

Test Plots with hopping ($\pi/4$ DQPSK)

Band Edges (CH.0)



Test Plots with hopping ($\pi/4$ DQPSK)

Band Edges (CH.78)



10.3 FREQUENCY SEPARATION / OCCUPIED BANDWIDTH (99% BW)

99% BW (kHz)			
Channel	GFSK	8DPSK	$\pi/4$ DQPSK
CH.0	880.86	1177.3	1168.8
CH.39	877.80	1177.5	1166.9
CH.78	876.84	1175.6	1166.7

20dB BW (kHz)			
Channel	GFSK	8DPSK	$\pi/4$ DQPSK
CH.0	964.8	1302	1316
CH.39	965.0	1302	1314
CH.78	963.3	1304	1313

Channel Separation(kHz)			Limit (kHz)
GFSK	8DPSK	$\pi/4$ DQPSK	
958	998	984	>25 kHz or >2/3 of the 20dB BW

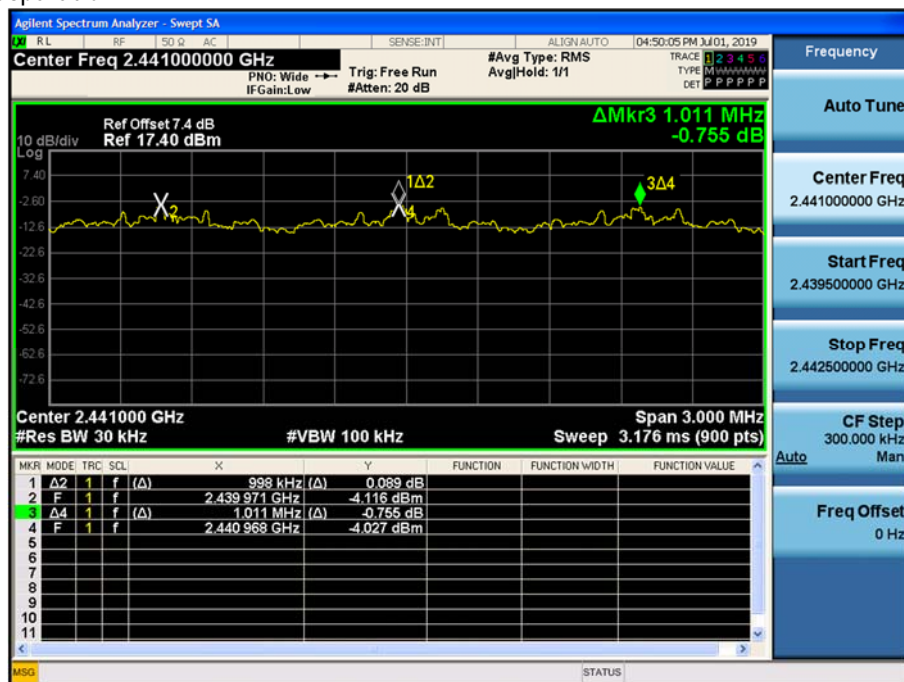
Test Plots (GFSK)

Channel Separation



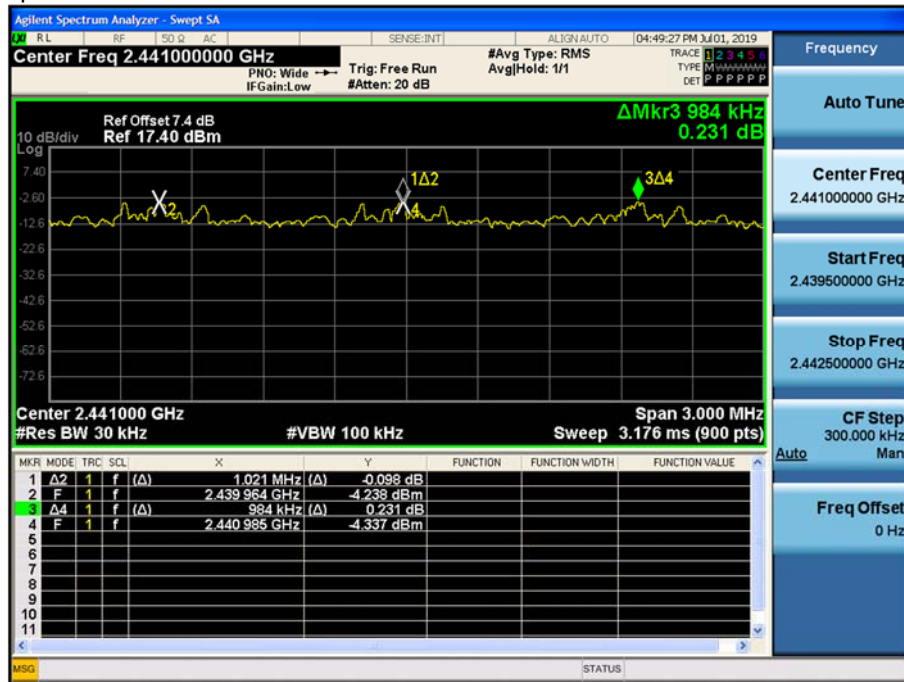
Test Plots (8DPSK)

Channel Separation



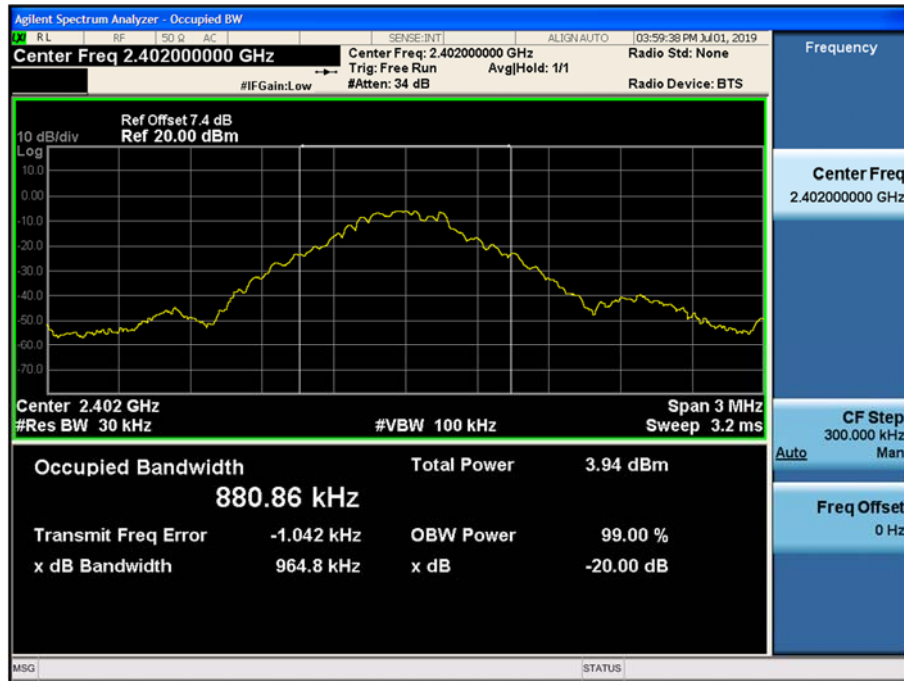
Test Plots ($\pi/4$ DQPSK)

Channel Separation



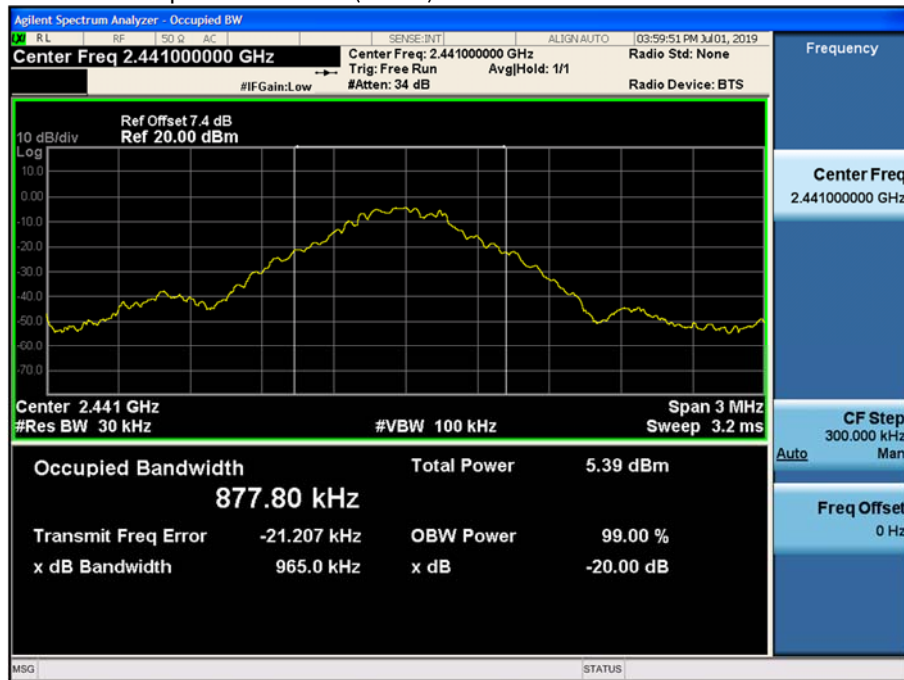
Test Plots (GFSK)

20 dB Bandwidth & Occupied Bandwidth (CH.0)



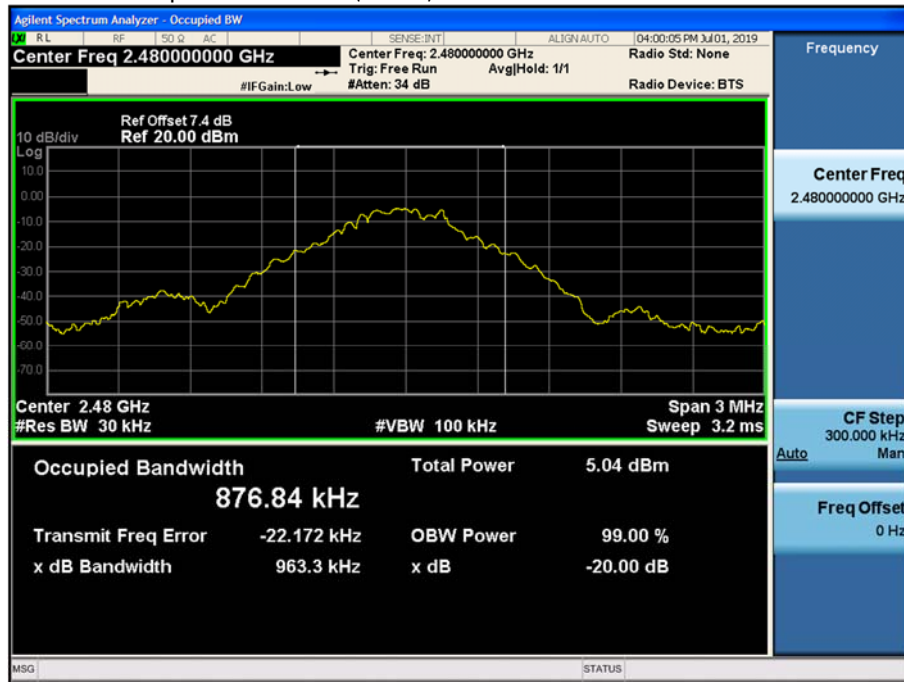
Test Plots (GFSK)

20 dB Bandwidth & Occupied Bandwidth (CH.39)



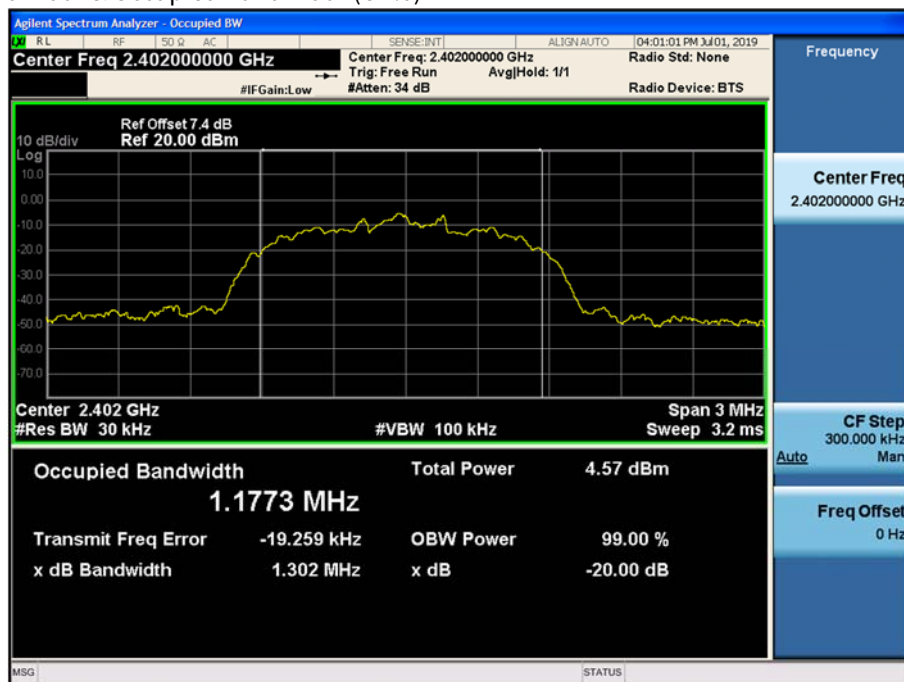
Test Plots (GFSK)

20 dB Bandwidth & Occupied Bandwidth (CH.78)



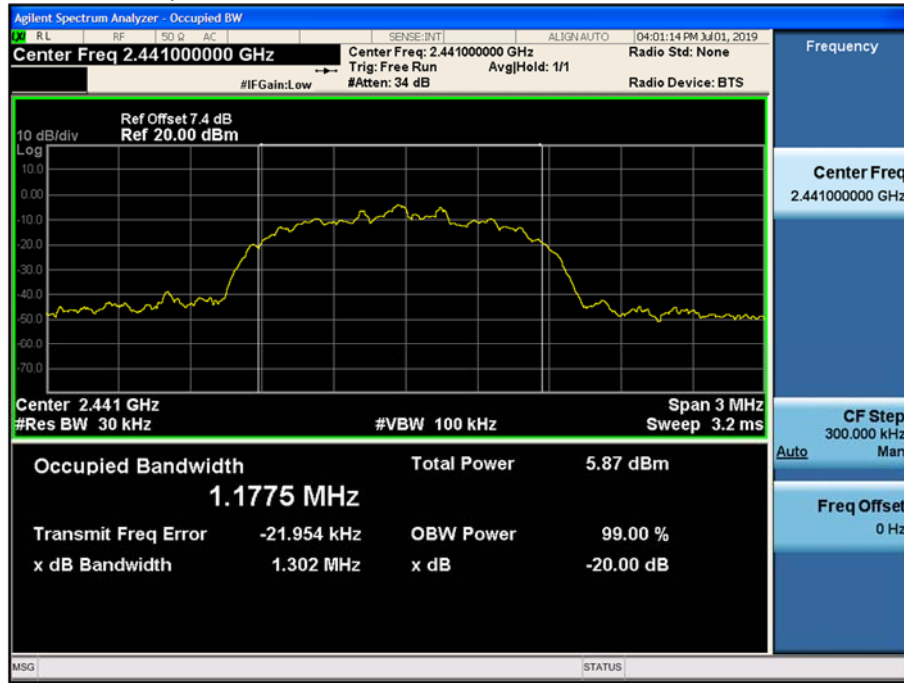
Test Plots (8DPSK)

20 dB Bandwidth & Occupied Bandwidth (CH.0)



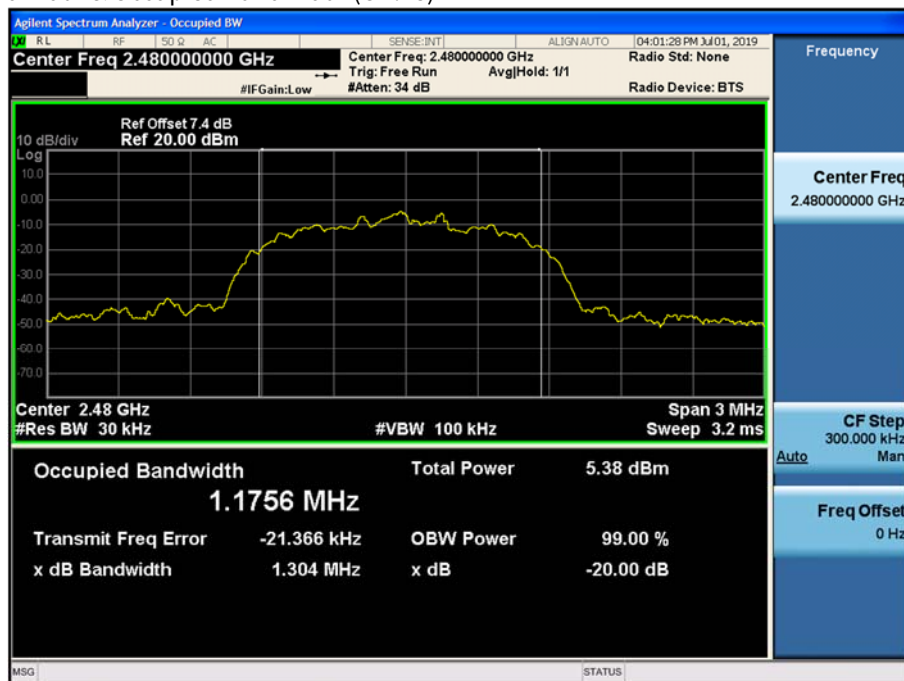
Test Plots (8DPSK)

20 dB Bandwidth & Occupied Bandwidth (CH.39)



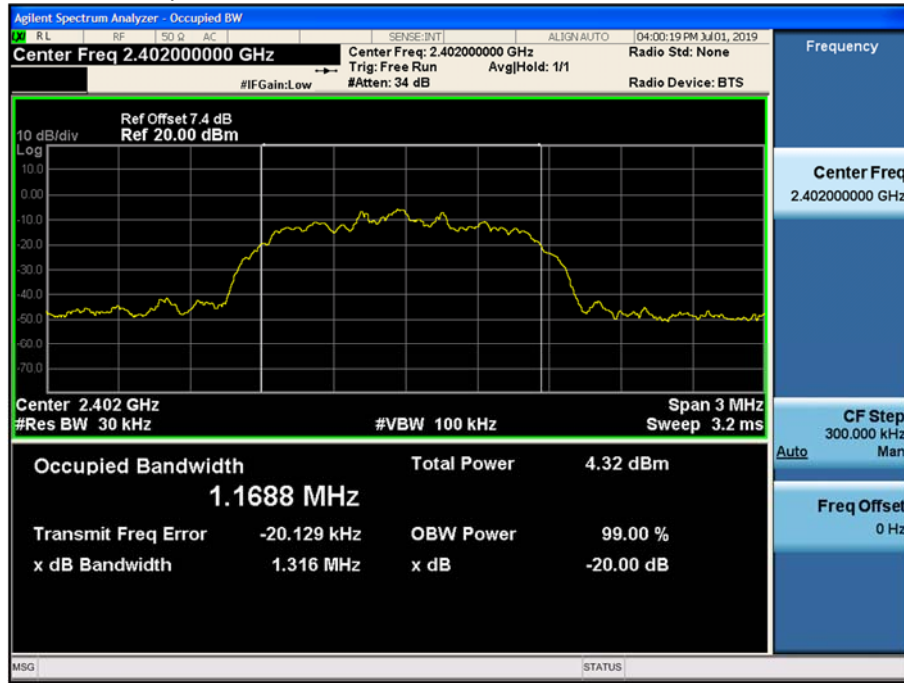
Test Plots (8DPSK)

20 dB Bandwidth & Occupied Bandwidth (CH.78)



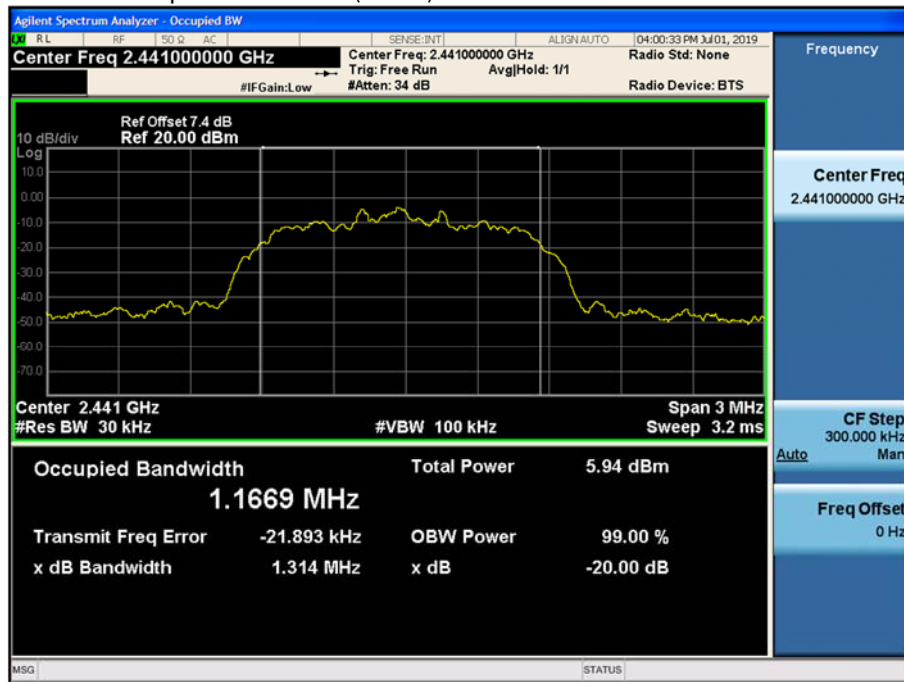
Test Plots ($\pi/4$ DQPSK)

20 dB Bandwidth & Occupied Bandwidth (CH.0)



Test Plots ($\pi/4$ DQPSK)

20 dB Bandwidth & Occupied Bandwidth (CH.39)



Test Plots ($\pi/4$ DQPSK)

20 dB Bandwidth & Occupied Bandwidth (CH.78)



10.4 NUMBER OF HOPPING FREQUENCY

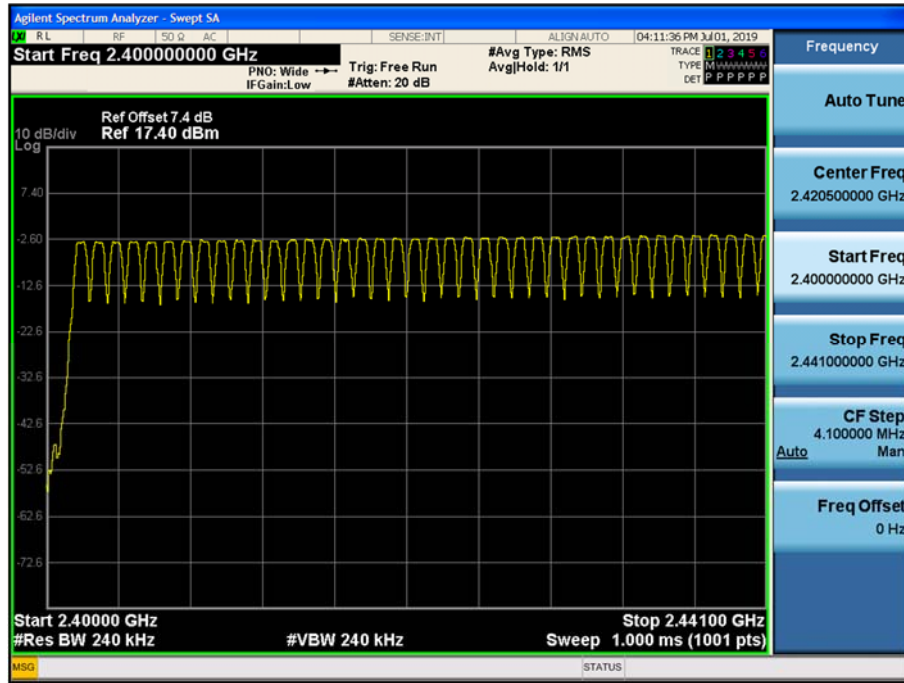
Result (No. of CH)			Limit
GFSK	8DPSK	$\pi/4$ DQPSK	
79	79	79	>15

Note :

In case of AFH mode, minimum number of hopping channels is 20.

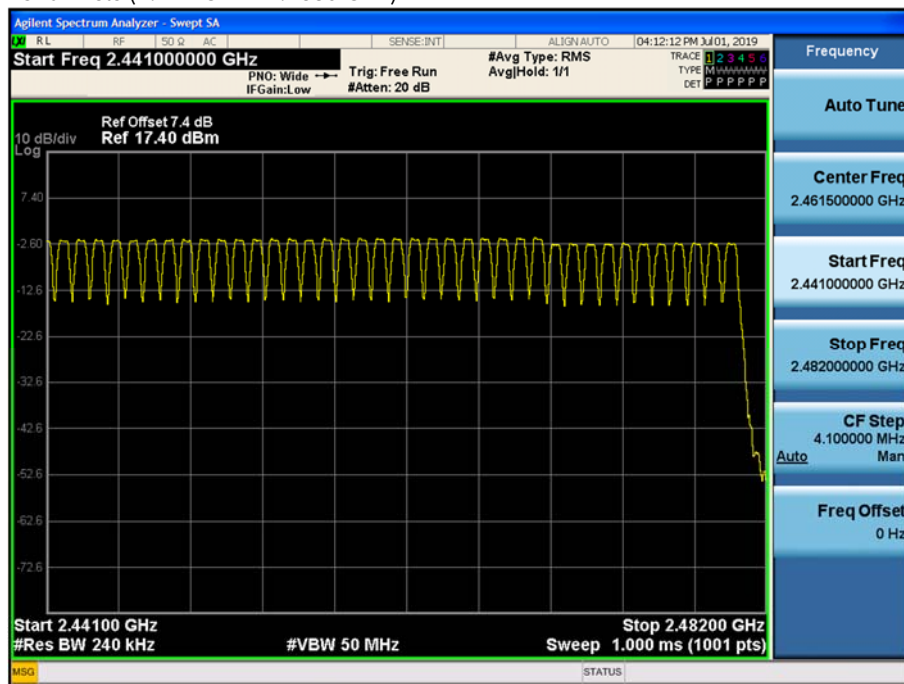
Test Plots (GFSK)

Number of Channels (2.4 GHz - 2.441 GHz)



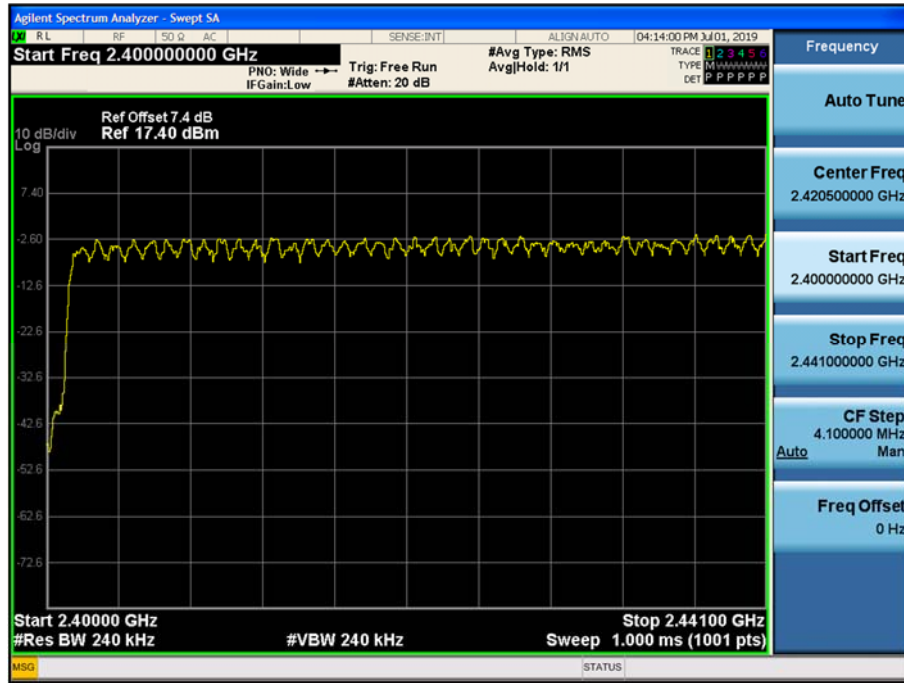
Test Plots (GFSK)

Number of Channels (2.441 GHz - 2.4835 GHz)



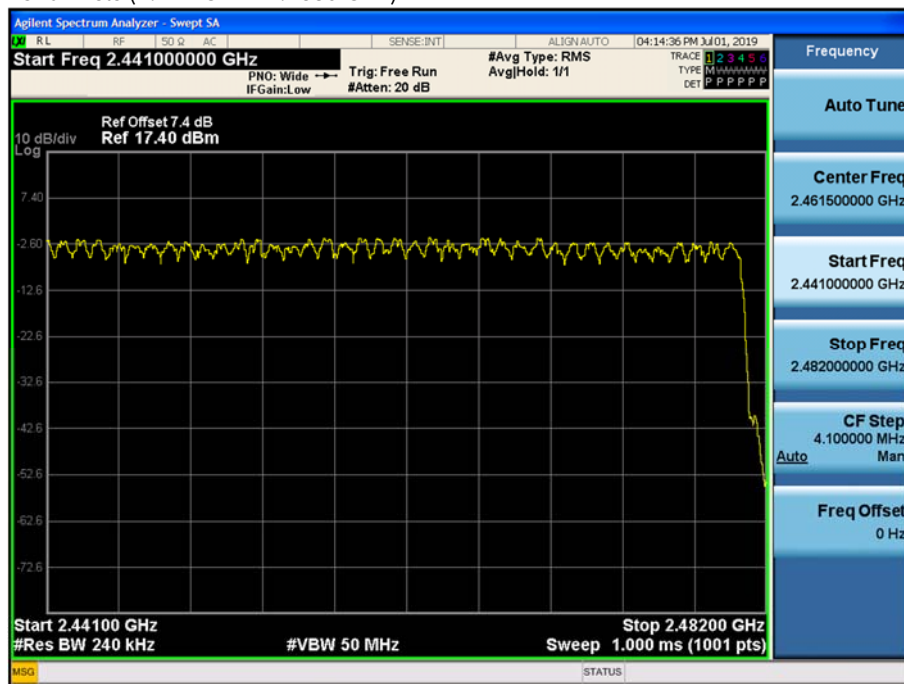
Test Plots (8DPSK)

Number of Channels (2.4 GHz - 2.441 GHz)



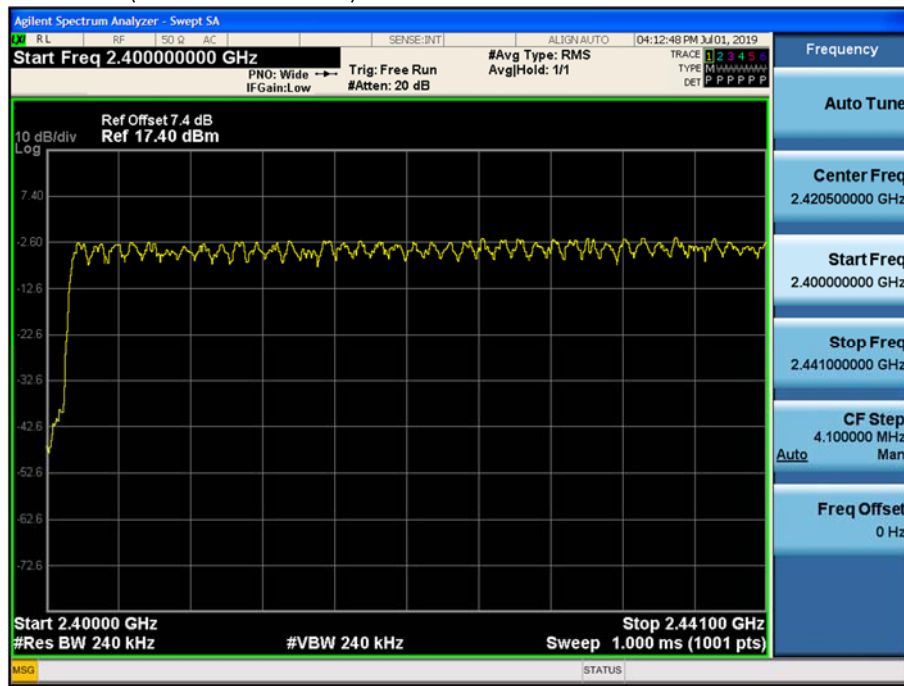
Test Plots (8DPSK)

Number of Channels (2.441 GHz - 2.4835 GHz)



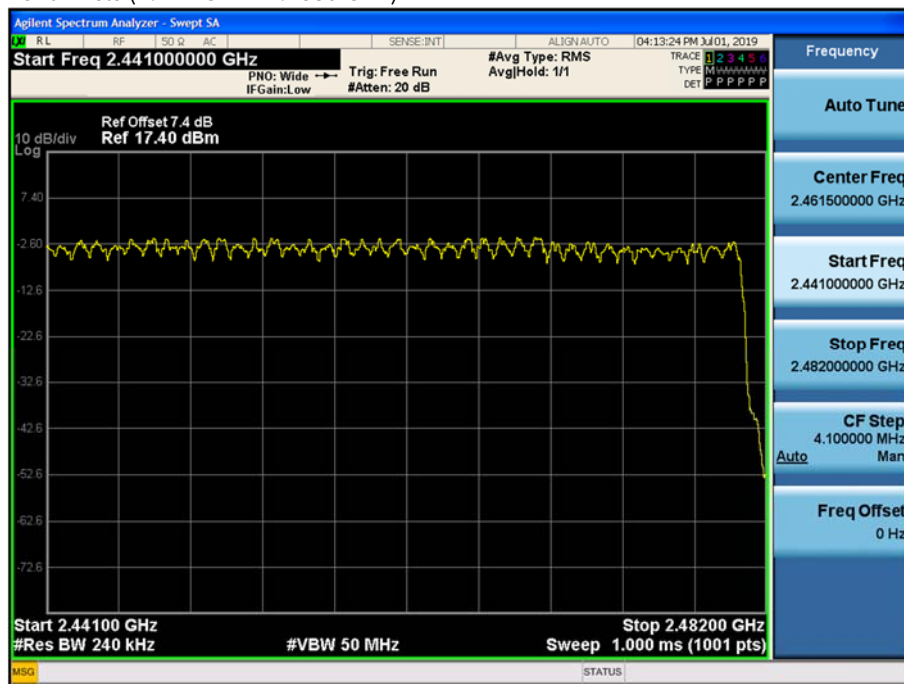
Test Plots ($\pi/4$ DQPSK)

Number of Channels (2.4 GHz - 2.441 GHz)



Test Plots ($\pi/4$ DQPSK)

Number of Channels (2.441 GHz - 2.4835 GHz)



10.5 TIME OF OCCUPANCY (DWELL TIME)

	Channel	GFSK	8DPSK	$\pi/4$ DQPSK
Pulse Time (ms)	Low	2.900	2.905	2.905
	Mid	2.900	2.910	2.905
	High	2.895	2.905	2.905

Non-AFH Mode

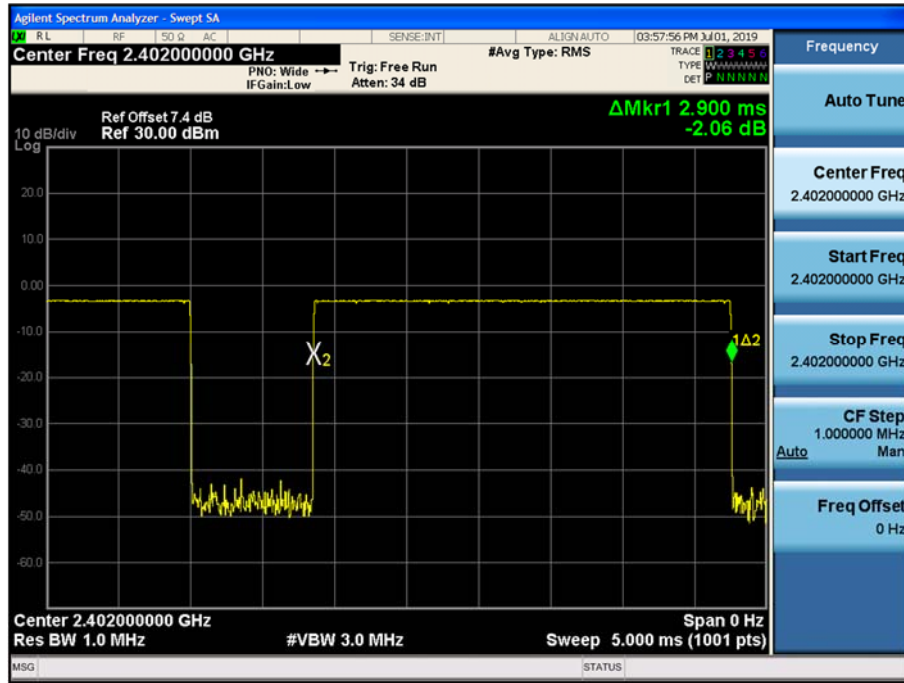
	Channel	GFSK	8DPSK	$\pi/4$ DQPSK	Period Time (s)	Limit (ms)
Total of Dwell (ms)	Low	309.33	309.87	309.87	31.6	400
	Mid	309.33	310.40	309.87	31.6	
	High	308.80	309.87	309.87	31.6	

AFH Mode

	Channel	GFSK	8DPSK	$\pi/4$ DQPSK	Period Time (s)	Limit (ms)
Total of Dwell (ms)	Low	154.67	154.93	154.93	8.0	400
	Mid	154.67	155.20	154.93	8.0	
	High	154.40	154.93	154.93	8.0	

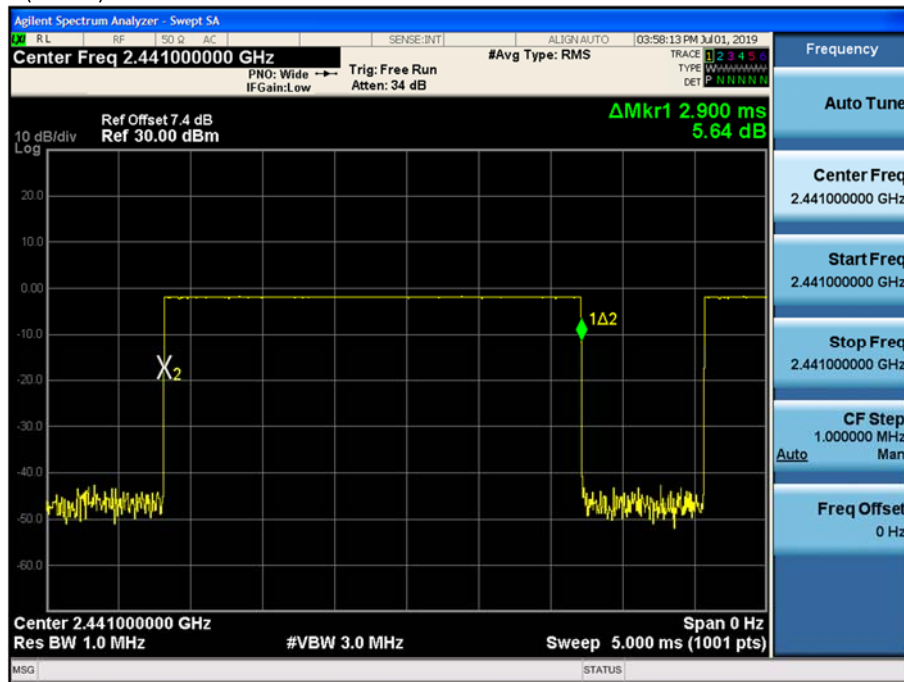
Test Plots (GFSK)

Dwell Time (CH.0)



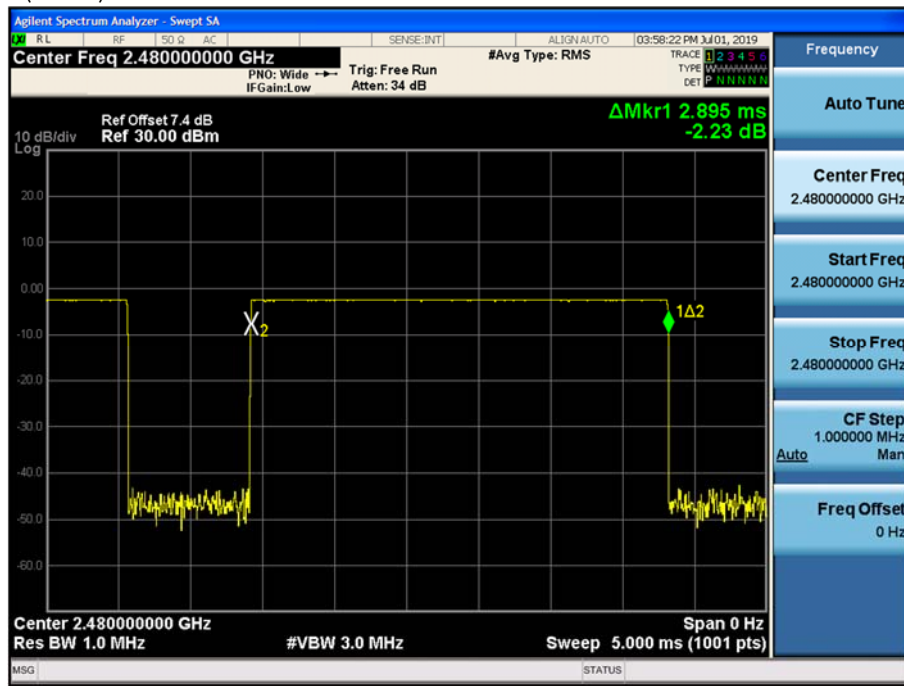
Test Plots (GFSK)

Dwell Time (CH.39)



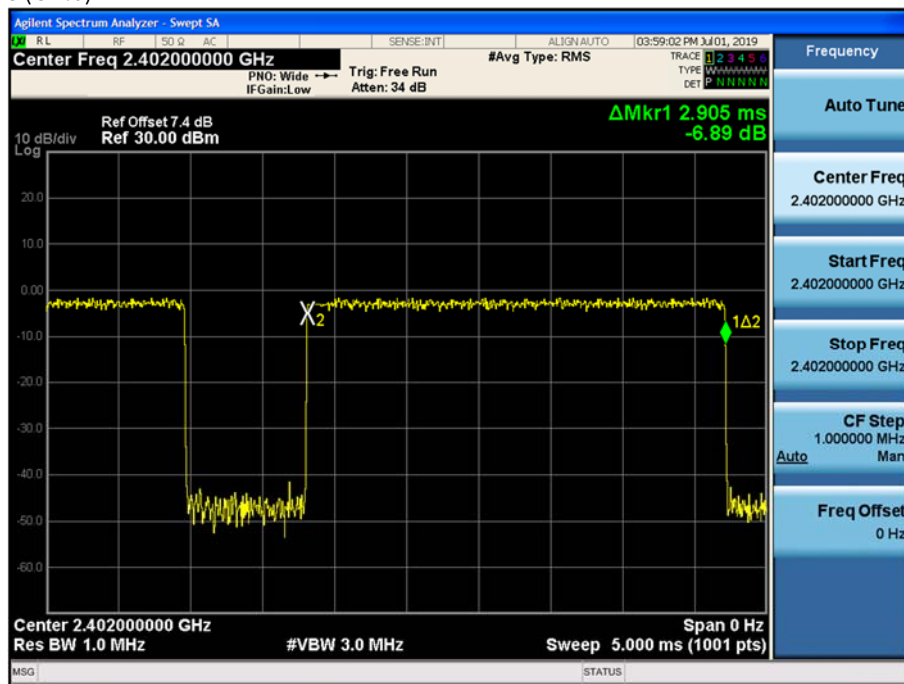
Test Plots (GFSK)

Dwell Time (CH.78)



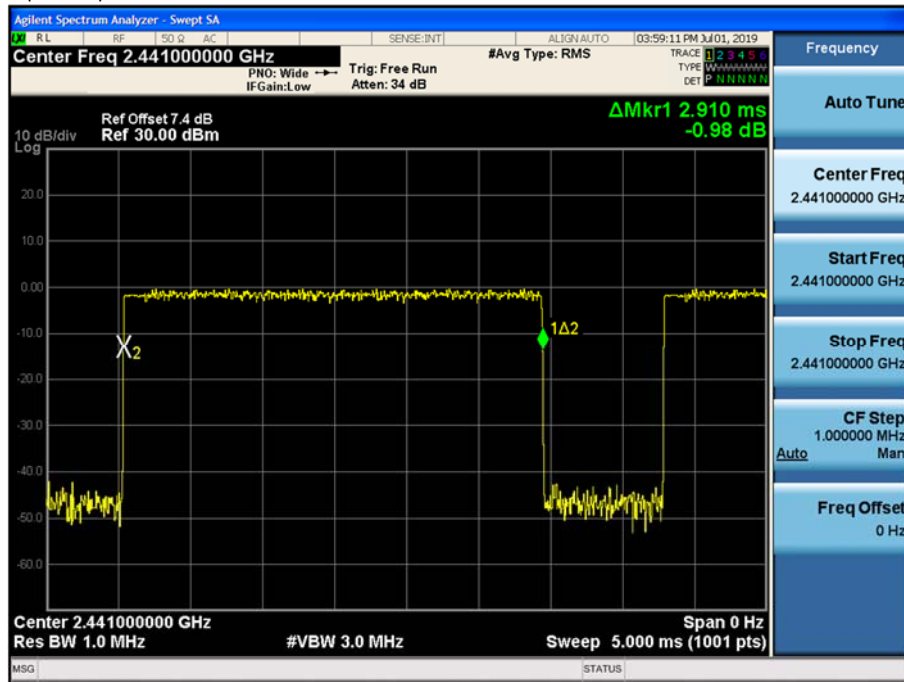
Test Plots (8DPSK)

Dwell Time (CH.0)



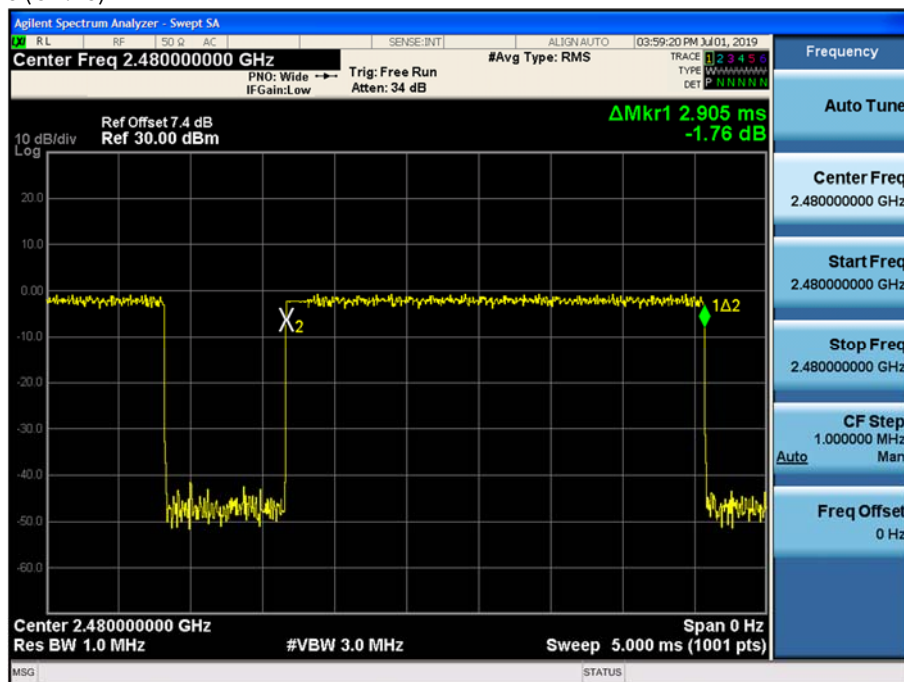
Test Plots (8DPSK)

Dwell Time (CH.39)



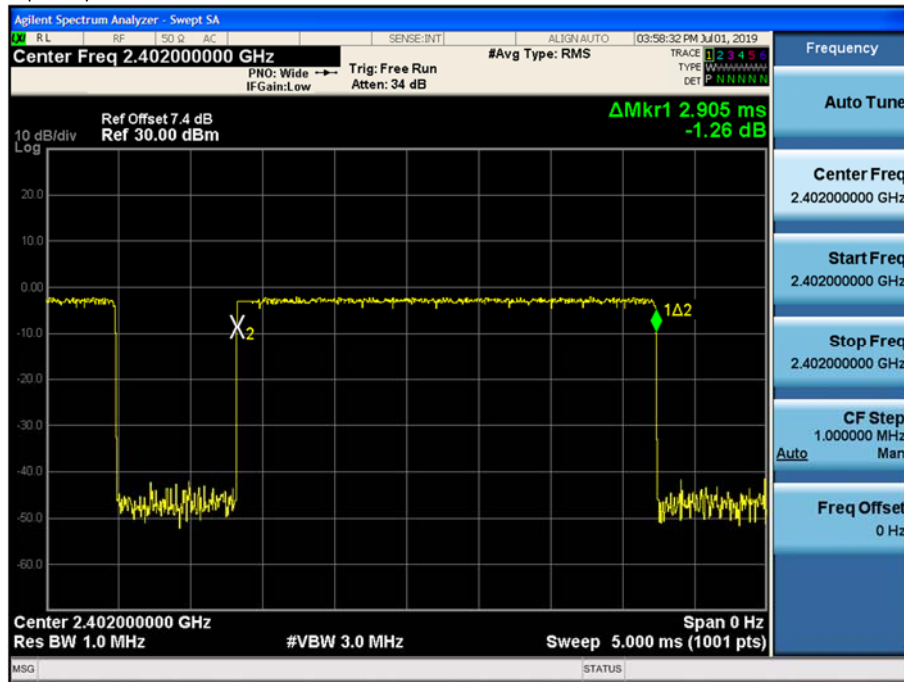
Test Plots (8DPSK)

Dwell Time (CH.78)

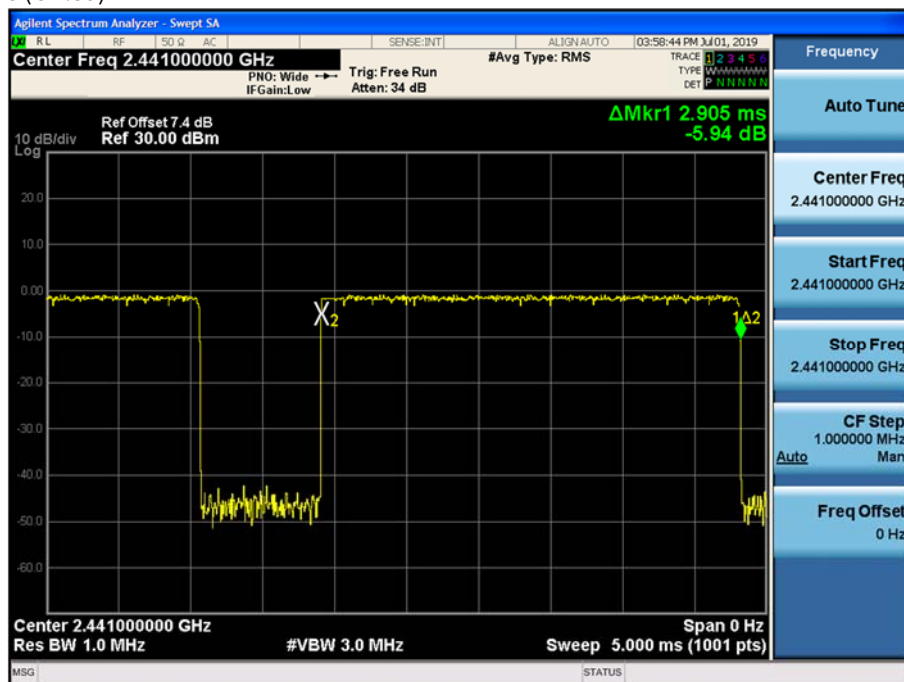


Test Plots ($\pi/4$ DQPSK)

Dwell Time (CH.0)

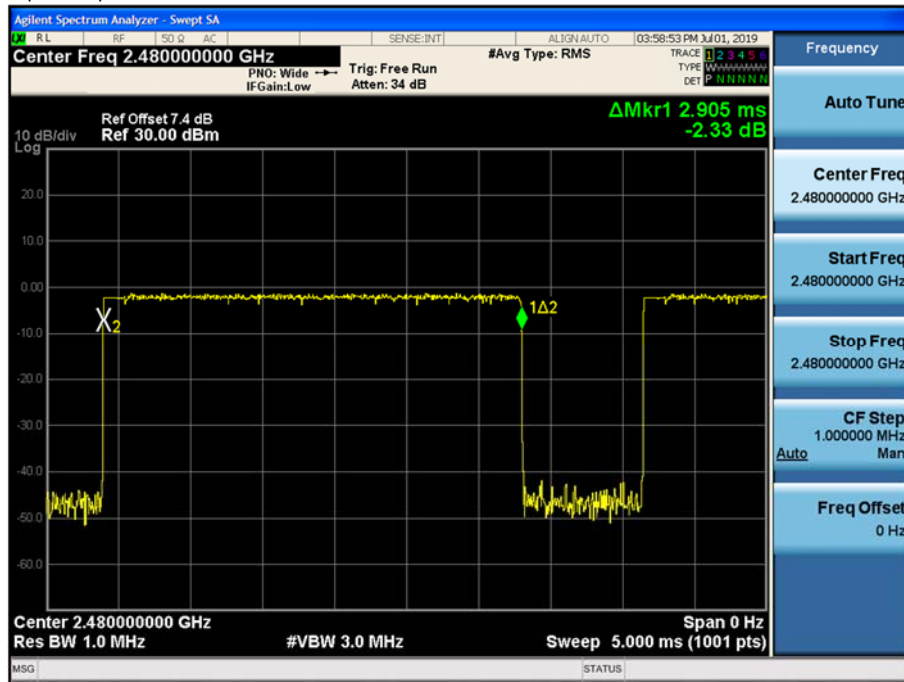

Test Plots ($\pi/4$ DQPSK)

Dwell Time (CH.39)



Test Plots ($\pi/4$ DQPSK)

Dwell Time (CH.78)



10.6 SPURIOUS EMISSIONS

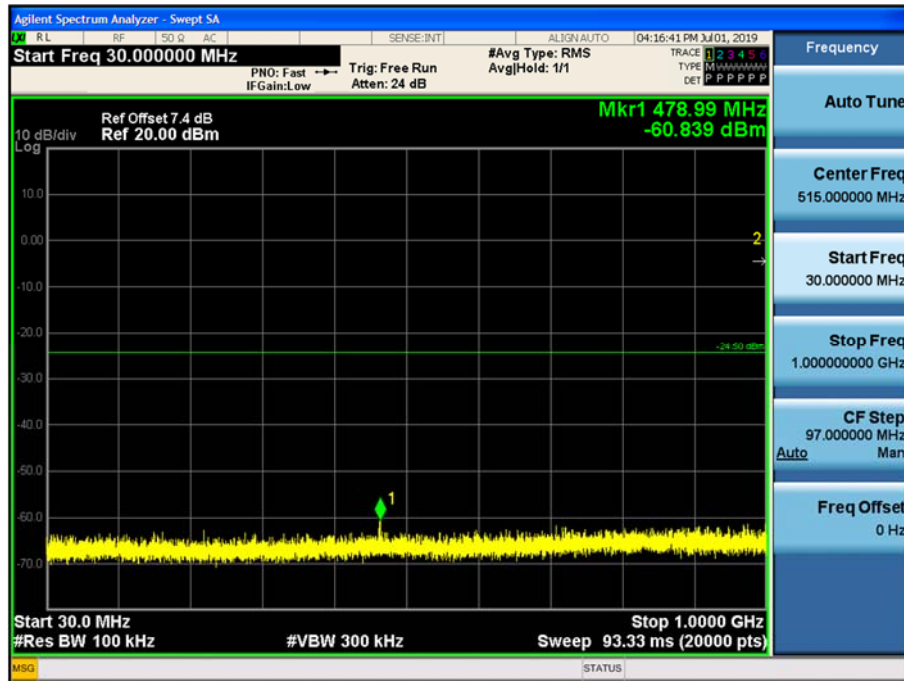
10.6.1 CONDUCTED SPURIOUS EMISSIONS

Test Result : please refer to the plot below.

In order to simplify the report, attached plots were only the worst case channel and data rate.

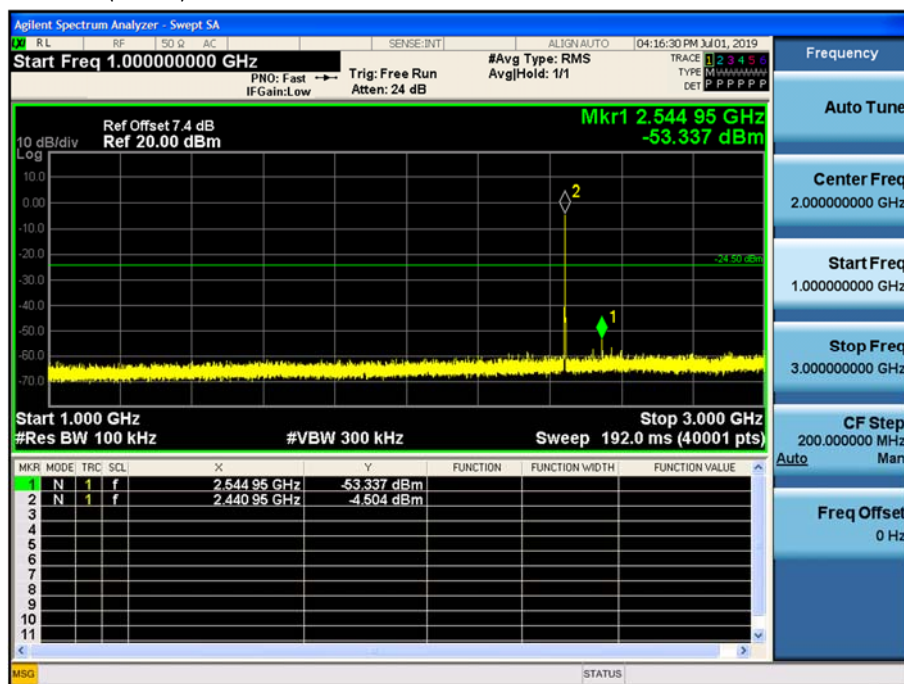
Test Plots (8DPSK)- 30 MHz - 1 GHz

Spurious Emission (CH.39)



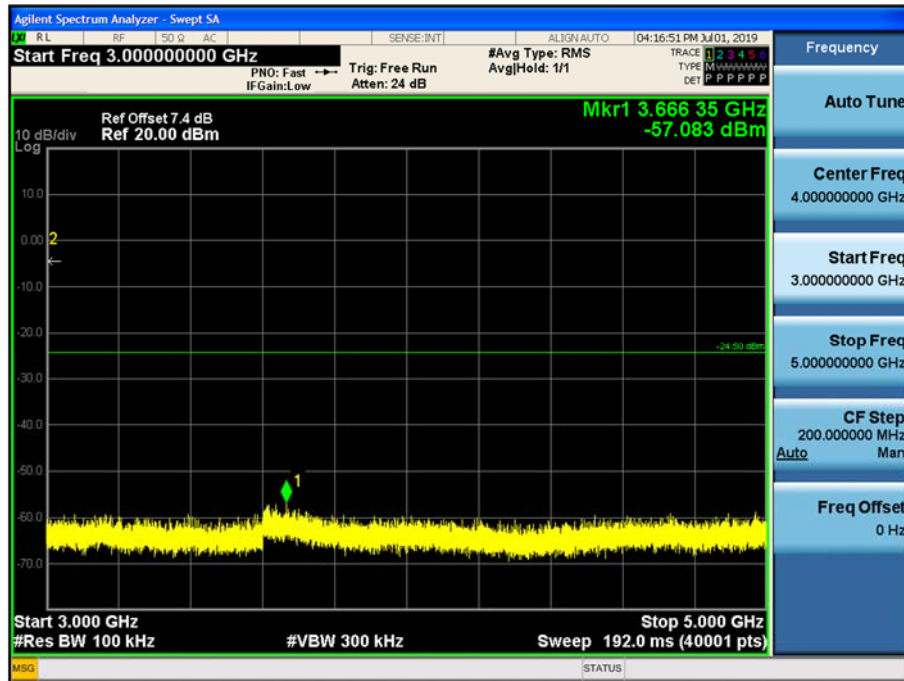
Test Plots (8DPSK)- 1 GHz – 3 GHz

Spurious Emission (CH.39)



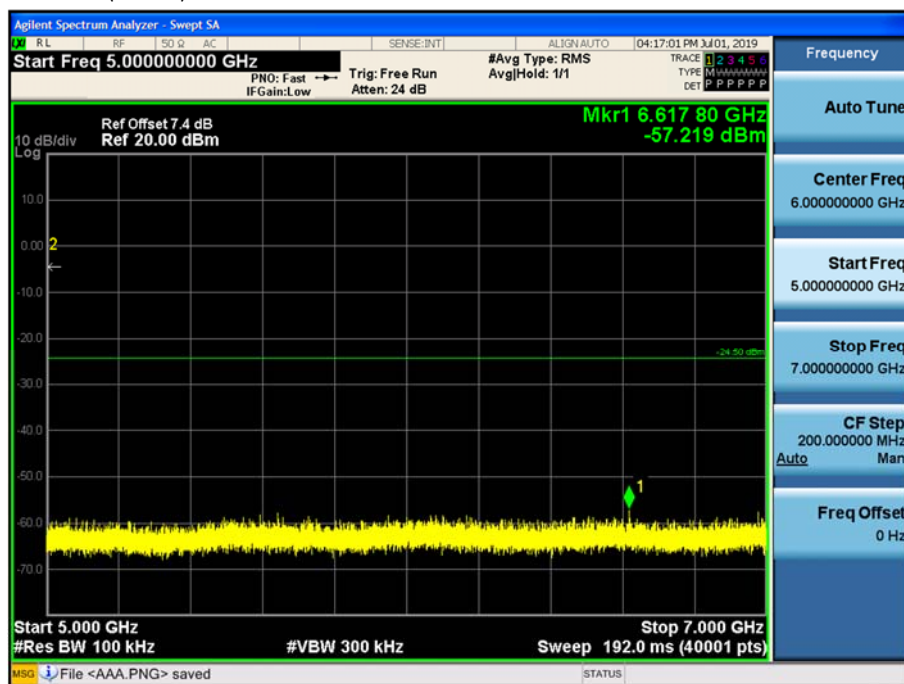
Test Plots(8DPSK)- 3 GHz - 5 GHz

Spurious Emission (CH.39)



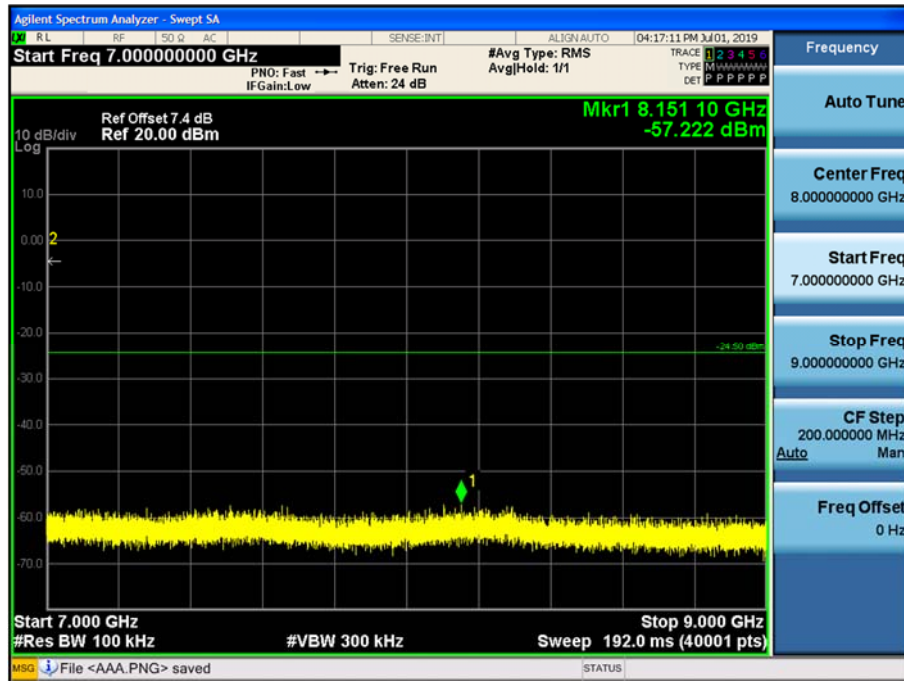
Test Plots (8DPSK)- 5 GHz - 7 GHz

Spurious Emission (CH.39)



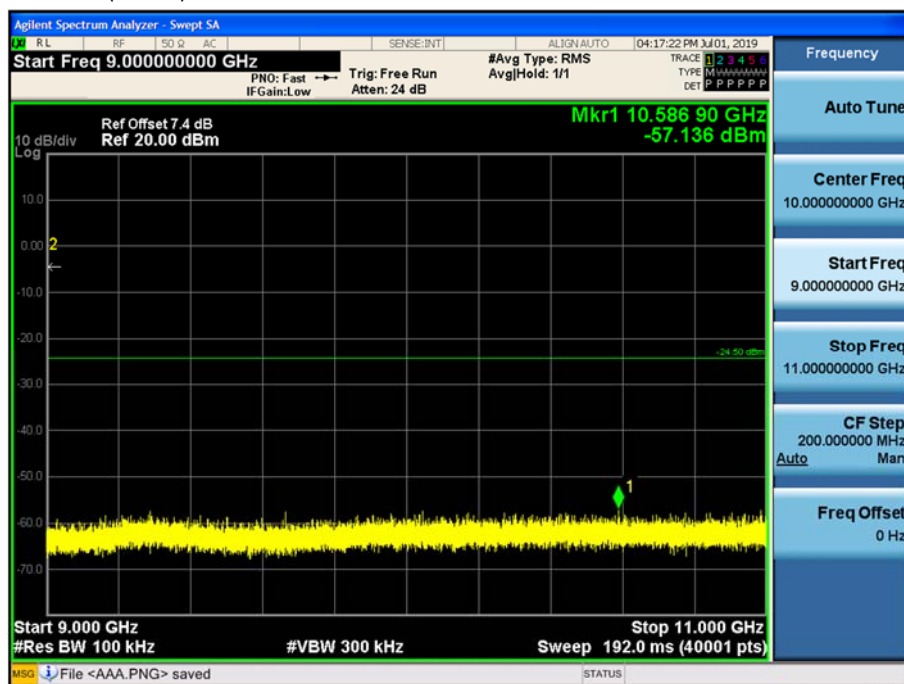
Test Plots(8DPSK)- 7 GHz - 9 GHz

Spurious Emission (CH.39)



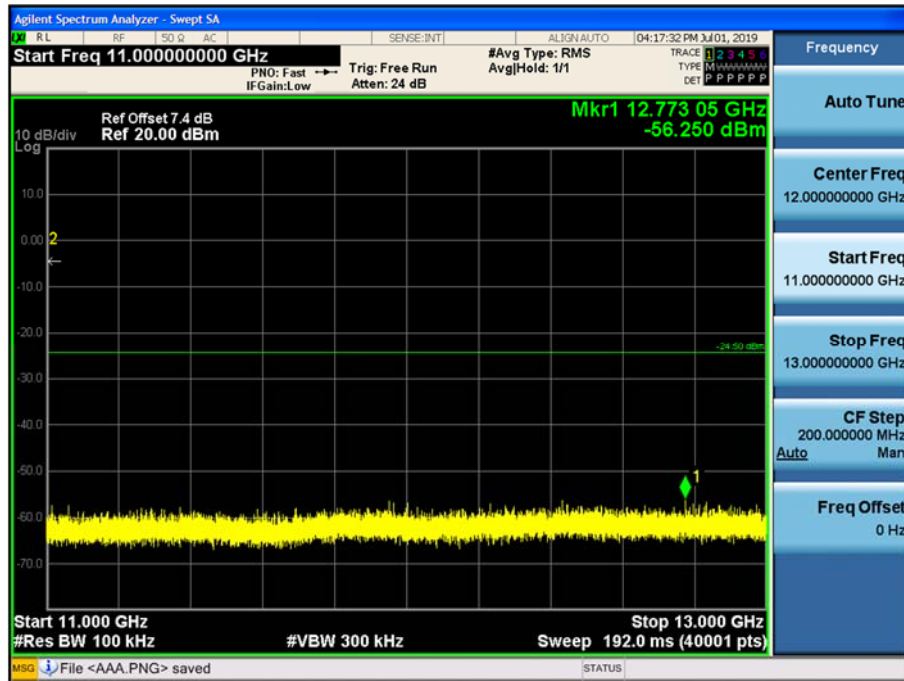
Test Plots(8DPSK)- 9 GHz - 11 GHz

Spurious Emission (CH.39)



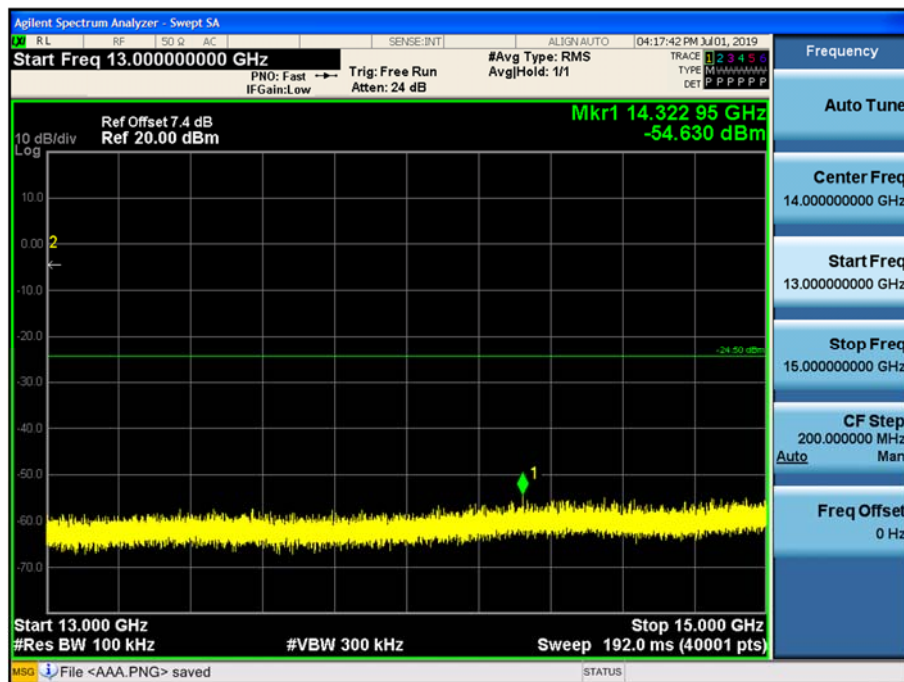
Test Plots(8DPSK) 11 GHz - 13 GHz

Spurious Emission (CH.39)



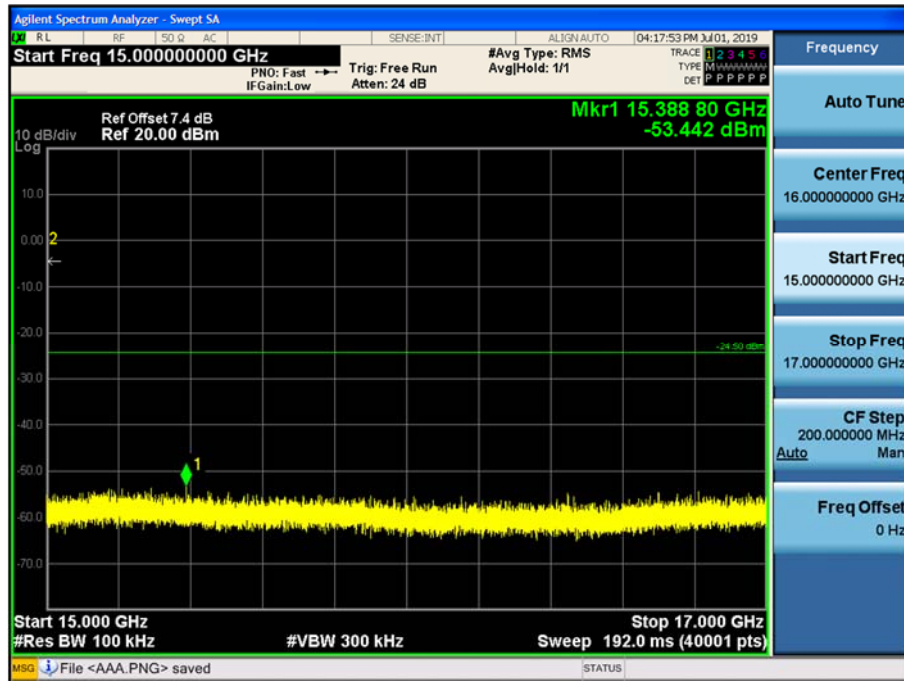
Test Plots (8DPSK)- 13 GHz – 15 GHz

Spurious Emission (CH.39)



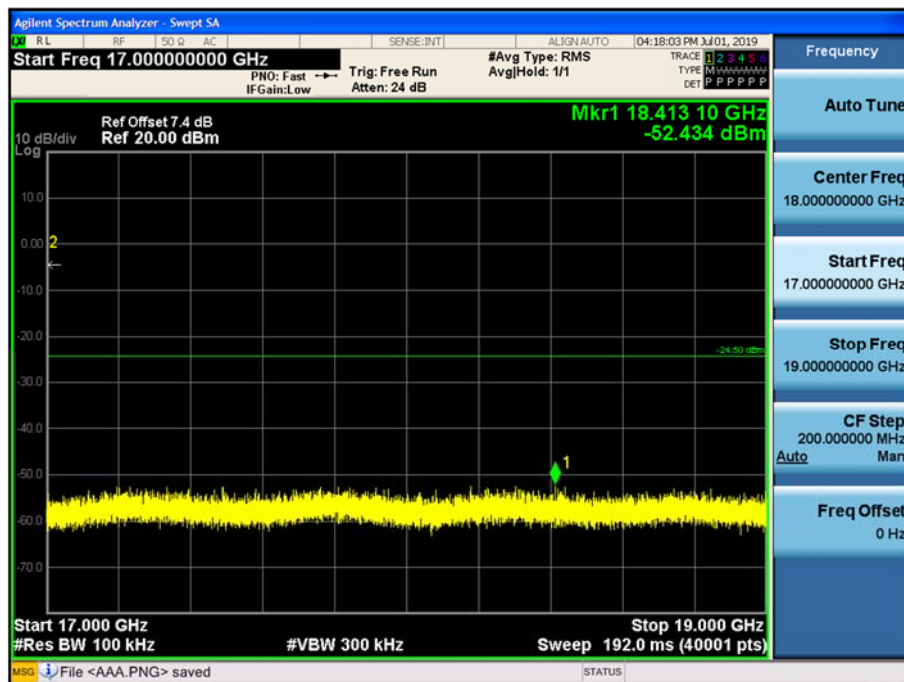
Test Plots(8DPSK)- 15 GHz - 17 GHz

Spurious Emission (CH.39)



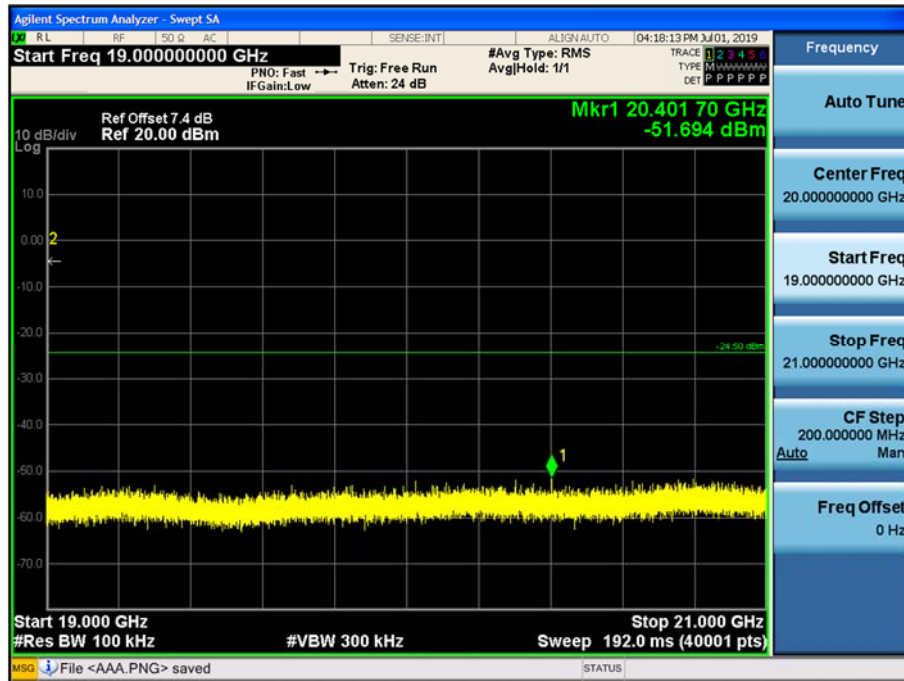
Test Plots(8DPSK)- 17 GHz - 19 GHz

Spurious Emission (CH.39)



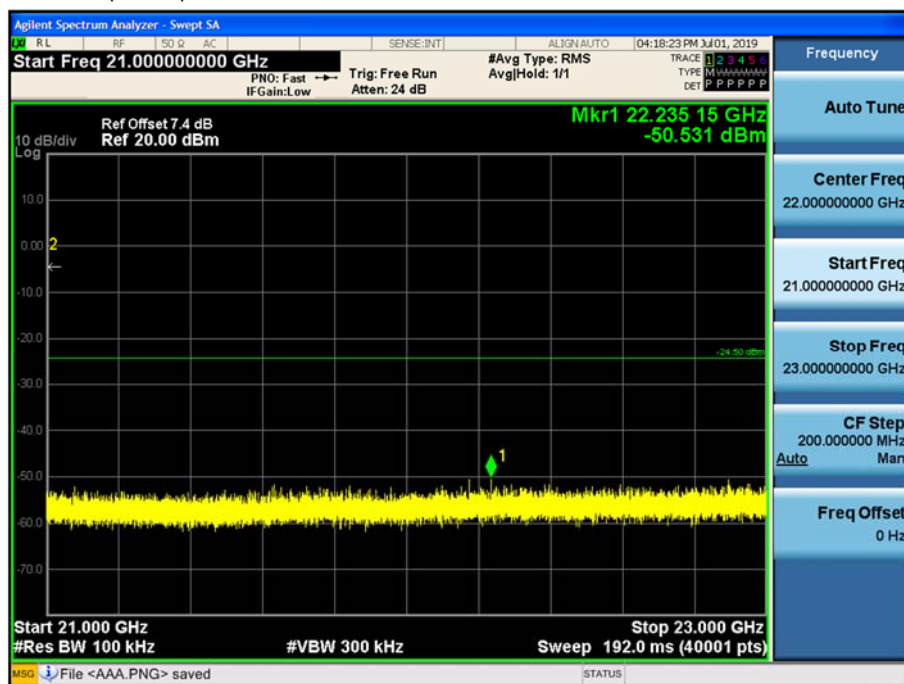
Test Plots (8DPSK)- 19 GHz - 21 GHz

Spurious Emission (CH.39)



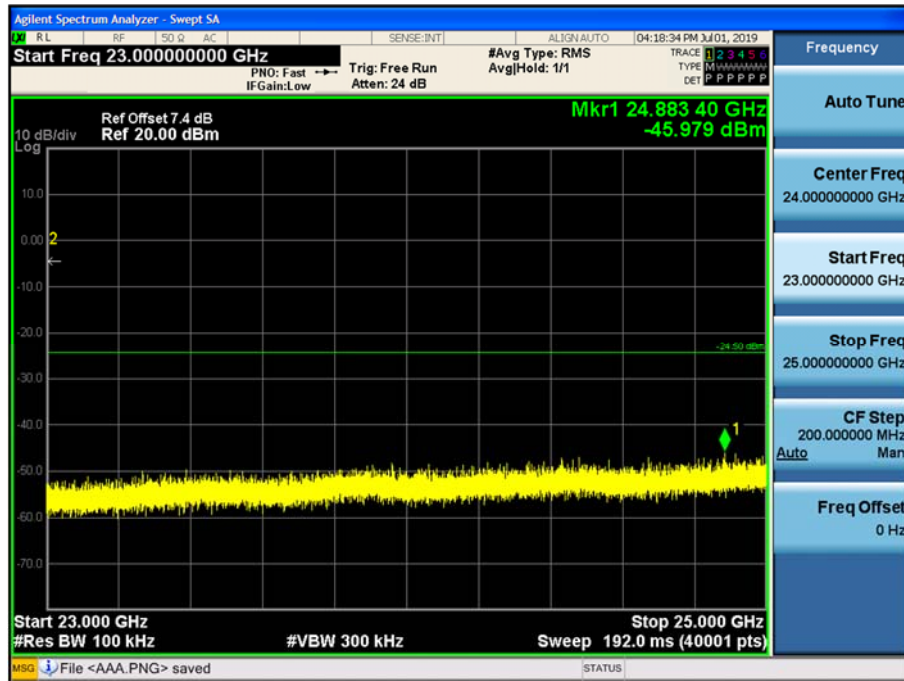
Test Plots (8DPSK)- 21 GHz - 23 GHz

Spurious Emission (CH.39)



Test Plots (8DPSK)- 23 GHz - 25 GHz

Spurious Emission (CH.39)



10.6.2 RADIATED SPURIOUS EMISSIONS

Frequency Range : 9 kHz – 30MHz

Frequency	Reading	Ant. factor	Cable loss	Ant. POL	Total	Limit	Margin
MHz	dBuV/m	dBm/m	dBm	(H/V)	dBuV/m	dBuV/m	dB
No Critical peaks found							

Note:

1. The reading of emissions are attenuated more than 20 dB below the permissible limits or the field strength is too small to be measured.
2. Distance extrapolation factor = $40 \cdot \log(\text{specific distance} / \text{test distance})$ (dB)
3. Limit line = specific Limits (dBuV) + Distance extrapolation factor
4. Radiated test is performed with hopping off.

Frequency Range : Below 1 GHz

Frequency	Reading	Ant. factor	Cable loss	Ant. POL	Total	Limit	Margin
MHz	dBuV/m	dBm/m	dBm	(H/V)	dBuV/m	dBuV/m	dB
No Critical peaks found							

Note:

1. Radiated emissions measured in frequency range from 30 MHz to 1000 MHz were made with an instrument using Quasi peak detector mode.
2. Radiated test is performed with hopping off.

Frequency Range : Above 1 GHz

Operation Mode: CH Low(GFSK)

Frequency [MHz]	Reading [dBuV]	A.F + C.L - A.G + D.F [dB]	Pol. [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
4804	50.14	0.44	V	50.58	73.98	23.40	PK
4804	40.18	0.44	V	40.62	53.98	13.36	AV
7206	47.32	9.25	V	56.57	73.98	17.42	PK
7206	34.01	9.25	V	43.26	53.98	10.73	AV
4804	50.15	0.44	H	50.59	73.98	23.39	PK
4804	41.37	0.44	H	41.81	53.98	12.17	AV
7206	47.55	9.25	H	56.50	73.98	17.19	PK
7206	34.27	9.25	H	43.52	53.98	10.47	AV

Operation Mode: CH Low(8DPSK)

Frequency [MHz]	Reading [dBuV]	A.F + C.L - A.G + D.F [dB]	Pol. [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
4804	49.62	0.44	V	50.06	73.98	23.92	PK
4804	37.42	0.44	V	37.86	53.98	16.12	AV
7206	47.11	9.25	V	56.36	73.98	17.63	PK
7206	34.05	9.25	V	43.30	53.98	10.69	AV
4804	49.74	0.44	H	50.18	73.98	23.80	PK
4804	37.62	0.44	H	38.06	53.98	15.92	AV
7206	47.75	9.25	H	57.00	73.98	16.99	PK
7206	34.18	9.25	H	43.43	53.98	10.56	AV

Operation Mode: CH Low($\pi/4$ DQPSK)

Frequency [MHz]	Reading [dBuV]	A.F + C.L - A.G + D.F [dB]	Pol. [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
4804	48.89	0.44	V	49.33	73.98	24.65	PK
4804	37.51	0.44	V	37.95	53.98	16.03	AV
7206	47.38	9.25	V	56.63	73.98	17.36	PK
7206	33.99	9.25	V	43.24	53.98	10.75	AV
4804	49.44	0.44	H	49.88	73.98	24.10	PK
4804	37.66	0.44	H	38.10	53.98	15.88	AV
7206	47.81	9.25	H	57.06	73.98	16.93	PK
7206	34.22	9.25	H	43.47	53.98	10.52	AV

Operation Mode: CH Mid(GFSK)

Frequency [MHz]	Reading [dBuV]	A.F + C.L - A.G + D.F [dB]	Pol. [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
4882	50.88	0.96	V	51.84	73.98	22.14	PK
4882	42.71	0.96	V	43.67	53.98	10.31	AV
7323	47.14	9.14	V	56.28	73.98	17.70	PK
7323	34.48	9.14	V	43.62	53.98	10.36	AV
4882	51.62	0.96	H	52.58	73.98	21.40	PK
4882	43.01	0.96	H	43.97	53.98	10.01	AV
7323	47.67	9.14	H	56.81	73.98	17.17	PK
7323	34.67	9.14	H	43.81	53.98	10.17	AV

Operation Mode: CH Mid(8DPSK)

Frequency [MHz]	Reading [dBuV]	A.F + C.L - A.G + D.F [dB]	Pol. [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
4882	49.25	0.96	V	50.21	73.98	23.77	PK
4882	38.59	0.96	V	39.55	53.98	14.43	AV
7323	47.32	9.14	V	56.46	73.98	17.52	PK
7323	34.49	9.14	V	43.63	53.98	10.35	AV
4882	50.22	0.96	H	51.18	73.98	22.80	PK
4882	38.68	0.96	H	39.64	53.98	14.34	AV
7323	47.48	9.14	H	56.62	73.98	17.36	PK
7323	34.60	9.14	H	43.74	53.98	10.24	AV

Operation Mode: CH Mid($\pi/4$ DQPSK)

Frequency [MHz]	Reading [dBuV]	A.F + C.L - A.G + D.F [dB]	Pol. [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
4882	50.07	0.96	V	51.03	73.98	22.95	PK
4882	38.32	0.96	V	39.28	53.98	14.70	AV
7323	47.35	9.14	V	56.49	73.98	17.49	PK
7323	34.55	9.14	V	43.69	53.98	10.29	AV
4882	50.10	0.96	H	51.06	73.98	22.92	PK
4882	38.75	0.96	H	39.71	53.98	14.27	AV
7323	47.51	9.14	H	56.65	73.98	17.33	PK
7323	34.61	9.14	H	43.75	53.98	10.23	AV

Operation Mode: CH High(GFSK)

Frequency [MHz]	Reading [dBuV]	A.F + C.L - A.G + D.F [dB]	Pol. [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
4960	50.75	0.66	V	51.41	73.98	22.57	PK
4960	41.53	0.66	V	42.19	53.98	11.79	AV
7440	46.36	10.16	V	56.52	73.98	17.46	PK
7440	33.04	10.16	V	43.20	53.98	10.78	AV
4960	50.90	0.66	H	51.56	73.98	22.42	PK
4960	41.75	0.66	H	42.41	53.98	11.57	AV
7440	46.44	10.16	H	56.60	73.98	17.38	PK
7440	33.07	10.16	H	43.23	53.98	10.75	AV

Operation Mode: CH High(8DPSK)

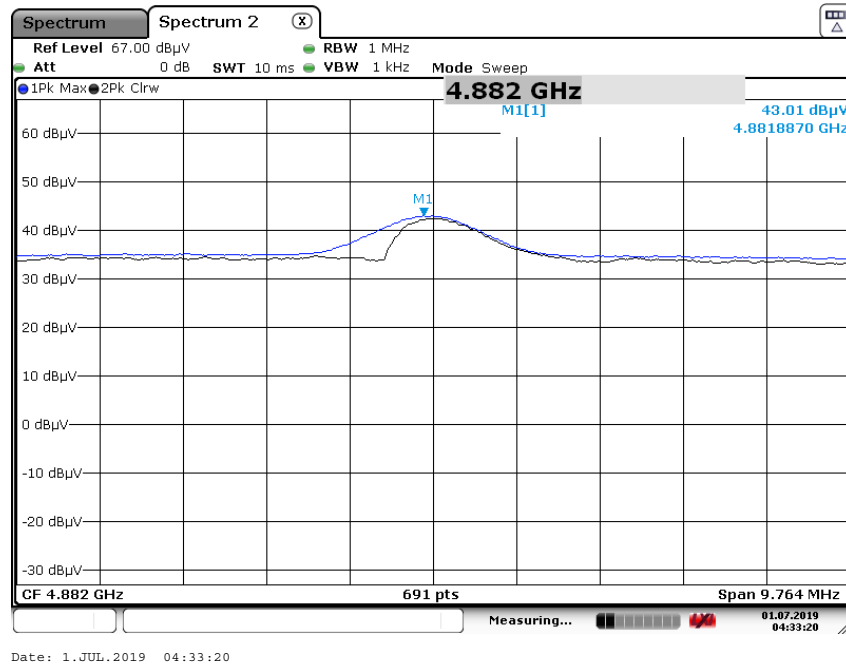
Frequency [MHz]	Reading [dBuV]	A.F + C.L - A.G + D.F [dB]	Pol. [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
4960	49.03	0.66	V	49.69	73.98	24.29	PK
4960	37.50	0.66	V	38.16	53.98	15.82	AV
7440	45.98	10.16	V	56.14	73.98	17.84	PK
7440	33.01	10.16	V	43.17	53.98	10.81	AV
4960	49.80	0.66	H	50.46	73.98	23.52	PK
4960	37.70	0.66	H	38.36	53.98	15.62	AV
7440	46.38	10.16	H	56.54	73.98	17.44	PK
7440	33.08	10.16	H	43.24	53.98	10.74	AV

Operation Mode: CH High ($\pi/4$ DQPSK)

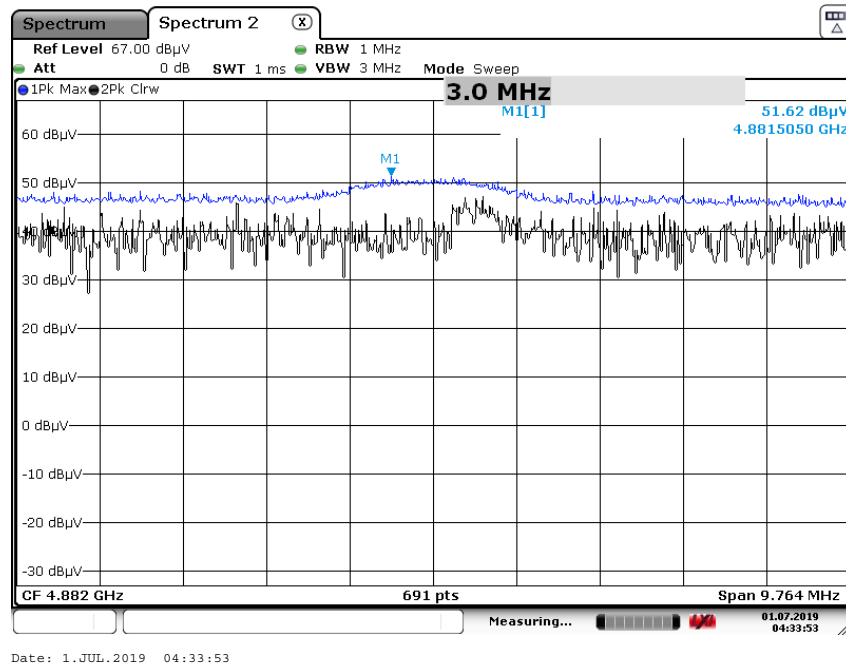
Frequency [MHz]	Reading [dBuV]	A.F + C.L - A.G + D.F [dB]	Pol. [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
4960	49.12	0.66	V	49.78	73.98	24.20	PK
4960	37.53	0.66	V	38.19	53.98	15.79	AV
7440	46.19	10.16	V	56.35	73.98	17.63	PK
7440	32.92	10.16	V	43.08	53.98	10.90	AV
4960	49.71	0.66	H	50.37	73.98	23.61	PK
4960	37.77	0.66	H	38.43	53.98	15.55	AV
7440	46.51	10.16	H	56.67	73.98	17.31	PK
7440	33.13	10.16	H	43.29	53.98	10.69	AV

RESULT PLOTS (Worst case: X-H)

Radiated Spurious Emissions plot – Average Reading (GFSK, Ch.39 2nd Harmonic)



Radiated Spurious Emissions plot – Peak Reading (GFSK, Ch.39 2nd Harmonic)



Note:

Plot of worst case are only reported.

10.6.3 RADIATED RESTRICTED BAND EDGES

Operation Mode	Normal(GFSK)
Operating Frequency	2402 MHz, 2480 MHz
Channel No	CH 0, CH 78

Frequency [MHz]	Reading [dBuV]	A.F + C.L + D.F [dB]	Pol. [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
2390.0	19.40	33.39	H	52.79	73.98	21.19	PK
2390.0	8.33	33.39	H	41.72	53.98	12.26	AV
2390.0	19.43	33.39	V	52.82	73.98	21.16	PK
2390.0	8.36	33.39	V	41.75	53.98	12.23	AV
2483.5	23.85	33.39	H	57.24	73.98	16.74	PK
2483.5	8.99	33.39	H	42.38	53.98	11.60	AV
2483.5	24.80	33.39	V	58.19	73.98	15.80	PK
2483.5	9.15	33.39	V	42.54	53.98	11.44	AV

Operation Mode	EDR(8DPSK)
Operating Frequency	2402 MHz, 2480 MHz
Channel No	CH 0, CH 78

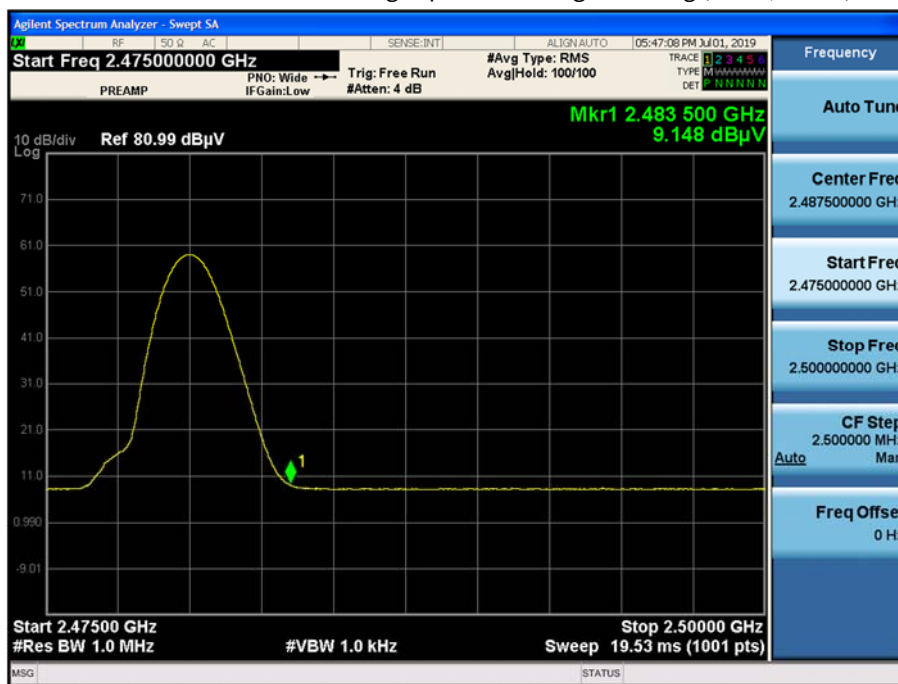
Frequency [MHz]	Reading [dBuV]	A.F + C.L + D.F [dB]	Pol. [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
2390.0	18.50	33.39	H	51.89	73.98	22.09	PK
2390.0	8.29	33.39	H	41.68	53.98	12.30	AV
2390.0	18.71	33.39	V	52.10	73.98	21.88	PK
2390.0	8.33	33.39	V	41.72	53.98	12.27	AV
2483.5	25.04	33.39	H	58.43	73.98	15.55	PK
2483.5	8.91	33.39	H	42.30	53.98	11.68	AV
2483.5	25.16	33.39	V	58.55	73.98	15.43	PK
2483.5	8.93	33.39	V	42.32	53.98	11.66	AV

Operation Mode	EDR(π /4DQPSK)
Operating Frequency	2402 MHz, 2480 MHz
Channel No	CH 0, CH 78

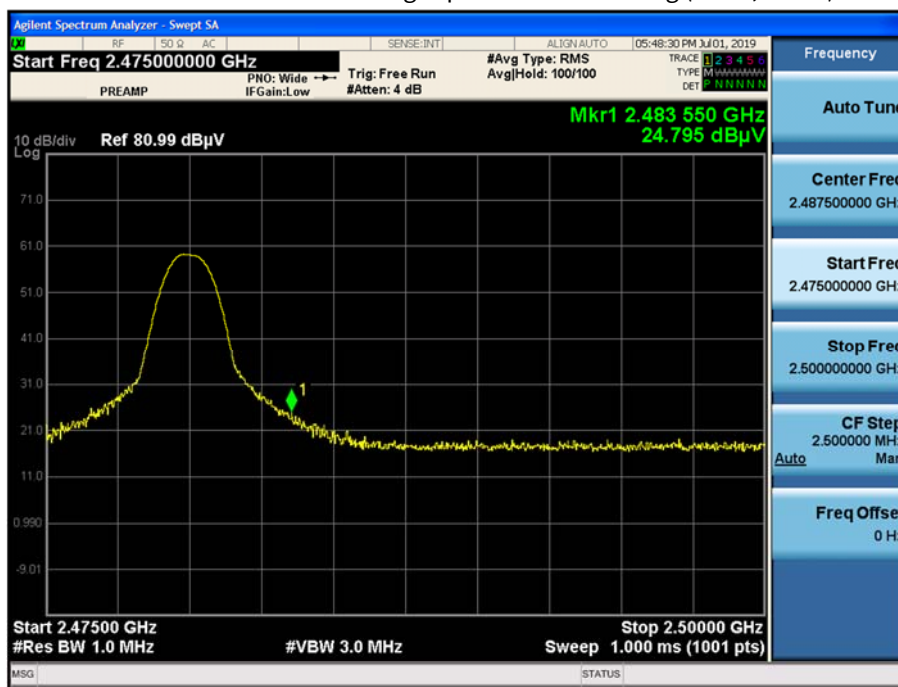
Frequency [MHz]	Reading [dBuV]	A.F + C.L + D.F [dB]	Pol. [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
2390.0	18.35	33.39	H	51.74	73.98	22.25	PK
2390.0	8.39	33.39	H	41.78	53.98	12.20	AV
2390.0	18.56	33.39	V	51.95	73.98	22.03	PK
2390.0	8.41	33.39	V	41.80	53.98	12.18	AV
2483.5	23.56	33.39	H	56.95	73.98	17.03	PK
2483.5	8.81	33.39	H	42.20	53.98	11.78	AV
2483.5	23.95	33.39	V	57.34	73.98	16.64	PK
2483.5	8.86	33.39	V	42.25	53.98	11.73	AV

RESULT PLOTS (Worst case : X-V)

Radiated Restricted Band Edges plot – Average Reading (GFSK, Ch.78)



Radiated Restricted Band Edges plot – Peak Reading (GFSK, Ch.78)



Note:

Plot of worst case are only reported.

11. LIST OF TEST EQUIPMENT

Conducted Test

Manufacturer	Model / Equipment	Calibration Date	Calibration Interval	Serial No.
Rohde & Schwarz	ENV216 / LISN	12/12/2018	Annual	102245
Rohde & Schwarz	ESCI / Test Receiver	06/18/2019	Annual	100033
ESPAC	SU-642 / Temperature Chamber	03/12/2019	Annual	0093008124
Agilent	N9020A / Signal Analyzer	05/23/2019	Annual	MY51110085
Agilent	N9020A / Signal Analyzer	05/24/2019	Annual	MY52090906
Agilent	N9030A / Signal Analyzer	01/10/2019	Annual	MY49431210
Rohde & Schwarz	OSP 120 / Power Measurement Set	07/26/2018	Annual	101231
Agilent	N1911A / Power Meter	04/10/2019	Annual	MY45100523
Agilent	N1921A / Power Sensor	04/10/2019	Annual	MY52260025
Agilent	87300B / Directional Coupler	11/20/2018	Annual	3116A03621
Hewlett Packard	11667B / Power Splitter	05/24/2019	Annual	05001
Hewlett Packard	E3632A / DC Power Supply	06/18/2019	Annual	KR75303960
Agilent	8493C / Attenuator(10 dB)	07/02/2019	Annual	07560
Rohde & Schwarz	EMC32 / Software	N/A	N/A	N/A
HCT CO., LTD.	FCC WLAN&BT&BLE Conducted Test Software v3.0	N/A	N/A	N/A
Rohde & Schwarz	CBT / Bluetooth Tester	05/16/2019	Annual	100422

Note:

1. Equipment listed above that calibrated during the testing period was set for test after the calibration.
2. Equipment listed above that has a calibration due date during the testing period, the testing is completed before equipment expiration date.

Radiated Test

Manufacturer	Model / Equipment	Calibration Date	Calibration Interval	Serial No.
Innco system	CO3000 / Controller(Antenna mast)	N/A	N/A	CO3000-4p
Innco system	MA4640/800-XP-EP / Antenna Position Tower	N/A	N/A	N/A
Audix	EM1000 / Controller	N/A	N/A	060520
Audix	Turn Table	N/A	N/A	N/A
Rohde & Schwarz	Loop Antenna	08/23/2018	Biennial	1513-175
Schwarzbeck	VULB 9168 / Hybrid Antenna	03/22/2019	Biennial	760
Schwarzbeck	VULB 9160 / TRILOG Antenna	08/09/2018	Biennial	9160-3368
Schwarzbeck	BBHA 9120D / Horn Antenna	04/29/2019	Biennial	9120D-937
Schwarzbeck	BBHA9170 / Horn Antenna(15 GHz ~ 40 GHz)	12/04/2017	Biennial	BBHA9170541
Rohde & Schwarz	FSP(9 kHz ~ 30 GHz) / Spectrum Analyzer	09/03/2018	Annual	100688
Rohde & Schwarz	FSV40-N / Spectrum Analyzer	09/28/2018	Annual	101068-SZ
Agilent	N9020A / Signal Analyzer	05/23/2019	Annual	MY51110085
Wainwright Instruments	WHK3.0/18G-10EF / High Pass Filter	05/23/2019	Annual	8
Wainwright Instruments	WHKX7.0/18G-8SS / High Pass Filter	05/03/2019	Annual	29
Wainwright Instruments	WRCJV2400/2483.5-2370/2520-60/12SS / Band Reject Filter	06/19/2019	Annual	2
Wainwright Instruments	WRCJV5100/5850-40/50-8EEK / Band Reject Filter	01/03/2019	Annual	2
Api tech.	18B-03 / Attenuator (3 dB)	06/04/2019	Annual	1
Agilent	8493C-10 / Attenuator(10 dB)	07/17/2018	Annual	08285
CERNEX	CBLU1183540 / Power Amplifier	07/01/2019	Annual	22964
CERNEX	CBL06185030 / Power Amplifier	07/01/2019	Annual	22965
CERNEX	CBL18265035 / Power Amplifier	01/03/2019	Annual	22966
CERNEX	CBL26405040 / Power Amplifier	06/18/2019	Annual	25956
TESCOM	TC-3000C / Bluetooth Tester	03/26/2019	Annual	3000C000276

Note:

1. Equipment listed above that calibrated during the testing period was set for test after the calibration.
2. Equipment listed above that has a calibration due date during the testing period, the testing is completed before equipment expiration date.

12. ANNEX A_ TEST SETUP PHOTO

Please refer to test setup photo file no. as follows;

No.	Description
1	HCT-RF-1907-FC003-P