



# **CERTIFICATION TEST REPORT**

**Report Number.** : 4790558569-E5V2

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

**Model** : SM-A236V

**FCC ID** : A3LSMA236V

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

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

**Date Of Issue:**

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Revision History

<u>Rev.</u>	<u>Issue Date</u>	<u>Revisions</u>	<u>Revised By</u>
V1	2022-11-11	Initial issue	Minju Cha
V2	2022-11-24	Updated to address TCB's question	Minju Cha

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# 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 and NFC

**MODEL:** SM-A236V

**SERIAL NUMBER:** 664a0edc42347ece, 664a125001347ece (CONDUCTED);  
664a1250e6347ece, 664a124c06347ece (RADIATED);

**DATE TESTED:** 2022-09-06 ~ 2022-11-11;

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:



Seokhwan Hong  
Suwon Lab Engineer  
UL Korea, Ltd.

Tested By:



Minju Cha  
Suwon Lab Technician  
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(3m semi-anechoic chamber)
<input checked="" type="checkbox"/>	Chamber 2(3m semi-anechoic chamber)
<input checked="" type="checkbox"/>	Chamber 3(3m semi-anechoic chamber)
<input type="checkbox"/>	Chamber 4(3m Full-anechoic chamber)
<input type="checkbox"/>	Chamber 5(3m Full-anechoic chamber)

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:

$$\text{Field Strength (dBuV/m)} = \text{Measured Voltage (dBuV)} + \text{Antenna Factor (dB/m)} + \text{Cable Loss (dB)} - \text{Preamp Gain (dB)}$$

$$36.5 \text{ dBuV} + 18.7 \text{ dB/m} + 0.6 \text{ dB} - 26.9 \text{ dB} = 28.9 \text{ dBuV/m}$$

$$\text{AC Corrected Reading (dBuV)} = \text{Measured Voltage (dBuV)} + \text{Extension Cord Loss (dB)} + \text{Cable Loss (dB)}$$

$$44.72 \text{ dBuV} = 34.72 \text{ dBuV} + 9.9 \text{ dB} + 0.1 \text{ dB}$$

### 4.3. 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	3.02 dB
Radiated Disturbance, 30 MHz to 1 GHz	4.05 dB
Radiated Disturbance, 1 GHz to 18 GHz	5.78 dB
Radiated Disturbance, 18 GHz to 40 GHz	5.58 dB

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

### 4.4. DECISION RULES

Decision rule for statement(s) of conformity is based on Procedure 2, Clause 4.4.3 in IEC Guide 115:2021.

## 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 and NFC.  
This test report addresses the BT(DSS) operational mode.

### 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	Peak	15.687	37.042
		Average	15.211	33.197
	Enhanced Pi/4-DPSK	Peak	13.679	23.329
		Average	11.443	13.941
	Enhanced 8PSK	Peak	13.944	24.797
		Average	11.462	14.002

### 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 antennas with ANT maximum gain of -4.51 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.

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	R37MANQ1E72SE3	N/A
Data Cable	SAMSUNG	EP-DN980	GH39-02115A BWE	N/A
Earphone	SAMSUNG	GH59-15055A	EHS64AVFWE	N/A

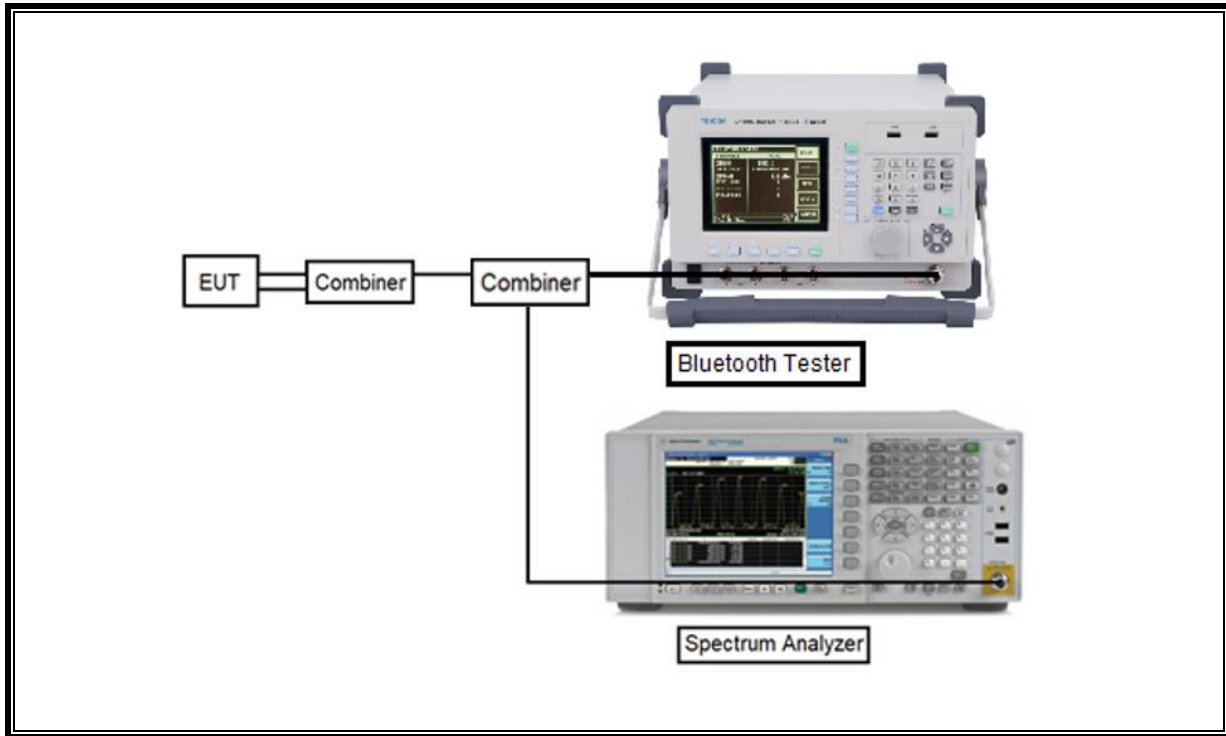
### I/O CABLE

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
2	Audio	2	Mini-Jack	Unshielded	0.7 m	N/A

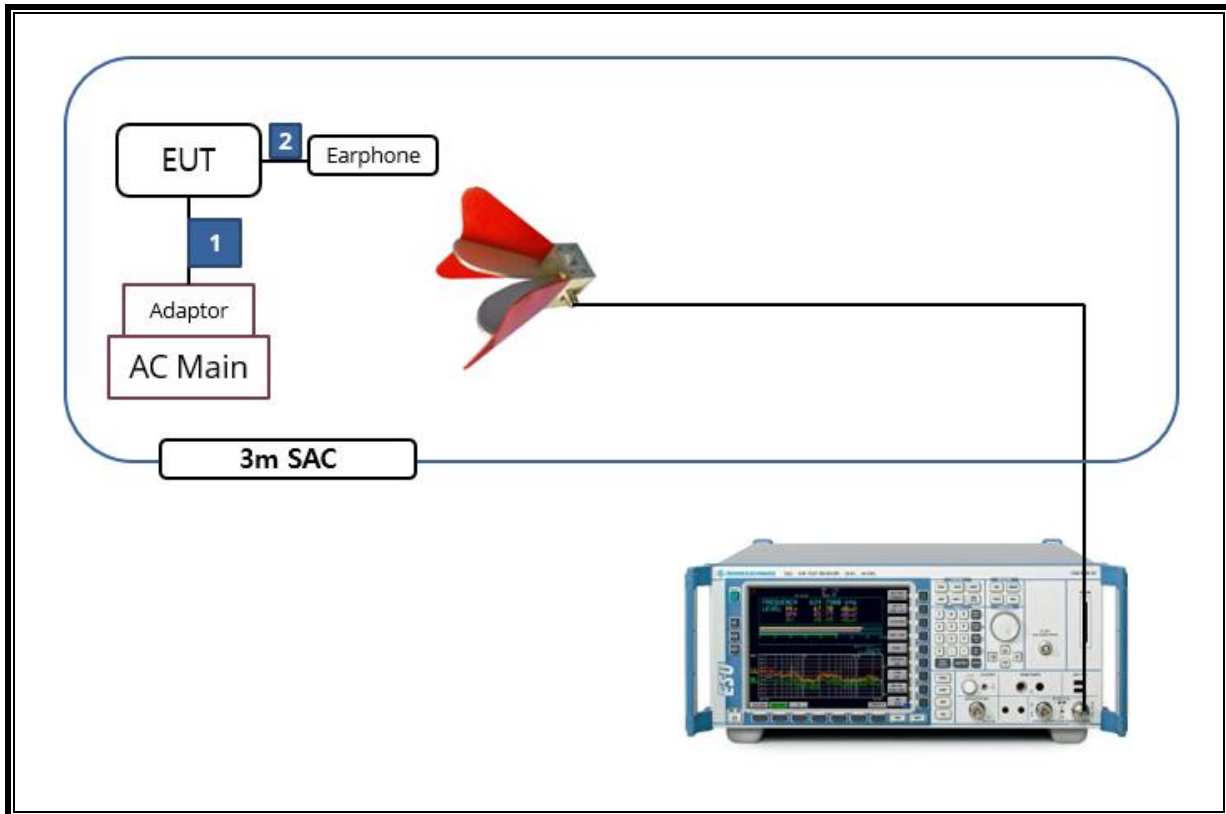
### TEST SETUP

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	2024-08-15
Antenna, Bilog, 30MHz-1GHz	SCHWARZBECK	VULB9163	749	2024-08-15
Antenna, Bilog, 30MHz-1GHz	SCHWARZBECK	VULB9163	845	2024-08-15
Antenna, Loop, 9kHz-30MHz	R&S	HFH2-Z2	100418	2023-10-06
Antenna, Horn, 18 GHz	ETS	3115	00167211	2024-08-04
Antenna, Horn, 18 GHz	ETS	3115	00161451	2024-08-21
Antenna, Horn, 18 GHz	ETS	3117	00168724	2024-08-04
Antenna, Horn, 18 GHz	ETS	3117	00168717	2024-08-21
Antenna, Horn, 40 GHz	ETS	3116C	00166155	2024-08-02
Preamplifier	ETS	3116C-PA	00168841	2023-08-04
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	2023-08-02
Preamplifier, 1000 MHz	Sonoma	310N	351741	2023-08-02
Preamplifier, 1000 MHz	Sonoma	310N	370599	2023-08-02
Preamplifier, 18 GHz	Miteq	AFS42-00101800-25-S-42	1876511	2023-08-02
Preamplifier, 18 GHz	Miteq	AFS42-00101800-25-S-42	1896138	2023-08-01
Preamplifier, 18 GHz	Miteq	AFS42-00101800-25-S-42	2029169	2023-08-01
Spectrum Analyzer, 44 GHz	Agilent / HP	N9030A	MY54170614	2023-08-03
Spectrum Analyzer, 44 GHz	Agilent / HP	N9030A	MY54490312	2023-08-01
Spectrum Analyzer, 44 GHz	KEYSIGHT	N9030B	MY60070693	2023-01-18
Spectrum Analyzer, 44 GHz	KEYSIGHT	N9040B	MY60080268	2023-01-19
Average Power Sensor	Agilent / HP	U2000	MY54270007	2023-08-03
Average Power Sensor	Agilent / HP	U2000	MY54260010	2023-08-03
Bluetooth Tester	TESCOM	TC-3000C	3000C000546	2023-08-02
Power Splitter	MINI-CIRCUITS	WA1534	UL003	2023-01-11
Power Splitter	MINI-CIRCUITS	WA1534	UL004	2023-01-11
Attenuator	PASTERNAK	PE7087-10	A009	2023-08-03
Attenuator	PASTERNAK	PE7087-10	A001	2023-08-03
Attenuator	PASTERNAK	PE7087-10	A008	2023-08-03
Attenuator	PASTERNAK	PE7004-10	2	2023-08-01
EMI Test Receive, 40 GHz	R&S	ESU40	100439	2023-08-02
EMI Test Receive, 40 GHz	R&S	ESU40	100457	2023-07-29
Low Pass Filter 5GHz	Micro-Tronics	LPS17541	009	2023-08-02
Low Pass Filter 5GHz	Micro-Tronics	LPS17541	015	2023-08-01
Low Pass Filter 5GHz	Micro-Tronics	LPS17541	020	2023-08-01
High Pass Filter 3GHz	Micro-Tronics	HPM17543	010	2023-08-02
High Pass Filter 3GHz	Micro-Tronics	HPM17543	015	2023-08-01
High Pass Filter 3GHz	Micro-Tronics	HPM17543	020	2023-08-01
High Pass Filter 6GHz	Micro-Tronics	HPS17542	009	2023-08-02
High Pass Filter 6GHz	Micro-Tronics	HPS17542	016	2023-08-01
High Pass Filter 6GHz	Micro-Tronics	HPS17542	021	2023-08-01
LISN	R&S	ENV-216	101837	2023-08-04
Termination	WEINSCHEL	M1406A	T09	2023-08-03
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	-20 dBc	Conducted	PASS
15.247 (b)(1)	TX conducted output power	< 21 dBm		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	< 8 dBm		PASS
15.207(a)	AC Power Line conducted emissions	Section 11	Power Line conducted	PASS
15.205, 15.209	Radiated Spurious Emission	< 54dBuV/m(Av)	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>					
BDR	2.878	3.752	76.706	1.152	0.347
EDR	2.885	3.756	76.810	1.146	0.347

## 9.2. 20 dB BANDWIDTH

### LIMITS

None; for reporting purposes only.

### TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer. The nominal IF filter bandwidth (3 dB RBW) shall be in the range of 1% to 5% of the OBW and video bandwidth (VBW) shall be approximately three times RBW, unless otherwise specified by the applicable requirement. The sweep time is coupled.

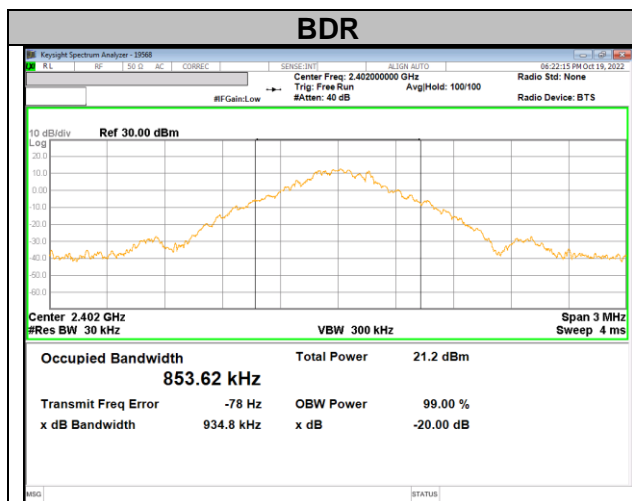
### RESULTS

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

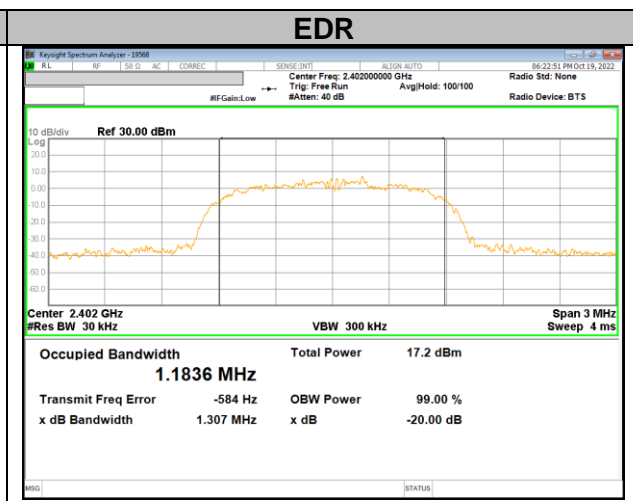
Channel	Frequency [MHz]	20 dB Bandwidth [kHz]
0	2 402	934.8
39	2 441	937.1
78	2 480	940.1
<b>Worst</b>		<b>934.8</b>

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

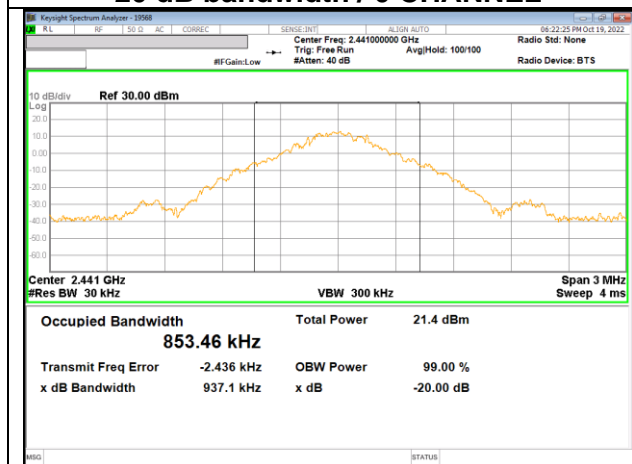
Channel	Frequency [MHz]	20 dB Bandwidth [kHz]
0	2 402	1307.0
39	2 441	1314.0
78	2 480	1308.0
<b>Worst</b>		<b>1307.0</b>



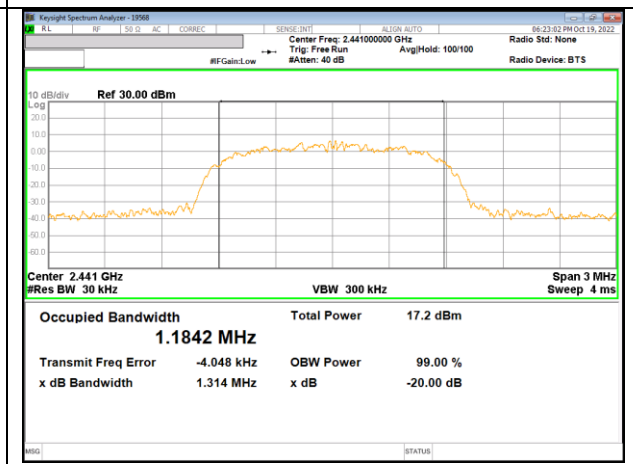
**20 dB bandwidth / 0 CHANNEL**



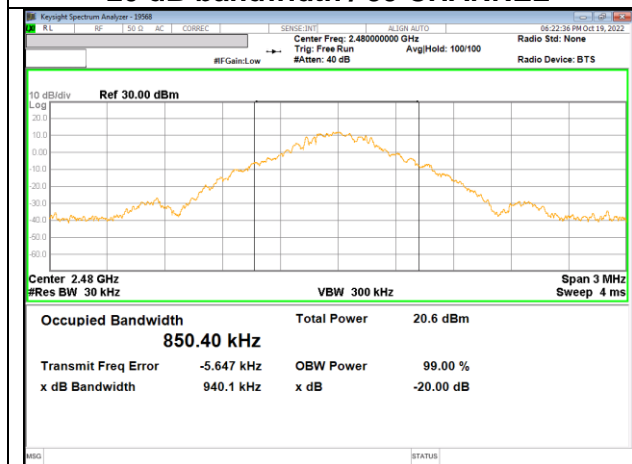
**20 dB bandwidth / 0 CHANNEL**



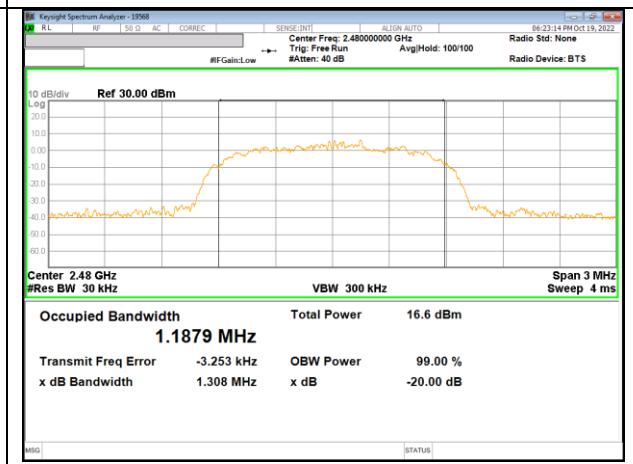
**20 dB bandwidth / 39 CHANNEL**



**20 dB bandwidth / 39 CHANNEL**



**20 dB bandwidth / 78 CHANNEL**



**20 dB bandwidth / 78 CHANNEL**



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

#### **LIMITS**

FCC §15.247 (a) (1)

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

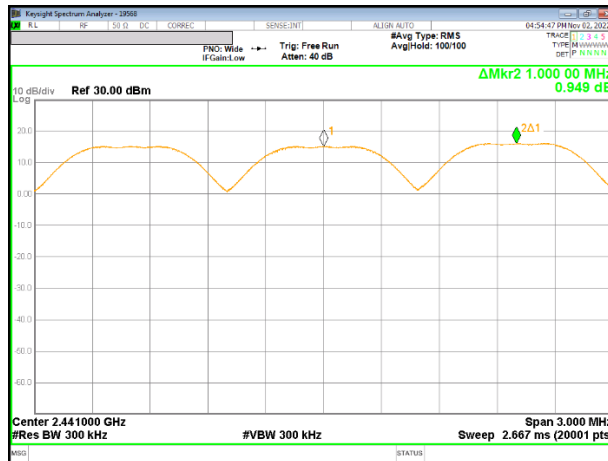
Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than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

#### **TEST PROCEDURE**

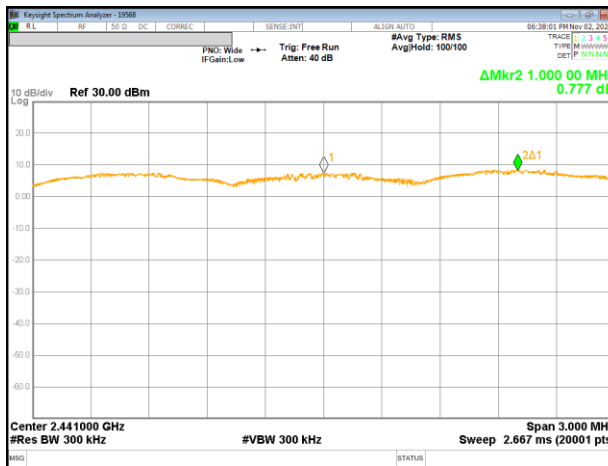
The transmitter output is connected to a spectrum analyzer. Start with the RBW set to approximately 30% of the channel spacing; adjust as necessary to best identify the center of each individual channel. The VBW is set to  $VBW \geq RBW$ . The sweep time is coupled.

#### **RESULTS**

### 9.3.1. BLUETOOTH BASIC DATA RATE GFSK MODULATION



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



## 9.4. NUMBER OF HOPPING CHANNELS

### LIMITS

FCC §15.247 (a) (1) (iii)

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

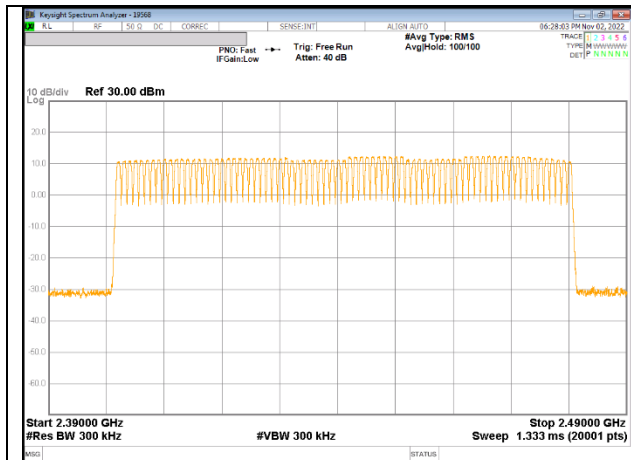
### TEST PROCEDURE

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. To identify clearly the individual channels, set the RBW to less than 30% of the channel spacing or the 20 dB bandwidth, whichever is smaller. The analyzer is set to Max Hold.

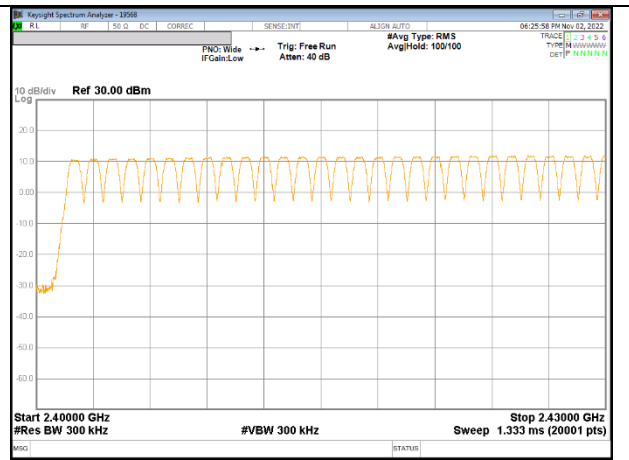
### RESULTS

Normal Mode: All Channels Observed

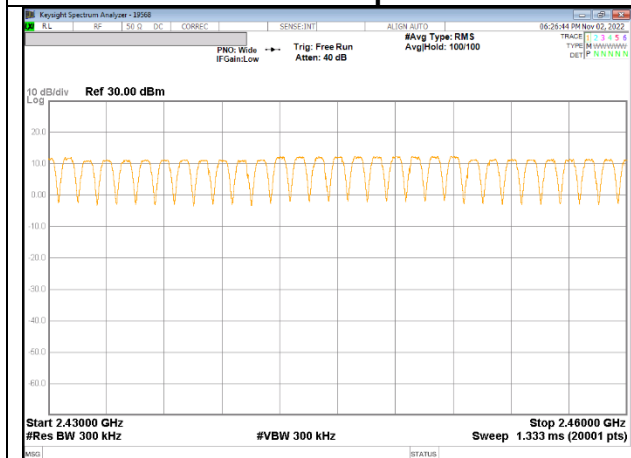
### 9.4.1. BLUETOOTH BASIC DATA RATE GFSK MODULATION



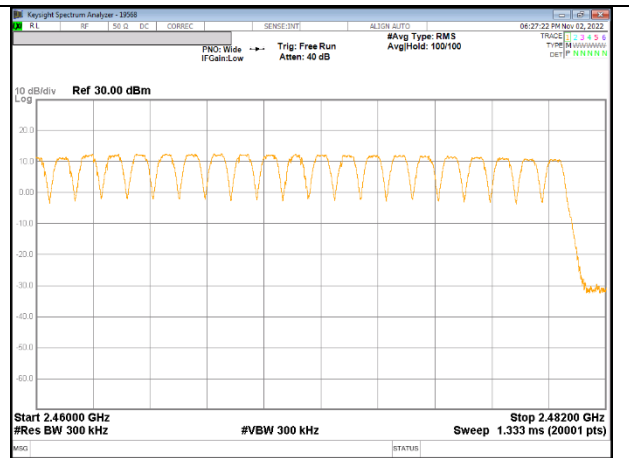
100 MHz Span



30MHz SPAN, SEGMENT 1 OF 3

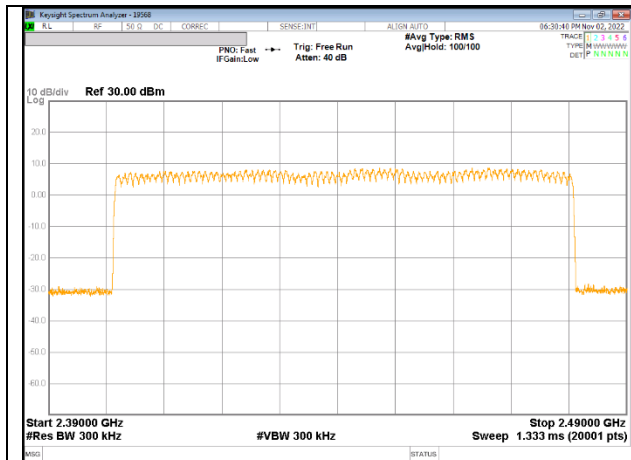


30MHz SPAN, SEGMENT 2 OF 3

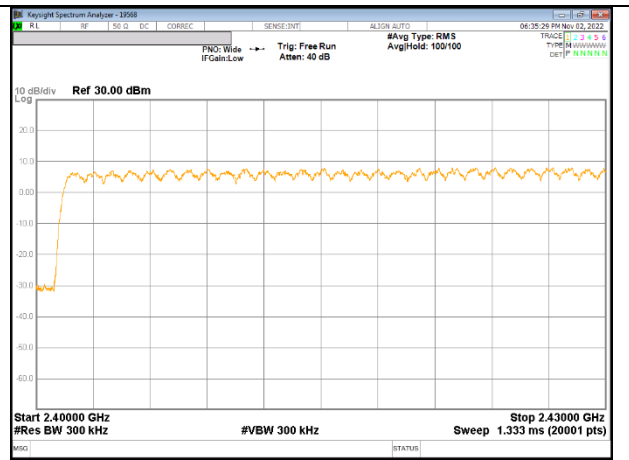


30MHz SPAN, SEGMENT 3 OF 3

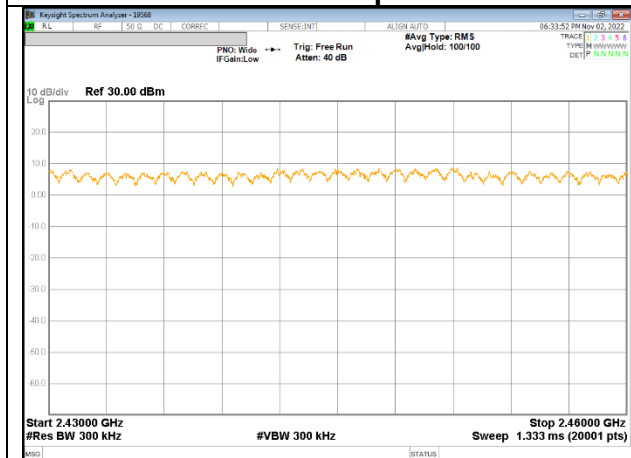
### 9.4.2. BLUETOOTH ENHANCED DATA RATE 8PSK MODULATION



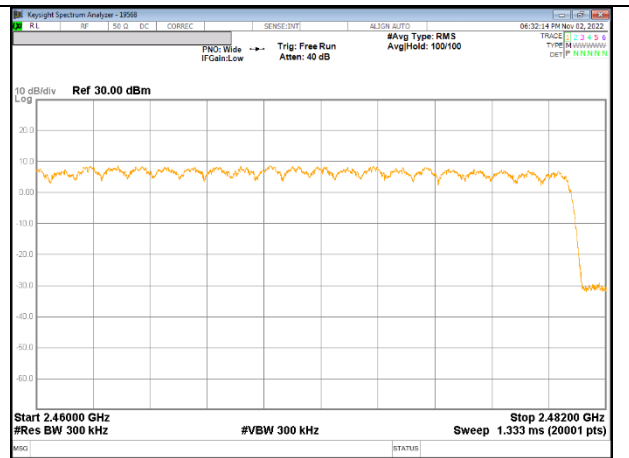
100 MHz Span



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)

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.

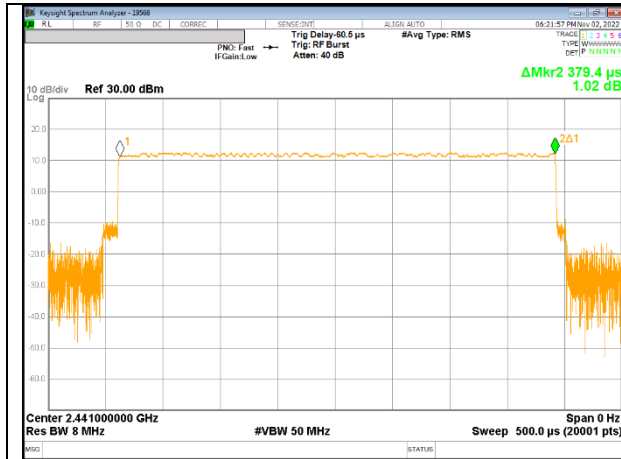
The average time of occupancy in the specified 3.16 second period (79 channels \* 0.4 s) is equal to  $10 * (\# \text{ of pulses in } 3.16 \text{ s}) * \text{ pulse width}$ .

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

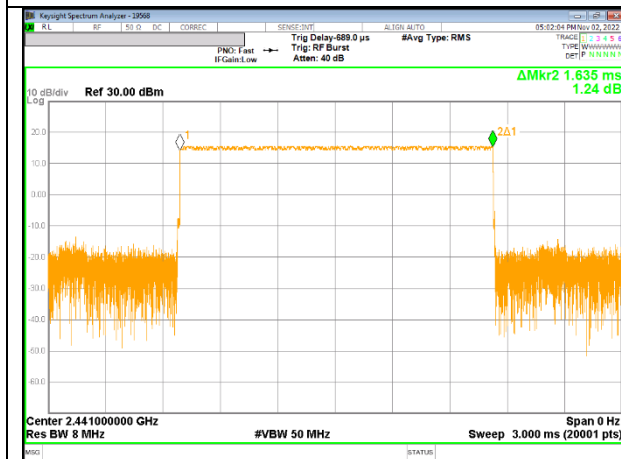
DH Packet	Pulse Width [msec]	Number of Pulses in 3.16 seconds	Average Time of Occupancy [sec]	Limit [sec]	Margin [sec]
GFSK Normal					
DH1	0.379	32	0.121	0.4	-0.279
DH3	1.635	17	0.278	0.4	-0.122
DH5	2.883	13	0.375	0.4	-0.025
DH Packet	Pulse Width [msec]	Number of Pulses in 0.8 seconds	Average Time of Occupancy [sec]	Limit [sec]	Margin [sec]
GFSK AFH					
DH1	0.379	8	0.030	0.4	-0.370
DH3	1.635	4	0.069	0.4	-0.331
DH5	2.883	3	0.094	0.4	-0.306



**PULSE WIDTH – DH1**



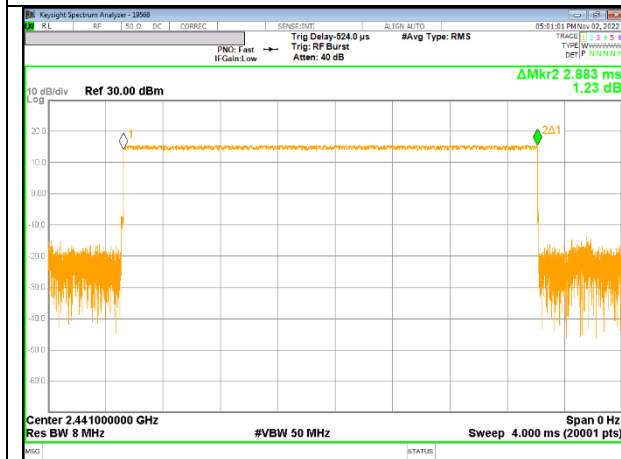
**NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD – DH1**



**PULSE WIDTH – DH3**



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



**PULSE WIDTH – DH5**

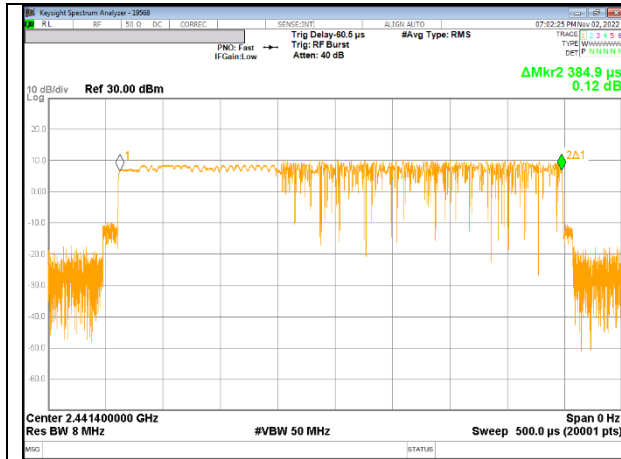


**NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD – DH5**

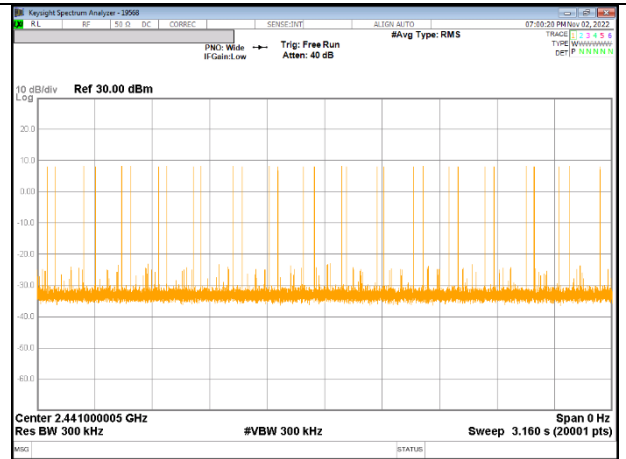


### 9.5.2. BLUETOOTH ENHANCED DATA RATE 8PSK MODULATION

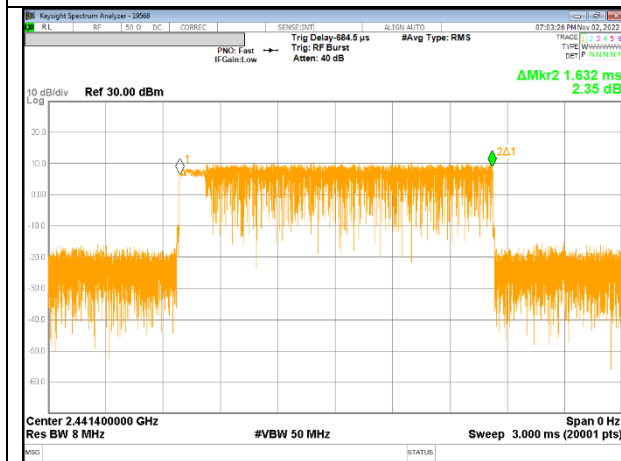
	Width [msec]	Pulses in 3.16 seconds	of Occupancy [sec]	[sec]	[sec]
GFSK Normal					
DH1	0.385	31	0.119	0.4	-0.281
DH3	1.632	15	0.245	0.4	-0.155
DH5	2.882	11	0.317	0.4	-0.083
DH Packet	Pulse Width [msec]	Number of Pulses in 0.8 seconds	Average Time of Occupancy [sec]	Limit [sec]	Margin [sec]
GFSK AFH					
DH1	0.385	8	0.030	0.4	-0.370
DH3	1.632	4	0.061	0.4	-0.339
DH5	2.882	3	0.079	0.4	-0.321



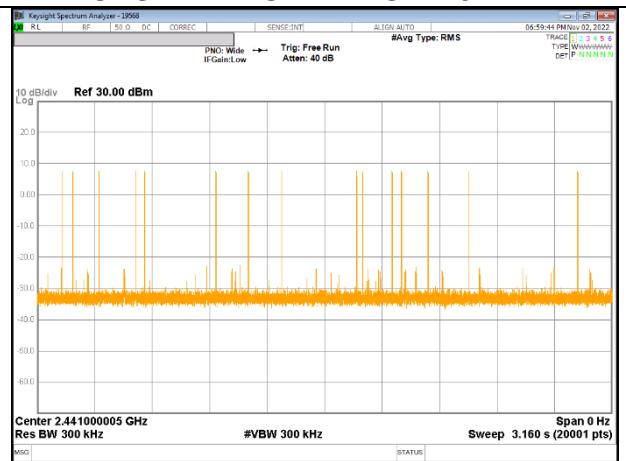
**PULSE WIDTH – 3-DH1**



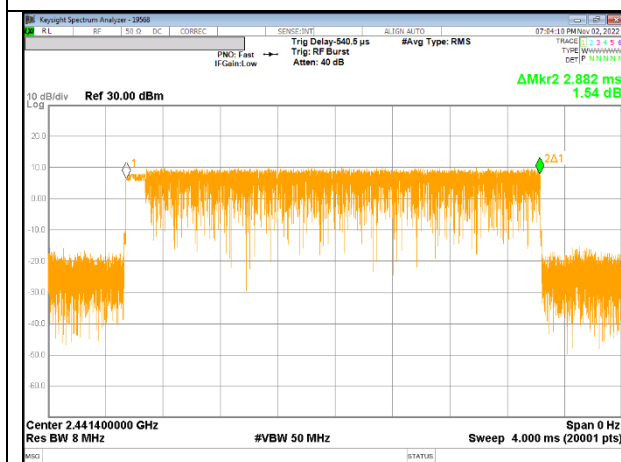
**NUMBER OF PULSES IN 3.16 SECOND  
 OBSERVATION PERIOD – 3-DH1**



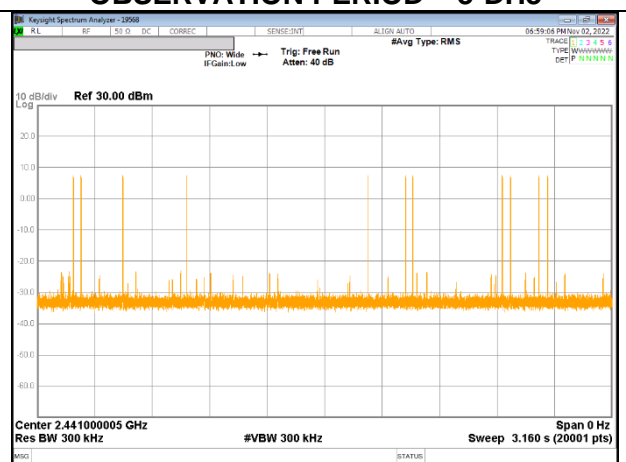
**PULSE WIDTH – 3-DH3**



**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]	Peak Output Power [dBm]	Limit [dBm]	Margin [dB]
0	2 402	15.687	21.000	-5.313
39	2 441	15.286		-5.714
78	2 480	13.732		-7.268
Worst		15.687		-5.313

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

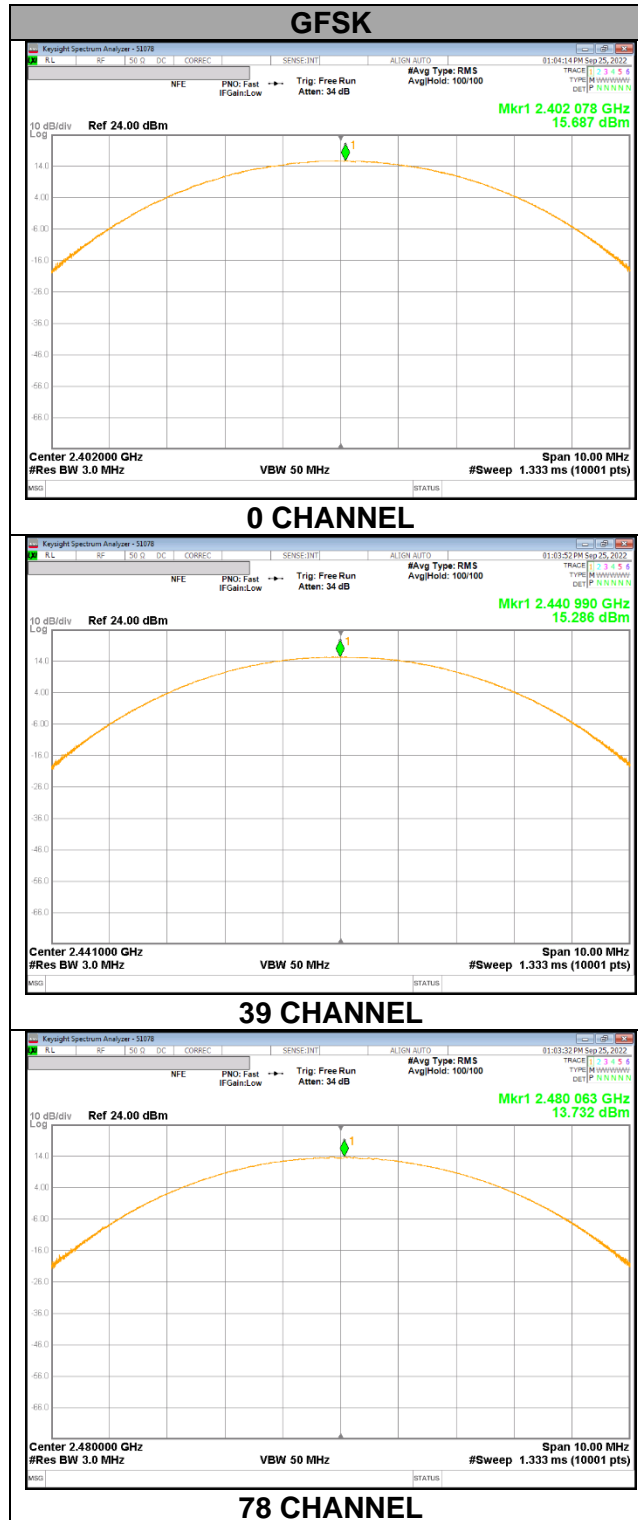
Channel	Frequency [MHz]	Peak Output Power [dBm]	Limit [dBm]	Margin [dB]
0	2 402	13.679	21.000	-7.321
39	2 441	12.922		-8.078
78	2 480	12.242		-8.758
Worst		13.679		-7.321

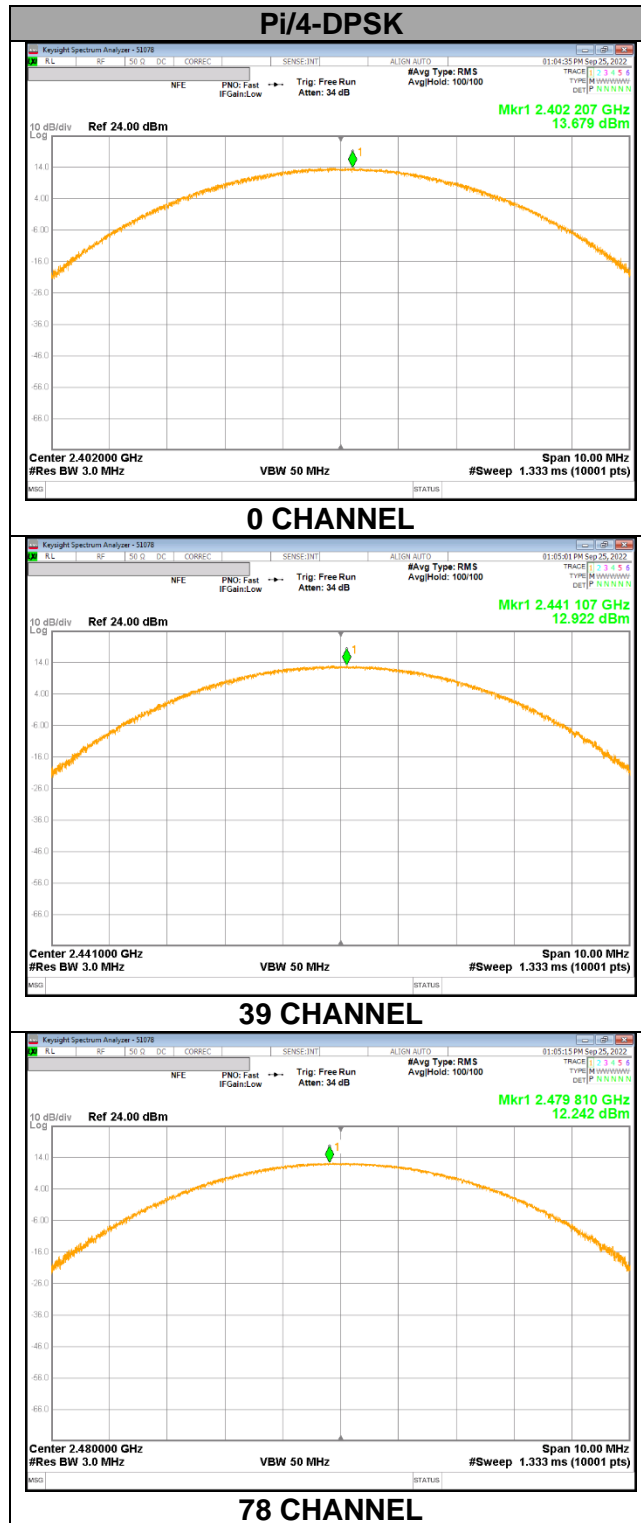
#### 9.6.3. ENHANCED DATA RATE 8PSK MODULATION

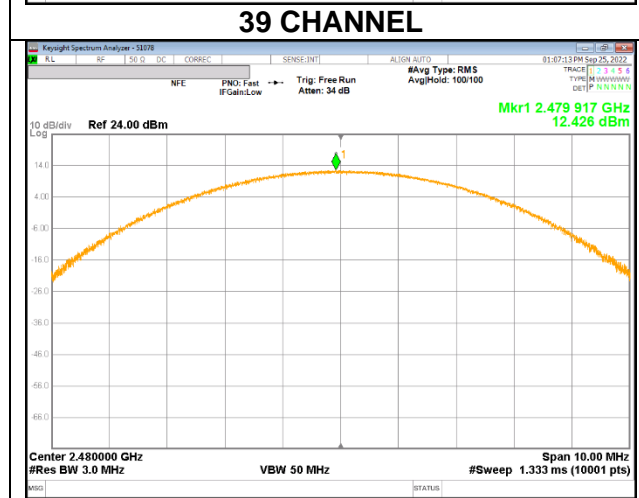
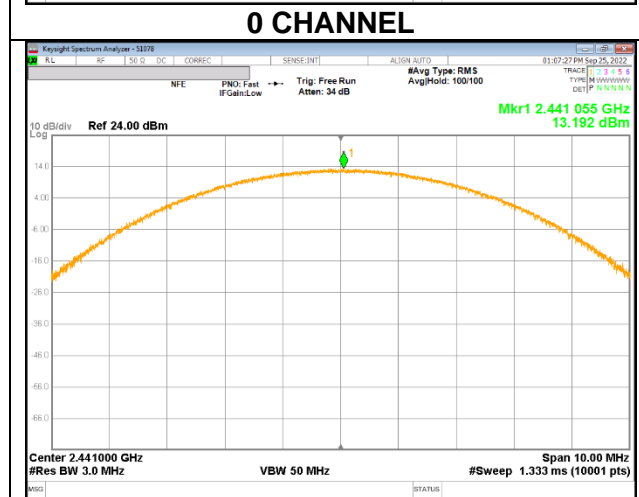
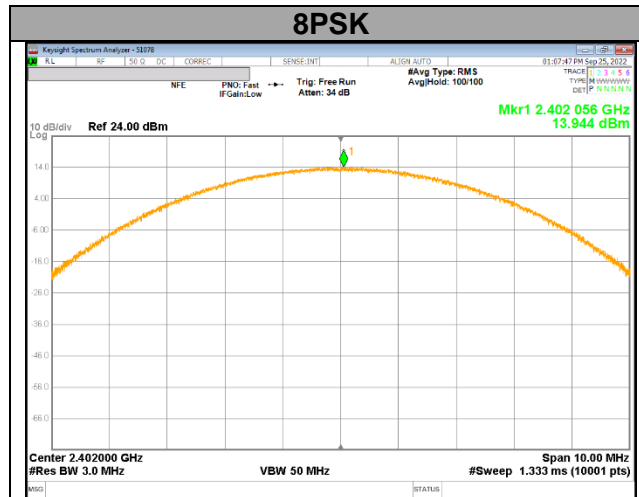
Channel	Frequency [MHz]	Peak Output Power [dBm]	Limit [dBm]	Margin [dB]
0	2 402	13.944	21.000	-7.056
39	2 441	13.192		-7.808
78	2 480	12.426		-8.574
Worst		13.944		-7.056

### 9.6.4. OUTPUT POWER PLOTS

#### PEAK OUTPUT POWER







### 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]	Average Output Power [dBm]	Average Output Power [mW]
0	2 402	15.211	33.197
39	2 441	14.887	30.811
78	2 480	13.135	20.583

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

Channel	Frequency [MHz]	Average Output Power [dBm]	Average Output Power [mW]
0	2 402	11.443	13.941
39	2 441	10.597	11.474
78	2 480	10.319	10.762

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

Channel	Frequency [MHz]	Average Output Power [dBm]	Average Output Power [mW]
0	2 402	11.462	14.002
39	2 441	10.621	11.537
78	2 480	10.356	10.854

## **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.

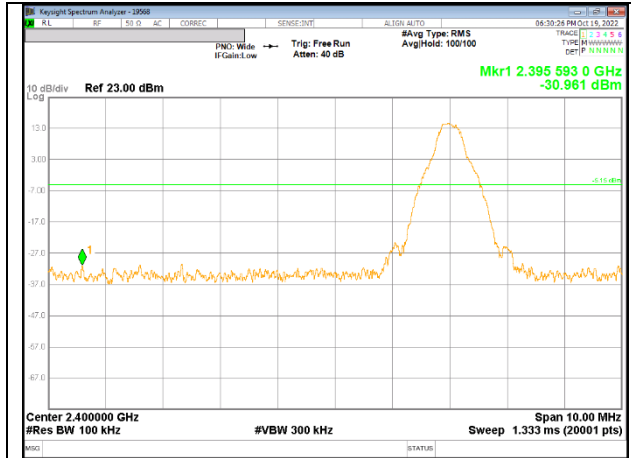
The band-edges at 2.4 and 2.4835 GHz are investigated with the transmitter set to the normal hopping mode.

### **RESULTS**

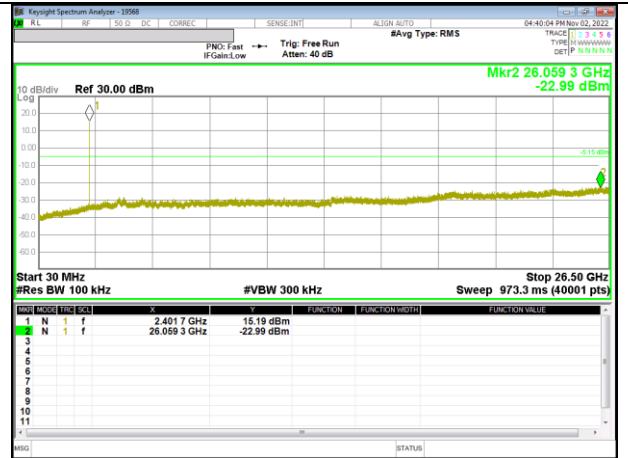


## 9.8.1. BLUETOOTH BASIC DATA RATE GFSK MODULATION

### SPURIOUS EMISSIONS, NON-HOPPING



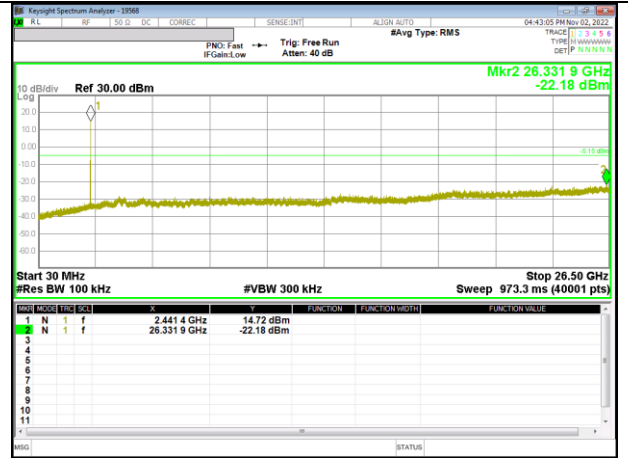
**0 CHANNEL BANDEDGE**



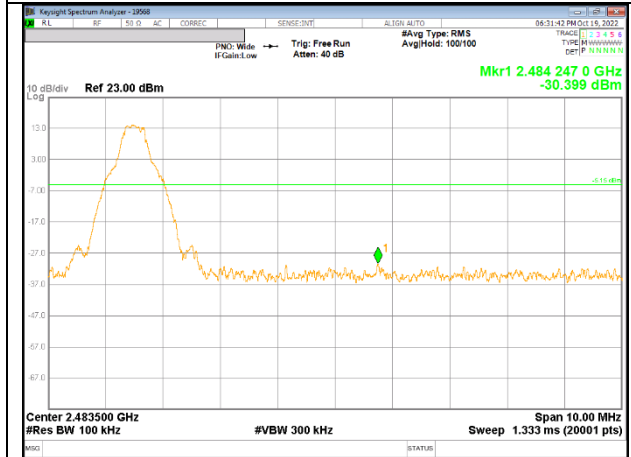
**OUT-OF-BAND 0 CHANNEL**



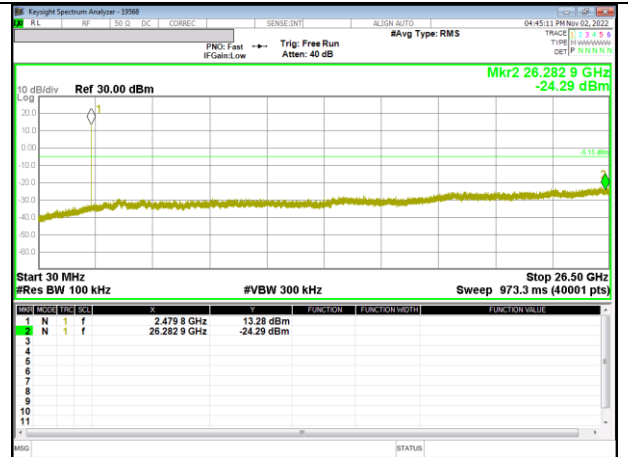
**IN-BAND REFERENCE LEVEL**



**OUT-OF-BAND 39 CHANNEL**

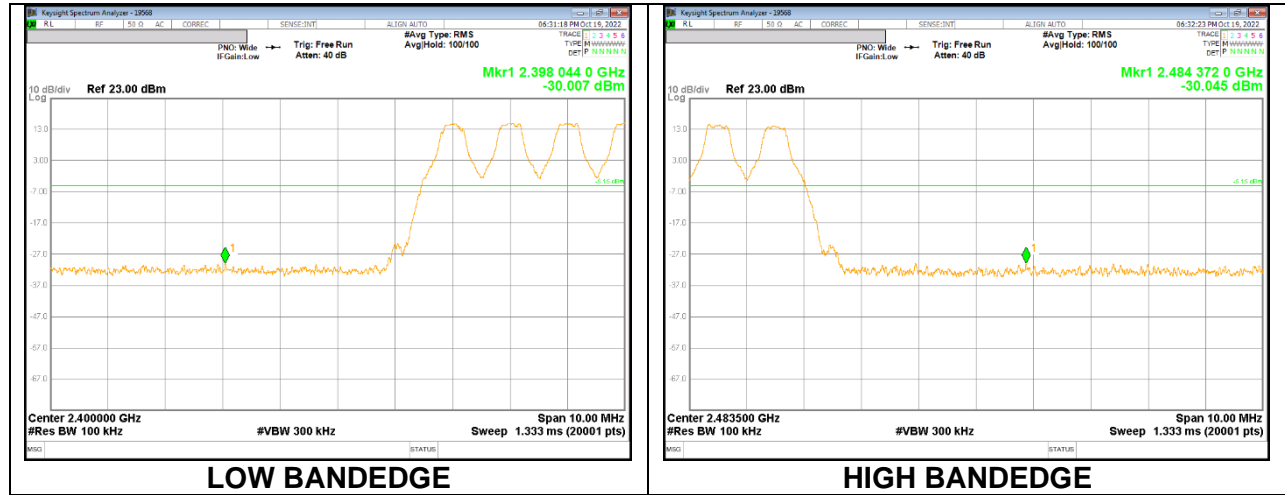


**78 CHANNEL BANDEDGE**



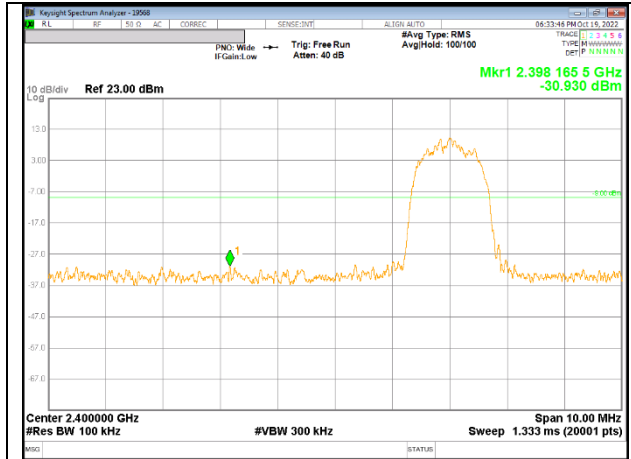
**OUT-OF-BAND 78 CHANNEL**

**SPURIOUS BANDEGE EMISSIONS WITH HOPPING ON**

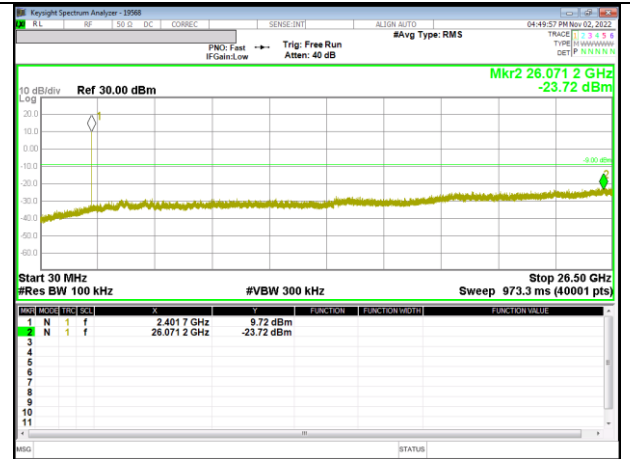


## 9.8.2. BLUETOOTH ENHANCED DATA RATE 8PSK MODULATION

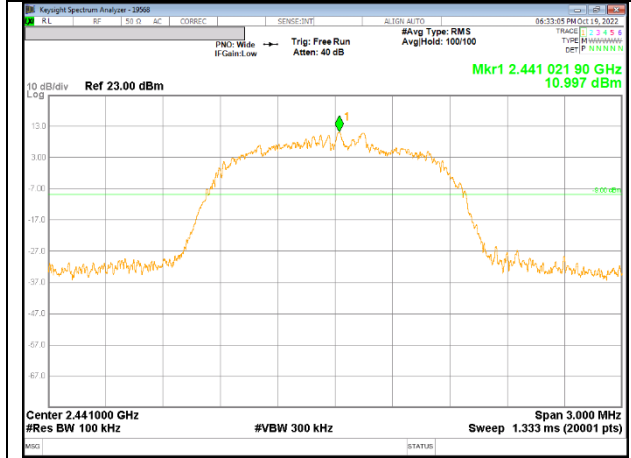
### SPURIOUS EMISSIONS, NON-HOPPING



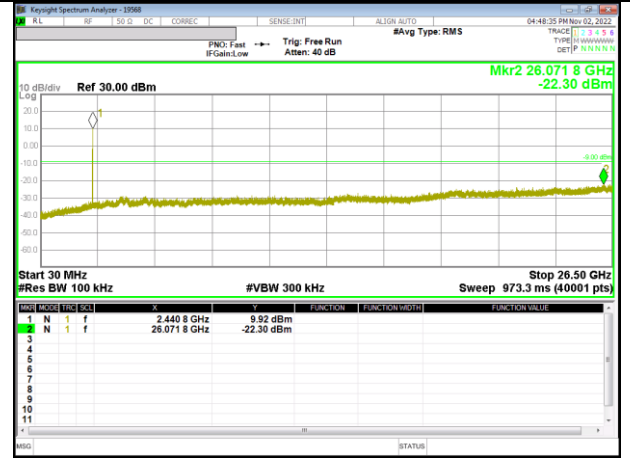
**0 CHANNEL BANDEDGE**



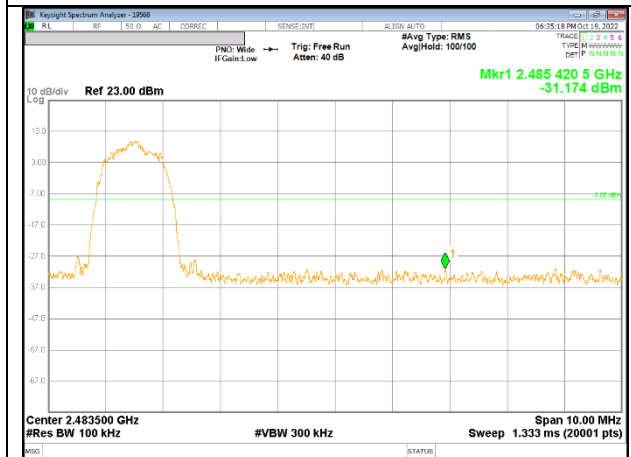
**OUT-OF-BAND 0 CHANNEL**



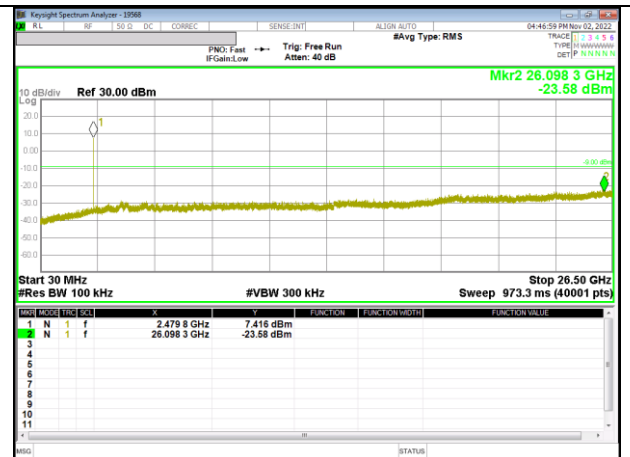
**IN-BAND REFERENCE LEVEL**



**OUT-OF-BAND 39 CHANNEL**

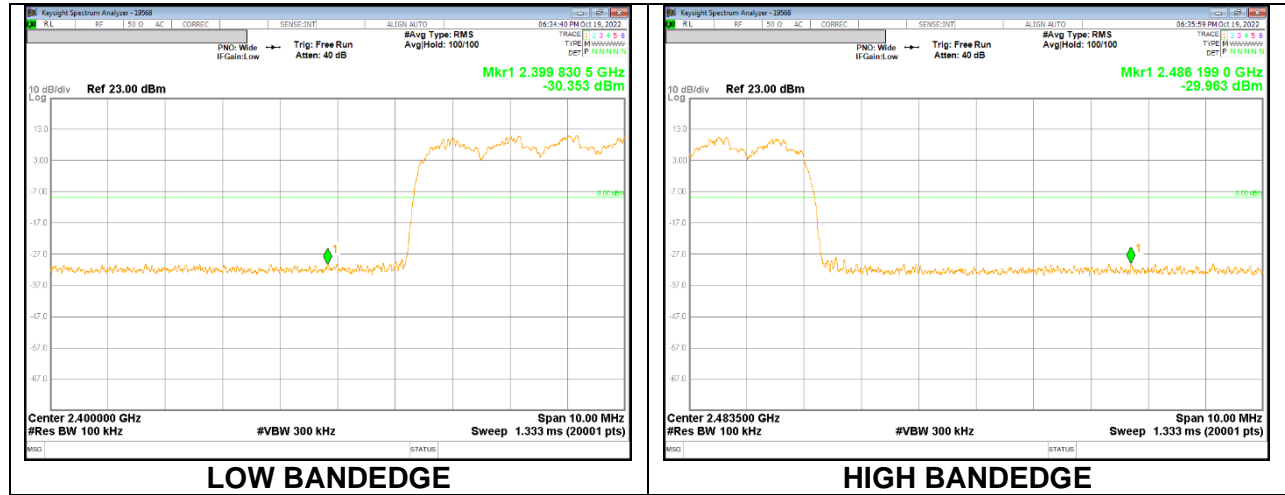


**78 CHANNEL BANDEDGE**



**OUT-OF-BAND 78 CHANNEL**

**SPURIOUS BANDEGE 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.

$$\text{GFSK} = 1/T = 1 / 0.00288\text{s} = 347\text{Hz}.$$

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.

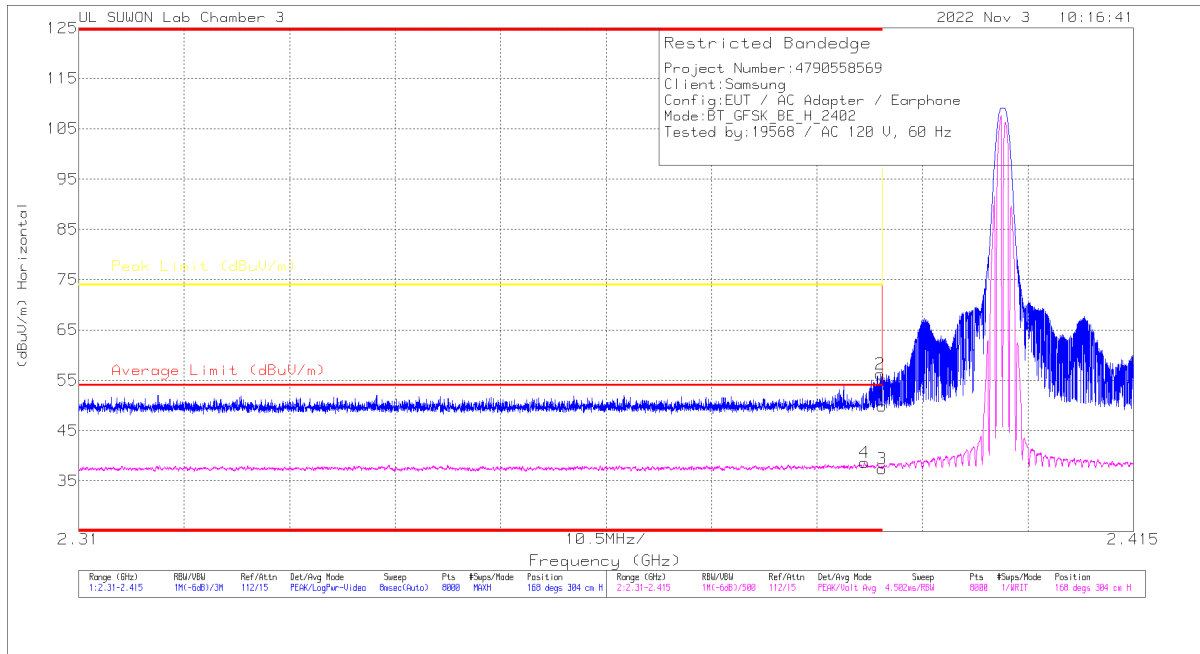
Although these tests were performed other than open field test site, adequate comparison measurements were confirmed against 30 m open are test site.  
Therefore sufficient tests were made to demonstrate that the alternative site produces results that correlate with the one of tests made in an open field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

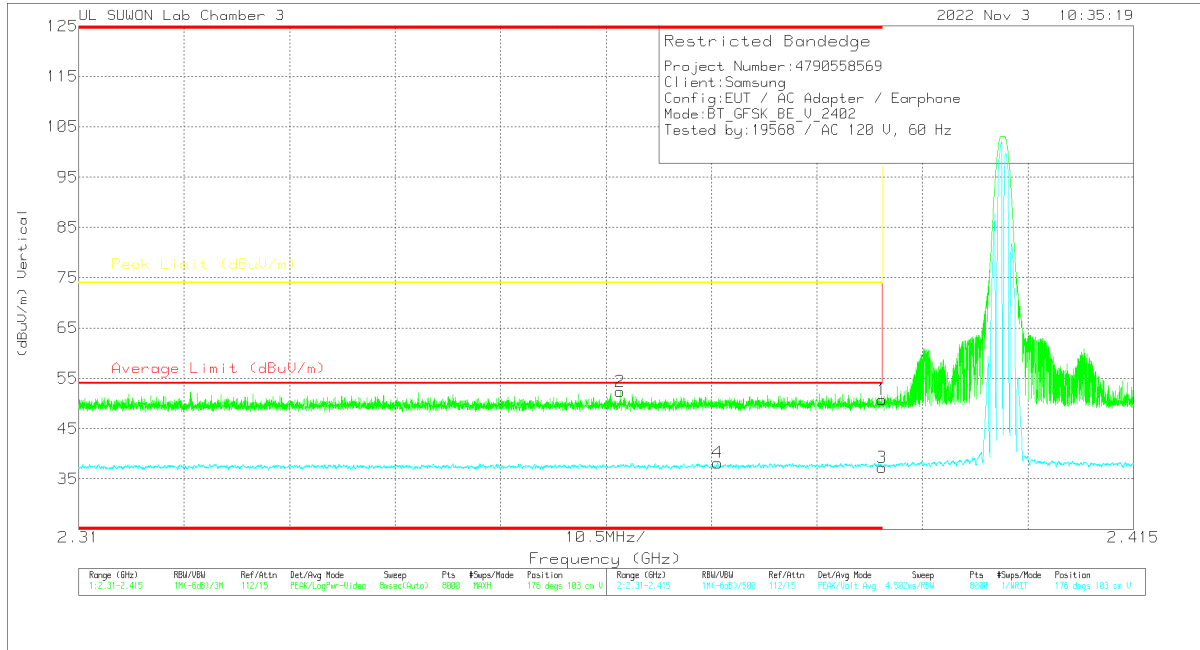
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	3117_00218957	10dB_ATT[dB]	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.39	41.91	Pk		-24.8	49.91	-	-	74	-24.09	168	304	H
2	* 2.38981	48.27	Pk		-24.8	56.27	-	-	74	-17.73	168	304	H
3	* 2.39	29.44	VA1T		-24.8	37.44	54	-16.56	-	-	168	304	H
4	* 2.38822	30.65	VA1T		-24.8	38.65	54	-15.35	-	-	168	304	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

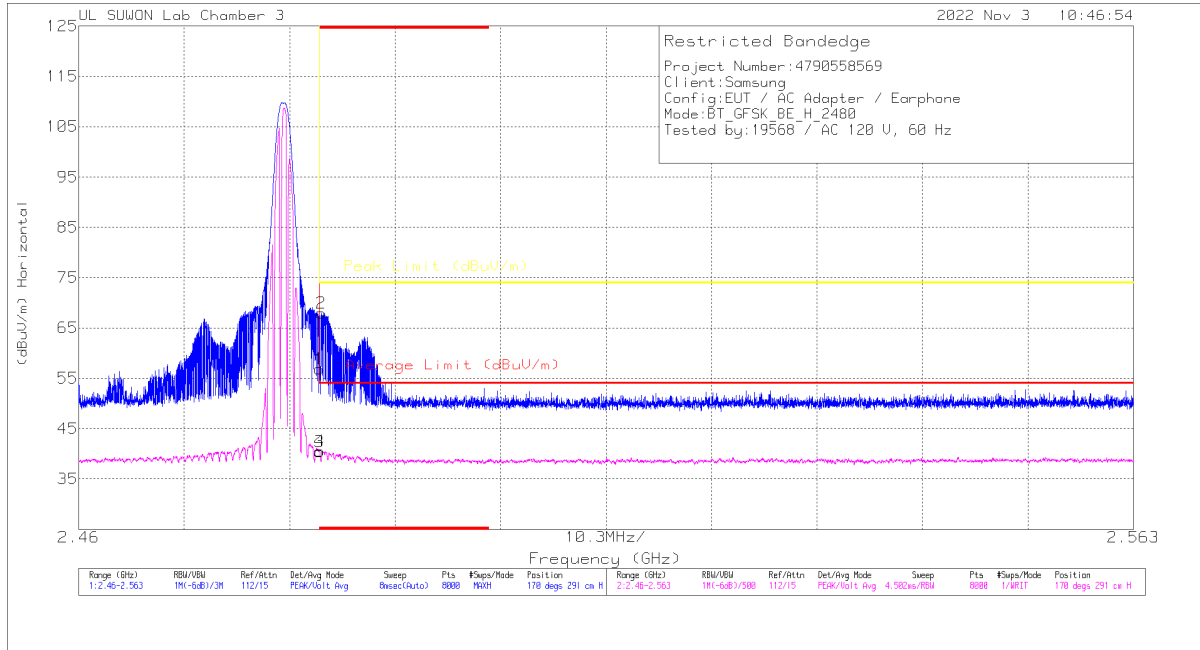
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	3117_00218957	10dB_ATT(dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.39	42.74	Pk	32.8	-24.8	50.74	-	-	74	-23.26	176	103	V
2	* 2.3639	44.59	Pk	32.7	-24.9	52.39	-	-	74	-21.61	176	103	V
3	* 2.39	29.35	VA1T	32.8	-24.8	37.35	54	-16.65	-	-	176	103	V
4	* 2.3736	30.43	VA1T	32.7	-24.9	38.23	54	-15.77	-	-	176	103	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**

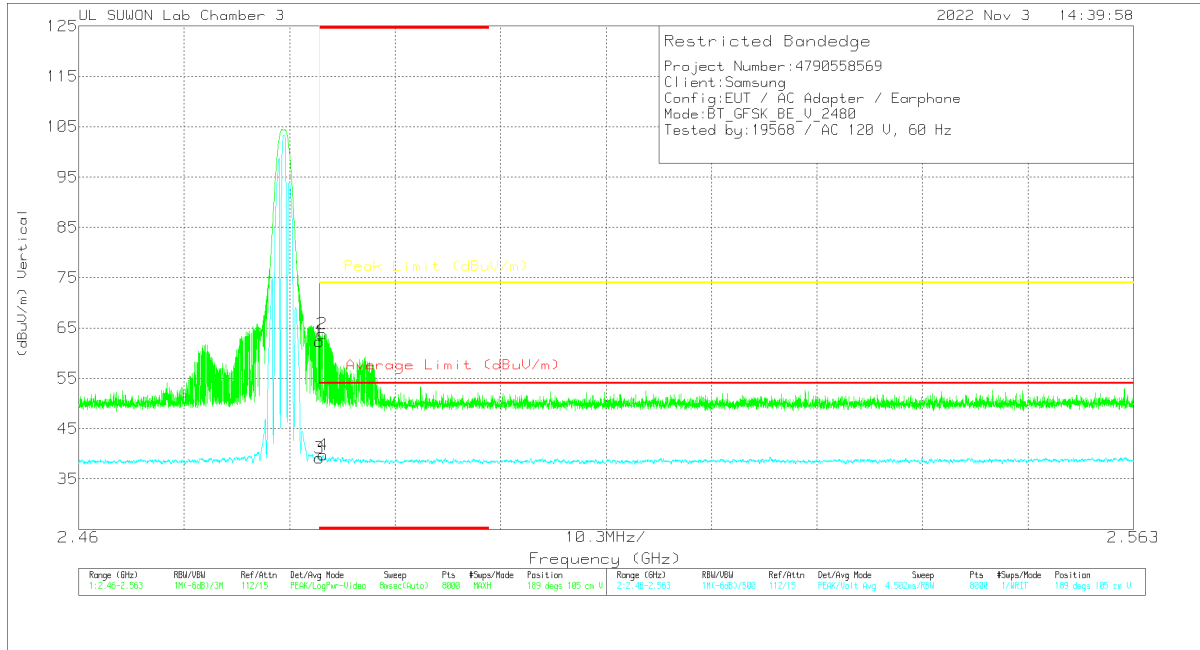


**Trace Markers**

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	3117_00218957	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	* 2.4835	48.69	Pk	32.9	-24.7	56.89	-	-	74	-17.11	170	291	H
2	* 2.48368	59.81	Pk	32.9	-24.7	68.01	-	-	74	-5.99	170	291	H
3	* 2.4835	32.22	VA1T	32.9	-24.7	40.42	54	-13.58	-	-	170	291	H
4	* 2.48353	32.29	VA1T	32.9	-24.7	40.49	54	-13.51	-	-	170	291	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



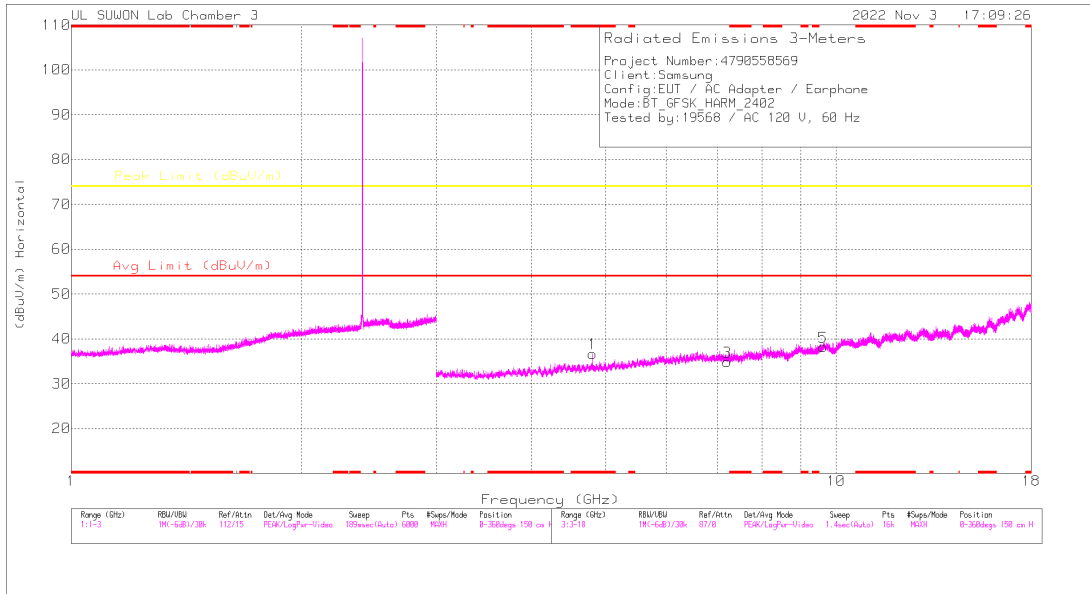
### Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	3117_00218957	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	* 2.4835	54.17	PK		-24.7	62.37	-	-	74	-11.63	189	105	V
2	* 2.48377	55.61	PK		-24.7	63.81	-	-	74	-10.19	189	105	V
3	* 2.4835	30.98	VA1T		-24.7	39.18	54	-14.82	-	-	189	105	V
4	* 2.48385	31.58	VA1T		-24.7	39.78	54	-14.22	-	-	189	105	V

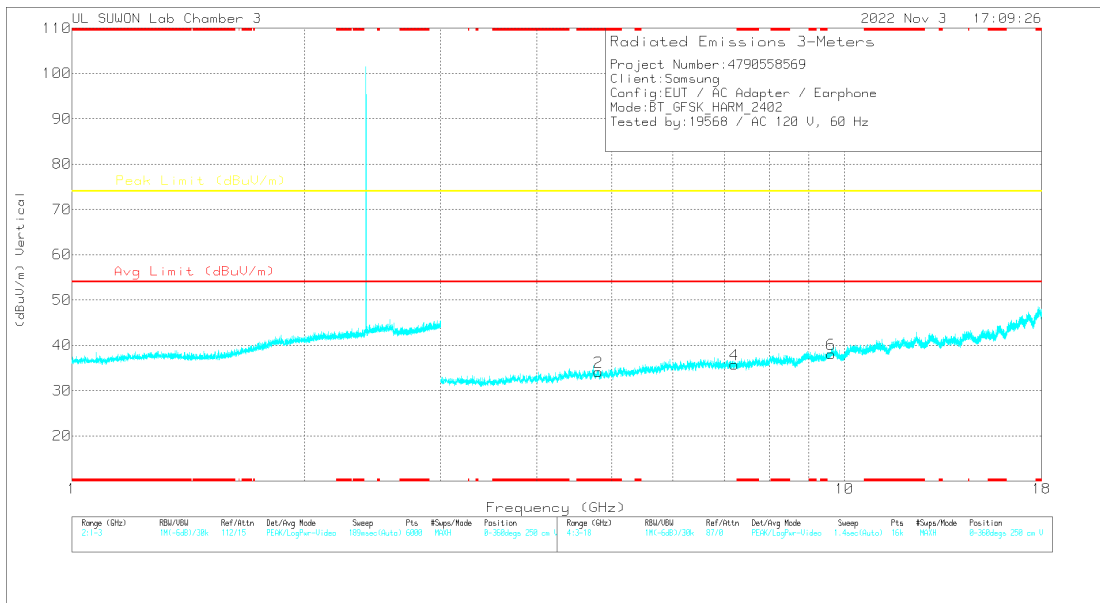
\* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band  
 Pk - Peak detector  
 VA1T - FHSS: Linear Voltage Average VB=1/Ton where: Ton is transmit duration

# HARMONICS AND SPURIOUS EMISSIONS

## 0 CHANNEL RESULTS



### HORIZONTAL



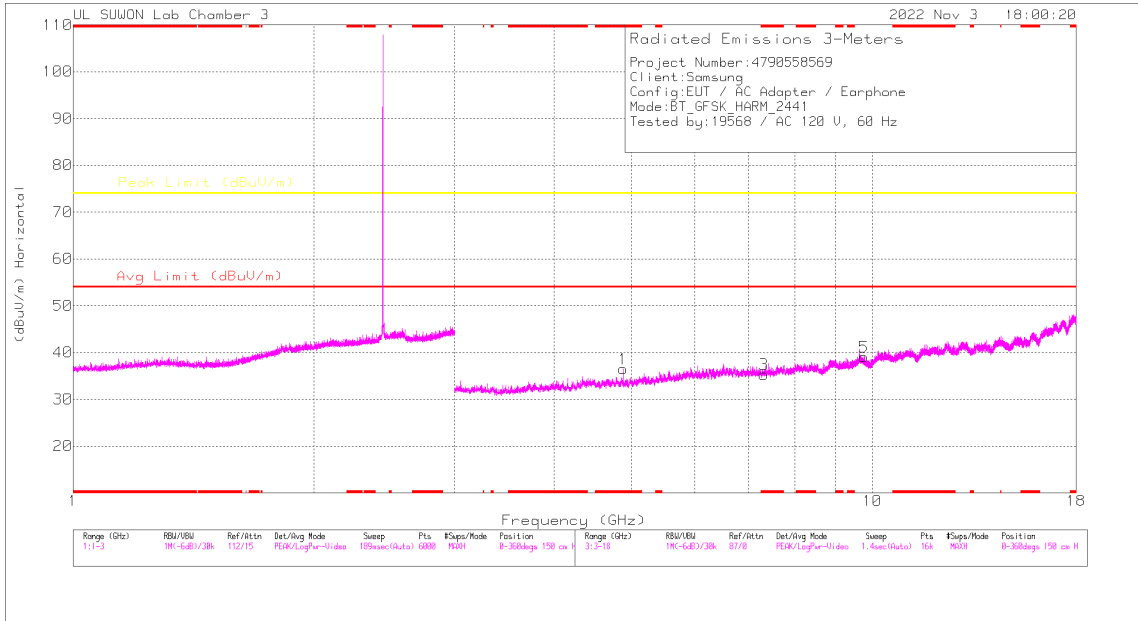
### VERTICAL

### Radiated Emissions

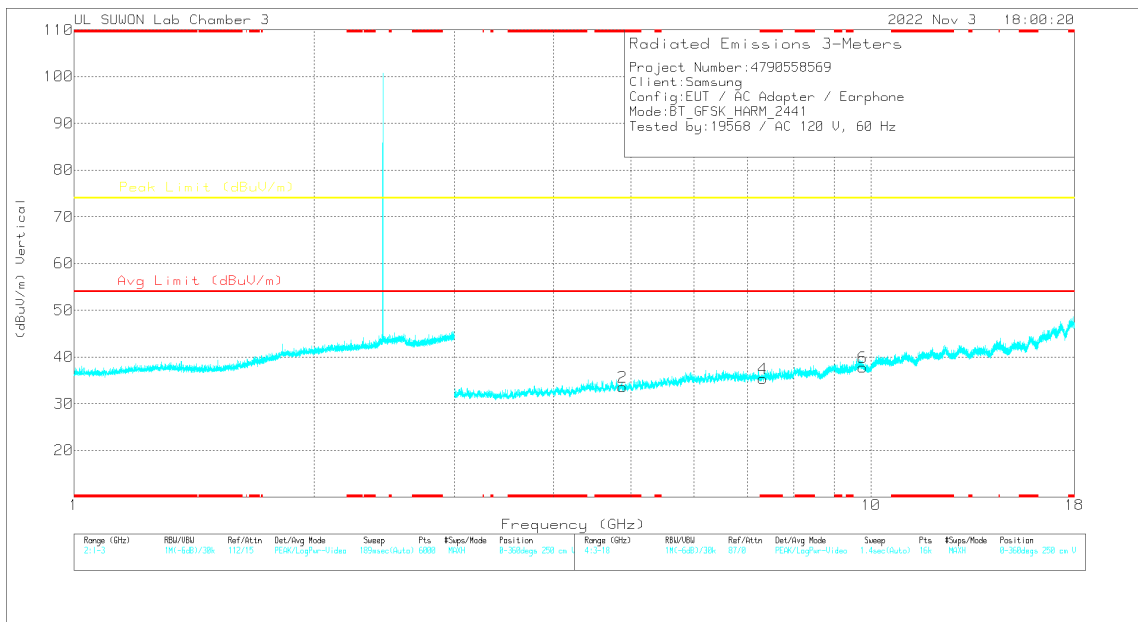
Frequency (GHz)	Meter Reading (dBuV)	Det	3117_00218957	3GHz_HP(dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
* 4.80366	39.31	PKFH	34.6	-29.9	44.01	-	-	74	-29.99	4	114	H
* 4.80416	29.9	VA1T	34.6	-29.9	34.6	54	-19.4	-	-	4	114	H
7.20545	34.29	PKFH	36.1	-25.6	44.79	-	-	74	-29.21	0	100	H
9.6138	31.18	PKFH	37.3	-21.7	46.78	-	-	74	-27.22	0	100	H
* 4.80233	38.66	PKFH	34.6	-29.9	43.36	-	-	74	-30.64	0	100	V
7.20751	35.03	PKFH	36.1	-25.6	45.53	-	-	74	-28.47	0	100	V
9.60595	30.73	PKFH	37.3	-21.8	46.23	-	-	74	-27.77	0	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  
 VA1T - FHSS: Linear Voltage Average VB=1/Ton where: Ton is transmit duration

### 39 CHANNEL RESULTS



### HORIZONTAL



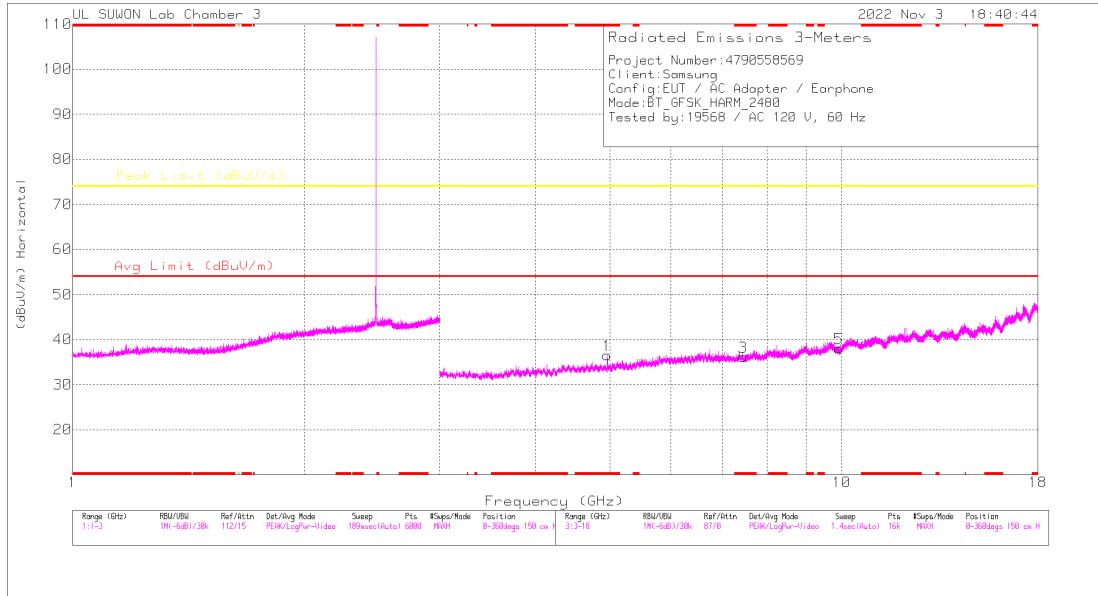
### VERTICAL

### Radiated Emissions

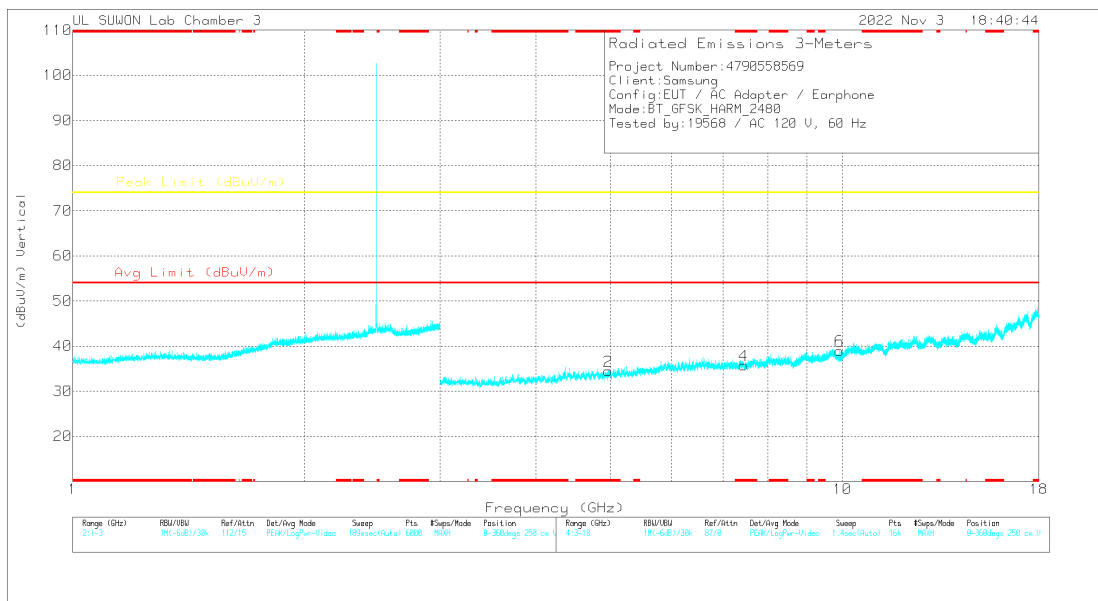
Frequency (GHz)	Meter Reading (dBuV)	Det	3117_0021895 7	3GHz_HP[dB]	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
* 4.88196	40.2	PKFH	34.7	-30.7	44.2	-	-	74	-29.8	13	110	H
* 4.88212	30.28	VA1T	34.7	-30.7	34.28	54	-19.72	-	-	13	110	H
* 7.33102	33.31	PKFH	36	-25	44.31	-	-	74	-29.69	0	100	H
9.75835	30.3	PKFH	37.5	-21.3	46.5	-	-	74	-27.5	0	100	H
* 4.87398	37.86	PKFH	34.6	-30.6	41.86	-	-	74	-32.14	0	100	V
* 7.31399	33.45	PKFH	36	-25.2	44.25	-	-	74	-29.75	0	100	V
9.77257	30.27	PKFH	37.5	-21.3	46.47	-	-	74	-27.53	0	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  
 VA1T - FHSS: Linear Voltage Average VB=1/Ton where: Ton is transmit duration

### 78 CHANNEL RESULTS



### HORIZONTAL



### VERTICAL

### Radiated Emissions

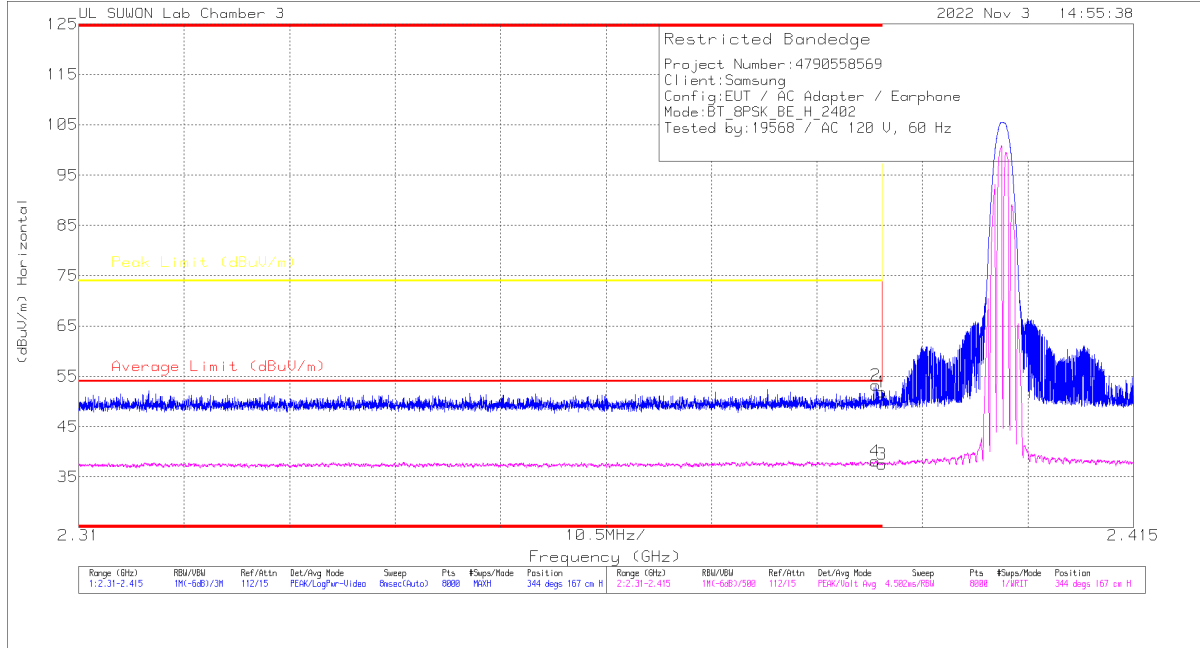
Frequency (GHz)	Meter Reading (dBuV)	Det	3117_0021895 7	3GHz_HP[dB]	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
* 4.9598	39.95	PKFH	34.7	-30.4	44.25	-	-	74	-29.75	18	101	H
* 4.96012	29.81	VA1T	34.7	-30.4	34.11	54	-19.89	-	-	18	101	H
* 4.96384	37.82	PKFH	34.7	-30.3	42.22	-	-	74	-31.78	0	100	V
* 7.43272	33.43	PKFH	36	-24.7	44.73	-	-	74	-29.27	0	100	H
* 7.4318	33.07	PKFH	36	-24.7	44.37	-	-	74	-29.63	0	100	V
9.92096	29.52	PKFH	37.7	-21.5	45.72	-	-	74	-28.28	0	100	H
9.91433	30.51	PKFH	37.7	-21.5	46.71	-	-	74	-27.29	358	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  
 VA1T - FHSS: Linear Voltage Average VB=1/Ton where: Ton is transmit duration

## 10.1.2. BLUETOOTH ENHANCED DATA RATE 8PSK MODULATION

### BANDEDGE (0 CHANNEL)

#### HORIZONTAL RESULT



#### Trace Markers

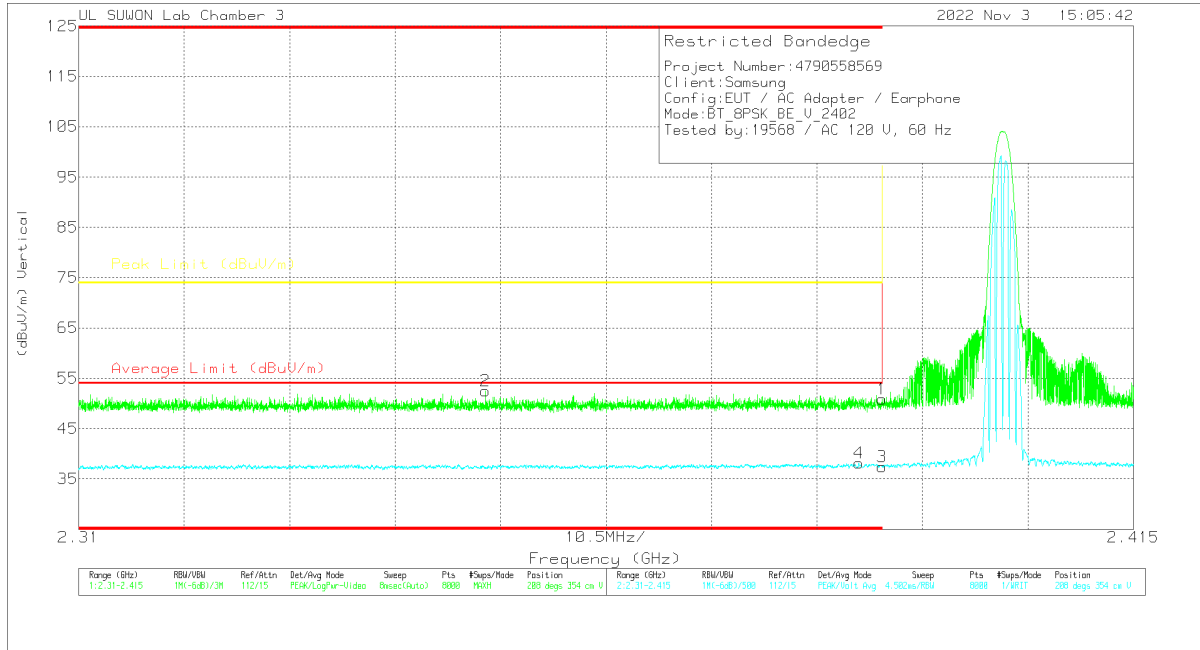
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	3117_00218957	10dB_ATT[dB]	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.39	43.87	Pk	32.8	-24.8	51.87	-	-	74	-22.13	344	167	H
2	* 2.38937	45.29	Pk	32.8	-24.8	53.29	-	-	74	-20.71	344	167	H
3	* 2.39	29.51	VA1T	32.8	-24.8	37.51	54	-16.49	-	-	344	167	H
4	* 2.38931	30.17	VA1T	32.8	-24.8	38.17	54	-15.83	-	-	344	167	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



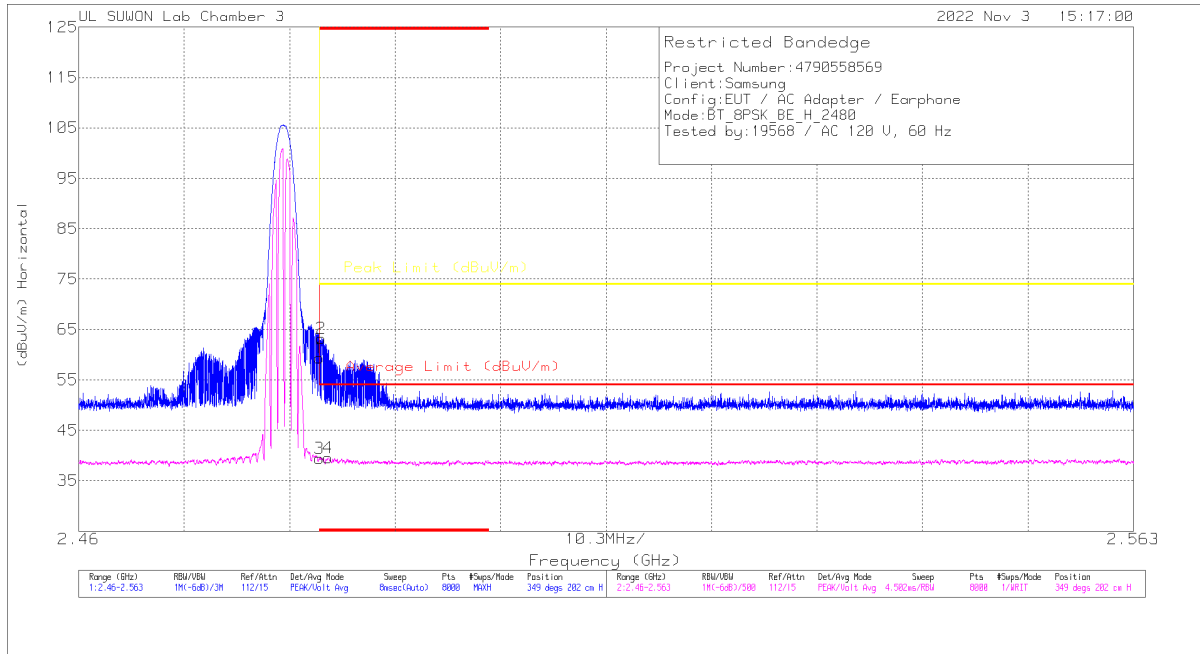
### Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	3117_00218957	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	42.89	PK		-24.8	50.89	-	-	74	-23.11	208	354	V
2	* 2.3505	44.76	PK		-24.9	52.46	-	-	74	-21.54	208	354	V
3	* 2.39	29.43	VA1T		-24.8	37.43	54	-16.57	-	-	208	354	V
4	* 2.38766	30.12	VA1T		-24.8	38.12	54	-15.88	-	-	208	354	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**



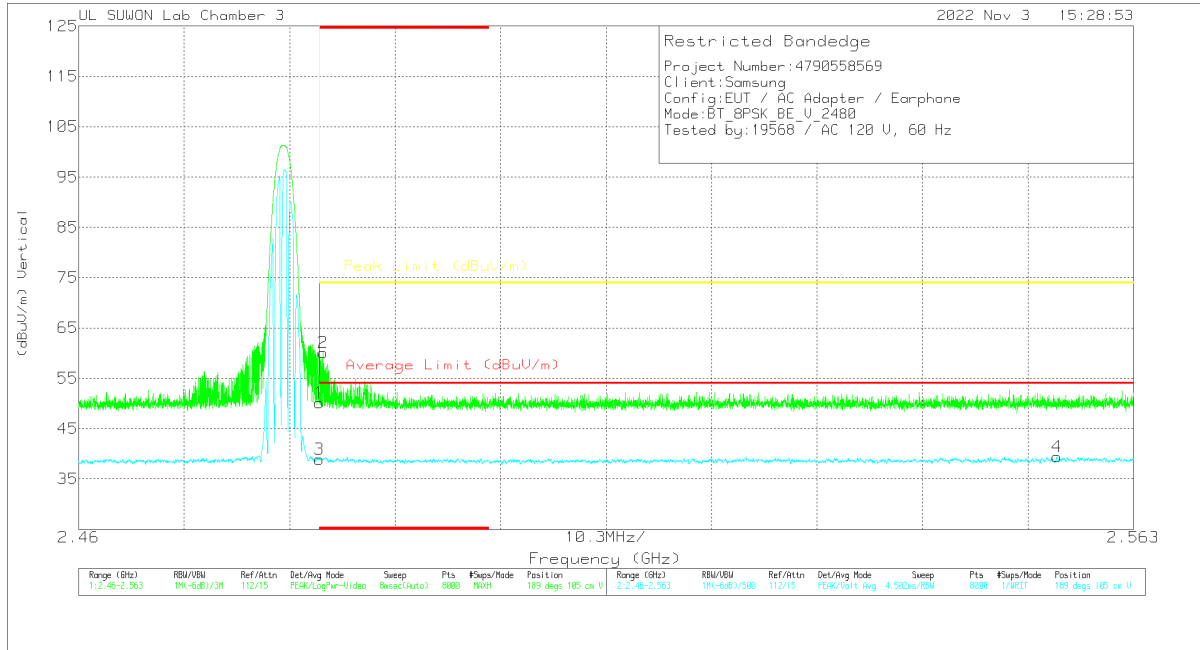
**Trace Markers**

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	3117_00218957	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	* 2.4835	51.19	Pk	32.9	-24.7	59.39	-	-	74	-14.61	349	202	H
2	* 2.48371	55.02	Pk	32.9	-24.7	63.22	-	-	74	-10.78	349	202	H
3	* 2.4835	31.2	VA1T	32.9	-24.7	39.4	54	-14.6	-	-	349	202	H
4	* 2.48438	31.38	VA1T	32.9	-24.7	39.58	54	-14.42	-	-	349	202	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



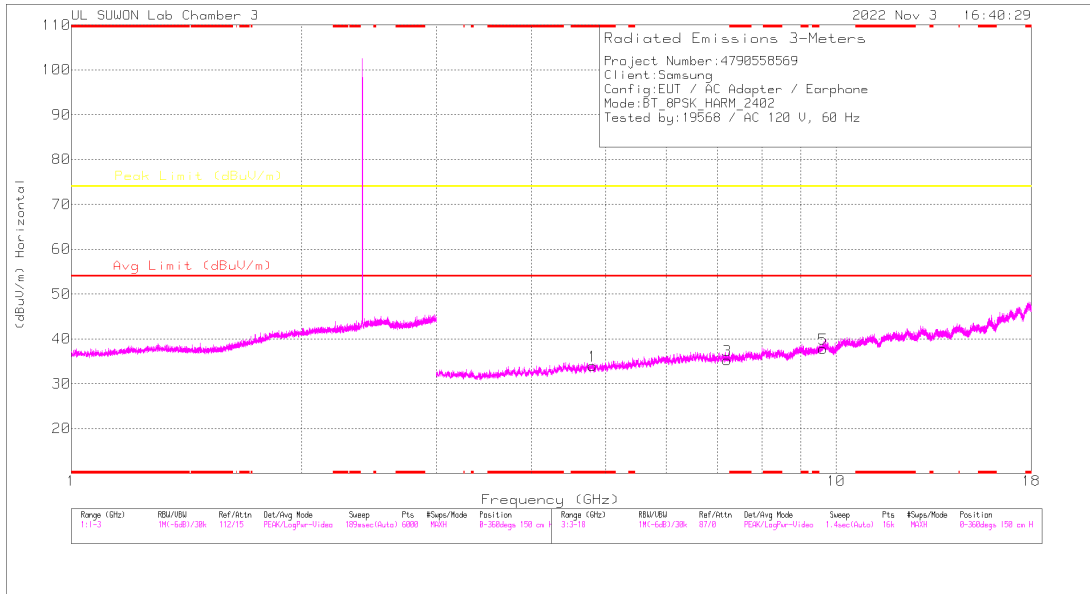
### Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	3117_00218957	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	* 2.4835	41.94	Pk	32.9	-24.7	50.14	-	-	74	-23.86	189	105	V
2	* 2.48384	51.87	Pk	32.9	-24.7	60.07	-	-	74	-13.93	189	105	V
3	* 2.4835	30.77	VA1T	32.9	-24.7	38.97	54	-15.03	-	-	189	105	V
4	2.55552	31.12	VA1T	32.9	-24.6	39.42	54	-14.58	-	-	189	105	V

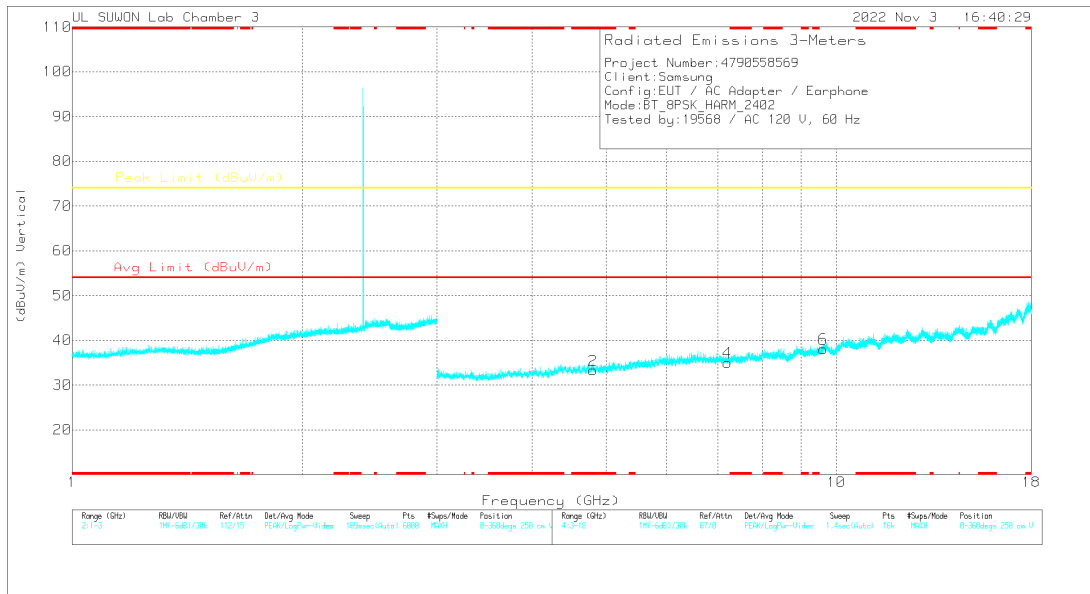
\* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band  
 Pk - Peak detector  
 VA1T - FHSS: Linear Voltage Average VB=1/Ton where: Ton is transmit duration

# HARMONICS AND SPURIOUS EMISSIONS

## 0 CHANNEL RESULTS



### HORIZONTAL



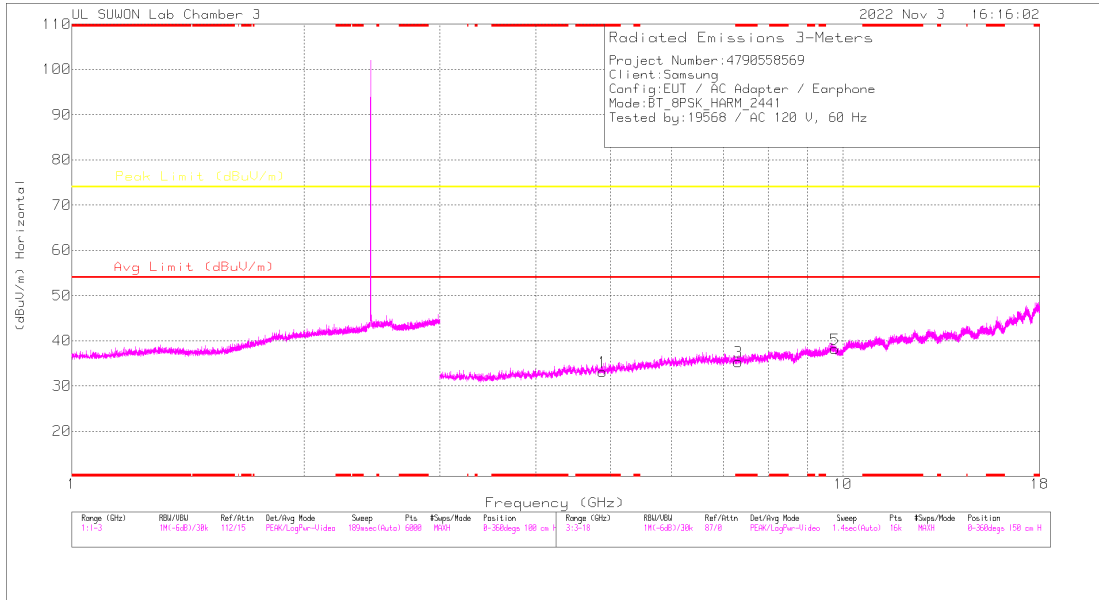
### VERTICAL

### Radiated Emissions

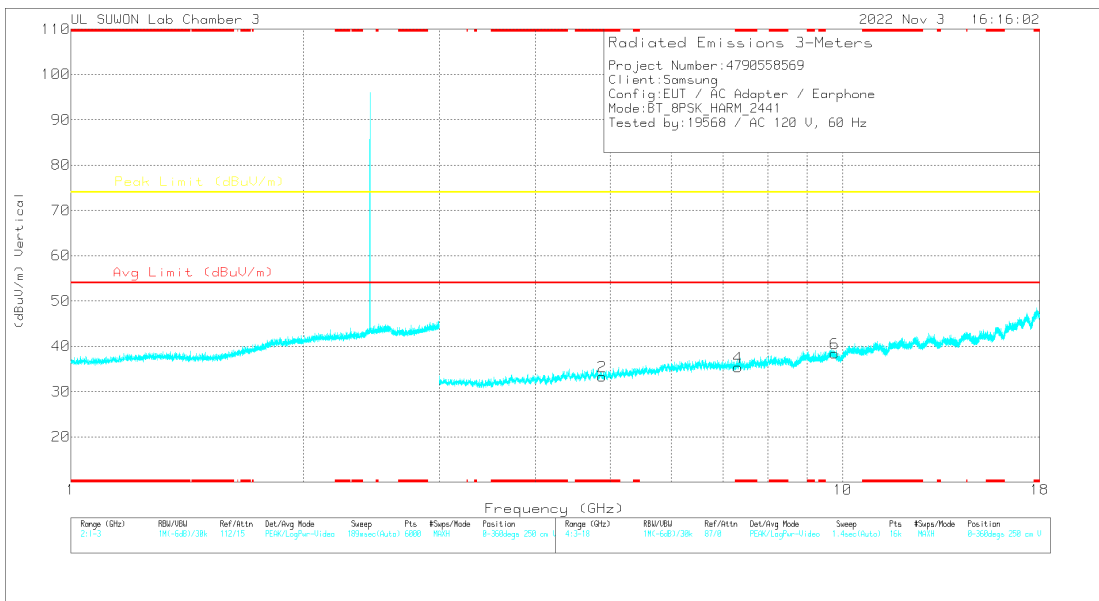
Frequency (GHz)	Meter Reading (dBuV)	Det	3117_00218957	3GHz_HP(dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
* 4.8142	38.2	PKFH	34.6	-30	42.8	-	-	74	-31.2	0	100	H
* 4.80615	38.49	PKFH	34.6	-29.9	43.19	-	-	74	-30.81	0	100	V
7.21258	33.11	PKFH	36.1	-25.7	43.51	-	-	74	-30.49	0	100	H
7.19702	33.86	PKFH	36.1	-25.7	44.26	-	-	74	-29.74	0	100	V
9.60754	31.21	PKFH	37.3	-21.8	46.71	-	-	74	-27.29	0	100	H
9.60483	31.06	PKFH	37.3	-21.8	46.56	-	-	74	-27.44	0	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



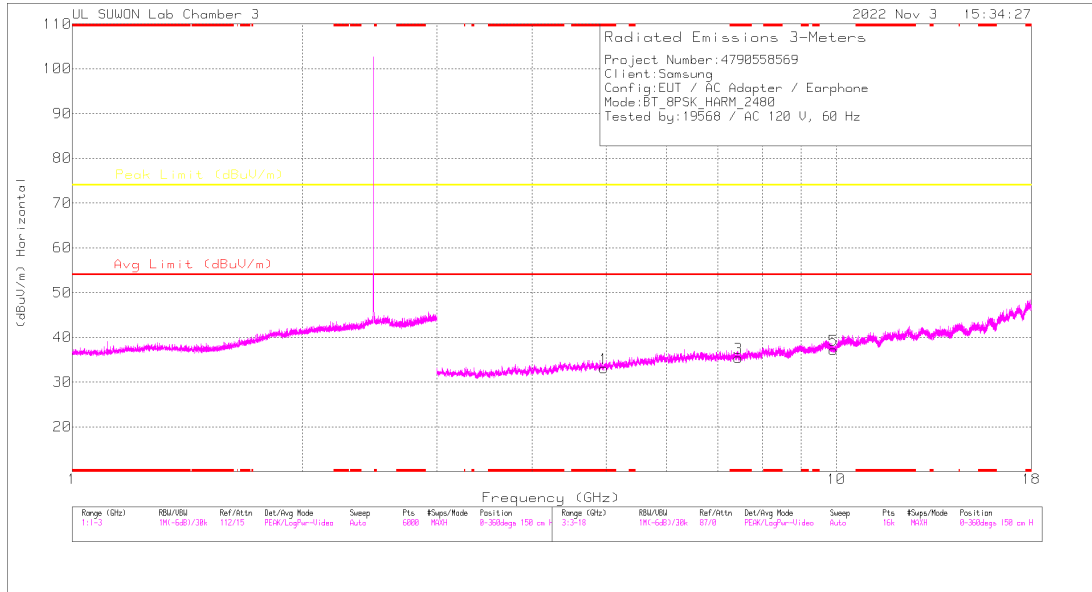
### VERTICAL

### Radiated Emissions

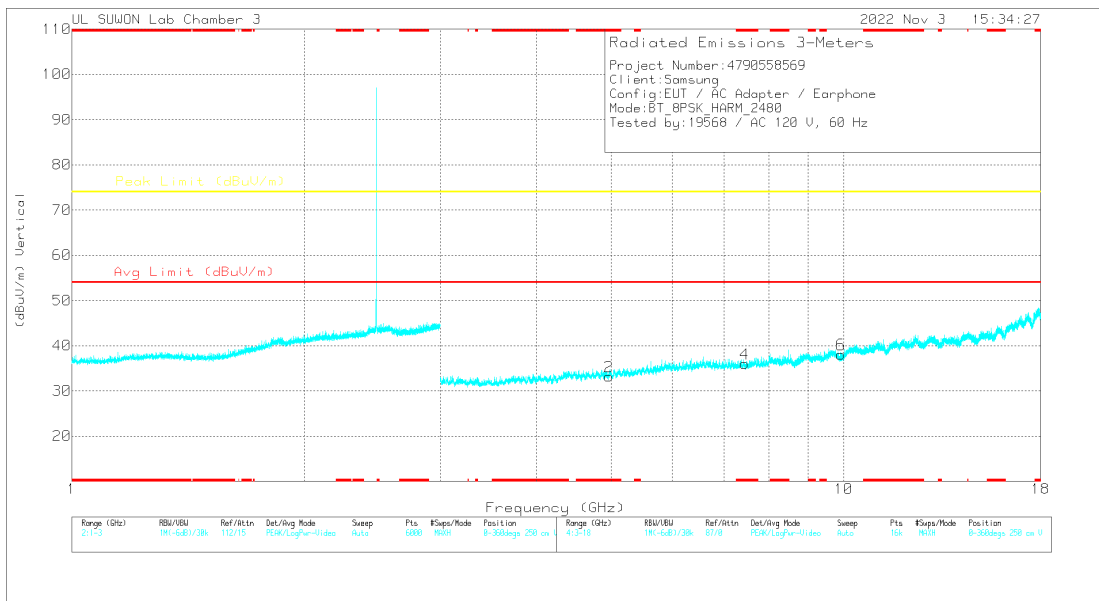
Frequency (GHz)	Meter Reading (dBuV)	Det	3117_00218957	3GHz_HP[dB]	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
* 4.88349	38.12	PKFH	34.7	-30.7	42.12	-	-	74	-31.88	0	100	H
* 4.87398	37.92	PKFH	34.6	-30.6	41.92	-	-	74	-32.08	0	100	V
* 7.32961	33.62	PKFH	36	-25	44.62	-	-	74	-29.38	0	100	H
* 7.3161	33.4	PKFH	36	-25.2	44.2	-	-	74	-29.8	0	100	V
9.7657	30.93	PKFH	37.5	-21.3	47.13	-	-	74	-26.87	0	100	H
9.76199	29.83	PKFH	37.5	-21.3	46.03	-	-	74	-27.97	0	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**



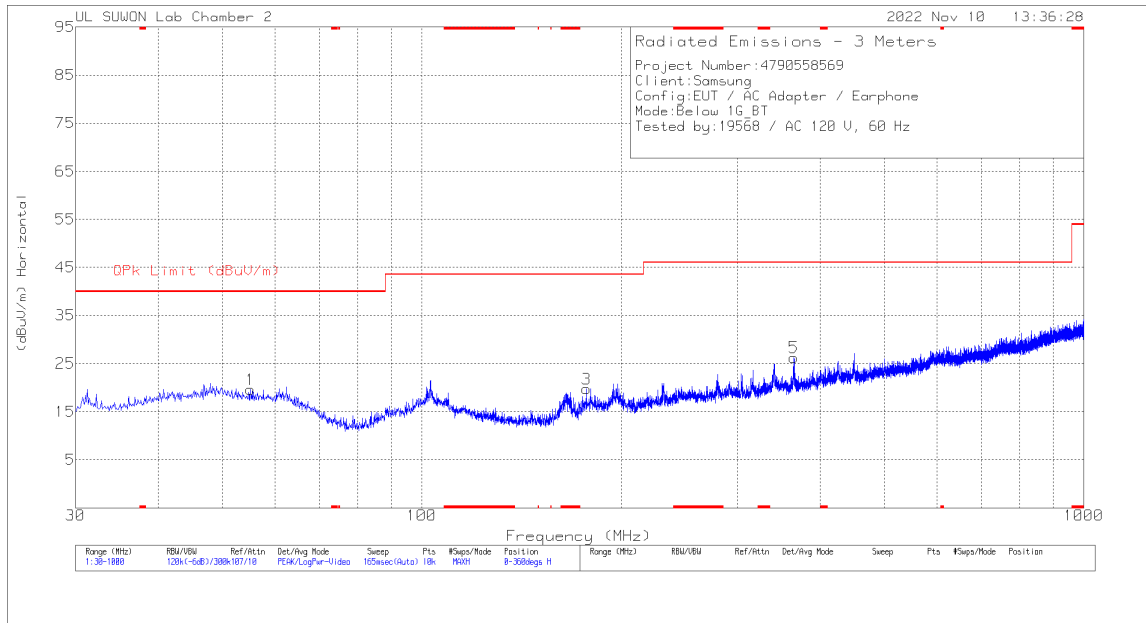
**VERTICAL**

### Radiated Emissions

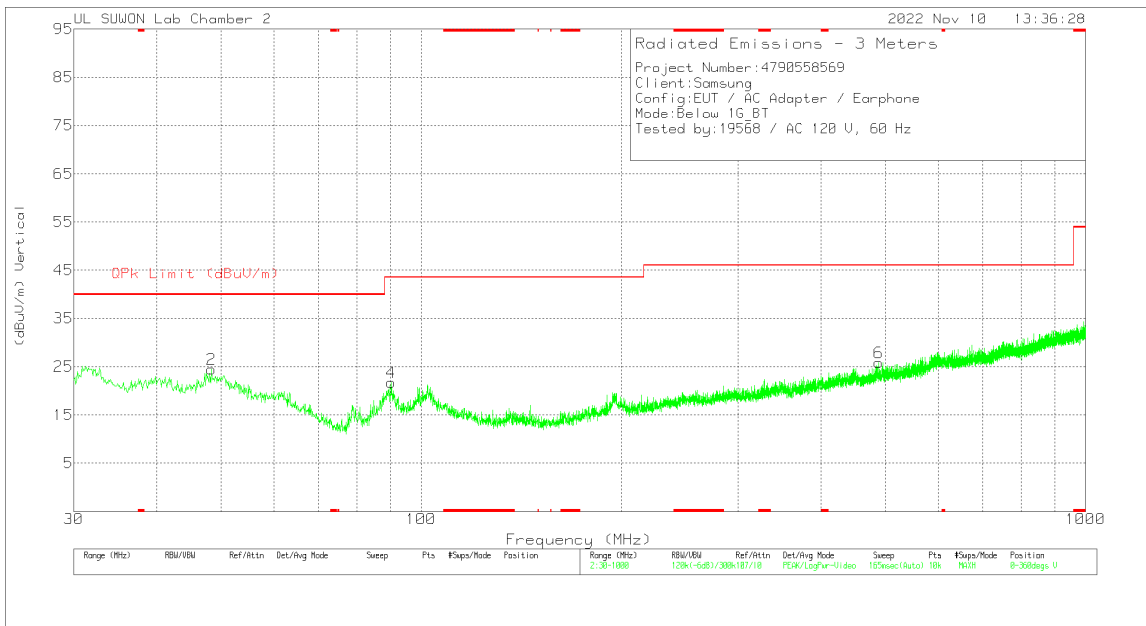
Frequency (GHz)	Meter Reading (dBuV)	Det	3117_00218957	3GHz_HP[dB]	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
* 4.96233	38	PKFH	34.7	-30.3	42.4	-	-	74	-31.6	0	100	H
* 4.95523	37.5	PKFH	34.7	-30.5	41.7	-	-	74	-32.3	0	100	V
* 7.44728	33.61	PKFH	36	-24.9	44.71	-	-	74	-29.29	0	100	H
* 7.43366	33.71	PKFH	36	-24.7	45.01	-	-	74	-28.99	0	100	V
9.9264	29.92	PKFH	37.8	-21.5	46.22	-	-	74	-27.78	0	100	H
9.92012	29.93	PKFH	37.7	-21.5	46.13	-	-	74	-27.87	0	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**

**Trace Markers**

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	VULB9163_749	Below 1G[dB]	Corrected Reading (dBuV/m)	QPK Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	55.123	31.23	Pk	19.6	-31.2	19.63	40	-20.37	0-360	100	H
3	177.246	34.7	Pk	15.1	-30	19.8	43.52	-23.72	0-360	100	H
5	364.941	34.7	Pk	20.2	-28.6	26.3	46.02	-19.72	0-360	100	H
2	48.333	35.55	Pk	20.1	-31.2	24.45	40	-15.55	0-360	100	V
4	90.14	36.52	Pk	15.9	-30.7	21.72	43.52	-21.8	0-360	100	V
6	488.616	31.26	Pk	22.7	-28.1	25.86	46.02	-20.16	0-360	100	V

Pk - Peak detector

## 11. AC POWER LINE CONDUCTED EMISSIONS

### LIMITS

FCC §15.207 (a)

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 C63.10:2013.

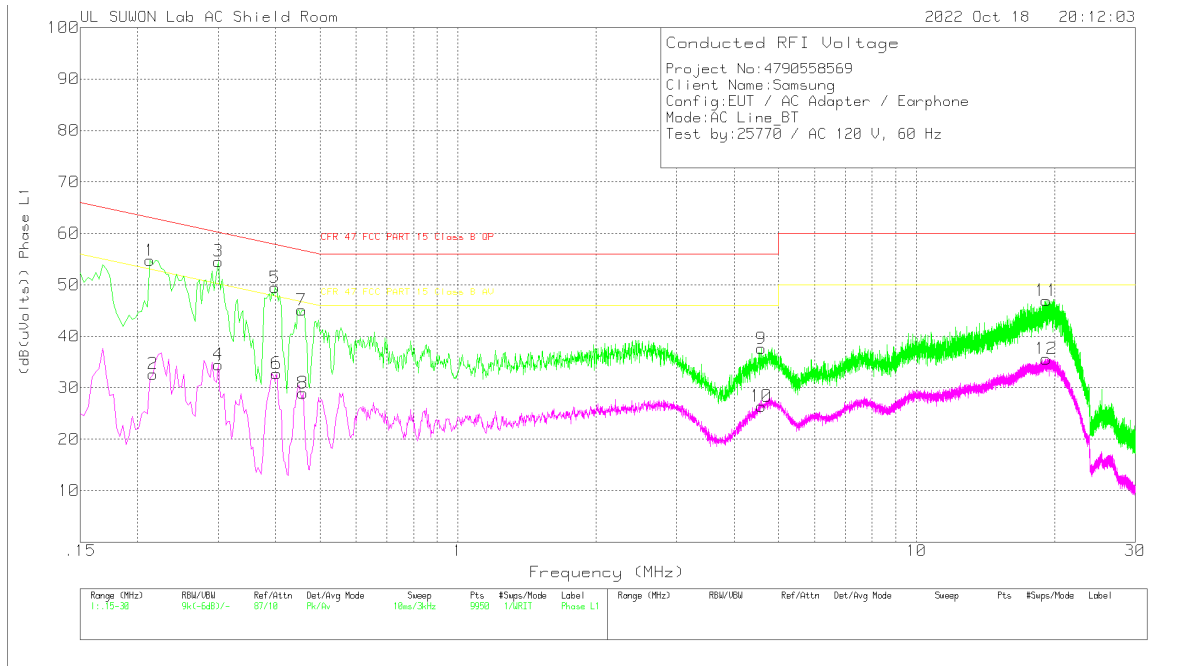
The receiver is set to a resolution bandwidth of 9 kHz. Peak detection is used unless otherwise noted as quasi-peak or average.

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

### RESULTS

# 11.1. AC Power Line

## LINE 1 RESULTS



### Trace Markers

Range 1: Phase L1 .15 - 30MHz

Marker	Frequency(MHz)	Meter Reading (dBuV)	Det	101836_Wit 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	.213	44.72	Pk	9.8	.2	54.72	63.09	-8.37	-	-
2	.216	22.67	Av	9.8	.2	32.67	-	-	52.97	-20.3
3	.3	44.66	Pk	9.7	.2	54.56	60.24	-5.68	-	-
4	.3	24.6	Av	9.7	.2	34.5	-	-	50.24	-15.74
5	.399	39.47	Pk	9.8	.2	49.47	57.87	-8.4	-	-
6	.402	22.77	Av	9.8	.2	32.77	-	-	47.81	-15.04
7	.456	34.98	Pk	9.9	.2	45.08	56.77	-11.69	-	-
8	.459	18.87	Av	9.9	.2	28.97	-	-	46.71	-17.74
9	4.587	27.63	Pk	9.7	.3	37.63	56	-18.37	-	-
10	4.587	16.42	Av	9.7	.3	26.42	-	-	46	-19.58
11	19.182	36.43	Pk	10.1	.4	46.93	60	-13.07	-	-
12	19.182	25.12	Av	10.1	.4	35.62	-	-	50	-14.38

Pk - Peak detector

Av - Average detection

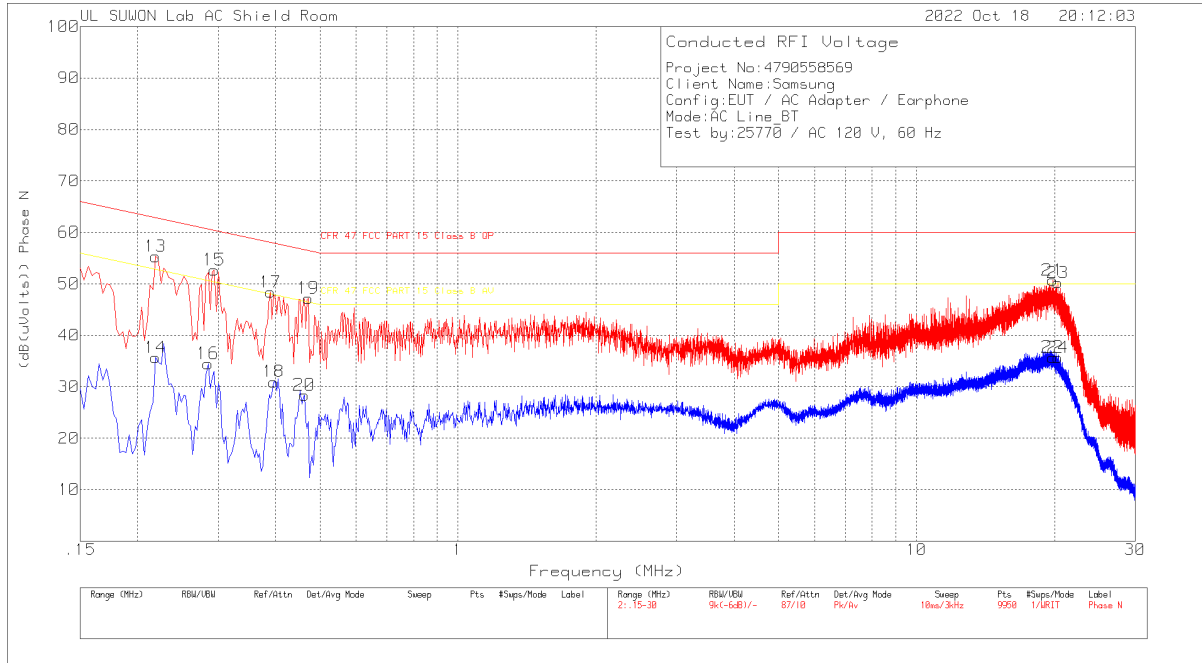
### Quasi-Peak Emissions

Range 1: Phase L1 .15 - 30MHz

Frequency (MHz)	Meter Reading (dBuV)	Det	101836_Wit h EX_L1[dB]	CABLELOS S(dB)	Corrected Reading (dB(uVolts))	CFR 47 FCC PART 15 Class B AV	Margin (dB)	CFR 47 FCC PART 15 Class B AV	Margin (dB)
.21315	24.83	Qp	9.8	.2	34.83	63.08	-28.25	-	-
.30075	36.54	Qp	9.7	.2	46.44	60.22	-13.78	-	-
.39975	37.26	Qp	9.8	.2	47.26	57.86	-10.6	-	-

Qp - Quasi-Peak detector

**LINE 2 RESULTS**



**Trace Markers**

Range 2: Phase N .15 - 30MHz

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	101836_Wit h 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	.219	45.32	Pk	9.8	.2	55.32	62.86	-7.54	-	-
14	.219	25.67	Av	9.8	.2	35.67	-	-	52.86	-17.19
15	.294	42.79	Pk	9.7	.2	52.69	60.41	-7.72	-	-
16	.285	24.6	Av	9.7	.2	34.5	-	-	50.67	-16.17
17	.39	38.38	Pk	9.8	.2	48.38	58.06	-9.68	-	-
18	.396	20.97	Av	9.8	.2	30.97	-	-	47.94	-16.97
19	.471	37.08	Pk	9.9	.2	47.18	56.5	-9.32	-	-
20	.462	18.25	Av	9.9	.2	28.35	-	-	46.66	-18.31
21	19.812	40.11	Pk	10.2	.4	50.71	60	-9.29	-	-
22	19.812	25.12	Av	10.2	.4	35.72	-	-	50	-14.28
23	20.337	39.52	Pk	10.3	.4	50.22	60	-9.78	-	-
24	20.337	24.97	Av	10.3	.4	35.67	-	-	50	-14.33

Pk - Peak detector

Av - Average detection

**Quasi-Peak Emissions**

Range 2: Phase N .15 - 30MHz

Frequency (MHz)	Meter Reading (dBuV)	Det	101836_Wit h 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)
.21975	29.38	Qp	9.7	.2	39.28	62.83	-23.55	-	-
.29415	30.32	Qp	9.7	.2	40.22	60.41	-20.19	-	-
.39075	28.69	Qp	9.8	.2	38.69	58.05	-19.36	-	-
.47025	27.44	Qp	9.9	.2	37.54	56.51	-18.97	-	-
19.8128	31.02	Qp	10.2	.4	41.62	60	-18.38	-	-
20.3372	30.44	Qp	10.3	.4	41.14	60	-18.86	-	-

Qp - Quasi-Peak detector

**END OF TEST REPORT**