RADIO TEST REPORT

Product	:	Wi-Fi 7 AIW-173 module
Model Name	:	AIW-173BQ-GI1
Series Model	:	AIW-173LQ-GI1, AIW-173LQ-GI2, AIW-173BQ-GI2, AIW-173HQ-GI1, AIW-173HQ-GI2
FCC ID	:	M82-AIW-173
Test Regulation	:	FCC 47 CFR Part 15 Subpart C (Section 15.247)
Received Date	:	2024/9/18
Test Date	:	2024/9/19 ~ 2025/2/10
Issued Date	:	2025/3/21
Applicant	:	Advantech Co Ltd No. 1, Alley 20, Lane 26, Rueiguang Road Neihu District, Taipei, Taiwan 114
Issued By	:	Underwriters Laboratories Taiwan Co., Ltd. Building A, B and E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan

Testing Laboratory
3398

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REVISION HISTORY

Original Test Report No.: 4791471150-US-R4-V0

Revision	Test report No.	Date	Page revised	Contents
Original	4791471150-US-R4-V0	2025/3/21	-	Initial issue

Table of Contents

1. Attestation of Test Results

APPLICANT:	Advantech Co Ltd No. 1, Alley 20, Lane 26, Rueiguang Road Neihu District, Taipei, Taiwan 114
MANUFACTURER:	Advantech Co Ltd No. 1, Alley 20, Lane 26, Rueiguang Road Neihu District, Taipei, Taiwan 114
EUT DESCRIPTION:	Wi-Fi 7 AIW-173 module
BRAND:	ADVANTECH
MODEL:	AIW-173BQ-GI1
SERIES MODEL:	AIW-173LQ-GI1, AIW-173LQ-GI2, AIW-173BQ-GI2, AIW-173HQ-GI1, AIW-173HQ-GI2
SAMPLE STAGE:	Design Verification Test Sample
DATE of TESTED:	2024/9/19 ~ 2025/2/10

APPLICABLE STANDARDS	
STANDARD	**Test Results**
FCC 47 CFR PART 15 Subpart C (Section 15.247)	PASS

Underwriters Laboratories Taiwan Co., Ltd. tested the above equipment in accordance with the requirements set forth in the above standards. All indications of Pass/Fail in this report are opinions expressed by Underwriters Laboratories Taiwan Co., Ltd. based on interpretations and/or observations of test results. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

Note: The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. This document may not be altered or revised in any way unless done so by Underwriters Laboratories Taiwan Co., Ltd. and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by Underwriters Laboratories Taiwan Co., Ltd. will constitute fraud and shall nullify the document. This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, any agency of the Federal Government, or any agency of any government.

Prepared By:

Sally Lu Date : 2025/3/21
Project Handler

Approved and Authorized By:

Eric Lee Date : 2025/3/21
Senior Laboratory Engineer

2. Summary of Test Results

Summary of Test Results		
FCC Clause	**Test Items**	**Result**
15.247(a)(1) (iii)	Number of Hopping Frequency Used	PASS
15.247(a)(1) (iii)	Dwell Time on Each Channel	PASS
15.247(a)(1)	1. Hopping Channel Separation 2. Spectrum Bandwidth of a Frequency Hopping Sequence Spread Spectrum System	PASS
15.247(b)	Conducted Output Power	PASS
15.247(d)	Antenna Port Emission	PASS
15.205 / 15.209 / 15.247(d)	Radiated Emissions and Band Edge Measurement	PASS
15.207	AC Power Conducted Emission	PASS
15.203	Antenna Requirement	PASS

3. Test Methodology and Reference Procedures

The tests documented in this report were performed in accordance with 47 CFR FCC Part 2, KDB558074 D01 Meas Guidance v05r02, KDB414788 D01 Radiated Test Site v01r01, ANSI C63.10-2013.

4. Facilities and Accreditation

Test Location	Underwriters Laboratories Taiwan Co., Ltd.
Address	Building A, B and E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan
Accreditation Certificate	Underwriters Laboratories Taiwan Co., Ltd. is accredited by TAF, Laboratory Code 3398.

5. Measurement Uncertainty

For statement of conformity, Simple acceptance (Section 3.1.4 of IEC Guide 115) was applied as decision rule for measurement in this test report.

The following uncertainties have been calculated to provide a confidence level of 95 % using a coverage factor k=2.

Determining compliance based on the results of the compliance measurement, not considering measurement instrumentation uncertainty.

Measurement	Frequency	Uncertainty
Conducted disturbance at mains terminals ports	150kHz ~ 30MHz	3.1 dB
RF Conducted	9 kHz - 40GHz	2.3 dB
Radiated disturbance below 30MHz	9 kHz - 30 MHz	3.2 dB
Radiated disturbance below 1 GHz	30MHz ~ 1GHz	6.1 dB
Radiated disturbance above 1 GHz	1GHz ~ 40GHz	5.1 dB

6. Equipment under Test

6.1. Description of EUT

Product	Wi-Fi 7 AIW-173 module
Brand Name	ADVANTECH
Model Name	AIW-173BQ-GI1
Series Model	AIW-173LQ-GI1, AIW-173LQ-GI2, AIW-173BQ-GI2, AIW-173HQ-GI1, AIW-173HQ-GI2
Normal Voltage	3.3Vdc

Operating Frequency	2402MHz ~ 2480MHz
Modulation	GFSK, π/4-DQPSK and 8DPSK
Transfer Rate	Up to 3 Mbps
Maximum Output Power	13.02 dBm
Sample ID	Conducted Test:7620396
	Radiated Test:7620396

Note:
1. The models difference table as below:

Model	**Different**	
	Type	**Bluetooth Interface**
AIW-173LQ-GI1	LGA Module	Bluetooth USB control
AIW-173LQ-GI2		Bluetooth UART control
AIW-173BQ-GI1	M.2 type PCB board + LGA Module	Bluetooth USB control
AIW-173BQ-GI2		Bluetooth UART control
AIW-173HQ-GI1	PCIE type PCB board + LGA Module	Bluetooth USB control
AIW-173HQ-GI2		Bluetooth UART control

Remark:
1. There are no circuit or layout differences in the LGA Module part across the three types.
2. AIW-173LQ-GI1 and AIW-173LQ-GI2 have identical electrical characteristics.
3. AIW-173BQ-GI1 and AIW-173BQ-GI2 have identical electrical characteristics.
4. AIW-173HQ-GI1 and AIW-173HQ-GI2 have identical electrical characteristics.

2. EUT provides a complete 2Tx port and 2Rx port. Please refer to the following working transmission conditions:

Modulation Mode	**Tx/Rx Function**	
GFSK	2Tx	2Rx
π/4-DQPSK	2Tx	2Rx
8DPSK	2Tx	2Rx

3. The above EUT information is declared by manufacturer and for more detailed features description, please refer the manufacturer's or user's manual, the laboratory shall not be held responsible.

6.2. Channel List

79 channels are provided for BT-BR/EDR mode:

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

6.3. Test Condition

Test Item	Test Site No.	Environmental	Input Power	Test Date	Tested by
Antenna Port Conducted Measurement	SR4	20~25°C/ 56~69%RH	3.3Vdc	2024/09/23~ 2025/01/20	WaterNil Guan
Radiated Spurious Emission	966-2	22~26°C/ 62~68%RH	3.3Vdc	2024/09/19~ 2025/02/10	WaterNil Guan
AC power Line Conducted Emission	SR1	22°C/ 53%RH	120Vac/ 60Hz	2025/02/05	WaterNil Guan

Sample Calculation:

Antenna Port Conducted Measurement:

- Where relevant, the follow sample calculation is provided:
  Result Value (dBm) = Reading Value (dBm) +Attenuator Factor (dB) + Cable Loss (dB).
  Example: Result Value (10dBm) = Reading Value (-2dBm) +Attenuator Factor (10dB) + Cable Loss(2dB).
  *Test plot only shown the “Result Value”.

Radiated Spurious Emission:

- Where relevant, the follow sample calculation is provided:
  Result Value (dBuV/m) = Reading Value (dBuV) + Correction Factor (dB/m).
  Correction Factor (dB/m) = Antenna Factor (dB/m) + Cable Loss (dB) - Preamp Factor (dB).
  Example: Result Value (34.5dBuV/m) = Reading Value (40.1dBuV) + Antenna Factor (18.7dB/m) + Cable Loss (4.2dB) - Preamp Factor (28.5dB).

AC power Line Conducted Emission:

- Where relevant, the follow sample calculation is provided:
  Result Value (dBuV) = Reading Value (dBuV) + Correction Factor (dB).
  Correction Factor (dB) = Insertion loss(dB) + Cable loss(dB).
  Example: Result Value (53.7dBuV) = Reading Value (35.1dBuV) + Insertion loss(18.1dB) + Cable loss(0.5dB).

6.4. Description of Available Antennas

Ant. No.	Transmitter Circuit	Brand Name	Model Name	Maximum Gain (dBi)	Ant. Type	Connector Type
1	Chain0+1	Advantech	AIW-512-C (1751000460-01)	2.87 dBi : 2400 ~ 2500 MHz 3.11 dBi : 5150 ~ 5850 MHz 3.22 dBi : 5925 ~ 7125 MHz	Dipole	RP-SMA Male
2	Chain0+1	Advantech	AIW-512-I (1751000651-01)	2.87 dBi : 2400 ~ 2500 MHz 3.11 dBi : 5150 ~ 5850 MHz 3.22 dBi : 5925 ~ 7125 MHz	Dipole	RP-SMA Male
3	Chain0+1	Advantech	1751000642-01	1.61 dBi : 2400 ~ 2500 MHz 3.68 dBi : 5150 ~ 5850 MHz 4.06 dBi : 5925 ~ 7125 MHz	Dipole	RP-SMA Male
4	Chain0+1	Advantech	AIW-511 (1751000342-01)	2.28 dBi : 2400 ~ 2500 MHz 2.64 dBi : 5150 ~ 5850 MHz 3.28 dBi : 5925 ~ 7125 MHz	Dipole	RP-SMA Male
5	Chain0+1	Advantech	AIW-513 (1751000717-01)	1.48 dBi : 2400 ~ 2500 MHz 3.58 dBi : 5150 ~ 5850 MHz 4.04 dBi : 5925 ~ 7125 MHz	Dipole	RP-SMA Male
6	Chain0+1	Advantech	AIW-514	ANT0: 2.59 dBi @ 2400 – 2500 MHz 3.58 dBi @ 5150 – 5850 MHz 3.94 dBi @ 5925 – 7125 MHz ANT1: 2.60 dBi @ 2400 – 2500 MHz 3.51 dBi @ 5150 – 5850 MHz 3.91 dBi @ 5925 – 7125 MHz	Dipole	RP-SMA-Male

Note: The above antenna information was provided from customer and for more detailed features description, please refer the manufacturer's specification or user's manual, the laboratory shall not be held responsible.

6.5. Test Mode Applicability and Tested Channel Detail

Test Item	Modulation Type	Available Channel	Test Channel	Packet Type
Radiated Emissions (Above 1GHz)	GFSK	0 to 78	0,39,78	DH5
	8DPSK	0 to 78	0,39,78	3DH5
Radiated Emissions (Below 1GHz)	8DPSK	0 to 78	78	3DH5
AC Power Line Conducted Emission	8DPSK	0 to 78	78	3DH5
Antenna Port Conducted Measurement	GFSK	0 to 78	0,39,78	DH1*,DH3*,DH5
	8DPSK	0 to 78	0,39,78	3DH1*,3DH3*, 3DH5

* Only for Dwell Time on Each Channel test

- The EUT consists of six different models, all of which share the same LGA Module. Consequently, the fundamental level of the EUT was investigated across these six models. It was determined that the AIW-173BQ-GI1 represented the worst-case scenario and was selected as the representative test model documented in this report.

- The antennas No.1/ No.2 has the same highest gain at 2.4GHz band, therefore, the fundamental of the EUT was investigated in two antennas, it was determined antenna No.2 was worst-case, the Antenna No.2 was selected for the final test.

- The antennas No.2 has the highest and worst gain at 2.4GHz band and the antennas No.3 has the highest gain at 5GHz/6GHz band, therefore, the Radiated Emissions of the EUT was tested in two antennas, and it was found antenna No.2 have worst-case, and thus, the Antenna No.2 was selected representative test data documented in this report.

- The fundamental of the dipole antenna was investigated in two orthogonal (lay and stand), it was determined that stand mode was worst-case. Therefore, all final radiated testing was performed with the dipole antenna in stand mode.

- For radiated emissions below 1 GHz, the worst-case mode was determined from all series. It was found that the AIW-173BQ-GI1 represented the worst-case. Therefore, this model was selected for the final test.

- In the transmit mode, 8DPSK 3DH5 channel 78 has the highest RF output power. Therefore, the AC conduction was performed using this worst-case mode.

- In the transmit mode, 8DPSK 3DH5 channel 78 has the highest RF output power. Therefore, all final tests for the spurious emission (below 1GHz) were performed using this worst-case mode.

- The Packet Type for DH1, DH3, and DH5 have all been pre-tested, the fundamental worst case of the Packet Type was found in the DH5. Therefore, only DH5 Packet Type is recorded in the report. (Except Dwell Time).

- The modulation and bandwidth are similar for π/4-DQPSK mode and 8DPSK mode, therefore investigated 8DPSK mode to representative mode in test report.

- For Antenna Port Conducted Measurement, this item includes all test value of each mode, but only includes spectrum plot of worst value of each mode.

- Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).

- Since the DUT is a Bluetooth device, the AFH mode and non-AFH mode follow the Bluetooth timing protocol, and the same timing level has the same time interval, but the non-AFH mode has worse results, therefore only the test data of this type were recorded in this report.

Simultaneously transmission condition:

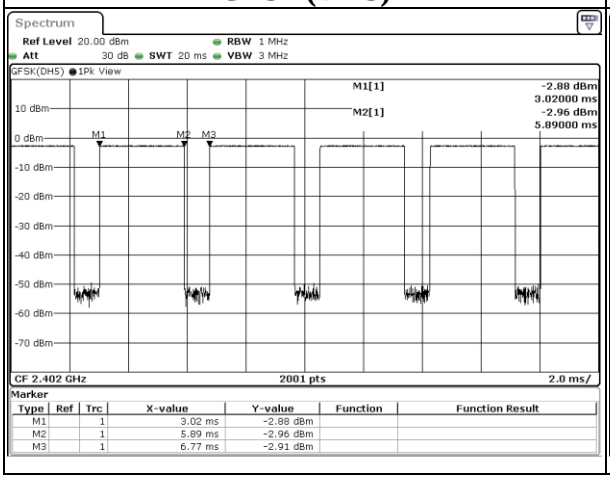
Condition	Technology		
1	BT	WLAN (2.4GHz)	-
2	BT	WLAN (5GHz)	-
3	BT	WLAN (6GHz)	-
4	BT	WLAN (2.4GHz)	WLAN (5GHz)
5	BT	WLAN (2.4GHz)	WLAN (6GHz)

Note: The emission of the simultaneous operation has been evaluated and no non-compliance was found.

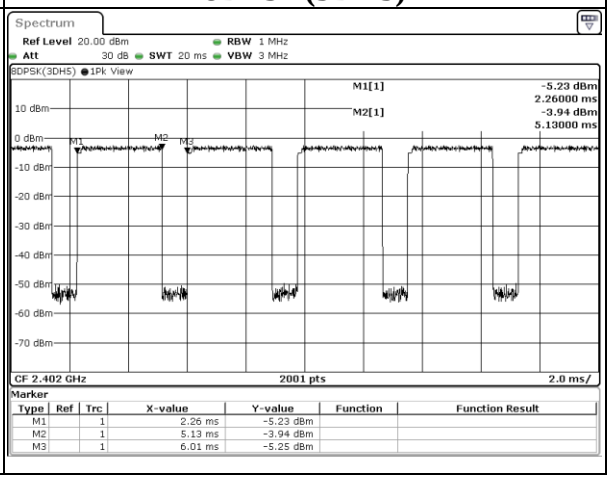
6.6. Duty cycle

Mode	On Time (ms)	On+Off Time (ms)	Duty Cycle	Duty Factor (dB)	VBW Set (above 1GHz)
GFSK(DH5)	2.870	3.750	0.7653	1.16	510Hz
8DPSK(3DH5)	2.870	3.750	0.7653	1.16	510Hz

GFSK(DH5)



8DPSK(3DH5)



7. Test Equipment

Test Equipment List					
Equipment	**Manufacturer**	**Model No.**	**Serial No.**	**Cal. Date**	**Expired date**
Radiated Spurious Emission					
Spectrum Analyzer	Keysight	N9010A	MY56070827	2024/3/29	2025/3/28
EMI Test Receiver	Rohde & Schwarz	ESR7	101754	2023/11/22	2024/11/21
				2024/12/24	2025/12/23
Loop Antenna	ETS lindgren	6502	00213440	2023/12/13	2024/12/12
				2024/12/11	2025/12/10
Trilog-Broadband Antenna with 5dB Attenuator	Schwarzbeck & EMCI	VULB 9168 & N-6-05	774 & AT-N0538	2024/1/5	2025/1/4
				2024/12/30	2025/12/29
Horn Antenna (1-18 GHz)	Schwarzbeck	BBHA 9120 D	01690	2023/12/8	2024/12/7
				2024/11/27	2025/11/26
Horn Antenna (18-40 GHz)	Schwarzbeck	BBHA 9170	781	2023/12/27	2024/12/26
				2024/12/18	2025/12/17
Preamplifier (30-1000 MHz)	EMCI	EMC330E	980405	2024/5/28	2025/5/27
Preamplifier (1-18 GHz)	EMCI	EMC051835BE	980406	2024/1/23	2025/1/22
				2025/1/13	2026/1/12
Preamplifier (18-40GHz)	EMCI	EMC184040SEE	980426	2024/4/16	2025/4/15
Cables (9k-18 GHz)	Hanyitek	K1K50-UP0264-K1K50-2500	170214-4 & 170425-2	2023/11/29	2024/11/28
				2024/11/22	2025/11/21
Cables (18-40GHz)	Hanyitek	K1K50-UP0264-K1K50-2500	170214-1 & 170214-2	2023/11/29	2024/11/28
				2024/11/22	2025/11/21

Test Equipment List					
Equipment	**Manufacturer**	**Model No.**	**Serial No.**	**Cal. Date**	**Expired date**
Antenna Port Conducted Measurement					
Signal Analyzer	Rohde & Schwarz	FSVA3044	101281	2024/3/18	2025/3/17
Signal Analyzer	Rohde & Schwarz	FSV40	101490	2024/7/1	2025/6/30
Attenuator	EMCI	EMC-40ATK2W10	17002	2023/11/15	2024/11/14
				2024/11/13	2025/11/12
USB Power Sensor	Anritsu	MA24408A	12031	2024/7/13	2025/7/12
Temperature &Humidity Test Chamber	GIANT FORCE	GTH-150- 40-CP-AR	MAA1701-010	2024/3/6	2025/3/5
AC power Line Conducted Emission					
EMI Test Receiver	Rohde & Schwarz	ESR7	101753	2024/10/1	2025/9/30
Two-Line V-Network	Rohde & Schwarz	ENV216	102136	2024/5/14	2025/5/13
Impuls-Begrenzer Pulse Limiter	Rohde & Schwarz	ESH3-Z2	102219-Qt	2024/8/29	2025/8/28
Cables	TITAN	CFD200	T0732ACFD 20020A300-2	2024/5/14	2025/5/13

UL Software		
Description	**Name**	**Version**
Radiated measurement	e3	6.191211 (V6)
Conducted measurement	RF-Conducted-FCC 15247	ver 1.0
AC power Line Conducted Emission	EZ_EMC	UL-3A1.2

8. Description of Test Setup

Tx Mode

Support Equipment

ID	Equipment	Brand Name	Model Name	S/N	Remark
A	Host	Advantech	AIMB-219	N/A	Supplied by Client
B	Test Tool (console board)	Advantech	Advantech	N/A	Supplied by Client

I/O Cables

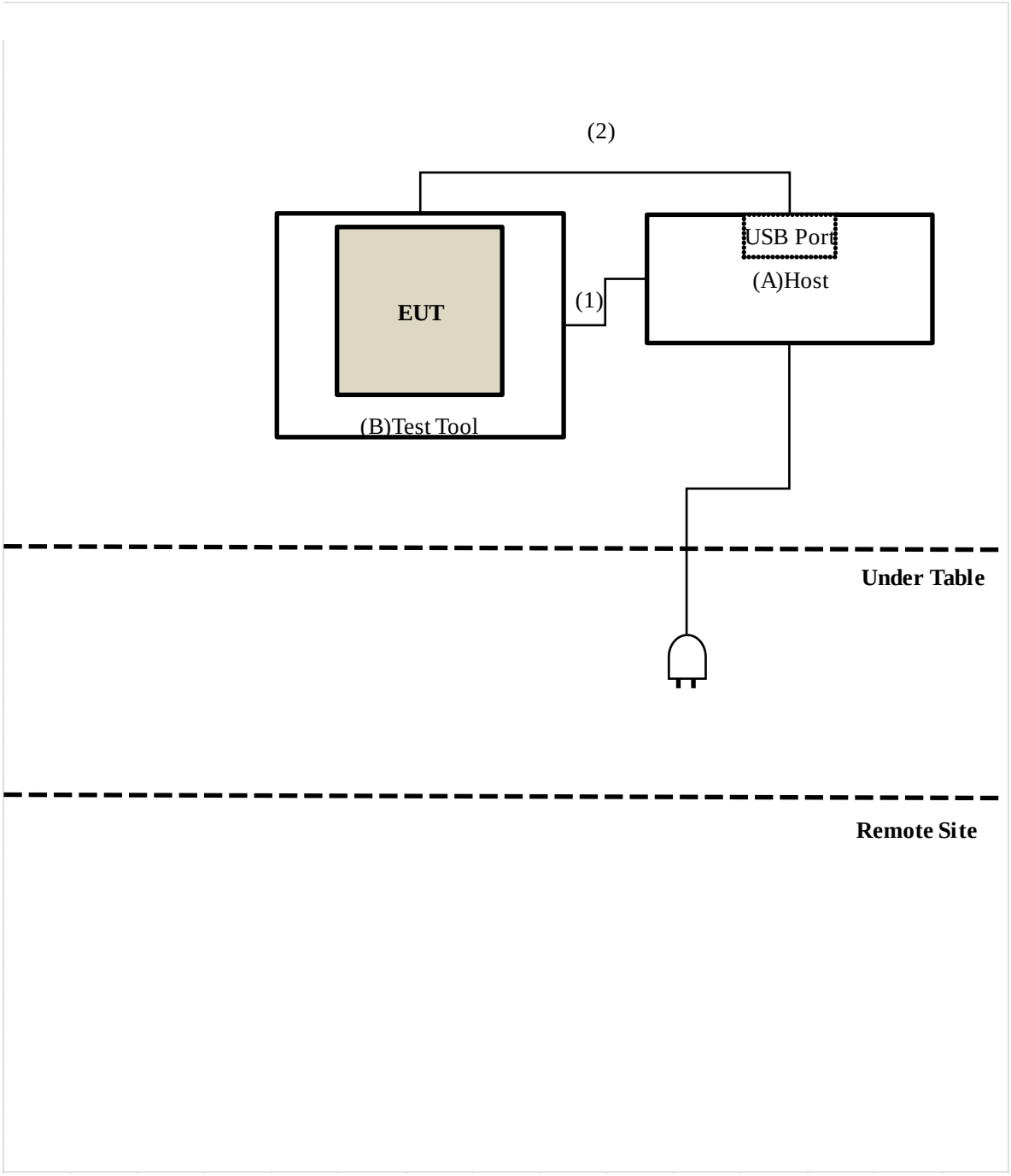
ID	Equipment	Brand Name	Model Name	Length (m)	Remark
1	Cable	ADTLink	R11SF-F	0.5	Supplied by Client
2	Test Tool (console cable)	Advantech	Advantech	0.5	Supplied by Client

Test Setup

Controlled using a bespoke application (QRCT version 4.0.2.11.0) on a test Notebook. The application was used to enable a continuous transmission mode and to select the test channels, data rates, modulation schemes and power setting as required.

Setup Diagram for Test

Tx Mode



9. Test Results

9.1. Channel Bandwidth

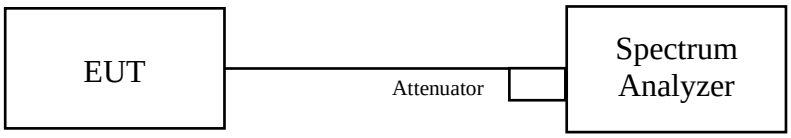
Requirements

For frequency hopping system operating in the 2400-2483.5MHz, If the 20dB bandwidth of hopping channel is greater than 25kHz, two-thirds 20dBbandwidth of hopping channel shall be a minimum limit for the hopping channel separation.

Test procedure

a. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
b. Turn on the EUT and connect it to measurement instrument. Then set it to any one convenient frequency within its operating range. Set a reference level on the measuring instrument equal to the highest peak value.
c. Measure the frequency difference of two frequencies that were attenuated 20dB from the reference level. Record the frequency difference as the emission bandwidth.
d. Repeat above procedures until all frequencies measured were complete.

Test Setup

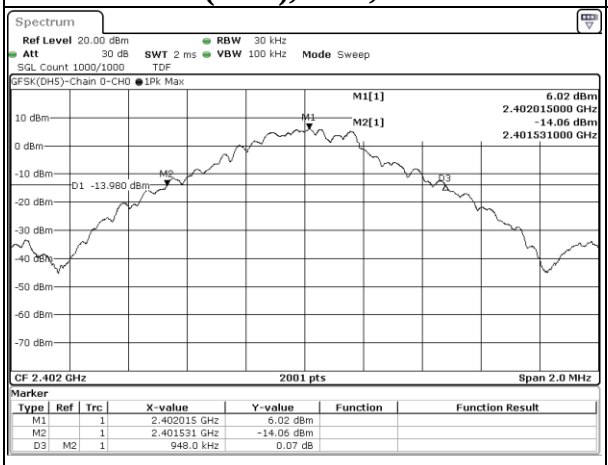


The loss between RF output port of the EUT and the input port of the Spectrum Analyzer has been taken into consideration.

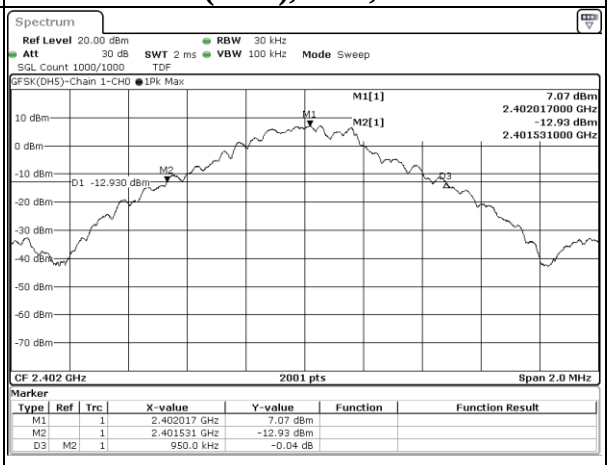
Test Data

Mode	CH	Freq (MHz)	Chain	20dB BW (MHz)	Limit (MHz)	Result
GFSK(DH5)	0	2402	Chain 0	0.948	N/A	Pass
GFSK(DH5)	0	2402	Chain 1	0.950	N/A	Pass
GFSK(DH5)	39	2441	Chain 0	0.949	N/A	Pass
GFSK(DH5)	39	2441	Chain 1	0.948	N/A	Pass
GFSK(DH5)	78	2480	Chain 0	0.949	N/A	Pass
GFSK(DH5)	78	2480	Chain 1	0.949	N/A	Pass
8DPSK(3DH5)	0	2402	Chain 0	1.305	N/A	Pass
8DPSK(3DH5)	0	2402	Chain 1	1.305	N/A	Pass
8DPSK(3DH5)	39	2441	Chain 0	1.304	N/A	Pass
8DPSK(3DH5)	39	2441	Chain 1	1.304	N/A	Pass
8DPSK(3DH5)	78	2480	Chain 0	1.304	N/A	Pass
8DPSK(3DH5)	78	2480	Chain 1	1.304	N/A	Pass

GFSK(DH5), CH0, Chain 0



GFSK(DH5), CH0, Chain 1



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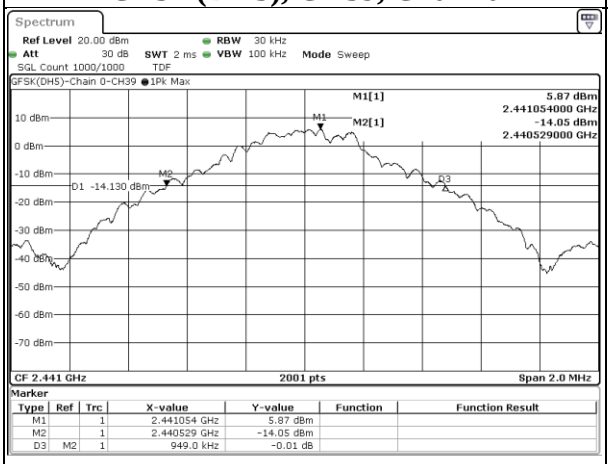

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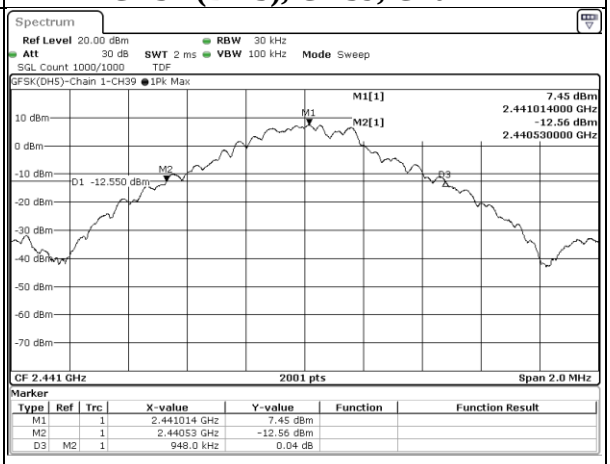

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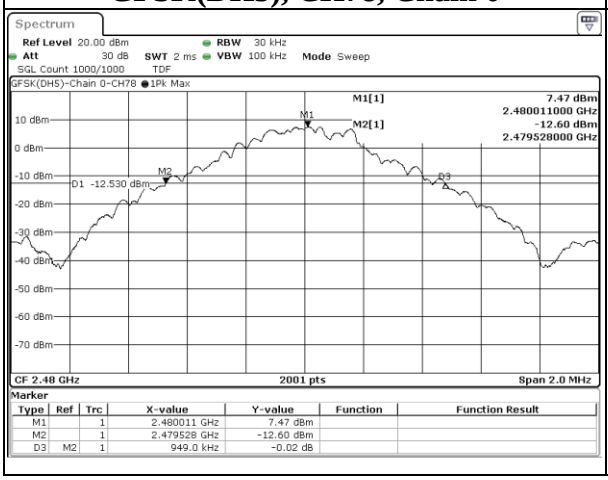
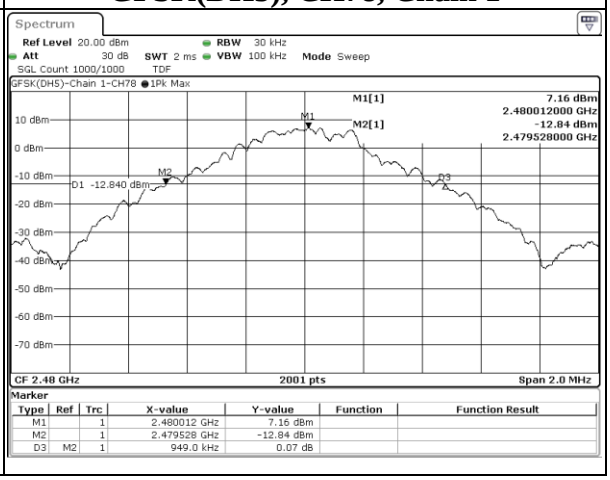
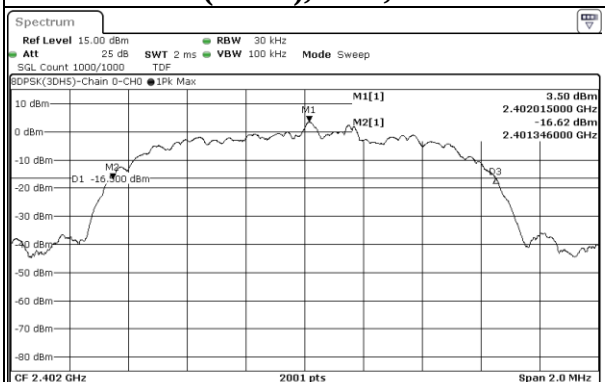


GFSK(DH5), CH78, Chain 1



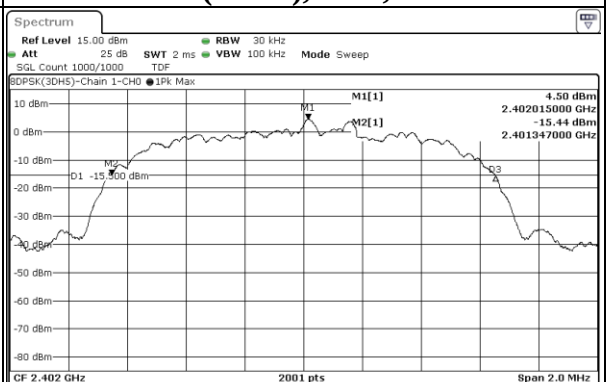
8DPSK(3DH5), CH0, Chain 0



Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.402015 GHz	3.50 dBm		
M2		1	2.401346 GHz	-16.62 dBm		
D3	M2	1	1.305 MHz	0.16 dB		

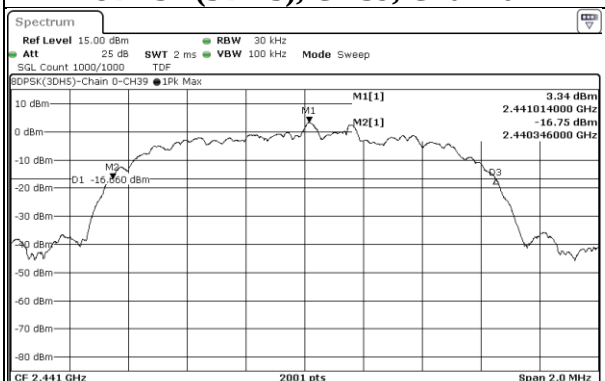
8DPSK(3DH5), CH0, Chain 1



Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.402015 GHz	4.50 dBm		
M2		1	2.401347 GHz	-15.44 dBm		
D3	M2	1	1.305 MHz	-0.14 dB		

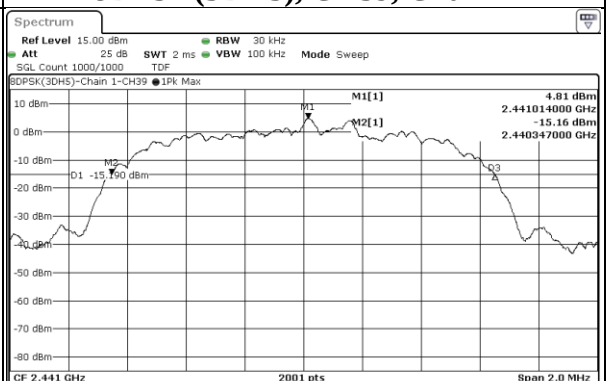
8DPSK(3DH5), CH39, Chain 0



Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.441014 GHz	3.34 dBm		
M2		1	2.440346 GHz	-16.75 dBm		
D3	M2	1	1.304 MHz	0.10 dB		

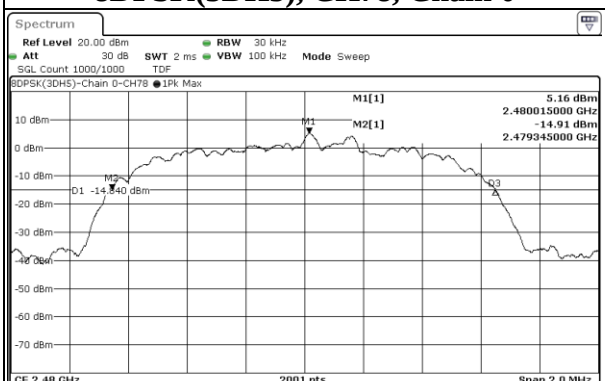
8DPSK(3DH5), CH39, Chain 1



Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.441014 GHz	4.81 dBm		
M2		1	2.440347 GHz	-15.16 dBm		
D3	M2	1	1.304 MHz	-0.01 dB		

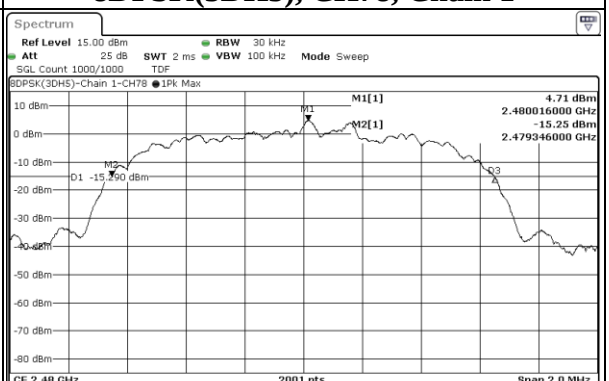
8DPSK(3DH5), CH78, Chain 0



Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.480015 GHz	5.16 dBm		
M2		1	2.479345 GHz	-14.91 dBm		
D3	M2	1	1.304 MHz	0.07 dB		

8DPSK(3DH5), CH78, Chain 1



Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.480016 GHz	4.71 dBm		
M2		1	2.479346 GHz	-15.25 dBm		
D3	M2	1	1.304 MHz	-0.07 dB		

9.2. Conducted Output Power

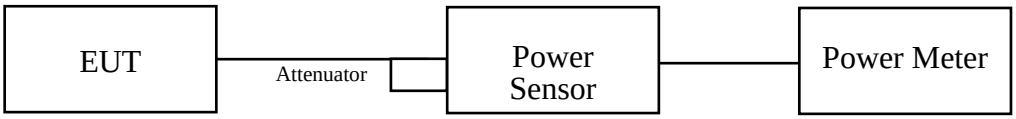
Requirements

The Maximum Output Power Measurement is 125mW.

Test Procedure

A peak power sensor was used on the output port of the EUT. A power meter was used to read the response of the peak power sensor. Record the power level.

Test Setup



The loss between RF output port of the EUT and the input port of the Power Meter has been taken into consideration.

Test Data

Mode	CH	Freq. (MHz)	Peak Power (dBm)		Total PK Power (mW)	Total PK Power (dBm)	AVG Power (dBm)		Total Power (mW)	Total Power (dBm)	Limit (dBm)	Result
			Chain 0	Chain 1			Chain 0	Chain 1				
BT-GFSK	0	2402	8.38	9.70	16.218	12.10	8.15	9.49	15.417	11.88	20.97	PASS
	39	2441	8.35	9.93	16.672	12.22	8.14	9.70	15.849	12.00	20.97	PASS
	78	2480	9.66	9.58	18.323	12.63	9.47	9.37	17.498	12.43	20.97	PASS
BT-8DPSK	0	2402	8.87	10.06	17.865	12.52	5.74	6.82	8.551	9.32	20.97	PASS
	39	2441	8.88	10.36	18.578	12.69	5.73	7.11	8.872	9.48	20.97	PASS
	78	2480	9.85	10.16	20.045	13.02	6.95	6.89	9.84	9.93	20.97	PASS

Note: Average Power is for reference Only.

9.3. Hopping Channel Separation

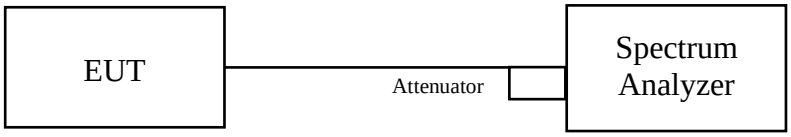
Requirements

At least 25kHz or two-third of 20dB hopping channel bandwidth (whichever is greater).

Test procedure

a. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
b. Turn on the EUT and connect it to measurement instrument. Then set it to any one convenient frequency within its operating range.
c. By using the MaxHold function record the separation of two adjacent channels.
d. Measure the frequency difference of these two adjacent channels by SA MARK function. And then plot the result on SA screen.

Test Setup

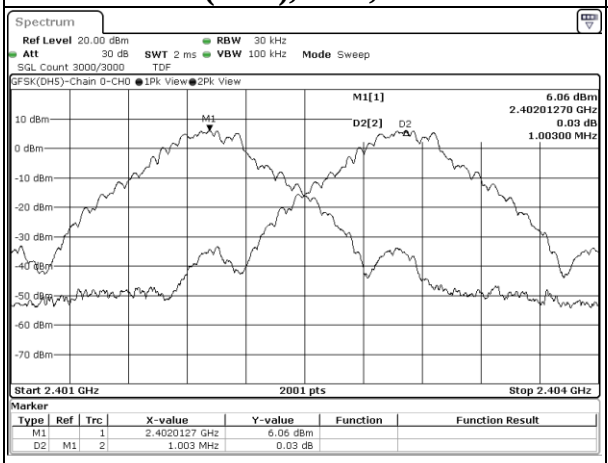


The loss between RF output port of the EUT and the input port of the Spectrum Analyzer has been taken into consideration.

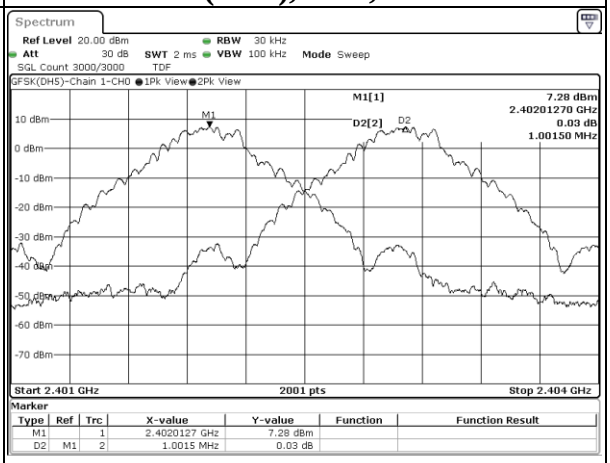
Test Data

Mode	CH	Freq (MHz)	Chain	Channel Separation (MHz)	> Limit (MHz)
GFSK(DH5)	0	2402	Chain 0	1.003	0.632
GFSK(DH5)	0	2402	Chain 1	1.002	0.633
GFSK(DH5)	39	2441	Chain 0	1.003	0.633
GFSK(DH5)	39	2441	Chain 1	1	0.632
GFSK(DH5)	78	2480	Chain 0	1	0.633
GFSK(DH5)	78	2480	Chain 1	1	0.633
8DPSK(3DH5)	0	2402	Chain 0	1.003	0.87
8DPSK(3DH5)	0	2402	Chain 1	1.002	0.87
8DPSK(3DH5)	39	2441	Chain 0	1.002	0.869
8DPSK(3DH5)	39	2441	Chain 1	1.002	0.869
8DPSK(3DH5)	78	2480	Chain 0	0.997	0.869
8DPSK(3DH5)	78	2480	Chain 1	1	0.869

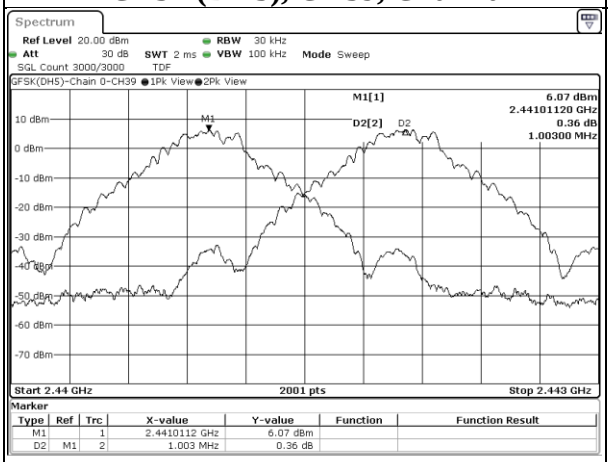
GFSK(DH5), CH0, Chain 0



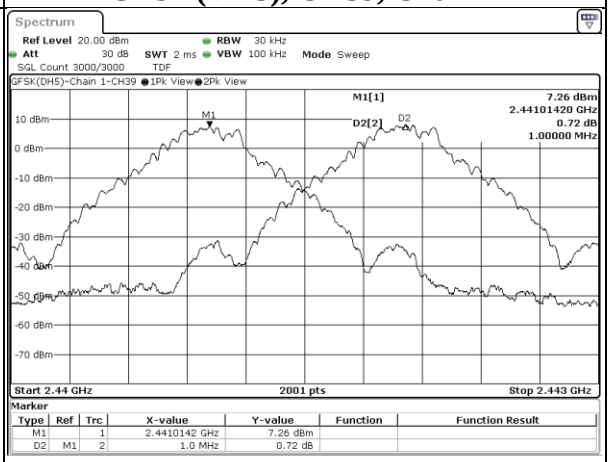
GFSK(DH5), CH0, Chain 1



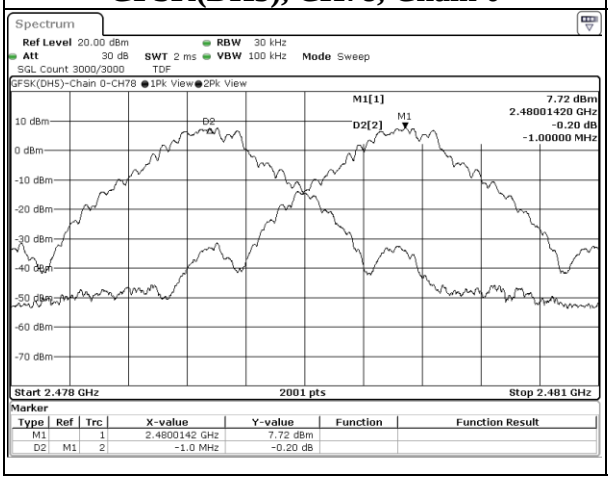
GFSK(DH5), CH39, Chain 0



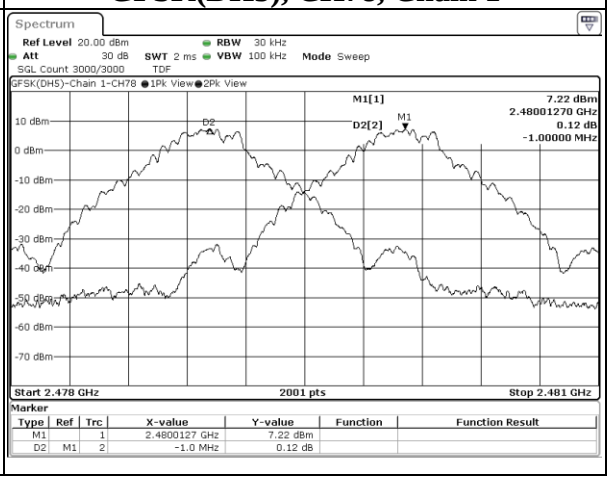
GFSK(DH5), CH39, Chain 1



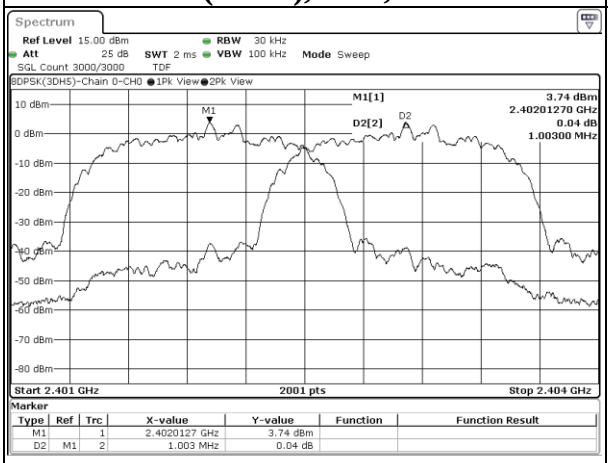
GFSK(DH5), CH78, Chain 0



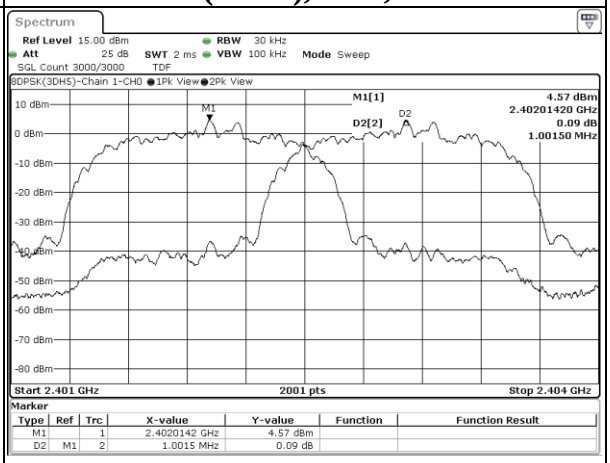
GFSK(DH5), CH78, Chain 1



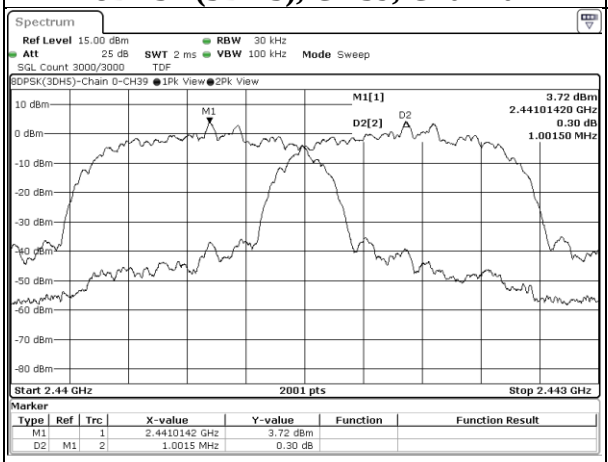
8DPSK(3DH5), CH0, Chain 0



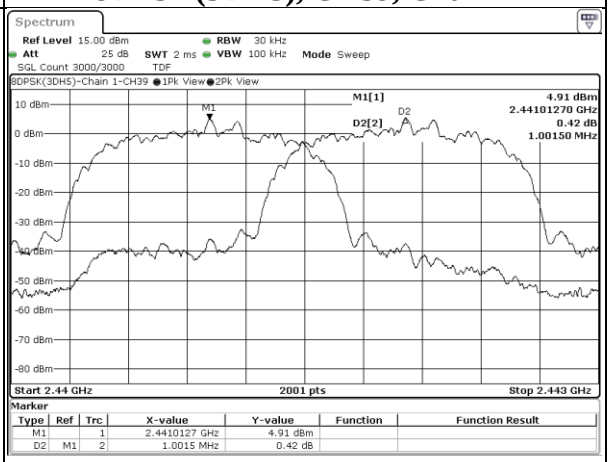
8DPSK(3DH5), CH0, Chain 1



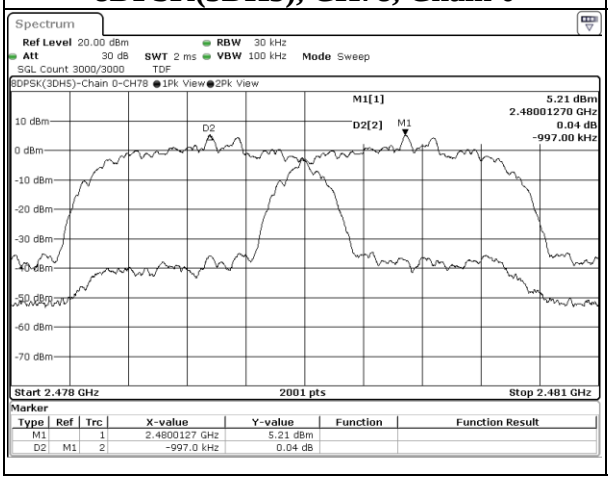
8DPSK(3DH5), CH39, Chain 0



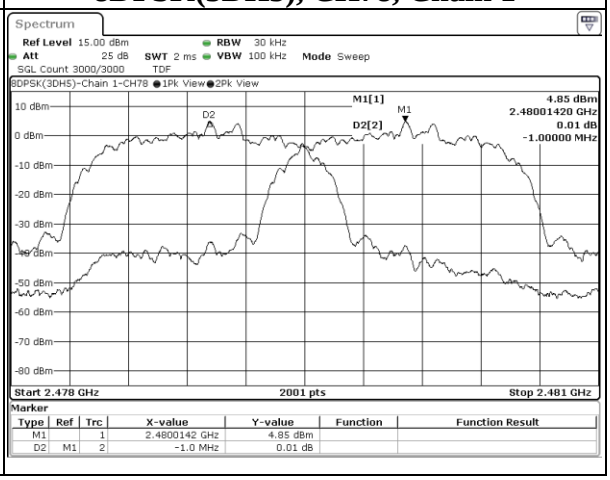
8DPSK(3DH5), CH39, Chain 1



8DPSK(3DH5), CH78, Chain 0



8DPSK(3DH5), CH78, Chain 1



9.4. Number of Hopping Frequency Used

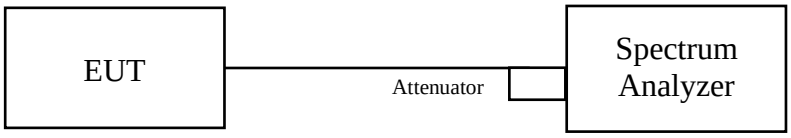
Requirements

At least 15 channels frequencies, and should be equally spaced.

Test procedure

a. Check the calibration of the measuring instrument (SA) using either an internal calibrator or a known signal from an external generator.
b. Turn on the EUT and connect its antenna terminal to measurement via a low loss cable. Then set it to any one measured frequency within its operating range and make sure the instrument is operated in its linear range.
c. Set the SA on MaxHold Mode, and then keep the EUT in hopping mode. Record all the signals from each channel until each one has been recorded.
d. Set the SA on View mode and then plot the result on SA screen.
e. Repeat above procedures until all frequencies measured were complete.

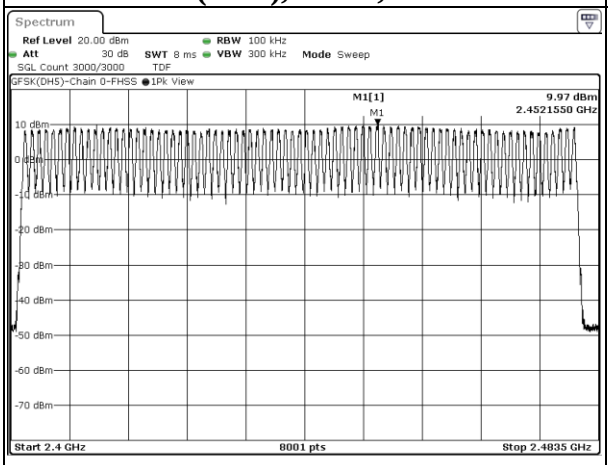
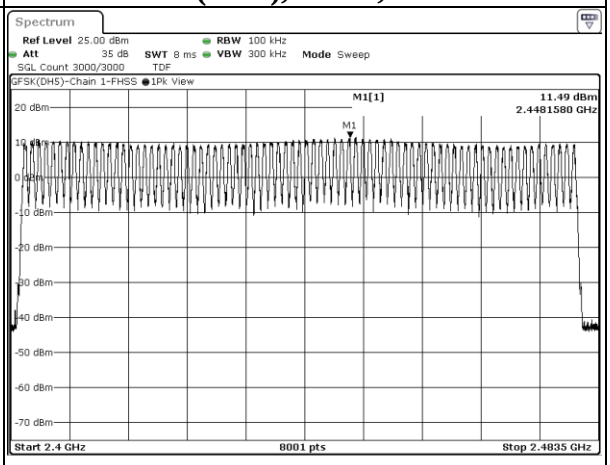
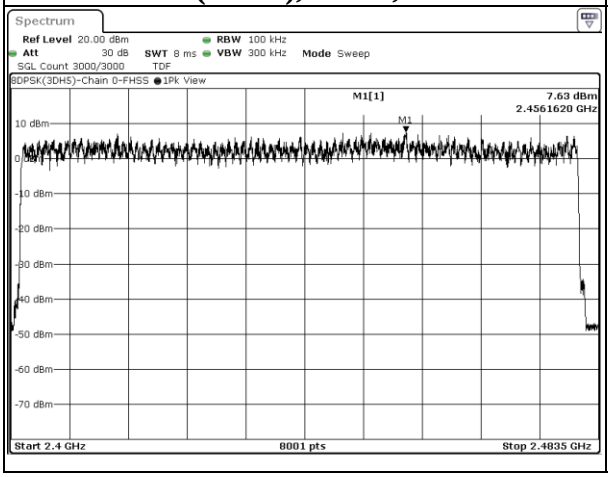
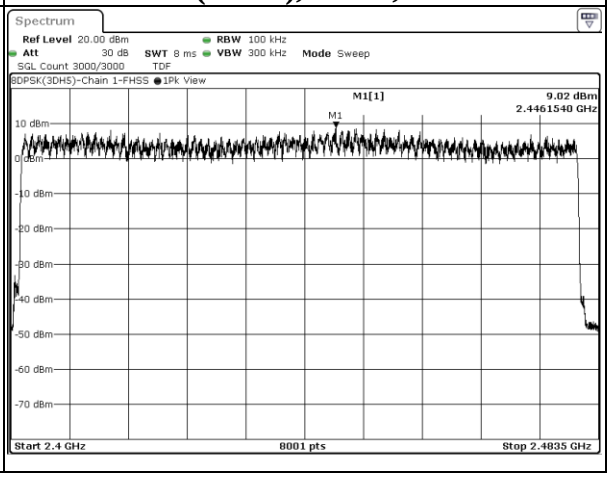
Test Setup



The loss between RF output port of the EUT and the input port of the Spectrum Analyzer has been taken into consideration.

Test Data

There are 79 hopping frequencies in the hopping mode. On the plots, it shows that the hopping frequencies are equally spaced.

GFSK(DH5), FHSS, Chain 0	GFSK(DH5), FHSS, Chain 1
	
8DPSK(3DH5), FHSS, Chain 0	**8DPSK(3DH5), FHSS, Chain 1**
	

9.5. Dwell Time on Each Channel

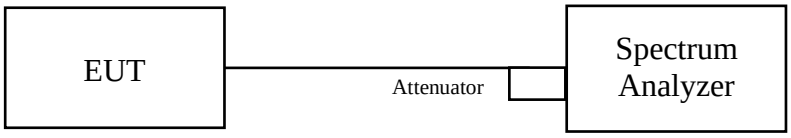
Requirements

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.

Test procedure

a. Check the calibration of the measuring instrument (SA) using either an internal calibrator or a known signal from an external generator.
b. Turn on the EUT and connect its antenna terminal to measurement via a low loss cable. Then set it to any one measured frequency within its operating range and make sure the instrument is operated in its linear range.
c. Adjust the center frequency of SA on any frequency be measured and set SA to zero span mode. And then, set RBW and VBW of spectrum analyzer to proper value.
d. Measure the time duration of one transmission on the measured frequency. And then plot the result with time difference of this time duration.
e. Repeat above procedures until all different time-slot modes have been completed.
f. Measure the maximum time duration of one single pulse.
   A Period Time = (channel number)*0.4
   For normal mode:
   DH1 Time Slot: Reading * (1600/2)*31.6/(channel number)
   DH3 Time Slot: Reading * (1600/4)*31.6/(channel number)
   DH5 Time Slot: Reading * (1600/6)*31.6/(channel number)
   For AFH mode:
   DH1 Time Slot: Reading * (800/2)*31.6/(channel number)
   DH3 Time Slot: Reading * (800/4)*31.6/(channel number)
   DH5 Time Slot: Reading * (800/6)*31.6/(channel number)

Test Setup

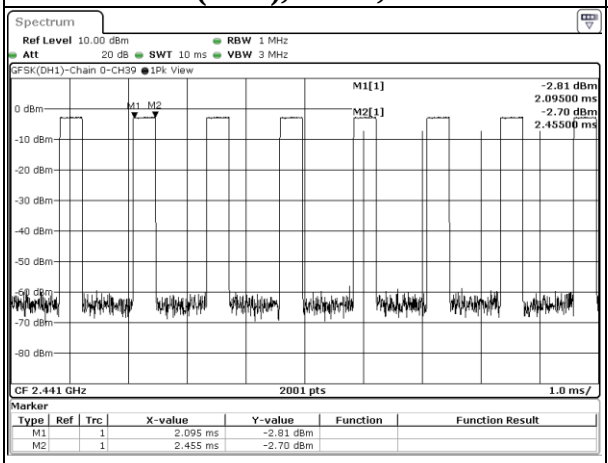


The loss between RF output port of the EUT and the input port of the Spectrum Analyzer has been taken into consideration.

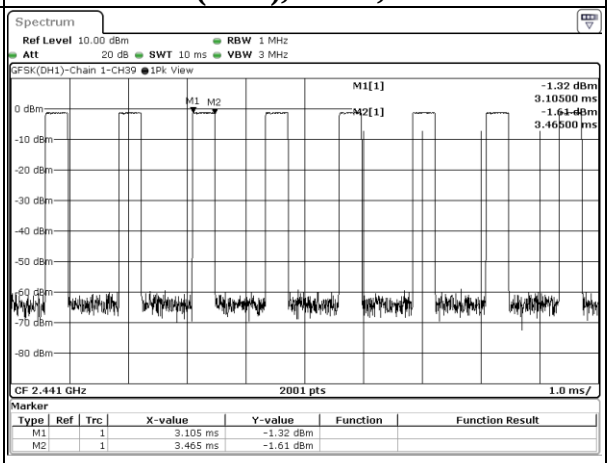
Test Data

Mode	Freq (MHz)	Chain	Length of transmission time (ms)	Dwell Time (ms)	Limit (ms)	Result
GFSK(DH1)	2441	Chain 0	0.360	115.200	400	PASS
GFSK(DH1)	2441	Chain 1	0.360	115.200	400	PASS
GFSK(DH3)	2441	Chain 0	1.630	260.800	400	PASS
GFSK(DH3)	2441	Chain 1	1.630	260.800	400	PASS
GFSK(DH5)	2441	Chain 0	2.870	306.133	400	PASS
GFSK(DH5)	2441	Chain 1	2.870	306.133	400	PASS
8DPSK(3DH1)	2441	Chain 0	0.360	115.200	400	PASS
8DPSK(3DH1)	2441	Chain 1	0.360	115.200	400	PASS
8DPSK(3DH3)	2441	Chain 0	1.630	260.800	400	PASS
8DPSK(3DH3)	2441	Chain 1	1.630	260.800	400	PASS
8DPSK(3DH5)	2441	Chain 0	2.870	306.133	400	PASS
8DPSK(3DH5)	2441	Chain 1	2.870	306.133	400	PASS

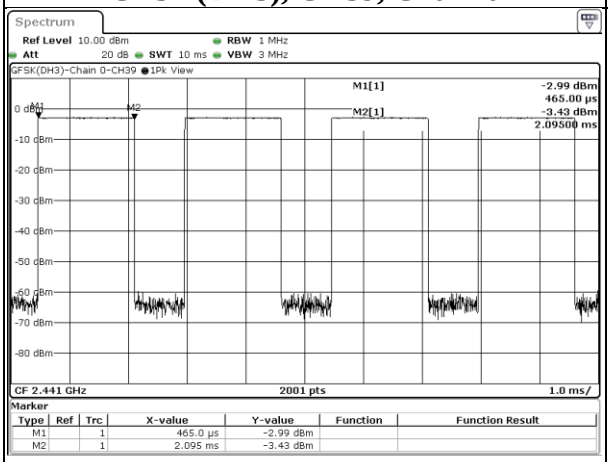
GFSK(DH1), CH39, Chain 0



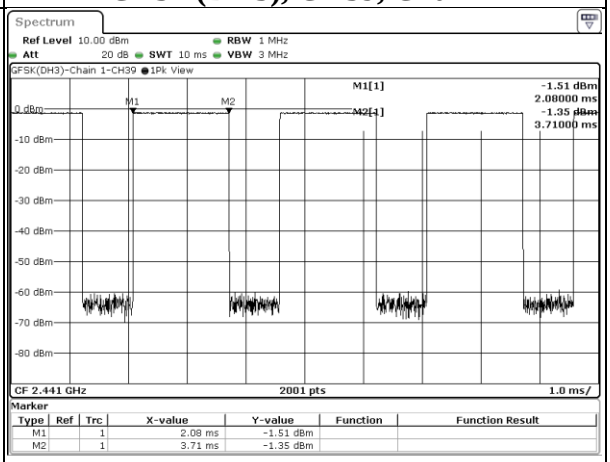
GFSK(DH1), CH39, Chain 1



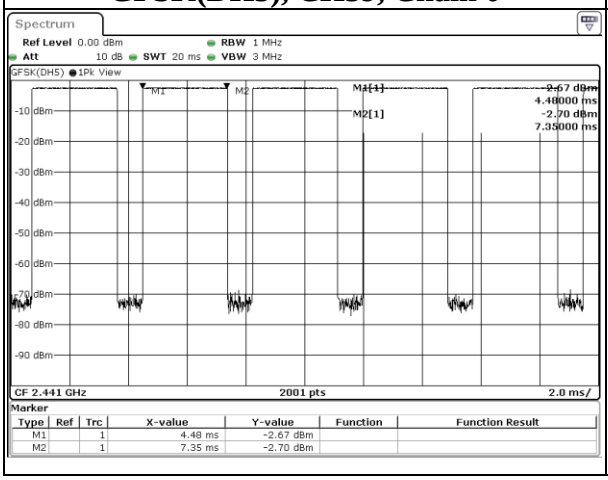
GFSK(DH3), CH39, Chain 0



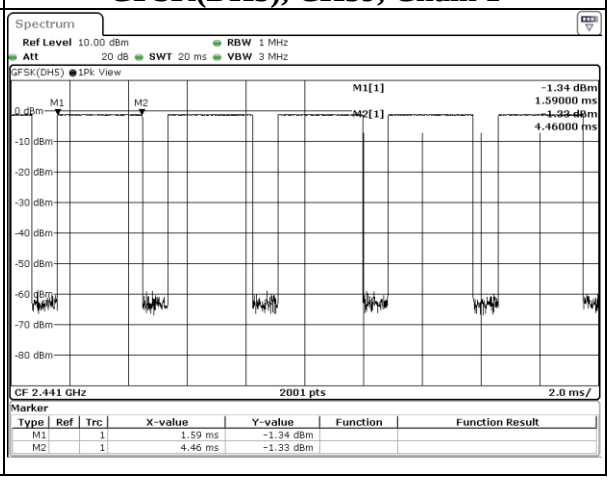
GFSK(DH3), CH39, Chain 1



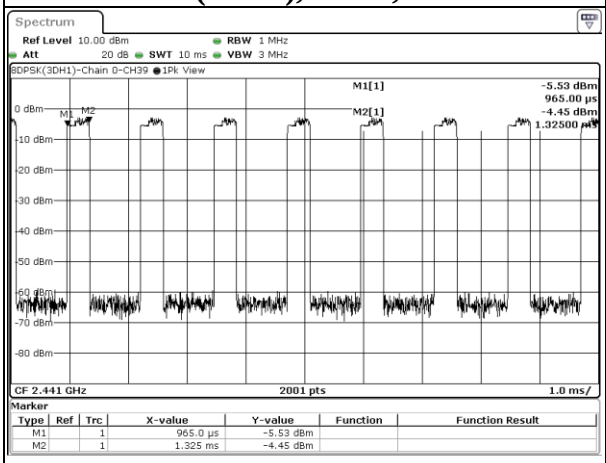
GFSK(DH5), CH39, Chain 0



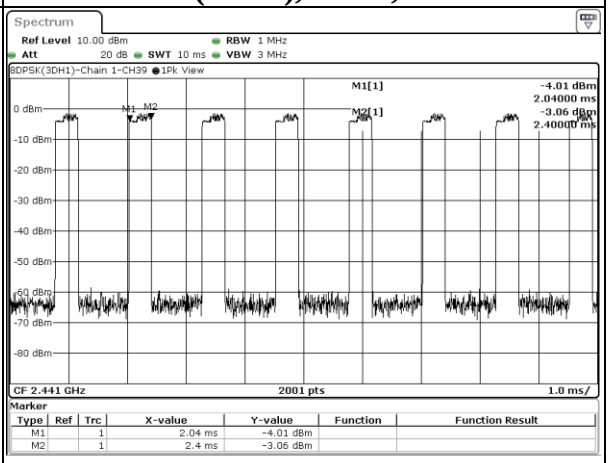
GFSK(DH5), CH39, Chain 1



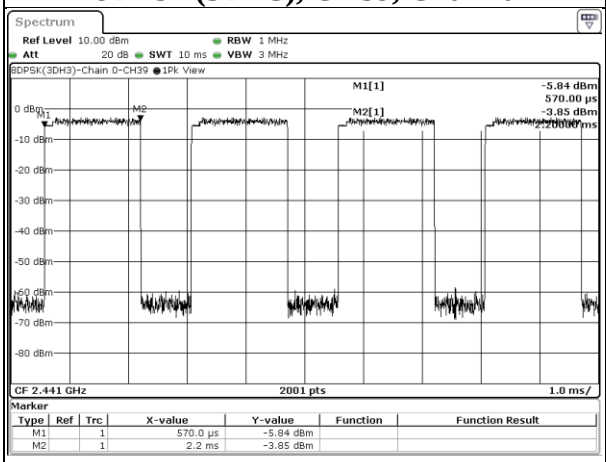
8DPSK(3DH1), CH39, Chain 0



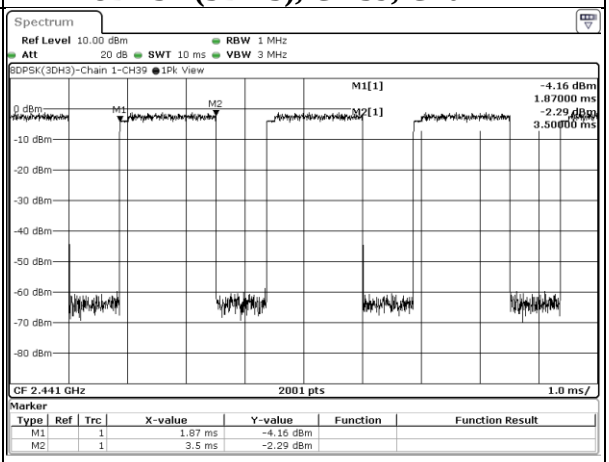
8DPSK(3DH1), CH39, Chain 1



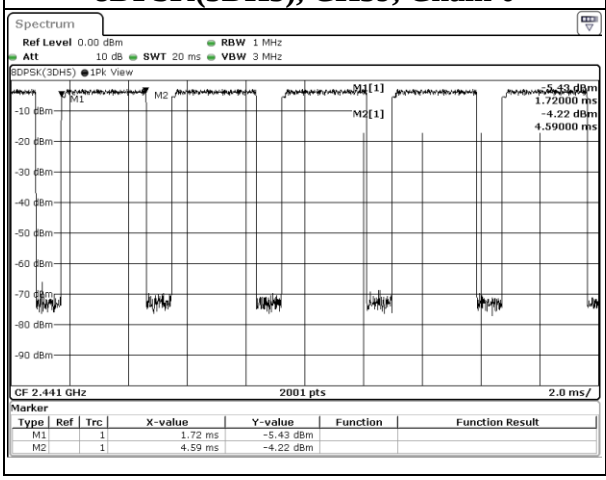
8DPSK(3DH3), CH39, Chain 0



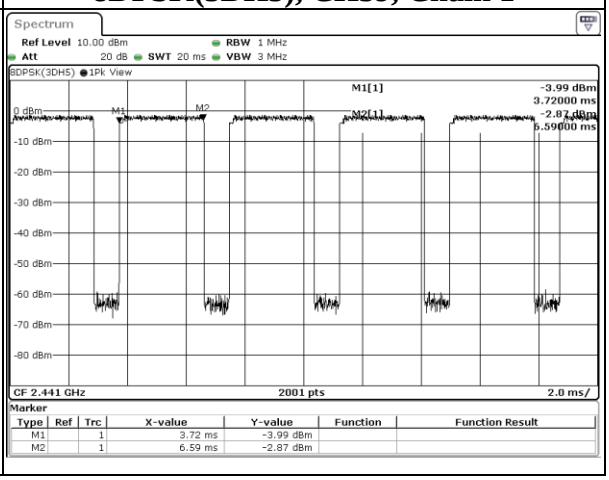
8DPSK(3DH3), CH39, Chain 1



8DPSK(3DH5), CH39, Chain 0



8DPSK(3DH5), CH39, Chain 1



9.6. Conducted Out of Band Emission

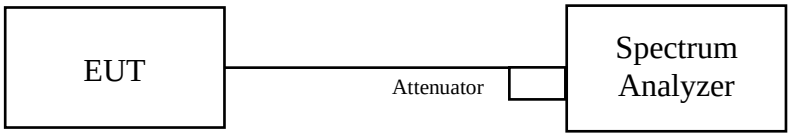
Requirements

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. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b) (3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209 (a) is not required.

Test procedure

The transmitter output was connected to the spectrum analyzer via a low lose cable. Set both RBW and VBW of spectrum analyzer to 100 kHz and 300 kHz with suitable frequency span including 100 MHz bandwidth from band edge. The band edges was measured and recorded.

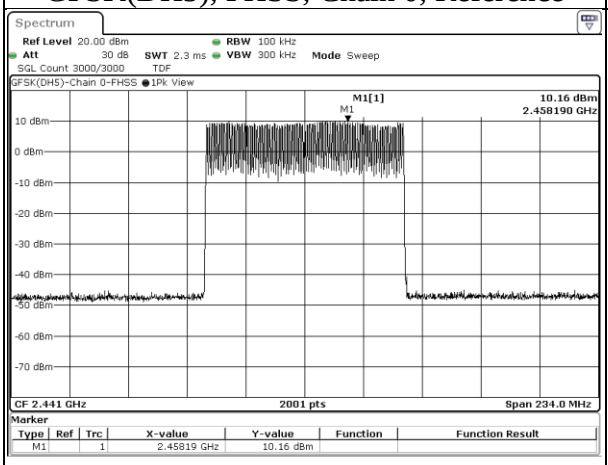
Test Setup



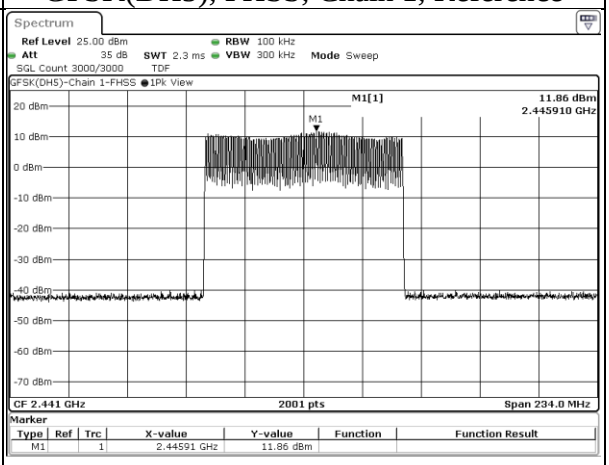
The loss between RF output port of the EUT and the input port of the Spectrum Analyzer has been taken into consideration.

Test Data

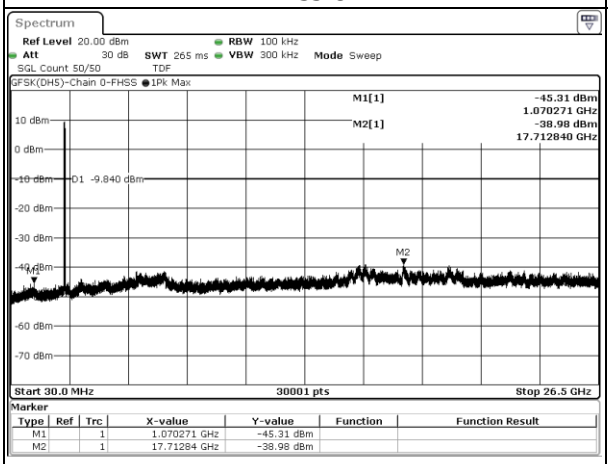
GFSK(DH5), FHSS, Chain 0, Reference



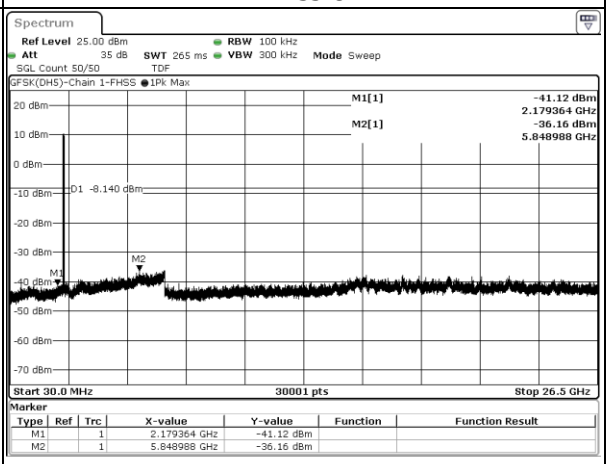
GFSK(DH5), FHSS, Chain 1, Reference



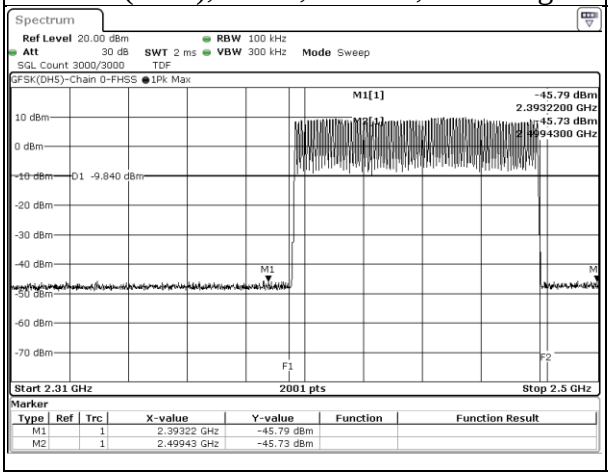
GFSK(DH5), FHSS, Chain 0, Conducted Emission



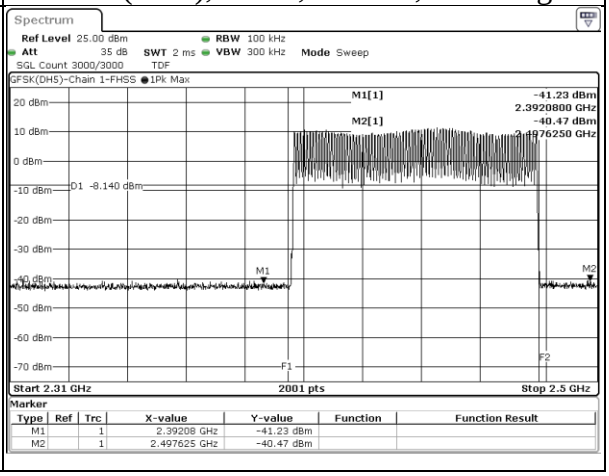
GFSK(DH5), FHSS, Chain 1, Conducted Emission



GFSK(DH5), FHSS, Chain 0, Band edge



GFSK(DH5), FHSS, Chain 1, Band edge



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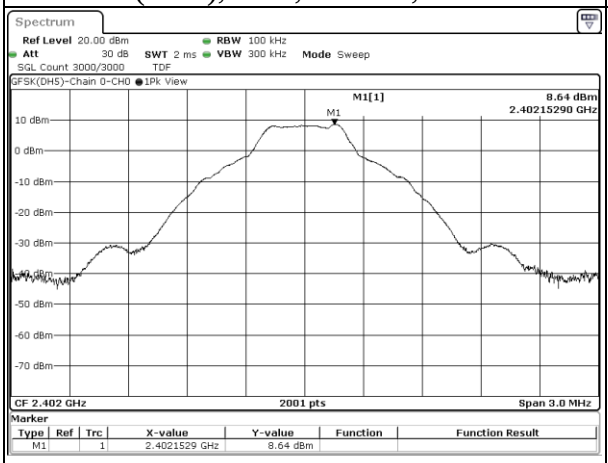
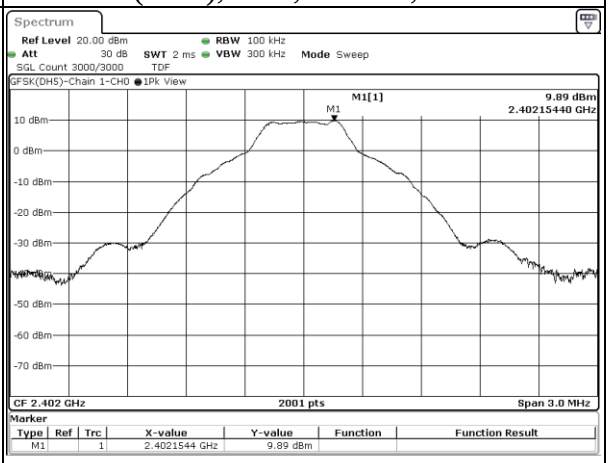
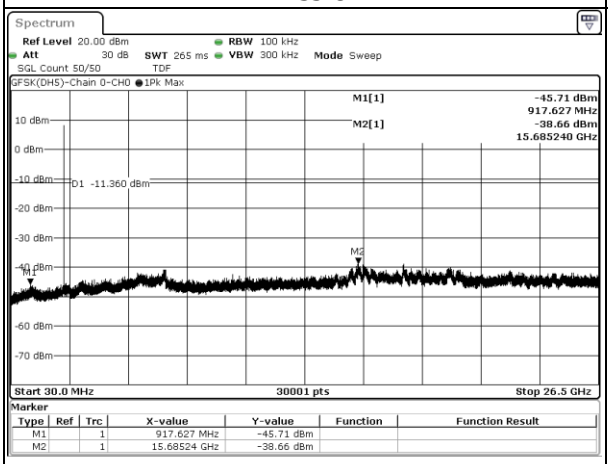


GFSK(DH5), CH0, Chain 1, Reference



GFSK(DH5), CH0, Chain 0, Conducted Emission



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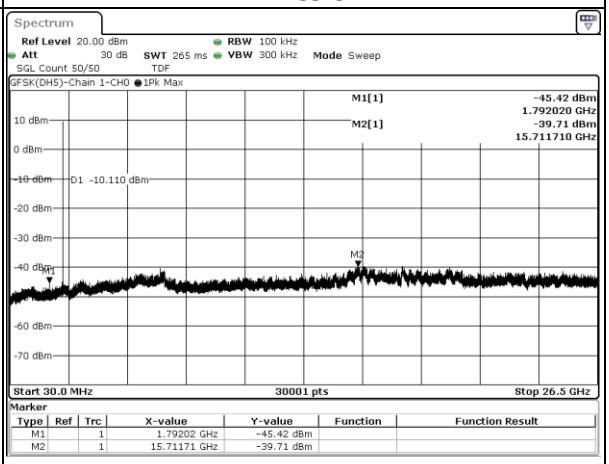
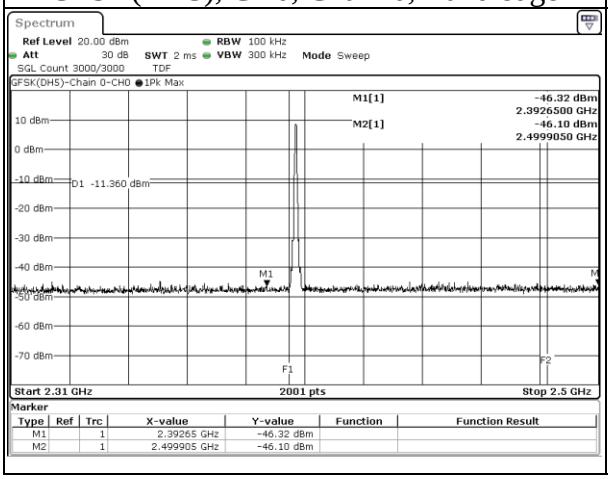
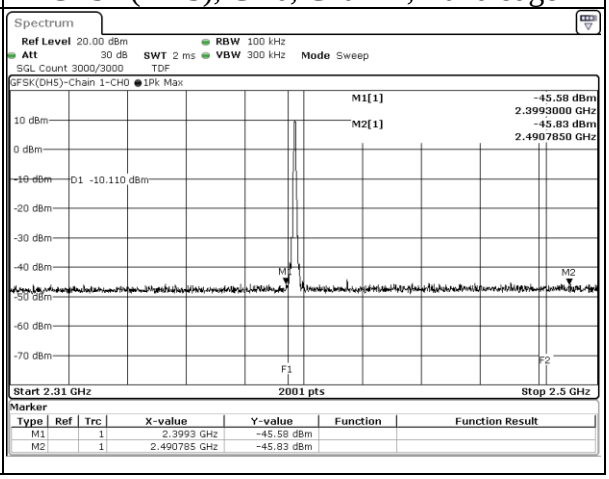
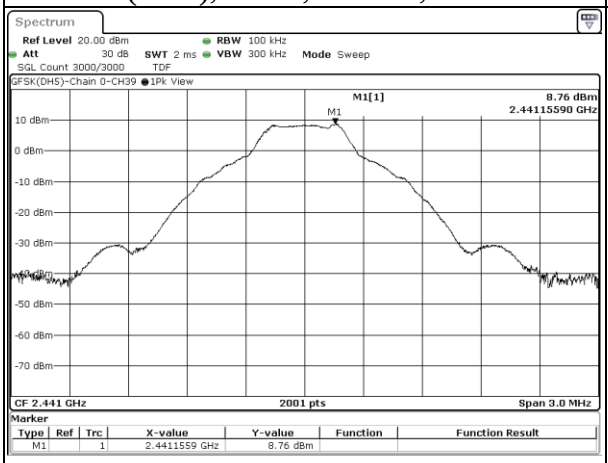
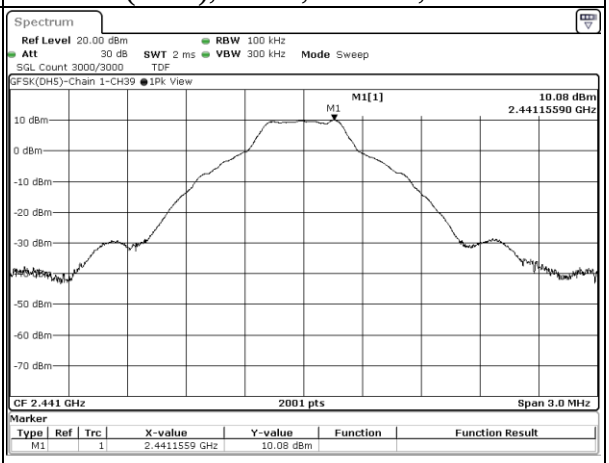
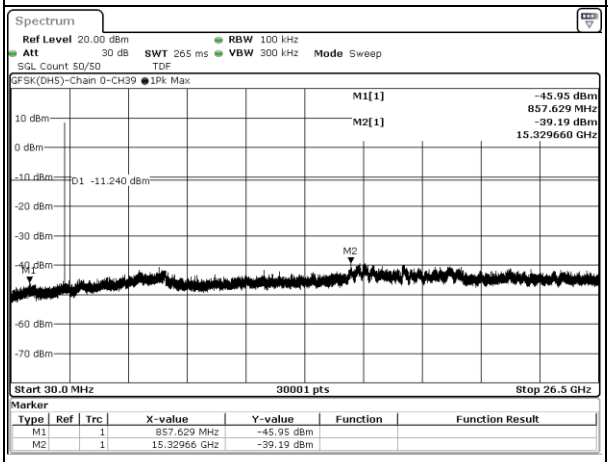
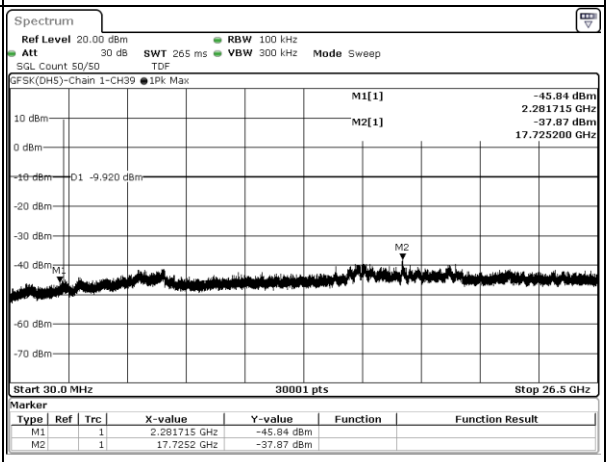
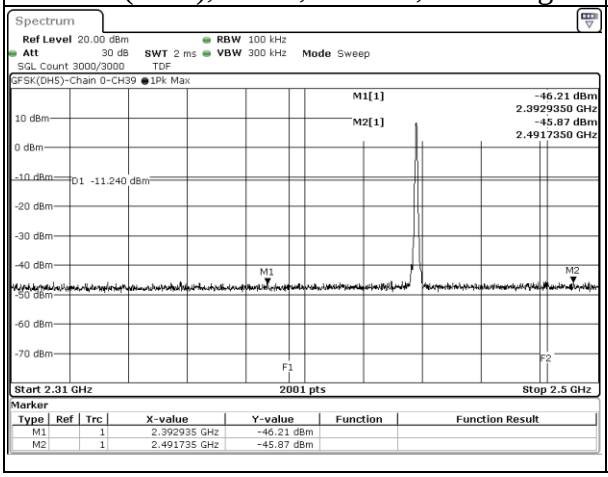
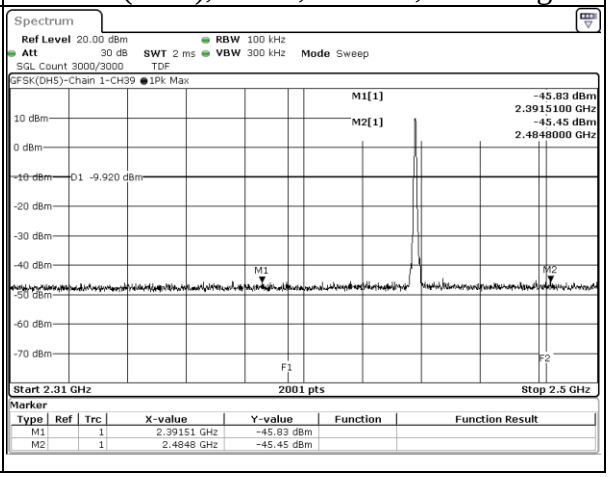


GFSK(DH5), CH0, Chain 0, Band edge

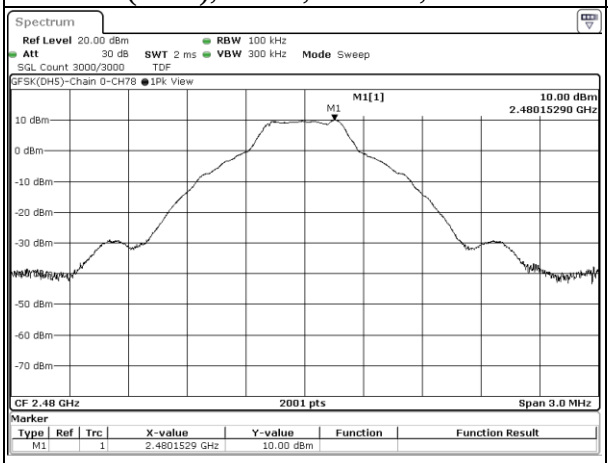


GFSK(DH5), CH0, Chain 1, Band edge

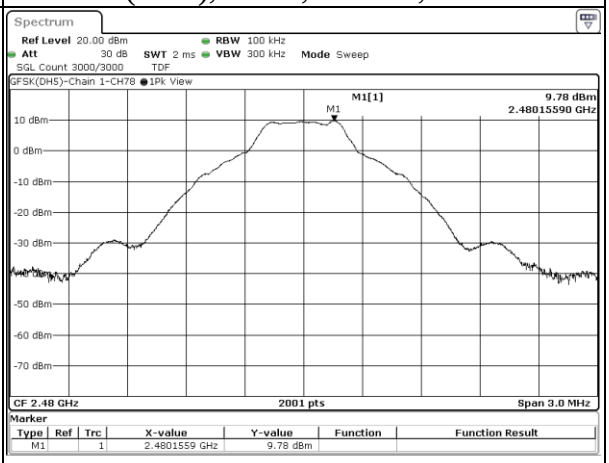


GFSK(DH5), CH39, Chain 0, Reference	GFSK(DH5), CH39, Chain 1, Reference
	
GFSK(DH5), CH39, Chain 0, Conducted Emission	GFSK(DH5), CH39, Chain 1, Conducted Emission
	
GFSK(DH5), CH39, Chain 0, Band edge	GFSK(DH5), CH39, Chain 1, Band edge
	

GFSK(DH5), CH78, Chain 0, Reference



GFSK(DH5), CH78, Chain 1, Reference



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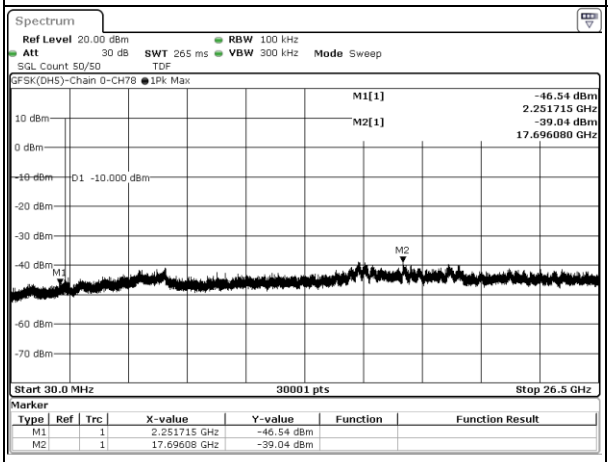

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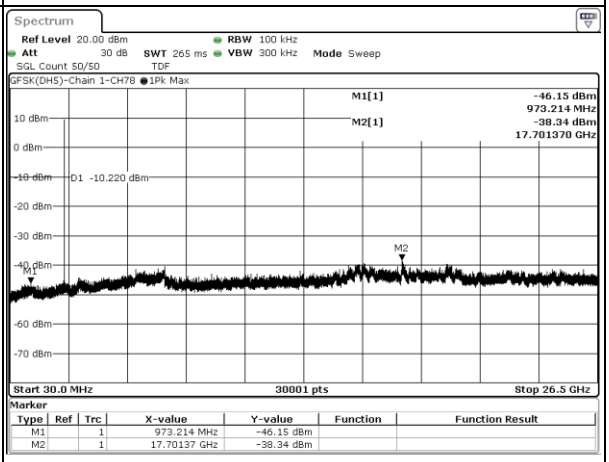

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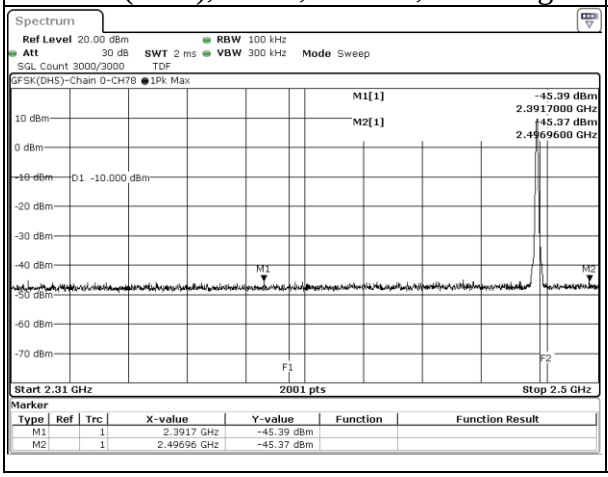
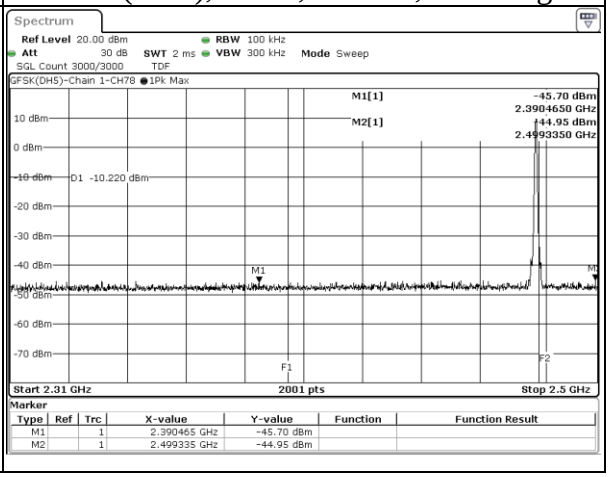
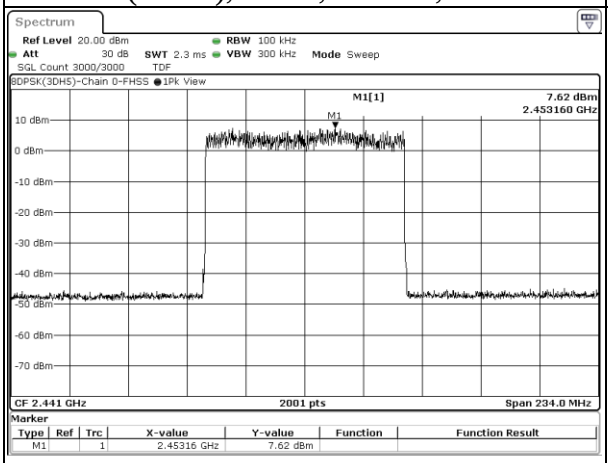
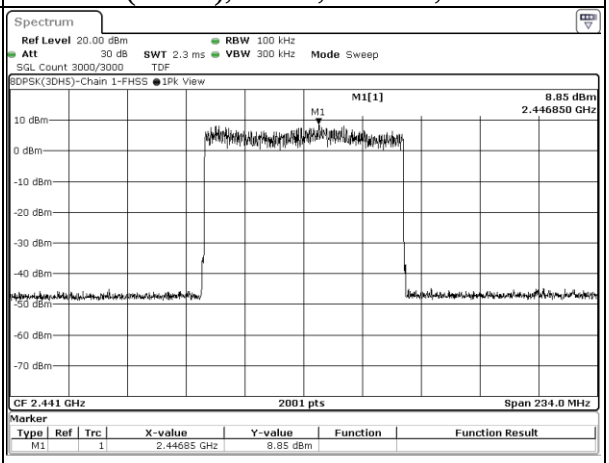


GFSK(DH5), CH78, Chain 1, Band edge



8DPSK(3DH5), FHSS, Chain 0, Reference	8DPSK(3DH5), FHSS, Chain 1, Reference
	
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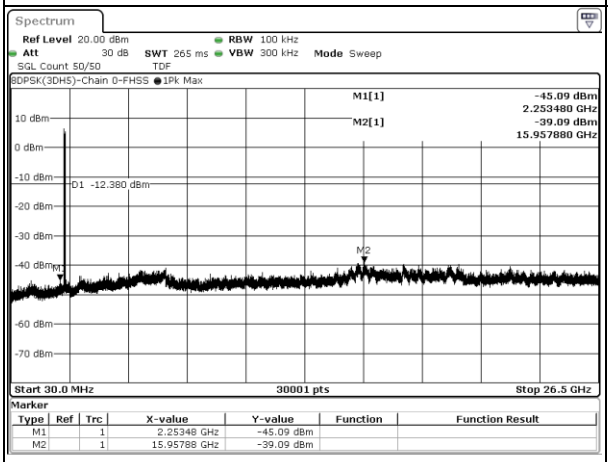	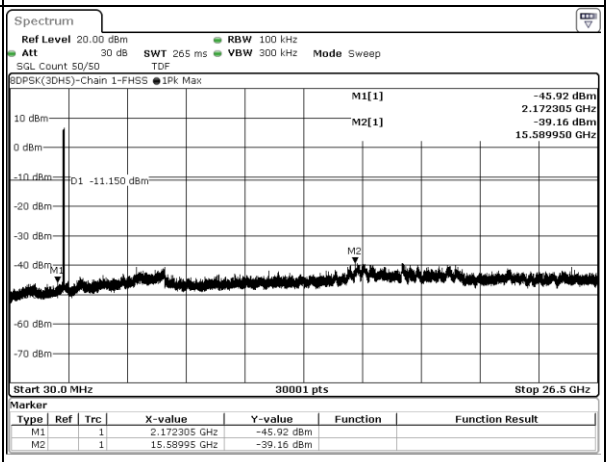
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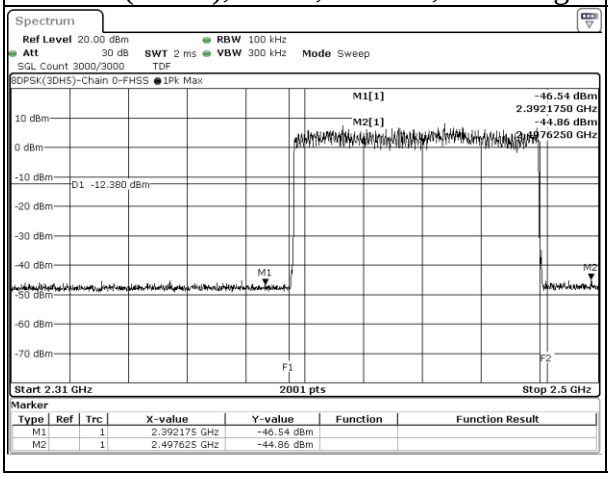
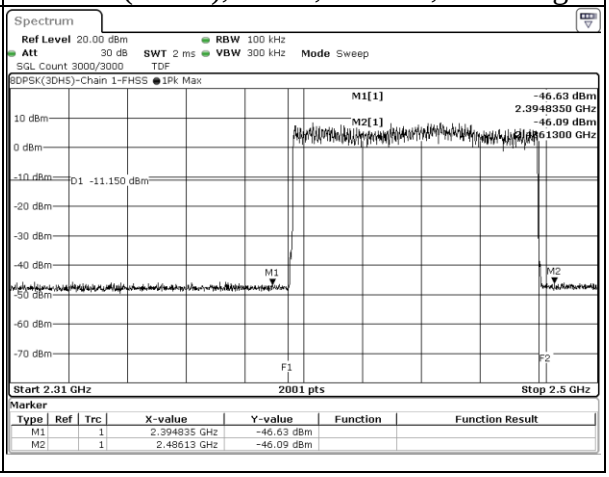
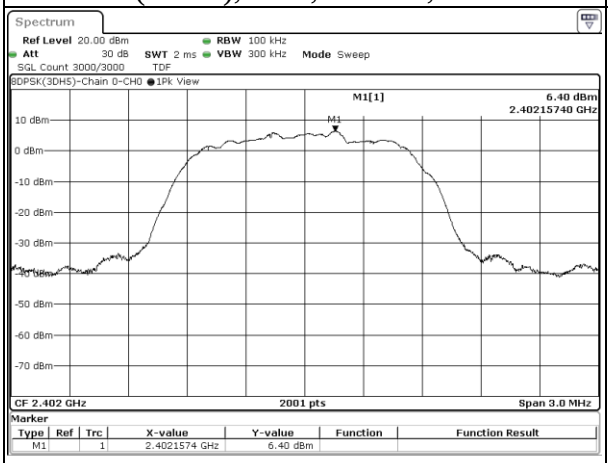
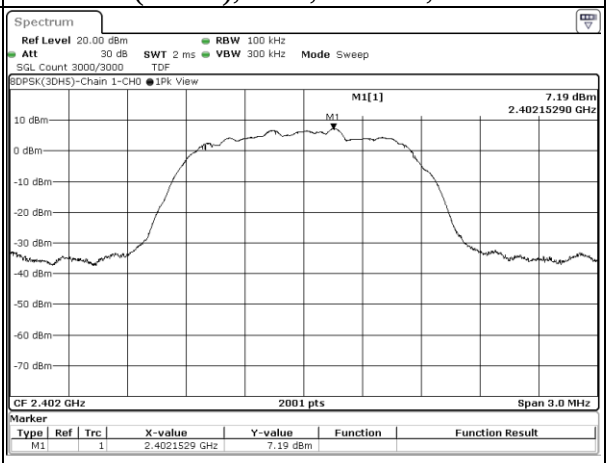
	

8DPSK(3DH5), CH0, Chain 0, Reference	8DPSK(3DH5), CH0, Chain 1, Reference
	
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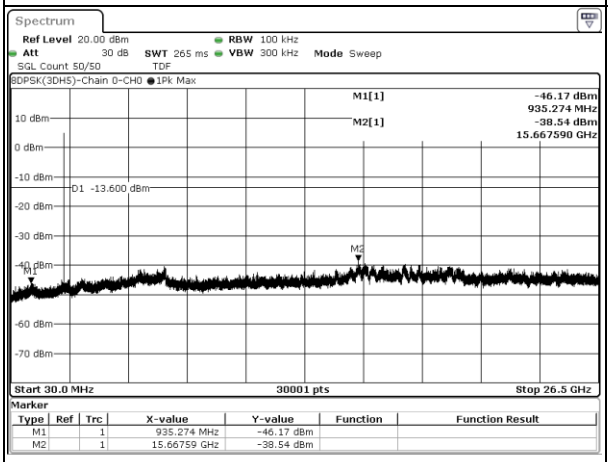
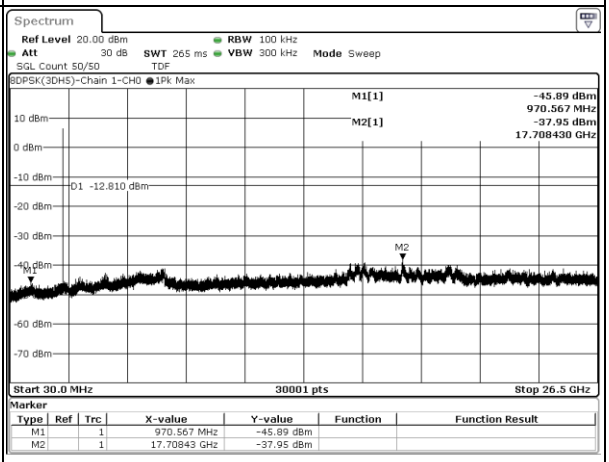
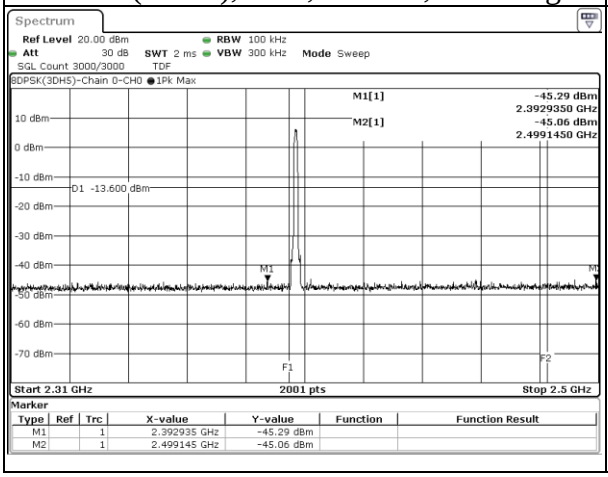
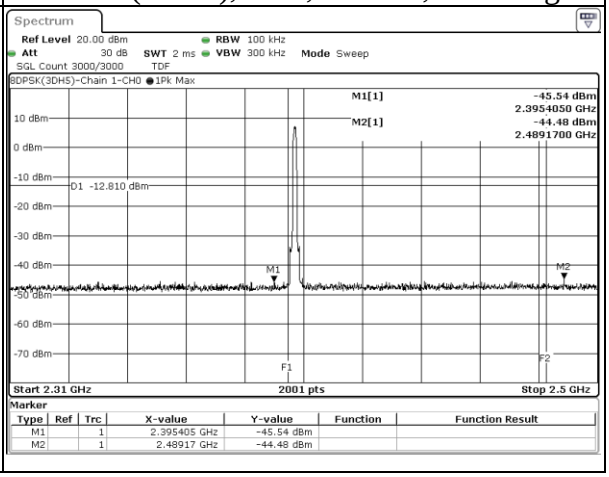
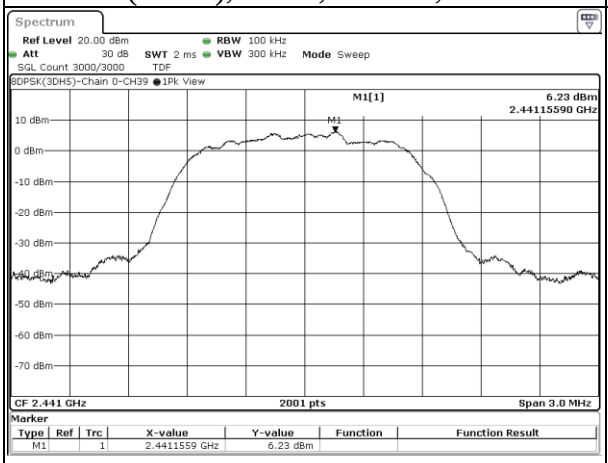
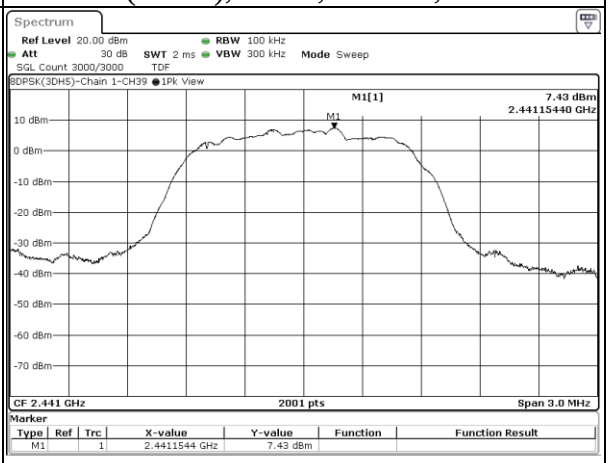
	
8DPSK(3DH5), CH0, Chain 0, Band edge	8DPSK(3DH5), CH0, Chain 1, Band edge
	

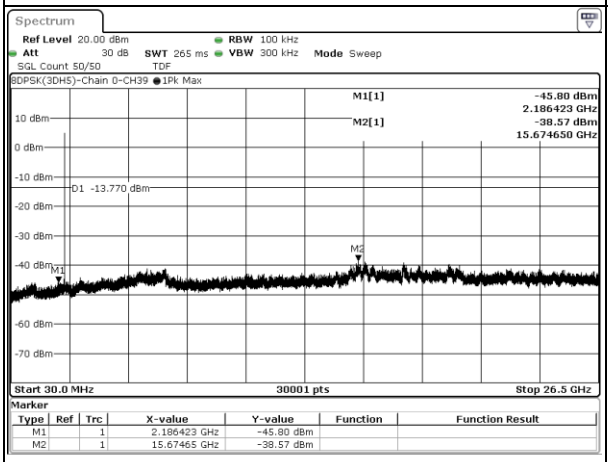
8DPSK(3DH5), CH39, Chain 0, Reference



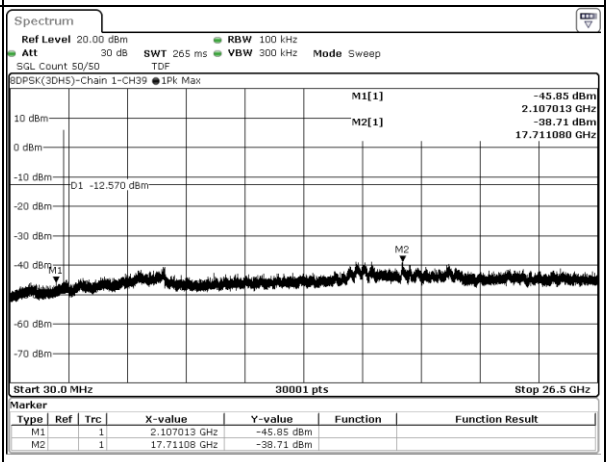
8DPSK(3DH5), CH39, Chain 1, Reference



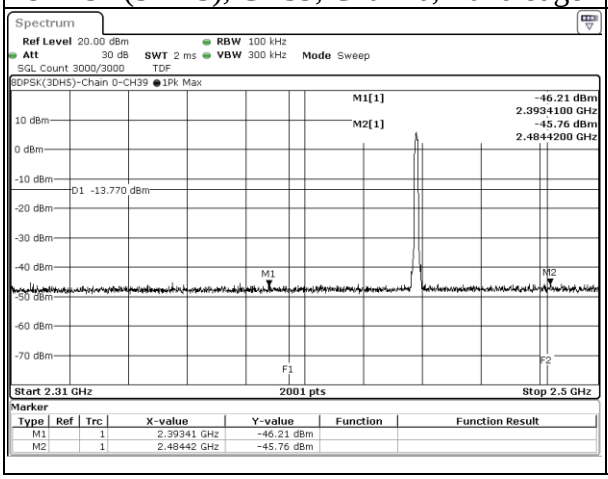
8DPSK(3DH5), CH39, Chain 0, Conducted Emission



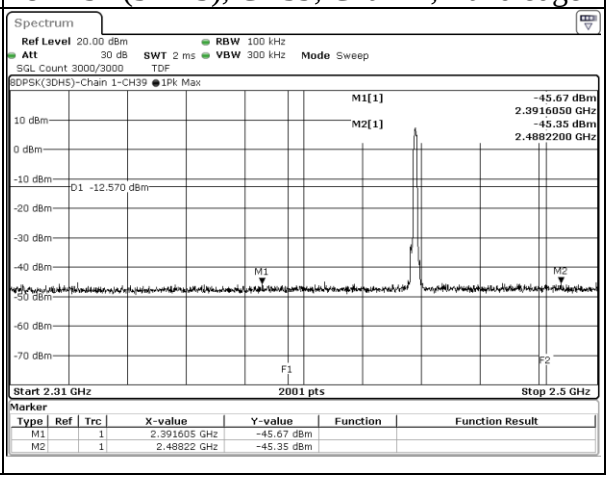
8DPSK(3DH5), CH39, Chain 1, Conducted Emission



8DPSK(3DH5), CH39, Chain 0, Band edge



8DPSK(3DH5), CH39, Chain 1, Band edge



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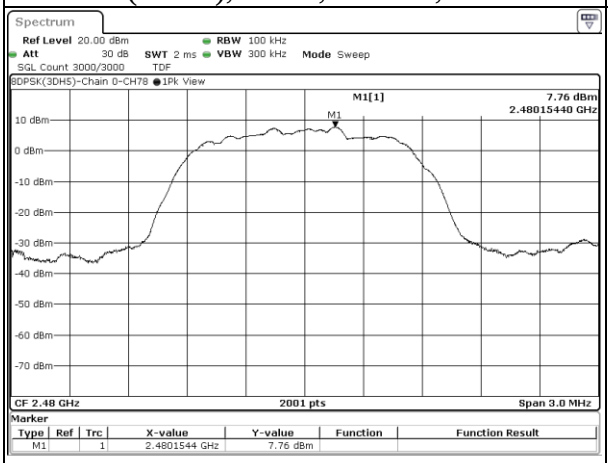
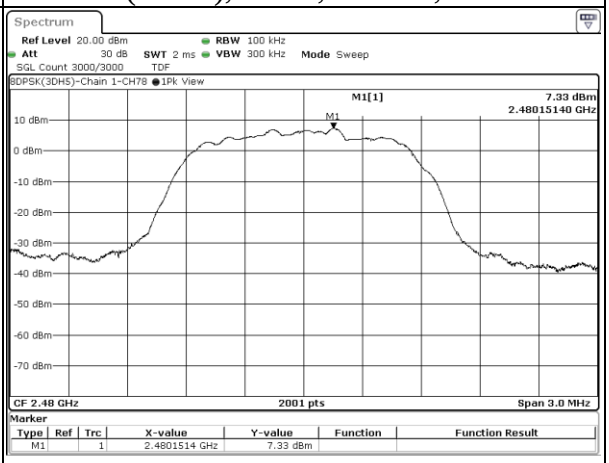
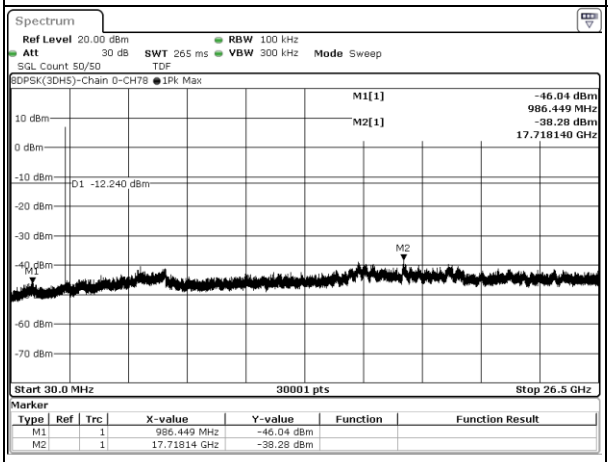


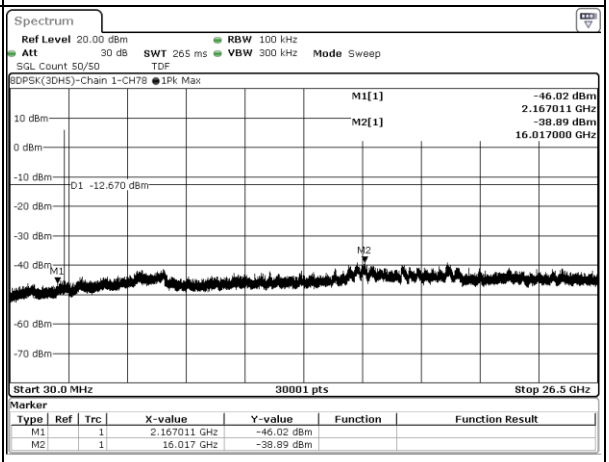
8DPSK(3DH5), CH78, Chain 1, Reference



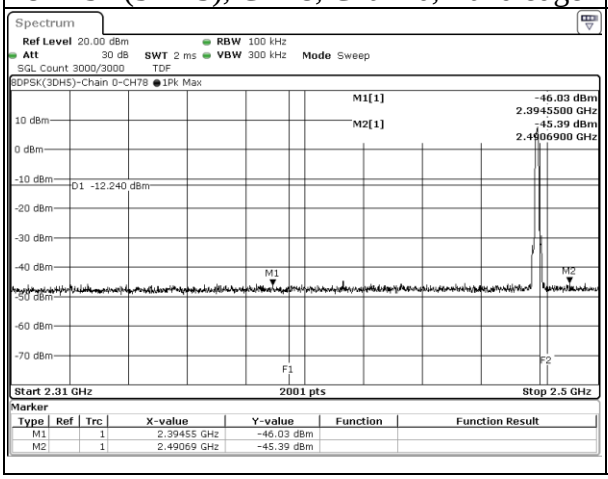
8DPSK(3DH5), CH78, Chain 0, Conducted Emission



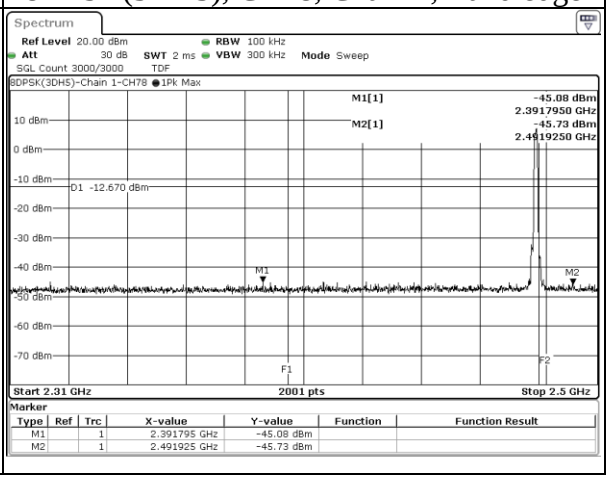
8DPSK(3DH5), CH78, Chain 1, Conducted Emission



8DPSK(3DH5), CH78, Chain 0, Band edge



8DPSK(3DH5), CH78, Chain 1, Band edge



9.7. Radiated Spurious Emission

Requirements

Radiated emissions which fall in the restricted bands must comply with the radiated emission limits specified as below table. Other emissions shall be at least 20dB below the highest level of the desired power:

Frequency (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:
1. The lower limit shall apply at the transition frequencies.
2. Emission level (dBuV/m) = 20 log Emission level (uV/m).
3. For frequencies above 1000MHz, the field strength limits are based on average detector, however, the peak field strength of any emission shall not exceed the maximum permitted average limits, specified above by more than 20dB under any condition of modulation.

Test Procedures

[For 9 kHz ~ 30 MHz]

a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter chamber room. The table was rotated 360 degrees to determine the position of the highest radiation.
b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
c. Parallel, perpendicular, and ground-parallel orientations of the antenna are set to make the measurement.
d. For each suspected emission, the EUT was arranged to its worst case and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
e. For measurement below 30MHz, the initial step in collecting conducted emission data is a spectrum analyzer peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak detector mode re-measured. If the emission level of the EUT measured by the peak detector is lower than the applicable limit, the peak emission level will be reported. Otherwise, the emission measurement will be repeated using the quasi-peak detector and reported.

NOTE:
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 9kHz at frequency below 30MHz.

[For above 30 MHz]

a. The EUT was placed on the top of a rotating table 0.8 meters (for 30MHz ~ 1GHz) / 1.5 meters (for above 1GHz) above the ground at 3 meter chamber room for test. The table was rotated 360 degrees to determine the position of the highest radiation.
b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
c. The height of antenna is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
e. For measurement below 1GHz, the initial step in collecting conducted emission data is a spectrum analyzer peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak detector mode re-measured. If the emission level of the EUT measured by the peak detector is lower than the applicable limit, the peak emission level will be reported. Otherwise, the emission measurement will be repeated using the quasi-peak detector and reported.
f. The test-receiver system was set to peak and average detects function and specified bandwidth with maximum hold mode when the test frequency is above 1 GHz. If the peak reading value also meets average limit, measurement with the average detector is unnecessary.

Note:

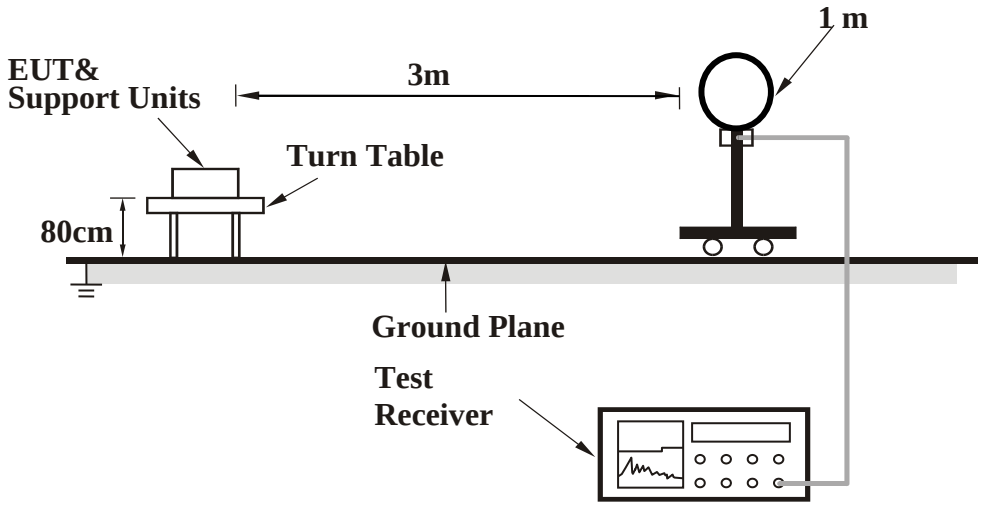
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1GHz.
3. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is ≥ 1/T (Duty cycle < 98%) or 10Hz (Duty cycle ≥ 98%) for Average detection (AV) at frequency above 1GHz.

Configuration	Average	
	RBW	VBW
Bluetooth	1MHz	Refer to section 6.6 for duty cycle.

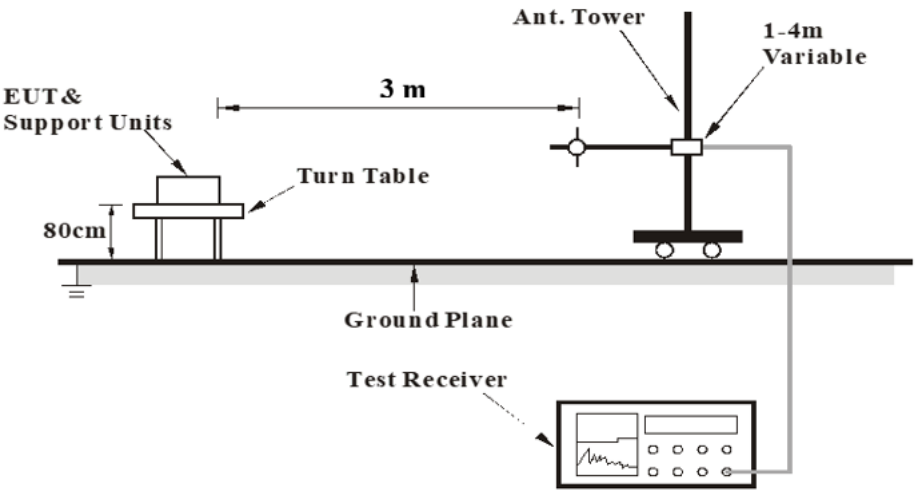
4. All modes of operation were investigated (includes all external accessories) and the worst-case emissions are reported, the other emission levels were low against the limit.
5. Test data of Result value (dBuV/m) = Reading value (dBuV/m) + Correction Factor (dB/m).
6. Test data of Margin(dB) = Result value (dBuV/m) - Limit value (dBuV/m).
7. Test data of Correction Factor (dB/m) = Antenna Factor (dB/m) + Cable Loss (dB) - Preamp Factor (dB).
8. Test data of Notation "@" = Fundamental Frequency
9. Test data of Notation " * " = The peak result under 20 dB above and complies with AVG limit, AVG result is deemed to comply with AVG limit.

Test Setup

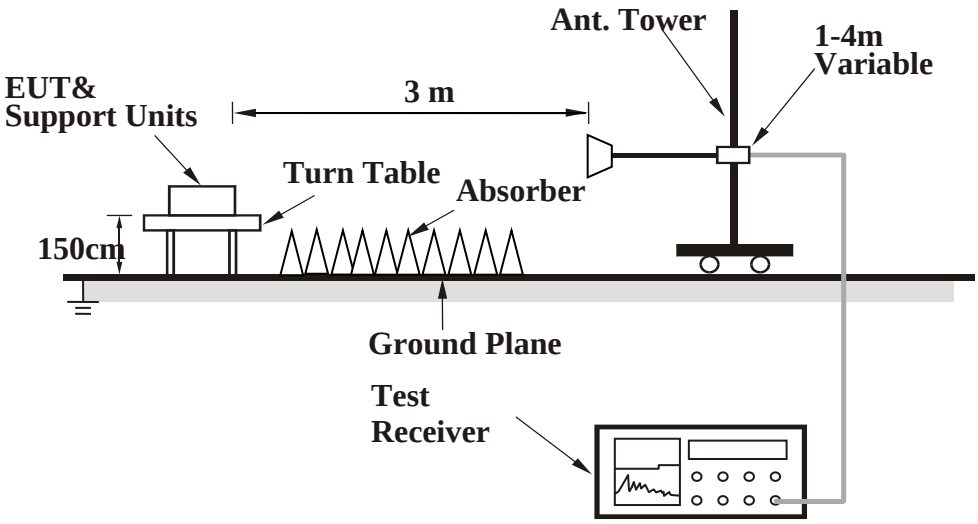
<Frequency Range 9 kHz ~ 30 MHz>



<Frequency Range 30 MHz ~ 1 GHz >



<Frequency Range above 1 GHz>



For the actual test configuration, please refer to the Setup Configurations.