



**FCC 47 CFR PART 15 SUBPART C  
ISED RSS-247 ISSUE 2**

**CERTIFICATION TEST REPORT**

*For*

**Rear Display**

**MODEL NUMBER: THRS**

**PROJECT NUMBER: 4790783952**

**REPORT NUMBER: 4790783952-1**

**FCC ID: A269ZUA170**

**IC: 700B-UA170**

**HVIN: THRS**

**ISSUE DATE: Jul. 10, 2023**

*Prepared for*

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## Revision History

Rev.	Issue Date	Revisions	Revised By
V0	07/10/2023	Initial Issue	

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## 1. APPLICANT INFORMATION

### Applicant Information

Company Name: ALPS ALPINE CO., LTD.  
Address: 20-1 Yoshima Industrial Park Iwaki, Fukushima 970-1192 Japan

### Manufacturer Information

Company Name: ALPS ALPINE CO., LTD.  
Address: 20-1 Yoshima Industrial Park Iwaki, Fukushima 970-1192 Japan

### EUT Description

Product Name: Rear Display  
Model Name: THRS  
Sample Number: 6221813  
Data of Receipt Sample: Jun. 27, 2023  
Test Date: Jun. 27, 2023~ Jul. 09, 2023

APPLICABLE STANDARDS	
STANDARD	TEST RESULTS
CFR 47 Part 15 Subpart C	PASS
ISED RSS-247 Issue 2	PASS
ISED RSS-GEN Issue 5	PASS

Summary of Test Results			
Clause	Test Items	FCC/ISED Rules	Test Results
1	20dB Bandwidth and 99% Occupied Bandwidth	FCC 15.247 (a) (1) RSS-247 Clause 5.1 (a) RSS-Gen Clause 6.7	Pass
2	Conducted Output Power	FCC 15.247 (b) (1) RSS-247 Clause 5.1 (b)	Pass
3	Carrier Hopping Channel Separation	FCC 15.247 (a) (1) RSS-247 Clause 5.1 (b)	Pass
4	Number of Hopping Frequency	15.247 (a) (1) III RSS-247 Clause 5.1 (d)	Pass
5	Time of Occupancy (Dwell Time)	15.247 (a) (1) III RSS-247 Clause 5.1 (d)	Pass
6	Conducted Bandedge	FCC 15.247 (d) RSS-247 Clause 5.5	Pass
7	Radiated Bandedge and Spurious	FCC 15.247 (d) FCC 15.209 FCC 15.205 RSS-247 Clause 5.5 RSS-GEN Clause 8.9 RSS-GEN Clause 8.10	Pass
8	Conducted Emission Test for AC Power Port	FCC 15.207 RSS-GEN Clause 8.8	N/A
9	Antenna Requirement	FCC 15.203 RSS-GEN Clause 6.8	Pass

Note:  
1. The product was powered by DC power source.  
2. The measurement result for the sample received is <Pass> according to < ANSI C63.10-2013, FCC CFR 47 Part 2, FCC CFR 47 Part 15C, ISED RSS-GEN, ISED RSS-247> when <Accuracy Method> decision rule is applied.

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Authorized By:

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## 2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with KDB 558074 D01 15.247 Meas Guidance v05r02, 414788 D01 Radiated Test Site v01r01, CFR 47 FCC Part 2, CFR 47 FCC Part 15, ANSI C63.10-2013, ISED RSS-247 Issue 2 and ISED RSS-GEN Issue 5.

## 3. FACILITIES AND ACCREDITATION

Accreditation Certificate	<p><b>A2LA (Certificate No.: 4829.01)</b>  <b>UL-CCIC COMPANY LIMITED has been assessed and proved to be in compliance with A2LA.</b></p> <p><b>FCC (FCC Designation No.: CN1247)</b>  <b>UL-CCIC COMPANY LIMITED has been recognized to perform compliance testing on equipment subject to the Commission's Declaration of Conformity (DoC) and Certification rules.</b></p> <p><b>IC (IC Designation No.: 25056; CAB No.: CN0073)</b>  <b>UL-CCIC COMPANY LIMITED has been recognized to perform compliance testing on equipment subject to the Commission's Declaration of Conformity (DoC) and Certification rules.</b></p>
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Note 1: All tests measurement facilities use to collect the measurement data are located at No. 2, Chengwan Road, Suzhou Industrial Park, Suzhou 215122, China.

Note 2: For below 30MHz, lab had performed measurements at test anechoic chamber and comparing to measurements obtained on an open field site. These measurements below 30MHz had been correlated to measurements performed on an OFS.

Note 3: The test anechoic chamber in UL-CCIC COMPANY LIMITED had been calibrated and compared to the open field sites and the test anechoic chamber is shown to be equivalent to or worst case from the open field site.

## 4. CALIBRATION AND UNCERTAINTY

### 4.1. MEASURING INSTRUMENT CALIBRATION

The measuring equipment utilized to perform the tests documented in this report has been calibrated in accordance with the manufacturer's recommendations and is traceable to recognized national standards.

### 4.2. MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus:

Test Item	Uncertainty
Conduction emission	3.1dB
Maximum Conduct Output Power	± 1.3dB
20dB Bandwidth and 99% Occupied Bandwidth	±1.9 %
Carrier Hopping Channel Separation	±1.9 %
Number of Hopping Frequency	±1.9 %
Time of Occupancy (Dwell Time)	±1.9 %
Conducted Bandedge	± 1.9%
Radiation Emission test (include Fundamental emission) (9kHz-30MHz)	3.4dB
Radiation Emission test (include Fundamental emission) (30MHz-1GHz)	3.4dB
Radiation Emission test (1GHz to 26GHz) (include Fundamental emission)	3.5dB (1GHz-18GHz)
	3.9dB (18GHz-26.5GHz)
Note: This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.	

## 5. EQUIPMENT UNDER TEST

### 5.1. DESCRIPTION OF EUT

Product Name:	Rear Display		
Model Name:	THRS		
Technology	Bluetooth – BR & EDR		
Transmit Frequency Range	2402 MHz ~ 2480 MHz		
Mode	Basic Rate		Enhanced Data Rate
Modulation	GFSK	π/4-DQPSK	8DPSK
Packet Type (Maximum Payload):	DH5	2DH5	3DH5
Data Rate	1 Mbps	2 Mbps	3 Mbps
Test software of EUT:	BlueTest3 (manufacturer declare)		
Antenna Type:	Metal Antenna		
Antenna Gain:	Antenna 1 (Antenna in module 1): 3.7 dBi Antenna 2 (Antenna in module 2): 3.7 dBi		
	Note: 1. Two BT modules are installed in this product. 2. This data is provided by customer and our lab isn't responsible for this data.		



## 5.2. MAXIMUM OUTPUT POWER

Module 1:

Test Mode	Frequency (MHz)	Channel Number	Maximum Output Power (dBm)
GFSK	2402 ~ 2480	0-78[79]	7.29
π/4-DQPSK	2402 ~ 2480	0-78[79]	5.99
8DPSK	2402 ~ 2480	0-78[79]	6.24

Module 2:

Test Mode	Frequency (MHz)	Channel Number	Maximum Output Power (dBm)
GFSK	2402 ~ 2480	0-78[79]	7.34
π/4-DQPSK	2402 ~ 2480	0-78[79]	5.84
8DPSK	2402 ~ 2480	0-78[79]	6.14

## 5.3. PACKET TYPE CONFIGURATION

Test Mode	Packet Type	Setting (Packet Length)
GFSK	DH1	27
	DH3	183
	DH5	339
π/4-DQPSK	2-DH1	54
	2-DH3	367
	2-DH5	679
8DPSK	3-DH1	83
	3-DH3	552
	3-DH5	1021

### 5.4. CHANNEL LIST

Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
00	2402	20	2422	40	2442	60	2462
01	2403	21	2423	41	2443	61	2463
02	2404	22	2424	42	2444	62	2464
03	2405	23	2425	43	2445	63	2465
04	2406	24	2426	44	2446	64	2466
05	2407	25	2427	45	2447	65	2467
06	2408	26	2428	46	2448	66	2468
07	2409	27	2429	47	2449	67	2469
08	2410	28	2430	48	2450	68	2470
09	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	/	/

### 5.5. TEST CHANNEL CONFIGURATION

Test Mode	Test Channel	Frequency
GFSK	CH 0(Low Channel), CH 39(MID Channel), CH 78(High Channel)	2402 MHz, 2441 MHz, 2480 MHz
Π/4-DQPSK	CH 0(Low Channel), CH 39(MID Channel), CH 78(High Channel)	2402 MHz, 2441 MHz, 2480 MHz
8DPSK	CH 0(Low Channel), CH 39(MID Channel), CH 78(High Channel)	2402 MHz, 2441 MHz, 2480 MHz
GFSK	Hopping	2402 MHz ~ 2480 MHz
Π/4-DQPSK	Hopping	2402 MHz ~ 2480 MHz
8DPSK	Hopping	2402 MHz ~ 2480 MHz

### 5.6. WORST-CASE CONFIGURATIONS

Test Mode	Modulation Technology	Modulation Type	Data Rate	Packet Type
BR	FHSS	GFSK	1Mbit/s	DH5
EDR	FHSS	π/4-DQPSK	2Mbit/s	2DH5
EDR	FHSS	8DPSK	3Mbit/s	3-DH5

### 5.7. THE WORSE CASE POWER SETTING PARAMETER

The Worse Case Power Setting Parameter under 2400 ~ 2483.5 MHz Band				
Test Software		BlueTest3		
Test Mode	Transmit Antenna Number	Test Software Setting Value		
		CH 00	CH 39	CH 78
GFSK	2	Default	Default	Default
π/4-DQPSK	2	Default	Default	Default
8DPSK	2	Default	Default	Default

### 5.8. DESCRIPTION OF AVAILABLE ANTENNAS

Ant.	Frequency (MHz)	Antenna Type	Antenna Gain (dBi)
Ant. in module 1	2400-2483.5	Metal Antenna	3.7 dBi
Ant. in module 2	2400-2483.5	Metal Antenna	3.7 dBi

- Note: 1. Two BT modules are installed in this product.  
2. This data is provided by customer and our lab isn't responsible for this data.

Test Mode	Transmit and Receive Mode	Description
GFSK	<input checked="" type="checkbox"/> 2TX, 2RX	Antenna 1&2 can be used as transmitting/receiving antenna.
II/4-DQPSK	<input checked="" type="checkbox"/> 2TX, 2RX	Antenna 1&2 can be used as transmitting/receiving antenna.
8DPSK	<input checked="" type="checkbox"/> 2TX, 2RX	Antenna 1&2 can be used as transmitting/receiving antenna.

Note: Two BT modules are installed in this product and the two BT modules can transmit simultaneously.

### 5.9. TEST ENVIRONMENT

Environment Parameter	Selected Values During Tests	
Relative Humidity:	55 ~ 65%	
Atmospheric Pressure:	101kPa	
Temperature:	TN	23 ~ 28°C
Voltage:	VL	N/A
	VN	DC 13.2V
	VH	N/A

Note: VL= Lower Extreme Test Voltage  
VN= Nominal Voltage  
VH= Upper Extreme Test Voltage  
TN= Normal Temperature

## 5.10. DESCRIPTION OF TEST SETUP

### SUPPORT EQUIPMENT

Item	Equipment	Brand Name	Model Name	Description
1	Laptop	Lenovo	K21	Supplied by UL Lab
2	DC Power Supply	Tektronix	PWS2326	Supplied by UL Lab

### I/O PORT

Cable No	Port	Connector Type	Cable Type	Cable Length(m)	Remarks
1	USB	USB	USB	100cm Length	/

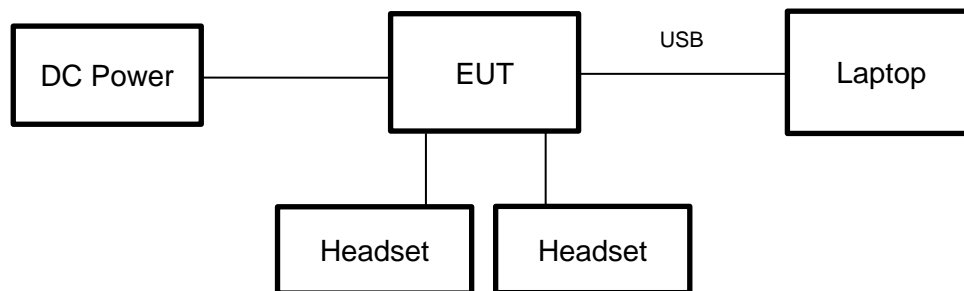
### ACCESSORY

Item	Accessory	Brand Name	Model Name	Description
1	Headset	Logitech	H111	Supplied by UL Lab

### TEST SETUP

The EUT can work in an engineer mode with a software through a table PC.

### SETUP DIAGRAM FOR TESTS



### 5.11. MEASURING INSTRUMENT AND SOFTWARE USED

Conducted Emissions (Instrument)							
Used	Equipment	Manufacturer	Model No.	Serial No.	Upper Last Cal.	Last Cal.	Next Cal.
<input checked="" type="checkbox"/>	EMI Test Receiver	R&S	ESR3	126700	2021-12-20	2022-12-19	2023-12-18
<input checked="" type="checkbox"/>	Two-Line V-Network	R&S	ENV216	126701	2021-12-04	2022-12-03	2023-12-02
<input checked="" type="checkbox"/>	Artificial Mains Networks	R&S	ENY81	126712	2021-10-12	2022-10-09	2023-10-08
Software							
Used	Description		Manufacturer	Name	Version		
<input checked="" type="checkbox"/>	Test Software for Conducted disturbance		R&S	EMC32	Ver. 9.25		
Radiated Emissions (Instrument)							
Used	Equipment	Manufacturer	Model No.	Serial No.	Upper Last Cal.	Last Cal.	Next Cal.
<input checked="" type="checkbox"/>	EMI test receiver	R&S	ESR7	222993	2022-04-09	2023-04-08	2024-04-07
<input checked="" type="checkbox"/>	EMI test receiver	R&S	ESR26	126703	2021-12-04	2022-12-03	2023-12-02
<input checked="" type="checkbox"/>	Spectrum Analyzer	R&S	FSV3044	222992	2022-04-09	2023-04-08	2024-04-07
<input checked="" type="checkbox"/>	Receiver Antenna (9kHz-30MHz)	Schwarzbeck	FMZB 1513	155456	2018-06-15	2021-06-03	2024-06-02
<input checked="" type="checkbox"/>	Receiver Antenna (30MHz-1GHz)	Schwarzbeck	VULB 9163	126704	2019-01-19	2022-01-18	2025-01-17
<input checked="" type="checkbox"/>	Receiver Antenna (1GHz-18GHz)	R&S	HF907	126705	2019-02-29	2022-02-28	2025-02-27
<input checked="" type="checkbox"/>	Receiver Antenna (18GHz-26.5GHz)	Schwarzbeck	BBHA9170	126706	2019-02-29	2022-02-28	2025-02-27
<input checked="" type="checkbox"/>	Pre-amplification (To 18GHz)	Tonscnd	TAP01018050	224539	/	2022-10-20	2023-10-19
<input checked="" type="checkbox"/>	Pre-amplification (To 18GHz)	R&S	SCU-18D	134667	2021-12-04	2022-12-03	2023-12-02
<input checked="" type="checkbox"/>	Pre-amplification (To 26.5GHz)	R&S	SCU-26D	135391	2021-12-04	2022-12-03	2023-12-02
<input checked="" type="checkbox"/>	Band Reject Filter	Wainwright	WRCGV12-2375-2400-2485-2510-40SS	1	2022-05-08	2023-05-07	2024-05-06
<input checked="" type="checkbox"/>	High Pass Filter	COM-MW	ZBF13-3-18G-01	2	2022-05-08	2023-05-07	2024-05-06
Software							
Used	Description		Manufacturer	Name	Version		
<input checked="" type="checkbox"/>	Test Software for Radiated disturbance		Tonscnd	TS+	Ver. 2.5		
<input checked="" type="checkbox"/>	Test Software for Radiated disturbance		Chinese-EMC	RE RSE	Ver. 3.03		
Other instruments							
Used	Equipment	Manufacturer	Model No.	Serial No.	Upper Last Cal.	Last Cal.	Next Cal.
<input checked="" type="checkbox"/>	Spectrum Analyzer	Keysight	N9010B	155368	2022-04-09	2023-04-08	2024-04-07
<input checked="" type="checkbox"/>	Power Meter	MWT	MW100-RFCB	221694	2022-05-23	2023-04-08	2024-04-07
<input checked="" type="checkbox"/>	Attenuator	PASTERNAK	PE7087-6	1624	2022-05-23	2023-05-22	2024-05-21

## 6. ANTENNA PORT TEST RESULTS

### 6.1. ON TIME AND DUTY CYCLE

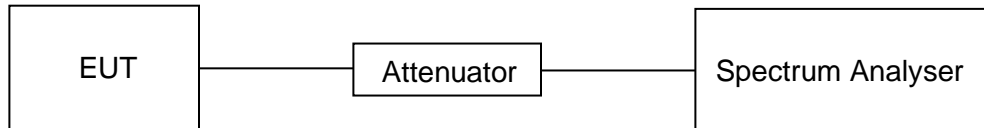
#### LIMITS

None; for reporting purposes only

#### PROCEDURE

Refer to ANSI C63.10-2013 Zero – Span Spectrum Analyzer method.

#### TEST SETUP



#### TEST ENVIRONMENT

Temperature	22°C	Relative Humidity	56%
Atmosphere Pressure	101kPa	Test Voltage	DC 13.2V

#### TEST RESULTS TABLE

Mode	On Time (msec)	Period (msec)	Duty Cycle x (Linear)	Duty Cycle (%)	Duty Cycle Correction Factor (dB)	1/T Minimum VBW (kHz)	Final VBW (kHz)
DH5	2.91	6.25	0.4656	46.56	3.32	0.34	1
2DH5	2.92	6.25	0.4672	46.72	3.30	0.34	1
3DH5	2.92	6.25	0.4672	46.72	3.30	0.34	1

Note: 1) Duty Cycle Correction Factor=10log(1/x).

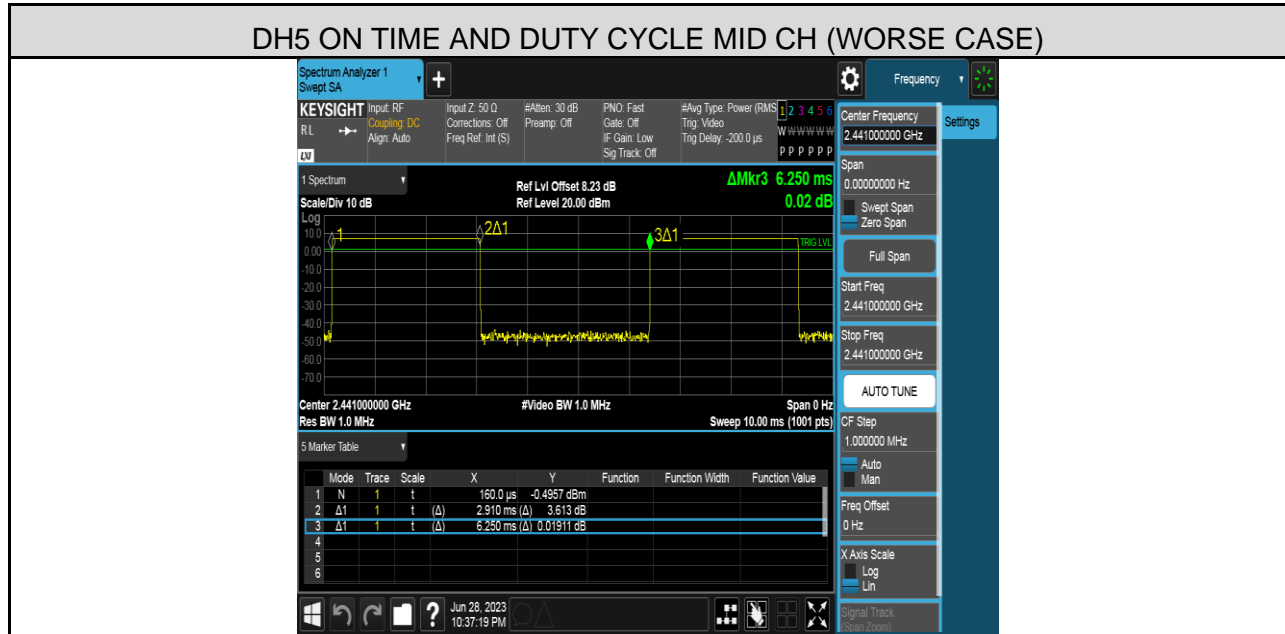
2) Where: x is Duty Cycle (Linear)

3) Where: T is On Time (transmit duration)

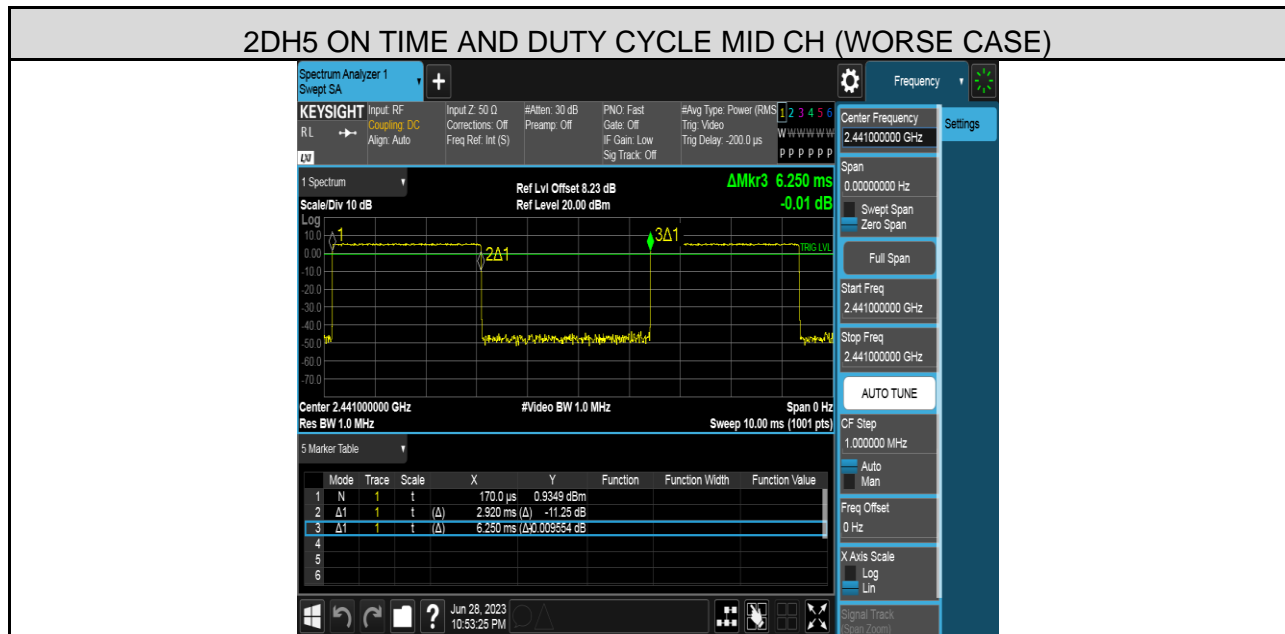
4) Antenna 1 and Antenna 2 have the same duty cycle and the three modes in the table were the worst case, so the data of the three modes of Antenna 1 was shown in this report.

**TEST GRAPHS**

**DH5 ON TIME AND DUTY CYCLE MID CH (WORSE CASE)**

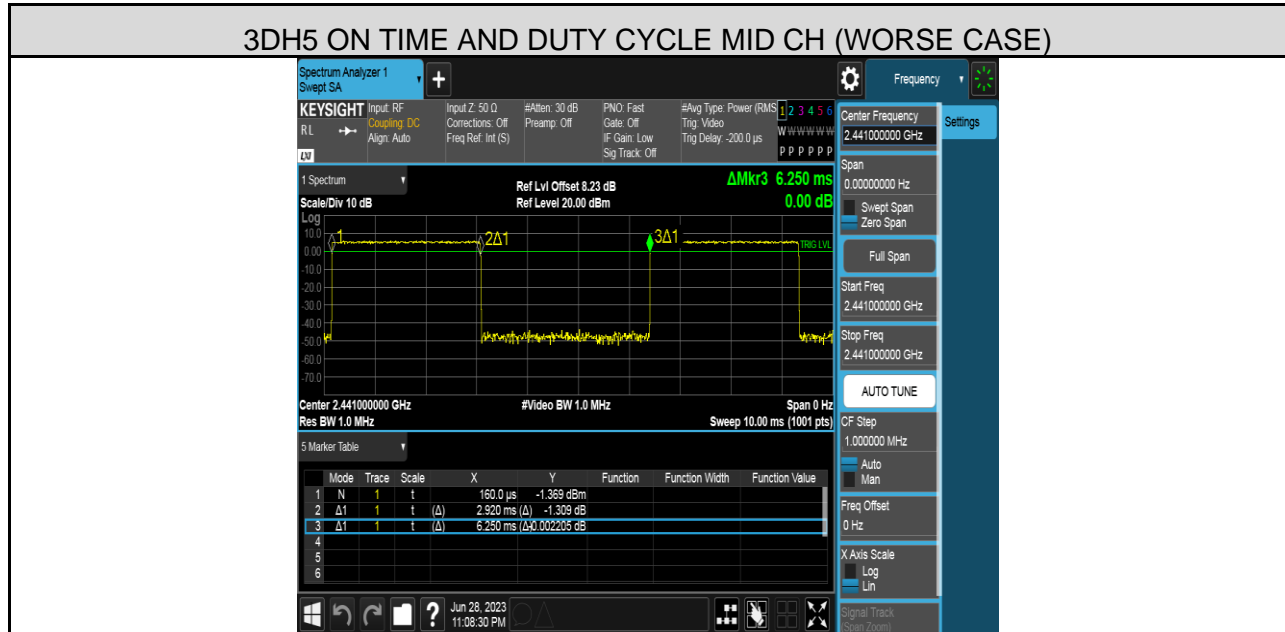


**2DH5 ON TIME AND DUTY CYCLE MID CH (WORSE CASE)**





### 3DH5 ON TIME AND DUTY CYCLE MID CH (WORSE CASE)



## 6.2. 20 dB BANDWIDTH AND 99 % OCCUPIED BANDWIDTH

### LIMITS

FCC Part15 (15.247) Subpart C, ISED RSS-Gen			
Section	Test Item	Limit	Frequency Range (MHz)
CFR 47 FCC 15.247 (a) (1) RSS-247 Clause 5.1 (a)	20 dB Bandwidth	None; for reporting purposes only.	2400-2483.5
ISED RSS-Gen Clause 6.7	99 % Occupied Bandwidth	None; for reporting purposes only.	2400-2483.5

### TEST PROCEDURE

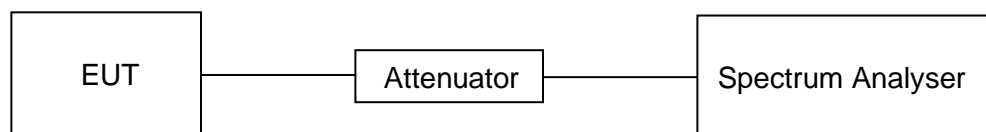
Refer to ANSI C63.10-2013 clause 6.9.2.

Connect the EUT to the spectrum analyser and use the following settings:

Center Frequency	The centre frequency of the channel under test
Detector	Peak
RBW	For 20 dB Bandwidth: 1 % to 5 % of the 20 dB bandwidth For 99 % Occupied Bandwidth: 1 % to 5 % of the occupied bandwidth
VBW	For 20 dB Bandwidth: approximately 3×RBW For 99 % Occupied Bandwidth: ≥ 3×RBW
Span	Approximately 2 to 5 times the OBW
Trace	Max hold
Sweep	Auto couple

Use the occupied bandwidth function of the instrument, allow the trace to stabilize and report the measured 99 % occupied bandwidth and 20 dB Bandwidth.

### TEST SETUP



**TEST ENVIRONMENT**

Temperature	22°C	Relative Humidity	56%
Atmosphere Pressure	101kPa	Test Voltage	DC 13.2V

**TEST RESULTS TABLE**

**Module 1:**

Test Mode	Test Channel (MHz)	20dB bandwidth (MHz)	99% bandwidth (MHz)	Result
DH5	2402	0.9402	0.86700	Pass
	2441	0.9390	0.85930	Pass
	2480	0.9404	0.86834	Pass
2DH5	2402	1.2417	1.1687	Pass
	2441	1.2632	1.1694	Pass
	2480	1.2650	1.1669	Pass
3DH5	2402	1.2735	1.1731	Pass
	2441	1.2802	1.1734	Pass
	2480	1.2727	1.1766	Pass

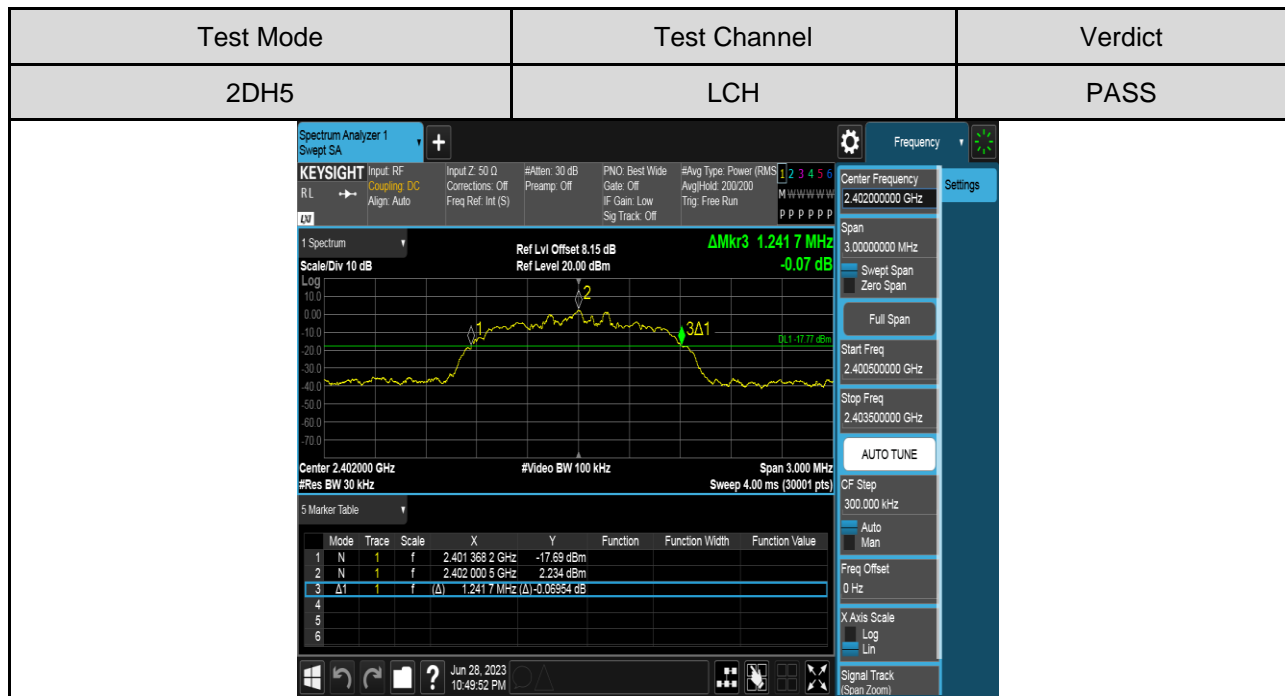
**Module 2:**

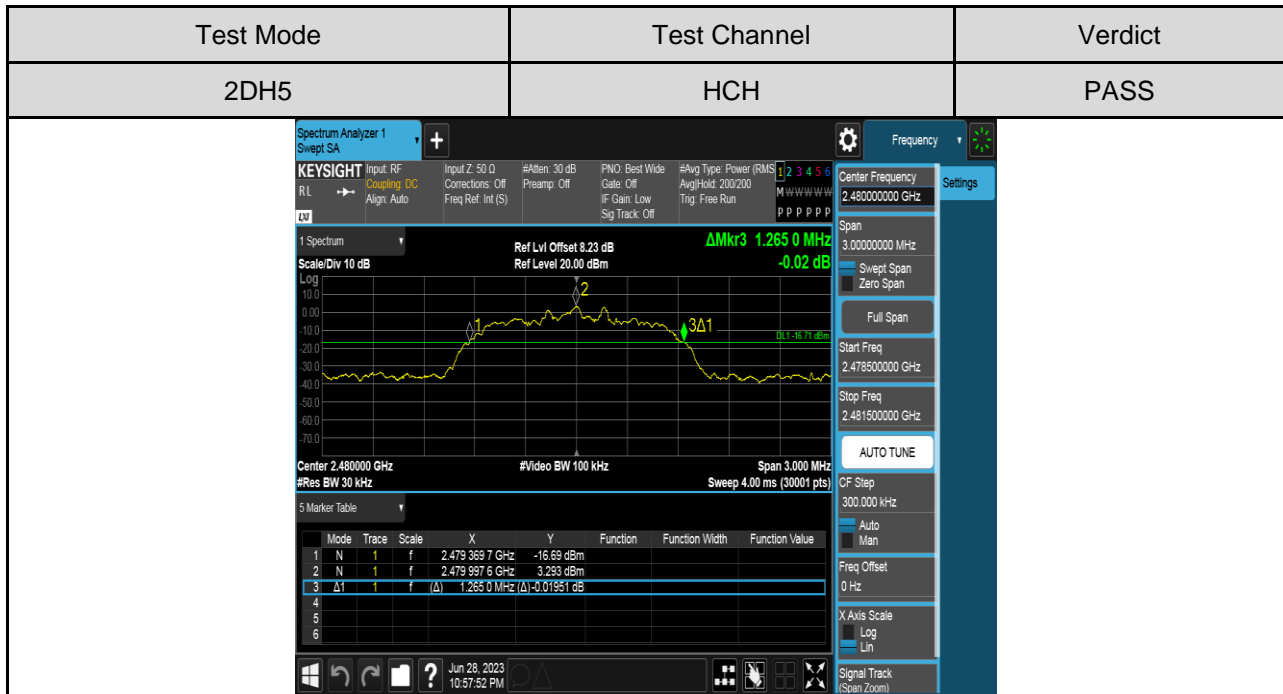
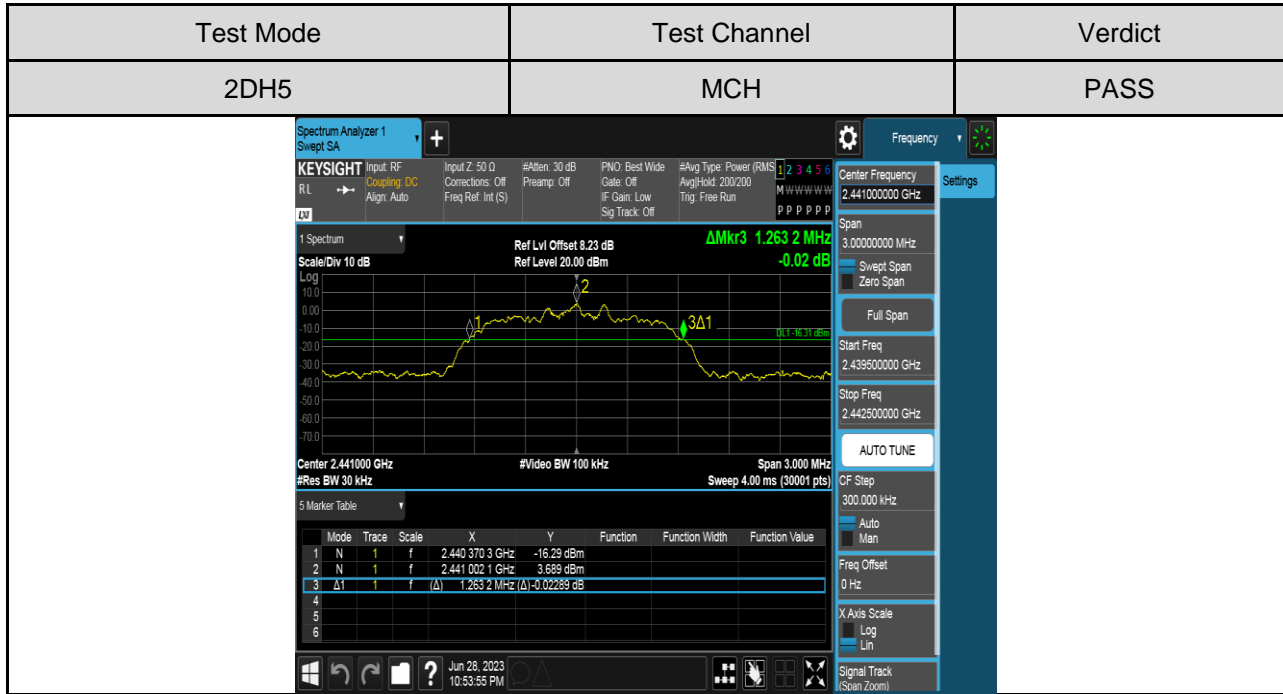
Test Mode	Test Channel (MHz)	20dB bandwidth (MHz)	99% bandwidth (MHz)	Result
DH5	2402	0.9402	0.86311	Pass
	2441	0.9394	0.86636	Pass
	2480	0.9380	0.85574	Pass
2DH5	2402	1.2694	1.1647	Pass
	2441	1.2564	1.1643	Pass
	2480	1.2595	1.1637	Pass
3DH5	2402	1.2737	1.1712	Pass
	2441	1.2671	1.1703	Pass
	2480	1.2741	1.1703	Pass

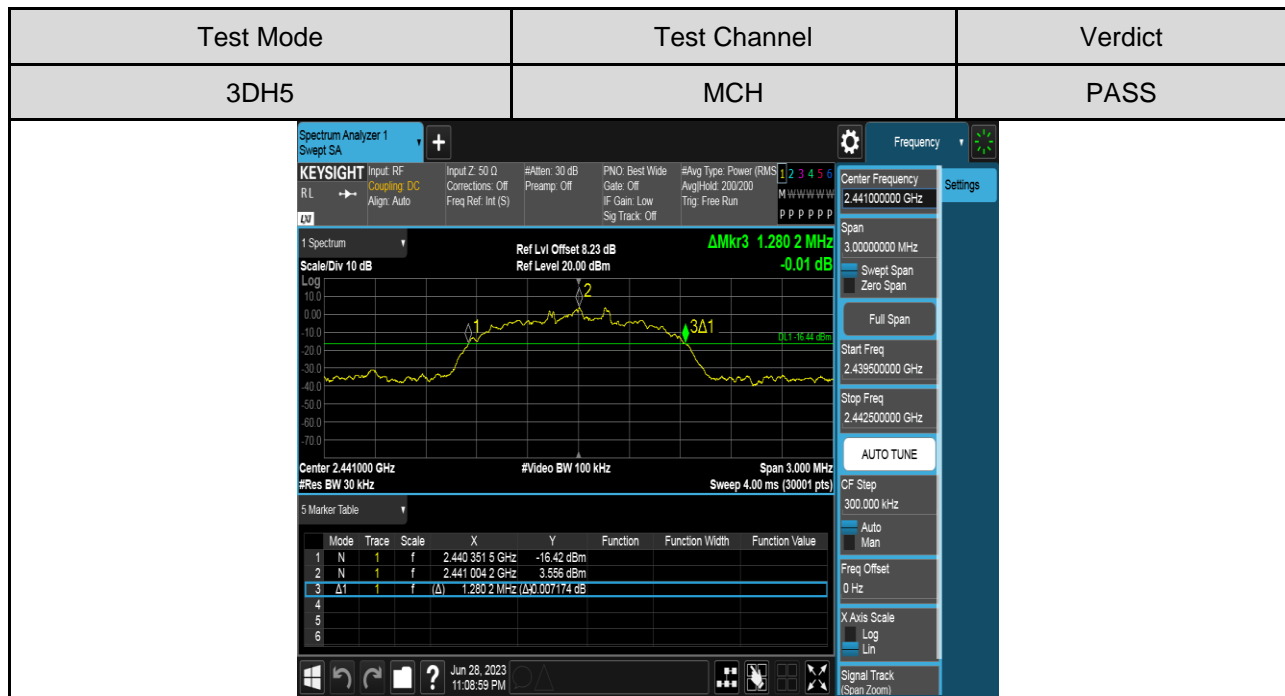
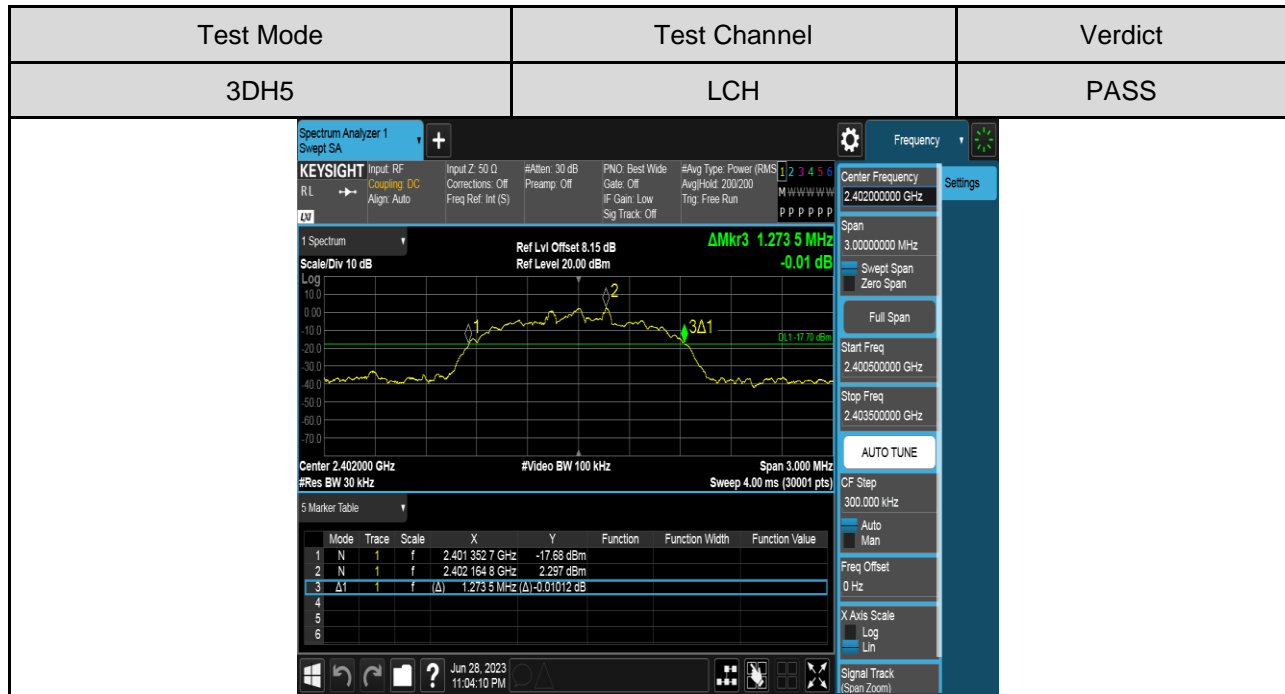
**TEST GRAPHS**  
**For 20dB Bandwidth**  
**Module 1:**

Test Mode	Test Channel	Verdict
DH5	LCH	PASS

Test Mode	Test Channel	Verdict
DH5	MCH	PASS



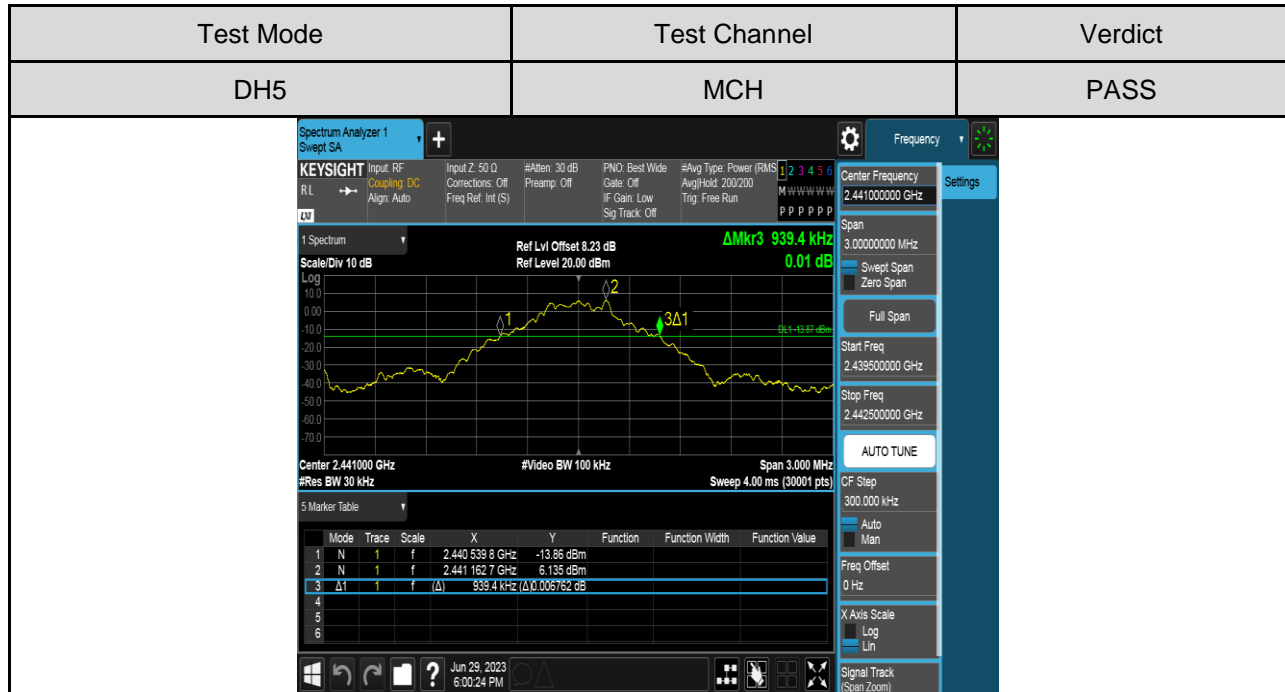
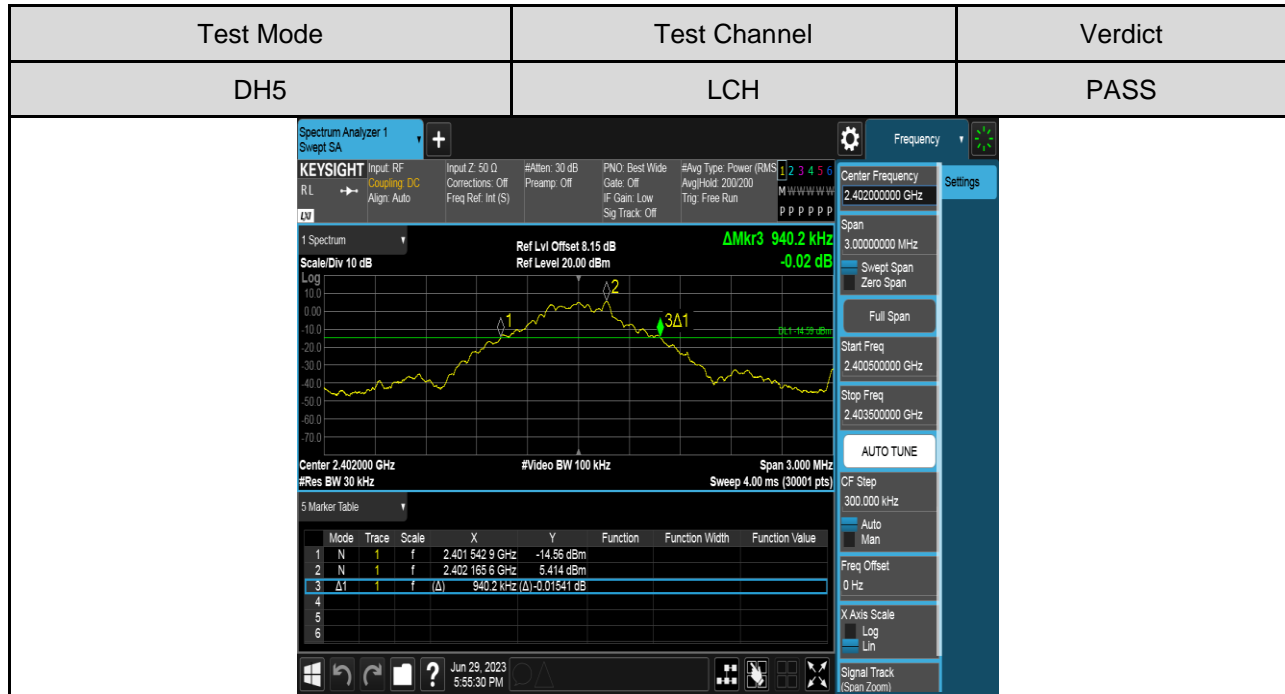


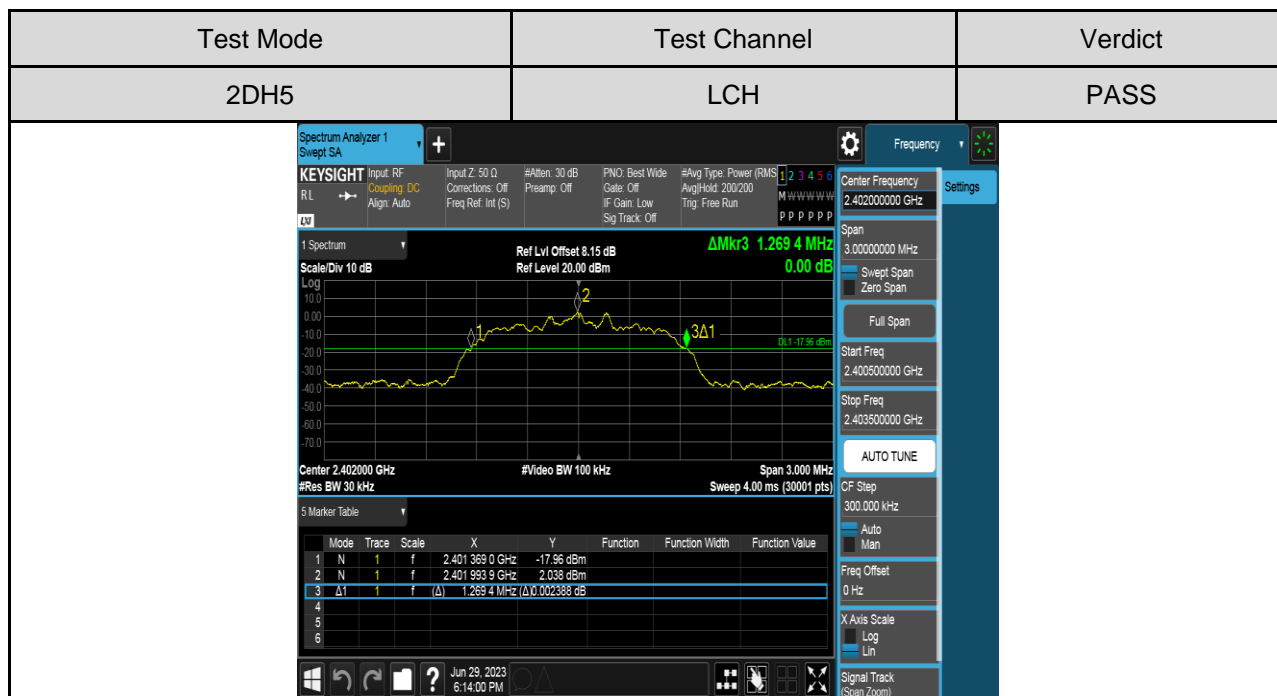
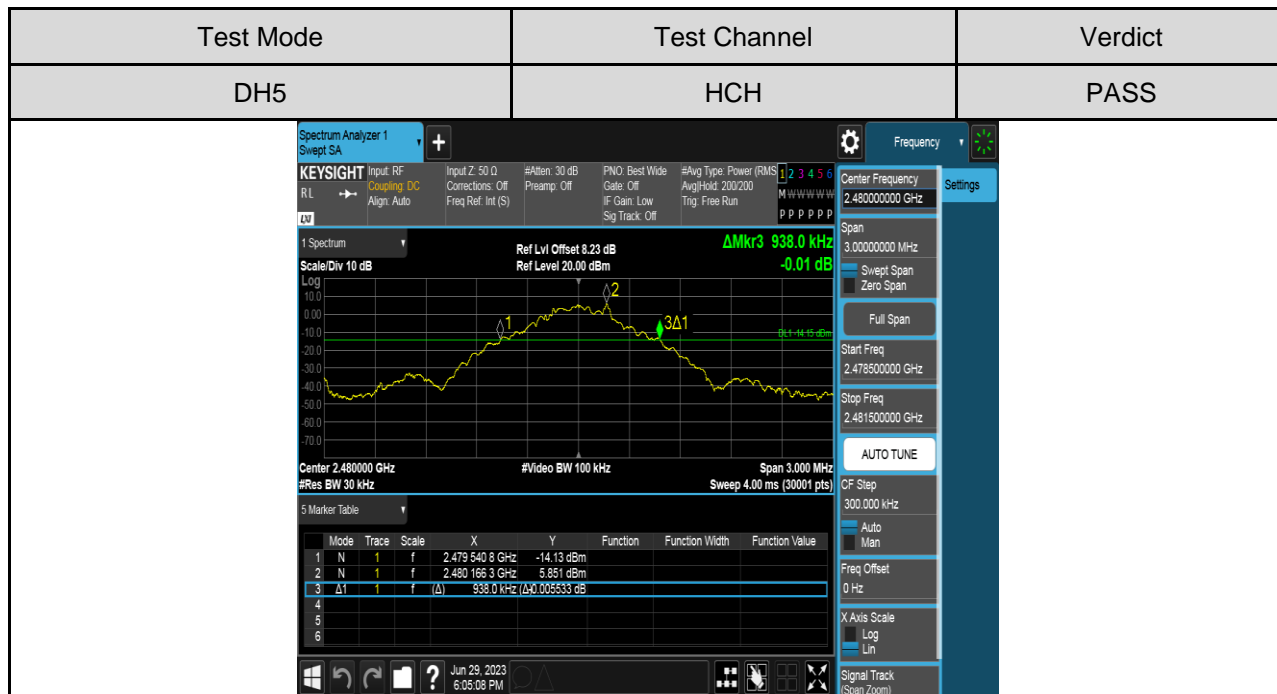


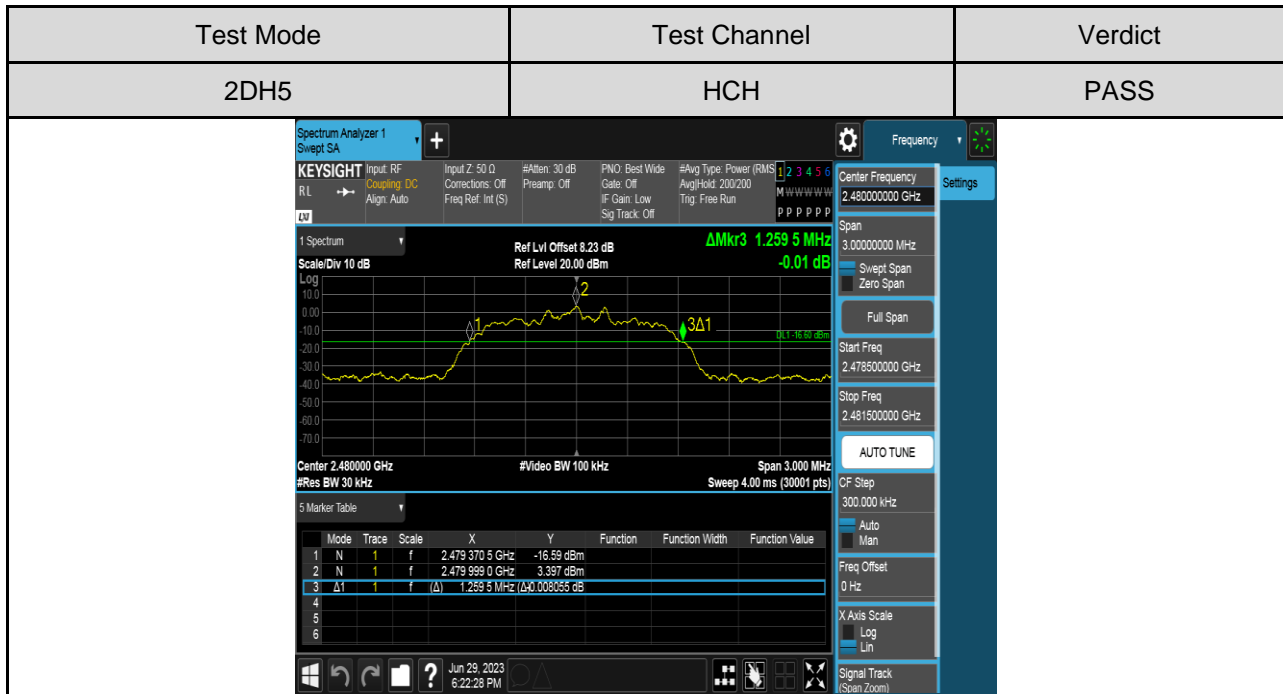
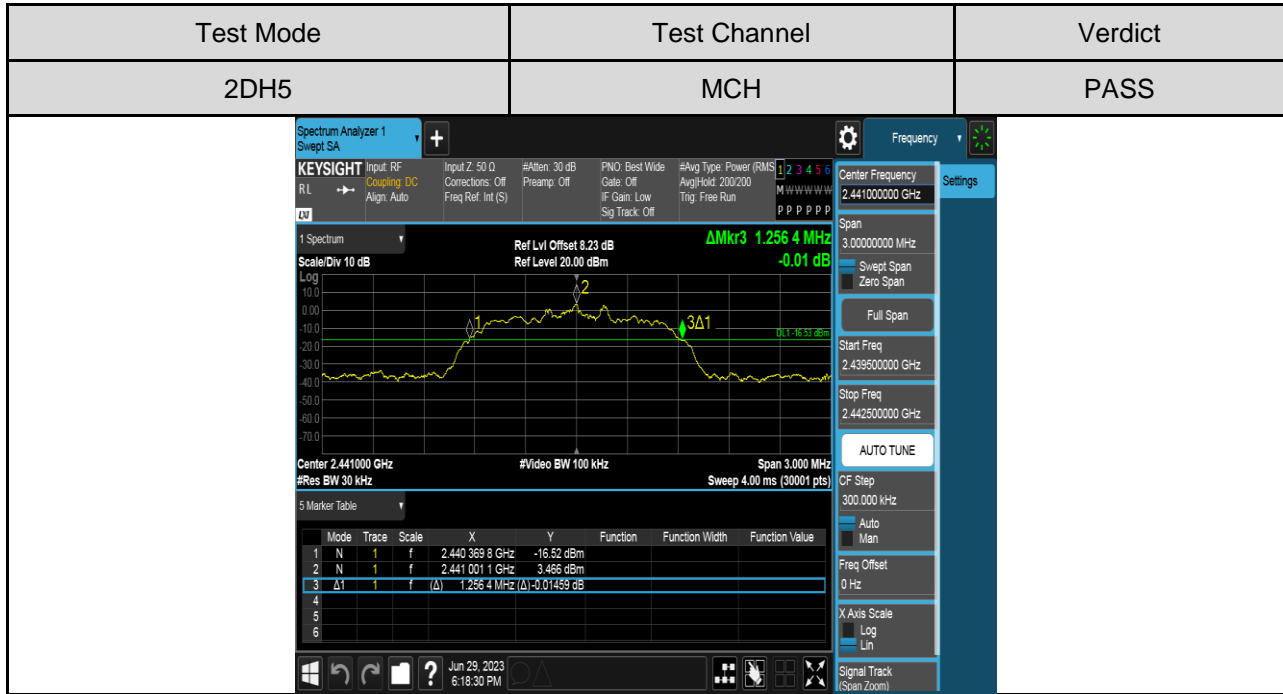
Test Mode	Test Channel	Verdict																																																								
3DH5	HCH	PASS																																																								
<p>The screenshot displays the Keysight Spectrum Analyzer interface. The main plot shows a spectrum with a peak at 2.4801619 GHz. A marker is placed at 2.4801619 GHz with a frequency difference of 1.2727 MHz. The plot shows a signal with a peak at approximately -16.58 dBm. The center frequency is 2.480000 GHz and the span is 3.000 MHz. The resolution bandwidth is 30 kHz and the video bandwidth is 100 kHz. The sweep rate is 4.00 ms (30001 pts).</p> <table border="1" data-bbox="462 724 998 871"> <thead> <tr> <th>Mode</th> <th>Trace</th> <th>Scale</th> <th>X</th> <th>Y</th> <th>Function</th> <th>Function Width</th> <th>Function Value</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>N</td> <td>1</td> <td>f</td> <td>2.4793529 GHz</td> <td>-16.58 dBm</td> <td></td> <td></td> </tr> <tr> <td>2</td> <td>N</td> <td>1</td> <td>f</td> <td>2.4801619 GHz</td> <td>3.414 dBm</td> <td></td> <td></td> </tr> <tr> <td>3</td> <td>Δ1</td> <td>1</td> <td>f (Δ)</td> <td>1.2727 MHz</td> <td>Δ1.0007324 dB</td> <td></td> <td></td> </tr> <tr> <td>4</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>5</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>6</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> </tbody> </table>			Mode	Trace	Scale	X	Y	Function	Function Width	Function Value	1	N	1	f	2.4793529 GHz	-16.58 dBm			2	N	1	f	2.4801619 GHz	3.414 dBm			3	Δ1	1	f (Δ)	1.2727 MHz	Δ1.0007324 dB			4								5								6							
Mode	Trace	Scale	X	Y	Function	Function Width	Function Value																																																			
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4																																																										
5																																																										
6																																																										

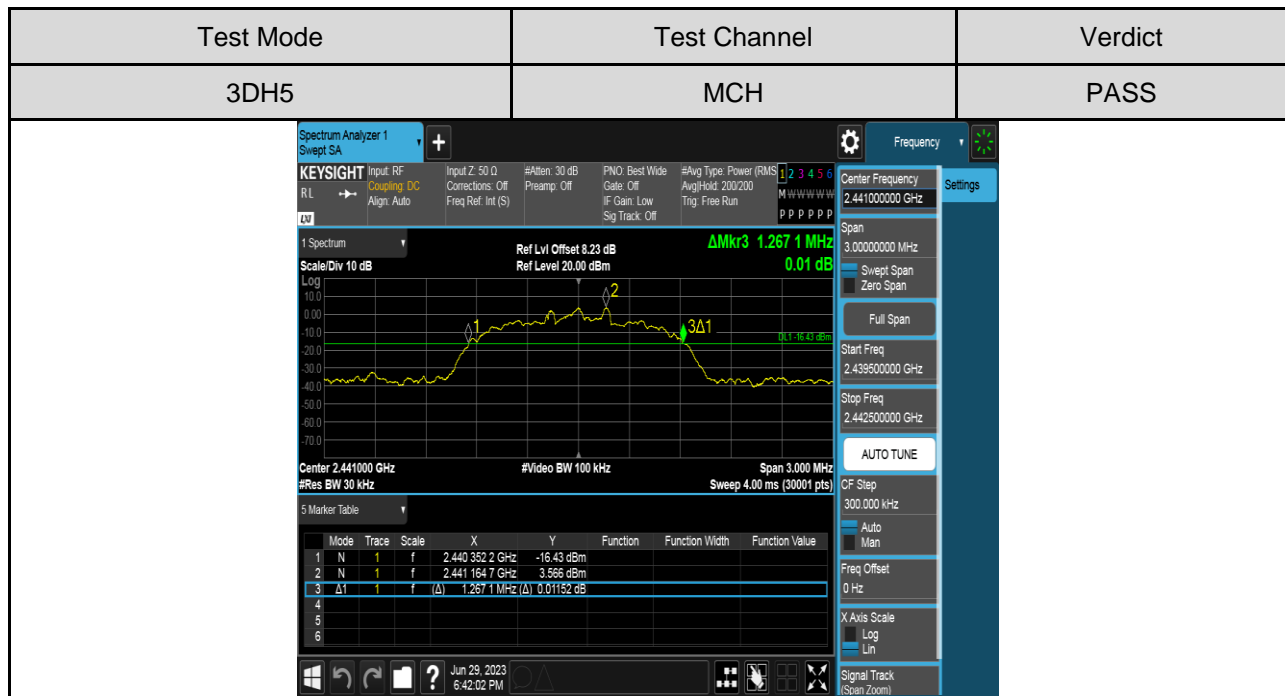
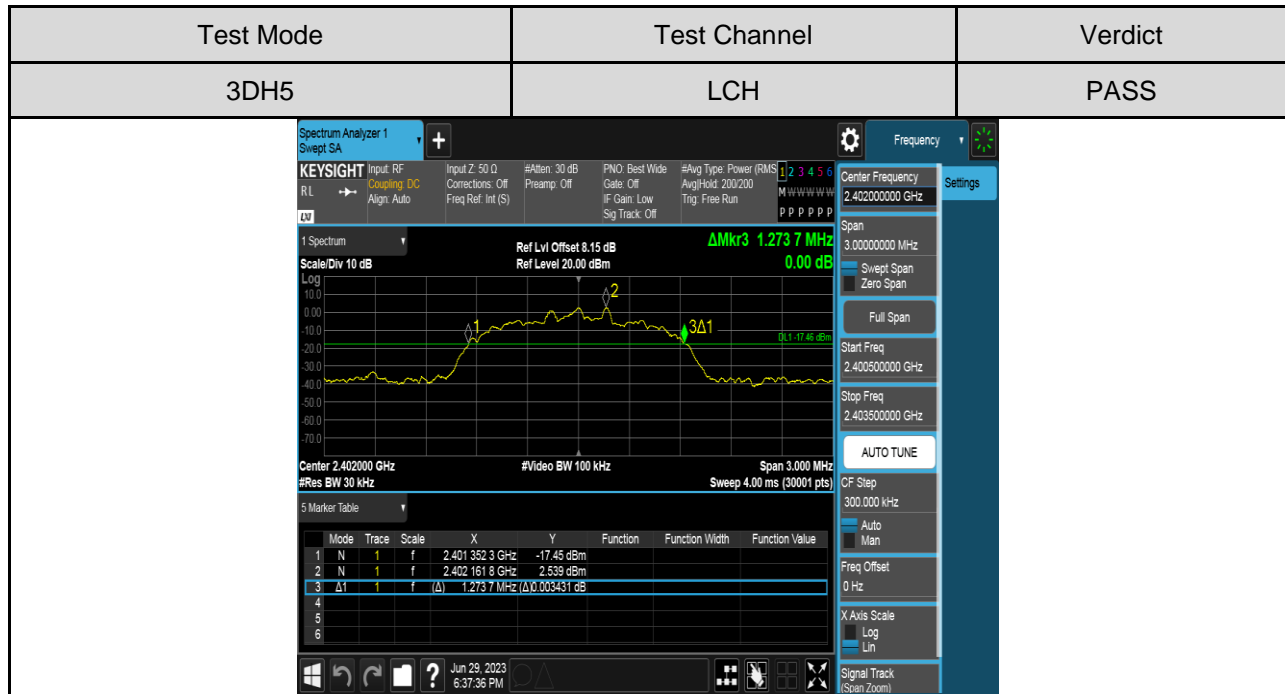


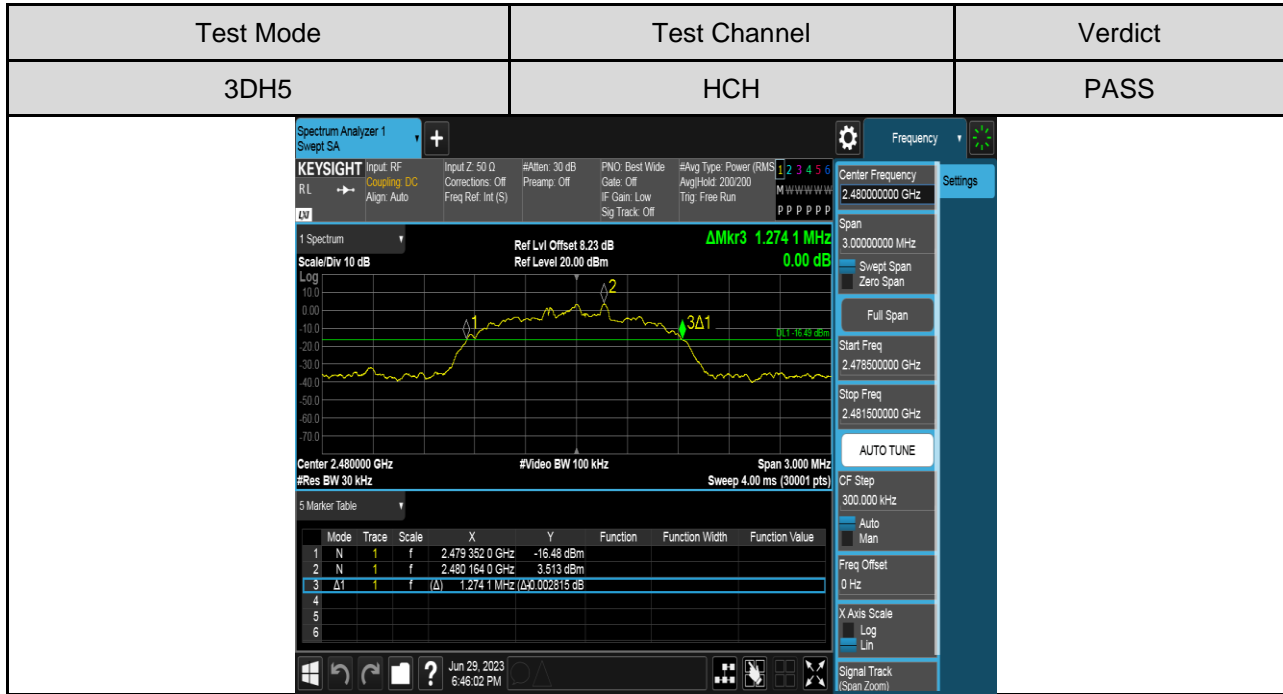
**Module 2:**



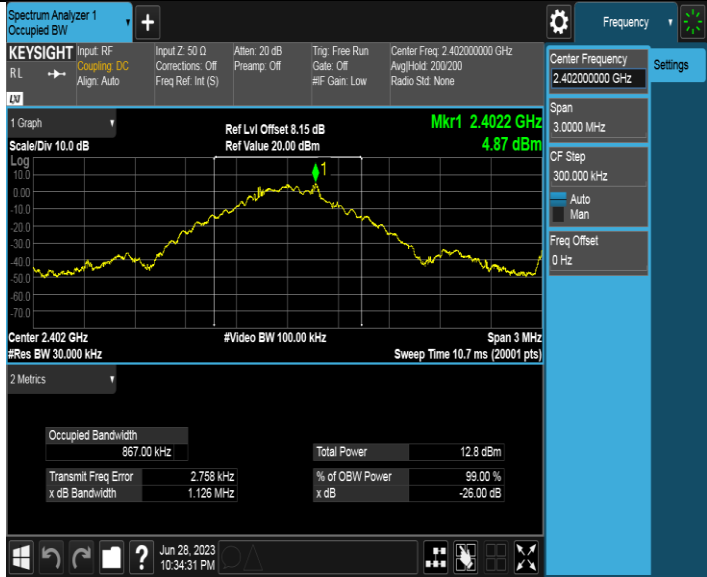







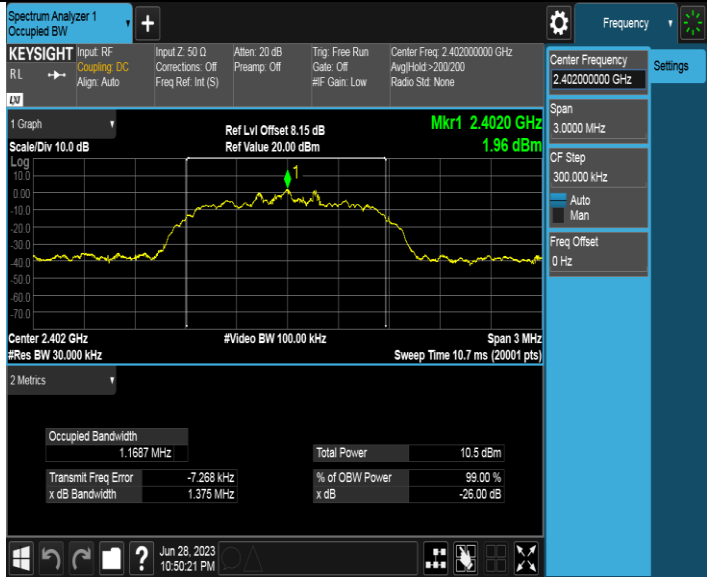


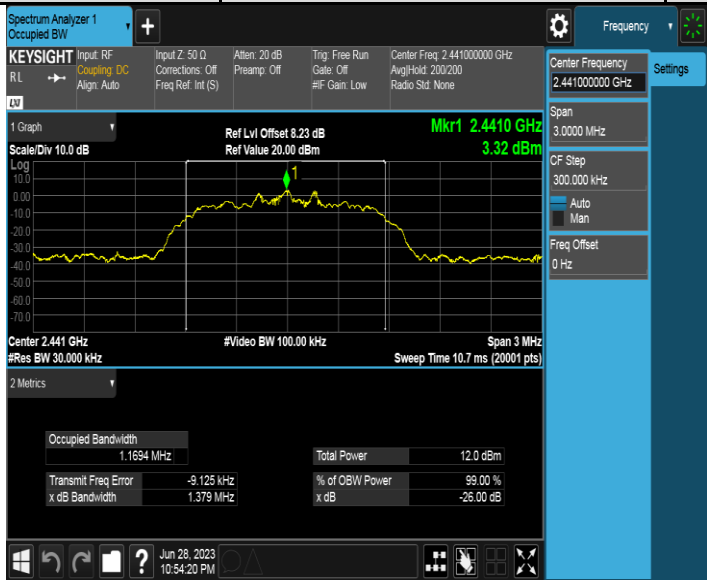
**For 99% Bandwidth**  
**Module 1:**

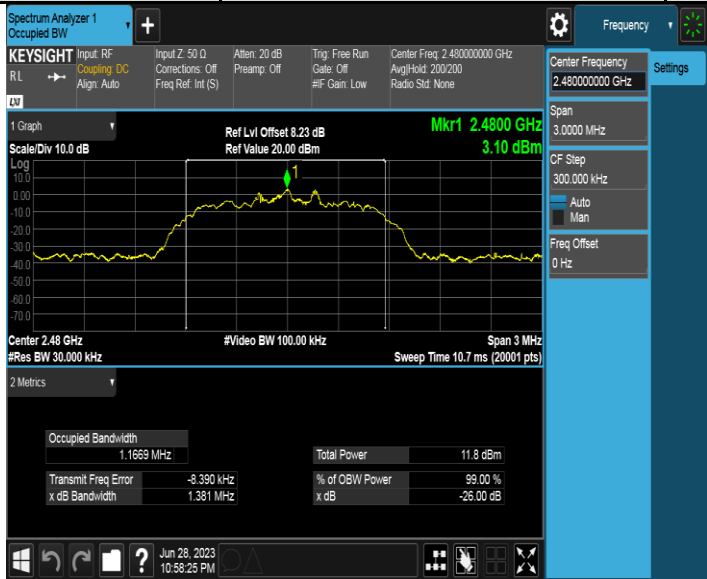
Test Mode	Test Channel	Verdict
DH5	LCH	PASS
		

Test Mode	Test Channel	Verdict
DH5	MCH	PASS
		

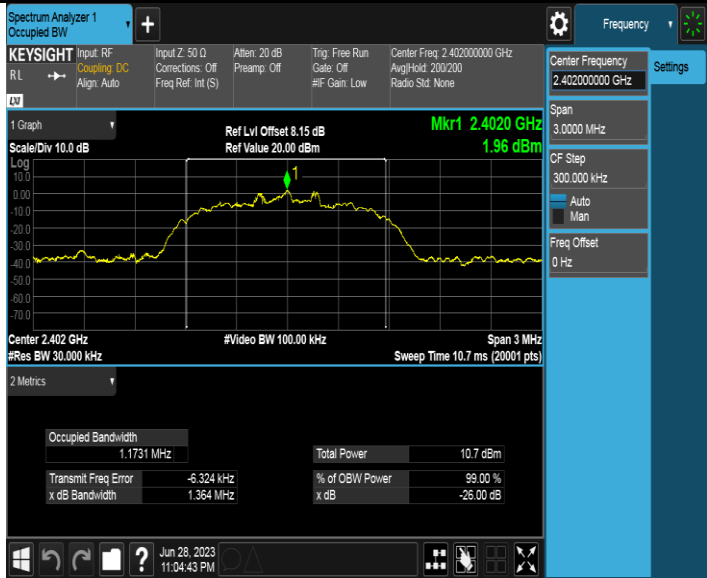
Test Mode	Test Channel	Verdict
DH5	HCH	PASS
		

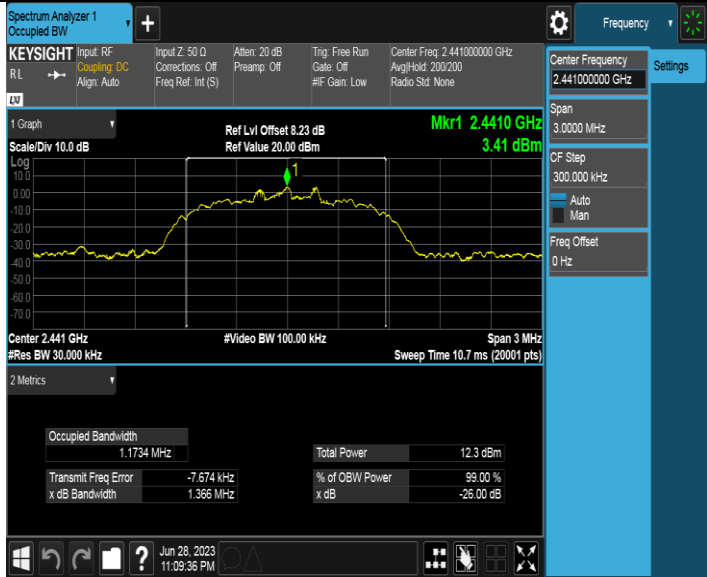
Test Mode	Test Channel	Verdict
2DH5	LCH	PASS
		

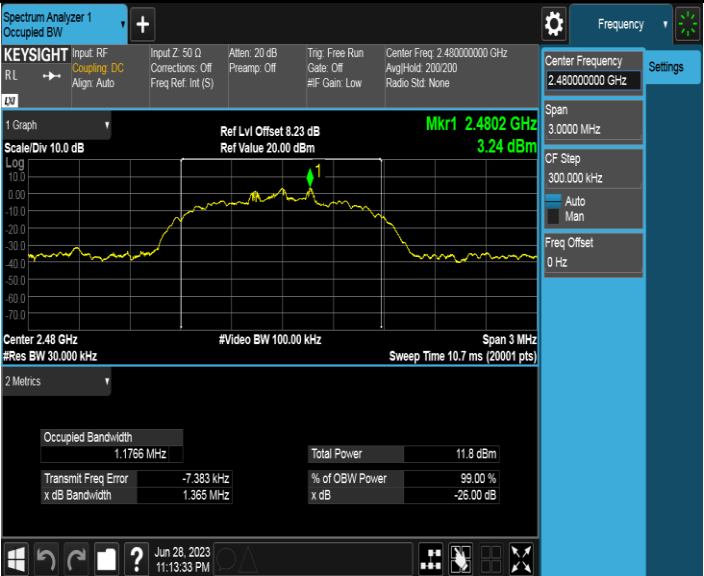
Test Mode	Test Channel	Verdict												
2DH5	MCH	PASS												
 <p>The screenshot displays the Keysight Spectrum Analyzer interface. The main graph shows a signal centered at 2.441 GHz with a power level of 3.32 dBm. The settings panel on the right indicates a center frequency of 2.441000000 GHz and a span of 3.0000 MHz. The metrics table at the bottom provides the following data:</p> <table border="1"> <tr> <td>Occupied Bandwidth</td> <td>1.1694 MHz</td> <td>Total Power</td> <td>12.0 dBm</td> </tr> <tr> <td>Transmit Freq Error</td> <td>-9.125 kHz</td> <td>% of OBW Power</td> <td>99.00 %</td> </tr> <tr> <td>x dB Bandwidth</td> <td>1.379 MHz</td> <td>x dB</td> <td>-26.00 dB</td> </tr> </table>			Occupied Bandwidth	1.1694 MHz	Total Power	12.0 dBm	Transmit Freq Error	-9.125 kHz	% of OBW Power	99.00 %	x dB Bandwidth	1.379 MHz	x dB	-26.00 dB
Occupied Bandwidth	1.1694 MHz	Total Power	12.0 dBm											
Transmit Freq Error	-9.125 kHz	% of OBW Power	99.00 %											
x dB Bandwidth	1.379 MHz	x dB	-26.00 dB											

Test Mode	Test Channel	Verdict												
2DH5	HCH	PASS												
 <p>The screenshot displays the Keysight Spectrum Analyzer interface. The main graph shows a signal centered at 2.480 GHz with a power level of 3.10 dBm. The settings panel on the right indicates a center frequency of 2.480000000 GHz and a span of 3.0000 MHz. The metrics table at the bottom provides the following data:</p> <table border="1"> <tr> <td>Occupied Bandwidth</td> <td>1.1693 MHz</td> <td>Total Power</td> <td>11.8 dBm</td> </tr> <tr> <td>Transmit Freq Error</td> <td>-8.390 kHz</td> <td>% of OBW Power</td> <td>99.00 %</td> </tr> <tr> <td>x dB Bandwidth</td> <td>1.381 MHz</td> <td>x dB</td> <td>-26.00 dB</td> </tr> </table>			Occupied Bandwidth	1.1693 MHz	Total Power	11.8 dBm	Transmit Freq Error	-8.390 kHz	% of OBW Power	99.00 %	x dB Bandwidth	1.381 MHz	x dB	-26.00 dB
Occupied Bandwidth	1.1693 MHz	Total Power	11.8 dBm											
Transmit Freq Error	-8.390 kHz	% of OBW Power	99.00 %											
x dB Bandwidth	1.381 MHz	x dB	-26.00 dB											

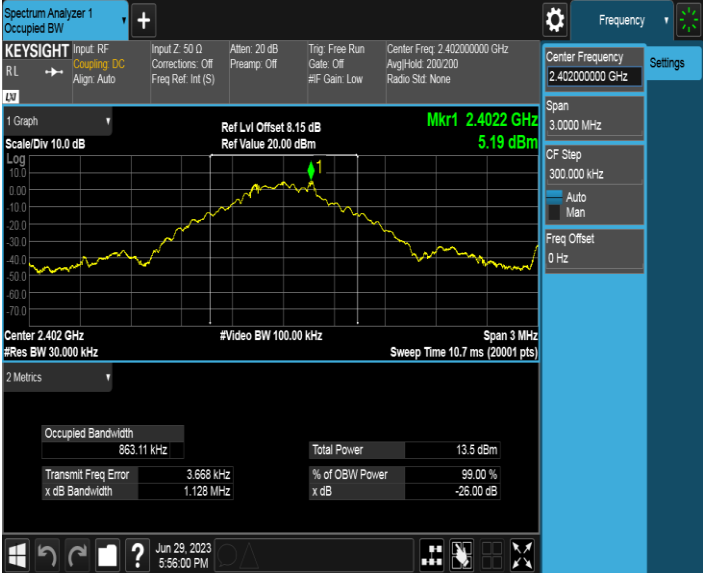


Test Mode	Test Channel	Verdict
3DH5	LCH	PASS
		

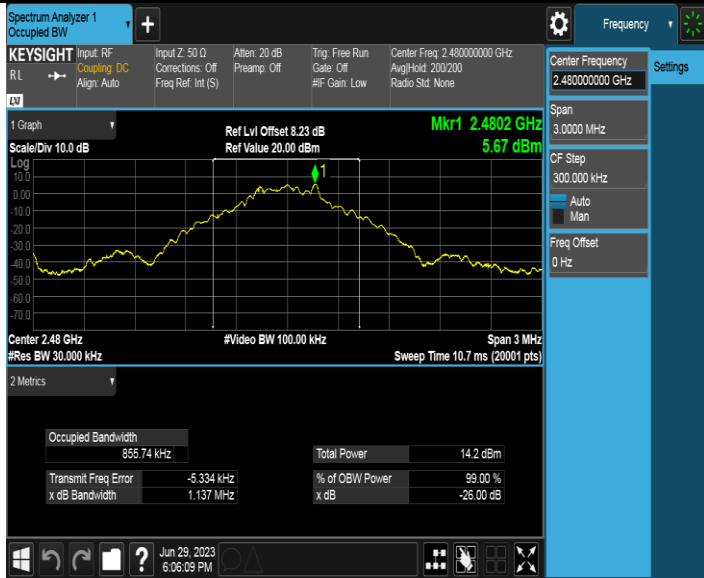
Test Mode	Test Channel	Verdict
3DH5	MCH	PASS
		

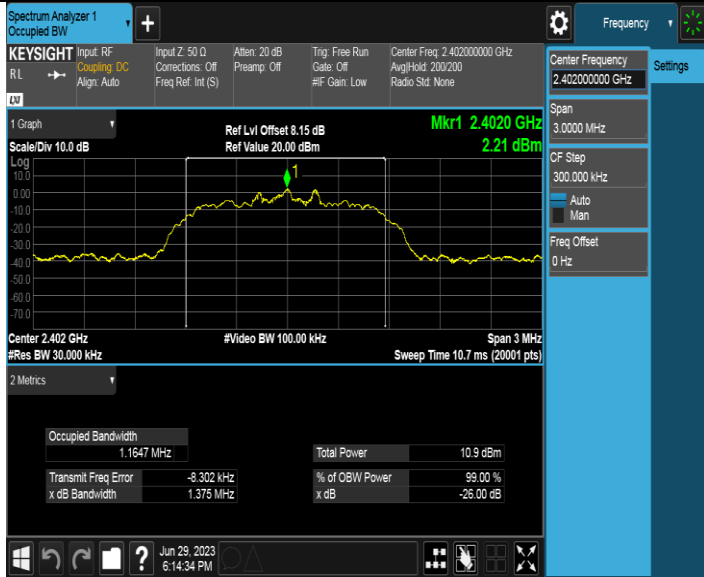
Test Mode	Test Channel	Verdict
3DH5	HCH	PASS
 <p>The screenshot displays the Keysight Spectrum Analyzer 1 interface. The main display shows a spectral plot with a peak at 2.4802 GHz and a power level of 3.24 dBm. The center frequency is set to 2.48000000 GHz with a span of 3.0000 MHz. The occupied bandwidth is 1.1766 MHz, and the total power is 11.8 dBm. The interface also shows various settings such as Input Z (50 Ω), Atten (20 dB), and Res BW (30.000 kHz).</p>		

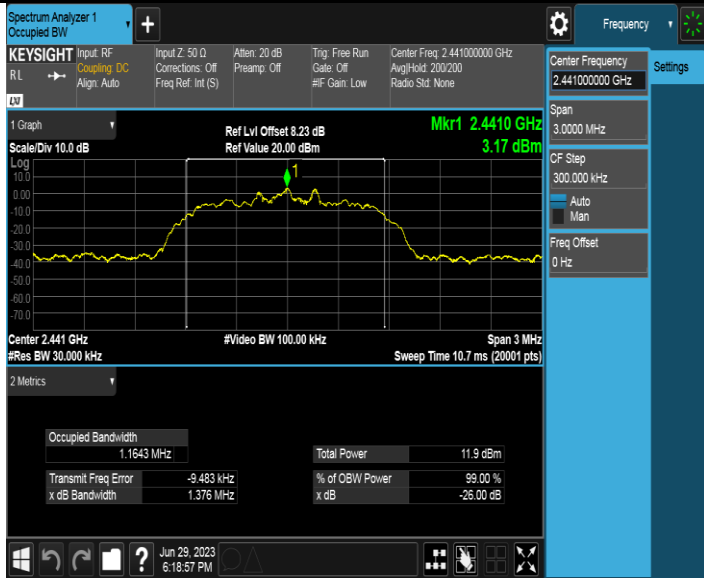
**Module 2:**

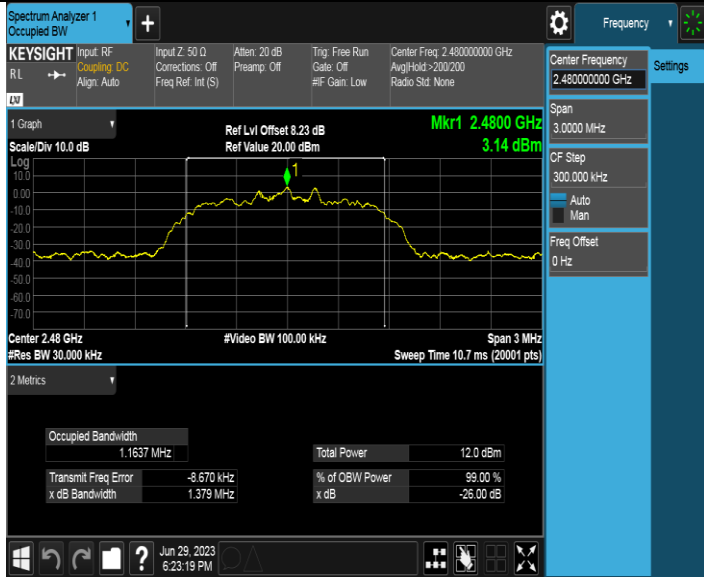
Test Mode	Test Channel	Verdict
DH5	LCH	PASS
		

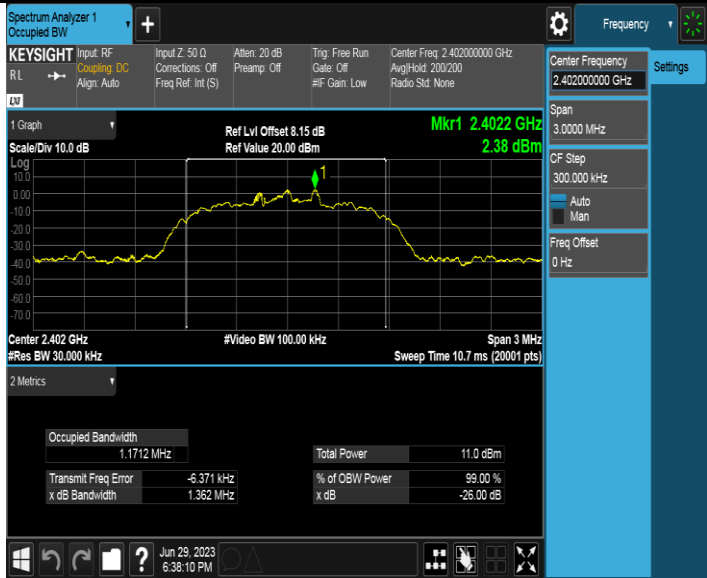
Test Mode	Test Channel	Verdict
DH5	MCH	PASS
		

Test Mode	Test Channel	Verdict
DH5	HCH	PASS
		

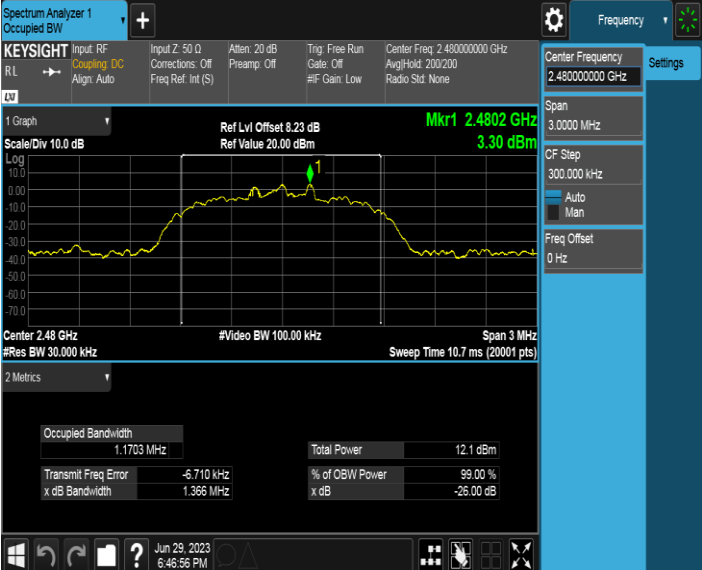
Test Mode	Test Channel	Verdict
2DH5	LCH	PASS
		

Test Mode	Test Channel	Verdict
2DH5	MCH	PASS
		

Test Mode	Test Channel	Verdict
2DH5	HCH	PASS
		

Test Mode	Test Channel	Verdict
3DH5	LCH	PASS
 <p><b>Keysight Spectrum Analyzer 1</b> Center Frequency: 2.40200000 GHz Span: 3.0000 MHz CF Step: 300.000 kHz Mkr1 2.4022 GHz, 2.38 dBm Ref Lvl Offset 8.15 dB, Ref Value 20.00 dBm Occupied Bandwidth: 1.1712 MHz Total Power: 11.0 dBm Transmit Freq Error: -6.371 kHz % of OBW Power: 99.00 % x dB Bandwidth: 1.362 MHz, x dB: -26.00 dB</p>		

Test Mode	Test Channel	Verdict
3DH5	MCH	PASS
 <p><b>Keysight Spectrum Analyzer 1</b> Center Frequency: 2.44100000 GHz Span: 3.0000 MHz CF Step: 300.000 kHz Mkr1 2.4412 GHz, 3.29 dBm Ref Lvl Offset 8.23 dB, Ref Value 20.00 dBm Occupied Bandwidth: 1.1703 MHz Total Power: 12.0 dBm Transmit Freq Error: -7.805 kHz % of OBW Power: 99.00 % x dB Bandwidth: 1.365 MHz, x dB: -26.00 dB</p>		

Test Mode	Test Channel	Verdict														
3DH5	HCH	PASS														
 <p>The screenshot displays the Keysight Spectrum Analyzer 1 interface. The main graph shows a signal at 2.4802 GHz with a power level of 3.30 dBm. The graph is set to a scale of 10.0 dB and a video bandwidth of 100.00 kHz. The center frequency is 2.48 GHz, and the span is 3 MHz. The interface also shows various settings and metrics.</p> <table border="1" data-bbox="500 764 997 848"> <thead> <tr> <th colspan="2">2 Metrics</th> </tr> </thead> <tbody> <tr> <td>Occupied Bandwidth</td> <td>1.1703 MHz</td> </tr> <tr> <td>Total Power</td> <td>12.1 dBm</td> </tr> <tr> <td>Transmit Freq Error</td> <td>-6.710 kHz</td> </tr> <tr> <td>% of OBW Power</td> <td>99.00 %</td> </tr> <tr> <td>x dB Bandwidth</td> <td>1.366 MHz</td> </tr> <tr> <td>x dB</td> <td>-26.00 dB</td> </tr> </tbody> </table>			2 Metrics		Occupied Bandwidth	1.1703 MHz	Total Power	12.1 dBm	Transmit Freq Error	-6.710 kHz	% of OBW Power	99.00 %	x dB Bandwidth	1.366 MHz	x dB	-26.00 dB
2 Metrics																
Occupied Bandwidth	1.1703 MHz															
Total Power	12.1 dBm															
Transmit Freq Error	-6.710 kHz															
% of OBW Power	99.00 %															
x dB Bandwidth	1.366 MHz															
x dB	-26.00 dB															

### 6.3. CONDUCTED OUTPUT POWER

#### LIMITS

FCC Part15 (15.247) Subpart C, ISED RSS-Gen			
Section	Test Item	Limit	Frequency Range (MHz)
CFR 47 FCC 15.247 (b) (1) ISED RSS-247 Clause 5.4 (b)	Output Power	Hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel: 1 watt or 30 dBm; Hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20dB bandwidth of the hopping channel: 125 mW or 21 dBm	2400-2483.5

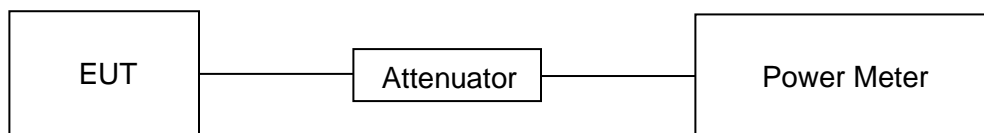
#### TEST PROCEDURE

Place the EUT on the table and set it in the transmitting mode.  
Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the Power sensor.  
Measure the power of each channel.  
PK Detector used for PK result.  
Average Detector used for Average result.

#### TEST ENVIRONMENT

Temperature	22°C	Relative Humidity	56%
Atmosphere Pressure	101kPa	Test Voltage	DC 13.2V

#### TEST SETUP





**TEST RESULTS TABLE**

Test Mode	Test Channel	Module	Maximum Conducted Output Power (PK)	LIMIT
			dBm	dBm
DH5	LCH	1	6.13	30
		2	6.55	30
		1+2	9.36	30
	MCH	1	7.29	30
		2	7.34	30
		1+2	10.33	30
	HCH	1	6.87	30
		2	7.04	30
		1+2	9.97	30
2DH5	LCH	1	4.55	30
		2	4.92	30
		1+2	7.75	30
	MCH	1	5.99	30
		2	5.84	30
		1+2	8.93	30
	HCH	1	5.55	30
		2	5.67	30
		1+2	8.62	30
3DH5	LCH	1	4.92	30
		2	5.19	30
		1+2	8.07	30
	MCH	1	6.24	30
		2	6.14	30
		1+2	9.20	30
	HCH	1	5.87	30
		2	6.01	30
		1+2	8.95	30

## 6.4. CARRIER FREQUENCY SEPARATION

### LIMITS

CFR 47 FCC Part15 (15.247), Subpart C ISSED RSS-247 ISSUE 2			
Section	Test Item	Limit	Frequency Range (MHz)
CFR 47 FCC 15.247 (a) (1) ISSED RSS-247 Clause 5.1 (b)	Carrier Frequency Separation	Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. Alternatively, 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.	2400-2483.5

### TEST PROCEDURE

Refer to ANSI C63.10-2013 clause 7.8.2.

Connect the EUT to the spectrum analyzer and use the following settings:

Center Frequency	The center frequency of the channel under test
Span	wide enough to capture the peaks of two adjacent channels
Detector	Peak
RBW	Start with the RBW set to approximately 30 % of the channel spacing; adjust as necessary to best identify the center of each individual channel.
VBW	≥RBW
Trace	Max hold
Sweep time	Auto couple

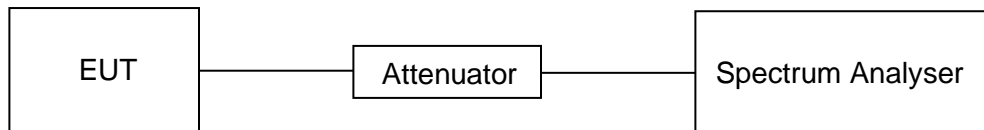
Allow the trace to stabilize and use the marker-delta function to determine the separation between the peaks of the adjacent channels.

Compliance of an EUT with the appropriate regulatory limit shall be determined.

**TEST ENVIRONMENT**

Temperature	22°C	Relative Humidity	56%
Atmosphere Pressure	101kPa	Test Voltage	DC 13.2V

**TEST SETUP**



**TEST RESULTS TABLE**

**Module 1:**

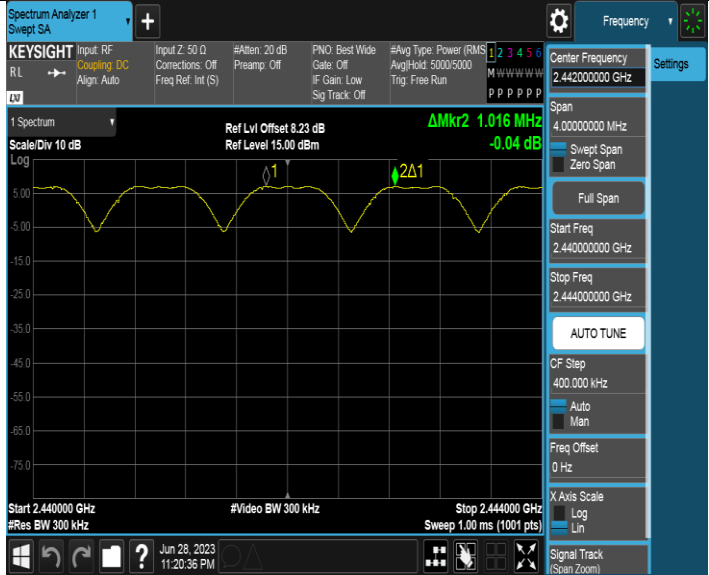
Test Mode	Test Channel	Result (MHz)	Result
DH5	Hop	1.016	Pass
2DH5	Hop	1.176	Pass
3DH5	Hop	1.084	Pass


**Module 2:**

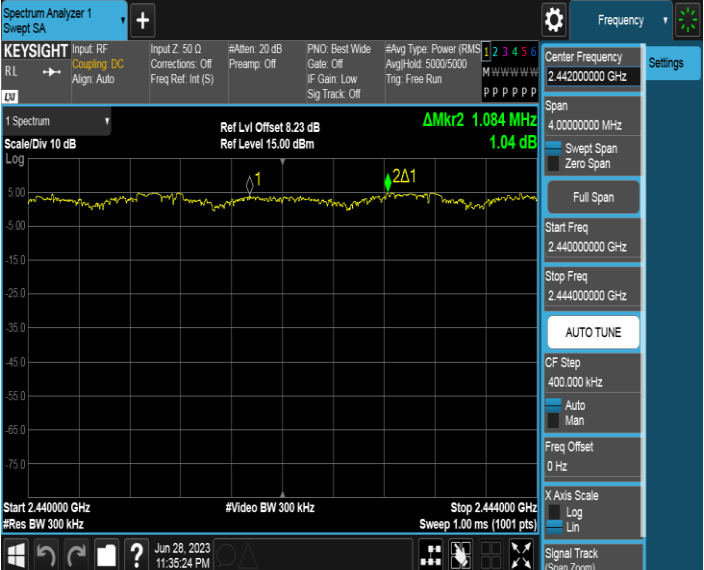
Test Mode	Test Channel	Result (MHz)	Result
DH5	Hop	1.008	Pass
2DH5	Hop	1.356	Pass
3DH5	Hop	1.128	Pass

**TEST GRAPHS**

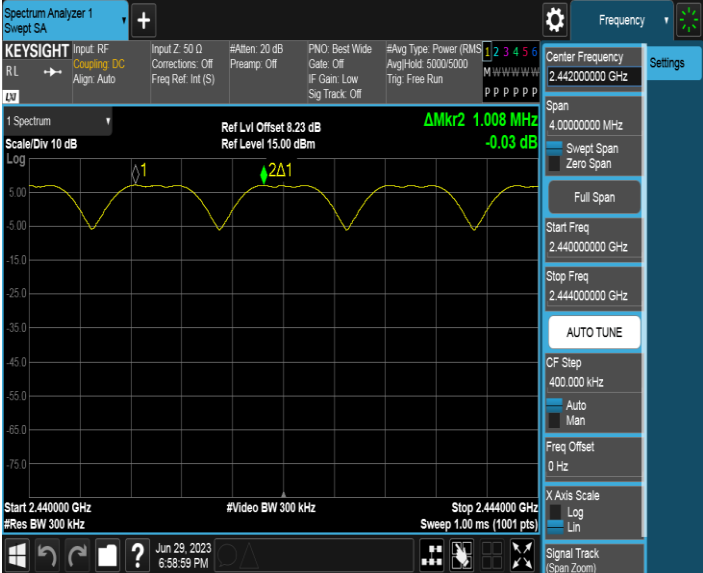
**Module 1:**

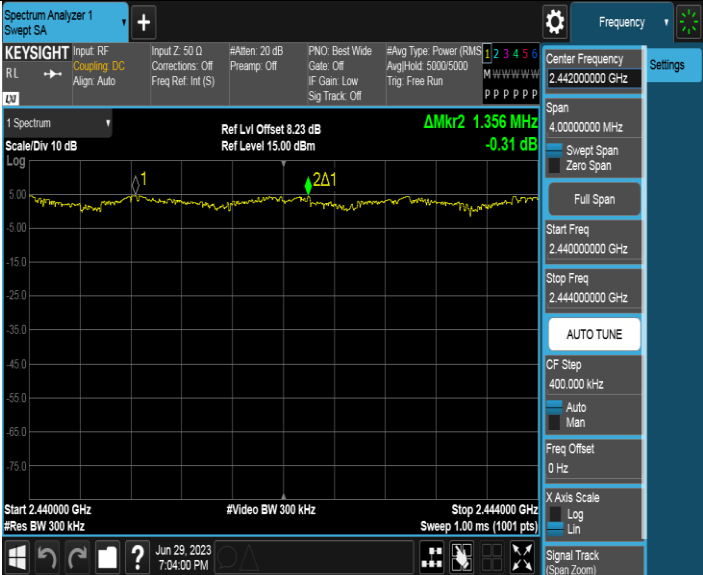
Test Mode	Test Channel	Verdict
DH5	Hop	PASS
		

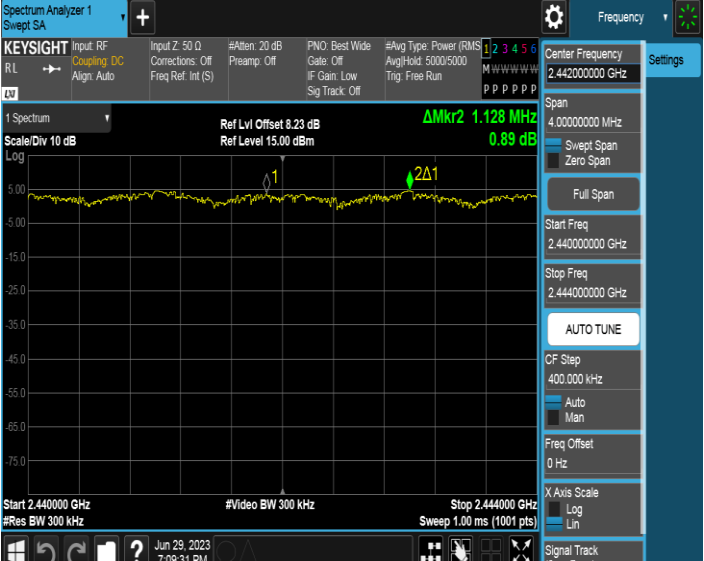
Test Mode	Test Channel	Verdict
2DH5	Hop	PASS
		

Test Mode	Test Channel	Verdict
3DH5	Hop	PASS
		

**Module 2:**

Test Mode	Test Channel	Verdict
DH5	Hop	PASS
		

Test Mode	Test Channel	Verdict
2DH5	Hop	PASS
		

Test Mode	Test Channel	Verdict
3DH5	Hop	PASS
		

## 6.5. NUMBER OF HOPPING FREQUENCIES

### LIMITS

CFR 47 FCC Part15 (15.247), Subpart C ISED RSS-247 ISSUE 2		
Section	Test Item	Limit
CFR 47 15.247 (a) (1) III ISED RSS-247 Clause 5.1 (d)	Number of Hopping Frequency	at least 15 hopping channels

### TEST PROCEDURE

Refer to ANSI C63.10-2013 clause 7.8.3.

Connect the EUT to the spectrum Analyzer and use the following settings:

Detector	Peak
RBW	To identify clearly the individual channels, set the RBW to less than 30 % of the channel spacing or the 20 dB bandwidth, whichever is smaller.
VBW	$\geq$ RBW
Span	The frequency band of operation. Depending on the number of channels the device supports, it may be necessary to divide the frequency range of operation across multiple spans, to allow the individual channels to be clearly seen.
Trace	Max hold
Sweep time	Auto couple

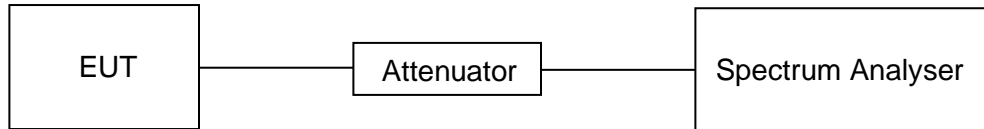
Set EUT to transmit maximum output power and switch on frequency hopping function. then set enough count time (larger than 5000 times) to get all the hopping frequency channel displayed on the screen of spectrum analyzer, count the quantity of peaks to get the number of hopping channels.



**TEST ENVIRONMENT**

Temperature	22°C	Relative Humidity	56%
Atmosphere Pressure	101kPa	Test Voltage	DC 13.2V

**TEST SETUP**



**TEST RESULTS TABLE**

**Module 1:**

Test Mode	Test Channel	Result (Num)	Result
DH5	Hop	79	Pass
2DH5	Hop	79	Pass
3DH5	Hop	79	Pass

**Module 2:**

Test Mode	Test Channel	Result (Num)	Result
DH5	Hop	79	Pass
2DH5	Hop	79	Pass
3DH5	Hop	79	Pass