CERTIFICATION TEST REPORT

Report Number. : 4790716492-E5V2

Applicant	:	SAMSUNG ELECTRONICS CO., LTD. 129 SAMSUNG-RO, YEONGTONG-GU, SUWON-SI, GYEONGGI-DO, 16677, KOREA
Model	:	SM-A145FB/DS
FCC ID	:	A3LSMA145F
EUT Description	:	GSM/WCDMA/LTE Phone + BT/BLE, DTS/UNII a/b/g/n/ac.
Test Standard(s)	:	FCC 47 CFR PART 15 SUBPART C

Date Of Issue:
2023-02-20

Prepared by:
UL Korea, Ltd.
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ACCREDITED
Testing Laboratory
TL-637

Rev.	Issue Date	Revisions	Revised By
V1	2023-02-07	Initial issue	Yeonhee Lim
V2	2023-02-20	Updated to address TCB's question	Yeonhee Lim

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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.

MODEL NUMBER: SM-A145FB/DS

SERIAL NUMBER: R38T90084BB, R38T90083YX (CONDUCTED)
R38T90076XE, R38T90085AH, R38T90083KP (RADIATED)

DATE TESTED: 2023-01-27 ~ 2023-02-07

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

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

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

Approved & Released For
UL Korea, Ltd. By:

Seokhwan Hong
Suwon Lab Engineer
UL Korea, Ltd.

Tested By:

Yeonhee Lim
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
☒ Chamber 1(3m semi-anechoic chamber)
☒ Chamber 2(3m semi-anechoic chamber)
☒ Chamber 3(3m semi-anechoic chamber)
☐ Chamber 4(3m Full-anechoic chamber)
☐ Chamber 5(3m Full-anechoic chamber)

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

4. DECISION RULES AND MEASUREMENT UNCERTAINTY

4.1. METROLOGICAL TRACEABILITY

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

4.2. SAMPLE CALCULATION

Where relevant, the following sample calculation is provided:

Field Strength (dBuV/m) = Measured Voltage (dBuV) + Antenna Factor (dB/m) + Cable Loss (dB) – Preamp Gain (dB)
36.5 dBuV + 18.7 dB/m + 0.6 dB – 26.9 dB = 28.9 dBuV/m

AC Corrected Reading (dBuV) = Measured Voltage (dBuV) + Extension Cord Loss (dB) + Cable Loss (dB)
44.72 dBuV = 34.72 dBuV + 9.9 dB + 0.1 dB

4.3. MEASUREMENT UNCERTAINTY

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

PARAMETER	UNCERTAINTY
Conducted Disturbance, 0.15 to 30 MHz	2.80 dB
Radiated Disturbance, 30 MHz to 1 GHz	3.92 dB
Radiated Disturbance, 1 GHz to 18 GHz	5.06 dB
Radiated Disturbance, 18 GHz to 40 GHz	6.02 dB

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

4.4. DECISION RULES

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

5. EQUIPMENT UNDER TEST

5.1. EUT DESCRIPTION

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

5.2. MAXIMUM OUTPUT POWER

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

Frequency Range [MHz]	Mode	Power Mode	Output Power [dBm]	Output Power [mW]
2 402 ~ 2 480	Basic GFSK	Peak	9.586	9.091
		Average	8.731	7.465
	Enhanced Pi/4-DPSK	Peak	9.785	9.517
		Average	7.533	5.667
	Enhanced 8PSK	Peak	10.368	10.884
		Average	7.510	5.637

5.3. DESCRIPTION OF AVAILABLE ANTENNAS

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

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

The radio utilizes an internal antennas with ANT maximum gain of -4.51 dBi

5.4. WORST-CASE CONFIGURATION AND MODE

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

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

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

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

5.5. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

Support Equipment List				
Description	**Manufacture**	**Model**	**Serial Number**	**FCC ID**
Charger	SAMSUNG	EP-TA200	R37NS8Q7J35DK3	N/A
Data Cable	SAMSUNG	EP-DR140AWE	GH39-02134A	N/A
Charger	SAMSUNG	EP-TA800	R37T2H82D29SEA	N/A
Data Cable	SAMSUNG	EP-DN980BWE	GH39-02115A	N/A
Earphone	SAMSUNG	EHS61ASFBE	GH59-15063A	N/A

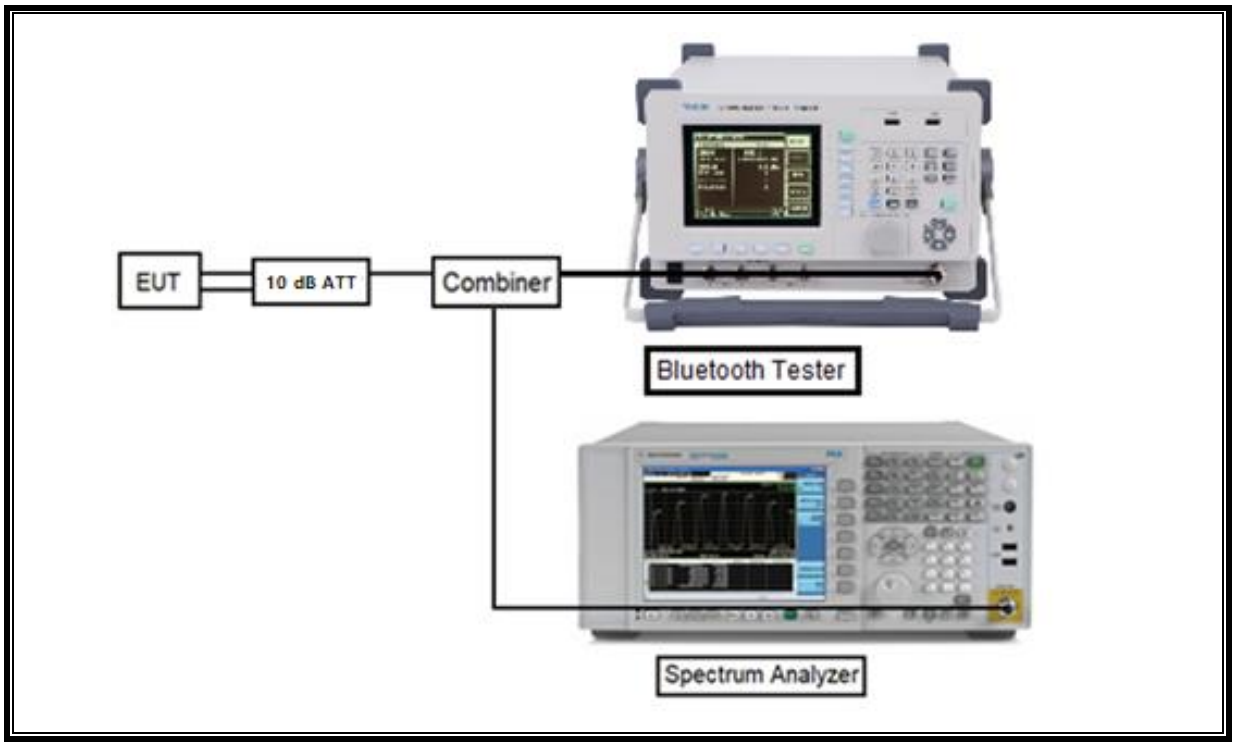
I/O CABLE

I/O Cable List						
Cable No.	**Port**	**# of identical ports**	**Connector Type**	**Cable Type**	**Cable Length (m)**	**Remarks**
1	DC Power	1	C Type	Shielded	1.0 m	N/A
2	Audio	2	Mini-jack	Unshielded	0.7 m	N/A

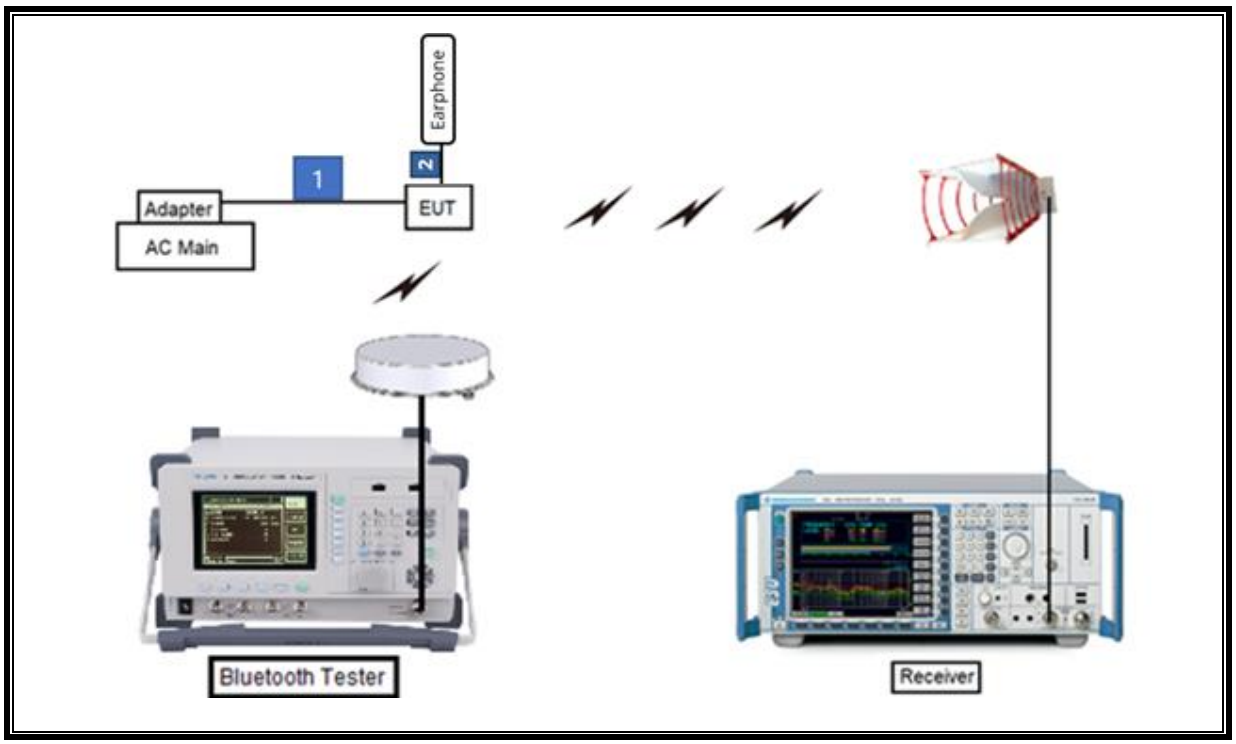
TEST SETUP

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

SETUP DIAGRAM FOR TESTS (CONDUCTED TEST SETUP)



SETUP DIAGRAM FOR TESTS (RADIATED TEST SETUP)



6. TEST AND MEASUREMENT EQUIPMENT

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

Test Equipment List				
Description	Manufacture	Model	S/N	Cal Due
Antenna, Bilog, 30MHz-1GHz	SCHWARZBECK	VULB9163	750	2024-08-15
Antenna, Bilog, 30MHz-1GHz	SCHWARZBECK	VULB9163	749	2024-08-15
Antenna, Bilog, 30MHz-1GHz	SCHWARZBECK	VULB9163	845	2024-08-15
Antenna, Loop, 9kHz-30MHz	R&S	HFH2-Z2	100418	2023-10-06
Antenna, Horn, 18 GHz	ETS	3115	00167211	2024-08-04
Antenna, Horn, 18 GHz	ETS	3115	00161451	2024-08-21
Antenna, Horn, 18 GHz	ETS	3117	00168724	2024-08-04
Antenna, Horn, 18 GHz	ETS	3117	00168717	2024-08-21
Antenna, Horn, 40 GHz	ETS	3116C	00166155	2024-08-02
Antenna, Horn, 40 GHz	ETS	3116C	00168645	2025-01-17
Preamplifier	ETS	3116C-PA	00168841	2023-08-04
Directional Antenna	Cobham	FPA3-0.8-6.0R/1329	80108-0004	N/A
Directional Antenna	Cobham	FPA3-0.8-6.0R/1329	110367-0003	N/A
Preamplifier, 1000 MHz	Sonoma	310N	341282	2023-08-02
Preamplifier, 1000 MHz	Sonoma	310N	351741	2023-08-02
Preamplifier, 1000 MHz	Sonoma	310N	370599	2023-08-02
Preamplifier, 18 GHz	Miteq	AFS42-00101800-25-S-42	1876511	2023-08-02
Preamplifier, 18 GHz	Miteq	AFS42-00101800-25-S-42	1896138	2023-08-01
Preamplifier, 18 GHz	Miteq	AFS42-00101800-25-S-42	2029169	2023-08-01
Spectrum Analyzer, 44 GHz	Agilent / HP	N9030A	MY54170614	2023-08-03
Spectrum Analyzer, 44 GHz	Agilent / HP	N9030A	MY54490312	2023-08-01
Spectrum Analyzer, 44 GHz	KEYSIGHT	N9030B	MY60070693	2024-01-09
Spectrum Analyzer, 44 GHz	KEYSIGHT	N9040B	MY60080268	2024-01-09
Average Power Sensor	Agilent / HP	U2000	MY54270007	2023-08-03
Average Power Sensor	Agilent / HP	U2000	MY54260010	2023-08-03
Bluetooth Tester	TESCOM	TC-3000C	3000C000546	2023-08-02
Power Splitter	MINI-CIRCUITS	WA1534	UL003	2024-01-09
Power Splitter	MINI-CIRCUITS	WA1534	UL004	2024-01-09
Attenuator	PASTERNACK	PE7087-10	A009	2023-08-03
Attenuator	PASTERNACK	PE7087-10	A001	2023-08-03
Attenuator	PASTERNACK	PE7087-10	A008	2023-08-03
Attenuator	PASTERNACK	PE7004-10	2	2023-08-01
EMI Test Receive, 40 GHz	R&S	ESU40	100439	2023-08-02
EMI Test Receive, 40 GHz	R&S	ESU40	100457	2023-07-29
Low Pass Filter 5GHz	Micro-Tronics	LPS17541	009	2023-08-02
Low Pass Filter 5GHz	Micro-Tronics	LPS17541	015	2023-08-01
Low Pass Filter 5GHz	Micro-Tronics	LPS17541	020	2023-08-01
High Pass Filter 3GHz	Micro-Tronics	HPM17543	010	2023-08-02
High Pass Filter 3GHz	Micro-Tronics	HPM17543	015	2023-08-01
High Pass Filter 3GHz	Micro-Tronics	HPM17543	020	2023-08-01
High Pass Filter 6GHz	Micro-Tronics	HPS17542	009	2023-08-02
High Pass Filter 6GHz	Micro-Tronics	HPS17542	016	2023-08-01
High Pass Filter 6GHz	Micro-Tronics	HPS17542	021	2023-08-01
LISN	R&S	ENV-216	101837	2023-08-04
Termination	WEINSCHEL	M1406A	T09	2023-08-03
UL Software				
Description	Manufacturer	Model	Version	
Radiated software	UL	UL EMC	Ver 9.5	
AC Line Conducted software	UL	UL EMC	Ver 9.5	

7. TEST RESULTS SUMMARY

FCC Part Section	Test Description	Test Limit	Test Condition	Test Result
2.1051, 15.247(d)	Band Edge / Conducted Spurious Emission	-20 dBc	Conducted	Complies
15.247 (b)(1)	TX conducted output power	< 21 dBm		Complies
15.247 (a)(1)	Hopping frequency separation	> two-thirds of the 20 dB bandwidth		Complies
15.247 (a)(1)(iii)	Number of Hopping channels	More than 15 non-overlapping channels		Complies
15.247 (a)(1)(iii)	Avg Time of Occupancy	< 8 dBm		Complies
15.207(a)	AC Power Line conducted emissions	Section 11	Power Line conducted	Complies
15.205, 15.209	Radiated Spurious Emission	< 54dBuV/m(Av)	Radiated	Complies

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

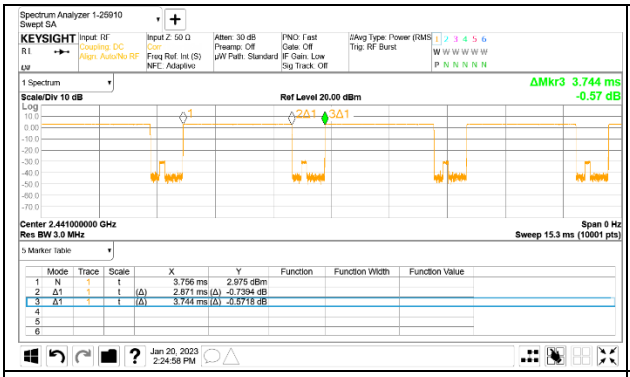
LIMITS

None; for reporting purposes only.

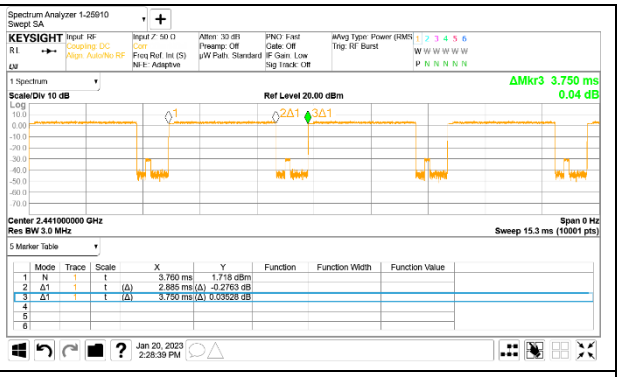
PROCEDURE

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

ON TIME AND DUTY CYCLE RESULTS



1-DH5



3-DH5

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					
BDR	2.871	3.744	76.683	1.153	0.348
EDR	2.885	3.750	76.933	1.139	0.347

9.2. 20 dB BANDWIDTH

LIMITS

None; for reporting purposes only.

TEST PROCEDURE

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

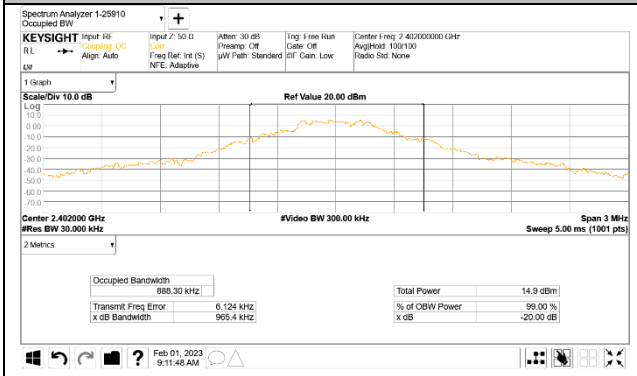
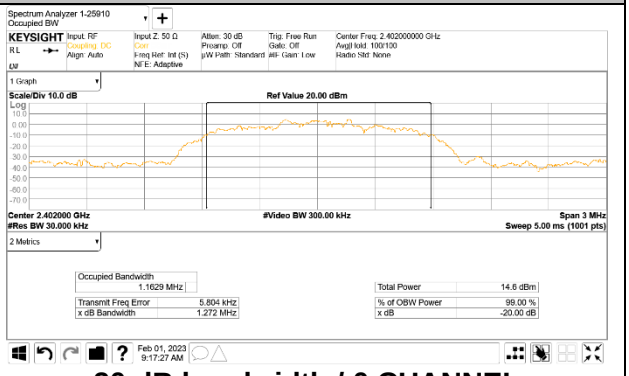
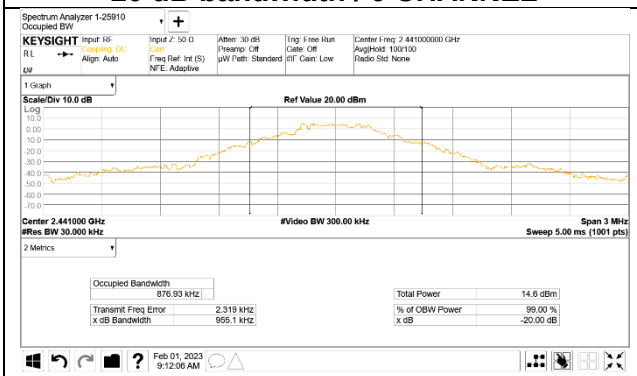
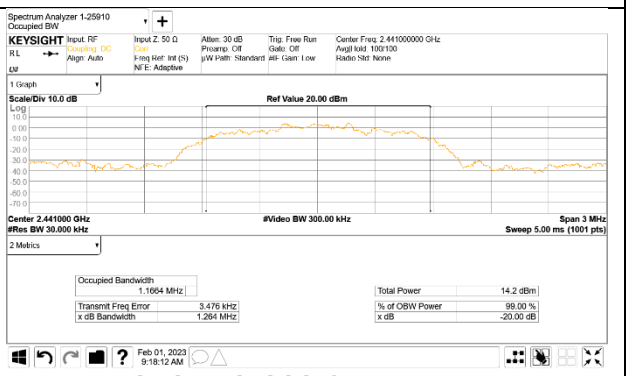
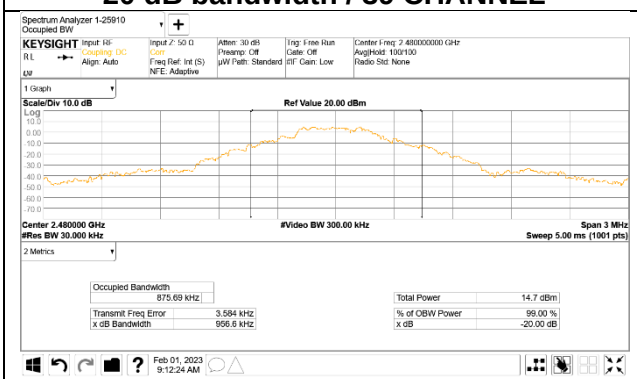
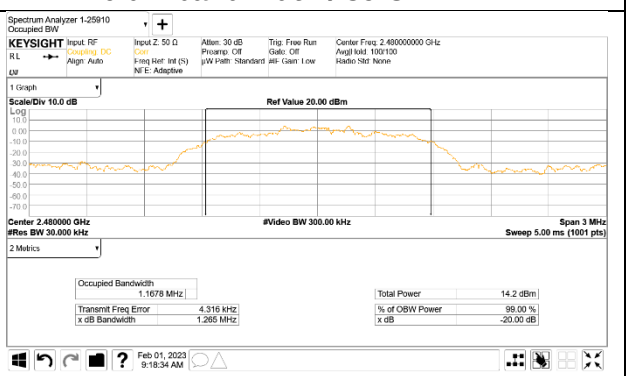
RESULTS

9.2.1. BLUETOOTH BASIC DATA RATE GFSK MODULATION

Channel	Frequency [MHz]	20 dB Bandwidth [kHz]
0	**2 402**	**965.4**
39	2 441	955.1
78	2 480	956.6
Worst		**965.4**

9.2.2. BLUETOOTH ENHANCED DATA RATE 8PSK MODULATION

Channel	Frequency [MHz]	20 dB Bandwidth [kHz]
0	**2 402**	**1 272.0**
39	2 441	1 264.0
78	2 480	1 265.0
Worst		**1 272.0**

BDR	EDR
	
20 dB bandwidth / 0 CHANNEL	**20 dB bandwidth / 0 CHANNEL**
	
20 dB bandwidth / 39 CHANNEL	**20 dB bandwidth / 39 CHANNEL**
	
20 dB bandwidth / 78 CHANNEL	**20 dB bandwidth / 78 CHANNEL**

9.3. HOPPING FREQUENCY SEPARATION

LIMITS

FCC §15.247 (a) (1)

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

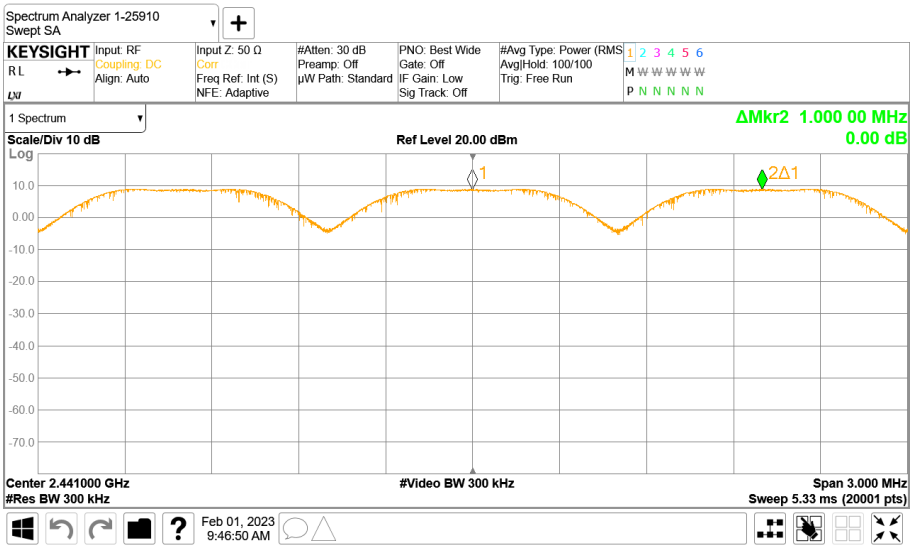
Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than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

TEST PROCEDURE

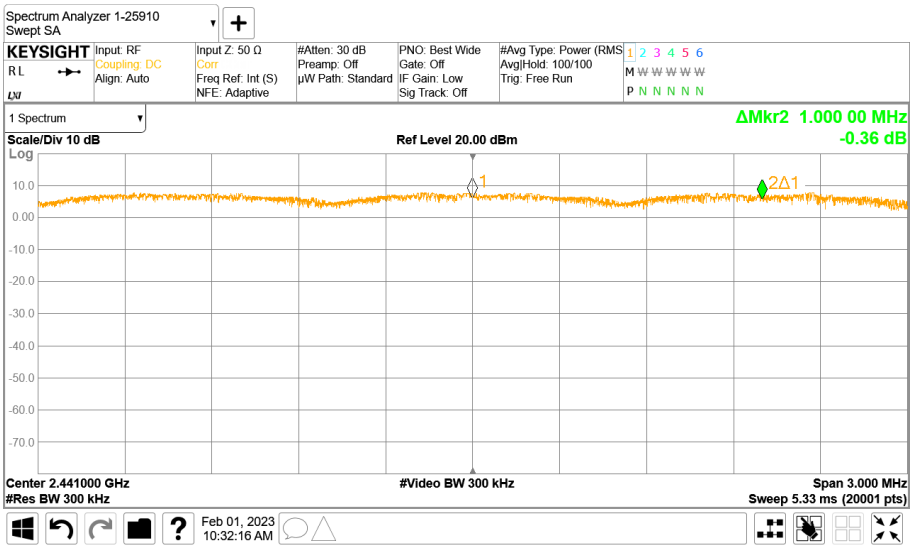
The transmitter output is connected to a spectrum analyzer. Start with the RBW set to approximately 30% of the channel spacing; adjust as necessary to best identify the center of each individual channel. The VBW is set to VBW >= RBW. The sweep time is coupled.

RESULTS

9.3.1. BLUETOOTH BASIC DATA RATE GFSK MODULATION



9.3.2. BLUETOOTH ENHANCED DATA RATE 8PSK MODULATION



9.4. NUMBER OF HOPPING CHANNELS

LIMITS

FCC §15.247 (a) (1) (iii)

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

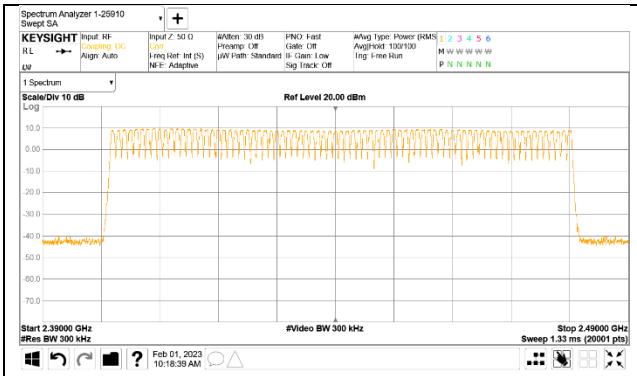
TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer. The span is set to cover the entire authorized band, in either a single sweep or in multiple contiguous sweeps. To identify clearly the individual channels, set the RBW to less than 30% of the channel spacing or the 20 dB bandwidth, whichever is smaller. The analyzer is set to Max Hold.

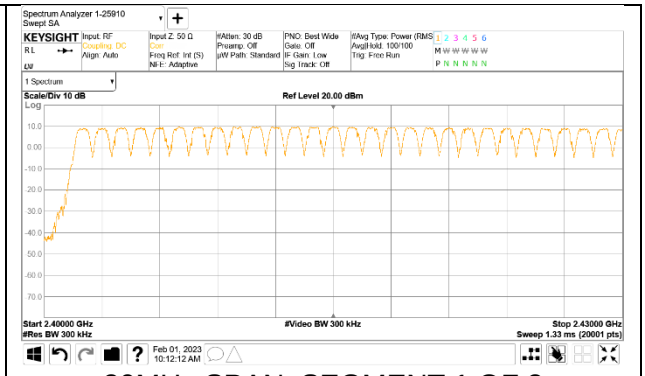
RESULTS

Normal Mode: All Channels Observed

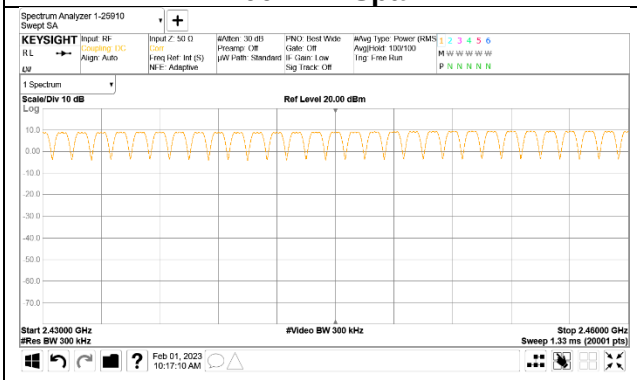
9.4.1. BLUETOOTH BASIC DATA RATE GFSK MODULATION



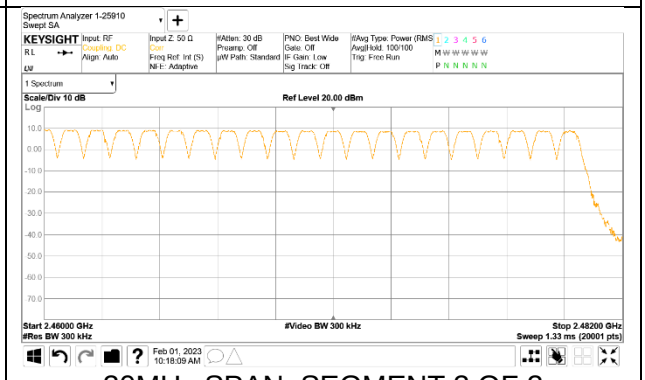
100 MHz Span



30MHz SPAN, SEGMENT 1 OF 3

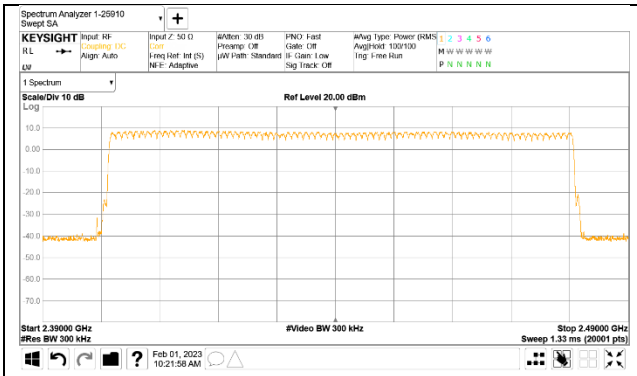


30MHz SPAN, SEGMENT 2 OF 3

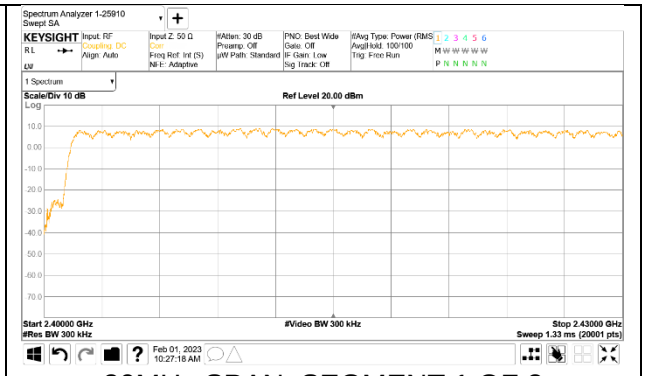


30MHz SPAN, SEGMENT 3 OF 3

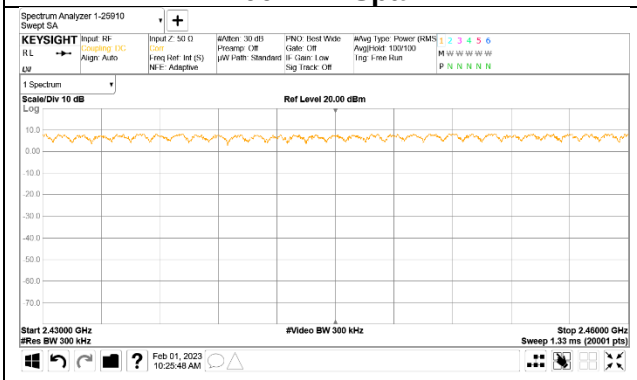
9.4.2. BLUETOOTH ENHANCED DATA RATE 8PSK MODULATION



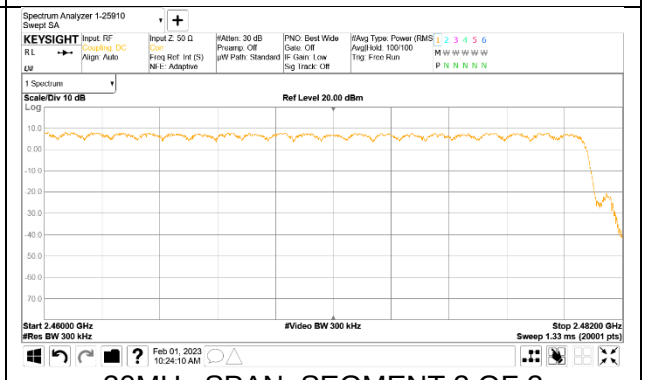
100 MHz Span



30MHz SPAN, SEGMENT 1 OF 3



30MHz SPAN, SEGMENT 2 OF 3



30MHz SPAN, SEGMENT 3 OF 3

9.5. AVERAGE TIME OF OCCUPANCY

LIMITS

FCC §15.247 (a) (1) (iii)

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

TEST PROCEDURE

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

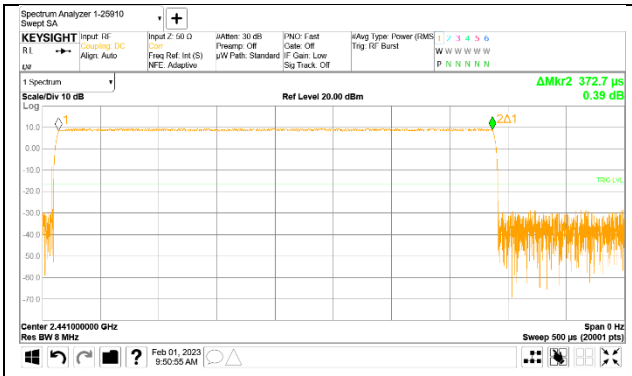
The average time of occupancy in the specified 3.16 second period (79 channels * 0.4 s) is equal to 10 * (# of pulses in 3.16 s) * pulse width.

For AFH mode, the average time of occupancy in the specified 8 second period (20 channels * 0.4 seconds) is equal to 10 * (# of pulses in 0.8 s) * 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	0.373	32	0.119	0.4	-0.281
DH3	1.628	17	0.277	0.4	-0.123
DH5	2.874	11	0.316	0.4	-0.084
DH Packet	**Pulse Width [msec]**	**Number of Pulses in 0.8 seconds**	**Average Time of Occupancy [sec]**	**Limit [sec]**	**Margin [sec]**
GFSK AFH					
DH1	0.373	8	0.030	0.4	-0.370
DH3	1.628	5	0.081	0.4	-0.319
DH5	2.874	3	0.086	0.4	-0.314

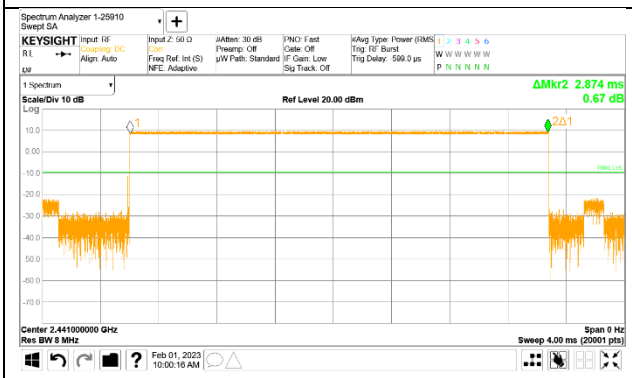


PULSE WIDTH – DH1

NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD – DH1

PULSE WIDTH – DH3

NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD – DH3



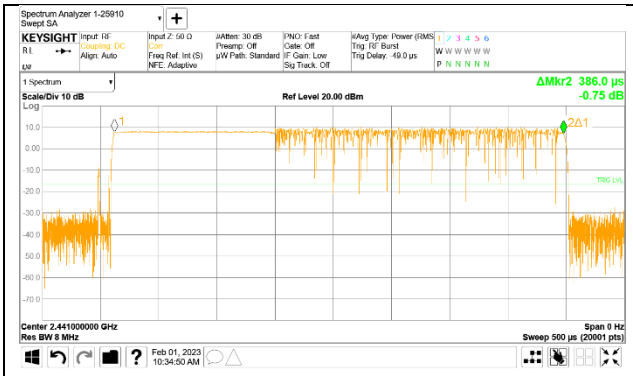
PULSE WIDTH – DH5

NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD – DH5

9.5.2. BLUETOOTH ENHANCED DATA RATE 8PSK MODULATION

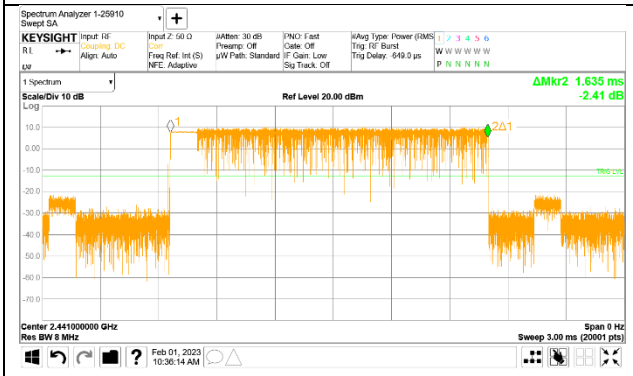
DH Packet	Pulse Width [msec]	Number of Pulses in 3.16 seconds	Average Time of Occupancy [sec]	Limit [sec]	Margin [sec]
GFSK Normal					
DH1	0.386	32	0.124	0.4	-0.276
DH3	1.635	17	0.278	0.4	-0.122
DH5	2.887	11	0.318	0.4	-0.082
DH Packet	**Pulse Width [msec]**	**Number of Pulses in 0.8 seconds**	**Average Time of Occupancy [sec]**	**Limit [sec]**	**Margin [sec]**
GFSK AFH					
DH1	0.386	8	0.031	0.4	-0.369
DH3	1.635	5	0.082	0.4	-0.318
DH5	2.887	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. OUTPUT POWER

LIMITS

§15.247 (b) (1)
The maximum antenna gain is less than 6 dBi, therefore the limit is 21 dBm.

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

RESULTS

9.6.1. BASIC DATA RATE GFSK MODULATION

Channel	Frequency [MHz]	Peak Output Power [dBm]	Limit [dBm]	Margin [dB]
0	2 402	**9.59**	21.00	**-11.41**
39	2 441	9.00		-12.00
78	2 480	9.20		-11.80
Worst		**9.59**		**-11.41**

9.6.2. ENHANCED DATA RATE Pi/4-DPSK MODULATION

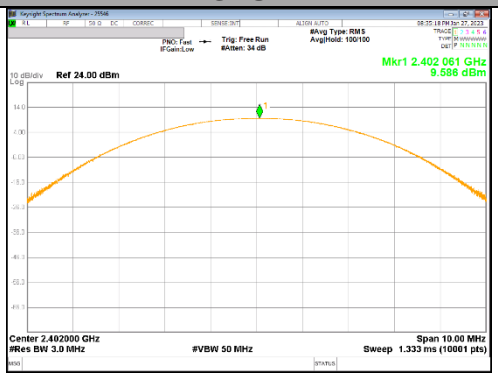
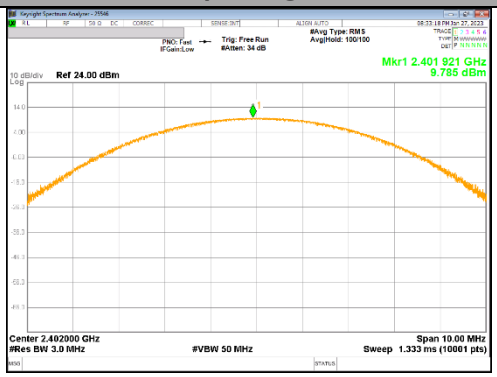
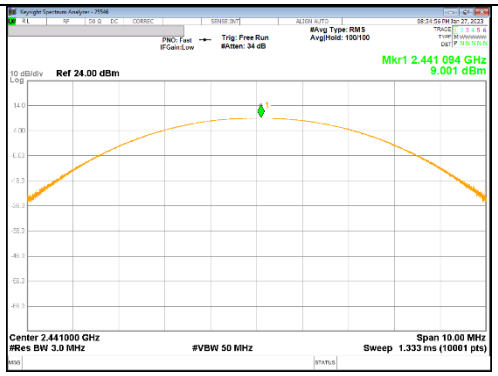
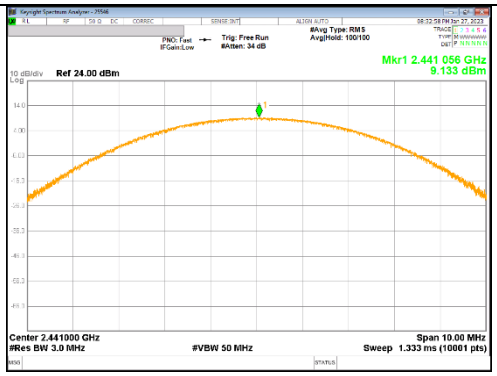
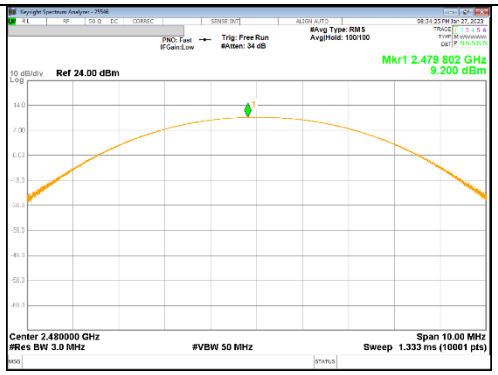
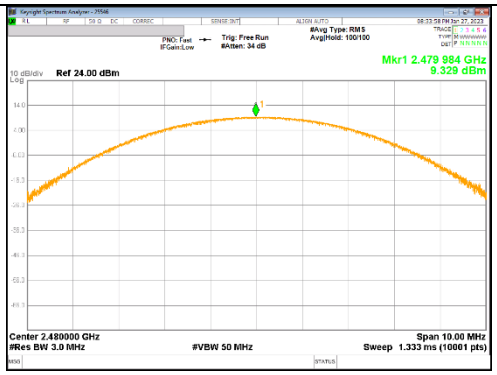
Channel	Frequency [MHz]	Peak Output Power [dBm]	Limit [dBm]	Margin [dB]
0	2 402	**9.79**	21.00	**-11.21**
39	2 441	9.13		-11.87
78	2 480	9.33		-11.67
Worst		**9.79**		**-11.21**

9.6.3. ENHANCED DATA RATE 8PSK MODULATION

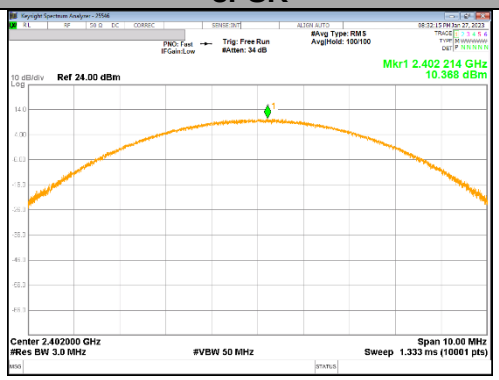
Channel	Frequency [MHz]	Peak Output Power [dBm]	Limit [dBm]	Margin [dB]
0	2 402	**10.37**	21.00	**-10.63**
39	2 441	9.83		-11.17
78	2 480	10.02		-10.98
Worst		**10.37**		**-10.63**

9.6.4. OUTPUT POWER PLOTS

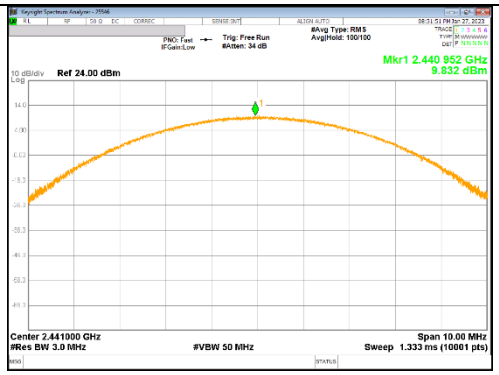
PEAK OUTPUT POWER

GFSK	Pi/4-DPSK
	
0 CHANNEL	**0 CHANNEL**
	
39 CHANNEL	**39 CHANNEL**
	
78 CHANNEL	**78 CHANNEL**

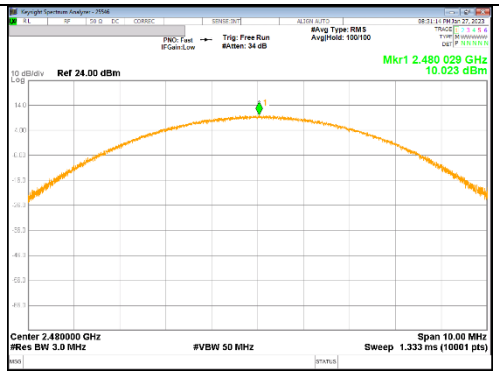
8PSK



0 CHANNEL



39 CHANNEL



78 CHANNEL

9.7. AVERAGE POWER

LIMITS

None; for reporting purposes only

TEST PROCEDURE

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

RESULTS

9.7.1. BASIC DATA RATE GFSK MODULATION

Channel	Frequency [MHz]	Average Output Power [dBm]	Average Output Power [mW]
0	2 402	8.731	7.465
39	2 441	8.433	6.970
78	2 480	8.636	7.304

9.7.2. ENHANCED DATA RATE PI/4-DQPSK MODULATION

Channel	Frequency [MHz]	Average Output Power [dBm]	Average Output Power [mW]
0	2 402	7.533	5.667
39	2 441	7.000	5.012
78	2 480	7.225	5.279

9.7.3. ENHANCED DATA RATE 8PSK MODULATION

Channel	Frequency [MHz]	Average Output Power [dBm]	Average Output Power [mW]
0	2 402	7.510	5.637
39	2 441	6.960	4.966
78	2 480	7.174	5.217

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.

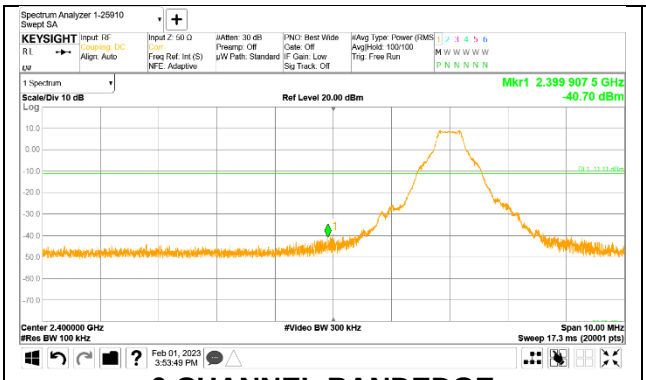
The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels.

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

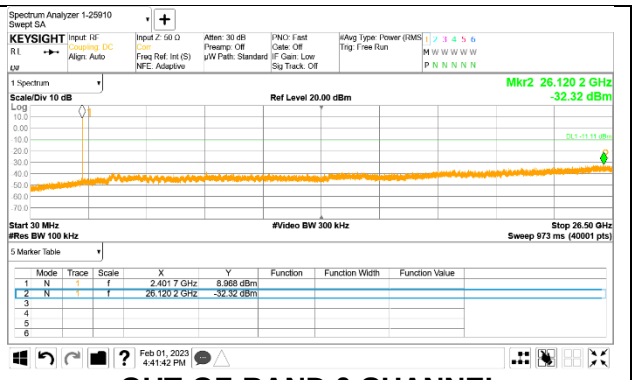
RESULTS

9.8.1. BLUETOOTH BASIC DATA RATE GFSK MODULATION

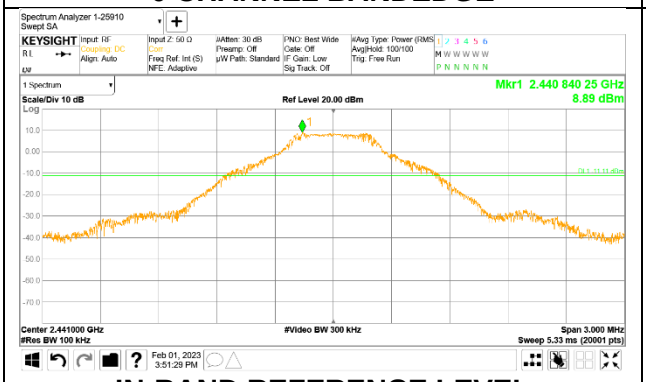
SPURIOUS EMISSIONS, NON-HOPPING



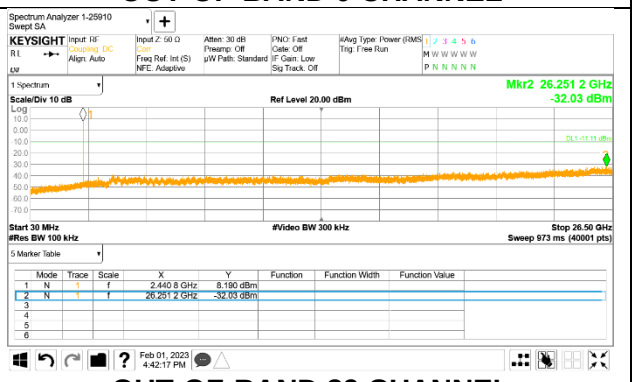
0 CHANNEL BANDEDGE



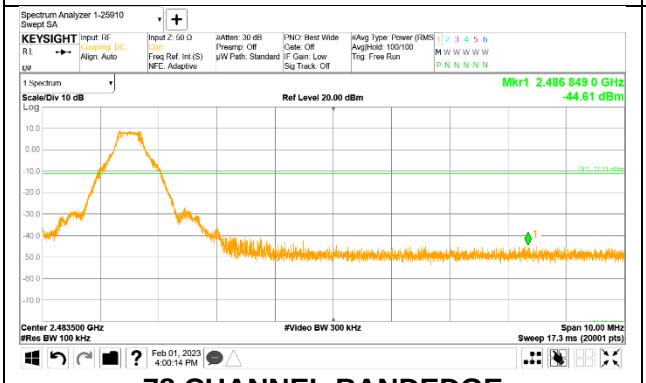
OUT-OF-BAND 0 CHANNEL



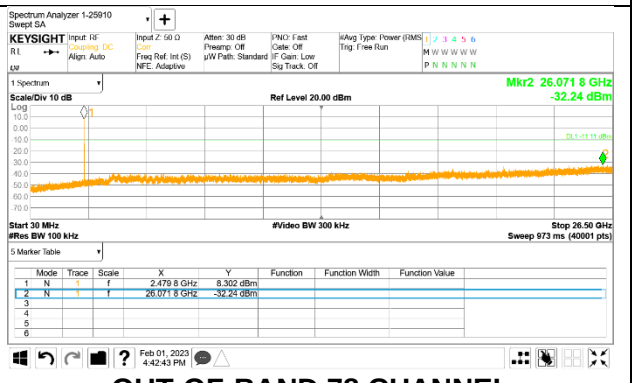
IN-BAND REFERENCE LEVEL



OUT-OF-BAND 39 CHANNEL

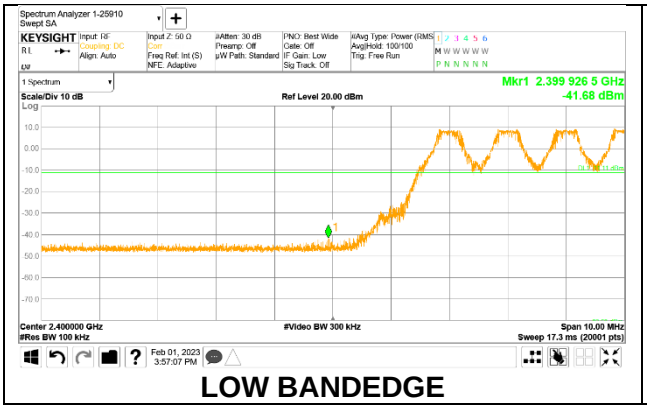


78 CHANNEL BANDEDGE

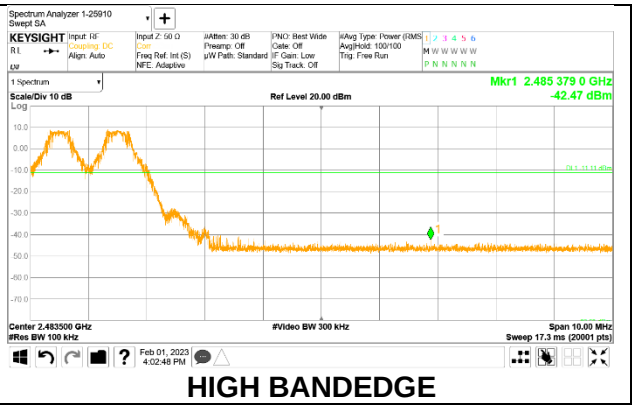


OUT-OF-BAND 78 CHANNEL

SPURIOUS BANDEDGE EMISSIONS WITH HOPPING ON



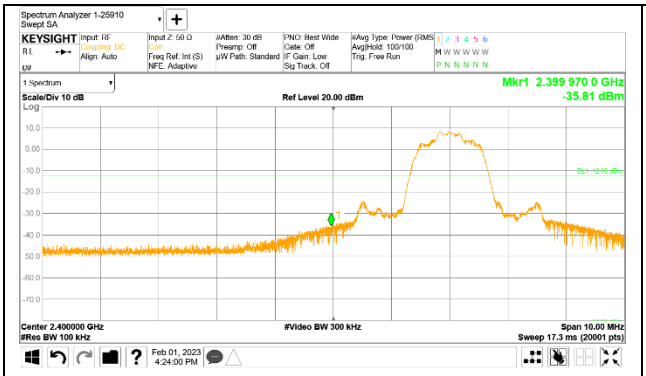
LOW BANDEDGE



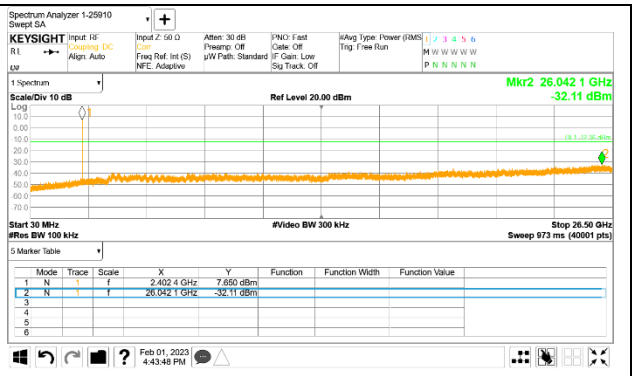
HIGH BANDEDGE

9.8.2. BLUETOOTH ENHANCED DATA RATE 8PSK MODULATION

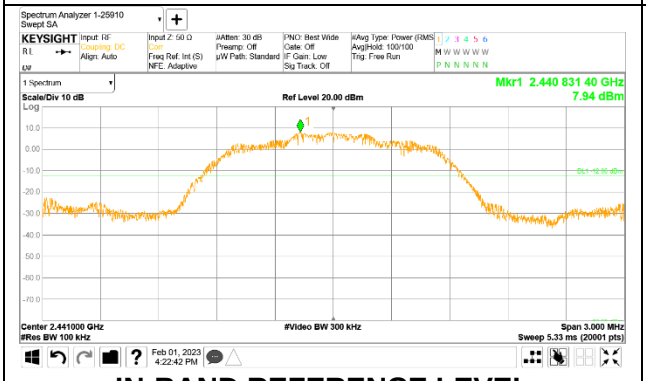
SPURIOUS EMISSIONS, NON-HOPPING



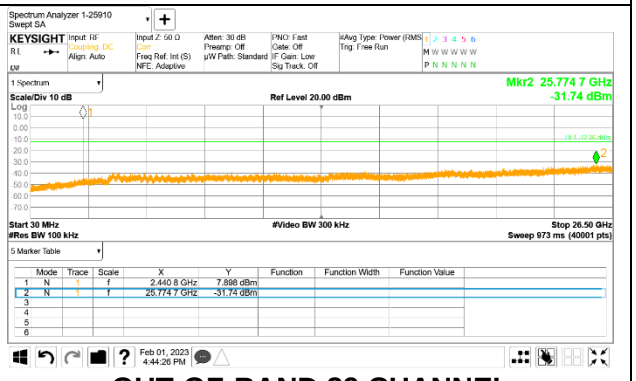
0 CHANNEL BANDEDGE



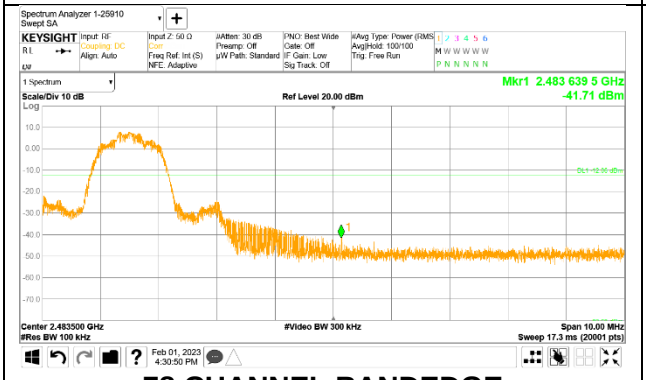
OUT-OF-BAND 0 CHANNEL



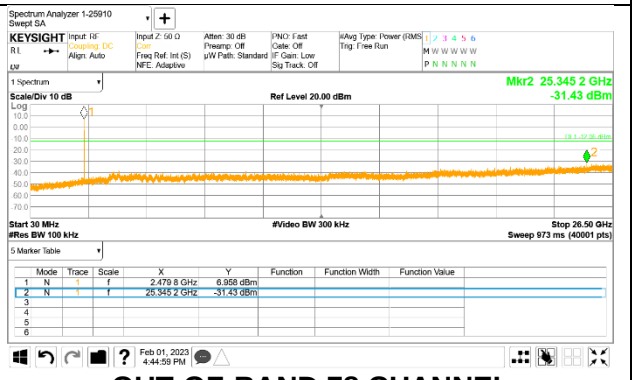
IN-BAND REFERENCE LEVEL



OUT-OF-BAND 39 CHANNEL

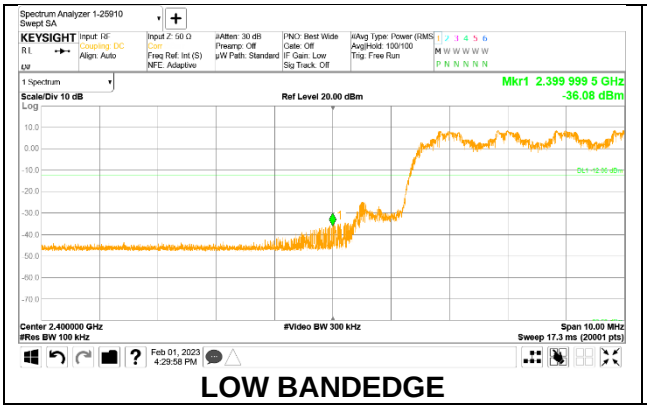


78 CHANNEL BANDEDGE

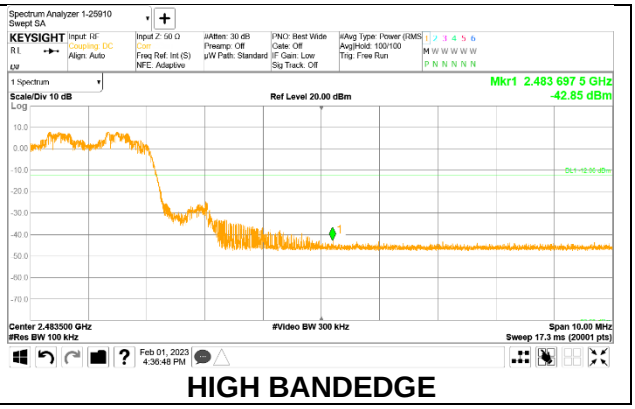


OUT-OF-BAND 78 CHANNEL

SPURIOUS BANDEDGE EMISSIONS WITH HOPPING ON



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.

GFSK = 1/T = 1 / 0.00287s = 348Hz.

The minimum VBW was 348Hz, but test receiver(ESU40) couldn’t set value 348Hz. Due to this reason, testing VBW was set to 500Hz(Worst cases).

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

The frequency range of interest is monitored at a fixed antenna height and EUT azimuth. The EUT is rotated through 360 degrees to maximize emissions received. The antenna is scanned from 1 to 4 meters above the ground plane to further maximize the emission. Measurements are made with the antenna polarized in both the vertical and the horizontal positions.

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

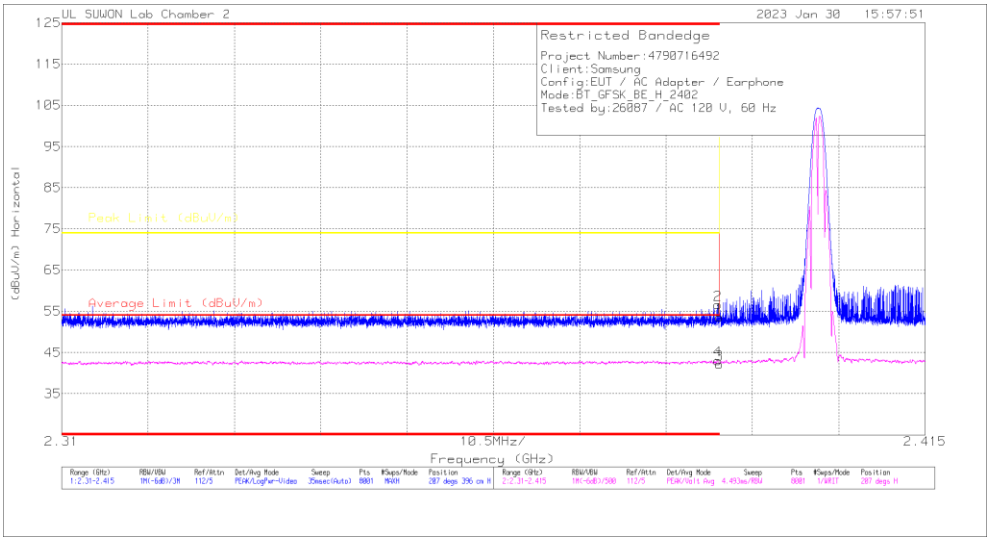
Although these tests were performed other than open field test site, adequate comparison measurements were confirmed against 30 m open are test site.
Therefore sufficient tests were made to demonstrate that the alternative site produces results that correlate with the one of tests made in an open field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

10.1. TRANSMITTER ABOVE 1 GHz

10.1.1. BLUETOOTH BASIC DATA RATE GFSK MODULATION

BANDEDGE (0 CHANNEL)

HORIZONTAL RESULT



Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	3117_00168724	10dB_ATT[dB]	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.39	41.58	Pk	31.7	-19.7	53.58	-	-	74	-20.42	207	396	H
2	* 2.38981	44.59	Pk	31.7	-19.7	56.59	-	-	74	-17.41	207	396	H
3	* 2.39	30.2	VA1T	31.7	-19.7	42.2	54	-11.8	-	-	207	396	H
4	* 2.38977	31.09	VA1T	31.7	-19.7	43.09	54	-10.91	-	-	207	396	H

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

VERTICAL RESULT

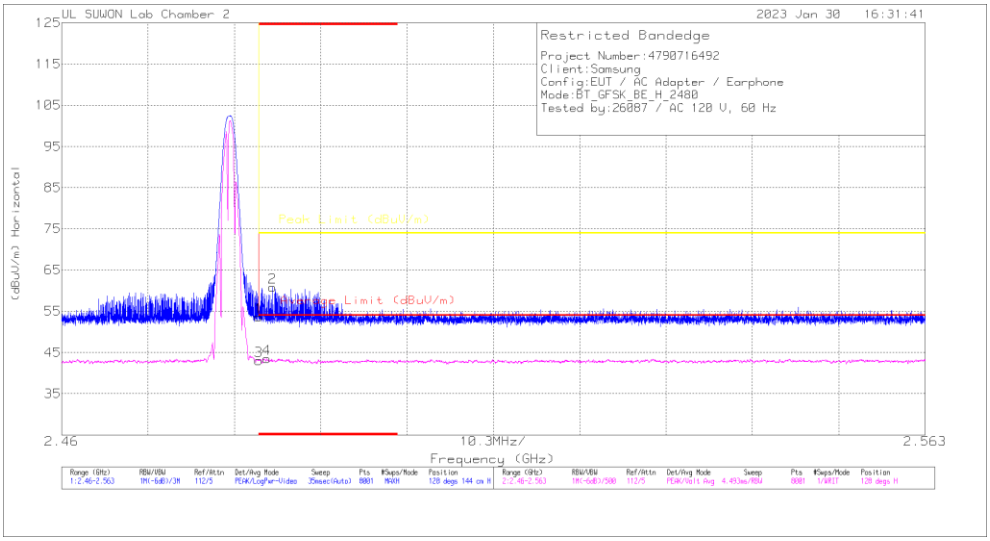
Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	3117_00168724	10dB_ATT[dB]	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.39	40.91	Pk	31.7	-19.7	52.91	-	-	74	-21.09	64	103	V
2	* 2.3888	44.5	Pk	31.7	-19.6	56.6	-	-	74	-17.4	64	103	V
3	* 2.39	30.29	VA1T	31.7	-19.7	42.29	54	-11.71	-	-	64	103	V
4	* 2.3887	30.94	VA1T	31.7	-19.6	43.04	54	-10.96	-	-	64	103	V

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

BANDEDGE (78 CHANNEL)

HORIZONTAL RESULT

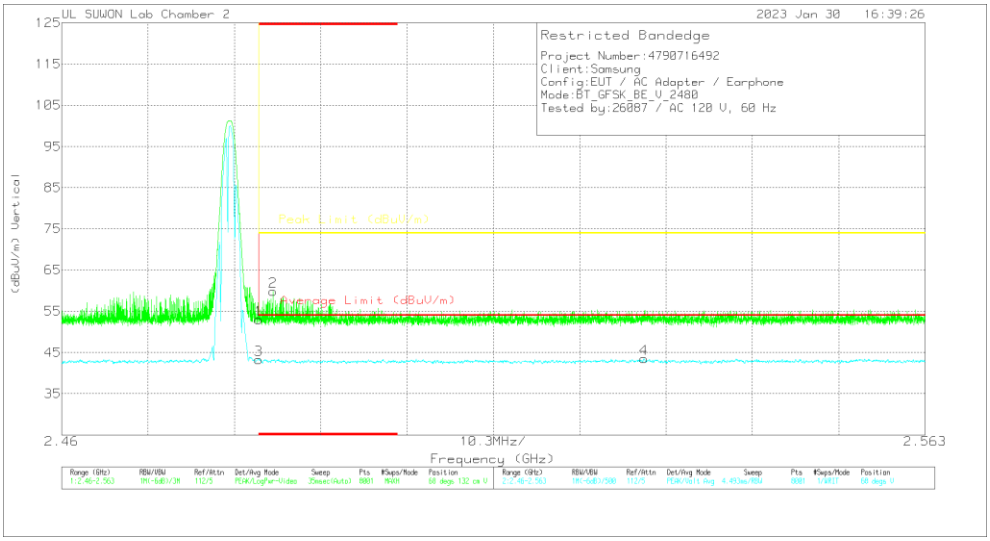


Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	3117_00168724	10dB_ATT[dB]	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.48351	41.27	Pk	31.9	-19.6	53.57	-	-	74	-20.43	128	144	H
2	* 2.48517	48.58	Pk	31.9	-19.6	60.88	-	-	74	-13.12	128	144	H
3	* 2.48351	30.76	VA1T	31.9	-19.6	43.06	54	-10.94	-	-	128	144	H
4	* 2.48449	31.18	VA1T	31.9	-19.6	43.48	54	-10.52	-	-	128	144	H

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

VERTICAL RESULT



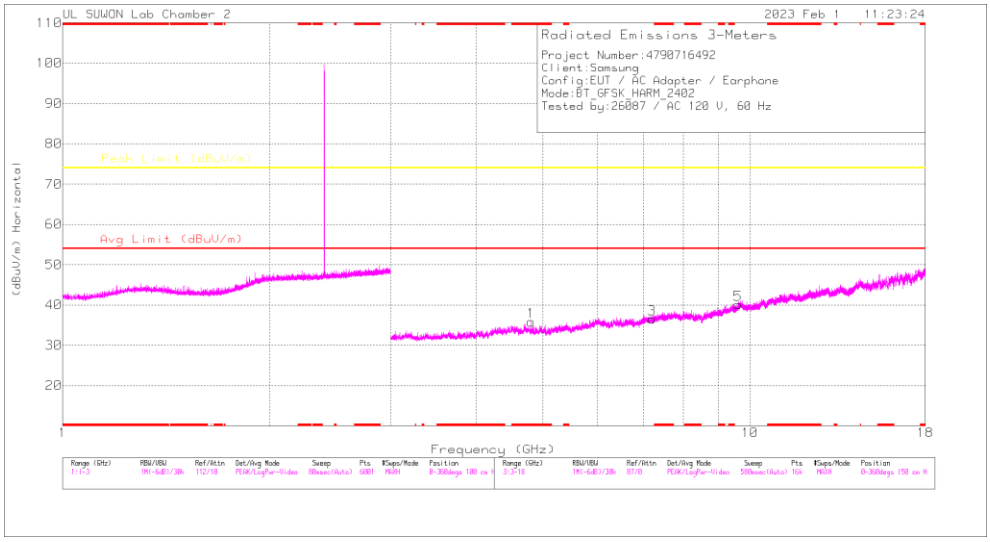
Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	3117_00168724	10dB_ATT[dB]	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.48351	40.73	Pk	31.9	-19.6	53.03	-	-	74	-20.97	68	132	V
2	* 2.4852	47.53	Pk	31.9	-19.6	59.83	-	-	74	-14.17	68	132	V
3	* 2.48351	30.93	VA1T	31.9	-19.6	43.23	54	-10.77	-	-	68	132	V
4	2.52945	31.03	VA1T	31.9	-19.4	43.53	54	-10.47	-	-	68	132	V

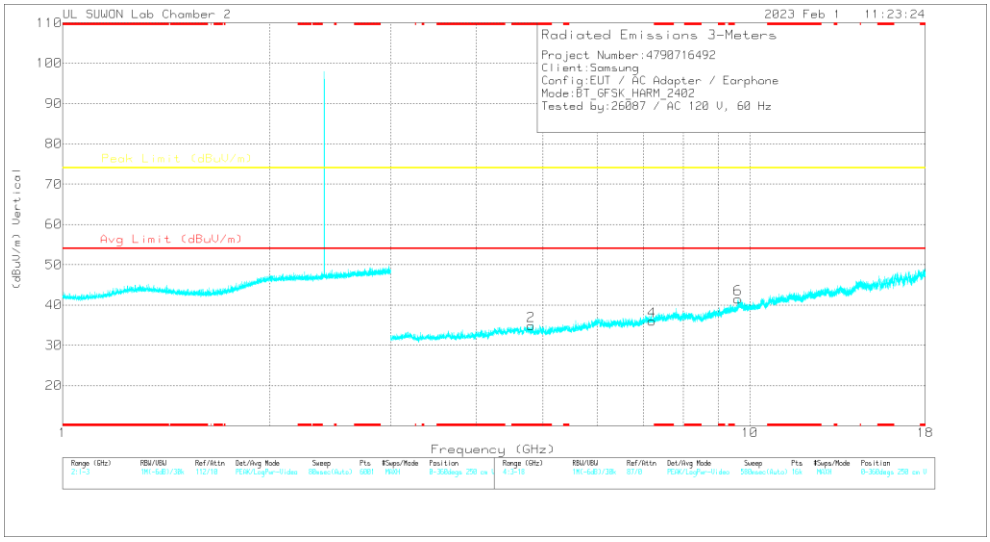
* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
Pk - Peak detector
VA1T - FHSS: Linear Voltage Average VB=1/Ton where: Ton is transmit duration

HARMONICS AND SPURIOUS EMISSIONS

0 CHANNEL RESULTS



HORIZONTAL



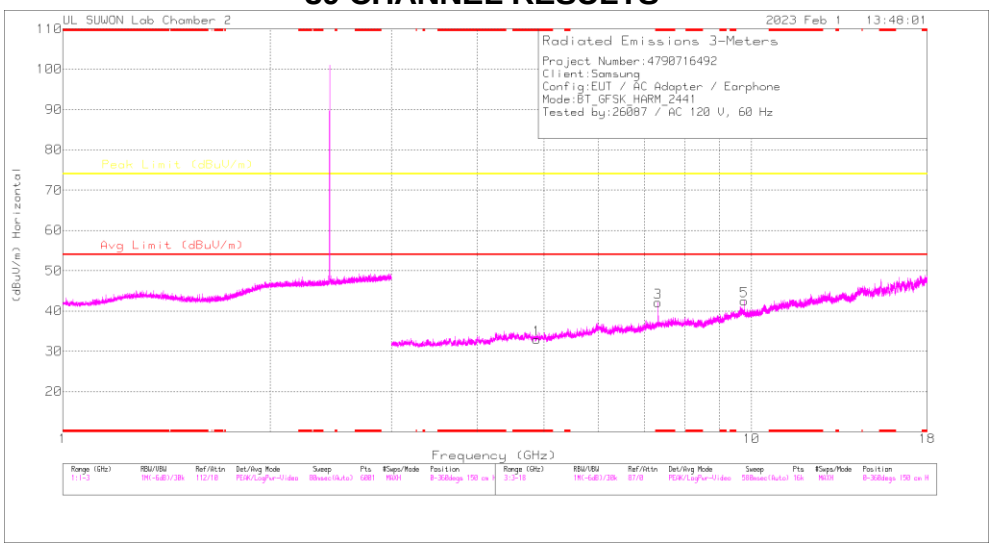
VERTICAL

Radiated Emissions

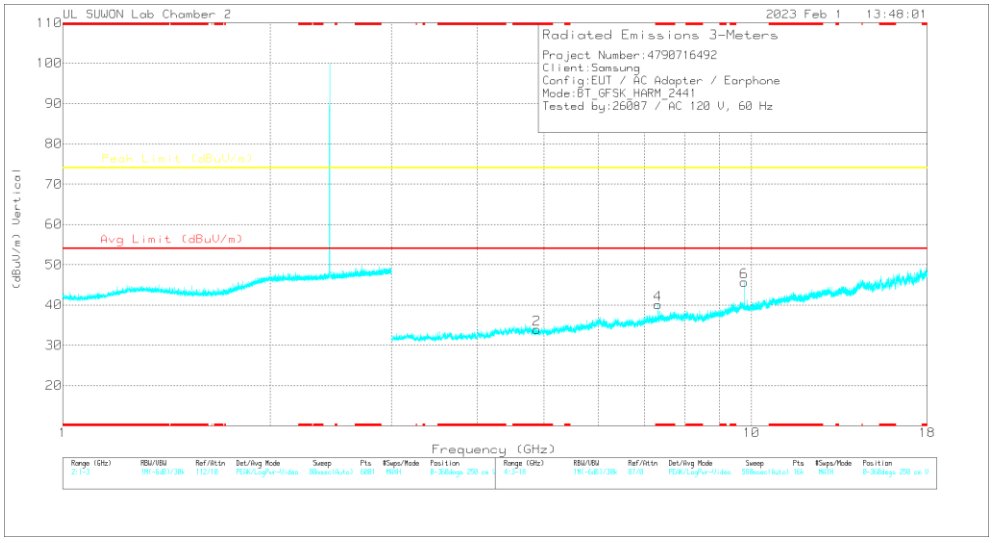
Frequency (GHz)	Meter Reading (dBuV)	Det	3117_0016872 4	3GHz_HP[dB]	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
* 4.80388	36.82	PKFH	34	-27.7	43.12	-	-	74	-30.88	193	113	H
* 4.804	28.43	VA1T	34	-27.7	34.73	54	-19.27	-	-	193	113	H
* 4.80382	35.62	PKFH	34	-27.7	41.92	-	-	74	-32.08	84	102	V
* 4.80408	26.63	VA1T	34	-27.7	32.93	54	-21.07	-	-	84	102	V
7.20054	33.9	PKFH	35.7	-25	44.6	-	-	74	-29.4	162	105	H
7.2065	34.52	PKFH	35.7	-25	45.22	-	-	74	-28.78	134	140	V
9.61298	31.86	PKFH	36.9	-21.2	47.56	-	-	74	-26.44	152	103	H
9.60792	34.09	PKFH	36.9	-21.3	49.69	-	-	74	-24.31	187	111	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



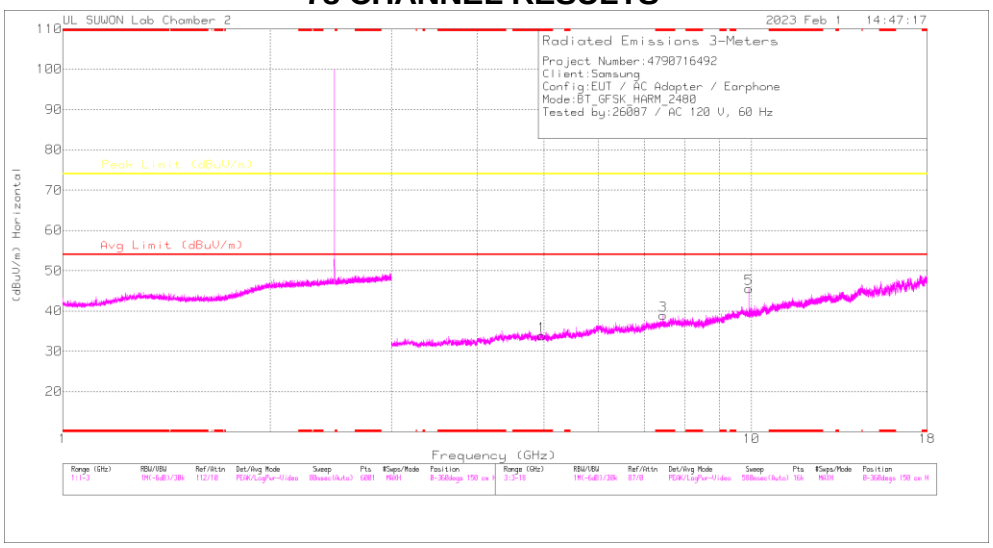
VERTICAL

Radiated Emissions

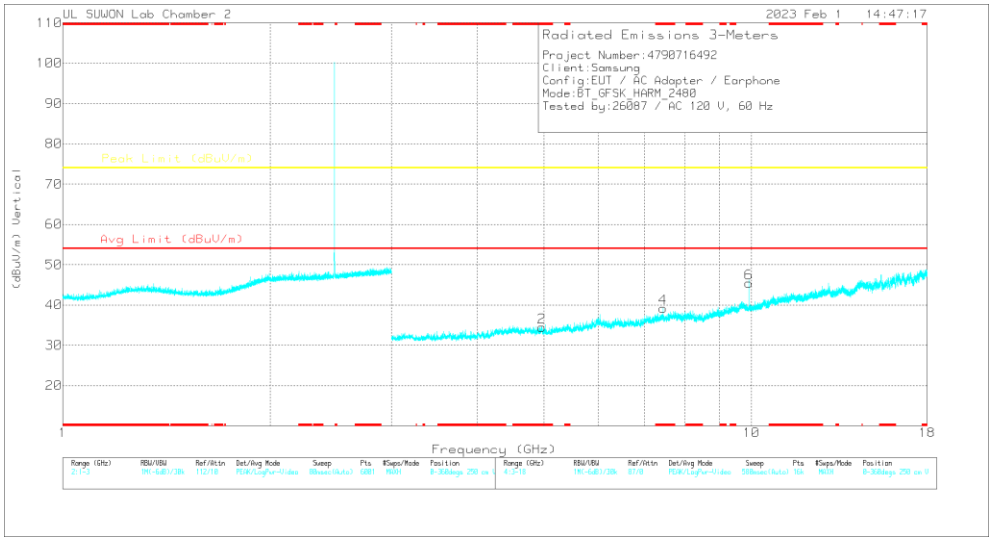
Frequency (GHz)	Meter Reading (dBuV)	Det	3117_0016872 4	3GHz_HP[dB]	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
* 4.88404	34.51	PKFH	34	-27.6	40.91	-	-	74	-33.09	173	264	H
* 4.88204	23.71	VA1T	34	-27.6	30.11	54	-23.89	-	-	173	264	H
* 4.87492	34.75	PKFH	34	-27.7	41.05	-	-	74	-32.95	196	100	V
* 4.88202	24.69	VA1T	34	-27.6	31.09	54	-22.91	-	-	196	100	V
* 7.32327	36.76	PKFH	35.7	-24.4	48.06	-	-	74	-25.94	161	100	H
* 7.32307	29.03	VA1T	35.7	-24.5	40.23	54	-13.77	-	-	161	100	H
* 7.32258	36.54	PKFH	35.7	-24.5	47.74	-	-	74	-26.26	125	116	V
* 7.32298	28.91	VA1T	35.7	-24.5	40.11	54	-13.89	-	-	125	116	V
9.76486	34.86	PKFH	37.1	-21	50.96	-	-	74	-23.04	146	100	H
9.76341	35.63	PKFH	37.1	-21	51.73	-	-	74	-22.27	174	120	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

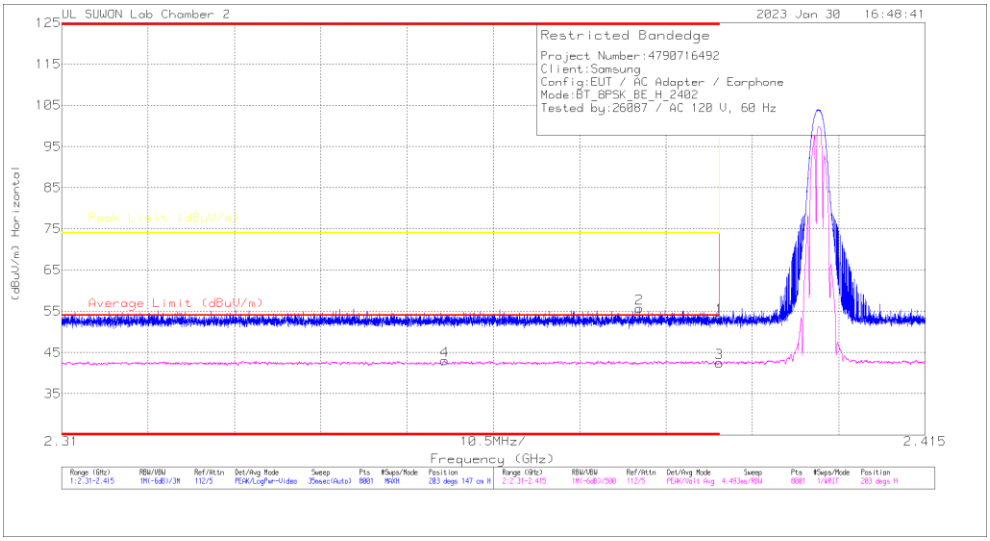
Frequency (GHz)	Meter Reading (dBuV)	Det	3117_0016872 4	3GHz_HP[dB]	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
* 4.96017	36.11	PKFH	34	-27	43.11	-	-	74	-30.89	164	100	H
* 4.95995	24.95	VA1T	34	-27	31.95	54	-22.05	-	-	164	100	H
* 4.95999	34.88	PKFH	34	-27	41.88	-	-	74	-32.12	192	101	V
* 4.95991	24.58	VA1T	34	-27	31.58	54	-22.42	-	-	192	101	V
* 7.43978	33.62	PKFH	35.7	-23.7	45.62	-	-	74	-28.38	132	104	H
* 7.44036	23.81	VA1T	35.7	-23.7	35.81	54	-18.19	-	-	132	104	H
* 7.44	33.63	PKFH	35.7	-23.7	45.63	-	-	74	-28.37	124	103	V
* 7.43976	23.49	VA1T	35.7	-23.7	35.49	54	-18.51	-	-	124	103	V
9.91973	37.38	PKFH	37.3	-21.1	53.58	-	-	74	-20.42	160	102	H
9.91951	37.57	PKFH	37.3	-21.1	53.77	-	-	74	-20.23	170	125	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

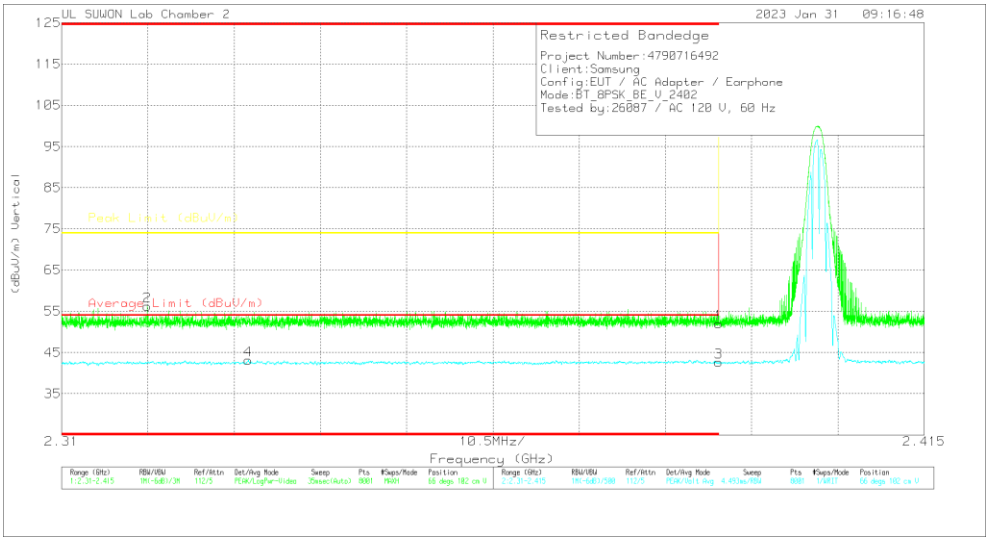


Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	3117_00168724	10dB_ATT[dB]	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.39	41.44	Pk	31.7	-19.7	53.44	-	-	74	-20.56	203	147	H
2	* 2.38027	43.59	Pk	31.7	-19.6	55.69	-	-	74	-18.31	203	147	H
3	* 2.39	30.47	VA1T	31.7	-19.7	42.47	54	-11.53	-	-	203	147	H
4	* 2.35657	31.02	VA1T	31.6	-19.6	43.02	54	-10.98	-	-	203	147	H

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

VERTICAL RESULT



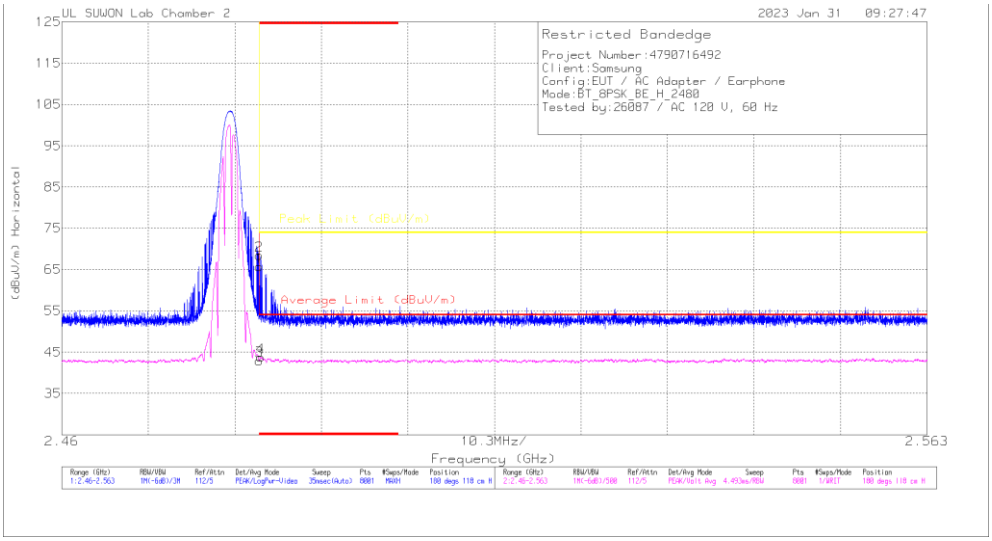
Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	3117_00168724	10dB_ATT[dB]	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.39	39.96	Pk	31.7	-19.7	51.96	-	-	74	-22.04	66	102	V
2	* 2.32042	44.19	Pk	31.6	-19.6	56.19	-	-	74	-17.81	66	102	V
3	* 2.39	30.67	VA1T	31.7	-19.7	42.67	54	-11.33	-	-	66	102	V
4	* 2.33273	31.04	VA1T	31.6	-19.5	43.14	54	-10.86	-	-	66	102	V

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

BANDEDGE (78 CHANNEL)

HORIZONTAL RESULT

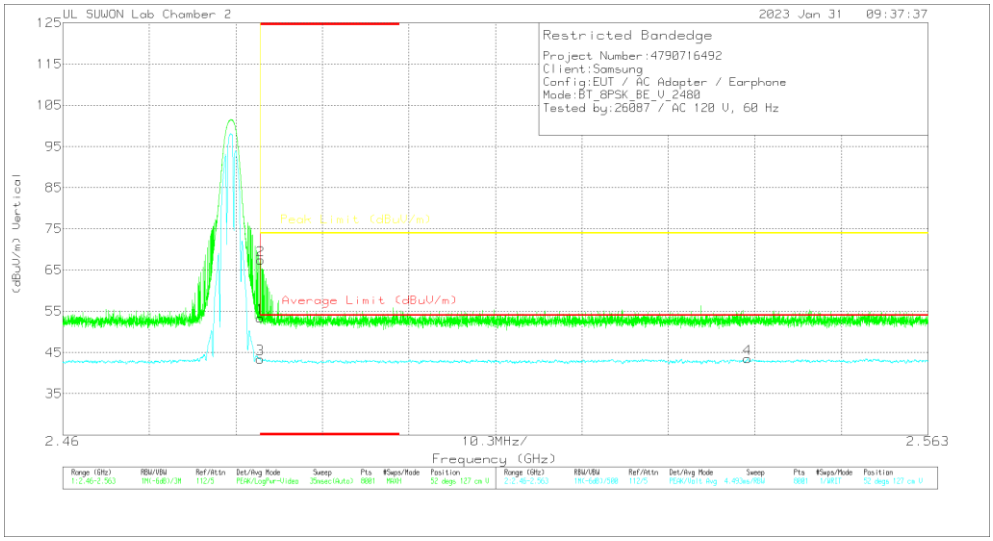


Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	3117_00168724	10dB_ATT[dB]	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.48351	53.39	Pk	31.9	-19.6	65.69	-	-	74	-8.31	180	118	H
2	* 2.48352	56.2	Pk	31.9	-19.6	68.5	-	-	74	-5.5	180	118	H
3	* 2.48351	30.66	VA1T	31.9	-19.6	42.96	54	-11.04	-	-	180	118	H
4	* 2.48365	31.49	VA1T	31.9	-19.6	43.79	54	-10.21	-	-	180	118	H

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

VERTICAL RESULT



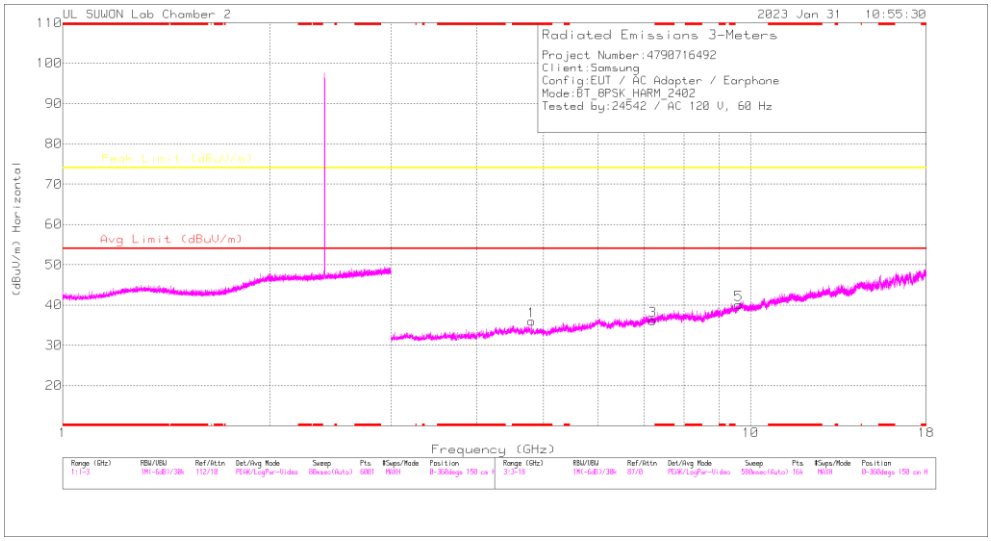
Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	3117_00168724	10dB_ATT[dB]	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.48351	41.13	Pk	31.9	-19.6	53.43	-	-	74	-20.57	52	127	V
2	* 2.48355	55.11	Pk	31.9	-19.6	67.41	-	-	74	-6.59	52	127	V
3	* 2.48351	31.16	VA1T	31.9	-19.6	43.46	54	-10.54	-	-	52	127	V
4	2.54154	30.89	VA1T	32	-19.4	43.49	54	-10.51	-	-	52	127	V

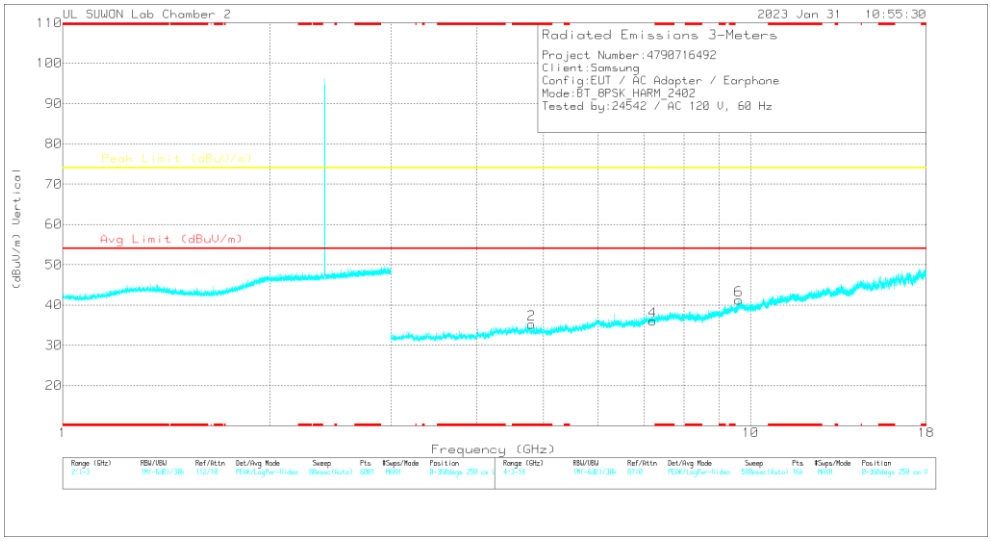
* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
Pk - Peak detector
VA1T - FHSS: Linear Voltage Average VB=1/Ton where: Ton is transmit duration

HARMONICS AND SPURIOUS EMISSIONS

0 CHANNEL RESULTS



HORIZONTAL



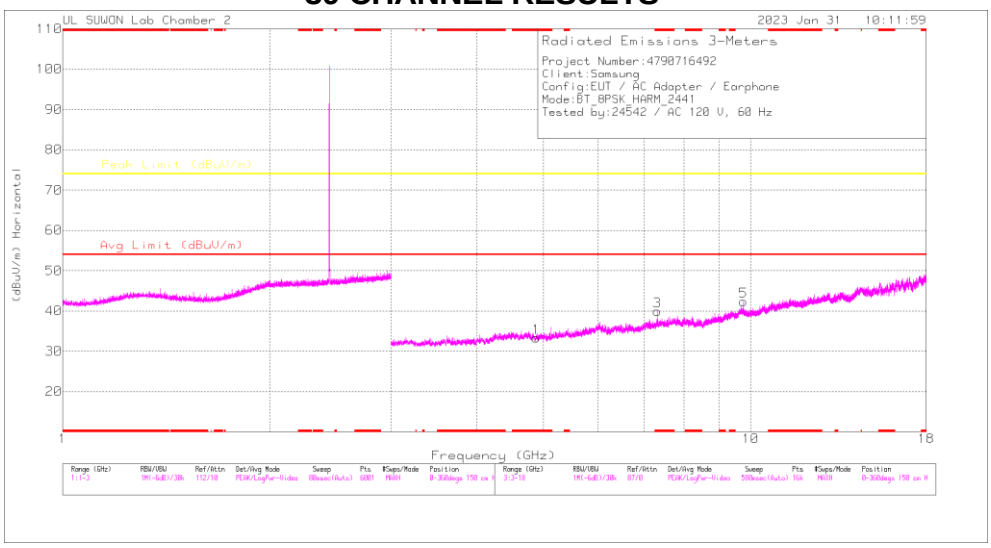
VERTICAL

Radiated Emissions

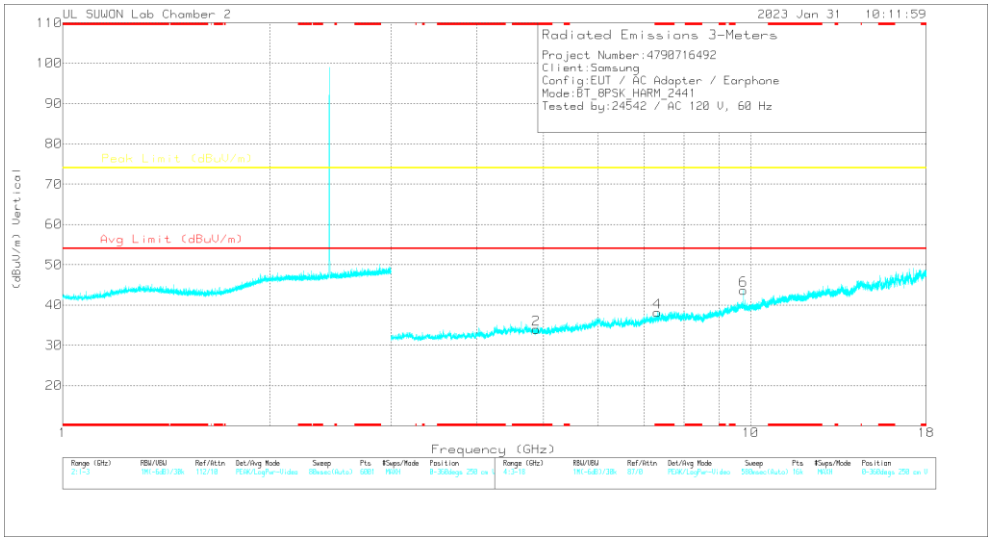
Frequency (GHz)	Meter Reading (dBuV)	Det	3117_0016872 4	3GHz_HP[dB]	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
* 4.80472	37.51	PKFH	34	-27.7	43.81	-	-	74	-30.19	190	106	H
* 4.80409	28.16	VA1T	34	-27.7	34.46	54	-19.54	-	-	190	106	H
* 4.80371	35.35	PKFH	34	-27.7	41.65	-	-	74	-32.35	91	110	V
* 4.8039	25.33	VA1T	34	-27.7	31.63	54	-22.37	-	-	91	110	V
7.20837	32.85	PKFH	35.7	-25.1	43.45	-	-	74	-30.55	0	100	H
7.19851	33.93	PKFH	35.6	-25	44.53	-	-	74	-29.47	0	100	V
9.60783	32.47	PKFH	36.9	-21.3	48.07	-	-	74	-25.93	163	101	H
9.60816	34.29	PKFH	36.9	-21.3	49.89	-	-	74	-24.11	189	106	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



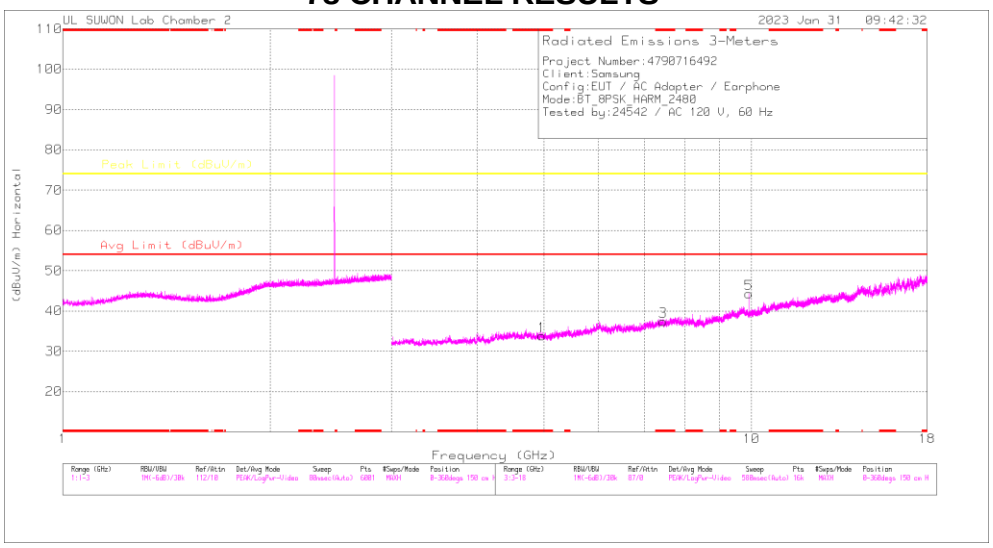
VERTICAL

Radiated Emissions

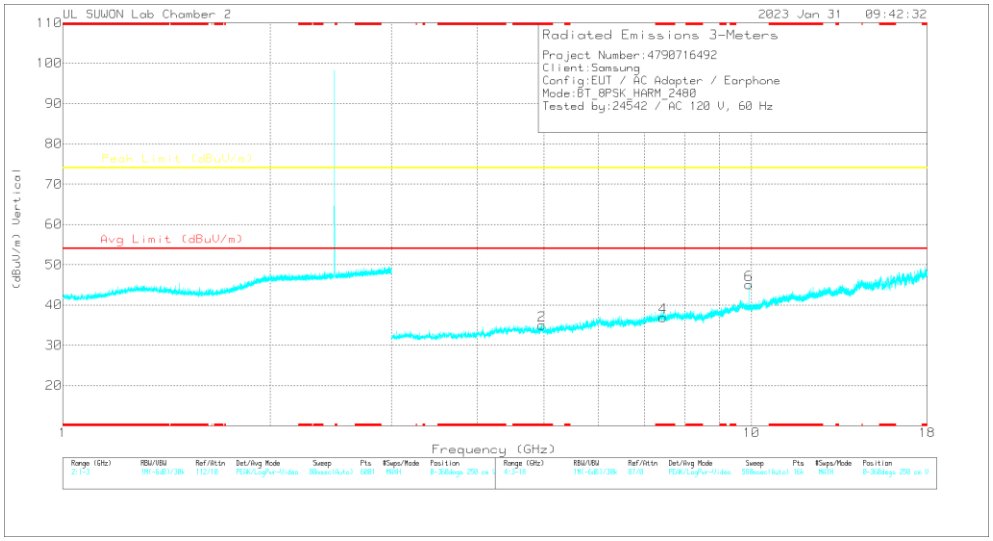
Frequency (GHz)	Meter Reading (dBuV)	Det	3117_0016872 4	3GHz_HP[dB]	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
* 4.88327	34.59	PKFH	34	-27.6	40.99	-	-	74	-33.01	0	100	H
* 4.88091	35.09	PKFH	34	-27.6	41.49	-	-	74	-32.51	0	100	V
* 7.32275	36.96	PKFH	35.7	-24.5	48.16	-	-	74	-25.84	160	100	H
* 7.3231	27.4	VA1T	35.7	-24.5	38.6	54	-15.4	-	-	160	100	H
* 7.32319	35.94	PKFH	35.7	-24.5	47.14	-	-	74	-26.86	130	128	V
* 7.32293	26.85	VA1T	35.7	-24.5	38.05	54	-15.95	-	-	130	128	V
9.76375	33.28	PKFH	37.1	-20.9	49.48	-	-	74	-24.52	152	103	H
9.76363	34.64	PKFH	37.1	-21	50.74	-	-	74	-23.26	174	129	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

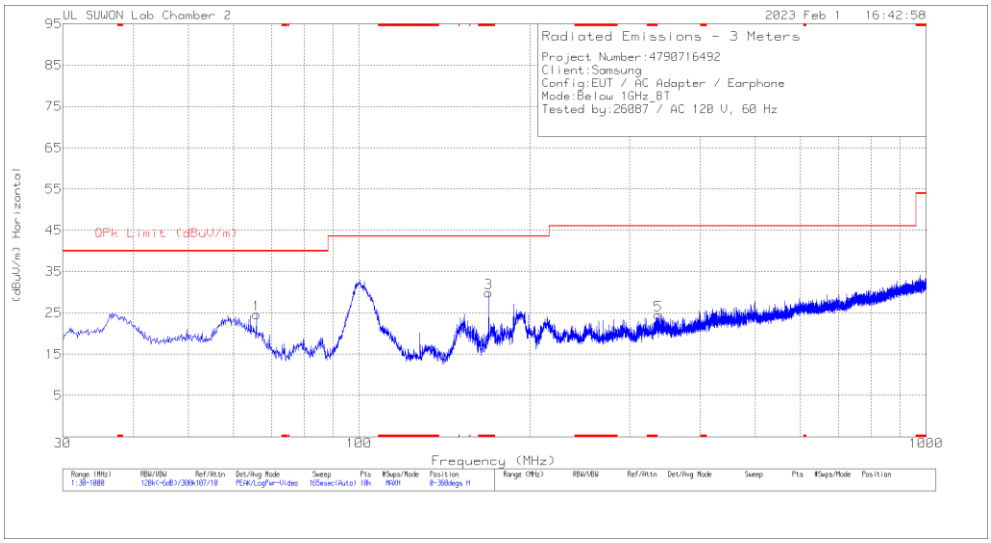
Radiated Emissions

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
* 4.95604	34.75	PKFH	34	-27.1	41.65	-	-	74	-32.35	0	100	H
* 4.96972	34.34	PKFH	34	-27	41.34	-	-	74	-32.66	0	100	V
* 7.43192	33.98	PKFH	35.7	-23.7	45.98	-	-	74	-28.02	0	100	H
* 7.44307	33.1	PKFH	35.7	-23.7	45.1	-	-	74	-28.9	0	100	V
9.92017	36.11	PKFH	37.3	-21.1	52.31	-	-	74	-21.69	163	102	H
9.92015	35.65	PKFH	37.3	-21.1	51.85	-	-	74	-22.15	171	100	V

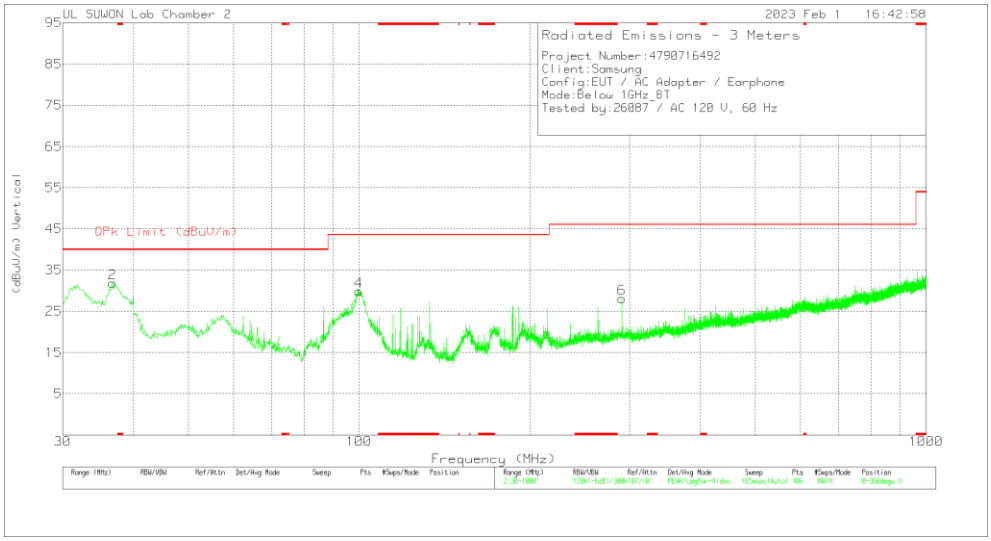
* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
PKFH FHSS/BT RB=100k for Frequencies<1GHz / RB=1MHz for Frequencies>1GHz, VB=3 x RB, Peak

10.2. WORST CASE BELOW 1 GHz

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



HORIZONTAL



VERTICAL

Trace Markers

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	VULB9163_749	Below 1G[dB]	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	65.89	38.73	Pk	17	-31.1	24.63	40	-15.37	0-360	300	H
3	* 169.195	45.3	Pk	14.6	-30	29.9	43.52	-13.62	0-360	100	H
5	337.199	33.24	Pk	20.1	-28.8	24.54	46.02	-21.48	0-360	100	H
2	36.693	45.95	Pk	17.4	-31.5	31.85	40	-8.15	0-360	100	V
4	99.84	43.1	Pk	17.4	-30.6	29.9	43.52	-13.62	0-360	100	V
6	290.833	38.16	Pk	19	-29	28.16	46.02	-17.86	0-360	100	V

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

11. AC POWER LINE CONDUCTED EMISSIONS

LIMITS

FCC §15.207 (a)

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

* Decreases with the logarithm of the frequency.

TEST PROCEDURE

The EUT is placed on a non-conducting table 40 cm from the vertical ground plane and 80 cm above the horizontal ground plane. The EUT is configured in accordance with ANSI C63.10:2013.

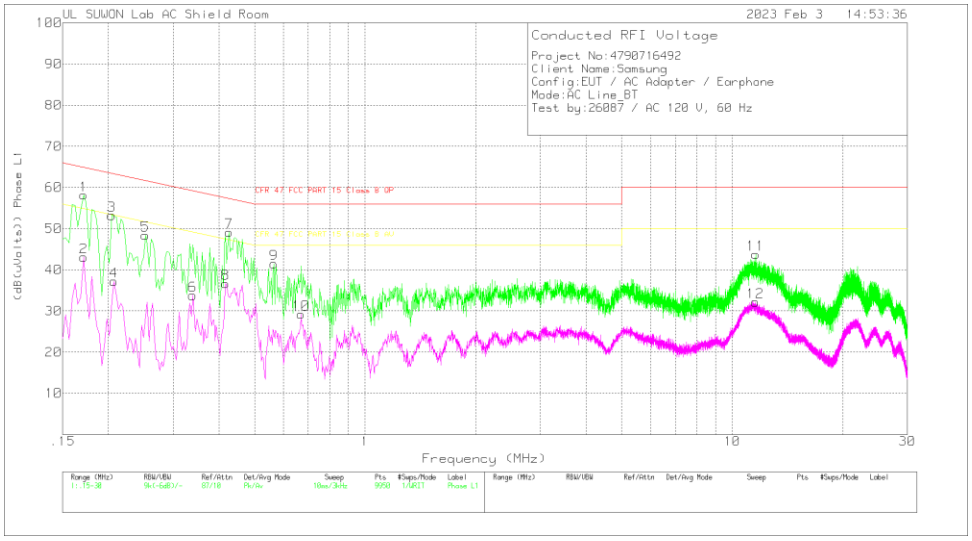
The receiver is set to a resolution bandwidth of 9 kHz. Peak detection is used unless otherwise noted as quasi-peak or average.

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

RESULTS

11.1. AC Power Line (USB C to C Cable)

LINE 1 RESULTS



Trace Markers

Range 1: Phase L1 .15 - 30MHz

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	101836_With EX_L1[dB]	CABLELOSS(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	.171	47.97	Pk	10	.2	58.17	64.91	-6.74	-	-
2	.171	32.89	Av	10	.2	43.09	-	-	54.91	-11.82
3	.204	43.13	Pk	9.9	.2	53.23	63.45	-10.22	-	-
4	.207	27.11	Av	9.9	.2	37.21	-	-	53.32	-16.11
5	.252	38.54	Pk	9.7	.2	48.44	61.69	-13.25	-	-
6	.339	23.81	Av	9.8	.2	33.81	-	-	49.23	-15.42
7	.426	39.05	Pk	9.9	.2	49.15	57.33	-8.18	-	-
8	.417	26.59	Av	9.9	.2	36.69	-	-	47.51	-10.82
9	.564	31.39	Pk	9.9	.2	41.49	56	-14.51	-	-
10	.669	19.12	Av	9.9	.2	29.22	-	-	46	-16.78
11	11.586	33.46	Pk	10	.3	43.76	60	-16.24	-	-
12	11.559	21.9	Av	10	.3	32.2	-	-	50	-17.8

Pk - Peak detector
Av - Average detection

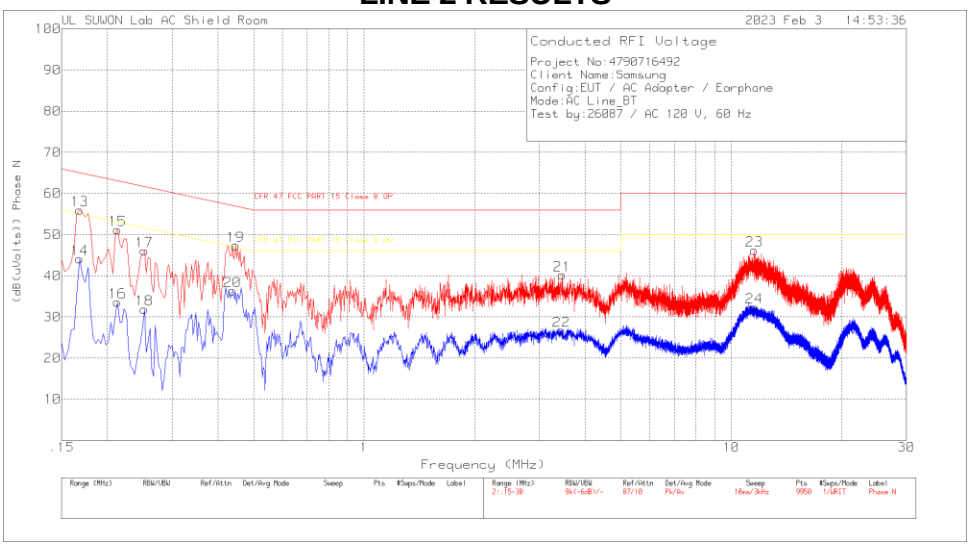
Quasi-Peak Emissions

Range 1: Phase L1 .15 - 30MHz

Frequency (MHz)	Meter Reading (dBuV)	Det	101836_With EX_L1[dB]	CABLELOSS(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)
.17175	37.8	Qp	10	.2	48	64.88	-16.88	-	-
.42675	27.39	Qp	9.9	.2	37.49	57.32	-19.83	-	-

Qp - Quasi-Peak detector

LINE 2 RESULTS



Trace Markers

Range 2: Phase N .15 - 30MHz

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	101836_With EX_N[dB]	CABLELOSS(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	.168	45.81	Pk	10.1	.1	56.01	65.06	-9.05	-	-
14	.168	33.93	Av	10.1	.1	44.13	-	-	55.06	-10.93
15	.213	41.22	Pk	9.8	.2	51.22	63.09	-11.87	-	-
16	.213	23.64	Av	9.8	.2	33.64	-	-	53.09	-19.45
17	.252	36.18	Pk	9.7	.2	46.08	61.69	-15.61	-	-
18	.252	22.02	Av	9.7	.2	31.92	-	-	51.69	-19.77
19	.447	37.27	Pk	9.9	.2	47.37	56.93	-9.56	-	-
20	.438	26.27	Av	9.9	.2	36.37	-	-	47.1	-10.73
21	3.462	30.11	Pk	9.8	.3	40.21	56	-15.79	-	-
22	3.45	16.63	Av	9.8	.3	26.73	-	-	46	-19.27
23	11.565	35.92	Pk	10	.3	46.22	60	-13.78	-	-
24	11.556	22.14	Av	10	.3	32.44	-	-	50	-17.56

Pk - Peak detector
Av - Average detection

Quasi-Peak Emissions

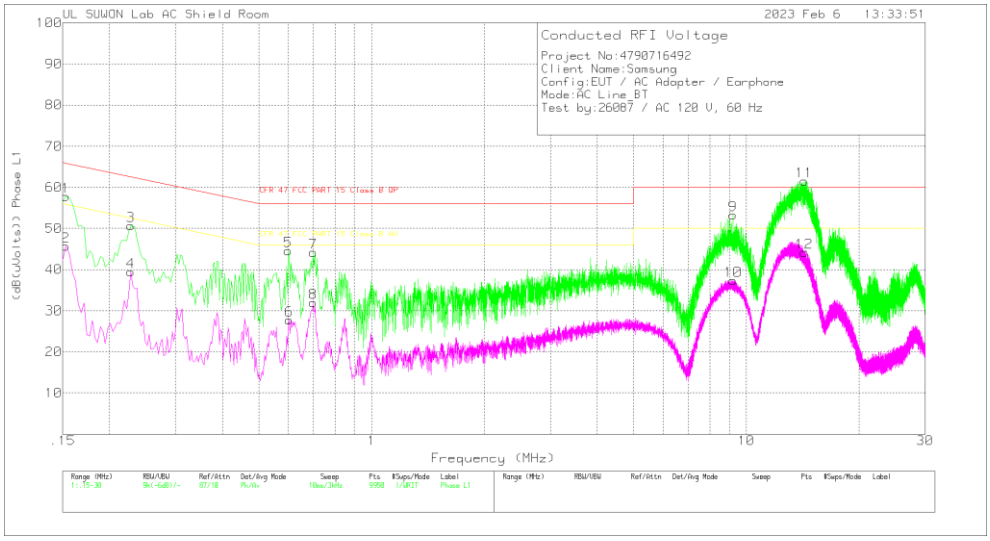
Range 2: Phase N .15 - 30MHz

Frequency (MHz)	Meter Reading (dBuV)	Det	101836_With EX_N[dB]	CABLELOSS(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)
.16875	26.07	Qp	10.1	.1	36.27	65.02	-28.75	-	-
.44775	32.31	Qp	9.9	.2	42.41	56.92	-14.51	-	-

Qp - Quasi-Peak detector

11.2. AC Power Line (USB A to C Cable)

LINE 1 RESULTS



Trace Markers

Range 1: Phase L1 .15 - 30MHz

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	101836_With EX_L1[dB]	CABLELOSS(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	47.88	Pk	9.8	.1	57.78	65.84	-8.06	-	-
2	.153	35.83	Av	9.8	.1	45.73	-	-	55.84	-10.11
3	.228	40.81	Pk	9.7	.2	50.71	62.52	-11.81	-	-
4	.228	29.57	Av	9.7	.2	39.47	-	-	52.52	-13.05
5	.6	34.54	Pk	9.8	.2	44.54	56	-11.46	-	-
6	.603	17.74	Av	9.8	.2	27.74	-	-	46	-18.26
7	.699	34.18	Pk	9.8	.2	44.18	56	-11.82	-	-
8	.699	21.94	Av	9.8	.2	31.94	-	-	46	-14.06
9	9.204	43.05	Pk	9.8	.4	53.25	60	-6.75	-	-
10	9.225	27.13	Av	9.8	.4	37.33	-	-	50	-12.67
11	14.256	51.08	Pk	10	.4	61.48	**60**	**1.48**	-	-
12	14.259	33.81	Av	10	.4	44.21	-	-	50	-5.79

Pk - Peak detector
Av - Average detection

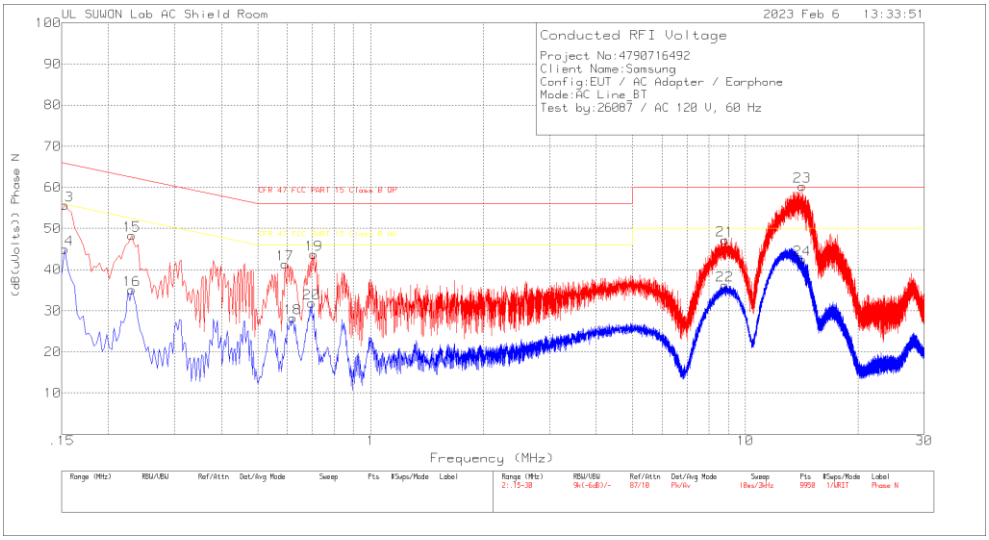
Quasi-Peak Emissions

Range 1: Phase L1 .15 - 30MHz

Frequency (MHz)	Meter Reading (dBuV)	Det	101836_With EX_L1[dB]	CABLELOSS(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	40.5	Qp	9.8	.1	50.4	65.83	-15.43	-	-
9.20475	31.93	Qp	9.8	.4	42.13	60	-17.87	-	-
14.2568	42.03	Qp	10	.4	52.43	60	-7.57	-	-
14.2592	41.78	Qp	10	.4	52.18	60	-7.82	-	-

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]	CABLELOSS(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	.153	45.75	Pk	9.8	.1	55.65	65.84	-10.19	-	-
14	.153	35.05	Av	9.8	.1	44.95	-	-	55.84	-10.89
15	.231	38.47	Pk	9.7	.2	48.37	62.41	-14.04	-	-
16	.231	25.22	Av	9.7	.2	35.12	-	-	52.41	-17.29
17	.591	31.28	Pk	9.9	.2	41.38	56	-14.62	-	-
18	.621	18.21	Av	9.8	.2	28.21	-	-	46	-17.79
19	.705	33.67	Pk	9.8	.2	43.67	56	-12.33	-	-
20	.696	21.84	Av	9.8	.2	31.84	-	-	46	-14.16
21	8.802	36.95	Pk	9.8	.4	47.15	60	-12.85	-	-
22	8.802	26.07	Av	9.8	.4	36.27	-	-	50	-13.73
23	14.193	49.91	Pk	10	.4	60.31	**60**	**.31**	-	-
24	14.169	32.03	Av	10	.4	42.43	-	-	50	-7.57

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]	CABLELOSS(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)
14.1923	39.26	Qp	10	.4	49.66	60	-10.34	-	-
14.1698	39.01	Qp	10	.4	49.41	60	-10.59	-	-

Qp - Quasi-Peak detector

END OF TEST REPORT