



CERTIFICATION TEST REPORT

Report Number. : 4789497455-E5V2

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

Model : SM-N985F/DS, SM-N985F

FCC ID : A3LSMN985F

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

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

Date Of Issue:

July 08, 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	07/02/20	Initial issue	Jihyeon Park
V2	07/08/20	Updated to address TCB's question	Jihyeon Park

TABLE OF CONTENTS

1. ATTESTATION OF TEST RESULTS	5
1.1. INTRODUCTION OF TEST DATA REUSE	6
1.2. DIFFERENCE	6
1.3. SPOT CHECK VERIFICATION DATA.....	6
1.4. REFERENCE DETAIL.....	7
2. TEST METHODOLOGY	8
3. FACILITIES AND ACCREDITATION	8
4. DECISION RULES AND MEASUREMENT UNCERTAINTY	9
4.1. METROLOGICAL TRACEABILITY.....	9
4.2. SAMPLE CALCULATION.....	9
4.3. DECISION RULES.....	9
4.4. MEASUREMENT UNCERTAINTY	9
5. EQUIPMENT UNDER TEST	10
5.1. EUT DESCRIPTION.....	10
5.2. MAXIMUM OUTPUT POWER.....	10
5.3. DESCRIPTION OF AVAILABLE ANTENNAS	10
5.4. WORST-CASE CONFIGURATION AND MODE	10
5.5. DESCRIPTION OF TEST SETUP	11
6. TEST AND MEASUREMENT EQUIPMENT	13
7. TEST RESULTS SUMMARY	14
8. MEASUREMENT METHODS	15
9. ANTENNA PORT TEST RESULTS	16
9.1. ON TIME AND DUTY CYCLE	16
9.2. 20 dB AND 99% BANDWIDTH.....	17
9.2.1. BLUETOOTH BASIC DATA RATE GFSK MODULATION	18
9.2.2. BLUETOOTH ENHANCED DATA RATE 8PSK MODULATION.....	20
9.3. HOPPING FREQUENCY SEPARATION.....	22
9.3.1. BLUETOOTH BASIC DATA RATE GFSK MODULATION	23
9.3.2. BLUETOOTH ENHANCED DATA RATE 8PSK MODULATION.....	24
9.4. NUMBER OF HOPPING CHANNELS	25
9.4.1. BLUETOOTH BASIC DATA RATE GFSK MODULATION	26
9.4.2. BLUETOOTH ENHANCED DATA RATE 8PSK MODULATION.....	28
9.5. AVERAGE TIME OF OCCUPANCY.....	30
9.5.1. BLUETOOTH BASIC DATA RATE GFSK MODULATION	31

9.5.2. BLUETOOTH ENHANCED DATA RATE 8PSK MODULATION.....	33
9.6. OUTPUT POWER.....	35
9.6.1. BASIC DATA RATE GFSK MODULATION.....	35
9.6.2. ENHANCED DATA RATE PI/4-DPSK MODULATION	35
9.6.3. ENHANCED DATA RATE 8PSK MODULATION	35
9.6.1. OUTPUT POWER PLOTS.....	36
9.7. AVERAGE POWER	39
9.7.1. BASIC DATA RATE GFSK MODULATION.....	39
9.7.2. ENHANCED DATA RATE PI/4-DQPSK MODULATION	39
9.7.3. ENHANCED DATA RATE 8PSK MODULATION	39
9.8. CONDUCTED SPURIOUS EMISSIONS.....	40
9.8.1. BLUETOOTH BASIC DATA RATE GFSK MODULATION	41
9.8.2. BLUETOOTH ENHANCED DATA RATE 8PSK MODULATION.....	43
10. RADIATED TEST RESULTS	45
10.1. TRANSMITTER ABOVE 1 GHz.....	47
10.1.1. BLUETOOTH BASIC DATA RATE GFSK MODULATION	47
10.1.2. BLUETOOTH ENHANCED DATA RATE 8PSK MODULATION	57
10.2. WORST CASE BELOW 1 GHZ.....	67
11. AC POWER LINE CONDUCTED EMISSIONS	69
11.1.1. AC Power Line Host	70

1. ATTESTATION OF TEST RESULTS

COMPANY NAME: SAMSUNG ELECTRONICS CO., LTD.

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

MODEL NUMBER: SM-N985F/DS, SM-N985F

SERIAL NUMBER: 43d9e5cc711e7ece, 41a26381d91f7ece(CONDUCTED, Original)
R3CN40FXTKX, R3CN40CD5BN, R3CN40CD4FP
(RADIATED, Original);
R38N406WLZB, R38N406WEPX(Spot-Check);

DATE TESTED: MAY 04, 2020 – JUN 15, 2020(Original);
JUN 03, 2020 – JUN 26, 2020(Spot-Check);

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:



Jihyeon Park
Suwon Lab Technician
UL Korea, Ltd.

1.1. INTRODUCTION OF TEST DATA REUSE

This report referenced from the FCC ID: A3LSMN986B DSS BT(FCC CFR 47 Part 15C). And the applicant takes full responsibility that the test data as referenced in this report represent compliance for this FCC ID.

1.2. DIFFERENCE

The FCC ID: A3LSMN985F shares the same enclosure and circuit board as FCC ID: A3LSMN986B. The BT antennas and surrounding circuitry and layout are identical between these two units.

After confirming through preliminary radiated emissions that the performance of the FCC ID: A3LSMN986B remains representative of FCC ID: A3LSMN985F. The test data of FCC ID: A3LSMN986B being submitted for this application to cover BT features.

1.3. SPOT CHECK VERIFICATION DATA

(Worst case of the radiated band-edge and radiated spurious emissions)

Band	Test Item	Mode	Frequency	Test Limit	Original model	Spot-check model	Deviation	Remark
					SM-N986B/DS Results	SM-N985F/DS Results		
					FCC ID : A3LSMN986B	FCC ID : A3LSMN985F		
DSS BT (2.4GHz)	Band Edge	GFSK	2480 MHz	54 dBuV/m	41.10 dBuV/m	40.34 dBuV/m	-0.76 dB	-
	RSE	GFSK	9920 MHz	74 dBuV/m	48.30 dBuV/m	48.23 dBuV/m	-0.07 dB	Noise floor

Comparison of two models, upper deviation is within 3 dB range and all test results are under FCC Technical Limits.

1.4. REFERENCE DETAIL

Reference application that contains the reused reference data in the individual test reports:

Equipment Class	Reference FCC ID (Parent)	Application Type	Reference Test report number	Exhibit Type	Variant Test Report Number	Data Re-used
PCE	A3LSMN986B	Original Grant	4789468331-E2	Test Report	4789497455-E2	All
DTS	A3LSMN986B	Original Grant	4789468331-E3 (802.11b/g/n/ax)	Test Report	4789497455-E3 (802.11b/g/n/ax)	All
			4789468331-E4 Bluetooth LE	Test Report	4789497455-E4 Bluetooth LE	All
DSS	A3LSMN986B	Original Grant	4789468331-E5 (Bluetooth)	Test Report	4789497455-E5 (Bluetooth)	All
NII	A3LSMN986B	Original Grant	4789468331-E6 (802.11a/n/ac/ax)	Test Report	4789497455-E6 (802.11a/n/ac/ax)	All
DXX	A3LSMN986B	Original Grant	4789468331-E7 (NFC)	Test Report	4789497455-E7 (NFC)	All
DCD	A3LSMN986B	Original Grant	4789468331-E8 (WPT)	Test Report	4789497455-E8 (WPT)	All

For this application the data reuse is summarized below for each equipment class:

Equipment Class	Reference FCC ID (Parent)	Application Type	Test Item	Data Re-used
PCE	A3LSMN986B	Original Grant	WWAN	All except SAR (full test), HAC (full test)
DTS	A3LSMN986B	Original Grant	BLE	All
			WLAN	All except SAR (full test), HAC (full test)
			WLAN 802.11ax	All except HAC (full test)
DSS	A3LSMN986B	Original Grant	BT	All except SAR (full test)
NII	A3LSMN986B	Original Grant	WLAN	All except SAR (full test), HAC (full test)
			WLAN 802.11ax	All except HAC (full test)
DXX	A3LSMN986B	Original Grant	NFC	All
DCD	A3LSMN986B	Original Grant	WPT	All except RF exposure

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.
5. KDB 484596 D01 Referencing Test Data v01

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	2.35 dB
Radiated Disturbance, 30 MHz to 1 GHz	3.49 dB
Radiated Disturbance, 1 GHz to 18 GHz	5.82 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 Phone + BT/BLE, DTS/UNII a/b/g/n/ac/ax, UWB, WPT and NFC. This test report addresses the BT(DSS) operational mode.

This report covers the Samsung models SM-N986B/DS and SM-N986B. These models are identical in hardware except SM-N986B has single SIM tray. With some pre-scan, model SM-N986B/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	16.684	46.60
		Peak	17.003	50.15
	Enhanced Pi/4-DPSK	Average	9.949	9.88
		Peak	12.647	18.40
	Enhanced 8PSK	Average	9.968	9.93
		Peak	13.352	21.64

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 -5.12 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	R37N39301T8SE3	N/A
Data Cable	SAMSUNG	EP-DG980	N/A	N/A

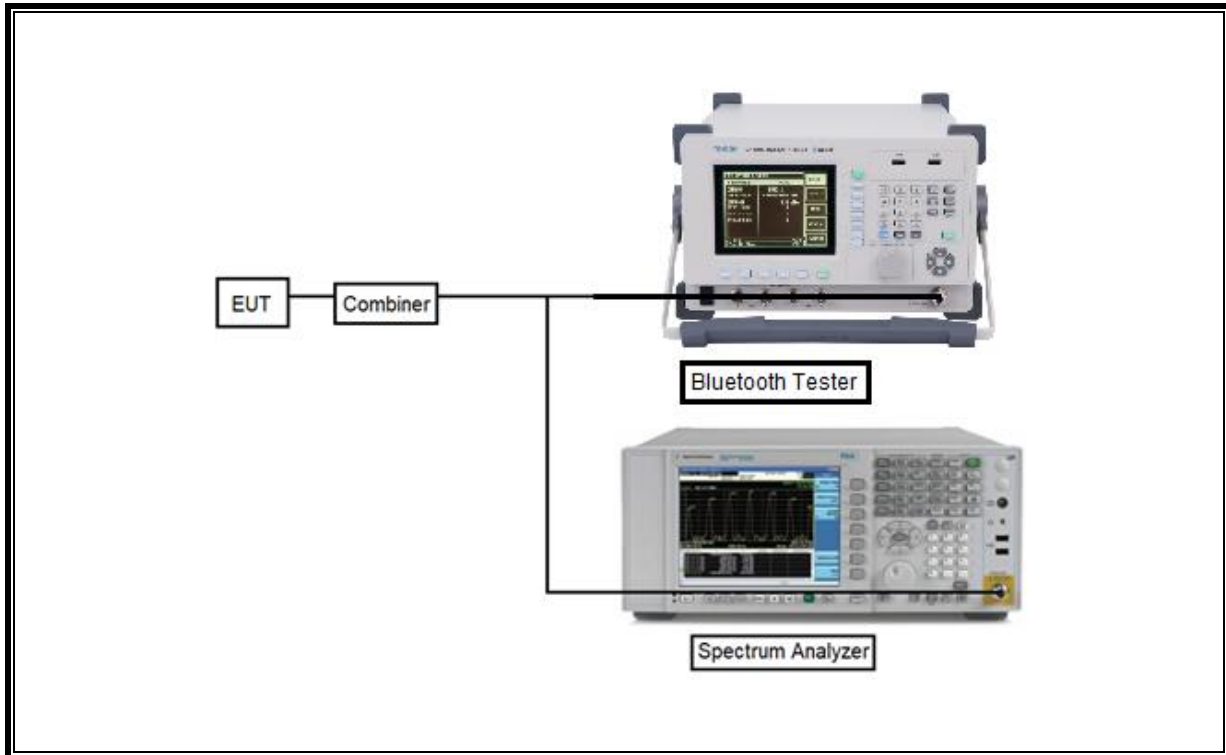
I/O CABLE

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	1.1m	N/A

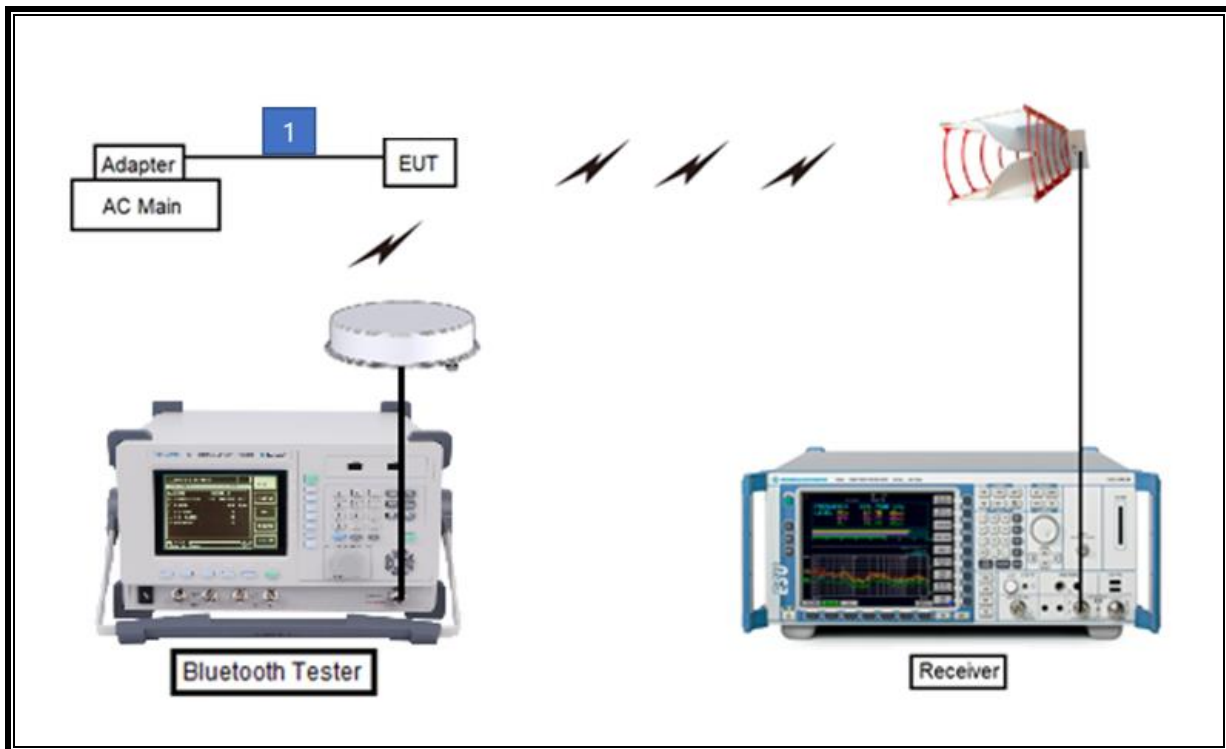
TEST SETUP

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	Next Cal. Date
Antenna, Bilog, 30MHz-1GHz	SCHWARZBECK	VULB9163	750	08-04-20
Antenna, Bilog, 30MHz-1GHz	SCHWARZBECK	VULB9163	749	08-04-20
Antenna, Bilog, 30MHz-1GHz	SCHWARZBECK	VULB9163	845	08-04-20
Antenna, Loop, 9kHz-30MHz	R&S	HFH2-Z2	100418	10-02-21
Antenna, Horn, 18 GHz	ETS	3115	00167211	08-04-20
Antenna, Horn, 18 GHz	ETS	3115	00161451	08-04-20
Antenna, Horn, 18 GHz	ETS	3117	00168724	08-04-20
Antenna, Horn, 18 GHz	ETS	3117	00168717	08-04-20
Antenna, Horn, 18 GHz	ETS	3117	00205959	08-04-20
Antenna, Horn, 40 GHz	ETS	3116C	00166155	08-14-20
Antenna, Horn, 40 GHz	ETS	3116C	00168645	10-02-21
Preamplifier	ETS	3116C-PA	00168841	08-08-20
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	08-05-20
Preamplifier, 1000 MHz	Sonoma	310N	351741	08-05-20
Preamplifier, 1000 MHz	Sonoma	310N	370599	08-05-20
Preamplifier, 18 GHz	Miteq	AFS42-00101800-25-S-42	1876511	08-06-20
Preamplifier, 18 GHz	Miteq	AFS42-00101800-25-S-42	1896138	08-06-20
Preamplifier, 18 GHz	Miteq	AFS42-00101800-25-S-42	2029169	08-06-20
Spectrum Analyzer, 44 GHz	Keysight	N9030B	MY57143717	01-20-21
Spectrum Analyzer, 44 GHz	Agilent / HP	N9030A	MY54170614	08-06-20
Spectrum Analyzer, 44 GHz	Agilent / HP	N9030A	MY54490312	08-06-20
Average Power Sensor	Agilent / HP	U2000	MY54270007	08-09-20
Bluetooth Tester	TESCOM	TC-3000C	3000C000546	08-07-20
Combiner	WEINCHEL	1575	2150	08-08-20
Attenuator	PASTERNAK	PE7087-10	A001	08-08-20
Attenuator	PASTERNAK	PE7087-10	A008	08-08-20
Attenuator	PASTERNAK	PE7087-10	2	08-06-20
EMI Test Receive, 40 GHz	R&S	ESU40	100439	08-06-20
EMI Test Receive, 40 GHz	R&S	ESU40	100457	08-06-20
EMI Test Receive, 44 GHz	R&S	ESW44	101590	08-05-20
EMI Test Receive, 3 GHz	R&S	ESR3	101832	08-05-20
Low Pass Filter 5GHz	Micro-Tronics	LPS17541	009	08-06-20
Low Pass Filter 5GHz	Micro-Tronics	LPS17541	015	08-06-20
Low Pass Filter 5GHz	Micro-Tronics	LPS17541	020	08-06-20
High Pass Filter 3GHz	Micro-Tronics	HPM17543	010	08-06-20
High Pass Filter 3GHz	Micro-Tronics	HPM17543	015	08-06-20
High Pass Filter 3GHz	Micro-Tronics	HPM17543	020	08-06-20
High Pass Filter 6GHz	Micro-Tronics	HPS17542	009	08-06-20
High Pass Filter 6GHz	Micro-Tronics	HPS17542	016	08-06-20
High Pass Filter 6GHz	Micro-Tronics	HPS17542	021	08-06-20
LISN	R&S	ENV-216	101837	08-09-20
Termination	WEINSCHEL	M1406A	T01	08-08-20
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

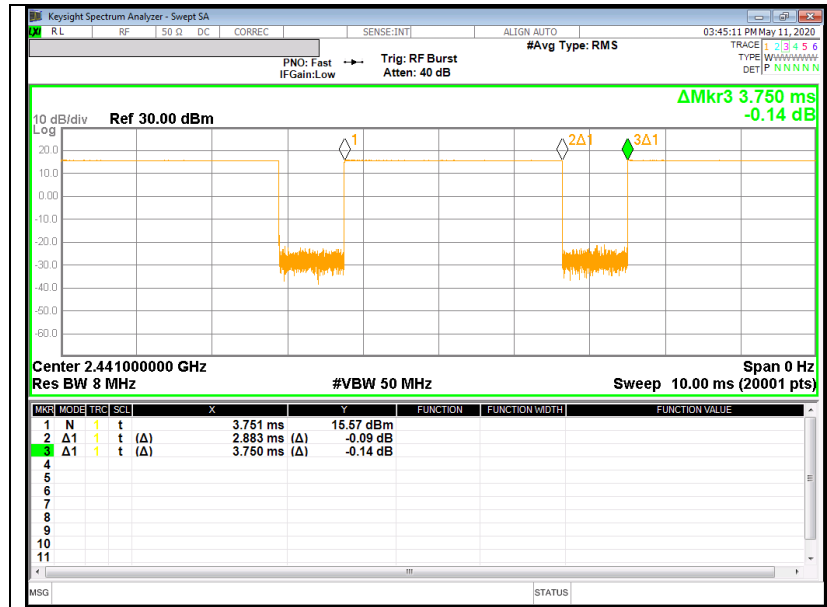
None; for reporting purposes only.

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 x [Linear]	Duty Cycle [%]	Duty Cycle Correction Factor [dB]	1/T Minimum VBW [kHz]
2 400 ~ 2 483.5 MHz Bands						
Bluetooth	2.883	3.750	0.769	76.880	1.142	0.347



9.2. 20 dB AND 99% BANDWIDTH

LIMITS

None; for reporting purposes only.

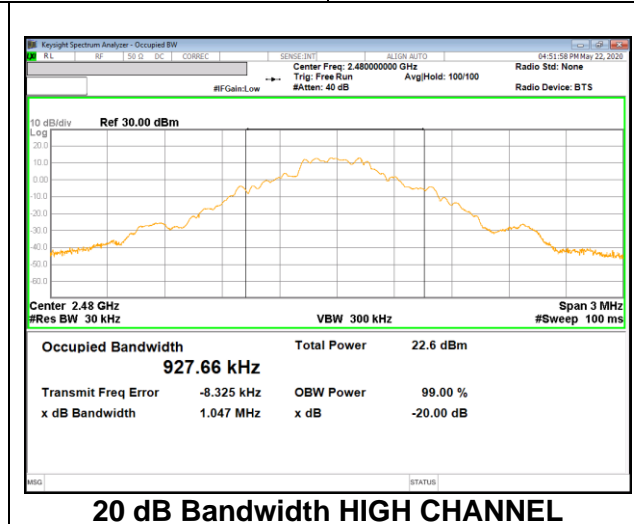
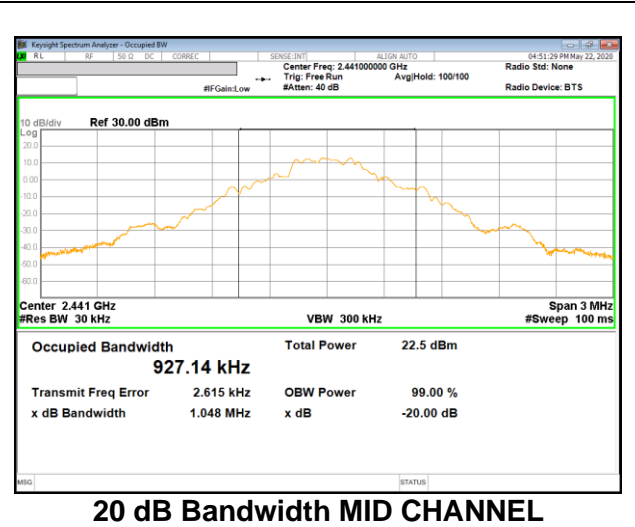
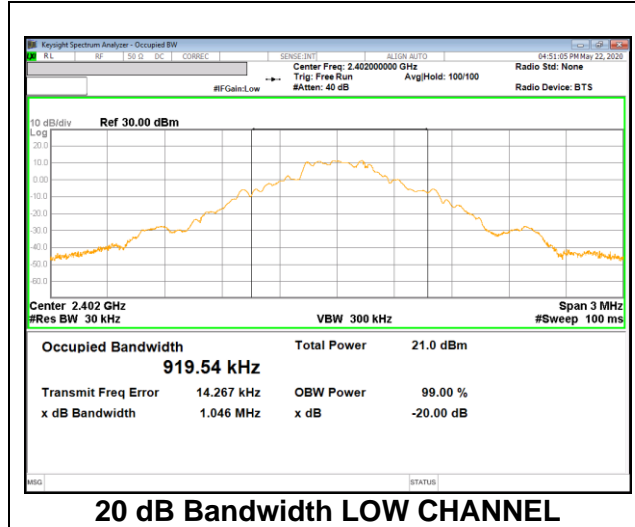
TEST PROCEDURE

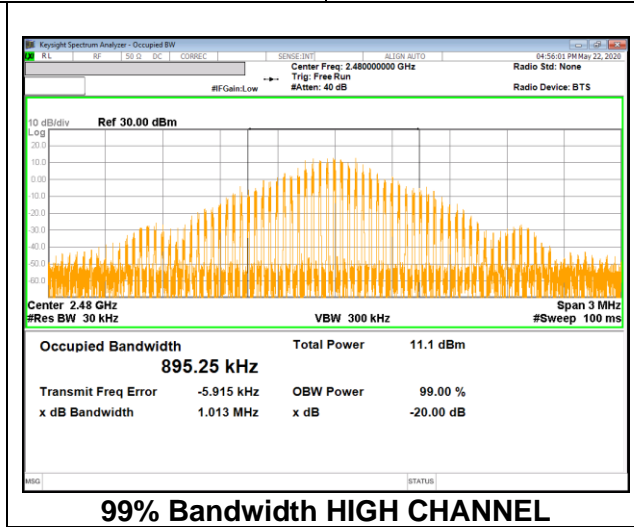
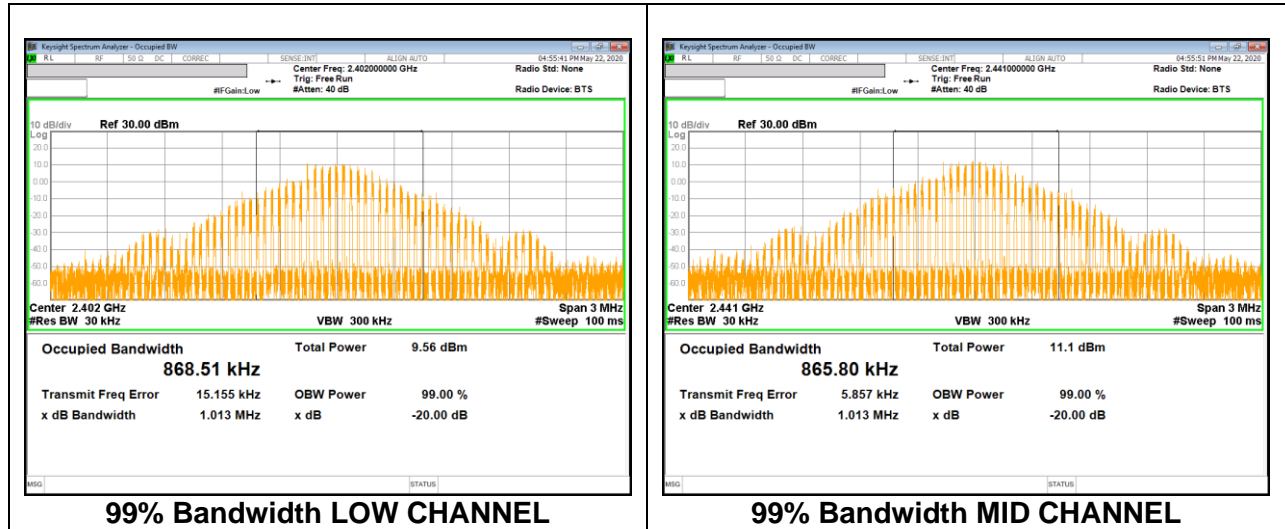
The transmitter output is connected to a spectrum analyzer. The RBW is set to $\geq 1\%$ of the 20 dB bandwidth. The VBW is set to \geq RBW. The sweep time is coupled.

RESULTS

9.2.1. BLUETOOTH BASIC DATA RATE GFSK MODULATION

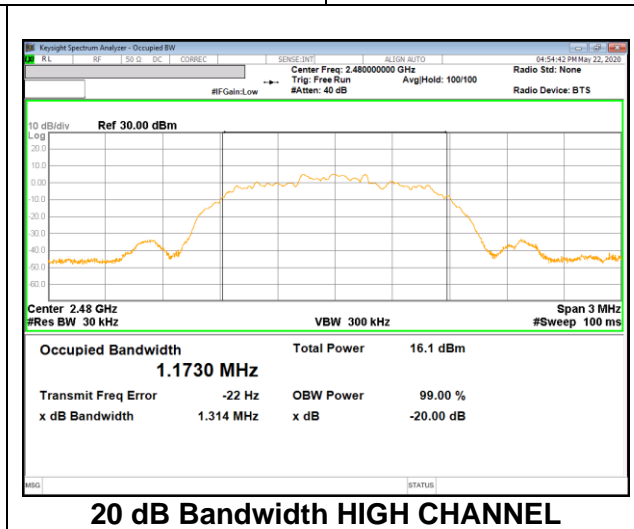
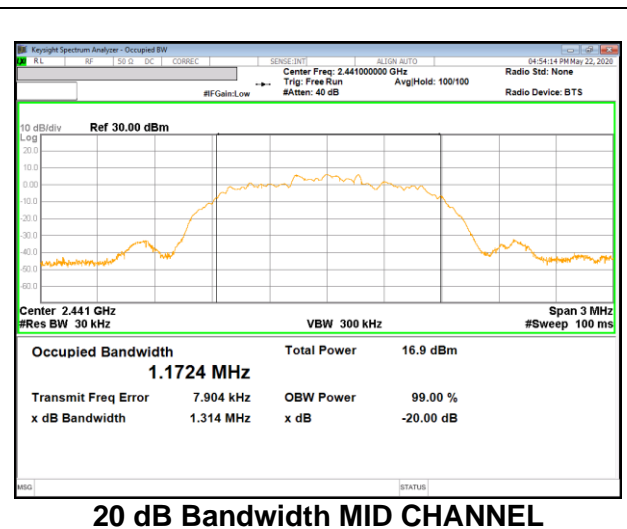
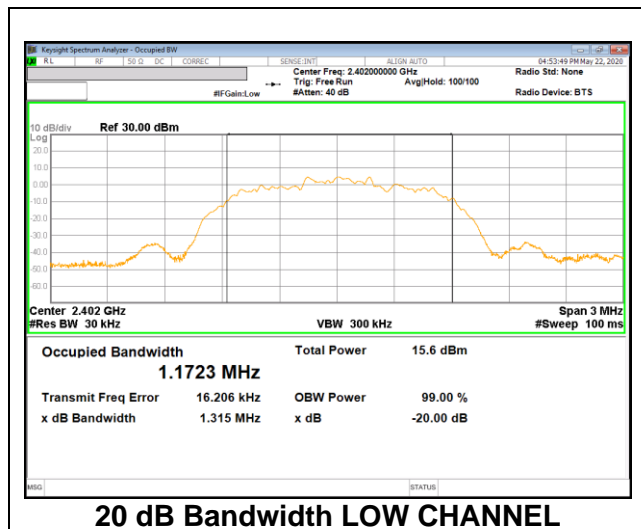
Channel	Frequency [MHz]	20 dB Bandwidth [kHz]	99% Bandwidth [kHz]
Low	2 402	1046.0	868.5
Mid	2 441	1048.0	865.8
High	2 480	1047.0	895.3
Worst		1048.0	895.3

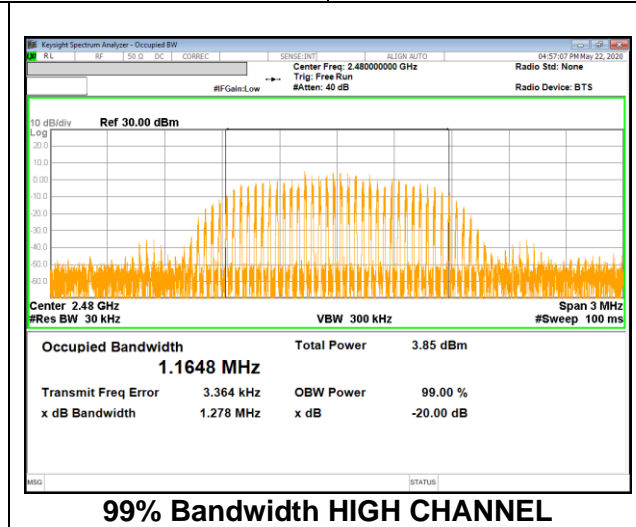
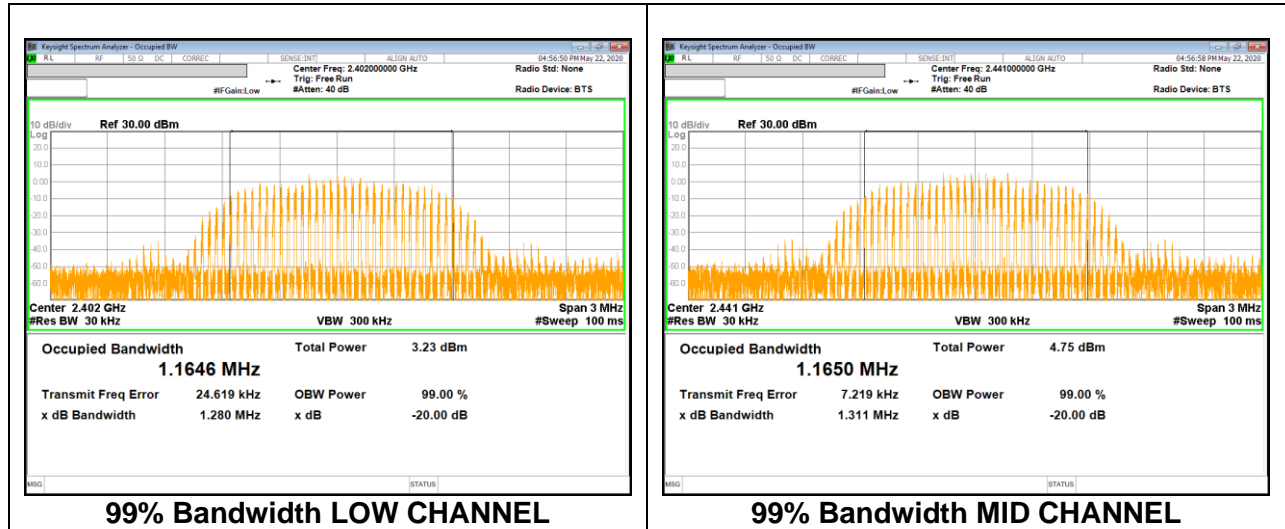




9.2.2. BLUETOOTH ENHANCED DATA RATE 8PSK MODULATION

Channel	Frequency [MHz]	20 dB Bandwidth [kHz]	99% Bandwidth [kHz]
Low	2 402	1315.0	1164.6
Mid	2 441	1314.0	1165.0
High	2 480	1314.0	1164.8
Worst		1315.0	1165.0





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.

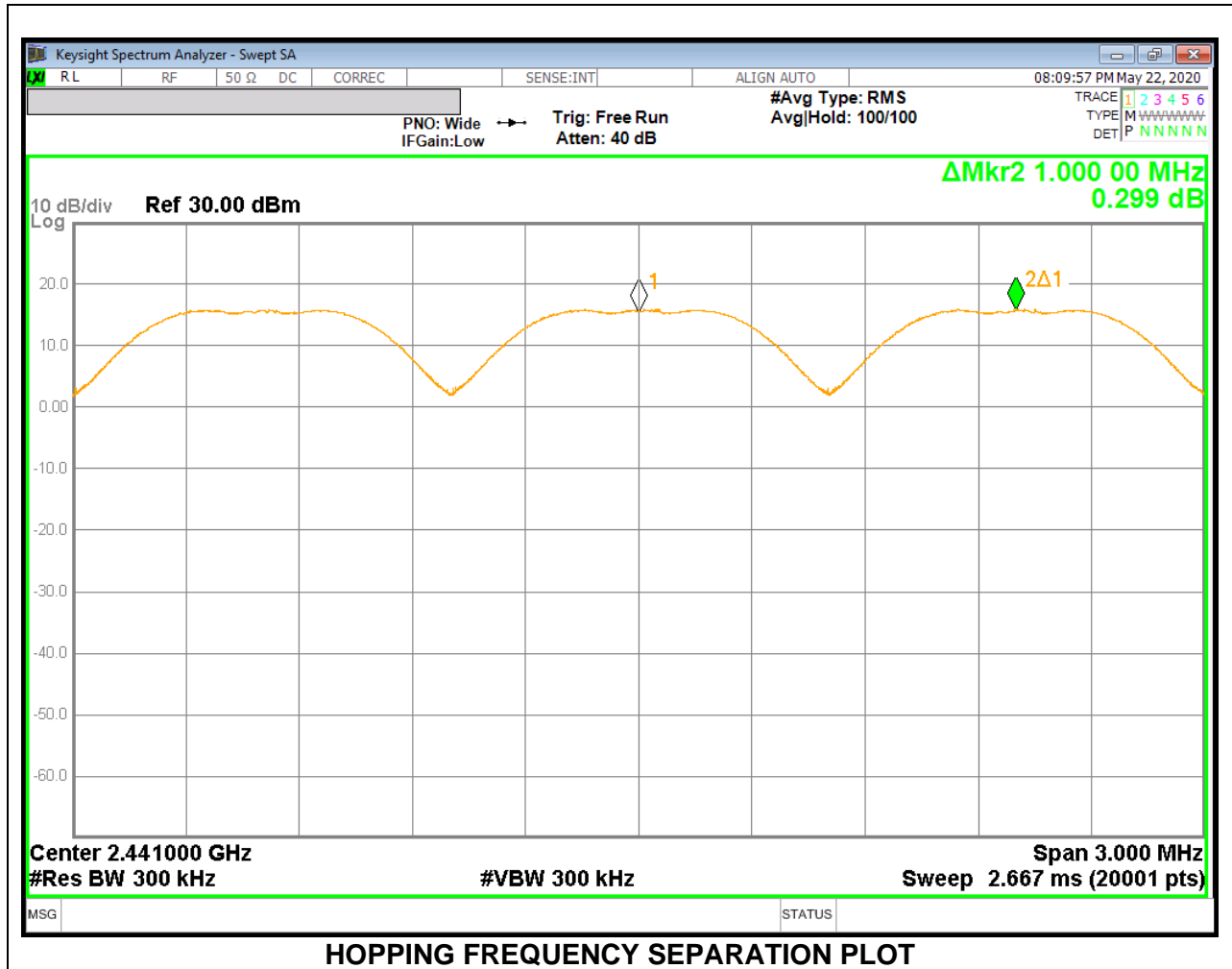
Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than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

TEST PROCEDURE

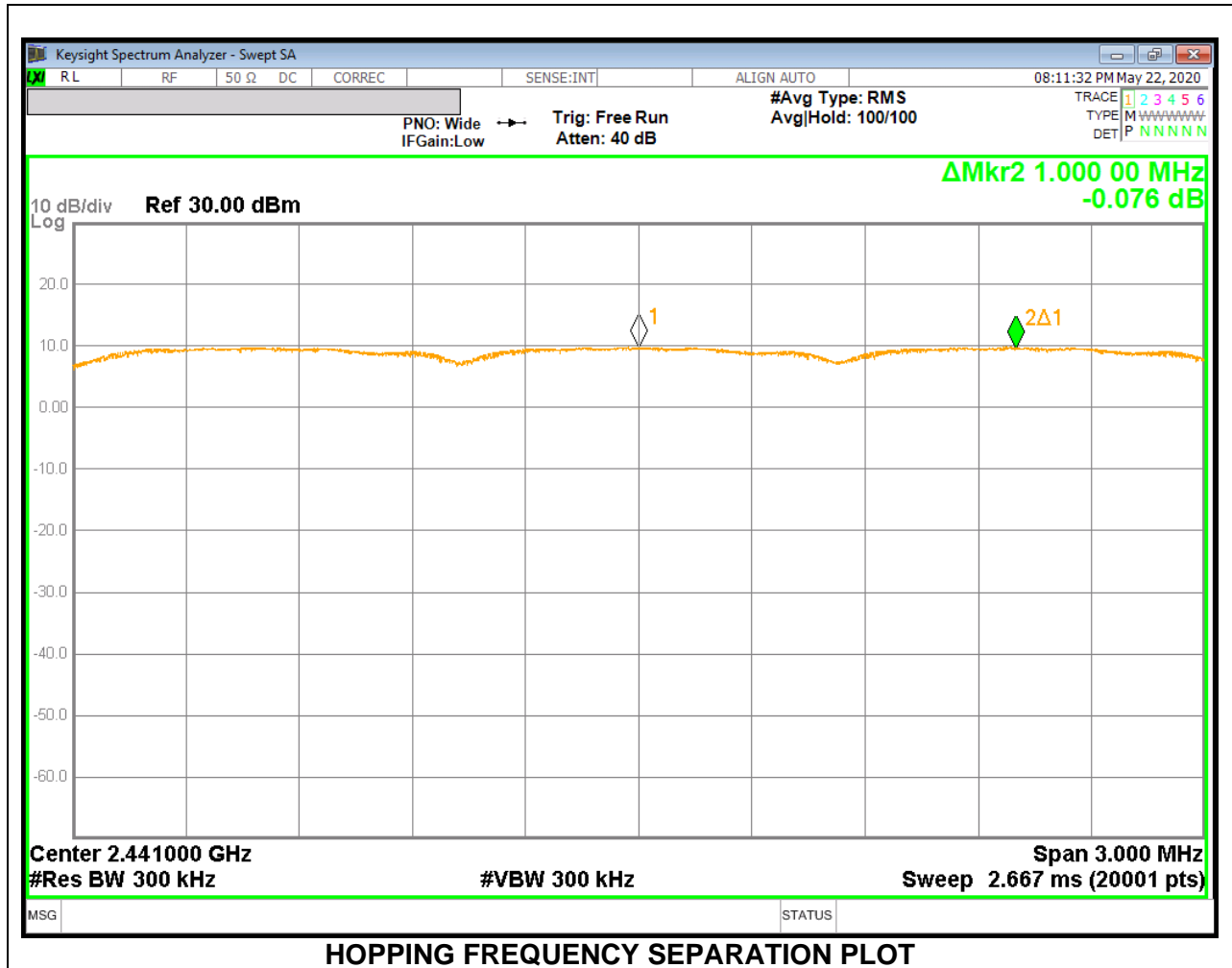
The transmitter output is connected to a spectrum analyzer. The RBW is set to 300 kHz and the VBW is set to $VBW \geq RBW$. The sweep time is coupled.

RESULTS

9.3.1. BLUETOOTH BASIC DATA RATE GFSK MODULATION



9.3.2. BLUETOOTH ENHANCED DATA RATE 8PSK MODULATION



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.

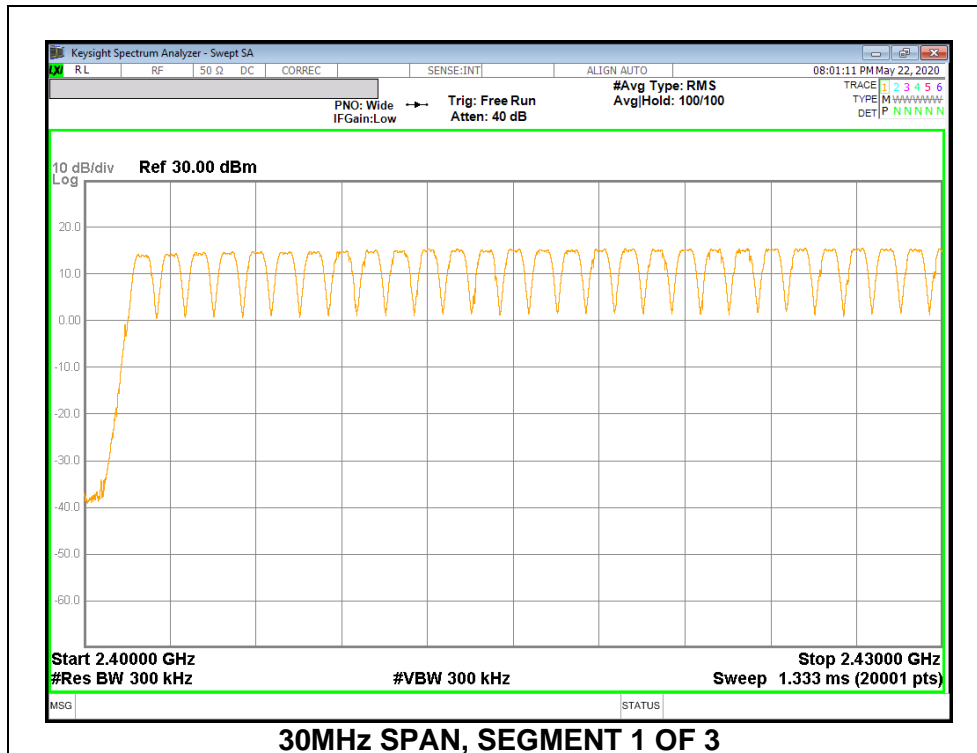
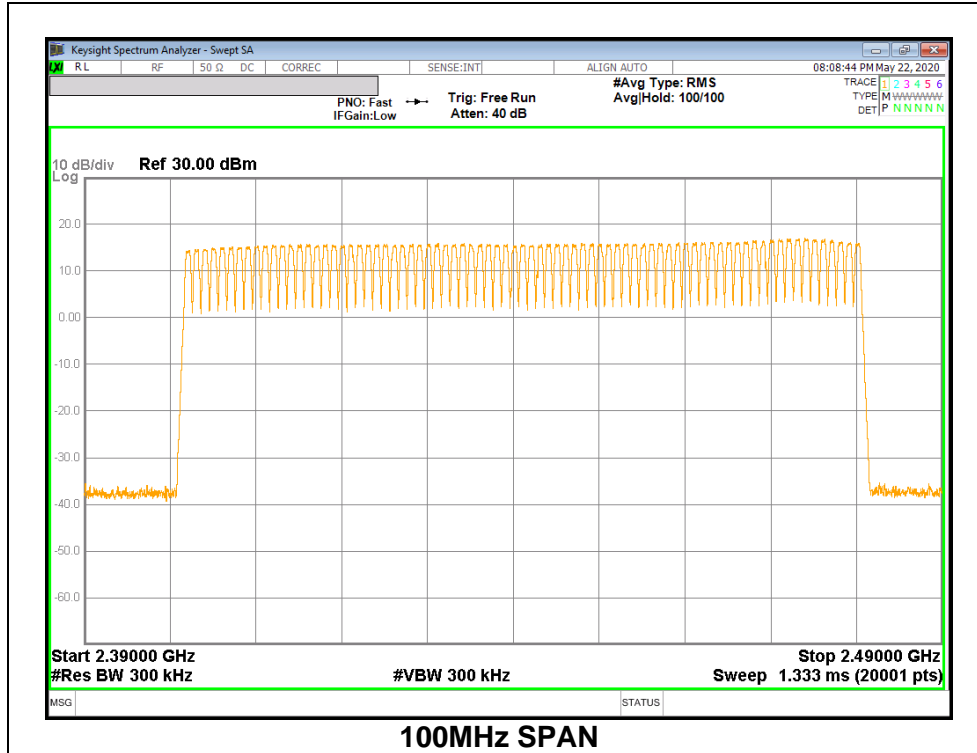
TEST PROCEDURE

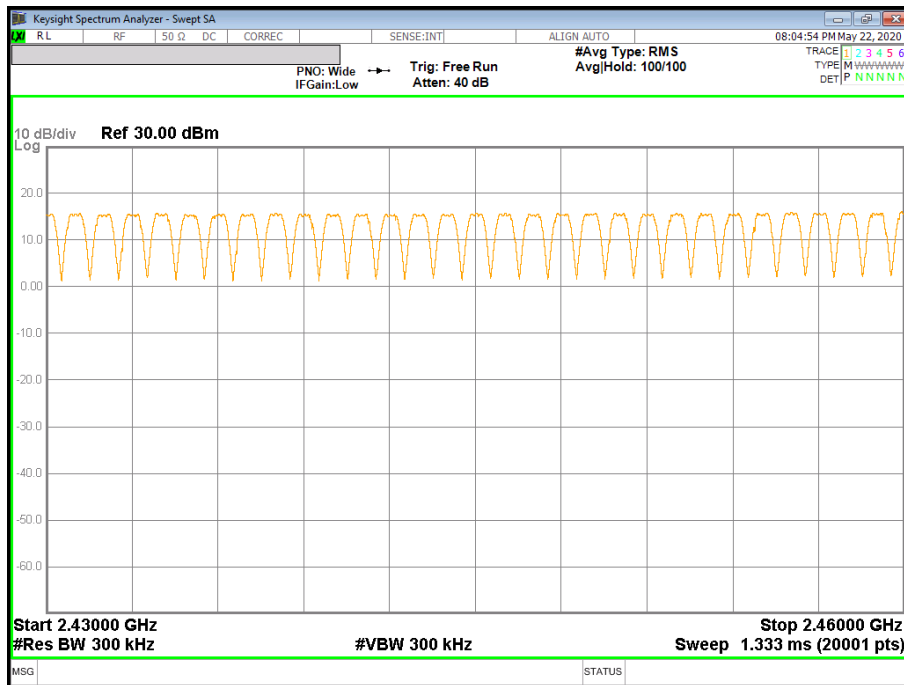
The transmitter output is connected to a spectrum analyzer. The span is set to cover the entire authorized band, in either a single sweep or in multiple contiguous sweeps. The RBW is set to a maximum of 1 % of the span. The analyzer is set to Max Hold.

RESULTS

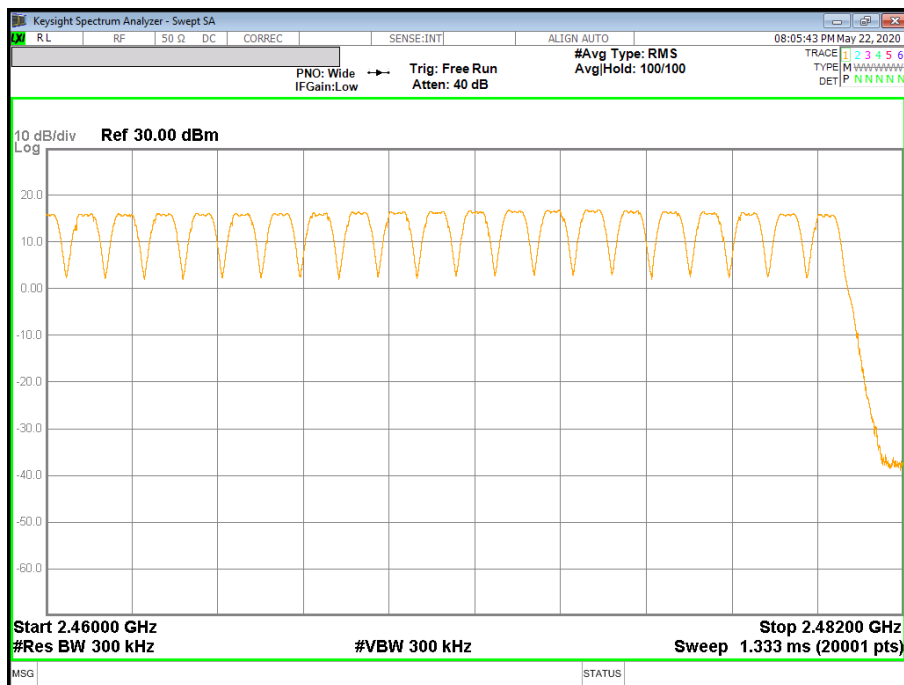
Normal Mode: All Channels Observed

9.4.1. BLUETOOTH BASIC DATA RATE GFSK MODULATION



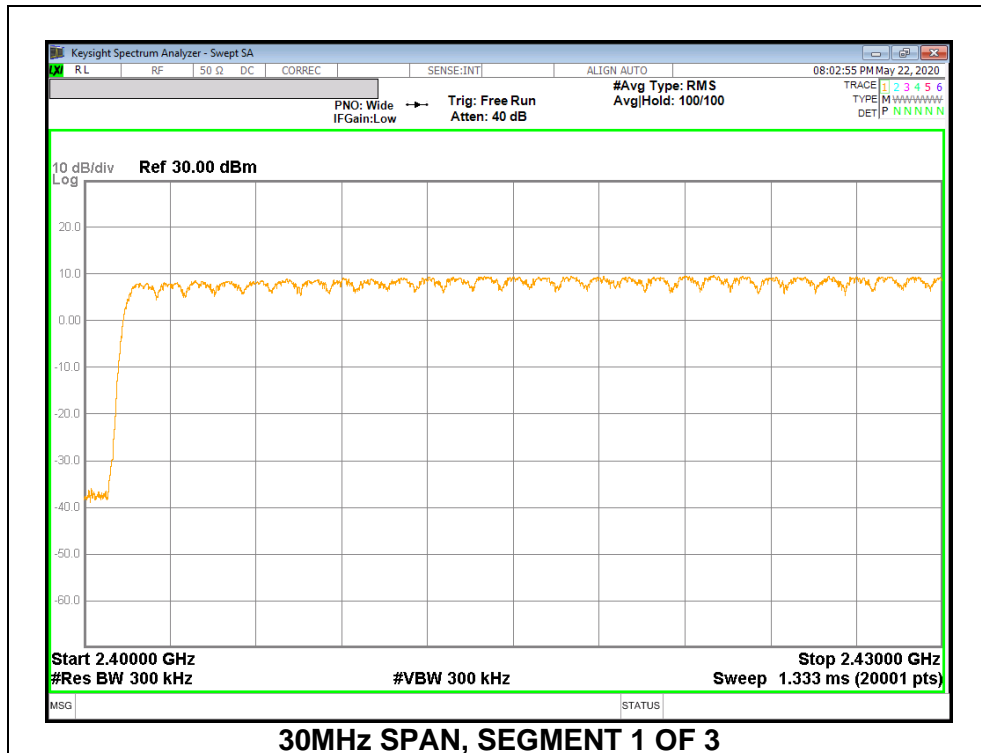
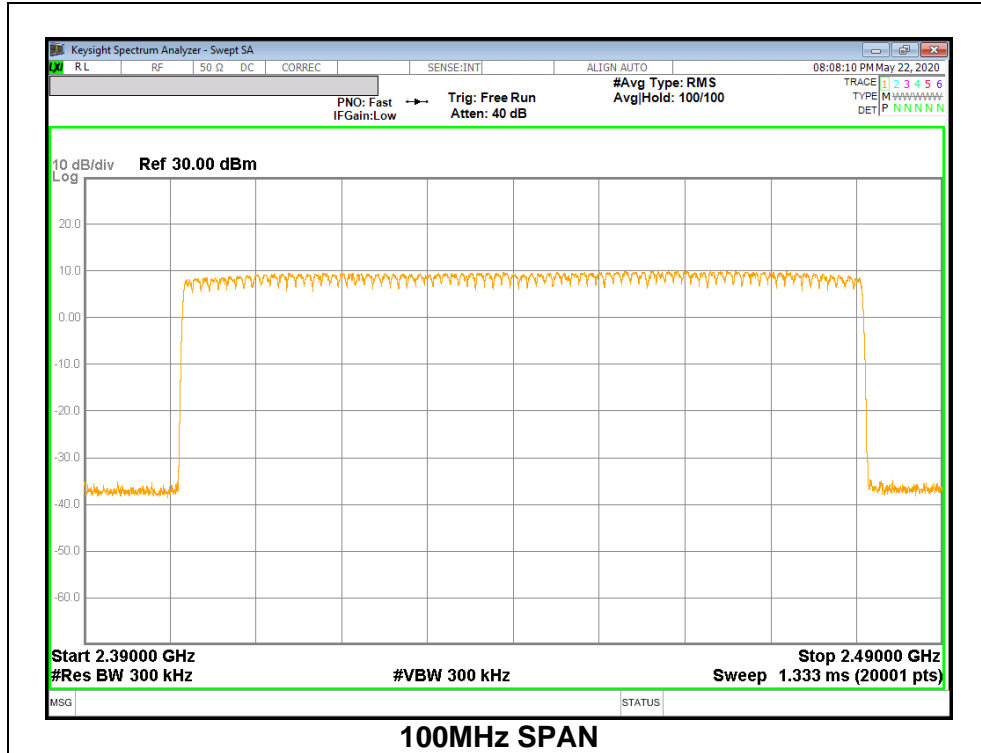


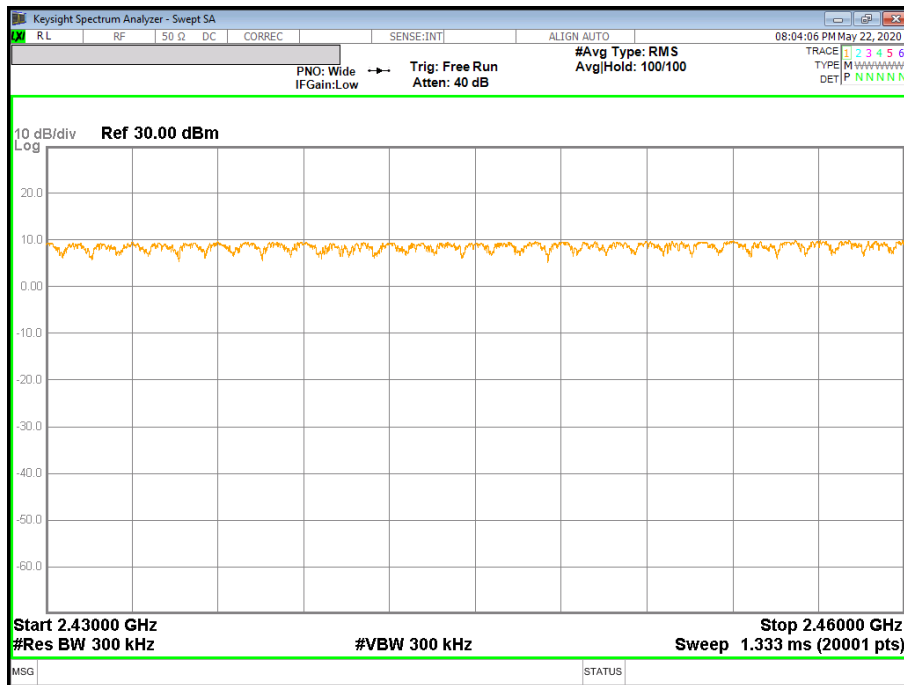
30MHz SPAN, SEGMENT 2 OF 3



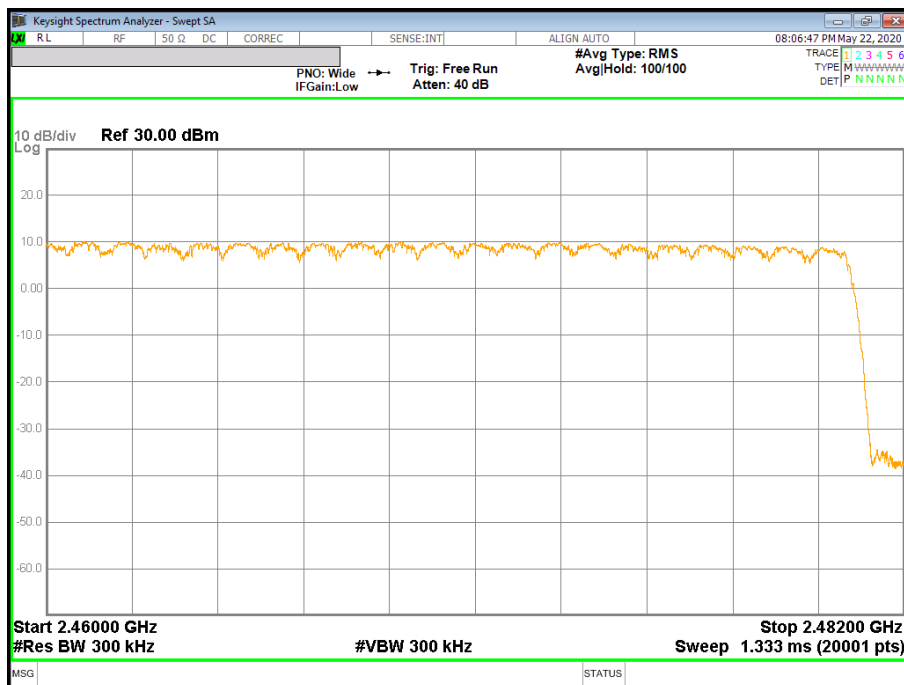
30MHz SPAN, SEGMENT 3 OF 3

9.4.2. BLUETOOTH ENHANCED DATA RATE 8PSK MODULATION





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.

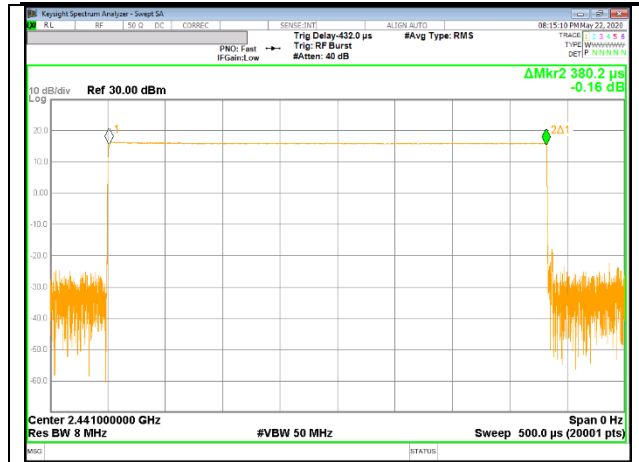
The average time of occupancy in the specified 3.16 second period (79 channels * 0.4 s) is equal to $10 * (\# \text{ of pulses in } 3.16 \text{ s}) * \text{ pulse width}$.

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

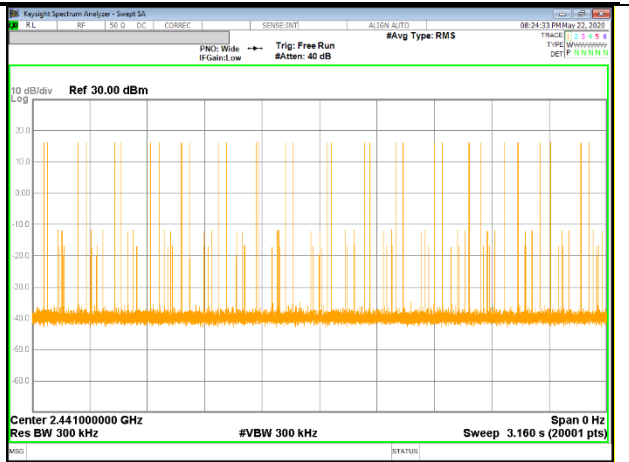
RESULTS

9.5.1. BLUETOOTH BASIC DATA RATE GFSK MODULATION

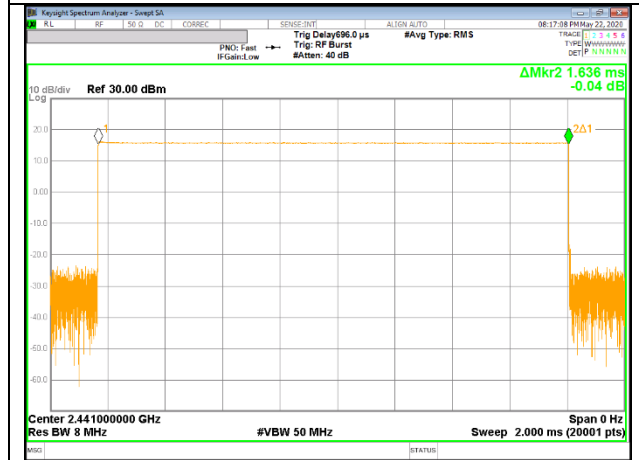
DH Packet	Pulse Width [msec]	Number of Pulses in 3.16 seconds	Average Time of Occupancy [sec]	Limit [sec]	Margin [sec]
GFSK Normal					
DH1	0.380	32	0.121664	0.4	-0.2783
DH3	1.636	16	0.261760	0.4	-0.1382
DH5	2.884	12	0.346080	0.4	-0.0539
DH Packet	Pulse Width [msec]	Number of Pulses in 0.8 seconds	Average Time of Occupancy [sec]	Limit [sec]	Margin [sec]
GFSK AFH					
DH1	0.380	8	0.030416	0.4	-0.3696
DH3	1.636	4	0.065440	0.4	-0.3346
DH5	2.884	3	0.086520	0.4	-0.3135



PULSE WIDTH – DH1



NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD – DH1



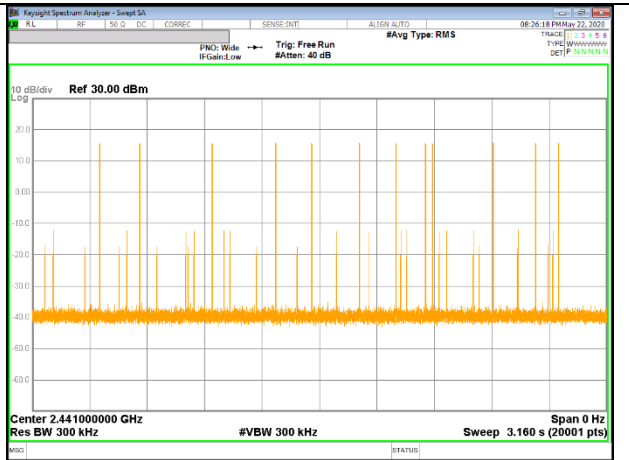
PULSE WIDTH – DH3



NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD – DH3



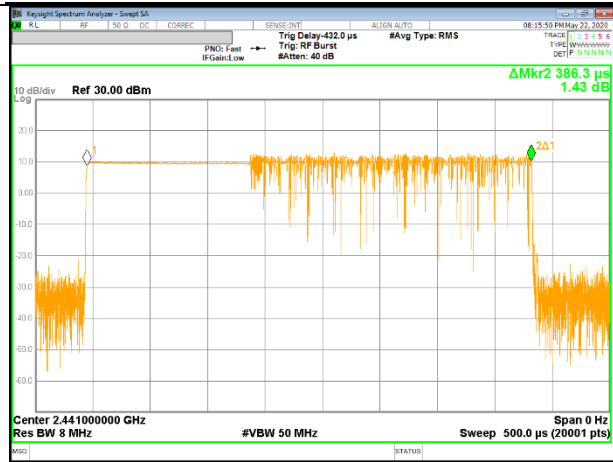
PULSE WIDTH – DH5



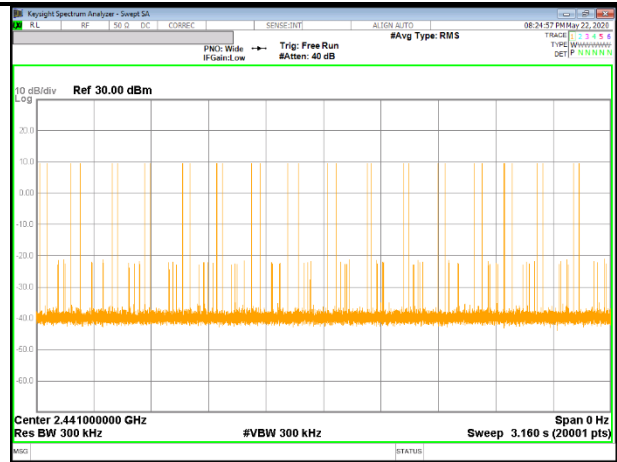
NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD – DH5

9.5.2. BLUETOOTH ENHANCED DATA RATE 8PSK MODULATION

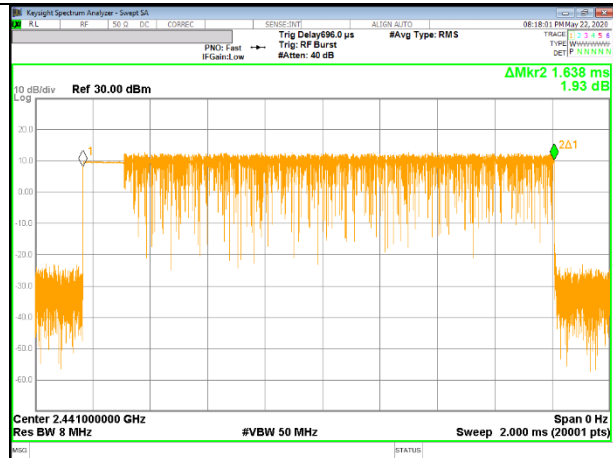
DH Packet	Pulse Width [msec]	Number of Pulses in 3.16 seconds	Average Time of Occupancy [sec]	Limit [sec]	Margin [sec]
GFSK Normal					
DH1	0.386	32	0.123616	0.4	-0.2764
DH3	1.638	17	0.278460	0.4	-0.1215
DH5	2.889	12	0.346680	0.4	-0.0533
DH Packet	Pulse Width [msec]	Number of Pulses in 0.8 seconds	Average Time of Occupancy [sec]	Limit [sec]	Margin [sec]
GFSK AFH					
DH1	0.386	8	0.030904	0.4	-0.369096
DH3	1.638	4.25	0.069615	0.4	-0.330385
DH5	2.889	3	0.086670	0.4	-0.31333



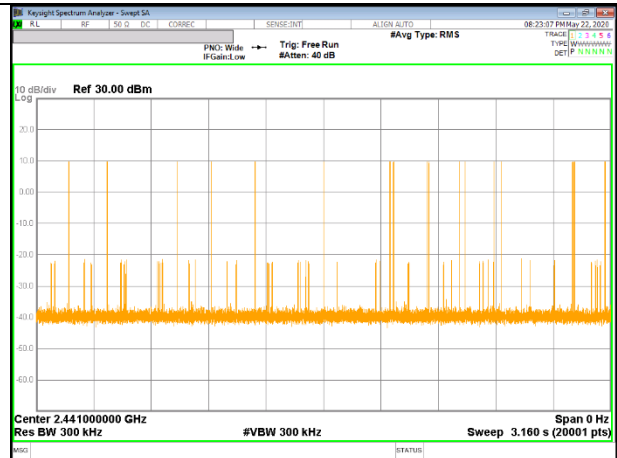
PULSE WIDTH – 3DH1



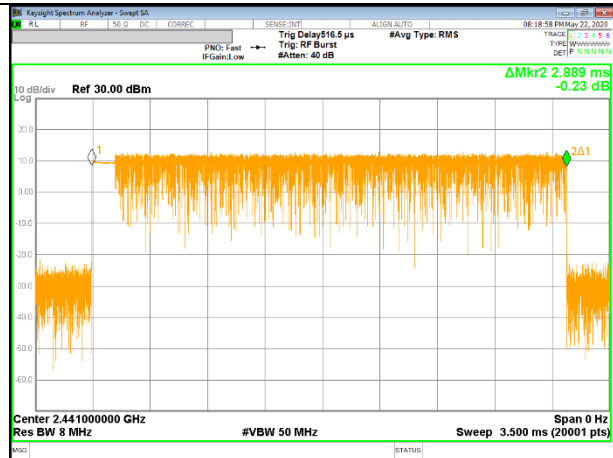
NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD – 3DH1



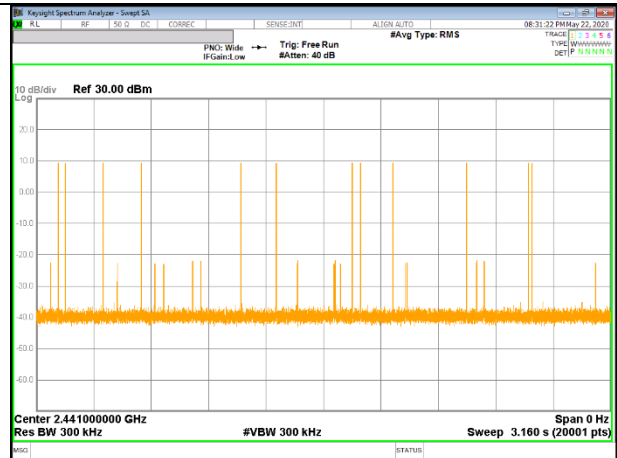
PULSE WIDTH – 3DH3



NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD – 3DH3



PULSE WIDTH – 3DH5



NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD – 3DH5

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 [dB]
Low	2 402	15.704	21.000	-5.296
Mid	2 441	17.003	21.000	-3.997
High	2 480	16.871	21.000	-4.129
Worst		17.003	21.000	-3.997

9.6.2. ENHANCED DATA RATE Pi/4-DPSK MODULATION

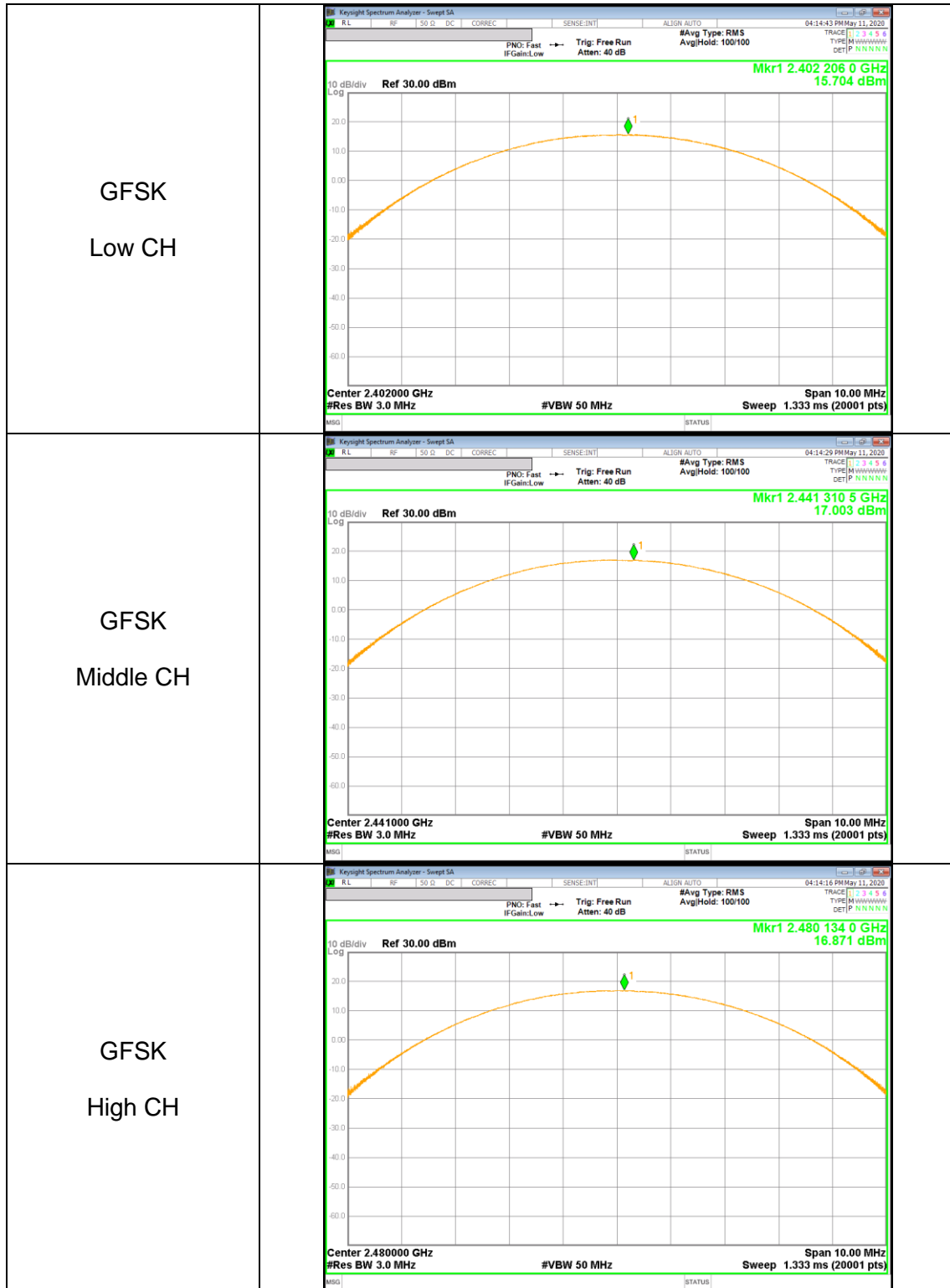
Channel	Frequency [MHz]	Output Power [dBm]	Limit [dBm]	Margin [dB]
Low	2 402	11.659	21.000	-9.341
Mid	2 441	12.647	21.000	-8.353
High	2 480	11.865	21.000	-9.135
Worst		12.647	21.000	-8.353

9.6.3. ENHANCED DATA RATE 8PSK MODULATION

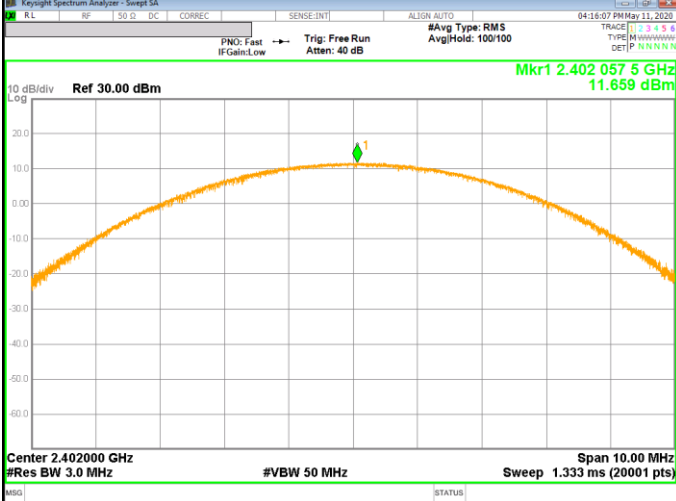
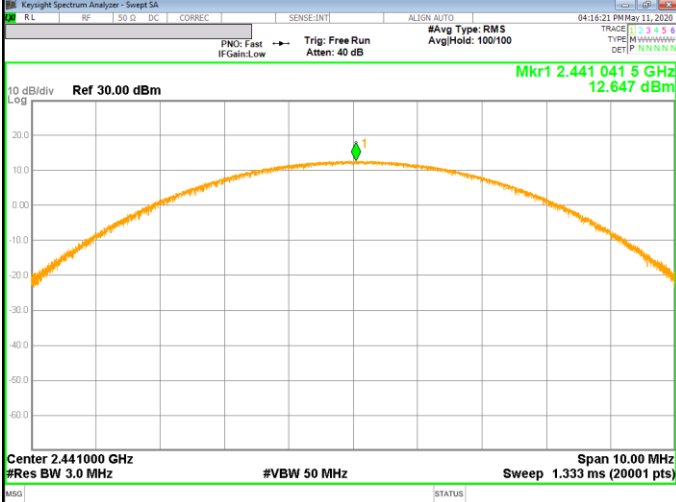
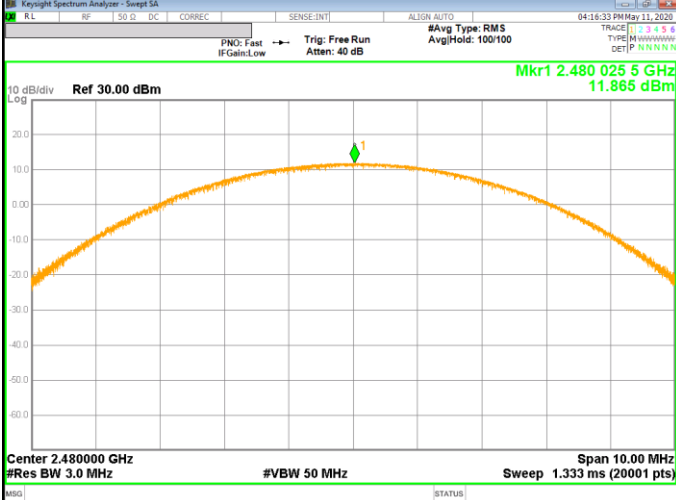
Channel	Frequency [MHz]	Output Power [dBm]	Limit [dBm]	Margin [dB]
Low	2 402	12.112	21.000	-8.888
Mid	2 441	13.352	21.000	-7.648
High	2 480	12.544	21.000	-8.456
Worst		13.352	21.000	-7.648

9.6.1. OUTPUT POWER PLOTS

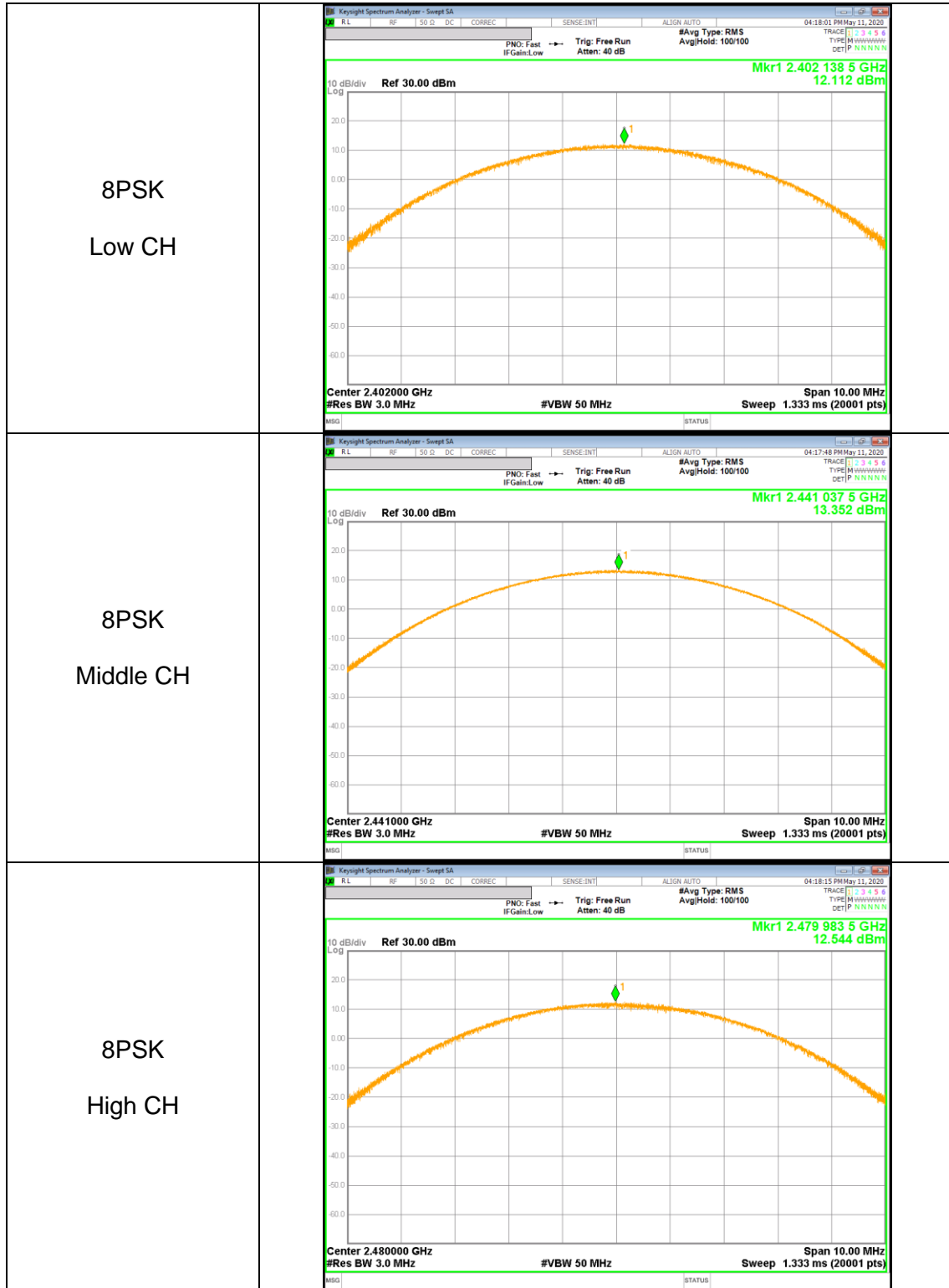
GFSK OUTPUT POWER



Pi/4-DPSK OUTPUT POWER

<p>Pi/4-DPSK Low CH</p>	 <p>KeySight Spectrum Analyzer - Serial SA RL RF 50 Ω DC CORREC SENSE INT ALIGN AUTO 04:16:07 PM May 11, 2020 PNO: Fast Trig: Free Run #Avg Type: RMS IF Gain: Low Atten: 40 dB Avg Hold: 100/100 TRACE 1 2 3 4 5 6 TYPE M W W W W W W W DEFP N N N N N N N N Ref 30.00 dBm Mkr1 2.402 057 5 GHz 11.659 dBm 10 dB/div LOG Center 2.402000 GHz Span 10.00 MHz #Res BW 3.0 MHz #VBW 50 MHz Sweep 1.333 ms (20001 pts)</p>
<p>Pi/4-DPSK Middle CH</p>	 <p>KeySight Spectrum Analyzer - Serial SA RL RF 50 Ω DC CORREC SENSE INT ALIGN AUTO 04:16:21 PM May 11, 2020 PNO: Fast Trig: Free Run #Avg Type: RMS IF Gain: Low Atten: 40 dB Avg Hold: 100/100 TRACE 1 2 3 4 5 6 TYPE M W W W W W W W DEFP N N N N N N N N Ref 30.00 dBm Mkr1 2.441 041 5 GHz 12.647 dBm 10 dB/div LOG Center 2.441000 GHz Span 10.00 MHz #Res BW 3.0 MHz #VBW 50 MHz Sweep 1.333 ms (20001 pts)</p>
<p>Pi/4-DPSK High CH</p>	 <p>KeySight Spectrum Analyzer - Serial SA RL RF 50 Ω DC CORREC SENSE INT ALIGN AUTO 04:16:33 PM May 11, 2020 PNO: Fast Trig: Free Run #Avg Type: RMS IF Gain: Low Atten: 40 dB Avg Hold: 100/100 TRACE 1 2 3 4 5 6 TYPE M W W W W W W W DEFP N N N N N N N N Ref 30.00 dBm Mkr1 2.480 025 5 GHz 11.865 dBm 10 dB/div LOG Center 2.480000 GHz Span 10.00 MHz #Res BW 3.0 MHz #VBW 50 MHz Sweep 1.333 ms (20001 pts)</p>

8PSK OUTPUT POWER



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]
Low	2 402	15.035	31.879
Middle	2 441	16.549	45.175
High	2 480	16.684	46.602

9.7.2. ENHANCED DATA RATE PI/4-DQPSK MODULATION

Channel	Frequency [MHz]	AV power [dBm]	AV power [mW]
Low	2 402	7.451	5.560
Middle	2 441	9.949	9.883
High	2 480	9.372	8.654

9.7.3. ENHANCED DATA RATE 8PSK MODULATION

Channel	Frequency [MHz]	AV power [dBm]	AV power [mW]
Low	2 402	8.570	7.195
Middle	2 441	9.968	9.926
High	2 480	9.365	8.639

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.

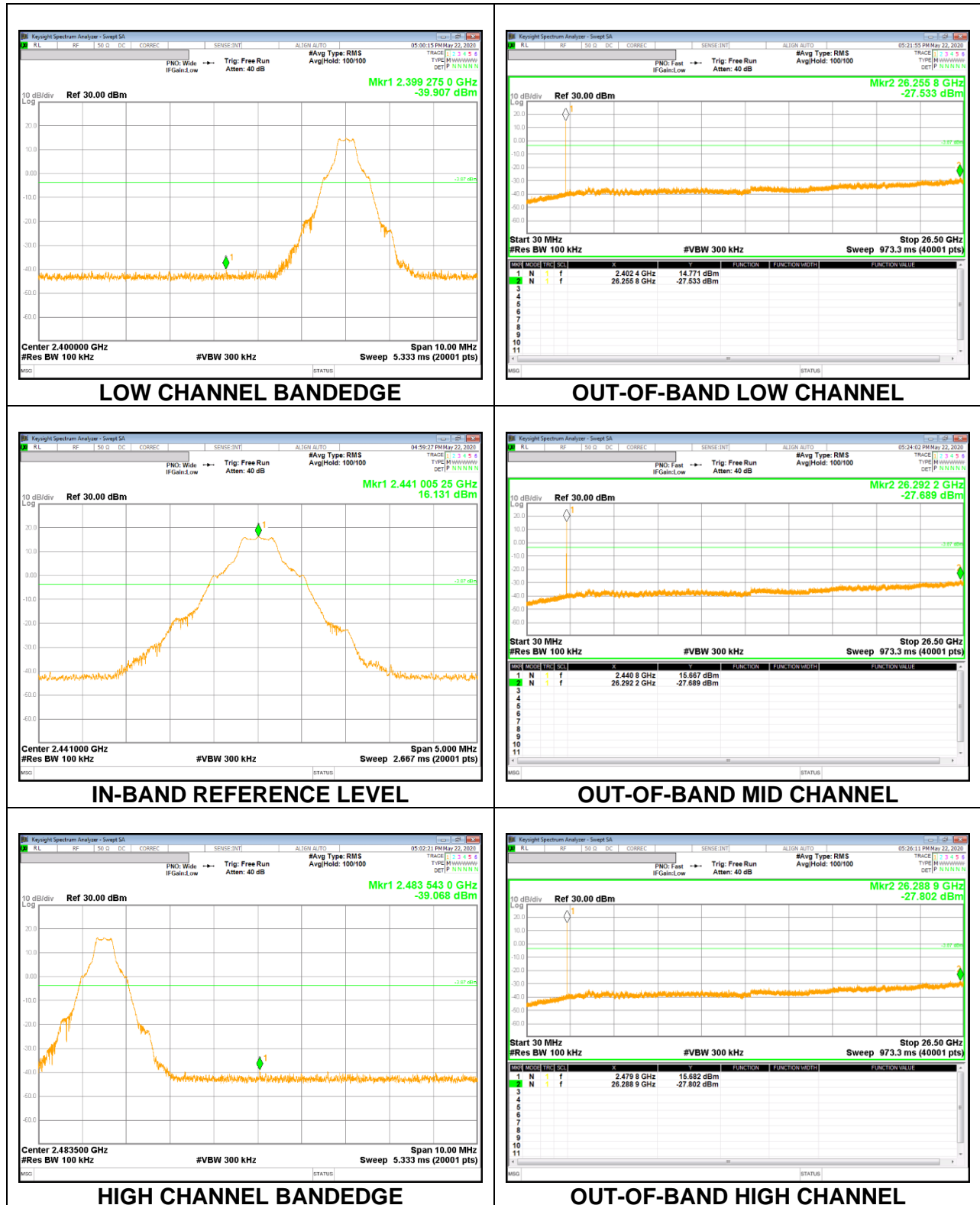
The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels.

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

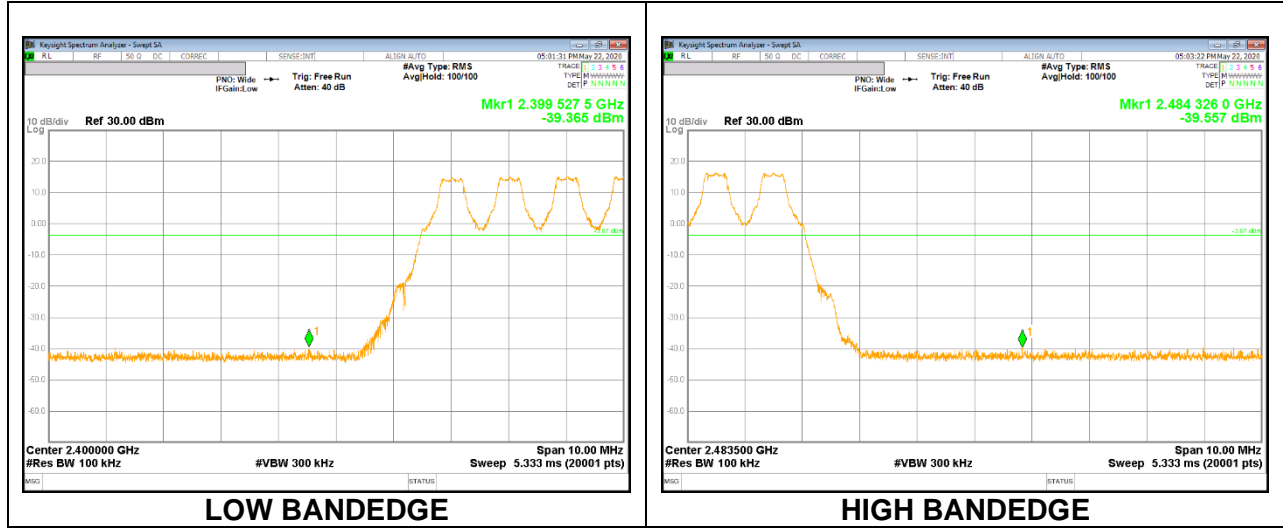
RESULTS

9.8.1. BLUETOOTH BASIC DATA RATE GFSK MODULATION

SPURIOUS EMISSIONS, NON-HOPPING

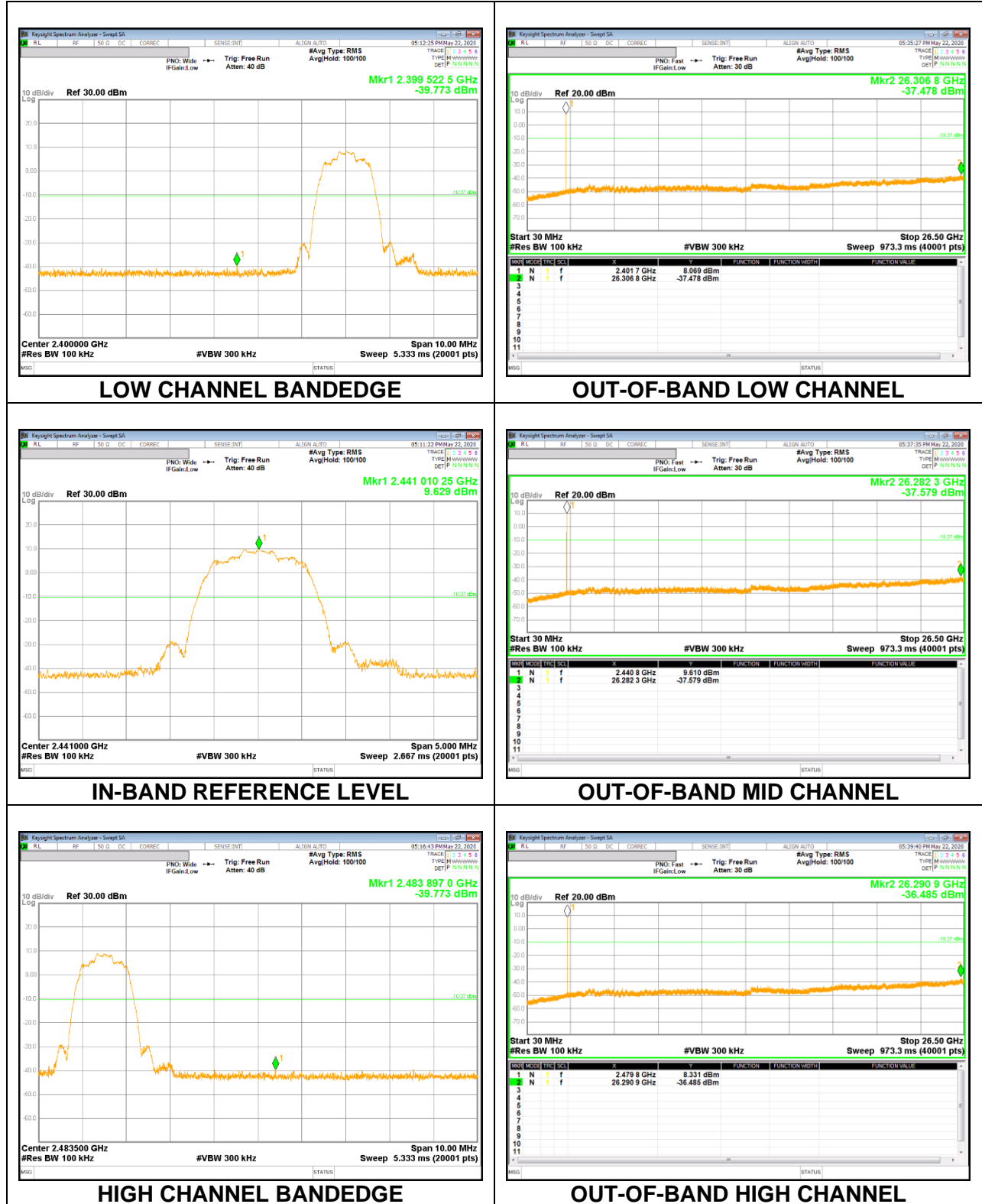


SPURIOUS BANDEDGE EMISSIONS WITH HOPPING ON

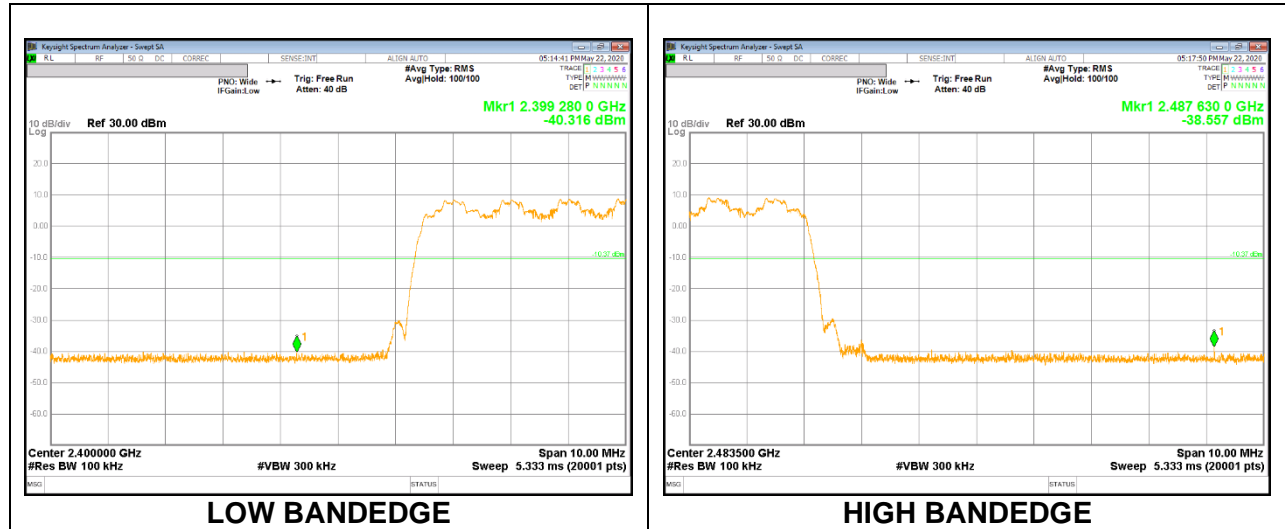


9.8.2. BLUETOOTH ENHANCED DATA RATE 8PSK MODULATION

SPURIOUS EMISSIONS, NON-HOPPING



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.

$$\text{GFSK} = 1/T = 1 / 0.002883\text{S} = 347\text{Hz}.$$

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.

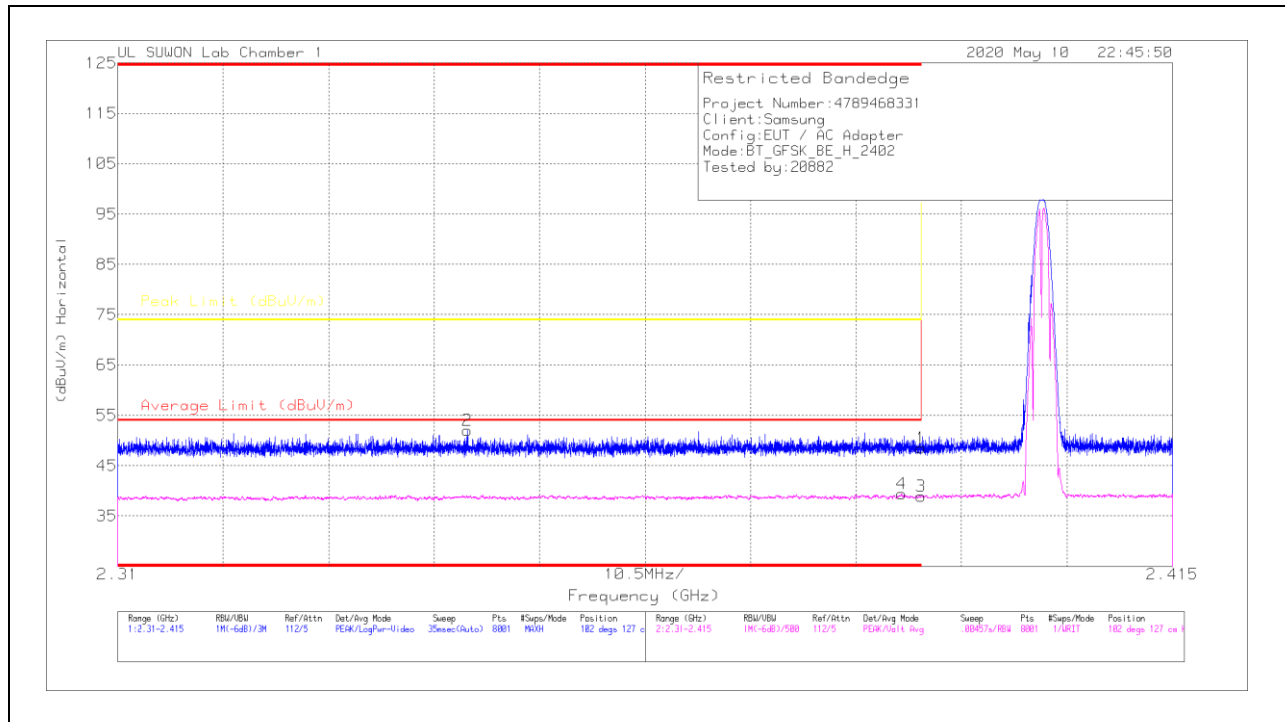
Although these tests were performed other than open field test site, adequate comparison measurements were confirmed against 30 m open are test site.
Therefore sufficient tests were made to demonstrate that the alternative site produces results that correlate with the one of tests made in an open field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

10.1. TRANSMITTER ABOVE 1 GHz

10.1.1. BLUETOOTH BASIC DATA RATE GFSK MODULATION

BANDEDGE (LOW CHANNEL)

HORIZONTAL RESULT



Trace Markers

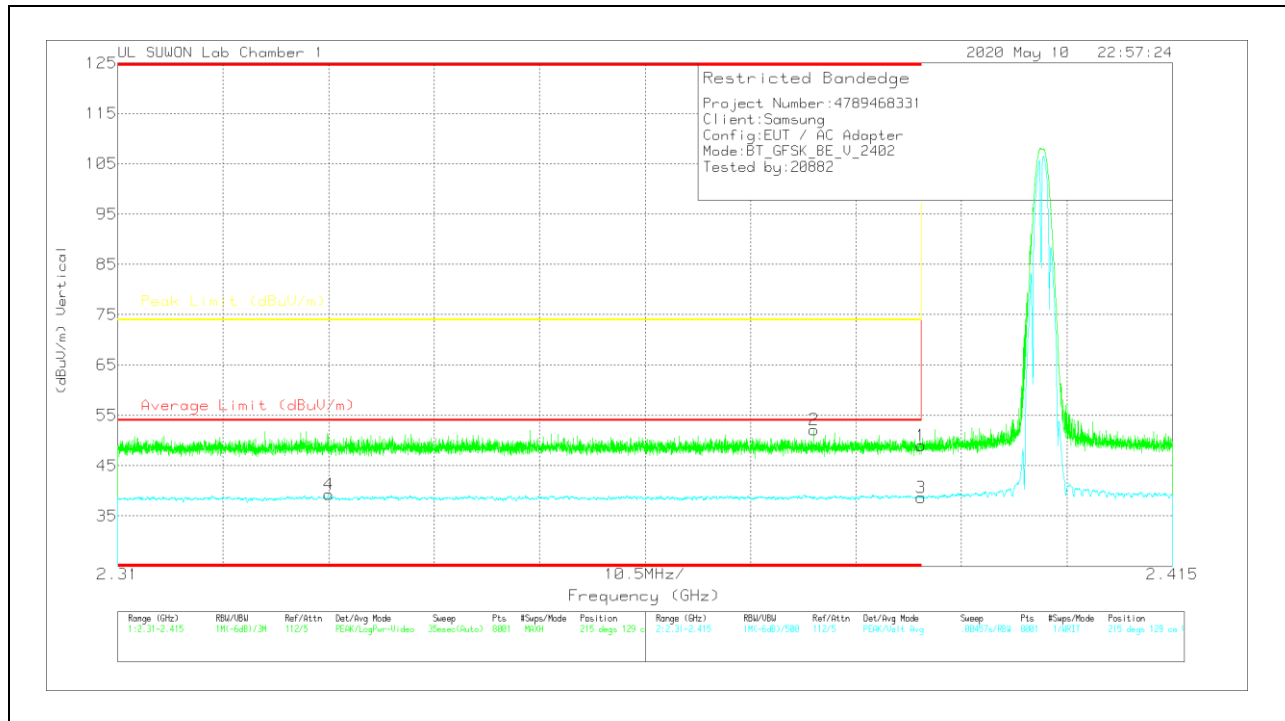
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	3117_00168717	10dB_ATT[dB]	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.39	42.34	Pk	31.7	-25.5	48.54	-	-	74	-25.46	102	127	H
2	* 2.34483	46.01	Pk	31.6	-25.6	52.01	-	-	74	-21.99	102	127	H
3	* 2.39	32.67	VA1T	31.7	-25.5	38.87	54	-15.13	-	-	102	127	H
4	* 2.38804	33.2	VA1T	31.7	-25.5	39.4	54	-14.6	-	-	102	127	H

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

Pk - Peak detector

VA1T - FHSS: Linear Voltage Average $V_B=1/T_{on}$ where: T_{on} 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	42.76	Pk	31.7	-25.5	48.96	-	-	74	-25.04	215	129	V
2	* 2.37931	46.09	Pk	31.6	-25.6	52.09	-	-	74	-21.91	215	129	V
3	* 2.39	32.46	VA1T	31.7	-25.5	38.66	54	-15.34	-	-	215	129	V
4	* 2.33103	33.35	VA1T	31.5	-25.6	39.25	54	-14.75	-	-	215	129	V

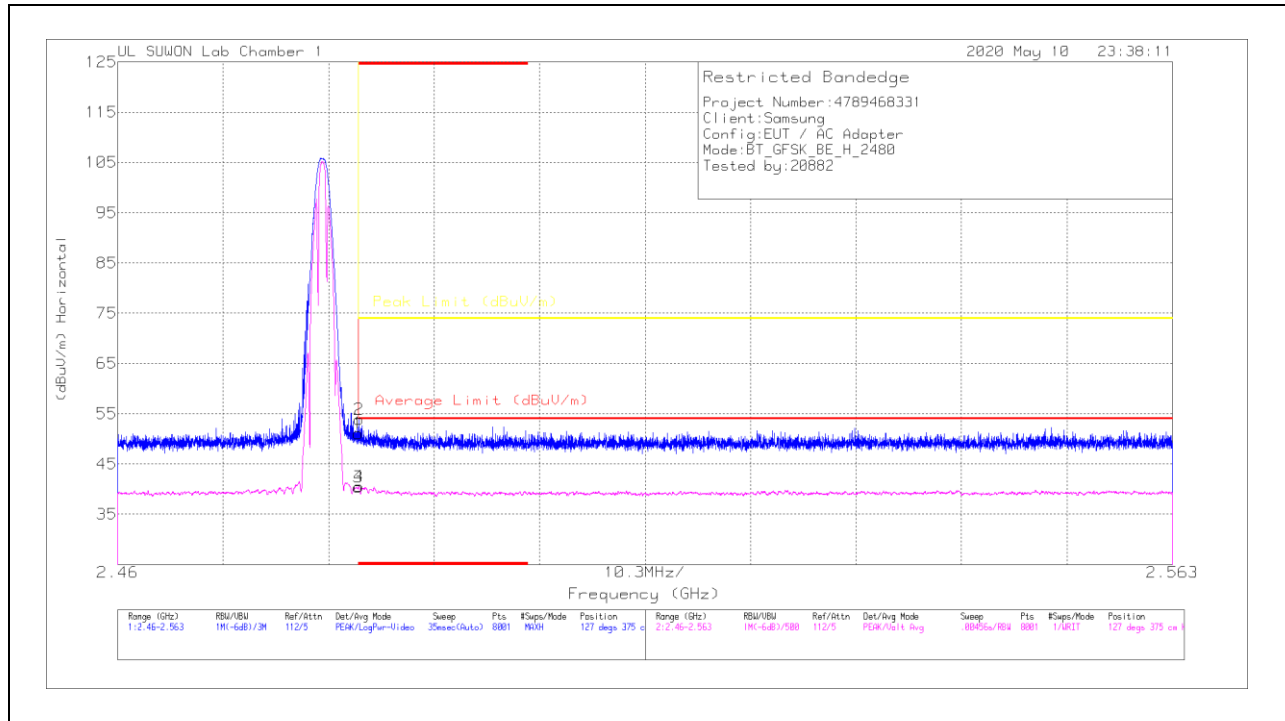
* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

Pk - Peak detector

VA1T - FHSS: Linear Voltage Average VB=1/Ton where: Ton is transmit duration

BANDEDGE (HIGH CHANNEL)

HORIZONTAL RESULT



Trace Markers

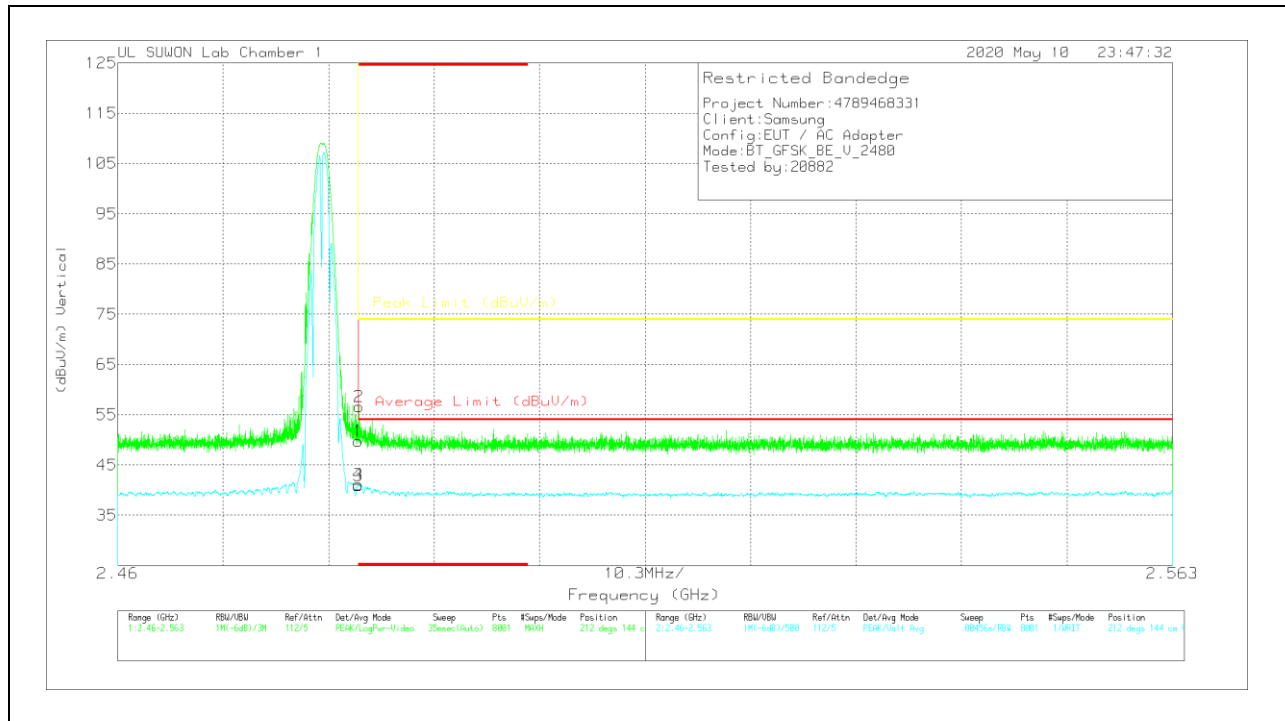
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	3117_00168717	10dB_ATT[dB]	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.48351	44.37	Pk	31.9	-25.2	51.07	-	-	74	-22.93	127	375	H
2	* 2.48355	47.13	Pk	31.9	-25.2	53.83	-	-	74	-20.17	127	375	H
3	* 2.48351	33.69	VA1T	31.9	-25.2	40.39	54	-13.61	-	-	127	375	H
4	* 2.48354	33.79	VA1T	31.9	-25.2	40.49	54	-13.51	-	-	127	375	H

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

Pk - Peak detector

VA1T - FHSS: Linear Voltage Average $V_B=1/T_{on}$ where: T_{on} 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	43.03	Pk	31.9	-25.2	49.73	-	-	74	-24.27	212	144	V
2	* 2.48355	49.89	Pk	31.9	-25.2	56.59	-	-	74	-17.41	212	144	V
3	* 2.48351	34.27	VA1T	31.9	-25.2	40.97	54	-13.03	-	-	212	144	V
4	* 2.48352	34.4	VA1T	31.9	-25.2	41.1	54	-12.9	-	-	212	144	V

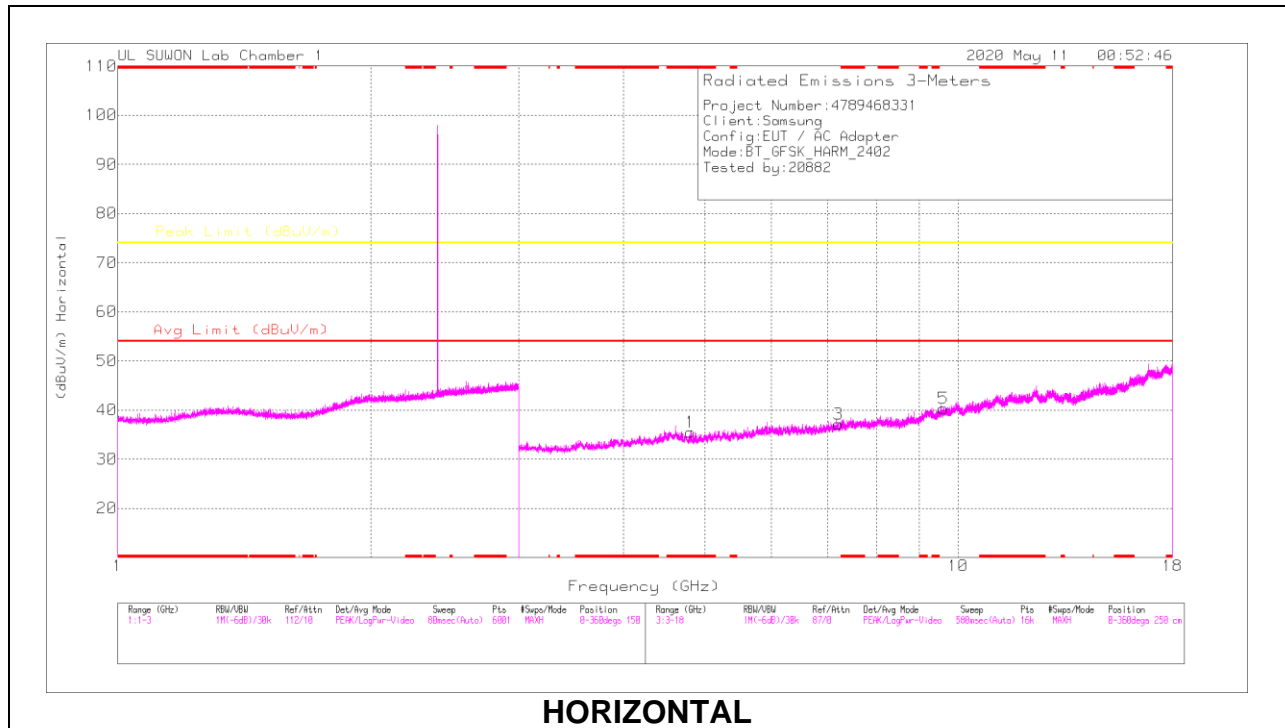
* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

Pk - Peak detector

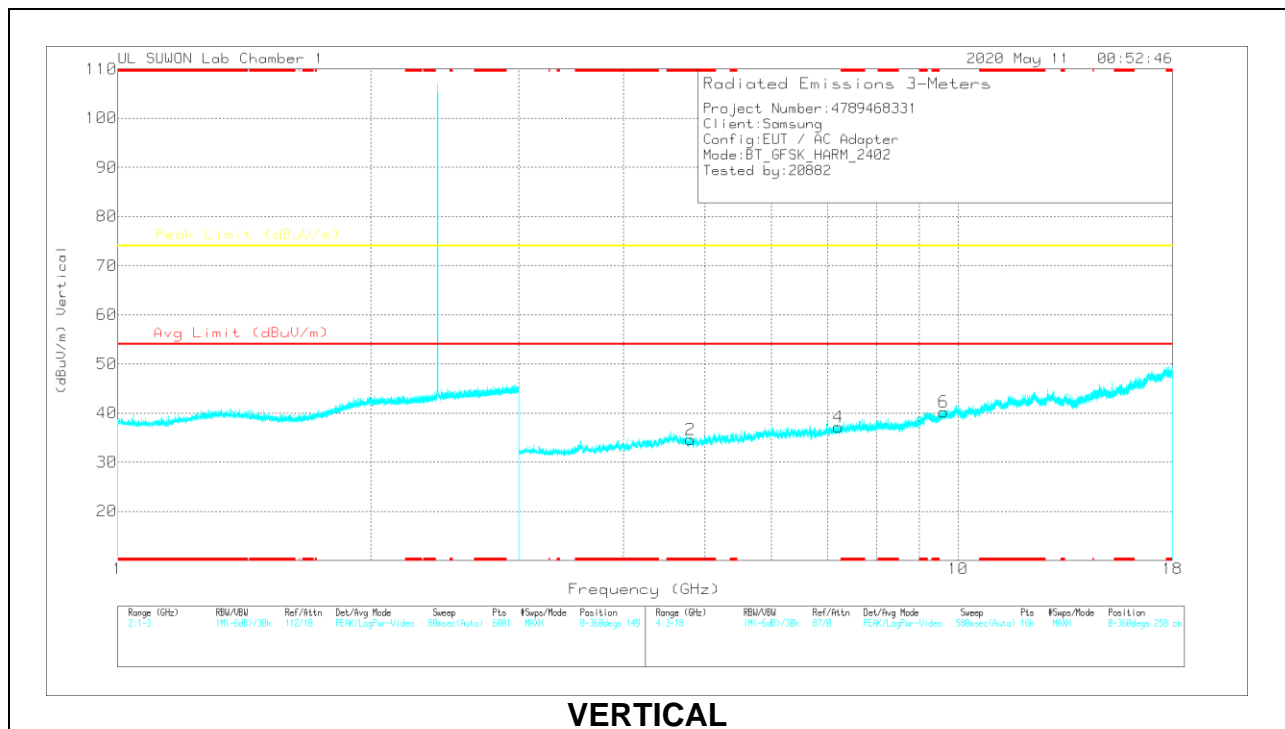
VA1T - FHSS: Linear Voltage Average VB=1/Ton where: Ton is transmit duration

HARMONICS AND SPURIOUS EMISSIONS

LOW CHANNEL RESULTS



HORIZONTAL



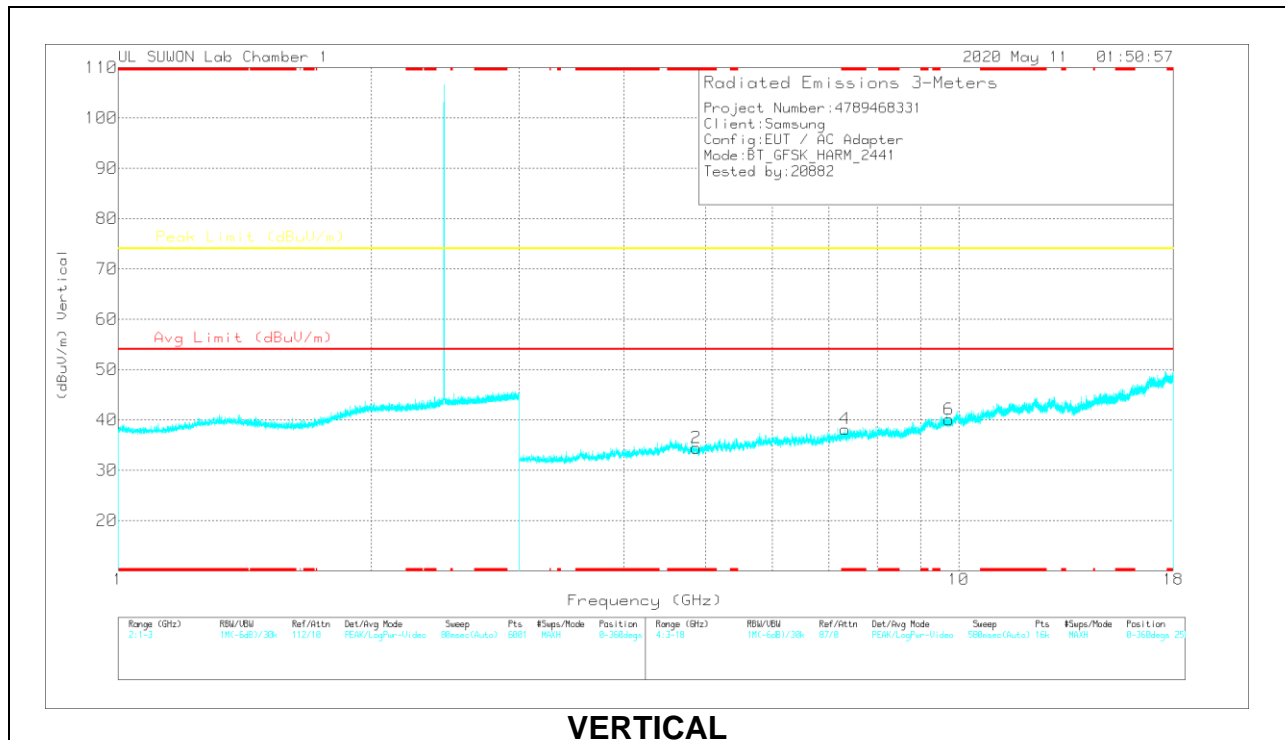
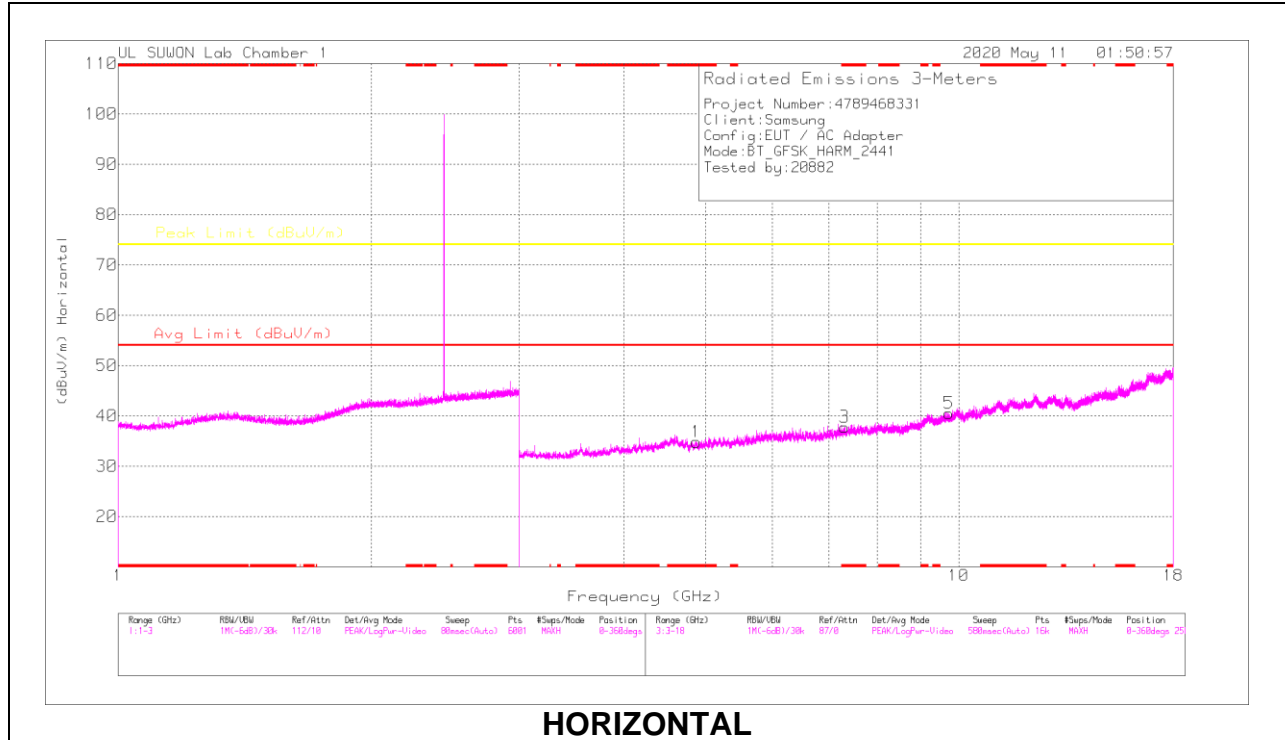
VERTICAL

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
* 4.80697	40.33	PKFH	34.2	-31.6	42.93	-	-	74	-31.07	0	100	H
* 4.80441	40.27	PKFH	34.2	-31.5	42.97	-	-	74	-31.03	0	100	V
7.21071	36.11	PKFH	35.8	-27.9	44.01	-	-	74	-29.99	0	100	H
7.20817	36.5	PKFH	35.8	-27.9	44.4	-	-	74	-29.6	0	100	V
9.60918	32.74	PKFH	37	-23.2	46.54	-	-	74	-27.46	0	100	H
9.60795	33.32	PKFH	37	-23.2	47.12	-	-	74	-26.88	0	100	V

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

MID CHANNEL RESULTS

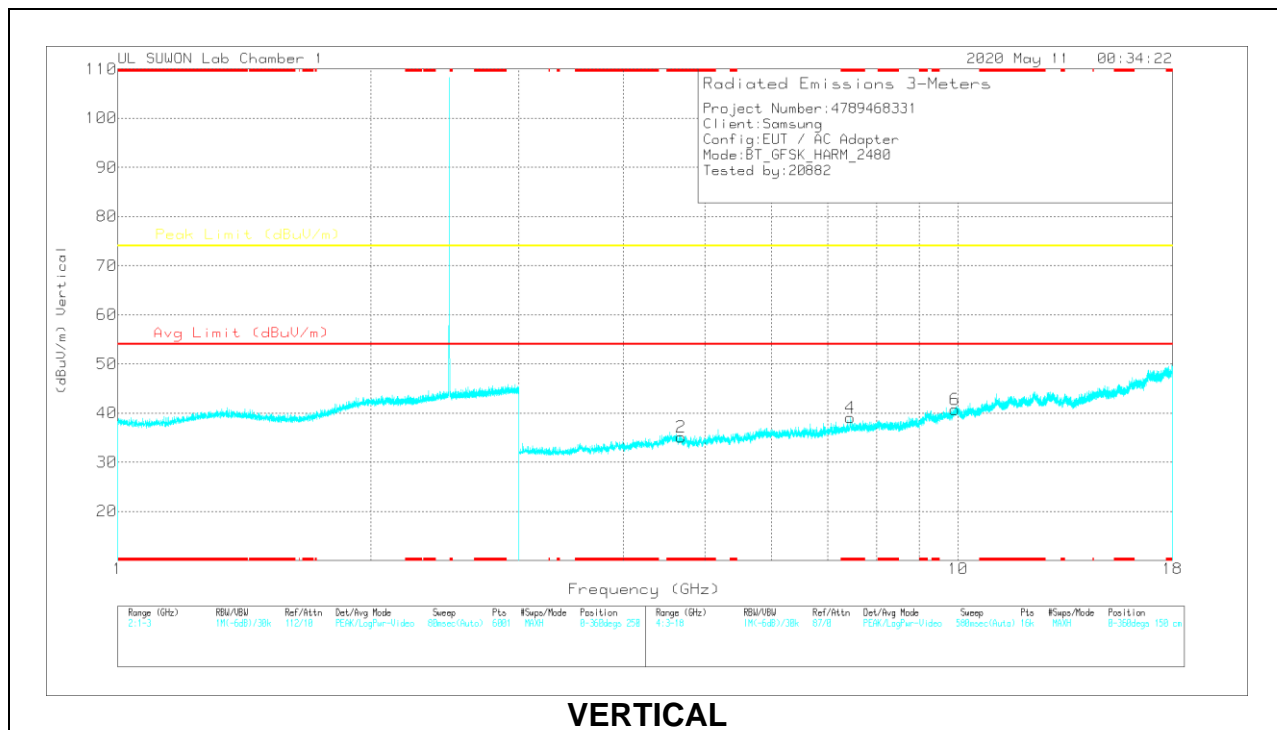
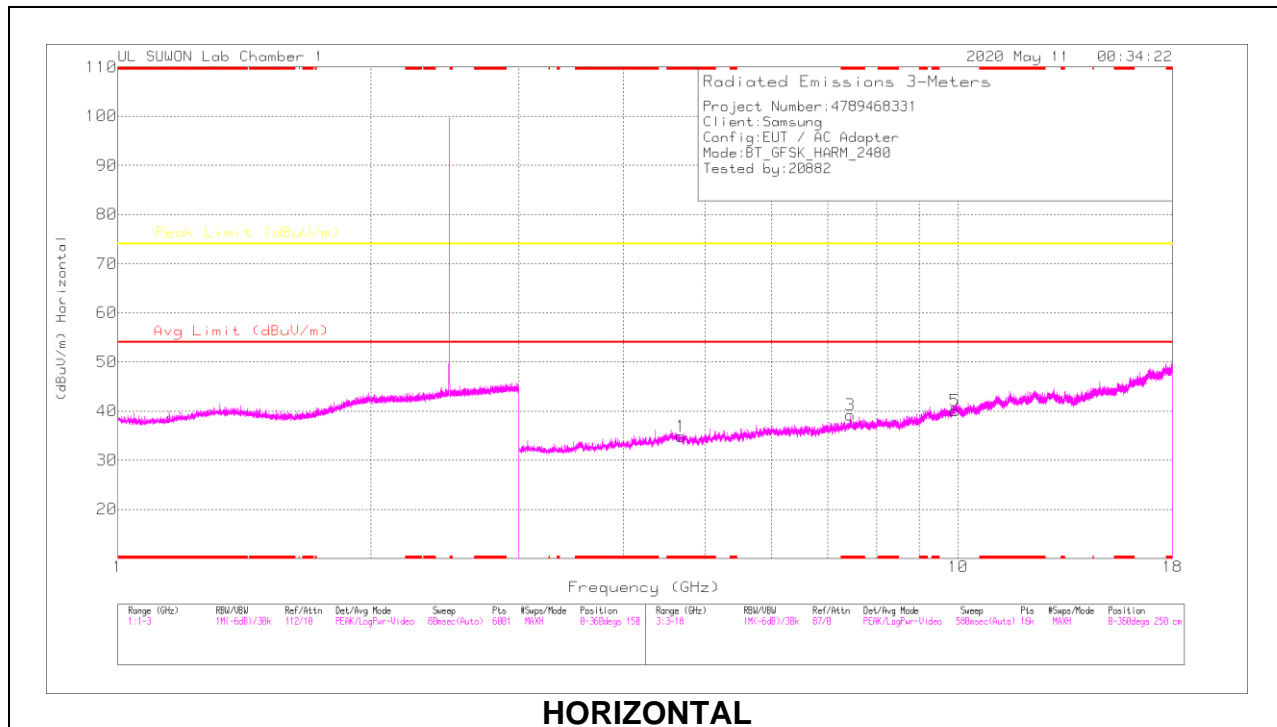


RADIATED EMISSIONS

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
* 4.87384	39.53	PKFH	34.2	-31.6	42.13	-	-	74	-31.87	0	100	H
* 4.87279	40.84	PKFH	34.2	-31.6	43.44	-	-	74	-30.56	0	100	V
* 7.31404	36.82	PKFH	35.8	-27.4	45.22	-	-	74	-28.78	0	100	H
* 7.31289	36.12	PKFH	35.8	-27.4	44.52	-	-	74	-29.48	0	100	V
9.73528	33.84	PKFH	37.2	-24	47.04	-	-	74	-26.96	0	100	H
9.7354	34.61	PKFH	37.2	-24	47.81	-	-	74	-26.19	0	100	V

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

HIGH CHANNEL RESULTS



RADIATED EMISSIONS

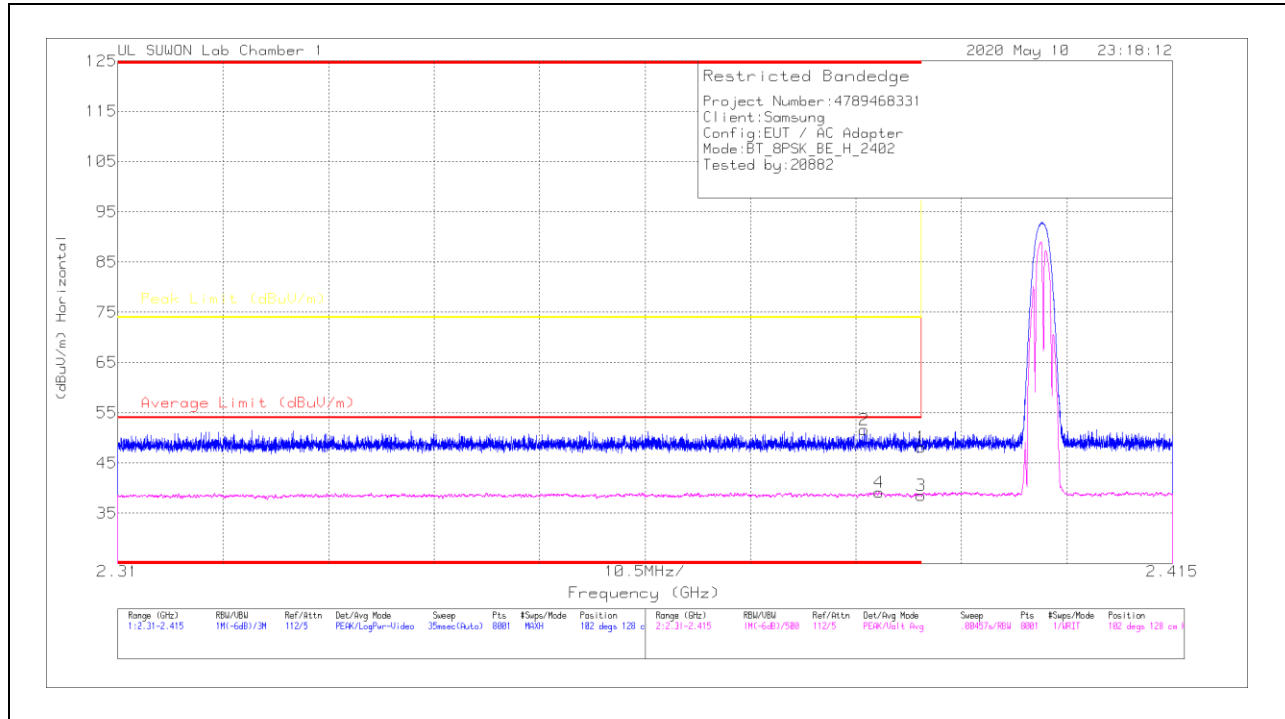
Frequency (GHz)	Meter Reading (dBuV)	Det	3117_00168717	3GHz_HP[dB]	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
* 4.68627	39.22	PKFH	34.2	-31.6	41.82	-	-	74	-32.18	0	100	H
* 4.68414	40.32	PKFH	34.2	-31.6	42.92	-	-	74	-31.08	0	100	V
* 7.43958	36.43	PKFH	35.8	-27.1	45.13	-	-	74	-28.87	0	100	H
* 7.43878	35.91	PKFH	35.8	-27.1	44.61	-	-	74	-29.39	0	100	V
9.92008	32.9	PKFH	37.5	-22.1	48.3	-	-	74	-25.7	0	100	H
9.91833	32.53	PKFH	37.5	-22.1	47.93	-	-	74	-26.07	0	100	V

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

10.1.2. BLUETOOTH ENHANCED DATA RATE 8PSK MODULATION

BANDEDGE (LOW CHANNEL)

HORIZONTAL RESULT



Trace Markers

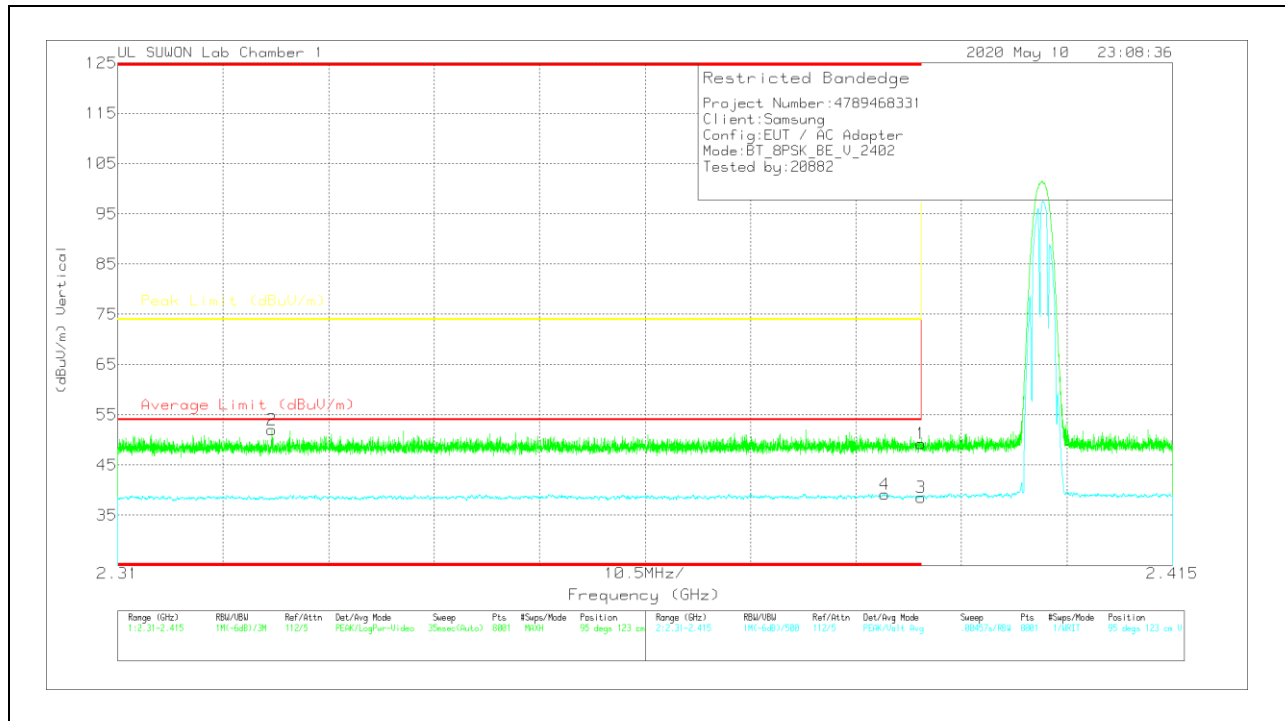
Marker	Frequency (GHz)	Meter Reading (dBuV)	Dot	3117_00168717	10dB_ATT[dB]	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.39	41.9	Pk	31.7	-25.5	48.1	-	-	74	-25.9	102	128	H
2	* 2.38431	45.48	Pk	31.7	-25.5	51.68	-	-	74	-22.32	102	128	H
3	* 2.39	32.3	VA1T	31.7	-25.5	38.5	54	-15.5	-	-	102	128	H
4	* 2.38577	33	VA1T	31.7	-25.5	39.2	54	-14.8	-	-	102	128	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	43.01	Pk	31.7	-25.5	49.21	-	-	74	-24.79	95	123	V
2	* 2.32537	46.3	Pk	31.5	-25.8	52	-	-	74	-22	95	123	V
3	* 2.39	32.31	VA1T	31.7	-25.5	38.51	54	-15.49	-	-	95	123	V
4	* 2.38634	32.95	VA1T	31.7	-25.5	39.15	54	-14.85	-	-	95	123	V

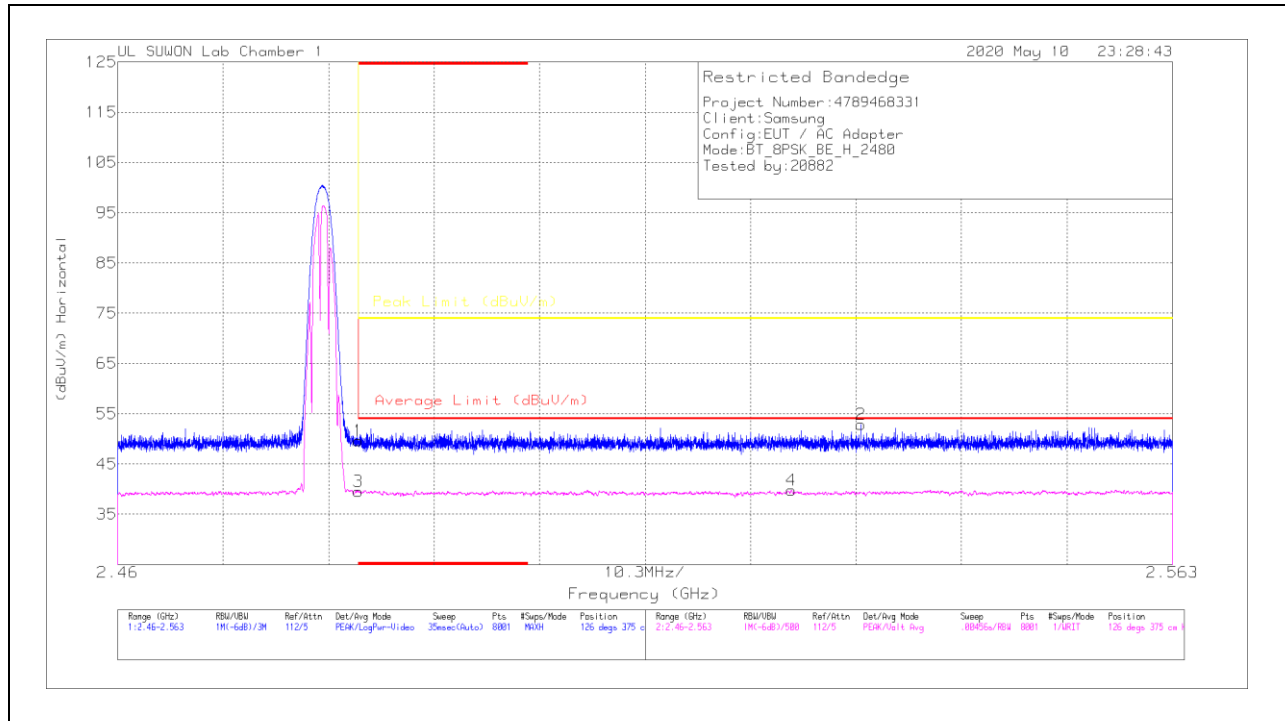
* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

Pk - Peak detector

VA1T - FHSS: Linear Voltage Average VB=1/Ton where: Ton is transmit duration

BANDEDGE (HIGH CHANNEL)

HORIZONTAL RESULT



Trace Markers

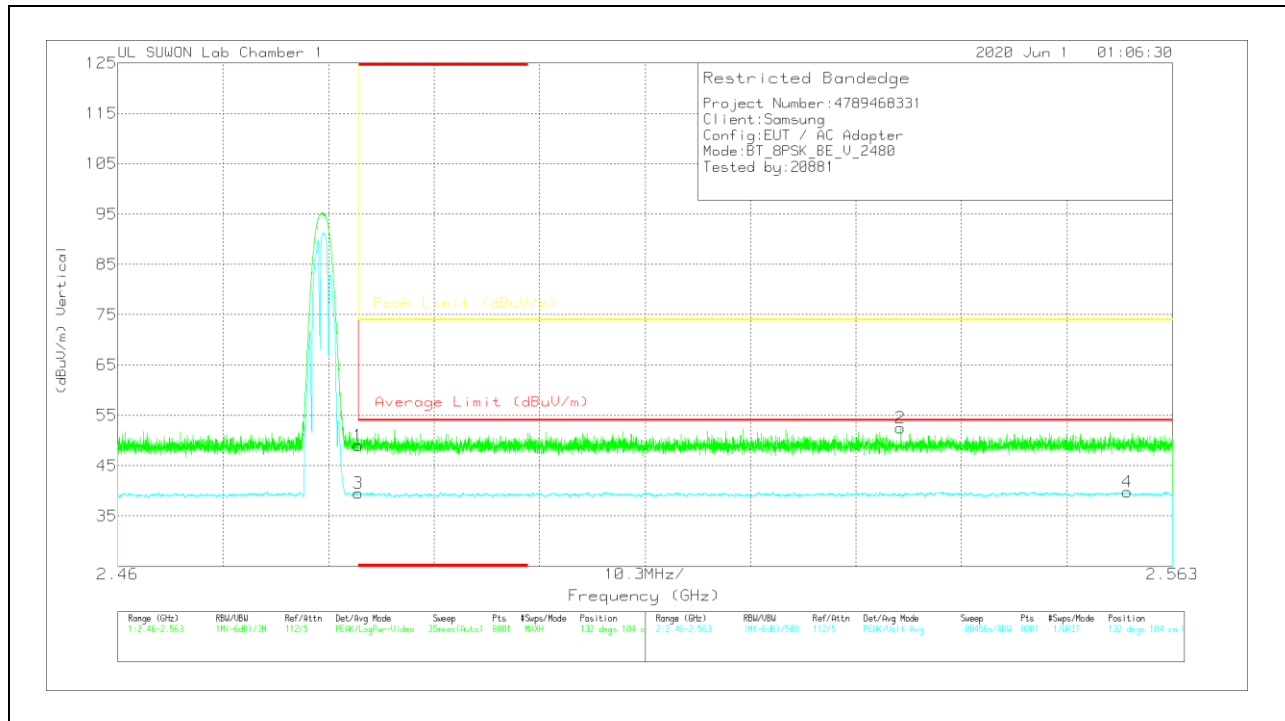
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	3117_00168717	10dB_ATT[dB]	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.48351	42.89	Pk	31.9	-25.2	49.59	-	-	74	-24.41	126	375	H
2	2.53258	46.03	Pk	32	-25.2	52.83	-	-	74	-21.17	126	375	H
3	* 2.48351	32.84	VA1T	31.9	-25.2	39.54	54	-14.46	-	-	126	375	H
4	2.52579	32.9	VA1T	32	-25.1	39.8	54	-14.2	-	-	126	375	H

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

Pk - Peak detector

VA1T - FHSS: Linear Voltage Average $V_B=1/T_{on}$ where: T_{on} 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	42.28	Pk	31.9	-25.2	48.98	-	-	74	-25.02	132	104	V
2	2.53645	45.74	Pk	32	-25.2	52.54	-	-	74	-21.46	132	104	V
3	* 2.48351	32.84	VA1T	31.9	-25.2	39.54	54	-14.46	-	-	132	104	V
4	2.55857	32.82	VA1T	32	-25	39.82	54	-14.18	-	-	132	104	V

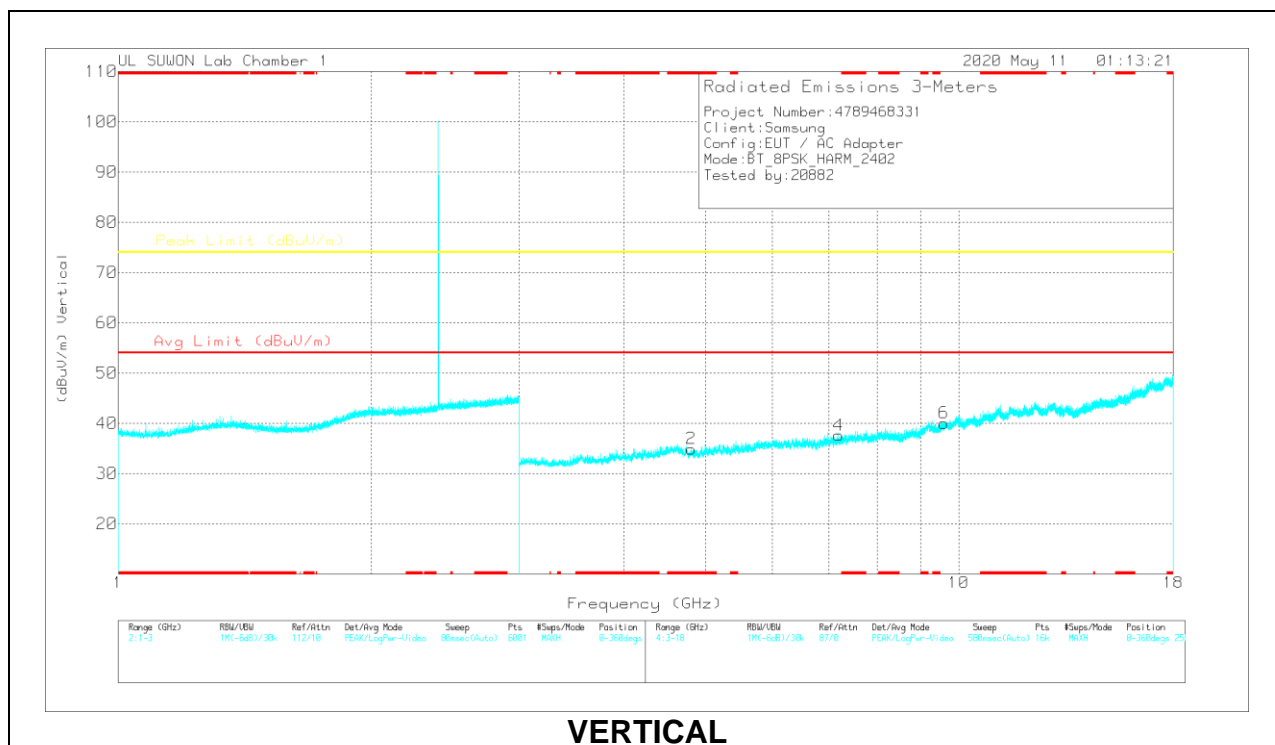
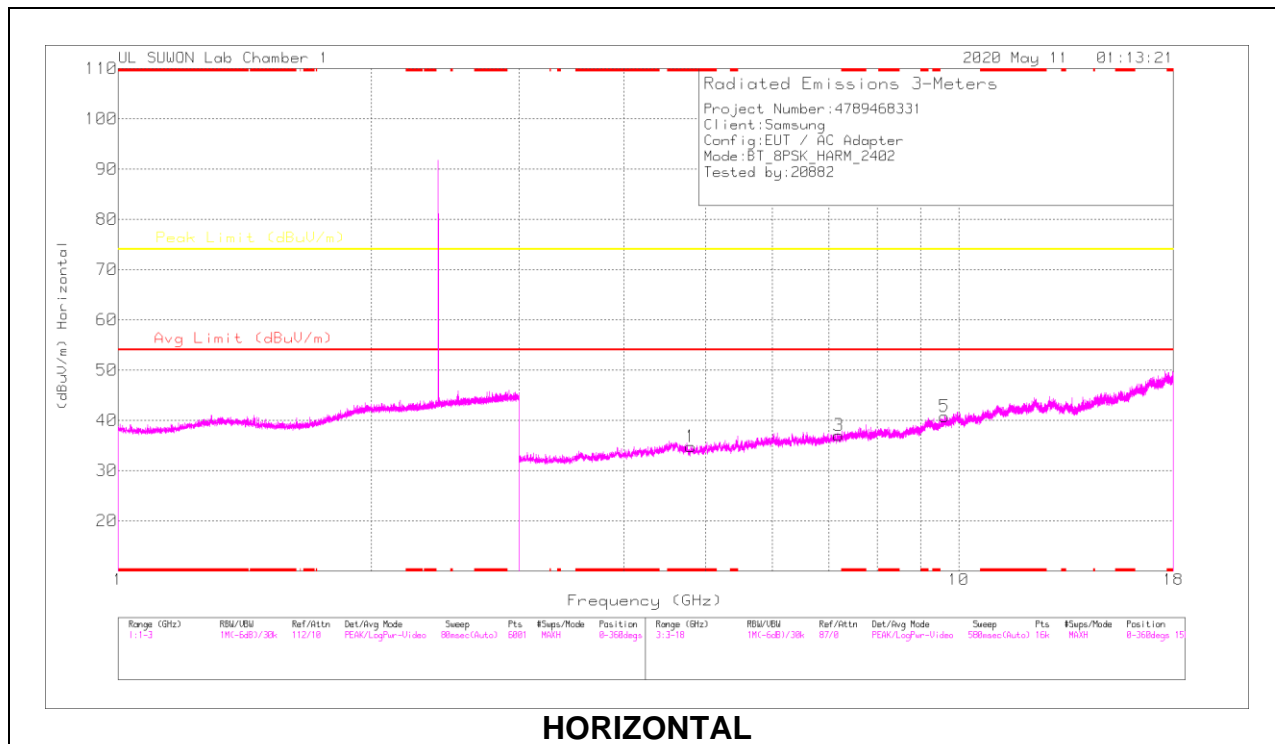
* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

Pk - Peak detector

VA1T - FHSS: Linear Voltage Average $V_B=1/T_{on}$ where: T_{on} is transmit duration

HARMONICS AND SPURIOUS EMISSIONS

LOW CHANNEL RESULTS

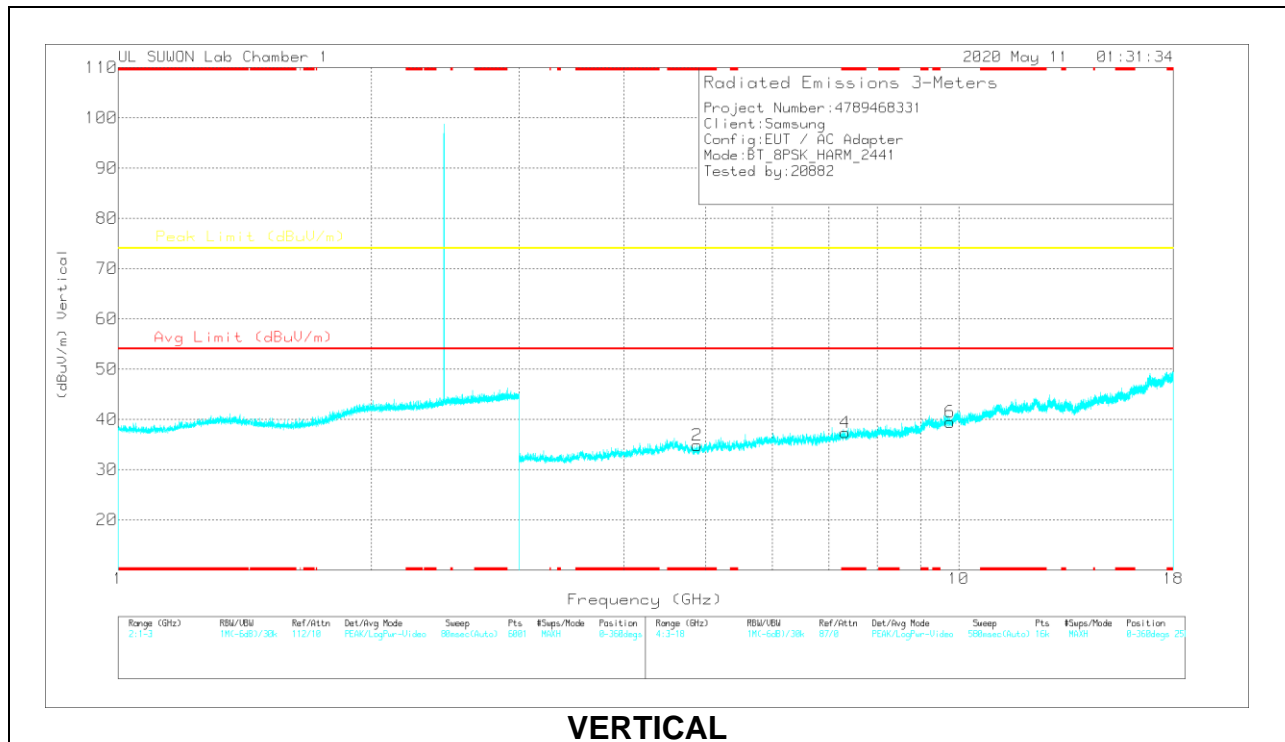
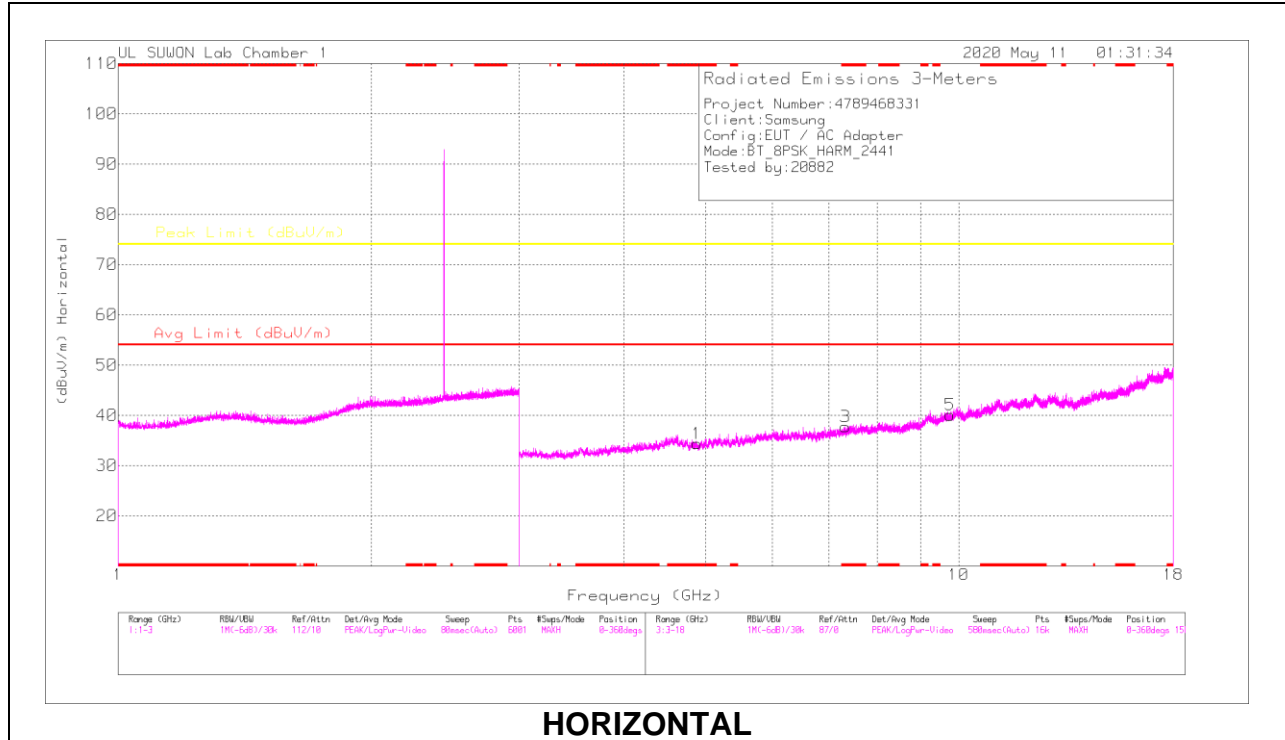


RADIATED EMISSIONS

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
* 4.80004	38.98	PKFH	34.2	-31.5	41.68	-	-	74	-32.32	0	100	H
* 4.80183	40.1	PKFH	34.2	-31.6	42.7	-	-	74	-31.3	0	100	V
7.19517	36.99	PKFH	35.8	-27.8	44.99	-	-	74	-29.01	0	100	H
7.19506	37.34	PKFH	35.8	-27.8	45.34	-	-	74	-28.66	0	100	V
9.61393	32.87	PKFH	37	-23.1	46.77	-	-	74	-27.23	0	100	H
9.61536	32.99	PKFH	37	-23.1	46.89	-	-	74	-27.11	0	100	V

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

MID CHANNEL RESULTS

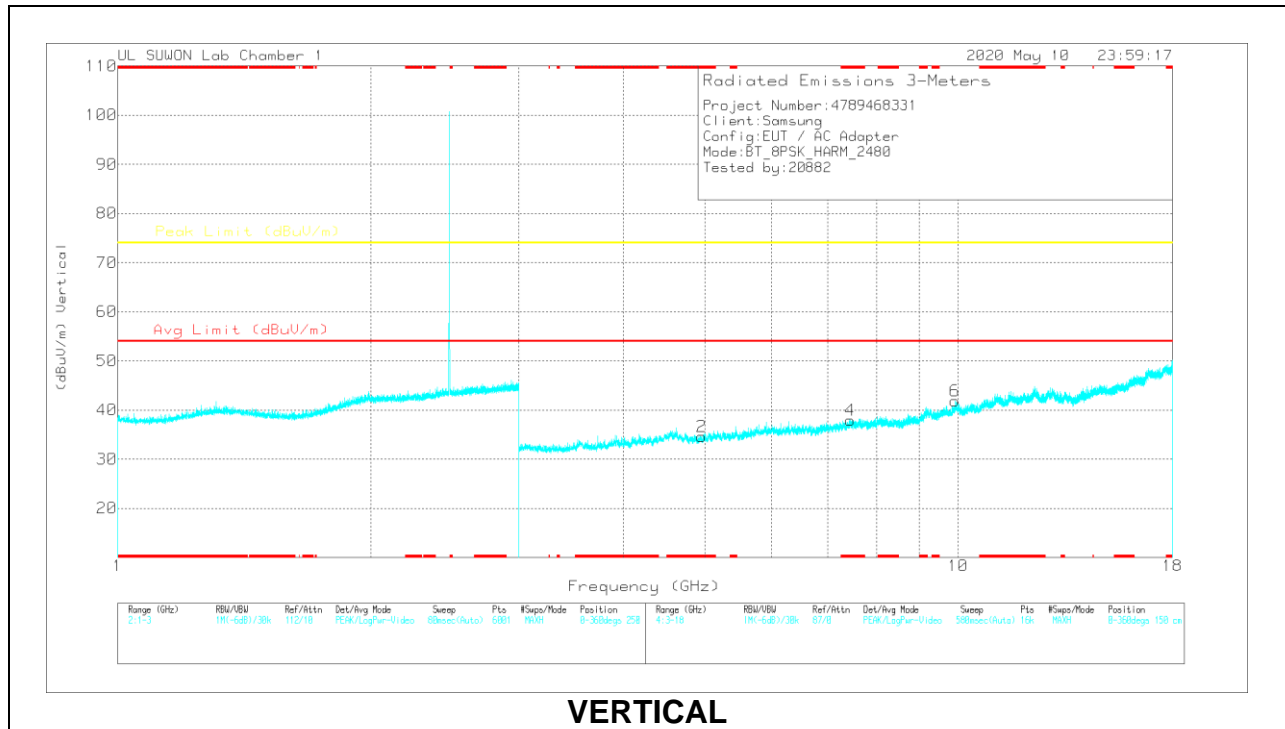
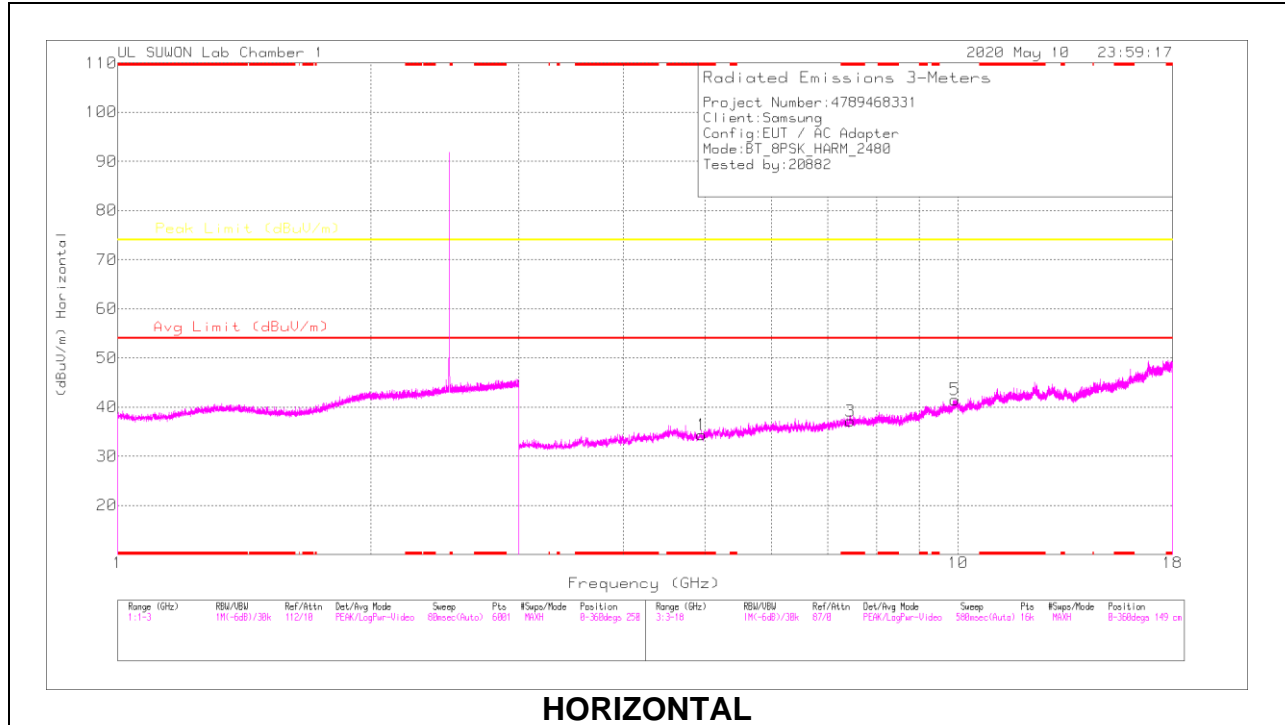


RADIATED EMISSIONS

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
* 4.87995	38.64	PKFH	34.2	-31.7	41.14	-	-	74	-32.86	0	100	H
* 4.88024	39.48	PKFH	34.2	-31.7	41.98	-	-	74	-32.02	0	100	V
* 7.33149	37.95	PKFH	35.8	-27.4	46.35	-	-	74	-27.65	0	100	H
* 7.33035	35.89	PKFH	35.8	-27.3	44.39	-	-	74	-29.61	0	100	V
9.76411	33	PKFH	37.2	-24	46.2	-	-	74	-27.8	0	100	H
9.76369	33.26	PKFH	37.2	-24	46.46	-	-	74	-27.54	0	100	V

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

HIGH CHANNEL RESULTS



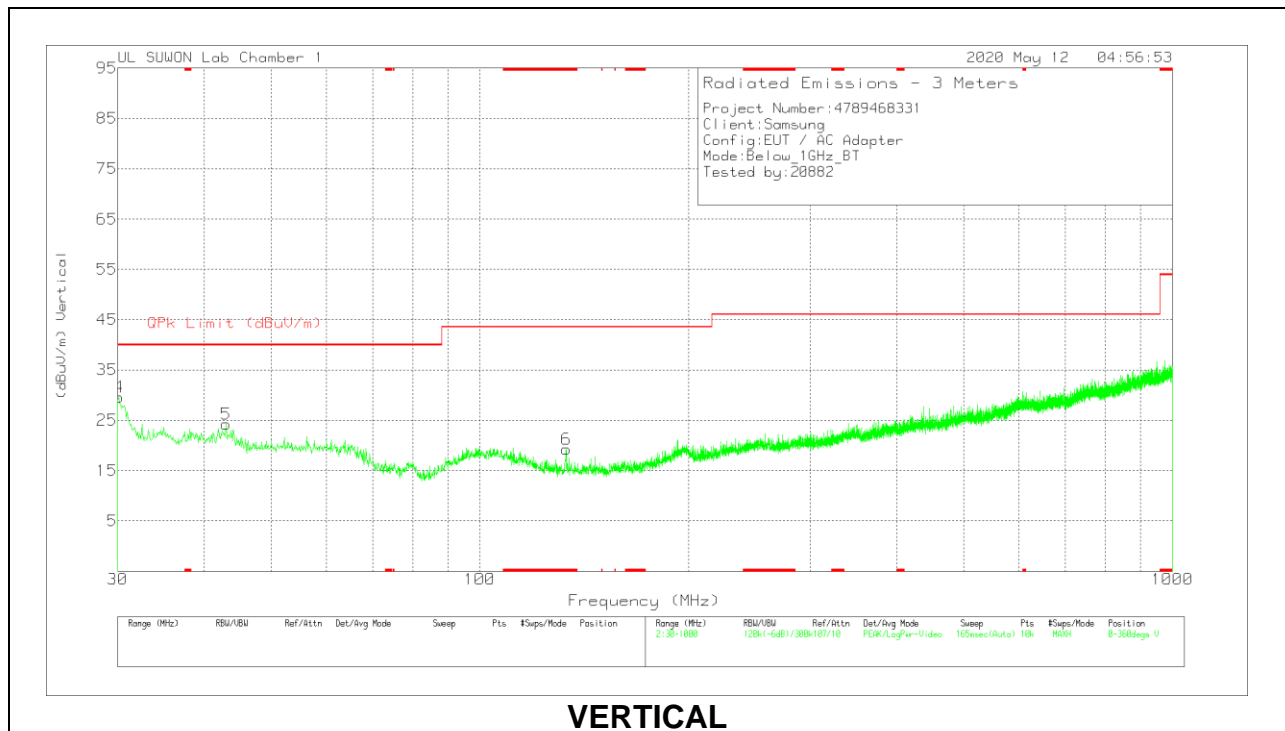
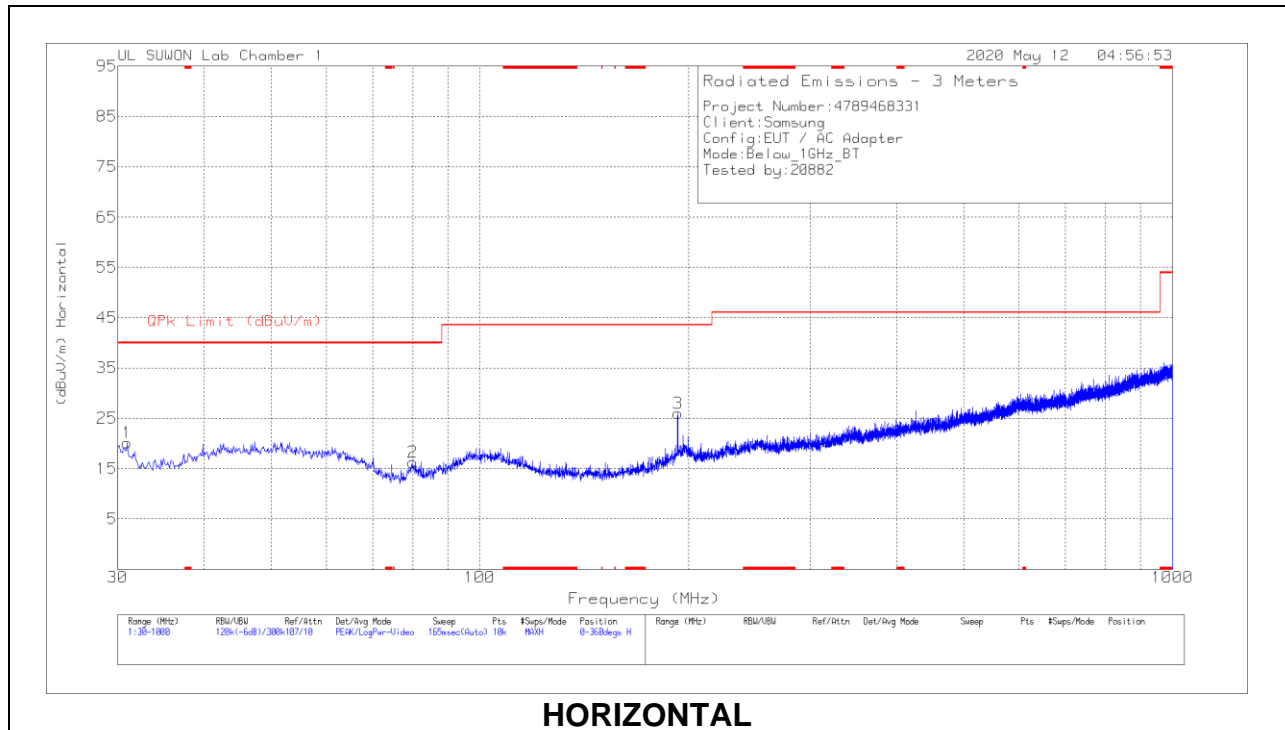
RADIATED EMISSIONS

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
* 4.95338	39.99	PKFH	34.2	-31.7	42.49	-	-	74	-31.51	0	100	H
* 4.95466	38.66	PKFH	34.2	-31.6	41.26	-	-	74	-32.74	0	100	V
* 7.4414	36.6	PKFH	35.8	-27.1	45.3	-	-	74	-28.7	0	100	H
* 7.44192	36.63	PKFH	35.8	-27.1	45.33	-	-	74	-28.67	0	100	V
9.92443	32.7	PKFH	37.5	-21.9	48.3	-	-	74	-25.7	0	100	H
9.92487	32.11	PKFH	37.5	-21.9	47.71	-	-	74	-26.29	0	100	V

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

10.2. WORST CASE BELOW 1 GHZ

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



Below 1GHz Data

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	VULB9163_750	Below_1G[dB]	DC Corr (dB)	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	30.97	34.98	Pk	15.8	-30.7	0	20.08	40	-19.92	0-360	300	H
2	79.955	33.52	PK	12.6	-29.9	0	16.22	40	-23.78	0-360	400	H
3	193.057	36.82	Pk	17.7	-28.5	0	26.02	43.52	-17.5	0-360	100	H
4	30.097	43.45	Pk	16.1	-30	0	29.55	40	-10.45	0-360	100	V
5	42.998	34.7	Pk	19.3	-29.8	0	24.2	40	-15.8	0-360	100	V
6	* 133.208	33.25	Pk	14.2	-28.2	0	19.25	43.52	-24.27	0-360	100	V

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

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.

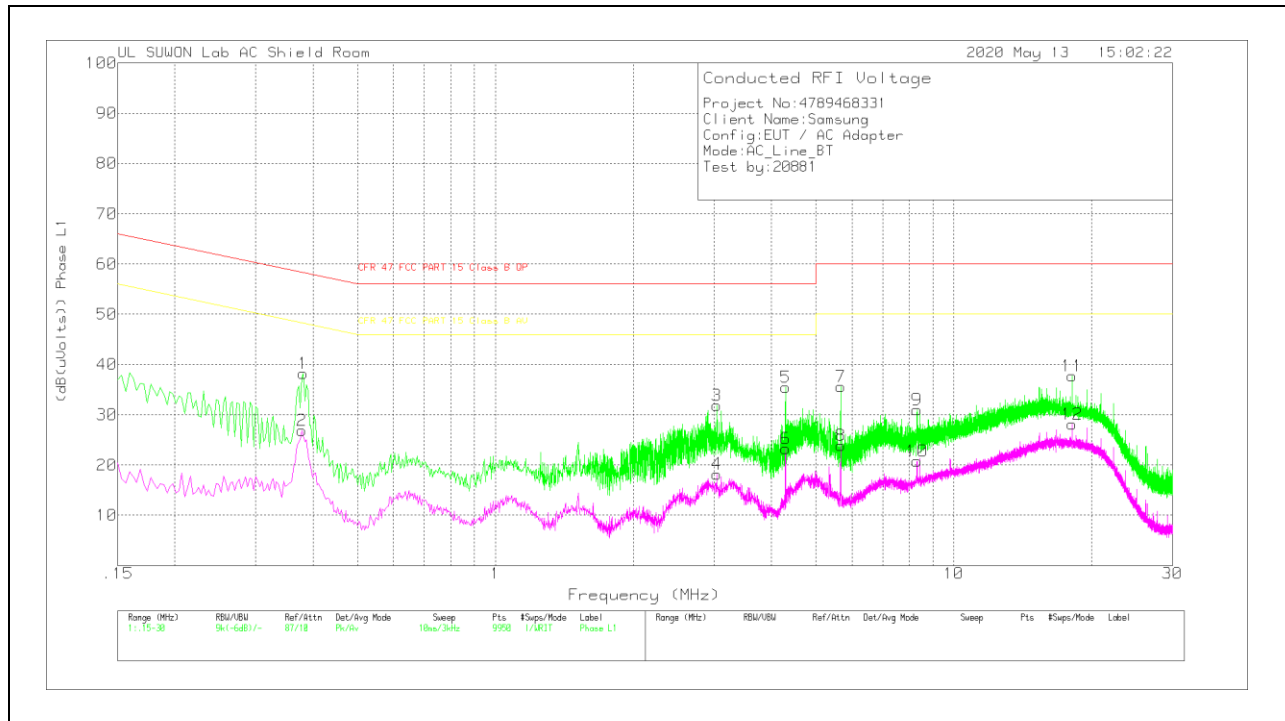
The receiver is set to a resolution bandwidth of 9 kHz. Peak detection is used unless otherwise noted as quasi-peak or average.

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

RESULTS

11.1.1. AC Power Line Host

LINE 1 RESULTS



Trace Markers

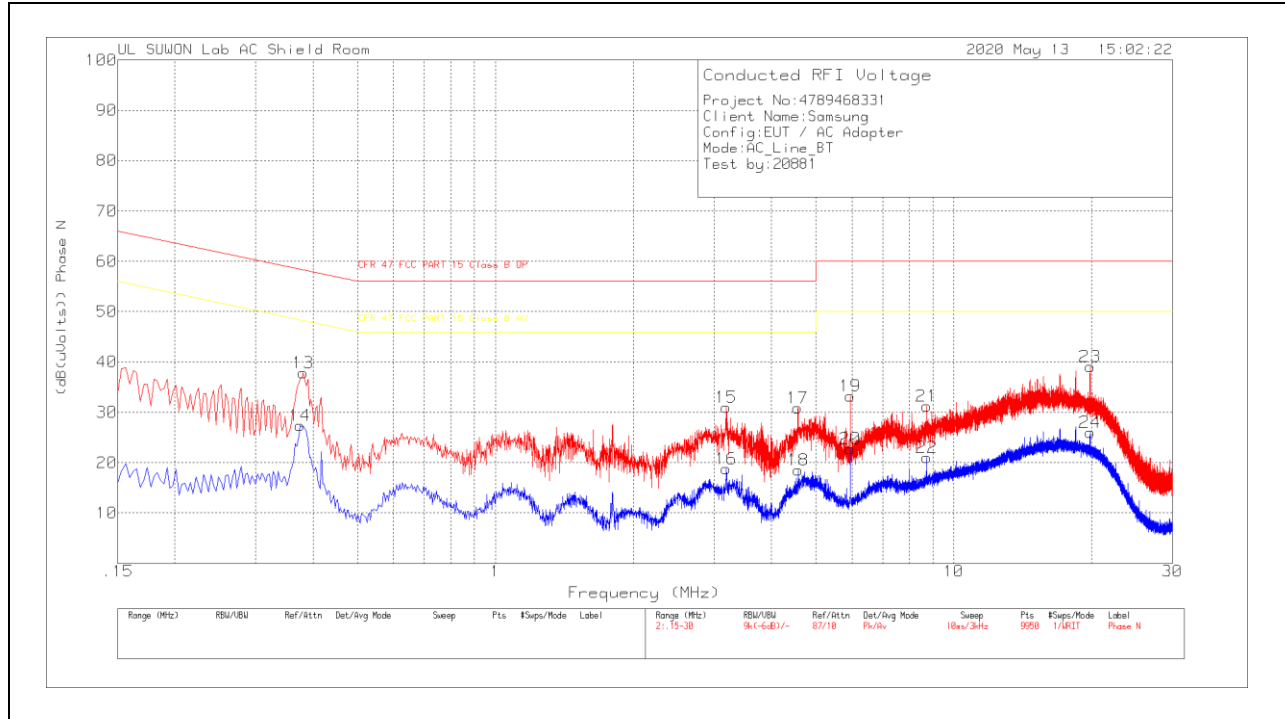
Range 1: Phase L1 .15 - 30MHz

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	101836_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	.381	28.17	Pk	9.9	.2	38.27	58.26	-19.99	-	-
2	.378	16.8	Av	9.9	.2	26.9	-	-	48.32	-21.42
3	3.042	21.73	Pk	9.8	.3	31.83	56	-24.17	-	-
4	3.042	8.11	Av	9.8	.3	18.21	-	-	46	-27.79
5	4.296	25.32	Pk	9.8	.3	35.42	56	-20.58	-	-
6	4.296	13.14	Av	9.8	.3	23.24	-	-	46	-22.76
7	5.67	25.51	Pk	9.8	.3	35.61	60	-24.39	-	-
8	5.67	13.73	Av	9.8	.3	23.83	-	-	50	-26.17
9	8.316	20.74	Pk	9.9	.3	30.94	60	-29.06	-	-
10	8.316	10.6	Av	9.9	.3	20.8	-	-	50	-29.2
11	18.144	27.09	Pk	10.2	.4	37.69	60	-22.31	-	-
12	18.147	17.49	Av	10.2	.4	28.09	-	-	50	-21.91

Pk - Peak detector

Av - Average detection

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	.381	27.74	Pk	9.9	.2	37.84	58.26	-20.42	-	-
14	.375	17.23	Av	9.9	.2	27.33	-	-	48.39	-21.06
15	3.192	20.85	Pk	9.8	.3	30.95	56	-25.05	-	-
16	3.192	8.71	Av	9.8	.3	18.81	-	-	46	-27.19
17	4.569	20.71	Pk	9.8	.3	30.81	56	-25.19	-	-
18	4.575	8.41	Av	9.8	.3	18.51	-	-	46	-27.49
19	5.952	23.1	Pk	9.8	.3	33.2	60	-26.8	-	-
20	5.952	12.7	Av	9.8	.3	22.8	-	-	50	-27.2
21	8.727	20.93	Pk	9.9	.4	31.23	60	-28.77	-	-
22	8.727	10.73	Av	9.9	.4	21.03	-	-	50	-28.97
23	19.83	28.42	Pk	10.3	.4	39.12	60	-20.88	-	-
24	19.83	15.26	Av	10.3	.4	25.96	-	-	50	-24.04

Pk - Peak detector
 Av - Average detection

END OF TEST REPORT