

TEST REPORT

Applicant : D2G Group LLC
Address : 81 Commerce Drive, Fall River, Massachusetts 02720, United States
Manufacturer : GUANGZHOU YOUGUANG OPTOELECTRONICS CO., LTD.
Address : No.75, Pacific Ind. Zone, Xingtang Town, Zengcheng, Guangzhou, 511340 China
Product Name : 43-inch Non-Touch Digital Signage Cash Wrap 140s
Model Number : DE043NLW14, DE043NLW
Trademark : N/A
FCC ID : 2ASCB-DE043NLW14
Test Date : Jul. 28, 2026
Date of Report : Jul. 28, 2026 to Sep. 03, 2026

Test Result : This device described above has been tested by NTT, and the test results show that the equipment under test (EUT) is in compliance with the Standard requirements. And it is applicable only to the tested sample identified in the report.

Test Procedure Used:

Standards : FCC CFR Title 47 Part 15 Subpart C Section 15.247
ANSI C63.10-2020 + Cor. 1-2023+C63.10a-2024 + Errata to C63.10a-2024
KDB 558074 D01 15.247 Meas Guidance v05r02

Prepared by (Test Engineer):
Zhao Di

Reviewer (Supervisor):
Ken Wu

Approved (Manager):
Abel Yu

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1. General Information

1.1. Description of Device (EUT)

EUT Name	:	43-inch Non-Touch Digital Signage Cash Wrap 140s
Model No.	:	DE043NLW14, DE043NLW
Model Difference	:	All the model are the same circuit and RF module, only the names and appearance colors are different. Test sample model: DE043NLW14
Power supply	:	AC 120V/60Hz
Operation frequency	:	2402-2480MHz
Modulation	:	GFSK, $\pi/4$ DQPSK, 8DPSK
Antenna Type	:	Rubber rod antenna, Maximum Gain is 2.57dBi
Intend use environment	:	Residential, commercial and light industrial environment

1.2. Channel List

Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
0	2402	1	2403	2	2404	3	2405
4	2406	5	2407	6	2408	7	2409
8	2410	9	2411	10	2412	11	2413
12	2414	13	2415	14	2416	15	2417
16	2418	17	2419	18	2420	19	2421
20	2422	21	2423	22	2424	23	2425
24	2426	25	2427	26	2428	27	2429
28	2430	29	2431	30	2432	31	2433
32	2434	33	2435	34	2436	35	2437
36	2438	37	2439	38	2440	39	2441
40	2442	41	2443	42	2444	43	2445
44	2446	45	2447	46	2448	47	2449
48	2450	49	2451	50	2452	51	2453
52	2454	53	2455	54	2456	55	2457
56	2458	57	2459	58	2460	59	2461
60	2462	61	2463	62	2464	63	2465
64	2466	65	2467	66	2468	67	2469
68	2470	69	2471	70	2472	71	2473
72	2474	73	2475	74	2476	75	2477
76	2478	77	2479	78	2480	-	-

1.3. Summary of test result

RF PART		
Test Items	Test Requirement	Result
Radiated Spurious Emissions	15.205(a) 15.209 15.247(d)	PASS
Band edge	15.247(d) 15.205(a)	PASS
Conduct Emission	15.207	PASS
20dB Bandwidth 99% Occupied Bandwidth	15.247(a)(1)	PASS
Maximum Peak Output Power	15.247(b)(1)	PASS
Frequency Separation	15.247(a)(1)	PASS
Number of Hopping Frequency	15.247(a)(1)(iii)	PASS
Dwell time	15.247(a)(1)(iii)	PASS
Antenna Requirement	15.203	PASS
Remark: N/A is an abbreviation for Not Applicable. Measurement Uncertainty is not taken into account for conformity statement.		

1.4. Special Accessories and Auxiliary Equipment

Description	Manufacturer	Model No.	Hardware Version	Software Version
Adapter	/	/	/	/
Laptop	DELL	Vostro 5490	/	/
cable	/	/	/	/

1.5. Test mode

The special RF test software was used to control EUT work in Continuous BT TX mode, and select test channel, wireless mode.

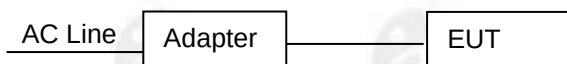
Test mode	Low channel	Middle channel	High channel
GFSK	2402MHz	2441MHz	2480MHz
Π/4-DQPSK	2402MHz	2441MHz	2480MHz
8DPSK	2402MHz	2441MHz	2480MHz
Note: Only the worst Data DH1/2DH1/3DH1 Record in the report			

1.6. Test configuration

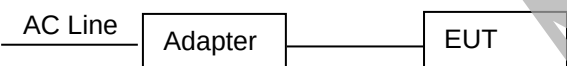
Transmitting mode	Keep the EUT in continuously transmitting mode.
Remark: During the test, the test voltage was tuned from 85% to 115% of the nominal rated supply voltage, and found that the worst case was under the nominal rated supply condition. So the report just shows that condition's data.	
Test Software	set_txtone
Power level setup	Default

1.7. Block Diagram

Conducted Emission



Radiated Emission



RF Conducted Test



1.8. Test Conditions

Category	Normal Conditions	Extreme Conditions
Temperature range	15-35℃	N/A
Humidity range	20-75%	N/A
Pressure range	86-106kPa	N/A
Power supply	AC 120V	N/A
Note: N/A is an abbreviation for Not Applicable.		

1.9. Measurement Uncertainty (95% confidence levels, k=2)

Parameter	Uncertainty
RF output power, conducted	±1.0dB
Power Spectral Density, conducted	±2.2dB
Radio Frequency	± 1 x 10 ⁻⁶
Bandwidth	± 1.5 x 10 ⁻⁶
Time	±2%
Duty Cycle	±2%
Temperature	±1°C
Humidity	±5%
DC and low frequency voltages	±3%
Conducted Emissions (150kHz~30MHz)	±3.64dB
Radiated Emission(9KHz~30MHz)	±4.51dB
Radiated Emission(30MHz~1GHz)	±5.03dB
Radiated Emission(1GHz~25GHz)	±4.74dB
Remark:When making a conformity declaration based on test results for regulations/standards or specifications,the default is to use Clause 4.2.1of ILAC-G8:09/2019 and the guidelines on decision rules and conformity declaration in IEC Guide 115:2023.	

1.10. Test Facility

Site Description	
Name of Firm	: Shenzhen NTT Testing Technology Co.,Ltd.
Site Location	: 1B, Building 2, Factory Building & 103, Building 3, Factory Building, Dayang Industrial Park, No.4, Industrial Avenue, Tangwei Community, Fuhai Sub-district, Bao 'an District, Shenzhen City, Guangdong, China
FCC Designation Number	: CN3446
FCC Test Firm Registration Number	: 129414

1.11. Test Equipment

Conducted Test Site

Name	Model No.	Serial No.	Manufacturer	Date of Cal.	Due Date
944 Shielded Room	HSRCE944	/	HTEC	2025/4/30	2028/4/29
EMI Test Receiver	ESPI	/	RS	2025/9/8	2026/9/7
LISN	NNLK 8129	00603	Schwarzbeck	2025/9/8	2026/9/7
LISN	NNHV 8123-400	00694	Schwarzbeck	2025/9/8	2026/9/7
LISN	NNHV 8123-400	00680	Schwarzbeck	2025/9/8	2026/9/7
Cable	RG223-1500MM	NA	RG	2025/9/8	2026/9/7

Radiated Test Site(Below 1G and Above 1G)&RF Test Site

Name	Model No.	Serial No.	Manufacturer	Date of Cal.	Due Date
966 Shielded Room	966 Room	/	EMToni	2025/7/24	2028/7/23
EMI Test Receiver	ESCI	101018	RS	2025/9/8	2026/9/7
Amplifi (30MHz-1GHz)	BBV 9718D	00042	SCHWARZBECK	2025/9/8	2026/9/7
Bilog Antenna (30MHz-1GHz)	VULB9168	1858	SCHWARZBECK	2025/9/9	2026/9/8
Horn antenna (1GHz-18GHz)	BBHA 9120 D	02622	SCHWARZBECK	2025/9/9	2026/9/8
Pream plifier (1GHz-18GHz)	BBV 9718D	0024	SCHWARZBECK	2025/9/8	2026/9/7
Spectrum Analyze (10Hz-40GHz)	FSV 40	100952	Rohde & Schwarz	2025/9/8	2026/9/7
Pream plifier (18GHz-40GHz)	BBV 9721	0056	SCHWARZBECK	2025/9/8	2026/9/7
Double Ridge Guide Horn Antenna (18GHz-40GHz)	SAS 574	588	A.H.System	2025/9/8	2026/9/7
Loop Antenna (9KHz-30MHz)	FMZB1519B	014	SCHWARZBECK	2025/9/8	2026/9/7
Amplifier (9KHz-30MHz)	CVP 9222 C	00109	SCHWARZBECK	2025/9/8	2026/9/7
MXG Signal Analyzer	N9020A	MY50510202	Agilent	2025/9/8	2026/9/7

MXG Vector Signal Generator	N5182A	MY50140020	Agilent	2025/9/8	2026/9/7
MXG Analog Signal Generator	N5181A	MY47420919	Agilent	2025/9/8	2026/9/7
Power Sensor	TR1029-2	512364	Techoy	2025/9/8	2026/9/7
RF Swith	TR1029-1	512364	Techoy	2025/9/8	2026/9/7
Cable	DA800-4000MM	NA	DA	2025/9/8	2026/9/7
Cable	DA800-11000MM	NA	DA	2025/9/8	2026/9/7

Test software

Item	Name	Manufacturer	Model	Software version
1	EMC Conduction Test System	FALA	EZ-EMC	Ver.EMC-CON 3A1.1+
2	EMC radiation test system	FALA	EZ-EMC	Ver.FA-03A2 RE+
3	RF test system	TACHOY	RFTest	V1.0.0
4	RF communication test system	TACHOY	RFTest	V1.0.0

2. Conducted emission at the mains terminals test

2.1. Limit

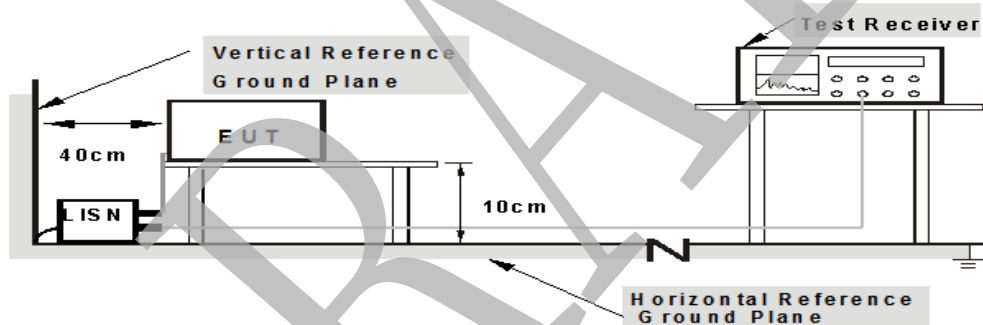
Test Requirement:	FCC Part15 C Section 15.207
Test Method:	ANSI C63.10-2020 + Cor. 1-2023+C63.10a-2024 + Errata to C63.10a-2024
Test Frequency Range:	150KHz to 30MHz
Receiver setup:	RBW=9KHz, VBW=30KHz, Sweep time=auto

Frequency MHz	Limits dB(μV)	
	Quasi-peak Level	Average Level
0.15 ~ 0.50	66 ~ 56*	56 ~ 46*
0.50 ~ 5.00	56	46
5.00 ~ 30.00	60	50

Notes: 1. *Decreasing linearly with logarithm of frequency.

2. The lower limit shall apply at the transition frequencies.

2.2. Test Setup



Note: 1. Support units were connected to second LISN.

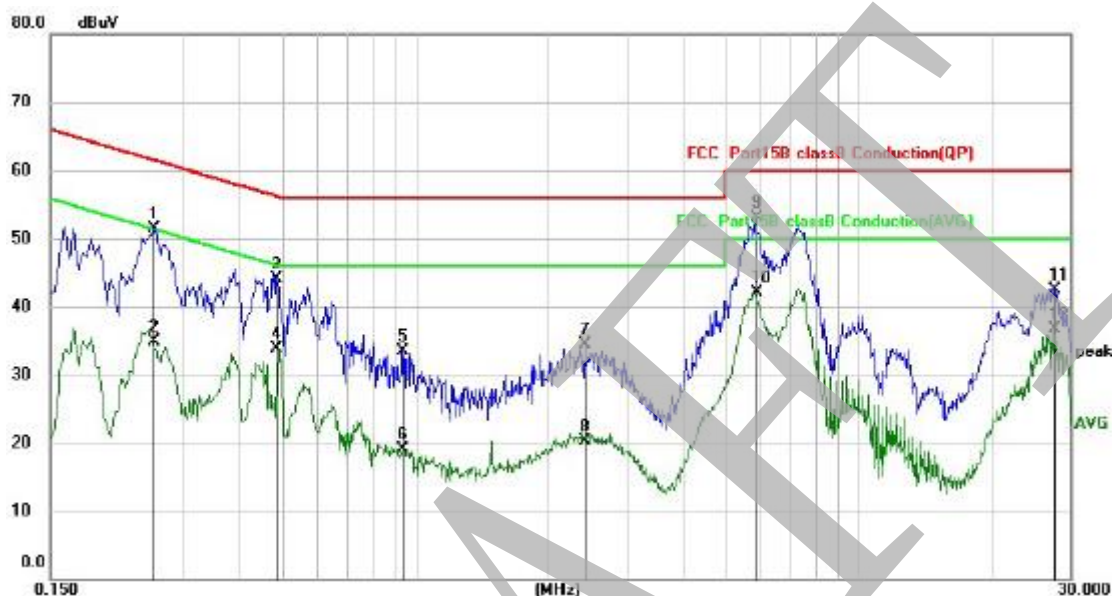
2. Both of LISNs (AMN) are 10 cm from EUT and at least 10 from other units and other metal planes

2.3. Test Procedure

1. The EUT was placed 0.1 meters from the horizontal ground plane with EUT being connected to the power mains through a line impedance stabilization network (LISN). All other support equipments powered from additional LISN(s). The LISN provide 50 Ohm/ 50uH of coupling impedance for the measuring instrument.
2. Interconnecting cables that hang closer than 40 cm to the ground plane shall be folded back and forth in the center forming a bundle 30 to 40 cm long.
3. I/O cables that are not connected to a peripheral shall be bundled in the center. The end of the cable may be terminated, if required, using the correct terminating impedance. The overall length shall not exceed 1 m.
4. LISN at least 80 cm from nearest part of EUT chassis.
5. For the actual test configuration, please refer to the related Item - EUT Test Photos.

2.4. Test Result

Conducted Emission At The Mains Terminals Test Data			
Temperature:	25.1℃	Relative Humidity:	56%
Pressure:	1008hPa	Phase :	Line
Test Voltage :	AC 120V/60Hz	Test Mode:	GFSK(CH00)



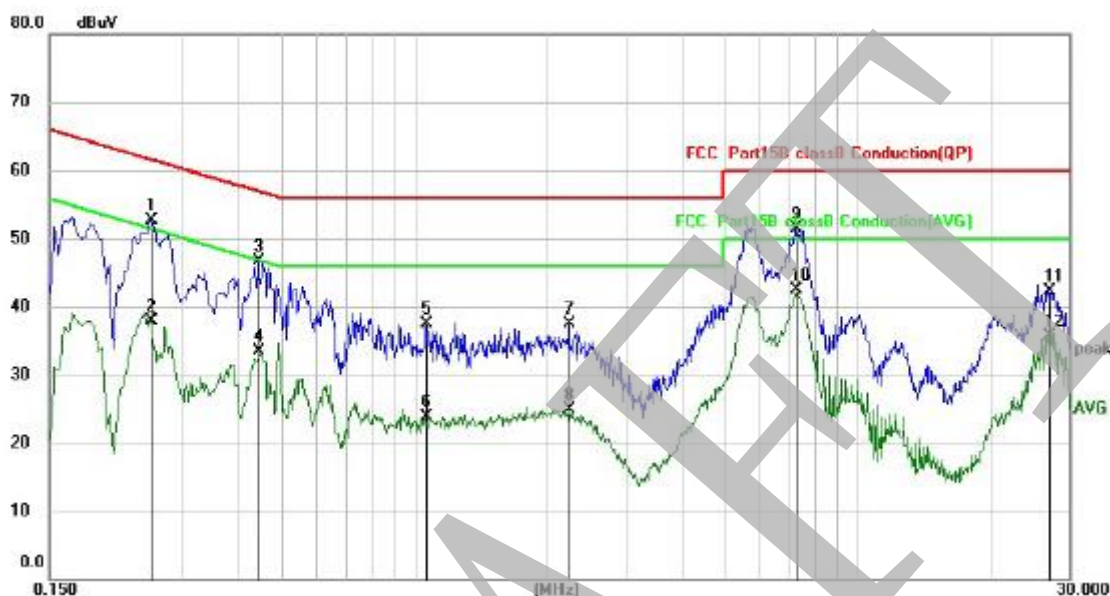
No.	Mk.	Freq. MHz	Reading Level dBμV	Correct Factor dB	Measure- ment dBμV	Limit dBμV	Over dB	Detector
1		0.2562	40.76	10.71	51.47	61.55	-10.08	QP
2		0.2562	24.10	10.71	34.81	51.55	-16.74	AVG
3		0.4860	33.72	10.48	44.20	56.24	-12.04	QP
4		0.4860	23.39	10.48	33.87	46.24	-12.37	AVG
5		0.9380	23.00	10.46	33.46	56.00	-22.54	QP
6		0.9380	8.72	10.46	19.18	46.00	-26.82	AVG
7		2.4100	23.94	10.48	34.42	56.00	-21.58	QP
8		2.4100	9.84	10.48	20.32	46.00	-25.68	AVG
9	*	5.8659	42.52	10.53	53.05	60.00	-6.95	QP
10		5.8659	31.50	10.53	42.03	50.00	-7.97	AVG
11		27.6100	31.17	11.39	42.56	60.00	-17.44	QP
12		27.6100	25.40	11.39	36.79	50.00	-13.21	AVG

Note:

1. Quasi-Peak and Average measurement were performed at the frequencies with maximized peak emission.
2. Margin = Reading level + Correct Factor - Limit
3. All the modes have tested and recorded the worst mode(GFSK-CH00) in the report

Conducted Emission At The Mains Terminals Test Data

Temperature:	25.1°C	Relative Humidity:	56%
Pressure:	1008hPa	Phase :	Neutral
Test Voltage :	AC 120V/60Hz	Test Mode:	GFSK(CH00)



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV	Limit dBuV	Over dB	Detector
1		0.2540	41.99	10.71	52.70	61.63	-8.93	QP
2		0.2540	27.16	10.71	37.87	51.63	-13.76	AVG
3		0.4460	36.12	10.52	46.64	56.95	-10.31	QP
4		0.4460	22.95	10.52	33.47	46.95	-13.48	AVG
5		1.0620	26.96	10.46	37.42	56.00	-18.58	QP
6		1.0620	13.51	10.46	23.97	46.00	-22.03	AVG
7		2.2340	27.10	10.47	37.57	56.00	-18.43	QP
8		2.2340	14.51	10.47	24.98	46.00	-21.02	AVG
9		7.2460	40.87	10.55	51.42	60.00	-8.58	QP
10	*	7.2460	31.95	10.55	42.50	50.00	-7.50	AVG
11		26.9700	31.01	11.37	42.38	60.00	-17.62	QP
12		26.9700	24.30	11.37	35.67	50.00	-14.33	AVG

Note:

1. Quasi-Peak and Average measurement were performed at the frequencies with maximized peak emission.
2. Margin = Reading level + Correct Factor - Limit
3. All the modes have tested and recorded the worst mode(GFSK-CH00) in the report

3. Radiated Spurious Emissions

3.1. Limit

Test Requirement: FCC CFR47 Part 15 Section 15.209 & 15.247
 Test Method: KDB 558074 D01 15.247 Meas Guidance v05r02 April 2, 2019;
 ANSI C63.10-2020 + Cor. 1-2023+C63.10a-2024 + Errata to C63.10a-2024
 Test Result: PASS
 Measurement Distance: 3m

Frequency	Detector	RBW	VBW	Value
9KHz-150KHz	Quasi-peak	200Hz	600Hz	Quasi-peak
150KHz-30MHz	Quasi-peak	9KHz	30KHz	Quasi-peak
30MHz-1GHz	Quasi-peak	100KHz	300KHz	Quasi-peak
Above 1GHz	Peak	1MHz	3MHz	Peak
	Peak	1MHz	10Hz	Average

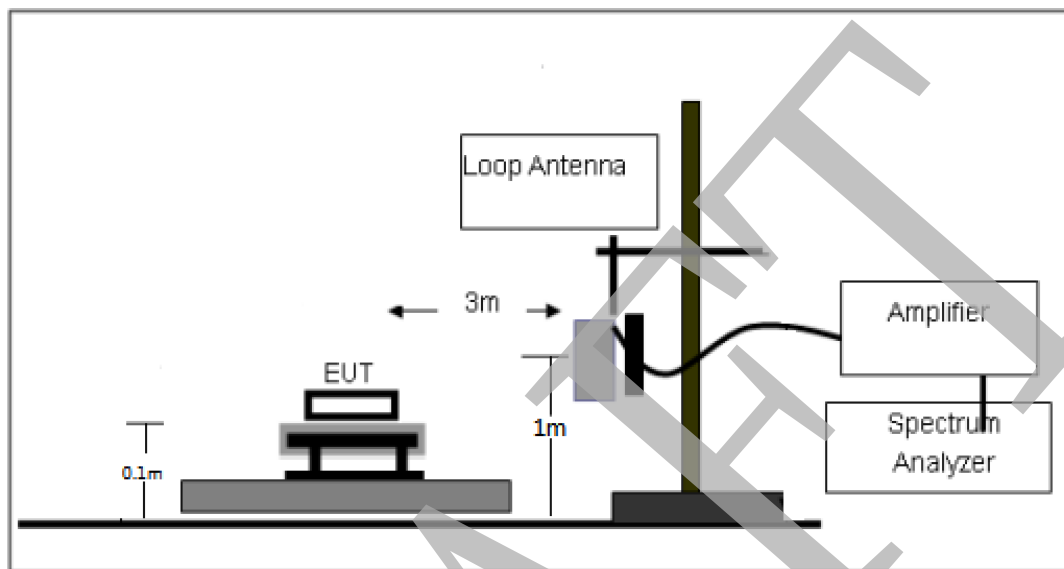
Limit:

Frequency (MHz)	Field Strength		Field Strength Limit at 3m Measurement Dist	
	uV/m	Distance (m)	uV/m	dBuV/m
0.009 ~ 0.490	$2400/F(\text{kHz})$	300	$10000 * 2400/F(\text{kHz})$	$20\log(2400/F(\text{kHz})) + 80$
0.490 ~ 1.705	$24000/F(\text{kHz})$	30	$100 * 24000/F(\text{kHz})$	$20\log(24000/F(\text{kHz})) + 40$
1.705 ~ 30	30	30	$100 * 30$	$20\log(30) + 40$
30 ~ 88	100	3	100	$20\log(100)$
88 ~ 216	150	3	150	$20\log(150)$
216 ~ 960	200	3	200	$20\log(200)$
Above 960	500	3	500	$20\log(500)$

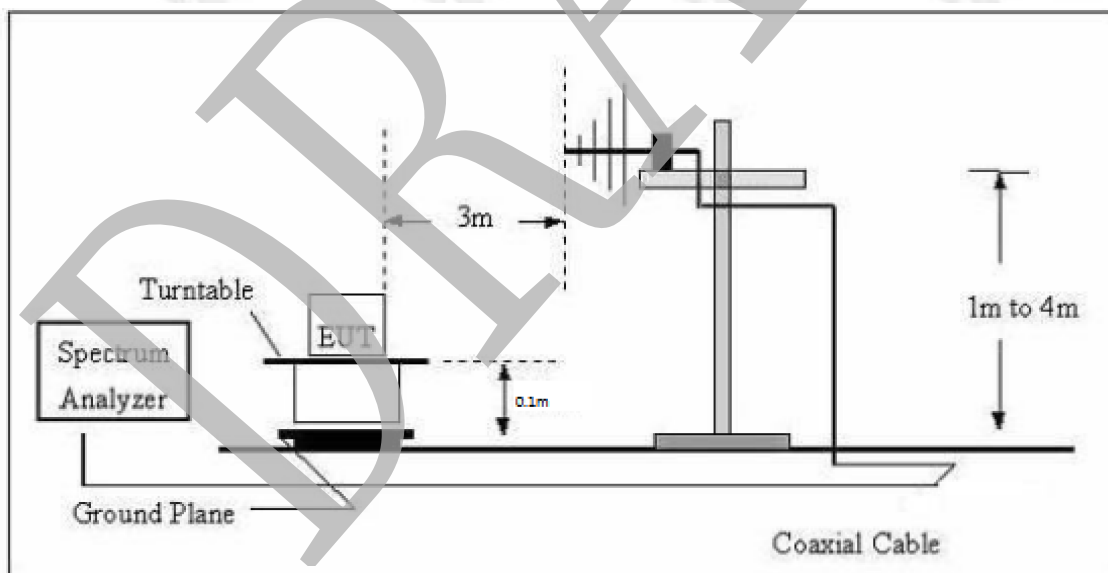
3.2. Test Setup

The radiated emission tests were performed in the 3m Semi- Anechoic Chamber test site, using the setup accordance with the ANSI C63.10.

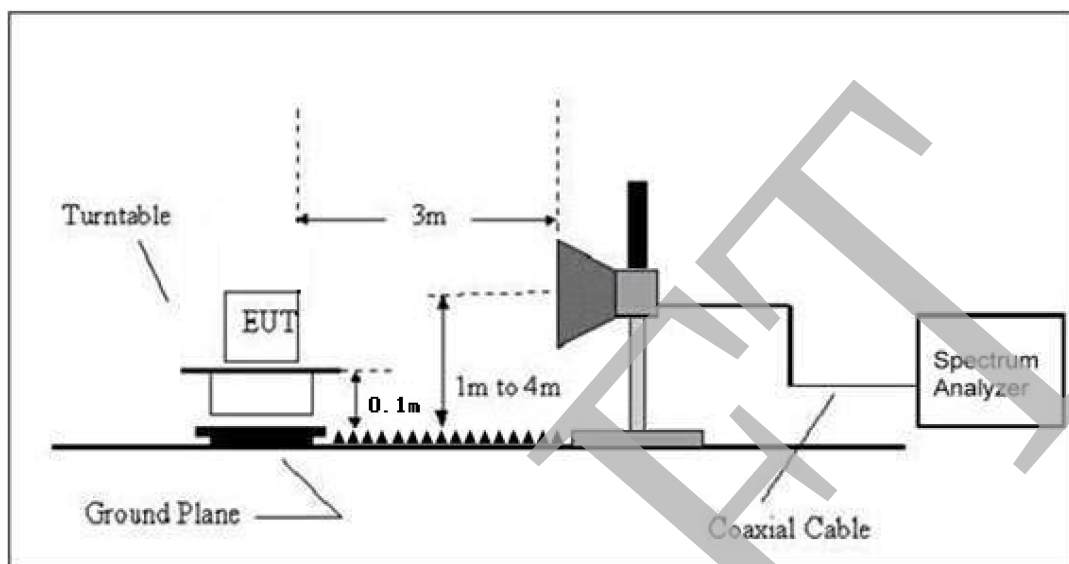
The test setup for emission measurement below 30MHz.



The test setup for emission measurement from 30 MHz to 1 GHz.



The test setup for emission measurement above 1 GHz.



3.3. Test Procedure

1. The EUT is placed on a turntable, which is 0.1m above ground plane for below 1GHz and 0.1m for above 1GHz.
2. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
3. EUT is set 3m away from the receiving antenna, which is moved from 1m to 4m to find out the maximum emissions.
4. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
5. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
6. Repeat above procedures until the measurements for all frequencies are complete.
7. The radiation measurements are performed in X,Y and Z axis positioning(X denotes lying on the table, Y denotes side stand and Z denotes vertical stand),the worst condition was tested putting the eut in Z axis,so the worst data were shown as follow.
8. A 2.4GHz high - pass filter is used during radiated emissions above 1GHz measurement.

3.4. Test Result

Test Frequency: 9KHz~30MHz

The measurements were more than 20 dB below the limit and not reported.

Test Frequency : 30MHz ~ 1GHz

Radiation Emission Test Data			
Temperature:	25.1℃	Relative Humidity:	56%
Pressure:	1008hPa	Phase :	Horizontal
Test Voltage :	AC 120V	Test Mode	GFSK(CH00)



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dB/m	Over dB	Detector
1	!	150.5377	43.32	-4.35	38.97	43.50	-4.53	QP
2		221.3917	41.64	-5.73	35.91	46.00	-10.09	QP
3		298.2681	41.60	-2.60	39.00	46.00	-7.00	QP
4		368.1116	39.00	-1.42	37.58	46.00	-8.42	QP
5	!	762.0384	32.70	7.73	40.43	46.00	-5.57	QP
6	*	892.2907	32.80	9.44	42.24	46.00	-3.76	QP

Note:

1. Factor = Antenna Factor + Cable Loss – Pre-amplifier.

Emission Level = Reading + Factor

Margin=Emission Level-Limit

2. All the modes have tested and recorded the worst mode(GFSK-CH00) in the report

Radiation Emission Test Data			
Temperature:	25.1°C	Relative Humidity:	56%
Pressure:	1008hPa	Phase :	Vertical
Test Voltage :	AC 120V/60Hz	Test Mode	GFSK(CH00)



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dB/m	Over dB	Detector
1		57.3922	40.16	-7.05	33.11	40.00	-6.89	QP
2		147.9214	41.28	-4.60	36.68	43.50	-6.82	QP
3		184.1665	36.95	-4.68	32.27	43.50	-11.23	QP
4	!	298.2681	42.76	-2.60	40.16	46.00	-5.84	QP
5		596.1770	33.36	3.87	37.23	46.00	-8.77	QP
6	*	916.0683	31.40	9.44	40.84	46.00	-5.16	QP

Note:

1. Factor = Antenna Factor + Cable Loss – Pre-amplifier.

Emission Level = Reading + Factor

Margin=Emission Level-Limit

2. All the modes have tested and recorded the worst mode(GFSK-CH00) in the report

GFSK

Polar (H/V)	Frequency (MHz)	Meter Reading (dBuV)	Pre-amplifier (dB)	Cable Loss (dB)	Antenna Factor (dB)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Detector Type
Low Channel:2402MHz									
V	4804.00	52.19	30.55	5.77	24.66	52.07	74	-21.93	Pk
V	4804.00	39.84	30.55	5.77	24.66	39.72	54	-14.28	AV
V	7206.00	48.77	30.33	6.32	24.55	49.31	74	-24.69	Pk
V	7206.00	35.53	30.33	6.32	24.55	36.07	54	-17.93	AV
V	9608.00	48.15	30.85	7.45	24.69	49.44	74	-24.56	Pk
V	9608.00	32.69	30.85	7.45	24.69	33.98	54	-20.02	AV
V	12010.00	45.41	31.02	8.99	25.57	48.95	74	-25.05	Pk
V	12010.00	27.35	31.02	8.99	25.57	30.89	54	-23.11	AV
H	4804.00	48.81	30.55	5.77	24.66	48.69	74	-25.31	Pk
H	4804.00	40.17	30.55	5.77	24.66	40.05	54	-13.95	AV
H	7206.00	47.62	30.33	6.32	24.55	48.16	74	-25.84	Pk
H	7206.00	33.81	30.33	6.32	24.55	34.35	54	-19.65	AV
H	9608.00	48.18	30.85	7.45	24.69	49.47	74	-24.53	Pk
H	9608.00	29.49	30.85	7.45	24.69	30.78	54	-23.22	AV
H	12010.00	38.70	31.02	8.99	25.57	42.24	74	-31.76	Pk
H	12010.00	25.27	31.02	8.99	25.57	28.81	54	-25.19	AV

Polar (H/V)	Frequency (MHz)	Meter Reading (dBuV)	Pre-amplifier (dB)	Cable Loss (dB)	Antenna Factor (dB)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Detector Type
Middle Channel:2441MHz									
V	4882.00	50.32	30.55	5.77	24.66	50.20	74	-23.80	Pk
V	4882.00	38.62	30.55	5.77	24.66	38.50	54	-15.50	AV
V	7323.00	46.13	30.33	6.32	24.55	46.67	74	-27.33	Pk
V	7323.00	36.79	30.33	6.32	24.55	37.33	54	-16.67	AV
V	9764.00	42.43	30.85	7.45	24.69	43.72	74	-30.28	Pk
V	9764.00	32.01	30.85	7.45	24.69	33.30	54	-20.70	AV
V	12205.00	40.84	31.02	8.99	25.57	44.38	74	-29.62	Pk
V	12205.00	30.29	31.02	8.99	25.57	33.83	54	-20.17	AV
H	4882.00	49.17	30.55	5.77	24.66	49.05	74	-24.95	Pk
H	4882.00	39.36	30.55	5.77	24.66	39.24	54	-14.76	AV
H	7323.00	46.96	30.33	6.32	24.55	47.50	74	-26.50	Pk
H	7323.00	35.48	30.33	6.32	24.55	36.02	54	-17.98	AV
H	9764.00	42.08	30.85	7.45	24.69	43.37	74	-30.63	Pk
H	9764.00	30.41	30.85	7.45	24.69	31.70	54	-22.30	AV
H	12205.00	40.63	31.02	8.99	25.57	44.17	74	-29.83	Pk
H	12205.00	30.16	31.02	8.99	25.57	33.70	54	-20.30	AV

Polar (H/V)	Frequency (MHz)	Meter Reading (dBuV)	Pre-amplifier (dB)	Cable Loss (dB)	Antenna Factor (dB)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Detector Type
High Channel:2480MHz									
V	4960.00	48.14	30.55	5.77	24.66	48.02	74	-25.98	Pk
V	4960.00	36.01	30.55	5.77	24.66	35.89	54	-18.11	AV
V	7440.00	44.52	30.33	6.32	24.55	45.06	74	-28.94	Pk
V	7440.00	36.11	30.33	6.32	24.55	36.65	54	-17.35	AV
V	9920.00	42.19	30.85	7.45	24.69	43.48	74	-30.52	Pk
V	9920.00	31.11	30.85	7.45	24.69	32.40	54	-21.60	AV
V	12400.00	37.56	31.02	8.99	25.57	41.10	74	-32.90	Pk
V	12400.00	28.06	31.02	8.99	25.57	31.60	54	-22.40	AV
H	4960.00	48.40	30.55	5.77	24.66	48.28	74	-25.72	Pk
H	4960.00	38.67	30.55	5.77	24.66	38.55	54	-15.45	AV
H	7440.00	44.73	30.33	6.32	24.55	45.27	74	-28.73	Pk
H	7440.00	32.66	30.33	6.32	24.55	33.20	54	-20.80	AV
H	9920.00	40.30	30.85	7.45	24.69	41.59	74	-32.41	Pk
H	9920.00	28.69	30.85	7.45	24.69	29.98	54	-24.02	AV
H	12400.00	41.56	31.02	8.99	25.57	45.10	74	-28.90	Pk
H	12400.00	28.90	31.02	8.99	25.57	32.44	54	-21.56	AV

- Note: 1. The testing has been conformed to 10*2480MHz=24800MHz.
 2. All other emissions more than 30dB below the limit.
 3. Factor = Antenna Factor + Cable Loss – Pre-amplifier.
 Emission Level = Reading + Factor
 Margin=Emission Level-Limit
 4. All the modes have tested and recorded the worst mode(GFSK) in the report

Radiated Band Emission Measurement:

	Polar (H/V)	Frequenc y (MHz)	Meter Reading (dBuV)	Pre-am plifier (dB)	Cable Loss (dB)	Antenna Factor (dB/m)	Emission level (dBuV/m)	Limit (dBuV /m)	Margi n (dB)	Detect or Type
GFSK	Low Channel: 2402MHz									
	H	2390	59.08	35.17	3.48	27.49	54.88	74	-19.12	PK
	H	2390	49.98	35.17	3.48	27.49	45.78	54	-8.22	AV
	H	2400	61.63	35.16	3.49	27.52	57.48	74	-16.52	PK
	H	2400	49.22	35.16	3.49	27.52	45.07	54	-8.93	AV
	V	2390	58.76	35.17	3.48	27.49	54.56	74	-19.44	PK
	V	2390	50.84	35.17	3.48	27.49	46.64	54	-7.36	AV
	V	2400	61.01	35.16	3.49	27.52	56.86	74	-17.14	PK
	V	2400	50.68	35.16	3.49	27.52	46.53	54	-7.47	AV
	High Channel: 2480MHz									
	H	2483.5	59.61	35.11	3.56	27.75	55.81	74	-18.19	PK
	H	2483.5	48.38	35.11	3.56	27.75	44.58	54	-9.42	AV
	H	2500	61.43	35.1	3.57	27.8	57.70	74	-16.30	PK
	H	2500	49.34	35.1	3.57	27.8	45.61	54	-8.39	AV
	V	2483.5	58.75	35.11	3.56	27.75	54.95	74	-19.05	PK
	V	2483.5	52.21	35.11	3.56	27.75	48.41	54	-5.59	AV
	V	2500	58.08	35.1	3.57	27.8	54.35	74	-19.65	PK
	V	2500	51.40	35.1	3.57	27.8	47.67	54	-6.33	AV
$\pi/4$ -DQPSK	Low Channel: 2402MHz									
	H	2390	58.28	35.17	3.48	27.49	54.08	74	-19.92	PK
	H	2390	50.83	35.17	3.48	27.49	46.63	54	-7.37	AV
	H	2400	60.74	35.16	3.49	27.52	56.59	74	-17.41	PK
	H	2400	49.07	35.16	3.49	27.52	44.92	54	-9.08	AV
	V	2390	60.00	35.17	3.48	27.49	55.80	74	-18.20	PK
	V	2390	52.26	35.17	3.48	27.49	48.06	54	-5.94	AV
	V	2400	59.72	35.16	3.49	27.52	55.57	74	-18.43	PK
	V	2400	50.83	35.16	3.49	27.52	46.68	54	-7.32	AV
	High Channel: 2480MHz									
	H	2483.5	59.33	35.11	3.56	27.75	55.53	74	-18.47	PK
	H	2483.5	48.62	35.11	3.56	27.75	44.82	54	-9.18	AV
	H	2500	61.67	35.1	3.57	27.8	57.94	74	-16.06	PK
	H	2500	49.49	35.1	3.57	27.8	45.76	54	-8.24	AV
	V	2483.5	58.68	35.11	3.56	27.75	54.88	74	-19.12	PK
	V	2483.5	51.48	35.11	3.56	27.75	47.68	54	-6.32	AV
	V	2500	58.26	35.1	3.57	27.8	54.53	74	-19.47	PK
	V	2500	51.11	35.1	3.57	27.8	47.38	54	-6.62	AV
8DPSK	Low Channel: 2402MHz									
	H	2390	59.46	35.17	3.48	27.49	55.26	74	-18.74	PK
	H	2390	49.91	35.17	3.48	27.49	45.71	54	-8.29	AV
	H	2400	60.14	35.16	3.49	27.52	55.99	74	-18.01	PK
	H	2400	49.28	35.16	3.49	27.52	45.13	54	-8.87	AV
	V	2390	57.93	35.17	3.48	27.49	53.73	74	-20.27	PK
	V	2390	51.14	35.17	3.48	27.49	46.94	54	-7.06	AV
	V	2400	59.59	35.16	3.49	27.52	55.44	74	-18.56	PK
	V	2400	50.45	35.16	3.49	27.52	46.30	54	-7.70	AV
	High Channel: 2480MHz									
	H	2483.5	58.17	35.11	3.56	27.75	54.37	74	-19.63	PK
	H	2483.5	49.49	35.11	3.56	27.75	45.69	54	-8.31	AV

	H	2500	61.36	35.1	3.57	27.8	57.63	74	-16.37	PK
	H	2500	51.52	35.1	3.57	27.8	47.79	54	-6.21	AV
	V	2483.5	59.18	35.11	3.56	27.75	55.38	74	-18.62	PK
	V	2483.5	50.02	35.11	3.56	27.75	46.22	54	-7.78	AV
	V	2500	57.96	35.1	3.57	27.8	54.23	74	-19.77	PK
	V	2500	49.15	35.1	3.57	27.8	45.42	54	-8.58	AV

Remark:

1. Emission Level = Meter Reading + Antenna Factor + Cable Loss – Pre-amplifier, Margin= Emission Level - Limit

DRAFT

4. Maximum Peak Output Power

4.1. Limit

Test Requirement: FCC CFR47 Part 15 Section 15.247

Test Method: KDB 558074 D01 15.247 Meas Guidance v05r02 April 2, 2019;

ANSI C63.10-2020 + Cor. 1-2023+C63.10a-2024 + Errata to C63.10a-2024

FCC Part15 (15.247) , Subpart C				
Section	Test Item	Limit	Frequency Range (MHz)	Result
15.247(b)(3)	Peak Output Power	1 watt or 21dBm	2400-2483.5	PASS

For frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 non-overlapping hopping channels, and all frequency hopping systems in the 5725-5850 MHz band: 1 watt. For all other frequency hopping systems in the 2400-2483.5 MHz band: 0.125 watts.

RSS-247 § 5.4

For FHSs operating in the band 2400-2483.5 MHz, the maximum peak conducted output power shall not exceed 1.0 W if the hopset uses 75 or more hopping channels; the maximum peak conducted output power shall not exceed 0.125 W if the hopset uses less than 75 hopping channels. The e.i.r.p. shall not exceed 4 W.

4.2. Test Setup



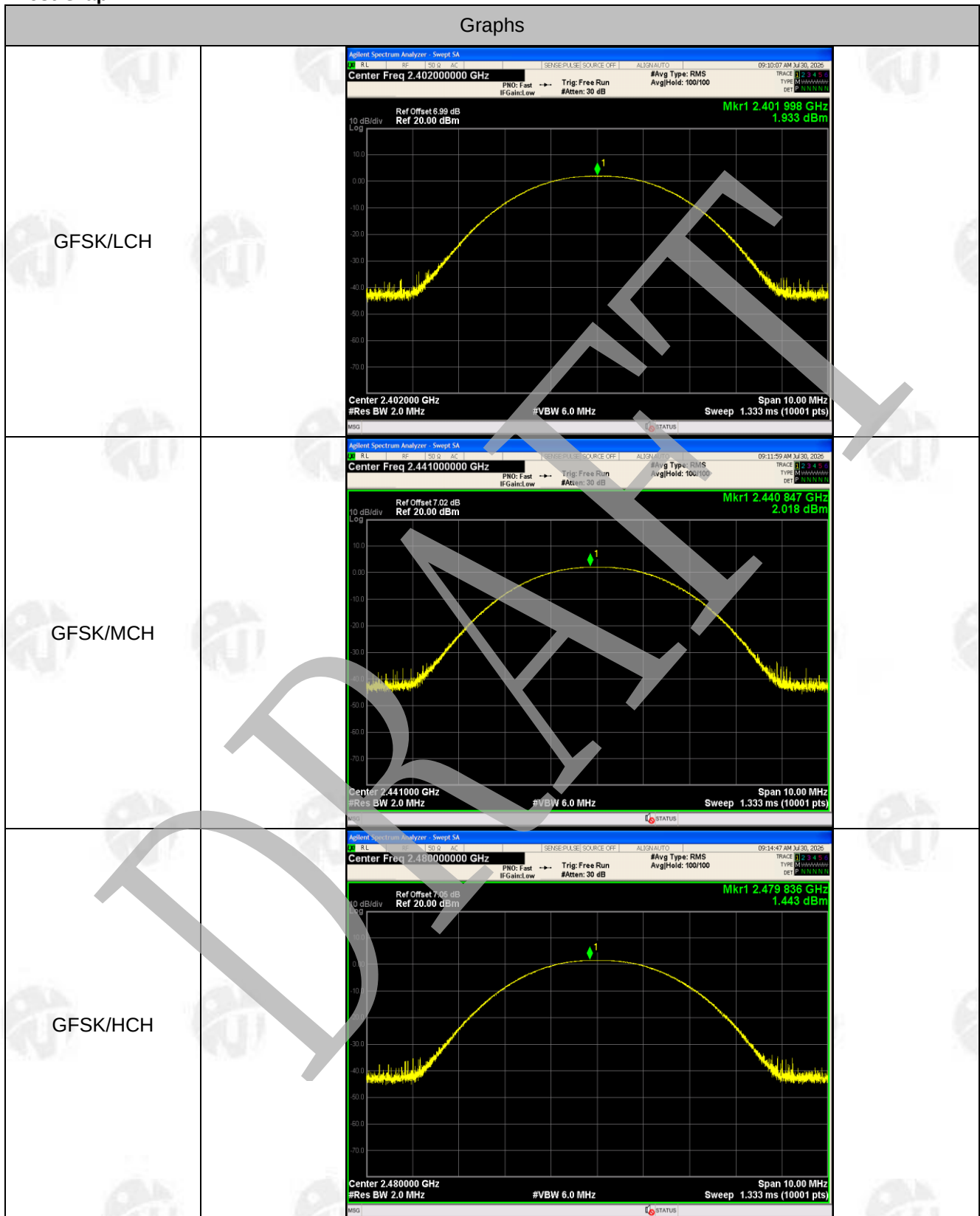
4.3. Test Procedure

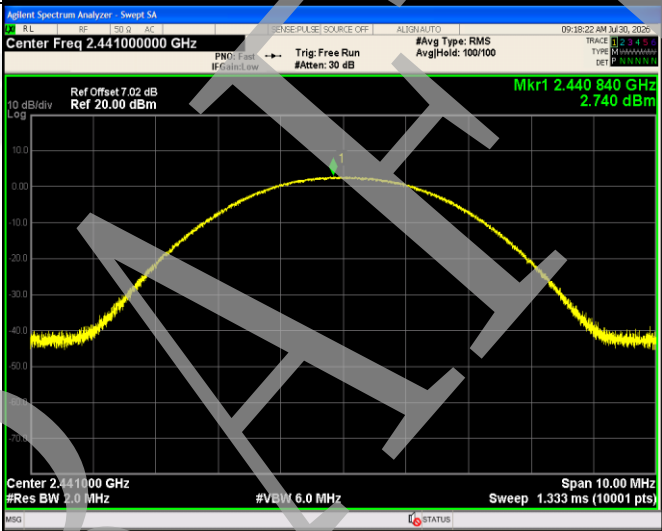
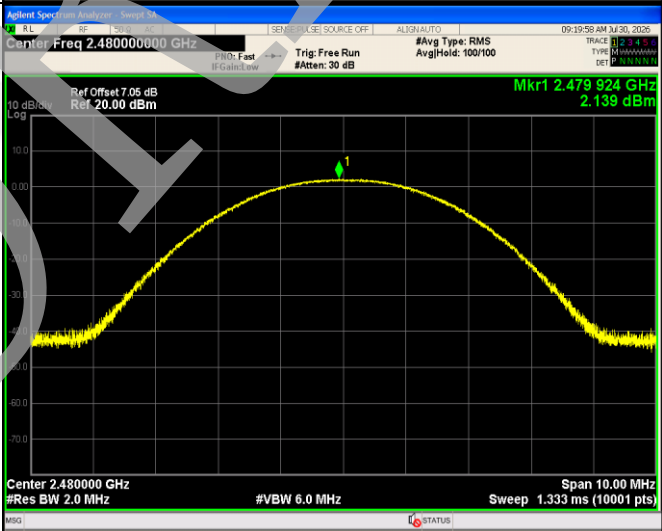
1. The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram above,
2. Spectrum Setting:
 - RBW > the 20 dB bandwidth of the emission being measured
 - Span = approximately 5 times the 20 dB bandwidth, centered on a hopping channel
 - VBW ≥ RBW
 - Sweep = auto
 - Detector function = peak
 - Trace = max hold

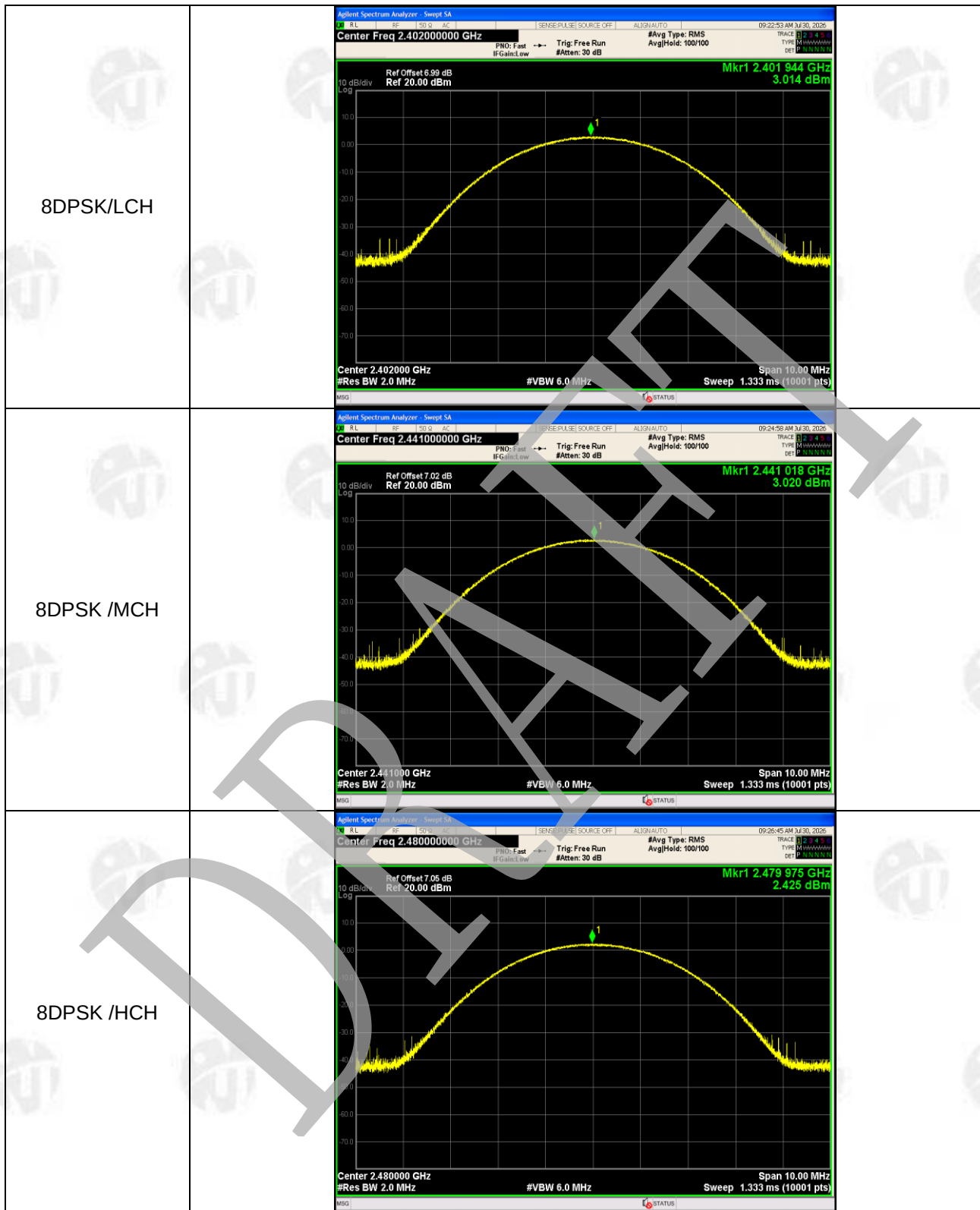
4.4. Test Result

Mode	Channel.	Maximum Peak Output Power [dBm]	Limit [dBm]	Verdict
GFSK	LCH	1.93	20.97	PASS
	MCH	2.02	20.97	PASS
	HCH	1.44	20.97	PASS
$\pi/4$ DQPSK	LCH	2.7	20.97	PASS
	MCH	2.74	20.97	PASS
	HCH	2.14	20.97	PASS
8DPSK	LCH	3.01	20.97	PASS
	MCH	3.02	20.97	PASS
	HCH	2.42	20.97	PASS

Test Graph:



$\pi/4$DQPSK/LCH	 Agilent Spectrum Analyzer - Sweep SA Center Freq 2.40200000 GHz Ref Offset 6.89 dB Ref 20.00 dBm Mkr1 2.402 133 GHz 2.703 dBm 10 dB/div Log Center 2.402000 GHz #Res BW 2.0 MHz #VBW 6.0 MHz Sweep 1.333 ms (10001 pts)
$\pi/4$DQPSK/MCH	 Agilent Spectrum Analyzer - Sweep SA Center Freq 2.441000000 GHz Ref Offset 7.02 dB Ref 20.00 dBm Mkr1 2.440 840 GHz 2.740 dBm 10 dB/div Log Center 2.441000 GHz #Res BW 2.0 MHz #VBW 6.0 MHz Sweep 1.333 ms (10001 pts)
$\pi/4$DQPSK/HCH	 Agilent Spectrum Analyzer - Sweep SA Center Freq 2.480000000 GHz Ref Offset 7.05 dB Ref 20.00 dBm Mkr1 2.479 924 GHz 2.139 dBm 10 dB/div Log Center 2.480000 GHz #Res BW 2.0 MHz #VBW 6.0 MHz Sweep 1.333 ms (10001 pts)



5. -20 dB Bandwidth Measurement

5.1. Limit

Test Requirement: FCC CFR47 Part 15 Section 15.247

Test Method: KDB 558074 D01 15.247 Meas Guidance v05r02 April 2, 2019;

ANSI C63.10-2020 + Cor. 1-2023+C63.10a-2024 + Errata to C63.10a-2024

Test Setup



5.2. Test Procedure

For 20dB Bandwidth Measurement

Using the following spectrum analyzer settings:

1. Span= approximately 2 to 3 times the 20dB bandwidth, centered on a hopping channel.
2. Set the RBW = 30 kHz.
3. Set the VBW = 100 kHz.
4. Sweep time = auto couple.
5. Detector function = peak.
6. Trace mode = max hold.
7. Allow trace to fully stabilize.

For 99% Bandwidth Measurement

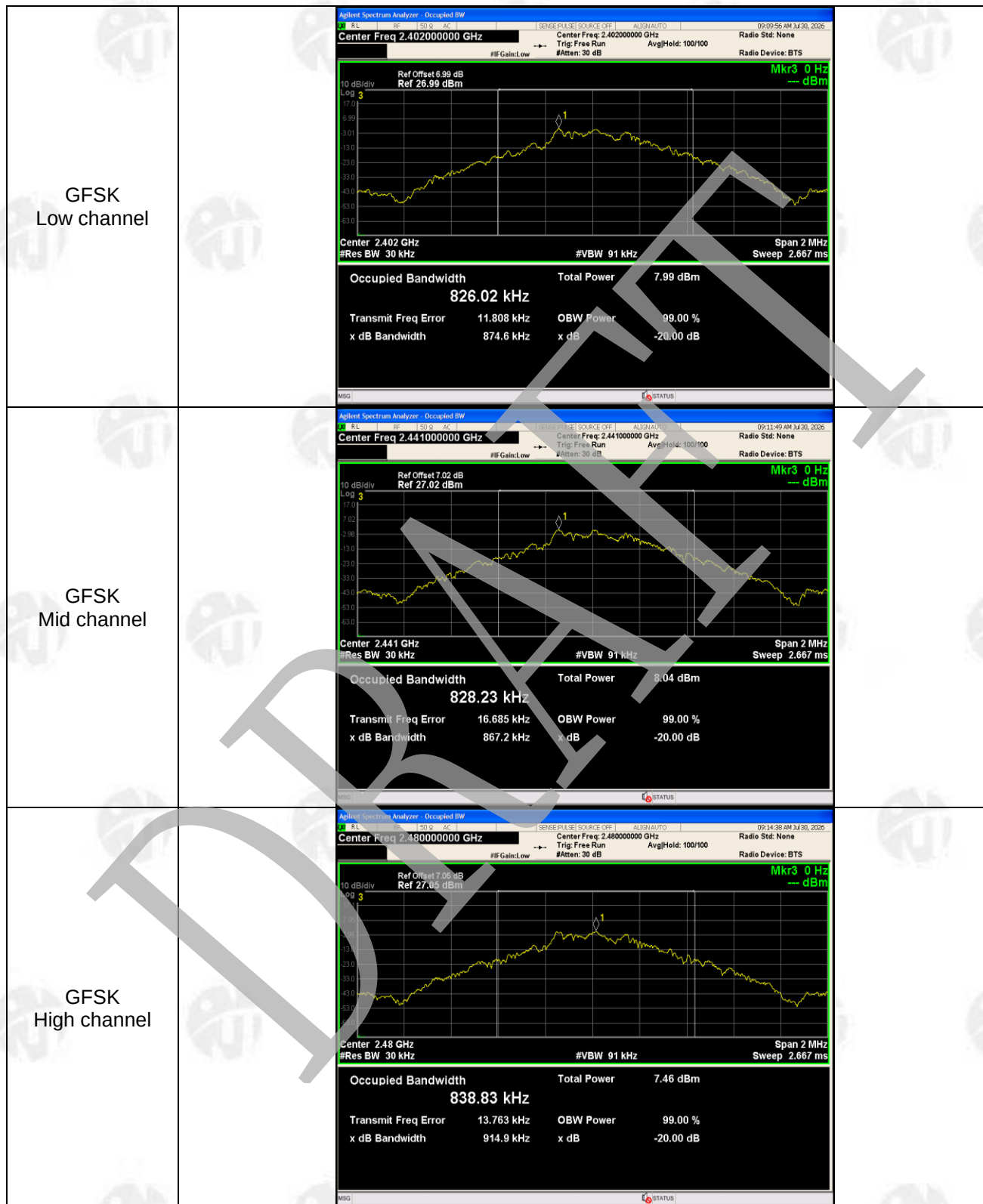
1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum;
2. Set the spectrum analyzer: RBW = 1%-5% OBW, VBW $\geq$ 3RBW

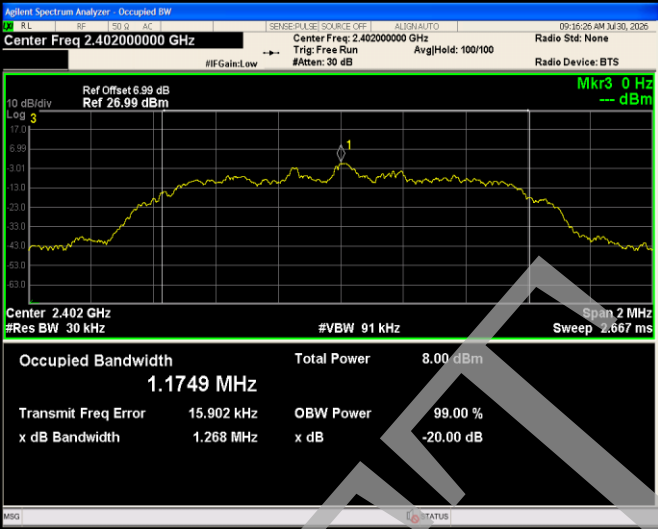
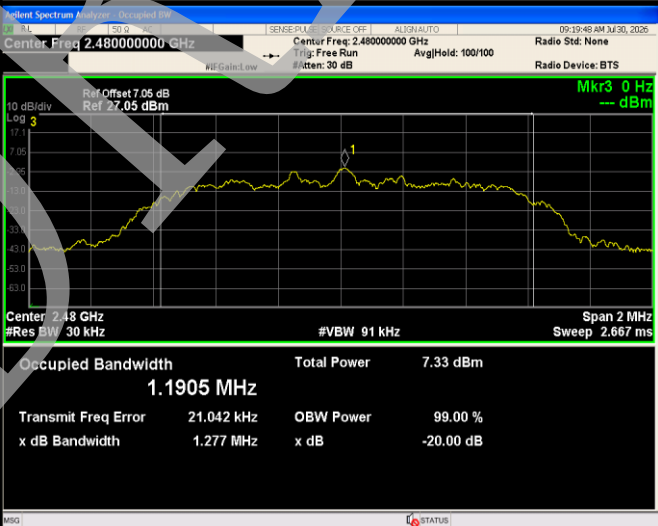
5.3. Test Result

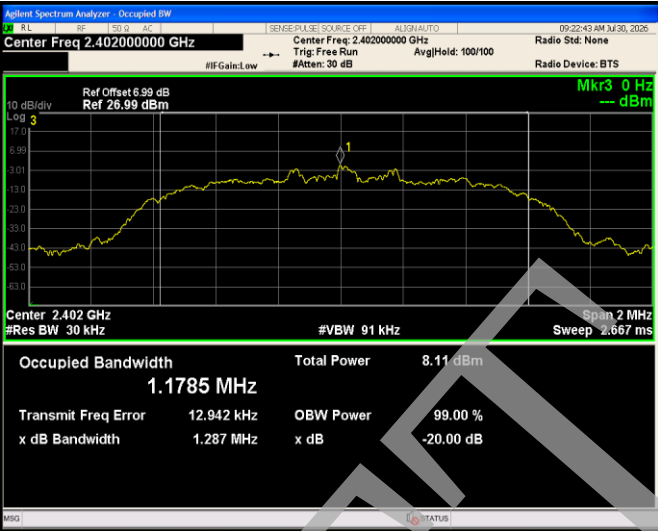
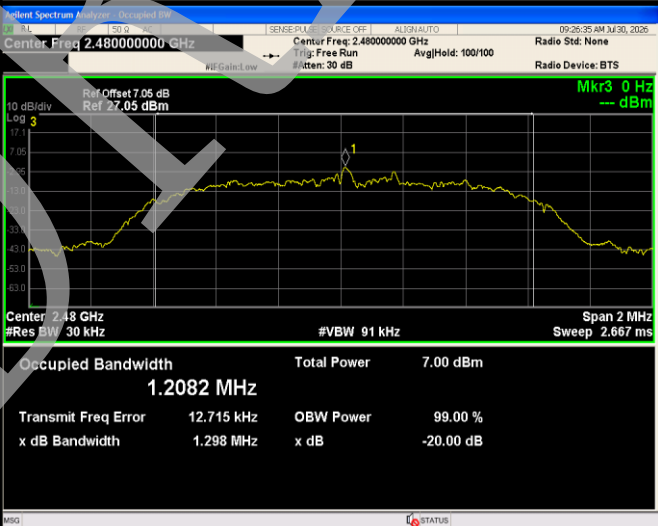
Test Mode	Frequency	20dB Bandwidth (MHz)	Result
GFSK	Low channel	0.875	PASS
	Mid channel	0.867	PASS
	High channel	0.915	PASS
$\pi/4$ DQPSK	Low channel	1.268	PASS
	Mid channel	1.283	PASS
	High channel	1.277	PASS
8DPSK	Low channel	1.287	PASS
	Mid channel	1.322	PASS
	High channel	1.298	PASS

Note: All modes of operation were Pre-scan and the worst-case emissions are reported.

Test Graph:



$\pi/4$-DQPSK Low channel	
$\pi/4$-DQPSK Mid channel	
$\pi/4$-DQPSK High channel	

8DPSK Low channel	
8DPSK Mid channel	
8DPSK High channel	

6. Carrier Frequency Separation Test

6.1. Limit

Test Standard	FCC Part15 C Section 15.247 (a)(1)
Test Limit	>25KHz or >two-thirds of the 20 dB bandwidth

6.2. Test Setup



6.3. Test Procedure

The EUT must have its hopping function enabled. Using the following spectrum analyzer settings:

1. Span= Wide enough to capture the peaks of two adjacent channels
2. Set the RBW = 300 kHz.
3. Set the VBW = 1 MHz.
4. Sweep time = auto couple.
5. Detector function = peak.
6. Trace mode = max hold.
7. Allow trace to fully stabilize.

6.4. Test Result

Mode	Channel	Carrier Frequency Separation [MHz]	Limit(2/3 of the 20dB bandwidth MHz)	Verdict
GFSK	LCH	0.998	0.583	PASS
GFSK	MCH	0.994	0.578	PASS
GFSK	HCH	0.998	0.610	PASS
$\pi/4$ DQPSK	LCH	0.998	0.845	PASS
$\pi/4$ DQPSK	MCH	0.998	0.855	PASS
$\pi/4$ DQPSK	HCH	0.998	0.851	PASS
8DPSK	LCH	0.994	0.858	PASS
8DPSK	MCH	0.994	0.882	PASS
8DPSK	HCH	1.000	0.865	PASS

Test Graph

Graphs

GFSK/LCH

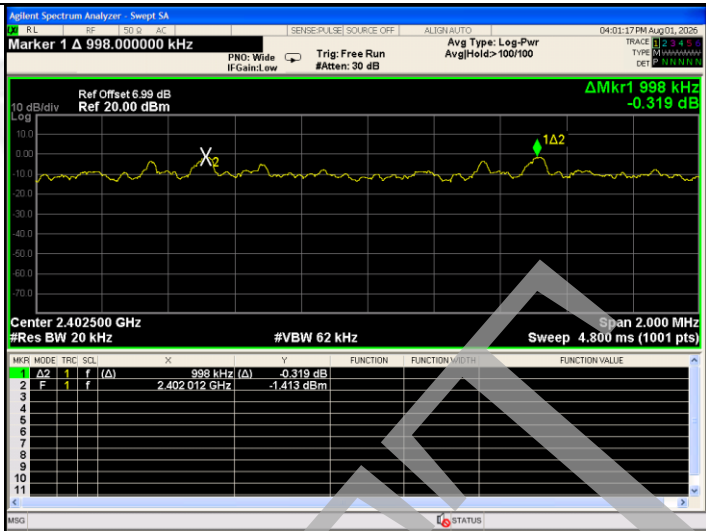
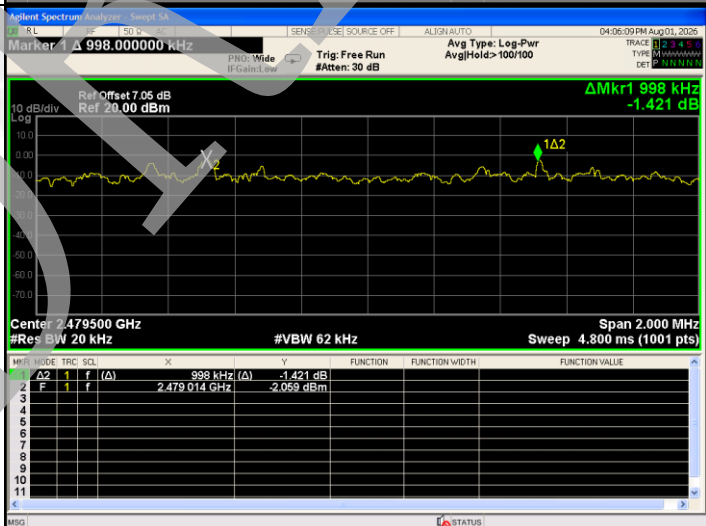


GFSK/MCH



GFSK/HCH



$\pi/4$ DQPSK/LCH	 <table><tr><th>MKR</th><th>MODE</th><th>TRC</th><th>SCN</th><th>X</th><th>Y</th><th>FUNCTION</th><th>FUNCTION WIDTH</th><th>FUNCTION VALUE</th></tr><tr><td>1</td><td>Δ</td><td>1</td><td>f</td><td>(Δ)</td><td>998 kHz (Δ)</td><td></td><td></td><td>-0.319 dB</td></tr><tr><td>2</td><td>F</td><td>1</td><td>f</td><td></td><td>2.402 012 GHz</td><td></td><td></td><td>-1.413 dBm</td></tr></table>	MKR	MODE	TRC	SCN	X	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE	1	Δ	1	f	(Δ)	998 kHz (Δ)			-0.319 dB	2	F	1	f		2.402 012 GHz			-1.413 dBm
MKR	MODE	TRC	SCN	X	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE																				
1	Δ	1	f	(Δ)	998 kHz (Δ)			-0.319 dB																				
2	F	1	f		2.402 012 GHz			-1.413 dBm																				
$\pi/4$ DQPSK/MCH	 <table><tr><th>MKR</th><th>MODE</th><th>TRC</th><th>SCN</th><th>X</th><th>Y</th><th>FUNCTION</th><th>FUNCTION WIDTH</th><th>FUNCTION VALUE</th></tr><tr><td>1</td><td>Δ</td><td>1</td><td>f</td><td>(Δ)</td><td>998 kHz (Δ)</td><td></td><td></td><td>-0.163 dB</td></tr><tr><td>2</td><td>F</td><td>1</td><td>f</td><td></td><td>2.441 010 GHz</td><td></td><td></td><td>-1.458 dBm</td></tr></table>	MKR	MODE	TRC	SCN	X	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE	1	Δ	1	f	(Δ)	998 kHz (Δ)			-0.163 dB	2	F	1	f		2.441 010 GHz			-1.458 dBm
MKR	MODE	TRC	SCN	X	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE																				
1	Δ	1	f	(Δ)	998 kHz (Δ)			-0.163 dB																				
2	F	1	f		2.441 010 GHz			-1.458 dBm																				
$\pi/4$ DQPSK/HCH	 <table><tr><th>MKR</th><th>MODE</th><th>TRC</th><th>SCN</th><th>X</th><th>Y</th><th>FUNCTION</th><th>FUNCTION WIDTH</th><th>FUNCTION VALUE</th></tr><tr><td>1</td><td>Δ</td><td>1</td><td>f</td><td>(Δ)</td><td>998 kHz (Δ)</td><td></td><td></td><td>-1.421 dB</td></tr><tr><td>2</td><td>F</td><td>1</td><td>f</td><td></td><td>2.479 014 GHz</td><td></td><td></td><td>-2.059 dBm</td></tr></table>	MKR	MODE	TRC	SCN	X	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE	1	Δ	1	f	(Δ)	998 kHz (Δ)			-1.421 dB	2	F	1	f		2.479 014 GHz			-2.059 dBm
MKR	MODE	TRC	SCN	X	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE																				
1	Δ	1	f	(Δ)	998 kHz (Δ)			-1.421 dB																				
2	F	1	f		2.479 014 GHz			-2.059 dBm																				

8DPSK/LCH



8DPSK /MCH



8DPSK /HCH



7. Number of Hopping Channel Test

7.1. Limit

Test Standard	FCC Part15 C Section 15.247 (a)(1)(iii)
Test Limit	>15 channels

7.2. Test Setup



7.3. Test Procedure

The EUT must have its hopping function enabled. Using the following spectrum analyzer settings:

1. Span= Wide enough to capture the peaks of two adjacent channels
2. Set the RBW = 100 kHz.
3. Set the VBW = 300 kHz.
4. Sweep time = auto couple.
5. Detector function = peak.
6. Trace mode = max hold.
7. Allow trace to fully stabilize.

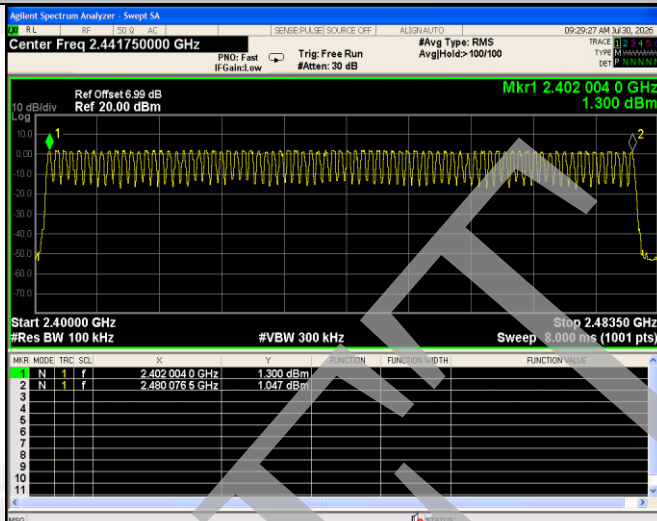
7.4. Test Result

Mode	Channel.	Number of Hopping Channel	Limit	Verdict
GFSK	Hop	79	≥ 15	PASS
$\pi/4$ DQPSK	Hop	79	≥ 15	PASS
8DPSK	Hop	79	≥ 15	PASS

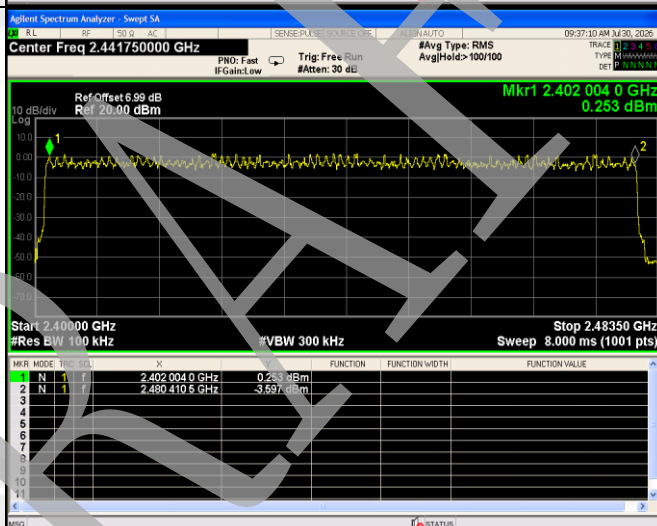
Test Graph

Graphs

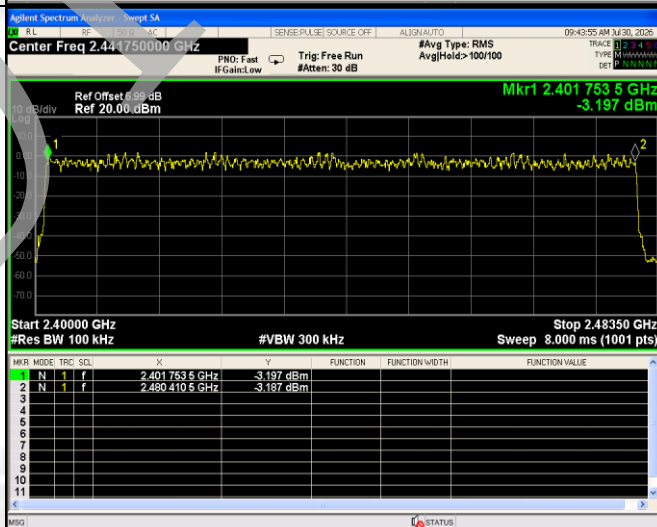
GFSK/Hop



π /4DQPSK/Hop



8DPSK/Hop



8. Dwell Time Test

8.1. Limit

Test Standard	FCC Part15 C Section 15.247 (a)(1)(iii)
Test Limit	0.4 sec

8.2. Test setup



8.3. Test Procedure

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

1. Span= zero span, centered on a hopping channel
2. Set the RBW = 1 MHz.
3. Set the VBW = 3 MHz.
4. Sweep time = as necessary to capture the entire dwell time per hopping channel.
5. Detector function = peak.
6. Trace mode = max hold.
7. Allow trace to fully stabilize.
8. The burst width [ms/hop/ch], which is directly measured, refers to the duration on one channel hop.
The hops per second for all channels: The selected EUT Conf uses a slot type of 5-Tx&1-Rx and a Hopping rate of 1600 [ch*hop/s] for all channels. So the final hopping rate for all channels is $1600/6=266.67$ [ch*hop/s]
The hops per second on one channel: 266.67 [ch*hops/s]/ 79 [ch]= 3.38 [hop/s].
The total hops for all channels within the dwell time calculation duration: 3.38 [hop/s]* 31.6 [s*ch]= 106.67 [hop*ch].
The dwell time for all channels hopping: 106.67 [hop*ch]*Burst Width [ms/hop/ch].
9. The duration for dwell time calculation: 0.4 [s]*hopping number= 0.4 [s]* 79 [ch]= 31.6 [s*ch].
10. Pulse Time(ms)*Total Hops=Dwell Time

8.4. Test Result

Packet	Channel	Pulse Time (ms)	Burst Count (Num)	Total Dwell Time (ms)	Limit (ms)	Verdict
DH1	LCH	0.382	317	121.094	400	PASS
DH1	MCH	0.382	319	121.858	400	PASS
DH1	HCH	0.381	316	120.396	400	PASS
2DH3	LCH	1.643	159	261.237	400	PASS
2DH3	MCH	1.643	160	262.88	400	PASS
2DH3	HCH	1.643	160	262.88	400	PASS
3DH5	LCH	2.893	97	280.621	400	PASS
3DH5	MCH	2.893	109	315.337	400	PASS
3DH5	HCH	2.893	109	315.337	400	PASS

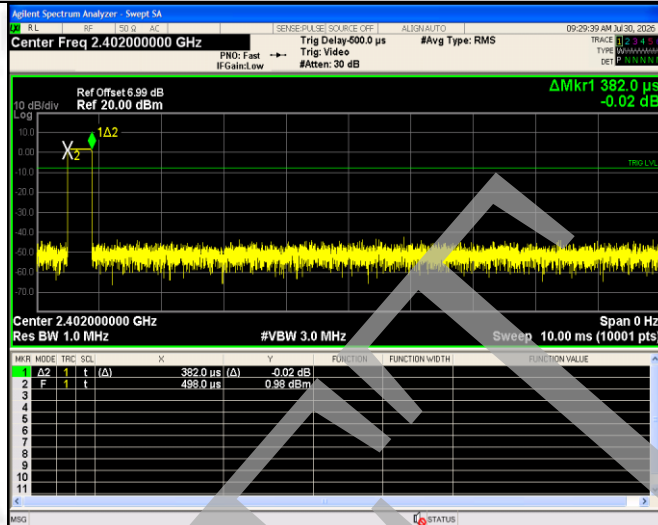
Remark: Dwell time = Pulse time * Total Hops

Remark: Mkr Delta is once pulse time.

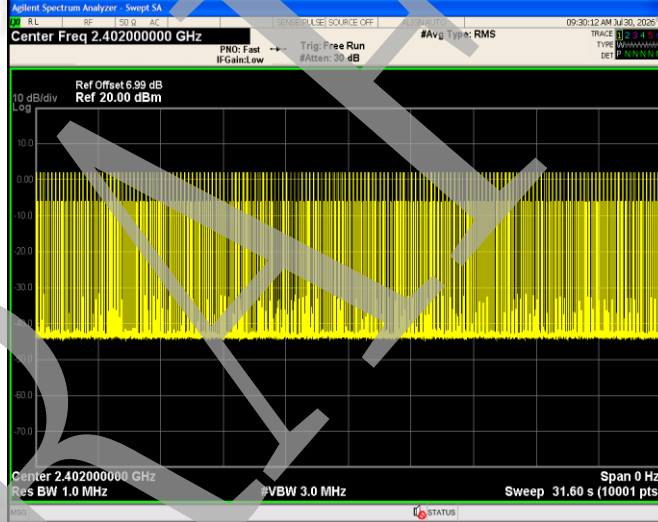
Test Graph

Graphs

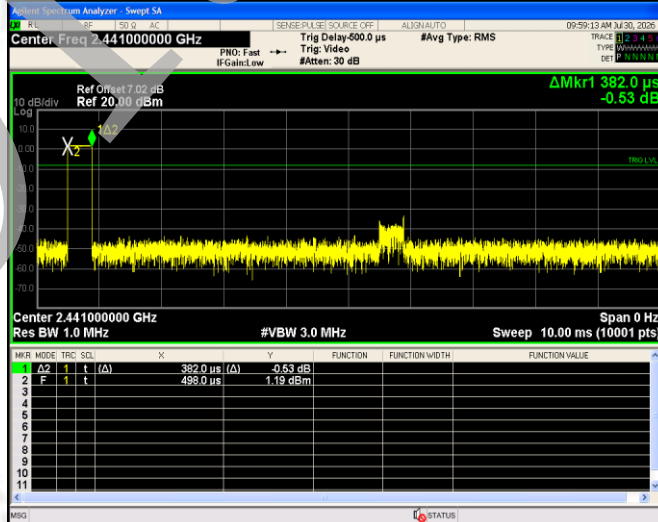
GFSK_1DH1/LCH-
One Burst

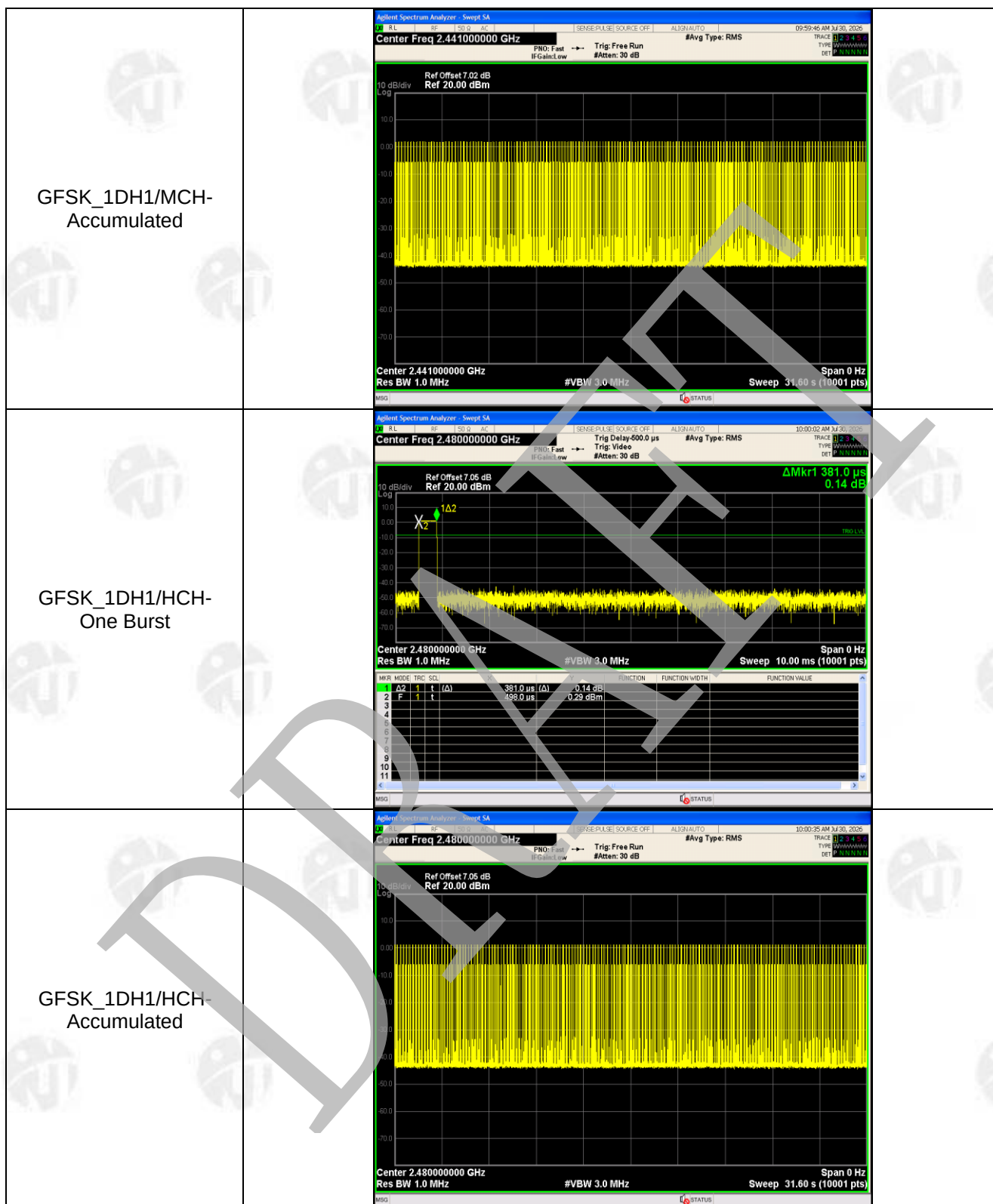


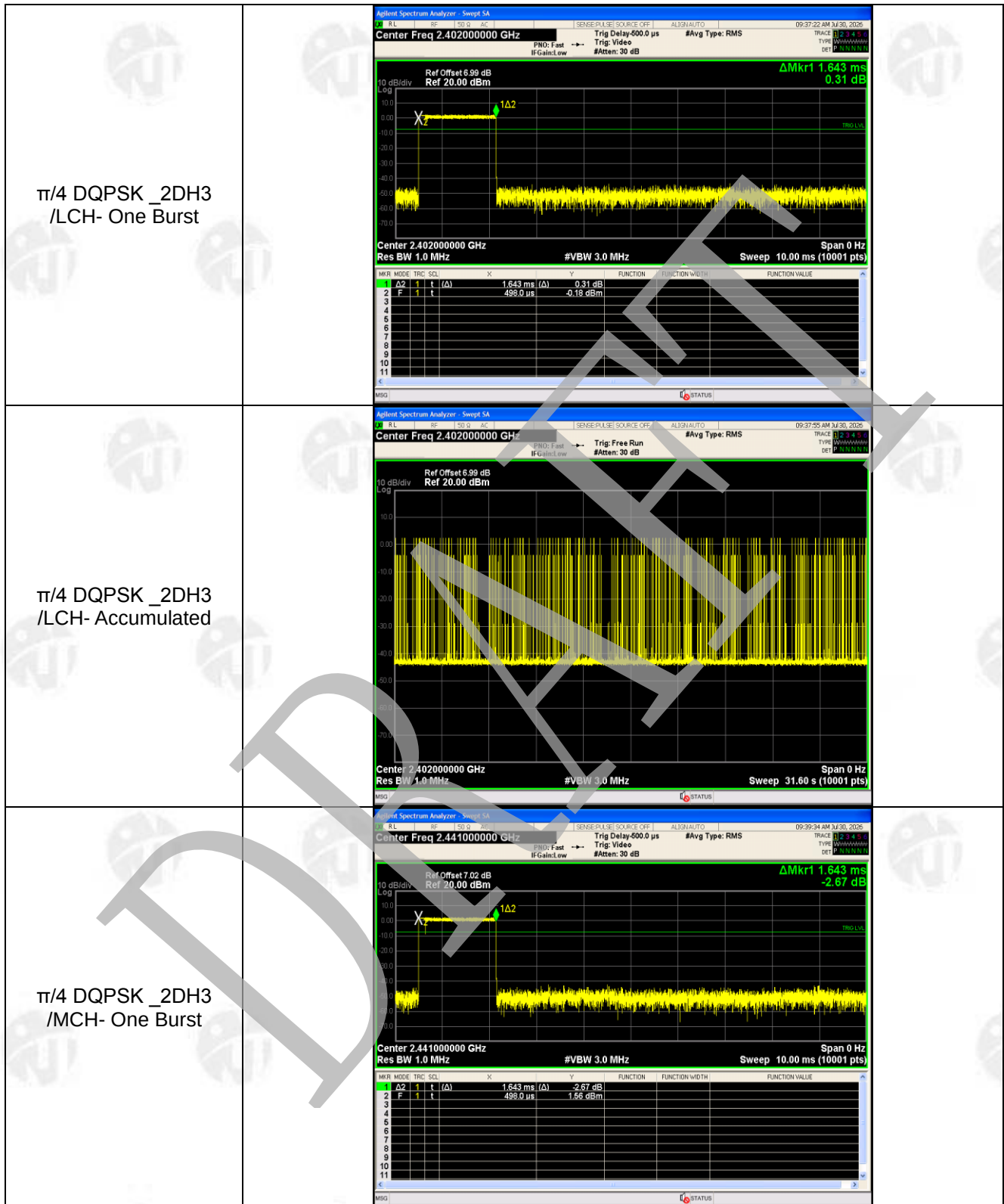
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Accumulated

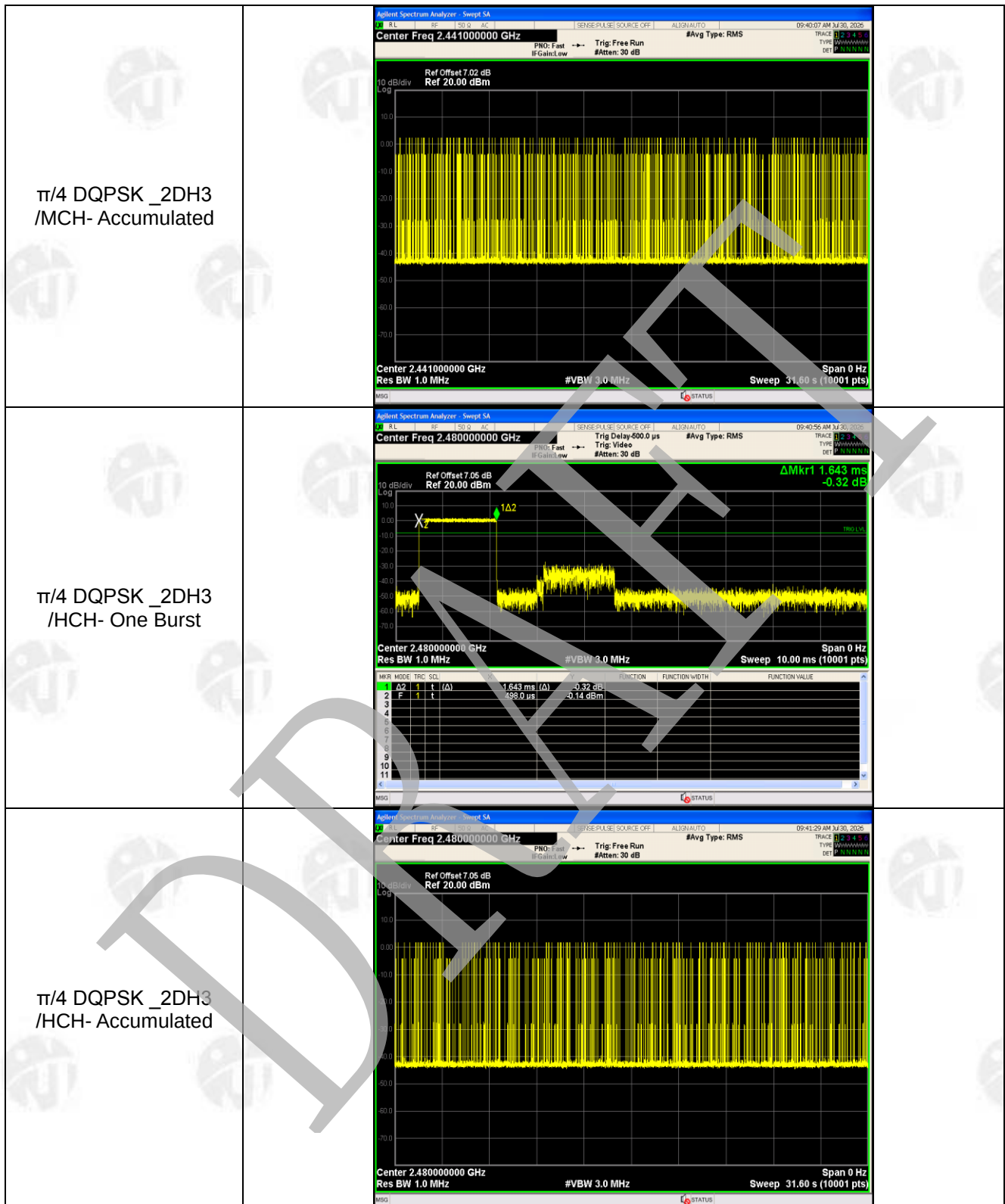


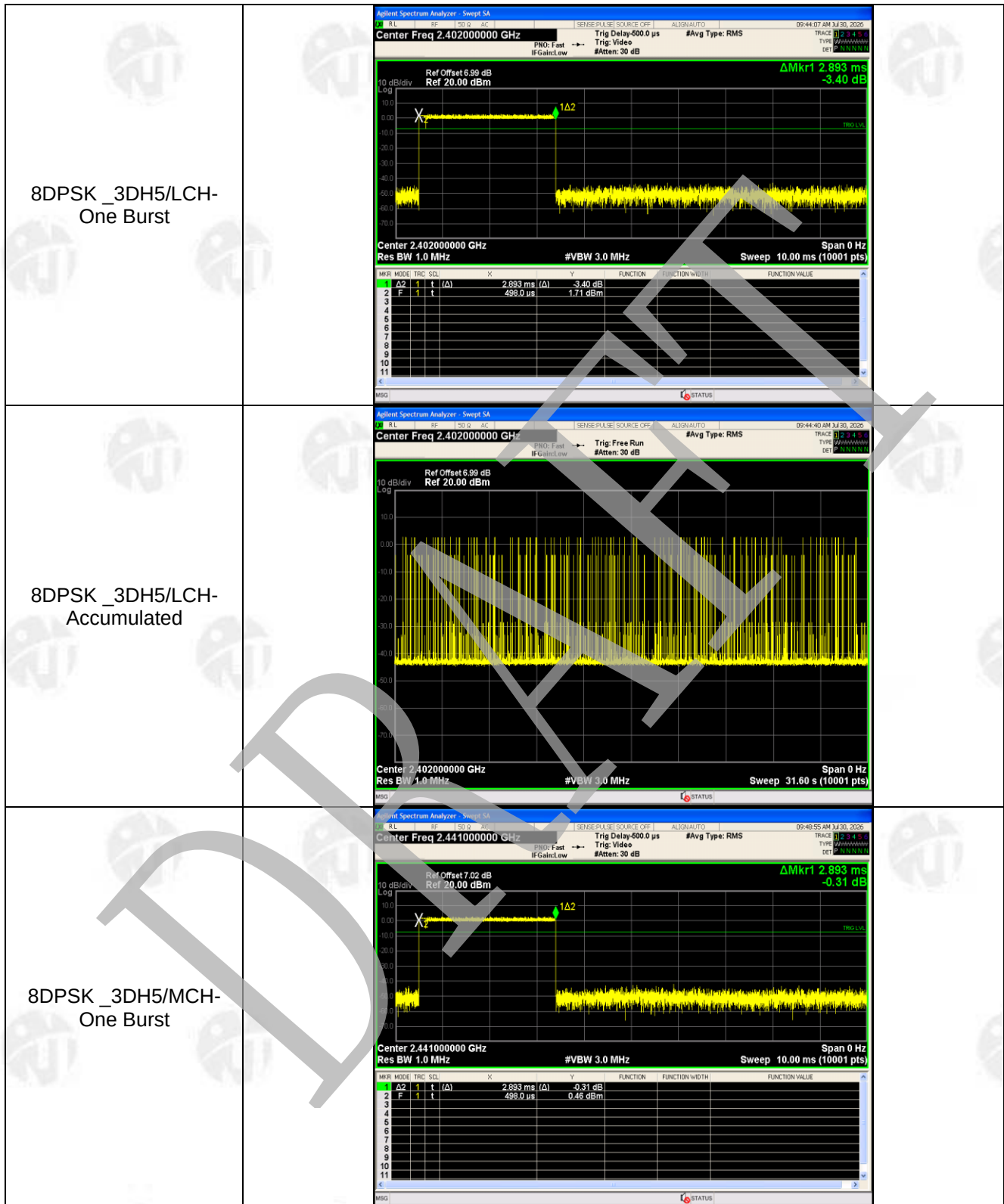
GFSK_1DH1/MCH-
One Burst

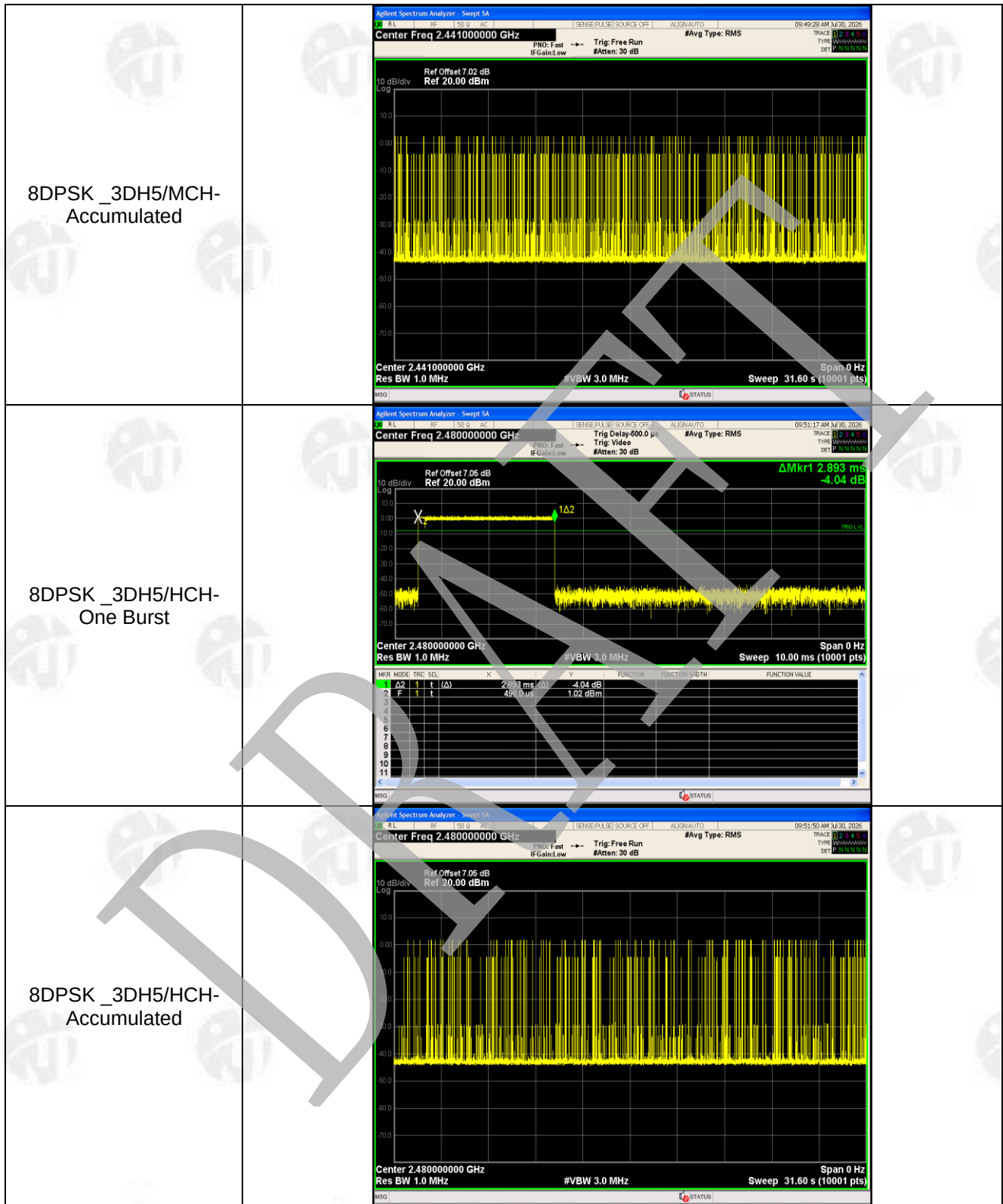












9. Conducted Spurious Emissions and Band Edge Requirement

9.1. Limit

Test Standard	FCC Part15 C Section 15.247 (d)
Test Limit	in any 100 kHz bandwidth outside the frequency bands in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20dB below that in the 100kHz bandwidth within the band that contains the highest level of the desired power. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in 15.209(a).

9.2. Test Setup



9.3. Test Procedure

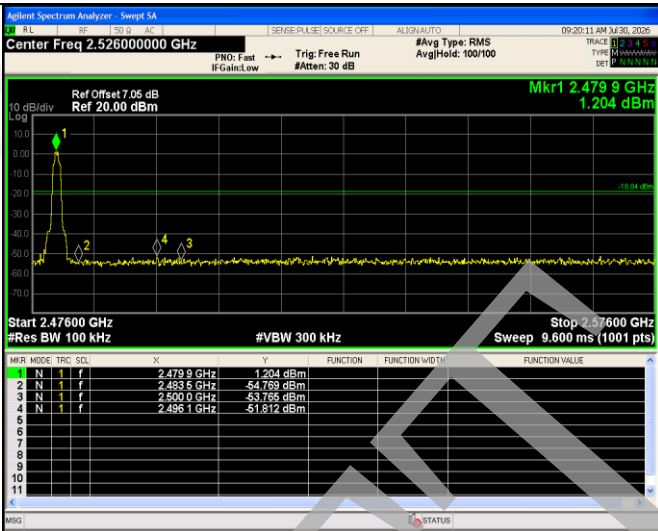
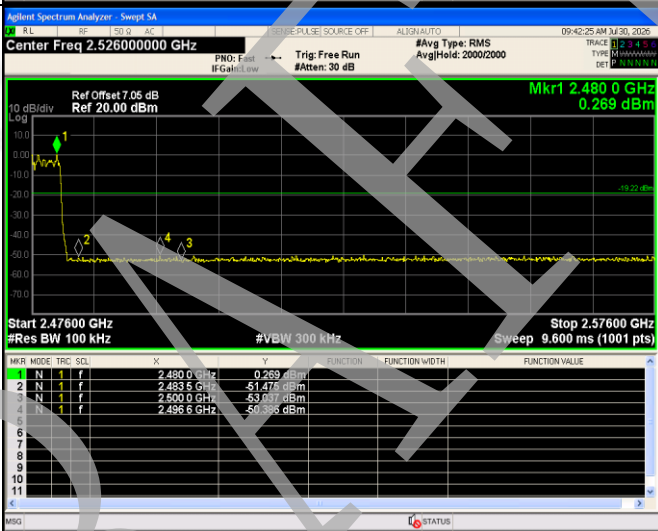
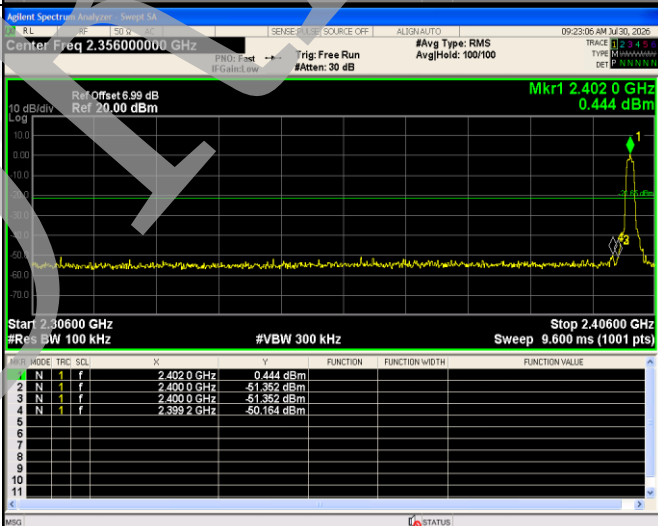
The EUT must have its hopping/Non-hopping function enabled. Using the following spectrum analyzer setting:

1. Set the RBW = 100kHz.
2. Set the VBW = 300kHz.
3. Sweep time = auto couple.
4. Detector function = peak.
5. Trace mode = max hold.
6. Allow trace to fully stabilize.

9.4. Test Result



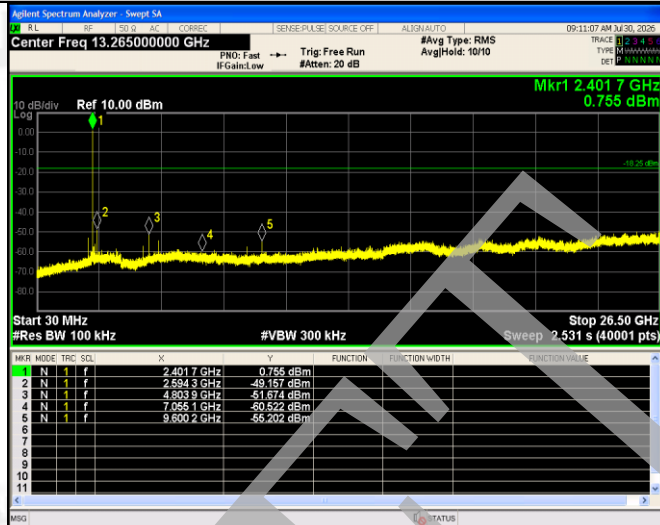
GFSK/HCH/ Hop	<table><tr><th>MKR</th><th>MODE</th><th>TRIG</th><th>SOL</th><th>X</th><th>Y</th><th>FUNCTION</th><th>FUNCTION WIDTH</th><th>FUNCTION VALUE</th></tr><tr><td>1</td><td>N</td><td>1</td><td>f</td><td>2.478 9 GHz</td><td>1.374 dBm</td><td></td><td></td><td></td></tr><tr><td>2</td><td>N</td><td>1</td><td>f</td><td>2.483 6 GHz</td><td>-51.318 dBm</td><td></td><td></td><td></td></tr><tr><td>3</td><td>N</td><td>1</td><td>f</td><td>2.500 0 GHz</td><td>-51.297 dBm</td><td></td><td></td><td></td></tr><tr><td>4</td><td>N</td><td>1</td><td>f</td><td>2.496 8 GHz</td><td>-50.874 dBm</td><td></td><td></td><td></td></tr></table>	MKR	MODE	TRIG	SOL	X	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE	1	N	1	f	2.478 9 GHz	1.374 dBm				2	N	1	f	2.483 6 GHz	-51.318 dBm				3	N	1	f	2.500 0 GHz	-51.297 dBm				4	N	1	f	2.496 8 GHz	-50.874 dBm			
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RF Conducted Spurious Emissions Graphs

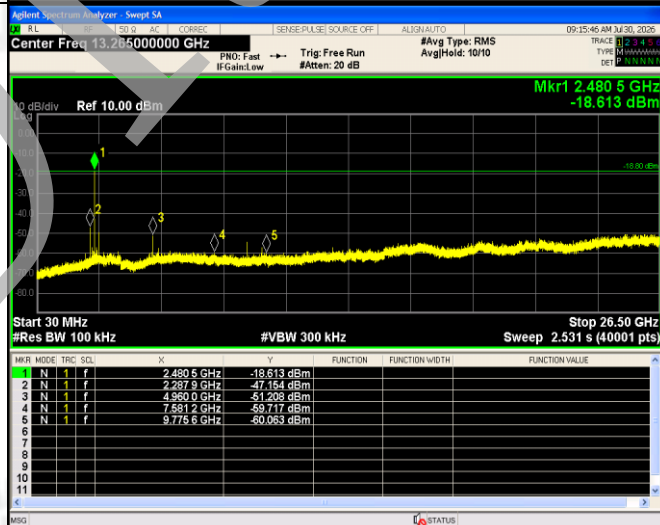
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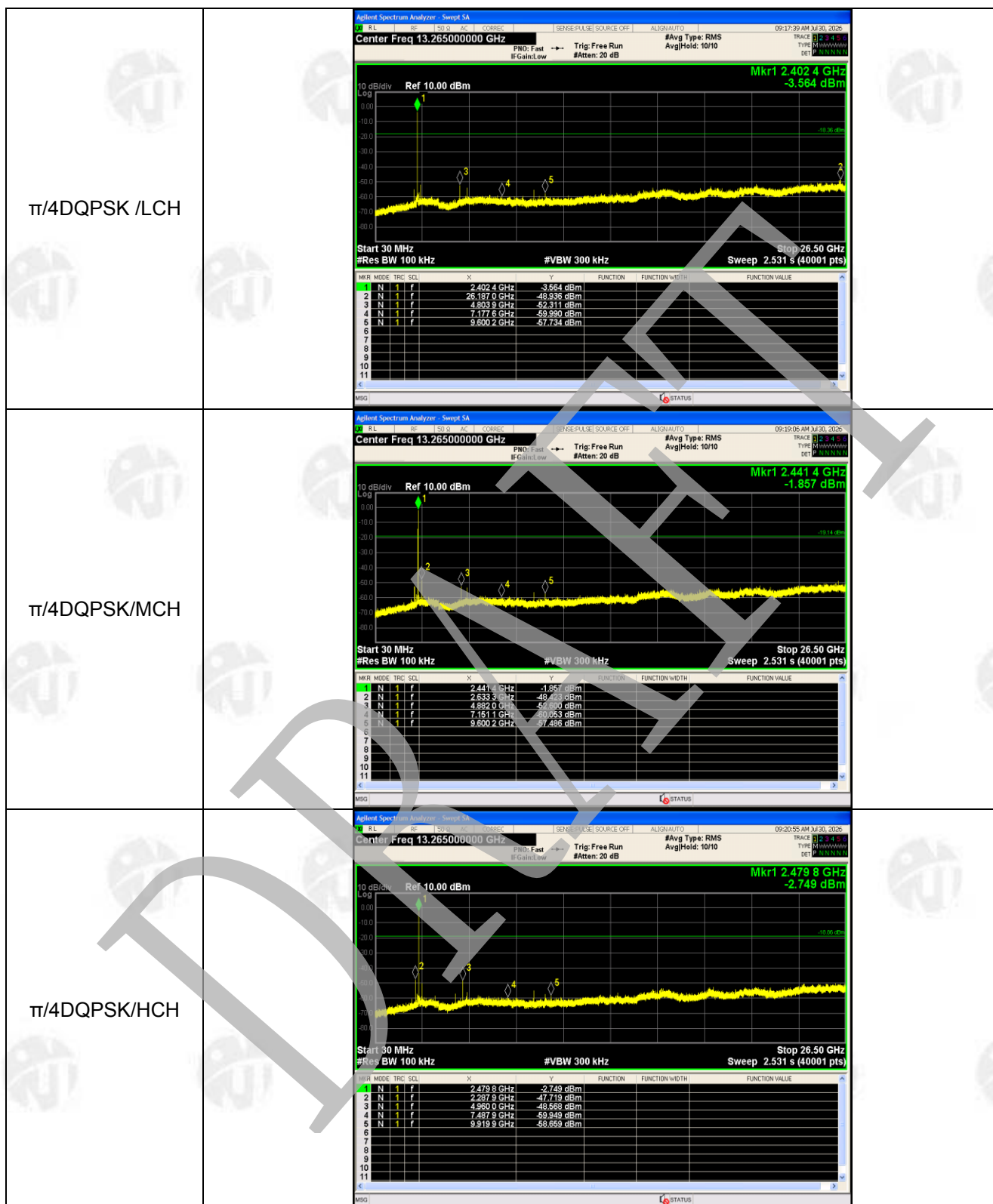


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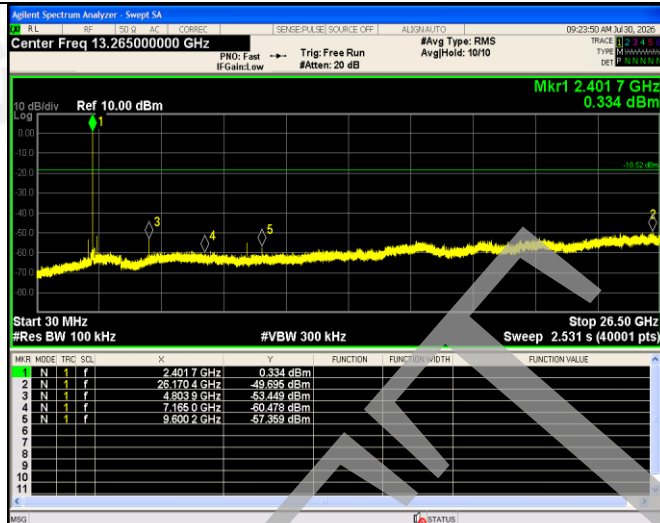


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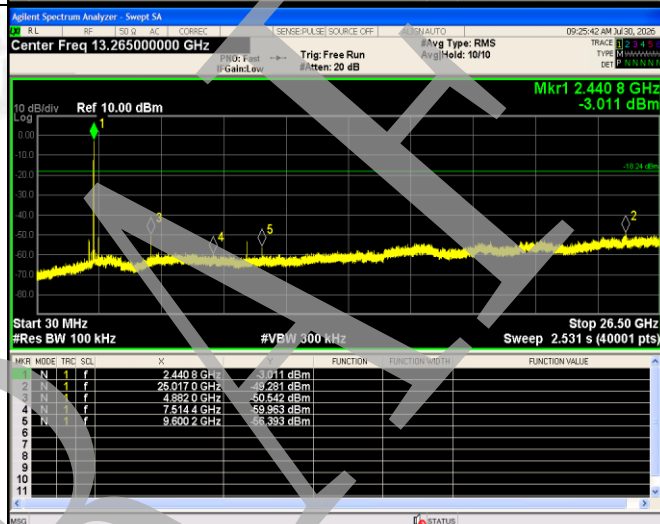




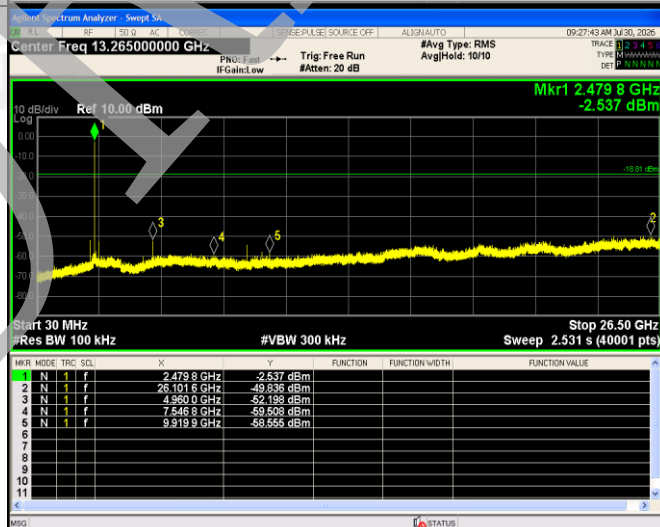
8DPSK /LCH



8DPSK /MCH



8DPSK /HCH



10. Antenna Requirement

10.1. Test Standard and Requirement

Test Standard	FCC Part15 Section 15.203 /247(b)(4)
Requirement	1) 15.203 requirement: An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator, the manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited. 2) 15.247(b) (4) requirement: The conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

10.2. Antenna Connected Construction

The antenna is Rubber rod antenna which permanently attached, and the best case gain of the antenna is 2.57dBi. It complies with the standard requirement.

11. TEST SETUP & EUT PHOTOGRAPH

Reference to EUT photo attachment for details.

----- End of Report -----

DRAFT