



**FCC CFR47 PART 15 SUBPART C
INDUSTRY CANADA RSS-247 ISSUE 2**

DTS Wireless LAN

CERTIFICATION TEST REPORT

FOR

BT/BLE and DTS b/g/n Wrist device

MODEL NUMBER : SM-R810

FCC ID: A3LSMR810

IC: 649E-SMR810

REPORT NUMBER: 4788542024-E1V1

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Prepared for
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TL-637

Revision History

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME: SAMSUNG ELECTRONICS CO., LTD.

EUT DESCRIPTION: BT/BLE and DTS b/g/n Wrist device

MODEL NUMBER: SM-R810

SERIAL NUMBER: R3AK40021AW, R3AK500BDNK (RADIATED, Original);
R3AK4000216M (CONDUCTED, Original)
R3AK600Q1CA (Spot check)

DATE TESTED: MAY 16, 2018 - JUN 25, 2018 (Original)
JUL 06, 2018 (Spot check)

APPLICABLE STANDARDS	
STANDARD	TEST RESULTS
CFR 47 Part 15 Subpart C	Pass
INDUSTRY CANADA RSS-247 Issue 2	Pass
INDUSTRY CANADA RSS-GEN Issue 5	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.

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Suwon Lab Engineer
UL Korea, Ltd.

1.1. INTRODUCTION OF TEST DATA REUSE

This report referenced from the FCC ID: A3LSMR815U (IC:649E-SMR815W) DTS WLAN(FCC CFR 47 Part 15C, IC RSS-247). And the applicant takes full responsibility that the test data as referenced in this report represent compliance for this FCC ID.

1.2. DIFFERENCE

The FCC ID: A3LSMR810 (IC:649E-SMR810) shares the same enclosure and circuit board as FCC ID: A3LSMR815U(IC:649E-SMR815W). The WLAN antennas and surrounding circuitry and layout are identical between these two units.

After confirming through preliminary radiated emissions that the performance of the FCC ID: A3LSMR815U (IC:649E-SMR815W) remains representative of FCC ID: A3LSMR810 (IC:649E-SMR810). The test data of FCC ID: A3LSMR815U (IC:649E-SMR815W) being submitted for this application to cover WLAN features.

1.3. SPOT CHECK VERIFICATION DATA

Band	Test Item	Mode	Frequency	Test Limit	Original model	Spot check model	Deviation	Remark
					SM-R815U	SM-R810		
					FCC ID : A3LSMR815U IC : 649E-SMR815W	FCC ID : A3LSMR810 IC : 649E-SMR810		
DTS WLAN (2.4GHz)	Band Edge	802.11b	2467 MHz	54 dBuV/m	39.90 dBuV/m	39.55 dBuV/m	-0.35 dB	
	RSE	802.11b	2412 MHz	74 dBuV/m	40.19 dBuV/m	39.94 dBuV/m	-0.25 dB	Noise floor level
	Band Edge	802.11g	2462 MHz	54 dBuV/m	41.95 dBuV/m	40.05 dBuV/m	-1.90 dB	
	RSE	802.11g	2462 MHz	74 dBuV/m	40.62 dBuV/m	40.14 dBuV/m	-0.48 dB	Noise floor level
	Band Edge	802.11n	2472 MHz	54 dBuV/m	42.67 dBuV/m	41.84 dBuV/m	-0.83 dB	
	RSE	802.11n	2462 MHz	74 dBuV/m	39.92 dBuV/m	40.14 dBuV/m	0.22 dB	Noise floor level

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

1.4. REFERENCE DETAIL

Reference application that contains the reused reference data.

Equipment Class	Reference FCC ID (IC Number)	Type Grant/ Permissive Change	Reference Application	Folder Test/RF Exposure	Report Tittle / Section
DTS	A3LSMR815U (649E-SMR815W)	Grant	4788480988-E1V1	Test	FCC Report DTS WLAN / All sections
			4788480988-E2V1	Test	FCC Report BLE All sections
DSS	A3LSMR815U (649E-SMR815W)	Grant	4788480988-E3V1	Test	FCC Report BT / All sections

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. IC RSS-GEN Issue 5
4. IC RSS-247 Issue 2
5. KDB 558074 D01 DTS Meas Guidance v04.
6. 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
☐	Chamber 3

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 BT/BLE and DTS b/g/n Wrist device.
This test report addresses the DTS (WLAN) operational mode.

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	16.40	43.65
	802.11g	14.89	30.83
	802.11n HT20	13.77	23.82

5.3. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes an internal antennas, with a antenna's maximum gain of -5.2 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.

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

Note : All radiated and power line conducted tests were performed connected with earphone and charger for evaluation of worst case mode.

5.5. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

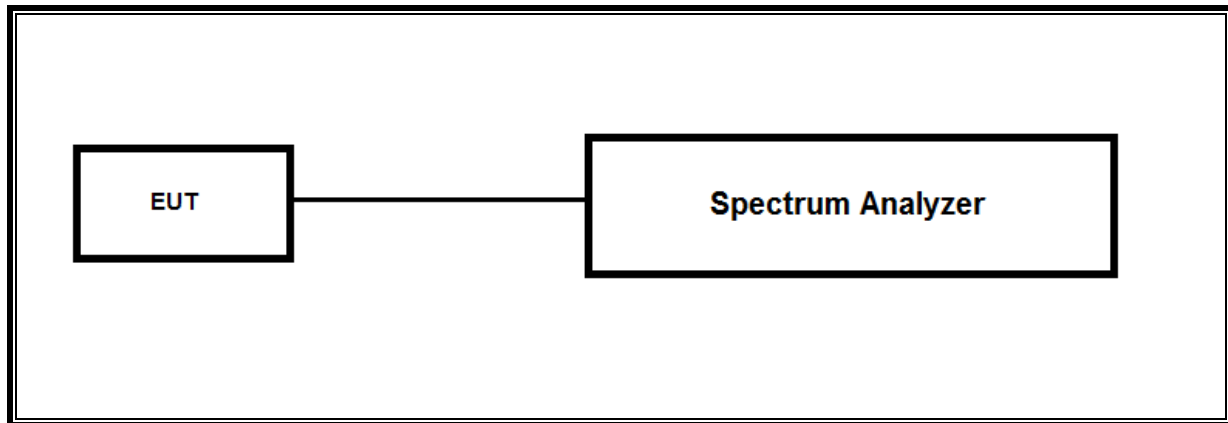
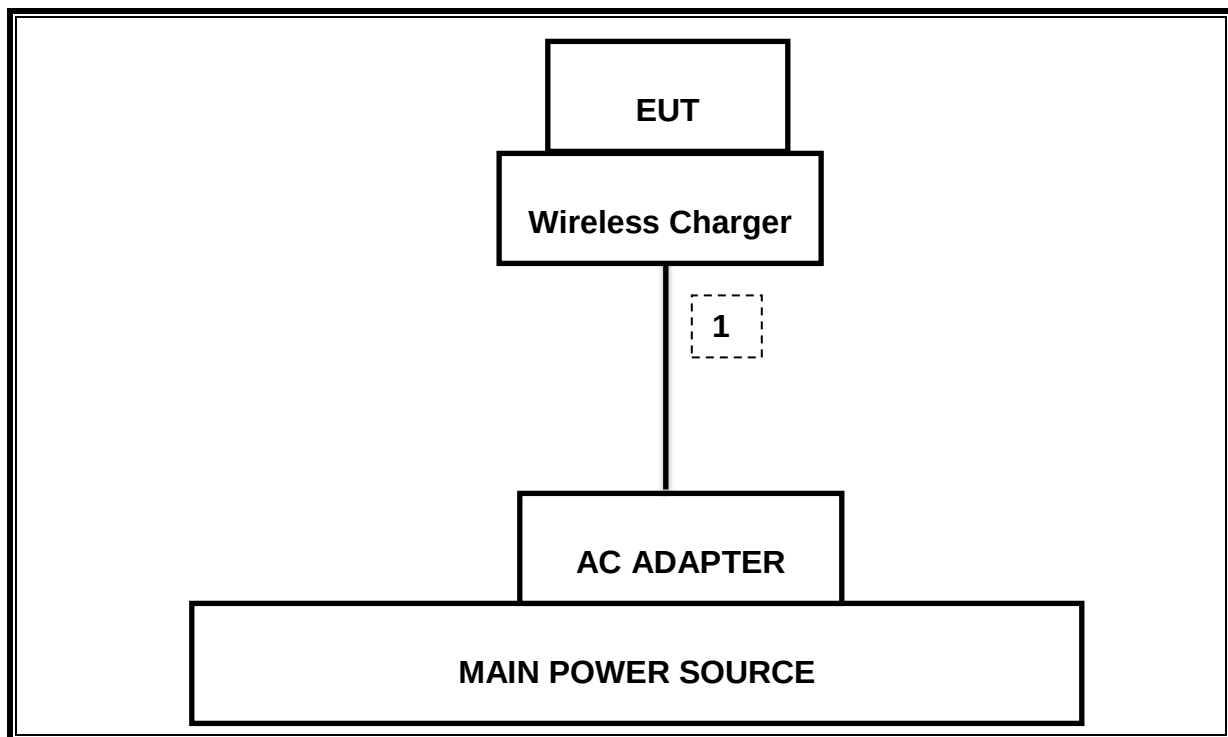
Support Equipment List				
Description	Manufacturer	Model	Serial Number	FCC ID
Adapter	SAMSUNG	ETA0U60JBE	RT2K424HS/7- E	N/A
Wireless Charger	SAMSUNG	EP-YO805	N/A	A3LEPYO805
Data cable	SAMSUNG	ECB-DU2EBE	N/A	N/A

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	Un-Shielded	1 m	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 (CONDUCTED TEST SETUP)**SETUP DIAGRAM FOR TESTS (RADIATED TEST SETUP)**

6. TEST AND MEASUREMENT EQUIPMENT

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

Test Equipment List				
Description	Manufacturer	Model	S/N	Cal Due
Antenna, Bilog, 30MHz-1GHz	SCHWARZBECK	VULB9163	750	08-31-19
Antenna, Bilog, 30MHz-1GHz	SCHWARZBECK	VULB9163	749	09-14-19
Antenna, Bilog, 30MHz-1GHz	SCHWARZBECK	VULB9163	845	08-31-19
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, 18 GHz	ETS	3117	00205959	11-29-18
Antenna, Horn, 40 GHz	ETS	3116C	00166155	12-04-19
Antenna, Horn, 40 GHz	ETS	3116C	00168645	12-04-19
Antenna, Horn, 40 GHz	ETS	3116C-PA	00168841	11-13-19
Preamplifier, 1000 MHz	Sonoma	310N	341282	08-09-18
Preamplifier, 1000 MHz	Sonoma	310N	351741	08-07-18
Preamplifier, 1000 MHz	Sonoma	310N	370599	08-10-18
Preamplifier, 18 GHz	Miteq	AFS42-00101800-25-S-42	1876511	08-08-18
Preamplifier, 18 GHz	Miteq	AFS42-00101800-25-S-42	1896138	08-08-18
Preamplifier, 18 GHz	Miteq	AFS42-00101800-25-S-42	2029169	08-11-18
Spectrum Analyzer, 44 GHz	Agilent / HP	N9030A	MY54170614	08-08-18
Spectrum Analyzer, 44 GHz	Agilent / HP	N9030A	MY54490312	08-08-18
Spectrum Analyzer, 43.5 GHz	R&S	FSW43	104089	08-11-18
Average Power Sensor	Agilent / HP	U2000	MY54270007	08-08-18
Attenuator	PASTERNAK	PE7087-10	A001	08-08-18
Attenuator	PASTERNAK	PE7087-10	A008	08-08-18
Attenuator	PASTERNAK	PE7087-10	2	08-10-18
Attenuator	PASTERNAK	PE7087-10	A009	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, 44 GHz	R&S	ESW44	101590	08-09-18
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
Low Pass Filter 5GHz	Micro-Tronics	LPS17541	020	08-11-18
High Pass Filter 3GHz	Micro-Tronics	HPM17543	010	08-08-18
High Pass Filter 3GHz	Micro-Tronics	HPM17543	015	08-08-18
High Pass Filter 3GHz	Micro-Tronics	HPM17543	020	08-11-18
High Pass Filter 6GHz	Micro-Tronics	HPS17542	009	08-08-18
High Pass Filter 6GHz	Micro-Tronics	HPS17542	016	08-08-18
High Pass Filter 6GHz	Micro-Tronics	HPS17542	021	08-11-18
LISN	R&S	ENV-216	101837	08-09-18
UL Software				
Description	Manufacturer	Model	Version	
Radiated software	UL	UL EMC	Ver 9.5	

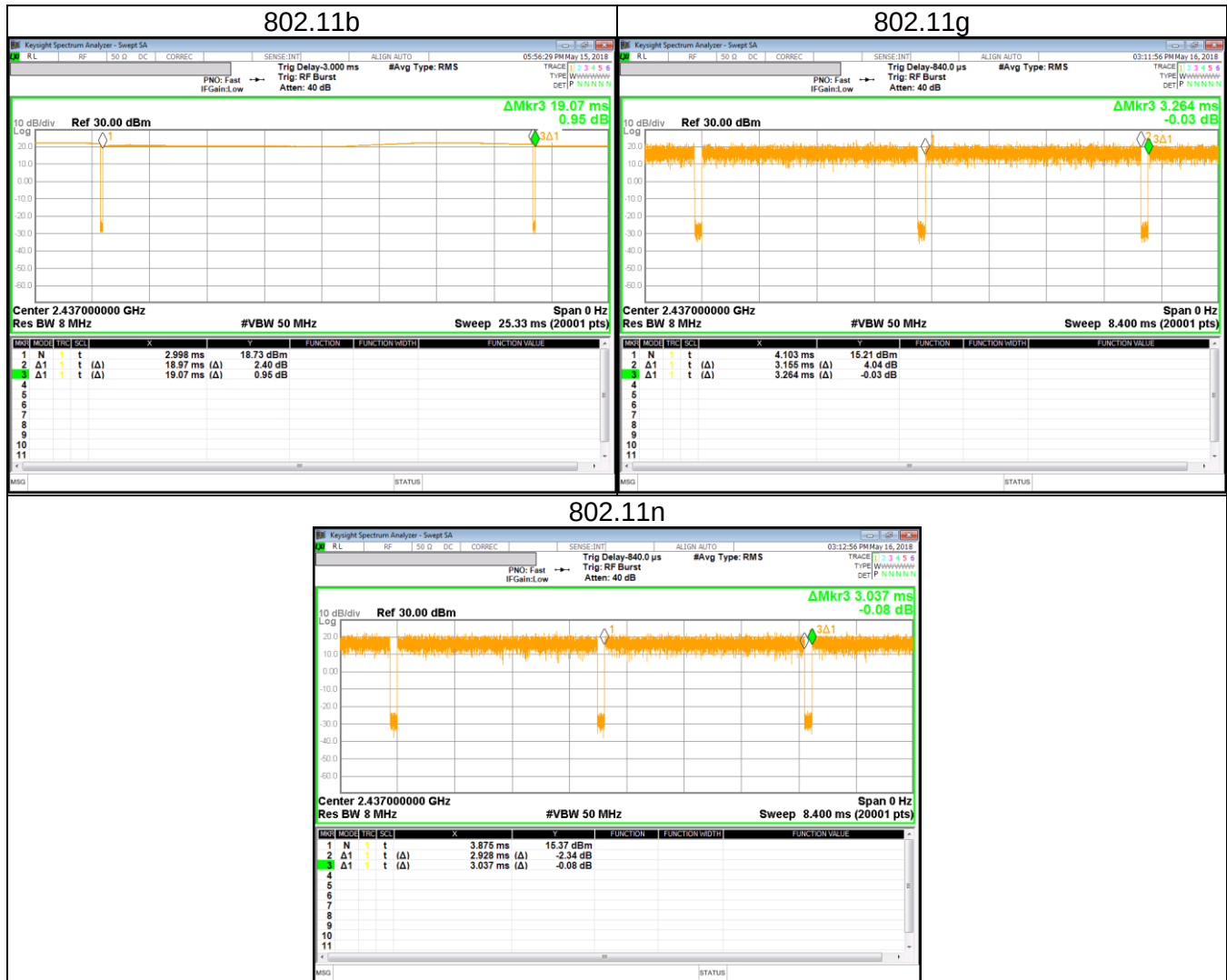
7. REFERENCE MEASUREMENT RESULTS

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	18.97	19.07	0.995	99.5%	0.00	0.010
802.11g	3.155	3.264	0.967	96.7%	0.15	0.317
802.11n HT20	2.928	3.037	0.964	96.4%	0.16	0.342



7.2. 99% BANDWIDTH

LIMITS

None; for reporting purposes only.

RESULTS

7.2.1. 802.11b MODE IN THE 2.4 GHz BAND

Channel	Frequency [MHz]	99% Bandwidth [MHz]
1	2412	11.726
6	2437	11.628
11	2462	11.620
12	2467	11.251
13	2472	11.508
Worst		11.726

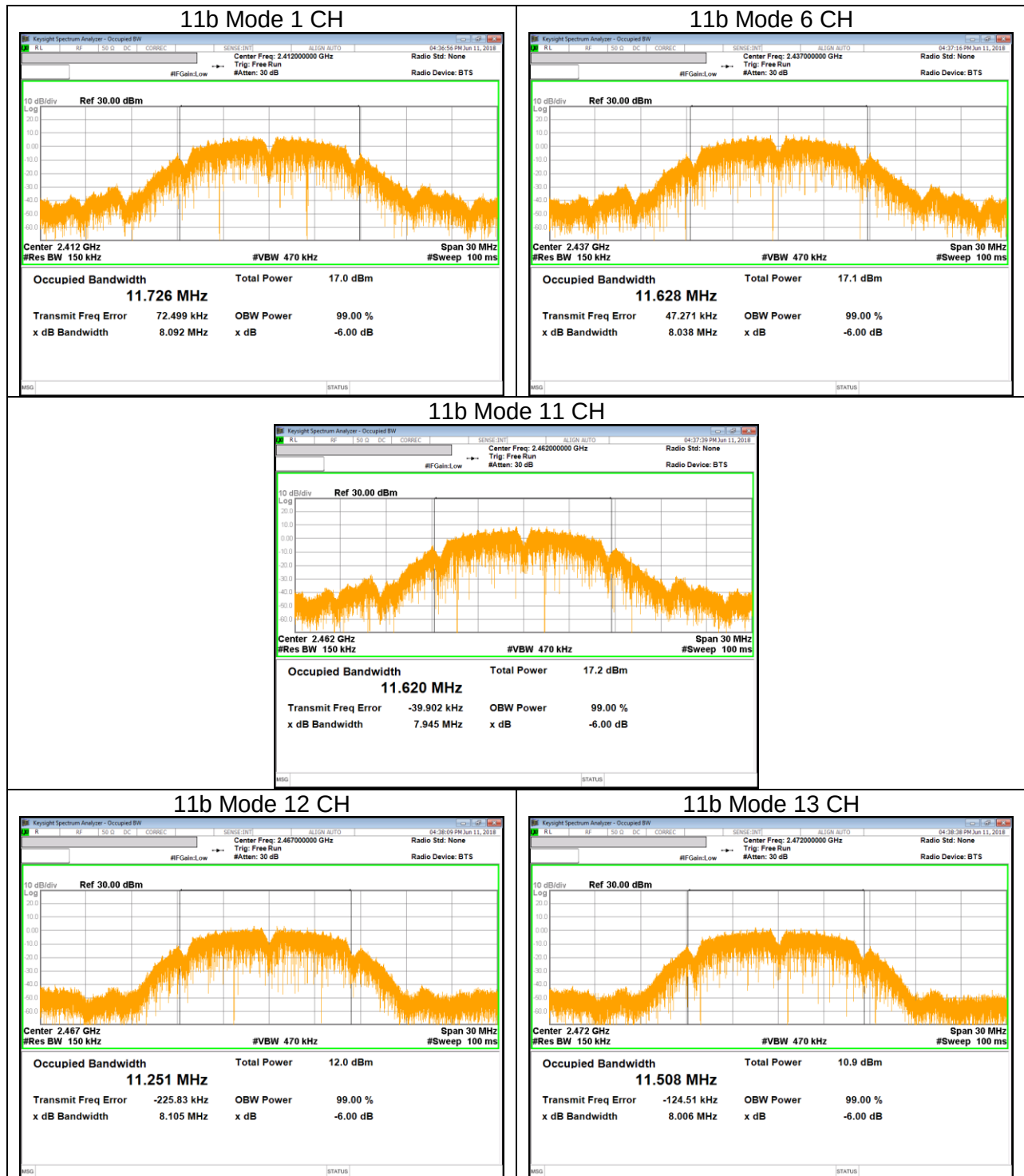
7.2.2. 802.11g MODE IN THE 2.4 GHz BAND

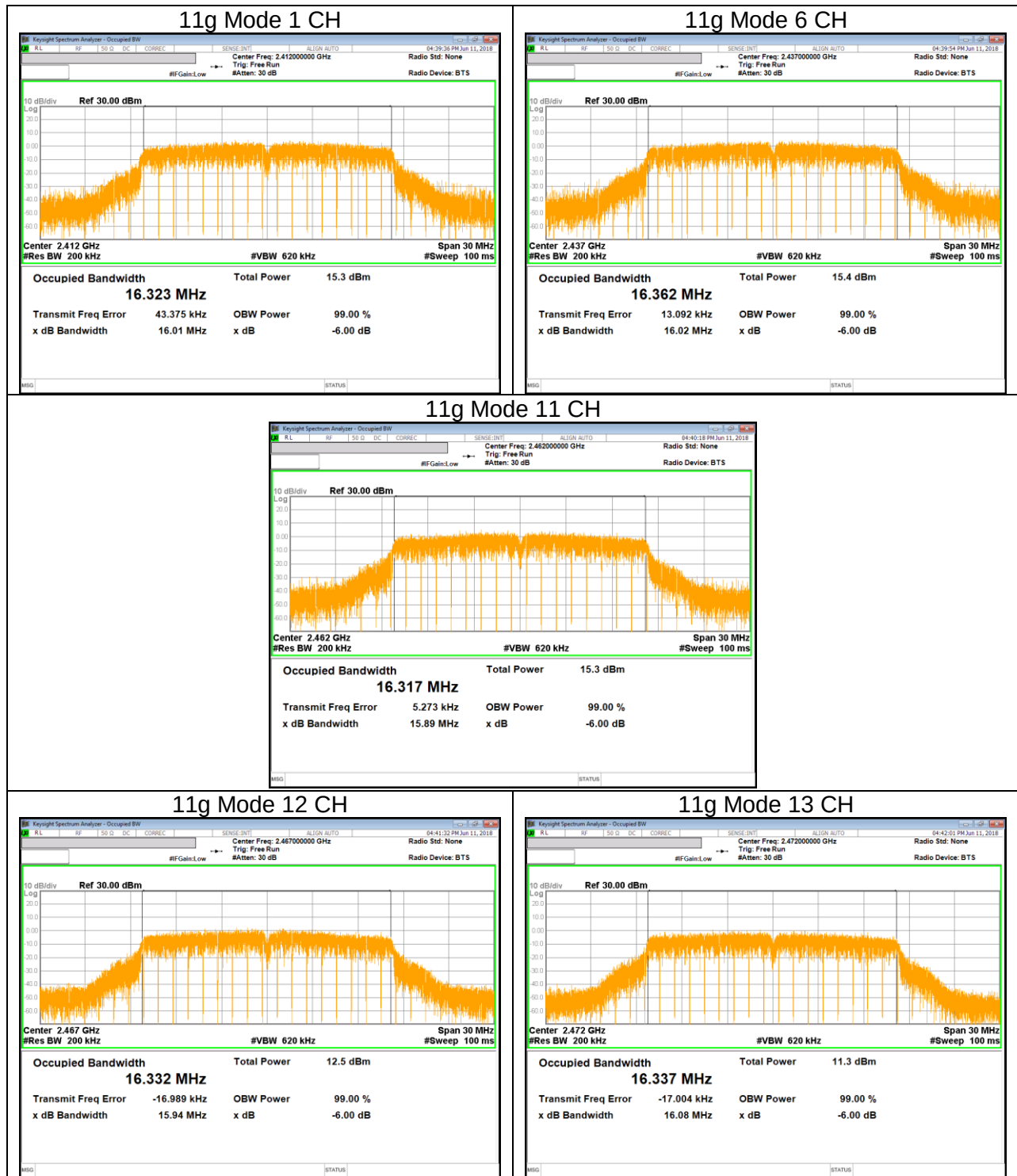
Channel	Frequency [MHz]	99% Bandwidth [MHz]
1	2412	16.323
6	2437	16.362
11	2462	16.317
12	2467	16.332
13	2472	16.337
Worst		16.362

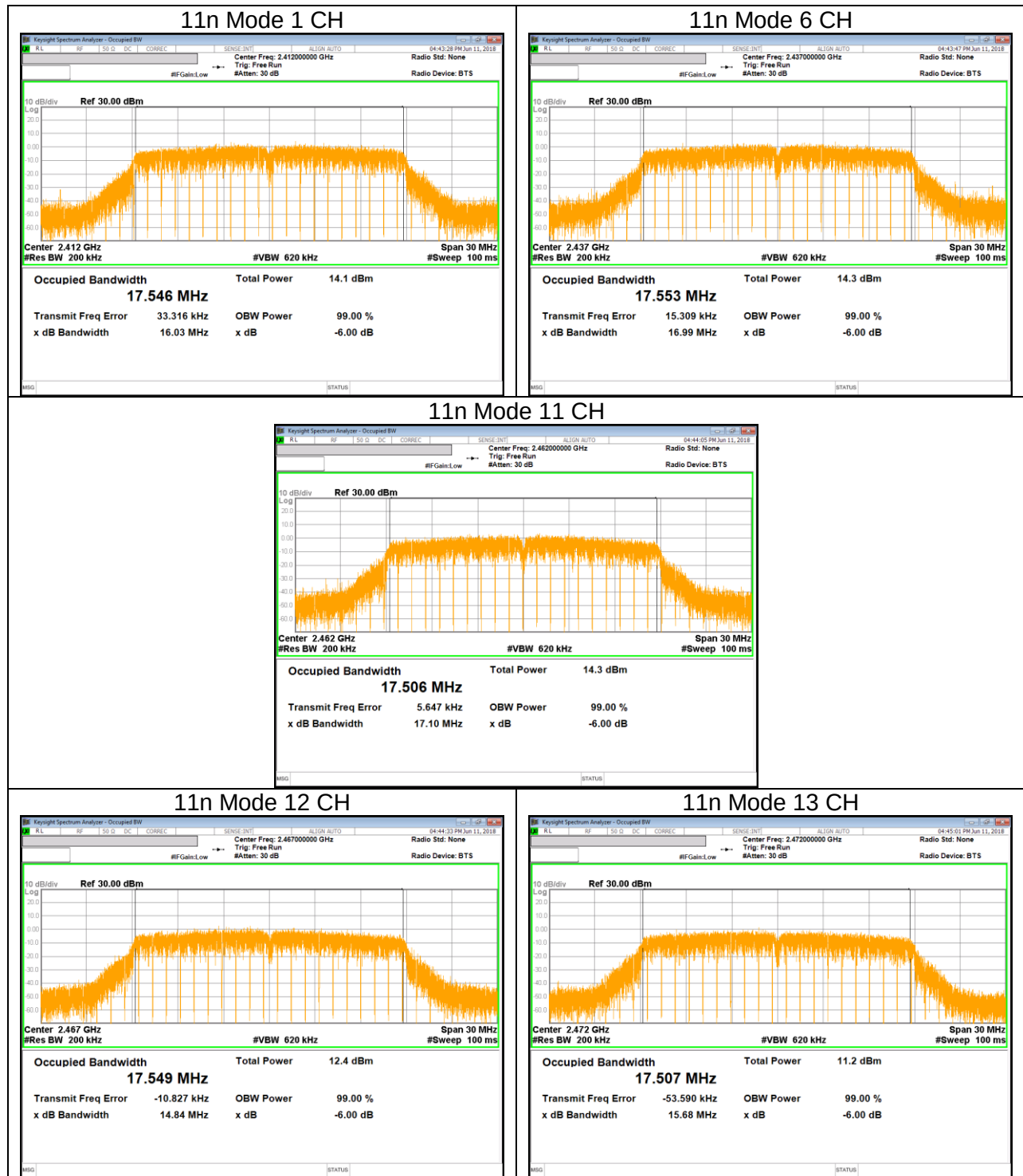
7.2.3. 802.11n HT20 MODE IN THE 2.4 GHz BAND

Channel	Frequency [MHz]	99% Bandwidth [MHz]
1	2412	17.546
6	2437	17.553
11	2462	17.506
12	2467	17.549
13	2472	17.507
Worst		17.553

7.2.4. 99% BANDWIDTH PLOTS







8. MEASUREMENT METHODS

6 dB BW : KDB 558074 D01 v04, Section 8.2.

OUTPUT POWER : KDB 558074 D01 v04, Section 9.2.3.1.

POWER SPECTRAL DENSITY : KDB 558074 D01 v04, Section 10.3./10.5.

Out-of-band EMISSIONS (Conducted) : KDB 558074 D01 v04, Section 11.1, 11.2.

Out-of-band EMISSIONS IN NON-RESTRICTED BANDS: KDB 558074 D01 v04, Section 11.0.

Out-of-band EMISSIONS IN RESTRICTED BANDS : KDB 558074 D01 v04, Section 12.1.

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

9. SUMMARY TABLE

FCC Part Section	IC Section	Test Description	Test Limit	Test Condition	Test Result
15.247 (a)(2)	RSS-247 5.2(a)	Occupied Band width (6dB)	>500KHz	Conducted	Pass
2.1051, 15.247 (d)	RSS-247 5.5	Band Edge / Conducted Spurious Emission	-30dBc		Pass
15.247 (b)(3)	RSS-247 5.4(d)	TX conducted output power	<30dBm		Pass
15.247 (e)	RSS-247 5.2(b)	PSD	<8dBm		Pass
15.207 (a)	RSS-GEN Clause 8.8	AC Power Line conducted emissions	Section 10	Power Line conducted	Pass
15.205, 15.209	RSS-GEN Clause 7 & 8.9	Radiated Spurious Emission	< 54dBuV/m	Radiated	Pass

10. ANTENNA PORT TEST RESULTS

10.1. 6 dB BANDWIDTH

LIMITS

FCC §15.247 (a) (2)
IC RSS-247 §5.2 (a)

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 100KHz, the VBW $\geq 3 \times$ RBW, peak detector and max hold.

RESULTS

10.1.1.802.11b MODE IN THE 2.4 GHz BAND

Channel	Frequency [MHz]	6 dB Bandwidth [MHz]	Minimum Limit [MHz]
Low	2412	9.021	0.5
Mid	2437	9.017	0.5
High	2462	8.050	0.5
12	2467	8.571	0.5
13	2472	8.548	0.5
Worst		8.050	0.5

10.1.1.1. 802.11g MODE IN THE 2.4 GHz BAND

Channel	Frequency [MHz]	6 dB Bandwidth [MHz]	Minimum Limit [MHz]
Low	2412	15.760	0.5
Mid	2437	15.120	0.5
High	2462	15.060	0.5
12	2467	15.450	0.5
13	2472	15.600	0.5
Worst		15.060	0.5

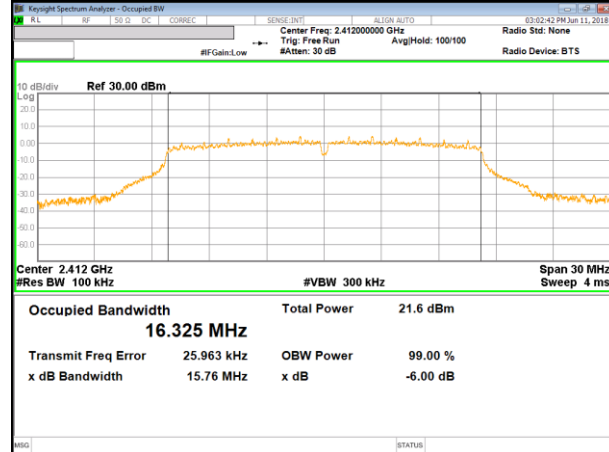
10.1.2.802.11n HT20 MODE IN THE 2.4 GHz BAND

Channel	Frequency [MHz]	6 dB Bandwidth [MHz]	Minimum Limit [MHz]
Low	2412	15.390	0.5
Mid	2437	15.310	0.5
High	2462	15.110	0.5
12	2467	15.940	0.5
13	2472	16.070	0.5
Worst		15.110	0.5

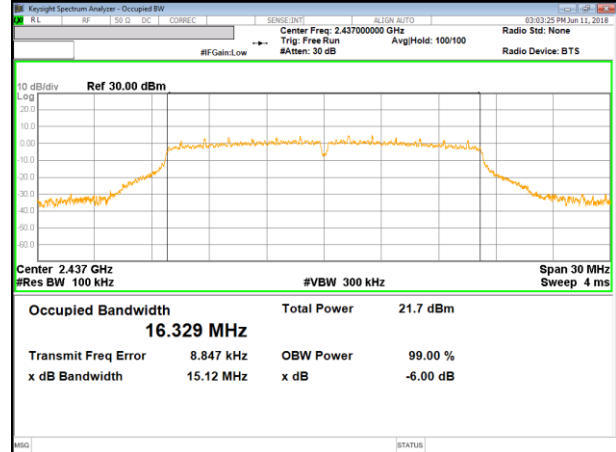
10.1.3.6 dB BANDWIDTH PLOTS



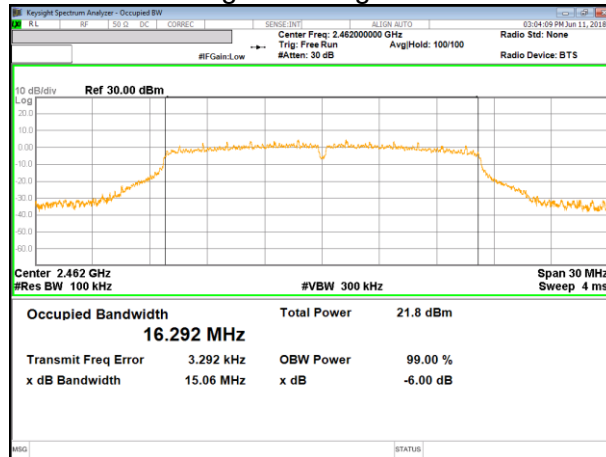
11g Mode Low CH



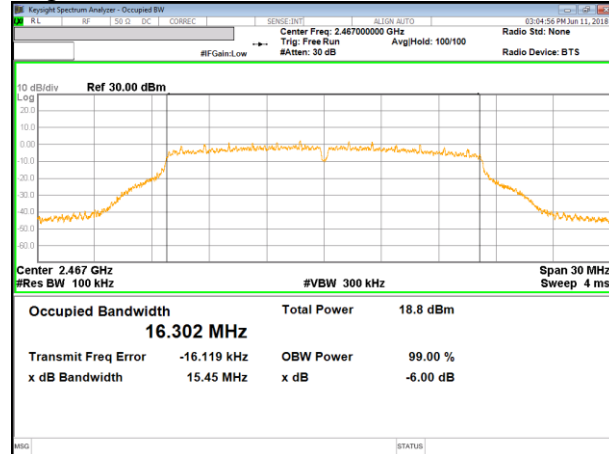
11g Mode Middle CH



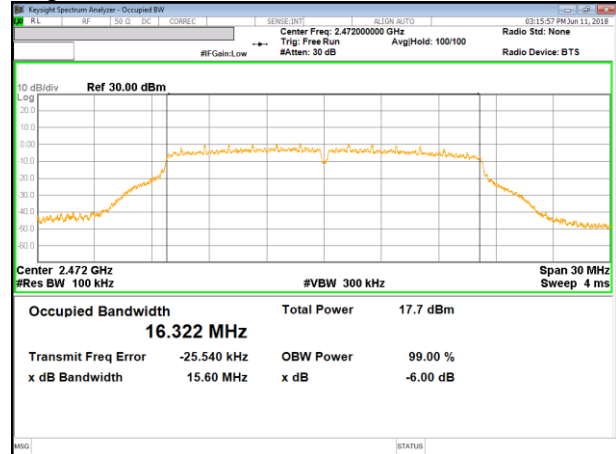
11g Mode High CH



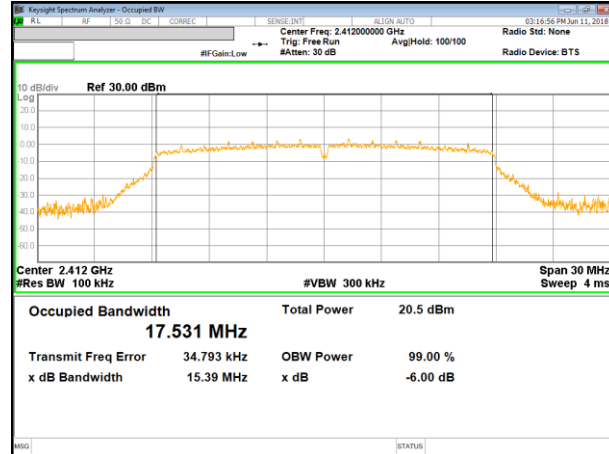
11g Mode 12 CH



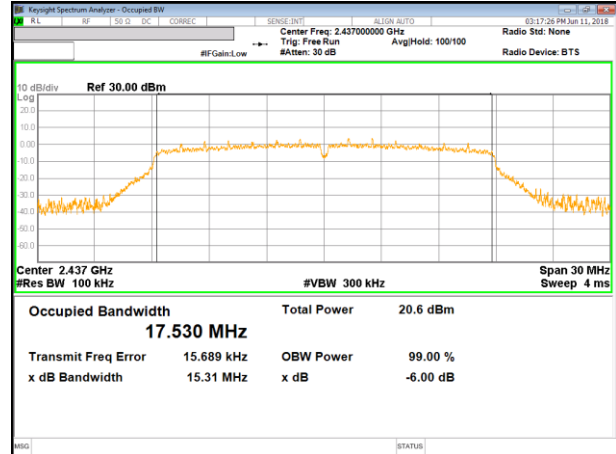
11g Mode 13 CH



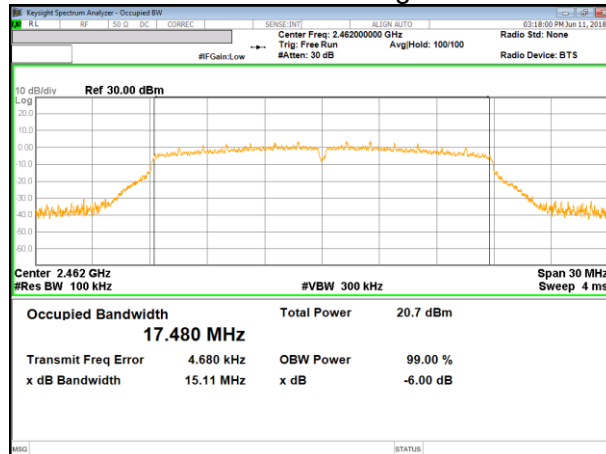
11n HT20 Mode Low CH



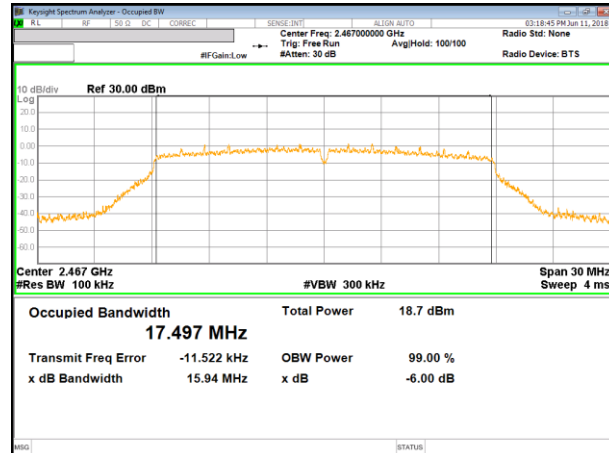
11n HT20 Middle CH



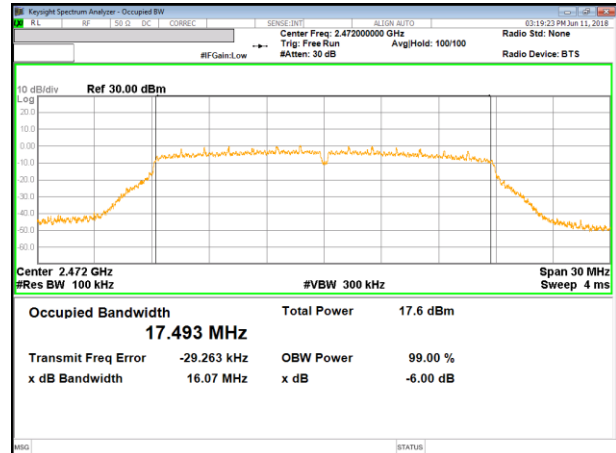
11n HT20 Mode High CH



11n HT20 Mode 12 CH



11n HT20 Mode 13 CH



10.2. OUTPUT POWER

LIMITS

FCC §15.247
IC RSS-247 §5.4 (d)

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/n mode)

RESULTS

10.2.1.802.11b MODE IN THE 2.4 GHz BAND

Limits

Channel	Frequency [MHz]	Directional Gain Primary [dBi]	FCC Power Limit [dBm]	Max Power [dBm]
Low	2412	-5.20	30.00	30.00
Mid	2437	-5.20	30.00	30.00
High	2462	-5.20	30.00	30.00
12	2467	-5.20	30.00	30.00
13	2472	-5.20	30.00	30.00

Results

Channel	Frequency [MHz]	Meas Power [dBm]	Total Power [dBm]	Power Limit [dBm]	Margin [dB]
Low	2412	16.26	16.26	30.00	-13.74
Mid	2437	16.26	16.26	30.00	-13.74
High	2462	16.40	16.40	30.00	-13.60
12	2467	10.52	10.52	30.00	-19.48
13	2472	8.92	8.92	30.00	-21.08
Worst			16.40	30.00	-13.60

10.2.2.802.11g MODE IN THE 2.4 GHz BAND

Limits

Channel	Frequency [MHz]	Directional Gain Primary [dBi]	FCC Power Limit [dBm]	Max Power [dBm]
Low	2412	-5.20	30.00	30.00
Mid	2437	-5.20	30.00	30.00
High	2462	-5.20	30.00	30.00
12	2467	-5.20	30.00	30.00
13	2472	-5.20	30.00	30.00

Results

Channel	Frequency [MHz]	Meas Power [dBm]	Total Power [dBm]	Power Limit [dBm]	Margin [dB]
Low	2412	14.56	14.56	30.00	-15.44
Mid	2437	14.84	14.84	30.00	-15.16
High	2462	14.89	14.89	30.00	-15.11
12	2467	11.08	11.08	30.00	-18.92
13	2472	9.80	9.80	30.00	-20.20
Worst			14.89	30.00	-15.11

10.2.3.802.11n 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	-5.20	30.00	30.00
Mid	2437	-5.20	30.00	30.00
High	2462	-5.20	30.00	30.00
12	2467	-5.20	30.00	30.00
13	2472	-5.20	30.00	30.00

Results

Channel	Frequency [MHz]	Meas Power [dBm]	Total Power [dBm]	Power Limit [dBm]	Margin [dB]
Low	2412	13.50	13.50	30.00	-16.50
Mid	2437	13.77	13.77	30.00	-16.23
High	2462	13.76	13.76	30.00	-16.24
12	2467	10.99	10.99	30.00	-19.01
13	2472	9.60	9.60	30.00	-20.40
Worst			13.77	30.00	-16.23

10.3. PSD

LIMITS

FCC §15.247
IC RSS-247 §5.2 (b)

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 AVGPSD-1” (802.11 b mode) and “Method §10.5 AVGPSD-2” (802.11 g/n mode) under KDB558074 D01 DTS Meas Guidance v04.

RESULTS

10.3.1.802.11b MODE IN THE 2.4 GHz BAND

PSD Results

Channel	Frequency [MHz]	PSD Meas [dBm]	Duty Factor [dB]	Final PSD [dBm/3kHz]	Limit [dBm/3kHz]	Margin [dB]
Low	2412	-15.447	0.00	-15.447	8.00	-23.447
Mid	2437	-14.703	0.00	-14.703	8.00	-22.703
High	2462	-14.772	0.00	-14.772	8.00	-22.772
12	2467	-20.655	0.00	-20.655	8.00	-28.655
13	2472	-22.218	0.00	-22.218	8.00	-30.218

10.3.2.802.11g MODE IN THE 2.4 GHz BAND

PSD Results

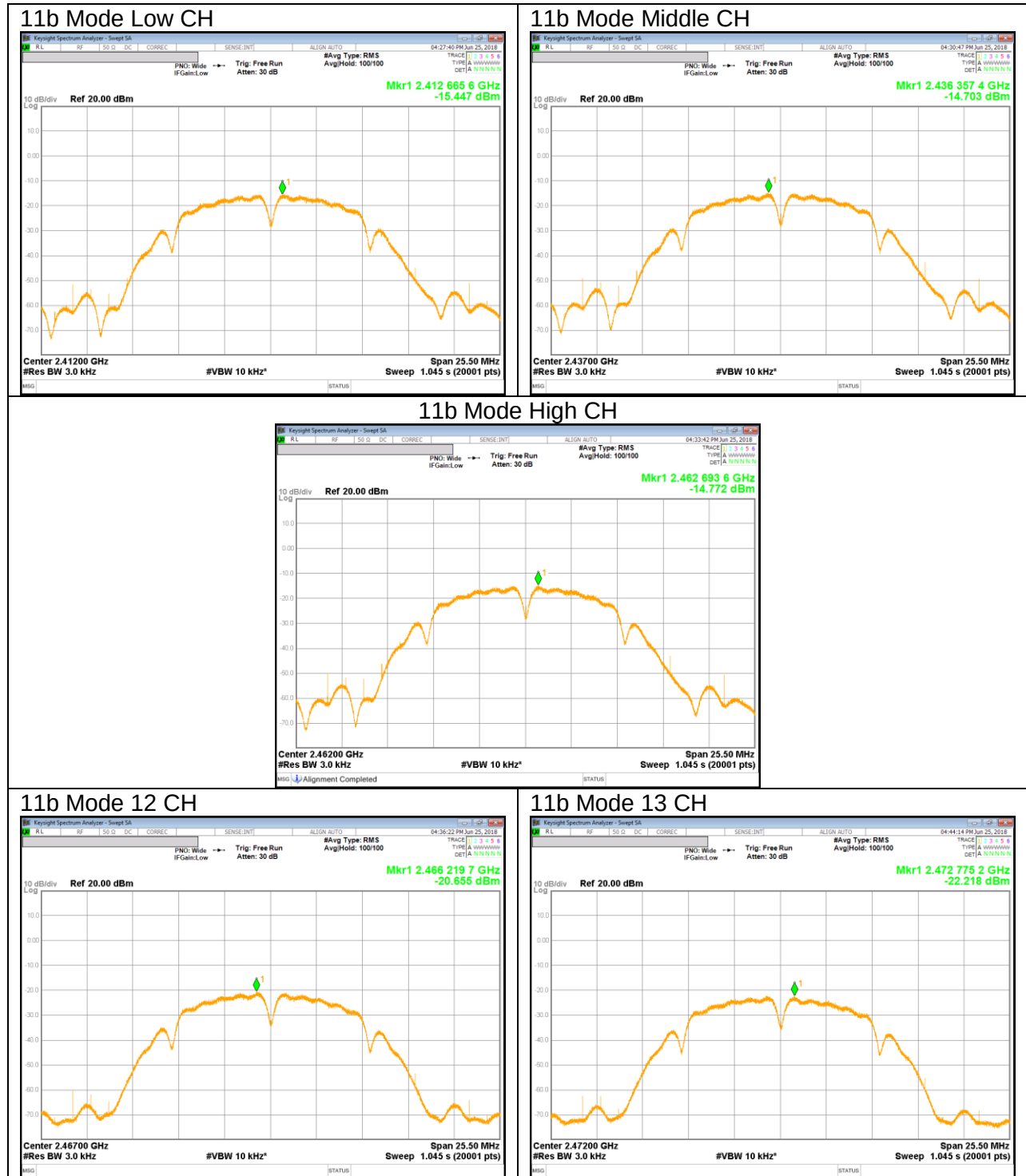
Channel	Frequency [MHz]	PSD Meas [dBm]	Duty Factor [dB]	Final PSD [dBm/3kHz]	Limit [dBm/3kHz]	Margin [dB]
Low	2412	-16.825	0.15	-16.675	8.00	-24.825
Mid	2437	-16.660	0.15	-16.510	8.00	-24.660
High	2462	-16.598	0.15	-16.448	8.00	-24.598
12	2467	-19.685	0.15	-19.535	8.00	-27.685
13	2472	-21.091	0.15	-20.941	8.00	-29.091

10.3.3.802.11n HT20 MODE IN THE 2.4 GHz BAND

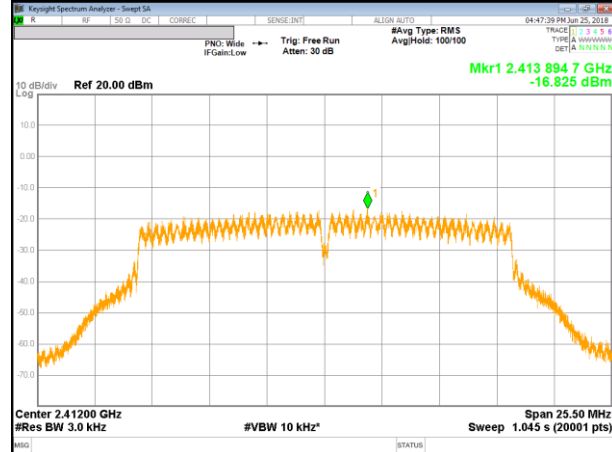
PSD Results

Channel	Frequency [MHz]	PSD Meas [dBm]	Duty Factor [dB]	Final PSD [dBm/3kHz]	Limit [dBm/3kHz]	Margin [dB]
1	2412	-19.658	0.16	-19.498	8.00	-27.658
6	2437	-19.757	0.16	-19.597	8.00	-27.757
11	2462	-19.478	0.16	-19.318	8.00	-27.478
12	2467	-22.208	0.16	-22.048	8.00	-30.208
13	2472	-23.874	0.16	-23.714	8.00	-31.874

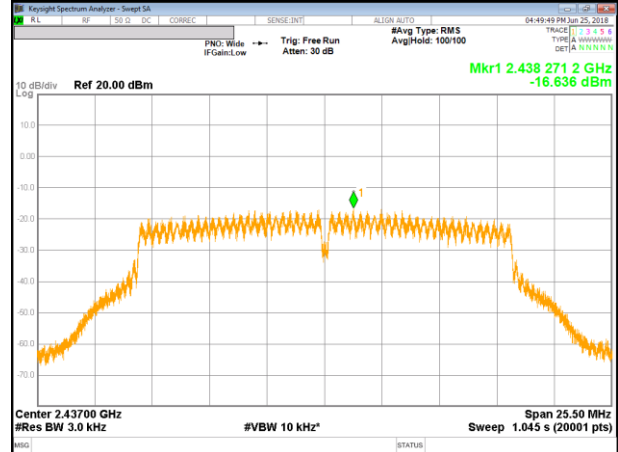
10.3.4.PSD PLOTS



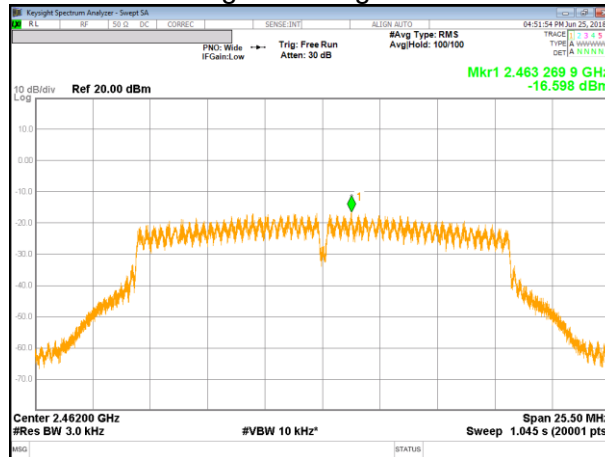
11g Mode Low CH



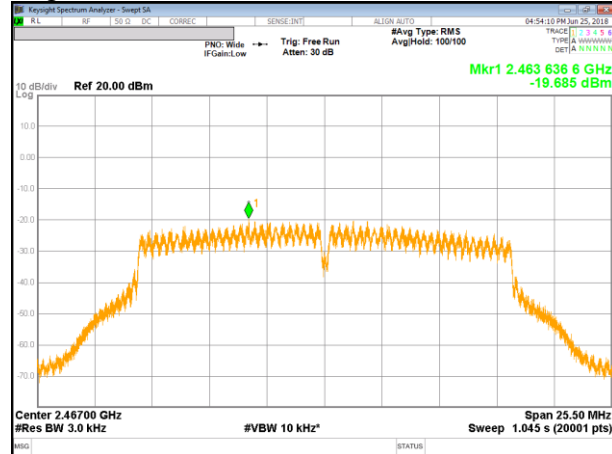
11g Mode Middle CH



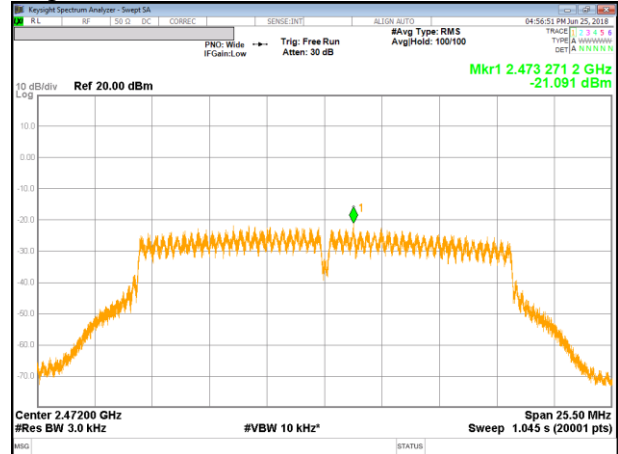
11g Mode High CH



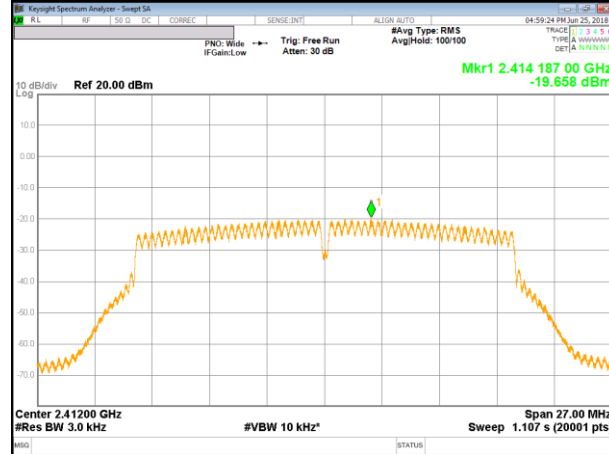
11g Mode 12 CH



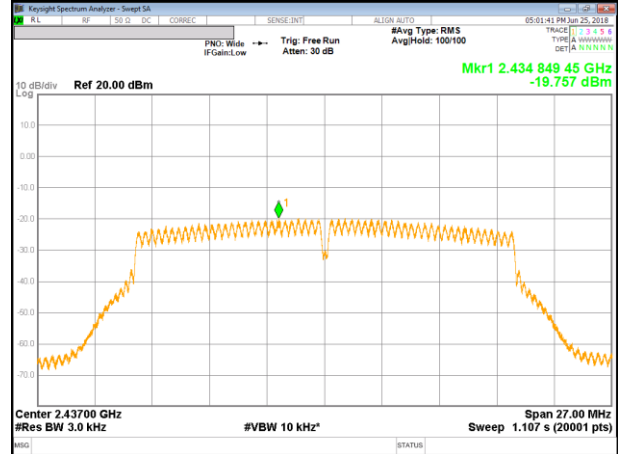
11g Mode 13 CH



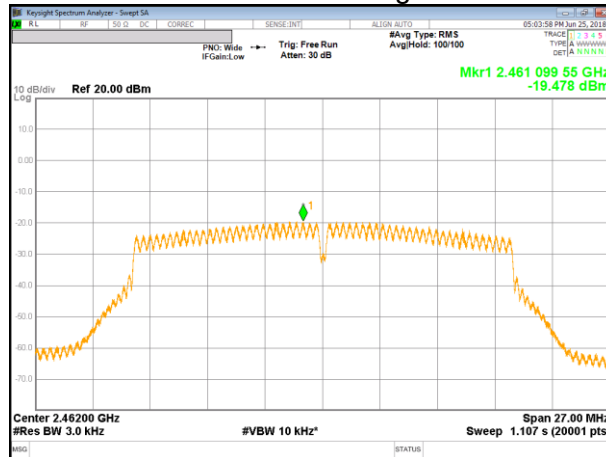
11n HT20 Mode Low CH



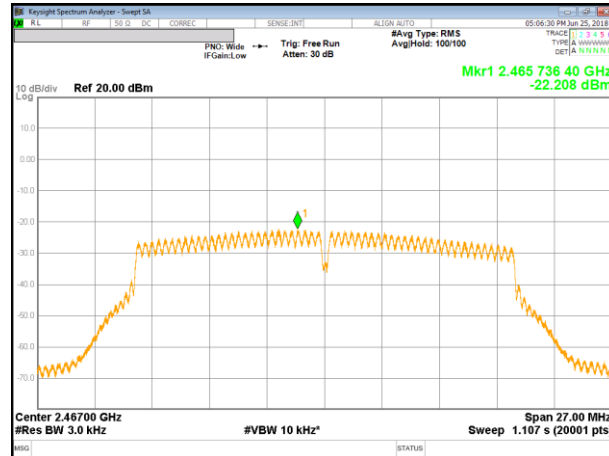
11n HT20 Mode Middle CH



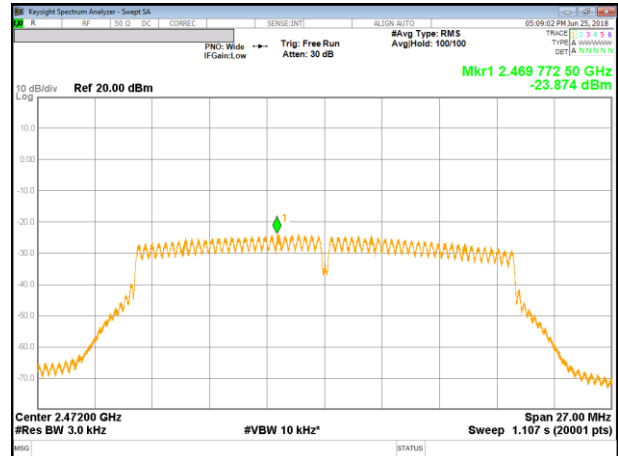
11n HT20 Mode High CH



11n HT20 Mode 12 CH



11n HT20 Mode 13 CH



10.4. OUT-OF-BAND EMISSIONS

LIMITS

FCC §15.247 (d)
IC RSS-247 §5.2 (b)

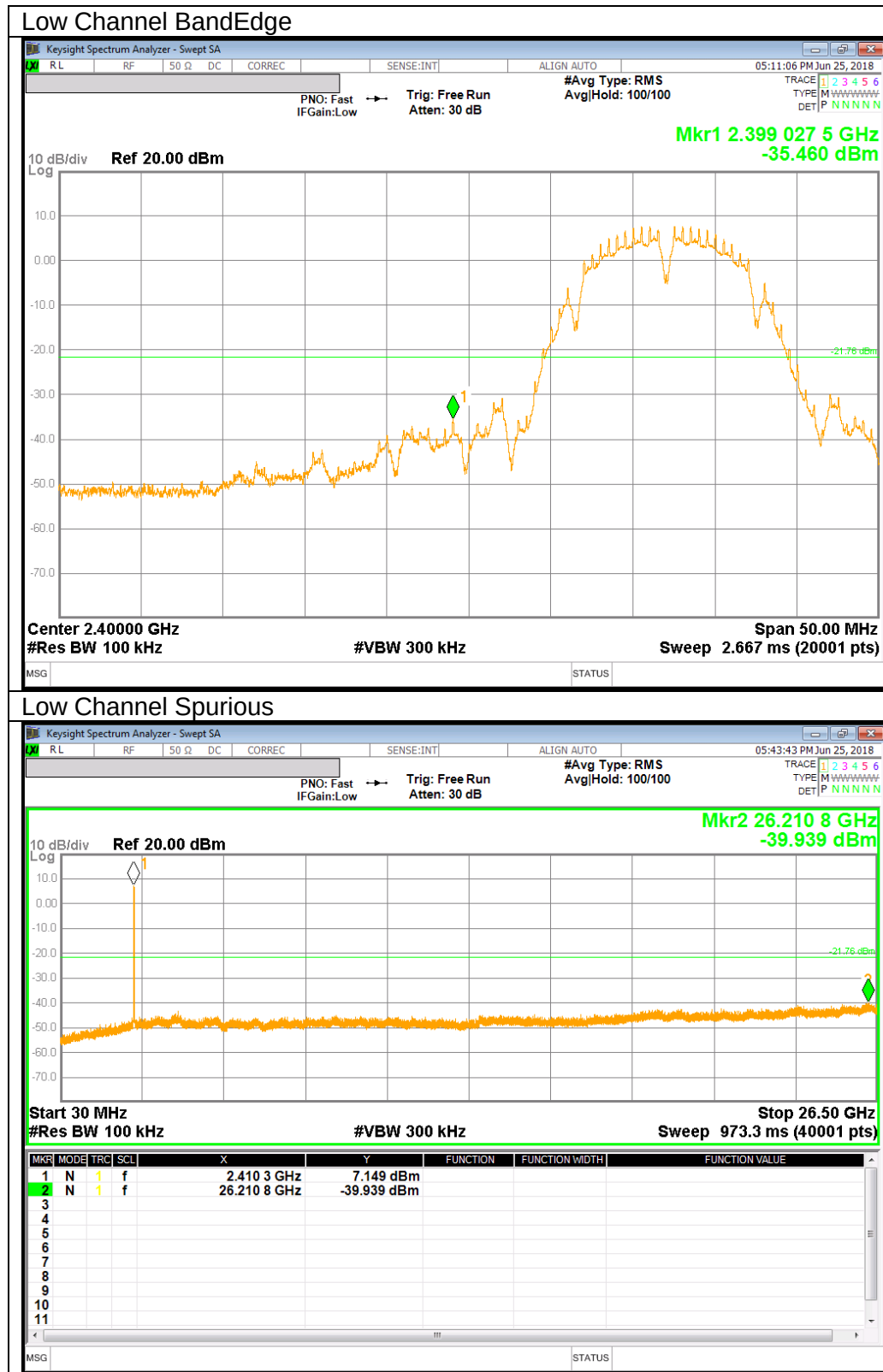
In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the 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

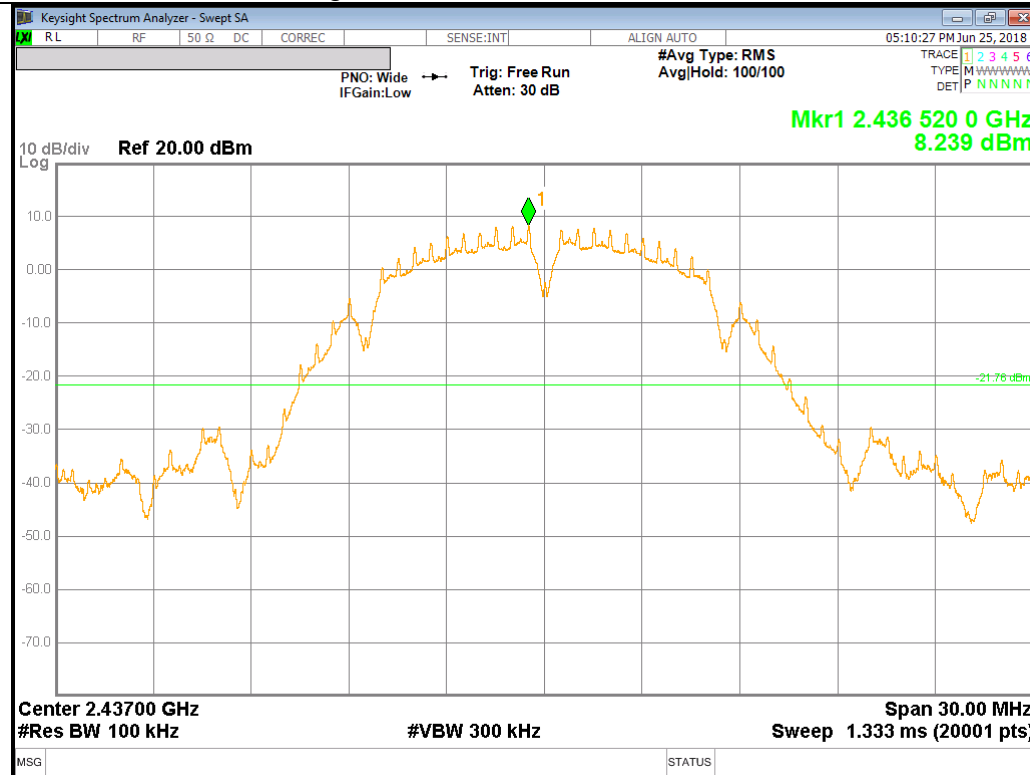
The transmitter output is connected to a spectrum analyzer with RBW = 100 kHz, VBW = 300 kHz, peak detector, and max hold. Measurements utilizing these settings are made of the in-band reference level, bandedge (where measurements to the general radiated limits will not be made)

For out-of-band emissions, it was tested with RBW = 1 MHz, VBW = 3 MHz, peak detector, and max hold.

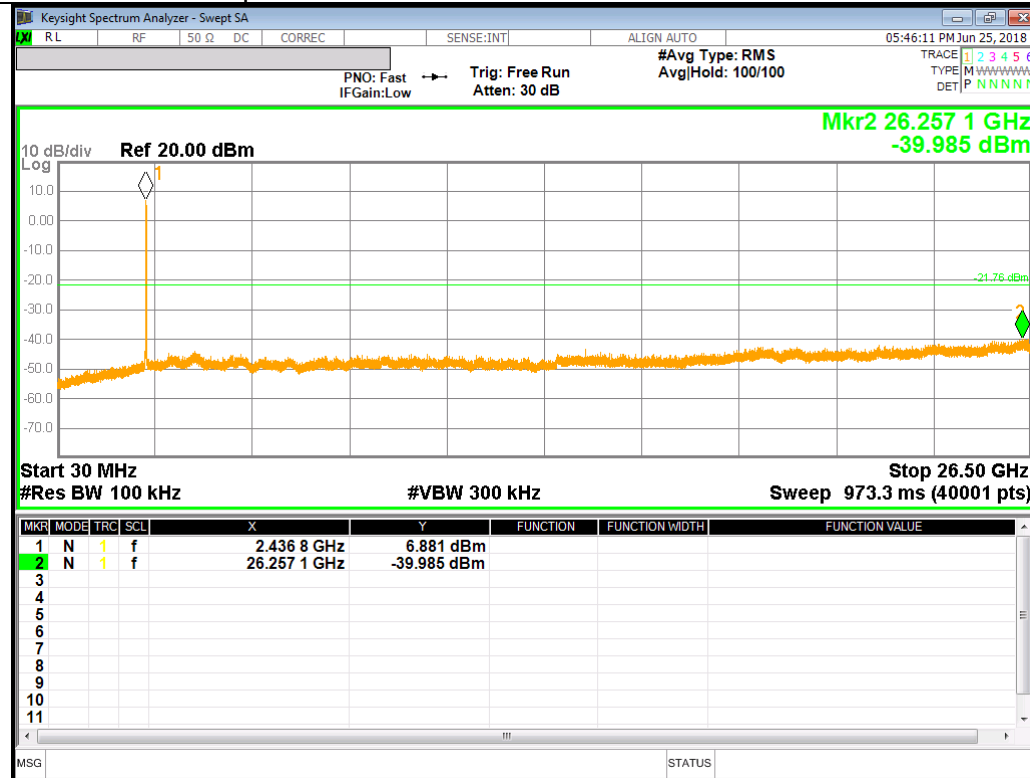
If the emission level with above setting was close to the limit (ie, less than 3 dB margin) then re-test is required using RBW = 100 kHz, VBW = 300 kHz, peak detector, and max hold to get accurate emission level within 100 kHz BW

RESULTS**10.4.1.802.11b MODE IN THE 2.4 GHz BAND**

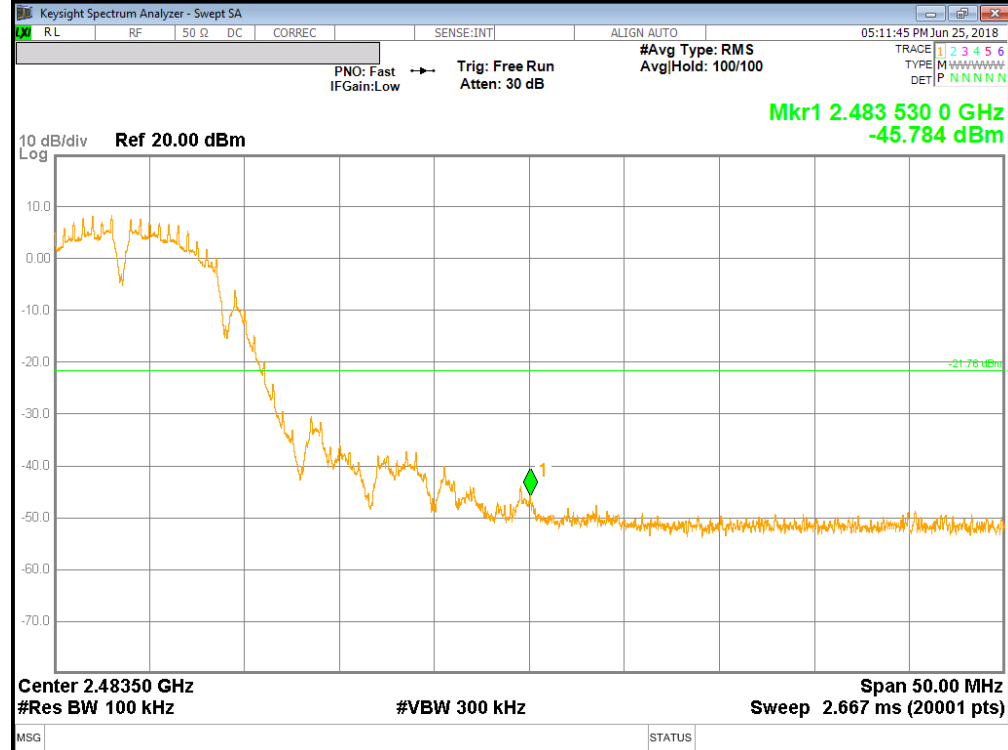
Middle Channel BandEdge



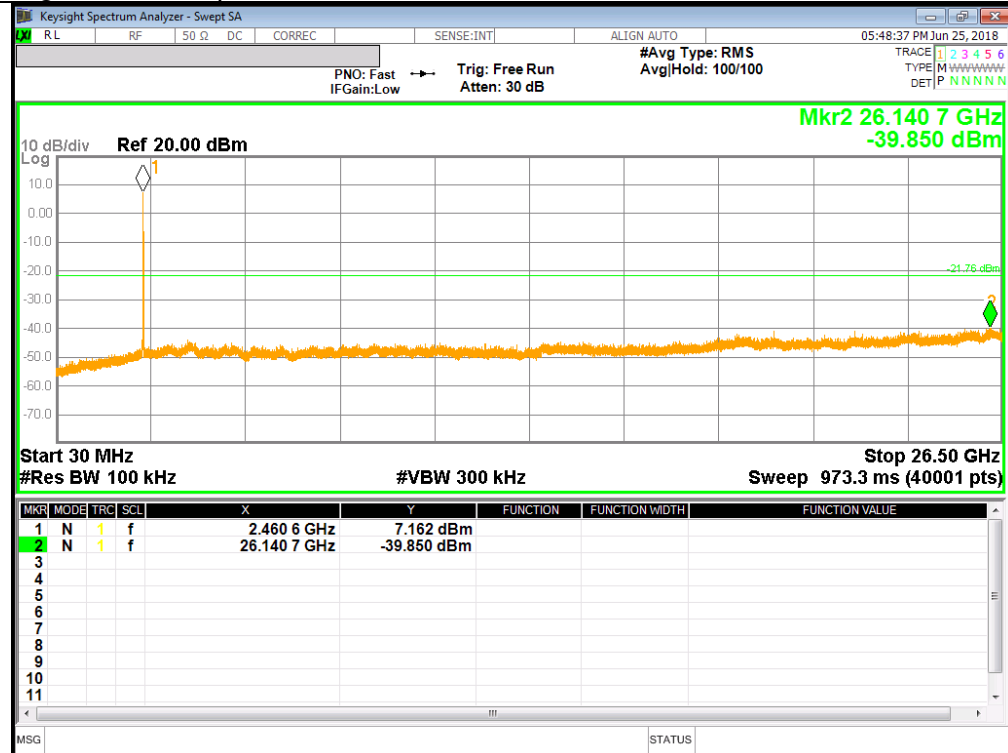
Middle Channel Spurious



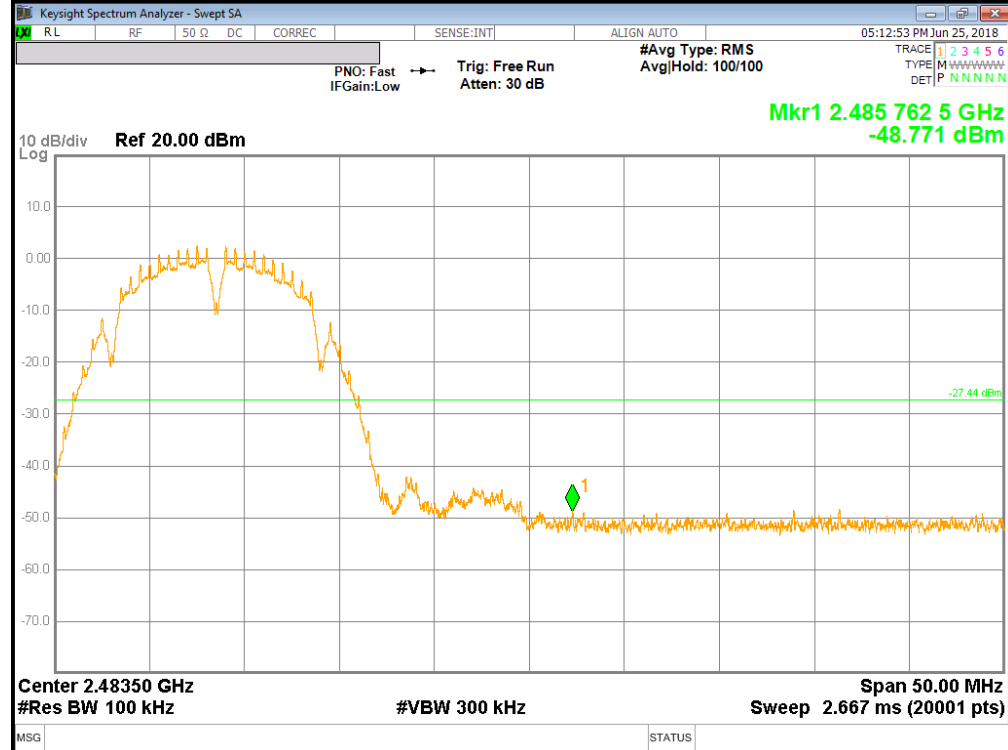
High Channel BandEdge



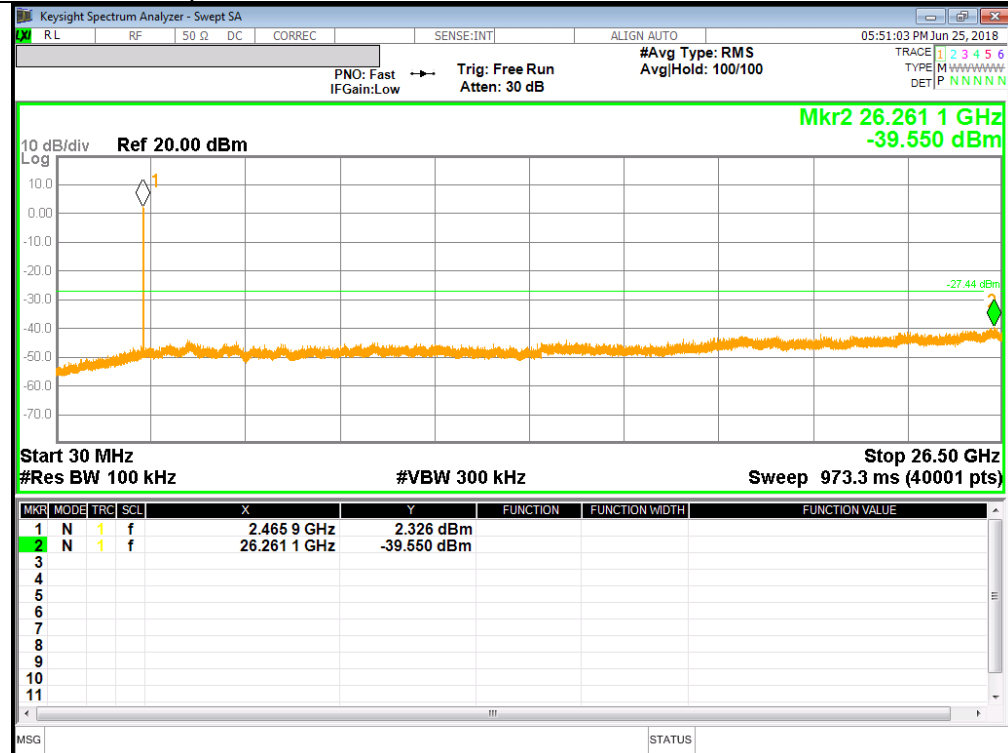
High Channel Spurious



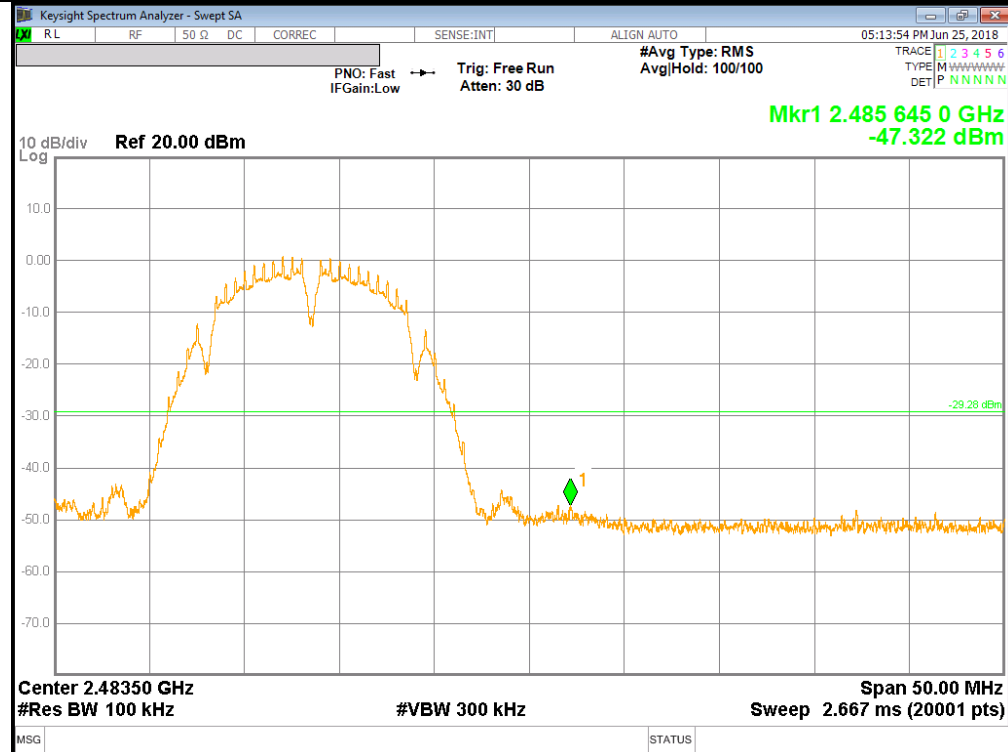
12 Channel BandEdge



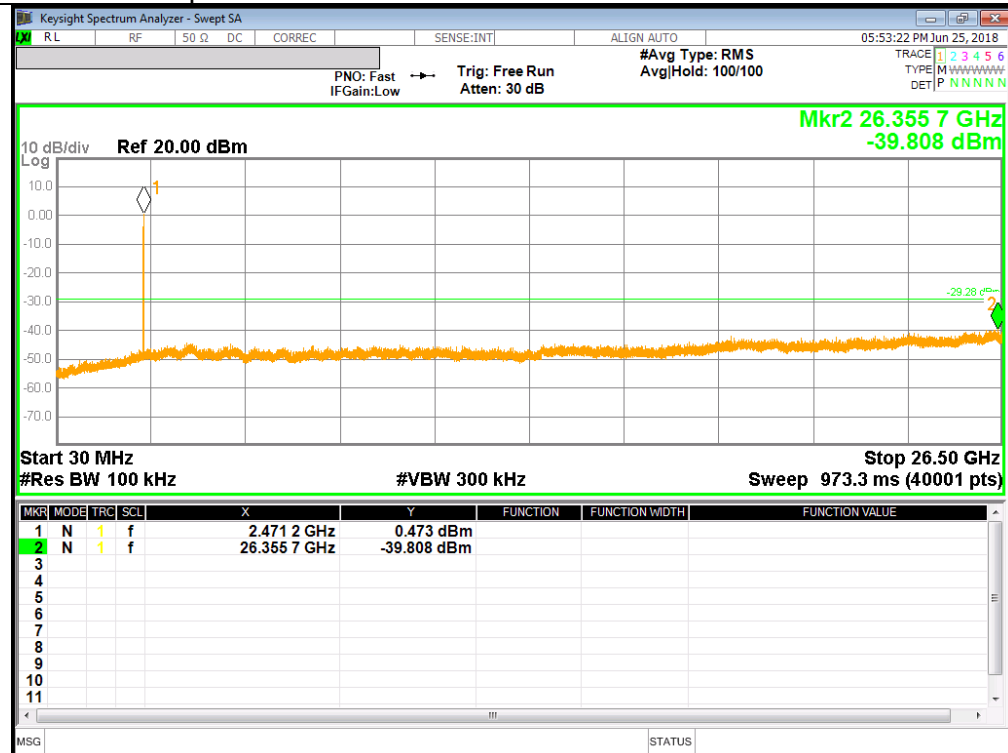
12 Channel Spurious



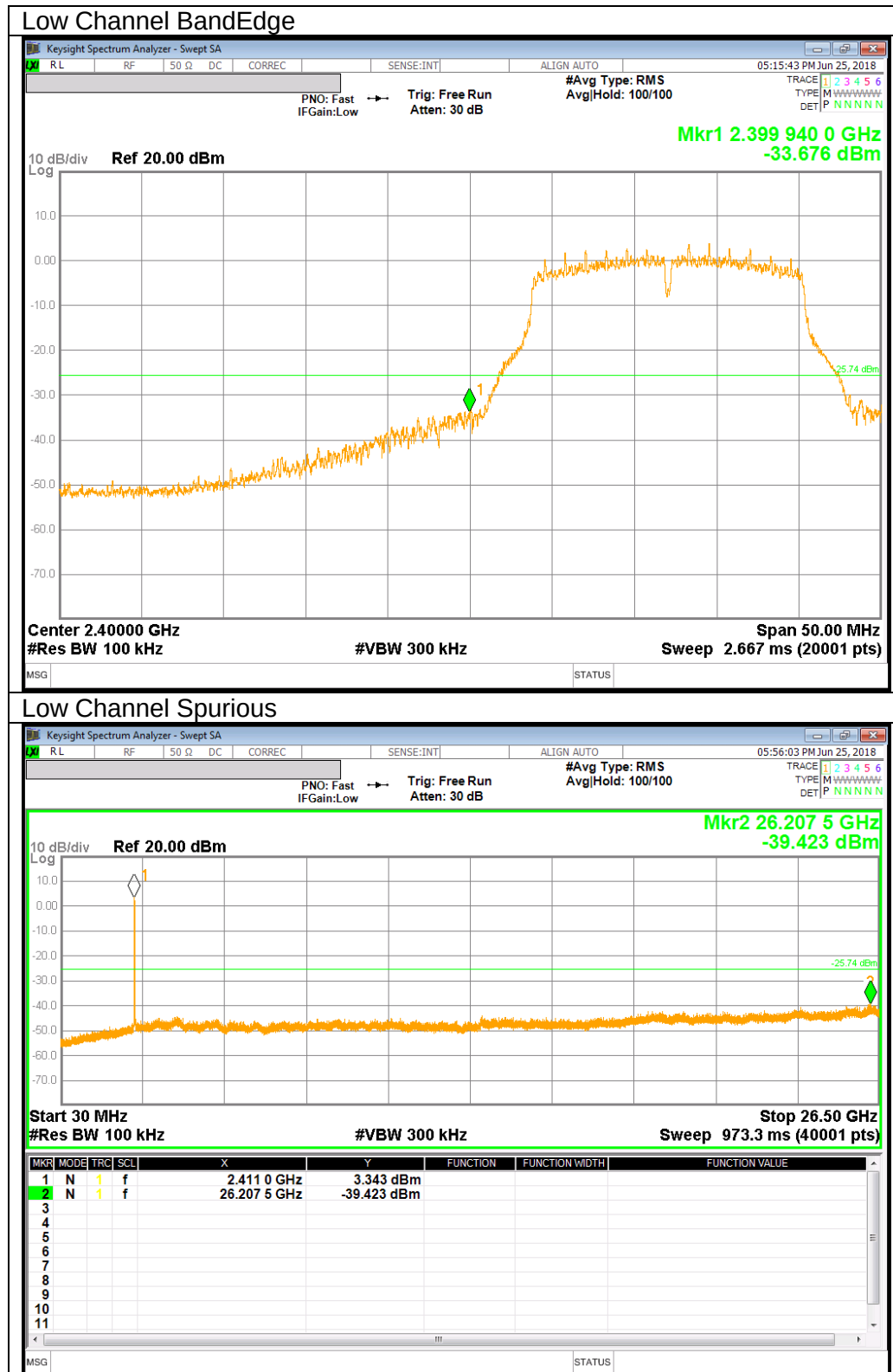
13 Channel BandEdge



13 Channel Spurious



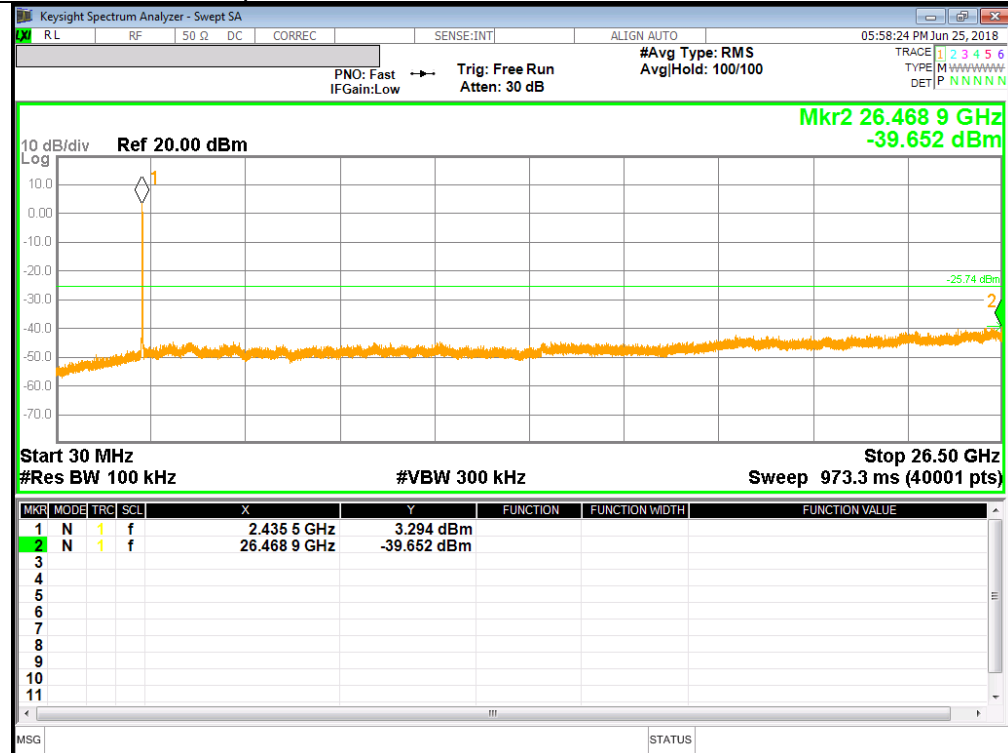
10.4.2.802.11g MODE IN THE 2.4 GHz BAND



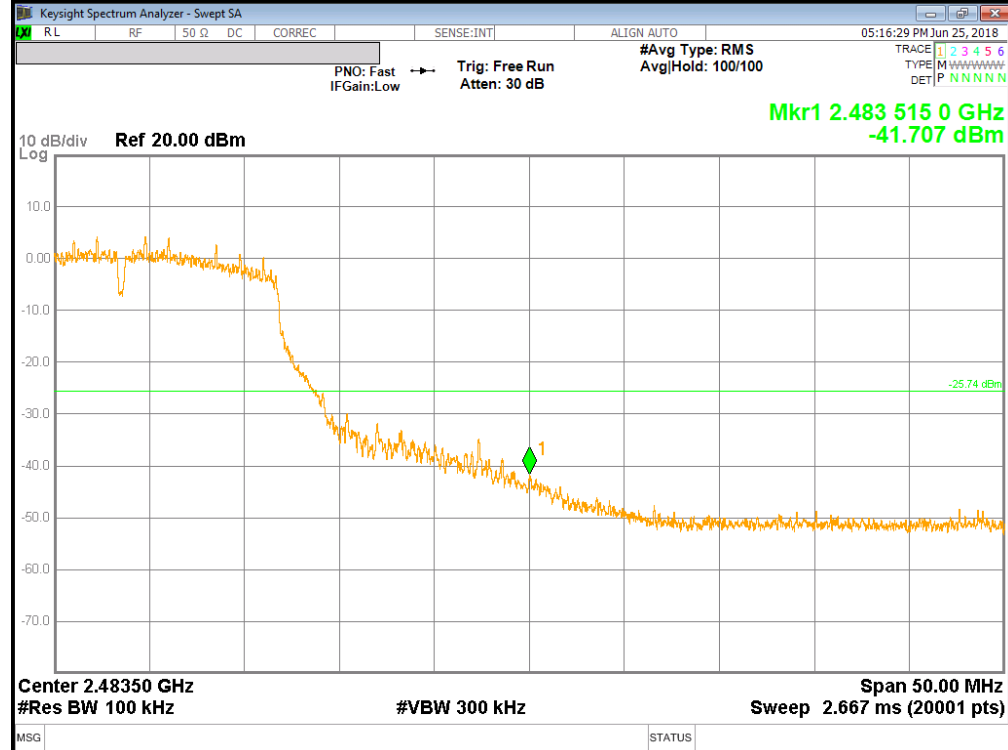
Middle Channel BandEdge



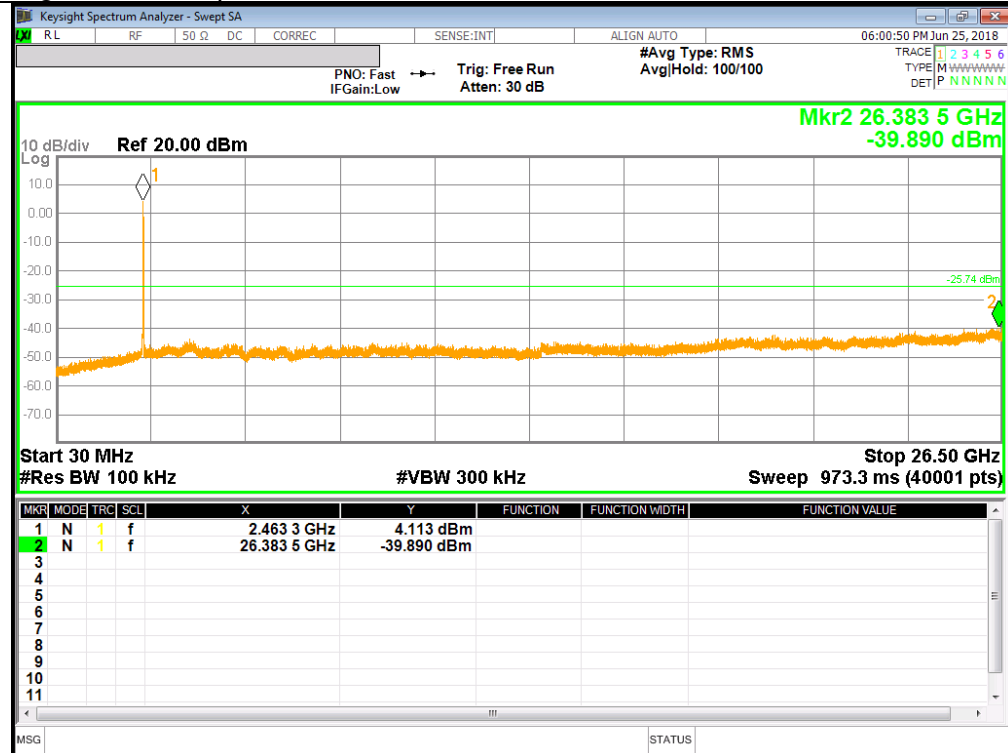
Middle Channel Spurious



High Channel BandEdge



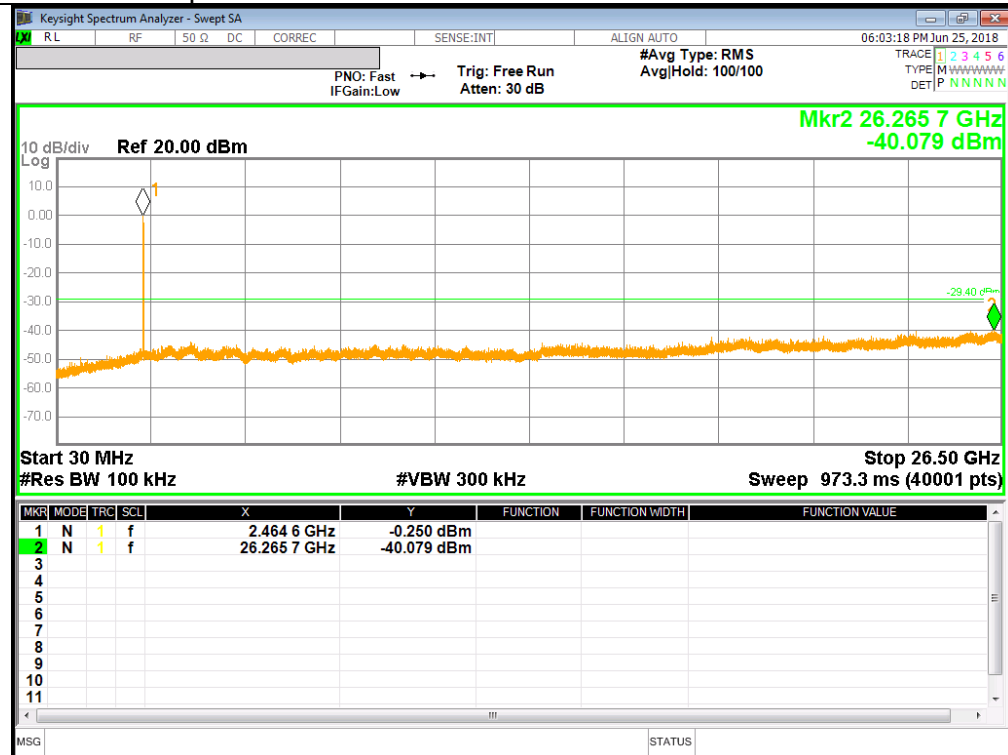
High Channel Spurious



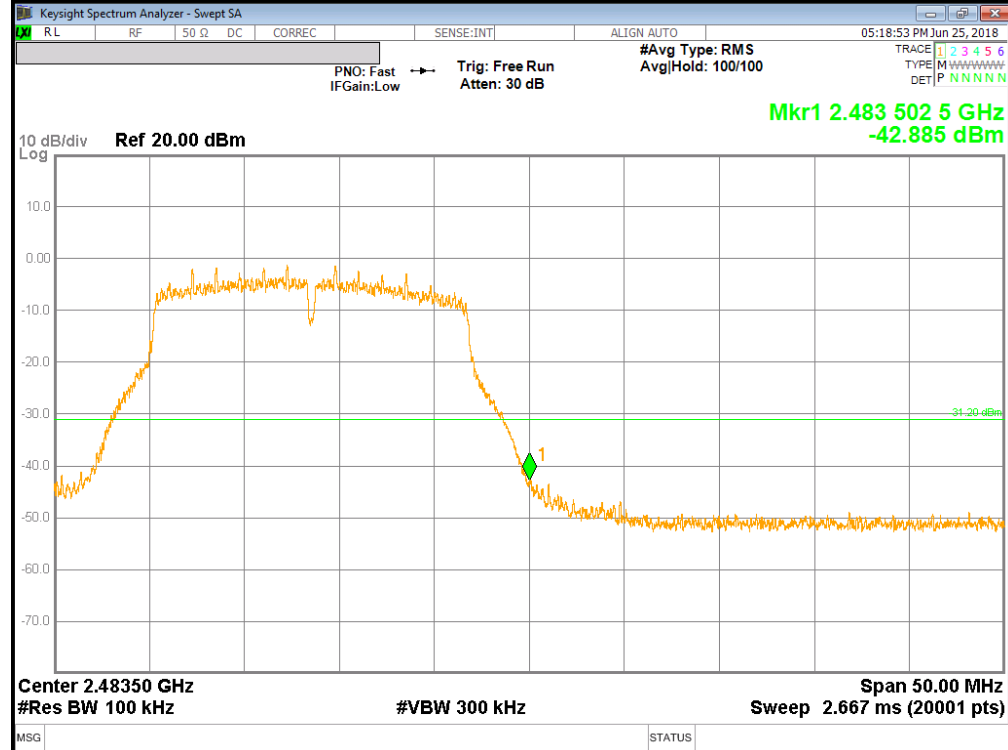
12 Channel BandEdge



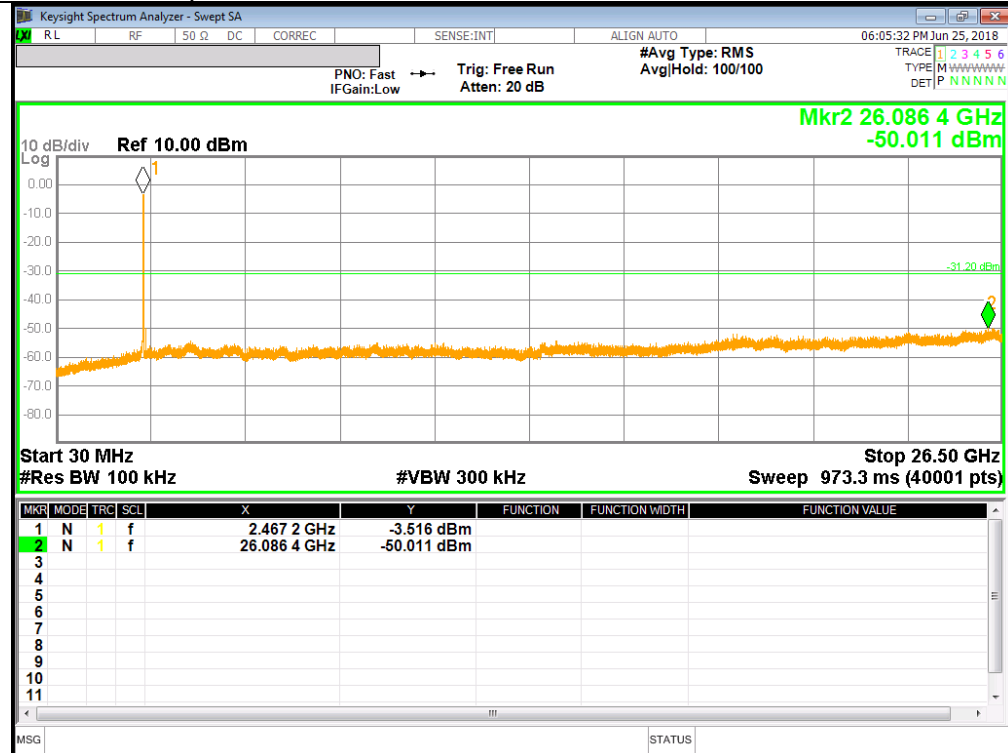
12 Channel Spurious



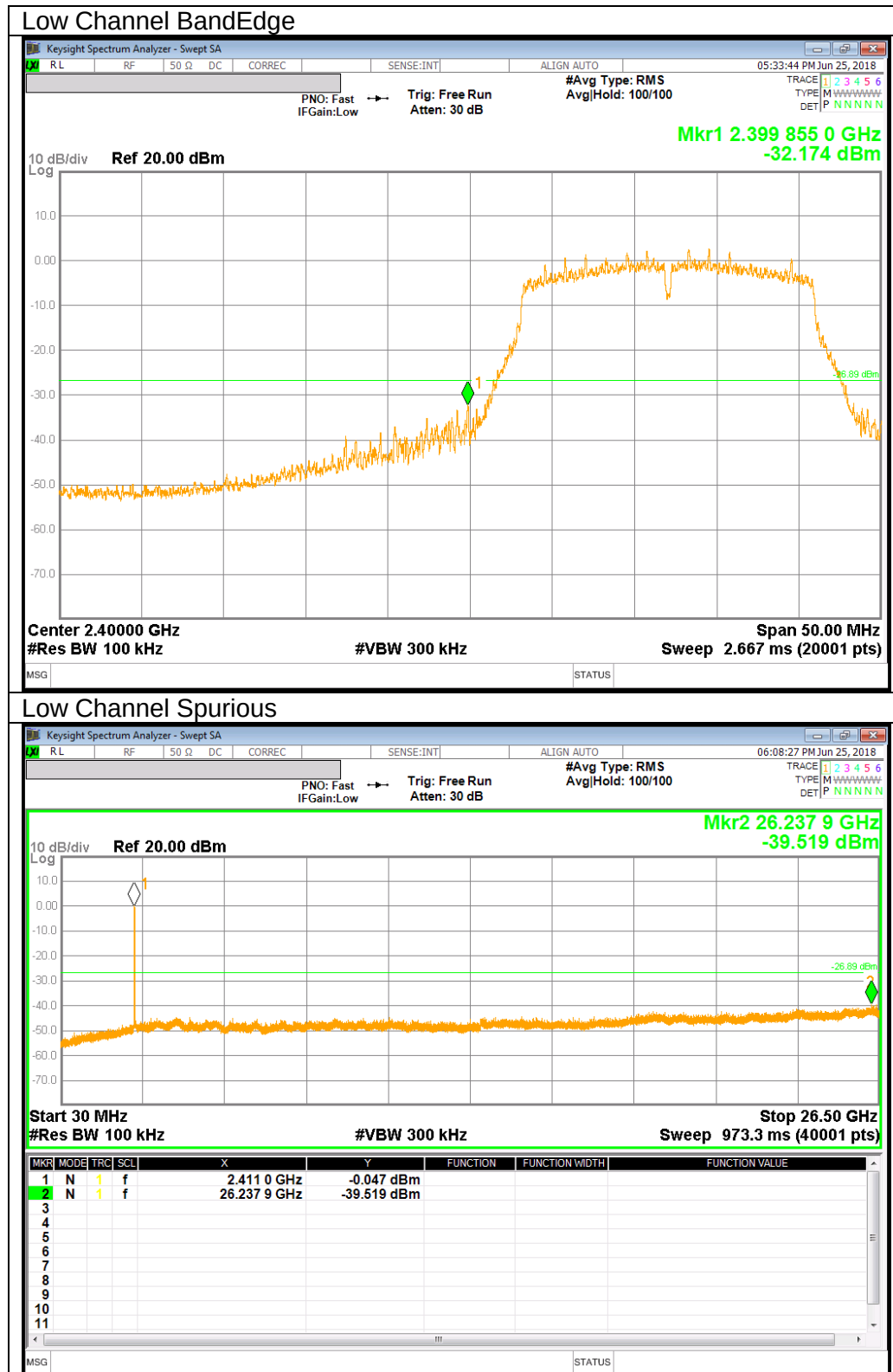
13 Channel BandEdge



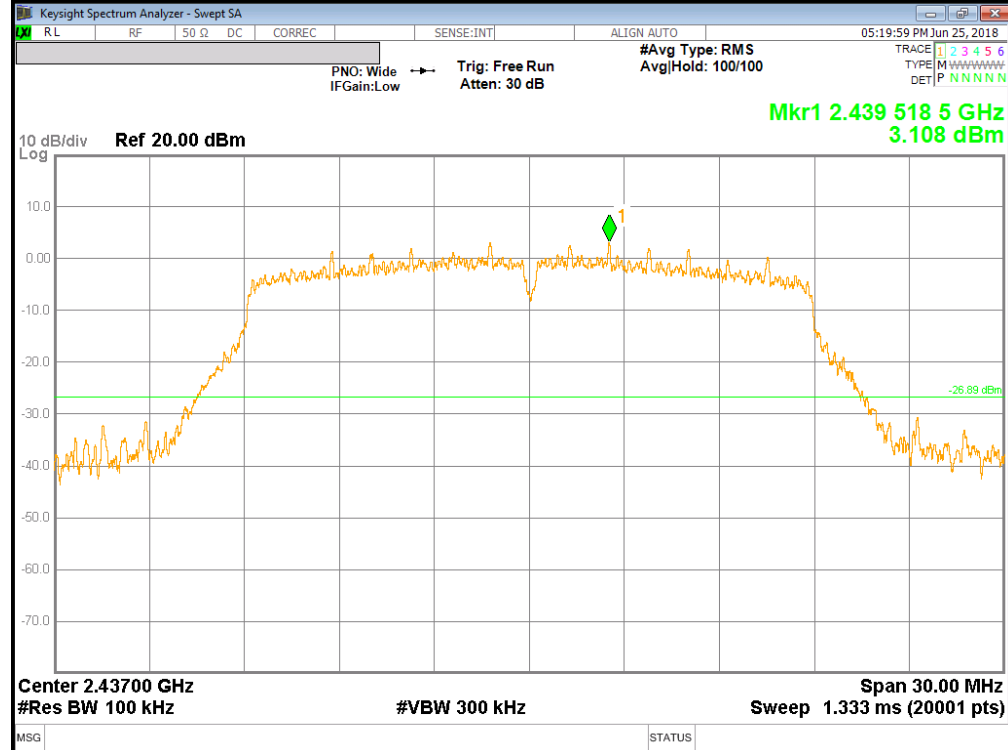
13 Channel Spurious



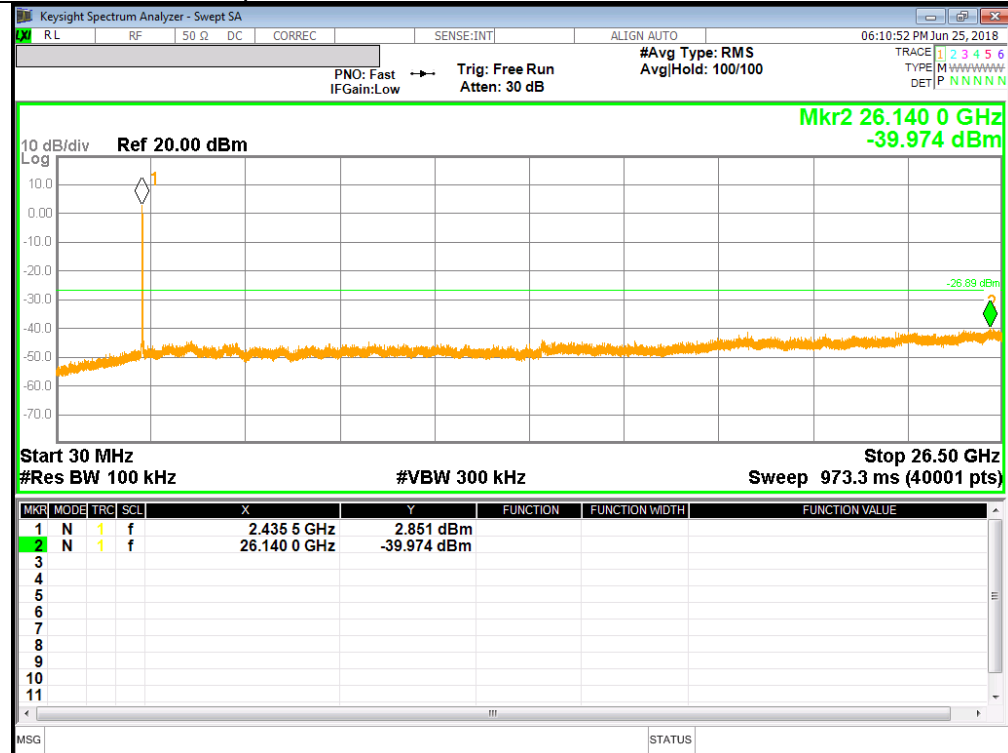
10.4.3.802.11n HT20 MODE IN THE 2.4 GHz BAND



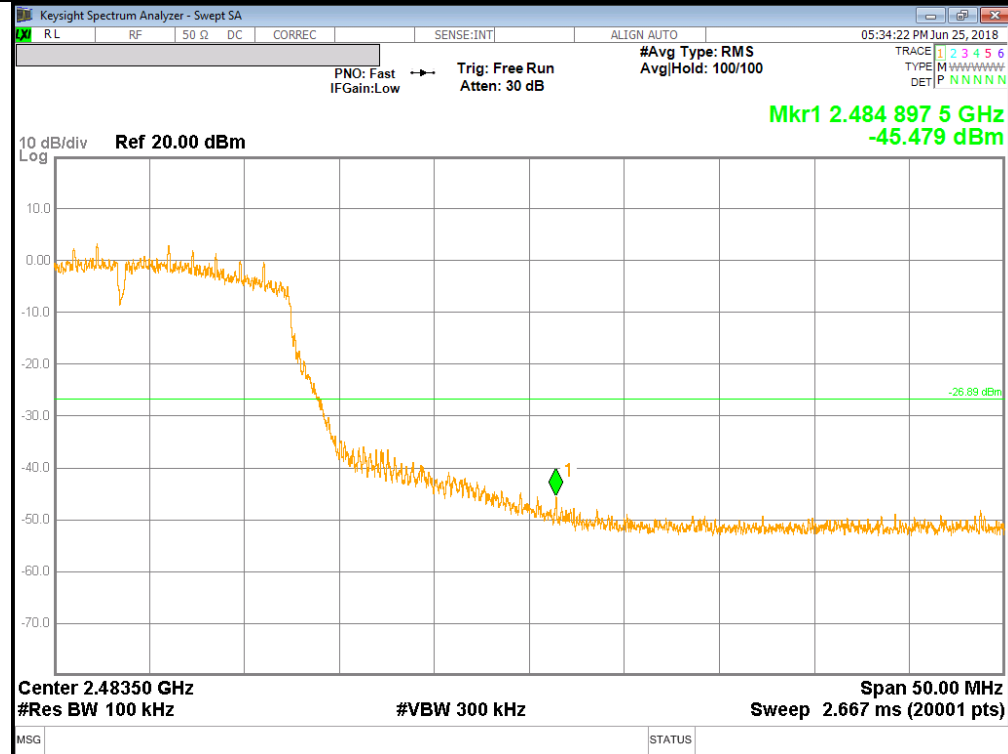
Middle Channel BandEdge



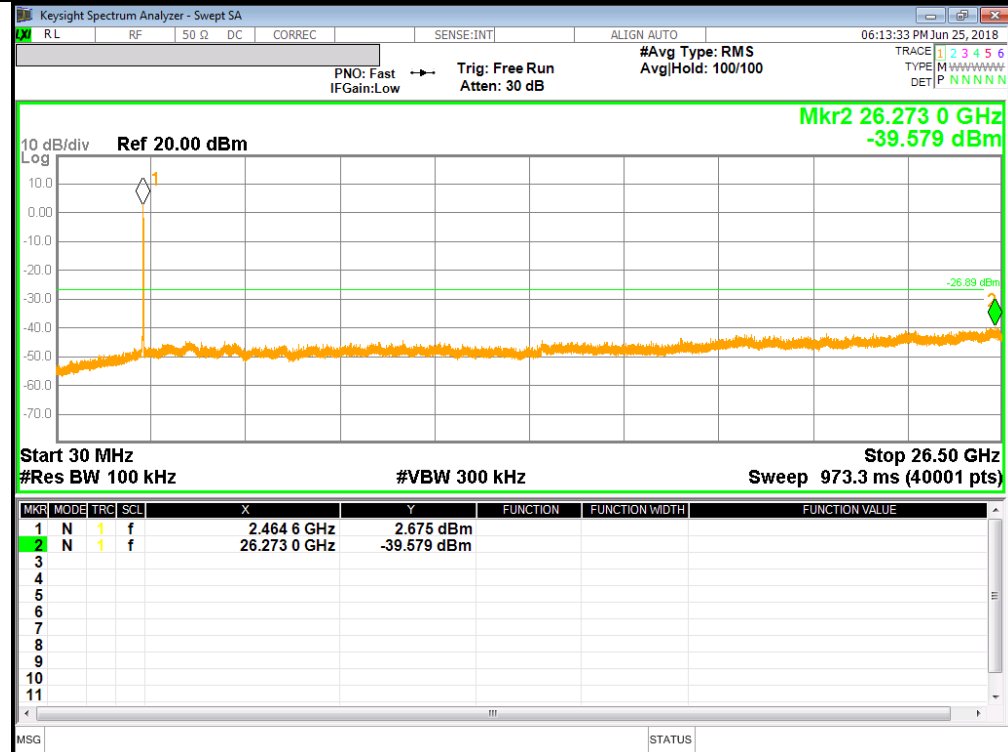
Middle Channel Spurious



High Channel BandEdge



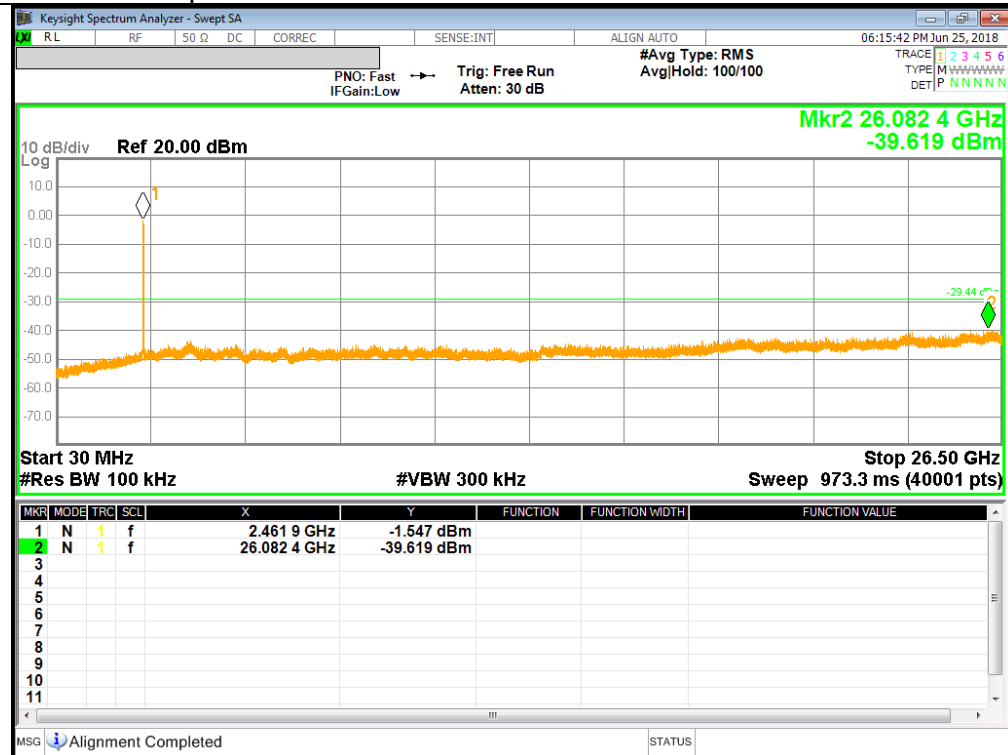
High Channel Spurious



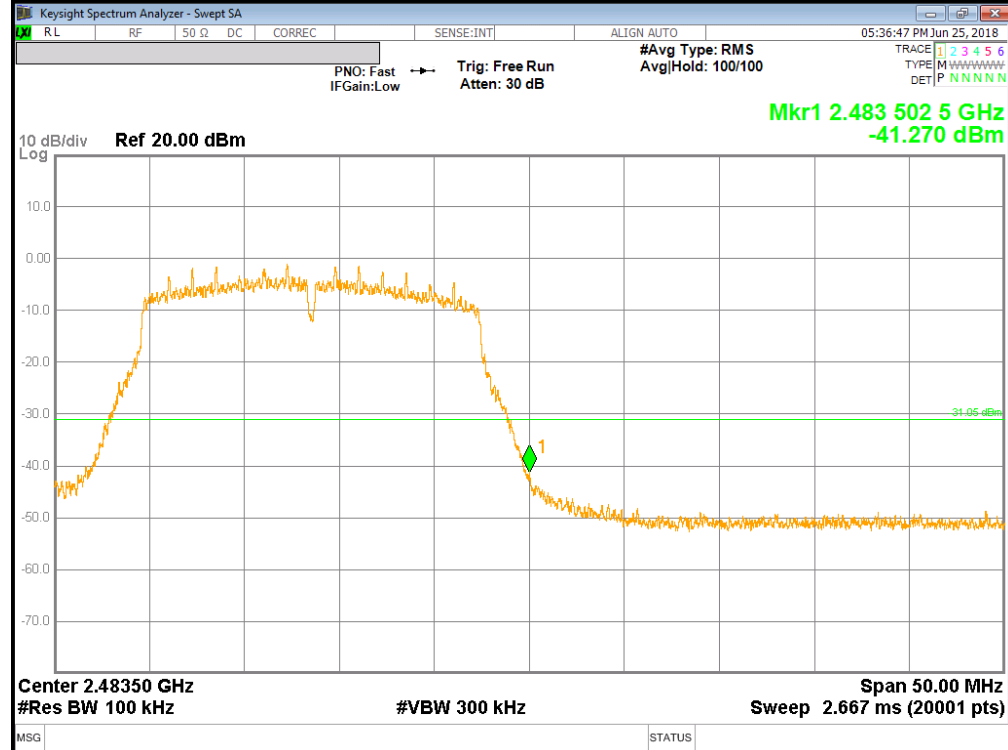
12 Channel BandEdge



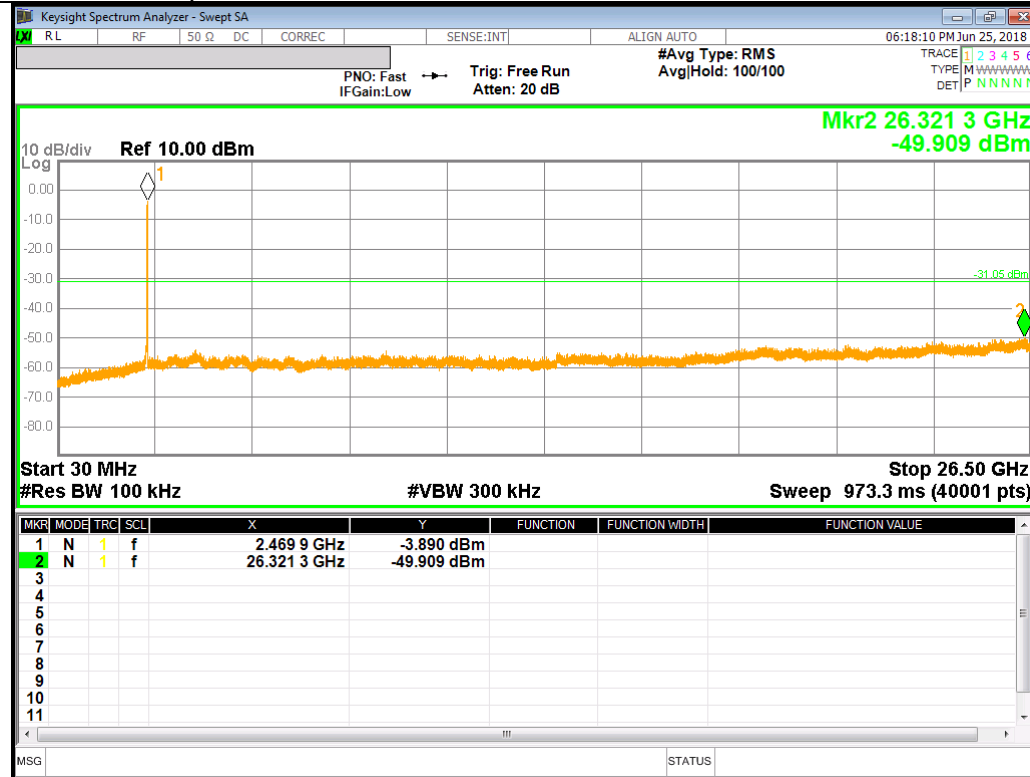
12 Channel Spurious



13 Channel BandEdge



13 Channel Spurious



11. RADIATED TEST RESULTS

11.1. LIMITS AND PROCEDURE

LIMITS

FCC §15.205 and §15.209

IC RSS-GEN Clause 8.9 (Transmitter)

IC RSS-GEN Clause 7 (Receiver)

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 = 0.15dB ; N mode = 0.16dB.

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.

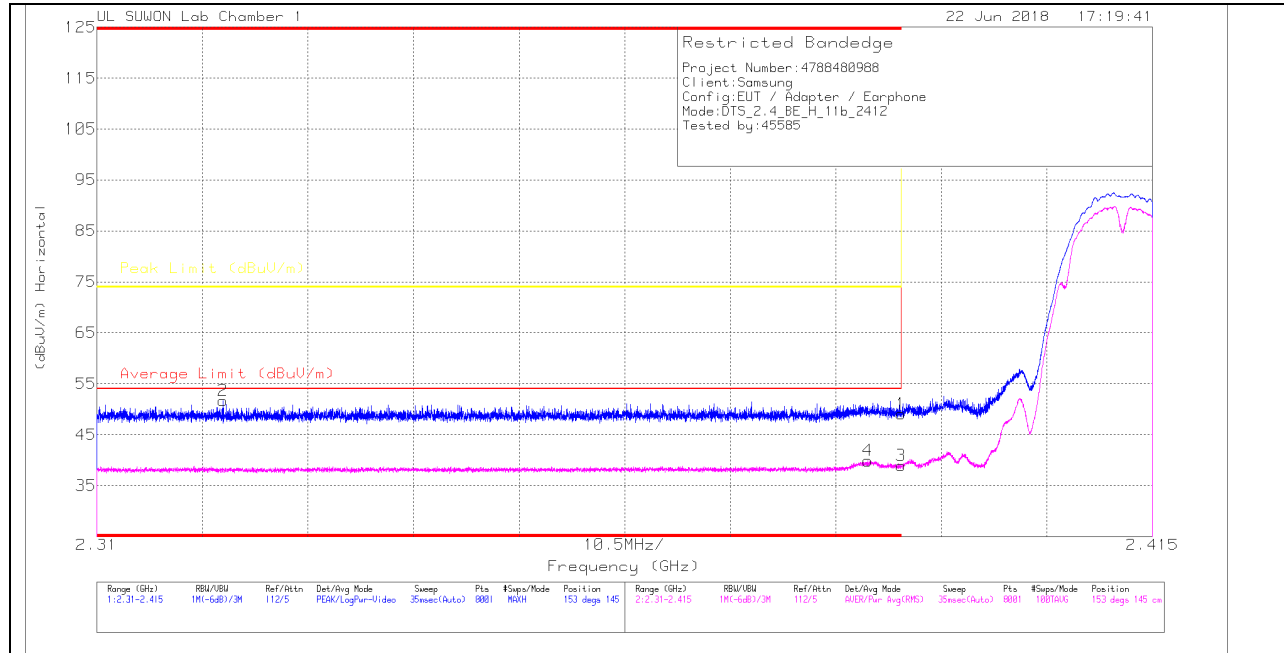
Although these tests were performed other than open area test site, adequate comparison measurements were confirmed against 30 m open area test site.
Therefore sufficient tests were made to demonstrate that the alternative site produces results that correlate with the one of tests made in an open field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

11.2. TRANSMITTER ABOVE 1 GHz

11.2.1.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

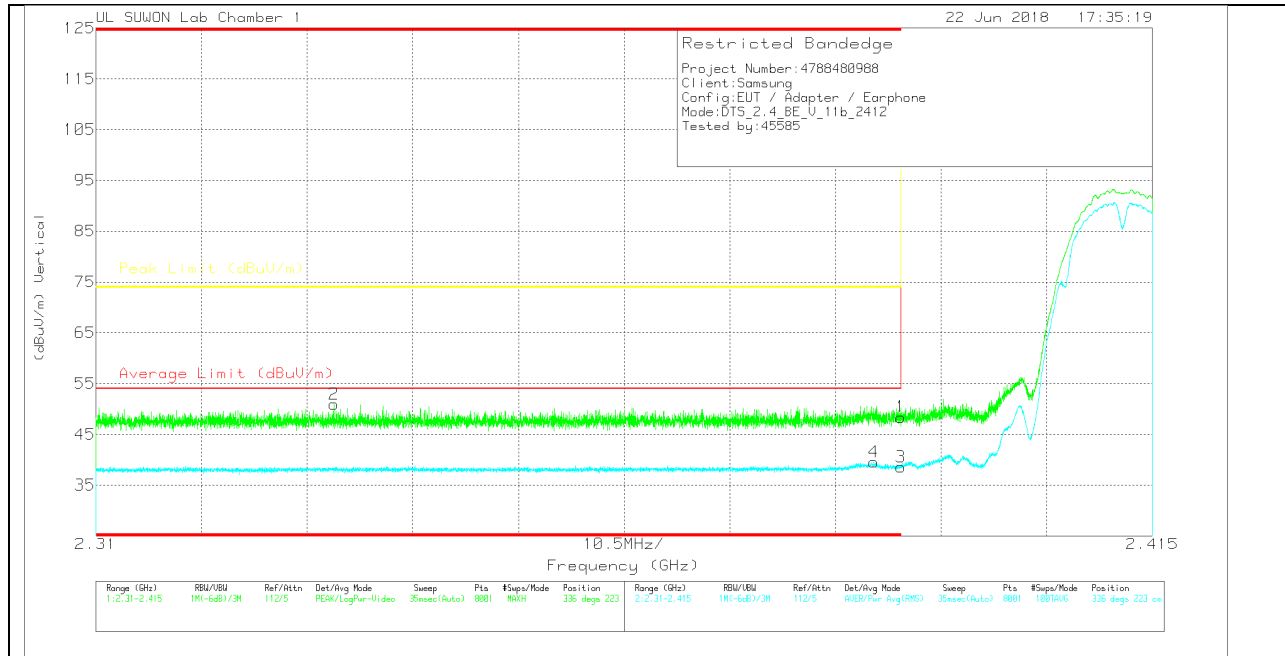
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	20170531_3117_00168 717	10dB_ATT(dB)_170809	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Altitude (Degs)	Height (cm)	Polarity
1	* 2.39	43.51	Pk	31.3	-25.7	0	49.11	-	-	74	-24.89	153	145	H
2	* 2.323	46.42	Pk	31.2	-25.9	0	51.72	-	-	74	-22.28	153	145	H
3	* 2.39	33.4	RMS	31.3	-25.7	0	39	54	-15	-	-	153	145	H
4	* 2.387	34.28	RMS	31.3	-25.7	0	39.88	54	-14.12	-	-	153	145	H

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

Pk - Peak detector

RMS - RMS detection

VERTICAL PEAK AND AVERAGE PLOT



VERTICAL DATA

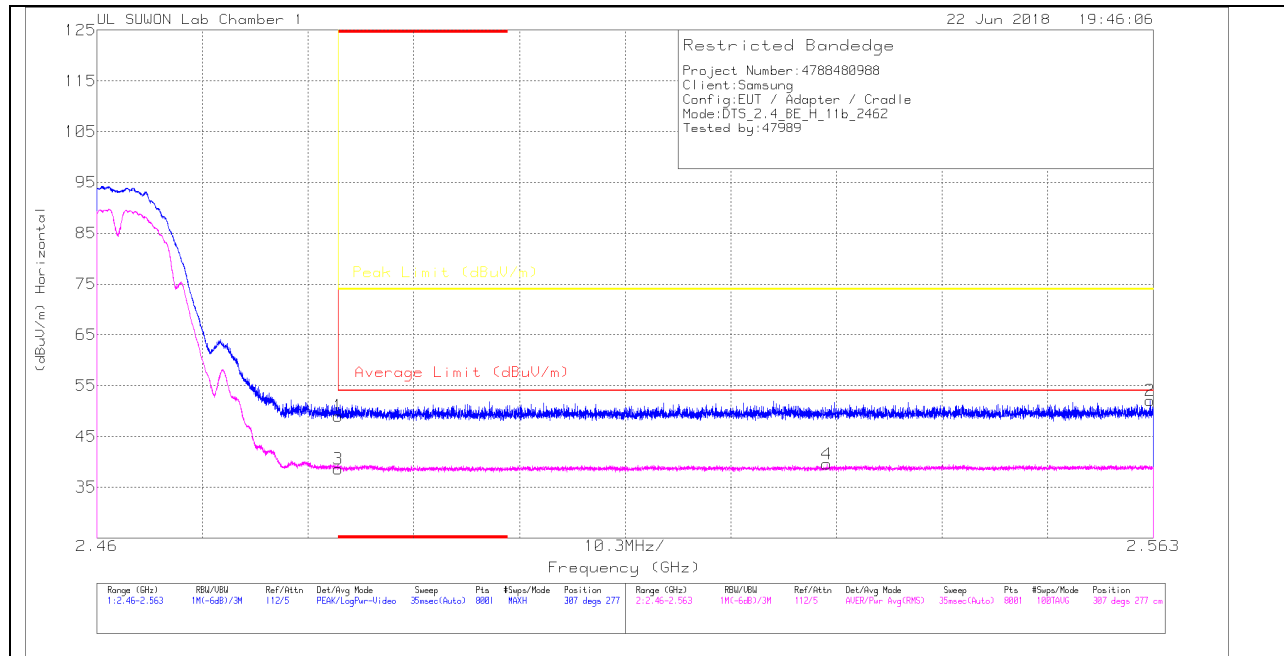
Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	20170531_3117_00168 717	10dB_ATT(dB)_170809	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	42.81	Pk	31.3	-25.7	0	48.41	-	-	74	-25.59	336	223	V
2	* 2.334	45.6	Pk	31.2	-25.9	0	50.9	-	-	74	-23.1	336	223	V
3	* 2.39	33.01	RMS	31.3	-25.7	0	38.61	54	-15.39	-	-	336	223	V
4	* 2.387	33.97	RMS	31.3	-25.7	0	39.57	54	-14.43	-	-	336	223	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**

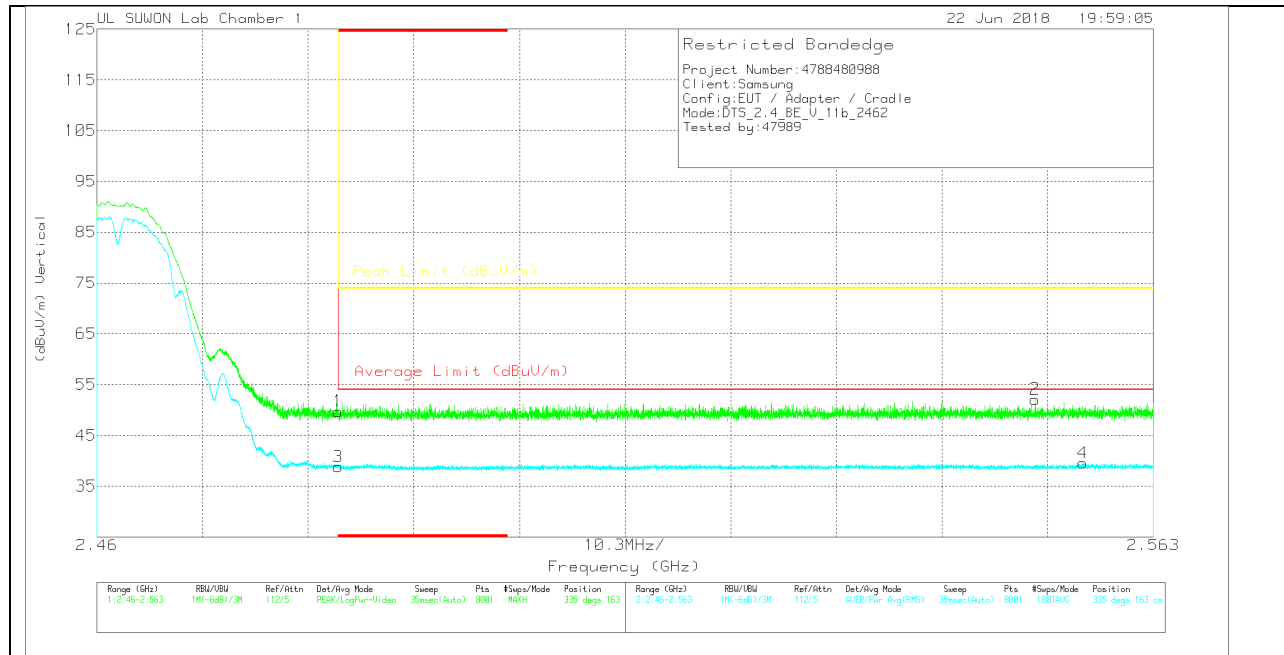
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	20170531_3117_00108 717	10dB_ATT(dB)_170809	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Altitude (Degs)	Height (cm)	Polarity
1	* 2.484	42.93	Pk		-25.5	0	49.03	-	-	74	-24.97	307	277	H
2	2.563	45.51	Pk		-25.3	0	52.01	-	-	74	-21.99	307	277	H
3	* 2.484	32.46	RMS		-25.5	0	38.56	54	-15.44	-	-	307	277	H
4	2.531	33.22	RMS		-25.4	0	39.52	54	-14.48	-	-	307	277	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	20170531_3117_00108 717	10dB_ATT(dB)_170809	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	43.67	PK	31.6	-25.5	0	49.77	-	-	74	-24.23	335	163	V
2	2.551	45.72	PK	31.7	-25.3	0	52.12	-	-	74	-21.88	335	163	V
3	* 2.484	32.71	RMS	31.6	-25.5	0	38.81	54	-15.19	-	-	335	163	V
4	2.556	33.03	RMS	31.7	-25.2	0	39.53	54	-14.47	-	-	335	163	V

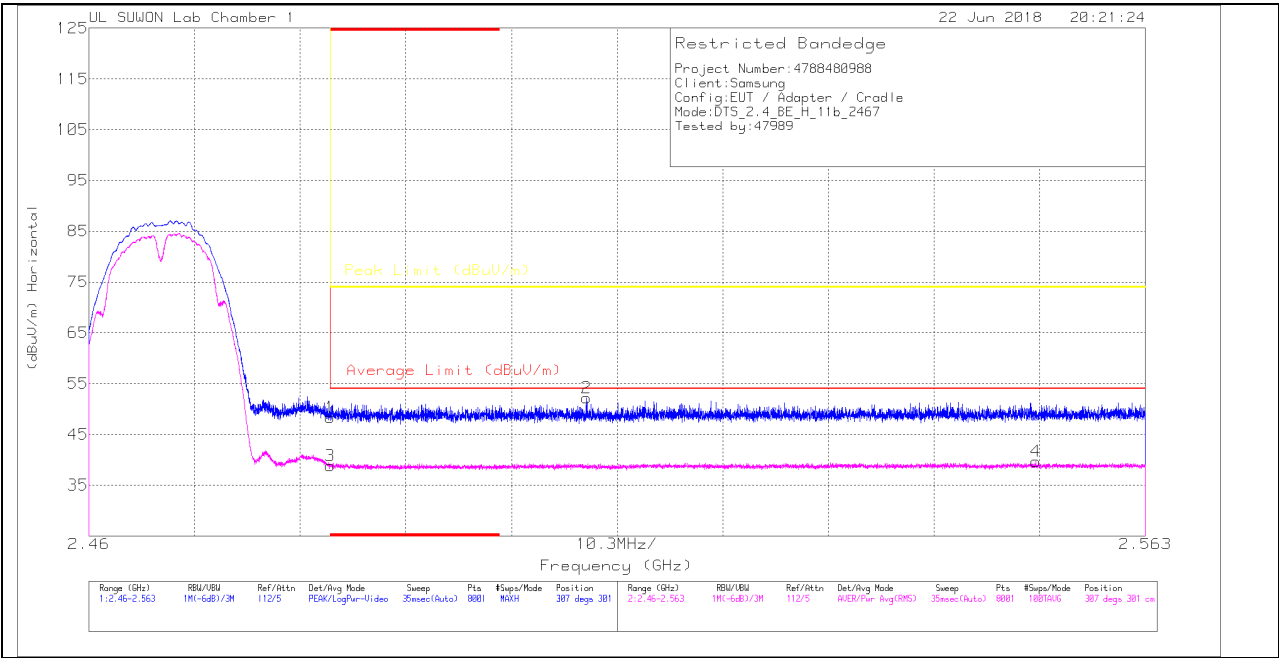
* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

PK - Peak detector

RMS - RMS detection

AUTHORIZED BANDEDGE (12 CHANNEL)

HORIZONTAL PEAK AND AVERAGE PLOT



HORIZONTAL DATA

Trace Markers

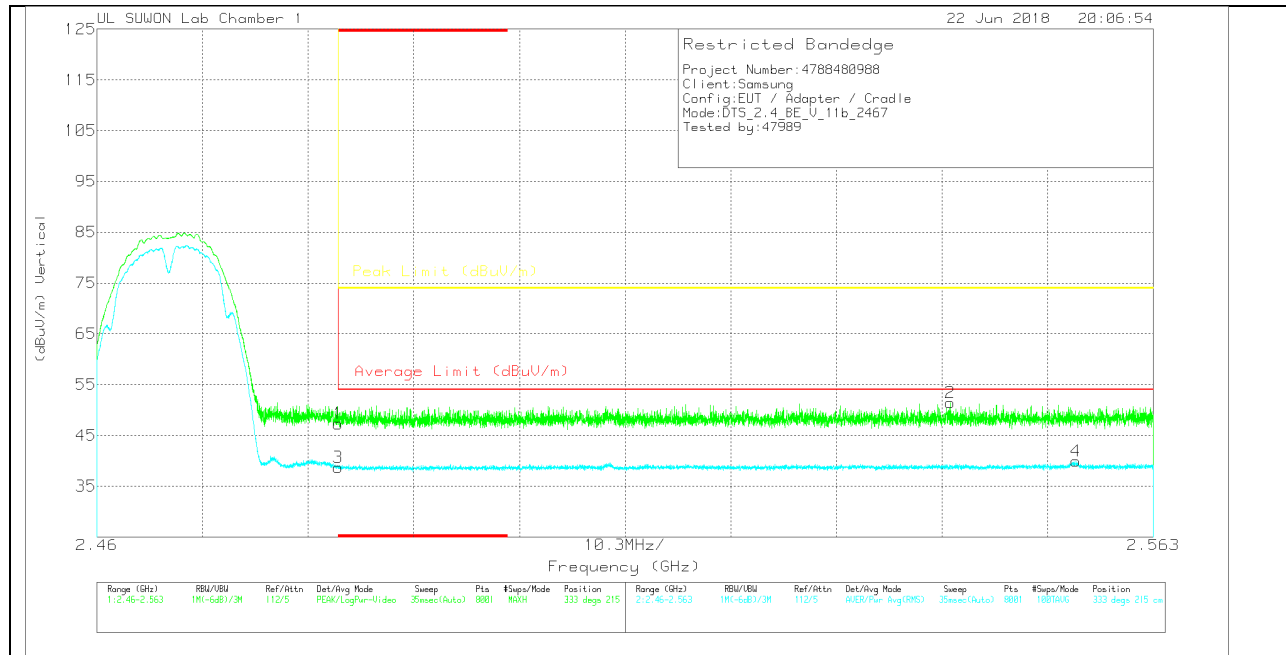
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	20170531_3117_00108 717	10dB_ATT(dB)_170809	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Altitude (Degs)	Height (cm)	Polarity
1	* 2.484	42.26	Pk		-25.5	0	48.36	-	-	74	-25.64	307	301	H
2	2.509	45.96	Pk		-25.4	0	52.16	-	-	74	-21.84	307	301	H
3	* 2.484	32.78	RMS		-25.5	0	38.88	54	-15.12	-	-	307	301	H
4	2.552	33.24	RMS		-25.3	0	39.64	54	-14.36	-	-	307	301	H

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

Pk - Peak detector

RMS - RMS detection

VERTICAL PEAK AND AVERAGE PLOT



VERTICAL DATA

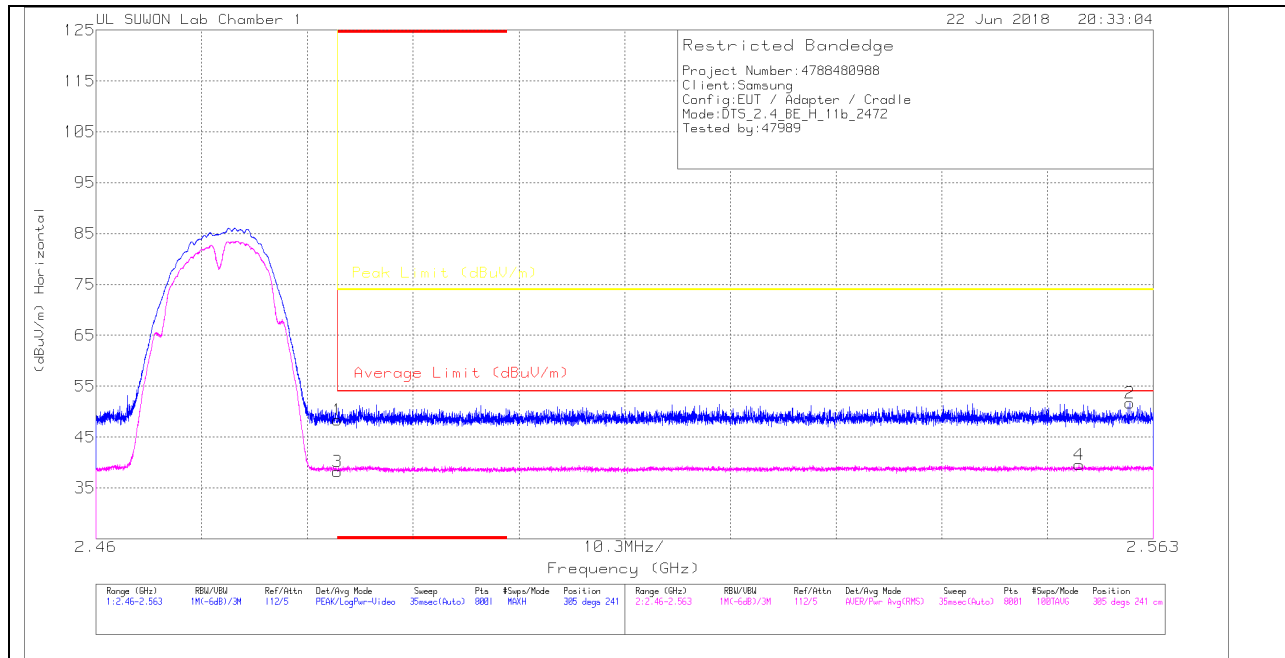
Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	20170531_3117_00108 717	10dB_ATT(170809	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	41.2	PK	31.6	-25.5	0	47.3	-	-	74	-26.7	333	215	V
2	2.543	44.95	PK	31.7	-25.2	0	51.45	-	-	74	-22.55	333	215	V
3	* 2.484	32.64	RMS	31.6	-25.5	0	38.74	54	-15.26	-	-	333	215	V
4	2.555	33.5	RMS	31.7	-25.3	0	39.9	54	-14.1	-	-	333	215	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**

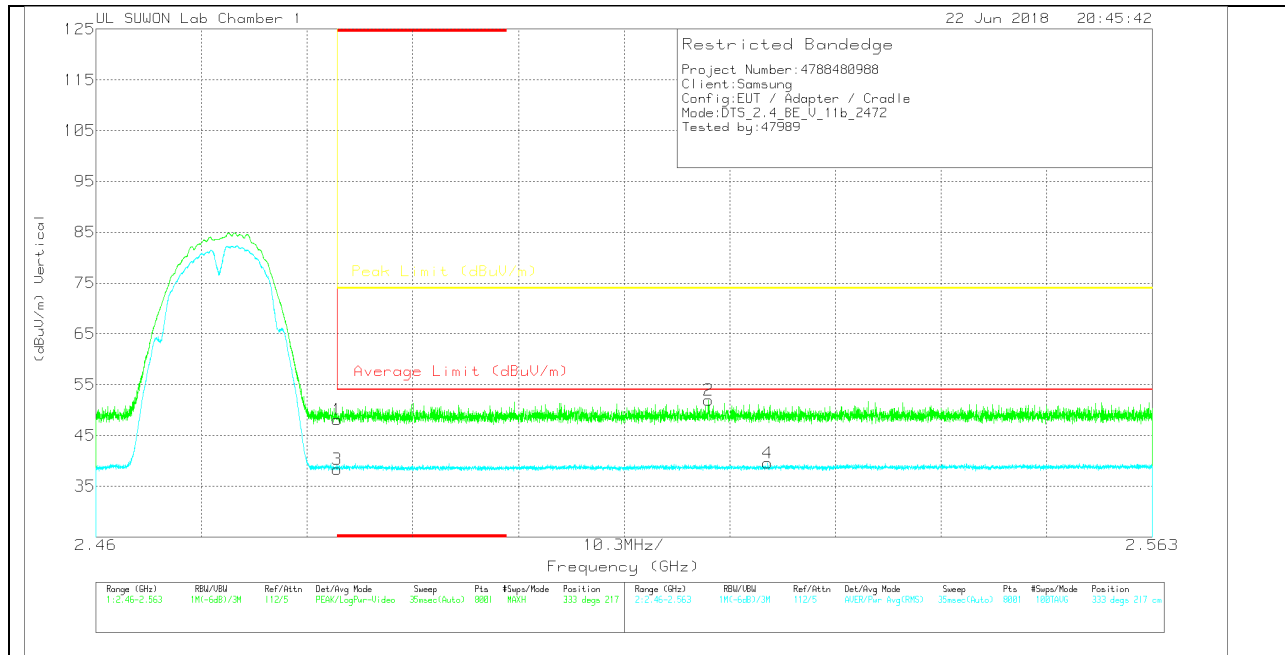
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	20170531_3117_00108 717	10dB_ATT(dB)_170809	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Pk Margin (dB)	Altitude (Degs)	Height (cm)	Polarity
1	* 2.484	42.28	Pk		-25.5	0	48.38	-	-	74	-25.62	305	241	H
2	2.561	45.26	Pk		-25.3	0	51.66	-	-	74	-22.34	305	241	H
3	* 2.484	32.12	RMS		-25.5	0	38.22	54	-15.78	-	-	305	241	H
4	2.556	33.13	RMS		-25.3	0	39.53	54	-14.47	-	-	305	241	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	20170531_3117_00168 717	10dB_ATT(dB)_170809	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	42.05	Pk	31.6	-25.5	0	48.15	-	-	74	-25.85	333	217	V
2	2.52	45.65	Pk	31.6	-25.3	0	51.95	-	-	74	-22.05	333	217	V
3	* 2.484	32.27	RMS	31.6	-25.5	0	38.37	54	-15.63	-	-	333	217	V
4	2.525	33.25	RMS	31.7	-25.4	0	39.55	54	-14.45	-	-	333	217	V

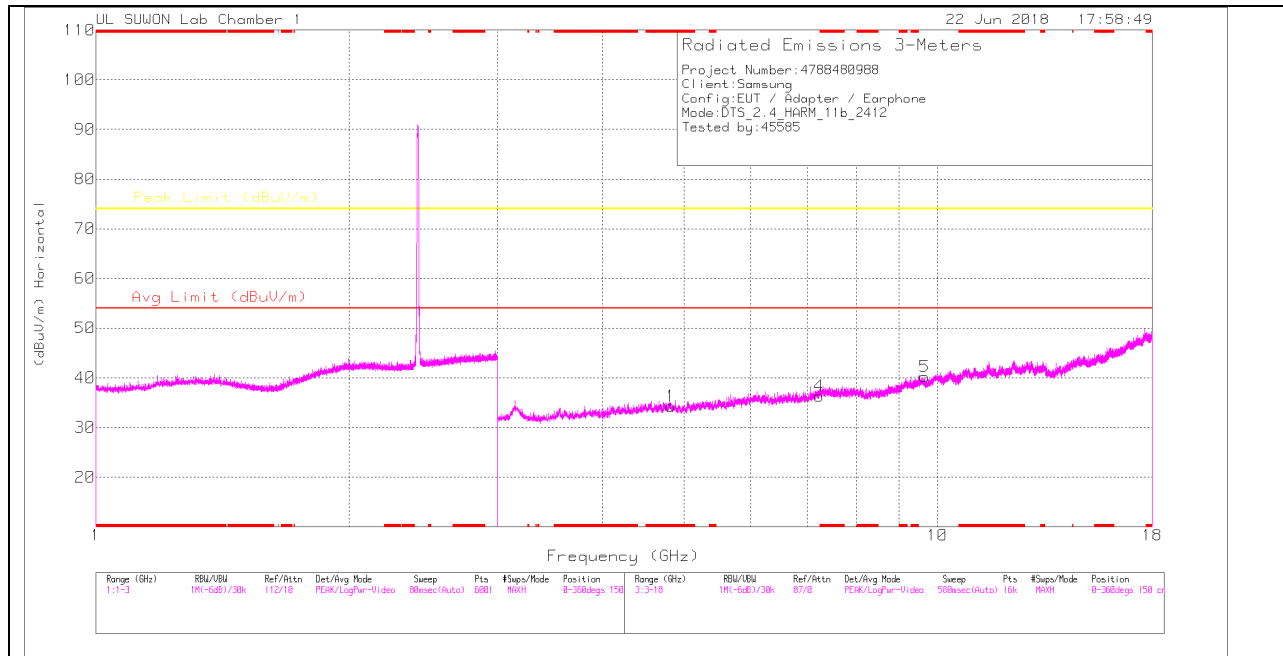
* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

Pk - Peak detector

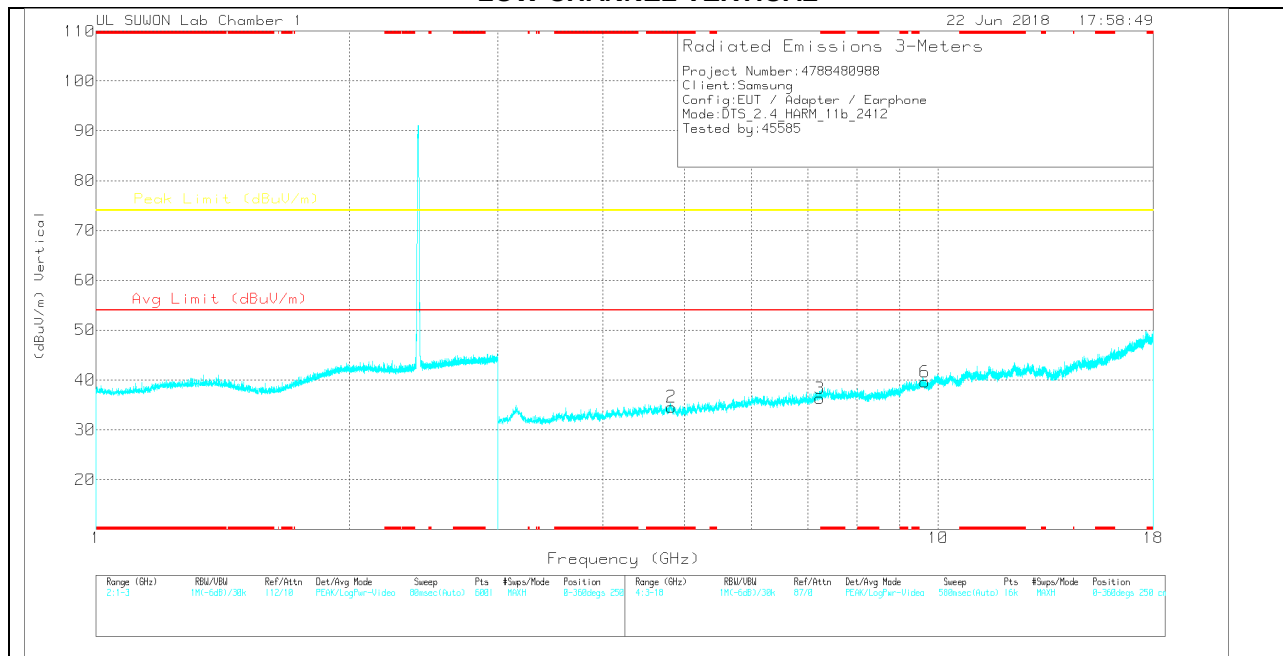
RMS - RMS detection

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

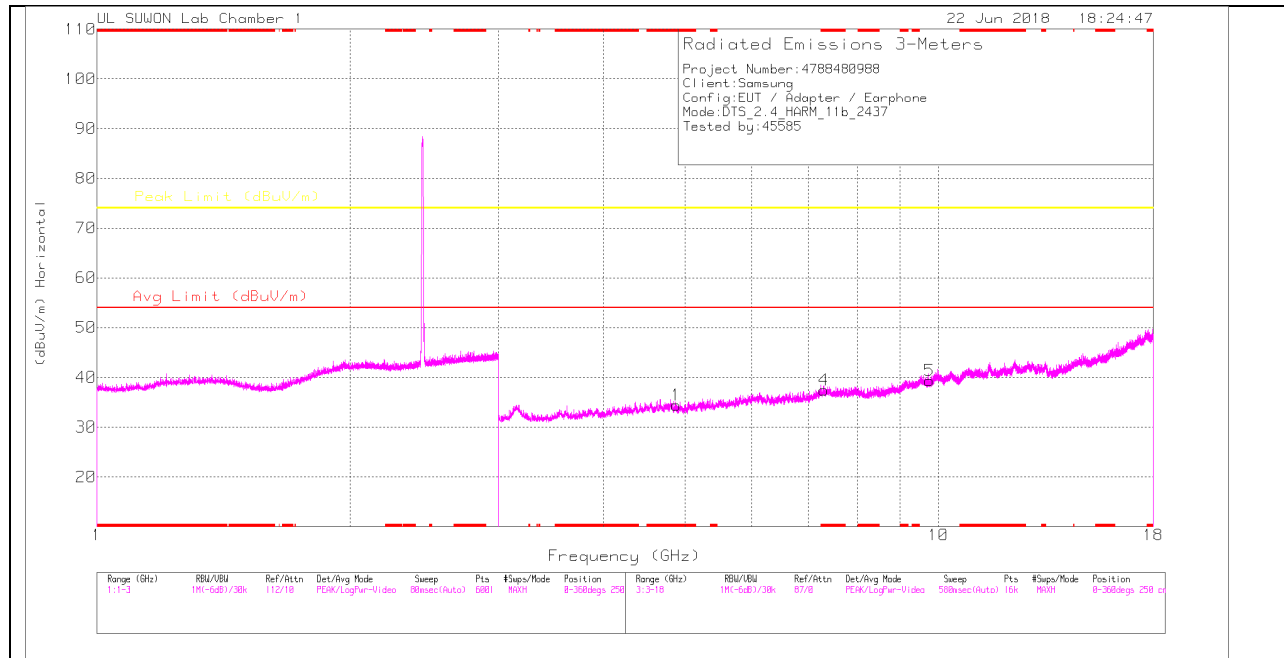
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	20170531_3117_001687 17	3GHz_HP(dB)_170809	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 4.825	32.13	PK	33.8	-31.6	0	34.33	-	-	74	-39.67	0-360	150	H
4	7.236	28.42	PK	35.9	-28	0	36.32	-	-	74	-37.68	0-360	150	H
5	9.649	27.09	PK	36.8	-23.7	0	40.19	-	-	74	-33.81	0-360	250	H
2	* 4.823	32.41	PK	33.8	-31.6	0	34.61	-	-	74	-39.39	0-360	150	V
3	7.236	28.41	PK	35.9	-28	0	36.31	-	-	74	-37.69	0-360	150	V
6	9.646	26.43	PK	36.8	-23.6	0	39.63	-	-	74	-34.37	0-360	250	V

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

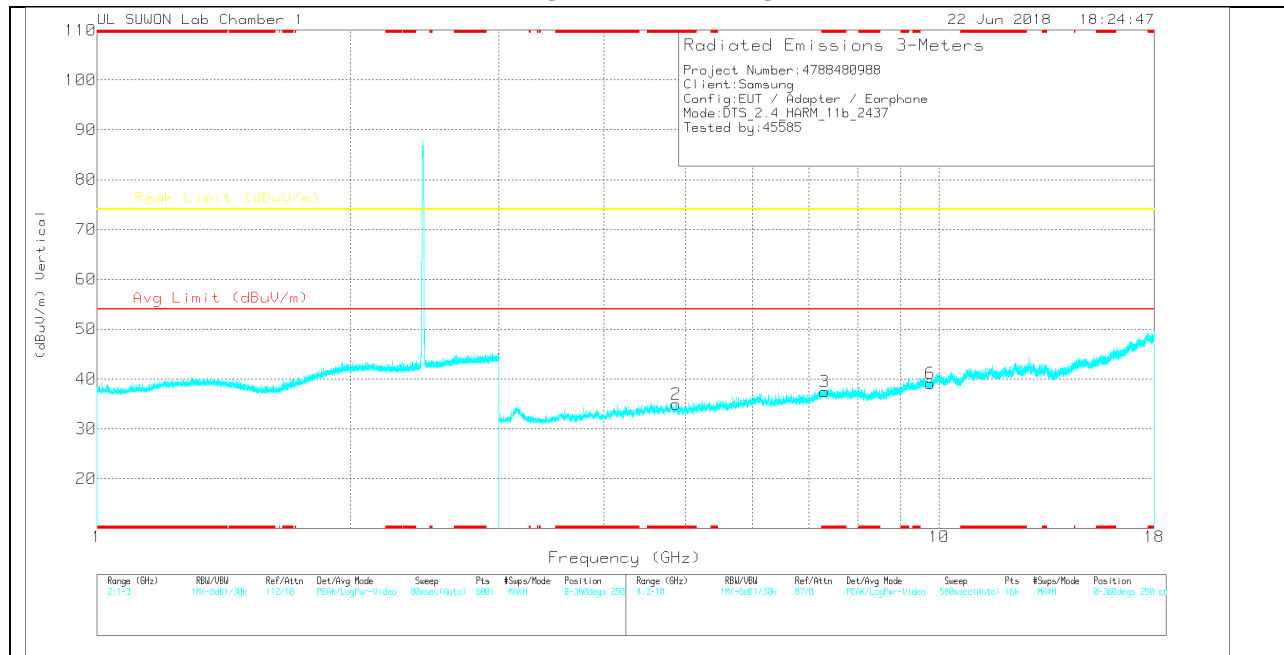
PK – Peak Detector

Note: Only peak measurement was performed. Because peak measurement result of unwanted emission is less than average limit (54dBuV/m).

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

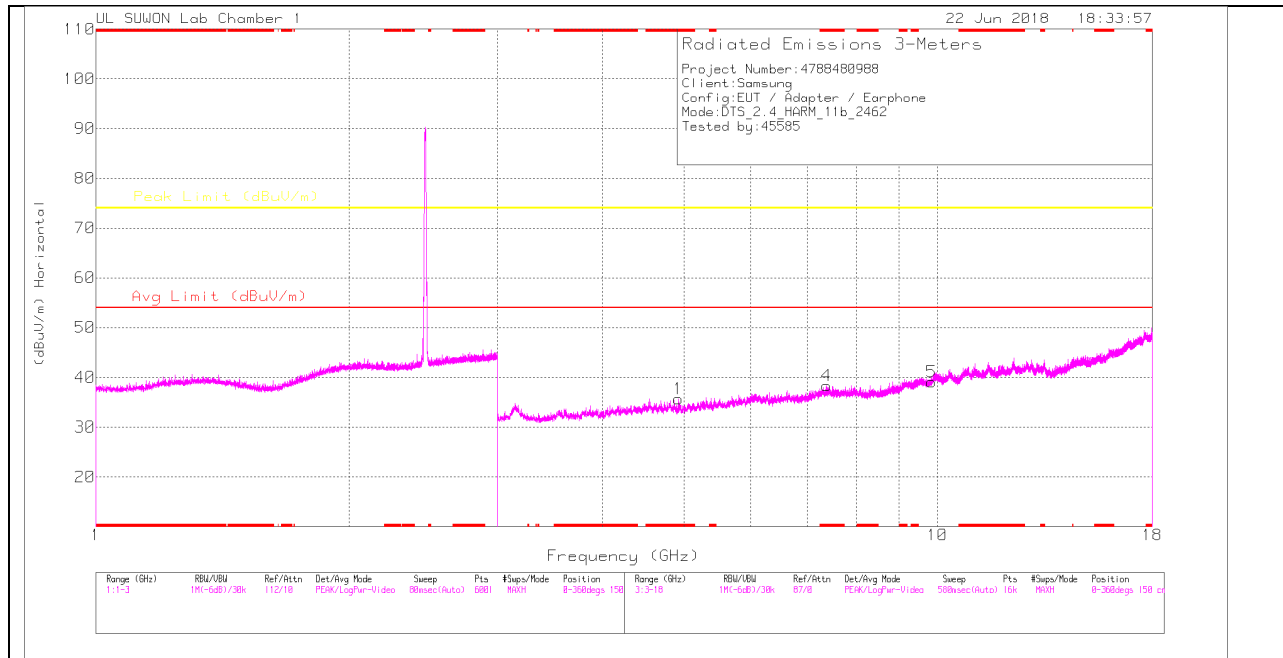
Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	20170531_3117_001687 17	3GHz_HP(dB)_170809	OC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 4.876	32.36	PK	33.8	-31.7	0	34.46	-	-	74	-39.54	0-360	150	H
4	* 7.313	29.13	PK	35.9	-27.6	0	37.43	-	-	74	-36.57	0-360	250	H
5	9.752	26.69	PK	36.9	-24.2	0	39.39	-	-	74	-34.61	0-360	250	H
2	* 4.875	32.87	PK	33.8	-31.7	0	34.97	-	-	74	-39.03	0-360	150	V
3	* 7.311	29.13	PK	35.9	-27.6	0	37.43	-	-	74	-36.57	0-360	250	V
6	9.751	26.43	PK	36.9	-24.2	0	39.13	-	-	74	-34.87	0-360	150	V

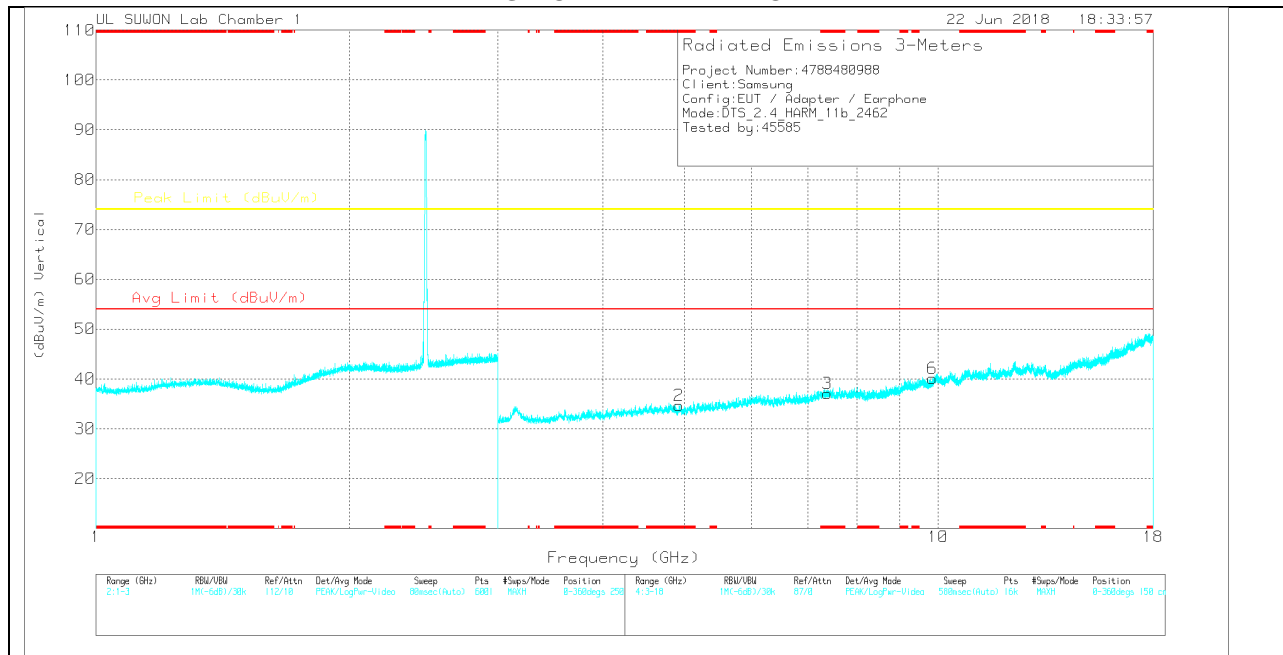
* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
PK – Peak Detector

Note: Only peak measurement was performed. Because peak measurement result of unwanted emission is less than average limit (54dBuV/m).

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	20170531_3117_001687 17	3GHz_HP(dB)_170809	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	* 4.924	33.72	PK	33.8	-31.8	0	35.72	-	-	74	-38.28	0-360	150	H
4	* 7.388	29.6	PK	35.9	-27.2	0	38.3	-	-	74	-35.7	0-360	250	H
5	9.849	25.49	PK	37	-23.4	0	39.09	-	-	74	-34.91	0-360	150	H
2	* 4.925	32.63	PK	33.8	-31.8	0	34.63	-	-	74	-39.37	0-360	250	V
3	* 7.387	28.35	PK	35.9	-27.2	0	37.05	-	-	74	-36.95	0-360	250	V
6	9.847	26.51	PK	37	-23.4	0	40.11	-	-	74	-33.89	0-360	150	V

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
PK – Peak Detector

Note: Only peak measurement was performed. Because peak measurement result of unwanted emission is less than average limit (54dBuV/m).