

ELECTROMAGNETIC EMISSIONS COMPLIANCE REPORT



EUT Description: WLAN module
Applicant: HP Inc.
1501 Page Mill Road, Palo Alto CA 94304 USA
Manufacturer: HP Inc.
1501 Page Mill Road, Palo Alto CA 94304 USA
Brand Name: HP
Model No. HSC-I014RWL
Report Number: TERF2604001383E2
FCC ID B94-HSCI014RWL
Date of EUT Received: N/A, the test results are fully leveraged from test report number TERF2604001391E2, for more details please refer to section 2 in this report.
Date of Test: N/A, the test results are fully leveraged from test report number TERF2604001391E2, for more details please refer to section 2 in this report.
Issue Date: August 31, 2026

Approved By _____

Alex Hsieh

We hereby certify that:

The above equipment was tested by SGS Taiwan Ltd. Central RF Lab. The test data, data evaluation, test procedures, and equipment configurations shown in this report were made in accordance with the procedures given in ANSI C63.10 and the energy emitted by the sample EUT comply with FCC rule part §15.247.

The results of this report relate only to the sample identified in this report.

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Revision History

Report Number	Revision	Description	Issue Date	Revised By	Remark
TERF2604001383E2	00	Original	August 31, 2026	Candice Li	

Note:

- 1、The remark "*" indicates modification of the report upon requests from certification body.

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1 GENERAL INFORMATION

1.1 Equipment Under Test (EUT)

EUT Description	WLAN module
Brand Name	HP
Model No.	HSC-I014RWL
Power Supply	4 Vdc
Test Software (Name/Version)	Qualcomm Radio Control Toolkit/V4.0.192.1

1.2 RF Specification

Radio Technology:	BT BR+EDR
Channel number:	79 channels
Modulation type:	GFSK + $\pi/4$ DQPSK + 8DPSK
Transmit Power:	11.92 dBm
Frequency Range:	2.402GHz ~ 2.480GHz
Dwell Time:	$\leq 0.4s$

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1.3 Antenna Designation

Ant. Type	Supplier	Main/Aux	Model No.	Freq. (MHz)	Peak Gain(dBi)
PIFA	Vendor 1	Main	6036B0396101 (81EAB615.GBC)	2400~2483.5	2.61
		Aux	6036B0396201 (81EAB615.GBB)		2.66
PIFA	Vendor 2	Main	WA-P-LE-02-460	2400~2483.5	1.84
		Aux	WA-P-LE-02-459		1.88
PIFA	Vendor 1	Main	6036B0395901 (81EAB615.GBE)	2400~2483.5	2.65
		Aux	6036B0396001 (81EAB615.GBD)		2.58
PIFA	Vendor 2	Main	WA-P-LE-02-462	2400~2483.5	2.52
		Aux	WA-P-LE-02-461		2.79
PIFA	Vendor 1	Main	6036B0395701 (81EAB615.GBG)	2400~2483.5	2.14
		Aux	6036B0395801 (81EAB615.GBF)		2.51
PIFA	Vendor 2	Main	WA-P-LE-02-464	2400~2483.5	2.54
		Aux	WA-P-LE-02-463		2.66

Note:

1. Pre-scanned was done on the above antennas, measurements were demonstrated by using the antenna with the highest gain as the worst case scenarios.
2. The antenna information is provided by the applicant. The laboratory does not verify the accuracy of this information, and all test results related to antenna characteristics are based solely on the data supplied. Responsibility for the authenticity and accuracy of these specifications rests entirely with the party who provided the information.
3. The antenna complies with part 15.203 requirement and no consideration of replacement. Please see EUT photo for details.

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1.4 Operating Frequencies

2400~2483.5 MHz							
Item	Freq.	Item	Freq.	Item	Freq.	Item	Freq.
0	2402 MHz	1	2403 MHz	2	2404 MHz	3	2405 MHz
4	2406 MHz	5	2407 MHz	6	2408 MHz	7	2409 MHz
8	2410 MHz	9	2411 MHz	10	2412 MHz	11	2413 MHz
12	2414 MHz	13	2415 MHz	14	2416 MHz	15	2417 MHz
16	2418 MHz	17	2419 MHz	18	2420 MHz	19	2421 MHz
20	2422 MHz	21	2423 MHz	22	2424 MHz	23	2425 MHz
24	2426 MHz	25	2427 MHz	26	2428 MHz	27	2429 MHz
28	2430 MHz	29	2431 MHz	30	2432 MHz	31	2433 MHz
32	2434 MHz	33	2435 MHz	34	2436 MHz	35	2437 MHz
36	2438 MHz	37	2439 MHz	38	2440 MHz	39	2441 MHz
40	2442 MHz	41	2443 MHz	42	2444 MHz	43	2445 MHz
44	2446 MHz	45	2447 MHz	46	2448 MHz	47	2449 MHz
48	2450 MHz	49	2451 MHz	50	2452 MHz	51	2453 MHz
52	2454 MHz	53	2455 MHz	54	2456 MHz	55	2457 MHz
56	2458 MHz	57	2459 MHz	58	2460 MHz	59	2461 MHz
60	2462 MHz	61	2463 MHz	62	2464 MHz	63	2465 MHz
64	2466 MHz	65	2467 MHz	66	2468 MHz	67	2469 MHz
68	2470 MHz	69	2471 MHz	70	2472 MHz	71	2473 MHz
72	2474 MHz	73	2475 MHz	74	2476 MHz	75	2477 MHz
76	2478 MHz	77	2479 MHz	78	2480 MHz	-	-

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1.5 EUT Availability and The Worst Test Modes

1. Test program used to control the EUT for staying in continuous transmitting and receiving mode is programmed.
2. The field strength of radiation emission was measured as the EUT positioned in different orthogonal planes (E1/E2/H) based on actual usage of the EUT to pre-scan the emissions for determining the worst case scenario.
3. Investigation has been done on all the possible configurations for searching the worst case. The given UE is pre-scanned among modes below.

ANTENNA PORT CONDUCTED TEST				
MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION	PACKET TYPE
Peak Output Power, 20dB Band Width, Spurious Emission				
Bluetooth	0 to 78	0,39,78	GFSK	DH5
	0 to 78	0,39,78	$\pi/4$ -DQPSK	2DH5
	0 to 78	0,39,78	8-DPSK	3DH5
Band Edge				
Bluetooth	0 to 78	0,78	GFSK,8-DPSK	DH5,3DH5
Frequency Separation				
Bluetooth	0 to 78	0,1,2, 38,39,40, 76,77,78	GFSK	DH5
			$\pi/4$ -DQPSK	2DH5
			8-DPSK	3DH5
Number of Hopping Frequency, Hopping Band edge				
Bluetooth	0 to 78	0 to 78	GFSK,8-DPSK	DH5,3DH5
Time of Occupancy(Dwell time)				
Bluetooth	0 to 78	39	GFSK	DH1,DH3,DH5
			$\pi/4$ -DQPSK	2DH1,2DH3,2DH5
			8-DPSK	3DH1,3DH3,3DH5

MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION	PACKET TYPE
TRANSMIT RADIATED EMISSION TEST (BELOW 1 GHz)				
Bluetooth	0 to 78	39	GFSK	DH5
TRANSMIT RADIATED EMISSION TEST (ABOVE 1 GHz)				
Bluetooth	0 to 78	0,39,78	GFSK,8-DPSK	DH5,3DH5

Note: The field strength of radiation emission was measured as EUT stand-up position (H mode) and lie down position (E1, E2 mode) for channel Low, Mid and High, the worst case position was reported.

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2 SUMMARY OF TEST RESULTS

FCC Rules	Description Of Test	Result	Note
§15.207(a)	AC Power Line Conducted Emission	Compliant	
§15.247(b)(1)	Peak Output Power	Compliant	
§15.247(a)(1)	Emission Bandwidth	Compliant	
§15.205 §15.209 §15.247(d)	Out of Band Emission	Compliant	
§15.205 §15.209 §15.247(d)	Unwanted Emission	Compliant	
§15.247(a)(1)	Frequency Separation	Compliant	
§15.247(a)(1)(i) ii)	Number of hopping frequency Time of Occupancy	Compliant	
§15.203	Antenna Requirement	Compliant	

Note

1. N/S Indicates whether item(s) being newly tested [N] or spot checked [S].
2. Items other than newly tested [N] are leveraged from test report TERF2604001391E2.

2.1 Test Methodology of Applied Standards

1. FCC Part 15, Subpart C §15.247
2. ANSI C63.10:2020
3. FCC KDB 558074 D01 15.247 Meas Guidance v05r02

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2.2 Measurement Uncertainty

Test Items	Uncertainty
AC Power Line Conducted Emission	+/- 1.61 dB
Output Power measurement	+/- 0.97 dB
Emission Bandwidth	+/- 1.38 Hz
Conducted emission measurement	+/- 0.77 dB
Frequency Separation	+/- 1.48 Hz
Number of hopping frequency	+/- 1.48 Hz
Time of Occupancy	+/- 1.48 Hz
Temperature	+/- 0.60 °C
Humidity	+/- 3.00 %
DC / AC Power Source	+/- 1.00 %

Radiated Spurious Emission Measurement Uncertainty		
Polarization: Vertical	+/- 1.89 dB	9kHz - 30MHz
	+/- 4.10 dB	30MHz - 1000MHz
	+/- 3.41 dB	1GHz - 18GHz
	+/- 3.89 dB	18GHz - 40GHz
Polarization: Horizontal	+/- 1.89 dB	9kHz - 30MHz
	+/- 4.10 dB	30MHz - 1000MHz
	+/- 3.41 dB	1GHz - 18GHz
	+/- 3.89 dB	18GHz - 40GHz
Radiated Spurious Emission	+/- 2.00 dB	33GHz - 50GHz
	+/- 1.59 dB	50GHz - 60GHz
	+/- 1.71 dB	60GHz - 90GHz
	+/- 1.64 dB	90GHz - 140GHz
	+/- 3.84 dB	140GHz - 220GHz

Note

1. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.
2. The conformity assessment statement in this report is based solely on the test results, measurement uncertainty is excluded.

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2.3 Test Facility

Laboratory	Test Site Address	Test Site Name	FCC Designation number / Registration Number	IC CAB identifier / Company Number
SGS Taiwan Ltd. Central RF Lab. (TAF code 3702)	No.134, Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803	SAC 1 / SAC 2 / SAC 3 Conduction 1 / Conducted 1 Conducted 2 / Conducted 3 Conducted 4 / Conducted 5 Conducted 6 / FAC 1	TW0027 / 891563	TW3702 / 4620A
SGS Taiwan Ltd. Central RF Lab. (TAF code 3702)	No.2, Keji 1st Rd, Guishan District, Taoyuan City, Taiwan 333	SAC C / SAC D / SAC G Conduction C/ Conducted A Conducted B / Conducted C Conducted D / Conducted E Conducted F / Conducted G FAC A	TW0028 / 200037	TW3702 / 4620E

Measurement	Test Site Name	Test Engineer	EUT S/N	Test Environment	Test Date
Conducted	Conducted E	Henry Chiang	P84844-001	22.6~23.4°C / 74~68%	2026/05/05 ~ 2026/06/15
Radiated	SAC C	Alex Li	P84844-001	22.1~24.5°C / 55~67%	2026/06/10 ~ 2026/06/16
Conduction	Conduction C	Alex Li	P84844-001	21.3°C / 62%	2026/07/04

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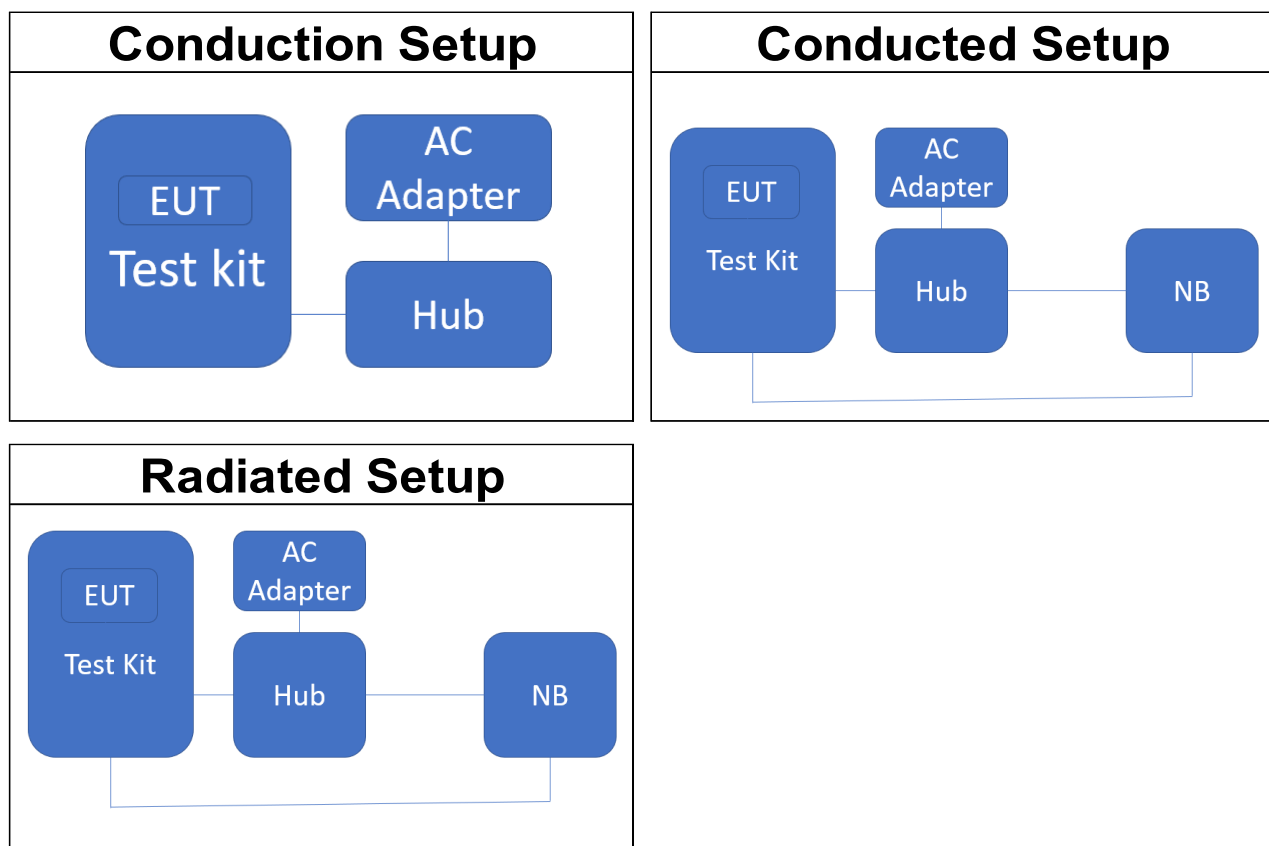
3 CONTROL UNIT(S) AND PERIPHERAL(S)

3.1 EUT Exercise

An engineering test mode (software/firmware) that applicant provided was utilized to manipulate the EUT into transmit, selection of the test channel, and modulation scheme.

The offset level is set in the spectrum analyzer to compensate the RF cable loss and attenuation factor between EUT conducted port and spectrum analyzer. With the offset compensation, the spectrum analyzer reading level is exactly EUT RF output level.

3.2 Diagrams



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3.3 List

3.3.1 Conduction Setup

AC Power-Line Conducted Emission Test Site: Conduction C					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL. (mm/dd/yyyy)	CAL DUE. (mm/dd/yyyy)
AC Adapter	Chicony Power Technology Co., Ltd.	TPN-CA25	N/A	N/A	N/A
Hub	HP	TPC-I049-D	N/A	N/A	N/A
Test Kit	HP	HSC-I014RWL	N/A	N/A	N/A

3.3.2 Conducted Setup

Conducted Emission Test Site: Conducted E					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL. (mm/dd/yyyy)	CAL DUE. (mm/dd/yyyy)
AC Adapter	Delta Electronics, Inc.	TPN-DA25	N/A	N/A	N/A
Test kit	HP	HSC-I014RWL	N/A	N/A	N/A
Hub	HP	TPC-I049-D	N/A	N/A	N/A
Notebook	ASUS	ME407KA	N/A	N/A	N/A

3.3.3 Radiated Setup

Radiated Emission Test Site: SAC C					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL. (mm/dd/yyyy)	CAL DUE. (mm/dd/yyyy)
Notebook	Lenovo	L440	P0000367	N/A	N/A
USB Cable	SHANG LIAN TECHNOLOGY CO.,LTD	VPC-70	N/A	N/A	N/A
AC Adapter	Chicony Power Technology Co., Ltd.	TPN-CA25	N/A	N/A	N/A
Test Kit	HP	HSC-I014RWL	N/A	N/A	N/A
Hub	HP	TPC-I049-D	N/A	N/A	N/A

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4 TEST INSTRUMENT

4.1 Conducted Measurement

Conducted Emission Test Site: Conducted E					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL. (mm/dd/yyyy)	CAL DUE. (mm/dd/yyyy)
Attenuator	Marvelous	MVE2213-10	RF05	11/13/2025	11/12/2026
DC Block	PASTERNAK	PE8210	RF34	11/13/2025	11/12/2026
Power Meter	Anritsu	ML2496A	1326001	07/29/2025	07/28/2026
Power Sensor	Anritsu	MA2411B	1315048	07/29/2025	07/28/2026
Power Sensor	Anritsu	MA2411B	1315049	07/29/2025	07/28/2026
Spectrum Analyzer	KEYSIGHT	N9010B	MY63440390	02/02/2026	02/01/2027
Test Software	SGS Taiwan	Radio Test Software	Ver.21	N.C.R	N.C.R

4.2 Radiated Measurement

Radiated Emission Test Site: SAC C					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL. (mm/dd/yyyy)	CAL DUE. (mm/dd/yyyy)
3m Site NSA	SGS	966 chamber C	N/A	03/02/2026	03/01/2027
Active Loop Antenna	COM-POWER	AL-130R	10160105	12/16/2025	12/15/2026
Attenuator	Woken	WATT-218FS-10	RF17	11/13/2025	11/12/2026
Broadband Antenna	SCHWARZBECK	VULB 9168	9168-300	11/14/2025	11/13/2026
Coaxial Cable	EMCI+Huber Suhner	RG 214/U+EMC104-SM-SM-6000+EMC105-SM-SM-12000+15	W13.01+150813+2310002+15	11/13/2025	11/12/2026
EMI Test Receiver	R&S	ESU 40	100363	04/29/2026	04/28/2027
Horn Antenna	RF SPIN	DRH0844	KV2E12A0844	01/23/2026	01/22/2027
Pre-Amplifier	EMC Instruments	EMC118A45SE	980789	11/13/2025	11/12/2026
Pre-Amplifier	EMC Instruments	EMC184045SEE	980881	11/13/2025	11/12/2026
Pre-Amplifier	EMC Instruments	EMC330	980091	11/13/2025	11/12/2026
Spectrum Analyzer	KEYSIGHT	N9010B	MY63440390	02/02/2026	02/01/2027
Test Software	audix	e3	E3 210616 SGS Ver.9 (C)	N.C.R	N.C.R

4.3 Emission from AC power line

AC Power-Line Conducted Emission Test Site: Conduction C					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL. (mm/dd/yyyy)	CAL DUE. (mm/dd/yyyy)
Coaxial Cable	EC Lab	RF-HY-CAB-250	RF-HY-CAB-250-01	03/27/2026	03/26/2027
EMI Test Receiver	R&S	ESCI	101342	04/16/2026	04/15/2027
LISN	SCHWARZBECK Mess-Elektronik	NSLK8127	974	06/29/2026	06/28/2027
Pulse Limiter	EC Lab	VTSD 9561F-N	485	03/27/2026	03/26/2027

NOTE: N.C.R refers to Not Calibrated Required.

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5 REGULATORY REQUIREMENTS

5.1 Emission Bandwidth

This is the factor to determine applicable frequency separation.

5.2 Frequency Separation

Frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW.

5.3 Number Of Hopping Frequency

Frequency hopping systems operating in the 2400MHz-2483.5 MHz bands shall use at least 15 hopping frequencies.

5.4 Maximum Output Power

For frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 hopping channels, The Limit: 1Watt. For all other frequency hopping systems in the 2400 – 2483.5MHz band: The Limit: 0.125 Watts. The power limit for 1Mbps is 1watt, and 2Mbps, 3Mbps and AFH mode are 0.125 watts.

5.5 Time Of Occupancy (Dwell Time)

Frequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 channels. The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed. Frequency hopping systems may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 channels are used.

5.6 Out of Band Emission

For emissions in non-restricted frequency bands, in any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power produced by the intentional radiator shall be at least 20 dB below the power measured in the 100 kHz bandwidth that contains the highest level of the desired signal. This requirement is based on either a conducted or radiated RF measurement, provided the transmitter complies with the applicable peak conducted power limits.

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5.7 Unwanted Emissions

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits.

In addition, radiated emissions which fall in the restricted bands must also comply with the applicable radiated emission limits as defined in the general emission limit tables.

Moreover, for an intentional radiator operating below 10 GHz, the frequency range of measurements shall extend up to the tenth harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower.

Frequency (MHz)	Field strength (microvolts/meter)	Distance (meters)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	2400/F(kHz)	30
1.705-30	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

Note: The lower limit shall apply at the transition frequencies.

5.8 AC Power Line Conducted Emission

Frequency range within 150kHz to 30MHz shall not exceed the Limit table as below.

Frequency range MHz	Limits (dBμV)	
	Quasi-peak	Average
0.15 to 0.50	66 to 56	56 to 46
0.50 to 5	56	46
5 to 30	60	50

Note

- 1.The lower limit shall apply at the transition frequencies
- 2.The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz

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5.9 Antenna Requirements

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 shall be considered sufficient to comply with the provisions of this section. 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. This requirement does not apply to carrier current devices or to devices operated under the provisions of § 15.211, 15.213, 15.217, 15.219, 15.221, or § 15.236. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with § 15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this part are not exceeded.

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6 TEST CONFIGURATION

6.1 Emission Bandwidth



1. Place the EUT on the table and set it in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
3. 20dB BW measurements
The testing is performed in accordance with the applicable regulatory measurement procedure.
Set the spectrum analyzer as
RBW= 1 % to 5% of OBW without going below 10kHz,
VBW $\geq 3 \times$ RBW,
Span= 2 to 5 times of the OBW,
Sweep=Auto, Detector = Peak, and Trace mode = Max Hold.
Use the X dB bandwidth mode function of the spectrum analyzer and set to 20dB.
Repeat above procedures until all test default channel is completed.
4. 99% BW measurements
The testing is performed in accordance with the applicable regulatory measurement procedure.
Set the spectrum analyzer as
RBW= 1 % to 5% of 99% Bandwidth without going below 10kHz,
VBW $\geq 3 \times$ RBW
Span= 1.5 to 5 times of the 99% Bandwidth,
Sweep=Auto, Detector = Peak, and Trace mode = Max Hold.
Use the 99% power bandwidth function of the spectrum analyzer.
Repeat above procedures until all test default channel is completed.

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6.2 Frequency Separation



Place the EUT on the table and set it to transmit mode.

The testing is performed in accordance with the applicable measurement procedure.

1. Set center frequency of spectrum analyzer = middle of hopping channel.
2. Set the RBW approximately 30% of the channel spacing, VBW $\geq$ 1/10 of RBW.
3. Adjust Span to Wide enough to capture the peaks of two adjacent channels.
4. Sweep time = Auto Couple.
5. Max hold. Mark 3 Peaks of hopping channel and record the 3 peaks frequency.

6.3 Number Of Hopping Frequency

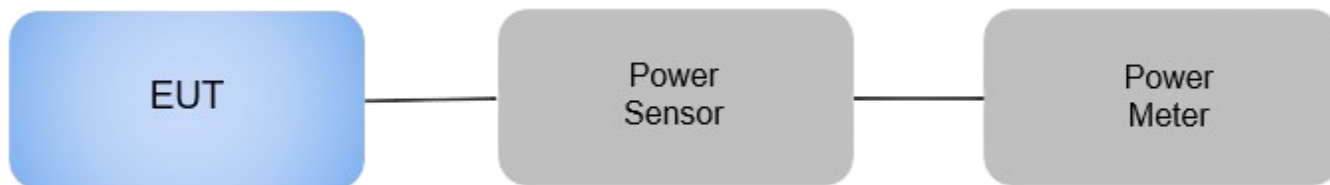


1. Place the EUT on the table and set it in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
3. The testing is performed in accordance with the applicable measurement procedure.
4. Configure the spectrum analyzer as follows:
 - Start frequency= 2400 MHz
 - Stop frequency= 2483.5 MHz
 - RBW = 30% of the channel spacing
 - VBW $\geq$ 1/10 of RBW
 - Detector = Peak
 - Sweep = Auto
 - Trace mode = Max Hold.View and count the number of hopping channels within the band.

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6.4 Maximum Output Power



1. Place the EUT on the table and set it to transmit mode.
2. The testing was performed in accordance with the applicable measurement procedure.
3. Remove the antenna from the EUT and connect a low-loss RF cable from the antenna port to the power meter.
4. Record the maximum reading as observed from the power meter(Max Hold, Detector = Peak, RBW $\geq$ 20dB bandwidth).
5. Repeat the above procedures until all default test channels have been measured.

6.5 Time Of Occupancy (Dwell Time)



1. Place the EUT on the table and set it in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
3. The testing is performed in accordance with the applicable measurement procedure.
4. Configure the spectrum analyzer as follows:
 - Set the center frequency of the spectrum analyzer to the operating frequency.
 - RBW = 1 MHz
 - VBW = 3 MHz
 - Span = 0Hz
 - Detector = Peak
 - Adjust Sweep = 2 ~ 8ms
 - Repeat above procedures until all datarate of the interest measured were complete.
5. Formula Deduced: time occupancy of one time slot X Hopping rate / total slot in one channel / total channel that hops X period of working channels.

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6. Where, standard hopping rate is 1600 hops/s, slot in one channel for DH1, DH3, and DH5 is 2, 4, and 6, respectively.

DH1 consists of single time slot of the uplink, and one slot of the downlink Total Slot: 2

DH3 consists of three time slot of the uplink, and one slot of the downlink. Total Slot: 4

DH5 consists of five time slot of the uplink, and one slot of the downlink. Total Slot: 6

*Note: the result of the complete test default channel at 1Mbps is recorded on the test report, 2Mbps, and 3Mbps only records the measurement result at middle channel that reveals no much deviation.

6.6 Out of Band Emission



6.6.1 Conducted Band Edge

1. Place the EUT on the table and set it in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
3. The testing is performed in accordance with the applicable measurement procedure.
4. Configure the spectrum analyzer as follows:
Set the center frequency of the spectrum analyzer to the operating frequency.
RBW = 100 kHz
VBW = 300 kHz
Sweep = Auto
Mark Peak, below 2.4GHz and above 2.4835GHz and record the max. level.
Repeat above procedures until all frequency measured were complete.

6.6.2 Conducted Spurious Emission

1. The testing is performed in accordance with the applicable measurement procedure.
2. Connect the antenna port of the EUT to the spectrum analyzer.
3. Configure the spectrum analyzer as follows:
RBW = 100 kHz
VBW = 300 kHz
Detector = Peak
Sweep = Auto
Allow the trace to fully stabilize.
Use the peak marker function to determine the maximum power level in any 100 kHz band segment within the fundamental emission bandwidth (EBW).
4. Repeat above procedures until all default test channel measured were complete.

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6.7 Unwanted Emissions

6.7.1 Duty Cycle Correction Factor



1. Correction Factor For Radiated Unwanted Emission
2. Adjust and configure any EUT switches, controls, or input data streams to ensure that the EUT is transmitting or encoded to produce the worst-case pulse ON time.
3. The testing was performed in accordance with the applicable measurement procedure.
4. Remove the antenna from the EUT and connect a low-loss RF cable from the antenna port to the spectrum analyzer.
5. Set the center frequency of the spectrum analyzer to the operating frequency.
6. Configure the spectrum analyzer as follows:
 - RBW = 1 MHz
 - VBW = 3 MHz
 - Span = 0 Hz
 - Detector = Peak
 - Sweep Time = 100 ms (manually adjusted)Repeat the above procedure until all datarate of interest have been measured.
7. Average Value (dB μ V/m) = Peak Actual Field Strength (dB μ V/m) + Duty Cycle Correction Factor (dB)
8. Duty Cycle Correction Factor (dB) = $20 \times \log_{10} (T_{on} / 100 \text{ ms})$

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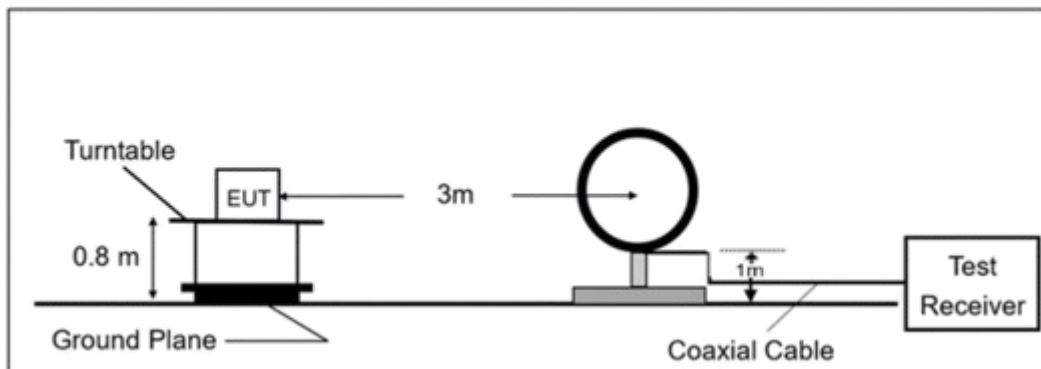
6.7.2 Radiated Emission

For Measurements From 9 kHz To 30 MHz

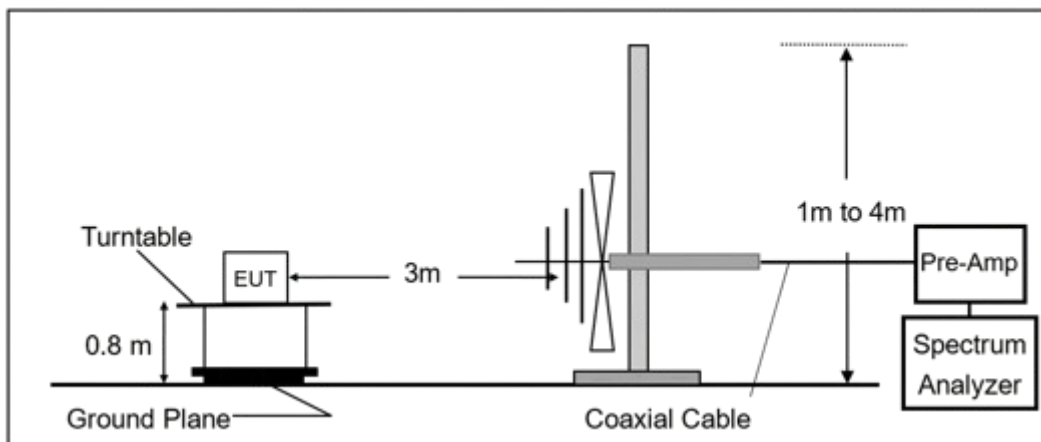
Radiated emission below 30MHz is measured in a 9m*6m*6m semi-anechoic chamber, the measurements correspond to those obtained at an open-field test site.

There is a comparison data of both open-field test site and semi-Anechoic chamber, and the result came out very similar.

Radiated Emission Test Set-Up, Frequency Below 30MHz.



Radiated Emission Test Set-Up, Frequency From 30MHz to 1000MHz.



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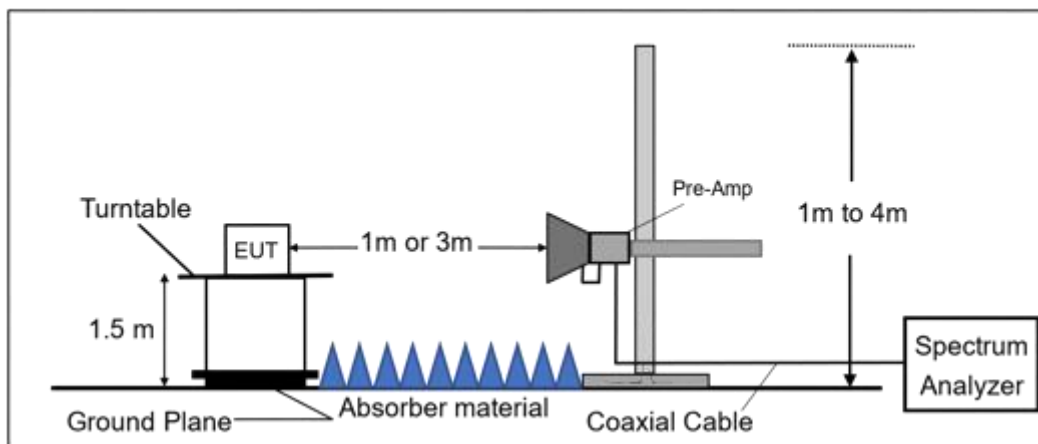
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Radiated Emission Test Set-Up, Frequency Above 1GHz.



1. The testing was performed in accordance with the applicable radiated emission measurement procedure.
2. The EUT was placed on a turntable at a height of 0.8 m for frequencies below 1 GHz and 1.5 m for frequencies above 1 GHz.
3. The turntable was rotated 360 degrees to determine the position of the maximum emission level.
4. The EUT was positioned 3 meters away from the receiving antenna, which was varied in height from 1 m to 4 m to locate the highest emissions.
5. The spectrum analyzer was set with RBW = 100 kHz and VBW = 300 kHz, using a Peak detector for frequencies between 30 MHz and 1 GHz.
6. A receiver mode with RBW = 120 kHz was used for Quasi-Peak (QP) measurements between 30 MHz and 1 GHz.
7. For frequencies above 1 GHz, the spectrum analyzer was set with RBW = 1 MHz, VBW = 3 MHz, and Detector = Peak for maximum emission measurements.
8. For average emission measurements above 1 GHz where the duty cycle (D) is $\geq 98\%$, the analyzer was set with RBW = 1 MHz, VBW = 3 MHz, and the RMS detector with correction factor $[10 \log(1/D)]$. If the emission is continuous ($D \geq 98\%$) and does not switch ON/OFF with the transmit cycle, then no duty cycle correction is required.
9. For average emission measurements above 1 GHz where $D < 98\%$, the analyzer was set with RBW = 1 MHz and $VBW \geq 1/T$.
10. The average value of pulsed emissions is determined using the duty cycle correction method, applying a correction factor of $20 \times \log_{10} (T_{on} / 100 \text{ ms})$.
11. When measuring radiated emissions above 1 GHz, the receiving antenna was maintained within the "cone of radiation" and pointed at the emission source in both azimuth and elevation, with polarization oriented for maximum response, ensuring it remained within the 3 dB illumination beamwidth of the measurement antenna.
12. The six highest emissions were fully maximized using the above procedures to ensure EUT compliance.
13. Each emission was further maximized by changing the receiving antenna polarization between horizontal and vertical.

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14. Repeat the above procedures until all default test channels (low, middle, and high) are measured.

Note: Emissions from 9 kHz to 30 MHz were pre-scanned and found to be at least 20 dB below the applicable limits, and are therefore not reported.

6.7.3 Field Strength Calculation

The field strength is calculated by adding the antenna factor and cable loss, then subtracting the amplifier gain and any applicable duty cycle correction factor from the measured reading. The basic equation and an example calculation are as follows:

$$FS = RA + AF + CL - AG$$

Where:

FS = Field Strength (dB μ V/m)
RA = Reading Amplitude (dB μ V)
AF = Antenna Factor (dB/m)
CL = Cable Loss (dB)
AG = Amplifier Gain (dB)

The emission limit is expressed in dB μ V/m, which corresponds to the logarithmic conversion of $20 \times \log_{10} (\mu\text{V/m})$.

Actual Field Strength (dB μ V/m) = Spectrum Analyzer Reading (dB μ V) + Total Factor (dB)

Total Factor (dB) = Antenna Factor (dB) + Cable Loss (dB) – Preamplifier Gain (dB)

Average value(dB μ V/m)=Peak Actual FS(dB μ V/m)+ Duty Cycle Correction Factor(dB)

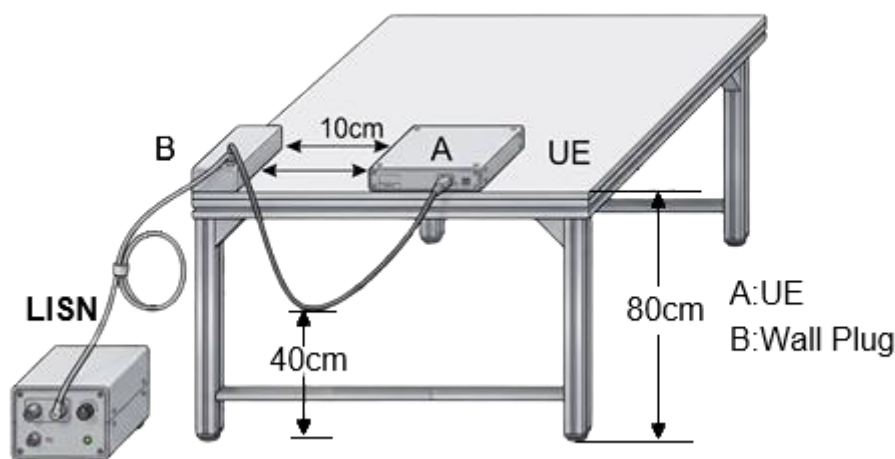
Duty Cycle Correction Factor(dB) = $20 \log (T_{\text{on}}/100 \text{ ms})$

The low frequency, which started from 9 kHz to 30MHz, was pre-scanned and the result which was 20dB lower than the limit was not reported.

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6.8 AC Power Line Conducted Emission



1. The conducted emission tests were performed at the designated test site using a setup in accordance with ANSI_C63.10
2. The EUT was placed on a non-conductive table that is 0.8 meters above the ground plane. Conducted emissions were measured in the frequency range from 0.15 MHz to 30 MHz using CISPR Quasi-Peak and Average detector modes. The two LISNs provided 50 μ H / 50 ohm coupling impedance for the measuring instrument. Both lines of the power mains connected to the EUT were checked for maximum conducted interference.
3. The AC/DC power adaptor of the EUT was connected to the LISN. The EUT was positioned flush with the rear edge of the table, with a minimum 0.4-meter distance from the shielding wall.
4. The LISNs were connected to the power source and configured according to the test requirements.
5. The maximum emission levels were investigated for each mode of operation. The six highest emissions were further maximized to ensure compliance.
6. The above procedures were repeated for all power supply configurations of the EUT.

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7 TEST RESULTS

7.1 Emission Bandwidth

7.1.1 20dB Bandwidth

GFSK

CH	20 dB BW (MHz)	2/3 BW (MHz)
0	0.8881	0.59
39	0.8874	0.59
78	0.8873	0.59

$\pi/4$ -DQPSK

CH	20 dB BW (MHz)	2/3 BW (MHz)
0	1.320	0.88
39	1.325	0.88
78	1.319	0.88

8-DPSK

CH	20 dB BW (MHz)	2/3 BW (MHz)
0	1.311	0.87
39	1.310	0.87
78	1.310	0.87

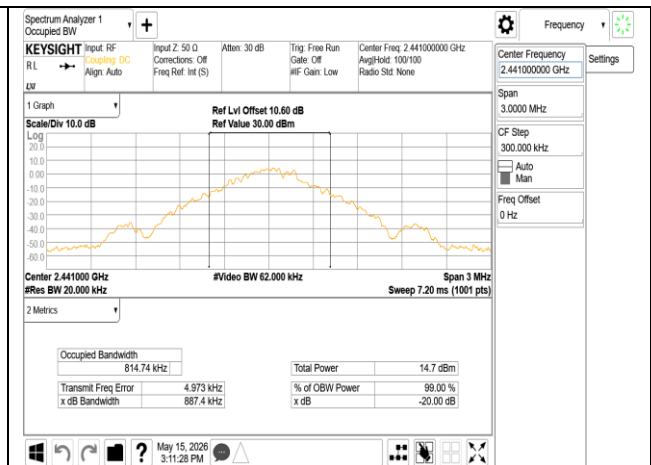
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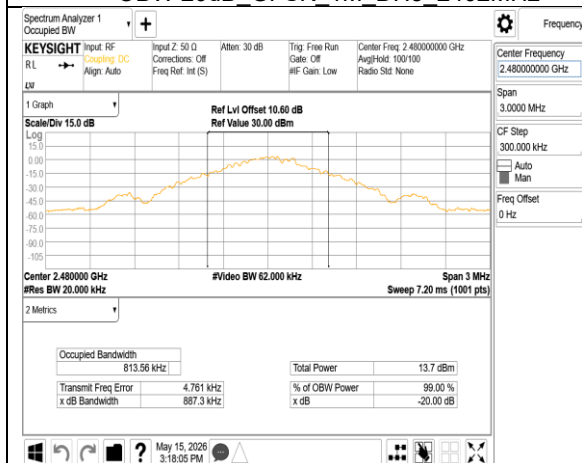
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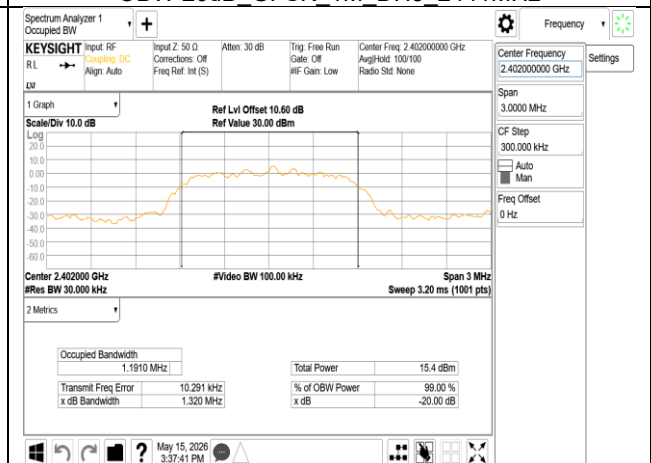
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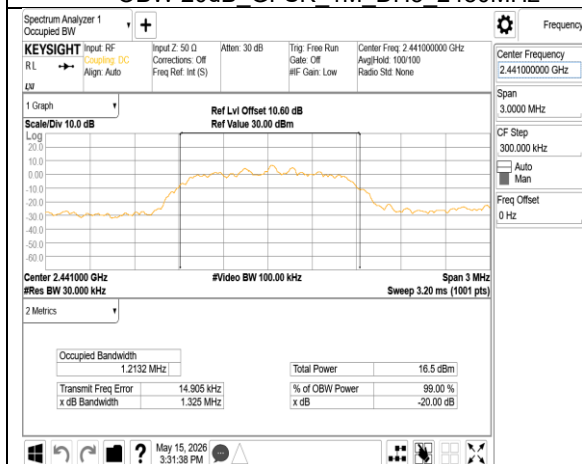
OBW 20dB GFSK 1M DH5 2441MHz



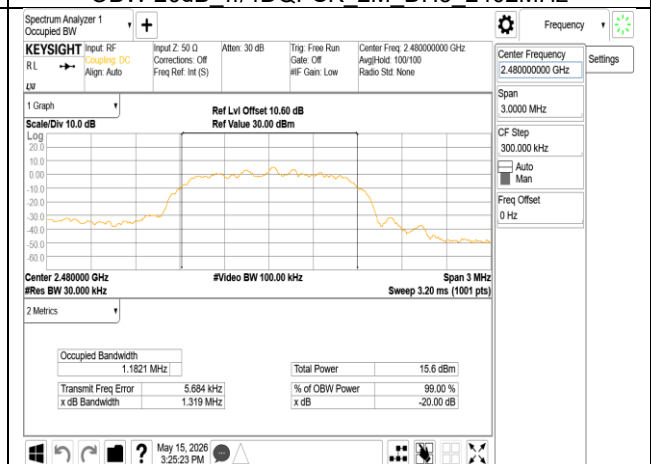
OBW 20dB GFSK 1M DH5 2480MHz



OBW 20dB $\pi/4$ DQPSK 2M DH5 2402MHz



OBW 20dB $\pi/4$ DQPSK 2M DH5 2441MHz

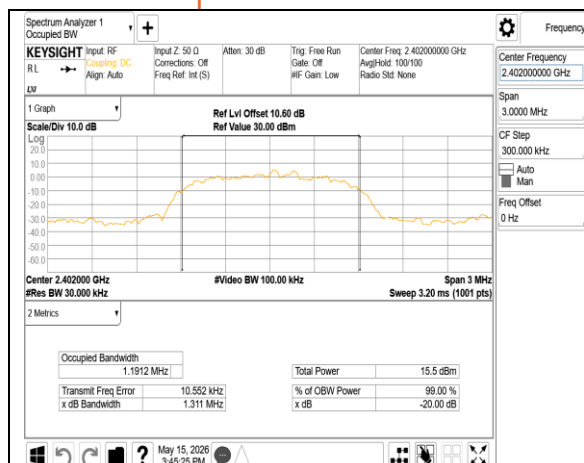


OBW 20dB $\pi/4$ DQPSK 2M DH5 2480MHz

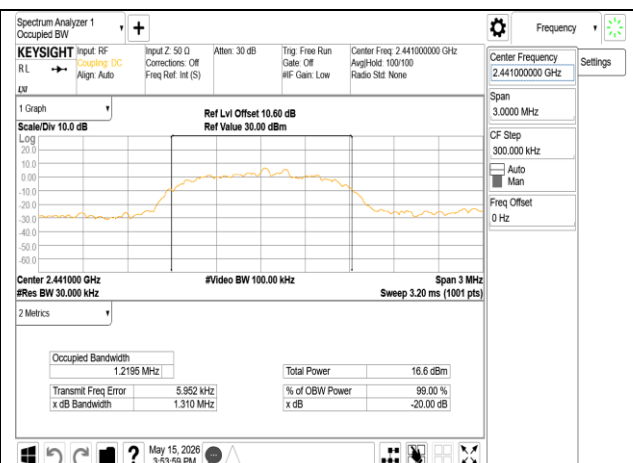
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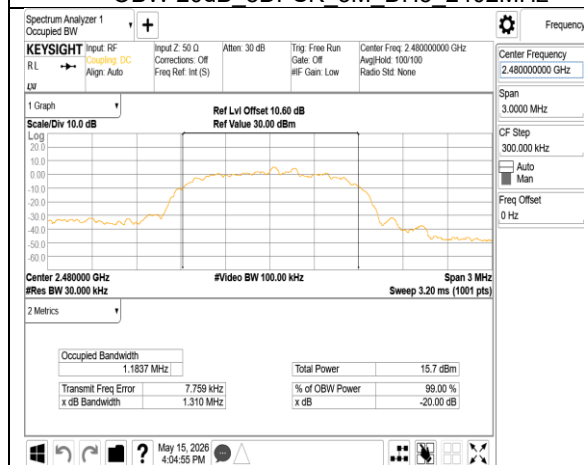
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OBW 20dB_8DPSK_3M_DH5_2402MHz



OBW 20dB_8DPSK_3M_DH5_2441MHz



OBW 20dB_8DPSK_3M_DH5_2480MHz

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7.1.2 99% Bandwidth

GFSK

CH	99% BW (MHz)
0	0.83859
39	0.83805
78	0.83762

 $\pi/4$ -DQPSK

CH	99% BW (MHz)
0	1.1852
39	1.1941
78	1.1805

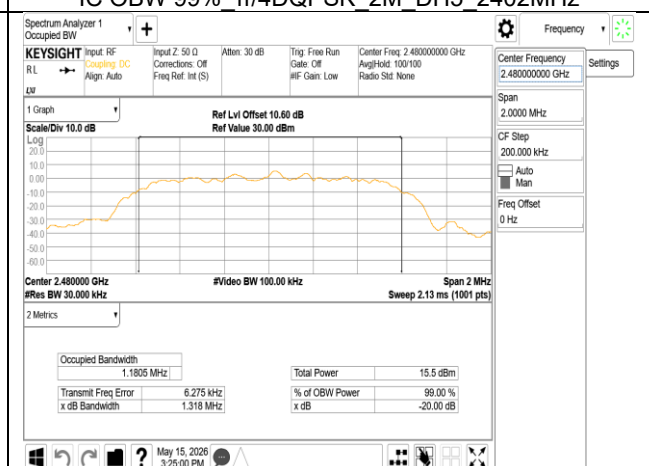
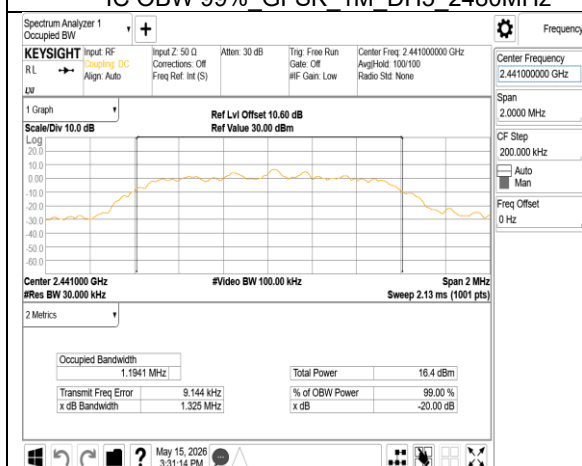
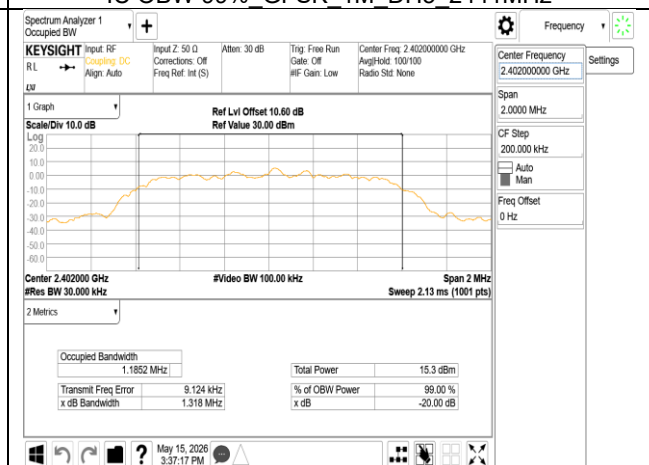
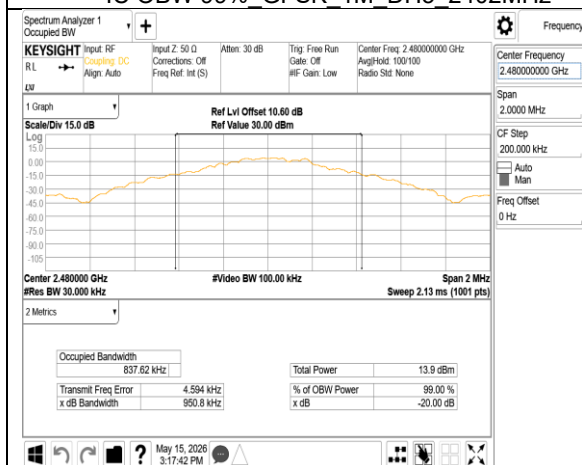
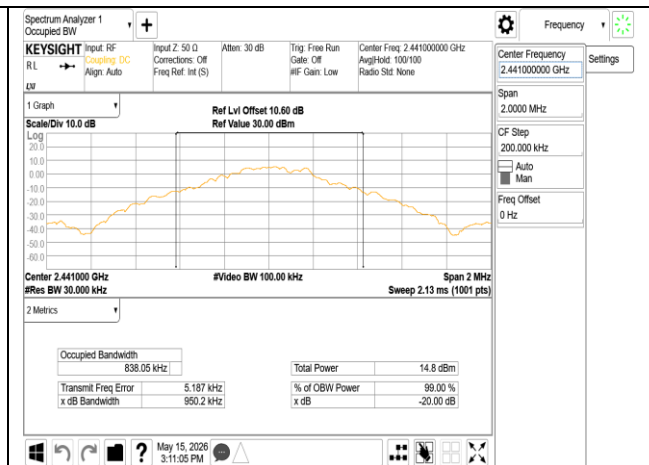
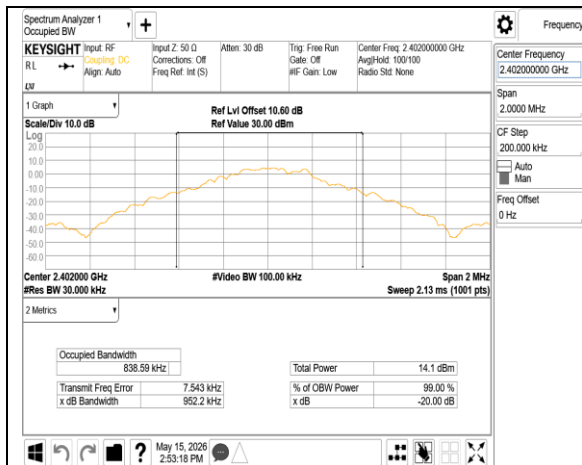
8-DPSK

CH	99% BW (MHz)
0	1.1852
39	1.2041
78	1.1820

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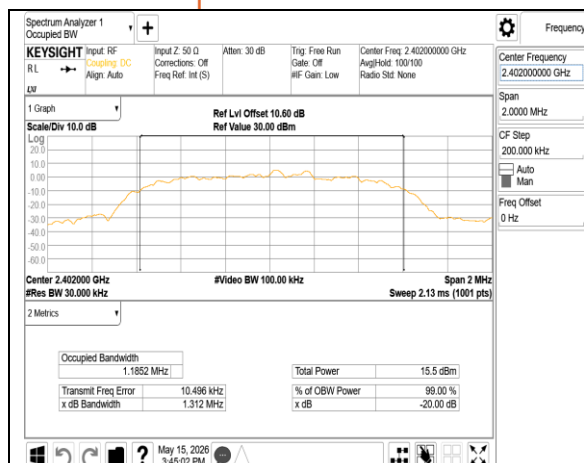
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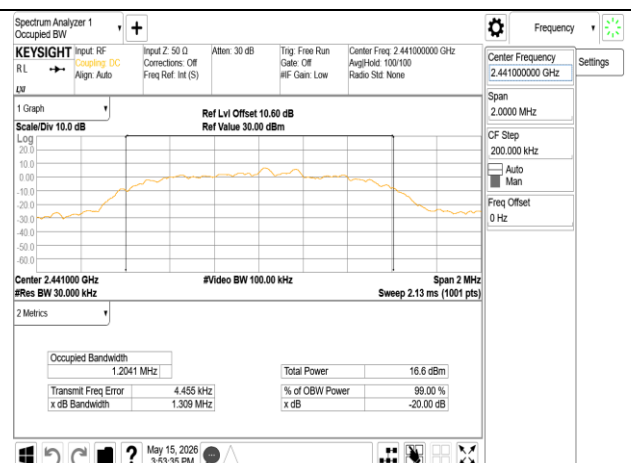
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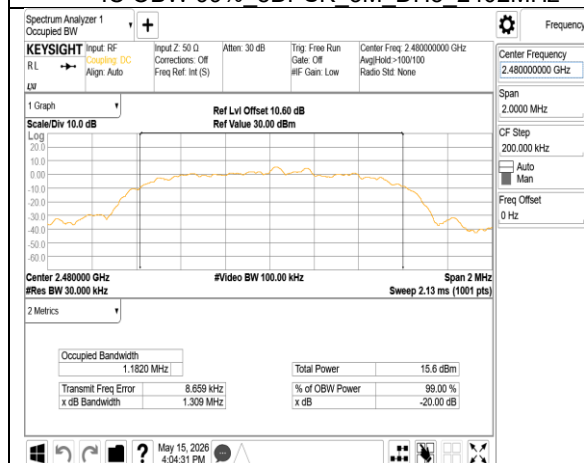
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IC OBW 99% 8DPSK 3M DH5 2402MHz



IC OBW 99% 8DPSK 3M DH5 2441MHz



IC OBW 99% 8DPSK 3M DH5 2480MHz

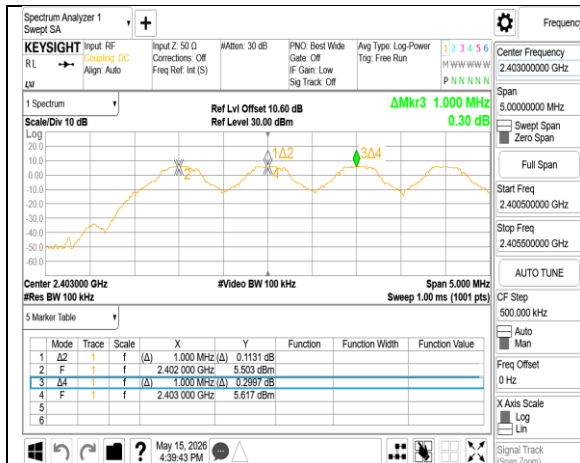
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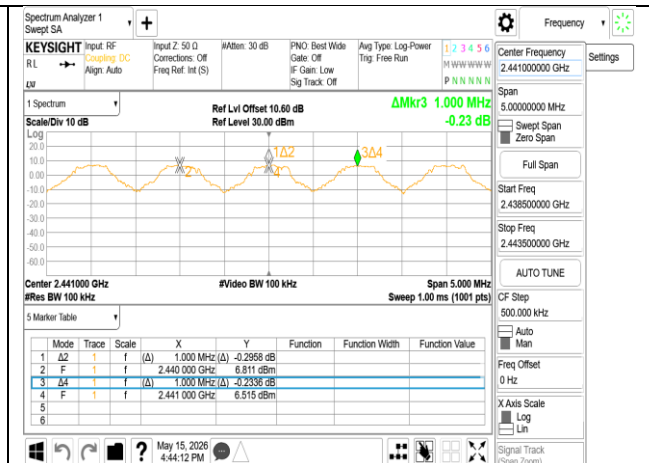
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7.2 Frequency Separation

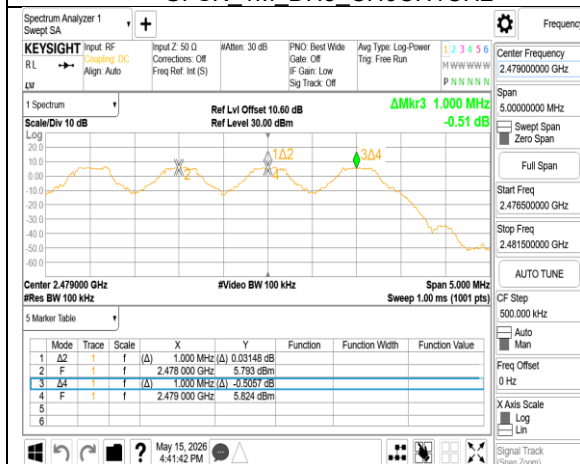
Channel separation (MHz)	Limit	Result
1	≥ 25 kHz or 2/3 times 20dB bandwidth	PASS



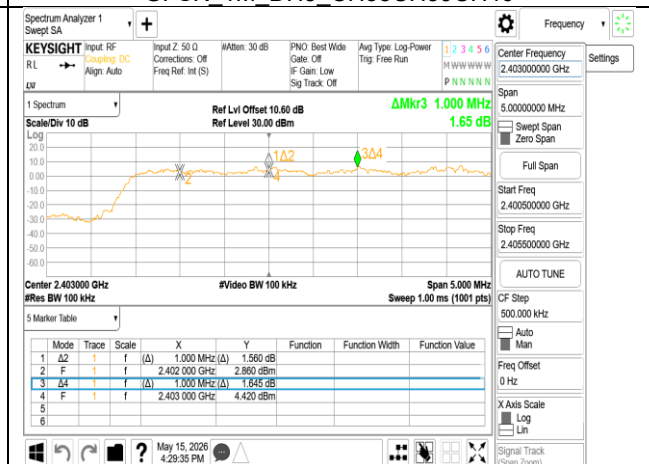
GFSK 1M DH5 CH0CH1CH2



GFSK 1M DH5 CH38CH39CH40



GFSK 1M DH5 CH76CH77CH78

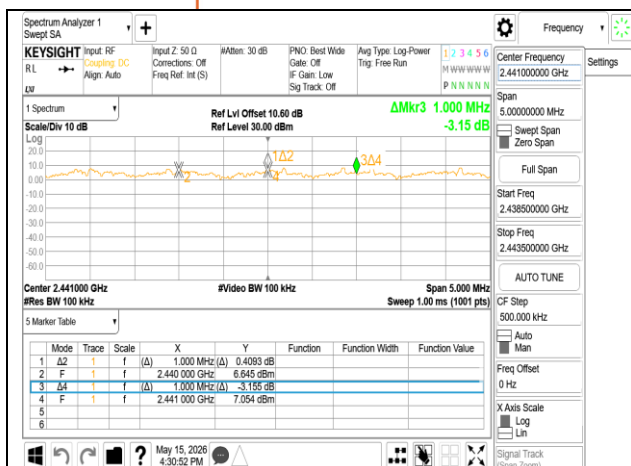


$\pi/4$ DQPSK 2M DH5 CH0CH1CH2

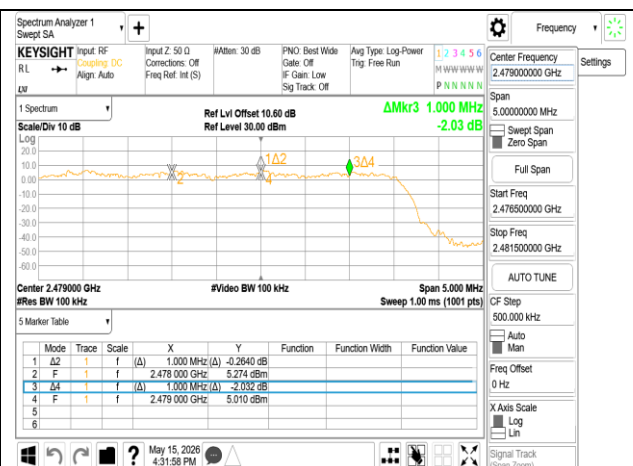
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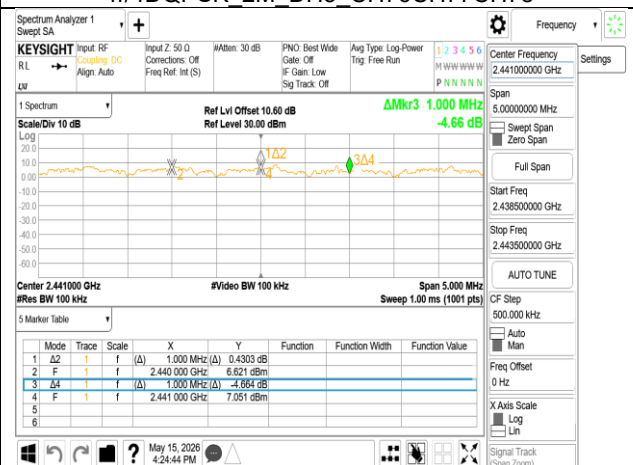
π/4DQPSK_2M_DH5_CH38CH39CH40



π/4DQPSK_2M_DH5_CH76CH77CH78



8DPSK_3M_DH5_CH0CH1CH2



8DPSK_3M_DH5_CH38CH39CH40



8DPSK_3M_DH5_CH76CH77CH78

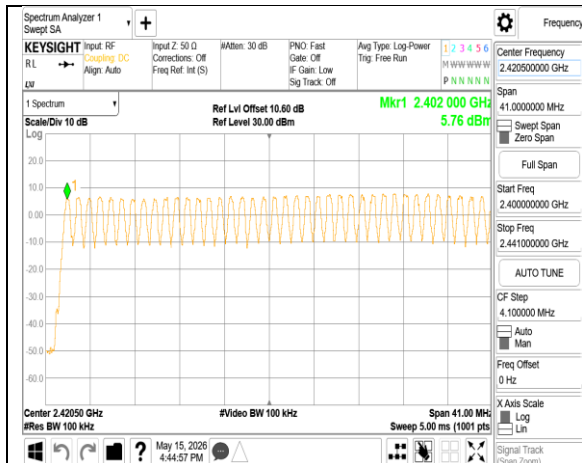
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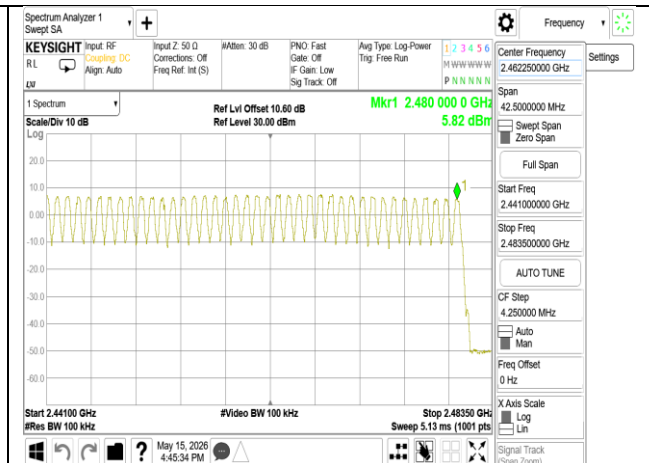
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7.3 Number Of Hopping Frequency Tabular Data of Total Channel Number

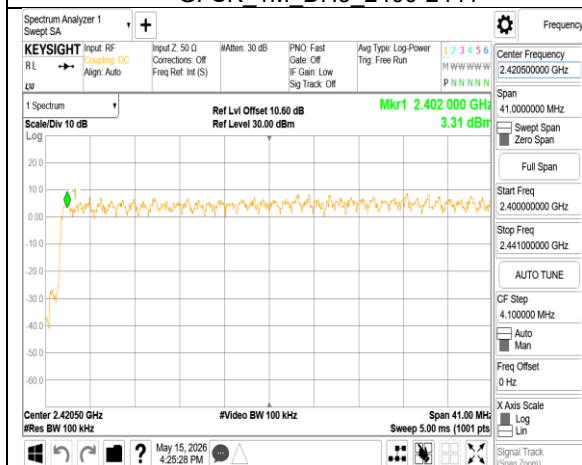
	Channel Number	Limit
2.4 GHz – 2.441 GHz	40	>15
2.441 GHz – 2.4835 GHz	39	>15
2.4 GHz ~2.4835 GHz	(40+39) = 79	>15



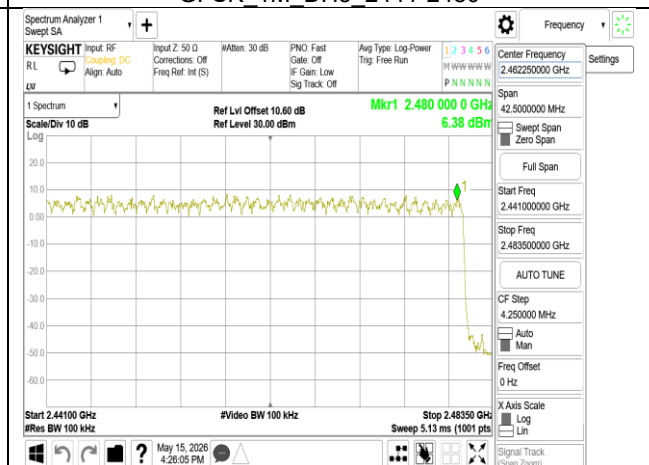
GFSK 1M DH5 2400-2441



GFSK 1M DH5 2441-2480



8DPSK 3M DH5 2400-2441



8DPSK 3M DH5 2441-2480

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7.4 Maximum Output Power

Mode	Duty Cycle (%) = Ton / (Ton+Toff)	Duty Factor (dB) =10*log (1/Duty Cycle)
DH5	77.20	1.12
2DH5	77.20	1.12
3DH5	77.20	1.12

1M BR mode (Peak):

CH	Freq. (MHz)	Power Setting	Peak Output Power (dBm)	Output Power (mW)	Limit (mW)
0	2402	8	7.58	5.728	1000
39	2441	8	8.15	6.531	1000
78	2480	8	6.54	4.508	1000

1M BR mode (Average):

CH	Freq. (MHz)	Power Setting	Avg. Output Power (dBm)	Output Power (mW)	Limit (mW)
0	2402	8	7.51	5.641	1000
39	2441	8	8.00	6.315	1000
78	2480	8	6.53	4.502	1000

2M EDR mode (Peak):

CH	Freq. (MHz)	Power Setting	Peak Output Power (dBm)	Output Power (mW)	Limit (mW)
0	2402	9	11.37	13.709	125
39	2441	9	11.23	13.274	125
78	2480	9	10.55	11.350	125

2M EDR mode (Average):

CH	Freq. (MHz)	Power Setting	Avg. Output Power (dBm)	Output Power (mW)	Limit (mW)
0	2402	9	8.62	7.284	125
39	2441	9	8.77	7.540	125
78	2480	9	8.04	6.374	125

3M EDR mode (Peak):

CH	Freq. (MHz)	Power Setting	Peak Output Power (dBm)	Output Power (mW)	Limit (mW)
0	2402	9	11.92	15.560	125
39	2441	9	11.58	14.388	125
78	2480	9	11.12	12.942	125

3M EDR mode (Average):

CH	Freq. (MHz)	Power Setting	Avg. Output Power (dBm)	Output Power (mW)	Limit (mW)
0	2402	9	8.63	7.301	125
39	2441	9	8.79	7.575	125
78	2480	9	8.05	6.388	125

*Note: Avg. output power has been calculated with duty factor.

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7.5 Time Of Occupancy (Dwell Time)

GFSK (1Mbps)

Channel	PACKET TYPE	Measurement Result (ms)	Limit (ms)
39	DH1	123.20	400
	DH3	262.40	400
	DH5	308.80	400

$\pi/4$ DQPSK (2Mbps)

Channel	PACKET TYPE	Measurement Result (ms)	Limit (ms)
39	2DH1	124.80	400
	2DH3	262.40	400
	2DH5	308.80	400

8-DPSK (3Mbps)

Channel	PACKET TYPE	Measurement Result (ms)	Limit (ms)
39	3DH1	124.80	400
	3DH3	262.40	400
	3DH5	308.80	400

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GFSK (1Mbps):

CH Mid	DH1 time slot	=	0.385	*	(1600/2/79)	*	31.6	=	123.20 (ms)
	DH3 time slot	=	1.640	*	(1600/4/79)	*	31.6	=	262.40 (ms)
	DH5 time slot	=	2.895	*	(1600/6/79)	*	31.6	=	308.80 (ms)

$\pi/4$ -DQPSK (2Mbps):

CH Mid	2DH1 time slot	=	0.390	*	(1600/2/79)	*	31.6	=	124.80 (ms)
	2DH3 time slot	=	1.640	*	(1600/4/79)	*	31.6	=	262.40 (ms)
	2DH5 time slot	=	2.895	*	(1600/6/79)	*	31.6	=	308.80 (ms)

8-DPSK (3Mbps):

CH Mid	3DH1 time slot	=	0.390	*	(1600/2/79)	*	31.6	=	124.80 (ms)
	3DH3 time slot	=	1.640	*	(1600/4/79)	*	31.6	=	262.40 (ms)
	3DH5 time slot	=	2.895	*	(1600/6/79)	*	31.6	=	308.80 (ms)

A period time = 0.4 (s) * 79 = 31.6 (s)

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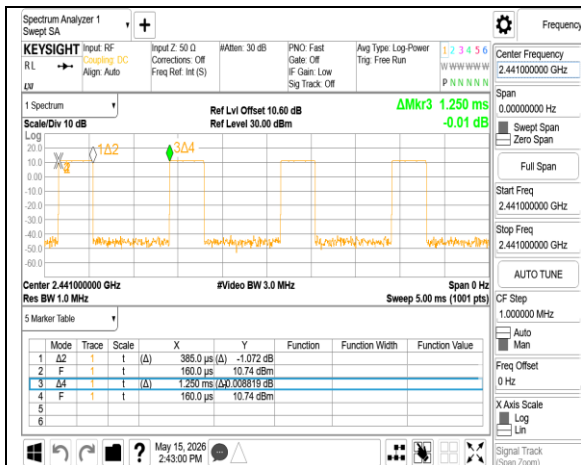
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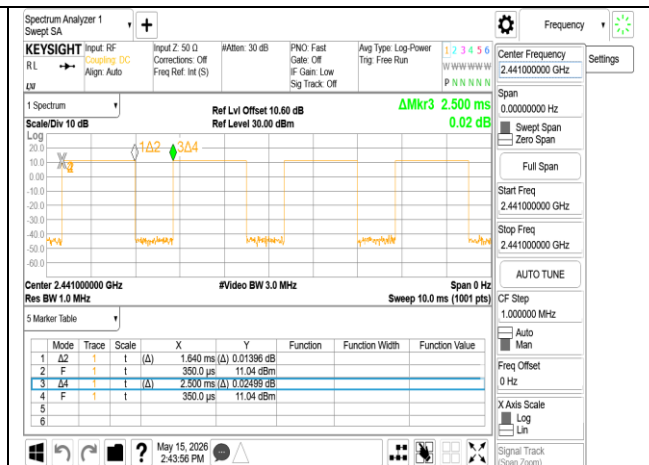
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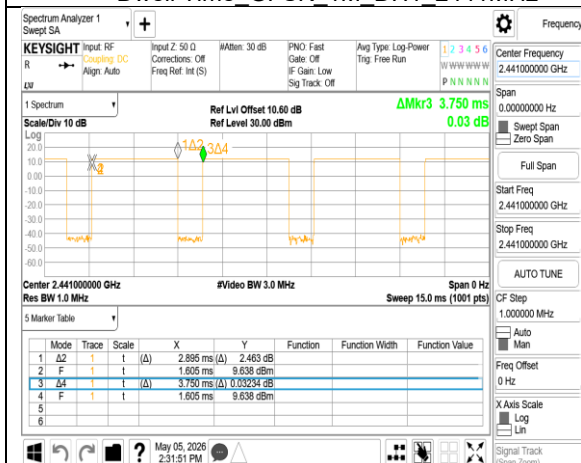
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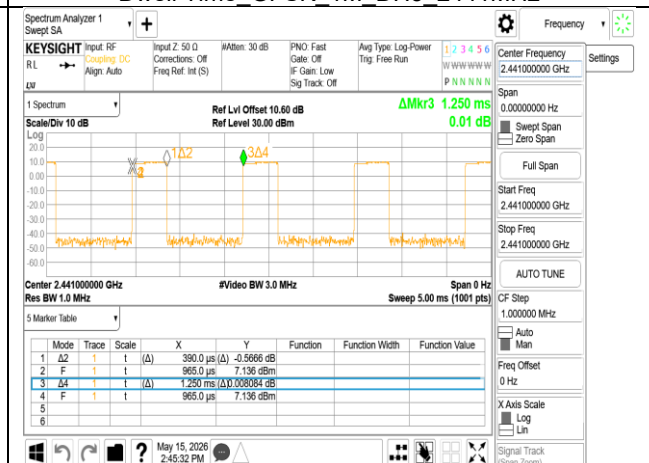
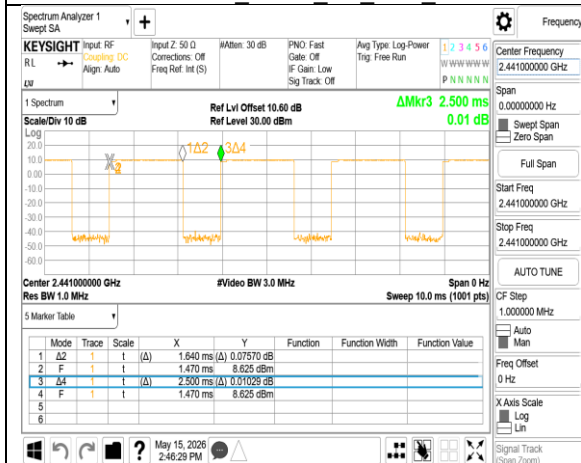
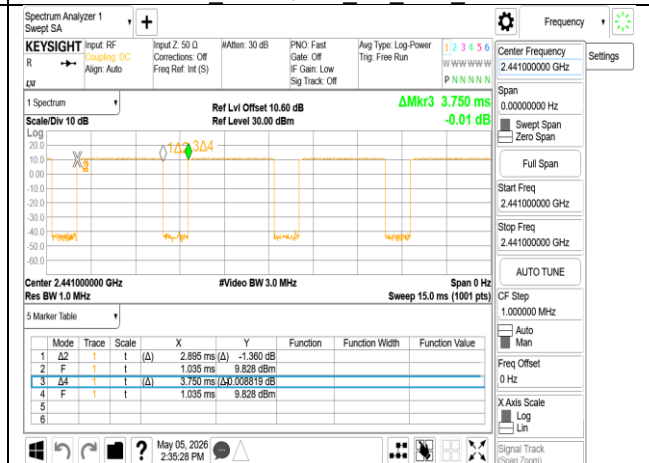
Dwell Time GFSK 1M DH1 2441MHz



Dwell Time GFSK 1M DH3 2441MHz



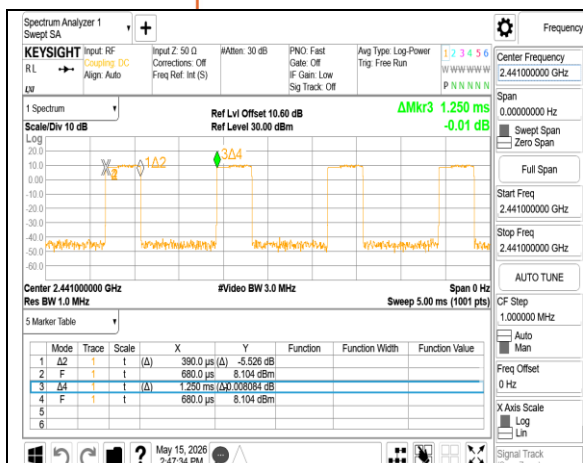
Dwell Time GFSK 1M DH5 2441MHz

Dwell Time $\pi/4$ QPSK 2M DH1 2441MHzDwell Time $\pi/4$ QPSK 2M DH3 2441MHzDwell Time $\pi/4$ QPSK 2M DH5 2441MHz

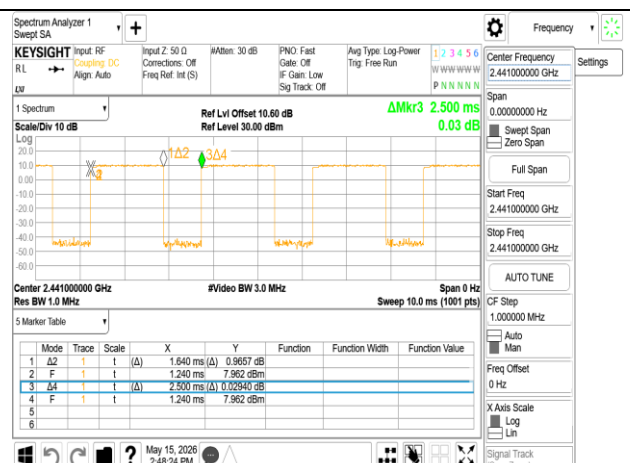
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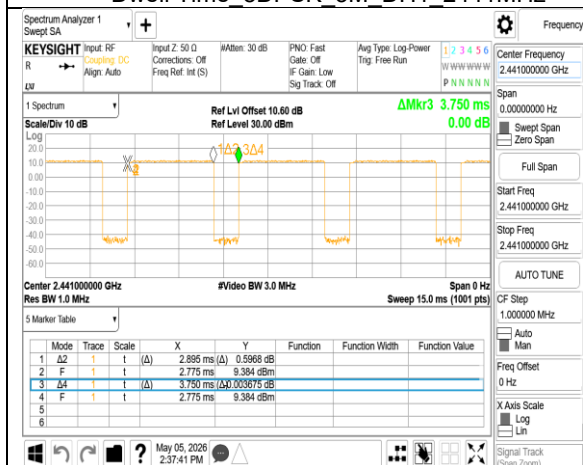
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Dwell Time 8DPSK 3M DH1 2441MHz



Dwell Time 8DPSK 3M DH3 2441MHz



Dwell Time 8DPSK 3M DH5 2441MHz

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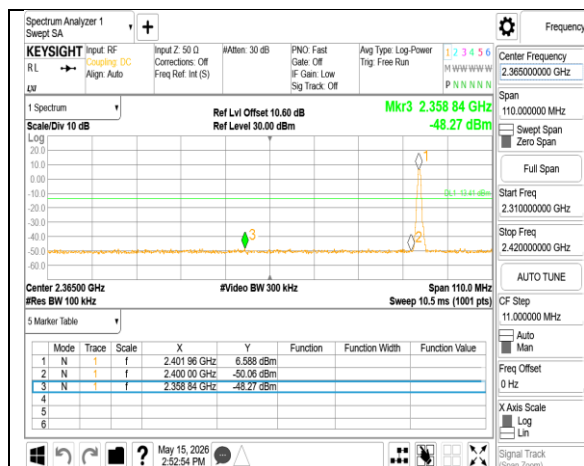
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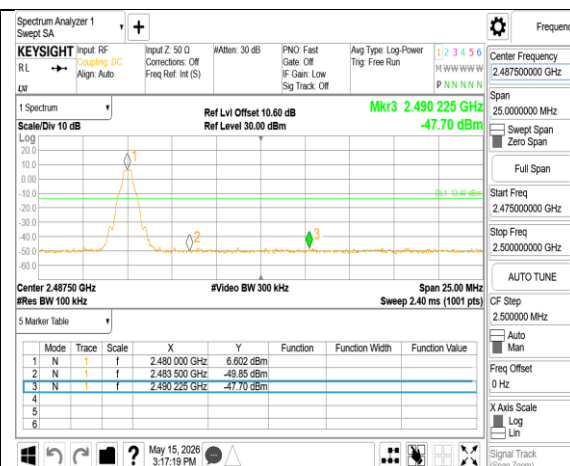
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7.6 Out of Band Emission



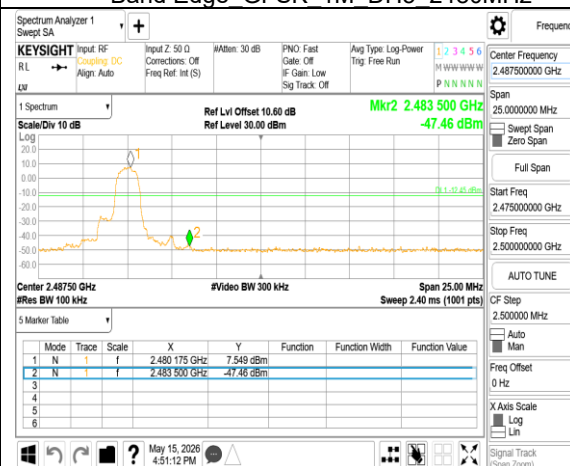
Band Edge GFSK 1M DH5 2402MHz



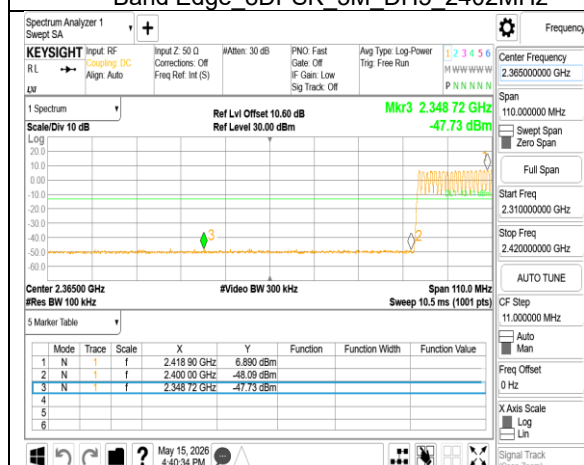
Band Edge GFSK 1M DH5 2480MHz



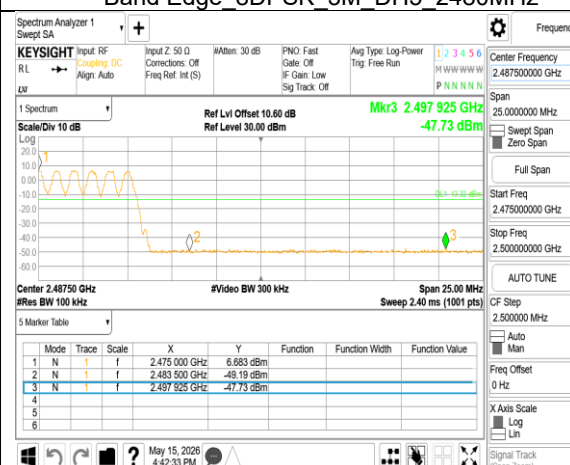
Band Edge 8DPSK 3M DH5 2402MHz



Band Edge 8DPSK 3M DH5 2480MHz



Hopping Band Edge GFSK 1M DH5 2402MHz



Hopping Band Edge GFSK 1M DH5 2480MHz

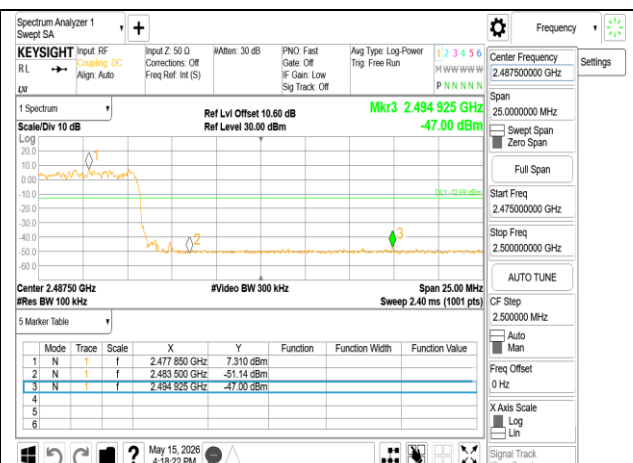
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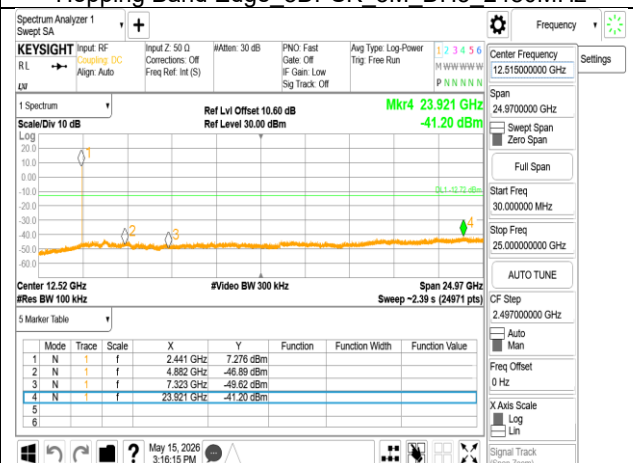
Hopping Band Edge 8DPSK 3M DH5 2402MHz



Hopping Band Edge 8DPSK 3M DH5 2480MHz



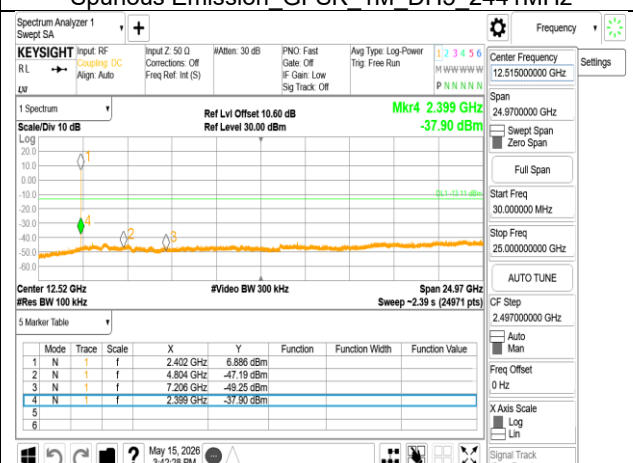
Spurious Emission GFSK 1M DH5 2402MHz



Spurious Emission GFSK 1M DH5 2441MHz



Spurious Emission GFSK 1M DH5 2480MHz



Spurious Emission $\pi/4$ DQPSK 2M DH5 2402MHz

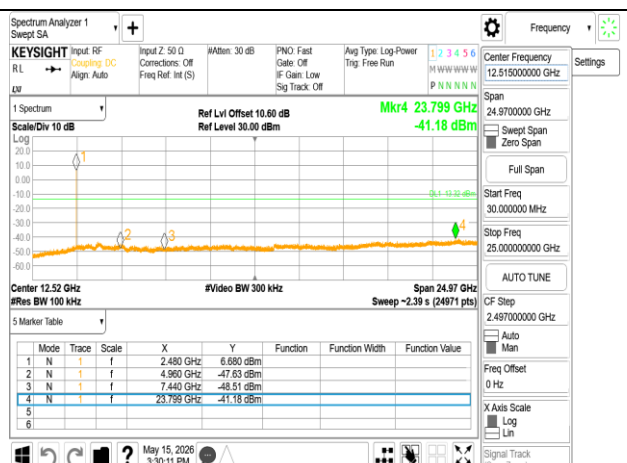
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Spurious Emission $\pi/4$ DQPSK 2M DH5 2441MHz



Spurious Emission $\pi/4$ DQPSK 2M DH5 2480MHz



Spurious Emission 8DPSK 3M DH5 2402MHz



Spurious Emission 8DPSK 3M DH5 2441MHz



Spurious Emission 8DPSK 3M DH5 2480MHz

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