



CERTIFICATION TEST REPORT

Report Number. : 4789746865-E5V3

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

Model : SM-A525F/DS, SM-A525F

FCC ID : A3LSMA525F

EUT Description : GSM/WCDMA/LTE 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	01/28/21	Initial issue	SunGeun Lee
V2	02/02/21	Updated to address TCB's question	SunGeun Lee
V3	02/05/21	Updated to address TCB's question	SunGeun Lee

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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 and NFC
MODEL NUMBER: SM-A525F/DS, SM-A525F
SERIAL NUMBER: R38NB02RCJH (CONDUCTED, Original);
R38NB02RD9T, R38NB02S3WA (RADIATED, Original);
R38NC03HCYN (RADIATED, Spot check);
DATE TESTED: NOV 30, 2020 – JAN 26, 2021(Original);
JAN 21, 2021(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
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Junwhan Lee
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Tested By:



Sungeun Lee
Suwon Lab Engineer
UL Korea, Ltd.

1.1. INTRODUCTION OF TEST DATA REUSE

This report referenced from the FCC ID: A3LSMA525M DSS BT(FCC CFR 47 Part 15).
 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: A3LSMA525F shares the same enclosure and circuit board as FCC ID: A3LSMA525M. The BT antenna and surrounding circuitry and layout are identical between these two units.

After confirming through preliminary radiated emissions that the performance of the FCC ID: A3LSMA525M remains representative of FCC ID: A3LSMA525F. The test data of FCC ID: A3LSMA525M being submitted for this application to cover BT features.

1.3. SPOT CHECK VERIFICATION DATA

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

Band	Test Item	Mode	Frequency	Test Limit	Original model	Spot check model	Deviation	Remark
					SM-A525M/DS Results	SM-A525F/DS Results		
					FCC ID : A3LSMA525M	FCC ID : A3LSMA525F		
DSS BT (2.4GHz)	Band Edge	GFSK	2480 MHz	54 dBuV/m	42.51 dBuV/m	43.80 dBuV/m	1.29 dB	
	RSE	GFSK	4804 MHz	54 dBuV/m	47.60 dBuV/m	47.96 dBuV/m	0.36 dB	

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	A3LSMA525M	Original Grant	4789746830-E2	Test Report	4789746865-E2	All
DTS	A3LSMA525M	Original Grant	4789746830-E3 (802.11b,g,n)	Test Report	4789746865-E3 (802.11b,g,n)	All
			4789746830-E4 (Bluetooth LE)	Test Report	4789746865-E4 (Bluetooth LE)	All
DSS	A3LSMA525M	Original Grant	4789746830-E5 (Bluetooth)	Test Report	4789746865-E5 (Bluetooth)	All
NII	A3LSMA525M	Original Grant	4789746830-E6 (802.11a,n,ac)	Test Report	4789746865-E6 (802.11a,n,ac)	All
DXX	A3LSMA525M	Original Grant	4789746830-E7 (NFC)	Test Report	4789746865-E7 (NFC)	All

2. TEST METHODOLOGY

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

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

3. FACILITIES AND ACCREDITATION

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

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

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

4. DECISION RULES AND MEASUREMENT UNCERTAINTY

4.1. METROLOGICAL TRACEABILITY

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

4.2. SAMPLE CALCULATION

Where relevant, the following sample calculation is provided:

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

4.3. DECISION RULES

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

4.4. MEASUREMENT UNCERTAINTY

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

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

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

5. EQUIPMENT UNDER TEST

5.1. EUT DESCRIPTION

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

This report covers the Samsung models SM-A525F/DS and SM-A525F.
 These models are identical in hardware except SM-A525F has single SIM tray.
 With some pre-scan, model SM-A525F/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	17.904	61.716
		Peak	18.197	66.024
	Enhanced Pi/4-DPSK	Average	12.828	19.178
		Peak	15.173	32.908
	Enhanced 8PSK	Average	12.865	19.342
		Peak	15.493	35.424

5.3. DESCRIPTION OF AVAILABLE ANTENNA

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 -3.57 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 Z orientation was worst-case orientation; therefore, all final radiated testing was performed with the EUT in Z 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-TA200	R37N6KYPMH2SE3	N/A
Data Cable	SAMSUNG	EP-DR140AWE	N/A	N/A
Earphone	SAMSUNG	EHS64AVFWE	N/A	N/A

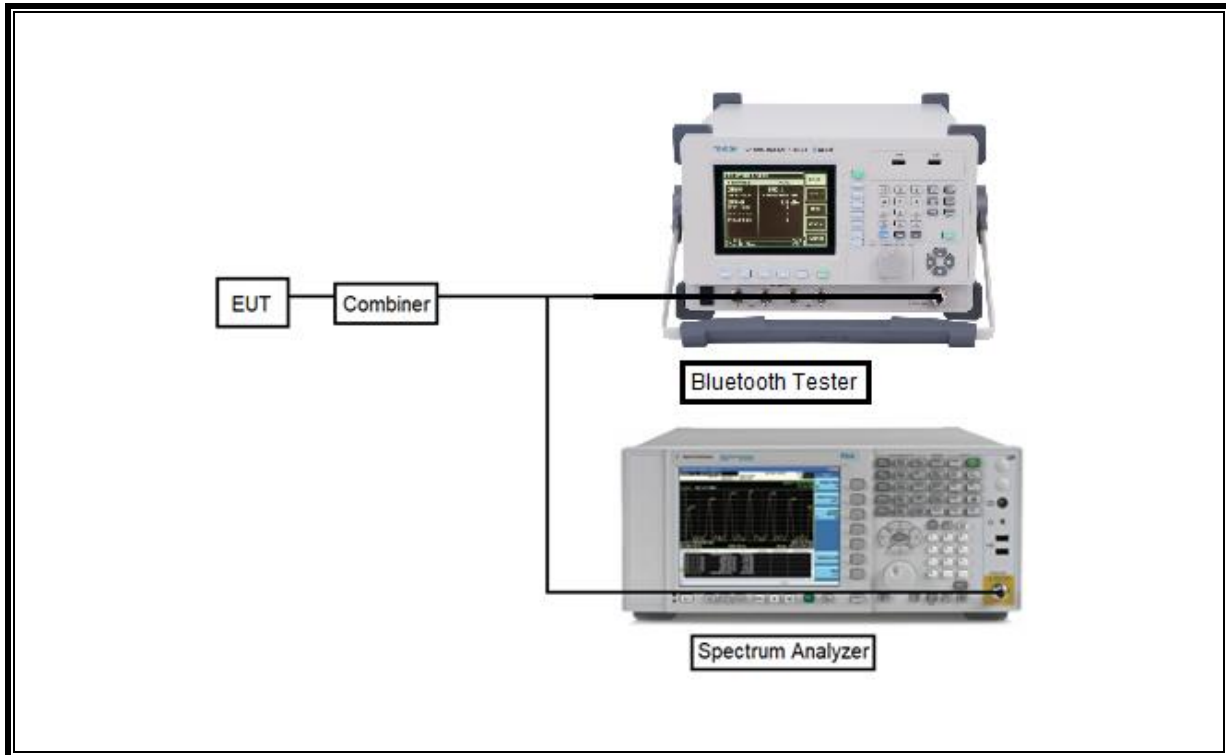
I/O CABLE

I/O Cable List						
Cable No.	Port	# of identical ports	Connector Type	Cable Type	Cable Length (m)	Remarks
1	DC Power	1	C Type	Shielded	1.0 m	N/A
2	Audio	2	Mini-Jack	Unshielded	1.2 m	N/A

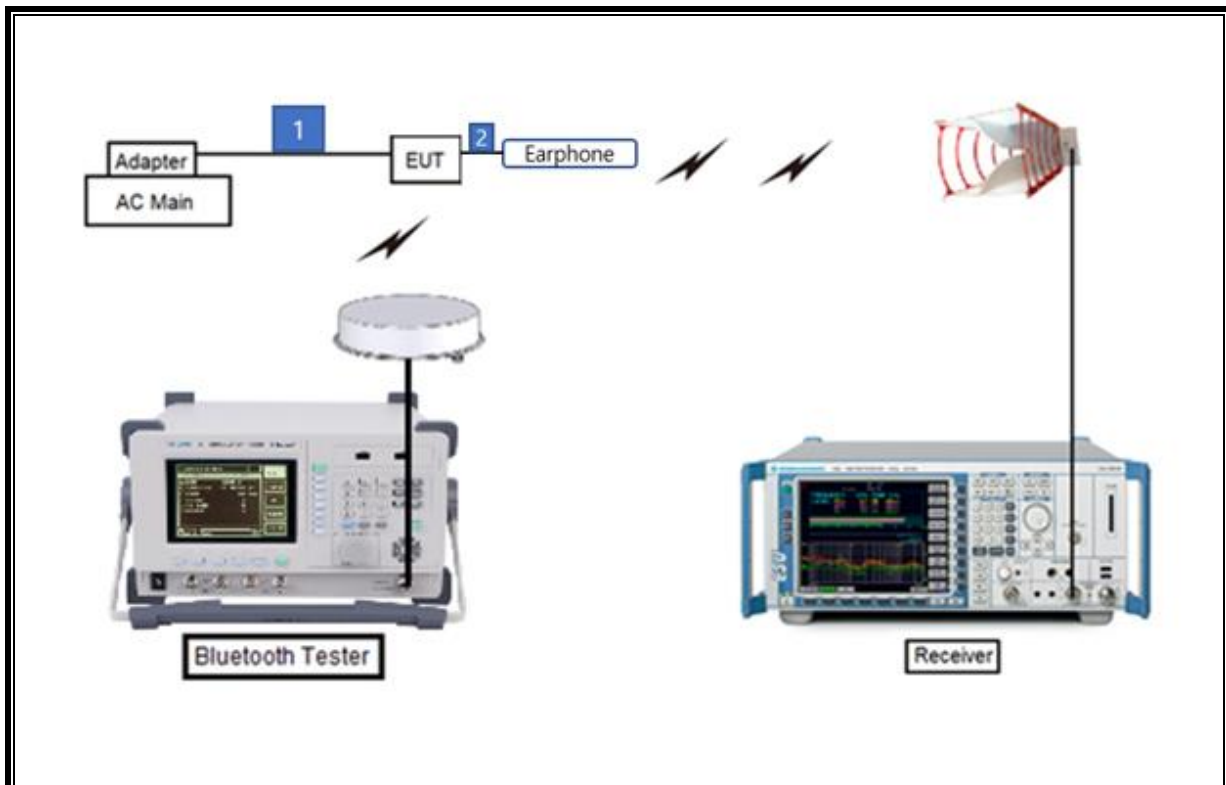
TEST SETUP

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

SETUP DIAGRAM FOR TESTS (CONDUCTED TEST SETUP)



SETUP DIAGRAM FOR TESTS (RADIATED TEST SETUP)



6. TEST AND MEASUREMENT EQUIPMENT

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

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

7. TEST RESULTS SUMMARY

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

8. MEASUREMENT METHODS

20dB BW : ANSI C63.10, Section 6.9.2

99% BW : ANSI C63.10, Section 6.9.3

HOPPING FREQUENCY SEPARATION : ANSI C63.10, Section 7.8.2

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

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

OUTPUT POWER : ANSI C63.10, Section 7.8.5.

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

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

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

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

9. ANTENNA PORT TEST RESULTS

9.1. ON TIME AND DUTY CYCLE

LIMITS

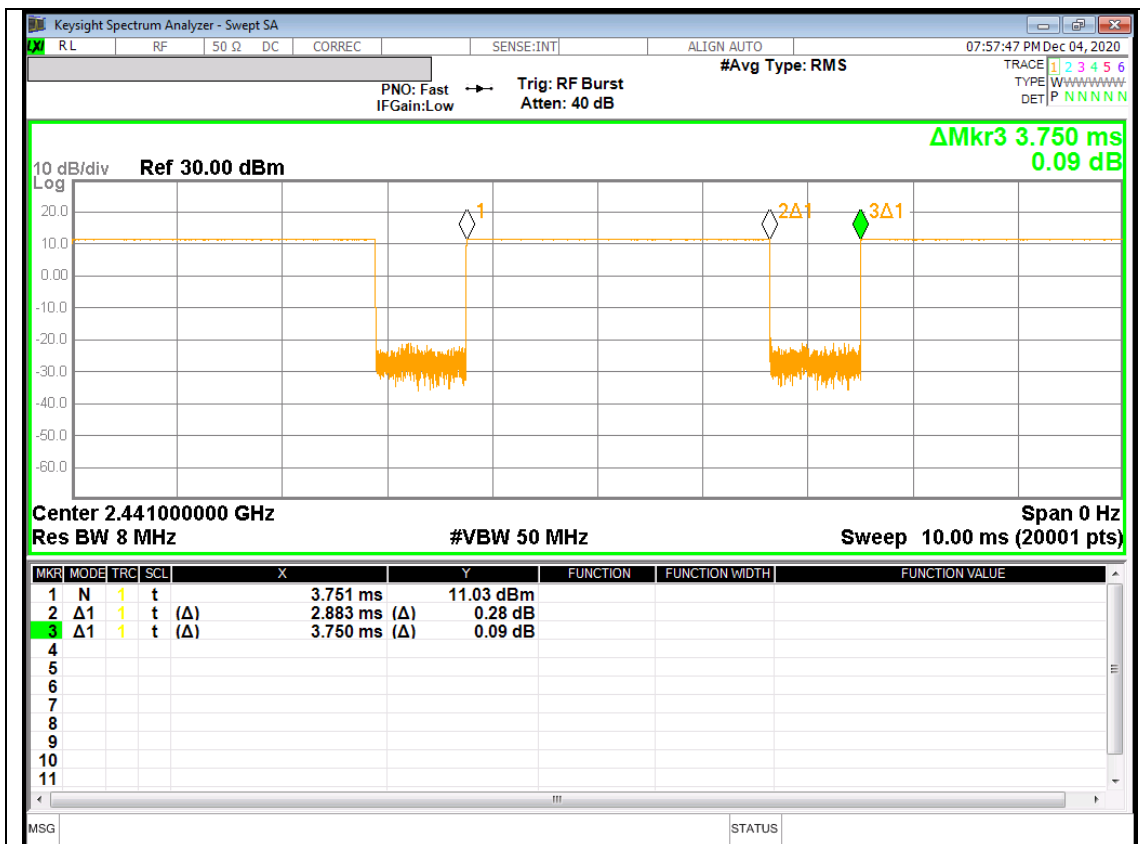
None; for reporting purposes only.

PROCEDURE

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

ON TIME AND DUTY CYCLE RESULTS

Mode	On time [msec]	Period [msec]	Duty Cycle [%]	Duty Cycle Correction Factor[dB]	1/T Minimum VBW [kHz]
2 400 ~ 2 483.5 MHz Band					
Bluetooth	2.883	3.750	76.88	1.14	0.35



9.2. 20 dB AND 99% BANDWIDTH

LIMITS

None; for reporting purposes only.

TEST PROCEDURE

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

RESULTS

9.2.1. BLUETOOTH BASIC DATA RATE GFSK MODULATION

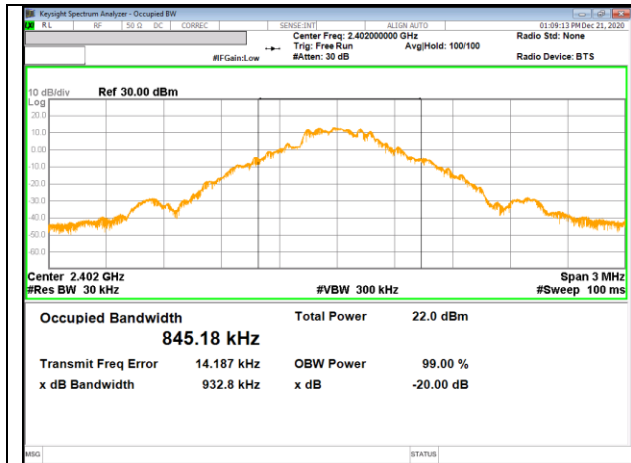
Channel	Frequency [MHz]	20 dB Bandwidth [kHz]	99% Bandwidth [kHz]
0	2 402	932.8	829.0
39	2 441	930.8	830.4
78	2 480	933.7	855.7
Worst		933.7	855.7

9.2.2. BLUETOOTH ENHANCED DATA RATE 8PSK MODULATION

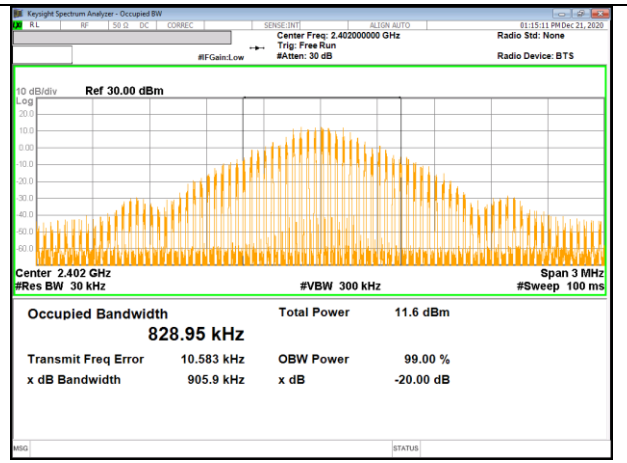
Channel	Frequency [MHz]	20 dB Bandwidth [kHz]	99% Bandwidth [kHz]
0	2 402	1257.0	1161.1
39	2 441	1262.0	1162.3
78	2 480	1265.0	1162.8
Worst		1265.0	1162.8

9.2.3. Bandwidth Plot

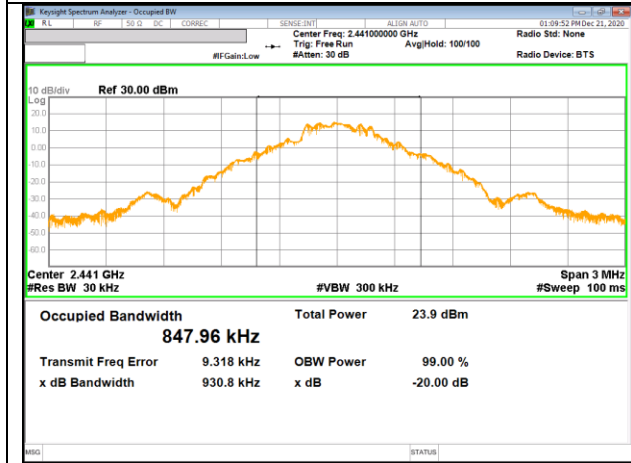
GFSK



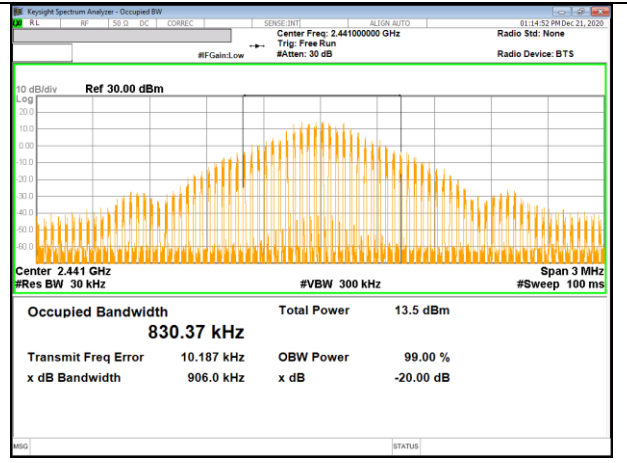
20 dB bandwidth / 0 CHANNEL



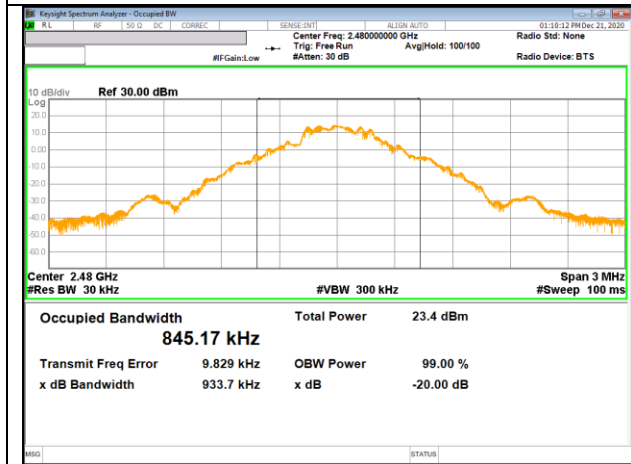
99% bandwidth / 0 CHANNEL



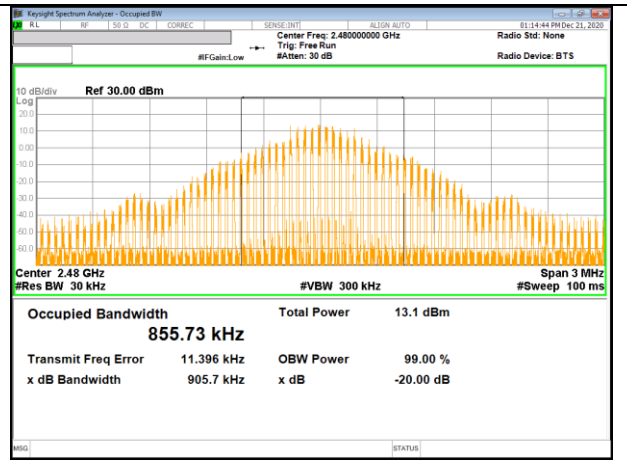
20 dB bandwidth / 39 CHANNEL



99% bandwidth / 39 CHANNEL

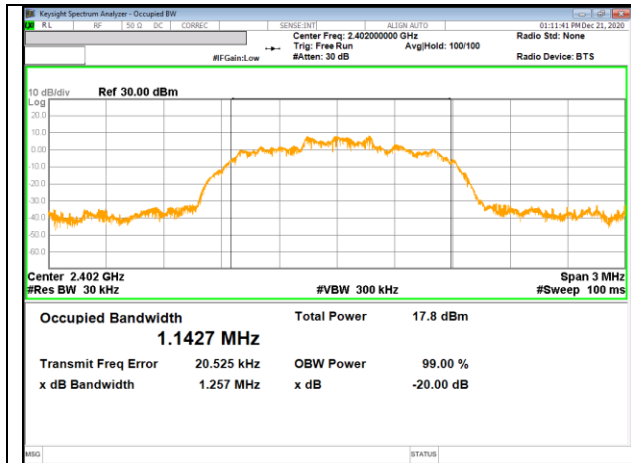


20 dB bandwidth / 78 CHANNEL

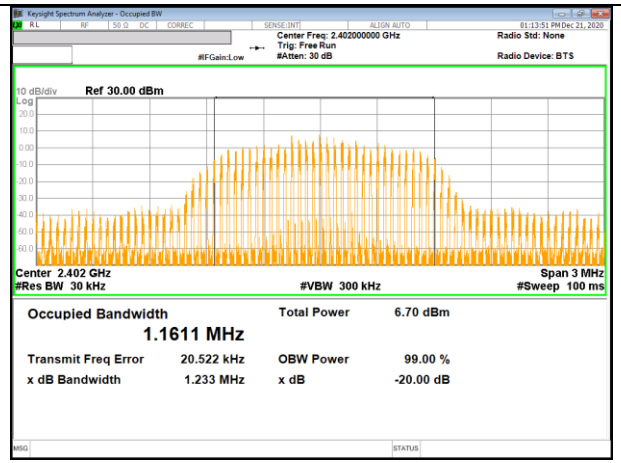


99% bandwidth / 78 CHANNEL

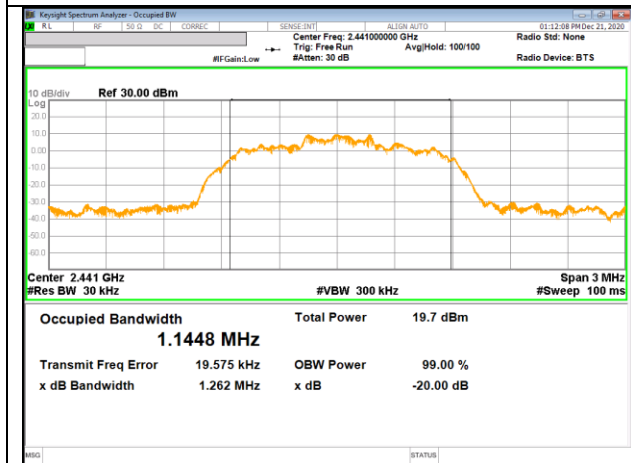
8PSK



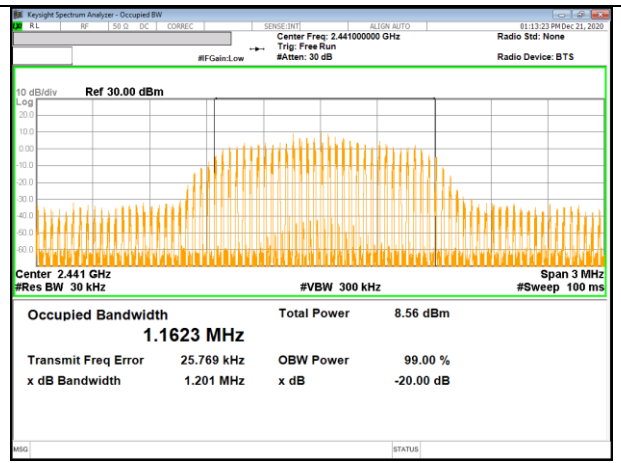
20 dB bandwidth / 0 CHANNEL



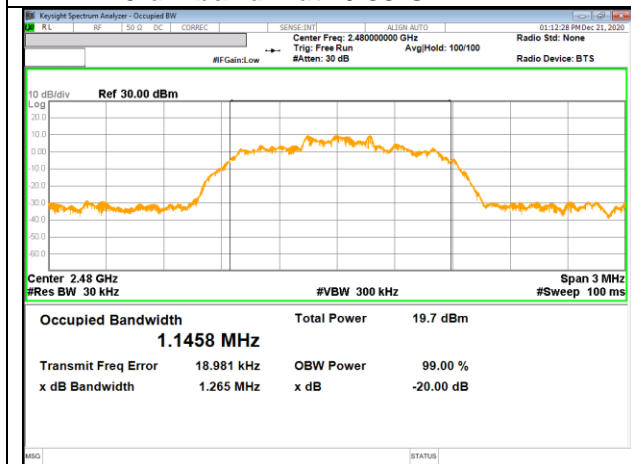
99% bandwidth / 0 CHANNEL



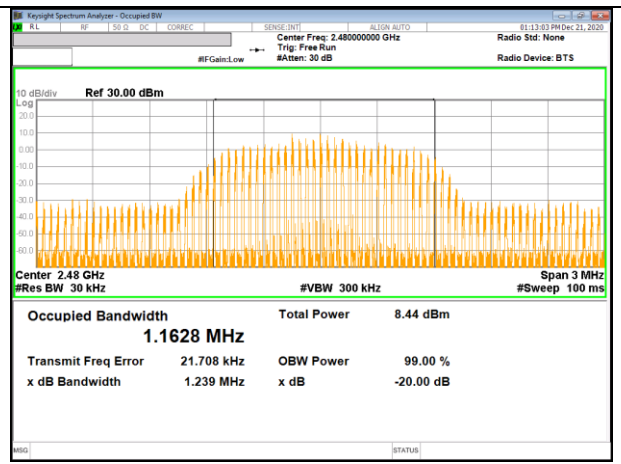
20 dB bandwidth / 39 CHANNEL



99% bandwidth / 39 CHANNEL



20 dB bandwidth / 78 CHANNEL



99% bandwidth / 78 CHANNEL

9.3. HOPPING FREQUENCY SEPARATION

LIMITS

FCC §15.247 (a) (1)

RSS-247 (5.1) (b)

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

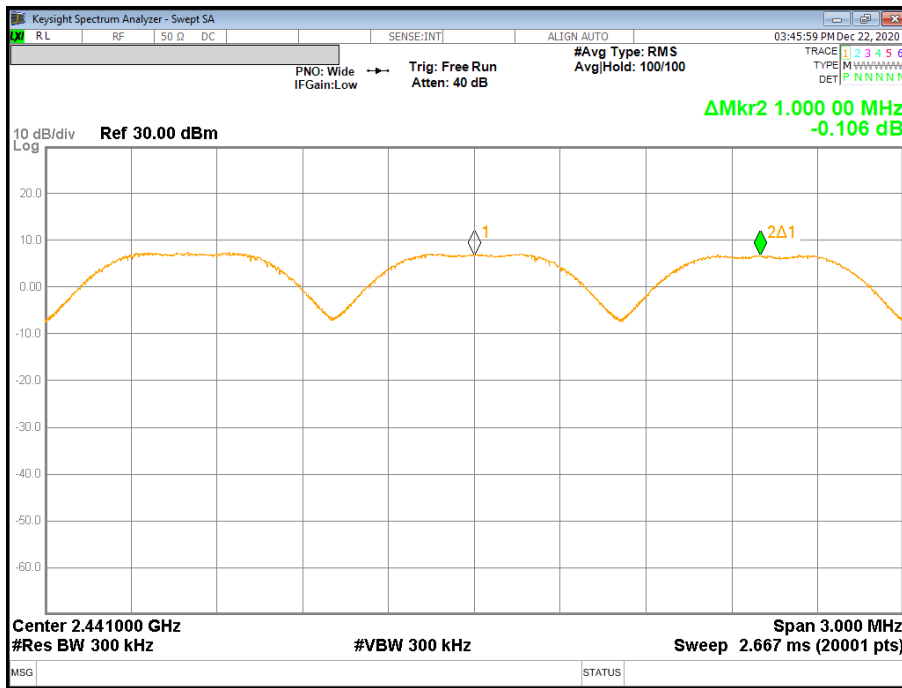
Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than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

TEST PROCEDURE

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

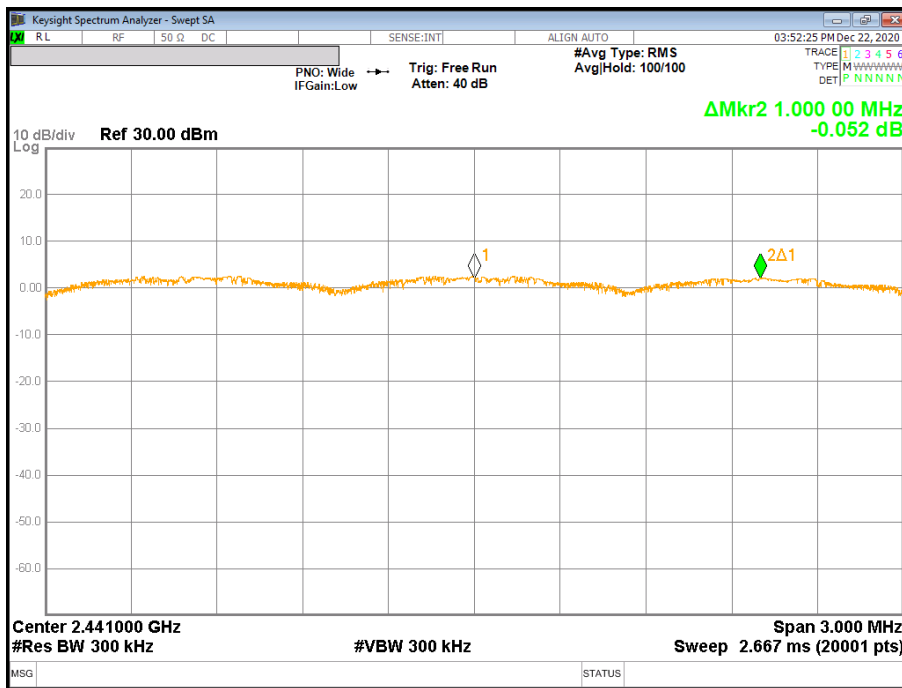
RESULTS

9.3.1. BLUETOOTH BASIC DATA RATE GFSK MODULATION



HOPPING FREQUENCY SEPARATION PLOT

9.3.2. BLUETOOTH ENHANCED DATA RATE 8PSK MODULATION



HOPPING FREQUENCY SEPARATION PLOT

9.4. NUMBER OF HOPPING CHANNELS

LIMITS

FCC §15.247 (a) (1) (iii)

RSS-247 (5.1) (d)

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

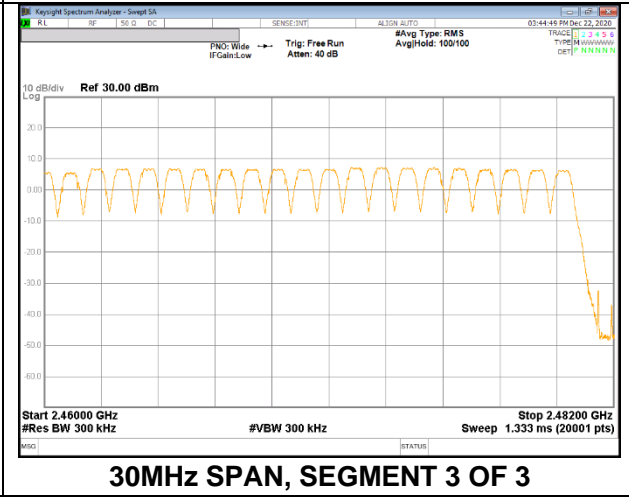
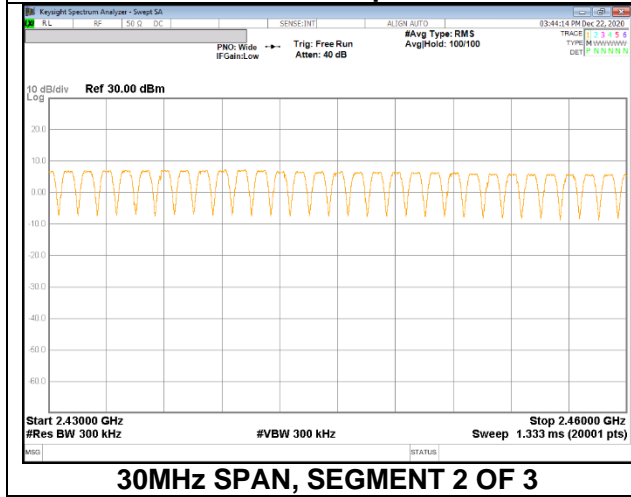
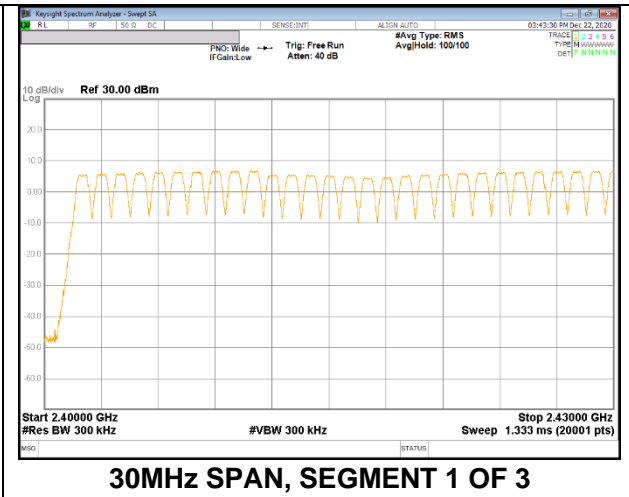
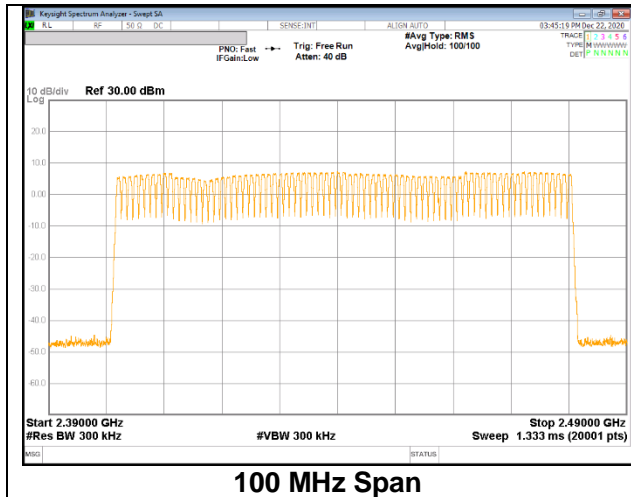
TEST PROCEDURE

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

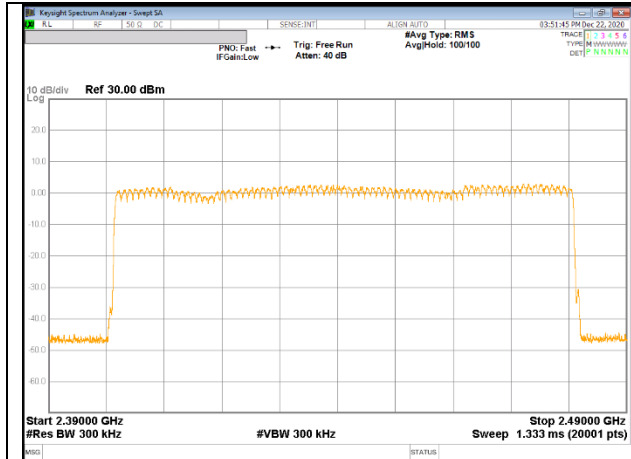
RESULTS

Normal Mode: All Channels Observed

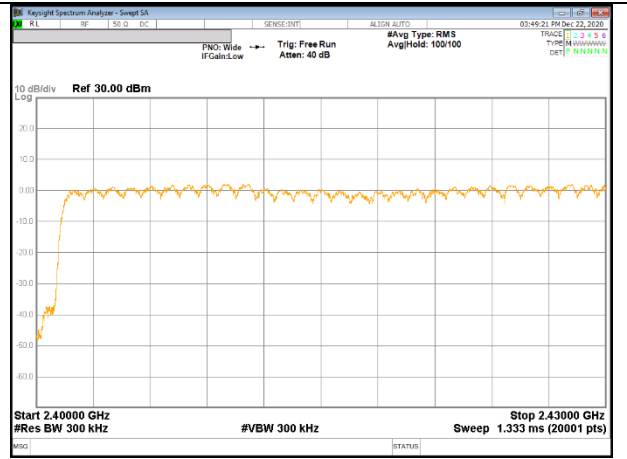
9.4.1. BLUETOOTH BASIC DATA RATE GFSK MODULATION



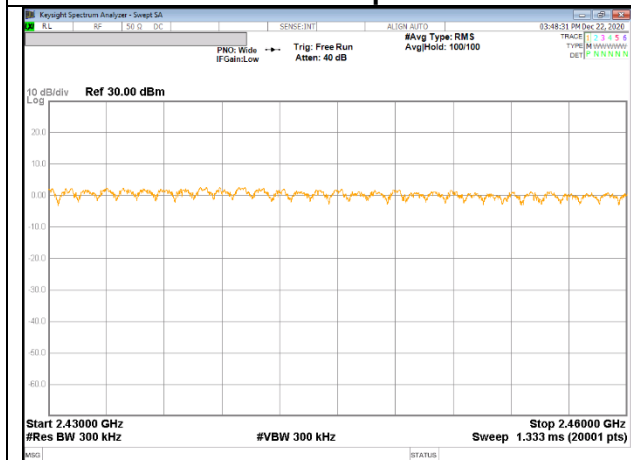
9.4.2. BLUETOOTH ENHANCED DATA RATE 8PSK MODULATION



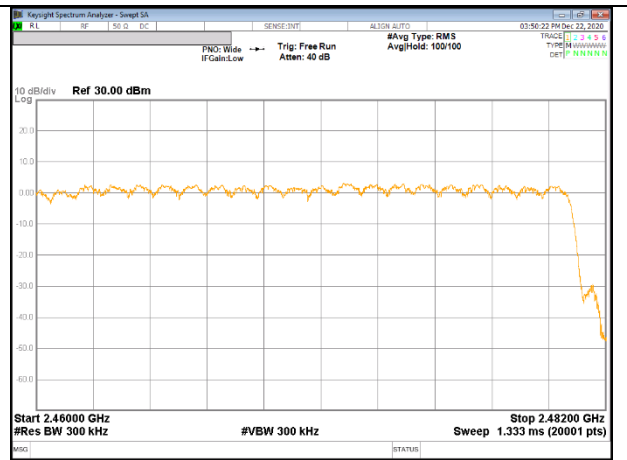
100 MHz Span



30MHz SPAN, SEGMENT 1 OF 3



30MHz SPAN, SEGMENT 2 OF 3



30MHz SPAN, SEGMENT 3 OF 3

9.5. AVERAGE TIME OF OCCUPANCY

LIMITS

FCC §15.247 (a) (1) (iii)

RSS-247 (5.1) (d)

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

TEST PROCEDURE

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

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

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

RESULTS

9.5.1. BLUETOOTH BASIC DATA RATE GFSK MODULATION

DH Packet	Pulse Width [msec]	Number of Pulses in 3.16 seconds	Average Time of Occupancy [sec]	Limit [sec]	Margin [sec]
GFSK Normal					
DH1	0.379	32	0.121	0.4	-0.279
DH3	1.635	16	0.262	0.4	-0.138
DH5	2.883	12	0.346	0.4	-0.054
DH Packet	Pulse Width [msec]	Number of Pulses in 0.8 seconds	Average Time of Occupancy [sec]	Limit [sec]	Margin [sec]
GFSK AFH					
DH1	0.379	8	0.030	0.4	-0.370
DH3	1.635	4	0.065	0.4	-0.335
DH5	2.883	3	0.086	0.4	-0.314



PULSE WIDTH – DH1



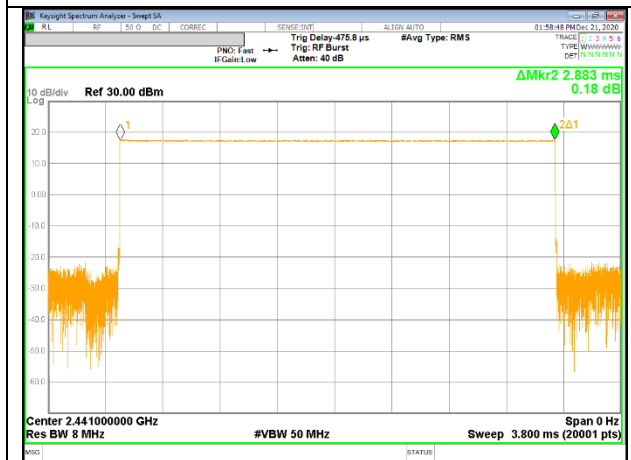
NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD – DH1



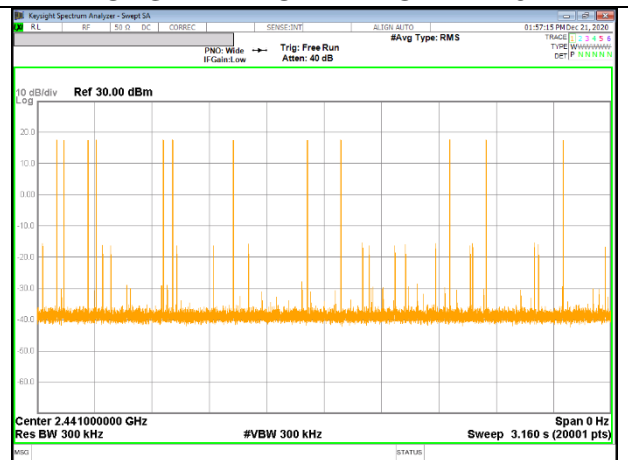
PULSE WIDTH – DH3



NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD – DH3



PULSE WIDTH – DH5



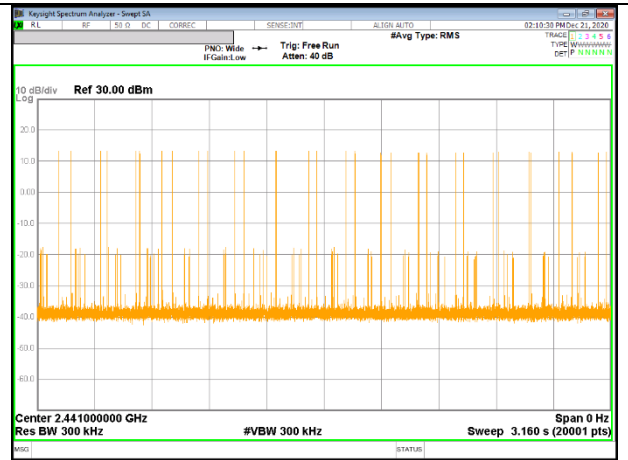
NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD – DH5

9.5.2. BLUETOOTH ENHANCED DATA RATE 8PSK MODULATION

DH Packet	Pulse Width [msec]	Number of Pulses in 3.16 seconds	Average Time of Occupancy [sec]	Limit [sec]	Margin [sec]
8PSK Normal					
DH1	0.386	32	0.123	0.4	-0.277
DH3	1.633	16	0.261	0.4	-0.139
DH5	2.885	12	0.346	0.4	-0.054
DH Packet	Pulse Width [msec]	Number of Pulses in 0.8 seconds	Average Time of Occupancy [sec]	Limit [sec]	Margin [sec]
8PSK AFH					
DH1	0.386	8	0.031	0.4	-0.369
DH3	1.633	4	0.065	0.4	-0.335
DH5	2.885	3	0.087	0.4	-0.313



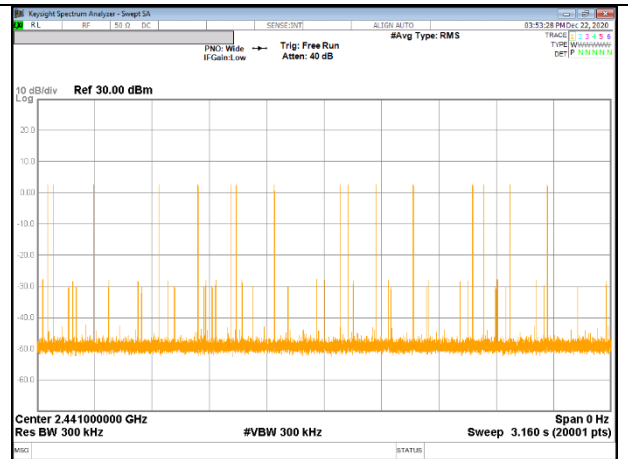
PULSE WIDTH – 3-DH1



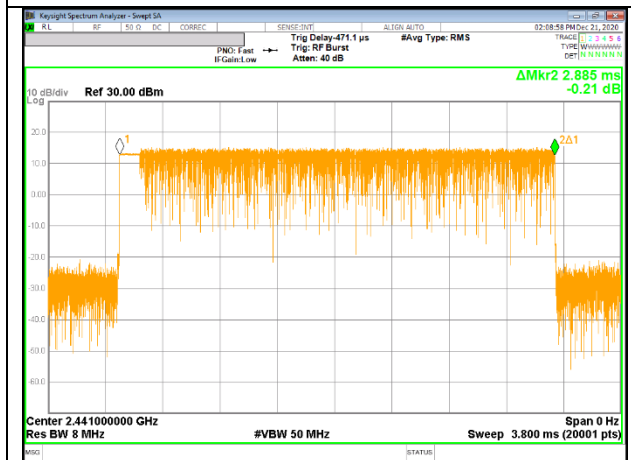
NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD – 3-DH1



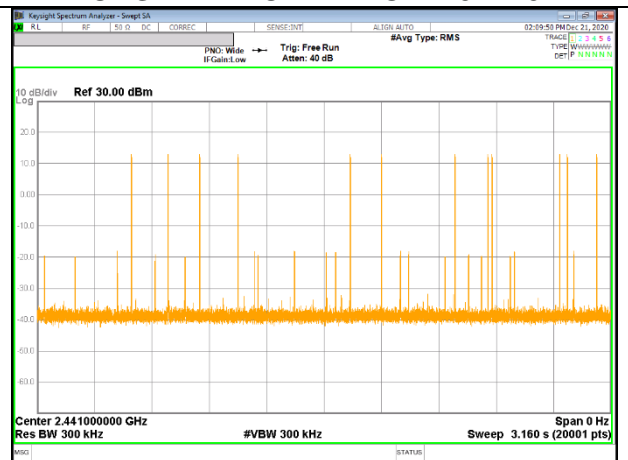
PULSE WIDTH – 3-DH3



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



PULSE WIDTH – 3-DH5



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

9.6. PEAK OUTPUT POWER

LIMITS

§15.247 (b) (1)

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

TEST PROCEDURE

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

RESULTS

9.6.1. BASIC DATA RATE GFSK MODULATION

Channel	Frequency [MHz]	Output Power [dBm]	Limit [dBm]	Margin [dBm]
0	2 402	16.247	21.000	-4.753
39	2 441	18.197	21.000	-2.803
78	2 480	17.556	21.000	-3.444
Worst		18.197	21.000	-2.803

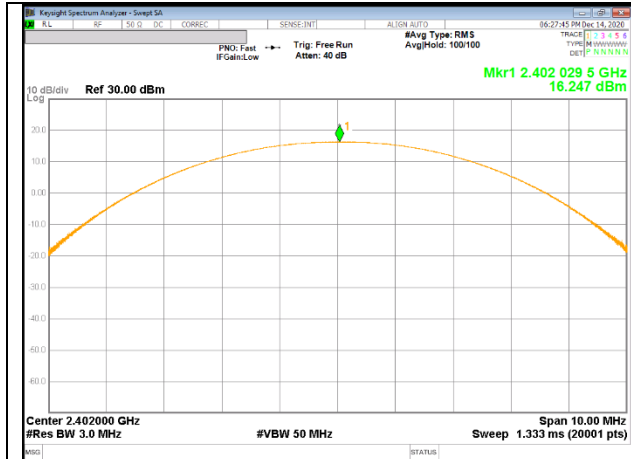
9.6.2. ENHANCED DATA RATE Pi/4-DPSK MODULATION

Channel	Frequency [MHz]	Output Power [dBm]	Limit [dBm]	Margin [dBm]
0	2 402	13.194	21.000	-7.806
39	2 441	15.173	21.000	-5.827
78	2 480	14.611	21.000	-6.389
Worst		15.173	21.000	-5.827

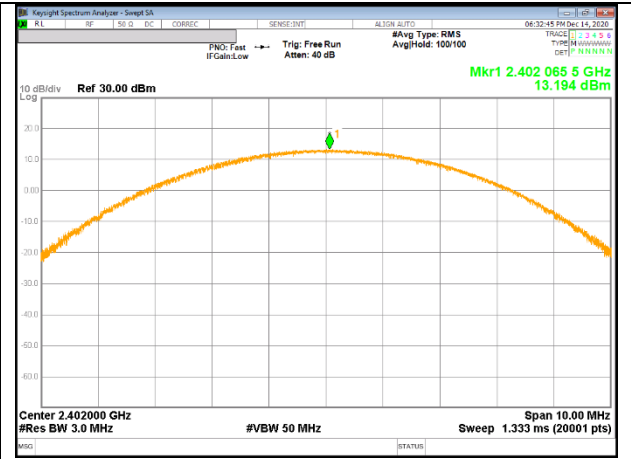
9.6.3. ENHANCED DATA RATE 8PSK MODULATION

Channel	Frequency [MHz]	Output Power [dBm]	Limit [dBm]	Margin [dBm]
0	2 402	13.541	21.000	-7.459
39	2 441	15.493	21.000	-5.507
78	2 480	15.089	21.000	-5.911
Worst		15.493	21.000	-5.507

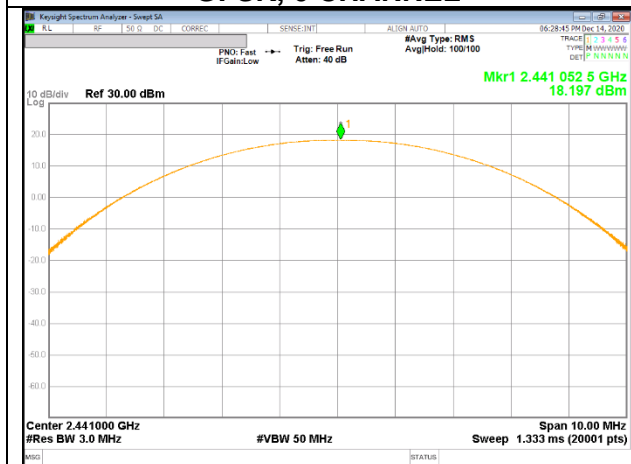
9.6.4. OUTPUT POWER PLOTS



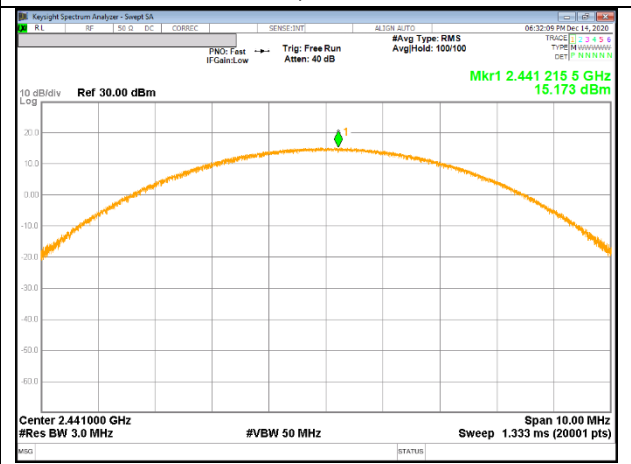
GFSK, 0 CHANNEL



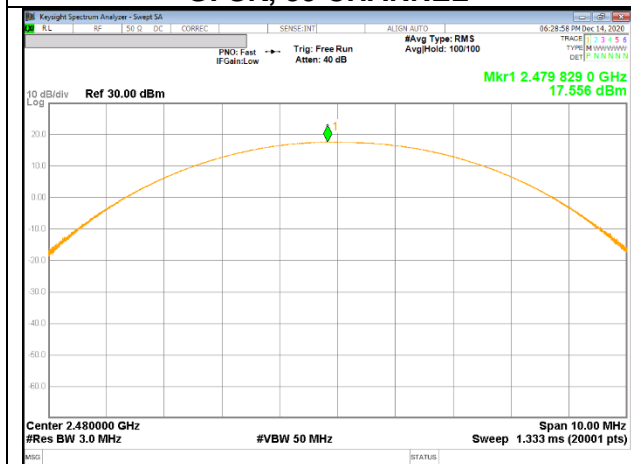
Pi/4-DPSK, 0 CHANNEL



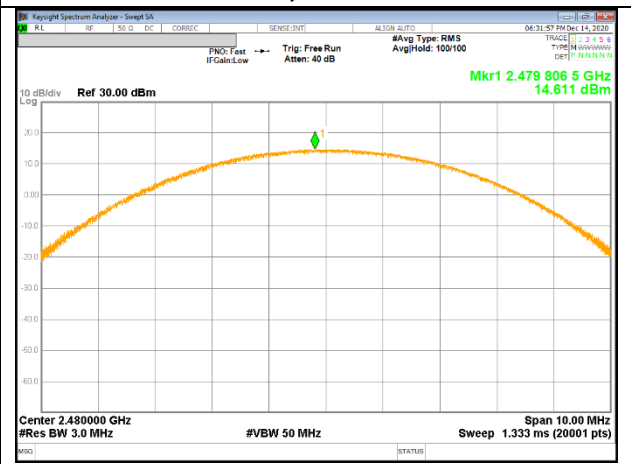
GFSK, 39 CHANNEL



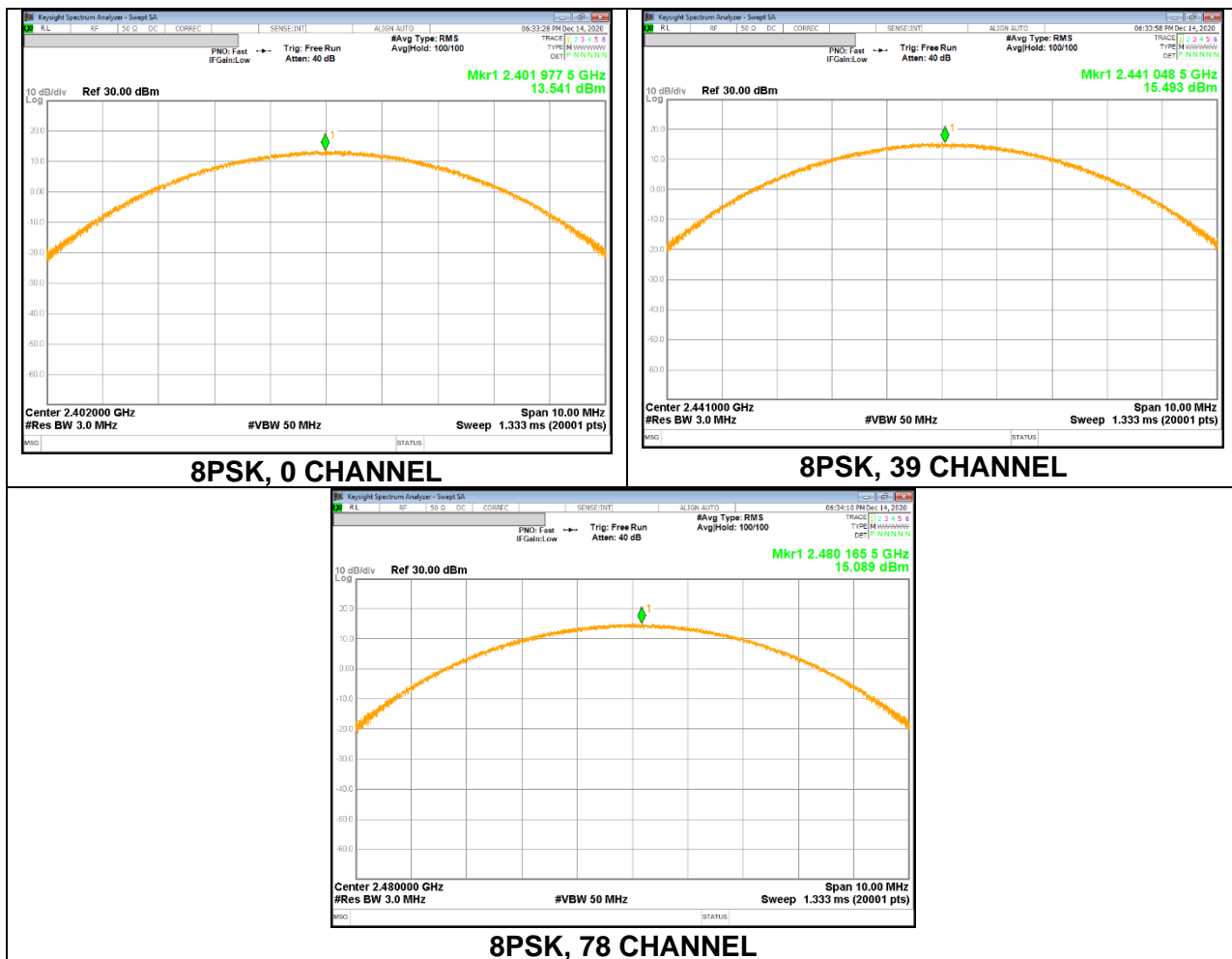
Pi/4-DPSK, 39 CHANNEL



GFSK, 78 CHANNEL



Pi/4-DPSK, 78 CHANNEL



9.7. AVERAGE POWER

LIMITS

None; for reporting purposes only

TEST PROCEDURE

Measurements perform using a wideband RF frame average power sensor. The cable assembly insertion loss and duty cycle correction factor was entered as an offset in the power sensor to allow for direct reading of power.

RESULTS

9.7.1. BASIC DATA RATE GFSK MODULATION

Channel	Frequency [MHz]	AV power [dBm]	AV power [mW]
0	2 402	15.946	39.319
39	2 441	17.904	61.716
78	2 480	17.243	53.003

9.7.2. ENHANCED DATA RATE PI/4-DQPSK MODULATION

Channel	Frequency [MHz]	AV power [dBm]	AV power [mW]
0	2 402	10.777	11.959
39	2 441	12.828	19.178
78	2 480	12.431	17.502

9.7.3. ENHANCED DATA RATE 8PSK MODULATION

Channel	Frequency [MHz]	AV power [dBm]	AV power [mW]
0	2 402	10.798	12.017
39	2 441	12.865	19.342
78	2 480	12.577	18.101

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.

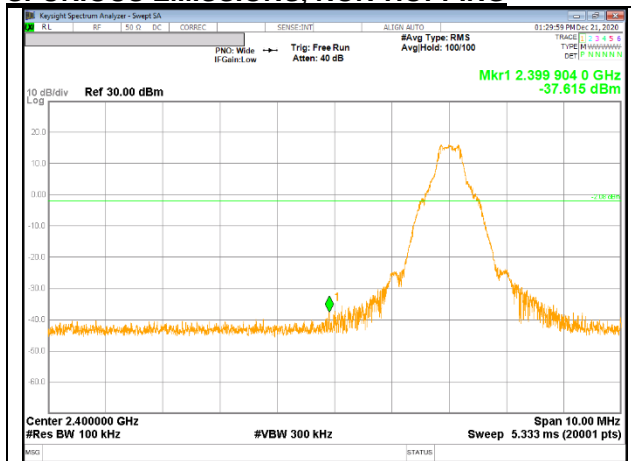
The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels.

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

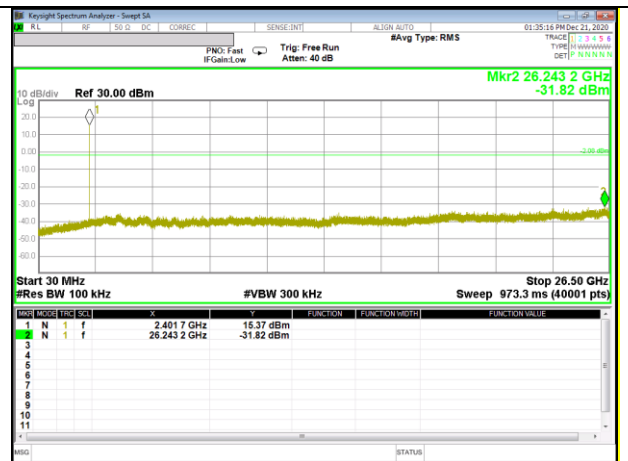
RESULTS

9.8.1. BLUETOOTH BASIC DATA RATE GFSK MODULATION

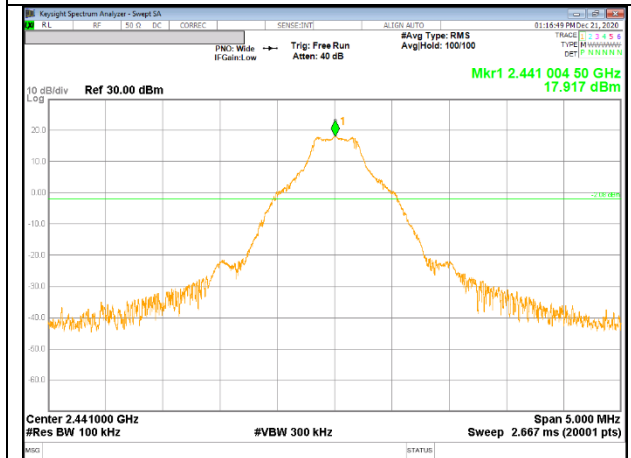
SPURIOUS EMISSIONS, NON-HOPPING



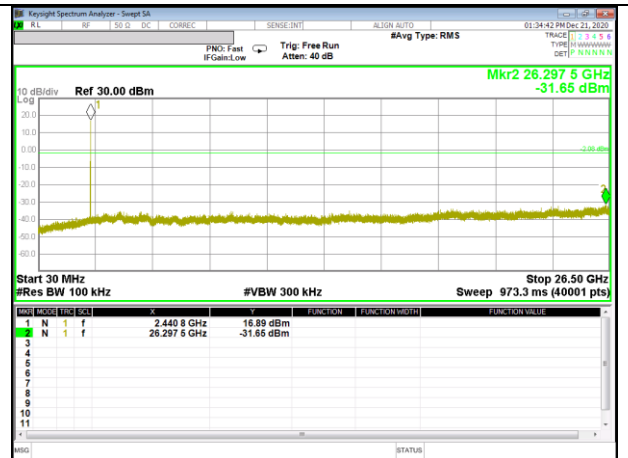
0 CHANNEL BANDEGE



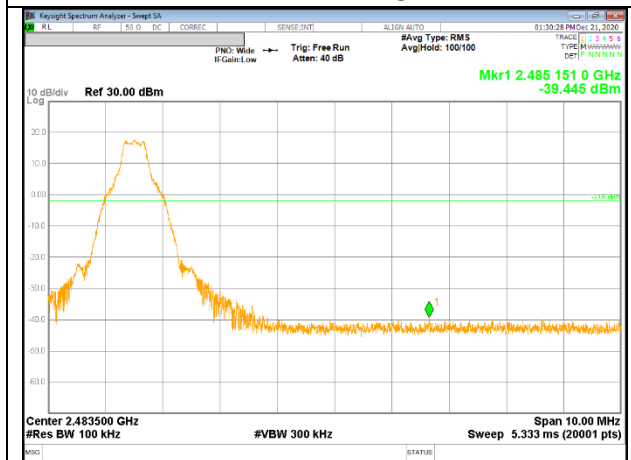
OUT-OF-BAND 0 CHANNEL



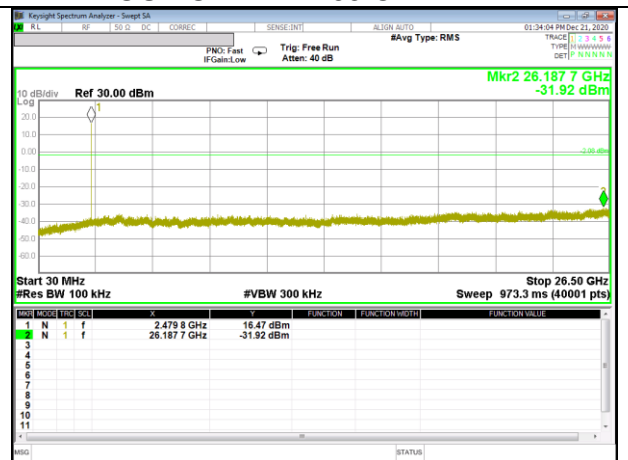
IN-BAND REFERENCE LEVEL



OUT-OF-BAND 39 CHANNEL

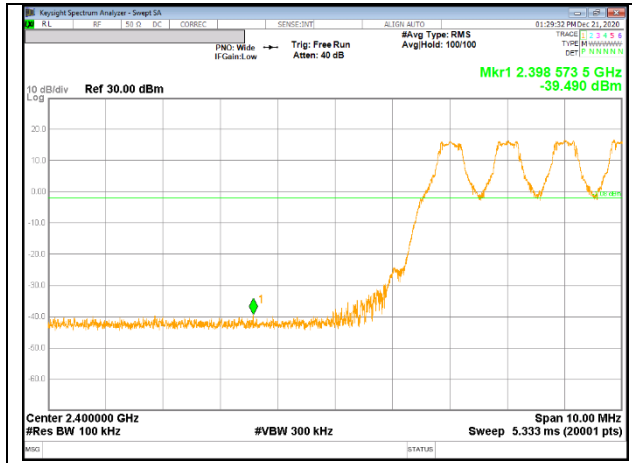


78 CHANNEL BANDEGE

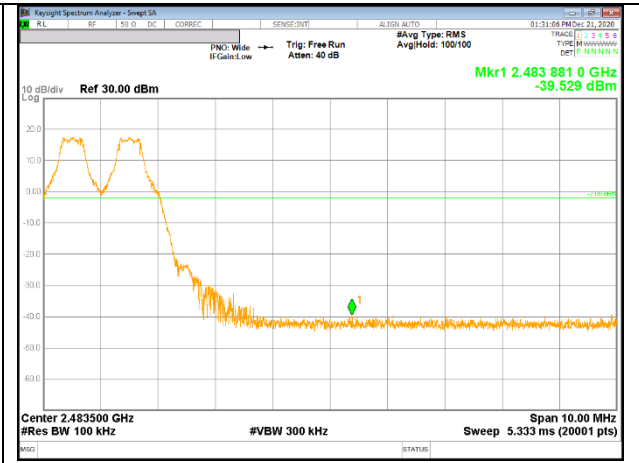


OUT-OF-BAND 78 CHANNEL

SPURIOUS BANDEDGE EMISSIONS WITH HOPPING ON



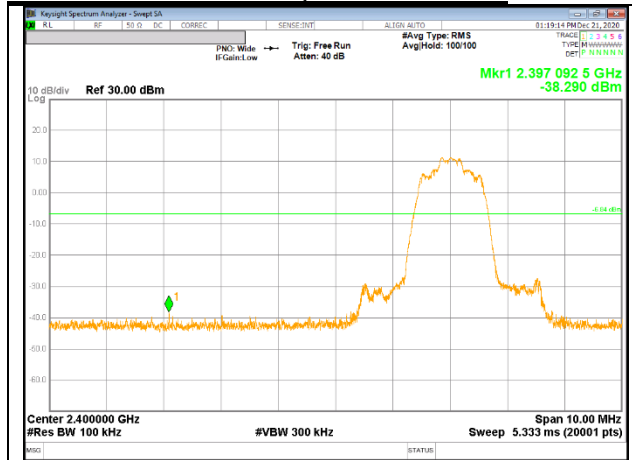
LOW BANDEDGE



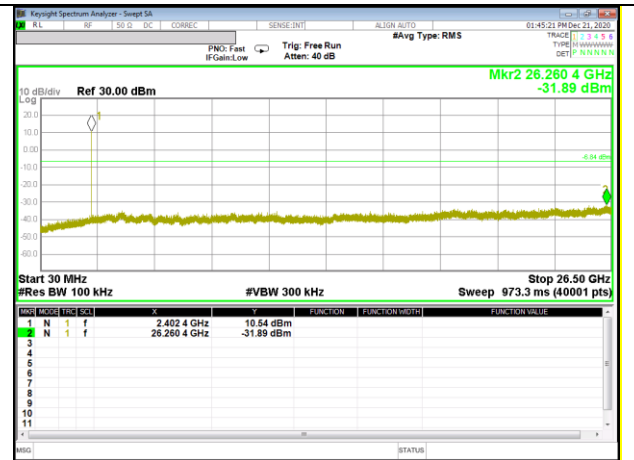
HIGH BANDEDGE

9.8.2. BLUETOOTH ENHANCED DATA RATE 8PSK MODULATION

SPURIOUS EMISSIONS, NON-HOPPING



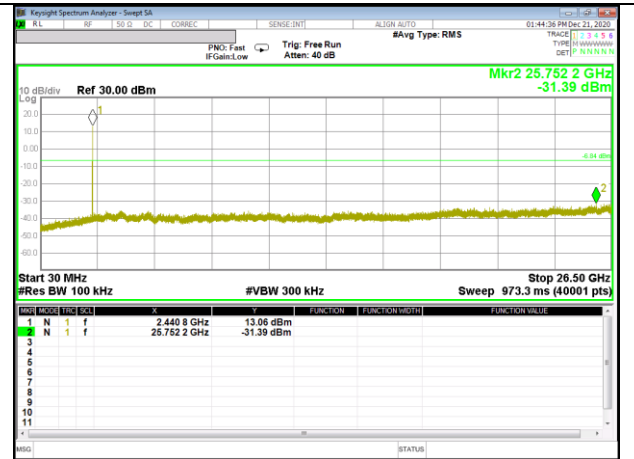
0 CHANNEL BANDEGE



OUT-OF-BAND 0 CHANNEL



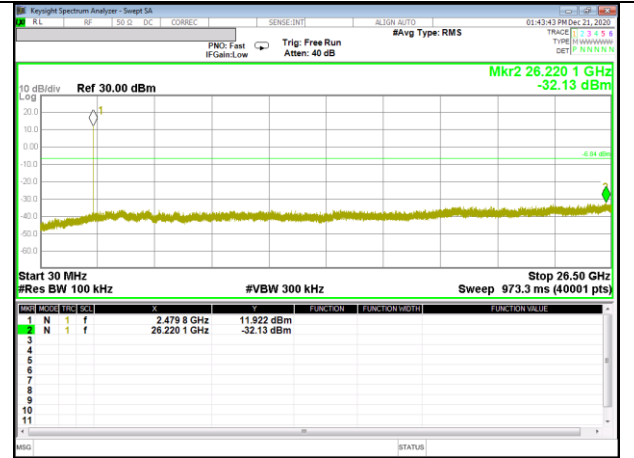
IN-BAND REFERENCE LEVEL



OUT-OF-BAND 39 CHANNEL



78 CHANNEL BANDEGE



OUT-OF-BAND 78 CHANNEL

SPURIOUS BANDEDGE EMISSIONS WITH HOPPING ON



LOW BANDEDGE



HIGH BANDEDGE

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.

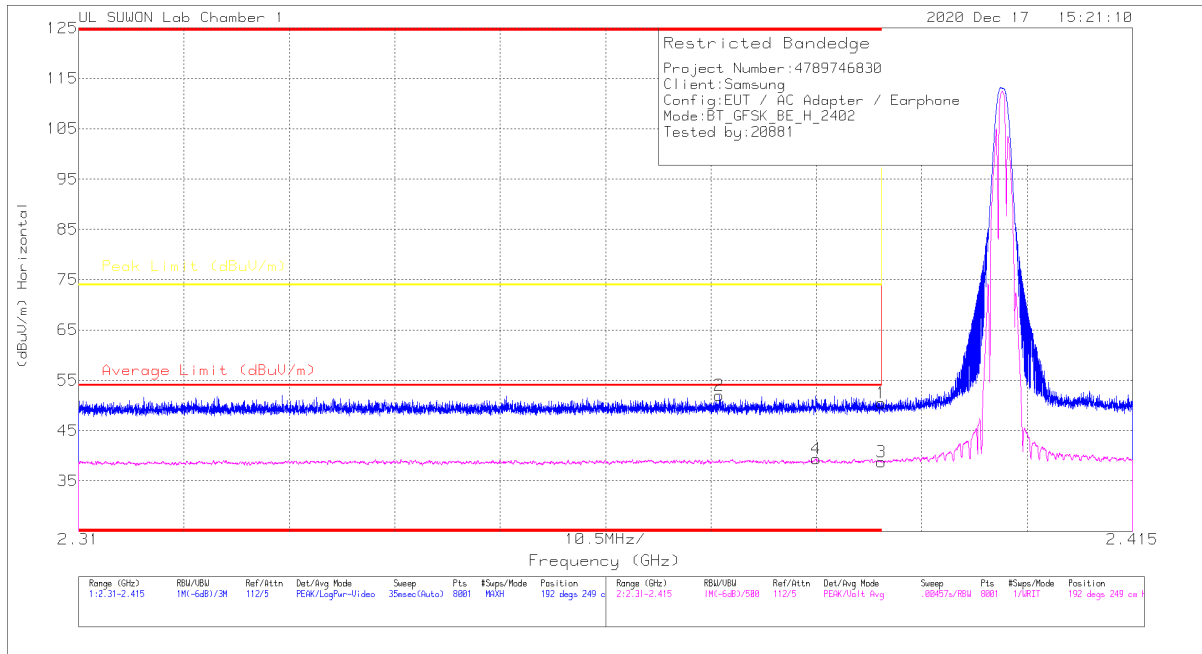
Although these tests were performed other than open field test site, adequate comparison measurements were confirmed against 30 m open are test site.
Therefore sufficient tests were made to demonstrate that the alternative site produces results that correlate with the one of tests made in an open field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

10.1. TRANSMITTER ABOVE 1 GHz

10.1.1. BLUETOOTH BASIC DATA RATE GFSK MODULATION

BANDEDGE (0 CHANNEL)

HORIZONTAL RESULT



Trace Markers

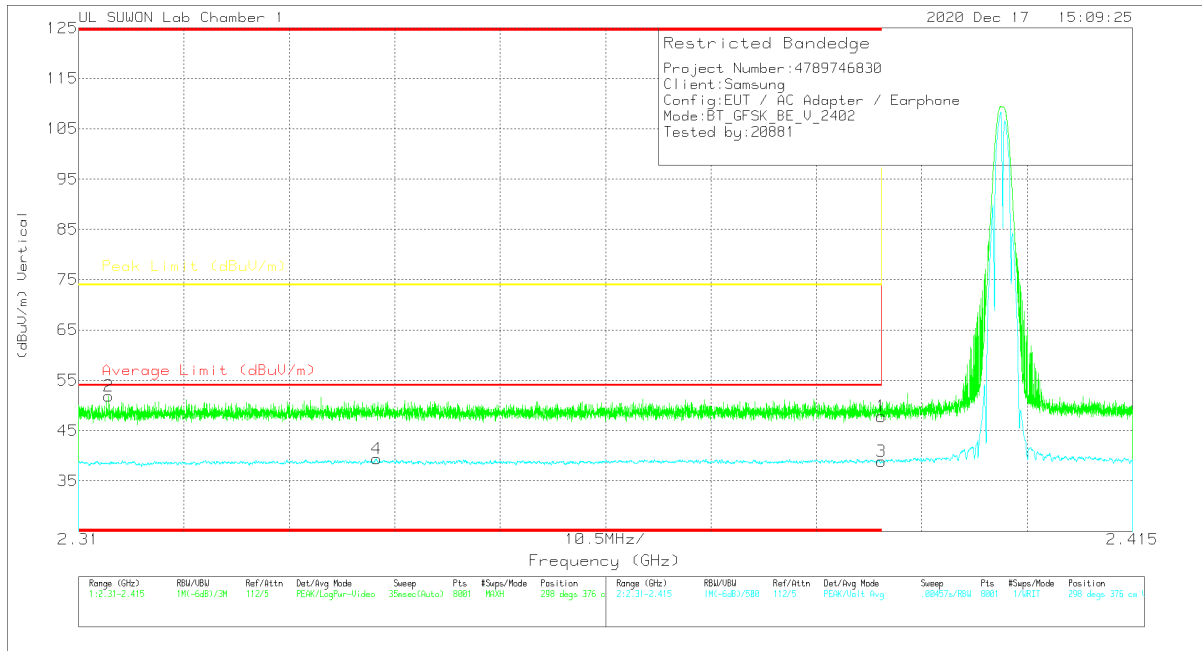
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	3117_00168717	10dB_ATT[dB]	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.39	44.25	Pk	31.8	-25.6	50.45	-	-	74	-23.55	192	249	H
2	* 2.37384	45.9	Pk	31.7	-25.6	52	-	-	74	-22	192	249	H
3	* 2.39	32.56	VA1T	31.8	-25.6	38.76	54	-15.24	-	-	192	249	H
4	* 2.38351	33.12	VA1T	31.8	-25.5	39.42	54	-14.58	-	-	192	249	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



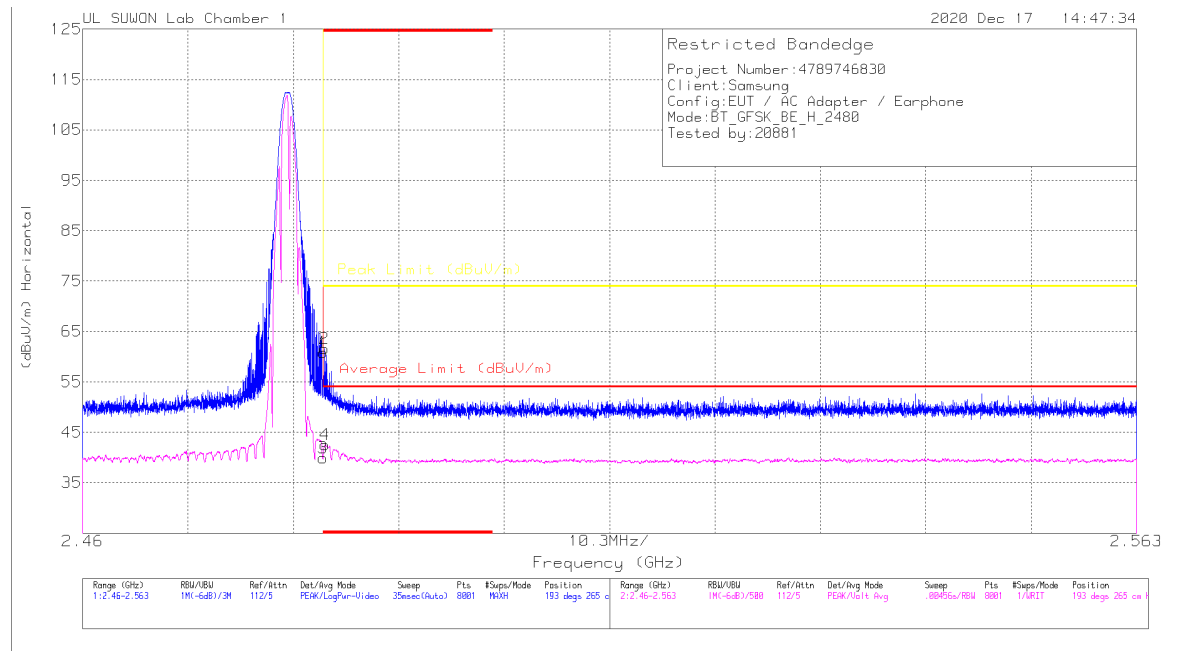
Trace Markers

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	41.63	PK	31.8	-25.6	47.83	-	-	74	-26.17	298	376	V
2	* 2.31301	46.03	PK	31.6	-25.8	51.83	-	-	74	-22.17	298	376	V
3	* 2.39	32.66	VA1T	31.8	-25.6	38.86	54	-15.14	-	-	298	376	V
4	* 2.33968	33.27	VA1T	31.7	-25.6	39.37	54	-14.63	-	-	298	376	V

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

BANDEDGE (78 CHANNEL)

HORIZONTAL RESULT

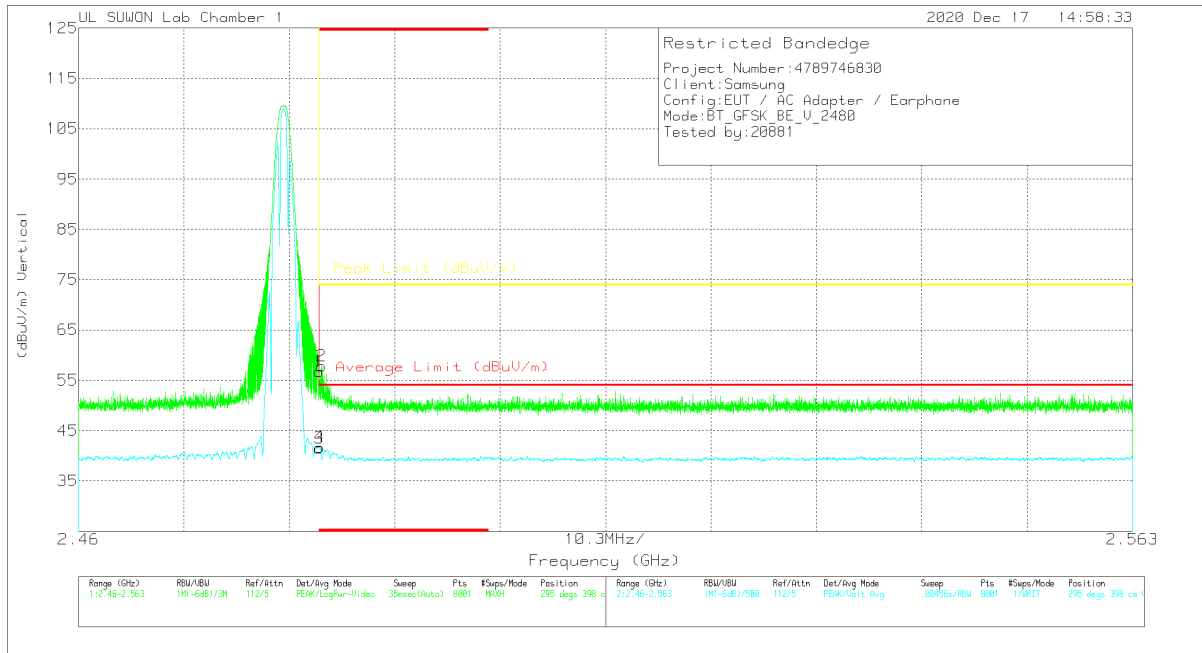


Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	3117_00168717	10dB_ATT[dB]	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.48351	54.12	Pk	32	-25.3	60.82	-	-	74	-13.18	193	265	H
2	* 2.4836	54.86	Pk	32	-25.3	61.56	-	-	74	-12.44	193	265	H
3	* 2.48351	33.23	VA1T	32	-25.3	39.93	54	-14.07	-	-	193	265	H
4	* 2.48369	35.81	VA1T	32	-25.3	42.51	54	-11.49	-	-	193	265	H

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

VERTICAL RESULT

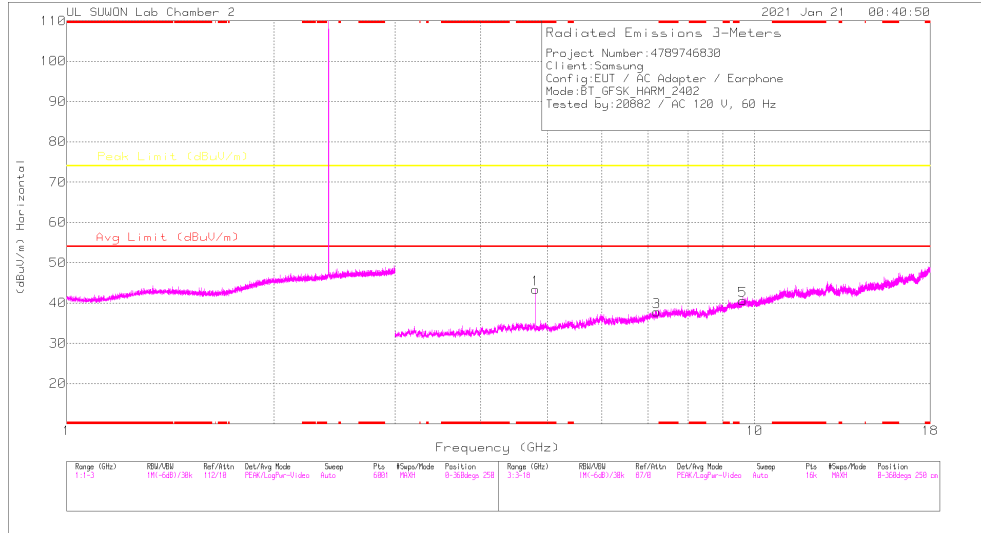


Trace Markers

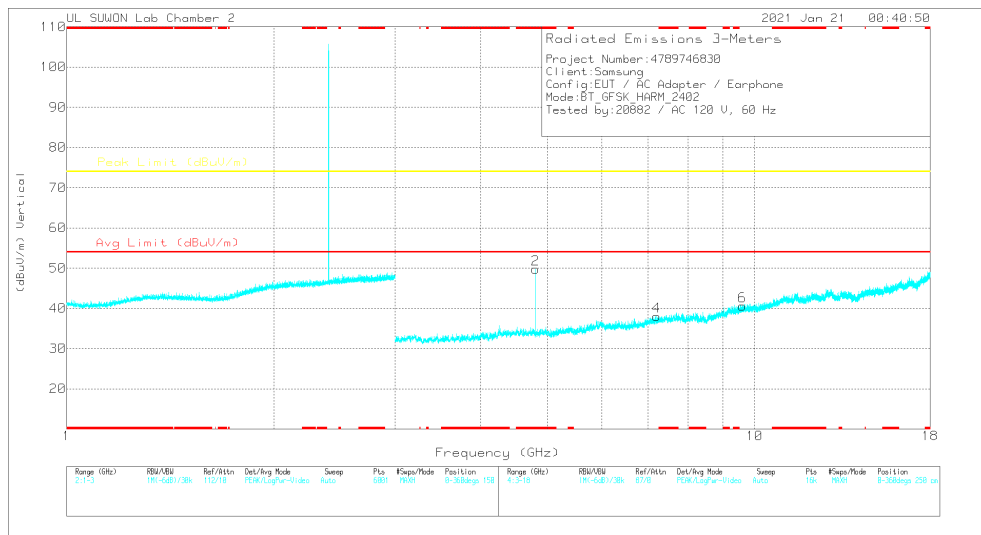
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	3117_00168717	10dB_ATT[dB]	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.48351	50.01	PK	32	-25.3	56.71	-	-	74	-17.29	295	398	V
2	* 2.48377	51.11	PK	32	-25.3	57.81	-	-	74	-16.19	295	398	V
3	* 2.48351	34.82	VA1T	32	-25.3	41.52	54	-12.48	-	-	295	398	V
4	* 2.48355	35.02	VA1T	32	-25.3	41.72	54	-12.28	-	-	295	398	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

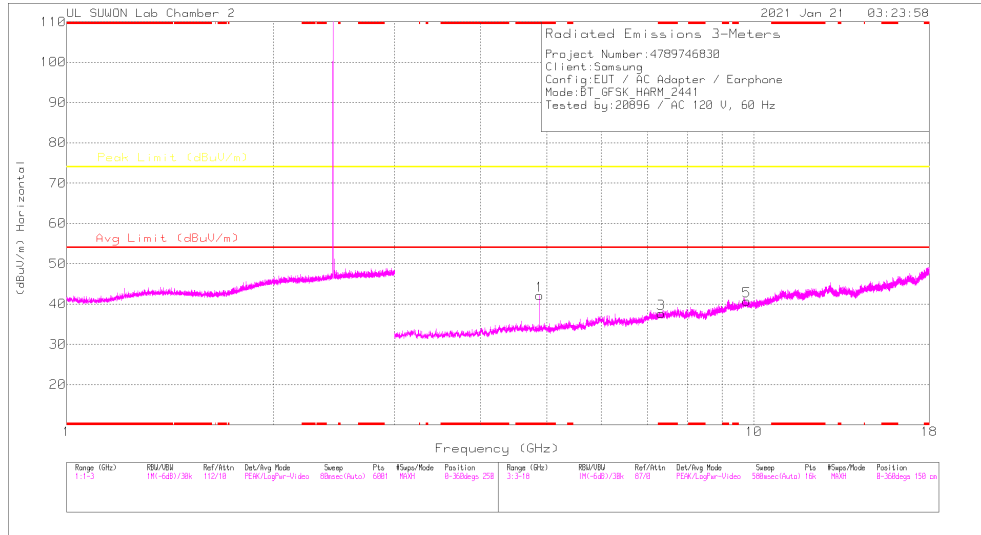
Frequency (GHz)	Meter Reading (dBuV)	Det	3117_00168724	3GHz_HP[dB]	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
* 4.80437	44.01	PKFH	34.1	-27.7	50.41	-	-	74	-23.59	241	100	H
* 4.80389	39.82	VA1T	34.1	-27.7	46.22	54	-7.78	-	-	241	100	H
* 4.80425	45.11	PKFH	34.1	-27.7	51.51	-	-	74	-22.49	185	118	V
* 4.80396	41.2	VA1T	34.1	-27.7	47.6	54	-6.4	-	-	185	118	V
7.20878	33.87	PKFH	36.2	-24.9	45.17	-	-	74	-28.83	360	100	H
7.20849	33.2	PKFH	36.2	-24.8	44.6	-	-	74	-29.4	360	100	V
9.60748	31.35	PKFH	37	-20.9	47.45	-	-	74	-26.55	360	100	H
9.60947	30.93	PKFH	37	-20.9	47.03	-	-	74	-26.97	360	100	V

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

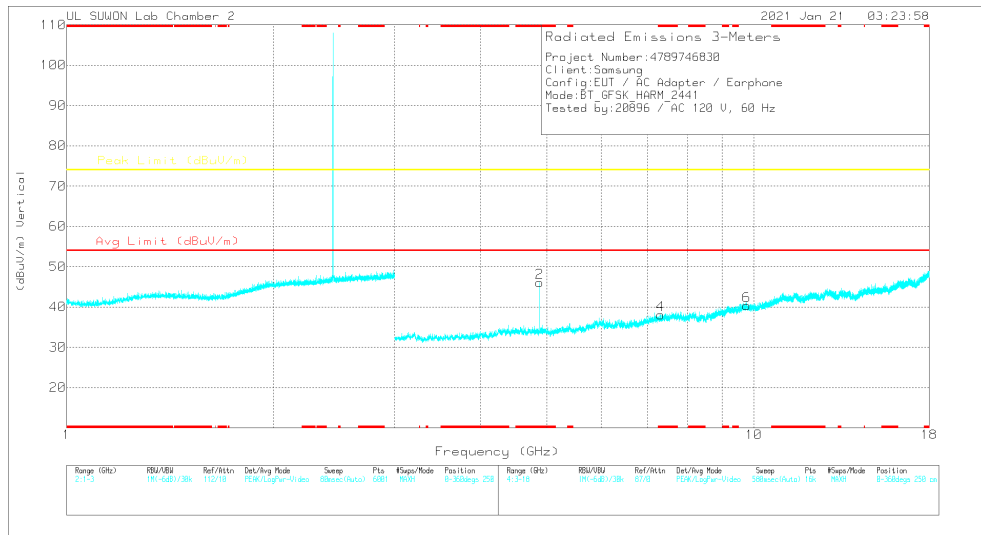
PKFH FHSS/BT RB=100k for Frequencies<1GHz / RB=1MHz for Frequencies>1GHz, VB=3 x RB, Peak

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

39 CHANNEL RESULTS



HORIZONTAL



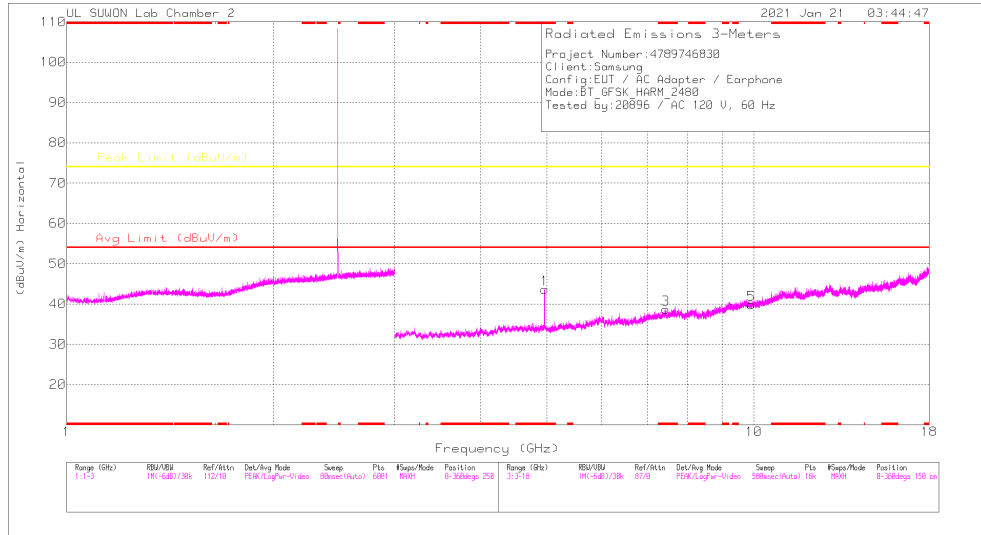
VERTICAL

Radiated Emissions

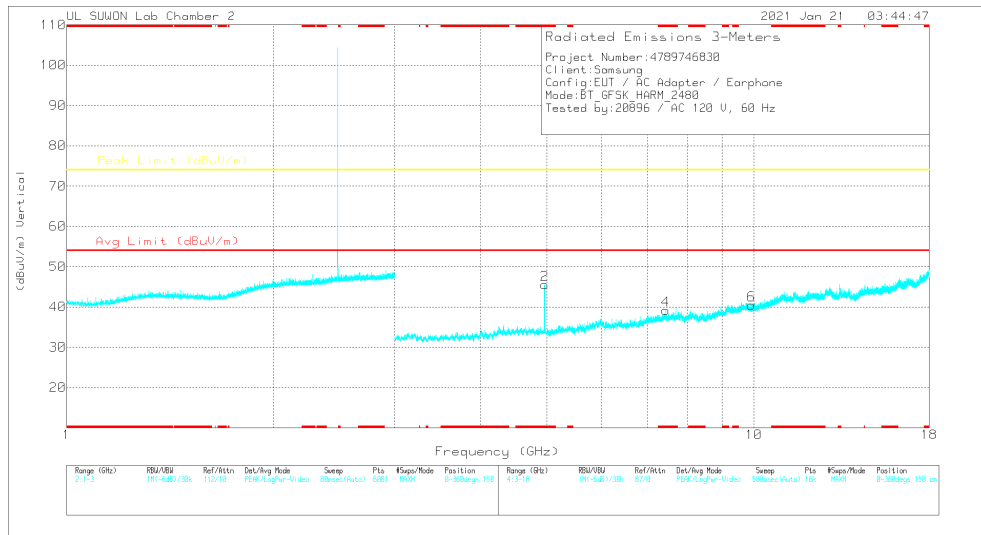
Frequency (GHz)	Meter Reading (dBuV)	Det	3117_00168724	3GHz_HP[dB]	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
* 4.8818	42.44	PKFH	34.1	-27.5	49.04	-	-	74	-24.96	167	110	H
* 4.88205	37.43	VA1T	34.1	-27.5	44.03	54	-9.97	-	-	167	110	H
* 4.88152	42.04	PKFH	34.1	-27.5	48.64	-	-	74	-25.36	202	124	V
* 4.88201	37.71	VA1T	34.1	-27.5	44.31	54	-9.69	-	-	202	124	V
* 7.32731	33.18	PKFH	36.1	-24.5	44.78	-	-	74	-29.22	360	100	H
* 7.32682	33.46	PKFH	36.1	-24.5	45.06	-	-	74	-28.94	360	100	V
9.76205	30.12	PKFH	37.2	-20.5	46.82	-	-	74	-27.18	360	100	H
9.76195	30.47	PKFH	37.2	-20.5	47.17	-	-	74	-26.83	360	100	V

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
 PKFH FHSS/BT RB=100k for Frequencies<1GHz / RB=1MHz for Frequencies>1GHz, VB=3 x RB, Peak
 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_00168724	3GHz_HP[dB]	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
* 4.95976	43.16	PKFH	34.1	-26.8	50.46	-	-	74	-23.54	247	120	H
* 4.95993	38.64	VA1T	34.1	-26.8	45.94	54	-8.06	-	-	247	120	H
* 4.96039	42.55	PKFH	34.1	-26.8	49.85	-	-	74	-24.15	288	100	V
* 4.96	37.41	VA1T	34.1	-26.8	44.71	54	-9.29	-	-	288	100	V
* 7.44033	32.35	PKFH	36	-23.6	44.75	-	-	74	-29.25	360	100	H
* 7.44071	33.83	PKFH	36	-23.6	46.23	-	-	74	-27.77	360	100	V
9.91887	30.22	PKFH	37.4	-20.4	47.22	-	-	74	-26.78	360	100	H
9.91911	30.36	PKFH	37.4	-20.4	47.36	-	-	74	-26.64	360	100	V

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

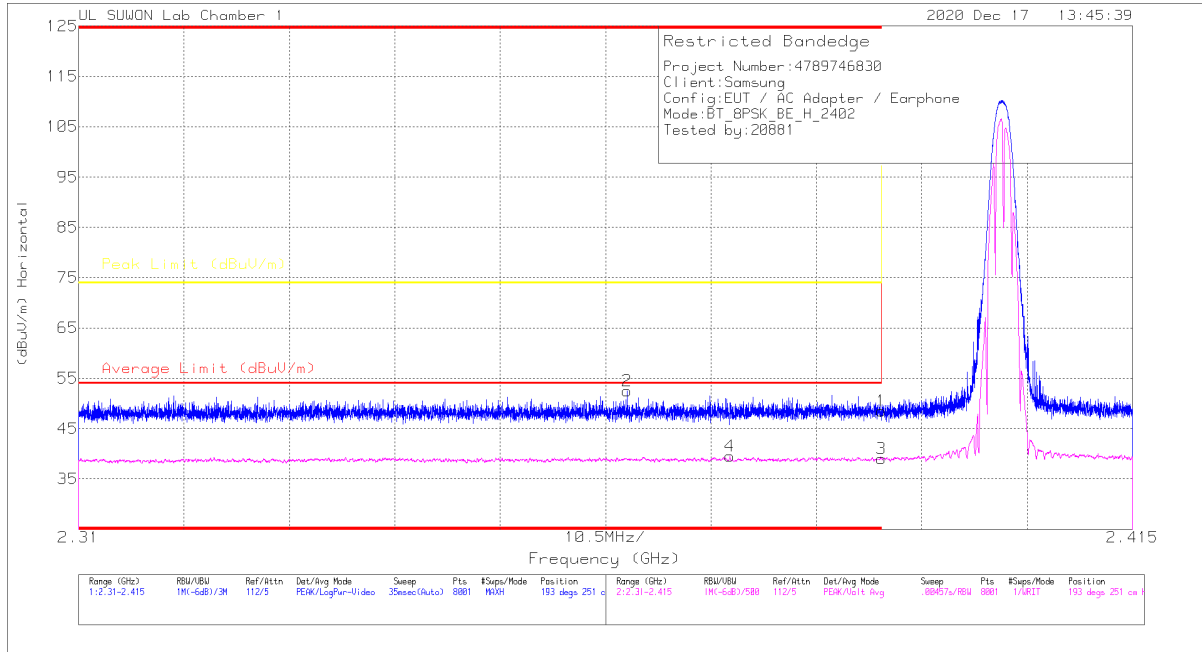
PKFH FHSS/BT RB=100k for Frequencies<1GHz / RB=1MHz for Frequencies>1GHz, VB=3 x RB, Peak

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

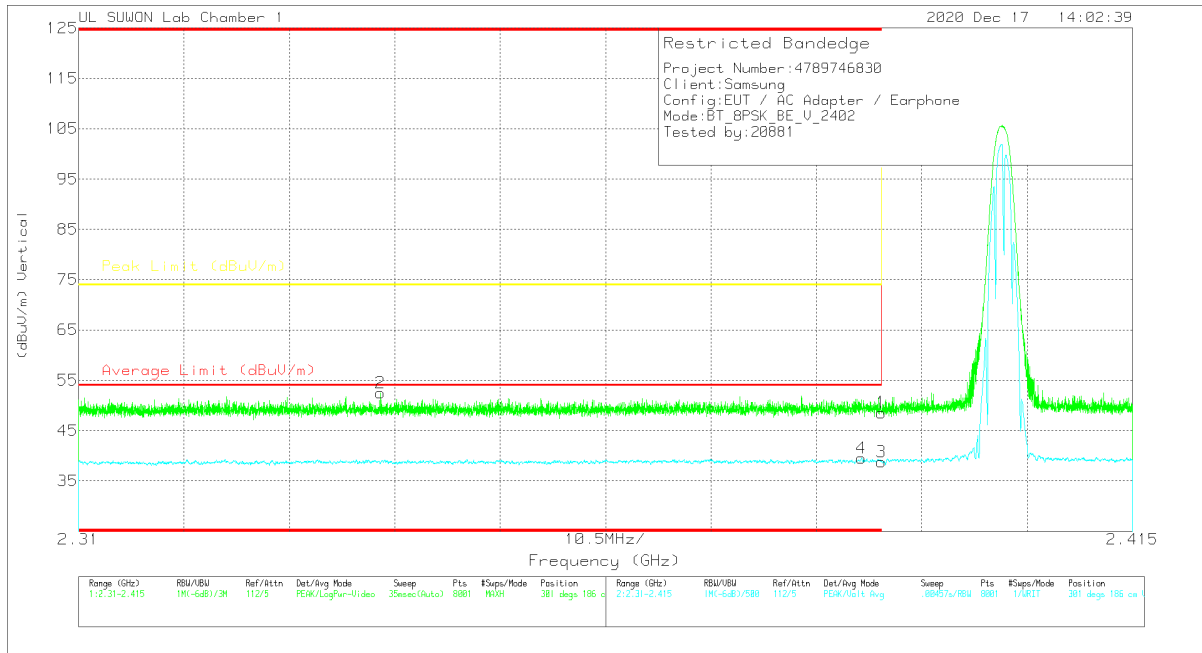


Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	3117_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	42.26	Pk	31.8	-25.6	48.46	-	-	74	-25.54	193	251	H
2	* 2.36464	46.4	Pk	31.7	-25.6	52.5	-	-	74	-21.5	193	251	H
3	* 2.39	32.81	VA1T	31.8	-25.6	39.01	54	-14.99	-	-	193	251	H
4	* 2.37486	33.42	VA1T	31.7	-25.6	39.52	54	-14.48	-	-	193	251	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



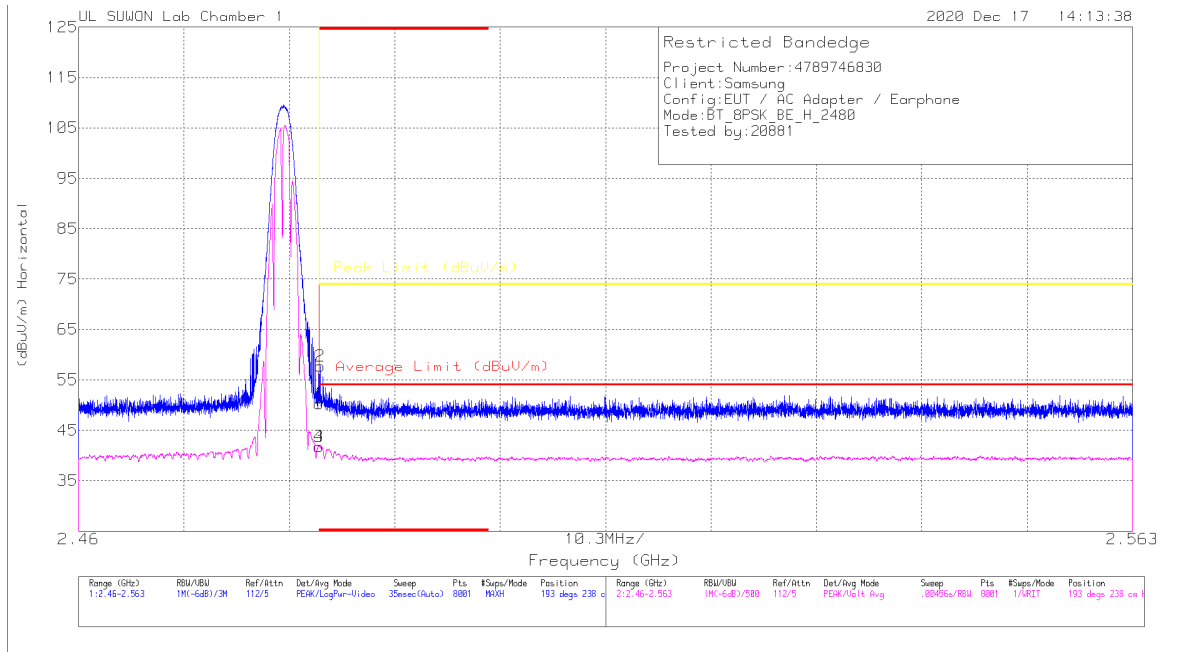
Trace Markers

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	42.37	Pk	31.8	-25.6	48.57	-	-	74	-25.43	301	186	V
2	* 2.3401	46.43	Pk	31.7	-25.6	52.53	-	-	74	-21.47	301	186	V
3	* 2.39	32.61	VA1T	31.8	-25.6	38.81	54	-15.19	-	-	301	186	V
4	* 2.388	33.19	VA1T	31.8	-25.5	39.49	54	-14.51	-	-	301	186	V

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

BANDEDGE (78 CHANNEL)

HORIZONTAL RESULT

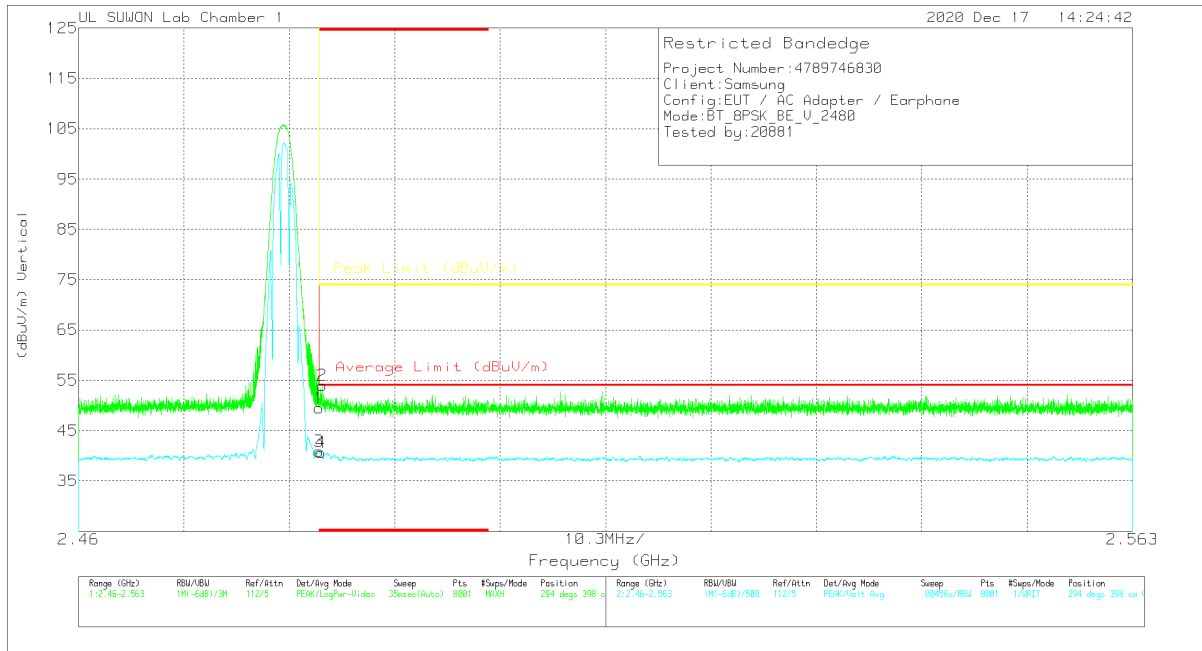


Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	3117_00168717	10dB_ATT[dB]	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.48351	43.58	Pk	32	-25.3	50.28	-	-	74	-23.72	193	238	H
2	* 2.4836	51	Pk	32	-25.3	57.7	-	-	74	-16.3	193	238	H
3	* 2.48351	35.09	VA1T	32	-25.3	41.79	54	-12.21	-	-	193	238	H
4	* 2.48352	35.13	VA1T	32	-25.3	41.83	54	-12.17	-	-	193	238	H

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

VERTICAL RESULT

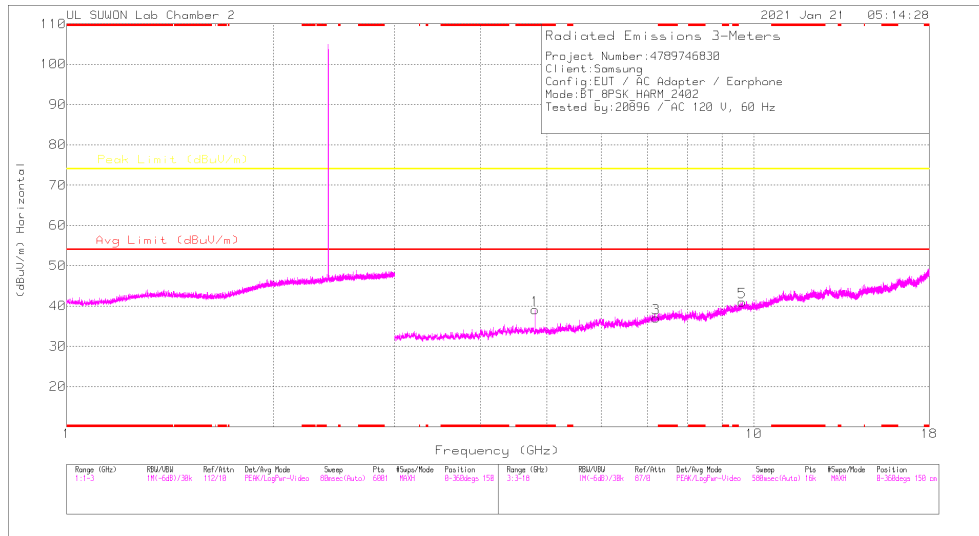


Trace Markers

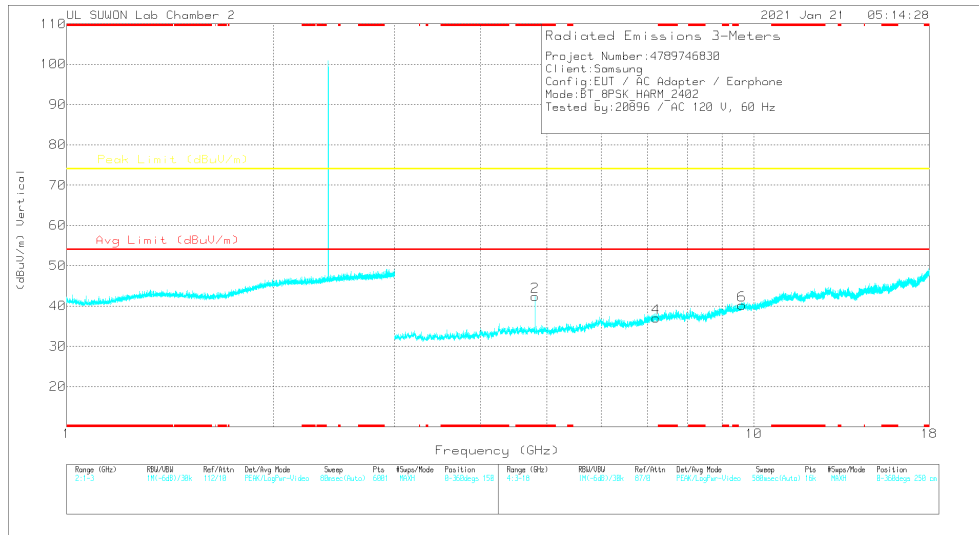
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	3117_00168717	10dB_ATT[dB]	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.48351	42.78	PK	32	-25.3	49.48	-	-	74	-24.52	294	398	V
2	* 2.48379	47.34	PK	32	-25.3	54.04	-	-	74	-19.96	294	398	V
3	* 2.48351	34.17	VA1T	32	-25.3	40.87	54	-13.13	-	-	294	398	V
4	* 2.48365	34.01	VA1T	32	-25.3	40.71	54	-13.29	-	-	294	398	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

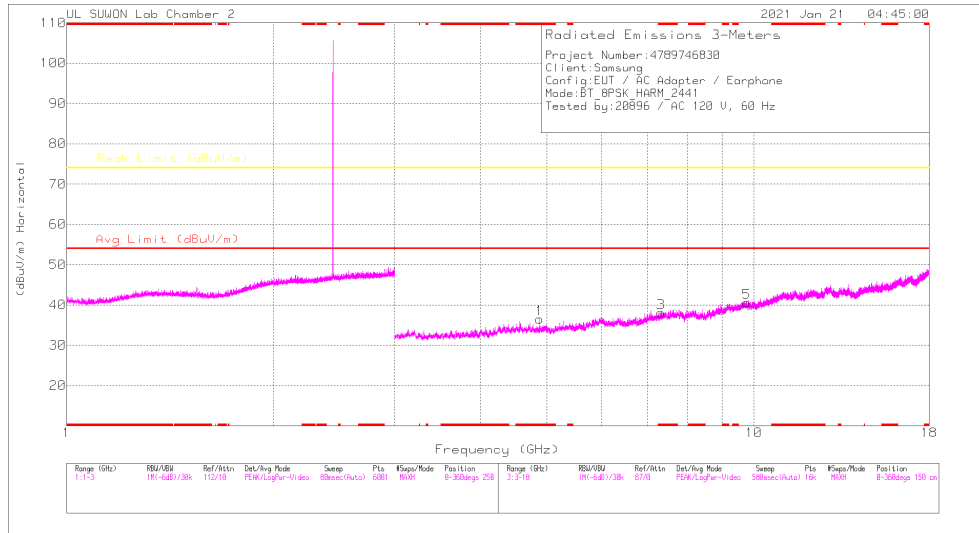
Frequency (GHz)	Meter Reading (dBuV)	Det	3117_0016872 4	3GHz_HP[dB]	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
* 4.80429	40.46	PKFH	34.1	-27.7	46.86	-	-	74	-27.14	171	387	H
* 4.80409	32.49	VA1T	34.1	-27.7	38.89	54	-15.11	-	-	171	387	H
* 4.8041	41.12	PKFH	34.1	-27.7	47.52	-	-	74	-26.48	186	118	V
* 4.80384	33.23	VA1T	34.1	-27.7	39.63	54	-14.37	-	-	186	118	V
7.20541	33.54	PKFH	36.2	-25	44.74	-	-	74	-29.26	0	100	H
7.20606	33.9	PKFH	36.2	-24.9	45.2	-	-	74	-28.8	0	100	V
9.60944	31.59	PKFH	37	-20.9	47.69	-	-	74	-26.31	0	100	H
9.60892	31.33	PKFH	37	-20.8	47.53	-	-	74	-26.47	0	100	V

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

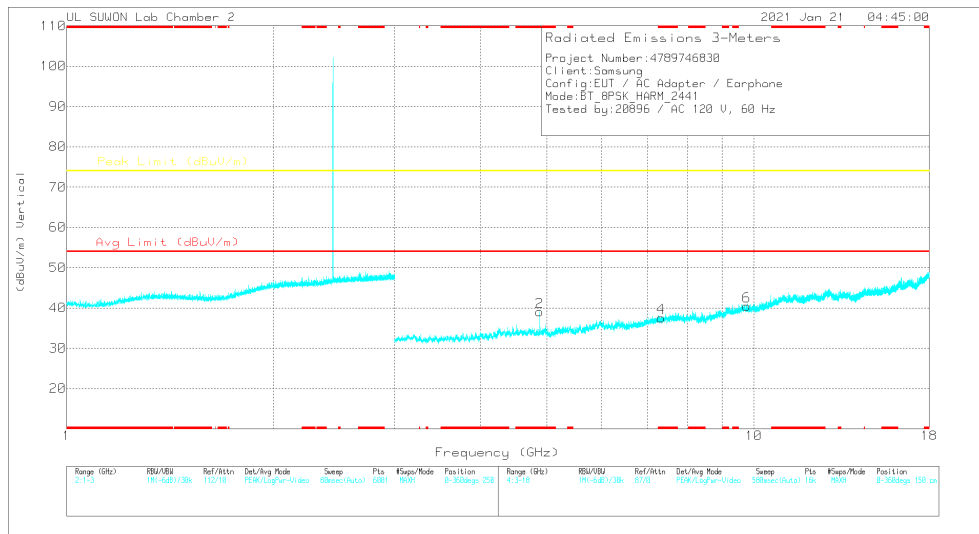
PKFH FHSS/BT RB=100k for Frequencies<1GHz / RB=1MHz for Frequencies>1GHz, VB=3 x RB, Peak

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

39 CHANNEL RESULTS



HORIZONTAL



VERTICAL

Radiated Emissions

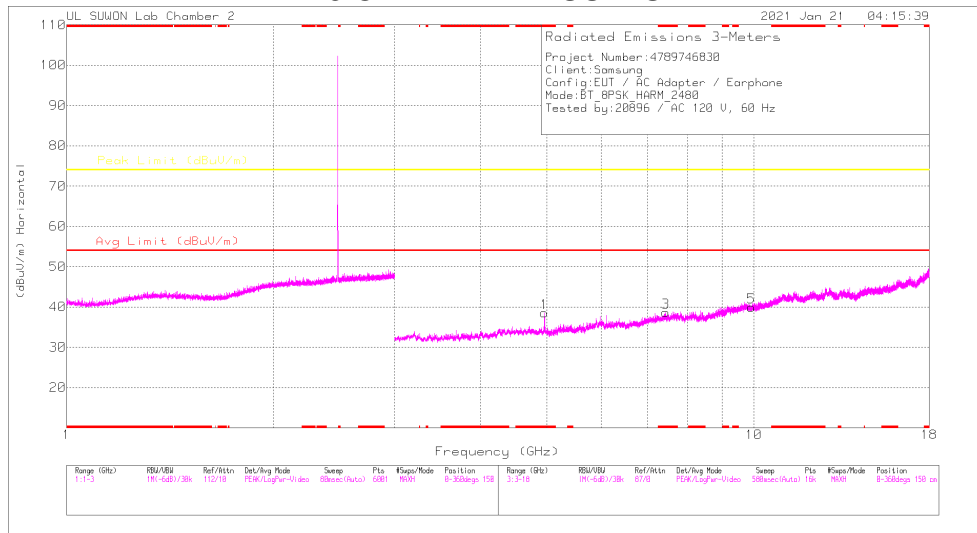
Frequency (GHz)	Meter Reading (dBuV)	Det	3117_0016872 4	3GHz_HP[dB]	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
* 4.88188	38.65	PKFH	34.1	-27.5	45.25	-	-	74	-28.75	166	109	H
* 4.88189	30.1	VA1T	34.1	-27.5	36.7	54	-17.3	-	-	166	109	H
* 4.88155	38.09	PKFH	34.1	-27.5	44.69	-	-	74	-29.31	297	111	V
* 4.88197	29.25	VA1T	34.1	-27.5	35.85	54	-18.15	-	-	297	111	V
* 7.32709	32.96	PKFH	36.1	-24.5	44.56	-	-	74	-29.44	360	100	H
* 7.32479	33.9	PKFH	36.1	-24.5	45.5	-	-	74	-28.5	360	100	V
9.76566	30.79	PKFH	37.2	-20.5	47.49	-	-	74	-26.51	360	100	H
9.76589	31.51	PKFH	37.2	-20.6	48.11	-	-	74	-25.89	360	100	V

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

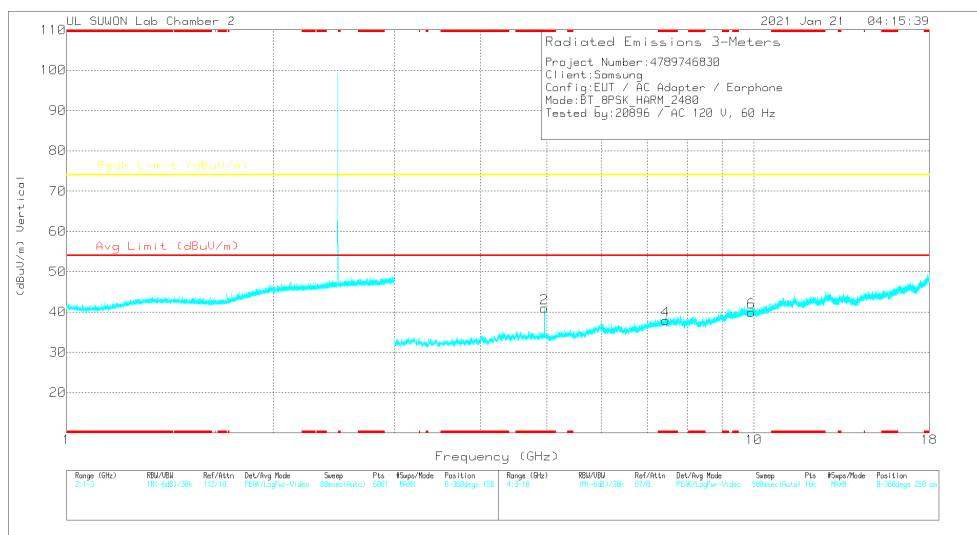
PKFH FHSS/BT RB=100k for Frequencies<1GHz / RB=1MHz for Frequencies>1GHz, VB=3 x RB, Peak

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

78 CHANNEL RESULTS



HORIZONTAL



VERTICAL

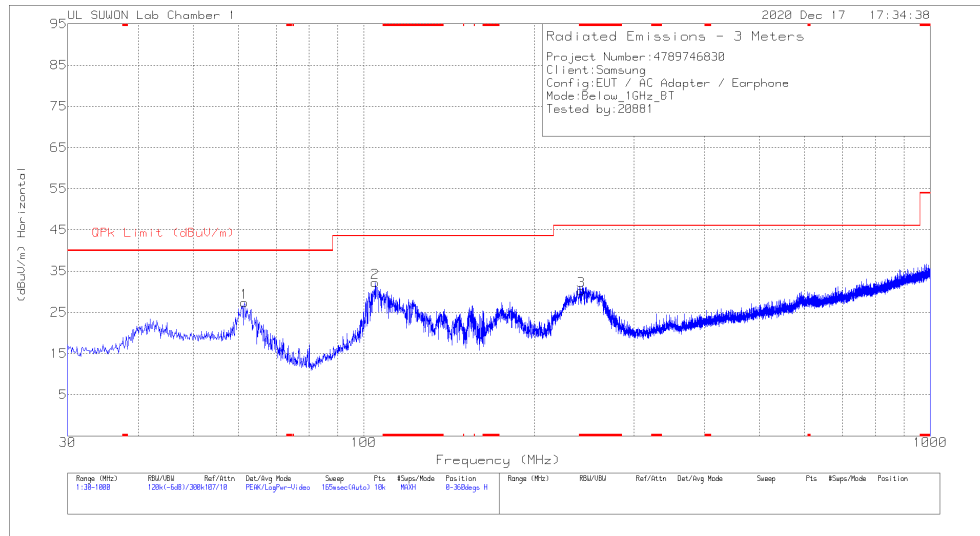
Radiated Emissions

Frequency (GHz)	Meter Reading (dBuV)	Det	3117_0016872 4	3GHz_HP[dB]	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
* 4.95963	39.61	PKFH	34.1	-26.8	46.91	-	-	74	-27.09	245	120	H
* 4.96001	31.46	VA1T	34.1	-26.8	38.76	54	-15.24	-	-	245	120	H
* 4.95955	38.7	PKFH	34.1	-26.8	46	-	-	74	-28	289	100	V
* 4.95994	30.19	VA1T	34.1	-26.8	37.49	54	-16.51	-	-	289	100	V
* 7.44431	32.92	PKFH	36	-23.7	45.22	-	-	74	-28.78	360	100	H
* 7.44547	33.38	PKFH	36	-23.7	45.68	-	-	74	-28.32	360	100	V
9.91825	30.43	PKFH	37.4	-20.4	47.43	-	-	74	-26.57	360	100	H
9.92105	29.85	PKFH	37.4	-20.3	46.95	-	-	74	-27.05	360	100	V

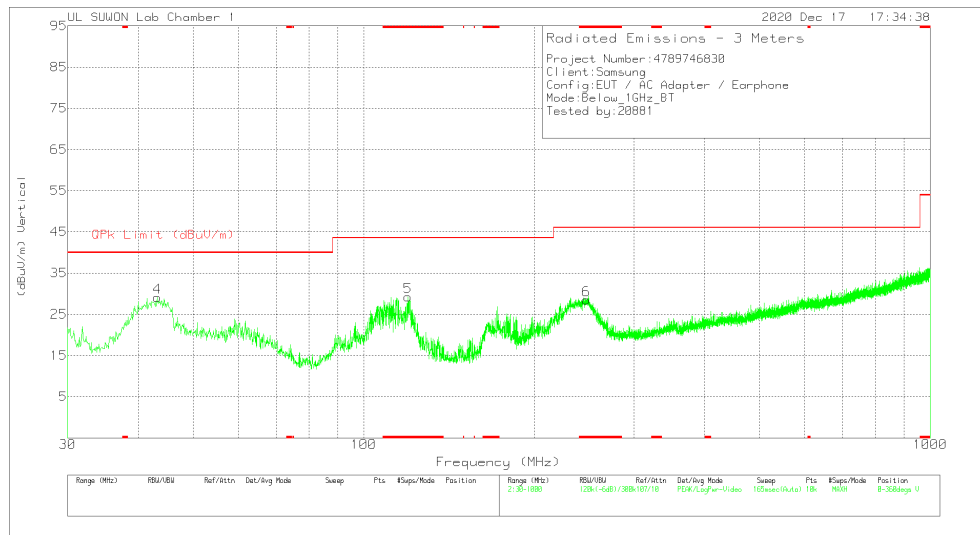
* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
 PKFH FHSS/BT RB=100k for Frequencies<1GHz / RB=1MHz for Frequencies>1GHz, VB=3 x RB, Peak
 VA1T - FHSS: Linear Voltage Average VB=1/Ton where: Ton is transmit duration

10.2. WORST CASE BELOW 1 GHZ

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



HORIZONTAL



VERTICAL

Below 1GHz Data

Trace Markers

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	61.525	39.14	Pk	18.2	-30	0	27.34	40	-12.66	0-360	400	H
2	104.69	44.17	Pk	17.7	-29.7	0	32.17	43.52	-11.35	0-360	200	H
3	* 241.751	39.95	Pk	18.3	-28	0	30.25	46.02	-15.77	0-360	100	H
4	43.192	40.15	Pk	19.3	-30.4	0	29.05	40	-10.95	0-360	100	V
5	* 119.725	43.03	Pk	15.6	-29.4	0	29.23	43.52	-14.29	0-360	100	V
6	* 246.892	38.2	Pk	18.4	-28.1	0	28.5	46.02	-17.52	0-360	200	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.

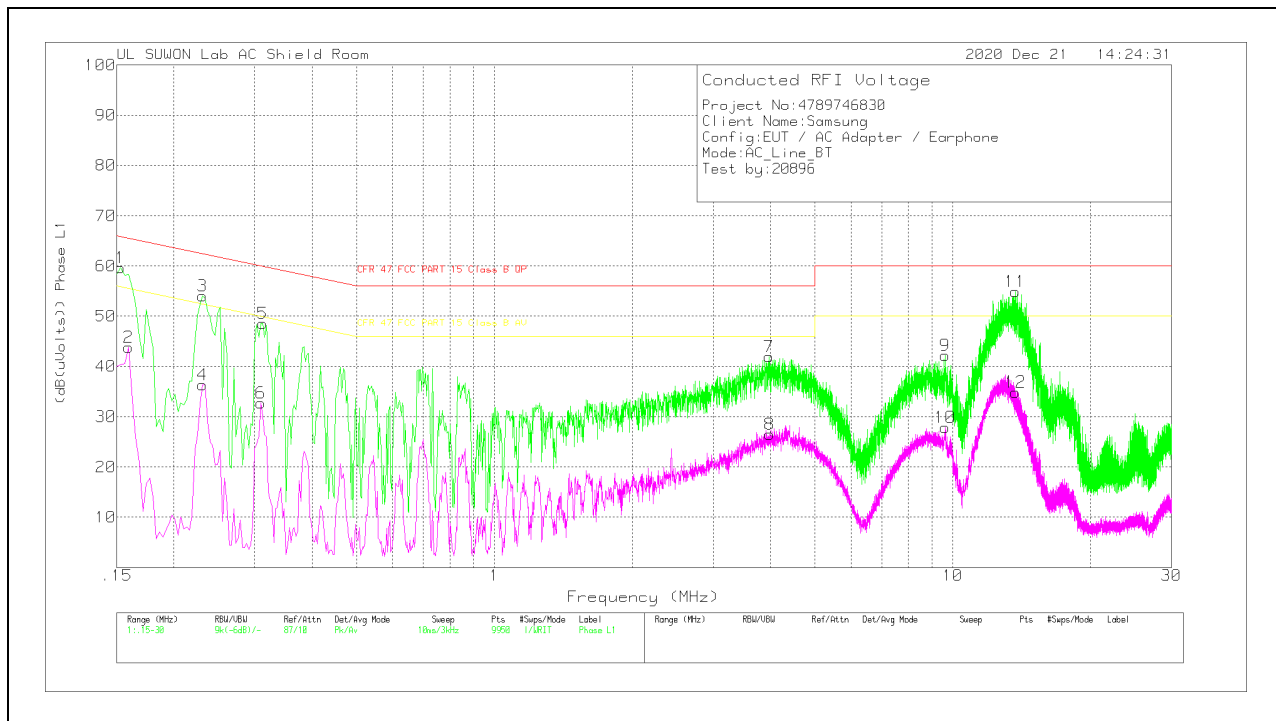
The receiver is set to a resolution bandwidth of 9 kHz. Peak detection is used unless otherwise noted as quasi-peak or average.

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

RESULTS

11.1.1. AC Power Line

LINE 1 RESULTS



Trace Markers

Range 1: Phase L1 .15 - 30MHz

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	101836_With 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	.153	49.73	Pk	9.8	.1	59.63	65.84	-6.21	-	-
2	.159	33.82	Av	9.9	.1	43.82	-	-	55.52	-11.7
3	.231	44.07	Pk	9.8	.2	54.07	62.41	-8.34	-	-
4	.231	26.33	Av	9.8	.2	36.33	-	-	52.41	-16.08
5	.312	38.59	Pk	9.8	.2	48.59	59.92	-11.33	-	-
6	.309	22.73	Av	9.8	.2	32.73	-	-	50	-17.27
7	3.978	31.89	Pk	9.8	.3	41.99	56	-14.01	-	-
8	3.984	16.42	Av	9.8	.3	26.52	-	-	46	-19.48
9	9.63	31.89	Pk	9.9	.4	42.19	60	-17.81	-	-
10	9.636	17.63	Av	9.9	.4	27.93	-	-	50	-22.07
11	13.713	44.53	Pk	10	.4	54.93	60	-5.07	-	-
12	13.701	24.51	Av	10	.4	34.91	-	-	50	-15.09

Pk - Peak detector

Av - Average detection

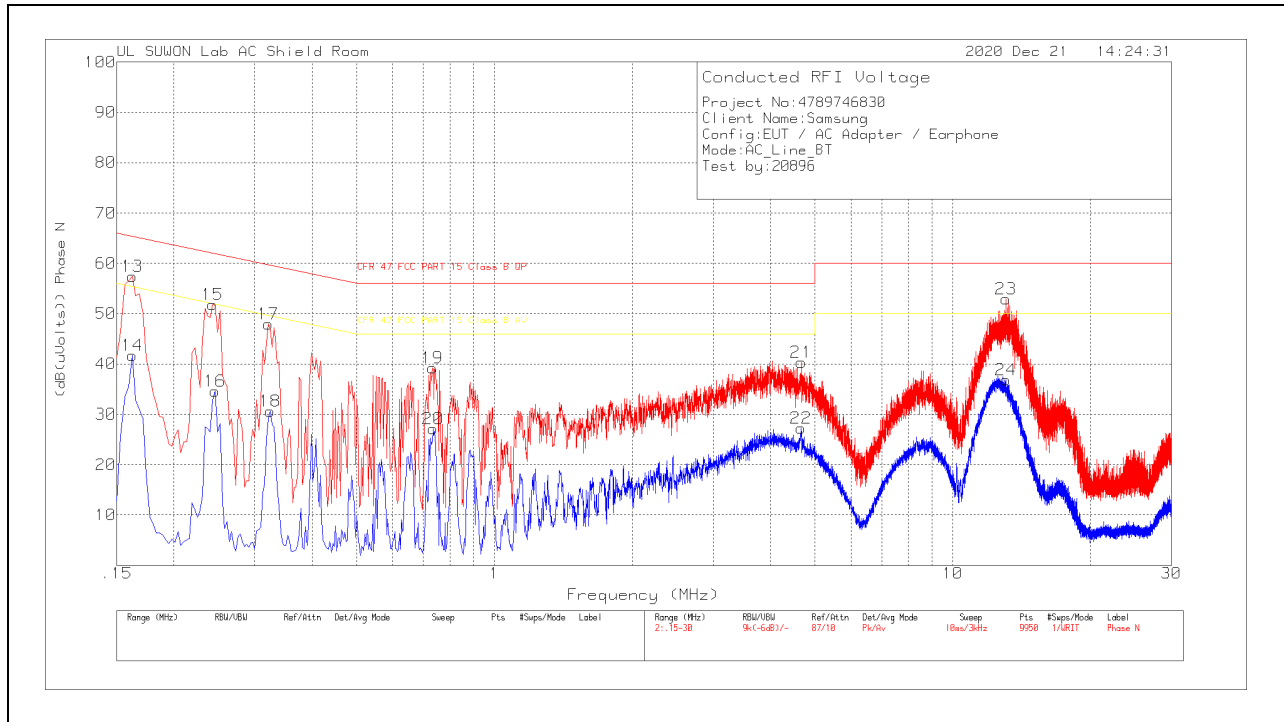
Quasi-Peak Emissions

Range 1: Phase L1 .15 - 30MHz

Frequency (MHz)	Meter Reading (dBuV)	Det	101836_With 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)
.15315	43.26	Qp	9.8	.1	53.16	65.83	-12.67	-	-
.23025	35.55	Qp	9.8	.2	45.55	62.44	-16.89	-	-
13.7123	29.05	Qp	10	.4	39.45	60	-20.55	-	-

Qp - Quasi-Peak detector

LINE 2 RESULTS



Trace Markers

Range 2: Phase N .15 - 30MHz

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	101836_With EX_N[dB]	CABLELOS S(dB)	Corrected Reading (dB(uVolts))	CFR 47 FCC PART 15 Class B QP	Margin (dB)	CFR 47 FCC PART 15 Class B AV	Margin (dB)
13	.162	47.28	Pk	10	.1	57.38	65.36	-7.98	-	-
14	.162	31.61	Av	10	.1	41.71	-	-	55.36	-13.65
15	.243	41.94	Pk	9.7	.2	51.84	61.99	-10.15	-	-
16	.246	24.71	Av	9.7	.2	34.61	-	-	51.89	-17.28
17	.321	37.94	Pk	9.8	.2	47.94	59.68	-11.74	-	-
18	.324	20.62	Av	9.8	.2	30.62	-	-	49.6	-18.98
19	.732	29.14	Pk	9.9	.2	39.24	56	-16.76	-	-
20	.735	16.98	Av	9.9	.2	27.08	-	-	46	-18.92
21	4.674	30.27	Pk	9.8	.3	40.37	56	-15.63	-	-
22	4.671	17.15	Av	9.8	.3	27.25	-	-	46	-18.75
23	13.077	42.4	Pk	10.1	.4	52.9	60	-7.1	-	-
24	13.05	26.4	Av	10	.4	36.8	-	-	50	-13.2

Pk - Peak detector

Av - Average detection

Quasi-Peak Emissions

Range 2: Phase N .15 - 30MHz

Frequency (MHz)	Meter Reading (dBuV)	Det	101836_With EX_N[dB]	CABLELOS S(dB)	Corrected Reading (dB(uVolts))	CFR 47 FCC PART 15 Class B QP	Margin (dB)	CFR 47 FCC PART 15 Class B AV	Margin (dB)
.16275	31.43	Qp	10	.1	41.53	65.32	-23.79	-	-
13.0772	32.29	Qp	10.1	.4	42.79	60	-17.21	-	-

Qp - Quasi-Peak detector

END OF TEST REPORT