FCC RADIO TEST REPORT

FCC ID: 2BBNO-CA701

Sample： CARPLAY

Trade Name： N/A

Main Model： CA701

Additional Model： Additional model please refer to the page 8

Report No.： 23060629ER-61

Prepared for

Shenzhen jinnaibo Electronic Co., Ltd.

Floor 3, building L, Shasi hi tech park, Shasi Community, Shajing street, Baoan, Shenzhen, China

Prepared by

Global United Technology Services Co. Ltd.

No. 123-128, Tower A, Jinyuan Business Building, No.2, Laodong Industrial Zone, Xixiang Road, Baoan District, Shenzhen, Guangdong, China 518102

TEST RESULTCERTIFICATION

Applicant	:	Shenzhen jinnaibo Electronic Co., Ltd.
Address	:	Floor 3, building L, Shasi hi tech park, Shasi Community, Shajing street, Baoan, Shenzhen, China
Manufacturer	:	Shenzhen jinnaibo Electronic Co., Ltd.
Address	:	Floor 3, building L, Shasi hi tech park, Shasi Community, Shajing street, Baoan, Shenzhen, China

Product description

Product	:	CARPLAY
Trade Name	:	N/A
Model Name	:	CA701, Additional model please refer to the page 8
Test Methods	:	FCC Rules and Regulations Part 15 Subpart C Section 15.247 ANSI C63.10: 2013

This device described above has been tested by Global United Technology Services Co. Ltd., and the test results show that the equipment under test (EUT) is in compliance with the FCC requirements. And it is applicable only to the tested sample identified in the report.

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Date (s) of performance of tests	:	Jun. 06, 2023 ~ Jul. 12, 2023
Date of Issue	:	Jul. 13, 2023
Test Result	:	Pass

Prepared By:	***Project Engineer***	***Date:***	*2023-7-13*
Check By:	***Reviewer***	***Date:***	*2023-7-13*

Table of Contents Pages

1TEST SUMMARY

1.1 TEST PROCEDURES AND RESULTS

Item	FCC Rules	Description Of Test	Result
1	15.247 (b)(1)	Peak Output Power	Pass
2	15.247(a)(1)	20 dB Bandwidth	Pass
3	15.247 (d)	Conducted Spurious Emission	N/A
4	15.209	Radiated Emission	Pass
5	15.247 (a)(1)(iii)	Number of Hopping Frequency	Pass
6	15.247 (a)(1)(iii)	Time of Occupancy	Pass
7	15.247 (a)(1)	Frequency Separation	Pass
8	15.207	Conducted Emission	Pass

Note:
“N/A” denotes test is not applicable in this Test Report.

1.2 TEST FACILITY

Test Firm : Global United Technology Services Co. Ltd.

Address : No. 123-128, Tower A, Jinyuan Business Building, No.2, Laodong Industrial Zone, Xixiang Road, Baoan District, Shenzhen, Guangdong, China 518102

The test facility is recognized, certified, or accredited by the following organizations:

● FCC—Registration No.: 381383

Designation Number: CN5029

Global United Technology Services Co., Ltd., Shenzhen EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in files.

● IC —Registration No.: 9079A

CAB identifier: CN0091

The 3m Semi-anechoic chamber of Global United Technology Services Co., Ltd. has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing.

● NVLAP (LAB CODE: 600179-0)

Global United Technology Services Co., Ltd., is accredited by the National Voluntary Laboratory Accreditation Program (NVLAP).

1.3 MEASUREMENT UNCERTAINTY

The reported uncertainty of measurement y ± U, where expended uncertainty U is based on a standard uncertainty multiplied by a coverage factor of k=2, providing a level of confidence of approximately 95 %.

A. Conducted Measurement:

Test Site	Method	Measurement Frequency Range	U, (dB)
UNI	ANSI	9kHz ~ 150kHz	2.96
		150kHz ~ 30MHz	2.44

B. Radiated Measurement:

Test Site	Method	Measurement Frequency Range	U, (dB)
UNI	ANSI	9kHz ~ 30MHz	2.50
		30MHz ~ 1000MHz	4.80
		1000MHz ~ 18000MHz	4.13

C. RF Conducted Method:

Item	Measurement Uncertainty
Uncertainty of total RF power, conducted	U_c = ±0.8 dB
Uncertainty of RF power density, conducted	U_c = ±2.6 dB
Uncertainty of spurious emissions, conducted	U_c = ±2 %
Uncertainty of Occupied Channel Bandwidth	U_c = ±2 %

1.4 ENVIRONMENTAL CONDITIONS

During the measurement the environmental conditions were within the listed ranges:

Temperature:	15~35 °C
Relative Humidity:	30~60 %
Air Pressure:	950~1050 hPa

2 GENERAL INFORMATION

2.1 PRODUCT DESCRIPTION

Product:	CARPLAY
Trade Name:	N/A
Main Model:	CA701
Additional Model:	CA702, CA703, CA704, CA705, CA706, CA707, CA708, CA709, CA710, CA711, CA712, CA713, CA714, CA715, CA716, CA717, CA718, CA719, CA720, CA721, CA722, CA723, CA724, CA725, CA726, CA727, CA728, CA729, CA730, CA901, CA902, CA903, CA904, CA905, CA906, CA907, CA908, CA909, CA910, CA911, CA912, CA913, CA914, CA915, CA916, CA917, CA918, CA919, CA920, CA921, CA922, CA923, CA924, CA925, CA926, CA927, CA928, CA929, CA930, CA101, CA102, CA103, CA104, CA105, CA106, CA107, CA108, CA109, CLP1, CLP2, CLP3, CLP4, CLP5, CLP6, CLP7, CLP8, CLP9, CLP10, CLP11, CLP12, CLP13, CLP15, LY7C-B, QZ7C-S, LY9C-S, LY9C-B, CL2, AA2, LY7C-ZYZ, QZ7C-01, QZ7C-02, QZ7C-03, QZ7C-05, QZ7C-06, QZ7C-07, QZ7C-08, QZ7C-09, T76, T96, A7, A9, S7, S9, J704, J706, J708, J710, J901, J904, D100, D200, D300, D400, D500, D600, D700, D800, D900
Model Difference:	All model's the function, software and electric circuit are the same, only with a product color and model named different. Test sample model: CA701.
Operation Frequency:	2402MHz~2480MHz
Number of Channels:	79CH
Modulation Type:	BR ☒GFSK, EDR ☒π/4-DQPSK, ☒8DPSK
RF Output Power:	1.239 dBm
Field Strength of Fundamental:	96.44dBuV/m
Antenna Type:	PCB Antenna
Antenna Gain:	-4.96dBi
Battery:	N/A
Adapter:	N/A
Power Source:	DC 9-26V from car charger

2.2 ABLE OF CARRIER FREQUENCYS

Frequency Band	Channel Number	Frequency
2402~2480MHz	0	2402 MHz
	1	2403 MHz
	:	:
	38	2440 MHz
	39	2441 MHz
	40	2442 MHz
	:	:
	77	2479 MHz
	78	2480 MHz

2.3 TEST METHODOLOGY

Both conducted and radiated testing was performed according to the procedures in ANSI C63.10 (2013). Radiated testing was performed at an antenna to EUT distance 3 meters.

2.4 SPECIAL ACCESSORIES

Refer to section 3.2.

2.5 EQUIPMENT MODIFICATIONS

Not available for this EUT intended for grant.

2.6 EXAMPLE OF A HOPPING SEQUENCY IN DATA MODE

Example of a hopping sequence in data mode:

40, 21, 44, 23, 04, 15, 66, 56, 19, 78, 07, 28, 69, 55, 36, 45, 05, 13, 43, 74, 57, 35, 67, 76, 02, 34, 54, 63,

42, 11, 30, 06, 64, 25, 75, 48, 17, 33, 58, 01, 29, 14, 51, 72, 03, 31, 50, 61, 77, 18, 10, 47, 12, 68, 08, 49,

20, 00, 73, 09, 16, 60, 71, 41, 24, 53, 38, 26, 46, 37, 65, 32, 70, 52, 27, 59, 22, 62, 39

2.7 ANTENNA REQUIREMENT

This intentional radiator is designed with a permanently attached antenna of an antenna to ensure that no antenna other than that furnished by the responsible party shall be used with the device.

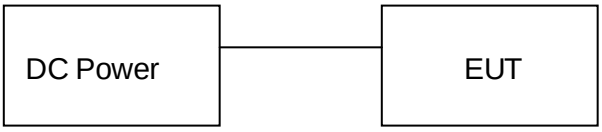
For more information of the antenna, please refer to the PHOTOGRAPHS OF EUT.

2.8 DESCRIPTION OF TEST MODES

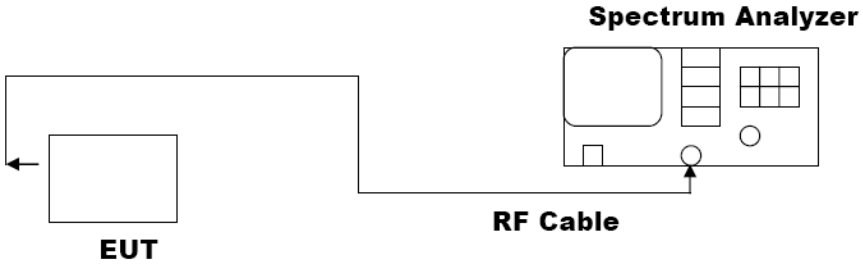
No.	Test Mode Description
1	Low channel GFSK
2	Middle channel GFSK
3	High channel GFSK
4	Low channel π/4 DQPSK
5	Middle channel π/4 DQPSK
6	High channel π/4 DQPSK
7	Low channel 8DPSK
8	Middle channel 8DPSK
9	High channel 8DPSK
10	Hopping mode GFSK
11	Hopping mode π/4 DQPSK
12	Hopping mode 8DPSK
Note: 1. Only the result of the worst case was recorded in the report, if no other cases. 2. For Radiated Emission, 3axis were chosen for testing for each applicable mode. 3. For Conducted Test method, at emporary antenna connector is provided by the manufacture.	

2.9 DESCRIPTION OF TEST SETUP

Operation of EUT during Conducted and Radiation testing:



Operation of EUT during RF Conducted testing:



2.10 EQUIPMENT USED IN TESTED SYSTEM

Item	Equipment	Model No.	Cable Length(cm)	Remark
1	CARPLAY	CA701	--	EUT
2	Battery	--	--	AE

Note:

1. The support equipment was authorized by Declaration of Confirmation.
2. All the above equipment/cables were placed in worse case positions to maximize emission signals during emission test.

2.11 ENVIRONMENTAL CONDITIONS

During the measurement the environmental conditions were within the listed ranges:

	NORMAL CONDITIONS	EXTREME CONDITIONS
Temperature range (℃)	15 - 35	-20 - 50
Relative humidty range	20 % - 75 %	20 % - 75 %
Pressure range (kPa)	86 - 106	86 - 106
Note: The Extreme Temperature and Extreme Voltages declared by the manufacturer.		

2.12 TEST EQUIPMENT OF RADIATED EMISSION TEST

Conducted Emission						
Item	**Test Equipment**	**Manufacturer**	**Model No.**	**Inventory No.**	**Cal.Date (mm-dd-yy)**	**Cal.Due date (mm-dd-yy)**
1	Shielding Room	ZhongYu Electron	7.3(L)x3.1(W)x2.9(H)	GTS252	July 12, 2022	July 11, 2027
2	EMI Test Receiver	R&S	ESCI 7	GTS552	April 14, 2023	April 13, 2024
3	LISN	ROHDE & SCHWARZ	ENV216	GTS226	April 14, 2023	April 13, 2024
4	Coaxial Cable	GTS	N/A	GTS227	N/A	N/A
5	EMI Test Software	AUDIX	E3	N/A	N/A	N/A
6	Thermo meter	JINCHUANG	GSP-8A	GTS642	April 19, 2023	April 18, 2024
7	Absorbing clamp	Elektronik-Feinmechanik	MDS21	GTS229	April 14, 2023	April 13, 2024
8	ISN	SCHWARZBECK	NTFM 8158	GTS565	April 14, 2023	April 13, 2024
9	High voltage probe	SCHWARZBECK	TK9420	GTS537	April 14, 2023	April 13, 2024
10	Antenna end assembly	Weinschel	1870A	GTS560	April 14, 2023	April 13, 2024

Radiated Emission:						
Item	**Test Equipment**	**Manufacturer**	**Model No.**	**Inventory No.**	**Cal.Date (mm-dd-yy)**	**Cal.Due date (mm-dd-yy)**
1	3m Semi-Anechoic Chamber	ZhongYu Electron	9.2(L)*6.2(W)* 6.4(H)	GTS250	June 23, 2021	June 22, 2024
2	Control Room	ZhongYu Electron	6.2(L)*2.5(W)* 2.4(H)	GTS251	N/A	N/A
3	EMI Test Receiver	Rohde & Schwarz	ESU26	GTS203	April 14, 2023	April 13, 2024
4	BiConiLog Antenna	SCHWARZBECK MESS-ELEKTRONIK	VULB9168	GTS640	March 19, 2023	March 18, 2025
5	Double -ridged waveguide horn	SCHWARZBECK MESS-ELEKTRONIK	BBHA 9120 D	GTS208	April 17, 2023	April 16, 2025
6	EMI Test Software	AUDIX	E3	N/A	N/A	N/A
7	Coaxial Cable	GTS	N/A	GTS213	April 21, 2023	April 20, 2024
8	Coaxial Cable	GTS	N/A	GTS211	April 21, 2023	April 20, 2024
9	Coaxial cable	GTS	N/A	GTS210	April 21, 2023	April 20, 2024
10	Coaxial Cable	GTS	N/A	GTS212	April 21, 2023	April 20, 2024
11	Wideband Radio Communication Tester	Rohde & Schwarz	CMW500	GTS575	April 14, 2023	April 13, 2024
12	Loop Antenna	ZHINAN	ZN30900A	GTS534	Nov. 29, 2022	Nov. 28, 2023
13	Broadband Preamplifier	SCHWARZBECK	BBV9718	GTS535	April 14, 2023	April 13, 2024
14	Amplifier(1GHz-26.5GHz)	HP	8449B	GTS601	April 14, 2023	April 13, 2024
15	Horn Antenna (18-26.5GHz)	/	UG-598A/U	GTS664	Oct. 30, 2022	Oct. 29, 2023
16	Horn Antenna (26.5-40GHz)	A.H Systems	SAS-573	GTS665	Oct. 30, 2022	Oct. 29, 2023
17	FSV·Signal Analyzer (10Hz-40GHz)	Keysight	FSV-40-N	GTS666	March 13, 2023	March 12, 2024
18	Amplifier	/	LNA-1000-30S	GTS650	April 14, 2023	April 13, 2024
19	CDNE M2+M3-16A	HCT	30MHz-300MHz	GTS668	Dec. 20, 2022	Dec.19, 2023
20	Thermo meter	JINCHUANG	GSP-8A	GTS643	April 19, 2023	April 18, 2024

RF Conducted Test:						
Item	**Test Equipment**	**Manufacturer**	**Model No.**	**Serial No.**	**Cal.Date (mm-dd-yy)**	**Cal.Due date (mm-dd-yy)**
1	MXA Signal Analyzer	Agilent	N9020A	GTS566	April 14, 2023	April 13, 2024
2	EMI Test Receiver	R&S	ESCI 7	GTS552	April 14, 2023	April 13, 2024
3	PSA Series Spectrum Analyzer	Agilent	E4440A	GTS536	April 14, 2023	April 13, 2024
4	MXG vector Signal Generator	Agilent	N5182A	GTS567	April 14, 2023	April 13, 2024
5	ESG Analog Signal Generator	Agilent	E4428C	GTS568	April 14, 2023	April 13, 2024
6	USB RF Power Sensor	DARE	RPR3006W	GTS569	April 14, 2023	April 13, 2024
7	RF Switch Box	Shongyi	RFSW3003328	GTS571	April 14, 2023	April 13, 2024
8	Programmable Constant Temp & Humi Test Chamber	WEWON	WHTH-150L-40-880	GTS572	April 14, 2023	April 13, 2024
9	Thermo meter	JINCHUANG	GSP-8A	GTS641	April 19, 2023	April 18, 2024

4 LINE CONDUCTED EMISSION TEST

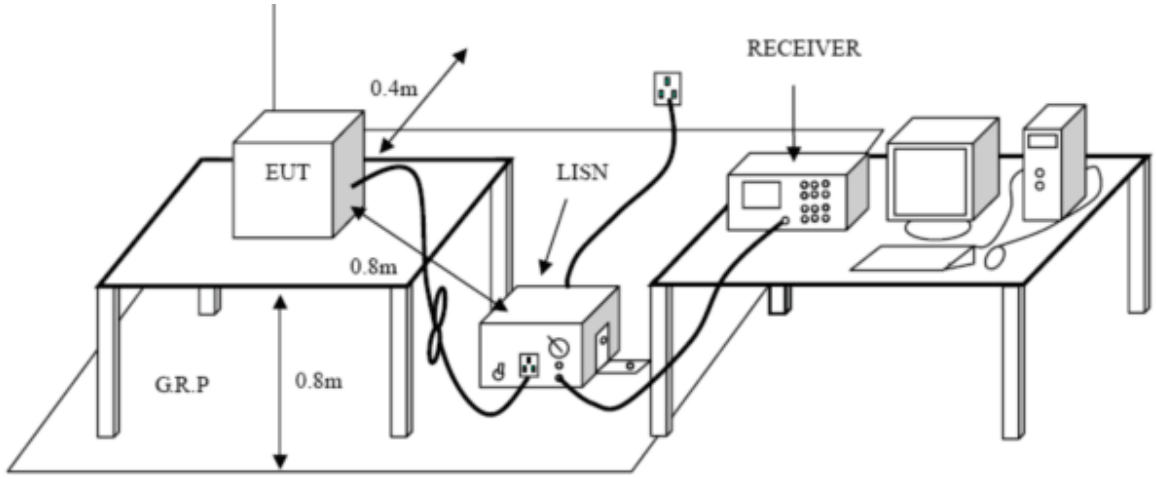
4.1 LIMITS OF LINE CONDUCTED EMISSION TEST

Frequency	Maximum RF Line Voltage	
	Q.P.(dBuV)	Average(dBuV)
150kHz~500kHz	66-56	56-46
500kHz~5MHz	56	46
5MHz~30MHz	60	50

Note: 1. The lower limit shall apply at the transition frequency.

2. The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz.

4.2 BLOCK DIAGRAM OF LINE CONDUCTED EMISSION TEST



4.3 PRELIMINARY PROCEDURE OF LINE CONDUCTED EMISSION TEST

1. The equipment was set up as per the test configuration to simulate typical actual usage per the user's manual. The EUT is placed on a wooden table with a height of 0.8 meters is used and is placed on the ground plane as per ANSI C63.10.
2. Support equipment, if needed, was placed as per ANSI C63.10.
3. All I/O cables were positioned to simulate typical actual usage as per ANSI C63.10.
4. If a EUT received DC power from the USB Port of Notebook PC, the PC's adapter received AC120V/60Hz power through a Line Impedance Stabilization Network (LISN) which supplied power source and was grounded to the ground plane.
5. All support equipments received AC power from a second LISN, if any.
6. The EUT test program was started. Emissions were measured on each current carrying line of the EUT using a spectrum Analyzer / Receiver connected to the LISN powering the EUT. The LISN has two monitoring points: Line 1 (Hot Side) and Line 2 (Neutral Side). Two scans were taken: one with Line 1 connected to Analyzer / Receiver and Line 2 connected to a 50 ohm load; the second scan had Line 1 connected to a 50 ohm load and Line 2 connected to the Analyzer / Receiver.
7. Analyzer / Receiver scanned from 150 kHz to 30MHz for emissions in each of the test modes.

4.5 TEST RESULT OF LINE CONDUCTED EMISSION TEST

N/A

Remark:
The EUT is powered by DC power.

5 PEAK OUTPUT POWER

5.1 MEASUREMENT PROCEDURE

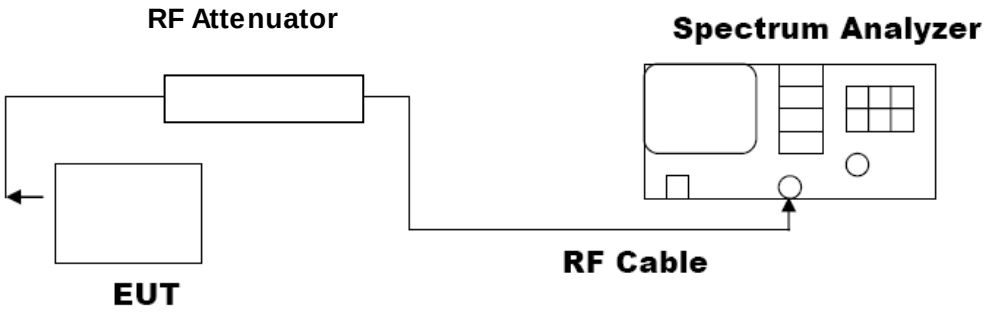
For peak power test:

1. Connect EUT RF output port to the Spectrum Analyzer through an RF attenuator
2. Span: Approximately five times the 20 dB bandwidth, centered on a hopping channel.
3. RBW > 20 dB bandwidth of the emission being measured.
4. VBW ≥RBW.
5. Sweep: Auto.
6. Detector function: Peak.
7. Trace: Max hold.

Allow trace to stabilize. Use the marker-to-peak function to set the marker to the peak of the emission. The indicated level is the peak output power, after any corrections for external attenuators and cables.

5.2 TEST SET-UP (BLOCK DIAGRAM OF CONFIGURATION)

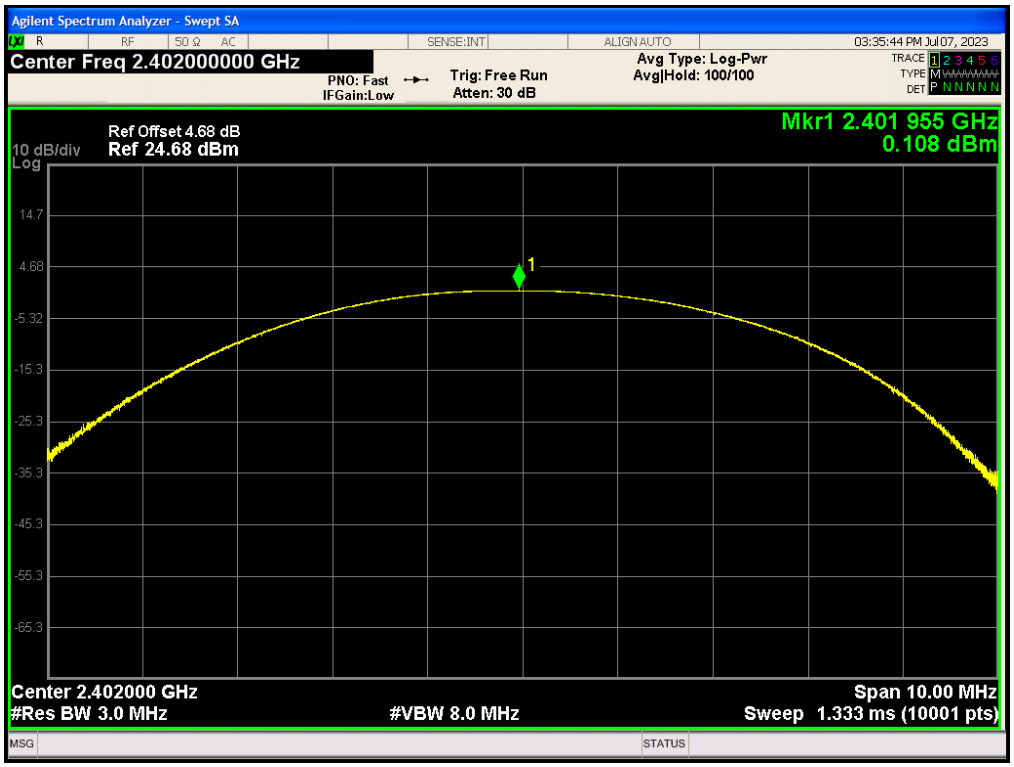
PEAK POWER TEST SETUP



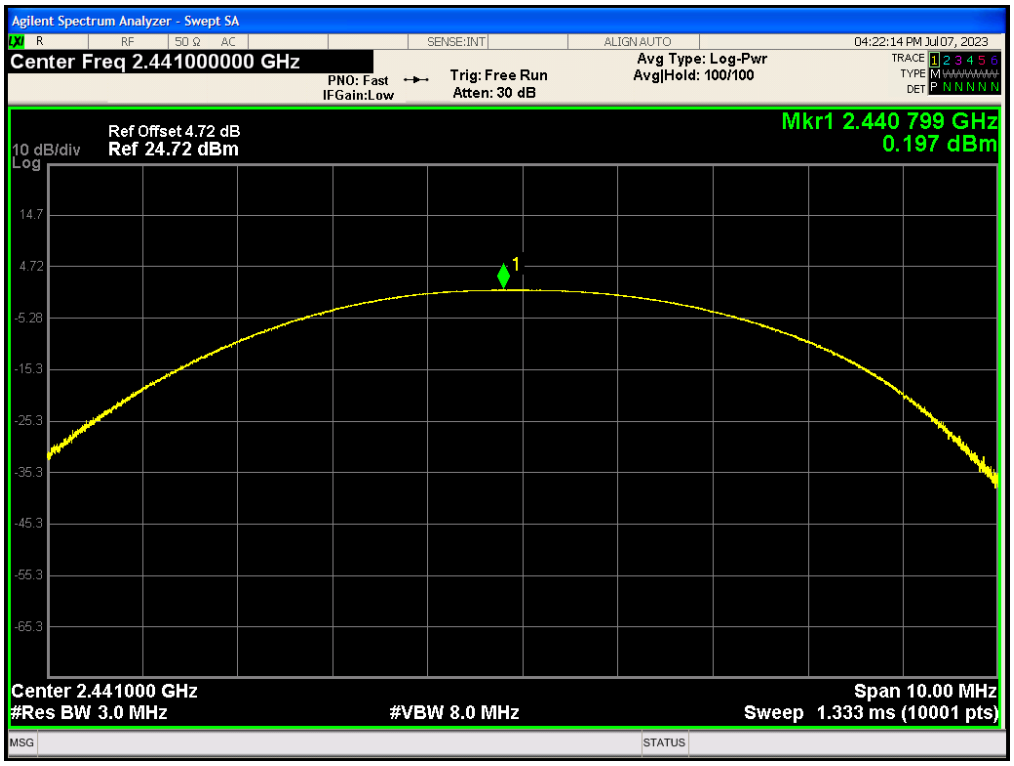
5.3 LIMITS AND MEASUREMENT RESULT

PEAK OUTPUT POWER MEASUREMENT RESULT FOR GFSK MODULATION			
Frequency (GHz)	**Peak Power (dBm)**	**Applicable Limits (dBm)**	**Result**
2.402	0.108	21	Pass
2.441	0.197	21	Pass
2.480	-0.802	21	Pass

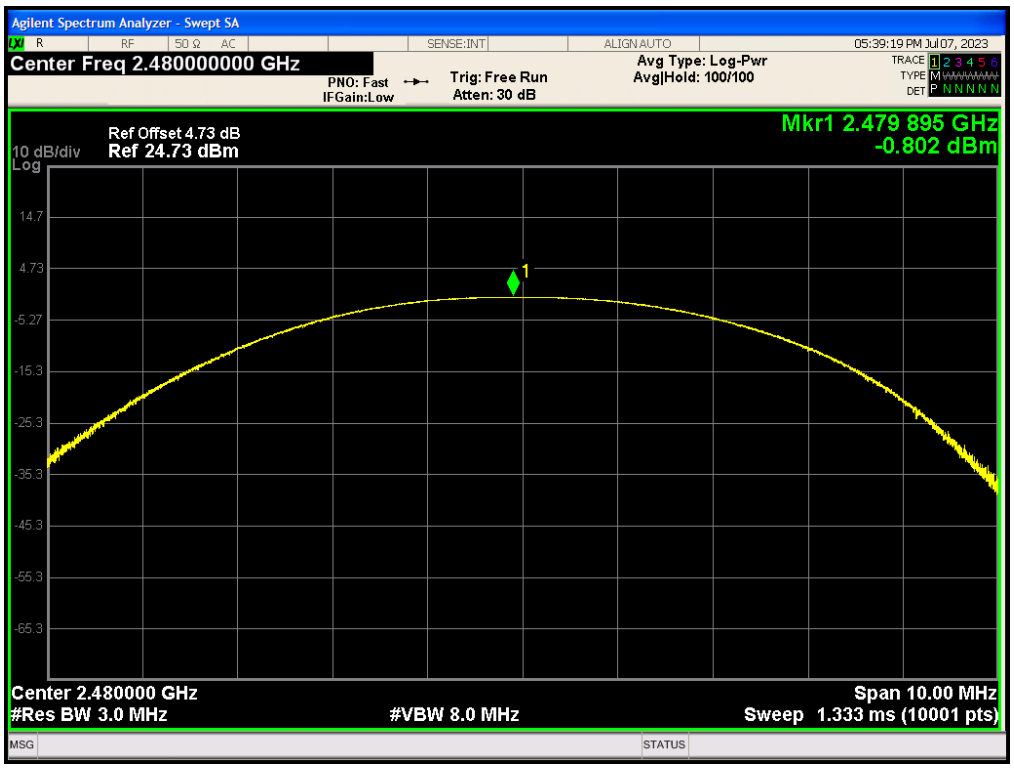
CH0



CH39

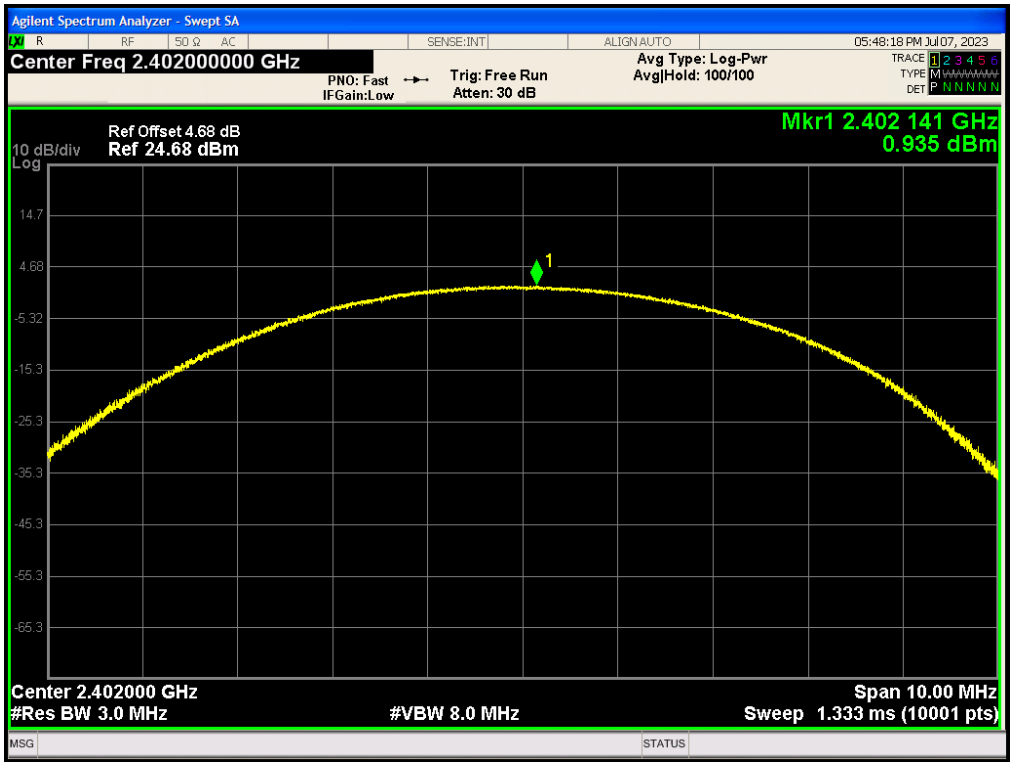

Agilent Spectrum Analyzer - Swept SA
Center Freq 2.441000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
Atten: 30 dB
Avg Type: Log-Pwr
Avg|Hold: 100/100
04:22:14 PM Jul 07, 2023
Ref Offset 4.72 dB
10 dB/div
Log
Ref 24.72 dBm
Mkr1 2.440 799 GHz
0.197 dBm
14.7
4.72
-5.28
-15.3
-25.3
-35.3
-45.3
-55.3
-65.3
Center 2.441000 GHz
#Res BW 3.0 MHz
#VBW 8.0 MHz
Span 10.00 MHz
Sweep 1.333 ms (10001 pts)
MSG
STATUS

CH78

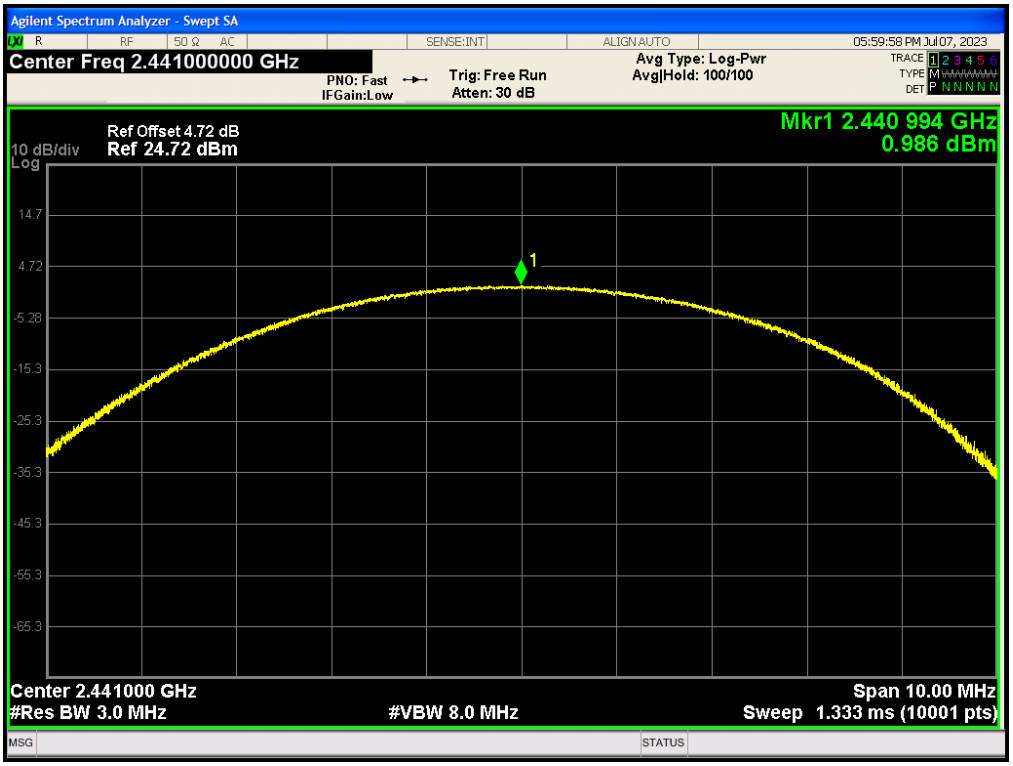

Agilent Spectrum Analyzer - Swept SA
Center Freq 2.480000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
Atten: 30 dB
Avg Type: Log-Pwr
Avg|Hold: 100/100
05:39:19 PM Jul 07, 2023
Ref Offset 4.73 dB
10 dB/div
Log
Ref 24.73 dBm
Mkr1 2.479 895 GHz
-0.802 dBm
14.7
4.73
-5.27
-15.3
-25.3
-35.3
-45.3
-55.3
-65.3
Center 2.480000 GHz
#Res BW 3.0 MHz
#VBW 8.0 MHz
Span 10.00 MHz
Sweep 1.333 ms (10001 pts)
MSG
STATUS

PEAK OUTPUT POWER MEASUREMENT RESULT FOR Π/4 DQPSK MODULATION			
Frequency (GHz)	**Peak Power (dBm)**	**Applicable Limits (dBm)**	**Result**
2.402	0.935	21	Pass
2.441	0.986	21	Pass
2.480	0.114	21	Pass

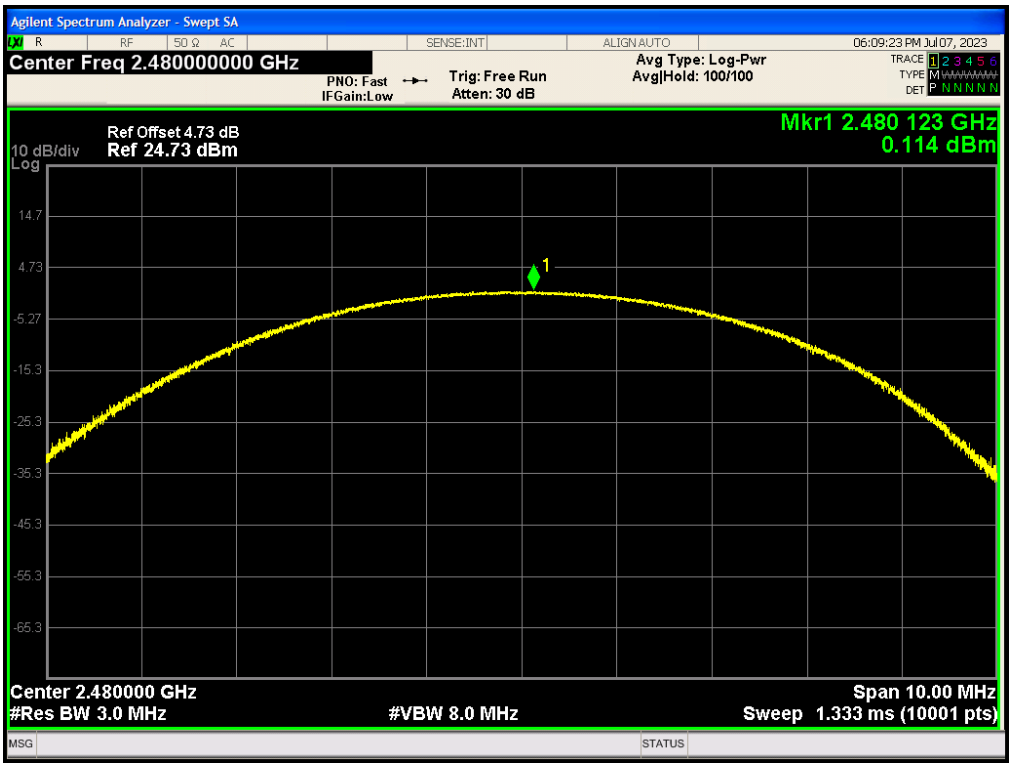
CH0



CH39

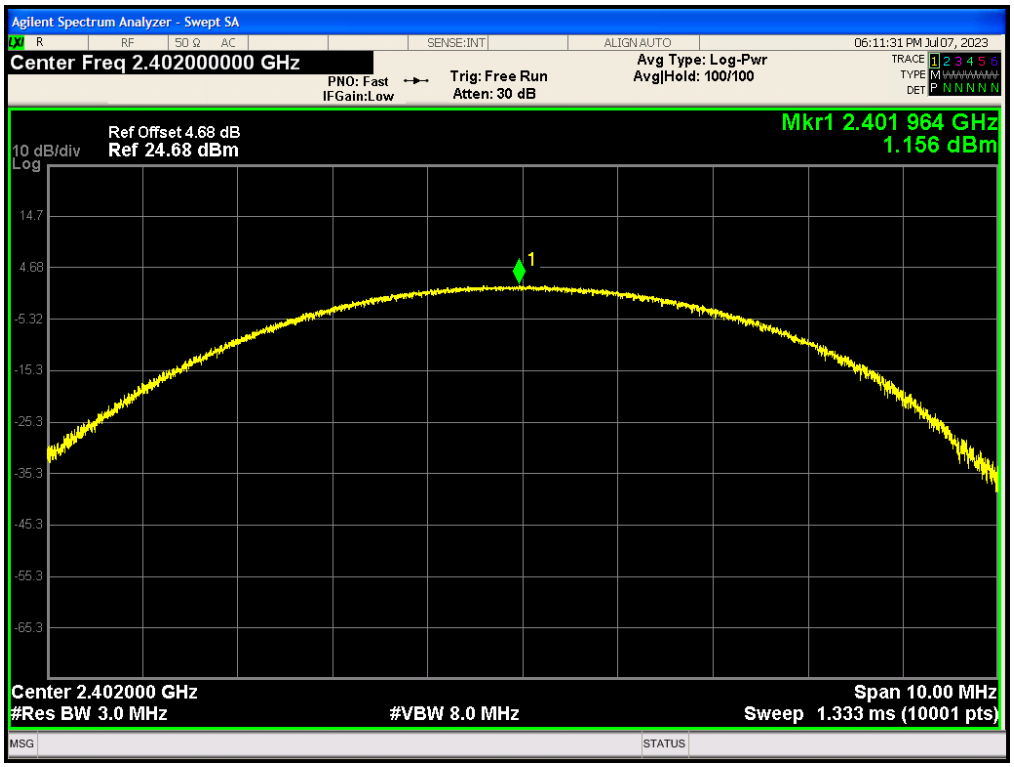

Agilent Spectrum Analyzer - Swept SA
Center Freq 2.441000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
Atten: 30 dB
Avg Type: Log-Pwr
Avg|Hold: 100/100
05:59:58 PM Jul 07, 2023
Ref Offset 4.72 dB
10 dB/div
Log
Ref 24.72 dBm
Mkr1 2.440 994 GHz
0.986 dBm
14.7
4.72
-5.28
-15.3
-25.3
-35.3
-45.3
-55.3
-65.3
Center 2.441000 GHz
#Res BW 3.0 MHz
#VBW 8.0 MHz
Span 10.00 MHz
Sweep 1.333 ms (10001 pts)

CH78

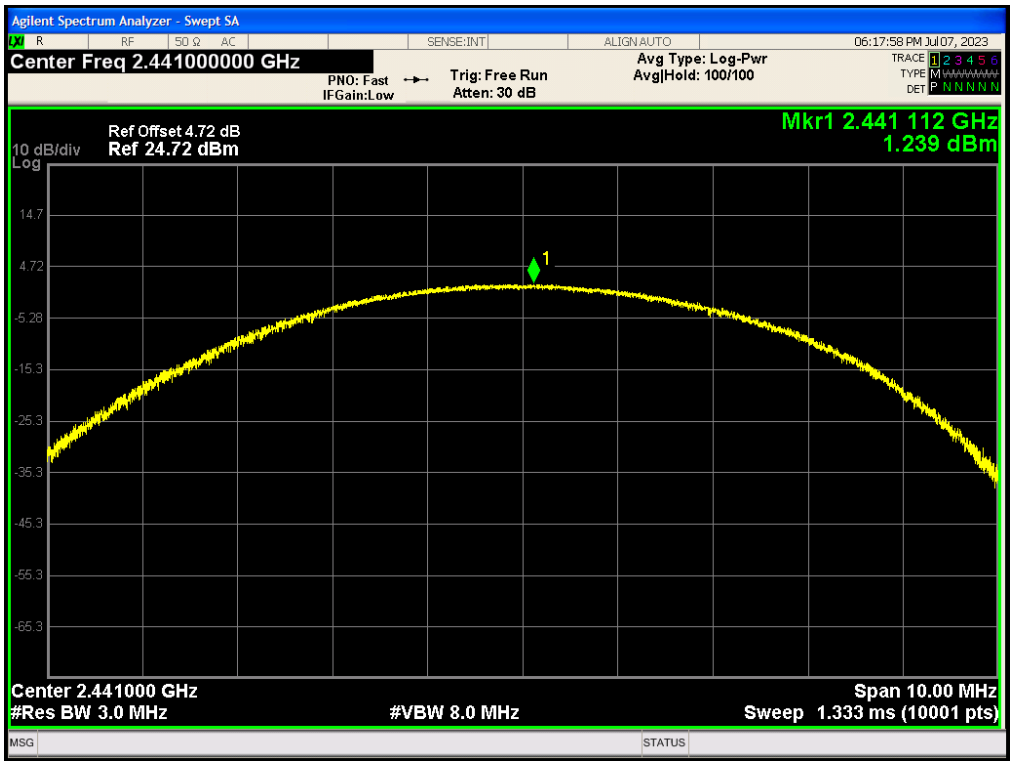

Agilent Spectrum Analyzer - Swept SA
Center Freq 2.480000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
Atten: 30 dB
Avg Type: Log-Pwr
Avg|Hold: 100/100
06:09:23 PM Jul 07, 2023
Ref Offset 4.73 dB
10 dB/div
Log
Ref 24.73 dBm
Mkr1 2.480 123 GHz
0.114 dBm
14.7
4.73
-5.27
-15.3
-25.3
-35.3
-45.3
-55.3
-65.3
Center 2.480000 GHz
#Res BW 3.0 MHz
#VBW 8.0 MHz
Span 10.00 MHz
Sweep 1.333 ms (10001 pts)

PEAK OUTPUT POWER MEASUREMENT RESULT FOR 8DPSK MODULATION			
Frequency (GHz)	**Peak Power (dBm)**	**Applicable Limits (dBm)**	**Result**
2.402	1.156	21	Pass
2.441	1.239	21	Pass
2.480	0.342	21	Pass

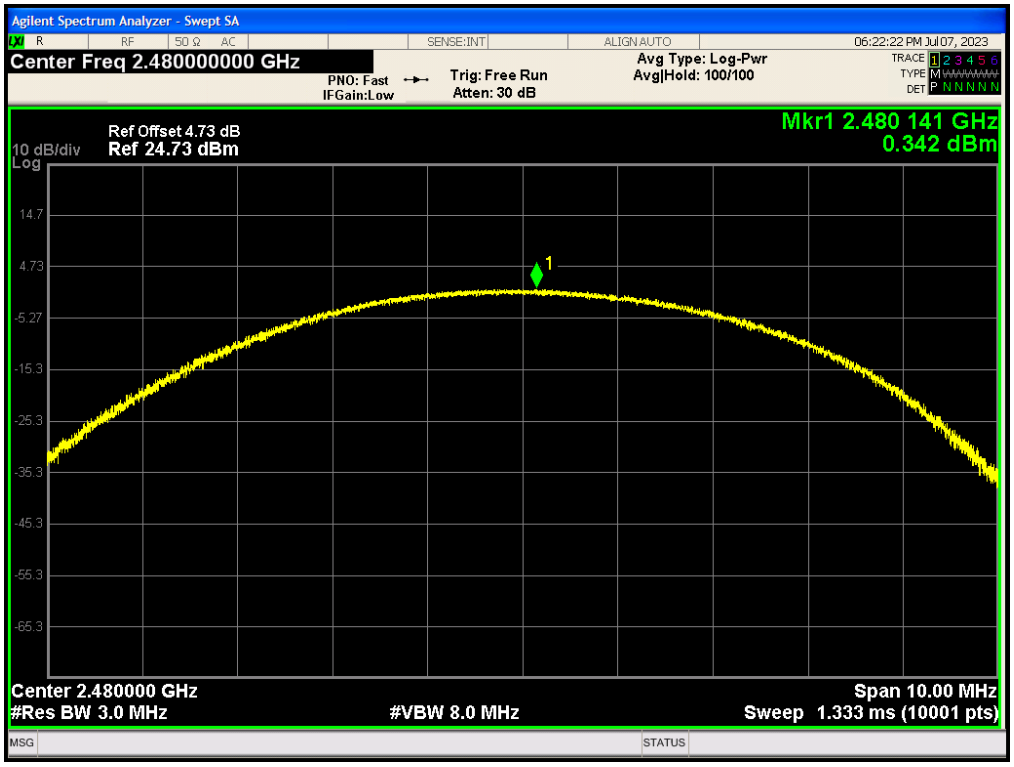
CH0



CH39


Agilent Spectrum Analyzer - Swept SA
Center Freq 2.441000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
Atten: 30 dB
Avg Type: Log-Pwr
Avg|Hold: 100/100
06:17:58 PM Jul 07, 2023
Ref Offset 4.72 dB
10 dB/div
Ref 24.72 dBm
Log
Mkr1 2.441 112 GHz
1.239 dBm
14.7
4.72
-5.28
-15.3
-25.3
-35.3
-45.3
-55.3
-65.3
Center 2.441000 GHz
#Res BW 3.0 MHz
#VBW 8.0 MHz
Span 10.00 MHz
Sweep 1.333 ms (10001 pts)
MSG
STATUS

CH78


Agilent Spectrum Analyzer - Swept SA
Center Freq 2.480000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
Atten: 30 dB
Avg Type: Log-Pwr
Avg|Hold: 100/100
06:22:22 PM Jul 07, 2023
Ref Offset 4.73 dB
10 dB/div
Ref 24.73 dBm
Log
Mkr1 2.480 141 GHz
0.342 dBm
14.7
4.73
-5.27
-15.3
-25.3
-35.3
-45.3
-55.3
-65.3
Center 2.480000 GHz
#Res BW 3.0 MHz
#VBW 8.0 MHz
Span 10.00 MHz
Sweep 1.333 ms (10001 pts)
MSG
STATUS

6 20DB BANDWIDTH

6.1 MEASUREMENT PROCEDURE

1. Connect EUT RF output port to the Spectrum Analyzer through an RF attenuator
2, Set the EUT Work on the top, the middle and the bottom operation frequency individually.
3. Set Span = approximately 2 to 5 times the 99% bandwidth, centered on a hoping channel
   The nominal IF filter bandwidth (3 dB RBW) shall be in the range of 1% to 5% of the OBW and video bandwidth (VBW) shall be approximately three times RBW; Sweep = auto; Detector function = peak
   Set Span = approximately 2 to 5 times the 20 dB bandwidth, centered on a hoping channel
   The nominal IF filter bandwidth (3 dB RBW) shall be in the range of 1% to 5% of the OBW and video bandwidth (VBW) shall be approximately three times RBW; Sweep = auto; Detector function = peak
4. Set SPA Trace 1 Max hold, then View.

6.2 TEST SET-UP (BLOCK DIAGRAM OF CONFIGURATION)

The same as described in section 3.1.

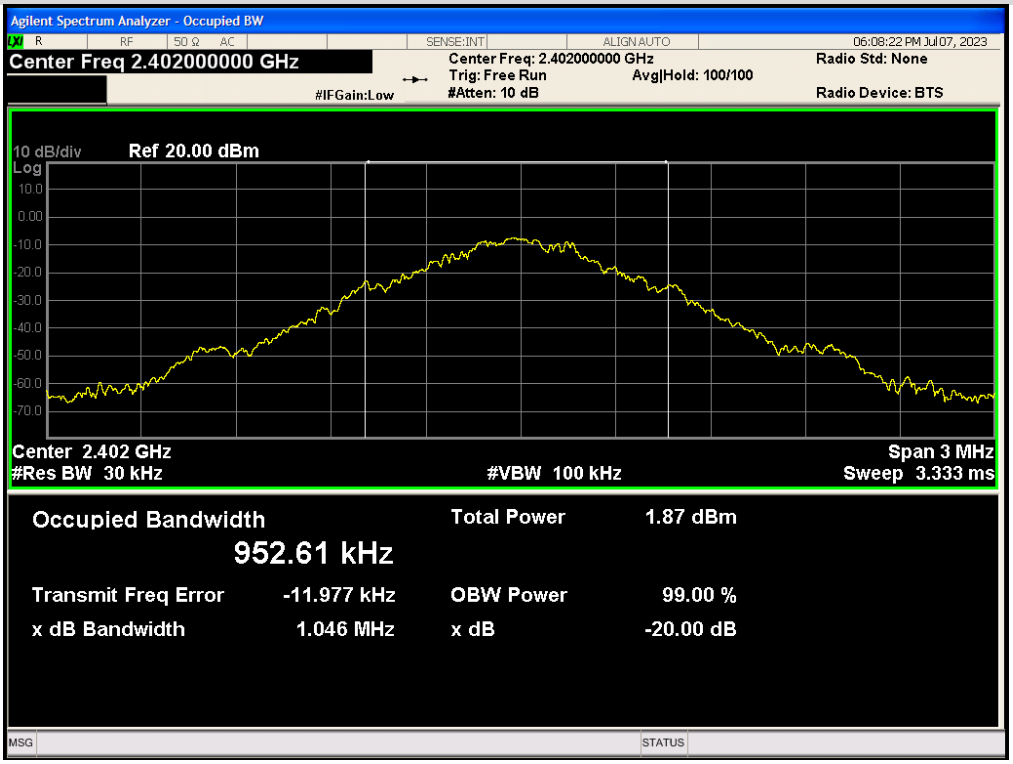
6.3 LIMITS AND MEASUREMENT RESULTS

GFSK MODULATION			
Applicable Limits	Measurement Result		
	Test Channel	20dB Bandwidth (MHz)	Result
N/A	Low Channel	1.046	Pass
	Middle Channel	1.039	Pass
	High Channel	1.047	Pass

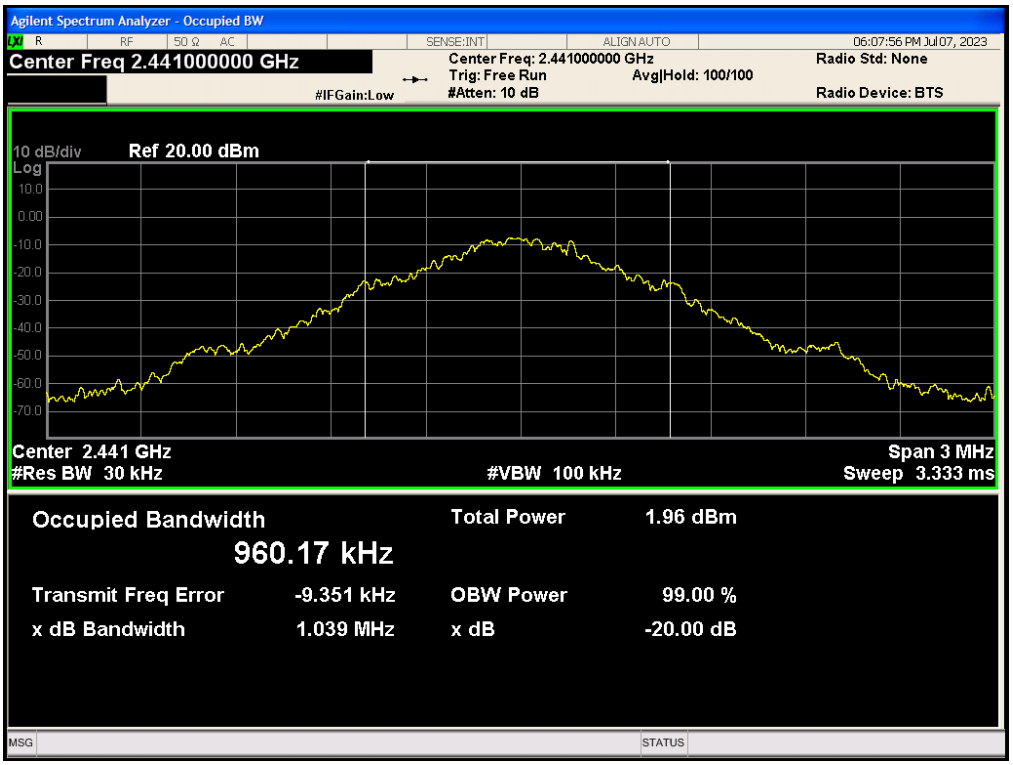
Π/4 DQPSK MODULATION			
Applicable Limits	Measurement Result		
	Test Channel	20dB Bandwidth (MHz)	Result
N/A	Low Channel	1.317	Pass
	Middle Channel	1.316	Pass
	High Channel	1.321	Pass

8DPSK MODULATION			
Applicable Limits	Measurement Result		
	Test Channel	20dB Bandwidth (MHz)	Result
N/A	Low Channel	1.280	Pass
	Middle Channel	1.304	Pass
	High Channel	1.358	Pass

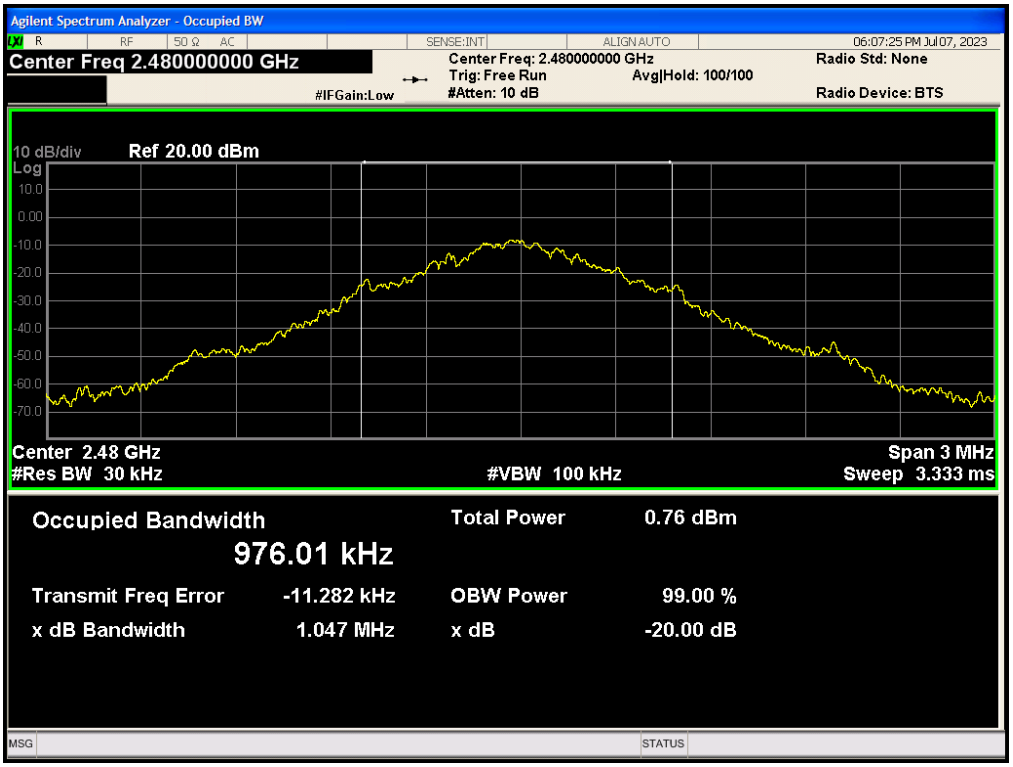
GFSK



2402MHz

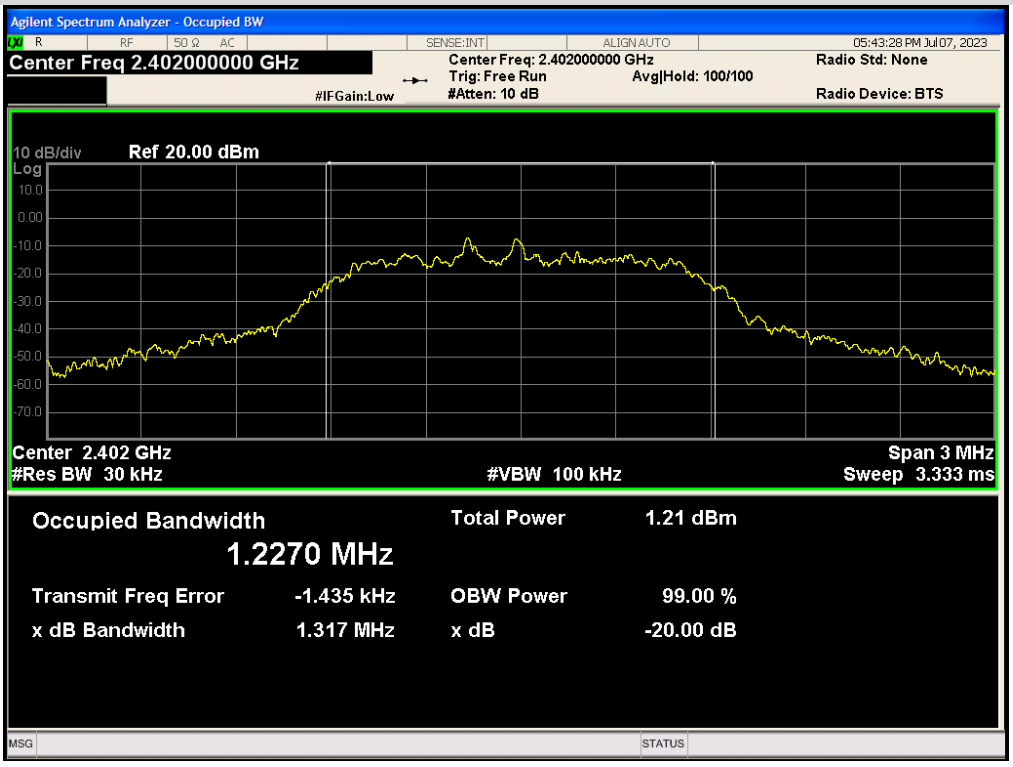


2441MHz

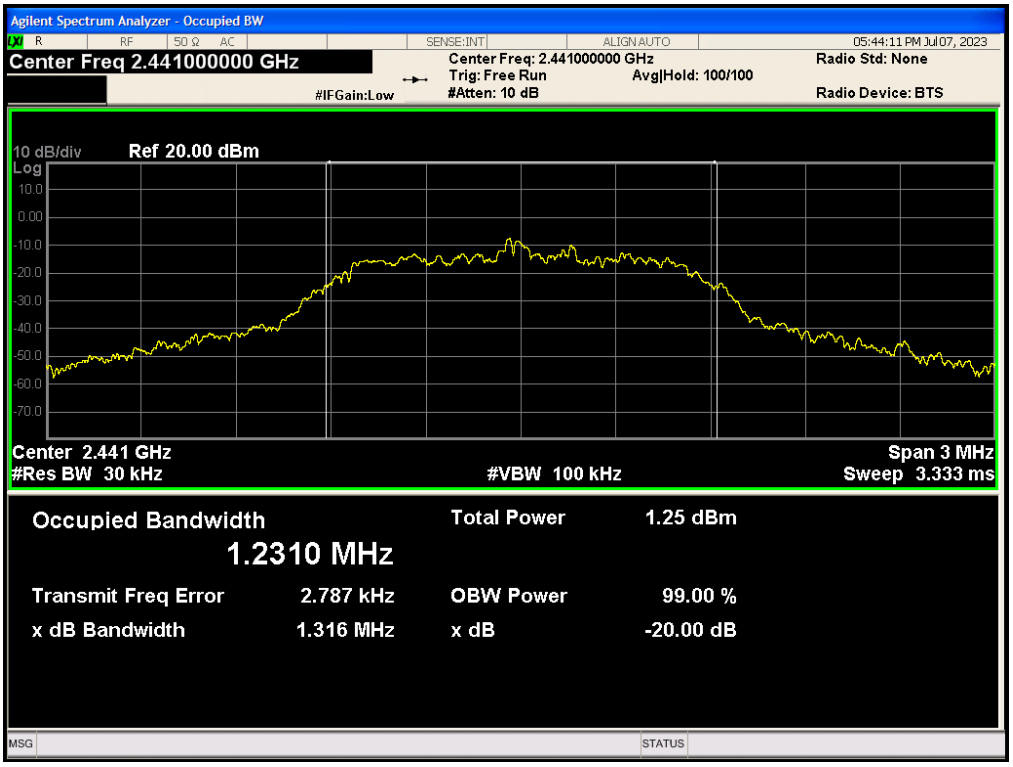

Agilent Spectrum Analyzer - Occupied BW
RF
50 Ω AC
SENSE:INT
ALIGN AUTO
06:07:25 PM Jul 07, 2023
Center Freq 2.480000000 GHz
Center Freq: 2.480000000 GHz
Trig: Free Run
Avg|Hold: 100/100
#IFGain:Low
#Atten: 10 dB
Radio Std: None
Radio Device: BTS
10 dB/div
Ref 20.00 dBm
Log
10.0
0.00
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
Center 2.48 GHz
#Res BW 30 kHz
#VBW 100 kHz
Span 3 MHz
Sweep 3.333 ms
Occupied Bandwidth
976.01 kHz
Total Power 0.76 dBm
Transmit Freq Error -11.282 kHz
OBW Power 99.00 %
x dB Bandwidth 1.047 MHz
x dB -20.00 dB
MSG
STATUS

2480 MHz

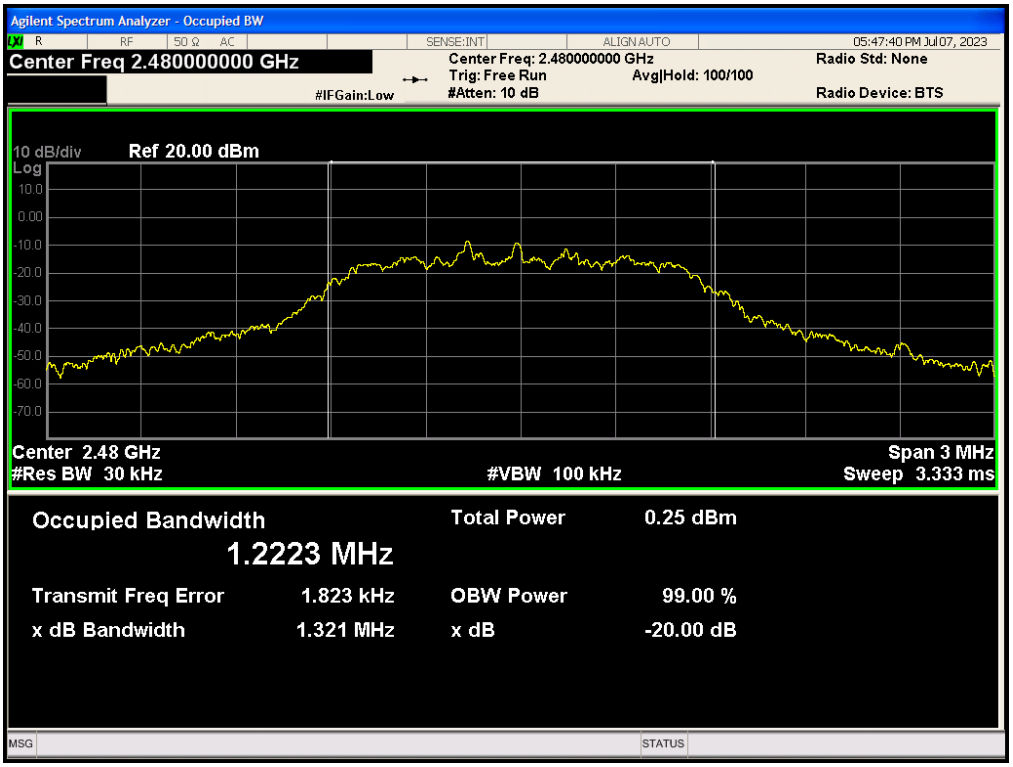
Π/4DQPSK



2402MHz

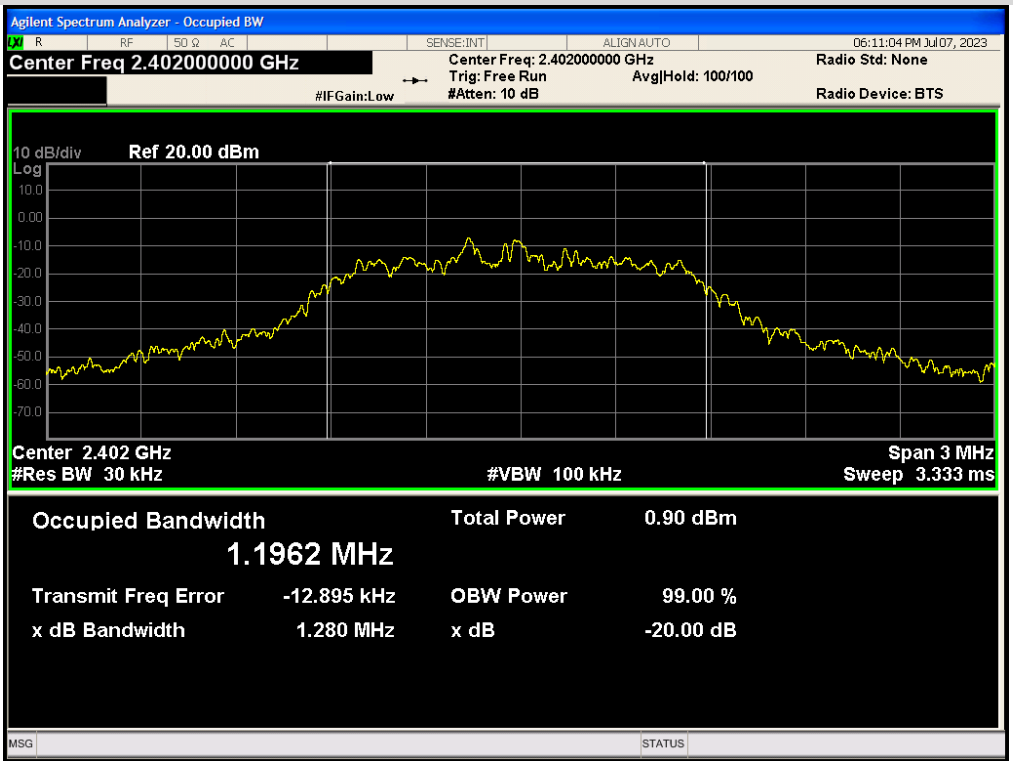


2441MHz

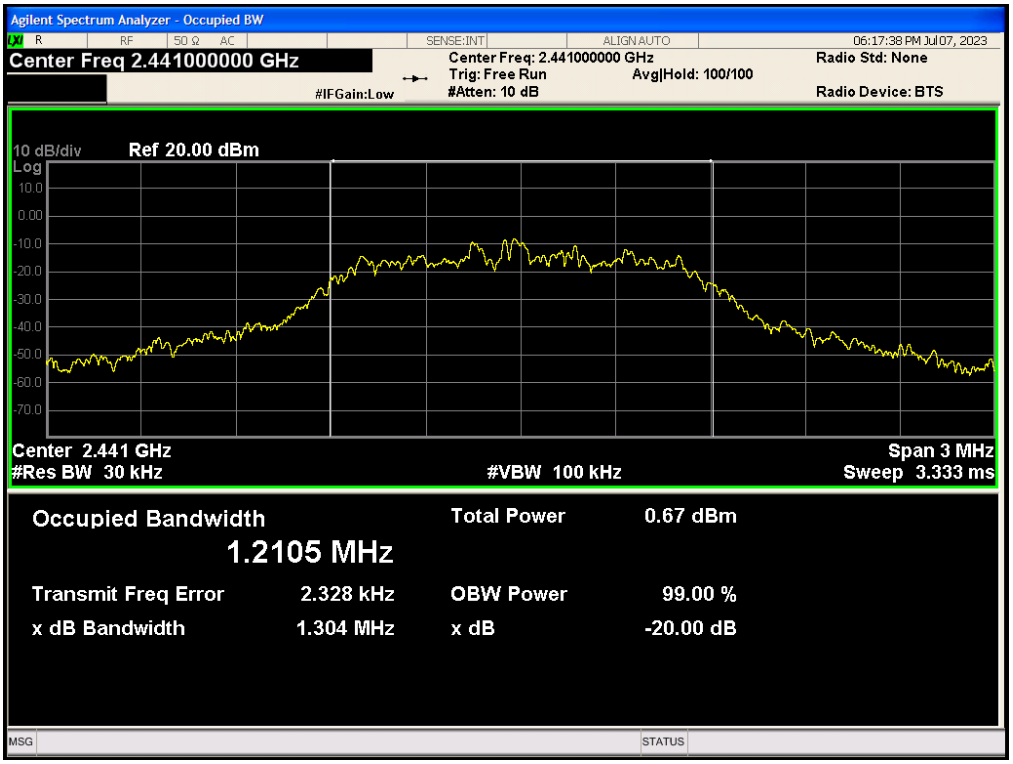

Agilent Spectrum Analyzer - Occupied BW
RF
50 Ω AC
SENSE:INT
ALIGN AUTO
05:47:40 PM Jul 07, 2023
Center Freq 2.480000000 GHz
Center Freq: 2.480000000 GHz
Trig: Free Run
Avg|Hold: 100/100
#IFGain:Low
#Atten: 10 dB
Radio Std: None
Radio Device: BTS
10 dB/div
Ref 20.00 dBm
Log
10.0
0.00
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
Center 2.48 GHz
#Res BW 30 kHz
#VBW 100 kHz
Span 3 MHz
Sweep 3.333 ms
Occupied Bandwidth
1.2223 MHz
Total Power
0.25 dBm
Transmit Freq Error
1.823 kHz
OBW Power
99.00 %
x dB Bandwidth
1.321 MHz
x dB
-20.00 dB
MSG
STATUS

2480 MHz

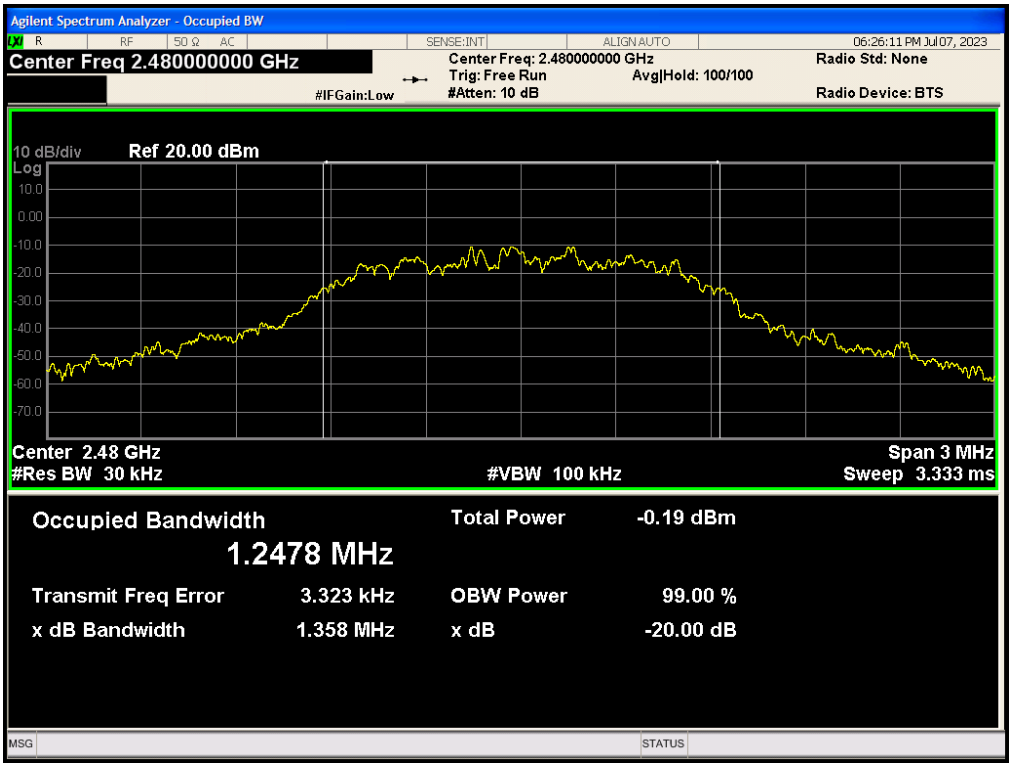
8DPSK



2402MHz



2441MHz


Agilent Spectrum Analyzer - Occupied BW
RF
50 Ω AC
SENSE:INT
ALIGN AUTO
06:26:11 PM Jul 07, 2023
Center Freq 2.480000000 GHz
Center Freq: 2.480000000 GHz
Trig: Free Run
Avg|Hold: 100/100
#IFGain:Low
#Atten: 10 dB
Radio Std: None
Radio Device: BTS
10 dB/div
Ref 20.00 dBm
Log
10.0
0.00
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
Center 2.48 GHz
#Res BW 30 kHz
#VBW 100 kHz
Span 3 MHz
Sweep 3.333 ms
Occupied Bandwidth
1.2478 MHz
Total Power
-0.19 dBm
Transmit Freq Error
3.323 kHz
OBW Power
99.00 %
x dB Bandwidth
1.358 MHz
x dB
-20.00 dB
MSG
STATUS

2480 MHz

7 CONDUCTED SPURIOUS EMISSION

7.1 MEASUREMENT PROCEDURE

1. Connect EUT RF output port to the Spectrum Analyzer through an RF attenuator
2. Set the EUT Work on the top, the Middle and the bottom operation frequency individually.
3. Set the Span = wide enough to capture the peak level of the in-band emission and all spurious emissions from the lowest frequency generated in the EUT up through the 10th harmonic.
   RBW = 100 kHz; VBW= 300 kHz; Sweep = auto; Detector function = peak.
4. Set SPA Trace 1 Max hold, then View.

Note: The EUT was tested according to ANSI C63.10 for compliance to RSS-247 requirements.

7.2 TEST SET-UP (BLOCK DIAGRAM OF CONFIGURATION)

The same as described in section 3.1.

7.3 MEASUREMENT EQUIPMENT USED

The same as described in section 3.4.

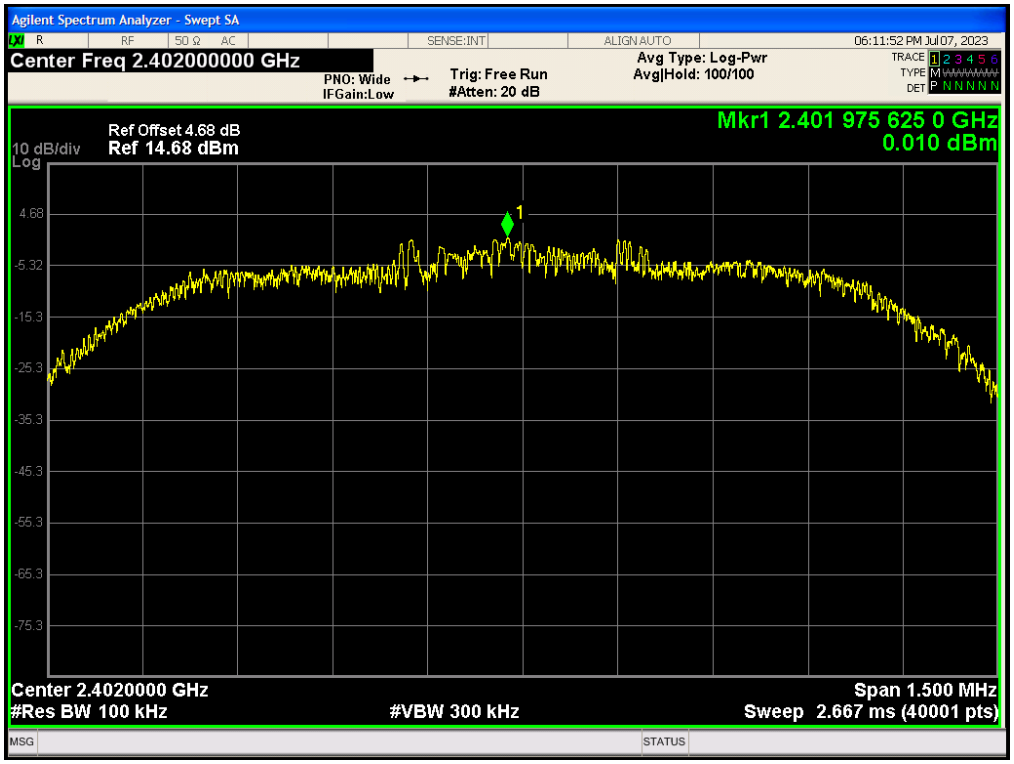
7.4 LIMITS AND MEASUREMENT RESULT

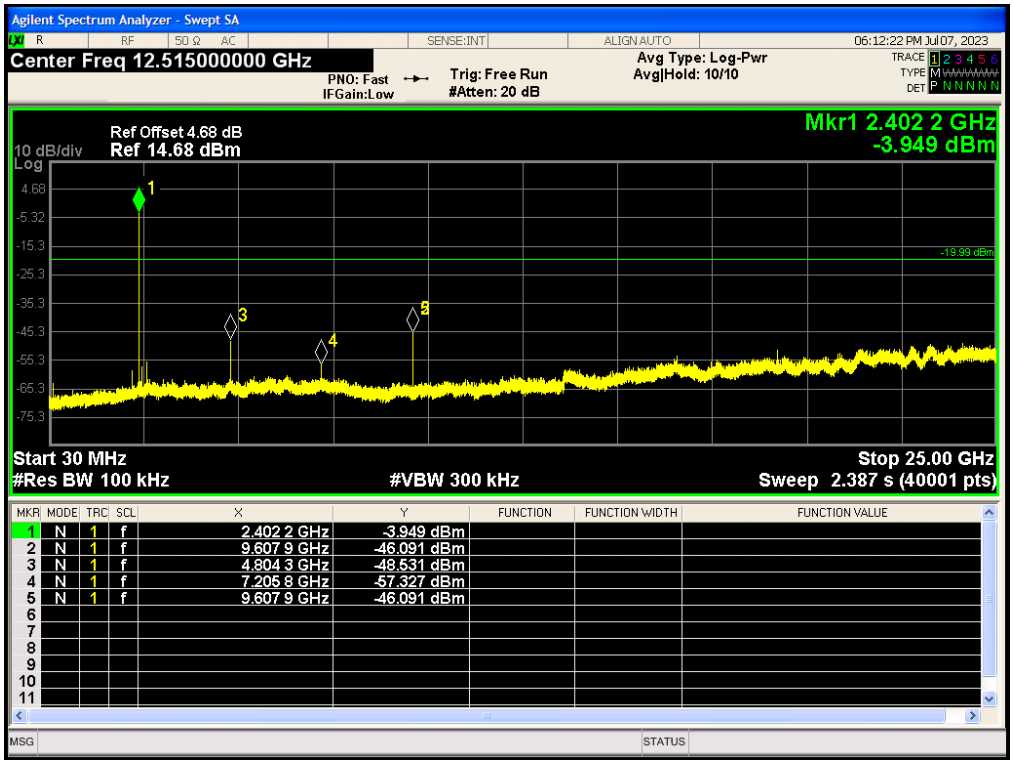
LIMITS AND MEASUREMENT RESULT		
Applicable Limits	**Measurement Result**	
	Test Data	**Result**
In any 100 kHz Bandwidth Outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produce by the intentional radiator shall be at least 20 dB below that in 100KHz bandwidth within the band that contains the highest level of the desired power.	At least -20dBc than the reference level	PASS

TEST RESULT FOR ENTIRE FREQUENCY RANGE

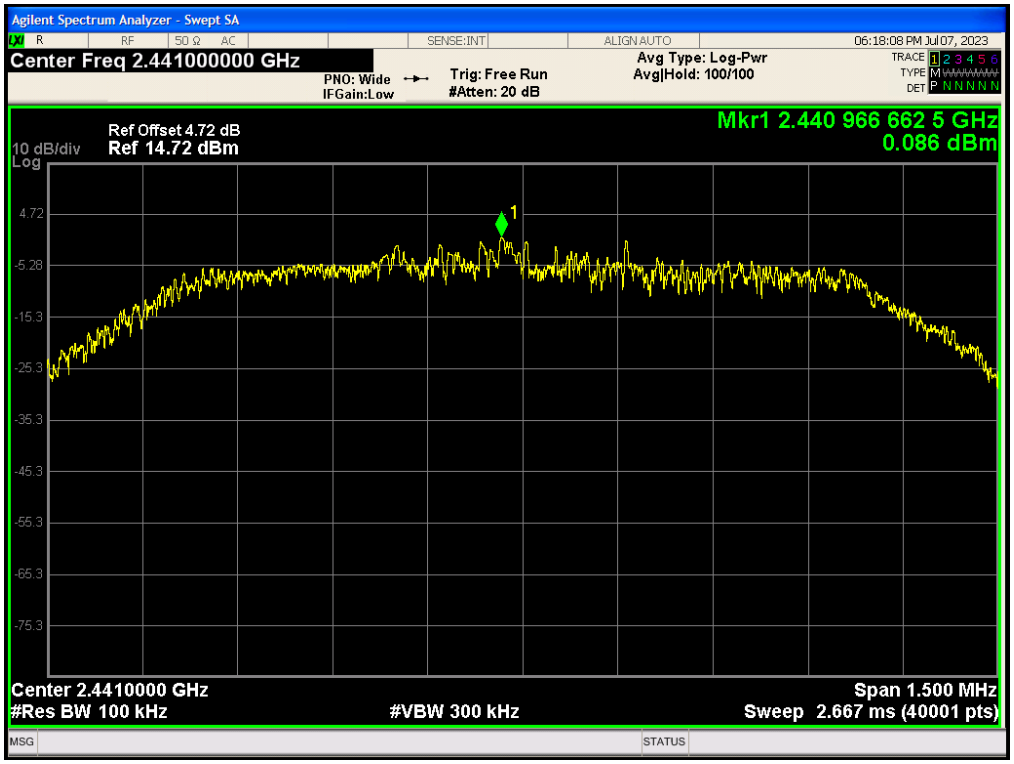
8DPSK MODULATION

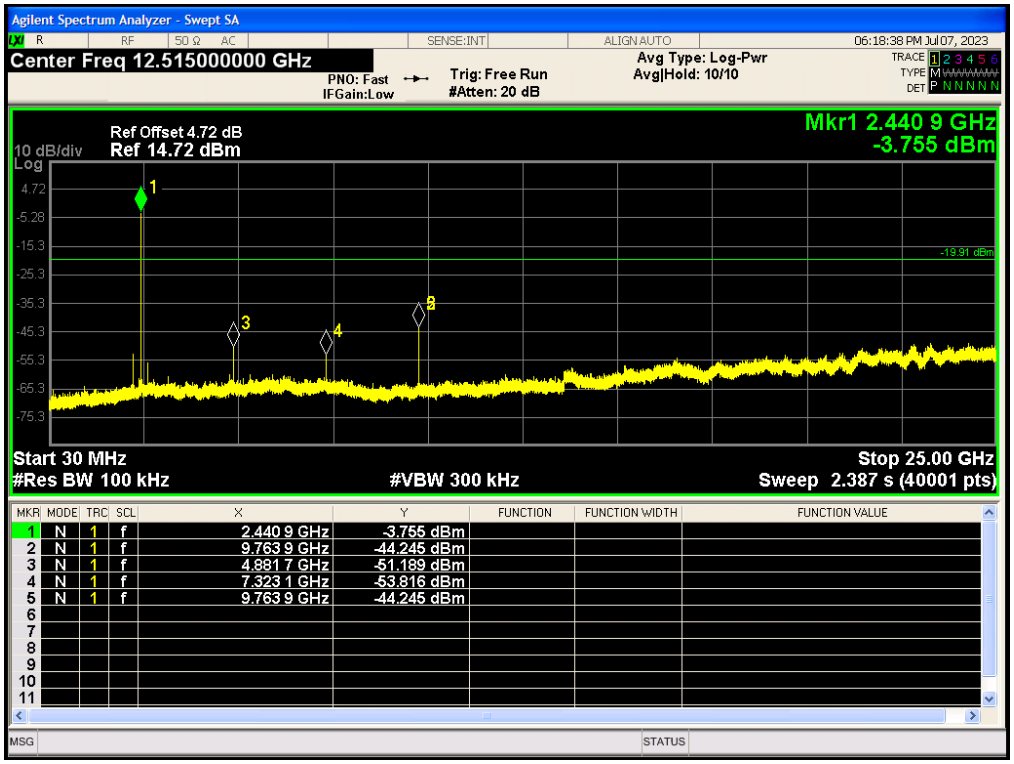
LOW CHANNEL



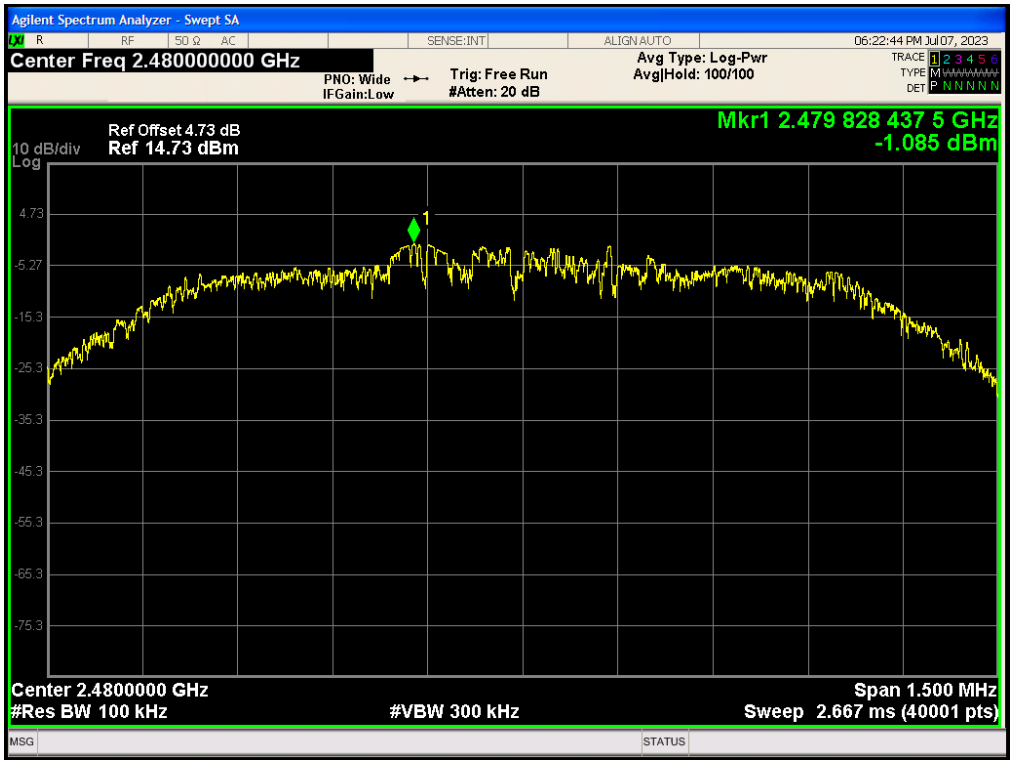


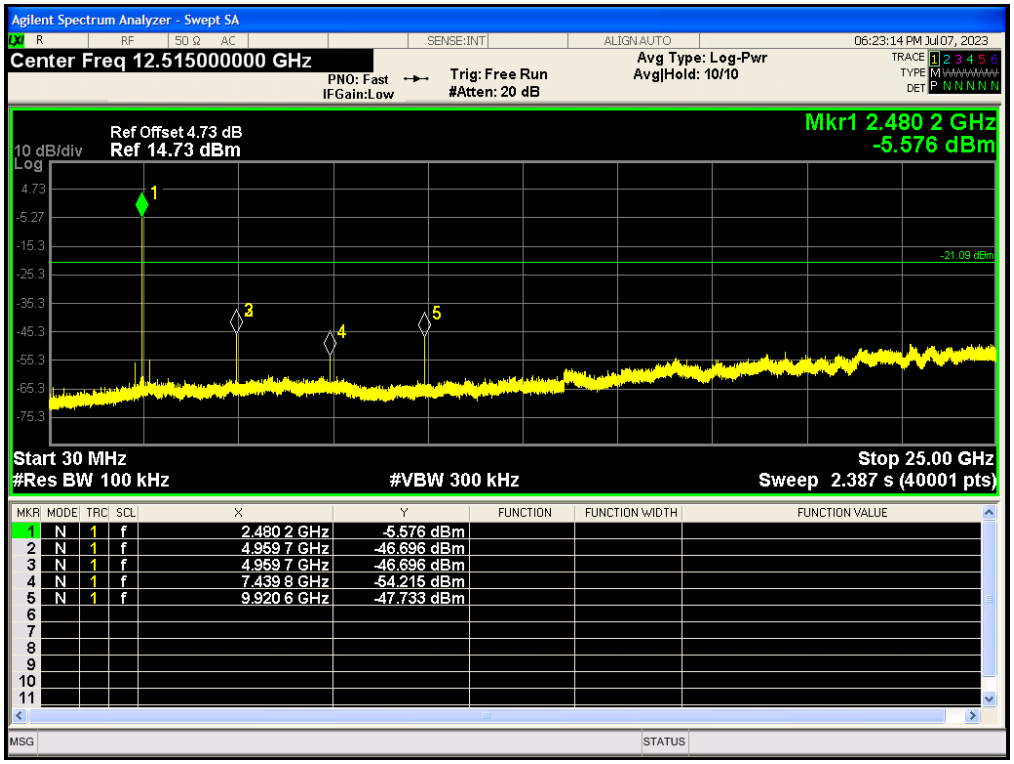
MIDDLE CHANNEL





HIGH CHANNEL



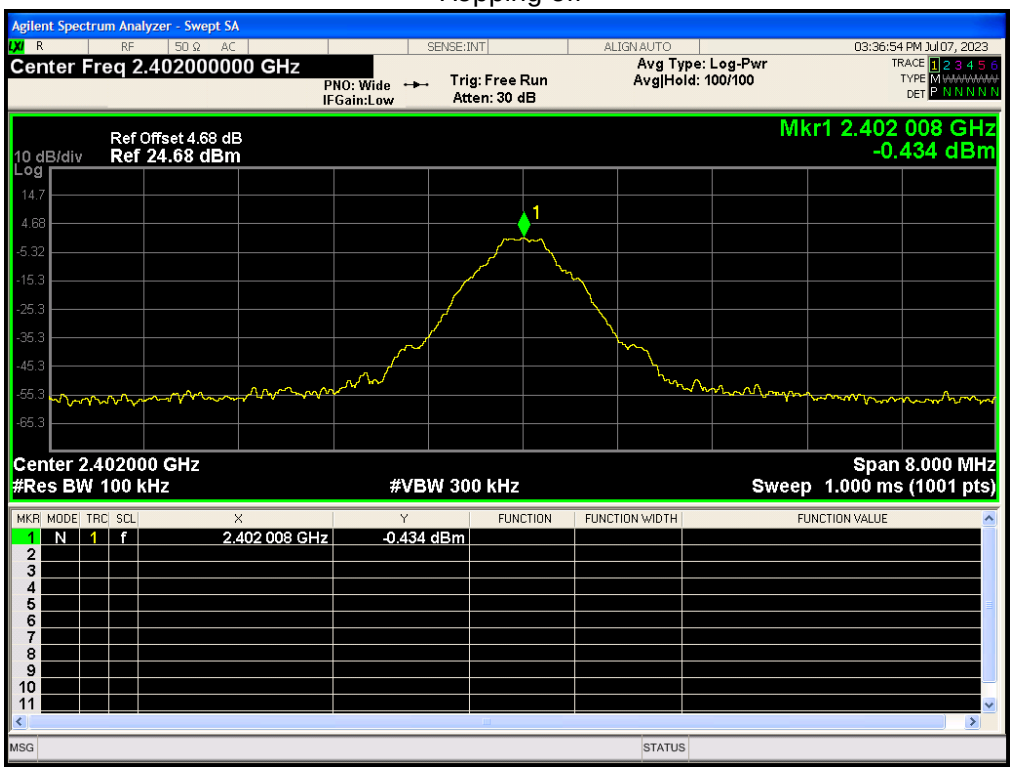


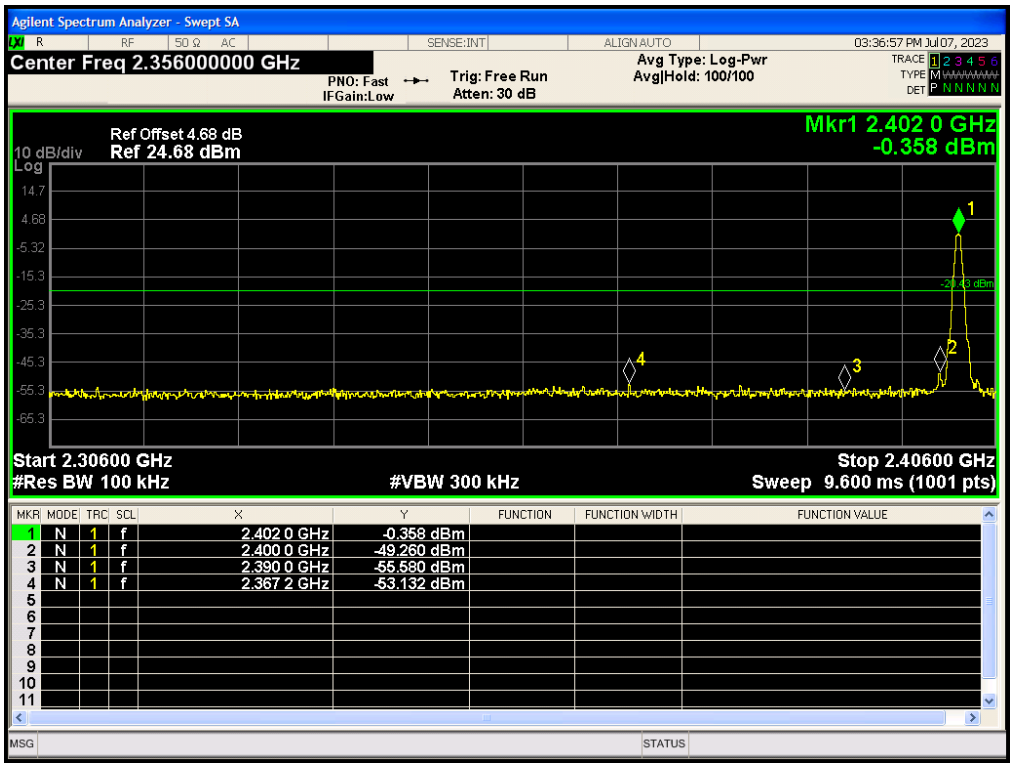
Note: The Π/4 DQPSK modulation is the worst case and only those data recorded in the report.

TEST RESULT FOR BAND EDGE

GFSK MODULATION IN LOW CHANNEL

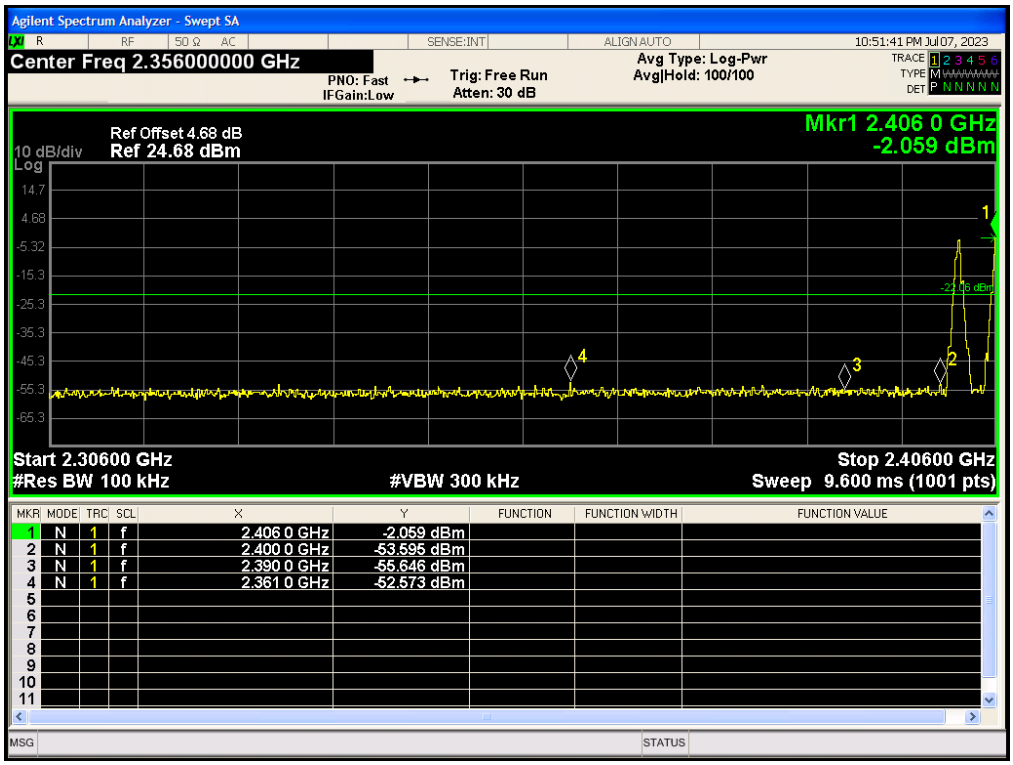
Hopping off





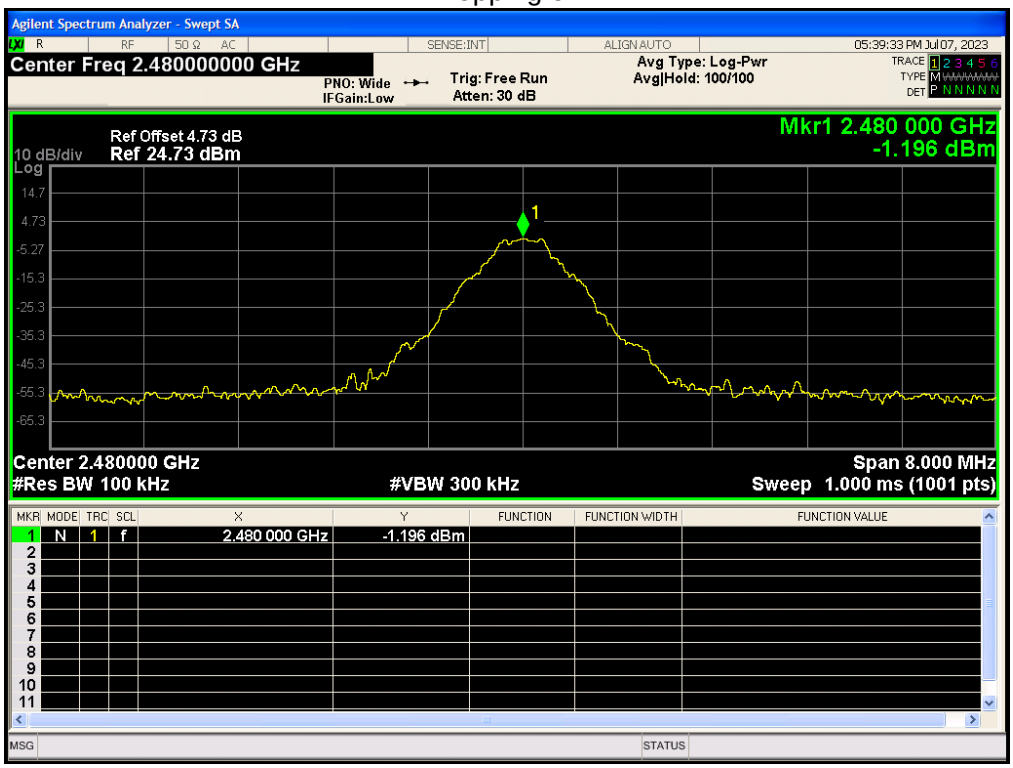
Hopping on

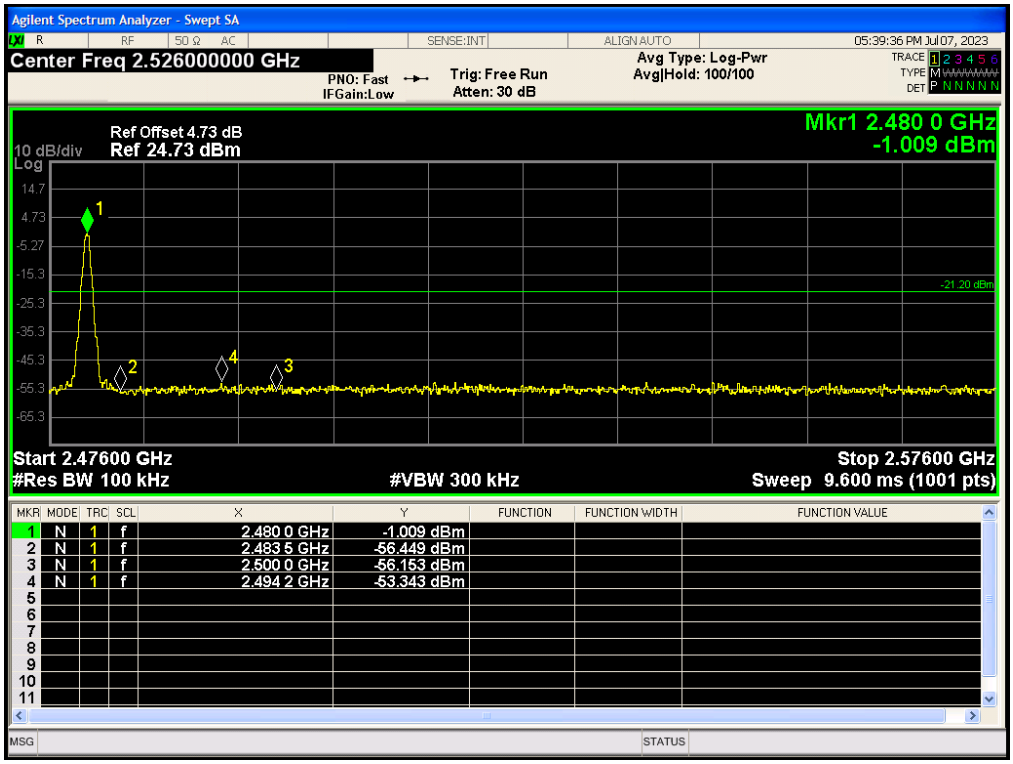

Agilent Spectrum Analyzer - Swept SA
Center Freq 2.402000000 GHz
PNO: Wide
IFGain:Low
Trig: Free Run
Atten: 30 dB
Avg Type: Log-Pwr
Avg|Hold: 100/100
10:51:38 PM Jul 07, 2023
Ref Offset 4.68 dB
10 dB/div
Ref 24.68 dBm
Log
Mkr1 2.404 016 GHz
-2.060 dBm
Center 2.402000 GHz
#Res BW 100 kHz
#VBW 300 kHz
Span 8.000 MHz
Sweep 1.000 ms (1001 pts)
1 N 1 f 2.404 016 GHz -2.060 dBm


Agilent Spectrum Analyzer - Swept SA
Center Freq 2.356000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
Atten: 30 dB
Avg Type: Log-Pwr
Avg|Hold: 100/100
10:51:41 PM Jul 07, 2023
Ref Offset 4.68 dB
10 dB/div
Ref 24.68 dBm
Log
Mkr1 2.406 0 GHz
-2.059 dBm
Start 2.30600 GHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 2.40600 GHz
Sweep 9.600 ms (1001 pts)
1 N 1 f 2.406 0 GHz -2.059 dBm
2 N 1 f 2.400 0 GHz -53.595 dBm
3 N 1 f 2.390 0 GHz -55.646 dBm
4 N 1 f 2.361 0 GHz -52.573 dBm

GFSK MODULATION IN HIGH CHANNEL

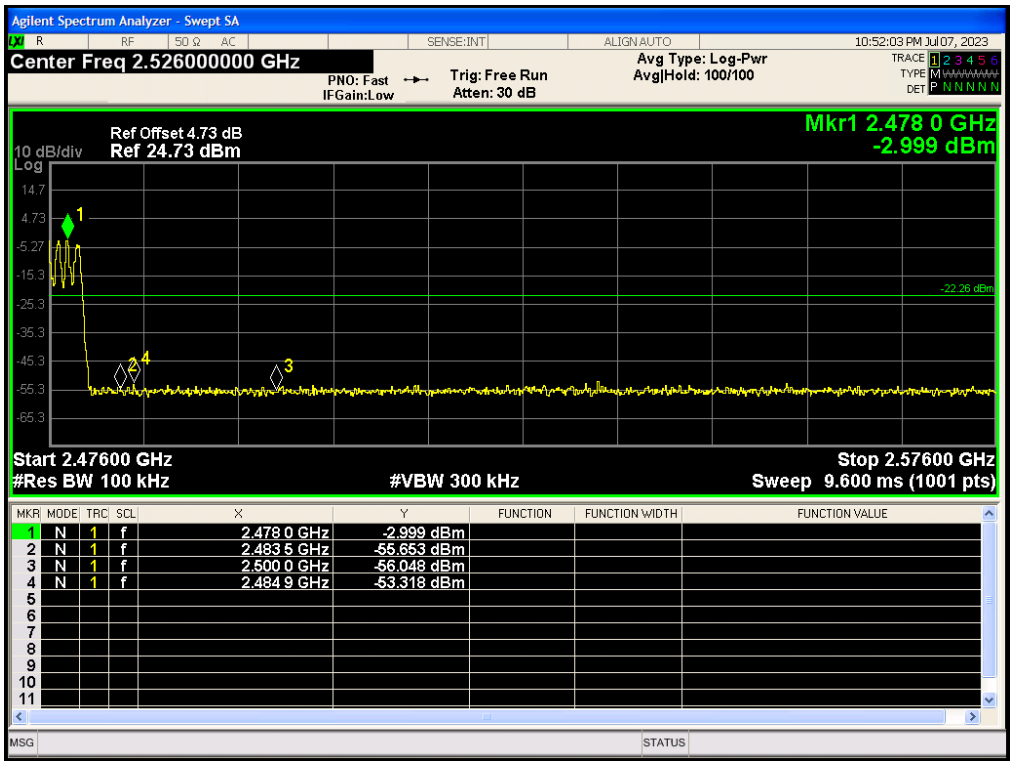
Hopping off





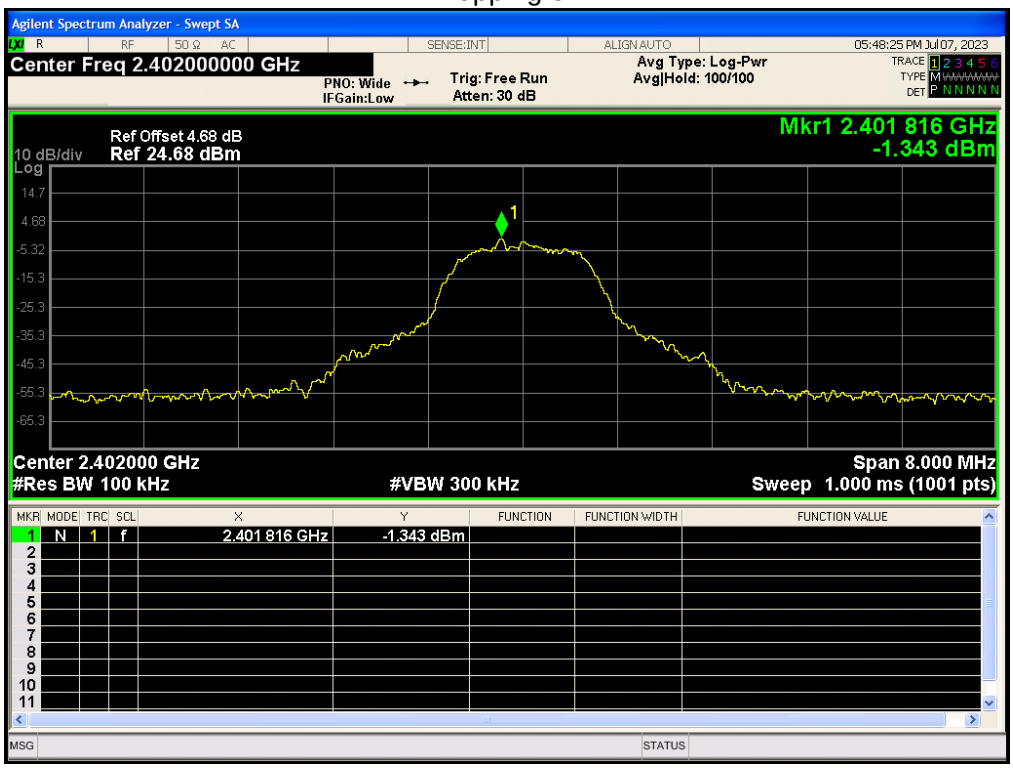
Hopping on

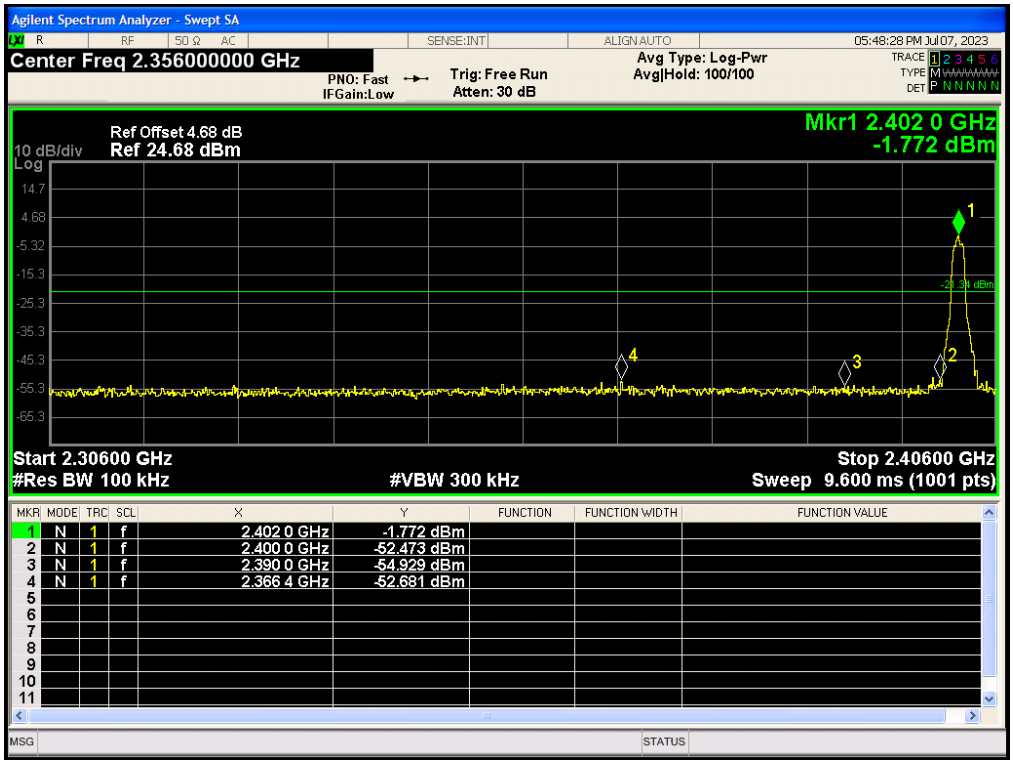

Agilent Spectrum Analyzer - Swept SA
Center Freq 2.480000000 GHz
PNO: Wide
IFGain:Low
Trig: Free Run
Atten: 30 dB
Avg Type: Log-Pwr
Avg|Hold: 100/100
10:52:00 PM Jul 07, 2023
Ref Offset 4.73 dB
10 dB/div
Ref 24.73 dBm
Log
Mkr1 2.477 016 GHz
-2.256 dBm
Center 2.480000 GHz
#Res BW 100 kHz
#VBW 300 kHz
Span 8.000 MHz
Sweep 1.000 ms (1001 pts)
1 N 1 f 2.477 016 GHz -2.256 dBm


Agilent Spectrum Analyzer - Swept SA
Center Freq 2.526000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
Atten: 30 dB
Avg Type: Log-Pwr
Avg|Hold: 100/100
10:52:03 PM Jul 07, 2023
Ref Offset 4.73 dB
10 dB/div
Ref 24.73 dBm
Log
Mkr1 2.478 0 GHz
-2.999 dBm
-22.26 dBm
Start 2.47600 GHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 2.57600 GHz
Sweep 9.600 ms (1001 pts)
1 N 1 f 2.478 0 GHz -2.999 dBm
2 N 1 f 2.483 5 GHz -55.653 dBm
3 N 1 f 2.500 0 GHz -56.048 dBm
4 N 1 f 2.484 9 GHz -53.318 dBm

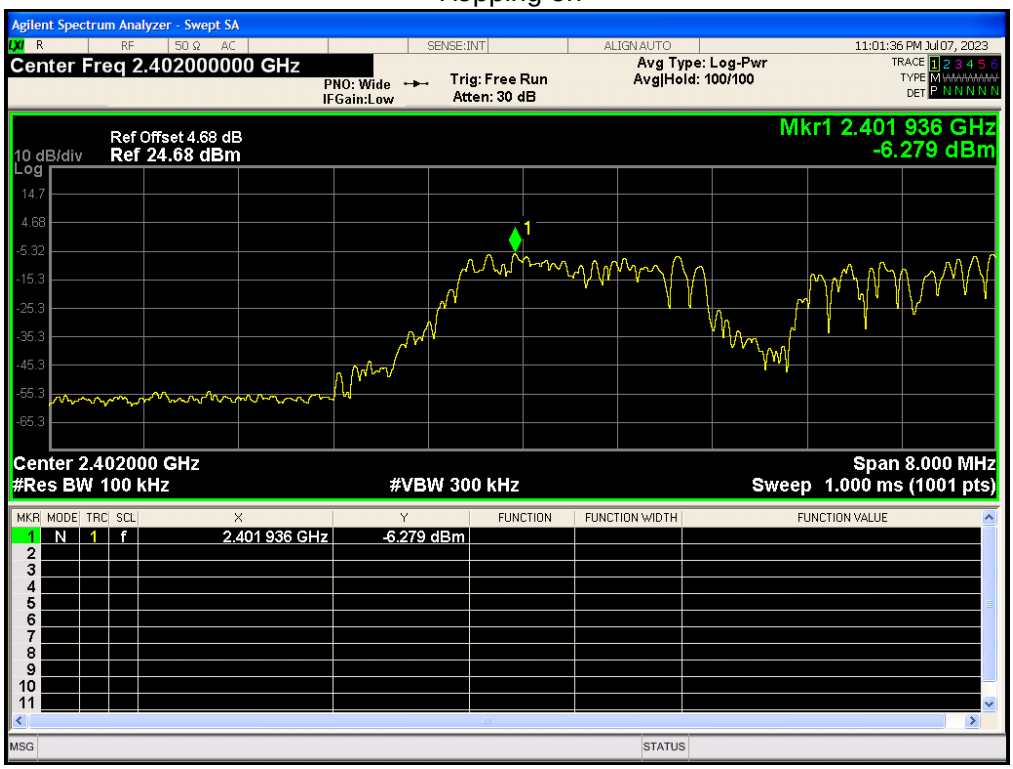
π/4 DQPSK MODULATION IN LOW CHANNEL

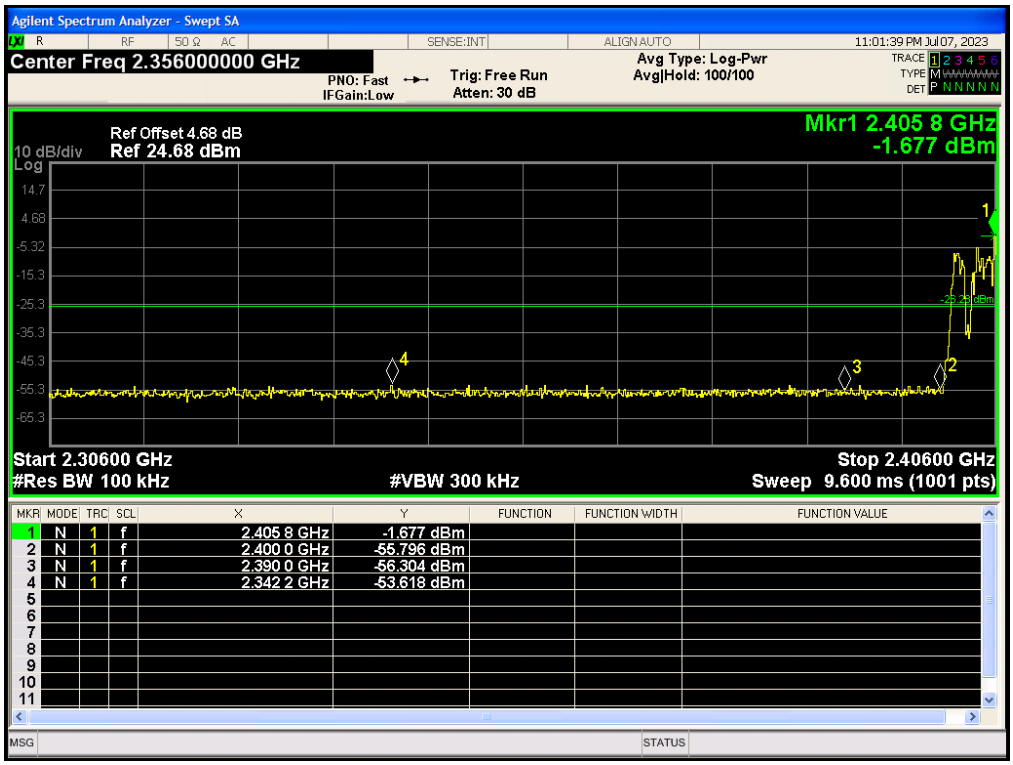
Hopping off





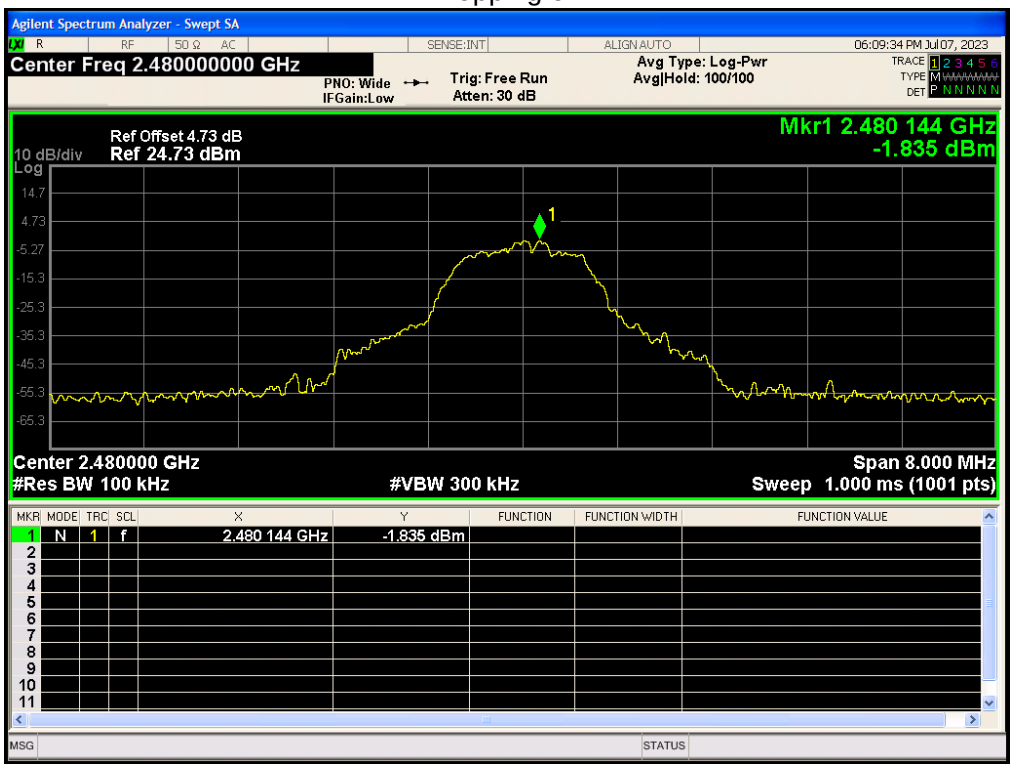
Hopping on

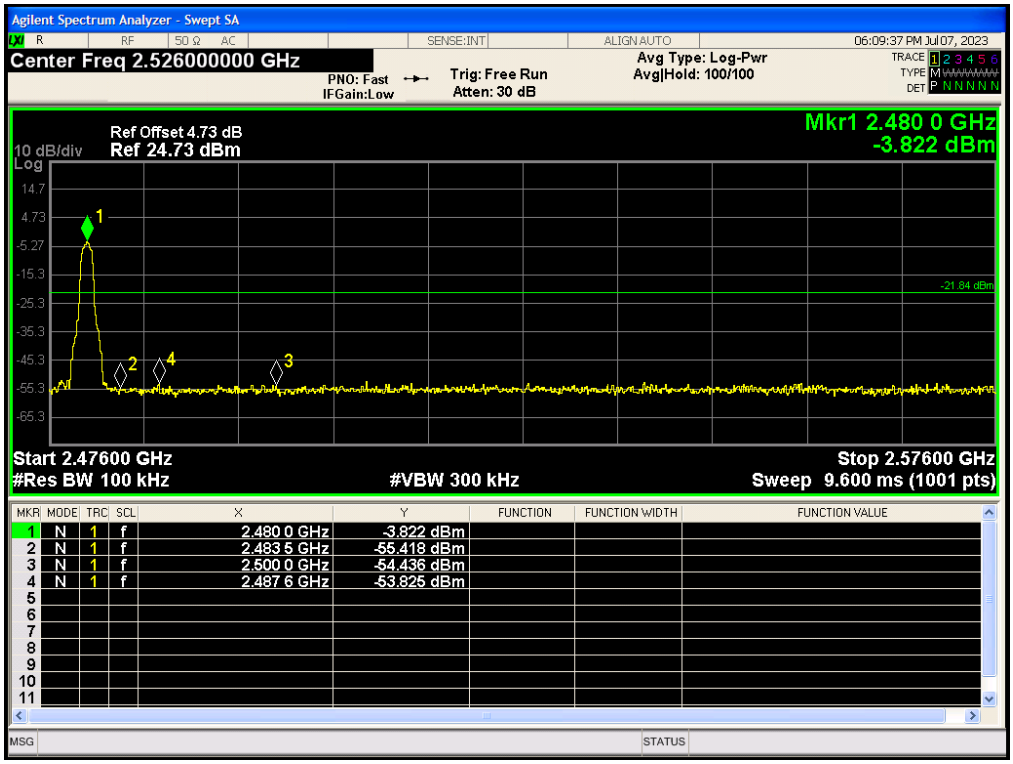

Agilent Spectrum Analyzer - Swept SA
Center Freq 2.402000000 GHz
PNO: Wide
IFGain:Low
Trig: Free Run
Atten: 30 dB
Avg Type: Log-Pwr
Avg|Hold: 100/100
11:01:36 PM Jul 07, 2023
Ref Offset 4.68 dB
10 dB/div
Ref 24.68 dBm
Log
Mkr1 2.401 936 GHz
-6.279 dBm
Center 2.402000 GHz
#Res BW 100 kHz
#VBW 300 kHz
Span 8.000 MHz
Sweep 1.000 ms (1001 pts)
1 N 1 f 2.401 936 GHz -6.279 dBm


Agilent Spectrum Analyzer - Swept SA
Center Freq 2.356000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
Atten: 30 dB
Avg Type: Log-Pwr
Avg|Hold: 100/100
11:01:39 PM Jul 07, 2023
Ref Offset 4.68 dB
10 dB/div
Ref 24.68 dBm
Log
Mkr1 2.405 8 GHz
-1.677 dBm
Start 2.30600 GHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 2.40600 GHz
Sweep 9.600 ms (1001 pts)
1 N 1 f 2.405 8 GHz -1.677 dBm
2 N 1 f 2.400 0 GHz -55.796 dBm
3 N 1 f 2.390 0 GHz -56.304 dBm
4 N 1 f 2.342 2 GHz -53.618 dBm

π/4 DQPSK MODULATION IN HIGH CHANNEL

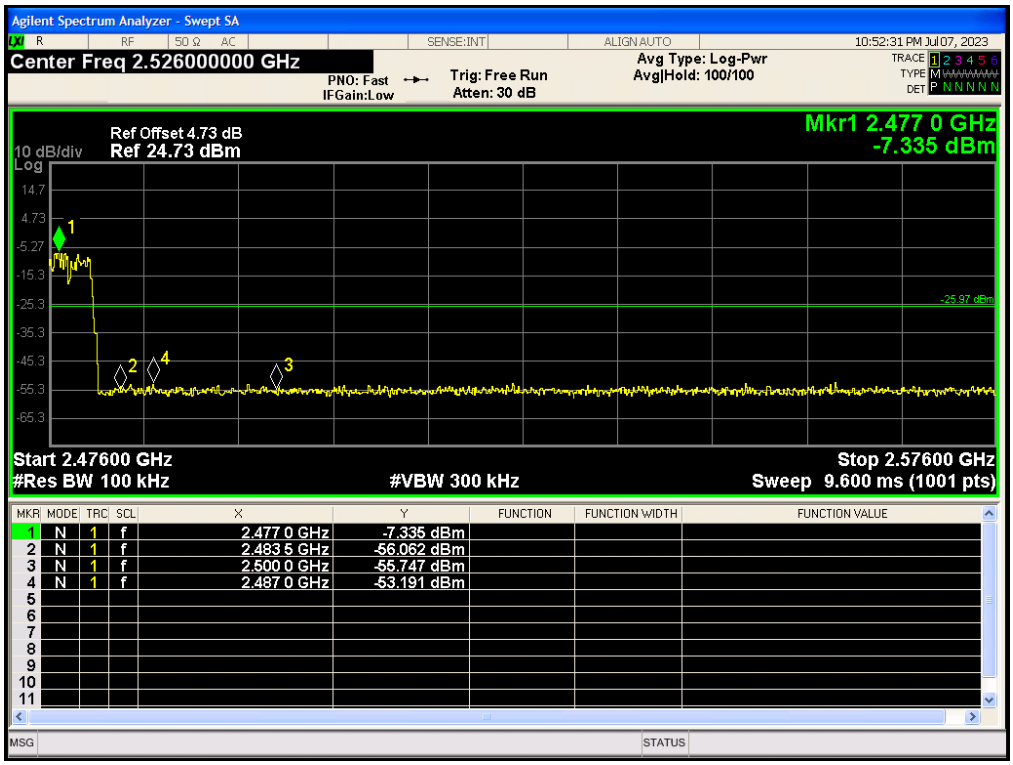
Hopping off





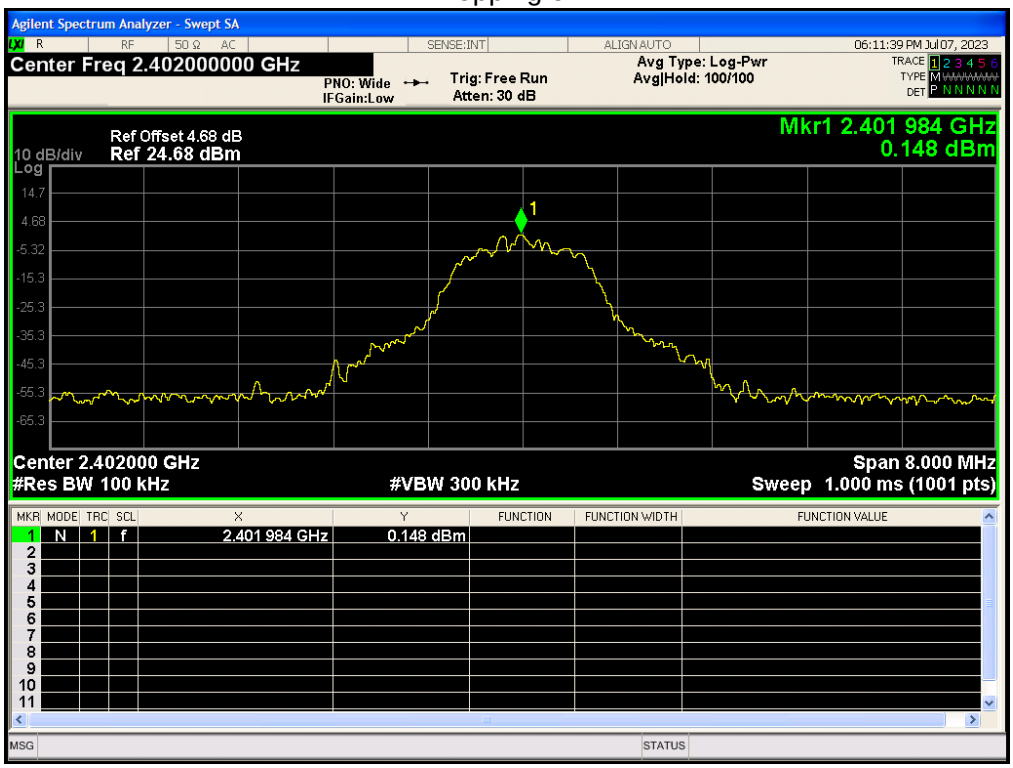
Hopping on

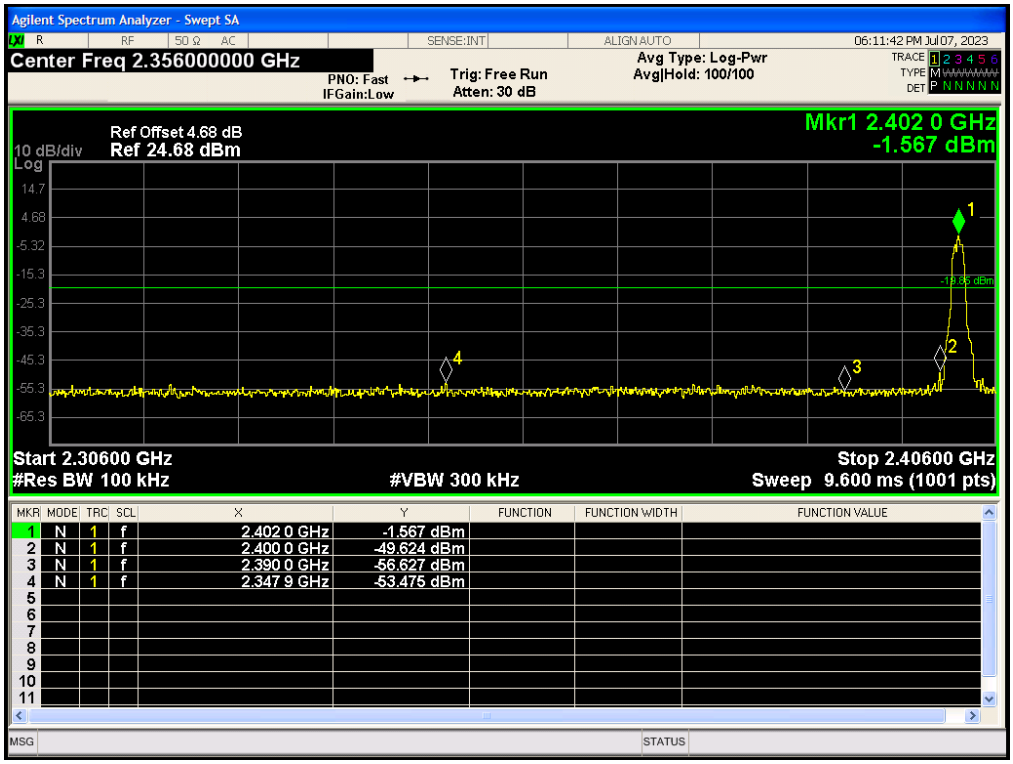

Agilent Spectrum Analyzer - Swept SA
Center Freq 2.480000000 GHz
PNO: Wide
IFGain:Low
Trig: Free Run
Atten: 30 dB
Avg Type: Log-Pwr
Avg|Hold: 100/100
10:52:28 PM Jul 07, 2023
Ref Offset 4.73 dB
10 dB/div
Ref 24.73 dBm
Log
Mkr1 2.477 000 GHz
-5.968 dBm
Center 2.480000 GHz
#Res BW 100 kHz
#VBW 300 kHz
Span 8.000 MHz
Sweep 1.000 ms (1001 pts)
1 N 1 f 2.477 000 GHz -5.968 dBm


Agilent Spectrum Analyzer - Swept SA
Center Freq 2.526000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
Atten: 30 dB
Avg Type: Log-Pwr
Avg|Hold: 100/100
10:52:31 PM Jul 07, 2023
Ref Offset 4.73 dB
10 dB/div
Ref 24.73 dBm
Log
Mkr1 2.477 0 GHz
-7.335 dBm
-25.97 dBm
Start 2.47600 GHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 2.57600 GHz
Sweep 9.600 ms (1001 pts)
1 N 1 f 2.477 0 GHz -7.335 dBm
2 N 1 f 2.483 5 GHz -56.062 dBm
3 N 1 f 2.500 0 GHz -55.747 dBm
4 N 1 f 2.487 0 GHz -53.191 dBm

8DPSK MODULATION IN LOW CHANNEL

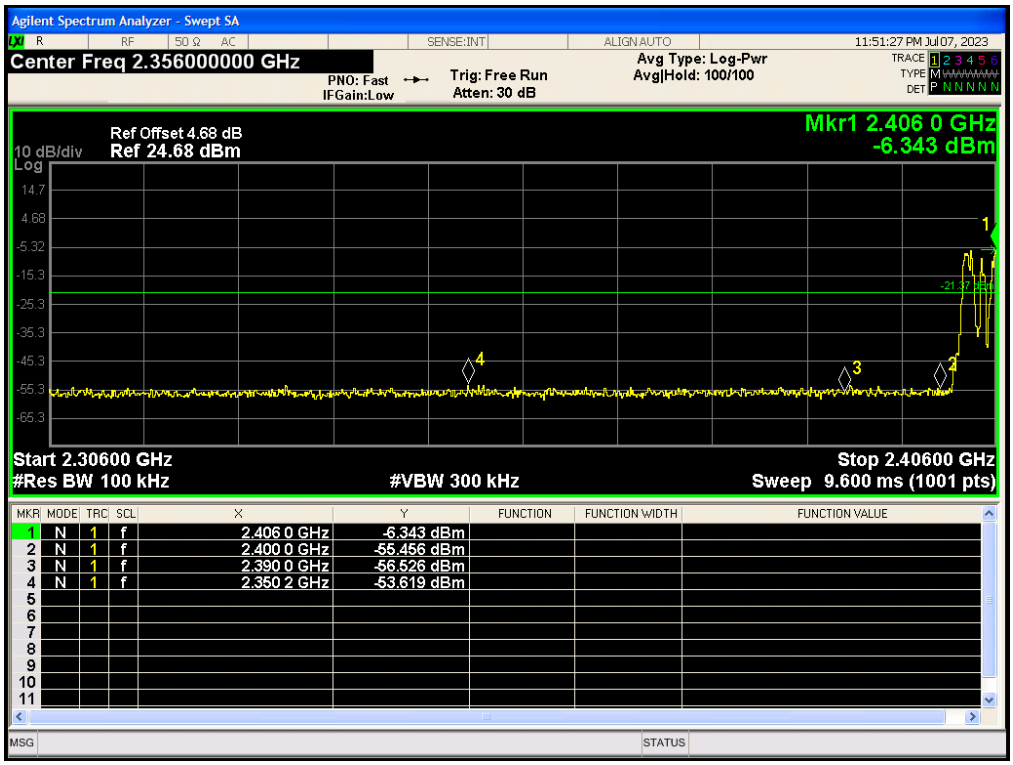
Hopping off





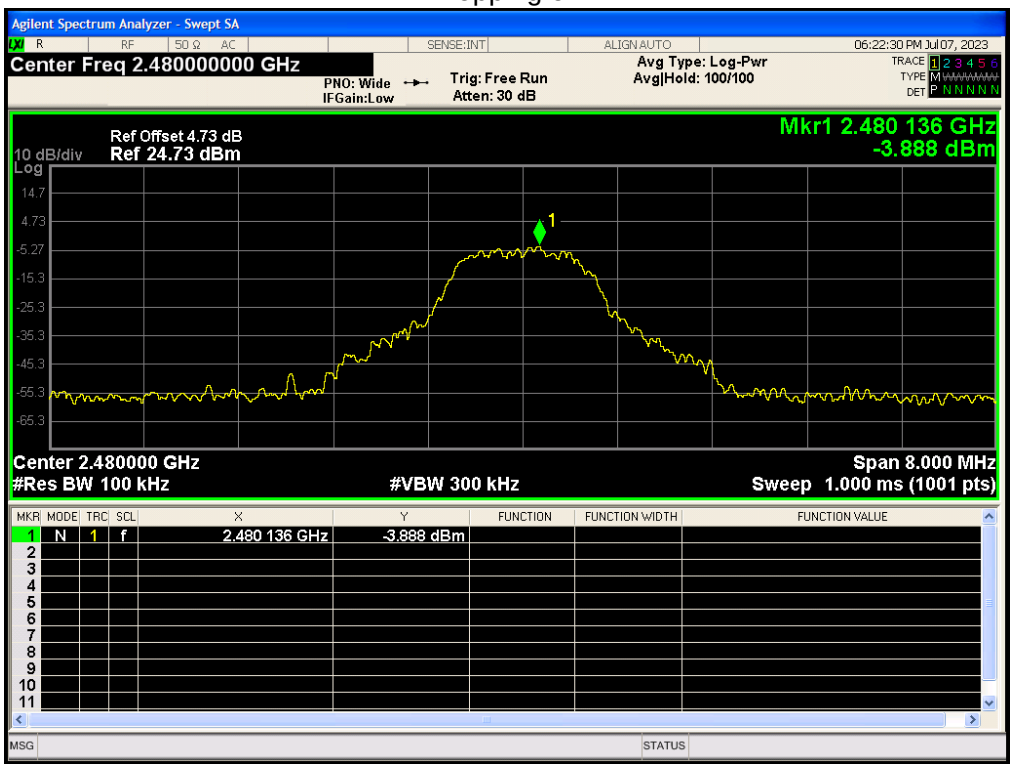
Hopping on

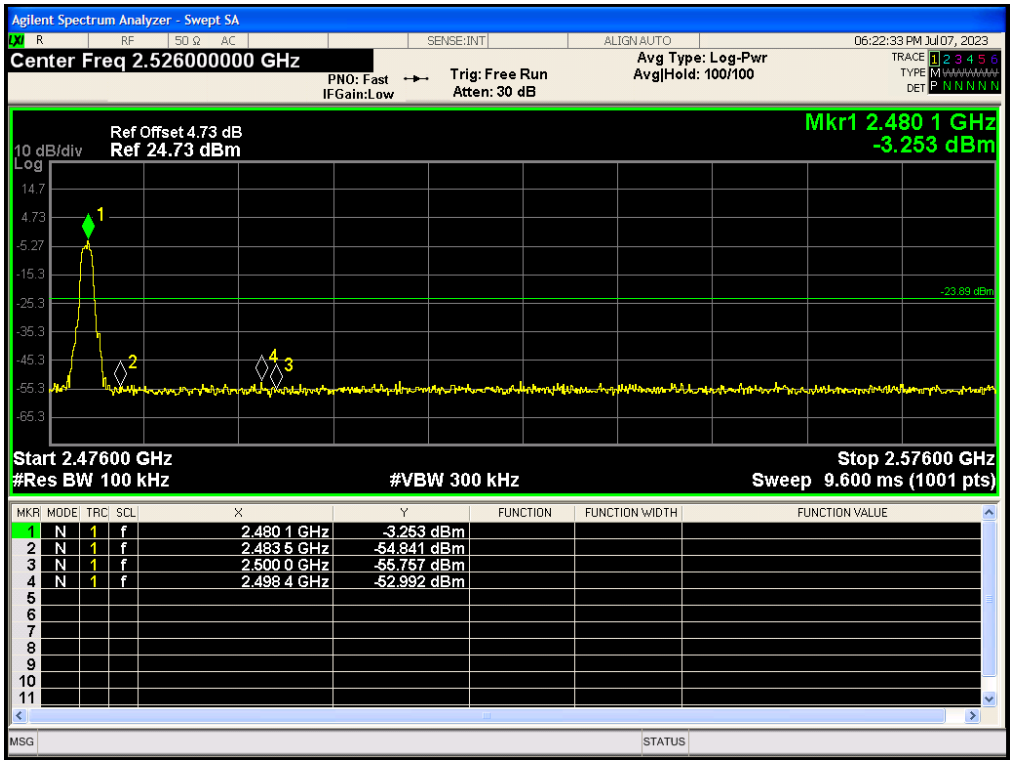

Agilent Spectrum Analyzer - Swept SA
Center Freq 2.402000000 GHz
PNO: Wide
IFGain:Low
Trig: Free Run
Atten: 30 dB
Avg Type: Log-Pwr
Avg|Hold: 100/100
11:51:25 PM Jul 07, 2023
Ref Offset 4.68 dB
10 dB/div
Ref 24.68 dBm
Log
Mkr1 2.403 976 GHz
-1.369 dBm
Center 2.402000 GHz
#Res BW 100 kHz
#VBW 300 kHz
Span 8.000 MHz
Sweep 1.000 ms (1001 pts)
1 N 1 f 2.403 976 GHz -1.369 dBm


Agilent Spectrum Analyzer - Swept SA
Center Freq 2.356000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
Atten: 30 dB
Avg Type: Log-Pwr
Avg|Hold: 100/100
11:51:27 PM Jul 07, 2023
Ref Offset 4.68 dB
10 dB/div
Ref 24.68 dBm
Log
Mkr1 2.406 0 GHz
-6.343 dBm
Start 2.30600 GHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 2.40600 GHz
Sweep 9.600 ms (1001 pts)
1 N 1 f 2.406 0 GHz -6.343 dBm
2 N 1 f 2.400 0 GHz -55.456 dBm
3 N 1 f 2.390 0 GHz -56.526 dBm
4 N 1 f 2.350 2 GHz -53.619 dBm

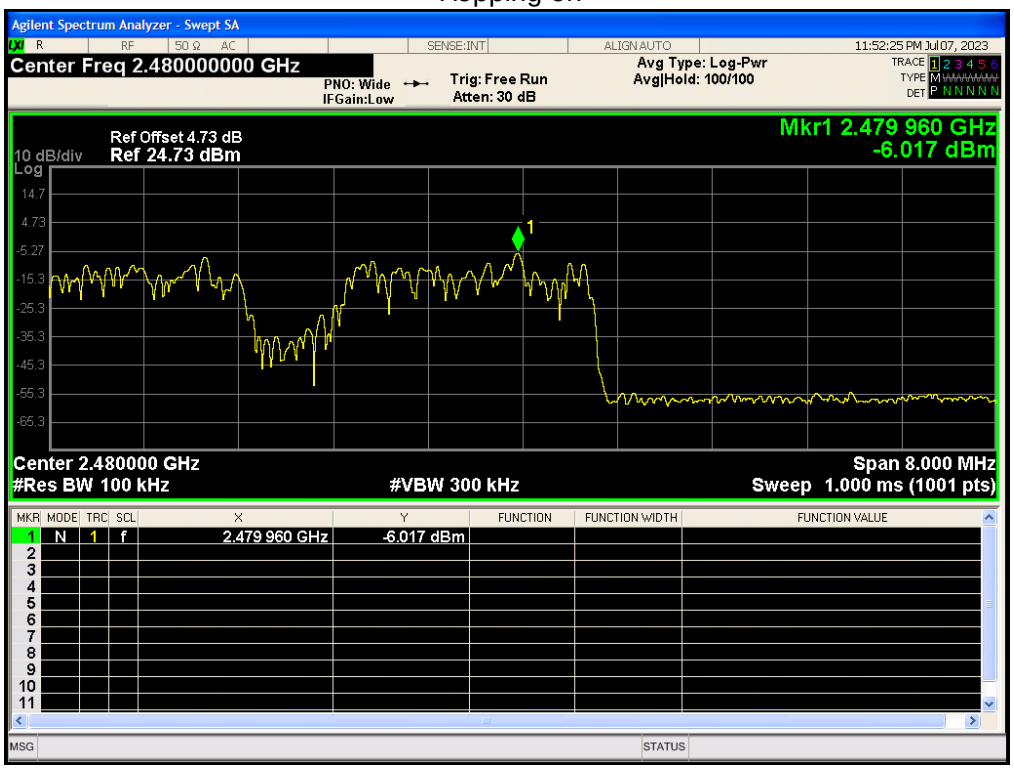
8DPSK MODULATION IN HIGH CHANNEL

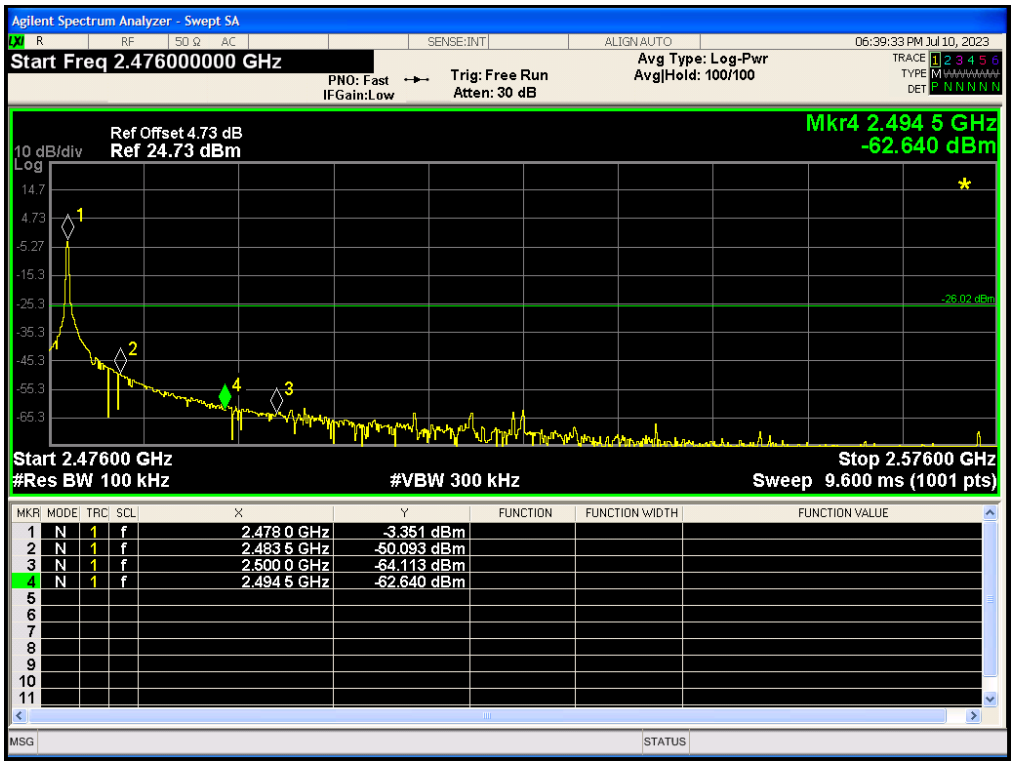
Hopping off





Hopping on


Agilent Spectrum Analyzer - Swept SA
Center Freq 2.480000000 GHz
PNO: Wide
IFGain:Low
Trig: Free Run
Atten: 30 dB
Avg Type: Log-Pwr
Avg|Hold: 100/100
11:52:25 PM Jul 07, 2023
Ref Offset 4.73 dB
10 dB/div
Ref 24.73 dBm
Log
Mkr1 2.479 960 GHz
-6.017 dBm
Center 2.480000 GHz
#Res BW 100 kHz
#VBW 300 kHz
Span 8.000 MHz
Sweep 1.000 ms (1001 pts)
1 N 1 f 2.479 960 GHz -6.017 dBm


Agilent Spectrum Analyzer - Swept SA
Start Freq 2.476000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
Atten: 30 dB
Avg Type: Log-Pwr
Avg|Hold: 100/100
06:39:33 PM Jul 10, 2023
Ref Offset 4.73 dB
10 dB/div
Ref 24.73 dBm
Log
Mkr4 2.494 5 GHz
-62.640 dBm
-26.02 dBm
Start 2.47600 GHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 2.57600 GHz
Sweep 9.600 ms (1001 pts)
1 N 1 f 2.478 0 GHz -3.351 dBm
2 N 1 f 2.483 5 GHz -50.093 dBm
3 N 1 f 2.500 0 GHz -64.113 dBm
4 N 1 f 2.494 5 GHz -62.640 dBm

8 NUMBER OF HOPPING FREQUENCY

8.1 MEASUREMENT PROCEDURE

The EUT shall have its hopping function enabled. Use the following spectrum analyzer settings:

1. Span: The frequency band of operation. Depending on the number of channels the device supports, it may be necessary to divide the frequency range of operation across multiple spans, to allow the individual channels to be clearly seen.
2. RBW: To identify clearly the individual channels, set the RBW to less than 30% of the channel spacing or the 20 dB bandwidth, whichever is smaller.
3. VBW ≥ RBW. Sweep: Auto. Detector function: Peak. Trace: Max hold.
4. Allow the trace to stabilize.

8.2 TEST SET-UP (BLOCK DIAGRAM OF CONFIGURATION)

Refer to Section 3.1.

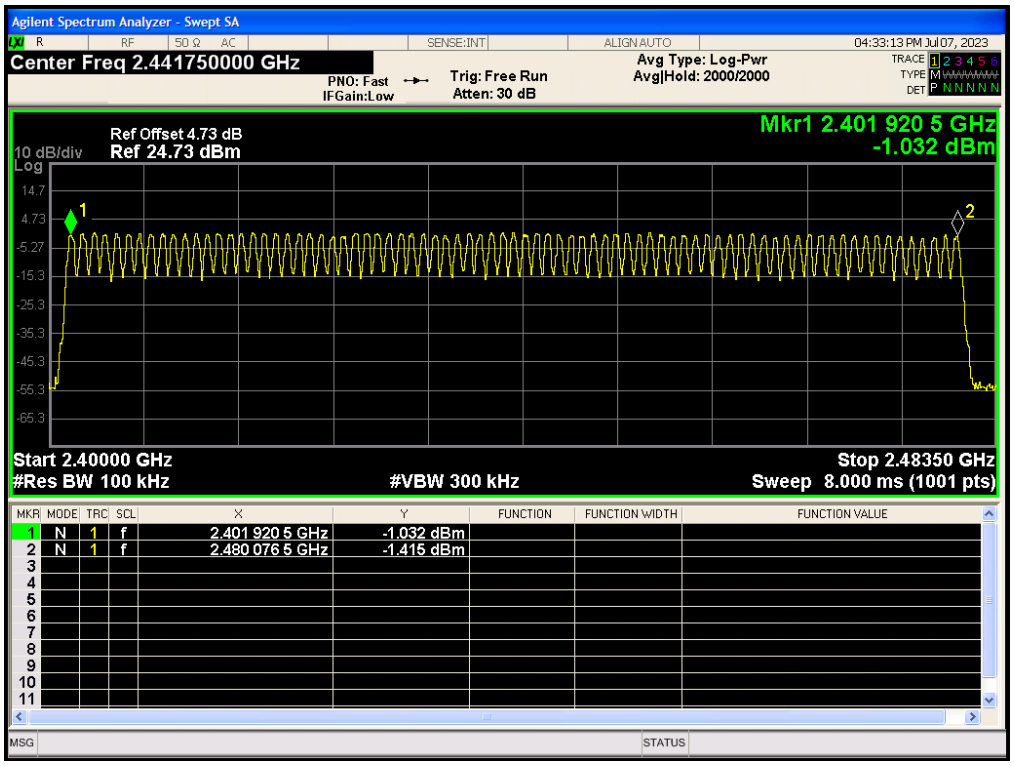
8.3 MEASUREMENT EQUIPMENT USED

Refer to Section 3.4.

8.4 LIMITS AND MEASUREMENT RESULT

Total No. of Hopping Channel	Limit (No. of CH)	Measurement (No. of CH)	Result
	>=15	79	Pass

TEST PLOT FOR NO. OF TOTAL CHANNELS



Note: The 8DPSK modulation is the worst case and recorded in the report.

9 TIME OF OCCUPANCY (DWELL TIME)

9.1 MEASUREMENT PROCEDURE

The EUT shall have its hopping function enabled. Use the following spectrum analyzer settings:
1. Span: Zero span, centered on a hopping channel.
2. RBW shall be≤channel spacing and where possible RBW should be set >> 1 / T, where T is the expected dwell time per channel.
3. Sweep: As necessary to capture the entire dwell time per hopping channel; where possible use a video trigger and trigger delay so that the transmitted signal starts a little to the right of the start of the plot. The trigger level might need slight adjustment to prevent triggering when the system hops on an adjacent channel; a second plot might be needed with a longer sweep time to show two successive hops on a channel.
4. Detector function: Peak. Trace: Max hold.
5. Use the marker-delta function to determine the transmit time per hop.
6. Repeat the measurement using a longer sweep time to determine the number of hops over the period specified in the requirements. The sweep time shall be equal to, or less than, the period specified in the requirements. Determine the number of hops over the sweep time and calculate the total number of hops in the period specified in the requirements, using the following equation:
(Number of hops in the period specified in the requirements) = (number of hops on spectrum analyzer) × (period specified in the requirements / analyzer sweep time)
7. The average time of occupancy is calculated from the transmit time per hop multiplied by the number of hops in the period specified in the requirements.

9.2 TEST SETUP (BLOCK DIAGRAM OF CONFIGURATION)

Refer to Section 3.1.

9.3 MEASUREMENT EQUIPMENT USED

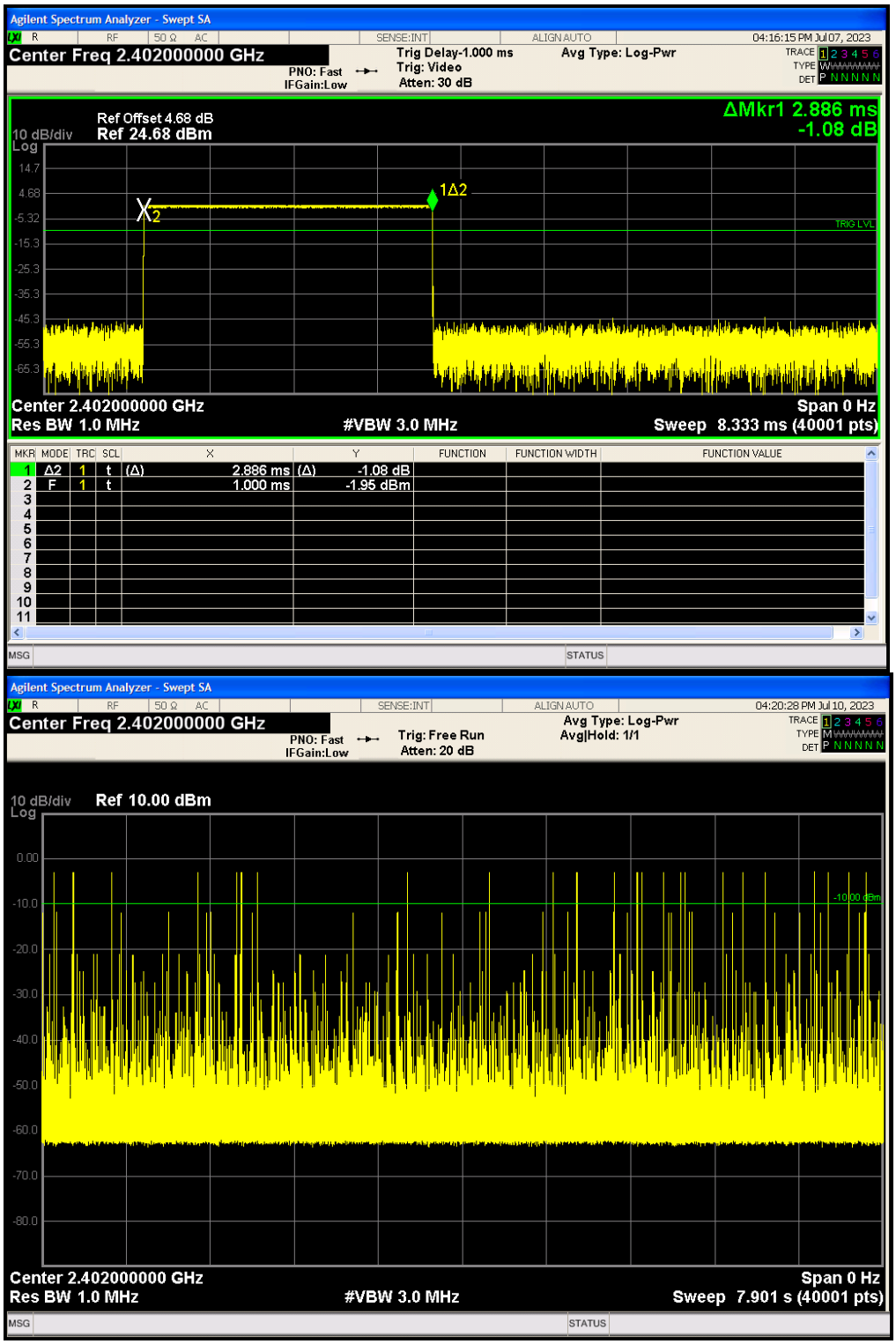
Refer to Section 3.4.

9.4 LIMITS AND MEASUREMENT RESULT

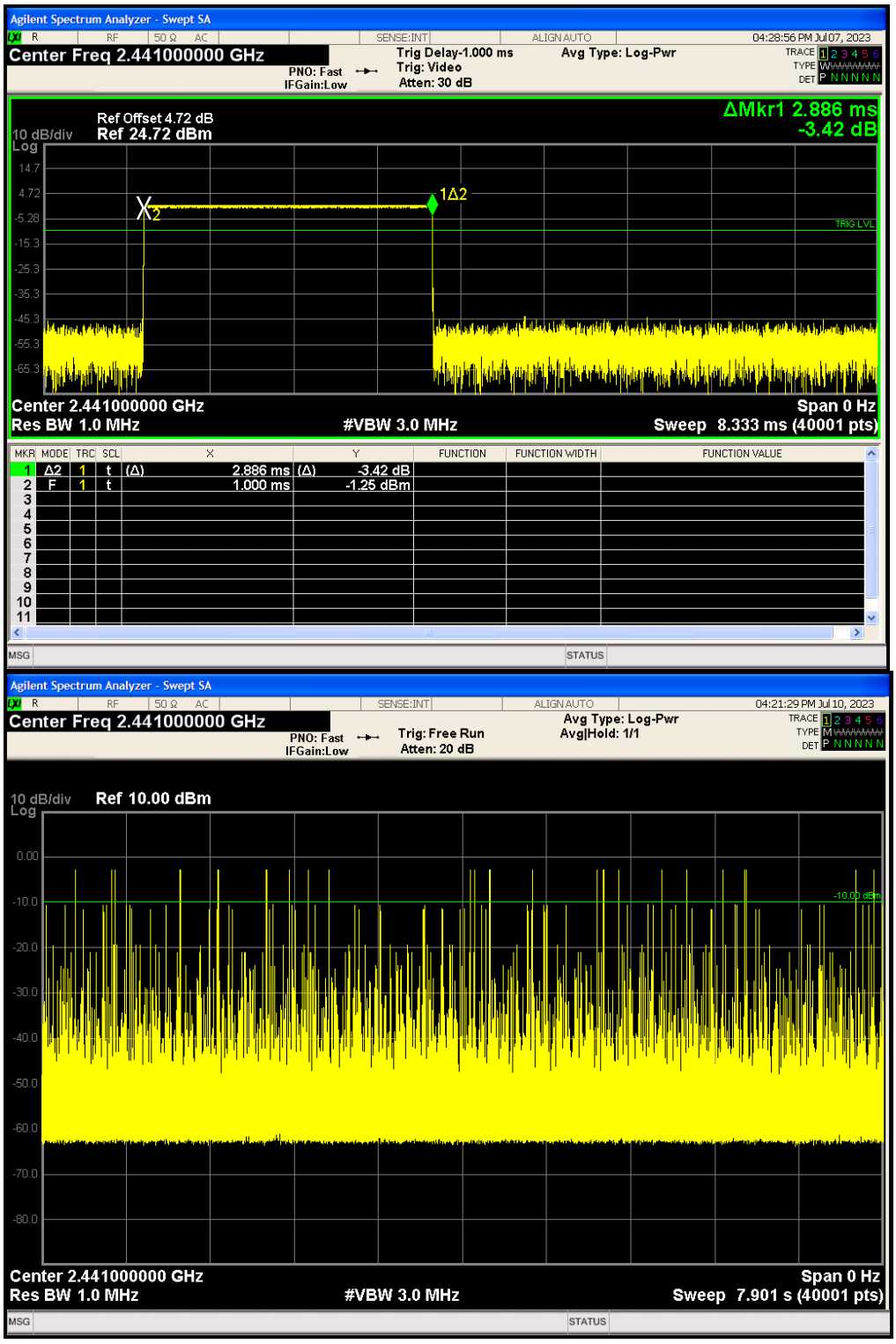
Channel	Time of Pulse (ms)	Number of hops in the period specified in the requirements	Sweep Time (ms)	Limit (ms)
Low	2.886	24*4	277.056	400
Middle	2.886	22*4	253.968	400
High	2.886	28*4	323.232	400

Note: The 8DPSK modulation is the worst case and recorded in the report.

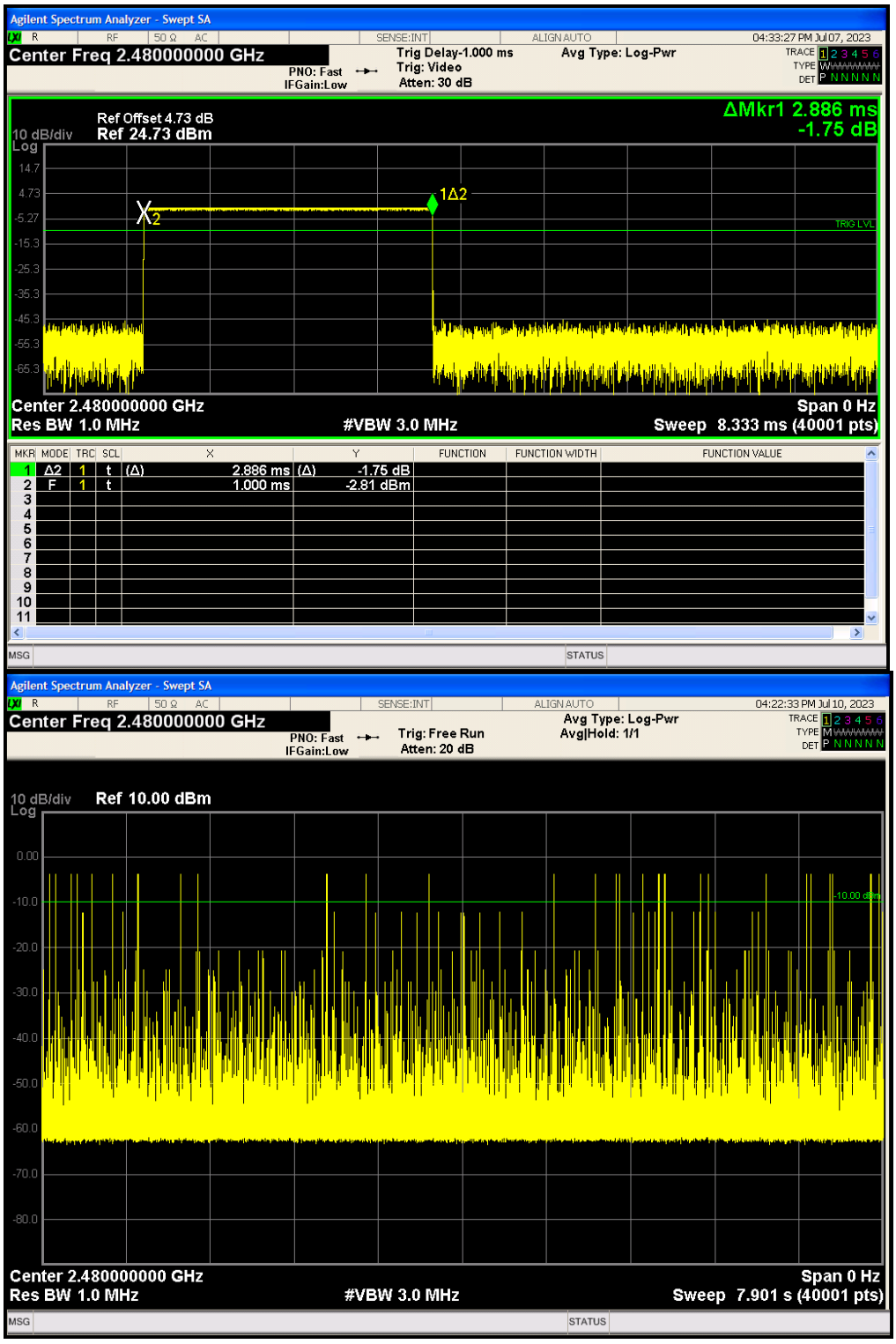
TEST PLOT OF LOW CHANNEL



TEST PLOT OF MIDDLE CHANNEL



TEST PLOT OF HIGH CHANNEL



10 FREQUENCY SEPARATION

10.1 MEASUREMENT PROCEDURE

The EUT shall have its hopping function enabled. Use the following spectrum analyzer settings:

1. Span: Wide enough to capture the peaks of two adjacent channels.
2. RBW: Start with the RBW set to approximately 30% of the channel spacing; adjust as necessary to best identify the center of each individual channel.
3. Video (or average) bandwidth (VBW) ≥ RBW.
4. Sweep: Auto. e) Detector function: Peak. f) Trace: Max hold. g) Allow the trace to stabilize. Use the marker-delta function to determine the separation between the peaks of the adjacent channels.

10.2 TEST SETUP (BLOCK DIAGRAM OF CONFIGURATION)

Refer to Section 3.1.

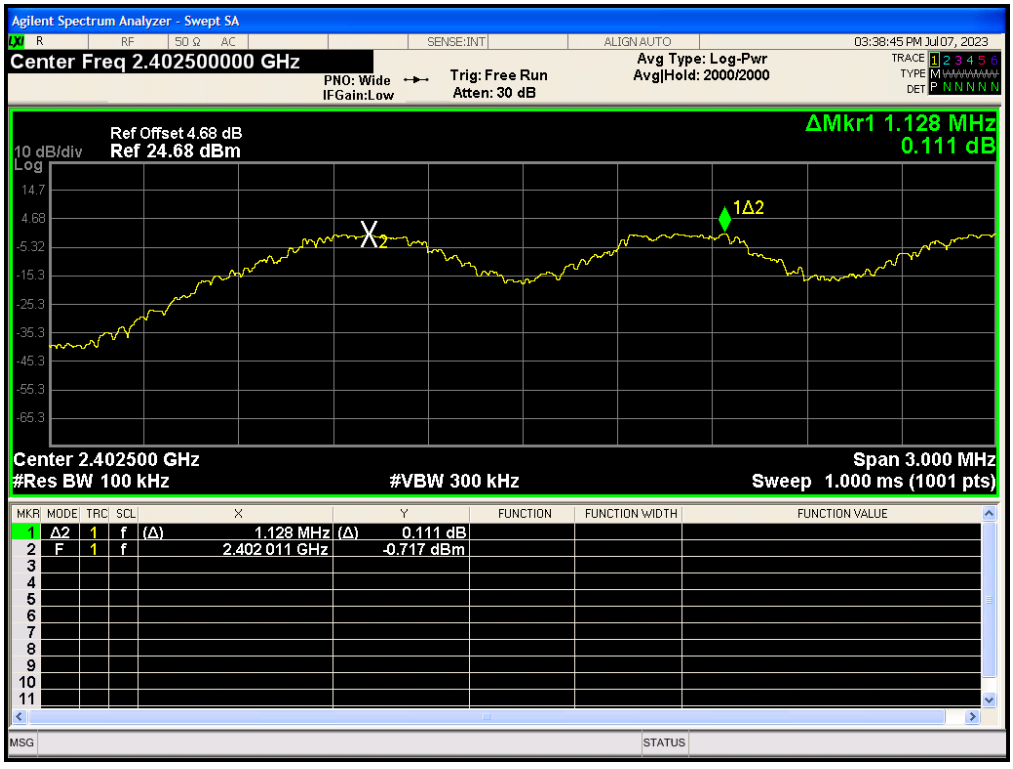
10.3 MEASUREMENT EQUIPMENT USED

Refer to Section 3.4.

10.4 LIMITS AND MEASUREMENT RESULT

Test Mode	Channel Separation	Limit (MHz)	Result
	MHz		
Hopping Mode	1.128	>= 0.839	Pass

TEST PLOT FOR FREQUENCY SEPARATION



Note: The 8DPSK modulation is the worst case and recorded in the report.

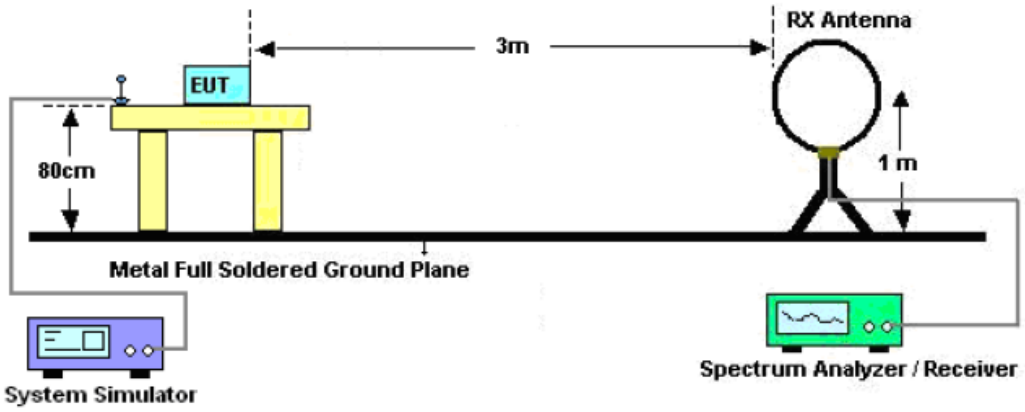
11 RADIATED EMISSION

11.1 MEASUREMENT PROCEDURE

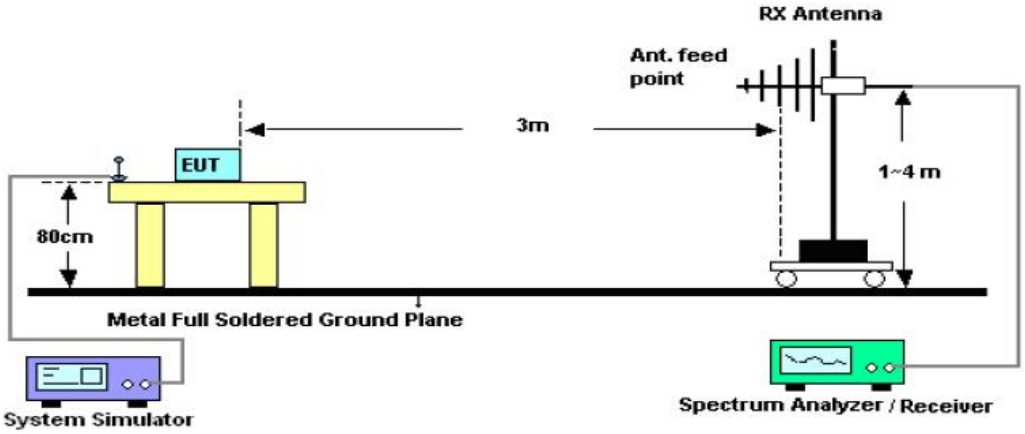
1. The EUT was placed on the top of the turntable 0.8 or 1.5 meter above ground. The phase center of the receiving antenna mounted on the top of a height-variable antenna tower was placed 3 meters far away from the turntable.
2. Power on the EUT and all the supporting units. The turntable was rotated by 360 degrees to determine the position of the highest radiation.
3. The height of the broadband receiving antenna was varied between one meter and four meters above ground to find the maximum emissions field strength of both horizontal and vertical polarization.
4. For each suspected emission, the antenna tower was scan (from 1 M to 4 M) and then the turntable was rotated (from 0 degree to 360 degrees) to find the maximum reading.
5. Set the test-receiver system to Peak or CISPR quasi-peak Detect Function with specified bandwidth under Maximum Hold Mode.
6. For emissions above 1GHz, use 1MHz RBW and 3MHz VBW for peak reading. Place the measurement antenna away from each area of the EUT determined to be a source of emissions at the specified measurement distance, while keeping the measurement antenna aimed at the source of emissions at each frequency of significant emissions, with polarization oriented for maximum response. The measurement antenna may have to be higher or lower than the EUT, depending on the radiation pattern of the emission and staying aimed at the emission source for receiving the maximum signal. The final measurement antenna elevation shall be that which maximizes the emissions. The measurement antenna elevation for maximum emissions shall be restricted to a range of heights of from 1 m to 4 m above the ground or reference ground plane.
7. When the radiated emissions limits are expressed in terms of the average value of the emissions, and pulsed operation is employed, the measurement field strength shall be determined by averaging over one complete pulse train, including blanking intervals, as long as the pulse train does not exceed 0.1 seconds. As an alternative (provided the transmitter operates for longer than 0.1 seconds) or in cases where the pulse train exceeds 0.1 seconds, the measured field strength shall be determined from the average absolute voltage during a 0.1 second interval during which the field strength is at its maximum values.
8. If the emissions level of the EUT in peak mode was 3 dB lower than the average limit specified, then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions which do not have 3 dB margin will be repeated one by one using the quasi-peak method for below 1GHz.
9. For testing above 1GHz, the emissions level of the EUT in peak mode was lower than average limit (that means the emissions level in peak mode also complies with the limit in average mode), then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions will be measured in average mode again and reported.
10. In case the emission is lower than 30MHz, loop antenna has to be used for measurement and the recorded data should be QP measured by receiver. High - Low scan is not required in this case.

11.2 TEST SETUP

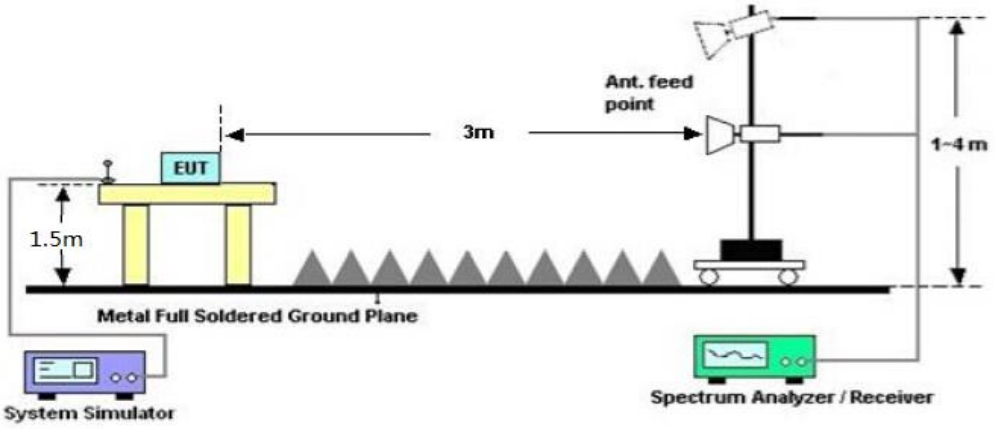
Radiated Emission Test-Setup Frequency Below 30MHz



RADIATED EMISSION TEST SETUP 30MHz-1000MHz



RADIATED EMISSION TEST SETUP ABOVE 1000MHz



11.3 LIMITS AND MEASUREMENT RESULT

RSS-Gen Limit in the below table has to be followed

Frequencies (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
0.009~0.490	2400/F(kHz)	300
0.490~1.705	24000/F(kHz)	30
1.705~30.0	30	30
30~88	100	3
88~216	150	3
216~960	200	3
Above 960	500	3

Note: All modes were tested for restricted band radiated emission, the test records reported below are the worst result compared to other modes.

The following table is the setting of spectrum analyzer and receiver.

Spectrum Parameter	Setting
Start ~Stop Frequency	9KHz~150KHz/RB 200Hz for QP
Start ~Stop Frequency	150KHz~30MHz/RB 9KHz for QP
Start ~Stop Frequency	30MHz~1000MHz/RB 120KHz for QP
Start ~Stop Frequency	1GHz~26.5GHz 1MHz/3MHz for Peak, 1MHz/3MHz for Average

Receiver Parameter	Setting
Start ~Stop Frequency	9KHz~150KHz/RB 200Hz for QP
Start ~Stop Frequency	150KHz~30MHz/RB 9KHz for QP
Start ~Stop Frequency	30MHz~1000MHz/RB 120KHz for QP

11.4 TEST RESULT

PASS

Remark:

1. All modes were test at Low, Middle, and High channel, only the worst result of 8DPSK Low Channel was reported for below 1GHz test.
2. By preliminary testing and verifying three axis (X, Y and Z) position of EUT transmitted status, it was found that "X axis" position was the worst, and test data recorded in this report.
3. Radiated emission test from 9kHz to 10th harmonic of fundamental was verified, and no emission found except system noise floor in 9kHz to 30MHz and not recorded in this report.

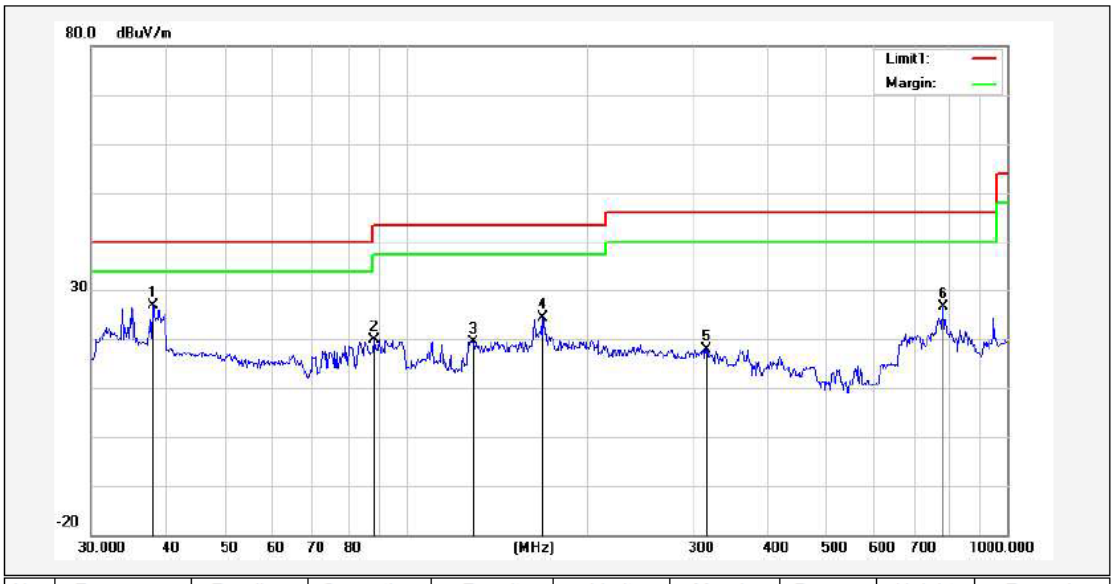
Below 1GHz Test Results:

Temperature:	24℃	Relative Humidity:	48%
Test Date:	Jun. 13, 2023	Pressure:	1010hPa
Test Voltage:	DC 24V	Phase:	Horizontal
Test Mode:	Transmitting mode of 8DPSK 2402MHz		

No.	Frequency (MHz)	Reading (dBuV)	Correction factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree (deg.)	Height (cm)	Remark
1	45.5347	47.10	-18.35	28.75	40.00	-11.25	147	100	peak
2*	79.5207	55.73	-20.79	34.94	40.00	-5.06	269	100	peak
3	88.0327	51.06	-20.76	30.30	43.50	-13.20	203	100	peak
4	205.6750	52.57	-16.72	35.85	43.50	-7.65	194	100	peak
5	656.5300	38.46	-8.77	29.69	46.00	-16.31	112	100	peak
6	790.6186	35.81	-6.85	28.96	46.00	-17.04	96	100	peak

Remark: Result = Reading Level + Factor, Margin = Result– Limit
Factor = Ant. Factor + Cable Loss – Pre-amplifier

Temperature:	24℃	Relative Humidity:	48%
Test Date:	Jun. 13, 2023	Pressure:	1010hPa
Test Voltage:	DC 24V	Phase:	Vertical
Test Mode:	Transmitting mode of 8DPSK 2402MHz		



No.	Frequency (MHz)	Reading (dBuV)	Correction factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree (deg.)	Height (cm)	Remark
1*	37.9450	40.12	-13.32	26.80	40.00	-13.20	353	100	peak
2	88.3421	40.72	-20.76	19.96	43.50	-23.54	194	100	peak
3	129.4678	35.45	-16.00	19.45	43.50	-24.05	182	100	peak
4	168.4138	41.29	-16.84	24.45	43.50	-19.05	96	100	peak
5	315.4807	32.73	-14.78	17.95	46.00	-28.05	53	100	peak
6	782.3451	33.68	-7.16	26.52	46.00	-19.48	21	100	peak

Remark: Result = Reading Level + Factor, Margin = Result – Limit
Factor = Ant. Factor + Cable Loss – Pre-amplifier

Remark：

1. Measuring frequencies from 9 kHz to the 1 GHz, Radiated emission test from 9kHz to 30MHzwas verified, and no any emission was found except system noise floor.
2. * denotes emission frequency which appearing within the Restricted Bands specified in provision of 15.205, then the general radiated emission limits in 15.209 apply.
3. The IF bandwidth of EMI Test Receiver between 30MHz to 1GHz was 120kHz, 1 MHz for measuring above 1 GHz, below 30MHz was 10kHz.

Above 1 GHz Test Results:

GFSK Modulation:
CH00 (2402MHz)

Horizontal:

Frequency	Reading Result	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
4804	50.37	-3.64	46.73	74	-27.27	PK
4804	38.62	-3.64	34.98	54	-19.02	AV
7206	45.73	-0.95	44.78	74	-29.22	PK
7206	33.94	-0.95	32.99	54	-21.01	AV
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier. Margin = Emission Level – Limit						

Vertical:

Frequency	Reading Result	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
4804	49.41	-3.64	45.77	74	-28.23	PK
4804	36.45	-3.64	32.81	54	-21.19	AV
7206	45.34	-0.95	44.39	74	-29.61	PK
7206	34.62	-0.95	33.67	54	-20.33	AV
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier. Margin = Emission Level – Limit						

CH39 (2441MHz)

Horizontal:

Frequency	Reading Result	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
4882	48.43	-3.51	44.92	74	-29.08	PK
4882	37.24	-3.51	33.73	54	-20.27	AV
7323	45.67	-0.82	44.85	74	-29.15	PK
7323	33.82	-0.82	33	54	-21	AV
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier. Margin = Emission Level – Limit						

Vertical:

Frequency	Reading Result	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
4882	48.37	-3.51	44.86	74	-29.14	PK
4882	37.52	-3.51	34.01	54	-19.99	AV
7323	45.43	-0.82	44.61	74	-29.39	PK
7323	35.31	-0.82	34.49	54	-19.51	AV
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier. Margin = Emission Level – Limit						

CH78 (2480MHz)

Horizontal:

Frequency	Reading Result	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
4960	49.12	-3.43	45.69	74	-28.31	PK
4960	37.37	-3.43	33.94	54	-20.06	AV
7440	45.25	-0.75	44.5	74	-29.5	PK
7440	34.33	-0.75	33.58	54	-20.42	AV
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier. Margin = Emission Level – Limit						

Vertical:

Frequency	Reading Result	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
4960	49.22	-3.43	45.79	74	-28.21	PK
4960	36.53	-3.43	33.1	54	-20.9	AV
7440	46.65	-0.75	45.9	74	-28.1	PK
7440	33.73	-0.75	32.98	54	-21.02	AV
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier. Margin = Emission Level – Limit						

π/4 DQPSK Modulation:
CH00 (2402MHz)

Horizontal:

Frequency	Reading Result	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
4804	49.11	-3.64	45.47	74	-28.53	PK
4804	37.38	-3.64	33.74	54	-20.26	AV
7206	45.74	-0.95	44.79	74	-29.21	PK
7206	34.04	-0.95	33.09	54	-20.91	AV
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier. Margin = Emission Level – Limit						

Vertical:

Frequency	Reading Result	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
4804	48.45	-3.64	44.81	74	-29.19	PK
4804	37.27	-3.64	33.63	54	-20.37	AV
7206	45.31	-0.95	44.36	74	-29.64	PK
7206	34.32	-0.95	33.37	54	-20.63	AV
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier. Margin = Emission Level – Limit						

CH39 (2441MHz)

Horizontal:

Frequency	Reading Result	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
4882	49.83	-3.51	46.32	74	-27.68	PK
4882	37.46	-3.51	33.95	54	-20.05	AV
7323	46.75	-0.82	45.93	74	-28.07	PK
7323	34.34	-0.82	33.52	54	-20.48	AV
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier. Margin = Emission Level – Limit						

Vertical:

Frequency	Reading Result	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
4882	49.85	-3.51	46.34	74	-27.66	PK
4882	36.44	-3.51	32.93	54	-21.07	AV
7323	46.67	-0.82	45.85	74	-28.15	PK
7323	35.28	-0.82	34.46	54	-19.54	AV
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier. Margin = Emission Level – Limit						

CH78 (2480MHz)

Horizontal:

Frequency	Reading Result	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
4960	49.75	-3.43	46.32	74	-27.68	PK
4960	37.46	-3.43	34.03	54	-19.97	AV
7440	46.37	-0.75	45.62	74	-28.38	PK
7440	35.12	-0.75	34.37	54	-19.63	AV
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier. Margin = Emission Level – Limit						

Vertical:

Frequency	Reading Result	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
4960	49.95	-3.43	46.52	74	-27.48	PK
4960	36.57	-3.43	33.14	54	-20.86	AV
7440	45.71	-0.75	44.96	74	-29.04	PK
7440	34.34	-0.75	33.59	54	-20.41	AV
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier. Margin = Emission Level – Limit						

8DPSK Modulation:
CH00 (2402MHz)

Horizontal:

Frequency	Reading Result	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
4804	48.95	-3.64	45.31	74	-28.69	PK
4804	37.14	-3.64	33.5	54	-20.5	AV
7206	45.78	-0.95	44.83	74	-29.17	PK
7206	35.55	-0.95	34.6	54	-19.4	AV
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier. Margin = Emission Level – Limit						

Vertical:

Frequency	Reading Result	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
4804	47.15	-3.64	43.51	74	-30.49	PK
4804	37.96	-3.64	34.32	54	-19.68	AV
7206	45.87	-0.95	44.92	74	-29.08	PK
7206	35.43	-0.95	34.48	54	-19.52	AV
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier. Margin = Emission Level – Limit						

CH39 (2441MHz)

Horizontal:

Frequency	Reading Result	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
4882	49.44	-3.51	45.93	74	-28.07	PK
4882	39.42	-3.51	35.91	54	-18.09	AV
7323	45.73	-0.82	44.91	74	-29.09	PK
7323	33.77	-0.82	32.95	54	-21.05	AV
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier. Margin = Emission Level – Limit						

Vertical:

Frequency	Reading Result	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
4882	47.57	-3.51	44.06	74	-29.94	PK
4882	37.24	-3.51	33.73	54	-20.27	AV
7323	45.75	-0.82	44.93	74	-29.07	PK
7323	33.83	-0.82	33.01	54	-20.99	AV
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier. Margin = Emission Level – Limit						

CH78 (2480MHz)

Horizontal:

Frequency	Reading Result	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
4960	48.33	-3.43	44.9	74	-29.1	PK
4960	37.15	-3.43	33.72	54	-20.28	AV
7440	43.87	-0.75	43.12	74	-30.88	PK
7440	33.77	-0.75	33.02	54	-20.98	AV
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier. Margin = Emission Level – Limit						

Vertical:

Frequency	Reading Result	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
4960	47.33	-3.43	43.9	74	-30.1	PK
4960	37.92	-3.43	34.49	54	-19.51	AV
7440	43.96	-0.75	43.21	74	-30.79	PK
7440	33.74	-0.75	32.99	54	-21.01	AV
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier. Margin = Emission Level – Limit						

Remark:

1. Measuring frequencies from 1 GHz to the 25 GHz.
2. “F” denotes fundamental frequency; “H” denotes spurious frequency. “E” denotes band edge frequency.
3. * denotes emission frequency which appearing within the Restricted Bands specified in provision of 15.205, then the general radiated emission limits in 15.209 apply.
4. Data of measurement within this frequency range shown “--- ” in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
5. The IF bandwidth of EMI Test Receiver between 30MHz to 1GHz was 120kHz, 1 MHz for measuring above 1 GHz, below 30MHz was 10kHz. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and video bandwidth is 3MHz for peak measurement with peak detector at frequency above 1GHz. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and video bandwidth is 10Hz for Average measurement with peak detection at frequency above 1GHz.
6. When the test results of Peak Detected below the limits of Average Detected, the Average Detected is not need completed. For example: Top Channel at Fundamental 73.16dBuV/m(PK Value) <93.98(AV Limit), at harmonic 53.20 dBuV/m(PK Value) <54 dBuV/m(AV Limit), the Average Detected not need to completed.
7. For fundamental frequency, RBW>20dB Bandwidth, VBW>=3*RBW, Peak detector for PK value, RMS detector for AV value.

Band Edge:

Operation Mode: TX CH00 (2402MHz)

Horizontal:

Frequency (MHz)	Reading Result (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
2310	43.36	-5.81	37.55	74	-36.45	PK
2310	/	-5.81	/	54	/	AV
2390	43.02	-5.84	37.18	74	-36.82	PK
2390	/	-5.84	/	54	/	AV
2400	44.16	-5.84	38.32	74	-35.68	PK
2400	/	-5.84	/	54	/	AV
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

Vertical:

Frequency (MHz)	Reading Result (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
2310	44.25	-5.81	38.44	74	-35.56	PK
2310	/	-5.81	/	54	/	AV
2390	44.08	-5.84	38.24	74	-35.76	PK
2390	/	-5.84	/	54	/	AV
2400	45.32	-5.84	39.48	74	-34.52	PK
2400	/	-5.84	/	54	/	AV
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

Operation Mode: TX CH78 (2480MHz)

Horizontal:

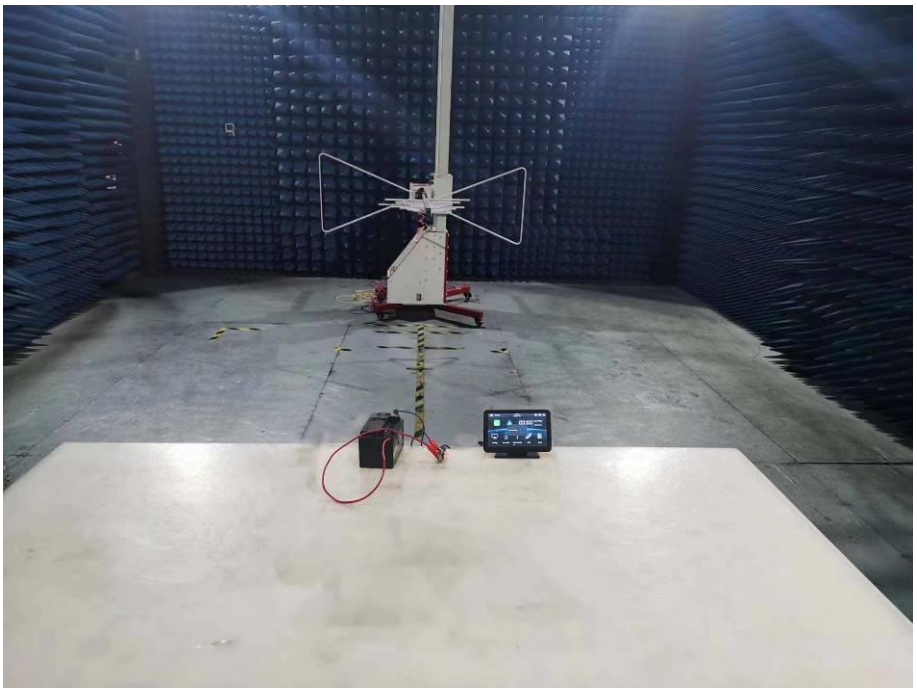
Frequency (MHz)	Reading Result (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
2483.5	44.82	-5.65	39.17	74	-34.83	PK
2483.5	/	-5.65	/	54	/	AV
2500	44.16	-5.72	38.44	74	-35.56	PK
2500	/	-5.72	/	54	/	AV
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

Vertical:

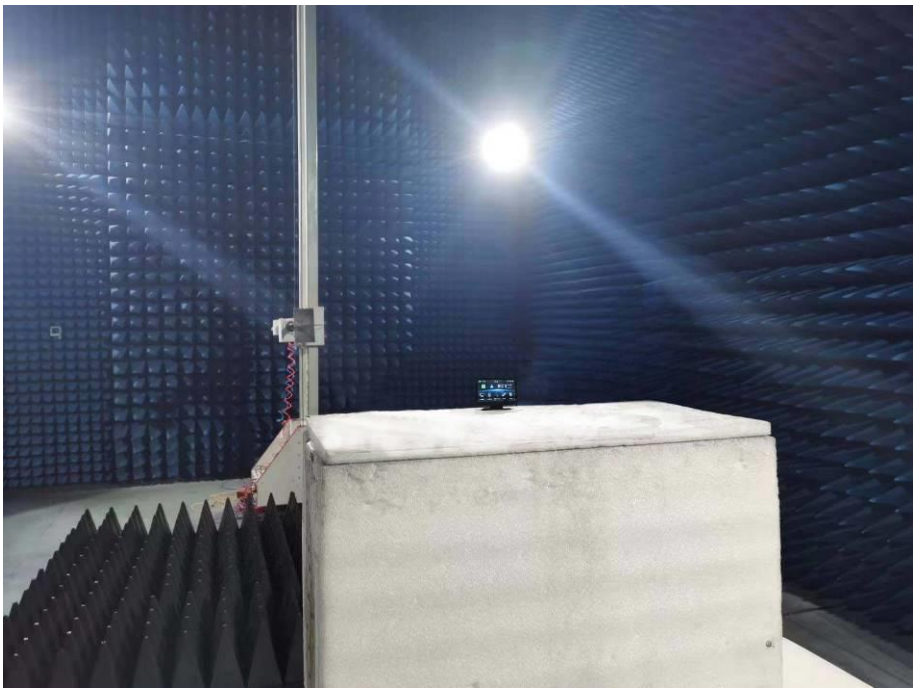
Frequency (MHz)	Reading Result (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
2483.5	45.57	-5.65	39.92	74	-34.08	PK
2483.5	/	-5.65	/	54	/	AV
2500	45.26	-5.72	39.54	74	-34.46	PK
2500	/	-5.72	/	54	/	AV
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

12 PHOTOGRAPH OF TEST

Radiated Emission



30MHz-1000MHz

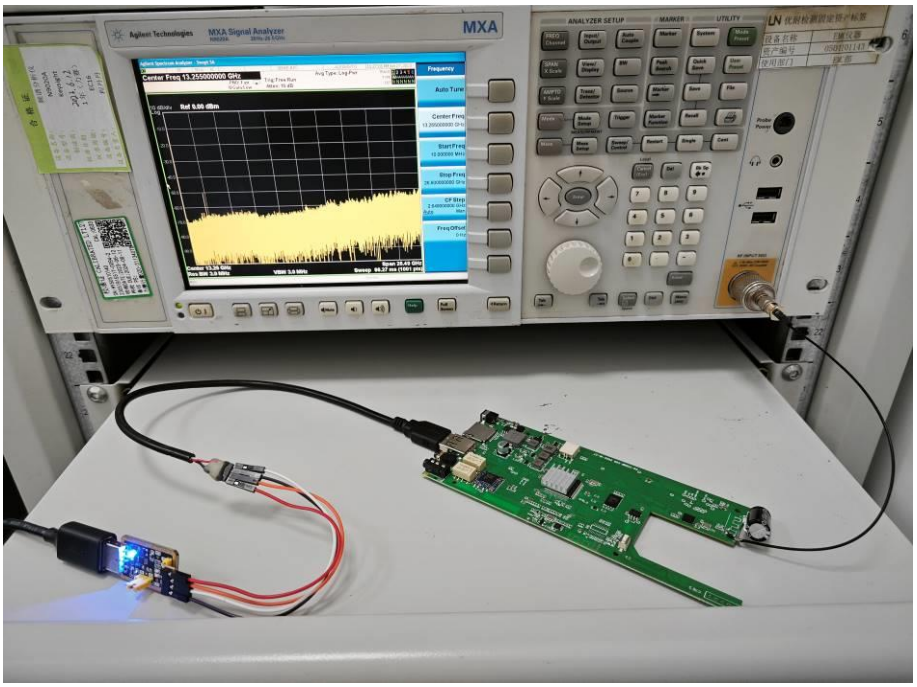


Above 1GHz

Conducted Emission

N/A

RF Conducted



*************************End of Report*************************