



CERTIFICATION TEST REPORT

Report Number. : 4789841420-E5V1

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

Model : SM-T736B

FCC ID : A3LSMT736B

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

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

Date Of Issue:

2021-04-14

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Revision History

<u>Rev.</u>	<u>Issue Date</u>	<u>Revisions</u>	<u>Revised By</u>
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1. ATTESTATION OF TEST RESULTS

COMPANY NAME: SAMSUNG ELECTRONICS CO., LTD.
EUT DESCRIPTION: GSM/WCDMA/LTE/5G NR Tablet + BT/BLE, DTS/UNII a/b/g/n/ac
MODEL: SM-T736B
SERIAL NUMBER: R32R2009HKX (CONDUCTED);
R32R2009QPH, R32R2009K5M, R32R300FS7B (RADIATED);
DATE TESTED: 2021-03-16 ~ 2021-04-14

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:



Sungeun Lee
Suwon Lab Engineer
UL Korea, Ltd.

2. TEST METHODOLOGY

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

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

3. FACILITIES AND ACCREDITATION

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

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

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

4. DECISION RULES AND MEASUREMENT UNCERTAINTY

4.1. METROLOGICAL TRACEABILITY

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

4.2. SAMPLE CALCULATION

Where relevant, the following sample calculation is provided:

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

4.3. DECISION RULES

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

4.4. MEASUREMENT UNCERTAINTY

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

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

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

5. EQUIPMENT UNDER TEST

5.1. EUT DESCRIPTION

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

5.2. MAXIMUM OUTPUT POWER

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

Frequency Range [MHz]	Mode	Power Mode	Output Power [dBm]	Output Power [mW]
2 402 ~ 2 480	Basic GFSK	Average	17.261	53.22
		Peak	17.696	58.83
	Enhanced Pi/4-DPSK	Average	15.450	35.08
		Peak	17.893	61.56
	Enhanced 8PSK	Average	15.473	35.26
		Peak	18.517	71.07

5.3. DESCRIPTION OF AVAILABLE ANTENNAS

An intentional radiator antenna shall be designed to ensure that no antenna other than that furnished by the responsible party can be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section.

**The internal antenna was Permanently attached.
 Therefore this E.U.T Complies with the requirement of §15.203.**

The radio utilizes an internal antennas, with maximum gain of -1.71 dBi.

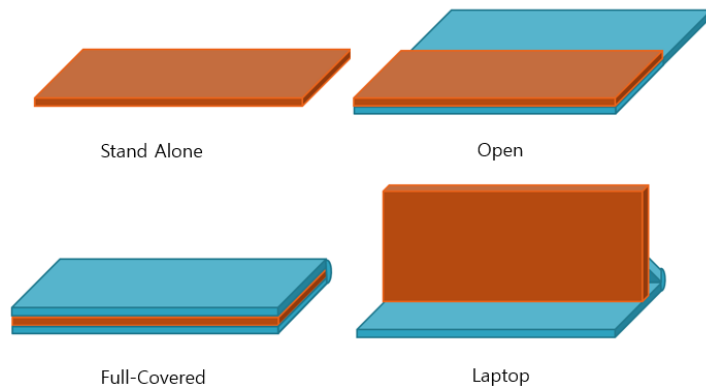
5.4. WORST-CASE CONFIGURATION AND MODE

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.

Foldable condition: Stand Alone



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	R37R1XS0P35DK3	N/A
Data Cable	SAMSUNG	EP-DT725BBE	N/A	N/A

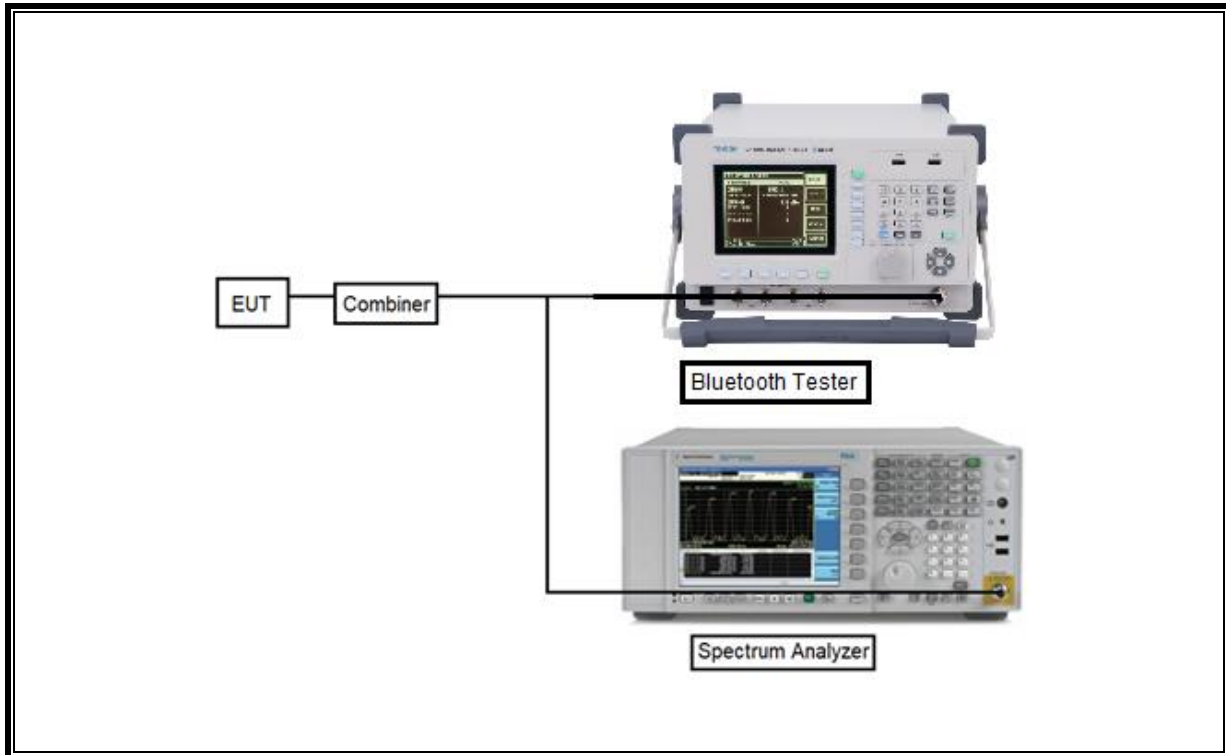
I/O CABLE

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

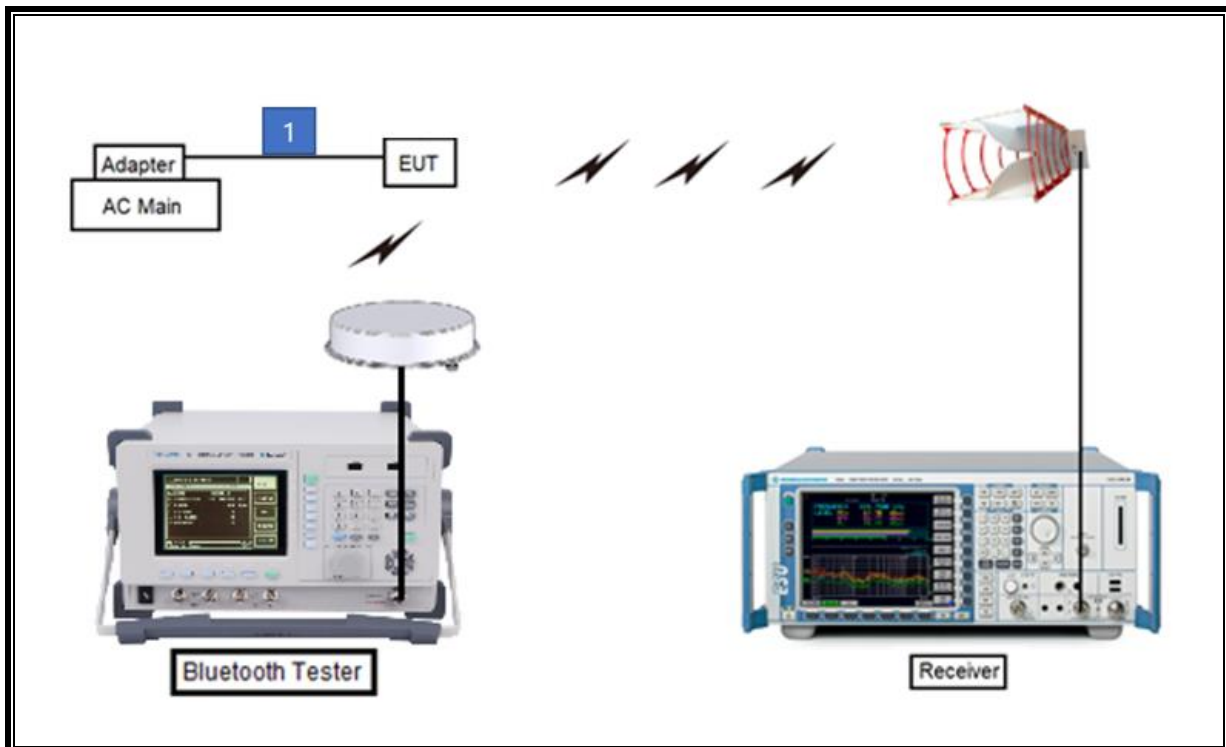
TEST SETUP

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

SETUP DIAGRAM FOR TESTS (CONDUCTED TEST SETUP)



SETUP DIAGRAM FOR TESTS (RADIATED TEST SETUP)



6. TEST AND MEASUREMENT EQUIPMENT

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

Test Equipment List				
Description	Manufacturer	Model	S/N	Cal Due
Antenna, Bilog, 30MHz-1GHz	SCHWARZBECK	VULB9163	750	08-19-22
Antenna, Bilog, 30MHz-1GHz	SCHWARZBECK	VULB9163	749	08-13-22
Antenna, Bilog, 30MHz-1GHz	SCHWARZBECK	VULB9163	845	08-13-22
Antenna, 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
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
Spectrum Analyzer, 43.5 GHz	R&S	FSW43	104089	08-06-21
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	01-27-22
Attenuator	PASTERNAK	PE7087-10	A001	08-03-21
Attenuator	PASTERNAK	PE7087-10	A008	08-03-21
Attenuator	PASTERNAK	PE7004-10	2	08-04-21
Attenuator	PASTERNAK	PE7087-10	A009	08-03-21
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
Antenna, Loop, 9kHz-30MHz	R&S	HFH2-Z2	100418	10-02-21
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	-20 dBc	Conducted	PASS
15.247 (b)(1)	TX conducted output power	< 21 dBm		PASS
15.247 (a)(1)	Hopping frequency separation	> two-thirds of the 20 dB bandwidth		PASS
15.247 (a)(1)(iii)	Number of Hopping channels	More than 15 non-overlapping channels		PASS
15.247 (a)(1)(iii)	Avg Time of Occupancy	< 8 dBm		PASS
15.207(a)	AC Power Line conducted emissions	Section 11	Power Line conducted	PASS
15.205, 15.209	Radiated Spurious Emission	< 54dBuV/m(Av)	Radiated	PASS

8. MEASUREMENT METHODS

20dB BW : ANSI C63.10, Section 6.9.2

99% BW : ANSI C63.10, Section 6.9.3

HOPPING FREQUENCY SEPARATION : ANSI C63.10, Section 7.8.2

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

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

OUTPUT POWER : ANSI C63.10, Section 7.8.5.

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

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

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

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

9. ANTENNA PORT TEST RESULTS

9.1. ON TIME AND DUTY CYCLE

LIMITS

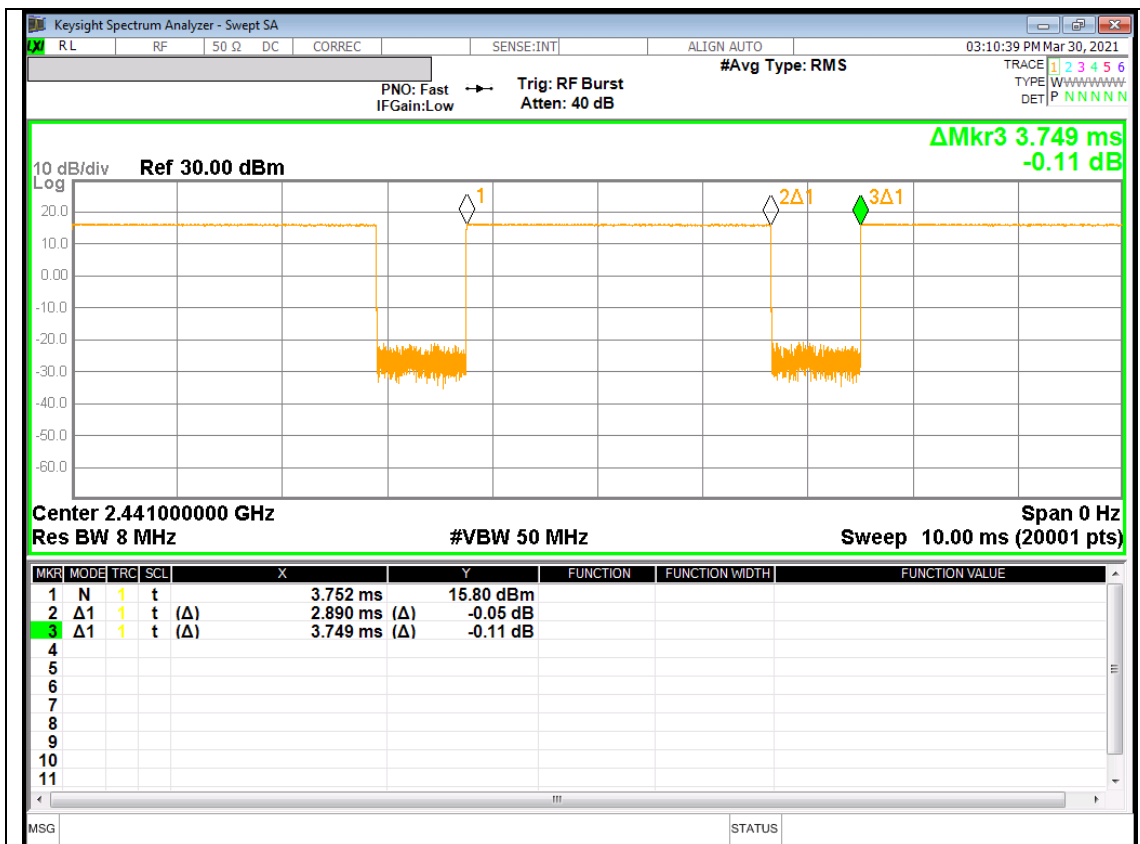
None; for reporting purposes only.

PROCEDURE

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

ON TIME AND DUTY CYCLE RESULTS

Mode	On time [msec]	Period [msec]	Duty Cycle [%]	Duty Cycle Correction Factor[dB]	1/T Minimum VBW [kHz]
2 400 ~ 2 483.5 MHz Band					
Bluetooth	2.890	3.749	77.09	1.13	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

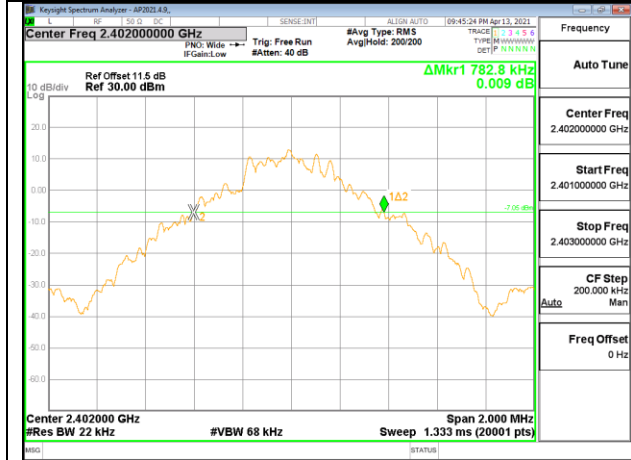
9.2.1. BLUETOOTH BASIC DATA RATE GFSK MODULATION

Channel	Frequency [MHz]	20 dB Bandwidth [kHz]	99% Bandwidth [kHz]
0	2 402	782.8	810.6
39	2 441	823.5	811.6
78	2 480	828.3	814.5

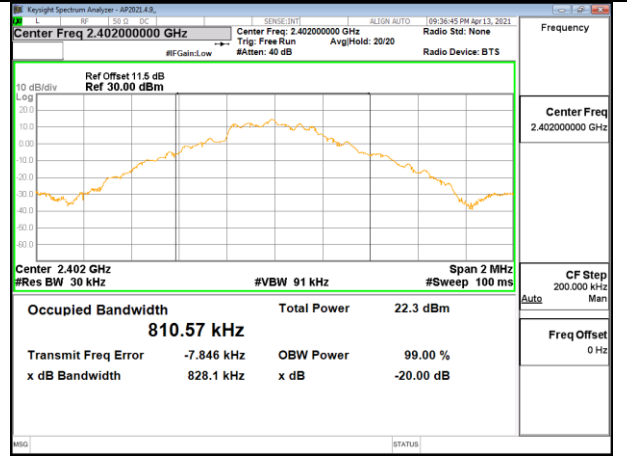
9.2.2. BLUETOOTH ENHANCED DATA RATE 8PSK MODULATION

Channel	Frequency [MHz]	20 dB Bandwidth [kHz]	99% Bandwidth [kHz]
0	2 402	1202.5	1136.4
39	2 441	1204.8	1139.6
78	2 480	1205.8	1135.2

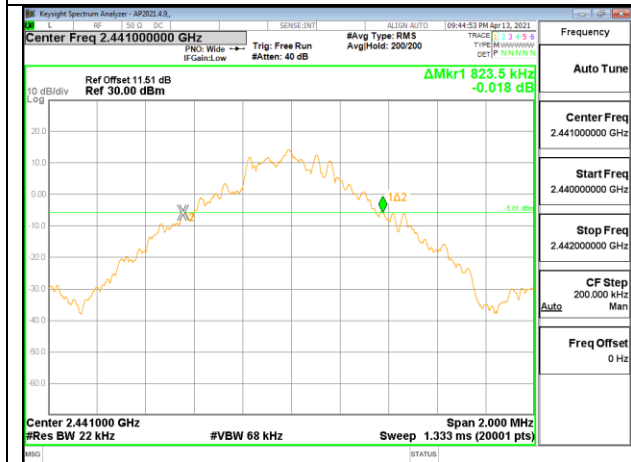
- BDR



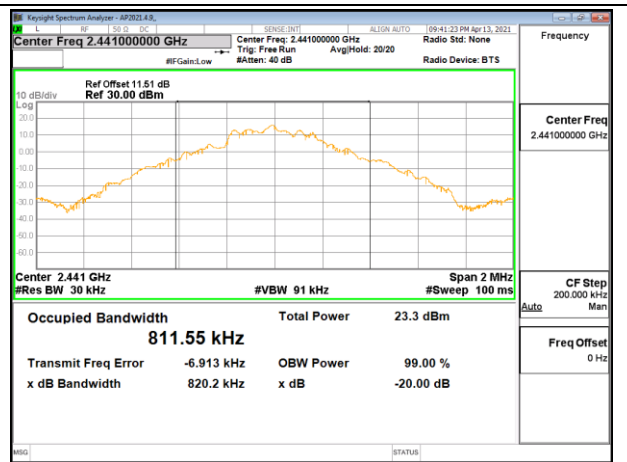
20 dB bandwidth / 0 CHANNEL



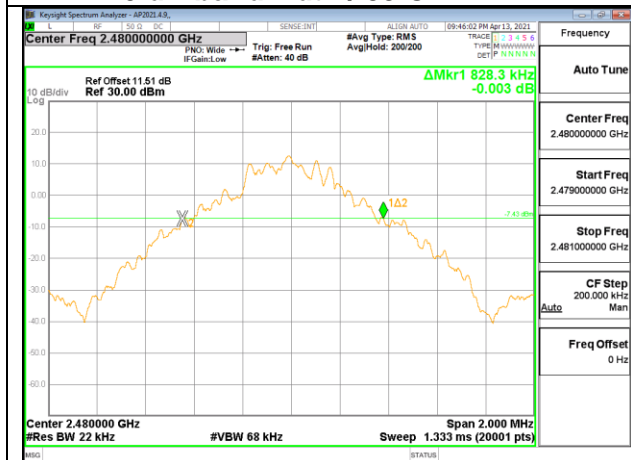
99% bandwidth / 0 CHANNEL



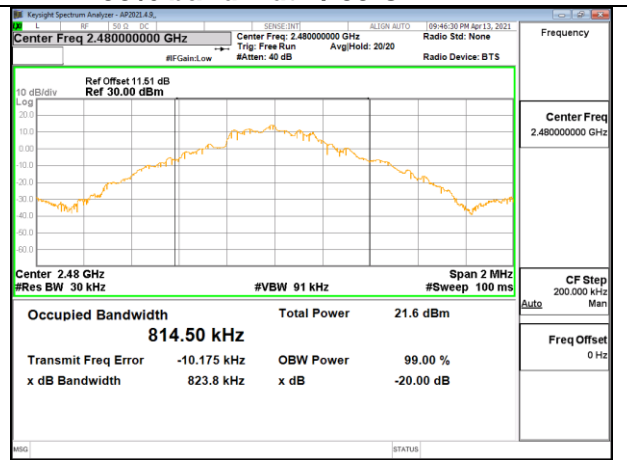
20 dB bandwidth / 39 CHANNEL



99% bandwidth / 39 CHANNEL

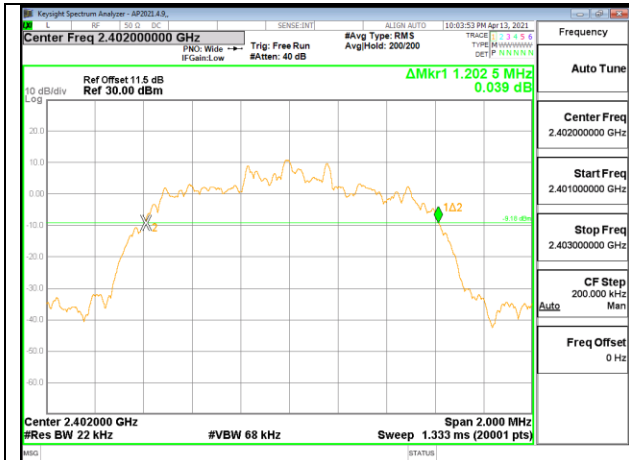


20 dB bandwidth / 78 CHANNEL

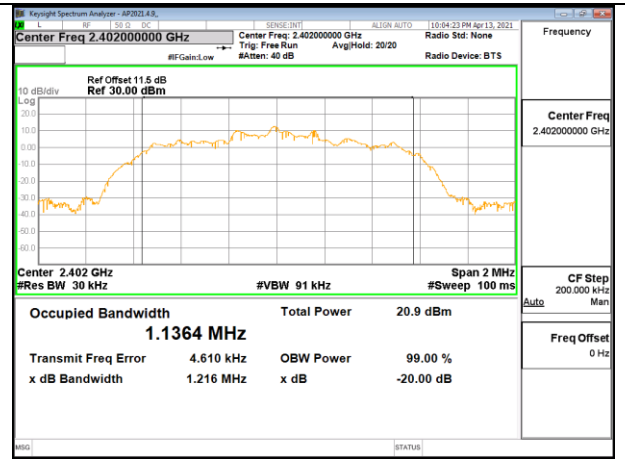


99% bandwidth / 78 CHANNEL

- EDR



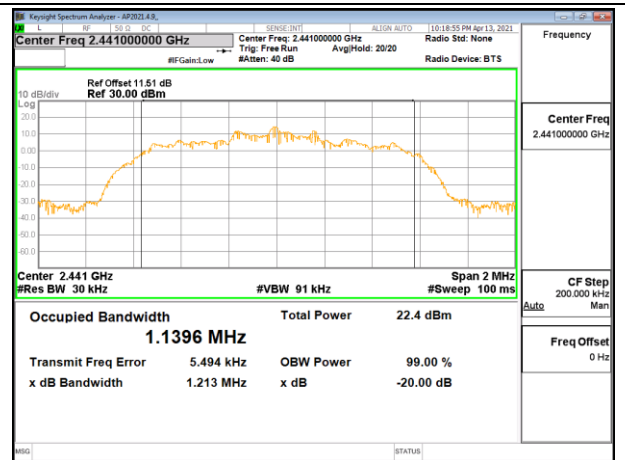
20 dB bandwidth / 0 CHANNEL



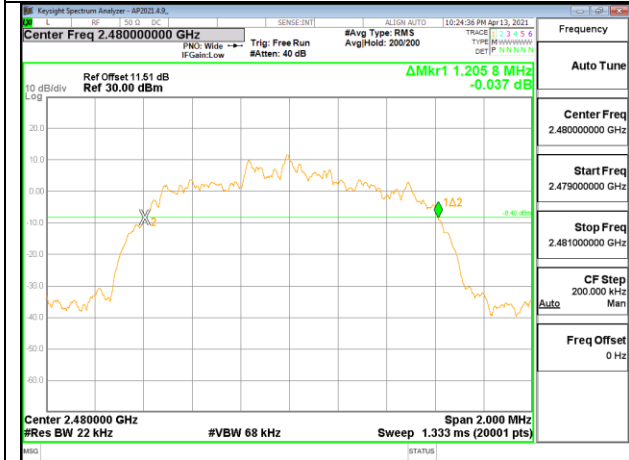
99% bandwidth / 0 CHANNEL



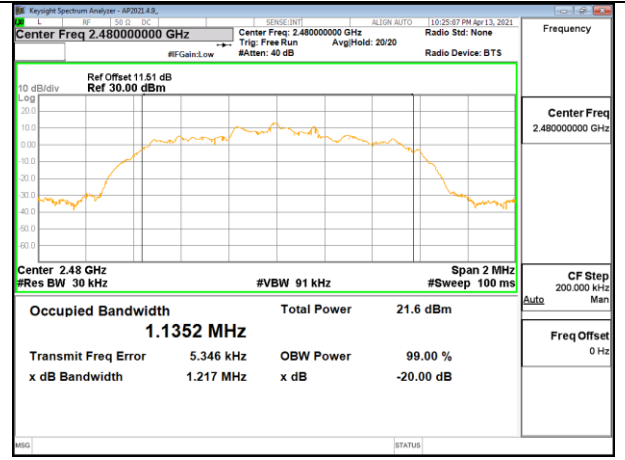
20 dB bandwidth / 39 CHANNEL



99% bandwidth / 39 CHANNEL



20 dB bandwidth / 78 CHANNEL



99% bandwidth / 78 CHANNEL

9.3. HOPPING FREQUENCY SEPARATION

LIMITS

FCC §15.247 (a) (1)

RSS-247 (5.1) (b)

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

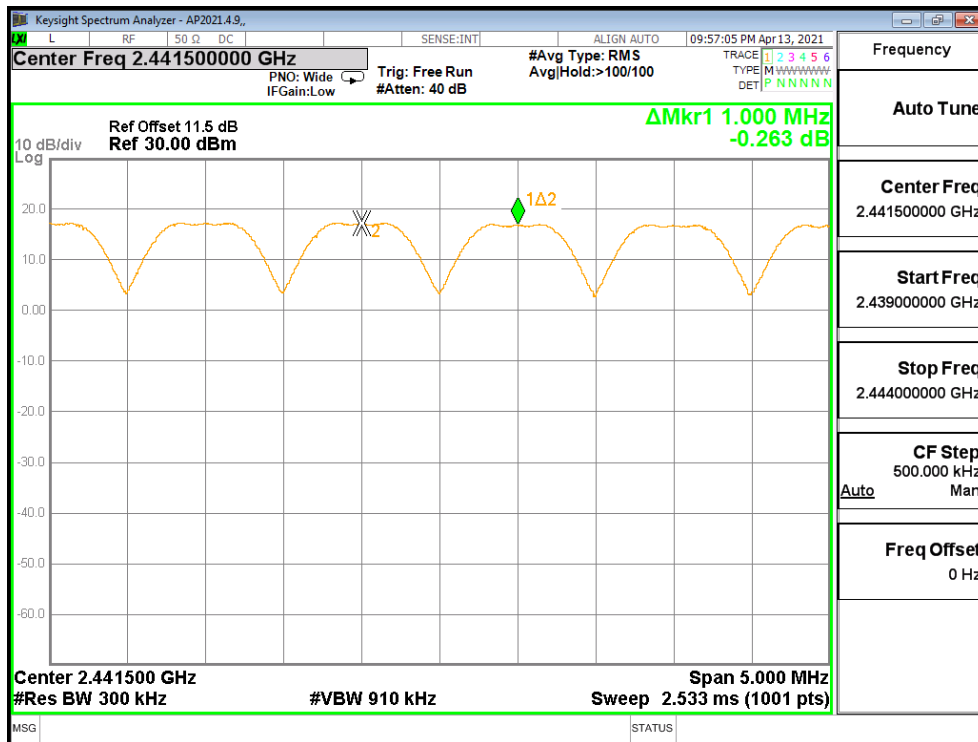
Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than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

TEST PROCEDURE

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

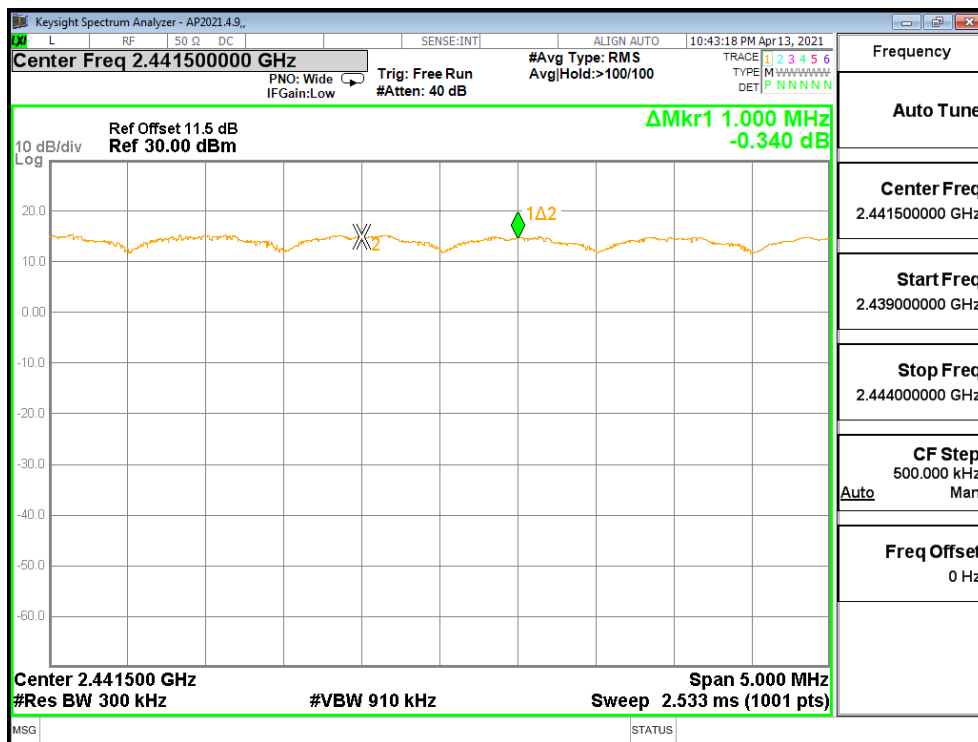
RESULTS

9.3.1. BLUETOOTH BASIC DATA RATE GFSK MODULATION



HOPPING FREQUENCY SEPARATION PLOT

9.3.2. BLUETOOTH ENHANCED DATA RATE 8PSK MODULATION



HOPPING FREQUENCY SEPARATION PLOT

9.4. NUMBER OF HOPPING CHANNELS

LIMITS

FCC §15.247 (a) (1) (iii)

RSS-247 (5.1) (d)

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

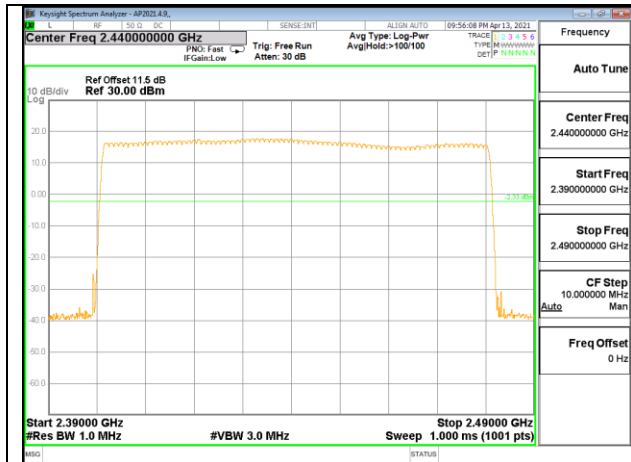
TEST PROCEDURE

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

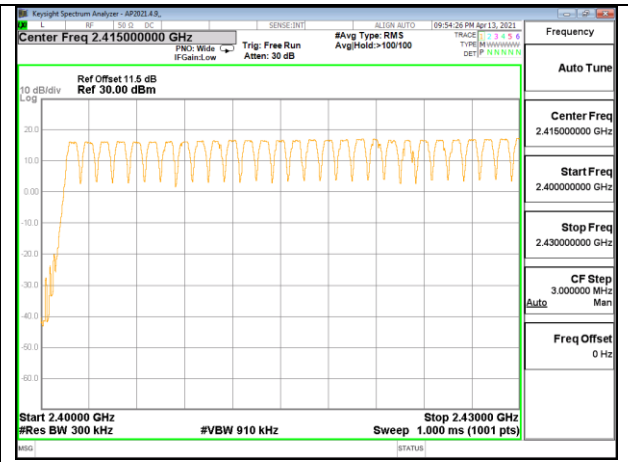
RESULTS

Normal Mode: All Channels Observed

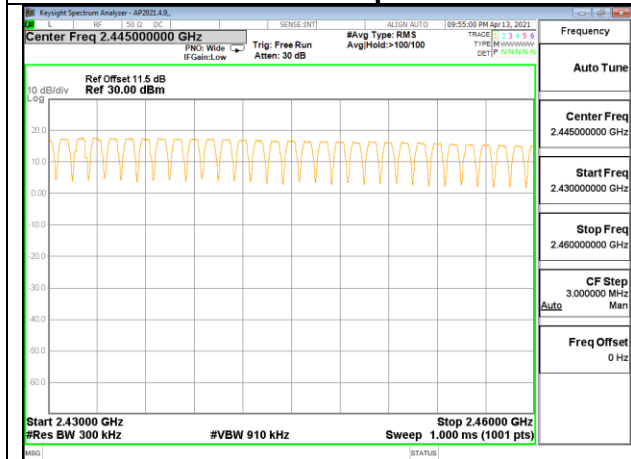
9.4.1. BLUETOOTH BASIC DATA RATE GFSK MODULATION



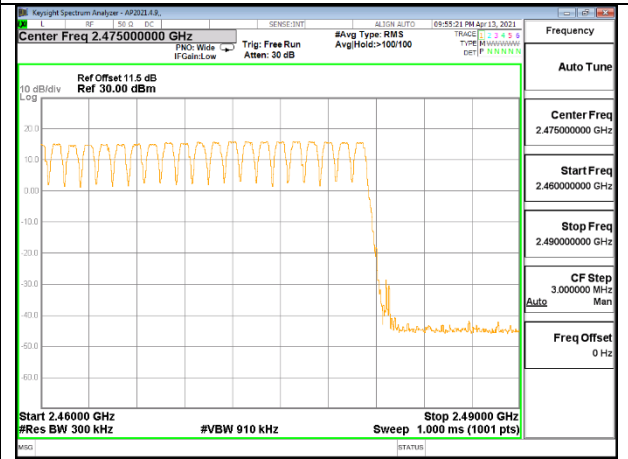
100 MHz Span



30MHz SPAN, SEGMENT 1 OF 3

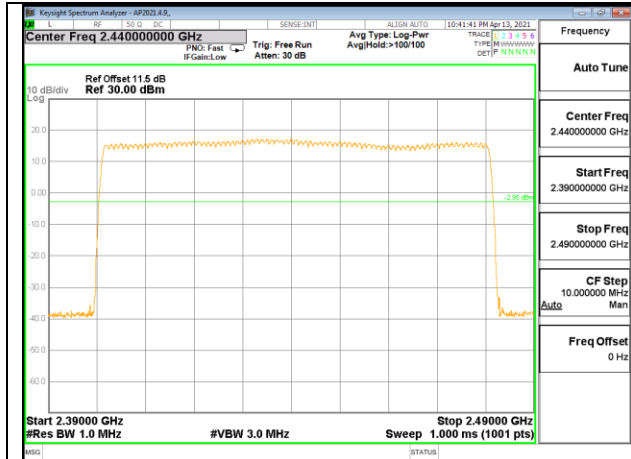


30MHz SPAN, SEGMENT 2 OF 3

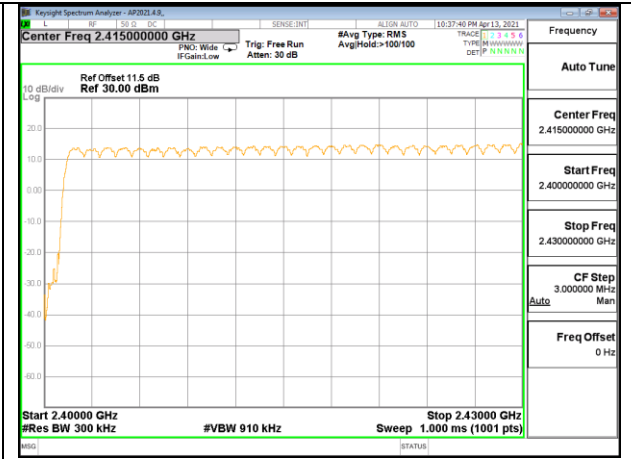


30MHz SPAN, SEGMENT 3 OF 3

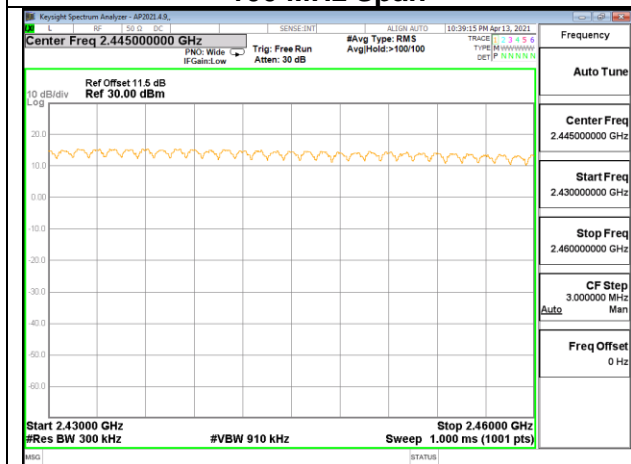
9.4.2. BLUETOOTH ENHANCED DATA RATE 8PSK MODULATION



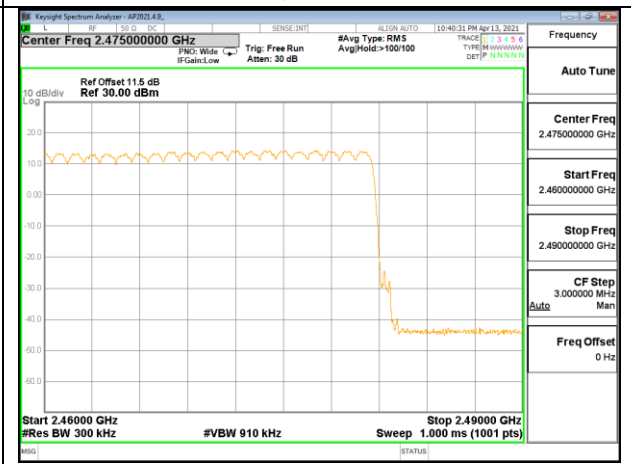
100 MHz Span



30MHz SPAN, SEGMENT 1 OF 3



30MHz SPAN, SEGMENT 2 OF 3



30MHz SPAN, SEGMENT 3 OF 3

9.5. AVERAGE TIME OF OCCUPANCY

LIMITS

FCC §15.247 (a) (1) (iii)

RSS-247 (5.1) (d)

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

TEST PROCEDURE

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

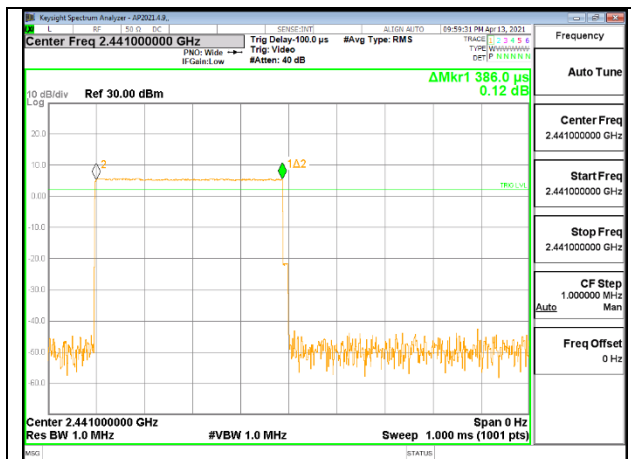
The average time of occupancy in the specified 3.16 second period (79 channels * 0.4 s) is equal to $10 * (\# \text{ of pulses in } 3.16 \text{ s}) * \text{ pulse width}$.

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

RESULTS

9.5.1. BLUETOOTH BASIC DATA RATE GFSK MODULATION

DH Packet	Pulse Width [msec]	Number of Pulses in 3.16 seconds	Average Time of Occupancy [sec]	Limit [sec]	Margin [sec]
GFSK Normal					
DH1	0.386	32	0.123520	0.4	-0.2765
DH3	1.638	16	0.262080	0.4	-0.1379
DH5	2.884	11	0.317240	0.4	-0.0828
GFSK AFH					
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	0.030880	0.4	-0.3691
DH3	1.638	4	0.065520	0.4	-0.3345
DH5	2.884	2.75	0.079310	0.4	-0.3207



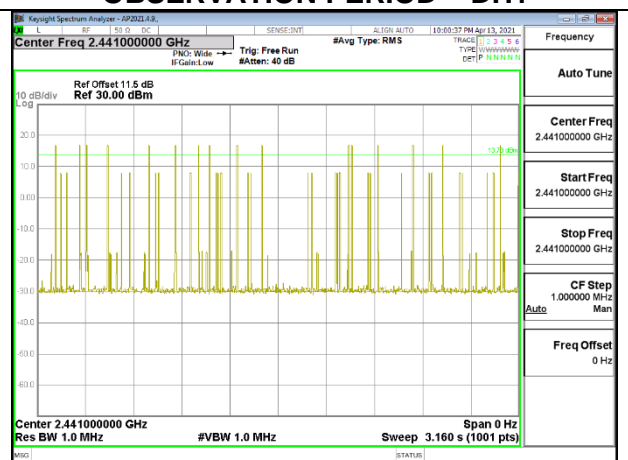
PULSE WIDTH – DH1



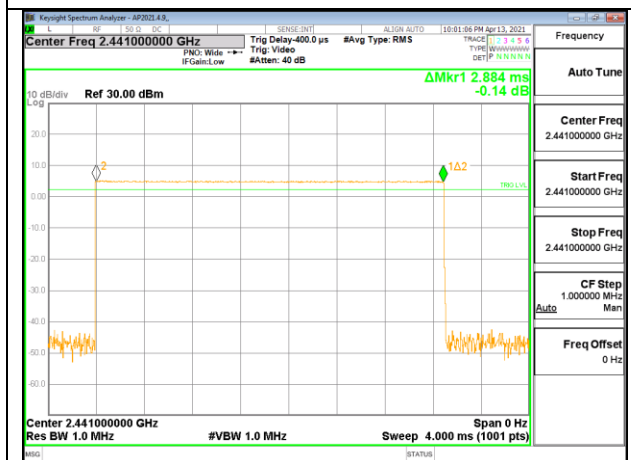
NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD – DH1



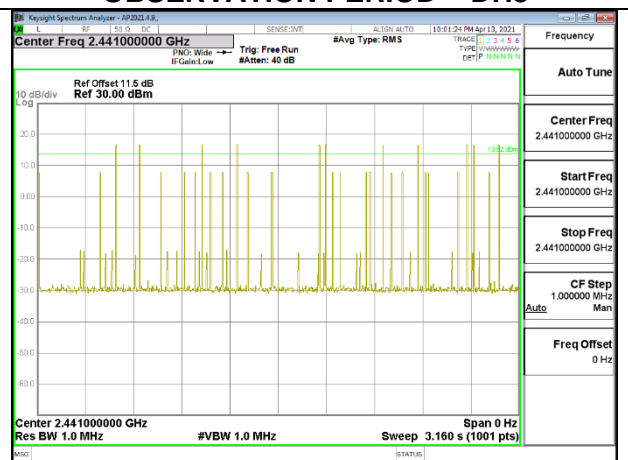
PULSE WIDTH – DH3



NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD – DH3



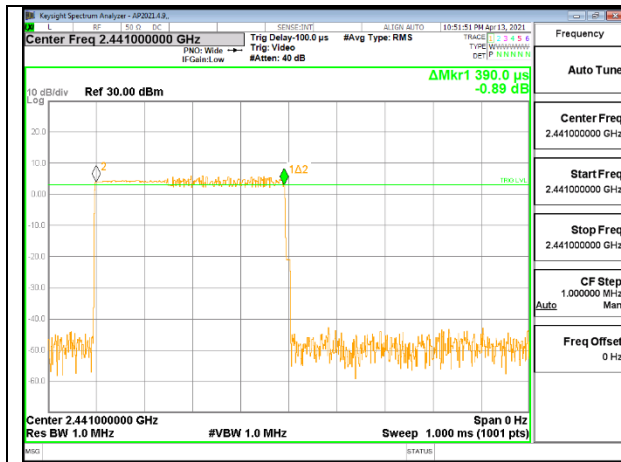
PULSE WIDTH – DH5



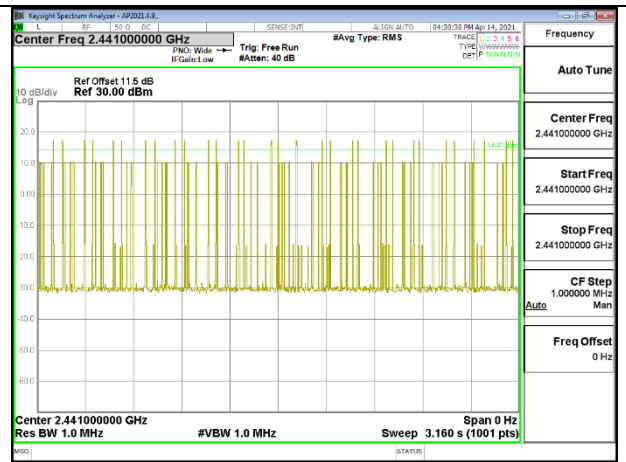
NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD – DH5

9.5.2. BLUETOOTH ENHANCED DATA RATE 8PSK MODULATION

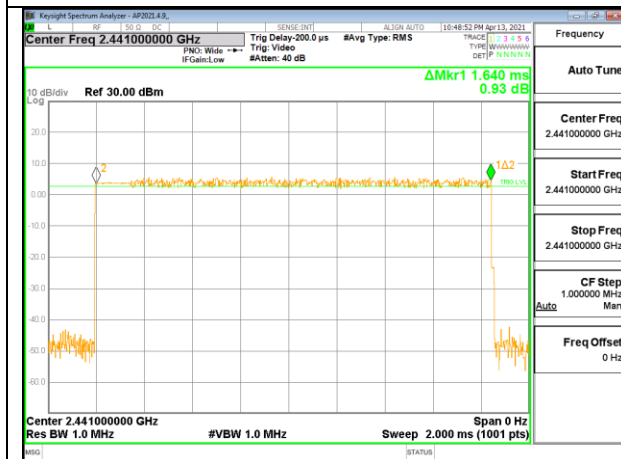
DH Packet	Pulse Width [msec]	Number of Pulses in 3.16 seconds	Average Time of Occupancy [sec]	Limit [sec]	Margin [sec]
8PSK Normal					
DH1	0.390	31	0.120900	0.4	-0.2791
DH3	1.640	18	0.295200	0.4	-0.1048
DH5	2.884	10	0.288400	0.4	-0.1116
8PSK AFH					
DH Packet	Pulse Width [msec]	Number of Pulses in 0.8 seconds	Average Time of Occupancy [sec]	Limit [sec]	Margin [sec]
8PSK AFH					
DH1	0.390	7.75	0.030225	0.4	-0.3698
DH3	1.640	4.5	0.073800	0.4	-0.3262
DH5	2.884	2.5	0.072100	0.4	-0.3279



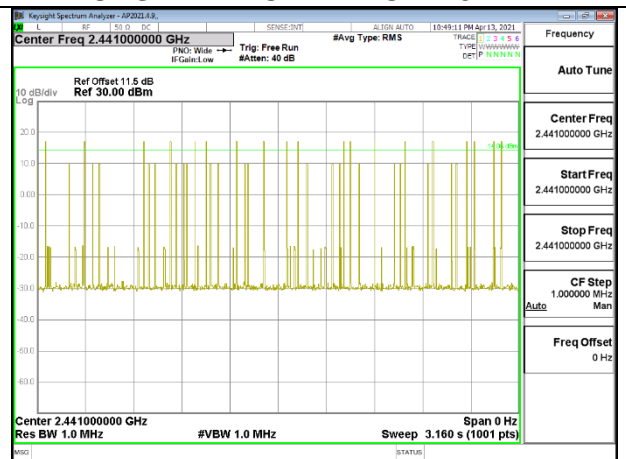
PULSE WIDTH – 3-DH1



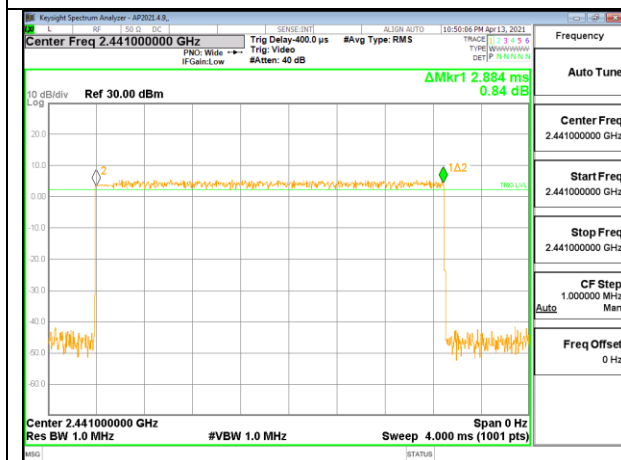
NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD – 3-DH1



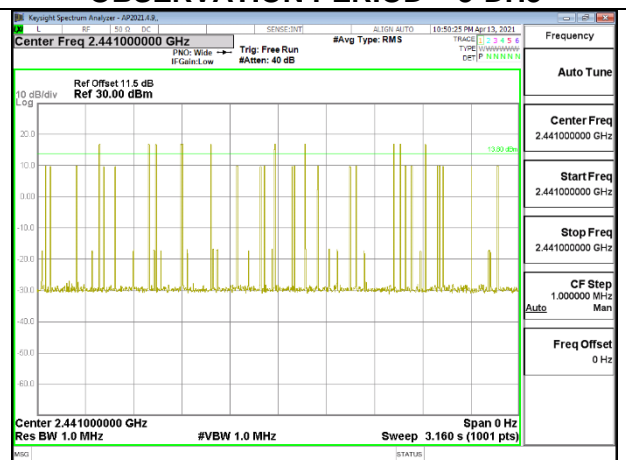
PULSE WIDTH – 3-DH3



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



PULSE WIDTH – 3-DH5



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

9.6. OUTPUT POWER

LIMITS

§15.247 (b) (1)

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

TEST PROCEDURE

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

RESULTS

9.6.1. BASIC DATA RATE GFSK MODULATION

Channel	Frequency [MHz]	Peak Output Power [dBm]	Limit [dBm]	Margin [dB]
Low	2 402	16.464	21.000	-4.536
Mid	2 441	17.696	21.000	-3.304
High	2 480	16.300	21.000	-4.700
Worst		17.696	21.000	-3.304

9.6.2. ENHANCED DATA RATE Pi/4-DPSK MODULATION

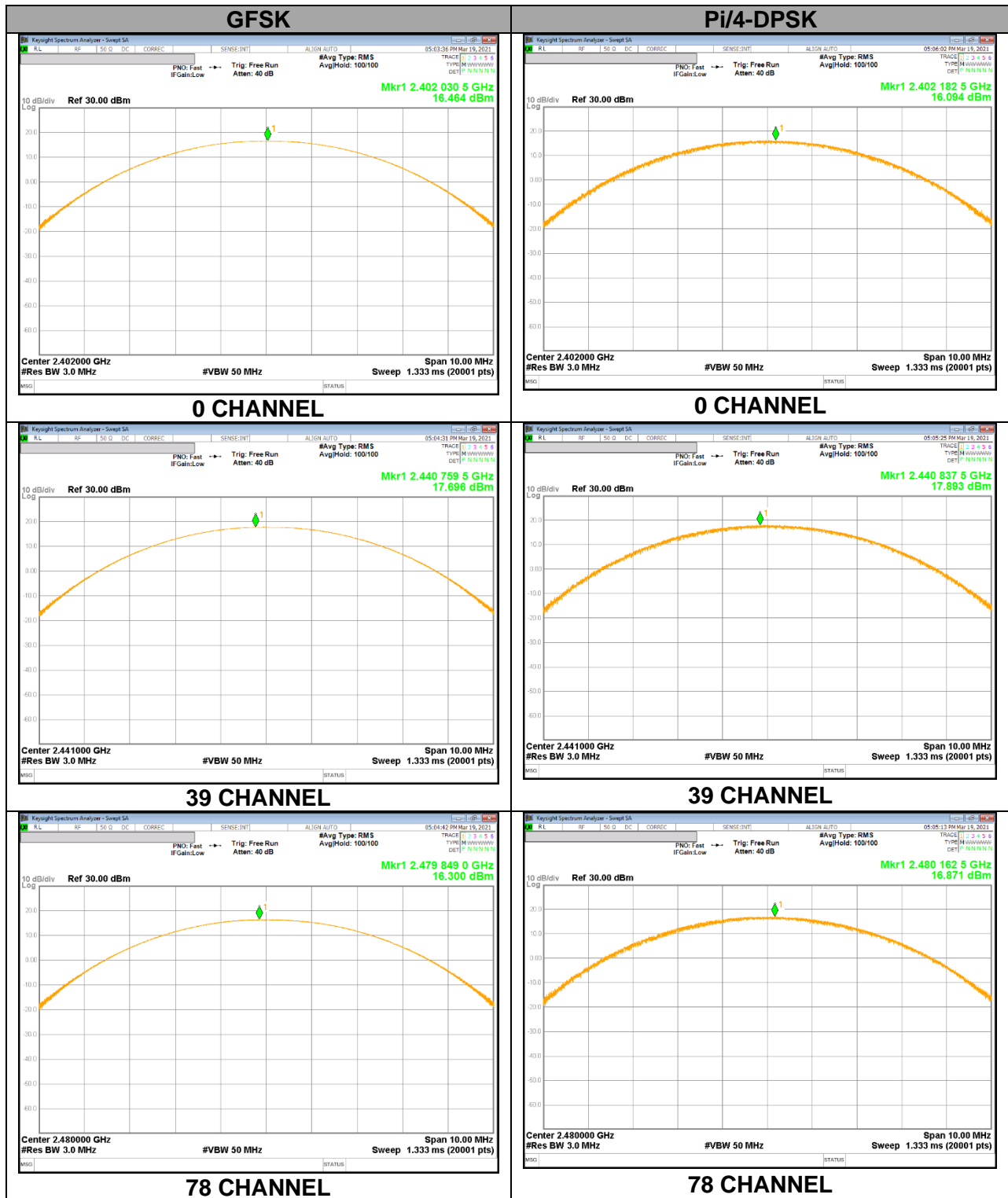
Channel	Frequency [MHz]	Peak Output Power [dBm]	Limit [dBm]	Margin [dB]
Low	2 402	16.094	21.000	-4.906
Mid	2 441	17.893	21.000	-3.107
High	2 480	16.871	21.000	-4.129
Worst		17.893	21.000	-3.107

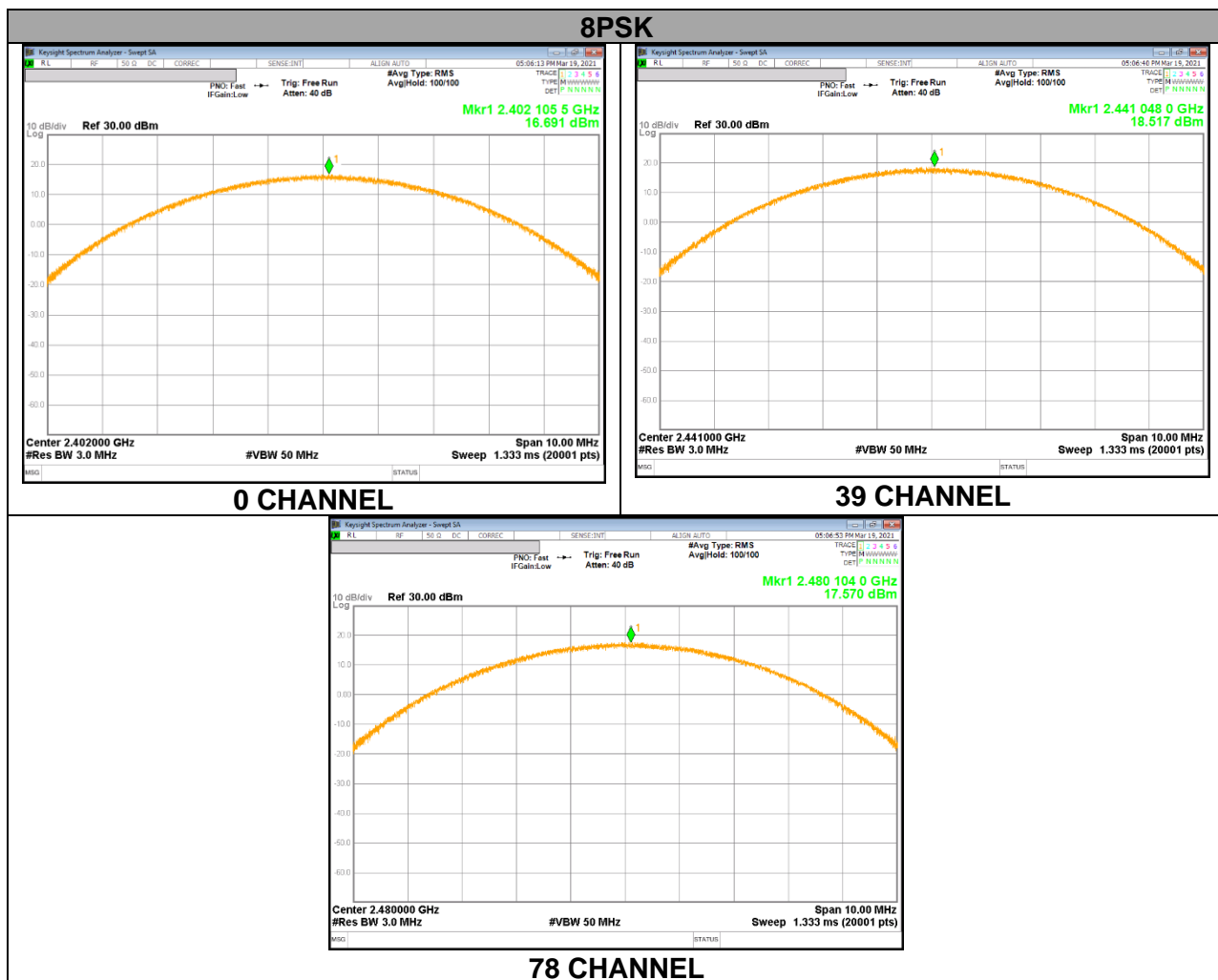
9.6.3. ENHANCED DATA RATE 8PSK MODULATION

Channel	Frequency [MHz]	Peak Output Power [dBm]	Limit [dBm]	Margin [dB]
Low	2 402	16.691	21.000	-4.309
Mid	2 441	18.517	21.000	-2.483
High	2 480	17.570	21.000	-3.430
Worst		18.517	21.000	-2.483

9.6.4. OUTPUT POWER PLOTS

PEAK 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	15.990	39.719
Middle	2 441	17.261	53.223
High	2 480	15.855	38.503

9.7.2. ENHANCED DATA RATE PI/4-DQPSK MODULATION

Channel	Frequency [MHz]	AV power [dBm]	AV power [mW]
Low	2 402	13.567	22.735
Middle	2 441	15.450	35.075
High	2 480	14.413	27.625

9.7.3. ENHANCED DATA RATE 8PSK MODULATION

Channel	Frequency [MHz]	AV power [dBm]	AV power [mW]
Low	2 402	13.573	22.767
Middle	2 441	15.473	35.261
High	2 480	14.441	27.804

9.8. CONDUCTED SPURIOUS EMISSIONS

LIMITS

FCC §15.247 (d)

Limit = -20 dBc

TEST PROCEDURE

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

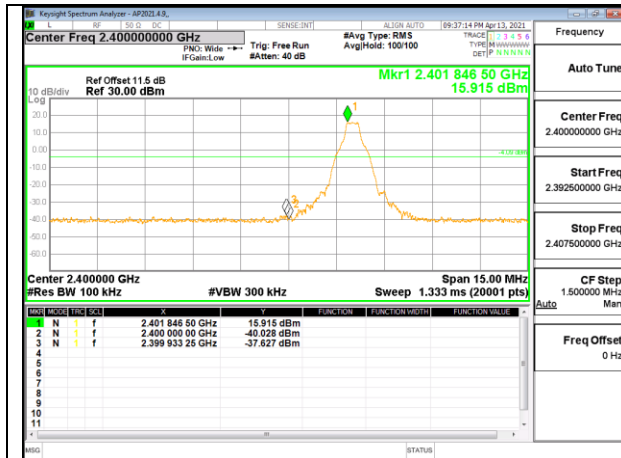
The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels.

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

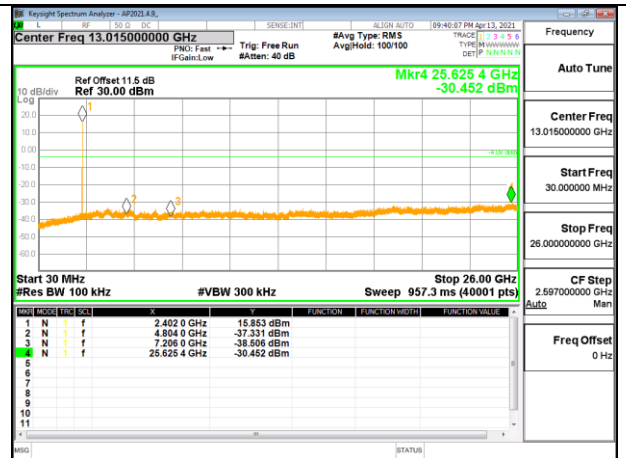
RESULTS

9.8.1. BLUETOOTH BASIC DATA RATE GFSK MODULATION

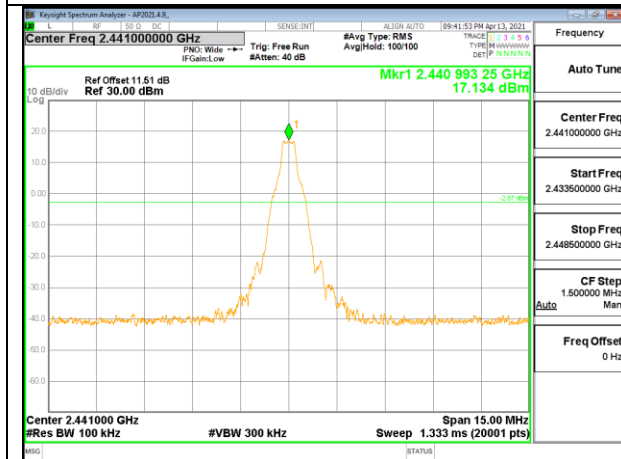
SPURIOUS EMISSIONS, NON-HOPPING



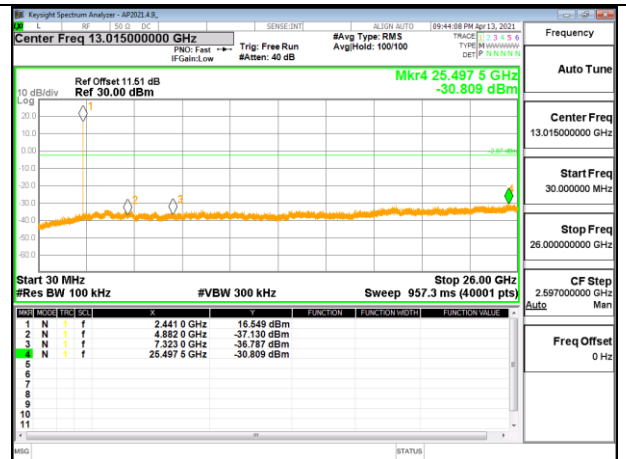
0 CHANNEL BANDEDGE



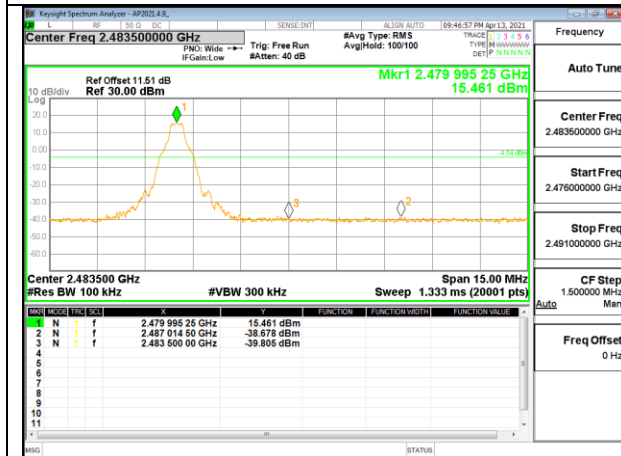
OUT-OF-BAND 0 CHANNEL



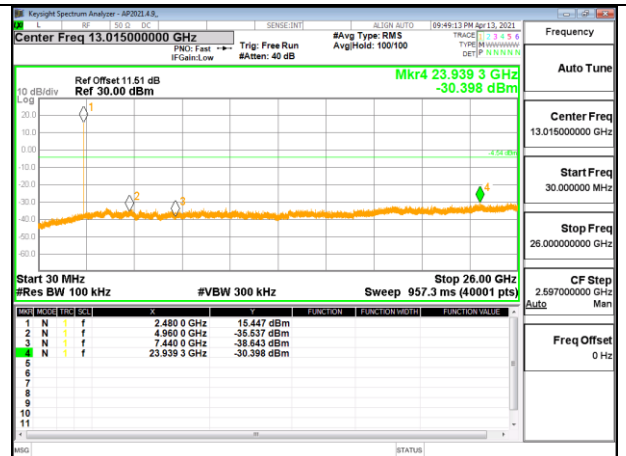
IN-BAND REFERENCE LEVEL



OUT-OF-BAND 39 CHANNEL

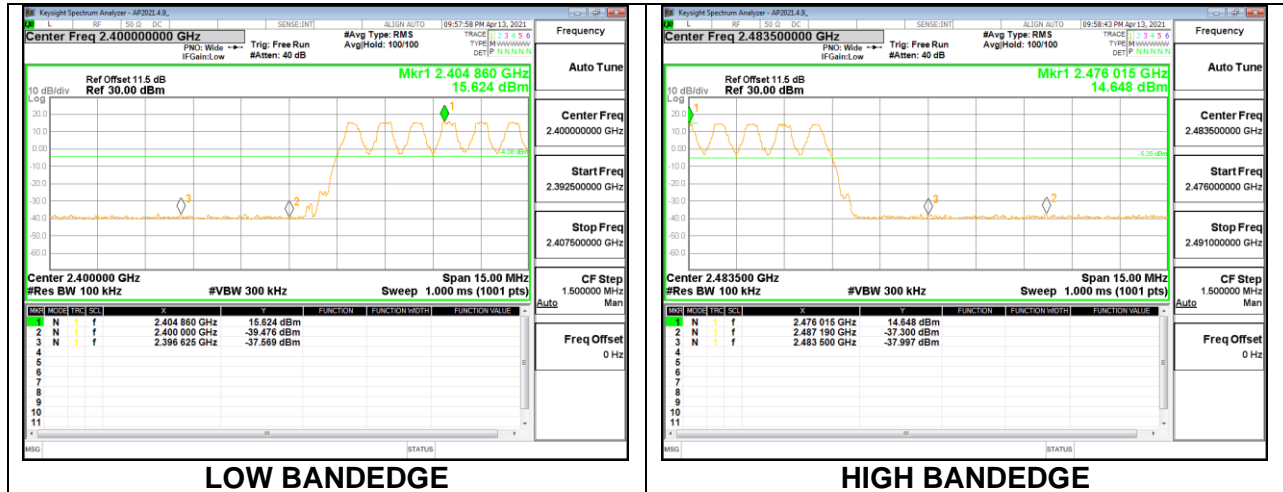


78 CHANNEL BANDEDGE



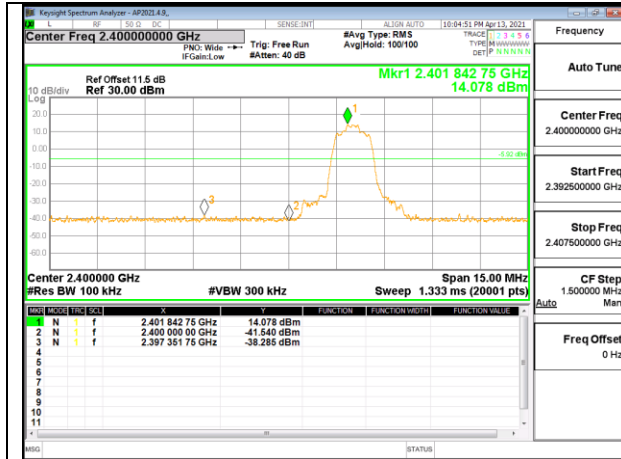
OUT-OF-BAND 78 CHANNEL

SPURIOUS BANDEDGE EMISSIONS WITH HOPPING ON

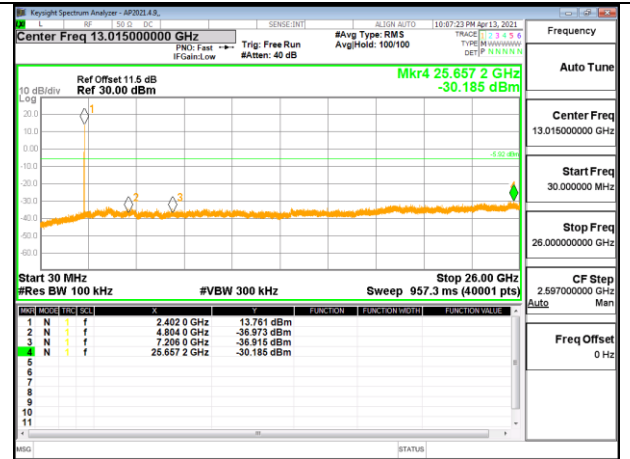


9.8.2. BLUETOOTH ENHANCED DATA RATE 8PSK MODULATION

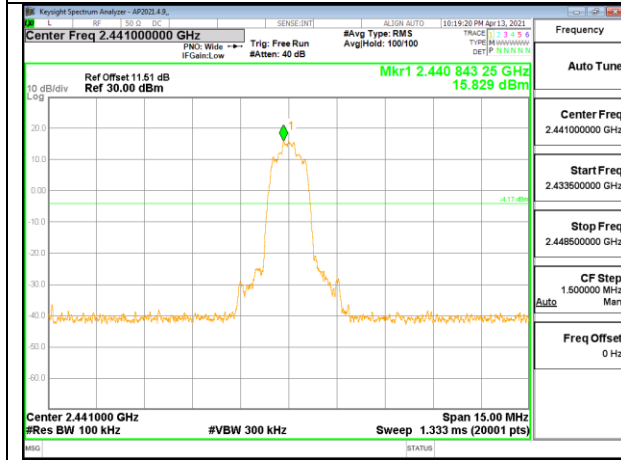
SPURIOUS EMISSIONS, NON-HOPPING



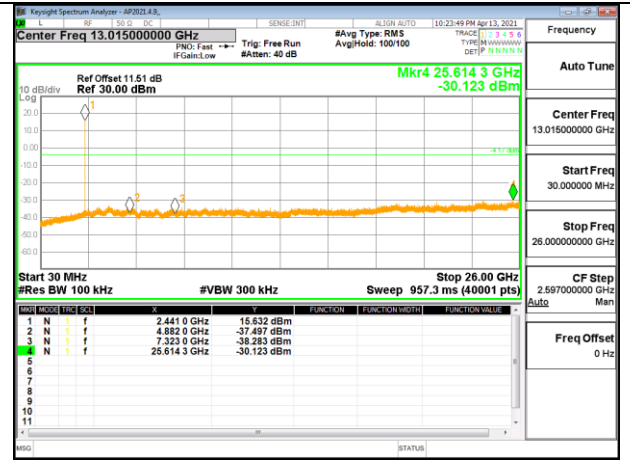
0 CHANNEL BANDEGE



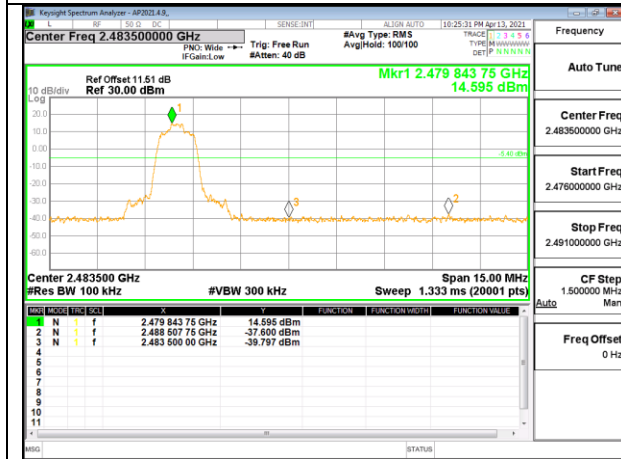
OUT-OF-BAND 0 CHANNEL



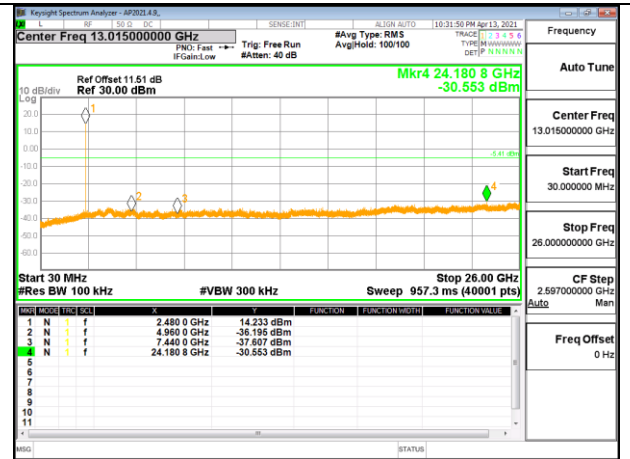
IN-BAND REFERENCE LEVEL



OUT-OF-BAND 39 CHANNEL

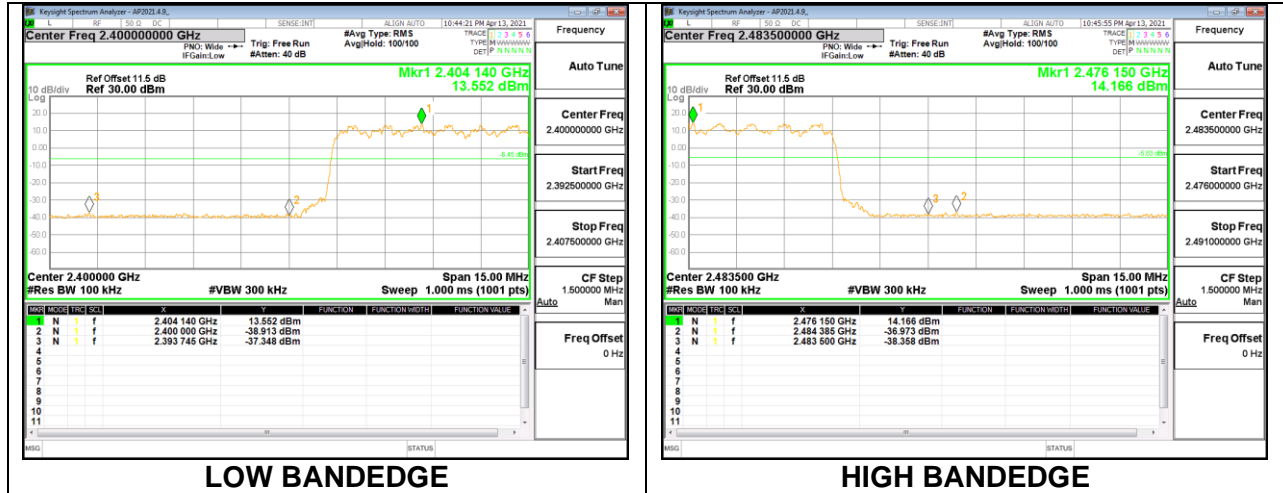


78 CHANNEL BANDEGE



OUT-OF-BAND 78 CHANNEL

SPURIOUS BANDEGE EMISSIONS WITH HOPPING ON



10. RADIATED TEST RESULTS

LIMITS

FCC §15.205 and §15.209

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

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

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

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

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

TEST PROCEDURE

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

For measurements below 1 GHz the resolution bandwidth is set to 100 kHz for peak detection measurements or 120 kHz for quasi-peak detection measurements. Peak detection is used unless otherwise noted as quasi-peak.

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

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

$$\text{GFSK} = 1/T = 1 / 0.00289\text{s} = 346\text{Hz}.$$

The minimum VBW was 346Hz, 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.

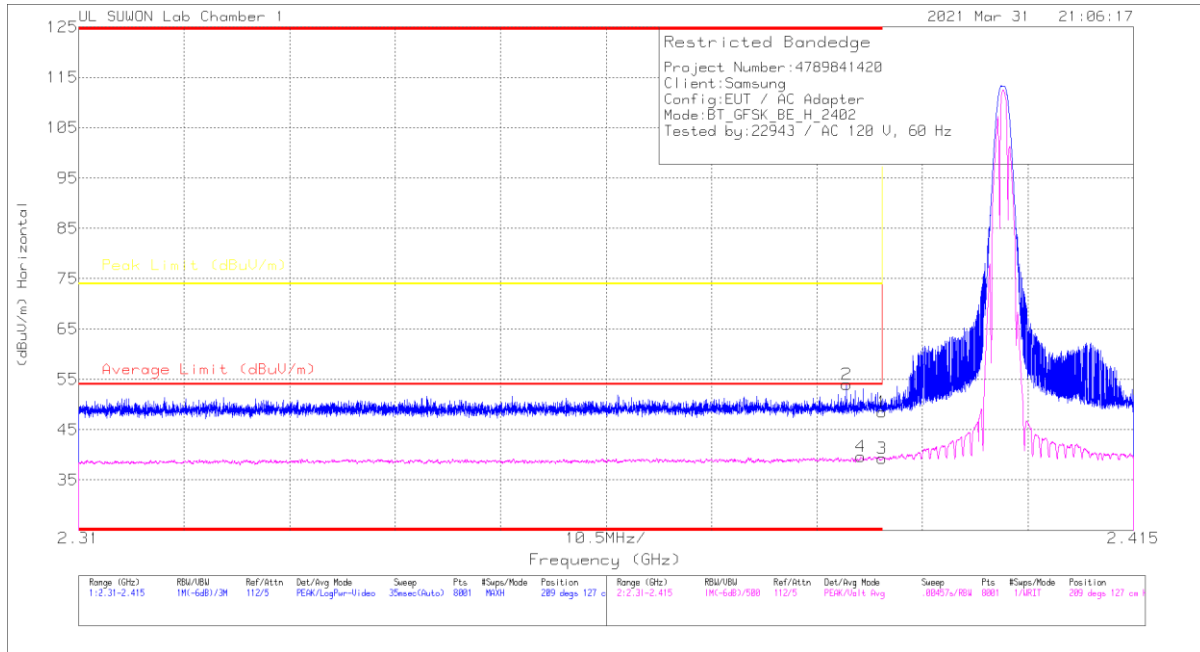
Although these tests were performed other than open field test site, adequate comparison measurements were confirmed against 30 m open are test site.
Therefore sufficient tests were made to demonstrate that the alternative site produces results that correlate with the one of tests made in an open field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

10.1. TRANSMITTER ABOVE 1 GHz

10.1.1. BLUETOOTH BASIC DATA RATE GFSK MODULATION

BANDEDGE (0 CHANNEL)

HORIZONTAL RESULT

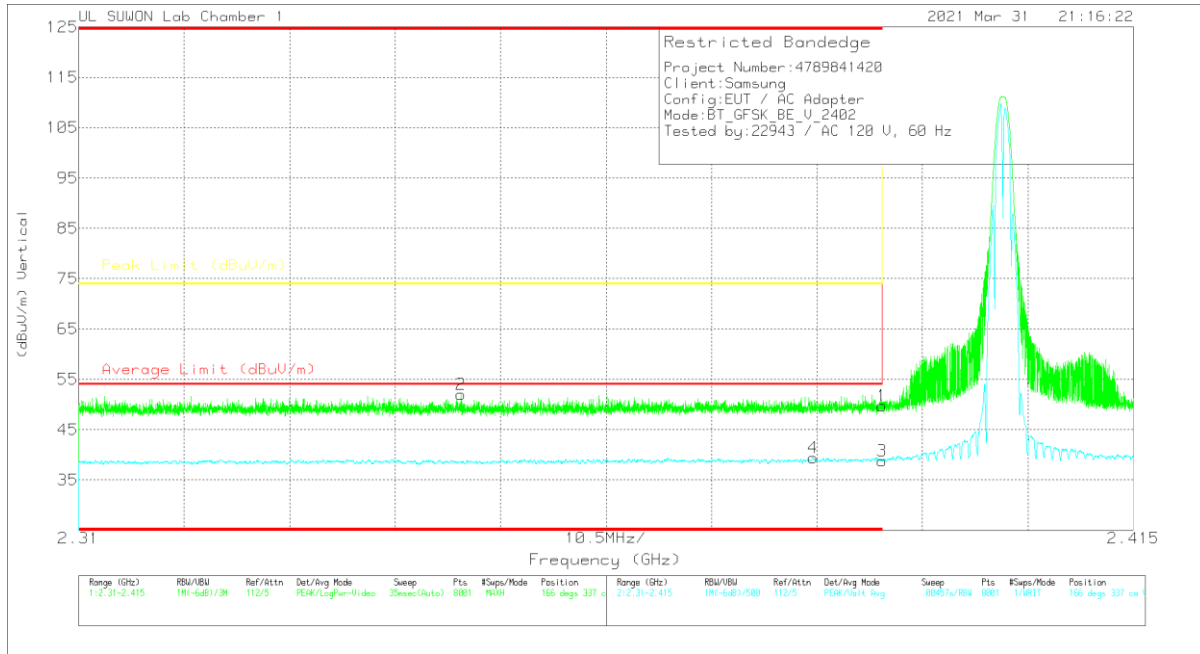


Trace Markers

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	42.32	Pk	31.8	-25.6	48.52	-	-	74	-25.48	209	127	H
2	* 2.38645	47.83	Pk	31.8	-25.6	54.03	-	-	74	-19.97	209	127	H
3	* 2.39	33.04	VA1T	31.8	-25.6	39.24	54	-14.76	-	-	209	127	H
4	* 2.38786	33.31	VA1T	31.8	-25.5	39.61	54	-14.39	-	-	209	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



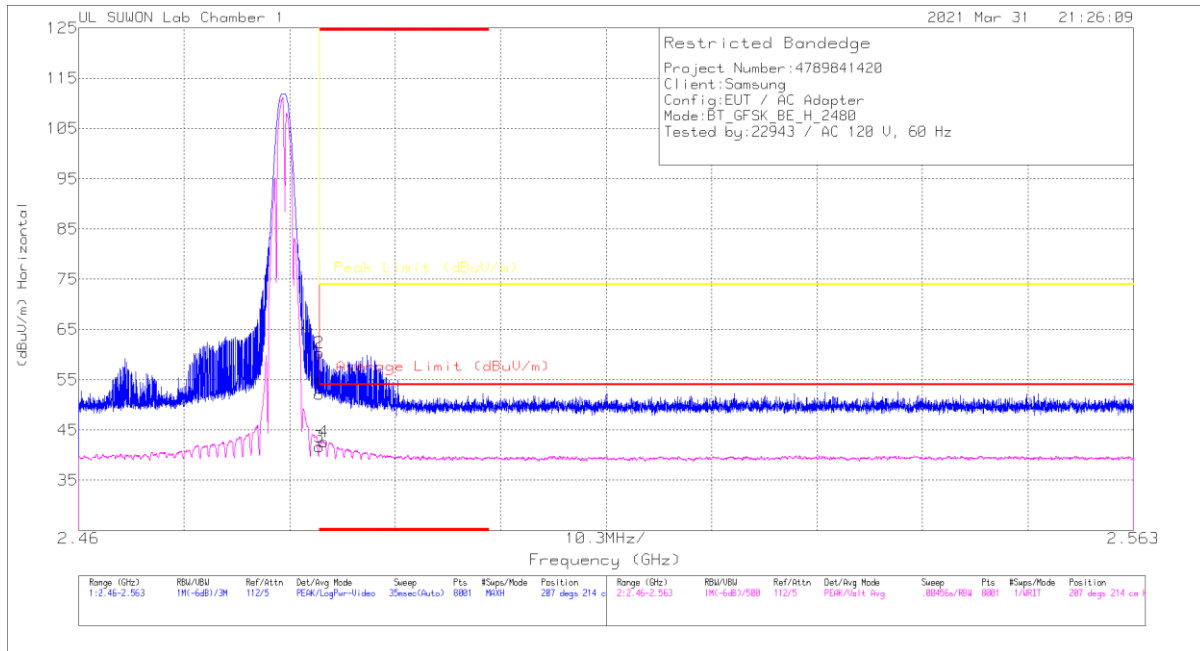
Trace Markers

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	43.58	Pk	31.8	-25.6	49.78	-	-	74	-24.22	166	337	V
2	* 2.34802	45.98	Pk	31.7	-25.7	51.98	-	-	74	-22.02	166	337	V
3	* 2.39	32.57	VA1T	31.8	-25.6	38.77	54	-15.23	-	-	166	337	V
4	* 2.38309	33.13	VA1T	31.8	-25.5	39.43	54	-14.57	-	-	166	337	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

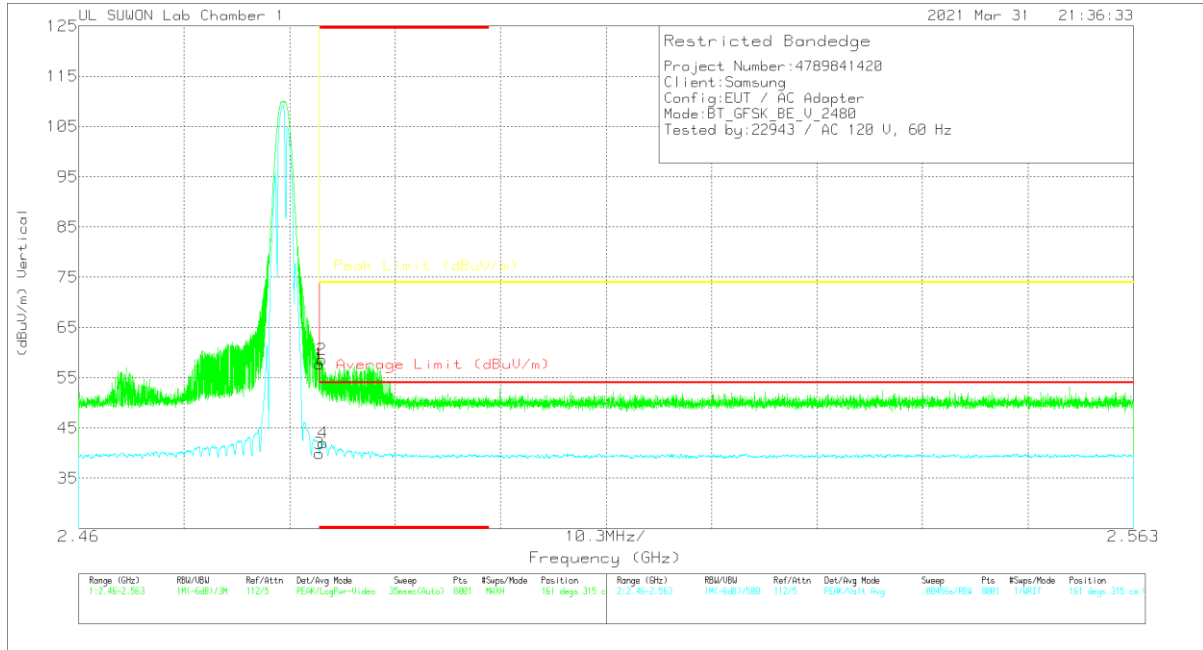


Trace Markers

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	45.48	Pk	32	-25.3	52.18	-	-	74	-21.82	207	214	H
2	* 2.48352	53.66	PK	32	-25.3	60.36	-	-	74	-13.64	207	214	H
3	* 2.48351	34.9	VA1T	32	-25.3	41.6	54	-12.4	-	-	207	214	H
4	* 2.48391	35.99	VA1T	32	-25.3	42.69	54	-11.31	-	-	207	214	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



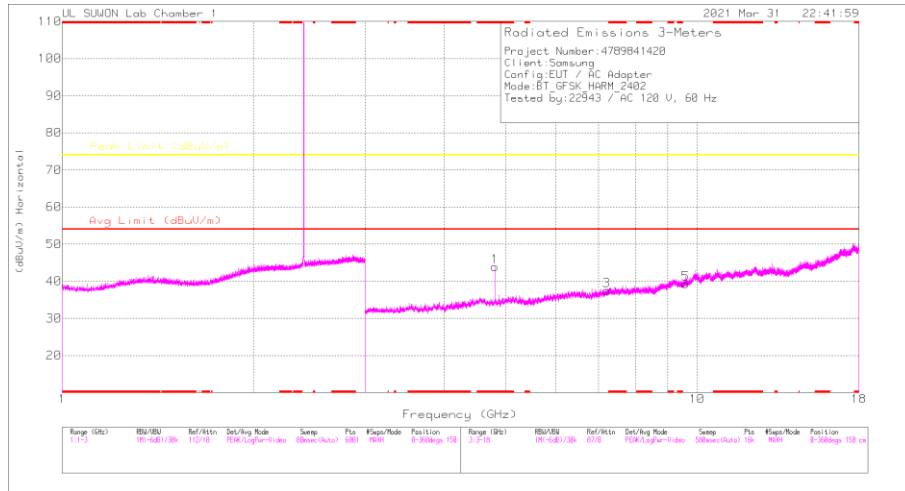
Trace Markers

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	50.98	Pk	32	-25.3	57.68	-	-	74	-16.32	161	315	V
2	* 2.48375	51.88	Pk	32	-25.3	58.58	-	-	74	-15.42	161	315	V
3	* 2.48351	33.22	VA1T	32	-25.3	39.92	54	-14.08	-	-	161	315	V
4	* 2.48387	35.3	VA1T	32	-25.3	42	54	-12	-	-	161	315	V

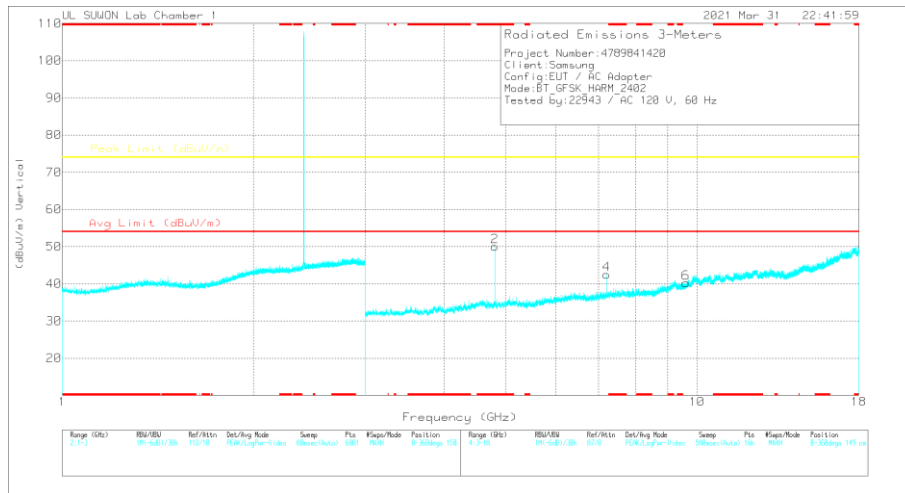
* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
 Pk - Peak detector
 VA1T - FHSS: Linear Voltage Average VB=1/Ton where: Ton is transmit duration

HARMONICS AND SPURIOUS EMISSIONS

0 CHANNEL RESULTS



HORIZONTAL



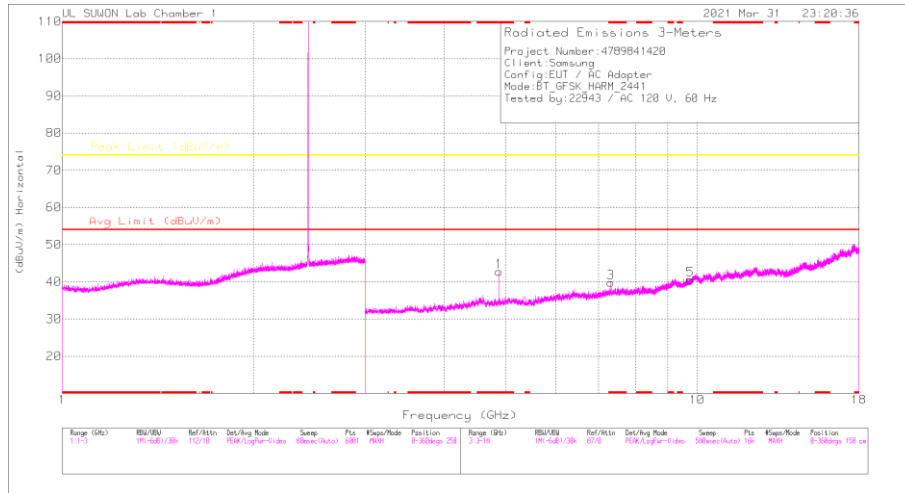
VERTICAL

RADIATED EMISSIONS

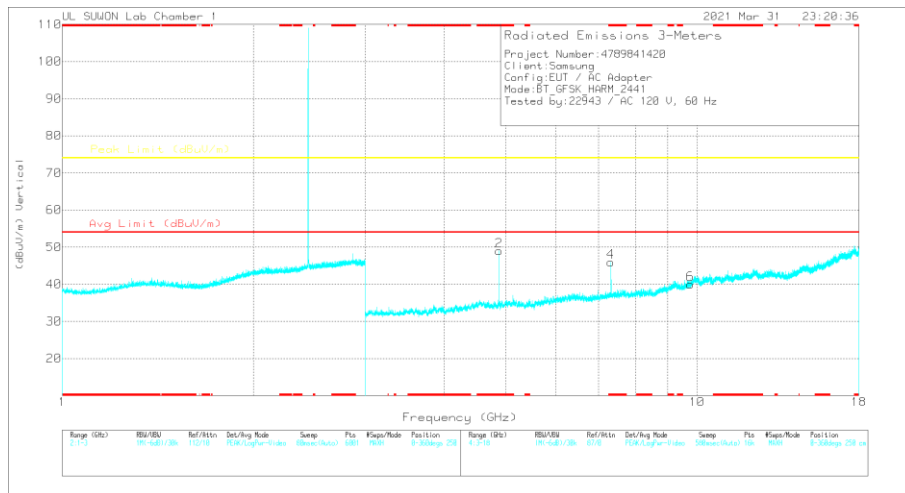
Frequency (GHz)	Meter Reading (dBuV)	Det	3117_0016871 7	3GHz_HP[dB]	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
* 4.80378	46.12	PKFH	34.1	-31.5	48.72	-	-	74	-25.28	55	124	H
* 4.80402	41.29	VA1T	34.1	-31.5	43.89	54	-10.11	-	-	55	124	H
* 4.80424	48.47	PKFH	34.1	-31.5	51.07	-	-	74	-22.93	37	151	V
* 4.80402	44.57	VA1T	34.1	-31.5	47.17	54	-6.83	-	-	37	151	V
7.19936	36.95	PKFH	35.9	-27.7	45.15	-	-	74	-28.85	61	213	H
7.2066	39.4	PKFH	35.9	-27.6	47.7	-	-	74	-26.3	296	144	V
9.6108	33.6	PKFH	37.1	-23.1	47.6	-	-	74	-26.4	360	100	H
9.60695	32.98	PKFH	37.1	-23	47.08	-	-	74	-26.92	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



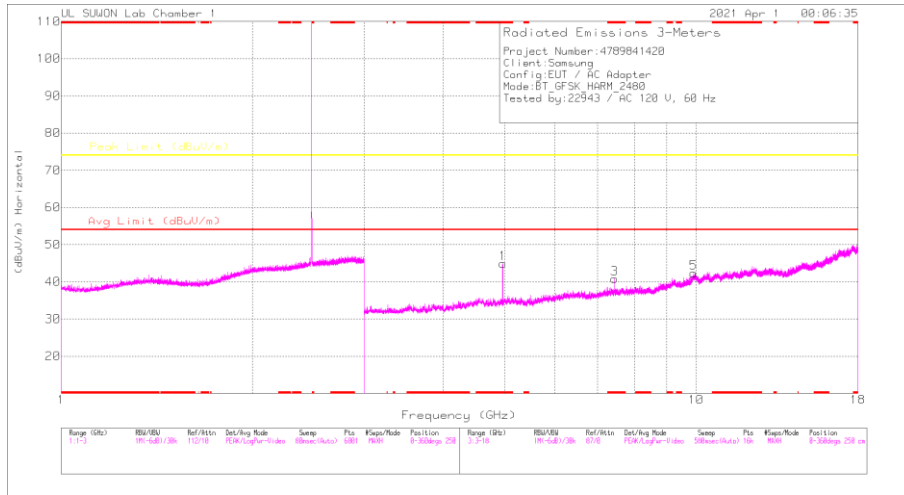
VERTICAL

RADIATED EMISSIONS

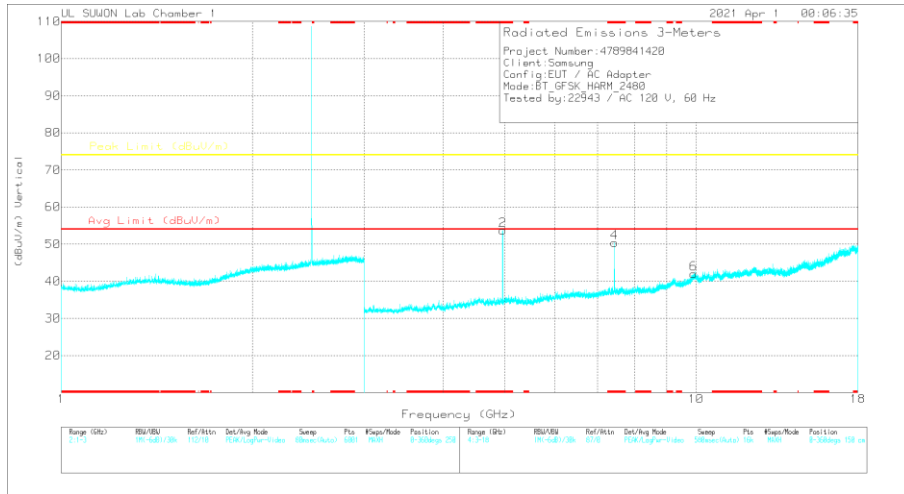
Frequency (GHz)	Meter Reading (dBuV)	Det	3117_0016871 7	3GHz_HP[dB]	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
* 4.88224	46.62	PKFH	34.1	-31.4	49.32	-	-	74	-24.68	59	109	H
* 4.88194	40.31	VA1T	34.1	-31.3	43.11	54	-10.89	-	-	59	109	H
* 4.88202	49.1	PKFH	34.1	-31.3	51.9	-	-	74	-22.1	150	199	V
* 4.8818	44.78	VA1T	34.1	-31.3	47.58	54	-6.42	-	-	150	199	V
* 7.32238	38.48	PKFH	35.8	-27.3	46.98	-	-	74	-27.02	66	150	H
* 7.3233	29.1	VA1T	35.8	-27.3	37.6	54	-16.4	-	-	66	150	H
* 7.32344	42.29	PKFH	35.8	-27.3	50.79	-	-	74	-23.21	96	250	V
* 7.32302	36.21	VA1T	35.8	-27.3	44.71	54	-9.29	-	-	96	250	V
9.77061	33.03	PKFH	37.5	-23.8	46.73	-	-	74	-27.27	0	100	H
9.76315	32.81	PKFH	37.4	-23.7	46.51	-	-	74	-27.49	0	100	V

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

78 CHANNEL RESULTS



HORIZONTAL



VERTICAL

RADIATED EMISSIONS

Frequency (GHz)	Meter Reading (dBuV)	Det	3117_0016871 7	3GHz_HP[dB]	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
* 4.95974	53.27	PKFH	34.1	-31.4	55.97	-	-	74	-18.03	149	238	V
* 4.95974	53.27	PKFH	34.1	-31.4	**31.21	54	-22.79	-	-	149	238	V
* 4.95964	46.76	PKFH	34.1	-31.4	49.46	-	-	74	-24.54	204	167	H
* 4.96002	42.87	VA1T	34.1	-31.4	45.57	54	-8.43	-	-	204	167	H
* 7.4404	43.74	PKFH	35.8	-26.8	52.74	-	-	74	-21.26	289	326	V
* 7.43998	38.04	VA1T	35.8	-26.8	47.04	54	-6.96	-	-	289	326	V
* 7.4406	39.99	PKFH	35.8	-26.8	48.99	-	-	74	-25.01	222	387	H
* 7.43998	32.61	VA1T	35.8	-26.8	41.61	54	-12.39	-	-	222	387	H
9.92171	32.72	PKFH	37.7	-21.5	48.92	-	-	74	-25.08	360	100	H
9.91975	32.53	PKFH	37.7	-21.6	48.63	-	-	74	-25.37	360	100	V

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

** Data subtracted from the peak value: $20\log(2*2.890\text{ms}/100\text{ms}) = -24.76 \text{ dB}$

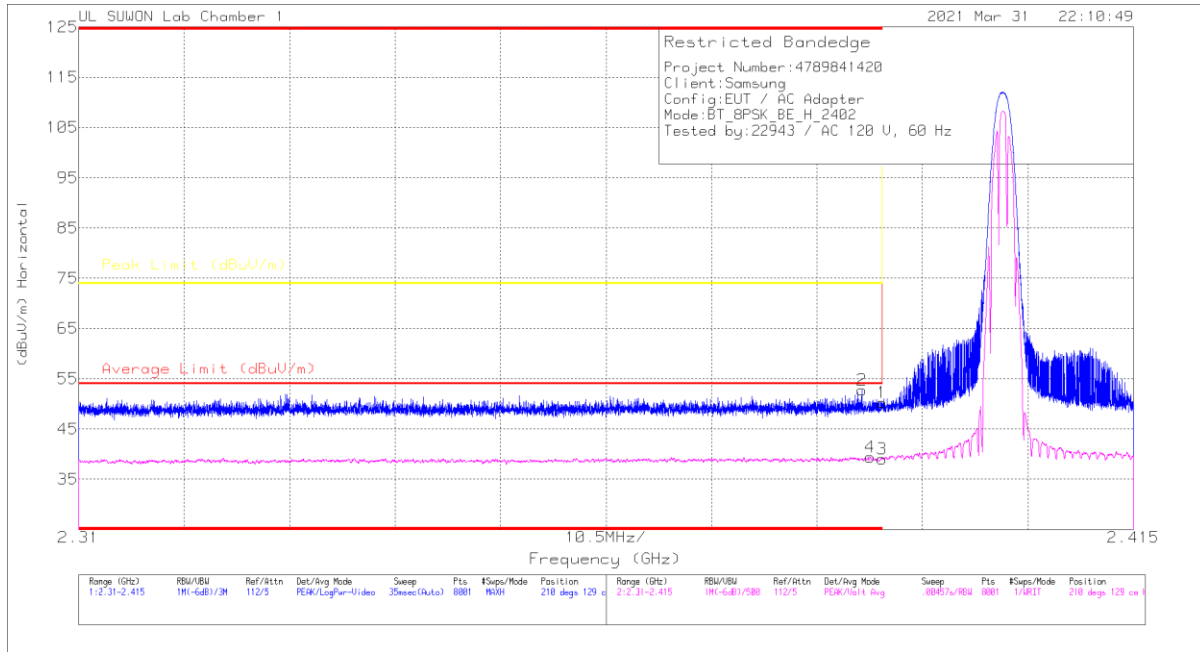
PKFH FHSS/BT RB=100k for Frequencies<1GHz / RB=1MHz for Frequencies>1GHz, VB=3 x RB, Peak

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

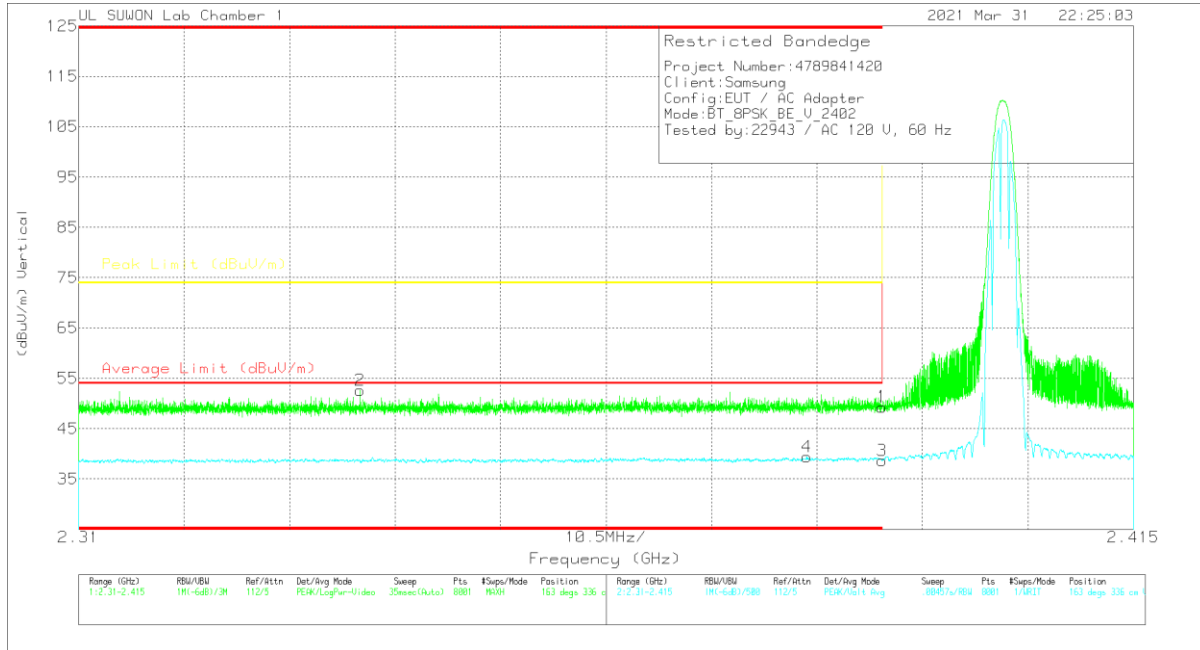
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	3117_00168717	10dB_ATT[dB]	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.39	44	Pk	31.8	-25.6	50.2	-	-	74	-23.8	210	129	H
2	* 2.38796	46.43	Pk	31.8	-25.5	52.73	-	-	74	-21.27	210	129	H
3	* 2.39	32.86	VA1T	31.8	-25.6	39.06	54	-14.94	-	-	210	129	H
4	* 2.3888	33.12	VA1T	31.8	-25.5	39.42	54	-14.58	-	-	210	129	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



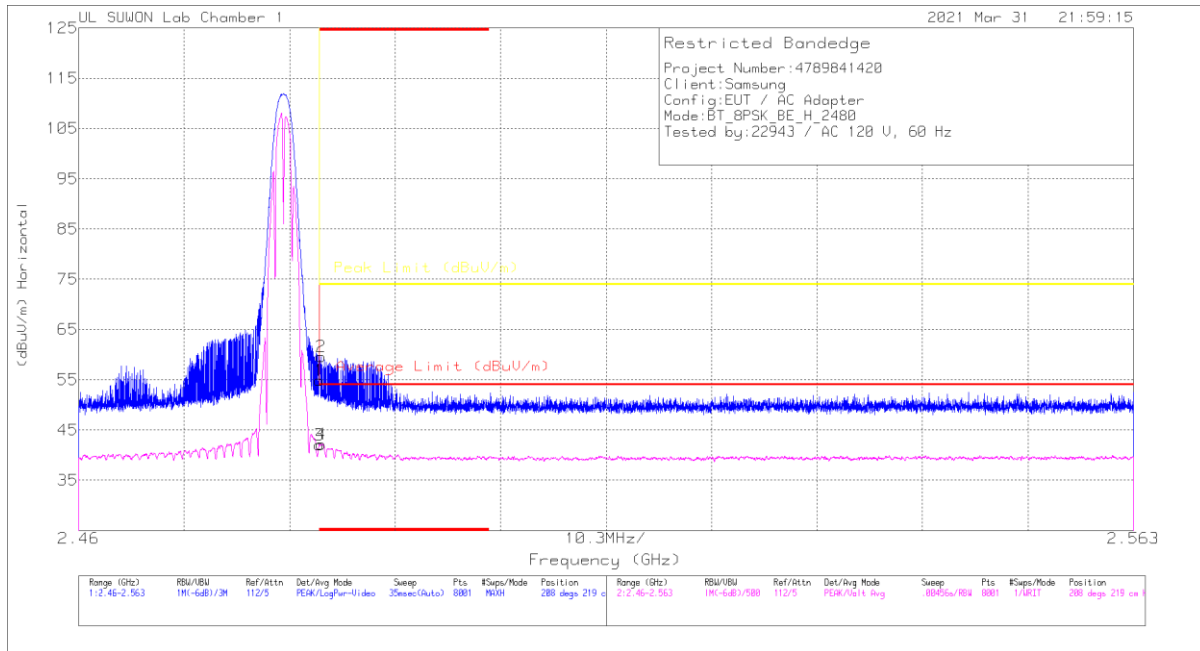
Trace Markers

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	43.12	Pk	31.8	-25.6	-49.32	-	-	74	-24.68	163	336	V
2	* 2.33801	46.49	Pk	31.7	-25.6	-52.59	-	-	74	-21.41	163	336	V
3	* 2.39	32.51	VA1T	31.8	-25.6	38.71	54	-15.29	-	-	163	336	V
4	* 2.38246	33.21	VA1T	31.8	-25.6	39.41	54	-14.59	-	-	163	336	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	48.2	Pk	32	-25.3	54.9	-	-	74	-19.1	208	219	H
2	* 2.48365	52.87	PK	32	-25.3	59.57	-	-	74	-14.43	208	219	H
3	* 2.48351	35.37	VA1T	32	-25.3	42.07	54	-11.93	-	-	208	219	H
4	* 2.48368	35.47	VA1T	32	-25.3	42.17	54	-11.83	-	-	208	219	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