



FCC CFR47 PART 15 SUBPART C

DTS Wireless LAN

CERTIFICATION TEST REPORT

FOR

GSM/WCDMA/LTE Phone + BT/BLE, DTS b/g/n, ANT+ and NFC

MODEL NUMBER : SM-G611S, SM-G611K, SM-G611L

FCC ID: A3LSMG611KOR

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Revision History

Rev.	Issue Date	Revisions	Revised By
V1	01/04/18	Initial issue	Junwhan Lee
V2	01/05/18	Revised to address TCB's question	Junwhan Lee

TABLE OF CONTENTS

1. ATTESTATION OF TEST RESULTS	5
2. TEST METHODOLOGY	6
3. FACILITIES AND ACCREDITATION	6
4. CALIBRATION AND UNCERTAINTY	6
4.1. MEASURING INSTRUMENT CALIBRATION	6
4.2. SAMPLE CALCULATION	6
4.3. MEASUREMENT UNCERTAINTY	6
5. EQUIPMENT UNDER TEST	7
5.1. DESCRIPTION OF EUT	7
5.2. MAXIMUM OUTPUT POWER.....	7
5.3. DESCRIPTION OF AVAILABLE ANTENNAS	7
5.4. WORST-CASE CONFIGURATION AND MODE.....	7
5.5. DESCRIPTION OF TEST SETUP.....	8
6. TEST AND MEASUREMENT EQUIPMENT	10
7. REFERENCE MEASUREMENT RESULTS.....	11
7.1. ON TIME AND DUTY CYCLE RESULTS.....	11
8. SUMMARY TABLE	13
9. ANTENNA PORT TEST RESULTS	14
9.1. 6 dB BANDWIDTH.....	14
9.1.1. 802.11b MODE IN THE 2.4 GHz BAND.....	15
9.1.2. 802.11g MODE IN THE 2.4 GHz BAND.....	15
9.1.3. 802.11n HT20 MODE IN THE 2.4 GHz BAND	15
9.1.4. 6 dB BANDWIDTH PLOTS	16
9.2. OUTPUT POWER.....	19
9.2.1. 802.11b MODE IN THE 2.4 GHz BAND.....	20
9.2.2. 802.11g MODE IN THE 2.4 GHz BAND.....	21
9.2.3. 802.11n HT20 MODE IN THE 2.4 GHz BAND	22
9.3. PSD	23
9.3.1. 802.11b MODE IN THE 2.4 GHz BAND.....	24
9.3.2. 802.11g MODE IN THE 2.4 GHz BAND.....	24
9.3.3. 802.11n HT20 MODE IN THE 2.4 GHz BAND	24
9.3.4. PSD PLOTS	25
9.4. OUT-OF-BAND EMISSIONS	28
9.4.1. 802.11b MODE IN THE 2.4 GHz BAND.....	29
9.4.2. 802.11g MODE IN THE 2.4 GHz BAND.....	34

9.4.3.	802.11n HT20 MODE IN THE 2.4 GHz BAND	39
10.	RADIATED TEST RESULTS	44
10.1.	LIMITS AND PROCEDURE.....	44
10.2.	TRANSMITTER ABOVE 1 GHz.....	46
10.2.1.	TX ABOVE 1 GHz 802.11b MODE IN THE 2.4 GHz BAND.....	46
10.2.2.	TX ABOVE 1 GHz 802.11g MODE IN THE 2.4 GHz BAND.....	60
10.2.3.	TX ABOVE 1 GHz 802.11n HT20 MODE IN THE 2.4 GHz BAND	74
10.3.	WORST-CASE BELOW 1 GHz	88
11.	AC POWER LINE CONDUCTED EMISSIONS	90
12.	SETUP PHOTOS	95

1. ATTESTATION OF TEST RESULTS

COMPANY NAME: SAMSUNG ELECTRONICS CO., LTD.

EUT DESCRIPTION: GSM/WCDMA/LTE Phone + BT/BLE, DTS b/g/n, ANT+ and NFC

MODEL NUMBER: SM-G611S, SM-G611K, SM-G611L

SERIAL NUMBER: R39JB04JBD, R39JB04JBP (RADIATED);
R39JB04JMRA (CONDUCTED)

DATE TESTED: DEC 08, 2017 - JAN 02, 2018

APPLICABLE STANDARDS	
STANDARD	TEST RESULTS
CFR 47 Part 15 Subpart C	Pass

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

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

Approved & Released For
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SungGil Park
Suwon Lab Engineer
UL Korea, Ltd.

Tested By:



Junwhan 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 DTS Meas Guidance v04.
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
☒	Chamber 2

UL Korea, Ltd. is accredited by IAS, Laboratory Code TL-637. The full scope of accreditation can be viewed at <http://www.iasonline.org/PDF/TL/TL-637.pdf>.

4. CALIBRATION AND UNCERTAINTY

4.1. MEASURING INSTRUMENT CALIBRATION

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. 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	2.32 dB
Radiated Disturbance, Below 1GHz	3.86 dB
Radiated Disturbance, Above 1 GHz	5.97 dB

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

5. EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF EUT

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

SM-G611S and SM-G611K/SM-G611L are same hardware and only difference is S/W user interface for different network operator. SM-G611S was used for the tests.

5.2. MAXIMUM OUTPUT POWER

The transmitter has a maximum total conducted average output power as follows:

Frequency Range [MHz]	Mode	Output Power [dBm]	Output Power [mW]
2412 - 2472	802.11b	17.25	53.09
	802.11g	12.19	16.56
	802.11n HT20	12.01	15.89

5.3. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes an internal antennas, with a antenna's maximum gain of 0.91 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.

Based on the baseline scan, the worst-case data rates were:

802.11b mode: 1 Mbps
802.11g mode: 6 Mbps
802.11n HT20 mode: MCS0

5.5. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

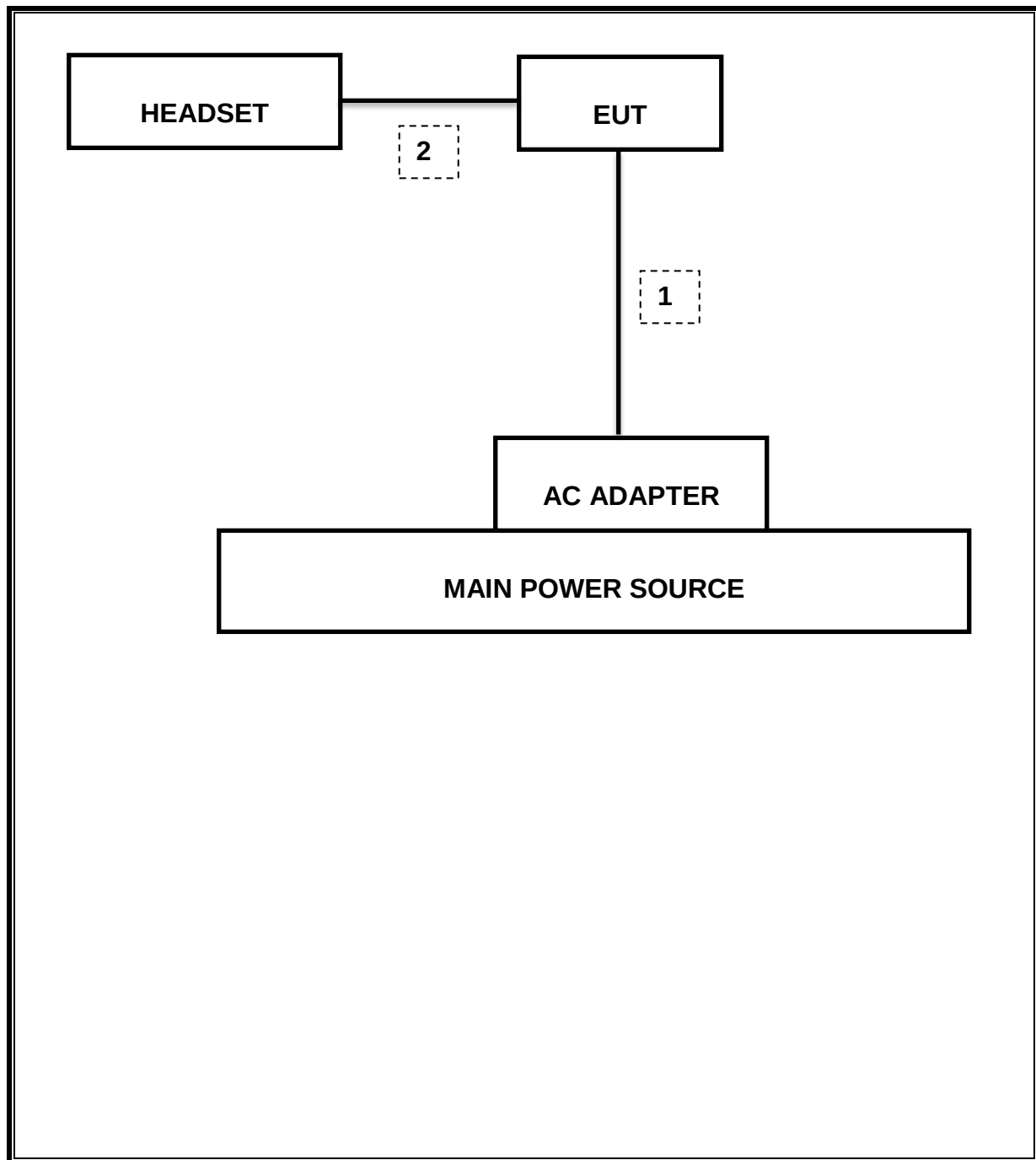
Support Equipment List				
Description	Manufacturer	Model	Serial Number	FCC ID
Charger	SAMSUNG	EP-TA50KWK	DW2J609DS/A -E	N/A
Data Cable	SAMSUNG	ECB-DU68WE	N/A	N/A
Earphone	SAMSUNG	EHS64AVFWE	N/A	N/A

I/O CABLES

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

TEST SETUP

The EUT is a stand-alone unit during the tests.
Test software in hidden menu exercised the EUT to enable DTS mode.

SETUP DIAGRAM FOR TESTS

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	08-31-19
Antenna, Bilog, 30MHz-1GHz	SCHWARZBECK	VULB9163	749	04-14-19
Antenna, Horn, 18 GHz	ETS	3115	00167211	10-14-18
Antenna, Horn, 18 GHz	ETS	3115	00161451	03-10-19
Antenna, Horn, 18 GHz	ETS	3117	00168724	05-31-19
Antenna, Horn, 18 GHz	ETS	3117	00168717	05-31-19
Antenna, Horn, 40 GHz	ETS	3116C	00166155	12-04-19
Preamplifier	ETS	3116C-PA	00168841	11-13-19
Antenna, Horn, 40 GHz	ETS	3116C	00168645	12-04-19
Attenuator / Switch driver	HP	11713A	3748A04272	N/A
Preamplifier, 1000 MHz	Sonoma	310N	341282	08-09-18
Preamplifier, 1000 MHz	Sonoma	310N	351741	08-07-18
Preamplifier	ETS	3115-PA	00167475	08-09-18
Preamplifier, 18 GHz	Miteq	AFS42-00101800-25-S-42	1896138	08-08-18
Spectrum Analyzer, 44 GHz	Agilent / HP	N9030A	MY54170614	08-08-18
Spectrum Analyzer, 44 GHz	Agilent / HP	N9030A	MY54490312	08-08-18
Average Power Sensor	Agilent / HP	U2000	MY54270007	08-08-18
EMI Test Receive, 40 GHz	R&S	ESU40	100439	08-08-18
EMI Test Receive, 40 GHz	R&S	ESU40	100457	08-08-18
EMI Test Receive, 3 GHz	R&S	ESR3	101832	08-07-18
Low Pass Filter 5GHz	Micro-Tronics	LPS17541	009	08-08-18
Low Pass Filter 5GHz	Micro-Tronics	LPS17541	015	08-08-18
High Pass Filter 3GHz	Micro-Tronics	HPM17543	010	08-08-18
ATTENUATOR	PASTERNAK	PE7087-10	A009	08-08-18
High Pass Filter 3GHz	Micro-Tronics	HPM17543	015	08-08-18
High Pass Filter 6GHz	Micro-Tronics	HPM17542	009	08-08-18
High Pass Filter 6GHz	Micro-Tronics	HPM17542	016	08-08-18
LISN	R&S	ENV-216	101837	08-09-18
Antenna, Loop, 9kHz-30MHz	R&S	HFH2-Z2	100418	10-26-19
UL Software				
Description	Manufacturer	Model	Version	
Radiated software	UL	UL EMC	Ver 9.5	
AC Line Conducted software	UL	UL EMC	Ver 9.5	

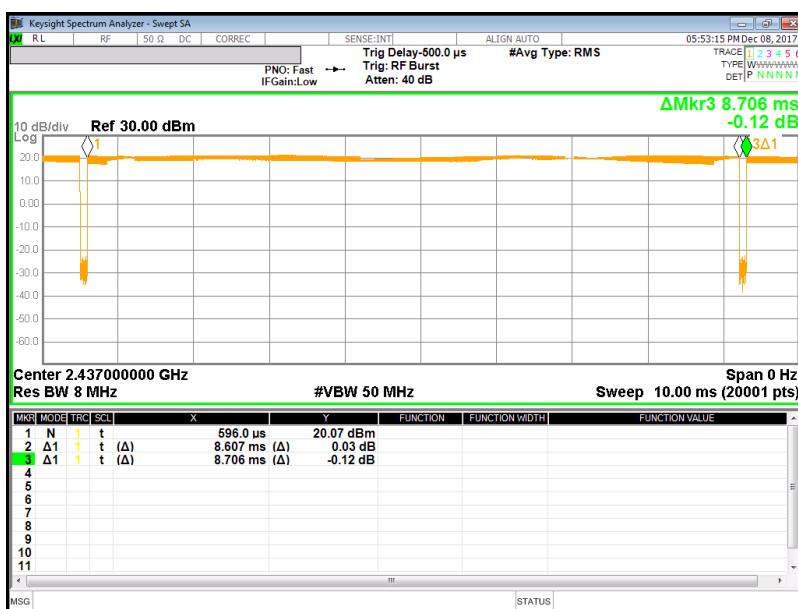
7. REFERENCE MEASUREMENT RESULTS

7.1. ON TIME AND DUTY CYCLE RESULTS

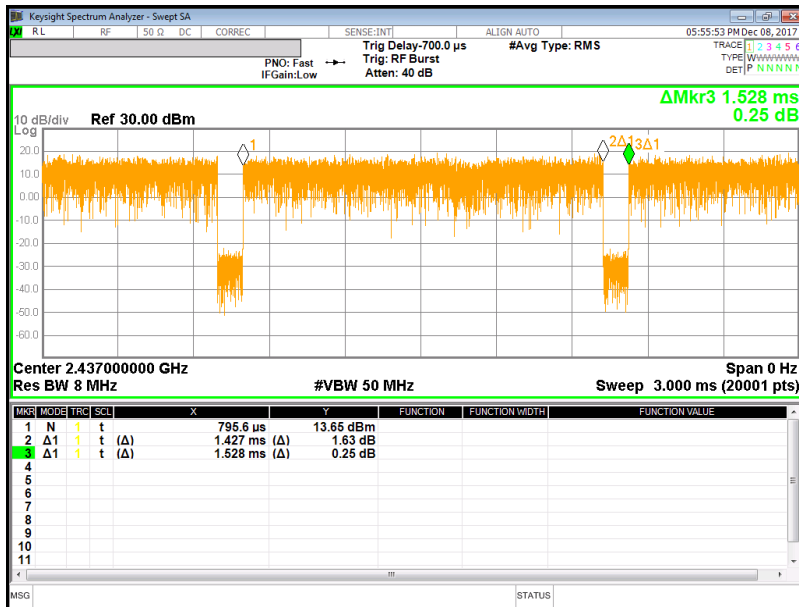
LIMITS

None; for reporting purposes only.

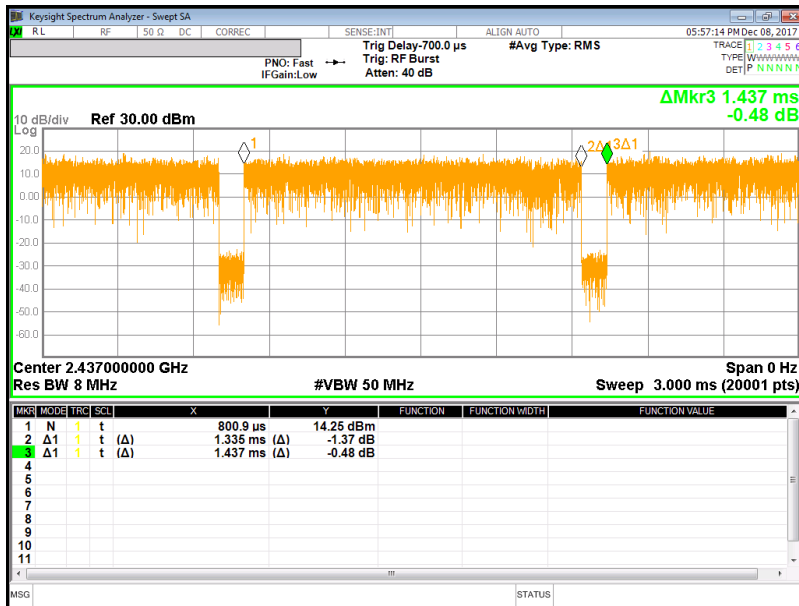
Mode	ON Time B [msec]	Period [msec]	Duty Cycle x [linear]	Duty Cycle [%]	Duty Cycle Correction Factor [dB]	1/T Minimum VBW [kHz]
2400MHz Bands						
802.11b	8.607	8.706	0.989	98.9%	0.00	0.010
802.11g	1.427	1.528	0.934	93.4%	0.30	0.701
802.11n HT20	1.335	1.437	0.929	92.9%	0.32	0.749



[802.11b]



[802.11g]



[802.11n]

8. SUMMARY TABLE

FCC Part Section	Test Description	Test Limit	Test Condition	Test Result	Worst Case
15.247 (a)(2)	Occupied Band width (6dB)	>500KHz	Conducted	Pass	8.538 MHz
2.1051, 15.247 (d)	Band Edge / Conducted Spurious Emission	-30dBc		Pass	-30.814 dBm
15.247 (b)(3)	TX conducted output power	<30dBm		Pass	17.25 dB
15.247 (e)	PSD	<8dBm		Pass	-13.375 dBm
15.207 (a)	AC Power Line conducted emissions	Section 10	Power Line conducted	Pass	39.98 dBuV (Pk)
15.205, 15.209	Radiated Spurious Emission	< 54dBuV/m	Radiated	Pass	50.82 dBuV/m (Av)

9. ANTENNA PORT TEST RESULTS

9.1. 6 dB BANDWIDTH

LIMITS

FCC §15.247 (a) (2)

The minimum 6 dB bandwidth shall be at least 500 kHz.

TEST PROCEDURE

Reference to KDB 558074 D01 DTS Meas Guidance v04: The transmitter output is connected to a spectrum analyzer with the RBW set to 100 KHz, the VBW $\geq 3 \times$ RBW, peak detector and max hold.

RESULTS

9.1.1. 802.11b MODE IN THE 2.4 GHz BAND

Channel	Frequency [MHz]	6 dB Bandwidth [MHz]	Minimum Limit [MHz]
Low	2412	8.046	0.5
Mid	2437	9.527	0.5
High	2462	9.049	0.5
12	2467	8.567	0.5
13	2472	9.041	0.5
Worst		8.538	0.5

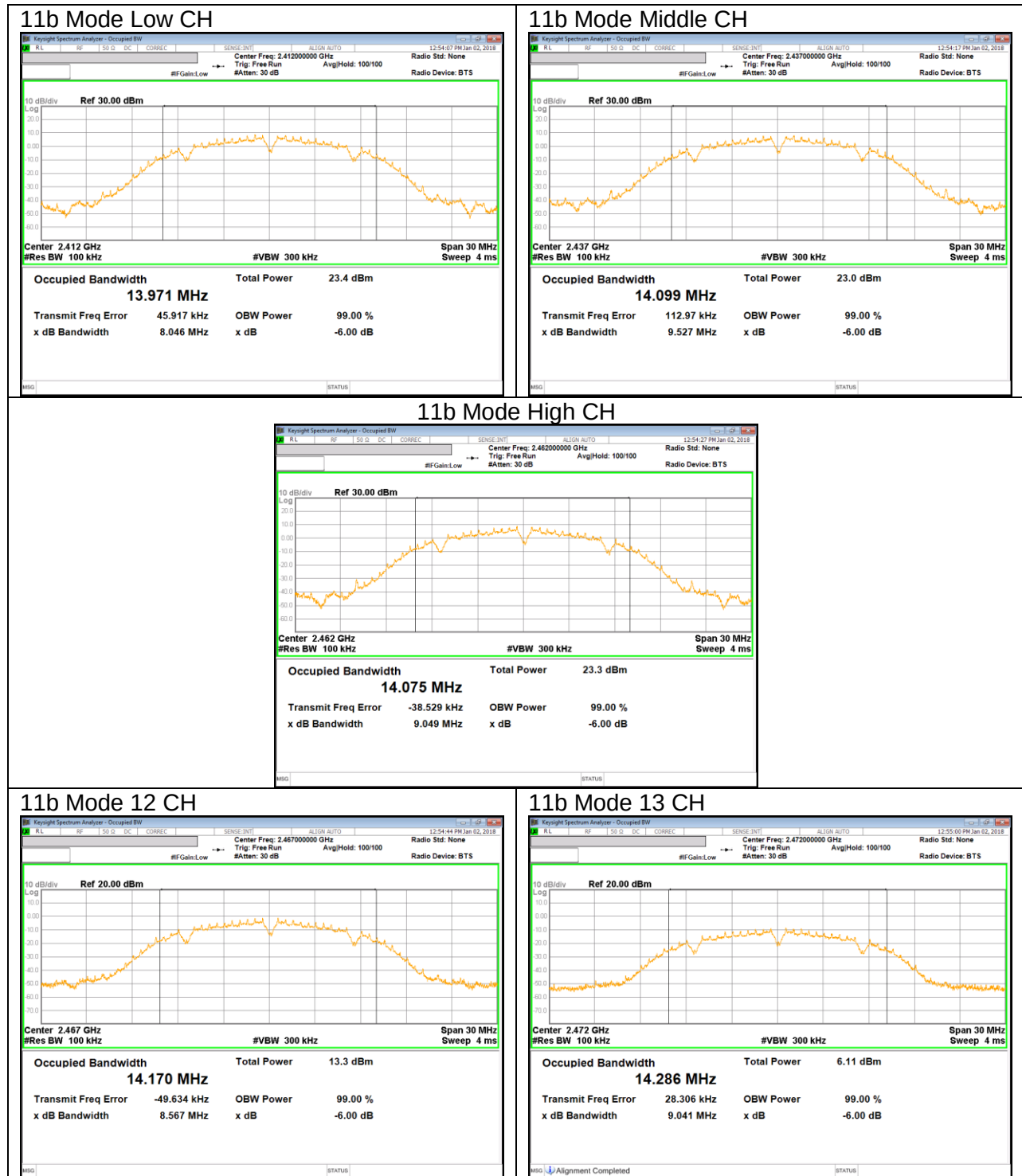
9.1.2. 802.11g MODE IN THE 2.4 GHz BAND

Channel	Frequency [MHz]	6 dB Bandwidth [MHz]	Minimum Limit [MHz]
Low	2412	15.080	0.5
Mid	2437	15.300	0.5
High	2462	15.050	0.5
12	2467	15.280	0.5
13	2472	15.030	0.5
Worst		15.030	0.5

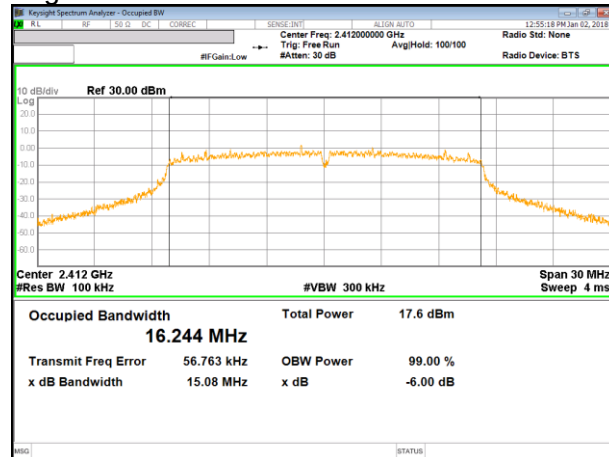
9.1.3. 802.11n HT20 MODE IN THE 2.4 GHz BAND

Channel	Frequency [MHz]	6 dB Bandwidth [MHz]	Minimum Limit [MHz]
Low	2412	15.100	0.5
Mid	2437	15.690	0.5
High	2462	15.010	0.5
12	2467	15.130	0.5
13	2472	15.690	0.5
Worst		15.010	0.5

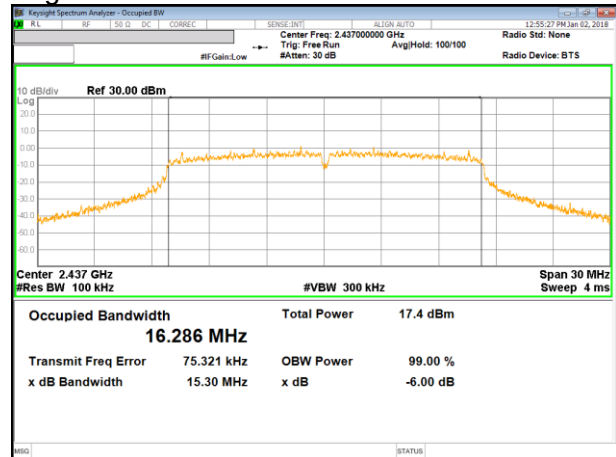
9.1.4. 6 dB BANDWIDTH PLOTS



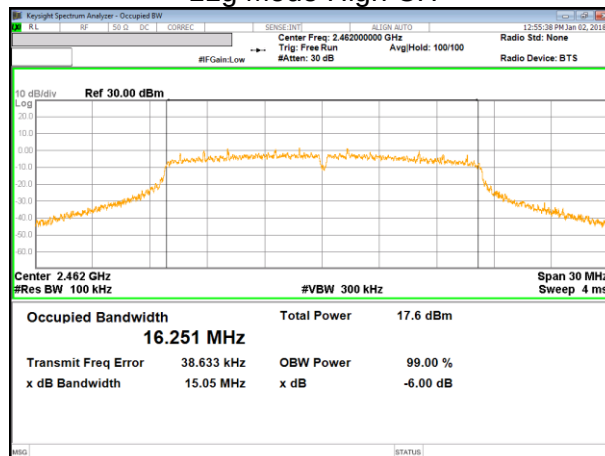
11g Mode Low CH



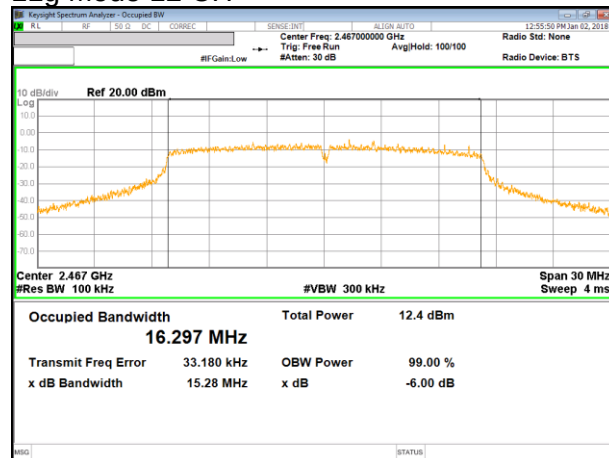
11g Mode Middle CH



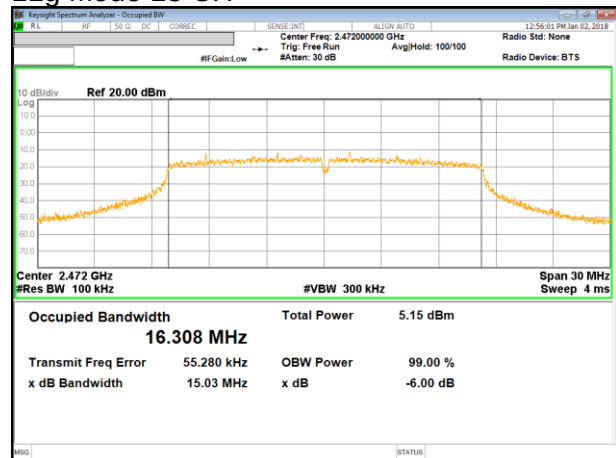
11g Mode High CH



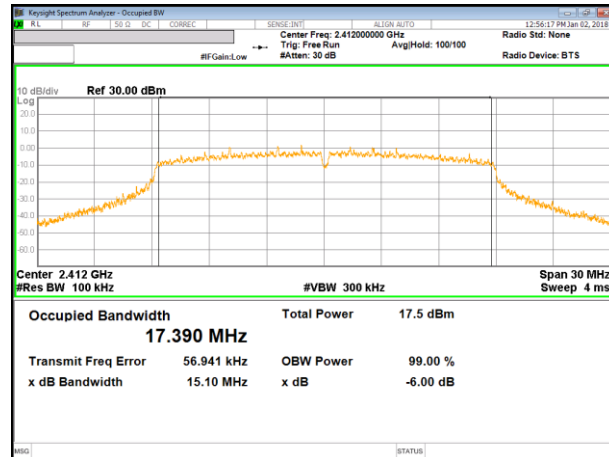
11g Mode 12 CH



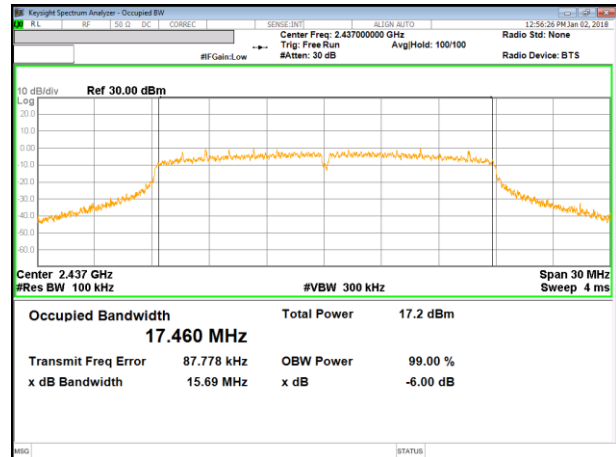
11g Mode 13 CH



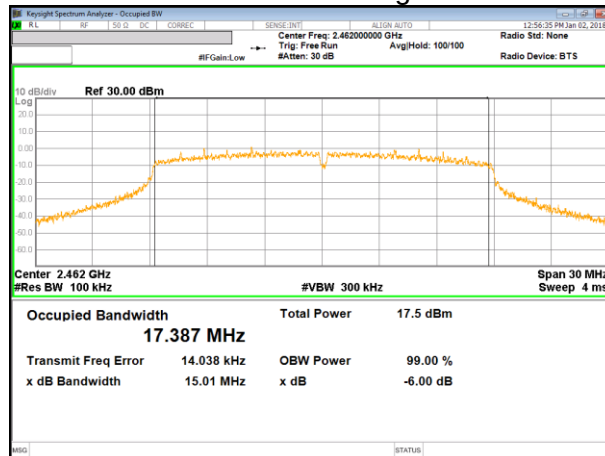
11n HT20 Mode Low CH



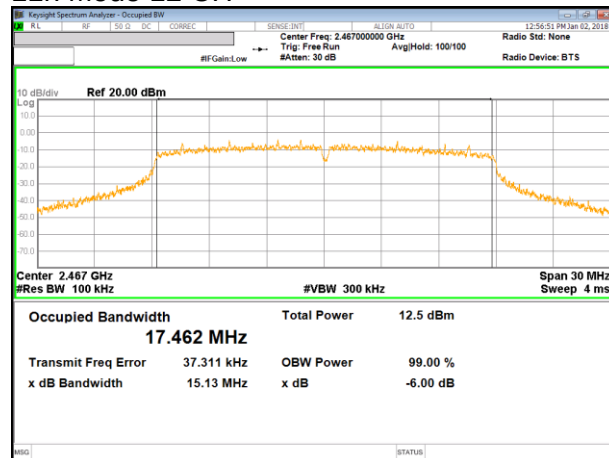
11n HT20 Mode Middle CH



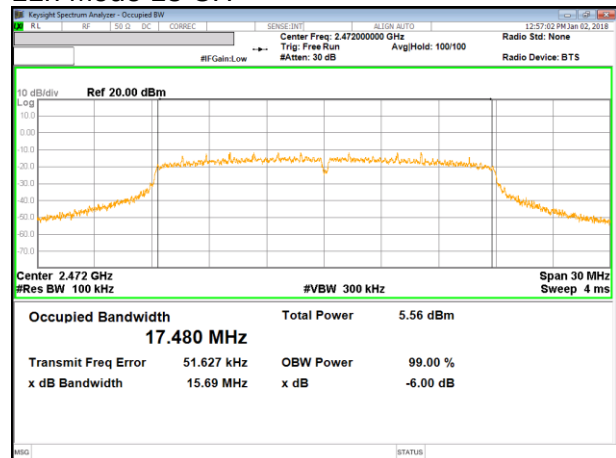
11n HT20 Mode High CH



11n Mode 12 CH



11n Mode 13 CH



9.2. OUTPUT POWER

LIMITS

FCC §15.247

For systems using digital modulation in the 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz bands: 1 Watt, based on the use of antennas with directional gains that do not exceed 6 dBi. If transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

DIRECTIONAL ANTENNA GAIN

There is only one transmitter output therefore the directional gain is equal to the antenna gain.

TEST PROCEDURE

The transmitter output is connected to a power meter.

The cable assembly insertion loss was entered as an offset in the power meter to allow for direct reading of power.

Output power measurement was performed utilizing the “§9.2.3.1 AVGPM” under KDB558074 D01 DTS Meas Guidance v04.

Duty cycle correction factor is already added to the average output power results for duty cycle factor < 98%. (802.11g, 802.11n mode)

RESULTS

9.2.1. 802.11b MODE IN THE 2.4 GHz BAND

Limits

Channel	Frequency [MHz]	Directional Gain Primary [dBi]	FCC Power Limit [dBm]	Max Power [dBm]
Low	2412	0.91	30.00	30.00
Mid	2437	0.91	30.00	30.00
High	2462	0.91	30.00	30.00
12	2467	0.91	30.00	30.00
13	2472	0.91	30.00	30.00

Results

Channel	Frequency [MHz]	Meas Power [dBm]	Total Power [dBm]	Power Limit [dBm]	Margin [dB]
Low	2412	17.25	17.25	30.00	-12.75
Mid	2437	16.98	16.98	30.00	-13.02
High	2462	17.18	17.18	30.00	-12.82
12	2467	7.17	7.17	30.00	-22.83
13	2472	-0.15	-0.15	30.00	-30.15
Worst			17.25	30.00	-12.75

9.2.2. 802.11g MODE IN THE 2.4 GHz BAND

Limits

Channel	Frequency [MHz]	Directional Gain Primary [dBi]	FCC Power Limit [dBm]	Max Power [dBm]
Low	2412	0.91	30.00	30.00
Mid	2437	0.91	30.00	30.00
High	2462	0.91	30.00	30.00
12	2467	0.91	30.00	30.00
13	2472	0.91	30.00	30.00

Results

Channel	Frequency [MHz]	Meas Power [dBm]	Total Power [dBm]	Power Limit [dBm]	Margin [dB]
Low	2412	12.19	12.19	30.00	-17.81
Mid	2437	11.98	11.98	30.00	-18.02
High	2462	12.14	12.14	30.00	-17.86
12	2467	7.07	7.07	30.00	-22.93
13	2472	0.04	0.04	30.00	-29.96
Worst			12.19	30.00	-17.81

9.2.3. 802.11n HT20 MODE IN THE 2.4 GHz BAND

Limits

Channel	Frequency [MHz]	Directional Gain Primary [dBi]	FCC Power Limit [dBm]	Max Power [dBm]
Low	2412	0.91	30.00	30.00
Mid	2437	0.91	30.00	30.00
High	2462	0.91	30.00	30.00
12	2467	0.91	30.00	30.00
13	2472	0.91	30.00	30.00

Results

Channel	Frequency [MHz]	Meas Power [dBm]	Total Power [dBm]	Power Limit [dBm]	Margin [dB]
Low	2412	12.01	12.01	30.00	-17.99
Mid	2437	11.84	11.84	30.00	-18.16
High	2462	11.99	11.99	30.00	-18.01
12	2467	6.94	6.94	30.00	-23.06
13	2472	-0.12	-0.12	30.00	-30.12
Worst			12.01	30.00	-17.99

9.3. PSD

LIMITS

FCC §15.247

The power spectral density conducted from the transmitter to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

TEST PROCEDURE

Power Spectral Density was performed utilizing the “Method §10.3 AVGPS-1 (802.11 b mode) and §10.5 AVGPS-2(802.11 g/n mode)” under KDB558074 D01 DTS Meas Guidance v04.

RESULTS

9.3.1. 802.11b MODE IN THE 2.4 GHz BAND

PSD Results

Channel	Frequency [MHz]	PSD Meas [dBm]	Duty Factor [dB]	Final PSD [dBm]	Limit [dBm]	Margin [dB]
Low	2412	-14.366	0.00	-14.366	8.00	-22.366
Mid	2437	-13.776	0.00	-13.776	8.00	-21.776
High	2462	-13.375	0.00	-13.375	8.00	-21.375
12	2467	-23.182	0.00	-23.182	8.00	-31.182
13	2472	-31.229	0.00	-31.229	8.00	-39.229

9.3.2. 802.11g MODE IN THE 2.4 GHz BAND

PSD Results

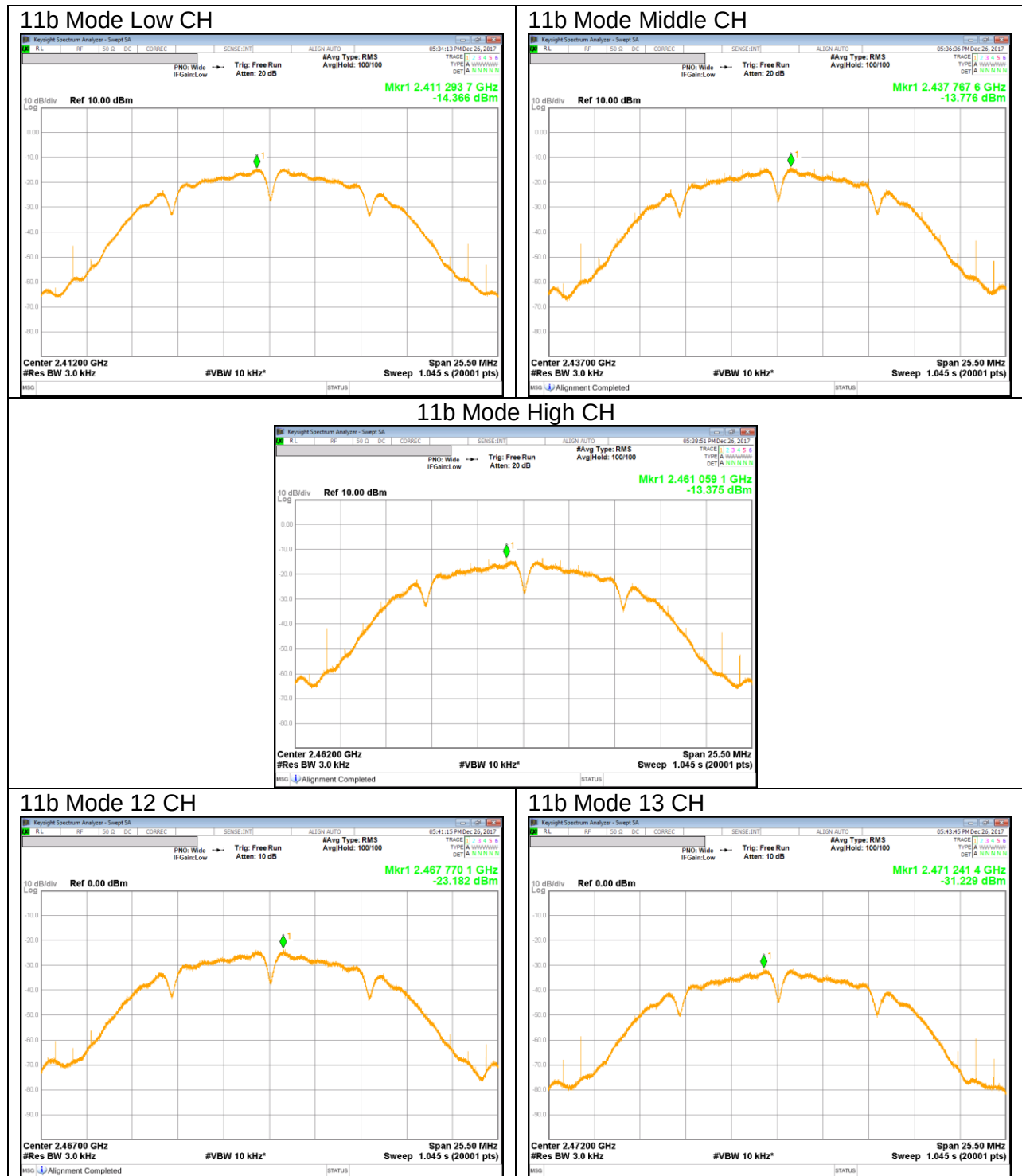
Channel	Frequency [MHz]	PSD Meas [dBm]	Duty Factor [dB]	Final PSD [dBm]	Limit [dBm]	Margin [dB]
Low	2412	-22.096	0.30	-21.796	8.00	-30.096
Mid	2437	-21.628	0.30	-21.328	8.00	-29.628
High	2462	-21.751	0.30	-21.451	8.00	-29.751
12	2467	-27.031	0.30	-26.731	8.00	-35.031
13	2472	-34.153	0.30	-33.853	8.00	-42.153

9.3.3. 802.11n HT20 MODE IN THE 2.4 GHz BAND

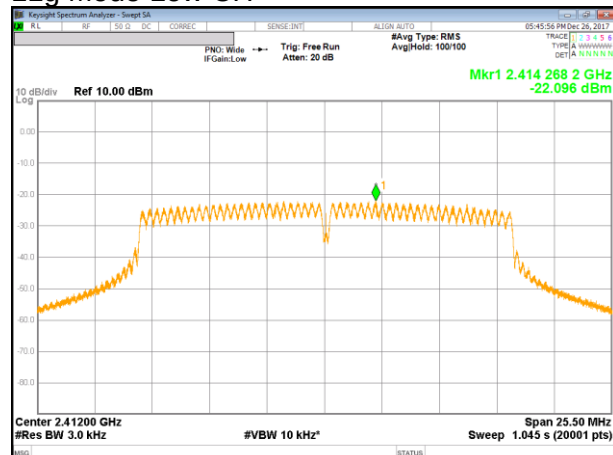
PSD Results

Channel	Frequency [MHz]	PSD Meas [dBm]	Duty Factor [dB]	Final PSD [dBm]	Limit [dBm]	Margin [dB]
Low	2412	-22.239	0.32	-21.919	8.00	-30.239
Mid	2437	-21.612	0.32	-21.292	8.00	-29.612
High	2462	-22.166	0.32	-21.846	8.00	-30.166
12	2467	-27.335	0.32	-27.015	8.00	-35.335
13	2472	-33.545	0.32	-33.225	8.00	-41.545

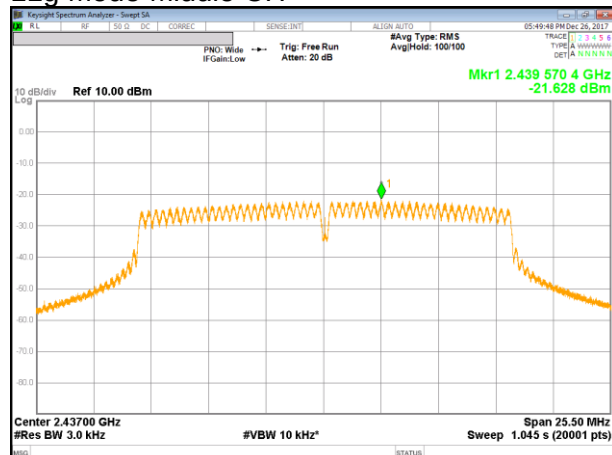
9.3.4. PSD PLOTS



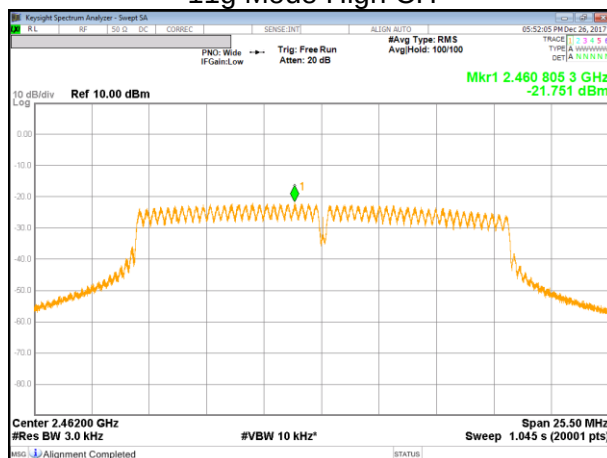
11g Mode Low CH



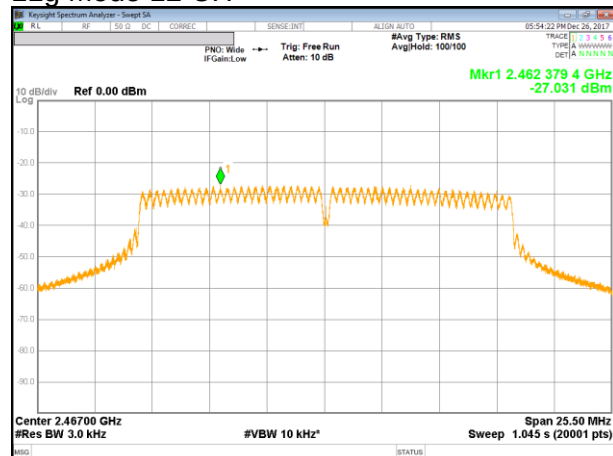
11g Mode Middle CH



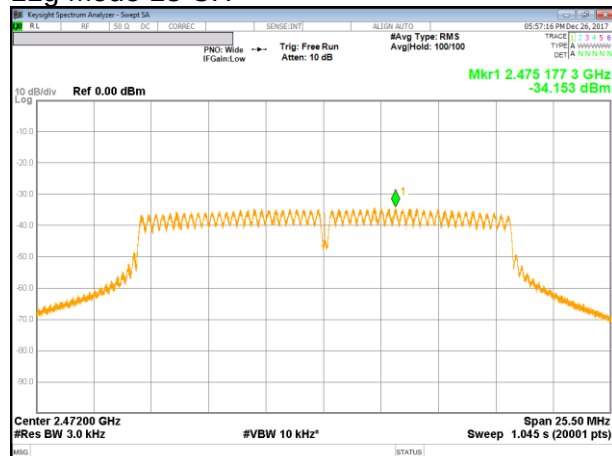
11g Mode High CH



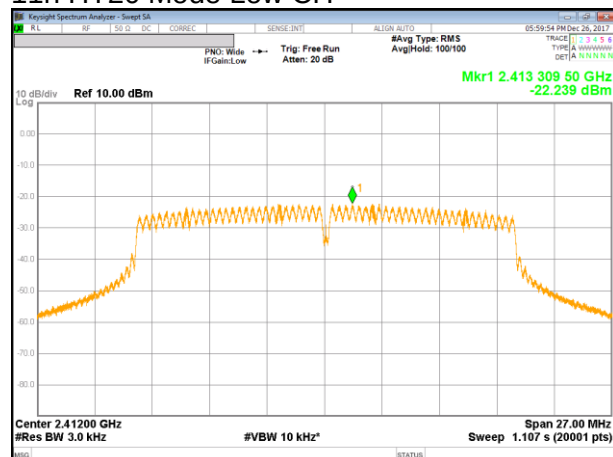
11g Mode 12 CH



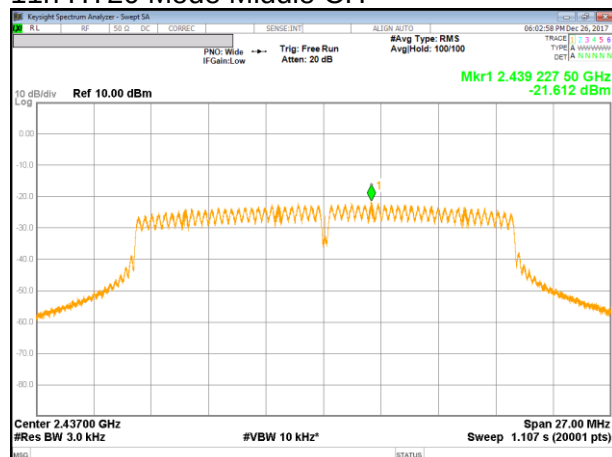
11g Mode 13 CH



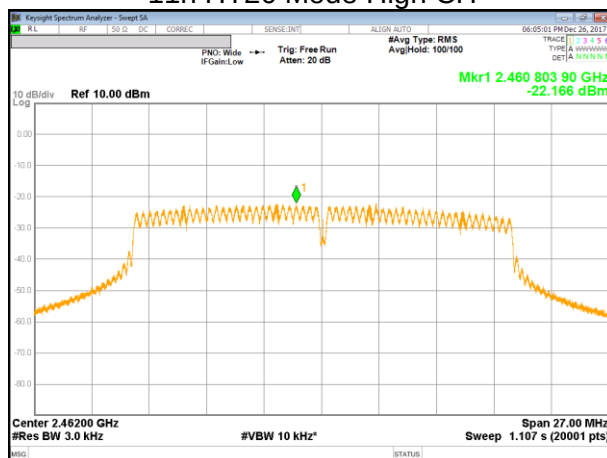
11n HT20 Mode Low CH



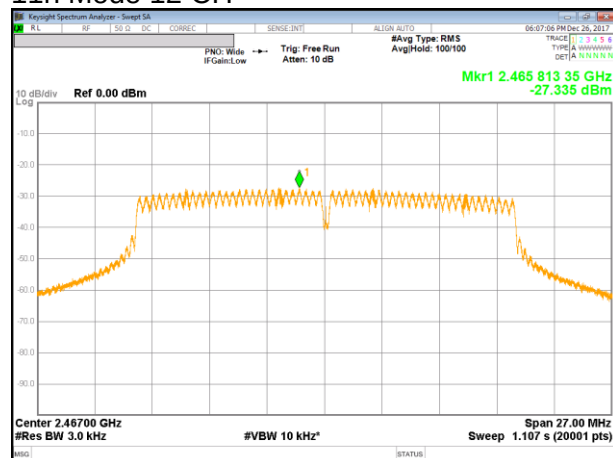
11n HT20 Mode Middle CH



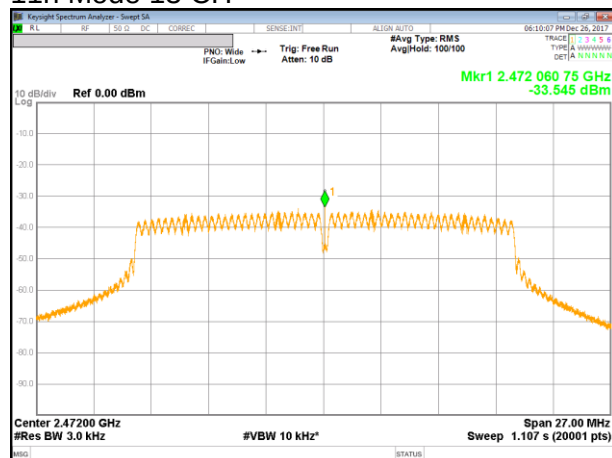
11n HT20 Mode High CH



11n Mode 12 CH



11n Mode 13 CH



9.4. OUT-OF-BAND EMISSIONS

LIMITS

FCC §15.247 (d)

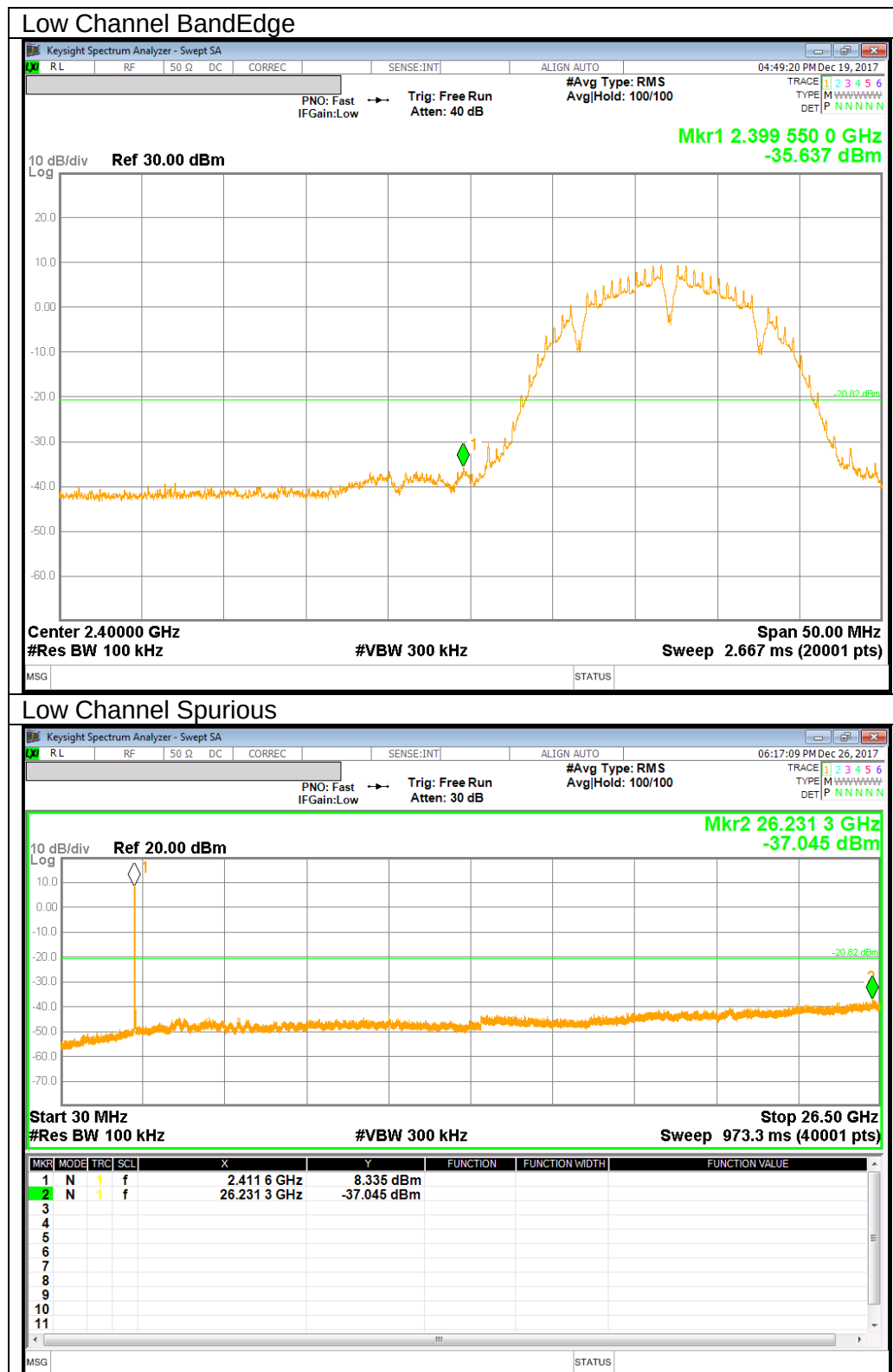
In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required.

TEST PROCEDURE

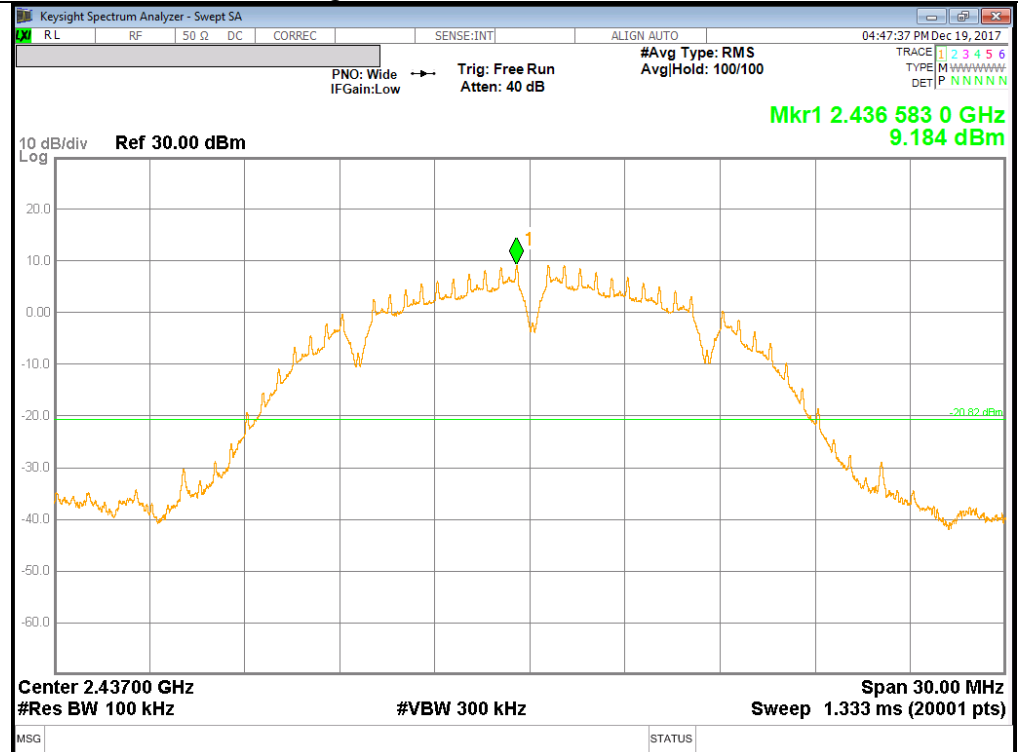
The transmitter output is connected to a spectrum analyzer with RBW = 100 kHz, VBW = 300 kHz, peak detector, and max hold. Measurements utilizing these settings are made of the in-band reference level, bandedge (where measurements to the general radiated limits will not be made) and out-of-band emissions.

RESULTS

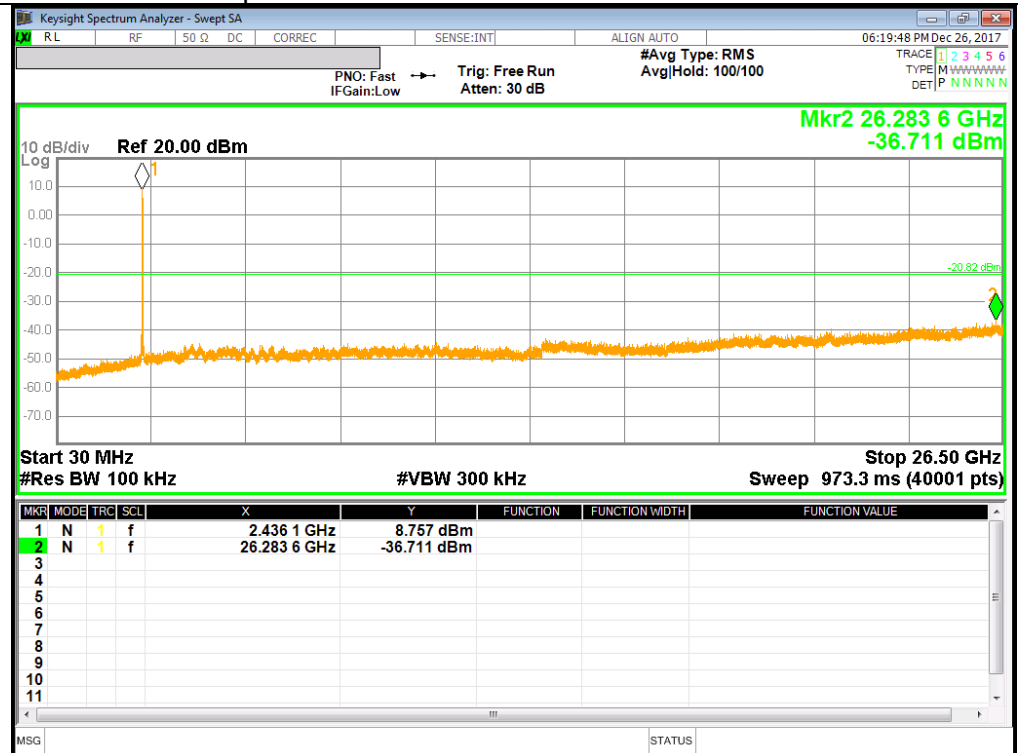
9.4.1. 802.11b MODE IN THE 2.4 GHz BAND



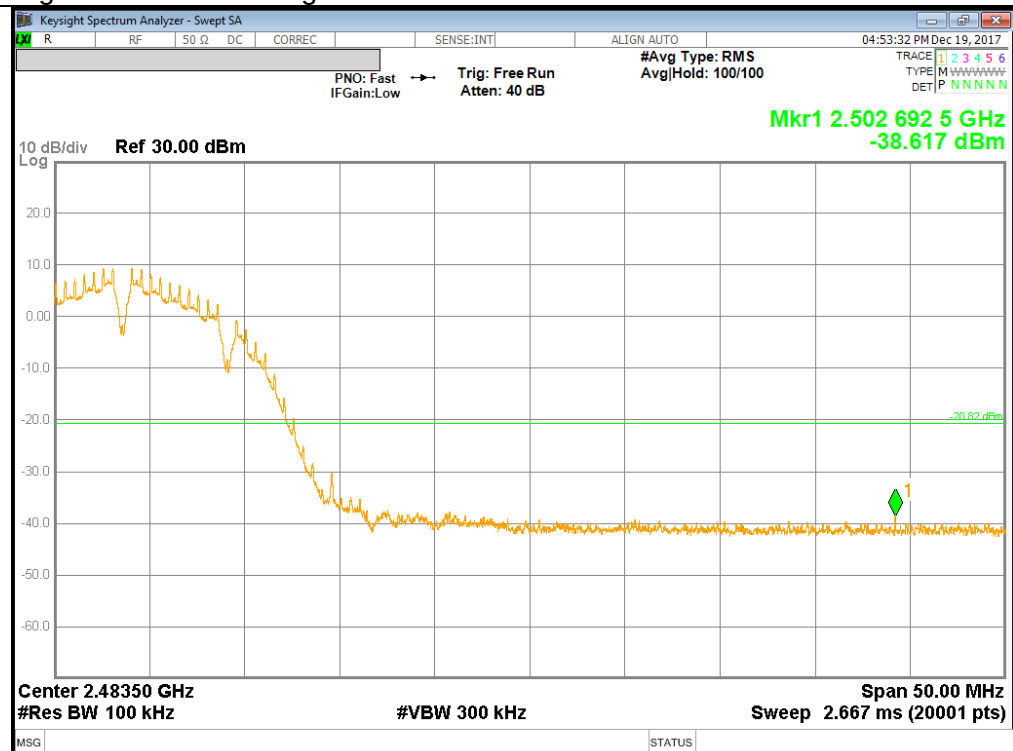
Middle Channel BandEdge



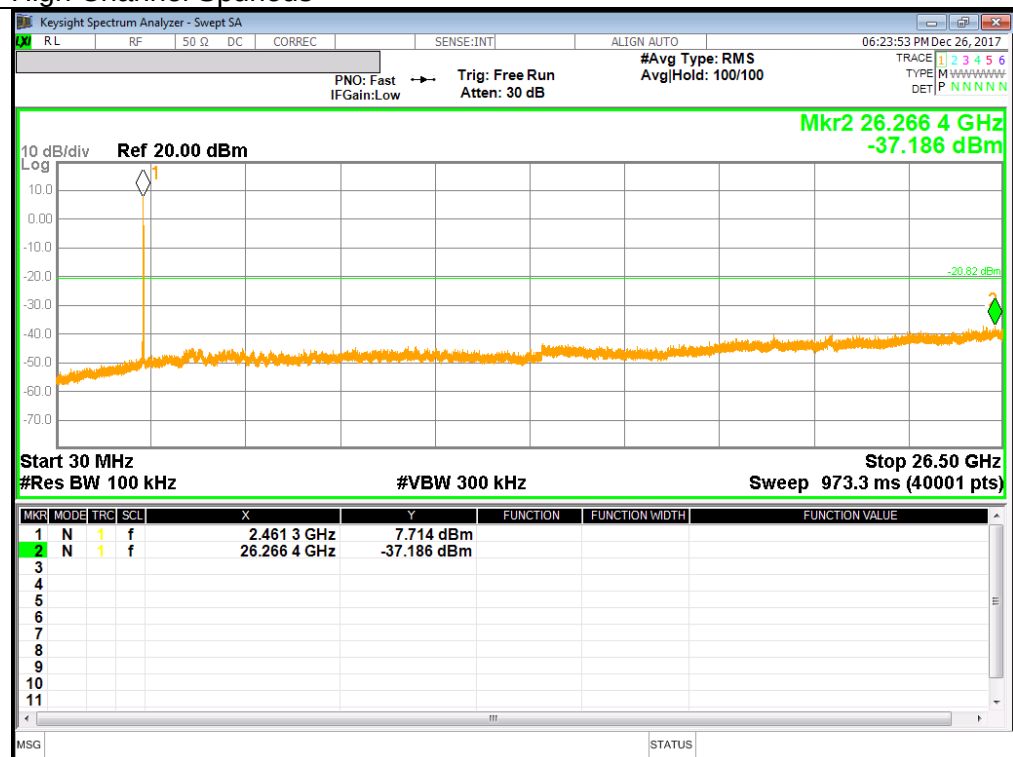
Middle Channel Spurious



High Channel BandEdge



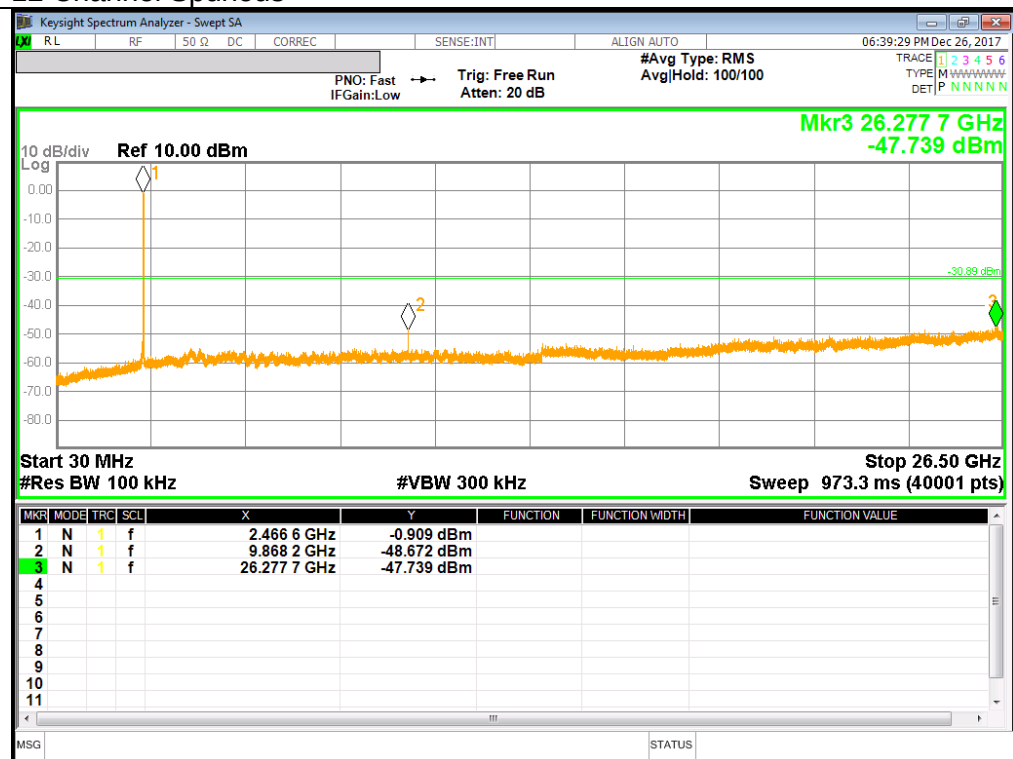
High Channel Spurious



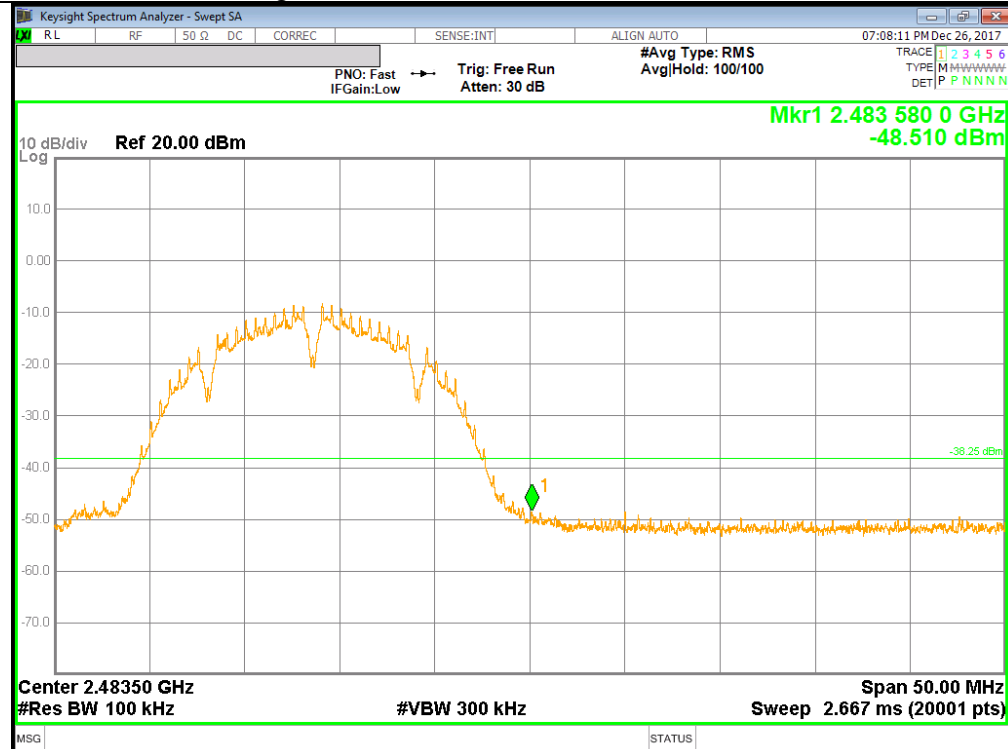
12 Channel BandEdge



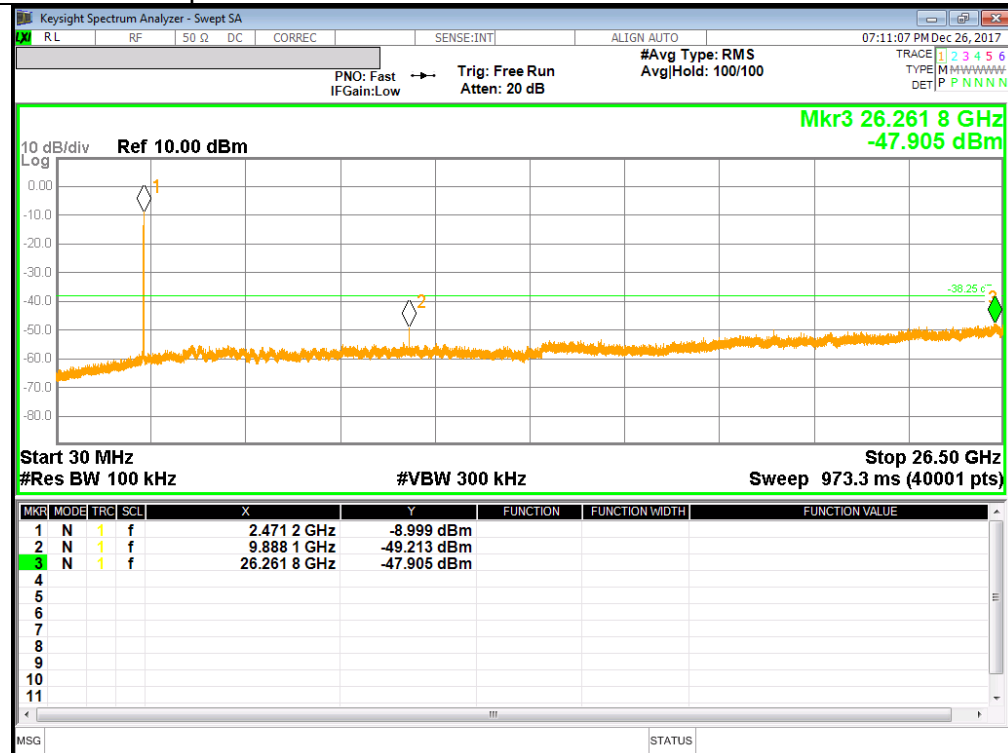
12 Channel Spurious



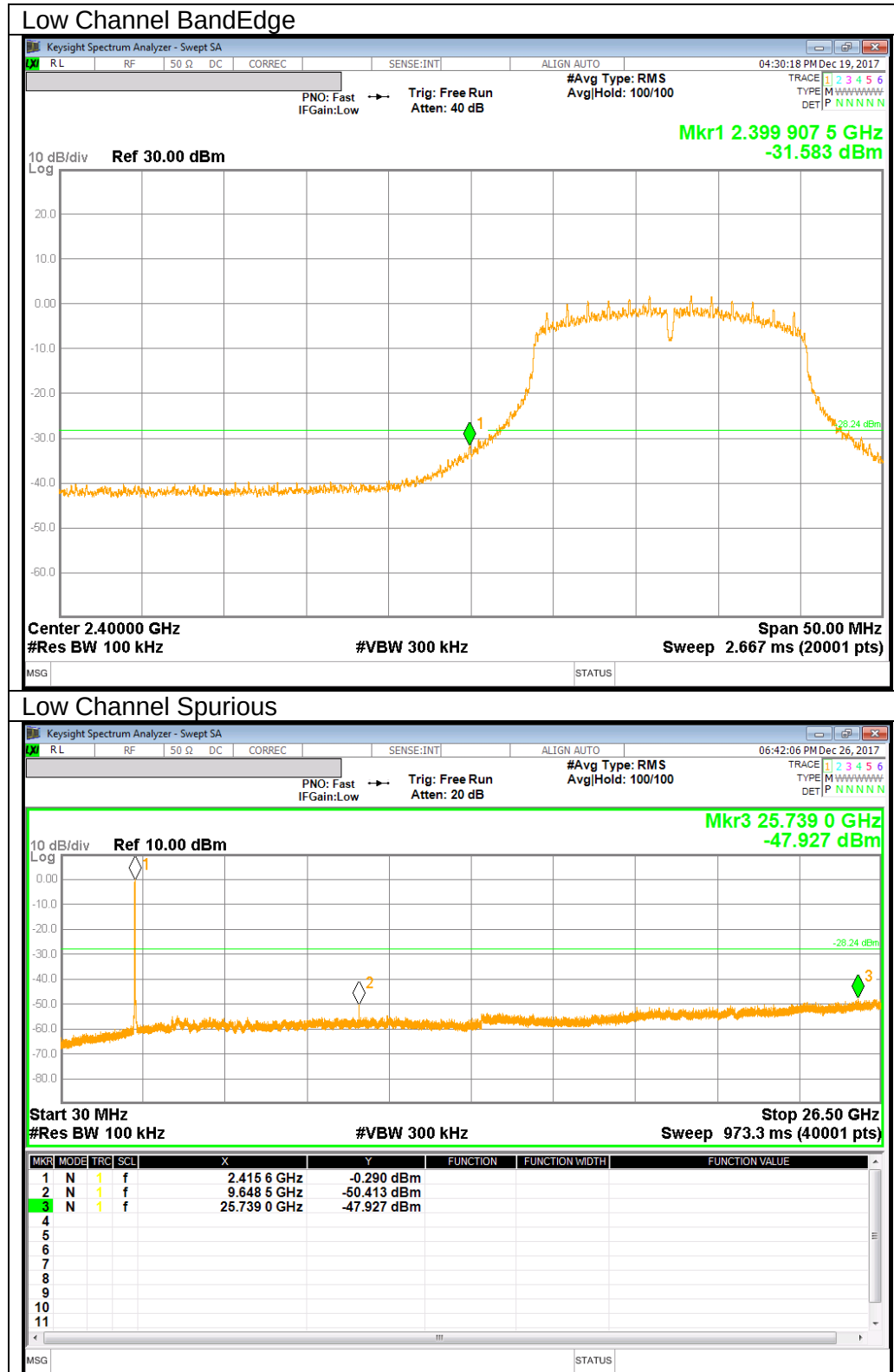
13 Channel BandEdge



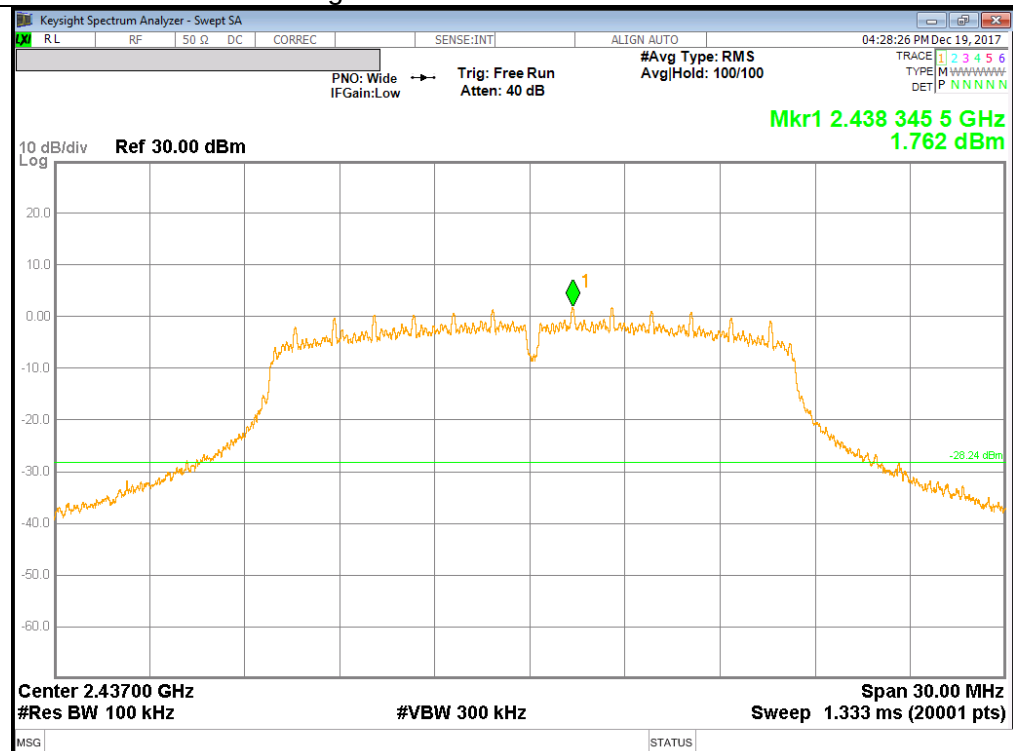
13 Channel Spurious



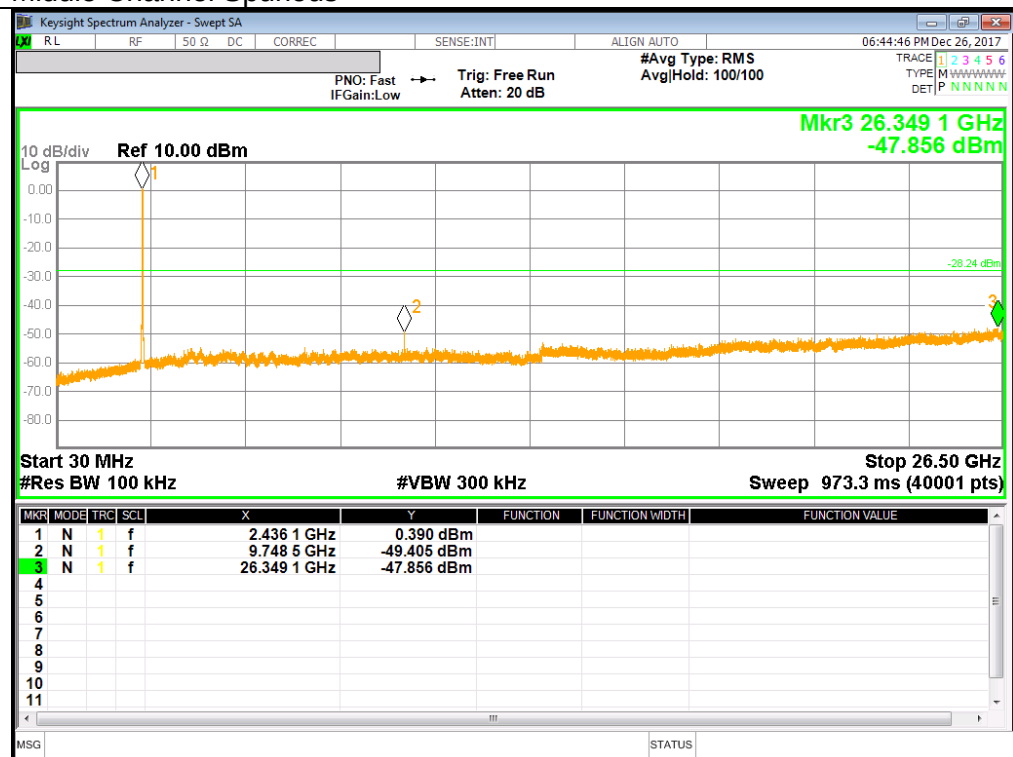
9.4.2. 802.11g MODE IN THE 2.4 GHz BAND



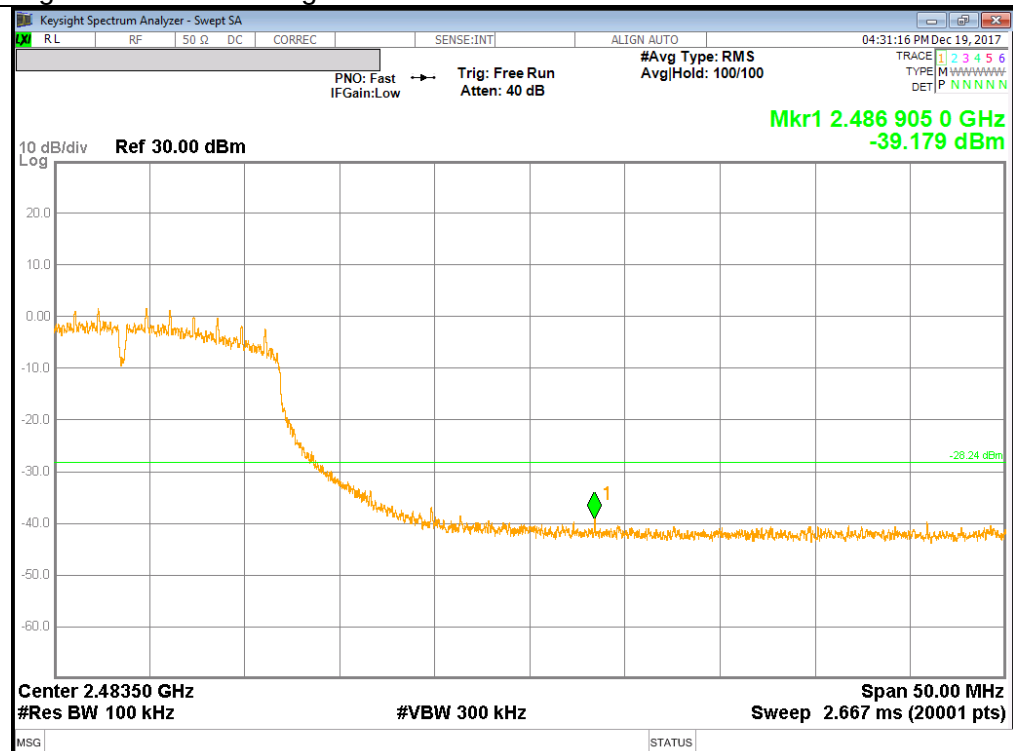
Middle Channel BandEdge



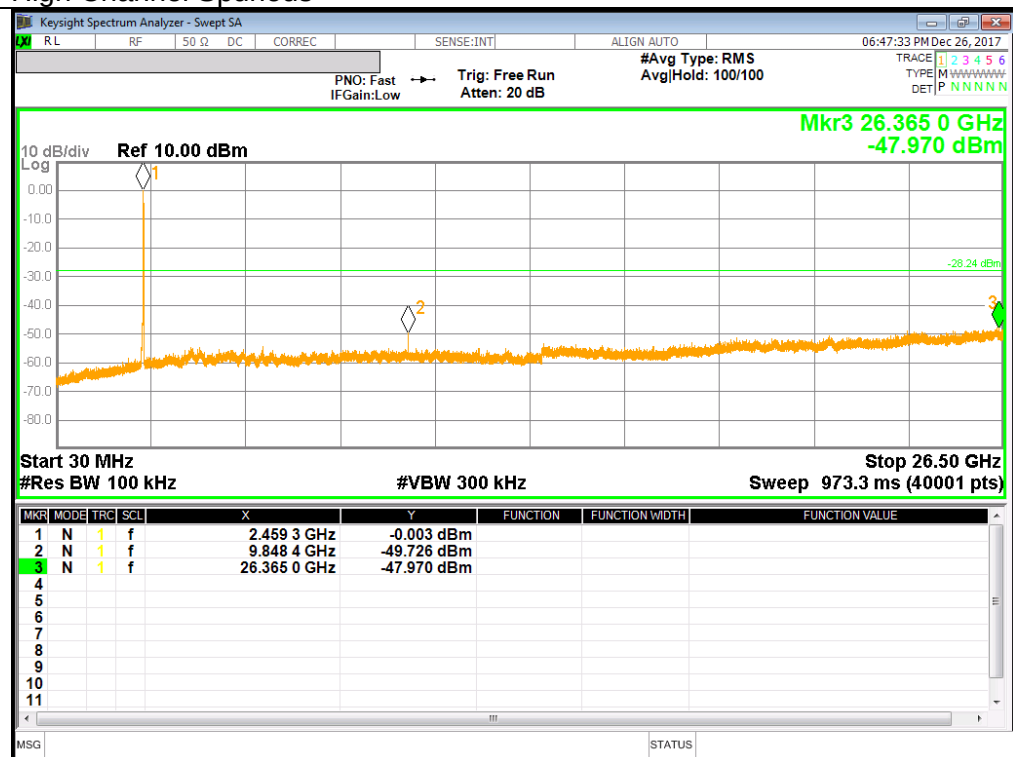
Middle Channel Spurious



High Channel BandEdge



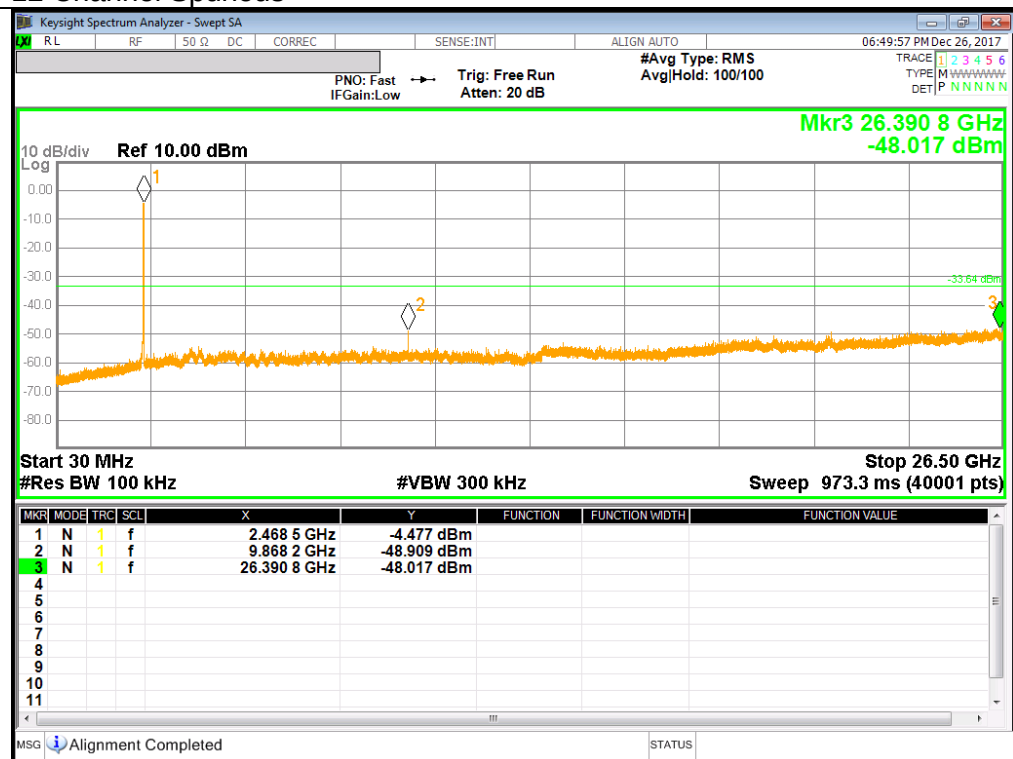
High Channel Spurious



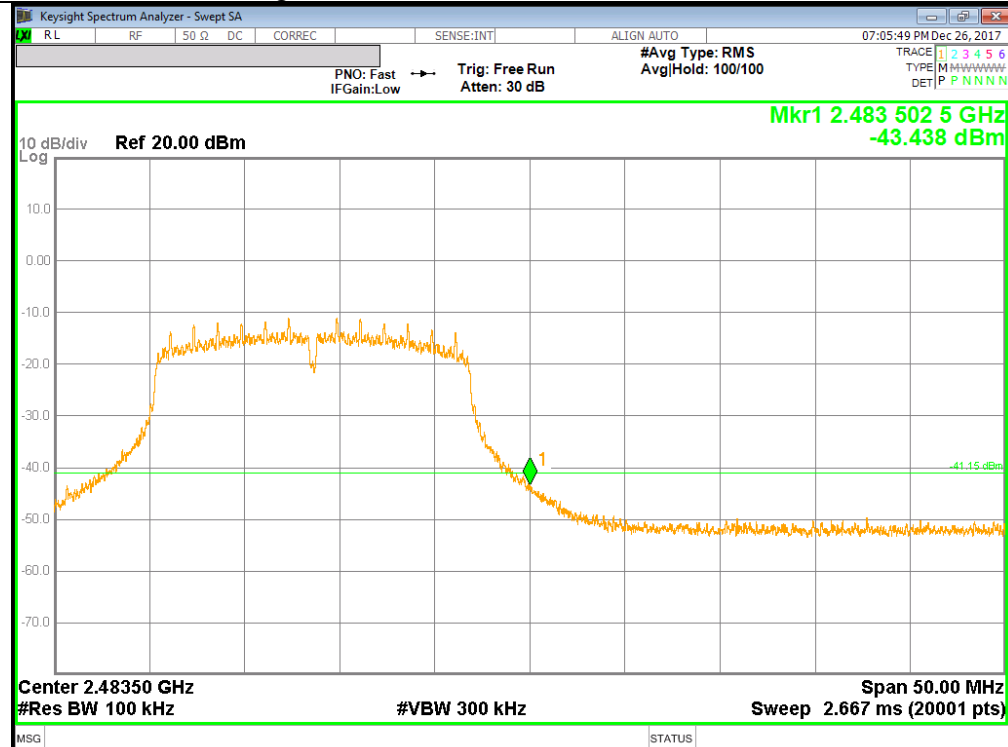
12 Channel BandEdge



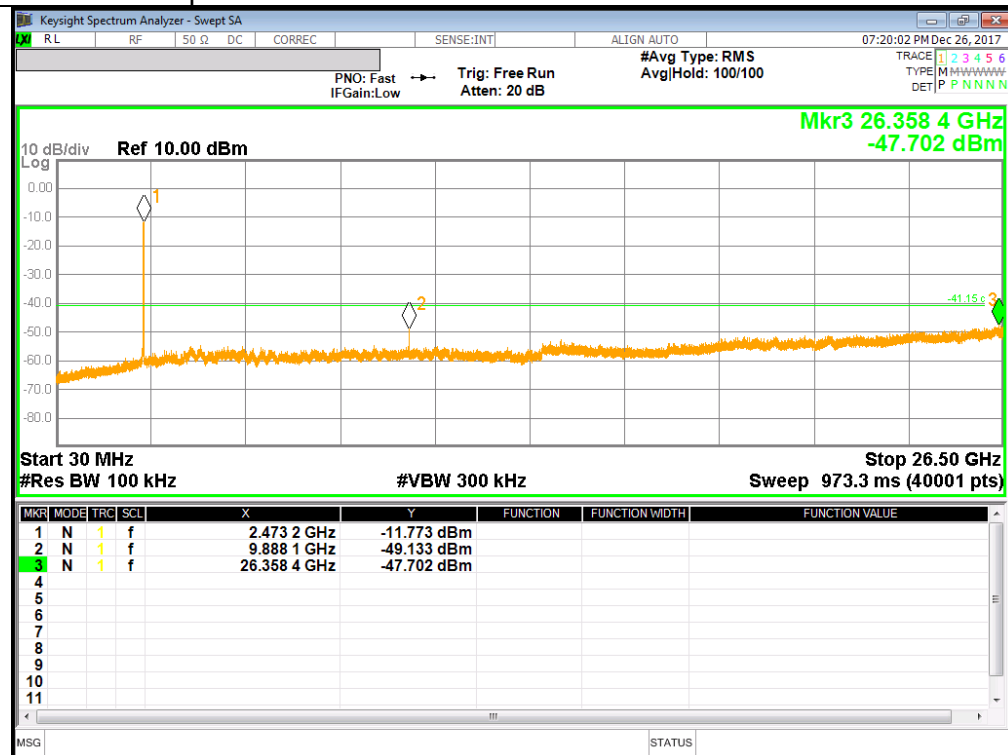
12 Channel Spurious



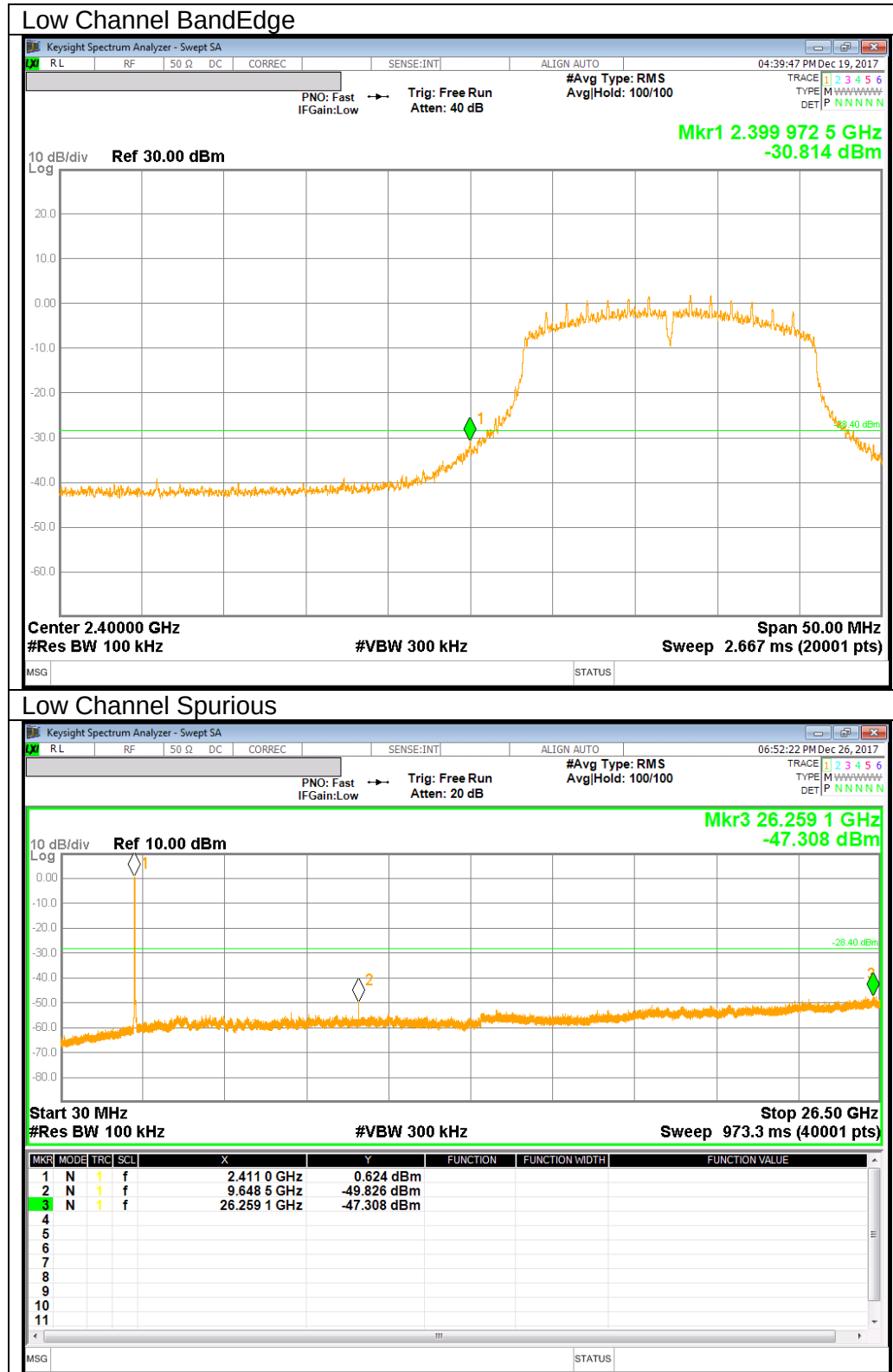
13 Channel BandEdge



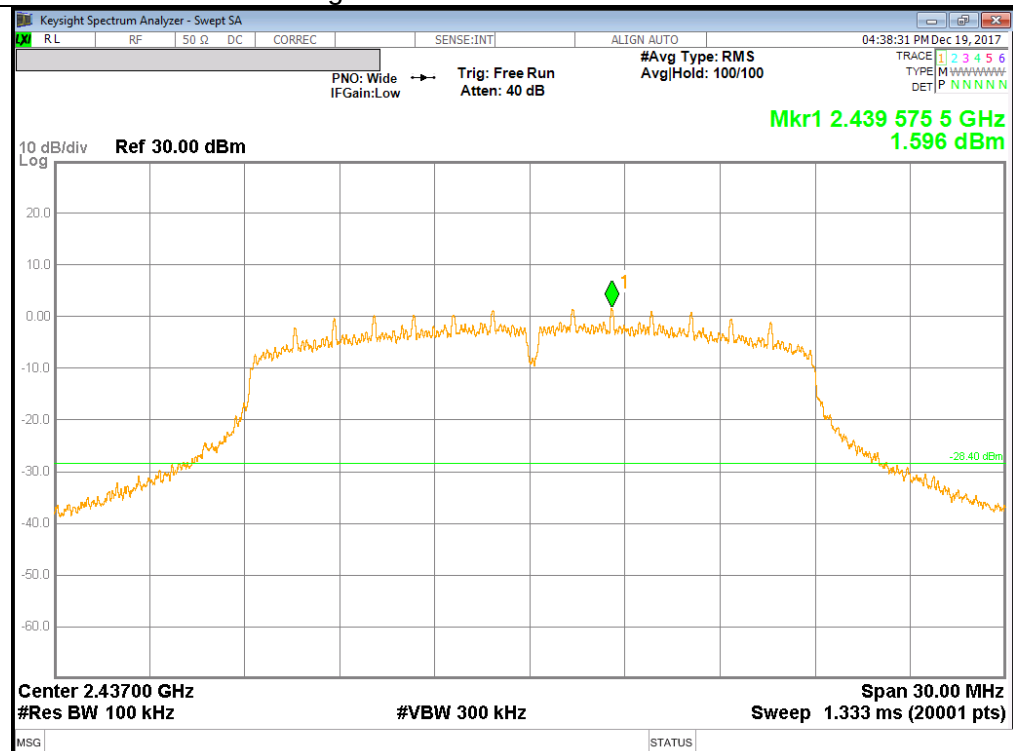
13 Channel Spurious



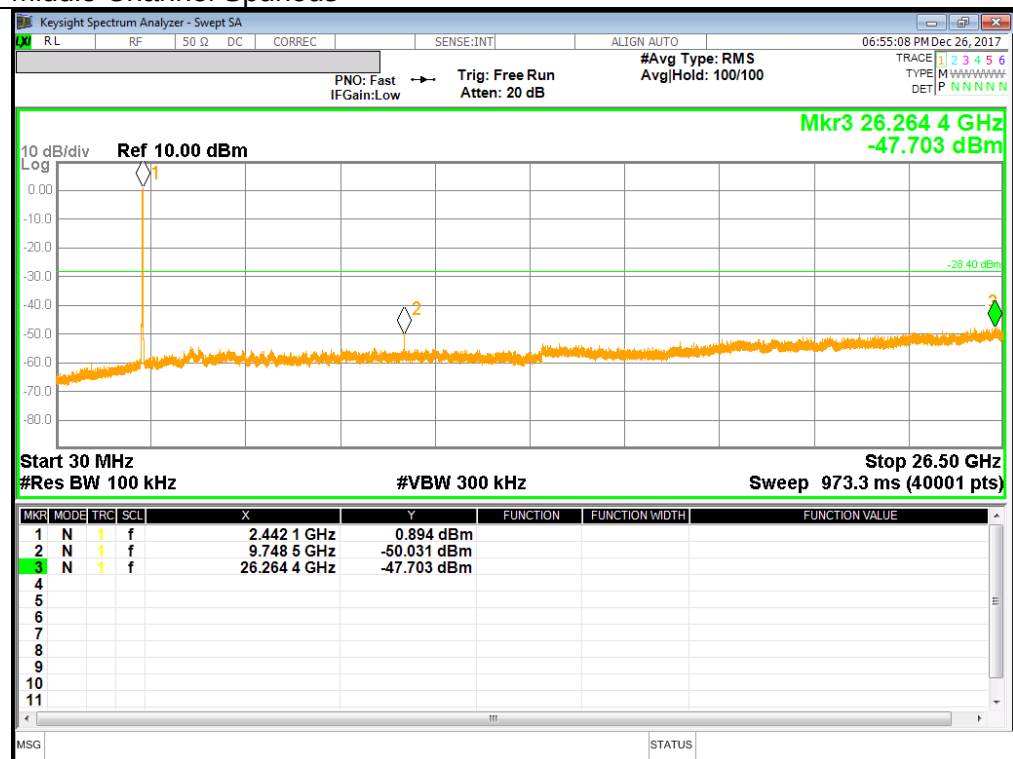
9.4.3. 802.11n HT20 MODE IN THE 2.4 GHz BAND



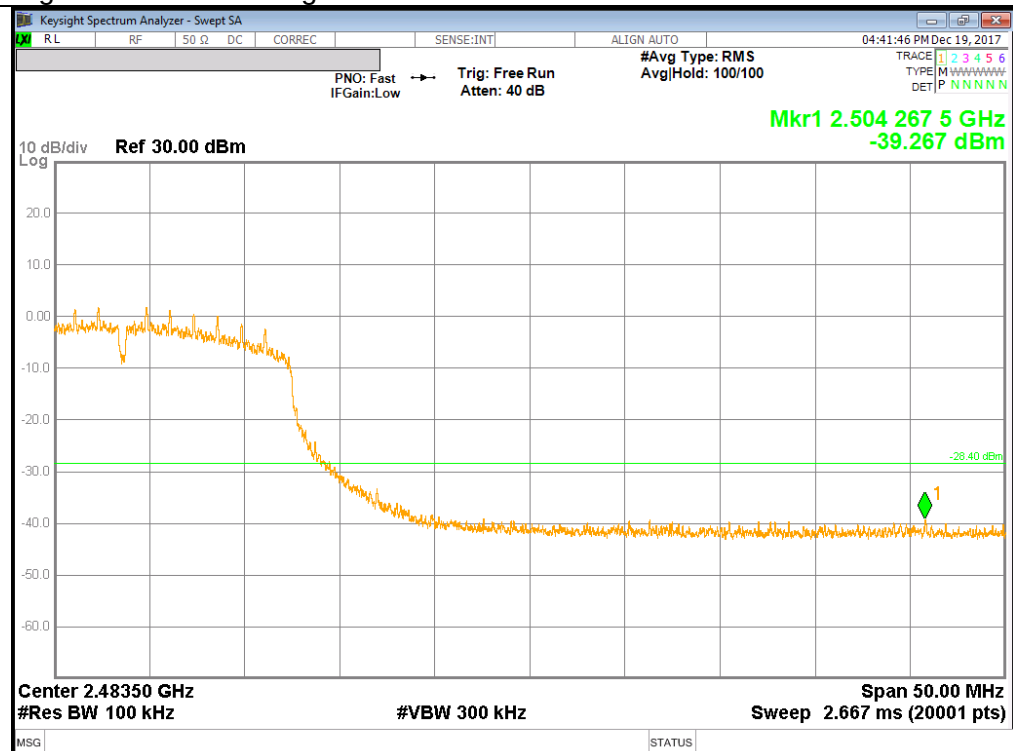
Middle Channel BandEdge



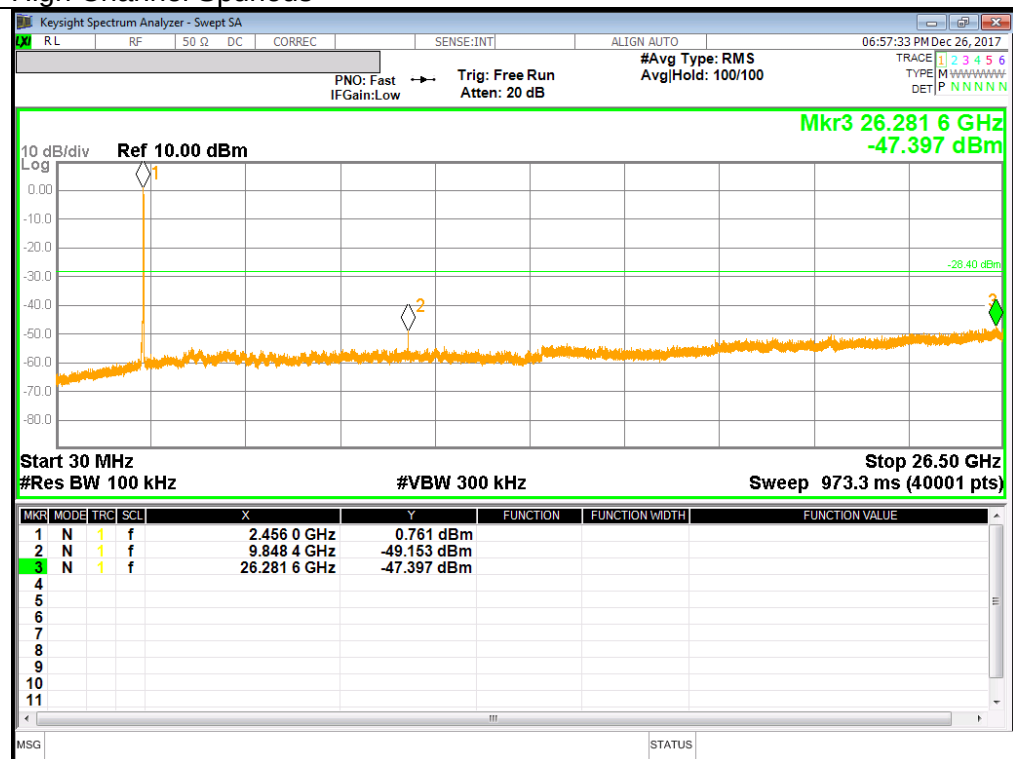
Middle Channel Spurious



High Channel BandEdge



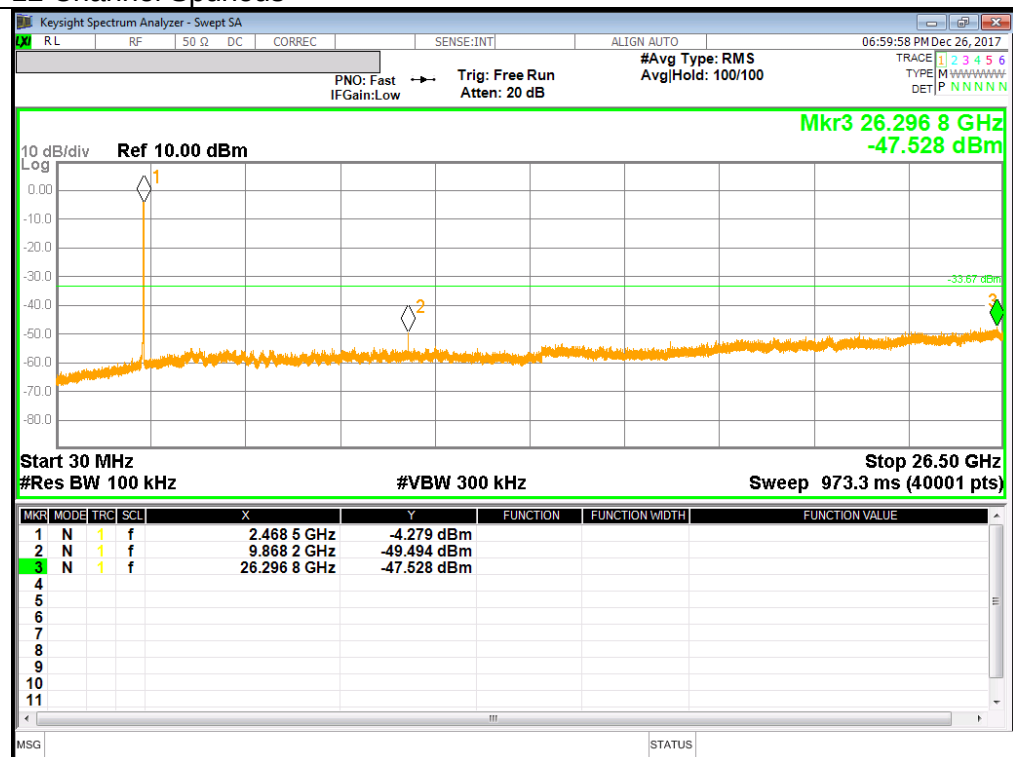
High Channel Spurious



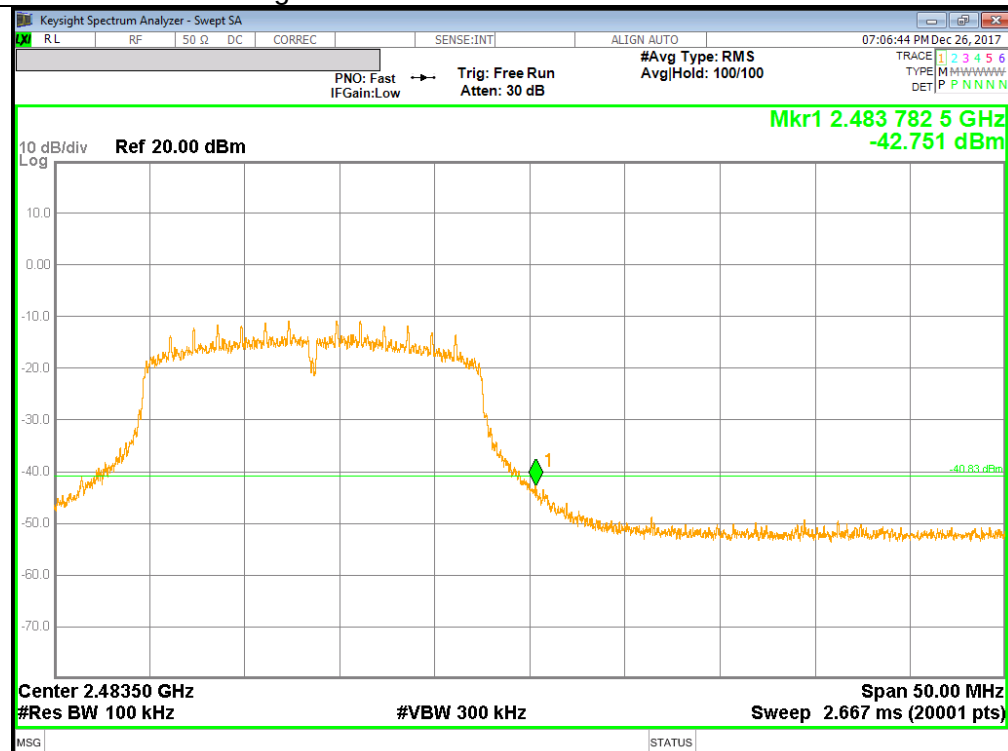
12 Channel BandEdge



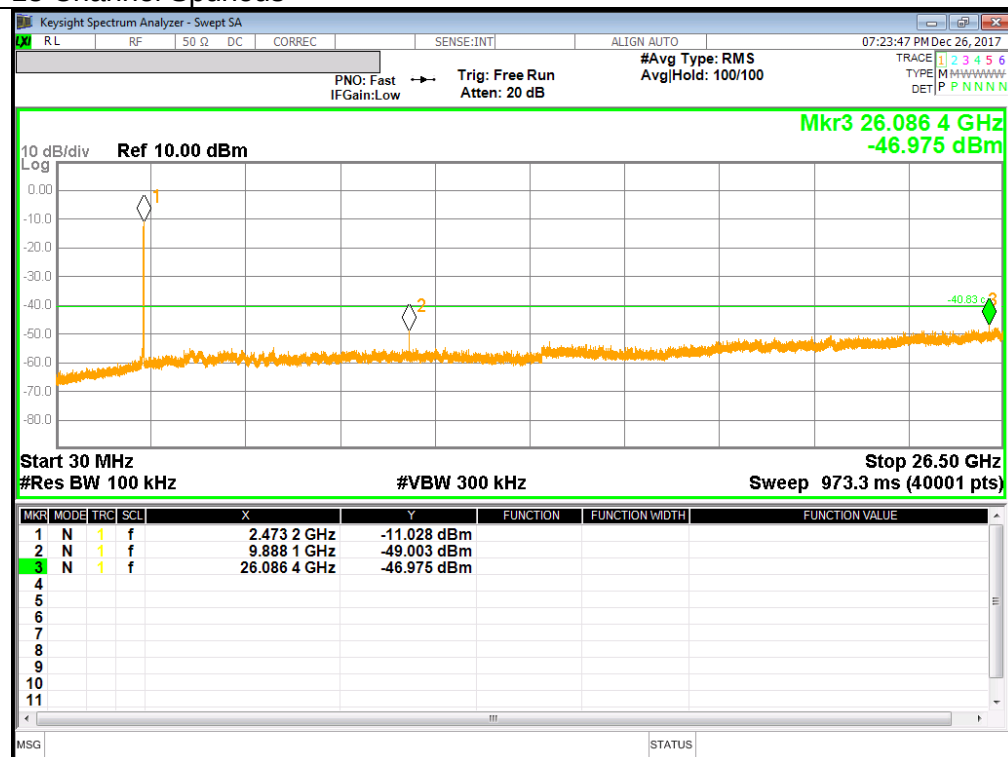
12 Channel Spurious



13 Channel BandEdge



13 Channel Spurious



10. RADIATED TEST RESULTS

10.1. LIMITS AND PROCEDURE

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.

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 antenna to EUT distance is 3 meters. 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 and add duty cycle factor for average measurements. (Restricted bandedge, Final detection of spurious harmonic emissions)
Duty cycle factor= $10\log(1/x)$ For this sample B mode = 0dB (duty cycle >98%); G mode = 0.30dB; N mode = 0.32dB.

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.

The spectrum from 1 GHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in each applicable 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.

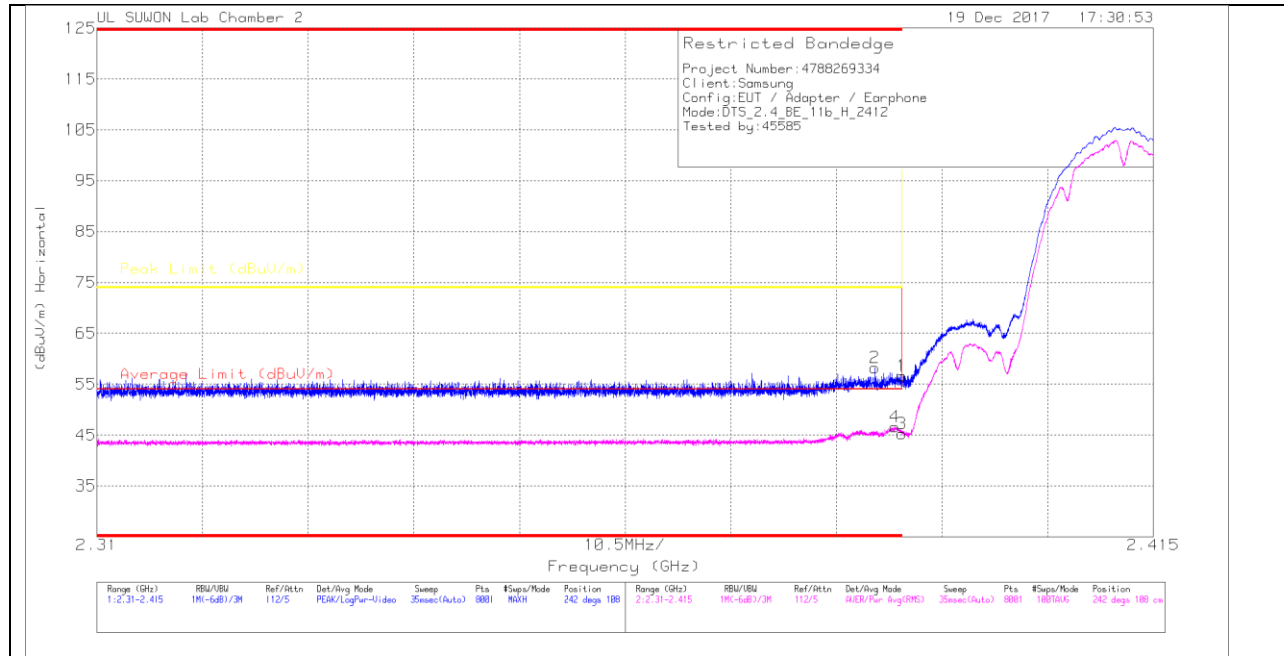
Although these tests were performed other than open area test site, adequate comparison measurements were confirmed against 30 m open area test site.
Therefore sufficient tests were made to demonstrate that the alternative site produces results that correlate with the one of tests made in an open field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

10.2. TRANSMITTER ABOVE 1 GHz

10.2.1. TX ABOVE 1 GHz 802.11b MODE IN THE 2.4 GHz BAND

RESTRICTED BANDEDGE (LOW CHANNEL)

HORIZONTAL PEAK AND AVERAGE PLOT



HORIZONTAL DATA

Trace Markers

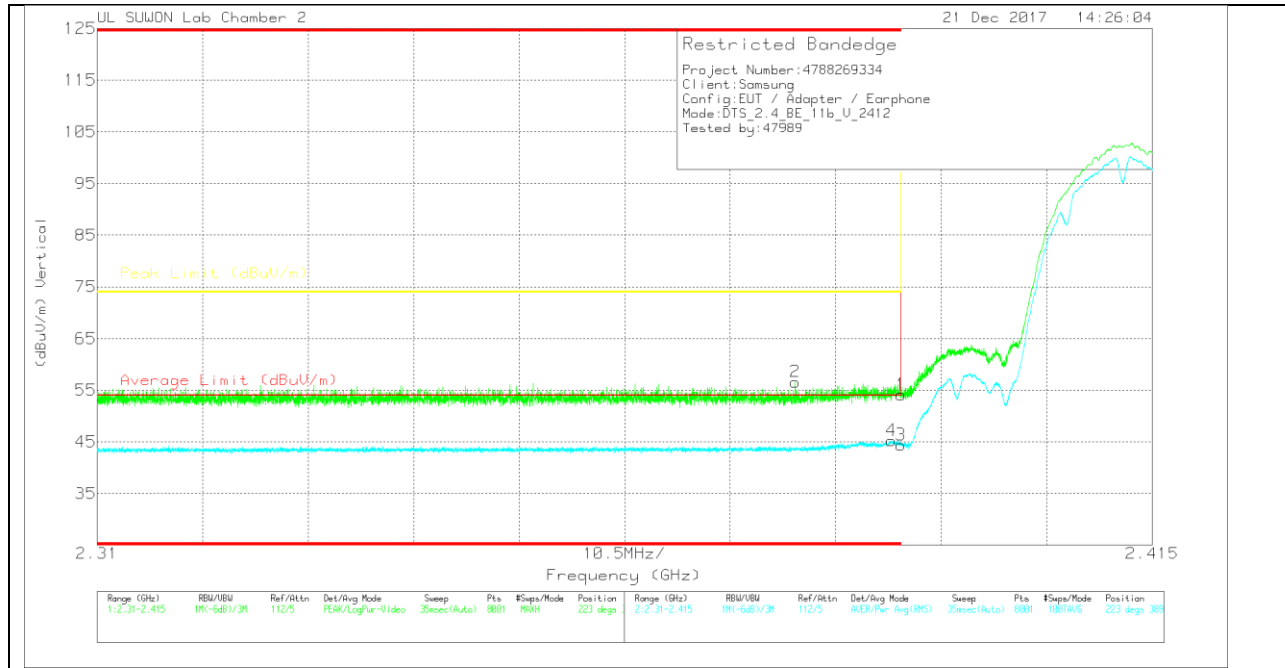
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	170531_311700168724	10dB(dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Altitude (Degs)	Height (cm)	Polarity
1	* 2.39	43.53	Pk	31.3	-18.2	0	56.63	-	-	74	-17.37	242	108	H
2	* 2.387	45.18	Pk	31.3	-18.2	0	58.28	-	-	74	-15.72	242	108	H
3	* 2.39	32.1	RMS	31.3	-18.2	0	45.2	54	-8.8	-	-	242	108	H
4	* 2.389	33.55	RMS	31.3	-18.2	0	46.65	54	-7.35	-	-	242	108	H

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

Pk - Peak detector

RMS - RMS detection

VERTICAL PEAK AND AVERAGE PLOT



VERTICAL DATA

Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	170531_311700168724	10dB(dB)	DC Corr (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	41.05	Pk		-18.2	0	54.15	-	-	74	-19.85	223	389	V
2	* 2.379	43.63	Pk		-18.3	0	56.63	-	-	74	-17.37	223	389	V
3	* 2.39	31.32	RMS		-18.2	0	44.42	54	-9.58	-	-	223	389	V
4	* 2.389	32.17	RMS		-18.2	0	45.27	54	-8.73	-	-	223	389	V

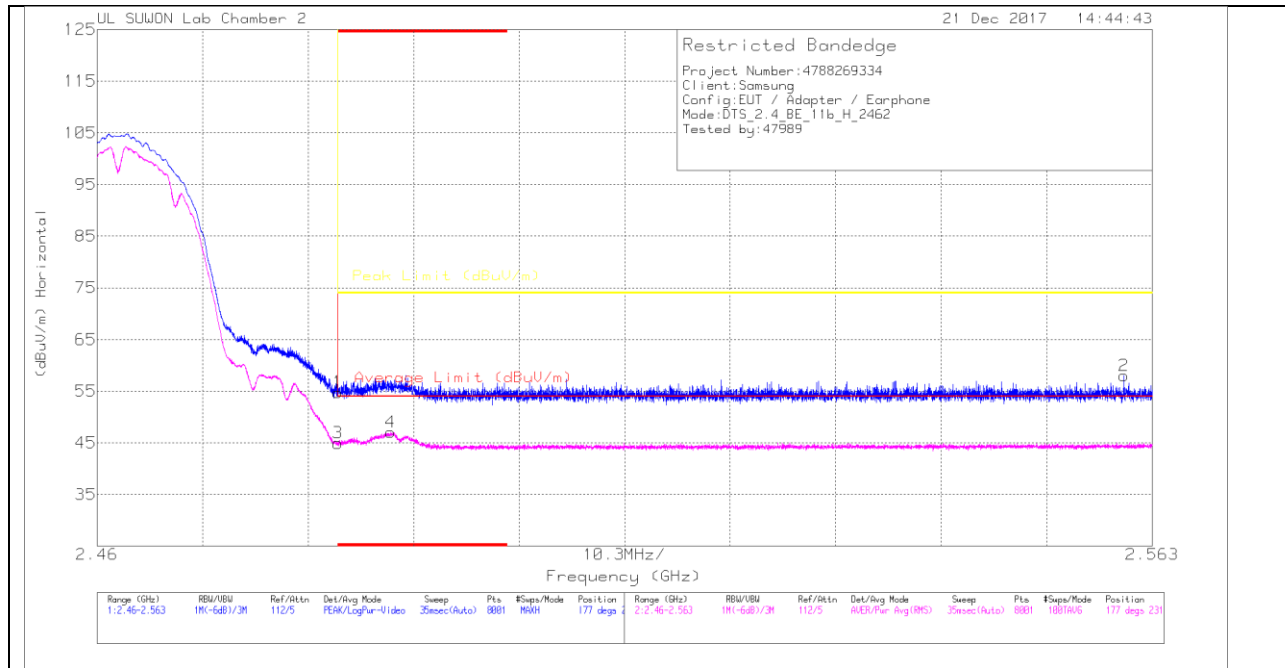
* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

Pk - Peak detector

RMS - RMS detection

AUTHORIZED BANDEDGE (HIGH CHANNEL)

HORIZONTAL PEAK AND AVERAGE PLOT



HORIZONTAL DATA

Trace Markers

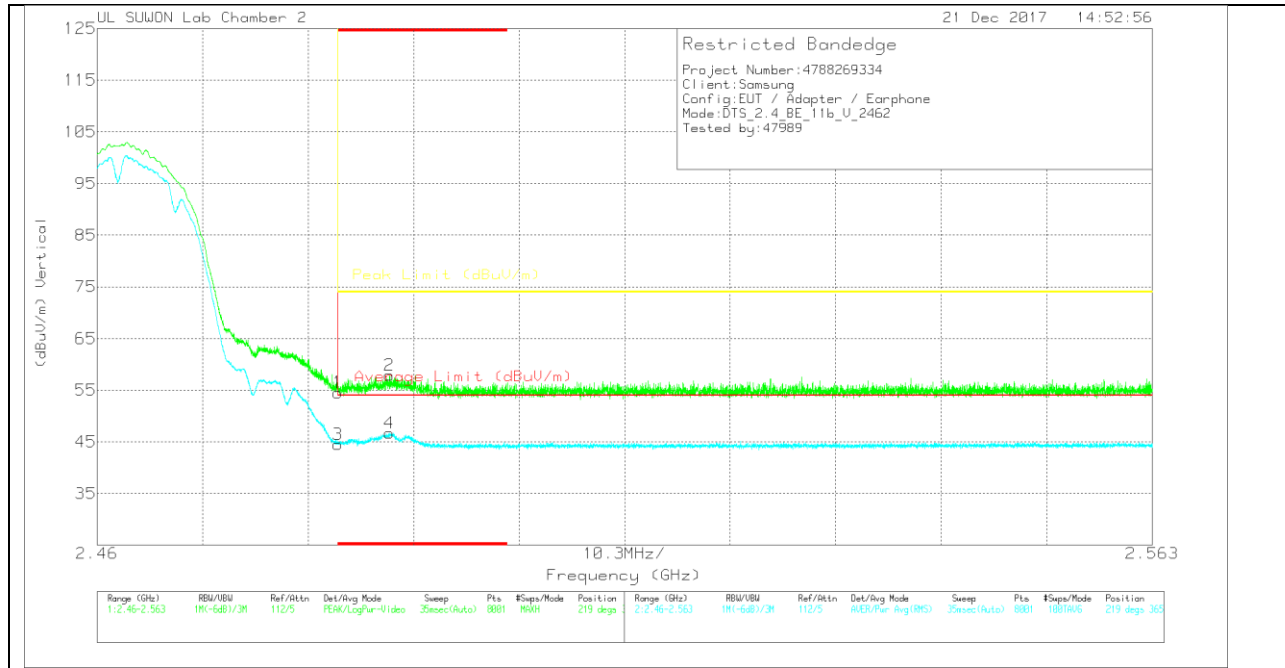
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	1705311_3117(00168724)	10dB(dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Altitude (Degs)	Height (cm)	Polarity
1	* 2.484	41.17	PK		31.6	-18	54.77	-	-	74	-19.23	177	231	H
2	2.56	44.3	PK		31.7	-18	58	-	-	74	-16	177	231	H
3	* 2.484	31.36	RMS		31.6	-18	44.96	54	-9.04	-	-	177	231	H
4	* 2.489	33.45	RMS		31.6	-18	47.05	54	-6.95	-	-	177	231	H

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

PK - Peak detector

RMS - RMS detection

VERTICAL PEAK AND AVERAGE PLOT



VERTICAL DATA

Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	170531_311700168724	10dB(dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Pk Margin (dB)	Altitude (Degs)	Height (cm)	Polarity
1	* 2.484	40.94	Pk		-18	0	54.54	-	-	74	-19.46	219	365	V
2	* 2.489	44.3	Pk		-18	0	57.9	-	-	74	-16.1	219	365	V
3	* 2.484	30.92	RMS		-18	0	44.52	54	-9.48	-	-	219	365	V
4	* 2.489	33.1	RMS		-18	0	46.7	54	-7.3	-	-	219	365	V

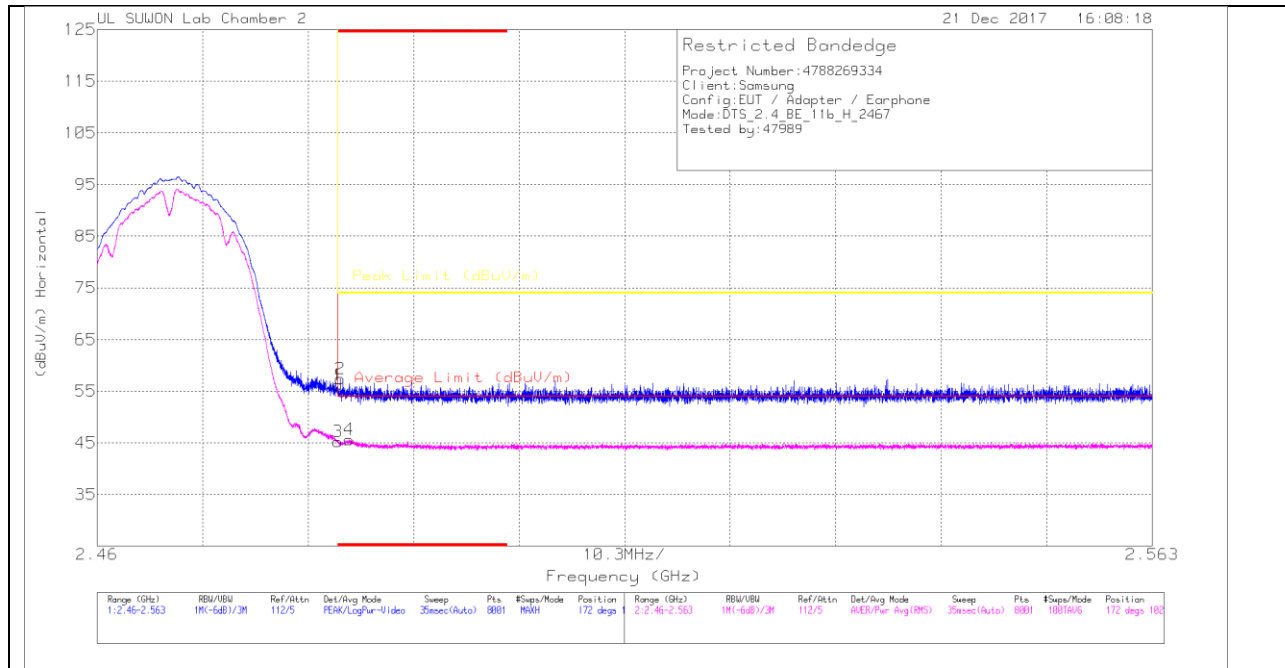
* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

Pk - Peak detector

RMS - RMS detection

AUTHORIZED BANDEDGE (12 CHANNEL)

HORIZONTAL PEAK AND AVERAGE PLOT



HORIZONTAL DATA

Trace Markers

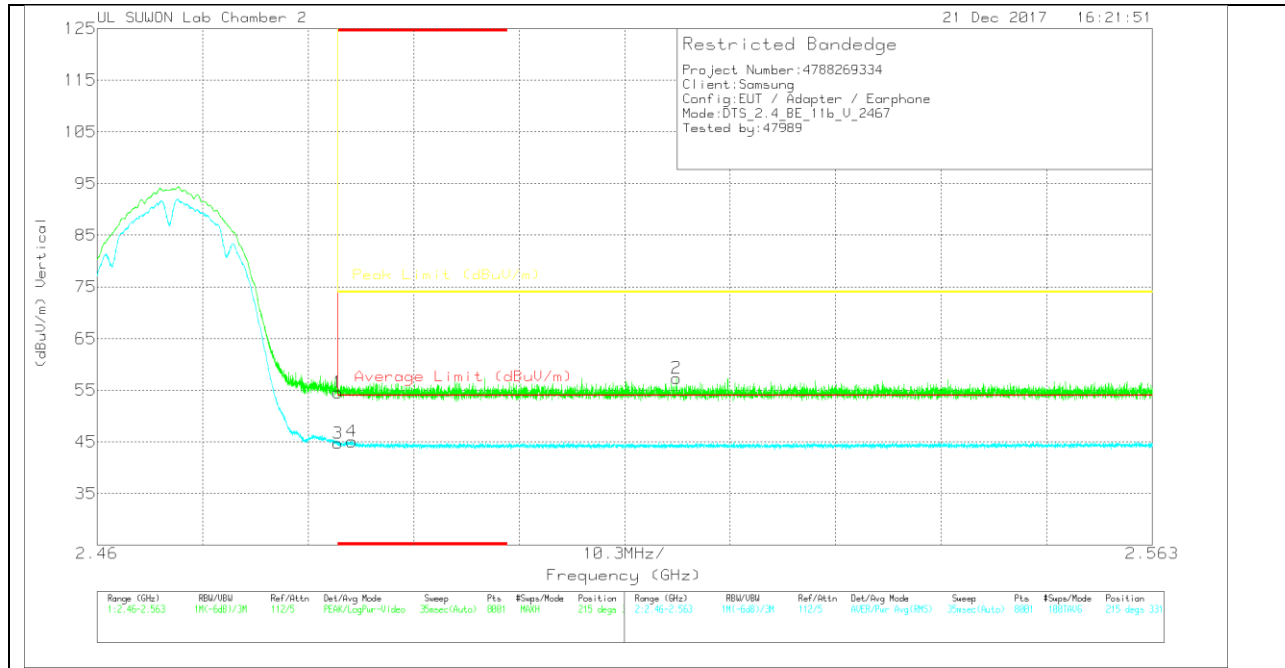
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	170531_3117(00168724)	10dB(dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.484	42.58	PK		31.6	-18	56.18	-	-	74	-17.82	172	102	H
2	* 2.484	43.83	PK		31.6	-18	57.43	-	-	74	-16.57	172	102	H
3	* 2.484	31.63	RMS		31.6	-18	45.23	54	-8.77	-	-	172	102	H
4	* 2.485	32.05	RMS		31.6	-18	45.65	54	-8.35	-	-	172	102	H

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

PK - Peak detector

RMS - RMS detection

VERTICAL PEAK AND AVERAGE PLOT



VERTICAL DATA

Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	170531_311700168724	10dB(dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Pk Margin (dB)	Altitude (Degs)	Height (cm)	Polarity
1	* 2.484	40.97	Pk		-18	0	54.57	-	-	74	-19.43	215	331	V
2	2.517	43.74	Pk		-18	0	57.34	-	-	74	-16.66	215	331	V
3	* 2.484	31.13	RMS		-18	0	44.73	54	-9.27	-	-	215	331	V
4	* 2.485	31.49	RMS		-18	0	45.09	54	-8.91	-	-	215	331	V

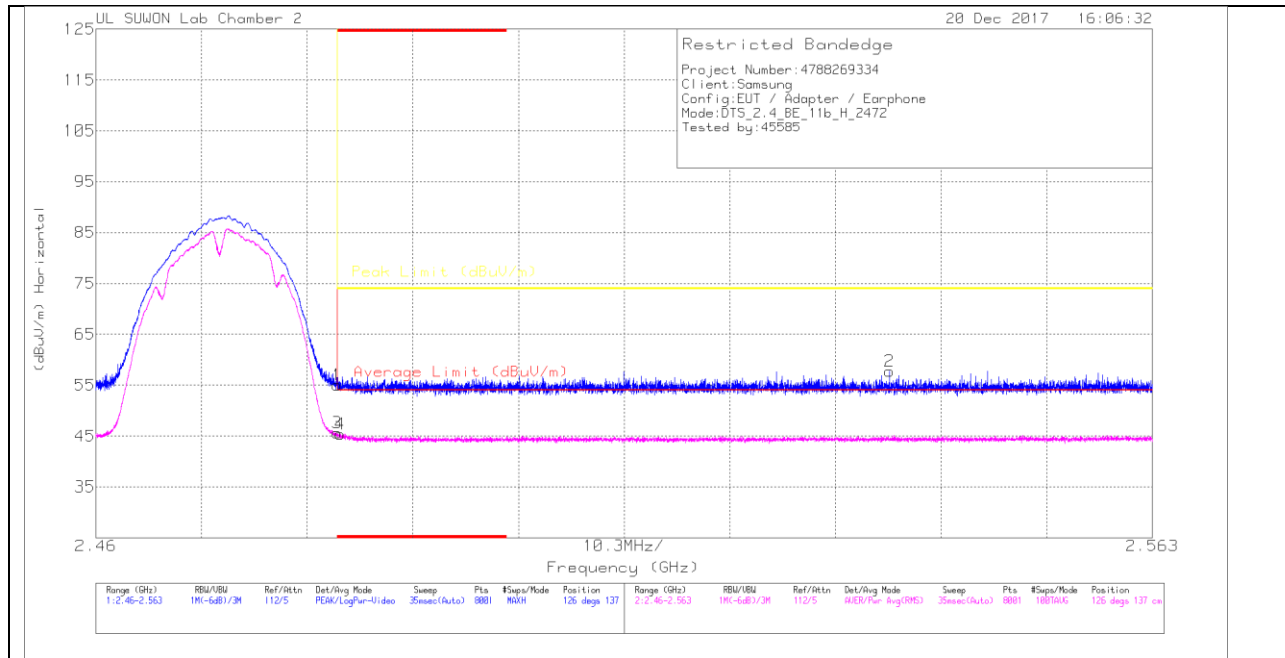
* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

Pk - Peak detector

RMS - RMS detection

AUTHORIZED BANDEDGE (13 CHANNEL)

HORIZONTAL PEAK AND AVERAGE PLOT



HORIZONTAL DATA

Trace Markers

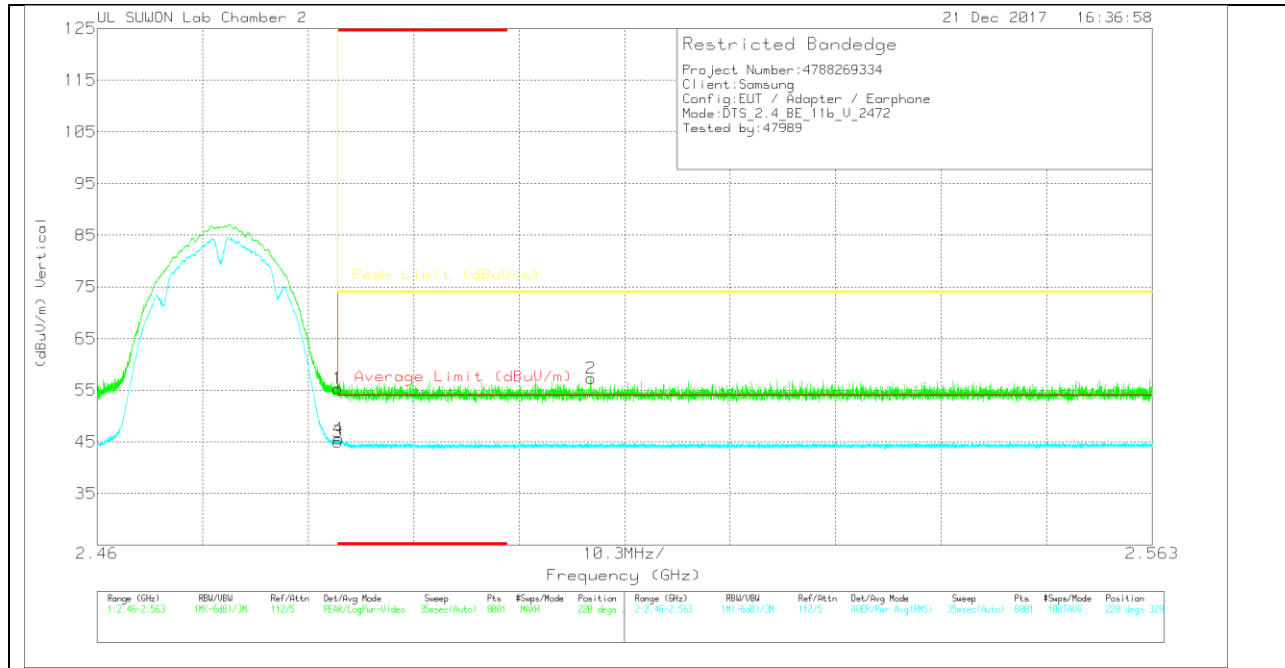
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	170531_3117(00168724)	10dB(dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.484	41.42	Pk		-18	0	55.02	-	-	74	-18.98	126	137	H
2	2.537	44.04	Pk		-18	0	57.74	-	-	74	-16.26	126	137	H
3	* 2.484	31.99	RMS		-18	0	45.59	54	-8.41	-	-	126	137	H
4	* 2.484	31.81	RMS		-18	0	45.41	54	-8.59	-	-	126	137	H

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

Pk - Peak detector

RMS - RMS detection

VERTICAL PEAK AND AVERAGE PLOT



VERTICAL DATA

Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	170531_311700168724	10dB(dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Pk Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.484	41.73	Pk		-18	0	55.33	-	-	74	-18.67	220	329	V
2	2.508	43.71	Pk		-18	0	57.31	-	-	74	-16.69	220	329	V
3	* 2.484	31.41	RMS		-18	0	45.01	54	-8.99	-	-	220	329	V
4	* 2.484	31.98	RMS		-18	0	45.58	54	-8.42	-	-	220	329	V

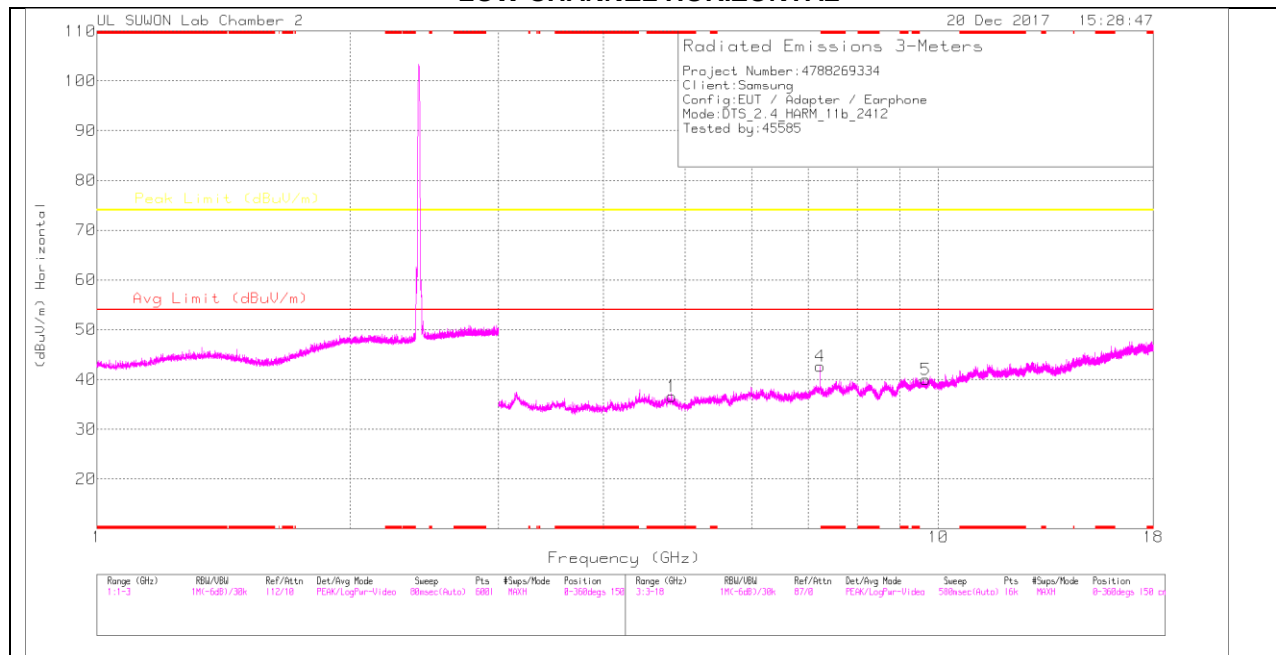
* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

Pk - Peak detector

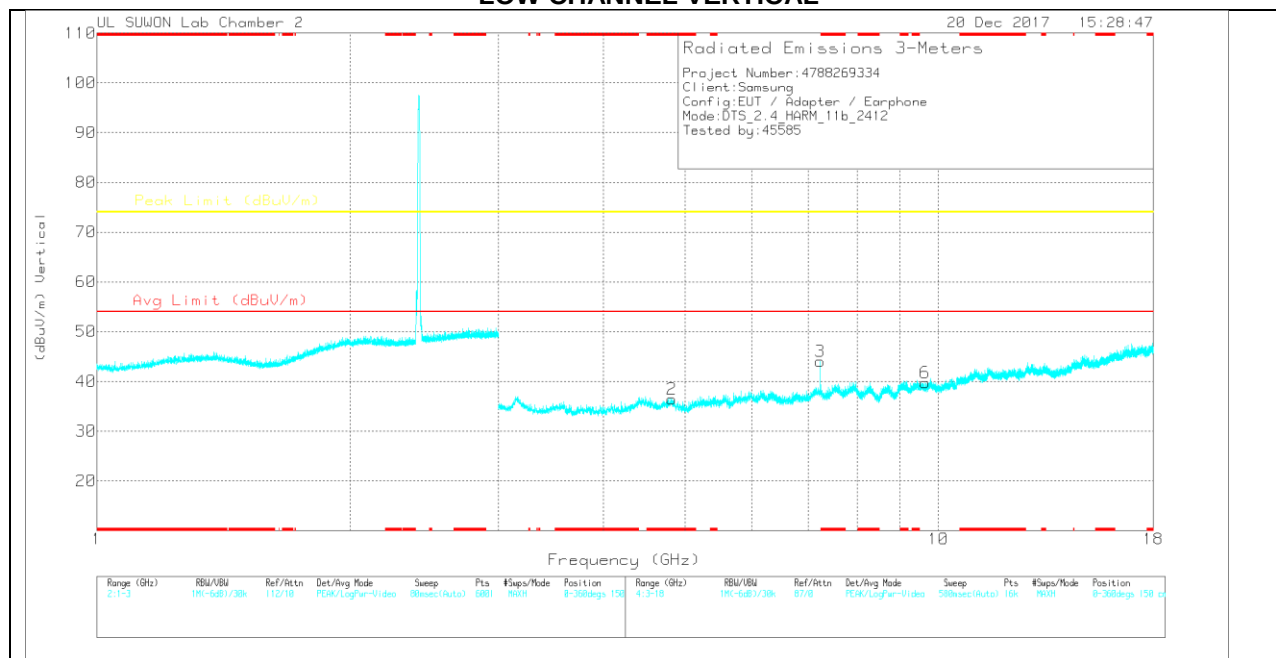
RMS - RMS detection

HARMONICS AND SPURIOUS EMISSIONS

LOW CHANNEL HORIZONTAL



LOW CHANNEL VERTICAL



Note: Emission was scanned up to 26GHz; No emissions were detected above the noise floor which was at least 20dB below the specification limit.

LOW CHANNEL DATA

Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	170531_3117[00168724]	3GHz_HP[dB]	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 4.823	27.06	PK		33.8	-24.3	0	36.56	-	74	-37.44	0-360	150	H
4	7.237	28.79	PK		35.9	-22	0	42.69	-	74	-31.31	0-360	250	H
5	9.658	21.4	PK		36.8	-18.2	0	40	-	74	-34	0-360	150	H
2	* 4.818	26.95	PK		33.8	-24.3	0	36.45	-	74	-37.55	0-360	250	V
3	7.235	30.02	PK		35.9	-21.9	0	44.02	-	74	-29.98	0-360	250	V
6	9.646	21.27	PK		36.8	-18.3	0	39.77	-	74	-34.23	0-360	150	V

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

PK – Peak Detector

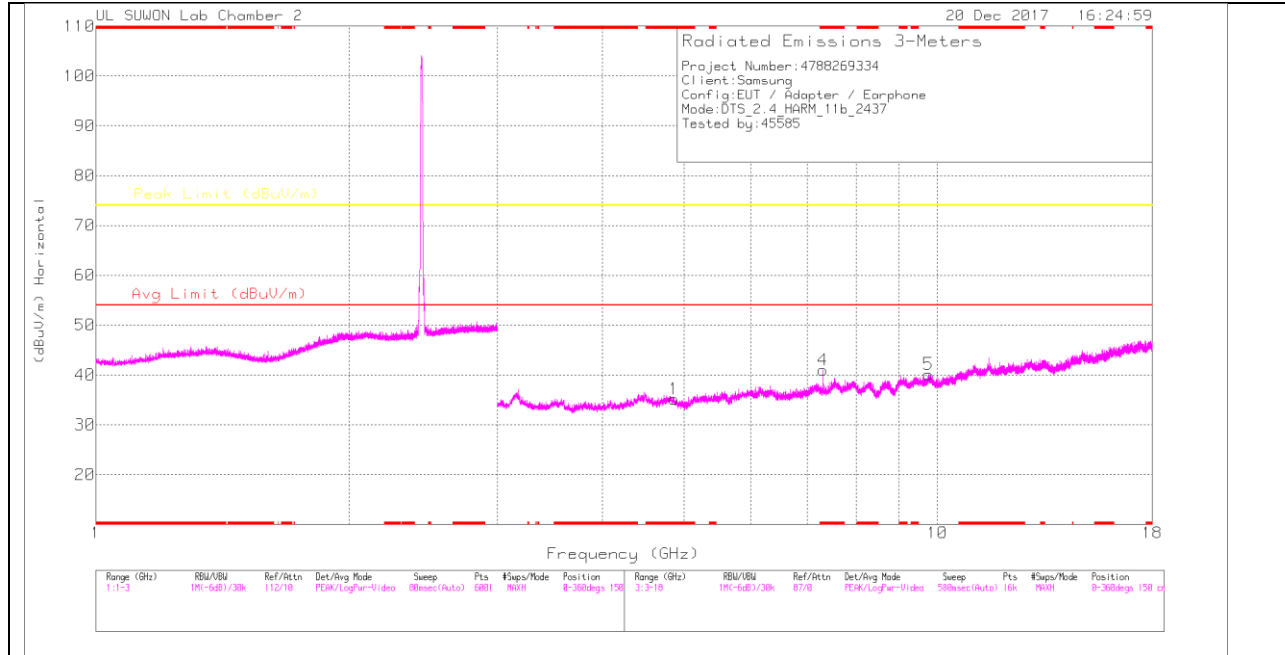
Radiated Emissions

Frequency (GHz)	Meter Reading (dBuV)	Det	170531_3117[00168724]	3GHz_HP[dB]	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
7.235	37.87	PK2		35.9	-21.9	0	51.87	-	74	-22.13	13	364	H
7.235	36.82	PK2		35.9	-21.9	0	50.82	-	74	-23.18	220	112	V

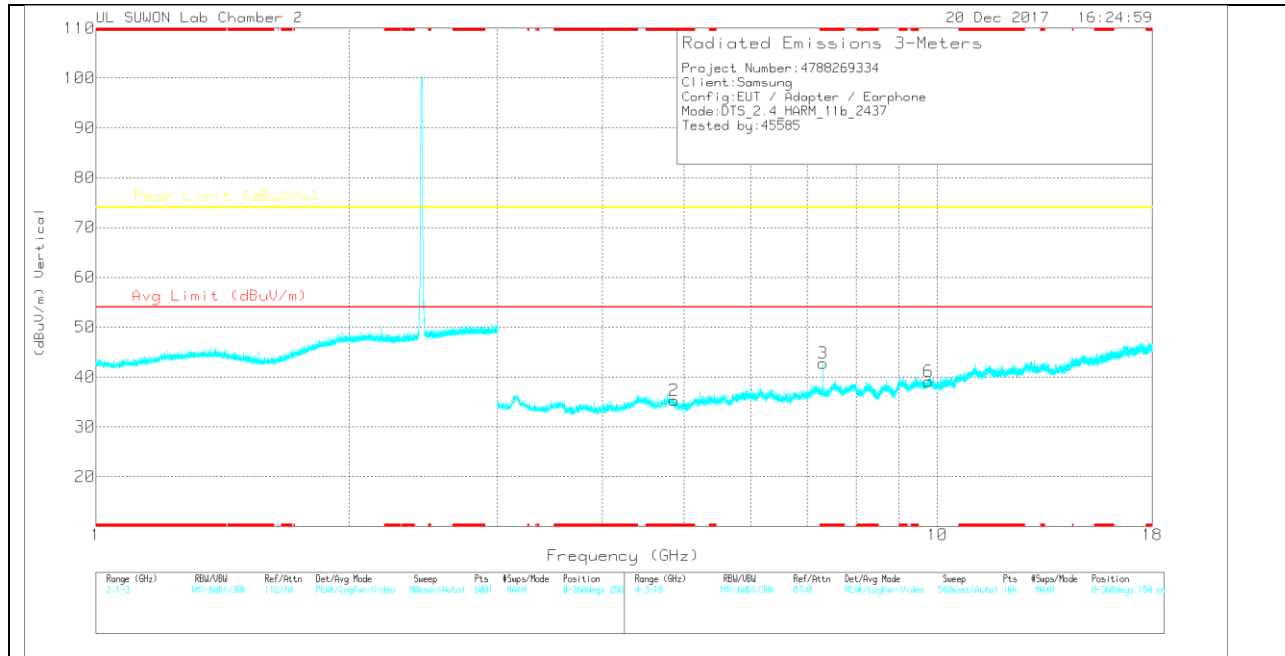
* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

PK2 - KDB558074 Method: Maximum Peak

MID CHANNEL HORIZONTAL



MID CHANNEL VERTICAL



Note: Emission was scanned up to 26GHz; No emissions were detected above the noise floor which was at least 20dB below the specification limit.

MID CHANNEL DATA

Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	170531_3117[00168724]	3GHz_HP[dB]	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 4.866	25.73	PK	33.8	-24.4	0	35.13	-	-	74	-38.87	0-360	150	H
4	* 7.31	27.12	PK	35.9	-22	0	41.02	-	-	74	-32.98	0-360	150	H
5	9.755	21.27	PK	36.9	-18	0	40.17	-	-	74	-33.83	0-360	250	H
2	* 4.862	25.88	PK	33.8	-24.4	0	35.28	-	-	74	-38.72	0-360	250	V
3	* 7.31	28.81	PK	35.9	-22	0	42.71	-	-	74	-31.29	0-360	250	V
6	9.757	20.22	PK	36.9	-18	0	39.12	-	-	74	-34.88	0-360	150	V

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

PK – Peak Detector

Radiated Emissions

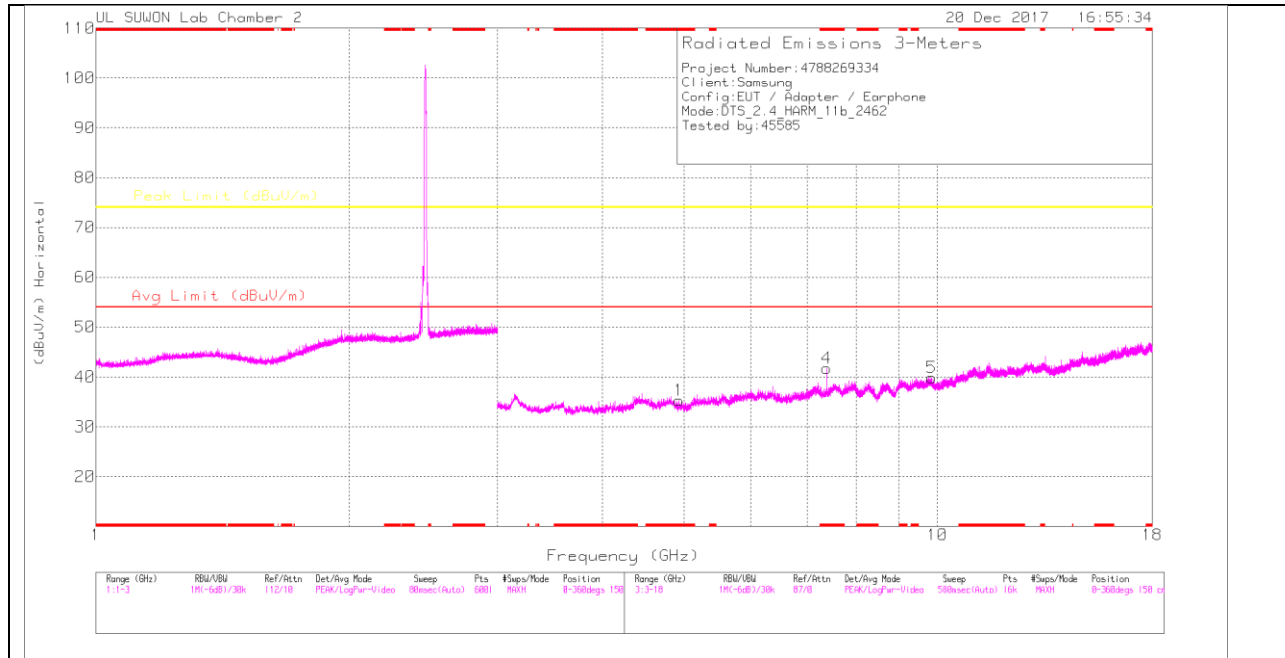
Frequency (GHz)	Meter Reading (dBuV)	Det	170531_3117[00168724]	3GHz_HP[dB]	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
* 7.311	35.84	PK2	35.9	-22	0	49.74	-	-	74	-24.26	29	342	H
* 7.312	27.13	MAv1	35.9	-22	0	41.03	54	-12.97	-	-	29	342	H
* 7.311	35.49	PK2	35.9	-22	0	49.39	-	-	74	-24.61	358	334	V
* 7.31	27.22	MAv1	35.9	-22	0	41.12	54	-12.88	-	-	358	334	V

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

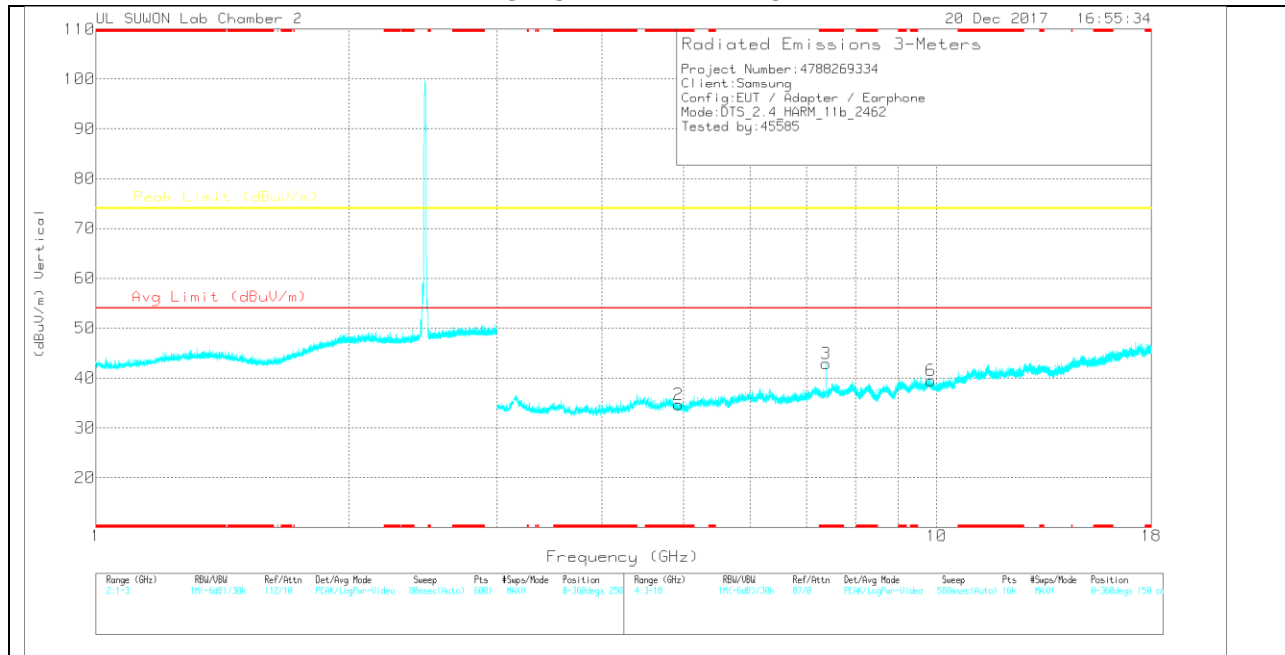
PK2 - KDB558074 Method: Maximum Peak

MAv1 - KDB558074 Option 1 Maximum RMS Average

HIGH CHANNEL HORIZONTAL



HIGH CHANNEL VERTICAL



Note: Emission was scanned up to 26GHz; No emissions were detected above the noise floor which was at least 20dB below the specification limit.

HIGH CHANNEL DATA

Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	170531_3117[00168724]	3GHz_HP[dB]	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 4.93	26.23	PK	33.8	-24.7	0	35.33	-	-	74	-38.67	0-360	250	H
4	* 7.387	27.31	PK	35.9	-21.4	0	41.81	-	-	74	-32.19	0-360	150	H
5	9.848	20.79	PK	37	-17.9	0	39.89	-	-	74	-34.11	0-360	250	H
2	* 4.933	25.63	PK	33.8	-24.7	0	34.73	-	-	74	-39.27	0-360	250	V
3	* 7.385	28.4	PK	35.9	-21.4	0	42.9	-	-	74	-31.1	0-360	250	V
6	9.848	20.39	PK	37	-17.9	0	39.49	-	-	74	-34.51	0-360	250	V

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

PK – Peak Detector

Radiated Emissions

Frequency (GHz)	Meter Reading (dBuV)	Det	170531_3117[00168724]	3GHz_HP[dB]	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
* 7.385	34.37	PK2	35.9	-21.4	0	48.87	-	-	74	-25.13	96	313	H
* 7.387	26.3	MAv1	35.9	-21.4	0	40.8	54	-13.2	-	-	96	313	H
* 7.387	35.2	PK2	35.9	-21.4	0	49.7	-	-	74	-24.3	351	383	V
* 7.387	26.83	MAv1	35.9	-21.4	0	41.33	54	-12.67	-	-	351	383	V

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

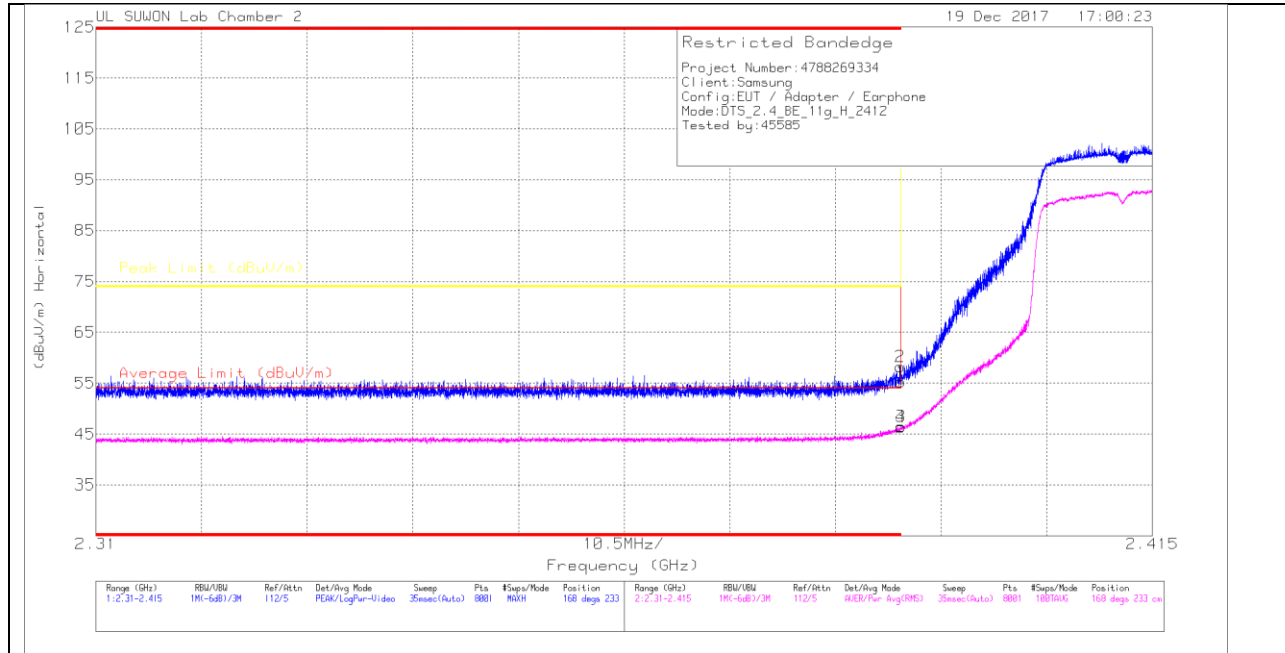
PK2 - KDB558074 Method: Maximum Peak

MAv1 - KDB558074 Option 1 Maximum RMS Average

10.2.2.TX ABOVE 1 GHz 802.11g MODE IN THE 2.4 GHz BAND

RESTRICTED BANDEDGE (LOW CHANNEL)

HORIZONTAL PEAK AND AVERAGE PLOT



HORIZONTAL DATA

Trace Markers

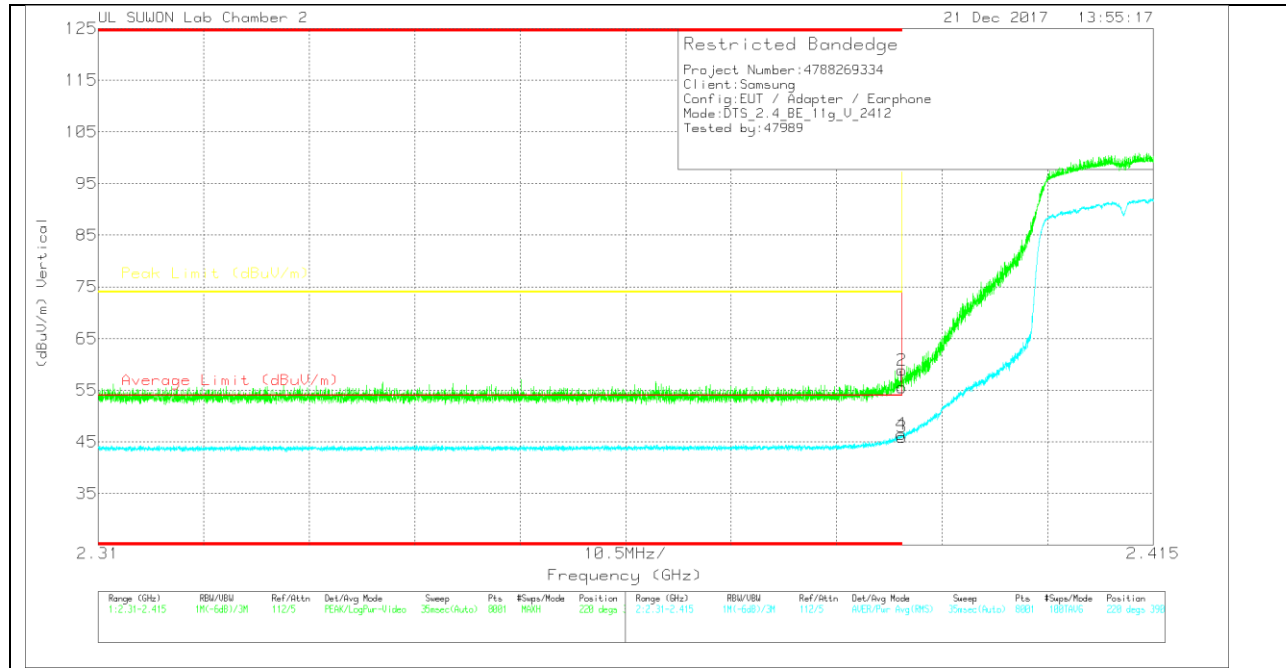
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	170531_3117(00168724)	10dB(dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Altitude (Degs)	Height (cm)	Polarity
1	* 2.39	42.18	Pk	31.3	-18.2	0	55.28	-	-	74	-18.72	168	233	H
2	* 2.39	45.1	PK	31.3	-18.2	0	58.2	-	-	74	-15.8	168	233	H
3	* 2.39	33.12	RMS	31.3	-18.2	.3	46.52	54	-7.48	-	-	168	233	H
4	* 2.39	32.99	RMS	31.3	-18.2	.3	46.39	54	-7.61	-	-	168	233	H

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

Pk - Peak detector

RMS - RMS detection

VERTICAL PEAK AND AVERAGE PLOT



VERTICAL DATA

Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	170531_311700168724	10dB(dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Altitude (Degs)	Height (cm)	Polarity
1	* 2.39	42.46	Pk	31.3	-18.2	0	55.56	-	-	74	-18.44	220	390	V
2	* 2.39	45.75	Pk	31.3	-18.2	0	58.85	-	-	74	-15.15	220	390	V
3	* 2.39	32.54	RMS	31.3	-18.2	.3	45.94	54	-8.06	-	-	220	390	V
4	* 2.39	33.09	RMS	31.3	-18.2	.3	46.49	54	-7.51	-	-	220	390	V

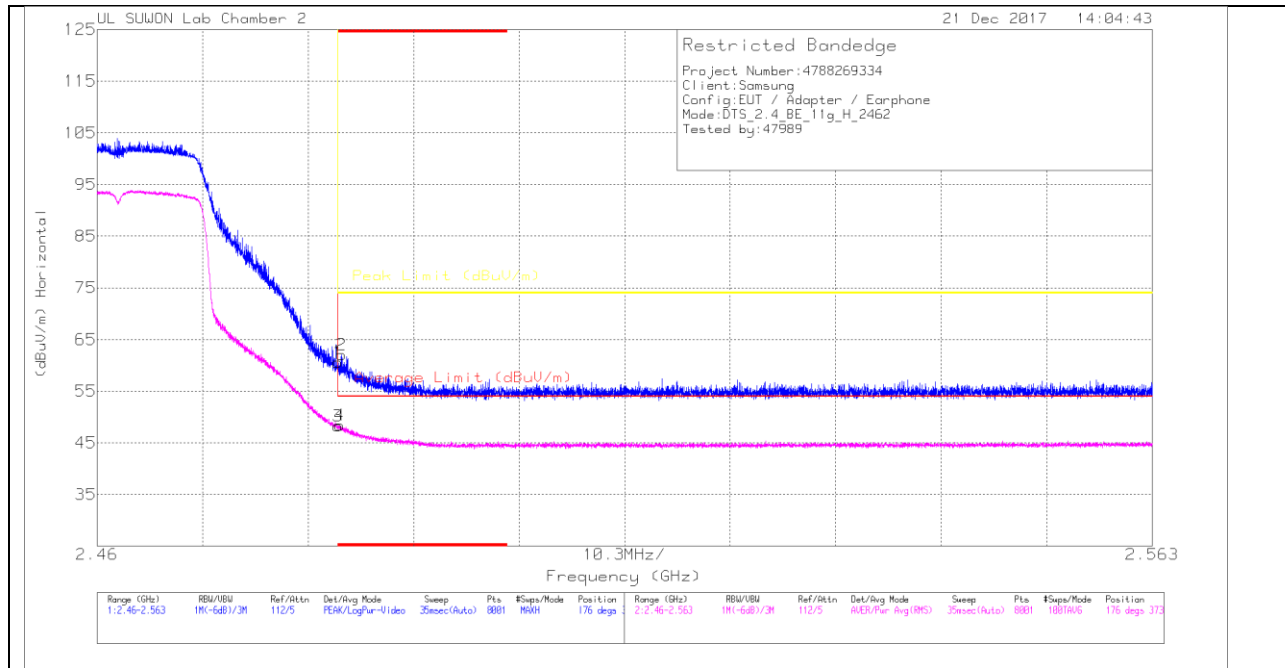
* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

Pk - Peak detector

RMS - RMS detection

AUTHORIZED BANDEDGE (HIGH CHANNEL)

HORIZONTAL PEAK AND AVERAGE PLOT



HORIZONTAL DATA

Trace Markers

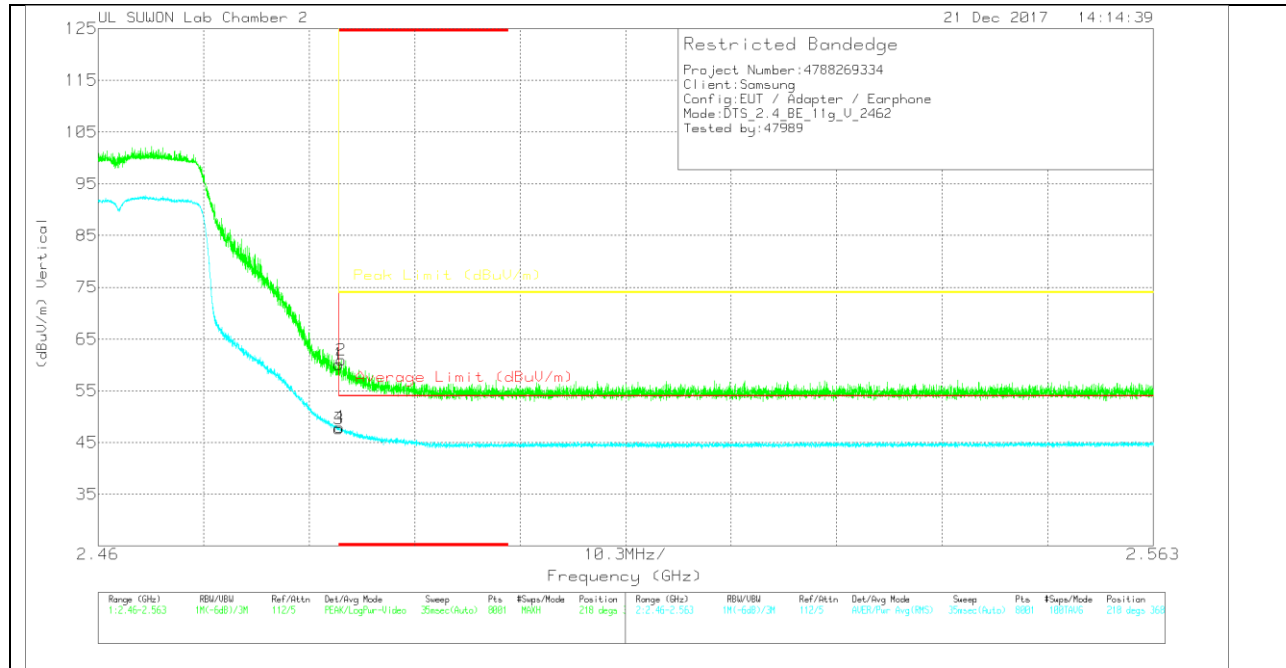
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	170531_3117(00168724)	10dB(dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Altitude (Degs)	Height (cm)	Polarity
1	* 2.484	47.01	Pk		-18	0	60.61	-	-	74	-13.39	176	373	H
2	* 2.484	48.42	Pk		-18	0	62.02	-	-	74	-11.98	176	373	H
3	* 2.484	34.37	RMS		-18	.3	48.27	54	-5.73	-	-	176	373	H
4	* 2.484	34.49	RMS		-18	.3	48.39	54	-5.61	-	-	176	373	H

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

Pk - Peak detector

RMS - RMS detection

VERTICAL PEAK AND AVERAGE PLOT



VERTICAL DATA

Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	170531_311700168724	10dB(dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Altitude (Degs)	Height (cm)	Polarity
1	* 2.484	46.54	Pk		31.6	-18	60.14	-	-	74	-13.86	218	368	V
2	* 2.484	47.33	Pk		31.6	-18	60.93	-	-	74	-13.07	218	368	V
3	* 2.484	33.78	RMS		31.6	-18	47.68	54	-6.32	-	-	218	368	V
4	* 2.484	34.06	RMS		31.6	-18	47.96	54	-6.04	-	-	218	368	V

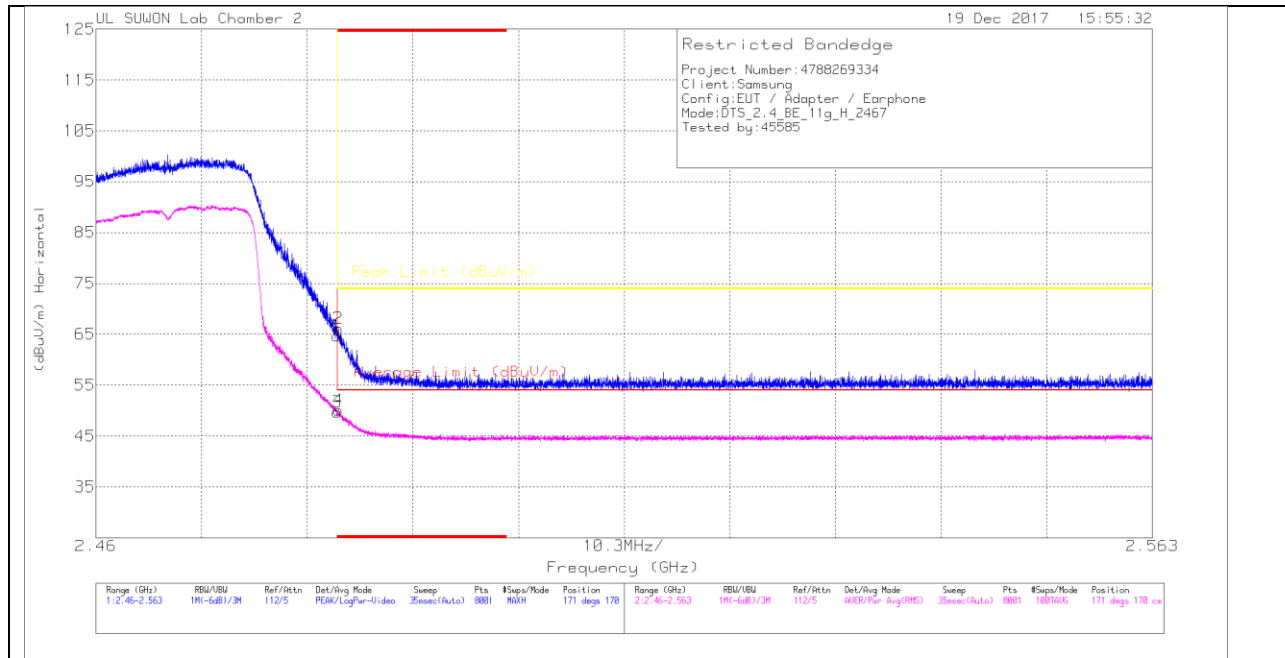
* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

Pk - Peak detector

RMS - RMS detection

AUTHORIZED BANDEDGE (12 CHANNEL)

HORIZONTAL PEAK AND AVERAGE PLOT



HORIZONTAL DATA

Trace Markers

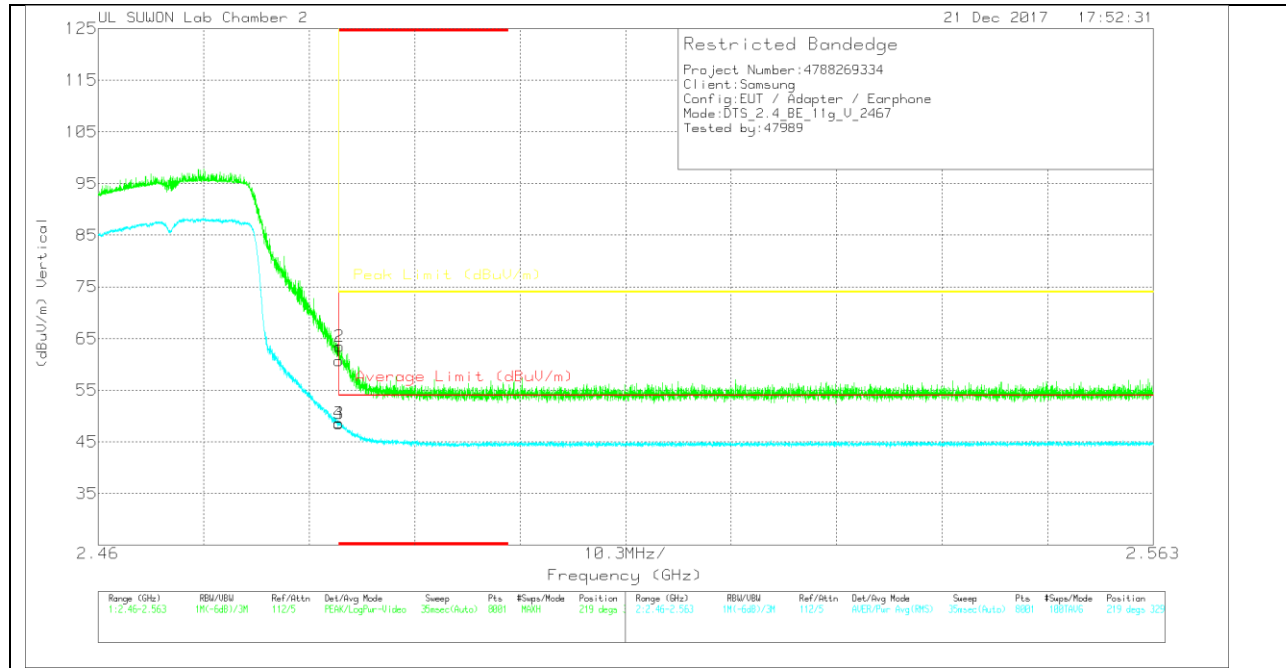
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	170531_3117(00168724)	10dB(dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Altitude (Degs)	Height (cm)	Polarity
1	* 2.484	51.09	PK	31.6	-18	0	64.69	-	-	74	-9.31	171	170	H
2	* 2.484	52.55	PK	31.6	-18	0	66.15	-	-	74	-7.85	171	170	H
3	* 2.484	35.8	RMS	31.6	-18	.3	49.7	54	-4.3	-	-	171	170	H
4	* 2.484	36.18	RMS	31.6	-18	.3	50.08	54	-3.92	-	-	171	170	H

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

Pk - Peak detector

RMS - RMS detection

VERTICAL PEAK AND AVERAGE PLOT



VERTICAL DATA

Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	170531_311700168724	10dB(dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Pk Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.484	47.1	Pk		31.6	-18	60.7	-	-	74	-13.3	219	329	V
2	* 2.484	49.9	Pk		31.6	-18	63.5	-	-	74	-10.5	219	329	V
3	* 2.484	34.67	RMS		31.6	-18	48.57	54	-5.43	-	-	219	329	V
4	* 2.484	34.77	RMS		31.6	-18	48.67	54	-5.33	-	-	219	329	V

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

Pk - Peak detector

RMS - RMS detection