TEST REPORT

Report No.:	BCTC2210566464-1E
Applicant:	OKdo Technology Limited
Product Name:	ROCK Pi 4/ROCK 4
Model/Type Ref.:	ROCK 4 SE
Tested Date:	2022-10-21 to 2022-12-06
Issued Date:	2022-12-07

Shenzhen BCTC Testing Co., Ltd.

Product Name:	ROCK Pi 4/ROCK 4
Trademark:	N/A
Model/Type Ref.:	ROCK 4 SE ROCK 4, ROCK 4 A, ROCK 4 A+, ROCK 4 B, ROCK 4 B+, ROCK 4 C, ROCK 4 C+, ROCK Pi 4, ROCK Pi 4 A, ROCK Pi 4 A+, ROCK Pi 4 B, ROCK Pi 4 B+, ROCK Pi 4 C, ROCK Pi 4 C+
Prepared For:	OKdo Technology Limited
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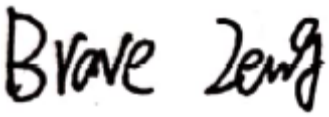
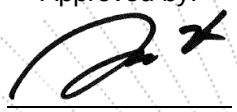
Manufacturer:	OKdo Technology Limited
Address:	5th Floor, 2 Pancras Square, King's Cross, London N1C 4AG, United Kingdom
Prepared By:	Shenzhen BCTC Testing Co., Ltd.
Address:	1-2/F., Building B, Pengzhou Industrial Park, No.158, Fuyuan 1st Road, Zhancheng, Fuhai Subdistrict, Bao'an District, Shenzhen, Guangdong, China
Sample Received Date:	2022-10-21
Sample tested Date:	2022-10-21 to 2022-12-06
Issue Date:	2022-12-07
Report No.:	BCTC2210566464-1E
Test Standards:	Article2 Paragraph 1, item 19
Test Results:	PASS
Remark:	This is JAPAN RADIO test report.

Tested by:



Brave Zeng/ Project Handler

Approved by:



Zero Zhou/Reviewer

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Table Of Content

Test Report Declaration Page
1. Version 5
2. Test Summary 6
3. Measurement Uncertainty 7
4. Product Information And Test Setup 8
4.1 Product Information 8
4.2 Block Digram Parameters Of Text Software Setting 8
4.3 Description Of Support Units (Conducted Mode) 8
4.4 Channel List 9
4.5 Test Mode 9
4.6 Test Conditions 10
4.7 Table Of Parameters Of Test Software Setting 10
5. Test Facility And Test Instrument Used 11
5.1 Test Facility 11
5.2 Test Instrument Used 11
6. RF Shielding Method 12
7. Frequency Error 13
7.1 Block Diagram Of Test Setup 13
7.2 Limit 13
7.3 Measuring Instruments And Setting 13
7.4 Test Procedure 13
7.5 Test Result 14
8. Antenna Power 16
8.1 Block Diagram Of Test Setup 16
8.2 Limit 16
8.3 Measuring Instruments And Setting 16
8.4 Test Procedure 16
8.5 Test Result 17
9. Occupied Bandwith 18
9.1 Block Diagram Of Test Setup 18
9.2 Limit 18
9.3 Test Procedure 18
9.4 Test Result 19
10. Unwanted Emission Intensity Measurement 23
10.1 Block Diagram Of Test Setup 23
10.2 Limit 23
10.3 Measuring Instruments And Setting 23
10.4 Test Procedure 23
10.5 Test Result 24
11. Radio Interference Prevention Capability Measurement 51
11.1 Block Diagram Of Test Setup 51
11.2 Limit 51
11.3 Measuring Instruments And Setting 51
11.4 Test Procedure 51

11.5 Test Result....51
12. Dwell Time....52
12.1 Block Diagram Of Test Setup....52
12.2 Limit....52
12.3 Measuring Instruments And Setting....52
12.4 Test Procedure....52
12.5 Test Result....53
13. Carrier Sense....65
14. Imitation Of Collateral Emission Of Receiver Measurement....66
14.1 Block Diagram Of Test Setup....66
14.2 Limit....66
14.3 Measuring Instruments And Setting....66
14.4 Test Procedure....66
14.5 Test Result....67
15. EUT Photographs....70
16. EUT Test Setup Photographs....72

(Note: N/A Means Not Applicable)

1. Version

Report No.	Issue Date	Description	Approved
BCTC2210566464-1E	2022-12-07	Original	Valid

2. Test Summary

Test procedures according to the technical standards:

Article 2 paragraph 1 of item 19			
Standard Section	Test Item	Judgment	Remark
General provisions			
5	Frequency Error	PASS	
6	Occupied Bandwidth	PASS	
7	Spurious Emissions Intensity	PASS	
8	Radio Interference Prevention Capability Measurement	PASS	
Transmitting equipment			
6	Antenna Power	PASS	
Transmitting antenna			
20	Type, Configuration, etc., of Transmitting Antenna	PASS	
22	Direction Pattern of Transmitting Antenna (Provided at Individual Antenna Report)	PASS	
Receiving antenna			
24	Limitation of Collateral Emission of Receiver	PASS	
26	Refer to All Articles for Transmitting Antenna	PASS	
Operating frequency 2400~2483.5MHz			
49.20(1);a	RF Shielding Method	PASS	
49.20(1);a	Communication Method	PASS	
49.20(1);b	Spread-spectrum Method	PASS	
49.20(1);c	Antenna Power	PASS	
49.20(1);d	Absolute Antenna Gain (Provided at Individual Antenna Report)	PASS	
49.20(1);e	Spread-Spectrum Bandwidth	PASS	
49.20(1);f	Spreading Factor	PASS	
49.20(1);g	Hopping Frequency Dwell Time (FH employed)	PASS	

NOTE:

(1)" N/A" denotes test is not applicable in this Test Report

3. Measurement Uncertainty

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

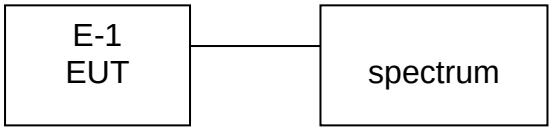
No.	Item	Uncertainty
1	Conducted Emission Test	±3.2dB
2	Radiated Emission Test	±4.7dB
3	RF power,conducted	±0.16dB
4	Spurious emissions,conducted	±0.21dB
5	All emissions,radiated(<1G)	±4.68dB
6	All emissions,radiated(>1G)	±5.0dB
7	frequency error ppm	±0.5ppm

4. Product Information And Test Setup

4.1 Product Information

Model/Type Ref.:	ROCK 4 SE ROCK 4, ROCK 4 A, ROCK 4 A+, ROCK 4 B, ROCK 4 B+, ROCK 4 C, ROCK 4 C+, ROCK Pi 4, ROCK Pi 4 A, ROCK Pi 4 A+, ROCK Pi 4 B, ROCK Pi 4 B+, ROCK Pi 4 C, ROCK Pi 4 C+
Model differences:	All the model are the same circuit and RF module, except model names.
Bluetooth Version:	5.0
Hardware Version:	V1.52
Software Version:	4.4
Operation Frequency:	2402-2480MHz
Type of Modulation:	GFSK, π/4-DQPSK, 8DPSK
Number Of Channel:	79 CH
Antenna installation:	Chip antenna
Antenna Gain:	1.5 dBi
Ratings:	DC 5V

4.2 Block Digram Parameters Of Text Software Setting



4.3 Description Of Support Units (Conducted Mode)

Item	Equipment	Mfr/Brand	Model/Type No.	Series No.	Note
E-1	ROCK Pi 4/ROCK 4	N/A	ROCK 4 SE	N/A	EUT

Notes:
1. The support equipment was authorized by Declaration of Confirmation.
2. For detachable type I/O cable should be specified the length in cm in『Length』column
3. “YES” is means “shielded” “with core”; “NO” is means “unshielded” “without core”.

4.4 Channel List

Channel List					
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
00	2402	27	2429	54	2456
01	2403	28	2430	55	2457
02	2404	29	2431	56	2458
03	2405	30	2432	57	2459
04	2406	31	2433	58	2460
05	2407	32	2434	59	2461
06	2408	33	2435	60	2462
07	2409	34	2436	61	2463
08	2410	35	2437	62	2464
09	2411	36	2438	63	2465
10	2412	37	2439	64	2466
11	2413	38	2440	65	2467
12	2414	39	2441	66	2468
13	2415	40	2442	67	2469
14	2416	41	2443	68	2470
15	2417	42	2444	69	2471
16	2418	43	2445	70	2472
17	2419	44	2446	71	2473
18	2420	45	2447	72	2474
19	2421	46	2448	73	2475
20	2422	47	2449	74	2476
21	2423	48	2450	75	2477
22	2424	49	2451	76	2478
23	2425	50	2452	77	2479
24	2426	51	2453	78	2480
25	2427	52	2454		
26	2428	53	2455		

4.5 Test Mode

To investigate the maximum EMI emission characteristics generates from EUT, the test system was pre-scanning tested base on the consideration of following EUT operation mode or test configuration mode which possible have effect on EMI emission level. Each of these EUT operation mode(s) or test configuration mode(s) mentioned above was evaluated respectively.

For All Mode	Description	Modulation Type
Mode 1	CH 00	GFSK
Mode 2	CH 39	
Mode 3	CH 78	
Mode 4	RX	
Mode 5	CH 00	π/4-DQPSK
Mode 6	CH 39	
Mode 7	CH 78	
Mode 8	RX	
Mode 9	CH 00	8DPSK
Mode 10	CH 39	
Mode 11	CH 78	
Mode 12	RX	

4.6 Test Conditions

The BT module was tested while in a continuous transmitter/receiver mode.
The EUT was tuned to a low, middle, and high channel for all tests. For all test case pre/scans were completed in all Modes to determine worst case levels.

Power Supply Voltage Fluctuation Test

Voltage Fluctuation Test	Normal Voltage	High Voltage +10% of Normal Voltage	Low Voltage -10% of Normal Voltage
Input DC Power	5V	5.5V	4.5V
Voltage Variation (%)	0%	+10%	-10%

Note:
Voltage Variation (%)
= (Output high or Low Voltage - Output Normal Voltage)/ Output Normal Voltage* 100

During the input supply voltage to the EUT from the external power source is varied by +/-10%,+/-10% of the external power change, will not affect the voltage of the RF, so only operated in normal voltage to test all regulations.

4.7 Table Of Parameters Of Test Software Setting

During testing channel & power controlling software provided by the customer was used to control the operating channel as well as the output power level. The RF output power selection is for the setting of RF output power expected by the customer and is going to be fixed on the firmware of the final end product power parameters

Test software Version	SecureCRT		
Frequency	2402 MHz	2441 MHz	2480 MHz
Parameters	DEF	DEF	DEF

5. Test Facility And Test Instrument Used

5.1 Test Facility

All measurement facilities used to collect the measurement data are located at Shenzhen BCTC Testing Co., Ltd. Address: 1-2/F., Building B, Pengzhou Industrial Park, No.158, Fuyuan 1st Road, Zhancheng, Fuhai Subdistrict, Bao'an District, Shenzhen, Guangdong, China. The site and apparatus are constructed in conformance with the requirements of ANSI C63.4 and CISPR 16-1-1 other equivalent standards.

FCC Test Firm Registration Number: 712850

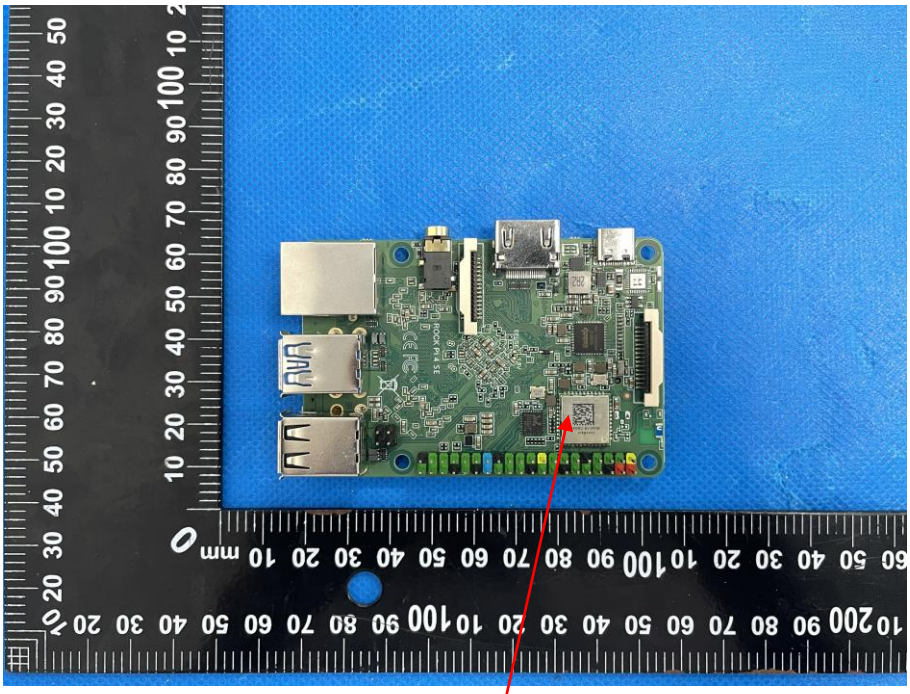
IC Registered No.: 23583

5.2 Test Instrument Used

Item	Equipment	Manufacturer	Type No.	Serial No.	Last calibration	Calibrated until
1	Power meter	Keysight	E4419	\	May 26, 2022	May 25, 2023
2	Signal Analyzer20kHz-26.5GHz	Keysight	N9020A	MY49100060	May 26, 2022	May 25, 2023
3	D.C. Power Supply	LongWei	TPR-6405D	\	\	\
4.	Signal Generator	Keysight	N5182B	MY56200519	May 24, 2022	May 23, 2023
5.	Attenuator	\	10dB DC-6GHz	1650	May 24, 2022	May 23, 2023

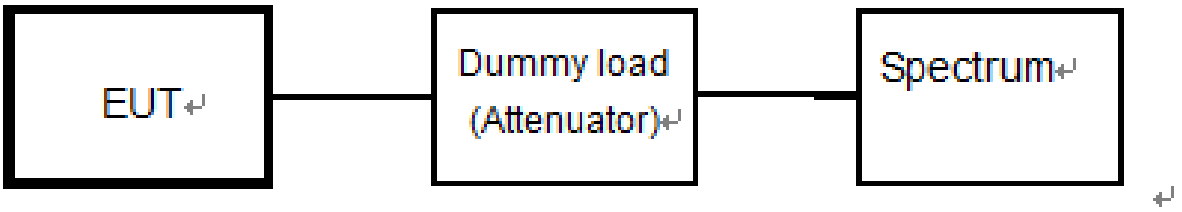
6. RF Shielding Method

Enclosure:



7. Frequency Error

7.1 Block Diagram Of Test Setup



7.2 Limit

Item	Limits
Frequency Error	±50ppm

7.3 Measuring Instruments And Setting

The following table is the setting of Spectrum Analyzer.

Spectrum Parameter	Setting
Attenuation	Auto
RB / VB	10KHz
Detector	Peak
Trace	Max Hold
Sweep Time	Auto

7.4 Test Procedure

(1) In the case of unmodulated signal (continuous or continuous burst), measure the frequency directly by a frequency meter.

(2) In the case of burst waves, the measurement shall be done for enough time in order to obtain the enough measuring accuracy, and the average of the measured values becomes the final value.

(3) In the case of a test mode with a specific frequency spectrum, measure the frequency of the specific spectrum by a spectrum analyzer.

(4) In the cases above, if the frequency equivalent to the test frequency is not directly measured in principle, it shall be obtained by necessary calculation.

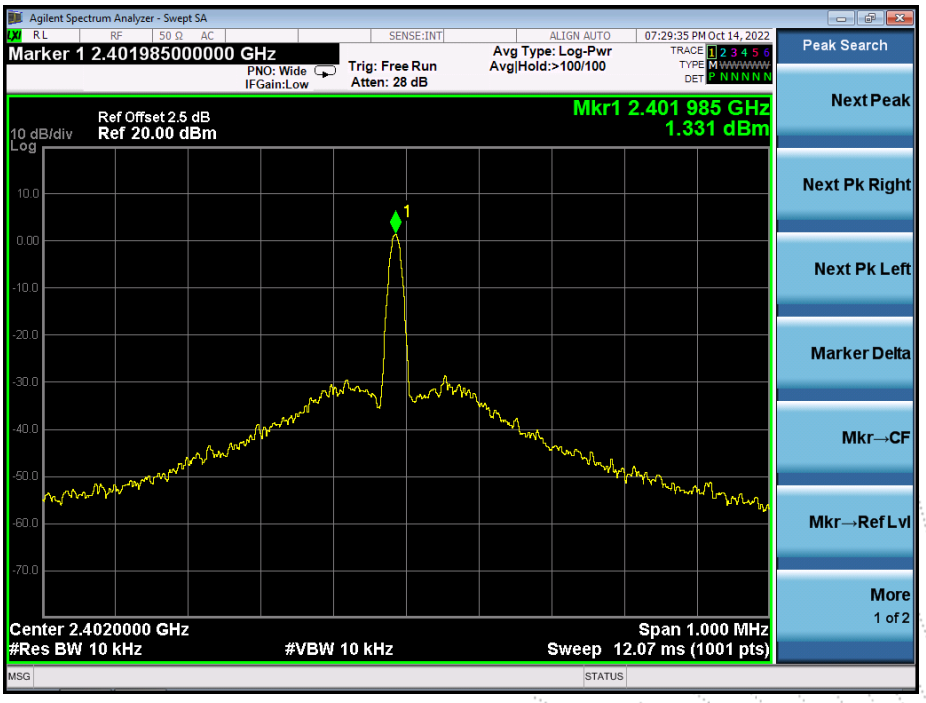
In the case of modulated signal, if there is no specific spectrum measurable by a spectrum analyzer but a specific dip is observed, it is allowed to measure the frequency with the signal generator (synthesized). That is, observe a signal of the signal generator concurrently (or alternately) with the tested signal using the spectrum analyzer while setting the frequency of the signal generator to the position of the dip on the screen of the spectrum analyzer, and determine the frequency of the signal generator at the time as a measured value.

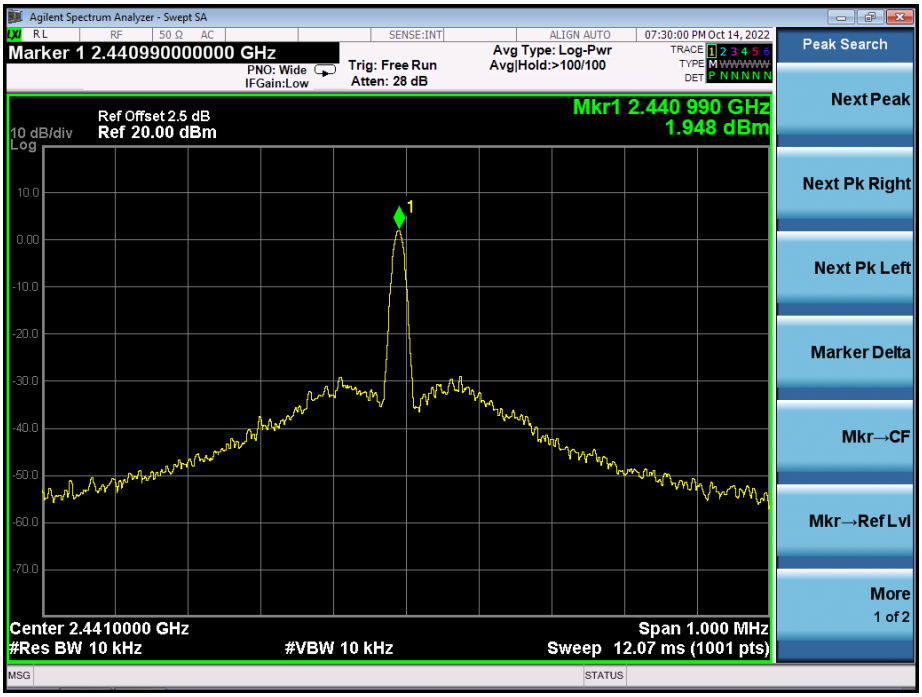
7.5 Test Result

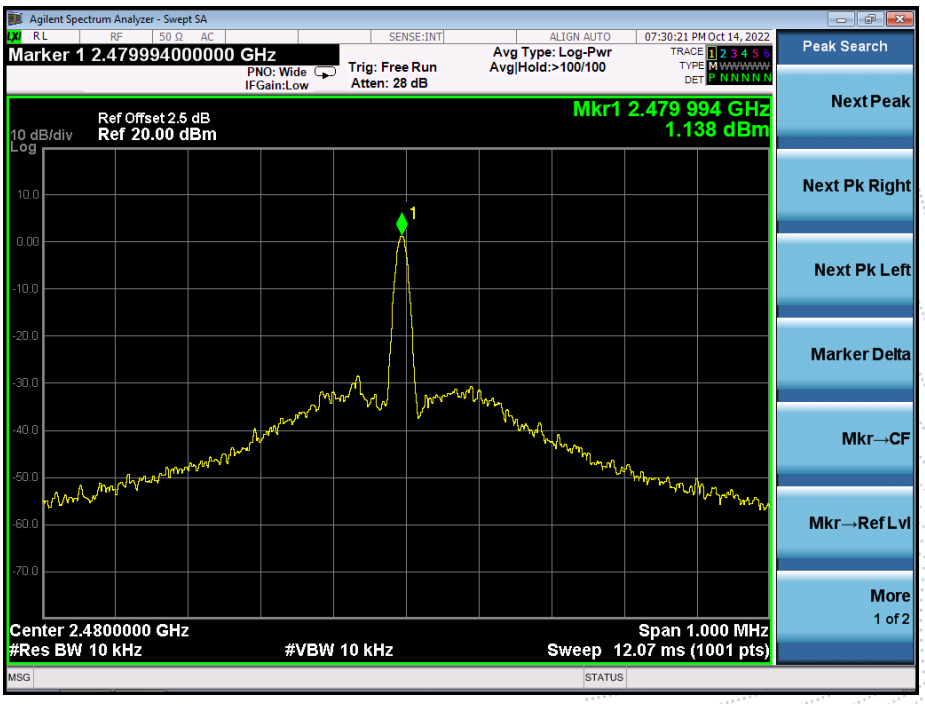
Operation Mode:	Transmiting- unmodulation mode

Voltage	Frequency	Reading	Tolerance	Limit
Normal Voltage	MHz	MHz	ppm	(ppm)
	2402	2401.985	-6.24	±50
	2441	2440.990	-4.10	±50
	2480	2479.994	-2.42	±50

Normal Voltage:

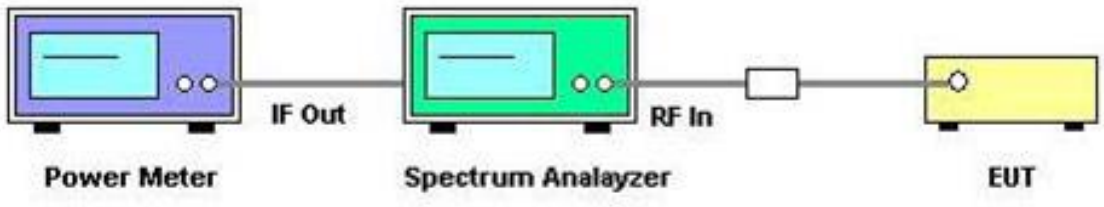



Agilent Spectrum Analyzer - Swept SA
Marker 1 2.440990000000 GHz
PNO: Wide
IFGain:Low
Trig: Free Run
Atten: 28 dB
Avg Type: Log-Pwr
Avg|Hold:>100/100
07:30:00 PM Oct 14, 2022
Ref Offset 2.5 dB
10 dB/div
Ref 20.00 dBm
Mkr1 2.440 990 GHz
1.948 dBm
Center 2.4410000 GHz
#Res BW 10 kHz
#VBW 10 kHz
Span 1.000 MHz
Sweep 12.07 ms (1001 pts)
Peak Search
Next Peak
Next Pk Right
Next Pk Left
Marker Delta
Mkr→CF
Mkr→Ref Lvl
More
1 of 2


Agilent Spectrum Analyzer - Swept SA
Marker 1 2.479994000000 GHz
PNO: Wide
IFGain:Low
Trig: Free Run
Atten: 28 dB
Avg Type: Log-Pwr
Avg|Hold:>100/100
07:30:21 PM Oct 14, 2022
Ref Offset 2.5 dB
10 dB/div
Ref 20.00 dBm
Mkr1 2.479 994 GHz
1.138 dBm
Center 2.4800000 GHz
#Res BW 10 kHz
#VBW 10 kHz
Span 1.000 MHz
Sweep 12.07 ms (1001 pts)
Peak Search
Next Peak
Next Pk Right
Next Pk Left
Marker Delta
Mkr→CF
Mkr→Ref Lvl
More
1 of 2

8. Antenna Power

8.1 Block Diagram Of Test Setup



8.2 Limit

Item	Limits
Antenna Power Density	(1)≦3mW/MHz (FH,FH+DS,FH+OFDM form 2400 - 2483.5 MHz) (2)≦10mW/MHz (OFDM OBW＜26MHz, DS, FH other than (1)) (3)≦5mW (OFDM OBW 26-38MHz) (4) ≦10mW (Other than (1) & (2)& (3)
Antenna Power Error	+20%, -80% (Base on manufacturer declare antenna power density)

8.3 Measuring Instruments And Setting

Please refer to section 5 in this report. The following table is the setting of Spectrum Analyzer.

Spectrum Parameter	Setting
Attenuation	Auto
RB / VB	1 MHz
Detector	Peak
Trace	Max Hold
Sweep Time	Auto

8.4 Test Procedure

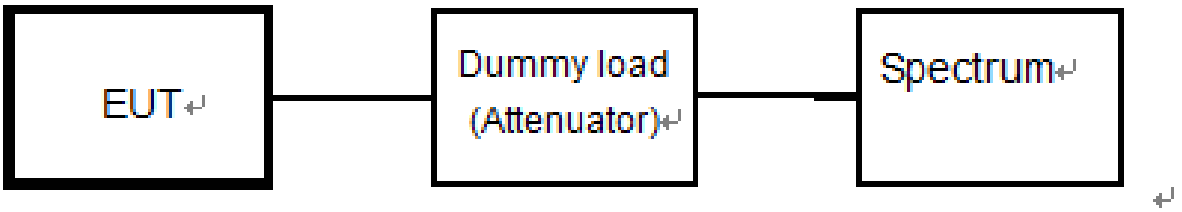
1. A power meter is connected on the IF output port of the spectrum analyzer.
2. Adjust the spectrum analyzer to have the center frequency the same with the measured carrier. RBW=VBW=1MHz, detector mode is positive peak. Turn off the averaging function and use zero span.
3. The calibrating signal power shall be reduced to 0 dBm and it shall be verified that the power meter reading also reduces by 10 dB.
4 . Connect the equipment to be measured. Using the following settings of the spectrum analyzer in combination with "max hold" function, find the frequency of highest power output in the power envelope: center frequency equal to operating frequency; RBW & VBW: 1 MHz; detector mode: positive peak; averaging: off; span: 3 times the spectrum width; amplitude: adjust for middle of the instrument' range. The frequency found shall be recorded.
5 . Set the center frequency of the spectrum analyzer to the found frequency and switch to zero span. The power meter indicates the measured power density “E”.
6. Calculate antenna power density by the formula below PD = P/ Spread bandwidth.
7. Antenna Power Error is definition that actual measure antenna power tolerance between + 20% to - 80% power range that base on manufacturer declare the conducted power density.

8.5 Test Result

Normal Voltage	Test Frequency	Conducted RF output power (dBm)	Conducted RF output power (mW)	90% Hopping Occupied bandwidth (MHz)	Conducted RF output power density (mW/MHz)	Rated power density (mW/MHz)	Limit (mW/MHz)	Antenna Power Error (%)
GFSK	Hopping	3.106	2.045	71.445	0.029	0.040	3	-28
π/4-DQPSK	Hopping	3.890	2.449	71.846	0.034	0.040	3	-15
8DPSK	Hopping	4.063	2.549	71.684	0.036	0.040	3	-11
Limit : +20%, -80% (Base on manufacturer declare antenna power density) Conducted RF output power density= Conducted RF output power/ 90%Hopping Occupied bandwidth								

9. Occupied Bandwith

9.1 Block Diagram Of Test Setup



9.2 Limit

Item	Limits
Occupied Band Width:	FH 83.5MHz; OFDM,DS ≦26MHz;Others≦26MHz
Spreading Bandwidth:	≧500 kHz (FH, DS)
Spreading Factor	≧5

9.3 Test Procedure

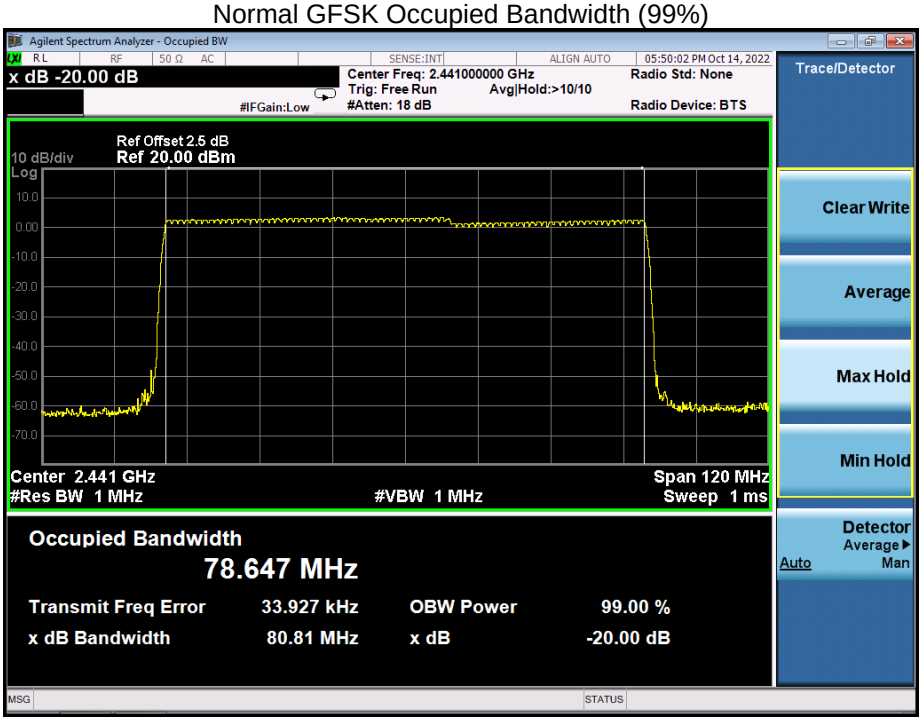
1. Setting of SA is following as: RB: 1MHz / VB:1MHz / SPAN: 120MHz / AT: 20dB Ref: 10dBm / Sweep time: Auto / Sweep Mode: Continuous sweep / Detect mode: Positive peak / Trace mode: Max hold
2 . EUT have transmitted the maximum modulation signal and fixed channelize (For DSSS or OFDM Device) or continuous maximum power of hopping mode(For FHSS Device). SA set to 99% of occupied bandwidth to measure occupied bandwidth. The limit is less than 26MHz(For DSSS or OFDM Device) or 83.5MHz(For FHSS Device).
3. SA set to 90% of occupied bandwidth to measure Spread Spectrum Bandwidth and must greater than 500kHz.
4. Spread Spectrum Factor = Spread Spectrum Bandwidth / modulation rate of EUT.
5. Spread Spectrum Factor limit is greater than 5

9.4 Test Result

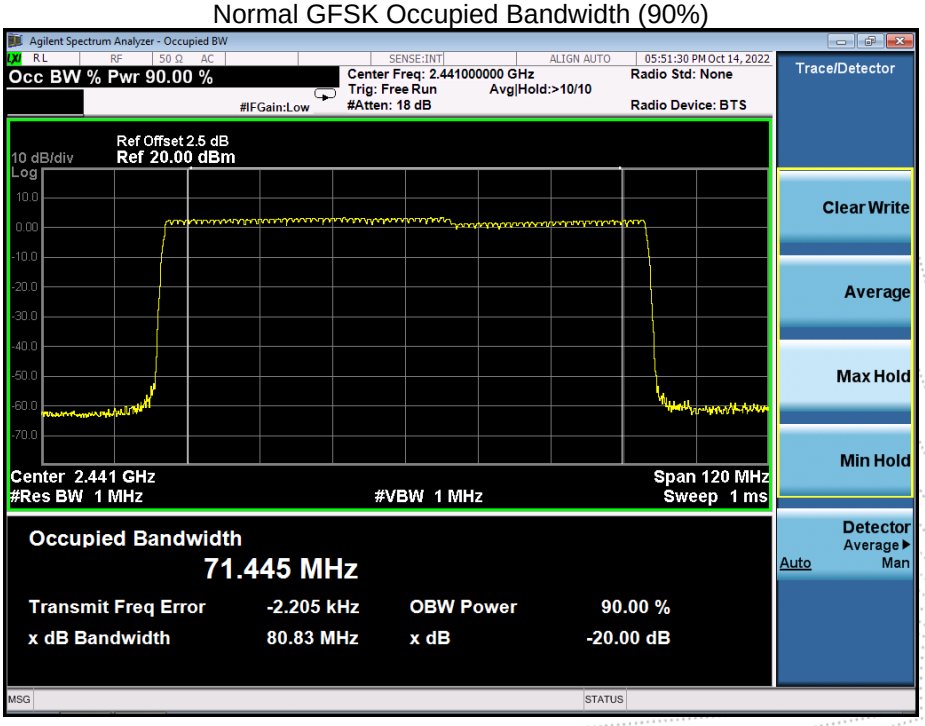
Test Voltage	Test Condition	99%Hopping Mode(Occupied bandwidth) MHz	90%Hopping Mode(Occupied bandwidth) MHz	Spreading Factor
Normal Voltage	GFSK	78.647	71.445	71.445
	π/4-DQPSK	78.689	71.846	35.923
	8DPSK	77.840	71.684	23.895

Remark:
1.Spreading Factor = (90%Hopping Mode(Occupied bandwidth)) / (transmission rate);
2.Transmission Rate=(GFSK=1Mbps, π/4-DQPSK=2Mbps, 8DPSK=3Mbps)

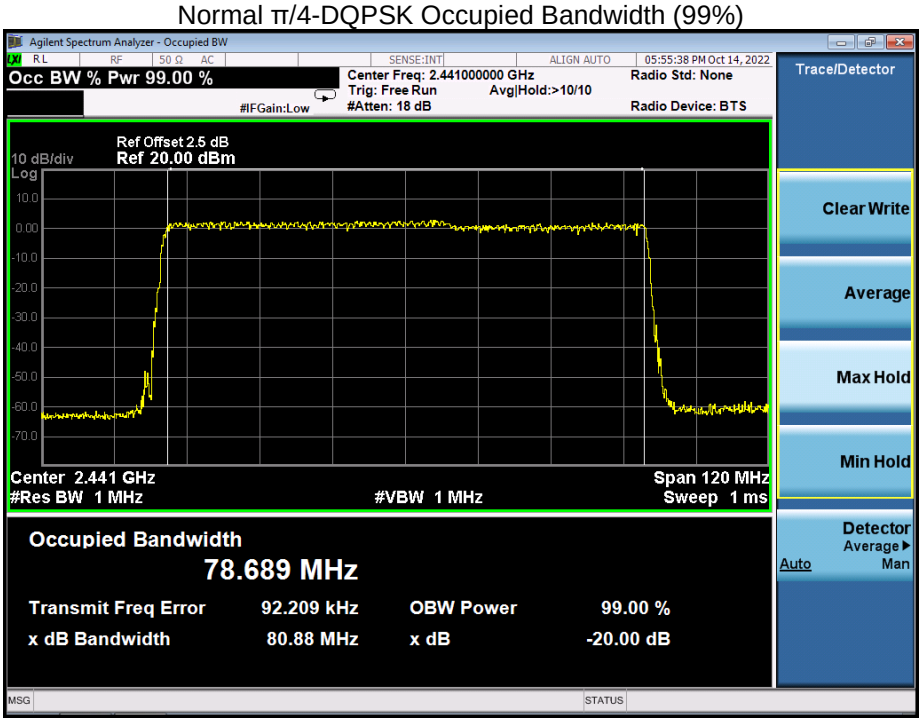
Normal GFSK Occupied Bandwidth (99%)



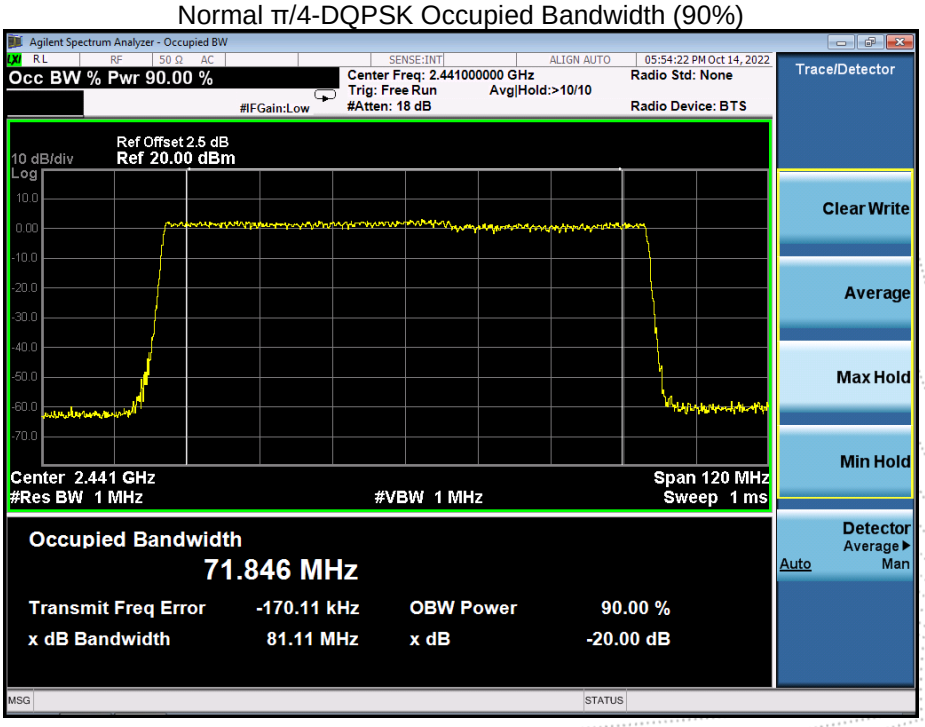
Normal GFSK Occupied Bandwidth (90%)



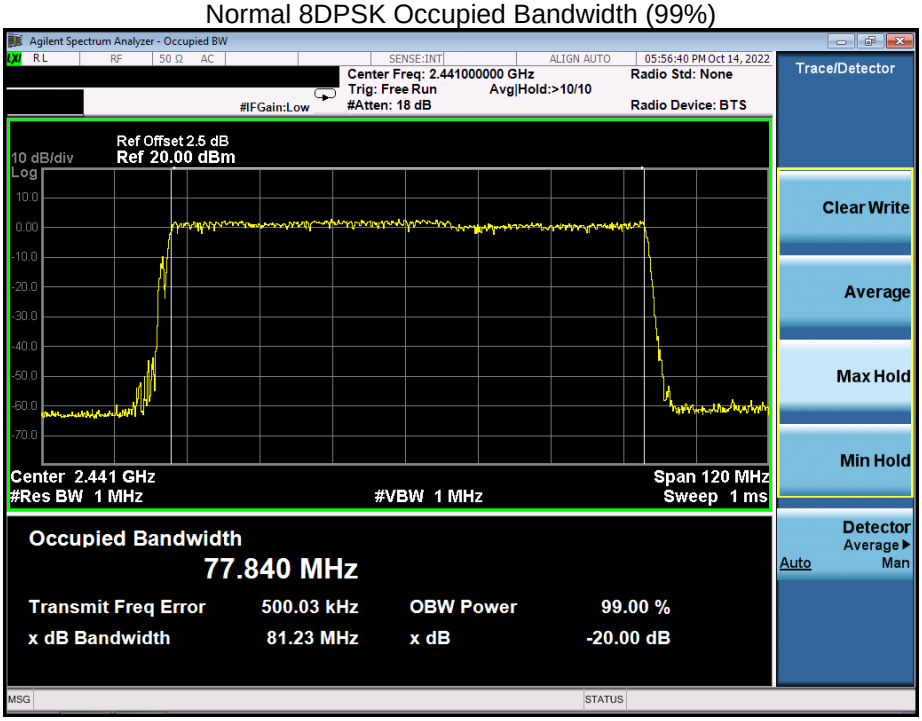
Normal π/4-DQPSK Occupied Bandwidth (99%)



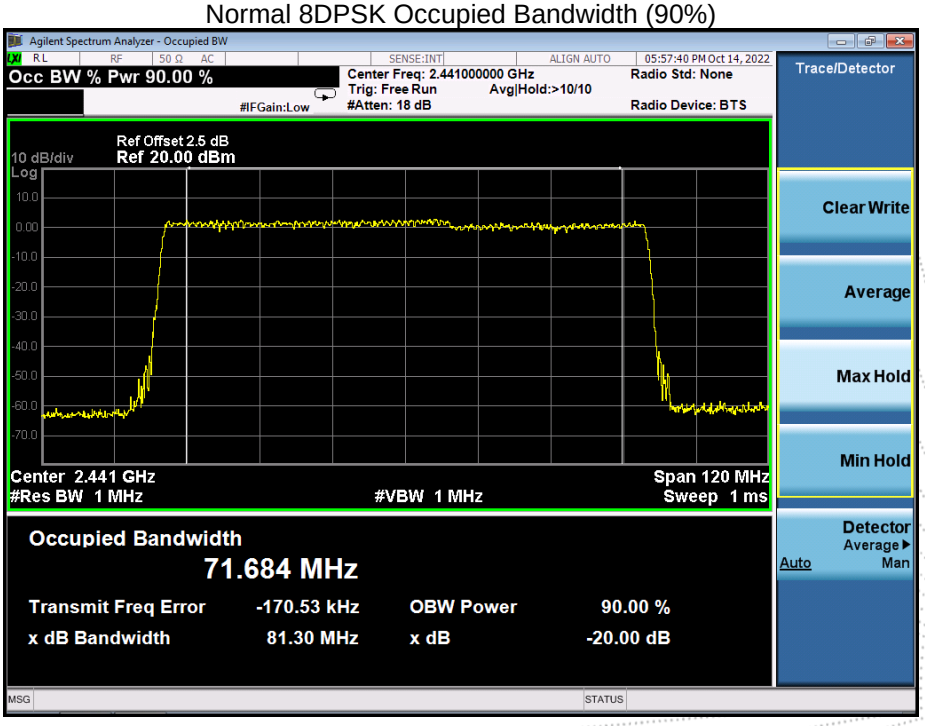
Normal π/4-DQPSK Occupied Bandwidth (90%)



Normal 8DPSK Occupied Bandwidth (99%)

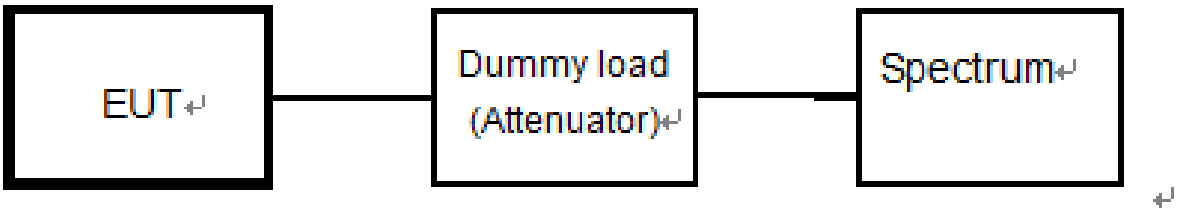


Normal 8DPSK Occupied Bandwidth (90%)



10. Unwanted Emission Intensity Measurement

10.1 Block Diagram Of Test Setup



10.2 Limit

Item	Limits
TX Spurious Emission	≦ 0.25 μW (30MHz≦f≦1000MHz)
	≦2.5 μW (1000MHz<f≦2387MHz)
	≦25 μW (2387MHz<f≦2400MHz)
	≦25 μW (2483.5MHz≦f<2496.5MHz)
	≦2.5 μW (2496.5MHz≦f<12500MHz)

10.3 Measuring Instruments And Setting

Please refer to section 5 in this report. The following table is the setting of Spectrum Analyzer.

Spectrum Parameter	Setting
Attenuation	Auto
RB / VB	1 MHz
Detector	Peak
Trace	Max Hold
Sweep Time	Auto

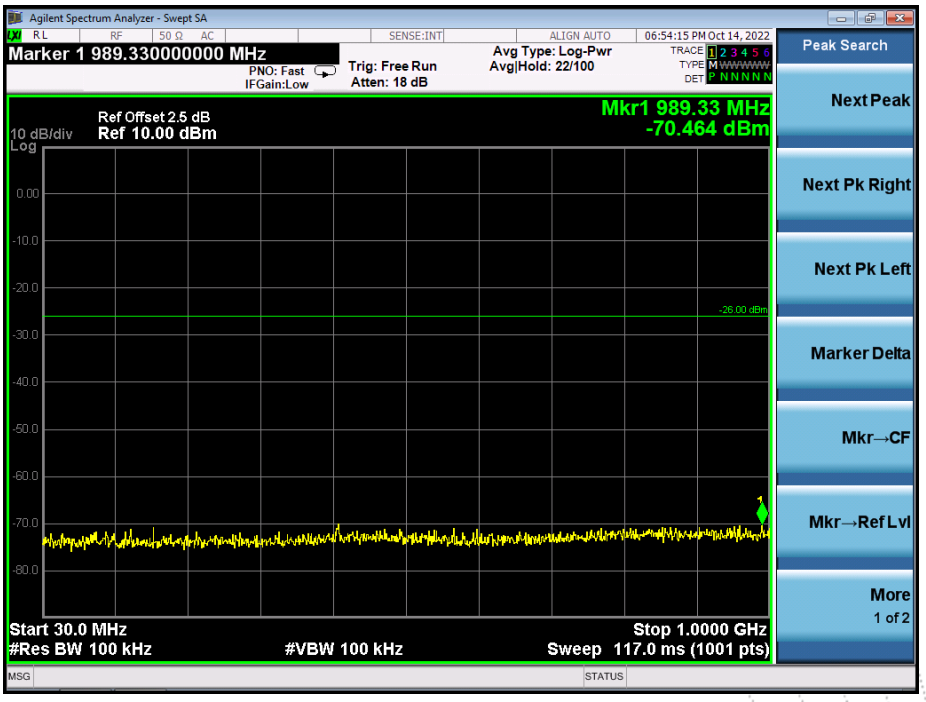
10.4 Test Procedure

1. EUT have transmitted the maximum modulation signal and fixed channelize.
2. Setting of SA is following as: Below 1GHz RB:100KHz / VB:100KHz
Above 1GHz RB:1MHz / VB:1MHz / AT: 20dB Ref: 10dBm / Sweep time: Auto
Sweep Mode: Continuous sweep / Detect mode: Positive peak
Trace mode: Max hold
3. Setting of SA is following as 30MHz and stop frequency 1000MHz Then to mark peak reading value + cable loss shall be less than 0.25μW.
4. Setting of SA is following as 1000MHz and stop frequency 2387MHz Then to mark peak reading value + cable loss shall be less than 2.5μW.
5. SA adjusted to start frequency 2387MHz and stop frequency 2400MHz. Then to mark peak reading value + cable loss shall be less than 25μW.
6. SA adjusted to start frequency 2483.5MHz and stop frequency 2496.5MHz Then to mark peak reading value + cable loss shall be less than 25μW
7. SA adjusted to start frequency 2496.5MHz and stop frequency 12500MHz Then to mark peak reading value + cable loss shall be less than 2.5μW

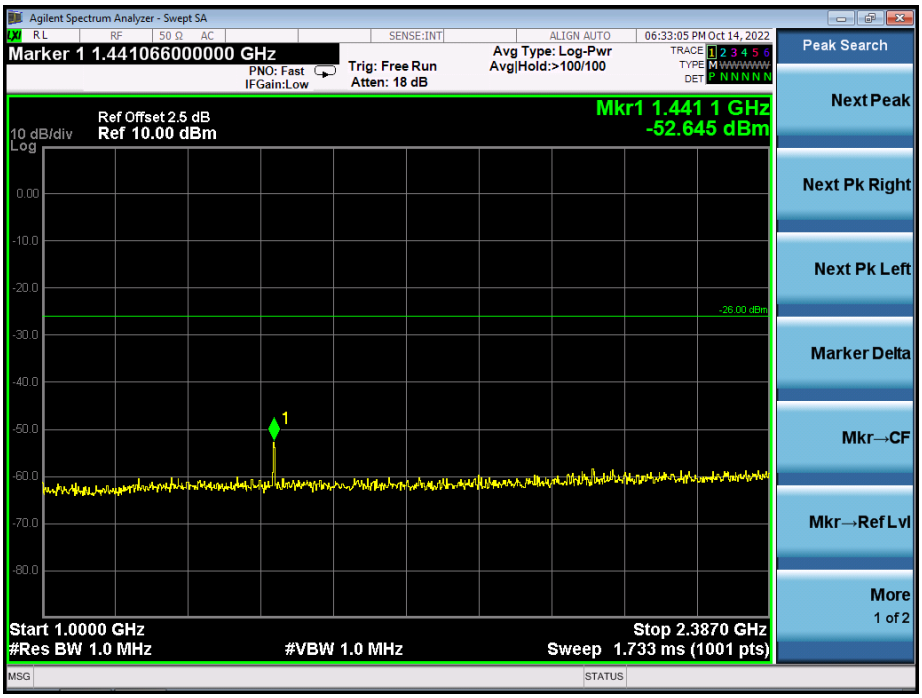
10.5 Test Result

Temperature:	25°C		
Humidity:	55 % RH	Test Voltage	DC 5V
Operation Mode:	GFSK ; Normal Voltage		

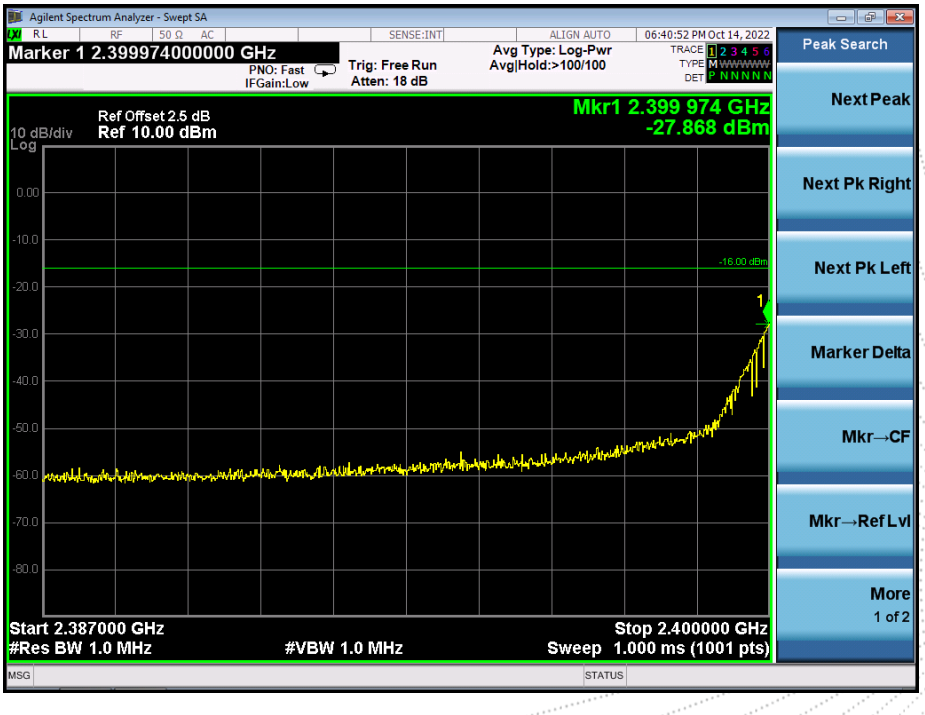
CH 00- Frequency Band 1 (30 MHz ≦ f ≦ 1000 MHz)



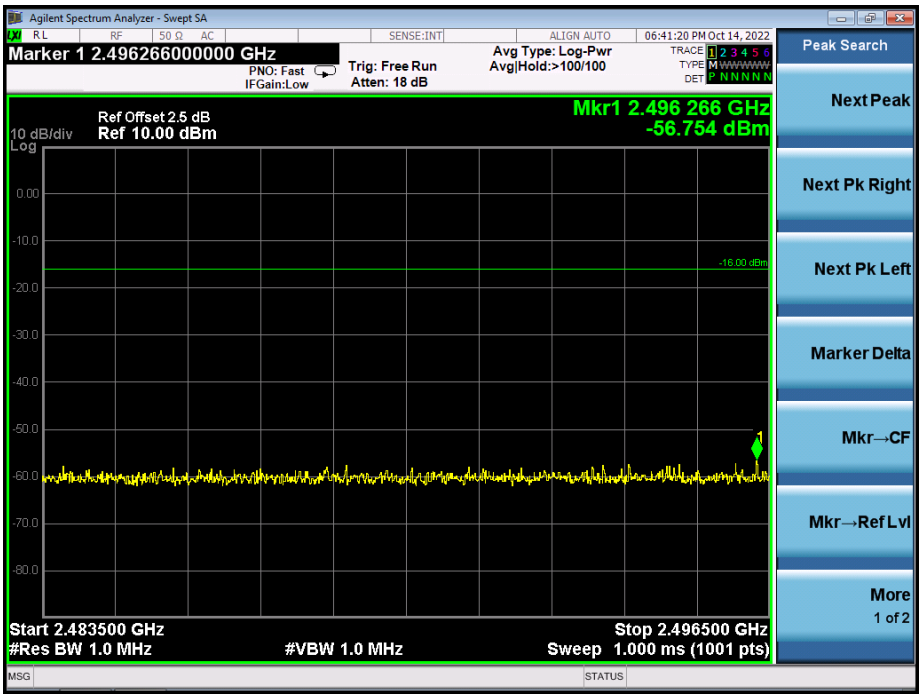
CH 00- Frequency Band 2 (1000 MHz < f ≦ 2387 MHz)



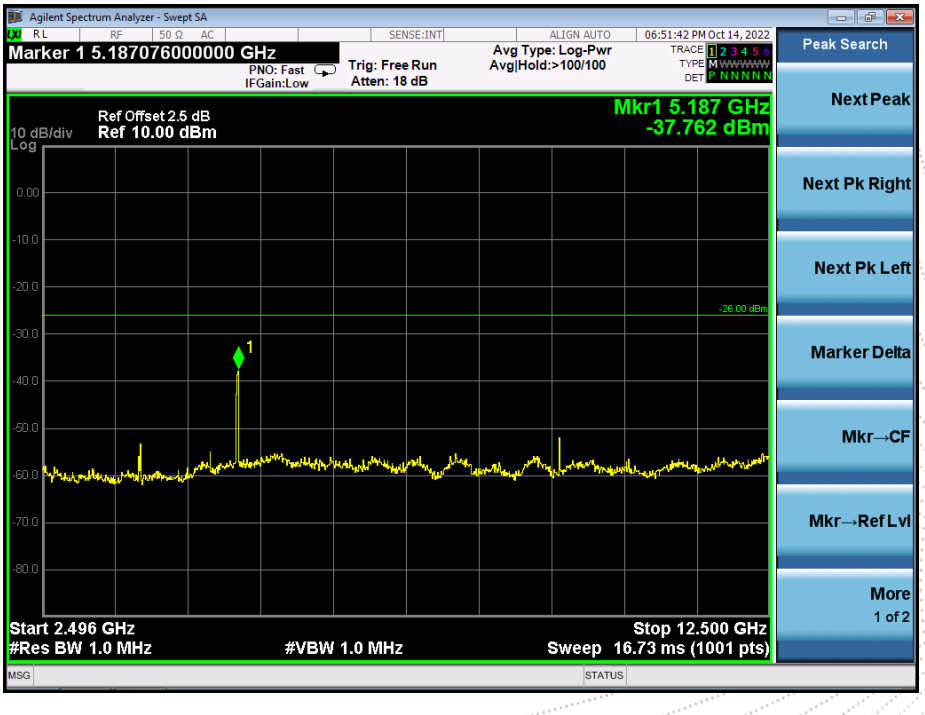
CH 00- Frequency Band 3 (2387 MHz < f ≦ 2400 MHz)



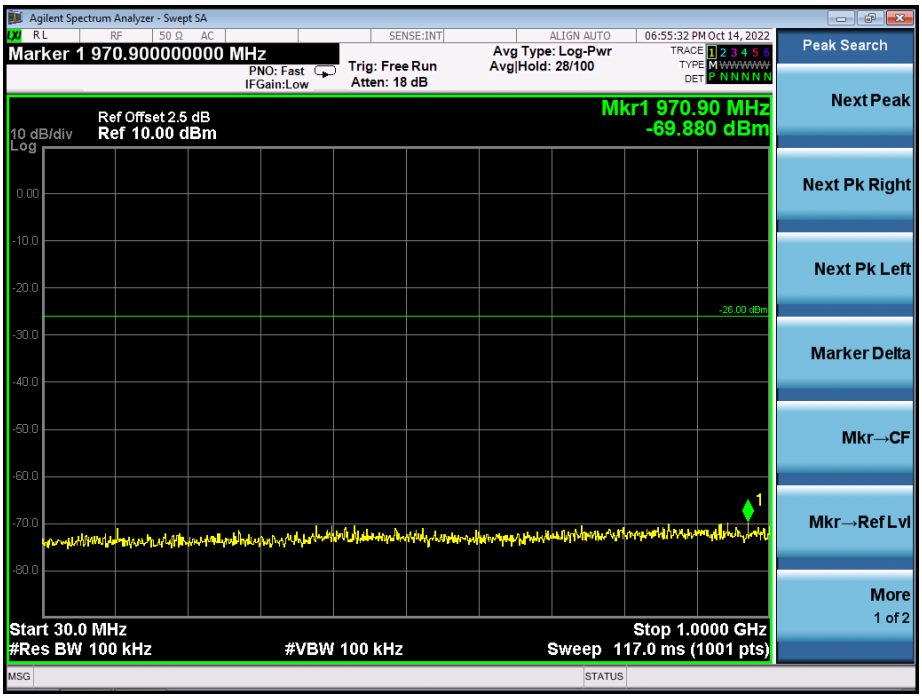
CH 00- Frequency Band 4 (2483.5 MHz ≦ f < 2496.5 MHz)



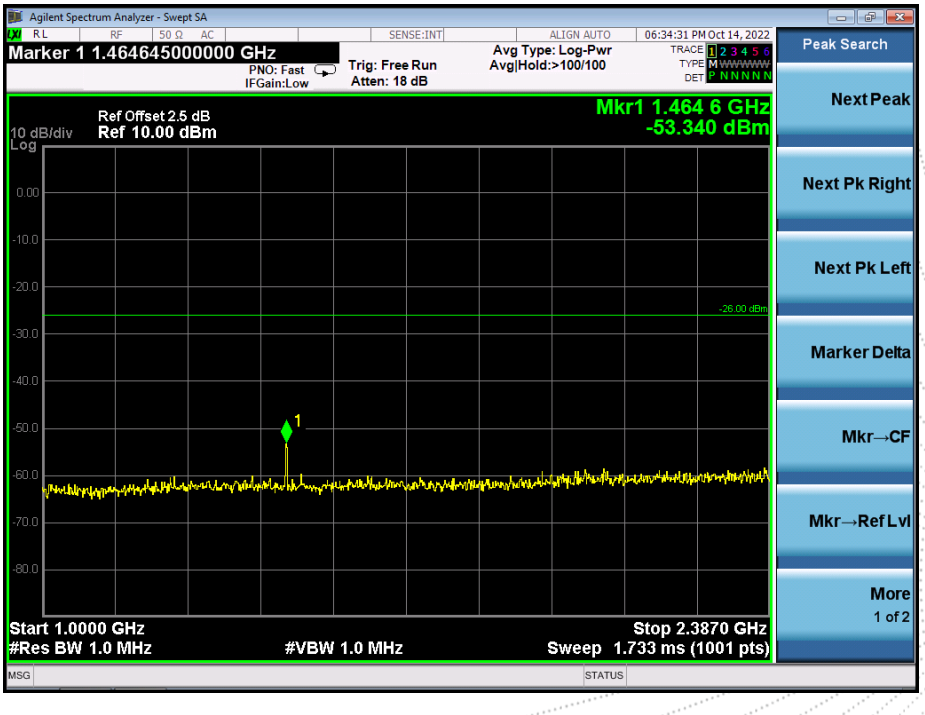
CH 00- Frequency Band 5 (2496.5 MHz ≦ f < 12.5 GHz)



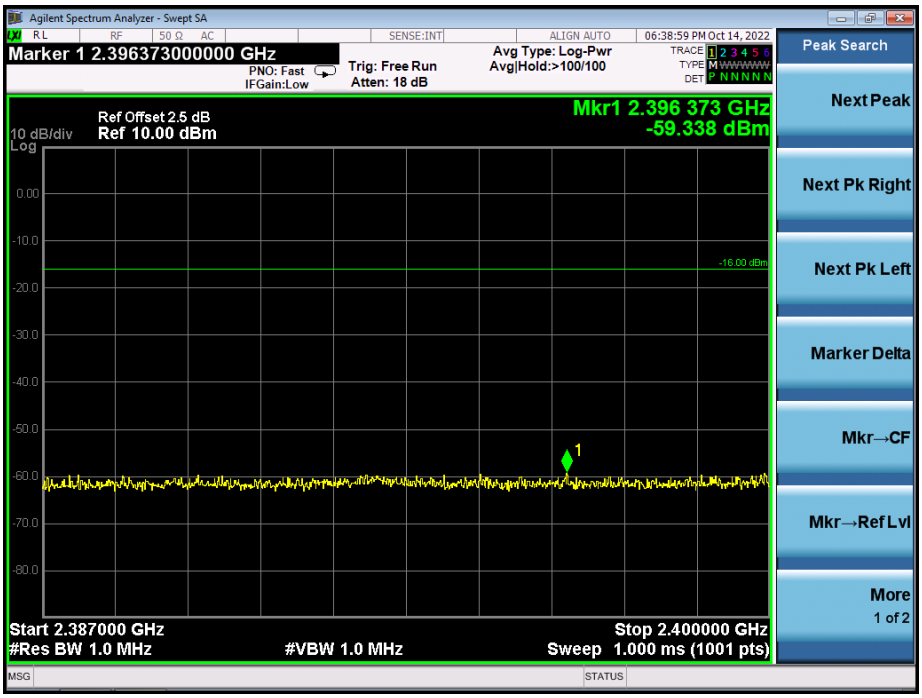
CH 39- Frequency Band 1 (30 MHz ≦ f ≦ 1000 MHz)



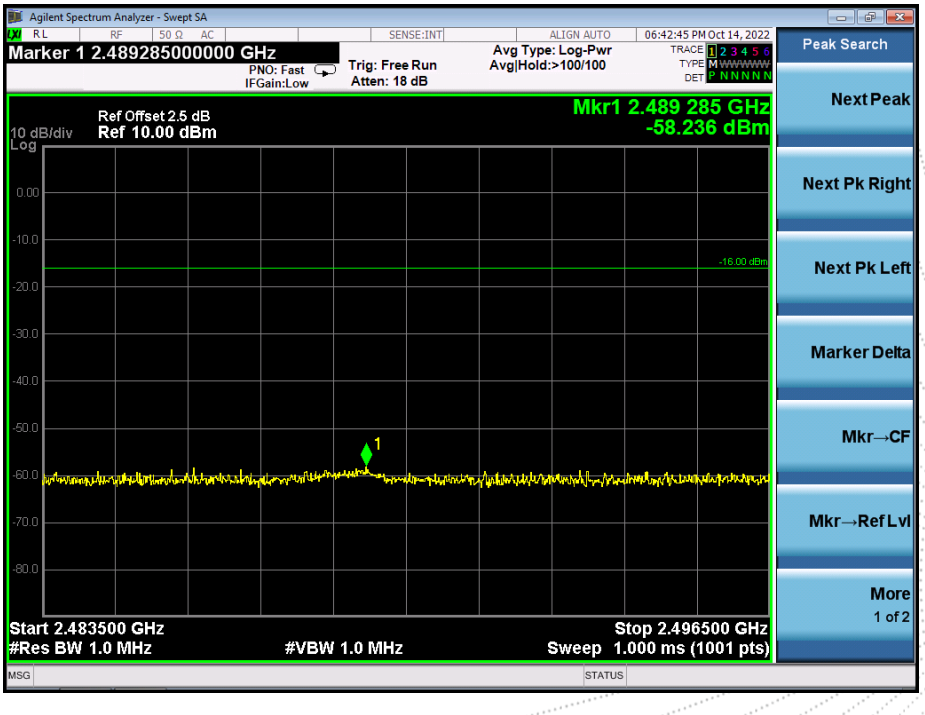
CH 39- Frequency Band 2 (1000 MHz < f ≦ 2387 MHz)



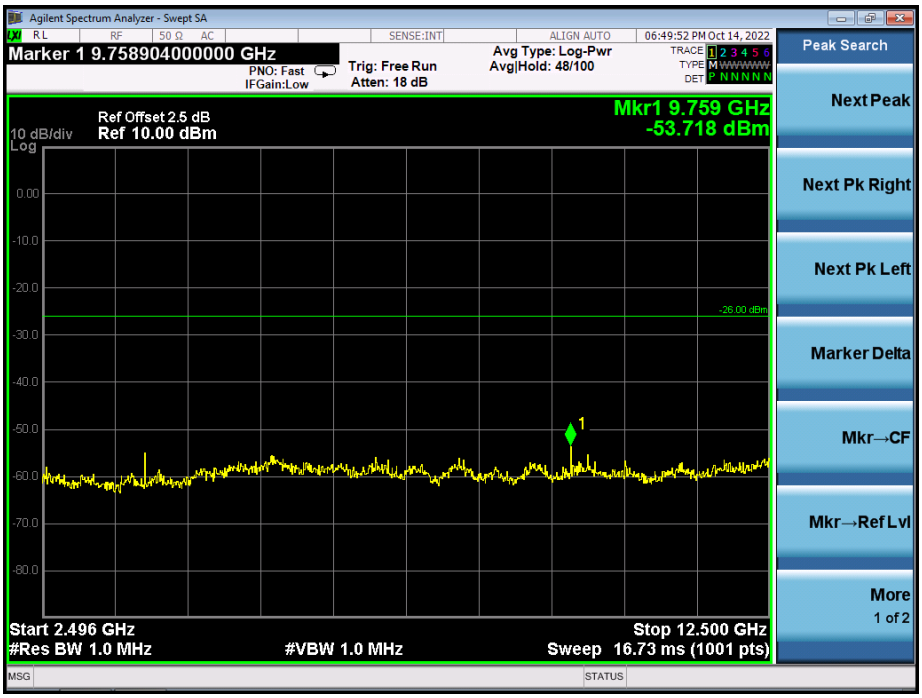
CH 39- Frequency Band 3 (2387 MHz < f ≦ 2400 MHz)



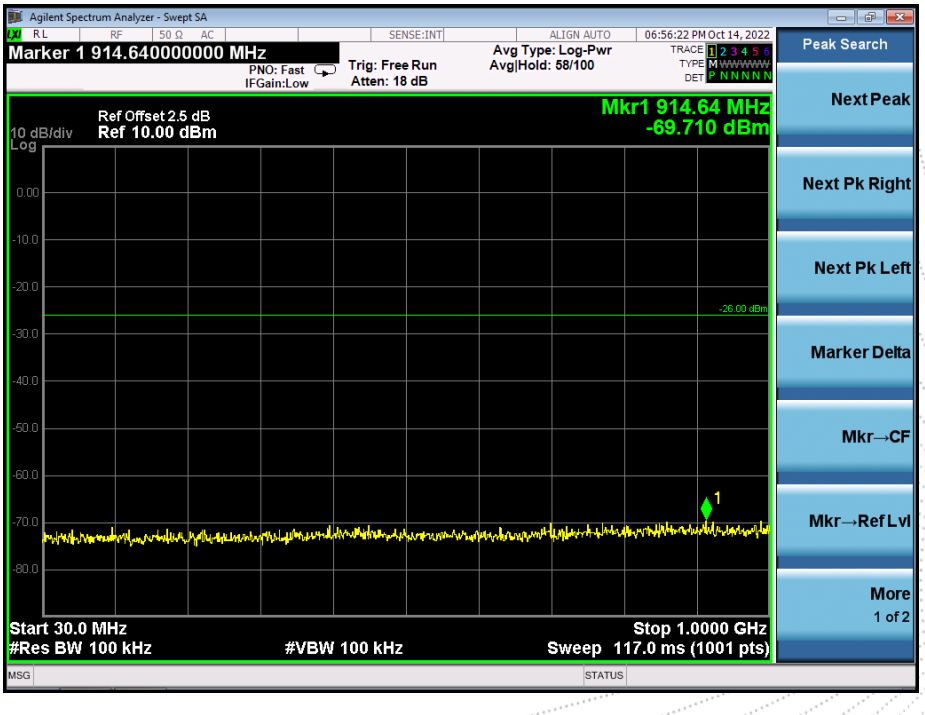
CH 39- Frequency Band 4 (2483.5 MHz ≦ f < 2496.5 MHz)



CH 39- Frequency Band 5 (2496.5 MHz ≦ f < 12.5 GHz)

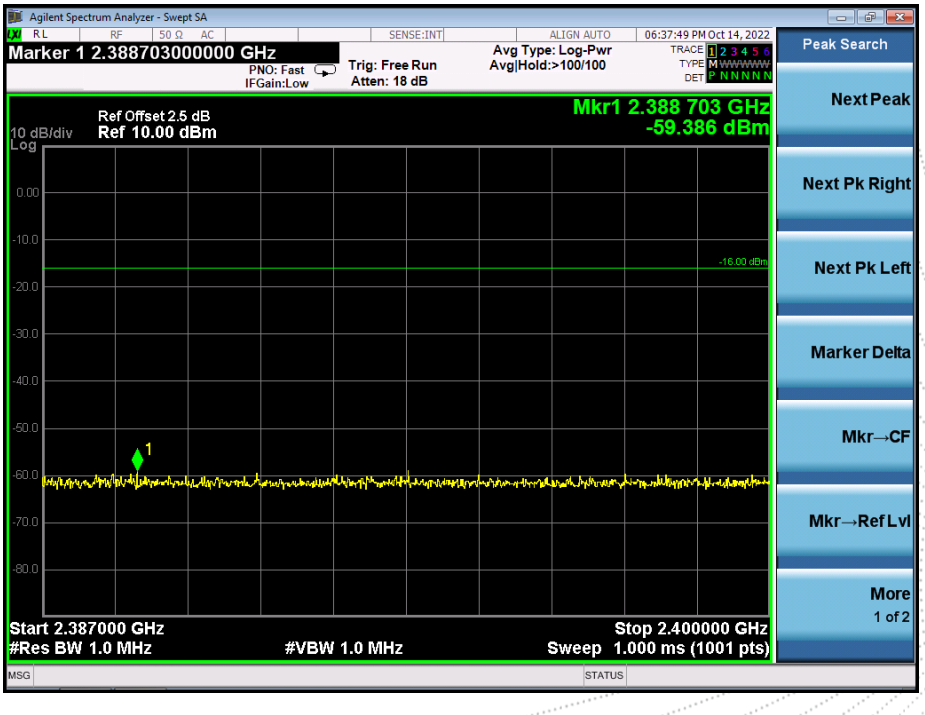


CH 78- Frequency Band 1 (30 MHz ≦ f ≦ 1000 MHz)

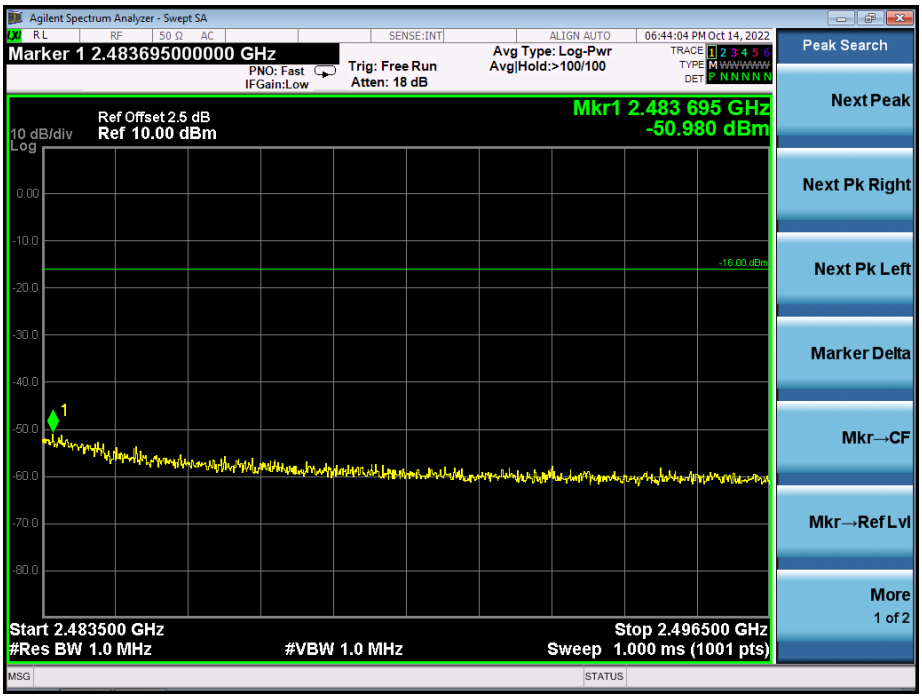


CH 78- Frequency Band 2 (1000 MHz < f ≦ 2387 MHz)

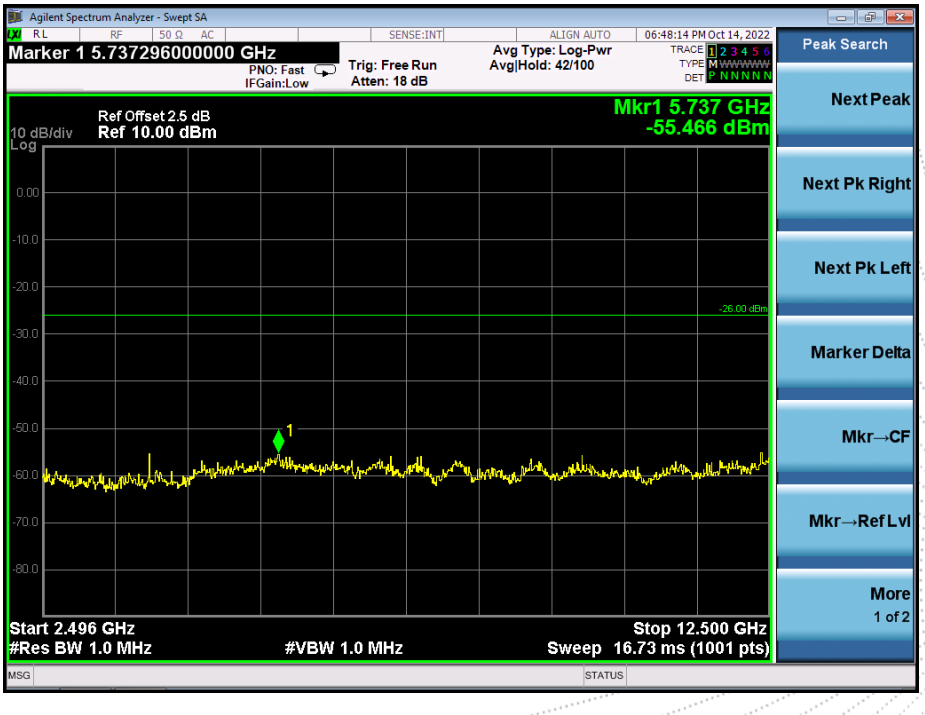
CH 78- Frequency Band 3 (2387 MHz < f ≦ 2400 MHz)



CH78- Frequency Band 4 (2483.5 MHz ≦ f < 2496.5 MHz)

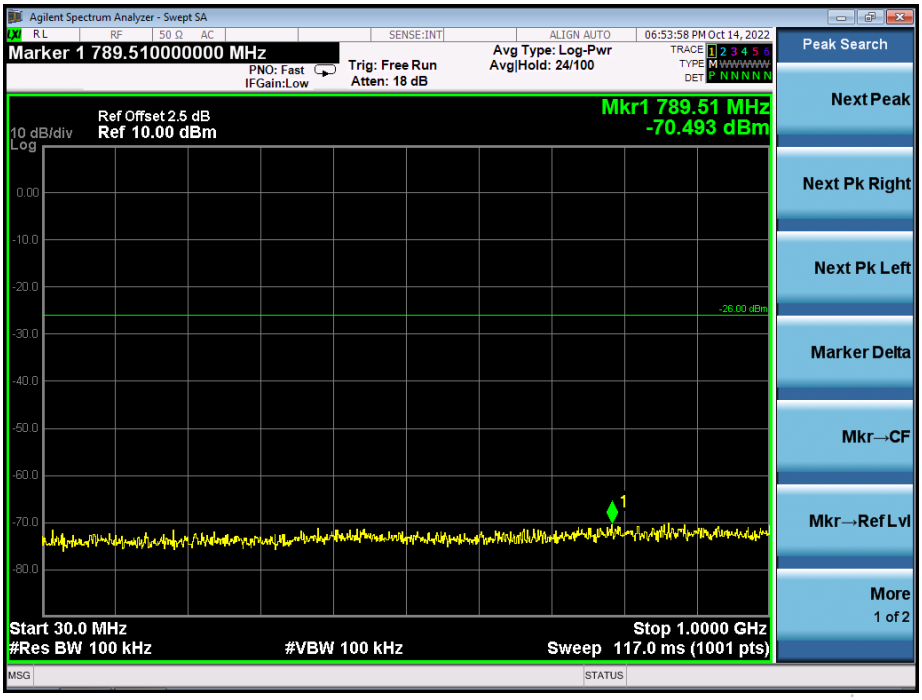


CH 78- Frequency Band 5 (2496.5 MHz ≦ f < 12.5 GHz)

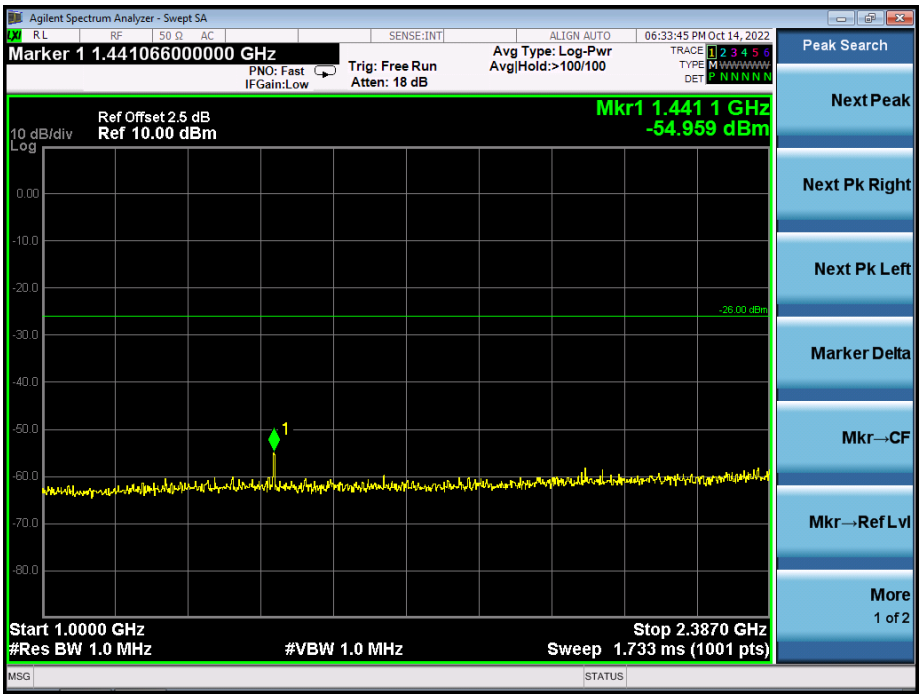


Temperature:	25°C		
Humidity:	55 % RH	Test Voltage	DC 5V
Operation Mode:	π/4-DQPSK ; Normal Voltage		

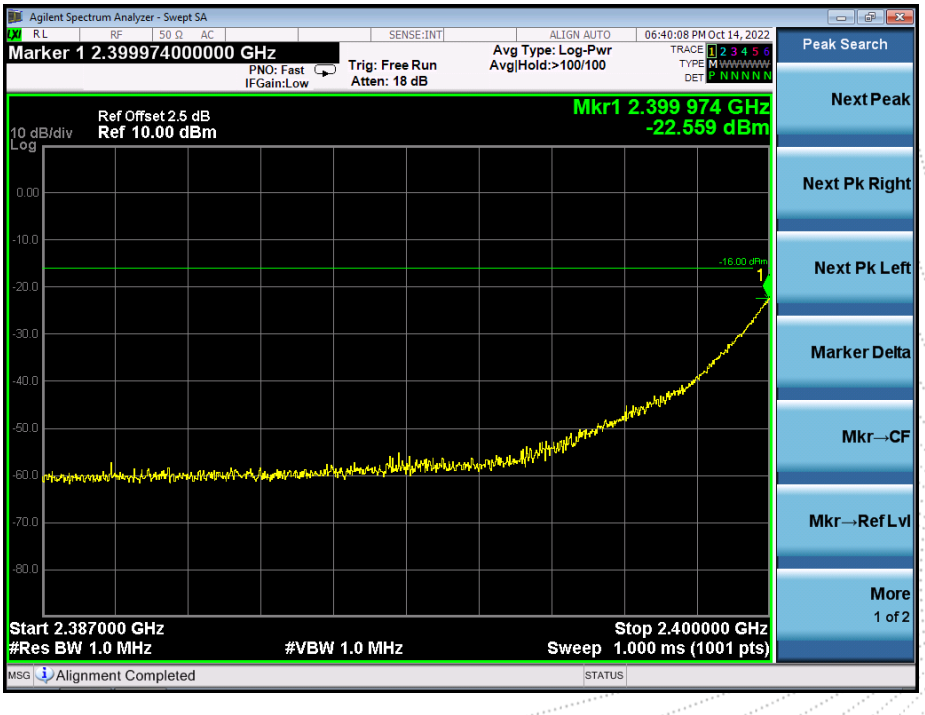
CH 00- Frequency Band 1 (30 MHz ≦ f ≦ 1000 MHz)



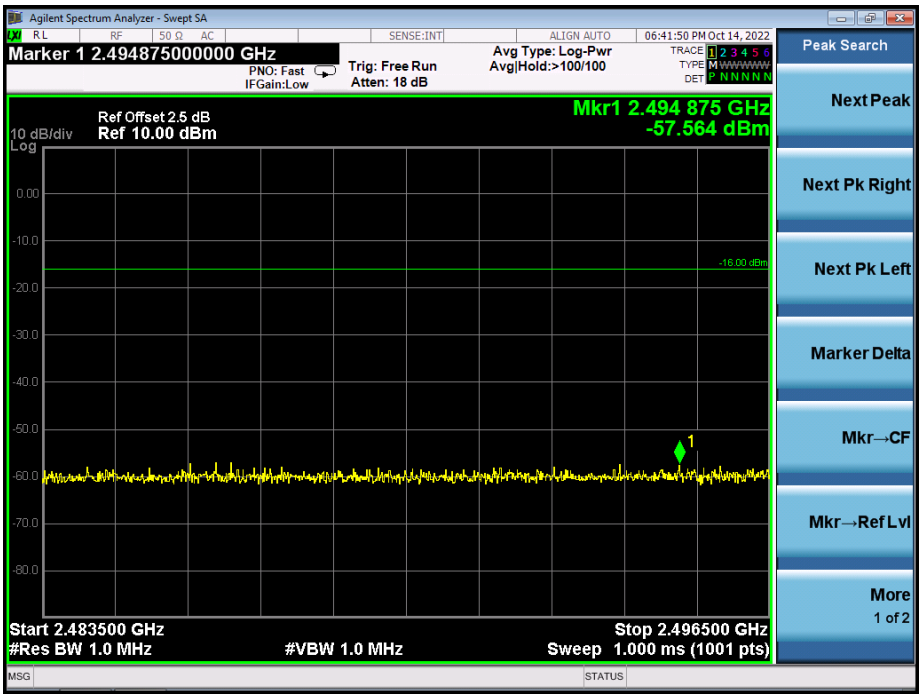
CH 00- Frequency Band 2 (1000 MHz < f ≦ 2387 MHz)



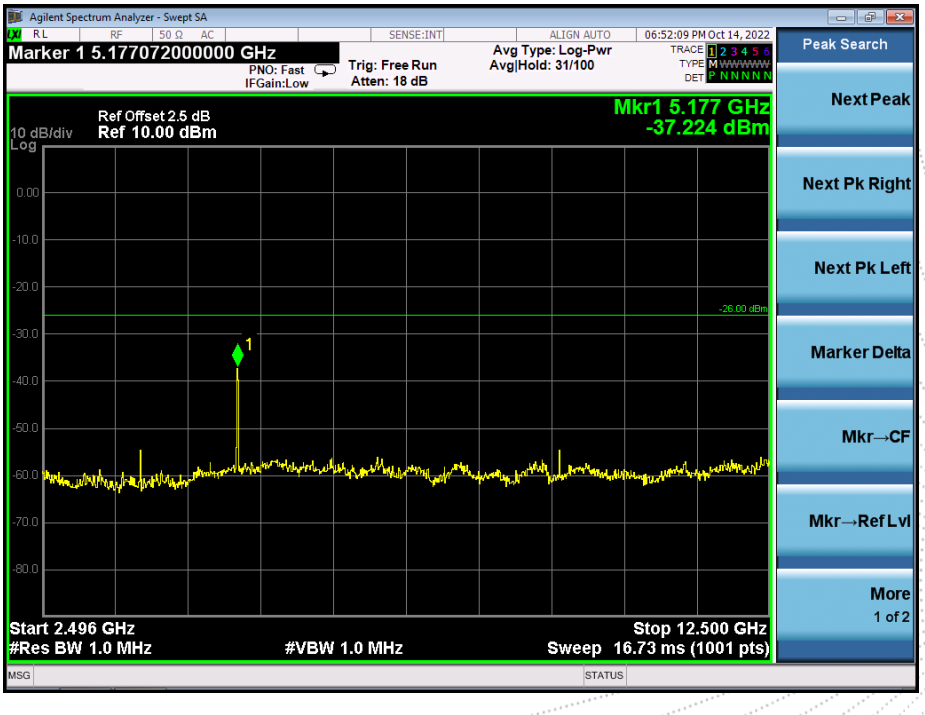
CH 00- Frequency Band 3 (2387 MHz < f ≦ 2400 MHz)



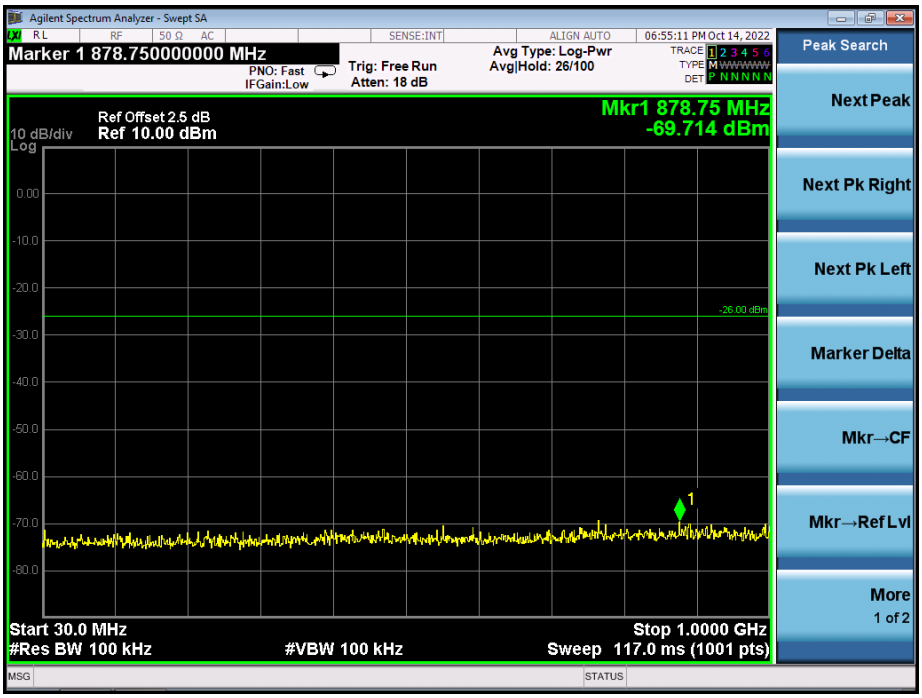
CH 00- Frequency Band 4 (2483.5 MHz ≦ f < 2496.5 MHz)



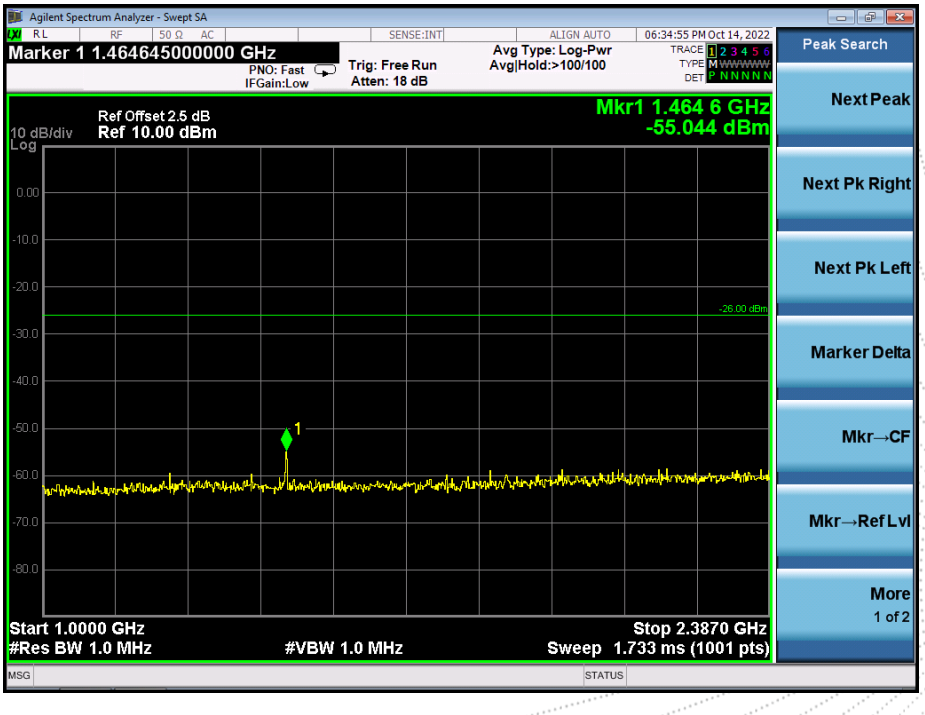
CH 00- Frequency Band 5 (2496.5 MHz ≦ f < 12.5 GHz)



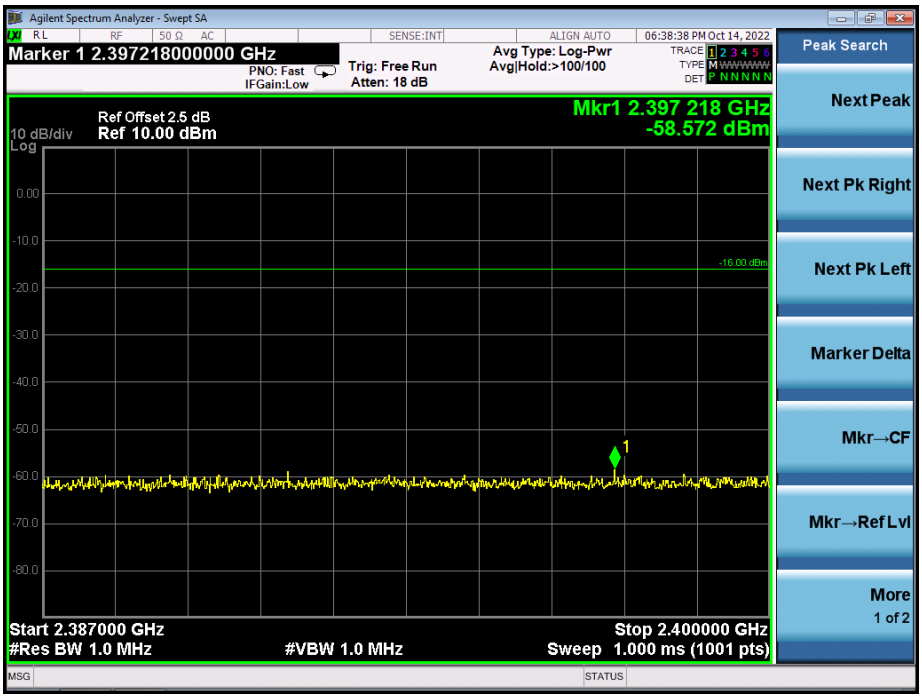
CH 39- Frequency Band 1 (30 MHz ≦ f ≦ 1000 MHz)



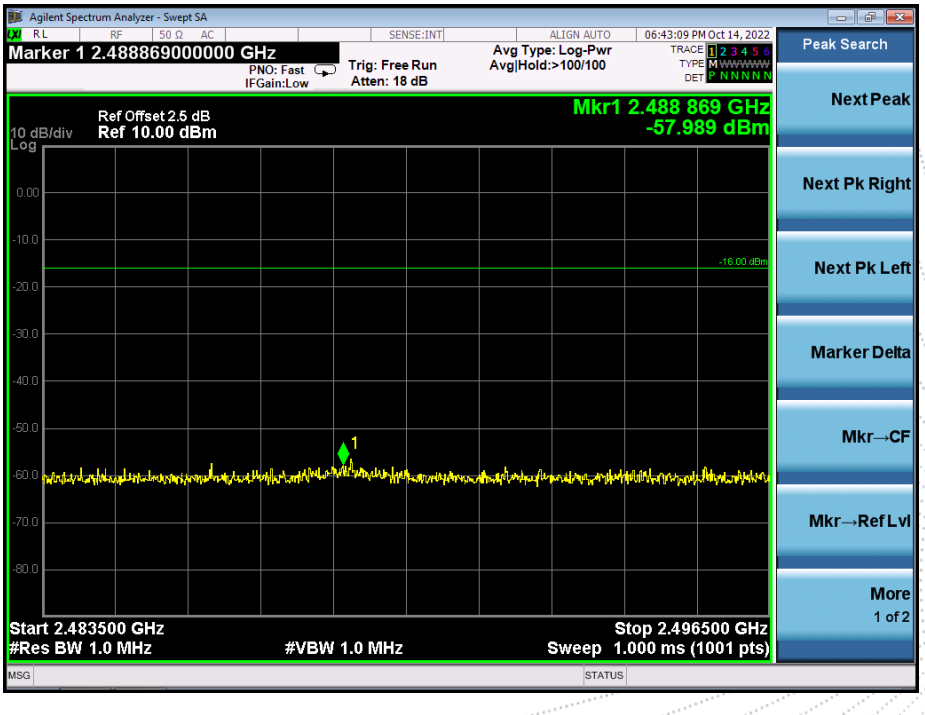
CH 39- Frequency Band 2 (1000 MHz < f ≦ 2387 MHz)



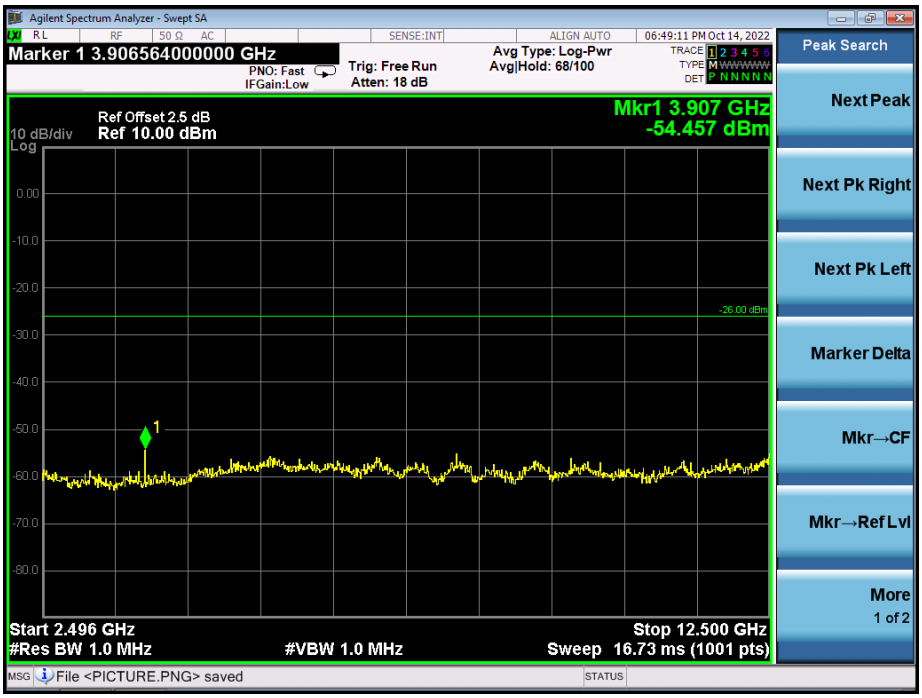
CH 39- Frequency Band 3 (2387 MHz < f ≦ 2400 MHz)



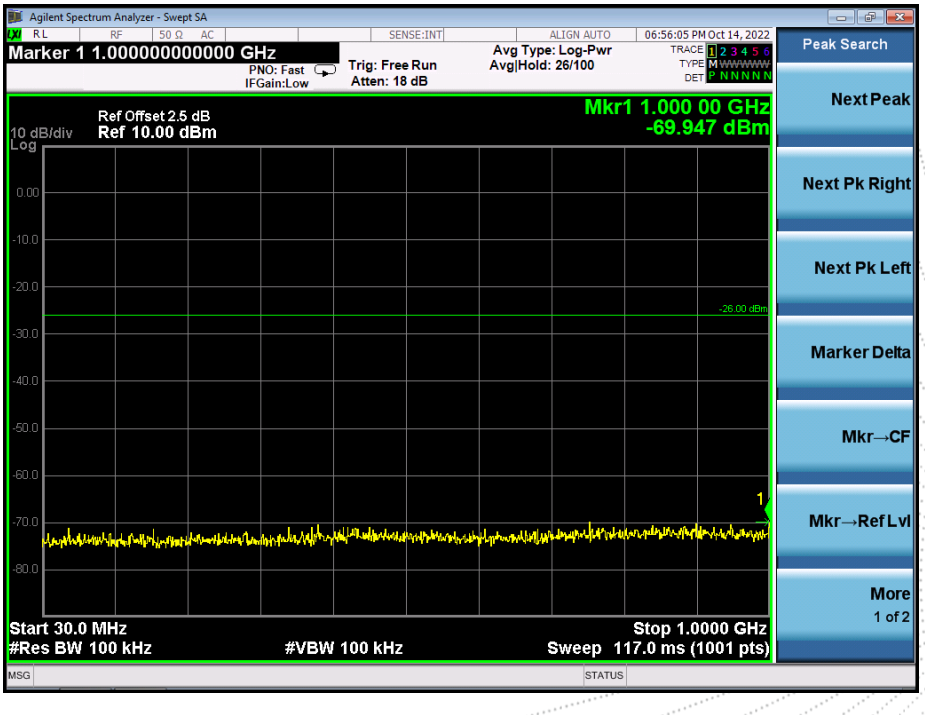
CH 39- Frequency Band 4 (2483.5 MHz ≦ f < 2496.5 MHz)



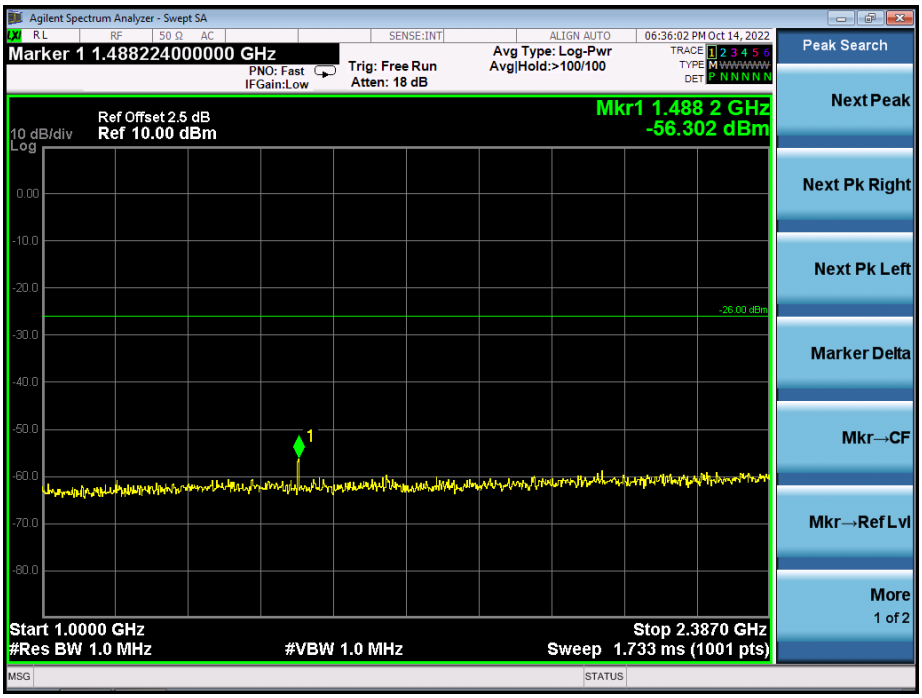
CH 39- Frequency Band 5 (2496.5 MHz ≦ f < 12.5 GHz)



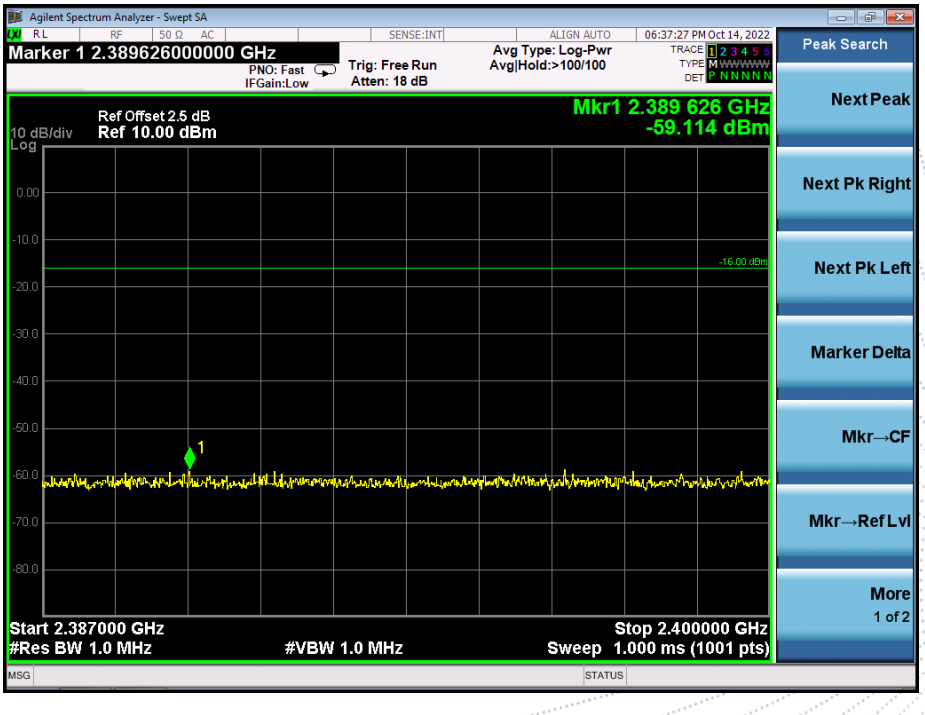
CH 78- Frequency Band 1 (30 MHz ≦ f ≦ 1000 MHz)



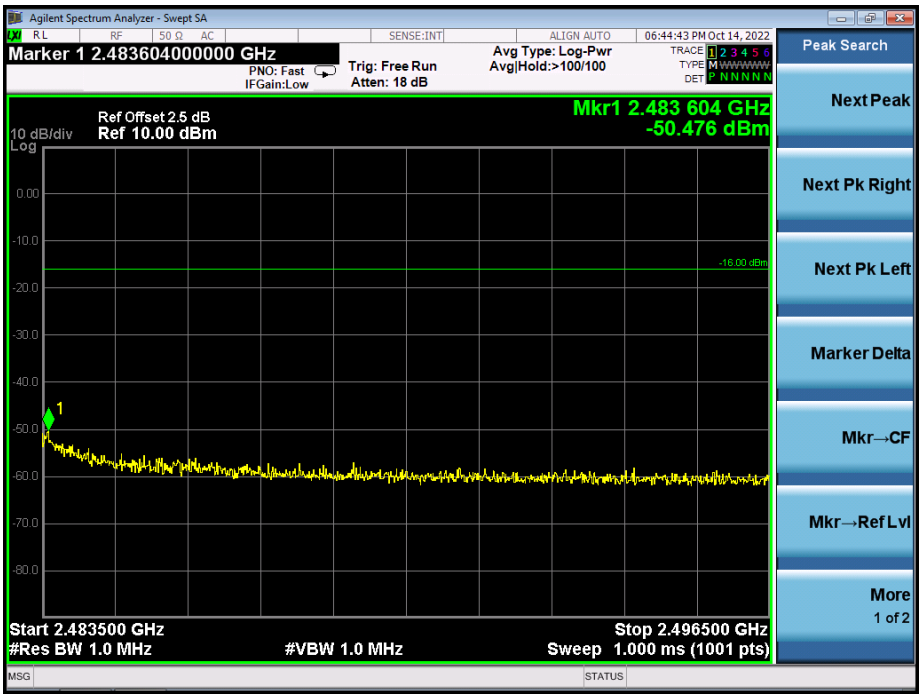
CH 78- Frequency Band 2 (1000 MHz < f ≦ 2387 MHz)



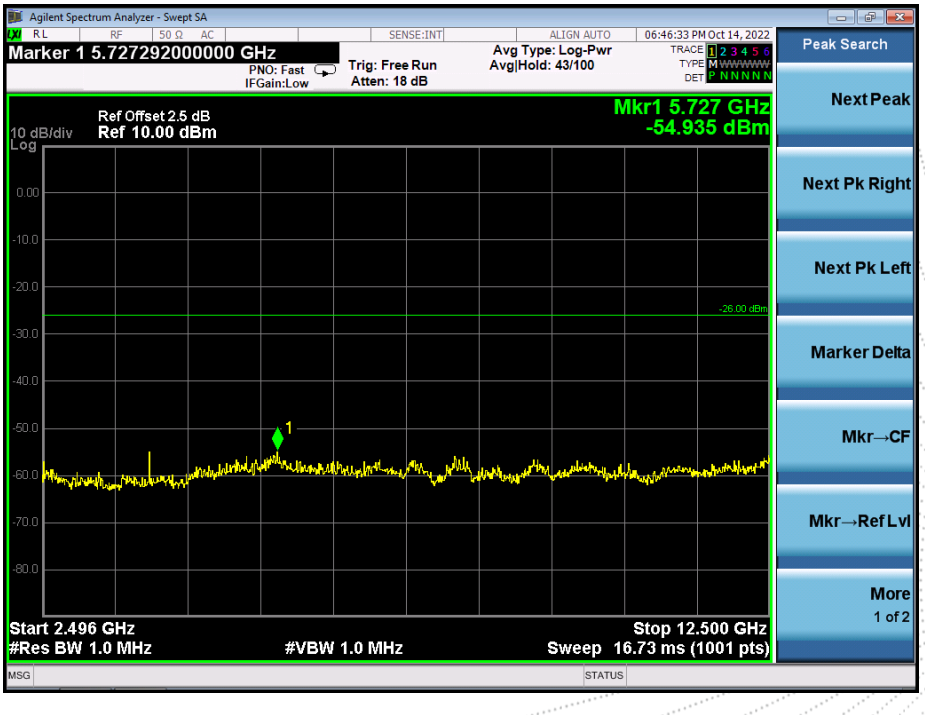
CH 78- Frequency Band 3 (2387 MHz < f ≦ 2400 MHz)



CH78- Frequency Band 4 (2483.5 MHz ≦ f < 2496.5 MHz)

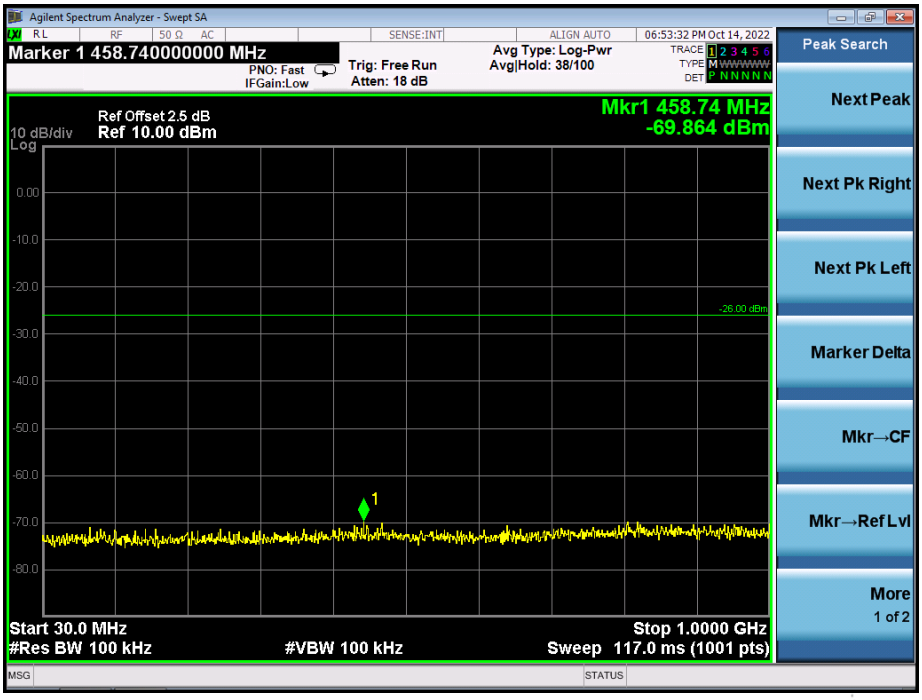


CH 78- Frequency Band 5 (2496.5 MHz ≦ f < 12.5 GHz)



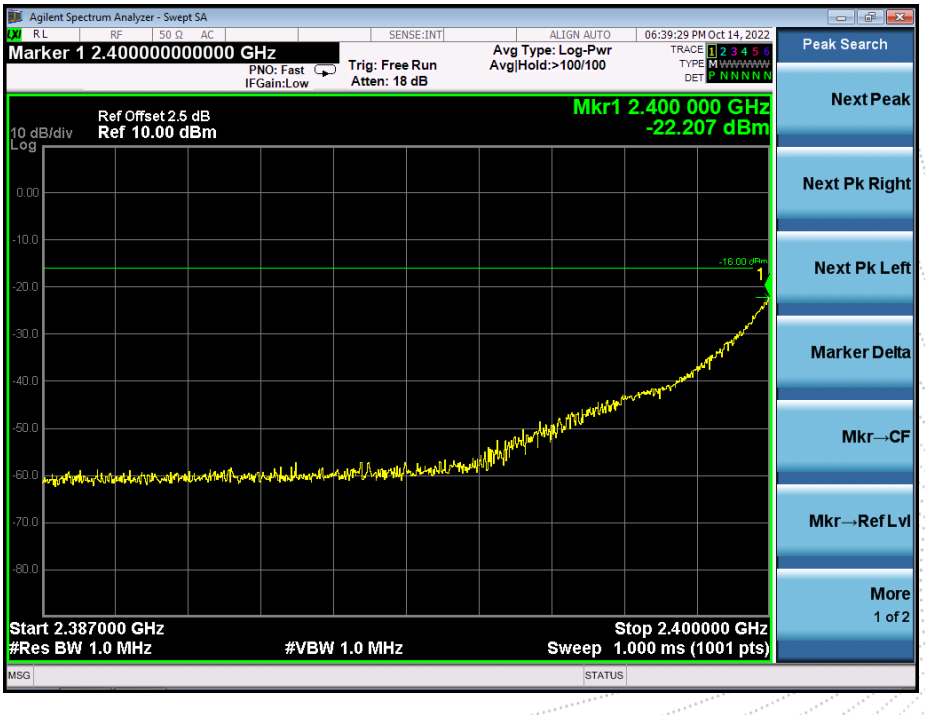
Temperature:	25°C		
Humidity:	55 % RH	Test Voltage	DC 5V
Operation Mode:	8DPSK ; Normal Voltage		

CH 00- Frequency Band 1 (30 MHz ≦ f ≦ 1000 MHz)

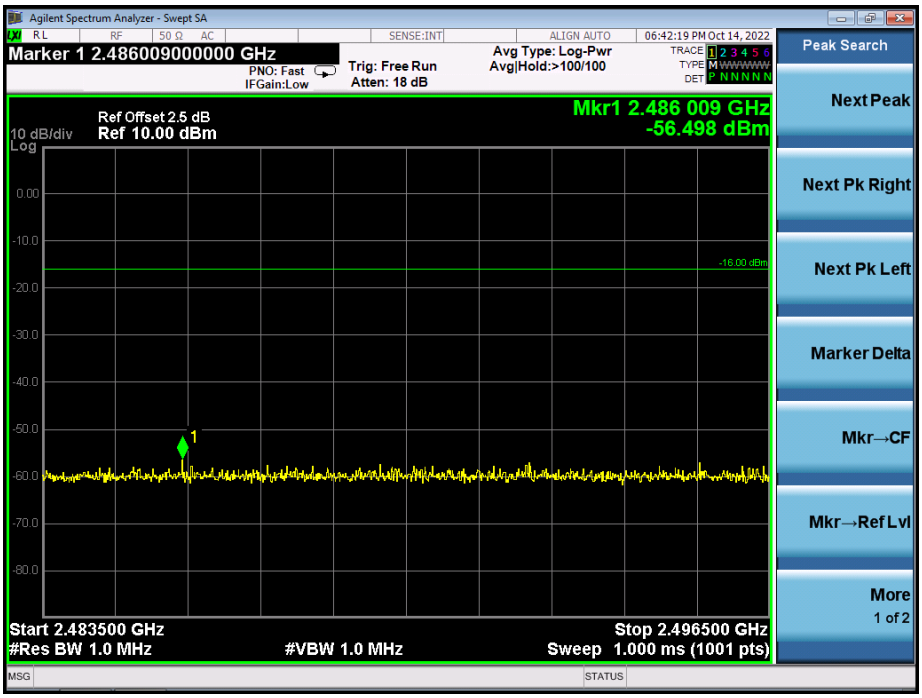


CH 00- Frequency Band 2 (1000 MHz < f ≦ 2387 MHz)

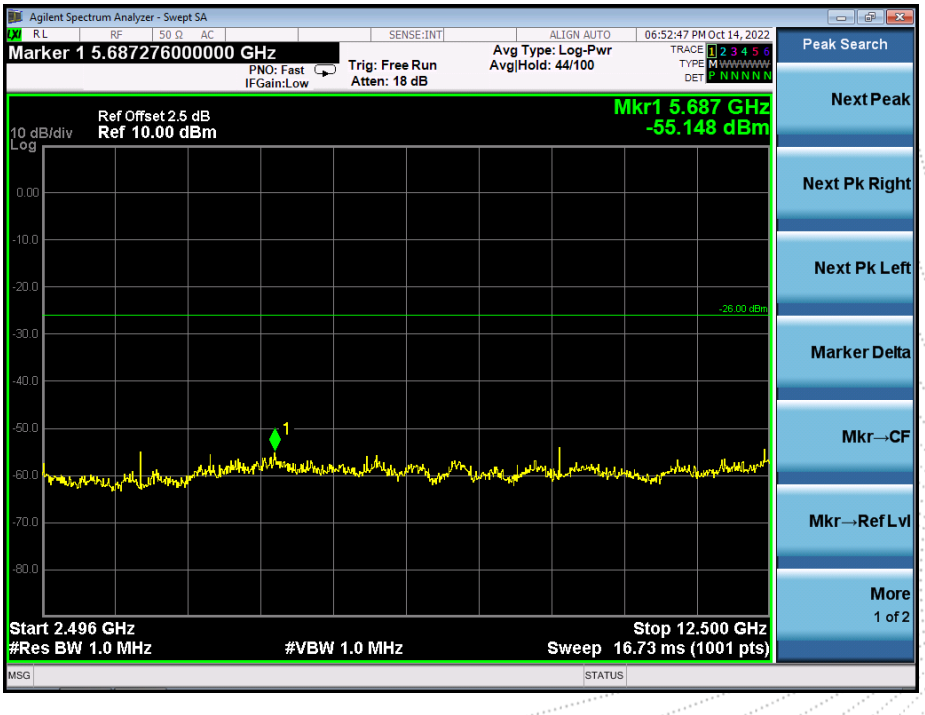
CH 00- Frequency Band 3 (2387 MHz < f ≦ 2400 MHz)



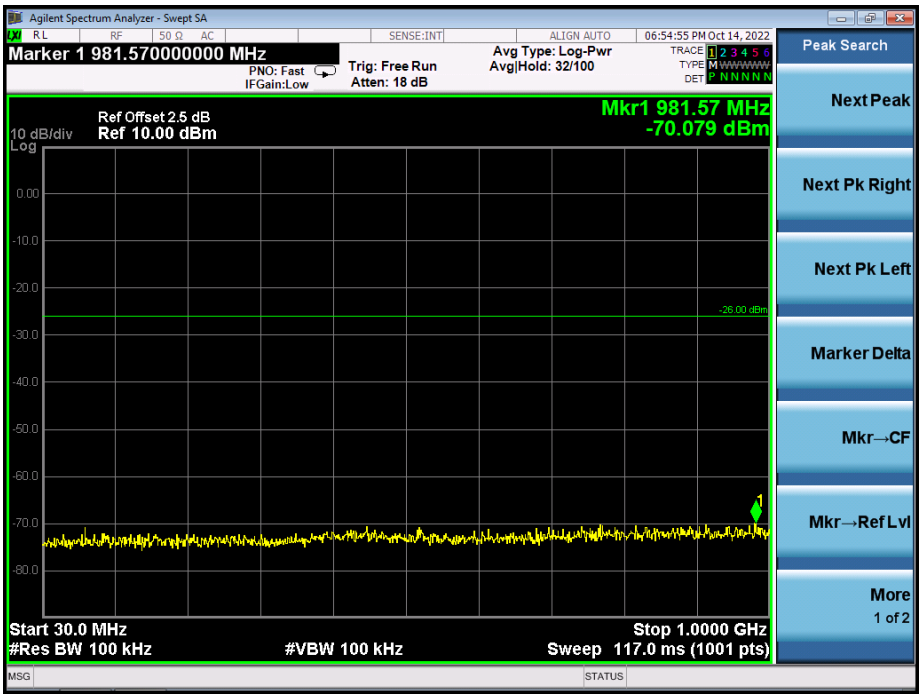
CH 00- Frequency Band 4 (2483.5 MHz ≦ f < 2496.5 MHz)



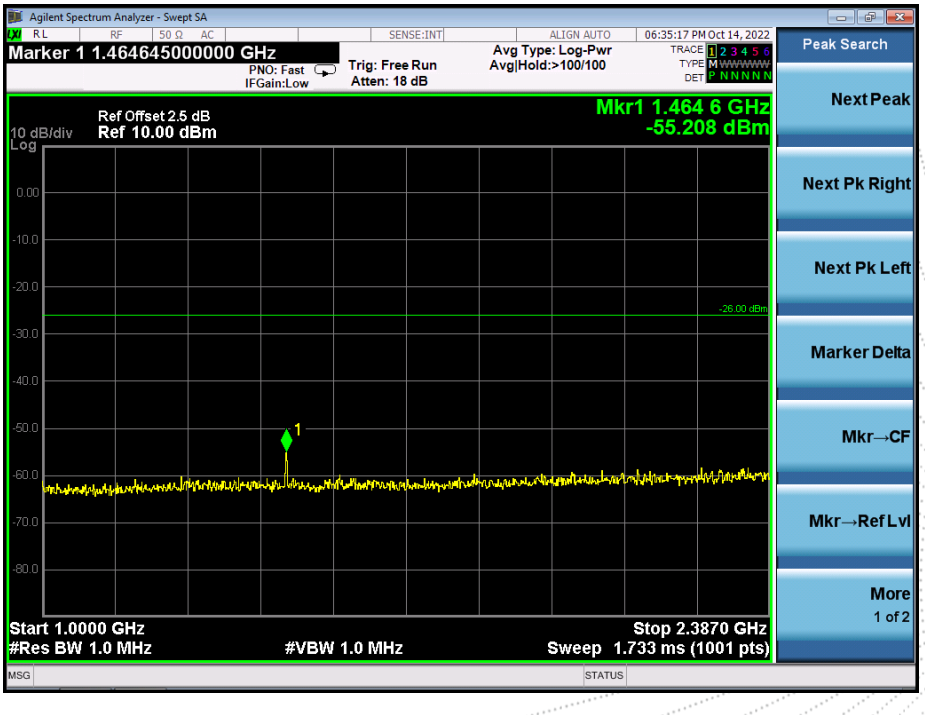
CH 00- Frequency Band 5 (2496.5 MHz ≦ f < 12.5 GHz)



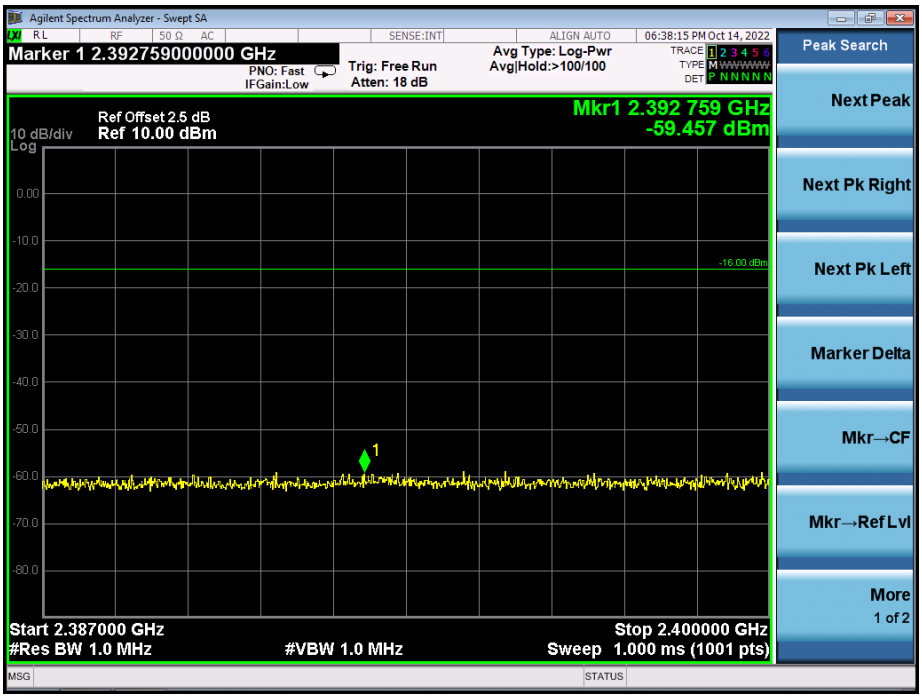
CH 39- Frequency Band 1 (30 MHz ≦ f ≦ 1000 MHz)



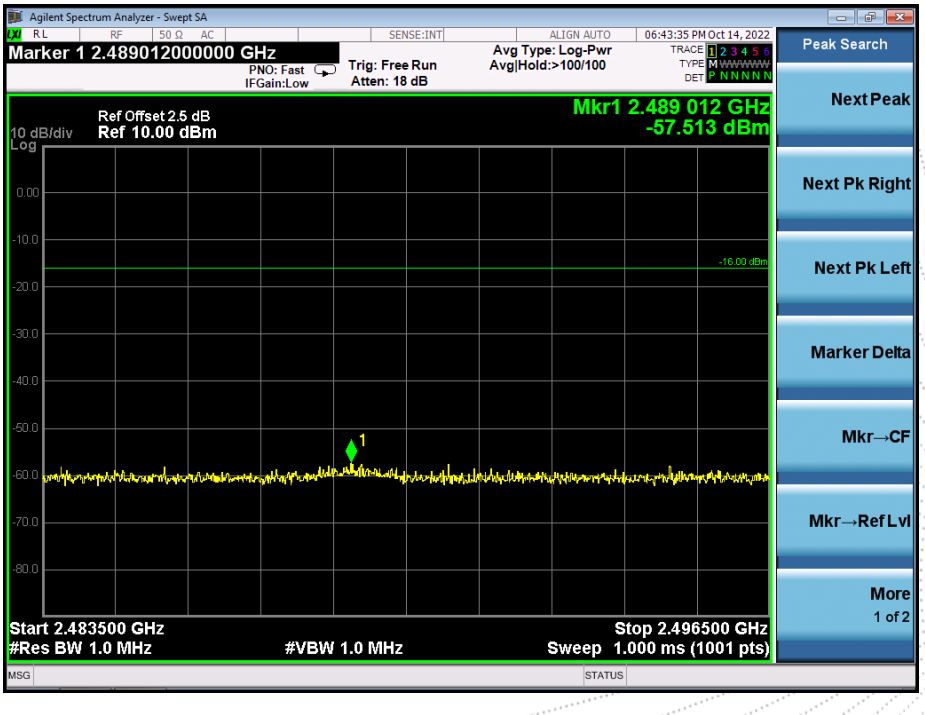
CH 39- Frequency Band 2 (1000 MHz < f ≦ 2387 MHz)



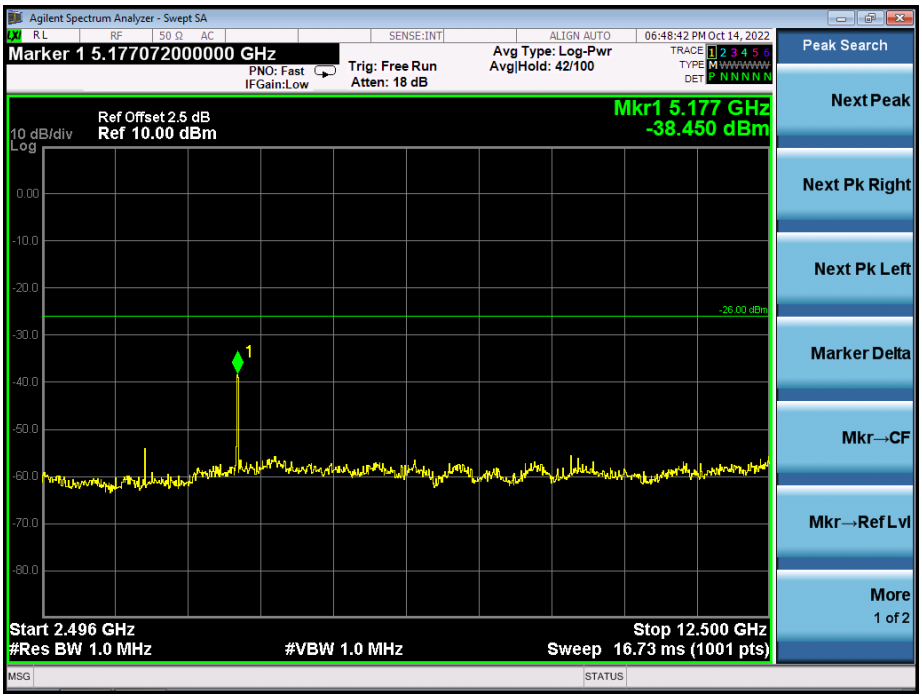
CH 39- Frequency Band 3 (2387 MHz < f ≦ 2400 MHz)



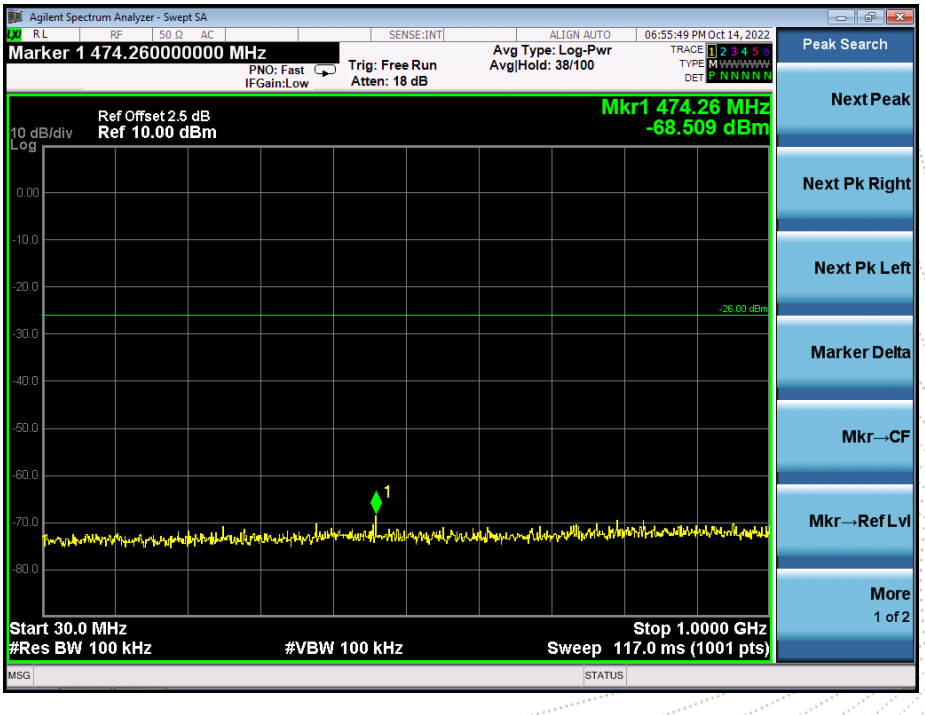
CH 39- Frequency Band 4 (2483.5 MHz ≦ f < 2496.5 MHz)



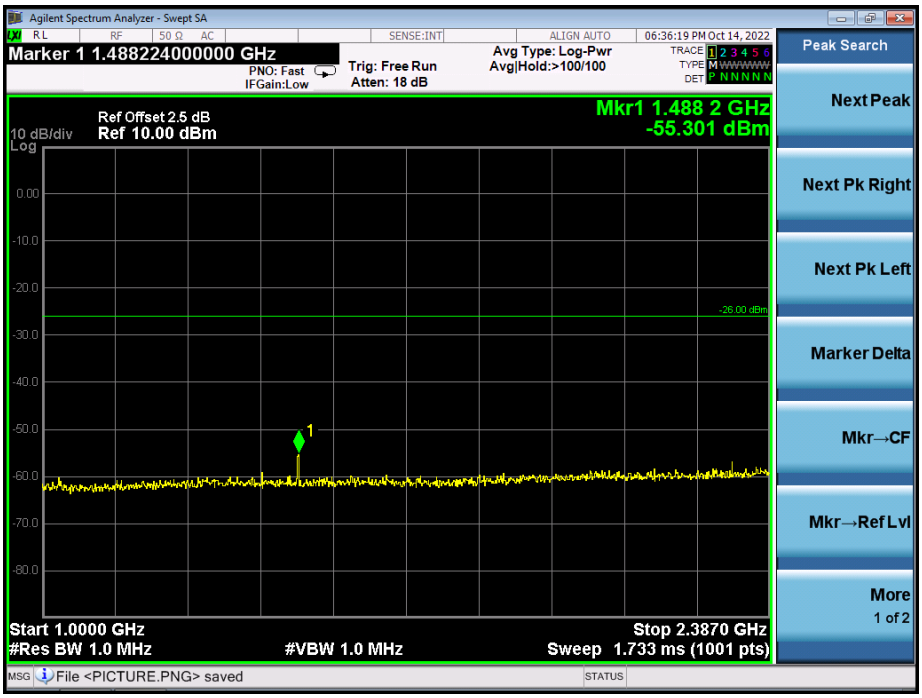
CH 39- Frequency Band 5 (2496.5 MHz ≦ f < 12.5 GHz)



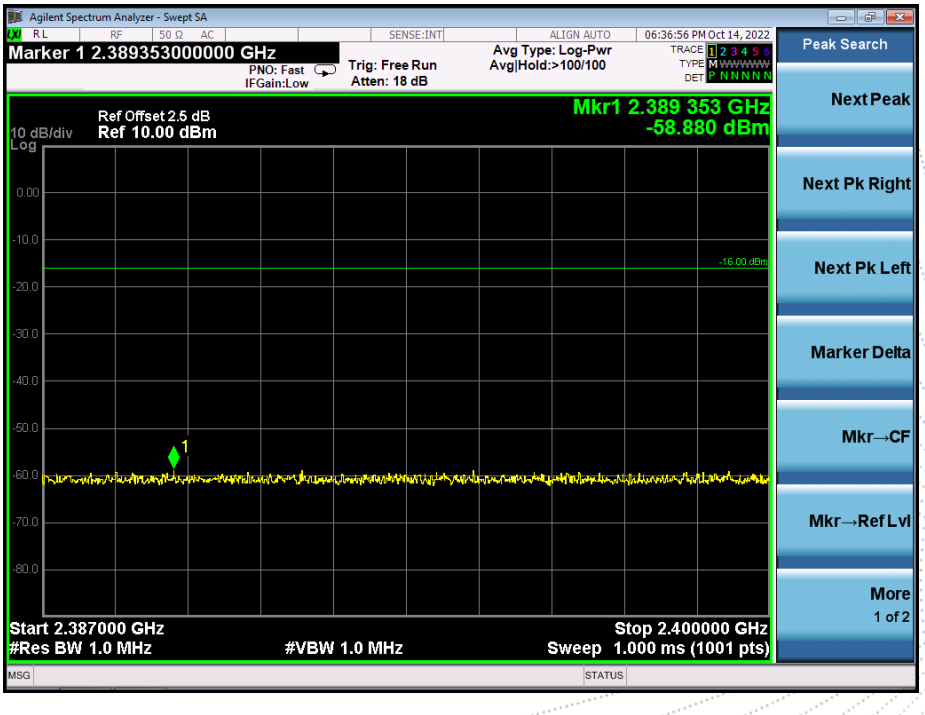
CH 78- Frequency Band 1 (30 MHz ≦ f ≦ 1000 MHz)



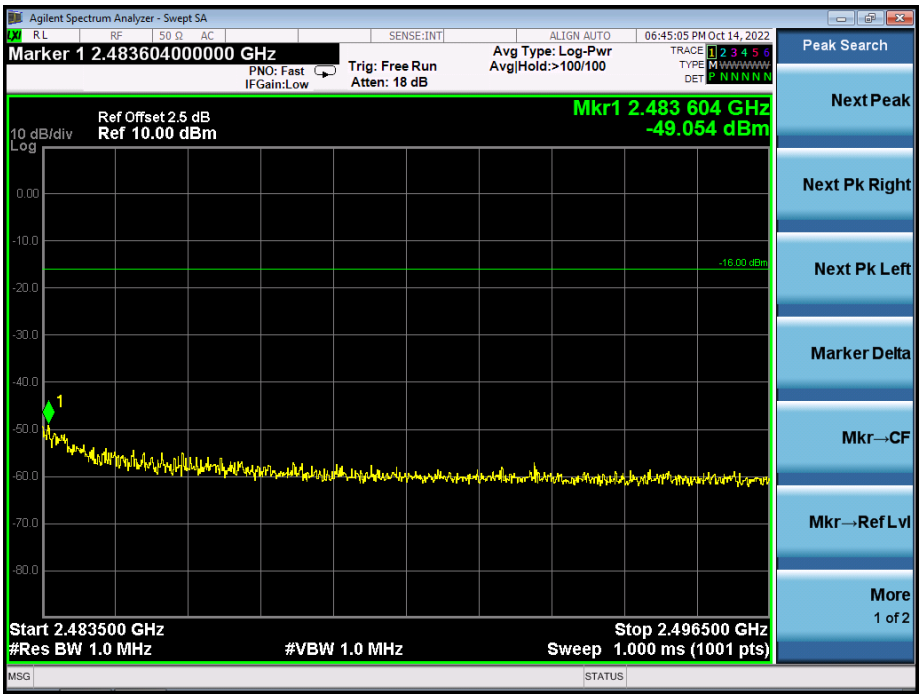
CH 78- Frequency Band 2 (1000 MHz < f ≦ 2387 MHz)



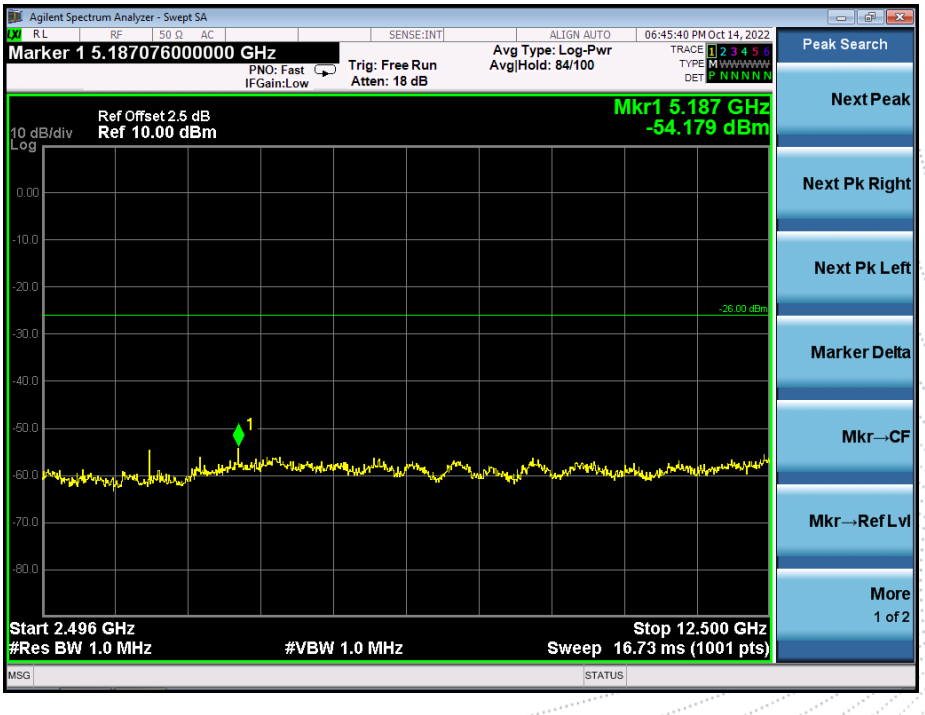
CH 78- Frequency Band 3 (2387 MHz < f ≦ 2400 MHz)



CH78- Frequency Band 4 (2483.5 MHz ≦ f < 2496.5 MHz)

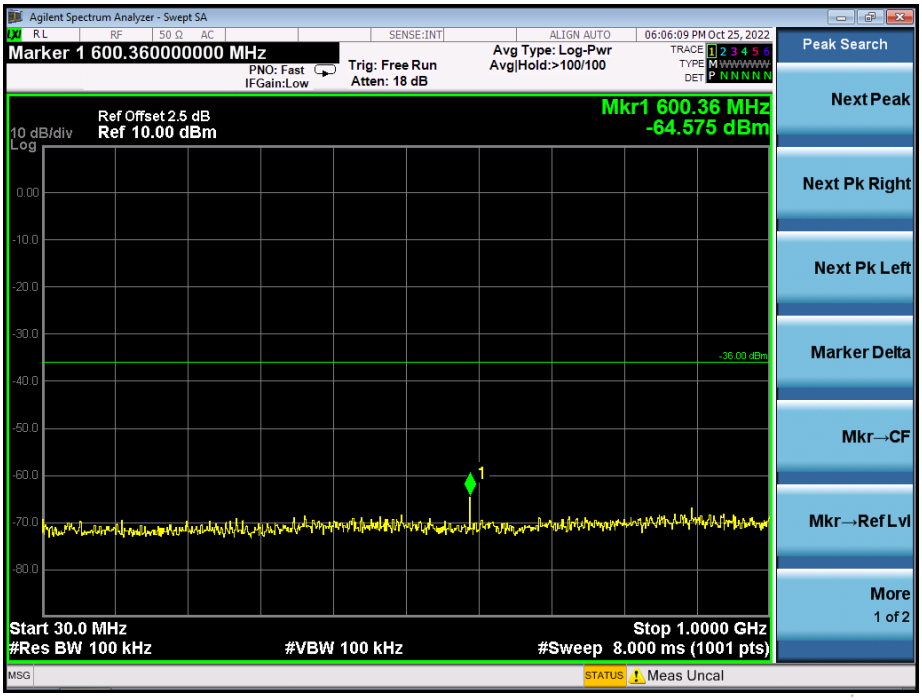


CH 78- Frequency Band 5 (2496.5 MHz ≦ f < 12.5 GHz)

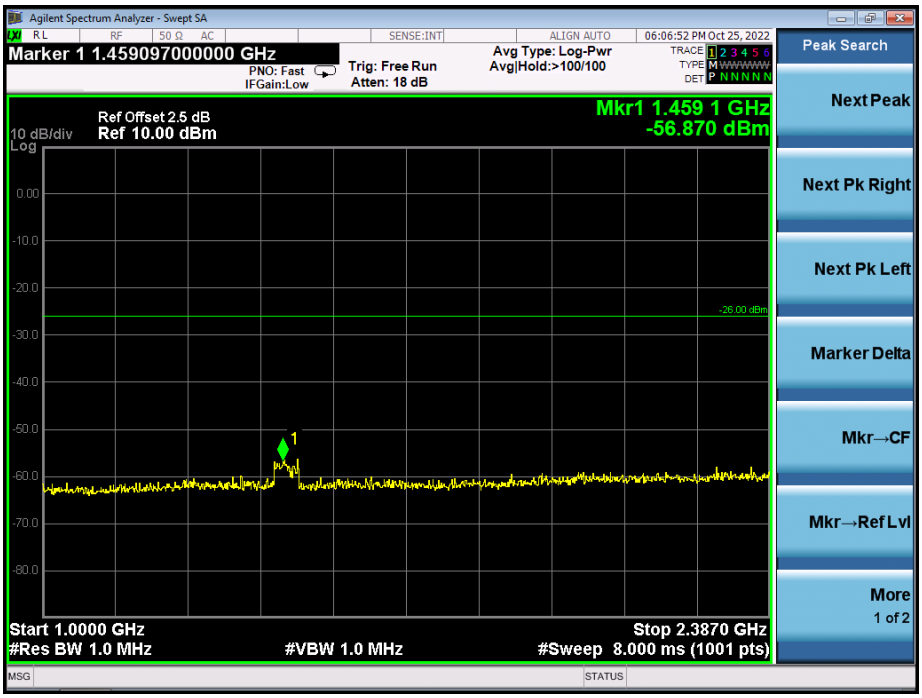


Temperature:	25°C		
Humidity:	55 % RH	Test Voltage	DC 5V
Operation Mode:	Hoping Mode; Normal Voltage		

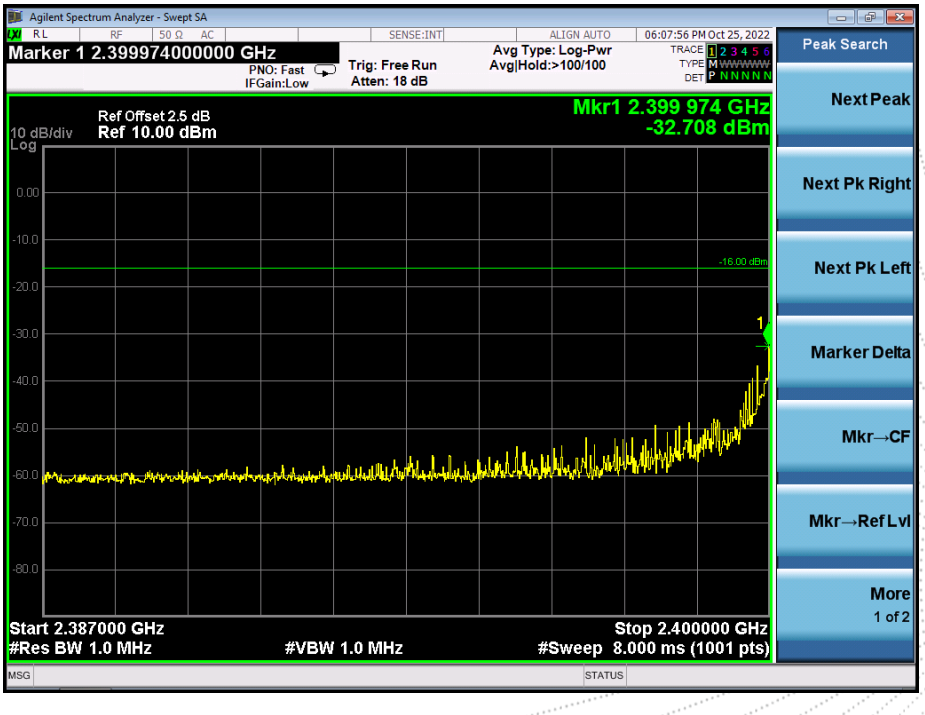
Frequency Band 1 (30 MHz ≦ f ≦ 1000 MHz)



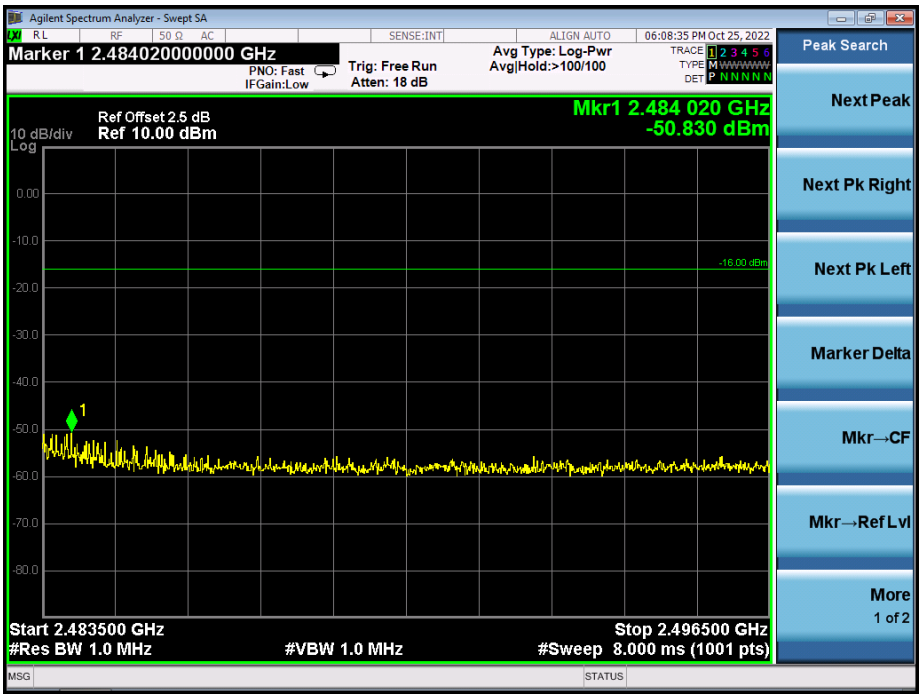
Frequency Band 2 (1000 MHz < f ≦ 2387 MHz)



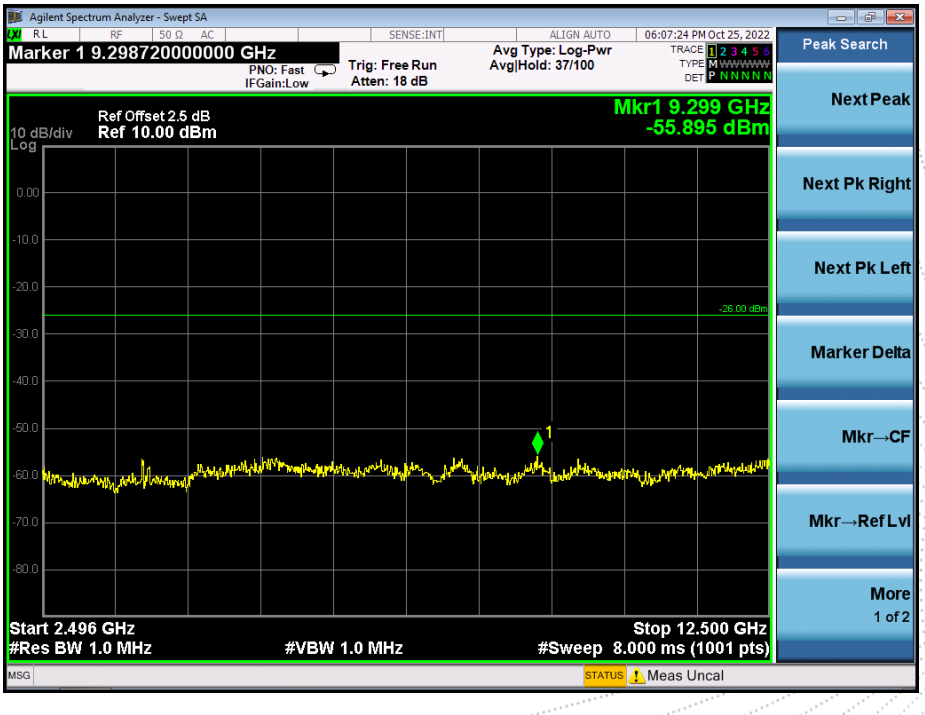
Frequency Band 3 (2387 MHz < f ≦ 2400 MHz)



Frequency Band 4 (2483.5 MHz ≦ f < 2496.5 MHz)

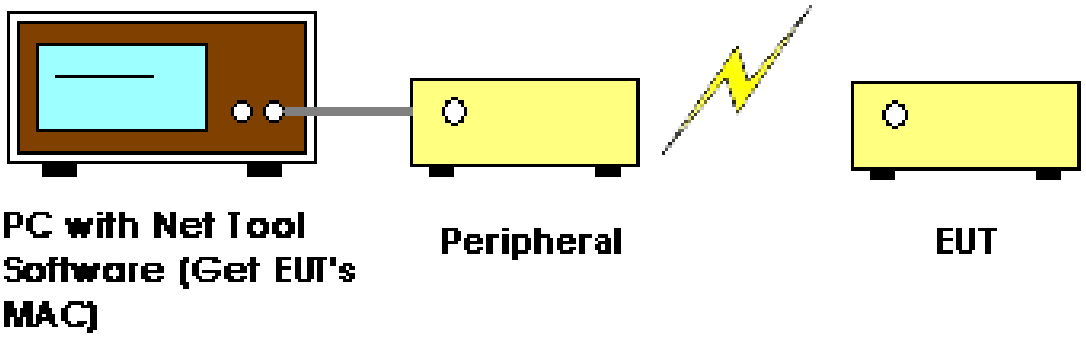


Frequency Band 5 (2496.5 MHz ≦ f < 12.5 GHz)



11. Radio Interference Prevention Capability Measurement

11.1 Block Diagram Of Test Setup



11.2 Limit

Item	Limits
Identification code	≧48 bits

11.3 Measuring Instruments And Setting

Item	Limits
MAC IP List	MAC Scan

11.4 Test Procedure

1. In the case that the EUT has the function of automatically transmitting the identification code: a. Transmit the predetermined identification codes form EUT. b. Check the transmitted identification codes with the demodulator.
2. In the case of receiving the identification ocde:
a. Transmit the predetermined identification codes form the counterpart.
b . Check if communication is normal.
c. Transmit the signals other than predetermined ID codes form the counterpart.
d. check if the EUT stops the transmission, or if it displays that idnetification codes are different from the predetermined ones.

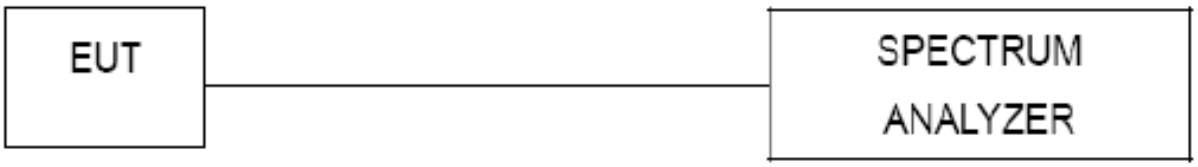
11.5 Test Result

Temperature:	25°C		
Humidity:	55 % RH	Test Voltage	DC 5V
Operation Mode:	GFSK		

Bluetooth Device Address: 65-16-12-BC-C7-93

12. Dwell Time

12.1 Block Diagram Of Test Setup



12.2 Limit

Item	Limits
Hopping Freq. Dwell Time	≦ 0.4 sec (In 0.4 sec × spreading rate)

12.3 Measuring Instruments And Setting

Please refer to section 5 in this report. The following table is the setting of the spectrum analyzer.

Spectrum Parameter	Setting
Attenuation	Auto
Span Frequency	0 Hz
RB	1 MHz
VB	1 MHz
Detector	Peak
Trace	Max Hold
Sweep	Continuous

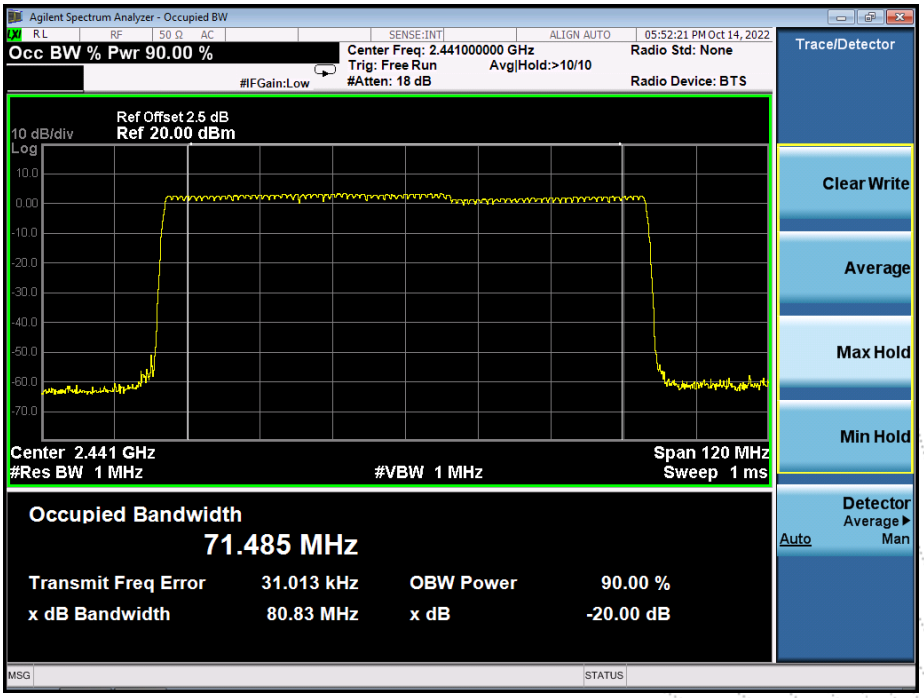
12.4 Test Procedure

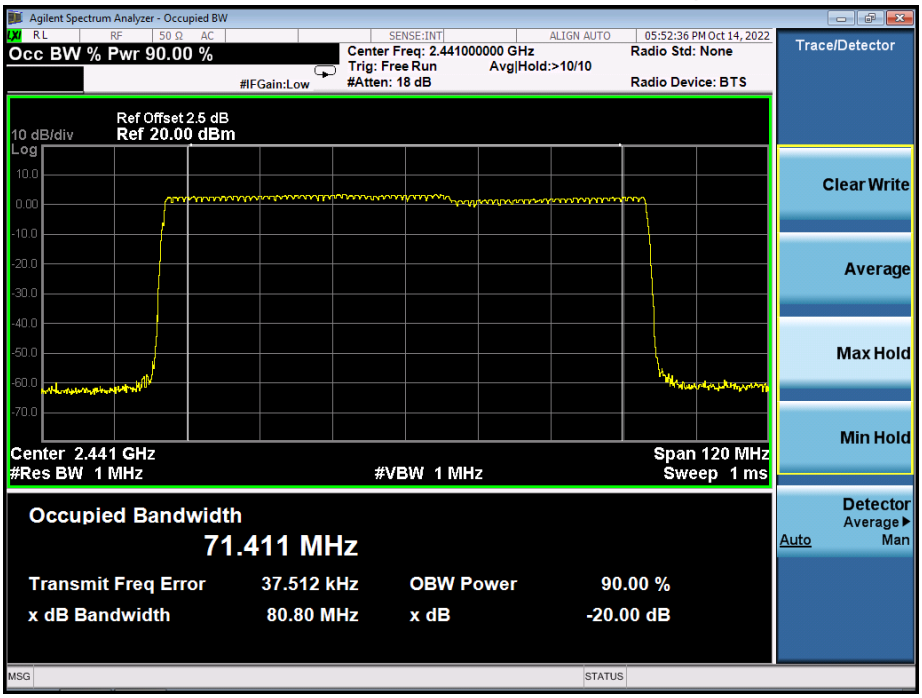
1. The transmitter output (antenna port) was connected to the spectrum analyzer
2. Set RBW of spectrum analyzer to 1MHz and VBW to 1MHz.
3. Use a video trigger with the trigger level set to enable triggering only on full pulses.
4. Sweep Time is more than once pulse time.
5. Set the center frequency on any frequency would be measure and set the frequency span to zero span.
6. Measure the maximum time duration of one single pulse.
7. Set the EUT for DH5, DH3 and DH1 packet transmitting.
8. Measure the maximum time duration of one single pulse.
9. Dwell time = [spreading rate/79] x duty-cycle x 0.4 seconds. (to be determined for each mode, DH1, DH3, DH5)

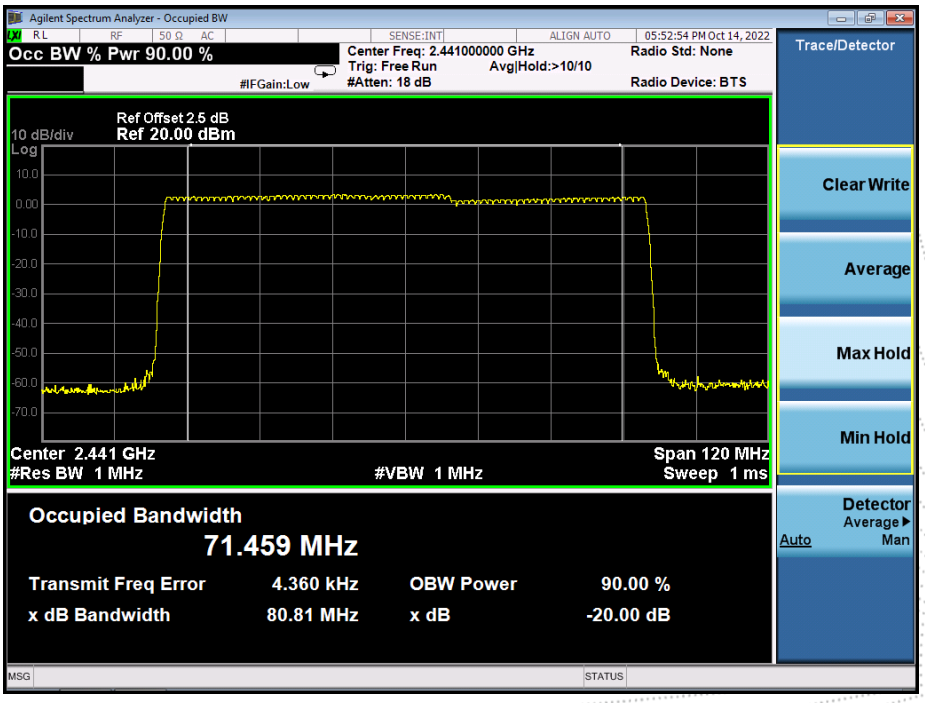
12.5 Test Result

Temperature:	25°C		
Humidity:	55 % RH	Test Voltage	DC 5V
Test Mode:	GFSK		

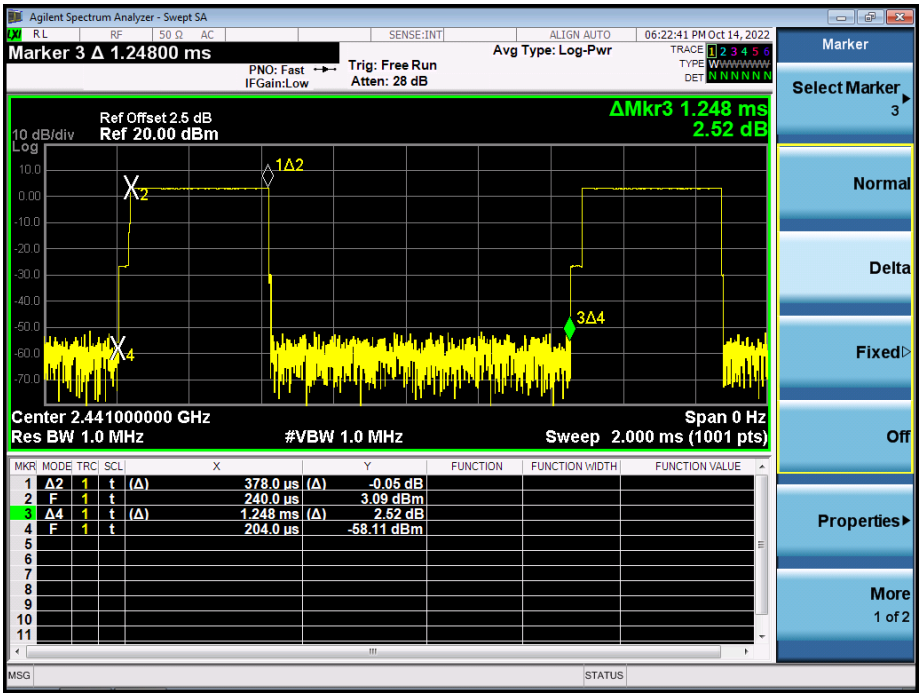
Data Packet	90% Spread BW	On time	burst cycle	Duty cycle	Dwell Time	Limits
	(MHz)	(ms)	(ms)	(%)	(s)	(s)
1DH1	71.485	0.378	1.248	0.303	0.110	0.400
1DH3	71.411	1.635	2.510	0.651	0.236	0.400
1DH5	71.459	2.864	3.744	0.765	0.277	0.400



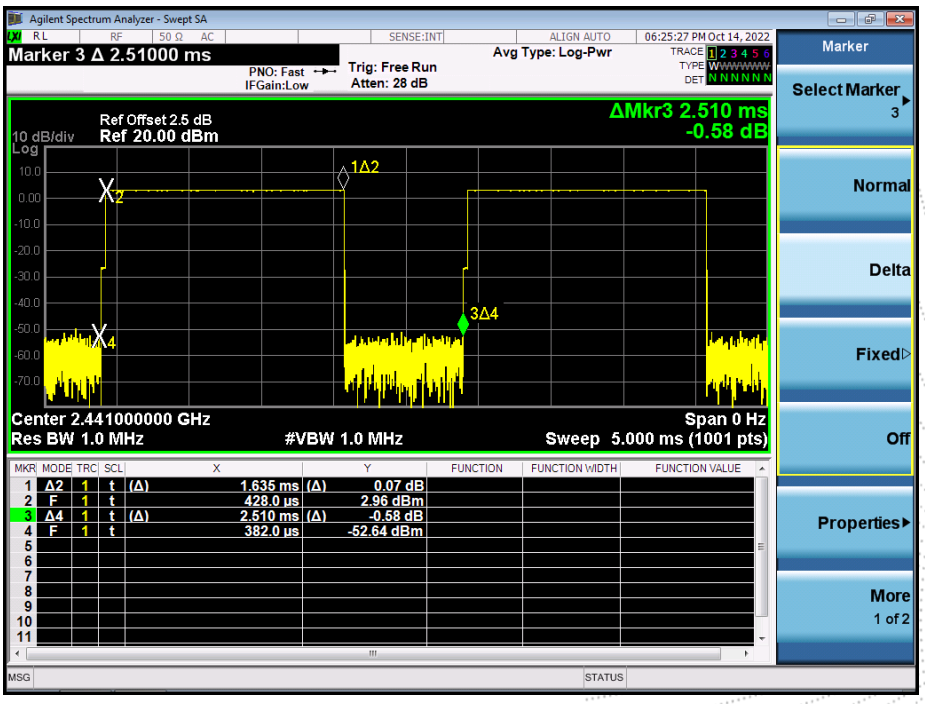




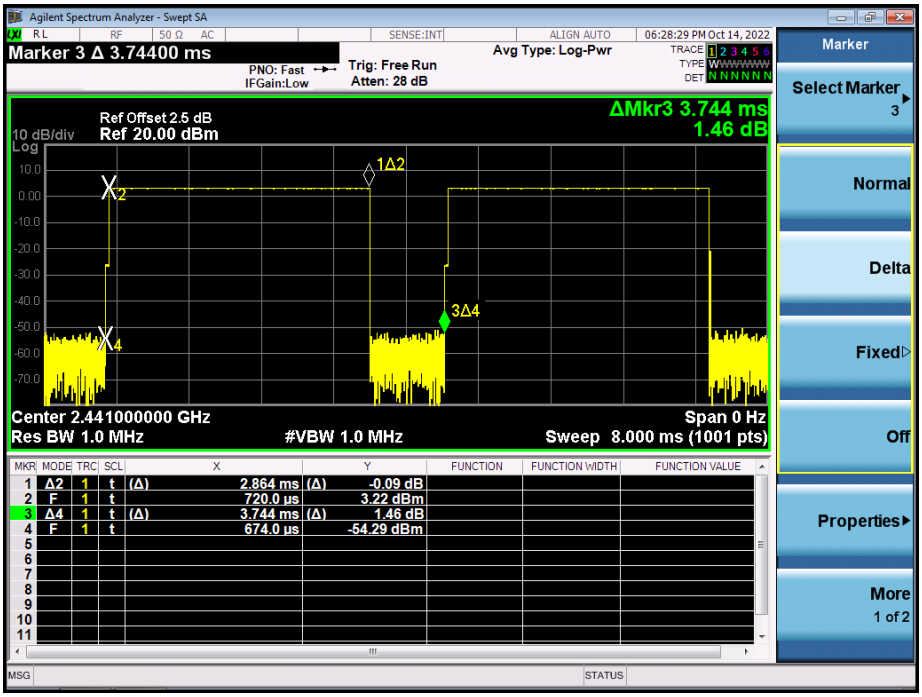
Duty-cycle = [on time/total time] x 100%
Dwell time = [spreading rate/79] x duty-cycle x 0.4 seconds


Agilent Spectrum Analyzer - Swept SA
Marker 3 Δ 1.24800 ms
PNO: Fast
IFGain:Low
Trig: Free Run
Atten: 28 dB
Avg Type: Log-Pwr
06:22:41 PM Oct 14, 2022
Ref Offset 2.5 dB
10 dB/div
Ref 20.00 dBm
ΔMkr3 1.248 ms
2.52 dB
Center 2.441000000 GHz
Res BW 1.0 MHz
#VBW 1.0 MHz
Span 0 Hz
Sweep 2.000 ms (1001 pts)
1 Δ2 378.0 µs (Δ) -0.05 dB
2 F 240.0 µs 3.09 dBm
3 Δ4 1.248 ms (Δ) 2.52 dB
4 F 204.0 µs -58.11 dBm
Marker
Select Marker 3
Normal
Delta
Fixed
Off
Properties
More 1 of 2

1DH1


Agilent Spectrum Analyzer - Swept SA
Marker 3 Δ 2.51000 ms
PNO: Fast
IFGain:Low
Trig: Free Run
Atten: 28 dB
Avg Type: Log-Pwr
06:25:27 PM Oct 14, 2022
Ref Offset 2.5 dB
10 dB/div
Ref 20.00 dBm
ΔMkr3 2.510 ms
-0.58 dB
Center 2.441000000 GHz
Res BW 1.0 MHz
#VBW 1.0 MHz
Span 0 Hz
Sweep 5.000 ms (1001 pts)
1 Δ2 1.635 ms (Δ) 0.07 dB
2 F 428.0 µs 2.96 dBm
3 Δ4 2.510 ms (Δ) -0.58 dB
4 F 382.0 µs -52.64 dBm
Marker
Select Marker 3
Normal
Delta
Fixed
Off
Properties
More 1 of 2

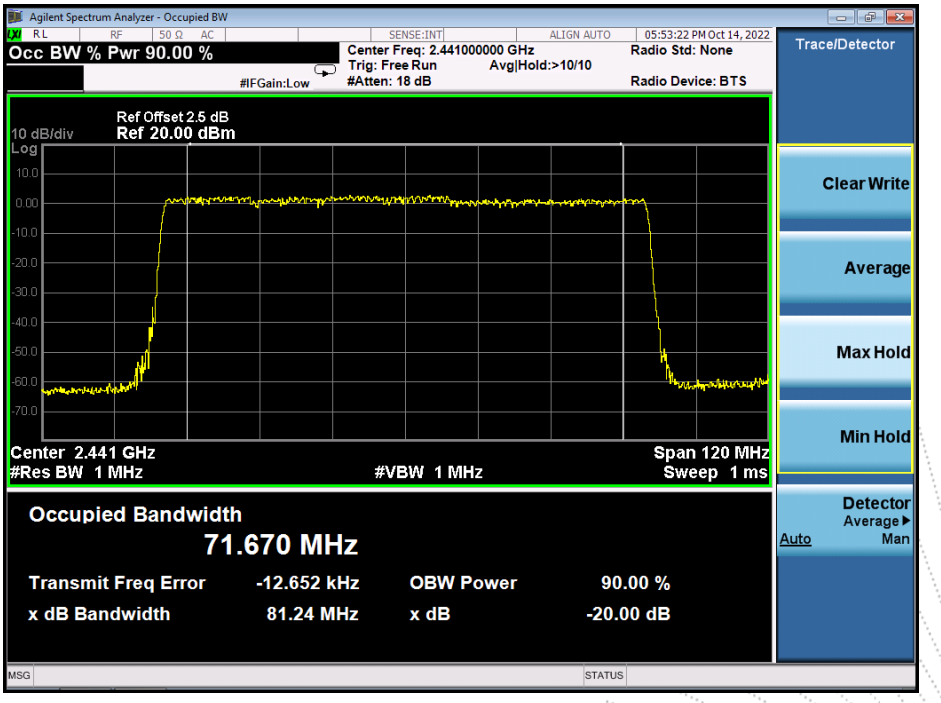
1DH3

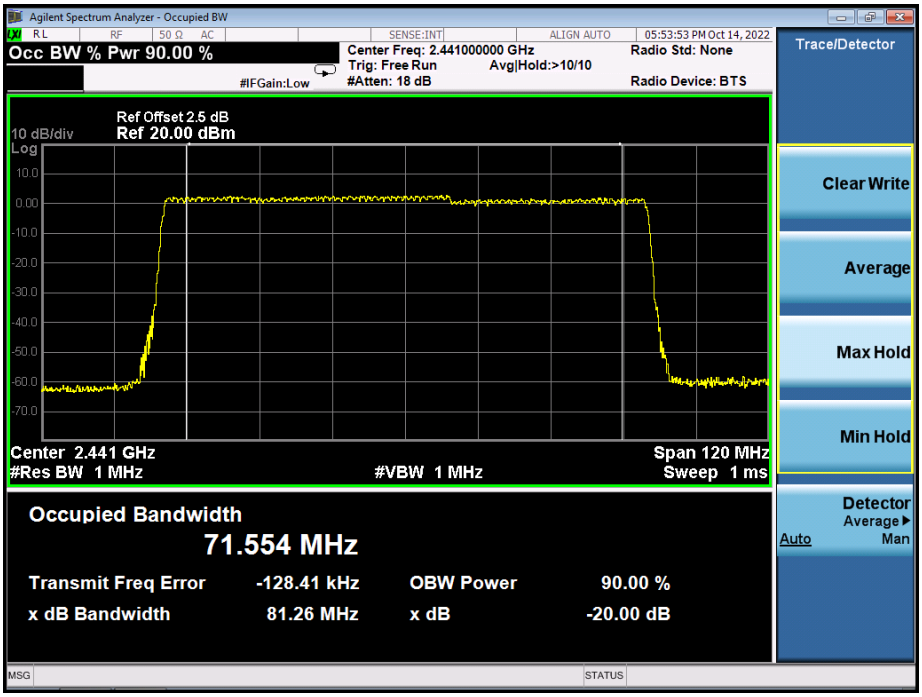

Agilent Spectrum Analyzer - Swept SA
Marker 3 Δ 3.74400 ms
PNO: Fast
IFGain:Low
Trig: Free Run
Atten: 28 dB
Avg Type: Log-Pwr
06:28:29 PM Oct 14, 2022
Ref Offset 2.5 dB
10 dB/div
Log
Ref 20.00 dBm
ΔMkr3 3.744 ms
1.46 dB
Center 2.441000000 GHz
Res BW 1.0 MHz
#VBW 1.0 MHz
Span 0 Hz
Sweep 8.000 ms (1001 pts)
1 Δ2 2.864 ms (Δ) -0.09 dB
2 F 1 t 720.0 µs 3.22 dBm
3 Δ4 1 t (Δ) 3.744 ms (Δ) 1.46 dB
4 F 1 t 674.0 µs -54.29 dBm
Marker
Select Marker
Normal
Delta
Fixed
Off
Properties
More
1 of 2

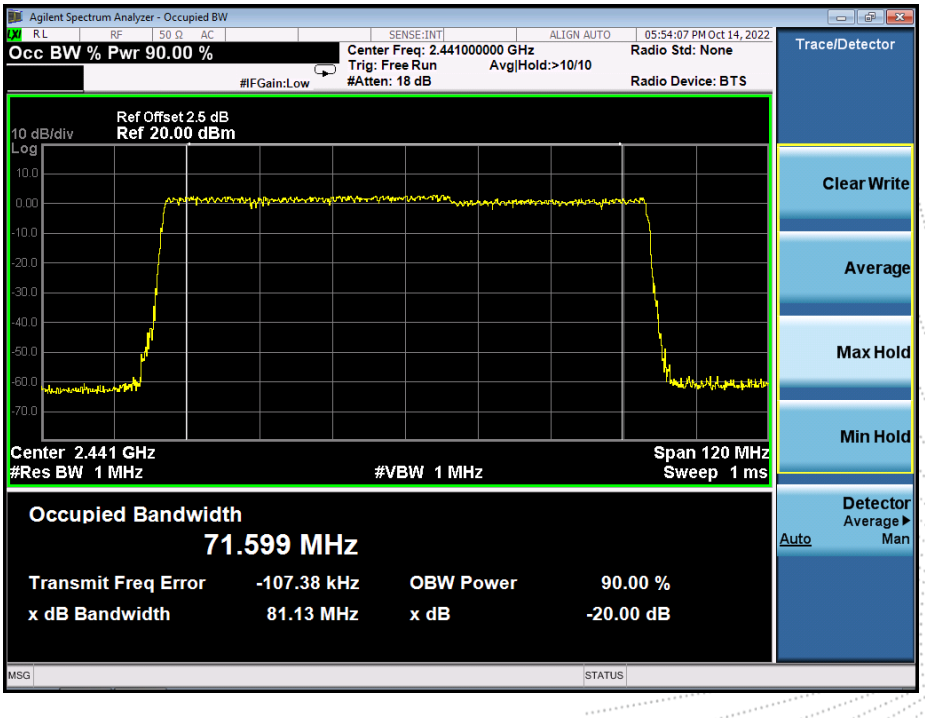
1DH5

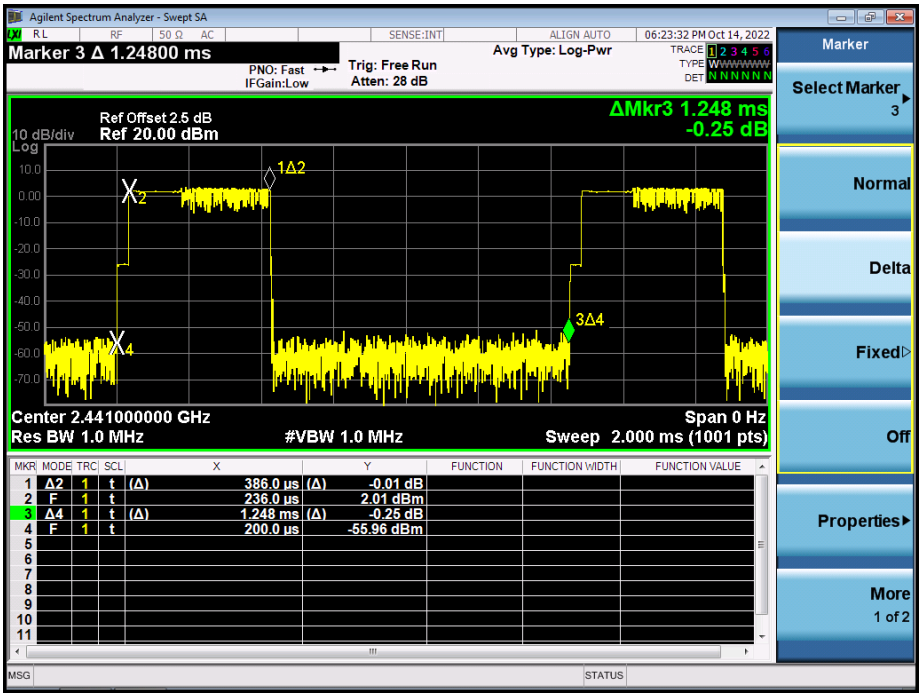
Temperature:	25°C		
Humidity:	55 % RH	Test Voltage	DC 5V
Test Mode:	π/4-DQPSK		

Data Packet	90% Spread BW	On time	burst cycle	Duty cycle	Dwell Time	Limits
	(MHz)	(ms)	(ms)	(%)	(s)	(s)
2DH1	71.670	0.386	1.248	0.309	0.112	0.400
2DH3	71.554	1.630	2.500	0.652	0.236	0.400
2DH5	71.599	2.864	3.744	0.765	0.277	0.400

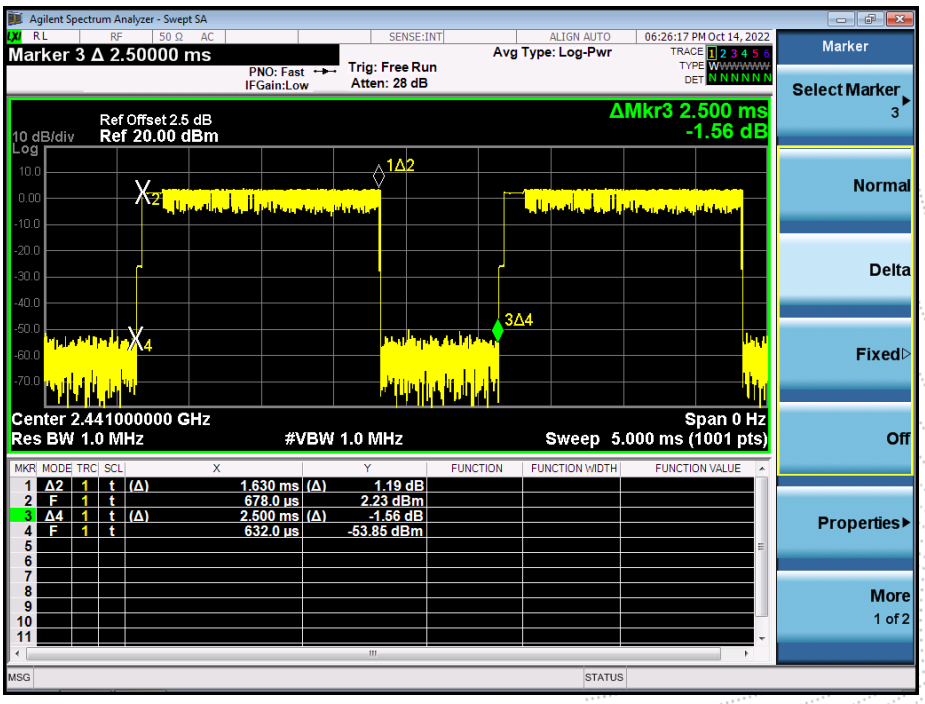



Agilent Spectrum Analyzer - Occupied BW
RL
RF
50 Ω AC
SENSE:INT
ALIGN AUTO
05:53:53 PM Oct 14, 2022
Occ BW % Pwr 90.00 %
Center Freq: 2.441000000 GHz
Trig: Free Run
Avg|Hold:>10/10
#IFGain:Low
#Atten: 18 dB
Radio Std: None
Radio Device: BTS
Trace/Detector
Ref Offset 2.5 dB
10 dB/div
Ref 20.00 dBm
Log
10.0
0.00
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
Center 2.441 GHz
#Res BW 1 MHz
#VBW 1 MHz
Span 120 MHz
Sweep 1 ms
Occupied Bandwidth
71.554 MHz
Transmit Freq Error
-128.41 kHz
OBW Power
90.00 %
x dB Bandwidth
81.26 MHz
x dB
-20.00 dB
MSG
STATUS
Clear Write
Average
Max Hold
Min Hold
Detector
Average
Auto
Man

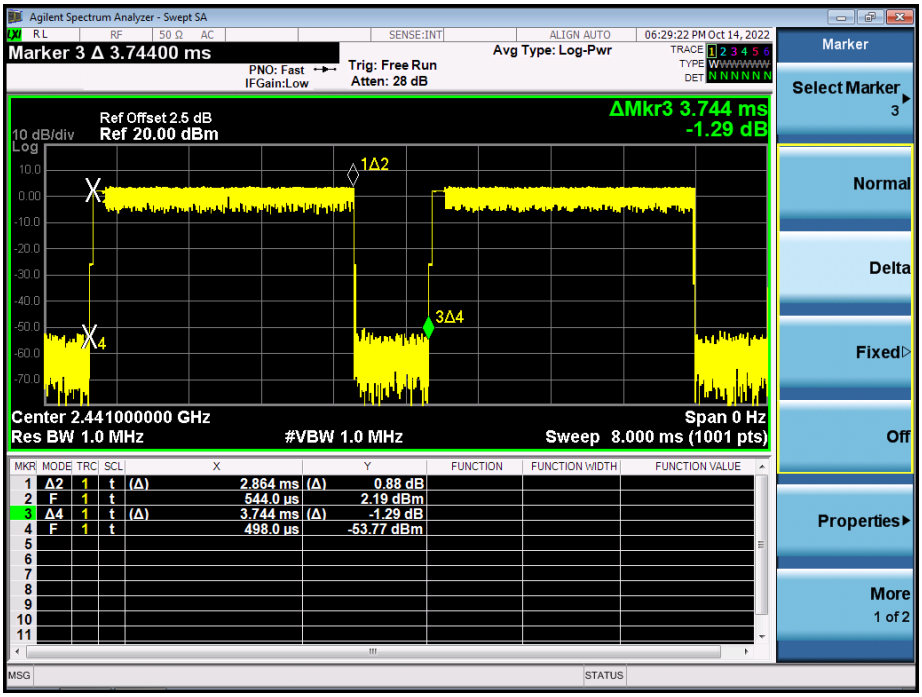

Agilent Spectrum Analyzer - Occupied BW
RL
RF
50 Ω AC
SENSE:INT
ALIGN AUTO
05:54:07 PM Oct 14, 2022
Occ BW % Pwr 90.00 %
Center Freq: 2.441000000 GHz
Trig: Free Run
Avg|Hold:>10/10
#IFGain:Low
#Atten: 18 dB
Radio Std: None
Radio Device: BTS
Trace/Detector
Ref Offset 2.5 dB
10 dB/div
Ref 20.00 dBm
Log
10.0
0.00
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
Center 2.441 GHz
#Res BW 1 MHz
#VBW 1 MHz
Span 120 MHz
Sweep 1 ms
Occupied Bandwidth
71.599 MHz
Transmit Freq Error
-107.38 kHz
OBW Power
90.00 %
x dB Bandwidth
81.13 MHz
x dB
-20.00 dB
MSG
STATUS
Clear Write
Average
Max Hold
Min Hold
Detector
Average
Auto
Man


Agilent Spectrum Analyzer - Swept SA
Marker 3 Δ 1.24800 ms
PNO: Fast
IFGain:Low
Trig: Free Run
Atten: 28 dB
Avg Type: Log-Pwr
06:23:32 PM Oct 14, 2022
Ref Offset 2.5 dB
10 dB/div
Ref 20.00 dBm
ΔMkr3 1.248 ms
-0.25 dB
Center 2.441000000 GHz
Res BW 1.0 MHz
#VBW 1.0 MHz
Span 0 Hz
Sweep 2.000 ms (1001 pts)
1 Δ2 386.0 µs (Δ) -0.01 dB
2 F 236.0 µs 2.01 dBm
3 Δ4 1.248 ms (Δ) -0.25 dB
4 F 200.0 µs -55.96 dBm
Marker
Select Marker
Normal
Delta
Fixed
Off
Properties
More
1 of 2

2DH1


Agilent Spectrum Analyzer - Swept SA
Marker 3 Δ 2.50000 ms
PNO: Fast
IFGain:Low
Trig: Free Run
Atten: 28 dB
Avg Type: Log-Pwr
06:26:17 PM Oct 14, 2022
Ref Offset 2.5 dB
10 dB/div
Ref 20.00 dBm
ΔMkr3 2.500 ms
-1.56 dB
Center 2.441000000 GHz
Res BW 1.0 MHz
#VBW 1.0 MHz
Span 0 Hz
Sweep 5.000 ms (1001 pts)
1 Δ2 1.630 ms (Δ) 1.19 dB
2 F 678.0 µs 2.23 dBm
3 Δ4 2.500 ms (Δ) -1.56 dB
4 F 632.0 µs -53.85 dBm
Marker
Select Marker
Normal
Delta
Fixed
Off
Properties
More
1 of 2

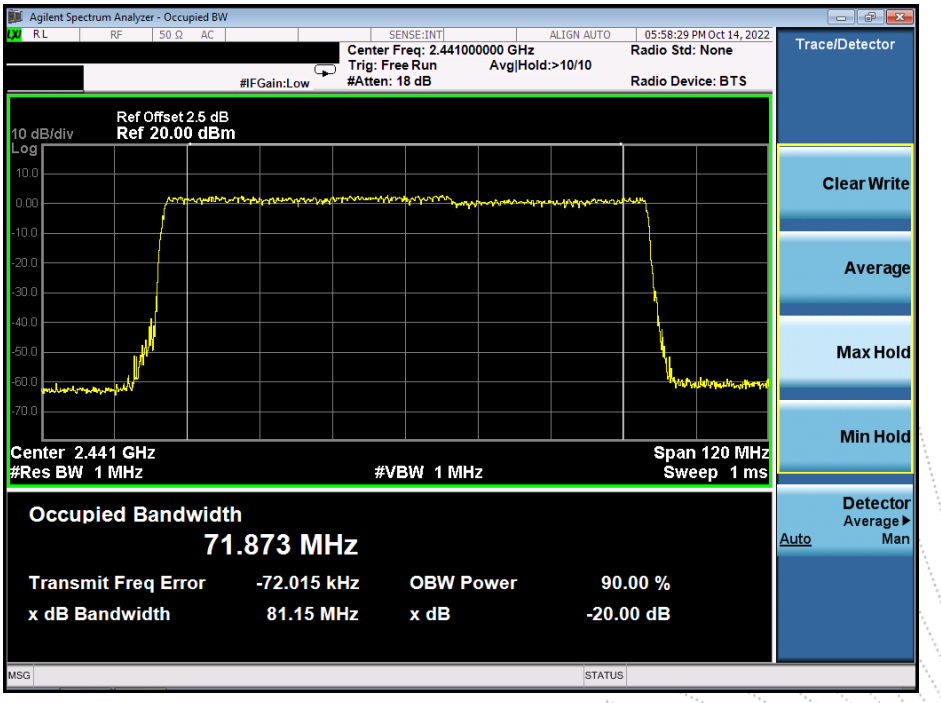
2DH3

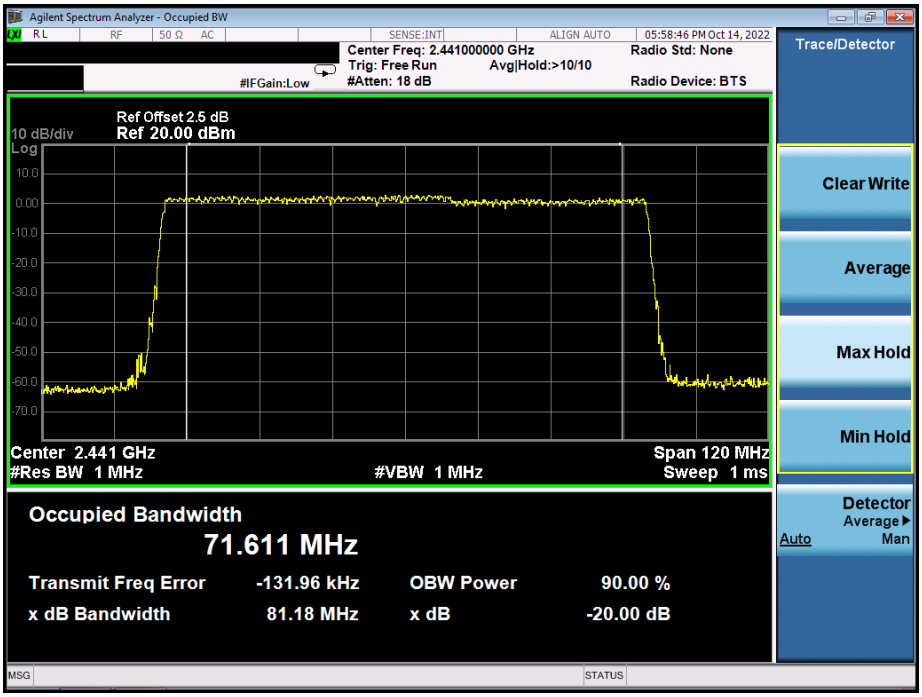

Agilent Spectrum Analyzer - Swept SA
Marker 3 Δ 3.74400 ms
PNO: Fast
IFGain:Low
Trig: Free Run
Atten: 28 dB
Avg Type: Log-Pwr
06:29:22 PM Oct 14, 2022
Ref Offset 2.5 dB
10 dB/div
Ref 20.00 dBm
ΔMkr3 3.744 ms
-1.29 dB
1Δ2
3Δ4
Center 2.441000000 GHz
Res BW 1.0 MHz
#VBW 1.0 MHz
Span 0 Hz
Sweep 8.000 ms (1001 pts)
1 Δ2 1 t (Δ) 2.864 ms (Δ) 0.88 dB
2 F 1 t 544.0 µs 2.19 dBm
3 Δ4 1 t (Δ) 3.744 ms (Δ) -1.29 dB
4 F 1 t 498.0 µs -53.77 dBm
Marker
Select Marker
3
Normal
Delta
Fixed
Off
Properties
More
1 of 2

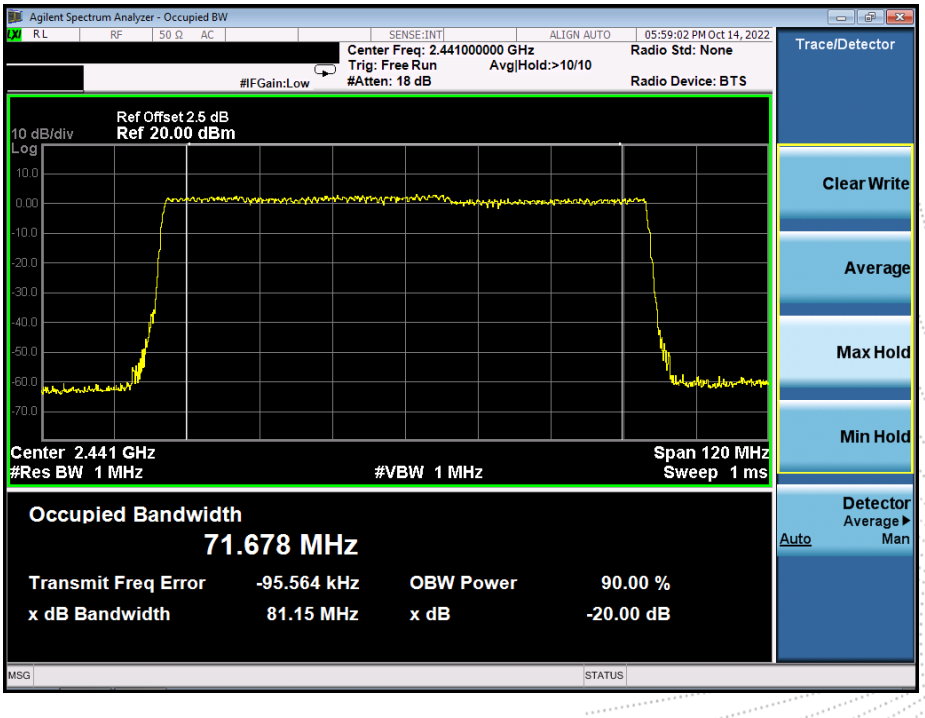
2DH5

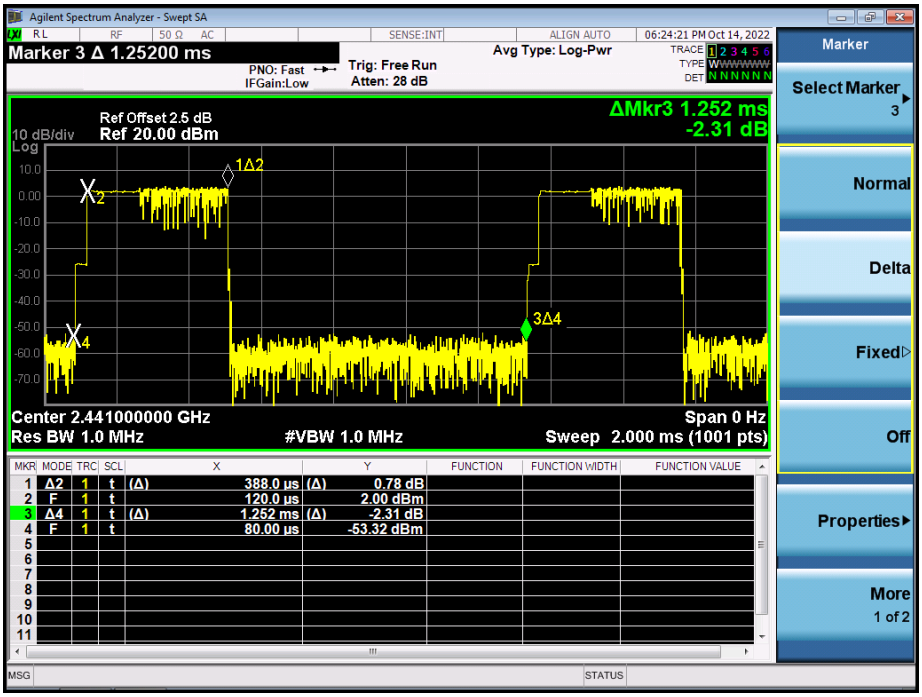
Temperature:	25°C		
Humidity:	55 % RH	Test Voltage	DC 5V
Test Mode:	8DPSK		

Data Packet	90% Spread BW	On time	burst cycle	Duty cycle	Dwell Time	Limits
	(MHz)	(ms)	(ms)	(%)	(s)	(s)
3DH1	71.873	0.388	1.252	0.310	0.113	0.400
3DH3	71.611	1.630	2.510	0.649	0.235	0.400
3DH5	71.678	2.880	3.768	0.764	0.277	0.400

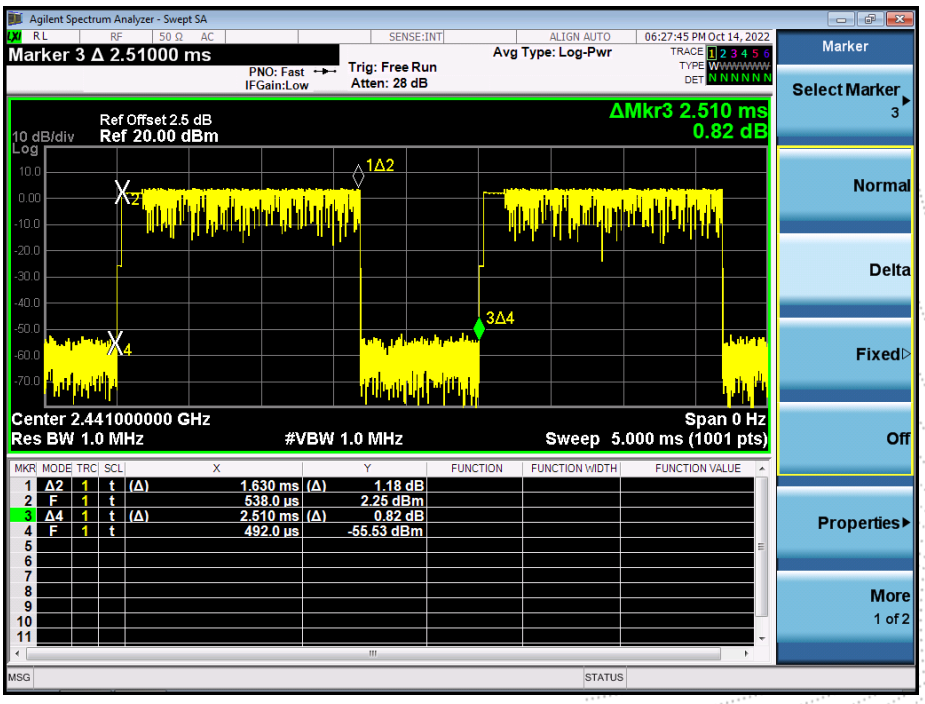



Agilent Spectrum Analyzer - Occupied BW
RL
RF
50 Ω AC
SENSE:INT
ALIGN AUTO
05:58:46 PM Oct 14, 2022
Center Freq: 2.441000000 GHz
Trig: Free Run
Avg|Hold:>10/10
#IFGain:Low
#Atten: 18 dB
Radio Std: None
Radio Device: BTS
Trace/Detector
Ref Offset 2.5 dB
10 dB/div
Ref 20.00 dBm
Log
10.0
0.00
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
Center 2.441 GHz
#Res BW 1 MHz
#VBW 1 MHz
Span 120 MHz
Sweep 1 ms
Occupied Bandwidth
71.611 MHz
Transmit Freq Error
-131.96 kHz
OBW Power
90.00 %
x dB Bandwidth
81.18 MHz
x dB
-20.00 dB
Clear Write
Average
Max Hold
Min Hold
Detector
Average
Auto
Man
MSG
STATUS

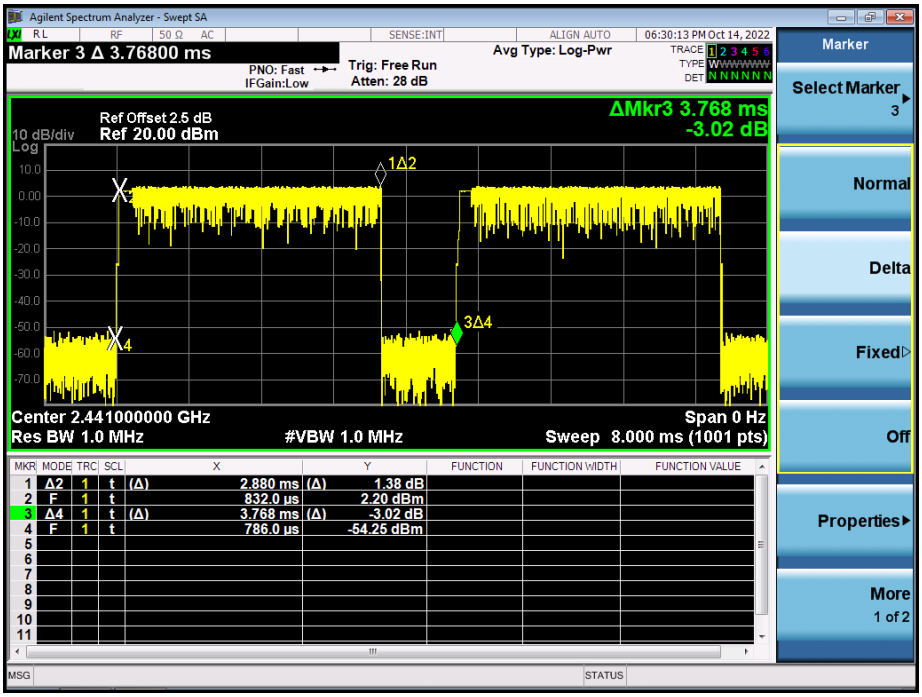

Agilent Spectrum Analyzer - Occupied BW
RL
RF
50 Ω AC
SENSE:INT
ALIGN AUTO
05:59:02 PM Oct 14, 2022
Center Freq: 2.441000000 GHz
Trig: Free Run
Avg|Hold:>10/10
#IFGain:Low
#Atten: 18 dB
Radio Std: None
Radio Device: BTS
Trace/Detector
Ref Offset 2.5 dB
10 dB/div
Ref 20.00 dBm
Log
10.0
0.00
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
Center 2.441 GHz
#Res BW 1 MHz
#VBW 1 MHz
Span 120 MHz
Sweep 1 ms
Occupied Bandwidth
71.678 MHz
Transmit Freq Error
-95.564 kHz
OBW Power
90.00 %
x dB Bandwidth
81.15 MHz
x dB
-20.00 dB
Clear Write
Average
Max Hold
Min Hold
Detector
Average
Auto
Man
MSG
STATUS


Agilent Spectrum Analyzer - Swept SA
Marker 3 Δ 1.25200 ms
PNO: Fast
IFGain:Low
Trig: Free Run
Atten: 28 dB
Avg Type: Log-Pwr
06:24:21 PM Oct 14, 2022
Ref Offset 2.5 dB
10 dB/div
Ref 20.00 dBm
ΔMkr3 1.252 ms
-2.31 dB
Center 2.441000000 GHz
Res BW 1.0 MHz
#VBW 1.0 MHz
Span 0 Hz
Sweep 2.000 ms (1001 pts)
1 Δ2 388.0 µs (Δ) 0.78 dB
2 F 120.0 µs 2.00 dBm
3 Δ4 1.252 ms (Δ) -2.31 dB
4 F 80.00 µs -53.32 dBm
Marker
Select Marker
Normal
Delta
Fixed
Off
Properties
More
1 of 2

3DH1


Agilent Spectrum Analyzer - Swept SA
Marker 3 Δ 2.51000 ms
PNO: Fast
IFGain:Low
Trig: Free Run
Atten: 28 dB
Avg Type: Log-Pwr
06:27:45 PM Oct 14, 2022
Ref Offset 2.5 dB
10 dB/div
Ref 20.00 dBm
ΔMkr3 2.510 ms
0.82 dB
Center 2.441000000 GHz
Res BW 1.0 MHz
#VBW 1.0 MHz
Span 0 Hz
Sweep 5.000 ms (1001 pts)
1 Δ2 1.630 ms (Δ) 1.18 dB
2 F 538.0 µs 2.25 dBm
3 Δ4 2.510 ms (Δ) 0.82 dB
4 F 492.0 µs -55.53 dBm
Marker
Select Marker
Normal
Delta
Fixed
Off
Properties
More
1 of 2

3DH3


Agilent Spectrum Analyzer - Swept SA
Marker 3 Δ 3.76800 ms
PNO: Fast
IFGain:Low
Trig: Free Run
Atten: 28 dB
Avg Type: Log-Pwr
06:30:13 PM Oct 14, 2022
Ref Offset 2.5 dB
10 dB/div
Log
Ref 20.00 dBm
ΔMkr3 3.768 ms
-3.02 dB
Center 2.441000000 GHz
Res BW 1.0 MHz
#VBW 1.0 MHz
Span 0 Hz
Sweep 8.000 ms (1001 pts)
1 Δ2 2.880 ms (Δ) 1.38 dB
2 F 832.0 µs 2.20 dBm
3 Δ4 3.768 ms (Δ) -3.02 dB
4 F 786.0 µs -54.25 dBm
Marker
Select Marker
Normal
Delta
Fixed
Off
Properties
More
1 of 2

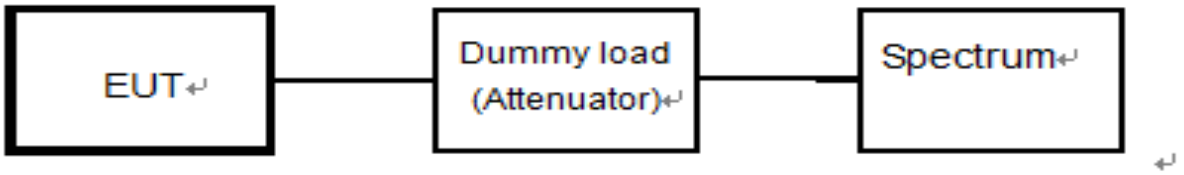
3DH5

13. Carrier Sense

Not applicable, Since the EUT belong to Bluetooth

14. Imitation Of Collateral Emission Of Receiver Measurement

14.1 Block Diagram Of Test Setup



14.2 Limit

Item	Limits
RX Spurious Emission:	≦4nW (f<1GHz)
	≦20nW (1GHz≦f)

14.3 Measuring Instruments And Setting

Please refer to section 5 in this report. The following table is the setting of Spectrum Analyzer.

Spectrum Parameter	Setting
Attenuation	Auto
RB	100 kHz (below 1GHz emissions) 1 MHz (above 1GHz emissions)
VB	100 kHz (below 1GHz emissions) 1 MHz (above 1GHz emissions)
Detector	Peak
Trace	Max Hold
Sweep Time	Auto

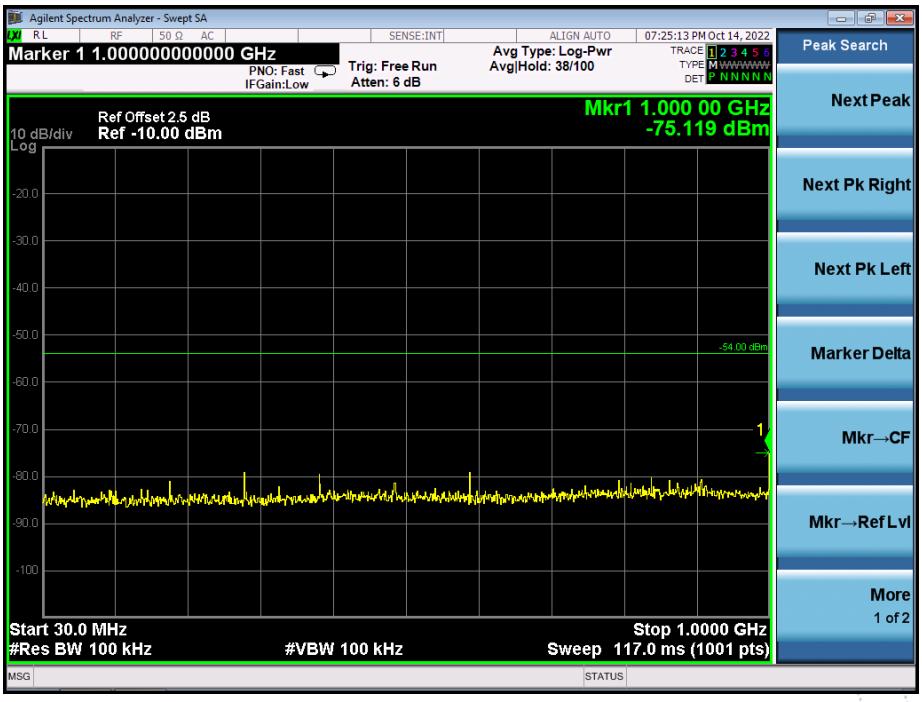
14.4 Test Procedure

1. EUT have the continuous reception mode and fixed only one channelize.
2. Setting of SA is following as RB / VB: 100 kHz (below 1GHz emissions) / 1 MHz (above 1GHz emissions) /
AT: 6dB / Ref: -20dBm / Sweep time: Auto / Sweep Mode: Continuous sweep / Detect mode: Positive peak / Trace mode: Max hold
3. SA set RB: 100kHz and VB: 100kHz. Then adjust to start frequency 30MHz and stop frequency 1000MHz. Search to mark peak reading value + cable loss shall be less than 4nW
4. SA set RB: 1MHz and VB: 1MHz. Then adjust to start frequency 1000MHz and stop frequency 12500MHz. Search to mark peak reading value + cable loss shall be less than 20nW
5. If power level of lower emissions are more than 1/10 of limit (.0.4nW for f < 1GHz, 2nW for f >= 1GHz), all those are to be indicated in the 2nd and 3rd lines. If others are 1/10 or less more of the limit, no necessary to be indicated.

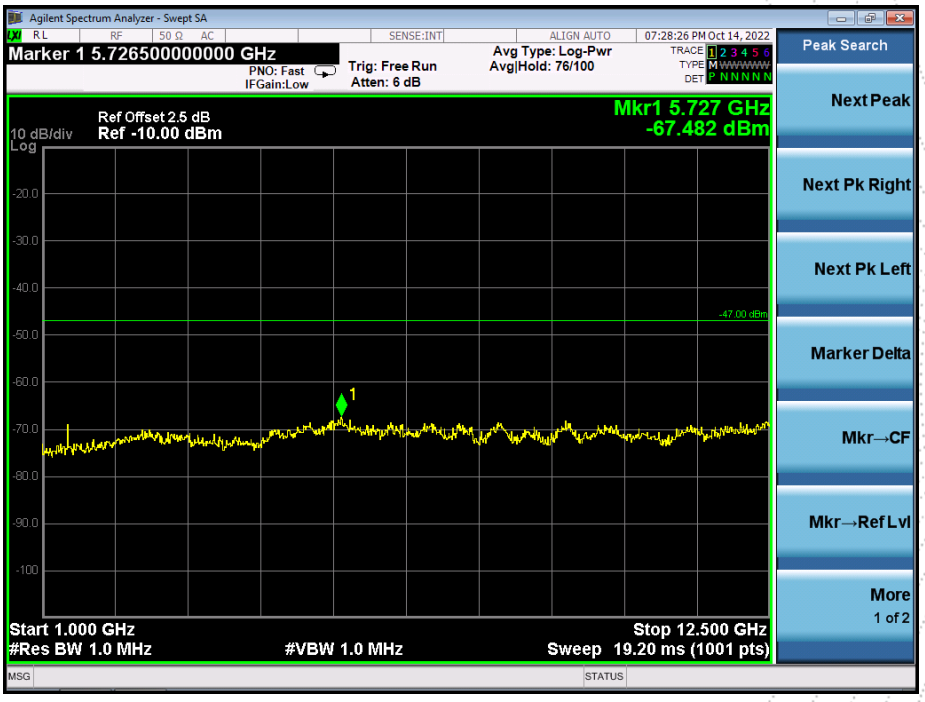
14.5 Test Result

Temperature:	25°C		
Humidity:	55 % RH	Test Voltage	DC 5V
Operation Mode:	Normal Voltage-GFSK		

RX-Frequency Band 1 (30 MHz ≦ f < 1000 MHz)

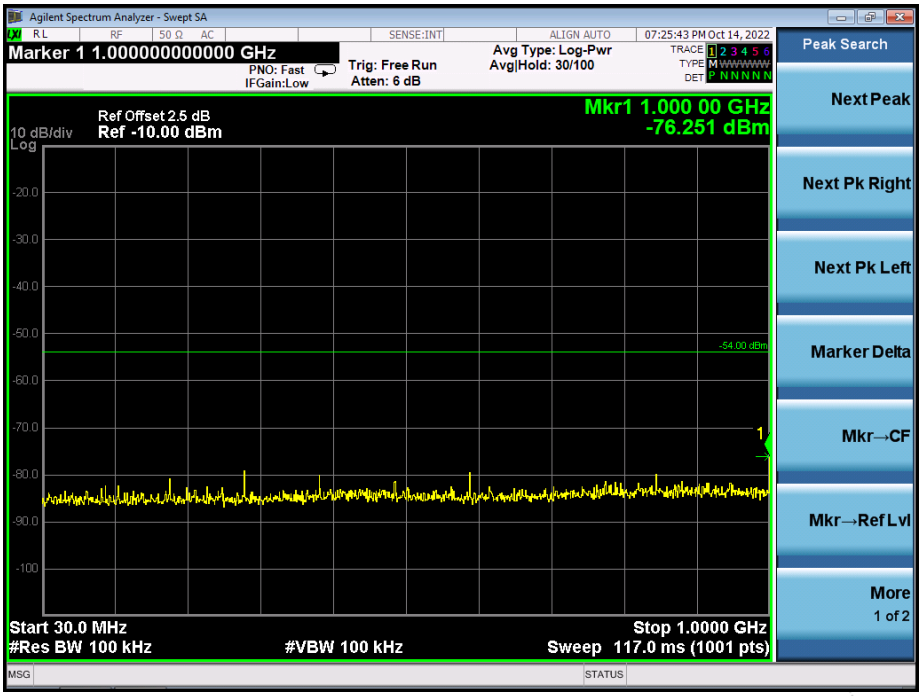


RX-Frequency Band 2 (1000 MHz ≦ f < 12500 MHz)

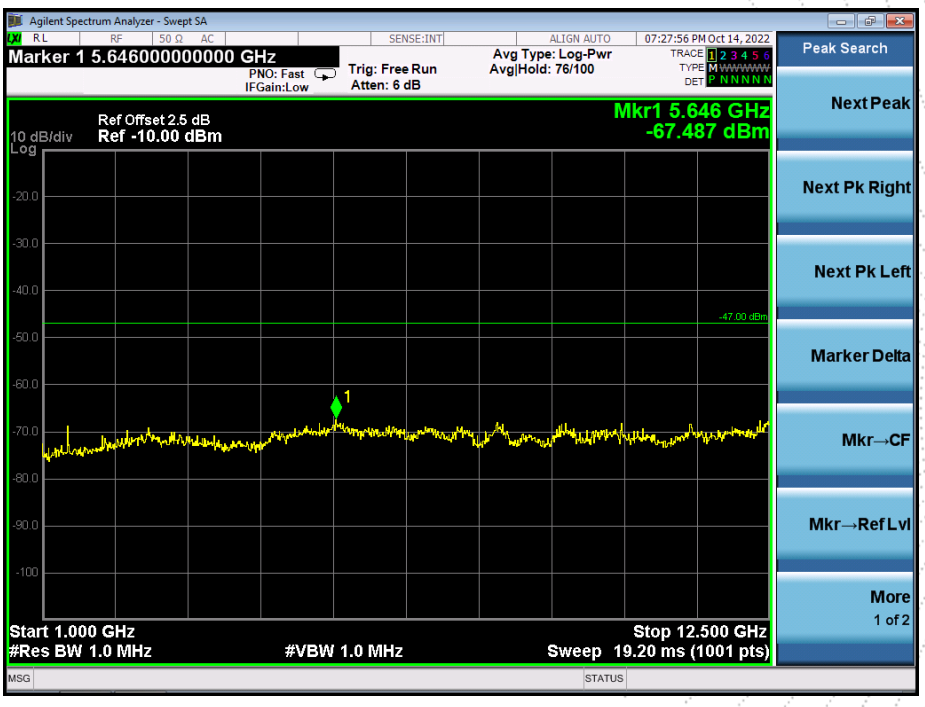


Temperature:	25°C		
Humidity:	55 % RH	Test Voltage	DC 5V
Operation Mode:	Normal Voltage-π/4-DQPSK		

RX-Frequency Band 1 (30 MHz ≦ f < 1000 MHz)

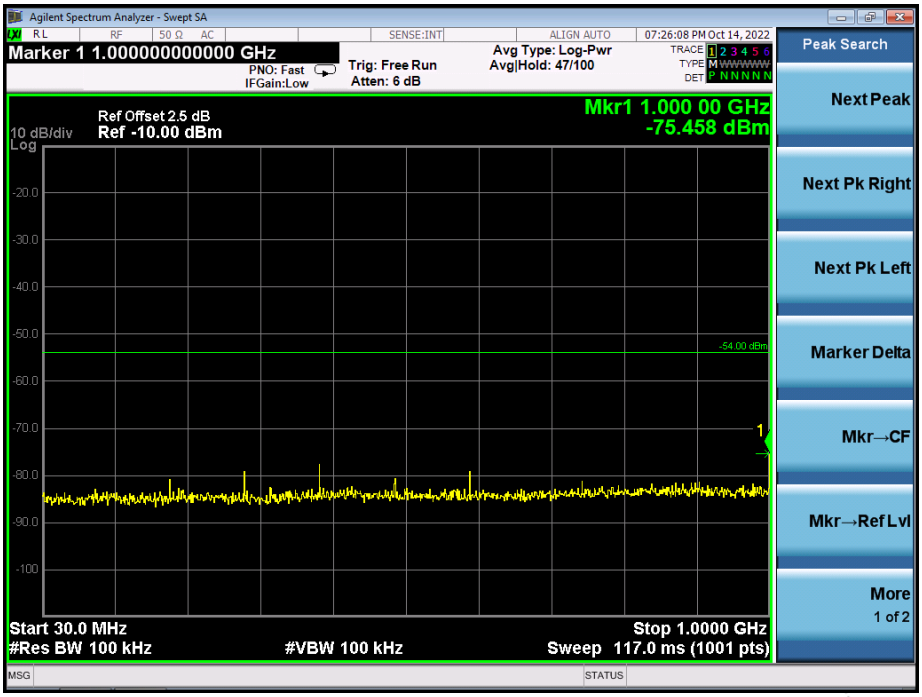


RX-Frequency Band 2 (1000 MHz ≦ f < 12500 MHz)

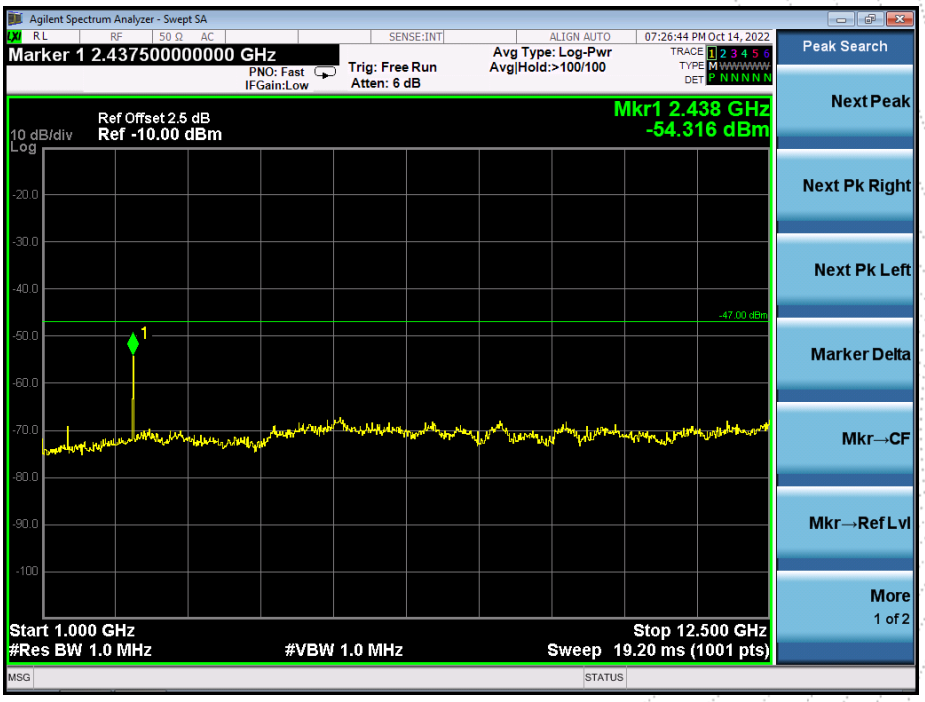


Temperature:	25°C		
Humidity:	55 % RH	Test Voltage	DC 5V
Operation Mode:	Normal Voltage-8DPSK		

RX-Frequency Band 1 (30 MHz ≦ f < 1000 MHz)

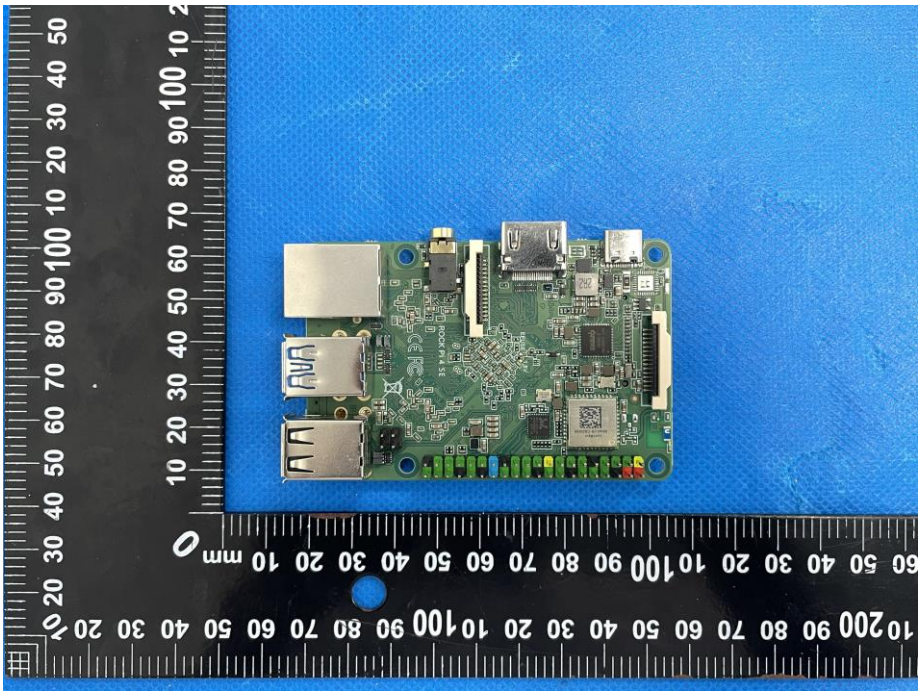


RX-Frequency Band 2 (1000 MHz ≦ f < 12500 MHz)

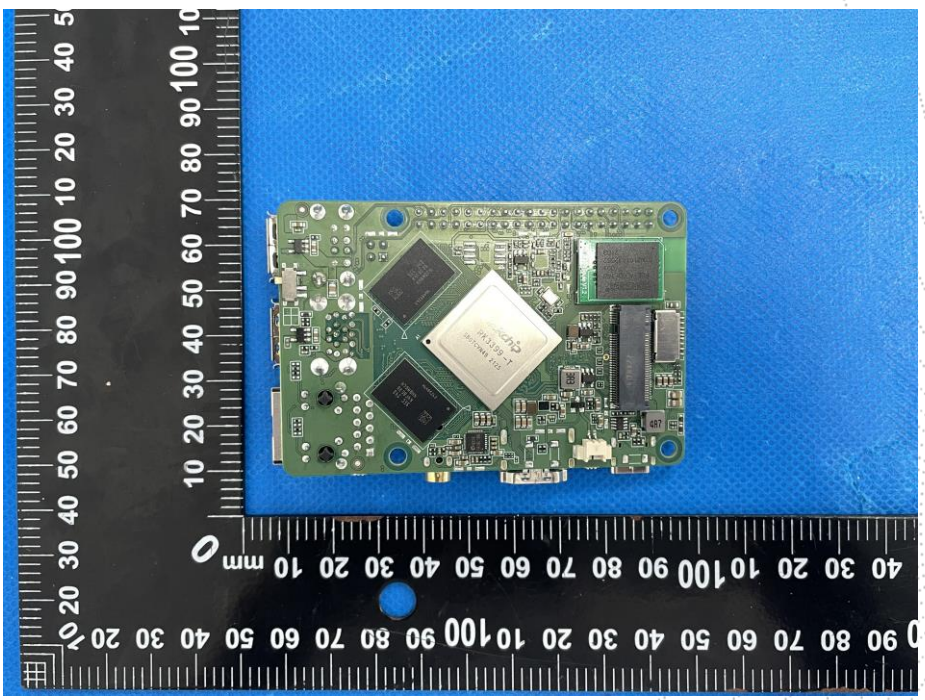


15. EUT Photographs

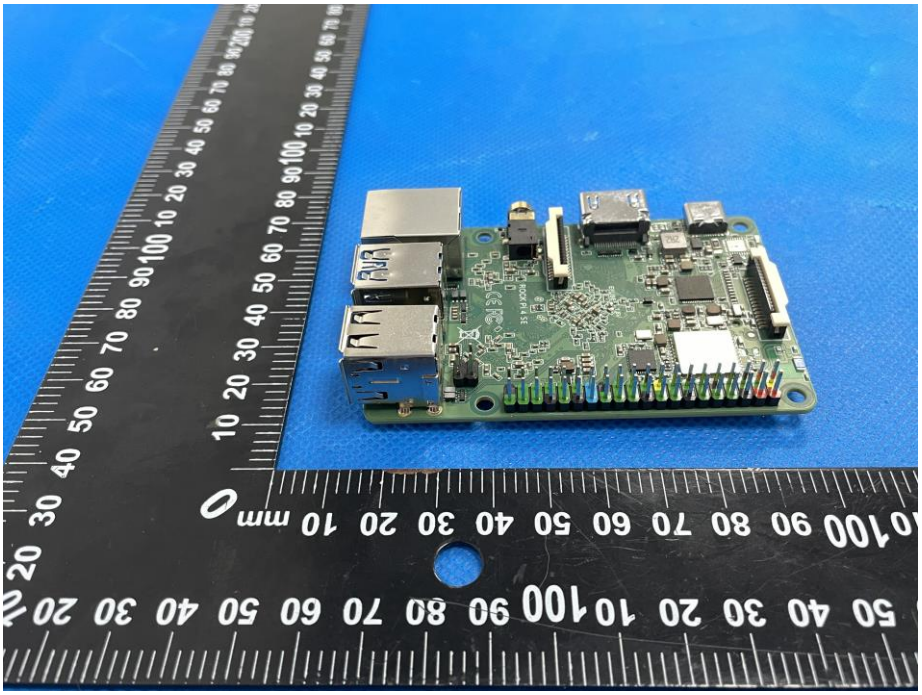
EUT Photo 1



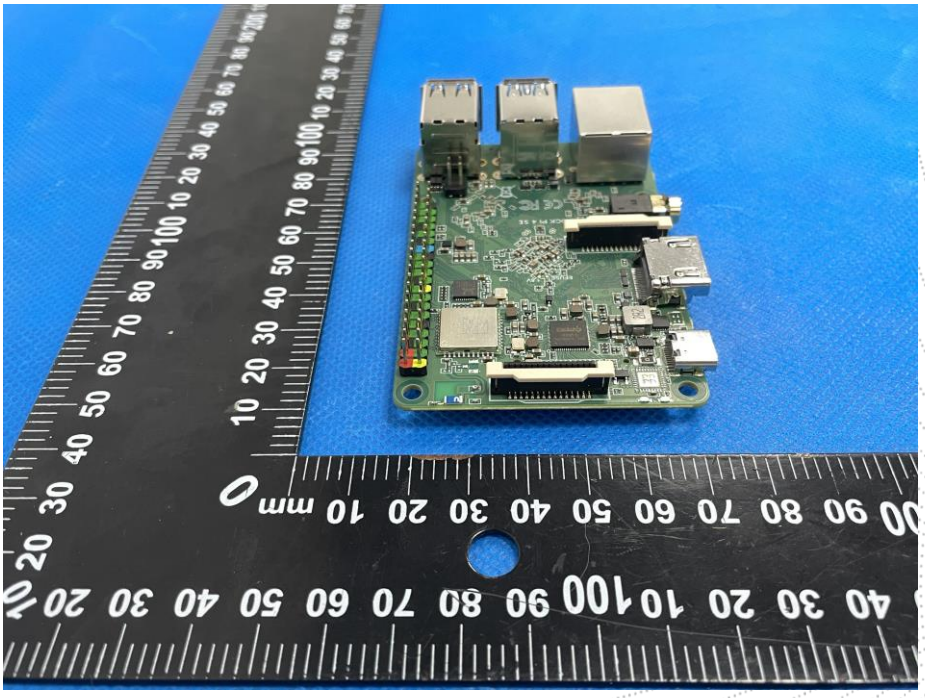
EUT Photo 2



EUT Photo 3

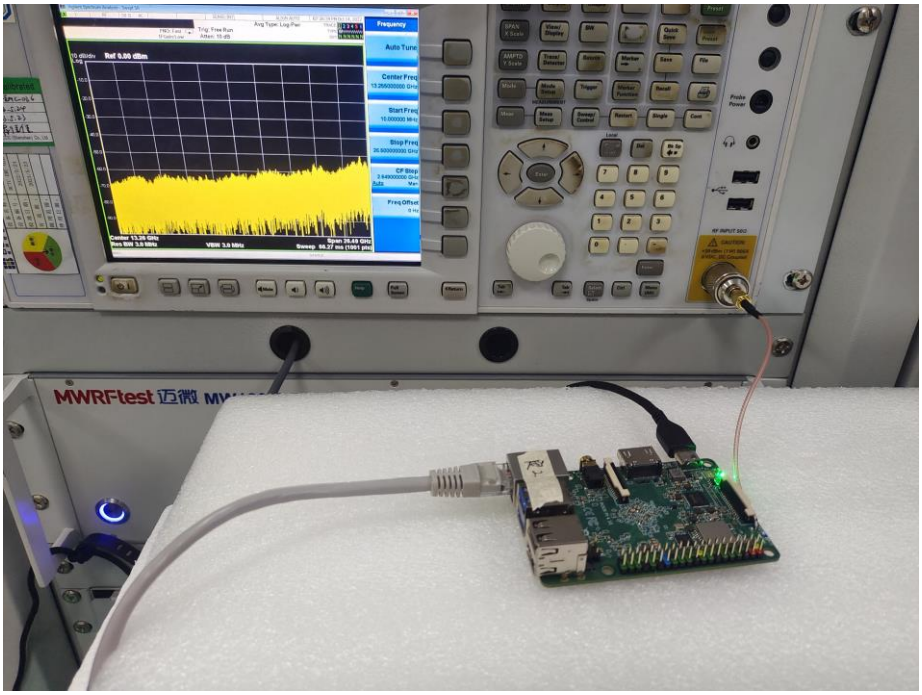


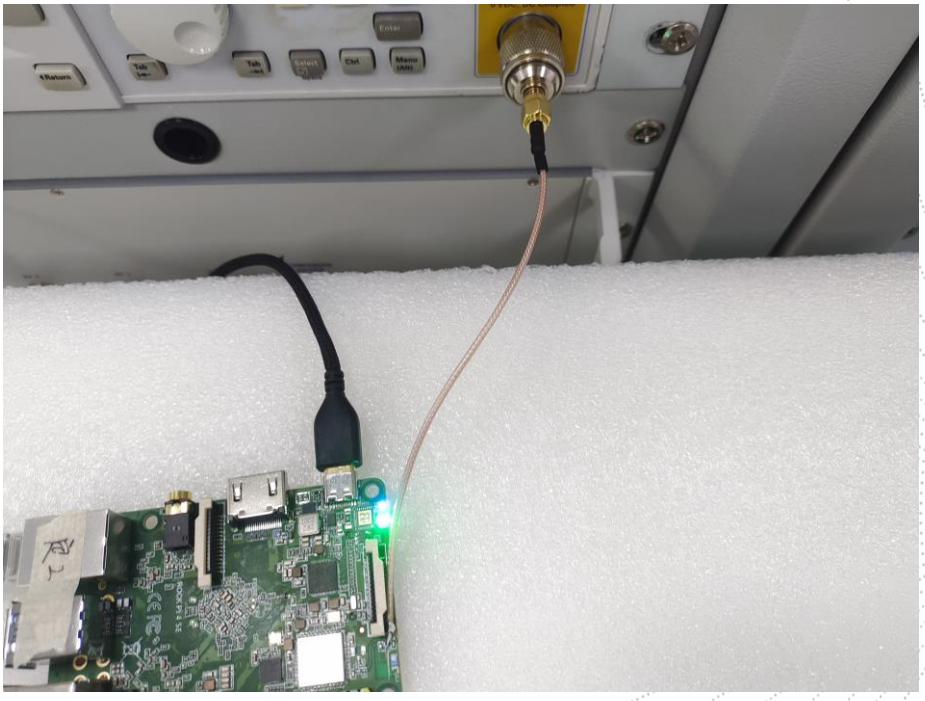
EUT Photo 4



16. EUT Test Setup Photographs

Measurement Photos





STATEMENT

1. The equipment lists are traceable to the national reference standards.

2. The test report can not be partially copied unless prior written approval is issued from our lab.

3. The test report is invalid without the "special seal for inspection and testing".

4. The test report is invalid without the signature of the approver.

5. The test process and test result is only related to the Unit Under Test.

6. Sample information is provided by the client and the laboratory is not responsible for its authenticity.

7. The test report without CMA mark is only used for scientific research, teaching, enterprise product development and internal quality control purposes.

8. The quality system of our laboratory is in accordance with ISO/IEC17025.

9. If there is any objection to this test report, the client should inform issuing laboratory within 15 days from the date of receiving test report.

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※※※※※ **END** ※※※※※