TEST REPORT

Applicant	:	Shenzhen UniStrong Science & Technology Co.,Ltd.
Address of Applicant	:	B,4-4Factory, Zhengcheng Road, Fuyong Baoan District, Shenzhen, China
Product Name	:	Rugged Tablet
Model No.	:	UT56
Sample No.	:	E20040045-01#01; E20040045-01#05
FCC ID	:	2AOPD-UT56
ISED Number	:	11546A-UT56
Standards	:	FCC CFR47 Part 15, Subpart C RSS-Gen (Issue 5, March 2019) RSS-247 (Issue 2, February 2017)
Date of Receipt	:	2020-04-14
Date of Test	:	2020-04-27 ~ 2020-07-09
Date of Issue	:	2020-07-15

Remark:

This report details the results of the testing carried out on one sample, the results contained in this report do not relate to other samples of the same product. The manufacturer should ensure that all products in series production are in conformity with the product sample detailed in this report.

Prepared by: Jennifer zhou (Jennifer Zhou) Reviewed by: jesse (Jesse) Approved by: Guoyou Chi (Authorized signatory: Guoyou Chi)

TEST REPORT

Revision Record			
Version	**Date**	**Revisions**	**Revised By**
1.0	2019-11-05	Original	--

Contents

1 General Information

1.1 Testing Laboratory

Company Name	ICAS Testing Technology Services (Shanghai) Co., Ltd.
Address	155 Pingbei Rd, Minhang District, Shanghai, China
Telephone	0086 21-51682999
Fax	0086 21-54711112

Homepage	www.icasiso.com

1.2 Details of Application

Company Name	Shenzhen UniStrong Science & Technology Co.,Ltd.
Address	B,4-4Factory, Zhengcheng Road, Fuyong Baoan District, Shenzhen, China
Contact Person	Lili Zheng
Telephone	+86-21-54467182
Email	ll.zheng@unistrong.com

1.3 Details of EUT

Product Name	Rugged android Tablet
Brand Name	Unistrong
Model No.	UT56
FCC ID	2AOPD-UT56
ISED Number	11546A-UT56
Mode of Operation	Bluetooth BR/EDR
Frequency Range	2400MHz ~ 2483.5MHz
Number of Channels	79 (at intervals of 1 MHz)
Modulation Type	GFSK, π/4-DQPSK, 8-DPSK
Antenna Type	Internal Antenna
Antenna Gain	-3.63 dBi
Extreme Temperature Range	-10℃~ +55℃
Test Voltage	DC 3.8V

1.4 Test Methodology

47 CFR Part 15, Subpart C (10-1-16 Edition)	Miscellaneous Wireless Communications Services
FCC PUBLIC NOTICE DA 00-705 (Mar.30, 2000)	Filling and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems
RSS-Gen (Issue 5, March 2019)	General Requirements for Compliance of Radio Apparatus
RSS-247 (Issue 2, February 2017)	Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSs) and Licence-Exempt Local Area Network (LE-LAN) Devices
ANSI C63.10-2013	American National Standard for Testing Unlicensed Wireless Devices

Note(s):

All test items were verified and recorded according to the standards and without any addition/deviation/exclusion during the test.

2 Test Condition

2.1 Environmental conditions

Temperature (°C)	18-25
Humidity (%RH)	40-65
Barometric Pressure (mbar)	960-1060

2.2 Equipment List

Name of Equipment	Manufacturer	Model	Serial No.	Cal. Due Date
Spectrum Analyzer	Keysight	N9020B	MY59260184	2020-07-28
Spectrum Analyzer	Rohde & Schwarz	FSV40N	101450	2021-06-24
EMI Test Receiver	Rohde & Schwarz	ESPI3	100173	2021-06-19
EMI Test Receiver	Rohde & Schwarz	ESR 7	101911	2020-06-19
V-network	SCHWARZBECK	NSLK 8127	8127-902	2021-02-20
Wideband Radio Communication Tester	Rohde & Schwarz	CMW 500	100687	2020-08-22
Broadband Antenna	SCHWARZBECK	VULB9163	9163-1037	2021-06-06
Horn Antenna-18G	SCHWARZBECK	BBHA9120D	9120D-1775	2021-06-06
Loop Antenna	SCHWARZBECK	FMZB 1513	N/A	2021-03-19
Horn Antenna-40G	YINGLIAN	LB-180400-KF	N/A	2020-07-26
EMC chamber 9*6*6（L*W*H)	CHANGNING	966	N/A	2023-06-26
Shielded Enclosure 8*5*4（L*W*H)	CHANGNING	854	N/A	2020-08-28
Test Software	BL	BL410_E	N/A	N/A

2.3 Measurement Uncertainty

Parameter	Frequency	Uncertainty
Antenna Port Conducted Emission	< 1GHz	± 1.5 dB
	> 1GHz	± 1.5 dB
Radiated Emission	30 MHz – 1 GHz	± 3 dB
	> 1GHz	± 3 dB

3 Test Set-up and Operation Modes

3.1 Details of Test Mode

Using test software was control EUT work in continuous transmitter and receiver mode. Select test channel as below:

Channel	Frequency
The lowest channel(CH0)	2402MHz
The middle channel(CH39)	2441MHz
The Highest channel(CH78)	2480MHz

The basic operation modes are:

A. On
   1. BR/EDR mode
      a. Transmitting
         i. Low Channel
         ii. Middle Channel
         iii. High Channel
         iv. Hopping mode
      b. Receiving
   2. Normal working with Bluetooth on

B. Standby

C. Off

3.2 Special Accessories and Auxiliary Equipment

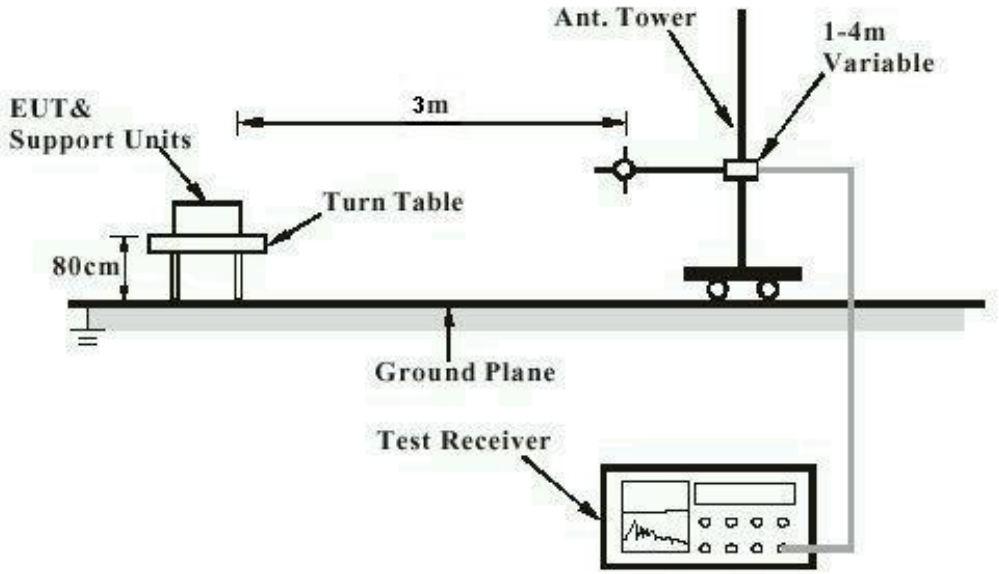
Description	Manufacturer	Model No.	Serial No.
N/A	N/A	N/A	N/A

3.3 Support Software

Description	Manufacturer	Software Name
N/A	N/A	N/A

3.4 Test Setup Diagram

Diagram of Measurement Configuration for Radiation Test



Note: Measurements above 1GHz are done with a table height of 1.5m. In addition, there is RF absorbing material on the floor of the test site for above 1GHz measurement.

Diagram of Measurement Equipment Configuration for Conduction Measurement

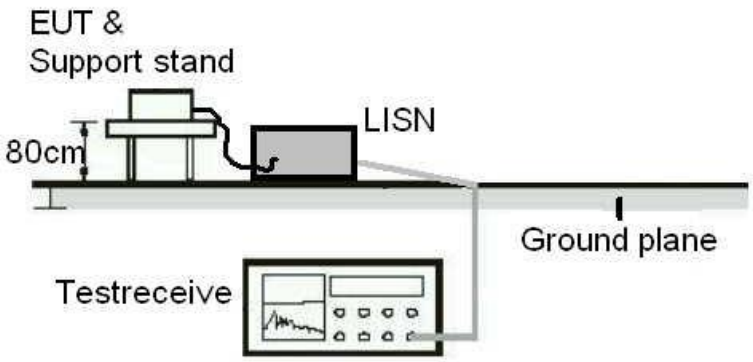
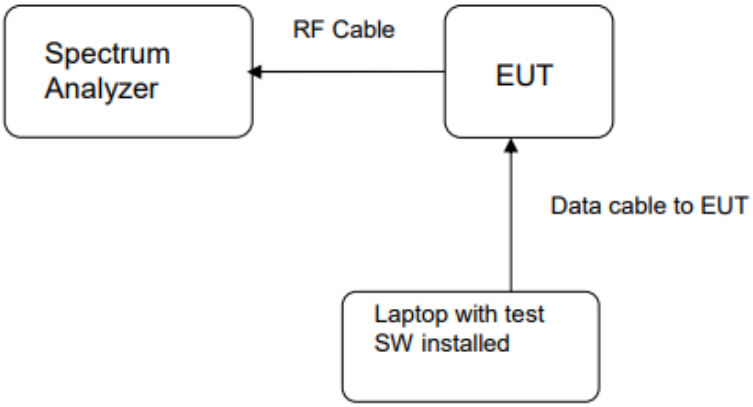


Diagram of Measurement Equipment Configuration for Transmitter Measurement



4 Test Results

4.1 Transmitter Requirement & Test Suites

4.1.1 Antenna Requirement

RESULT: **PASS**

Test standard	:	FCC Part 15.247(b)(4), Part 15.203 RSS-247 5.4(6)
Requirement	:	The use of approved antennas only with directional gains that do not exceed 6 dBi

According to the manufacturer declaration, the EUT has an antenna with a directional gain of -3.63 dBi. The antenna is an internal antenna with no possibility of replacement with a non-approvrd antenna by the end-user.

Therefore, the EUT is considered to comply with this provision.

4.1.2 Maximum Conducted Output Power and E.I.R.P

RESULT: **PASS**

Test standard : FCC Part 15.247(b)(1)
RSS-247 5.4(2)
Requirement : ANSI C63.10-2013
Kind of test site : Shielded room

Test setup

Test Channel : Low/Middle/High
Operation Mode : A.1.a
Ambient temperature : 25°C
Relative humidity : 52%

Table 1: Maximum Conducted Output Power

Test Mode	Test Channel (MHz)	Measured Peak Power		Limit (W)
		(dBm)	(mW)	
GFSK	2402	**4.80**	3.02	< 1
	2441	**7.09**	5.12	
	2480	**4.37**	2.74	
π/4-DQPSK	2402	**4.11**	2.58	< 0.125
	2441	**6.29**	4.26	
	2480	**3.54**	2.26	
8-DPSK	2402	**4.13**	2.59	< 0.125
	2441	**6.28**	4.25	
	2480	**3.57**	2.28	

Table 2: E.I.R.P

Test Mode	Test Channel (MHz)	E.I.R.P		Limit (W)
		(dBm)	(mW)	
GFSK	2402	8.43	6.97	< 4
	2441	10.72	11.80	
	2480	8.00	6.31	
π/4-DQPSK	2402	7.74	5.94	
	2441	9.92	9.82	
	2480	7.17	5.21	
8-DPSK	2402	7.76	5.97	
	2441	9.91	9.79	
	2480	7.20	5.25	

Figure 1: Maximum Conducted Output Power, 2402MHz, GFSK

Figure 2: Maximum Conducted Output Power, 2441MHz, GFSK

Figure 3: Maximum Conducted Output Power, 2480MHz, GFSK

Figure 4: Maximum Conducted Output Power, 2402MHz, π /4-DQPSK

Figure 5: Maximum Conducted Output Power, 2441MHz, π /4-DQPSK

Figure 6: Maximum Conducted Output Power, 2480MHz, π /4-DQPSK

Figure 7: Maximum Conducted Output Power, 2402MHz, 8-DPSK

Figure 8: Maximum Conducted Output Power, 2441MHz, 8-DPSK

Figure 9: Maximum Conducted Output Power, 2480MHz, 8-DPSK

4.1.3 20dB Bandwidth and 99% Bandwidth

RESULT: **PASS**

Test standard	:	FCC Part 15.247(a)(1) RSS-247 5.1(1) RSS-Gen 6.7
Requirement	:	ANSI C63.10-2013
Kind of test site	:	Shielded room

Test setup

Test Channel	:	Low/Middle/High
Operation Mode	:	A.1.a
Ambient temperature	:	25°C
Relative humidity	:	52%

Table 3: 20dB Bandwidth and 99% Bandwidth

Test Mode	Test Channel (MHz)	20dB Bandwidth (MHz)	99% Bandwidth (MHz)
GFSK	2402	0.659	0.694
	2441	0.657	0.693
	2480	0.792	0.752
8-DPSK	2402	1.246	1.154
	2441	1.247	1.156
	2480	1.247	1.156

Figure 10: 20dB Bandwidth and 99% Bandwidth, 2402MHz, GFSK

Figure 11: 20dB Bandwidth and 99% Bandwidth, 2441MHz, GFSK

Figure 12: 20dB Bandwidth and 99% Bandwidth, 2480MHz, GFSK

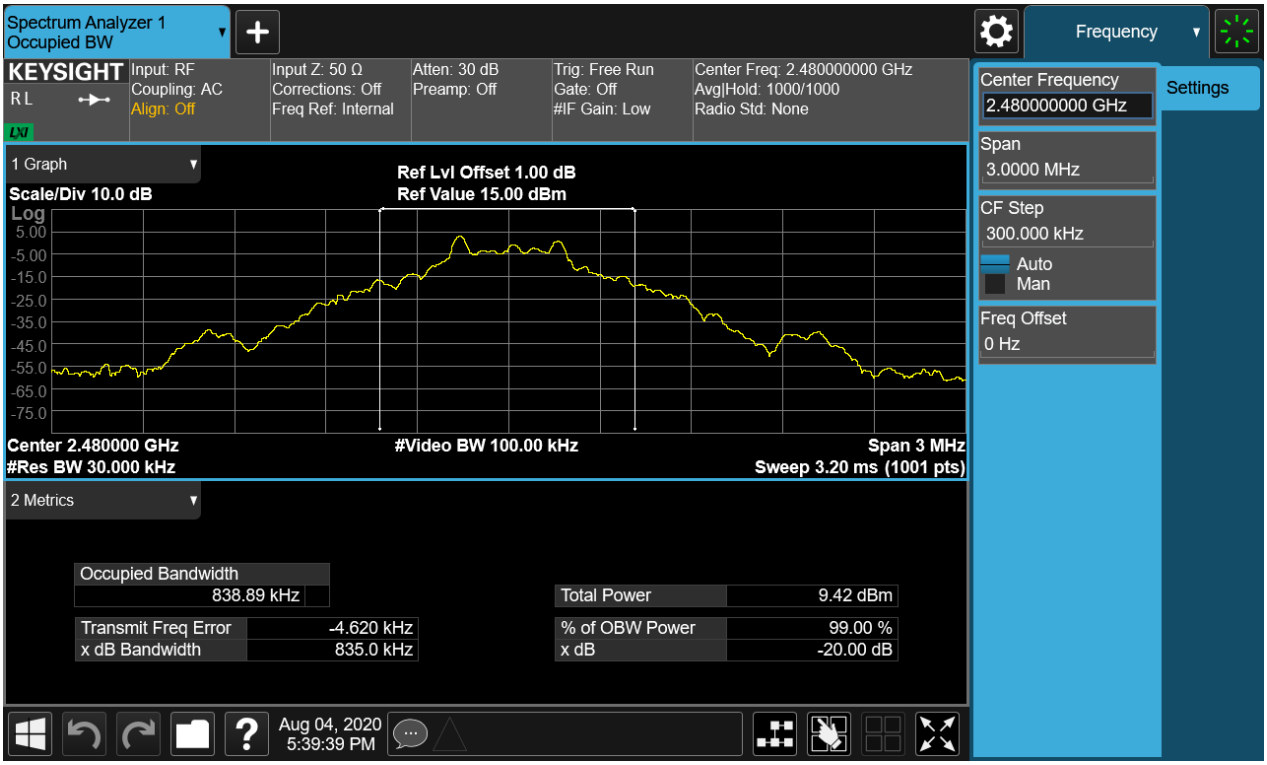


Figure 13: 20dB Bandwidth and 99% Bandwidth, 2402MHz, 8-DPSK

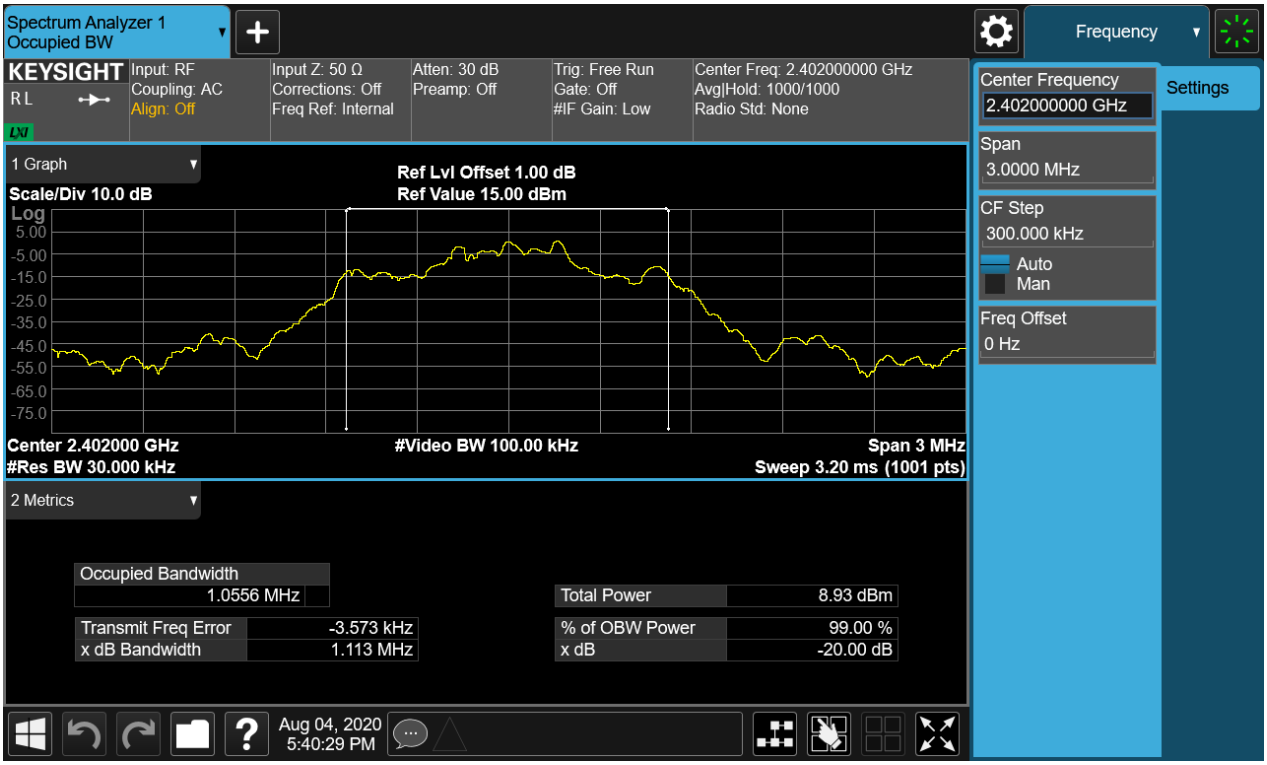


Figure 14: 20dB Bandwidth and 99% Bandwidth, 2441MHz, 8-DPSK

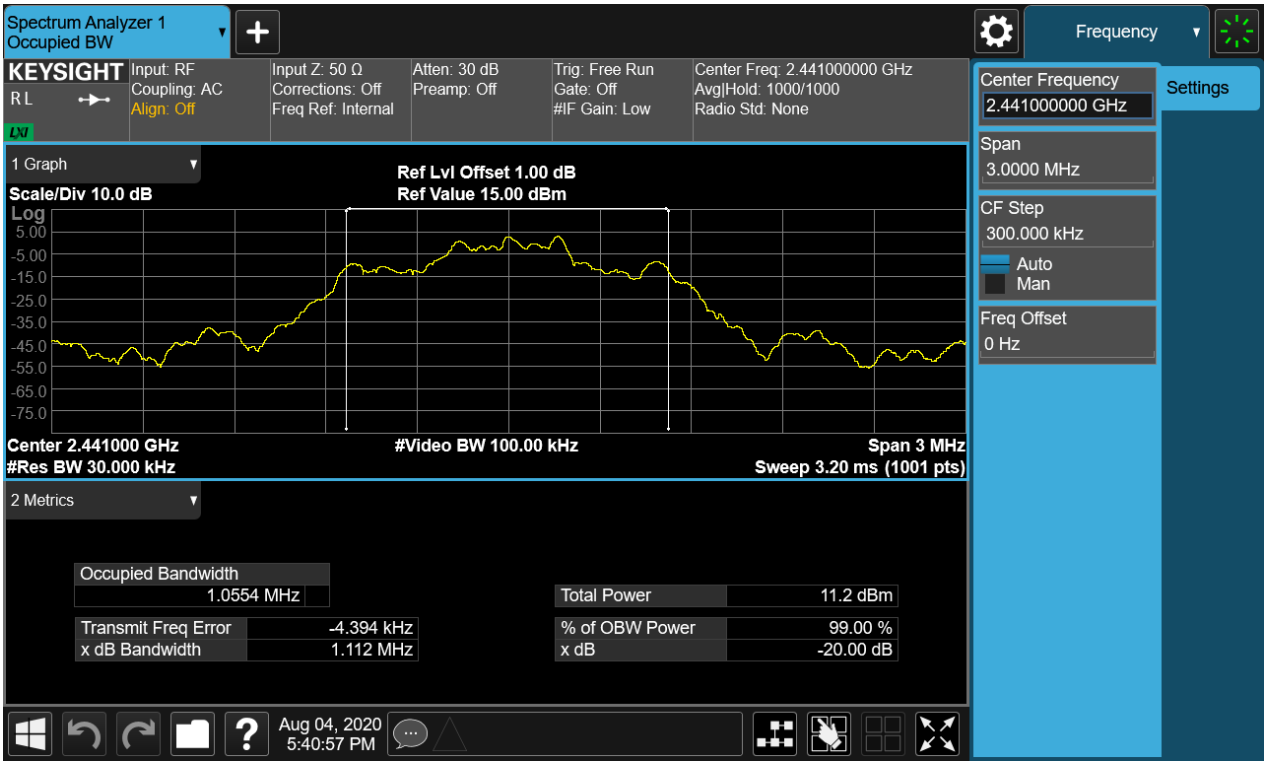
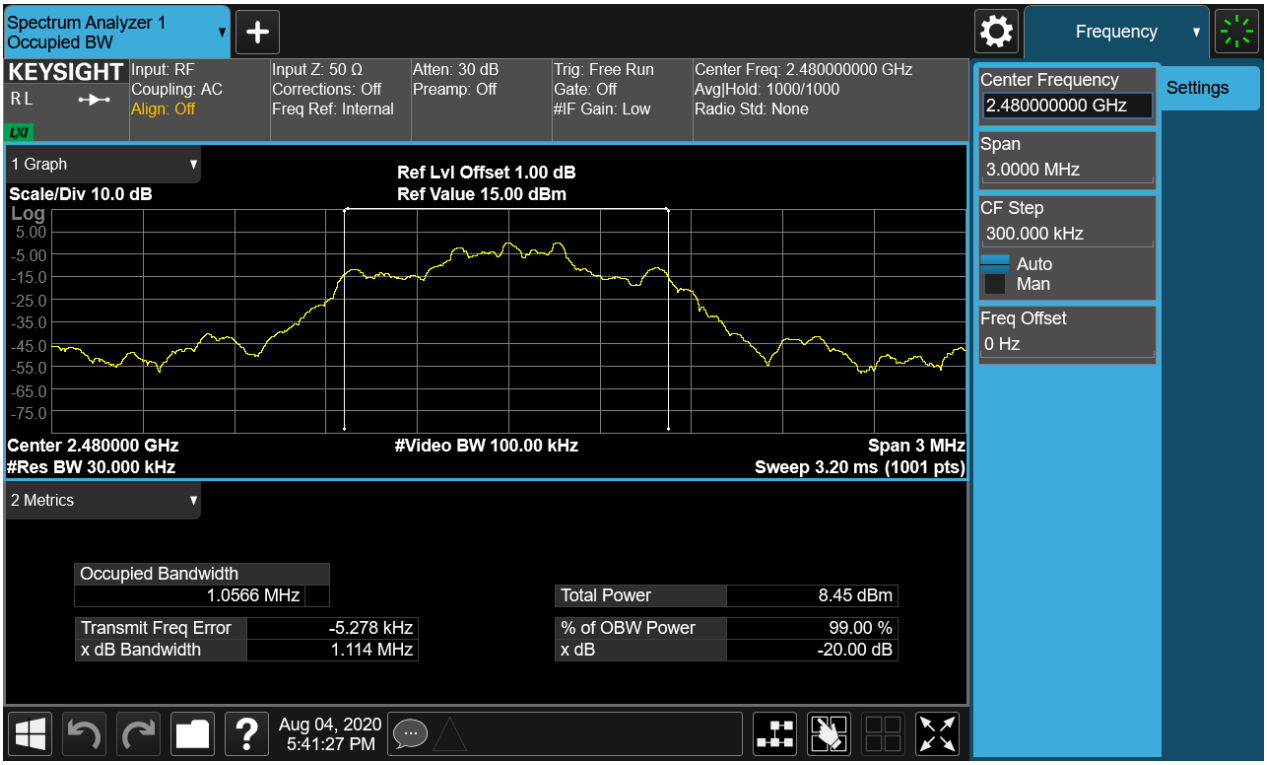


Figure 15: 20dB Bandwidth and 99% Bandwidth, 2480MHz, 8-DPSK



4.1.4 Conducted Spurious Emission & Authorized-band band-edge

RESULT: **PASS**

Test standard	:	FCC Part 15.247(d) RSS-247 5.5
Requirement	:	ANSI C63.10-2013
Kind of test site	:	Shielded room

Test setup

Test Channel	:	Low/Middle/High for spurious, Low/High for Band Edge
Operation Mode	:	A.1.a
Ambient temperature	:	25°C
Relative humidity	:	52%

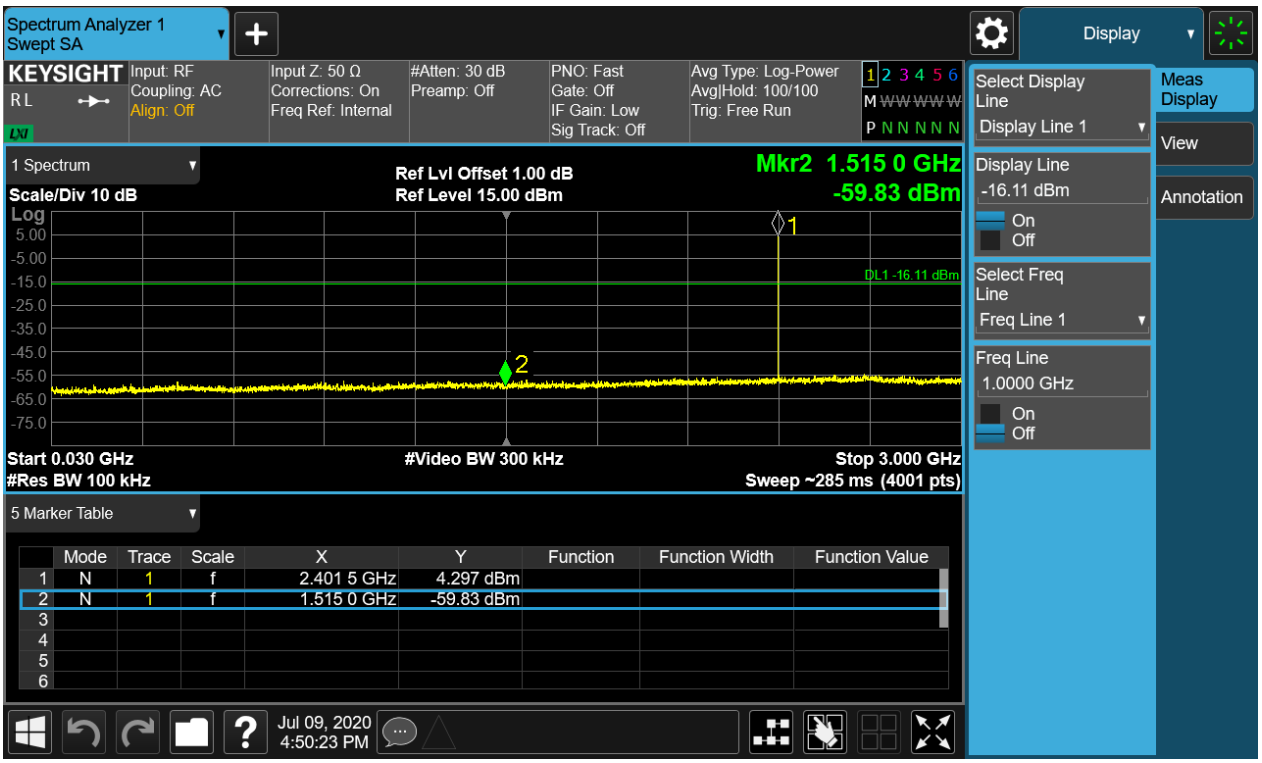
For details refer to following test plot.

Figure 16: Conducted Spurious Emission & Authorized-band band-edge, 2402MHz, GFSK

Carrier Level

Band Edge

Conducted spurious emissions 30MHz-25GHz



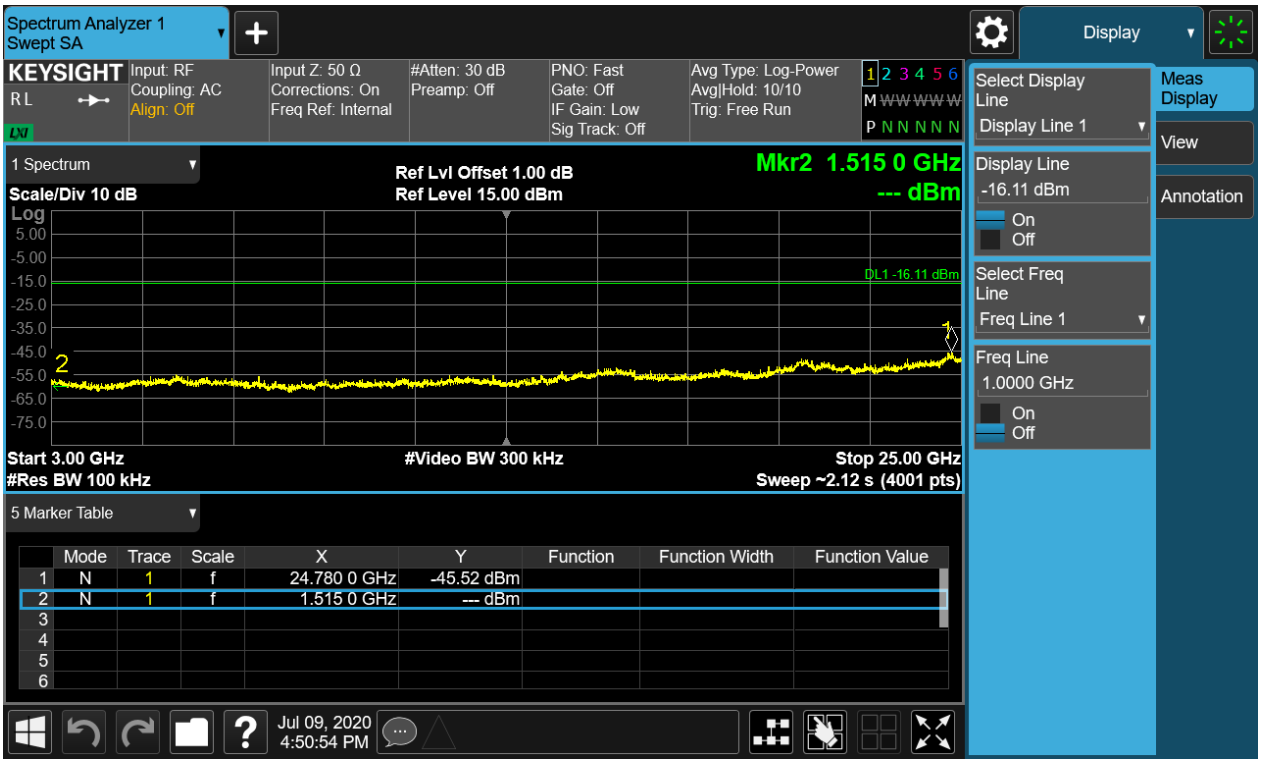
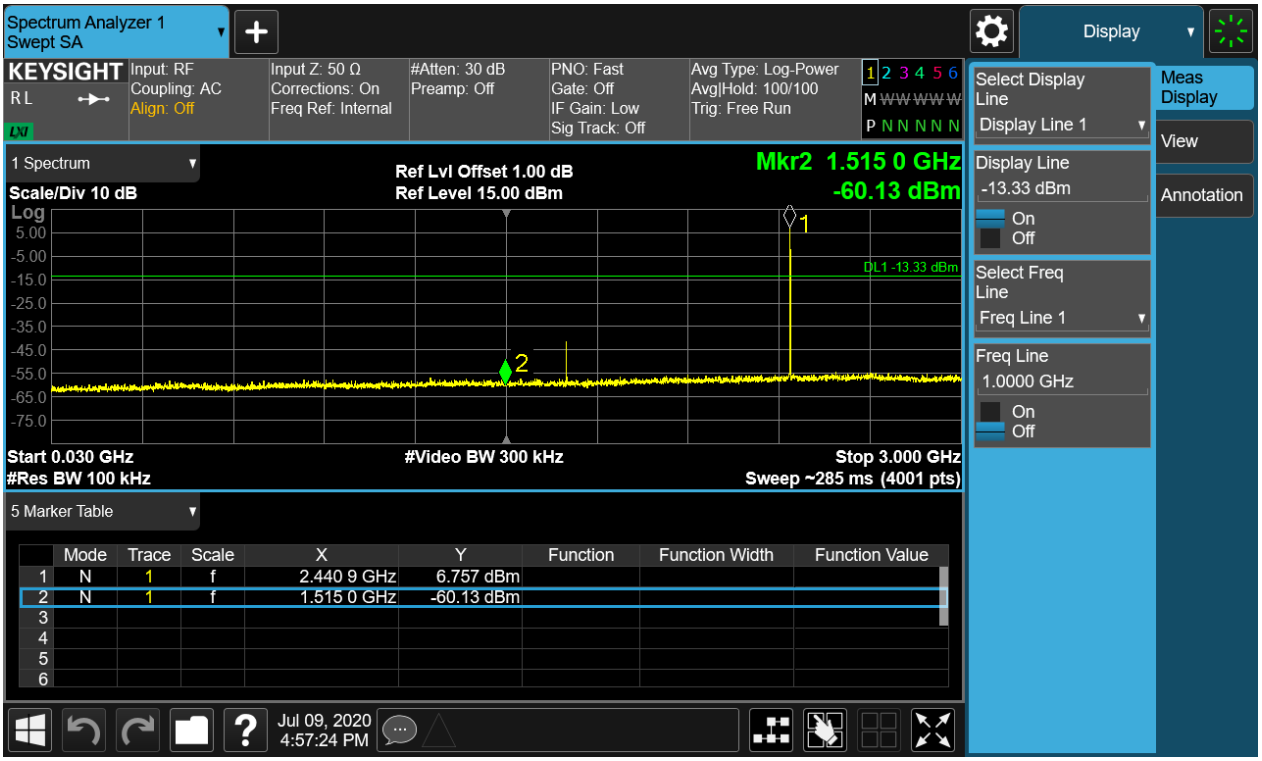


Figure 17: Conducted Spurious Emission & Authorized-band band-edge, 2441MHz, GFSK Carrier Level

Conducted spurious emissions 30MHz-25GHz



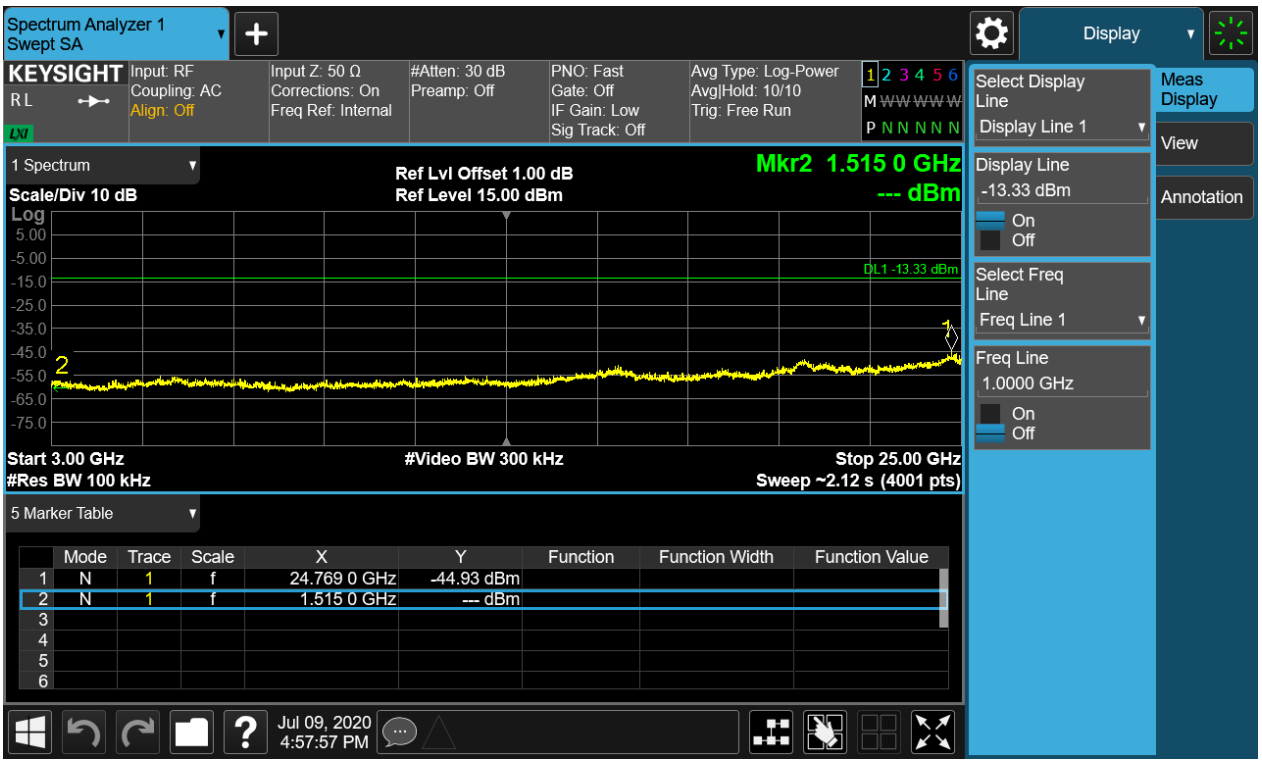
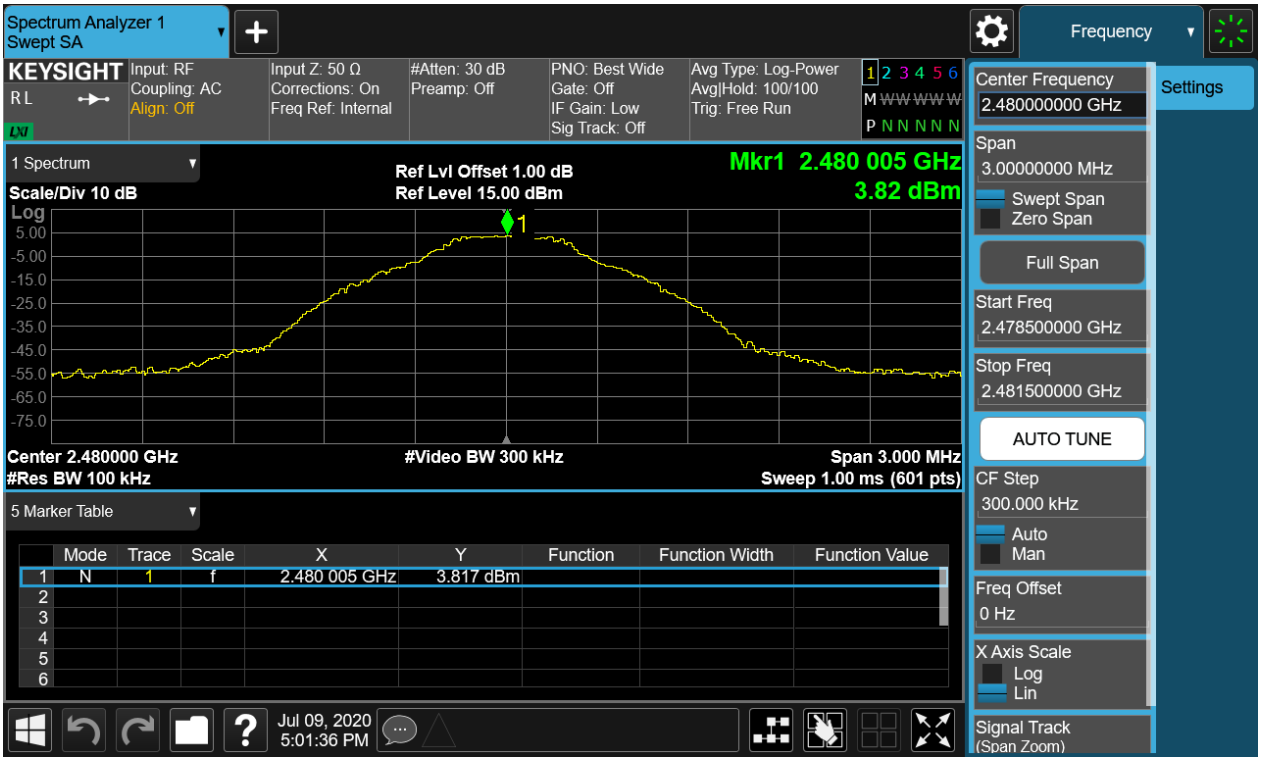
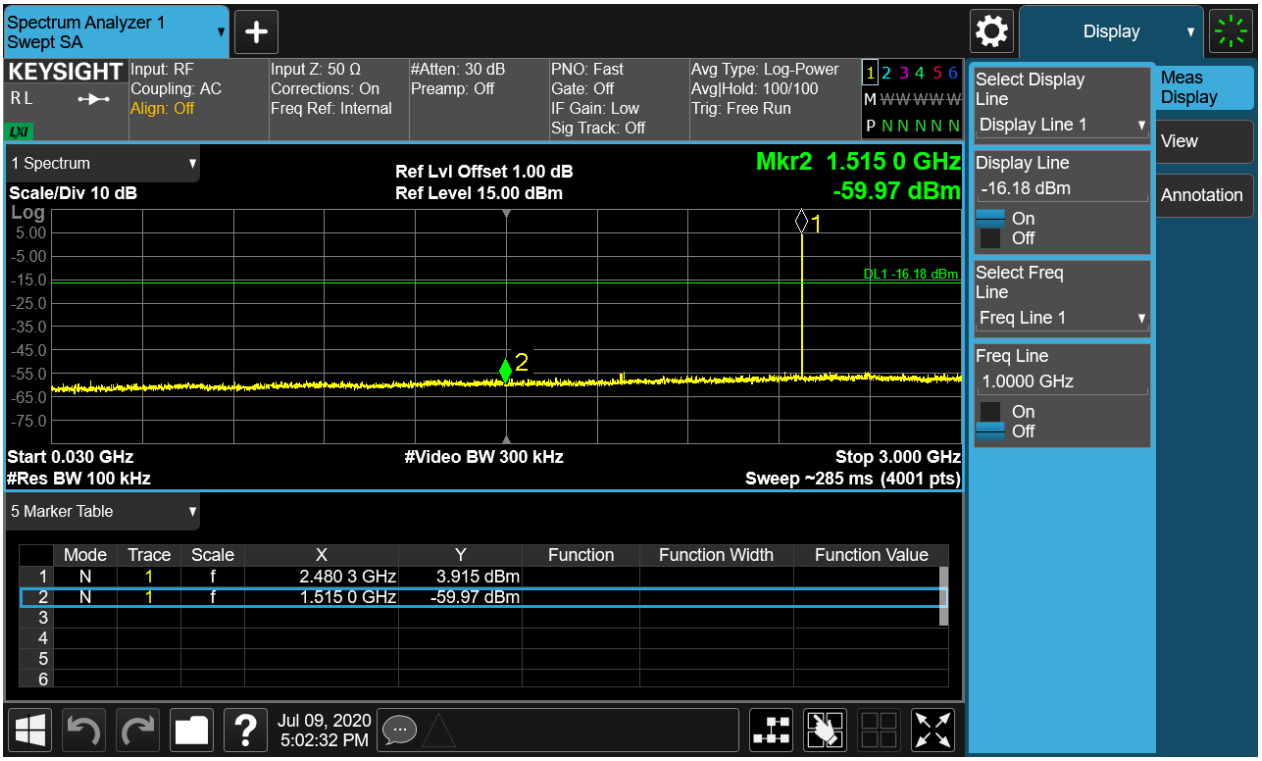


Figure 18: Conducted Spurious Emission & Authorized-band band-edge, 2480MHz, GFSK Carrier Level



Band Edge

Conducted spurious emissions 30MHz-25GHz



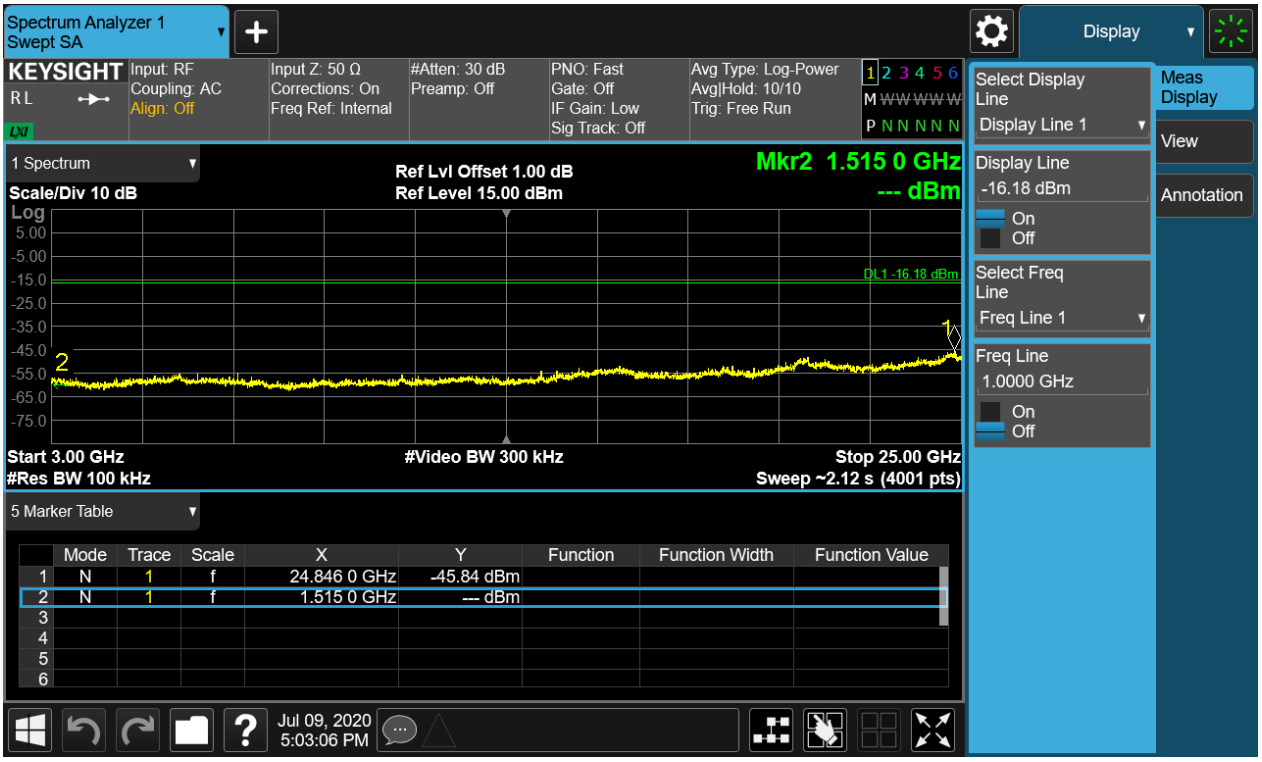
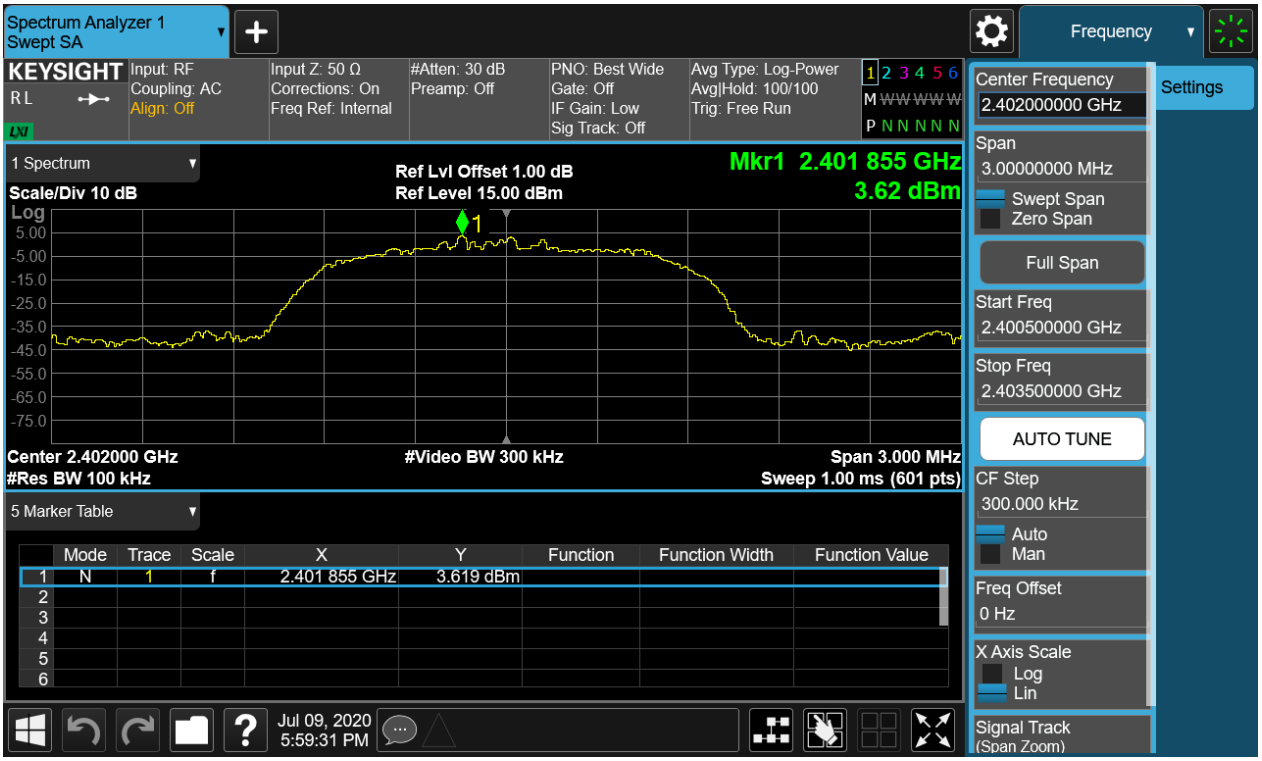
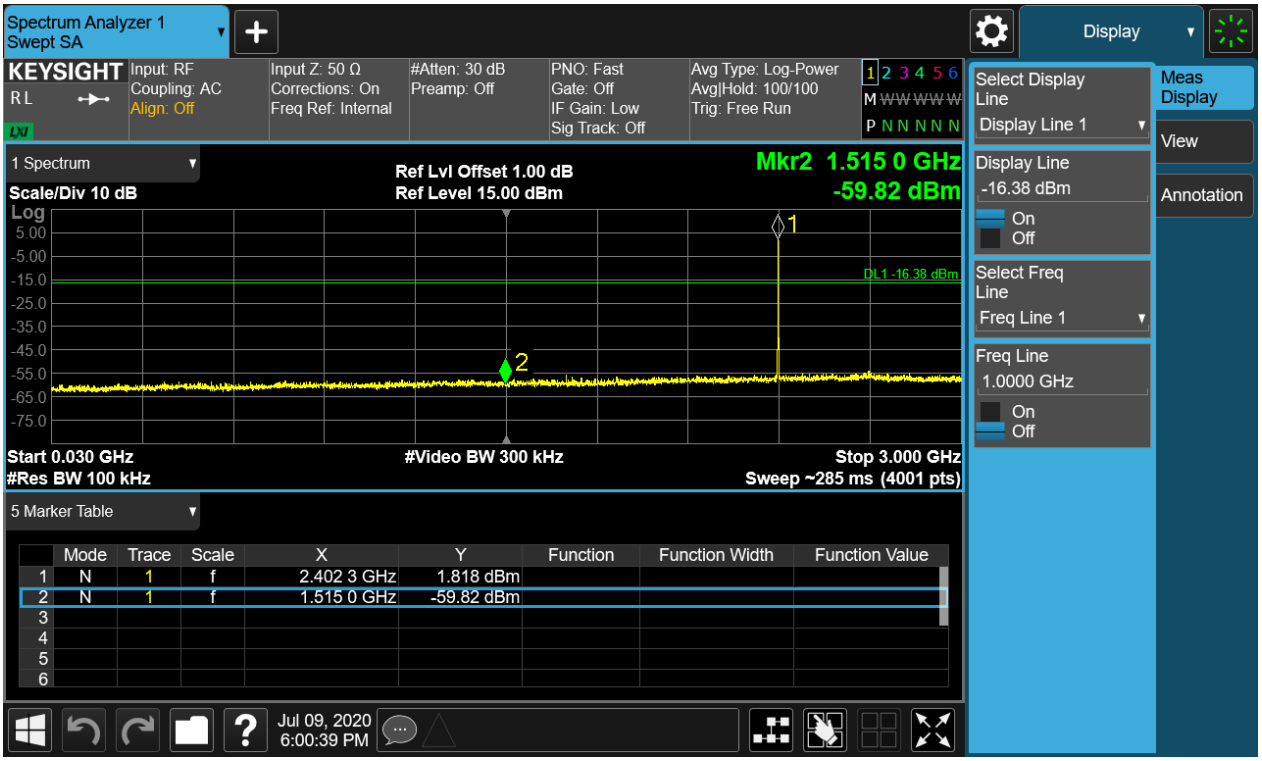


Figure 19: Conducted Spurious Emission & Authorized-band band-edge, 2402MHz, 8-DPSK Carrier Level



Band Edge

Conducted spurious emissions 30MHz-25GHz



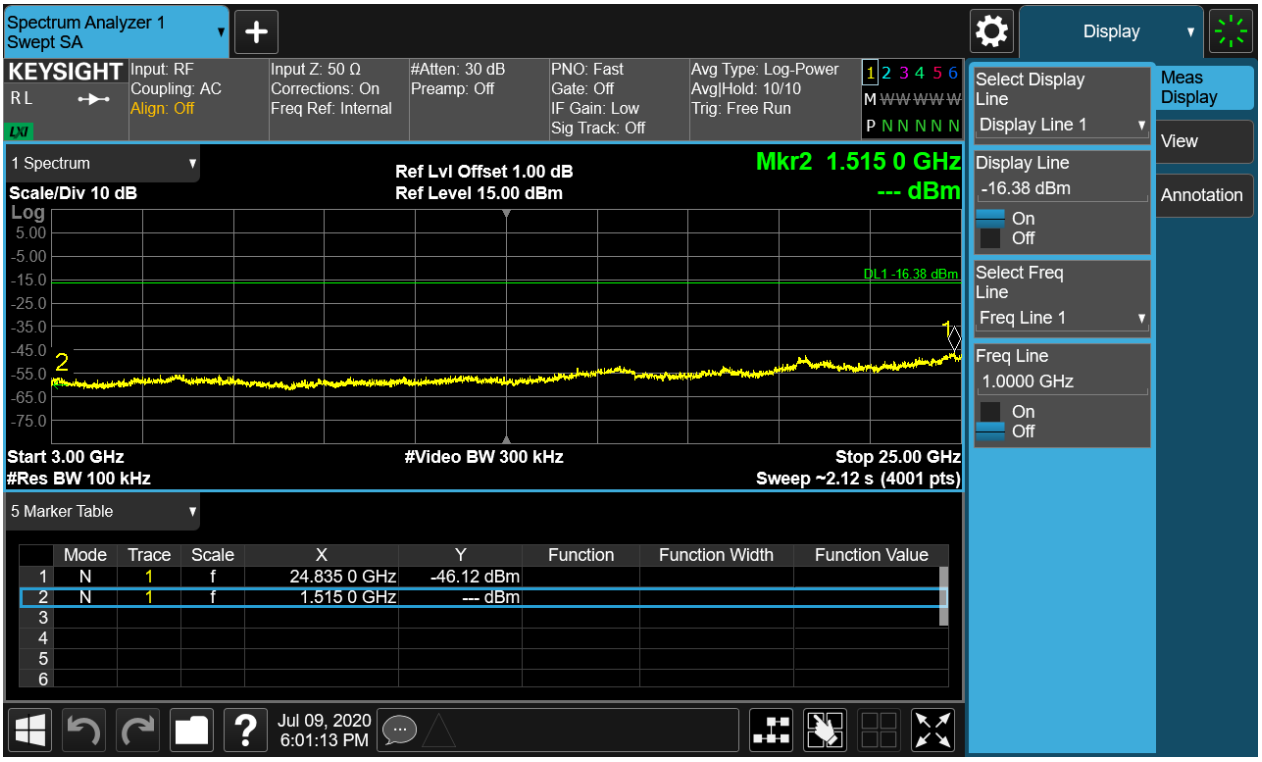
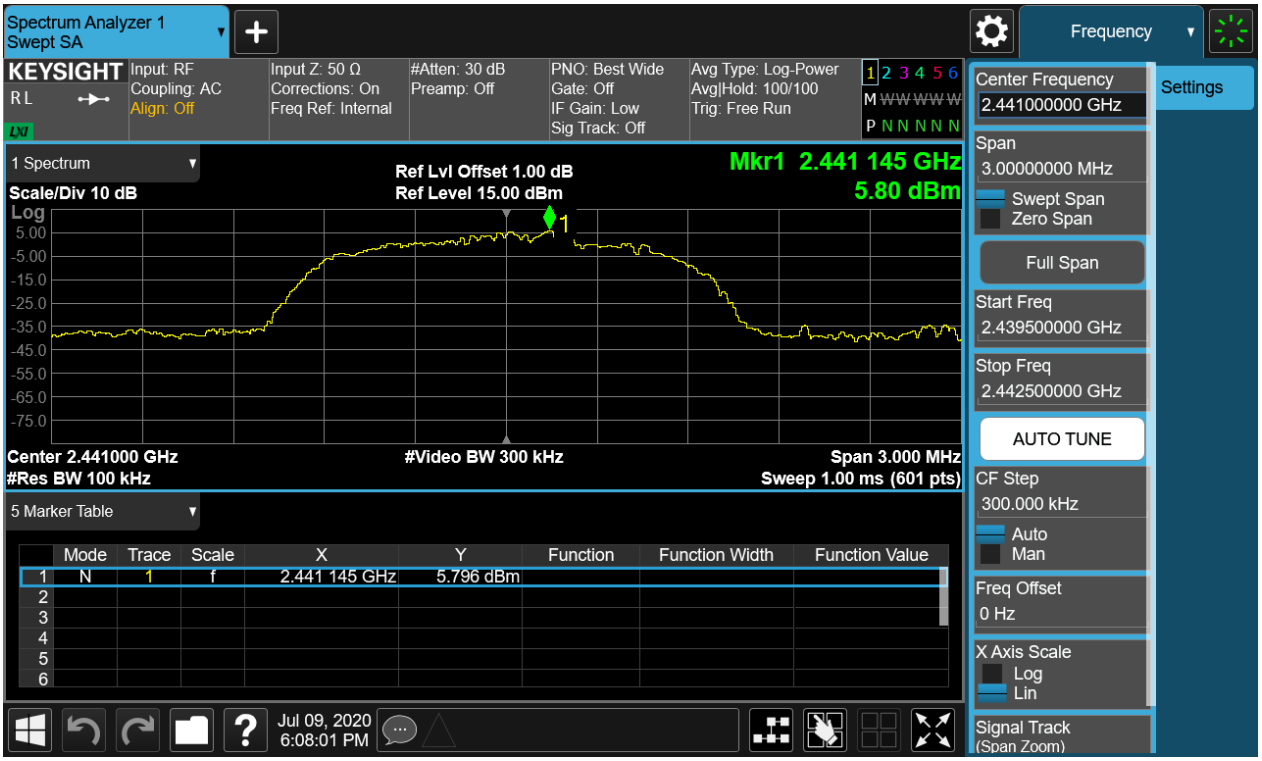
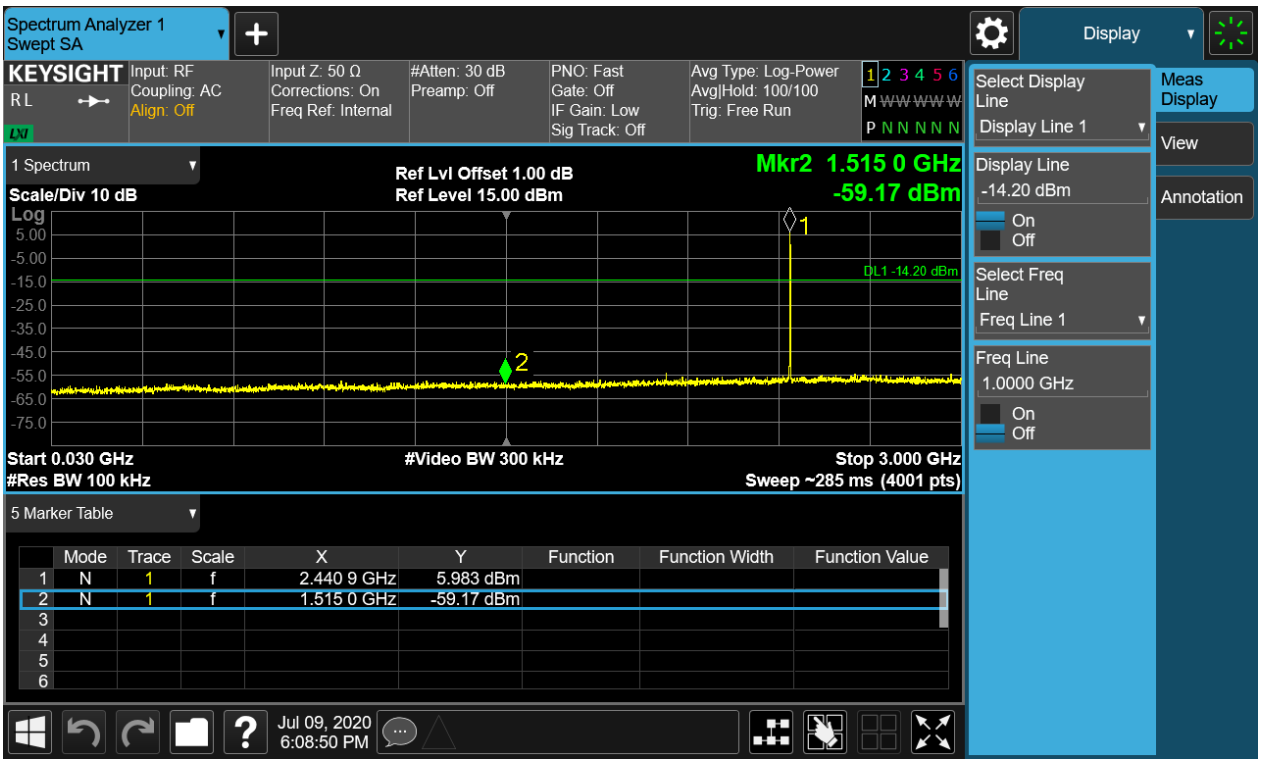


Figure 20: Conducted Spurious Emission & Authorized-band band-edge, 2441MHz, 8-DPSK Carrier Level



Conducted spurious emissions 30MHz-25GHz



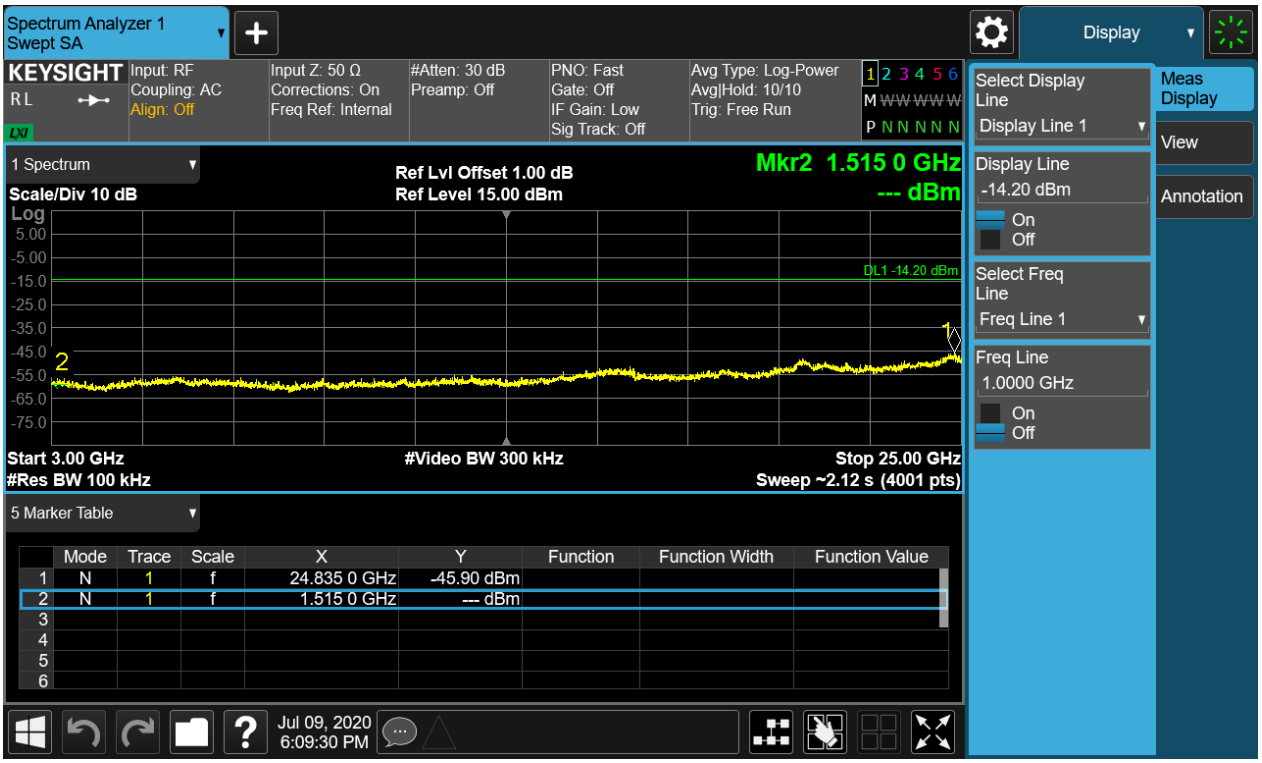
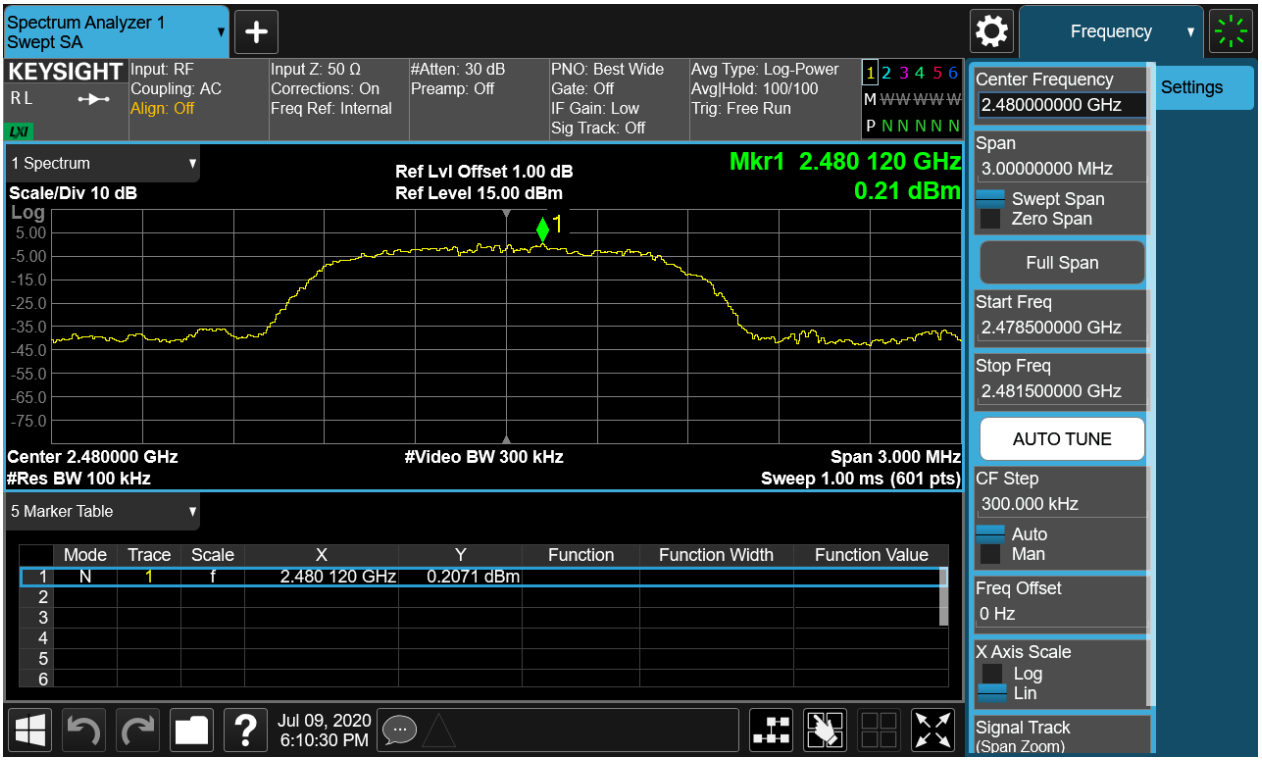


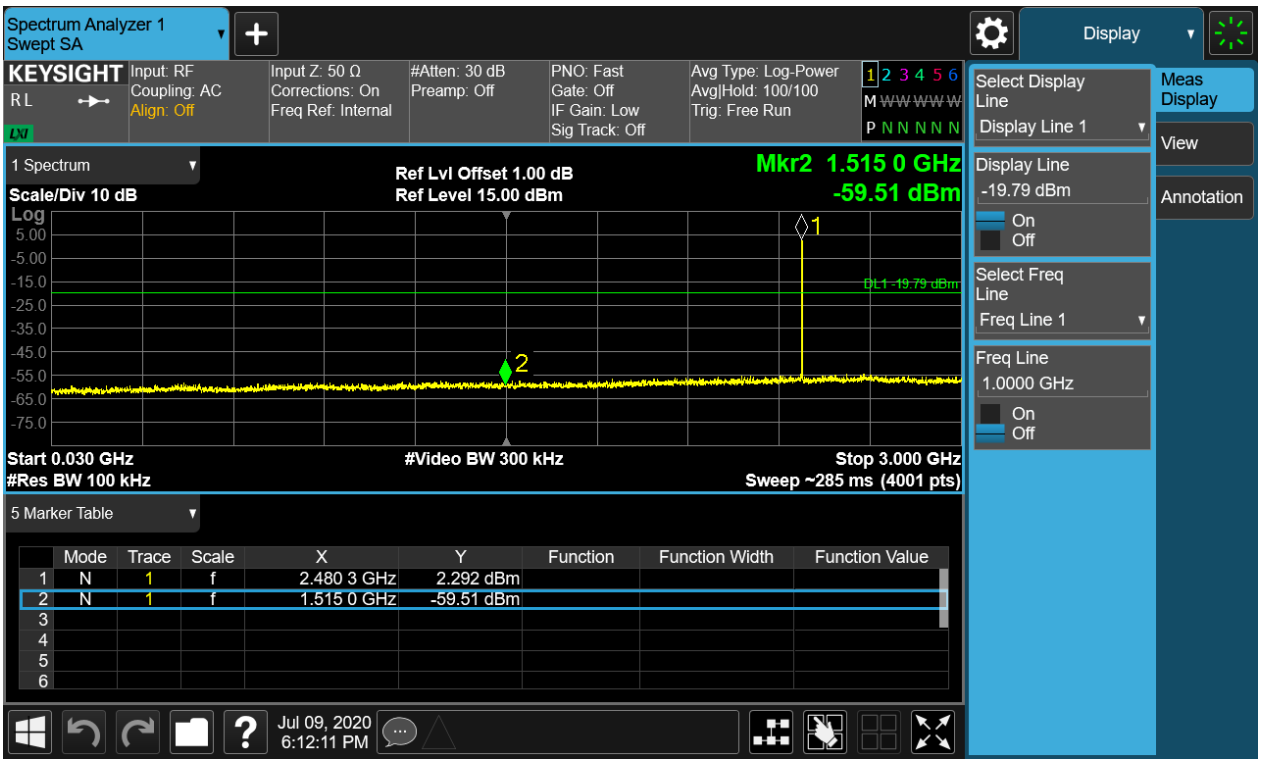
Figure 21: Conducted Spurious Emission & Authorized-band band-edge, 2480MHz, 8-DPSK

Carrier Level



Band Edge

Conducted spurious emissions 30MHz-25GHz



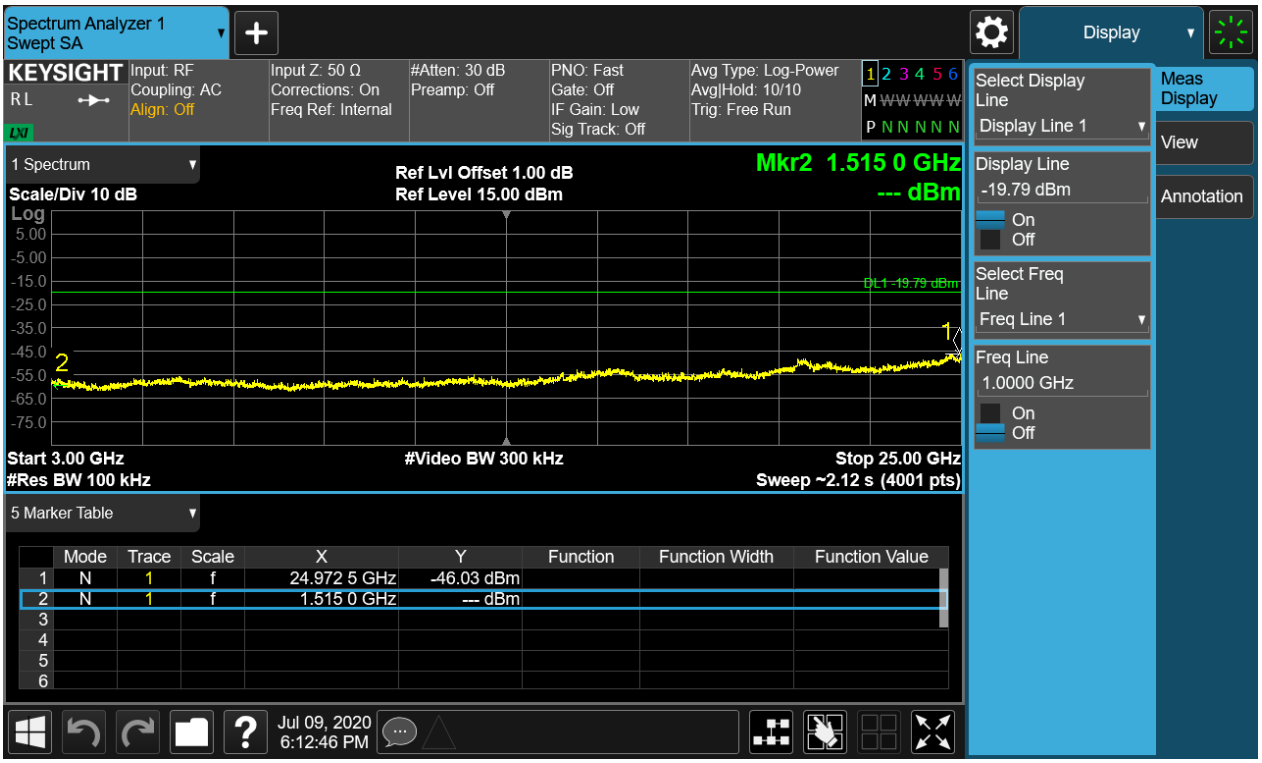
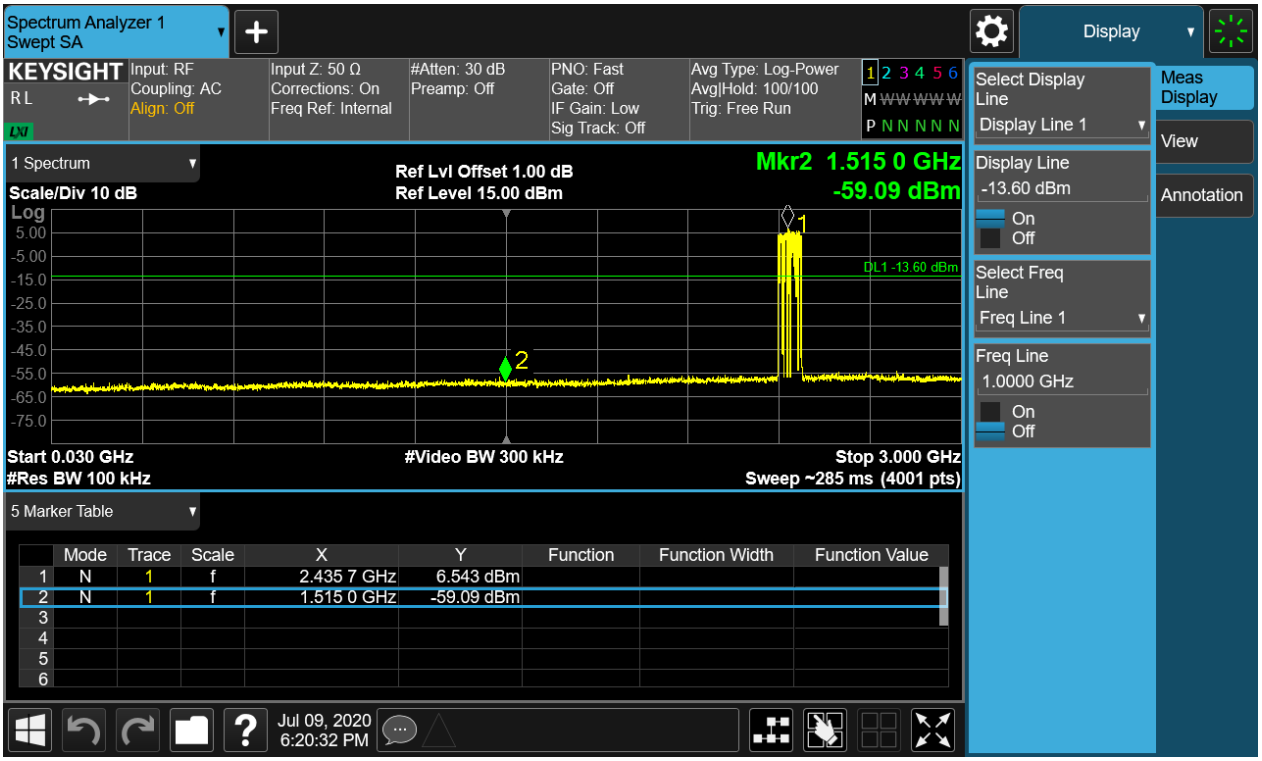


Figure 22: Conducted Spurious Emission & Authorized-band band-edge, Hopping Mode, GFSK Carrier Level

Band Edge(Low)

Band Edge(High)

Conducted spurious emissions 30MHz-25GHz



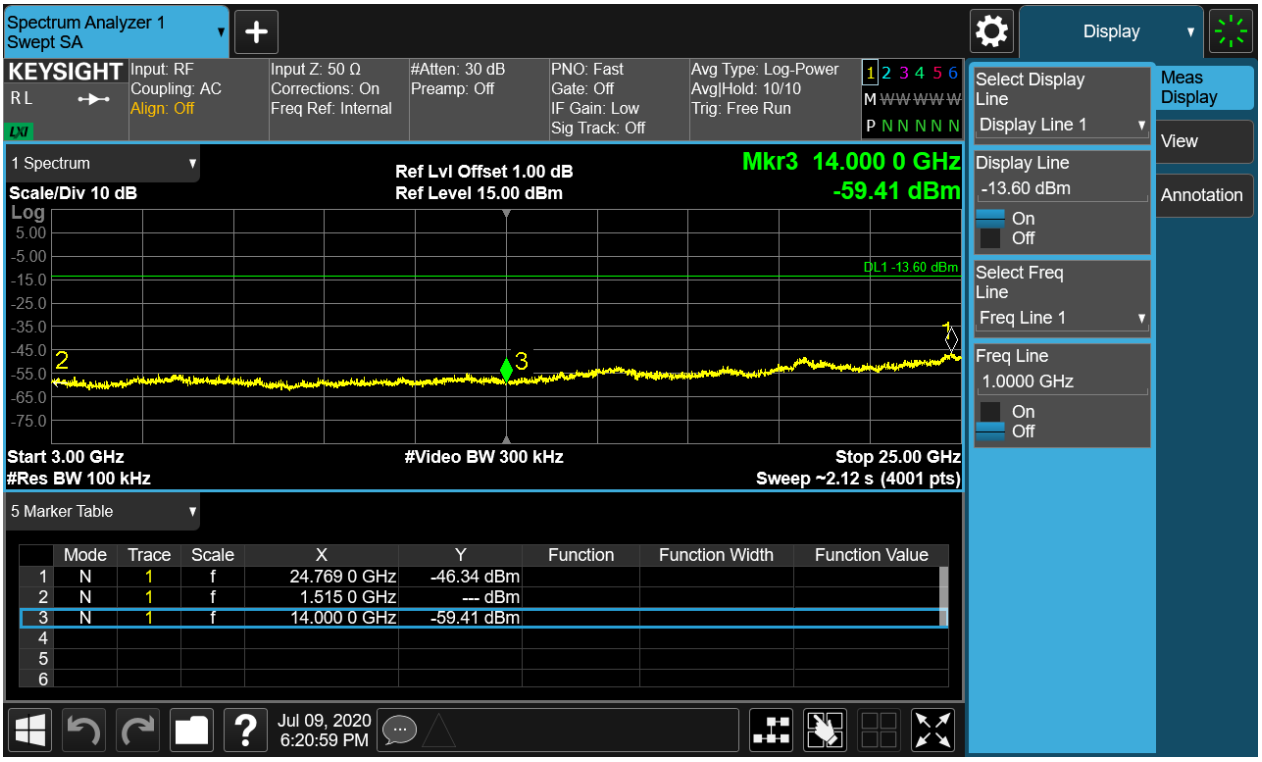
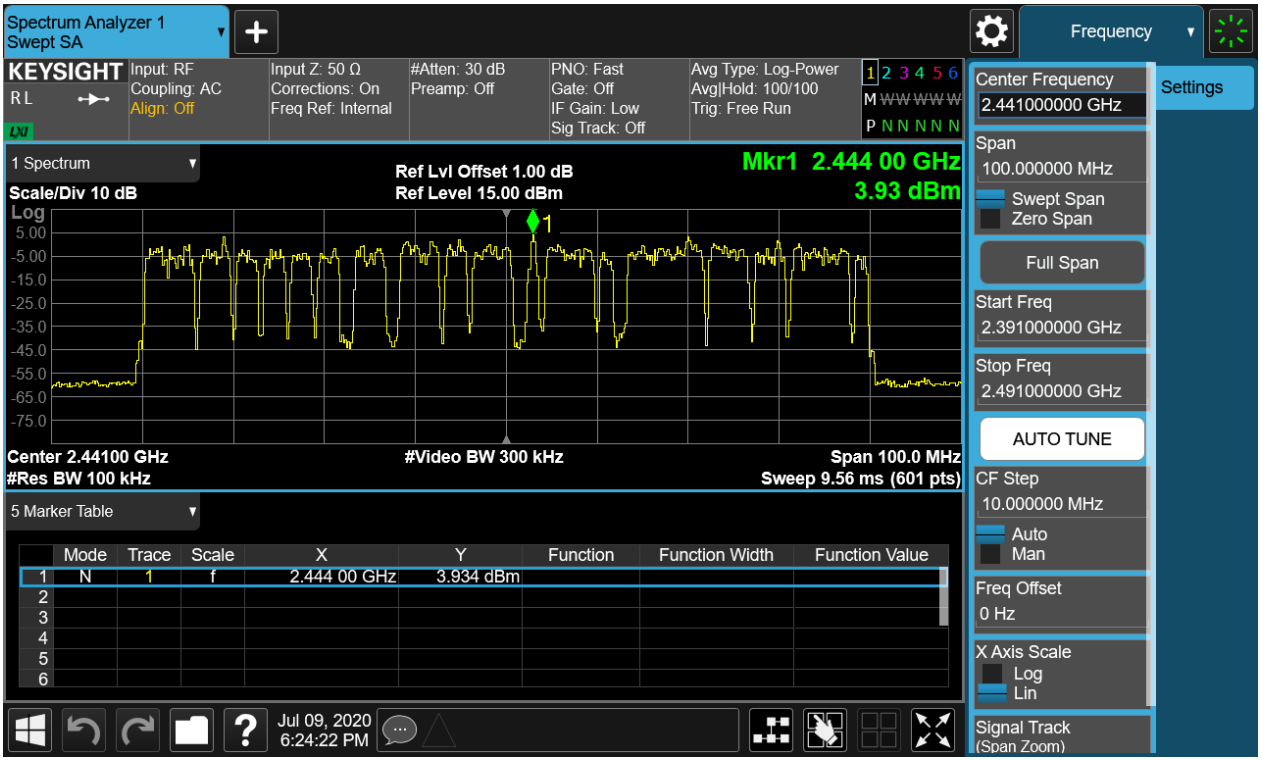


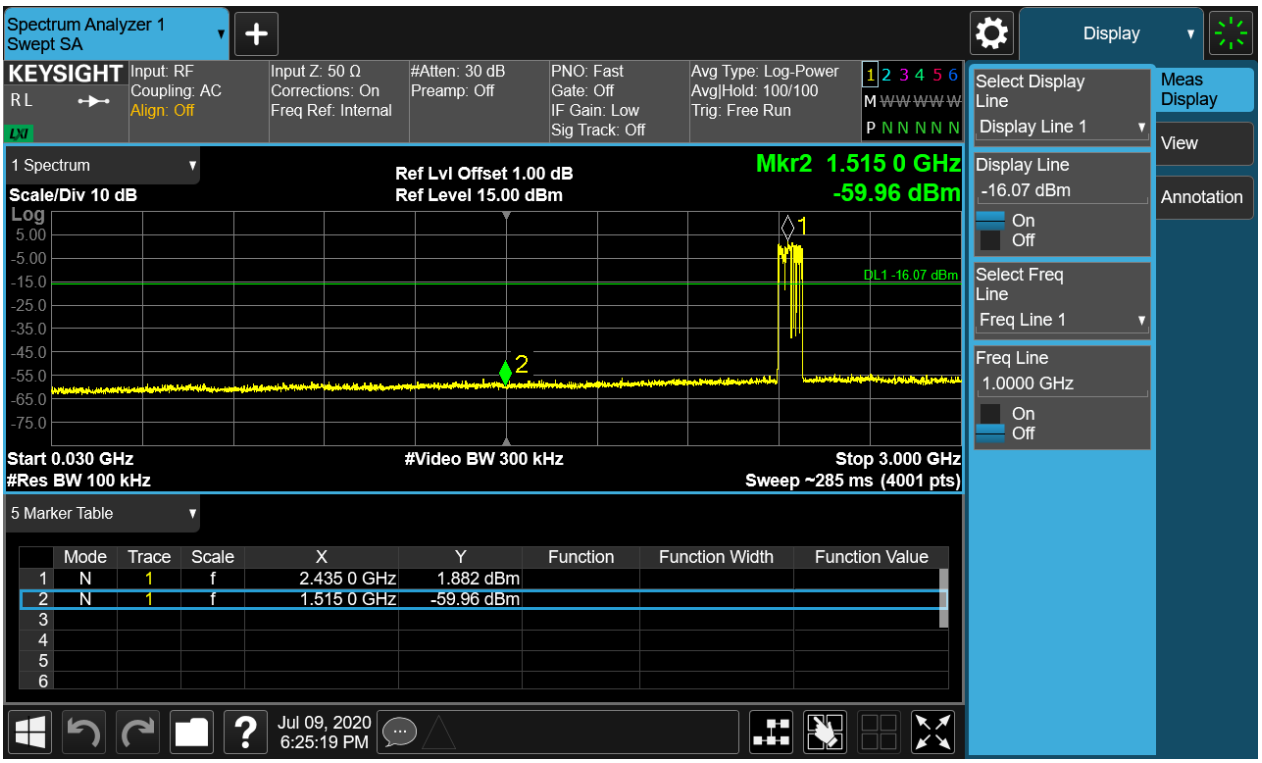
Figure 23: Conducted Spurious Emission & Authorized-band band-edge, Hopping Mode, 8-DPSK Carrier Level

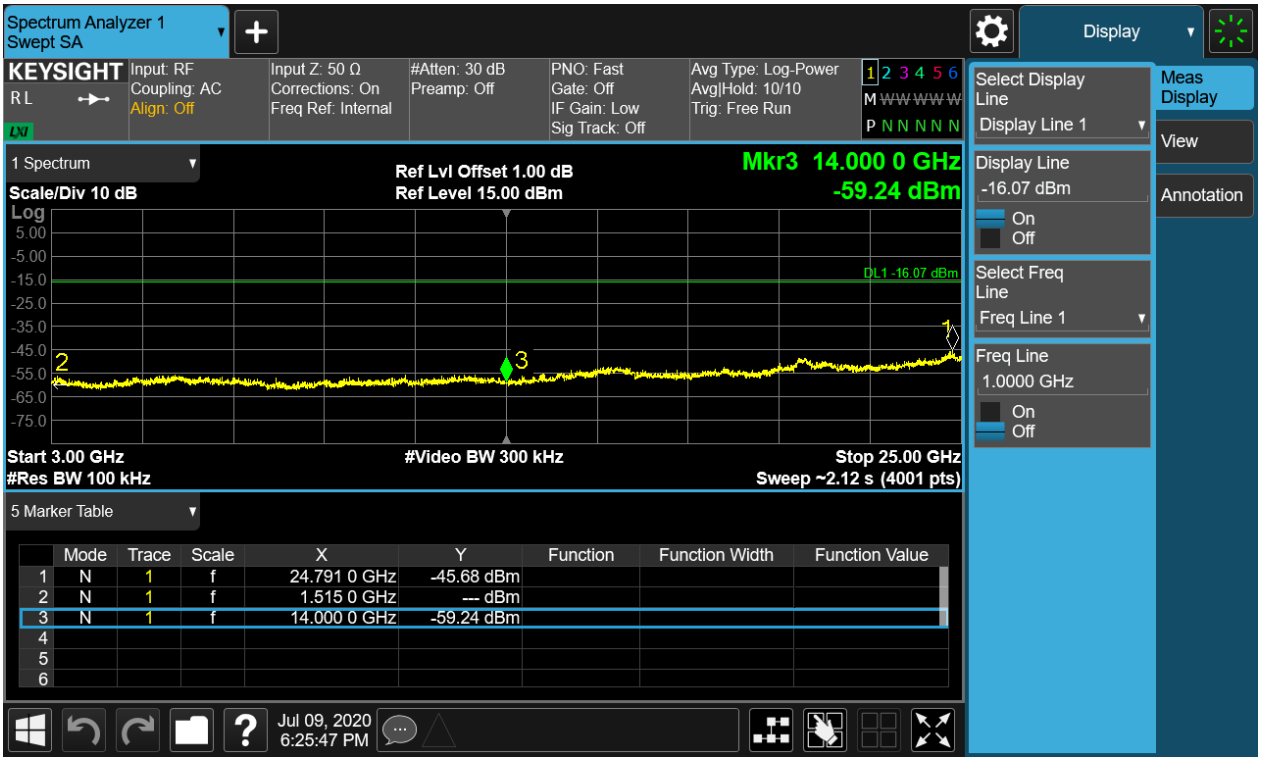


Band Edge(Low)

Band Edge(High)

Conducted spurious emissions 30MHz-25GHz





4.1.5 Spurious Emission

RESULT: **PASS**

Test standard	:	FCC Part 15.247(d), 15.205, 15.209 RSS-247 5.5
Requirement	:	ANSI C63.10-2013
Kind of test site	:	3m Semi-Anechoic Chamber

Test setup

Test Channel	:	Low/Middle/High
Operation Mode	:	A
Ambient temperature	:	25°C
Relative humidity	:	52%

Notes

Test plots please refer to the annex document "BDEDR-TX EXHIBIT A of SHE20040045-02HE".

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. The EUT is working in the Normal link mode below 1 GHz.

4.1.6 Band Edge (Restricted-band band-edge)

RESULT: **PASS**

Test standard	:	FCC Part 15.247(d), 15.205, 15.209 RSS-247 5.5
Requirement	:	ANSI C63.10-2013
Kind of test site	:	3m Semi-Anechoic Chamber

Test setup

Test Channel	:	Low/Middle/High
Operation Mode	:	A.1
Ambient temperature	:	25°C
Relative humidity	:	52%

Notes

Test plots please refer to the annex document “BDEDR-TX EXHIBIT A of SHE20040045-02HE”.

4.1.7 Hopping Frequency Separation

RESULT: **PASS**

Test standard	:	FCC Part 15.247(a)(1) RSS-247 5.1(2)
Requirement	:	ANSI C63.10-2013
Kind of test site	:	Shielded room

Test setup

Test Channel	:	Hopping
Operation Mode	:	A.1.a.iv
Ambient temperature	:	25°C
Relative humidity	:	52%

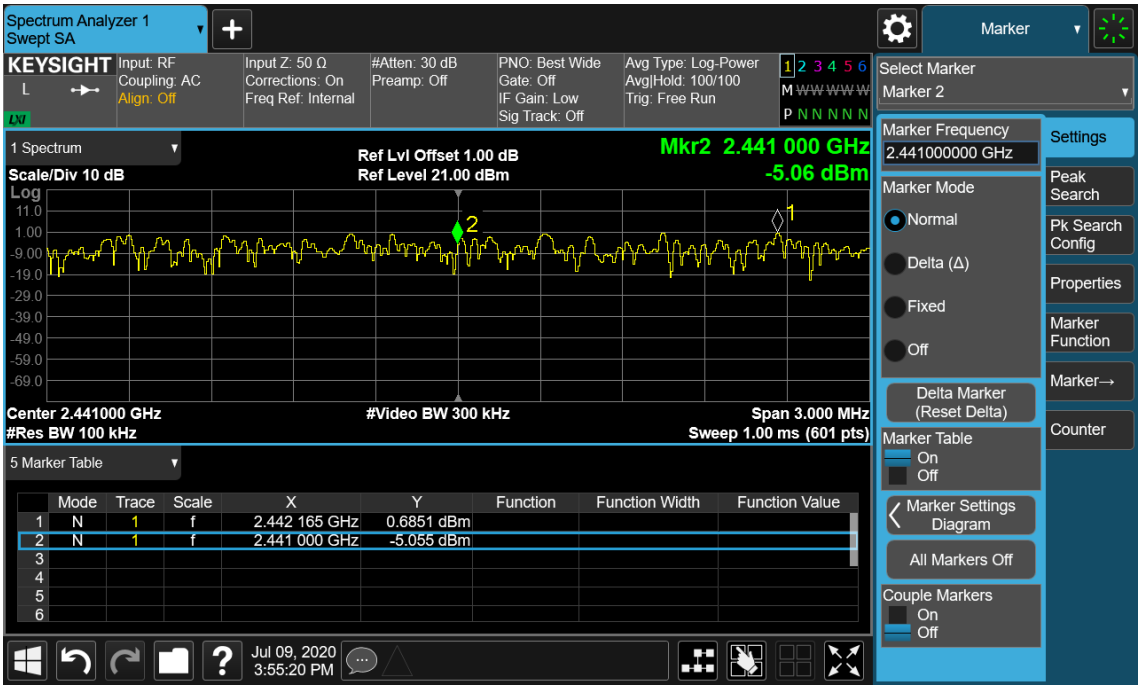
Table 4: Hopping Frequency Separation

Mode	Frequency (MHz)	Channel Separation (MHz)	Limit (MHz)
GFSK	2441	1.035	≥ 25kHz or two-thirds of 20dB bandwidth
8-DPSK	2441	1.166	

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

Figure 24: Hopping Frequency Separation, Hopping Mode, GFSK

Figure 25: Hopping Frequency Separation, Hopping Mode, 8DPSK



4.1.8 Number of Hopping Frequency

RESULT: **PASS**

Test standard	:	FCC Part 15.247(a)(1)(iii) RSS-247 5.1(4)
Requirement	:	ANSI C63.10-2013
Kind of test site	:	Shielded room

Test setup

Test Channel	:	Hopping
Operation Mode	:	A.1.a.iv
Ambient temperature	:	25°C
Relative humidity	:	52%

Table 5: Number of Hopping Frequency

Mode	Frequency Range	Measured Quantity of Hopping Channel	Limit
GFSK	2400 – 2483.5	79	≥15
8-DPSK	2400 – 2483.5	79	≥15

Figure 26: Number of Hopping Frequency, Hopping Mode, GFSK

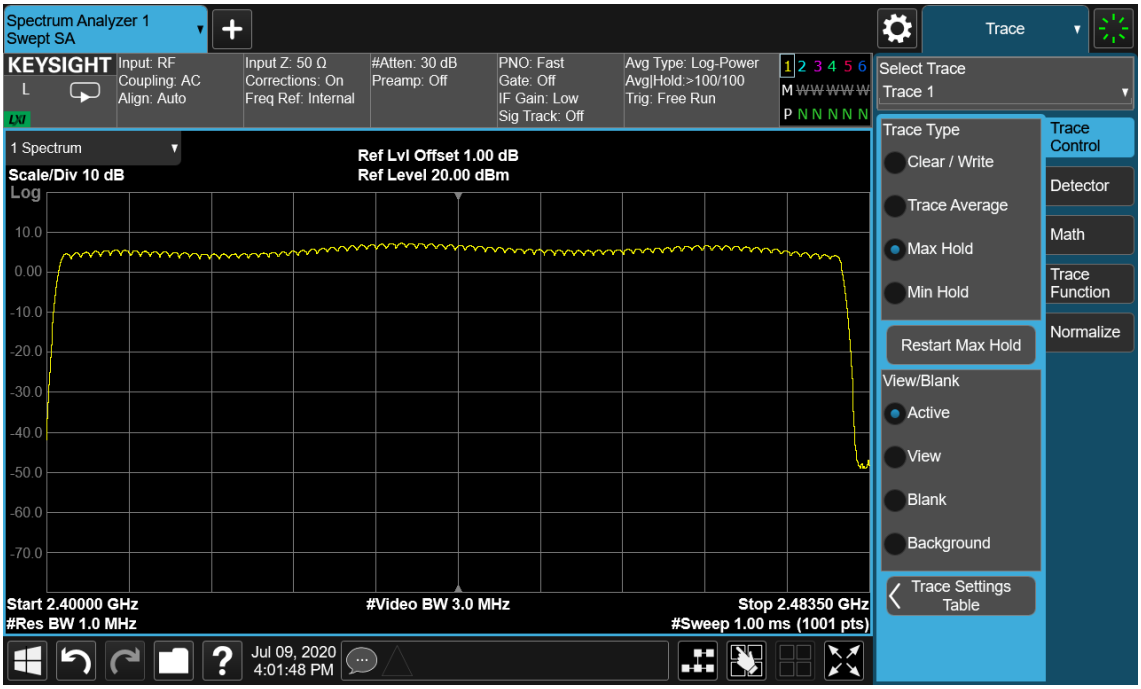
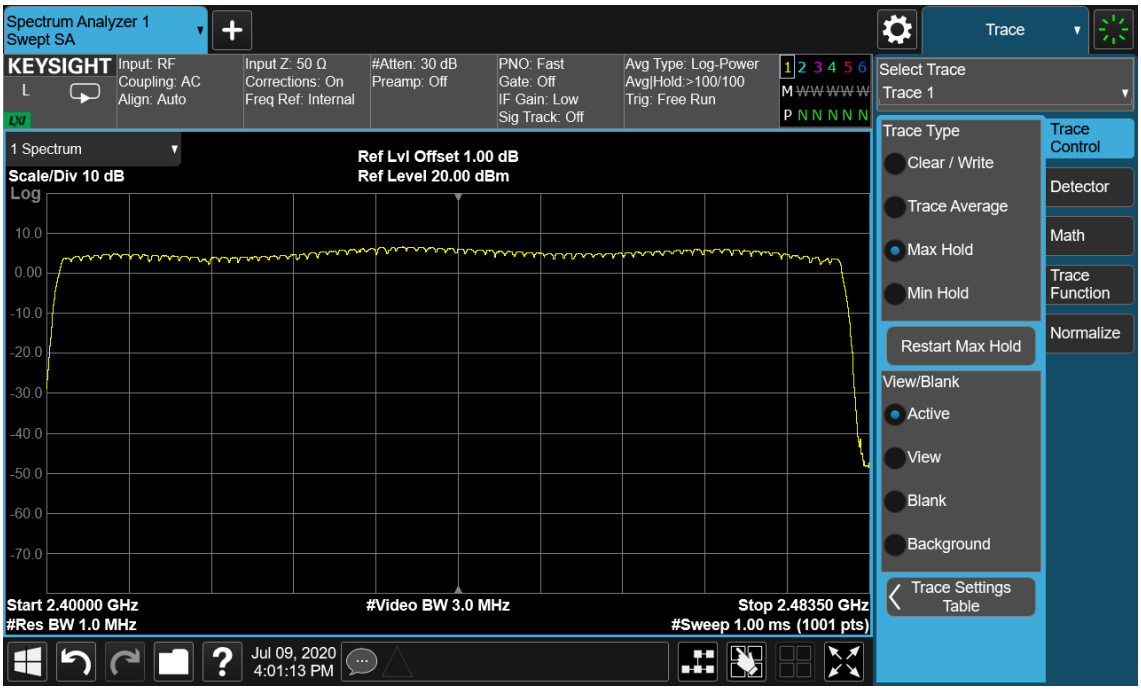


Figure 26: Number of Hopping Frequency, Hopping Mode, 8-DPSK



4.1.9 Time of Occupancy

RESULT: **PASS**

Test standard : FCC Part 15.247(a)(1)(iii)
RSS-247 5.1(4)
Requirement : ANSI C63.10-2013
Kind of test site : Shielded room

Test setup

Test Channel : Middle
Operation Mode : A.1.a
Ambient temperature : 25°C
Relative humidity : 52%

Table 6: Time of Occupancy

Mode	Packet Type	Pulse Time (ms)	Total of Dwell (ms)	Limit (s)
GFSK	DH1	0.3117	99.744	0.4
	DH3	1.6750	268.000	0.4
	DH5	2.9600	315.733	0.4
8-DPSK	DH1	0.3200	102.400	0.4
	DH3	1.6750	268.000	0.4
	DH5	2.9400	313.600	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

Figure 28: Time of Occupancy, 2441MHz, GFSK DH1

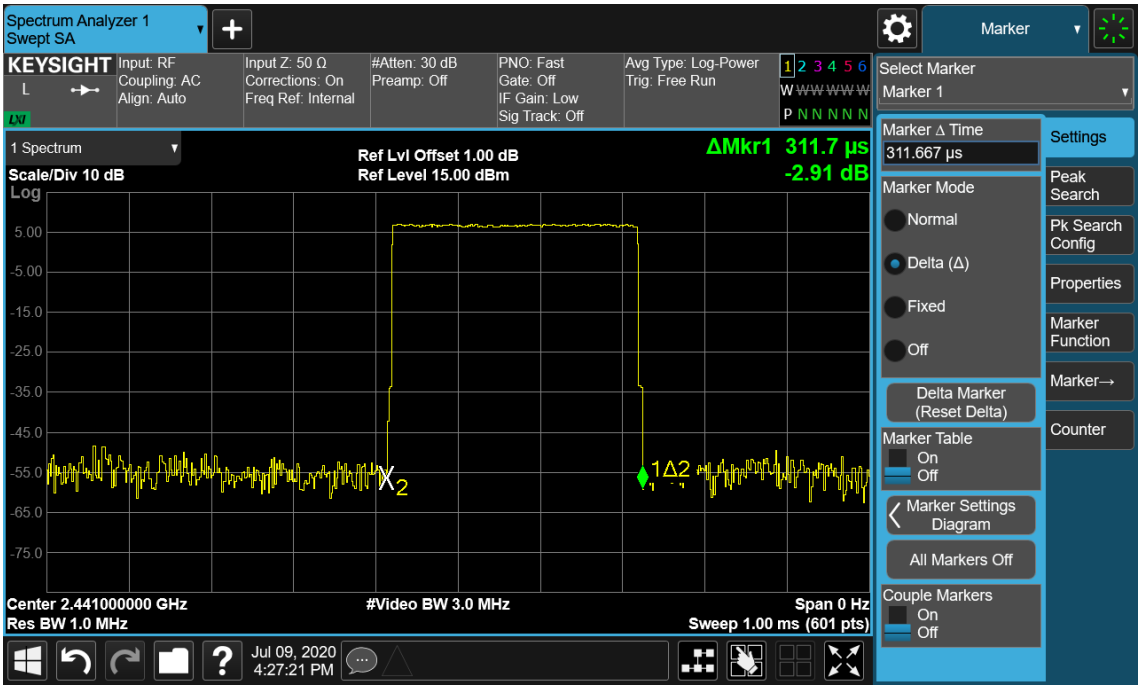


Figure 27: Time of Occupancy, 2441MHz, GFSK DH3

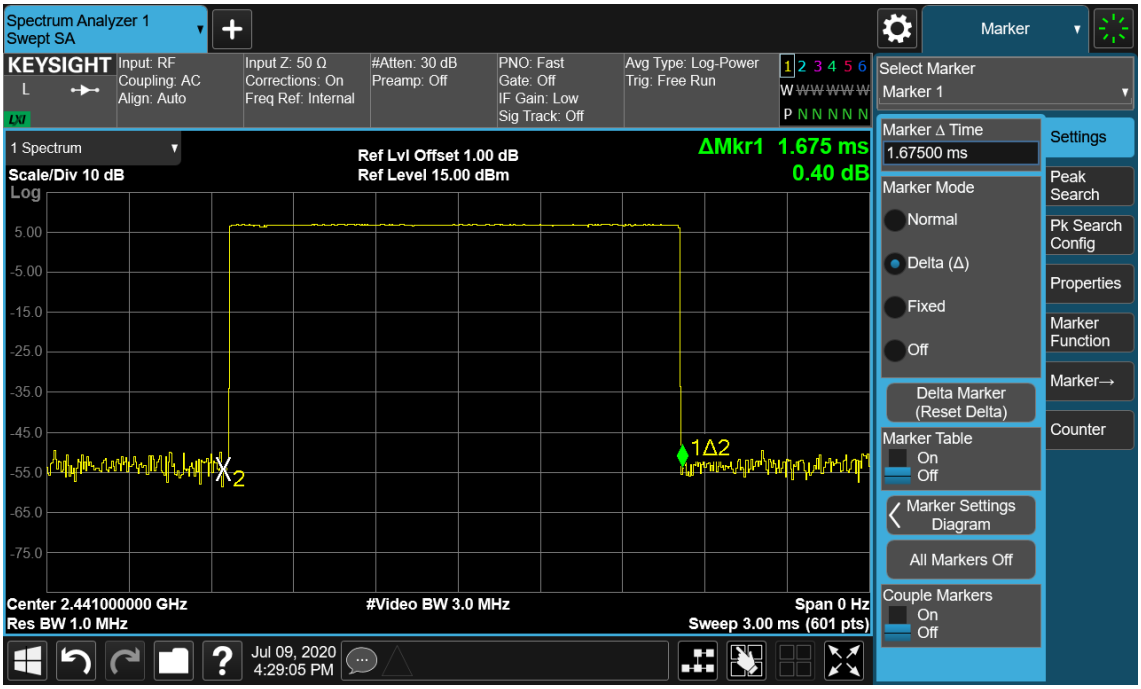


Figure 30: Time of Occupancy, 2441MHz, GFSK DH5

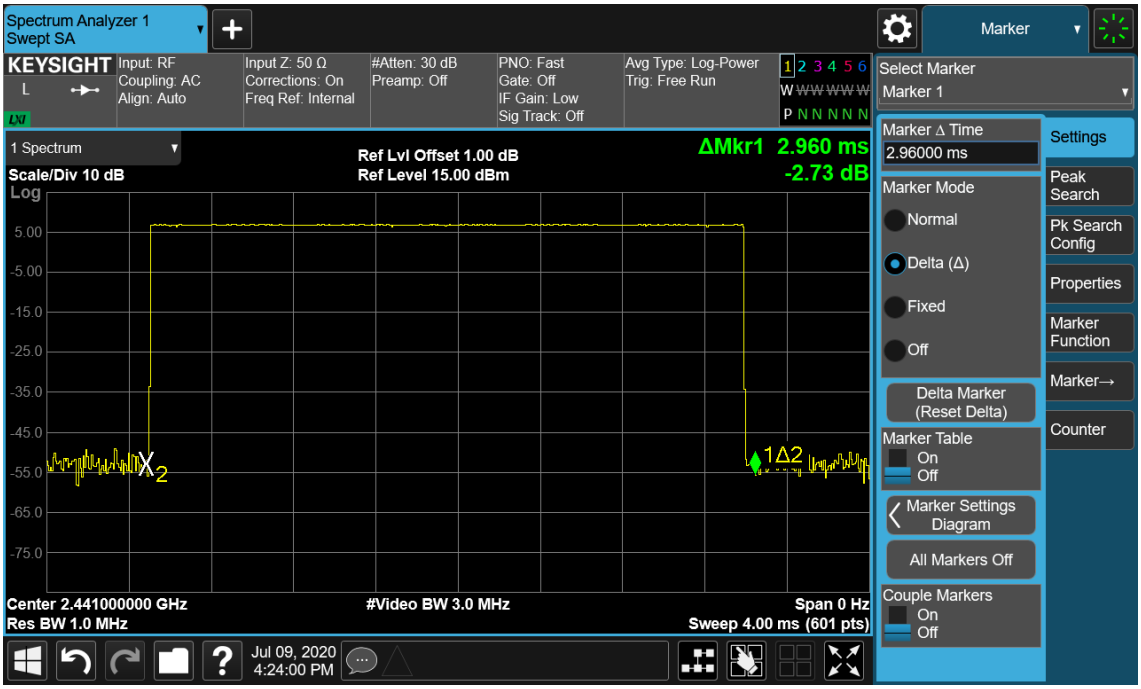


Figure 31: Time of Occupancy, 2441MHz, 8-DPSK DH1

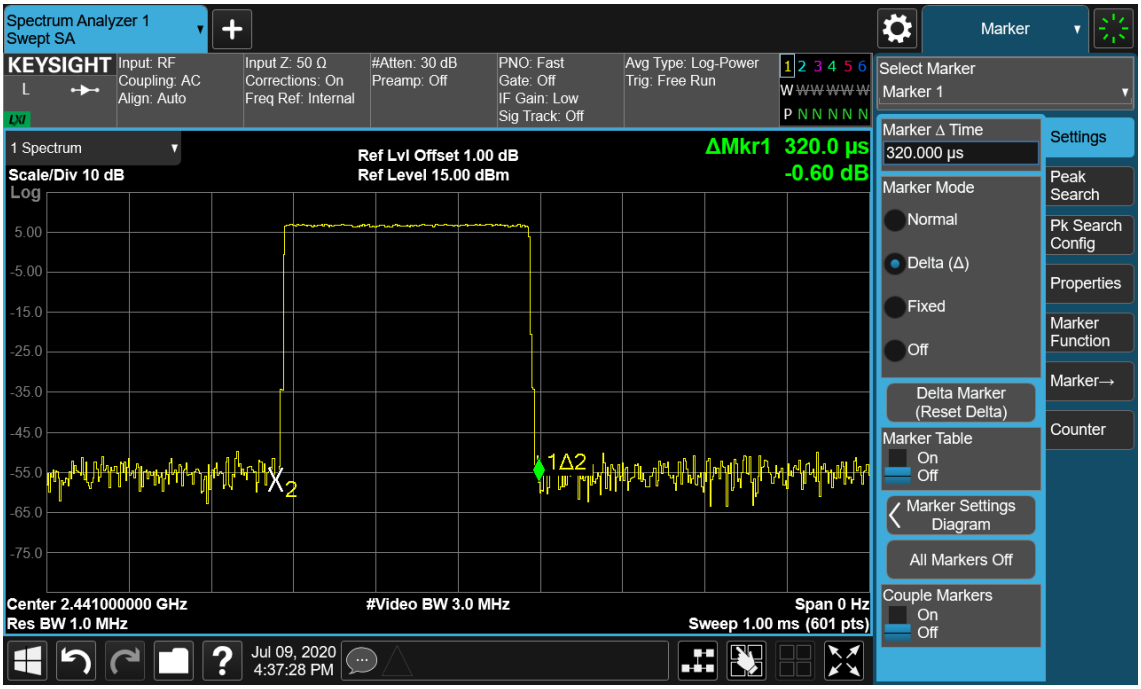


Figure 32: Time of Occupancy, 2441MHz, 8-DPSK DH3

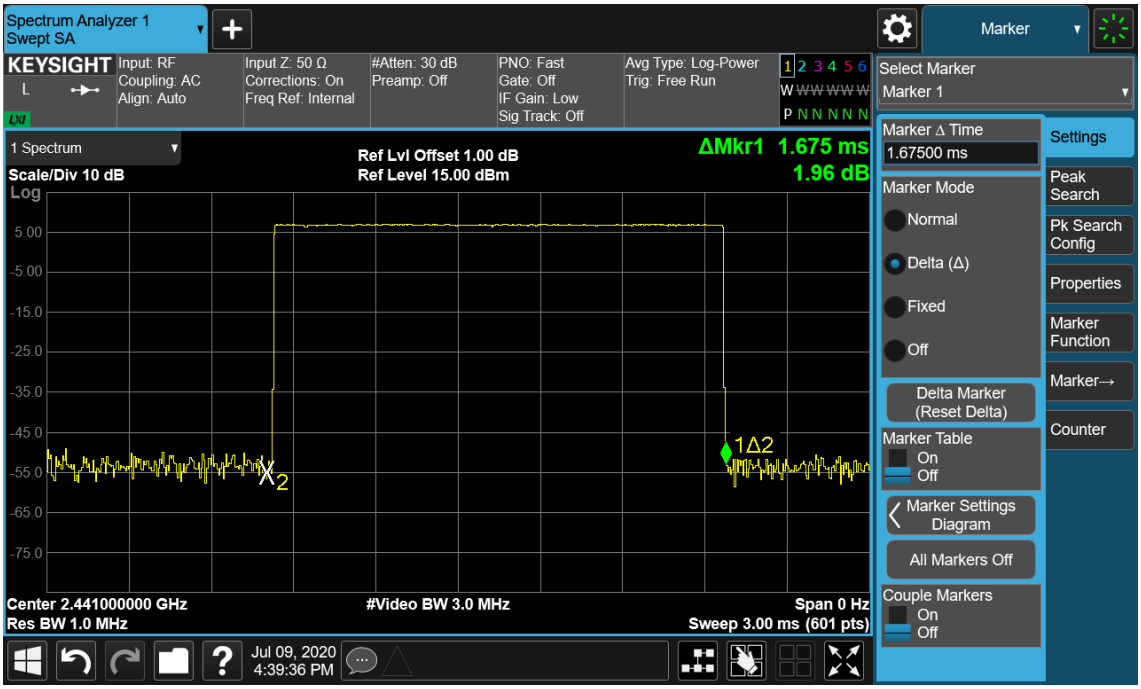
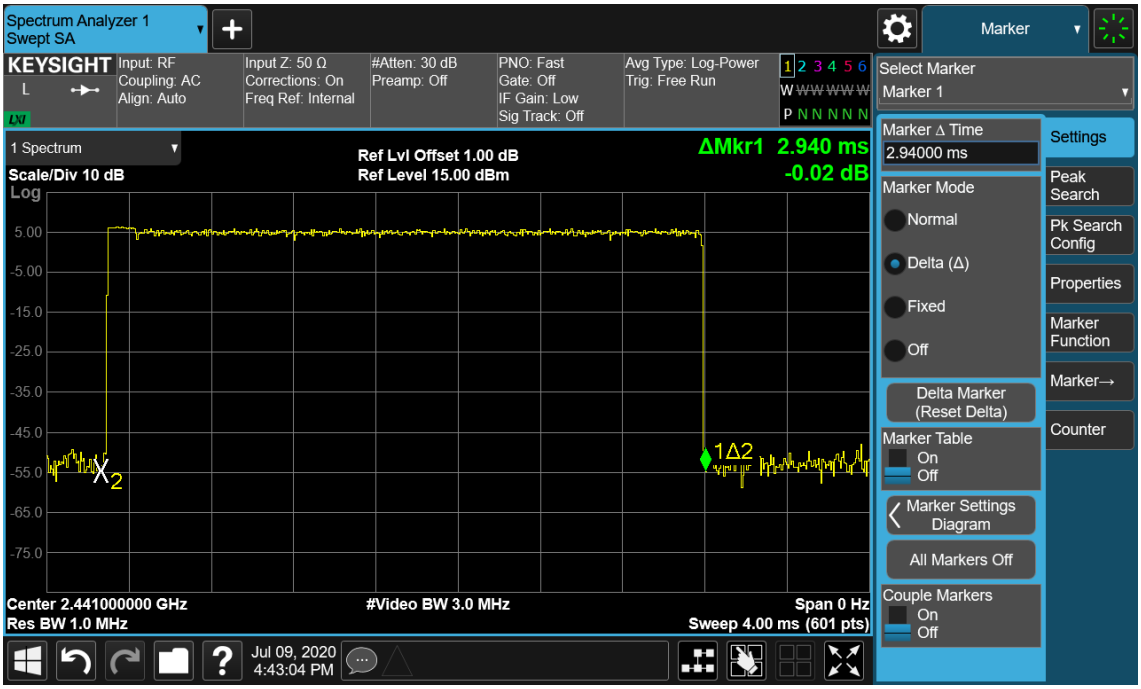


Figure 33: Time of Occupancy, 2441MHz, 8-DPSK DH5



4.2 Mains Emissions

4.2.1 Conducted Emission on AC Mains

RESULT: **PASS**

Test standard	:	FCC Part 15.207(a) RSS-Gen 8.8
Requirement	:	ANSI C63.10-2013
Kind of test site	:	Shielded room

Test setup

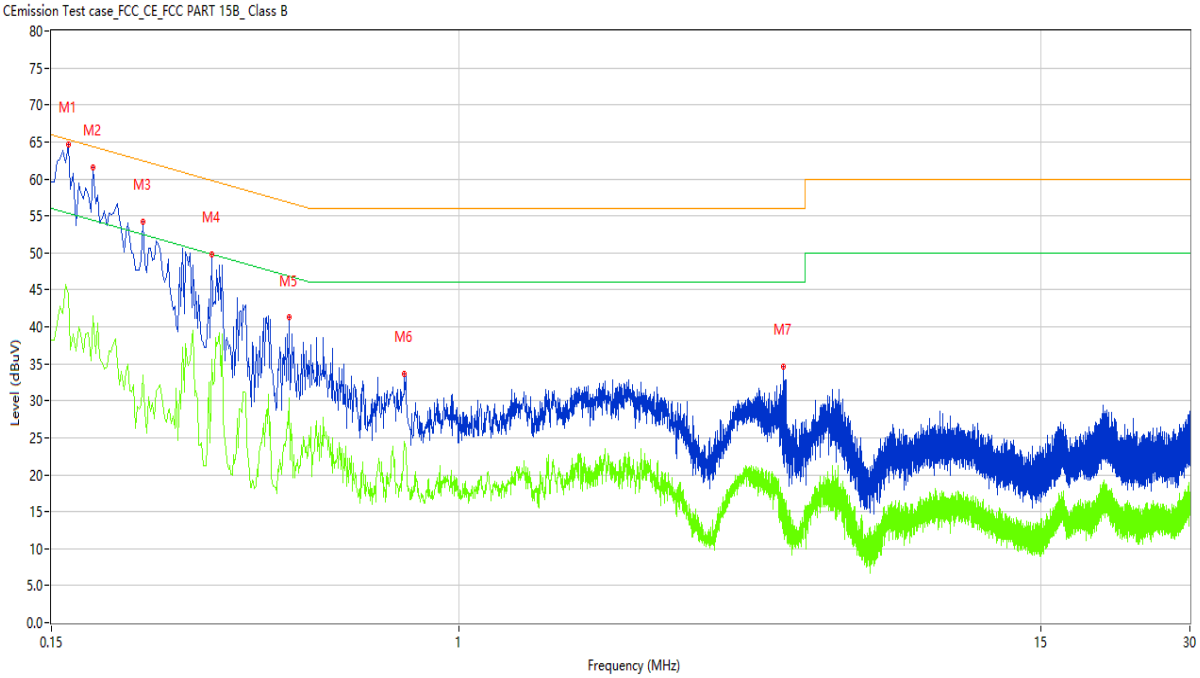
Input Voltage	:	AC 120V, 60Hz; AC 240V, 50Hz
Operation Mode	:	A.1.a
Earthing	:	Not Connected
Ambient temperature	:	25°C
Relative humidity	:	52%

For details refer to following test plot.

Note:

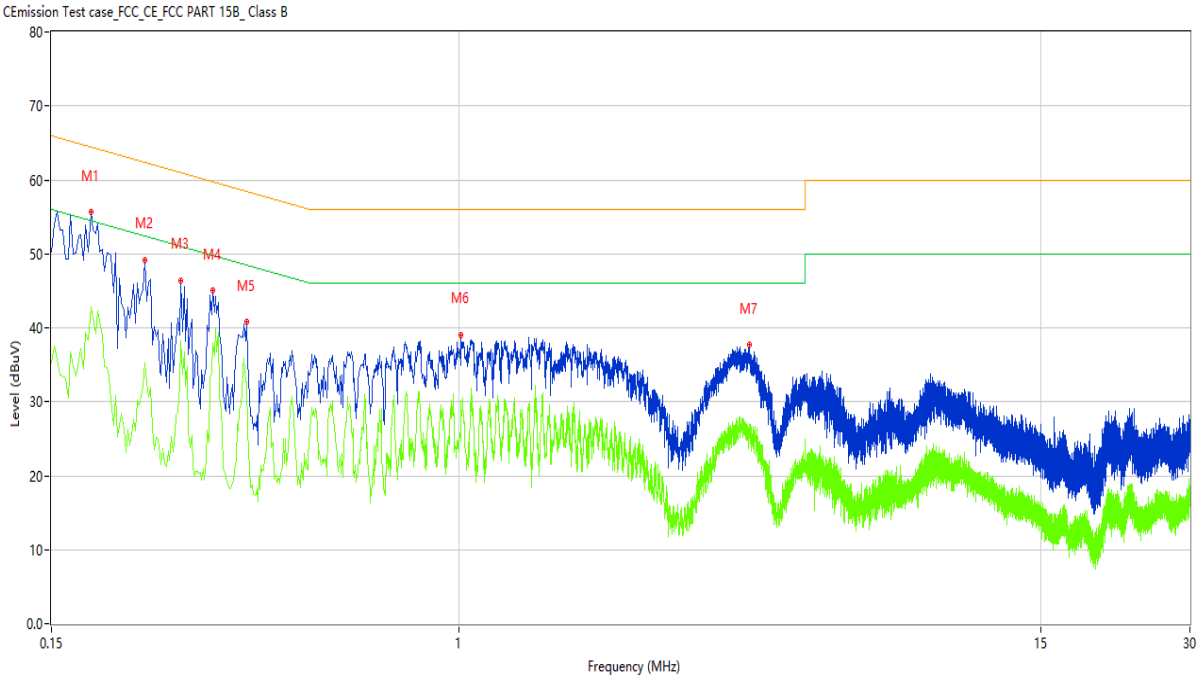
The all configurations were tested respectively, but only the worst configuration shown here.

Figure 34: Conducted Emission on AC Mains, L Phase



No.	Frequency(MHz)	Results (dBuV)	Factor(dB)	Limit (dBuV)	Over Limit (dB)	Detector	Line	Verdict
1	0.162	63.53	10.15	65.36	-1.83	Peak	L	Pass
1*	0.162	59.53	10.15	65.36	-5.83	QP	L	Pass
1**	0.162	44.43	10.15	55.36	-10.93	AV	L	Pass
2	0.182	60.65	10.15	64.39	-3.74	Peak	L	Pass
2*	0.182	56.66	10.15	64.39	-7.73	QP	L	Pass
2**	0.182	41.51	10.15	54.39	-12.88	AV	L	Pass
3	0.230	53.43	10.14	62.45	-9.02	Peak	L	Pass
3*	0.230	49.11	10.14	62.45	-13.34	QP	L	Pass
3**	0.230	33.52	10.14	52.45	-18.93	AV	L	Pass
4	0.316	49.81	10.14	59.81	-10.00	Peak	L	Pass
4*	0.316	44.16	10.14	59.81	-15.65	QP	L	Pass
4**	0.316	35.67	10.14	49.81	-14.14	AV	L	Pass
5	0.454	40.38	10.15	56.80	-16.42	Peak	L	Pass
5*	0.454	34.84	10.15	56.80	-21.96	QP	L	Pass
5**	0.454	30.32	10.15	46.80	-16.48	AV	L	Pass
6	0.776	33.67	10.15	56.00	-22.33	Peak	L	Pass
6**	0.776	24.49	10.15	46.00	-21.51	AV	L	Pass
7	4.530	34.64	10.25	56.00	-21.36	Peak	L	Pass
7**	4.530	15.82	10.25	46.00	-30.18	AV	L	Pass

Figure 35: Conducted Emission on AC Mains, N Phase



No.	Frequency(MHz)	Results (dBuV)	Factor(dB)	Limit (dBuV)	Over Limit (dB)	Detector	Line	Verdict
1	0.180	56.67	10.15	64.49	-7.82	Peak	N	Pass
1*	0.180	51.48	10.15	64.49	-13.01	QP	N	Pass
1**	0.180	42.75	10.15	54.49	-11.74	AV	N	Pass
2	0.232	49.77	10.14	62.38	-12.61	Peak	N	Pass
2*	0.232	45.06	10.14	62.38	-17.32	QP	N	Pass
2**	0.232	35.34	10.14	52.38	-17.04	AV	N	Pass
3	0.274	46.64	10.14	61.00	-14.36	Peak	N	Pass
3*	0.274	42.48	10.14	61.00	-18.52	QP	N	Pass
3**	0.274	38.19	10.14	51.00	-12.81	AV	N	Pass
4	0.318	45.53	10.14	59.76	-14.23	Peak	N	Pass
4*	0.318	41.69	10.14	59.76	-18.07	QP	N	Pass
4**	0.318	37.96	10.14	49.76	-11.80	AV	N	Pass
5	0.372	42.18	10.14	58.46	-16.28	Peak	N	Pass
5*	0.372	37.69	10.14	58.46	-20.77	QP	N	Pass
5**	0.372	32.66	10.14	48.46	-15.80	AV	N	Pass
6	1.010	39.10	10.15	56.00	-16.90	Peak	N	Pass
6**	1.010	29.12	10.15	46.00	-16.88	AV	N	Pass
7	3.858	37.72	10.24	56.00	-18.28	Peak	N	Pass
7**	3.858	25.96	10.24	46.00	-20.04	AV	N	Pass

End of the report