



# SGS-CSTC Standards Technical Services Co., Ltd. Guangzhou Branch

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Report No.: GZEM171200747402  
Page: 1 of 77  
FCC ID: 2AOUJDAJDOJO1

## TEST REPORT

**Application No.:** GZEM1712007474CR  
**Applicant:** OjO Electric, LLC  
**Address of Applicant:** 201 Lombard Street, Oxnard, Ca. 93030, USA  
**Equipment Under Test (EUT):**  
**EUT Name:** OjO Commuter Scooter  
**FCC ID:** 2AOUJDAJDOJO1  
**Model No.:** OjO500  
**Standard(s) :** 47 CFR Part 15, Subpart C 15.247  
**Date of Receipt:** 2017-12-29  
**Date of Test:** 2018-02-06 to 2018-03-30  
**Date of Issue:** 2018-07-20

<b>Test Result:</b>	Pass*
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\* In the configuration tested, the EUT complied with the standards specified above.



Kobe Jian

EMC Laboratory Manager

The manufacturer should ensure that all products in series production are in conformity with the product sample detailed in this report. If the product in this report is used in any configuration other than that detailed in the report, the manufacturer must ensure the new system complies with all relevant standards. Any mention of SGS International Electrical Approvals or testing done by SGS International Electrical Approvals in connection with, distribution or use of the product described in this report must be approved by SGS International Electrical Approvals in writing.

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Revision Record				
Version	Chapter	Date	Modifier	Remark
01		2018-07-20		Original

Authorized for issue by:			
Tested By	 Jackson Yuan	<hr/> Jackson_Yuan /Project Engineer	2018-02-06 to 2018-03-30
Checked By	 Ricky Liu	<hr/> Ricky_Liu /Reviewer	2018-04-20
			Date

## 2 Test Summary

<b>Radio Spectrum Technical Requirement</b>				
<b>Item</b>	<b>Standard</b>	<b>Method</b>	<b>Requirement</b>	<b>Result</b>
Antenna Requirement	47 CFR Part 15, Subpart C 15.247	N/A	47 CFR Part 15, Subpart C 15.203 & 15.247(c)	Pass
Other requirements Frequency Hopping Spread Spectrum System Hopping Sequence	47 CFR Part 15, Subpart C 15.247	N/A	47 CFR Part 15, Subpart C 15.247(a)(1),(g),(h)	Pass

<b>Radio Spectrum Matter Part</b>				
<b>Item</b>	<b>Standard</b>	<b>Method</b>	<b>Requirement</b>	<b>Result</b>
Conducted Peak Output Power	47 CFR Part 15, Subpart C 15.247	ANSI C63.10 (2013) Section 7.8.5	47 CFR Part 15, Subpart C 15.247(b)(1)	Pass
20dB Bandwidth	47 CFR Part 15, Subpart C 15.247	ANSI C63.10 (2013) Section 6.9	47 CFR Part 15, Subpart C 15.247(a)(1)	Pass
Carrier Frequencies Separation	47 CFR Part 15, Subpart C 15.247	ANSI C63.10 (2013) Section 7.8.2	47 CFR Part 15, Subpart C 15.247a(1)	Pass
Hopping Channel Number	47 CFR Part 15, Subpart C 15.247	ANSI C63.10 (2013) Section 7.8.3	47 CFR Part 15, Subpart C 15.247a(1)(iii)	Pass
Dwell Time	47 CFR Part 15, Subpart C 15.247	ANSI C63.10 (2013) Section 7.8.4	47 CFR Part 15, Subpart C 15.247a(1)(iii)	Pass
Conducted Band Edges Measurement	47 CFR Part 15, Subpart C 15.247	ANSI C63.10 (2013) Section 7.8.6	47 CFR Part 15, Subpart C 15.247(d)	Pass
Conducted Spurious Emissions	47 CFR Part 15, Subpart C 15.247	ANSI C63.10 (2013) Section 7.8.8	47 CFR Part 15, Subpart C 15.247(d)	Pass
Radiated Emissions which fall in the restricted bands	47 CFR Part 15, Subpart C 15.247	ANSI C63.10 (2013) Section 6.10.5	47 CFR Part 15, Subpart C 15.205 & 15.209	Pass
Radiated Spurious Emissions	47 CFR Part 15, Subpart C 15.247	ANSI C63.10 (2013) Section 6.10.4	47 CFR Part 15, Subpart C 15.205 & 15.209	Pass

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## 4 General Information

### 4.1 Details of E.U.T.

Power Supply: For Scooter

With built-in Li-ion battery operated:

Single battery:

Model: TG1865-089

Voltage: DC 48V

Capacity: 13AH

Watt-hour: 624Wh

Double batteries:

Model: TG1865-089

Model: TG1865-12

Voltage: DC 48V

Voltage: DC 48V

Capacity: 13AH

Capacity: 10.4AH

Watt-hour: 624Wh

Watt-hour: 499.2Wh

Test Voltage: DC 48V

Cable: USB ports for charging only (unshielded, <3m, output: DC 5V, 1A)

BT Version V 4.0 for Classic only

Antenna Gain -0.58 dBi

Antenna Type PCB Antenna

Channel Spacing 1MHz

Modulation Type GFSK, π/4DQPSK

Number of Channels 79

Operation Frequency 2402MHz to 2480MHz

Spectrum Spread Technology Frequency Hopping Spread Spectrum(FHSS)

Software Version FCC Assist 1.5

### 4.2 Description of Support Units

Description	Manufacturer	Model No.	Serial No.
NoteBook	IBM	T40	99-FBAF9 03/09

#### 4.3 Measurement Uncertainty

No.	Item	Measurement Uncertainty
1	Radio Frequency	$7.25 \times 10^{-8}$
2	Timeout	2s
3	Duty cycle	0.37%
4	Occupied Bandwidth	3%
5	RF Conducted power	0.75dB
6	RF Power Density	2.84dB
7	Conducted Spurious Emissions	0.75dB
8	RF Radiated Power	4.5dB (below 1GHz)
		4.8dB (above 1GHz)
9	Radiated Spurious Emission Test	4.5dB (30MHz-1GHz)
		4.8dB (1GHz-18GHz)
10	Temperature	0.4°C
11	Humidity	1.3%
12	Supply Voltages	1.5%
13	Time	3%

#### 4.4 Test Location

All tests were performed at:

SGS-CSTC Standards Technical Services Co., Ltd., Guangzhou Branch EMC Laboratory,  
198 Kezhu Road, Scientech Park, Guangzhou Economic & Technology Development District,  
Guangzhou, China 510663

Tel: +86 20 82155555      Fax: +86 20 82075059

No tests were sub-contracted.

## 4.5 Test Facility

The test facility is recognized, certified, or accredited by the following organizations:

● **NVLAP (Lab Code: 200611-0)**

SGS-CSTC Standards Technical Services Co., Ltd., Guangzhou EMC Laboratory is accredited by the National Voluntary Laboratory Accreditation Program (NVLAP/NIST). NVLAP Code: 200611-0.

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.

● **ACMA**

SGS-CSTC Standards Technical Services Co., Ltd., EMC Laboratory can also perform testing for the Australian C-Tick mark as a result of our NVLAP accreditation.

● **SGS UK(Certificate No.: 32), SGS-TUV SAARLAND and SGS-FIMKO**

Have approved SGS-CSTC Standards Technical Services Co., Ltd., EMC Laboratory as a supplier of EMC TESTING SERVICES and SAFETY TESTING SERVICES.

● **CNAS (Lab Code: L0167)**

SGS-CSTC Standards Technical Services Co., Ltd., EMC Laboratory has been assessed and in compliance with CNAS-CL01:2006 accreditation criteria for testing laboratories (identical to

ISO/IEC 17025:2005 General Requirements) for the Competence of Testing Laboratories.

● **FCC Recognized 2.948 Listed Test Firm(Registration No.: 282399)**

SGS-CSTC Standards Technical Services Co., Ltd., EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files. Registration 282399, May 31, 2002.

● **FCC Recognized Accredited Test Firm(Registration No.: 486818)**

SGS-CSTC Standards Technical Services Co., Ltd., EMC Laboratory has been accredited and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files. Designation Number: CN5016, Test Firm Registration Number: 486818, Jul 13, 2017.

● **Industry Canada (Registration No.: 4620B-1)**

The 3m/10m Alternate Semi-anechoic chamber of SGS-CSTC Standards Technical Services Co., Ltd., has been registered by Certification and Engineering of Industry Canada for radio equipment testing with Registration No. 4620B-1.

● **VCCI (Registration No.: R-2460, C-2584, G-449 and T-1179)**

The 10m Semi-anechoic chamber and Shielded Room of SGS-CSTC Standards Technical Services Co., Ltd. have been registered in accordance with the Regulations for Voluntary Control Measures with Registration No.: R-2460, C-2584, G-449 and T-1179 respectively.

● **CBTL (Lab Code: TL129)**

SGS-CSTC Standards Technical Services Co., Ltd., E&E Laboratory has been assessed and fully comply with the requirements of ISO/IEC 17025:2005, the Basic Rules, IEC600 01 and Rules of procedure IEC600 02, and the relevant IEC600 CB-Scheme Operational documents.

#### **4.6 Deviation from Standards**

None

#### **4.7 Abnormalities from Standard Conditions**

None

## 5 Equipment List

<b>Conducted Peak Output Power</b>					
<b>Equipment</b>	<b>Manufacturer</b>	<b>Model No</b>	<b>Inventory No</b>	<b>Cal Date</b>	<b>Cal Due Date</b>
EXA Signal Analyzer	AgilentTechnologies	N9010A	EMC2138	2017-11-15	2018-11-14
6dB Attenuator	HP	8491A	EMC2062	2018-04-04	2020-04-03
Test Software JS1120-3	HangTianXing	V2.6	GZE100-69	N/A	N/A

<b>20dB Bandwidth</b>					
<b>Equipment</b>	<b>Manufacturer</b>	<b>Model No</b>	<b>Inventory No</b>	<b>Cal Date</b>	<b>Cal Due Date</b>
EXA Signal Analyzer	AgilentTechnologies	N9010A	EMC2138	2017-11-15	2018-11-14
6dB Attenuator	HP	8491A	EMC2062	2018-04-04	2020-04-03
Test Software JS1120-3	HangTianXing	V2.6	GZE100-69	N/A	N/A

<b>Carrier Frequencies Separation</b>					
<b>Equipment</b>	<b>Manufacturer</b>	<b>Model No</b>	<b>Inventory No</b>	<b>Cal Date</b>	<b>Cal Due Date</b>
EXA Signal Analyzer	AgilentTechnologies	N9010A	EMC2138	2017-11-15	2018-11-14
6dB Attenuator	HP	8491A	EMC2062	2018-04-04	2020-04-03
Test Software JS1120-3	HangTianXing	V2.6	GZE100-69	N/A	N/A

<b>Hopping Channel Number</b>					
<b>Equipment</b>	<b>Manufacturer</b>	<b>Model No</b>	<b>Inventory No</b>	<b>Cal Date</b>	<b>Cal Due Date</b>
EXA Signal Analyzer	AgilentTechnologies	N9010A	EMC2138	2017-11-15	2018-11-14
6dB Attenuator	HP	8491A	EMC2062	2018-04-04	2020-04-03
Test Software JS1120-3	HangTianXing	V2.6	GZE100-69	N/A	N/A

<b>Dwell Time</b>					
<b>Equipment</b>	<b>Manufacturer</b>	<b>Model No</b>	<b>Inventory No</b>	<b>Cal Date</b>	<b>Cal Due Date</b>
EXA Signal Analyzer	AgilentTechnologies	N9010A	EMC2138	2017-11-15	2018-11-14
6dB Attenuator	HP	8491A	EMC2062	2018-04-04	2020-04-03
Test Software JS1120-3	HangTianXing	V2.6	GZE100-69	N/A	N/A

<b>Conducted Band Edges Measurement</b>					
<b>Equipment</b>	<b>Manufacturer</b>	<b>Model No</b>	<b>Inventory No</b>	<b>Cal Date</b>	<b>Cal Due Date</b>
MXA Signal Analyzer	AgilentTechnologies	N9020A	SEM004-10	2018-03-10	2019-03-09
ESG Vector Signal Generator	Keysight	E4438C	SEM006-03	2017-04-14	2018-04-13
EXG Analog Signal Generator	AgilentTechnologies	N5171B	SEM006-04	2017-07-26	2020-07-25
Power Meter	AgilentTechnologies	U2021XA_C_h2	SEM009-02	2017-09-19	2018-09-18
Power Meter	AgilentTechnologies	U2021XA_C_h3	SEM009-03	2017-09-19	2018-09-18
EXA Signal Analyzer	AgilentTechnologies	N9010A	EMC2138	2017-11-15	2018-11-14
6dB Attenuator	HP	8491A	EMC2062	2018-04-04	2020-04-03
Test Software JS1120-3	HangTianXing	V2.6	GZE100-69	N/A	N/A

<b>Conducted Spurious Emissions</b>					
<b>Equipment</b>	<b>Manufacturer</b>	<b>Model No</b>	<b>Inventory No</b>	<b>Cal Date</b>	<b>Cal Due Date</b>
EXA Signal Analyzer	AgilentTechnologies	N9010A	EMC2138	2017-11-15	2018-11-14
6dB Attenuator	HP	8491A	EMC2062	2018-04-04	2020-04-03
Test Software JS1120-3	HangTianXing	V2.6	GZE100-69	N/A	N/A

<b>Radiated Emissions which fall in the restricted bands</b>					
<b>Equipment</b>	<b>Manufacturer</b>	<b>Model No</b>	<b>Inventory No</b>	<b>Cal Date</b>	<b>Cal Due Date</b>
EMI Test Receiver	Rohde & Schwarz	ESIB26	EMC0522	2018-01-19	2019-01-18
EMI Test Receiver	Rohde & Schwarz	ESCI	EMC0056	2018-01-19	2019-01-18
RI High Frequency Cable	SGS	20 m	EMC0528	2016-04-19	2018-04-18
Trilog Broadband Antenna 30MHz-1GHz	SCHWARZBECKME SS-ELEKTRONIK	VULB 9160	EMC2025	2016-09-08	2019-09-07
Bi-log Type Antenna	Schaffner -Chase	CBL6112B	EMC0524	2016-09-08	2019-09-07
Bi-log Type Antenna	Schaffner -Chase	CBL6143	EMC0519	2017-05-04	2020-05-03
Horn Antenna 1GHz-18GHz	SCHWARZBECK MESS-ELEKTRONIK	BBHA 9120D	EMC2026	2016-09-09	2019-09-08
1GHz-26.5 GHz Pre-Amplifier	Agilent	8449B	EMC0521	2018-01-08	2019-01-07
Amplifier	HP	8447F	EMC2065	2017-06-19	2018-06-18
Pre-Amplifier MH648A	ANRITSU CORP	MH648A	EMC2086	2017-11-20	2018-11-19
Active Loop Antenna	EMCO	6502	EMC0523	2018-02-24	2019-02-23
High Pass Filter(915MHz)	FSY MICROWAVE	HM1465-9SS	EMC2079	2018-01-19	2019-01-18
2.4GHz Filter	Micro-Tronics	BRM 50702	EMC2069	2018-01-08	2019-01-07
10m Semi-Anechoic Chamber	ETS	N/A	EMC0530	2016-04-30	2018-04-29
966 Anechoic Chamber	C.R.T	9m x 6m x 6m	EMC2142	2017-11-29	2018-11-28
MXE EMI Receiver	Keysight	N9038A	EMC2139	2017-11-15	2018-11-14
EXA Signal Analyzer	Keysight	N9010A	EMC2138	2017-11-15	2018-11-14

<b>Radiated Spurious Emissions</b>					
<b>Equipment</b>	<b>Manufacturer</b>	<b>Model No</b>	<b>Inventory No</b>	<b>Cal Date</b>	<b>Cal Due Date</b>
EMI Test Receiver	Rohde & Schwarz	ESIB26	EMC0522	2018-01-19	2019-01-18
EMI Test Receiver	Rohde & Schwarz	ESCI	EMC0056	2018-01-19	2019-01-18
RI High Frequency Cable	SGS	20 m	EMC0528	2016-04-19	2018-04-18
Trilog Broadband Antenna 30MHz-1GHz	SCHWARZBECKME SS-ELEKTRONIK	VULB 9160	EMC2025	2016-09-08	2019-09-07
Bi-log Type Antenna	Schaffner -Chase	CBL6112B	EMC0524	2016-09-08	2019-09-07
Bi-log Type Antenna	Schaffner -Chase	CBL6143	EMC0519	2017-05-04	2020-05-03
Horn Antenna 1GHz-18GHz	SCHWARZBECK MESS-ELEKTRONIK	BBHA 9120D	EMC2026	2016-09-09	2019-09-08
1GHz-26.5 GHz Pre-Amplifier	Agilent	8449B	EMC0521	2018-01-08	2019-01-07
Amplifier	HP	8447F	EMC2065	2017-06-19	2018-06-18
Pre-Amplifier MH648A	ANRITSU CORP	MH648A	EMC2086	2017-11-20	2018-11-19
Active Loop Antenna	EMCO	6502	EMC0523	2018-02-24	2019-02-23
High Pass Filter(915MHz)	FSY MICROWAVE	HM1465-9SS	EMC2079	2018-01-19	2019-01-18
2.4GHz Filter	Micro-Tronics	BRM 50702	EMC2069	2018-01-08	2019-01-07
10m Semi-Anechoic Chamber	ETS	N/A	EMC0530	2016-04-30	2018-04-29
966 Anechoic Chamber	C.R.T	9m x 6m x 6m	EMC2142	2017-11-29	2018-11-28
MXE EMI Receiver	Keysight	N9038A	EMC2139	2017-11-15	2018-11-14
EXA Signal Analyzer	Keysight	N9010A	EMC2138	2017-11-15	2018-11-14

<b>General used equipment</b>					
<b>Equipment</b>	<b>Manufacturer</b>	<b>Model No</b>	<b>Inventory No</b>	<b>Cal Date</b>	<b>Cal Due Date</b>
DMM	Fluke	73	EMC0006	2017-07-26	2018-07-25
DMM	Fluke	73	EMC0007	2017-07-26	2018-07-25

## 6 Radio Spectrum Technical Requirement

### 6.1 Antenna Requirement

#### 6.1.1 Test Requirement:

47 CFR Part 15, Subpart C 15.203 & 15.247(c)

#### 6.1.2 Conclusion

Standard Requirement:

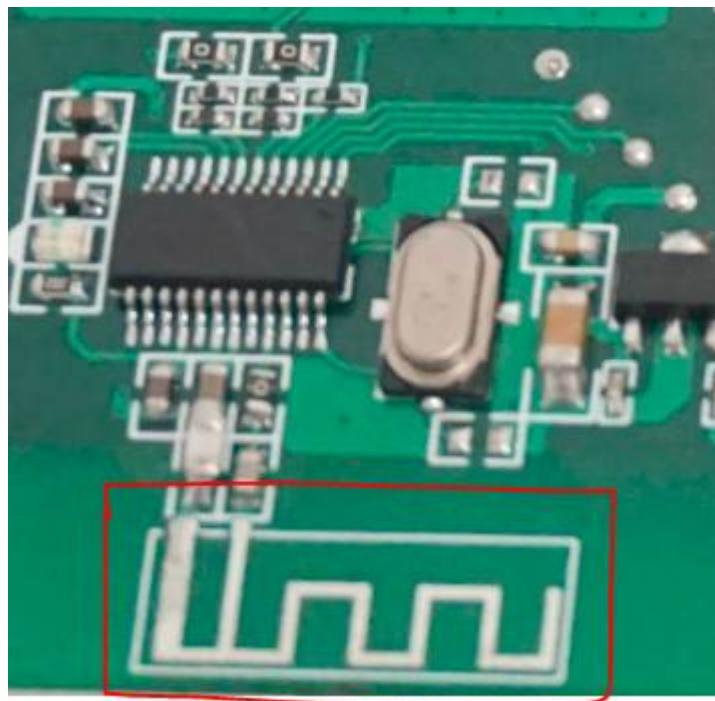
An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator, the manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

15.247(b) (4) requirement:

The conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

EUT Antenna:

The antenna is integrated on the main PCB and no consideration of replacement. The best case gain of the antenna is -0.58 dBi.



**Test result: The unit does meet the FCC requirements.**

## **6.2 Other requirements Frequency Hopping Spread Spectrum System Hopping Sequence**

### **6.2.1 Test Requirement:**

47 CFR Part 15, Subpart C 15.247(a)(1),(g),(h)

### **6.2.2 Conclusion**

Standard Requirement:

The system shall hop to channel frequencies that are selected at the system hopping rate from a Pseudorandom ordered list of hopping frequencies. Each frequency must be used equally on the average by each transmitter. The system receivers shall have input bandwidths that match the hopping channel bandwidths of their corresponding transmitters and shall shift frequencies in synchronization with the transmitted signals.

Frequency hopping spread spectrum systems are not required to employ all available hopping channels during each transmission. However, the system, consisting of both the transmitter and the receiver, must be designed to comply with all of the regulations in this section should the transmitter be presented with a continuous data (or information) stream. In addition, a system employing short transmission bursts must comply with the definition of a frequency hopping system and must distribute its transmissions over the minimum number of hopping channels specified in this section.

The incorporation of intelligence within a frequency hopping spread spectrum system that permits the system to recognize other users within the spectrum band so that it individually and independently chooses and adapts its hopsets to avoid hopping on occupied channels is permitted. The coordination of frequency hopping systems in any other manner for the express purpose of avoiding the simultaneous occupancy of individual hopping frequencies by multiple transmitters is not permitted.

Compliance for section 15.247(a)(1):

According to Technical Specification, the pseudorandom sequence may be generated in a nine-stage shift register whose 5th and 9th stage outputs are added in a modulo-two addition stage. And the result is fed back to the input of the first stage. The sequence begins with the first ONE of 9 consecutive ONEs; i.e. the shift register is initialized with nine ones.

> Number of shift register stages: 9

> Length of pseudo-random sequence:  $2^9 - 1 = 511$  bits

> Longest sequence of zeros: 8 (non-inverted signal)

Linear Feedback Shift Register for Generation of the PRBS sequence

An example of Pseudorandom Frequency Hopping Sequence as follow:

Each frequency used equally on the average by each transmitter.

According to Technical Specification, the receivers are designed to have input and IF bandwidths that match the hopping channel bandwidths of any transmitters and shift frequencies in synchronization with the transmitted signals.

Compliance for section 15.247(g):

According to Technical Specification, the system transmits the packet with the pseudorandom hopping frequency with a continuous data and the short burst transmission from the Bluetooth system is also transmitted under the frequency hopping system with the pseudorandom hopping frequency system.

Compliance for section 15.247(h):

According to Technical specification, the system incorporates with an adaptive system to detect other user within the spectrum band s

## 7 Radio Spectrum Matter Test Results

### 7.1 Conducted Peak Output Power

Test Requirement 47 CFR Part 15, Subpart C 15.247(b)(1)

Test Method: ANSI C63.10 (2013) Section 7.8.5

Limit:

Frequency range(MHz)	Output power of the intentional radiator(watt)
902-928	1 for $\geq 50$ hopping channels
	0.25 for $25 \leq$ hopping channels $< 50$
	1 for digital modulation
2400-2483.5	1 for $\geq 75$ non-overlapping hopping channels
	0.125 for all other frequency hopping systems
	1 for digital modulation
5725-5850	1 for frequency hopping systems and digital modulation

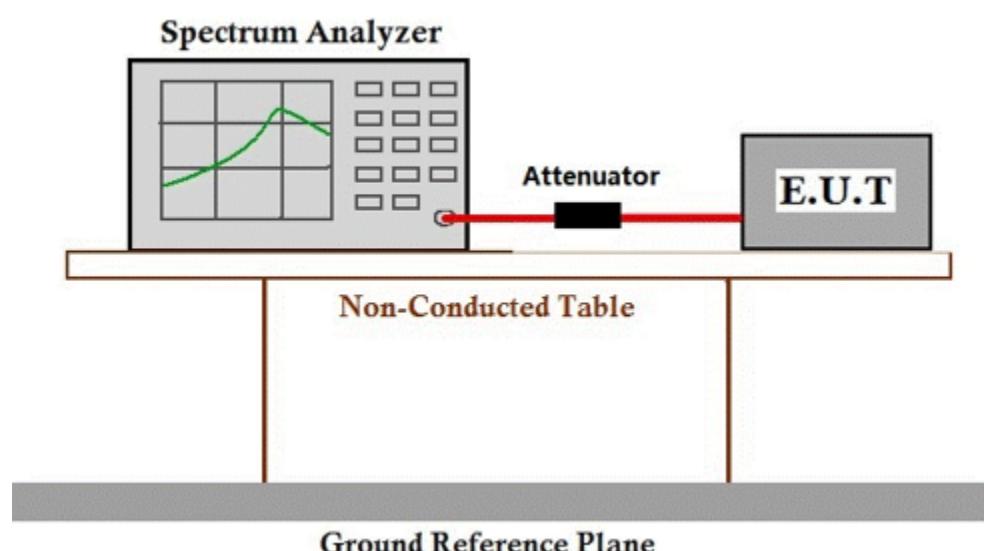
#### 7.1.1 E.U.T. Operation

Operating Environment:

Temperature: 25.4 °C Humidity: 46.5 % RH Atmospheric Pressure: 1020 mbar

Test Mode: c: TX\_non-Hop mode\_Keep the EUT in continuously transmitting mode with GFSK modulation,  $\pi/4$ DQPSK modulation. All modes have been tested and only the data of worst case is recorded in the report.

#### 7.1.2 Test Setup Diagram



#### 7.1.3 Measurement Procedure and Data

The detailed test data see: Appendix 15.247

## 7.2 20dB Bandwidth

Test Requirement 47 CFR Part 15, Subpart C 15.247(a)(1)

Test Method: ANSI C63.10 (2013) Section 6.9

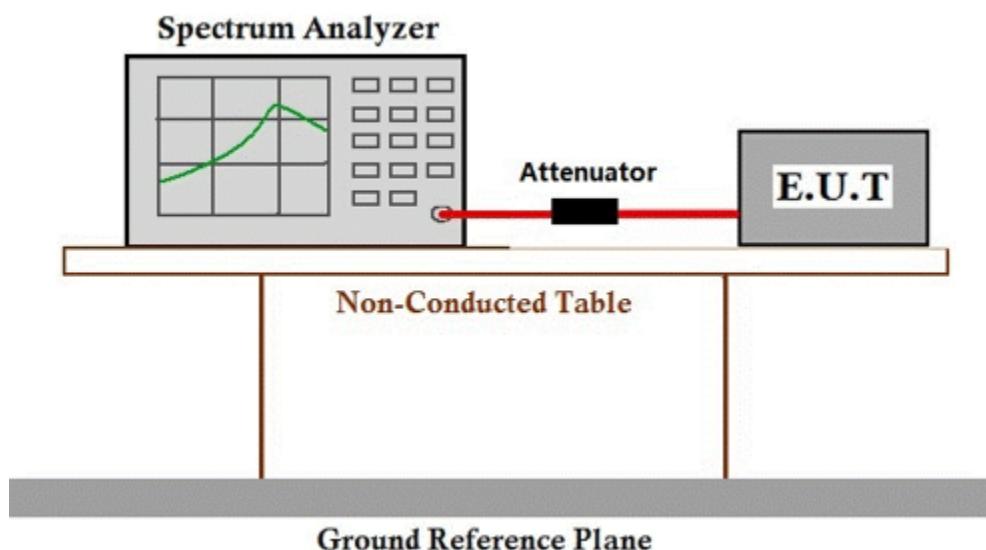
### 7.2.1 E.U.T. Operation

Operating Environment:

Temperature: 25.4 °C Humidity: 46.5 % RH Atmospheric Pressure: 1020 mbar

Test mode: c: TX\_non-Hop mode\_Keep the EUT in continuously transmitting mode with GFSK modulation,  $\pi/4$ DQPSK modulation. All modes have been tested and only the data of worst case is recorded in the report.

### 7.2.2 Test Setup Diagram



### 7.2.3 Measurement Procedure and Data

The detailed test data see: Appendix 15.247

### 7.3 Carrier Frequencies Separation

Test Requirement 47 CFR Part 15, Subpart C 15.247a(1)  
Test Method: ANSI C63.10 (2013) Section 7.8.2  
Limit: 2/3 of the 20dB bandwidth base on the transmission power is less than 0.125W

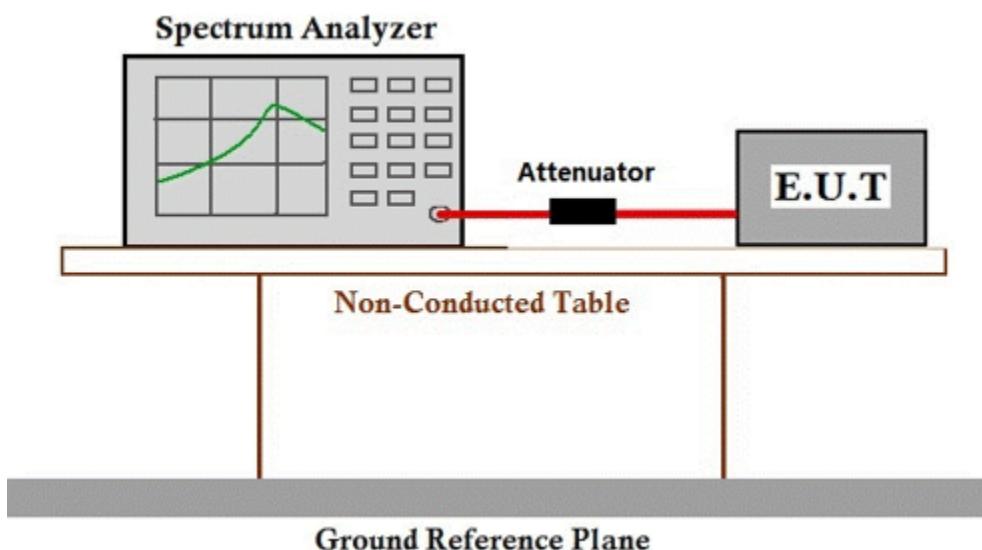
#### 7.3.1 E.U.T. Operation

Operating Environment:

Temperature: 25.4 °C Humidity: 46.5 % RH Atmospheric Pressure: 1020 mbar

Test Mode: b: TX\_Hop mode\_Keep the EUT in frequency hopping mode with GFSK modulation,  $\pi/4$ DQPSK modulation. All modes have been tested and only the data of worst case is recorded in the report.

#### 7.3.2 Test Setup Diagram



#### 7.3.3 Measurement Procedure and Data

The detailed test data see: Appendix 15.247

## 7.4 Hopping Channel Number

Test Requirement 47 CFR Part 15, Subpart C 15.247a(1)(iii)

Test Method: ANSI C63.10 (2013) Section 7.8.3

Limit:

Frequency range(MHz)	Number of hopping channels (minimum)
902-928	50 for 20dB bandwidth <250kHz
	25 for 20dB bandwidth ≥250kHz
2400-2483.5	15
5725-5850	75

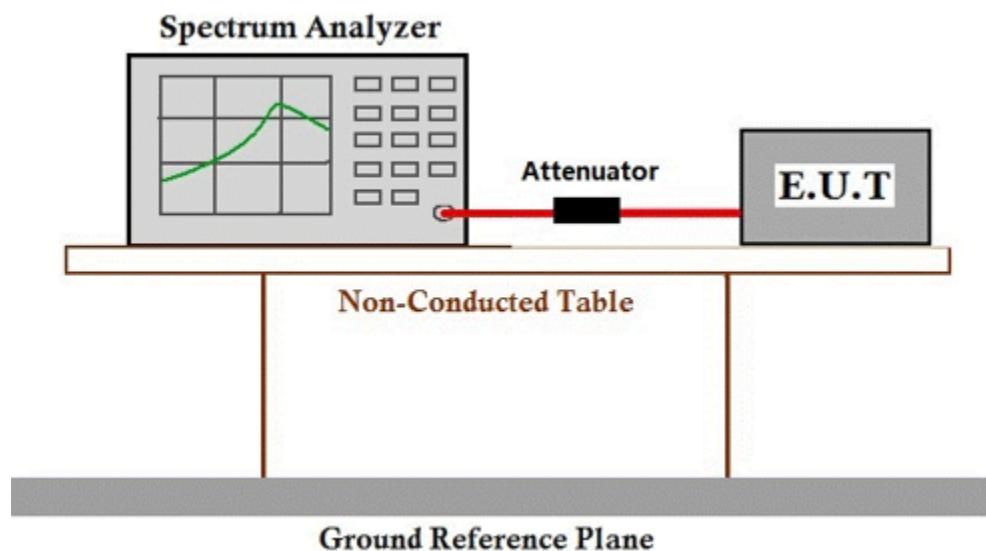
### 7.4.1 E.U.T. Operation

Operating Environment:

Temperature: 25.4 °C Humidity: 46.5 % RH Atmospheric Pressure: 1020 mbar

Test Mode: b: TX\_Hop mode\_Keep the EUT in frequency hopping mode with GFSK modulation, π/4DQPSK modulation. All modes have been tested and only the data of worst case is recorded in the report.

### 7.4.2 Test Setup Diagram



### 7.4.3 Measurement Procedure and Data

The detailed test data see: Appendix 15.247

## 7.5 Dwell Time

Test Requirement 47 CFR Part 15, Subpart C 15.247a(1)(iii)

Test Method: ANSI C63.10 (2013) Section 7.8.4

Limit:

Frequency(MHz)	Limit
902-928	0.4S within a 20S period(20dB bandwidth<250kHz)
	0.4S within a 10S period(20dB bandwidth≥250kHz)
2400-2483.5	0.4S within a period of 0.4S multiplied by the number of hopping channels
5725-5850	0.4S within a 30S period

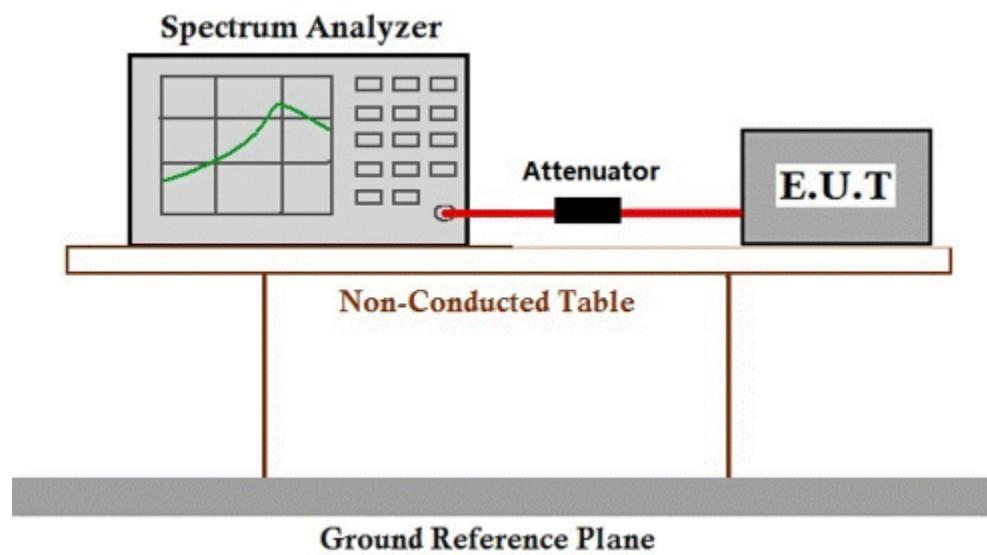
### 7.5.1 E.U.T. Operation

Operating Environment:

Temperature: 25.4 °C Humidity: 46.5 % RH Atmospheric Pressure: 1020 mbar

Test mode b: TX\_Hop mode\_Keep the EUT in frequency hopping mode with GFSK modulation, π/4DQPSK modulation. All modes have been tested and only the data of worst case is recorded in the report.

### 7.5.2 Test Setup Diagram



### 7.5.3 Measurement Procedure and Data

The detailed test data see: Appendix 15.247

## 7.6 Conducted Band Edges Measurement

Test Requirement	47 CFR Part 15, Subpart C 15.247(d)
Test Method:	ANSI C63.10 (2013) Section 7.8.6
Limit:	In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c))

### 7.6.1 E.U.T. Operation

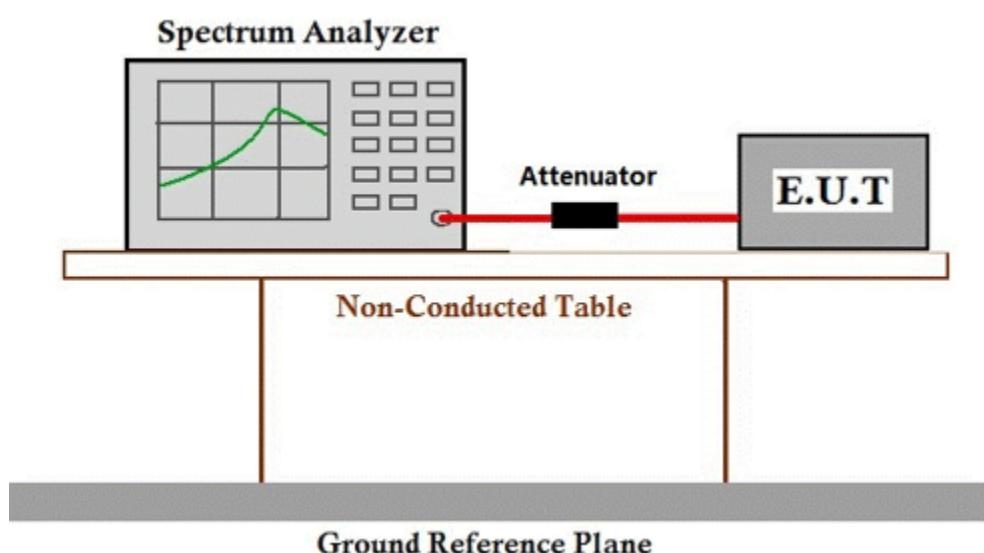
Operating Environment:

Temperature: 25.4 °C      Humidity: 46.5 % RH      Atmospheric Pressure: 1020 mbar

Test Mode: b: TX\_Hop mode\_Keep the EUT in frequency hopping mode with GFSK modulation, π/4DQPSK modulation. All modes have been tested and only the data of worst case is recorded in the report.

c: TX\_non-Hop mode\_Keep the EUT in continuously transmitting mode with GFSK modulation, π/4DQPSK modulation. All modes have been tested and only the data of worst case is recorded in the report.

### 7.6.2 Test Setup Diagram



### 7.6.3 Measurement Procedure and Data

The detailed test data see: Appendix 15.247

## 7.7 Conducted Spurious Emissions

Test Requirement	47 CFR Part 15, Subpart C 15.247(d)
Test Method:	ANSI C63.10 (2013) Section 7.8.8
Limit:	In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c))

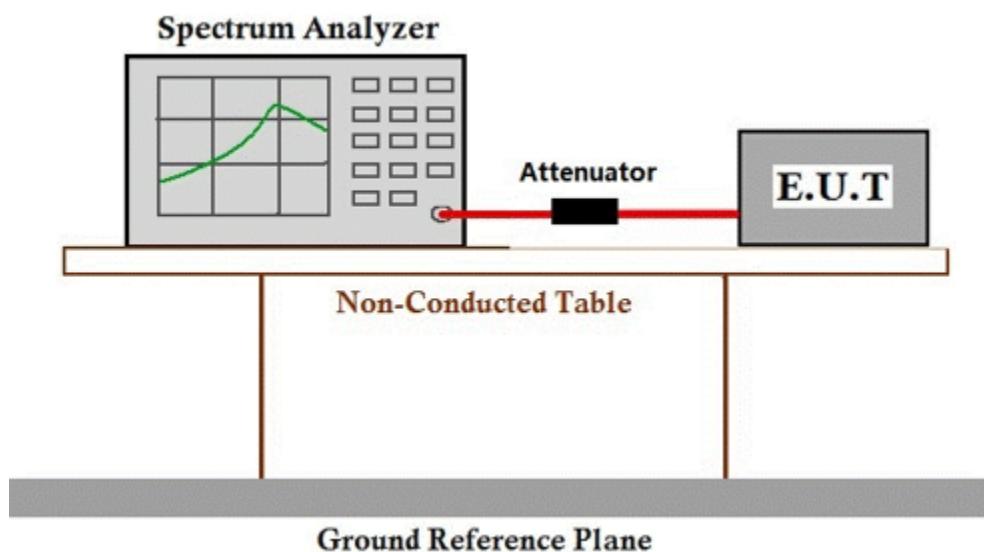
### 7.7.1 E.U.T. Operation

Operating Environment:

Temperature: 25.4 °C      Humidity: 46.5 % RH      Atmospheric Pressure: 1020 mbar

Test mode c: TX\_non-Hop mode\_Keep the EUT in continuously transmitting mode with GFSK modulation,  $\pi/4$ DQPSK modulation. All modes have been tested and only the data of worst case is recorded in the report.

### 7.7.2 Test Setup Diagram



### 7.7.3 Measurement Procedure and Data

The detailed test data see: Appendix 15.247

## 7.8 Radiated Emissions which fall in the restricted bands

Test Requirement 47 CFR Part 15, Subpart C 15.205 & 15.209

Test Method: ANSI C63.10 (2013) Section 6.10.5

Measurement Distance: 3m

Limit:

Frequency(MHz)	Field strength(microvolts/meter)	Measurement distance(meters)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30.0	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

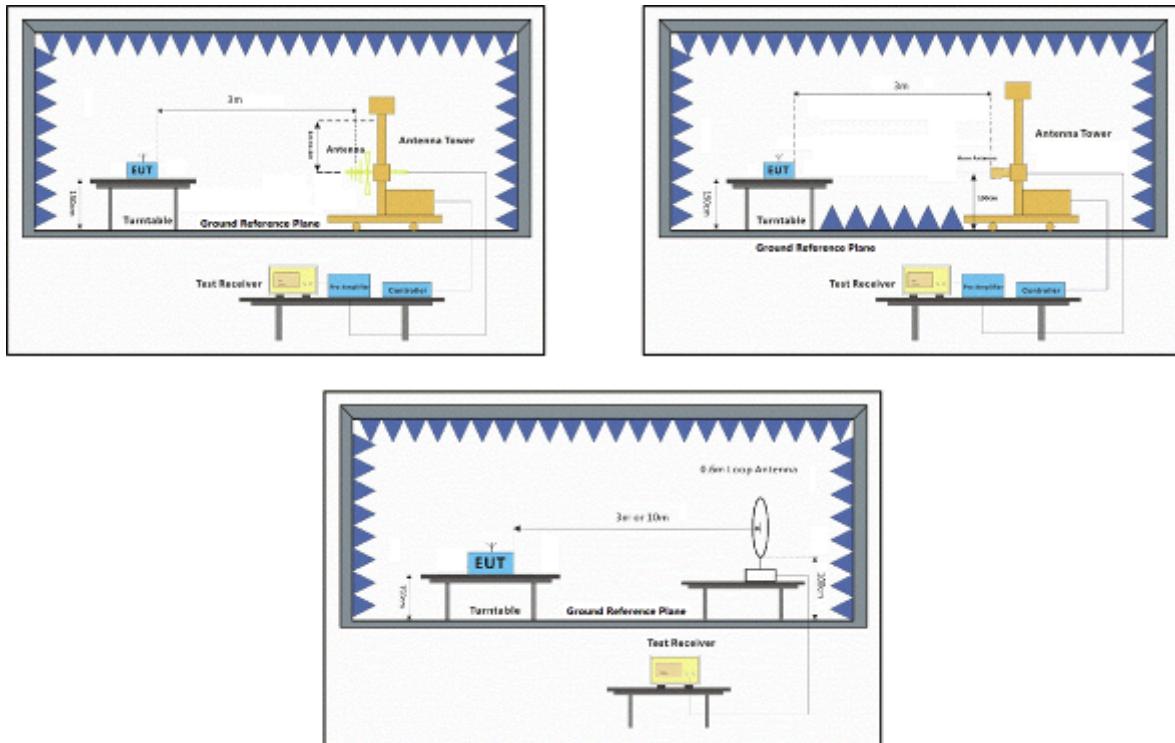
Remark: The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90kHz, 110-490kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation.

### 7.8.1 E.U.T. Operation

Operating Environment:

Temperature: 23 °C Humidity: 55 % RH Atmospheric Pressure: 1020 mbar

Test mode c: TX\_non-Hop mode\_Keep the EUT in continuously transmitting mode with GFSK modulation,  $\pi/4$ DQPSK modulation. All modes have been tested and only the data of worst case is recorded in the report.

**7.8.2 Test Setup Diagram**

### 7.8.3 Measurement Procedure and Data

- a. For below 1GHz, the EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 or 10 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. For above 1GHz, the EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter fully-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
- c. The EUT was set 3 or 10 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- d. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- e. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters (for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter) and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- f. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
- g. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.
- h. Test the EUT in the lowest channel, the middle channel, the Highest channel.
- i. The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, and found the X axis positioning which it is the worst case.
- j. Repeat above procedures until all frequencies measured was complete.

Remark 1: Level= Read Level+ Cable Loss+ Antenna Factor- Preamp Factor

Remark 2: For frequencies above 1GHz, the field strength limits are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation. For the emissions whose peak level is lower than the average limit, only the peak measurement is shown in the report.

**Above 1GHz Field Strength of Unwanted Emissions. Peak & Average Measurement**

Mode:c; Polarization:Horizontal; Modulation:GFSK; Channel:Low

Freq	ReadAntenna		Cable		Preamp	Limit	Over	Limit	Over
	Level	Factor	Loss	Factor	Level				
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
1	2310.000	40.77	26.25	5.03	37.44	34.61	54.00	-19.39	HORIZONTAL
2	2310.000	45.95	26.25	5.03	37.44	39.79	74.00	-34.21	HORIZONTAL
3	2390.000	46.81	26.43	4.88	37.42	40.70	54.00	-13.30	HORIZONTAL
4	2390.000	51.71	26.43	4.88	37.42	45.60	74.00	-28.40	HORIZONTAL
5	2483.500	41.26	26.58	5.23	37.40	35.67	54.00	-18.33	HORIZONTAL
6	2483.500	45.24	26.58	5.23	37.40	39.65	74.00	-34.35	HORIZONTAL
7	2500.000	40.75	26.60	4.95	37.39	34.91	54.00	-19.09	HORIZONTAL
8	2500.000	46.22	26.60	4.95	37.39	40.38	74.00	-33.62	HORIZONTAL

Mode:c; Polarization:Vertical; Modulation:GFSK; Channel:Low

Freq	ReadAntenna		Cable		Preamp	Limit	Over	Limit	Over
	Level	Factor	Loss	Factor	Level				
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
1	2310.000	42.98	26.25	5.03	37.44	36.82	54.00	-17.18	VERTICAL
2	2310.000	45.47	26.25	5.03	37.44	39.31	74.00	-34.69	VERTICAL
3	2390.000	45.09	26.43	4.88	37.42	38.98	54.00	-15.02	VERTICAL
4	2390.000	49.54	26.43	4.88	37.42	43.43	74.00	-30.57	VERTICAL
5	2483.500	40.70	26.58	5.23	37.40	35.11	54.00	-18.89	VERTICAL
6	2483.500	46.45	26.58	5.23	37.40	40.86	74.00	-33.14	VERTICAL
7	2500.000	40.96	26.60	4.95	37.39	35.12	54.00	-18.88	VERTICAL
8	2500.000	47.02	26.60	4.95	37.39	41.18	74.00	-32.82	VERTICAL

Mode:c; Polarization:Horizontal; Modulation:GFSK; Channel:High

Freq	ReadAntenna		Cable		Preamp Level	Limit Line	Over Limit	Over Limit Pol/Phase
	Level	Factor	Loss	Factor				
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB
1	2310.000	41.88	26.25	5.03	37.44	35.72	54.00	-18.28 HORIZONTAL
2	2310.000	45.60	26.25	5.03	37.44	39.44	74.00	-34.56 HORIZONTAL
3	2390.000	42.06	26.43	4.88	37.42	35.95	54.00	-18.05 HORIZONTAL
4	2390.000	47.50	26.43	4.88	37.42	41.39	74.00	-32.61 HORIZONTAL
5	2483.500	53.21	26.58	5.23	37.40	47.62	54.00	-6.38 HORIZONTAL
6	2483.500	59.09	26.58	5.23	37.40	53.50	74.00	-20.50 HORIZONTAL
7	2500.000	50.84	26.60	4.95	37.39	45.00	54.00	-9.00 HORIZONTAL
8	2500.000	56.84	26.60	4.95	37.39	51.00	74.00	-23.00 HORIZONTAL

Mode:c; Polarization:Vertical; Modulation:GFSK; Channel:High

Freq	ReadAntenna		Cable		Preamp Level	Limit Line	Over Limit	Over Limit Pol/Phase
	Level	Factor	Loss	Factor				
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB
1	2310.000	43.93	26.25	5.03	37.44	37.77	54.00	-16.23 VERTICAL
2	2310.000	46.32	26.25	5.03	37.44	40.16	74.00	-33.84 VERTICAL
3	2390.000	42.01	26.43	4.88	37.42	35.90	54.00	-18.10 VERTICAL
4	2390.000	46.77	26.43	4.88	37.42	40.66	74.00	-33.34 VERTICAL
5	2483.500	47.26	26.58	5.23	37.40	41.67	54.00	-12.33 VERTICAL
6	2483.500	52.29	26.58	5.23	37.40	46.70	74.00	-27.30 VERTICAL
7	2500.000	46.96	26.60	4.95	37.39	41.12	54.00	-12.88 VERTICAL
8	2500.000	52.88	26.60	4.95	37.39	47.04	74.00	-26.96 VERTICAL

## 7.9 Radiated Spurious Emissions

Test Requirement 47 CFR Part 15, Subpart C 15.205 & 15.209

Test Method: ANSI C63.10 (2013) Section 6.10.4

Measurement Distance: 3m

Limit:

Frequency(MHz)	Field strength(microvolts/meter)	Measurement distance(meters)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30.0	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

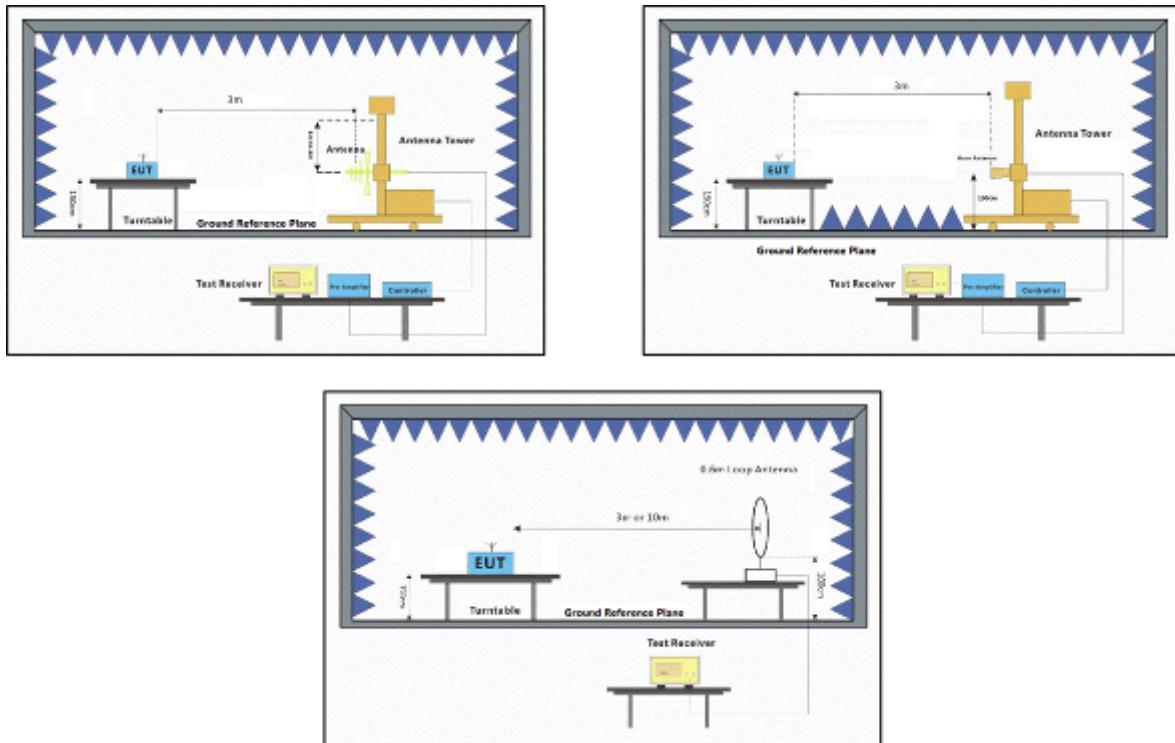
Remark: The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90kHz, 110-490kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation.

### 7.9.1 E.U.T. Operation

Operating Environment:

Temperature: 23 °C Humidity: 55 % RH Atmospheric Pressure: 1020 mbar

Test mode c: TX\_non-Hop mode\_Keep the EUT in continuously transmitting mode with GFSK modulation, π/4DQPSK modulation. All modes have been tested and only the data of worst case is recorded in the report.

**7.9.2 Test Setup Diagram**

### 7.9.3 Measurement Procedure and Data

- a. For below 1GHz, the EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 or 10 meters semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. For above 1GHz, the EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter fully-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
- c. The EUT was set 3 or 10 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- d. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- e. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters (for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter) and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- f. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
- g. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.
- h. Test the EUT in the lowest channel, the middle channel, the Highest channel.
- i. The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, and found the X axis positioning which it is the worst case.
- j. Repeat above procedures until all frequencies measured was complete.

Remark:

- 1) For emission below 1GHz, through pre-scan found the worst case is the lowest channel. Only the worst case is recorded in the report.
- 2) The field strength is calculated by adding the Antenna Factor, Cable Factor & Preamplifier. The basic equation with a sample calculation is as follows:

Final Test Level = Receiver Reading + Antenna Factor + Cable Factor – Preamplifier Factor

- 3) Scan from 9kHz to 25GHz, the disturbance above 18GHz and below 30MHz was very low. The points marked on above plots are the highest emissions could be found when testing, so only above points had been displayed. The amplitude of spurious emissions from the radiator which are attenuated more than 20dB below the limit need not be reported.

- 4) For frequencies above 1GHz, the field strength limits are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation. For the emissions whose peak level is lower than the average limit, only the peak measurement is shown

Mode:c; Polarization:Horizontal; Modulation:GFSK; Channel:Low

Freq	ReadAntenna		Cable		Preamp Level	Limit Line	Over Limit	Over Limit Pol/Phase
	MHz	dBuV	dB/m	dB				
1	50.409	41.67	12.98	0.60	24.88	30.37	40.00	-9.63 HORIZONTAL
2	61.995	49.21	12.00	0.60	25.27	36.54	40.00	-3.46 HORIZONTAL
3	96.099	47.95	8.97	0.85	27.01	30.76	43.50	-12.74 HORIZONTAL
4	144.335	50.57	13.15	1.09	28.15	36.66	43.50	-6.84 HORIZONTAL
5	191.745	51.35	11.74	1.26	28.22	36.13	43.50	-7.37 HORIZONTAL
6	240.830	49.29	12.41	1.57	29.21	34.06	46.00	-11.94 HORIZONTAL

Mode:c; Polarization:Horizontal; Modulation:GFSK; Channel:Low

Freq	ReadAntenna		Cable		Preamp Level	Limit Line	Over Limit	Over Limit Pol/Phase
	MHz	dBuV	dB/m	dB				
1	2990.531	42.59	27.89	4.63	37.08	38.03	54.00	-15.97 HORIZONTAL
2	2990.531	48.15	27.89	4.63	37.08	43.59	74.00	-30.41 HORIZONTAL
3	3536.341	41.45	27.99	6.16	36.95	38.65	54.00	-15.35 HORIZONTAL
4	3536.341	47.94	27.99	6.16	36.95	45.14	74.00	-28.86 HORIZONTAL
5	4804.520	41.07	30.79	5.87	36.94	40.79	54.00	-13.21 HORIZONTAL
6	4804.520	46.37	30.79	5.87	36.94	46.09	74.00	-27.91 HORIZONTAL
7	7206.263	37.06	35.45	7.34	36.93	42.92	54.00	-11.08 HORIZONTAL
8	7206.263	42.65	35.45	7.34	36.93	48.51	74.00	-25.49 HORIZONTAL
9	9608.452	37.84	37.51	8.15	37.08	46.42	54.00	-7.58 HORIZONTAL
10	9608.452	43.08	37.51	8.15	37.08	51.66	74.00	-22.34 HORIZONTAL
11	12010.540	35.51	39.50	10.67	37.20	48.48	54.00	-5.52 HORIZONTAL
12	12010.540	44.01	39.50	10.67	37.20	56.98	74.00	-17.02 HORIZONTAL

Mode:c; Polarization:Vertical; Modulation:GFSK; Channel:Low

Freq	ReadAntenna		Cable		Preamp Level	Limit Line	Over Limit	Over Limit Pol/Phase
	MHz	dBuV	dB/m	dB				
1	50.409	38.34	12.98	0.60	24.88	27.04	40.00	-12.96 VERTICAL
2	61.995	44.37	12.00	0.60	25.27	31.70	40.00	-8.30 VERTICAL
3	96.099	43.62	8.97	0.85	27.01	26.43	43.50	-17.07 VERTICAL
4	191.745	46.70	11.74	1.26	28.22	31.48	43.50	-12.02 VERTICAL
5	504.706	32.30	18.28	2.20	29.69	23.09	46.00	-22.91 VERTICAL
6	747.483	28.23	22.05	3.06	29.14	24.20	46.00	-21.80 VERTICAL

Mode:c; Polarization:Vertical; Modulation:GFSK; Channel:Low

Freq	ReadAntenna		Cable		Preamp Level	Limit Line	Over Limit	Over Limit Pol/Phase
	MHz	dBuV	dB/m	dB				
1	2822.558	42.33	27.59	4.73	37.21	37.44	54.00	-16.56 VERTICAL
2	2822.558	47.78	27.59	4.73	37.21	42.89	74.00	-31.11 VERTICAL
3	3308.894	44.25	27.90	5.66	36.98	40.83	54.00	-13.17 VERTICAL
4	3308.894	49.43	27.90	5.66	36.98	46.01	74.00	-27.99 VERTICAL
5	4804.110	48.29	30.79	5.87	36.94	48.01	54.00	-5.99 VERTICAL
6	4804.110	54.29	30.79	5.87	36.94	54.01	74.00	-19.99 VERTICAL
7	7206.049	40.86	35.45	7.34	36.93	46.72	54.00	-7.28 VERTICAL
8	7206.049	45.78	35.45	7.34	36.93	51.64	74.00	-22.36 VERTICAL
9	9608.982	35.28	37.51	8.15	37.08	43.86	54.00	-10.14 VERTICAL
10	9608.982	41.60	37.51	8.15	37.08	50.18	74.00	-23.82 VERTICAL
11	12010.530	35.19	39.50	10.67	37.20	48.16	54.00	-5.84 VERTICAL
12	12010.530	41.22	39.50	10.67	37.20	54.19	74.00	-19.81 VERTICAL

Mode:c; Polarization:Horizontal; Modulation:GFSK; Channel:middle

Freq	ReadAntenna		Cable		Preamp	Level	Limit	Over	Pol/Phase
	Level	Factor	Loss	Factor					
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
1	3007.868	44.37	27.90	4.65	37.07	39.85	54.00	-14.15	HORIZONTAL
2	3007.868	44.66	27.90	4.65	37.07	40.14	74.00	-33.86	HORIZONTAL
3	3924.135	40.37	29.35	7.47	36.91	40.28	54.00	-13.72	HORIZONTAL
4	3924.135	45.34	29.35	7.47	36.91	45.25	74.00	-28.75	HORIZONTAL
5	4882.043	50.06	30.95	6.86	36.95	50.92	54.00	-3.08	HORIZONTAL
6	4882.043	58.79	30.95	6.86	36.95	59.65	74.00	-14.35	HORIZONTAL
7	7323.520	37.91	35.74	7.39	36.92	44.12	54.00	-9.88	HORIZONTAL
8	7323.520	42.84	35.74	7.39	36.92	49.05	74.00	-24.95	HORIZONTAL
9	9764.542	36.54	37.70	8.33	37.09	45.48	54.00	-8.52	HORIZONTAL
10	9764.542	42.93	37.70	8.33	37.09	51.87	74.00	-22.13	HORIZONTAL
11	12205.850	36.86	39.21	10.98	37.06	49.99	54.00	-4.01	HORIZONTAL
12	12205.850	44.84	39.21	10.98	37.06	57.97	74.00	-16.03	HORIZONTAL

Mode:c; Polarization:Vertical; Modulation:GFSK; Channel:middle

Freq	ReadAntenna		Cable		Preamp	Level	Limit	Over	Pol/Phase
	Level	Factor	Loss	Factor					
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
1	2990.531	50.09	27.89	4.63	37.08	45.53	54.00	-8.47	VERTICAL
2	2990.531	54.79	27.89	4.63	37.08	50.23	74.00	-23.77	VERTICAL
3	3834.438	39.61	29.12	7.80	36.91	39.62	54.00	-14.38	VERTICAL
4	3834.438	45.96	29.12	7.80	36.91	45.97	74.00	-28.03	VERTICAL
5	4882.043	48.31	30.95	6.86	36.95	49.17	54.00	-4.83	VERTICAL
6	4882.043	55.29	30.95	6.86	36.95	56.15	74.00	-17.85	VERTICAL
7	7323.914	39.11	35.74	7.39	36.92	45.32	54.00	-8.68	VERTICAL
8	7323.914	45.31	35.74	7.39	36.92	51.52	74.00	-22.48	VERTICAL
9	9764.140	38.97	37.70	8.33	37.09	47.91	54.00	-6.09	VERTICAL
10	9764.140	45.28	37.70	8.33	37.09	54.22	74.00	-19.78	VERTICAL
11	12205.950	38.38	39.21	10.98	37.06	51.51	54.00	-2.49	VERTICAL
12	12205.950	44.61	39.21	10.98	37.06	57.74	74.00	-16.26	VERTICAL

Mode:c; Polarization:Horizontal; Modulation:GFSK; Channel:High

Freq	ReadAntenna		Cable		Preamp	Level	Limit	Over	Over
	Level	Factor	Loss	Factor					
	MHz	dBuV	dB/m		dB	dB	dBuV/m	dBuV/m	dB
1	2990.531	42.70	27.89	4.63	37.08	38.14	54.00	-15.86	HORIZONTAL
2	2990.531	47.75	27.89	4.63	37.08	43.19	74.00	-30.81	HORIZONTAL
3	3867.831	39.34	29.22	7.69	36.91	39.34	54.00	-14.66	HORIZONTAL
4	3867.831	44.88	29.22	7.69	36.91	44.88	74.00	-29.12	HORIZONTAL
5	4960.307	46.54	31.05	7.84	36.96	48.47	54.00	-5.53	HORIZONTAL
6	4960.307	57.05	31.05	7.84	36.96	58.98	74.00	-15.02	HORIZONTAL
7	7440.524	39.12	35.92	7.43	36.92	45.55	54.00	-8.45	HORIZONTAL
8	7440.524	45.56	35.92	7.43	36.92	51.99	74.00	-22.01	HORIZONTAL
9	9920.640	38.06	37.92	8.63	37.10	47.51	54.00	-6.49	HORIZONTAL
10	9920.640	46.71	37.92	8.63	37.10	56.16	74.00	-17.84	HORIZONTAL
11	12400.880	36.29	38.93	11.17	36.90	49.49	54.00	-4.51	HORIZONTAL
12	12400.880	46.83	38.93	11.17	36.90	60.03	74.00	-13.97	HORIZONTAL

Mode:c; Polarization:Vertical; Modulation:GFSK; Channel:High

Freq	ReadAntenna		Cable		Preamp	Level	Limit	Over	Over
	Level	Factor	Loss	Factor					
	MHz	dBuV	dB/m		dB	dB	dBuV/m	dBuV/m	dB
1	2990.531	44.82	27.89	4.63	37.08	40.26	54.00	-13.74	VERTICAL
2	2990.531	49.11	27.89	4.63	37.08	44.55	74.00	-29.45	VERTICAL
3	3834.438	40.33	29.12	7.80	36.91	40.34	54.00	-13.66	VERTICAL
4	3834.438	45.33	29.12	7.80	36.91	45.34	74.00	-28.66	VERTICAL
5	4960.307	46.22	31.05	7.84	36.96	48.15	54.00	-5.85	VERTICAL
6	4960.307	53.69	31.05	7.84	36.96	55.62	74.00	-18.38	VERTICAL
7	7440.879	38.77	35.92	7.43	36.92	45.20	54.00	-8.80	VERTICAL
8	7440.879	43.20	35.92	7.43	36.92	49.63	74.00	-24.37	VERTICAL
9	9920.161	37.97	37.92	8.63	37.10	47.42	54.00	-6.58	VERTICAL
10	9920.161	42.62	37.92	8.63	37.10	52.07	74.00	-21.93	VERTICAL
11	12400.540	37.17	38.93	11.17	36.90	50.37	54.00	-3.63	VERTICAL
12	12400.540	44.39	38.93	11.17	36.90	57.59	74.00	-16.41	VERTICAL

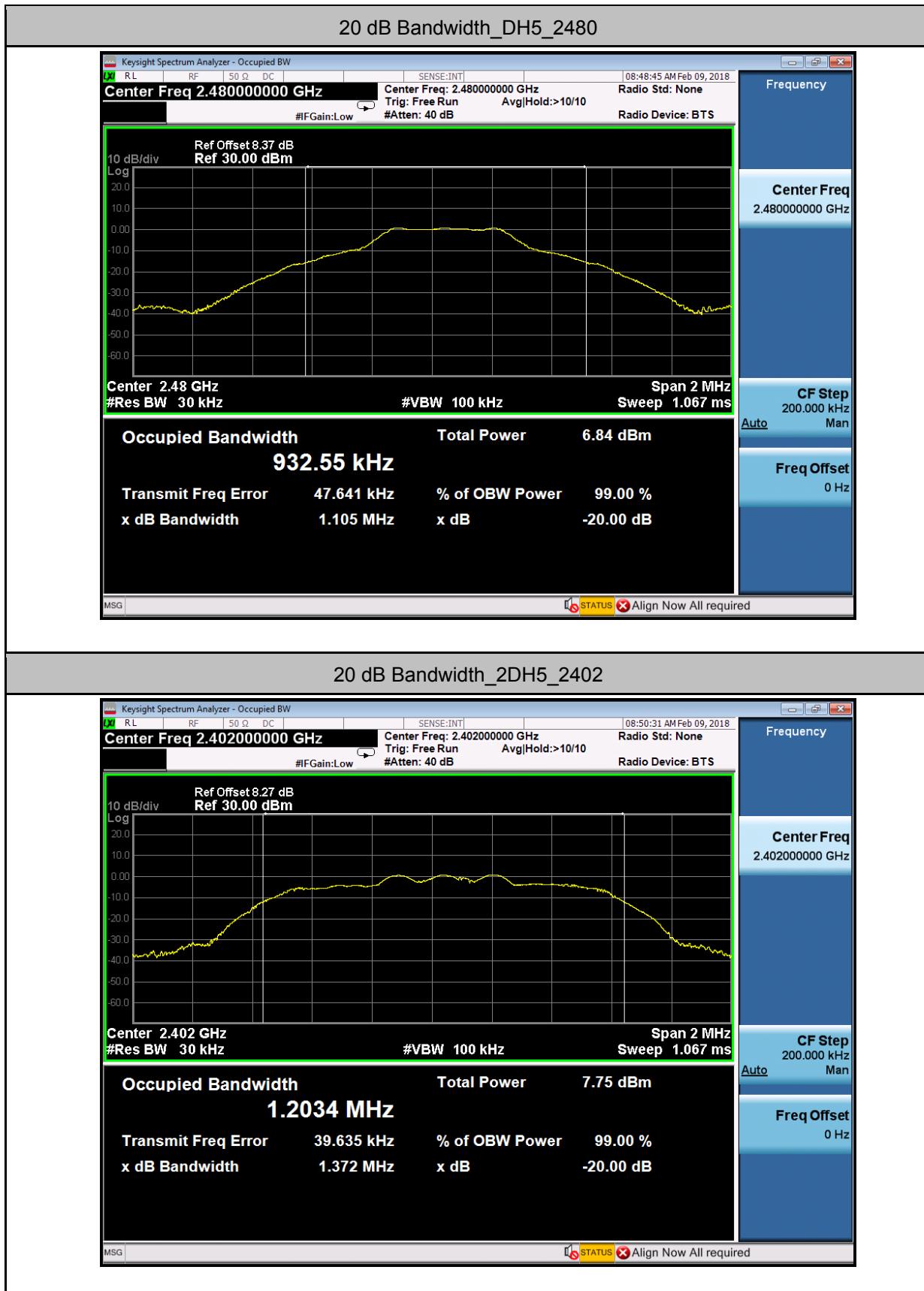
## **8 Appendix**

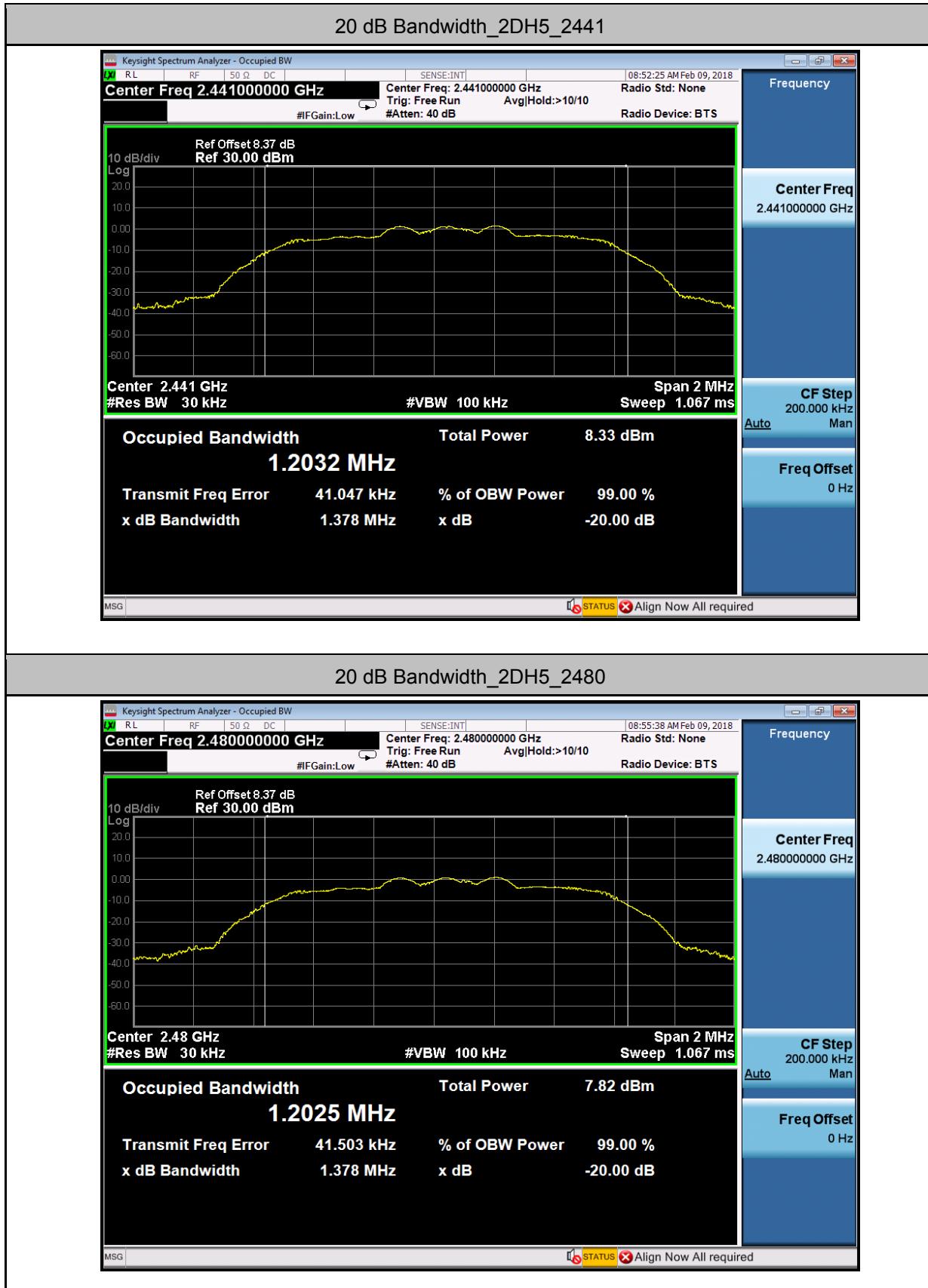
### **8.1 Appendix 15.247**

#### **1.20 dB Bandwidth**

Test Mode	Test Channel	OBW[MHz]	2/3 bandwidth (MHz)	Verdict
DH5	2402	1.101	0.734	PASS
DH5	2441	1.101	0.734	PASS
DH5	2480	1.105	0.737	PASS
2DH5	2402	1.372	0.915	PASS
2DH5	2441	1.378	0.919	PASS
2DH5	2480	1.378	0.919	PASS

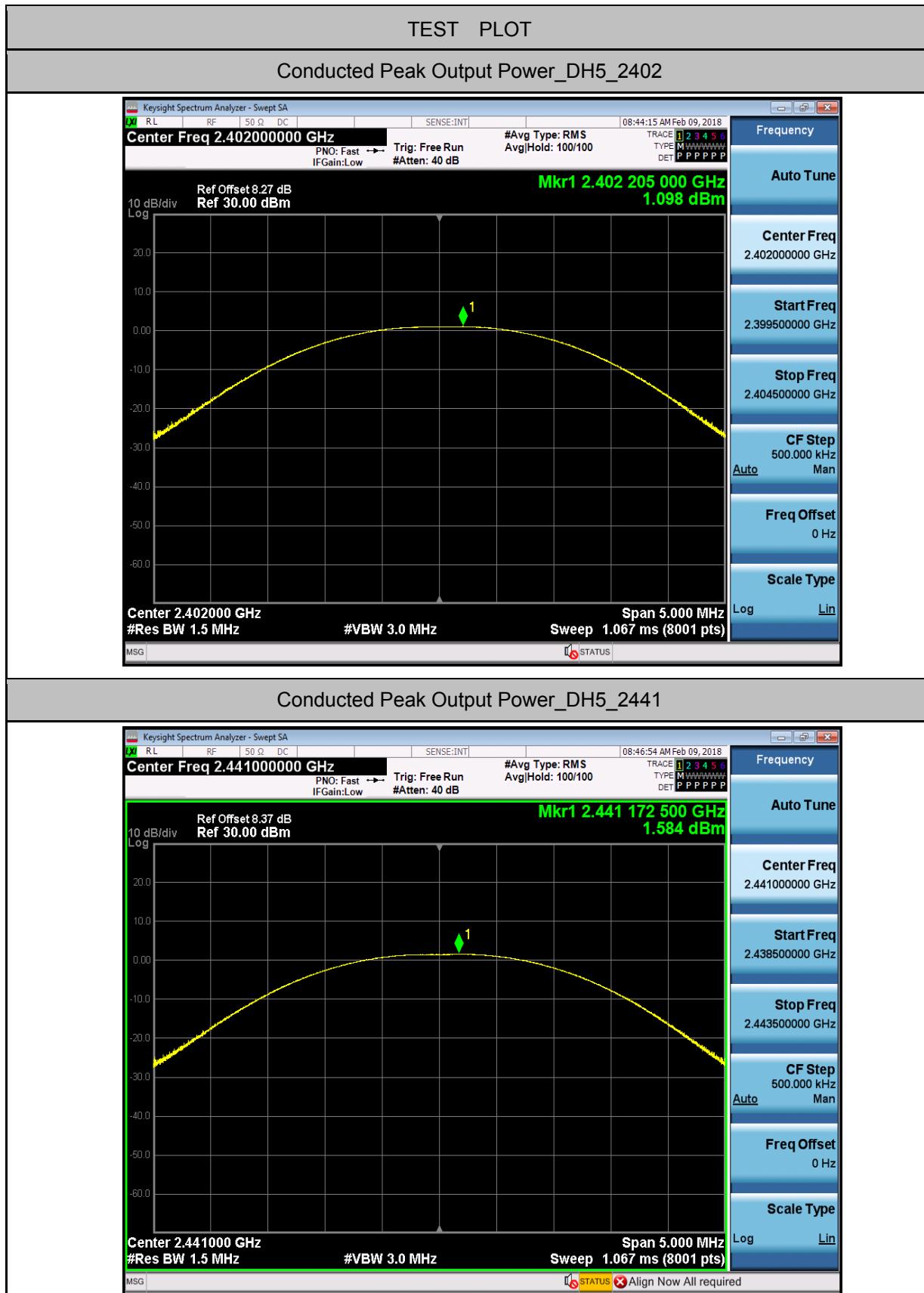




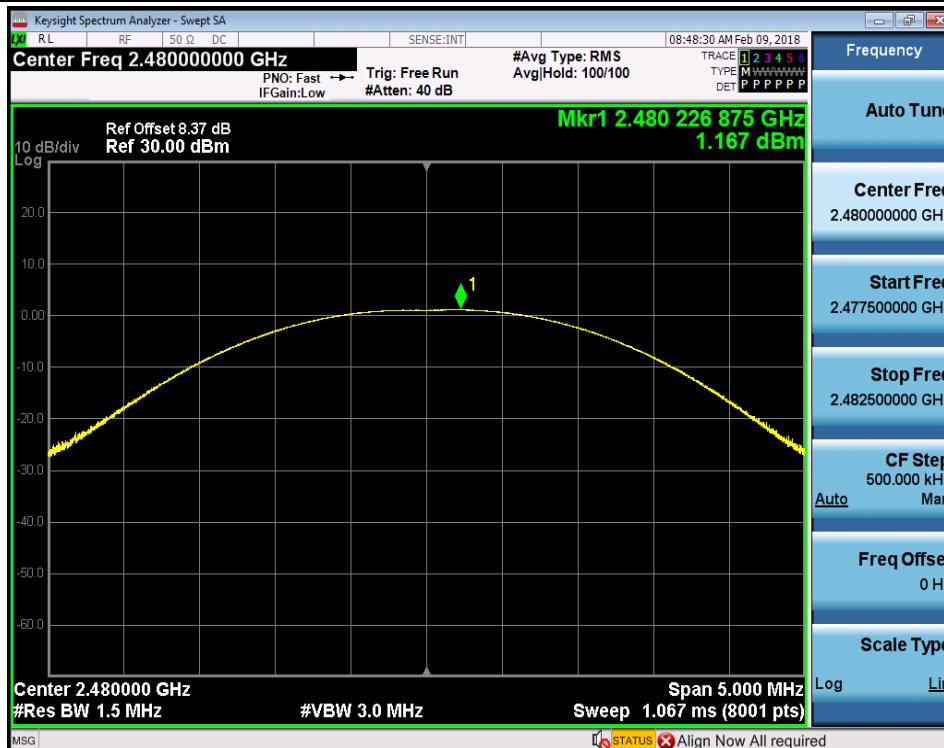


**2. Conducted Peak Output Power**

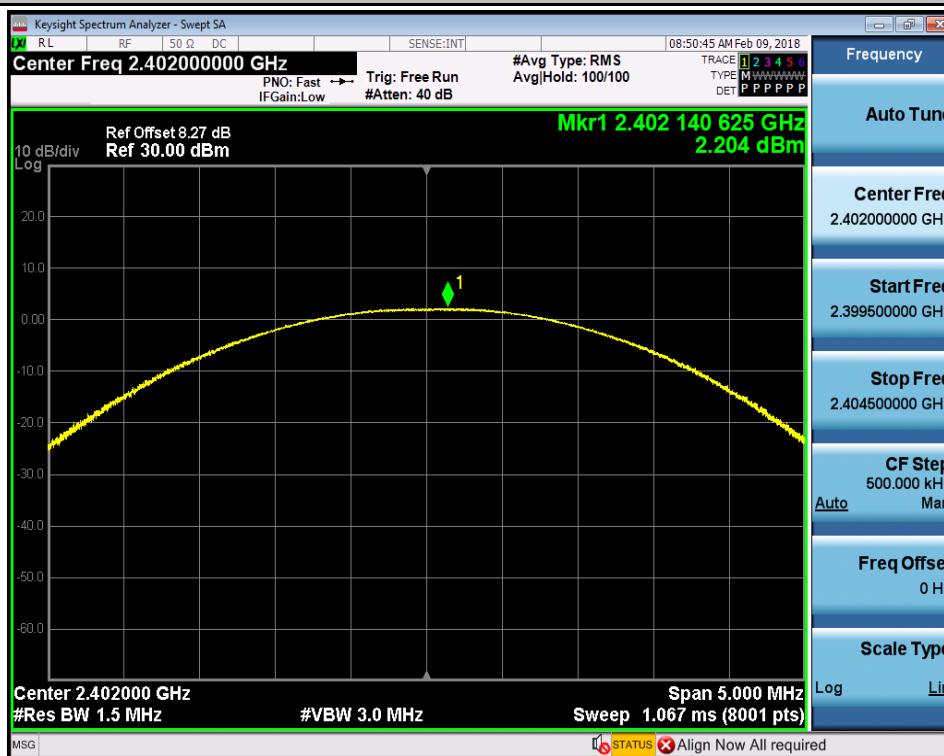
Test Mode	Test Channel	Power[dBm]	Limit[dBm]	Verdict
DH5	2402	1.098	21	PASS
DH5	2441	1.584	21	PASS
DH5	2480	1.167	21	PASS
2DH5	2402	2.204	21	PASS
2DH5	2441	2.788	21	PASS
2DH5	2480	2.297	21	PASS



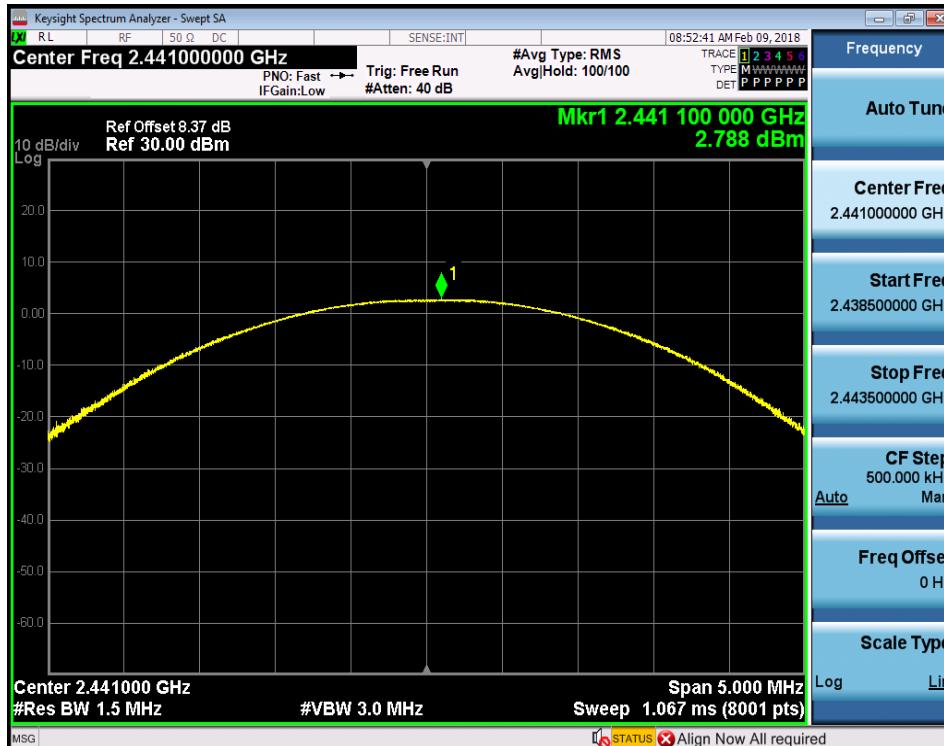
## Conducted Peak Output Power\_DH5\_2480



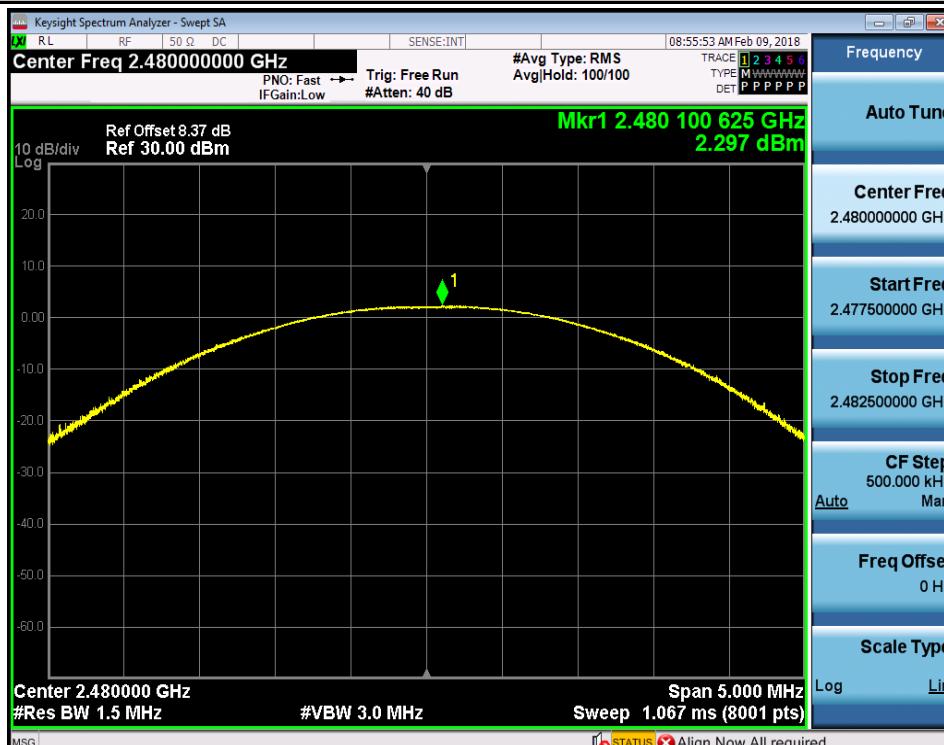
## Conducted Peak Output Power\_2DH5\_2402



## Conducted Peak Output Power\_2DH5\_2441

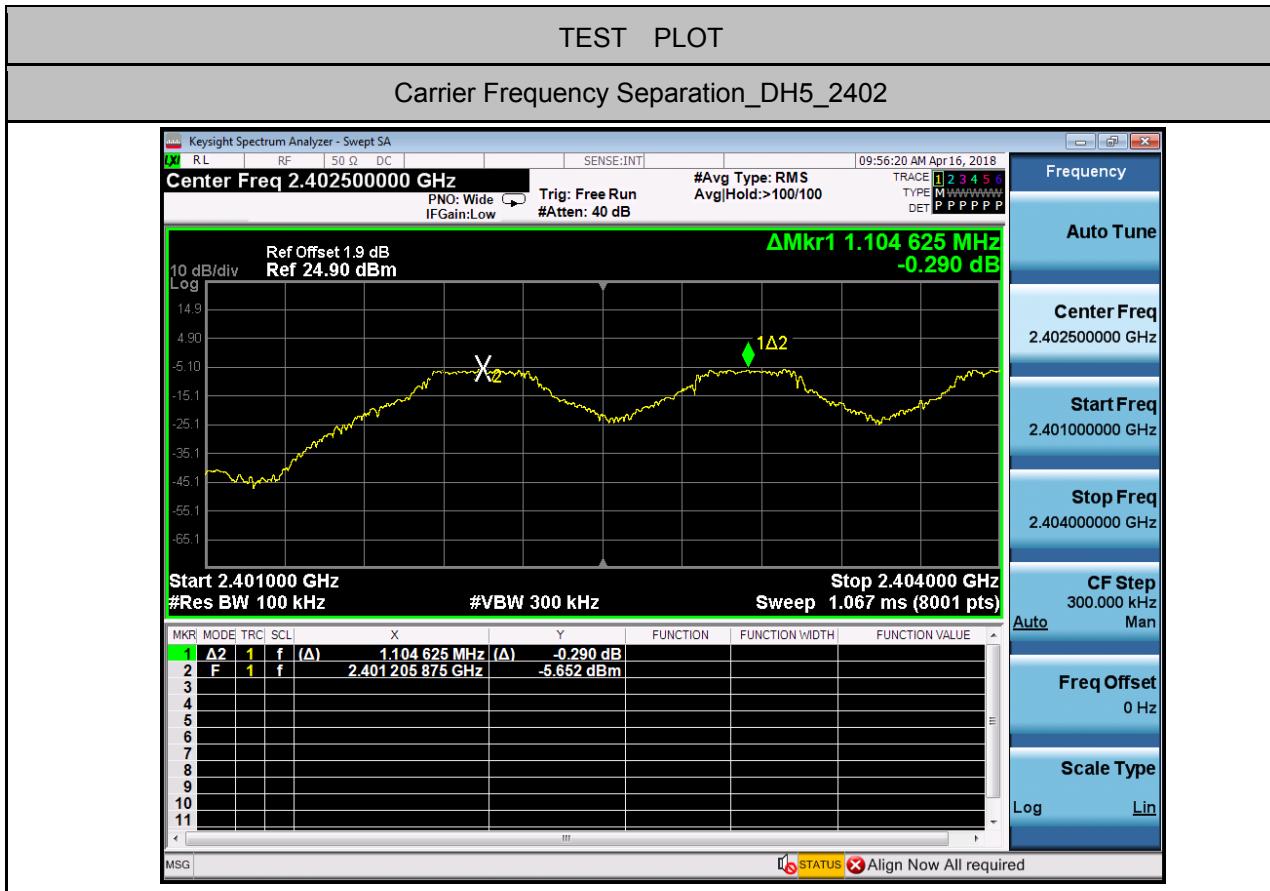


## Conducted Peak Output Power\_2DH5\_2480



### 3. Carrier Frequency Separation

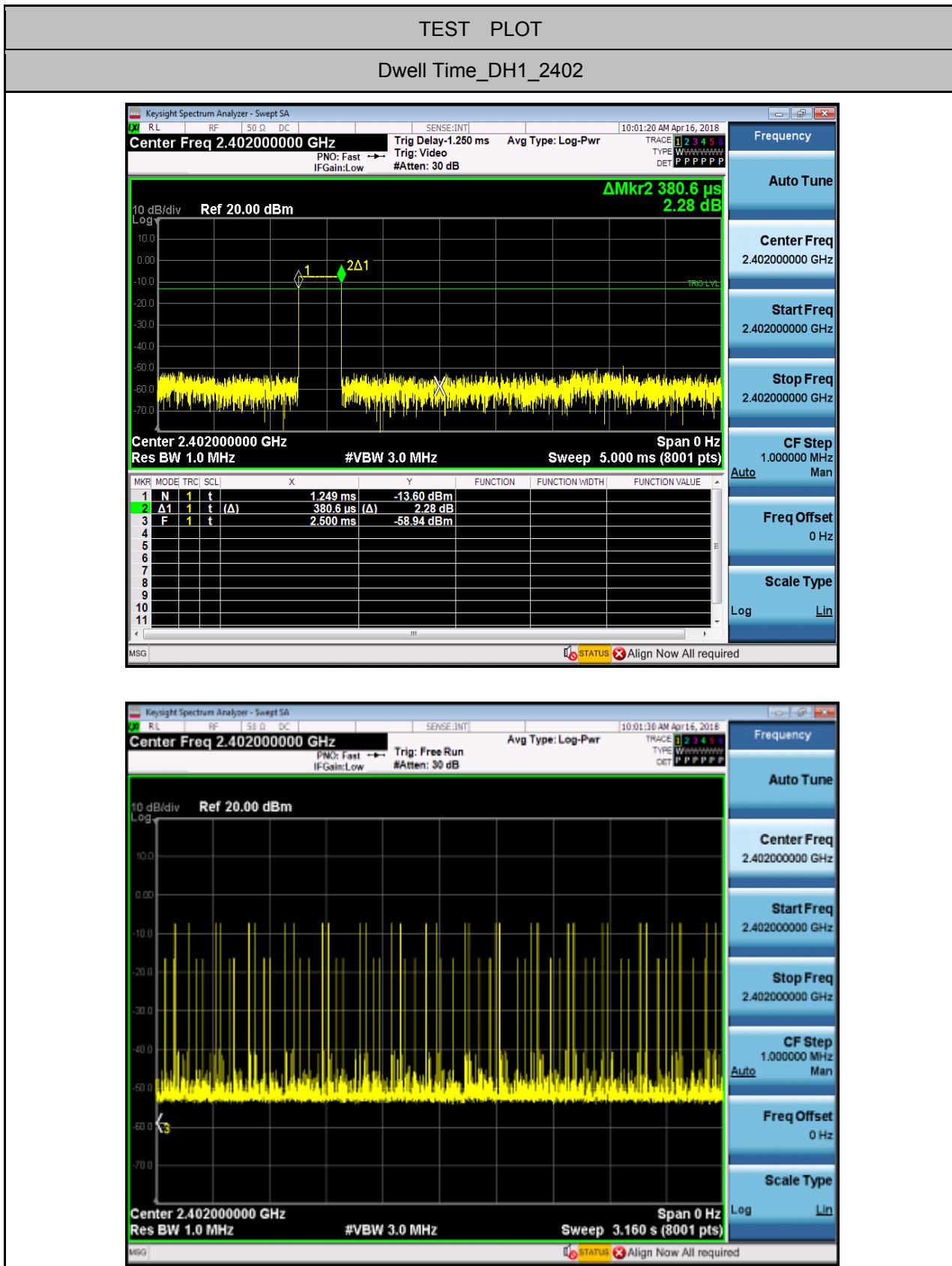
Test Mode	Test Channel	Result[MHz]	Limit[MHz]	Verdict
DH5	2402	1.105	0.734	PASS
DH5	2441	1.011	0.734	PASS
DH5	2480	1.071	0.737	PASS

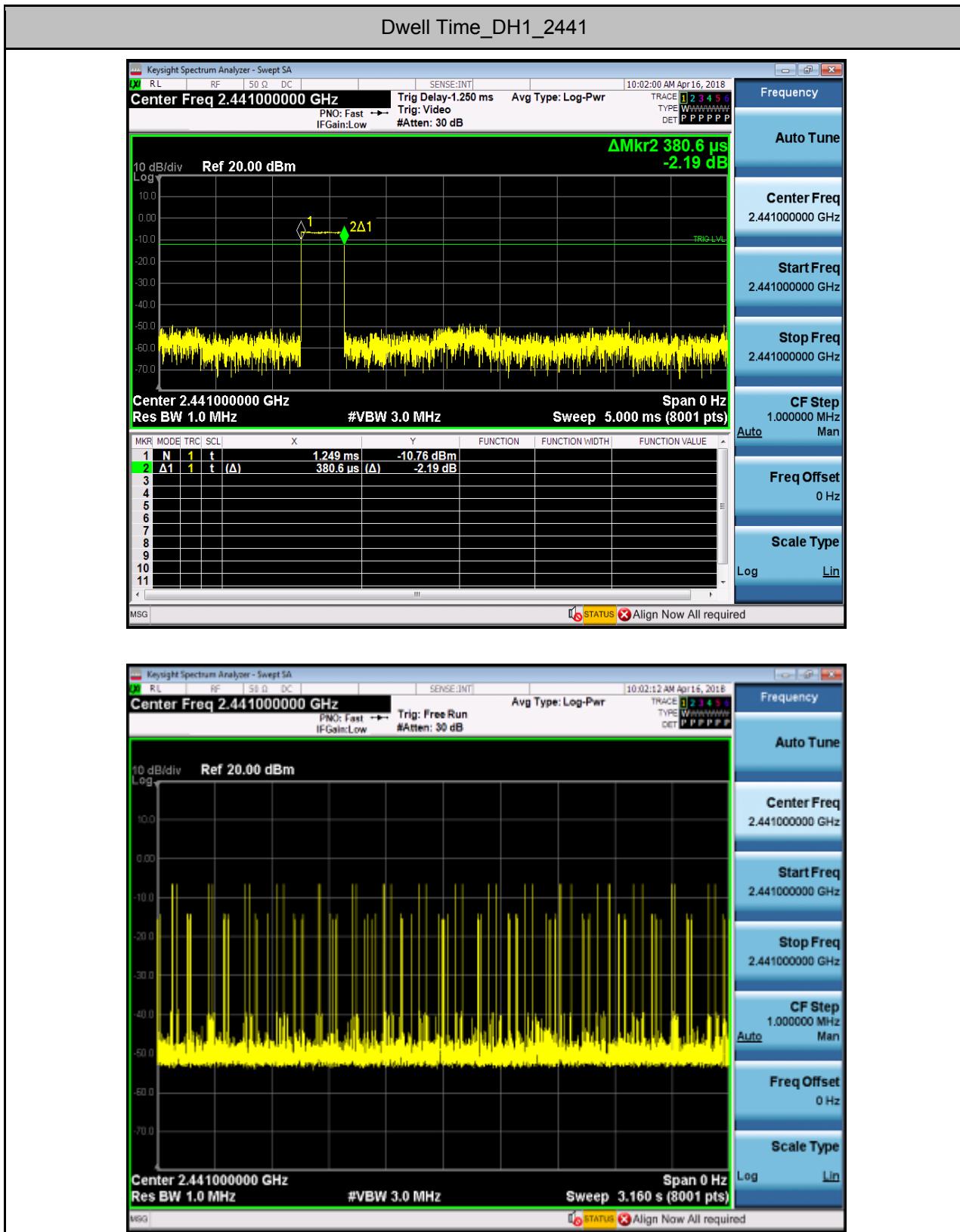


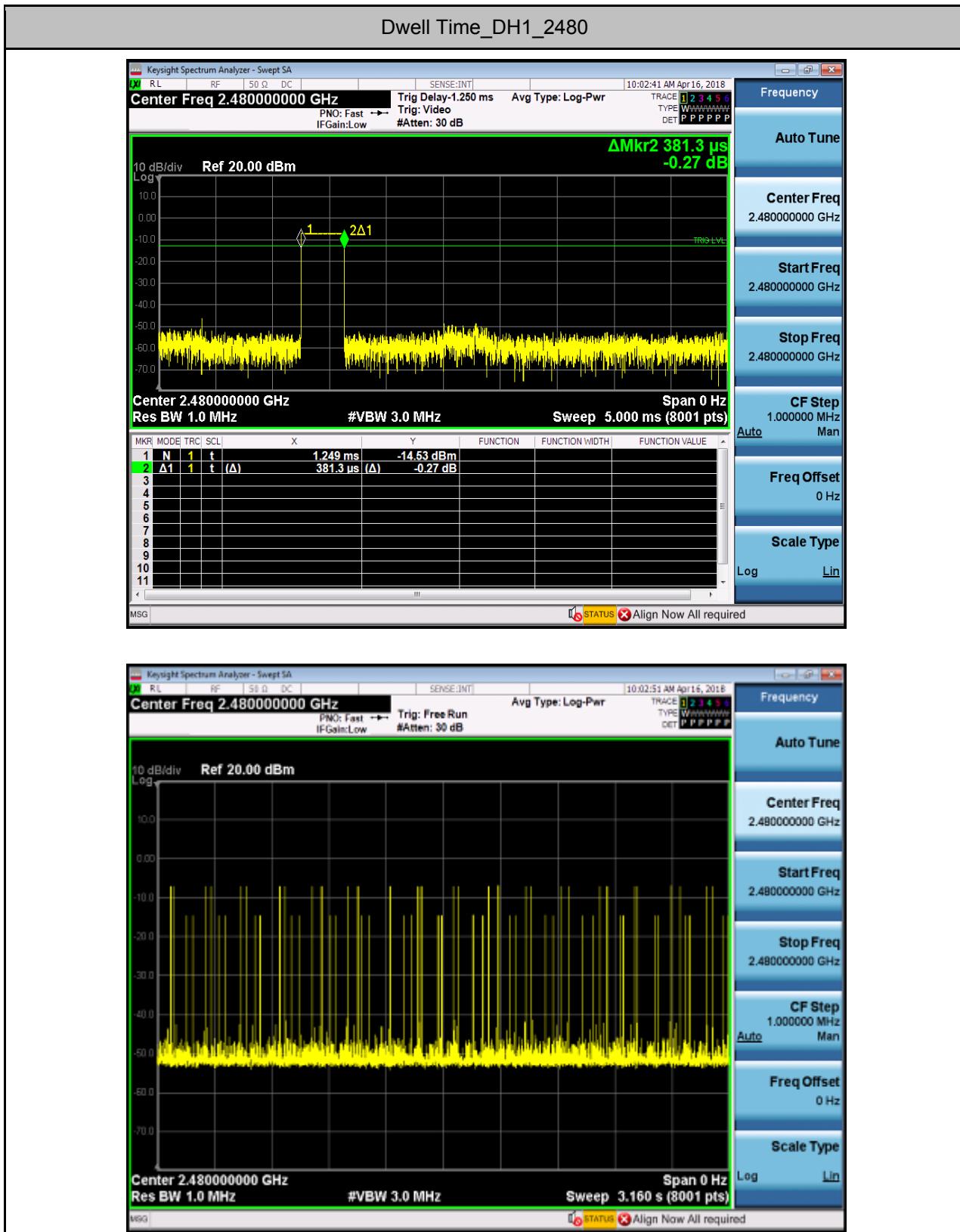


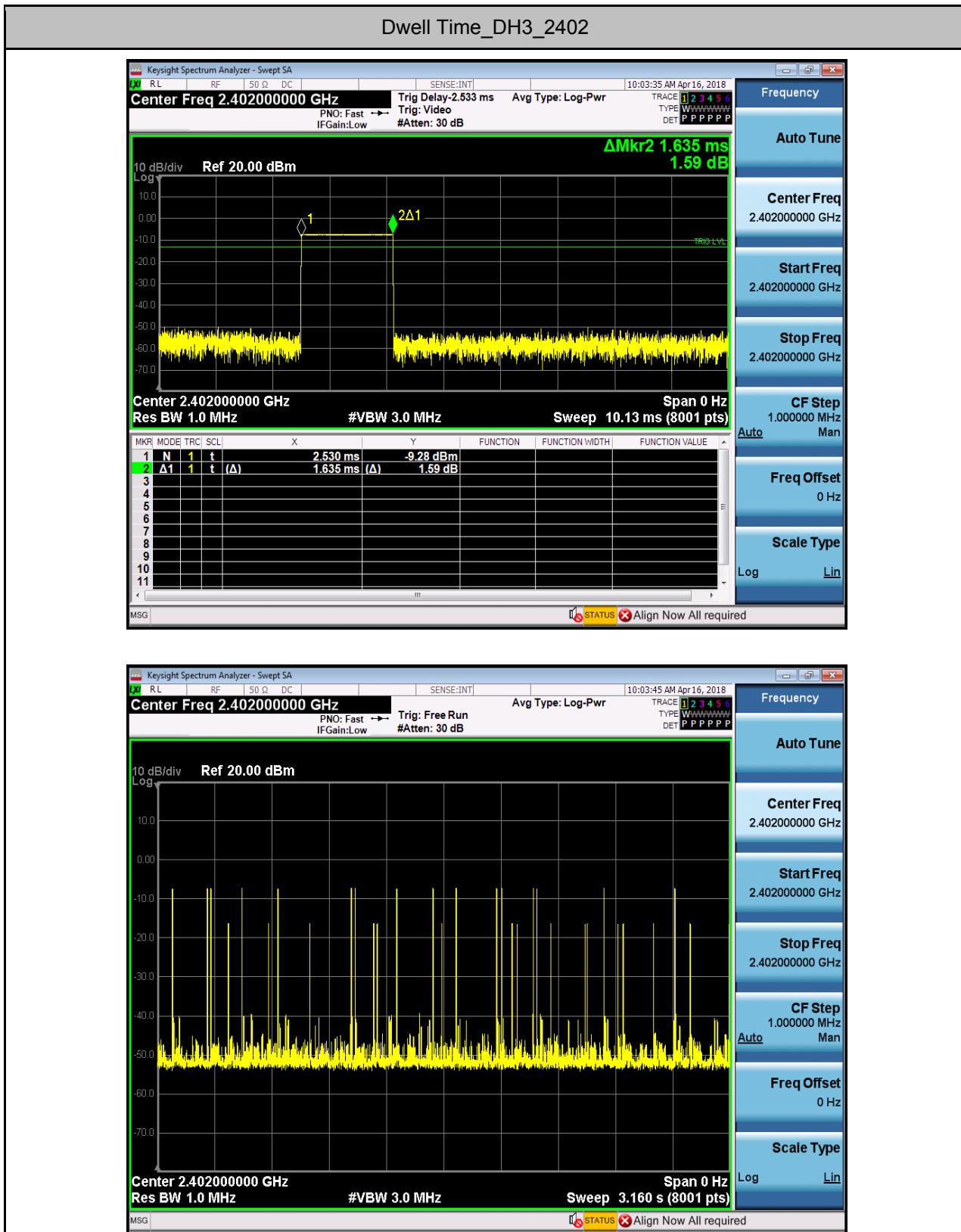
**4.Dwell Time**

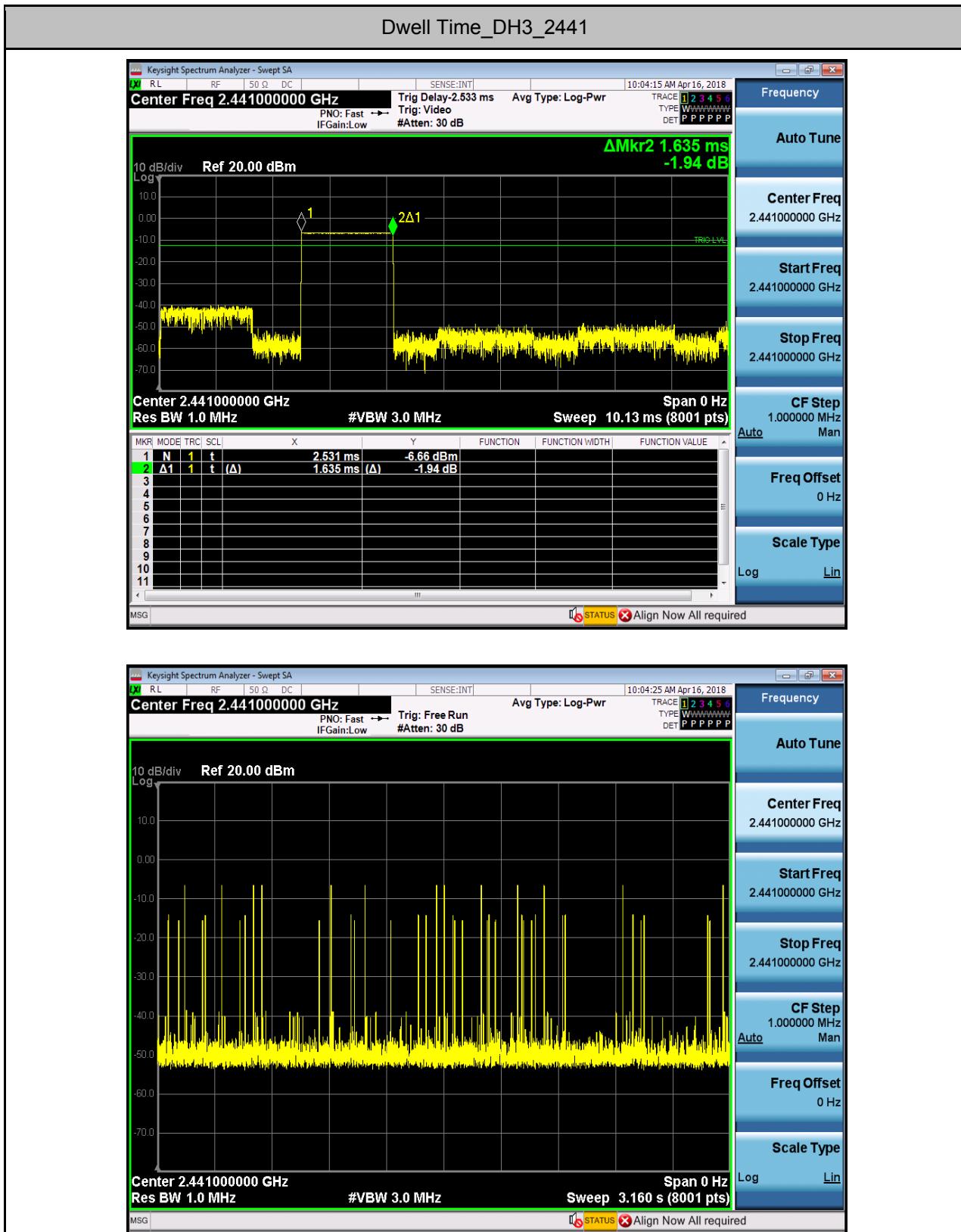
Test Mode	Test Channel	Burst Width[ms/hop/ch]	Total Hops[hop*ch]	Dwell Time[s]	Limit[s]	Verdict
DH1	2402	0.38	320	0.121	0.4	PASS
DH1	2441	0.38	310	0.118	0.4	PASS
DH1	2480	0.38	310	0.118	0.4	PASS
DH3	2402	1.64	160	0.262	0.4	PASS
DH3	2441	1.64	130	0.213	0.4	PASS
DH3	2480	1.64	170	0.279	0.4	PASS
DH5	2402	2.88	130	0.374	0.4	PASS
DH5	2441	2.88	120	0.346	0.4	PASS
DH5	2480	2.88	130	0.374	0.4	PASS
2DH1	2402	0.38	320	0.122	0.4	PASS
2DH1	2441	0.38	310	0.118	0.4	PASS
2DH1	2480	0.38	310	0.118	0.4	PASS
2DH3	2402	1.64	140	0.230	0.4	PASS
2DH3	2441	1.64	170	0.279	0.4	PASS
2DH3	2480	1.64	160	0.262	0.4	PASS
2DH5	2402	2.88	80	0.230	0.4	PASS
2DH5	2441	2.88	130	0.374	0.4	PASS
2DH5	2480	2.88	100	0.288	0.4	PASS

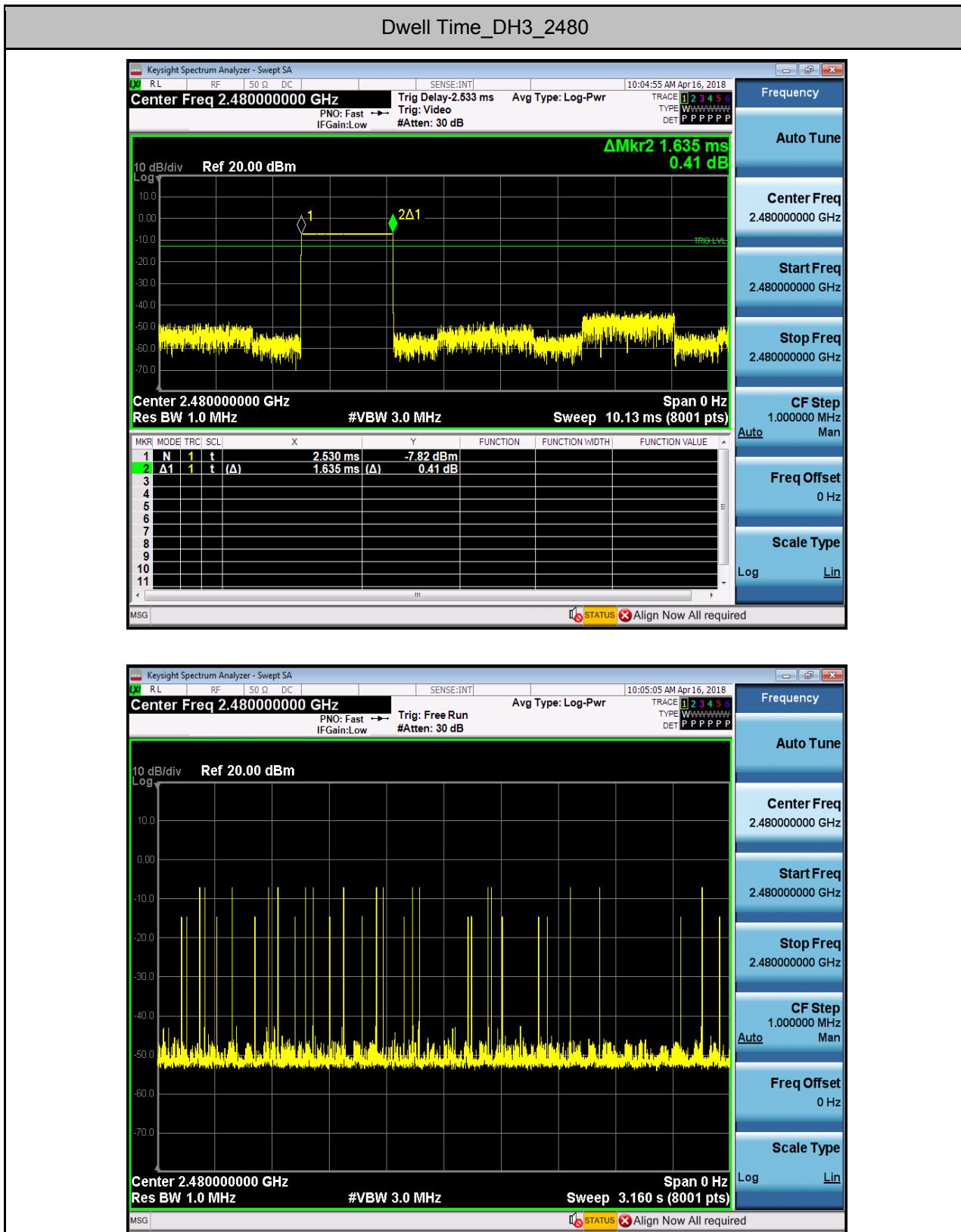


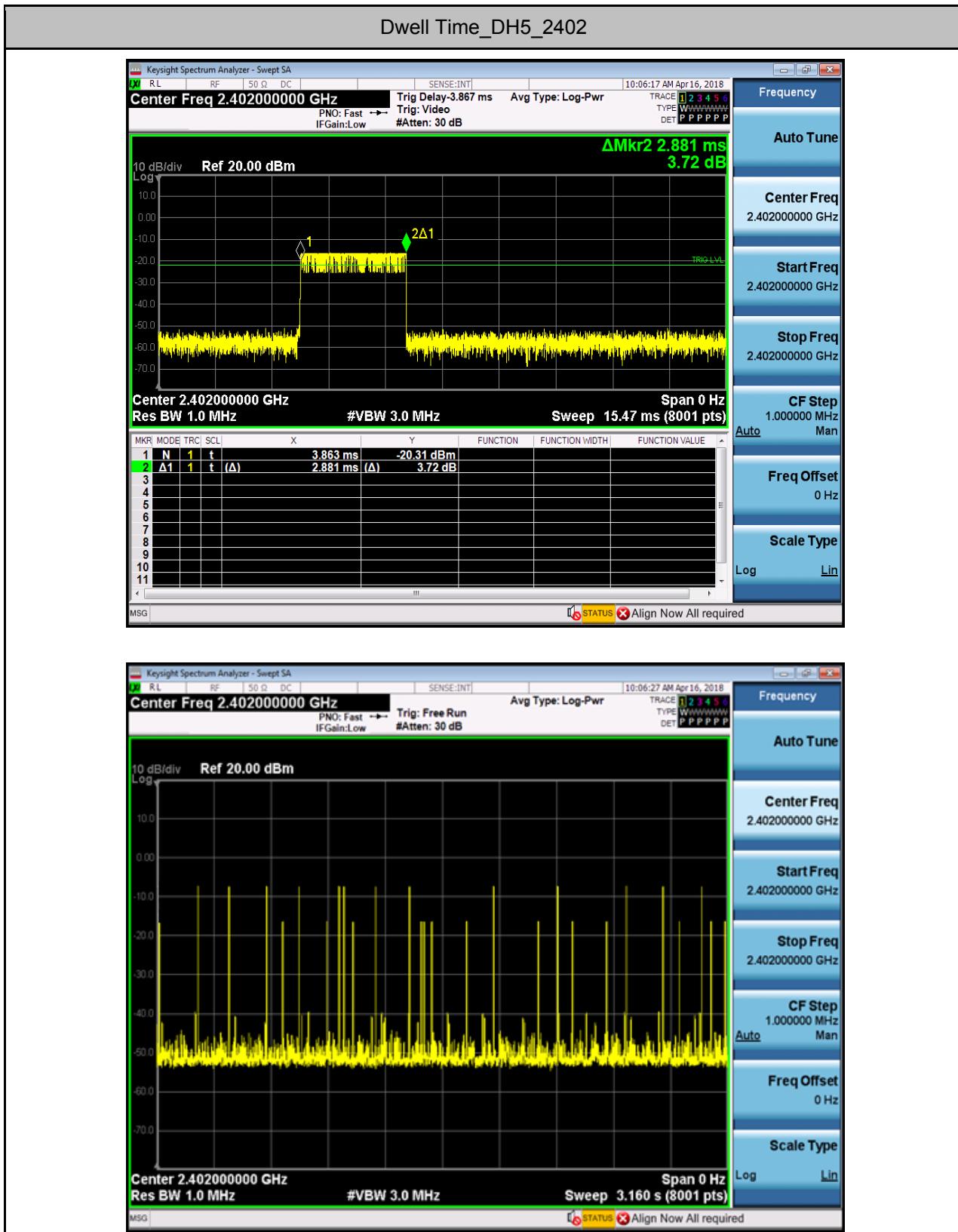


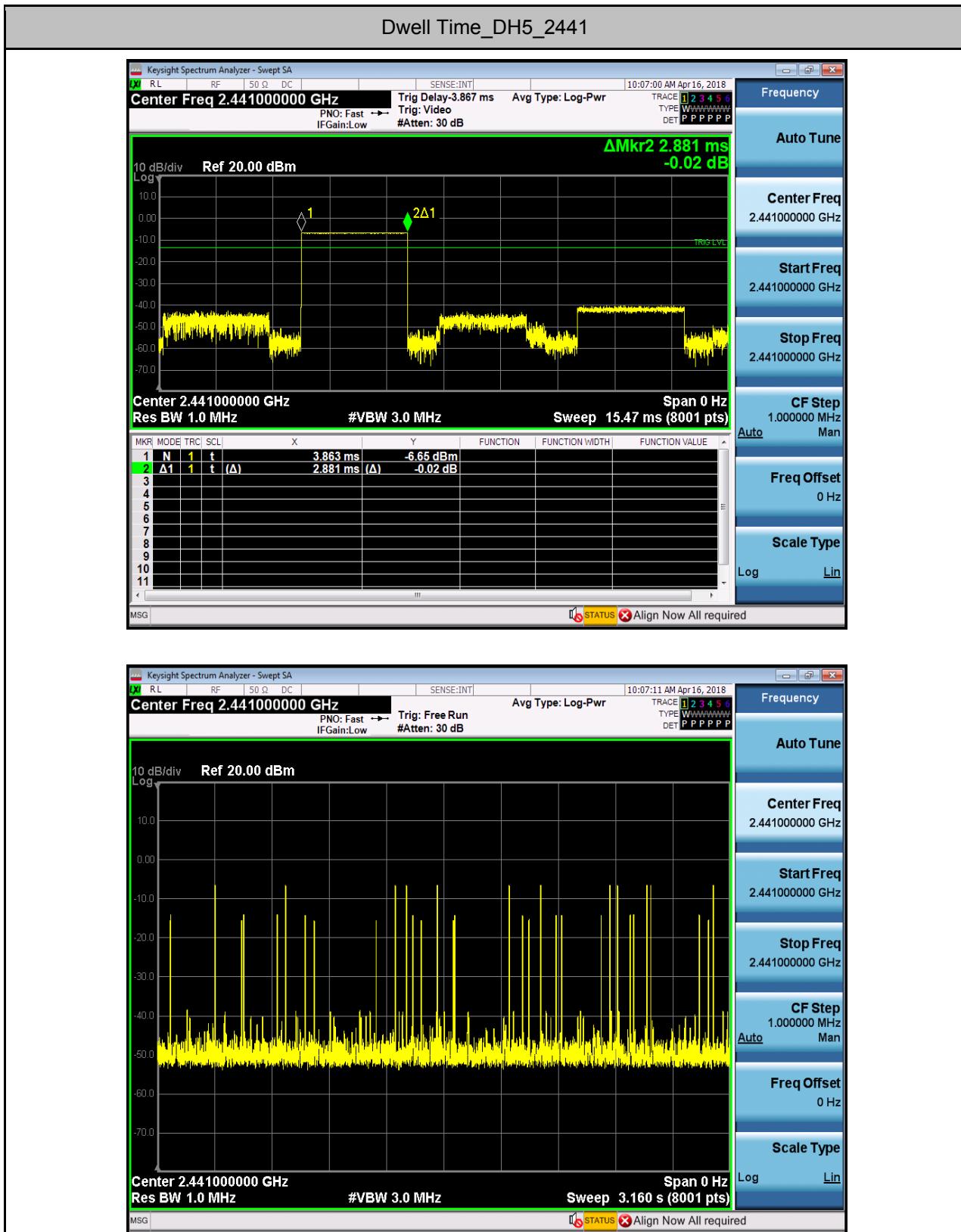


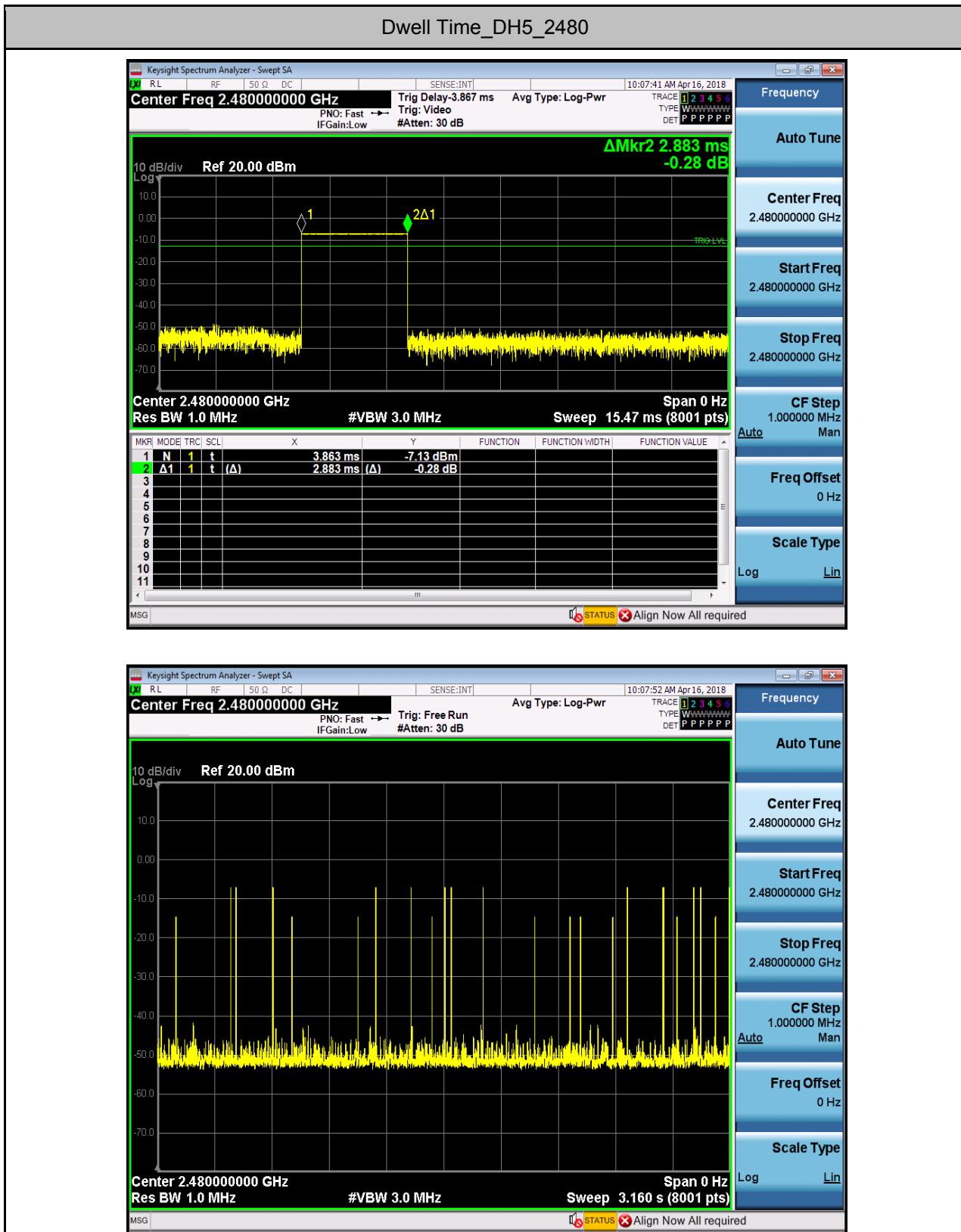


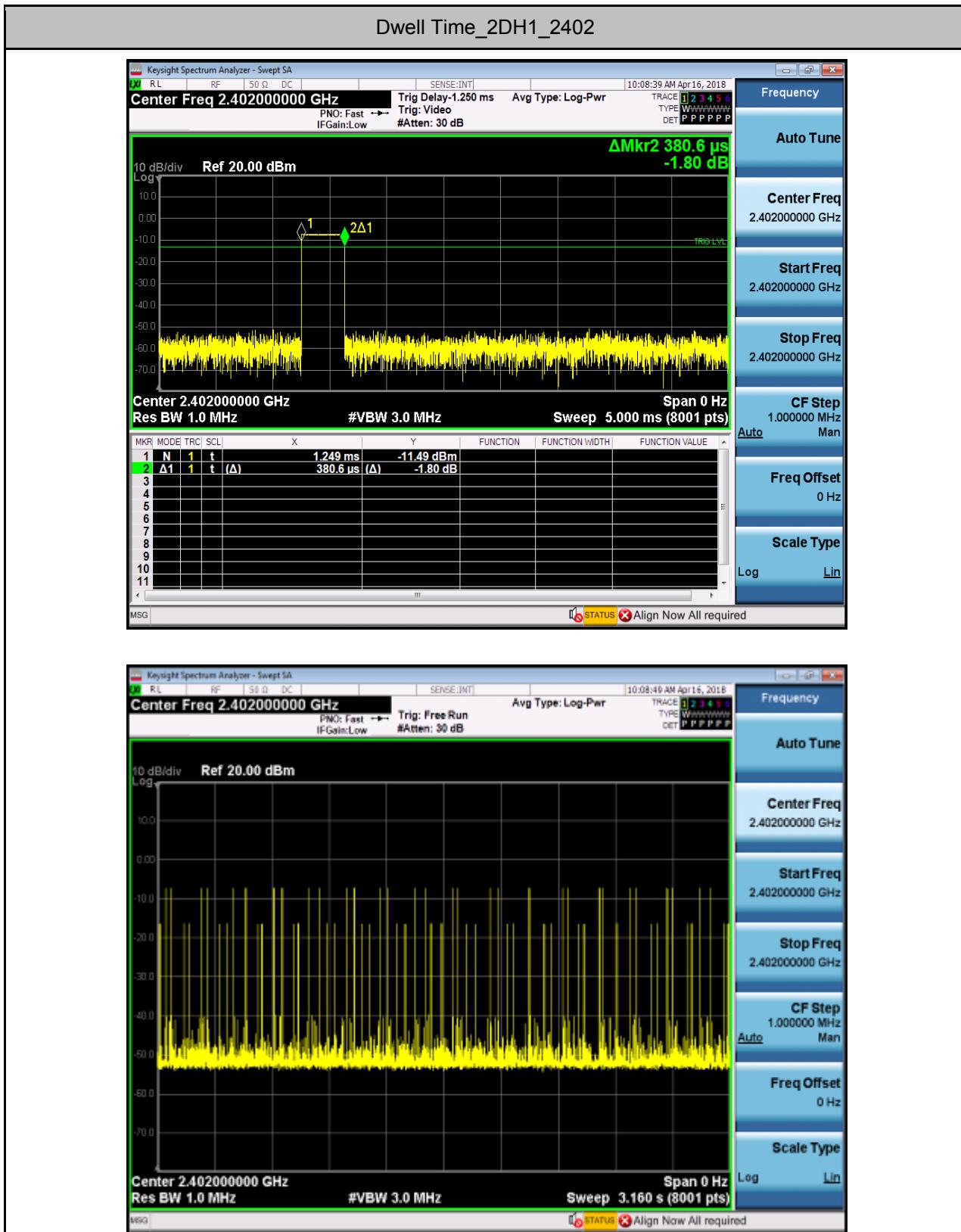


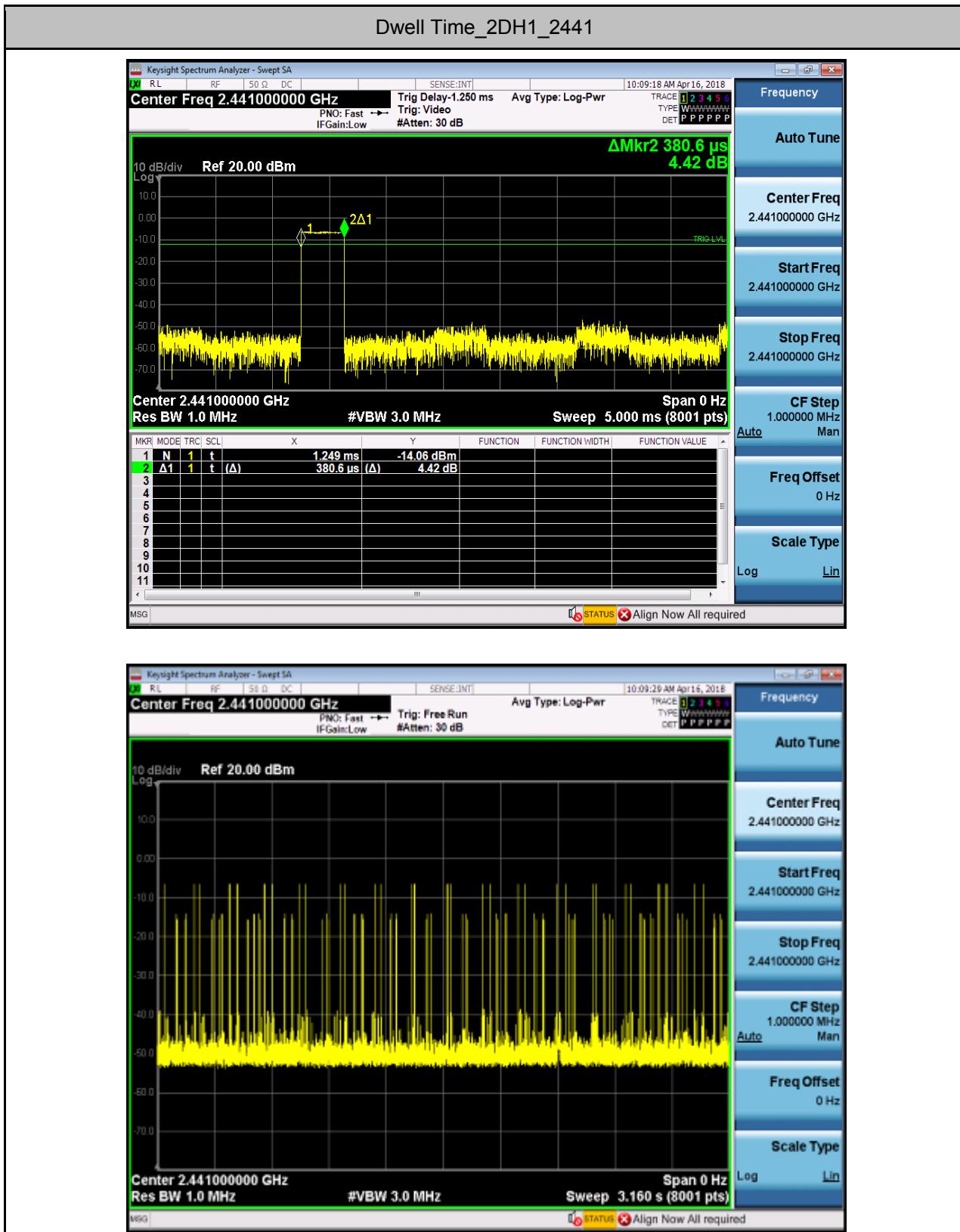


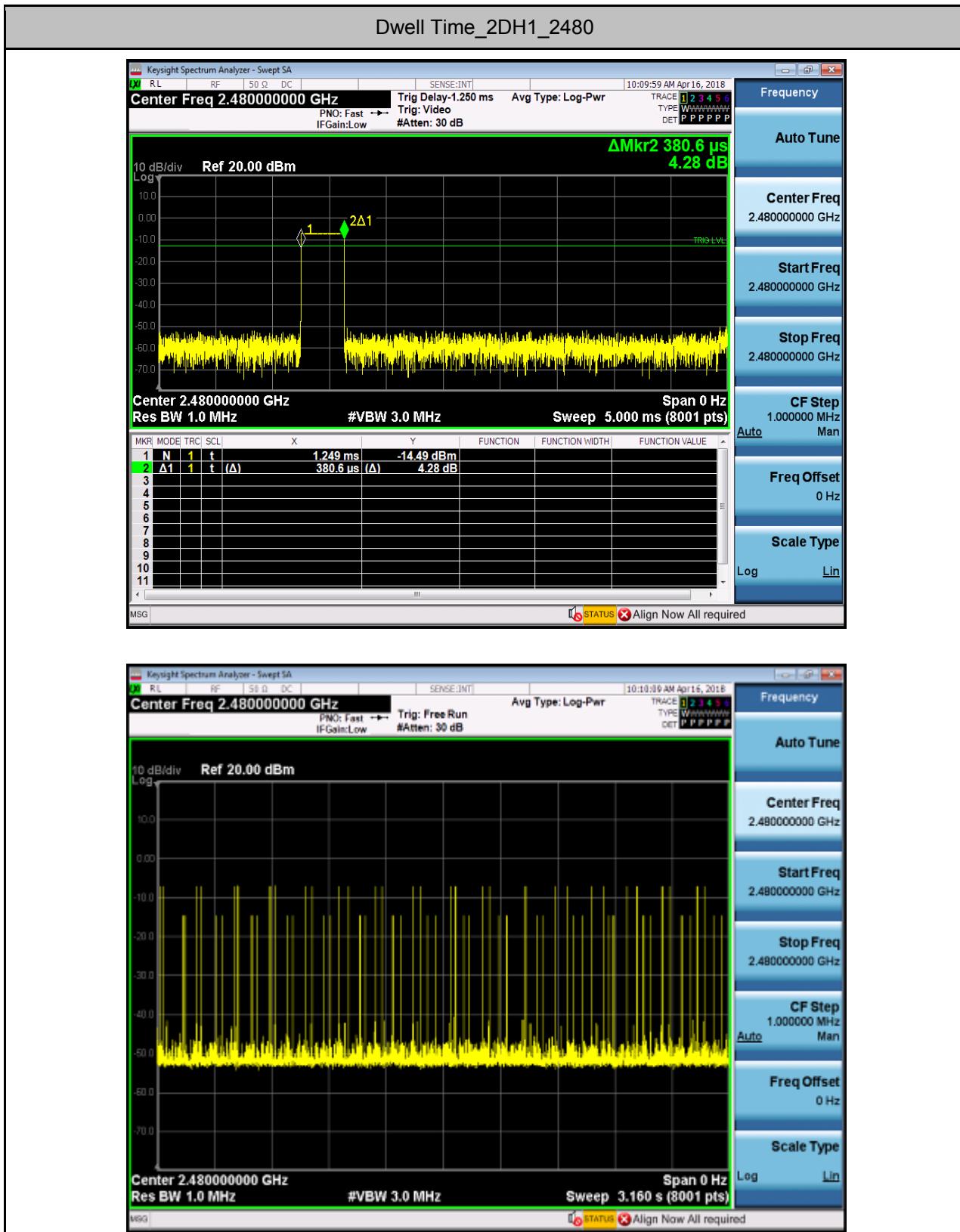


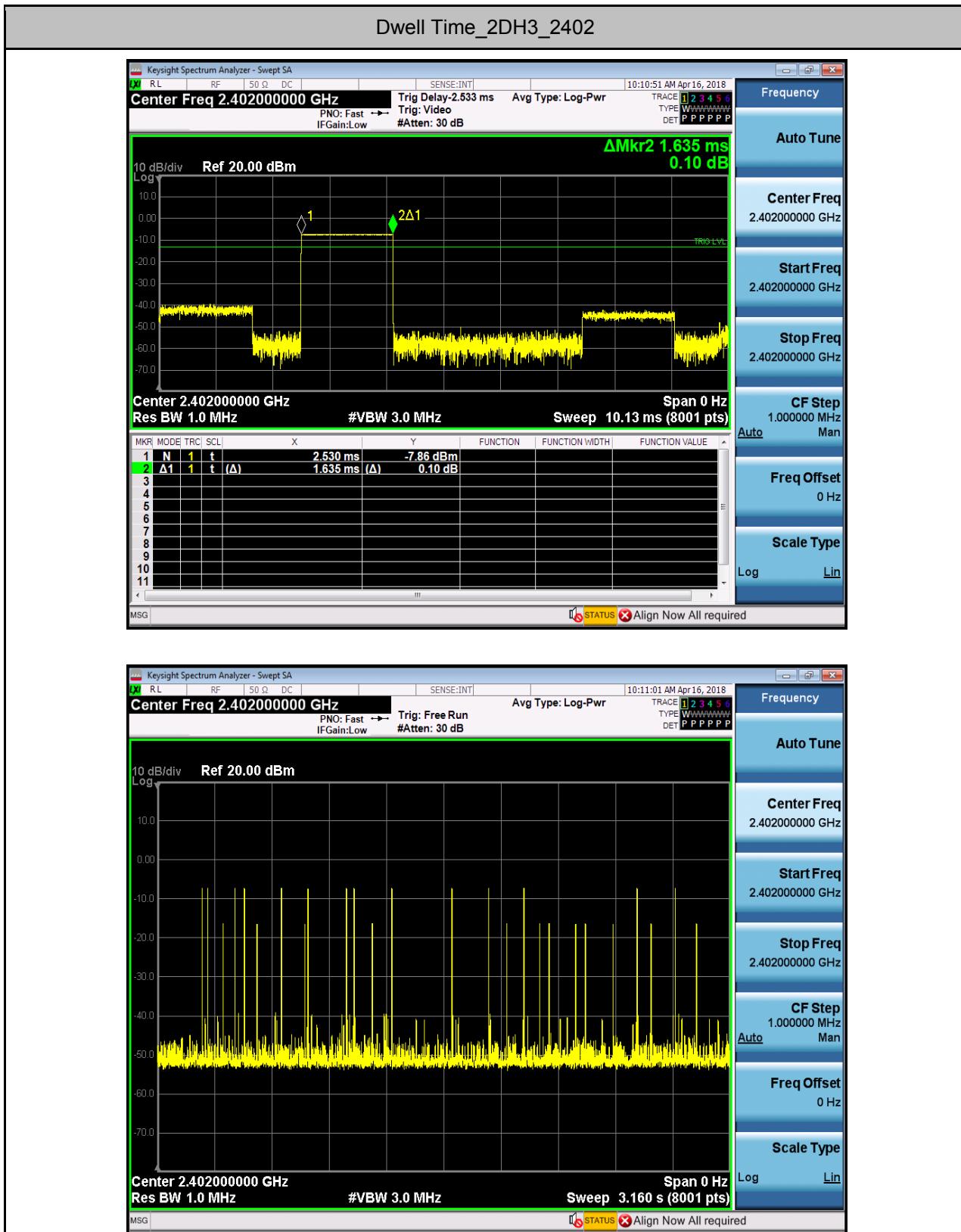


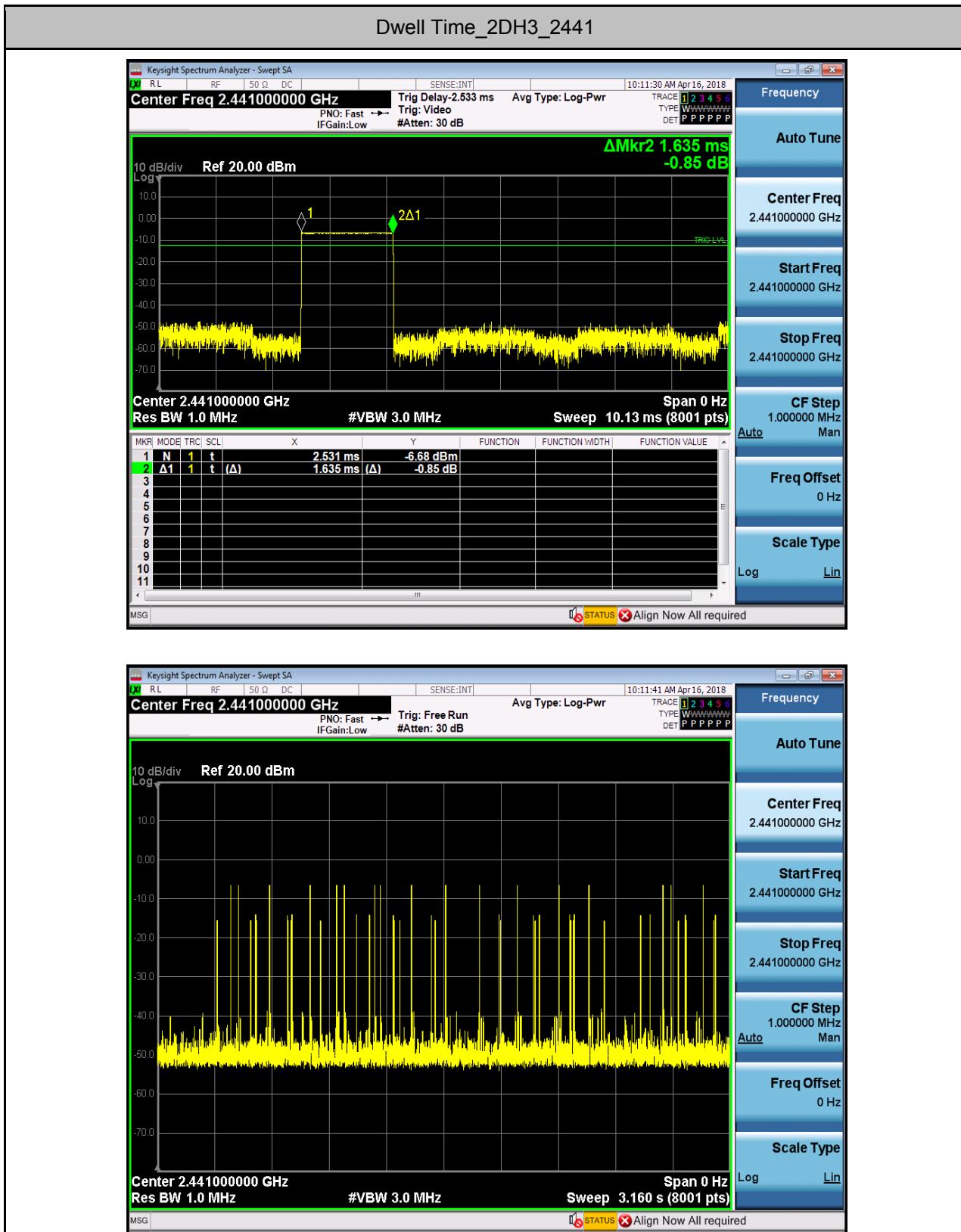


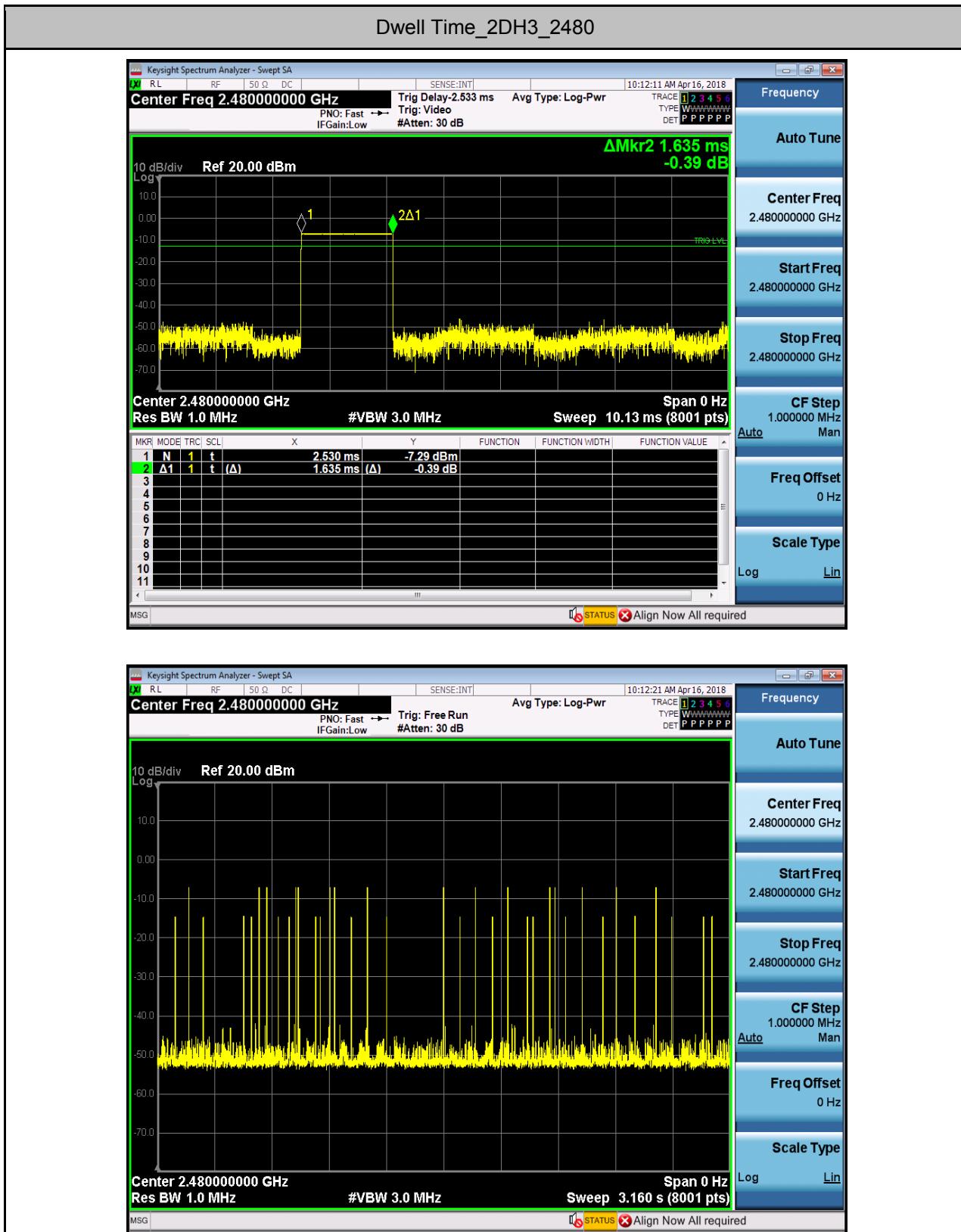


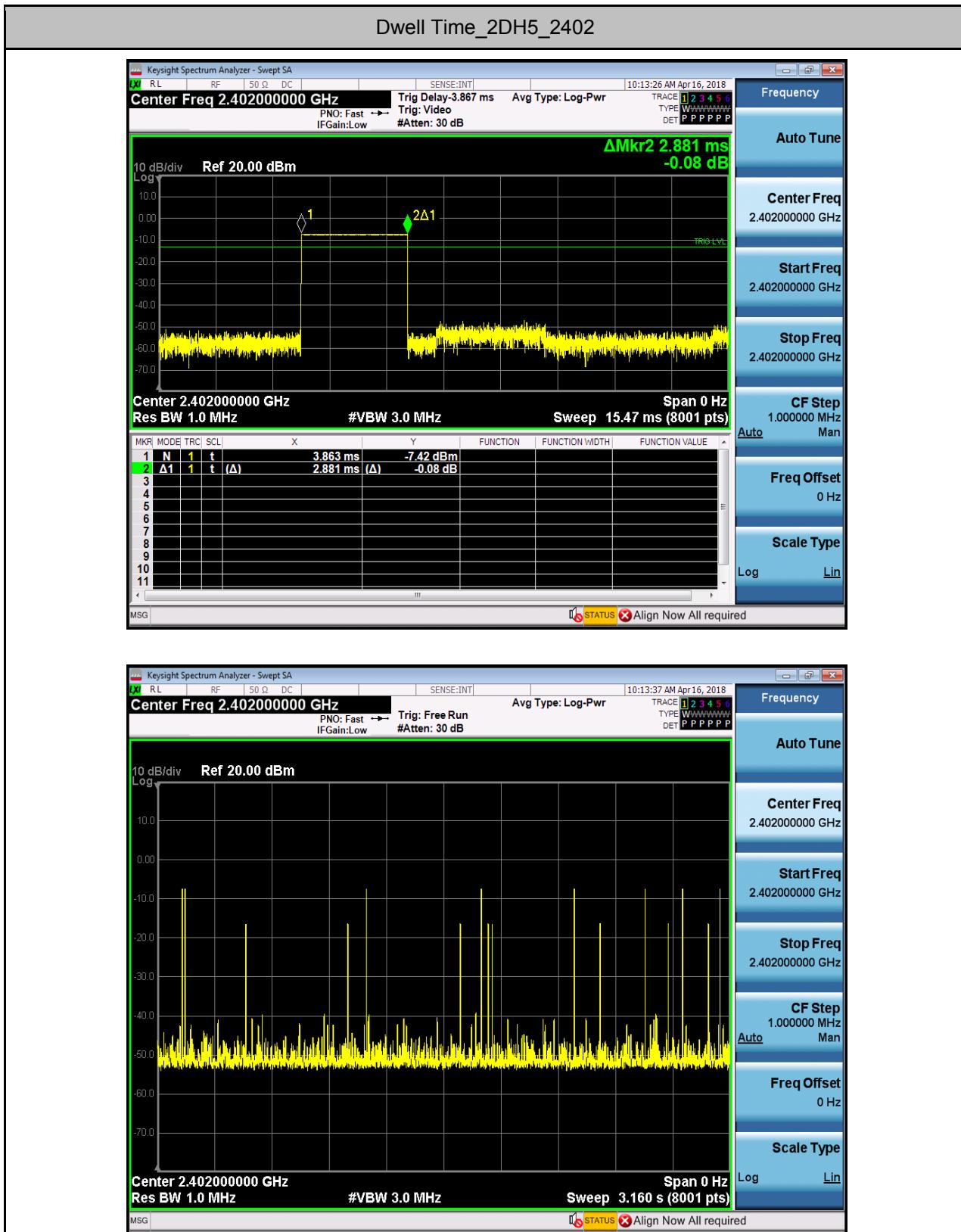


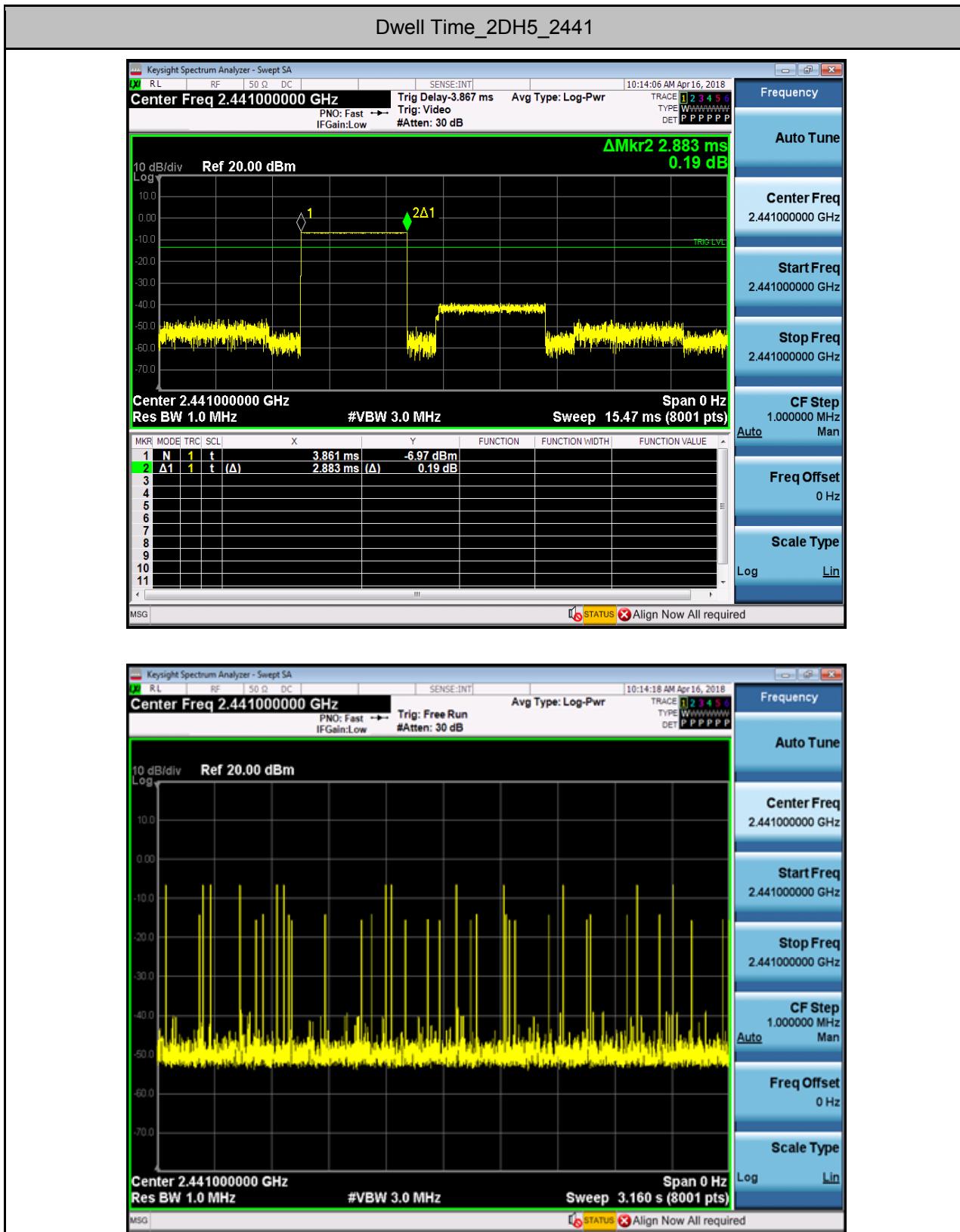


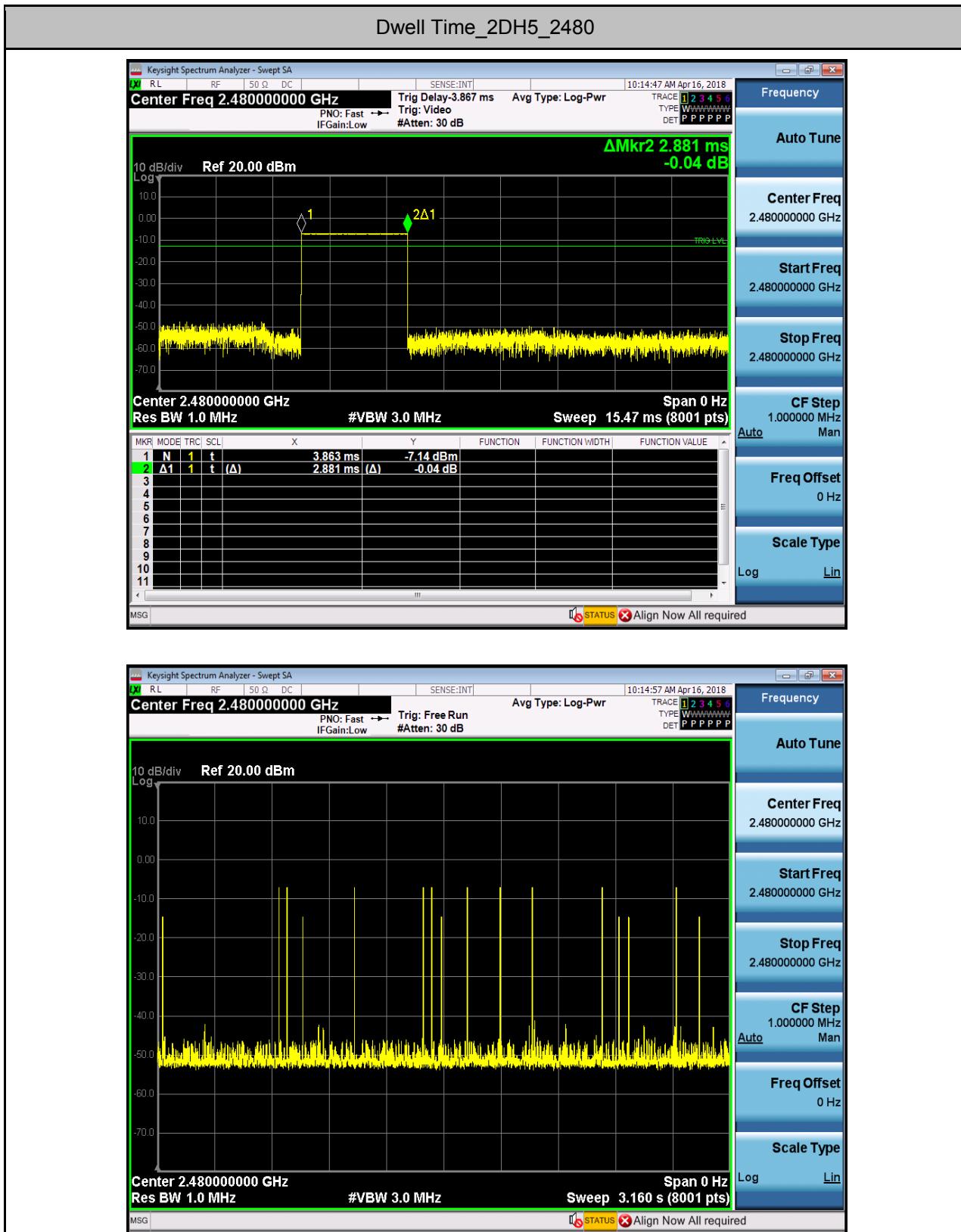






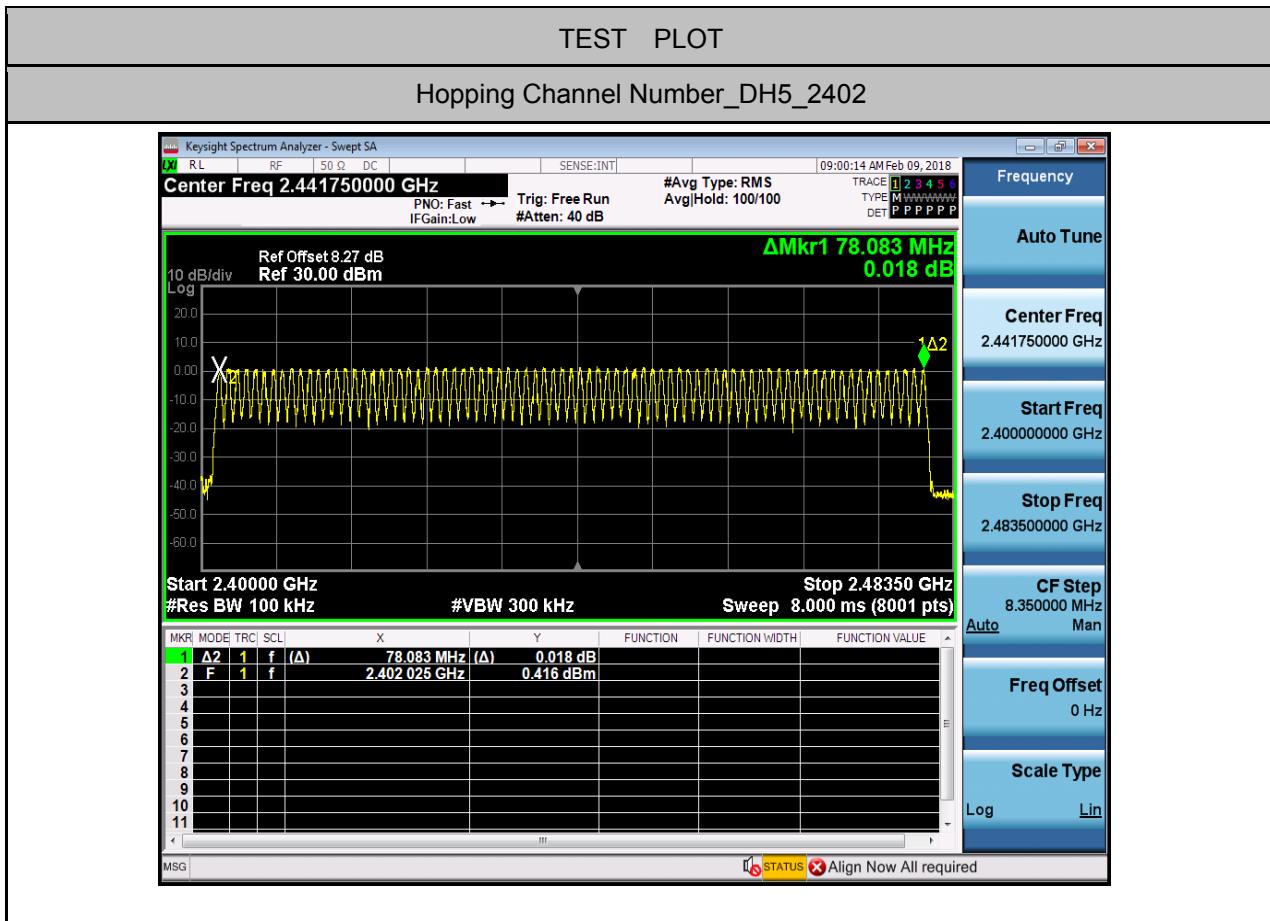






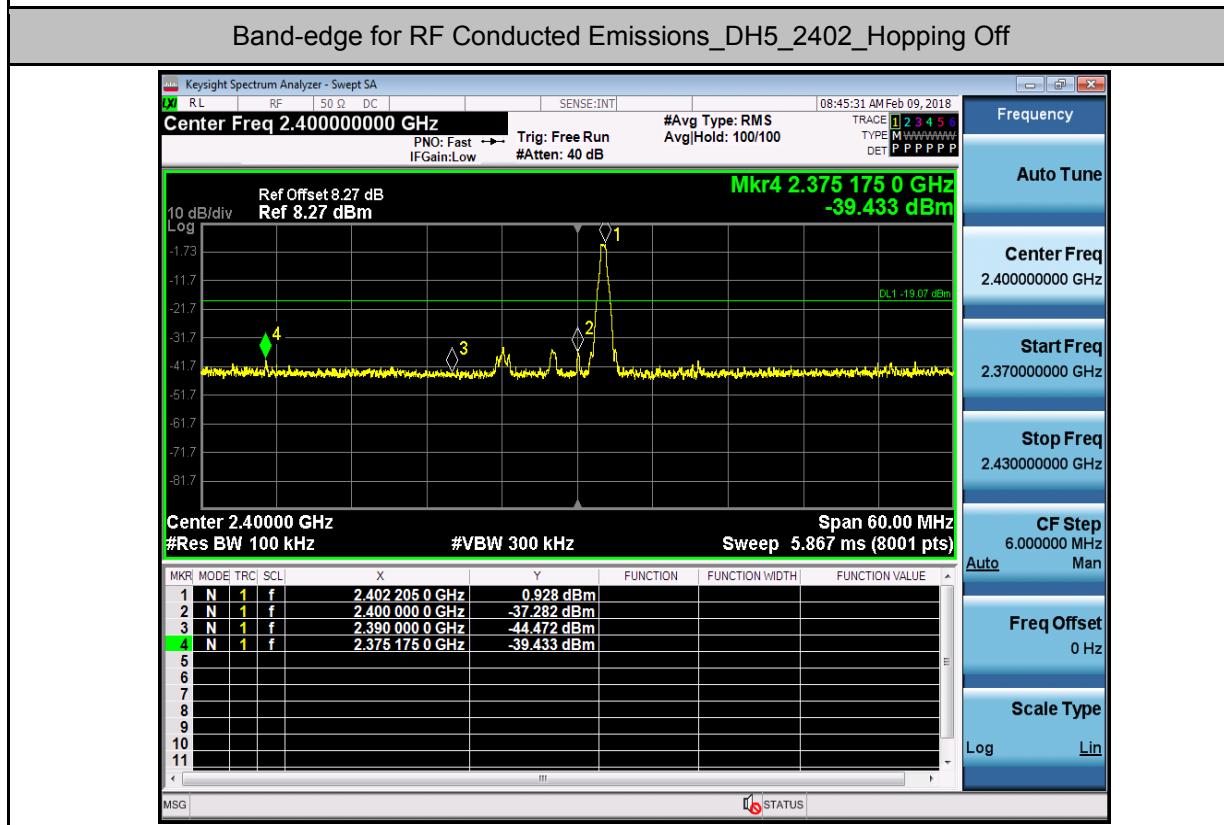
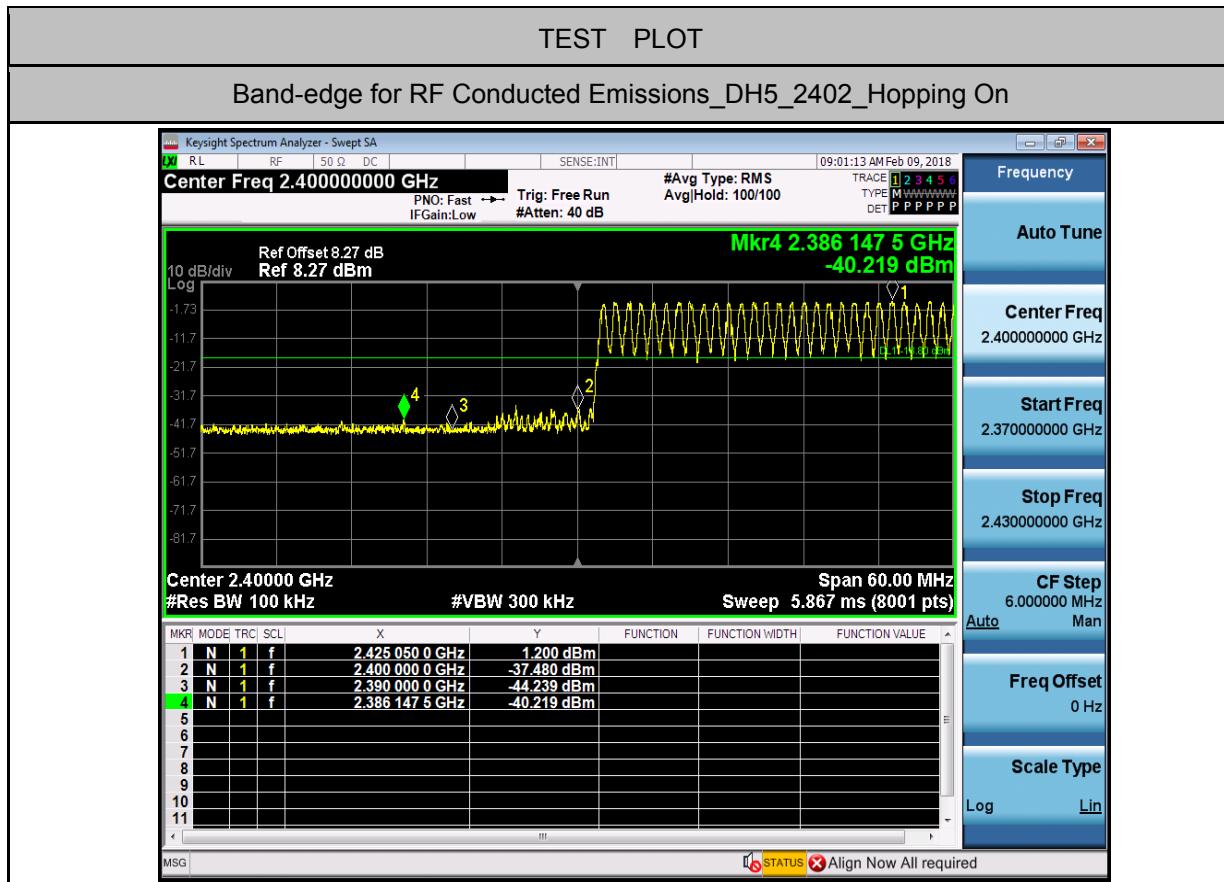
**5.Hopping Channel Number**

Test Mode	Test Channel	Number of Hopping Channel[N]	Limit[N]	Verdict
DH5	2402	79	>=15	PASS

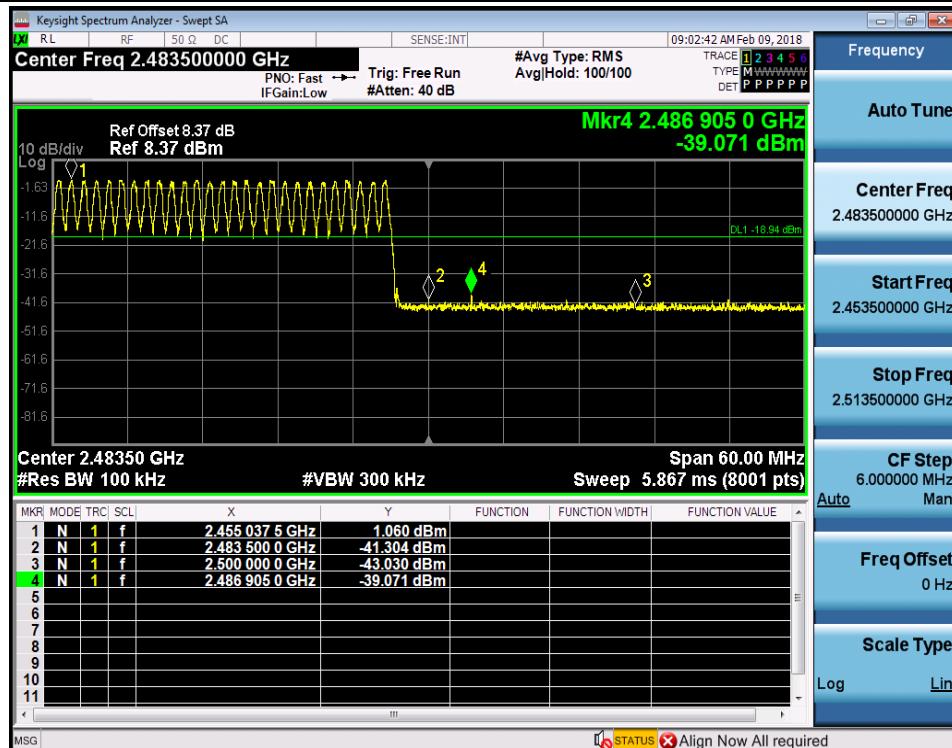


#### **6.Band-edge for RF Conducted Emissions**

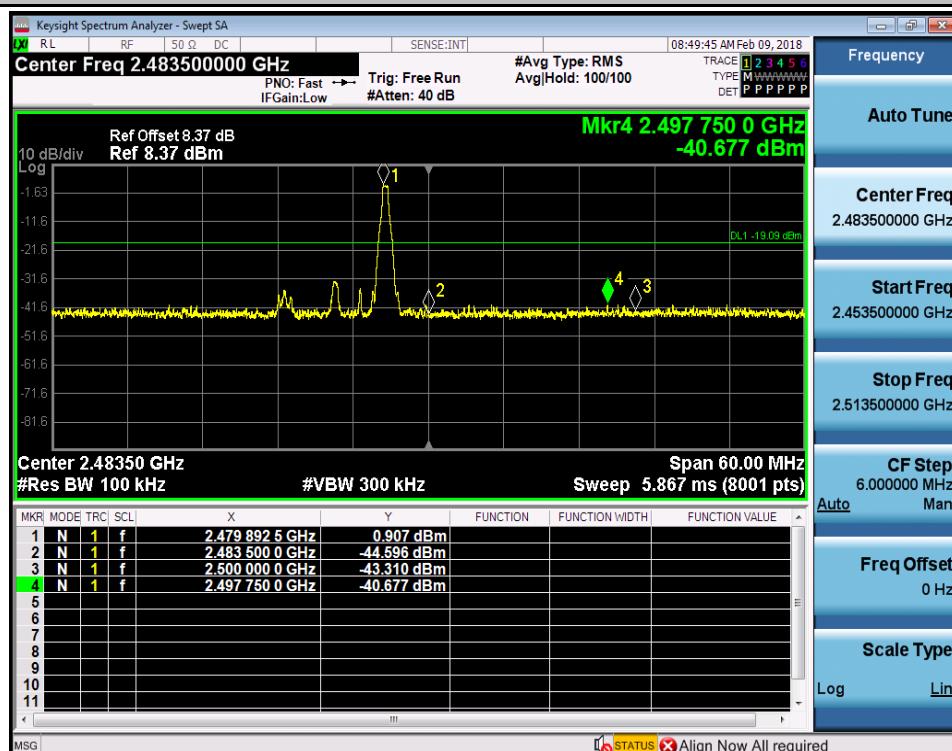
Test Mode	Test Channel	Hopping	Carrier Power[dBm]	Max. Spurious Level [dBm]	Limit[dBm]	Verdict
DH5	2402	On	1.200	-40.219	-18.8	PASS
DH5	2402	Off	0.928	-39.433	-19.07	PASS
DH5	2480	On	1.060	-39.071	-18.94	PASS
DH5	2480	Off	0.907	-40.677	-19.09	PASS



## Band-edge for RF Conducted Emissions\_DH5\_2480\_Hopping On

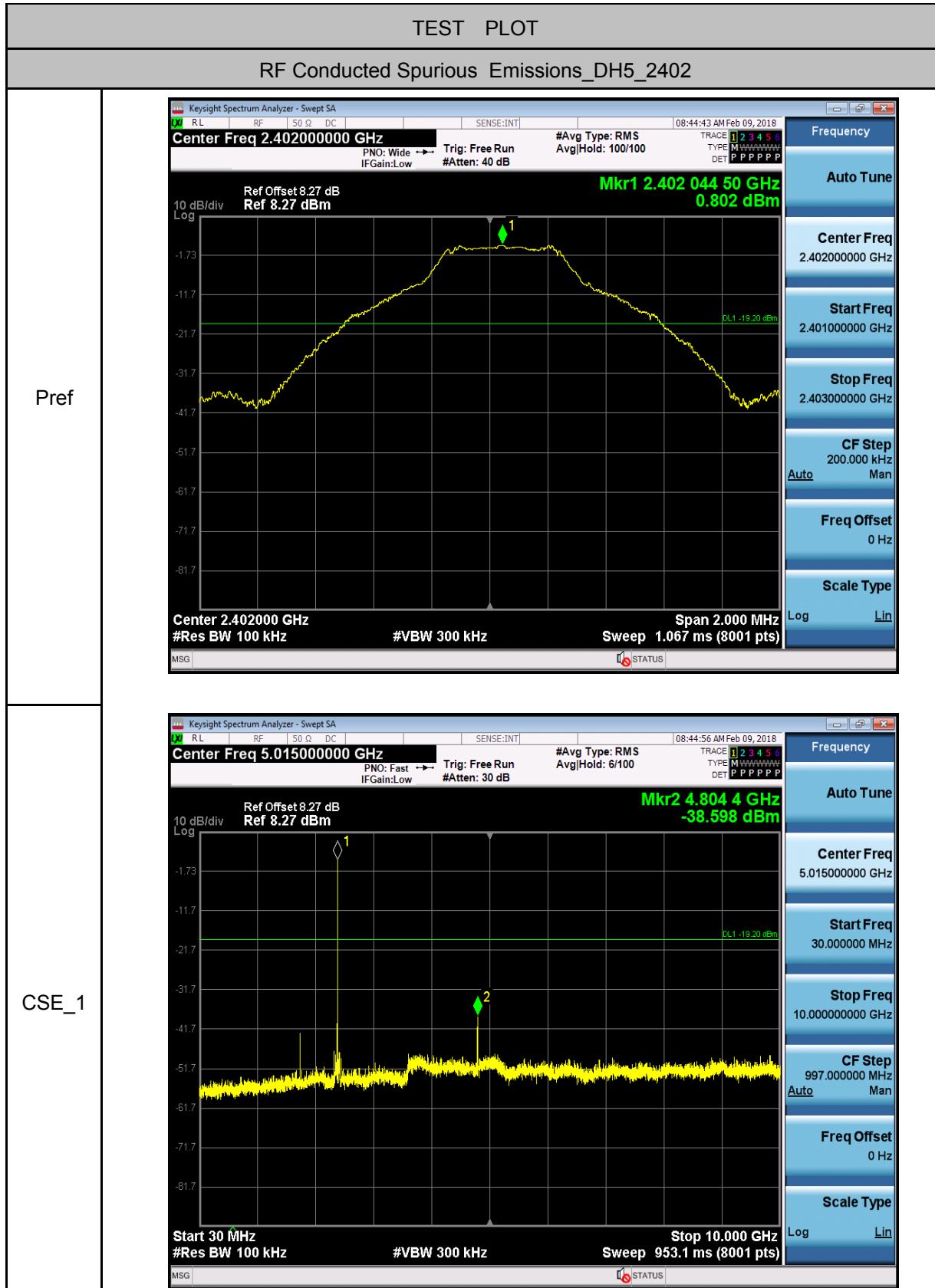


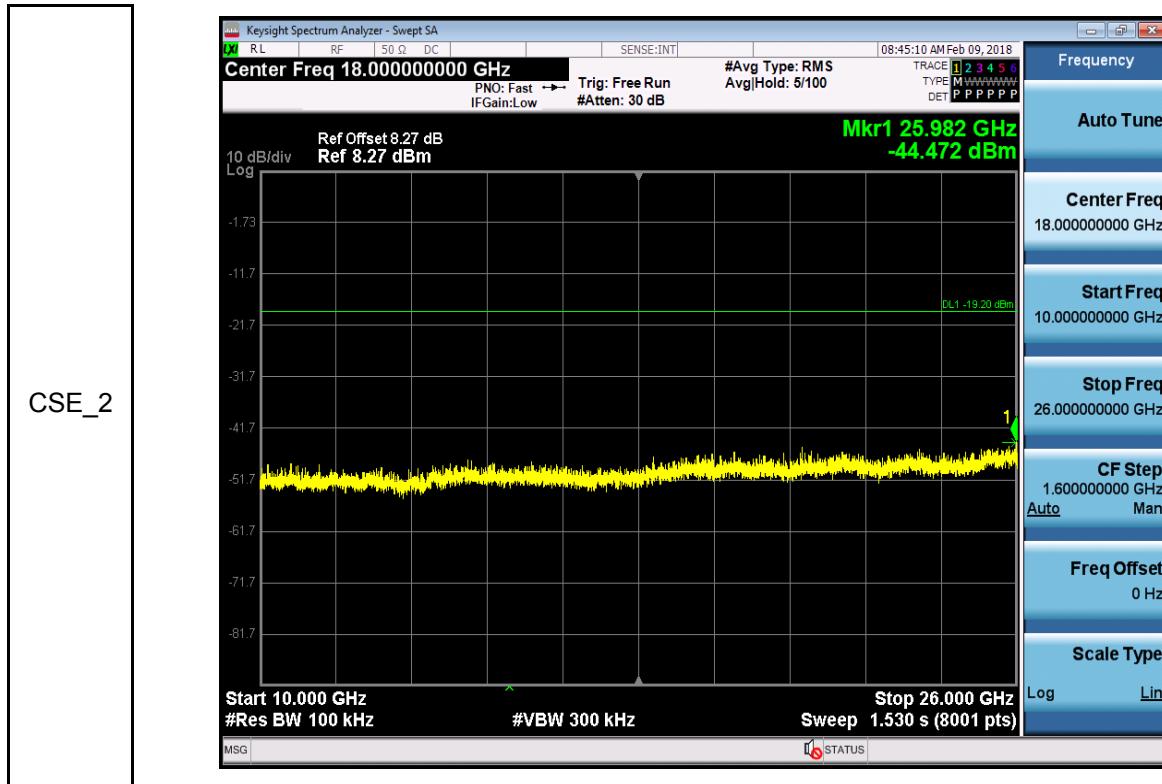
## Band-edge for RF Conducted Emissions\_DH5\_2480\_Hopping Off



### 7.RF Conducted Spurious Emissions

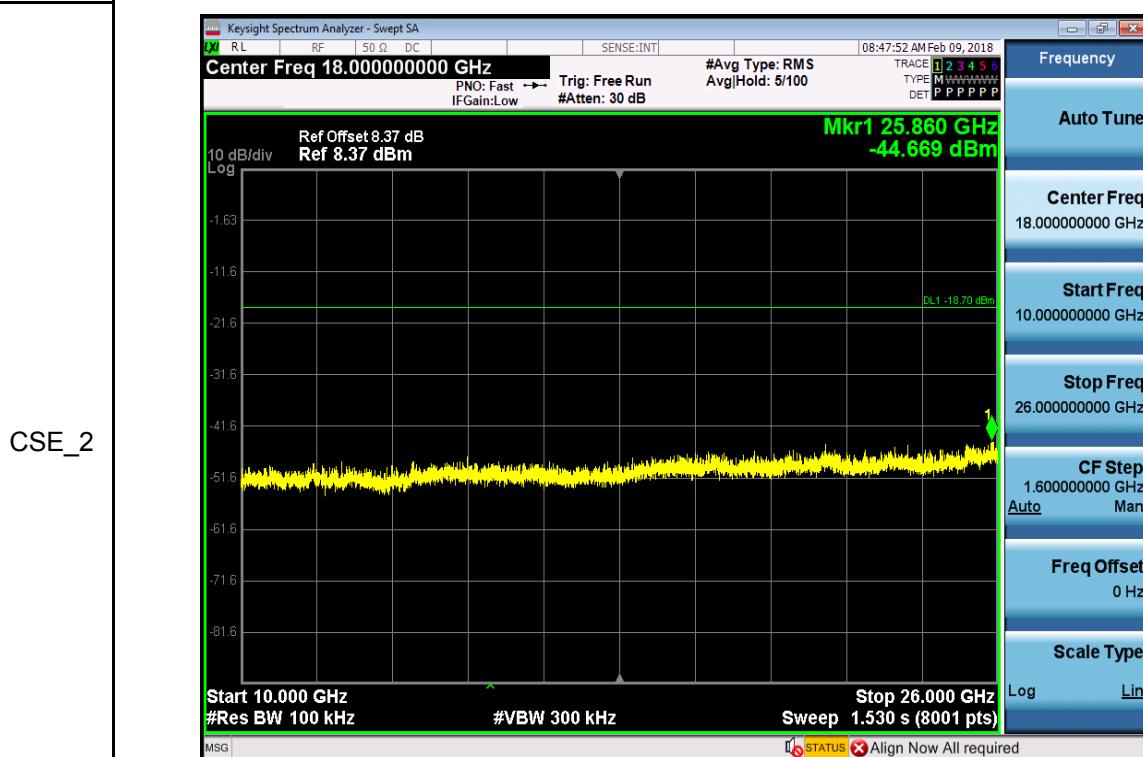
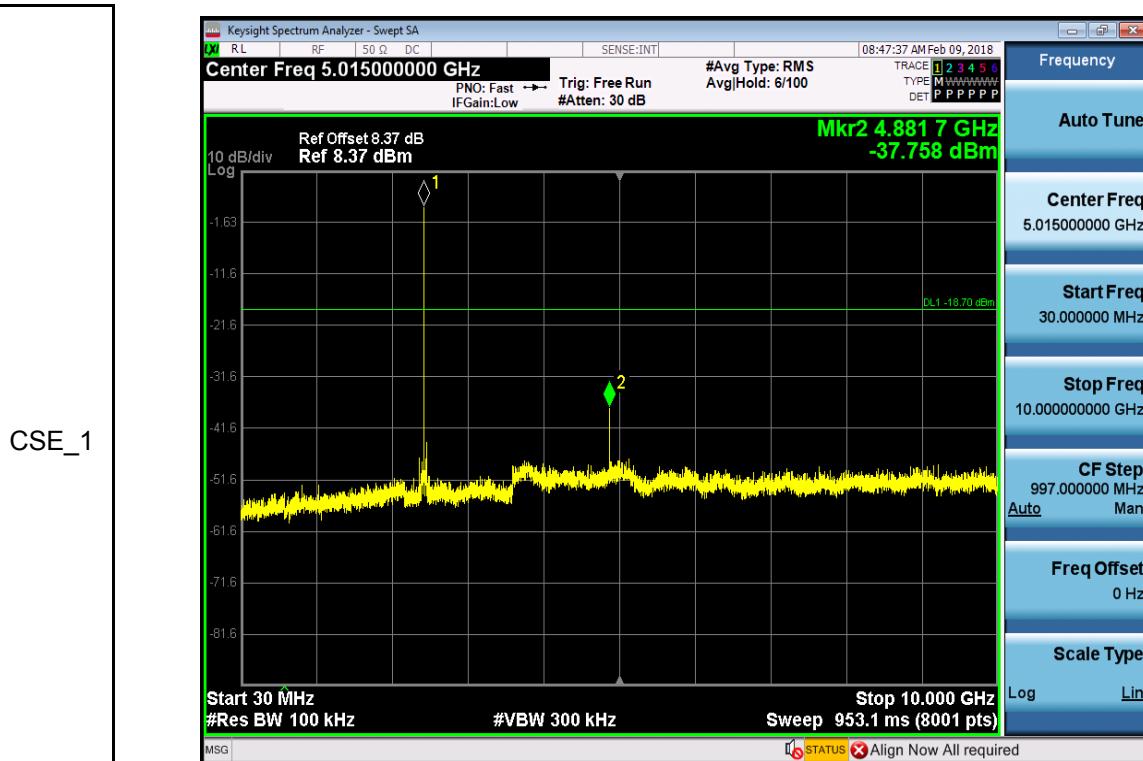
Test Mode	Test Channel	StartFre [MHz]	StopFre [MHz]	RBW [kHz]	VBW [kHz]	Pref[dBm]	Max. Level [dBm]	Limit [dBm]	Verdict
DH5	2402	30	10000	100	300	0.802	-38.598	<-19.198	PASS
DH5	2402	10000	26000	100	300	0.802	-44.472	<-19.198	PASS
DH5	2441	30	10000	100	300	1.303	-37.758	<-18.697	PASS
DH5	2441	10000	26000	100	300	1.303	-44.669	<-18.697	PASS
DH5	2480	30	10000	100	300	0.923	-38.053	<-19.077	PASS
DH5	2480	10000	26000	100	300	0.923	-44.687	<-19.077	PASS
2DH5	2402	30	10000	100	300	0.993	-42.035	<-19.007	PASS
2DH5	2402	10000	26000	100	300	0.993	-44.603	<-19.007	PASS
2DH5	2441	30	10000	100	300	1.496	-34.104	<-18.504	PASS
2DH5	2441	10000	26000	100	300	1.496	-44.525	<-18.504	PASS
2DH5	2480	30	10000	100	300	1.02	-40.798	<-18.98	PASS
2DH5	2480	10000	26000	100	300	1.02	-44.959	<-18.98	PASS

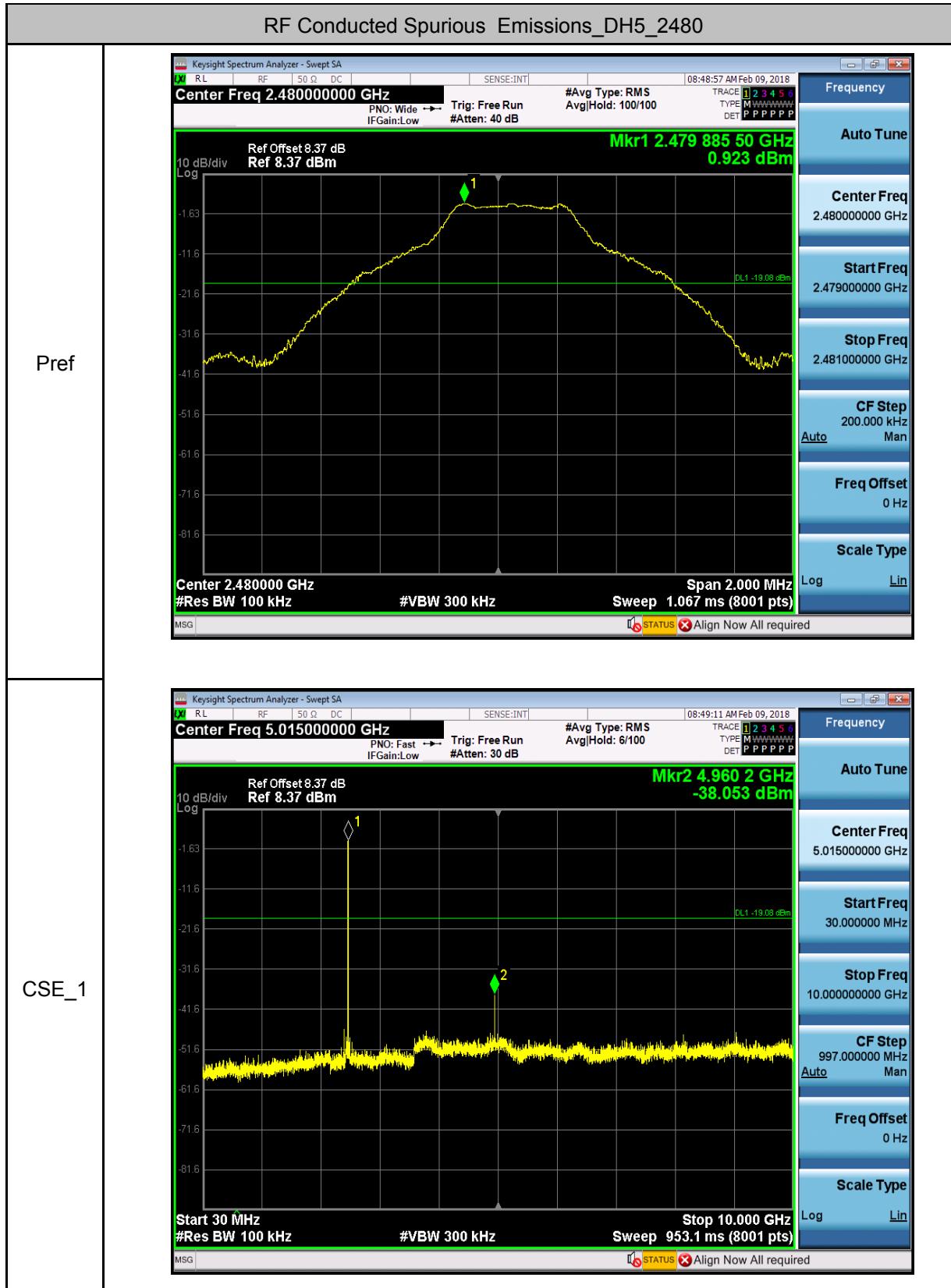


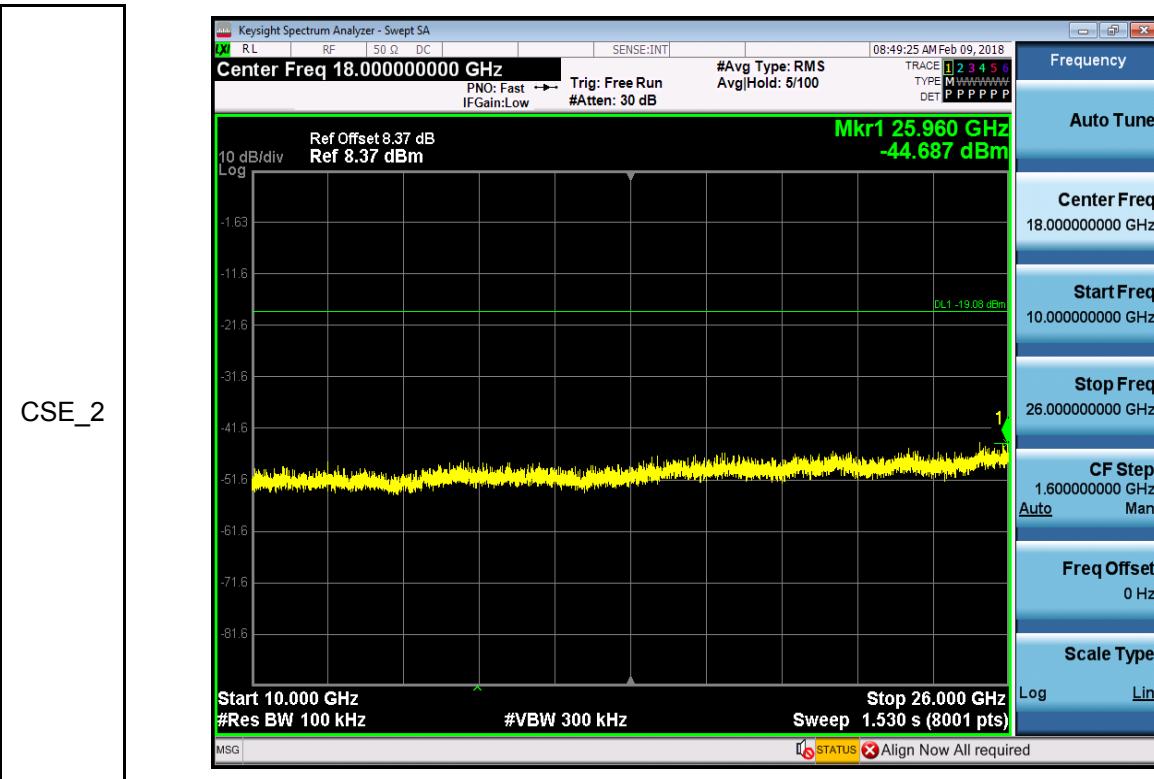


## RF Conducted Spurious Emissions\_DH5\_2441

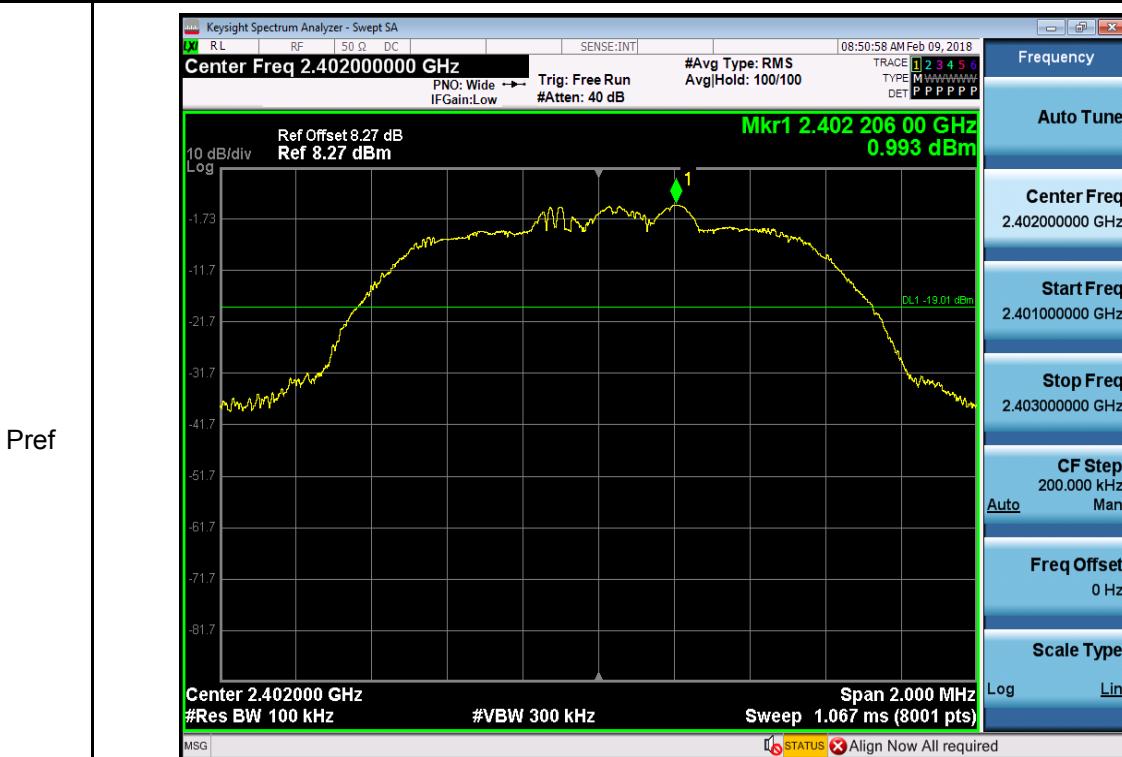


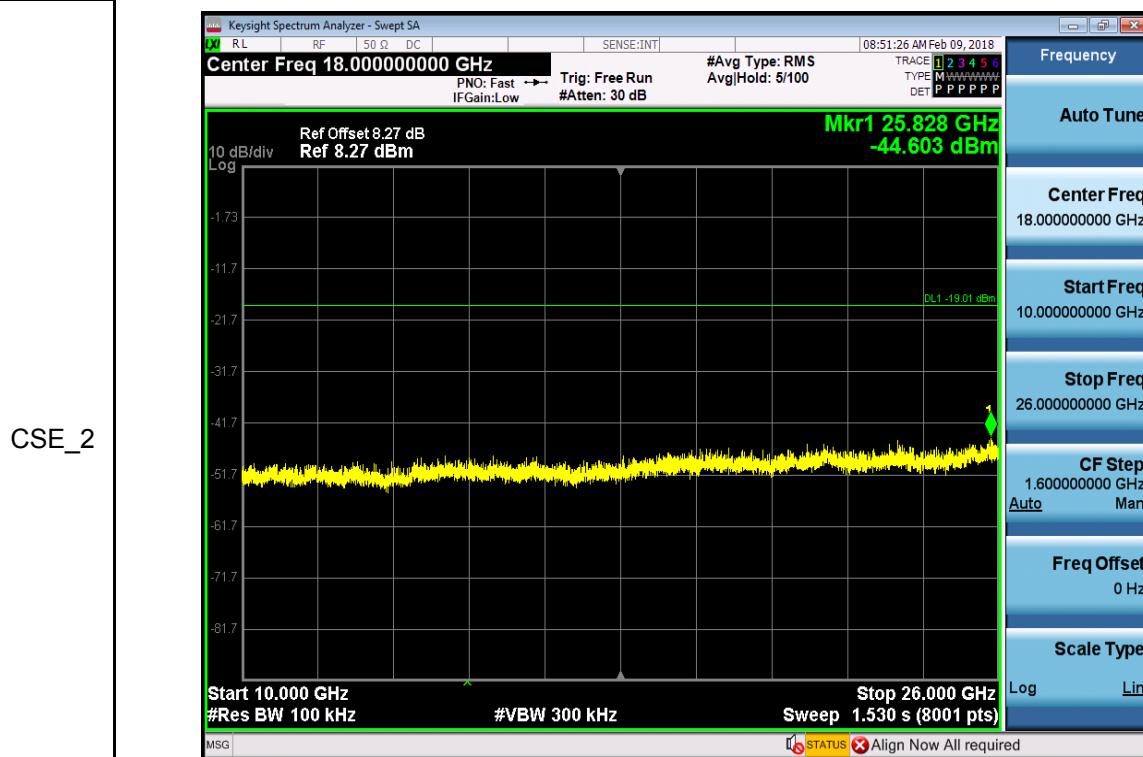
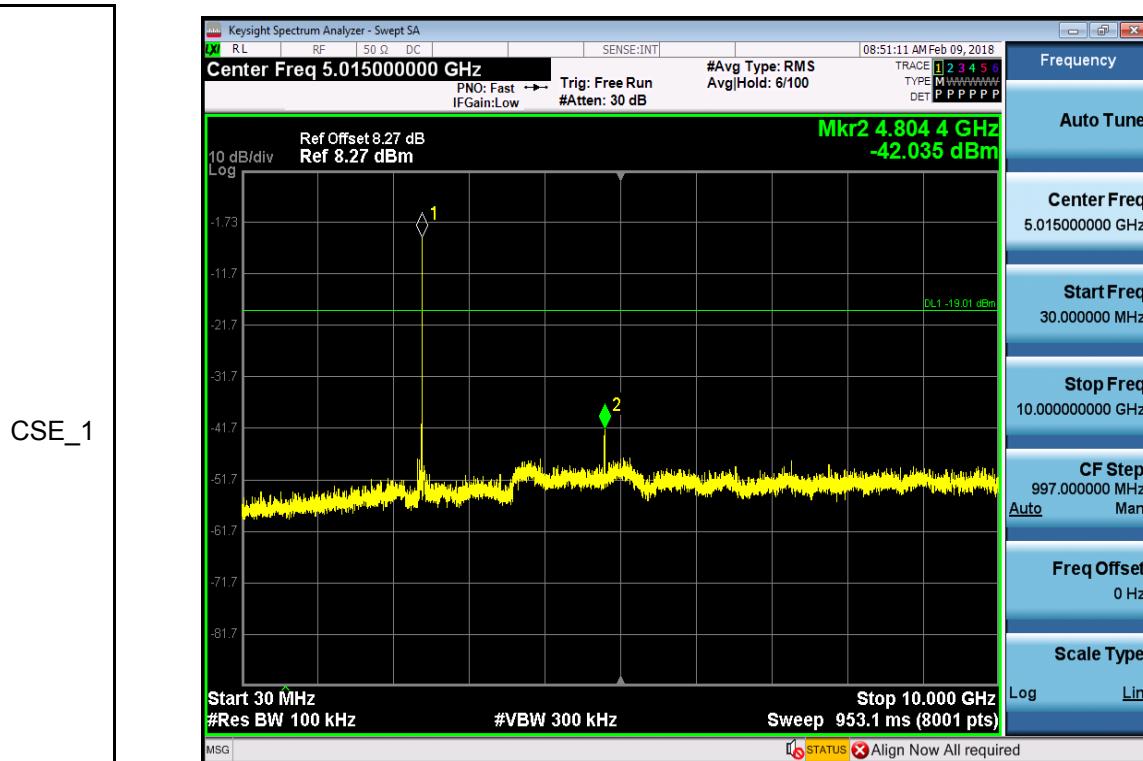


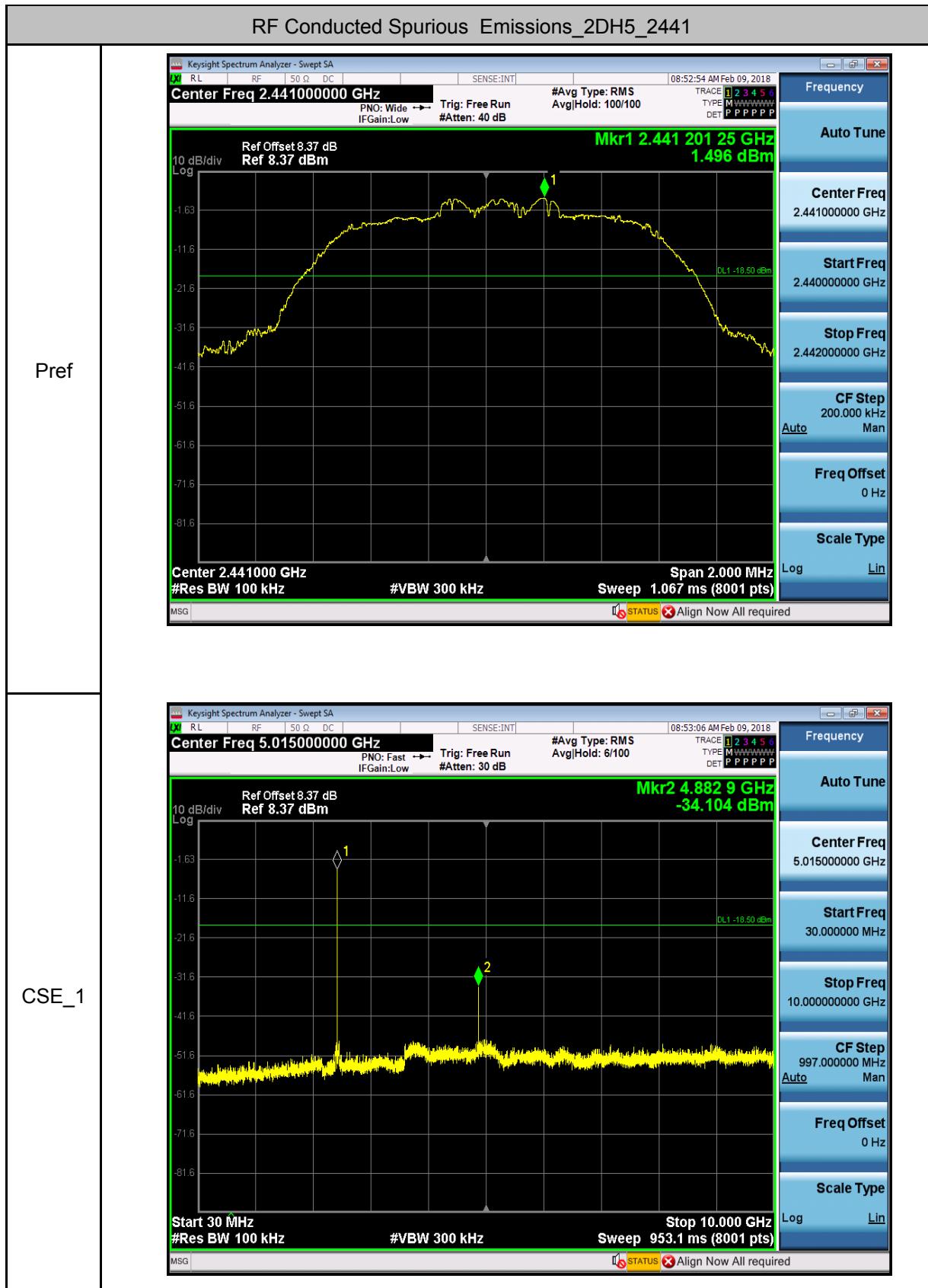


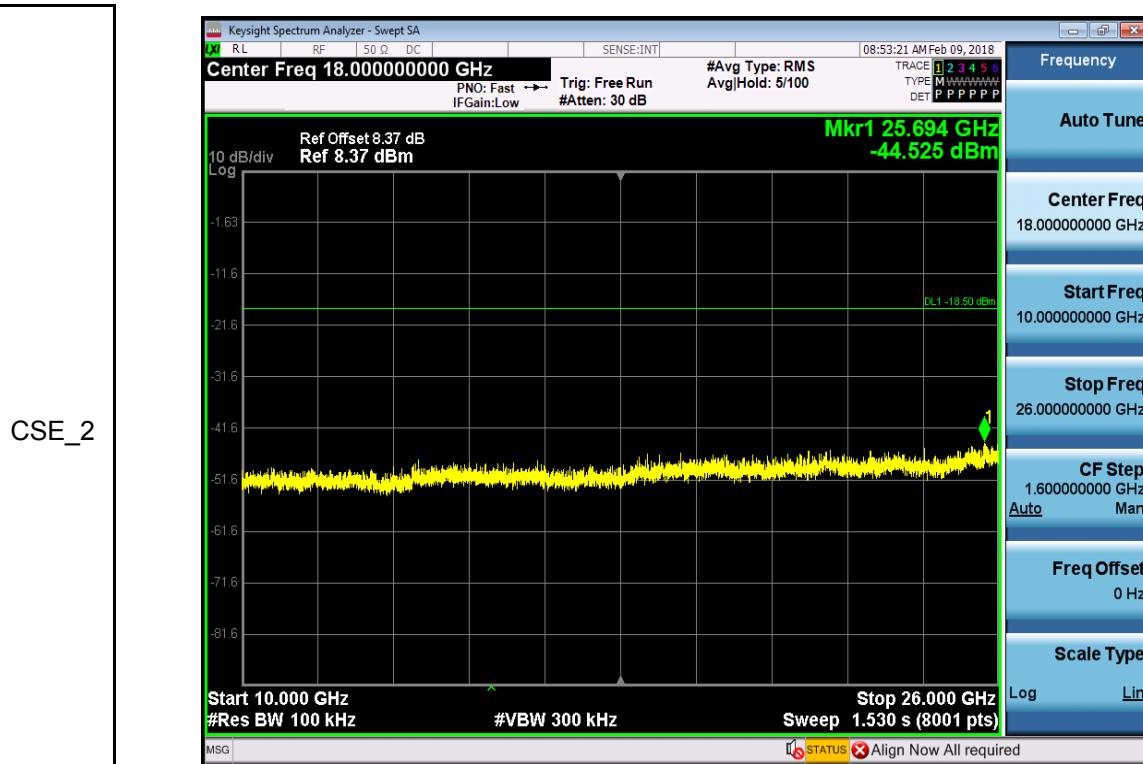


## RF Conducted Spurious Emissions\_2DH5\_2402



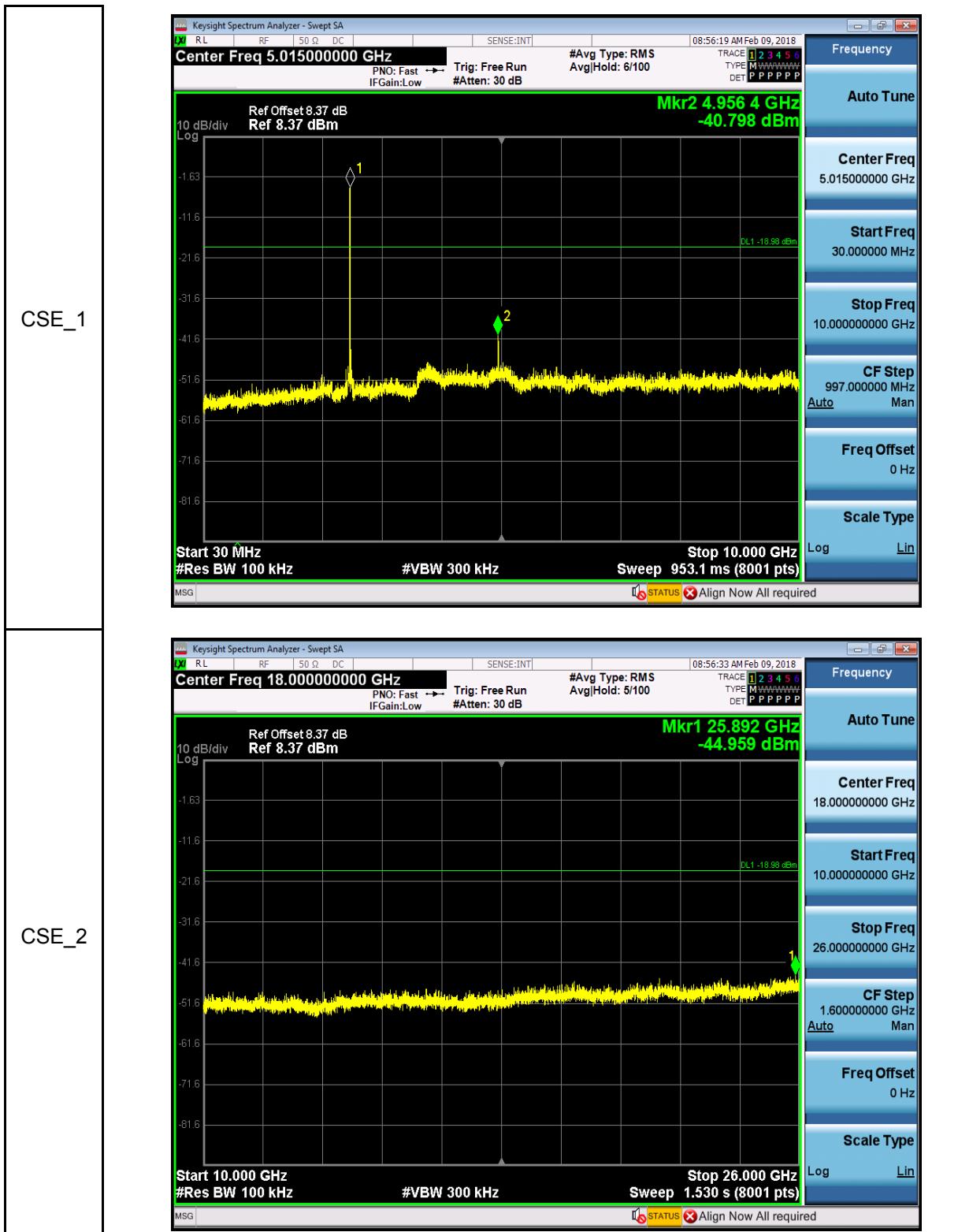






## RF Conducted Spurious Emissions\_2DH5\_2480





--End of Report--