

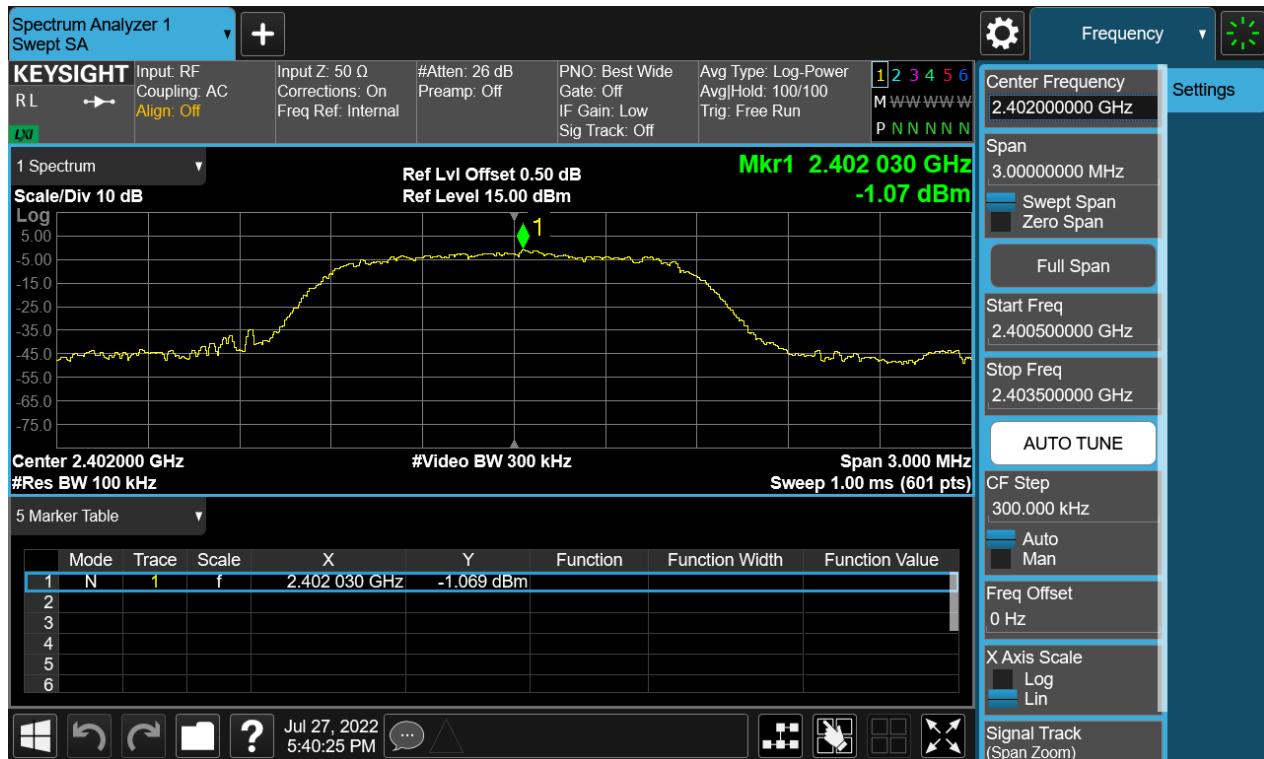
TEST REPORT

Report No.: SHE22060090-02DE

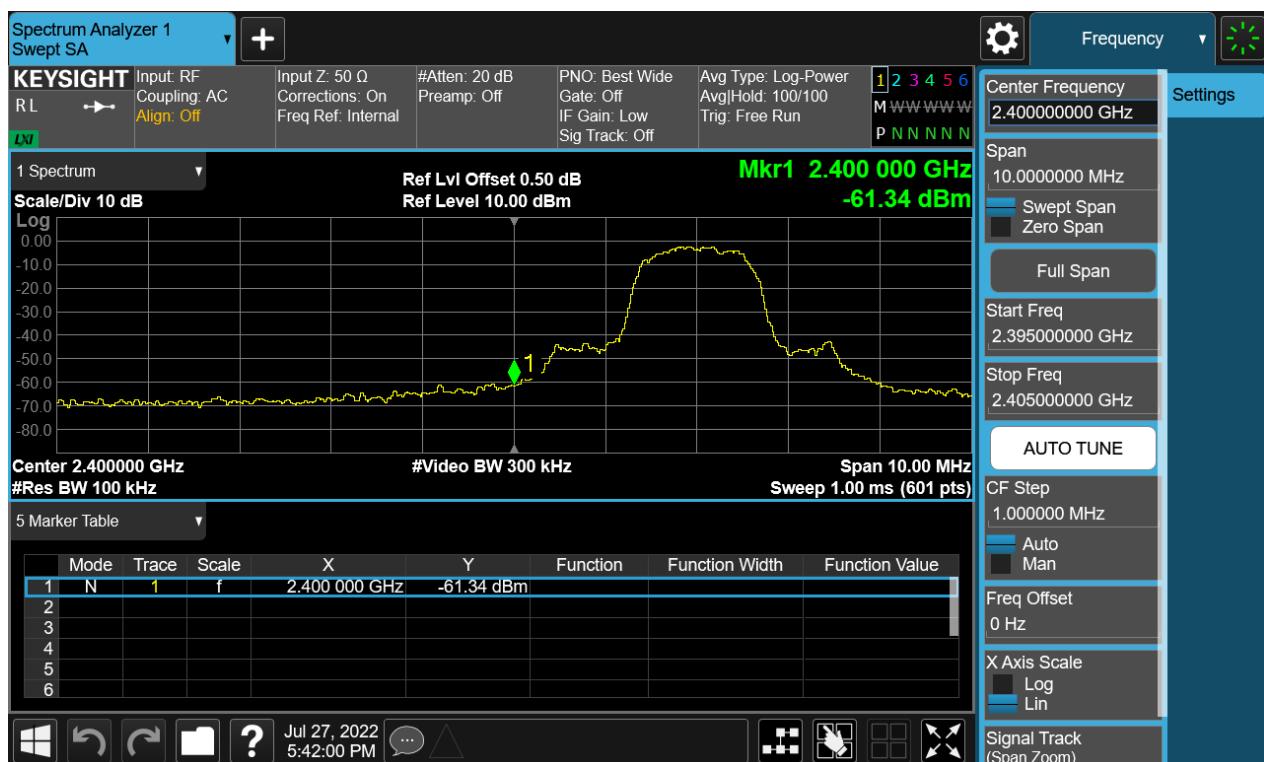
Date: 2022-07-29

Page 35 of 70

Figure 25: Conducted Spurious Emission & Authorized-band band-edge, 2402MHz, 8-DPSK Carrier Level



Band Edge



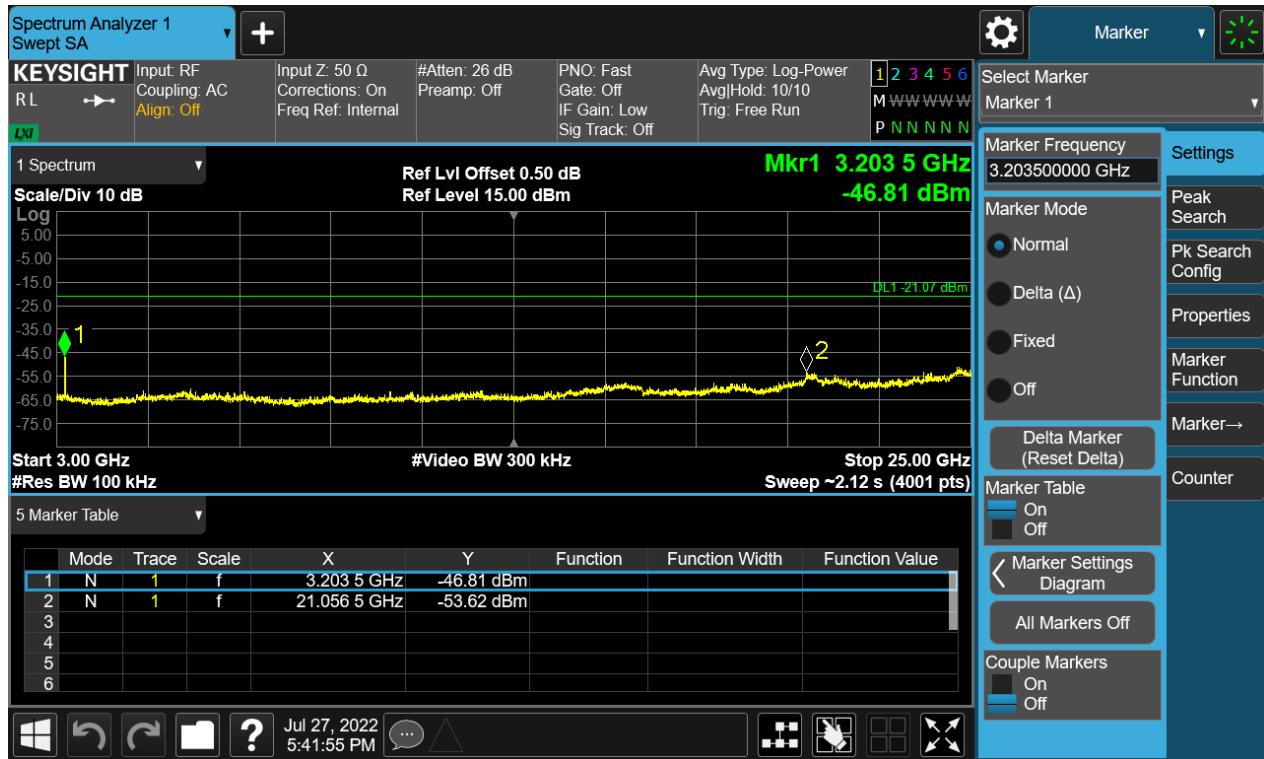
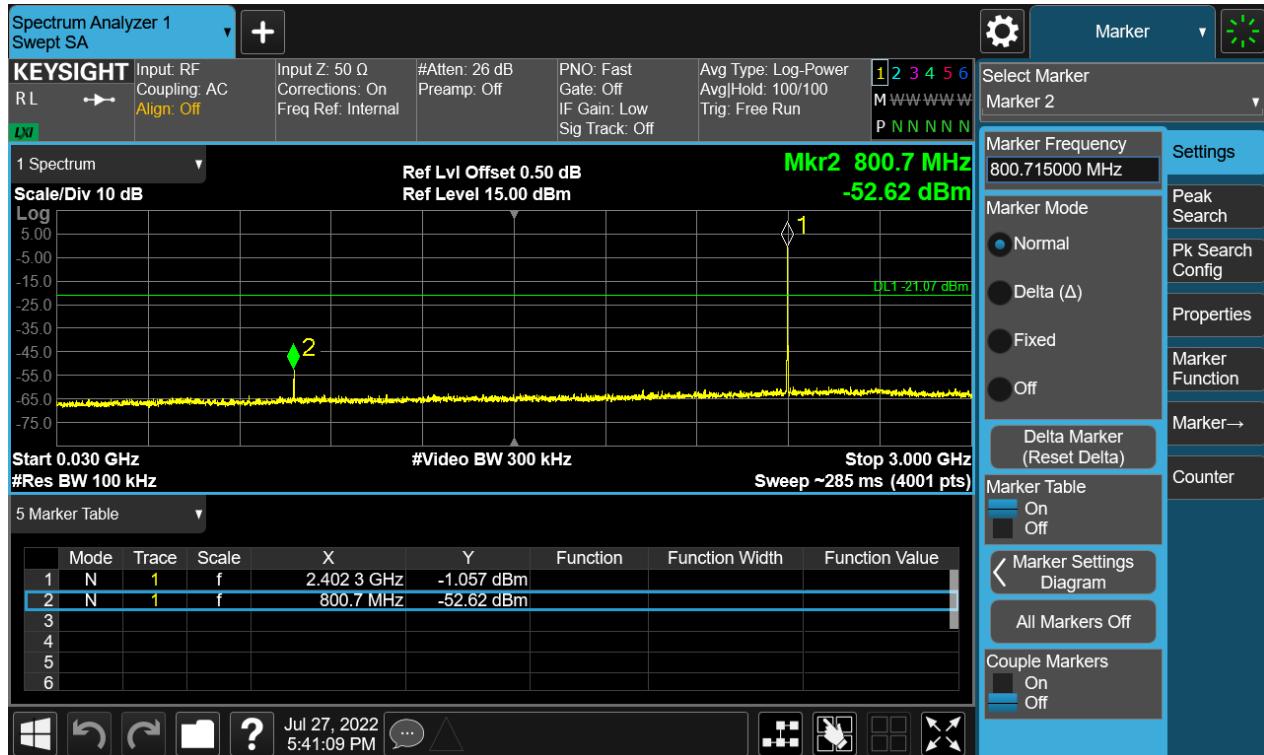
TEST REPORT

Report No.: SHE22060090-02DE

Date: 2022-07-29

Page 36 of 70

Conducted spurious emissions 30MHz-25GHz



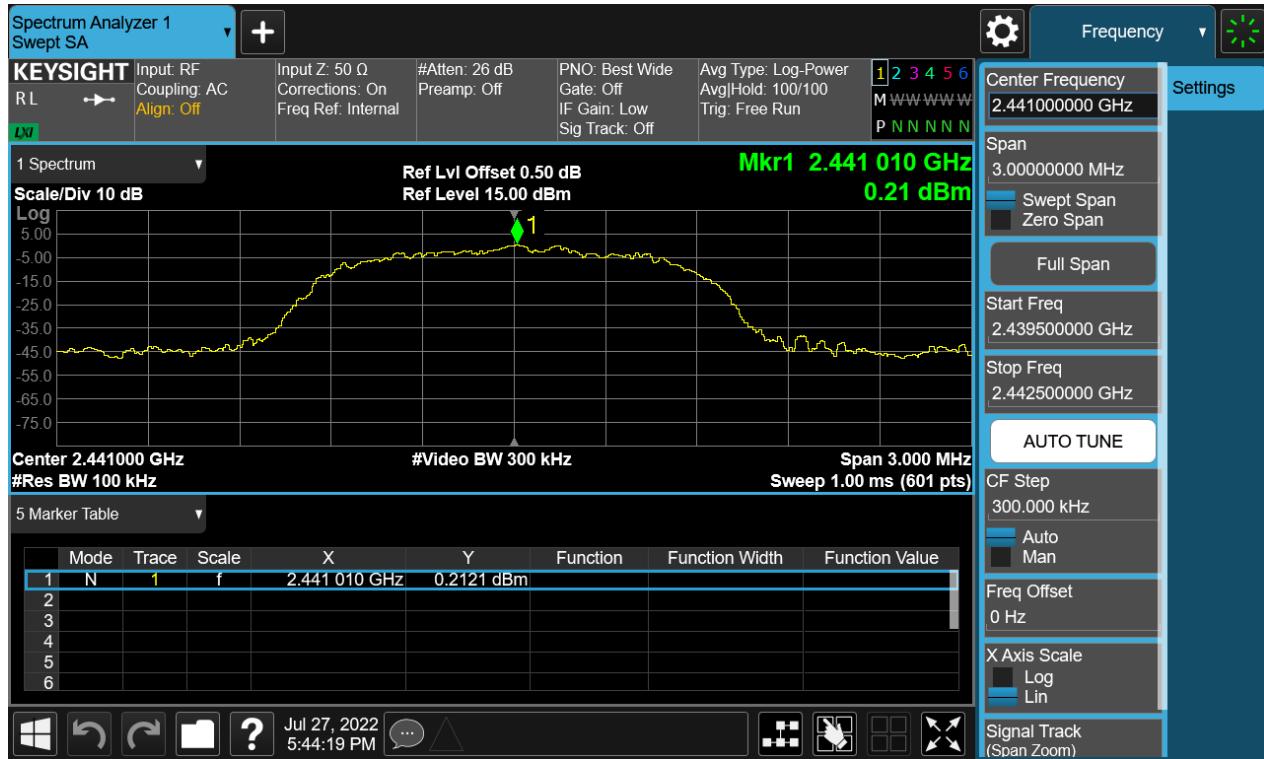
TEST REPORT

Report No.: SHE22060090-02DE

Date: 2022-07-29

Page 37 of 70

Figure 26: Conducted Spurious Emission & Authorized-band band-edge, 2441MHz, 8-DPSK Carrier Level



Conducted spurious emissions 30MHz-25GHz



TEST REPORT

Report No.: SHE22060090-02DE

Date: 2022-07-29

Page 38 of 70



Figure 27: Conducted Spurious Emission & Authorized-band band-edge, 2480MHz, 8-DPSK Carrier Level



TEST REPORT

Report No.: SHE22060090-02DE

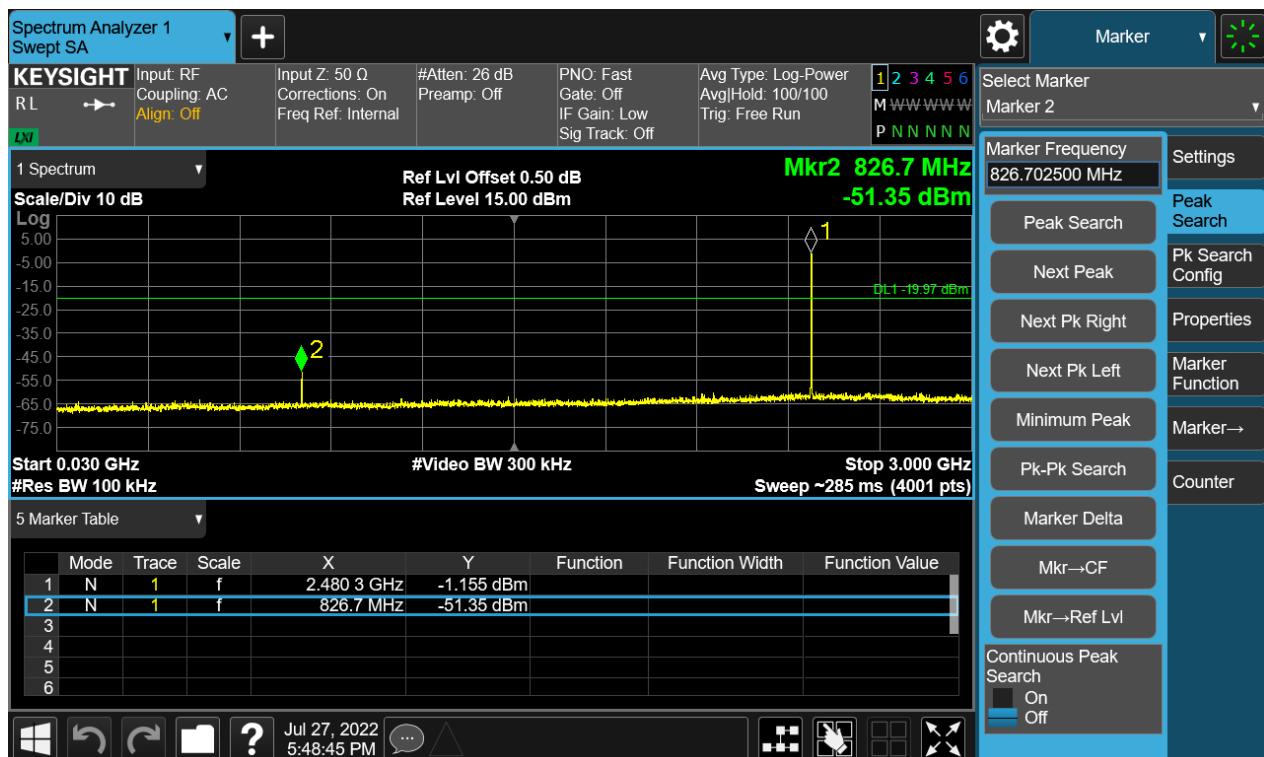
Date: 2022-07-29

Page 39 of 70

Band Edge



Conducted spurious emissions 30MHz-25GHz



TEST REPORT

Report No.: SHE22060090-02DE

Date: 2022-07-29

Page 40 of 70

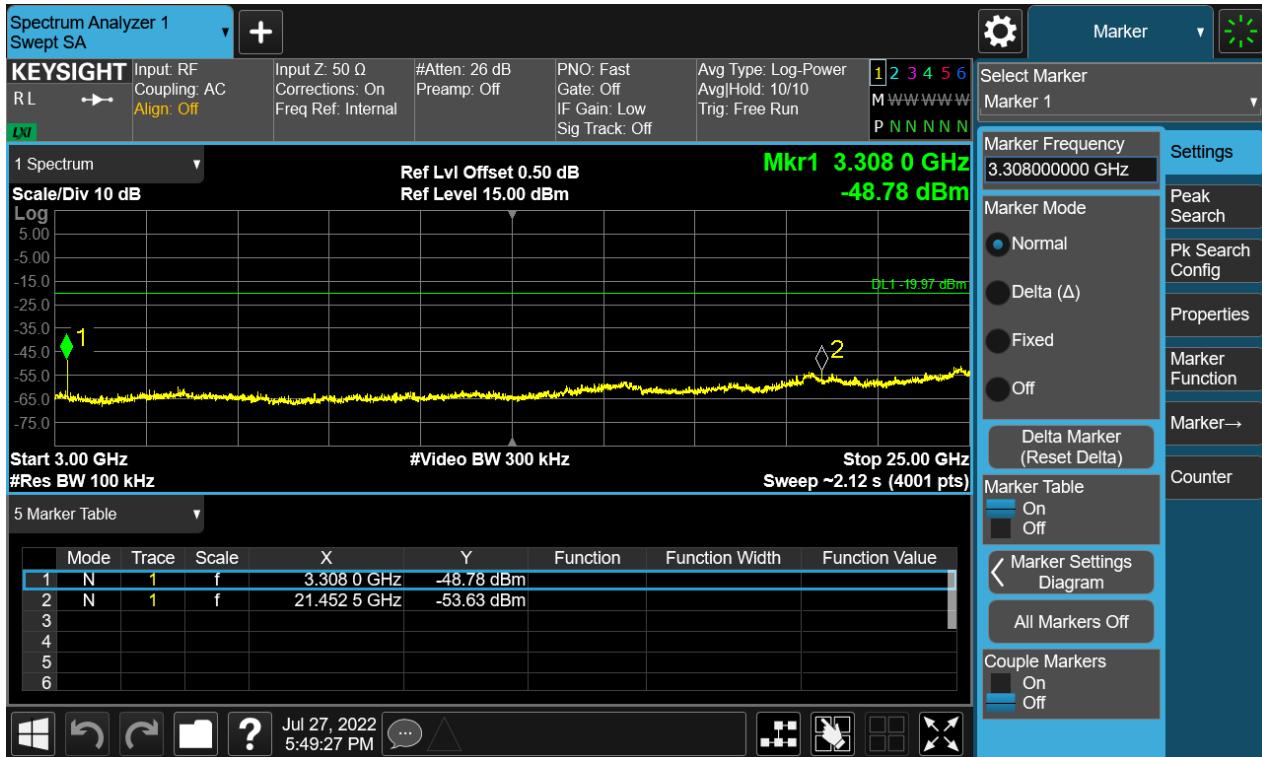
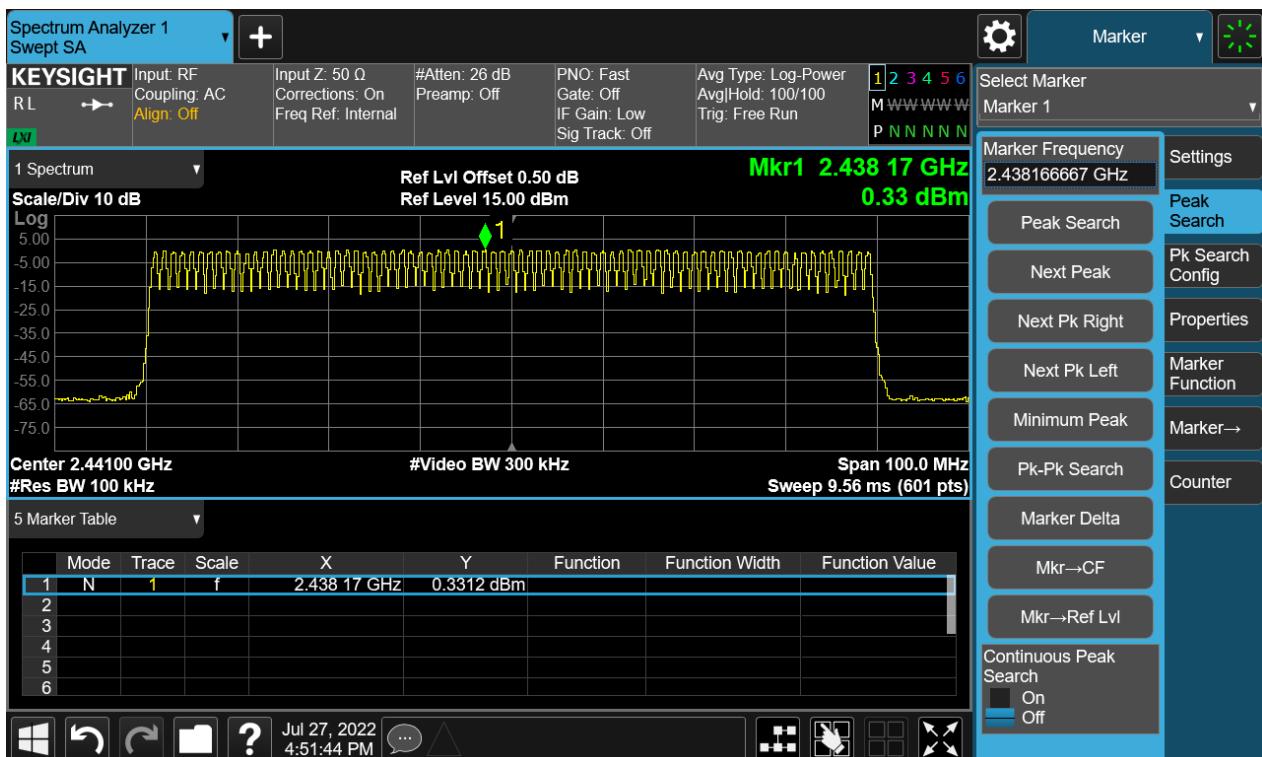


Figure 28: Conducted Spurious Emission & Authorized-band band-edge, Hopping Mode, GFSK Carrier Level



TEST REPORT

Report No.: SHE22060090-02DE

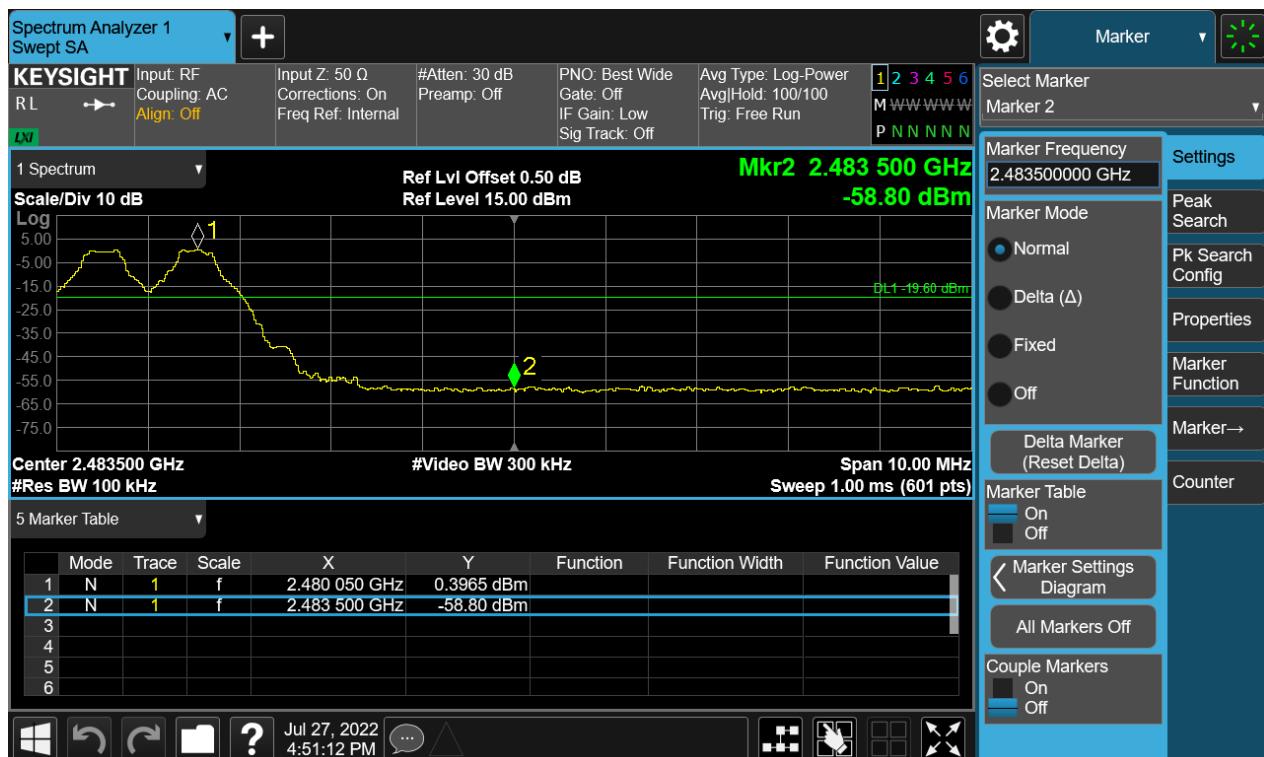
Date: 2022-07-29

Page 41 of 70

Band Edge(Low)



Band Edge(High)



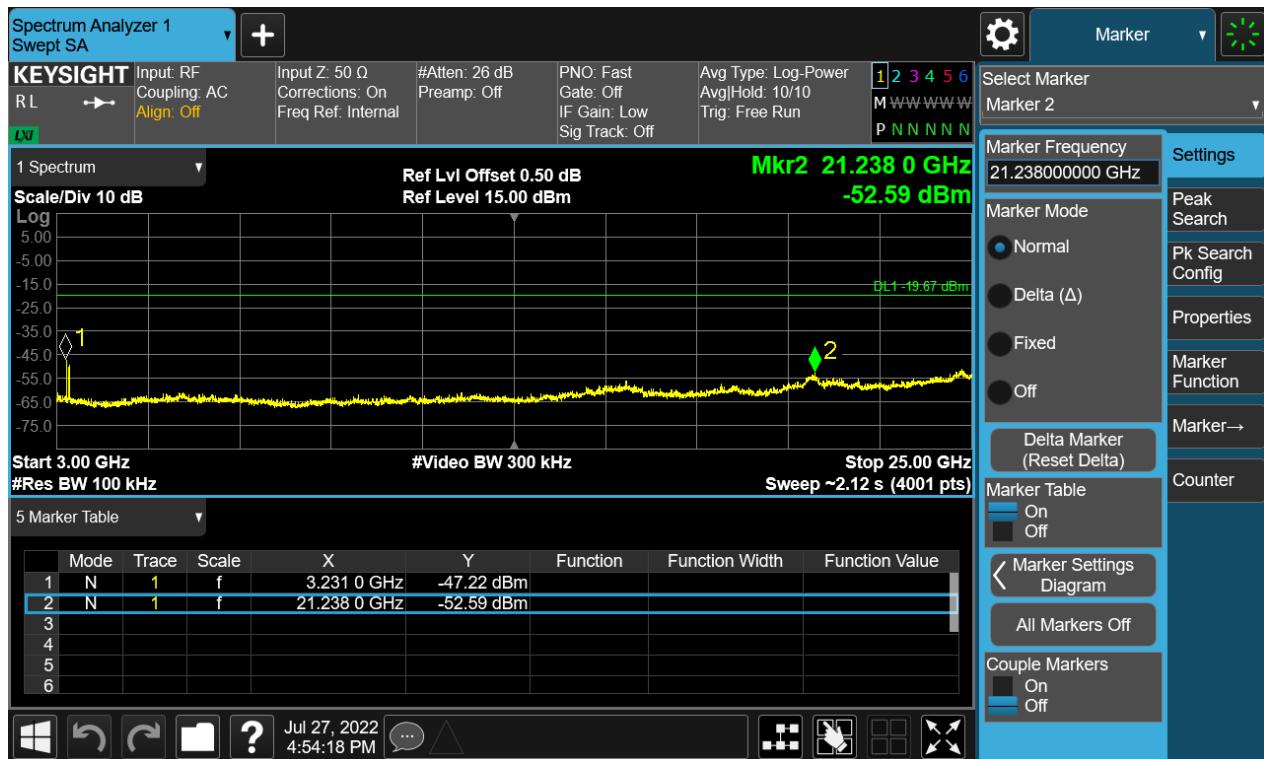
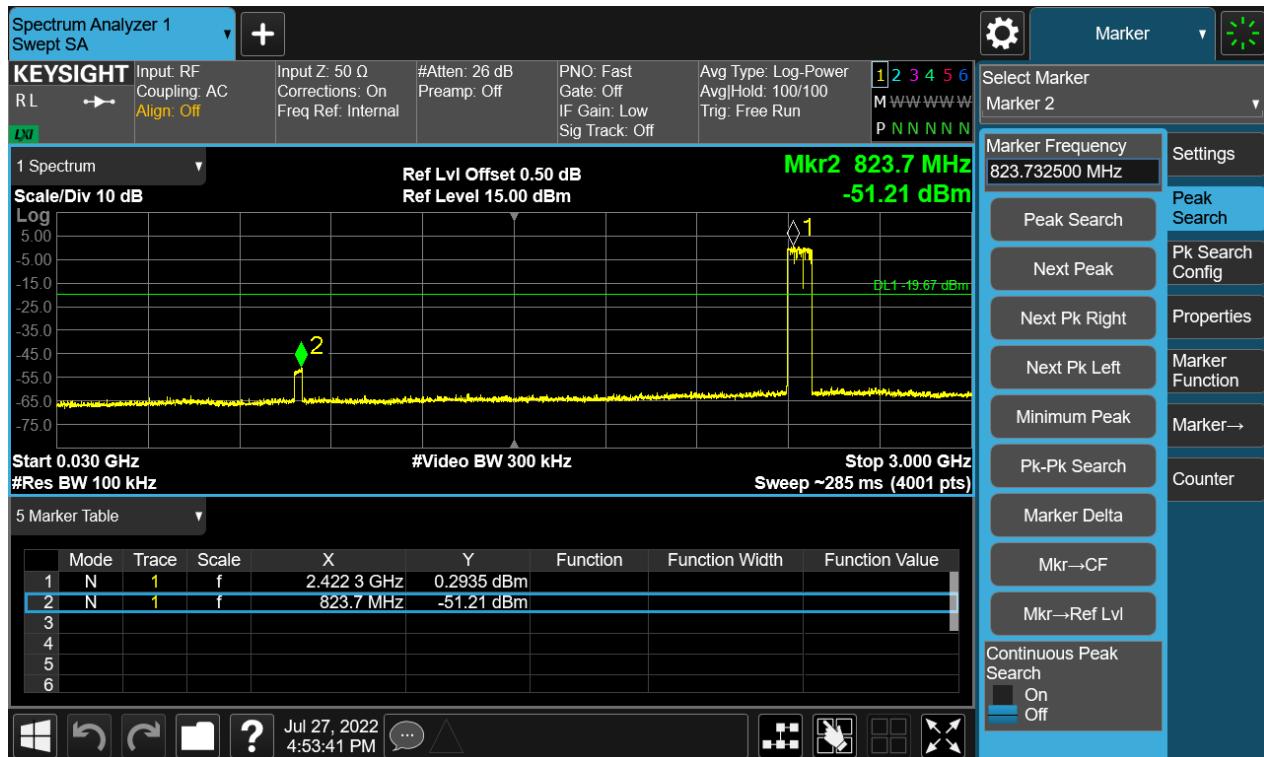
TEST REPORT

Report No.: SHE22060090-02DE

Date: 2022-07-29

Page 42 of 70

Conducted spurious emissions 30MHz-25GHz



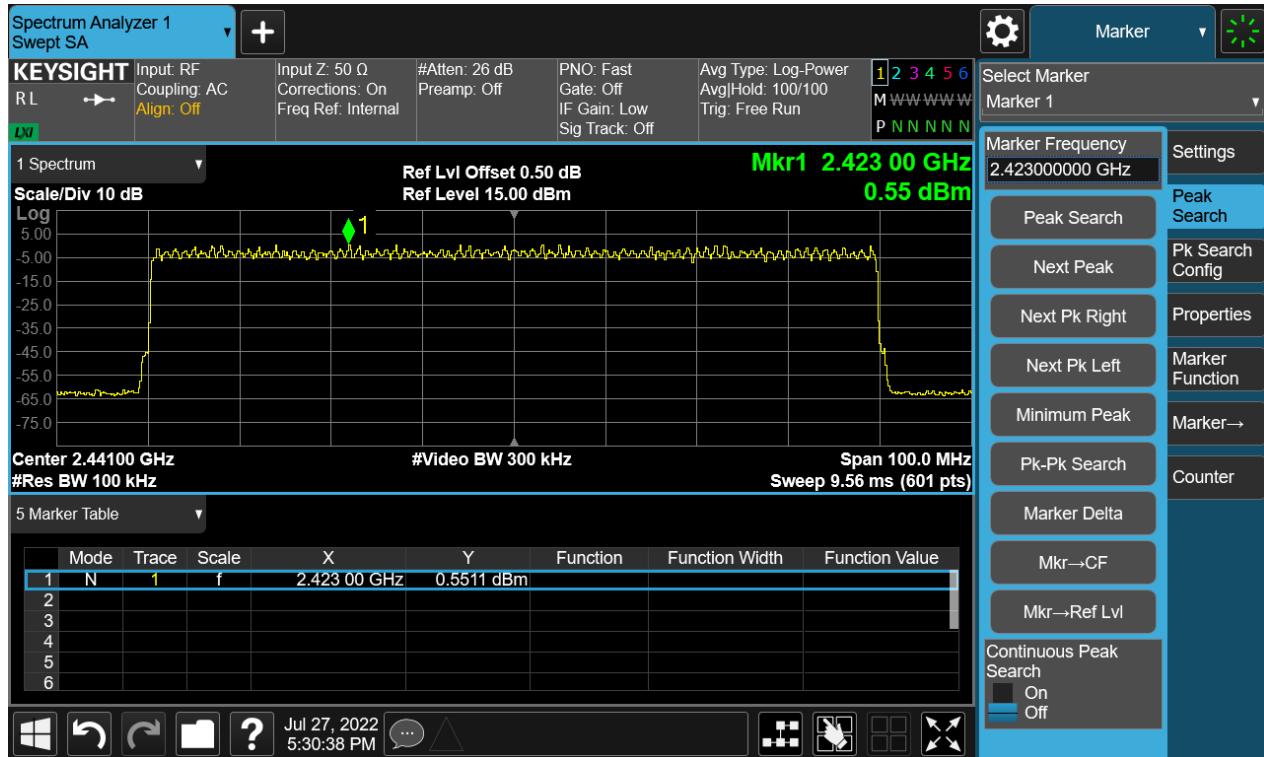
TEST REPORT

Report No.: SHE22060090-02DE

Date: 2022-07-29

Page 43 of 70

Figure 29: Conducted Spurious Emission & Authorized-band band-edge, Hopping Mode, $\pi/4$ -DQPSK Carrier Level



Band Edge(Low)



TEST REPORT

Report No.: SHE22060090-02DE

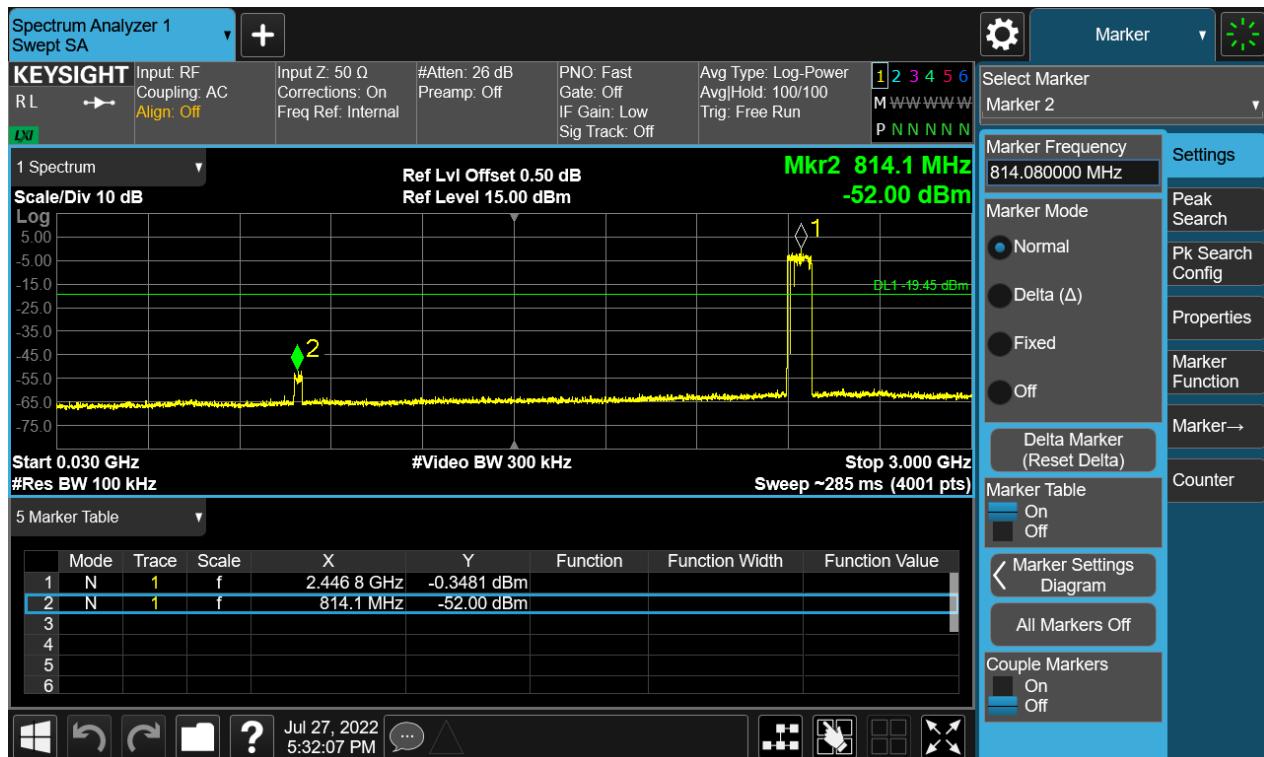
Date: 2022-07-29

Page 44 of 70

Band Edge(High)



Conducted spurious emissions 30MHz-25GHz



TEST REPORT

Report No.: SHE22060090-02DE

Date: 2022-07-29

Page 45 of 70

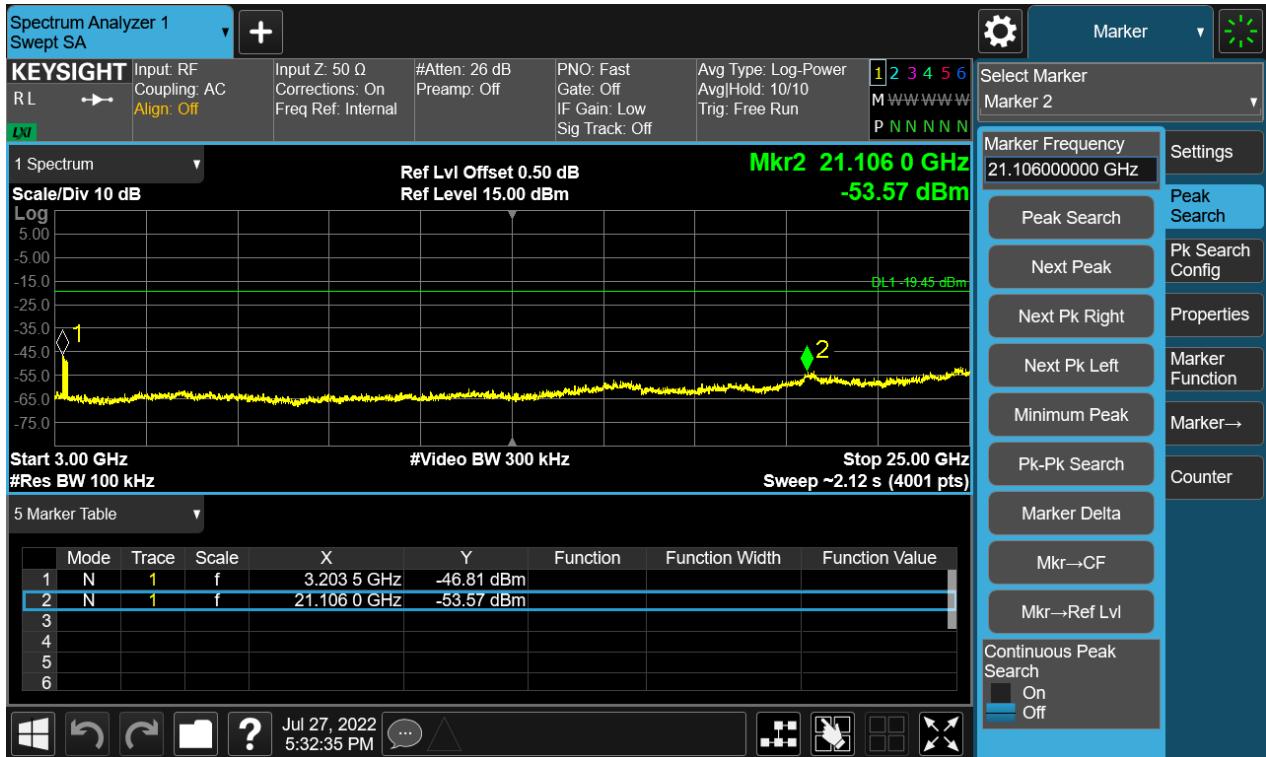
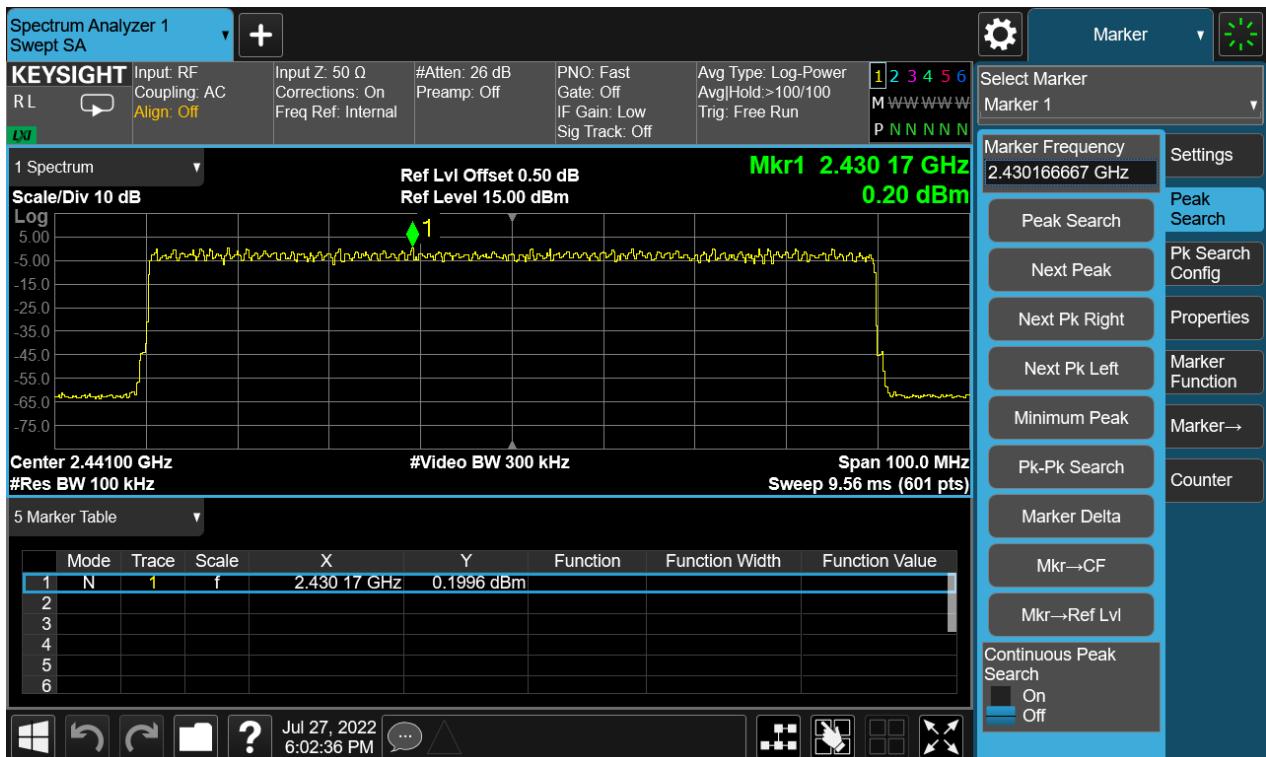


Figure 30: Conducted Spurious Emission & Authorized-band band-edge, Hopping Mode, 8-DPSK Carrier Level



TEST REPORT

Report No.: SHE22060090-02DE

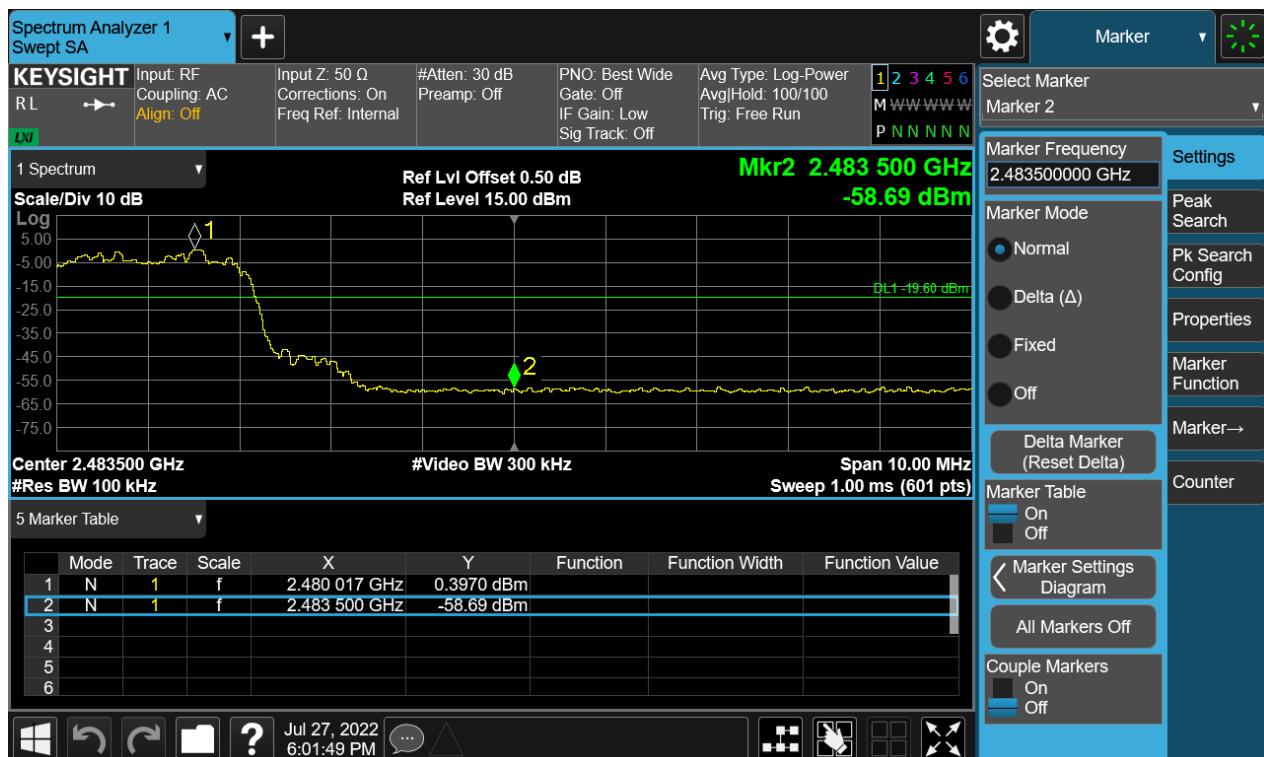
Date: 2022-07-29

Page 46 of 70

Band Edge(Low)



Band Edge(High)



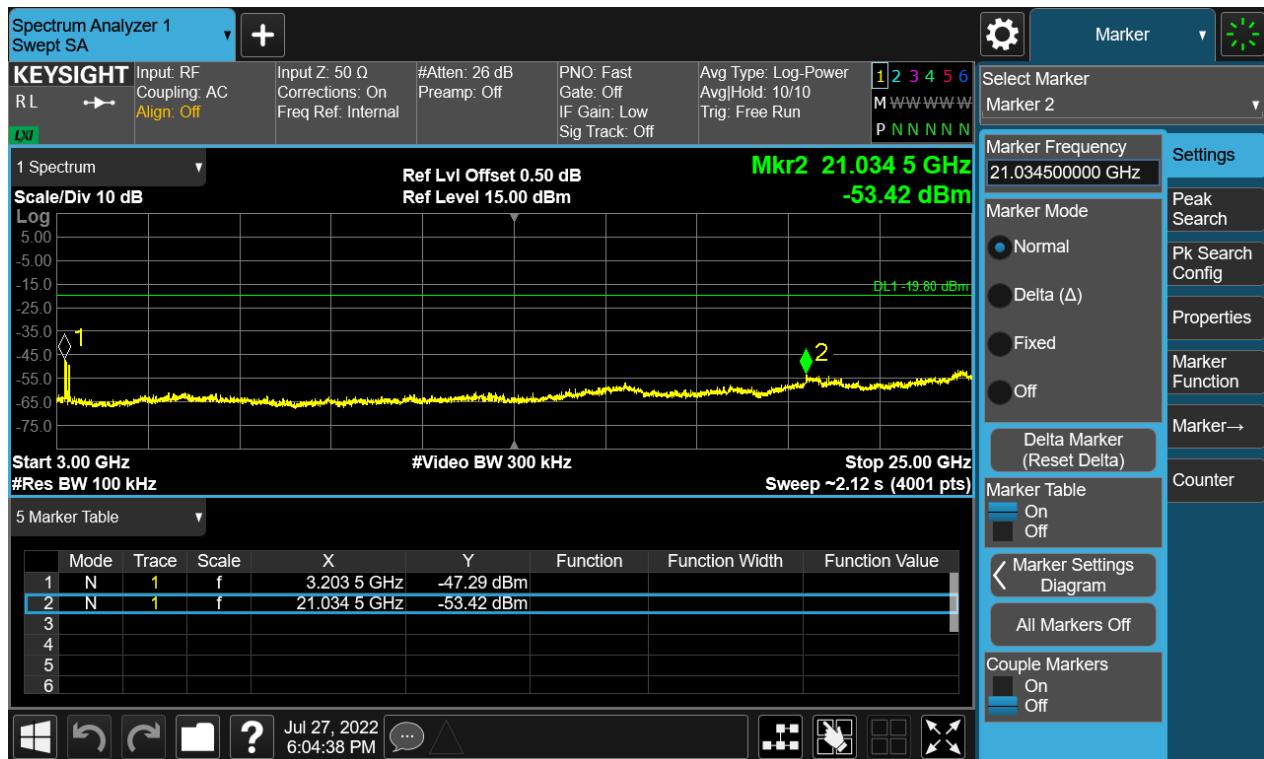
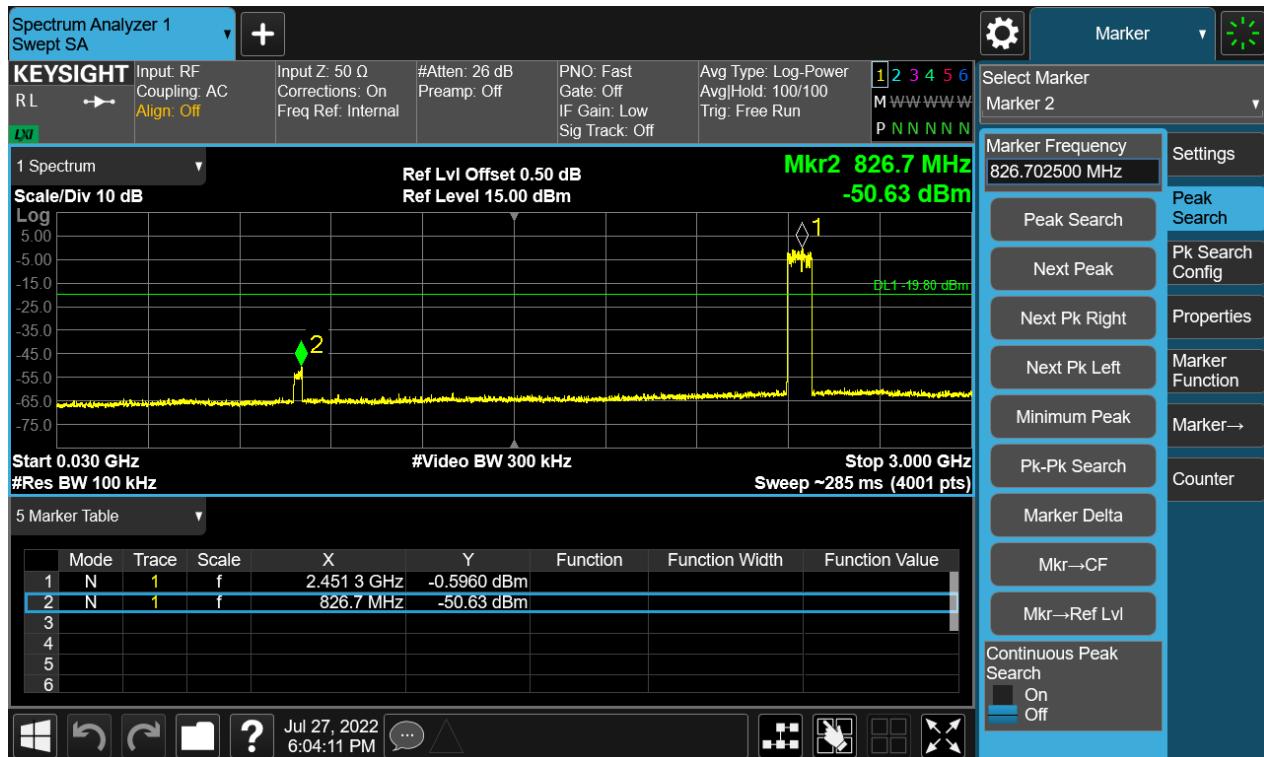
TEST REPORT

Report No.: SHE22060090-02DE

Date: 2022-07-29

Page 47 of 70

Conducted spurious emissions 30MHz-25GHz



TEST REPORT

Report No.: SHE22060090-02DE

Date: 2022-07-29

Page 48 of 70

4.1.5 Radiated Spurious Emission

RESULT:

PASS

Test standard : FCC Part 15.247(d), 15.205, 15.209

Requirement : ANSI C63.10-2013, Clause 7.8.8

Kind of test site : 3m Semi-Anechoic Chamber

Test setup

Test Channel : Low/Middle/High

Operation Mode : A

Ambient temperature : 22.1°C

Relative humidity : 52%

Notes

Test plots please refer to the annex document "SHE22060090-02DE DATA BDEDR-TX EXHIBIT A".

1. For 9 kHz ~ 30 MHz, the amplitude of spurious emissions that are attenuated by more than 20dB below the permissible. The value has no need to be reported.
2. The spurious above 18GHz is noise only and 20dB below the limit. The value has no need to be reported.
3. All test mode had been pre-test. Only the worst mode data of GFSK&8DPSK-hopping-DH5 and GFSK&8DPSK_Middle channel (below 1GHz) were recorded in the test report.
4. The EUT was pretested with 3 orientations placed on the table for the radiated emission measurement –X, Y, and Z-plane. The X-plane results were found as the worst case and were shown in this report.

TEST REPORT

Report No.: SHE22060090-02DE

Date: 2022-07-29

Page 49 of 70

4.1.6 Band Edge (Restricted-band band-edge)

RESULT:

PASS

Test standard : FCC Part 15.247(d), 15.205, 15.209

Requirement : ANSI C63.10-2013, Clause 7.8.6

Kind of test site : 3m Semi-Anechoic Chamber

Test setup

Test Channel : Low/Middle/High

Operation Mode : A.1

Ambient temperature : 23.1°C

Relative humidity : 52%

Notes

1. Test plots please refer to the annex document "SHE22060090-02DE DATA BDEDR-TX EXHIBIT A".

2. The EUT was pretested with 3 orientations placed on the table for the radiated emission measurement –X, Y, and Z-plane. The X-plane results were found as the worst case and were shown in this report.

TEST REPORT

Report No.: SHE22060090-02DE

Date: 2022-07-29

Page 50 of 70

4.1.7 Hopping Frequency Separation

RESULT:

PASS

Test standard : FCC Part 15.247(a)(1)

Requirement : ANSI C63.10-2013, Clause 7.8.2
KDB 558074 D01 v05r02, Clause 2.2

Kind of test site : Shielded room

Test setup

Test Channel : Hopping
Operation Mode : A.1.a.iv
Ambient temperature : 24.9°C
Relative humidity : 51%

Table 3: Hopping Frequency Separation

Mode	Frequency (MHz)	Channel Separation (MHz)	Limit (MHz)
GFSK	2441	0.990	$\geq 25\text{kHz}$ or two-thirds of 20dB bandwidth
$\pi/4$ -DQPSK	2441	1.025	
8-DPSK	2441	1.025	

*Note: The systems operate with an output power no greater than 125mW.

TEST REPORT

Report No.: SHE22060090-02DE

Date: 2022-07-29

Page 51 of 70

Figure 31: Hopping Frequency Separation, Hopping Mode, GFSK

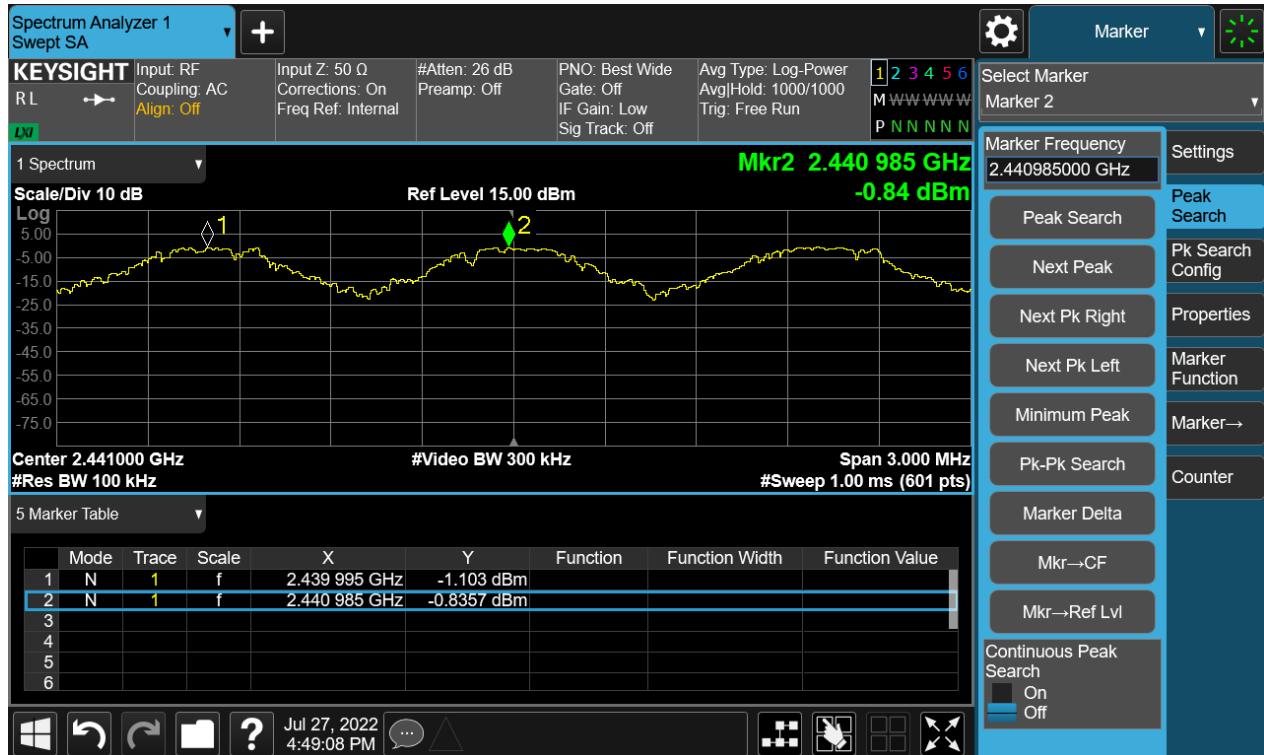
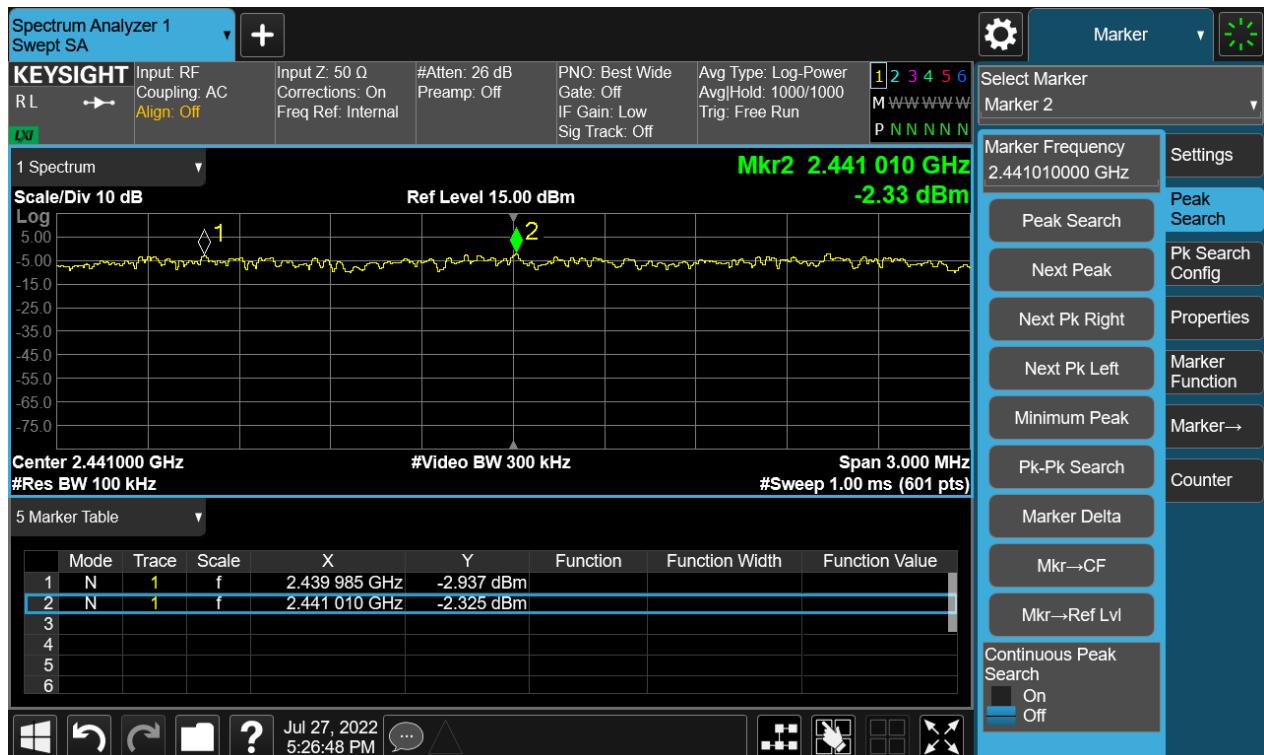


Figure 32: Hopping Frequency Separation, Hopping Mode, $\pi/4$ -DQPSK



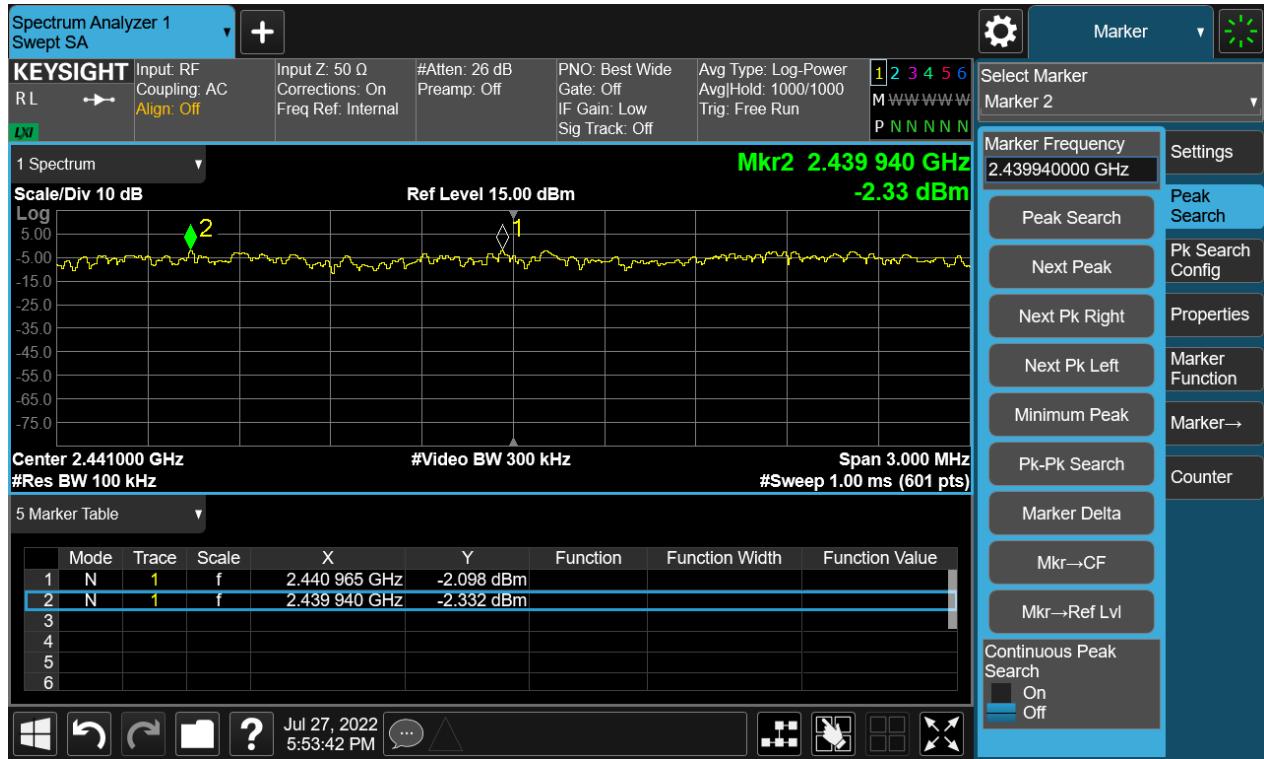
TEST REPORT

Report No.: SHE22060090-02DE

Date: 2022-07-29

Page 52 of 70

Figure 33: Hopping Frequency Separation, Hopping Mode, 8DPSK



TEST REPORT

Report No.: SHE22060090-02DE

Date: 2022-07-29

Page 53 of 70

4.1.8 Number of Hopping Frequency

RESULT:

PASS

Test standard : FCC Part 15.247(a)(1)(iii)

Requirement : ANSI C63.10-2013, Clause 7.8.3

KDB 558074 D01 v05r02, Clause 2.2

Kind of test site : Shielded room

Test setup

Test Channel : Hopping

Operation Mode : A.1.a.iv

Ambient temperature : 24.9°C

Relative humidity : 51%

Table 4: Number of Hopping Frequency

Mode	Frequency Range	Measured Quantity of Hopping Channel	Limit
GFSK	2400 – 2483.5	79	≥15
$\pi/4$ -DQPSK	2400 – 2483.5	79	≥15
8-DPSK	2400 – 2483.5	79	≥15

TEST REPORT

Report No.: SHE22060090-02DE

Date: 2022-07-29

Page 54 of 70

Figure 34: Number of Hopping Frequency, Hopping Mode, GFSK

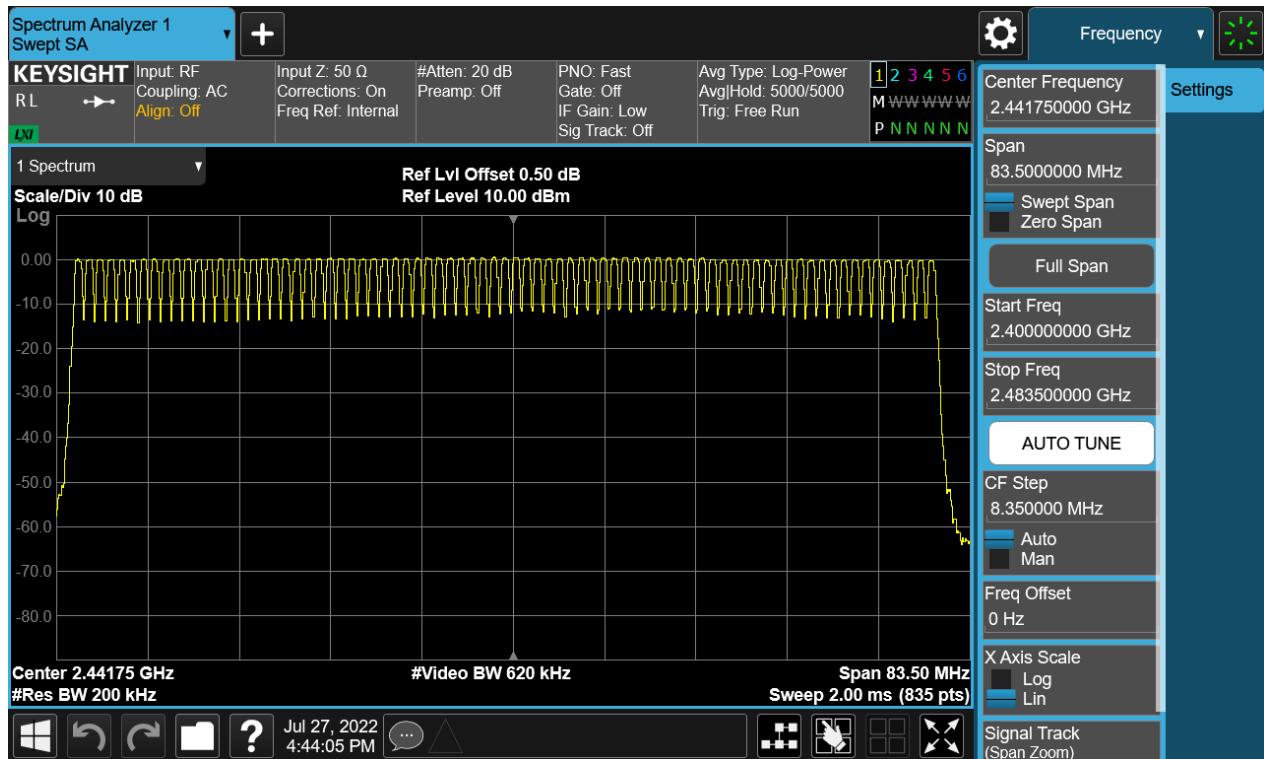
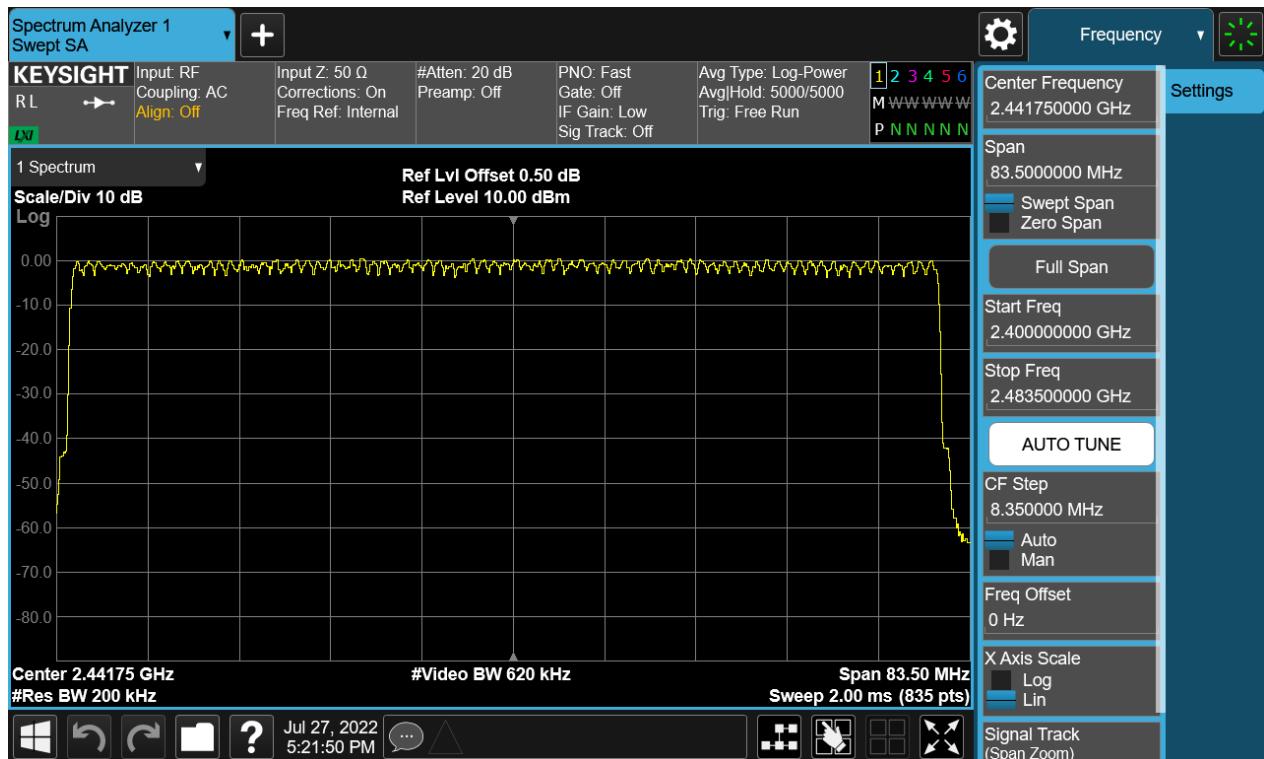


Figure 35: Number of Hopping Frequency, Hopping Mode, $\pi/4$ -DQPSK



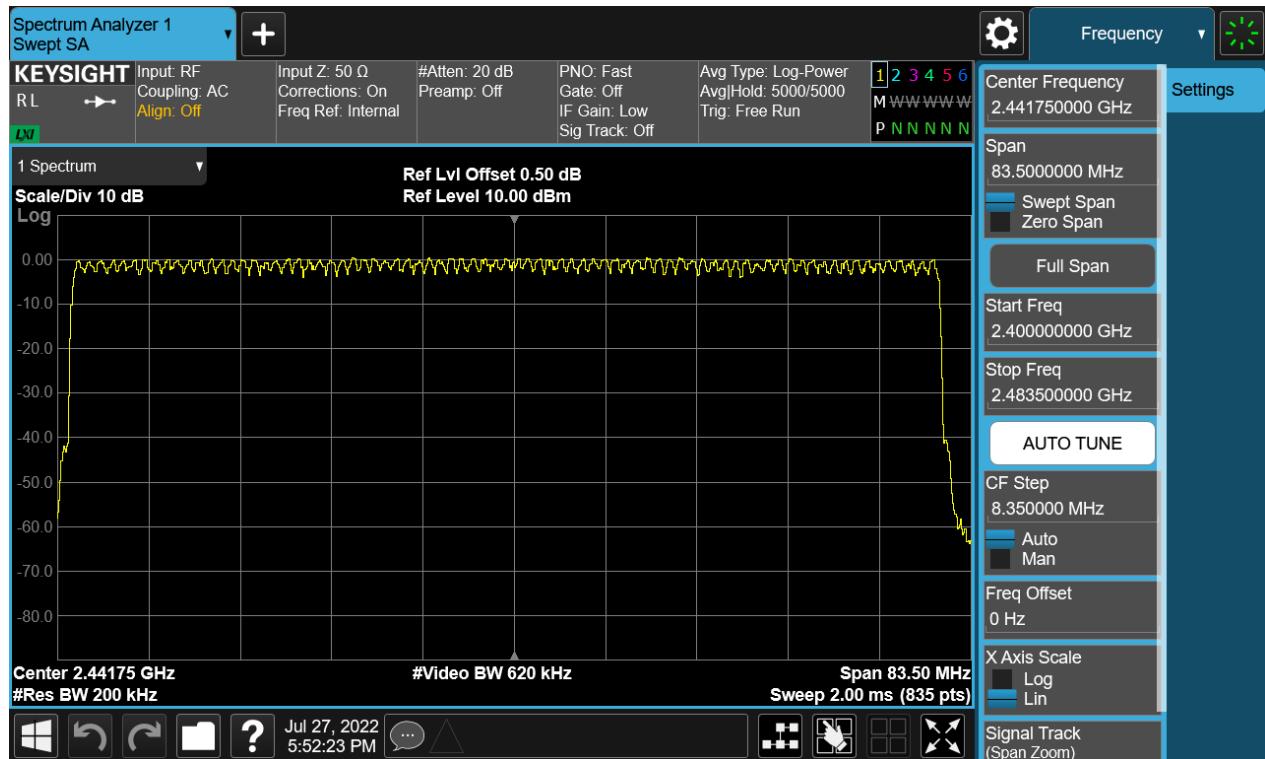
TEST REPORT

Report No.: SHE22060090-02DE

Date: 2022-07-29

Page 55 of 70

Figure 36: Number of Hopping Frequency, Hopping Mode, 8-DPSK



TEST REPORT

Report No.: SHE22060090-02DE

Date: 2022-07-29

Page 56 of 70

4.1.9 Time of Occupancy

RESULT:

PASS

Test standard : FCC Part 15.247(a)(1)(iii)

Requirement : ANSI C63.10-2013, Clause 7.8.4
KDB 558074 D01 v05r02, Clause 2.2

Kind of test site : Shielded room

Test setup

Test Channel : Middle
Operation Mode : A.1.a
Ambient temperature : 24.9°C
Relative humidity : 51%

Table 5: Time of Occupancy

Mode	Packet Type	Pulse Time (ms)	Total of Dwell Time (ms)	Total of Dwell Time (s)	Limit (s)
GFSK	DH1	0.3850	123.200	0.1232	0.4
	DH3	1.6500	264.000	0.2640	0.4
	DH5	2.9000	309.300	0.3093	0.4
$\pi/4$ -DQPSK	DH1	0.3983	127.456	0.1275	0.4
	DH3	1.6550	264.800	0.2648	0.4
	DH5	2.9070	310.080	0.3101	0.4
8-DPSK	DH1	0.3983	127.456	0.1275	0.4
	DH3	1.6550	264.800	0.2648	0.4
	DH5	2.9130	310.720	0.3107	0.4

Note:

For DH1 package type:

Total of Dwell = Pulse Time*(1600/2)/Number of Hopping Frequency*Period

Period = 0.4* Number of Hopping Frequency

For DH3 package type:

Total of Dwell = Pulse Time*(1600/4)/Number of Hopping Frequency*Period

Period = 0.4* Number of Hopping Frequency

For DH5 package type:

Total of Dwell = Pulse Time*(1600/6)/Number of Hopping Frequency*Period

Period = 0.4* Number of Hopping Frequency

TEST REPORT

Report No.: SHE22060090-02DE

Date: 2022-07-29

Page 57 of 70

Figure 37: Time of Occupancy, 2441MHz, GFSK DH1

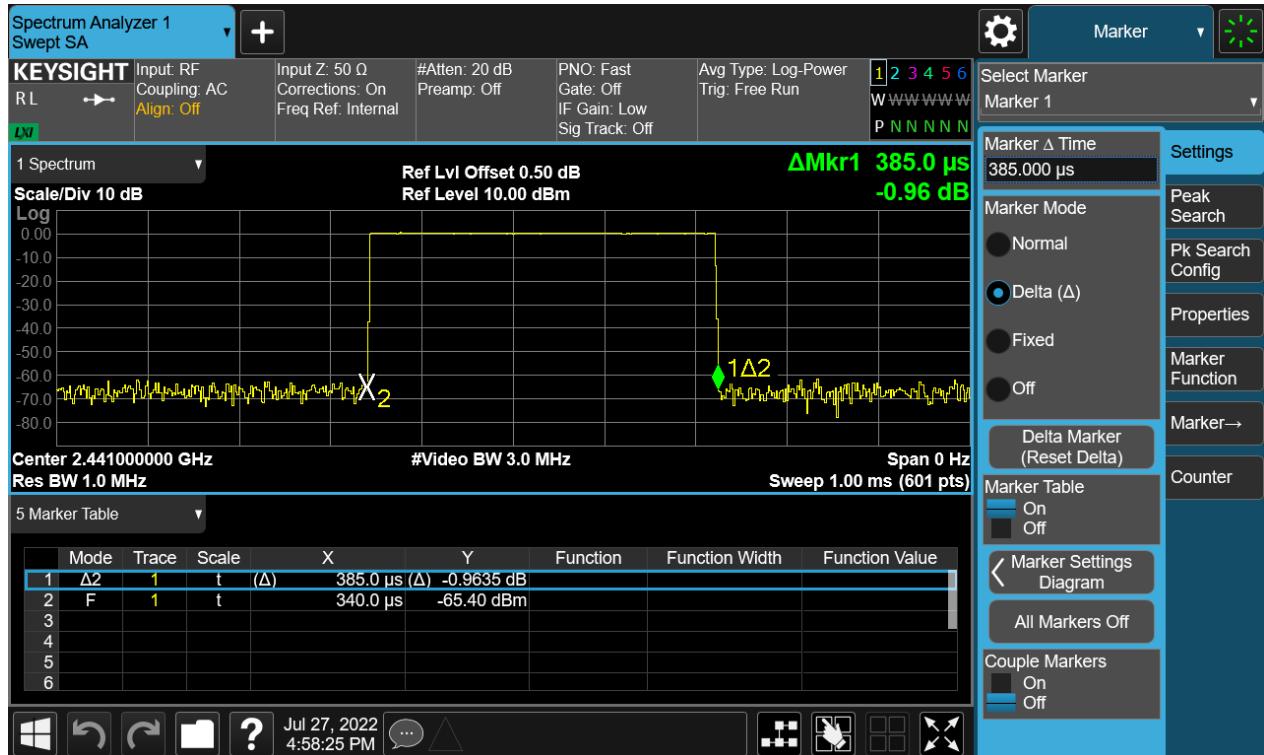
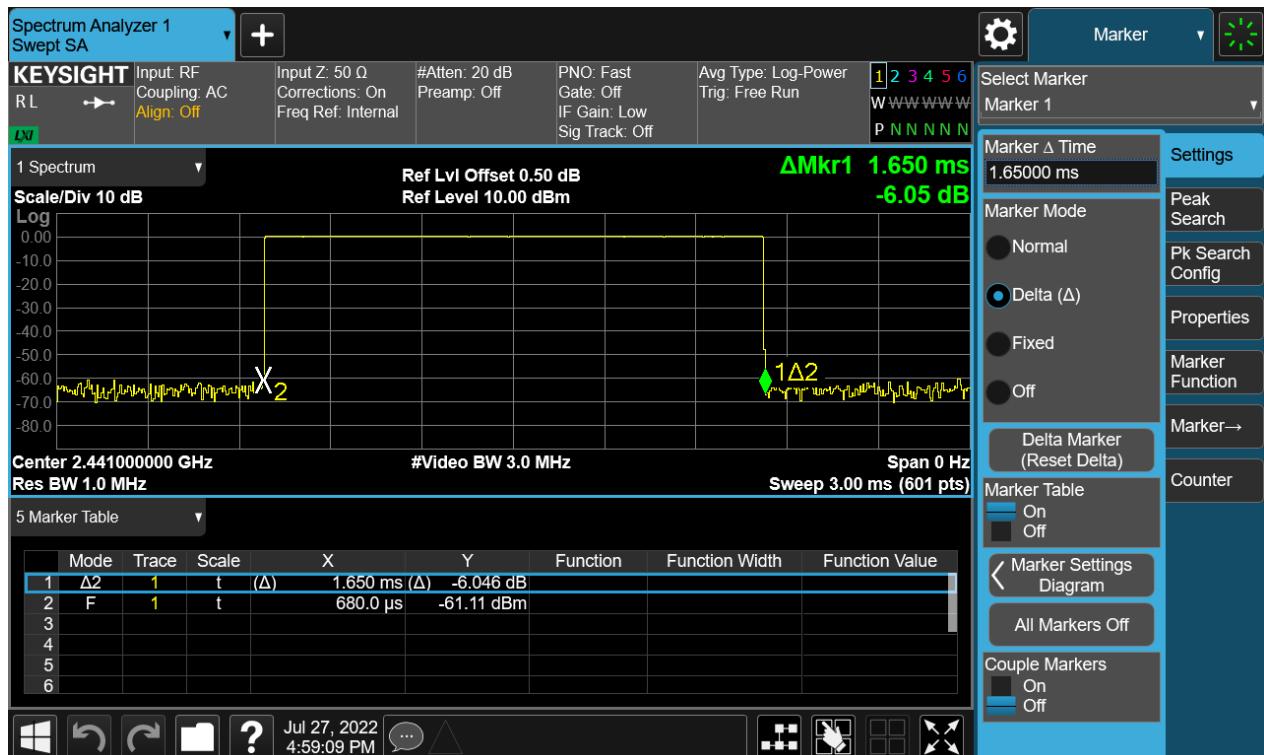


Figure 38: Time of Occupancy, 2441MHz, GFSK DH3



TEST REPORT

Report No.: SHE22060090-02DE

Date: 2022-07-29

Page 58 of 70

Figure 39: Time of Occupancy, 2441MHz, GFSK DH5

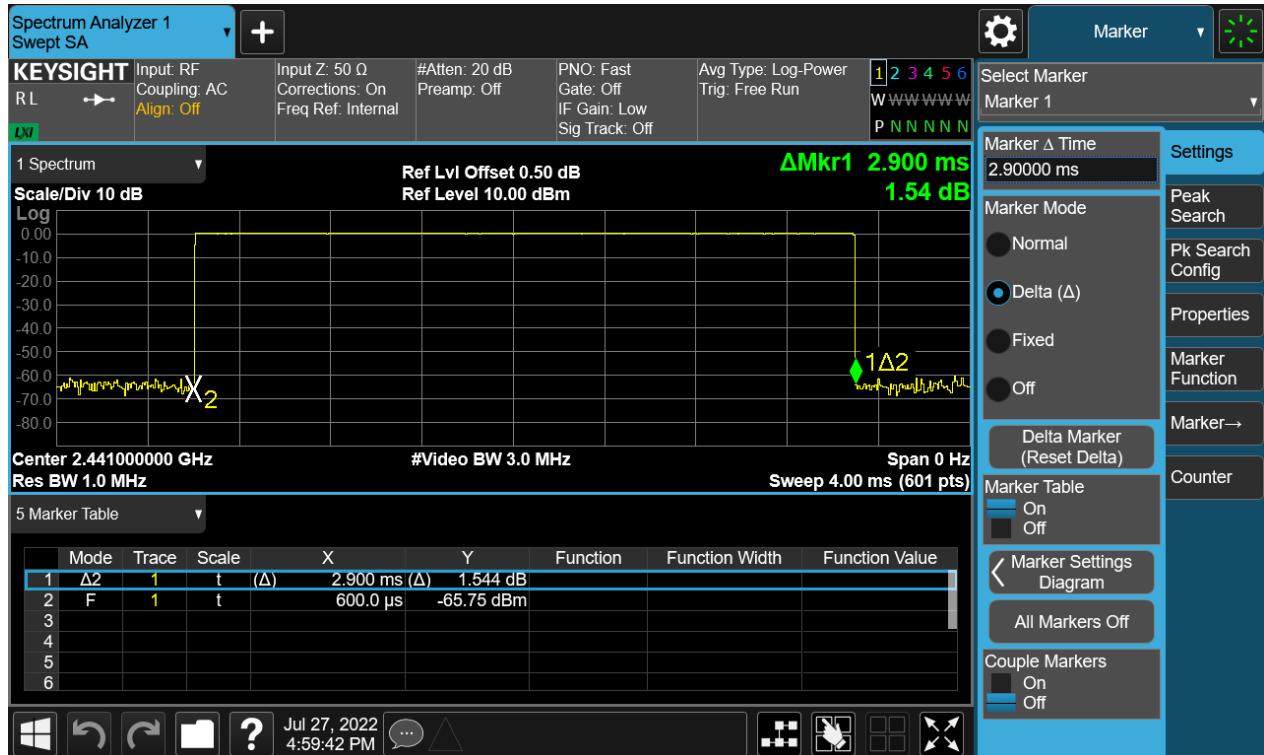
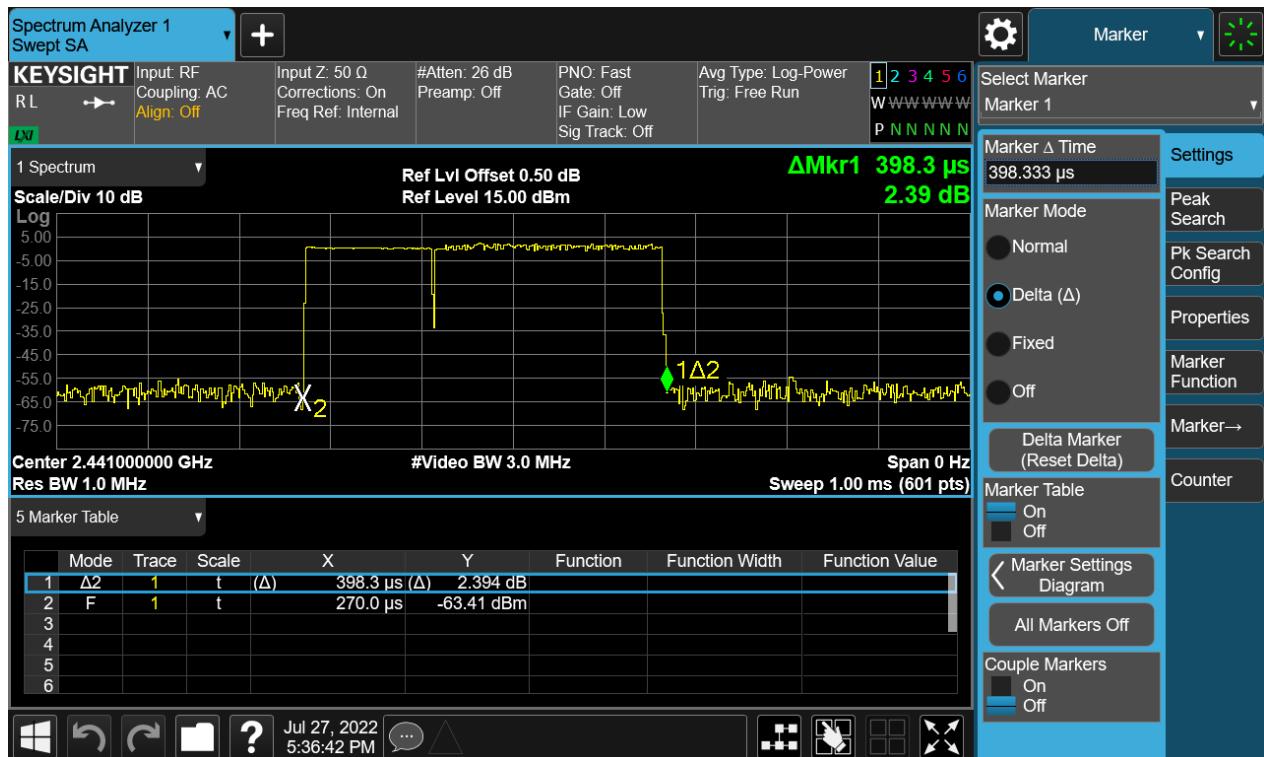


Figure 40: Time of Occupancy, 2441MHz, $\pi/4$ -DQPSK DH1



TEST REPORT

Report No.: SHE22060090-02DE

Date: 2022-07-29

Page 59 of 70

Figure 41: Time of Occupancy, 2441MHz, $\pi/4$ -DQPSK DH3

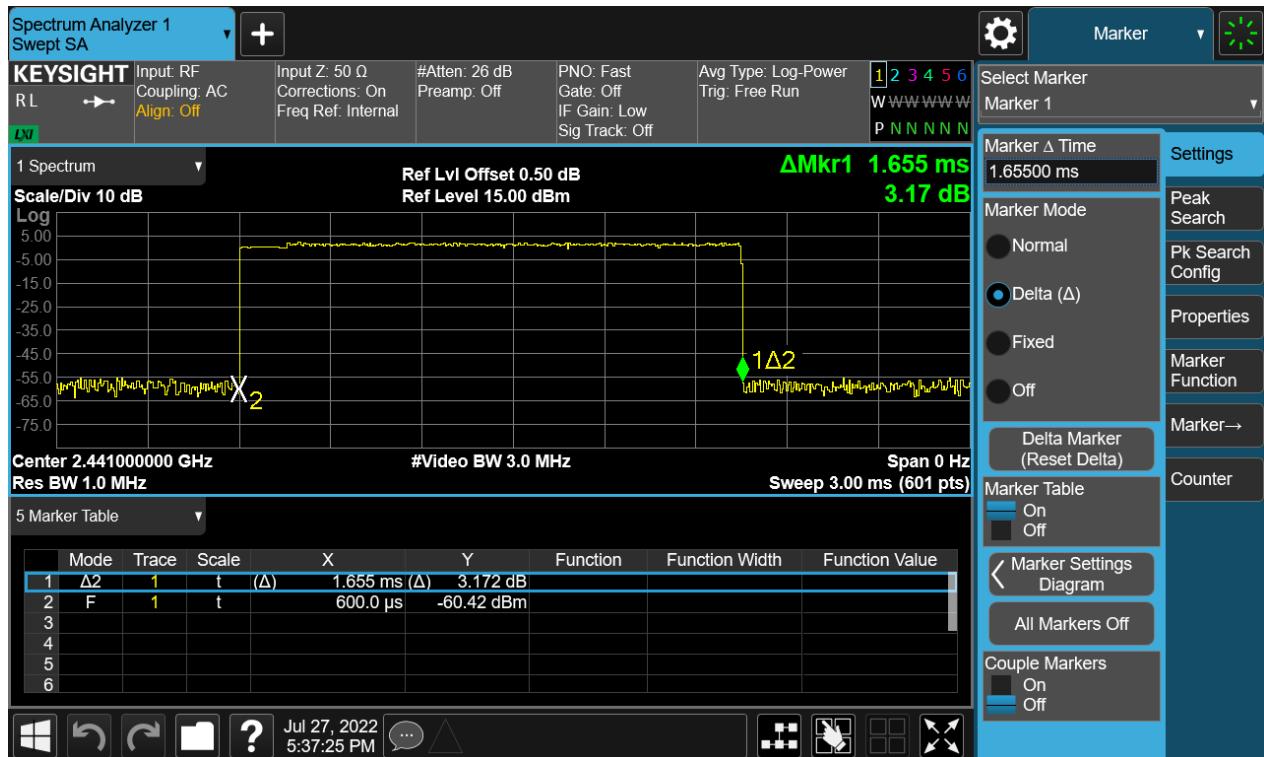
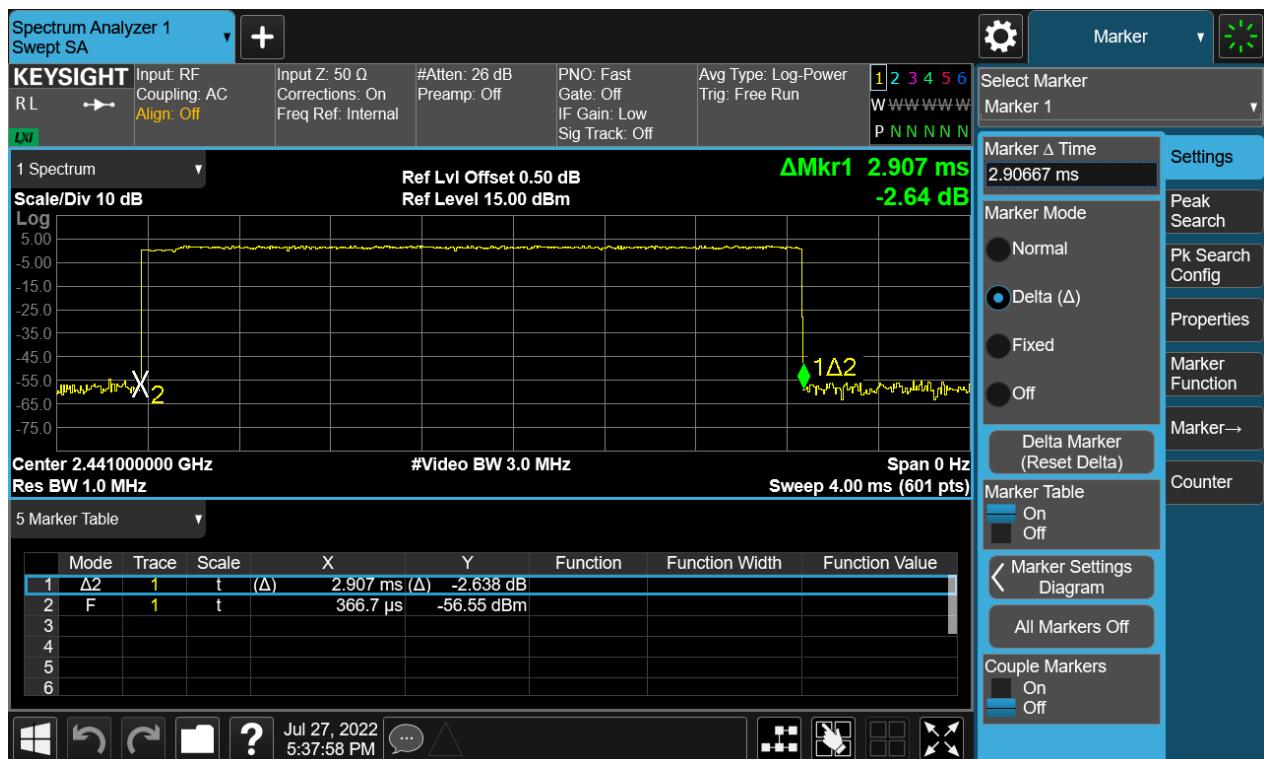


Figure 42: Time of Occupancy, 2441MHz, $\pi/4$ -DQPSK DH5



TEST REPORT

Report No.: SHE22060090-02DE

Date: 2022-07-29

Page 60 of 70

Figure 43: Time of Occupancy, 2441MHz, 8-DPSK DH1

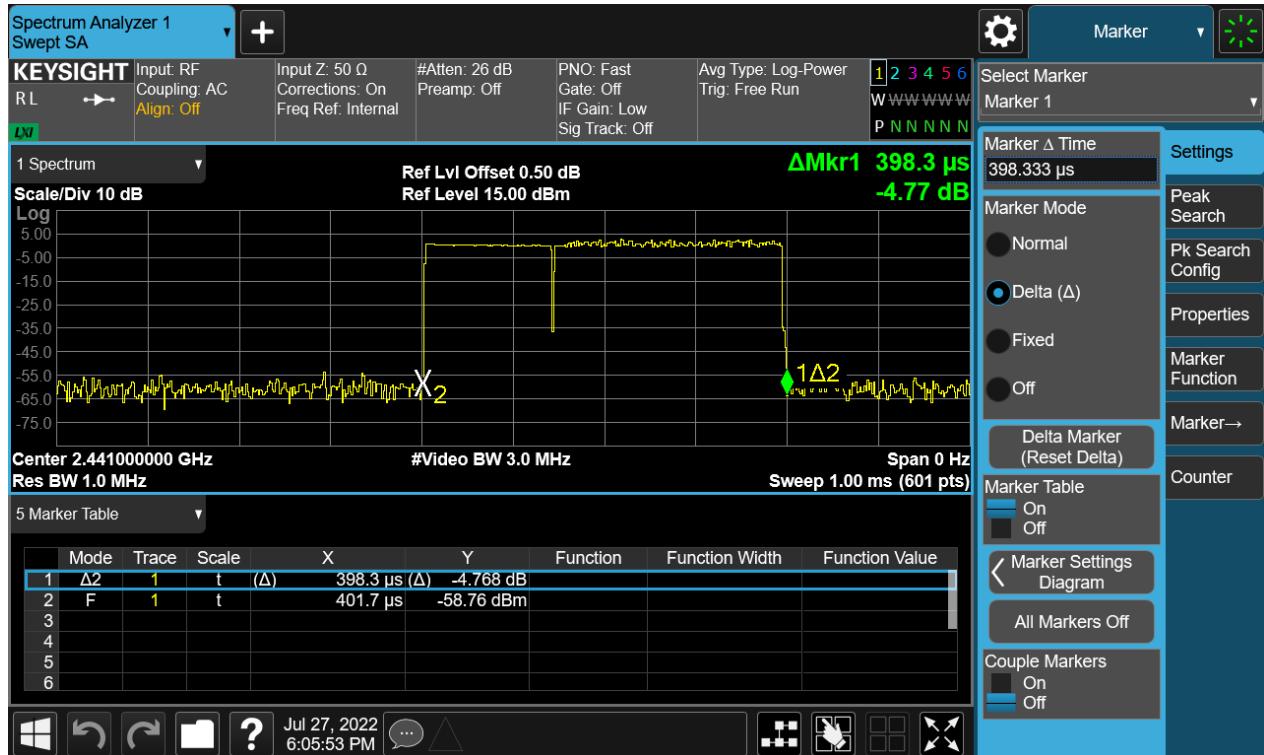
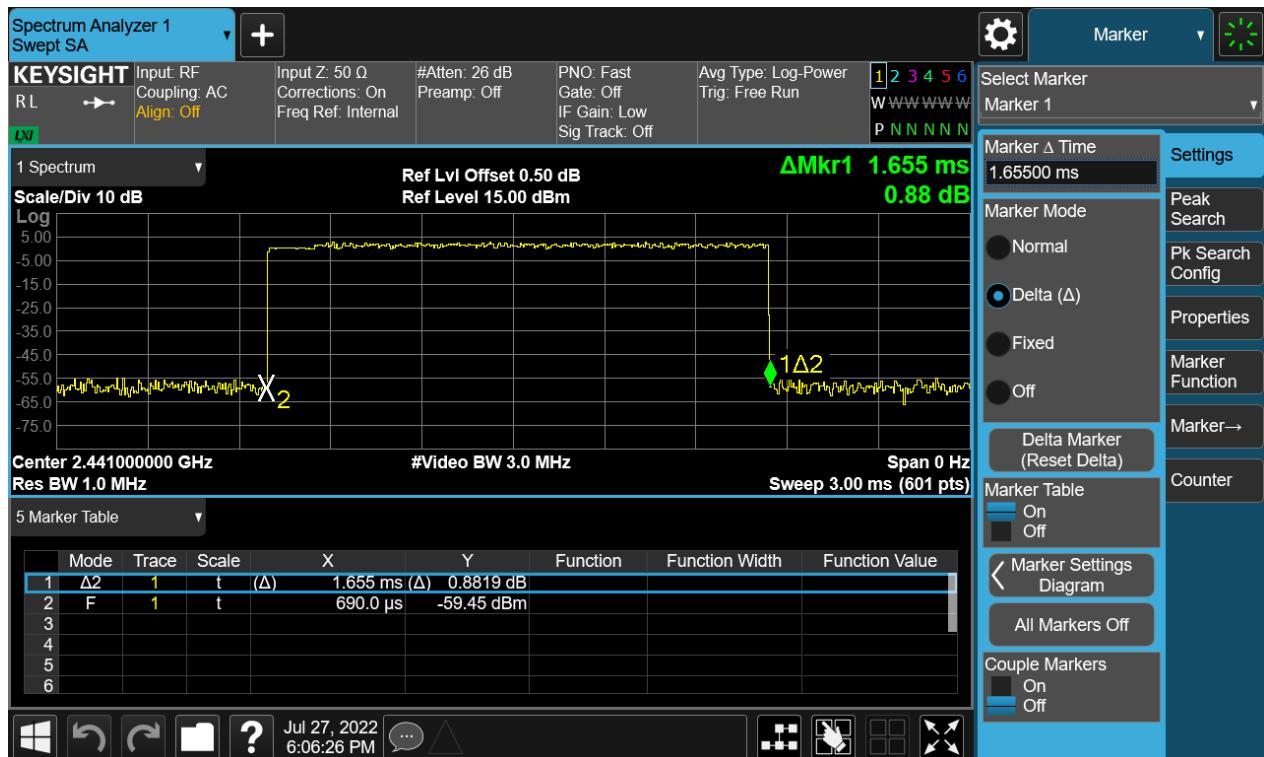


Figure 44: Time of Occupancy, 2441MHz, 8-DPSK DH3



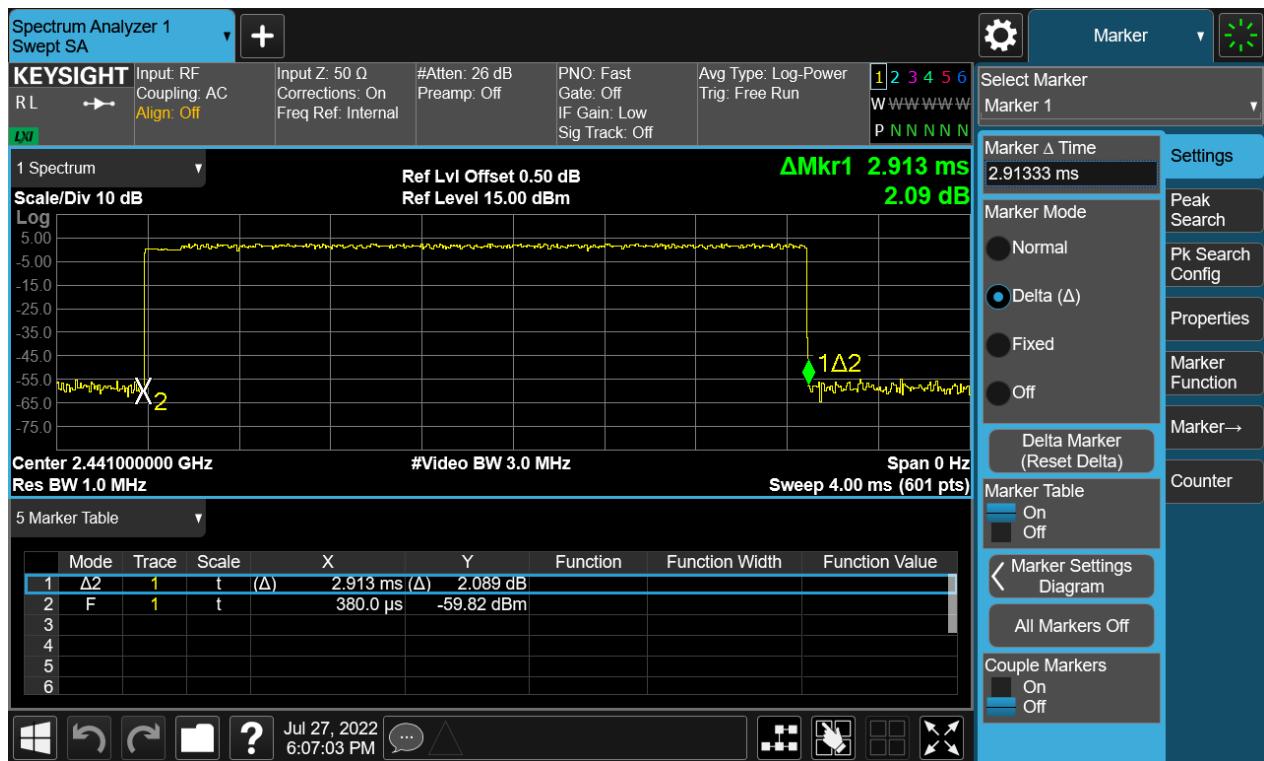
TEST REPORT

Report No.: SHE22060090-02DE

Date: 2022-07-29

Page 61 of 70

Figure 45: Time of Occupancy, 2441MHz, 8-DPSK DH5



TEST REPORT

Report No.: SHE22060090-02DE Date: 2022-07-29

Page 62 of 70

4.2 Mains Emissions

4.2.1 Conducted Emission on AC Mains

RESULT:

PASS

Test standard : FCC Part 15.207(a)

Requirement : ANSI C63.10-2013, Clause 6.2

Kind of test site : Shielded room

Test setup

Input Voltage : AC 120V 60Hz

Operation Mode : A.1.a

Earthing : Connected to GND

Ambient temperature : 23.6°C

Relative humidity : 57%

For details refer to following test plot.

TEST REPORT

Report No.: SHE22060090-02DE

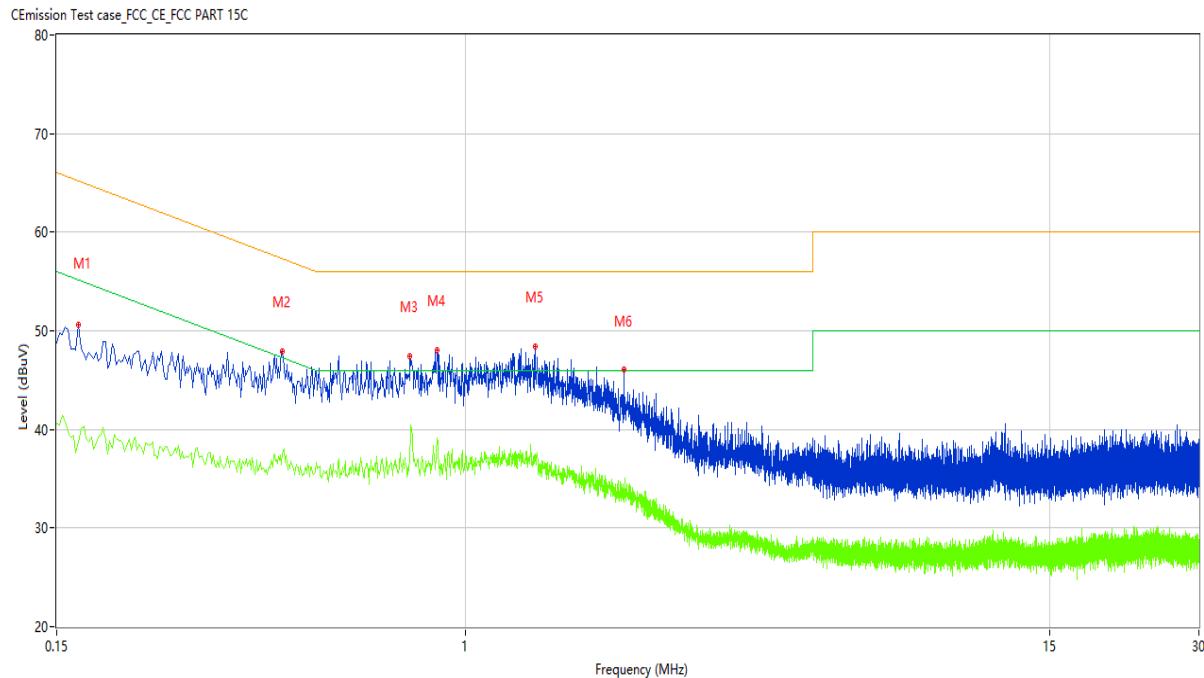
Date: 2022-07-29

Page 63 of 70

Note:

The all configurations were tested respectively, Only the worst mode data of 8DPSK-hopping-DH5 was recorded in the test report.

Figure 46: Conducted Emission on AC Mains, L Phase



No.	Frequency (MHz)	Results (dBuV)	Factor (dB)	Limit (dBuV)	Over Limit (dB)	Detector	Line	Verdict
1	0.166	50.58	10.26	65.16	-14.58	Peak	L	Pass
1*	0.166	47.02	10.26	65.16	-18.14	QP	L	Pass
1**	0.166	38.76	10.26	55.16	-16.40	AV	L	Pass
2	0.428	47.89	10.25	57.29	-9.40	Peak	L	Pass
2*	0.428	42.90	10.25	57.29	-14.39	QP	L	Pass
2**	0.428	37.58	10.25	47.29	-9.71	AV	L	Pass
3	0.772	47.39	10.31	56.00	-8.61	Peak	L	Pass
3*	0.772	44.27	10.31	56.00	-11.73	QP	L	Pass
3**	0.772	37.88	10.31	46.00	-8.12	AV	L	Pass
4	0.876	48.09	10.30	56.00	-7.91	Peak	L	Pass
4*	0.876	44.14	10.30	56.00	-11.86	QP	L	Pass
4**	0.876	39.05	10.30	46.00	-6.95	AV	L	Pass
5	1.380	48.38	10.18	56.00	-7.62	Peak	L	Pass
5*	1.380	44.89	10.18	56.00	-11.11	QP	L	Pass
5**	1.380	36.81	10.18	46.00	-9.19	AV	L	Pass
6	2.080	46.11	10.16	56.00	-9.89	Peak	L	Pass
6*	2.080	41.99	10.16	56.00	-14.01	QP	L	Pass
6**	2.080	33.93	10.16	46.00	-12.07	AV	L	Pass

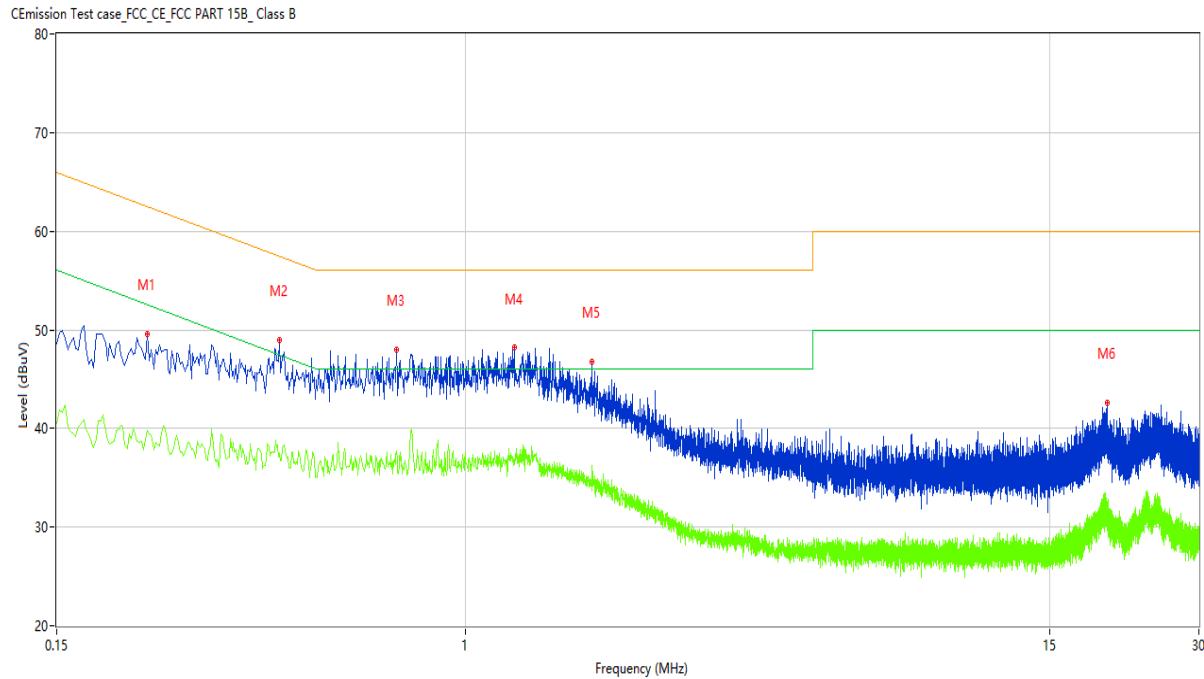
TEST REPORT

Report No.: SHE22060090-02DE

Date: 2022-07-29

Page 64 of 70

Figure 47: Conducted Emission on AC Mains, N Phase



No.	Frequency (MHz)	Results (dBuV)	Factor (dB)	Limit (dBuV)	Over Limit (dB)	Detector	Line	Verdict
1	0.228	42.27	10.24	62.52	-20.25	Peak	N	Pass
1*	0.228	37.66	10.24	62.52	-24.86	QP	N	Pass
1**	0.228	39.85	10.24	52.52	-12.67	AV	N	Pass
2	0.422	45.33	10.25	57.41	-12.08	Peak	N	Pass
2*	0.422	41.65	10.25	57.41	-15.76	QP	N	Pass
2**	0.422	37.44	10.25	47.41	-9.97	AV	N	Pass
3	0.726	38.49	10.31	56.00	-17.51	Peak	N	Pass
3*	0.726	33.78	10.31	56.00	-22.22	QP	N	Pass
3**	0.726	37.70	10.31	46.00	-8.30	AV	N	Pass
4	1.252	35.32	10.19	56.00	-20.68	Peak	N	Pass
4*	1.252	26.57	10.19	56.00	-29.43	QP	N	Pass
4**	1.252	36.84	10.19	46.00	-9.16	AV	N	Pass
5	1.796	33.25	10.17	56.00	-22.75	Peak	N	Pass
5*	1.796	26.36	10.17	56.00	-29.64	QP	N	Pass
5**	1.796	35.00	10.17	46.00	-11.00	AV	N	Pass
6	19.638	37.20	10.91	60.00	-22.80	Peak	N	Pass
6*	19.638	33.66	10.91	60.00	-26.34	QP	N	Pass
6**	19.638	31.94	10.91	50.00	-18.06	AV	N	Pass

TEST REPORT

Report No.: SHE22060090-02DE

Date: 2022-07-29

Page 65 of 70

5 Appendixes

5.1 Photographs of the Sample



All of the sample



Front of the sample

TEST REPORT

Report No.: SHE22060090-02DE

Date: 2022-07-29

Page 66 of 70



Rear of the sample



Left of the sample

TEST REPORT

Report No.: SHE22060090-02DE

Date: 2022-07-29

Page 67 of 70



Right of the sample



Top of the sample

TEST REPORT

Report No.: SHE22060090-02DE

Date: 2022-07-29

Page 68 of 70



Bottom of the sample

TEST REPORT

Report No.: SHE22060090-02DE

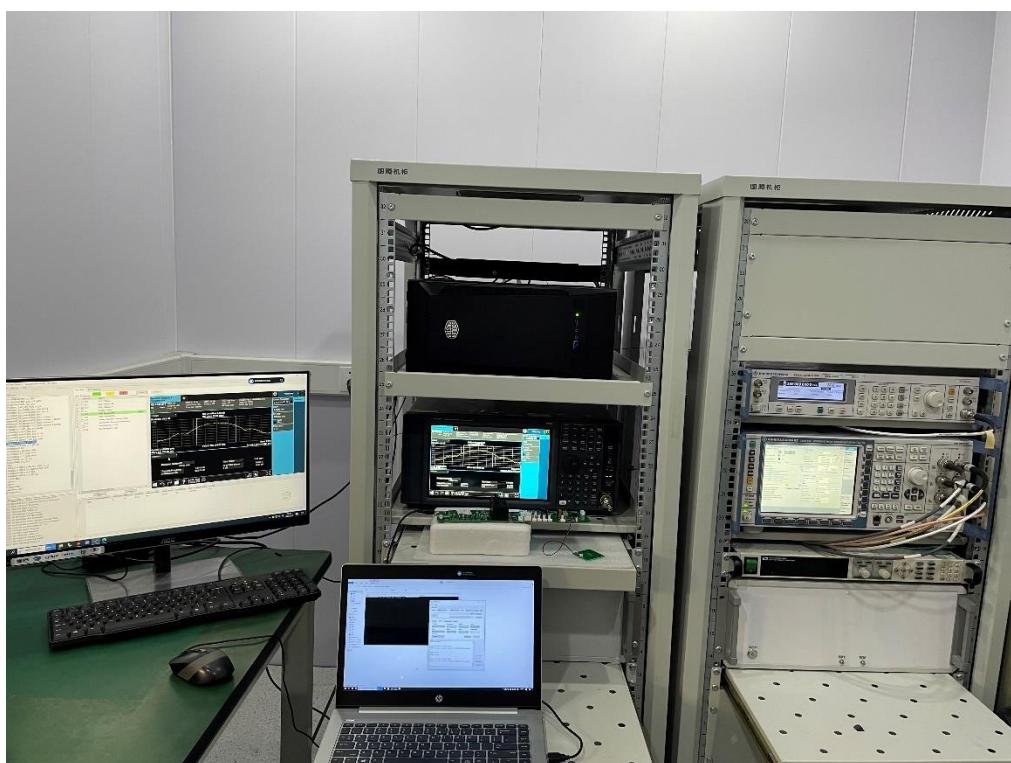
Date: 2022-07-29

Page 69 of 70

5.2 Set-up for Conducted Emission on AC Mains



5.3 Set-up for Conducted RF test at Antenna Port



TEST REPORT

Report No.: SHE22060090-02DE

Date: 2022-07-29

Page 70 of 70

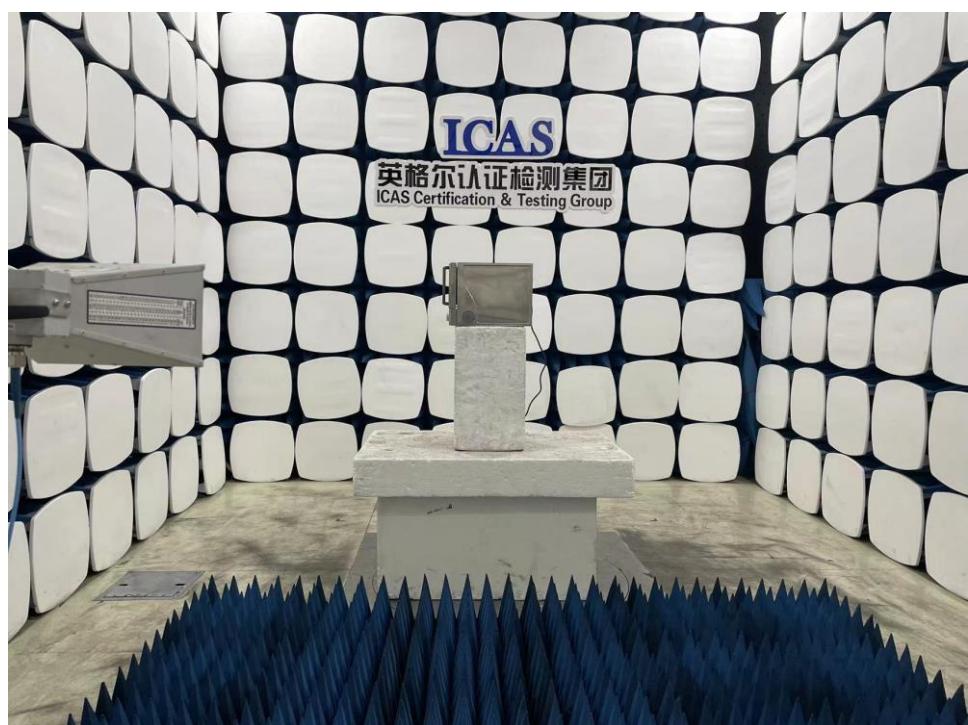
5.4 Set-up for Radiated Spurious Emission below 1GHz

30MHz-1GHz



5.5 Set-up for Radiated Spurious Emission above 1GHz

1GHz-18GHz



End of the report