



# **CERTIFICATION TEST REPORT**

**Report Number. :** 4789651209-E5V1

**Applicant :** SAMSUNG ELECTRONICS CO., LTD.  
129 SAMSUNG-RO, YEONGTONG-GU, SUWON-SI,  
GYEONGGI-DO, 16677, KOREA

**Model :** SM-G991B/DS, SM-G991B

**FCC ID :** A3LSMG991B

**EUT Description :** GSM/WCDMA/LTE/5G NR Phone + BT/BLE, DTS/UNII a/b/g/n/ac/ax,  
WPT and NFC

**Test Standard(s) :** FCC 47 CFR PART 15 SUBPART C

**Date Of Issue:**

November 18, 2020

**Prepared by:**

UL Korea, Ltd.

26th floor, 152, Teheran-ro, Gangnam-gu Seoul, 06236, Korea

Suwon Test Site: UL Korea, LTD. Suwon Laboratory

218 Maeyeong-ro, Yeongtong-gu

Suwon-si, Gyeonggi-do, 16675, Korea

TEL: (031) 337-9902

FAX: (031) 213-5433



Revision History

<u>Rev.</u>	<u>Issue Date</u>	<u>Revisions</u>	<u>Revised By</u>
V1	11/18/20	Initial issue	Hyunsik Yun

## TABLE OF CONTENTS

<b>1. ATTESTATION OF TEST RESULTS .....</b>	<b>5</b>
<b>2. TEST METHODOLOGY .....</b>	<b>6</b>
<b>3. FACILITIES AND ACCREDITATION .....</b>	<b>6</b>
<b>4. DECISION RULES AND MEASUREMENT UNCERTAINTY .....</b>	<b>7</b>
4.1. METROLOGICAL TRACEABILITY.....	7
4.2. SAMPLE CALCULATION.....	7
4.3. DECISION RULES.....	7
4.4. MEASUREMENT UNCERTAINTY.....	7
<b>5. EQUIPMENT UNDER TEST.....</b>	<b>8</b>
5.1. EUT DESCRIPTION.....	8
5.2. MAXIMUM OUTPUT POWER.....	8
5.3. DESCRIPTION OF AVAILABLE ANTENNAS .....	8
5.4. WORST-CASE CONFIGURATION AND MODE.....	9
5.5. DESCRIPTION OF TEST SETUP.....	10
<b>6. TEST AND MEASUREMENT EQUIPMENT .....</b>	<b>12</b>
<b>7. TEST RESULTS SUMMARY.....</b>	<b>13</b>
<b>8. MEASUREMENT METHODS.....</b>	<b>14</b>
<b>9. ANTENNA PORT TEST RESULTS.....</b>	<b>15</b>
9.1. ON TIME AND DUTY CYCLE.....	15
9.2. 20 dB AND 99% BANDWIDTH.....	16
9.2.1. BLUETOOTH BASIC DATA RATE GFSK MODULATION .....	16
9.2.2. BLUETOOTH ENHANCED DATA RATE 8PSK MODULATION.....	16
9.2.3. Bandwidth Plot.....	17
9.3. HOPPING FREQUENCY SEPARATION.....	19
9.3.1. BLUETOOTH BASIC DATA RATE GFSK MODULATION .....	20
9.3.2. BLUETOOTH ENHANCED DATA RATE 8PSK MODULATION.....	20
9.4. NUMBER OF HOPPING CHANNELS .....	21
9.4.1. BLUETOOTH BASIC DATA RATE GFSK MODULATION .....	22
9.4.2. BLUETOOTH ENHANCED DATA RATE 8PSK MODULATION.....	23
9.5. AVERAGE TIME OF OCCUPANCY.....	24
9.5.1. BLUETOOTH BASIC DATA RATE GFSK MODULATION .....	25
9.5.2. BLUETOOTH ENHANCED DATA RATE 8PSK MODULATION.....	27
9.6. OUTPUT POWER.....	29
9.6.1. BASIC DATA RATE GFSK MODULATION.....	29
9.6.2. ENHANCED DATA RATE Pi/4-DPSK MODULATION .....	29

---

9.6.3.	ENHANCED DATA RATE 8PSK MODULATION .....	29
9.6.4.	OUTPUT POWER PLOTS.....	30
9.7.	<i>AVERAGE POWER</i> .....	32
9.7.1.	BASIC DATA RATE GFSK MODULATION.....	32
9.7.2.	ENHANCED DATA RATE PI/4-DQPSK MODULATION .....	32
9.7.3.	ENHANCED DATA RATE 8PSK MODULATION .....	32
9.8.	<i>CONDUCTED SPURIOUS EMISSIONS</i> .....	33
9.8.1.	BLUETOOTH BASIC DATA RATE GFSK MODULATION .....	34
9.8.2.	BLUETOOTH ENHANCED DATA RATE 8PSK MODULATION.....	36
<b>10.</b>	<b>RADIATED TEST RESULTS</b> .....	<b>38</b>
10.1.	<i>TRANSMITTER ABOVE 1 GHz</i> .....	40
10.1.1.	BLUETOOTH BASIC DATA RATE GFSK MODULATION .....	40
10.1.2.	BLUETOOTH ENHANCED DATA RATE 8PSK MODULATION .....	47
10.2.	<i>WORST CASE BELOW 1 GHZ</i> .....	54
<b>11.</b>	<b>AC POWER LINE CONDUCTED EMISSIONS</b> .....	<b>55</b>
11.1.1.	AC Power Line Host .....	56

# 1. ATTESTATION OF TEST RESULTS

**COMPANY NAME:** SAMSUNG ELECTRONICS CO., LTD.

**EUT DESCRIPTION:** GSM/WCDMA/LTE/5G NR Phone + BT/BLE, DTS/UNII a/b/g/n/ac/ax, WPT and NFC

**MODEL NUMBER:** SM-G991B/DS, SM-G991B

**SERIAL NUMBER:** 47d1a444d81f7ece, R3CN80HSZ6E (CONDUCTED); R3CN90P9ETY, R3CN9046PJN (RADIATED);

**DATE TESTED:** OCT 05, 2020 – NOV 09, 2020;

APPLICABLE STANDARDS	
STANDARD	TEST RESULTS
CFR 47 Part 15 Subpart C	Complies

UL Korea, Ltd. tested the above equipment in accordance with the requirements set forth in the above standards. All indications of Pass/Fail in this report are opinions expressed by UL Korea, Ltd. based on interpretations and/or observations of test results. Measurement Uncertainties were not taken into account and are published for informational purposes only. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

**Note:** The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. This document may not be altered or revised in any way unless done so by UL Korea, Ltd. and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL Korea, Ltd. will constitute fraud and shall nullify the document. This report must not be used by the client to claim product certification, approval, or endorsement by IAS, any agency of the Federal Government, or any agency of any government.

Approved & Released For  
UL Korea, Ltd. By:



Junwhan Lee  
Suwon Lab Engineer  
UL Korea, Ltd.

Tested By:



Hyunsik Yun  
Suwon Lab Engineer  
UL Korea, Ltd.

## 2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with following methods.

1. FCC CFR 47 Part 2.
2. FCC CFR 47 Part 15.
3. KDB 558074 D01 15.247 Meas Guidance v05r02.
4. ANSI C63.10-2013.

## 3. FACILITIES AND ACCREDITATION

The test sites and measurement facilities used to collect data are located at 218 Maeyeong-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16675, Korea. Line conducted emissions are measured only at the 218 address. The following table identifies which facilities were utilized for radiated emission measurements documented in this report. Specific facilities are also identified in the test results sections.

218 Maeyeong-ro	
<input checked="" type="checkbox"/>	Chamber 1
<input checked="" type="checkbox"/>	Chamber 2
<input type="checkbox"/>	Chamber 3

UL Korea, Ltd. is accredited by IAS, Laboratory Code TL-637. The full scope of accreditation can be viewed at <https://www.iasonline.org/wp-content/uploads/2017/05/TL-637-cert-New.pdf>.

## 4. DECISION RULES AND MEASUREMENT UNCERTAINTY

### 4.1. METROLOGICAL TRACEABILITY

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.

### 4.2. SAMPLE CALCULATION

Where relevant, the following sample calculation is provided:

$$\begin{aligned} \text{Field Strength (dBuV/m)} &= \text{Measured Voltage (dBuV)} + \text{Antenna Factor (dB/m)} + \\ &\text{Cable Loss (dB)} - \text{Preamp Gain (dB)} \\ 36.5 \text{ dBuV} + 18.7 \text{ dB/m} + 0.6 \text{ dB} - 26.9 \text{ dB} &= 28.9 \text{ dBuV/m} \end{aligned}$$

### 4.3. DECISION RULES

Decision rule for statement(s) of conformity is based on Procedure 1, Clause 4.4.2 in IEC Guide 115:2007.

### 4.4. MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus:

PARAMETER	UNCERTAINTY
Conducted Disturbance, 0.15 to 30 MHz	3.01 dB
Radiated Disturbance, 30 MHz to 1 GHz	4.26 dB
Radiated Disturbance, 1 GHz to 18 GHz	5.90 dB
Radiated Disturbance, 18 GHz to 40 GHz	5.49 dB

Uncertainty figures are valid to a confidence level of 95%.

## 5. EQUIPMENT UNDER TEST

### 5.1. EUT DESCRIPTION

The EUT is a GSM/WCDMA/LTE/5G NR Phone + BT/BLE, DTS/UNII a/b/g/n/ac/ax, WPT and NFC. This test report addresses the BT(DSS) operational mode.

This report covers the Samsung models SM-G991B/DS and SM-G991B. These models are identical in hardware except SM-G991B has single SIM tray. With some pre-scan, model SM-G991B/DS was set for final test.

### 5.2. MAXIMUM OUTPUT POWER

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

Frequency Range [MHz]	Mode	Power Mode	Output Power [dBm]	Output Power [mW]
2 402 - 2 480	Basic GFSK	Average	16.801	47.874
		Peak	17.272	53.358
	Enhanced Pi/4-DPSK	Average	12.206	16.619
		Peak	15.078	32.196
	Enhanced 8PSK	Average	12.456	17.604
		Peak	15.643	36.669

### 5.3. DESCRIPTION OF AVAILABLE ANTENNAS

An intentional radiator antenna shall be designed to ensure that no antenna other than that furnished by the responsible party can 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 internal antenna was Permanently attached.  
 Therefore this E.U.T Complies with the requirement of §15.203.**

The radio utilizes an internal antenna, with a maximum gain of -5.15 dBi.



---

## **5.4. WORST-CASE CONFIGURATION AND MODE**

Radiated emission below 1GHz and power line conducted emission were performed with the EUT set to transmit at the channel with highest output power as worst-case scenario.

Radiated emission above 1GHz was performed with the EUT set to transmit low/mid/high channels.

The fundamental of the EUT was investigated in three orthogonal orientations X, Y and Z it was determined that X orientation was worst-case orientation; therefore, all final radiated testing was performed with the EUT in X orientation.

Note: GFSK, Pi/4-DQPSK, 8PSK average Power are all investigated, The GFSK & 8PSK Power are the worst case. Testing is based on this mode to showing compliance.

## 5.5. DESCRIPTION OF TEST SETUP

### SUPPORT EQUIPMENT

Support Equipment List				
Description	Manufacturer	Model	Serial Number	FCC ID
Charger	SAMSUNG	EP-TA800	R37N8BT85J8SE3	N/A
Data Cable	SAMSUNG	EP-DN980BBE	N/A	N/A

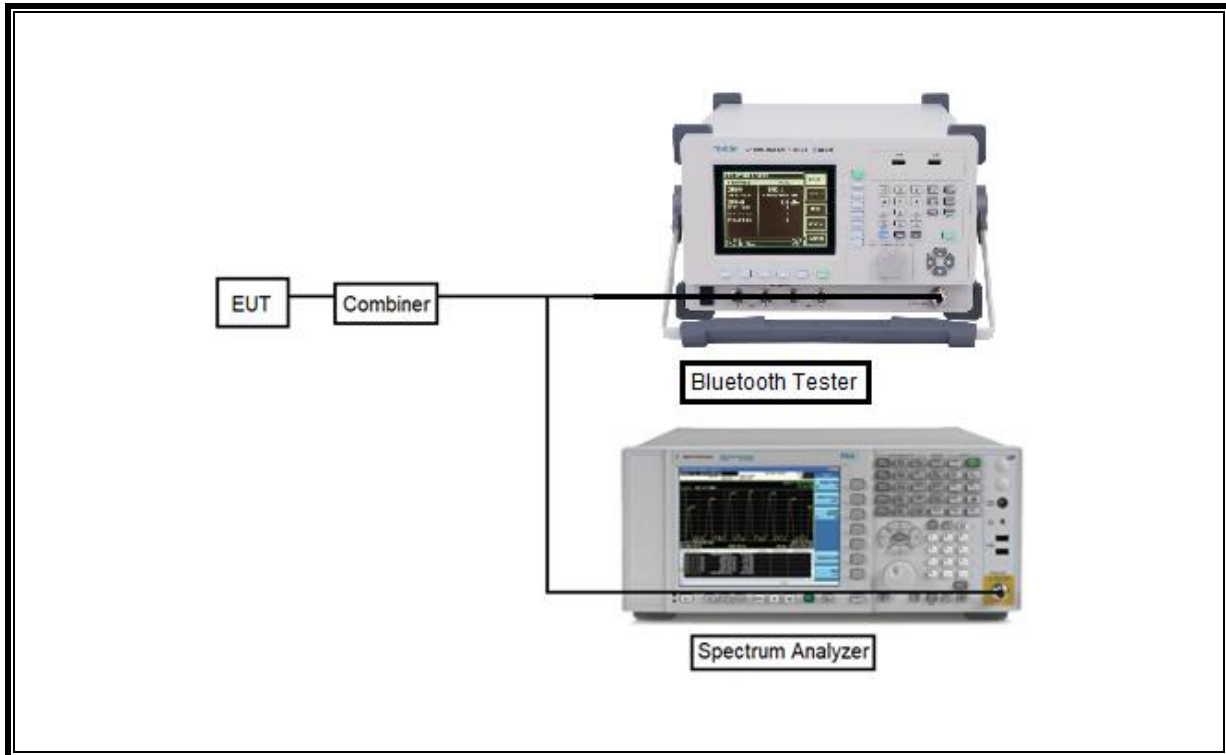
### I/O CABLE

I/O Cable List						
Cable No.	Port	# of identical ports	Connector Type	Cable Type	Cable Length (m)	Remarks
1	DC Power	1	C Type	Shielded	1.0 m	N/A

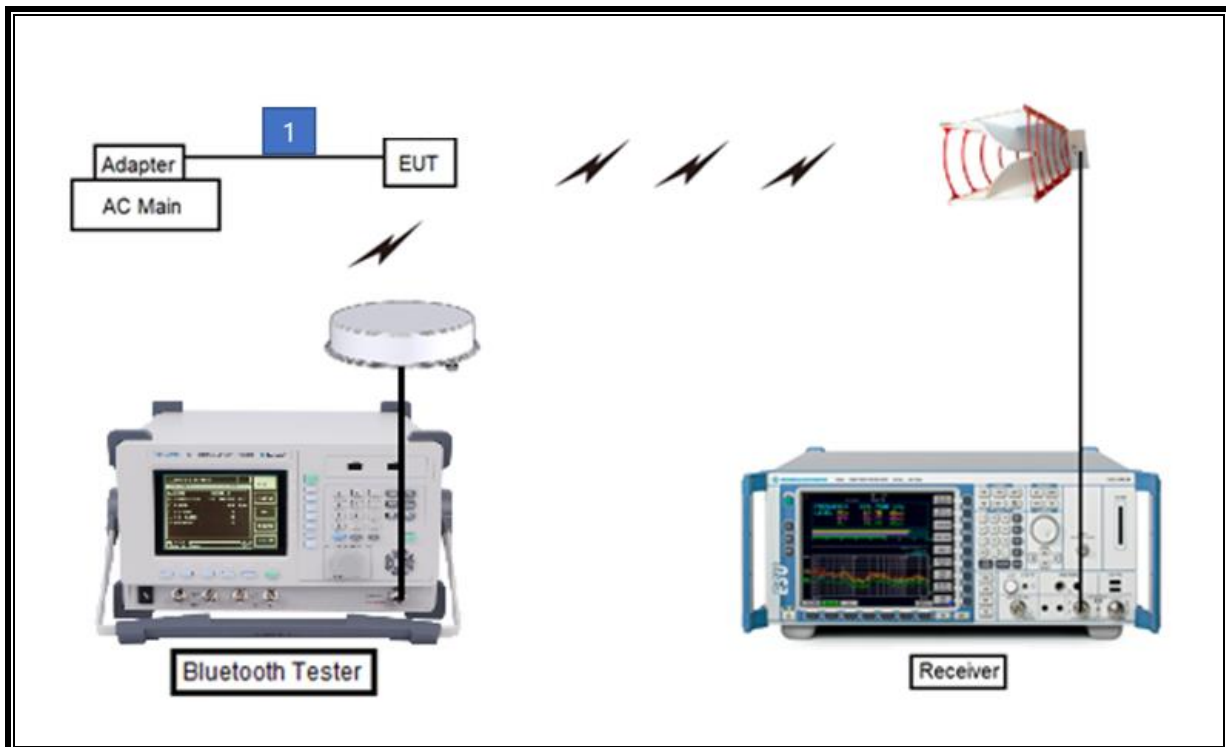
### TEST SETUP

The EUT is continuously communicating to the Bluetooth tester during the tests.  
Test software enable BT communications.

**SETUP DIAGRAM FOR TESTS (CONDUCTED TEST SETUP)**



**SETUP DIAGRAM FOR TESTS (RADIATED TEST SETUP)**



## 6. TEST AND MEASUREMENT EQUIPMENT

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

Test Equipment List				
Description	Manufacturer	Model	S/N	Cal Due
Antenna, Bilog, 30MHz-1GHz	SCHWARZBECK	VULB9163	750	08-19-22
Antenna, Bilog, 30MHz-1GHz	SCHWARZBECK	VULB9163	749	08-13-22
Antenna, Bilog, 30MHz-1GHz	SCHWARZBECK	VULB9163	845	08-13-22
Antenna, Loop, 9kHz-30MHz	R&S	HFH2-Z2	100418	10-02-21
Antenna, Horn, 18 GHz	ETS	3115	00167211	07-27-22
Antenna, Horn, 18 GHz	ETS	3115	00161451	08-15-22
Antenna, Horn, 18 GHz	ETS	3117	00168724	07-27-22
Antenna, Horn, 18 GHz	ETS	3117	00168717	08-15-22
Antenna, Horn, 40 GHz	ETS	3116C	00166155	08-04-22
Antenna, Horn, 40 GHz	ETS	3116C	00168645	10-02-21
Preamplifier	ETS	3116C-PA	00168841	08-06-21
Directional Antenna	Cobham	FPA3-0.8-6.0R/1329	80108-0004	N/A
Directional Antenna	Cobham	FPA3-0.8-6.0R/1329	110367-0003	N/A
Preamplifier, 1000 MHz	Sonoma	310N	341282	08-03-21
Preamplifier, 1000 MHz	Sonoma	310N	351741	08-03-21
Preamplifier, 1000 MHz	Sonoma	310N	370599	08-06-21
Preamplifier, 18 GHz	Miteq	AFS42-00101800-25-S-42	1876511	08-03-21
Preamplifier, 18 GHz	Miteq	AFS42-00101800-25-S-42	1896138	08-03-21
Preamplifier, 18 GHz	Miteq	AFS42-00101800-25-S-42	2029169	08-04-21
Spectrum Analyzer, 44 GHz	Keysight	N9030B	MY57143717	01-20-21
Spectrum Analyzer, 44 GHz	Agilent / HP	N9030A	MY54170614	08-05-21
Spectrum Analyzer, 44 GHz	Agilent / HP	N9030A	MY54490312	08-05-21
Average Power Sensor	Agilent / HP	U2000	MY54270007	08-05-21
Bluetooth Tester	TESCOM	TC-3000C	3000C000546	08-05-21
Power Splitter	MINI-CIRCUITS	WA1534	UL001	02-05-21
Attenuator	PASTERNAK	PE7087-10	A001	08-03-21
Attenuator	PASTERNAK	PE7087-10	A008	08-03-21
Attenuator	PASTERNAK	PE7004-10	2	08-04-21
EMI Test Receive, 40 GHz	R&S	ESU40	100439	08-03-21
EMI Test Receive, 40 GHz	R&S	ESU40	100457	08-03-21
EMI Test Receive, 3 GHz	R&S	ESR3	101832	08-03-21
Low Pass Filter 5GHz	Micro-Tronics	LPS17541	009	08-03-21
Low Pass Filter 5GHz	Micro-Tronics	LPS17541	015	08-03-21
Low Pass Filter 5GHz	Micro-Tronics	LPS17541	020	08-04-21
High Pass Filter 3GHz	Micro-Tronics	HPM17543	010	08-03-21
High Pass Filter 3GHz	Micro-Tronics	HPM17543	015	08-03-21
High Pass Filter 3GHz	Micro-Tronics	HPM17543	020	08-04-21
High Pass Filter 6GHz	Micro-Tronics	HPS17542	009	08-03-21
High Pass Filter 6GHz	Micro-Tronics	HPS17542	016	08-03-21
High Pass Filter 6GHz	Micro-Tronics	HPS17542	021	08-04-21
LISN	R&S	ENV-216	101837	08-06-21
Termination	WEINSCHL	M1406A	T01	08-05-21
UL Software				
Description	Manufacturer	Model	Version	
Radiated software	UL	UL EMC	Ver 9.5	
AC Line Conducted software	UL	UL EMC	Ver 9.5	

## 7. TEST RESULTS SUMMARY

FCC Part Section	Test Description	Test Limit	Test Condition	Test Result
2.1051, 15.247 (d)	Band Edge / Conducted Spurious Emission	-20dBc	Conducted	Pass
15.247 (b)(1)	TX conducted output power	<21dBm		Pass
15.247 (a)(1)	Hopping frequency separation	> two-thirds of the 20 dB bandwidth		Pass
15.247 (a)(1)(iii)	Number of Hopping channels	More than 15 non-overlapping channels		Pass
15.247 (a)(1)(iii)	Avg Time of Occupancy	< 0.4sec		Pass
15.207 (a)	AC Power Line conducted emissions	Section 10	Power Line conducted	Pass
15.205, 15.209	Radiated Spurious Emission	< 54dBuV/m	Radiated	Pass

---

## 8. MEASUREMENT METHODS

20dB BW : ANSI C63.10, Section 6.9.2

99% BW : ANSI C63.10, Section 6.9.3

HOPPING FREQUENCY SEPARATION : ANSI C63.10, Section 7.8.2

NUMBER OF HOPPING CHANNELS : ANSI C63.10, Section 7.8.3

AVERAGE TIME OF OCCUPANCY : ANSI C63.10, Section 7.8.4

OUTPUT POWER : ANSI C63.10, Section 7.8.5.

Out-of-band EMISSIONS (Conducted) : ANSI C63.10, Section 7.8.6, 7.8.8

Out-of-band EMISSIONS IN NON-RESTRICTED BANDS: ANSI C63.10, Section 6.

Out-of-band EMISSIONS IN RESTRICTED BANDS : ANSI C63.10, Section 6.

AC Power Line Conducted Emission : ANSI C63.10-2013, Section 6.2.

## 9. ANTENNA PORT TEST RESULTS

### 9.1. ON TIME AND DUTY CYCLE

#### LIMITS

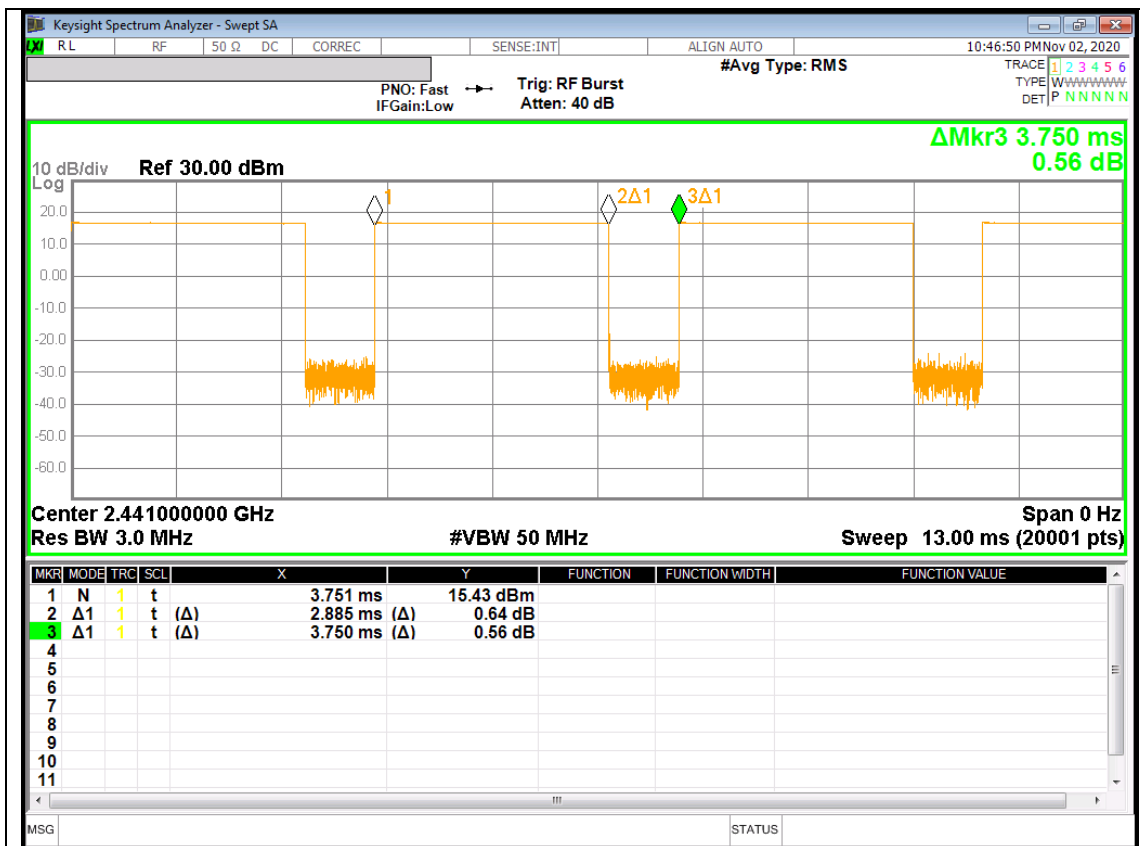
None; for reporting purposes only.

#### PROCEDURE

ANSI C63.10, Section 11.6 : Zero-Span Spectrum Analyzer Method.

#### ON TIME AND DUTY CYCLE RESULTS

Mode	On time [msec]	Period [msec]	Duty Cycle [%]	Duty Cycle Correction Factor[dB]	1/T Minimum VBW [kHz]
<b>2 400 ~ 2 483.5 MHz Band</b>					
Bluetooth	2.885	3.750	76.93	1.14	0.35



**9.2. 20 dB AND 99% BANDWIDTH**

**LIMITS**

None; for reporting purposes only.

**TEST PROCEDURE**

The transmitter output is connected to a spectrum analyzer. The RBW is set to  $\geq 1\%$  of the 20 dB bandwidth. The VBW is set to  $\geq$  RBW. The sweep time is coupled.

**RESULTS**

**9.2.1. BLUETOOTH BASIC DATA RATE GFSK MODULATION**

Channel	Frequency [MHz]	20 dB Bandwidth [kHz]	99% Bandwidth [kHz]
0	2 402	1 045.0	894.0
39	2 441	1 045.0	866.2
78	2 480	1 043.0	865.6
<b>Worst</b>		<b>1 045.0</b>	<b>894.0</b>

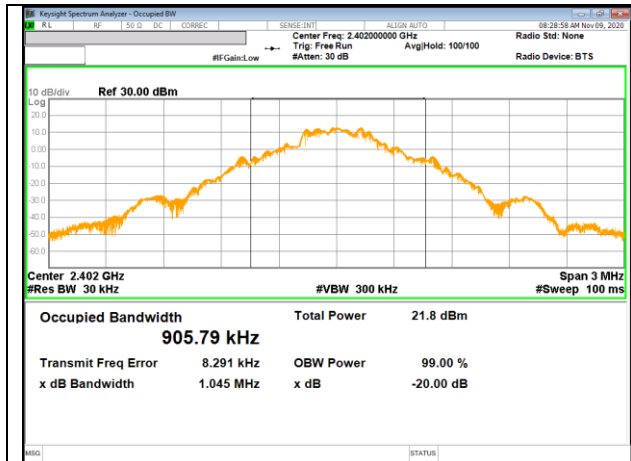
**9.2.2. BLUETOOTH ENHANCED DATA RATE 8PSK MODULATION**

Channel	Frequency [MHz]	20 dB Bandwidth [kHz]	99% Bandwidth [kHz]
0	2 402	1 305.0	1163.0
39	2 441	1 304.0	1164.6
78	2 480	1 308.0	1164.5
<b>Worst</b>		<b>1 308.0</b>	<b>1164.6</b>

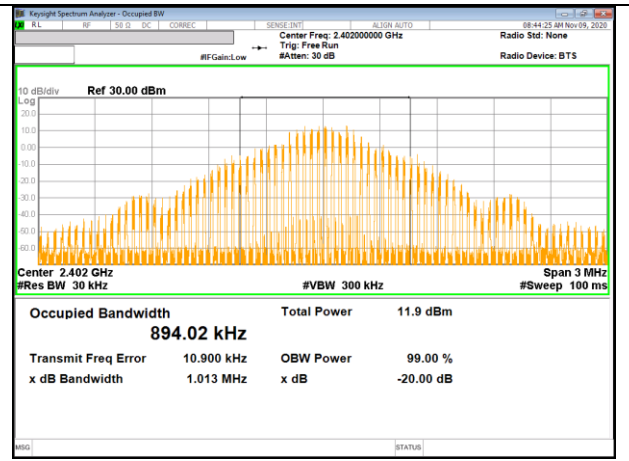


### 9.2.3. Bandwidth Plot

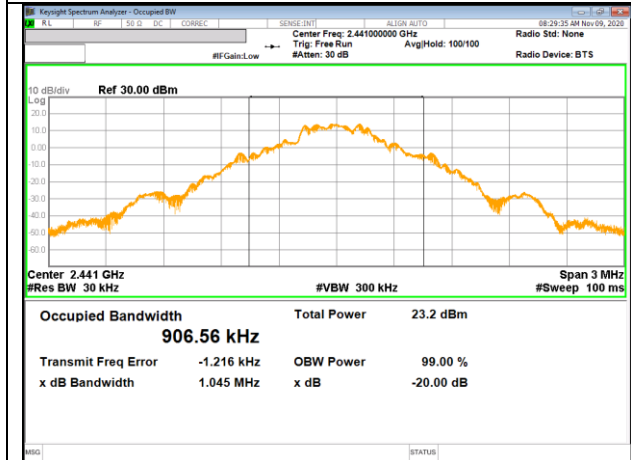
#### GFSK



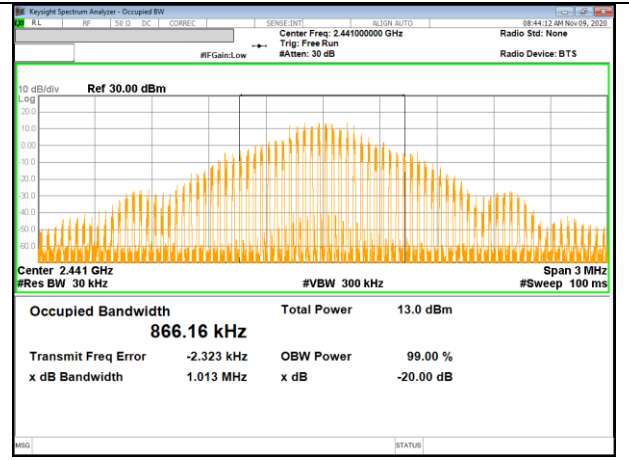
**20 dB bandwidth / 0 CHANNEL**



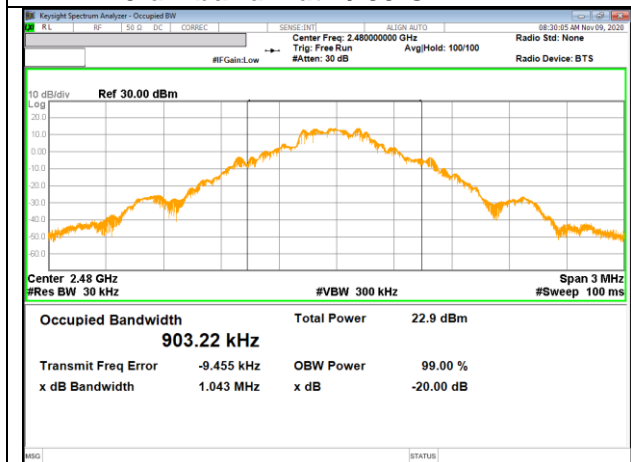
**99% bandwidth / 0 CHANNEL**



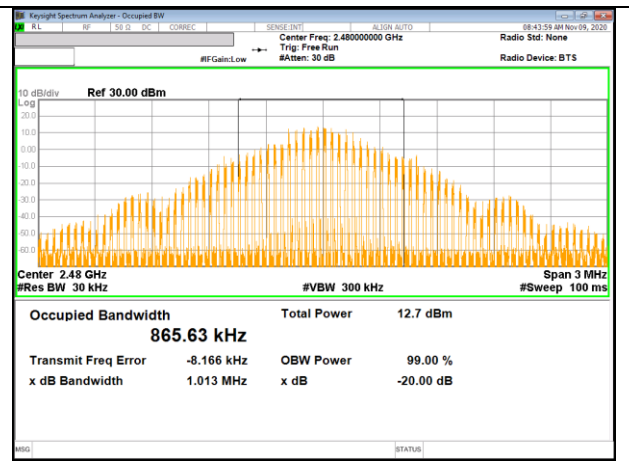
**20 dB bandwidth / 39 CHANNEL**



**99% bandwidth / 39 CHANNEL**

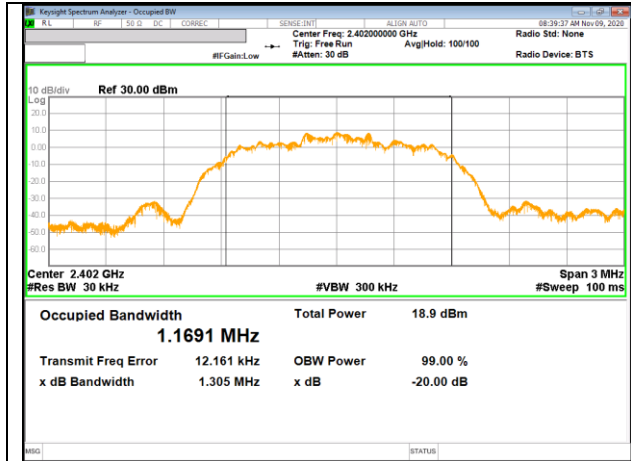


**20 dB bandwidth / 78 CHANNEL**

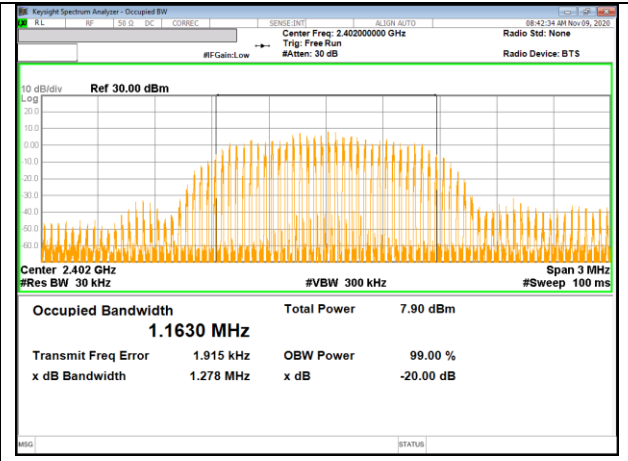


**99% bandwidth / 78 CHANNEL**

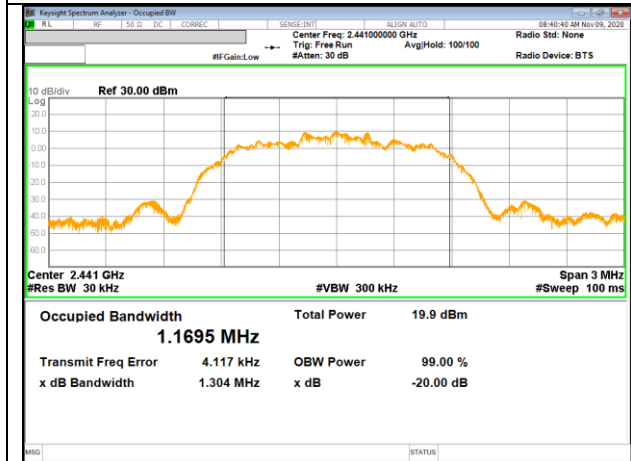
**8PSK**



**20 dB bandwidth / 0 CHANNEL**



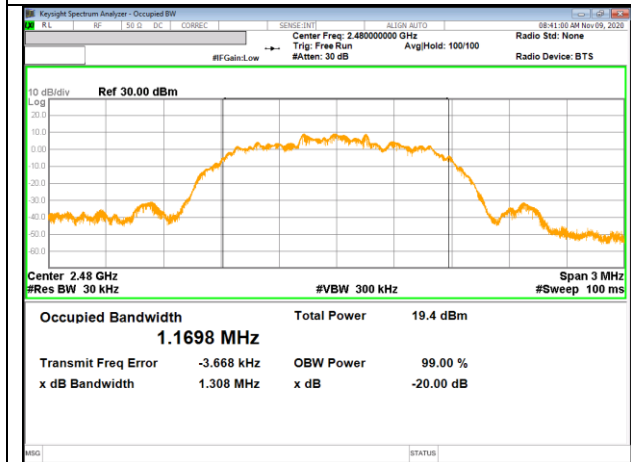
**99% bandwidth / 0 CHANNEL**



**20 dB bandwidth / 39 CHANNEL**



**99% bandwidth / 39 CHANNEL**



**20 dB bandwidth / 78 CHANNEL**



**99% bandwidth / 78 CHANNEL**

### **9.3. HOPPING FREQUENCY SEPARATION**

#### **LIMITS**

FCC §15.247 (a) (1)

RSS-247 (5.1) (b)

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

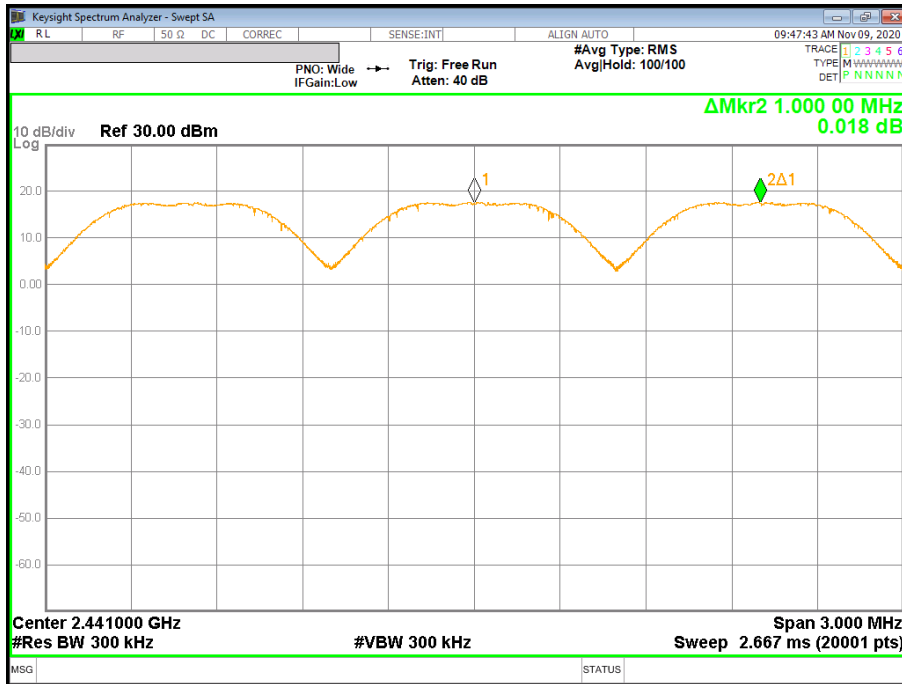
Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than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

#### **TEST PROCEDURE**

The transmitter output is connected to a spectrum analyzer. The RBW is set to 300 kHz and the VBW is set to  $VBW \geq RBW$ . The sweep time is coupled.

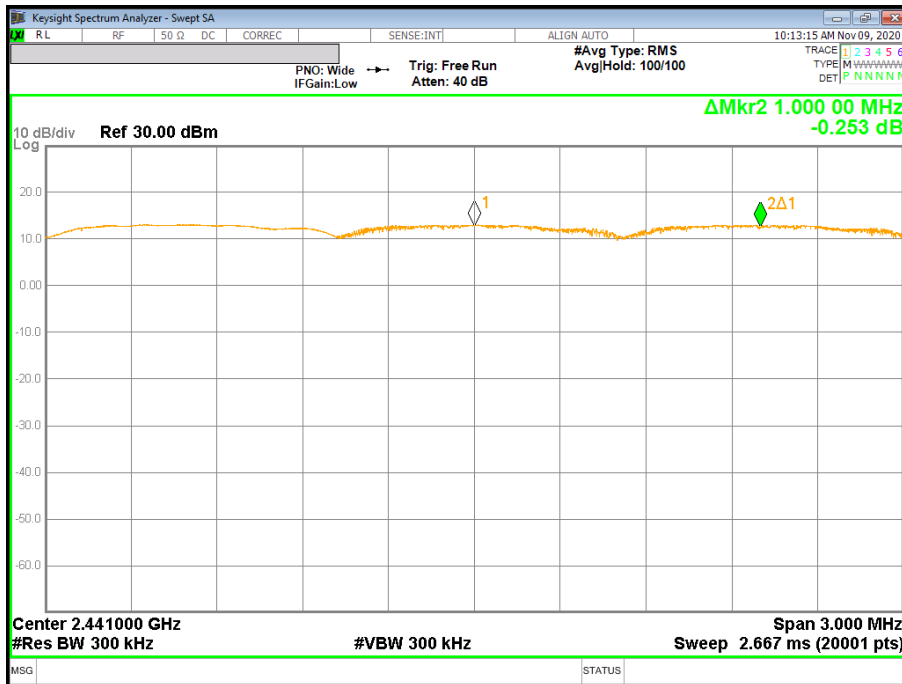
#### **RESULTS**

### 9.3.1. BLUETOOTH BASIC DATA RATE GFSK MODULATION



HOPPING FREQUENCY SEPARATION PLOT

### 9.3.2. BLUETOOTH ENHANCED DATA RATE 8PSK MODULATION



HOPPING FREQUENCY SEPARATION PLOT

---

## **9.4. NUMBER OF HOPPING CHANNELS**

### **LIMITS**

FCC §15.247 (a) (1) (iii)

RSS-247 (5.1) (d)

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

### **TEST PROCEDURE**

The transmitter output is connected to a spectrum analyzer. The span is set to cover the entire authorized band, in either a single sweep or in multiple contiguous sweeps. The RBW is set to a maximum of 1 % of the span. The analyzer is set to Max Hold.

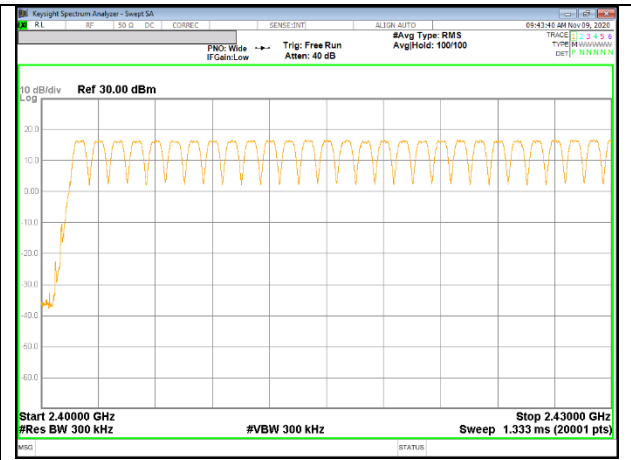
### **RESULTS**

Normal Mode: All Channels Observed

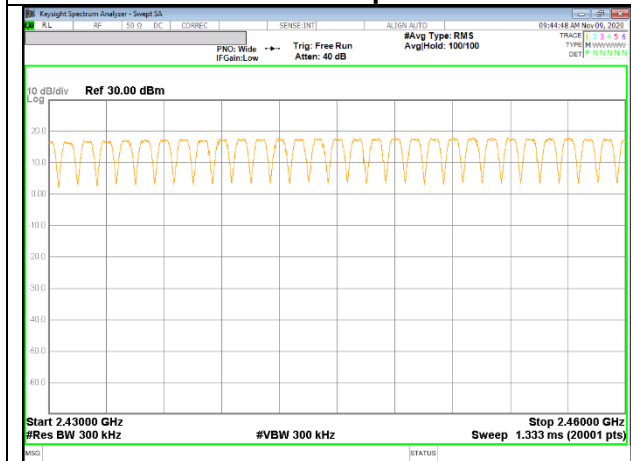
### 9.4.1. BLUETOOTH BASIC DATA RATE GFSK MODULATION



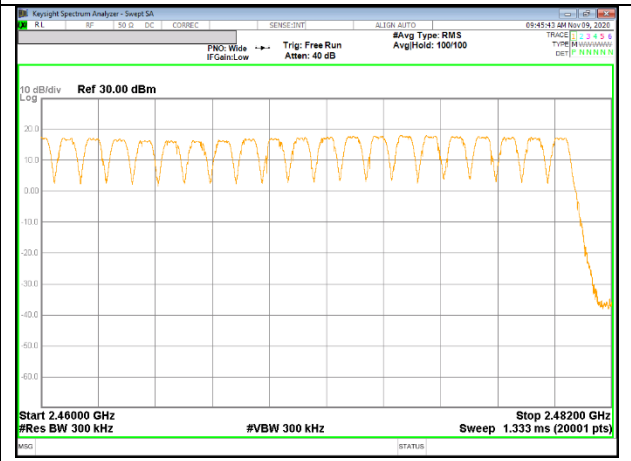
100 MHz Span



30MHz SPAN, SEGMENT 1 OF 3

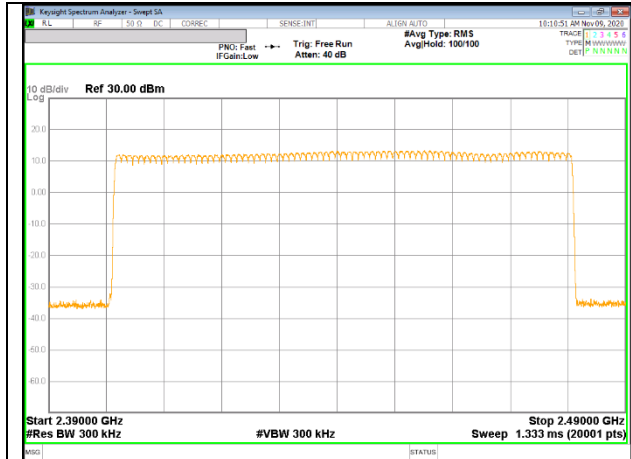


30MHz SPAN, SEGMENT 2 OF 3

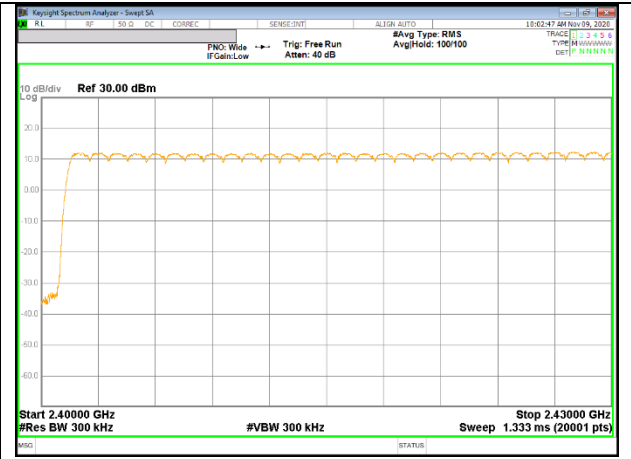


30MHz SPAN, SEGMENT 3 OF 3

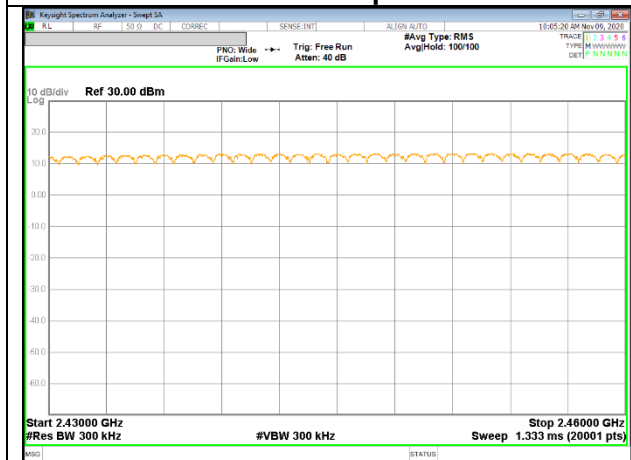
### 9.4.2. BLUETOOTH ENHANCED DATA RATE 8PSK MODULATION



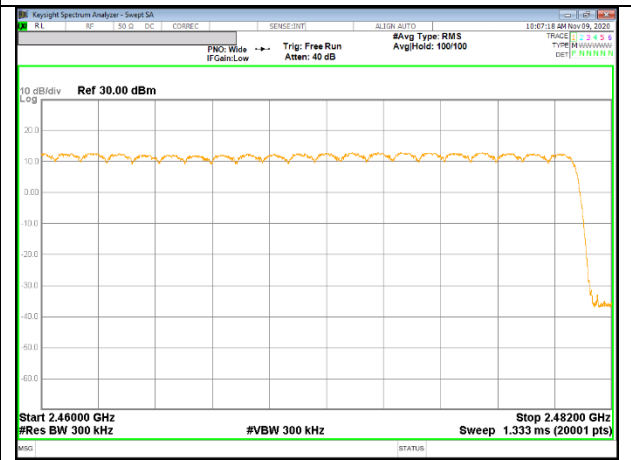
100 MHz Span



30MHz SPAN, SEGMENT 1 OF 3



30MHz SPAN, SEGMENT 2 OF 3



30MHz SPAN, SEGMENT 3 OF 3

---

## **9.5. AVERAGE TIME OF OCCUPANCY**

### **LIMITS**

FCC §15.247 (a) (1) (iii)

RSS-247 (5.1) (d)

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

### **TEST PROCEDURE**

The transmitter output is connected to a spectrum analyzer. The span is set to 0 Hz, centered on a single, selected hopping channel. The width of a single pulse is measured in a fast scan. The number of pulses is measured in a 3.16 second scan, to enable resolution of each occurrence.

The average time of occupancy in the specified 3.16 second period (79 channels \* 0.4 s) is equal to  $10 * (\# \text{ of pulses in } 3.16 \text{ s}) * \text{ pulse width}$ .

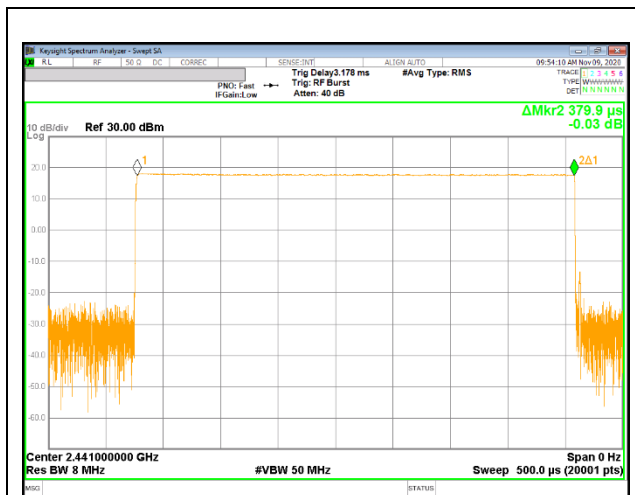
For AFH mode, the average time of occupancy in the specified 8 second period (20 channels \* 0.4 seconds) is equal to  $10 * (\# \text{ of pulses in } 0.8 \text{ s}) * \text{ pulse width}$ .

### **RESULTS**

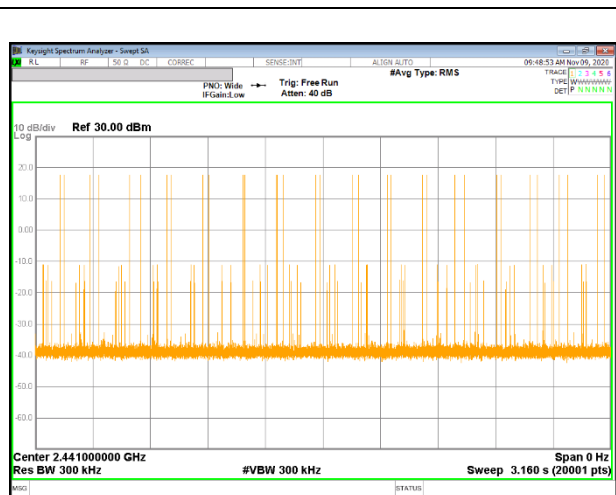


### 9.5.1. BLUETOOTH BASIC DATA RATE GFSK MODULATION

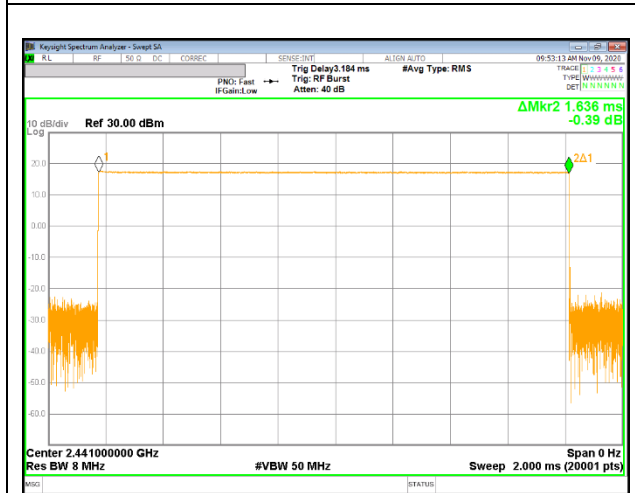
DH Packet	Pulse Width [msec]	Number of Pulses in 3.16 seconds	Average Time of Occupancy [sec]	Limit [sec]	Margin [sec]
GFSK Normal					
DH1	0.380	32	0.122	0.400	-0.278
DH3	1.636	16	0.262	0.400	-0.138
DH5	2.883	12	0.346	0.400	-0.054
DH Packet	Pulse Width [msec]	Number of Pulses in 0.8 seconds	Average Time of Occupancy [sec]	Limit [sec]	Margin [sec]
GFSK AFH					
DH1	0.380	8	0.030	0.400	-0.370
DH3	1.636	4	0.065	0.400	-0.335
DH5	2.883	3	0.086	0.400	-0.314



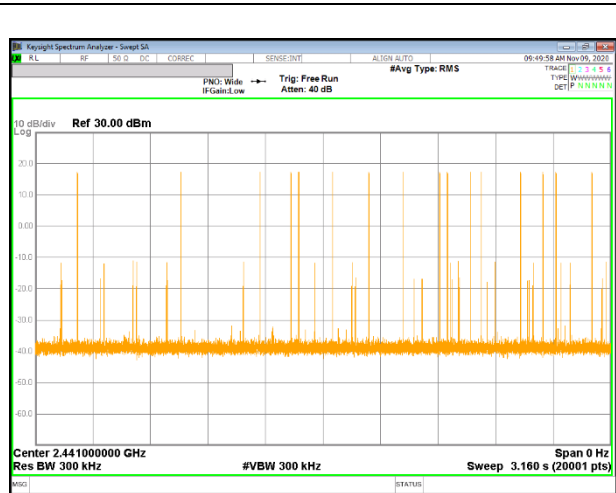
**PULSE WIDTH – DH1**



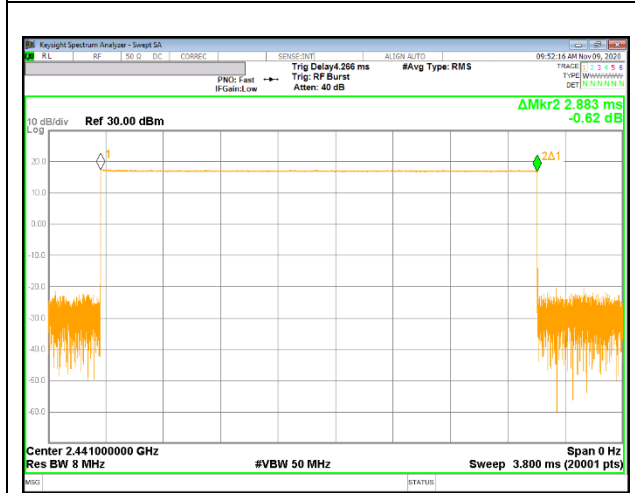
**NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD – DH1**



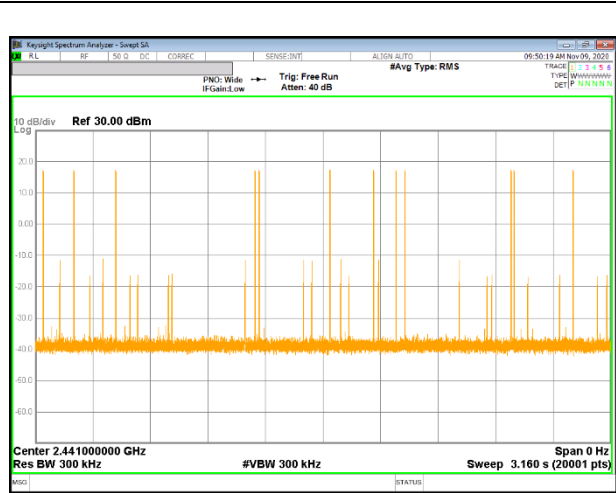
**PULSE WIDTH – DH3**



**NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD – DH3**



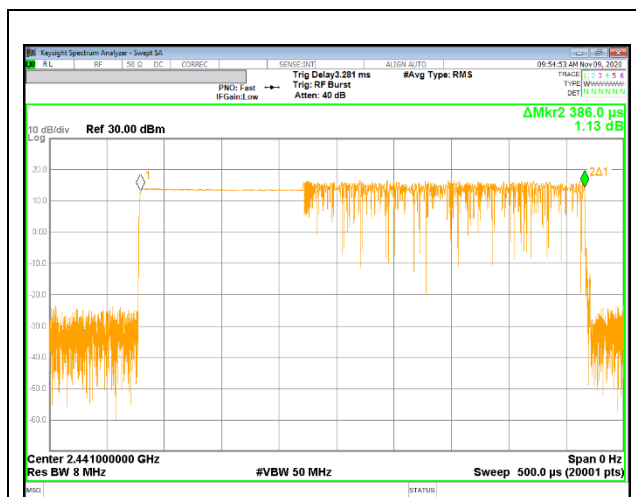
**PULSE WIDTH – DH5**



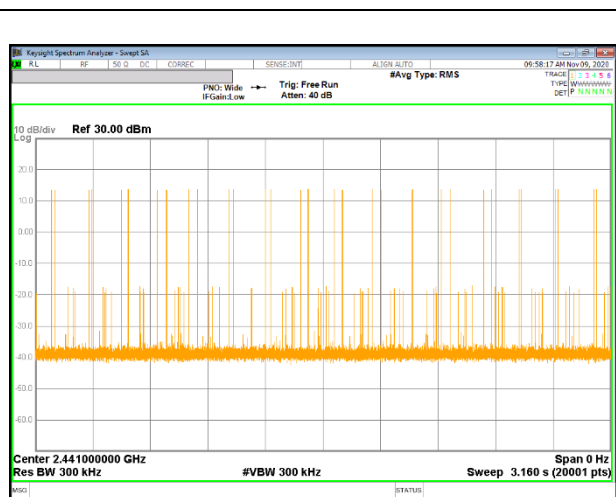
**NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD – DH5**

### 9.5.2. BLUETOOTH ENHANCED DATA RATE 8PSK MODULATION

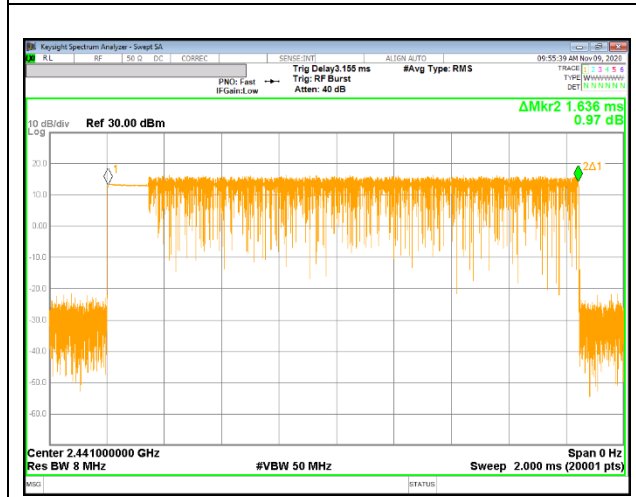
DH Packet	Pulse Width [msec]	Number of Pulses in 3.16 seconds	Average Time of Occupancy [sec]	Limit [sec]	Margin [sec]
8PSK Normal					
DH1	0.386	32	0.124	0.400	-0.276
DH3	1.636	16	0.262	0.400	-0.138
DH5	2.887	12	0.346	0.400	-0.054
DH Packet	Pulse Width [msec]	Number of Pulses in 0.8 seconds	Average Time of Occupancy [sec]	Limit [sec]	Margin [sec]
8PSK AFH					
DH1	0.386	8	0.031	0.400	-0.369
DH3	1.636	4	0.065	0.400	-0.335
DH5	2.887	3	0.087	0.400	-0.313



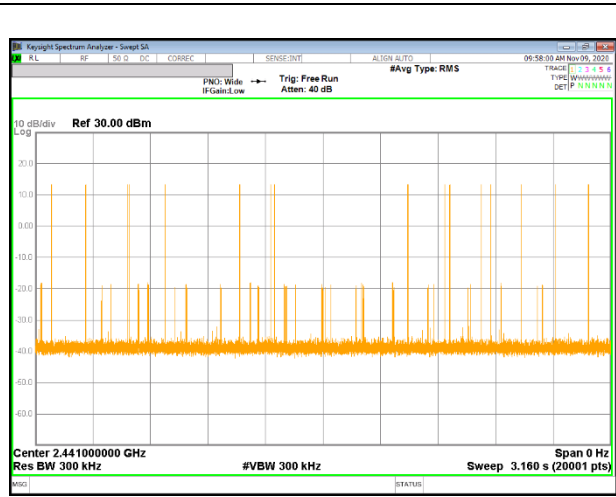
**PULSE WIDTH – 3-DH1**



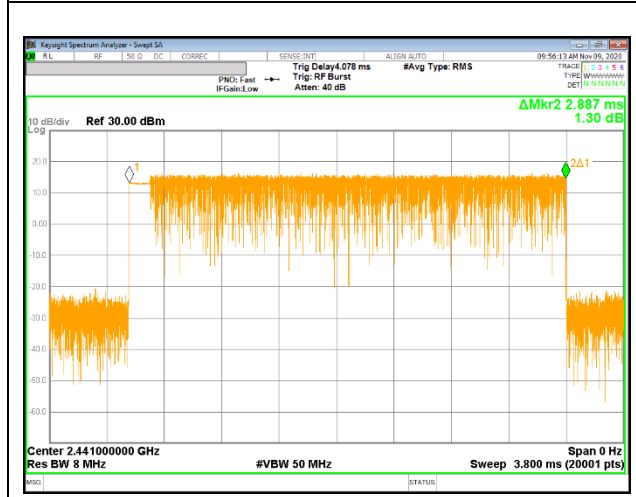
**NUMBER OF PULSES IN 3.16 SECOND  
 OBSERVATION PERIOD – 3-DH1**



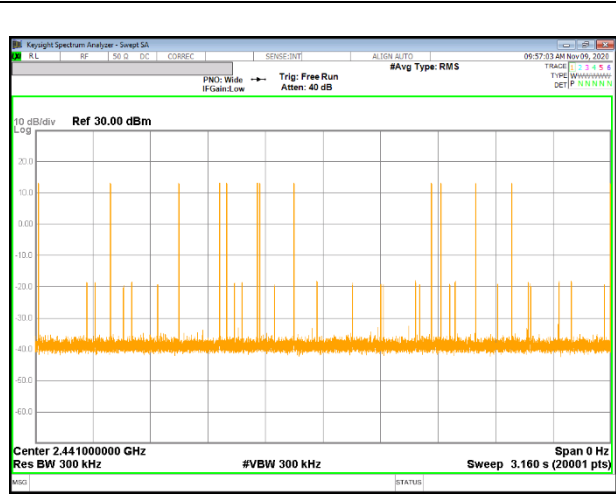
**PULSE WIDTH – 3-DH3**



**NUMBER OF PULSES IN 3.16 SECOND  
 OBSERVATION PERIOD – 3-DH3**



**PULSE WIDTH – 3-DH5**



**NUMBER OF PULSES IN 3.16 SECOND  
 OBSERVATION PERIOD – 3-DH5**

## 9.6. OUTPUT POWER

### LIMITS

§15.247 (b) (1)

The maximum antenna gain is less than 6 dBi, therefore the limit is 21 dBm.

### TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer the analyzer bandwidth is set to a value greater than the 20 dB bandwidth of the EUT.

### RESULTS

#### 9.6.1. BASIC DATA RATE GFSK MODULATION

Channel	Frequency [MHz]	Output Power [dBm]	Limit [dBm]	Margin [dBm]
0	2 402	16.066	21.000	-4.934
39	2 441	17.272	21.000	-3.728
78	2 480	17.208	21.000	-3.792
<b>Worst</b>		<b>17.272</b>	<b>21.000</b>	<b>-3.728</b>

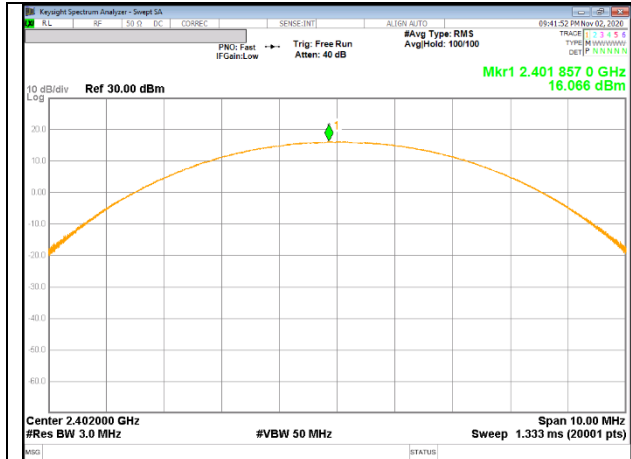
#### 9.6.2. ENHANCED DATA RATE Pi/4-DPSK MODULATION

Channel	Frequency [MHz]	Output Power [dBm]	Limit [dBm]	Margin [dBm]
0	2 402	14.122	21.000	-6.878
39	2 441	15.078	21.000	-5.922
78	2 480	14.638	21.000	-6.362
<b>Worst</b>		<b>15.078</b>	<b>21.000</b>	<b>-5.922</b>

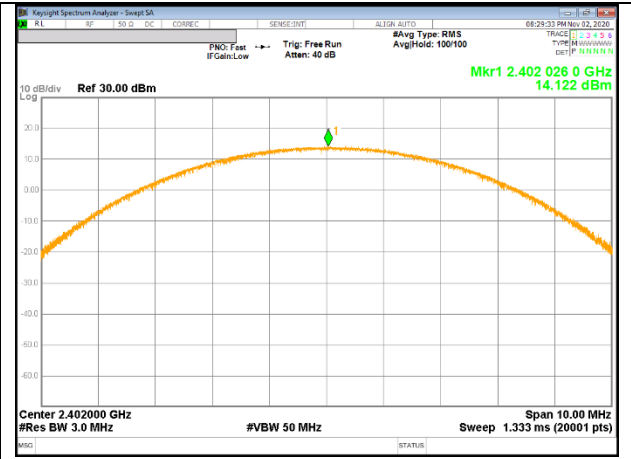
#### 9.6.3. ENHANCED DATA RATE 8PSK MODULATION

Channel	Frequency [MHz]	Output Power [dBm]	Limit [dBm]	Margin [dBm]
0	2 402	14.507	21.000	-6.493
39	2 441	15.643	21.000	-5.357
78	2 480	15.240	21.000	-5.760
<b>Worst</b>		<b>15.643</b>	<b>21.000</b>	<b>-5.357</b>

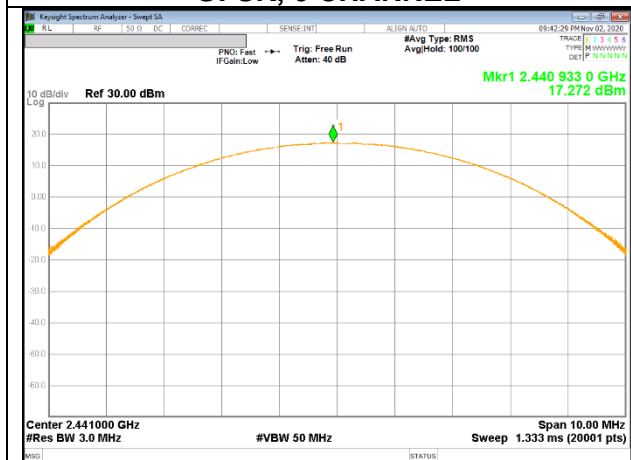
### 9.6.4. OUTPUT POWER PLOTS



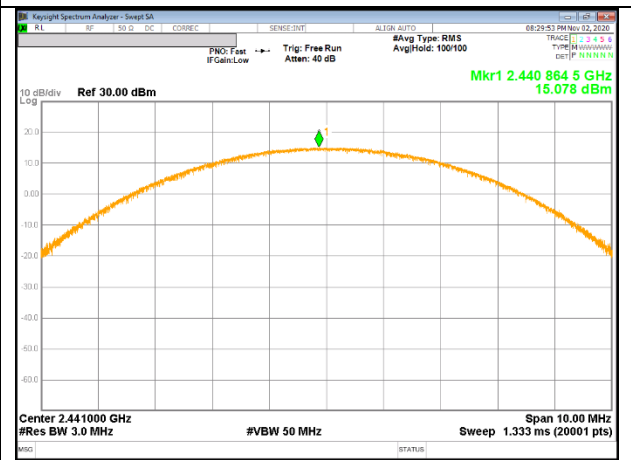
**GFSK, 0 CHANNEL**



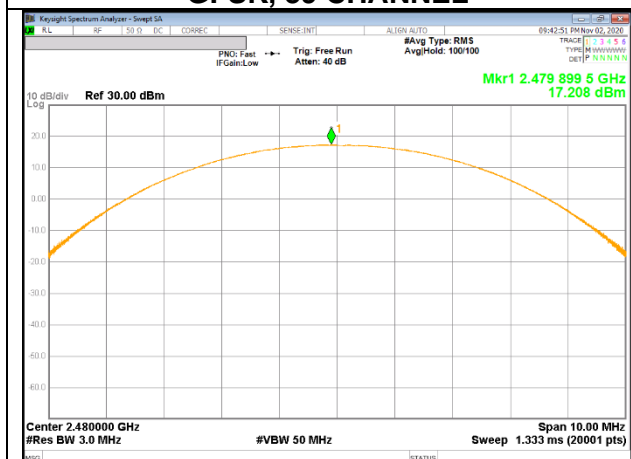
**Pi/4-DPSK, 0 CHANNEL**



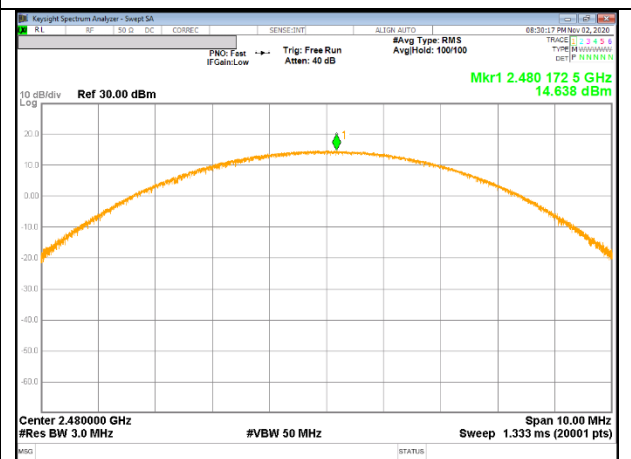
**GFSK, 39 CHANNEL**



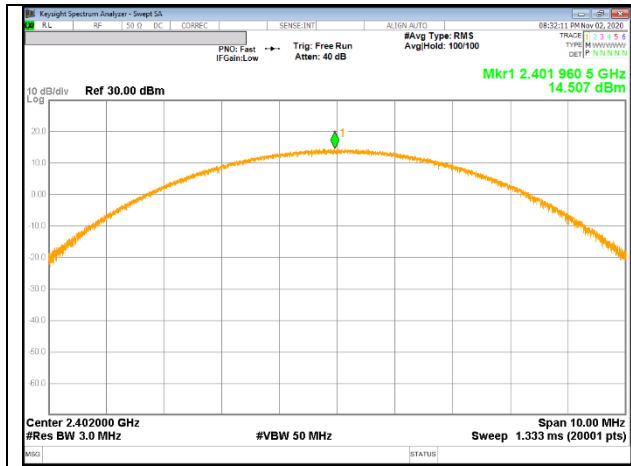
**Pi/4-DPSK, 39 CHANNEL**



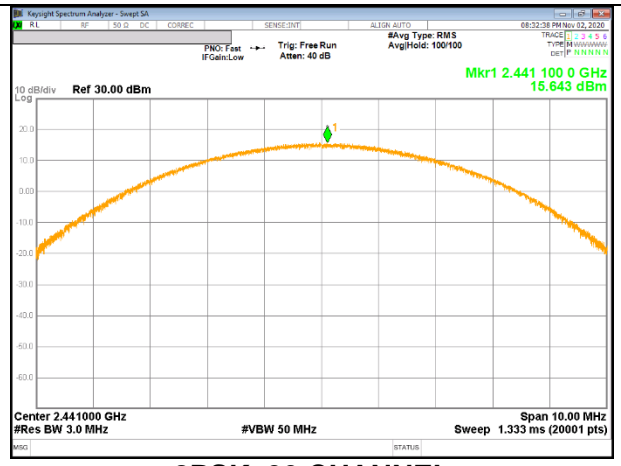
**GFSK, 78 CHANNEL**



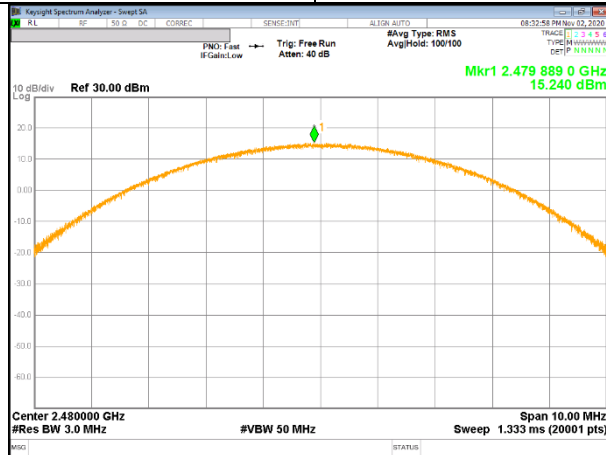
**Pi/4-DPSK, 78 CHANNEL**



**8PSK, 0 CHANNEL**



**8PSK, 39 CHANNEL**



**8PSK, 78 CHANNEL**

## 9.7. AVERAGE POWER

### LIMITS

None; for reporting purposes only

### TEST PROCEDURE

Measurements perform using a wideband gated RF power meter.  
 The cable assembly insertion loss was entered as an offset in the power meter to allow for direct reading of power.

### RESULTS

#### 9.7.1. BASIC DATA RATE GFSK MODULATION

Channel	Frequency [MHz]	AV power [dBm]	AV power [mW]
0	2 402	15.538	35.793
39	2 441	16.731	47.109
78	2 480	16.801	47.874

#### 9.7.2. ENHANCED DATA RATE PI/4-DQPSK MODULATION

Channel	Frequency [MHz]	AV power [dBm]	AV power [mW]
0	2 402	11.305	13.505
39	2 441	12.206	16.619
78	2 480	12.103	16.229

#### 9.7.3. ENHANCED DATA RATE 8PSK MODULATION

Channel	Frequency [MHz]	AV power [dBm]	AV power [mW]
0	2 402	11.294	13.471
39	2 441	12.456	17.604
78	2 480	12.131	16.334



## **9.8. CONDUCTED SPURIOUS EMISSIONS**

### **LIMITS**

FCC §15.247 (d)

Limit = -20 dBc

### **TEST PROCEDURE**

The transmitter output is connected to a spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 300 kHz.

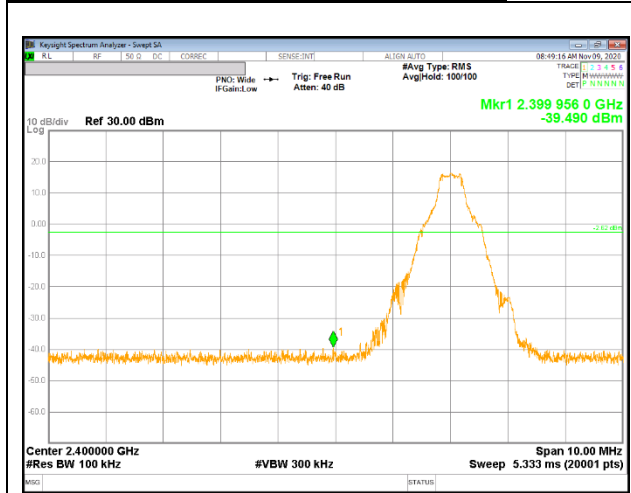
The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels.

The band-edges at 2.4 and 2.4835 GHz are investigated with the transmitter set to the normal hopping mode.

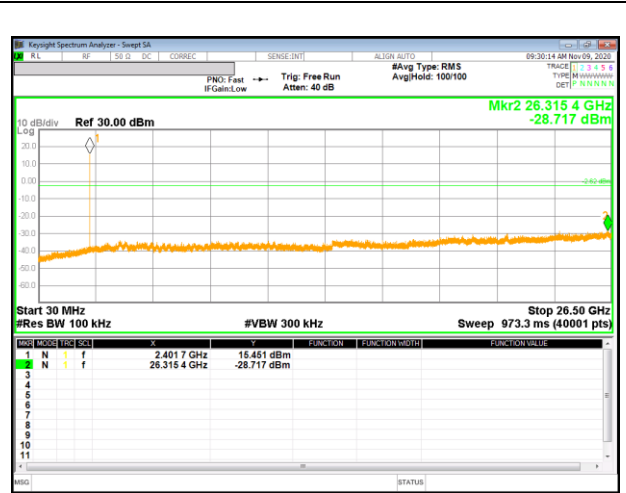
### **RESULTS**

### 9.8.1. BLUETOOTH BASIC DATA RATE GFSK MODULATION

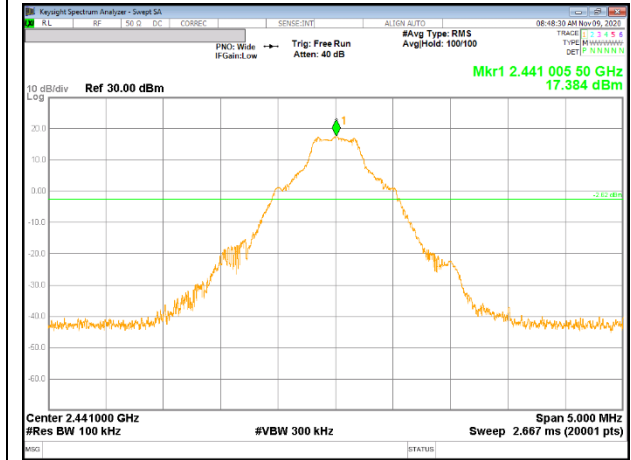
#### SPURIOUS EMISSIONS, NON-HOPPING



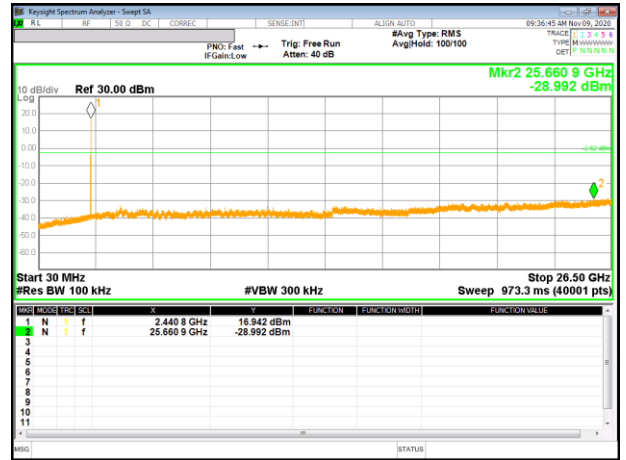
**0 CHANNEL BANDEDGE**



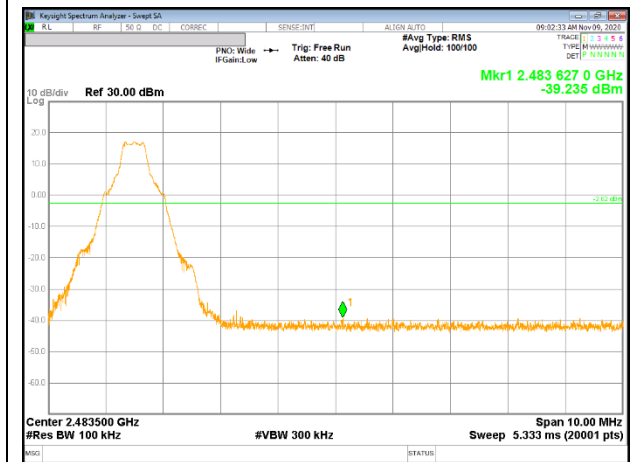
**OUT-OF-BAND 0 CHANNEL**



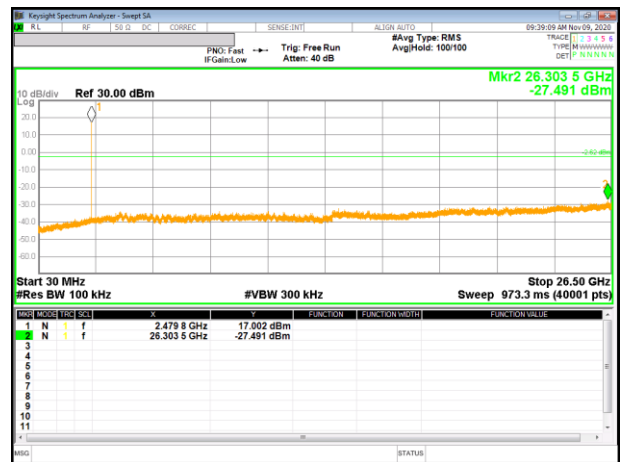
**IN-BAND REFERENCE LEVEL**



**OUT-OF-BAND 39 CHANNEL**

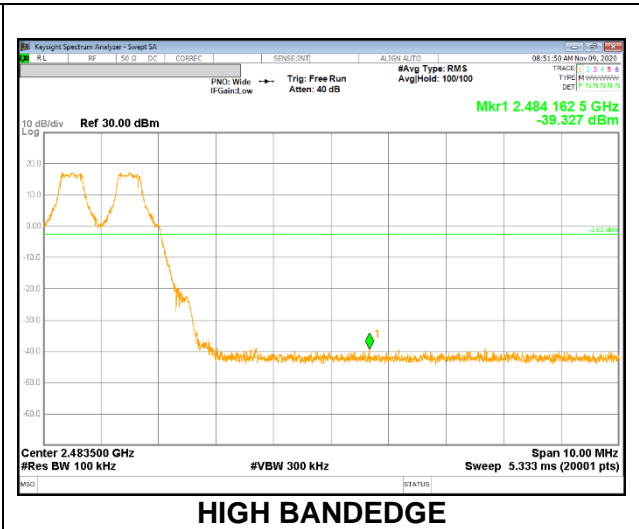
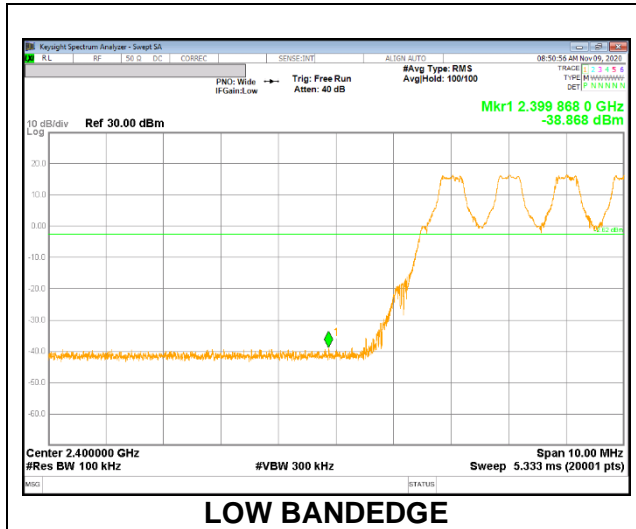


**78 CHANNEL BANDEDGE**



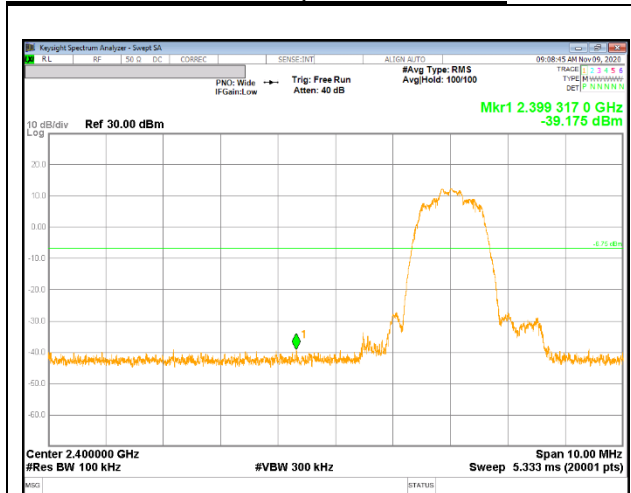
**OUT-OF-BAND 78 CHANNEL**

**SPURIOUS BANDEDGE EMISSIONS WITH HOPPING ON**

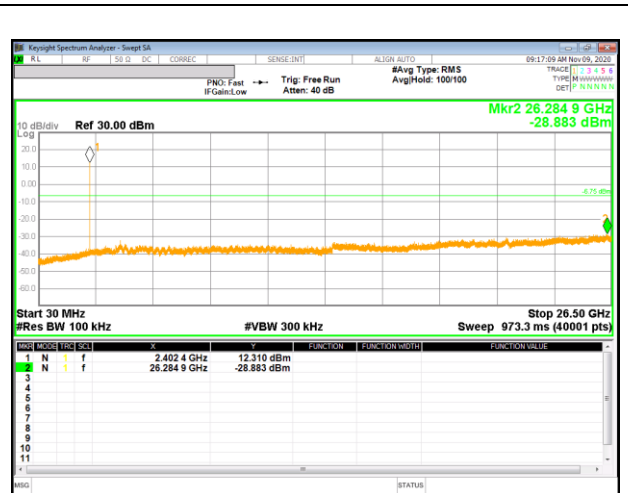


## 9.8.2. BLUETOOTH ENHANCED DATA RATE 8PSK MODULATION

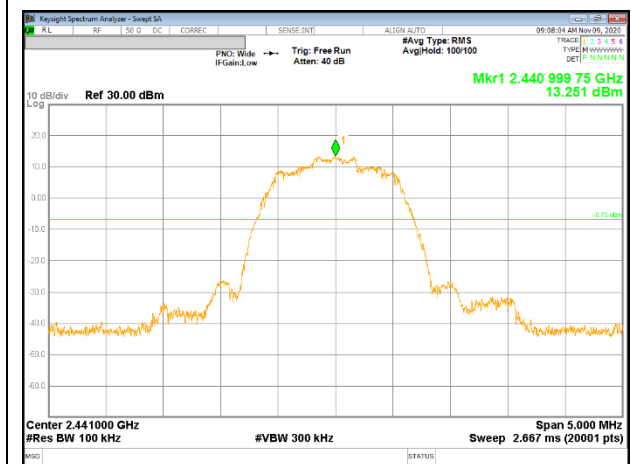
### SPURIOUS EMISSIONS, NON-HOPPING



**0 CHANNEL BANDEDGE**



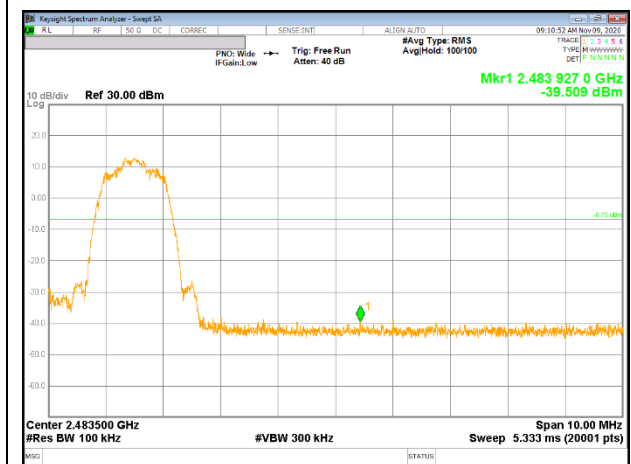
**OUT-OF-BAND 0 CHANNEL**



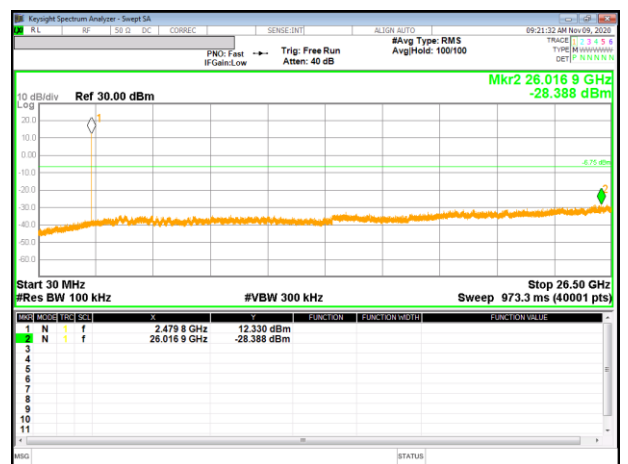
**IN-BAND REFERENCE LEVEL**



**OUT-OF-BAND 39 CHANNEL**

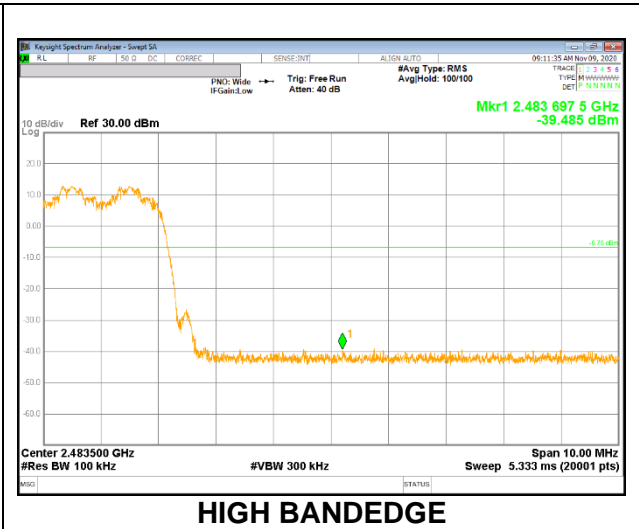
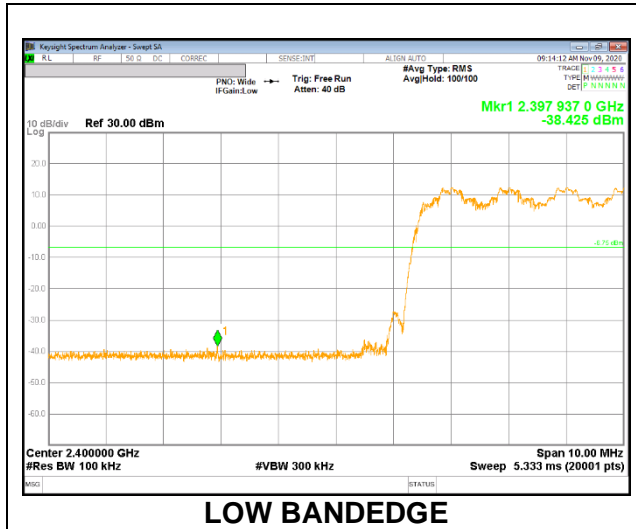


**78 CHANNEL BANDEDGE**



**OUT-OF-BAND 78 CHANNEL**

**SPURIOUS BANDEDGE EMISSIONS WITH HOPPING ON**



## 10. RADIATED TEST RESULTS

### LIMITS

FCC §15.205 and §15.209

Limits for radiated disturbance of an intentional radiator		
Frequency range (MHz)	Limits (µV/m)	Measurement Distance (m)
0.009 – 0.490	2400 / F (kHz)	300
0.490 – 1.705	24000 / F (kHz)	30
1.705 – 30.0	30	30
30 – 88	100**	3
88 - 216	150**	3
216 – 960	200**	3
Above 960	500	3

\*\* Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this part, e.g. §§ 15.231 and 15.241.

FCC Part 15.205 (a) : Only spurious emissions are permitted in any of the frequency bands listed below :

MHz	MHz	MHz	MHz	GHz	GHz
0.009 – 0.110	8.41425 ~ 8.41475	108 ~ 121.94	1300 ~ 1427	4.5 ~ 5.15	14.47 ~ 14.5
0.495 – 0.505	12.29 ~ 12.293	123 ~ 138	1435 ~ 1626.5	5.35 ~ 5.46	15.35 ~ 16.2
2.1735 ~ 2.1905	12.51975 ~ 12.52025	149.9 ~ 150.05	1645.5 ~ 1646.5	7.25 ~ 7.75	17.7 ~ 21.4
4.125 ~ 4.128	12.57675 ~ 12.57725	156.52475 ~	1660 ~ 1710	8.025 ~ 8.5	22.01 ~ 23.12
4.17725 ~ 4.17775	13.36 ~ 13.41	156.52525	1718.8 ~ 1722.2	9.0 ~ 9.2	23.6 ~ 24.0
4.20725 ~ 4.20775	16.42 ~ 16.423	156.7 ~ 156.9	2200 ~ 2300	9.3 ~ 9.5	31.2 ~ 31.8
6.215 ~ 6.218	16.69475 ~ 16.69525	162.0125 ~	2310 ~ 2390	10.6 ~ 12.7	36.43 ~ 36.5
6.26775 ~ 6.26825	16.80425 ~ 16.80475	167.17	2483.5 ~ 2500	13.25 ~ 13.4	Above 38.6
6.31175 ~ 6.31225	25.5 ~ 25.67	167.72 ~ 173.2	2655 ~ 2900		
8.291 ~ 8.294	37.5 ~ 38.25	240 ~ 285	3260 ~ 3267		
8.362 ~ 8.366	73 ~ 74.6	322 ~ 335.4	3332 ~ 3339		
8.37625 ~ 8.38675	74.8 ~ 75.2	399.90 ~ 410	3345.8 ~ 3358		
		608 ~ 614	3600 ~ 4400		
		960 ~ 1240			

▪ FCC Part 15.205(b) : The field strength of emissions appearing within these frequency bands shall not exceed the limits shown in §15.209. At frequencies equal to or less than 1000 MHz, compliance with the limits in §15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1000 MHz, compliance with the emission limits in §15.209 shall be demonstrated based on the average value of the measured emissions. The provisions in §15.35 apply to these measurements.

---

**TEST PROCEDURE**

The EUT is placed on a non-conducting table 80 cm above the ground plane for below 1GHz and 150 cm for above 1GHz. The EUT is configured in accordance with ANSI C63.10. The EUT is set to transmit in a continuous mode.

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; the video bandwidth is set to 3 MHz for peak measurements.(Pre-scans to detect harmonic and spurious emissions, the resolution bandwidth is set to 1 MHz; the video bandwidth is set to 30 kHz for peak measurements.)

For band edge measurements above 1 GHz the resolution bandwidth is set to 1 MHz, then the video bandwidth is set to 3 MHz for peak measurements and 1/T (on time) for average measurement.

$$\text{GFSK} = 1/T = 1 / 0.002885\text{S} = 347\text{Hz}.$$

The minimum VBW was 347Hz, but test receiver(ESU40) couldn't set value 347Hz. Due to this reason, testing VBW was set to 500Hz(Worst cases).

The spectrum from 1GHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in the 2.4 GHz band.  
(From 30MHz to 1GHz, test was performed with the EUT set to transmit at the channel with highest output power)

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.

Note : Emission was pre-scanned from 9kHz to 30MHz; No emissions were detected which was at least 20dB below the specification limit (consider distance correction factor).  
Per FCC part 15.31(o), test results were not reported.

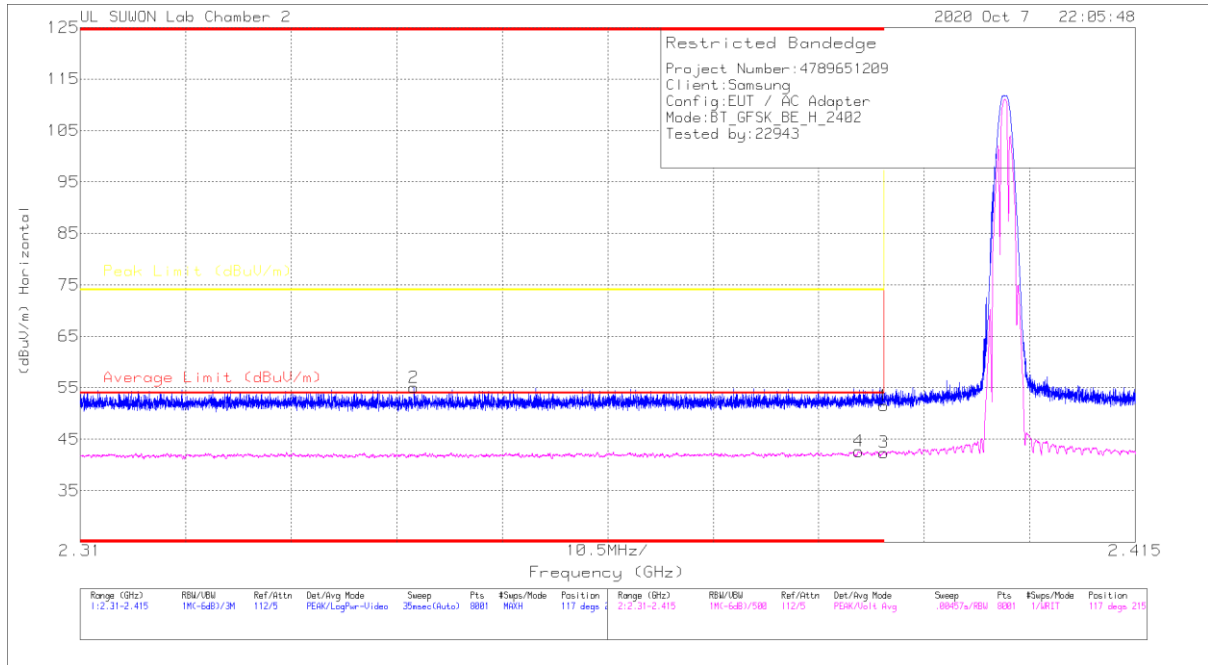
Although these tests were performed other than open field test site, adequate comparison measurements were confirmed against 30 m open are test site.  
Therefore sufficient tests were made to demonstrate that the alternative site produces results that correlate with the one of tests made in an open field based on KDB 414788.

## 10.1. TRANSMITTER ABOVE 1 GHz

### 10.1.1. BLUETOOTH BASIC DATA RATE GFSK MODULATION

#### BANDEDGE (0 CHANNEL)

#### HORIZONTAL RESULT



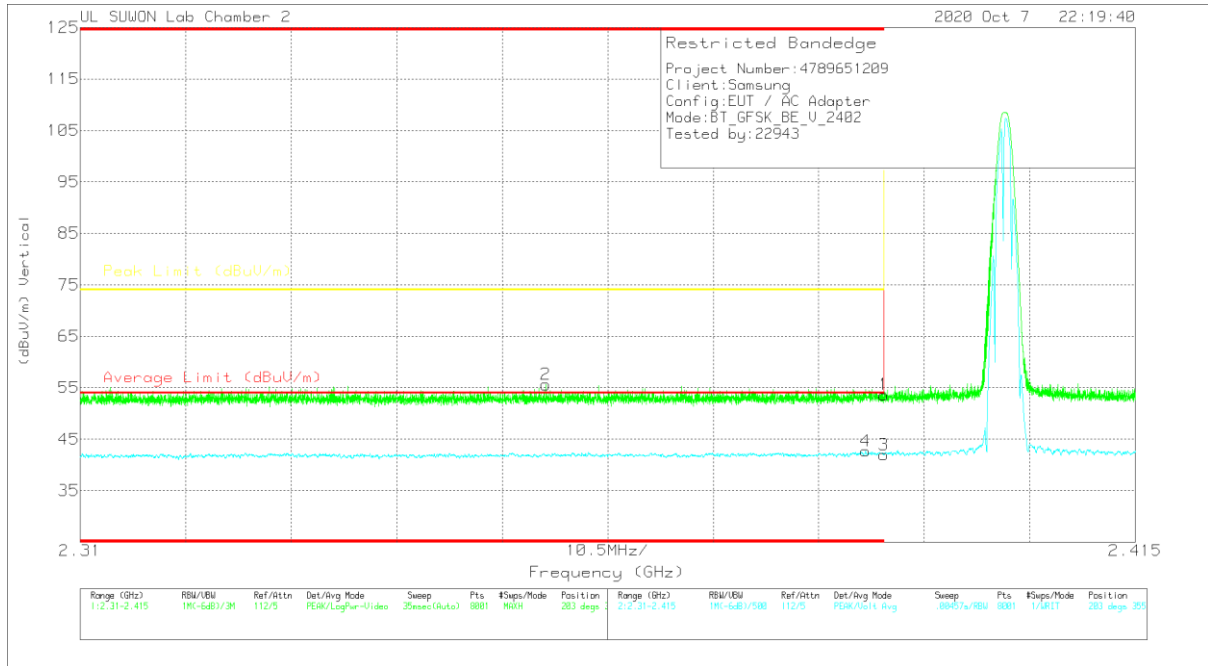
#### Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	3117_00168724	10dB_ATT[dB]	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.39	39.91	Pk	31.9	-20.3	51.51	-	-	74	-22.49	117	215	H
2	* 2.34322	43.75	Pk	31.8	-20.5	55.05	-	-	74	-18.95	117	215	H
3	* 2.39	30.8	VA1T	31.9	-20.3	42.4	54	-11.6	-	-	117	215	H
4	* 2.38746	30.95	VA1T	31.9	-20.2	42.65	54	-11.35	-	-	117	215	H

\* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band  
 Pk - Peak detector  
 VA1T - FHSS: Linear Voltage Average  $VB=1/Ton$  where: Ton is transmit duration



### VERTICAL RESULT



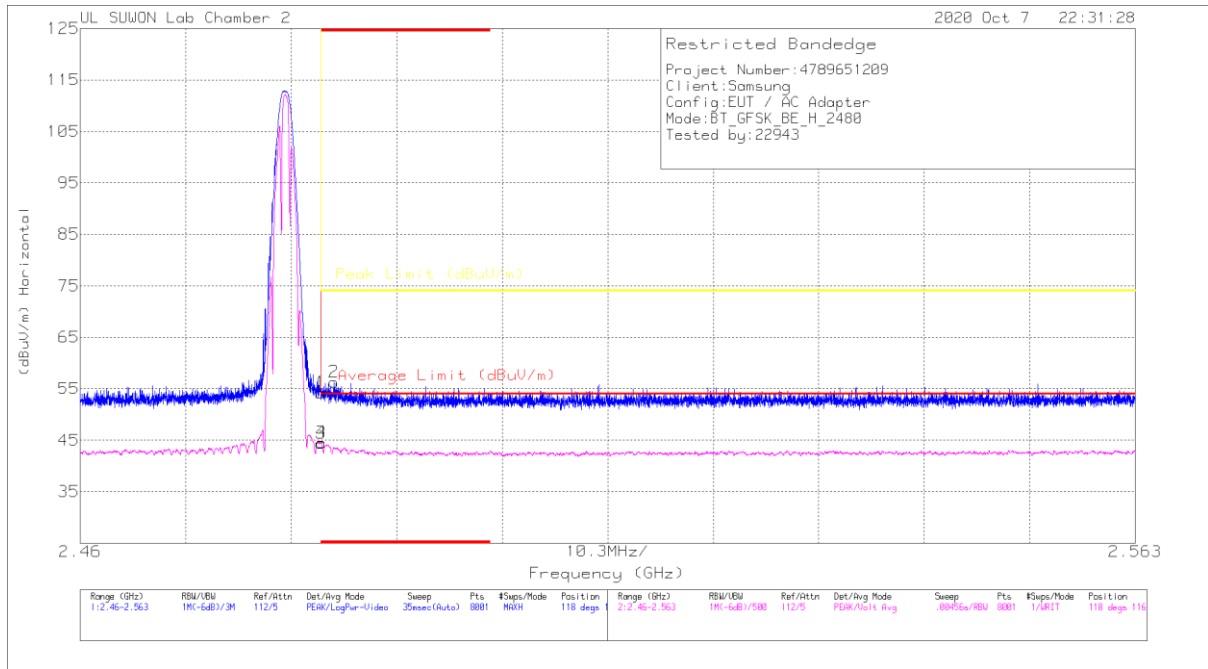
### Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	3117_00168724	10dB_ATT[dB]	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.39	42.04	PK	31.9	-20.3	53.64	-	-	74	-20.36	203	355	V
2	* 2.35633	44.23	PK	31.8	-20.4	55.63	-	-	74	-18.37	203	355	V
3	* 2.39	30.35	VA1T	31.9	-20.3	41.95	54	-12.05	-	-	203	355	V
4	* 2.38815	30.99	VA1T	31.9	-20.2	42.69	54	-11.31	-	-	203	355	V

\* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band  
 PK - Peak detector  
 VA1T - FHSS: Linear Voltage Average VB=1/Ton where: Ton is transmit duration

**BANDEDGE (78 CHANNEL)**

**HORIZONTAL RESULT**

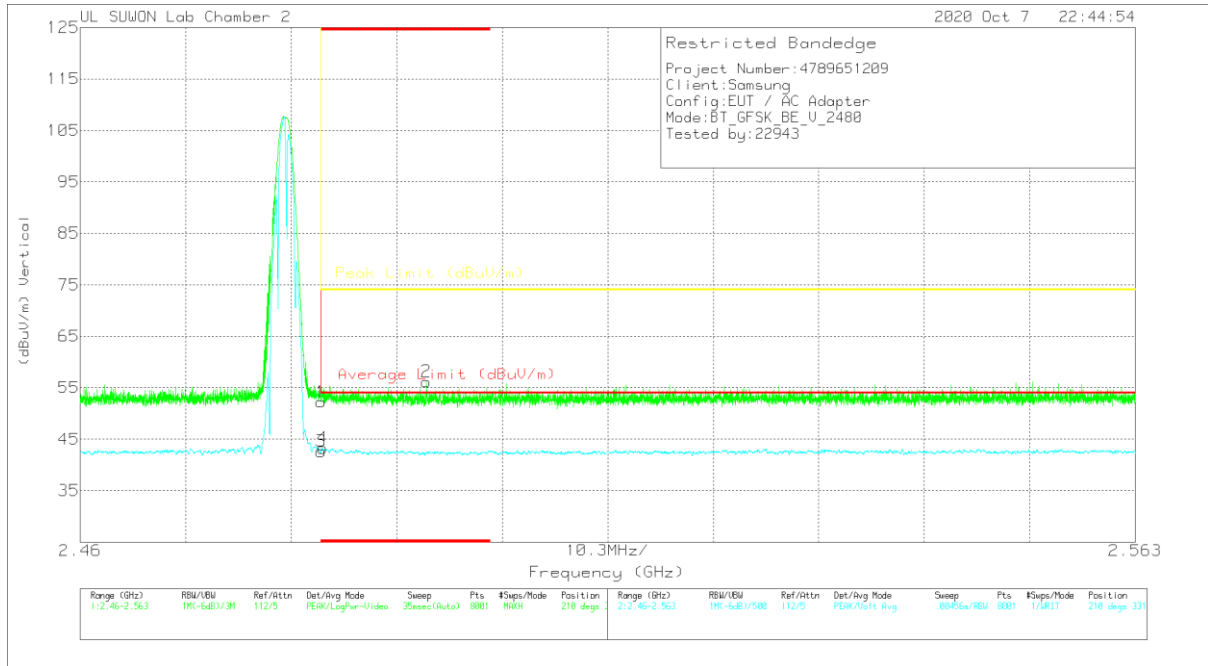


**Trace Markers**

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	3117_00168724	10dB_ATT[dB]	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.48351	42.44	Pk	32	-20.2	54.24	-	-	74	-19.76	118	116	H
2	* 2.4848	44.5	Pk	32	-20.2	56.3	-	-	74	-17.7	118	116	H
3	* 2.48351	32.66	VA1T	32	-20.2	44.46	54	-9.54	-	-	118	116	H
4	* 2.48354	32.79	VA1T	32	-20.2	44.59	54	-9.41	-	-	118	116	H

\* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band  
 Pk - Peak detector  
 VA1T - FHSS: Linear Voltage Average VB=1/Ton where: Ton is transmit duration

### VERTICAL RESULT

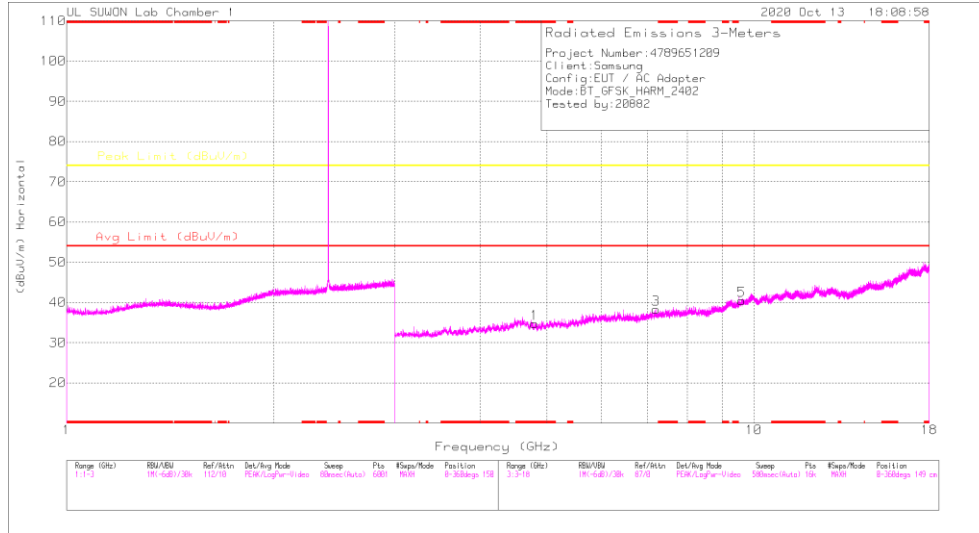


### Trace Markers

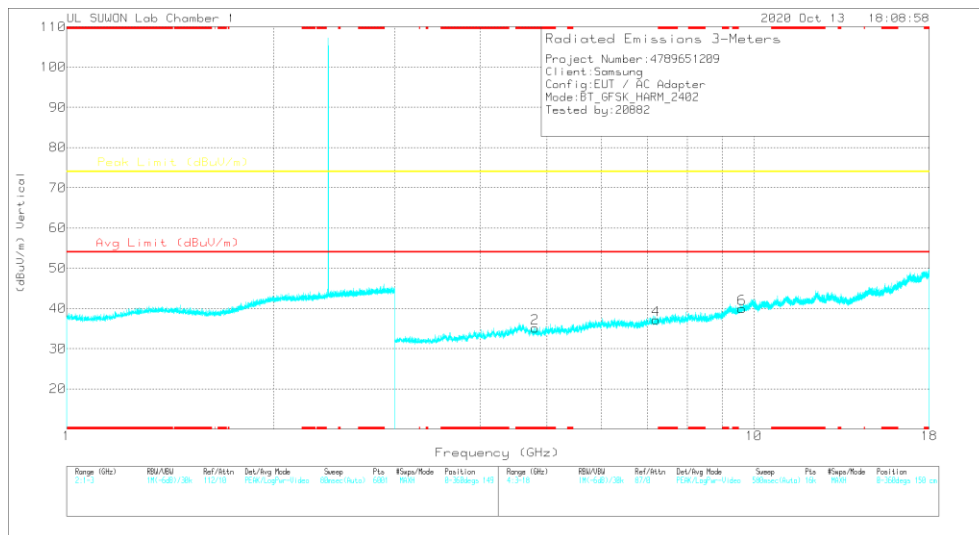
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	3117_00168724	10dB_ATT[dB]	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.48351	40.42	PK	32	-20.2	52.22	-	-	74	-21.78	210	331	V
2	* 2.49381	44.3	PK	32.1	-20.2	56.2	-	-	74	-17.8	210	331	V
3	* 2.48351	30.86	VA1T	32	-20.2	42.66	54	-11.34	-	-	210	331	V
4	* 2.48365	31.46	VA1T	32	-20.2	43.26	54	-10.74	-	-	210	331	V

\* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band  
 PK - Peak detector  
 VA1T - FHSS: Linear Voltage Average VB=1/Ton where: Ton is transmit duration

## HARMONICS AND SPURIOUS EMISSIONS 0 CHANNEL RESULTS



**HORIZONTAL**



**VERTICAL**

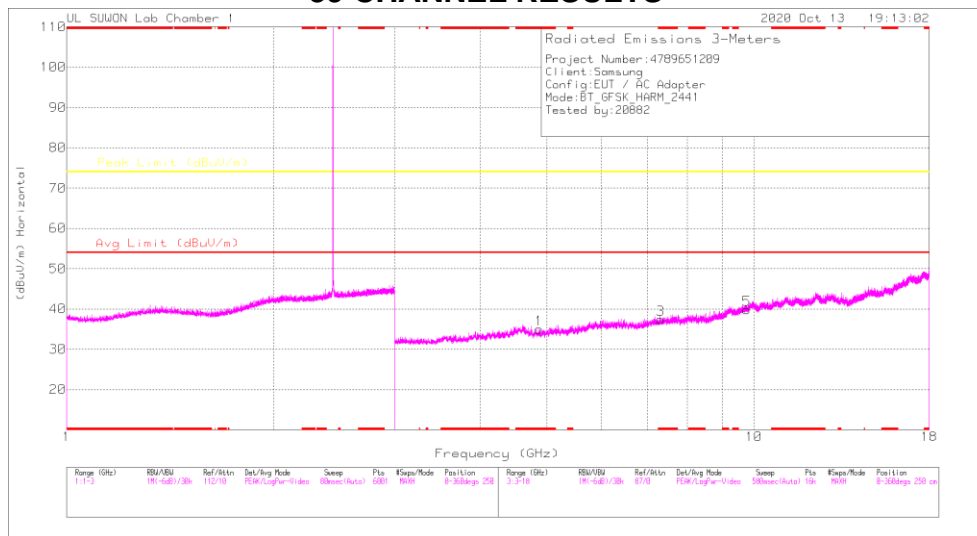
### RADIATED EMISSIONS

Frequency (GHz)	Meter Reading (dBuV)	Det	3117_00168717	3GHz_HP[dB]	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
* 4.79611	39.08	PKFH	34.1	-31.5	41.68	-	-	74	-32.32	360	100	H
* 4.80278	39.93	PKFH	34.1	-31.4	42.63	-	-	74	-31.37	360	100	V
7.20711	35.4	PKFH	35.9	-27.7	43.6	-	-	74	-30.4	360	100	H
7.20796	35.55	PKFH	35.9	-27.7	43.75	-	-	74	-30.25	360	100	V
9.6087	33.25	PKFH	37.1	-23	47.35	-	-	74	-26.65	360	100	H
9.60857	33.5	PKFH	37.1	-23	47.6	-	-	74	-26.4	360	100	V

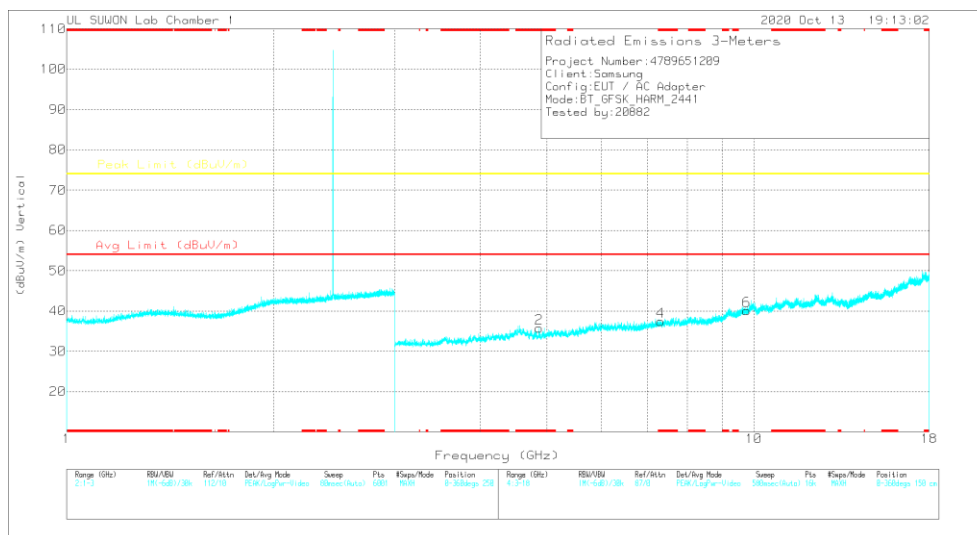
\* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

PKFH FHSS/BT RB=100k for Frequencies<1GHz / RB=1MHz for Frequencies>1GHz, VB=3 x RB, Peak

### 39 CHANNEL RESULTS



### HORIZONTAL



### VERTICAL

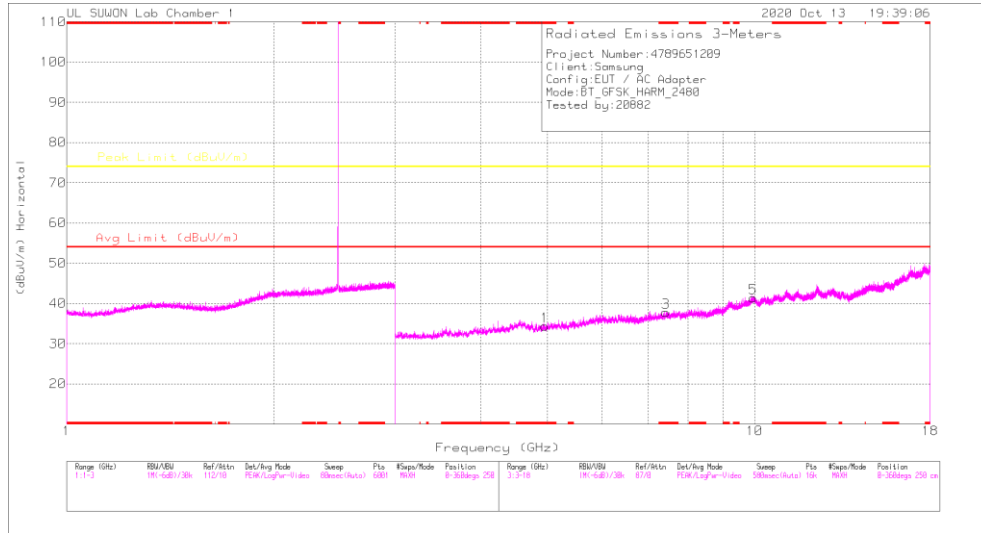
### RADIATED EMISSIONS

Frequency (GHz)	Meter Reading (dBuV)	Det	3117_00168717	3GHz_HP(dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
* 4.87548	39.26	PKFH	34.1	-31.3	42.06	-	-	74	-31.94	360	100	H
* 4.87249	39.03	PKFH	34.1	-31.3	41.83	-	-	74	-32.17	360	100	V
* 7.321	36.86	PKFH	35.8	-27.4	45.26	-	-	74	-28.74	360	100	H
* 7.31934	36.19	PKFH	35.8	-27.2	44.79	-	-	74	-29.21	360	100	V
9.7663	33.85	PKFH	37.4	-23.8	47.45	-	-	74	-26.55	360	100	H
9.76614	32.96	PKFH	37.4	-23.7	46.66	-	-	74	-27.34	360	100	V

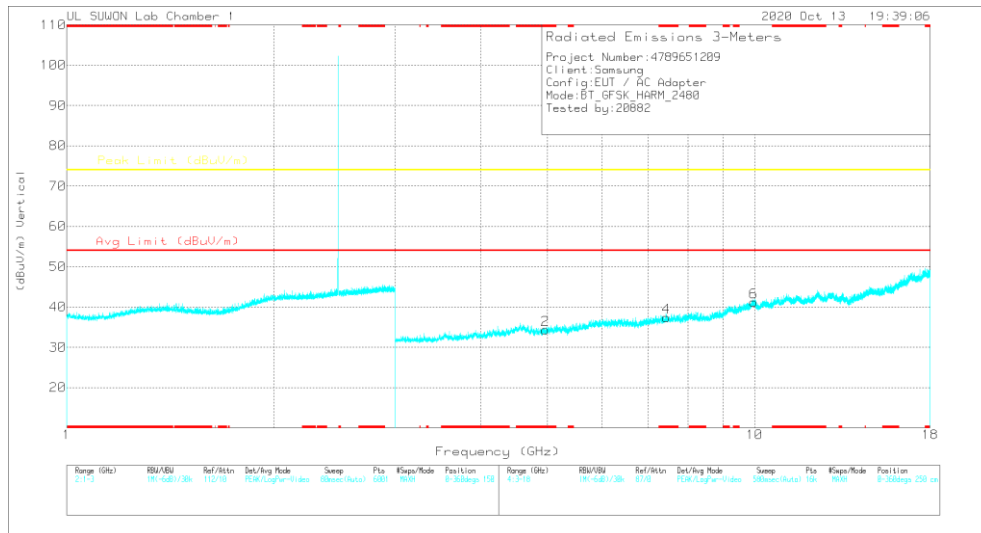
\* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

PKFH FHSS/BT RB=100k for Frequencies<1GHz / RB=1MHz for Frequencies>1GHz, VB=3 x RB, Peak

### 78 CHANNEL RESULTS



### HORIZONTAL



### VERTICAL

### RADIATED EMISSIONS

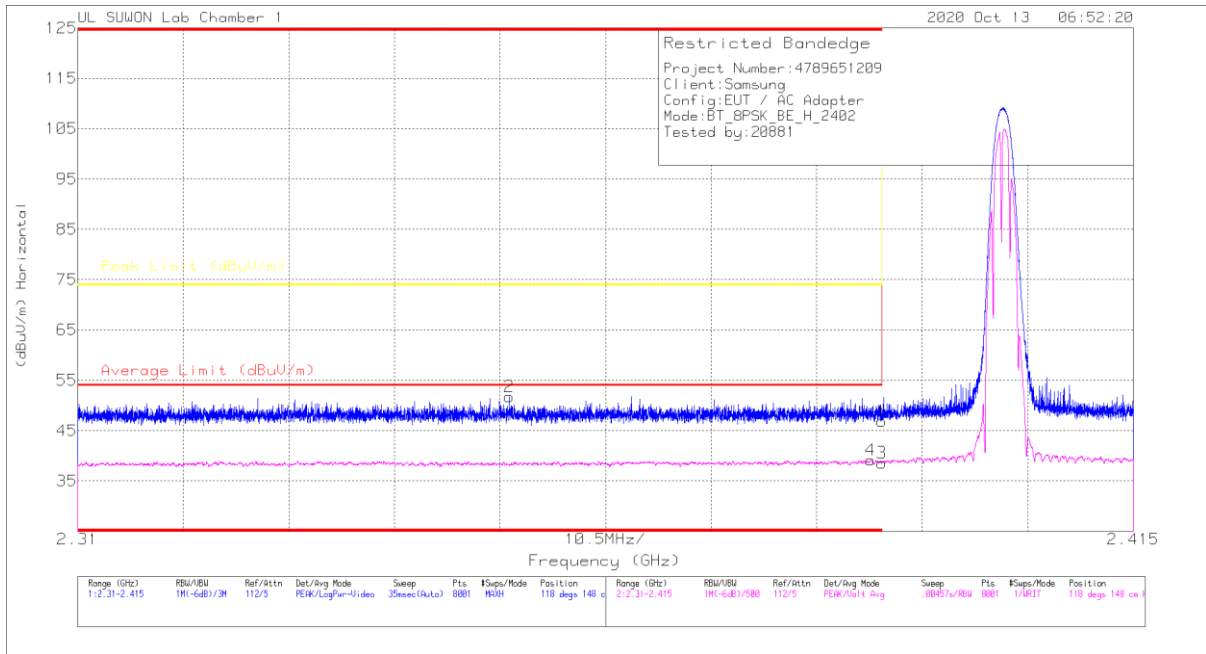
Frequency (GHz)	Meter Reading (dBuV)	Det	3117_00168717	3GHz_HP(dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
* 4.95464	39.29	PKFH	34.1	-31.5	41.89	-	-	74	-32.11	360	100	H
* 4.96138	38.53	PKFH	34.1	-31.5	41.13	-	-	74	-32.87	360	100	V
* 7.43801	36.63	PKFH	35.8	-26.8	45.63	-	-	74	-28.37	360	100	H
* 7.43929	36.11	PKFH	35.8	-26.8	45.11	-	-	74	-28.89	360	100	V
9.92012	32.26	PKFH	37.7	-21.6	48.36	-	-	74	-25.64	360	100	H
9.91892	31.84	PKFH	37.7	-21.6	47.94	-	-	74	-26.06	360	100	V

\* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band  
 PKFH FHSS/BT RB=100k for Frequencies<1GHz / RB=1MHz for Frequencies>1GHz, VB=3 x RB, Peak

## 10.1.2. BLUETOOTH ENHANCED DATA RATE 8PSK MODULATION

### BANDEDGE (0 CHANNEL)

### HORIZONTAL RESULT

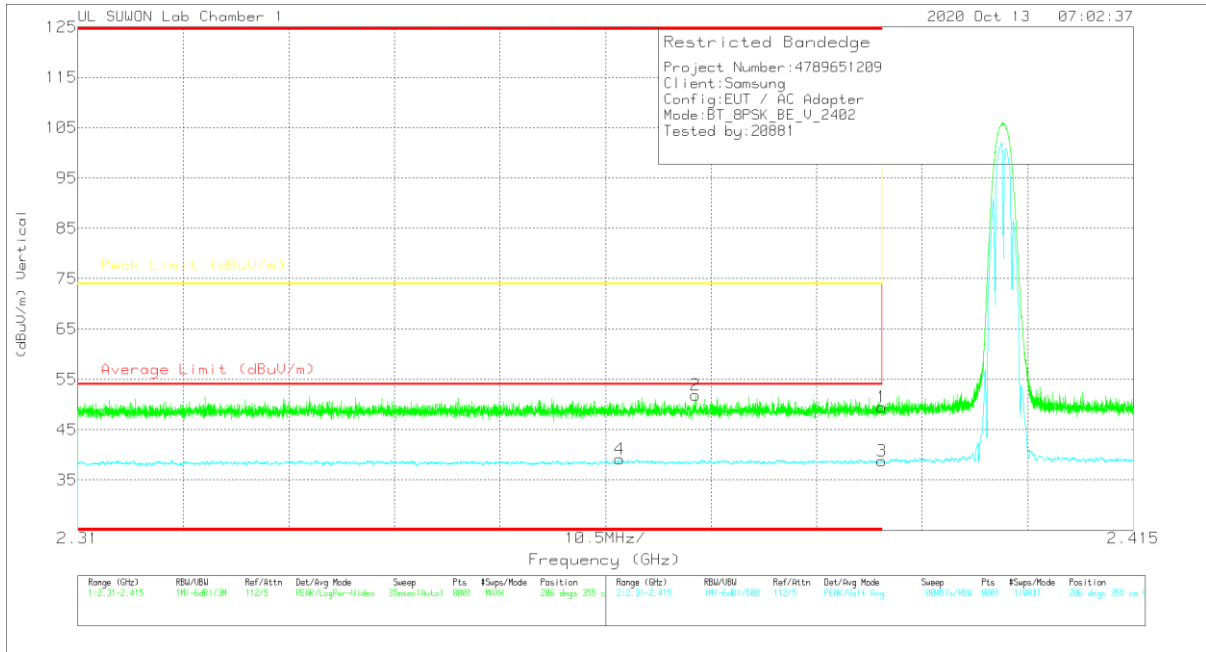


### Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	3117_00168717	10dB_ATT[dB]	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.39	40.71	Pk	31.8	-25.6	46.91	-	-	74	-27.09	118	148	H
2	* 2.35292	45.79	Pk	31.7	-25.7	51.79	-	-	74	-22.21	118	148	H
3	* 2.39	32.4	VA1T	31.8	-25.6	38.6	54	-15.4	-	-	118	148	H
4	* 2.38886	32.89	VA1T	31.8	-25.5	39.19	54	-14.81	-	-	118	148	H

\* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band  
 Pk - Peak detector  
 VA1T - FHSS: Linear Voltage Average VB=1/Ton where: Ton is transmit duration

### VERTICAL RESULT



### Trace Markers

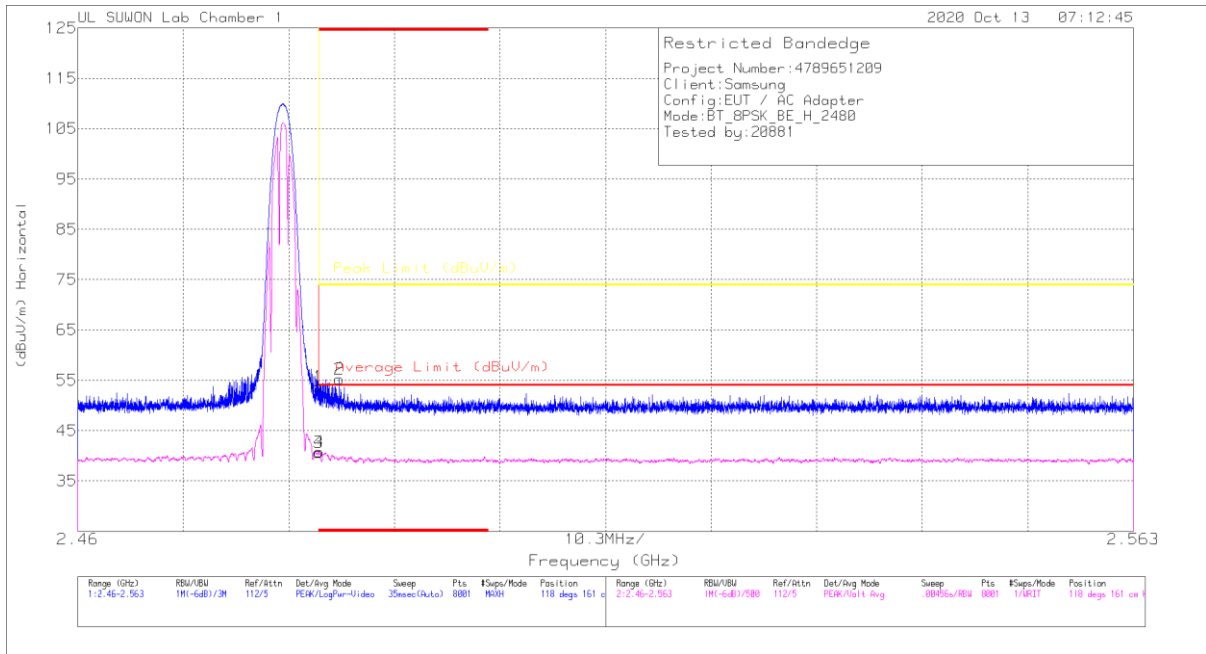
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	3117_00168717	10dB_ATT[dB]	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.39	43.27	Pk	31.8	-25.6	49.47	-	-	74	-24.53	206	355	V
2	* 2.37148	45.8	Pk	31.7	-25.6	51.9	-	-	74	-22.1	206	355	V
3	* 2.39	32.55	VA1T	31.8	-25.6	38.75	54	-15.25	-	-	206	355	V
4	* 2.36389	33.04	VA1T	31.7	-25.6	39.14	54	-14.86	-	-	206	355	V

\* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band  
 Pk - Peak detector  
 VA1T - FHSS: Linear Voltage Average VB=1/Ton where: Ton is transmit duration



**BANDEDGE (78 CHANNEL)**

**HORIZONTAL RESULT**

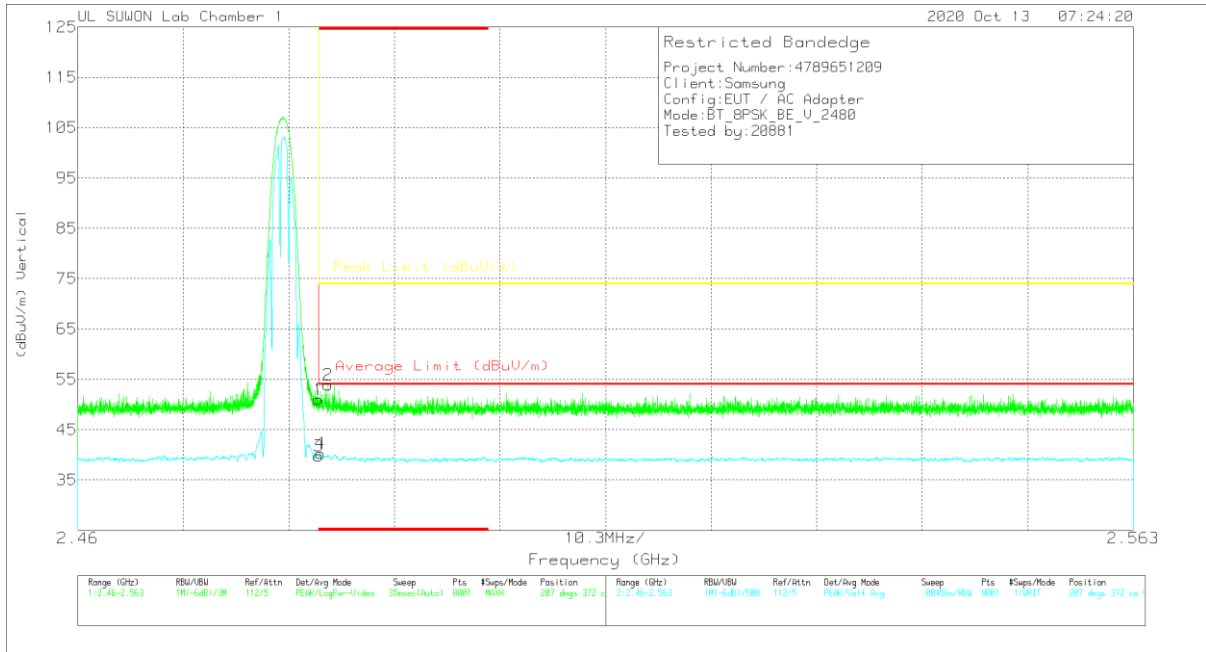


**Trace Markers**

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	3117_00168717	10dB_ATT[dB]	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.48351	47.09	Pk	32	-25.3	53.79	-	-	74	-20.21	118	161	H
2	* 2.48551	48.52	Pk	32	-25.3	55.22	-	-	74	-18.78	118	161	H
3	* 2.48351	34	VA1T	32	-25.3	40.7	54	-13.3	-	-	118	161	H
4	* 2.48356	34.11	VA1T	32	-25.3	40.81	54	-13.19	-	-	118	161	H

\* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band  
 Pk - Peak detector  
 VA1T - FHSS: Linear Voltage Average VB=1/Ton where: Ton is transmit duration

### VERTICAL RESULT

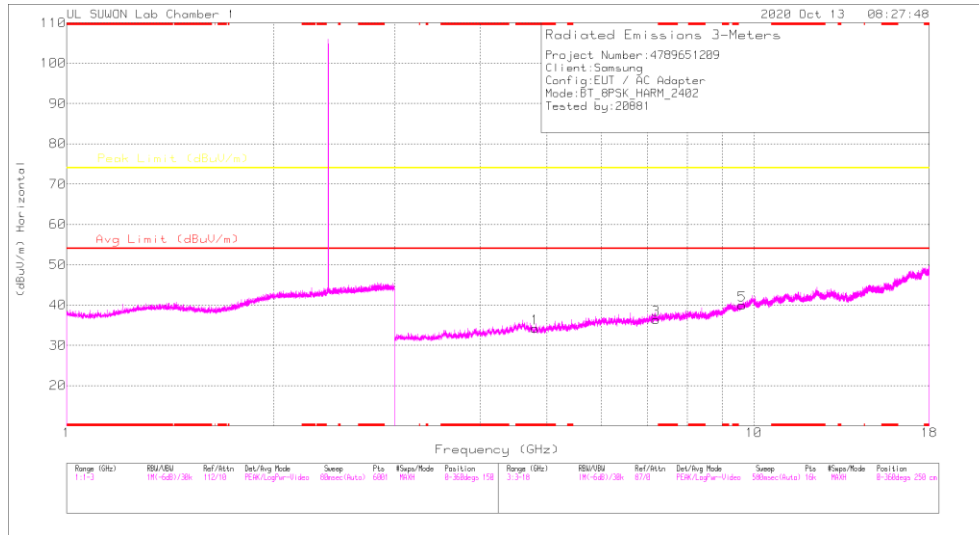


### Trace Markers

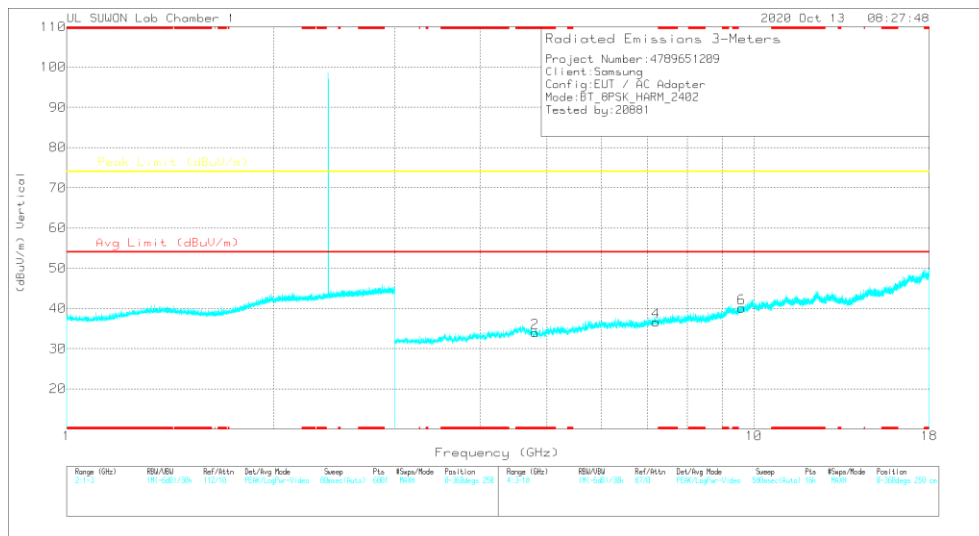
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	3117_00168717	10dB_ATT[dB]	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.48351	44.26	Pk	32	-25.3	50.96	-	-	74	-23.04	207	372	V
2	* 2.48444	47.08	Pk	32	-25.2	53.88	-	-	74	-20.12	207	372	V
3	* 2.48351	33.11	VA1T	32	-25.3	39.81	54	-14.19	-	-	207	372	V
4	* 2.48365	33.54	VA1T	32	-25.3	40.24	54	-13.76	-	-	207	372	V

\* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band  
 Pk - Peak detector  
 VA1T - FHSS: Linear Voltage Average VB=1/Ton where: Ton is transmit duration

## HARMONICS AND SPURIOUS EMISSIONS 0 CHANNEL RESULTS



**HORIZONTAL**



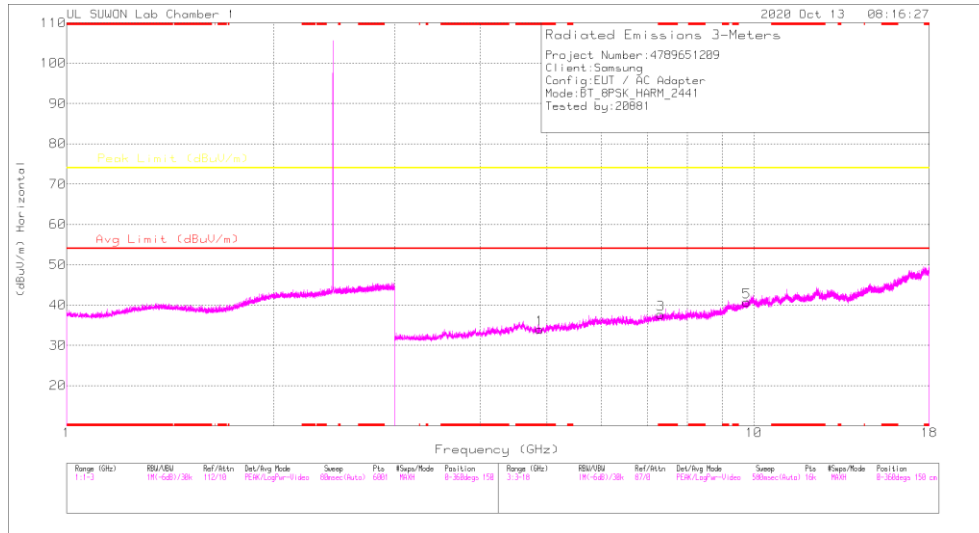
**VERTICAL**

### RADIATED EMISSIONS

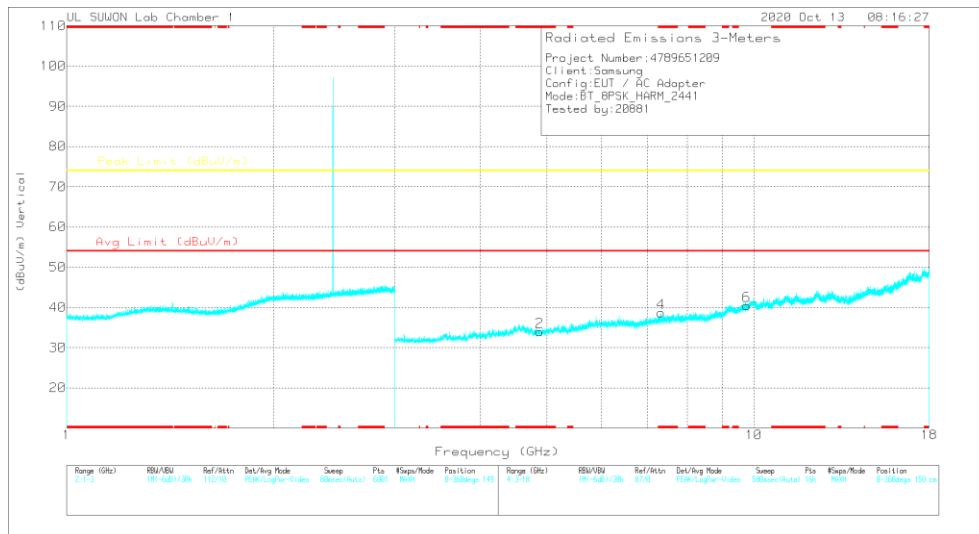
Frequency (GHz)	Meter Reading (dBuV)	Det	3117_00168717	3GHz_HP[dB]	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
* 4.80258	39.15	PKFH	34.1	-31.4	41.85	-	-	74	-32.15	360	100	H
* 4.80468	39.56	PKFH	34.1	-31.5	42.16	-	-	74	-31.84	360	100	V
7.20749	35.77	PKFH	35.9	-27.7	43.97	-	-	74	-30.03	360	100	H
7.2044	35.94	PKFH	35.9	-27.6	44.24	-	-	74	-29.76	360	100	V
9.60804	35.4	PKFH	37.1	-23	49.5	-	-	74	-24.5	360	100	H
9.60609	33.06	PKFH	37.1	-23	47.16	-	-	74	-26.84	360	100	V

\* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band  
 PKFH FHSS/BT RB=100k for Frequencies<1GHz / RB=1MHz for Frequencies>1GHz, VB=3 x RB, Peak

### 39 CHANNEL RESULTS



### HORIZONTAL



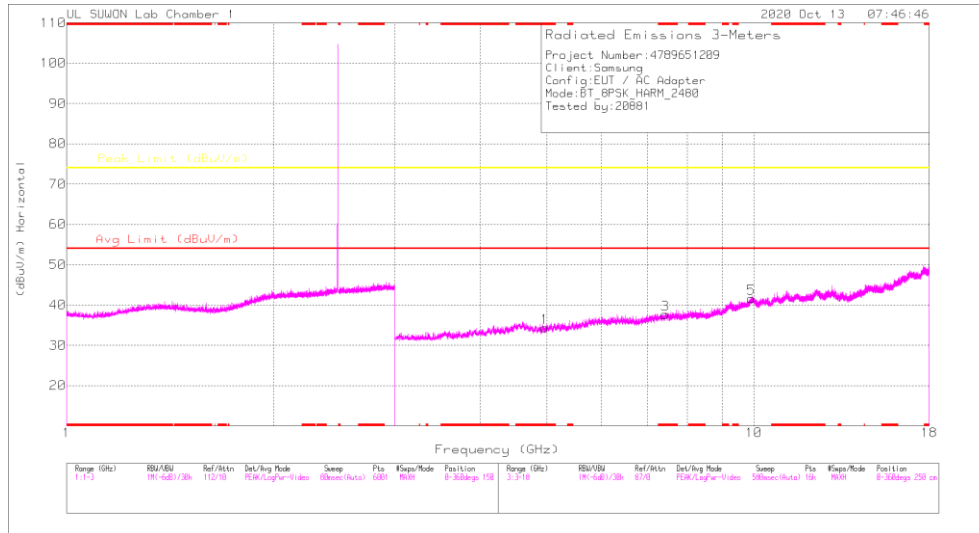
### VERTICAL

### RADIATED EMISSIONS

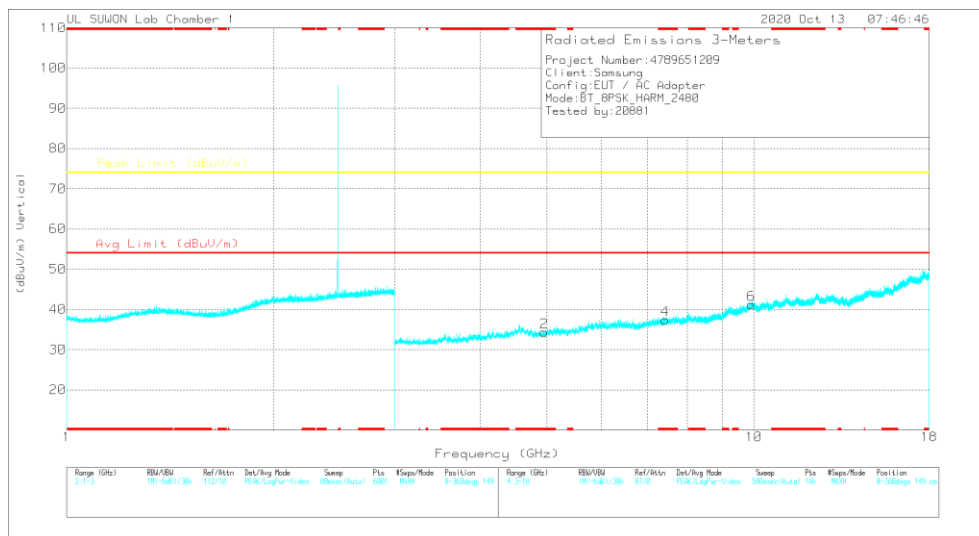
Frequency (GHz)	Meter Reading (dBuV)	Det	3117_00168717	3GHz_HP[dB]	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
* 4.88183	39.1	PKFH	34.1	-31.3	41.9	-	-	74	-32.1	360	100	H
* 4.88193	39.36	PKFH	34.1	-31.3	42.16	-	-	74	-31.84	360	100	V
* 7.32404	35.93	PKFH	35.8	-27.3	44.43	-	-	74	-29.57	360	100	H
* 7.32239	36.04	PKFH	35.8	-27.3	44.54	-	-	74	-29.46	360	100	V
9.76339	33.91	PKFH	37.4	-23.7	47.61	-	-	74	-26.39	360	100	H
9.7645	33.77	PKFH	37.4	-23.7	47.47	-	-	74	-26.53	360	100	V

\* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band  
 PKFH FHSS/BT RB=100k for Frequencies<1GHz / RB=1MHz for Frequencies>1GHz, VB=3 x RB, Peak

### 78 CHANNEL RESULTS



### HORIZONTAL



### VERTICAL

### RADIATED EMISSIONS

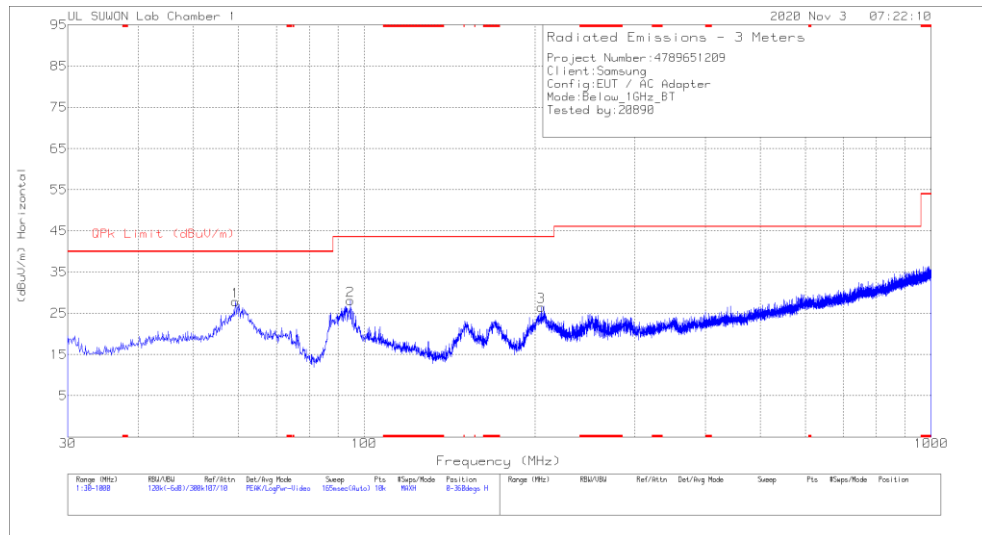
Frequency (GHz)	Meter Reading (dBuV)	Det	3117_00168717	3GHz_HP[dB]	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
* 4.96015	38.14	PKFH	34.1	-31.5	40.74	-	-	74	-33.26	360	100	H
* 4.9591	39.09	PKFH	34.1	-31.4	41.79	-	-	74	-32.21	360	100	V
* 7.43969	35.54	PKFH	35.8	-26.8	44.54	-	-	74	-29.46	360	100	H
* 7.43978	35.84	PKFH	35.8	-26.8	44.84	-	-	74	-29.16	360	100	V
9.91803	33.38	PKFH	37.7	-21.6	49.48	-	-	74	-24.52	360	100	H
9.91852	32.6	PKFH	37.7	-21.6	48.7	-	-	74	-25.3	360	100	V

\* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

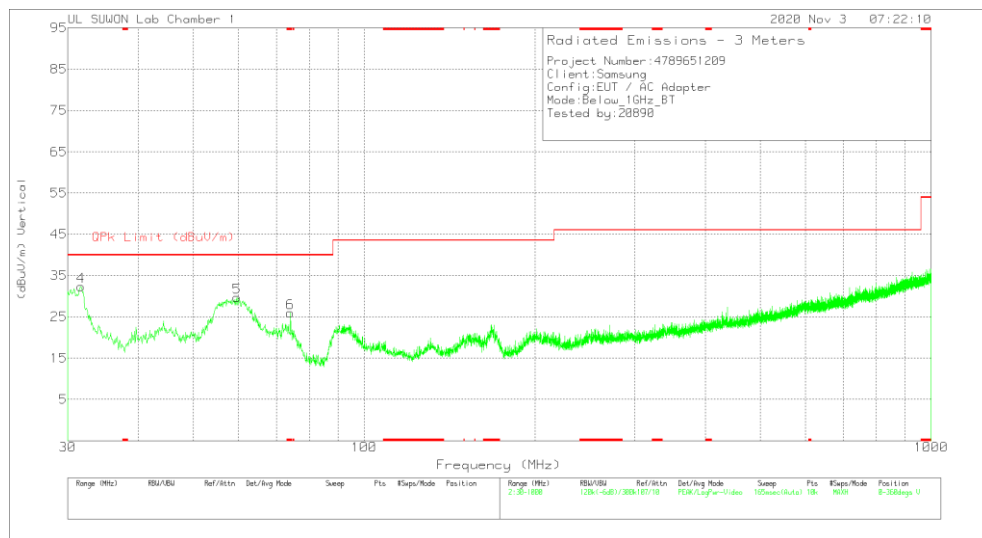
PKFH FHSS/BT RB=100k for Frequencies<1GHz / RB=1MHz for Frequencies>1GHz, VB=3 x RB, Peak

## 10.2. WORST CASE BELOW 1 GHZ

### SPURIOUS EMISSIONS 30 TO 1000 MHz (WORST-CASE CONFIGURATION)



**HORIZONTAL**



**VERTICAL**

#### Below 1GHz Data

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	VULB9163_750	Below_1G[dB]	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	59.294	39.34	Pk	18.7	-30.2	27.84	40	-12.16	0-360	400	H
2	94.505	41.42	Pk	16.5	-29.8	28.12	43.52	-15.4	0-360	300	H
3	205.376	38.45	Pk	16.6	-28.5	26.55	43.52	-16.97	0-360	200	H
4	31.649	48	Pk	15.6	-31.2	32.4	40	-7.6	0-360	100	V
5	59.682	41.18	Pk	18.7	-30.2	29.68	40	-10.32	0-360	100	V
6	* 74.135	42.31	Pk	13.7	-30	26.01	40	-13.99	0-360	300	V

Pk - Peak detector

## 11. AC POWER LINE CONDUCTED EMISSIONS

### LIMITS

FCC §15.207 (a)

RSS-Gen 8.8

Frequency of Emission (MHz)	Conducted Limit (dBuV)	
	Quasi-peak	Average
0.15-0.5	66 to 56	56 to 46
0.5-5	56	46
5-30	60	50

\*Decreases with the logarithm of the frequency.

### TEST PROCEDURE

The EUT is placed on a non-conducting table 40 cm from the vertical ground plane and 80 cm above the horizontal ground plane. The EUT is configured in accordance with ANSI C63.4.

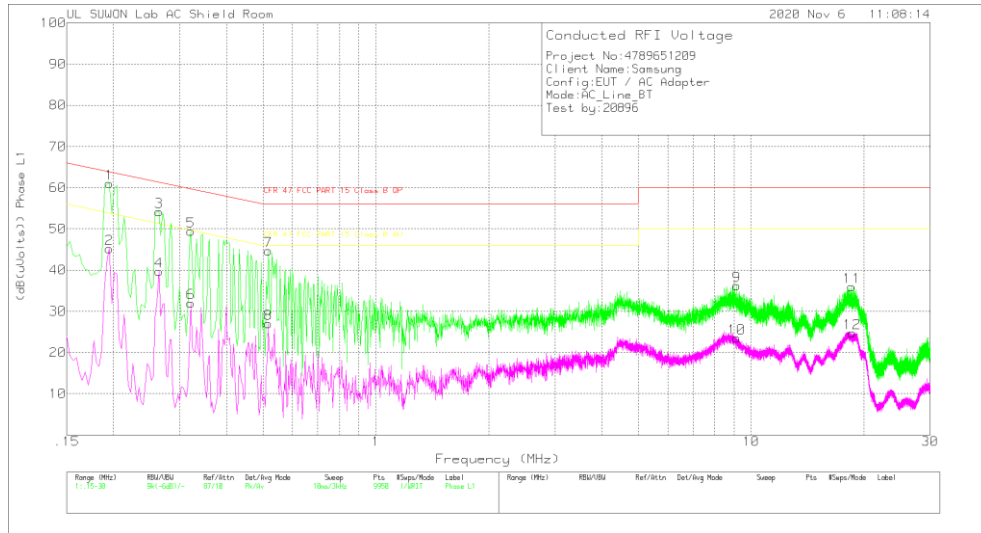
The receiver is set to a resolution bandwidth of 9 kHz. Peak detection is used unless otherwise noted as quasi-peak or average.

Line conducted data is recorded for both NEUTRAL and HOT lines.

### RESULTS

### 11.1.1. AC Power Line Host

#### LINE 1 RESULTS



#### Trace Markers

Range 1: Phase L1 .15 - 30MHz

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	101836_With h EX_L1[dB]	CABLELOS S(dB)	Corrected Reading (dB(uVolts))	CFR 47 FCC PART 15 Class B QP	Margin (dB)	CFR 47 FCC PART 15 Class B AV	Margin (dB)
1	.195	50.93	Pk	9.9	.2	61.03	63.82	-2.79	-	-
2	.195	35.05	Av	9.9	.2	45.15	-	-	53.82	-8.67
3	.264	44.24	Pk	9.7	.2	54.14	61.3	-7.16	-	-
4	.264	29.76	Av	9.7	.2	39.66	-	-	51.3	-11.64
5	.321	39.43	Pk	9.8	.2	49.43	59.68	-10.25	-	-
6	.321	22.05	Av	9.8	.2	32.05	-	-	49.68	-17.63
7	.516	34.61	Pk	9.9	.2	44.71	56	-11.29	-	-
8	.516	16.95	Av	9.9	.2	27.05	-	-	46	-18.95
9	9.165	25.95	Pk	9.9	.4	36.25	60	-23.75	-	-
10	9.141	13.23	Av	9.9	.4	23.53	-	-	50	-26.47
11	18.558	25.35	Pk	10.2	.4	35.95	60	-24.05	-	-
12	18.582	14.13	Av	10.2	.4	24.73	-	-	50	-25.27

Pk - Peak detector

Av - Average detection

#### Quasi-Peak Emissions

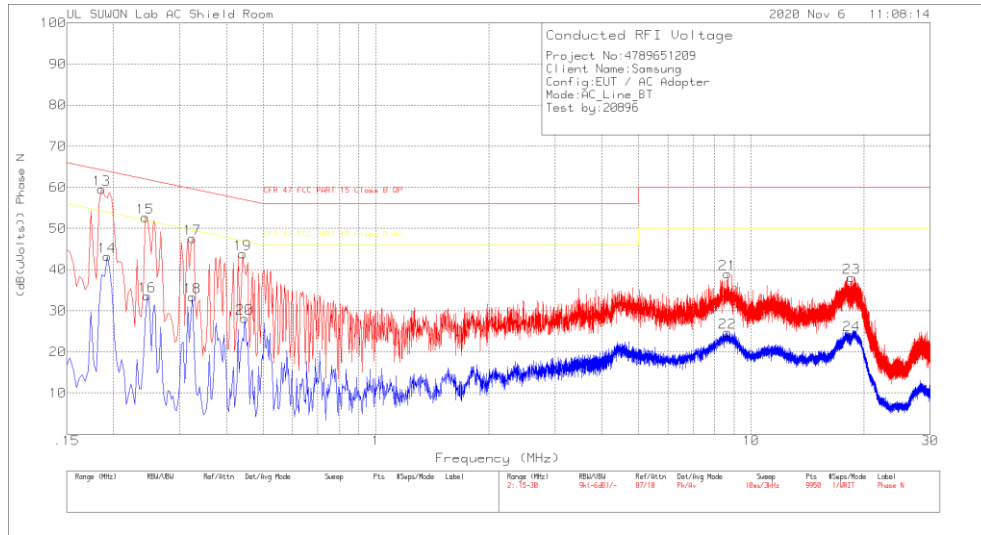
Range 1: Phase L1 .15 - 30MHz

Frequency (MHz)	Meter Reading (dBuV)	Det	101836_With h EX_L1[dB]	CABLELOS S(dB)	Corrected Reading (dB(uVolts))	CFR 47 FCC PART 15 Class B QP	Margin (dB)	CFR 47 FCC PART 15 Class B AV	Margin (dB)
.19425	40.84	Qp	9.9	.2	50.94	63.85	-12.91	-	-
.26475	33.55	Qp	9.7	.2	43.45	61.28	-17.83	-	-

Qp - Quasi-Peak detector



### LINE 2 RESULTS



#### Trace Markers

Range 2: Phase N .15 - 30MHz

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	101836_With EX_N[dB]	CABLELOS S(dB)	Corrected Reading (dB(uVolts))	CFR 47 FCC PART 15 Class B QP	Margin (dB)	CFR 47 FCC PART 15 Class B AV	Margin (dB)
13	.186	49.37	Pk	10	.2	59.57	64.21	-4.64	-	-
14	.192	33.09	Av	9.9	.2	43.19	-	-	53.95	-10.76
15	.243	42.73	Pk	9.7	.2	52.63	61.99	-9.36	-	-
16	.246	23.73	Av	9.7	.2	33.63	-	-	51.89	-18.26
17	.324	37.52	Pk	9.8	.2	47.52	59.6	-12.08	-	-
18	.324	23.41	Av	9.8	.2	33.41	-	-	49.6	-16.19
19	.441	33.73	Pk	9.9	.2	43.83	57.04	-13.21	-	-
20	.447	18.08	Av	9.9	.2	28.18	-	-	46.93	-18.75
21	8.652	28.72	Pk	9.9	.3	38.92	60	-21.08	-	-
22	8.64	14.54	Av	9.9	.3	24.74	-	-	50	-25.26
23	18.528	27.49	Pk	10.2	.4	38.09	60	-21.91	-	-
24	18.531	13.5	Av	10.2	.4	24.1	-	-	50	-25.9

Pk - Peak detector

Av - Average detection

#### Quasi-Peak Emissions

Range 2: Phase N .15 - 30MHz

Frequency (MHz)	Meter Reading (dBuV)	Det	101836_With EX_N[dB]	CABLELOS S(dB)	Corrected Reading (dB(uVolts))	CFR 47 FCC PART 15 Class B QP	Margin (dB)	CFR 47 FCC PART 15 Class B AV	Margin (dB)
.18525	41.84	Qp	10	.2	52.04	64.25	-12.21	-	-
.24375	34.32	Qp	9.7	.2	44.22	61.97	-17.75	-	-

Qp - Quasi-Peak detector

## END OF TEST REPORT