

Application for FCC Certification
On behalf of

JOHNSON INDUSTRIES(SHANGHAI) CO.,LTD.

Product Name: Console

Model No.: XER

FCC ID: 2AOTTXER

Prepared For : JOHNSON INDUSTRIES(SHANGHAI) CO.,LTD.
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Report No. : ACI-F18099
Date of Test : 2018.02.02–10
Date of Report : 2018.03.05

The statement is based on a single evaluation of one sample of the above-mentioned products. It does not imply an assessment of the whole production and does not permit the use of the test lab logo.
The report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the Federal Government.

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TEST REPORT FOR FCC CERTIFICATE

Applicant : JOHNSON INDUSTRIES(SHANGHAI) CO.,LTD.
Manufacturer : JOHNSON INDUSTRIES(SHANGHAI) CO.,LTD.
EUT Description : Console
(A) Model No. : XER
(B) Power Supply : AC 120V/60Hz
(C) Test Voltage : AC 120V/60Hz

Test Procedure Used:

*FCC RULES AND REGULATIONS PART 15 SUBPART C
AND ANSI C63.10-2013*

The device described above is tested by Audix Technology (Shanghai) Co., Ltd. to determine the maximum emission levels emanating from the device. The maximum emission levels are compared to the FCC Part 15 Subpart C limits.

The test results are contained in this test report and Audix Technology (Shanghai) Co., Ltd. is assumed full responsibility for the accuracy and completeness of these measurements. This report also shows that the EUT, which was tested on 2018.02.02-10 is technically compliance with the FCC limits.

This report applies to above tested Sample only. This report shall not be reproduced in part without written approval of Audix Technology (Shanghai) Co., Ltd.

Date of Test : 2018.02.02-10 Date of Report : 2018.03.05

Producer :

Alan He
ALAN HE / Assistant

Review :

Byron Wu
BYRON WU / Deputy Assistant Manager



For and on behalf of
Audix Technology (Shanghai) Co., Ltd.

Signatory :

.....
Authorized Signature(s) BYRON KWO/Assistant General Manager

1 SUMMARY OF STANDARDS AND RESULTS

1.1 Description of Standards and Results

The EUT have been tested according to the applicable standards as referenced below:

Description / Test Item	Test Standard	Results	Meets Limit
EMISSION			
Conducted Emission Measurement	FCC RULES AND REGULATIONS PART 15 SUBPART C AND ANSI C63.10:2013	Pass	15.207
Spurious Radiated Emissions Measurement	FCC RULES AND REGULATIONS PART 15 SUBPART C October 2014 AND ANSI C63.4:2009 AND DA 00-705	Pass	15.209(a) 15.205(a)(c)
20 dB Bandwidth Measurement	FCC RULES AND REGULATIONS PART 15 SUBPART C October 2014 AND DA 00-705	Pass	15.247(a)(1)
Peak Output Power Measurement	FCC RULES AND REGULATIONS PART 15 SUBPART C October 2014 AND DA 00-705	Pass	15.247(b)(1)
Spurious RF Conducted Emissions Measurement	FCC RULES AND REGULATIONS PART 15 SUBPART C October 2014 AND DA 00-705	Pass	15.247(d)
Band-edge Compliance of RF Conducted Emissions Measurement	FCC RULES AND REGULATIONS PART 15 SUBPART C October 2014 AND DA 00-705	Pass	15.247(d)
Number of Hopping Frequencies Measurement	FCC RULES AND REGULATIONS PART 15 SUBPART C October 2014 AND DA 00-705	Pass	15.247(a)(1)
Carrier Frequency Separation Measurement	FCC RULES AND REGULATIONS PART 15 SUBPART C October 2014 AND DA 00-705	Pass	15.247(a)(1)
Dwell Time Measurement	FCC RULES AND REGULATIONS PART 15 SUBPART C October 2014 AND DA 00-705	Pass	15.247(a)(1)
N/A is an abbreviation for Not Applicable.			

2 GENERAL INFORMATION

2.1 Description of Equipment Under Test

Description : Console

Model Number : XER

Type of EUT ☒ Production ☐ Pre-product ☐ Pro-type

Radio Tech : IEEE 802.11b/g/n (802.11n is 2.4GHz HT20 only)
: Bluetooth V4.0

Channel Freq. : IEEE 802.11b/g/n, 2412MHz ~ 2462MHz (Ch1-Ch11)
: Bluetooth V4.0, 2402MHz-2480MHz(Ch79):

Tested Freq. : 2402MHz(Ch00),2441MHz (Ch39),2480 MHz (Ch78)

Modulation : DQPSK, DBPSK, CCK, OFDM/64-QAM, 16-QAM
: QPSK, BPSK, FHSS, GFSK, DPSK

Antenna Type : SMA interface Small antenna(Cu)
Note: According to KDB 353028 D01 A 2) b) ii) (3)
antenna connector comply with 15.203

Connectoe Type : SMA Connector

Antenna Gain : 2 dBi

Applicant : JOHNSON INDUSTRIES(SHANGHAI) CO.,LTD.
: A1 NO.4500 BAOQIAN ROAD, ZHUQIAO TOWN,
: JIADING DISTRICT, SHANGHAI.

Manufacturer : Same as Applicant

Factory : Same as Applicant

2.2 Tested Supporting System Details

2.2.1 Earphone

Manufacturer : EDIFIER
Model Number : H210

2.2.2 Mobile Phone

Manufacturer : SUMSUNG
Model Number : GT-I9100G
Serial Number : 69351520011519
Certificate : CE/EMC

2.3 Description of Test Facility

Name of Firm : Audix Technology (Shanghai) Co., Ltd.

Site Location : 3 F 34 Bldg 680 Guiping Rd.,
Caohejing Hi-Tech Park,
Shanghai 200233, China

Accredited by NVLAP, Lab Code : 200371-0

FCC registration Number : 91789

Test Firm Registration Number : 954668

2.4 Measurement Uncertainty

Conducted Emission Expanded Uncertainty : U = 3.4dB

Radiated Emission Expanded Uncertainty (30-1000MHz):
U = 3.99dB

Radiated Emission Expanded Uncertainty (1000M-26.5GHz):
U = 4.98dB

6 dB Bandwidth Expanded Uncertainty : U = 1×10^{-8} MHz

Maximum Peak Output Power Expanded Uncertainty : U = 1.56 dB

Power Spectral Density Expanded Uncertainty : U = 0.38 dB

Spurious RF Conducted Emissions Expanded Uncertainty : U = 1.20 dB

3 CONDUCTED EMISSION TEST

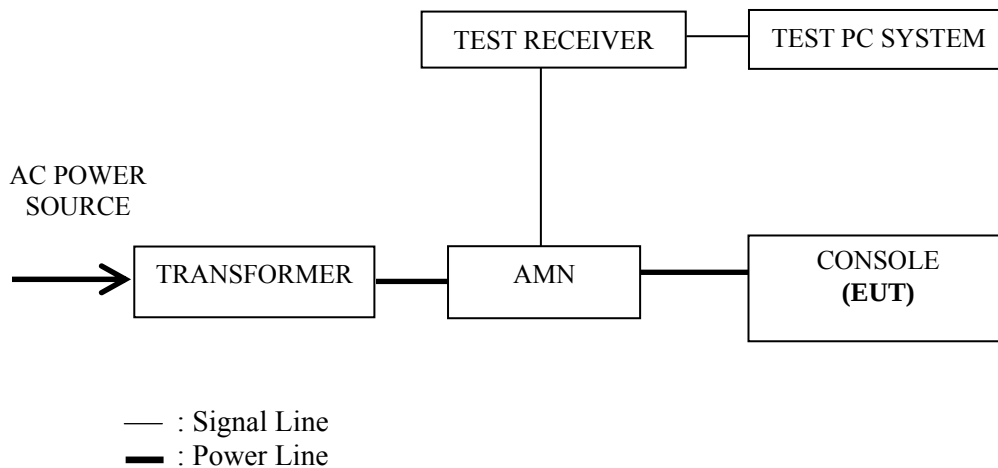
3.1 Test Equipment

The following test equipment are used during the conducted emission test in a shielded room:

Item	Type	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
1.	Test Receiver	R&S	ESCI	101303	May 07, 2017	May 06, 2018
2.	Artificial Mains Network (AMN)	R&S	ENV4200	100125	Jun 24, 2017	Jun 23, 2018
3.	50Ω Terminator	Anritsu	BNC	001	Mar 18, 2017	Mar 17, 2018
4.	Software	Audix	E3	SET00200 9804M592	--	--

3.2 Block Diagram of Test Setup

3.2.1 Conducted Disturbance Test Setup



3.3 Conducted Emission Limit [FCC Part 15 Subpart B 15.207]

Frequency Range (MHz)	Limits dB (μV)	
	Quasi-peak	Average
0.15 ~ 0.5	66~56	56~46
0.5 ~ 5	56	46
5 ~ 30	60	50

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

3.4 Test Configuration

The EUT (listed in Sec.2.1) and the peripherals (listed in Sec 2.2) were installed as shown on Sec.3.2 to meet FCC requirement and operating in a manner that tends to maximize its emission level in a normal application.

3.5 Operating Condition of EUT

3.5.1 Setup the EUT as shown in Sec. 3.2.

3.5.2 Turn on the power of all equipments and the EUT.

3.5.3 Turn the EUT on the test mode, and then test.

3.6 Test Procedures

The EUT were connected to the power mains through an Artificial Mains Network (AMN). This provided a 50 ohm coupling impedance for the measuring equipment.

Both sides of AC line (Line & Neutral) were checked for maximum conducted interference. In order to find the maximum emission, the relative positions of equipment and all of the interface cables were changed or manipulated according to ANSI C63.4:2009 during conducted emission test.

The bandwidth of R&S Test Receiver ESCI was set at 9 kHz.

The frequency range from 150 kHz to 30 MHz was checked.

The test modes were done on conducted disturbance test and all the test results are listed in Sec. 3.7.

3.7 Test Results

< PASS >

The frequency and amplitude of the highest conducted emission relative to the limit is reported. All emissions not reported below are too low against the prescribed limits.

NOTE 1 – Factor = Cable Loss + AMN Factor.

NOTE 2 – Emission Level = Meter Reading + Factor.

NOTE 3 – “QP” means “Quasi-Peak” values, “AV” means “Average” values.

EUT : Console Temperature : 25°C

Model No. : XER Humidity : 48%RH

Test Mode : Transmitting Date of Test : 2018.02.02

Test Line	Frequency (MHz)	Meter Reading dB(μV)	Factor (dB)	Emission Level dB(μV)	Limits dB(μV)	Margin (dB)	Remark
Line	0.16589	40.3	10.58	50.88	65.16	14.28	QP
	0.26724	34.9	10.47	45.37	61.2	15.83	
	0.53498	30.3	10.39	40.69	56	15.31	
	0.82172	17.5	10.39	27.89	56	28.11	
	3.509	15.1	10.44	25.54	56	30.46	
	7.769	23.8	10.49	34.29	60	25.71	
	0.16589	24	10.58	34.58	55.16	20.58	AV
	0.26724	20.6	10.47	31.07	51.2	20.13	
	0.53498	21.6	10.39	31.99	46	14.01	
	0.82172	6.8	10.39	17.19	46	28.81	
	3.509	8.3	10.44	18.74	46	27.26	
	7.769	15.4	10.49	25.89	50	24.11	
Neutral	0.16589	39.2	10.51	49.71	65.16	15.45	QP
	0.48119	28.6	10.38	38.98	56.32	17.34	
	0.54644	31.5	10.38	41.88	56	14.12	
	0.94308	22	10.39	32.39	56	23.61	
	4.874	17.7	10.47	28.17	56	27.83	
	9.654	21.5	10.5	32	60	28.00	
	0.16589	23.3	10.51	33.81	55.16	21.35	AV
	0.48119	20.5	10.38	30.88	46.32	15.44	
	0.54644	25	10.38	35.38	46	10.62	
	0.94308	13	10.39	23.39	46	22.61	
	4.874	11.7	10.47	22.17	46	23.83	
	9.654	13.4	10.5	23.9	50	26.10	

TEST ENGINEER: Kalsi

4 RADIATED EMISSION TEST

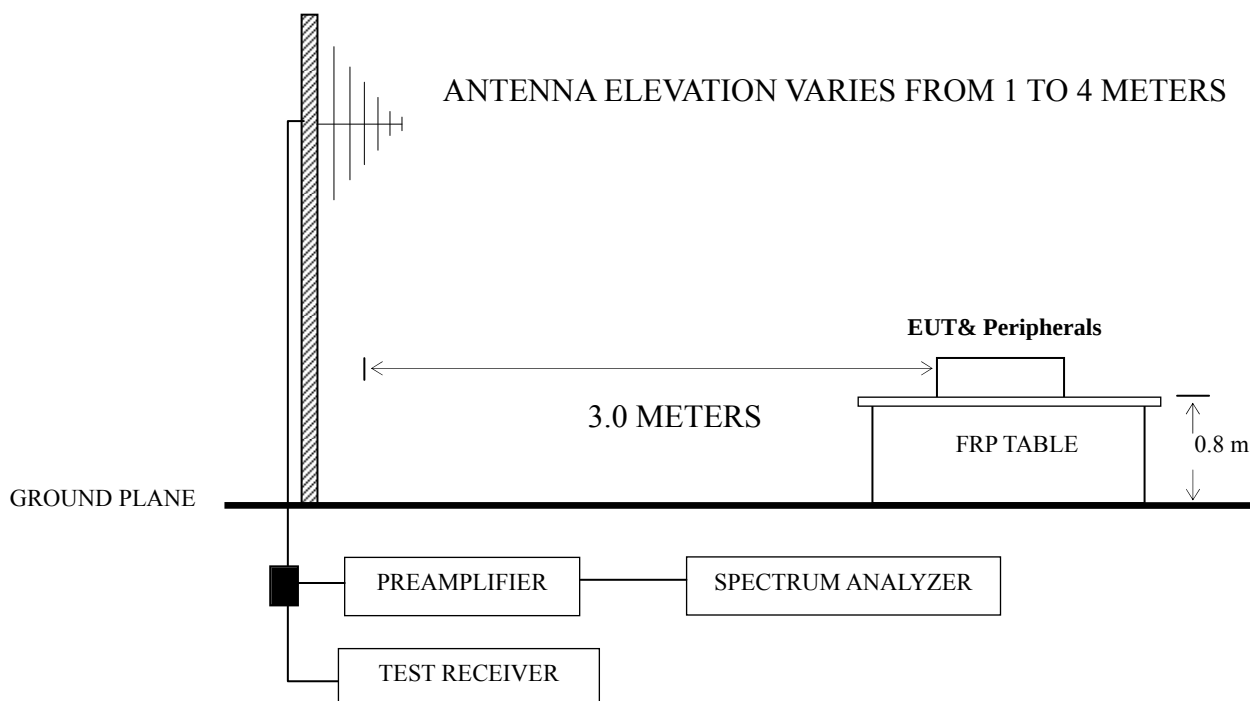
4.1 Test Equipment

The following test equipment are used during the radiated emission test in a semi-anechoic chamber:

Item	Type	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
1.	Preamplifier	Agilent	8447D	2944A06664	Apr 27, 2017	Apr 26, 2018
2.	Preamplifier	HP	8449B	3008A00864	Mar 20, 2017	Mar 19, 2018
3.	Spectrum Analyzer	Agilent	N9010A	MY52221182	May 25, 2017	May 24, 2018
4.	Test Receiver	R&S	ESCI	101303	May 07, 2017	May 06, 2018
5.	Bi-log Antenna	Schwarz beck	VULB 9168	708	Jul 20, 2017	Jul 19, 2018
6.	Horn Antenna	EMCO	3115	9607-4878	Jun 02, 2017	Jun 01, 2018
7.	Horn Antenna	EMCO	3116	00062643	Sep 08, 2017	Sep 08, 2019
8.	50Ω Coaxial Switch	Anritsu	MP59B	6200426390	Sep 17, 2017	Mar 17, 2018
9.	Software	Audix	E3	SET00200 9912M295-2	--	--

4.2 Block Diagram of Test Setup

4.2.1 Test Setup



4.3 Radiated Emission Limit [FCC Part 15 Subpart C 15.209]

Frequency (MHz)	Distance (m)	Field strength limits (μV/m)	
		(μV/m)	dB(μV/m)
30 ~ 88	3	100	40.0
88 ~ 216	3	150	43.5
216 ~ 960	3	200	46.0
Above 960	3	500	54.0
NOTE 1 - Emission Level dB (μV/m) = 20 log Emission Level (μV/m) NOTE 2 - The tighter limit applies at the band edges. NOTE 3 - Distance refers to the distance in meters between the measuring instrument antenna and the closed point of any part of the device or system. NOTE 4 - The limits shown are based on Quasi-peak value detector below or equal to 1GHz and Average value detector above 1GHz. NOTE 5 - Above 1 GHz, the limit on peak emission is 20 dB above the maximum permitted average emission limit applicable to the EUT			

4.4 Test Configuration

The EUT (listed in Sec.2.1) and the peripherals (listed in Sec.2.2) were installed as shown on Sec.4.2 to meet FCC requirements and operating in a manner that tends to maximize its emission level in a normal application.

4.5 Operating Condition of EUT

4.5.1 Setup the EUT as shown in Sec. 4.2.

4.5.2 Turn on the power of all equipment.

4.5.3 Turn the EUT on the test mode, and then test.

4.6 Test Procedures

Radiated emission test applies to harmonics/spurs that fall in the restricted bands listed in Section 15.205. The maximum permitted average field strength is listed in Section 15.209. A pre-amp is necessary for this measurement. For measurement above 1 GHz, set RBW = 1MHz, VBW = 10 Hz, Sweep: Auto. If the emission is pulsed, modify the unit for continuous operation; use the settings shown above, then correct the reading by subtracting the peak-average correction factor, derived from the appropriate duty cycle calculation.

The EUT was placed on a turntable that is 0.8 meter above ground. The turntable rotated 360 degrees to determine the position of the maximum emission level. The EUT was set 3 meters away from the receiving antenna, which was mounted on an antenna tower. The antenna moved up and down between 1 meter and 4 meters to find out the maximum emission level. Broadband antenna (Calibrated Bilog Antenna) or Horn antenna was used as receiving antenna. Both horizontal and vertical polarizations of the antenna were set on measurement. In order to find the maximum emission, all of the interference cables were manipulated according to ANSI C63.4:2009 requirements during radiated emission test.

The bandwidth of Test Receiver R&S ESCI was set at 120 kHz from 30MHz to 1000MHz.

The bandwidth of the VBW was set at 1MHz and RBW was set at 1MHz for peak emission measurement above 1GHz for Spectrum Agilent N9010A.

The frequency range from 30 MHz to 25 GHz (Up to 10th harmonics from fundamental frequency) was checked.

All the test results are listed in Sec.4.7.

4.7 Test Results

<PASS>

The frequency and amplitude of the highest radiated emission relative the limit is reported. All the emissions not reported below are too low against the FCC limit.

No.	Operation	Modulation	Channel	Frequency	Data Page	
1.	Transmitting	Worst case emission < 1GHz			P15	
2.		DH1	00	2402 MHz	P16	
3.			39	2441 MHz		
4.			78	2480 MHz		
5.		3DH5	00	2402 MHz	P17	
6.			39	2441 MHz		
7.			78	2480 MHz		
8.	Receiving	--	--		P18	
9.		DH1/3DH1/DH3/3DH3	01	2412 MHz	Restricted Frequency bands	P19
10.			11	2462 MHz		
11.		DH5/3DH5	01	2412 MHz		P20
12.			11	2462 MHz		

NOTE 1 – Level = Read Level + Antenna Factor + Cable Loss (<1GHz)

NOTE 2 – Level = Read Level + Antenna Factor + Cable Loss - Preamp Factor (>1GHz)

NOTE 3 – All reading are Quasi-Peak values below or equal to 1GHz, Peak and Average values above 1GHz.

For above 1GHz test, if the peak measured value complies with the average limit, it is unnecessary to perform an average measurement.

Worst case emission < 1GHz

EUT : Console Temperature : 22°C

Model No. : XER Humidity : 51%RH

Test Mode : Transmitting Date of Test : 2018.02.07

Polarization	Frequency (MHz)	Meter Reading dB (μV)	Antenna Factor (dB/m)	Cable Loss (dB)	Emission Level dB (μV/m)	Limits dB (μV/m)	Margin (dB)	Remark
Horizontal	67.915	17.08	7.35	0.81	25.24	40	14.76	QP
	84.765	16.69	10.3	0.9	27.89	40	12.11	
	183.223	24.65	9.93	1.42	36	43.5	7.50	
	205.234	21.88	10.26	1.52	33.66	43.5	9.84	
	239.365	17	11.62	1.6	30.22	46	15.78	
	595.483	16.55	19.5	2.5	38.55	46	7.45	
Vertical	55.958	22.29	7.83	0.73	30.85	40	9.15	QP
	70.239	20.06	8.96	0.85	29.87	40	10.13	
	144.098	19.24	12.27	1.24	32.75	43.5	10.75	
	203.776	22.8	10.26	1.52	34.58	43.5	8.92	
	596.876	14.39	19.5	2.5	36.39	46	9.61	
	723.204	16.34	20.48	2.73	39.55	46	6.45	

TEST ENGINEER: Sunny

Radiated Emission > 1GHz

EUT : Console Temperature : 22°C

Model No. : XER Humidity : 51%RH

Test Mode : Transmitting Date of Test : 2018.02.07

DH1Ch 00

Polarization	Frequency (MHz)	Meter Reading dB (μV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamplifier Factor (dB)	Emission Level dB (μV/m)	Limits dB (μV/m)	Margin (dB)	Remark
Horizontal	1577.611	45.5	26.24	4.13	35.68	40.19	74	33.81	Peak
	1857.804	44.85	27.31	4.46	35.42	41.2	74	32.80	Peak
	3647.54	45.21	32.02	6.41	34.52	49.12	74	24.88	Peak
Vertical	1721.869	45.71	26.81	4.31	35.54	41.29	74	32.71	Peak
	3388.442	45.98	31.45	6.16	34.78	48.81	74	25.19	Peak
	5093.309	44.22	34.31	7.84	33.93	52.44	74	21.56	Peak

DH1Ch 39

Polarization	Frequency (MHz)	Meter Reading dB (μV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamplifier Factor (dB)	Emission Level dB (μV/m)	Limits dB (μV/m)	Margin (dB)	Remark
Horizontal	1233.105	47.11	24.54	3.63	36.07	39.21	74	34.79	Peak
	2084.491	45.11	27.98	4.72	35.29	42.52	74	31.48	Peak
	3357.376	44.77	31.38	6.11	34.8	47.46	74	26.54	Peak
Vertical	1651.962	45.37	26.55	4.22	35.61	40.53	74	33.47	Peak
	2937.65	43.97	30.31	5.67	35.2	44.75	74	29.25	Peak
	4539.416	44.01	33.83	7.32	34.03	51.13	74	22.87	Peak

DH1Ch 78

Polarization	Frequency (MHz)	Meter Reading dB (μV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamplifier Factor (dB)	Emission Level dB (μV/m)	Limits dB (μV/m)	Margin (dB)	Remark
Horizontal	2280.342	44.8	28.38	5	35.27	42.91	74	31.09	Peak
	3273.407	44.36	31.18	6.06	34.89	46.71	74	27.29	Peak
	4120.975	44.68	32.97	6.85	34.16	50.34	74	23.66	Peak
Vertical	1663.413	46.91	26.58	4.25	35.6	42.14	74	31.86	Peak
	2202.927	45.71	28.23	4.88	35.28	43.54	74	30.46	Peak
	4405.549	43.81	33.61	7.19	34.07	50.54	74	23.46	Peak

3DH5Ch 00

Polarization	Frequency (MHz)	Meter Reading dB (μV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Emission Level dB (μV/m)	Limits dB (μV/m)	Margin (dB)	Remark
Horizontal	1386.756	45.76	25.36	3.87	35.88	39.11	74	34.89	Peak
	3013.006	44.67	30.55	5.75	35.18	45.79	74	28.21	Peak
	5116.818	44.68	34.35	7.84	33.94	52.93	74	21.07	Peak
Vertical	1409.289	45.63	25.48	3.9	35.86	39.15	74	34.85	Peak
	2606.154	45.16	29.18	5.35	35.23	44.46	74	29.54	Peak
	3605.786	44.71	31.93	6.36	34.56	48.44	74	25.56	Peak

3DH5Ch 39

Polarization	Frequency (MHz)	Meter Reading dB (μV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Emission Level dB (μV/m)	Limits dB (μV/m)	Margin (dB)	Remark
Horizontal	2041.738	45.43	27.89	4.68	35.3	42.7	74	31.30	Peak
	3033.891	45.66	30.59	5.75	35.15	46.85	74	27.15	Peak
	5942.921	42.07	35.16	8.43	34.18	51.48	74	22.52	Peak
Vertical	2004.472	45.21	27.81	4.64	35.3	42.36	74	31.64	Peak
	3097.419	46.01	30.75	5.85	35.09	47.52	74	26.48	Peak
	4954.502	44.5	34.17	7.72	33.91	52.48	74	21.52	Peak

3DH5Ch

Polarization	Frequency (MHz)	Meter Reading dB (μV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Emission Level dB (μV/m)	Limits dB (μV/m)	Margin (dB)	Remark
Horizontal	1766.038	44.79	26.98	4.37	35.5	40.64	74	33.36	Peak
	2818.383	43.62	29.91	5.55	35.22	43.86	74	30.14	Peak
	4355.119	43.27	33.5	7.12	34.09	49.8	74	24.20	Peak
Vertical	1297.179	45.92	24.9	3.75	35.99	38.58	74	35.42	Peak
	2060.63	45.48	27.93	4.72	35.29	42.84	74	31.16	Peak
	3539.973	44.2	31.79	6.31	34.62	47.68	74	26.32	Peak

TEST ENGINEER: Sunny

EUT : Console Temperature : 22℃

Model No. : XER Humidity : 51%RH

Test Mode : Receiving Date of Test : 2018.02.07

Polarization	Frequency (MHz)	Meter Reading dB (μV)	Cable Loss (dB)	Antenna Factor (dB/m)	Preamplifier Factor (dB)	Emission Level dB (μV/m)	Limits dB (μV/m)	Margin (dB)	Remark
Horizontal	35.234	12.91	0.61	14.55	0	28.07	40	11.93	QP
	57.443	14.2	0.73	7.18	0	22.11	40	17.89	
	174.736	11.98	1.4	10.61	0	23.99	43.5	19.51	
	241.131	18.46	1.6	11.96	0	32.02	46	13.98	
	412.387	13.78	2.06	16.48	0	32.32	46	13.68	
	835.384	3.47	2.96	20.6	0	27.03	46	18.97	
	1111.27	47.3	3.52	24.19	36.25	38.76	74	35.24	PK
	1800.153	44.88	4.47	26.84	35.4	40.79	74	33.21	
	3109.322	43.52	5.97	30.73	35.08	45.14	74	28.86	
Vertical	50.456	17.47	0.75	7.06	0	25.28	40	14.72	QP
	77.328	13.85	0.85	7.9	0	22.6	40	17.40	
	100.827	11.61	0.99	12.32	0	24.92	43.5	18.58	
	123.982	16.41	1.13	12.6	0	30.14	43.5	13.36	
	181.788	19.55	1.39	10.76	0	31.7	43.5	11.80	
	235.776	11.36	1.58	11.82	0	24.76	46	21.24	
	1202.726	46.83	3.58	24.31	36.21	38.51	74	35.49	PK
	1540.827	45.32	4.11	25.77	35.7	39.5	74	34.50	
	2323.298	44.45	5.19	28.22	35.2	42.66	74	31.34	

TEST ENGINEER: Sunny

Radiated Band Edge measurement:**DH1**

Polarization	Frequency (MHz)	Meter Reading dB (μV)	Cable Loss (dB)	Antenna Factor (dB/m)	Preamplifier Factor (dB)	Emission Level dB (μV/m)	Limits dB (μV/m)	Margin (dB)	Remark
Horizontal	2389.341	57.04	5.12	28.59	35.26	55.49	74	18.51	PK
	2483.515	54.82	5.19	28.77	35.25	53.53	74	20.47	
	2389.341	43.23	5.12	28.59	35.26	41.68	54	12.32	AV
	2483.515	39.75	5.19	28.77	35.25	38.46	54	15.54	
Vertical	2389.376	58.07	5.12	28.59	35.26	56.52	74	17.48	PK
	2483.485	55.38	5.19	28.77	35.25	54.09	74	19.91	
	2389.376	40.33	5.12	28.59	35.26	38.78	54	15.22	AV
	2483.485	37.12	5.19	28.77	35.25	35.83	54	18.17	

3DH1

Polarization	Frequency (MHz)	Meter Reading dB (μV)	Cable Loss (dB)	Antenna Factor (dB/m)	Preamplifier Factor (dB)	Emission Level dB (μV/m)	Limits dB (μV/m)	Margin (dB)	Remark
Horizontal	2389.446	57.18	5.12	28.59	35.26	55.63	74	18.37	PK
	2483.575	56.36	5.19	28.77	35.25	55.07	74	18.93	
	2389.446	41.2	5.12	28.59	35.26	39.65	54	14.35	AV
	2483.575	40.01	5.19	28.77	35.25	38.72	54	15.28	
Vertical	2389.551	56.94	5.12	28.59	35.26	55.39	74	18.61	PK
	2483.605	54.82	5.19	28.77	35.25	53.53	74	20.47	
	2389.551	39.42	5.12	28.59	35.26	37.87	54	16.13	AV
	2483.605	39.29	5.19	28.77	35.25	38	54	16.00	

DH3

Polarization	Frequency (MHz)	Meter Reading dB (μV)	Cable Loss (dB)	Antenna Factor (dB/m)	Preamplifier Factor (dB)	Emission Level dB (μV/m)	Limits dB (μV/m)	Margin (dB)	Remark
Horizontal	2390.076	56.31	5.12	28.59	35.26	54.76	74	19.24	PK
	2483.755	55.5	5.19	28.77	35.25	54.21	74	19.79	
	2390.076	39.77	5.12	28.59	35.26	38.22	54	15.78	AV
	2483.755	38.64	5.19	28.77	35.25	37.35	54	16.65	
Vertical	2389.076	55.66	5.12	28.59	35.26	54.11	74	19.89	PK
	2483.905	55.94	5.19	28.77	35.25	54.65	74	19.35	
	2389.076	39.28	5.12	28.59	35.26	37.73	54	16.27	AV
	2483.905	39.64	5.19	28.77	35.25	38.35	54	15.65	

3DH3

Polarization	Frequency (MHz)	Meter Reading dB (μV)	Cable Loss (dB)	Antenna Factor (dB/m)	Preamplifier Factor (dB)	Emission Level dB (μV/m)	Limits dB (μV/m)	Margin (dB)	Remark
Horizontal	2389.596	57.24	5.12	28.59	35.26	55.69	74	18.31	PK
	2483.696	54.65	5.19	28.77	35.25	53.36	74	20.64	
	2389.596	39.27	5.12	28.59	35.26	37.72	54	16.28	AV
	2483.696	40.04	5.19	28.77	35.25	38.75	54	15.25	
Vertical	2389.996	55.28	5.12	28.59	35.26	53.73	74	20.27	PK
	2483.766	53.81	5.19	28.77	35.25	52.52	74	21.48	
	2389.996	40.11	5.12	28.59	35.26	38.56	54	15.44	AV
	2483.766	38.64	5.19	28.77	35.25	37.35	54	16.65	

DH5

Polarization	Frequency (MHz)	Meter Reading dB (μV)	Cable Loss (dB)	Antenna Factor (dB/m)	Preamp Factor (dB)	Emission Level dB (μV/m)	Limits dB (μV/m)	Margin (dB)	Remark
Horizontal	2389.756	55.82	5.12	28.59	35.26	54.27	74	19.73	PK
	2484.046	55.34	5.19	28.77	35.25	54.05	74	19.95	
	2389.756	40.28	5.12	28.59	35.26	38.73	54	15.27	AV
	2484.046	37.65	5.19	28.77	35.25	36.36	54	17.64	
Vertical	2389.990	57.52	5.12	28.65	35.26	56.03	74	17.97	PK
	2483.801	53.62	5.19	28.77	35.25	52.33	74	21.67	
	2389.990	40.92	5.12	28.65	35.26	39.43	54	14.57	AV
	2483.801	38.33	5.19	28.77	35.25	37.04	54	16.96	

3DH5

Polarization	Frequency (MHz)	Meter Reading dB (μV)	Cable Loss (dB)	Antenna Factor (dB/m)	Preamp Factor (dB)	Emission Level dB (μV/m)	Limits dB (μV/m)	Margin (dB)	Remark
Horizontal	2389.955	55.43	5.12	28.65	35.26	53.94	74	20.06	PK
	2483.52	54.89	5.19	28.77	35.25	53.6	74	20.40	
	2389.955	40.79	5.12	28.65	35.26	39.3	54	14.70	AV
	2483.52	39.12	5.19	28.77	35.25	37.83	54	16.17	
Vertical	2389.945	54.52	5.12	28.65	35.26	53.03	74	20.97	PK
	2483.678	50.76	5.23	28.78	35.25	49.52	74	24.48	
	2389.945	40.49	5.12	28.65	35.26	39.00	54	15.00	AV
	2483.678	40.12	5.19	28.78	35.25	38.84	54	15.16	

TEST ENGINEER: Sunny

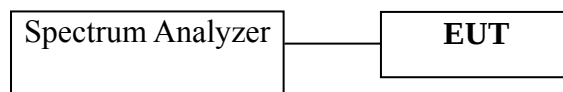
5 20 dB BANDWIDTH MEASUREMENT

5.1 Test Equipment

The following test equipment was used during the Emission Bandwidth measurement:

Item	Type	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
1.	EXA Signal Analyzer	Agilent	N9010A	MY52221182	May 25, 2017	May 24, 2018

5.2 Block Diagram of Test Setup



5.3 Specification Limits (§15.247(a)(1))

For frequency hopping systems, hopping channel carrier frequencies separated by a minimum of 25kHz or the 20dB bandwidth of hopping channel, whichever is greater.

5.4 Operating Condition of EUT

Enable the EUT to transmit data at different channel frequency individually.

5.5 Test Procedure

The transmitter output was connected to the spectrum analyzer. The bandwidth of the fundamental frequency was measured by spectrum analyzer.

Measure the frequency difference of two frequencies that were attenuated 20 dB from the reference level. Record the frequency difference as the emission bandwidth.

The test procedure is defined in DA 00-705.

5.6 Test Results

PASSED.

All the test results are attached in next pages.

(Test Date: 2018.02.10 Temperature: 23℃ Humidity: 50 %)

DH1

Channel	Frequency	20dB Bandwidth
00	2402 MHz	1.148 MHz
39	2441 MHz	1.143 MHz
78	2480 MHz	1.144 MHz

3DH1

Channel	Frequency	20dB Bandwidth
00	2402 MHz	1.162 MHz
39	2441 MHz	1.154 MHz
78	2480 MHz	1.148 MHz

DH3

Channel	Frequency	20dB Bandwidth
00	2402 MHz	1.144 MHz
39	2441 MHz	1.158 MHz
78	2480 MHz	1.144 MHz

3DH3

Channel	Frequency	20dB Bandwidth
00	2402 MHz	1.123 MHz
39	2441 MHz	1.127 MHz
78	2480 MHz	1.117 MHz

DH5

Channel	Frequency	20dB Bandwidth
00	2402 MHz	1.149 MHz
39	2441 MHz	1.150 MHz
78	2480 MHz	1.156 MHz

3DH5

Channel	Frequency	20dB Bandwidth
00	2402 MHz	1.199 MHz
39	2441 MHz	1.197 MHz
78	2480 MHz	1.106 MHz

DH1Ch 00

Center Freq 2.402000000 GHz

Center Freq: 2.402000000 GHz

Radio Std: None

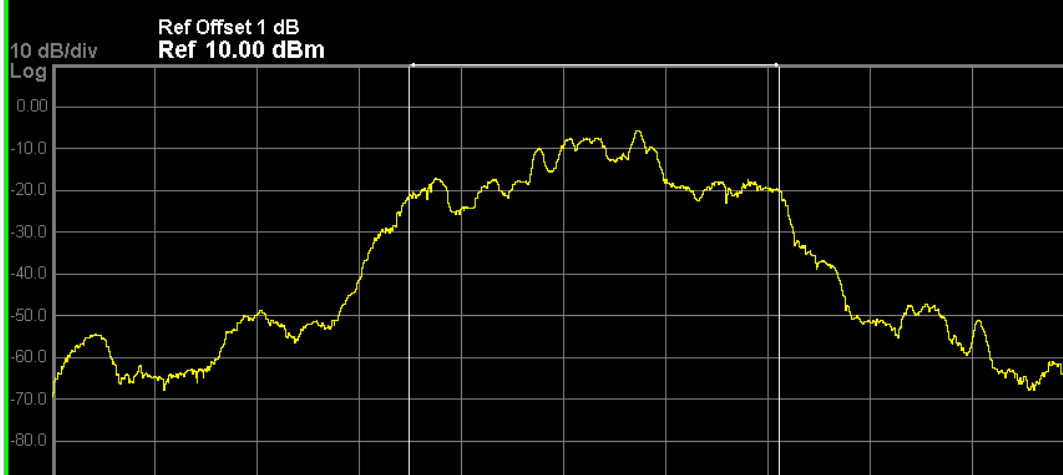
Trig: Free Run

Avg|Hold:>100/100

IFGain:Low

#Atten: 10 dB

Radio Device: BTS



Occupied Bandwidth

Total Power

2.29 dBm

1.0858 MHz

Transmit Freq Error

90.893 kHz

OBW Power

99.00 %

x dB Bandwidth

1.148 MHz

x dB

-20.00 dB

DH1Ch 39

Center Freq 2.441000000 GHz

Center Freq: 2.441000000 GHz

Radio Std: None

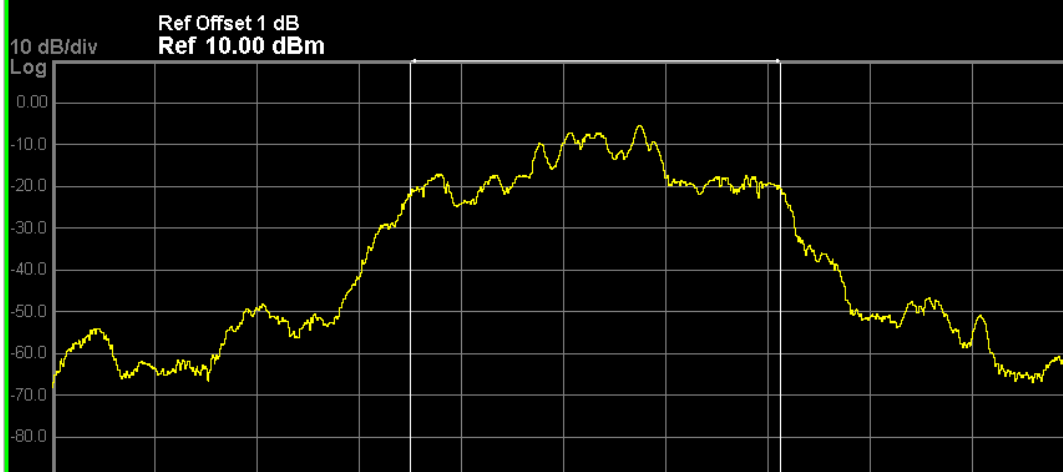
Trig: Free Run

Avg|Hold:>100/100

IFGain:Low

#Atten: 10 dB

Radio Device: BTS



Occupied Bandwidth

Total Power

2.39 dBm

1.0808 MHz

Transmit Freq Error

94.678 kHz

OBW Power

99.00 %

x dB Bandwidth

1.143 MHz

x dB

-20.00 dB

DH1Ch 78

Center Freq 2.48000000 GHz

Center Freq: 2.48000000 GHz

Radio Std: None

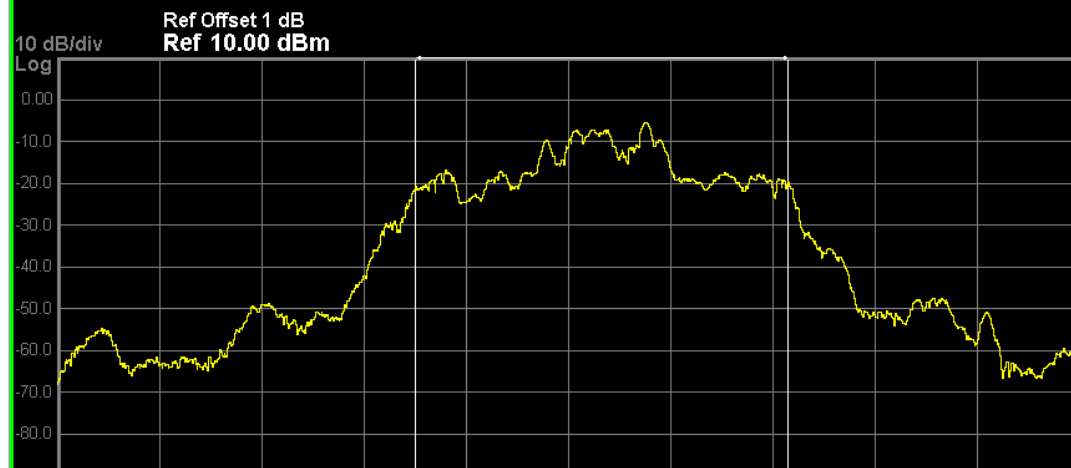
Trig: Free Run

Avg|Hold:>100/100

IFGain:Low

#Atten: 10 dB

Radio Device: BTS



Occupied Bandwidth

Total Power

2.35 dBm

1.0881 MHz

Transmit Freq Error

99.553 kHz

OBW Power

99.00 %

x dB Bandwidth

1.144 MHz

x dB

-20.00 dB

3DH1Ch 00

Center Freq 2.40200000 GHz

Center Freq: 2.40200000 GHz

Radio Std: None

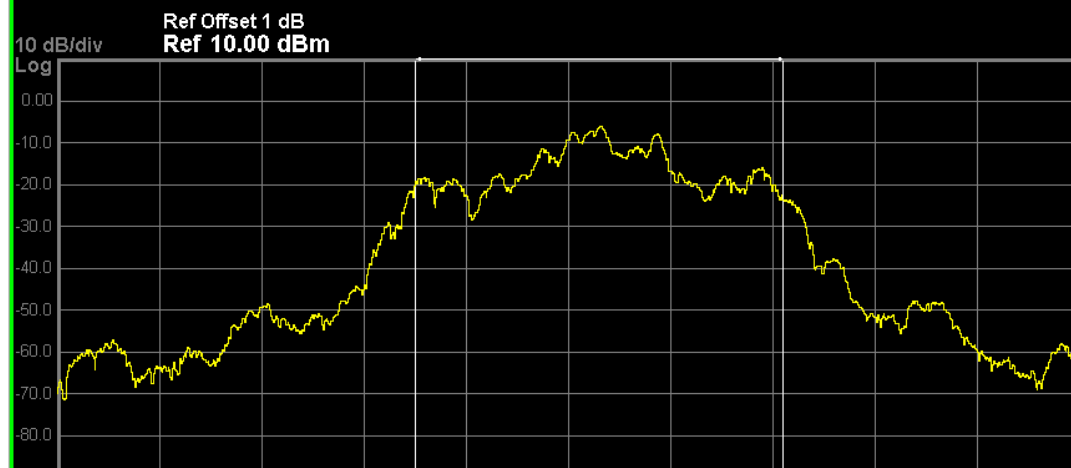
Trig: Free Run

Avg|Hold:>100/100

IFGain:Low

#Atten: 10 dB

Radio Device: BTS



Occupied Bandwidth

Total Power

1.97 dBm

1.0829 MHz

Transmit Freq Error

89.635 kHz

OBW Power

99.00 %

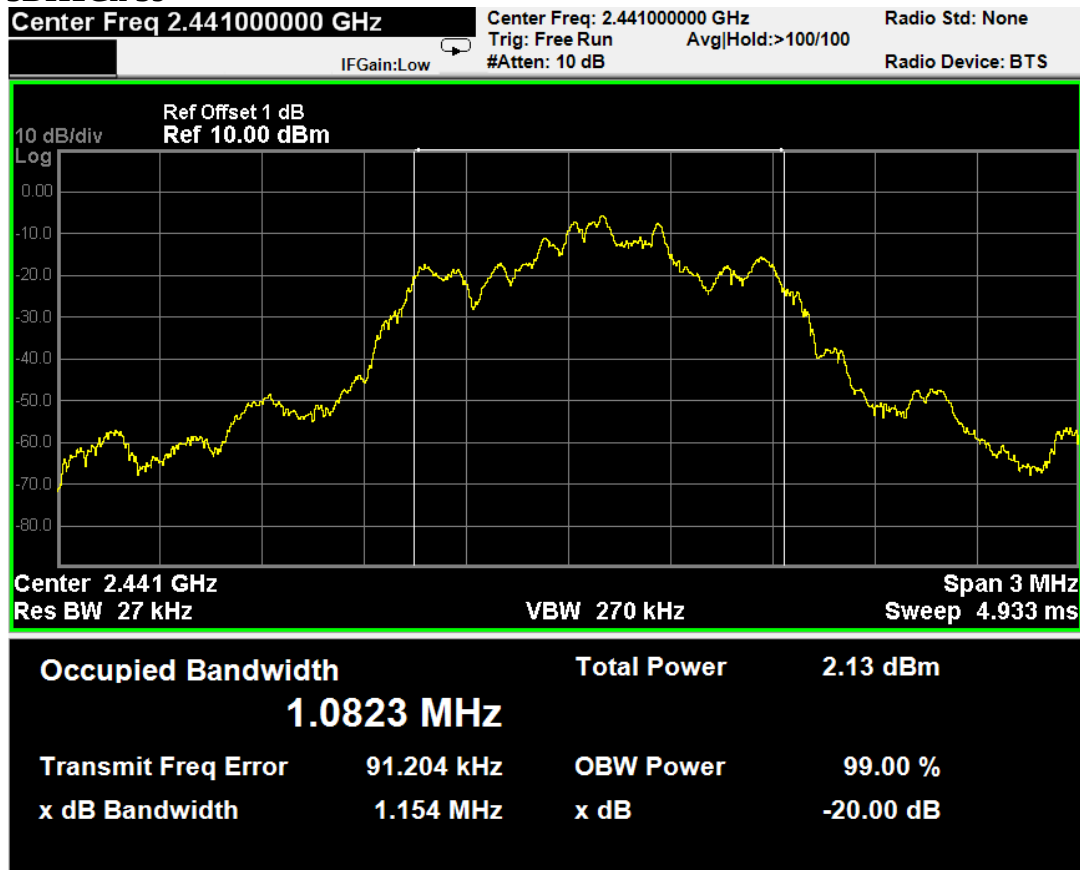
x dB Bandwidth

1.162 MHz

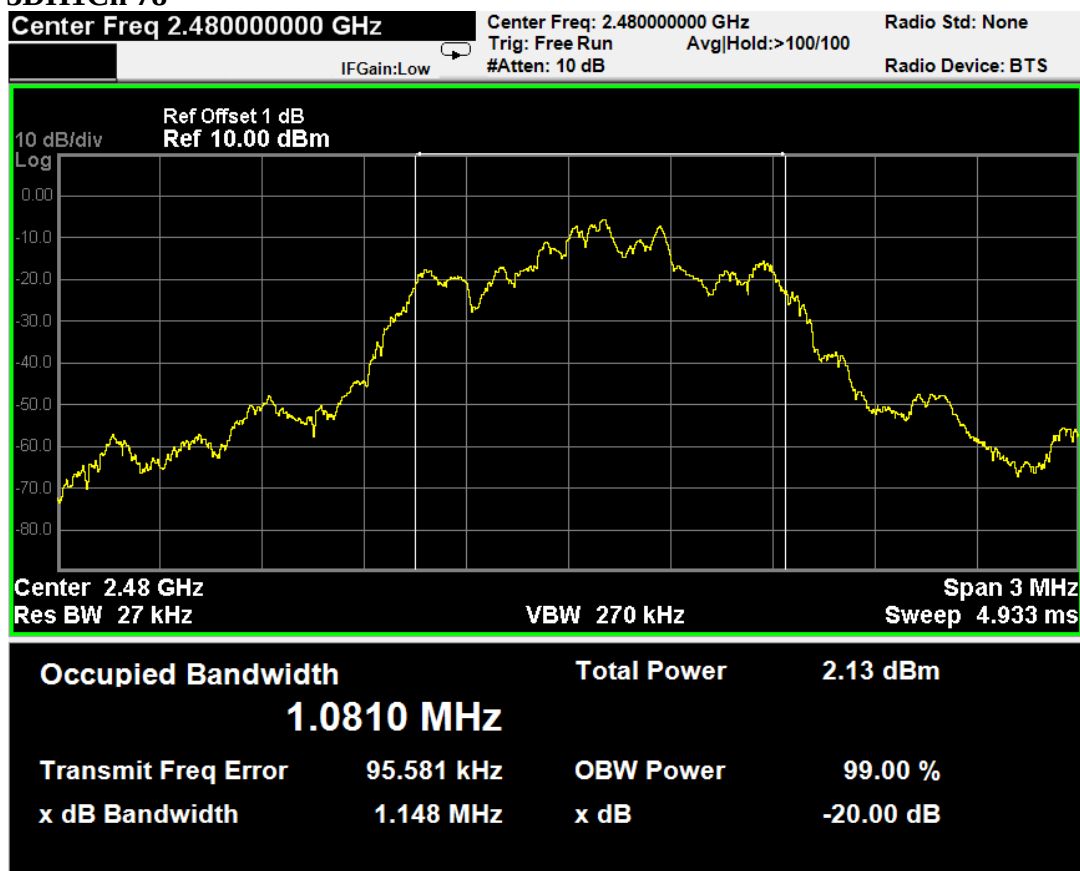
x dB

-20.00 dB

3DH1Ch 39



3DH1Ch 78



DH3Ch 00

Center Freq 2.402000000 GHz

Center Freq: 2.402000000 GHz

Radio Std: None

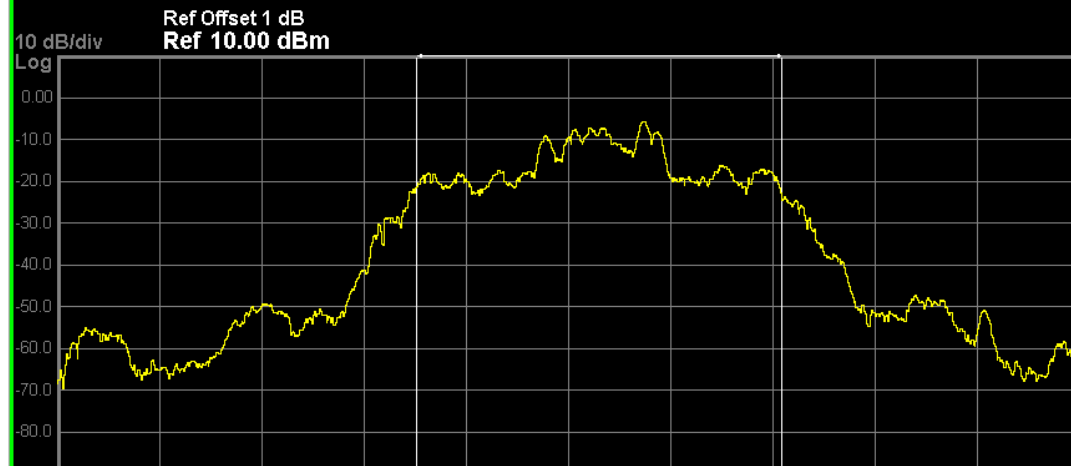
Trig: Free Run

Avg|Hold:>100/100

IFGain:Low

#Atten: 10 dB

Radio Device: BTS



Occupied Bandwidth

Total Power

2.39 dBm

1.0736 MHz

Transmit Freq Error

90.142 kHz

OBW Power

99.00 %

x dB Bandwidth

1.144 MHz

x dB

-20.00 dB

DH3Ch 39

Center Freq 2.441000000 GHz

Center Freq: 2.441000000 GHz

Radio Std: None

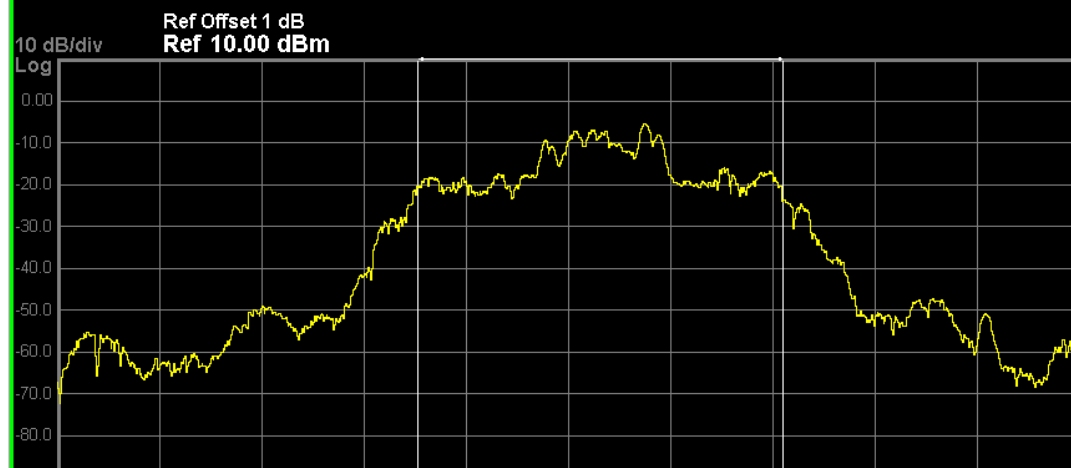
Trig: Free Run

Avg|Hold:>100/100

IFGain:Low

#Atten: 10 dB

Radio Device: BTS



Occupied Bandwidth

Total Power

2.48 dBm

1.0725 MHz

Transmit Freq Error

93.459 kHz

OBW Power

99.00 %

x dB Bandwidth

1.158 MHz

x dB

-20.00 dB

DH3Ch 78

Center Freq 2.48000000 GHz

Center Freq: 2.48000000 GHz

Radio Std: None

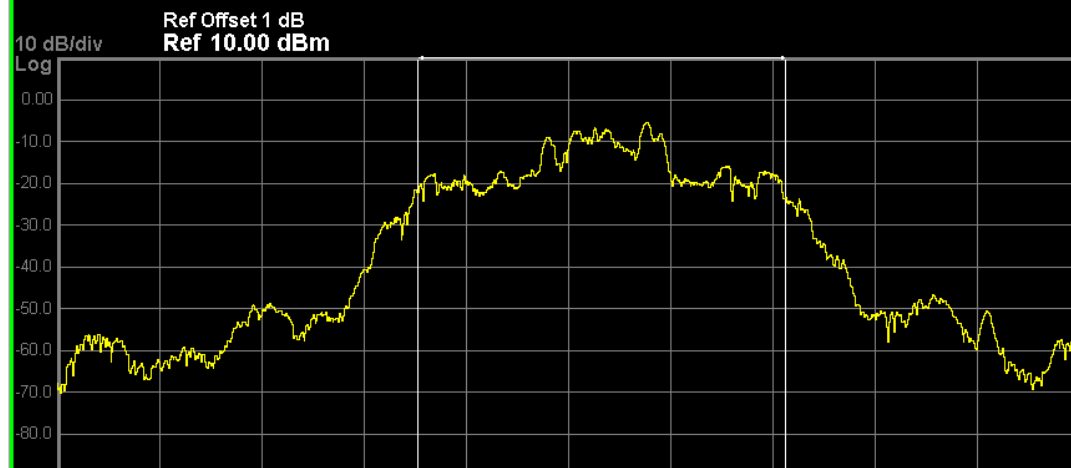
Trig: Free Run

Avg|Hold:>100/100

IFGain:Low

#Atten: 10 dB

Radio Device: BTS



Occupied Bandwidth

Total Power

2.43 dBm

1.0724 MHz

Transmit Freq Error

98.931 kHz

OBW Power

99.00 %

x dB Bandwidth

1.144 MHz

x dB

-20.00 dB

3DH3Ch 00

Center Freq 2.40200000 GHz

Center Freq: 2.40200000 GHz

Radio Std: None

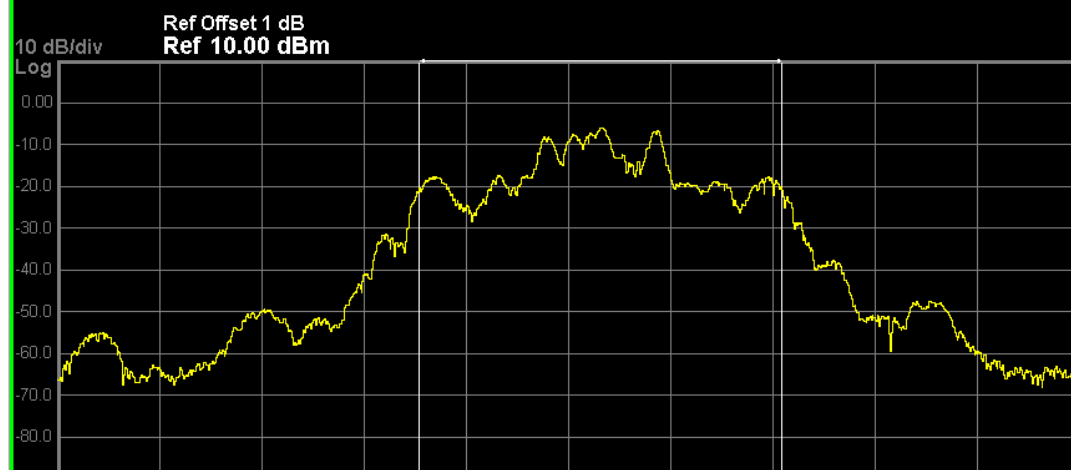
Trig: Free Run

Avg|Hold:>100/100

IFGain:Low

#Atten: 10 dB

Radio Device: BTS



Occupied Bandwidth

Total Power

2.14 dBm

1.0580 MHz

Transmit Freq Error

96.444 kHz

OBW Power

99.00 %

x dB Bandwidth

1.123 MHz

x dB

-20.00 dB

3DH3Ch 39

Center Freq 2.441000000 GHz

Center Freq: 2.441000000 GHz

Radio Std: None

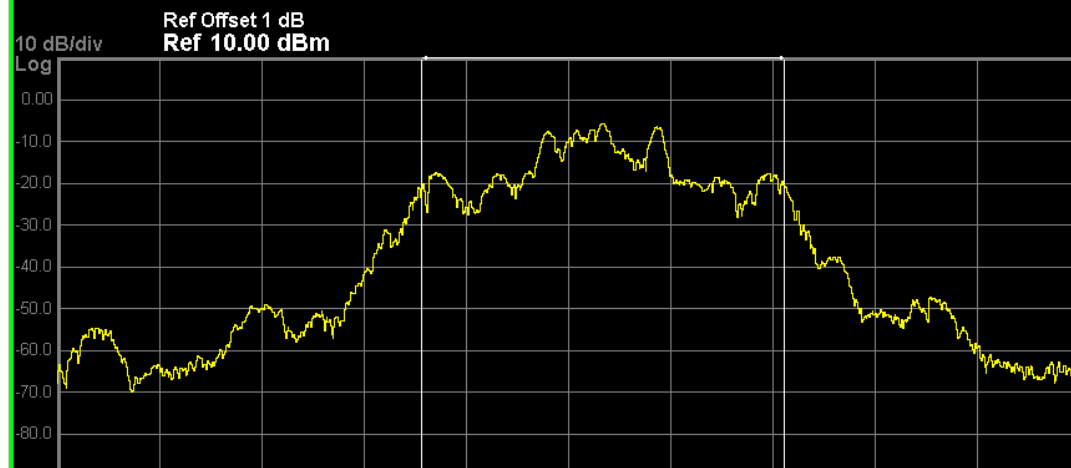
Trig: Free Run

Avg|Hold:>100/100

IFGain:Low

#Atten: 10 dB

Radio Device: BTS



Occupied Bandwidth

Total Power

2.27 dBm

1.0613 MHz

Transmit Freq Error

101.62 kHz

OBW Power

99.00 %

x dB Bandwidth

1.127 MHz

x dB

-20.00 dB

3DH3Ch 78

Center Freq 2.480000000 GHz

Center Freq: 2.480000000 GHz

Radio Std: None

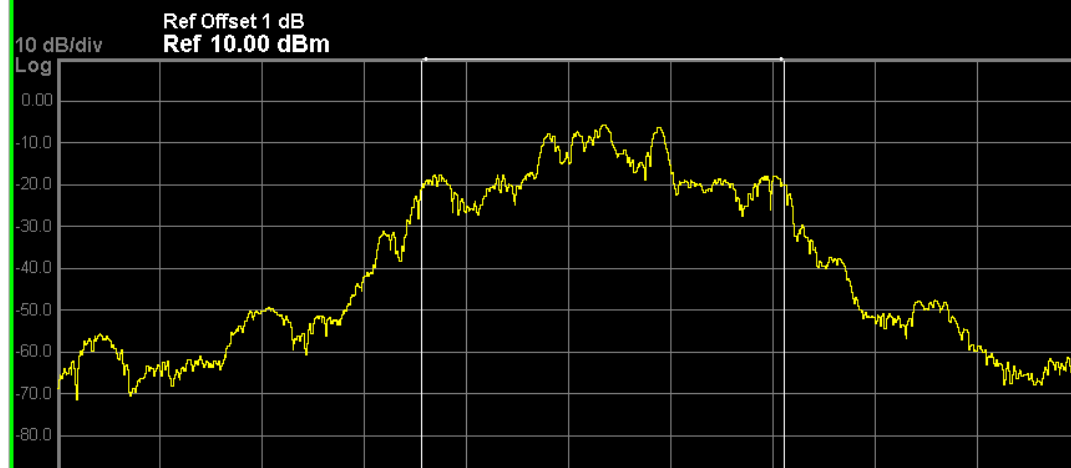
Trig: Free Run

Avg|Hold:>100/100

IFGain:Low

#Atten: 10 dB

Radio Device: BTS



Occupied Bandwidth

Total Power

2.07 dBm

1.0568 MHz

Transmit Freq Error

103.25 kHz

OBW Power

99.00 %

x dB Bandwidth

1.117 MHz

x dB

-20.00 dB

DH5Ch 00

Center Freq 2.40200000 GHz

Center Freq: 2.40200000 GHz

Radio Std: None

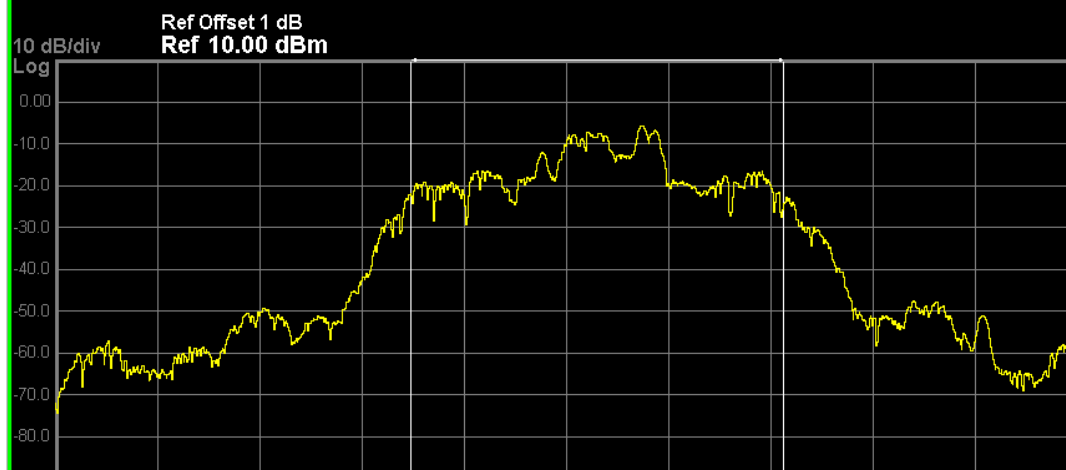
Trig: Free Run

Avg|Hold:>100/100

IFGain:Low

#Atten: 10 dB

Radio Device: BTS



Center 2.402 GHz

Res BW 27 kHz

VBW 270 kHz

Span 3 MHz

Sweep 4.933 ms

Occupied Bandwidth

Total Power

2.14 dBm

1.0860 MHz

Transmit Freq Error

92.523 kHz

OBW Power

99.00 %

x dB Bandwidth

1.149 MHz

x dB

-20.00 dB

DH5Ch 39

Center Freq 2.44100000 GHz

Center Freq: 2.44100000 GHz

Radio Std: None

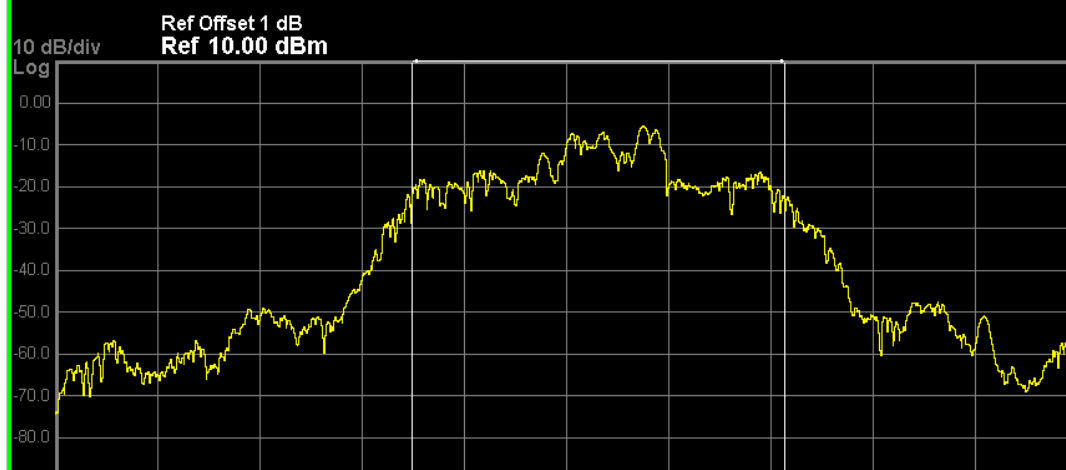
Trig: Free Run

Avg|Hold:>100/100

IFGain:Low

#Atten: 10 dB

Radio Device: BTS



Center 2.441 GHz

Res BW 27 kHz

VBW 270 kHz

Span 3 MHz

Sweep 4.933 ms

Occupied Bandwidth

Total Power

2.05 dBm

1.0851 MHz

Transmit Freq Error

96.291 kHz

OBW Power

99.00 %

x dB Bandwidth

1.150 MHz

x dB

-20.00 dB

DH5Ch 78

Center Freq 2.48000000 GHz

Center Freq: 2.48000000 GHz

Radio Std: None

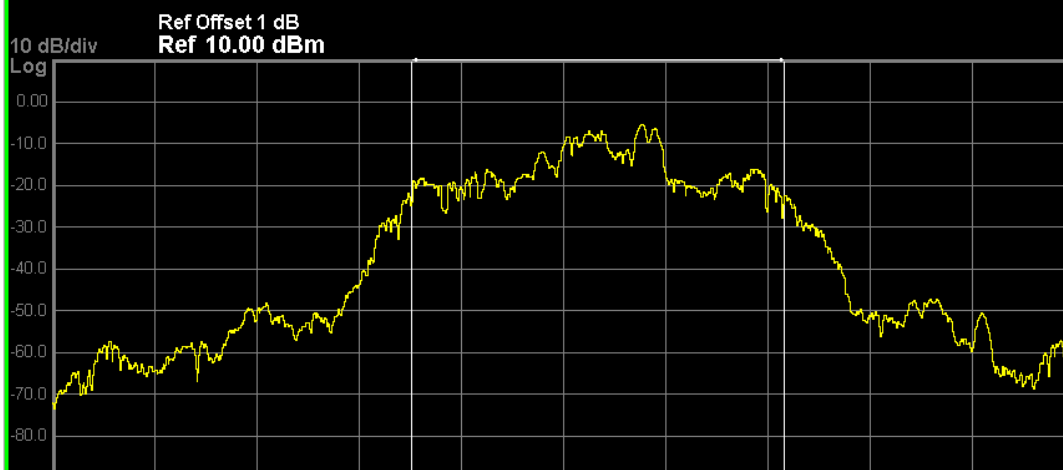
Trig: Free Run

Avg|Hold:>100/100

IFGain:Low

#Atten: 10 dB

Radio Device: BTS



Occupied Bandwidth

Total Power

2.26 dBm

1.0906 MHz

Transmit Freq Error

103.00 kHz

OBW Power

99.00 %

x dB Bandwidth

1.156 MHz

x dB

-20.00 dB

3DH5Ch 00

Center Freq 2.40200000 GHz

Center Freq: 2.40200000 GHz

Radio Std: None

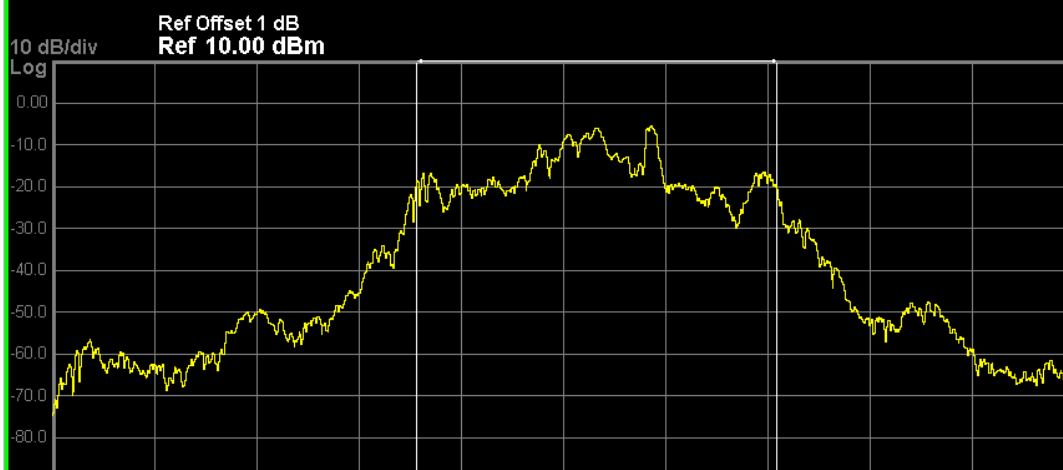
Trig: Free Run

Avg|Hold:>100/100

IFGain:Low

#Atten: 10 dB

Radio Device: BTS



Occupied Bandwidth

Total Power

1.84 dBm

1.0525 MHz

Transmit Freq Error

98.490 kHz

OBW Power

99.00 %

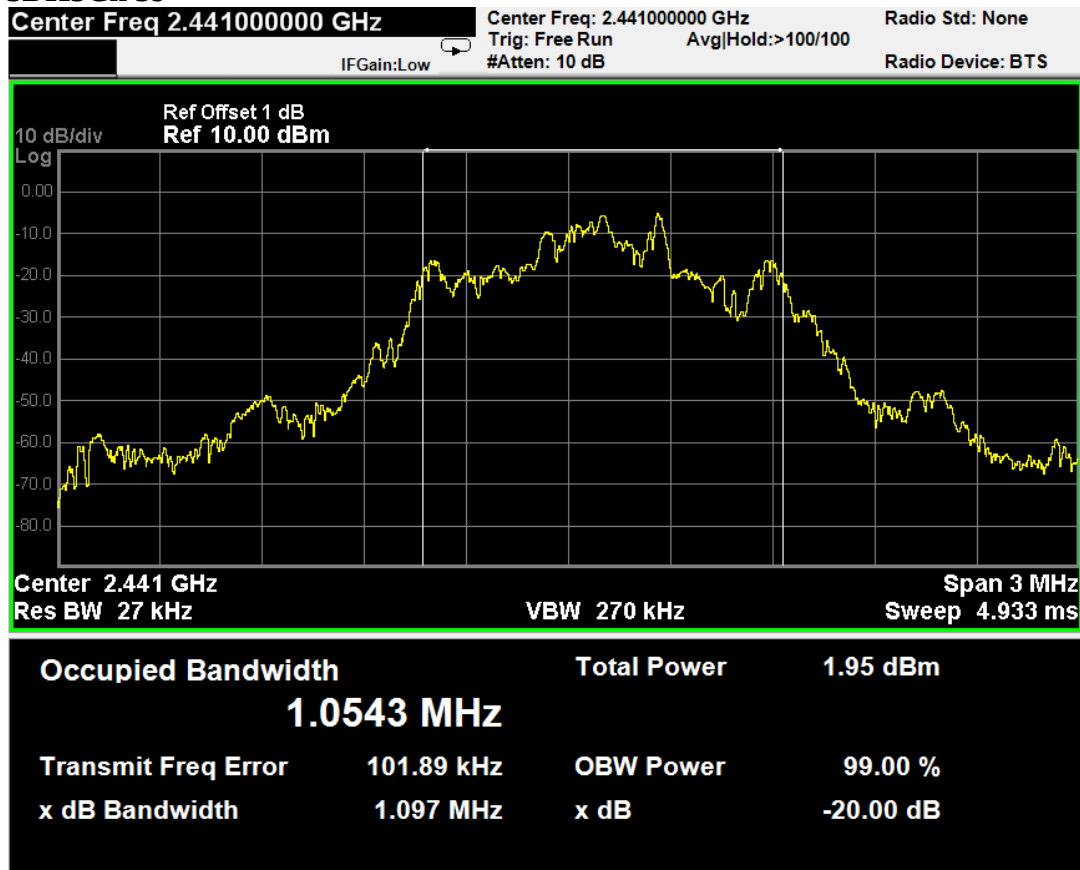
x dB Bandwidth

1.099 MHz

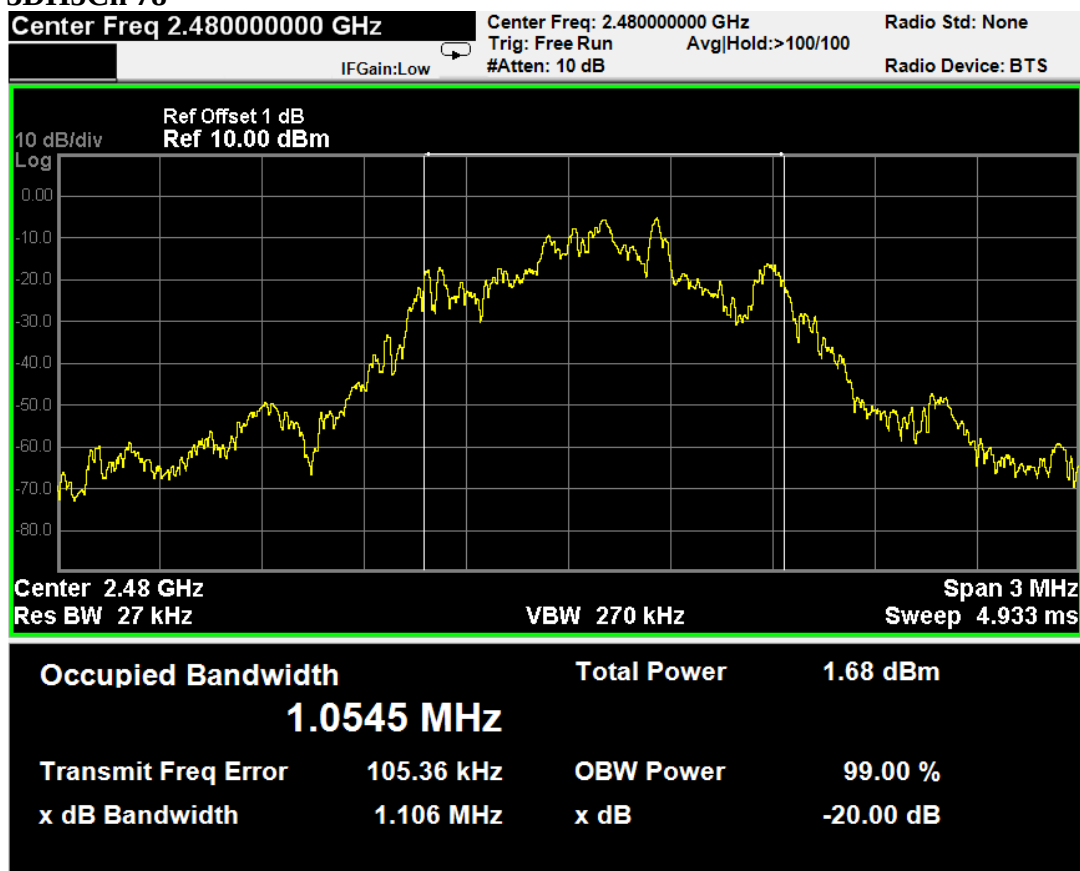
x dB

-20.00 dB

3DH5Ch 39



3DH5Ch 78



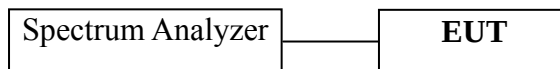
6 PEAK OUTPUT POWER MEASUREMENT

6.1 Test Equipment

The following test equipment was used during the maximum peak output power measurement:

Item	Type	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
1.	EXA Signal Analyzer	Agilent	N9010A	MY52221182	May 25, 2017	May 24, 2018

6.2 Block Diagram of Test Setup



6.3 Specification Limits ((§15.247(b)(1))

For frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 non-overlapping hopping channels: 1 watt. (30 dBm)

6.4 Operating Condition of EUT

Enable the EUT to transmit data at different channel frequency individually.

6.5 Test Procedure

The transmitter output was connected to the spectrum analyzer.
The test procedure is defined in DA 00-705.

6.6 Test Results

PASSED.

(Test Date: 2018.02.10 Temperature: 23°C Humidity: 50 %)

DH1

Channel	Frequency	Peak Output Power	Limit
00	2402 MHz	-3.085 dBm	30 dBm
39	2441 MHz	-2.978 dBm	30 dBm
78	2480 MHz	-2.872 dBm	30 dBm

3DH1

Channel	Frequency	Peak Output Power	Limit
00	2402 MHz	-3.282 dBm	30 dBm
39	2441 MHz	-3.222 dBm	30 dBm
78	2480 MHz	-3.172 dBm	30 dBm

DH3

Channel	Frequency	Peak Output Power	Limit
00	2402 MHz	-2.788 dBm	30 dBm
39	2441 MHz	-2.710 dBm	30 dBm
78	2480 MHz	-2.642 dBm	30 dBm

3DH3

Channel	Frequency	Peak Output Power	Limit
00	2402 MHz	-3.017 dBm	30 dBm
39	2441 MHz	-2.893 dBm	30 dBm
78	2480 MHz	-2.781 dBm	30 dBm

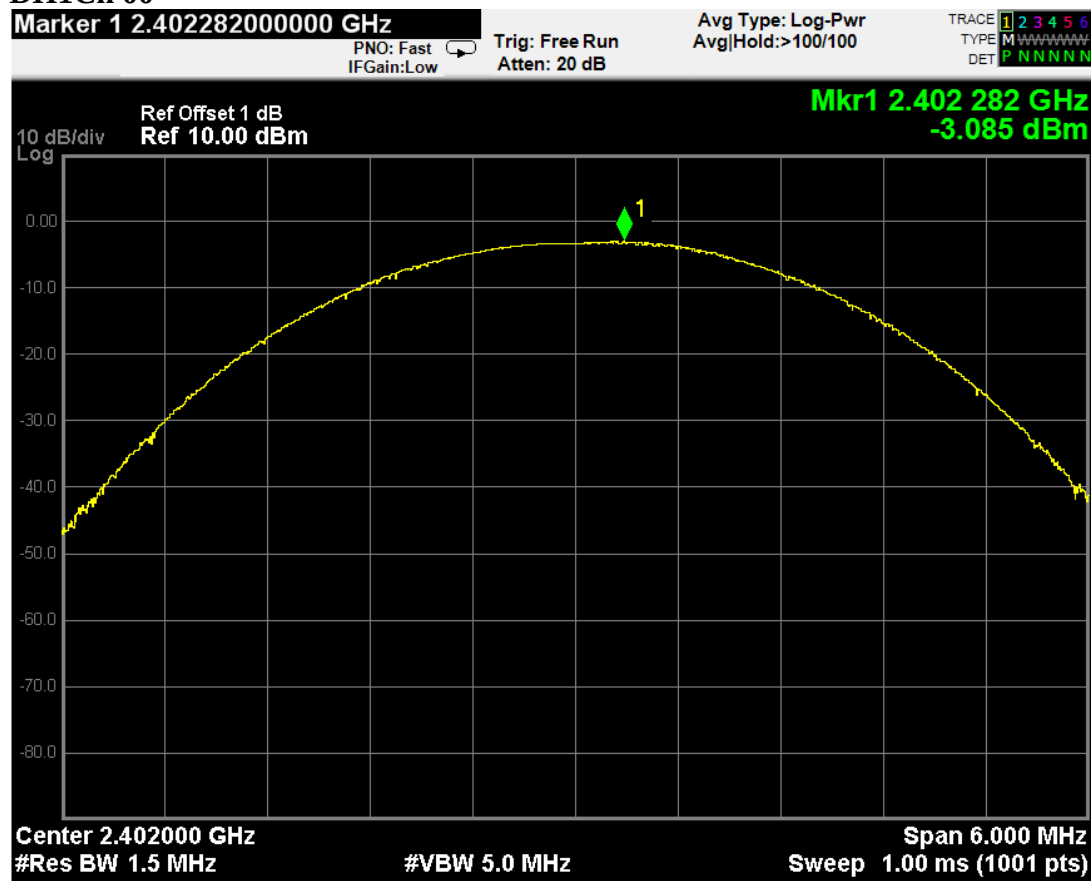
DH5

Channel	Frequency	Peak Output Power	Limit
00	2402 MHz	-3.270 dBm	30 dBm
39	2441 MHz	-3.150 dBm	30 dBm
78	2480 MHz	-3.047 dBm	30 dBm

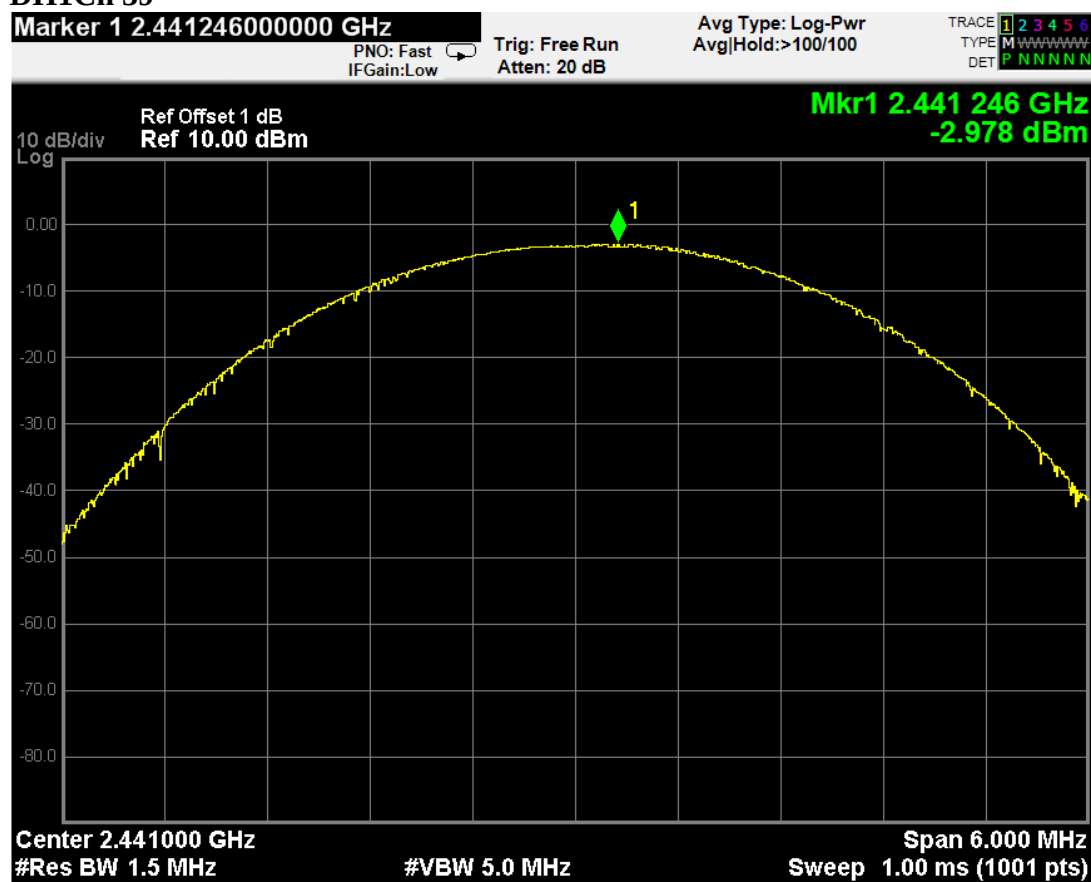
3DH5

Channel	Frequency	Peak Output Power	Limit
00	2402 MHz	-3.314 dBm	30 dBm
39	2441 MHz	-3.246 dBm	30 dBm
78	2480 MHz	-3.211 dBm	30 dBm

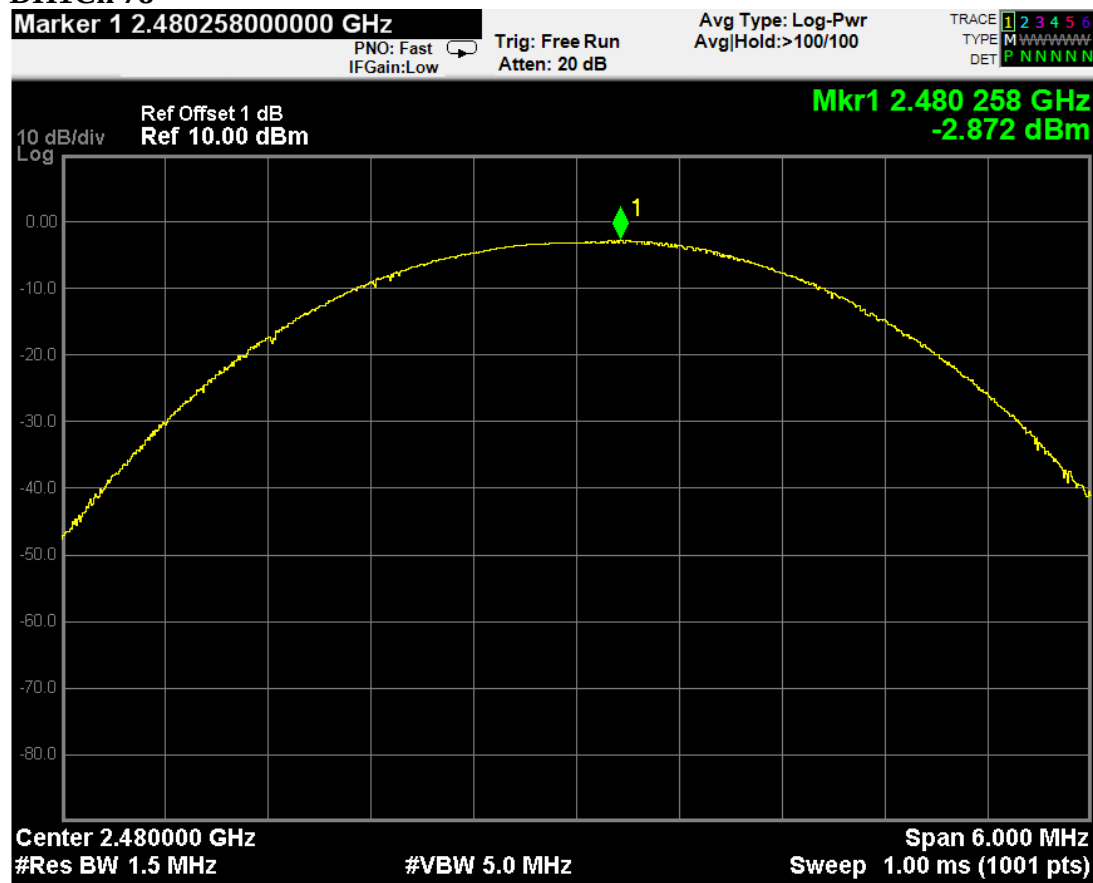
DH1Ch 00



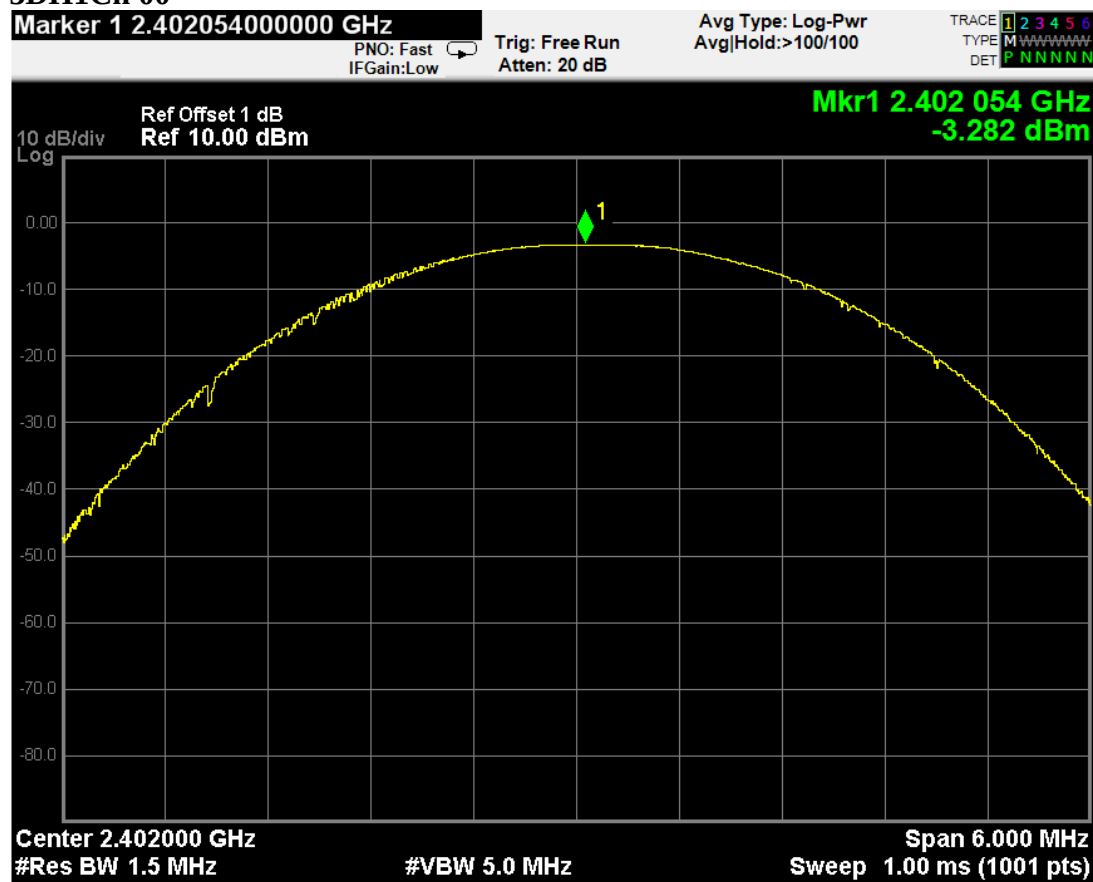
DH1Ch 39



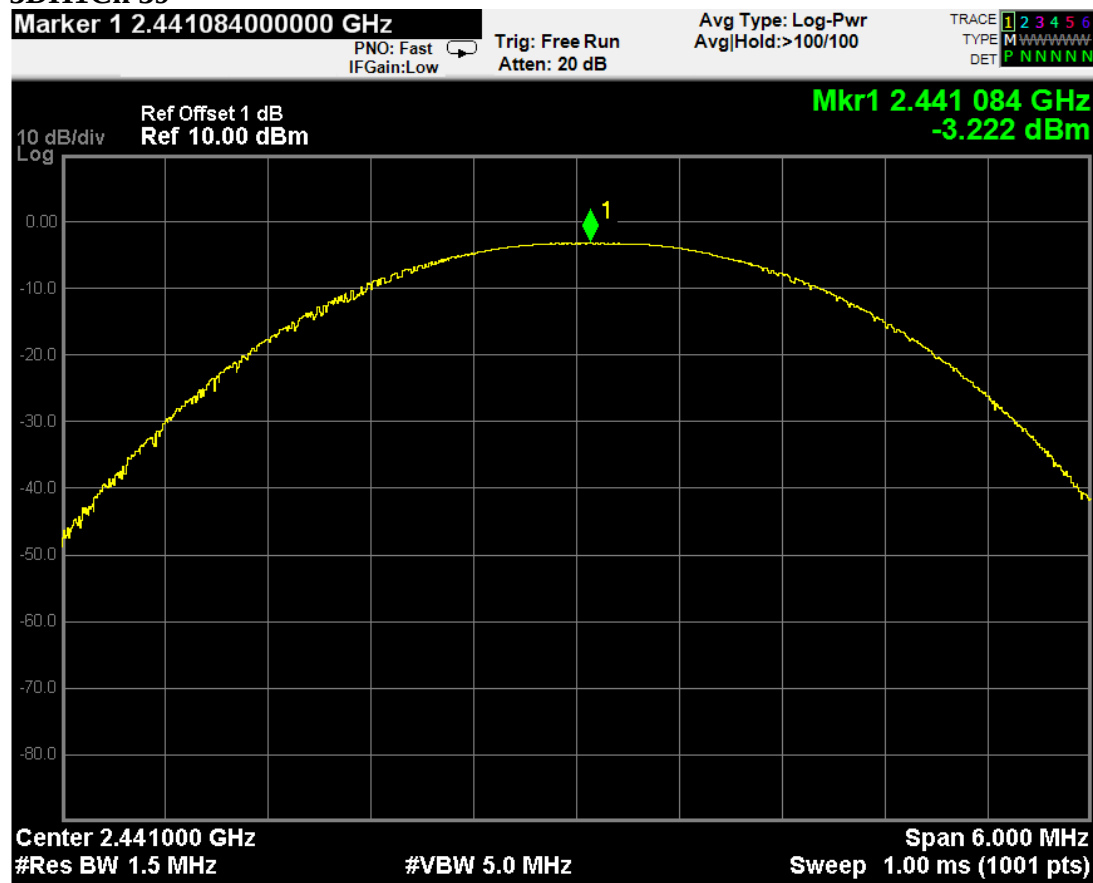
DH1Ch 78



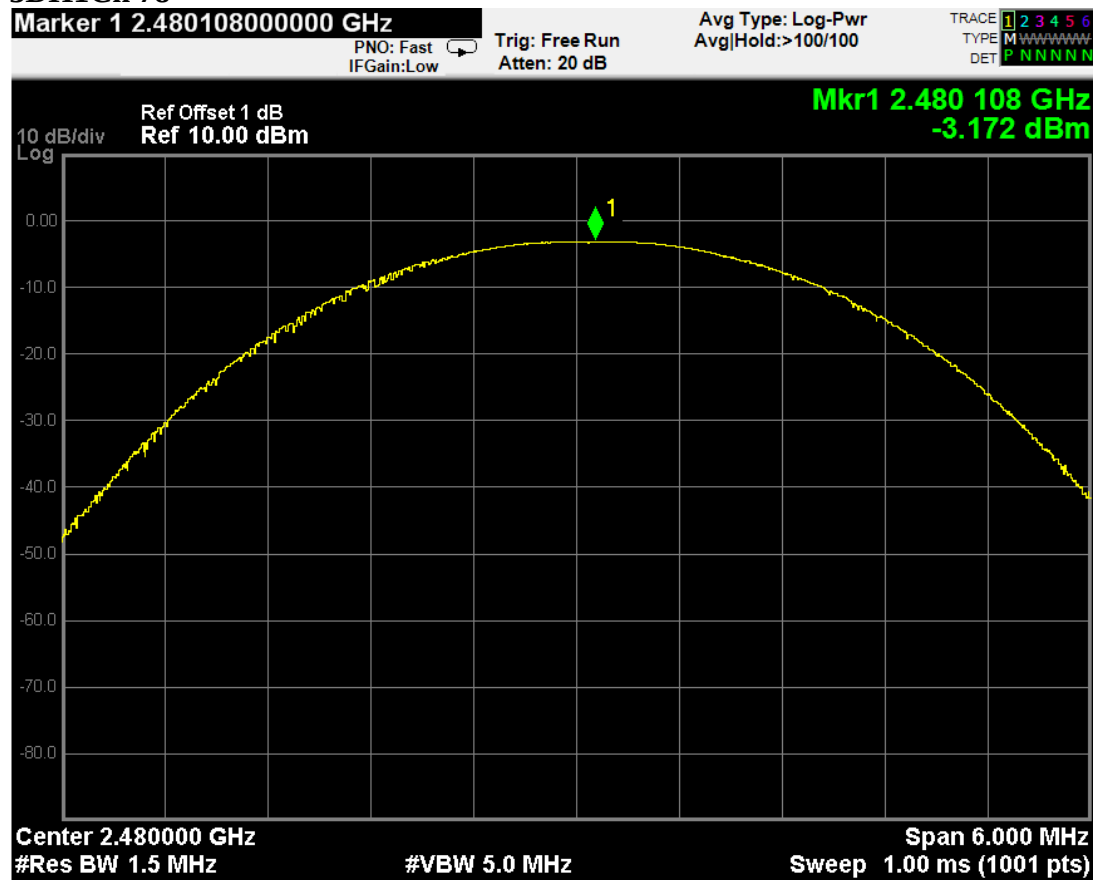
3DH1Ch 00



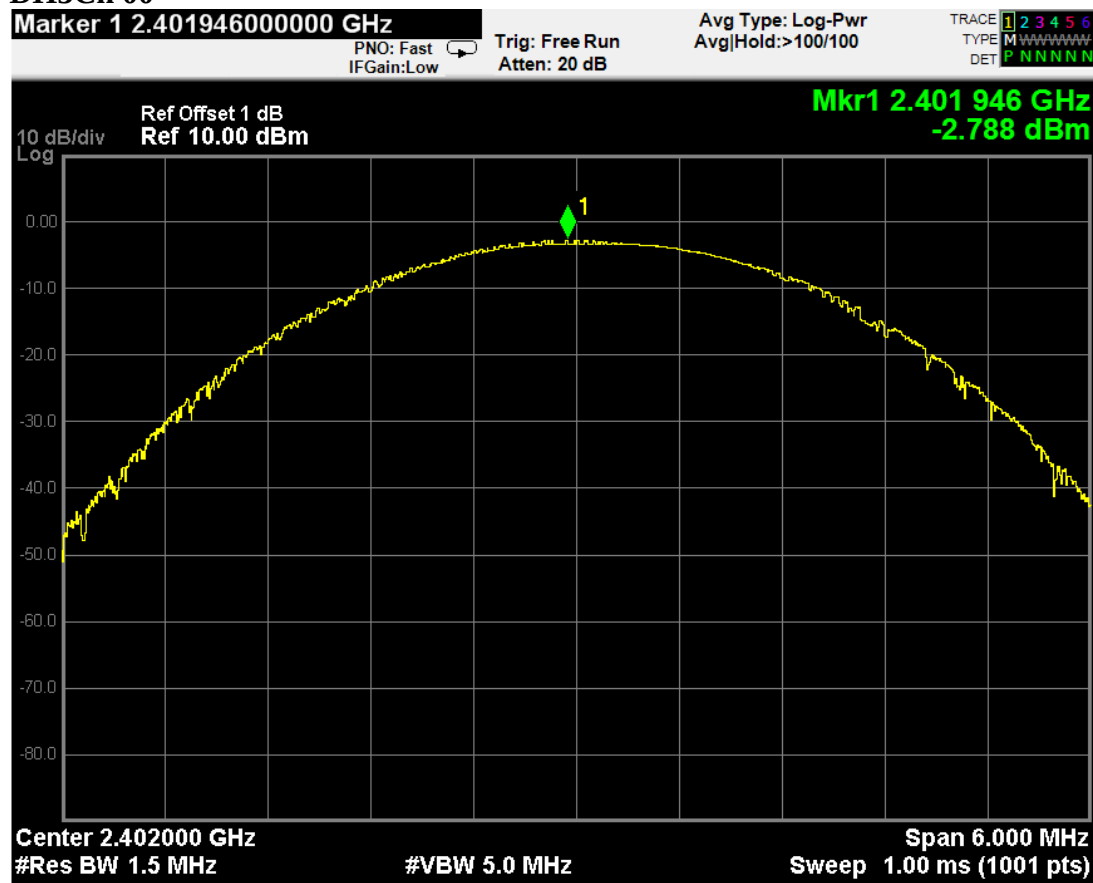
3DH1Ch 39



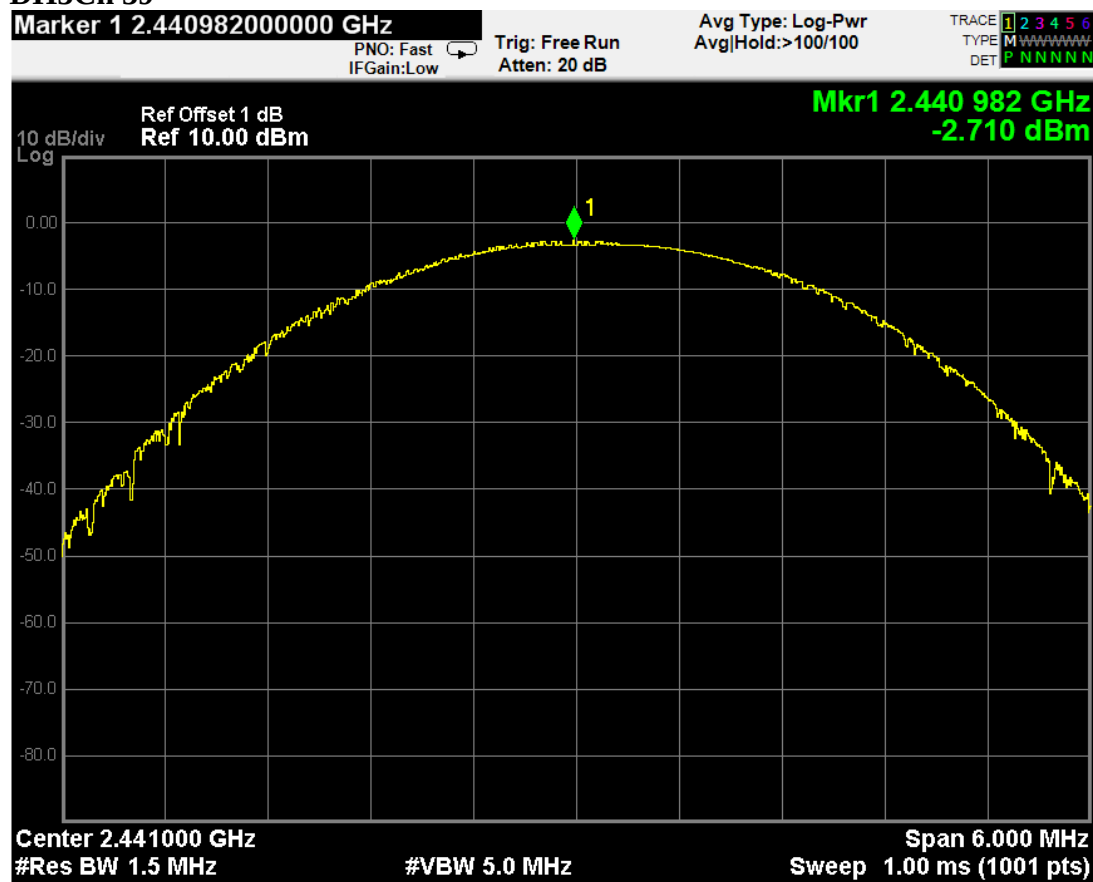
3DH1Ch 78



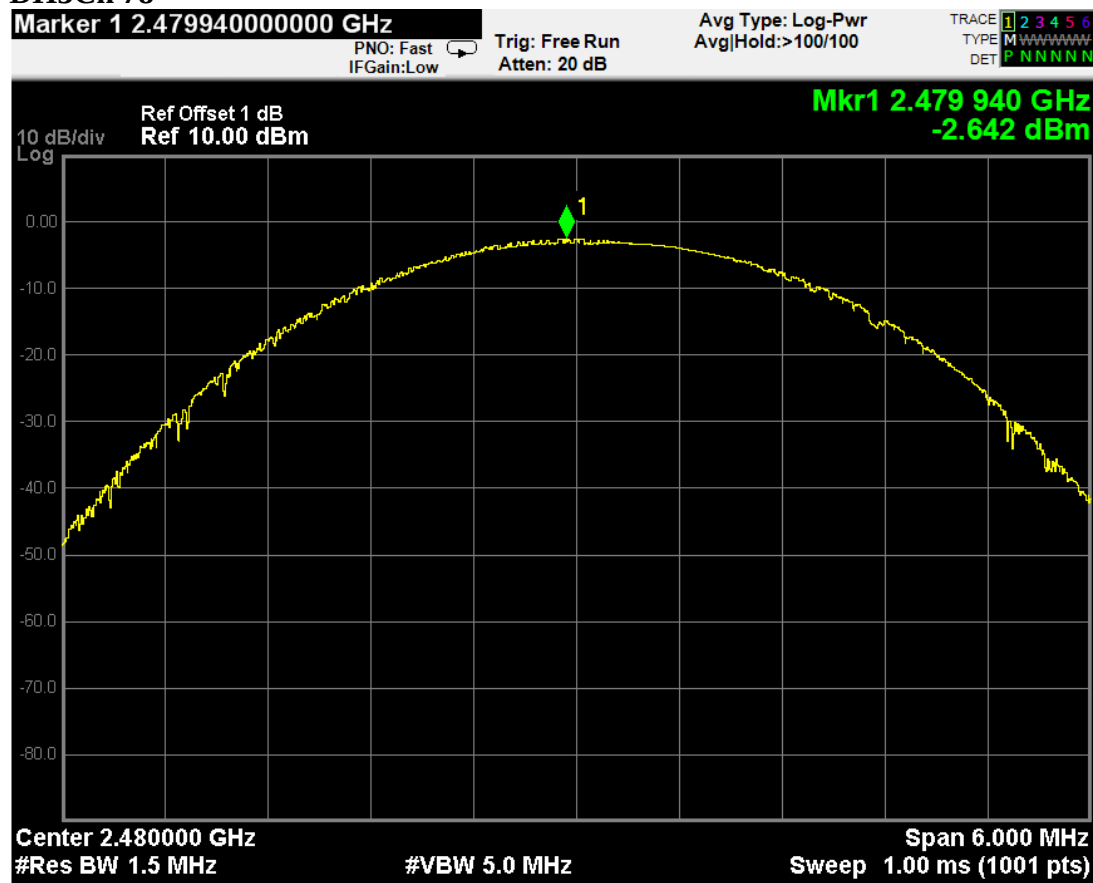
DH3Ch 00



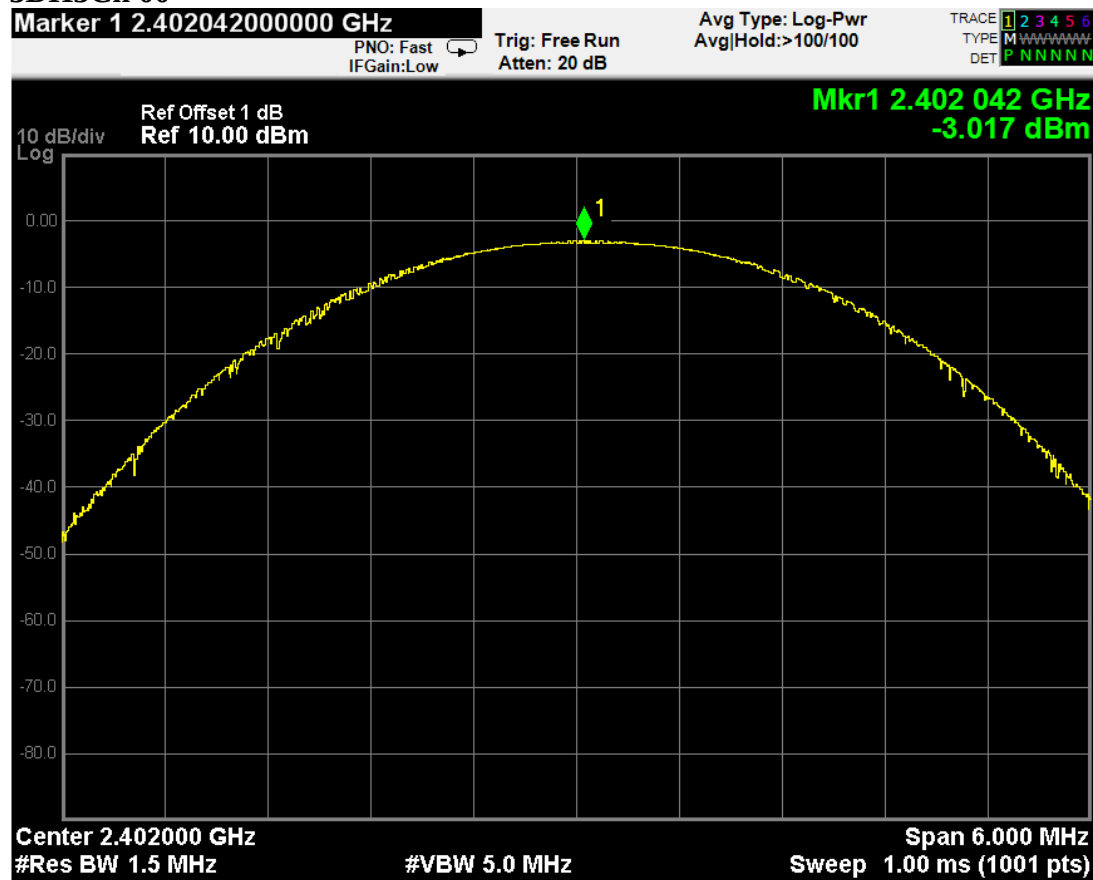
DH3Ch 39



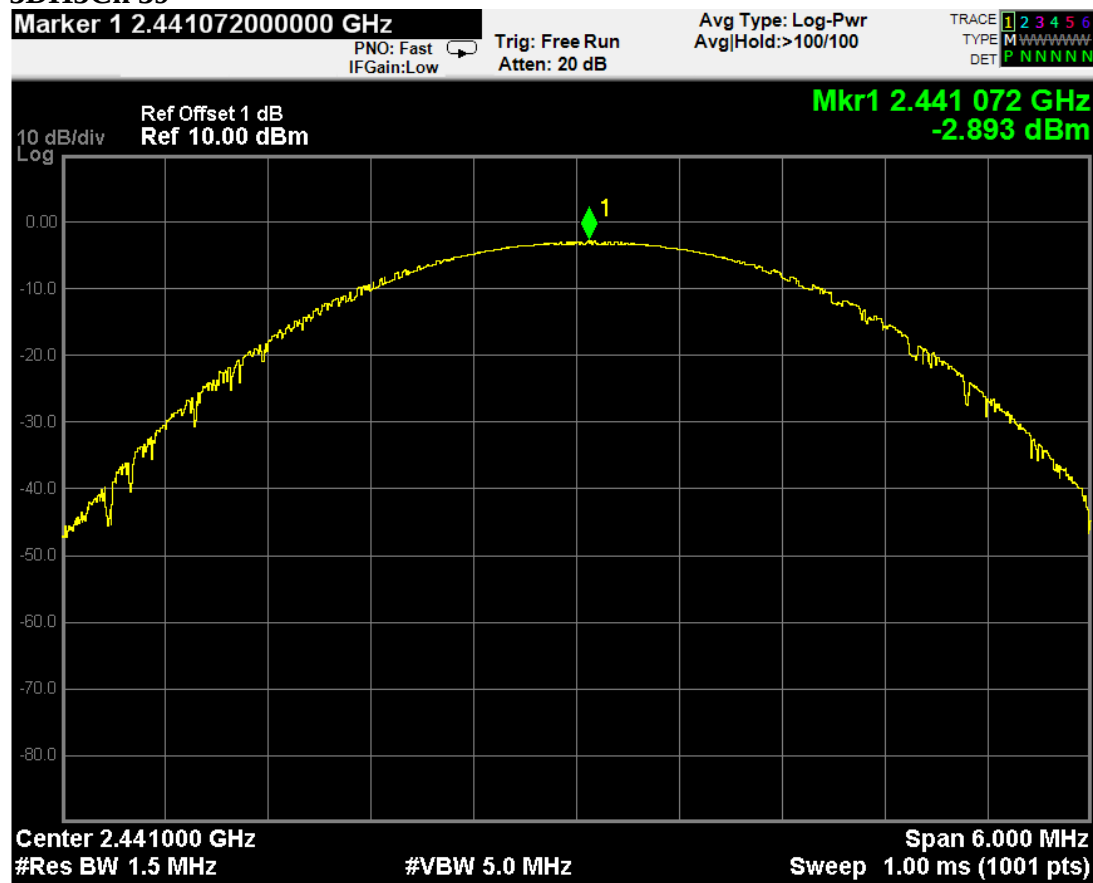
DH3Ch 78



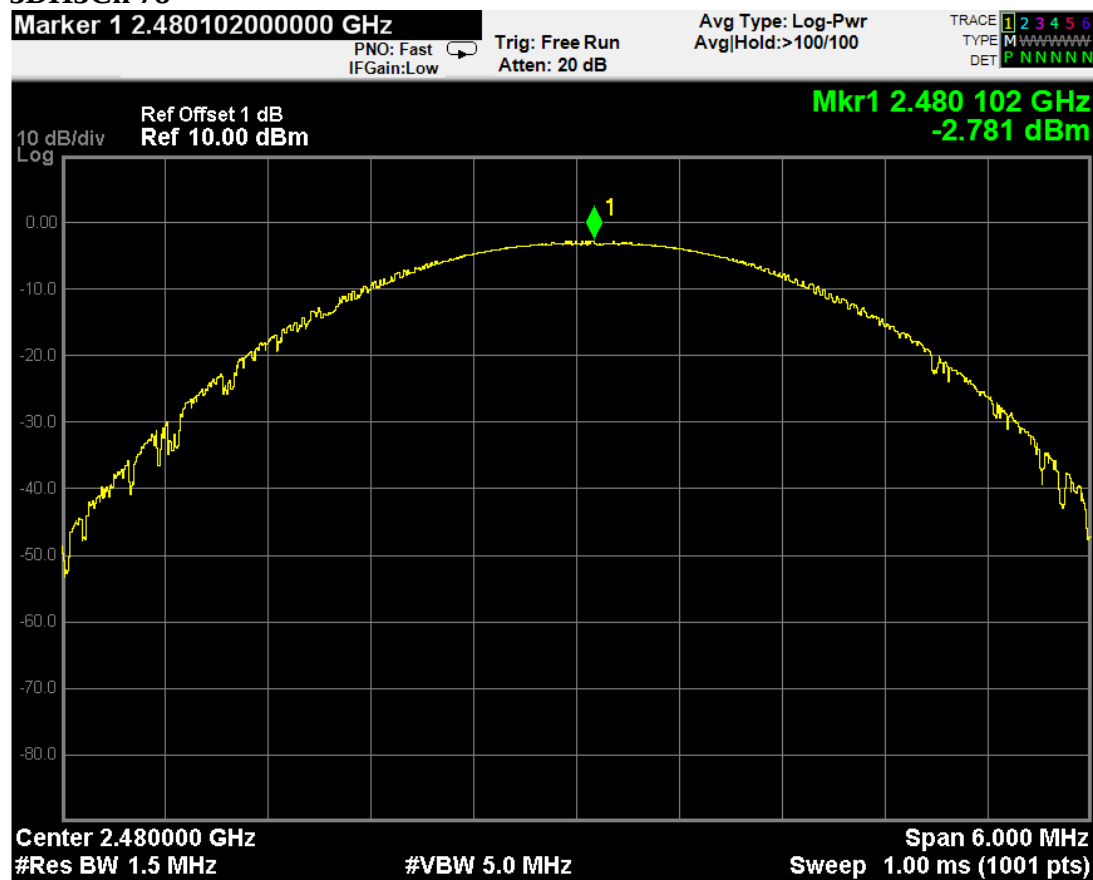
3DH3Ch 00



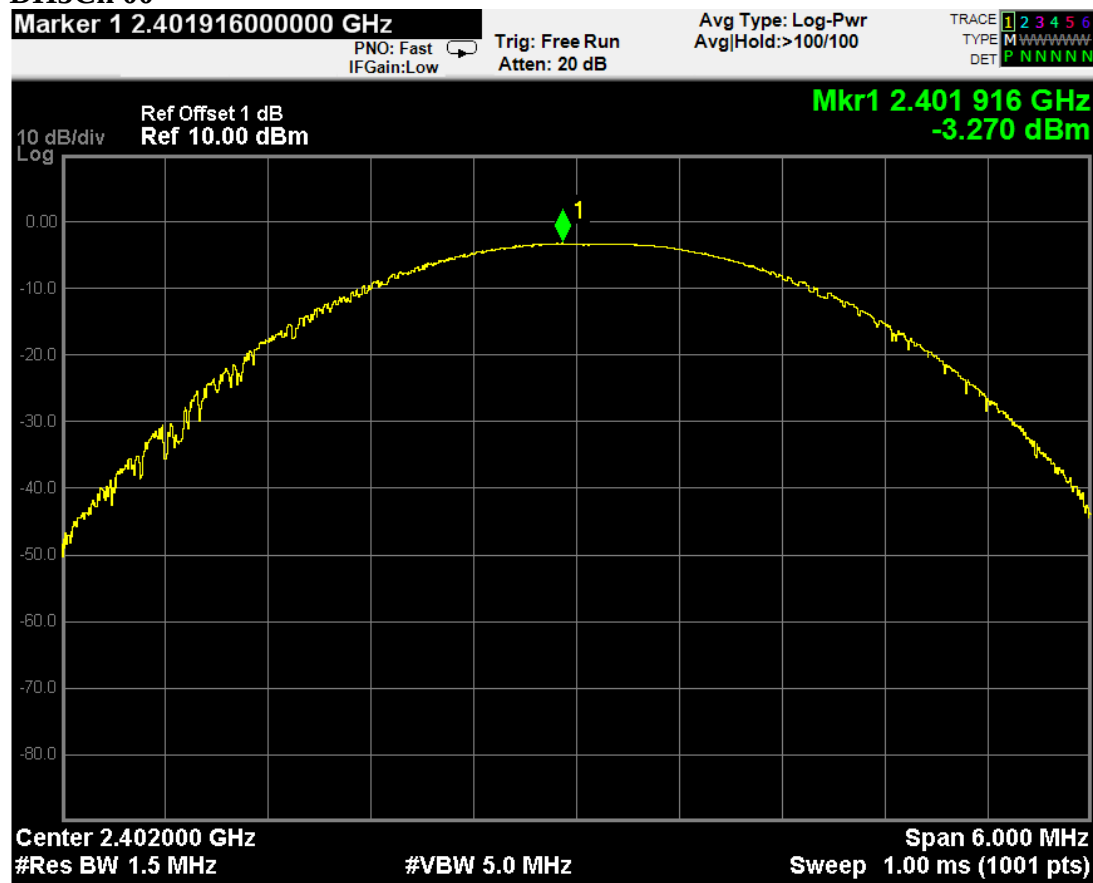
3DH3Ch 39



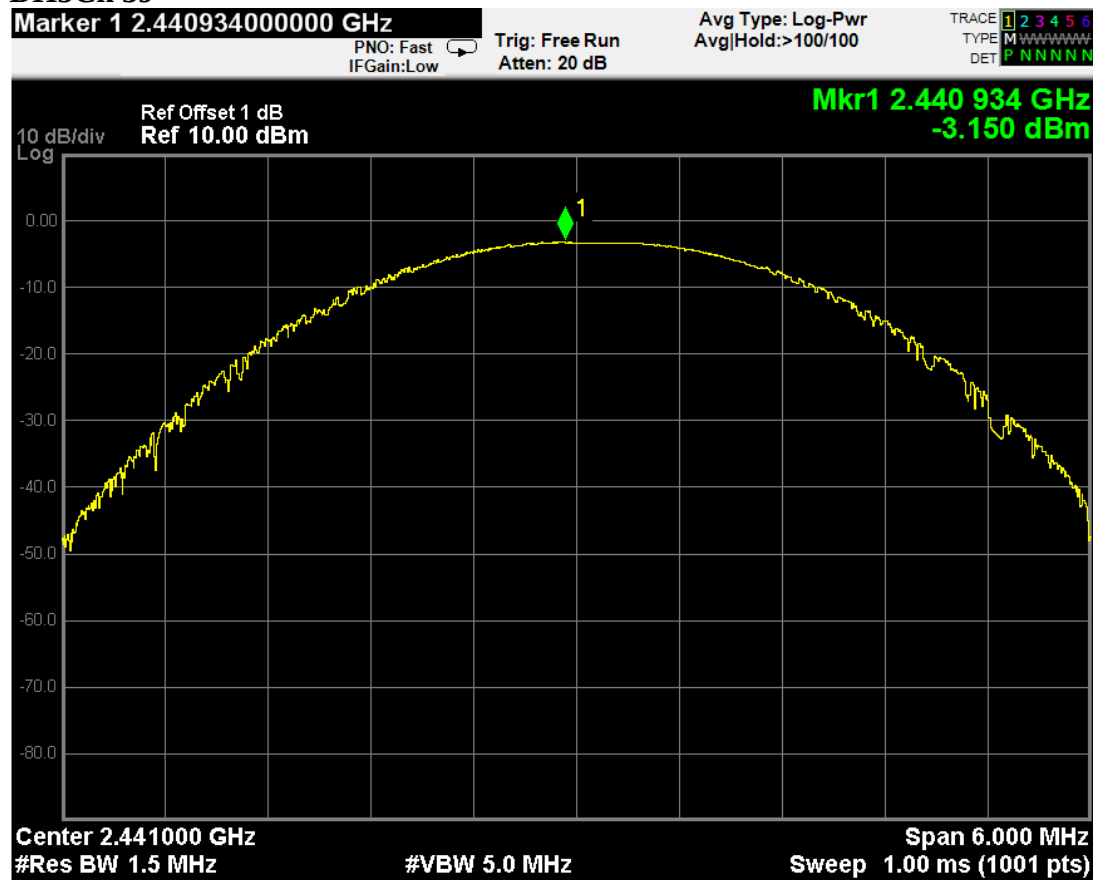
3DH3Ch 78



DH5Ch 00

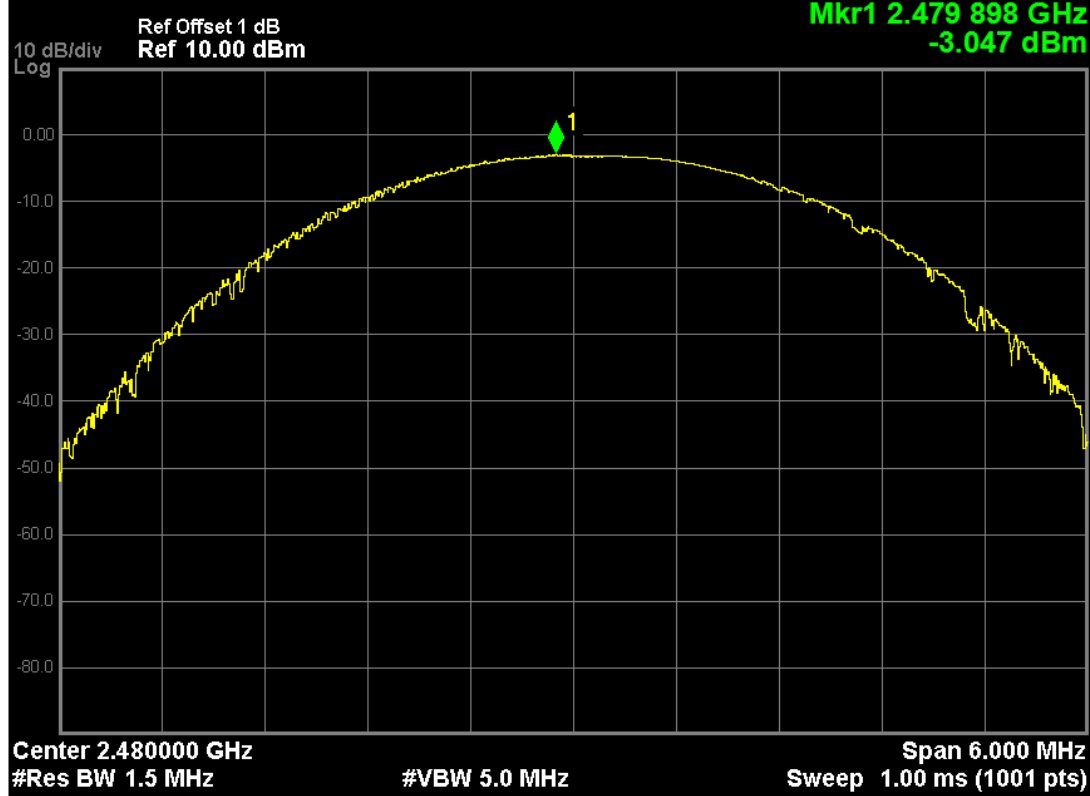


DH5Ch 39



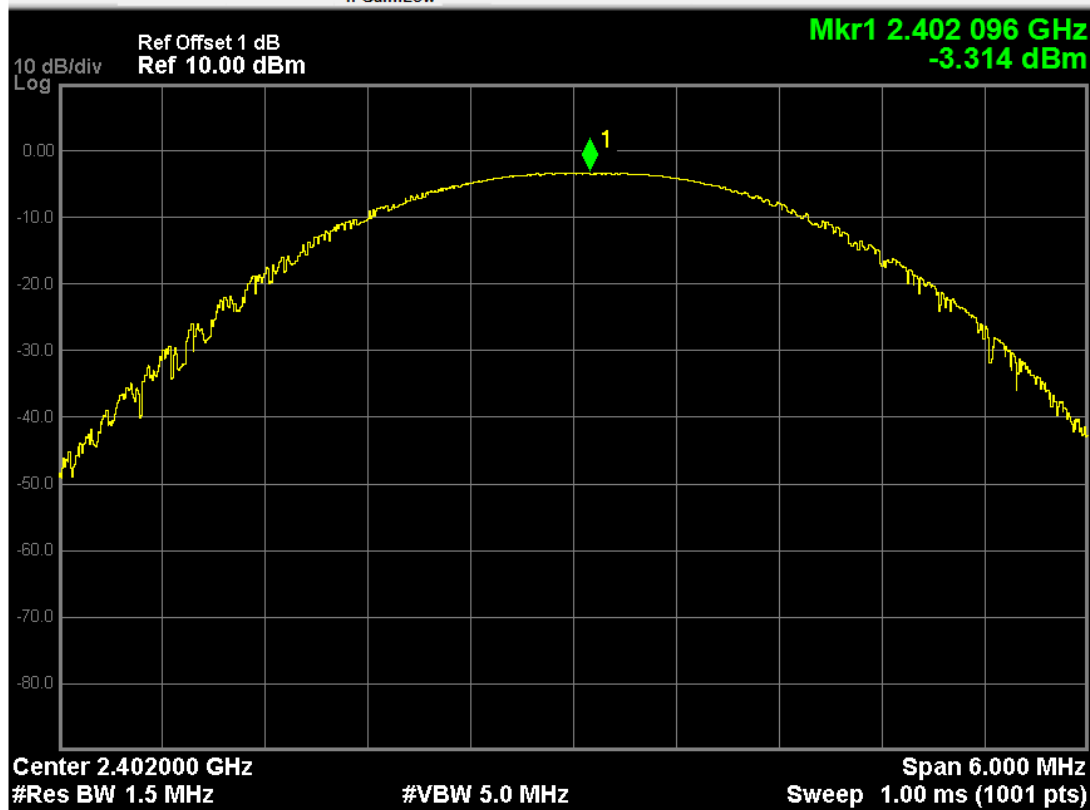
DH5Ch 78

Marker 1 2.479898000000 GHz

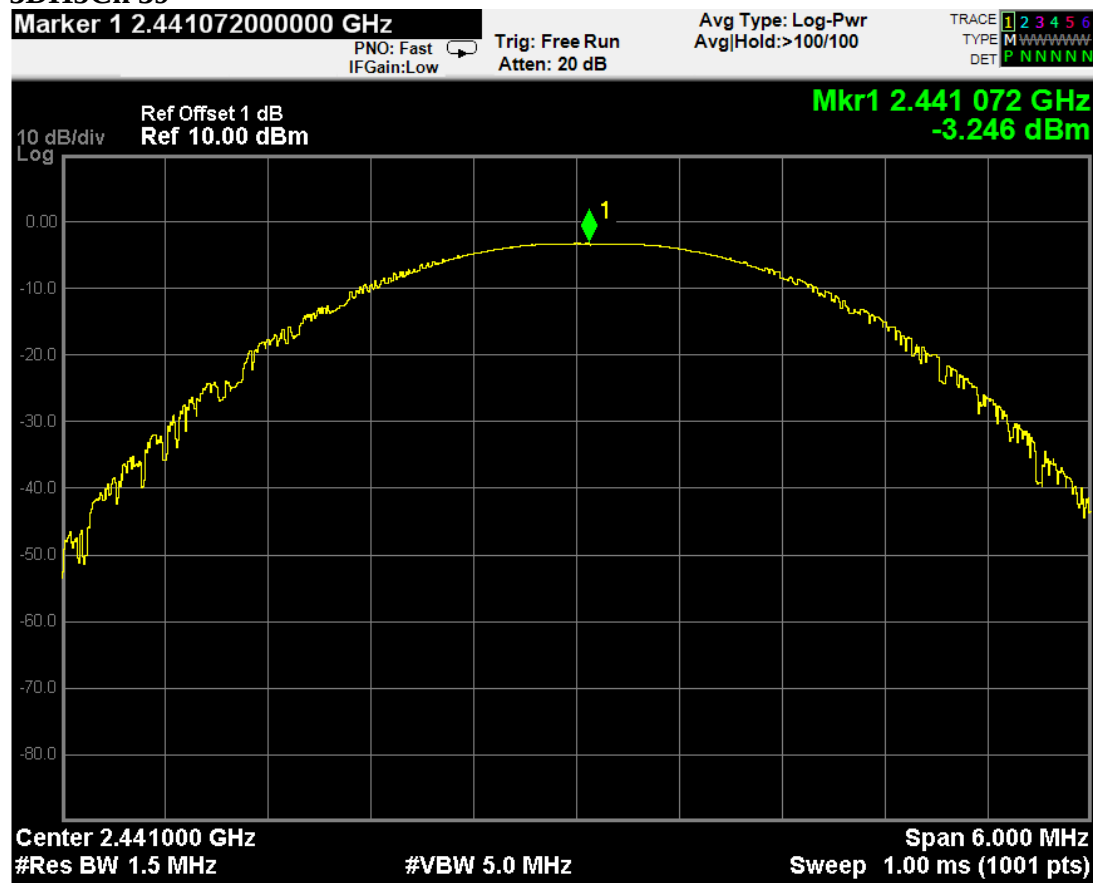
PNO: Fast
IFGain:LowTrig: Free Run
Atten: 20 dBAvg Type: Log-Pwr
Avg|Hold:>100/100TRACE 1 2 3 4 5 6
TYPE M W W W W W W W
DET P N N N N N

3DH5Ch 00

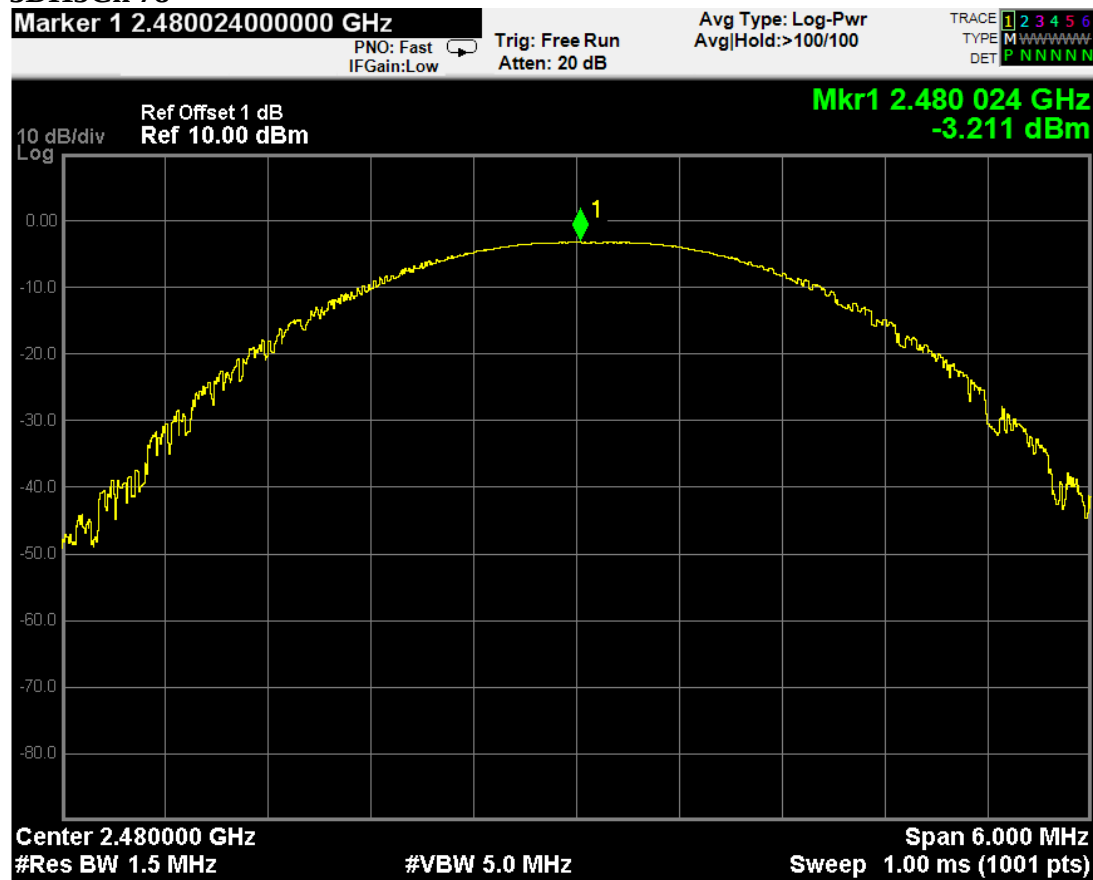
Marker 1 2.402096000000 GHz

PNO: Fast
IFGain:LowTrig: Free Run
Atten: 20 dBAvg Type: Log-Pwr
Avg|Hold:>100/100TRACE 1 2 3 4 5 6
TYPE M W W W W W W W
DET P N N N N N

3DH5Ch 39



3DH5Ch 78



7 SPURIOUS RF CONDUCTED EMISSIONS

MEASUREMENT

7.1 Test Equipment

The following test equipment was used during the emission limitations test :

Item	Type	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
1.	EXA Signal Analyzer	Agilent	N9010A	MY52221182	May 25, 2017	May 24, 2018

7.2 Block Diagram of Test Setup

The same as Section. 4.2.

7.3 Specification Limits (§15.247(d))

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. Attenuation below the general limits specified in Section 15.209(a) is not required.

In addition, radiated emissions which fall in restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (See Section 15.205(c)).(※This test result attaching to Section. 4.7)

7.4 Operating Condition of EUT

Enable the EUT to transmit data at different channel frequency individually.

7.5 Test Procedure

The transmitter output was connected to the spectrum analyzer. Set RBW = 100 kHz, VBW = 300 kHz, scan up through 10th harmonic. All harmonics/spurs must be at least 20 dB down from the highest emission level within the authorized band as measured with a 100 kHz RBW.

The test procedure is defined in DA 00-705.

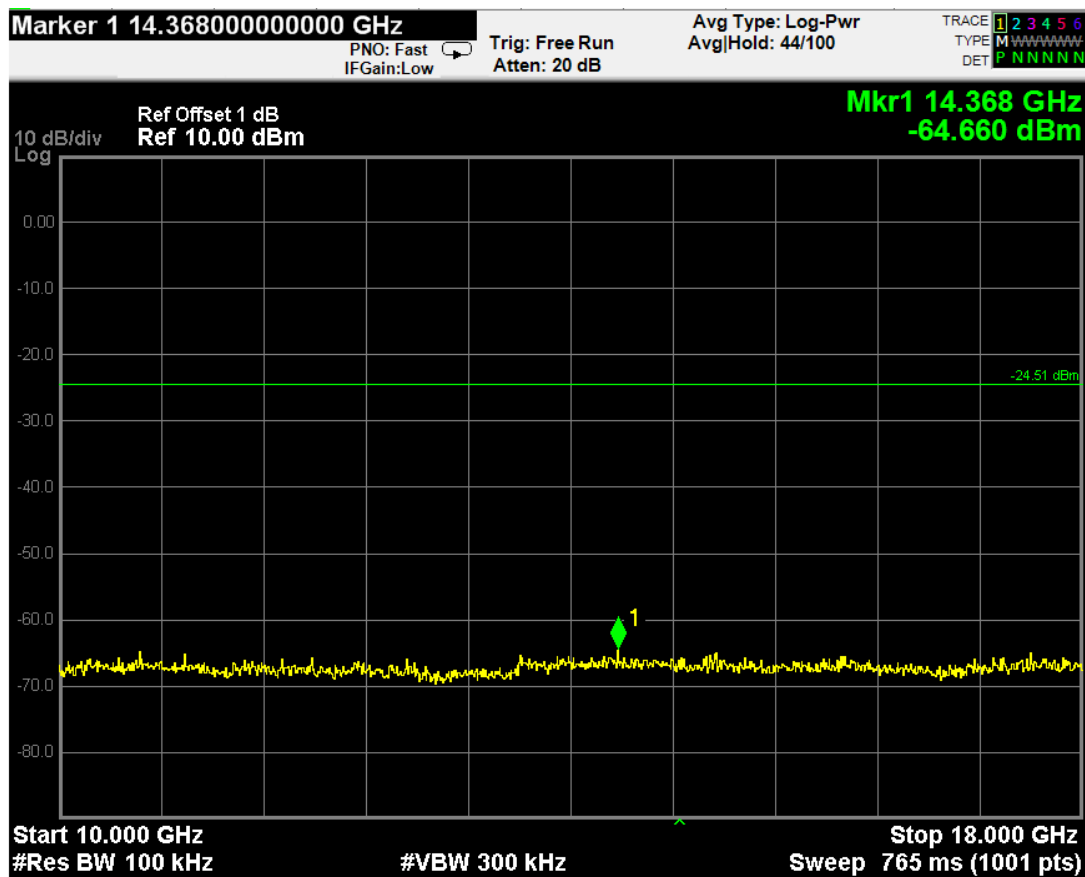
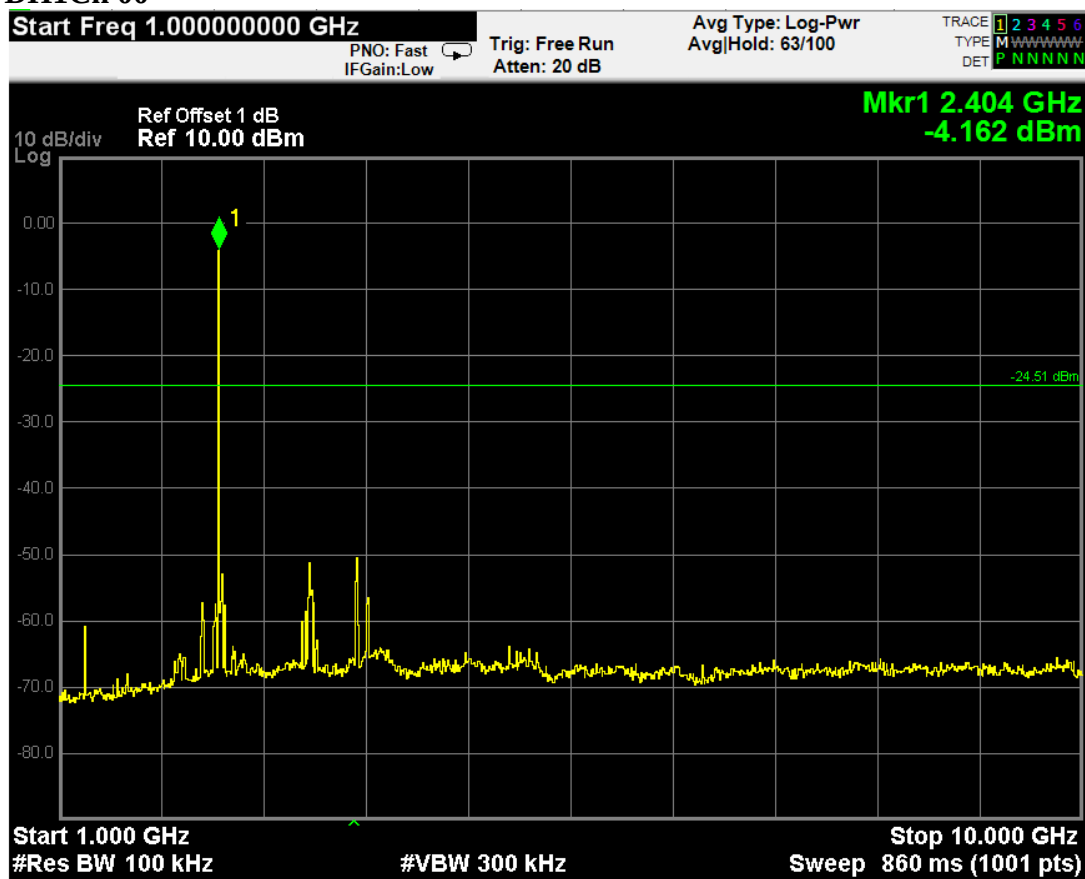
7.6 Test Results

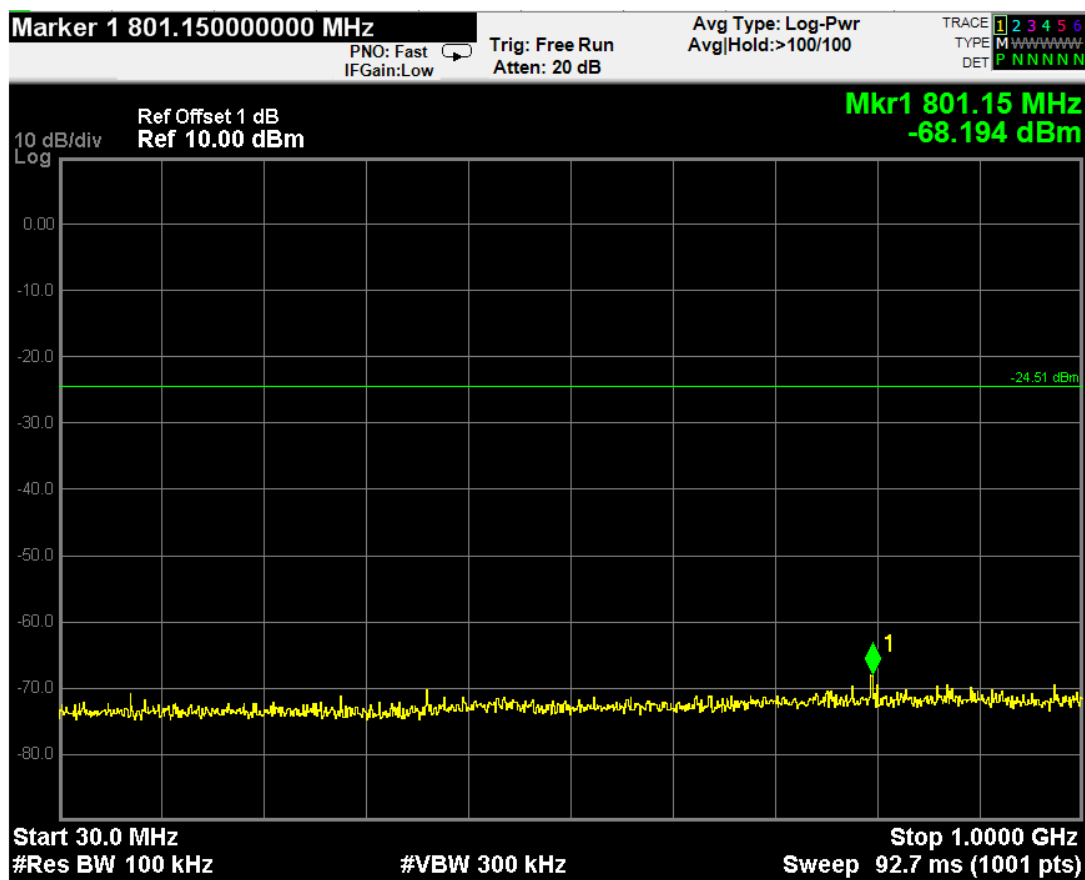
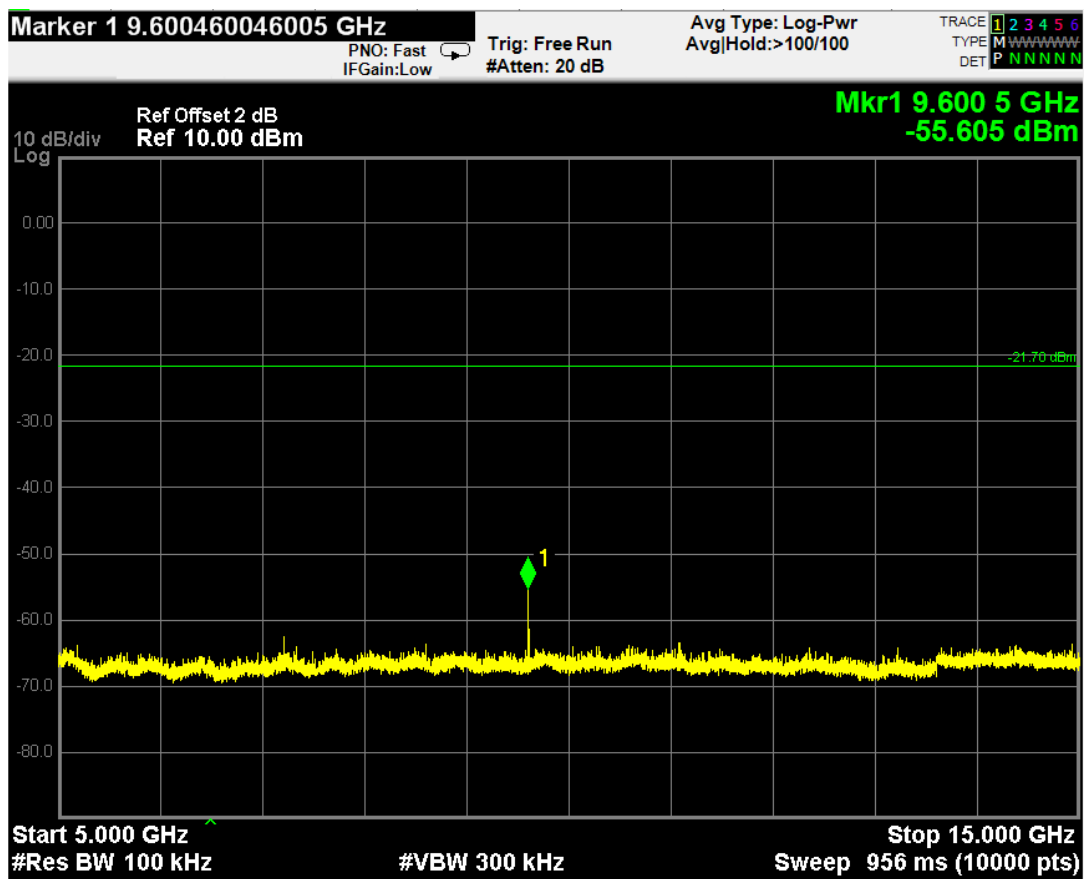
PASSED.

The test data was attached in the next pages.

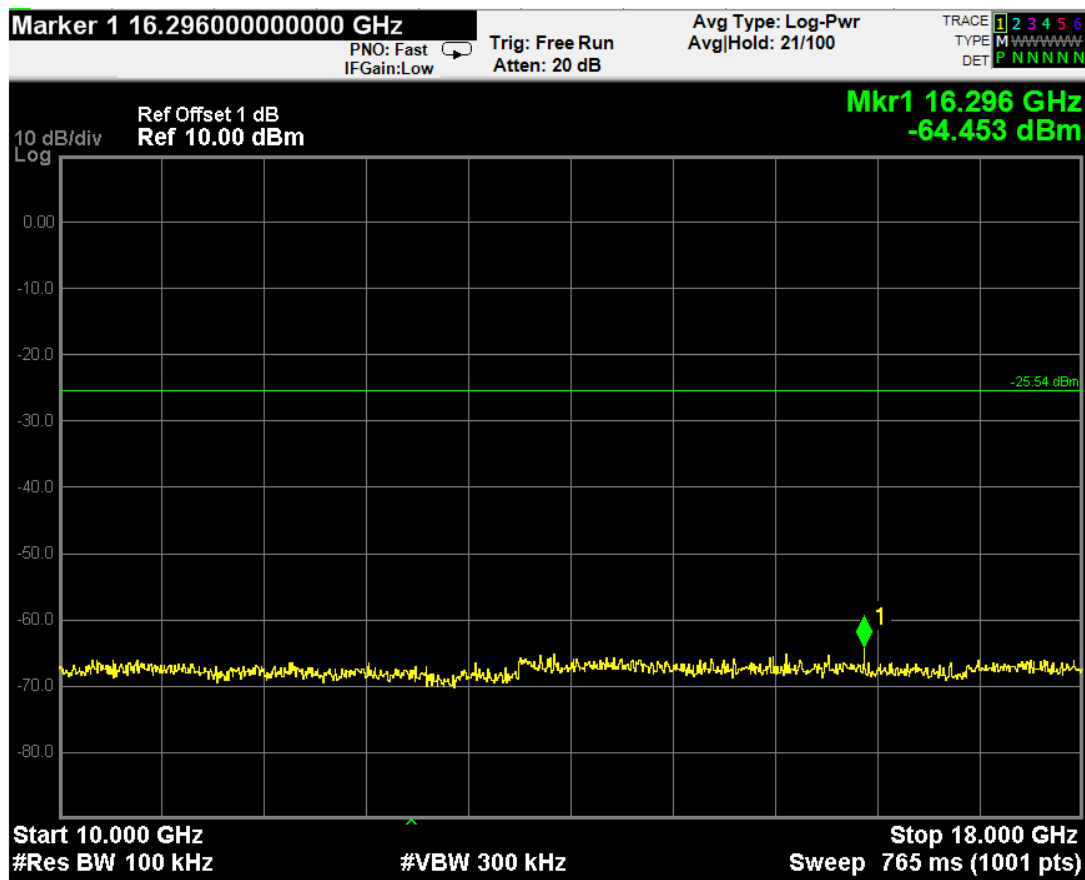
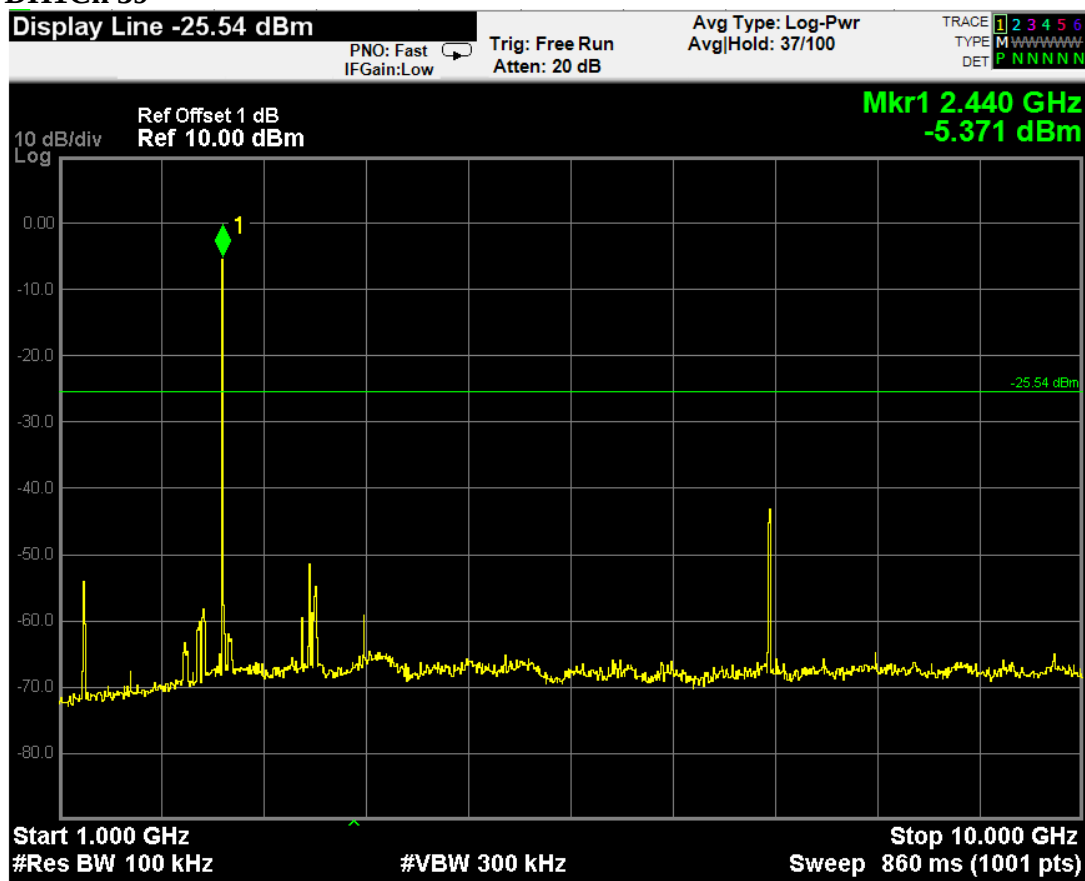
(Test Date: 2018.02.10 Temperature: 23℃ Humidity: 50 %)

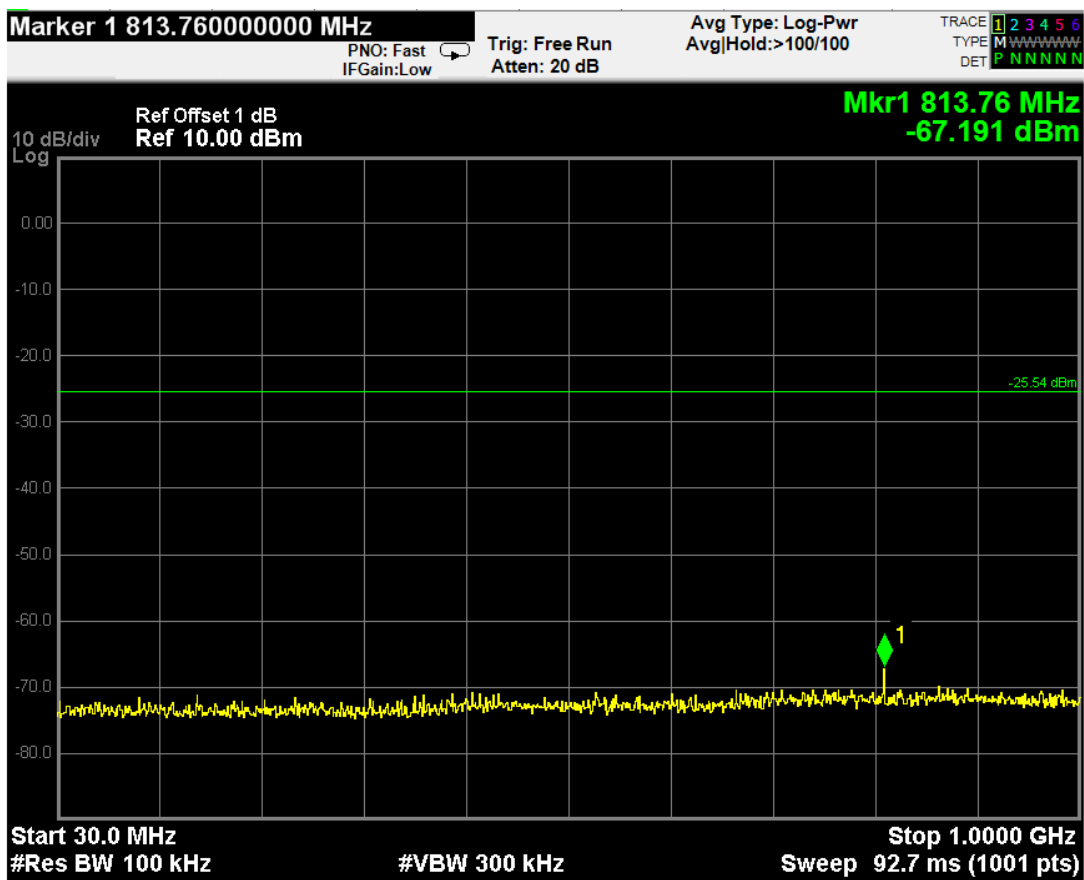
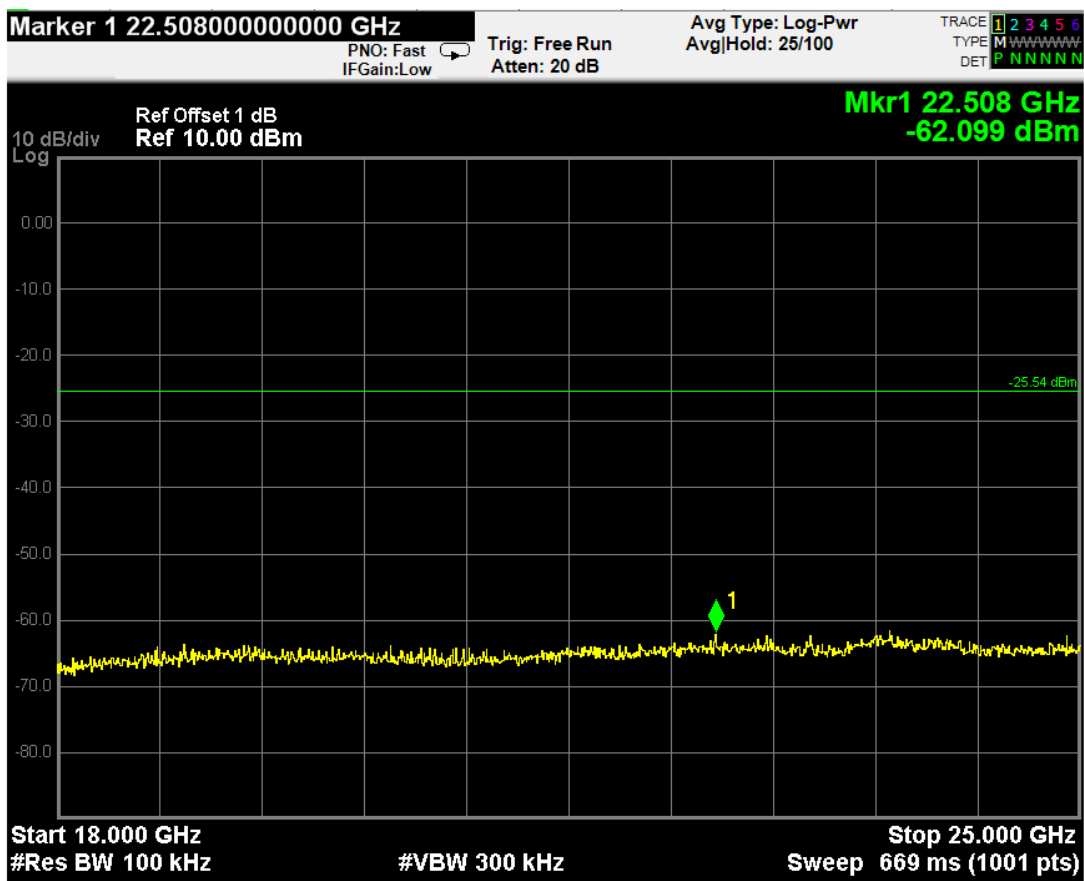
DH1Ch 00



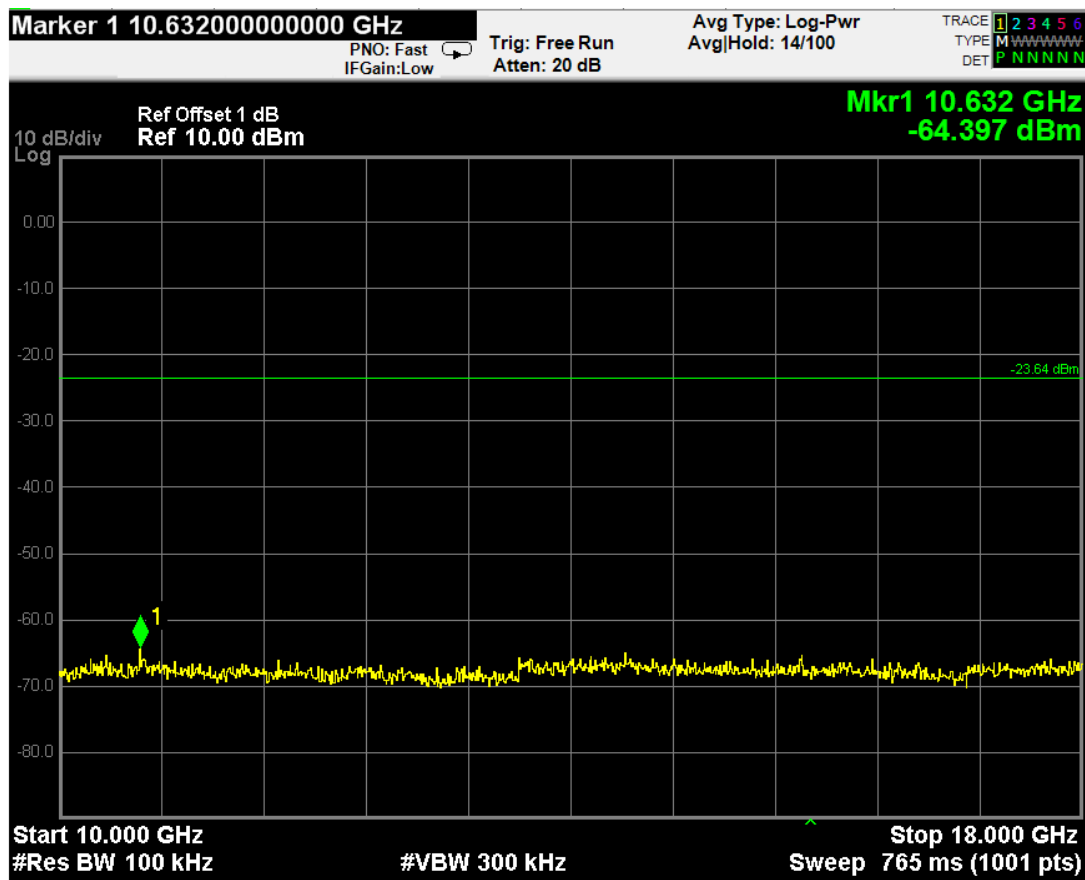
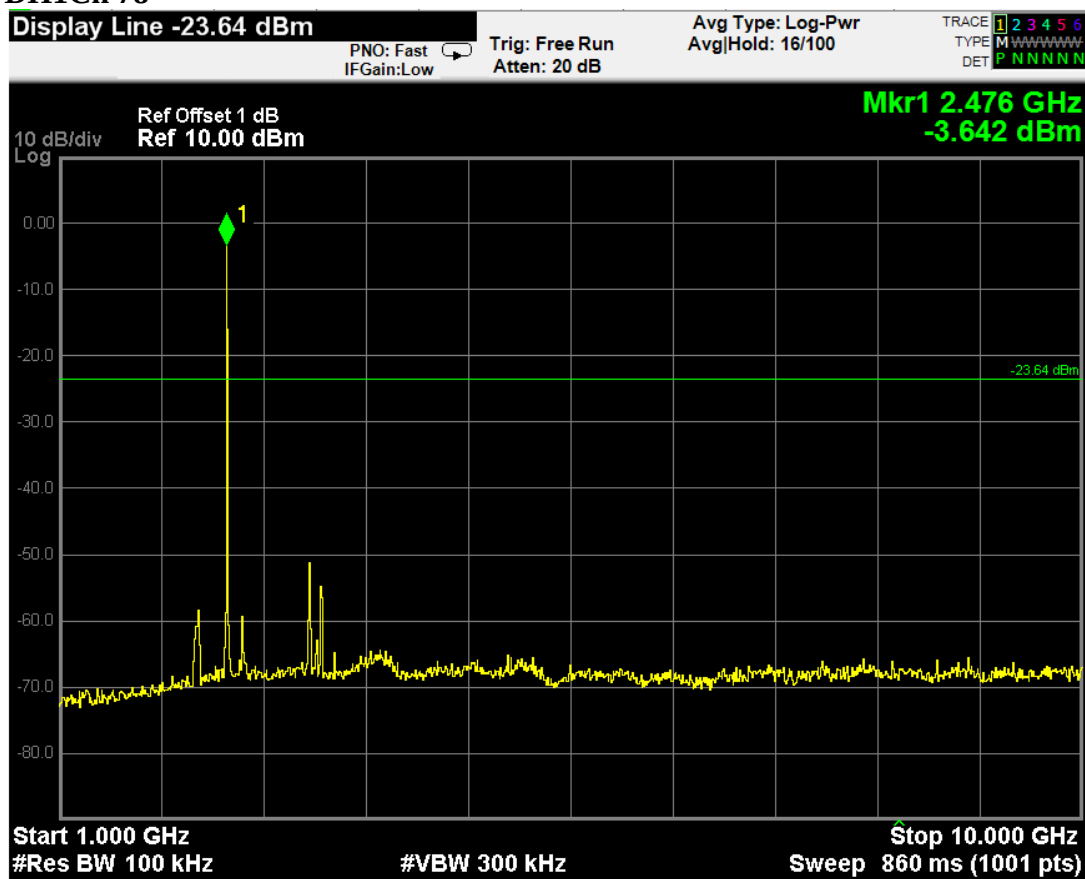


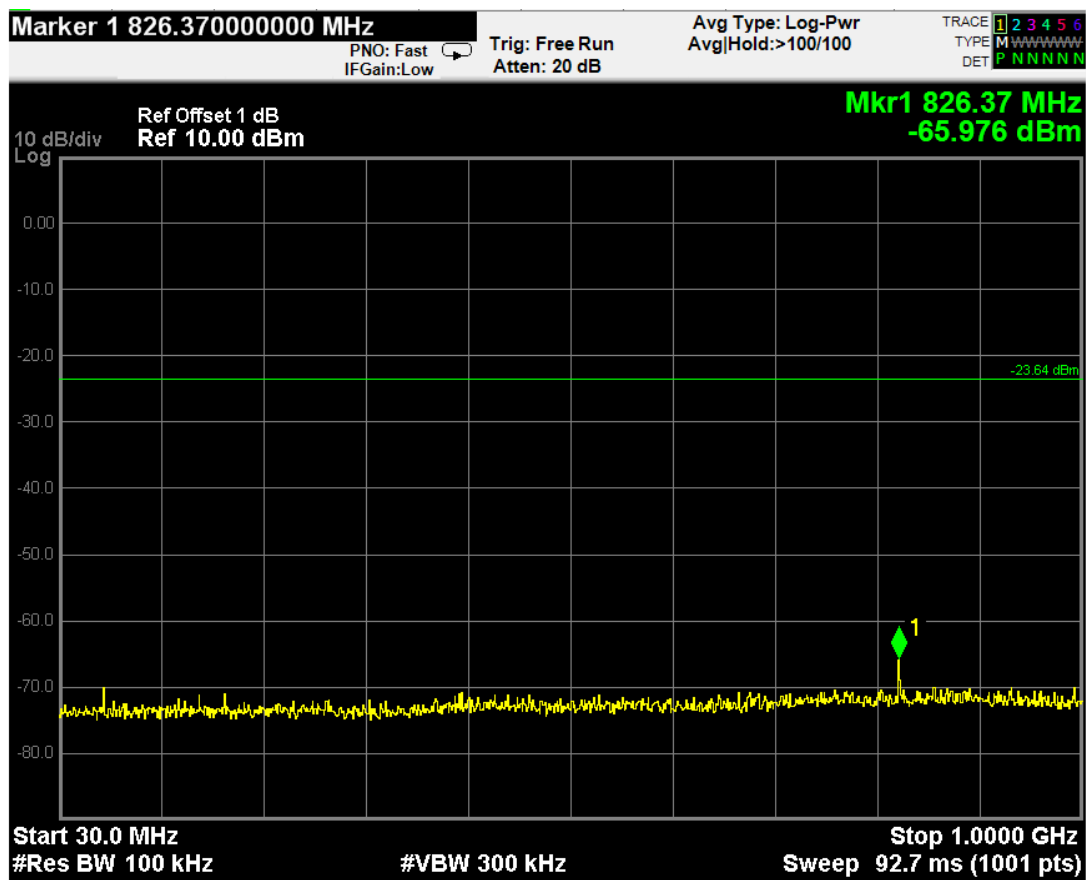
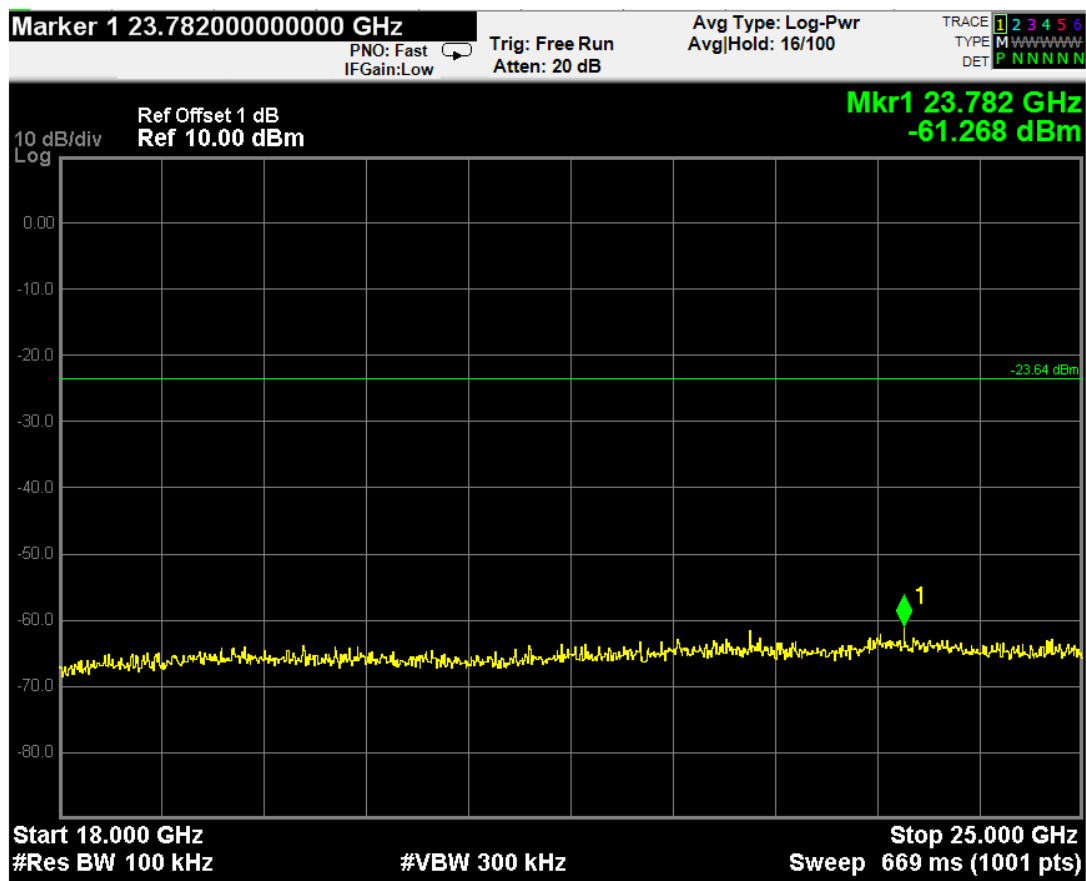
DH1Ch 39



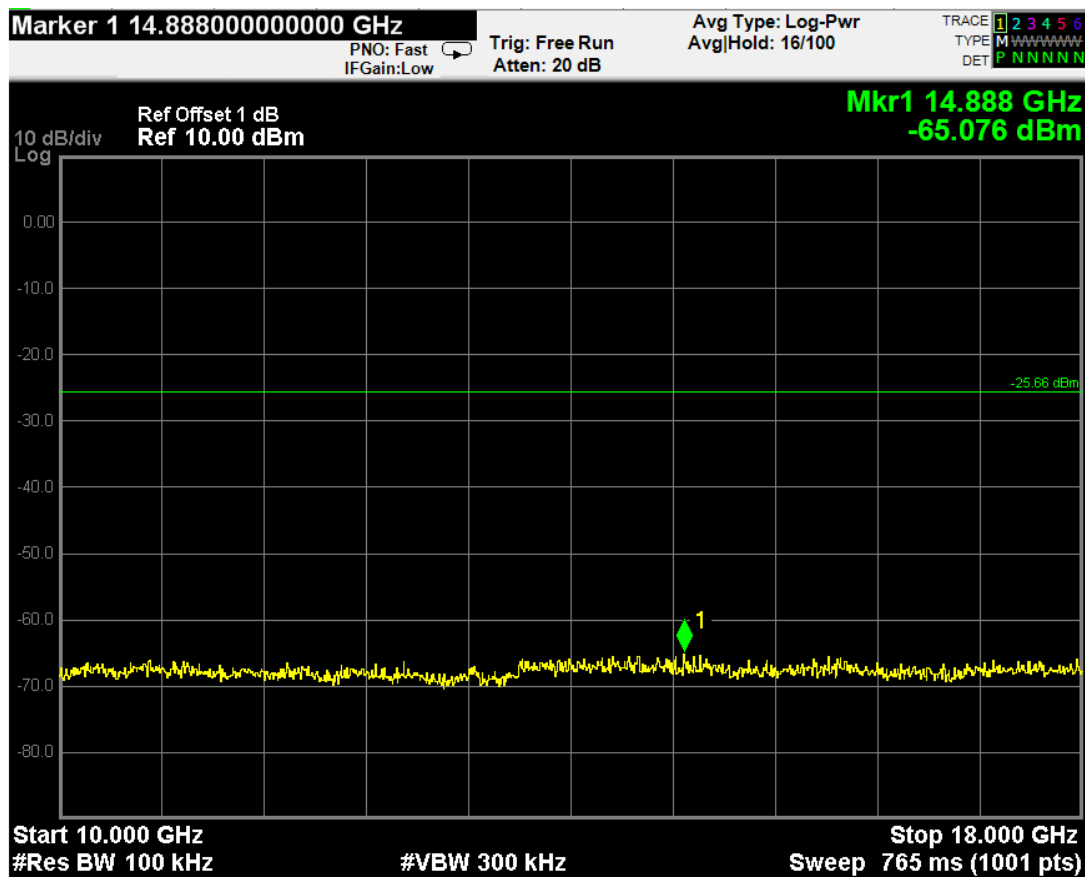
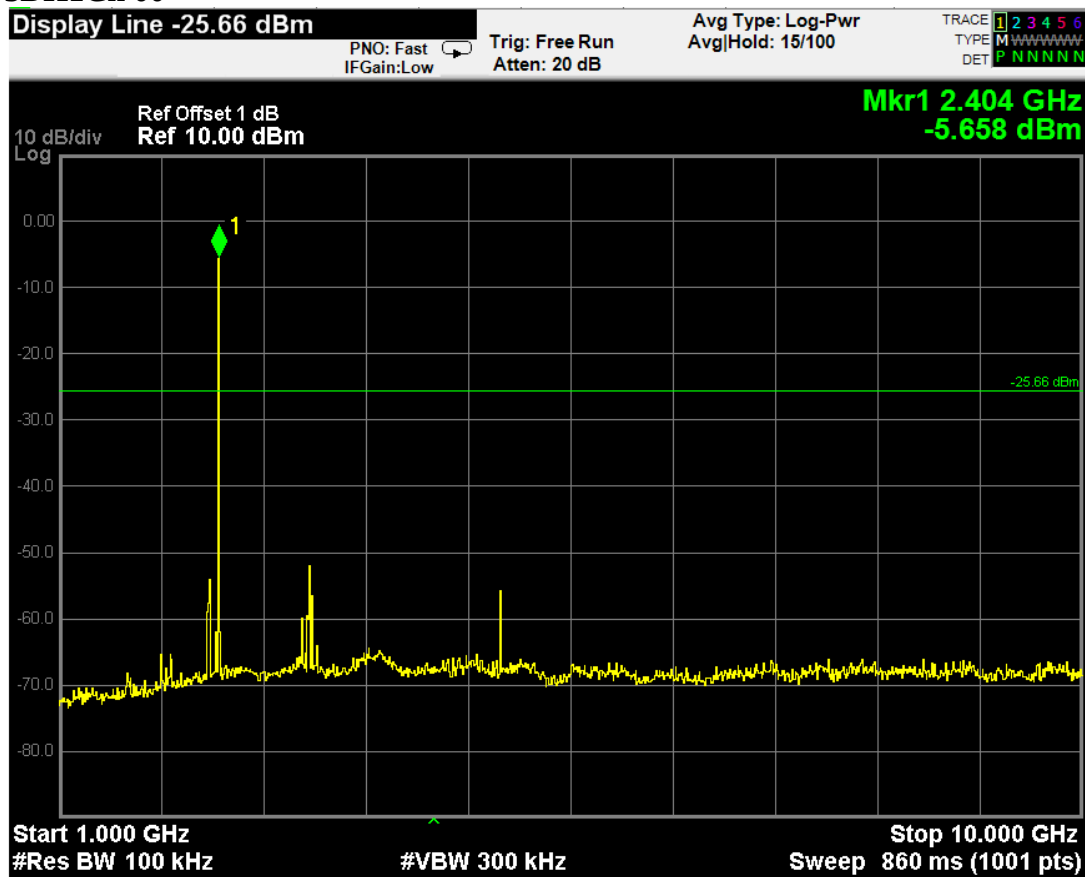


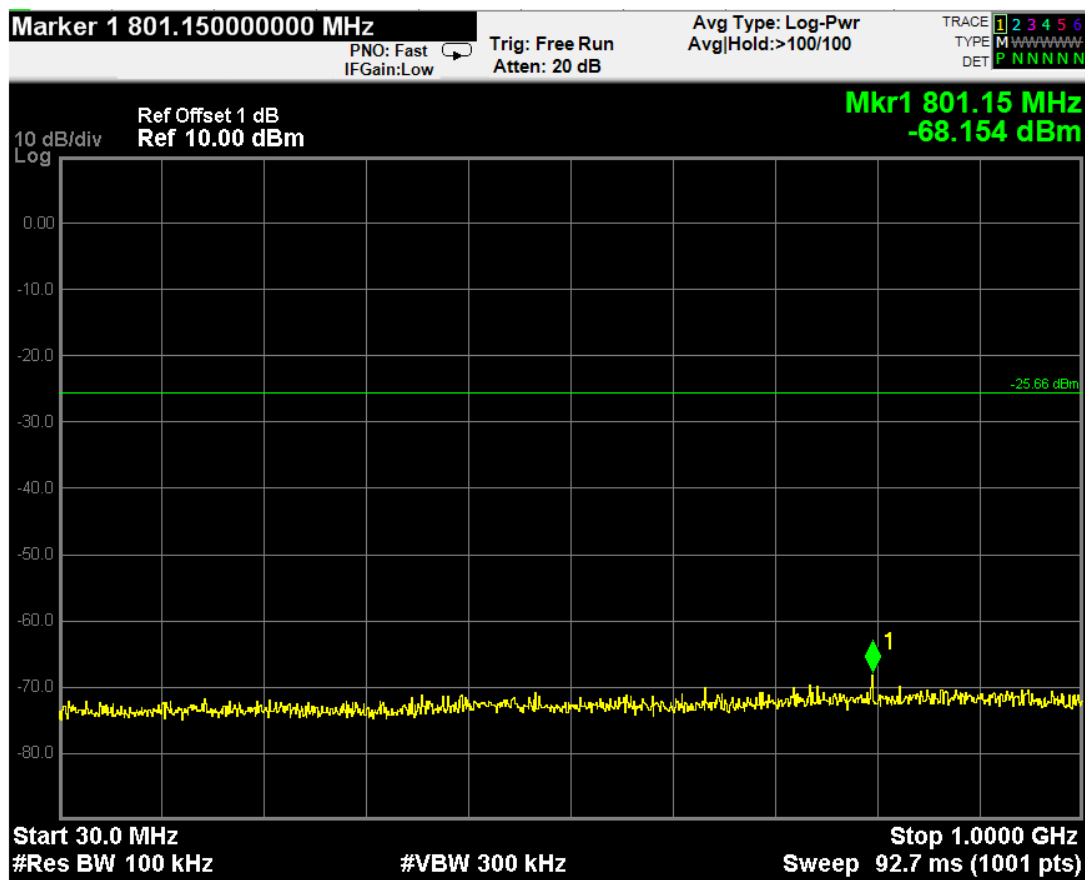
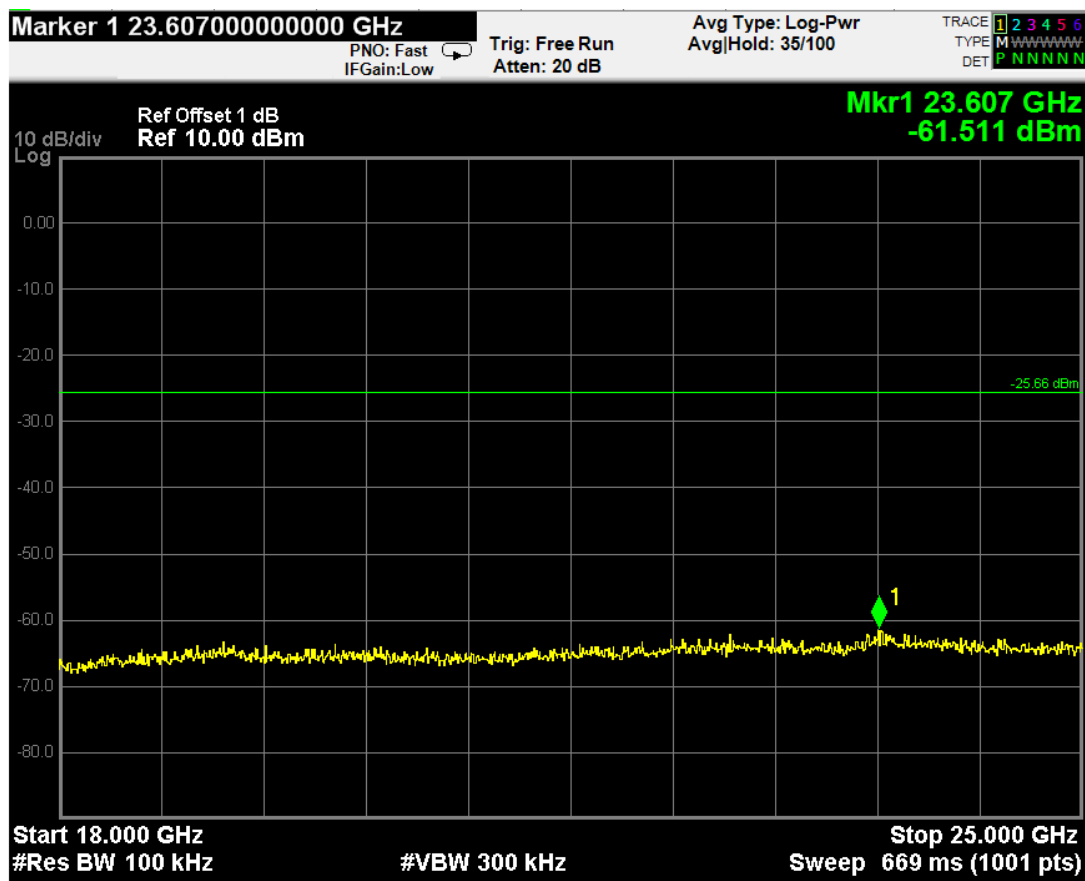
DH1Ch 78



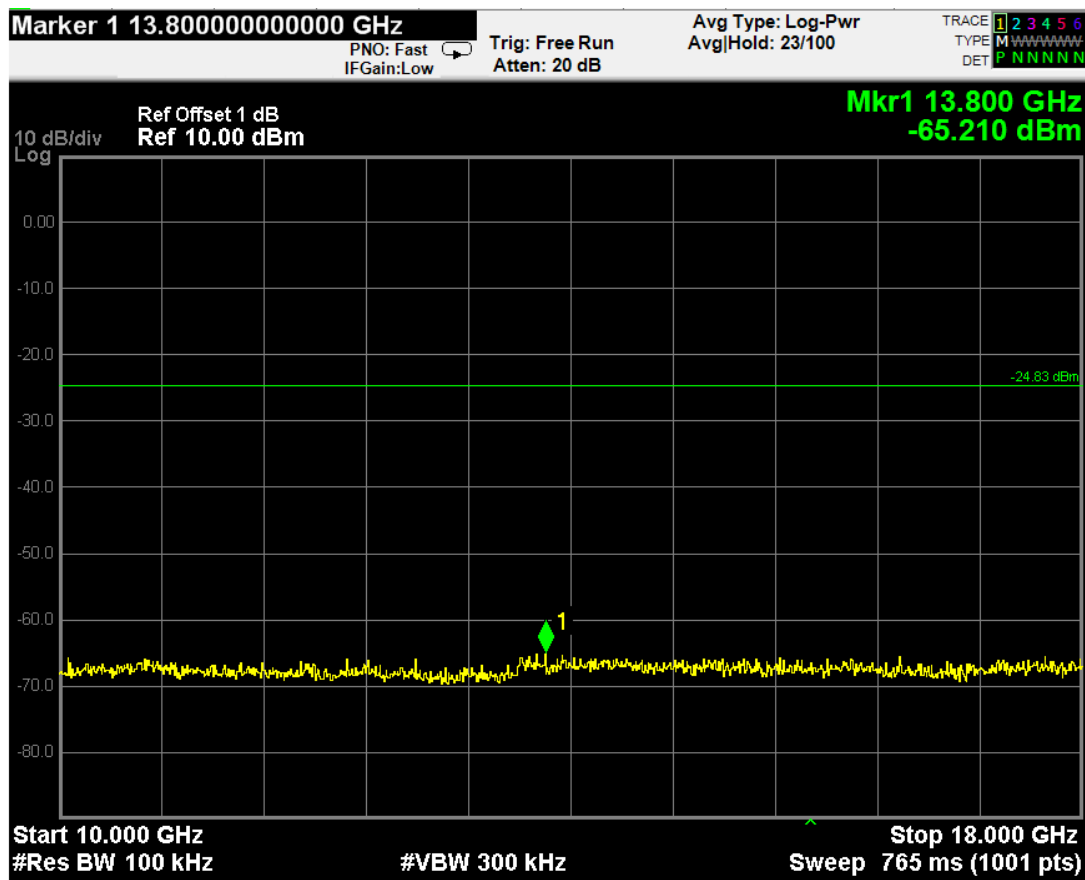
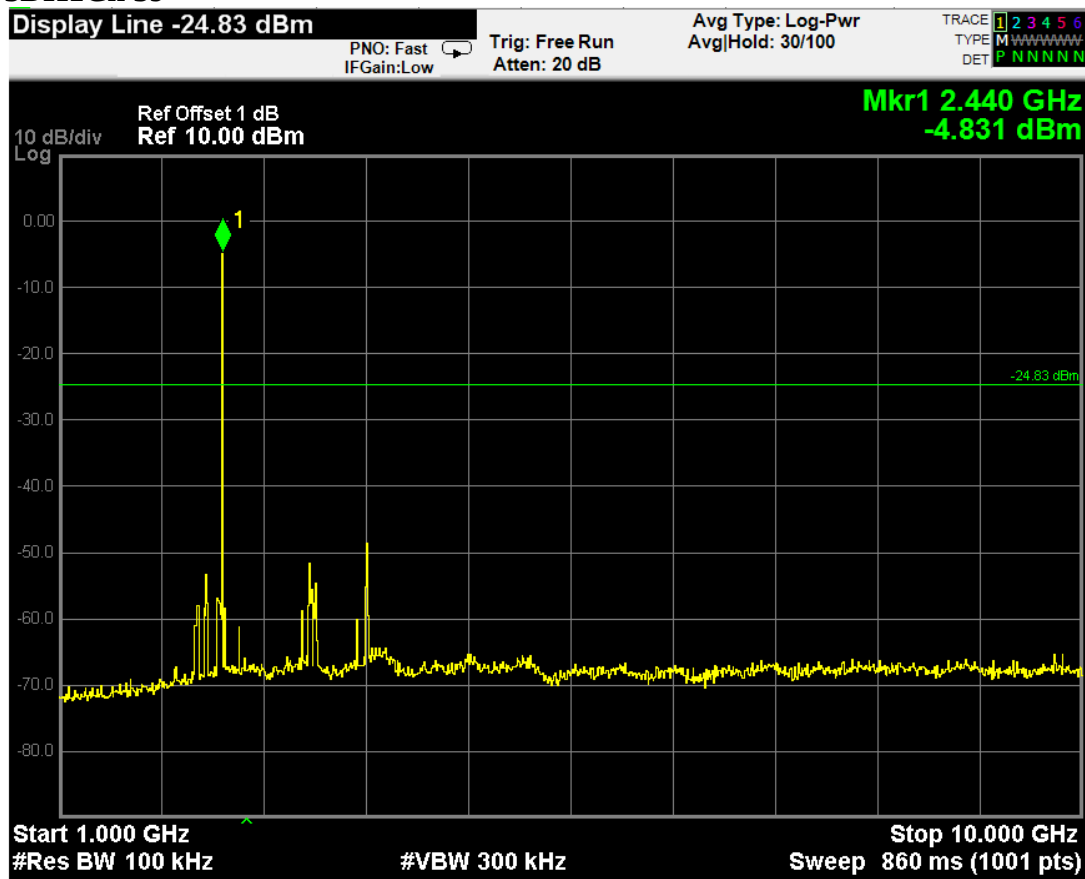


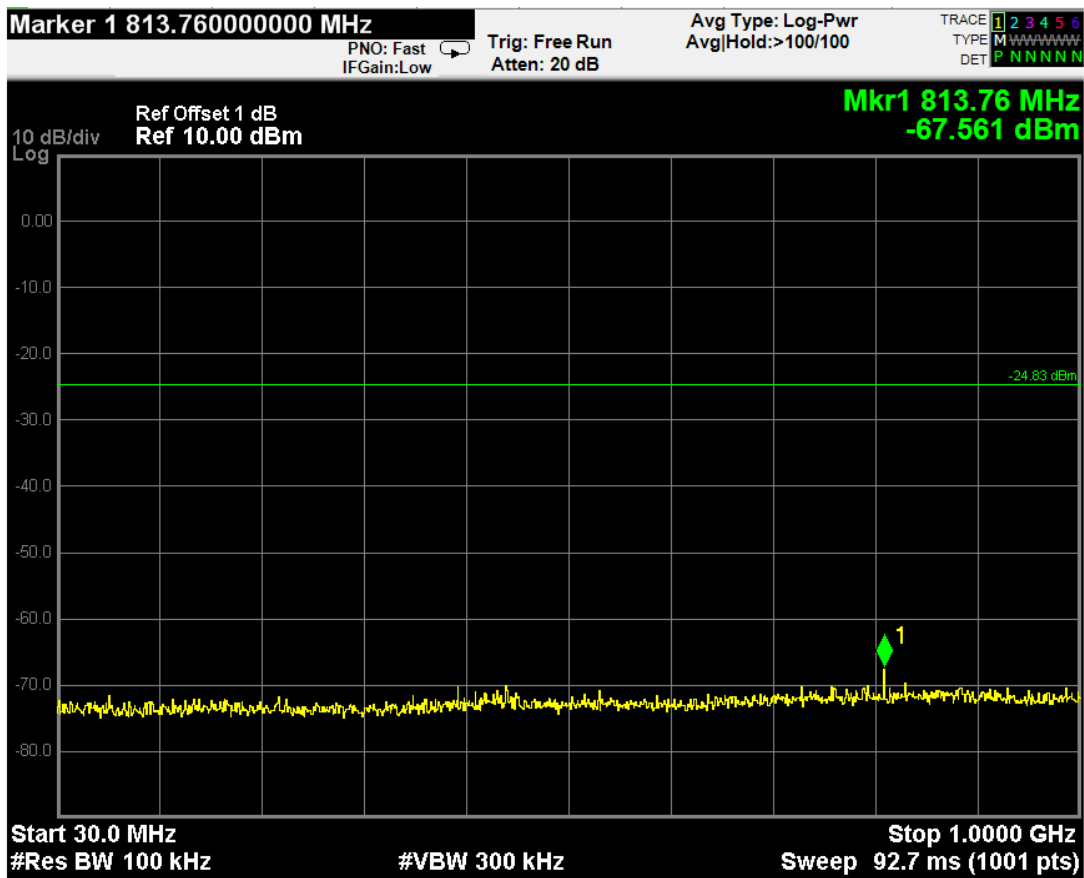
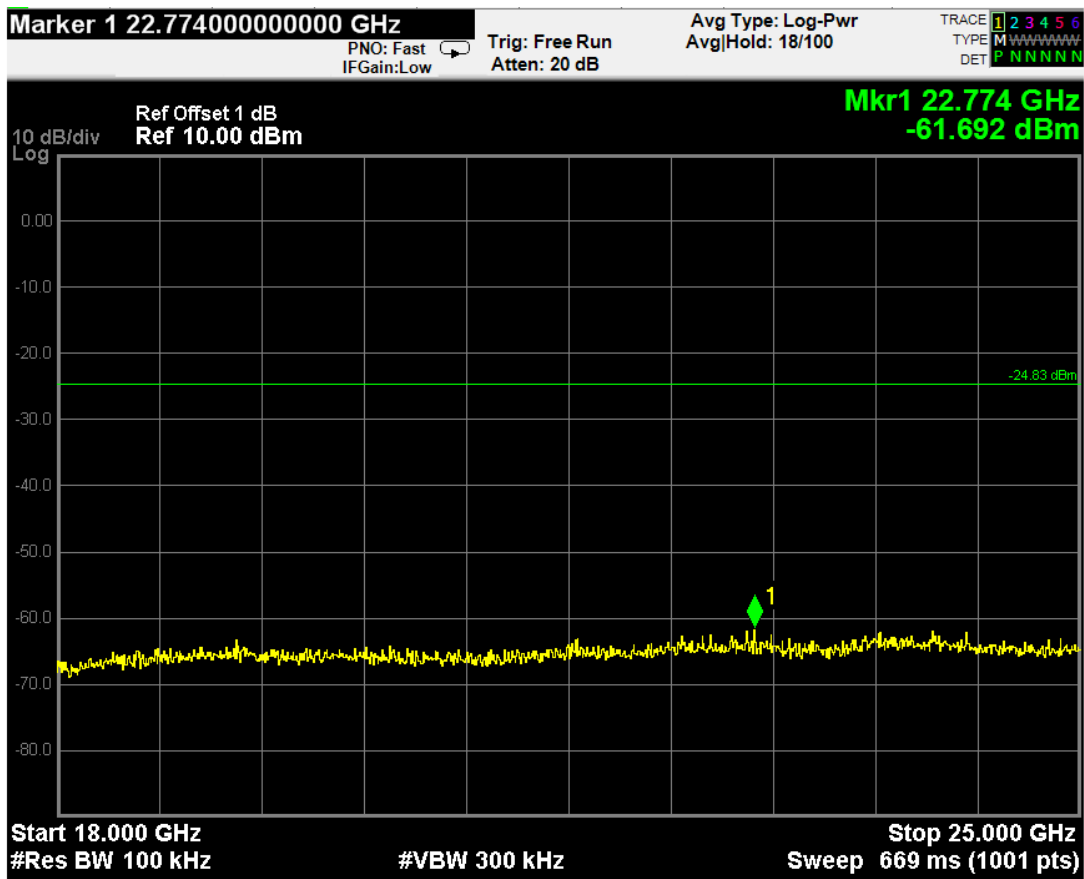
3DH1Ch 00



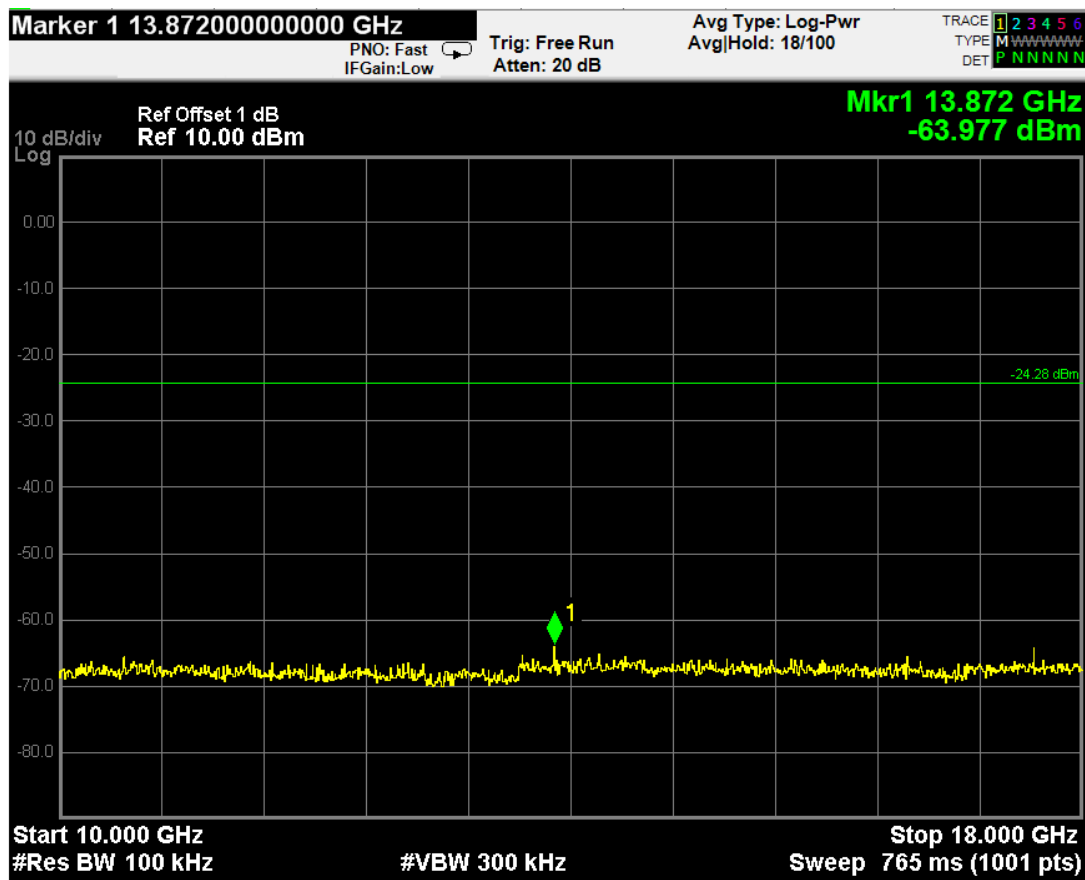
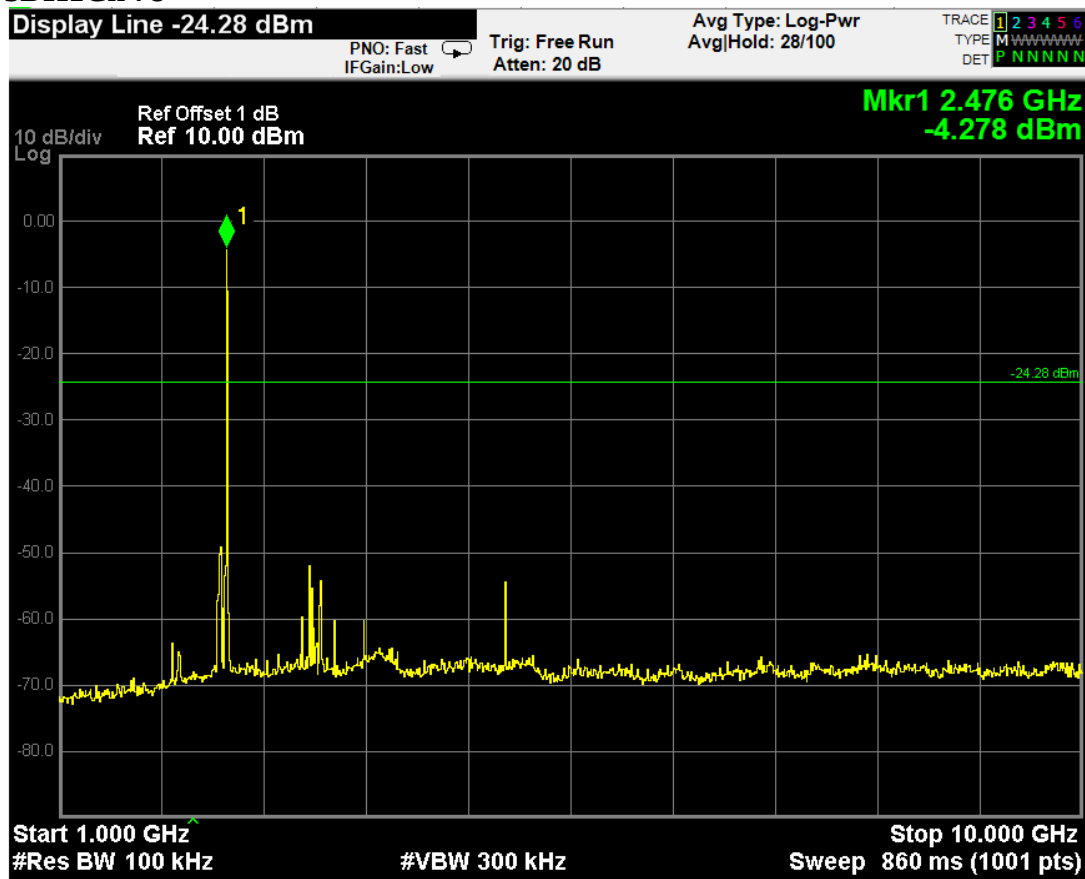


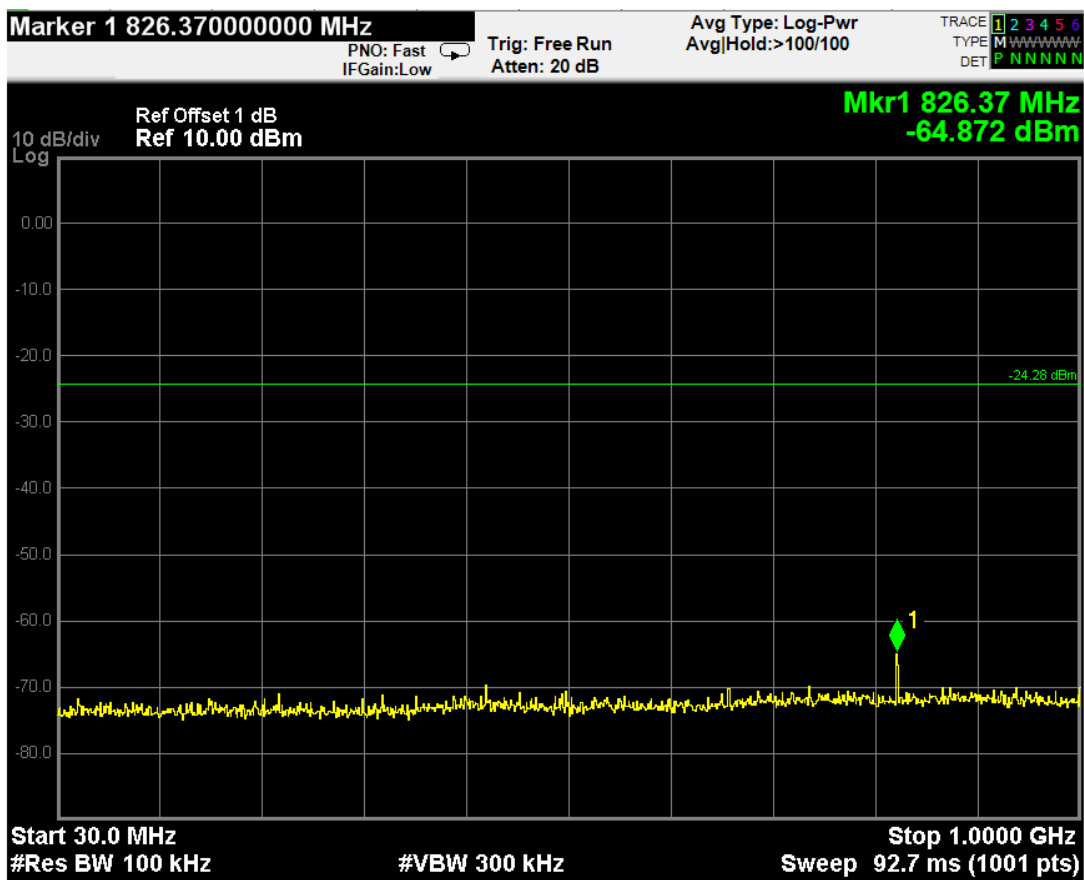
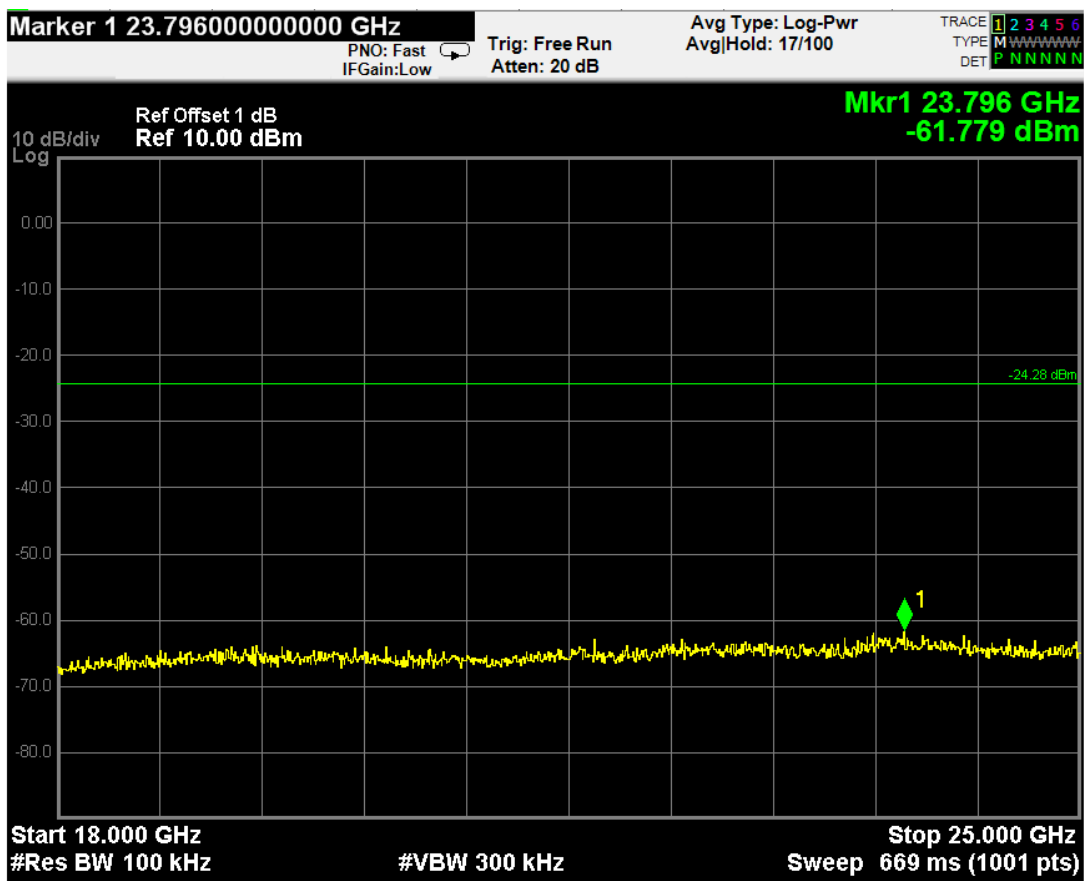
3DH1Ch 39



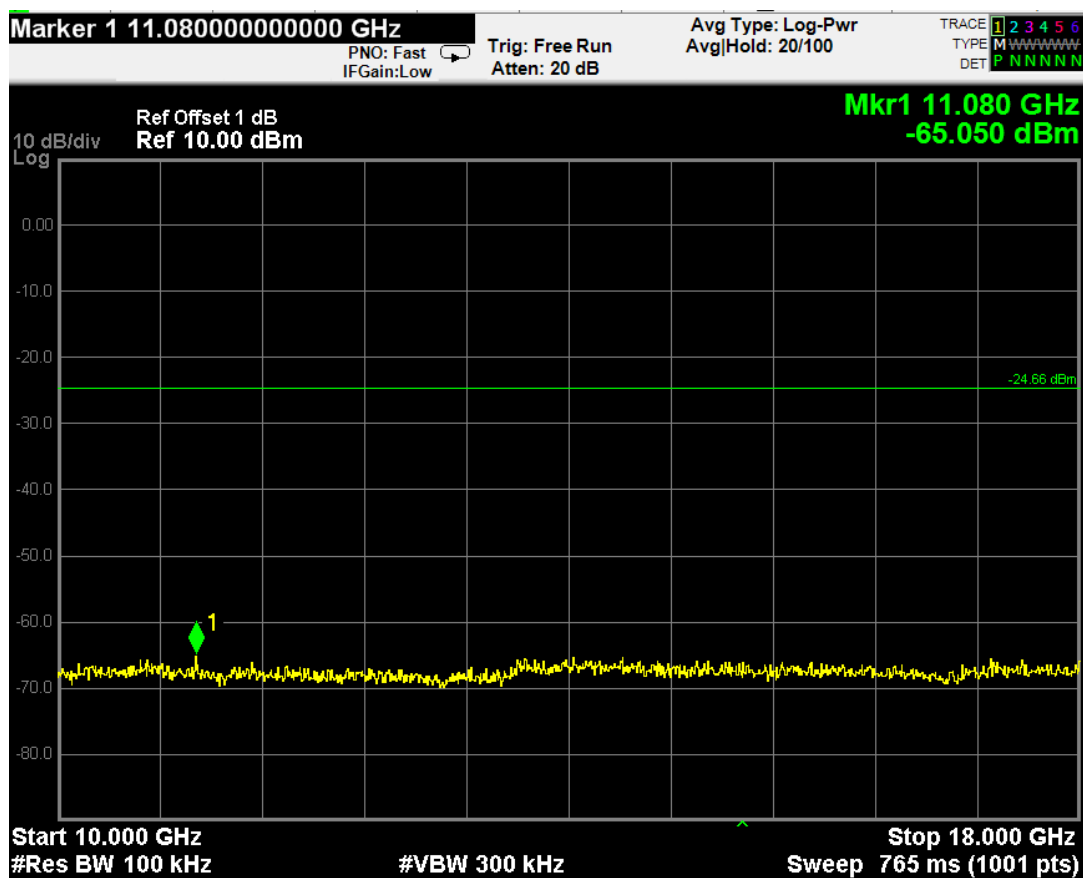
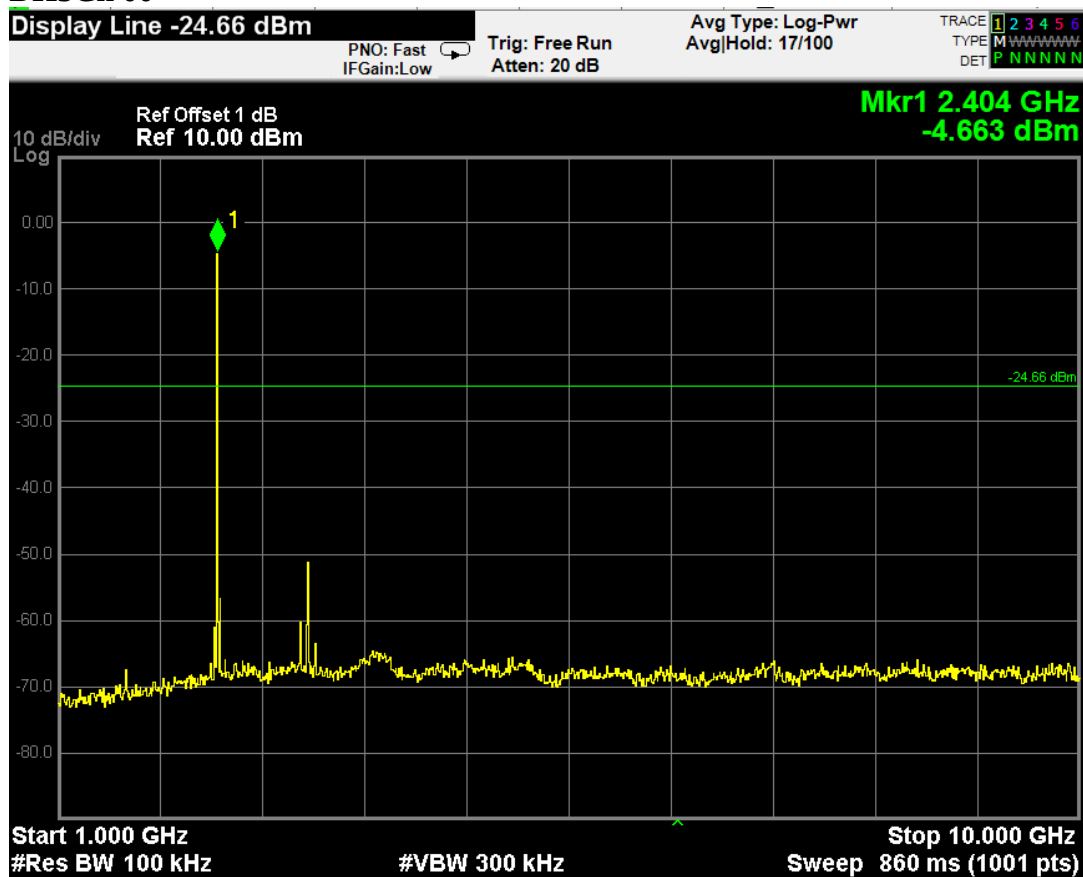


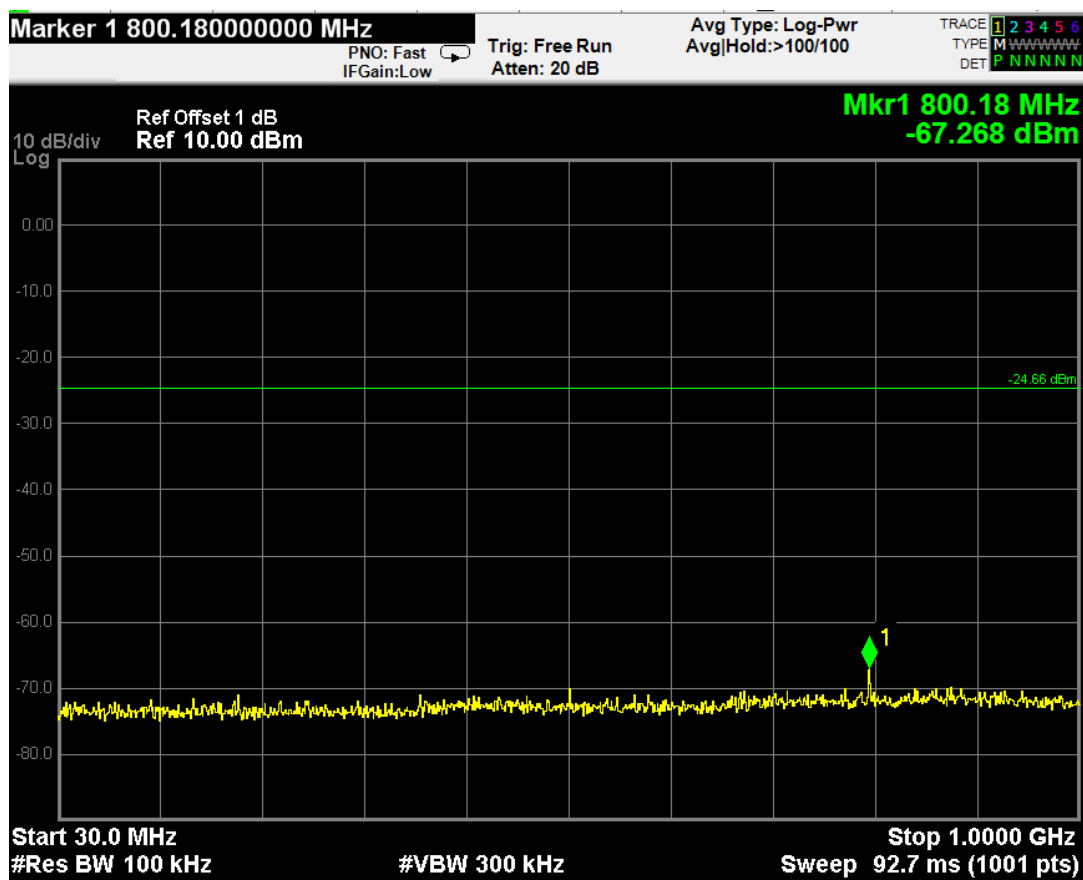
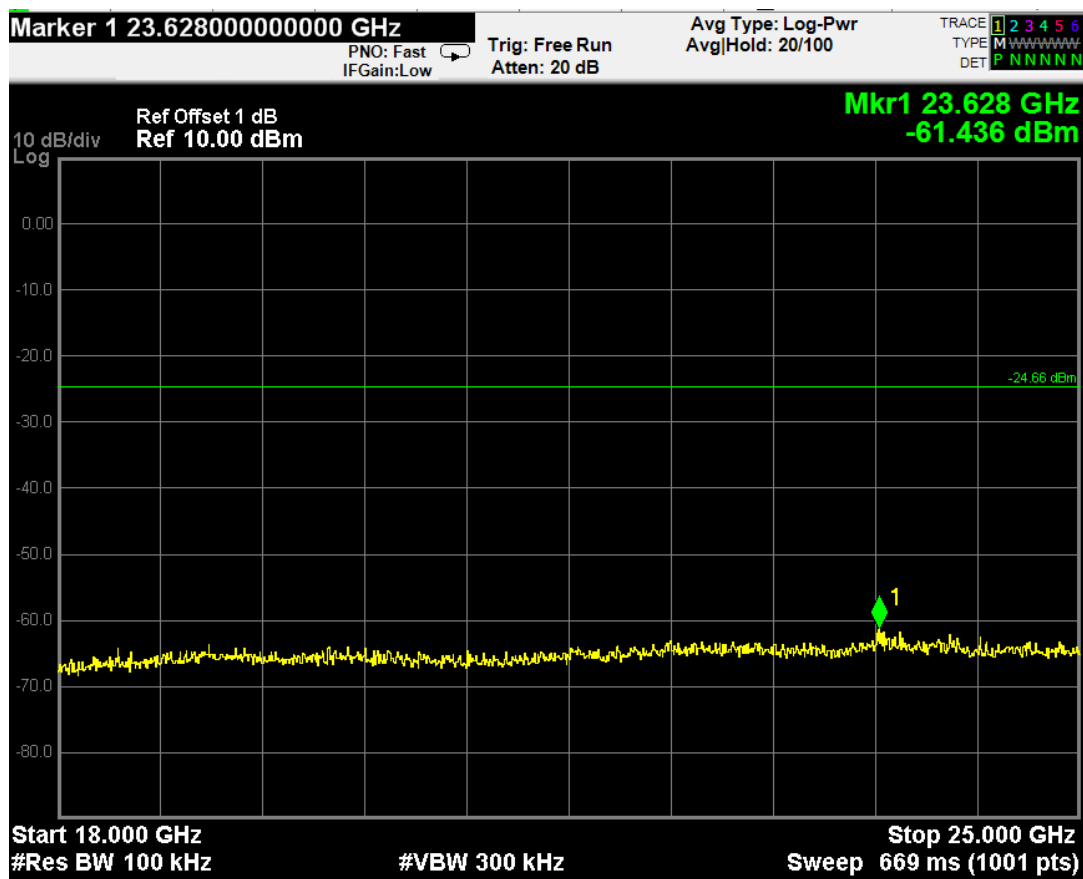
3DH1Ch 78



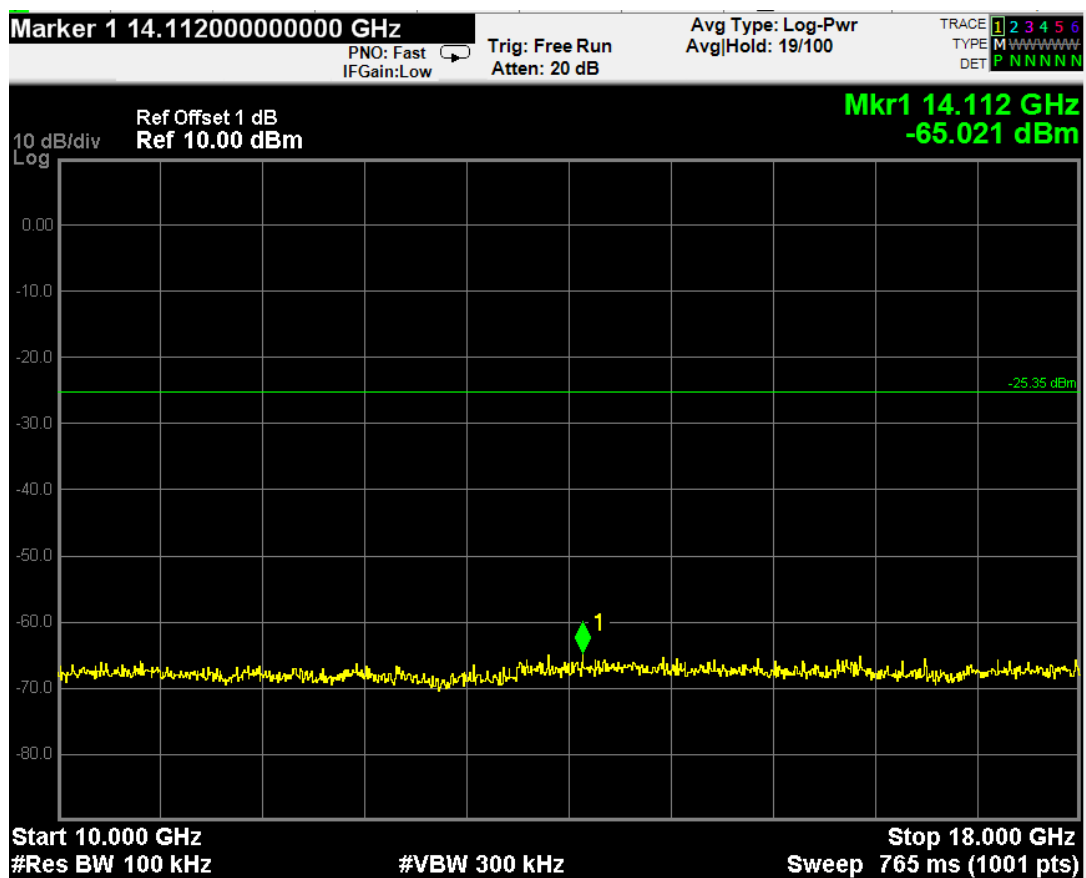
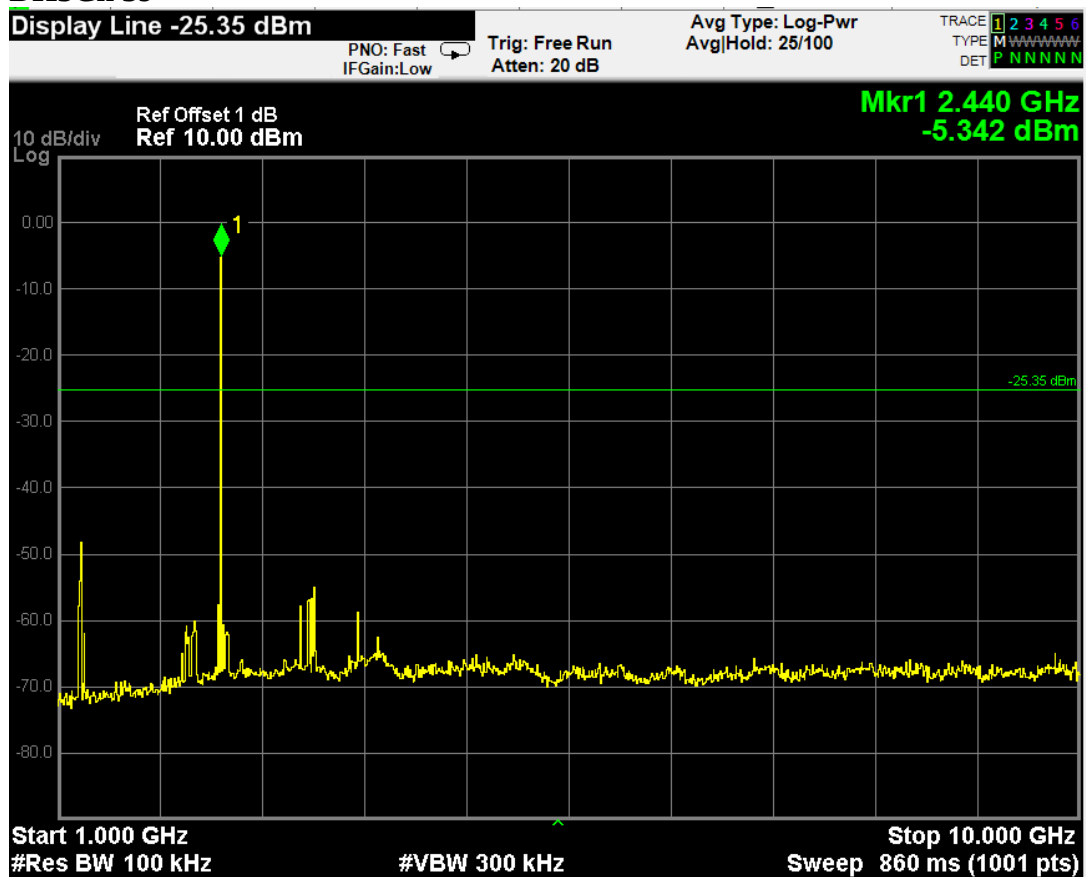


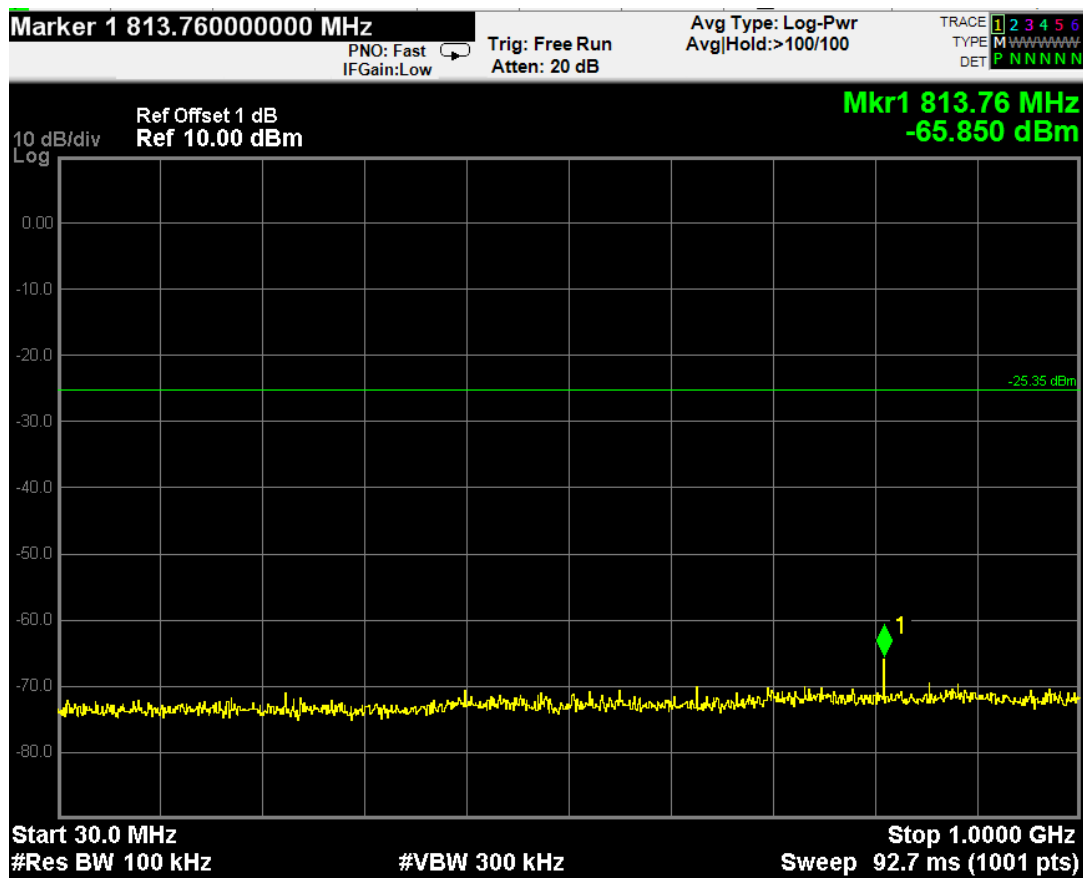
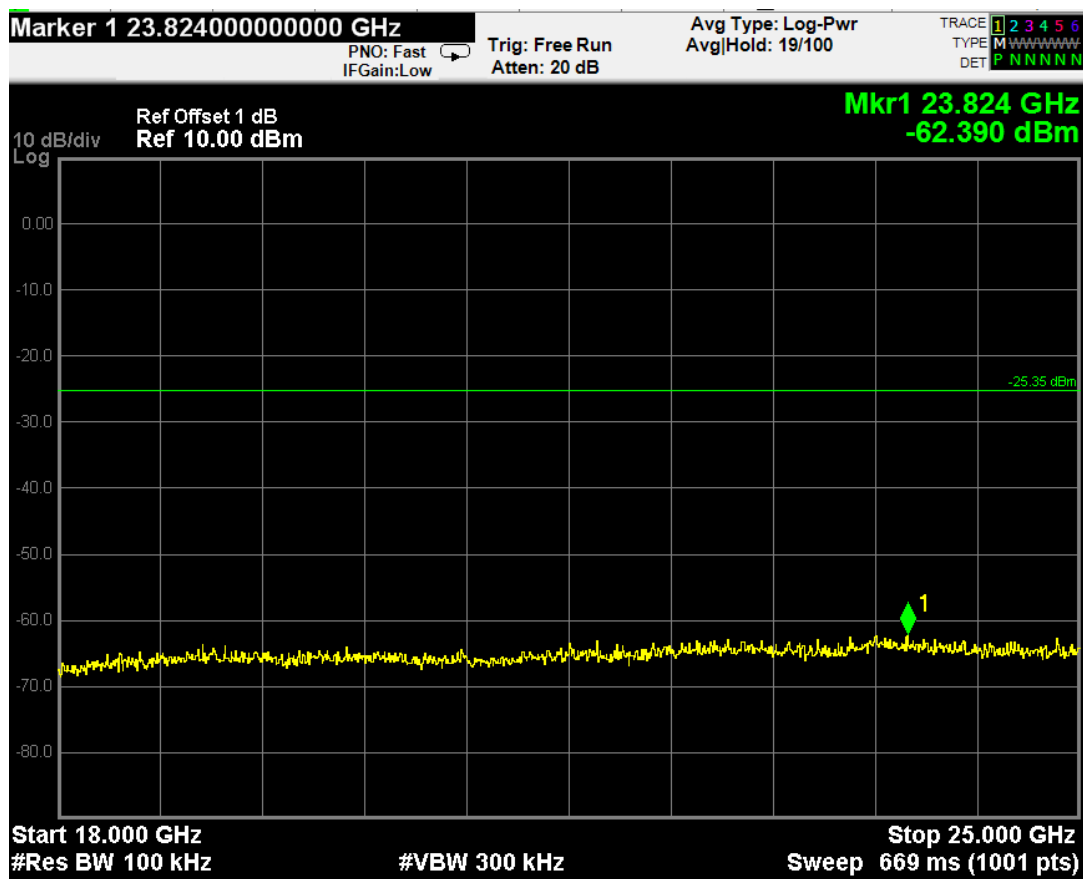
DH3Ch 00



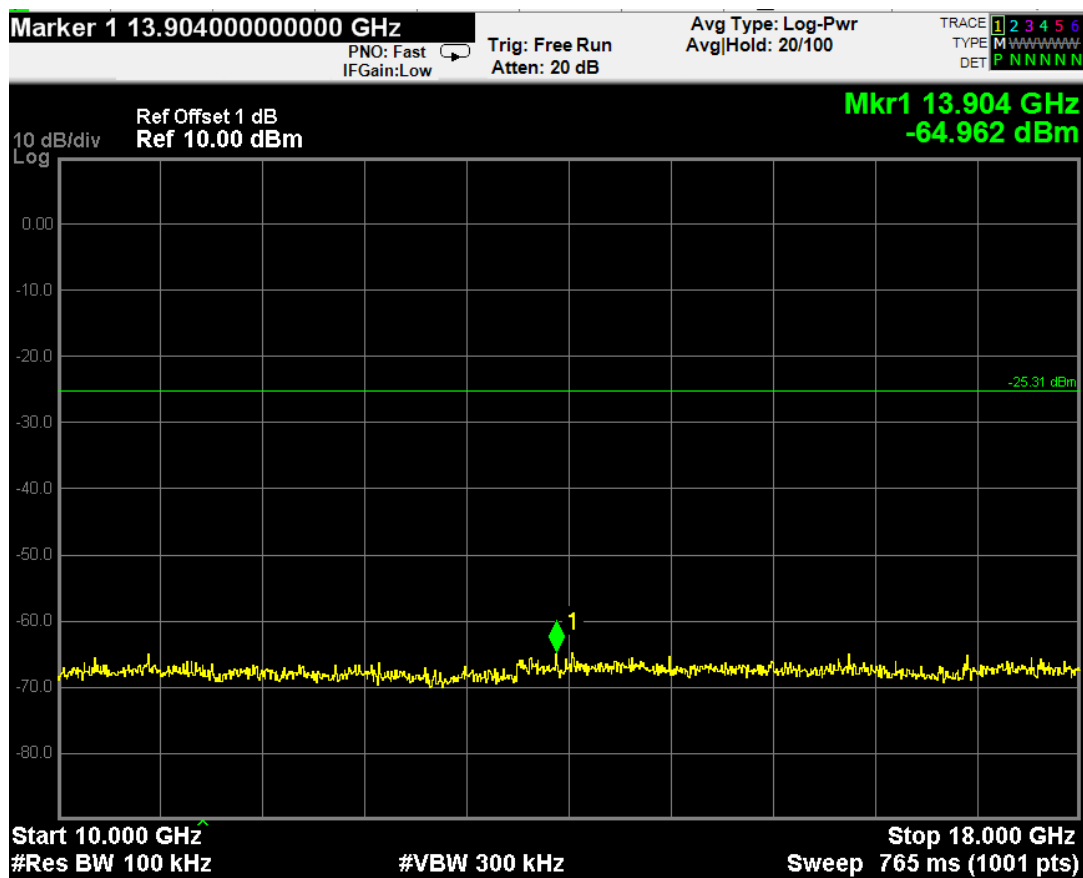
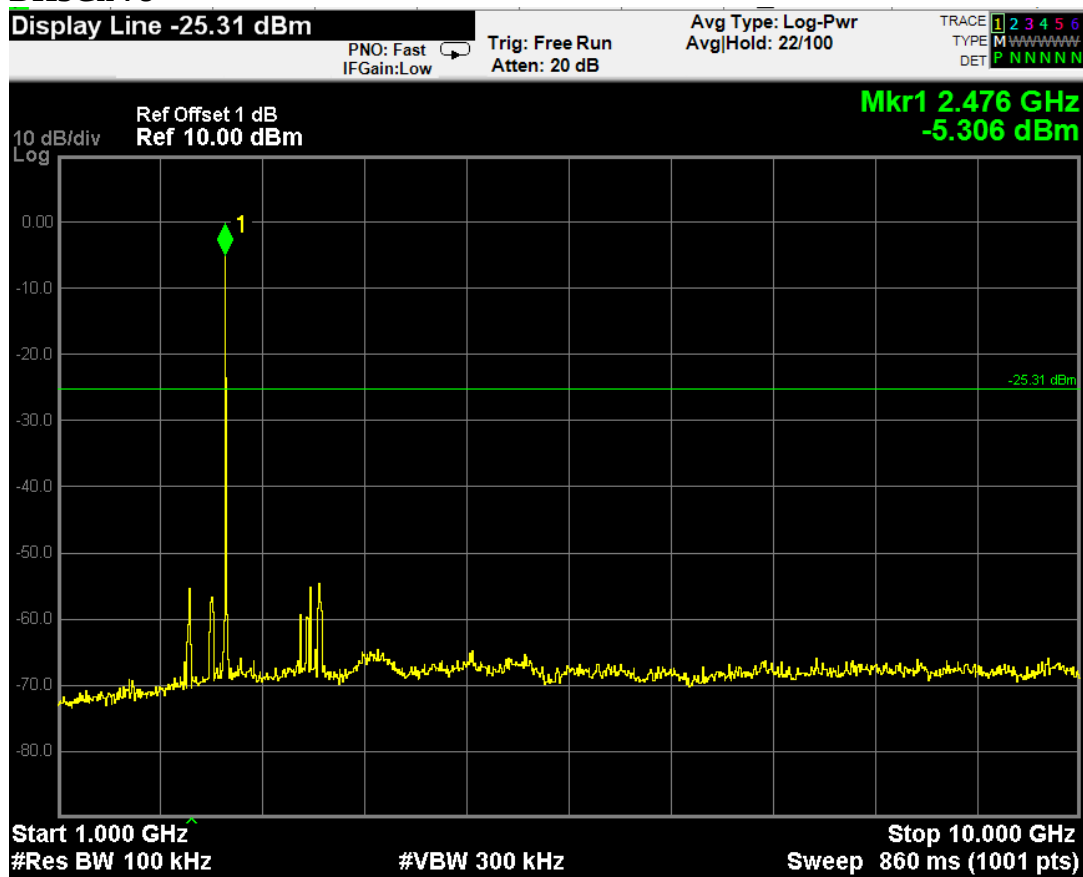


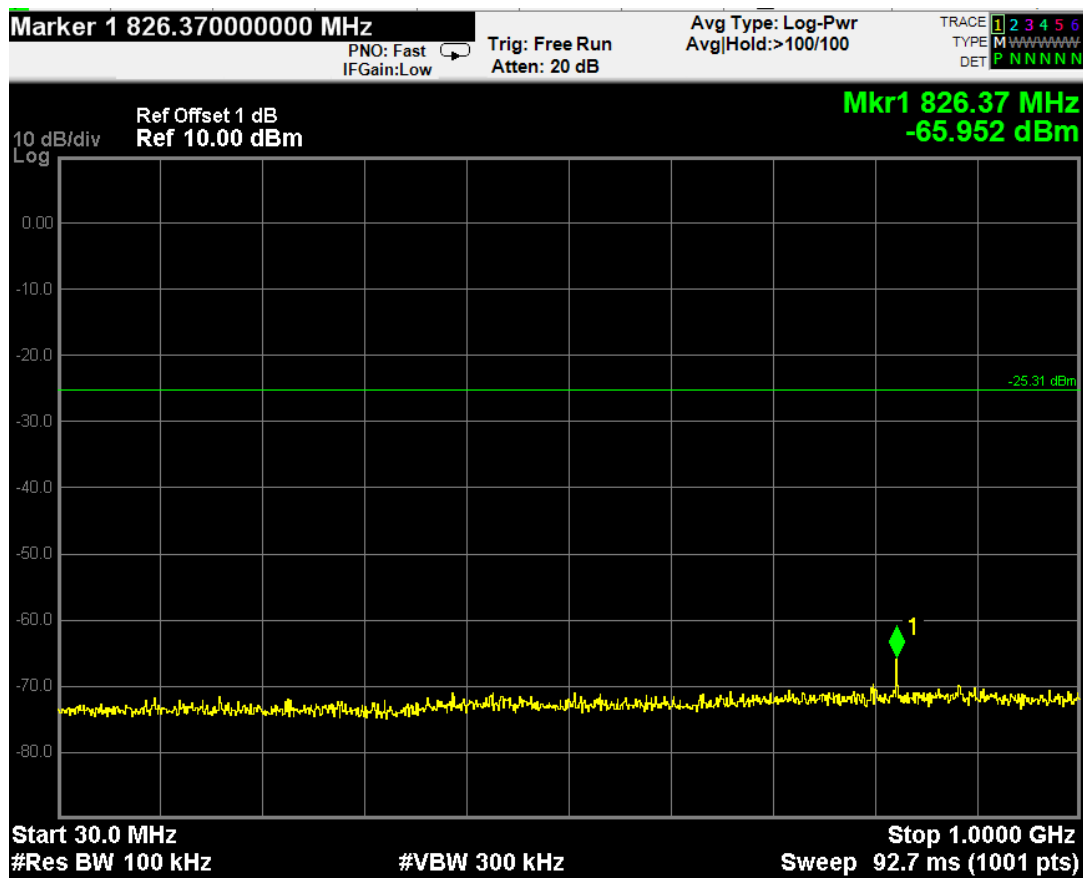
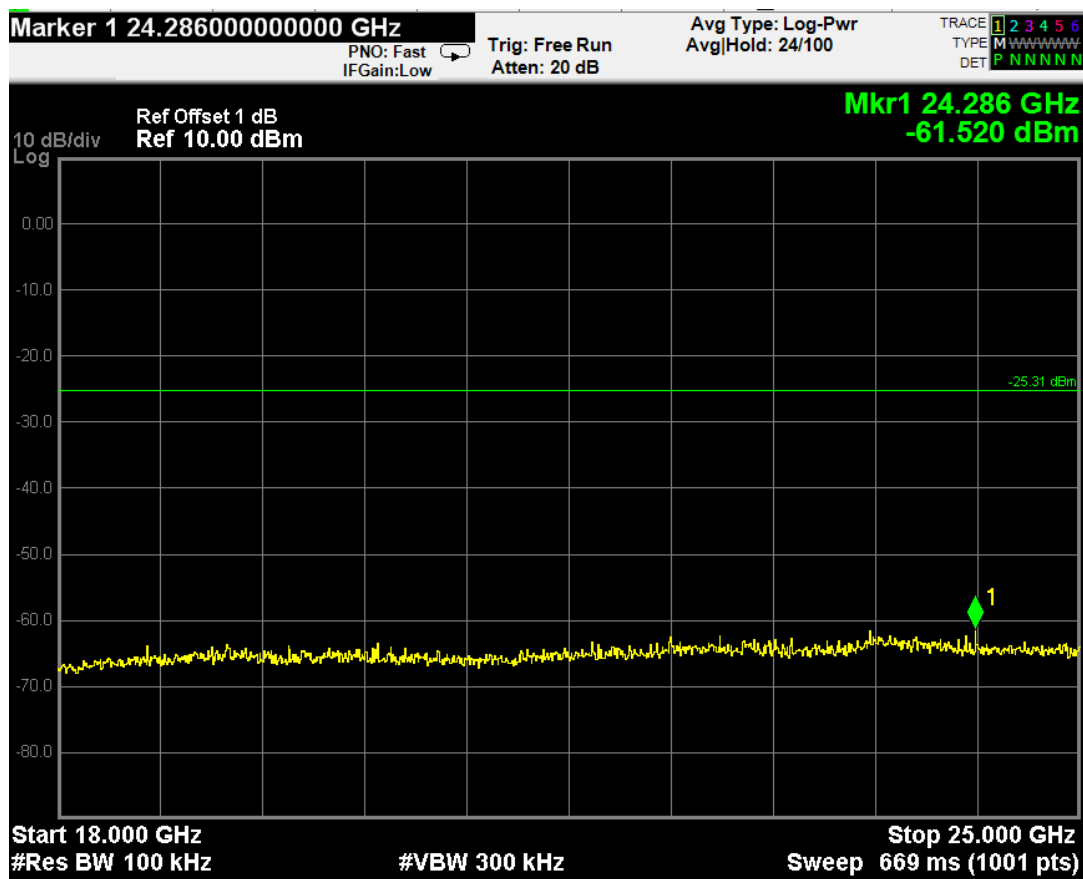
DH3Ch 39



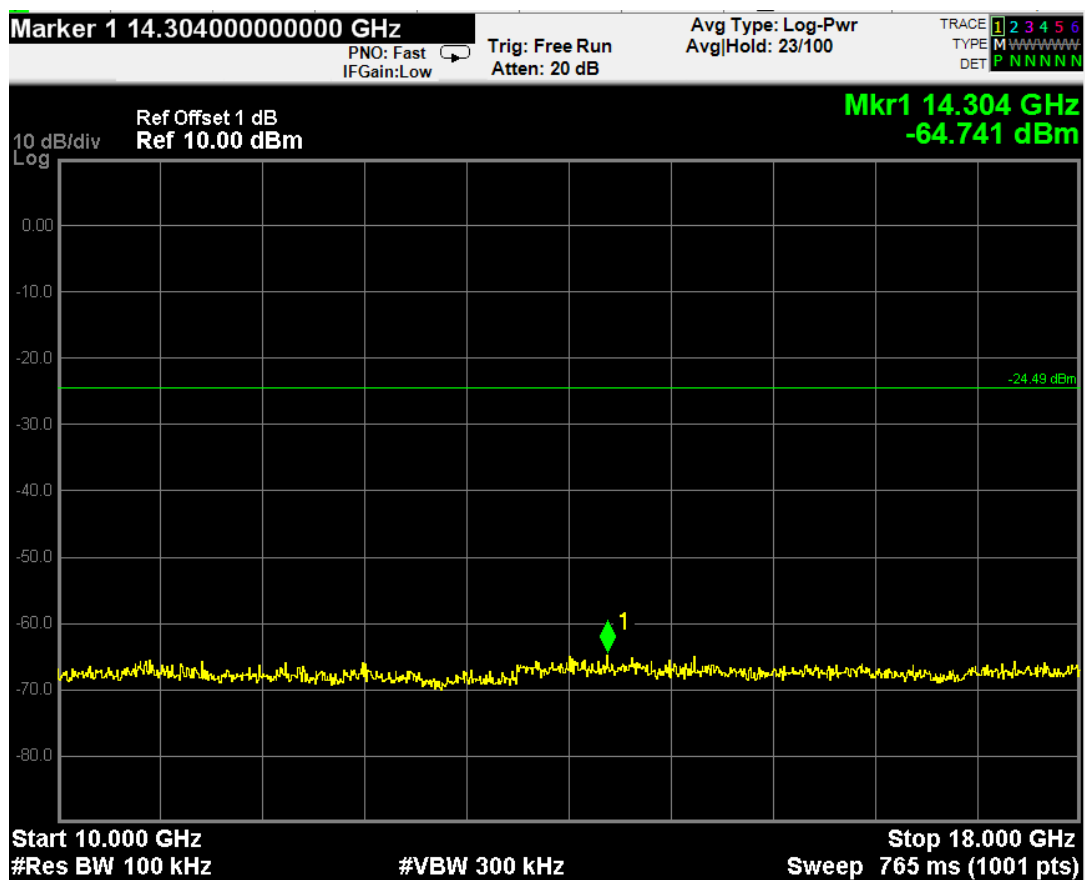
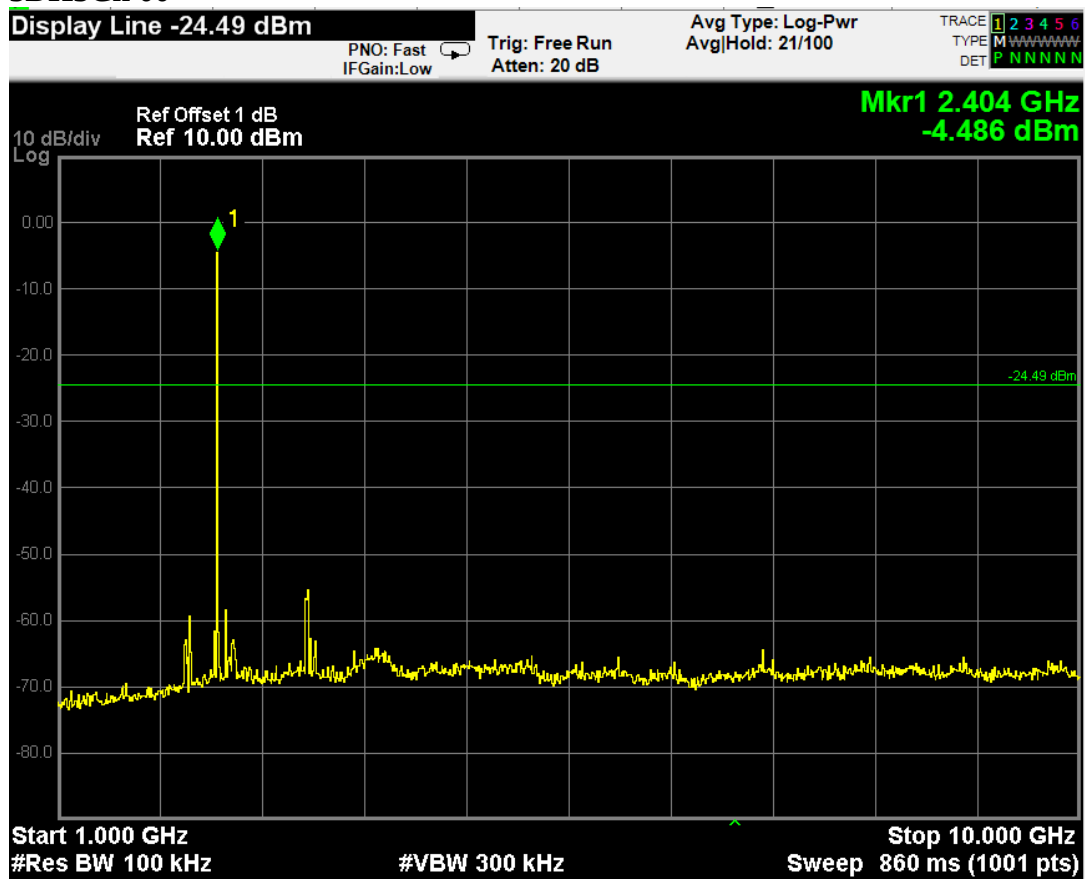


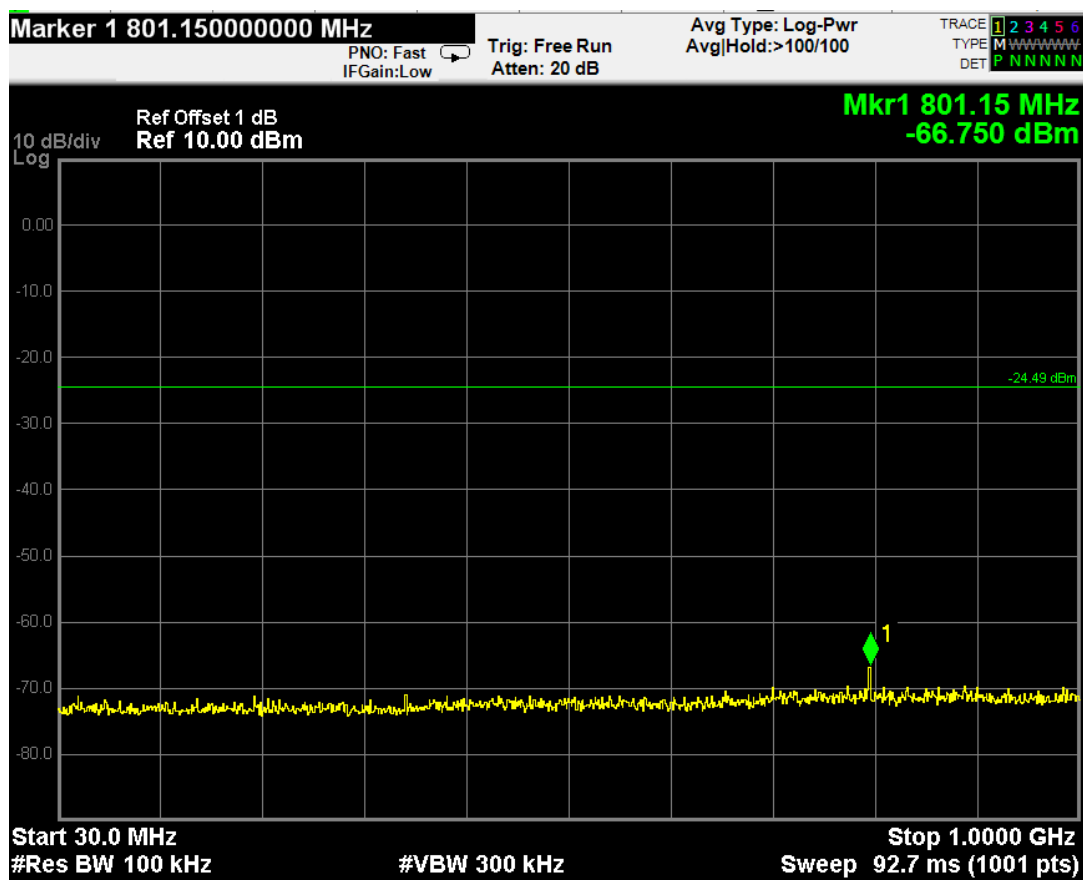
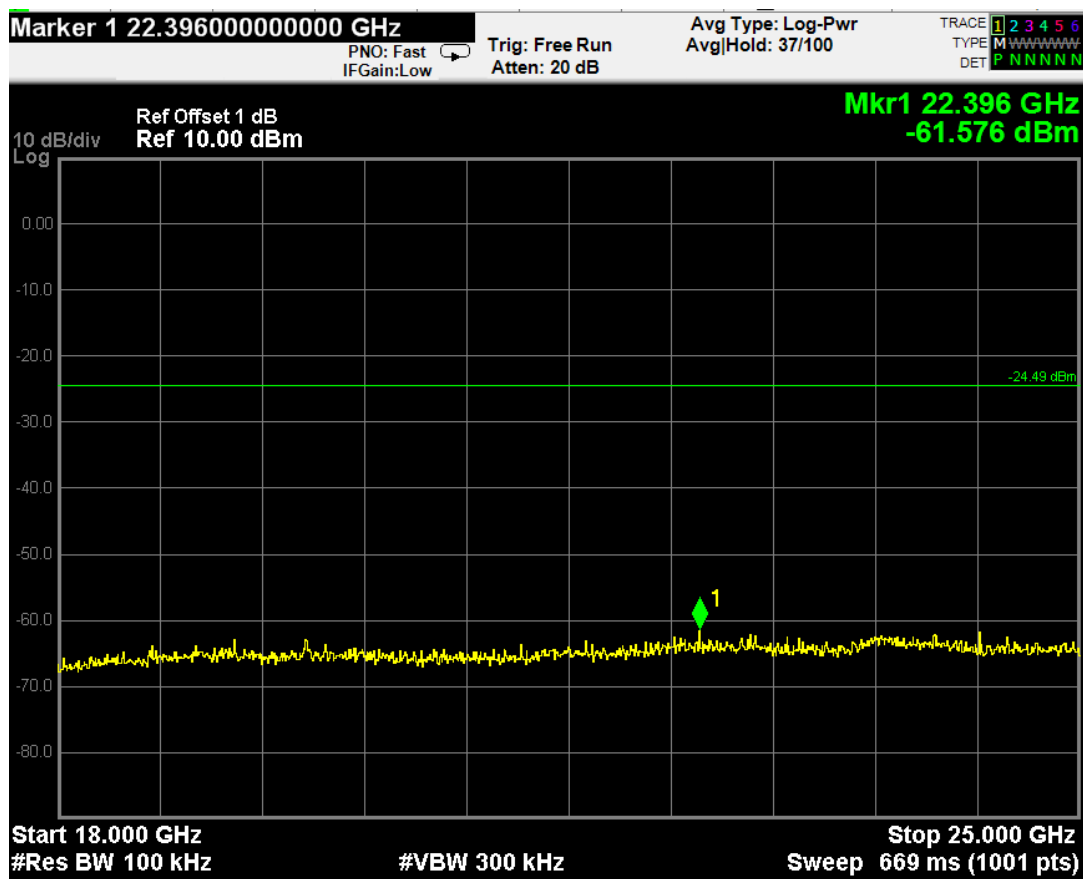
DH3Ch 78



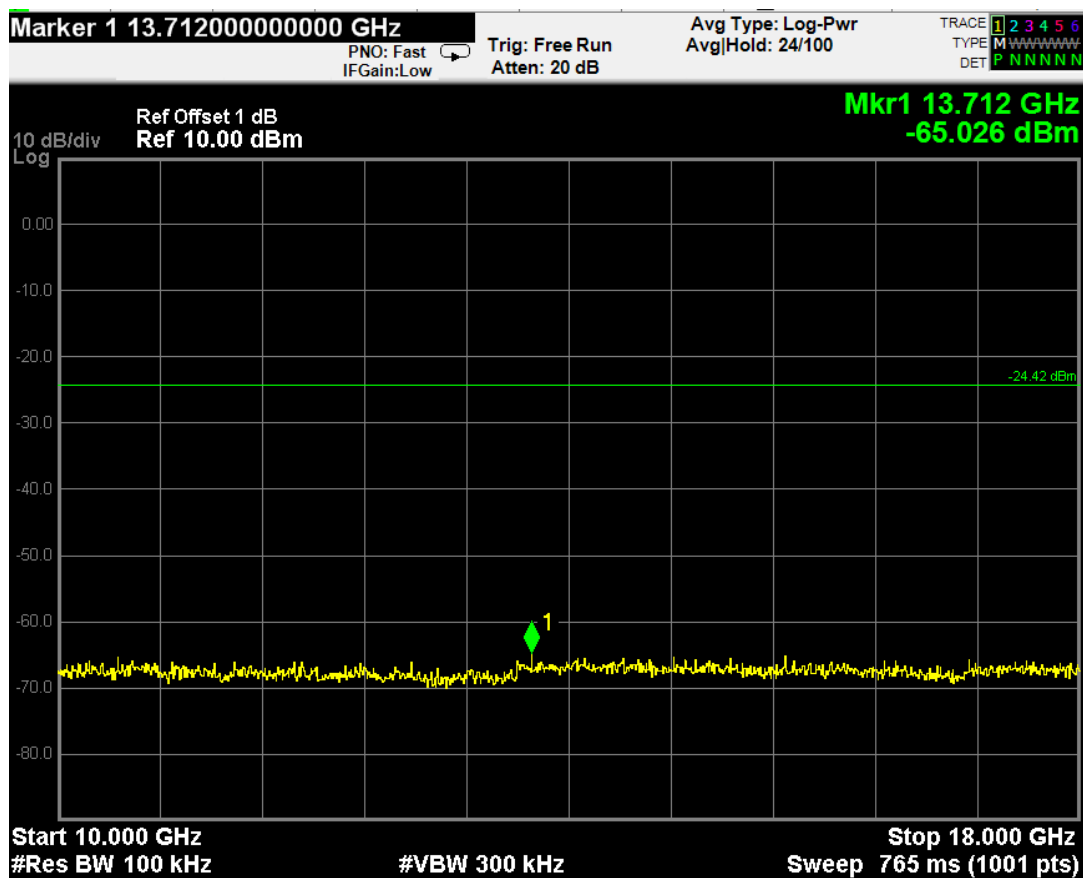
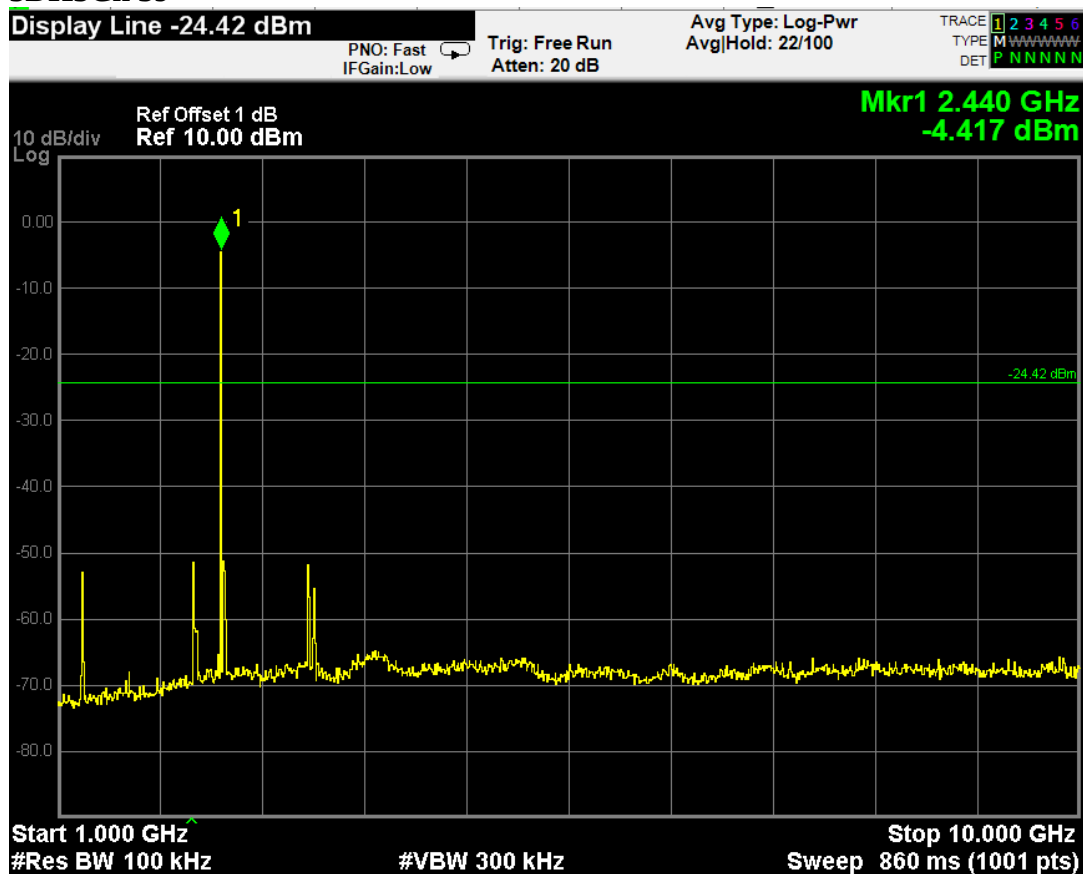


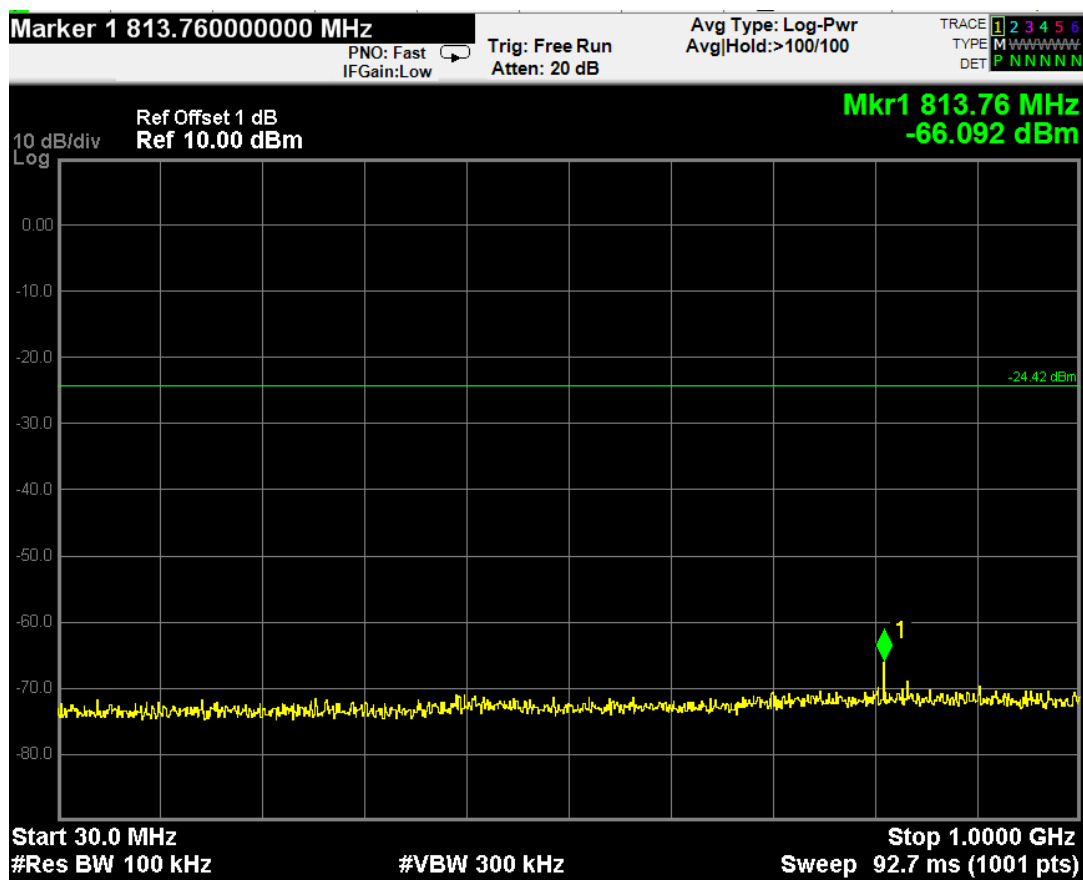
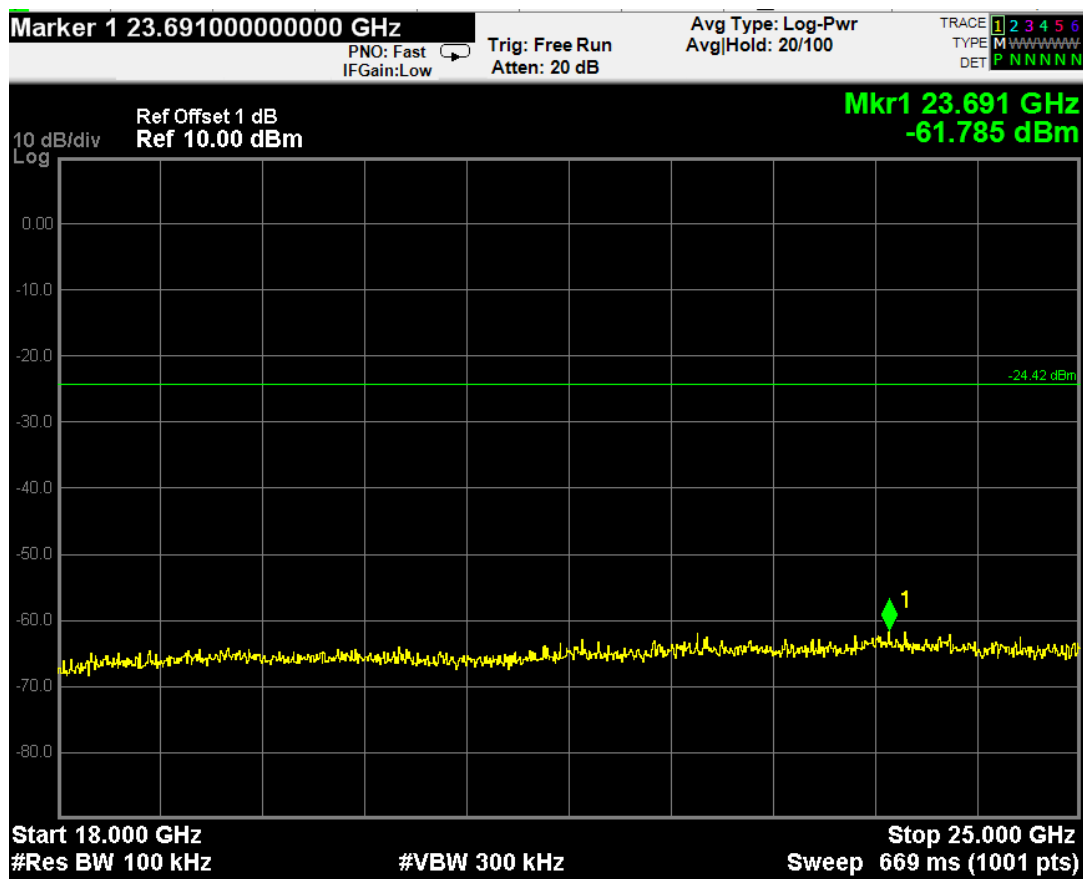
3DH3Ch 00



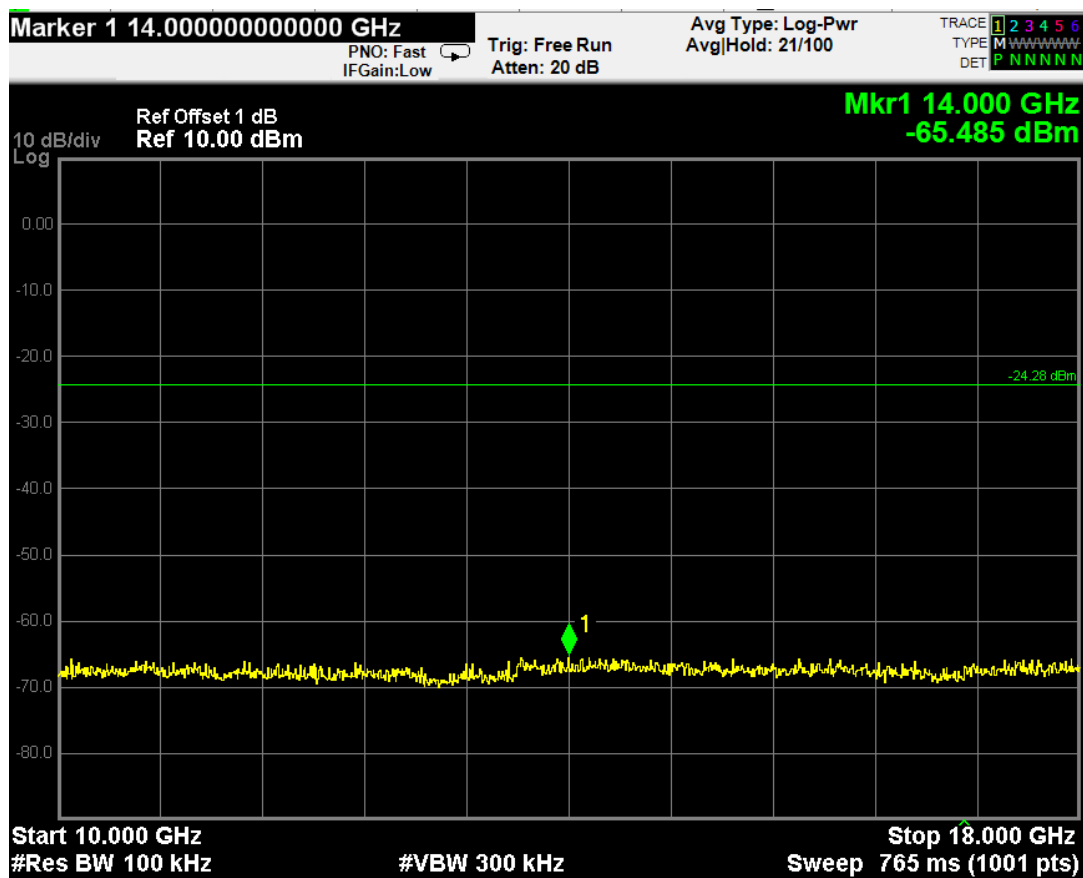
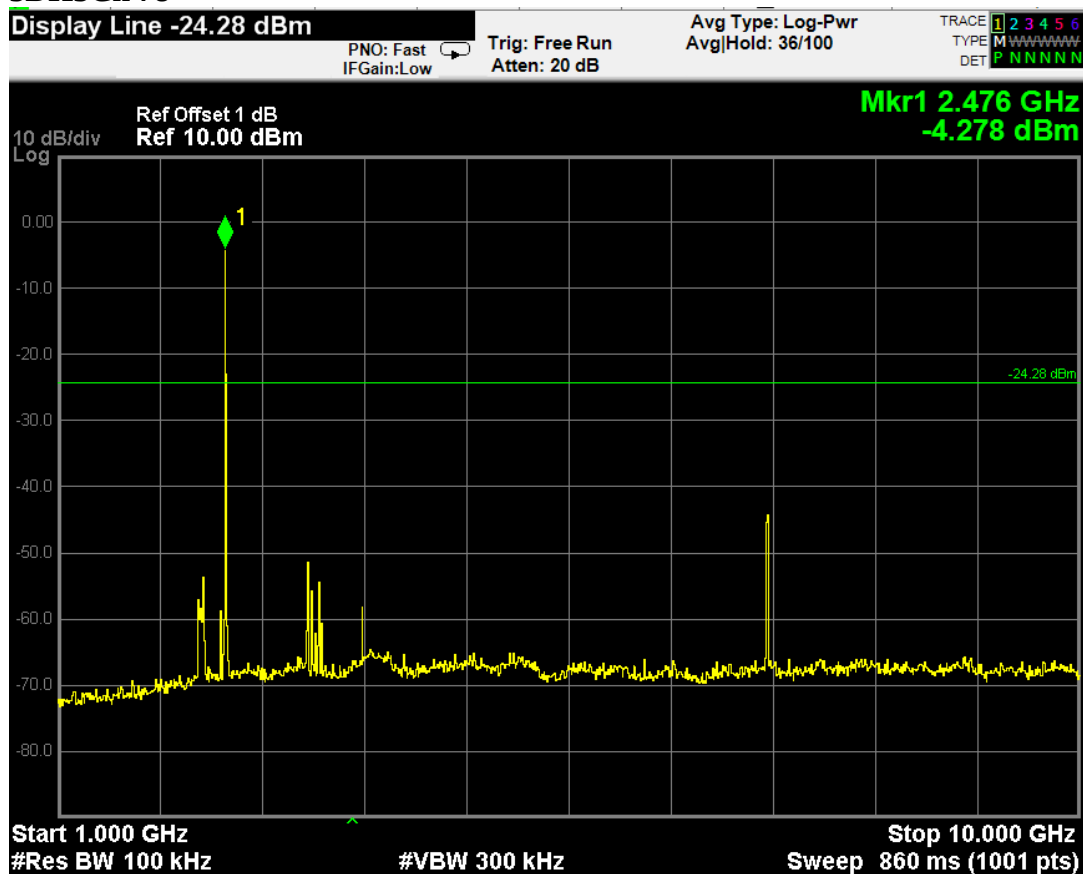


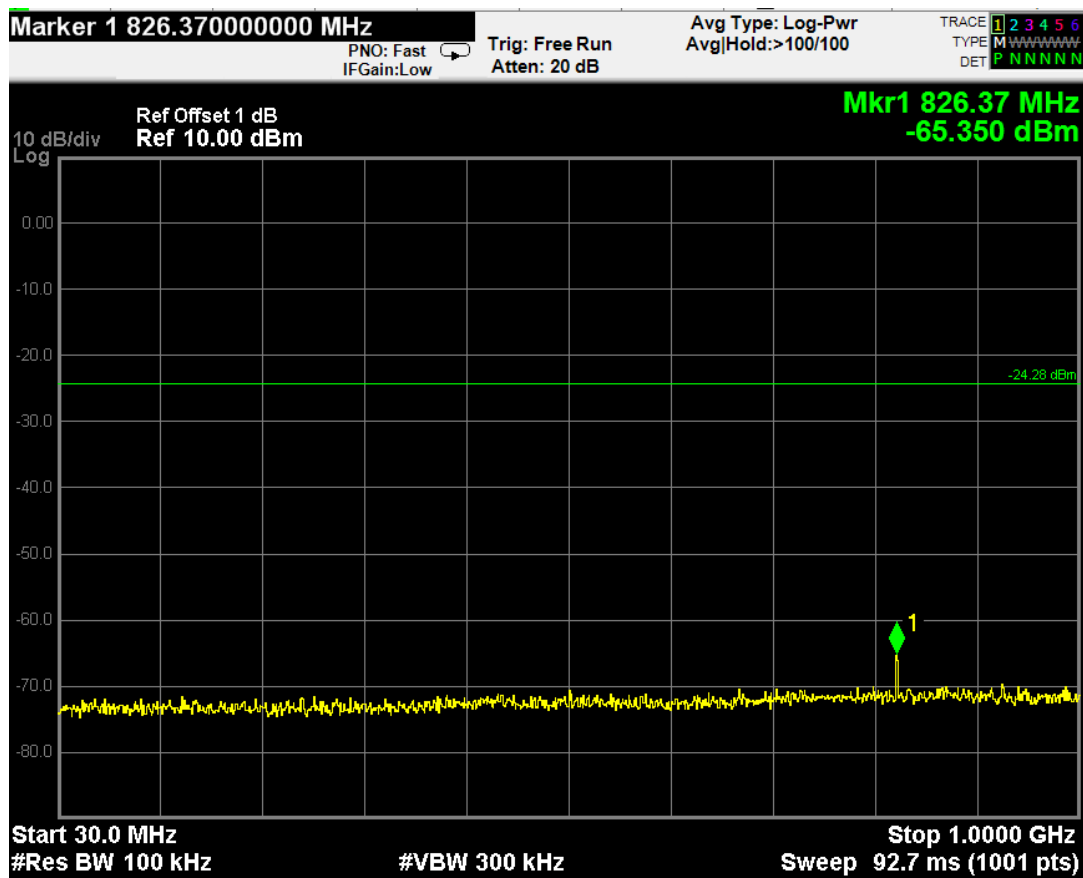
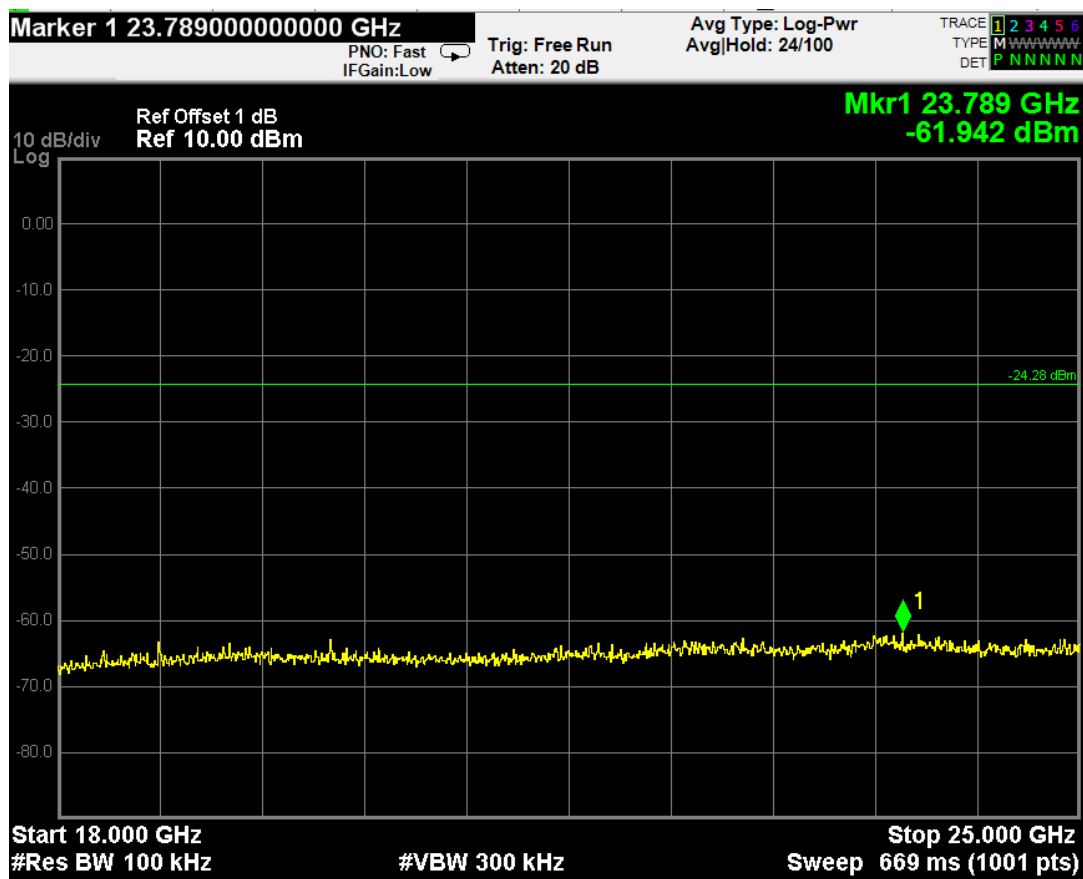
3DH3Ch 39





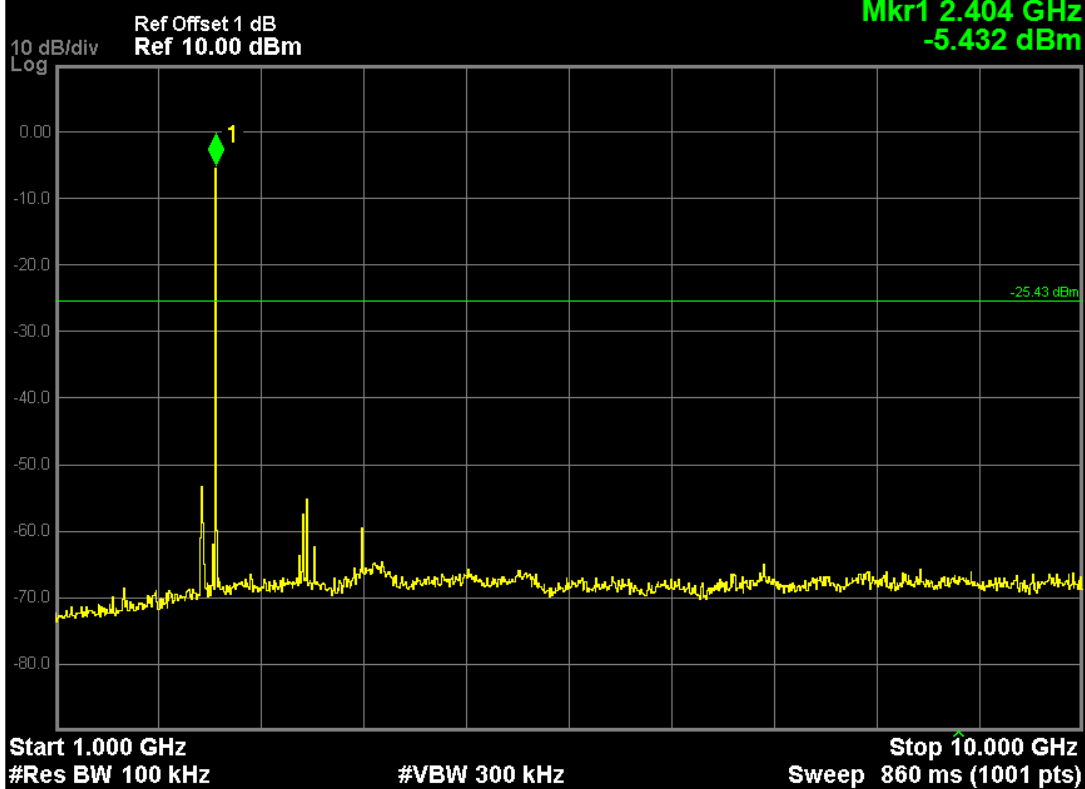
3DH3Ch 78



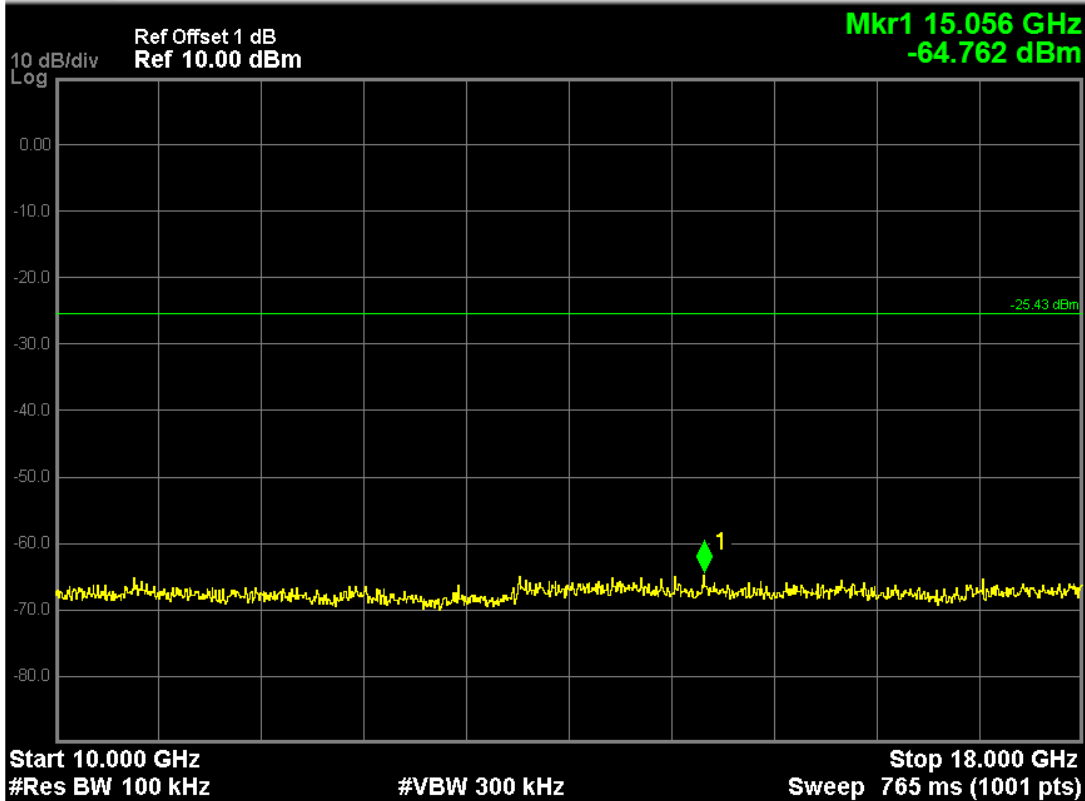


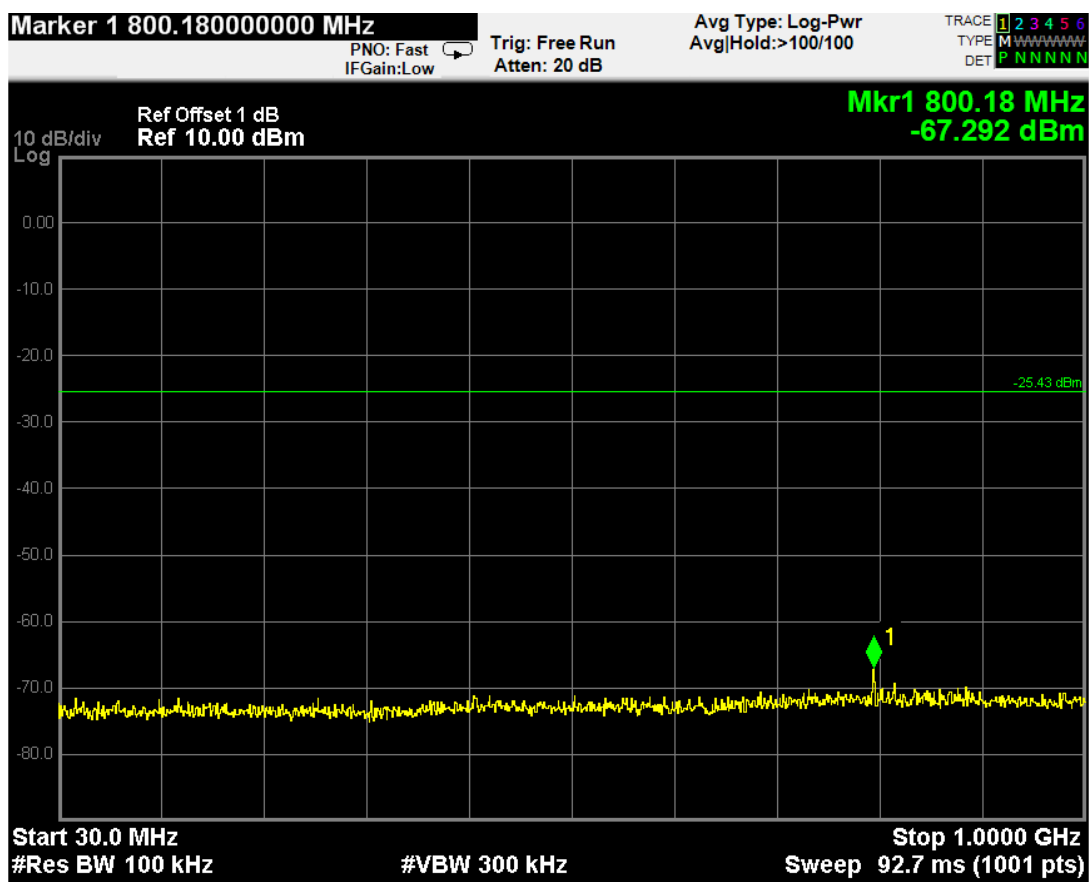
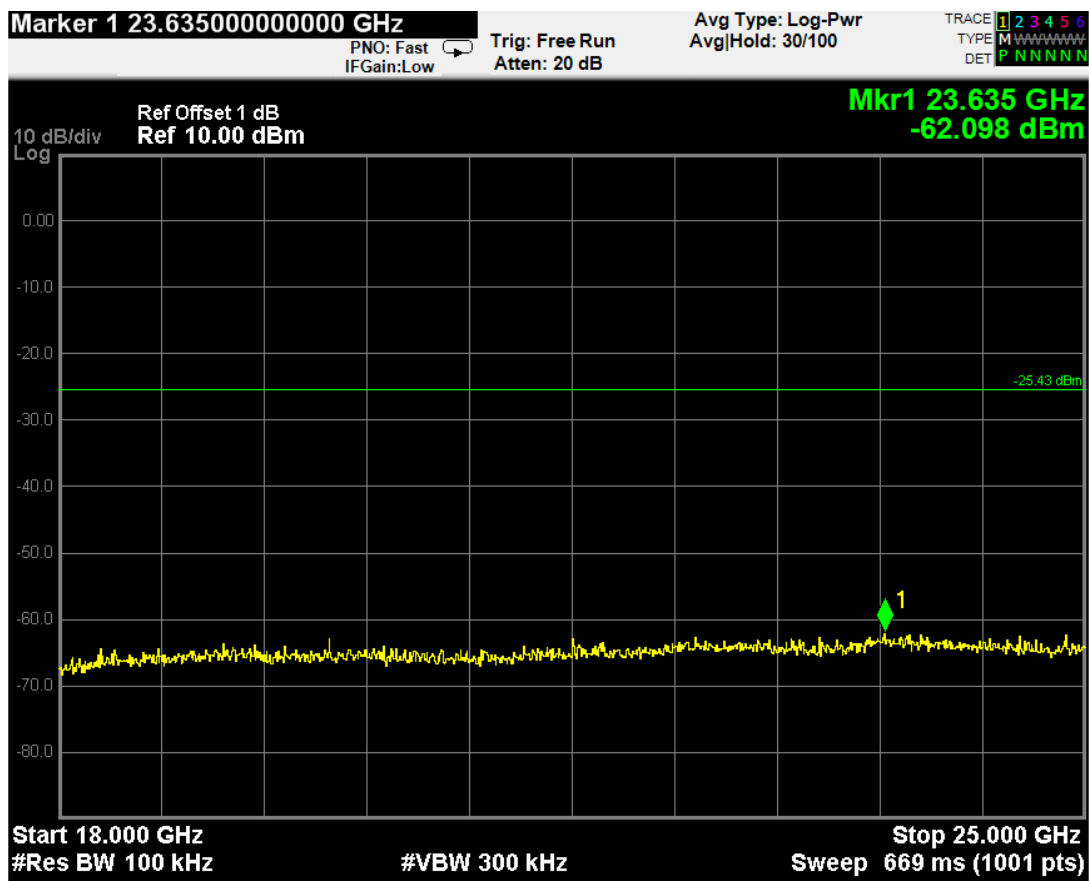
DH5Ch 00

Display Line -25.43 dBm

PNO: Fast
IFGain: LowTrig: Free Run
Atten: 20 dBAvg Type: Log-Pwr
Avg|Hold: 20/100TRACE 1 2 3 4 5 6
TYPE M
DET P N N N N N

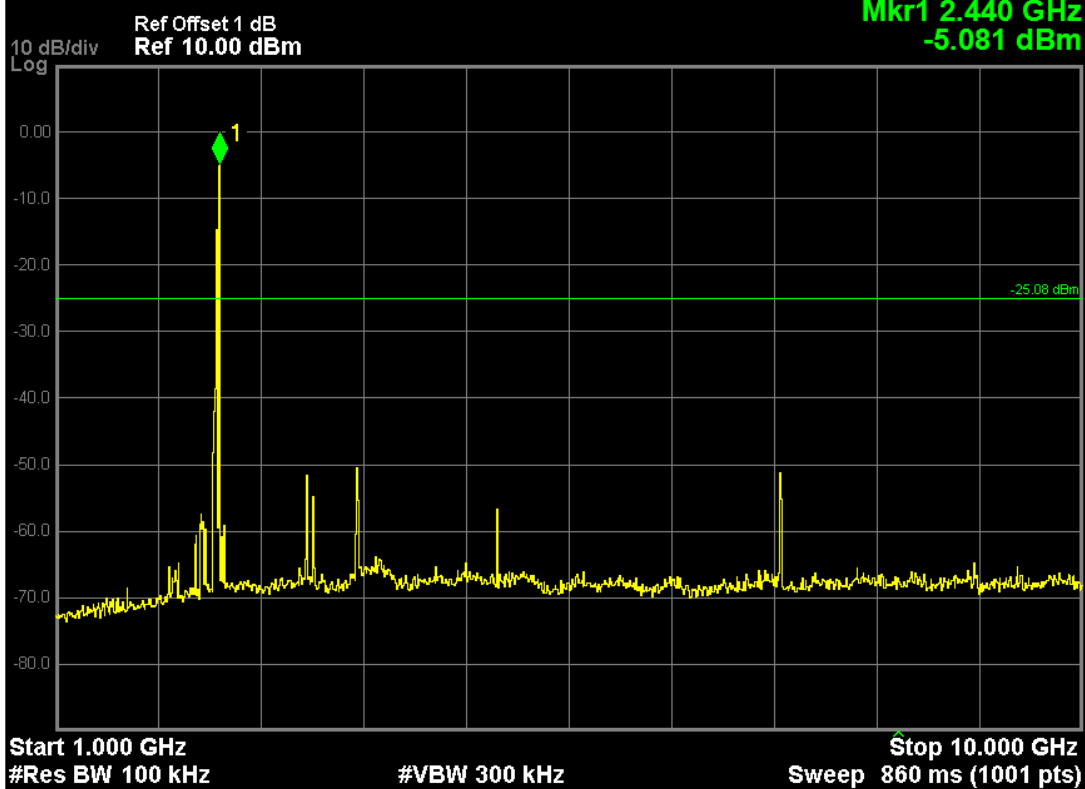
Marker 1 15.056000000000 GHz

PNO: Fast
IFGain: LowTrig: Free Run
Atten: 20 dBAvg Type: Log-Pwr
Avg|Hold: 23/100TRACE 1 2 3 4 5 6
TYPE M
DET P N N N N N

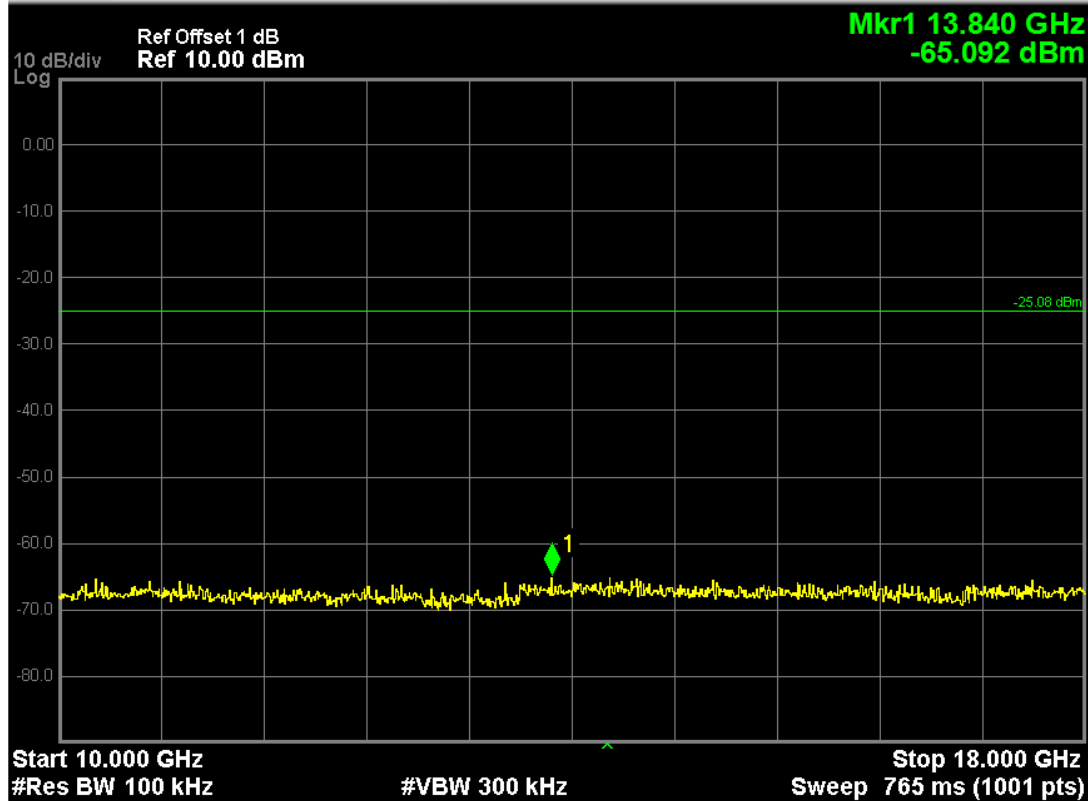


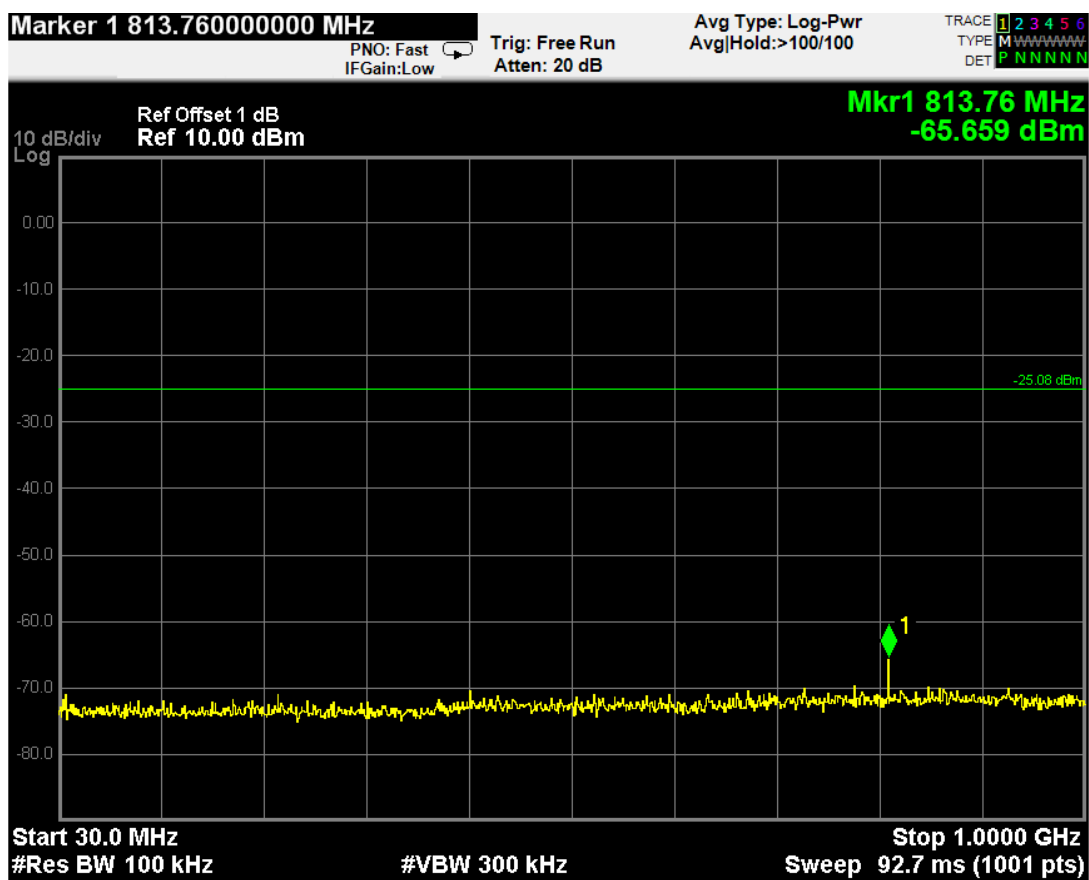
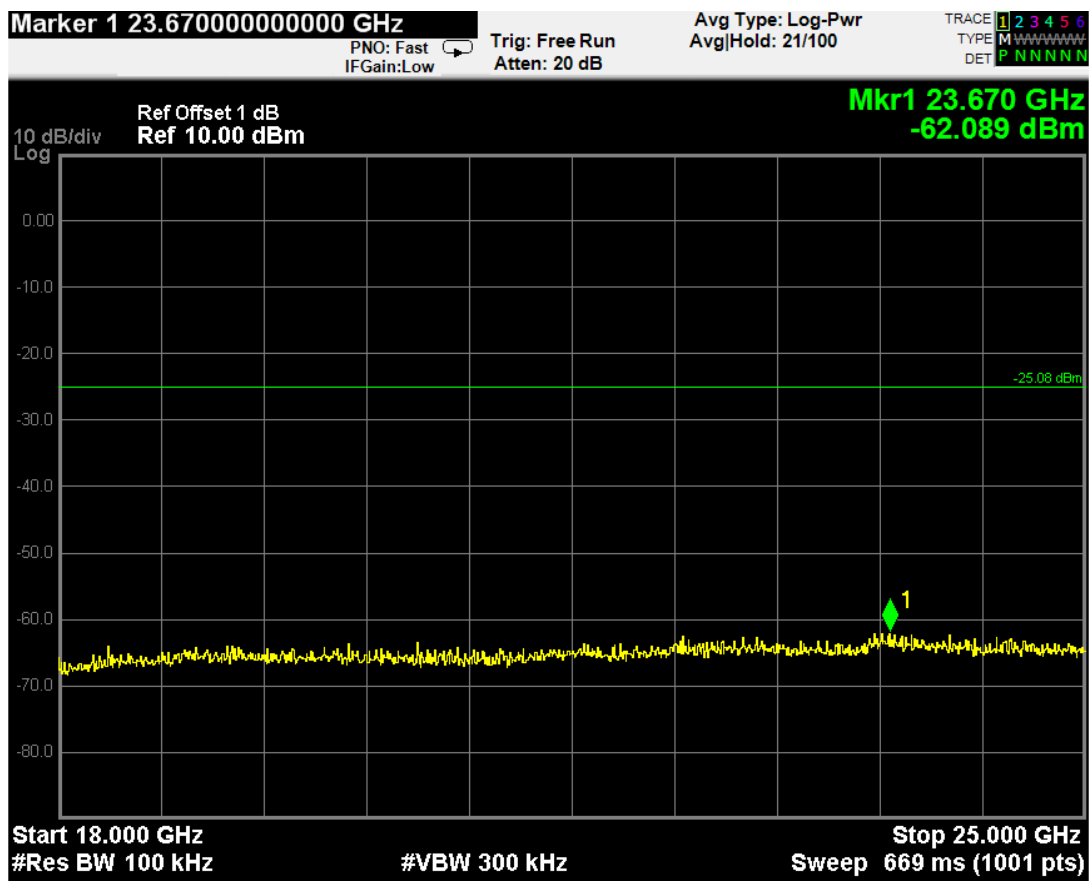
DH5Ch 39

Display Line -25.08 dBm

PNO: Fast
IFGain:LowTrig: Free Run
Atten: 20 dBAvg Type: Log-Pwr
Avg|Hold: 25/100TRACE 1 2 3 4 5 6
TYPE M
DET P N N N N N

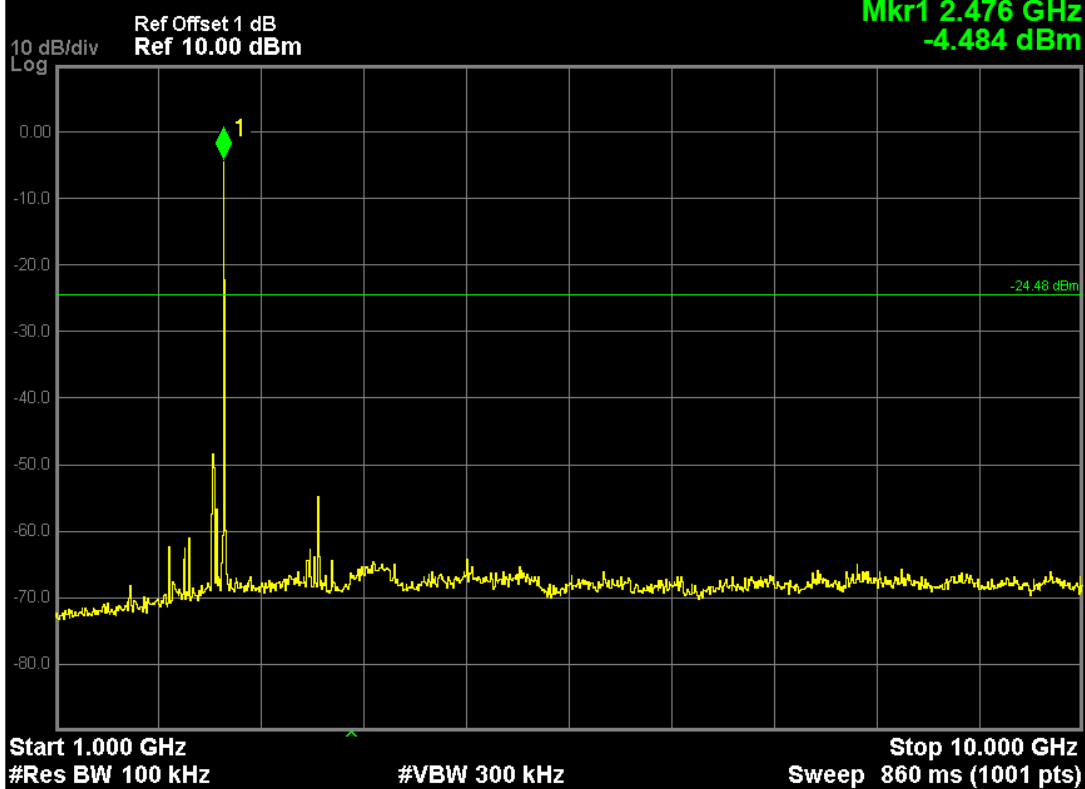
Marker 1 13.840000000000 GHz

PNO: Fast
IFGain:LowTrig: Free Run
Atten: 20 dBAvg Type: Log-Pwr
Avg|Hold: 20/100TRACE 1 2 3 4 5 6
TYPE M
DET P N N N N N

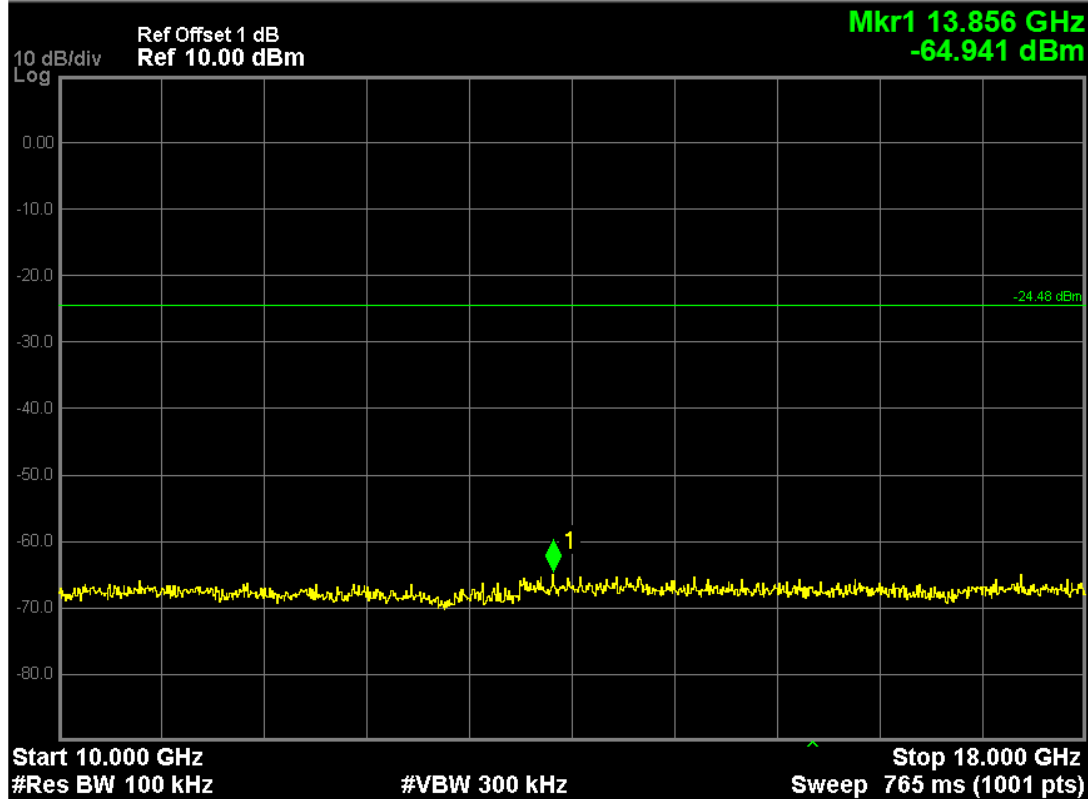


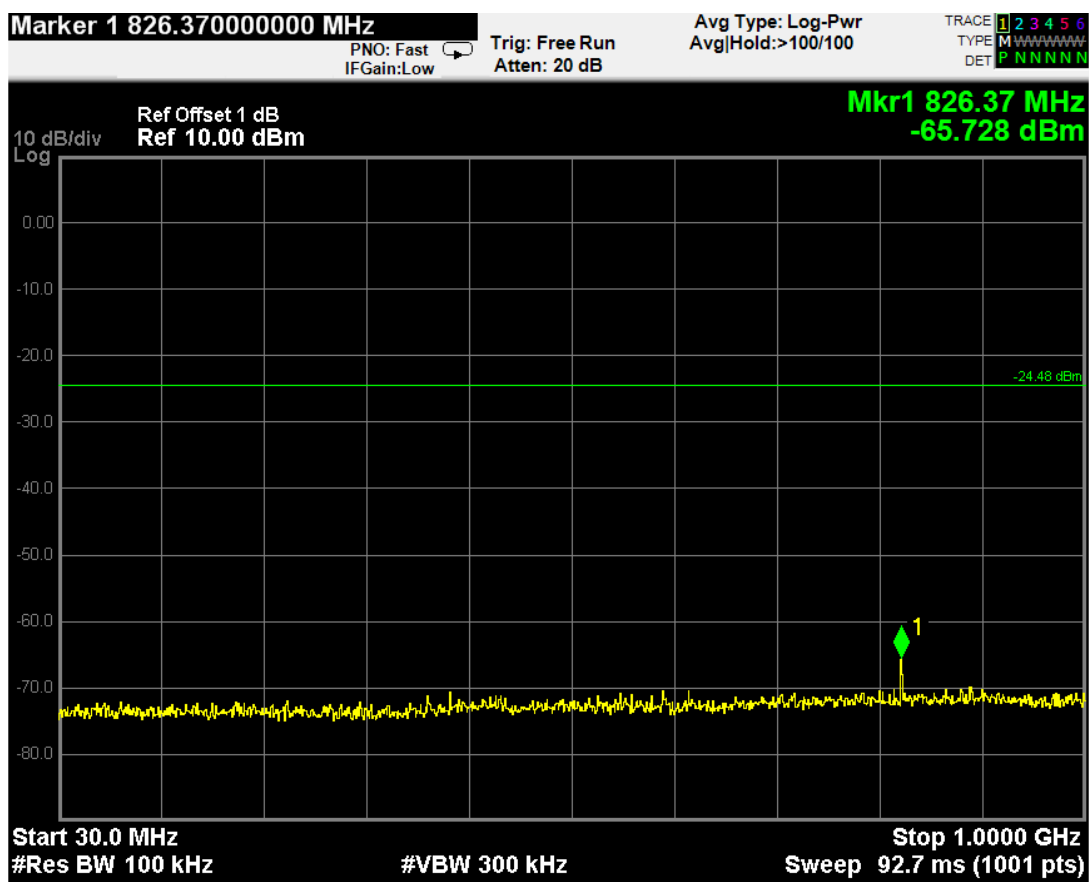
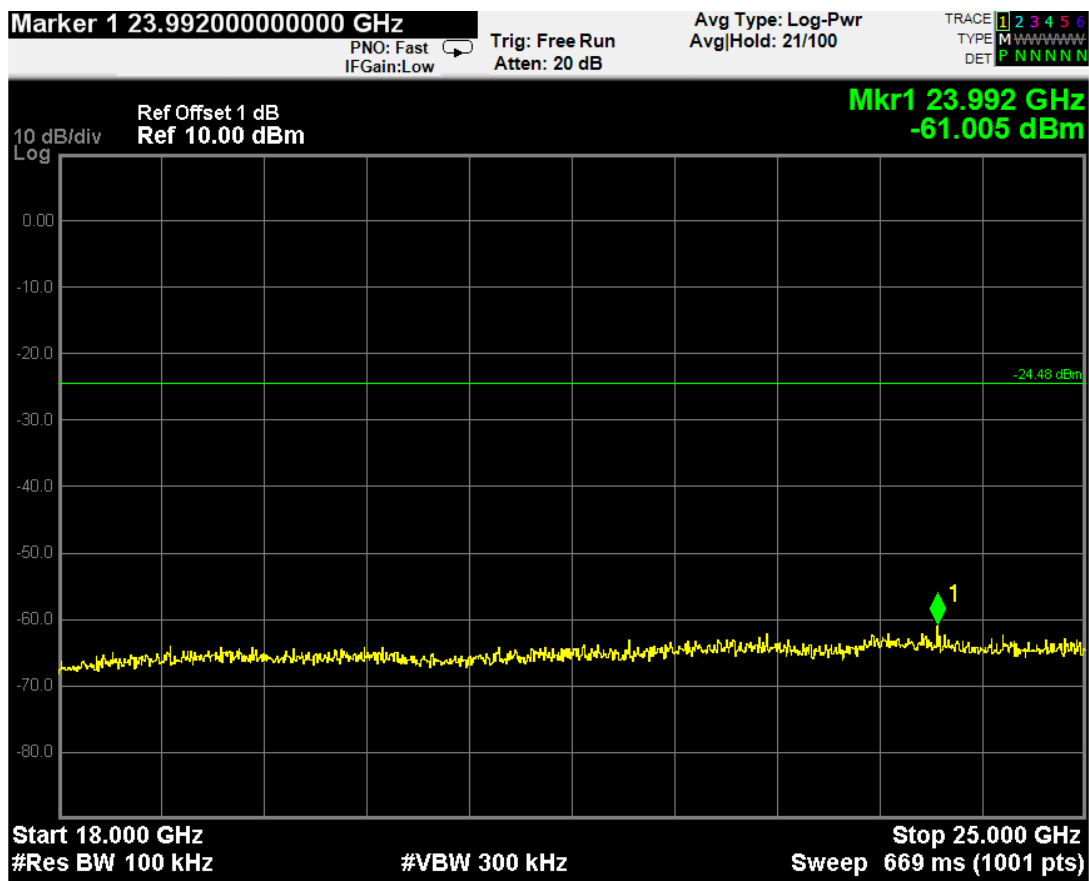
DH5Ch 78

Display Line -24.48 dBm

PNO: Fast
IFGain: LowTrig: Free Run
Atten: 20 dBAvg Type: Log-Pwr
Avg|Hold: 21/100TRACE 1 2 3 4 5 6
TYPE M
DET P N N N N N

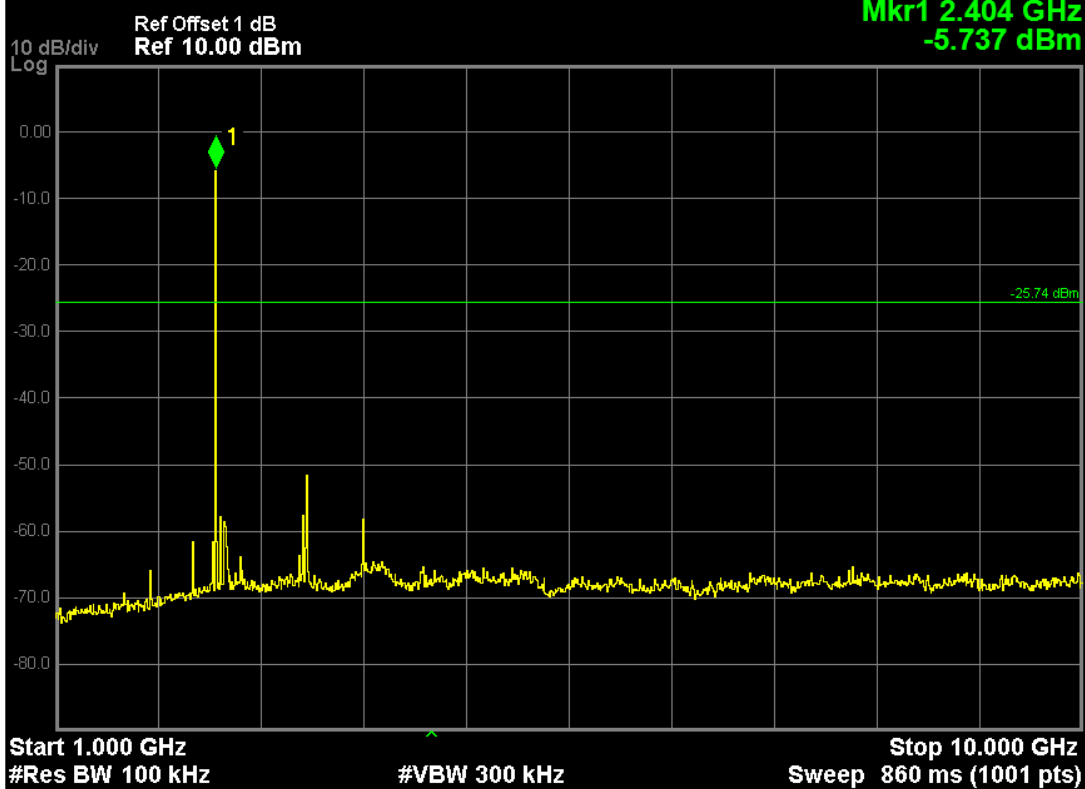
Marker 1 13.856000000000 GHz

PNO: Fast
IFGain: LowTrig: Free Run
Atten: 20 dBAvg Type: Log-Pwr
Avg|Hold: 20/100TRACE 1 2 3 4 5 6
TYPE M
DET P N N N N N

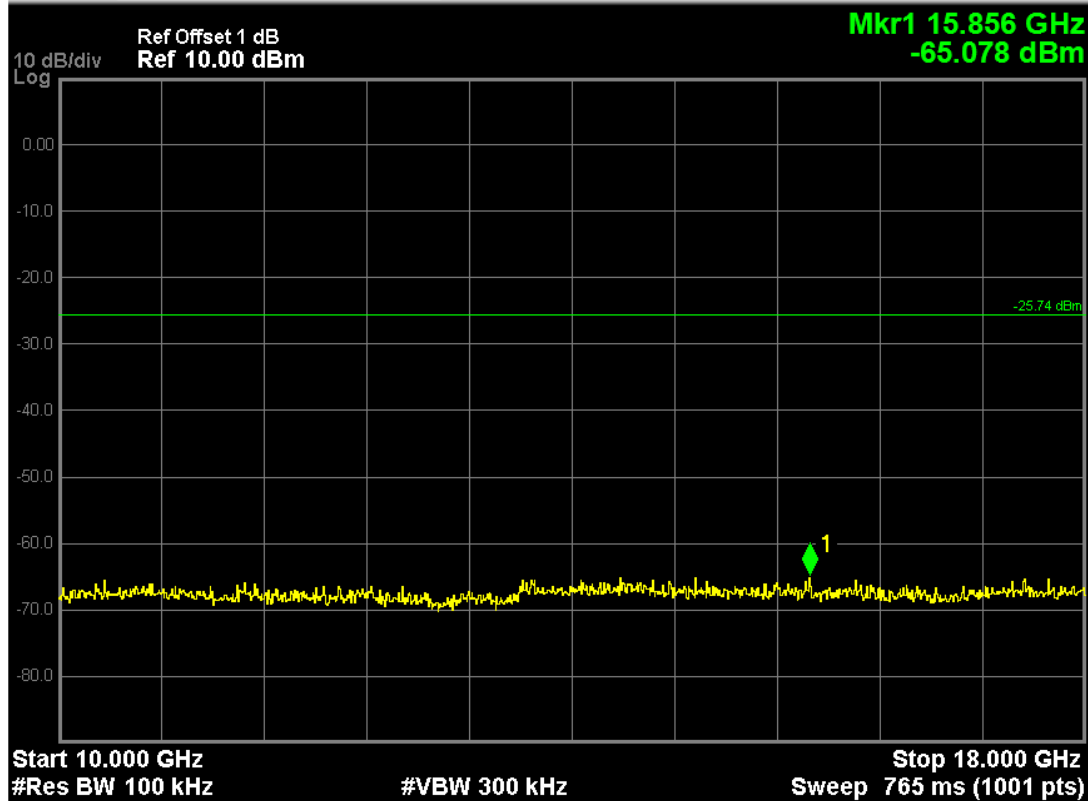


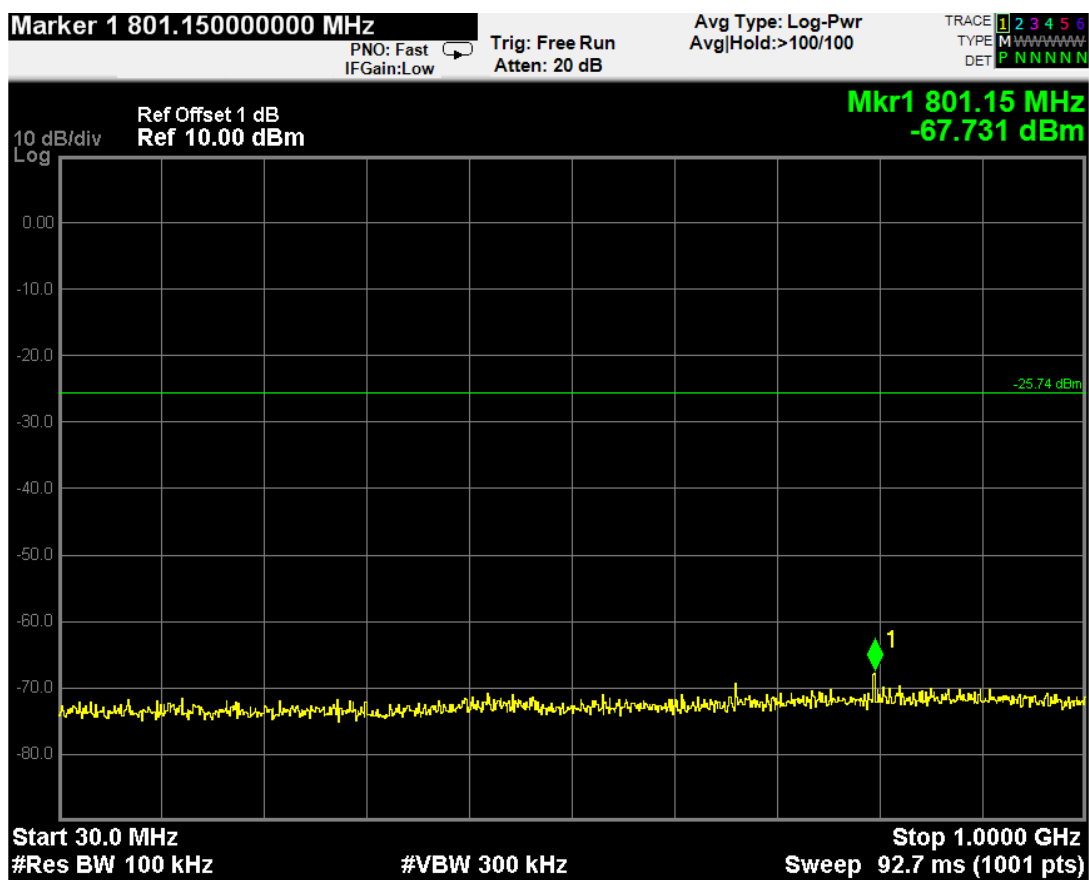
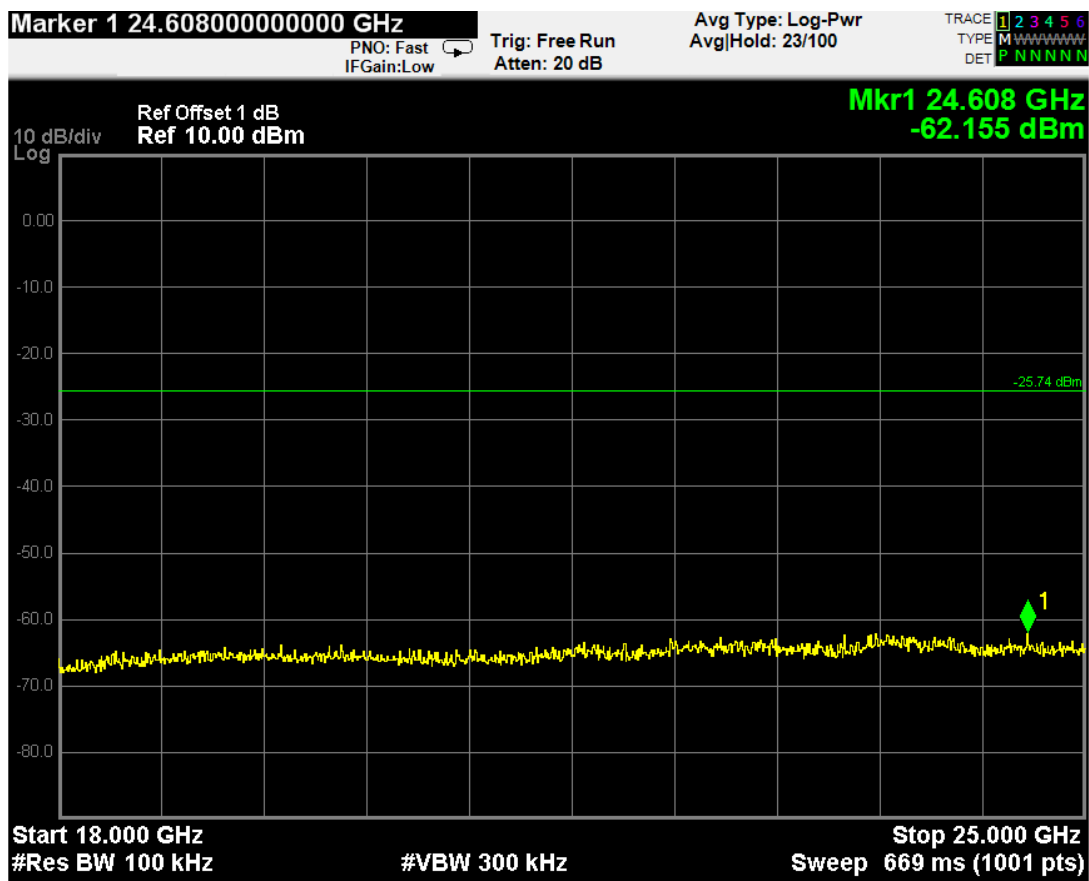
3DH5Ch 00

Display Line -25.74 dBm

PNO: Fast
IFGain: LowTrig: Free Run
Atten: 20 dBAvg Type: Log-Pwr
Avg|Hold: 25/100TRACE 1 2 3 4 5 6
TYPE M
DET P N N N N N

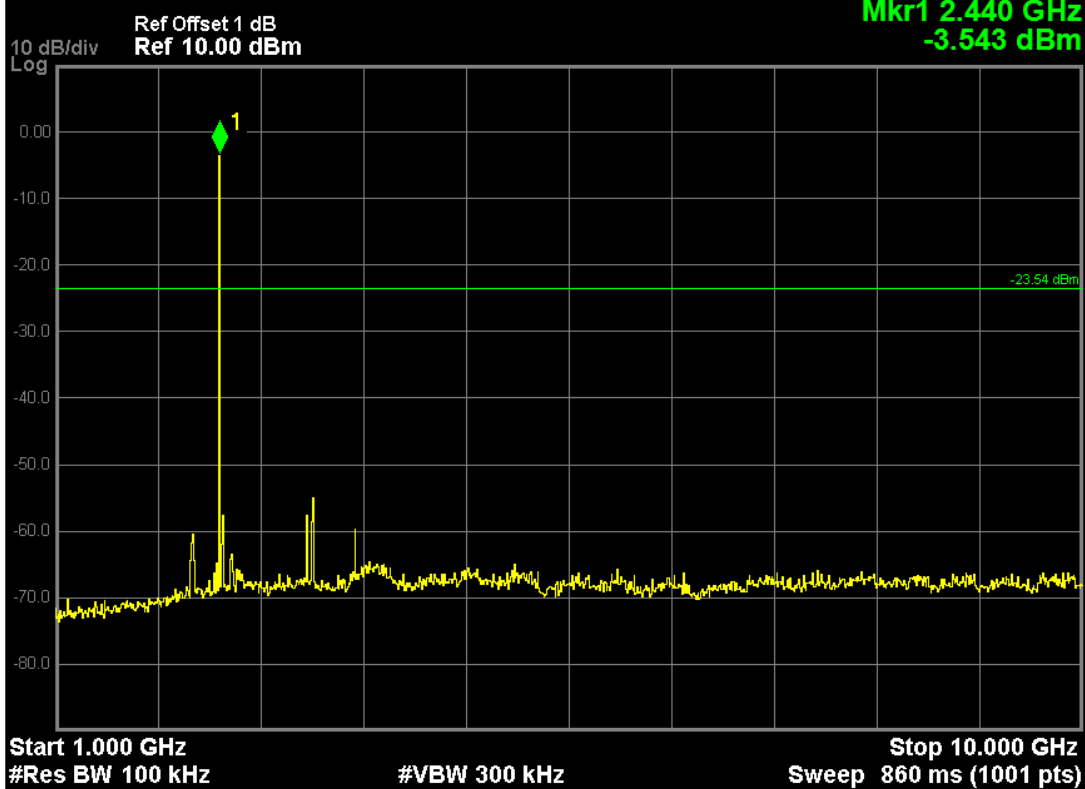
Marker 1 15.856000000000 GHz

PNO: Fast
IFGain: LowTrig: Free Run
Atten: 20 dBAvg Type: Log-Pwr
Avg|Hold: 22/100TRACE 1 2 3 4 5 6
TYPE M
DET P N N N N N

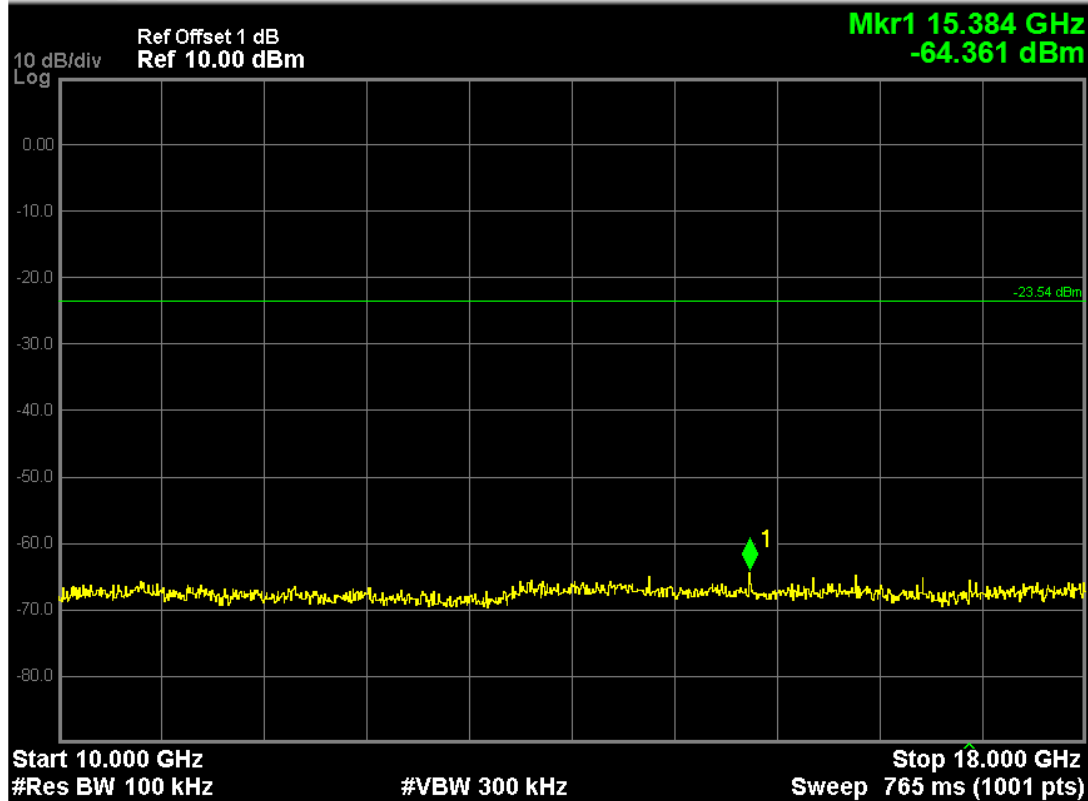


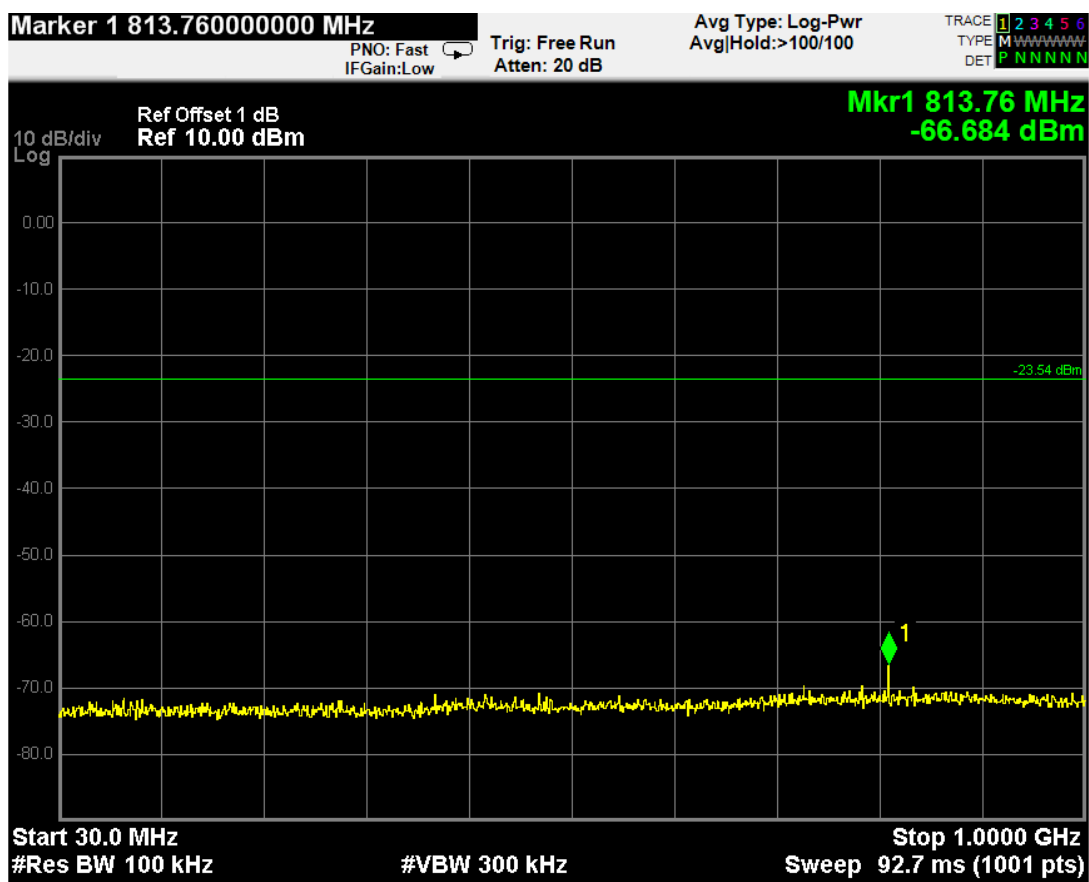
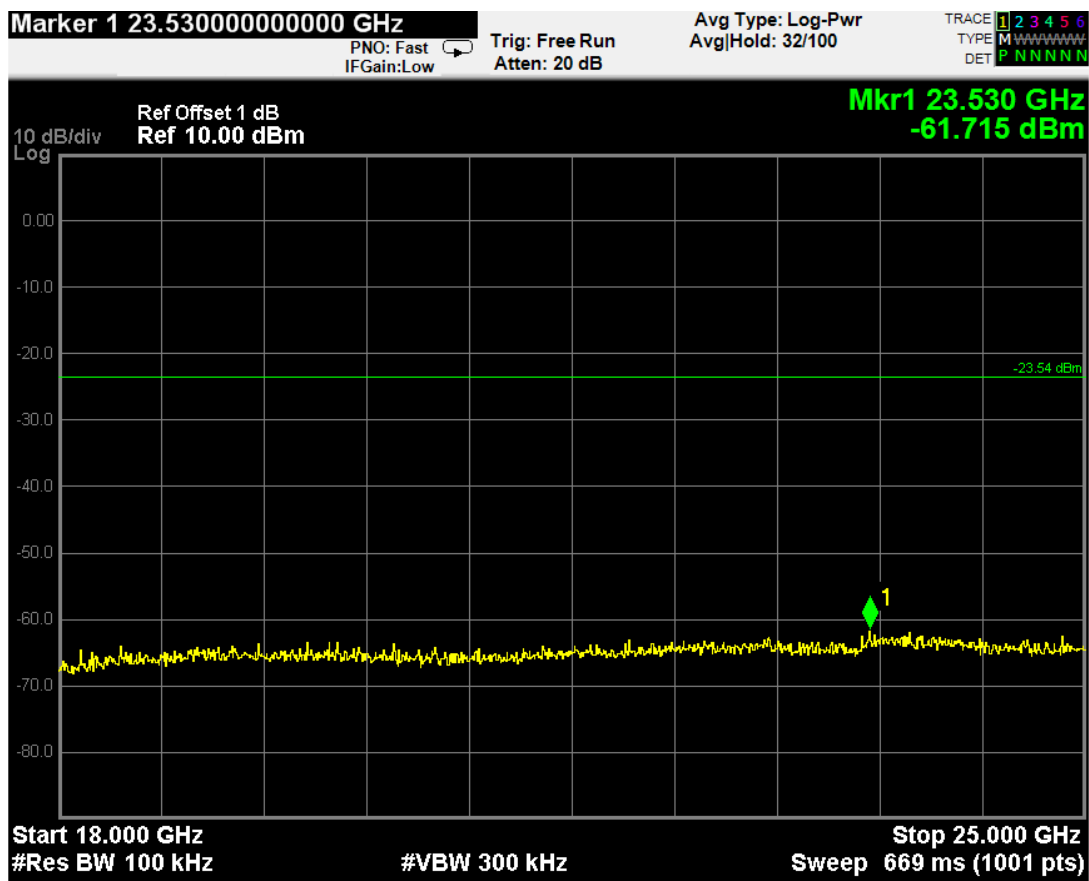
3DH5Ch 39

Display Line -23.54 dBm

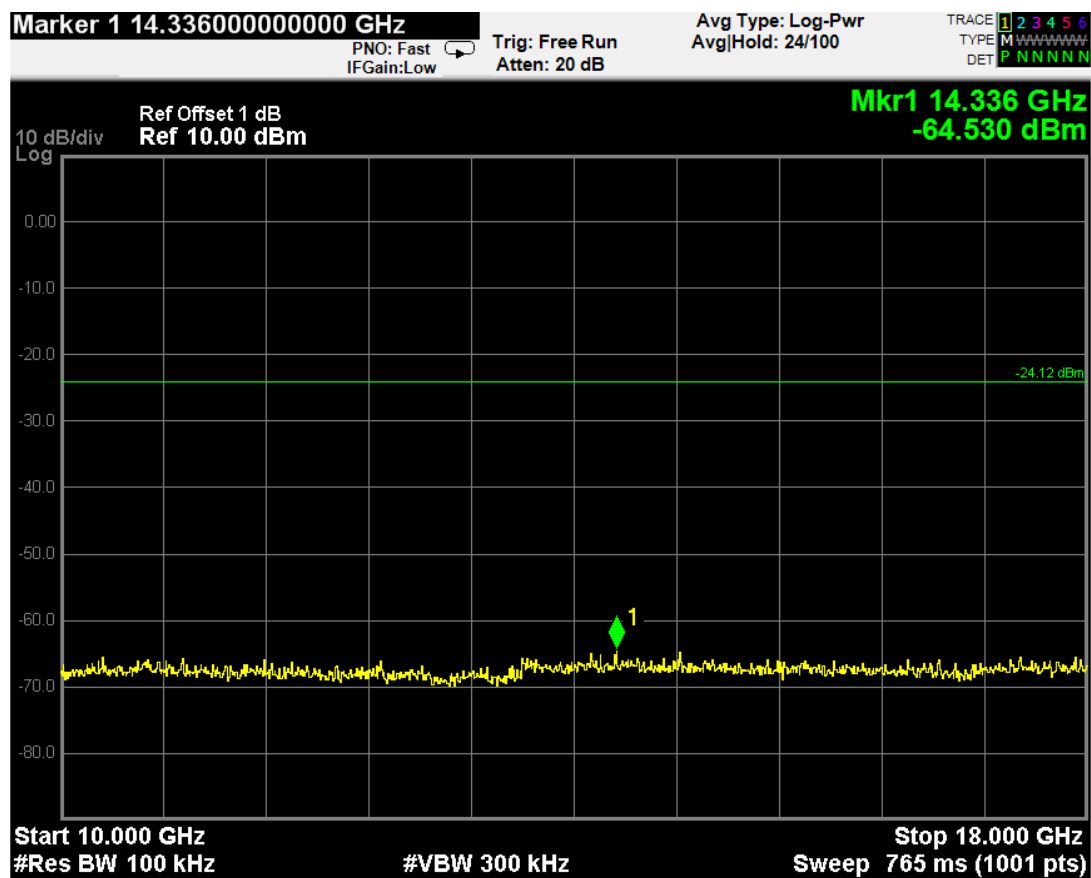
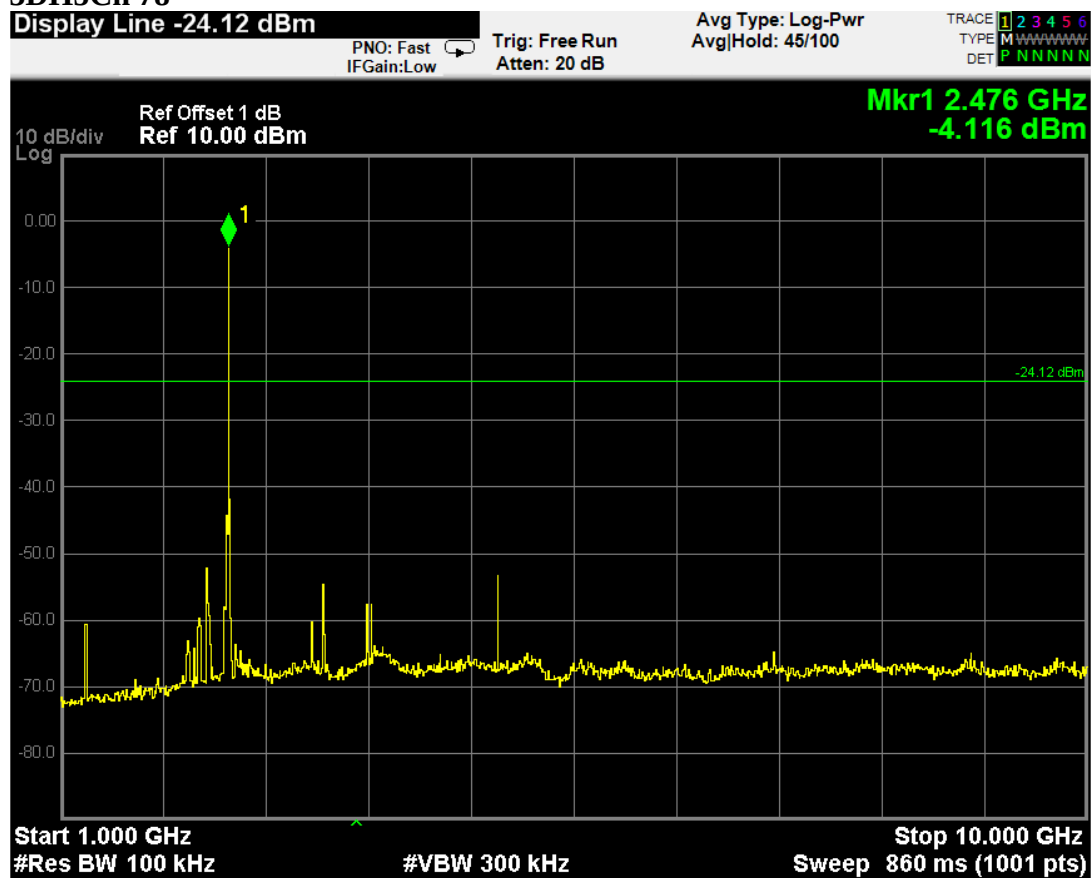
PNO: Fast
IFGain: LowTrig: Free Run
Atten: 20 dBAvg Type: Log-Pwr
Avg|Hold: 23/100TRACE 1 2 3 4 5 6
TYPE M
DET P N N N N N

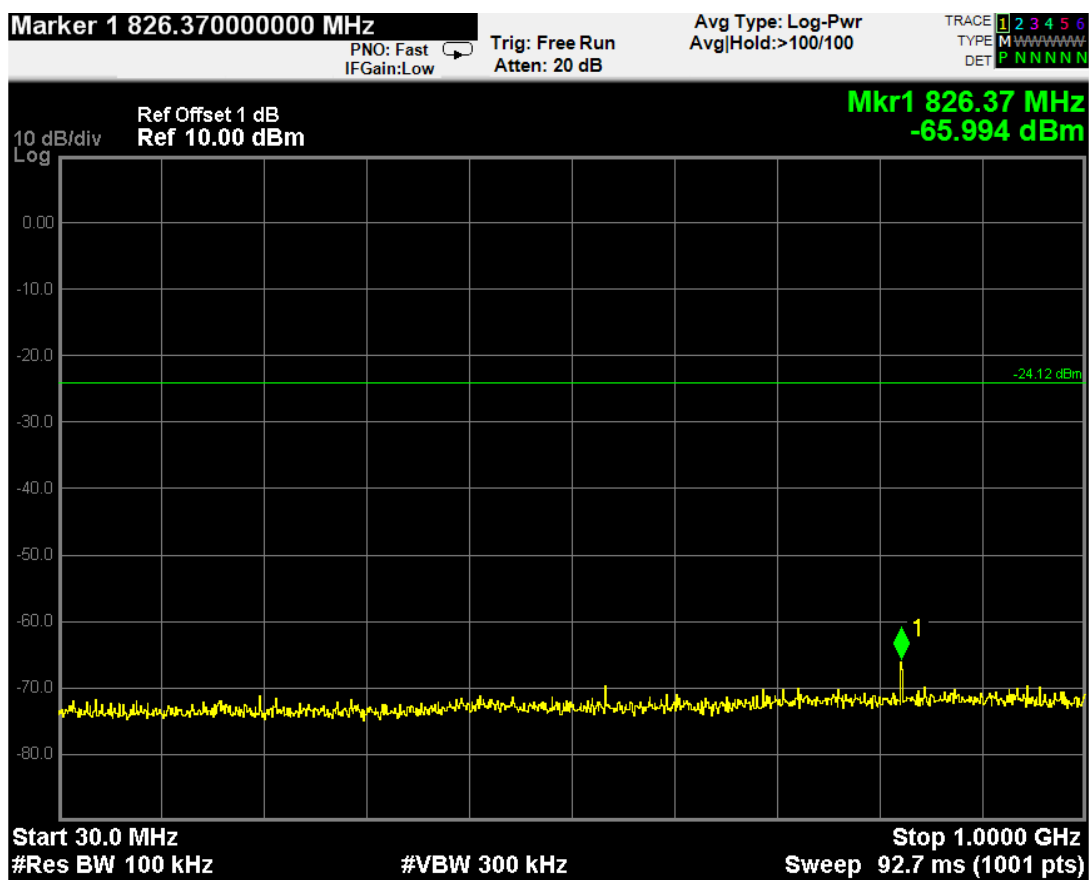
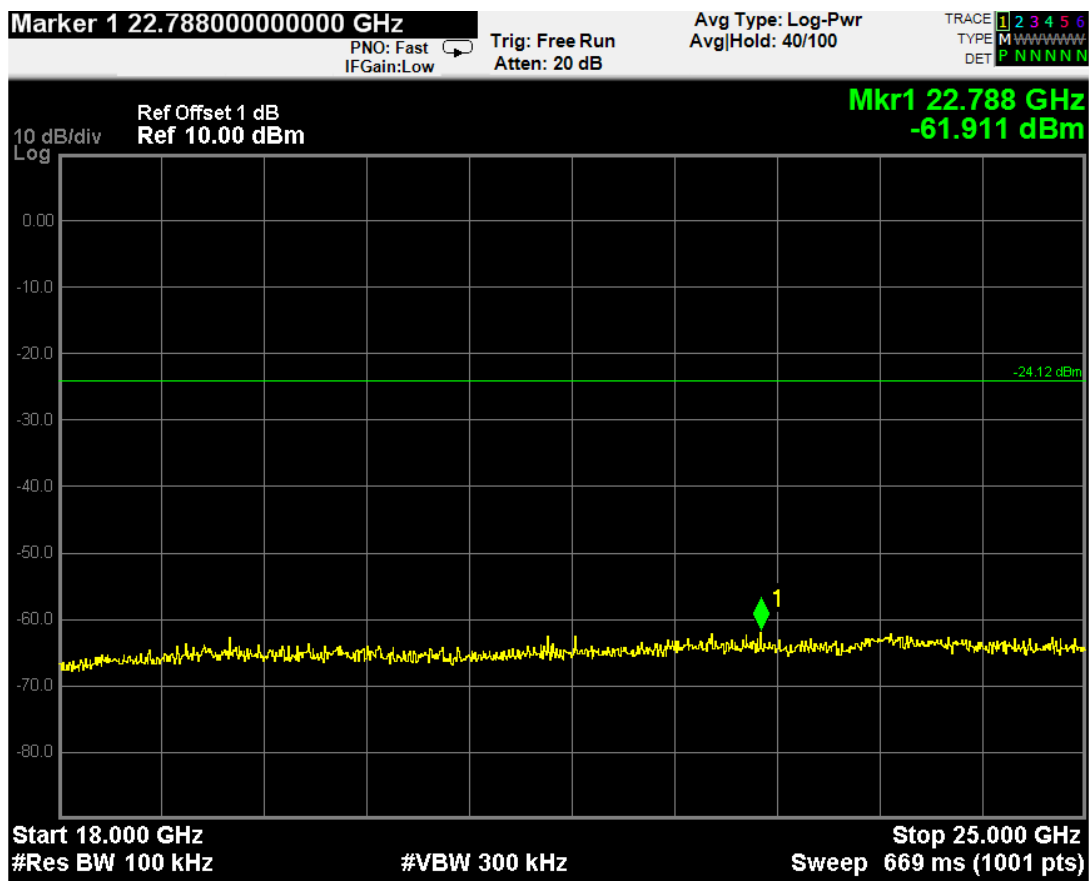
Marker 1 15.384000000000 GHz

PNO: Fast
IFGain: LowTrig: Free Run
Atten: 20 dBAvg Type: Log-Pwr
Avg|Hold: 20/100TRACE 1 2 3 4 5 6
TYPE M
DET P N N N N N



3DH5Ch 78





8 BAND-EDGE COMPLIANCE OF RF CONDUCTED EMISSIONS MEASUREMENT

8.1 Test Equipment

The following test equipment was used during the band edges measurement:

Item	Type	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
1.	EXA Signal Analyzer	Agilent	N9010A	MY52221182	May 25, 2017	May 24, 2018

8.2 Block Diagram of Test Setup

The same as section.4.2.

8.3 Specification Limits (§15.247(d))

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

8.4 Operating Condition of EUT

Enable the EUT to transmit data at different channel frequency individually.

8.5 Test Procedure

The transmitter output was connected to the spectrum analyzer. Set RBW of spectrum analyzer to 100 kHz and VBW to 300 kHz with span wide enough to fully capture the emission being measured.
The test procedure is defined in DA 00-705.

8.6 Test Results

PASSED. All the test results are attached in next pages.

(Test Date: 2018.02.10 Temperature: 23℃ Humidity: 50 %)

Hopping off

DH1Ch 00

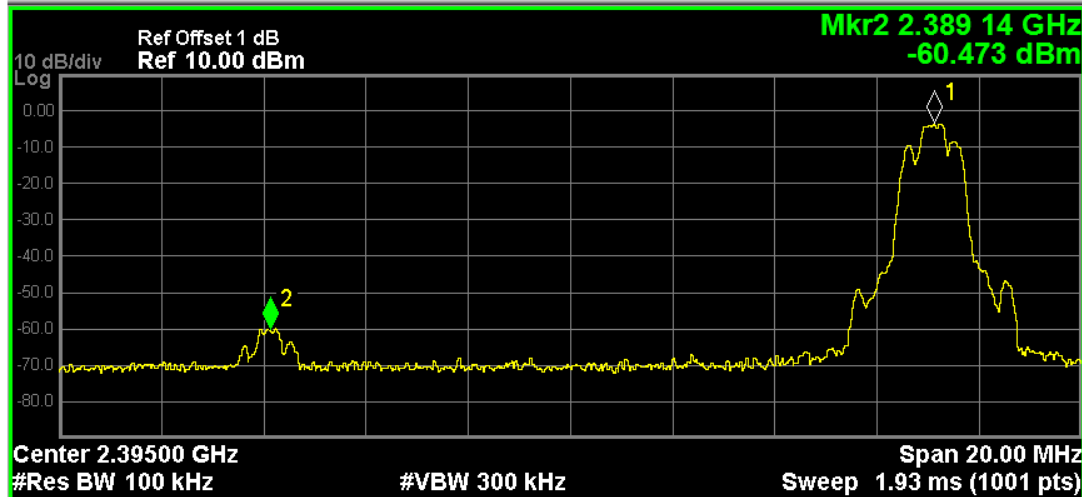


DH1Ch 78



3DH1Ch 00

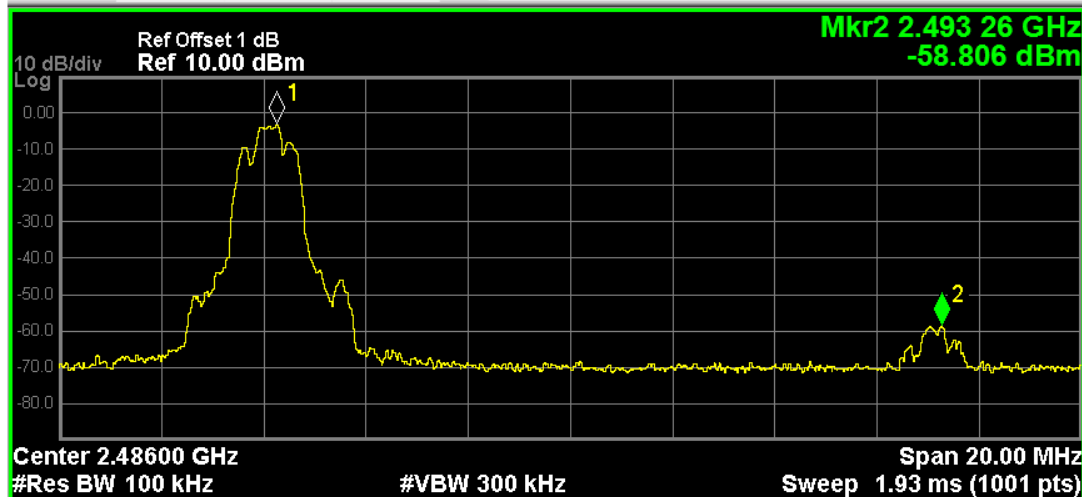
Center Freq 2.39500000 GHz

PNO: Fast
IFGain:LowTrig: Free Run
Atten: 20 dBAvg Type: Log-Pwr
Avg|Hold:>100/100TRACE 1 2 3 4 5 6
TYPE M
DET P NNNNN

MKR	MODE	TRC	SCL	X	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE
1	N	1	f	2.402 12 GHz	-3.892 dBm			
2	N	1	f	2.389 14 GHz	-60.473 dBm			
3								
4								
5								
6								
7								
8								
9								
10								
11								
12								

3DH1Ch 78

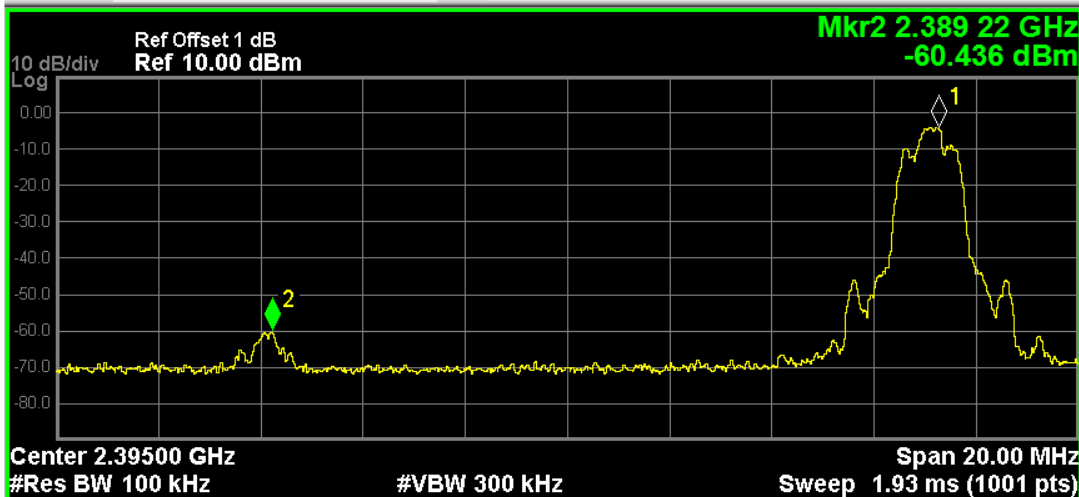
Center Freq 2.48600000 GHz

PNO: Fast
IFGain:LowTrig: Free Run
Atten: 20 dBAvg Type: Log-Pwr
Avg|Hold:>100/100TRACE 1 2 3 4 5 6
TYPE M
DET P NNNNN

MKR	MODE	TRC	SCL	X	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE
1	N	1	f	2.480 26 GHz	-3.530 dBm			
2	N	1	f	2.493 26 GHz	-58.806 dBm			
3								
4								
5								
6								
7								
8								
9								
10								
11								
12								

DH3Ch 00

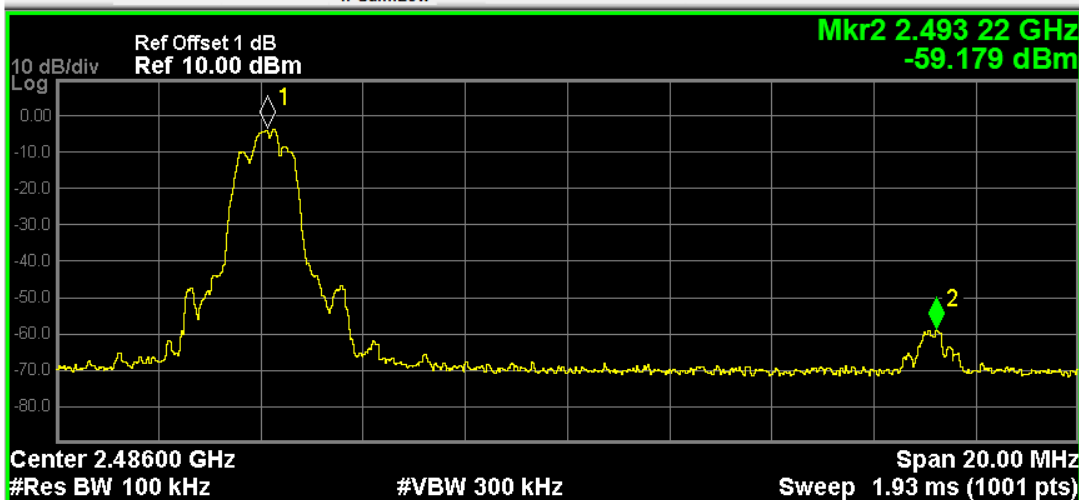
Center Freq 2.39500000 GHz

PNO: Fast
IFGain: LowTrig: Free Run
Atten: 20 dBAvg Type: Log-Pwr
Avg|Hold:>100/100TRACE 1 2 3 4 5 6
TYPE M
DET P N N N N N

MKR	MODE	TRC	SCL	X	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE
1	N	1	f	2.402 26 GHz	-4.583 dBm			
2	N	1	f	2.389 22 GHz	-60.436 dBm			
3								
4								
5								
6								
7								
8								
9								
10								
11								
12								

DH3Ch 78

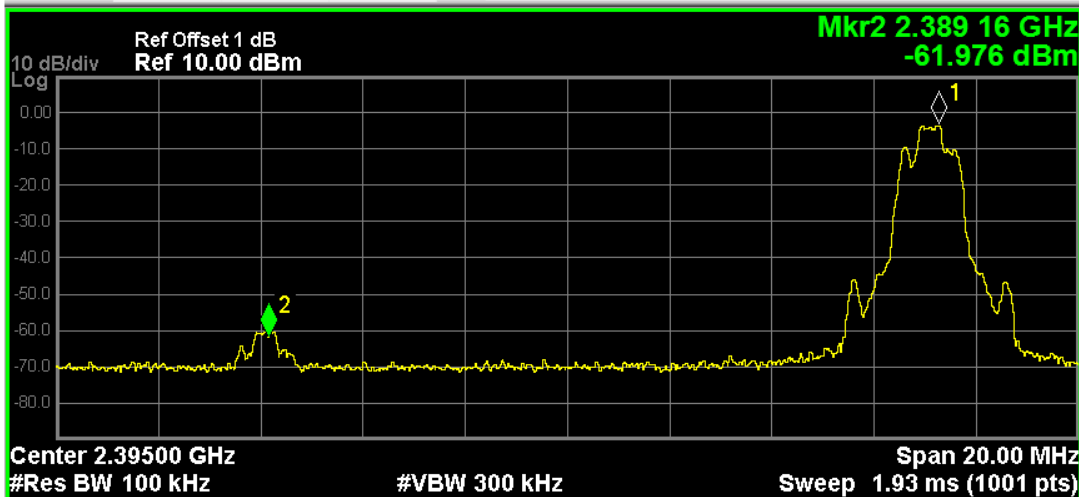
Center Freq 2.48600000 GHz

PNO: Fast
IFGain: LowTrig: Free Run
Atten: 20 dBAvg Type: Log-Pwr
Avg|Hold:>100/100TRACE 1 2 3 4 5 6
TYPE M
DET P N N N N N

MKR	MODE	TRC	SCL	X	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE
1	N	1	f	2.480 12 GHz	-3.992 dBm			
2	N	1	f	2.493 22 GHz	-59.179 dBm			
3								
4								
5								
6								
7								
8								
9								
10								
11								
12								

3DH3Ch 00

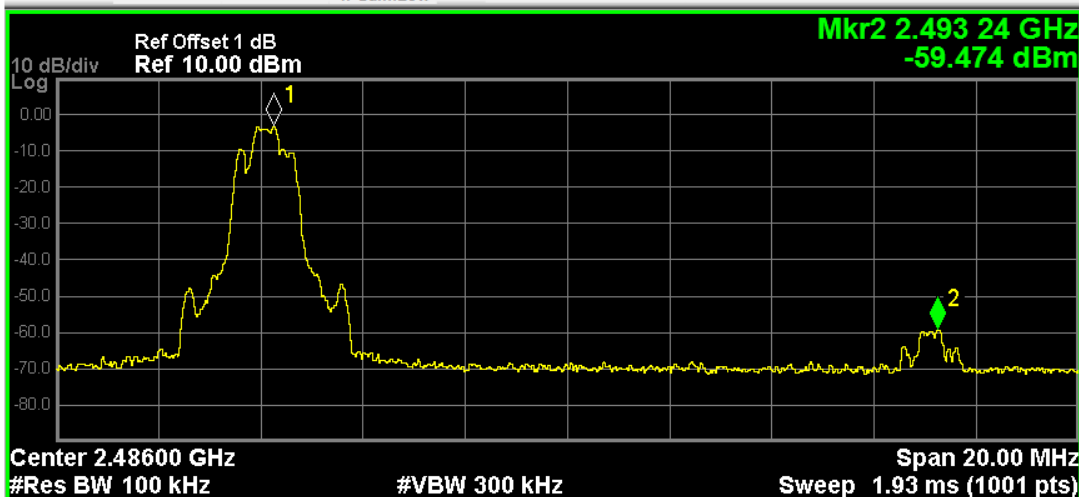
Center Freq 2.39500000 GHz

PNO: Fast
IFGain:LowTrig: Free Run
Atten: 20 dBAvg Type: Log-Pwr
Avg|Hold:>100/100TRACE 1 2 3 4 5 6
TYPE M
DET P NNNNN

MKR	MODE	TRC	SCL	X	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE
1	N	1	f	2.402 26 GHz	-3.614 dBm			
2	N	1	f	2.389 16 GHz	-61.976 dBm			
3								
4								
5								
6								
7								
8								
9								
10								
11								
12								

3DH3Ch 78

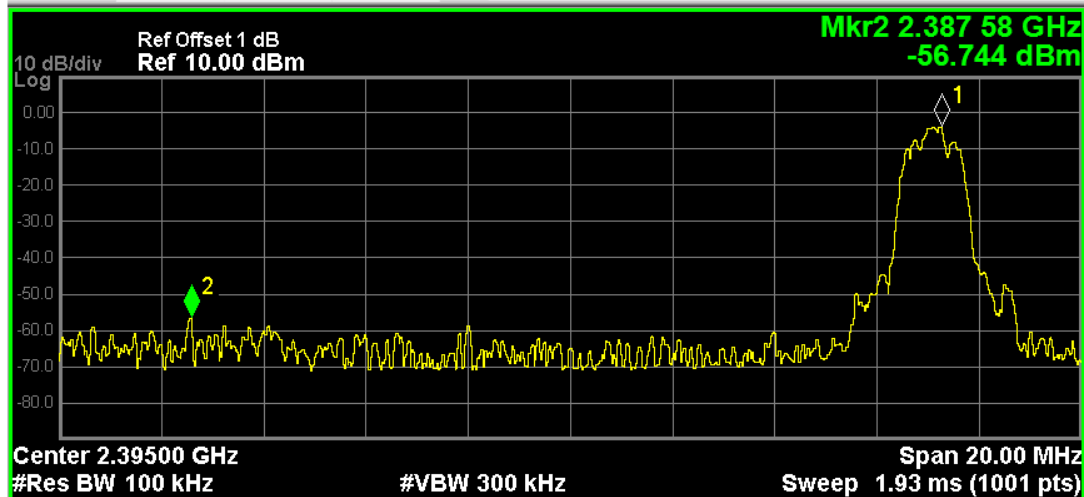
Center Freq 2.48600000 GHz

PNO: Fast
IFGain:LowTrig: Free Run
Atten: 20 dBAvg Type: Log-Pwr
Avg|Hold:>100/100TRACE 1 2 3 4 5 6
TYPE M
DET P NNNNN

MKR	MODE	TRC	SCL	X	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE
1	N	1	f	2.480 26 GHz	-3.417 dBm			
2	N	1	f	2.493 24 GHz	-59.474 dBm			
3								
4								
5								
6								
7								
8								
9								
10								
11								
12								

DH5Ch 00

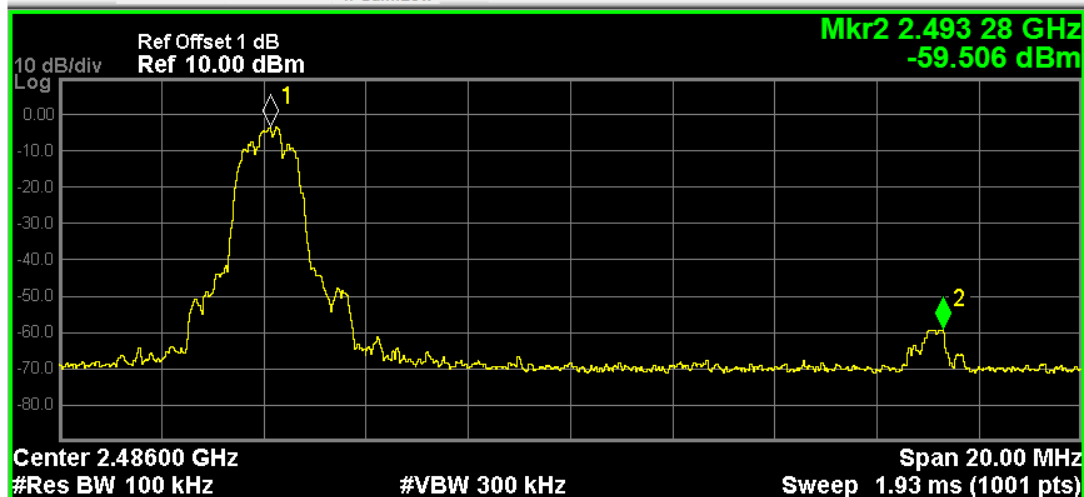
Center Freq 2.39500000 GHz

PNO: Fast
IFGain:LowTrig: Free Run
Atten: 20 dBAvg Type: Log-Pwr
Avg|Hold:>100/100TRACE 1 2 3 4 5 6
TYPE M
DET P NNNNN

MKR	MODE	TRC	SCL	X	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE
1	N	1	f	2.402 26 GHz	-4.243 dBm			
2	N	1	f	2.387 58 GHz	-56.744 dBm			
3								
4								
5								
6								
7								
8								
9								
10								
11								
12								

DH5Ch 78

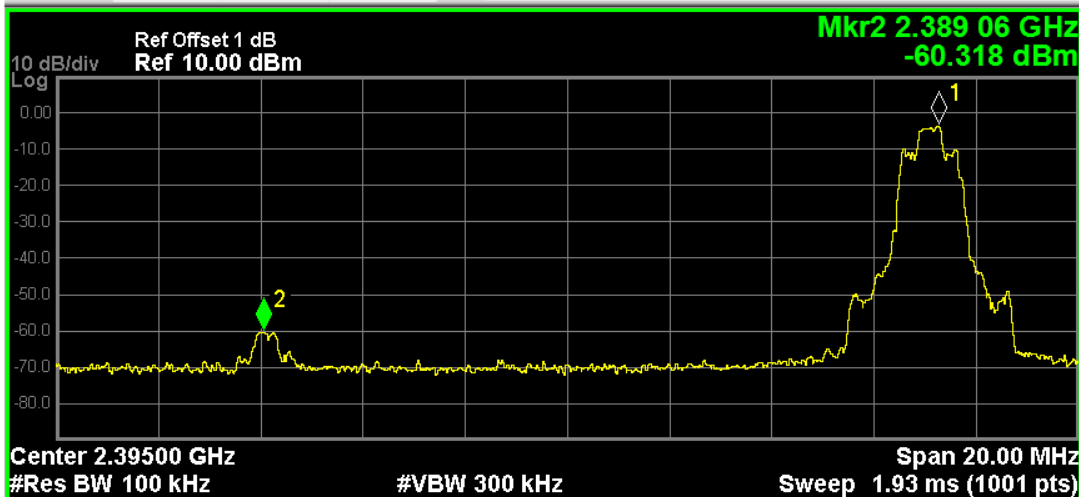
Center Freq 2.48600000 GHz

PNO: Fast
IFGain:LowTrig: Free Run
Atten: 20 dBAvg Type: Log-Pwr
Avg|Hold:>100/100TRACE 1 2 3 4 5 6
TYPE M
DET P NNNNN

MKR	MODE	TRC	SCL	X	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE
1	N	1	f	2.480 12 GHz	-3.905 dBm			
2	N	1	f	2.493 28 GHz	-59.506 dBm			
3								
4								
5								
6								
7								
8								
9								
10								
11								
12								

3DH5Ch 00

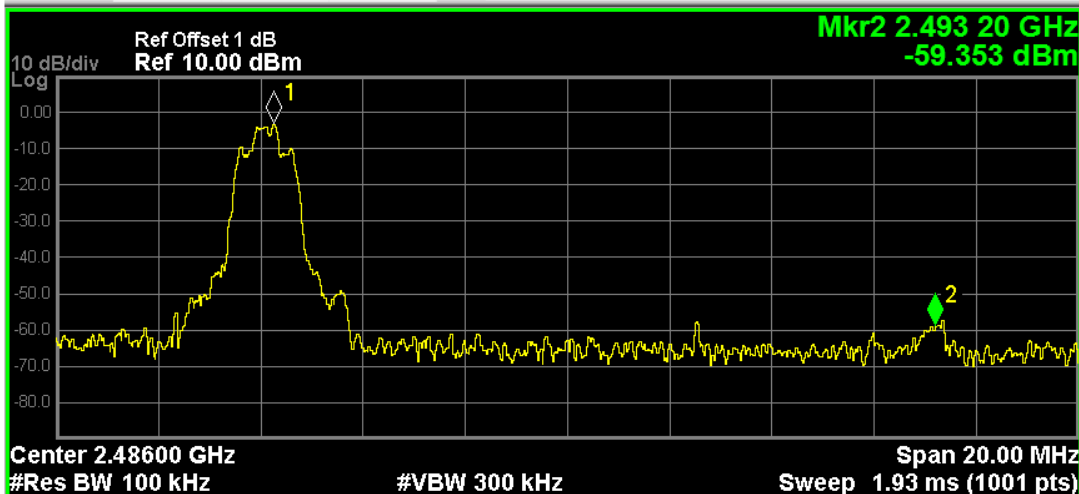
Center Freq 2.39500000 GHz

PNO: Fast
IFGain:LowTrig: Free Run
Atten: 20 dBAvg Type: Log-Pwr
Avg|Hold:>100/100TRACE 1 2 3 4 5 6
TYPE M
DET P NNNNN

MKR	MODE	TRC	SCL	X	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE
1	N	1	f	2.402 26 GHz	-3.707 dBm			
2	N	1	f	2.389 06 GHz	-60.318 dBm			
3								
4								
5								
6								
7								
8								
9								
10								
11								
12								

3DH5Ch 78

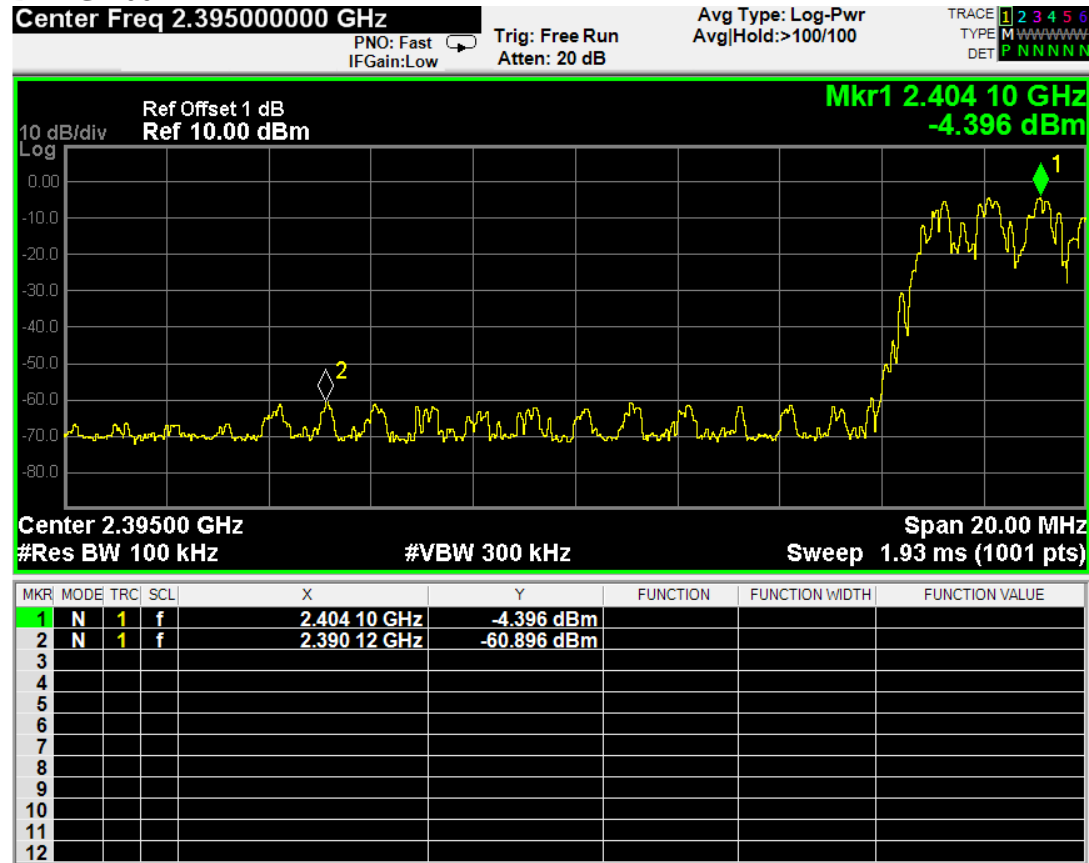
Center Freq 2.48600000 GHz

PNO: Fast
IFGain:LowTrig: Free Run
Atten: 20 dBAvg Type: Log-Pwr
Avg|Hold:>100/100TRACE 1 2 3 4 5 6
TYPE M
DET P NNNNN

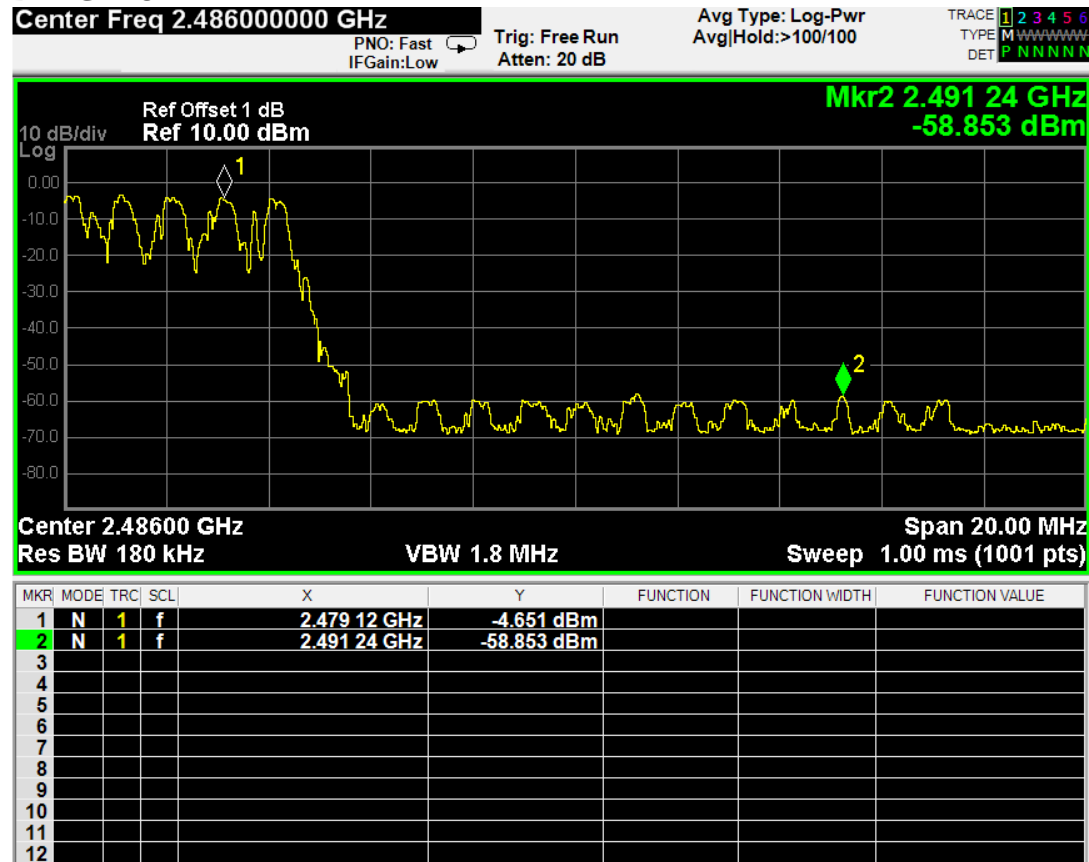
MKR	MODE	TRC	SCL	X	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE
1	N	1	f	2.480 26 GHz	-3.452 dBm			
2	N	1	f	2.493 20 GHz	-59.353 dBm			
3								
4								
5								
6								
7								
8								
9								
10								
11								
12								

Hopping

DH1Ch 00

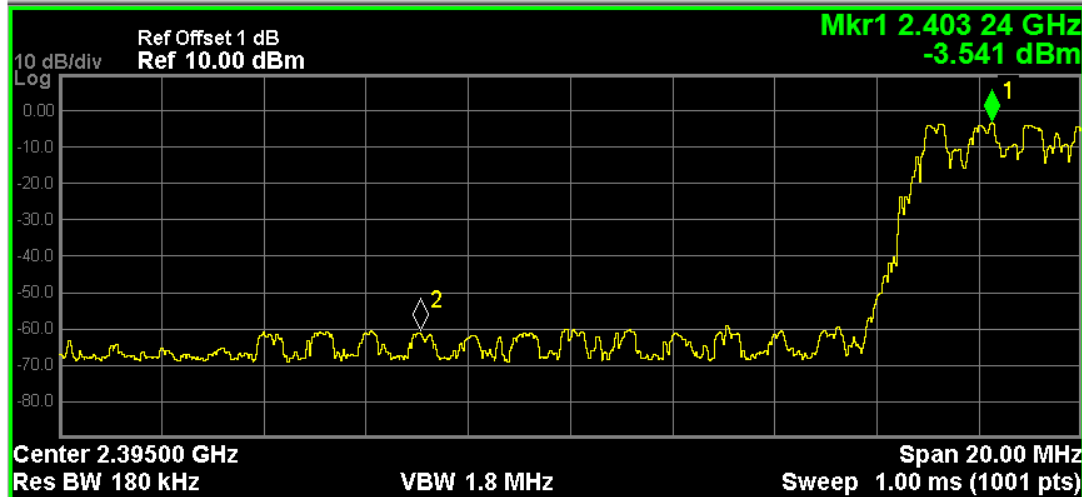


DH1Ch 78



3DH1Ch 00

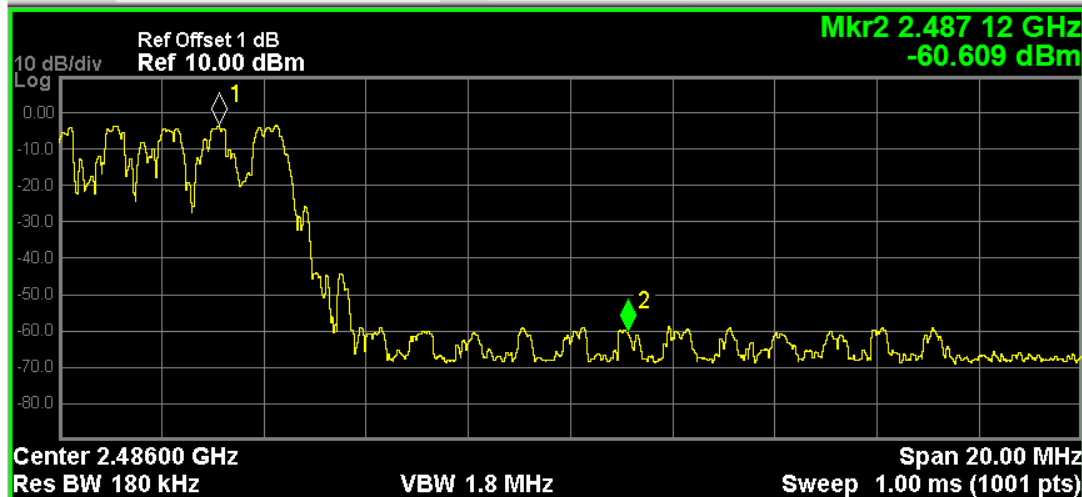
Center Freq 2.39500000 GHz

PNO: Fast
IFGain: LowTrig: Free Run
Atten: 20 dBAvg Type: Log-Pwr
Avg|Hold:>100/100TRACE 1 2 3 4 5 6
TYPE M
DET P N N N N N

MKR	MODE	TRC	SCL	X	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE
1	N	1	f	2.403 24 GHz	-3.541 dBm			
2	N	1	f	2.392 06 GHz	-60.984 dBm			
3								
4								
5								
6								
7								
8								
9								
10								
11								
12								

3DH1Ch 78

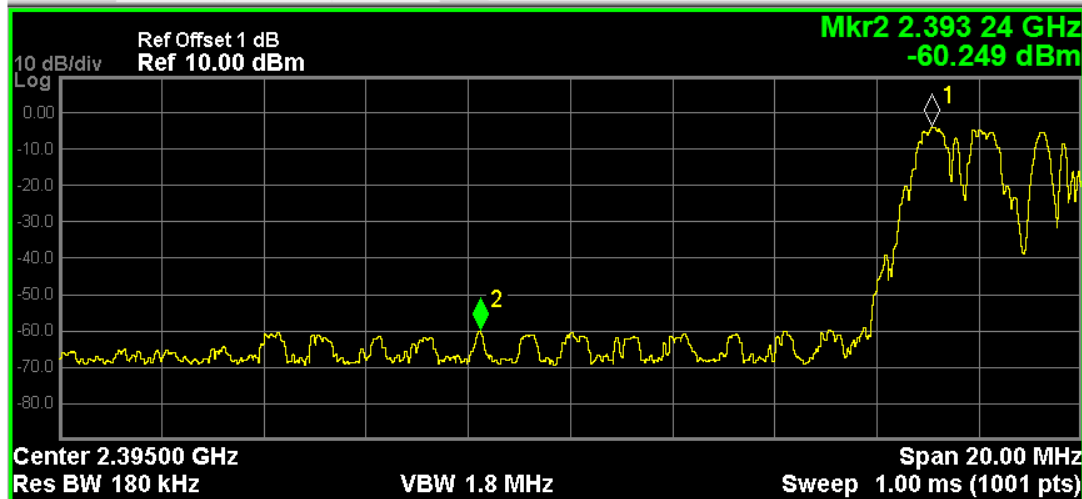
Center Freq 2.48600000 GHz

PNO: Fast
IFGain: LowTrig: Free Run
Atten: 20 dBAvg Type: Log-Pwr
Avg|Hold:>100/100TRACE 1 2 3 4 5 6
TYPE M
DET P N N N N N

MKR	MODE	TRC	SCL	X	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE
1	N	1	f	2.479 12 GHz	-3.831 dBm			
2	N	1	f	2.487 12 GHz	-60.609 dBm			
3								
4								
5								
6								
7								
8								
9								
10								
11								
12								

DH3Ch 00

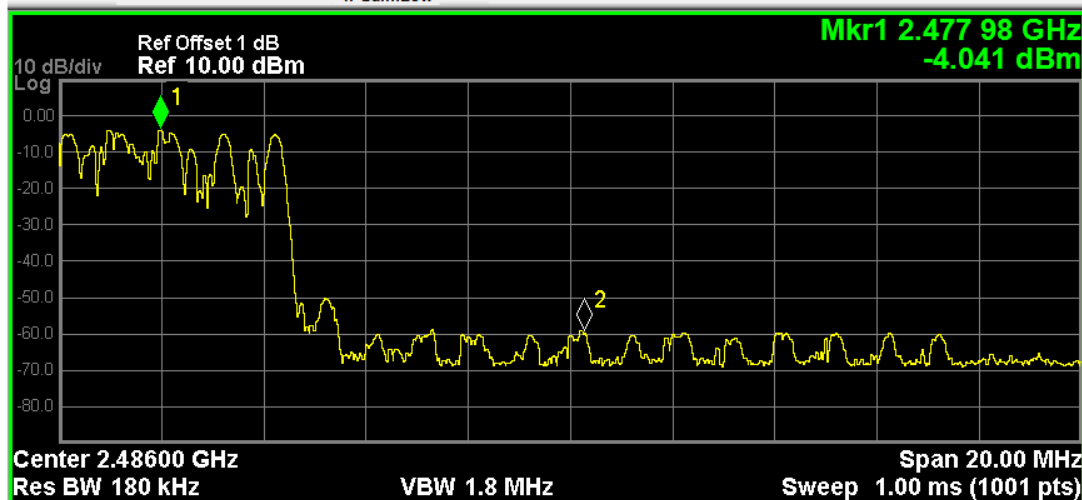
Center Freq 2.39500000 GHz

PNO: Fast
IFGain:LowTrig: Free Run
Atten: 20 dBAvg Type: Log-Pwr
Avg|Hold:>100/100TRACE 1 2 3 4 5 6
TYPE M
DET P NNNNN

MKR	MODE	TRC	SCL	X	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE
1	N	1	f	2.402 06 GHz	-4.201 dBm			
2	N	1	f	2.393 24 GHz	-60.249 dBm			
3								
4								
5								
6								
7								
8								
9								
10								
11								
12								

DH3Ch 78

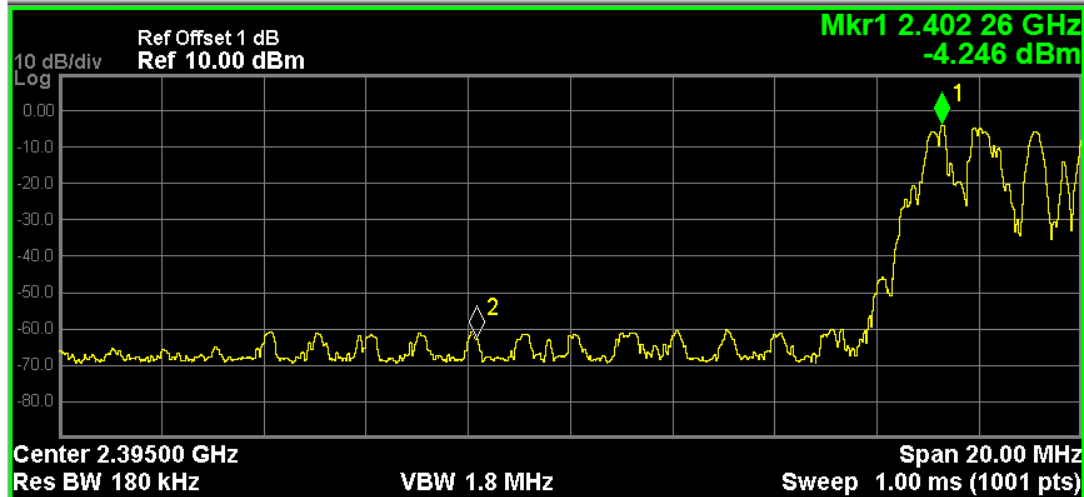
Center Freq 2.48600000 GHz

PNO: Fast
IFGain:LowTrig: Free Run
Atten: 20 dBAvg Type: Log-Pwr
Avg|Hold:>100/100TRACE 1 2 3 4 5 6
TYPE M
DET P NNNNN

MKR	MODE	TRC	SCL	X	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE
1	N	1	f	2.477 98 GHz	-4.041 dBm			
2	N	1	f	2.486 28 GHz	-59.725 dBm			
3								
4								
5								
6								
7								
8								
9								
10								
11								
12								

3DH3Ch 00

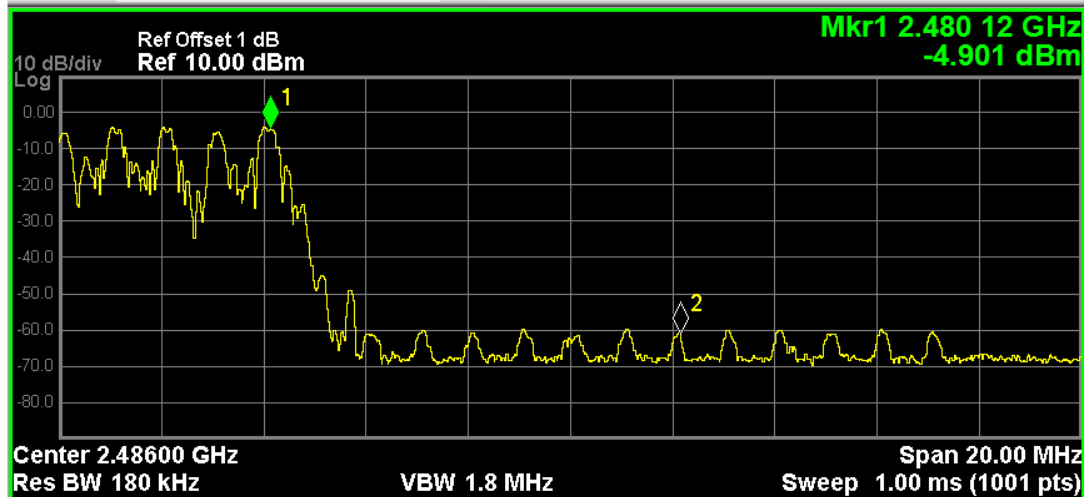
Center Freq 2.39500000 GHz

PNO: Fast
IFGain:LowTrig: Free Run
Atten: 20 dBAvg Type: Log-Pwr
Avg|Hold:>100/100TRACE 1 2 3 4 5 6
TYPE M
DET P NNNNN

MKR	MODE	TRC	SCL	X	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE
1	N	1	f	2.402 26 GHz	-4.246 dBm			
2	N	1	f	2.393 16 GHz	-62.965 dBm			
3								
4								
5								
6								
7								
8								
9								
10								
11								
12								

3DH3Ch 78

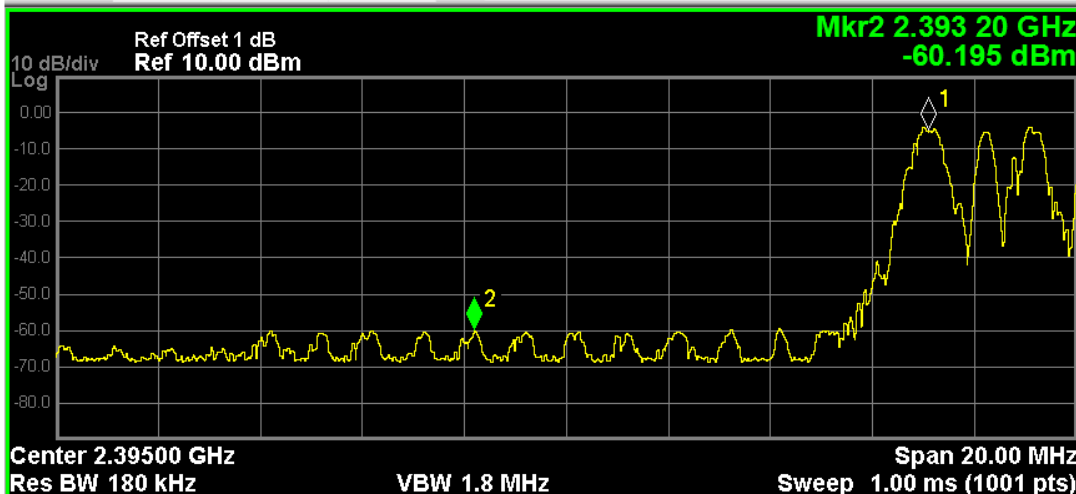
Marker 1 2.48012000000 GHz

PNO: Fast
IFGain:LowTrig: Free Run
Atten: 20 dBAvg Type: Log-Pwr
Avg|Hold:>100/100TRACE 1 2 3 4 5 6
TYPE M
DET P NNNNN

MKR	MODE	TRC	SCL	X	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE
1	N	1	f	2.480 12 GHz	-4.901 dBm			
2	N	1	f	2.488 16 GHz	-61.552 dBm			
3								
4								
5								
6								
7								
8								
9								
10								
11								
12								

DH5Ch 00

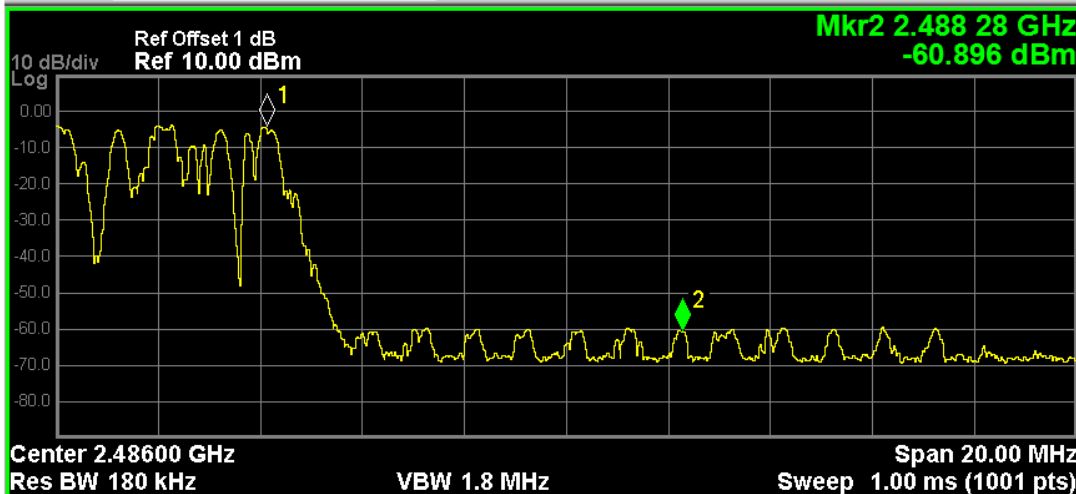
Center Freq 2.39500000 GHz

PNO: Fast
IFGain:LowTrig: Free Run
Atten: 20 dBAvg Type: Log-Pwr
Avg|Hold:>100/100TRACE 1 2 3 4 5 6
TYPE M W W W W W W W
DET P N N N N N

MKR	MODE	TRC	SCL	X	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE
1	N	1	f	2.402 10 GHz	-5.318 dBm			
2	N	1	f	2.393 20 GHz	-60.195 dBm			
3								
4								
5								
6								
7								
8								
9								
10								
11								
12								

DH5Ch 78

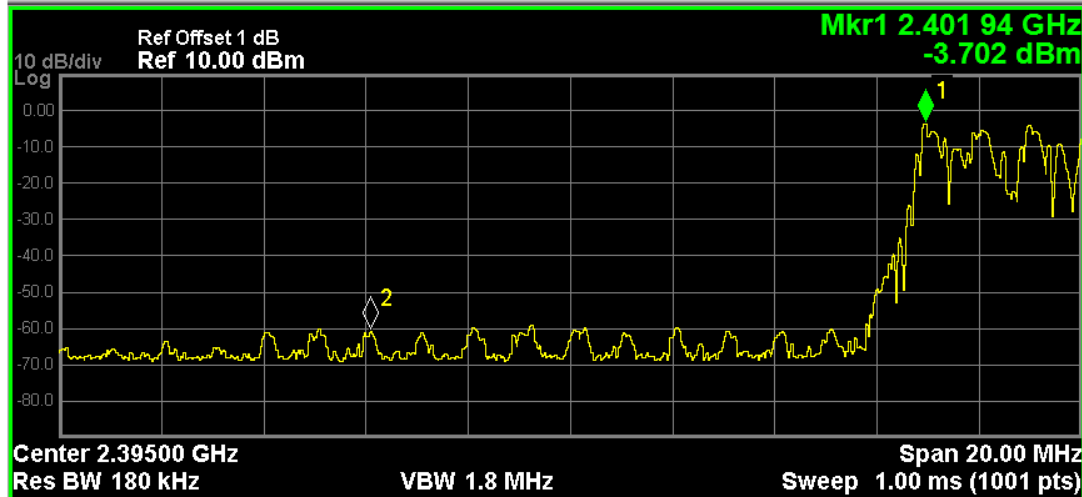
Center Freq 2.48600000 GHz

PNO: Fast
IFGain:LowTrig: Free Run
Atten: 20 dBAvg Type: Log-Pwr
Avg|Hold:>100/100TRACE 1 2 3 4 5 6
TYPE M W W W W W W W
DET P N N N N N

MKR	MODE	TRC	SCL	X	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE
1	N	1	f	2.480 12 GHz	-4.650 dBm			
2	N	1	f	2.488 28 GHz	-60.896 dBm			
3								
4								
5								
6								
7								
8								
9								
10								
11								
12								

3DH5Ch 00

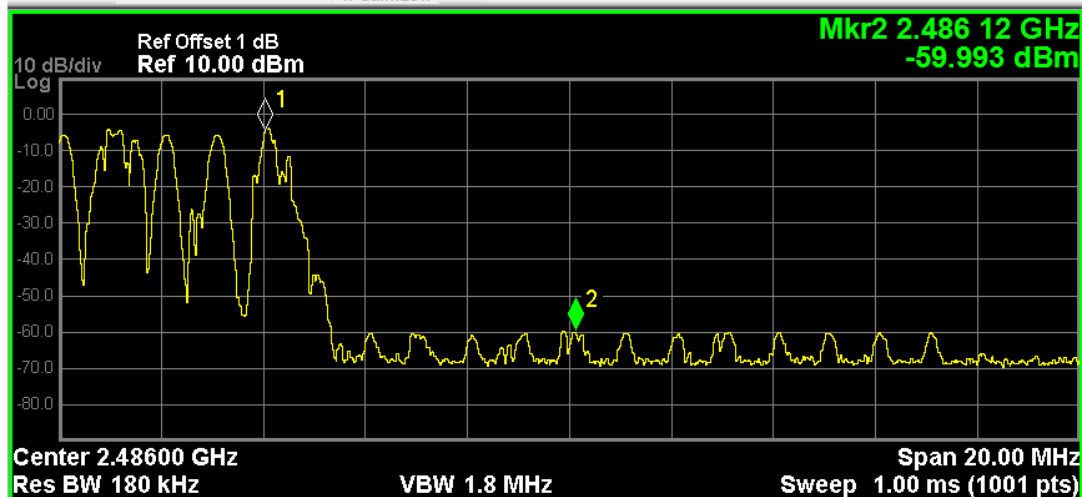
Center Freq 2.39500000 GHz

PNO: Fast
IFGain:LowTrig: Free Run
Atten: 20 dBAvg Type: Log-Pwr
Avg|Hold:>100/100TRACE 1 2 3 4 5 6
TYPE M
DET P NNNNN

MKR	MODE	TRC	SCL	X	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE
1	N	1	f	2.401 94 GHz	-3.702 dBm			
2	N	1	f	2.391 10 GHz	-60.729 dBm			
3								
4								
5								
6								
7								
8								
9								
10								
11								
12								

3DH5Ch 78

Center Freq 2.48600000 GHz

PNO: Fast
IFGain:LowTrig: Free Run
Atten: 20 dBAvg Type: Log-Pwr
Avg|Hold:>100/100TRACE 1 2 3 4 5 6
TYPE M
DET P NNNNN

MKR	MODE	TRC	SCL	X	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE
1	N	1	f	2.480 04 GHz	-5.041 dBm			
2	N	1	f	2.486 12 GHz	-59.993 dBm			
3								
4								
5								
6								
7								
8								
9								
10								
11								
12								

9 NUMBER OF HOPPING FREQUENCIES

MEASUREMENT

9.1 Test Equipment

The following test equipment was used during the power spectral density measurement:

Item	Type	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
1.	EXA Signal Analyzer	Agilent	N9010A	MY52221182	May 25, 2017	May 24, 2018

9.2 Block Diagram of Test Setup

The same as section.4.2.

9.3 Specification Limits (§15.247(a)(1)(iii))

Frequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 channels.

9.4 Operating Condition of EUT

Enable the EUT hopping function.

9.5 Test Procedure

The transmitter output was connected to the spectrum analyzer. The spectrum analyzer was set as RBW = 820kHz, VBW ≥ RBW, count the number of hopping frequencies used and recorded.

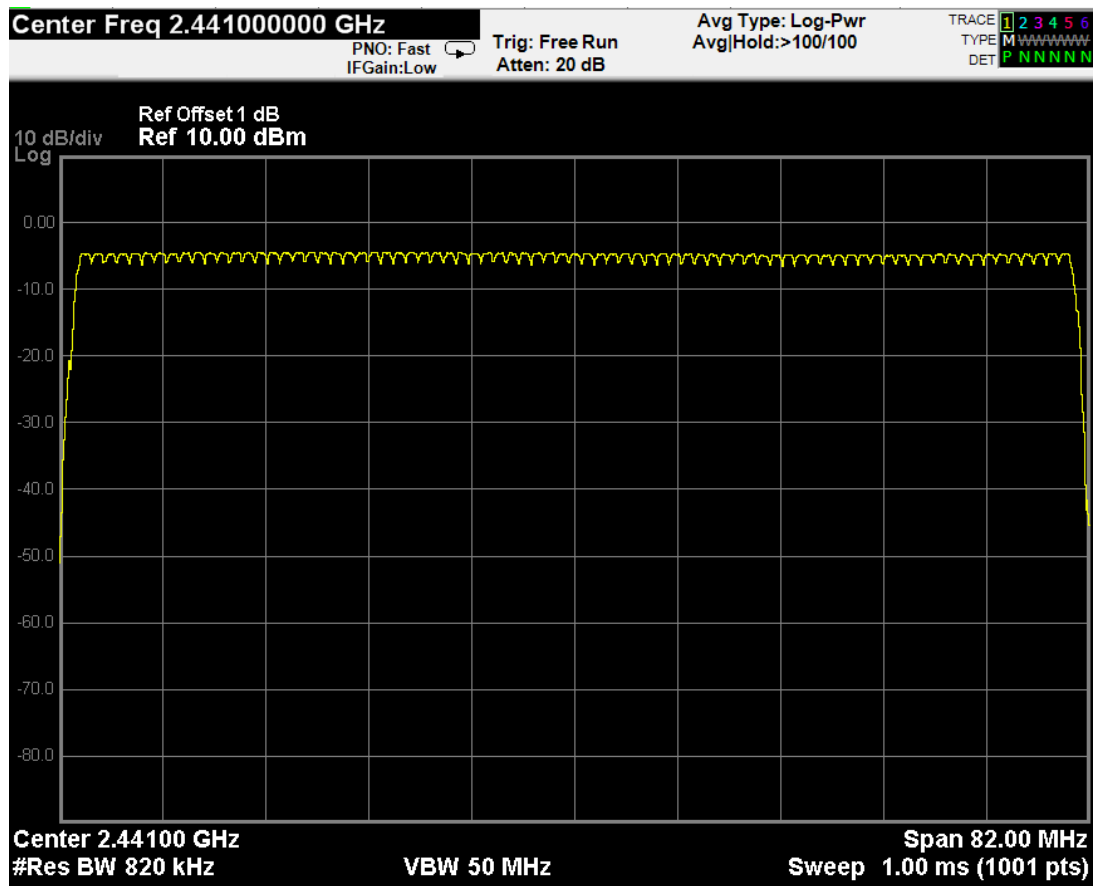
The test procedure is defined in DA 00-705.

9.6 Test Results

PASSED. All the test results are attached in next pages.

(Test Date: 2018.02.10 Temperature: 23°C Humidity:50 %)

Result	Limit	Conclusion
79	> 15	Pass



10 CARRIER FREQUENCY SEPARATION

MEASUREMENT

10.1 Test Equipment

The following test equipment was used during the power spectral density measurement:

Item	Type	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
1.	EXA Signal Analyzer	Agilent	N9010A	MY52221182	May 25, 2017	May 24, 2018

10.2 Block Diagram of Test Setup

The same as section.4.2.

10.3 Specification Limits (§15.247(a)(1))

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, whichever is greater, provided the systems operate with an output power no greater than 125 mW.

10.4 Operating Condition of EUT

Enable the EUT hopping function.

10.5 Test Procedure

The transmitter output was connected to the spectrum analyzer. The spectrum analyzer was set as RBW = 100 kHz, VBW = 300 kHz, span = wide enough to capture the peaks of two adjacent channels. Use the marker-delta function to determine the separation between the peaks of the adjacent channels.

The test procedure is defined in DA 00-705.

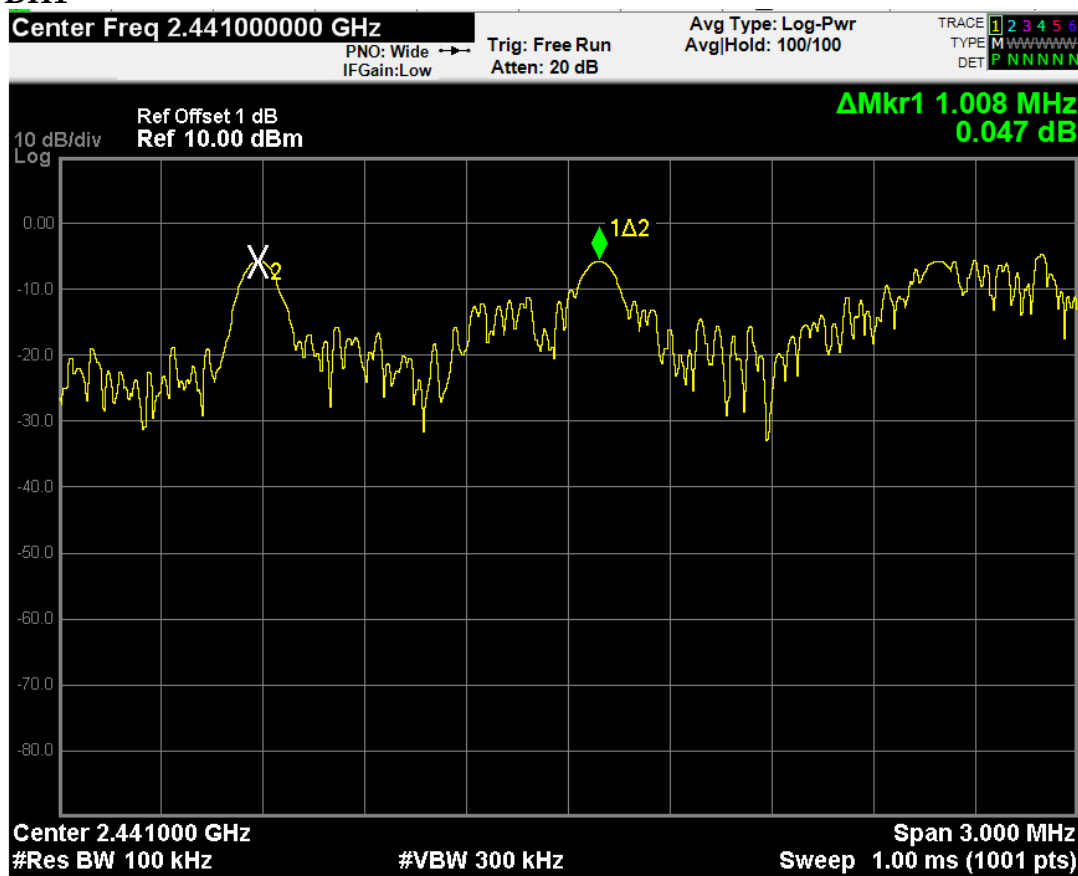
10.6 Test Results

PASSED. All the test results are attached in next pages.

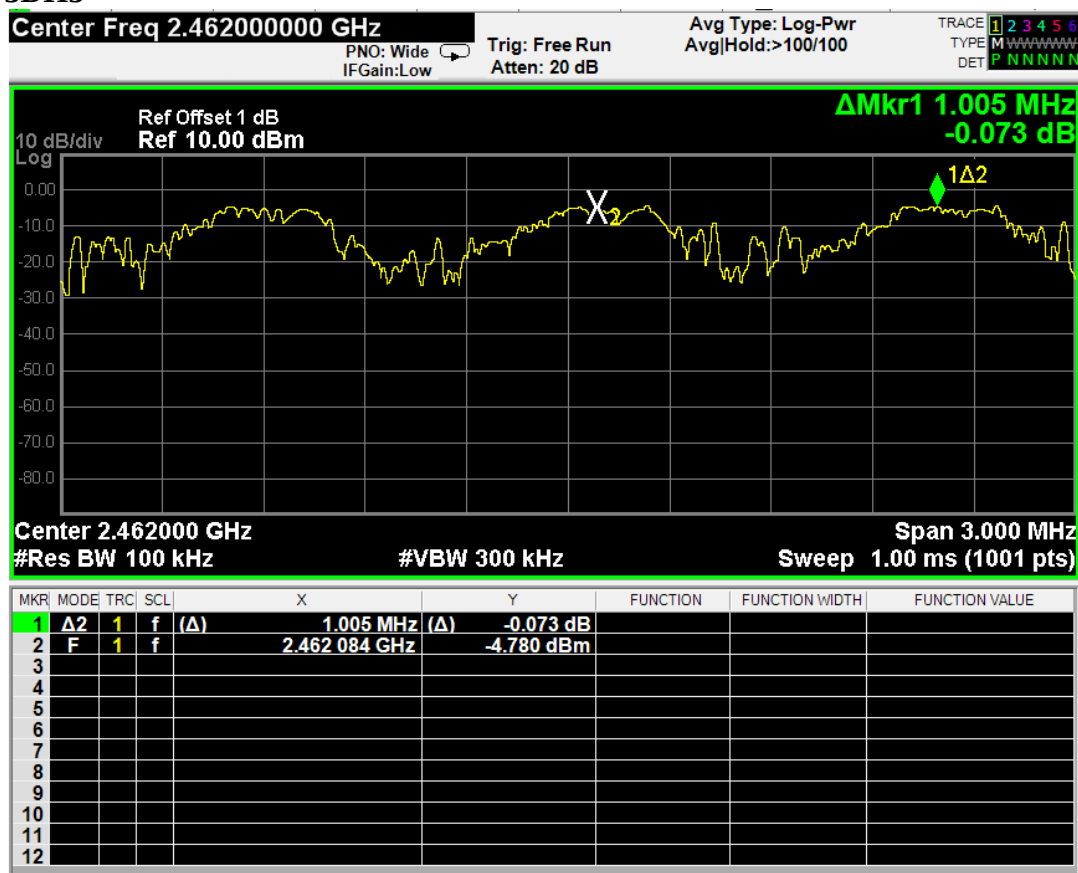
(Test Date: 2018.02.10 Temperature: 23°C Humidity: 50 %)

Mode	Result	Limit (2/3 of the 20dB bandwidth)	Conclusion
DH1	1.008 MHz	> 0.560 MHz	Pass
3DH5	1.005 MHz	> 0.804 MHz	Pass

DH1



3DH5



11 DEWLL TIME MEASUREMENT

11.1 Test Equipment

The following test equipment was used during the power spectral density measurement:

Item	Type	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
1.	EXA Signal Analyzer	Agilent	N9010A	MY52221182	May 25, 2017	May 24, 2018

11.2 Block Diagram of Test Setup

The same as section.4.2.

11.3 Specification Limits (§15.247(a)(1)(iii))

The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed.

11.4 Operating Condition of EUT

Enable the EUT hopping function.

11.5 Test Procedure

The transmitter output was connected to the spectrum analyzer. The spectrum analyzer was set as RBW = 1MHz, VBW = 1MHz, span = zero span, centered on a hopping channel. Use the marker-delta function to calculate the dwell time.

The test procedure is defined in DA 00-705.

11.6 Test Results

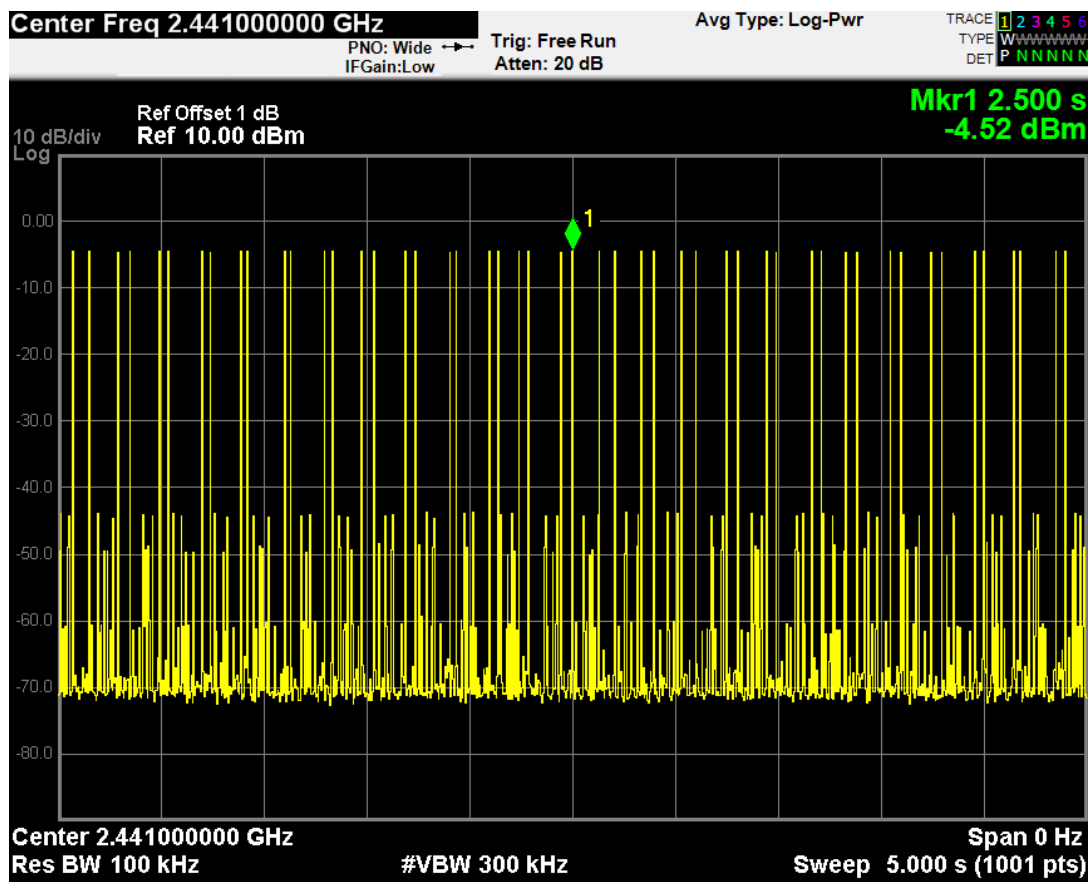
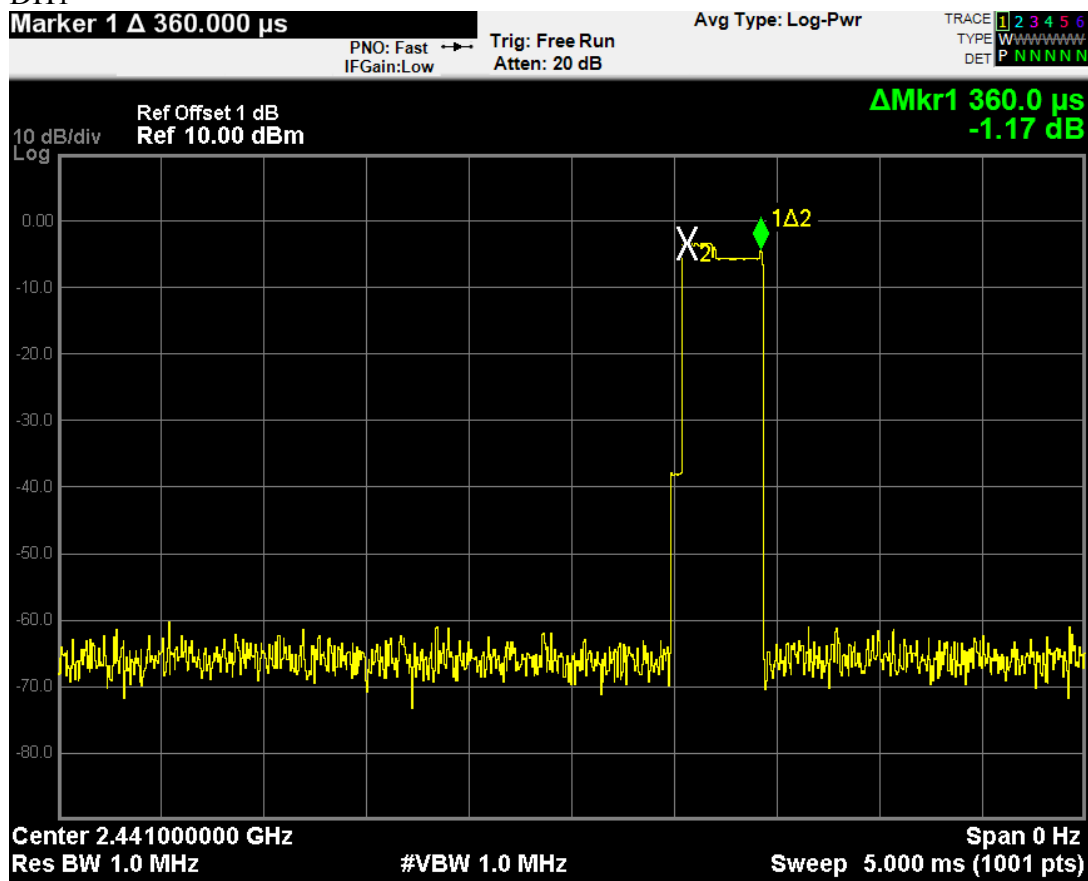
PASSED. All the test results are attached in next pages.

(Test Date: 2018.02.10 Temperature: 23°C Humidity: 50 %)

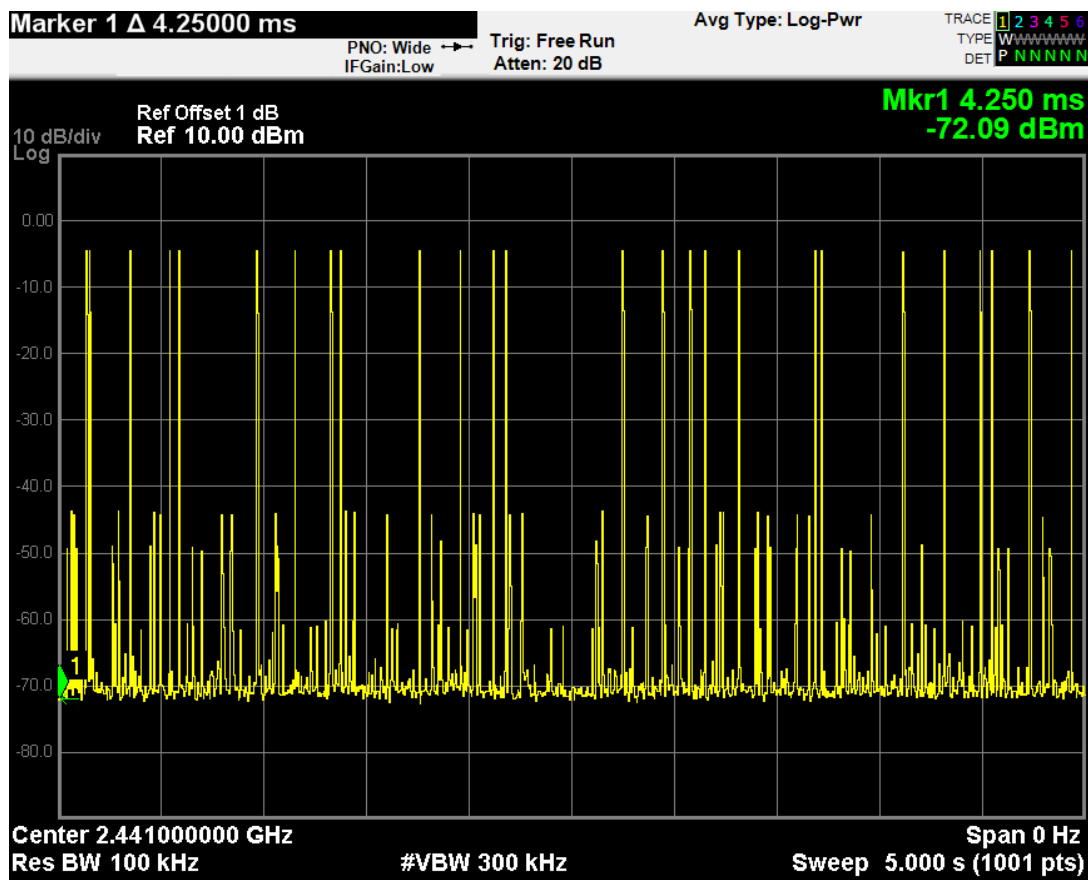
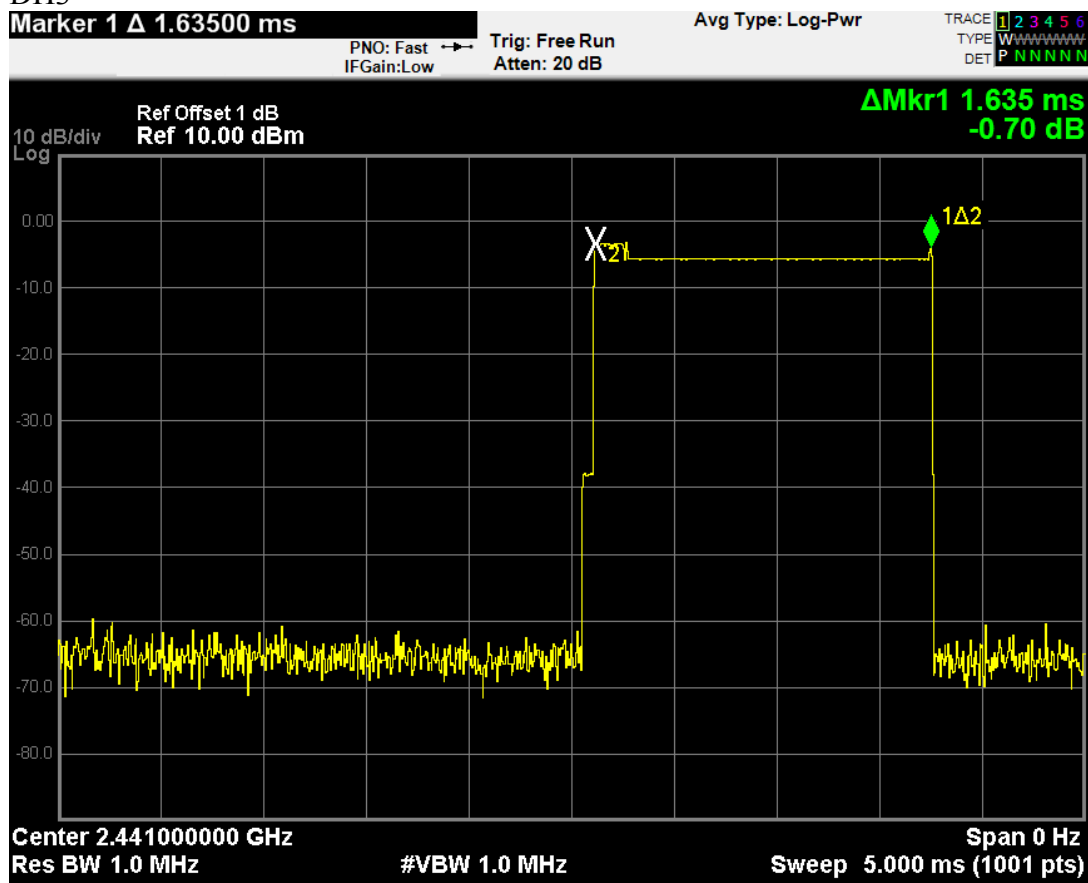
Mode	Number of transmission in a 31.6 (79 hopping*0.4) second period	Length of transmission time (msec)	Result (msec)	Limit (msec)	Conclusion
DH1	50 times/5 sec * 31.6=316 times	0.360	$316 * 0.360 = 113.76$	< 400	Pass
DH3	25 times/5 sec * 31.6=158 times	1.635	$158 * 1.635 = 258.33$	< 400	Pass
DH5	17 times/5 sec * 31.6=107.44 times	2.875	$107.44 * 2.875 = 308.89$	< 400	Pass

Mode	Number of transmission in a 31.6 (79 hopping*0.4) second period	Length of transmission time (msec)	Result (msec)	Limit (msec)	Conclusion
3DH1	50 times/5 sec * 31.6=316 times	0.360	$316 * 0.360 = 123.76$	< 400	Pass
3DH3	26 times/5 sec * 31.6=164.32 times	1.640	$164.32 * 1.640 = 269.49$	< 400	Pass
3DH5	19 times/5 sec * 31.6=120.08 times	2.88	$120.08 * 2.870 = 345.83$	< 400	Pass

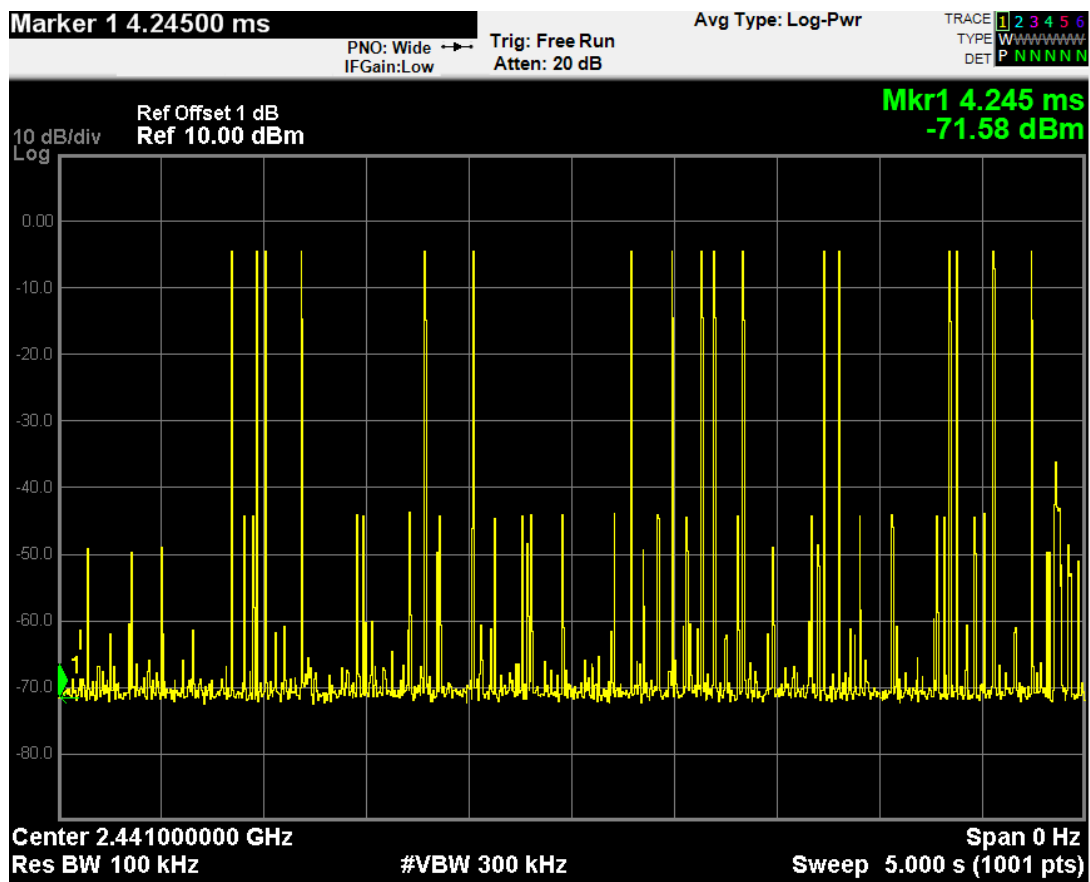
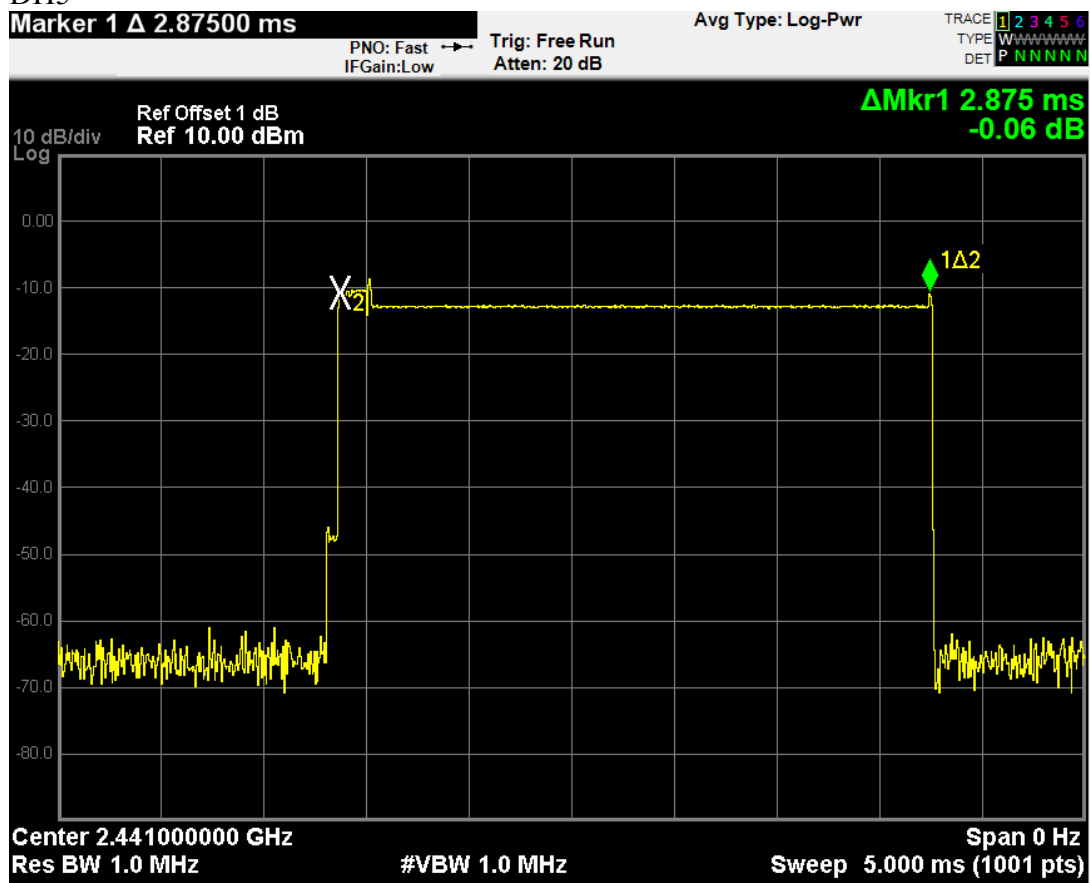
DH1



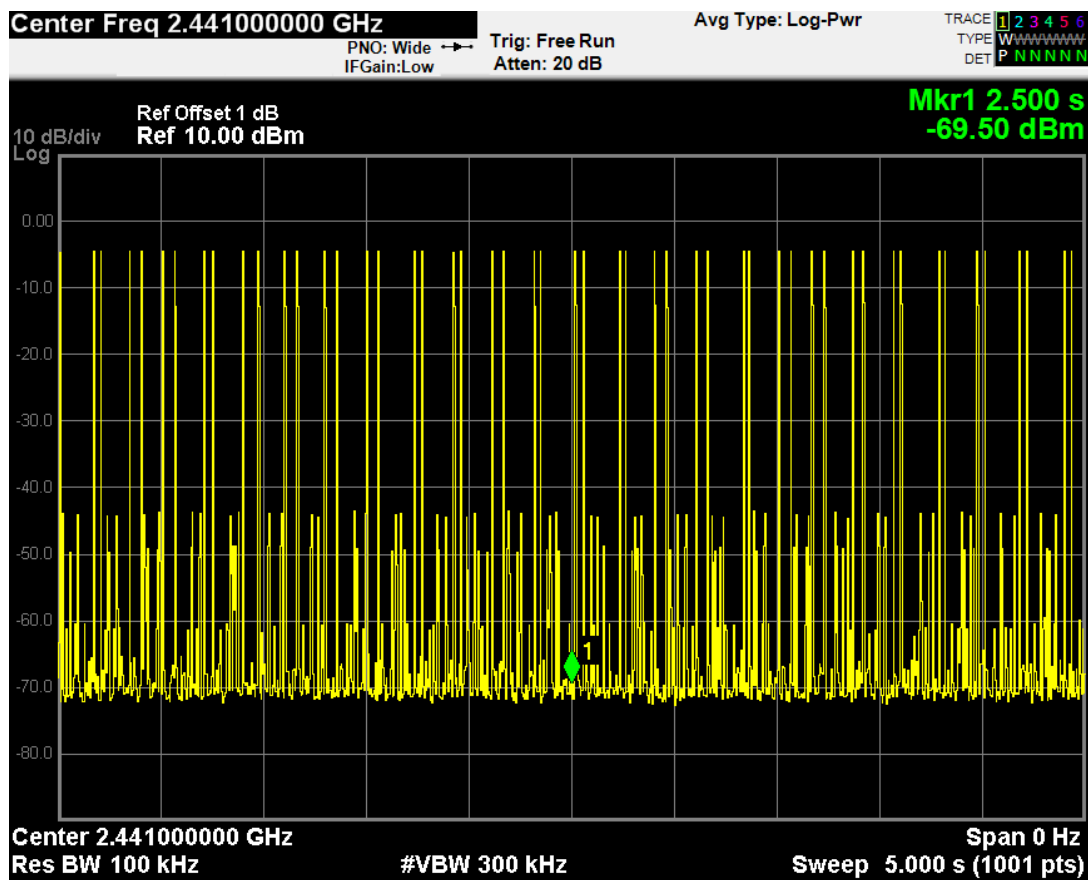
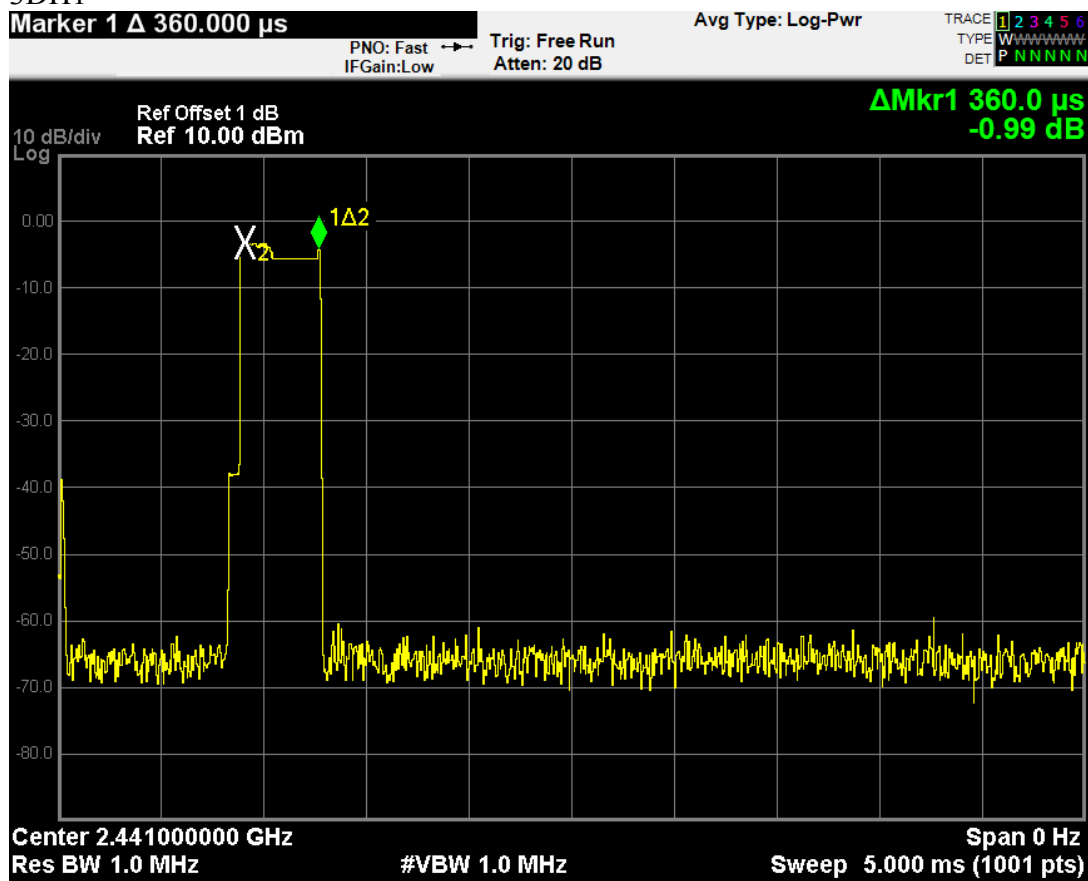
DH3



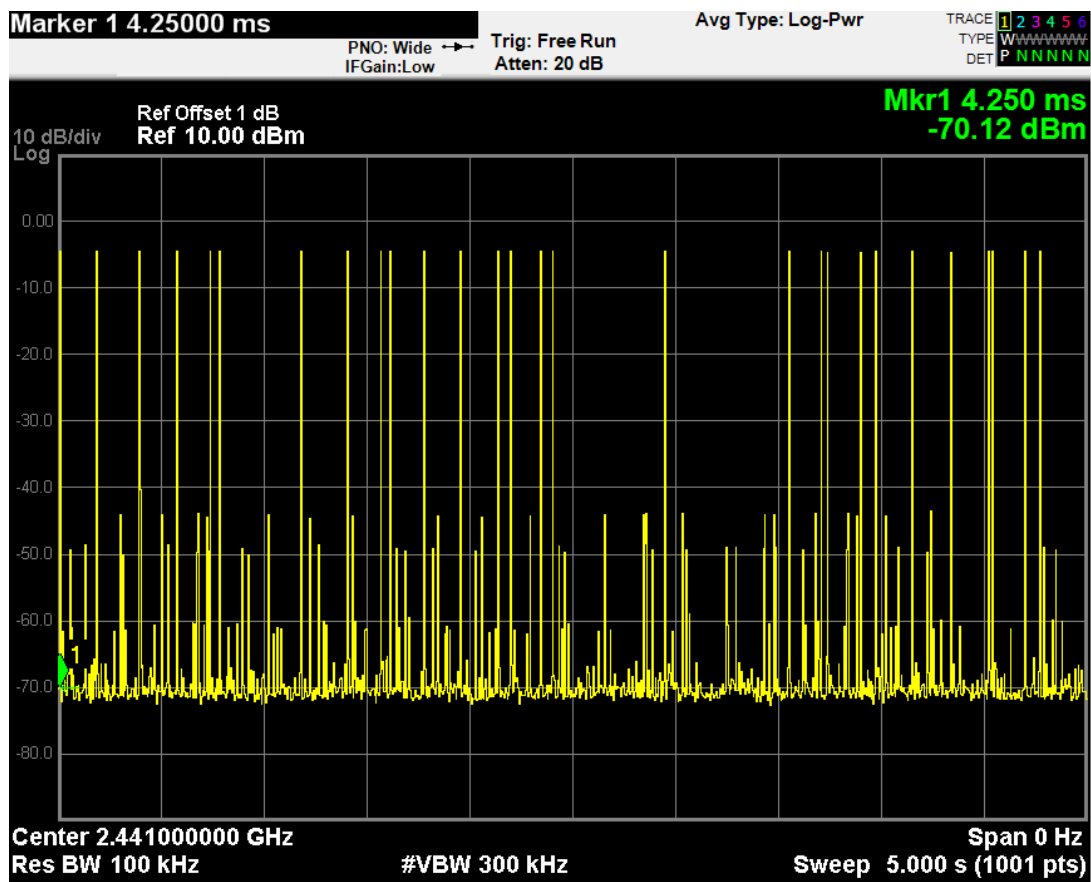
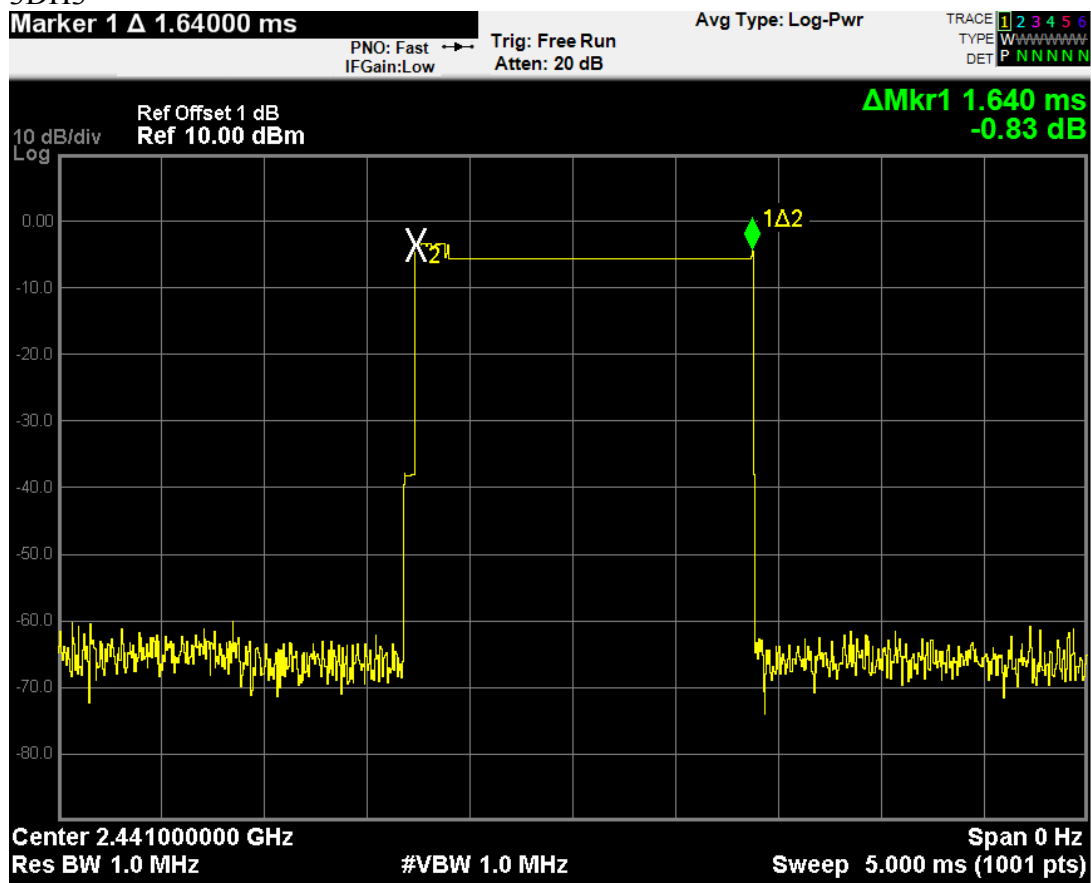
DH5



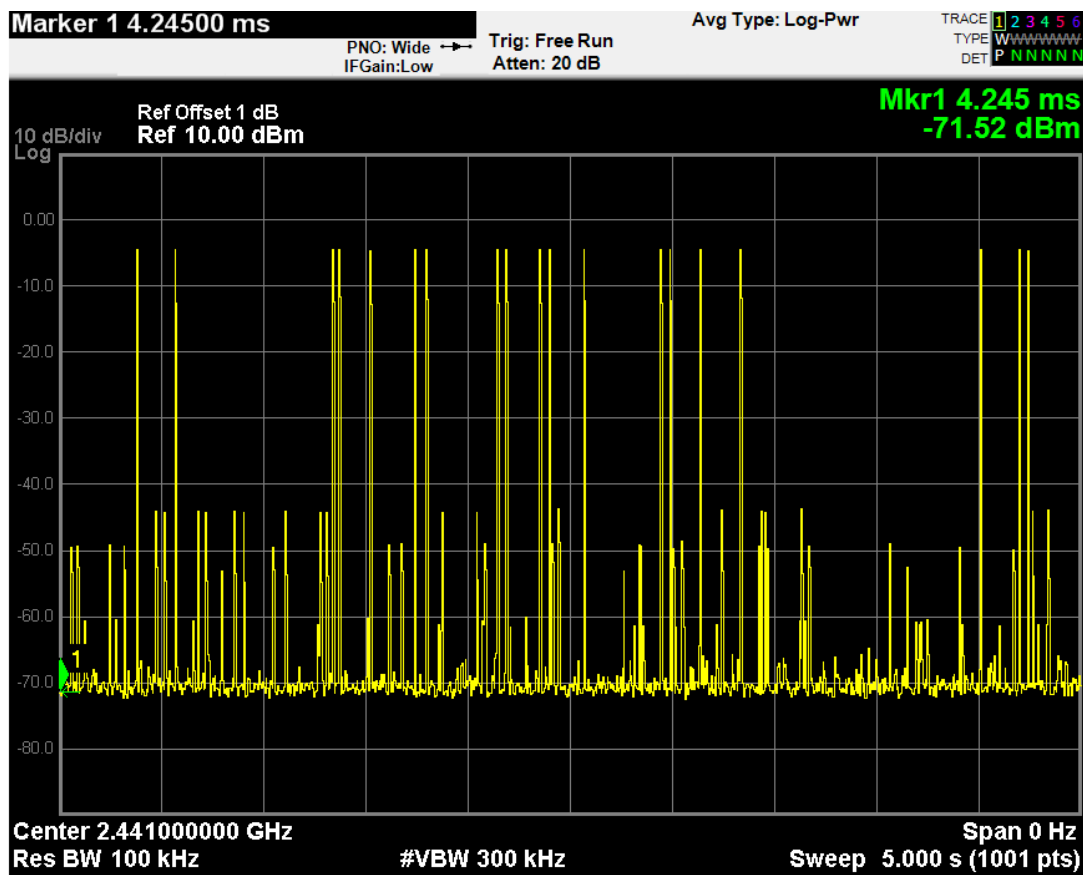
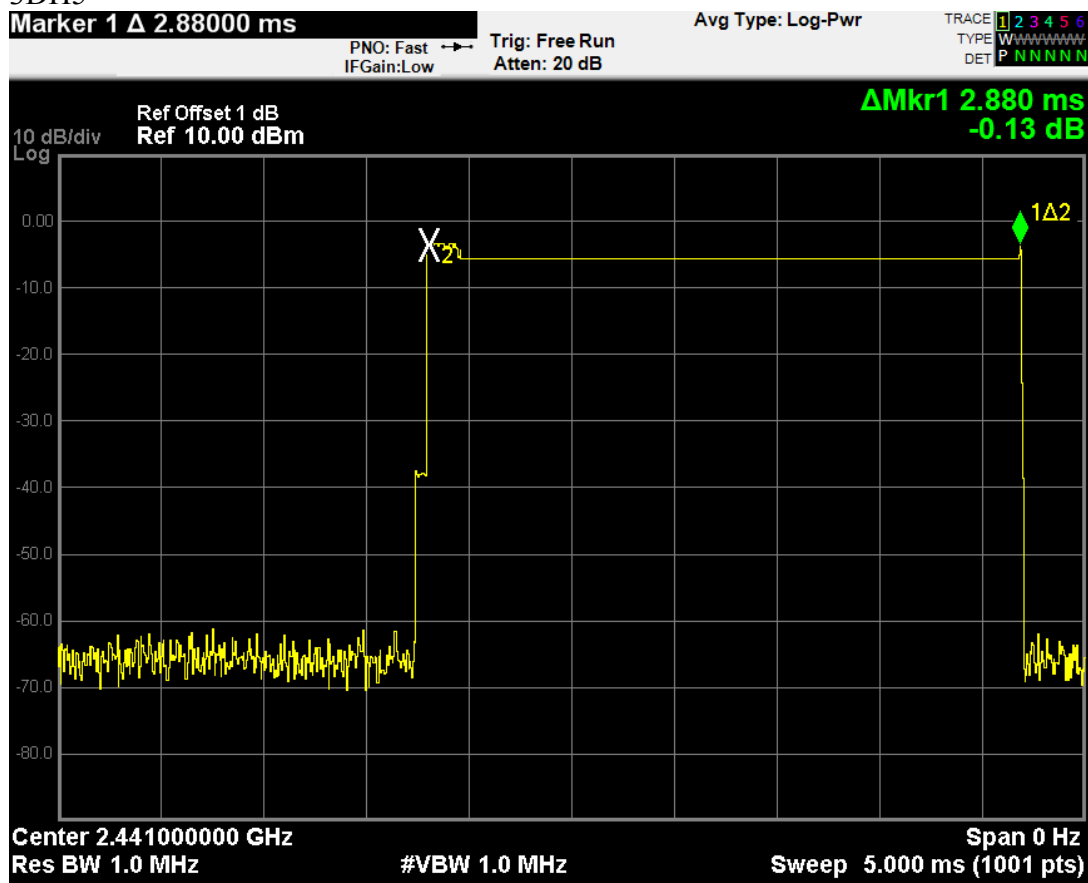
3DH1



3DH3



3DH5



12 DEVIATION TO TEST SPECIFICATIONS

None.