Advanced Compliance Laboratory

210 Cougar Court
Hillsborough, NJ 08844
Tel: (908) 927 9288
Fax: (908) 927 0728

FCC CFR47 PART 15 SUBPART C & IC RSS-247

TEST REPORT

For

SOMFY SYSTEMS INC.

Ysia 1 HP Zigbee II, Ysia 5 HP Zigbee II, Ysia 5 TDBU HP Zigbee II

Model Number: 5175210B, 5175211B, 5175066B

FCC ID: DWNV2TDBUBL
IC: 12049A-V2TDBUBL

Report Number: 0048-260706-01

Prepared for

SOMFY SYSTEMS INC.
121 Herrod Blvd.
Dayton, NJ 08810
USA

Prepared by
Advanced Compliance Laboratory, Inc.
210 Cougar Court
Hillsborough, NJ 08844
Tel: (908) 927 9288
Fax: (908) 927 0728

Date: 07/31/2026

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1. TEST RESULT CERTIFICATION

COMPANY NAME: SOMFY SYSTEMS INC.

EUT DESCRIPTION: Ysia 1 HP Zigbee II, Ysia 5 HP Zigbee II, Ysia 5 TDBU HP Zigbee II

MODEL: 5175210B, 5175211B, 5175066B

DATE TESTED: 07/06/2026 to 07/31/2026

APPLICABLE STANDARDS	
STANDARD	**TEST RESULTS**
FCC Part 15.247 & IC RSS-247:Issue 4 & RSS-Gen Issue 5	NO NON-COMPLIANCE NOTED

Test Summary

Testing Items Per FCC Part 2/ Part 15.247 & IC RSS-247 /RSS-Gen Standard Requirements for DTS Modulation	**Section**	**Limit**	**Result**
DTS Bandwidth	15.247(a) (2) RSS-247, 5.2(a)	>=500KHz	Complies
Peak Power Limit	15.247(b) (3) RSS-247, 5.4(d)	Conducted: 1W (30dBm) e.i.r.p. 4W(36dBm)	Complies
Peak Power Spectral Density	15.247(e) RSS-247, 5.2(b)	8dBm/3KHz	Complies
Emissions (Conducted)	15.247(d) RSS-247, 5.5	-20dB/-30dB	Complies*
Spurious (Radiated)	15.205(a) RSS-247, 5.5	15.209/RSS-Gen	Complies
RF Safety*	1.1310/RSS-102	1.0/5.0 mW/cm^2	Complies**

NOTE: *****For mobile or fixed location transmitters, the minimum separation distance is 20 cm, even if calculations indicate that the MPE distance would be less.

Advanced Compliance Laboratory, Inc. tested the above equipment in accordance with the requirements set forth in the above standards. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

Note : This document reports conditions under which testing was conducted and results of tests performed. This document may not be altered or revised in any way unless done so by Advanced Compliance Laboratory, Inc. (ACL) and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by ACL, Advanced Compliance Laboratory, Inc. will constitute fraud and shall nullify the document.

Approved & Released For ACL By:

Wei Li
Manager
Advanced Compliance Laboratory, Inc.

Tested By:

David Tu
EMC Engineer

2. EUT DESCRIPTION

The EUT for this certification is a low power transmitter, using digital modulation & operating in the 2400 MHz band.

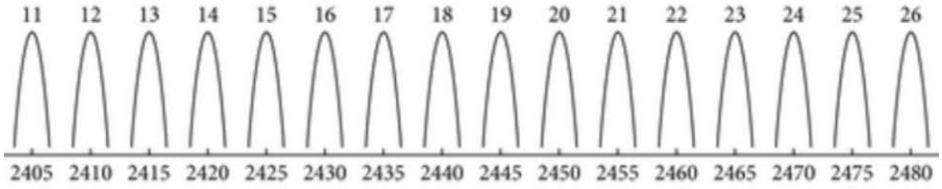
The transmitter has a maximum peak conducted output power as follows:

ZIGBEE Mode:

Frequency /Range (MHz)		Tested Peak Power at Antenna Input (dBm/W)	Tested EIRP (dBm/W)
2405-2480		12.10 dBm/ 0.016W	18.06dBm/ 0.064W

Frequency band: 2.400 to 2.4835 GHz
Channel spacing: 5 MHz
16 channels are available
Modulation: OQPSK
Coding: DSSS

Wire antenna gain: +5.96dBi



Bluetooth Low Energy (BLE) Mode:

Frequency /Range (MHz)		Tested Peak Power at Antenna Input (dBm/W)	Tested EIRP (dBm/W)
2402-2480		0.35 dBm/ 0.0011W	6.31dBm/ 0.0043W

Frequency band: 2.400 to 2.4835 GHz
Channel spacing: 2 MHz
40 channels are available

Modulation: GFSK

Wire antenna gain: +5.96dBi

Channel List:

Channel Number	Standard frequency & maximum tolerance
37 (Advertising chanel)	2402 MHz ±150 kHz
0	2404 MHz ±150 kHz
1	2406 MHz ±150 kHz
2	2408 MHz ±150 kHz
3	2410 MHz ±150 kHz
4	2412 MHz ±150 kHz
5	2414 MHz ±150 kHz
6	2416 MHz ±150 kHz
7	2418 MHz ±150 kHz
8	2420 MHz ±150 kHz
9	2422 MHz ±150 kHz
10	2424 MHz ±150 kHz
38 (Advertising chanel)	2426 MHz ±150 kHz
11	2428 MHz ±150 kHz
12	2430 MHz ±150 kHz
13	2432 MHz ±150 kHz
14	2434 MHz ±150 kHz
15	2436 MHz ±150 kHz
16	2438 MHz ±150 kHz
17	2440 MHz ±150 kHz

Channel Number	Standard frequency & maximum tolerance
18	2442 MHz ±150 kHz
19	2444 MHz ±150 kHz
20	2446 MHz ±150 kHz
21	2448 MHz ±150 kHz
22	2450 MHz ±150 kHz
23	2452 MHz ±150 kHz
24	2454 MHz ±150 kHz
25	2456 MHz ±150 kHz
26	2458 MHz ±150 kHz
27	2460 MHz ±150 kHz
28	2462 MHz ±150 kHz
29	2464 MHz ±150 kHz
30	2466 MHz ±150 kHz
31	2468 MHz ±150 kHz
32	2470 MHz ±150 kHz
33	2472 MHz ±150 kHz
34	2474 MHz ±150 kHz
35	2476 MHz ±150 kHz
36	2478 MHz ±150 kHz
39 (Advertising chanel)	2480 MHz ±150 kHz

3. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.4-2014/C63.10-2013, FCC CFR 47 Part 2 & 15 & IC RSS-247:Issue 4 & RSS-Gen Issue 5. Test procedure described in FCC "KDB 558074 D01 DTS Measurement Guidance " is used in this report.

4. FACILITIES AND ACCREDITATION

The test sites / measurement facilities for Advanced Compliance Laboratory, Inc.(ACL) to collect data are located at 210 Cougar Court, Hillsborough, New Jersey, USA. The sites are constructed in conformance with the requirements of ANSI C63.4, ANSI C63.7 and CISPR Publication 32. All receiving equipment conforms to CISPR Publication 16-1, "Radio Interference Measuring Apparatus and Measurement Methods".

This site is accepted by FCC to perform measurements under Part 15 or 18 (MRA#US3288) and also designated by IC as " site IC 3130A". ACL is recognized by ISED as a wireless testing laboratory (CAB ID: US0100) . The ANAB Lab code for accreditation of FCC EMC Test Method is AT-3288. The full accreditation can be viewed at http://www.ac-lab.com.

ANAB
ANSI National Accreditation Board

CERTIFICATE OF ACCREDITATION

The ANSI National Accreditation Board

Hereby attests that

Advanced Compliance Laboratory, Inc.
210 Cougar Court
Hillsborough, NJ 08844

Fulfills the requirements of

ISO/IEC 17025:2017

and

U.S. Federal Communication Commission (FCC) EMC and Telecommunications (EC&T) Testing Designation Program

Recognition of Telecommunications Testing - Innovation, Science, and Economic Development (ISED) Canada

Voluntary Control Council for Interference (VCCI) Normative Annex 1 Technical Requirements of the Rules for Voluntary Control Measures

In the field of

TESTING

This certificate is valid only when accompanied by a current scope of accreditation document.
The current scope of accreditation can be verified at www.anab.org

Jason Stine, Vice President
Expiry Date: 27 February 2028
Certificate Number: AT-3288

ANAB
ANSI National Accreditation Board
ilac-MRA

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2017. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (refer to joint ISO-ILAC-IAF Communiqué dated April 2017).

No part of this report may be used to claim or imply product endorsement by ANAB or any agency of the US Government.

5. CALIBRATION AND UNCERTAINTY

5.1. MEASURING INSTRUMENT CALIBRATION

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

5.2. MEASUREMENT UNCERTAINTY

The estimated uncertainty of the test result is given as following. The method of uncertainty calculation is provided in Advanced Compliance Lab. Doc. No. 0048-01-01.

	Prob. Dist.	Uncertainty(dB)	Uncertainty(dB)	Uncertainty(dB)
		30-1000MHz	1-6.5GHz	Conducted
Combined Std. Uncertainty u_c	norm.	±2.36	±2.99	±1.83

5.3. TEST AND MEASUREMENT EQUIPMENT

The following test and measurement equipment was utilized for the tests documented in this report:

Manufacturer	Model	Serial No.	Description	Last Cal dd/mm/yy	Cal Due dd/mm/yy
Agilent	E4440A	US40420700	3Hz-26.5GHz Spec. Analyzer	17/06/26	17/06/27
R &S	ESPI	100018	9KHz-7GHz EMI Receiver	15/01/26	15/01/27
HP	HP8546A	3448A00290	9kHz to 6.5GHz EMI Receiver	25/09/25	25/09/26
EMCO	3104C	9307-4396	20-300MHz Biconical Antenna	12/11/25	12/11/26
EMCO	3146	9008-2860	200-1000MHz Log-Periodic Antenna	13/11/25	13/11/26
Electro-Meterics	ALR-25M/30	289	10KHz-30MHz Active Loop Antenna	28/05/26	28/05/27
EMCO	3115	4945	Double Ridge Guide Horn Antenna	28/11/25	28/11/26
R&S	SMH	8942280/010	Signal Generator	15/01/26	15/01/27
RES-NET	RFA500NFF30	0108	30dB in-line Power Attenuator	15/01/26	15/01/27

All Test Equipment Used is Calibrated, Traceable to NIST Standards.

6. SETUP OF EQUIPMENT UNDER TEST

SUPPORT EQUIPMENT

None.

TEST SETUP

Testing Frequency/Channel/Port Selection: **Zigbee Mode**

- Selected Channel Frequency = 2405MHz, 2440 MHz, 2480MHz
- For intentional radiator measurements, 2405/2440/2480 MHz transmitter was configured to transmit continuously.

Testing Frequency/Channel/Port Selection: **BLE Mode**

- Selected Channel Frequency = 2402MHz, 2440 MHz, 2480MHz
- For intentional radiator measurements, 2402/2440/2480 MHz transmitter was configured to transmit continuously.

The EUT was powered by rechargeable DC battery.

Engineering Justification:

Model 5175210B, 5175211B, 5175066B: The Ysia Zigbee II and Ysia TDBU Zigbee II share the same schematics and PCB layouts. Only a few switch (buttons) configurations differ between the two models. For the 1C and 5C versions, the PCB remains identical; only a few components—such as LEDs, resistors, and transistors—are not populated on the 1C versions.

Since all devices utilize the same RF PCBA and configuration, 5175211B is used for conducted measurements. Based on the pre investigation results, 5175211B represents the worst case scenario and is configured for final tests.

7. APPLICABLE LIMITS AND TEST RESULTS

7.1 6dB &99% BANDWIDTH

LIMIT

§15.247 (a) (2) & RSS-247 Sec.5.1(1): Min. 6dB DTS bandwidth should be no less than 500KHz.

TEST PROCEDURE *per FCC KDB 558074D01v05r02*

Measurement Procedure for Emission Bandwidth (DTS Bandwidth)	Applicable to this EUT
8.2 DTS BW Measurement Procedure per Subclause 11.8 of ANSI C63.10	☒

RESULTS

No non-compliance noted.

Zigbee Mode:

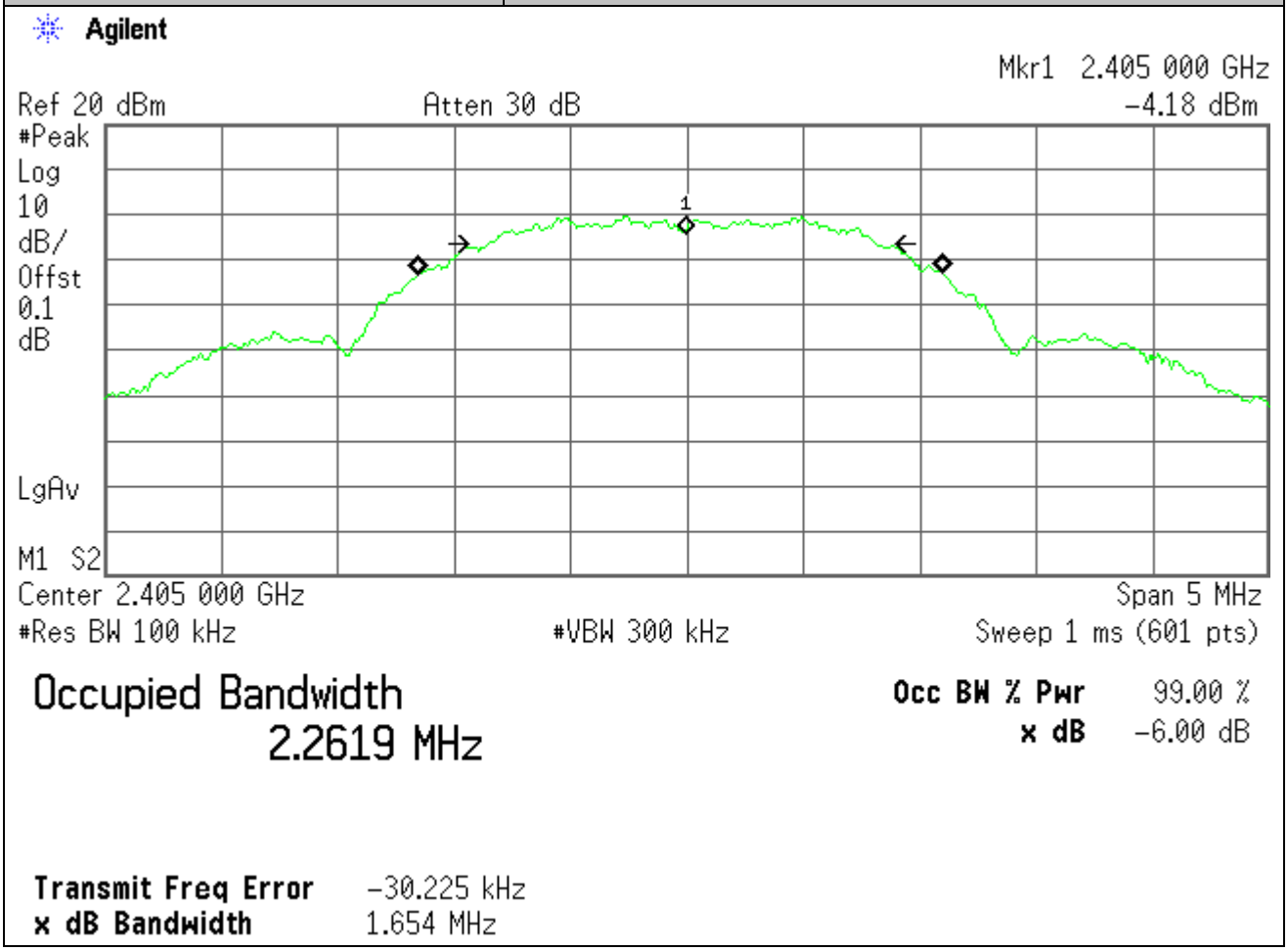
Channel	Frequency (MHz)	6dB Bandwidth (KHz)	99% Bandwidth (KHz)
L	2405	1653	2262
M	2440	1640	2271
H	2480	1638	2273

Bluetooth Low Energy (BLE) Mode:

Channel	Frequency (MHz)	6dB Bandwidth (KHz)	99% Bandwidth (KHz)
L	2402	641.8	1045.4
M	2440	662.2	1044.7
H	2480	660.3	1046.7

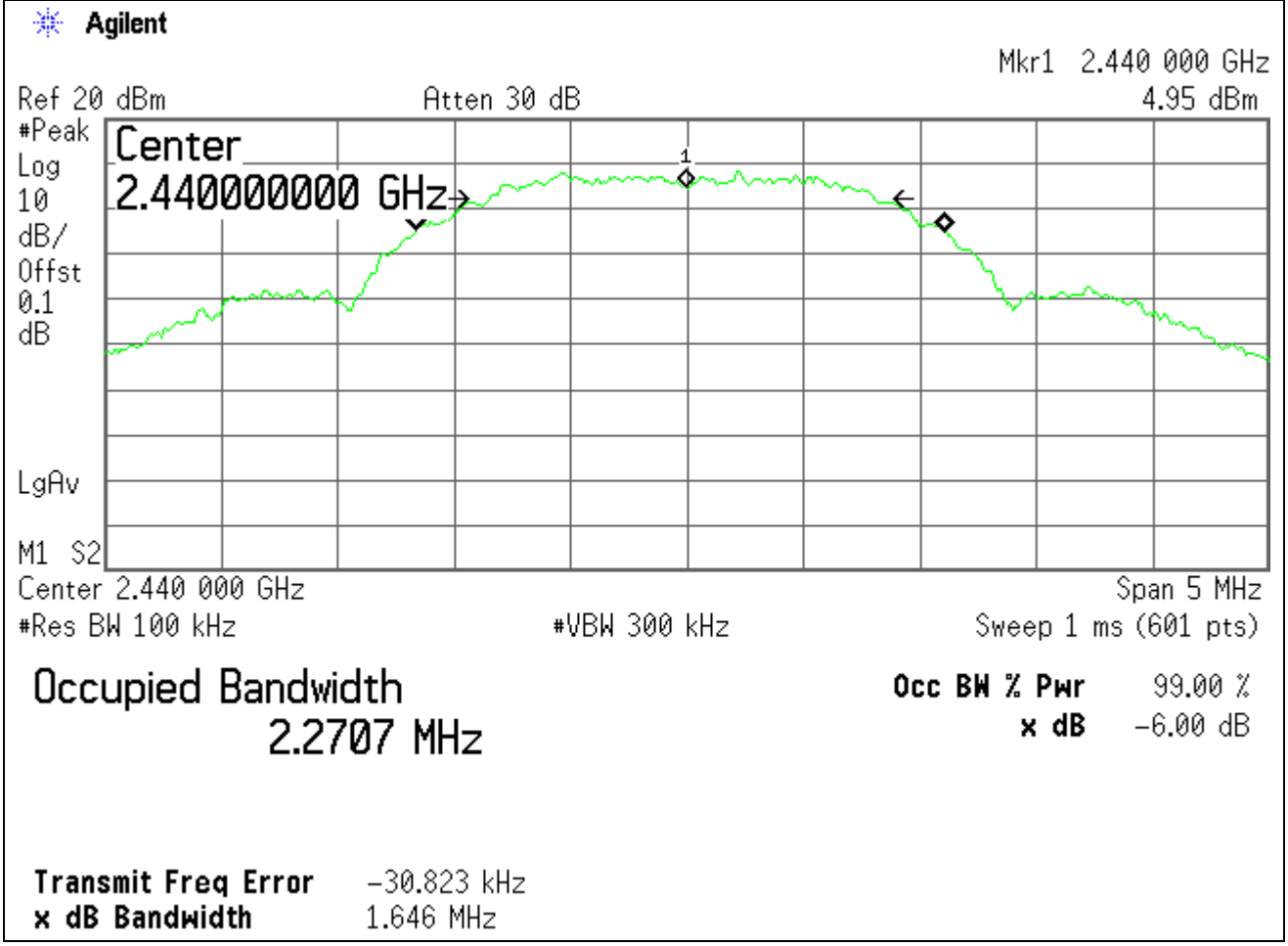
6dB & 99% BANDWIDTH_Zigbee Mode

Plot Name:	6dB & 99% Bandwidth Low CH



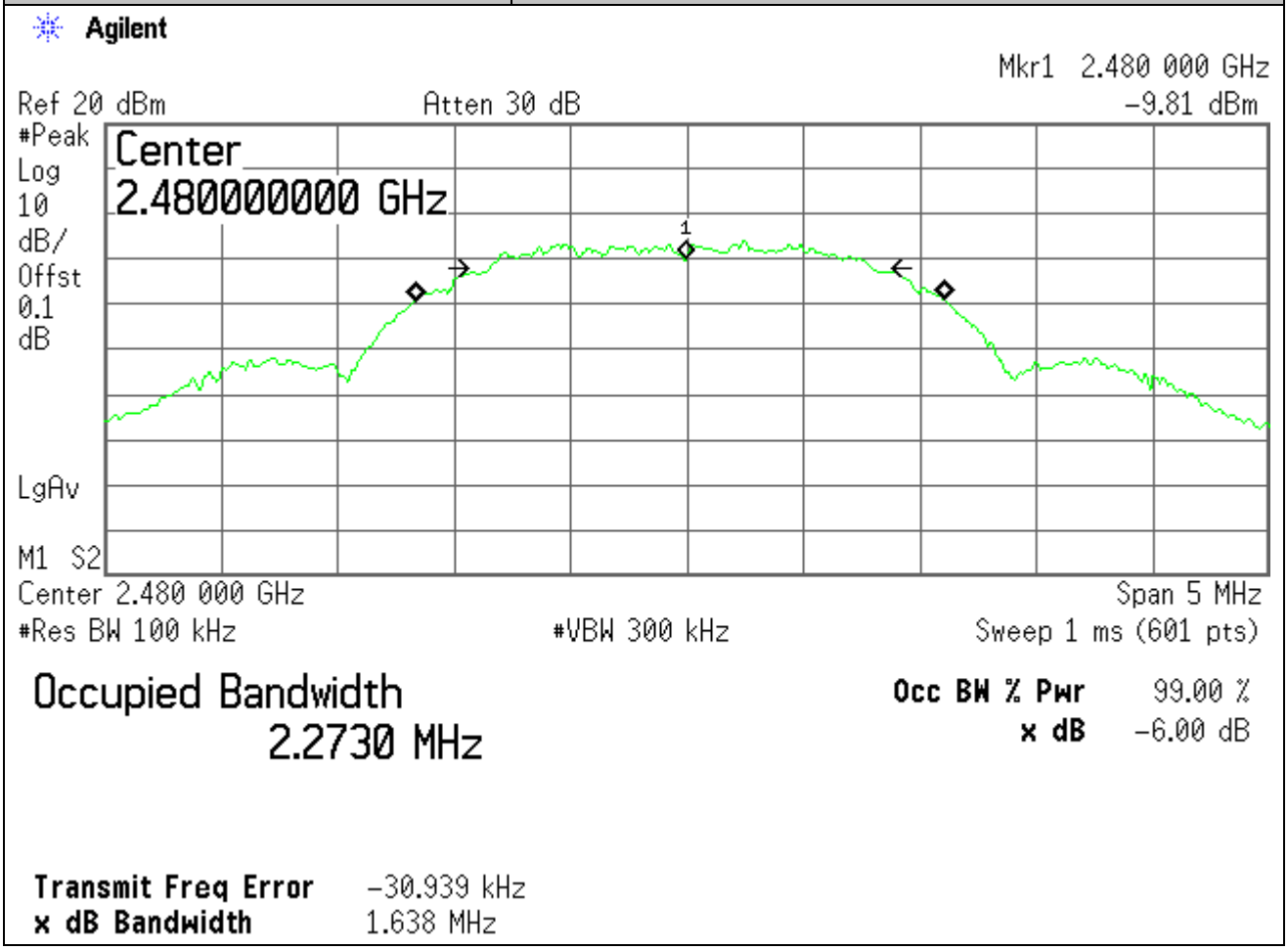
6dB & 99% BANDWIDTH_Zigbee Mode

Plot Name:	6dB & 99% Bandwidth Mid CH



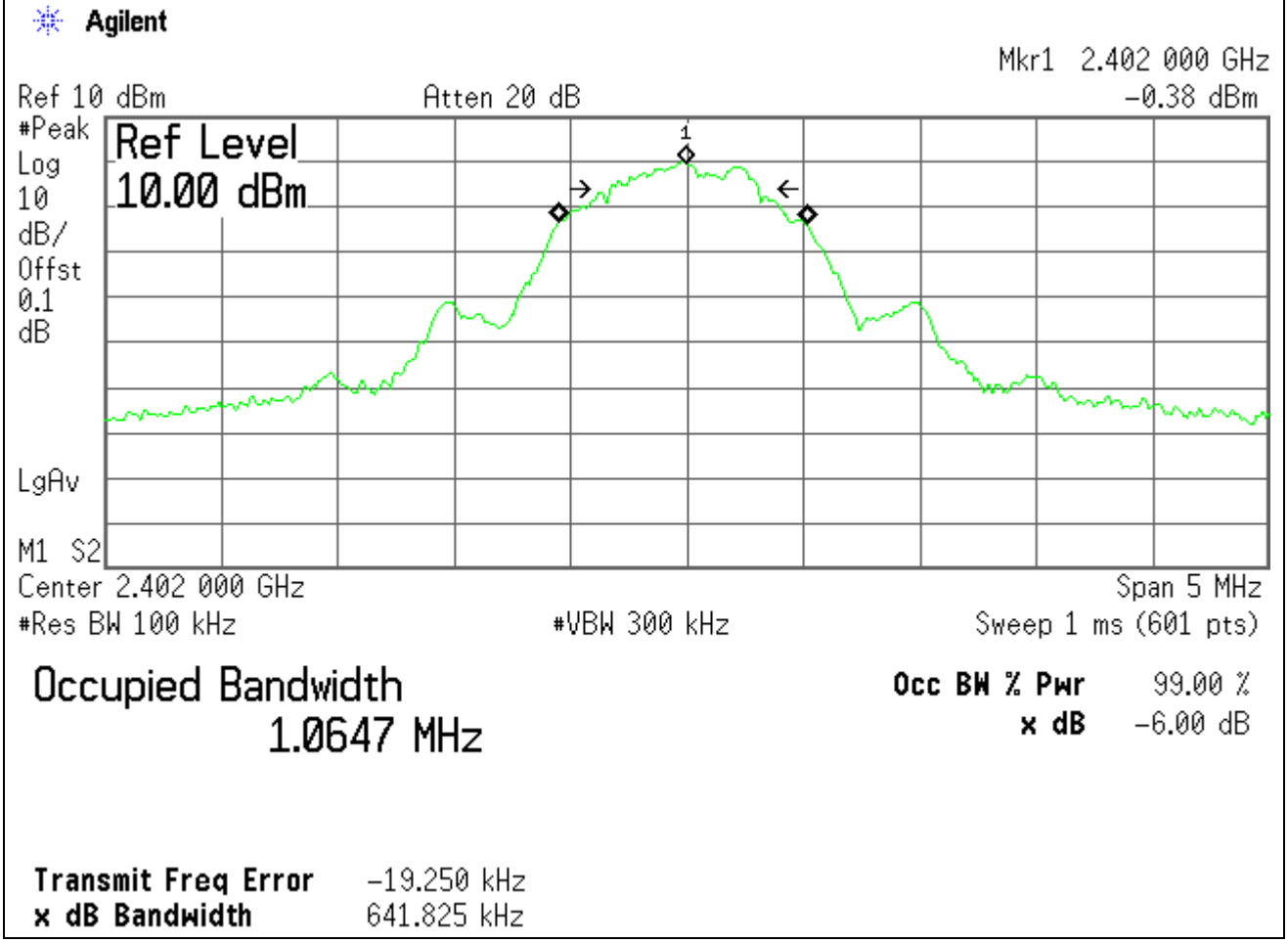
6dB & 99% BANDWIDTH_Zigbee Mode

Plot Name:	6dB & 99% Bandwidth High CH



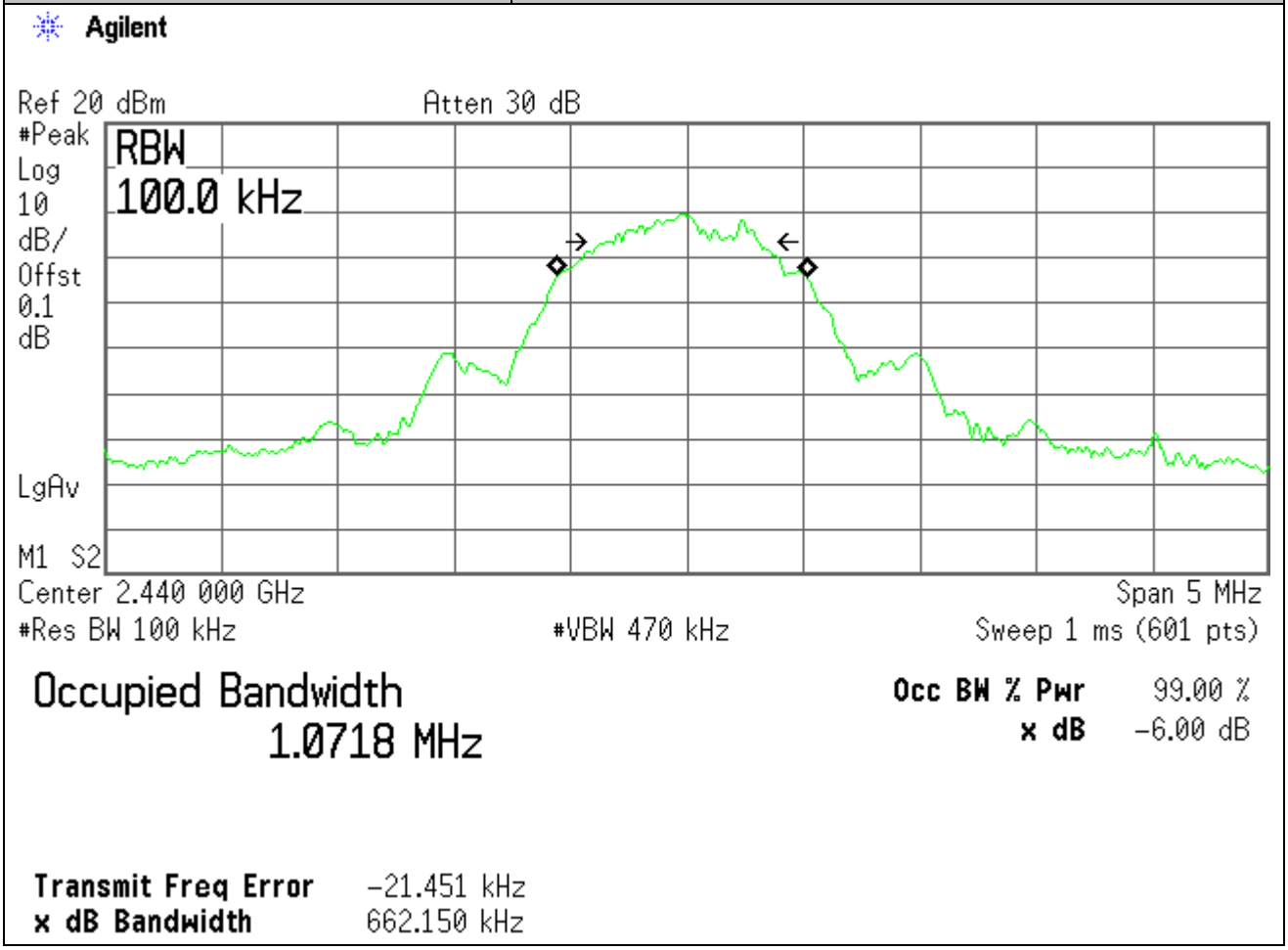
6dB BANDWIDTH_BLE Mode

Plot Name:	6dB Bandwidth Low CH



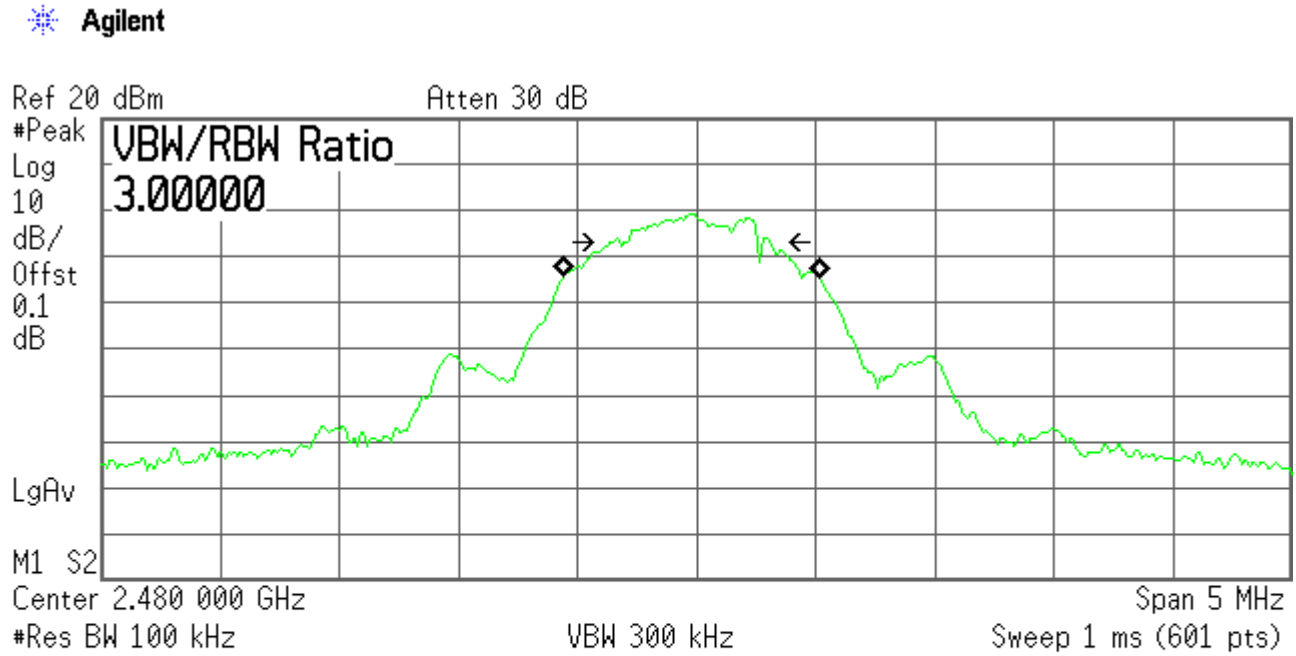
6dB BANDWIDTH_BLE Mode

Plot Name:	6dB Bandwidth Mid CH



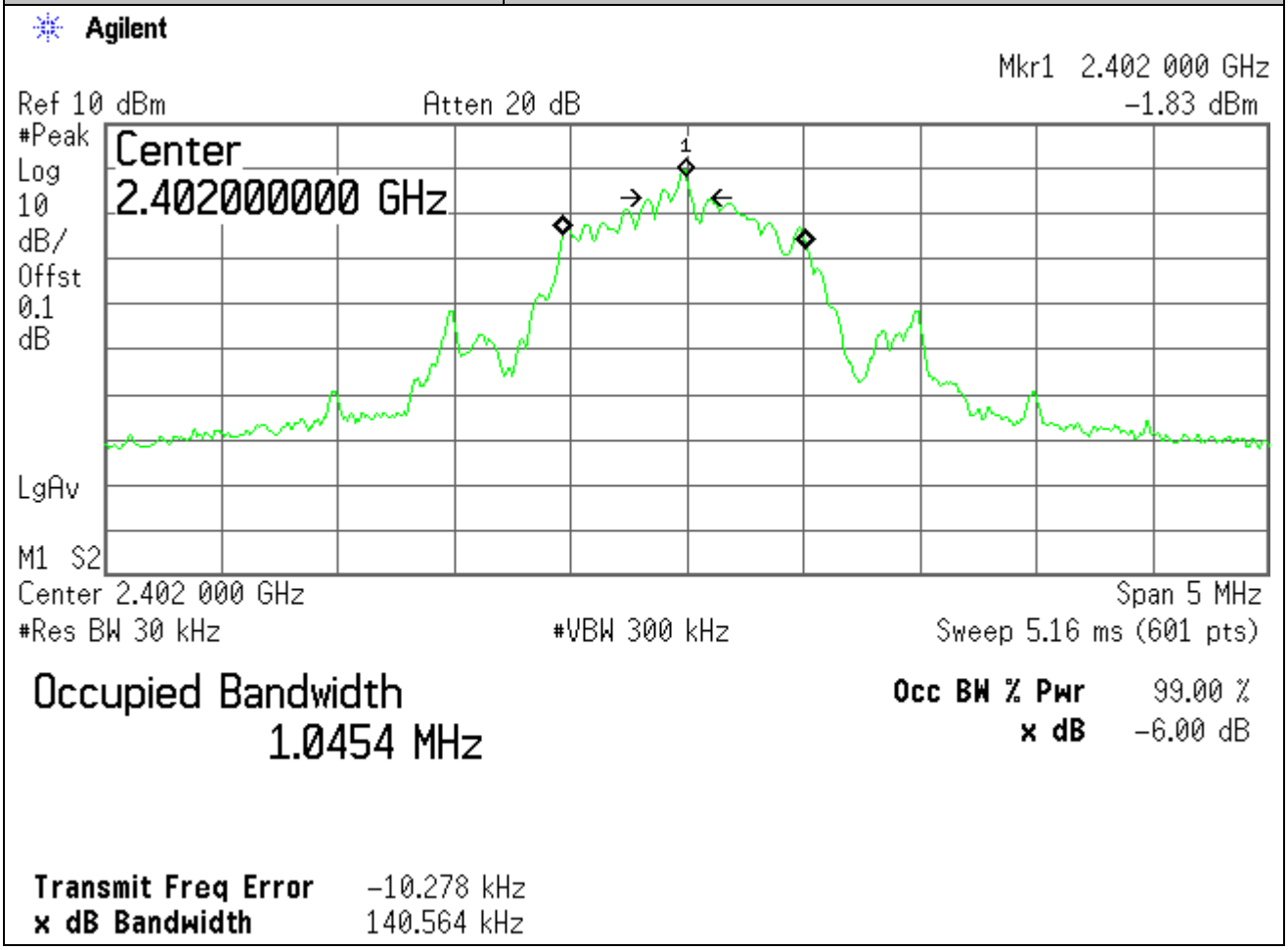
6dB BANDWIDTH_BLE Mode

Plot Name:	6dB Bandwidth High CH



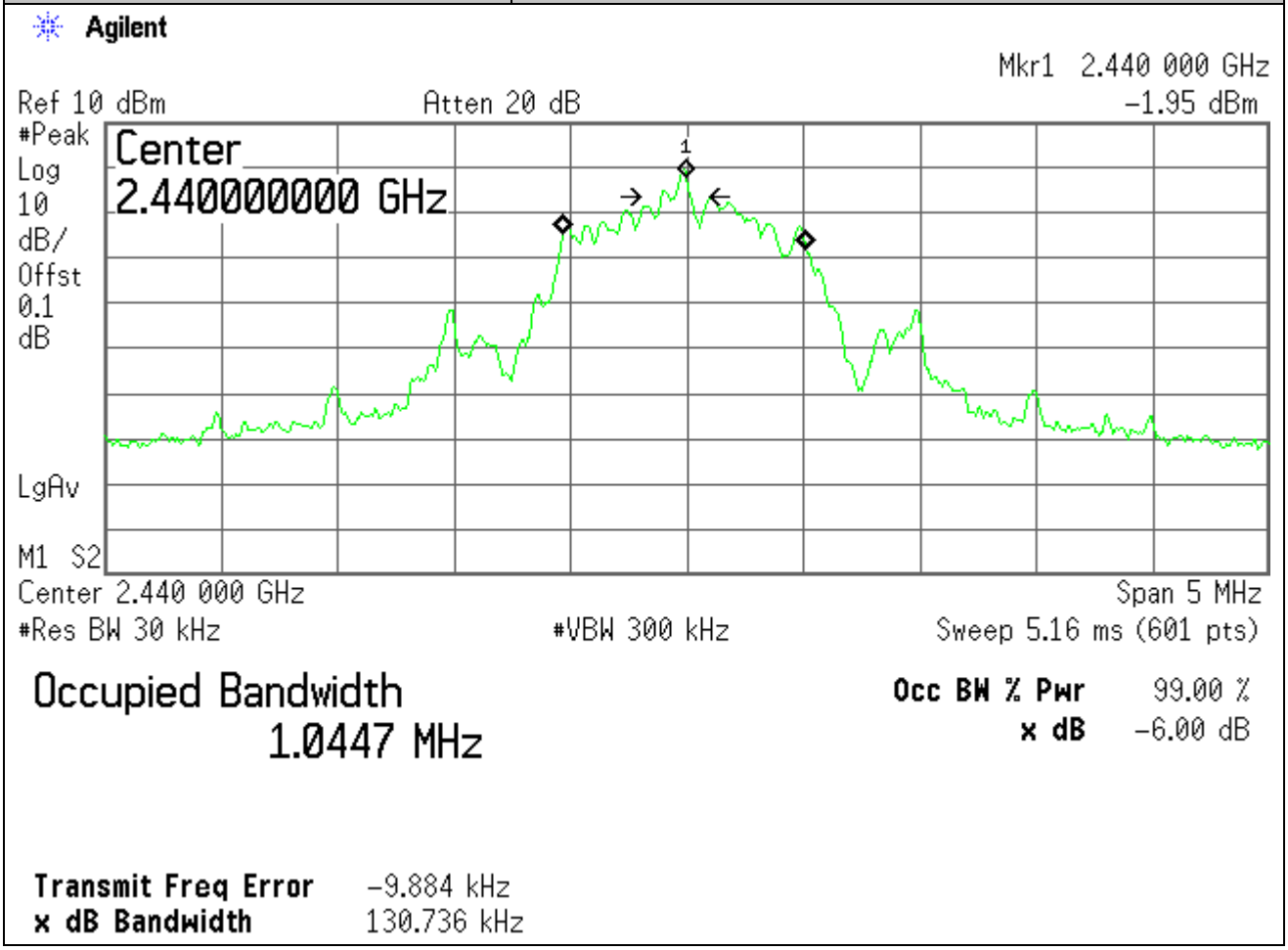
99% BANDWIDTH_BLE Mode

Plot Name:	99% Bandwidth Low CH



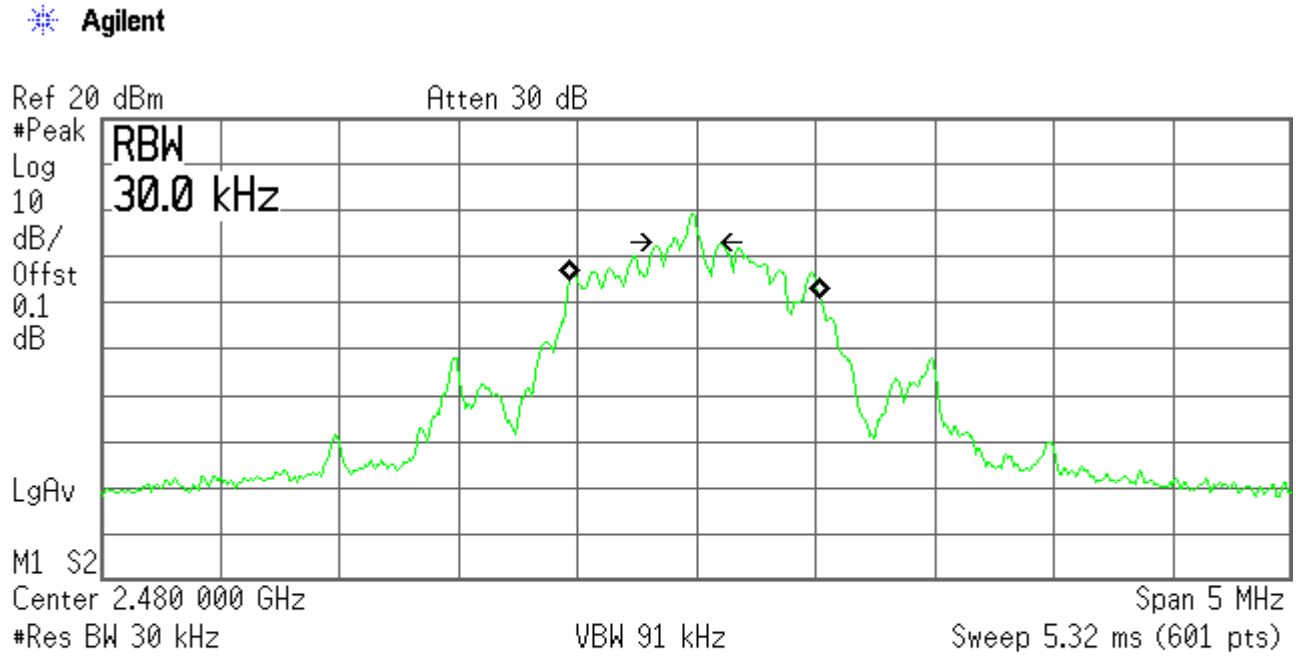
99% BANDWIDTH_BLE Mode

Plot Name:	99% Bandwidth Mid CH



99% BANDWIDTH_BLE Mode

Plot Name:	99% Bandwidth High CH



7.2 PEAK OUTPUT POWER

PEAK POWER LIMIT

§15.247 (b)(3) & RSS-247 Sec. 5.4(4)

The maximum peak conducted output power of the intentional radiator shall not exceed the following: For systems using digital modulation in the 900 MHz band: 1 Watt.

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.

b(4) 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.

Therefore, the applicable output power limit shall be calculated as follows:

Pout = 30 -(Gtx-6) for antenna gain ≤6dBi or
Pout = 30 -Floor[(Gtx-6)/3]
G_{Tx} = the maximum transmitting antenna directional gain in dBi.

TEST PROCEDURE ***per FCC KDB 558074D01v05r02***

Measurement Procedure for Fundamental Emission Output Power*	**Applicable to this EUT**
8.3.1.1 Maximum Peak Conducted Output Power Level Measurement Procedure Option 1 (RBW≥DTS BW): Per Subclause 11.9.1.1 of ANSI C63.10	☒**preferred**
8.3.1.2 Maximum Peak Conducted Output Power Level Measurement Procedure Option 2 (RBW<DTS BW) Integrated band power method: Prefer to use integrated average power measurement, as described in 8.3.2	☐
8.3.1.3 Maximum Peak Conducted Output Power Level Measurement Procedure Option 3: PKPM1 Peak-reading power meter method per Subclause 11.9.1.3 of ANSI C63.10	☐

* For measuring output power of a device transmitting a wide-band noise-like signal (i.e., digitally-modulated) where the peak power amplitude is a statistical parameter, the preferred methodology is to use integrated average power measurements, as described in 11.9.2 and 11.13.3 of ANSI C63.10.

If a radiated test configuration is used, then the measured power or field strength levels shall be converted to equivalent conducted power levels for comparison to the applicable output power limit. This may be accomplished by first measuring the radiated field strength or power levels using a methodology for maximum peak conducted power or maximum conducted (average) power as applicable and peak or average power spectral density as applicable. The radiated field strength or power level can then be converted to EIRP (see ANSI C63.10 for guidance). Therefore, the applicable output power limit shall be calculated as follows:

EIRP (dBm) = E (dBuV/m) – 95.2

No non-compliance noted.

OUTPUT PEAK POWER

Summary of Peak Power Testing Data:

Zigbee Mode

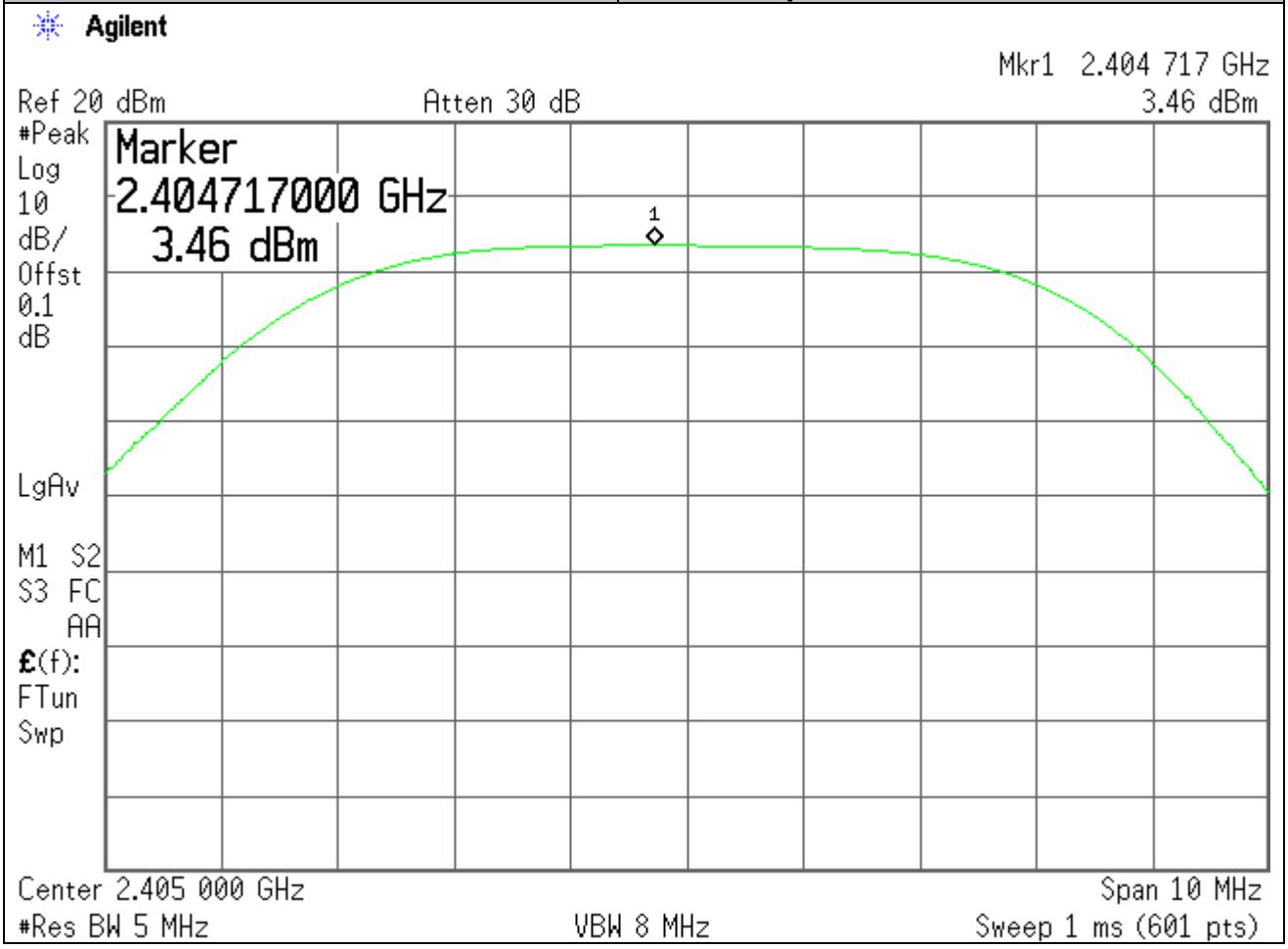
Channel	Frequency (MHz)		Peak Power at Module Output* (dBm)	Limit (dBm)	Margin (dB)
Low	2405		3.46	30	-26.54
Middle	2440		12.10	30	-17.9
High	2480		-2.12	30	-32.12

BLE Mode

Channel	Frequency (MHz)		Peak Power at Module Output* (dBm)	Limit (dBm)	Margin (dB)
Low	2402		0.35	30	-29.65
Middle	2440		0.00	30	-30
High	2480		-0.37	30	-30.37

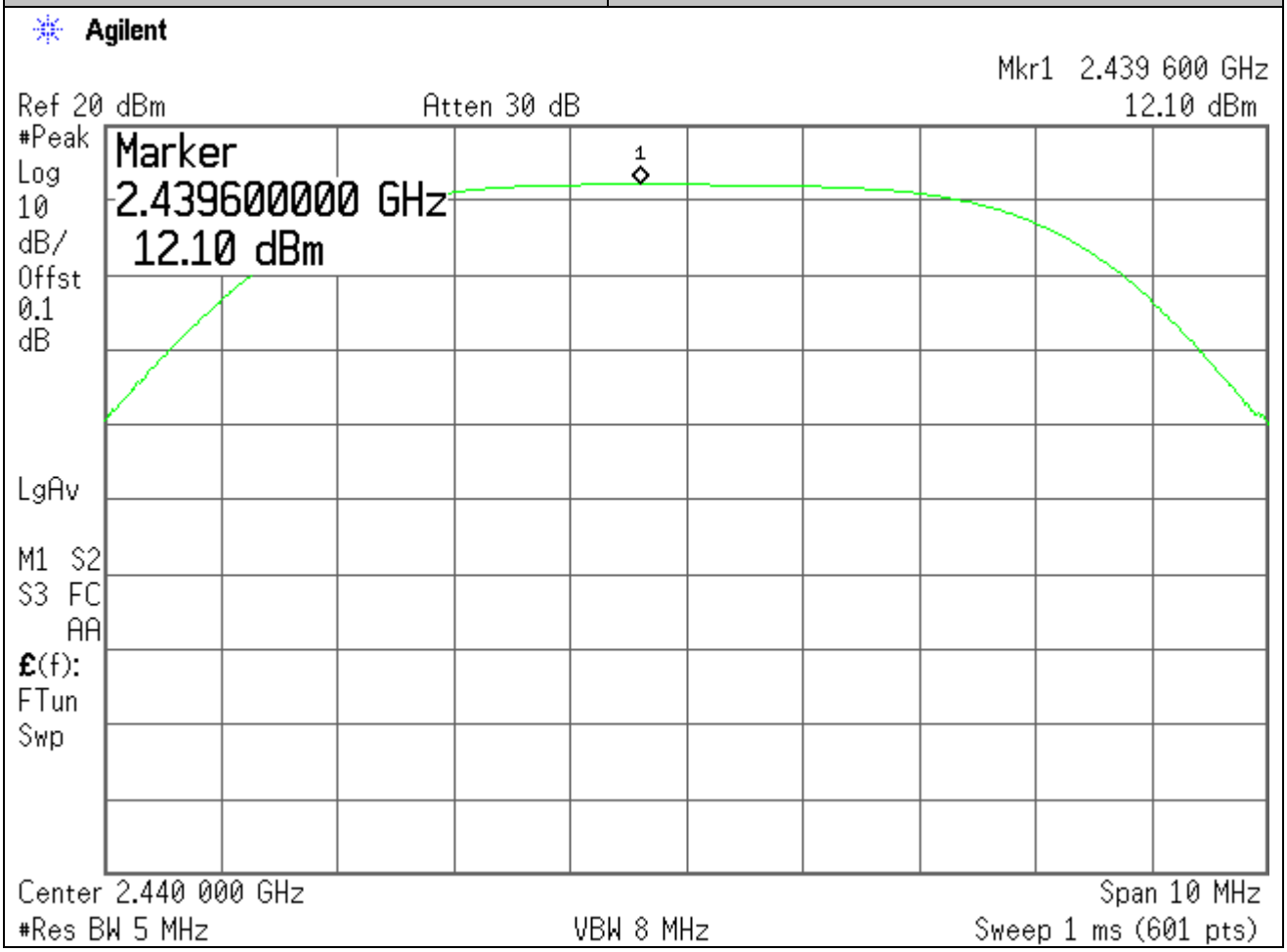
Zigbee Mode:

Plot Name:	Output Peak Power @ Low CH



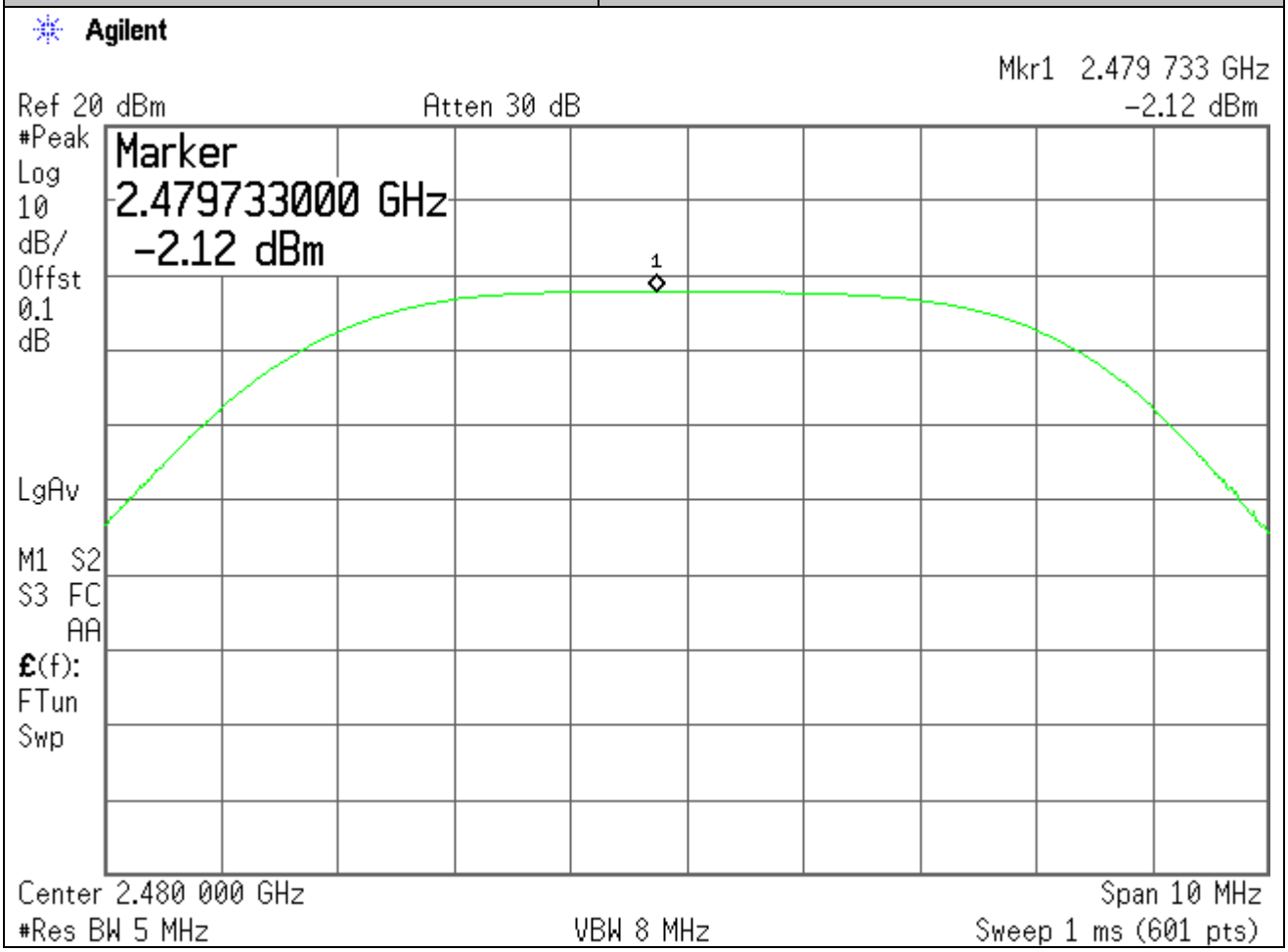
Zigbee Mode:

Plot Name:	Output Peak Power @ Mid CH



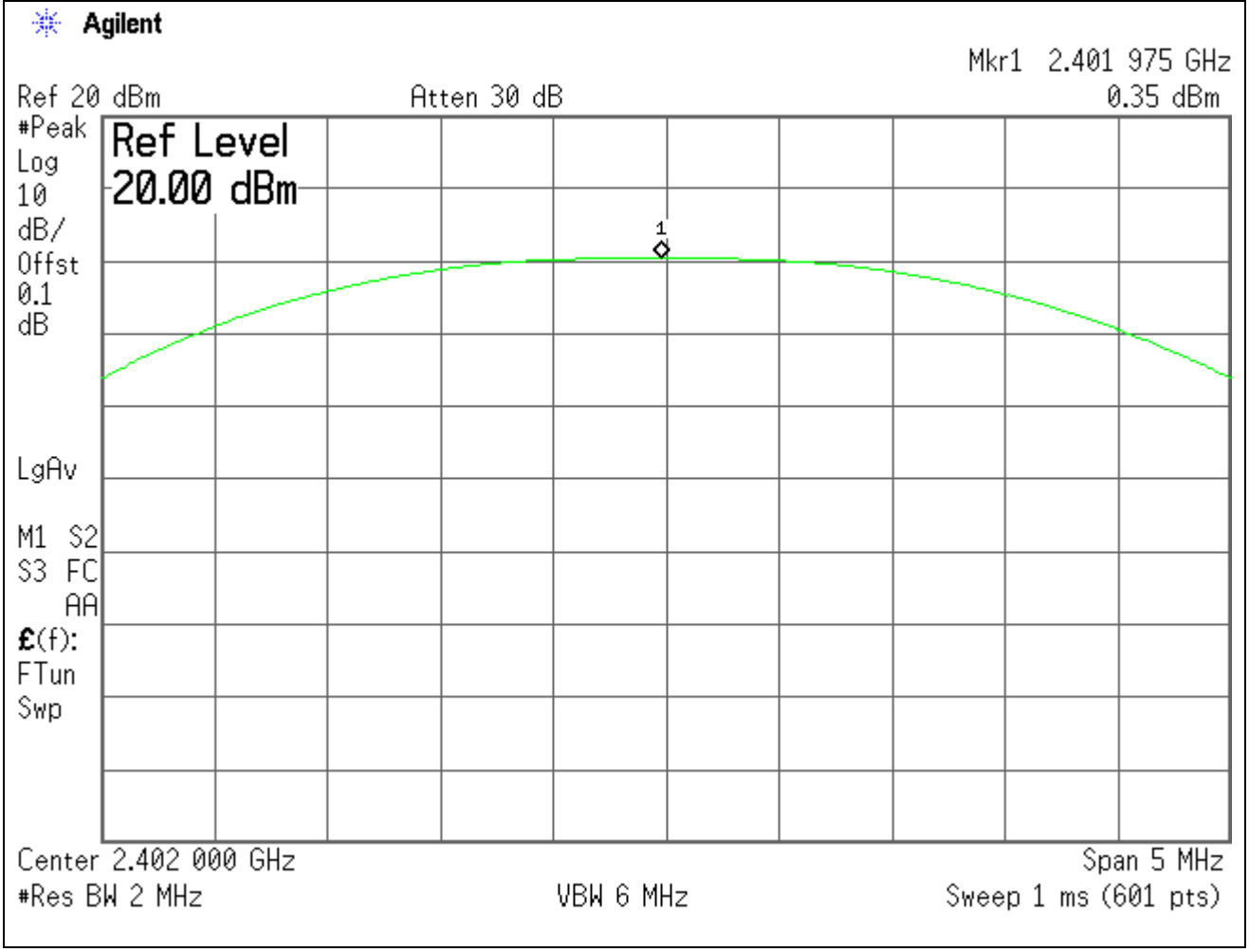
Zigbee Mode:

Plot Name:	Output Peak Power @ High CH



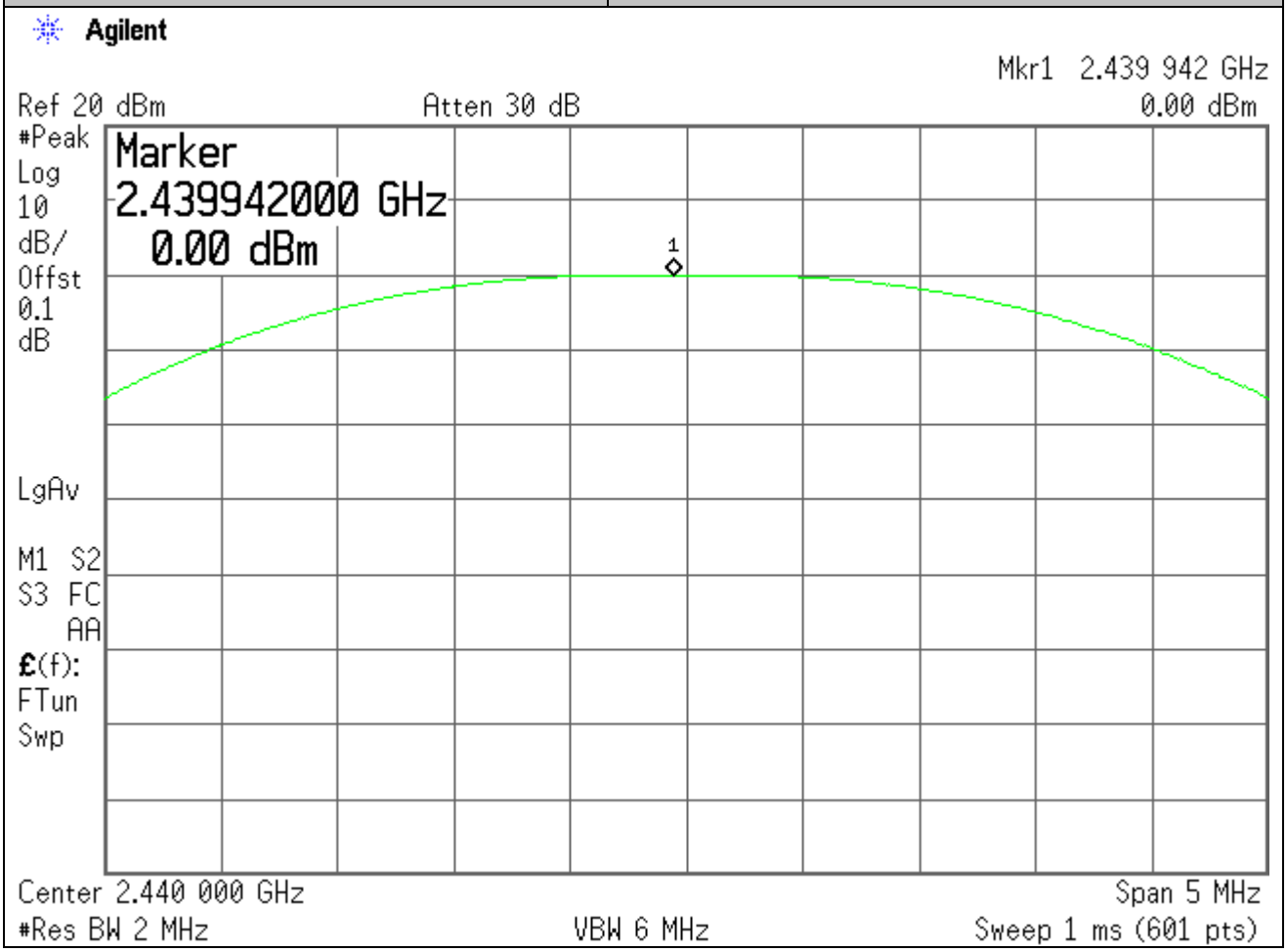
BLE Mode:

Plot Name:	Output Peak Power @ Low CH



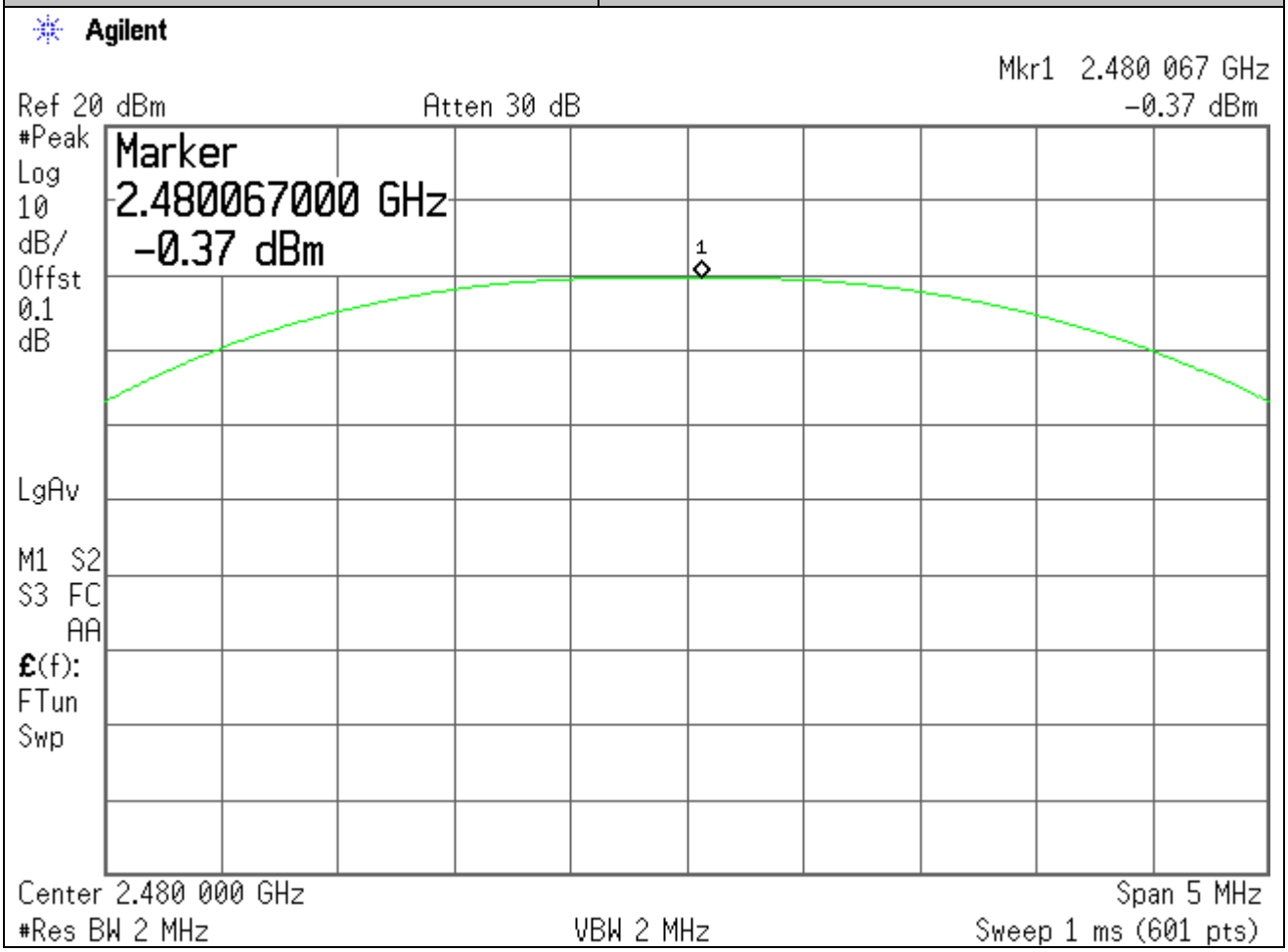
BLE Mode:

Plot Name:	Output Peak Power @ Mid CH



BLE Mode:

Plot Name:	Output Peak Power @ High CH



7.3 MAXIMUM PERMISSIBLE EXPOSURE

LIMITS for FCC RF Exposure Evaluation

§1.1310 The criteria listed in Table 1 shall be used to evaluate the environmental impact of human exposure to radio-frequency (RF) radiation as specified in §1.1307(b), except in the case of portable devices which shall be evaluated according to the provisions of §2.1093 of this chapter.

TABLE 1—LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm^2)	Averaging time (minutes)
(A) Limits for Occupational/Controlled Exposures				
0.3–3.0	614	1.63	*(100)	6
3.0–30	1842/f	4.89/f	*($900/f^2$)	6
30–300	61.4	0.163	1.0	6
300–1500			f/300	6
1500–100,000			5	6
(B) Limits for General Population/Uncontrolled Exposure				
0.3–1.34	614	1.63	*(100)	30
1.34–30	824/f	2.19/f	*($180/f^2$)	30

TABLE 1—LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)—Continued

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm^2)	Averaging time (minutes)
30–300	27.5	0.073	0.2	30
300–1500			f/1500	30
1500–100,000			1.0	30

f = frequency in MHz
* = Plane-wave equivalent power density
NOTE 1 TO TABLE 1: Occupational/controlled limits apply in situations in which persons are exposed as a consequence of their employment provided those persons are fully aware of the potential for exposure and can exercise control over their exposure. Limits for occupational/controlled exposure also apply in situations when an individual is transient through a location where occupational/controlled limits apply provided he or she is made aware of the potential for exposure.
NOTE 2 TO TABLE 1: General population/uncontrolled exposures apply in situations in which the general public may be exposed, or in which persons that are exposed as a consequence of their employment may not be fully aware of the potential for exposure or can not exercise control over their exposure.

LIMITS for FCC SAR Evaluation

KDB 447498 D04 Interim General RF Exposure Guidance v01, section 2.1.3 **SAR-Based Exemption:**
"A more comprehensive exemption, considering a variable power threshold that depends on both the *separation distance* and power, is provided in § 1.1307(b)(3)(i)(B). This exemption is applicable to the frequency range between 300 MHz and 6 GHz, with *test separation distances* between 0.5 cm and 40 cm, and for all RF sources in fixed, mobile, and portable device exposure conditions**."**

For 100 MHz to 6 GHz and test separation distances ≤ 50 mm, the 1-g and 10-g SAR test exclusion thresholds are determined by the following:
[(max. power of channel, including tune-up tolerance, mW) / (min. test separation distance, mm)] · [√f(GHz)] ≤ 3.0 for 1-g SAR, and ≤ 7.5 for 10-g extremity SAR,
where f(GHz) is the RF channel transmit frequency in GHz

FCC KDB 447498 D01 General RF Exposure Guidance v06, section 4.3.1 & Appendix A provides the SAR Test Exclusion Thresholds (ERP/Conducted) to verify that the device is exempt from 1-g extremity SAR at different separation distances. As example, for 900MHz Tx: 16mW (12dBm); For 2450MHz Tx: 10mW (10dBm) at ≤5 mm.

Details in calculation formula for reference, given in § 1.1307(b)(3)(i)(B) to calculate the exemption:

$$P_{th}\ (\text{mW}) = \begin{cases} ERP_{20\ cm}(d/20\ \text{cm})^{x} & d \le 20\ \text{cm} \\ ERP_{20\ cm} & 20\ \text{cm} < d \le 40\ \text{cm} \end{cases}$$

Where

$$x = -\log_{10}\left(\frac{60}{ERP_{20\ cm}\sqrt{f}}\right)$$ and f is in GHz;

and

$$ERP_{20\ cm}\ (\text{mW}) = \begin{cases} 2040f & 0.3\ \text{GHz} \le f < 1.5\ \text{GHz} \\ 3060 & 1.5\ \text{GHz} \le f \le 6\ \text{GHz} \end{cases}$$

d = the separation distance (cm);

LIMITS per ISED RSS-102 (issue 6)

Section 6.3 & Table 11 for Exemption Limits for Routine Evaluation — SAR Evaluation

Table 11: Power limits for exemption from routine SAR evaluation based on the separation distance

Frequency (MHz)	≤ 5 mm (mW)	10 mm (mW)	15 mm (mW)	20 mm (mW)	25 mm (mW)	30 mm (mW)	35 mm (mW)	40 mm (mW)	45 mm (mW)	> 50 mm (mW)
≤ 300	45	116	139	163	189	216	246	280	319	362
450	32	71	87	104	124	147	175	208	248	296
835	21	32	41	54	72	96	129	172	228	298
1900	6	10	18	33	57	92	138	194	257	323
2450	3	7	16	32	56	89	128	170	209	245
3500	2	6	15	29	50	72	94	114	134	158
5800	1	5	13	23	32	41	54	74	102	128

For limb-worn devices where the 10 gram value applies, the exemption limits for routine evaluation in Table 1 are multiplied by a factor of 2.5.

Example: Exclusion Thresholds to verify that the 2450MHz Tx is exempt from
1-g SAR at separation distance of ≤5 mm: 3mW (4.77dBm) & 10-g SAR at separation distance of ≤5 mm: 7.5mW (8.75dBm).

Section 5.3.2 Table 7&8 for Exemption Limits for Routine Evaluation – RF Exposure Evaluation

(10MHz ro300GHz)

Table 7: RF field strength and power density limits for devices used by the general public (uncontrolled environment)

Frequency range (MHz)	Electric field (V_{RMS}/m)	Magnetic field (A_{RMS}/m)	Power density (W/m^2)	Reference period (minutes)
10-20	27.46	0.0728	2	6
20-48	$58.07 / f^{0.25}$	$0.1540 / f^{0.25}$	$8.944 / f^{0.5}$	6
48-300	22.06	0.05852	1.291	6
300-6000	$3.142\ f^{0.3417}$	$0.008335\ f^{0.3417}$	$0.02619\ f^{0.6834}$	6
6000-15000	61.4	0.163	10	6
15000-150000	61.4	0.163	10	$616000/f^{1.2}$
150000-300000	$0.158\ f^{0.5}$	$4.21 \times 10^{-4}\ f^{0.5}$	$6.67 \times 10^{-5}\ f$	$616000/f^{1.2}$

Note: f is frequency in MHz.

Table 8: RF field strength and power density limits for controlled-use devices (controlled environment)

Frequency range (MHz)	Electric field (V_{RMS}/m)	Magnetic field (A_{RMS}/m)	Power density (W/m^2)	Reference period (minutes)
10-20	61.4	0.163	10	6
20-48	$129.8 / f^{0.25}$	$0.3444 / f^{0.25}$	$44.72 / f^{0.5}$	6
48-100	49.33	0.1309	6.455	6
100-6000	$15.60\ f^{0.25}$	$0.04138 f^{0.25}$	$0.6455\ f^{0.5}$	6
6000-15000	137	0.364	50	6
15000-150000	137	0.364	50	$616000 / f^{1.2}$
150000-300000	$0.354 f^{0.5}$	$9.40 \times 10^{-4}\ f^{0.5}$	$3.33 \times 10^{-4}\ f$	$616000 / f^{1.2}$

Note: f is frequency in MHz.

In these cases, the information contained in the RF exposure technical brief may be limited to information that demonstrates how the e.i.r.p. was derived.

Summary

For FCC and IC, that max. declared power level can be modified by any duty cycle over the time averaging period. Time-averaging period is a time period not to exceed 30 minutes for fixed RF sources or a time period inherent from device transmission characteristics not to exceed 30 minutes for mobile and portable RF sources.

For rf exposure, the averaging period is 6 minutes for ISED Canada and for FCC it varies by frequency but 1~60 second for RF exposure or the period specified by product design spec. for RF exposure can be used.

So the power value for RF exposure= Declared power x Duty Cycle factor

CALCULATIONS for MPE distance and Power Density

Given

$E = \sqrt{(30 * P * G)} / d$

and

$S = E \wedge 2 / 3770$

where

E = Field Strength in Volts/meter
P = Power in Watts
G = Numeric antenna gain
d = Distance in meters
S = Power Density in milliwatts/square centimeter

Combining equations and rearranging the terms to express the distance as a function of the remaining variables yields:

$d = \sqrt{((30 * P * G) / (3770 * S))}$

Changing to units of Power to mW and Distance to cm, using:

P(mW) = P (W) / 1000 and
d (cm) =100 * d (m)

yields

$d = 100 * \sqrt{((30 * (P / 1000) * G) / (3770 * S))}$
$d = 0.282 * \sqrt{(P * G / S)}$

where

d = distance in cm
P = Power in mW
G = Numeric antenna gain
S = Power Density in mW/cm^2

Substituting the logarithmic form of power and gain using: P (mW) = 10 ^ (P (dBm) / 10) and
G (numeric) = 10 ^ (G (dBi) / 10)

yields

$d = 0.282 * 10 \wedge ((P + G) / 20) / \sqrt{S}$ Equation (1)
$S = 0.0795 * 10 \wedge ((P + G)/10) / d\wedge 2$ Equation (2)

where

d = MPE distance in cm
P = Power in dBm
G = Antenna Gain in dBi
S = Power Density Limit in mW/cm^2

Equation (1) and the measured Output power is used to calculate the MPE distance.
Equation (2) and the measured Output power is used to calculate the Power density.

APPLICABLE LIMITS

RF MPE for separation >= 20cm

FCC: From §1.1310 Table 1 (B), for Public S = 1.0 mW/cm^2 (for Professional, S = 5.0 mW/cm^2)

Limits For Maximum Permissible Exposure (MPE)

Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm^2)	Average Time (minutes)
Limits For General Population / Uncontrolled Exposure				
300-1,500	-	-	F/1500	30
1,500-100,000	-	-	1.0	30

IC: Per RSS-102, Sec. 5.3.2 Table 7,

Limits For Maximum Permissible Exposure (MPE)

Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (W/m^2)	Average Time (minutes)
Limits For General Population / Uncontrolled Exposure				
48-300	22.06	0.05852	1.291	6
30-6000	$3.142*F^{0.3417}$	$0.008335*F^{0.3417}$	$0.02619*F^{0.6834}$	6

With formula of $2.619 \times 10^{-2}\ f^{\ 0.6834}$ W/m^2, most restricted power density limit values are 2.74W/m^2 at 902MHz, 5.34W/m^2 at 2400MHz.

SAR Exclusion Thresholds for separation ≤5~40cm:

FCC : Use Formular in FCC § 1.1307(b)(3)(i)(B) & KDB 447498 D04

IC: Use RSS-102 Table11
Apply duty cycle factor & 2.5 factor for extremity or limb-worn devices

RESULTS

No non-compliance noted.

For Hand-held /limb-worn usage: **SAR Exemption Evaluation Limit** (2.5 factor with 10-g extremity SAR) is ***10mW for separation distance of ≤5 mm, 17.5mW for 10mm separation distance for*** **EUT frequency band: 2.405-2.480GHz.**

Duty Cycle: Based on EUT design document, total duty cycle factor (DCF) is 21.63%.

---For FCC, Conducted power=16mW. With DCF, it is 3.5mW.

--- For IC, EIRP=64mW. With DCF, it is 13.8mW.

According to the product design, minimum 10mm distance from antenna to user's hand/wrist is also well kept. See the attachment.

Therefore, EUT design & power meets this minimum separation requirement for SAR test exclusion.

7.4 AVERAGE OUTPUT POWER

AVERAGE POWER LIMIT

Section 15.247 permits the maximum conducted (average) output power to be measured as an alternative to the maximum peak conducted output power for demonstrating compliance to the limit. When this option is exercised, the measured power is to be referenced to the OBW rather than the DTS bandwidth (see ANSI C63.10 for measurement guidance).

TEST PROCEDURE ***per FCC KDB 558074D01v05r02***

Measurement Procedure for Fundamental Emission Output Power	**Applicable to this EUT**
8.3.2.2 Maximum Conducted (average) Output Power Level * Measurement Procedure Option 1 (Measurement using a spectrum analyzer (SA): per Subclause 11.9.2.2 of ANSI C63.10	☐
8.3.2.3 Maximum Conducted (average) Output Power Level * Measurement Procedure Option 2 (using a power meter(PM): per Subclause 11.9.2.3 of ANSI C63.10	☒

* Alternative method. EUT shall be configured to transmit continuously (min. 98% duty cycle at full power). The spectrum analyzer shall be set for bin-to-bin spacing ≤RBW/2.

The transmitter output is connected to a RF broadband power meter.

RESULTS

Optional. N/A

Zigbee Mode:

Channel	**Frequency (MHz)**	**Average Power (dBm)**
Low	2405	
Middle	2440	
High	2480	

BLE Mode:

Channel	**Frequency (MHz)**	**Average Power (dBm)**
Low	2402	
Middle	2440	
High	2480	

7.5 PEAK POWER SPECTRAL DENSITY

LIMIT

§15.247 (e) & RSS-247 Sec. 5.2(2)
For direct sequence systems, the peak power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

TEST PROCEDURE ***per FCC KDB 558074D01v05r02***

Measurement Procedure for Maximum Power Spectral Density in the Fundamental Emission	**Applicable to this EUT**
8.4 Measurement Procedure Method PKPSD (peak PSD) per Subclause 11.10.2 of ANSI C63.10	☒**preferred**
8.4 Measurement Procedure for Average PSD** (6 methods: AVGPSD-1 & Alt, AVGPSD-2 & Alt, AVGPSD-3 & Alt) per Subclause 11.10.3~11.10.8 of ANSI C63.10	☐

RESULTS

No non-compliance noted:

Summary of PPSD Testing Data:

Zigbee Mode:

Channel	**Frequency (MHz)**	**PPSD (dBm/3KHz)**	**Limit (dBm/3KHz)**	**Margin (dB)**
Low	2405	-12.16	8	-20.16
Middle	2440	-2.90	8	-10.9
High	2480	-18.52	8	-26.52

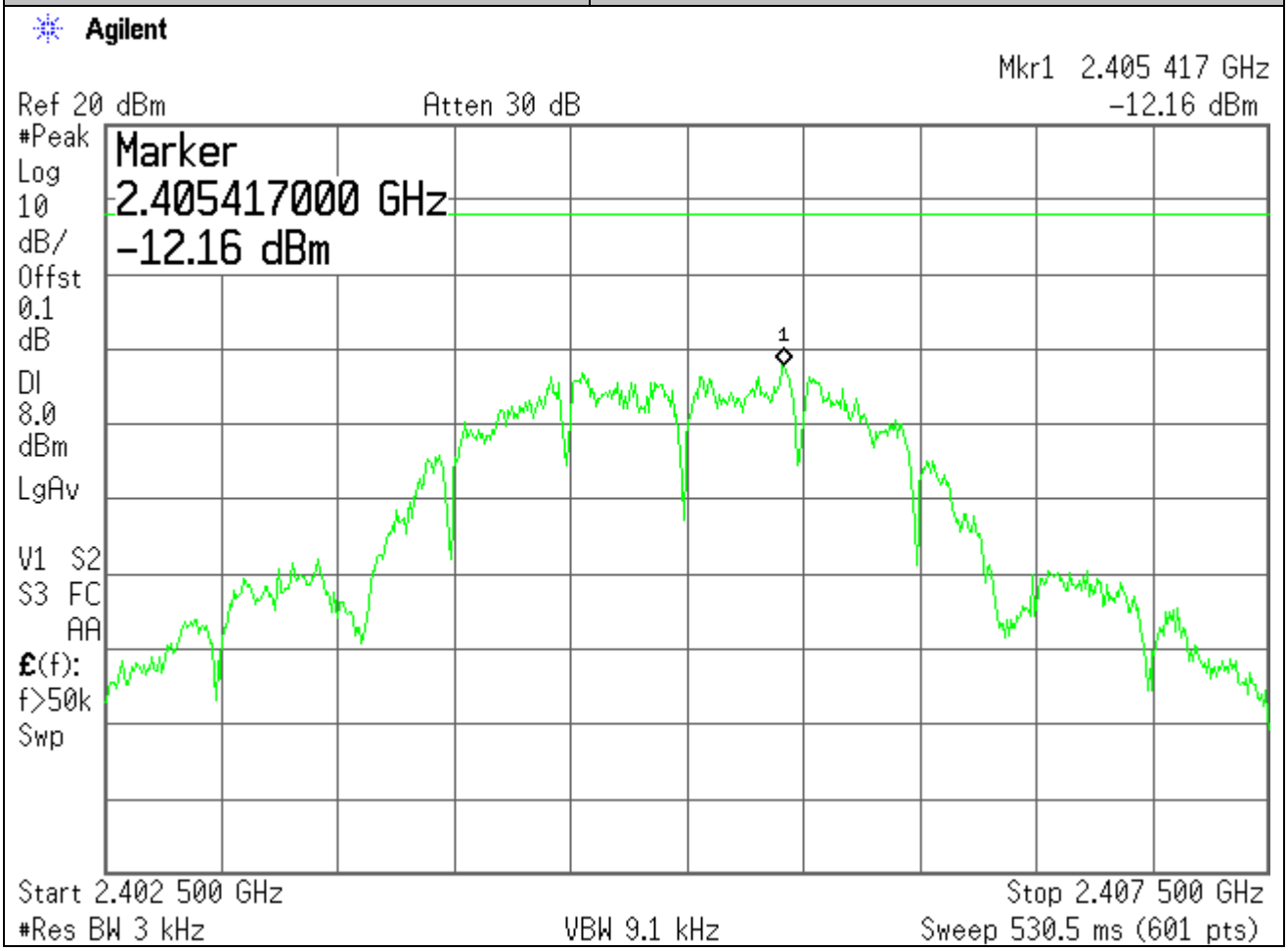
BLE Mode:

Channel	**Frequency (MHz)**	**PPSD (dBm/3KHz)**	**Limit (dBm/3KHz)**	**Margin (dB)**
Low	2402	-0.16	8	-8.16
Middle	2440	-0.55	8	-8.55
High	2480	-0.85	8	-8.85

PEAK POWER SPECTRAL DENSITY

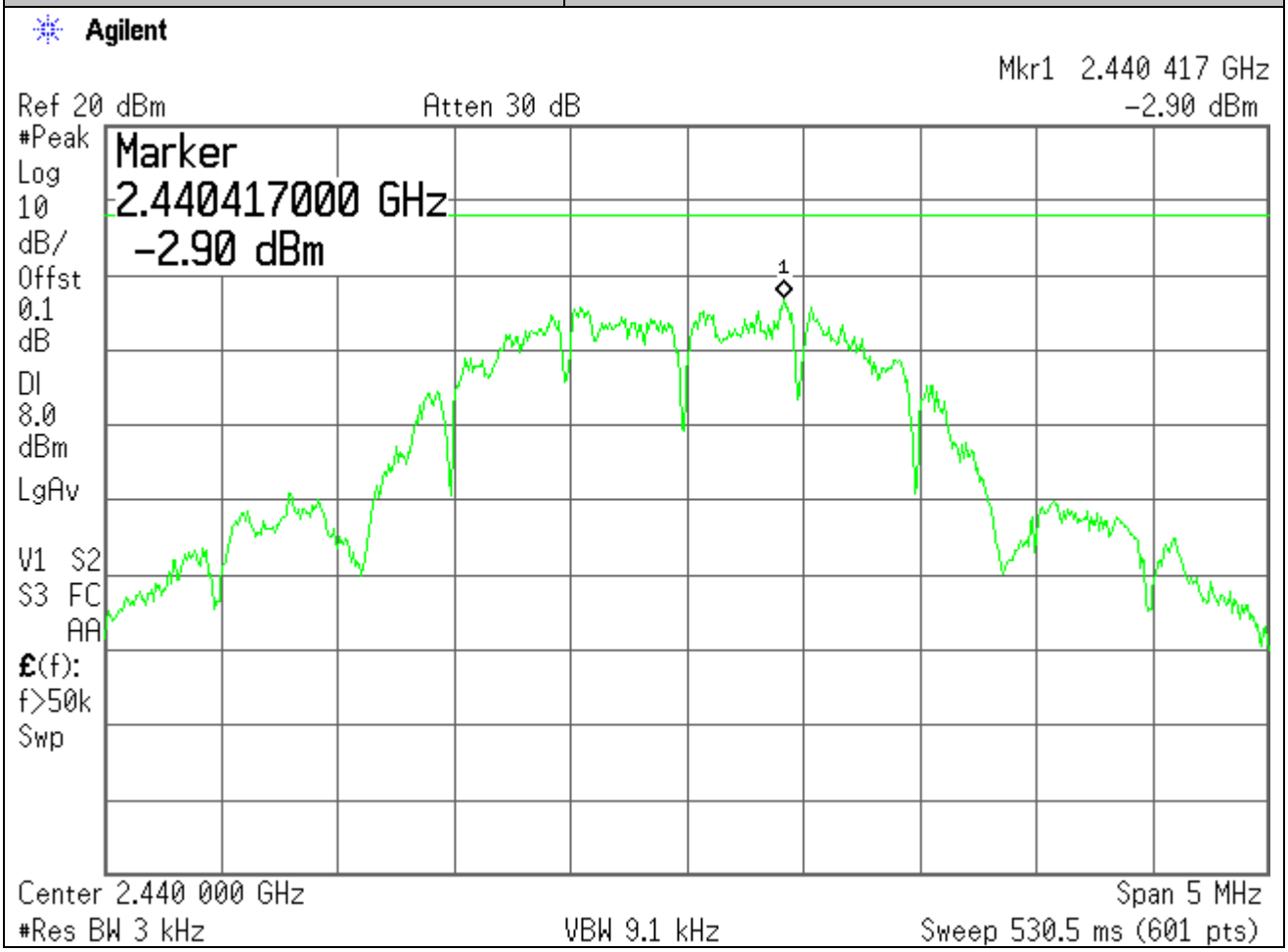
Zigbee Mode:

Plot Name:	PPSD @ Low CH



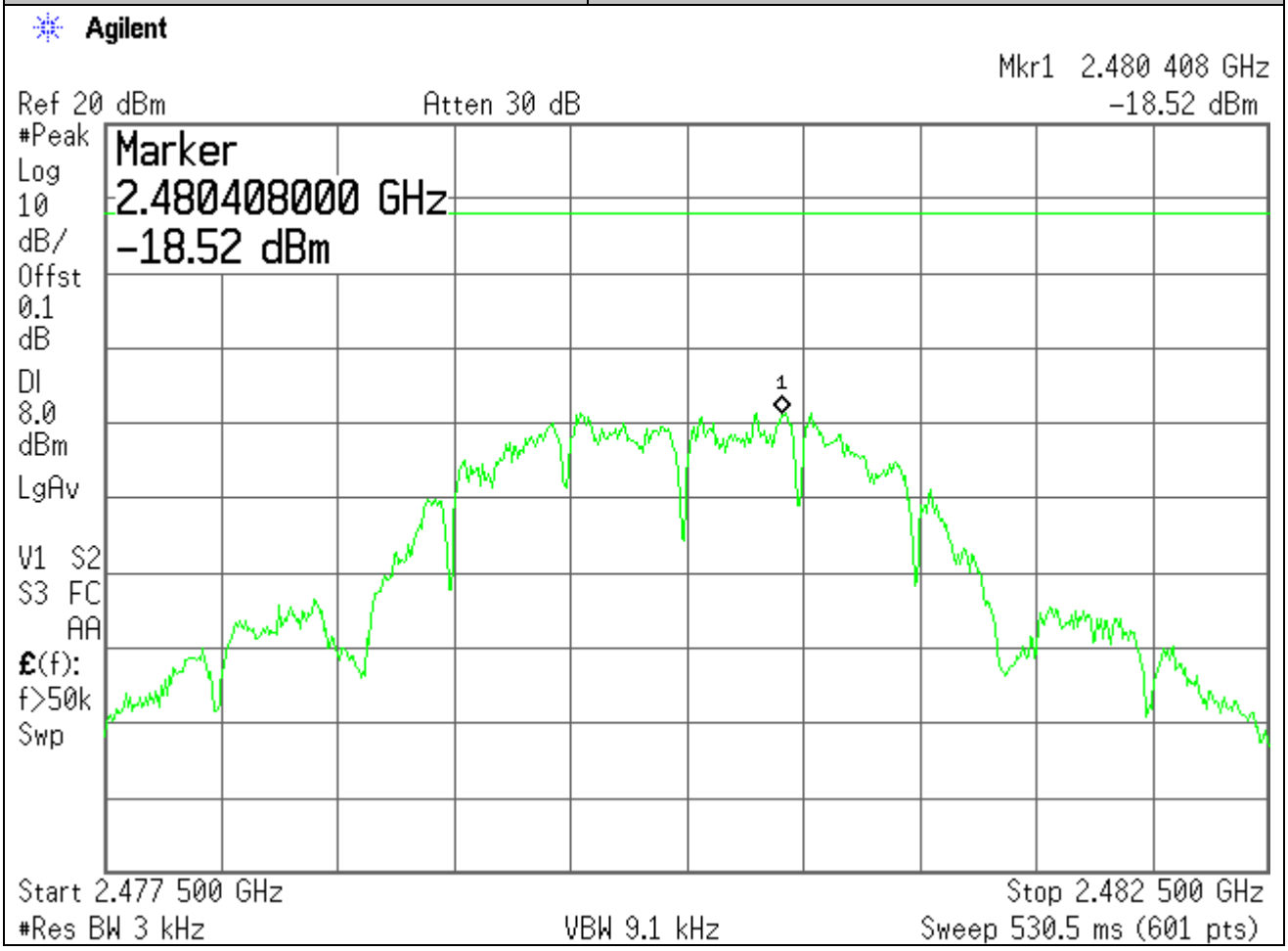
Zigbee Mode:

Plot Name:	PPSD @ Mid CH



Zigbee Mode:

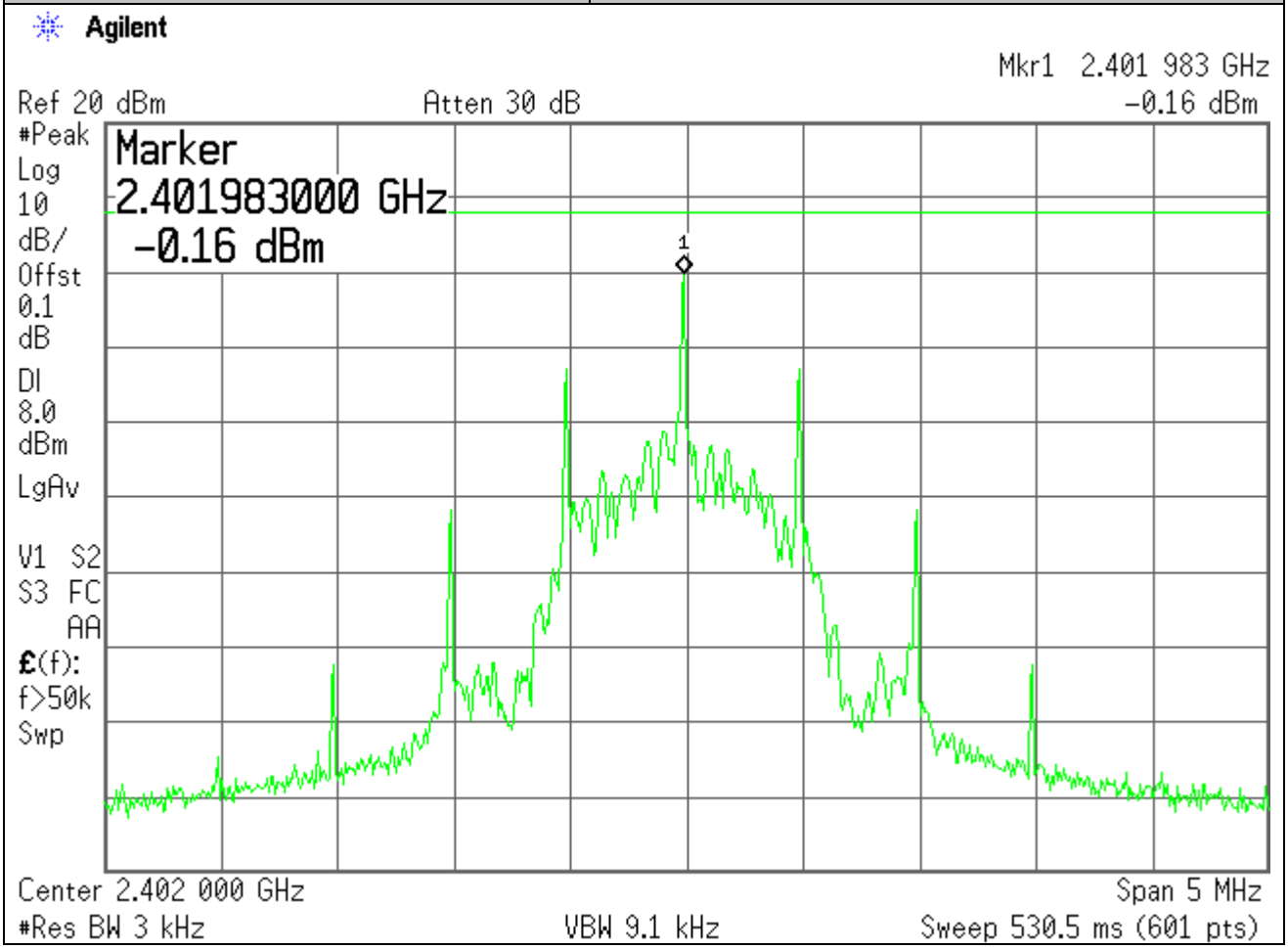
Plot Name:	PPSD @ High CH



PEAK POWER SPECTRAL DENSITY

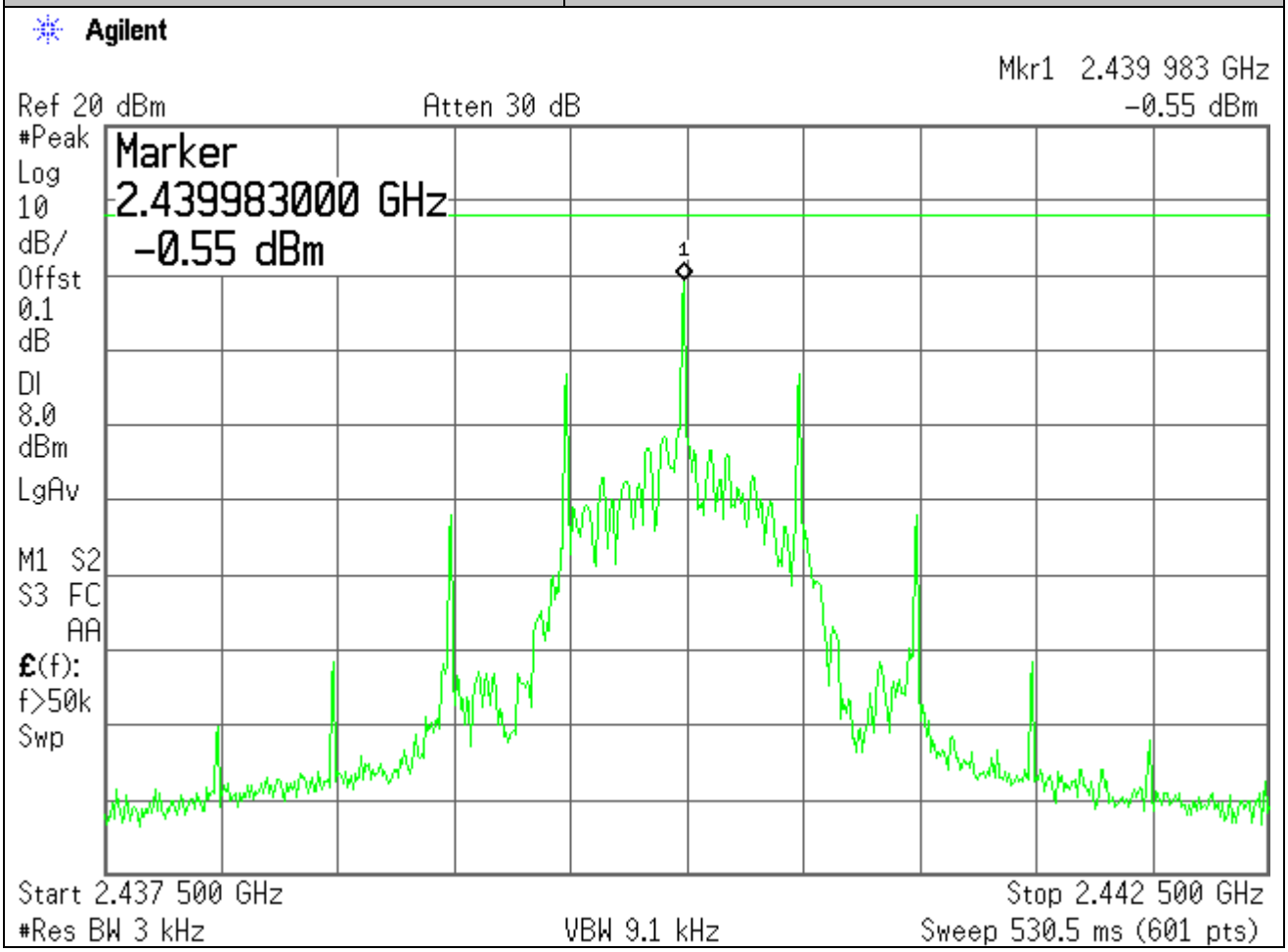
BLE Mode:

Plot Name:	PPSD @ Low CH



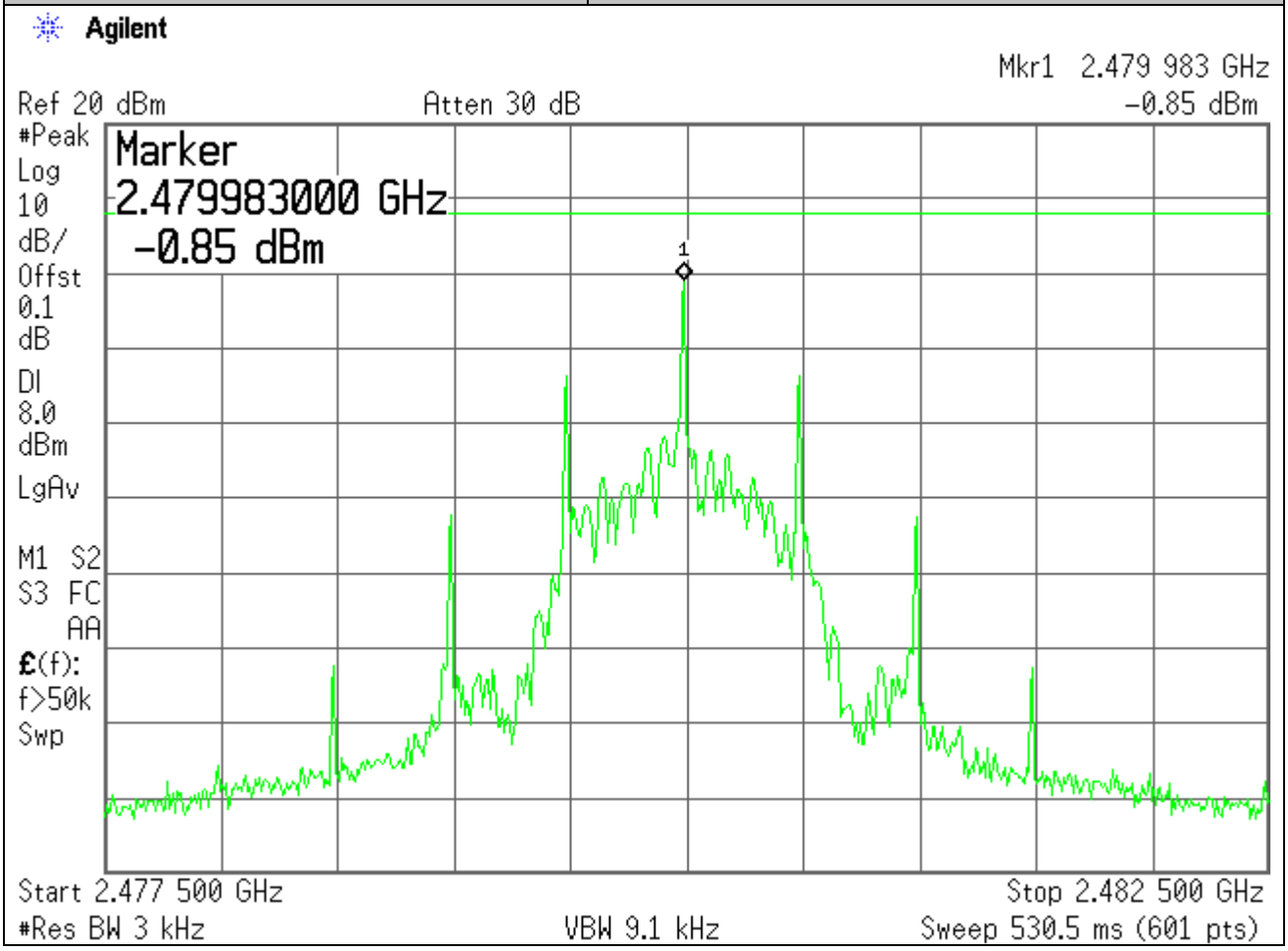
BLE Mode:

Plot Name:	PPSD @ Mid CH



BLE Mode:

Plot Name:	PPSD @ High CH



7.6 CONDUCTED SPURIOUS EMISSIONS

LIMITS

§15.247 (d) & RSS-247 Sec. 5.5
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) & RSS-Gen 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) & RSS-Gen (see §15.205(c)).

TEST PROCEDURE ***per FCC KDB 558074D01v05r02,***

A. Section 8.5 DTS emissions in non-restricted frequency bands following the methods in Subclause 11.11 of ANSI C63.10

Conducted Measurement Procedure for Maximum Unwanted Emissions into Non-Restricted Frequency Bands	**Applicable to this EUT**	
	Peak Power limit: (-20dB)	**Average Power Limit: (-30dB)**
ANSI C63.10, Sec.11.11.1-11.11.2 Measurement Procedure-Reference Level (RBW=100KHz, VBW=300KHz)	☒	☐
ANSI C63.10, Sec. 11.11.3 Measurement Procedure- Emission level*	☒ **preferred**	☐

* Different attenuation limit shall be used based on the measurement method of fundamental emission power and PSD.

B. Section 8.6 DTS emissions in restricted frequency bands following the methods in Subclause 11.12 of ANSI C63.10

Antenna-Port Conducted Measurement Procedure for Maximum Unwanted Emissions into Restricted Frequency Bands**	**Applicable to this EUT**
ANSI C63.10, Sec.11.12.2.3 CISPR Quasi-Peak Measurement (CISPR 16)	☐
ANSI C63.10, Sec.11.12.2.4 Peak Power Measurement	☐
ANSI C63.10, Sec.11.12.2.5 Average Power Measurement (three options)***	☐

** To use this conducted testing method, per 12.2.2-12.2.6, the followings shall be taken as consideration:

1. Proper RBW and detector, per 15.35 a/b, shall be chosen in different frequency ranges;
2. **Maximum transmitter antenna gain (no less than 2dBi), G, shall be added to the measured power level to determine the EIRP;**
3. **Appropriate factor, A, shall be added to model worst case ground reflections: 6.0dB (f≤30MHz) and 4.7dB (f≤30 to 1000MHz)**
4. **Electric field strength can be obtained from the equation: E= EIRP-20log(d)+104.8+G (or 2.0) +A; Then compare to applicable limit;**
5. Unwanted emissions from EUT cabinet or casing shall be measured via radiated emission test method per C63.10 (in this case, the antenna port may be terminated properly).
6. Absolute peak power limit of -21.2dBm within the unwanted emission bandwidth shall be used for meeting 15.35(b) requirement;
7. Per 15.35(c), for pulse operation, Duty Cycle factor reduction can be applied for unwanted emissions that have the same pulse characteristics as does the fundamental emissions (such as harmonics) pulse operation

*** EUT shall be configured to transmit continuously (min. 98% duty cycle at full power). The spectrum analyzer shall be set for bin-to-bin spacing ≤RBW/2.

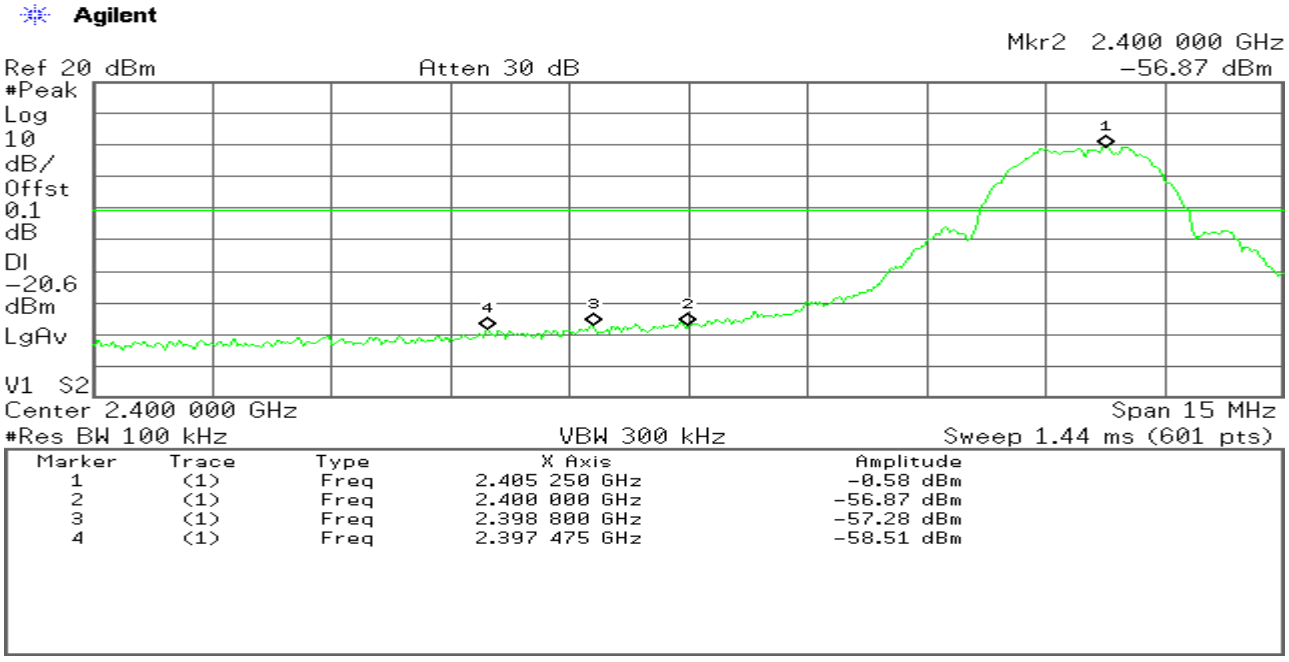
C. ***Section 8.7 DTS band-edge emission measurements following the methods in Subclause 11.13 of ANSI C63.10***

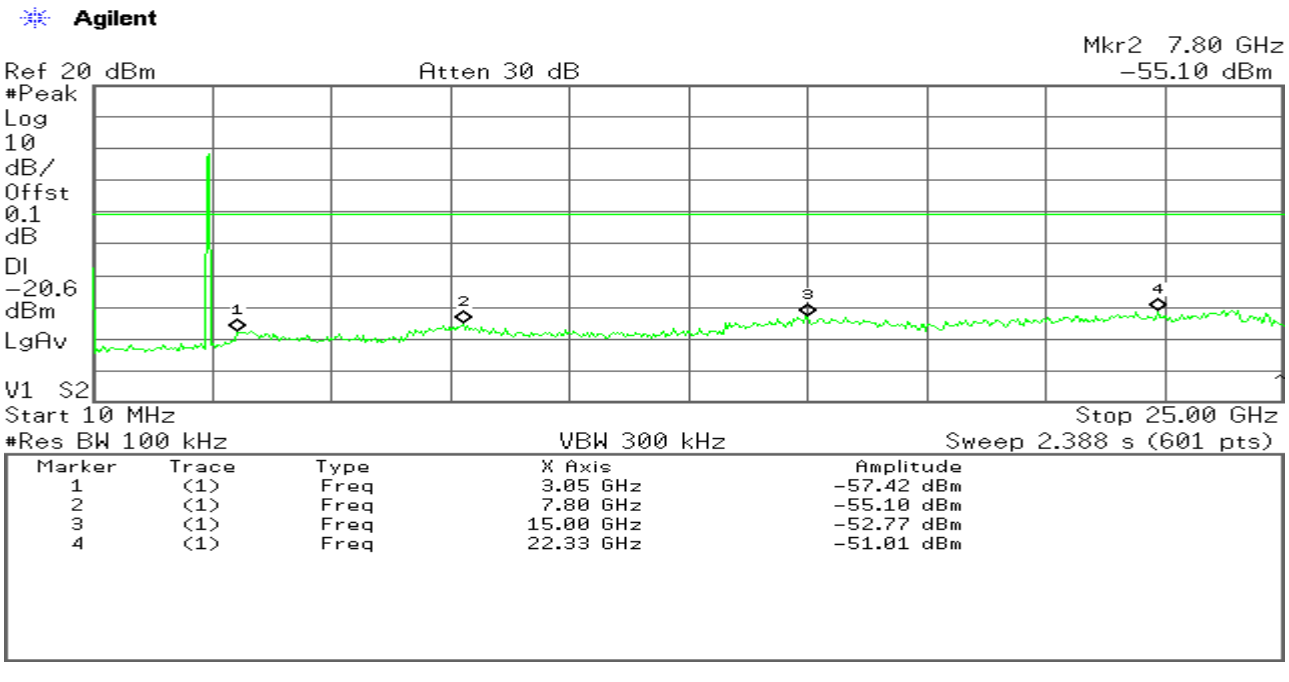
Conducted Band-edge measurements	**Applicable to this EUT**
ANSI C63.10, Sec.11.13.2 Band-Edge Marker-Delta Method (per ANSI C63.10, Sec. 6.10.6) (within 2MHz)	☐
ANSI C63.10, Sec. 11.13.3.2~5 Band-Edge Integration Method (peak / average)	☒

RESULTS:

Zigbee Mode:

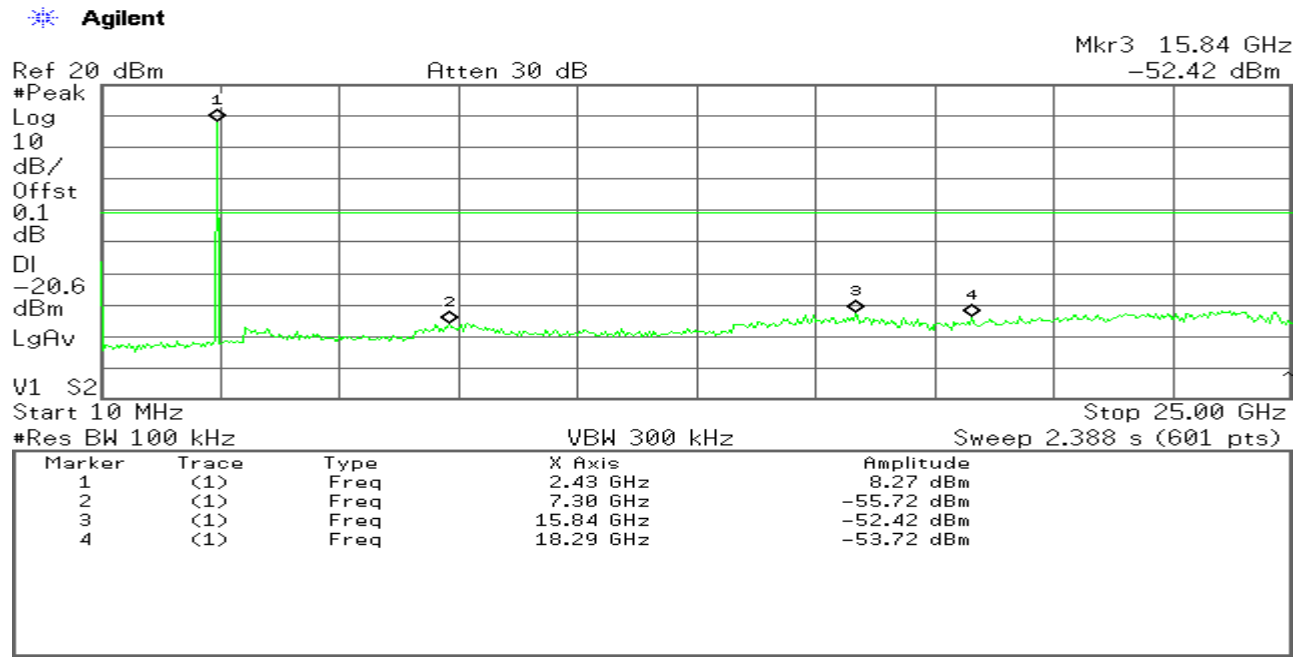
Plot Name:	Conducted Band Edge & Spurious @ Low CH





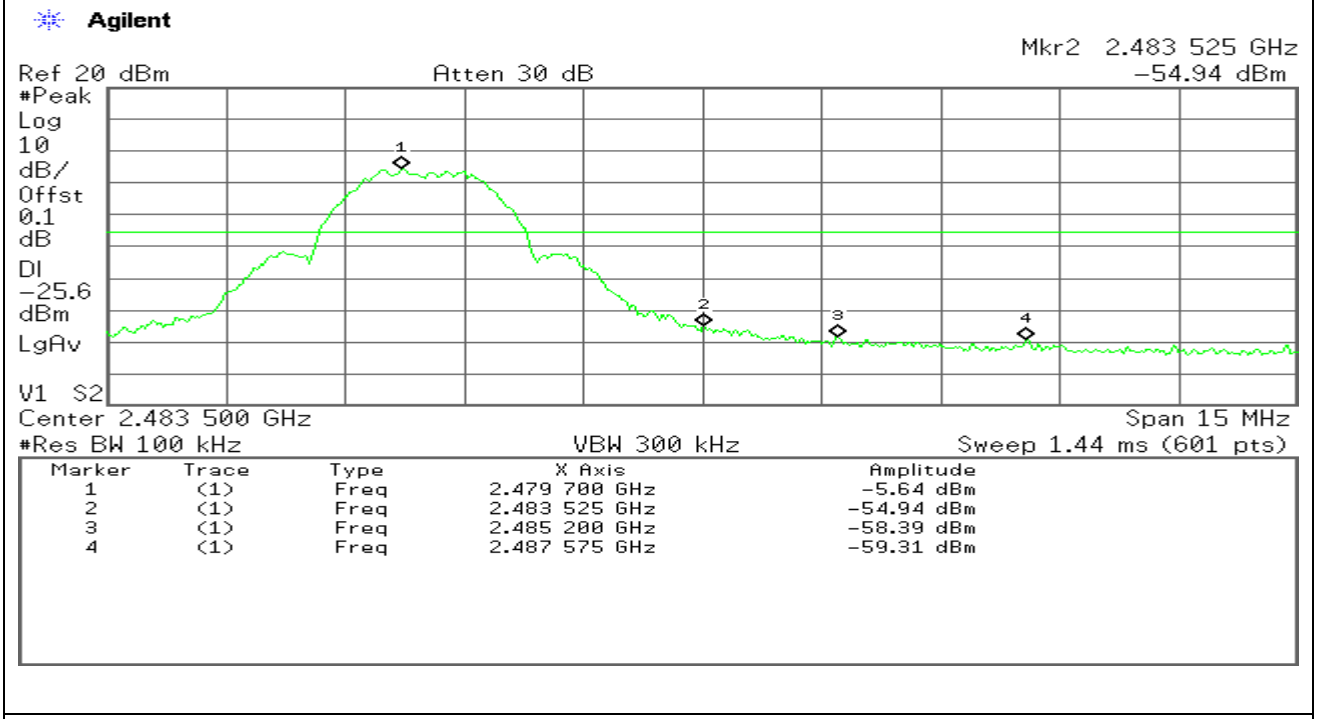
Zigbee Mode:

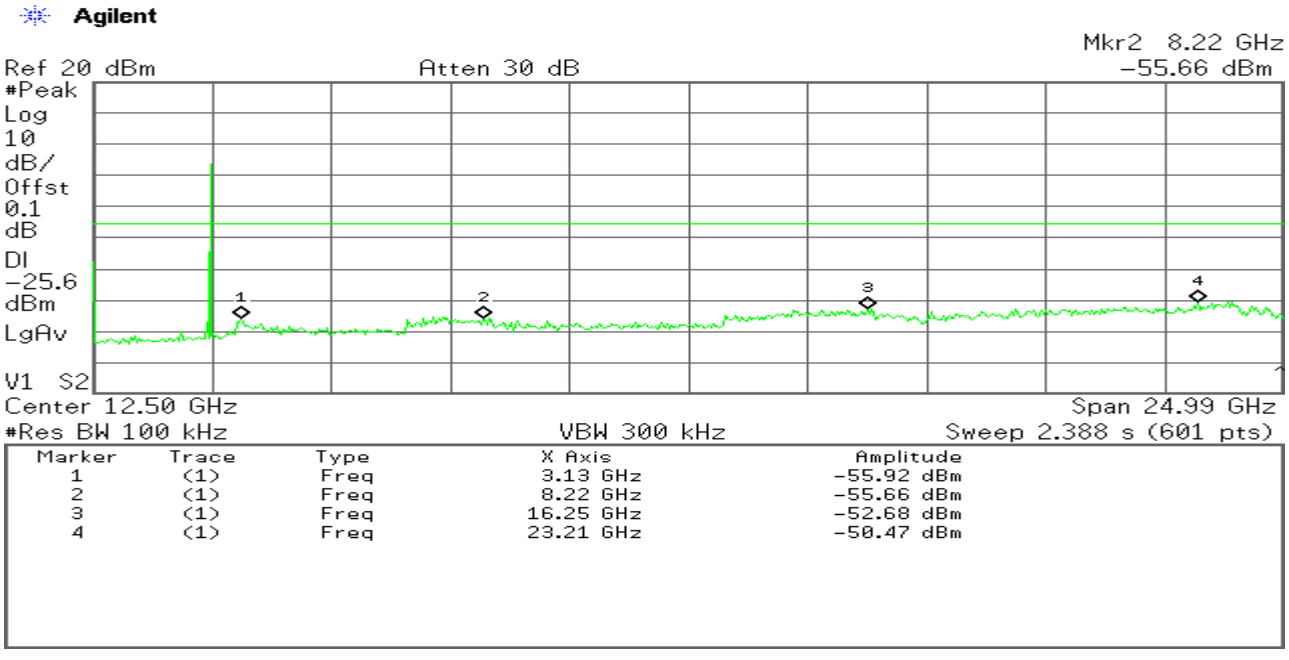
Plot Name:	Conducted Spurious @ Mid CH



Zigbee Mode:

Plot Name:	Conducted Band Edge & Spurious @ high CH

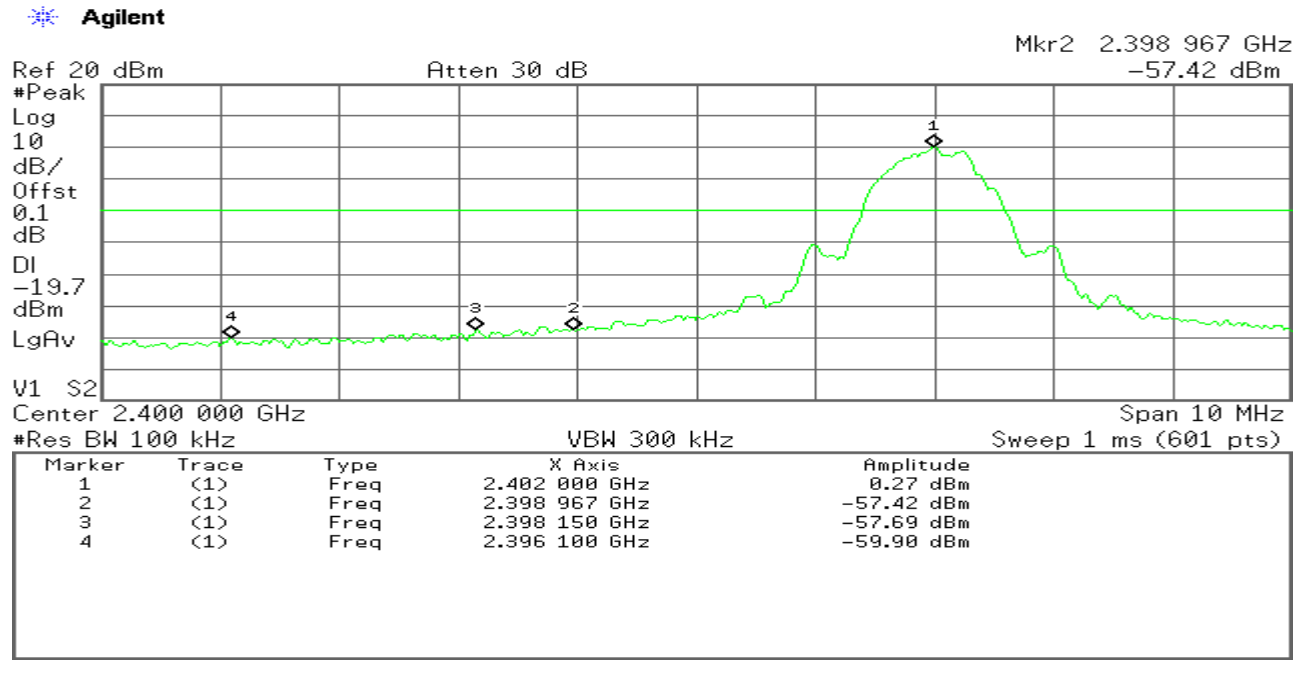


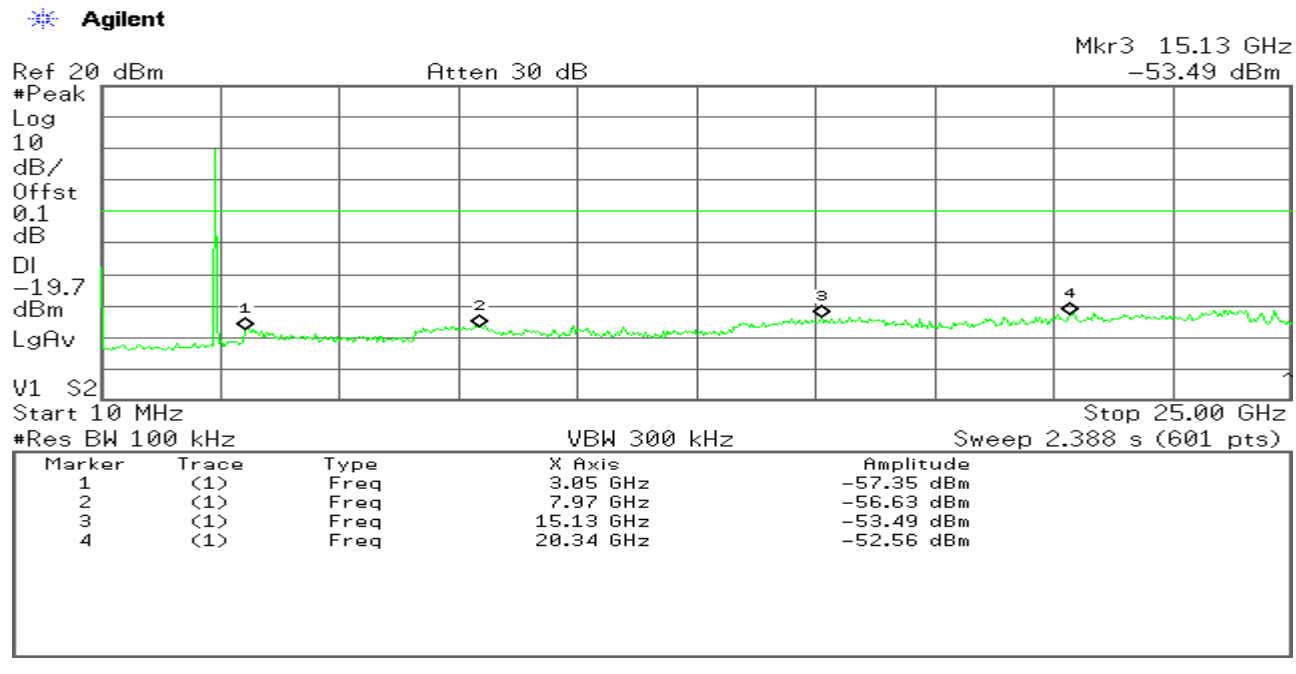


RESULTS:

BLE Mode:

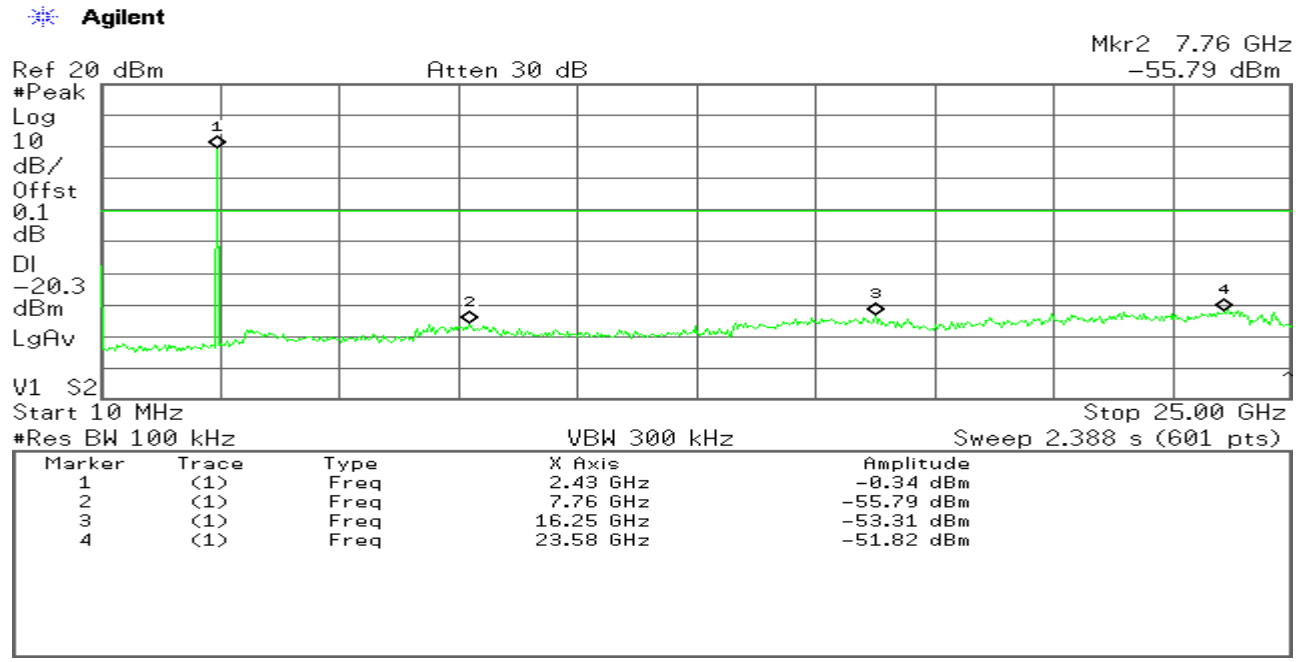
Plot Name:	Conducted Band Edge & Spurious @ Low CH





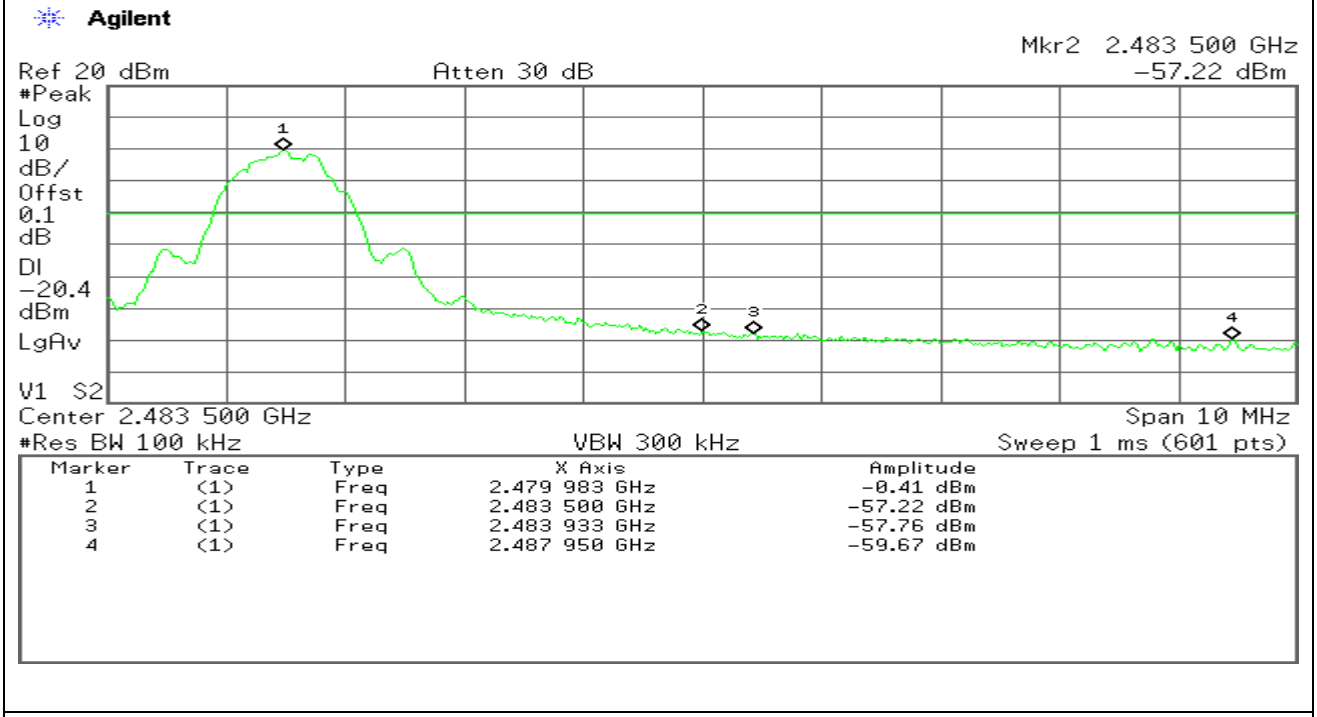
BLE Mode:

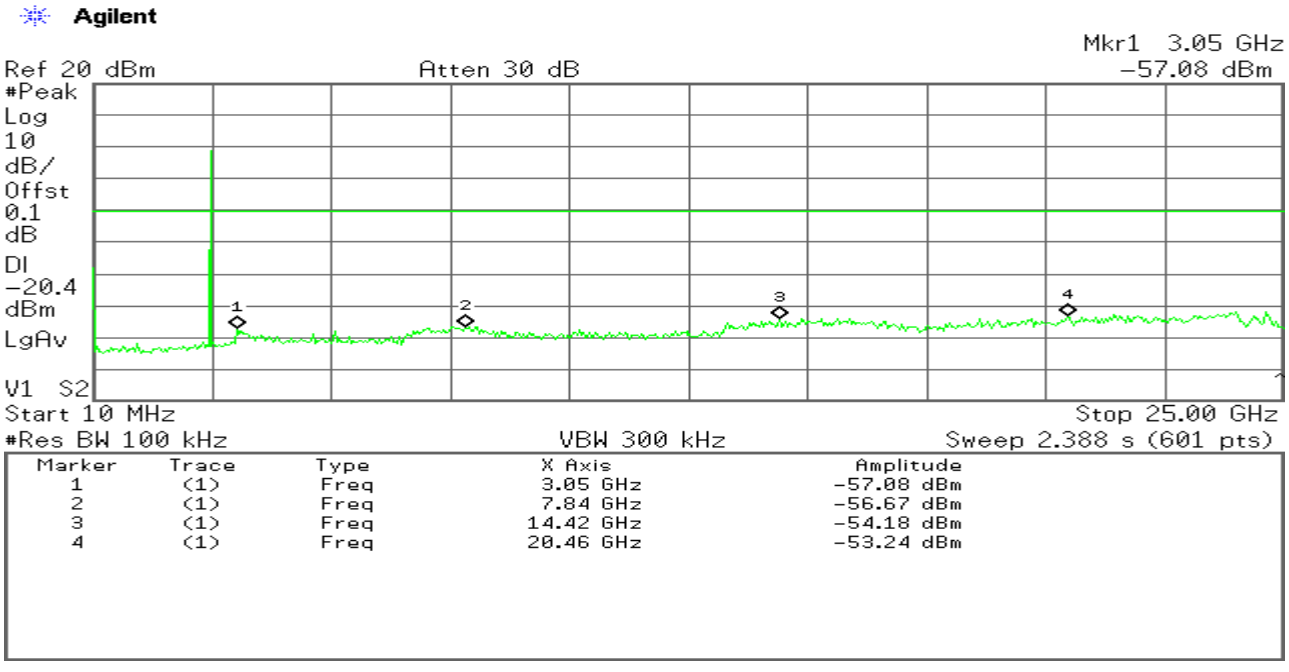
Plot Name:	Conducted Spurious @ Mid CH



BLE Mode:

Plot Name:	Conducted Band Edge & Spurious @ high CH





7.7 RADIATED EMISSIONS

7.7.1. TRANSMITTER RADIATED SPURIOUS EMISSIONS

LIMITS

§15.205 (a) RSS-102 Except as shown in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHZ	GHz
0.090-0.110	16.42-16.423	399.9-410	4.5-5.15
[1] 0.495-0.505	16.69475-16.69525	608-614	5.35-5.46
2.1735-2.1905	16.80425-16.80475	960-1240	7.25-7.75
4.125-4.128	25.5-25.67	1300-1427	8.025-8.5
4.17725-4.17775	37.5-38.25	1435-1626.5	9.0-9.2
4.20725-4.20775	73-74.6	1645.5-1646.5	9.3-9.5
6.215-6.218	74.8-75.2	1660-1710	10.6-12.7
6.26775-6.26825	108-121.94	1718.8-1722.2	13.25-13.4
6.31175-6.31225	123-138	2200-2300	14.47-14.5
8.291-8.294	149.9-150.05	2310-2390	15.35-16.2
8.362-8.366	156.52475-156.52525	2483.5-2500	17.7-21.4
8.37625-8.38675	156.7-156.9	2690-2900	22.01-23.12
8.41425-8.41475	162.0125-167.17	3260-3267	23.6-24.0
12.29-12.293	167.72-173.2	3332-3339	31.2-31.8
12.51975-12.52025	240-285	3345.8-3358	36.43-36.5
12.57675-12.57725	322-335.4	3600-4400	([2])
13.36-13.41			

[1] Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz.
[2] Above 38.6

§15.205 (b) Except as provided in paragraphs (d) and (e), the field strength of emissions appearing within these frequency bands shall not exceed the limits shown in Section 15.209 & RSS-Gen. At frequencies equal to or less than 1000 MHz, compliance with the limits in Section 15.209 & RSS-Gen shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1000 MHz, compliance with the emission limits in Section 15.209 & RSS-Gen shall be demonstrated based on the average value of the measured emissions. The provisions in Section 15.35 apply to these measurements.

§15.209 (a) & RSS-Gen Except as provided elsewhere in this Subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency (MHz)	Field Strength (microvolts /meter	Measurement Distance (meters)
30 – 88	100	3
88 – 216	150	3
216 – 960	200	3
Above 960	500	3

§15.209 (b) & RSS-Gen In the emission table above, the tighter limit applies at the band edges.

TEST PROCEDURE *per FCC KDB 558074D01v05r02 Sec.* 8.6 DTS emissions in restricted frequency bands following the method in Subclause 11.12.2.7 of ANSI C63.10 (Radiated method)
Also see Sec. 8.1 c)3): Additional measurement procedures and the allowance for duty cycle for DTS device out-of-band measurements in a restricted band for protocol-limited devices.

The EUT is set to transmit in a continuous mode. Established procedures in C63.4/C63.10 for performing radiated measurements shall be used. For cabinet emission measurements, the EUT transmit antenna may be replaced with a termination matching the nominal impedance of the antenna. For portable devices, the EUT was tested in three orthogonal planes.

For measurements below 1 GHz the resolution bandwidth is set to 100 kHz for peak detection measurements or 120 kHz for quasi-peak detection measurements. Peak detection is used unless otherwise noted as quasi-peak. For measurements above 1 GHz the resolution bandwidth is set to 1 MHz, and then the video bandwidth is set to 1 MHz for peak measurements and 10 Hz for average measurements.

The radio spectrum was investigated from the lowest frequency generated within the device (without going below 9 kHz) up to the 10^{th} harmonic of the rated transmitted emission. The emissions are investigated with the transmitter set to the lowest, middle, and highest channels.

The emissions are investigated with the transmitter set to the lowest, middle, and highest channels, if applicable. The frequency range of interest is monitored at a fixed antenna height and EUT azimuth. The EUT is rotated through 360 degrees to maximize emissions received. The antenna is scanned from 1 to 4 meters above the ground plane to further maximize the emission. Measurements are made with the antenna polarized in both the vertical and the horizontal positions.

RESULTS

No non-compliance noted.

7.7.2. TRANSMITTER RADIATED EMISSIONS DATA

(HARMONICS & SPURIOUS falling in restricted bands listed in Sec.15.205 and non-restricted bands *)

HARMONICS EMISSIONS

Zigbee Mode:

Low Channel Harmonics/Spurious*

Freq. (MHz)	Position (H,V) XYZ	Dist. (m)	D Corr (dB)	Peak@3m (dBuV/m)	Avg@3m (dBuV/m)	PK Lim (dBuV/m)	QP/Avg. Lim (dBuV/m)	PK Mar (dBuV/m)	QP/Avg.Mar. (dBuV/m)
4810	H,X	3		39.1	35.6	74	54	-34.9	-18.4
7215	H,X	3		40.0	36.2	74	54	-34	-17.8
4810	V,X	3		38.2	33.1	74	54	-35.8	-20.9
7215	V,X	3		40.5	35.2	74	54	-33.5	-18.8
4810	H,Y	3		40.0	35.8	74	54	-34	-18.2
7215	H,Y	3		41.2	37.4	74	54	-32.8	-16.6
4810	V,Y	3		38.2	32.9	74	54	-35.8	-21.1
7215	V,Y	3		39.9	36.0	74	54	-34.1	-18
4810	H,Z	3		39.8	34.7	74	54	-34.2	-19.3
7215	H,Z	3		40.2	36.9	74	54	-33.8	-17.1
4810	V,Z	3		40.1	37.4	74	54	-33.9	-16.6
7215	V,Z	3		41.4	37.8	74	54	-32.6	-16.2

Middle Channel Harmonics/Spurious

Freq. (MHz)	Position (H,V) XYZ	Dist. (m)	D Corr (dB)	Peak@3m (dBuV/m)	Avg@3m (dBuV/m)	PK Lim (dBuV/m)	QP/Avg. Lim (dBuV/m)	PK Mar (dBuV/m)	QP/Avg.Mar. (dBuV/m)
4880	H,X	3		42.0	38.9	74	54	-32	-15.1
7320	H,X	3		43.3	39.6	74	54	-30.7	-14.4
4880	V,X	3		40.4	35.5	74	54	-33.6	-18.5
7320	V,X	3		41.3	38.5	74	54	-32.7	-15.5
4880	H,Y	3		42.2	38.3	74	54	-31.8	-15.7
7320	H,Y	3		43.4	39.6	74	54	-30.6	-14.4
4880	V,Y	3		40.2	35.9	74	54	-33.8	-18.1
7320	V,Y	3		42.0	38.2	74	54	-32	-15.8
4880	H,Z	3		41.3	37.8	74	54	-32.7	-16.2
7320	H,Z	3		42.2	39.1	74	54	-31.8	-14.9
4880	V,Z	3		42.4	39.3	74	54	-31.6	-14.7
7320	V,Z	3		43.5	39.8	74	54	-30.5	-14.2

High Channel Harmonics/Spurious

Freq. (MHz)	Position (H,V) XYZ	Dist. (m)	D Corr (dB)	Peak@3m (dBuV/m)	Avg@3m (dBuV/m)	PK Lim (dBuV/m)	QP/Avg. Lim (dBuV/m)	PK Mar (dBuV/m)	QP/Avg.Mar. (dBuV/m)
4960	H,X	3		40.5	36.1	74	54	-33.5	-17.9
7440	H,X	3		41.0	35.7	74	54	-33	-18.3
4960	V,X	3		38.5	34.8	74	54	-35.5	-19.2
7440	V,X	3		39.6	34.3	74	54	-34.4	-19.7
4960	H,Y	3		40.0	35.7	74	54	-34	-18.3
7440	H,Y	3		41.2	35.8	74	54	-32.8	-18.2
4960	V,Y	3		38.0	33.8	74	54	-36	-20.2
7440	V,Y	3		39.7	34.4	74	54	-34.3	-19.6

4960	H,Z	3		39.0	34.7	74	54	-35	-19.3
7440	H,Z	3		40.1	35.6	74	54	-33.9	-18.4
4960	V,Z	3		40.7	36.5	74	54	-33.3	-17.5
7440	V,Z	3		41.4	35.6	74	54	-32.6	-18.4

* Data shown above represents the worst case in all applicable EUT orientations. No other significant emissions were found in the rest frequency range. For spurious in restricted band, the limit is per 15.209 & RSS-Gen. For the others, by measuring the field strength of fundamental (peak) with 100KHz RBW, the limit is 20dB below that level (here it is higher than the limit in 15.209 & RSS-Gen). In this case, all non-fundamental emission points are below 15.209 & RSS-Gen limit, so there is NO additional concern for non-restriction band limit compliance.

BLE Mode: Worst case @ Z position only per prescan

Low Channel Harmonics/Spurious*

Freq. (MHz)	Position (H,V) Z	Dist. (m)	D Corr (dB)	Peak@3m (dBuV/m)	Avg@3m (dBuV/m)	PK Lim (dBuV/m)	QP/Avg. Lim (dBuV/m)	PK Mar (dBuV/m)	QP/Avg.Mar. (dBuV/m)
4804	H,Z	3		39.1	36.3	74	54	-34.9	-17.7
7215	H,Z	3		40.0	36.8	74	54	-34	-17.2
4810	V,Z	3		41.5	38.4	74	54	-32.5	-15.6
7215	V,Z	3		41.7	38.6	74	54	-32.3	-15.4

Middle Channel Harmonics/Spurious

Freq. (MHz)	Position (H,V) Z	Dist. (m)	D Corr (dB)	Peak@3m (dBuV/m)	Avg@3m (dBuV/m)	PK Lim (dBuV/m)	QP/Avg. Lim (dBuV/m)	PK Mar (dBuV/m)	QP/Avg.Mar. (dBuV/m)
4880	H,Z	3		39.0	36.4	74	54	-35	-17.6
7320	H,Z	3		40.4	37.0	74	54	-33.6	-17
4880	V,Z	3		41.3	38.1	74	54	-32.7	-15.9
7320	V,Z	3		41.5	38.5	74	54	-32.5	-15.5

High Channel Harmonics/Spurious

Freq. (MHz)	Position (H,V) Z	Dist. (m)	D Corr (dB)	Peak@3m (dBuV/m)	Avg@3m (dBuV/m)	PK Lim (dBuV/m)	QP/Avg. Lim (dBuV/m)	PK Mar (dBuV/m)	QP/Avg.Mar. (dBuV/m)
4960	H,Z	3		39.0	35.9	74	54	-35	-18.1
7440	H,Z	3		40.2	36.5	74	54	-33.8	-17.5
4960	V,Z	3		41.1	38.0	74	54	-32.9	-16
7440	V,Z	3		40.9	38.4	74	54	-33.1	-15.6

* Data shown above represents the worst case in all applicable EUT orientations. No other significant emissions were found in the rest frequency range. For spurious in restricted band, the limit is per 15.209 & RSS-Gen. For the others, by measuring the field strength of fundamental (peak) with 100KHz RBW, the limit is 20dB below that level (here it is higher than the limit in 15.209 & RSS-Gen). In this case, all non-fundamental emission points are below 15.209 & RSS-Gen limit, so there is NO additional concern for non-restriction band limit compliance.

SPURIOUS EMISSIONS (>1GHz & <=1GHz) within restricted band

The worst case data recorded for Transmitting Mode with Zigbee Mode @Mid Channel.

Class B @3 meter

Test Freq	Detector	Polarity	Amplitude	Class B	Difference
(MHz)	*(P/Q/A)*	*(H/V)*	*(dBuV/m)*	*(dBuV/m)*	*(dB)*
115.1	P	H	32.6	43.5	-10.9
333.5	P	H	34.2	46.0	-11.8
994.2	P	H	41.7	54.0	-12.3
109.2	P	V	30.8	43.5	-12.7
115.0	P	V	33.4	43.5	-10.1
164.4	P	V	34.0	43.5	-9.5
255.3	P	V	32.8	46.0	-13.2
994.0	P	V	42.4	54.0	-11.6

(1) Only the emissions falling in resitricted bands are shown in this table, which shall be lower than the limit defined in FCC Sec. 15.209 & IC RSS-GEN.
(2) If the peak reading is less than the FCC/IC quasi-peak or average limit, it'll be not necessary to show the measured/ calculated quasi-peak or average reading.

Band Edge Data for EUT

In addition, the band-edge requirements are also verified.

Testing procedure per KDB 558074D01:

The measurement of unwanted emissions at the edge of the authorized frequency bands can be complicated by the capture of RF energy from the fundamental emission within the RBW passband. The following techniques are permitted for use in performing a measurement of the unwanted emission level at the band edges.

10.2.5.1 Marker-Delta Method

The marker-delta method, as described in KDB 913591 and in C63.10, can be used to perform measurements of the unwanted emissions level at the band-edges.

10.2.5.2 Integrated Power Measurement

A narrower resolution bandwidth can be used at the band edge to improve the measurement accuracy provided that the measurement is subsequently integrated to the relevant bandwidth specification (e.g., 100 kHz within non-restricted bands and 1 MHz within restricted frequency bands).

Results:

The testing results for worst case based on pretesting results are shown as following and comply with the band-edge requirements for 2400-2483.5MHz DTS per FCC Part 15.247. EUT antenna with max gain was used for this testing.

- H=Measurement antenna horizontal position
- V= Measurement antenna vertical position
- Using conventional manner for measuring the radiated emissions that are removed by more than two measurement bandwidths from band-edge, such as the emissions in the restricted band 2310-2390MHz & 2483.5-2500MHz, etc.
- Using conventional manner or if needed, using “delta” measurement technique for measuring the radiated emissions that are up to two measurement bandwidths removed from band-edge, such as the restricted band that begins at 2483.5MHz.
- The worst case for different EUT orientations was chosen for final data collection based on pre-scan testing results.

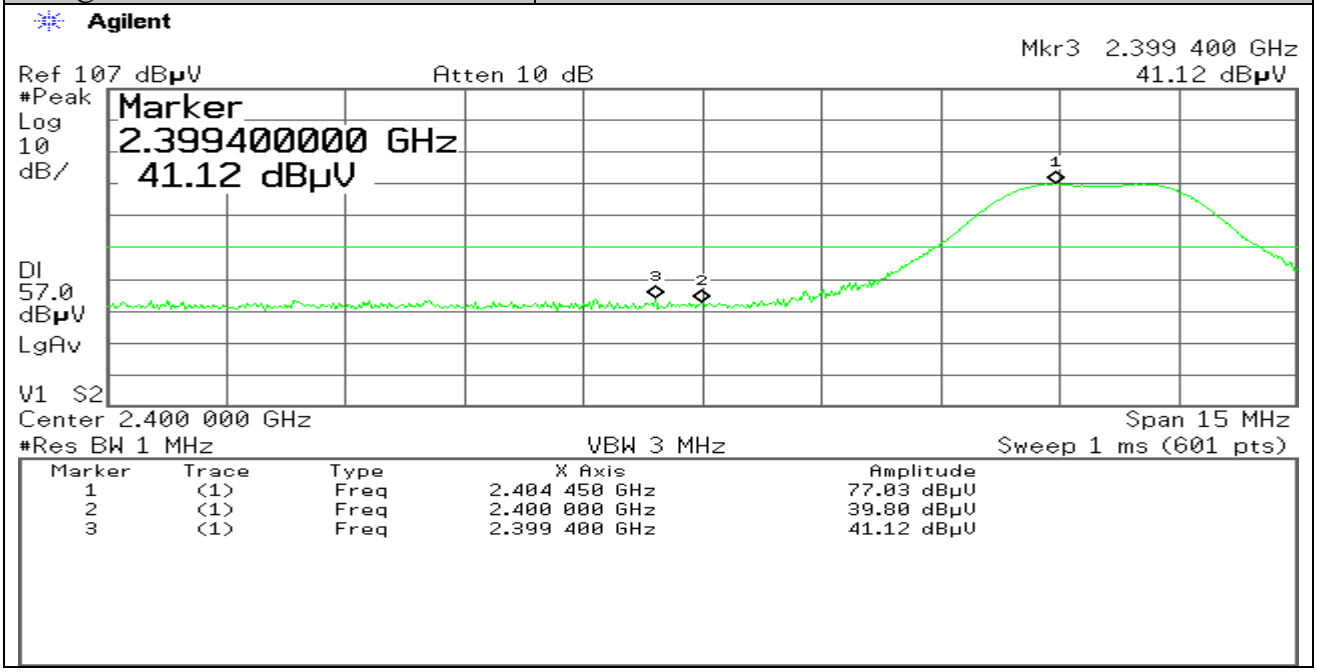
EUT Duty Cycle Factor:

It may not need to use the Duty Cycle correction factor if the output power from the 2.4GHz radio is low.

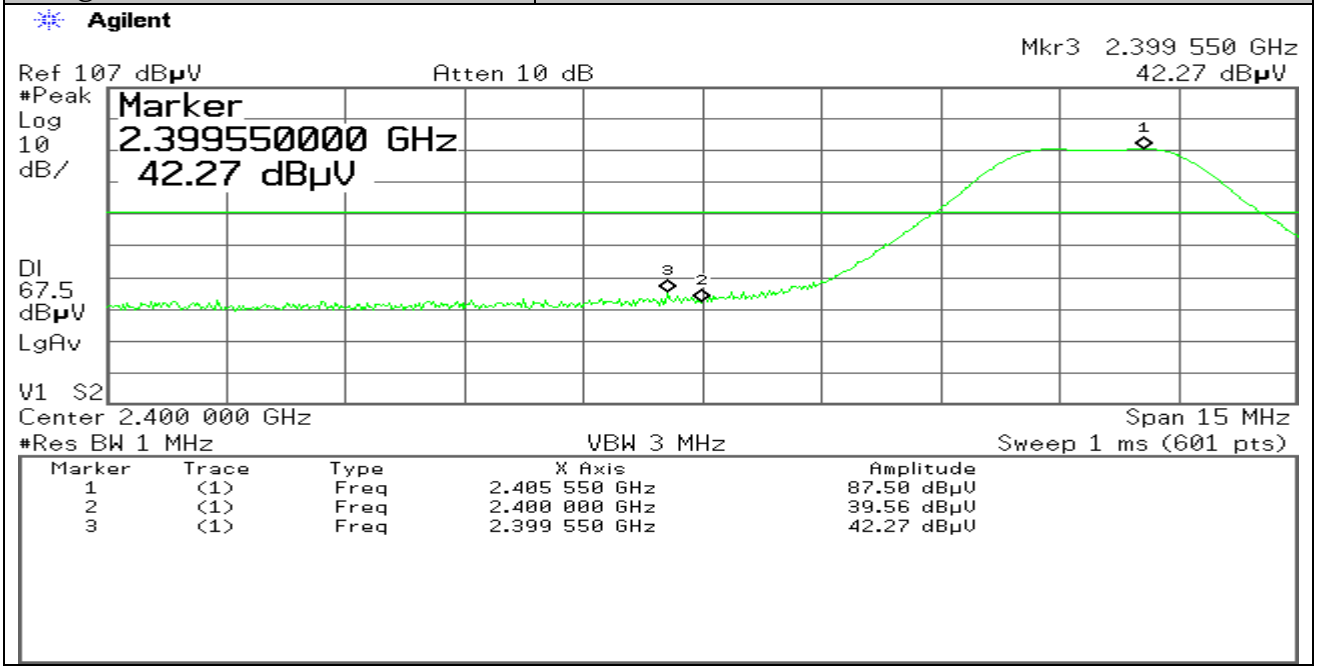
The following plots show band edge spurious are below the limit in FCC 15.247, 15.209 & RSS-247, RSS-Gen.

Zigbee Mode: Worst Case plots (Z). No need to show the average reading if its peaking reading is below the limit.

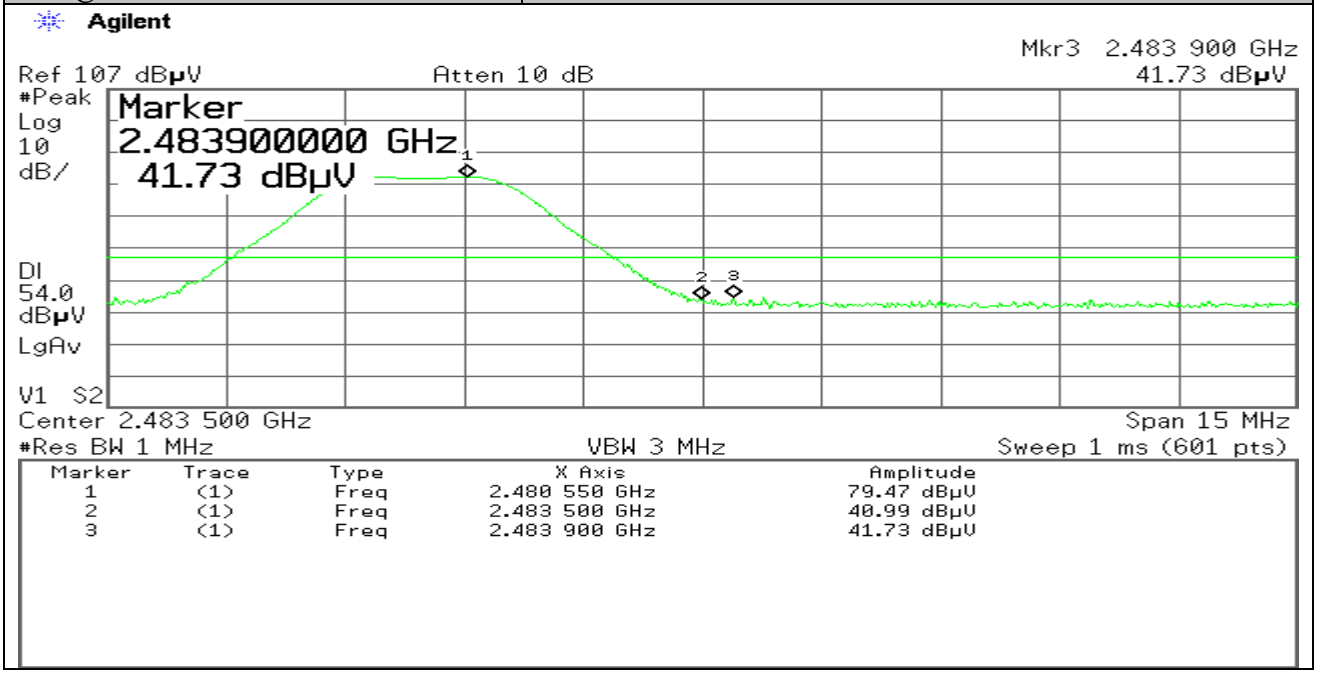
Plot Name: Radiated Emission Bandedge Test @ 2400MHz	**Spurious @ Lower Band-edge_Peak, H**



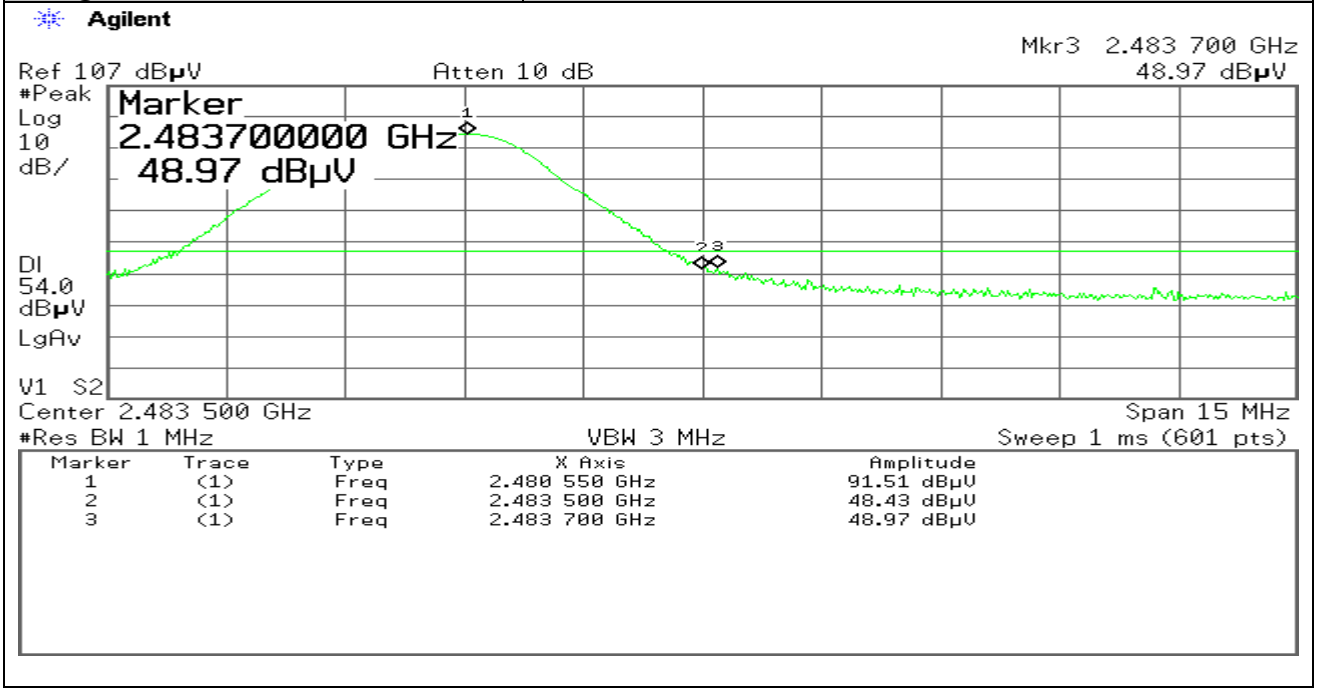
Plot Name: Radiated Emission Bandedge Test @ 2400MHz	**Spurious @ Lower Band-edge_Peak, V**



Plot Name: Radiated Emission Bandedge Test @ 2483.5 MHz	**Spurious @ High Band-edge_Peak, H**

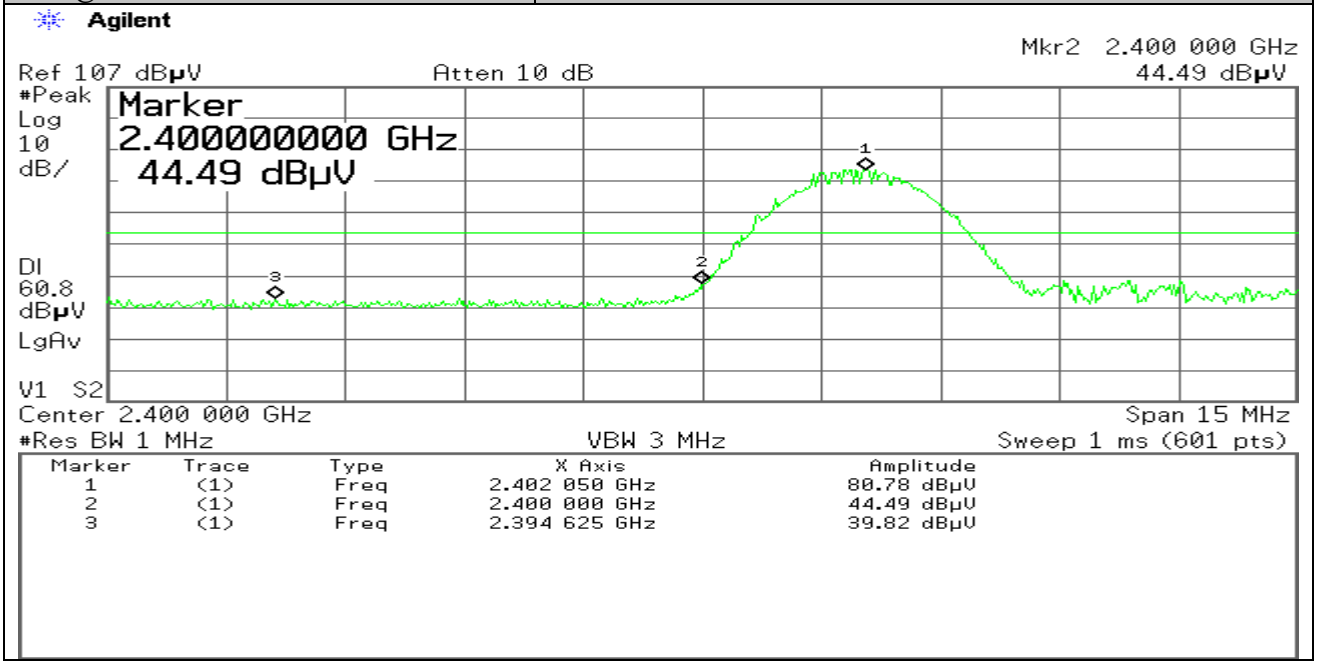


Plot Name: Radiated Emission Bandedge Test @ 2483.5MHz	**Spurious @ High Band-edge_Peak, V**

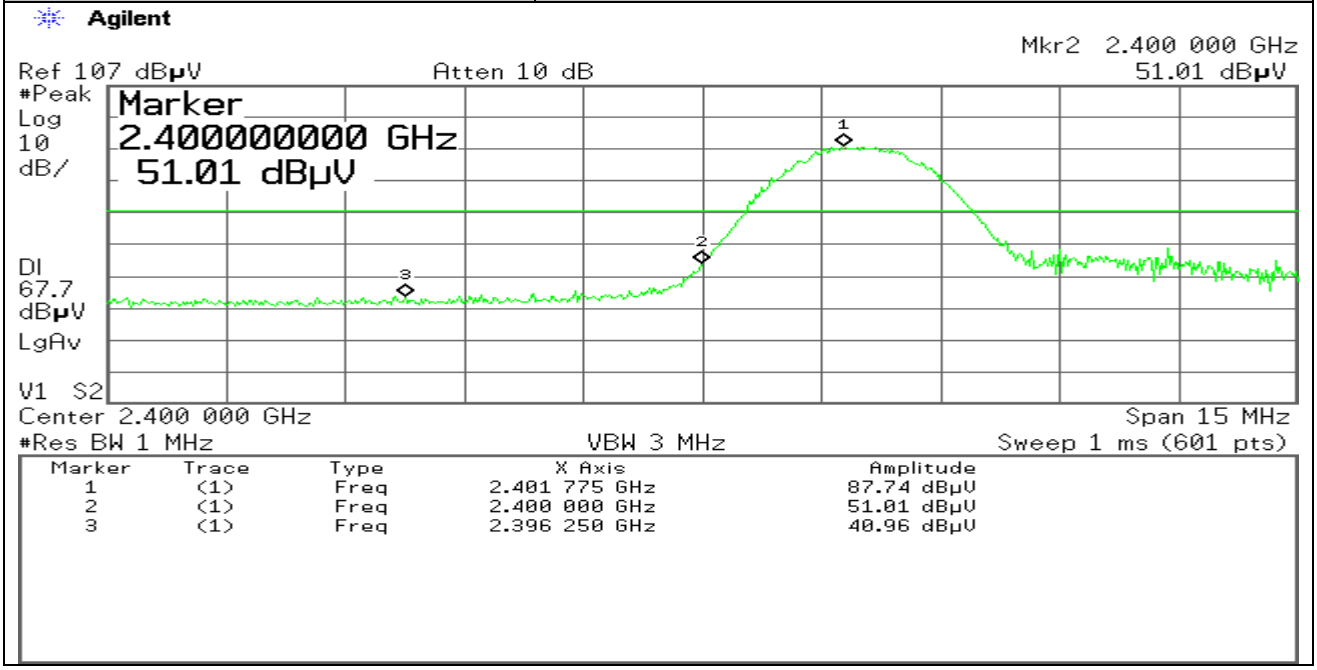


BLE Mode:

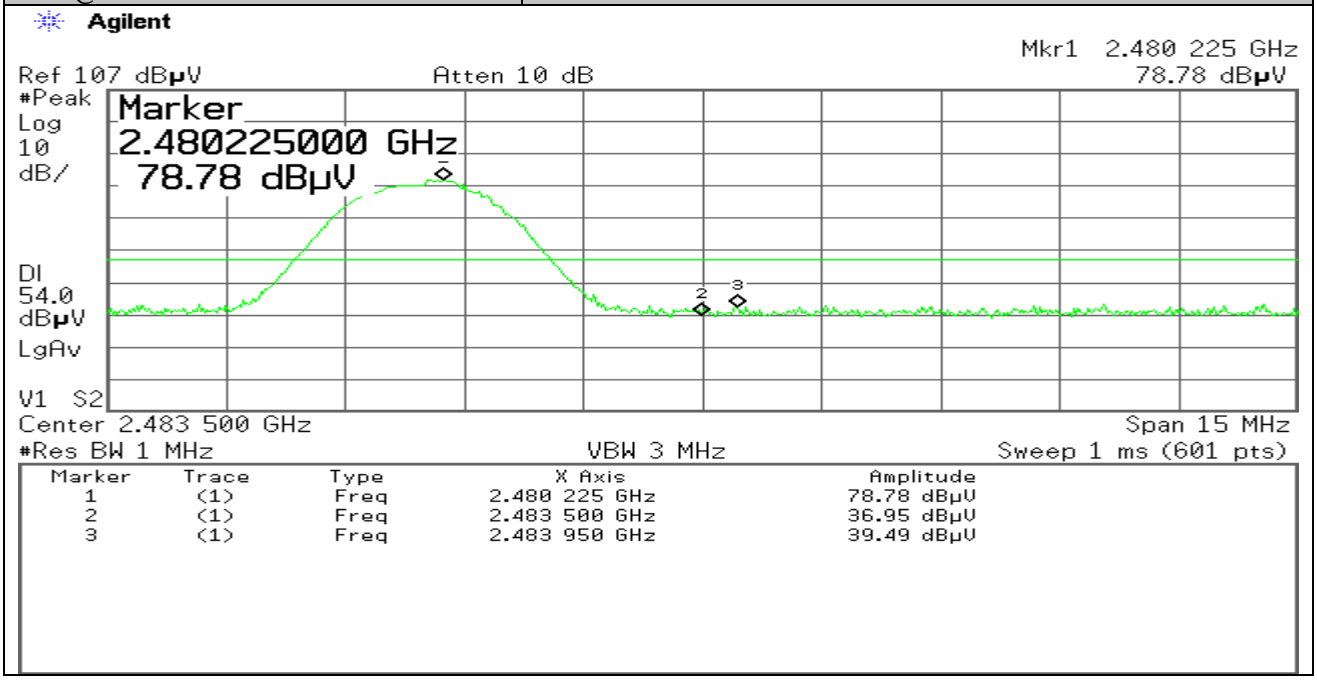
Plot Name: Radiated Emission Bandedge Test @ 2400MHz	**Spurious @ Lower Band-edge_Peak, H**



Plot Name: Radiated Emission Bandedge Test @ 2400MHz	**Spurious @ Lower Band-edge_Peak, V**



Plot Name: Radiated Emission Bandedge Test @ 2483.5 MHz	**Spurious @ High Band-edge_Peak, H**



Plot Name: Radiated Emission Bandedge Test @ 2483.5MHz	**Spurious @ High Band-edge_Peak, V**