



## Test Report

Date : 2018-10-19

No. : HM18100033

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**Applicant:**

TASCO CORP  
37 TRIPPS LANE RIVERSIDE, RI 02915-3013, USA

**Manufacturer:**

Dongguan Long Prosper Co., Ltd  
208 She qian Road, Yuanjiangyuan, Changping Town, Dongguan  
523561, China

**Description of Sample(s):**

Product: Bluetooth headset  
Brand Name: Connex  
Model Number: 3600  
FCC ID: 2ANIT-CONNEX

**Date Sample(s) Received:**

2017-08-07

**Date Tested:**

2017-08-29 to 2017-08-30

**Investigation Requested:**


Perform ElectroMagnetic Interference measurement in accordance with FCC 47 CFR [Codes of Federal Regulations] Part 15: 2017 and ANSI C63.10: 2013 for FCC Certification.

**Conclusion(s):**

The submitted product COMPLIED with the requirements of Federal Communications Commission [FCC] Rules and Regulations Part 15. The tests were performed in accordance with the standards described above and on Section 2.2 in this Test Report.

**Remark(s):**

Bluetooth FHSS (GFSK/  $\pi/4$ -DQPSK/ 8DPSK) is included in this report only.

  
CHEUNG Chi, Kenneth  
Authorized Signatory



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### **1.0 General Details**

#### **1.1 Test Laboratory**

The Hong Kong Standards and Testing Centre Ltd.  
EMC Laboratory  
10 Dai Wang Street, Taipo Industrial Estate

Telephone: (852) 26661888

Fax: (852) 26644353

#### **1.2 Equipment Under Test [EUT] Description of Sample(s)**

Product:	Bluetooth headset
Manufacturer:	Dongguan Long Prosper Co., Ltd 208 She qian Road, Yuanjiangyuan, Changping Town, Dongguan 523561, China
Brand Name:	Connex
Model Number:	3600
Rating:	Input: 4.5Vd.c, "AAA" x3

##### **1.2.1 Description of EUT Operation**

The Equipment Under Test (EUT) is a Bluetooth Headphones. The transmission signal is digital modulated with channel frequency range 2402-2480MHz. The R.F. signal was modulated by IC; the type of modulation used was frequency hopping spread spectrum Modulation.

#### **1.3 Date of Order**

2017-08-10

#### **1.4 Submitted Sample(s):**

3 Samples

#### **1.5 Test Duration**

2017-08-29 to 2017-08-30

#### **1.6 Country of Origin**

China

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### **1.7 Antenna Details**

Antenna Type (Bluetooth):

Circuit board printed meander line antenna

Antenna Gain (Bluetooth):

0.11dBi

### **1.8 Channel List**

#### **Bluetooth 2.1 EDR**

<b>Channel</b>	<b>Frequency (MHz)</b>	<b>Channel</b>	<b>Frequency (MHz)</b>
0	2402	42	2444
1	2403	43	2445
2	2404	44	2446
3	2405	45	2447
4	2406	46	2448
5	2407	47	2449
6	2408	48	2450
7	2409	...	...
8	2410	67	2469
9	2411	68	2470
...	...	69	2471
33	2435	70	2472
34	2436	71	2473
35	2437	72	2474
36	2438	73	2475
37	2439	74	2476
38	2440	75	2477
39	2441	76	2478
40	2442	77	2479
41	2443	78	2480

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**2.0 Technical Details**

### **2.1 Investigations Requested**

Perform Electromagnetic Interference measurements in accordance with FCC 47CFR [Codes of Federal Regulations] Part 15: 2017 Regulations. ANSI C63.10:2013 for FCC Certification.

### **2.2 Test Standards and Results Summary Tables**

<b>EMISSION (BLUETOOTH 2.1 EDR)</b>						
<b>Results Summary</b>						
Test Condition	Test Requirement	Test Method	Class / Severity	Test Result		
				Pass	Fail	N/A
Maximum Peak Conducted Output Power	FCC 47CFR 15.247(b)(1)	ANSI C63.10:2013	N/A	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Radiated Spurious Emissions	FCC 47CFR 15.209	ANSI C63.10:2013	N/A	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
AC Mains Conducted Emissions	FCC 47CFR 15.207	ANSI C63.10:2013	N/A	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Power Spectral Density (BLE Only)	FCC 47CFR 15.247(a)(1)	ANSI C63.10:2013	N/A	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
6dB Bandwidth (BLE Only)	FCC 47CFR 15.247(a)(1)	ANSI C63.10:2013	N/A	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Number of Hopping Frequency (Bluetooth 2.1 only)	FCC 47CFR 15.247 (b)(1)	ANSI C63.10:2013	N/A	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
20dB Bandwidth (Bluetooth 2.1 only)	FCC 47CFR 15.247(a)(2)	ANSI C63.10: 2013	N/A	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Hopping Channel Separation (Bluetooth 2.1 only)	FCC 47CFR 15.247(a)(1)	ANSI C63.10: 2013	N/A	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Band-edge measurement (Radiated)	FCC 47CFR 15.247(d)	ANSI C63.10: 2013	N/A	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Pseudorandom Hopping Algorithm (Bluetooth 2.1 only)	FCC 47CFR 15.247(a)(1)	N/A	N/A	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Time of Occupancy (Dwell Time) (Bluetooth 2.1 only)	FCC 47CFR 15.247(a)(1)(iii)	ANSI C63.10: 2013	N/A	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Antenna requirement	FCC 47CFR 15.203	N/A	N/A	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
RF Exposure	FCC 47CFR 15.247(i)	N/A	N/A	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Note: N/A – Not Applicable

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### **2.3 Table for Test Modes**

Preliminary tests were performed in different data rate to find the worst radiated emission. The data rate in the table below is the worst case rate with respect to the specific test item.

Investigation has been done on all the possible configurations for searching the worst cases.

The following table is a list of the test modes shown in this test report.

#### Bluetooth 2.1 + EDR

Test Items	Mode
Maximum Peak Conducted Output Power	GFSK / $\pi/4$ -DQPSK/ 8DPSK
Hopping Channel Separation	GFSK / $\pi/4$ -DQPSK/ 8DPSK
Number of Hopping Frequency	GFSK / $\pi/4$ -DQPSK/ 8DPSK
Time of Occupancy(Dwell Time)	8DPSK (DH1 / DH3 / DH5)
Radiated Spurious Emissions	GFSK / $\pi/4$ -DQPSK/ 8DPSK

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## Test Report

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**3.0**    Test Results

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### 3.1    Emission

#### 3.1.1    Maximum Peak Output Power (EIRP)

Ambient temperature 21°C

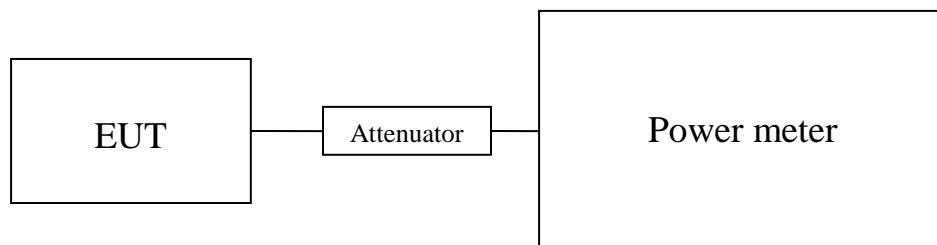
Relative humidity 51%

Test Requirement:    FCC 47CFR 15.247(b)(2)  
Test Method:        ANSI C63.10:2013  
Test Date:            2018-08-29  
Mode of Operation:    Bluetooth 2.1: Tx mode

#### Test Method:

The RF output of the EUT was connected to the power meter. All the attenuation or cable loss will be added to the measured maximum output power. The results are recorded in Watt.

#### Test Setup:



Note: a temporary antenna connector was soldered to the RF output.



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Limits for Maximum Peak Output Power (EIRP) [FCC 47CFR 15.247]:

2400–2483.5 MHz band:

The maximum peak output power shall not exceed the following limits:

For frequency hopping systems employing at least 75 hopping channels: 1 Watt

For all other frequency hopping systems in the 2400-2483.5 MHz band: 0.125 Watts

For Digital Transmission systems in 2400-2483.5 MHz Band: 1 Watt

**Results of Bluetooth 2.1: Tx mode (GFSK) (Fundamental Power): Pass**  
**Maximum output power (EIRP)**

Channel	Frequency(MHz)	Output Power(dBm)	Antenna Gain(dBi)	EIRP(dBm)	EIRP(Watt)
0	2402	0.7	0.11	0.81	0.00121
39	2441	-0.2	0.11	-0.09	0.00098
78	2480	-0.7	0.11	-0.59	0.00087

**Results of Bluetooth 2.1: Tx mode ( $\pi/4$ -DQPSK) (Fundamental Power): Pass**  
**Maximum output power (EIRP)**

Channel	Frequency(MHz)	Output Power(dBm)	Antenna Gain(dBi)	EIRP(dBm)	EIRP(Watt)
0	2402	-1.8	0.11	-1.69	0.00068
39	2441	-2.3	0.11	-2.19	0.00060
78	2480	-3.1	0.11	-2.99	0.00050

**Results of Bluetooth 2.1: Tx mode (8DPSK) (Fundamental Power): Pass**  
**Maximum output power (EIRP)**

Channel	Frequency(MHz)	Output Power(dBm)	Antenna Gain(dBi)	EIRP(dBm)	EIRP(Watt)
0	2402	-1.5	0.11	-1.39	0.00073
39	2441	-2	0.11	-1.89	0.00065
78	2480	-2.7	0.11	-2.59	0.00055

Calculated measurement uncertainty :

30MHz to 1GHz

1.7dB

1GHz to 18GHz

1.7dB

Remark:

1. All test data for each data rate were verified, but only the worst case was reported.
2. The EUT is programmed to transmit signals continuously for all testing.

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### **3.1.2 Radiated Spurious Emissions**

Ambient temperature 21°C

Relative humidity 51%

Test Requirement: FCC 47CFR 15.209

Test Method: ANSI C63.10:2013

Test Date: 2017-08-30

Mode of Operation: Bluetooth 2.1: Tx mode

#### **Test Method:**

For emission measurements at or below 1 GHz, the sample was placed 0.8m above the ground plane of semi-anechoic Chamber\*. For emission measurements above 1 GHz, the sample was placed 1.5m above the ground plane of semi-anechoic Chamber\*. Measurements in both horizontal and vertical polarities were performed. During the test, each emission was maximized by: having the EUT continuously working, investigated all operating modes, considered typical configuration to obtain worst position, manipulating interconnecting cables, rotating turntable, varying antenna height from 1m to 4m in both horizontal and vertical polarizations. The emissions worst-case are shown in Test Results of the following pages.

\*

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FCC Test Firm Registration Number 723883 Designation Number HK0001

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**Spectrum Analyzer Setting:**

9KHz – 30MHz (Pk & Av)

RBW: 10kHz  
VBW: 30kHz  
Sweep: Auto  
Span: Fully capture the emissions being measured  
Trace: Max. hold

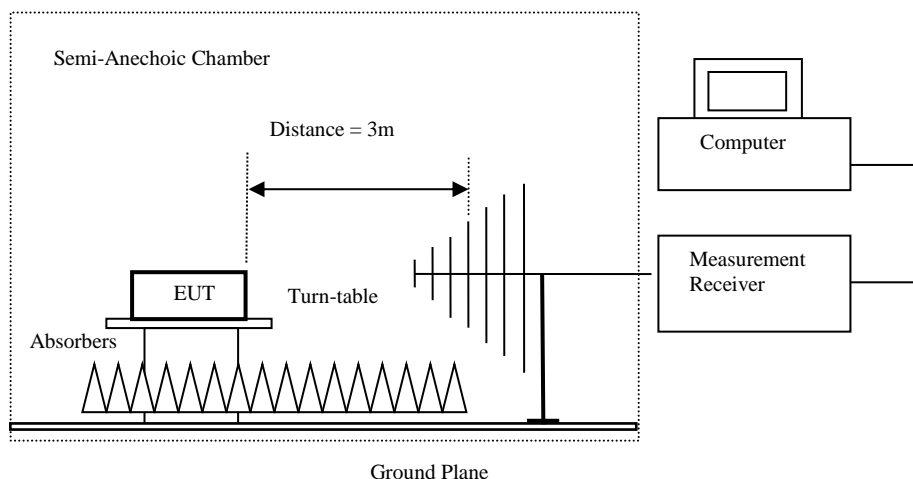
30MHz – 1GHz (QP)

RBW: 120kHz  
VBW: 120kHz  
Sweep: Auto  
Span: Fully capture the emissions being measured  
Trace: Max. hold

Above 1GHz (Pk & Av)

RBW: 1MHz  
VBW: 3MHz  
Sweep: Auto  
Span: Fully capture the emissions being measured  
Trace: Max. hold

**Test Setup:**



- Absorbers placed on top of the ground plane are for measurements above 1000MHz only.
- Measurements between 30MHz to 1000MHz made with Bi-log antennas, above 1000MHz horn antennas are used, 9kHz to 30MHz loop antennas are used.

For emissions testing at or below 1 GHz, the table height shall be 80 cm above the reference ground plane. For emission measurements above 1 GHz, the table height shall be 1.5 m

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**Limits for Radiated Emissions [FCC 47 CFR 15.209 Class B]:**

Frequency Range	Quasi-Peak Limits
[MHz]	[ $\mu$ V/m]
0.009-0.490	2400/F (kHz)
0.490-1.705	24000/F (kHz)
1.705-30	30
30-88	100
88-216	150
216-960	200
Above960	500

The emission limits shown in the above table are based on measurement employing a CISPR quasi-peak detector and above 1000MHz are based on measurements employing an average detector.

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Result of Bluetooth 2.1: Tx mode (2402.0 MHz) (GFSK) (9kHz – 30MHz): Pass

Field Strength of Spurious Emissions Peak Value						
Frequency MHz	Measured Level dBuV	Correction Factor dB/m	Field Strength dBuV/m	Field Strength uV/m	Limit uV/m	E-Field Polarity
Emissions detected are more than 20 dB below the Limits						

Result of Bluetooth 2.1:Tx mode (2402.0 MHz) (GFSK) (Above 1GHz): Pass

Field Strength of Spurious Emissions Peak Value						
Frequency MHz	Measured Level @3m dBuV	Correction Factor dB/m	Field Strength dBuV/m	Limit @3m dBuV/m	Margin dBuV/m	E-Field Polarity
2402.0	71.0	27.9	98.9	N/A	N/A	Horizontal
4804.0	4.6	32.1	36.7	74.0	37.3	Horizontal
7206.0	1.3	38.6	39.9	74.0	34.1	Horizontal
9608.0	-1.3	41.3	40.0	74.0	34.0	Vertical
12010.0	-2.1	43.5	41.4	74.0	32.6	Vertical

Field Strength of Spurious Emissions Average Value						
Frequency MHz	Measured Level @3m dBuV	Correction Factor dB/m	Field Strength dBuV/m	Limit @3m dBuV/m	Margin dBuV/m	E-Field Polarity
2402.0	60.4	27.9	88.3	N/A	N/A	Horizontal
4804.0	-1.3	32.1	30.8	54.0	23.2	Horizontal
7206.0	-3.2	38.6	35.4	54.0	18.6	Horizontal
9608.0	-2.3	41.3	39.0	54.0	15.0	Vertical
12010.0	-2.4	43.5	41.1	54.0	12.9	Vertical

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**Result of Bluetooth 2.1:Tx mode (2441.0 MHz) (GFSK) (9kHz – 30MHz): Pass**

Field Strength of Spurious Emissions						
Peak Value						
Frequency MHz	Measured Level dBuV	Correction Factor dB/m	Field Strength dBuV/m	Field Strength uV/m	Limit uV/m	E-Field Polarity
Emissions detected are more than 20 dB below the Limits						

**Result of Bluetooth 2.1:Tx mode (2441.0 MHz) (GFSK) (Above 1GHz): Pass**

Field Strength of Spurious Emissions						
Peak Value						
Frequency MHz	Measured Level @3m dBuV	Correction Factor dB/m	Field Strength dBuV/m	Limit @3m dBuV/m	Margin dBuV/m	E-Field Polarity
2441.0	70.1	27.9	98.0	N/A	N/A	Horizontal
4882.0	3.1	32.1	35.2	74.0	38.8	Horizontal
7323.0	2.1	38.6	40.7	74.0	33.3	Horizontal
9764.0	-1.4	41.3	39.9	74.0	34.1	Vertical
12205.0	-2.9	43.5	40.6	74.0	33.4	Vertical

Field Strength of Spurious Emissions						
Average Value						
Frequency MHz	Measured Level @3m dBuV	Correction Factor dB/m	Field Strength dBuV/m	Limit @3m dBuV/m	Margin dBuV/m	E-Field Polarity
2441.0	59.4	27.9	87.3	N/A	N/A	Horizontal
4882.0	-2.6	32.1	29.5	54.0	24.5	Horizontal
7323.0	-3.2	38.6	35.4	54.0	18.6	Horizontal
9764.0	-3.4	41.3	37.9	54.0	16.1	Vertical
12205.0	-2.7	43.5	40.8	54.0	13.2	Vertical

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**Result of Bluetooth 2.1:Tx mode (2480.0 MHz) (GFSK) (9kHz – 30MHz): Pass**

Field Strength of Spurious Emissions Peak Value						
Frequency MHz	Measured Level dBuV	Correction Factor dB/m	Field Strength dBuV/m	Field Strength uV/m	Limit uV/m	E-Field Polarity
Emissions detected are more than 20 dB below the Limits						

**Result of Bluetooth 2.1: Tx mode (2480.0 MHz) (GFSK) (Above 1GHz): Pass**

Field Strength of Spurious Emissions Peak Value						
Frequency MHz	Measured Level @3m dBuV	Correction Factor dB/m	Field Strength dBuV/m	Limit @3m dBuV/m	Margin dBuV/m	E-Field Polarity
2480.0	69.6	27.9	97.5	N/A	N/A	Horizontal
4960.0	4.1	32.2	36.3	74.0	37.7	Horizontal
7440.0	1.4	38.6	40.0	74.0	34.0	Horizontal
9920.0	-1.8	42.1	40.3	74.0	33.7	Vertical
12400.0	-2.8	44.1	41.3	74.0	32.7	Vertical

Field Strength of Spurious Emissions Average Value						
Frequency MHz	Measured Level @3m dBuV	Correction Factor dB/m	Field Strength dBuV/m	Limit @3m dBuV/m	Margin dBuV/m	E-Field Polarity
2480.0	58.3	27.9	86.2	N/A	N/A	Horizontal
4960.0	-2.7	32.2	29.5	54.0	24.5	Horizontal
7440.0	-2.8	38.6	35.8	54.0	18.2	Horizontal
9920.0	-2.7	42.1	39.4	54.0	14.6	Vertical
12400.0	-3.5	44.1	40.6	54.0	13.4	Vertical

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**Result of Bluetooth 2.1:Tx mode (2402.0 MHz) ( $\pi/4$ -DQPSK) (9kHz – 30MHz): Pass**

Field Strength of Spurious Emissions Peak Value						
Frequency MHz	Measured Level dBuV	Correction Factor dB/m	Field Strength dBuV/m	Field Strength uV/m	Limit uV/m	E-Field Polarity
Emissions detected are more than 20 dB below the Limits						

**Result of Bluetooth 2.1:Tx mode (2402.0 MHz) ( $\pi/4$ -DQPSK) (Above 1GHz): Pass**

Field Strength of Spurious Emissions Peak Value						
Frequency MHz	Measured Level @3m dBuV	Correction Factor dB/m	Field Strength dBuV/m	Limit @3m dBuV/m	Margin dBuV/m	E-Field Polarity
2402.0	68.5	27.9	96.4	N/A	N/A	Horizontal
4804.0	3.4	32.1	35.5	74.0	38.5	Horizontal
7206.0	2.5	38.6	41.1	74.0	32.9	Horizontal
9608.0	1.8	41.3	43.1	74.0	30.9	Vertical
12010.0	1.1	43.5	44.6	74.0	29.4	Vertical

Field Strength of Spurious Emissions Average Value						
Frequency MHz	Measured Level @3m dBuV	Correction Factor dB/m	Field Strength dBuV/m	Limit @3m dBuV/m	Margin dBuV/m	E-Field Polarity
2402.0	57.4	27.9	85.3	N/A	N/A	Horizontal
4804.0	-1.7	32.1	30.4	54.0	23.6	Horizontal
7206.0	-2.5	38.6	36.1	54.0	17.9	Horizontal
9608.0	-3.1	41.3	38.2	54.0	15.8	Vertical
12010.0	-2.8	43.5	40.7	54.0	13.3	Vertical

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**Result of Bluetooth 2.1:Tx mode (2441.0 MHz) ( $\pi/4$ -DQPSK) (9kHz – 30MHz): Pass**

Field Strength of Spurious Emissions						
Peak Value						
Frequency MHz	Measured Level dBuV	Correction Factor dB/m	Field Strength dBuV/m	Field Strength uV/m	Limit uV/m	E-Field Polarity
Emissions detected are more than 20 dB below the Limits						

**Result of Bluetooth 2.1:Tx mode (2441.0 MHz) ( $\pi/4$ -DQPSK) (Above 1GHz): Pass**

Field Strength of Spurious Emissions						
Peak Value						
Frequency MHz	Measured Level @3m dBuV	Correction Factor dB/m	Field Strength dBuV/m	Limit @3m dBuV/m	Margin dBuV/m	E-Field Polarity
2441.0	68.0	27.9	95.9	N/A	N/A	Horizontal
4882.0	3.3	32.1	35.4	74.0	38.6	Horizontal
7323.0	1.7	38.6	40.3	74.0	33.7	Horizontal
9764.0	-1.1	41.3	40.2	74.0	33.8	Vertical
12205.0	-2.8	43.5	40.7	74.0	33.3	Vertical

Field Strength of Spurious Emissions						
Average Value						
Frequency MHz	Measured Level @3m dBuV	Correction Factor dB/m	Field Strength dBuV/m	Limit @3m dBuV/m	Margin dBuV/m	E-Field Polarity
2441.0	57.2	27.9	85.1	N/A	N/A	Horizontal
4882.0	-2.2	32.1	29.9	54.0	24.1	Horizontal
7323.0	-2.3	38.6	36.3	54.0	17.7	Horizontal
9764.0	-3.1	41.3	38.2	54.0	15.8	Vertical
12205.0	-2.4	43.5	41.1	54.0	12.9	Vertical

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**Result of Bluetooth 2.1:Tx mode (2480.0 MHz) ( $\pi/4$ -DQPSK) (9kHz – 30MHz): Pass**

Field Strength of Spurious Emissions Peak Value						
Frequency MHz	Measured Level dBuV	Correction Factor dB/m	Field Strength dBuV/m	Field Strength uV/m	Limit uV/m	E-Field Polarity
Emissions detected are more than 20 dB below the Limits						

**Result of Bluetooth 2.1:Tx mode (2480.0 MHz) ( $\pi/4$ -DQPSK) (Above 1GHz): Pass**

Field Strength of Spurious Emissions Peak Value						
Frequency MHz	Measured Level @3m dBuV	Correction Factor dB/m	Field Strength dBuV/m	Limit @3m dBuV/m	Margin dBuV/m	E-Field Polarity
2480.0	67.2	27.9	95.1	N/A	N/A	Horizontal
4960.0	2.9	32.2	35.1	74.0	38.9	Horizontal
7440.0	2.5	38.6	41.1	74.0	32.9	Horizontal
9920.0	-1.9	42.1	40.2	74.0	33.8	Vertical
12400.0	-2.5	44.1	41.6	74.0	32.4	Vertical

Field Strength of Spurious Emissions Average Value						
Frequency MHz	Measured Level @3m dBuV	Correction Factor dB/m	Field Strength dBuV/m	Limit @3m dBuV/m	Margin dBuV/m	E-Field Polarity
2480.0	56.4	27.9	84.3	N/A	N/A	Horizontal
4960.0	-2.6	32.2	29.6	54.0	24.4	Horizontal
7440.0	-2.8	38.6	35.8	54.0	18.2	Horizontal
9920.0	-3.1	42.1	39.0	54.0	15.0	Vertical
12400.0	-2.8	44.1	41.3	54.0	12.7	Vertical

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**Result of Bluetooth 2.1:Tx mode (2402.0 MHz) (8DPSK) (9kHz – 30MHz): Pass**

Field Strength of Spurious Emissions Peak Value						
Frequency MHz	Measured Level dBuV	Correction Factor dB/m	Field Strength dBuV/m	Field Strength uV/m	Limit uV/m	E-Field Polarity
Emissions detected are more than 20 dB below the Limits						

**Result of Bluetooth 2.1:Tx mode (2402.0 MHz) (8DPSK) (Above 1GHz): Pass**

Field Strength of Spurious Emissions Peak Value						
Frequency MHz	Measured Level @3m dBuV	Correction Factor dB/m	Field Strength dBuV/m	Limit @3m dBuV/m	Margin dBuV/m	E-Field Polarity
2402.0	68.8	27.9	96.7	N/A	N/A	Horizontal
4804.0	3.6	32.1	35.7	74.0	38.3	Horizontal
7206.0	2.1	38.6	40.7	74.0	33.3	Horizontal
9608.0	-1.3	41.3	40.0	74.0	34.0	Vertical
12010.0	-2.1	43.5	41.4	74.0	32.6	Vertical

Field Strength of Spurious Emissions Average Value						
Frequency MHz	Measured Level @3m dBuV	Correction Factor dB/m	Field Strength dBuV/m	Limit @3m dBuV/m	Margin dBuV/m	E-Field Polarity
2402.0	57.6	27.9	85.5	N/A	N/A	Horizontal
4804.0	-2.1	32.1	30.0	54.0	24.0	Horizontal
7206.0	-1.8	38.6	36.8	54.0	17.2	Horizontal
9608.0	-2.3	41.3	39.0	54.0	15.0	Vertical
12010.0	-2.5	43.5	41.0	54.0	13.0	Vertical

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Result of Bluetooth 2.1:Tx mode (2441.0 MHz) (8DPSK) (9kHz – 30MHz): Pass

Field Strength of Spurious Emissions						
Peak Value						
Frequency MHz	Measured Level dBuV	Correction Factor dB/m	Field Strength dBuV/m	Field Strength uV/m	Limit uV/m	E-Field Polarity
Emissions detected are more than 20 dB below the Limits						

Result of Bluetooth 2.1:Tx mode (2441.0 MHz) (8DPSK) (Above 1GHz): Pass

Field Strength of Spurious Emissions						
Peak Value						
Frequency MHz	Measured Level @3m dBuV	Correction Factor dB/m	Field Strength dBuV/m	Limit @3m dBuV/m	Margin dBuV/m	E-Field Polarity
2441.0	68.3	27.9	96.2	N/A	N/A	Horizontal
4882.0	3.1	32.1	35.2	74.0	38.8	Horizontal
7323.0	2.1	38.6	40.7	74.0	33.3	Horizontal
9764.0	-1.5	41.3	39.8	74.0	34.2	Vertical
12205.0	-3.7	43.5	39.8	74.0	34.2	Vertical

Field Strength of Spurious Emissions						
Average Value						
Frequency MHz	Measured Level @3m dBuV	Correction Factor dB/m	Field Strength dBuV/m	Limit @3m dBuV/m	Margin dBuV/m	E-Field Polarity
2441.0	57.3	27.9	85.2	N/A	N/A	Horizontal
4882.0	-1.8	32.1	30.3	54.0	23.7	Horizontal
7323.0	-3.3	38.6	35.3	54.0	18.7	Horizontal
9764.0	-5.8	41.3	35.5	54.0	18.5	Vertical
12205.0	-6.4	43.5	37.1	54.0	16.9	Vertical

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**Result of Bluetooth 2.1:Tx mode (2480.0 MHz) (8DPSK) (9kHz – 30MHz): Pass**

Field Strength of Spurious Emissions						
Peak Value						
Frequency MHz	Measured Level dBuV	Correction Factor dB/m	Field Strength dBuV/m	Field Strength uV/m	Limit uV/m	E-Field Polarity
Emissions detected are more than 20 dB below the Limits						

**Result of Bluetooth 2.1:Tx mode (2480.0 MHz) (8DPSK) (Above 1GHz): Pass**

Field Strength of Spurious Emissions						
Peak Value						
Frequency MHz	Measured Level @3m dBuV	Correction Factor dB/m	Field Strength dBuV/m	Limit @3m dBuV/m	Margin dBuV/m	E-Field Polarity
2480.0	67.6	27.9	95.5	N/A	N/A	Horizontal
4960.0	3.4	32.2	35.6	74.0	38.4	Horizontal
7440.0	2.4	38.6	41.0	74.0	33.0	Horizontal
9920.0	-1.5	42.1	40.6	74.0	33.4	Vertical
12400.0	-4.2	44.1	39.9	74.0	34.1	Vertical

Field Strength of Spurious Emissions						
Average Value						
Frequency MHz	Measured Level @3m dBuV	Correction Factor dB/m	Field Strength dBuV/m	Limit @3m dBuV/m	Margin dBuV/m	E-Field Polarity
2480.0	56.5	27.9	84.4	N/A	N/A	Horizontal
4960.0	-1.1	32.2	31.1	54.0	22.9	Horizontal
7440.0	-2.7	38.6	35.9	54.0	18.1	Horizontal
9920.0	-3.3	42.1	38.8	54.0	15.2	Vertical
12400.0	-5.1	44.1	39.0	54.0	15.0	Vertical

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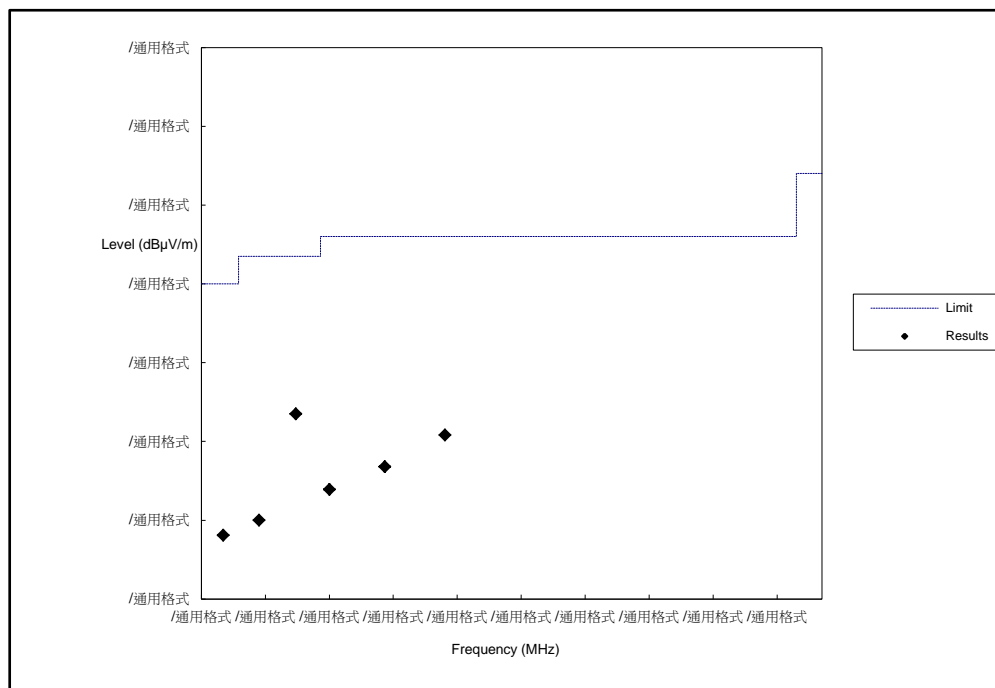
**Result of Bluetooth 2.1: Tx mode (8DPSK: 2480.0 MHz) (9kHz – 30MHz): Pass**  
**Limits for Radiated Emissions [FCC 47 CFR 15.209 Class B]:**

Frequency Range [MHz]	Quasi-Peak Limits [ $\mu$ V/m]
0.009-0.490	2400/F (kHz)
0.490-1.705	24000/F (kHz)
1.705-30	30
30-88	100
88-216	150
216-960	200
Above960	500

The emission limits shown in the above table are based on measurement employing a CISPR quasi-peak detector and above 1000MHz are based on measurements employing an average detector.

**Result of Bluetooth 2.1: Tx mode (8DPSK: 2480.0 MHz), (9kHz – 30MHz): PASS**  
Emissions detected are more than 20 dB below the FCC Limits

**Results of Bluetooth 2.1: Tx mode (8DPSK: 2480.0 MHz) (30MHz – 1GHz): Pass**  
Please refer to the following table for result details(The data is the worst cases)



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Radiated Emissions					
Quasi-Peak					
Emission Frequency	E-Field Polarity	Level @3m	Limit @3m	Level @3m	Limit @3m
MHz		dBμV/m	dBμV/m	μV/m	μV/m
64.3	Vertical	8.1	40.0	2.5	150
120.3	Horizontal	10.0	43.5	3.2	150
178.0	Horizontal	23.5	43.5	15.0	150
230.6	Horizontal	13.9	43.5	5.0	200
317.0	Horizontal	16.8	46.0	6.9	200
411.3	Horizontal	20.8	46.0	11.0	200

### **Result of Bluetooth 2.1: Tx mode (8DPSK: 2480.0 MHz), (1GHz – 26GHz): PASS**

Emissions detected are more than 20 dB below the FCC Limits

#### Remarks:

No additional spurious emissions found between lowest internal used/generated frequency and 30 MHz

\* Denotes restricted band of operation.

Measurements were made using a peak detector. Any emission less than 1000MHz and falling within the restricted bands of FCC Rules Part 15 Section 15.205 and the limits of FCC Rules Part 15 Section 15.209 were applied.

Correction Factor included Antenna Factor and Cable Attenuation.

Calculated measurement uncertainty : 9kHz-30MHz 3.3dB

30MHz -1GHz 4.6dB

1GHz -26GHz 4.4dB

Emissions in the vertical and horizontal polarizations have been investigated and the worst-case test results are recorded in this report.

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### 3.1.5 Number of Hopping Frequency

Ambient temperature 23°C

Relative humidity 51%

#### Limit of Number of Hopping Frequency

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

#### Test Method:

The RF output of the EUT was connected to the spectrum analyzer by a low loss cable.

#### Spectrum Analyzer Setting:

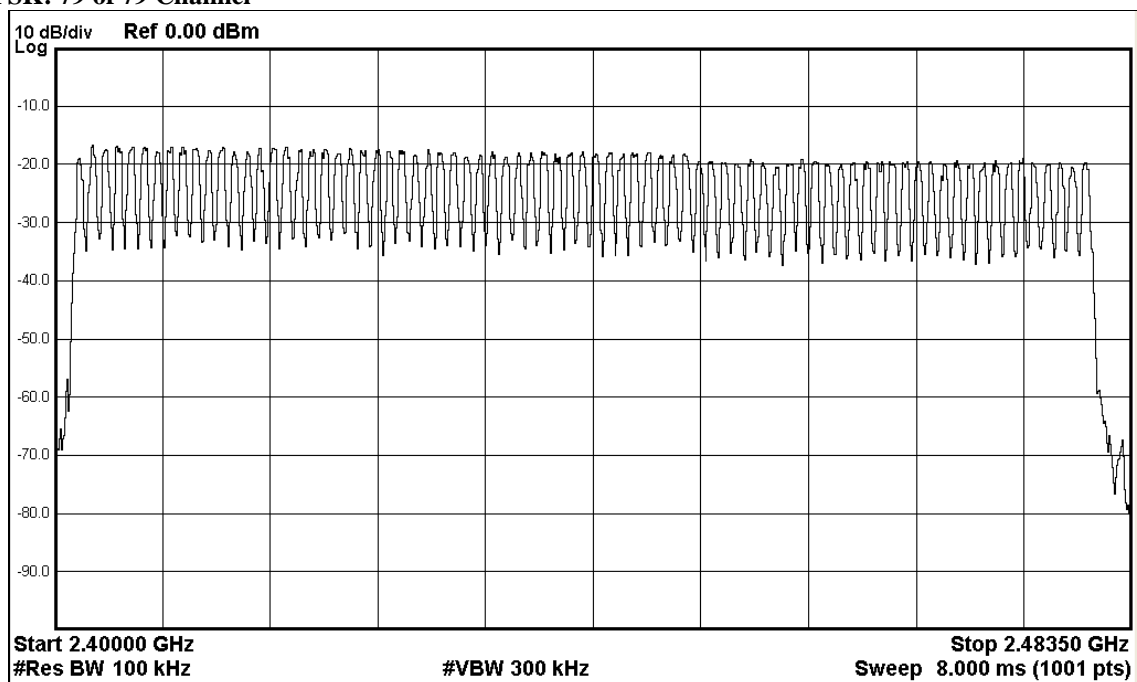
RBW = 100kHz, VBW  $\geq$  RBW, Sweep = Auto, Span = the frequency band of operation  
Detector = Peak, Trace = Max. hold

#### Test Setup:

As Test Setup of clause 3.1.1 in this test report.

#### Measurement Data:

##### GFSK: 79 of 79 Channel



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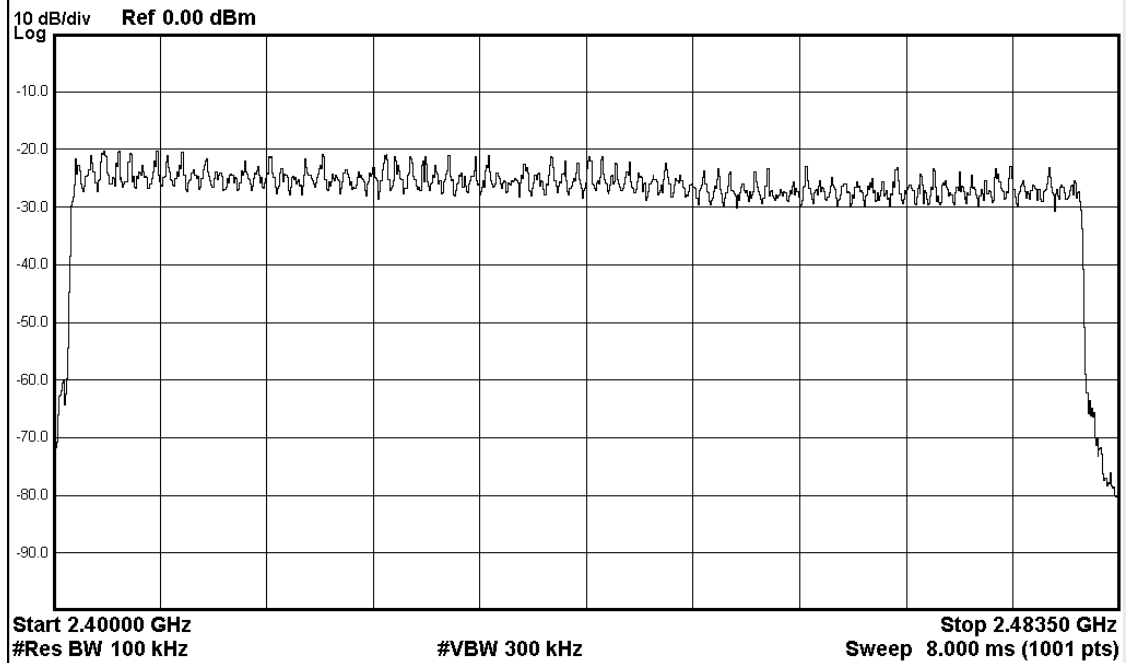
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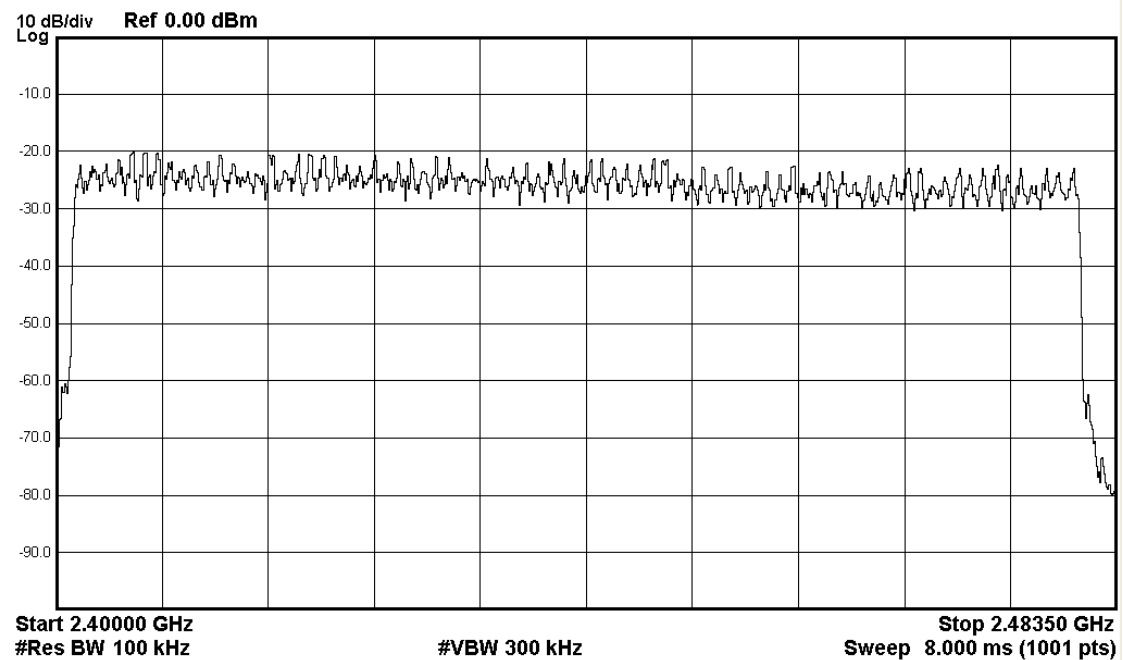
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$\pi/4$ -DQPSK: 79 of 79 Channel



8DPSK: 79 of 79 Channel



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## Test Report

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**3.1.6 20dB Bandwidth**

Ambient temperature 23°C

Relative humidity 51%

Test Requirement: FCC 47CFR 15.247(a)(1)

Test Method: ANSI C63.10:2013

Test Date: 2017-08-29

Mode of Operation: Bluetooth 2.1: Tx mode

### **Remark:**

The result has been done on all the possible configurations for searching the worst cases.

### **Test Method:**

The bandwidth is measured at an amplitude level reduced from the reference level by a specified ratio. The reference level is the level of the highest amplitude signal observed from the transmitter at the fundamental frequency. Once the reference level is established, the equipment is conditioned with typical modulating signal to produce the worst-case (i.e. the widest) bandwidth.

### **Spectrum Analyzer Setting:**

RBW = 30kHz, VBW  $\geq$  RBW, Sweep = Auto, Span = two times and five times the OBW  
Detector = Peak, Trace = Max. hold

### **Test Setup:**

As Test Setup of clause 3.1.1 in this test report.

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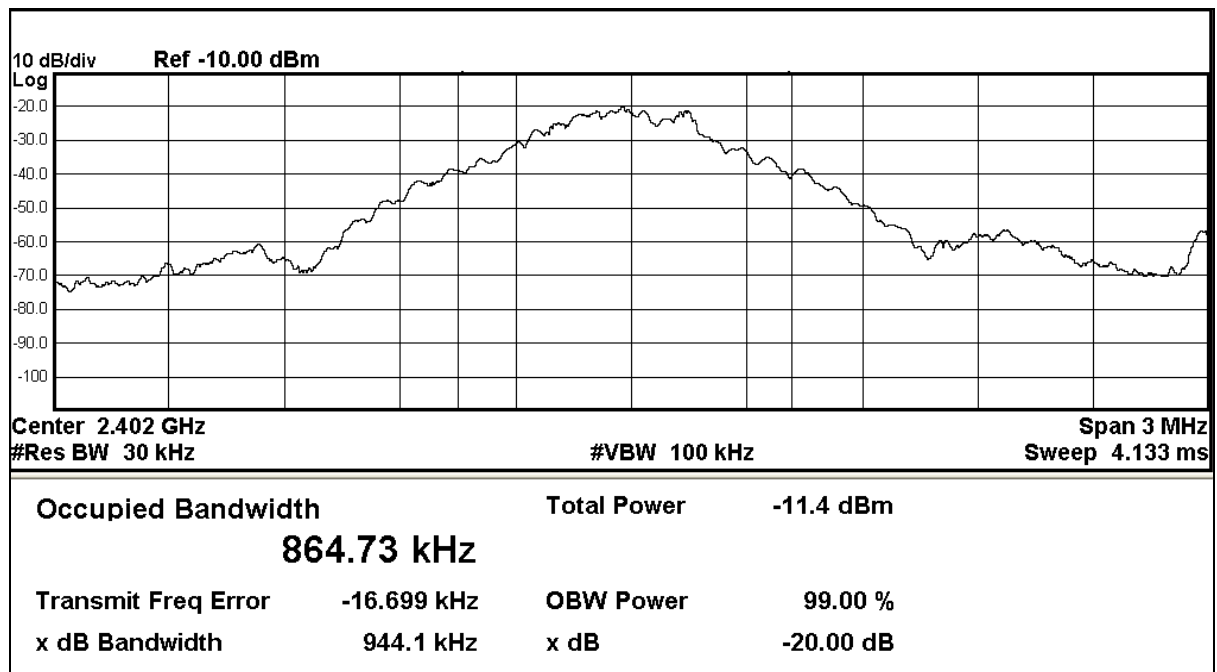
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Fundamental Frequency [MHz]	20dB Bandwidth [MHz]	FCC Limits [MHz]
2402	0.944	Within 2400-2483.5

**(Lowest Operating Frequency) - (GFSK)**



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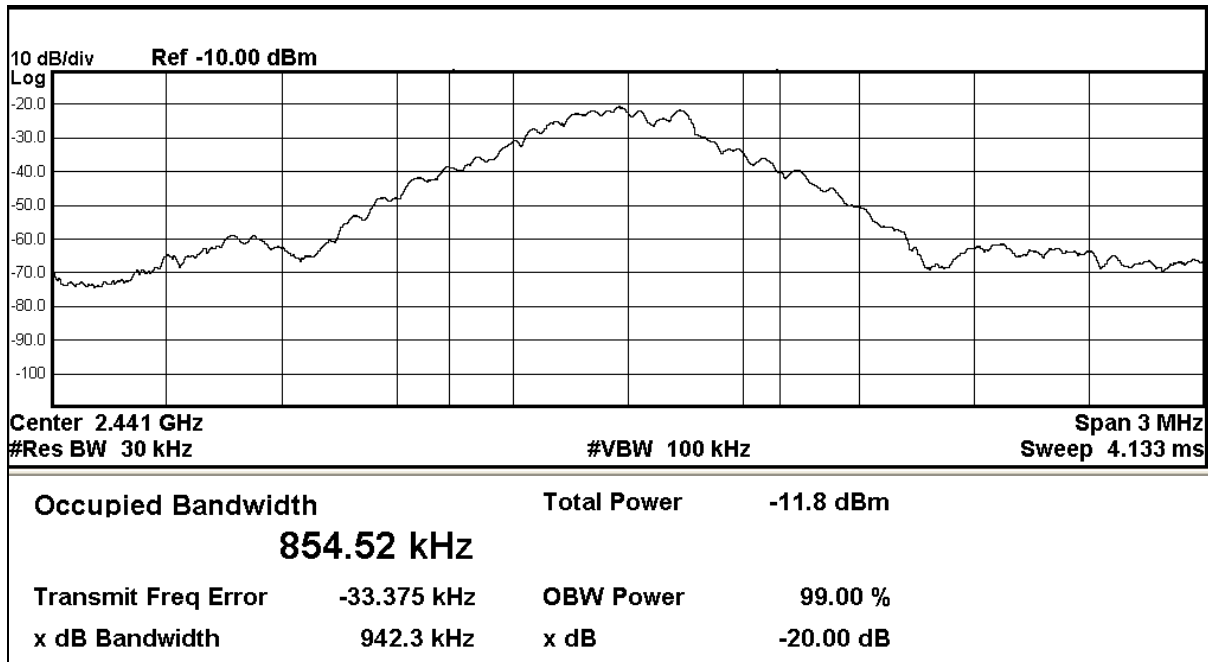
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Fundamental Frequency [MHz]	20dB Bandwidth [MHz]	FCC Limits [MHz]
2441	0.942	Within 2400-2483.5

(Middle Operating Frequency) - (GFSK)



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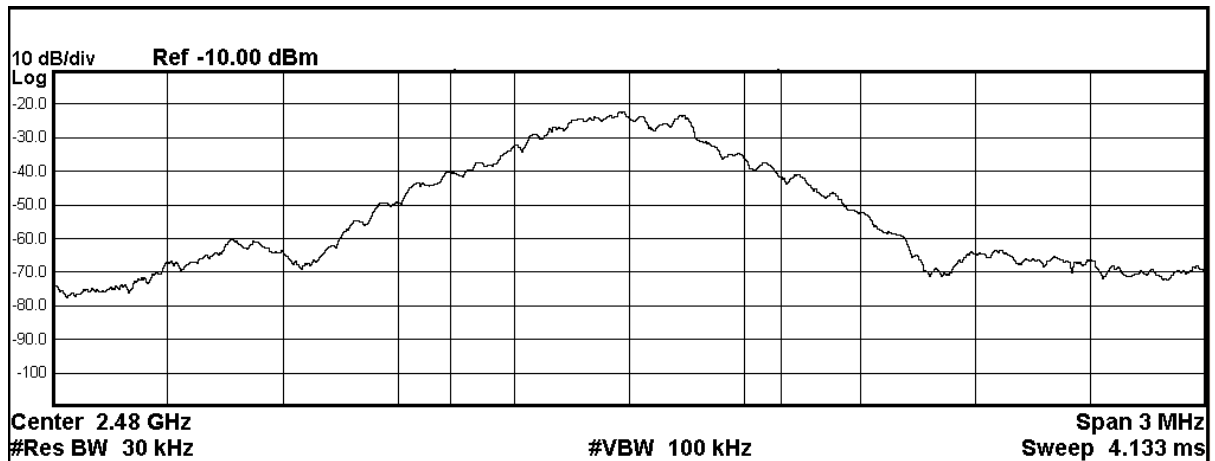
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Fundamental Frequency [MHz]	20dB Bandwidth [MHz]	FCC Limits [MHz]
2480	0.941	Within 2400-2483.5

(Highest Operating Frequency) - (GFSK)



Occupied Bandwidth

Total Power

-13.5 dBm

856.32 kHz

Transmit Freq Error

-33.325 kHz

OBW Power

99.00 %

x dB Bandwidth

941.9 kHz

x dB

-20.00 dB

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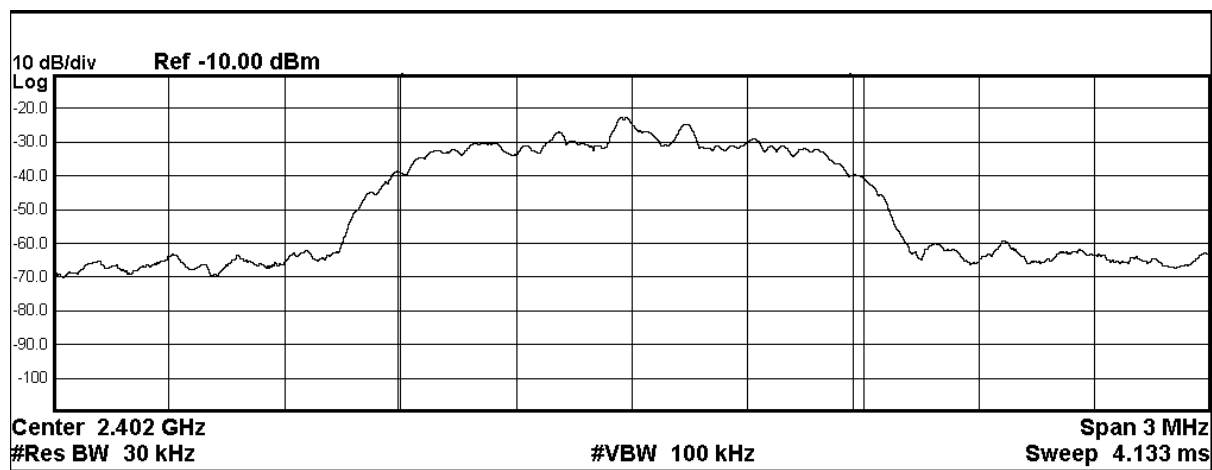
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Fundamental Frequency [MHz]	20dB Bandwidth [MHz]	FCC Limits [MHz]
2402	1.26	Within 2400-2483.5

(Lowest Operating Frequency) - ( $\pi/4$  DQPSK)



Occupied Bandwidth

Total Power

-14.3 dBm

1.1781 MHz

Transmit Freq Error

-14.989 kHz

OBW Power

99.00 %

x dB Bandwidth

1.263 MHz

x dB

-20.00 dB

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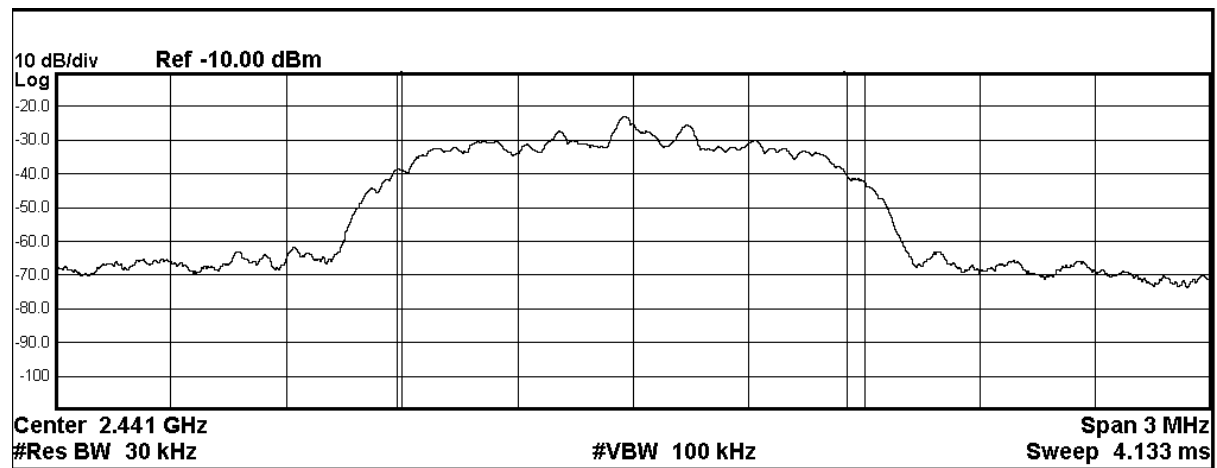
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Fundamental Frequency [MHz]	20dB Bandwidth [MHz]	FCC Limits [MHz]
2441	1.26	Within 2400-2483.5

(Middle Operating Frequency) - ( $\pi/4$  DQPSK)



Occupied Bandwidth		Total Power	-15.0 dBm
1.1690 MHz			
Transmit Freq Error	-28.869 kHz	OBW Power	99.00 %
x dB Bandwidth	1.255 MHz	x dB	-20.00 dB

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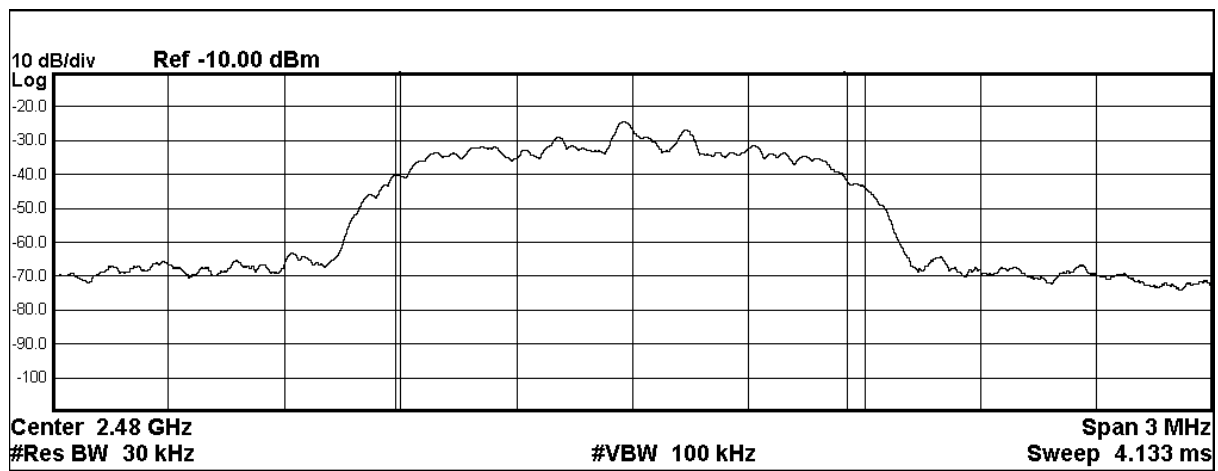
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Fundamental Frequency [MHz]	20dB Bandwidth [MHz]	FCC Limits [MHz]
2480	1.25	Within 2400-2483.5

(Highest Operating Frequency) - ( $\pi/4$  DQPSK)



Occupied Bandwidth		Total Power	-16.3 dBm
1.1690 MHz			
Transmit Freq Error	-29.086 kHz	OBW Power	99.00 %
x dB Bandwidth	1.254 MHz	x dB	-20.00 dB

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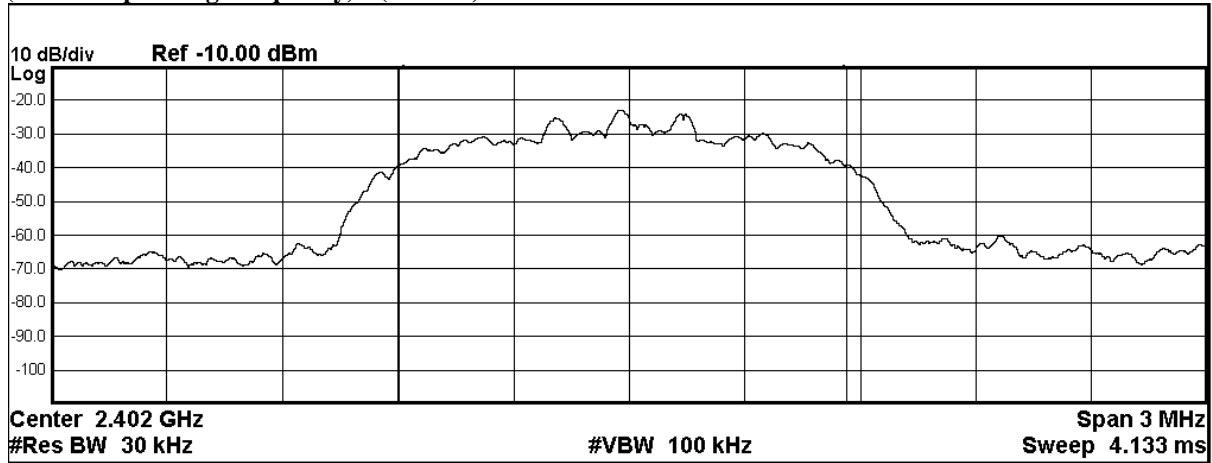
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Fundamental Frequency [MHz]	20dB Bandwidth [MHz]	FCC Limits [MHz]
2402	1.27	Within 2400-2483.5

**(Lowest Operating Frequency) - (8DPSK)**



Occupied Bandwidth	Total Power	-14.3 dBm
<b>1.1605 MHz</b>		
Transmit Freq Error	OBW Power	99.00 %
-16.808 kHz		
x dB Bandwidth	x dB	-20.00 dB
1.274 MHz		

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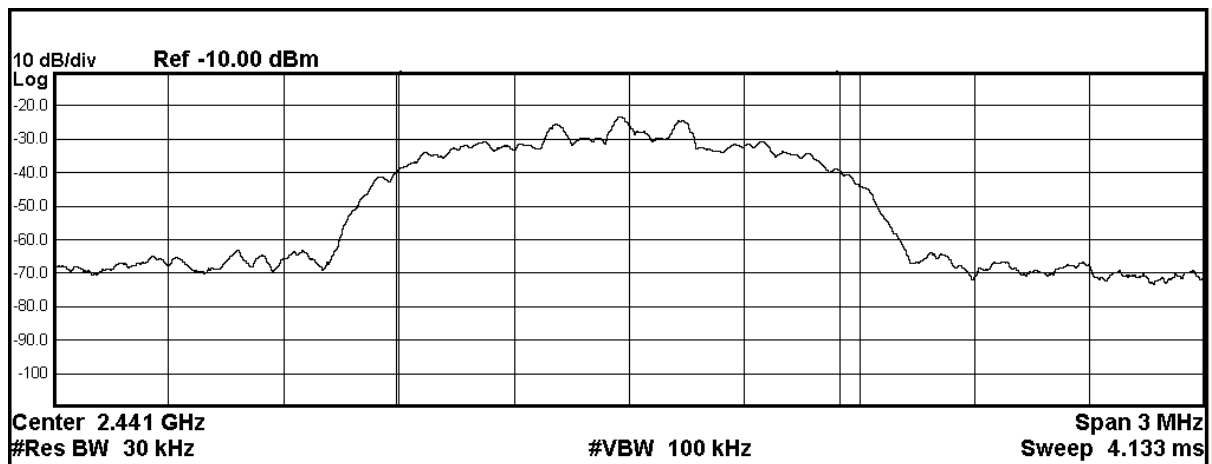
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Fundamental Frequency [MHz]	20dB Bandwidth [MHz]	FCC Limits [MHz]
2441	1.26	Within 2400-2483.5

(Middle Operating Frequency) - (8DPSK)



Occupied Bandwidth	Total Power	-14.7 dBm
1.1566 MHz		
Transmit Freq Error	OBW Power	99.00 %
-28.989 kHz		
x dB Bandwidth	x dB	-20.00 dB
1.258 MHz		

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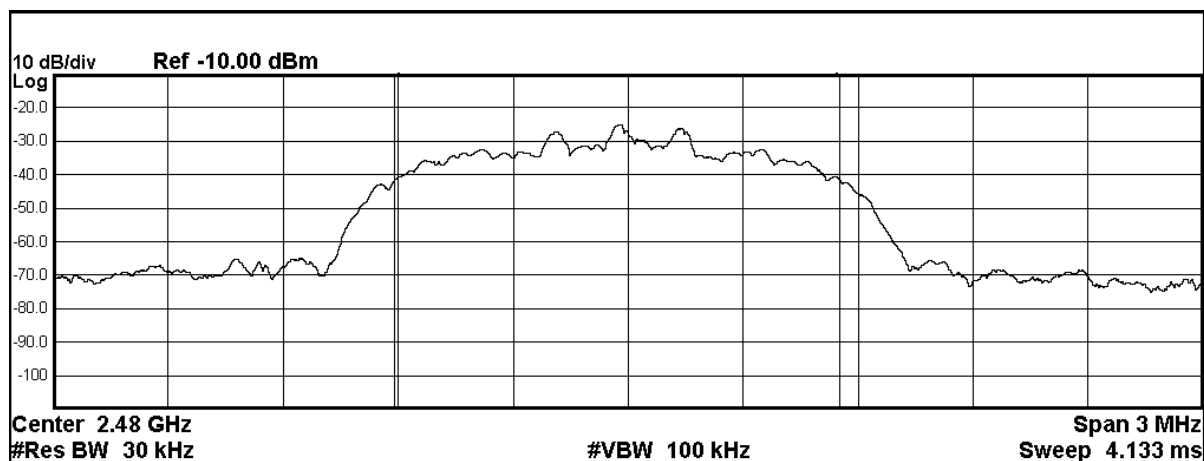
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Fundamental Frequency [MHz]	20dB Bandwidth [MHz]	FCC Limits [MHz]
2480	1.26	Within 2400-2483.5

(Highest Operating Frequency) - (8DPSK)



Occupied Bandwidth

**1.1574 MHz**

Total Power

**-16.5 dBm**

Transmit Freq Error

**-28.741 kHz**

OBW Power

**99.00 %**

x dB Bandwidth

**1.258 MHz**

x dB

**-20.00 dB**

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### 3.1.7 Hopping Channel Separation

Ambient temperature 22°C

Relative humidity 51%

#### Requirements:

Frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW.

#### Spectrum Analyzer Setting:

RBW = 30kHz, VBW  $\geq$  RBW, Sweep = Auto,

Span = Wide enough to capture the peaks of two adjacent channels

Detector = Peak, Trace = Max. hold

#### Limit:

GFSK: The measured maximum bandwidth \*  $\frac{2}{3}$  = 0.944MHz \*  $\frac{2}{3}$  = 629.3kHz

$\pi/4$  DQPSK: The measured maximum bandwidth \*  $\frac{2}{3}$  = 1.26MHz \*  $\frac{2}{3}$  = 840.0kHz

8DPSK: The measured maximum bandwidth \*  $\frac{2}{3}$  = 1.27MHz \*  $\frac{2}{3}$  = 846.7MHz

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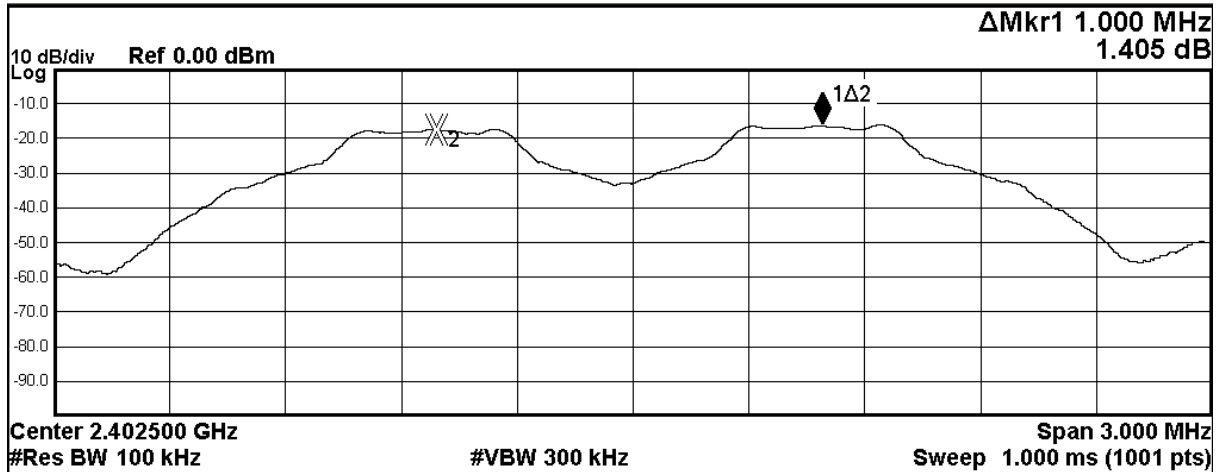
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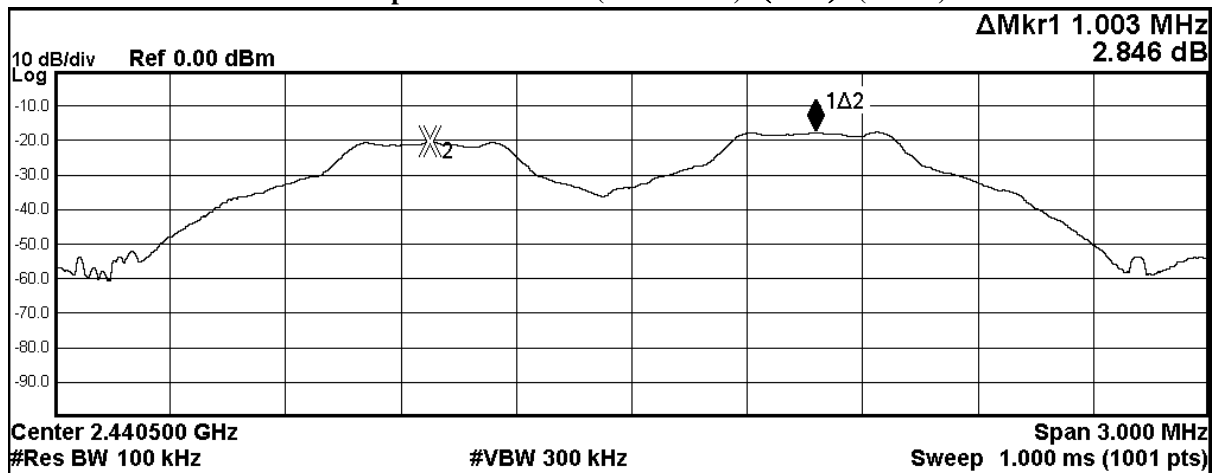
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Channel separation = 1MHz (>2/3 of BW) (Lowest) (GFSK)



Channel separation = 1MHz (>2/3 of BW) (Mid) (GFSK)



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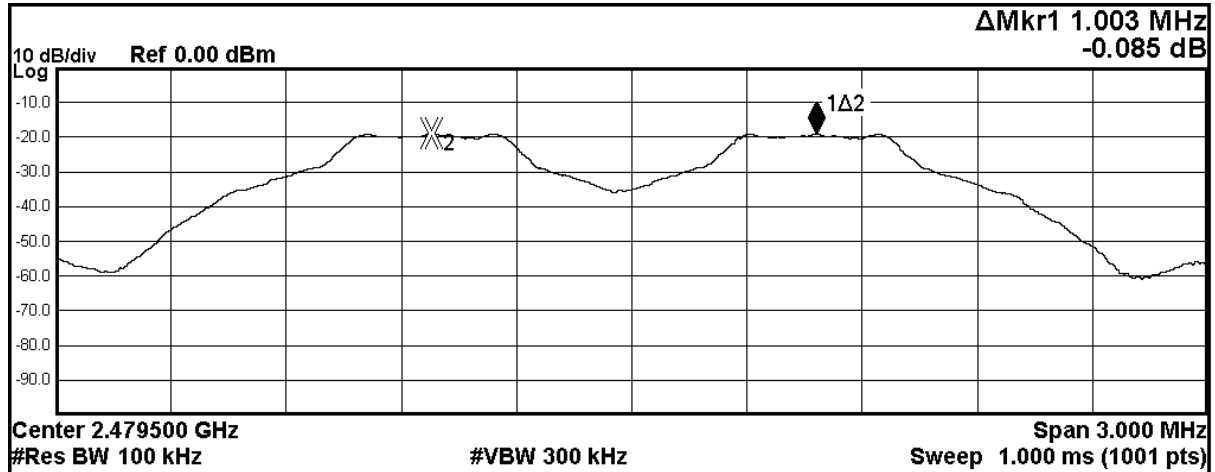
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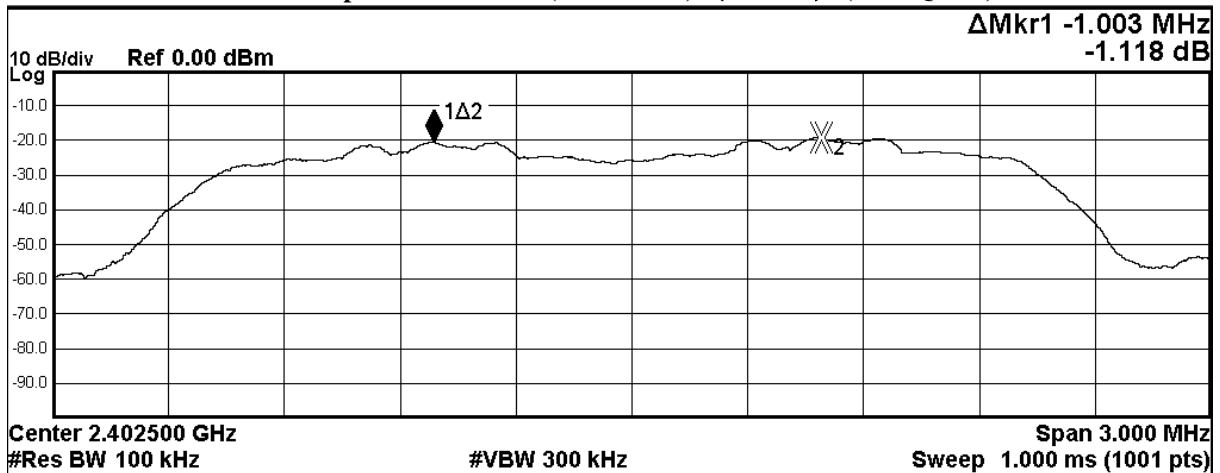
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Channel separation = 1MHz (>2/3 of BW) (Highest) (GFSK)



Channel separation = 1MHz (>2/3 of BW) (Lowest) ( $\pi/4$  DQPSK)



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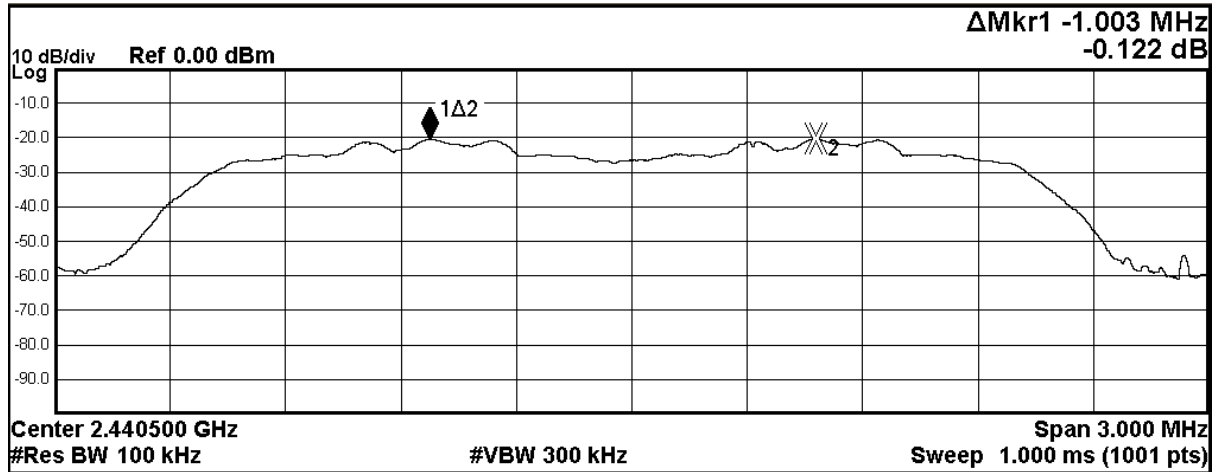
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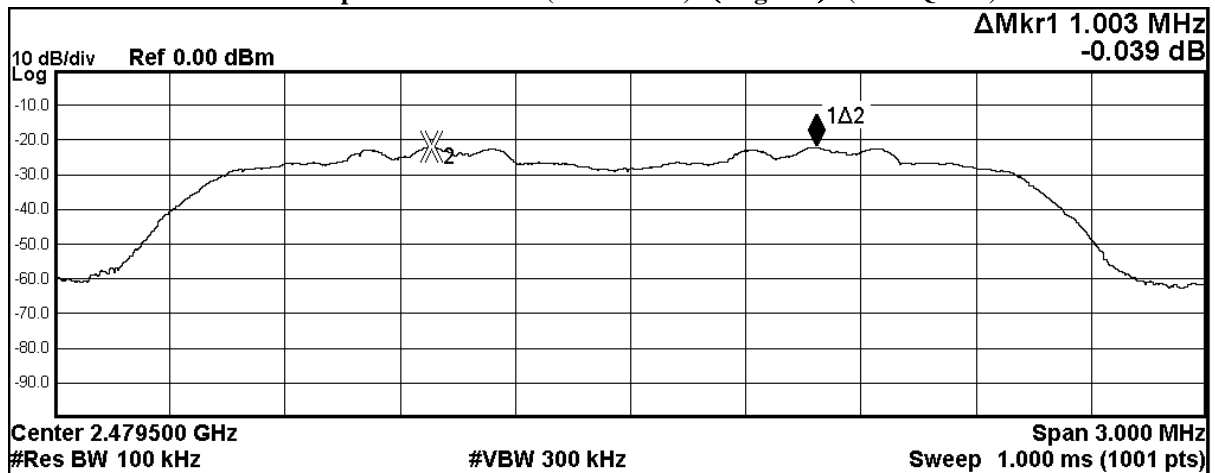
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Channel separation = 1MHz (>2/3 of BW) (Mid) ( $\pi/4$  DQPSK)



Channel separation = 1MHz (>2/3 of BW) (Highest) ( $\pi/4$  DQPSK)



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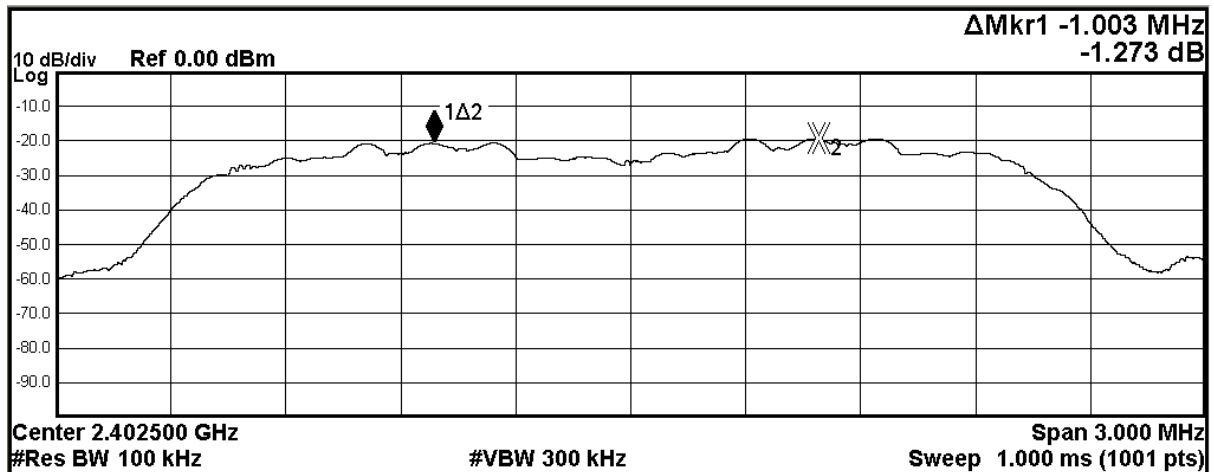
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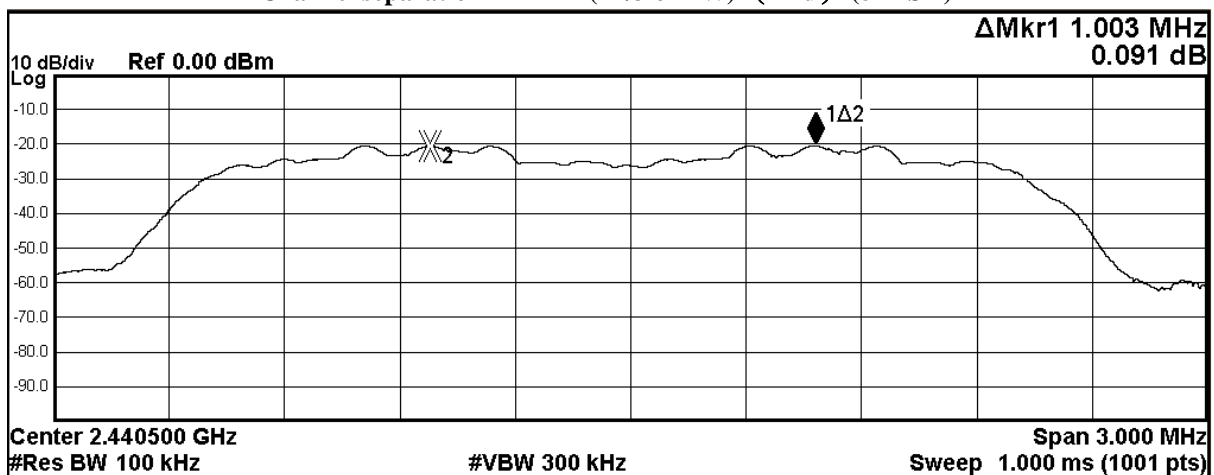
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Channel separation = 1MHz (>2/3 of BW) (Lowest) (8DPSK)



Channel separation = 1MHz (>2/3 of BW) (Mid) (8DPSK)



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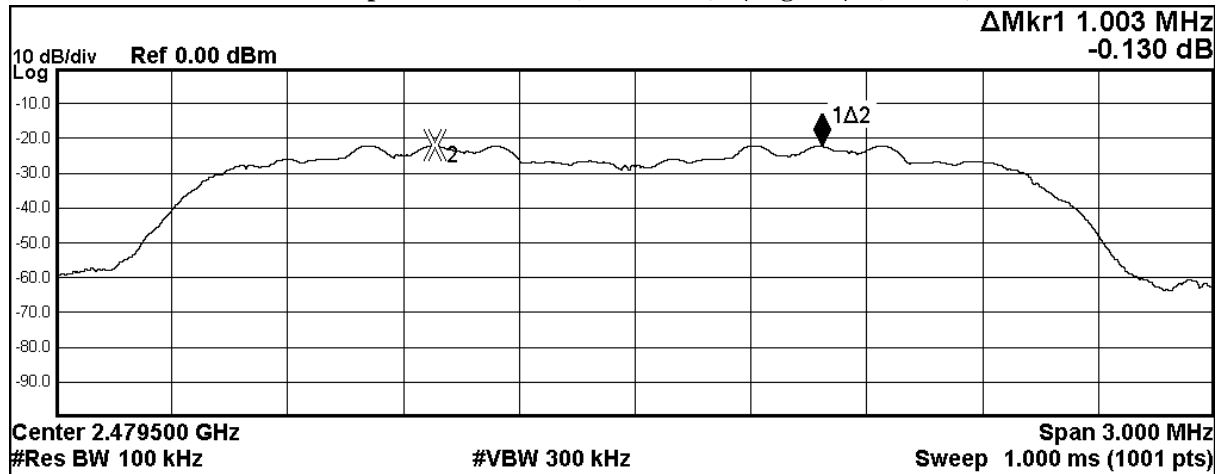
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Channel separation = 1MHz (>2/3 of BW) (Highest) (8DPSK)



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### **3.1.8 Band-edge Emissions Measurement:**

Ambient temperature 21°C

Relative humidity 51%

#### **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. Attenuation below the general limits specified in Section 15.209(a) is not required.

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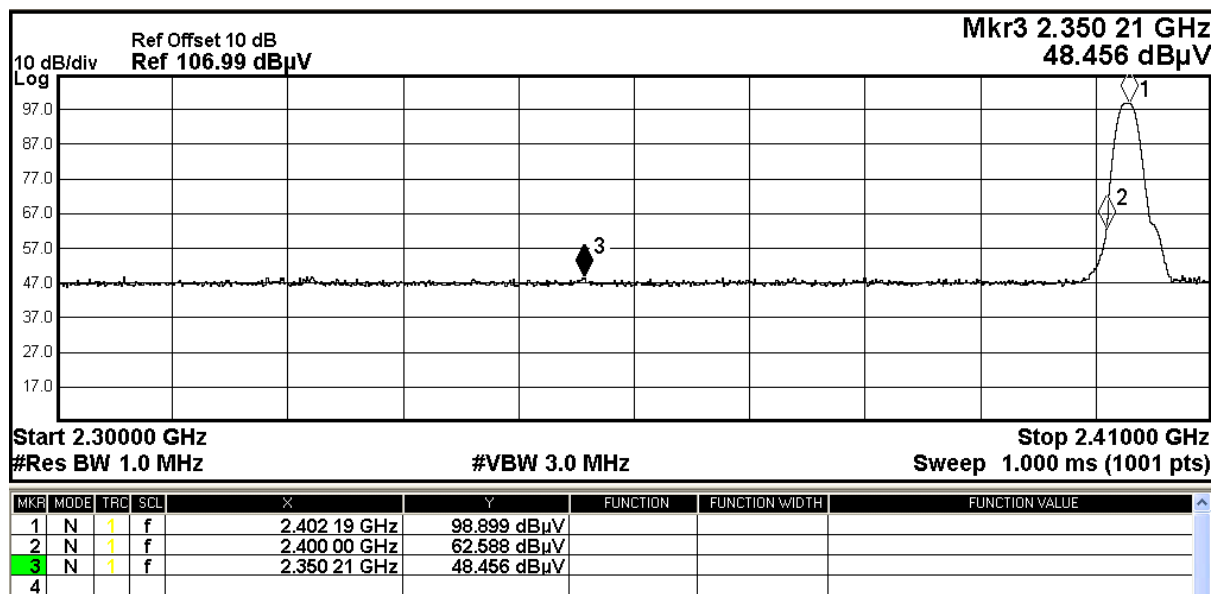
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Frequency Range	Conducted Emission Attenuated below the Fundamental
[MHz]	[dB]
2400 – Lowest Fundamental (2402)	36.3

### Conducted Band-edge Compliance Measurement, GFSK (Hopping Off) – Lower Band Edge



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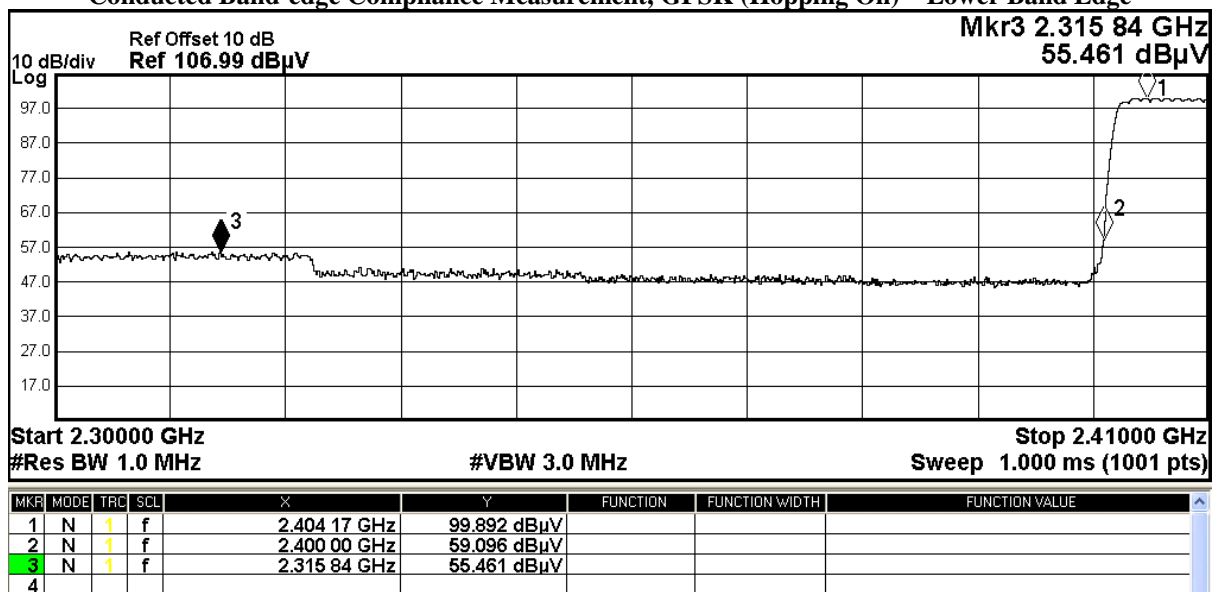
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Frequency Range	Conducted Emission Attenuated below the Fundamental
[MHz]	[dB]
2400 – Lowest Fundamental (2402)	40.8

### Conducted Band-edge Compliance Measurement, GFSK (Hopping On) – Lower Band Edge



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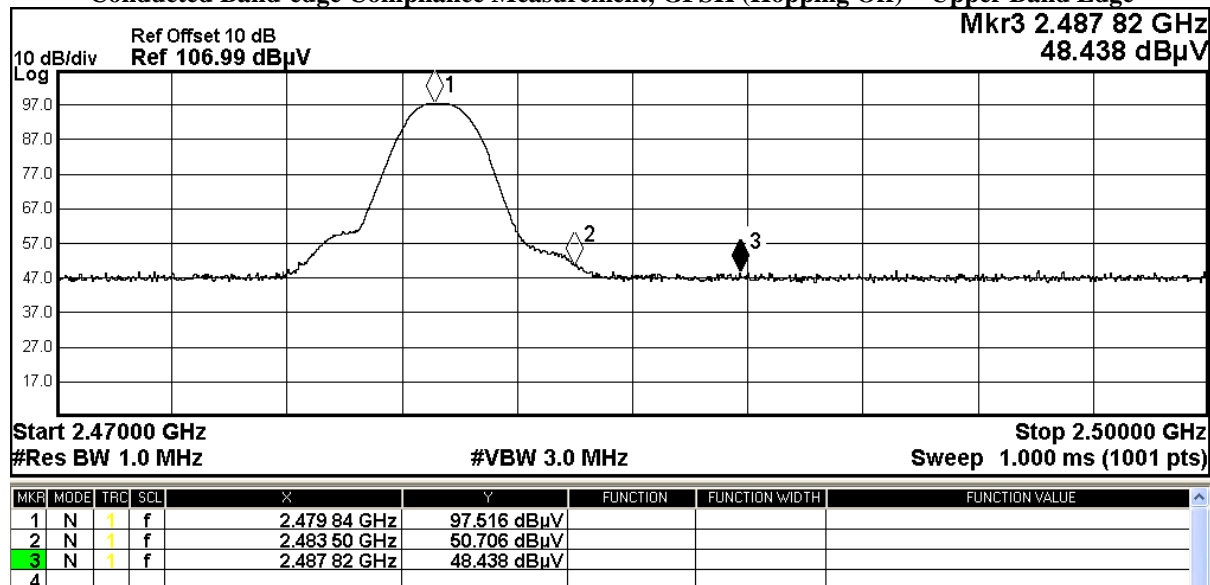
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Frequency Range	Conducted Emission Attenuated below the Fundamental
[MHz]	[dB]
2483.5 - Highest Fundamental (2480)	46.8

### Conducted Band-edge Compliance Measurement, GFSK (Hopping Off) – Upper Band Edge



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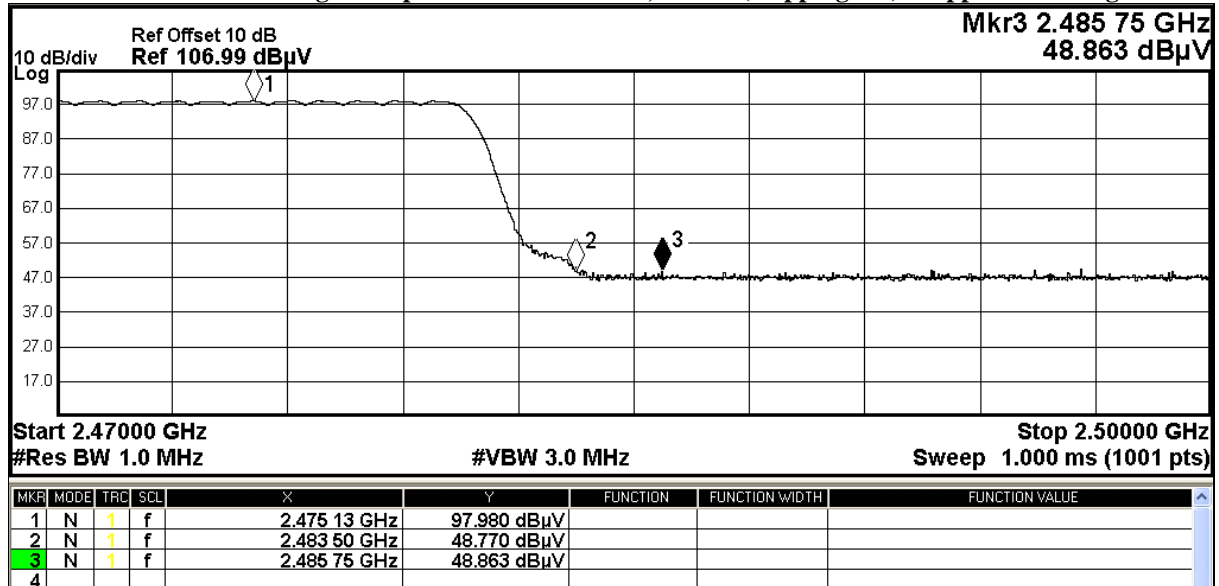
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Frequency Range	Conducted Emission Attenuated below the Fundamental
[MHz]	[dB]
2483.5 - Highest Fundamental (2480)	49.2

### Conducted Band-edge Compliance Measurement, GFSK (Hopping On) – Upper Band Edge



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Band-edge Emissions Measurement:

Result: Radiated Emissions Band-edge and Restricted Band - GFSK

Field Strength of Band-edge Compliance						
Peak Value						
Frequency MHz	Measured Level @3m dBuV	Correction Factor dB/m	Field Strength dBuV/m	Limit @3m dBuV/m	Margin dB	E-Field Polarity
2315.8	27.6	27.9	55.5	74.0	18.5	Horizontal
2350.2	20.6	27.9	48.5	74.0	25.5	Horizontal
2485.8	20.9	27.9	48.8	74.0	25.2	Horizontal
2487.8	20.5	27.9	48.4	74.0	25.6	Horizontal

Field Strength of Band-edge Compliance						
Average Value						
Frequency MHz	Measured Level @3m dBuV	Correction Factor dB/m	Field Strength dBuV/m	Limit @3m dBuV/m	Margin dB	E-Field Polarity
2315.8	16.3	27.9	44.2	54.0	9.8	Horizontal
2350.2	10.4	27.9	38.3	54.0	15.7	Horizontal
2485.8	9.9	27.9	37.8	54.0	16.2	Horizontal
2487.8	9.4	27.9	37.3	54.0	16.7	Horizontal

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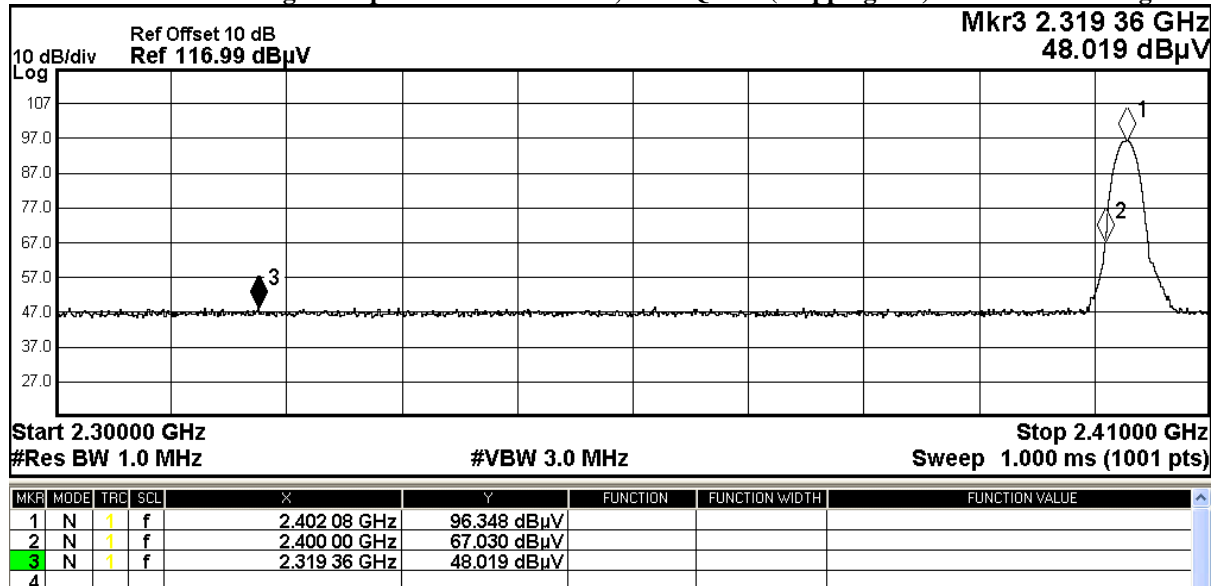
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Frequency Range	Conducted Emission Attenuated below the Fundamental
[MHz]	[dB]
2400 – Lowest Fundamental (2402)	29.3

### Conducted Band-edge Compliance Measurement, $\pi/4$ DQPSK (Hopping Off) – Lower Band Edge



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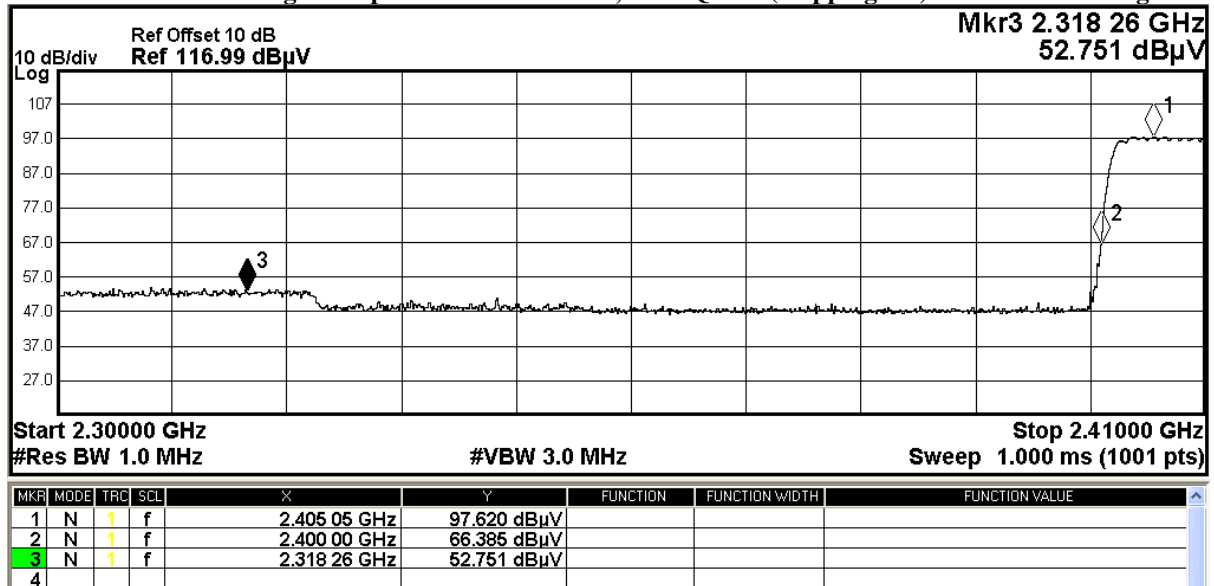
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Frequency Range	Conducted Emission Attenuated below the Fundamental
[MHz]	[dB]
2400 – Lowest Fundamental (2402)	31.3

### Conducted Band-edge Compliance Measurement, $\pi/4$ DQPSK (Hopping On) – Lower Band Edge



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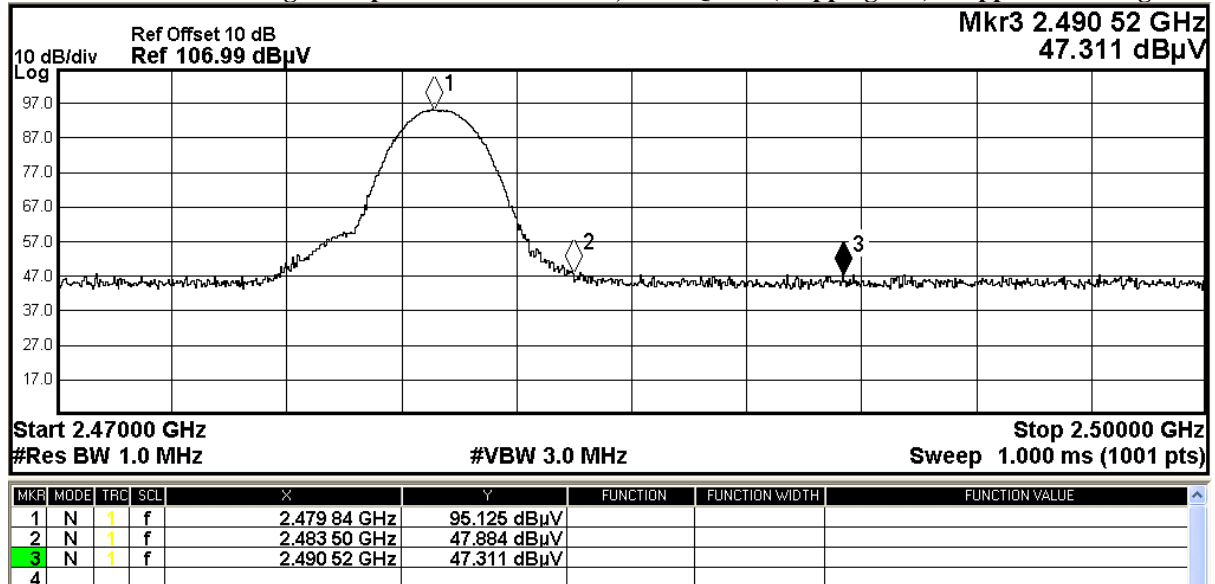
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Frequency Range	Conducted Emission Attenuated below the Fundamental
[MHz]	[dB]
2483.5 - Highest Fundamental (2480)	47.2

### Conducted Band-edge Compliance Measurement, $\pi/4$ DQPSK (Hopping Off) – Upper Band Edge



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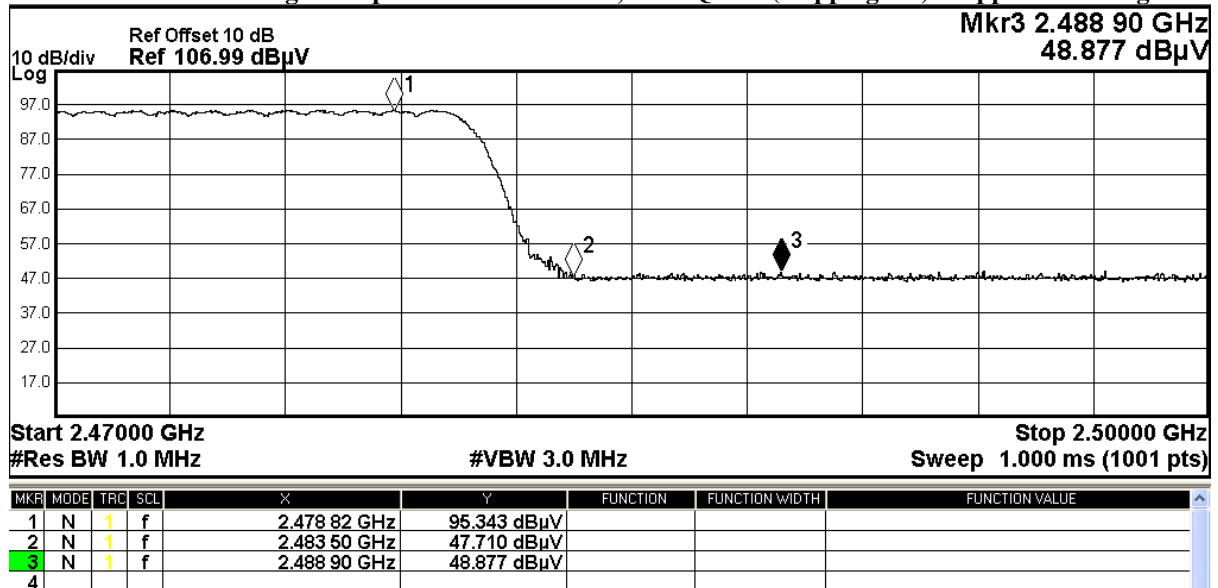
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Frequency Range	Conducted Emission Attenuated below the Fundamental
[MHz]	[dB]
2483.5 - Highest Fundamental (2480)	47.6

### Conducted Band-edge Compliance Measurement, $\pi/4$ DQPSK (Hopping On) – Upper Band Edge



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Band-edge Emissions Measurement:

**Result: Radiated Emissions Band-edge and Restricted Band  $-\pi/4$  DQPSK**

Field Strength of Band-edge Compliance Peak Value						
Frequency MHz	Measured Level @3m dBuV	Correction Factor dB/m	Field Strength dBuV/m	Limit @3m dBuV/m	Margin dB	E-Field Polarity
2318.3	24.9	27.9	52.8	74.0	21.2	Horizontal
2319.4	20.1	27.9	48.0	74.0	26.0	Horizontal
2488.9	21.0	27.9	48.9	74.0	25.1	Horizontal
2490.5	19.4	27.9	47.3	74.0	26.7	Horizontal

Field Strength of Band-edge Compliance Average Value						
Frequency MHz	Measured Level @3m dBuV	Correction Factor dB/m	Field Strength dBuV/m	Limit @3m dBuV/m	Margin dB	E-Field Polarity
2318.3	13.8	27.9	41.7	54.0	12.3	Horizontal
2319.4	9.7	27.9	37.6	54.0	16.4	Horizontal
2488.9	10.3	27.9	38.2	54.0	15.8	Horizontal
2490.5	9.6	27.9	37.5	54.0	16.5	Horizontal

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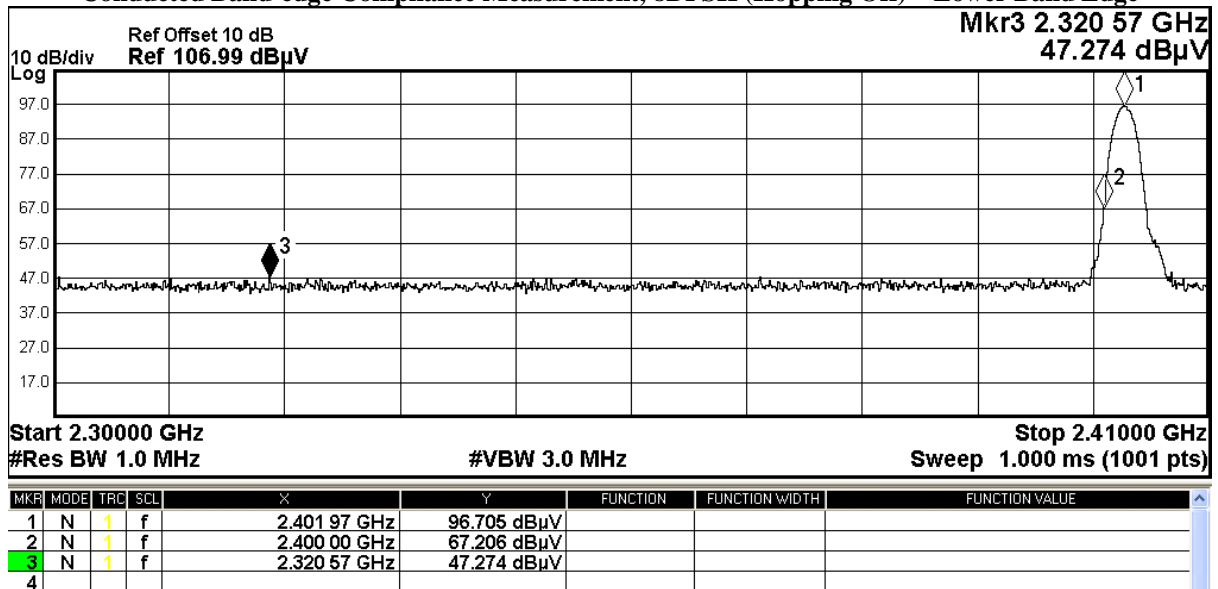
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Frequency Range	Conducted Emission Attenuated below the Fundamental
[MHz]	[dB]
2400 – Lowest Fundamental (2402)	29.5

### Conducted Band-edge Compliance Measurement, 8DPSK (Hopping Off) – Lower Band Edge



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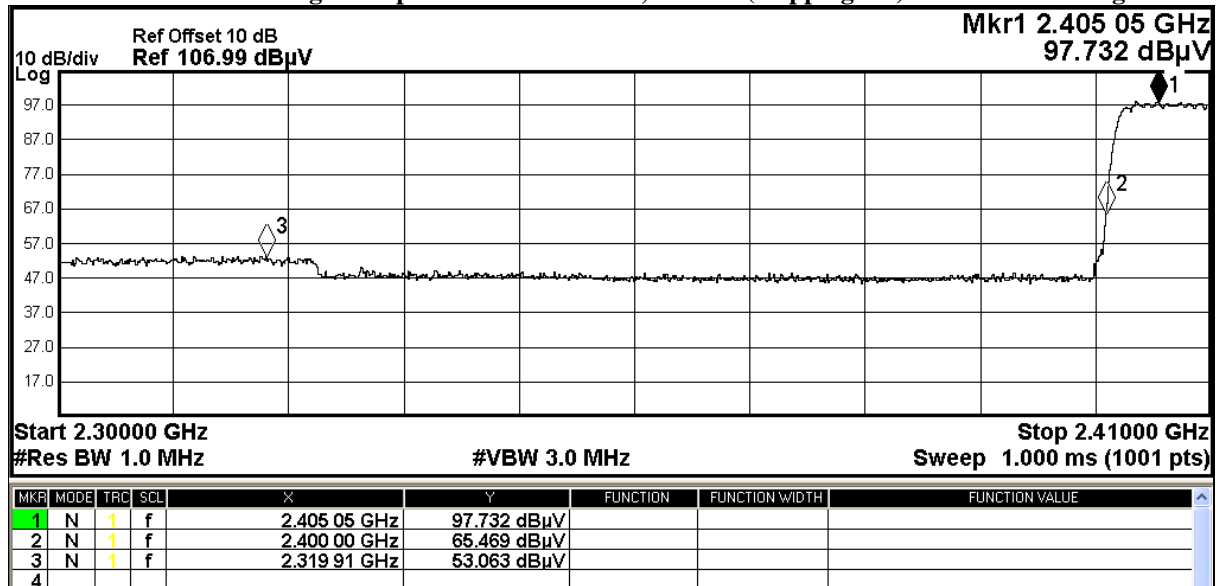
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Frequency Range	Conducted Emission Attenuated below the Fundamental
[MHz]	[dB]
2400 – Lowest Fundamental (2402)	32.3

### Conducted Band-edge Compliance Measurement, 8DPSK (Hopping On) – Lower Band Edge



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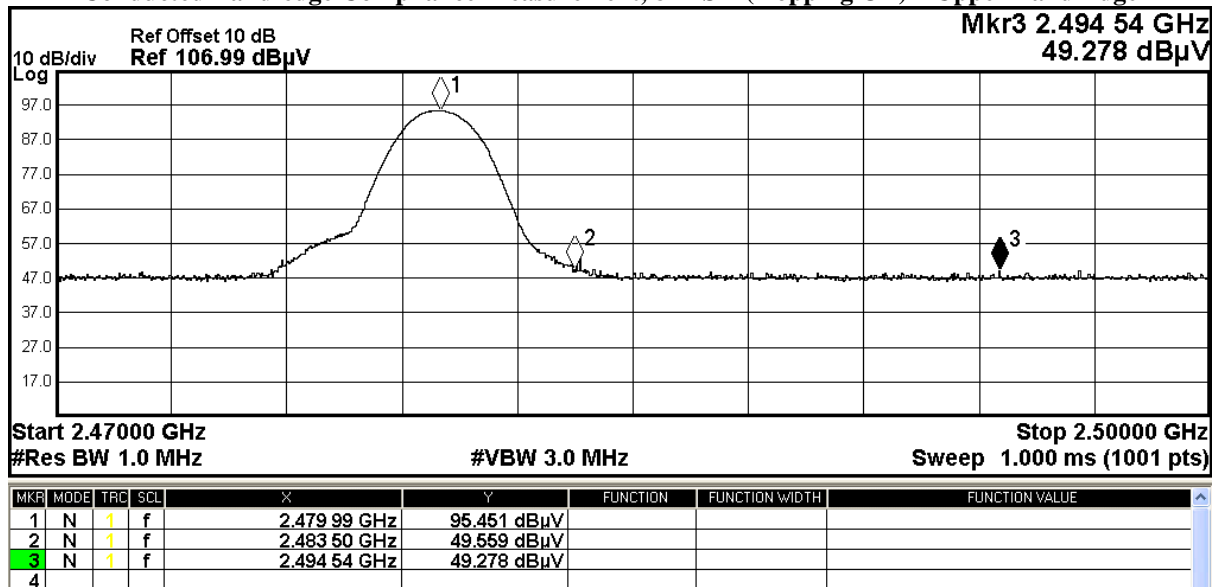
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Frequency Range [MHz]	Conducted Emission Attenuate below the Fundamental [dB]
2483.5 - Highest Fundamental (2480)	45.9

### Conducted Band-edge Compliance Measurement, 8DPSK (Hopping Off) – Upper Band Edge



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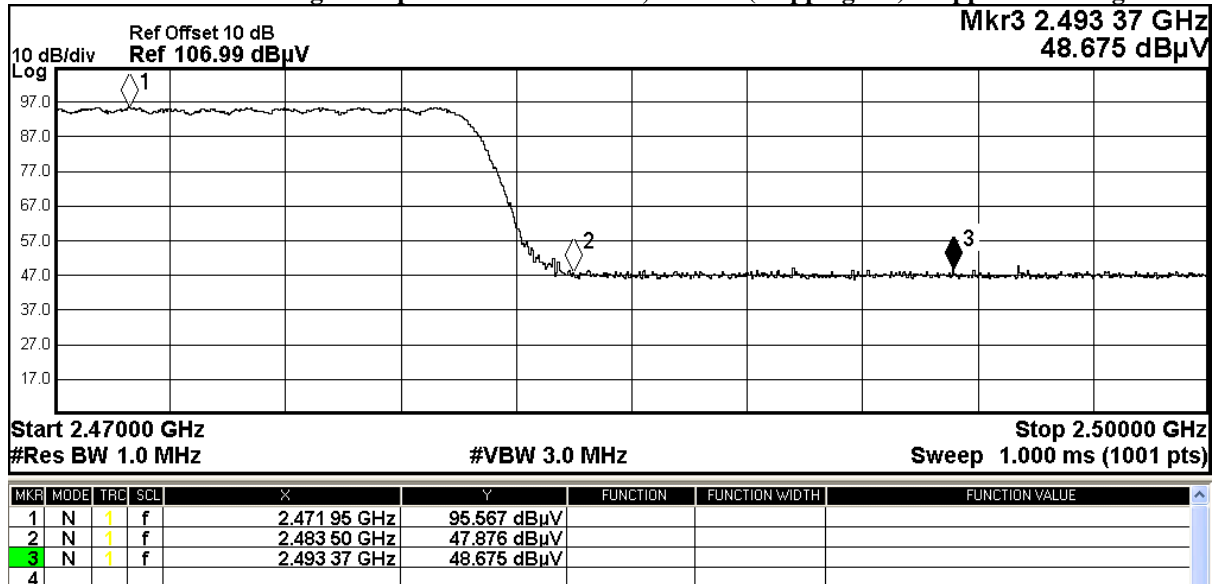
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Frequency Range	Conducted Emission Attenuated below the Fundamental
[MHz]	[dB]
2483.5 - Highest Fundamental (2480)	47.7

### Conducted Band-edge Compliance Measurement, 8DPSK (Hopping On) – Upper Band Edge



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Band-edge Emissions Measurement:

Result: Radiated Emissions Band-edge and Restricted Band- 8DPSK

Field Strength of Band-edge Compliance						
Peak Value						
Frequency MHz	Measured Level @3m dBuV	Correction Factor dB/m	Field Strength dBuV/m	Limit @3m dBuV/m	Margin dB	E-Field Polarity
2319.9	25.2	27.9	53.1	74.0	20.9	Horizontal
2320.6	19.4	27.9	47.3	74.0	26.7	Horizontal
2493.4	20.8	27.9	48.7	74.0	25.3	Horizontal
2494.5	21.4	27.9	49.3	74.0	24.7	Horizontal

Field Strength of Band-edge Compliance						
Average Value						
Frequency MHz	Measured Level @3m dBuV	Correction Factor dB/m	Field Strength dBuV/m	Limit @3m dBuV/m	Margin dB	E-Field Polarity
2319.9	14.3	27.9	42.2	54.0	11.8	Horizontal
2320.6	9.3	27.9	37.2	54.0	16.8	Horizontal
2493.4	9.5	27.9	37.4	54.0	16.6	Horizontal
2494.5	11.3	27.9	39.2	54.0	14.8	Horizontal

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### 3.1.9 Time of Occupancy (Dwell Time)

Ambient temperature 21°C

Relative humidity 51%

#### Requirements:

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

No requirements for Digital Transmission System.

#### Spectrum Analyzer Setting:

RBW = 300kHz, VBW ≥ RBW,

Sweep = A longer sweep time to show two successive hops on a channel,

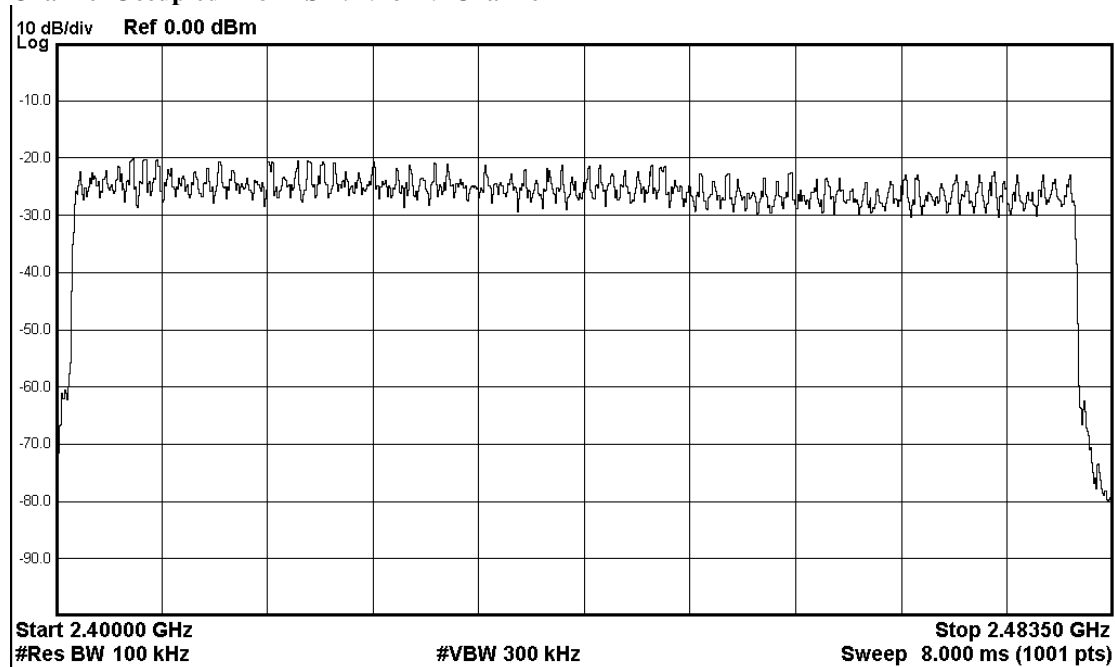
Span = Zero, Detector = Peak, Trace = Max. hold

Dwell Time = Pulse Duration \* hop rate / number of channel \* observation duration

Observed duration: 0.4s x 79 = 31.6s

#### Measurement Data:

##### Channel Occupied in 8DPSK: 79 of 79 Channel



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## Test Report

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DH5 Packet:

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DH5 Packet permit maximum  $1600/79/6 = 3.37$  hops per second in each channel (5 time slots RX, 1 time slot TX). The Dwell time is the time duration of the pulse times  $3.37 \times 31.6 = 106.6$  within 31.6 seconds

Fig. A  
[Pulse duration of Lowest Channel]

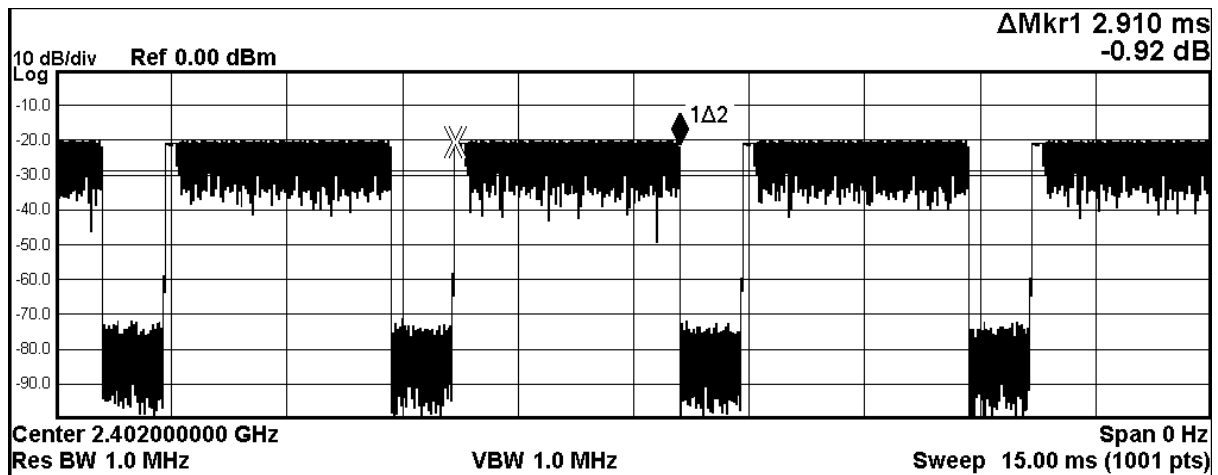
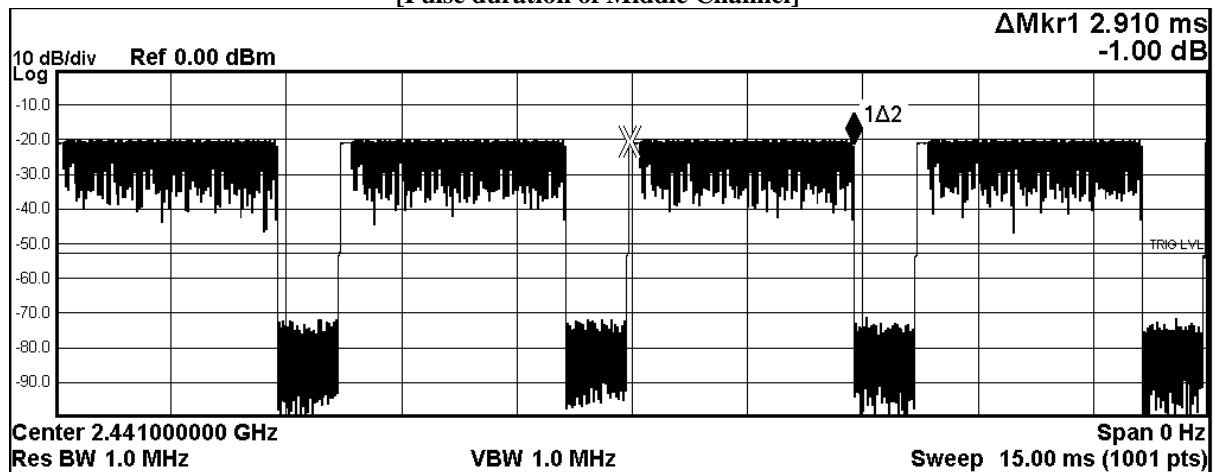


Fig. B  
[Pulse duration of Middle Channel]



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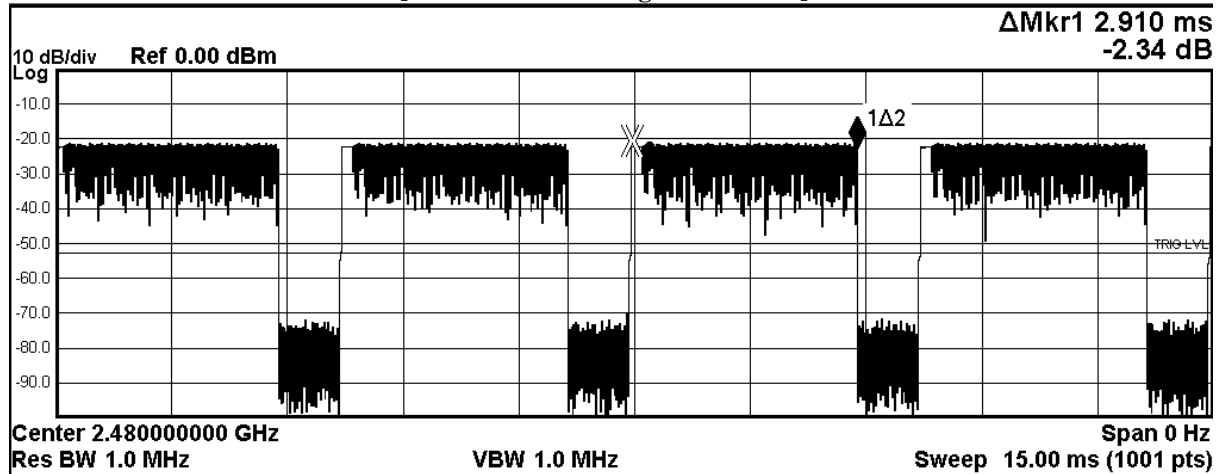


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Fig. C  
[Pulse duration of Highest Channel]



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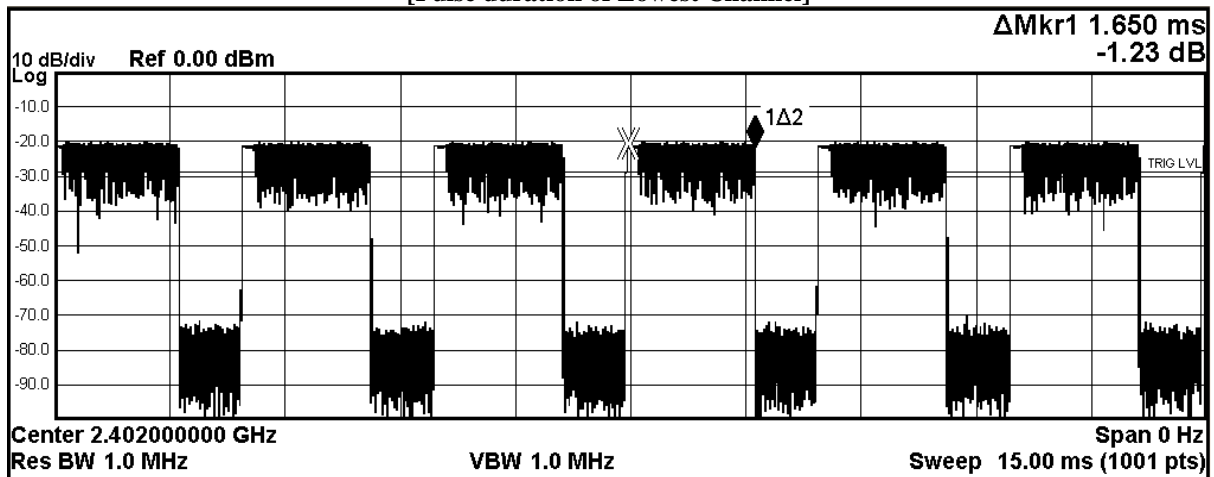
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 DH3 Packet:

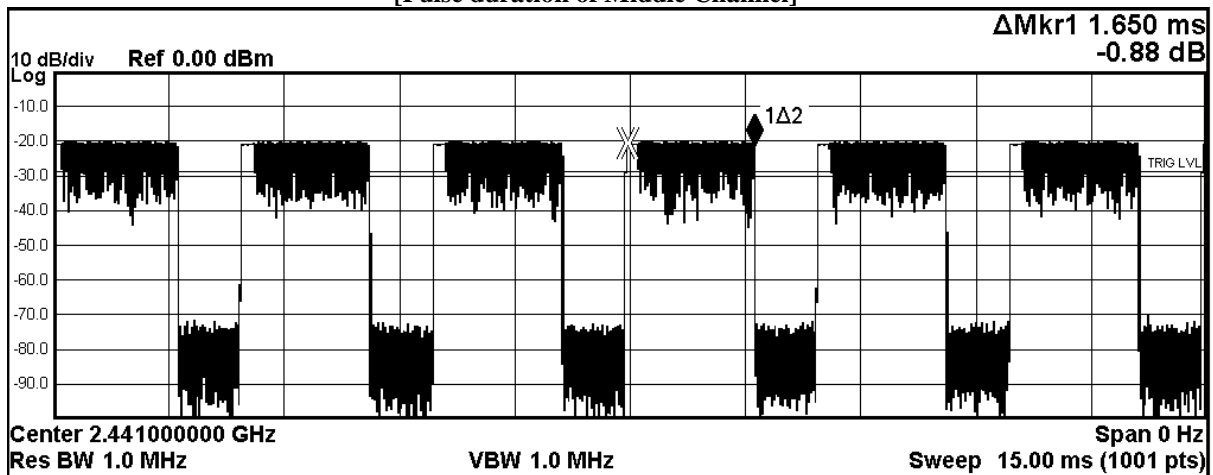
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DH3 Packet permit maximum  $1600/79/4 = 5.06$  hops per second in each channel (3 time slots RX, 1 time slot TX). The Dwell time is the time duration of the pulse times  $5.06 \times 31.6 = 160$  within 31.6 seconds

**Fig. D**  
**[Pulse duration of Lowest Channel]**



**Fig. E**  
**[Pulse duration of Middle Channel]**



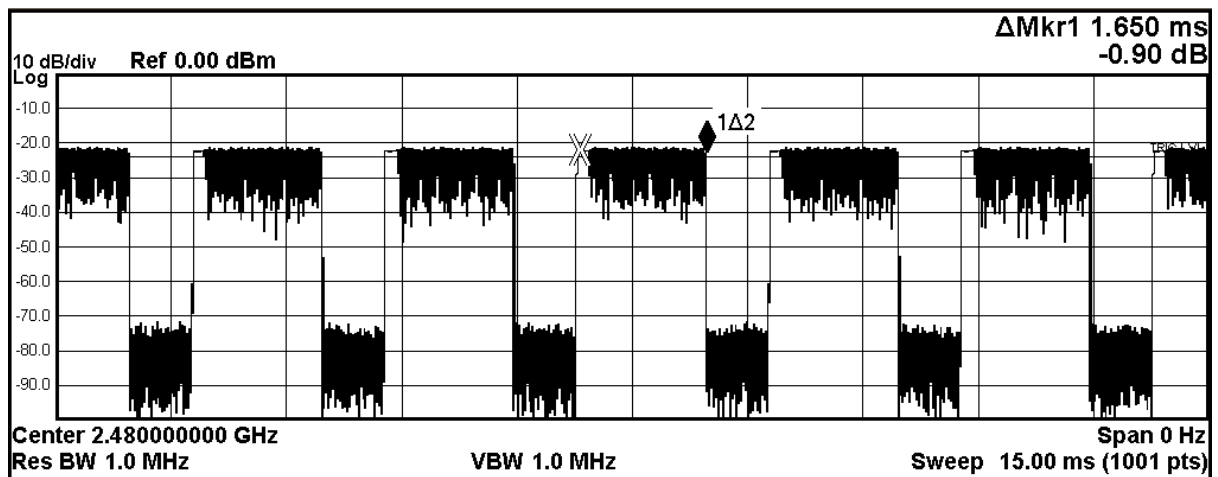


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Fig. F  
[Pulse duration of Highest Channel]



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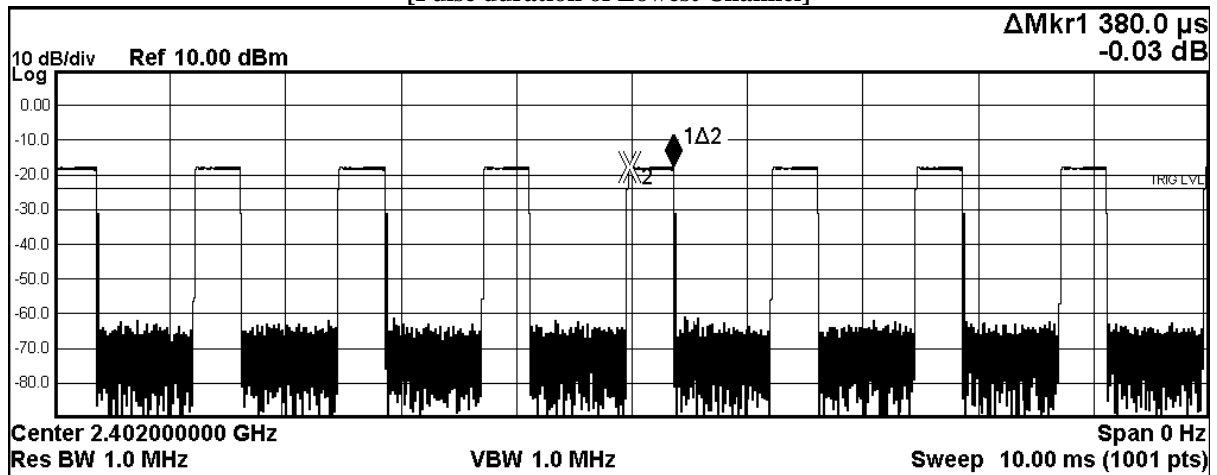
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 DH1 Packet:

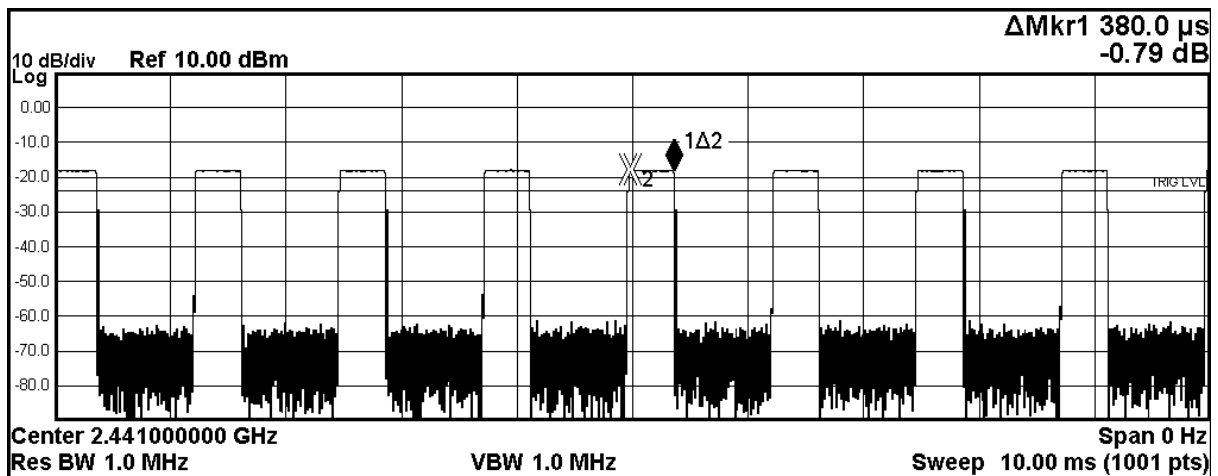
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DH1 Packet permit maximum  $1600/79/2 = 10.12$  hops per second in each channel (3 time slots RX, 1 time slot TX). The Dwell time is the time duration of the pulse times  $10.12 \times 31.6 = 320$  within 31.6 seconds

**Fig. G**  
**[Pulse duration of Lowest Channel]**



**Fig. H**  
**[Pulse duration of Middle Channel]**



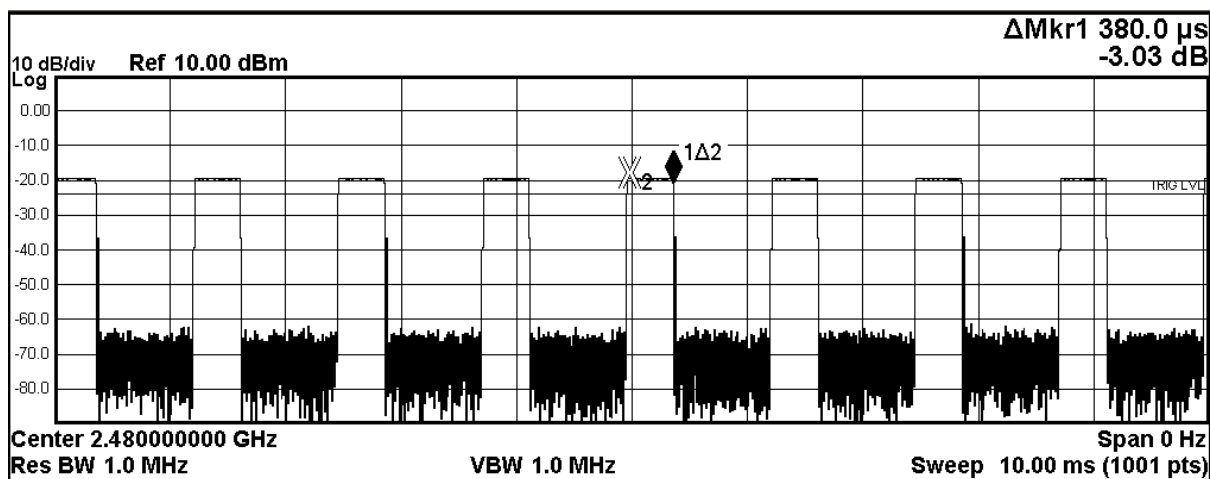


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Fig. I  
[Pulse duration of Highest Channel]



### Time of occupancy (Dwell Time):

Data Packet	Frequency (MHz)	Pulse Duration (ms)	Dwell Time (s)	Limits (s)	Test Results
DH5	2402	2.910	0.310	0.400	Complies
DH5	2441	2.910	0.310	0.400	Complies
DH5	2480	2.910	0.310	0.400	Complies
DH3	2402	1.652	0.264	0.400	Complies
DH3	2441	1.652	0.264	0.400	Complies
DH3	2480	1.652	0.264	0.400	Complies
DH1	2402	0.380	0.122	0.400	Complies
DH1	2441	0.380	0.122	0.400	Complies
DH1	2480	0.380	0.122	0.400	Complies

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### **3.1.10 Channel Centre Frequency**

Ambient temperature 21°C

Relative humidity 51%

#### **Requirements:**

Frequency hopping system in the 2400-2483.5MHz band shall use at least 79 (Channel 1 to 79) non-overlapping channels.

The EUT operates in according with the Bluetooth system specification within the 2400 - 2483.5 MHz frequency band.

RF channels for Bluetooth systems are spaced 1 MHz and are ordered in channel number k. In order to comply with out-of-band regulations, a lower frequency guard band of 2.0 MHz and a higher frequency guard band of 3.5MHz is used.

The operating frequencies of each channel are as follows:

First RF channel start from 2400MHz + 2MHz guard band = 2402MHz

Frequency of RF Channel = 2402+k MHz, k = 1,...,79 (Channel separation = 1MHz)

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### **3.1.11 Pseudorandom Hopping Algorithm**

Ambient temperature 21°C

Relative humidity 51%

#### **Requirements:**

The channel frequencies shall be selected from a pseudorandom ordered list of hopping frequencies. Each frequency must be used equally by the transmitter.

#### **EUT Pseudorandom Hopping Algorithm**

The EUT is a Bluetooth device, the Pseudo-random hopping pattern; hopping characteristics and algorithm are based on the Bluetooth specification.

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## **Test Report**

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### **3.1.12 Antenna Requirement**

Ambient temperature 21°C

Relative humidity 51%

**Test Requirements: § 15.203**

#### **Test Specification:**

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 shall be considered sufficient to comply with the provisions of this section. 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.

#### **Test Results:**

This is Circuit board printed meander line antenna. There is no external antenna, the antenna gain = 0.11dBi. User is unable to remove or changed the Antenna.

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## Test Report

**Date : 2018-10-19**  
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**3.1.13 RF Exposure**

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Test Requirement: FCC 47CFR 15.247(i)  
Test Date: 2017-08-29  
Mode of Operation: Bluetooth 2.1

### **Test Method:**

Systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy levels in excess of the Commission's guidelines.

### **Test Results:**

N/A, the output power of EUT << the SAR exclusion limit.

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### Appendix A

#### LIST OF MEASUREMENT EQUIPMENT

##### Radiated Emission

EQP NO.	DESCRIPTION	MANUFACTURER	MODEL NO.	SERIAL NO.	LAST CAL	DUE CAL
EM215	MULTIDevice CONTROLLER	EMCO	2090	00024676	N/A	N/A
EM217	ELECTRIC POWERED TURN TABLE	EMCO	2088	00029144	N/A	N/A
EM218	ANECCHOIC CHAMBER	ETS-LINDGREN	FACT-3	--	2018/01/24	2019/01/24
EM356	ANTENNA POSITIONING TOWER	ETS-LINDGREN	2171B	00150346	N/A	N/A
EM354	BICONILOG ANTENNA	ETS-LINDGREN	3143B	00142073	2018/03/29	2020/03/29
EM229	EMI TEST RECEIVER	R&S	ESIB40	100248	2018/06/01	2019/06/01
EM276	BROADBAND HORN ANTENNA	A-INFOMW	JXTXLB- 10180-SF	J203109090300 7	2018/04/27	2020/04/27
EM300	PYRAMIDAL STANDARD GAIN HORN ANTENNA	ETS-LINDGREN	3160-09	00130130	2018/05/13	2019/05/13
EM301	PYRAMIDAL STANDARD GAIN HORN ANTENNA	ETS-LINDGREN	3160-10	00130988	2018/05/13	2019/05/13
EM302	PRECISION OMNIDIRECTIONAL DIPOLE (1 – 6GHZ)	SEIBERSDORF LABORATORIES	POD 16	161806/L	2018/05/11	2020/05/11
EM303	PRECISION OMNIDIRECTIONAL DIPOLE (6 – 18GHZ)	SEIBERSDORF LABORATORIES	POD 618	6181908/L	2018/05/11	2020/05/11
EM353	LOOP ANTENNA	ETS LINDGREN	6502	00206533	2018/04/16	2020/04/16
EM318	USB WIDEBAND POWER SENSOR	AGILENT	U2022XA	MY53470001	2017/03/23	2019/03/23

Remarks:-

CM Corrective Maintenance  
N/A Not Applicable or Not Available  
TBD To Be Determined

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### Appendix B

#### Photographs of EUT

**Front View of the product**



**Rear View of the product**



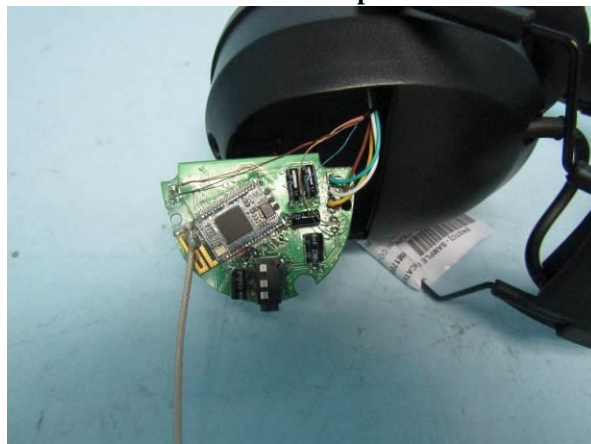
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### Photographs of EUT

**Inner Circuit Top View**



**Inner Circuit Bottom View**



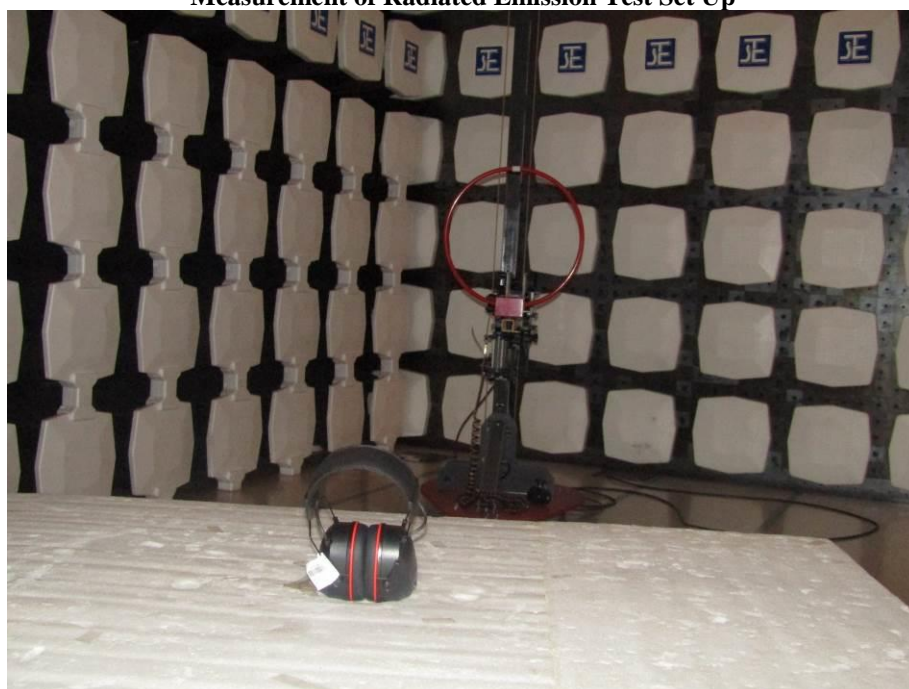
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### Photographs of EUT

**Measurement of Radiated Emission Test Set Up**



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### Measurement of Radiated Emission Test Set Up



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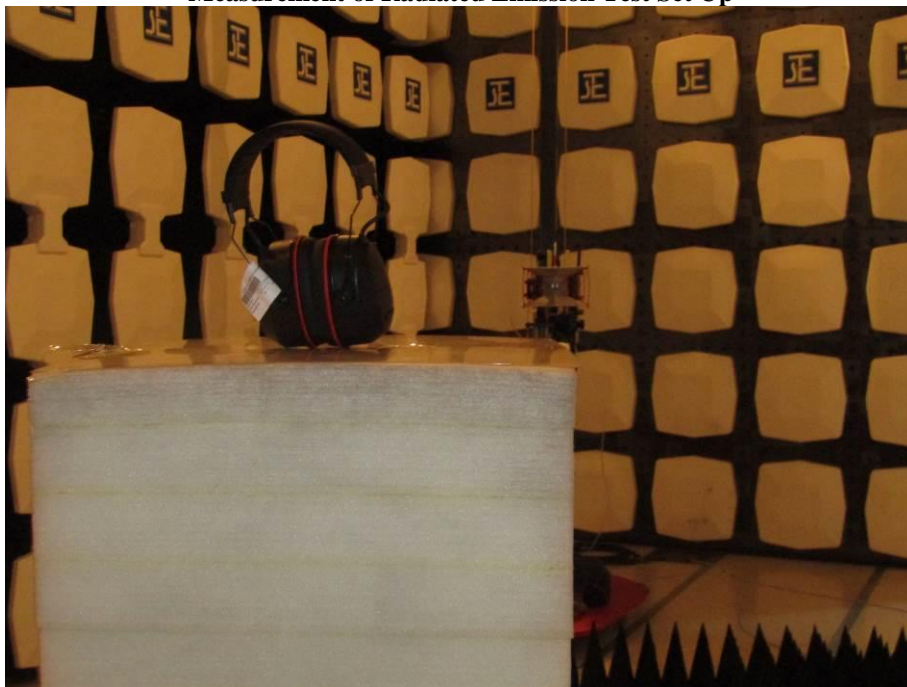
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Photographs of EUT

Measurement of Radiated Emission Test Set Up



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