



(HK316K(second display: 10.1 inch))

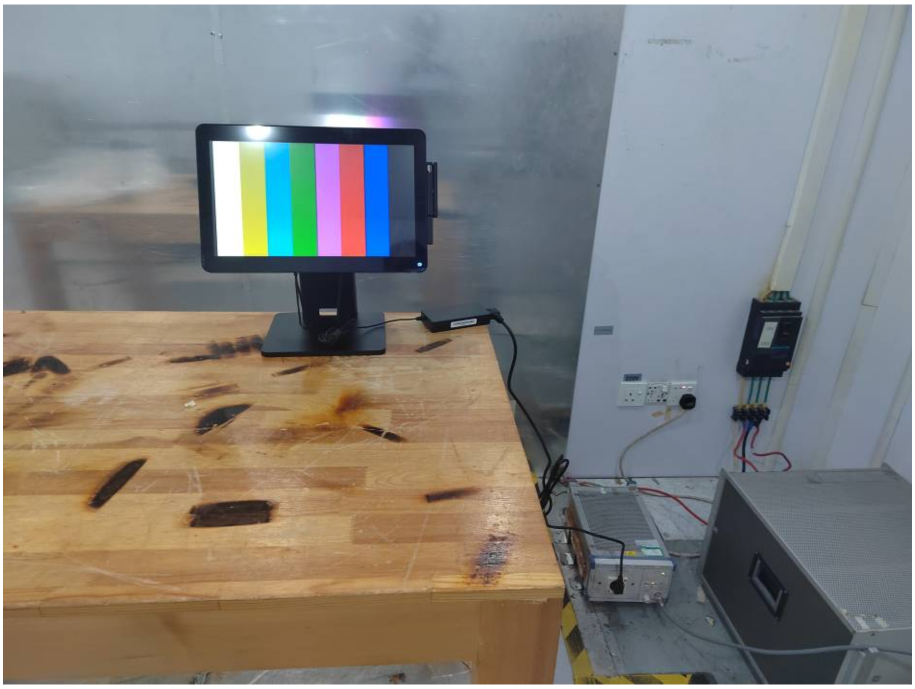
CE TEST SETUP

(Adapter:FSP060-DAAN3)

CE TEST SETUP

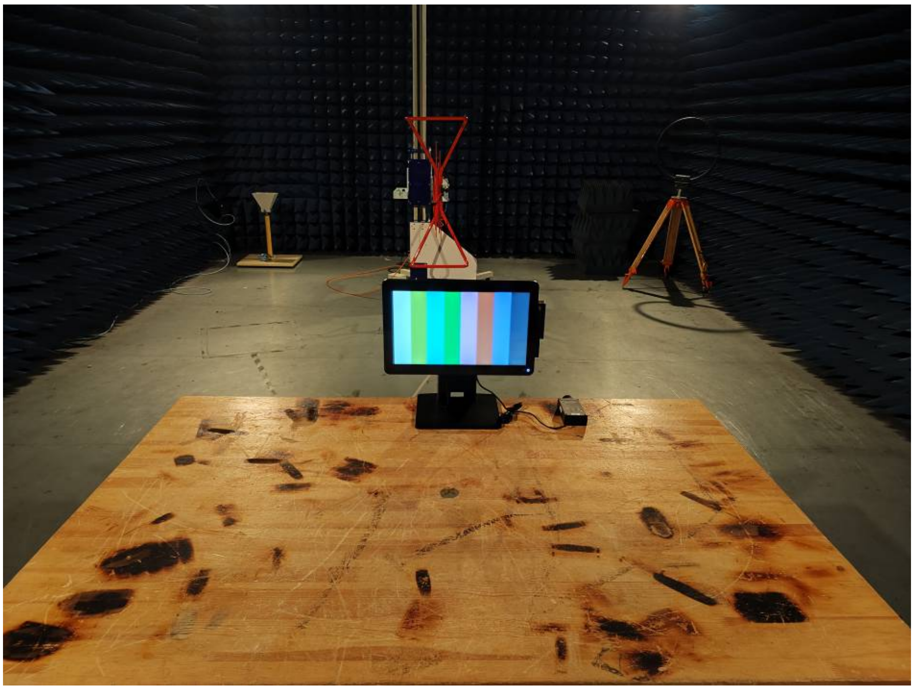
(Adapter:GM60-240250-F)

CE TEST SETUP



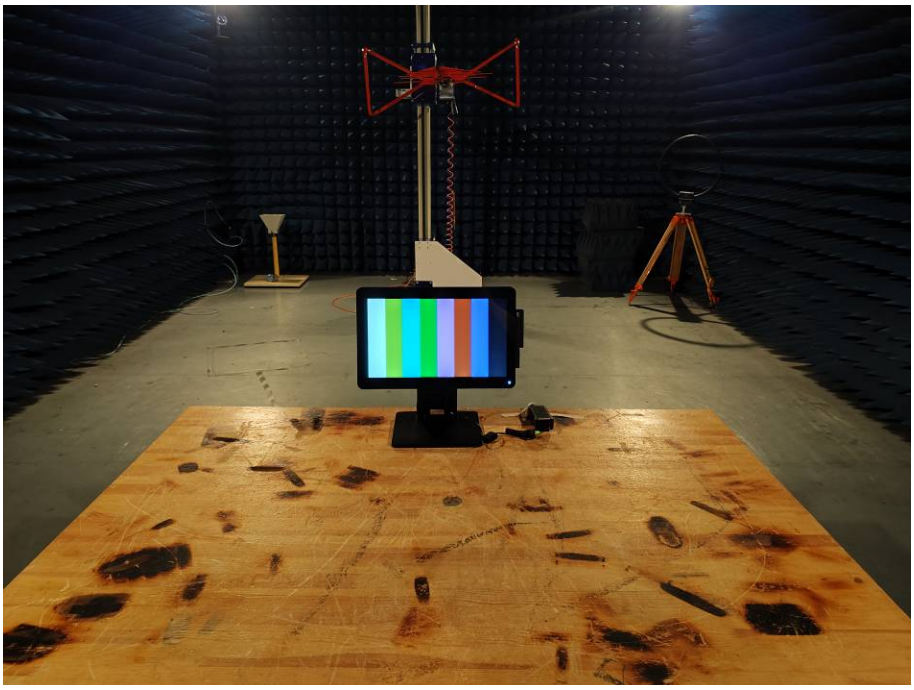
(Adapter:FSP120-AAAN3)

RE TEST SETUP



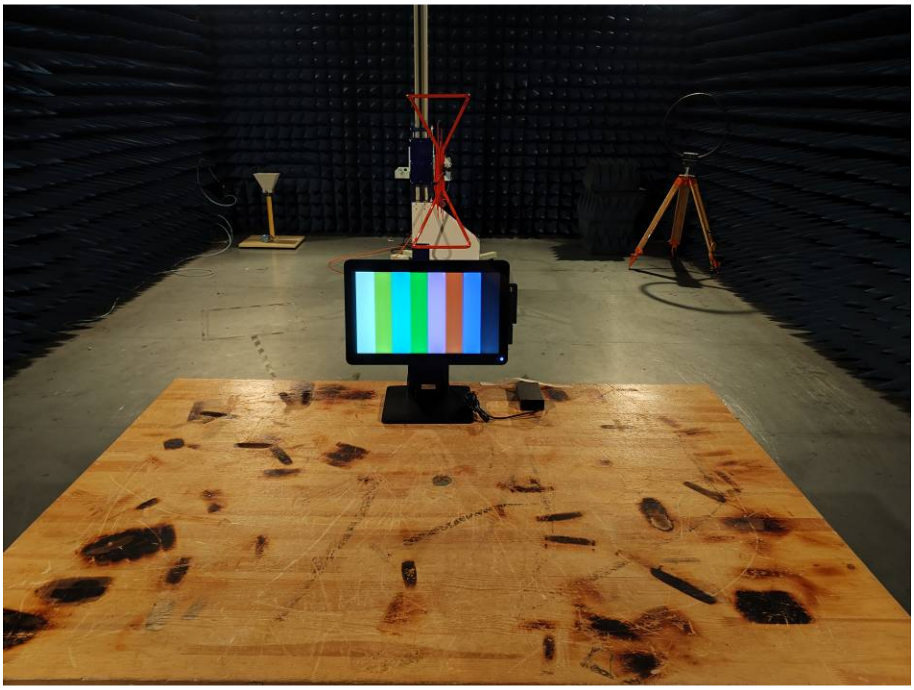
(Adapter:FSP060-DAAN3)

RE TEST SETUP



(Adapter:GM60-240250-F)

RE TEST SETUP



(Adapter:FSP120-AAAN3)

RE TEST SETUP

7 Photos of the EUT

See photo report

APPENDIX I. Conducted Peak Output Power

Test Result

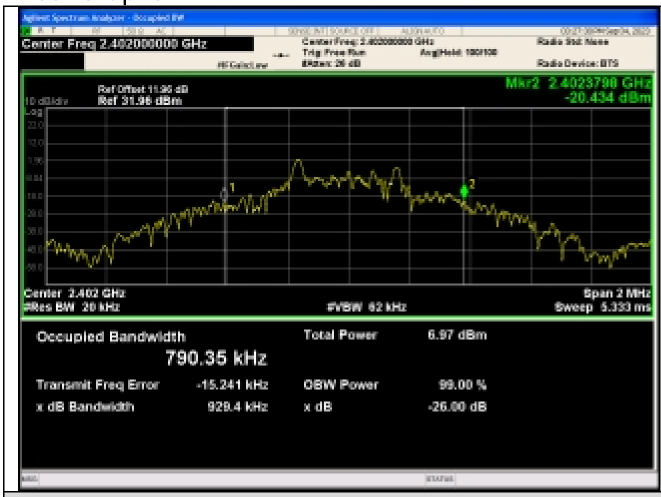
Modulation	Packet Type	Channel	Peak Output Power (dBm)	Peak Output Power (mW)	Max. Avg. Power (dBm)	Limit (dBm)	Result
GFSK	DH5	0	3.154	2.067	None	30	PASS
		39	0.807	1.204	None		PASS
		78	-5.323	0.294	None		PASS
π/4DQPSK	2-DH5	0	2.104	1.623	None	20.97	PASS
		39	-0.064	0.985	None		PASS
		78	-5.990	0.252	None		PASS
8DPSK	3-DH5	0	2.103	1.623	None		PASS
		39	-0.015	0.997	None		PASS
		78	-6.022	0.250	None		PASS

APPENDIX II. 99% Bandwidth

Test Result

Modulation	Channel	99% BW (MHz)
GFSK	0	0.79035
	39	0.82691
	78	0.88263
π/4DQPSK	0	1.0103
	39	1.0351
	78	1.0265
8DPSK	0	0.99398
	39	1.0143
	78	1.0324

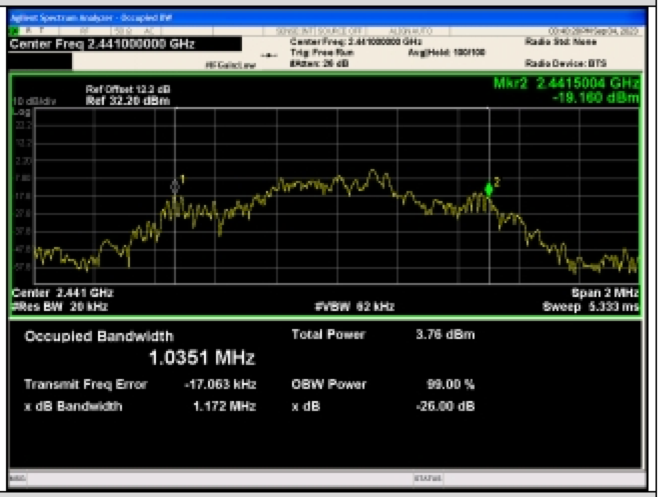
Test Graphs



GFSK_DH5_Channel 0

π/4DQPSK_2-DH5_Channel 0

GFSK_DH5_Channel 39



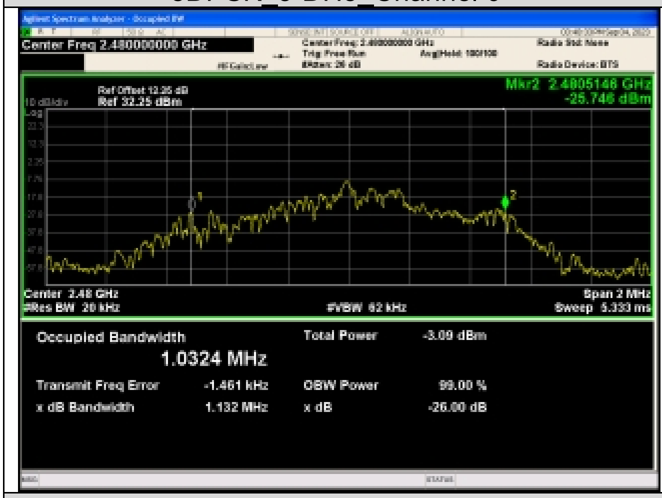
π/4DQPSK_2-DH5_Channel 39

GFSK_DH5_Channel 78

π/4DQPSK_2-DH5_Channel 78

8DPSK_3-DH5_Channel 0

8DPSK_3-DH5_Channel 39



8DPSK_3-DH5_Channel 78

Void

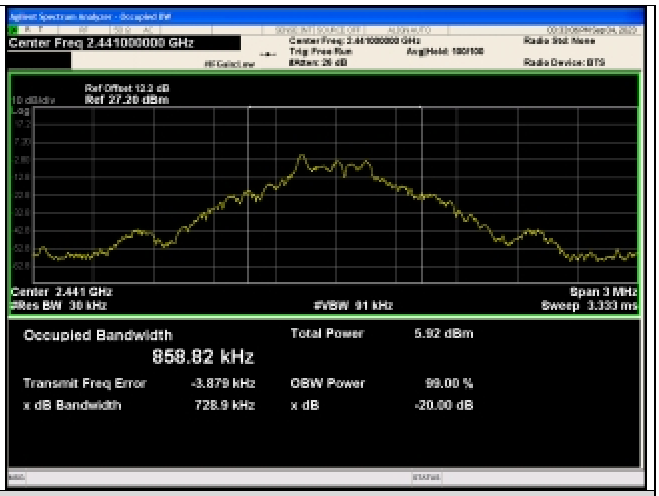
APPENDIX III. 20dB Bandwidth

Test Result

Modulation	Channel	Center Frequency (MHz)	20 dB Bandwidth (MHz)
GFSK	0	2402 MHz	0.8089
	39	2441 MHz	0.7289
	78	2480 MHz	0.8295
π/4DQPSK	0	2402 MHz	1.115
	39	2441 MHz	1.112
	78	2480 MHz	1.096
8DPSK	0	2402 MHz	1.124
	39	2441 MHz	1.104
	78	2480 MHz	1.126

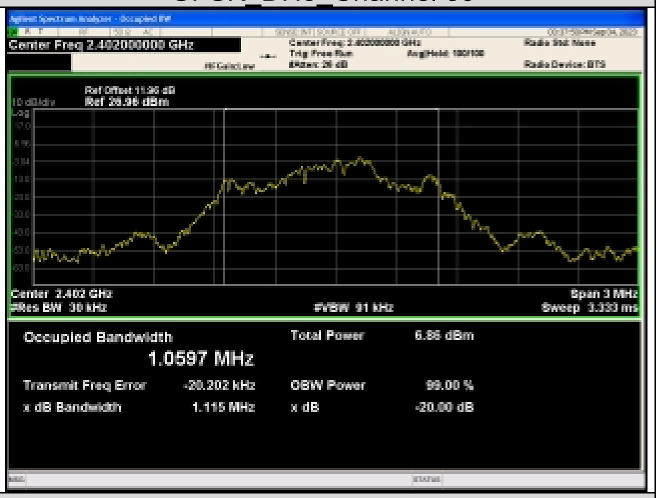
Test Graphs

GFSK_DH5_Channel 0



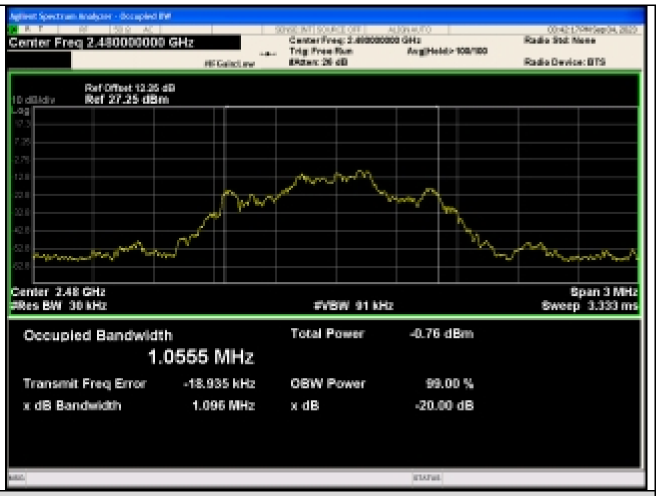
GFSK_DH5_Channel 39

GFSK_DH5_Channel 78



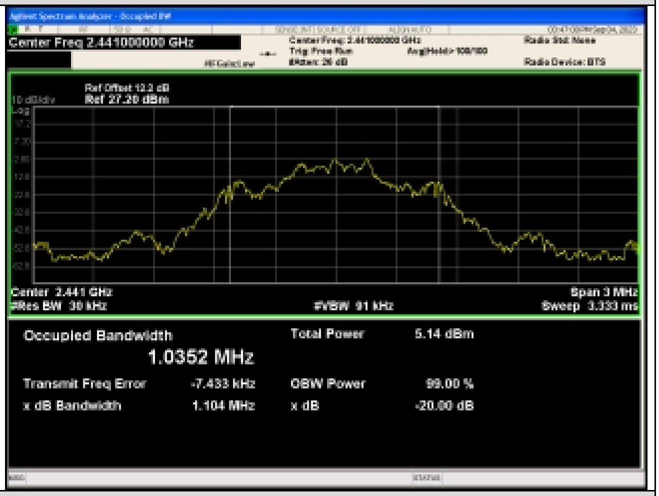
π/4DQPSK_2-DH5_Channel 0

π/4DQPSK_2-DH5_Channel 39

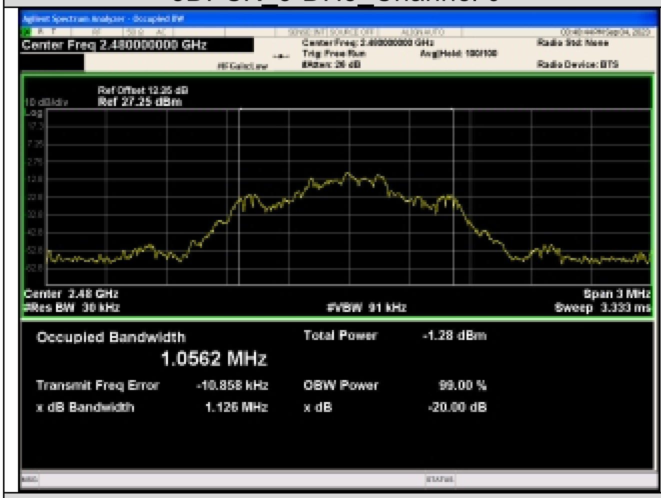


π/4DQPSK_2-DH5_Channel 78

8DPSK_3-DH5_Channel 0



8DPSK_3-DH5_Channel 39



8DPSK_3-DH5_Channel 78

Void

APPENDIX IV. Carrier Frequencies Separation

Test Result

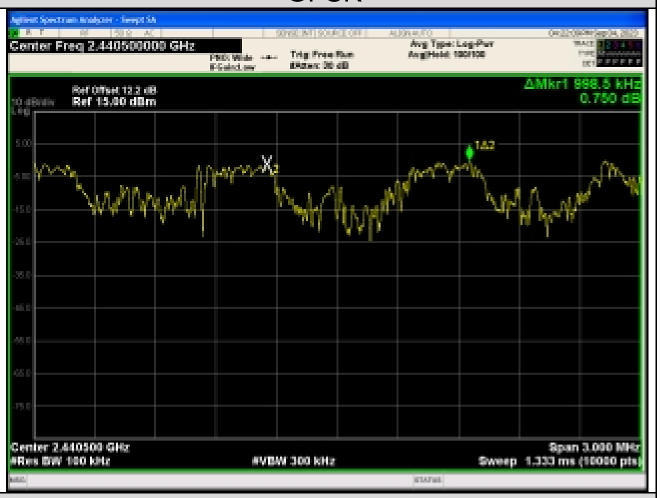
Modulation	Packet	Left Center frequency (MHz)	Right Center frequency (MHz)	Hopping Frequency Separation (MHz)	Limit (MHz)	Result
GFSK	DH5	2439.832	2440.8338	1.0018	0.539	PASS
GFSK	DH5	2439.832	2440.8332	1.0012	0.486	PASS
GFSK	DH5	2439.8332	2440.8329	0.9997	0.553	PASS
π/4DQPSK	2-DH5	2440.1539	2441.1524	0.9985	0.743	PASS
π/4DQPSK	2-DH5	2440.1578	2441.1434	0.9856	0.741	PASS
π/4DQPSK	2-DH5	2440.1452	2441.1356	0.9904	0.731	PASS
8DPSK	3-DH5	2440.0	2441.141	1.1410	0.749	PASS
8DPSK	3-DH5	2439.8329	2440.8329	1.0000	0.736	PASS
8DPSK	3-DH5	2440.1467	2441.1335	0.9868	0.751	PASS

Test Graphs

GFSK

GFSK

GFSK



π/4DQPSK

π/4DQPSK

π/4DQPSK

8DPSK

8DPSK

8DPSK

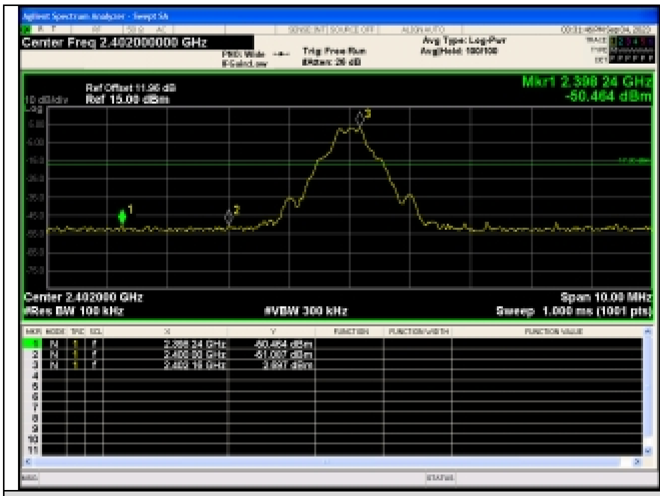
Void

APPENDIX V. Conducted Out Of Band Emission

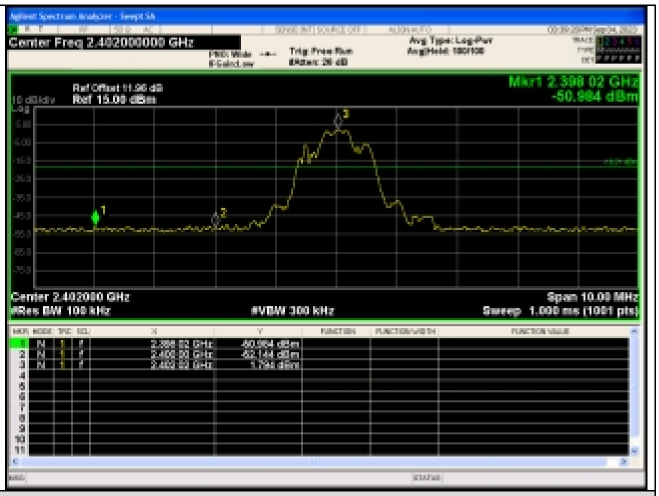
Test Result
Non-Hopping

Modulation	Packet	Channel	OOB Emission Frequency (MHz)	OOB Emission Level (dBm)	Limit (dBm)	Over Limit (dB)	Result
GFSK	DH5	0	2400.00	-51.087	-17.3	-33.787	PASS
			2398.24	-50.464	-17.3	-33.164	PASS
			4803.80	-56.132	-17.3	-38.832	PASS
			7205.90	-63.299	-17.3	-45.999	PASS
			9608.70	-64.085	-17.3	-46.785	PASS
			24951.9	-46.518	-17.3	-29.218	PASS
		39	4881.79	-53.299	-19.81	-33.489	PASS
			7322.05	-62.965	-19.81	-43.155	PASS
			9763.55	-61.856	-19.81	-42.046	PASS
			24993.8	-44.797	-19.81	-24.987	PASS
		78	2483.50	-51.779	-25.62	-26	PASS
			4959.83	-55.108	-25.62	-29.488	PASS
			7440.03	-62.037	-25.62	-36.417	PASS
			9919.62	-64.108	-25.62	-38.488	PASS
			24908.2	-44.466	-25.62	-18.846	PASS
π/4DQPSK	2-DH5	0	2400.00	-52.144	-18.21	-33.934	PASS
			2398.02	-50.984	-18.21	-32.774	PASS
			4804.40	-56.628	-18.21	-38.418	PASS
			7205.90	-61.925	-18.21	-43.715	PASS
			9607.50	-63.553	-18.21	-45.343	PASS
			24982.5	-46.185	-18.21	-27.975	PASS
		39	4882.42	-56.735	-20.49	-36.245	PASS
			7322.05	-62.726	-20.49	-42.236	PASS
			9764.17	-63.010	-20.49	-42.520	PASS
			24945.1	-45.460	-20.49	-24.970	PASS
		78	2483.50	-52.694	-26.46	-26	PASS
			4960.45	-56.948	-26.46	-30.488	PASS
			7440.66	-64.502	-26.46	-38.042	PASS
			9920.24	-64.656	-26.46	-38.196	PASS
			24930.7	-45.066	-26.46	-18.605	PASS
8DPSK	3-DH5	0	2400.00	-52.623	-18.09	-34.533	PASS
			2398.20	-50.273	-18.09	-32.183	PASS
			4803.80	-59.177	-18.09	-41.087	PASS
			7206.60	-61.383	-18.09	-43.293	PASS
			9608.70	-62.318	-18.09	-44.228	PASS
			24991.9	-45.837	-18.09	-27.747	PASS
		39	4881.79	-58.063	-20.59	-37.473	PASS
			7323.92	-63.358	-20.59	-42.768	PASS
			9764.17	-63.607	-20.59	-43.017	PASS
			24991.3	-45.735	-20.59	-25.145	PASS
		78	2483.50	-51.389	-26.47	-25	PASS
			4959.83	-56.149	-26.47	-29.679	PASS
			7440.03	-63.455	-26.47	-36.985	PASS
			9920.24	-62.513	-26.47	-36.043	PASS
			24976.3	-45.448	-26.47	-18.978	PASS

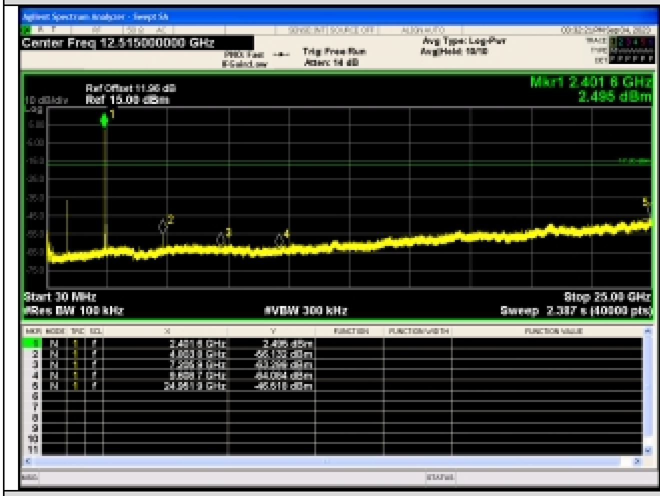
Test Graphs



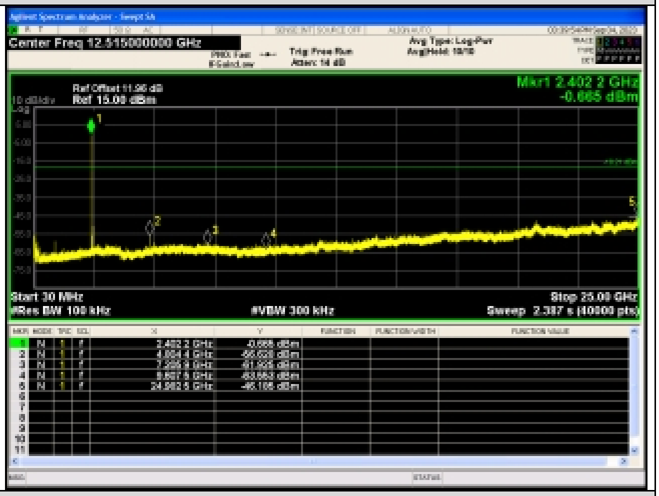
Out Of Band Emission
GFSK_DH5_Channel 0



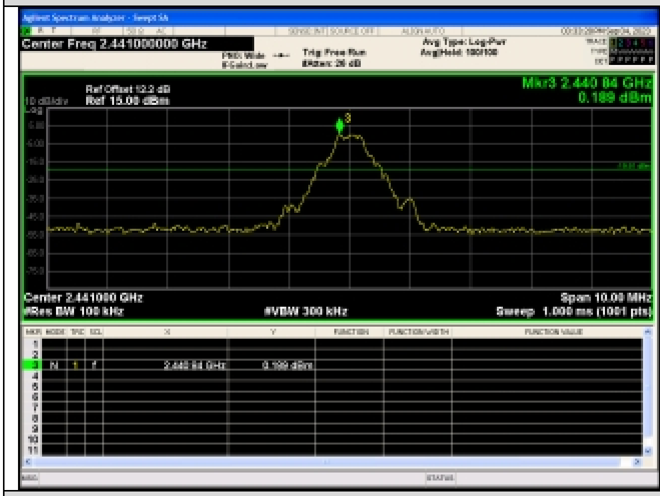
Out Of Band Emission
π/4DQPSK_2-DH5_Channel 0



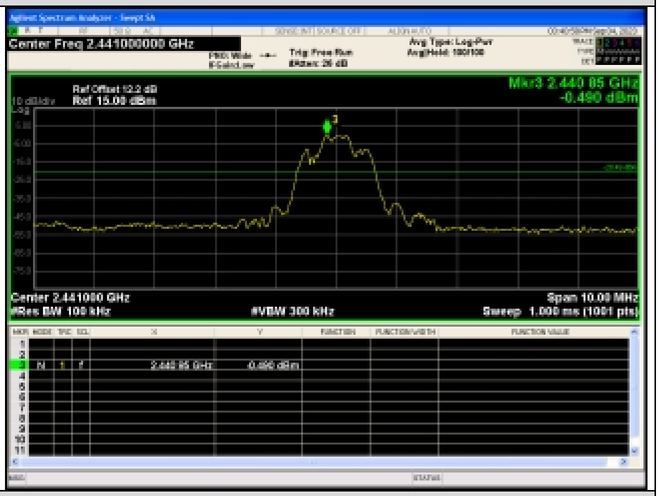
Spurious Emission
GFSK_DH5_Channel 0



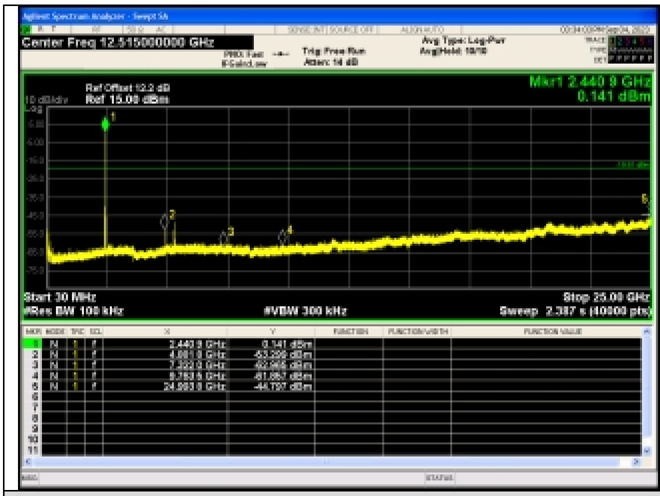
Spurious Emission
π/4DQPSK_2-DH5_Channel 0



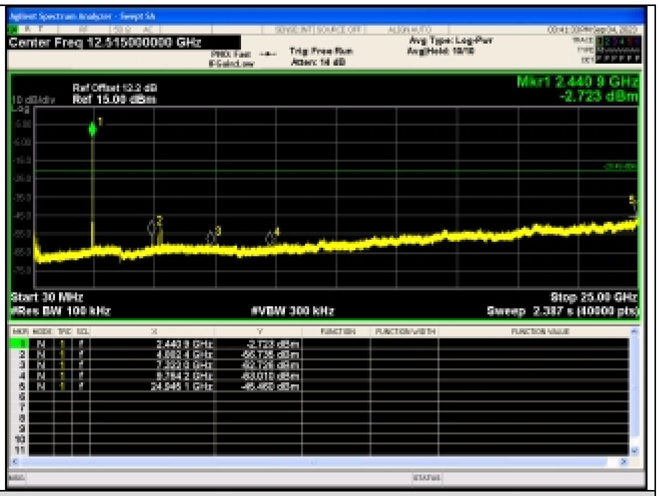
Out Of Band Emission
GFSK_DH5_Channel 39



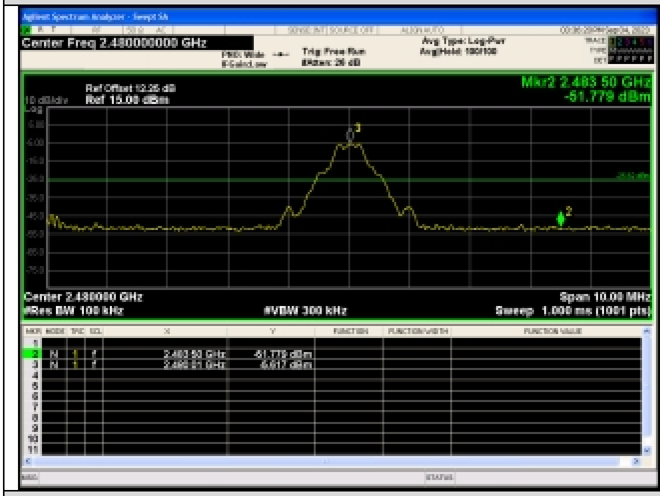
Out Of Band Emission
π/4DQPSK_2-DH5_Channel 39



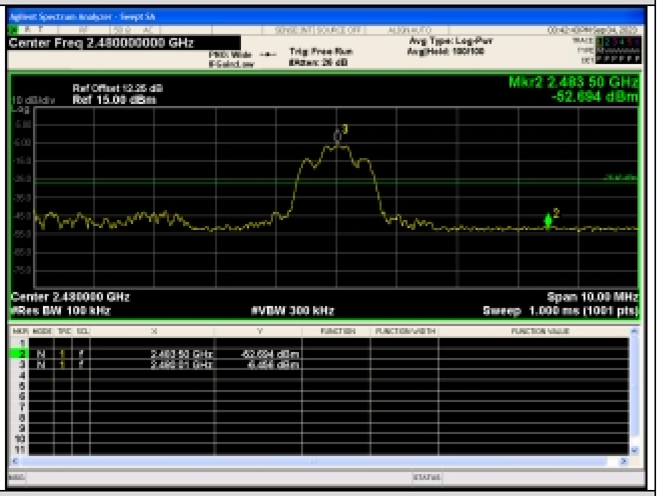
Spurious Emissions
GFSK_DH5_Channel 39



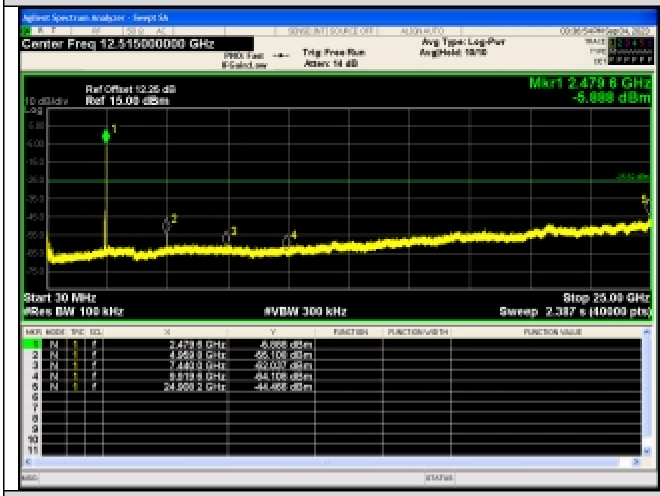
Spurious Emissions
π/4DQPSK_2-DH5_Channel 39



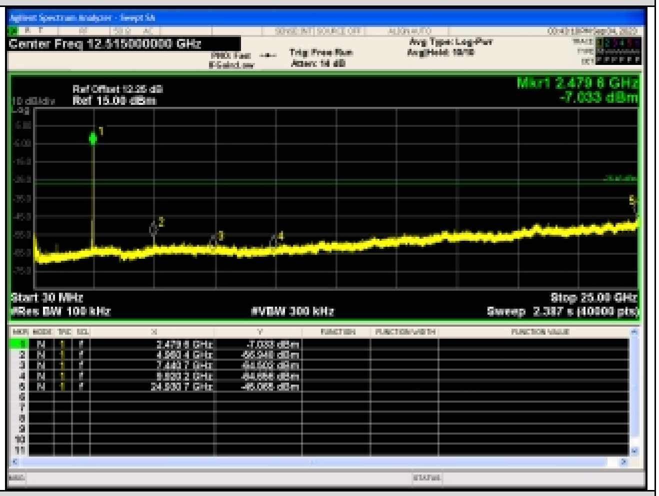
Out Of Band Emission
GFSK_DH5_Channel 78



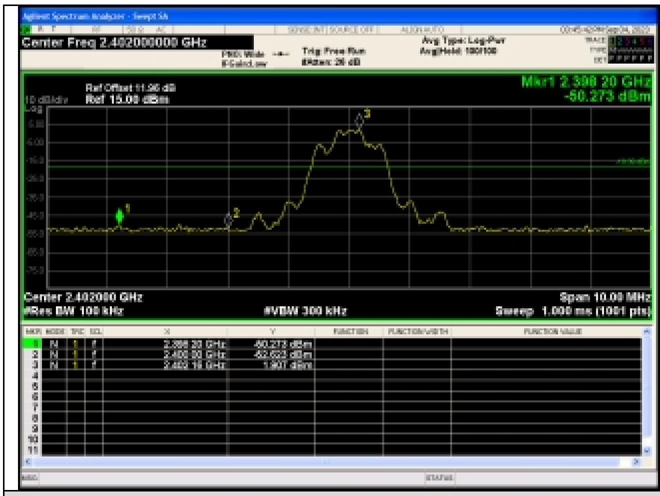
Out Of Band Emission
π/4DQPSK_2-DH5_Channel 78



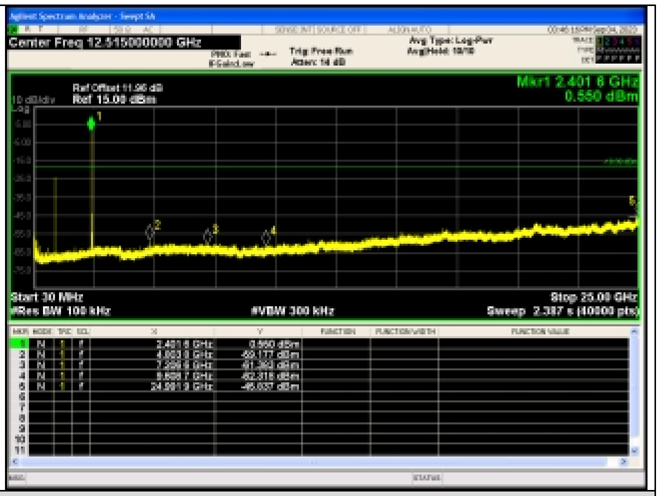
Spurious Emission
GFSK_DH5_Channel 78



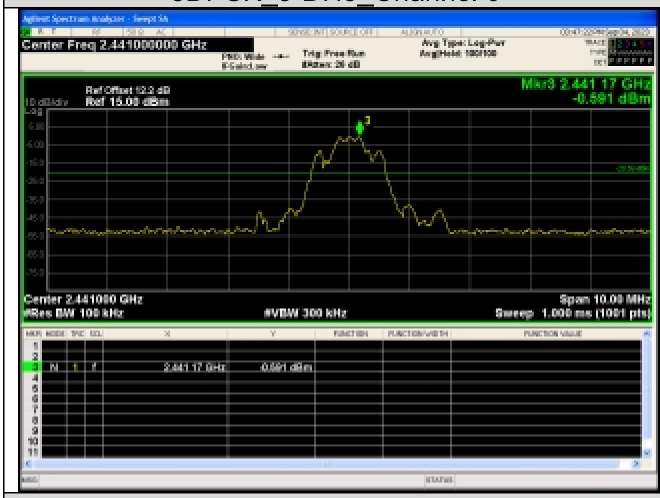
Spurious Emission
π/4DQPSK_2-DH5_Channel 78



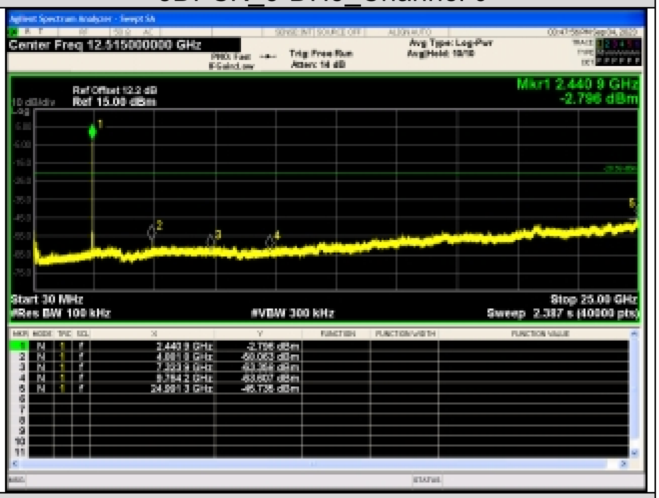
Out Of Band Emission
8DPSK_3-DH5_Channel 0



Spurious Emission
8DPSK_3-DH5_Channel 0

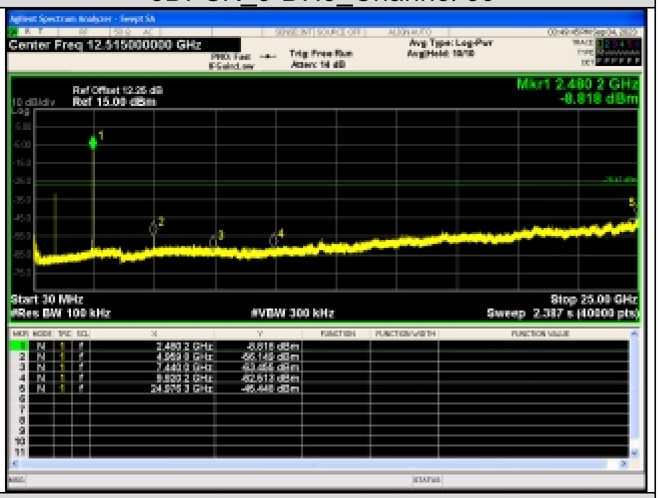


Out Of Band Emission
8DPSK_3-DH5_Channel 39



Spurious Emissions
8DPSK_3-DH5_Channel 39

Out Of Band Emission
8DPSK_3-DH5_Channel 78



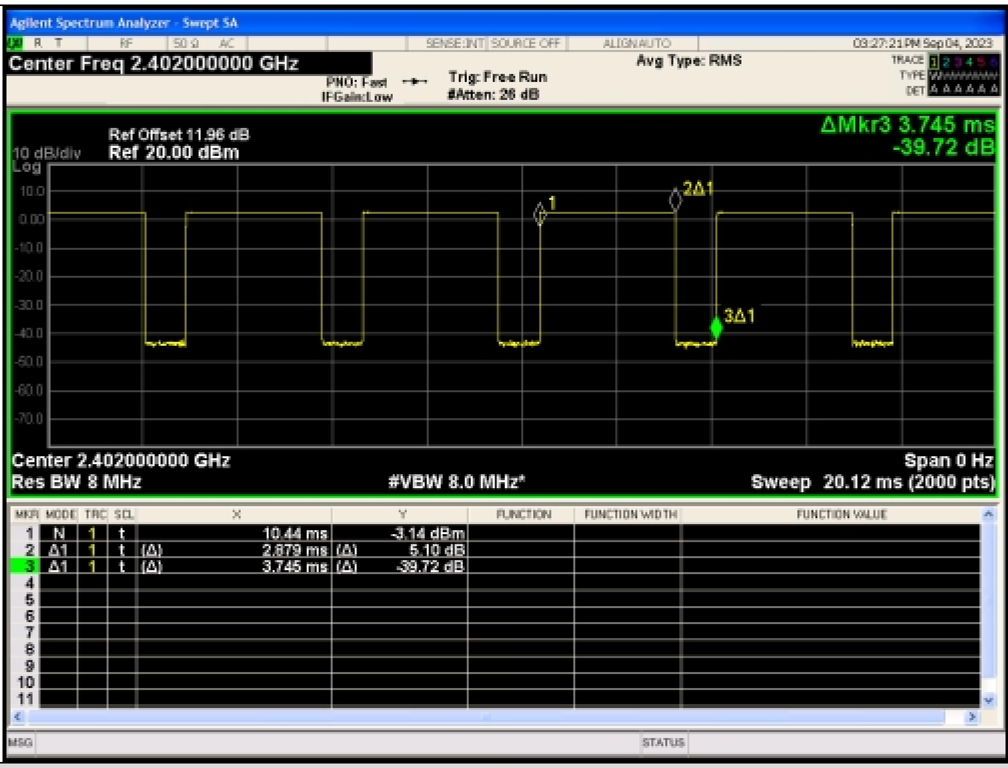
Spurious Emission
8DPSK_3-DH5_Channel 78

APPENDIX VI. Duty Cycle

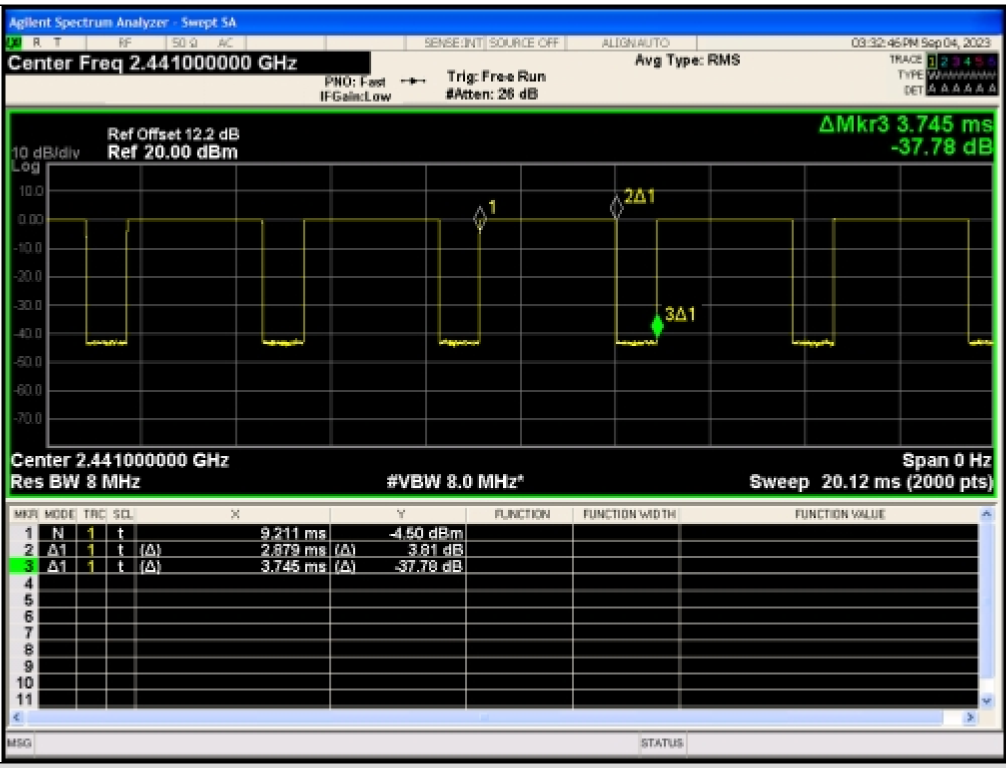
Test Result

Modulation	Packets	Channel	On Time (ms)	Period (ms)	Duty Cycle (%)	Duty Cycle (linear)	Duty Cycle Factor (dB)
GFSK	DH5	0	2.879	3.745	76.88	0.7688	1.1419
		39	2.879	3.745	76.88	0.7688	1.1419
		78	2.879	3.735	77.09	0.7709	1.13
π/4DQPSK	2-DH5	0	2.879	3.745	76.88	0.7688	1.1419
		39	2.879	3.735	77.09	0.7709	1.13
		78	2.879	3.735	77.09	0.7709	1.13
8DPSK	3-DH5	0	2.829	3.735	75.74	0.7574	1.2067
		39	2.819	3.735	75.47	0.7547	1.2223
		78	2.829	3.745	75.54	0.7554	1.2182

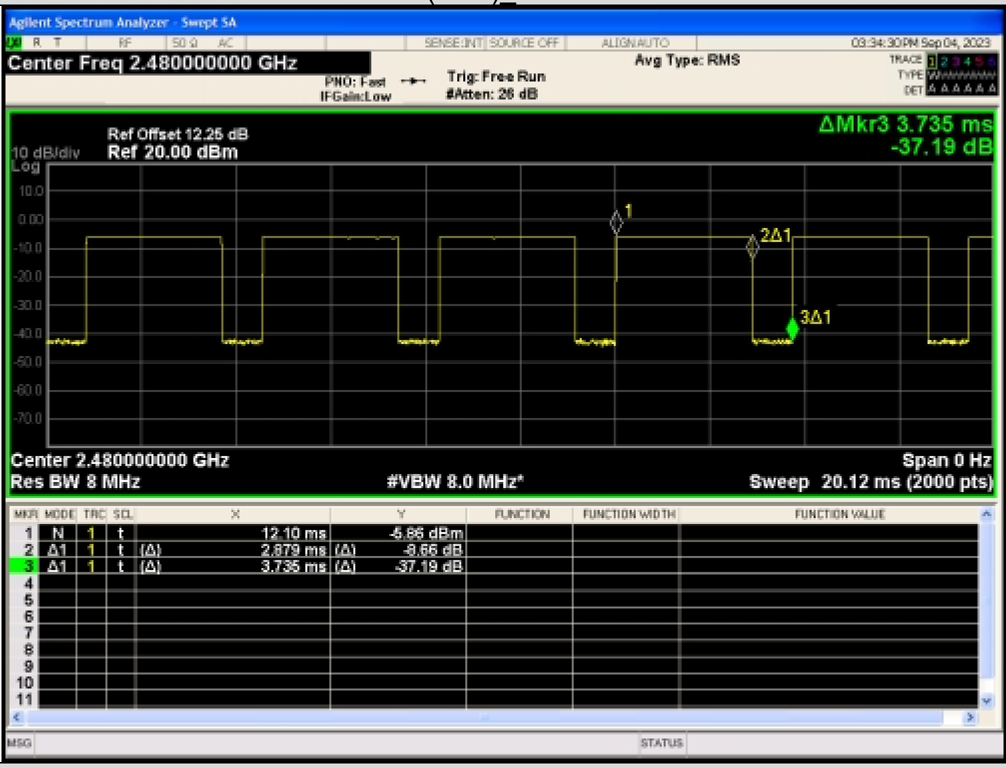
Test Graphs



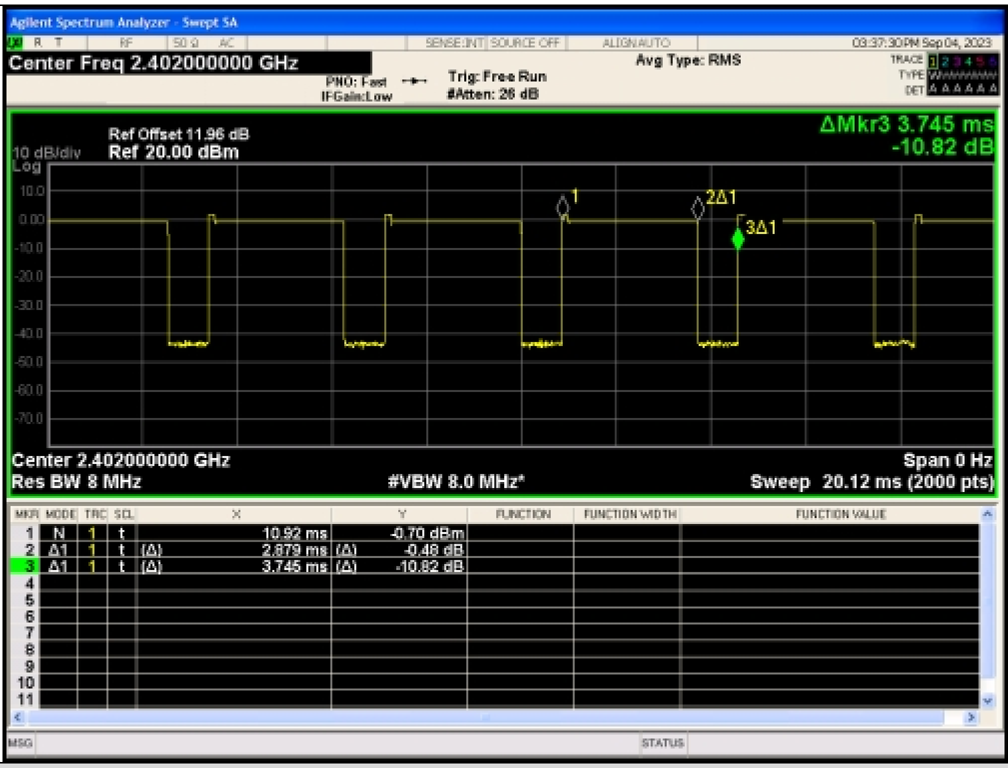
GFSK(DH5)_Channel 0



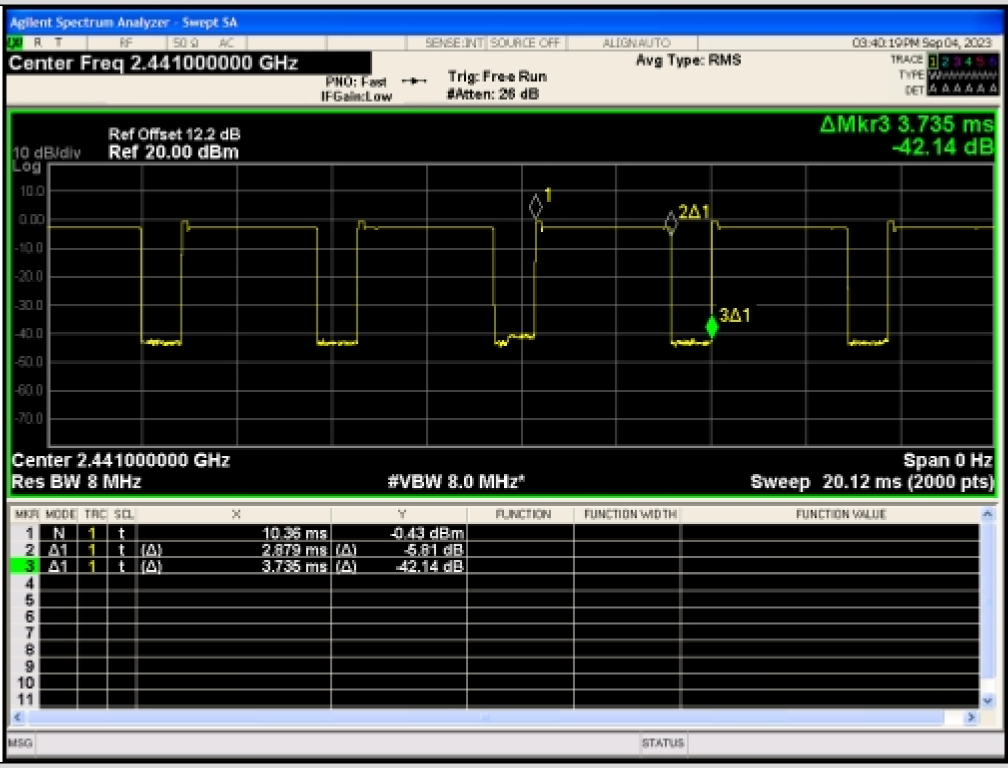
GFSK(DH5)_Channel 39



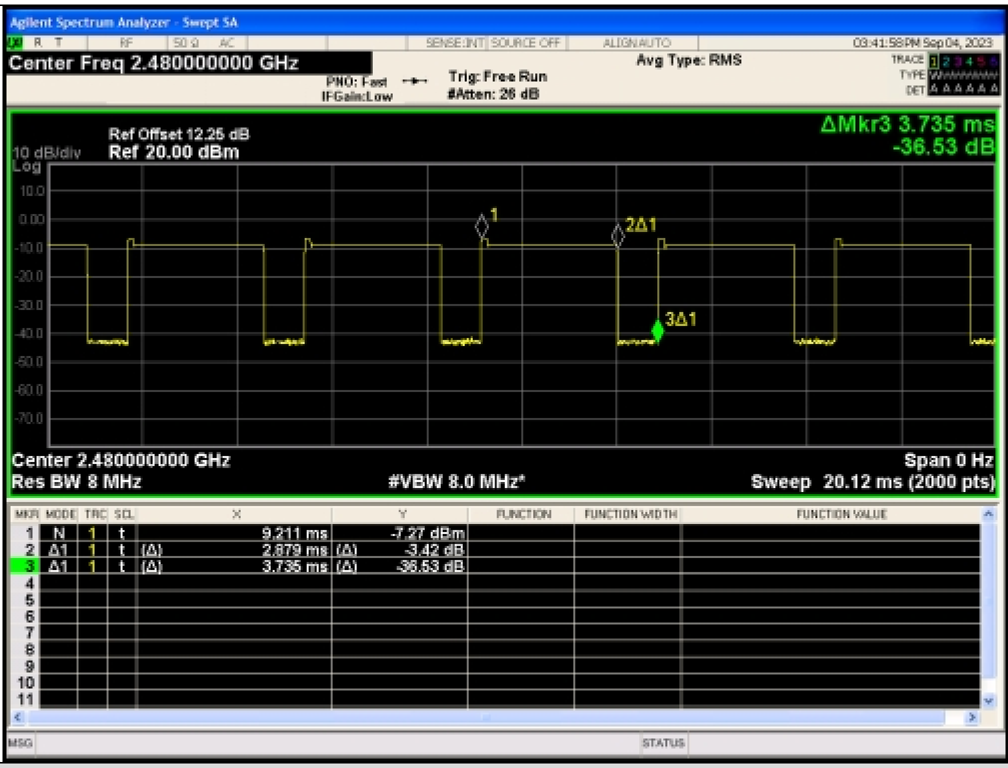
GFSK(DH5)_Channel 78



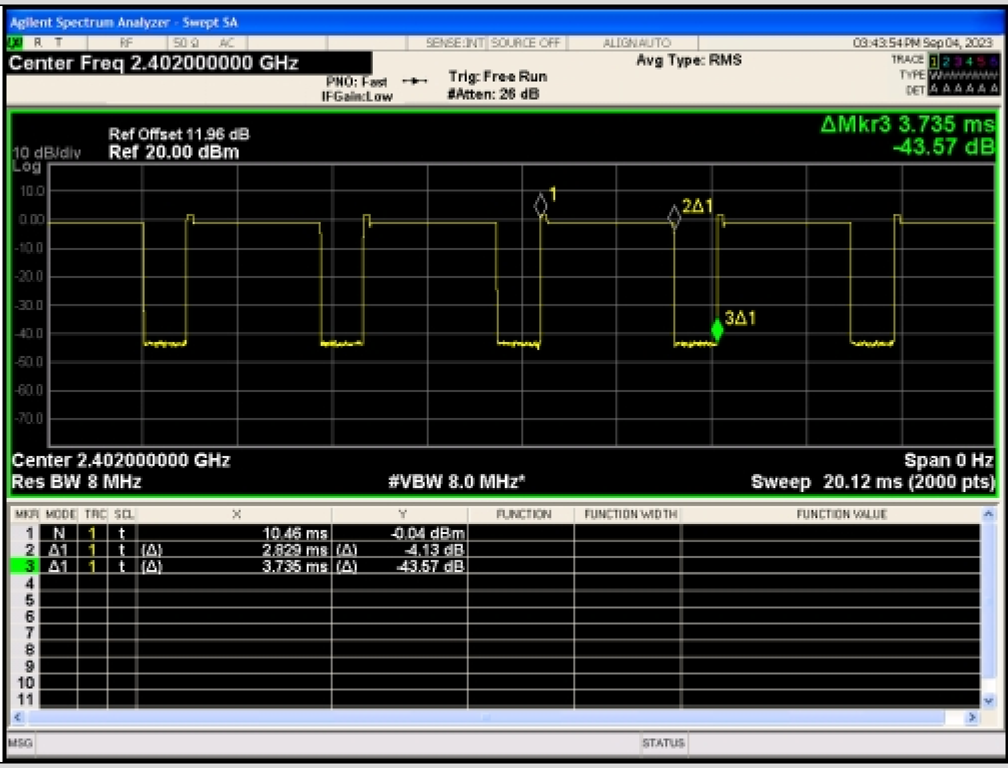
π/4DQPSK(2-DH5)_Channel 0



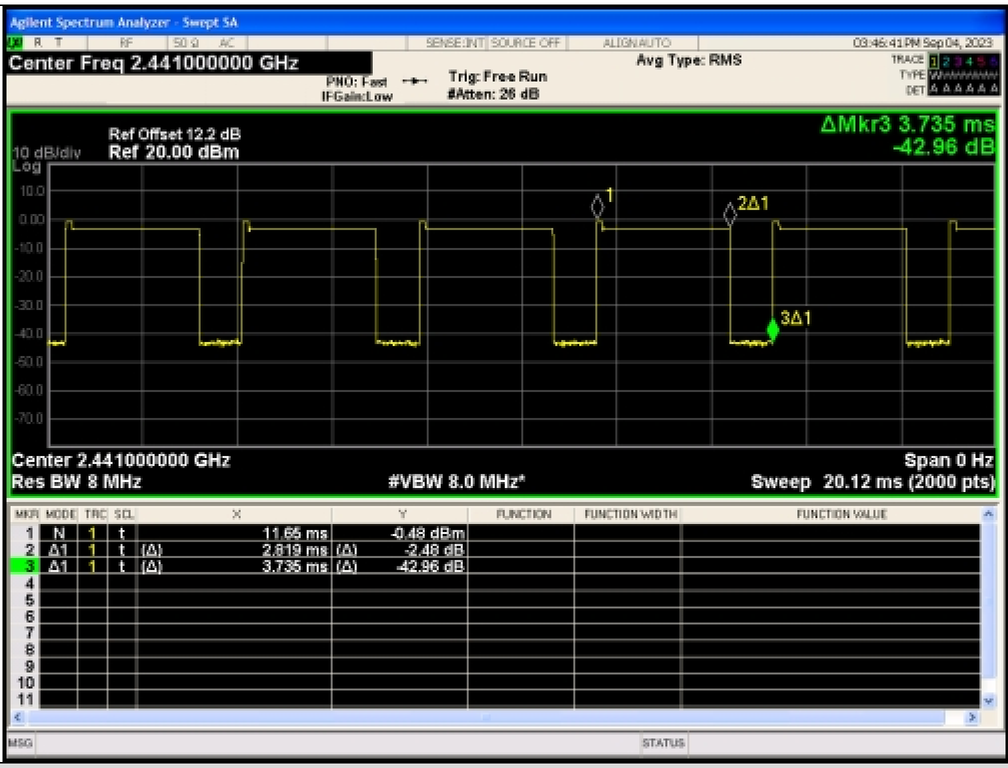
π/4DQPSK(2-DH5)_Channel 39



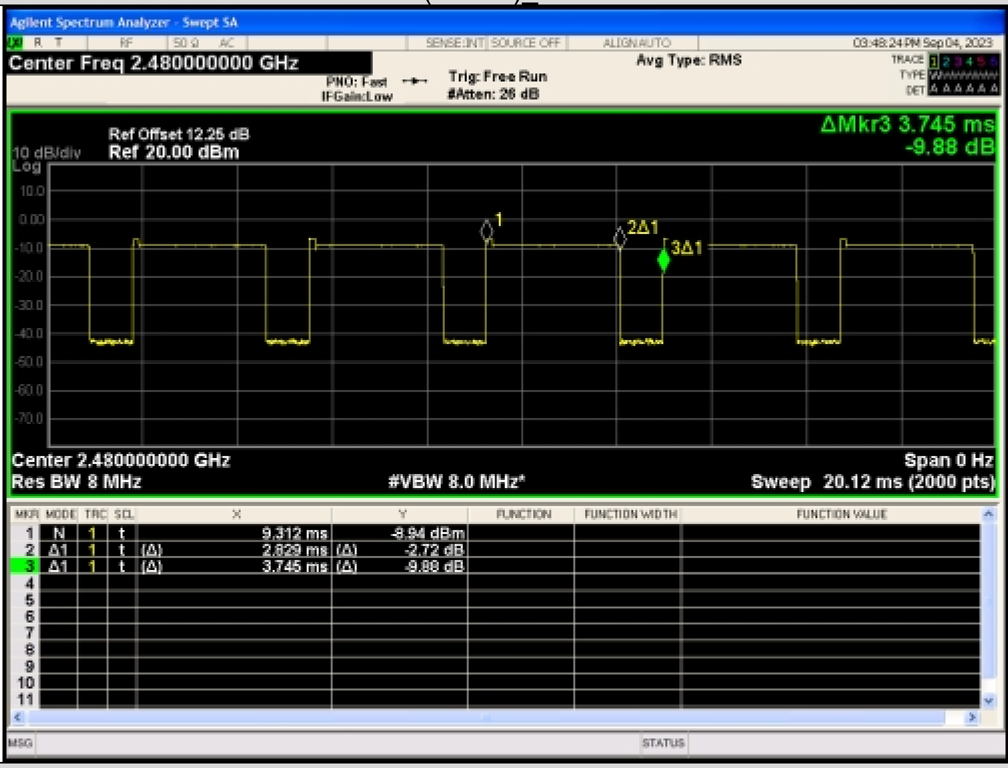
π/4DQPSK(2-DH5)_Channel 78



8DPSK(3-DH5)_Channel 0



8DPSK(3-DH5)_Channel 39



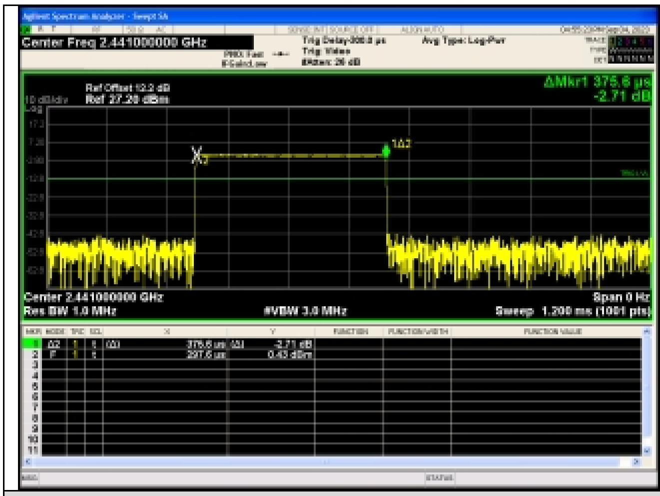
8DPSK(3-DH5)_Channel 78

APPENDIX VII. Dwell Time

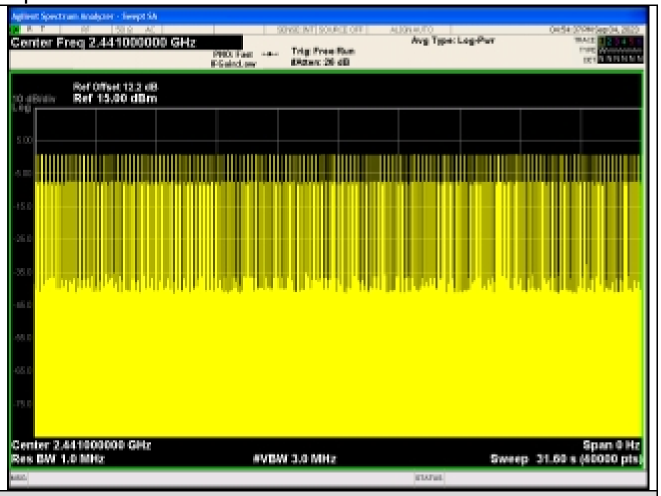
Test Result

Modulation	Packet	Channel	Pulse Width (ms)	Number of Pulses in 31.6 seconds	Dwell Time (ms)	Limit (ms)	Result
GFSK	DH1	CH39 (2441MHz)	0.3756	312	117.19	< 400	PASS
	DH3		1.632	158	257.86		PASS
	DH5		2.880	114	328.32		PASS
π/4DQPSK	2-DH1		0.3840	311	119.42		PASS
	2-DH3		1.656	159	263.3		PASS
	2-DH5		2.880	115	331.2		PASS
8DPSK	3-DH1		0.3852	312	120.18		PASS
	3-DH3		1.632	159	259.49		PASS
	3-DH5		2.832	114	322.85		PASS

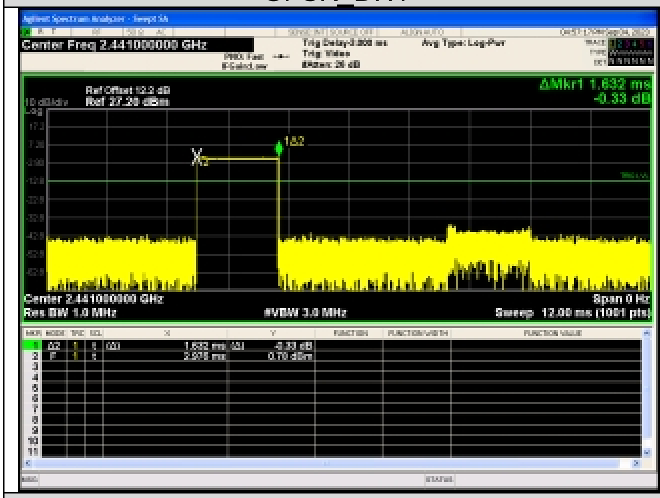
Test Graphs



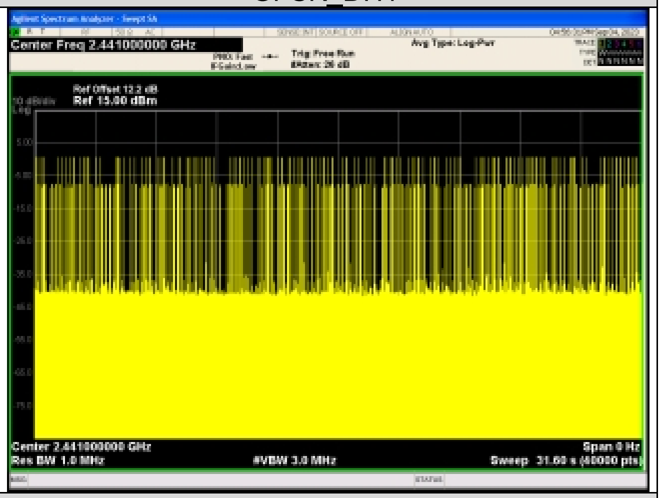
Pulse Width
GFSK_DH1



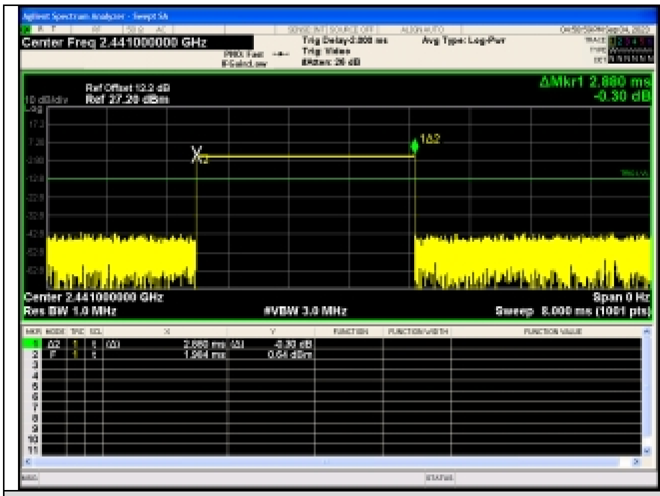
Number of Pulses in 31.6 seconds
GFSK_DH1



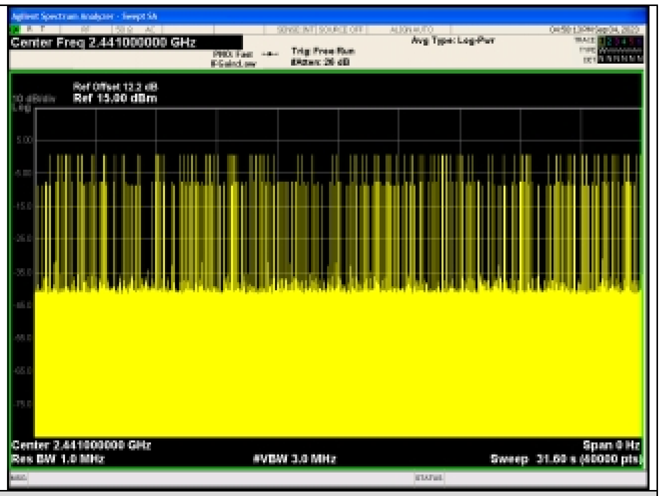
Pulse Width
GFSK_DH3



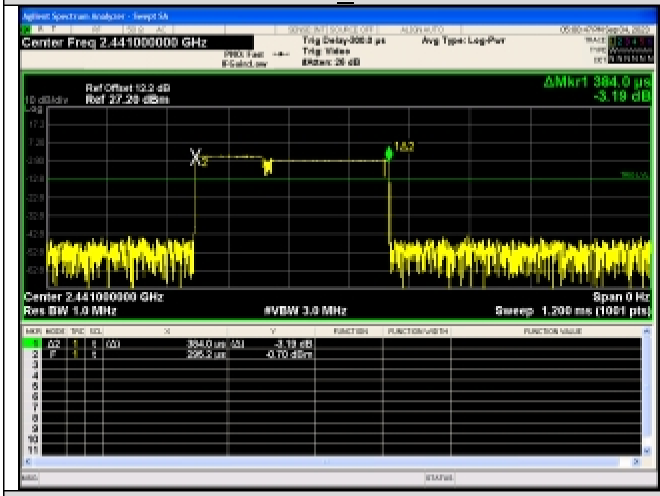
Number of Pulses in 31.6 seconds
GFSK_DH3



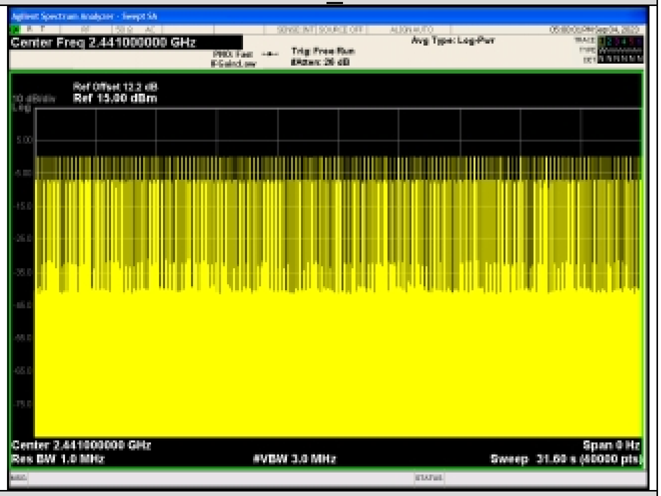
Pulse Width
GFSK_DH5



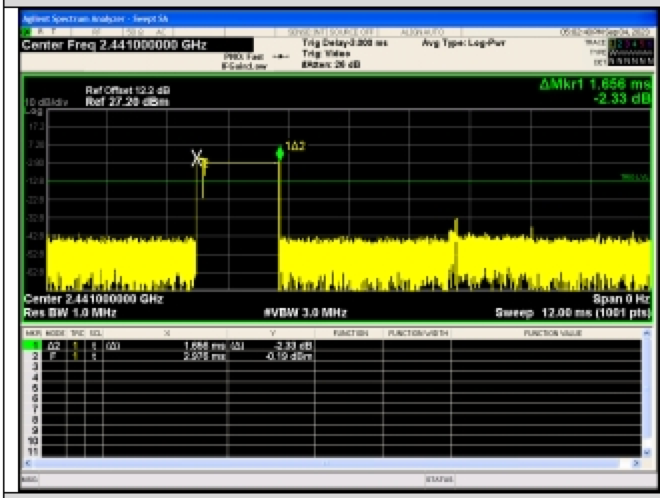
Number of Pulses in 31.6 seconds
GFSK_DH5



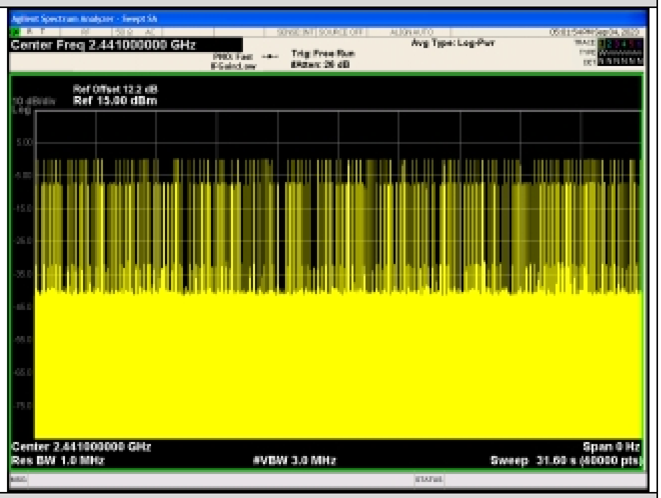
Pulse Width
π/4DQPSK_2-DH1



Number of Pulses in 31.6 seconds
π/4DQPSK_2-DH1



Pulse Width
π/4DQPSK_2-DH3



Number of Pulses in 31.6 seconds
π/4DQPSK_2-DH3