



FCC CFR47 PART 15 SUBPART C

CERTIFICATION TEST REPORT

FOR

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

MODEL NUMBER : SM-N9200

FCC ID: A3LSMN9200

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--	07/07/15	Initial issue	Junwhan Lee
A	07/09/15	Update version of ANSI C63.10	CY Choi
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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, ANT+ and NFC
MODEL NUMBER: SM-N9200
SERIAL NUMBER: R38G5101T0T (RADIATED); R38G5101SXX (CONDUCTED)
DATE TESTED: JUN 17 - JUL 08, 2015

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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2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.10-2009, FCC CFR 47 Part 2, FCC CFR 47 Part 15.

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, 443-823, 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	4.14 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/UNII a/b/g/n/ac, ANT+ and NFC.
This test report addresses the DTS (WLAN) operational mode.

WiFi MIMO Condition

Frequency	Mode	Antenna 1	Antenna 2
2.4 GHz	802.11b	TX / RX	TX / RX
	802.11g	TX / RX	TX / RX
	802.11n	TX / RX	TX / RX
	802.11n MIMO	TX / RX	TX / RX
5 GHz	802.11a	TX / RX	TX / RX
	802.11n	TX / RX	TX / RX
	802.11ac	TX / RX	TX / RX
	802.11n/ac MIMO	TX / RX	TX / RX

Simultaneous TX Condition

Frequency	Supported
2.4 GHz Ant 1 + 5 GHz Ant 2	Yes
2.4 GHz Ant 2 + 5 GHz Ant 1	No
2.4 GHz Ant 1 + 5 GHz Ant 1	No
2.4 GHz Ant 2 + 5 GHz Ant 2	No

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]	
		Antenna1	Antenna2	Antenna1	Antenna2
2412 - 2462	802.11b	18.02	18.38	63.39	68.87
	802.11g SISO	15.28	15.12	33.73	32.51
	802.11g MIMO	18.21		66.24	
	802.11n SISO	14.38	14.23	27.42	26.49
	802.11n MIMO	17.32		53.90	

5.3. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes an FPCB antennas, with a antenna1's maximum gain of -1.48 dBi and antenna2's maximum gain of -1.56 dBi .

5.4. LIST OF TEST REDUCTION AND MODES

2400 - 2483.5 MHz Authorized Frequency Band (Antenna Port & Radiated Testing)		
Frequency Range (MHz)	Mode	Covered by
2412 - 2462	802.11b Legacy 1TX	802.11b Legacy 1TX
	802.11g Legacy 1TX	802.11g CDD 2TX
	802.11n 1TX	802.11n HT20 CDD 2TX
	802.11n STBC 2TX	802.11n HT20 CDD 2TX

5.5. WORST-CASE CONFIGURATION AND MODE

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

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

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

5.6. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

Support Equipment List				
Description	Manufacturer	Model	Serial Number	FCC ID
Charger	SAMSUNG	EP-TA20CBC	R37FCPc00R1DK3	N/A
Data Cable	SAMSUNG	EP-DG925UWE	N/A	N/A
Earphone	SAMSUNG	EO-EG920LW	N/A	N/A

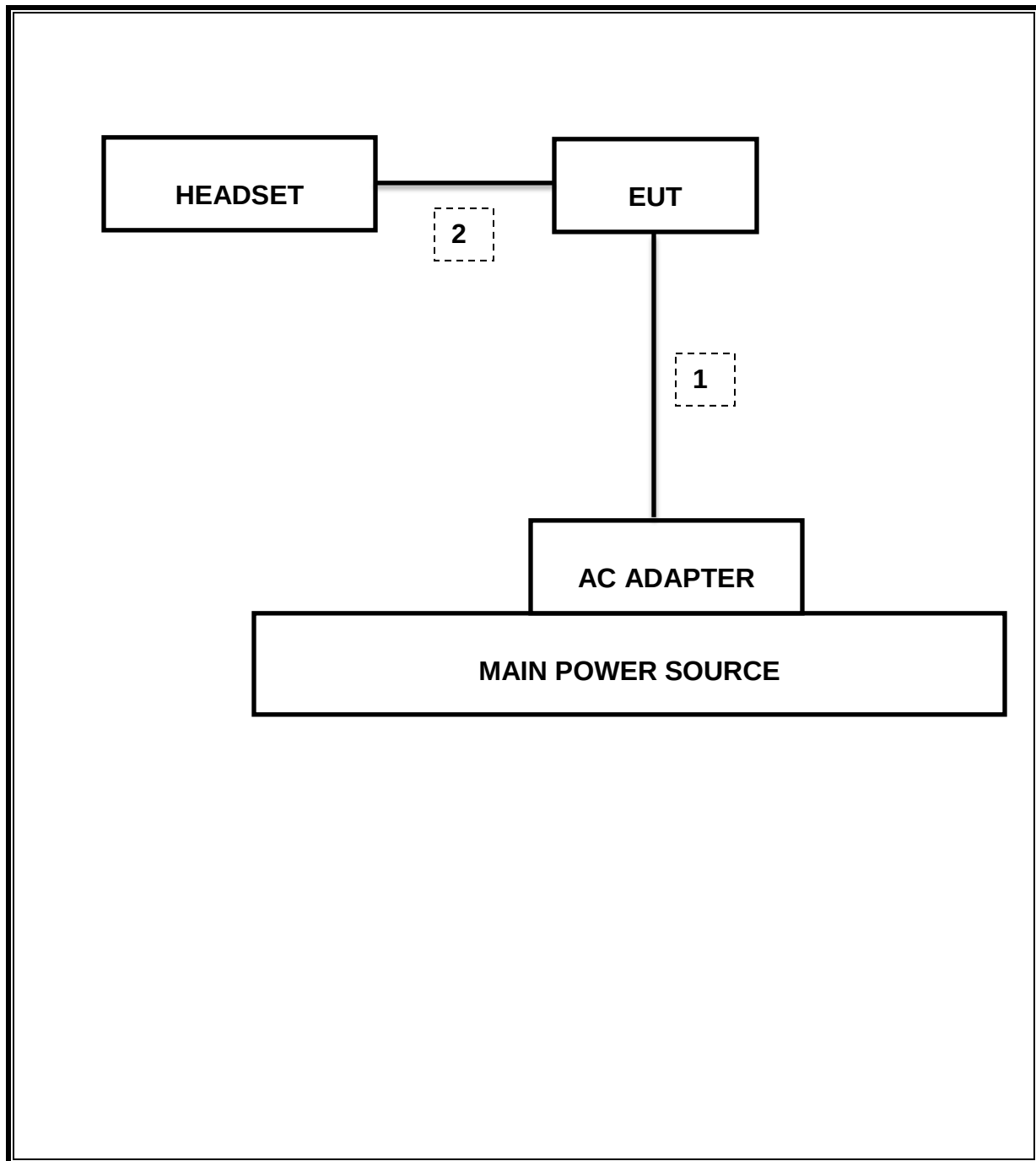
I/O CABLES

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	0.8m	N/A
2	Audio	1	Mini-Jack	Unshielded	1.0m	N/A

TEST SETUP

The EUT is a stand-alone unit during the tests. Test software exercised the radio card.

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	950	11-17-15
Antenna, Horn, 18 GHz	ETS	3115	00167211	09-20-15
Antenna, Horn, 40 GHz	ETS	3116C	00166255	09-23-15
Antenna, Horn, 40 GHz	ETS	3116C-PA	00168841	09-29-15
Preamplifier, 1000 MHz	Sonoma	310N	341282	11-17-15
Preamplifier, 18 GHz	Miteq	AFS42-00101800-25-S-42	1876511	11-18-15
Spectrum Analyzer, 44 GHz	Agilent / HP	N9030A	MY54170614	09-23-15
Bluetooth Tester	TESCOM	TC-3000C	3000C000546	11-17-15
Average Power Sensor	R&S	NRZ-Z91	102681	11-17-15
Average Power Sensor	Agilent / HP	U2000	MY54270007	09-23-15
EMI Test Receive, 40 GHz	R&S	ESU40	100439	11-17-15
EMI Test Receive, 3 GHz	R&S	ESR3	101832	11-17-15
Attenuator / Switch driver	HP	11713A	3748A04272	N/A
Low Pass Filter 3GHz	Micro-Tronics	LPS17541	009	11-17-15
High Pass Filter 5GHz	Micro-Tronics	HPS17542	009	11-17-15
High Pass Filter 6GHz	Micro-Tronics	HPM17543	010	11-17-15
LISN	R&S	ENV-216	101836	04-09-16
LISN	R&S	ENV-216	101837	04-09-16

7. MEASUREMENT METHODS

KDB 558074 D01 DTS Meas Guidance v03r03: Measurement Procedure §9.2.3.1 AVGPM is used for power and §10.1.a) AVGPS-1 is used for power spectral density.

Unwanted emissions within Restricted Bands are measured using traditional radiated procedures.

Band edge emissions within Restricted Bands are measured using RMS with duty cycle factor offset method.

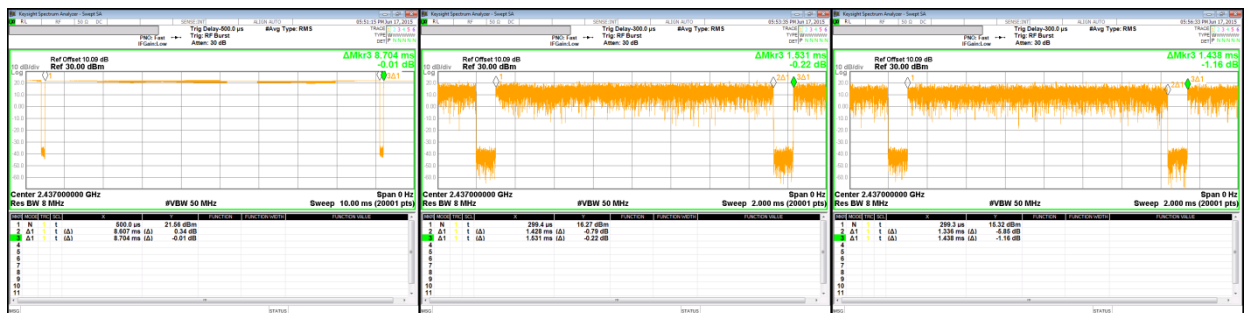
8. ON TIME, DUTY CYCLE AND MEASUREMENT METHODS

LIMITS

None; for reporting purposes only.

8.1. ON TIME AND DUTY CYCLE RESULTS

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	8.704	0.989	98.9%	0.00	0.010
802.11g	1.428	1.531	0.933	93.3%	0.30	0.700
802.11n HT20	1.336	1.438	0.929	92.9%	0.32	0.749



[802.11b Mode]

[802.11g Mode]

[802.11n Mode]

9. 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	7.043 MHz
2.1051, 15.247 (d)	Band Edge / Conducted Spurious Emission	-20dBc		Pass	-29.969 dBm
15.247	TX conducted output power	<30dBm		Pass	18.38 dBm (AV)
15.247	PSD	<8dBm		Pass	-9.24 dBm (AV)
15.207 (a)	AC Power Line conducted emissions	Section 10	Power Line conducted	Pass	43.82 dBuV (QP)
15.205, 15.209	Radiated Spurious Emission	< 54dBuV/m	Radiated	Pass	45.77 dBuV/m (AV)

10. ANTENNA PORT TEST RESULTS

10.1. 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 v03r02: 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]
		Primary Antenna 1	Secondary Antenna 2	
Low	2412	7.054	7.063	0.5
Mid	2437	7.056	7.066	0.5
High	2462	7.043	7.066	0.5
Worst		7.043		

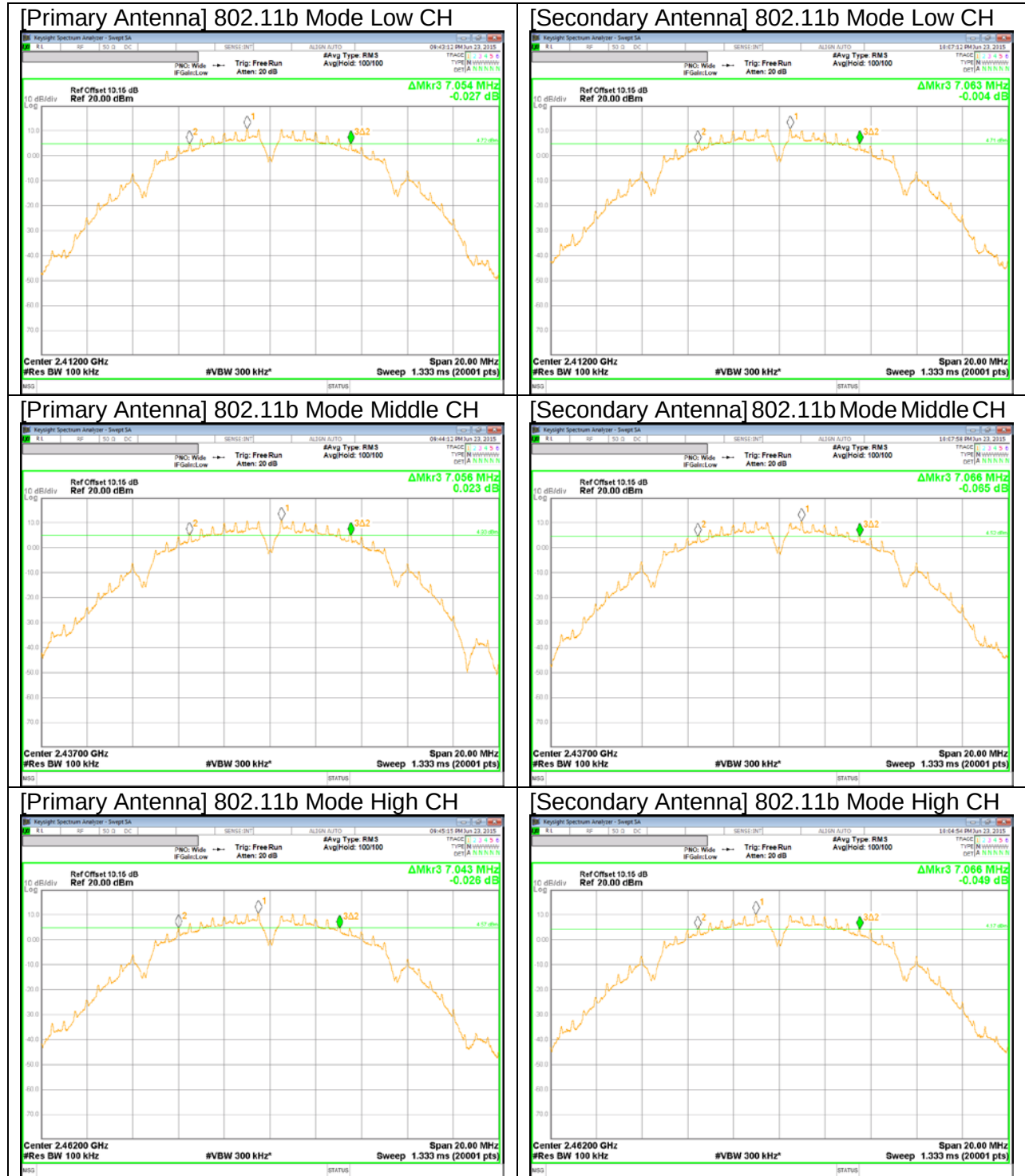
10.1.2. 802.11g MODE IN THE 2.4 GHz BAND

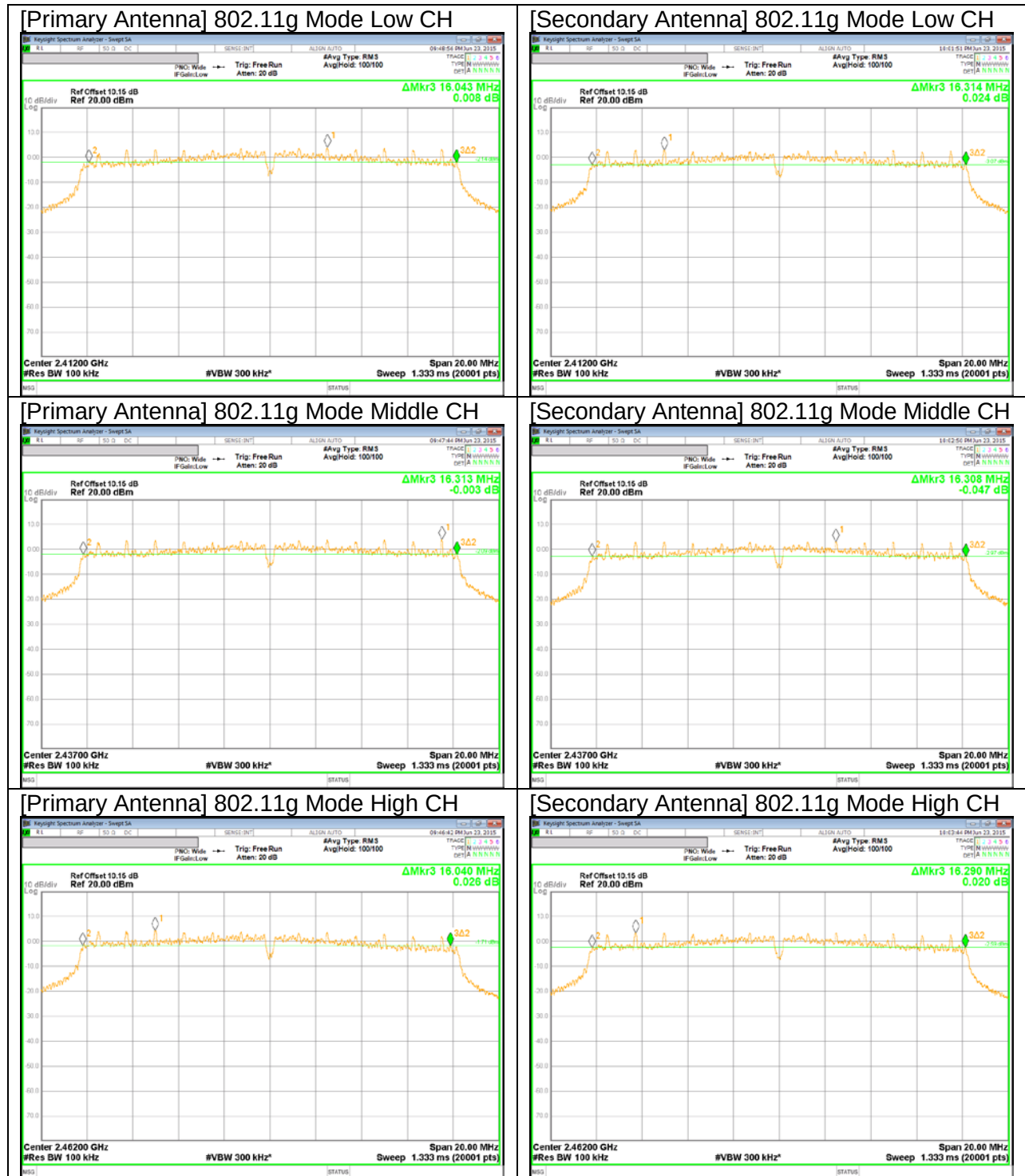
Channel	Frequency [MHz]	6 dB Bandwidth [MHz]		Minimum Limit [MHz]
		Primary Antenna 1	Secondary Antenna 2	
Low	2412	16.043	16.314	0.5
Mid	2437	16.313	16.308	0.5
High	2462	16.040	16.290	0.5
Worst		16.040		

10.1.3. 802.11n HT20 MODE IN THE 2.4 GHz BAND

Channel	Frequency [MHz]	6 dB Bandwidth [MHz]		Minimum Limit [MHz]
		Chain 0	Chain 1	
Low	2412	16.907	17.584	0.5
Mid	2437	17.568	17.567	0.5
High	2462	16.347	17.561	0.5
Worst		16.347		

10.1.4. 6 dB BANDWIDTH PLOTS







10.2. 99% BANDWIDTH

LIMITS

None; for reporting purposes only.

RESULTS

10.2.1. 802.11b MODE IN THE 2.4 GHz BAND

Channel	Frequency [MHz]	99% Bandwidth [MHz]	
		Primary Antenna 1	Secondary Antenna 2
Low	2412	10.121	10.325
Mid	2437	10.221	10.276
High	2462	10.175	10.237
Worst		10.121	

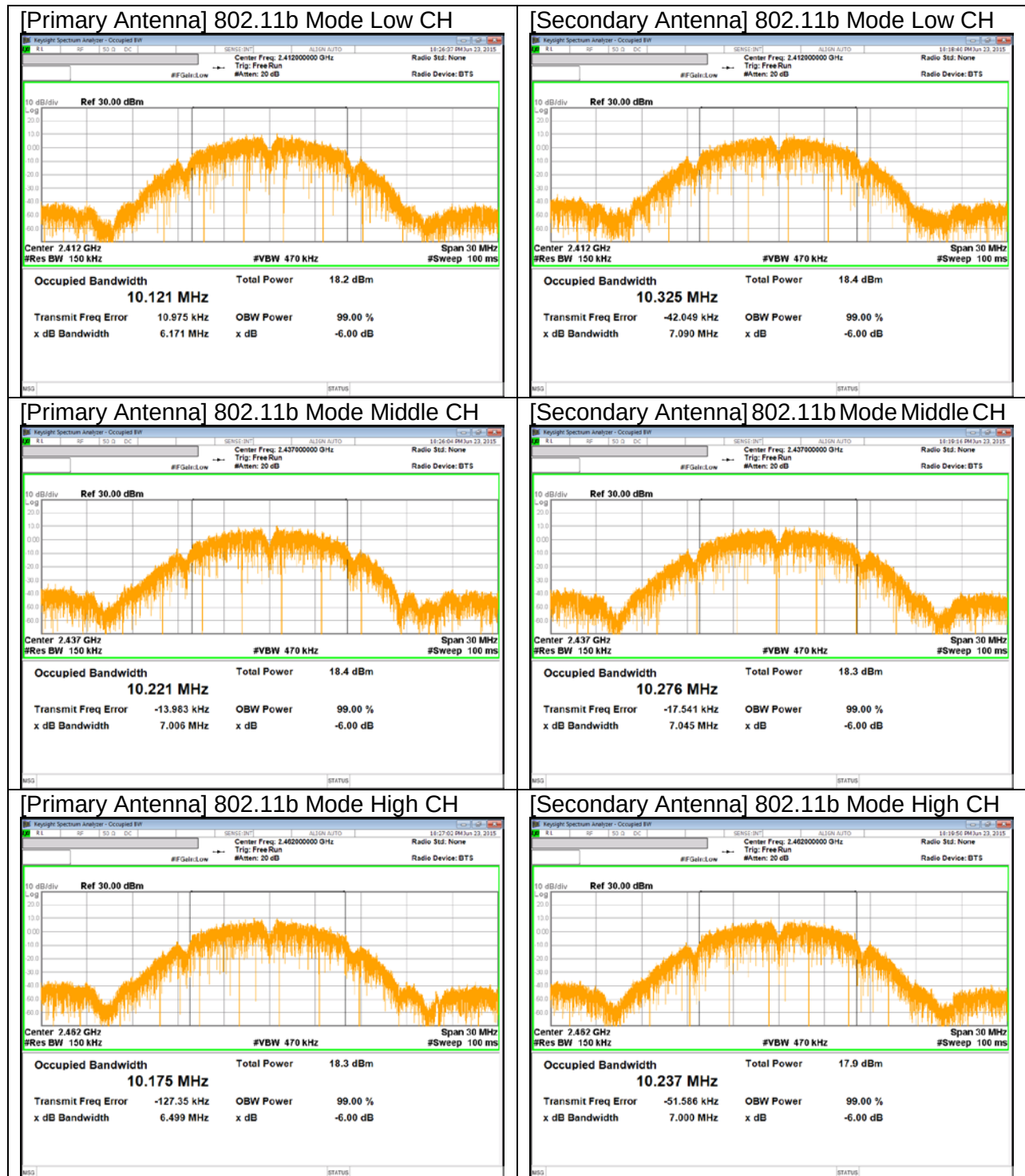
10.2.2. 802.11g MODE IN THE 2.4 GHz BAND

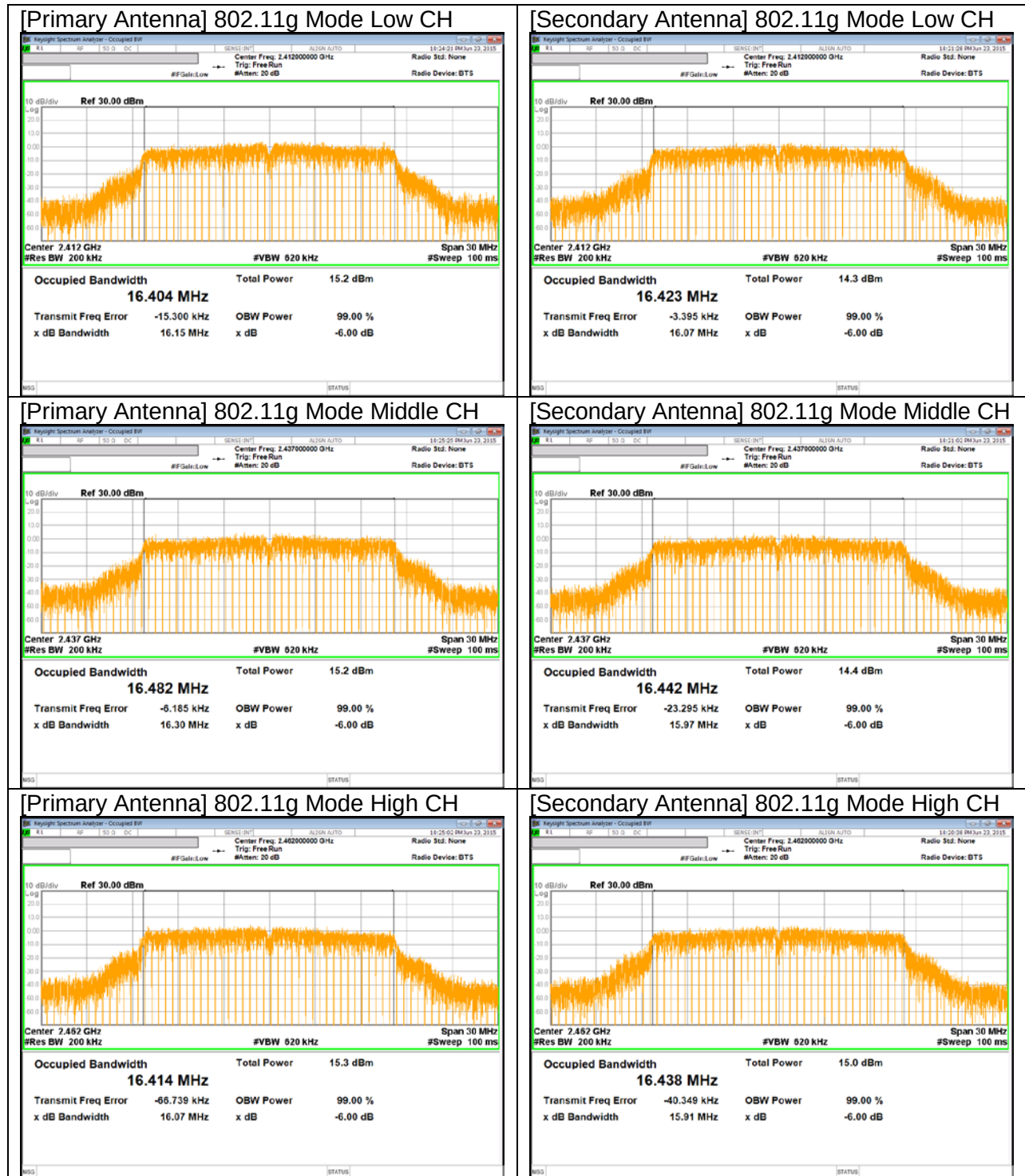
Channel	Frequency [MHz]	99% Bandwidth [MHz]	
		Primary Antenna 1	Secondary Antenna 2
Low	2412	16.404	16.423
Mid	2437	16.482	16.442
High	2462	16.414	16.438
Worst		16.404	

10.2.3. 802.11n HT20 MODE IN THE 2.4 GHz BAND

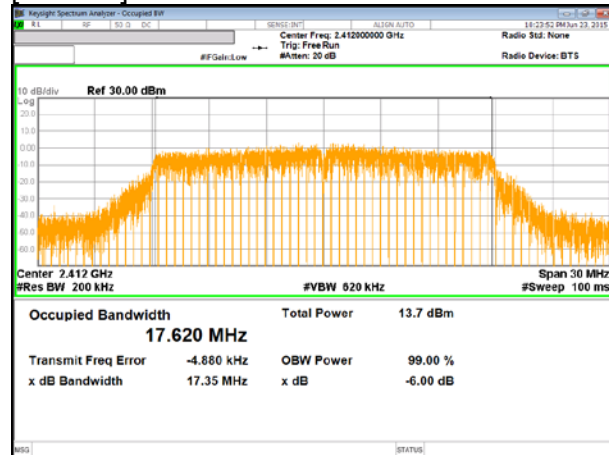
Channel	Frequency [MHz]	99% Bandwidth [MHz]	
		Chain 0	Chain 1
Low	2412	17.620	17.655
Mid	2437	17.664	17.625
High	2462	17.609	17.630
Worst		17.609	

10.2.4. 99% BANDWIDTH PLOTS

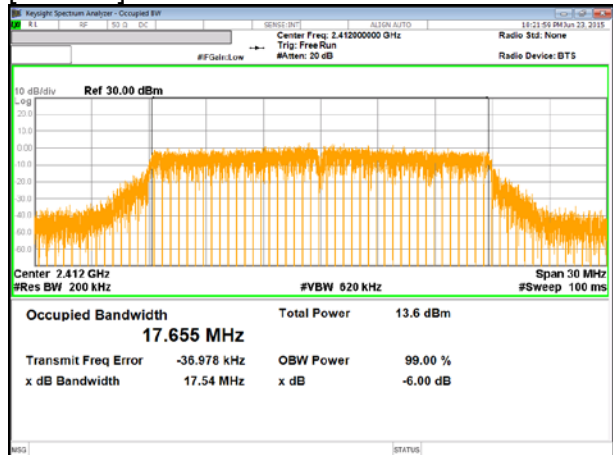




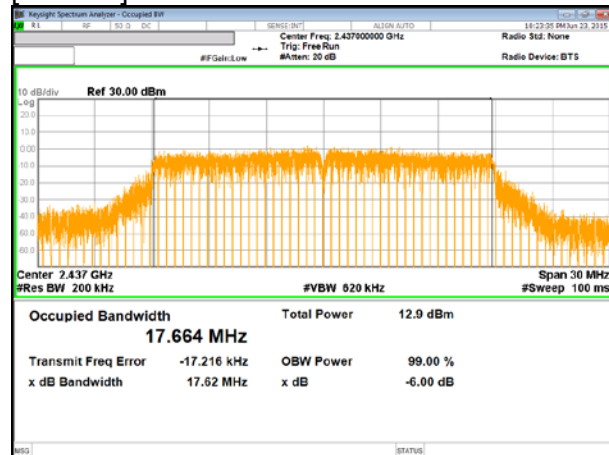
[Chain 0] 802.11n Mode Low CH



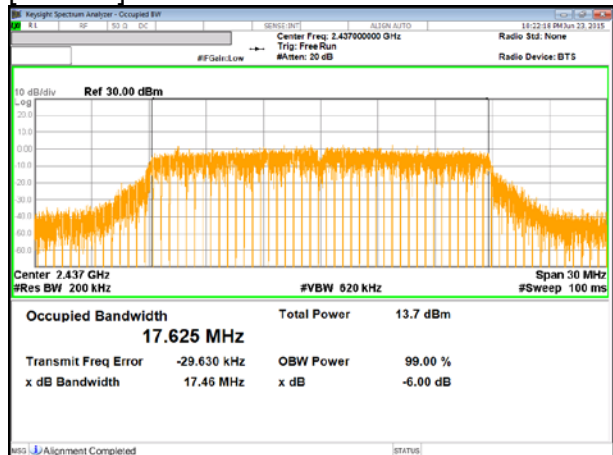
[Chain 1] 802.11n Mode Low CH



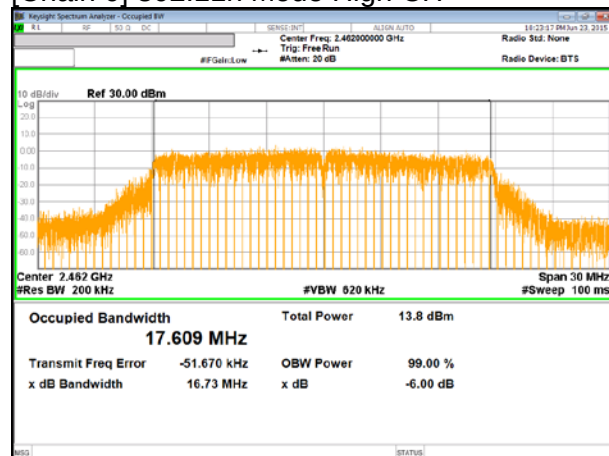
[Chain 0] 802.11n Mode Middle CH



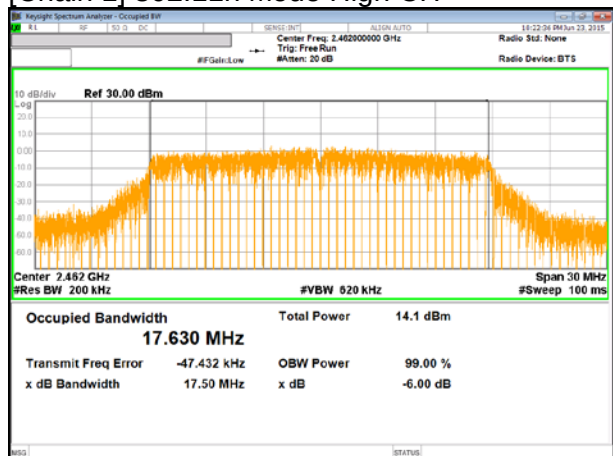
[Chain 1] 802.11n Mode Middle CH



[Chain 0] 802.11n Mode High CH



[Chain 1] 802.11n Mode High CH



10.3. 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.

TEST PROCEDURE

The transmitter output is connected to a power meter.

The cable assembly insertion loss of 10.1 dB (including 10 dB pad and 0.1 dB cable) was entered as an offset in the power meter to allow for direct reading of power.

DIRECTIONAL ANTENNA GAIN

For Power: The TX chains are uncorrelated and the antenna gain is the same for each chain. The directional gain is equal to the antenna gain.

2.4GHz

Chain 0 Antenna Gain [dBi]	Chain 1 Antenna Gain [dBi]	Uncorrelated Chains Directional Gain [dBi]
-1.48	-1.56	-1.52

For PSD: The TX chains are correlated and the antenna gain is unequal among the chains. The directional gain is:

2.4GHz

Chain 0 Antenna Gain [dBi]	Chain 1 Antenna Gain [dBi]	Correlated Chains Directional Gain [dBi]
-1.48	-1.56	1.49

- IEEE 802.11b Mode is not supported MIMO operation. So can't transmit on two antenna as same time.

RESULTS

10.3.1. 802.11b MODE IN THE 2.4 GHZ BAND

Limits

Channel	Frequency [MHz]	Directional Gain Primary [dBi]	Directional Gain Secondary [dBi]	FCC Power Limit [dBm]	IC Power Limit [dBm]	IC EIRP Limit [dBm]	Max Power [dBm]
Low	2412	-1.48	-1.56	30.00	30.00	36.00	30.00
Mid	2437	-1.48	-1.56	30.00	30.00	36.00	30.00
High	2462	-1.48	-1.56	30.00	30.00	36.00	30.00

Duty Cycle CF [dB]	0.00	Included in Calculations of Corr'd Power
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Results

Channel	Frequency [MHz]	Primary Meas Power [dBm]	Secondary Meas Power [dBm]	Maximum Power [dBm]	Power Limit [dBm]	Margin [dB]
Low	2412	18.02	18.38	18.38	36.00	-17.62
Mid	2437	18.02	18.23	18.23	36.00	-17.77
High	2462	18.02	17.79	18.02	36.00	-17.98
Worst				18.38		

10.3.2. 802.11g MODE IN THE 2.4 GHZ BAND

Limits

Channel	Frequency [MHz]	Directional Gain Primary [dBi]	Directional Gain Secondary [dBi]	FCC Power Limit [dBm]	IC Power Limit [dBm]	IC EIRP Limit [dBm]	Max Power [dBm]
Low	2412	-1.48	-1.56	30.00	30.00	36.00	30.00
Mid	2437	-1.48	-1.56	30.00	30.00	36.00	30.00
High	2462	-1.48	-1.56	30.00	30.00	36.00	30.00

Duty Cycle CF [dB]	0.30	Included in Calculations of Corr'd Power
--------------------	------	--

Results

Channel	Frequency [MHz]	Primary Meas Power [dBm]	Secondary Meas Power [dBm]	Maximum Power [dBm]	Power Limit [dBm]	Margin [dB]
Low	2412	14.98	14.31	17.99	36.00	-18.01
Mid	2437	14.92	14.54	18.06	36.00	-17.94
High	2462	14.90	14.82	18.19	36.00	-17.81
Worst				18.19		

10.3.3. 802.11n HT20 MODE IN THE 2.4 GHz BAND

Limits

Channel	Frequency [MHz]	Directional Gain [dBi]	FCC Power Limit [dBm]	IC Power Limit [dBm]	IC EIRP Limit [dBm]	Max Power [dBm]
Low	2412	-1.52	30.00	30.00	36.00	30.00
Mid	2437	-1.52	30.00	30.00	36.00	30.00
High	2462	-1.52	30.00	30.00	36.00	30.00

Duty Cycle CF [dB]	0.32	Included in Calculations of Corr'd Power
--------------------	------	--

Results

Channel	Frequency [MHz]	Chain 0 Meas Power [dBm]	Chain 1 Meas Power [dBm]	Total Corr'd Power [dBm]	Power Limit [dBm]	Margin [dB]
Low	2412	14.06	13.46	17.10	30.00	-12.90
Mid	2437	13.85	13.39	16.96	30.00	-13.04
High	2462	13.83	13.91	17.20	30.00	-12.80
Worst				17.20		

10.4. 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 AVGPS-1" under KDB558074 D01 DTS Meas Guidance v03r03

RESULTS

10.4.1. 802.11b MODE IN THE 2.4 GHz BAND

Channel	Frequency [MHz]	Primary Antenna 1 [dBm]	Secondary Antenna 2 [dBm]	Total PSD [dBm]	Limit [dBm]	Margin [dB]
Low	2412	-12.39	-12.23	-12.23	8.00	-20.23
Mid	2437	-12.18	-12.32	-12.18	8.00	-20.18
High	2462	-12.29	-12.66	-12.29	8.00	-20.29

Duty Cycle CF [dB]	0.00	Included in Calculations of PPSP
--------------------	------	----------------------------------

10.4.2. 802.11g MODE IN THE 2.4 GHz BAND

Channel	Frequency [MHz]	Primary Antenna 1 [dBm]	Secondary Antenna 2 [dBm]	Total PSD [dBm]	Limit [dBm]	Margin [dB]
Low	2412	-13.79	-15.70	-11.33	8.00	-19.33
Mid	2437	-14.69	-15.09	-11.57	8.00	-19.57
High	2462	-13.93	-14.86	-11.06	8.00	-19.06

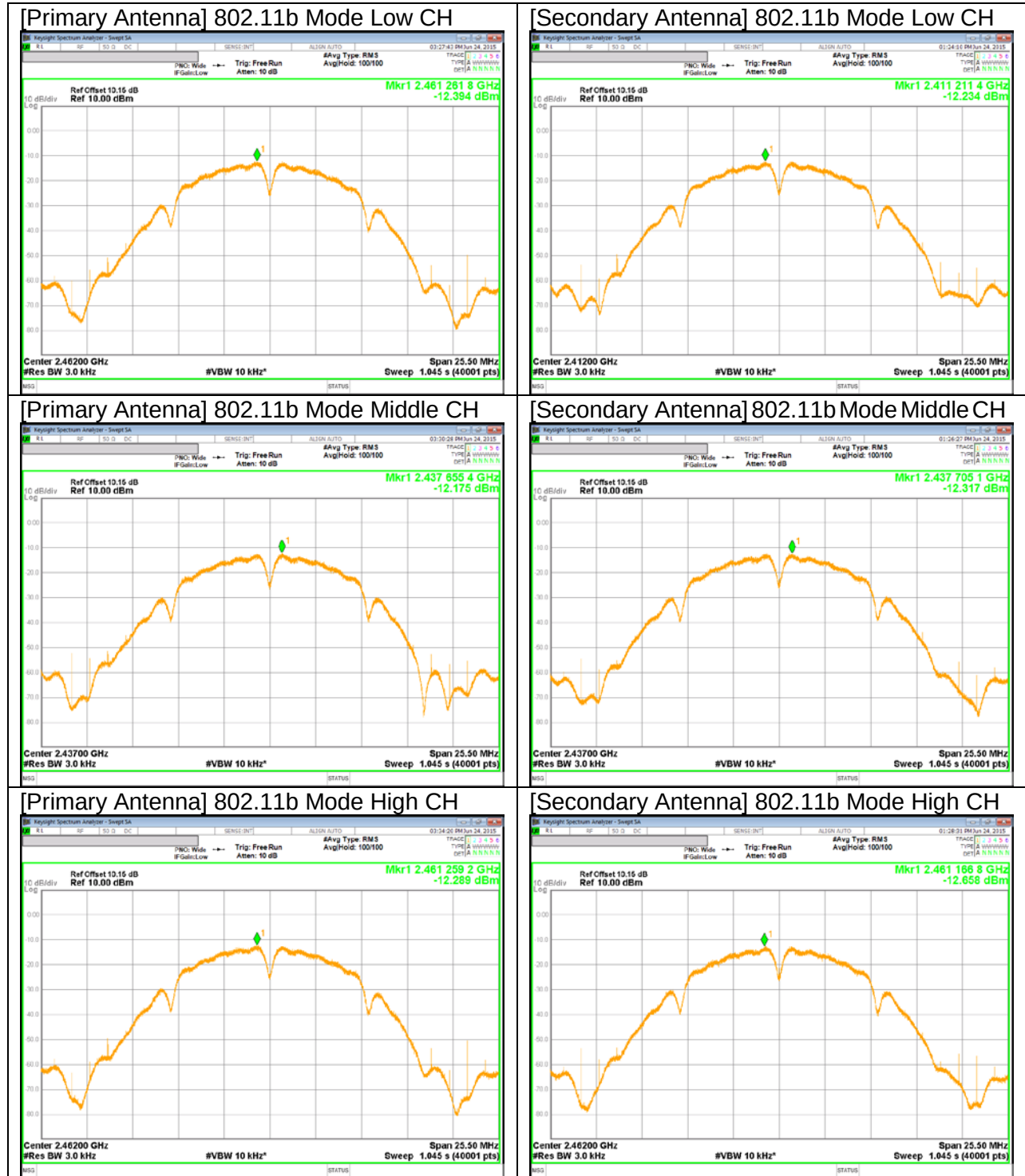
Duty Cycle CF [dB]	0.30	Included in Calculations of PPSP
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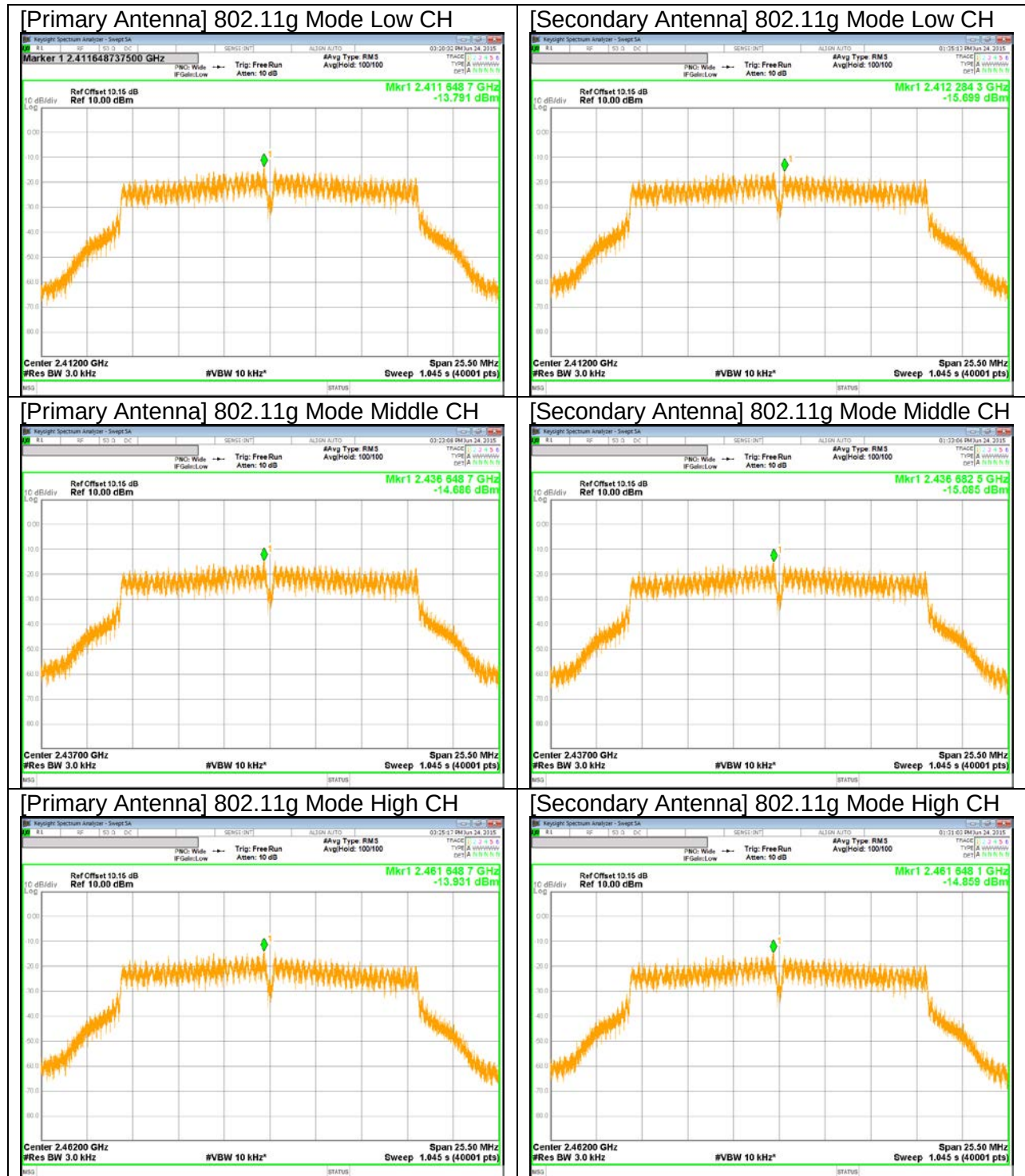
10.4.3. 802.11n HT20 MODE IN THE 2.4 GHz BAND

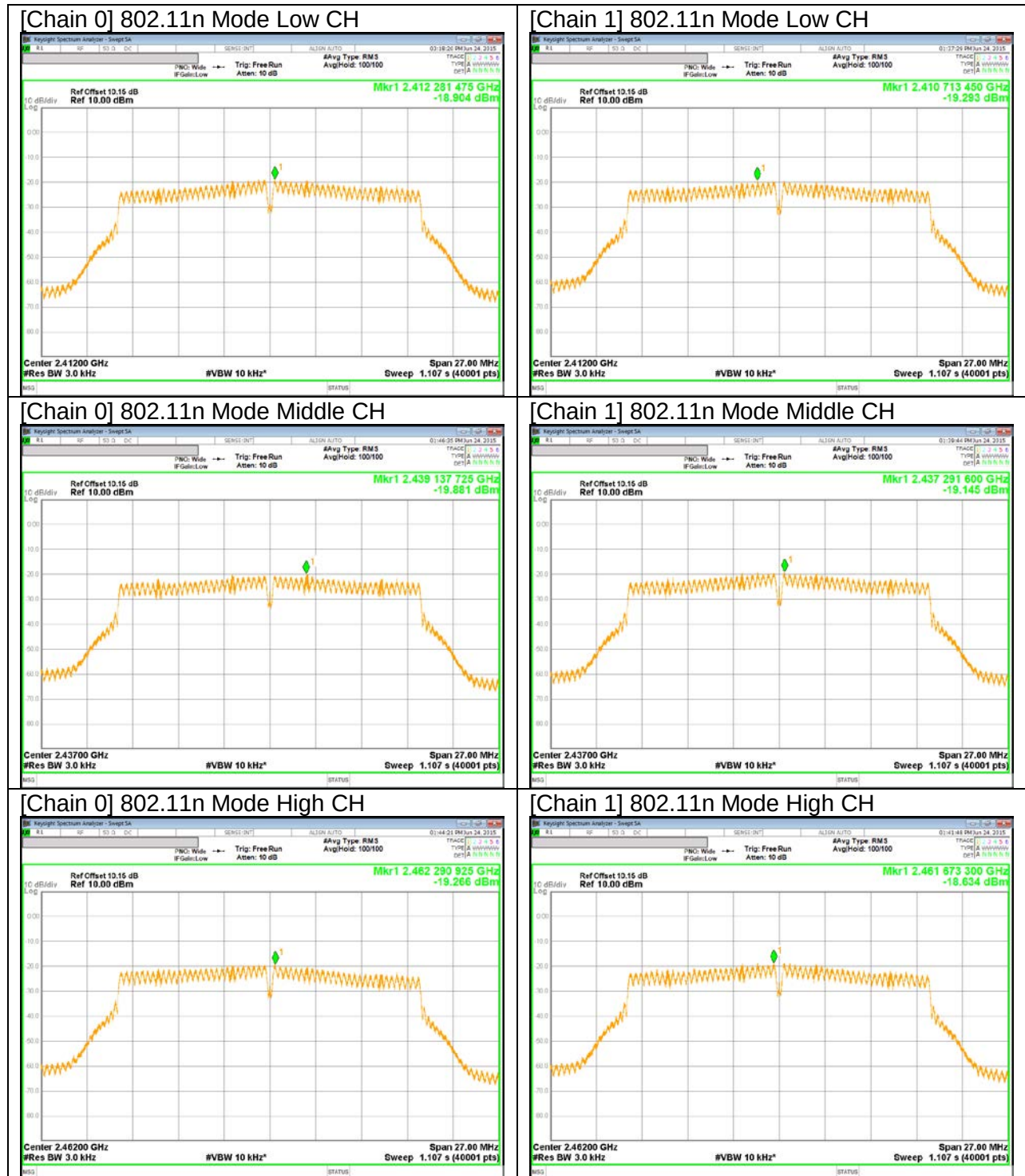
Channel	Frequency [MHz]	Chain 0 Meas [dBm]	Chain 1 Meas [dBm]	Total PSD [dBm]	Limit [dBm]	Margin [dB]
Low	2412	-18.90	-19.29	-15.76	8.00	-23.76
Mid	2437	-19.88	-19.15	-16.17	8.00	-24.17
High	2462	-19.27	-18.63	-15.61	8.00	-23.61

Duty Cycle CF [dB]	0.32	Included in Calculations of PPSP
--------------------	------	----------------------------------

10.4.4. PSD PLOTS







10.5. OUT-OF-BAND EMISSIONS

LIMITS

FCC §15.247 (d)

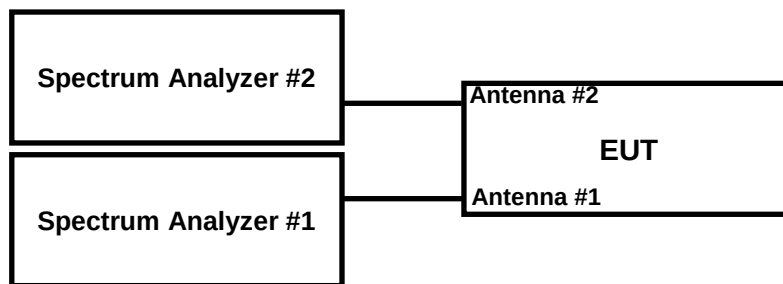
In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the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

ADDITIONAL PROCEDURE FOR RSDB

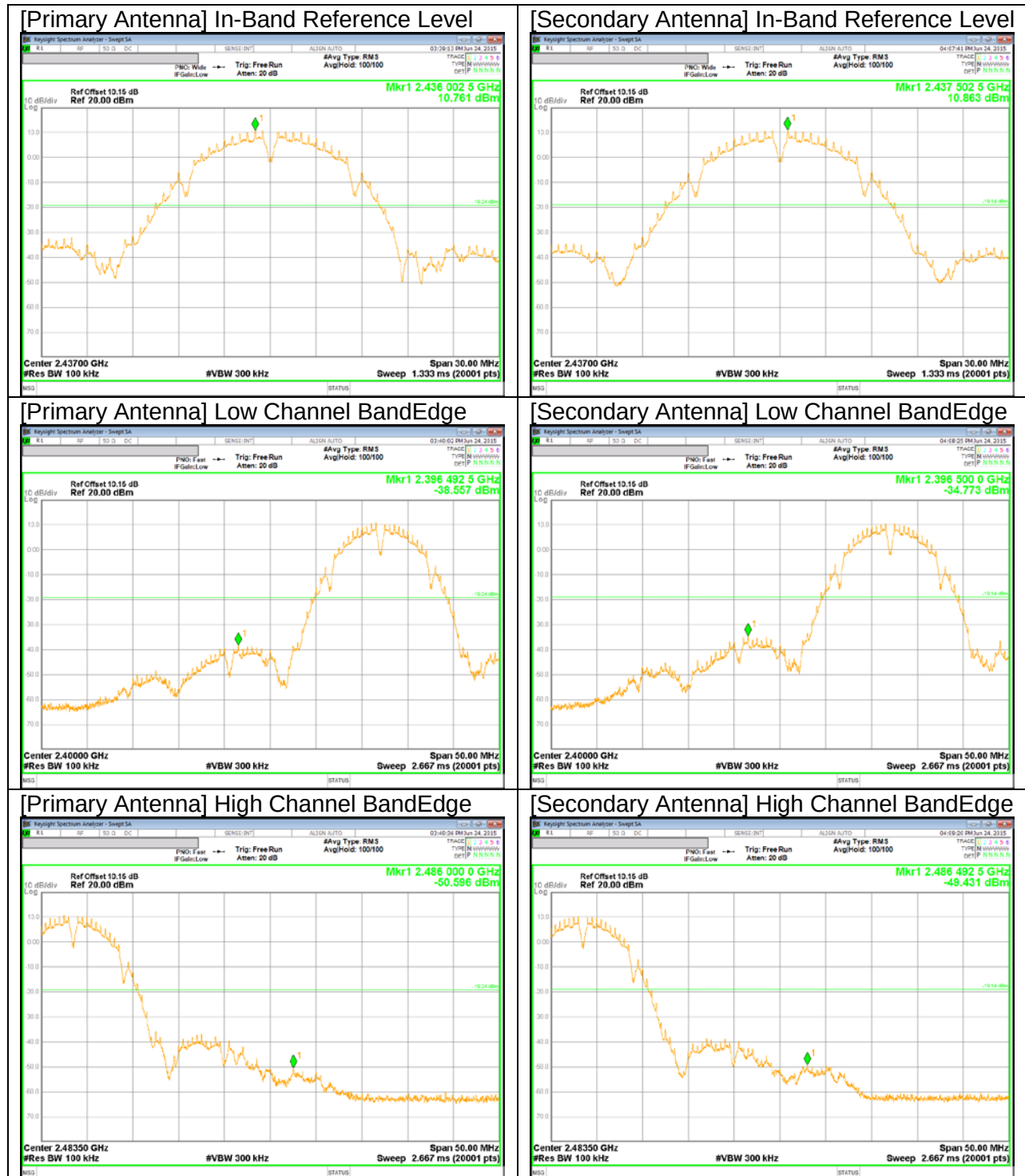
1. Measure 2.4 GHz and 5 GHz conducted emission separately on each antenna.
2. Turn of both 2.4 GHz and 5 GHz at the same time and observe if there is new emission not observed in #1 above.
3. If no new emission observed, then proceeded with radiated emission separately for 2.4 GHz and 5 GHz. If there is new emission, then in addition to radiated emission for 2.4 GHz and 5 GHz separately for single band SISO and MIMO modes, also perform radiated emission for dual band MIMO modes.

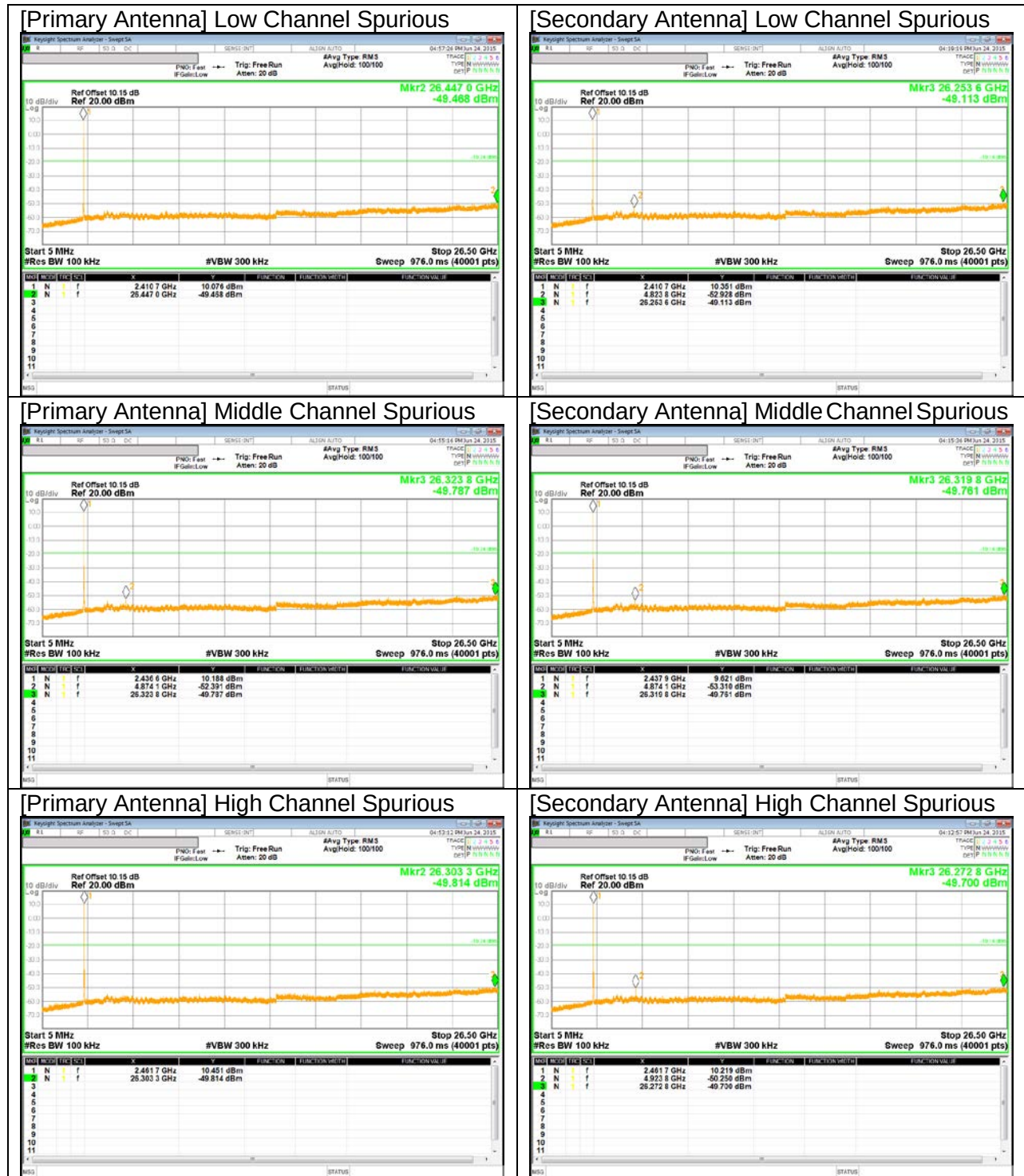


[Test Diagram]

RESULTS

10.5.1. 802.11b MODE IN THE 2.4 GHZ BAND

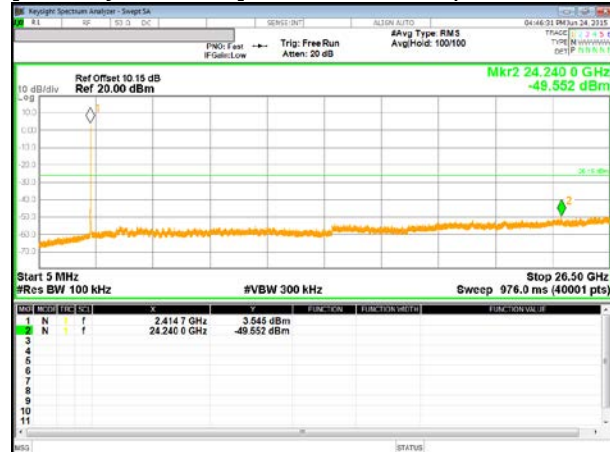




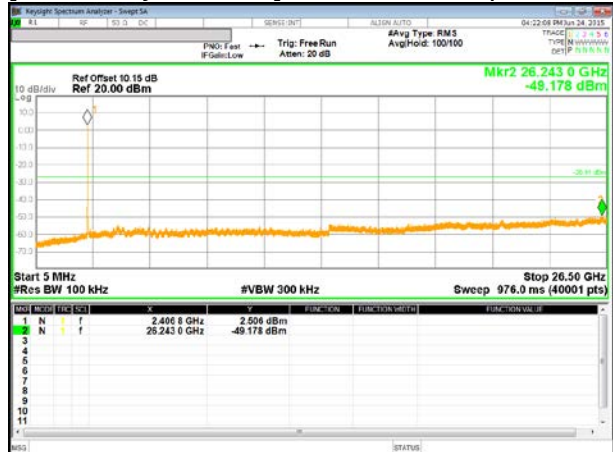
10.5.2. 802.11g MODE IN THE 2.4 GHZ BAND



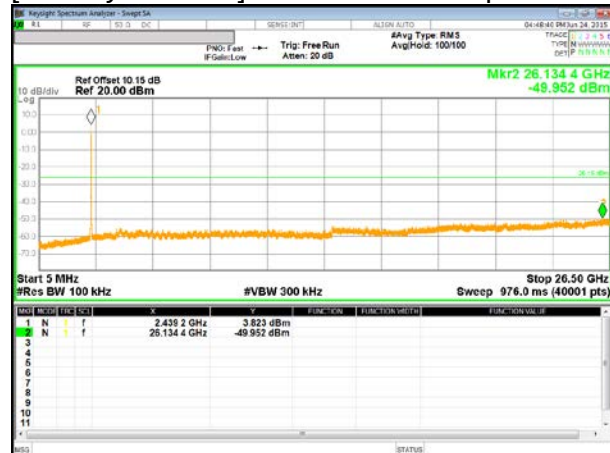
[Primary Antenna] Low Channel Spurious



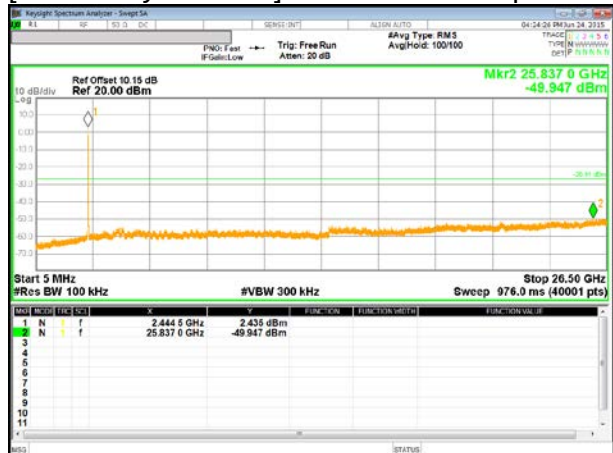
[Secondary Antenna] Low Channel Spurious



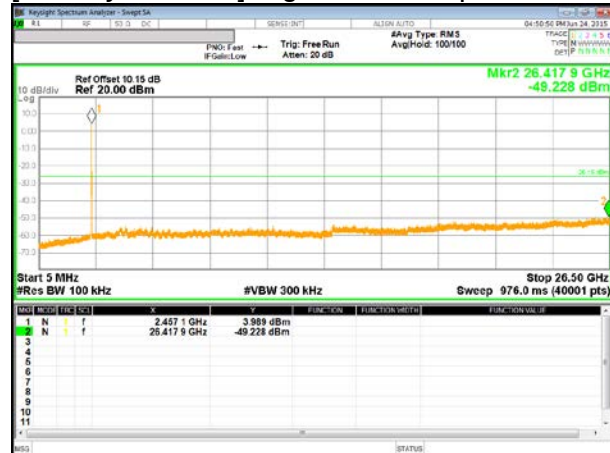
[Primary Antenna] Middle Channel Spurious



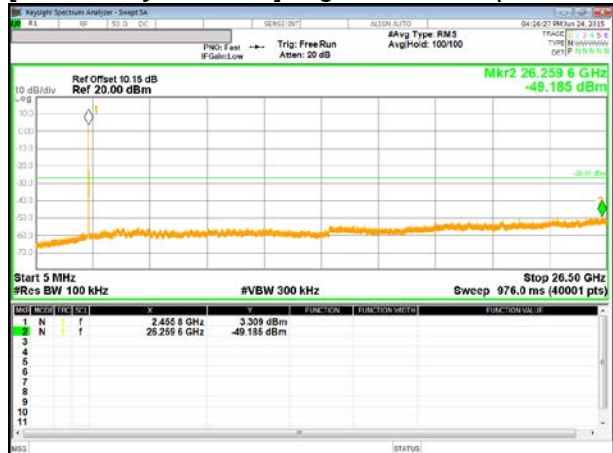
[Secondary Antenna] Middle Channel Spurious



[Primary Antenna] High Channel Spurious

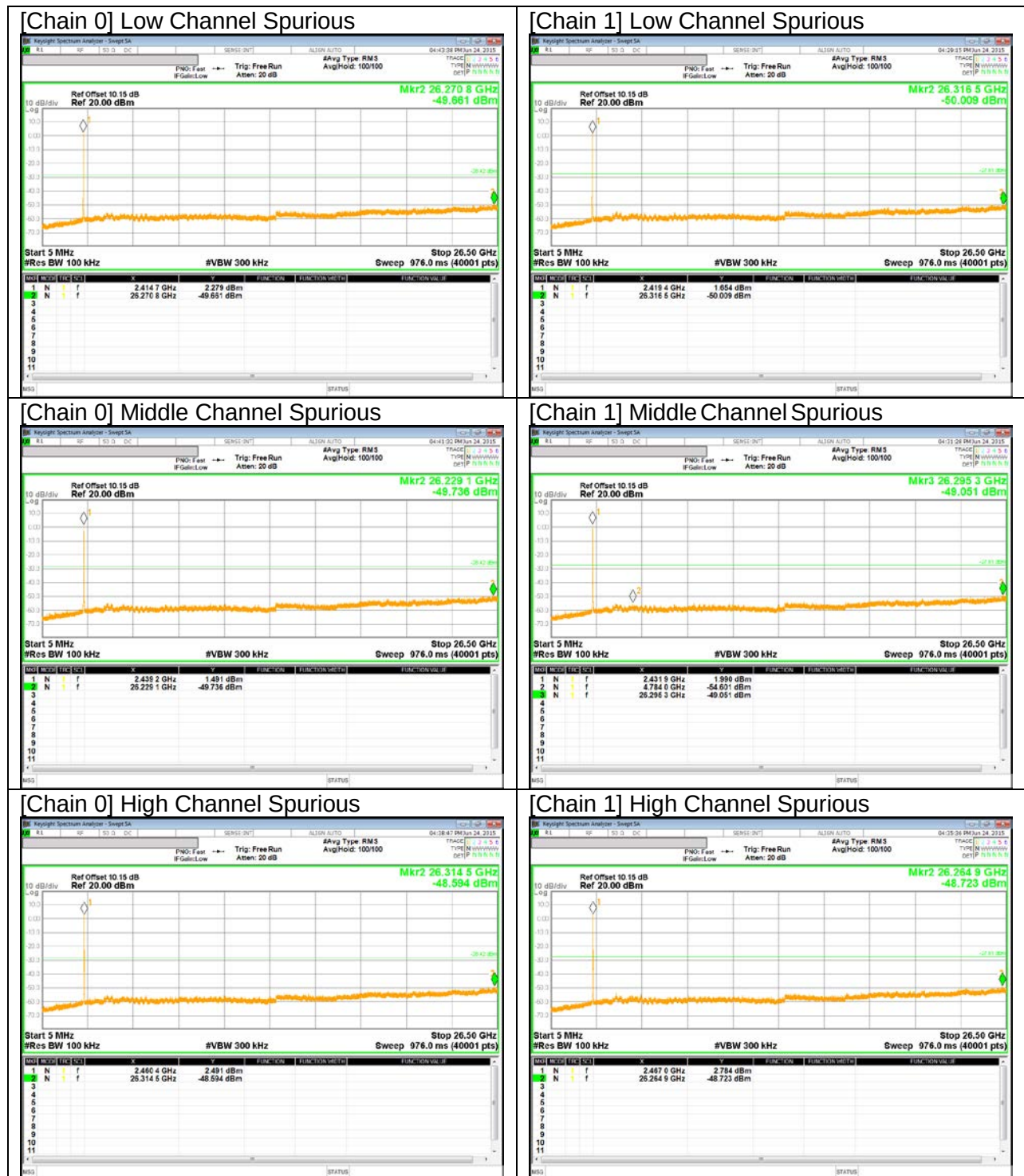


[Secondary Antenna] High Channel Spurious



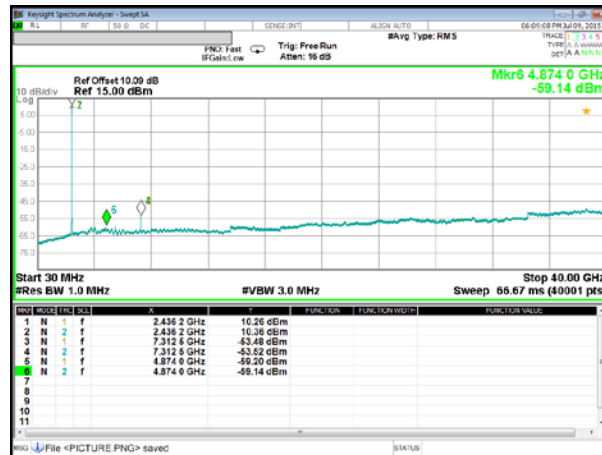
10.5.3. 802.11n HT20 MODE IN THE 2.4 GHz BAND





10.5.4. Spurious Emission for Simultaneous Transmission

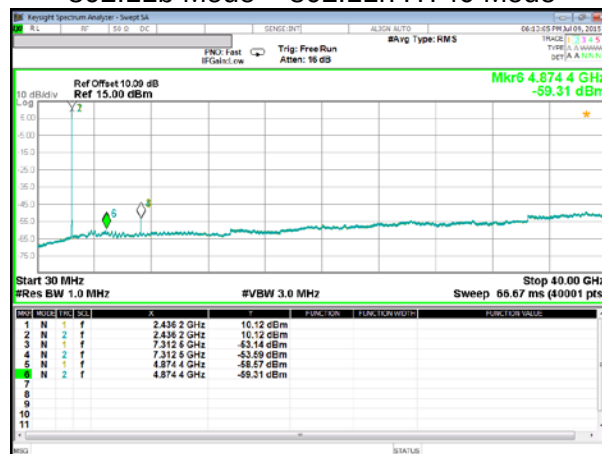
802.11b Mode + 802.11a Mode



Trace	TX Configuration	Detect Mode	Trace Mode	Unwanted Emission
Trace 1	2.4 GHz only	RMS	Average	2 nd & 3 rd Harmonic
Trace 2	2.4 GHz + 5GHz	RMS	Average	2 nd & 3 rd Harmonic

- New emission in not observed.

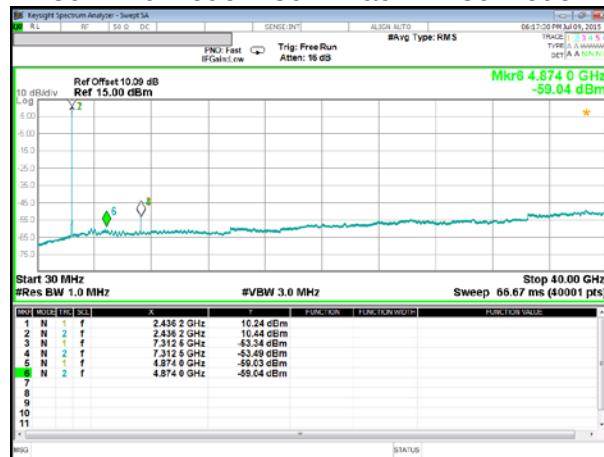
802.11b Mode + 802.11n HT40 Mode



Trace	TX Configuration	Detect Mode	Trace Mode	Unwanted Emission
Trace 1	2.4 GHz only	RMS	Average	2 nd & 3 rd Harmonic
Trace 2	2.4 GHz + 5GHz	RMS	Average	2 nd & 3 rd Harmonic

- New emission in not observed.

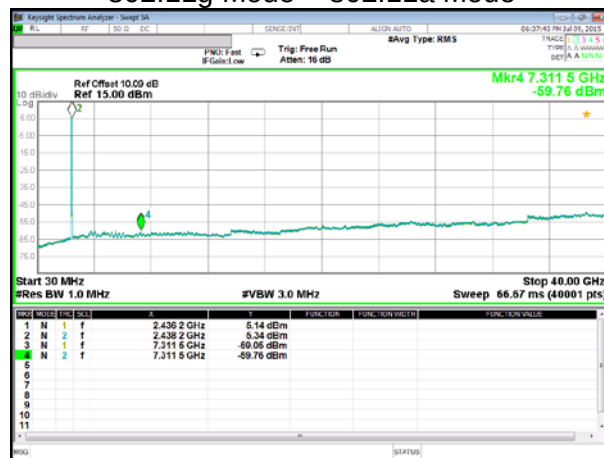
802.11b Mode + 802.11ac VHT80 Mode



Trace	TX Configuration	Detect Mode	Trace Mode	Unwanted Emission
Trace 1	2.4 GHz only	RMS	Average	2 nd & 3 rd Harmonic
Trace 2	2.4 GHz + 5GHz	RMS	Average	2 nd & 3 rd Harmonic

- New emission in not observed.

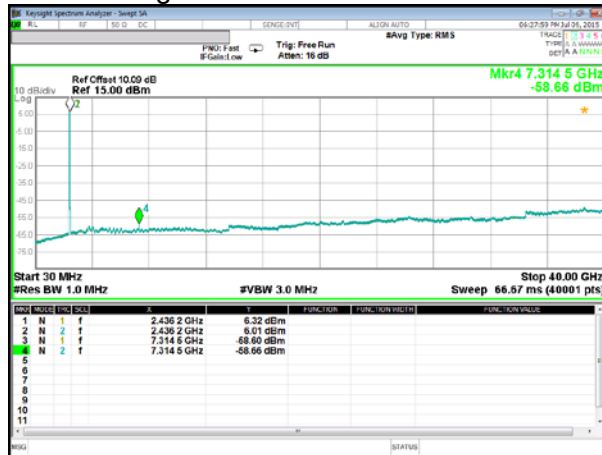
802.11g Mode + 802.11a Mode



Trace	TX Configuration	Detect Mode	Trace Mode	Unwanted Emission
Trace 1	2.4 GHz only	RMS	Average	3 rd Harmonic
Trace 2	2.4 GHz + 5GHz	RMS	Average	3 rd Harmonic

- New emission in not observed.

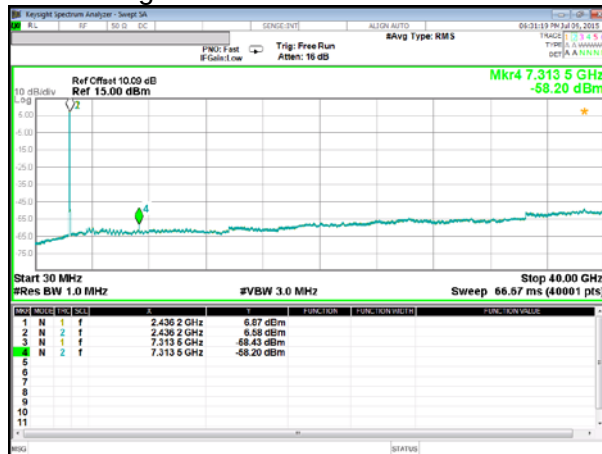
802.11g Mode + 802.11n HT40 Mode



Trace	TX Configuration	Detect Mode	Trace Mode	Unwanted Emission
Trace 1	2.4 GHz only	RMS	Average	3 rd Harmonic
Trace 2	2.4 GHz + 5GHz	RMS	Average	3 rd Harmonic

- New emission in not observed.

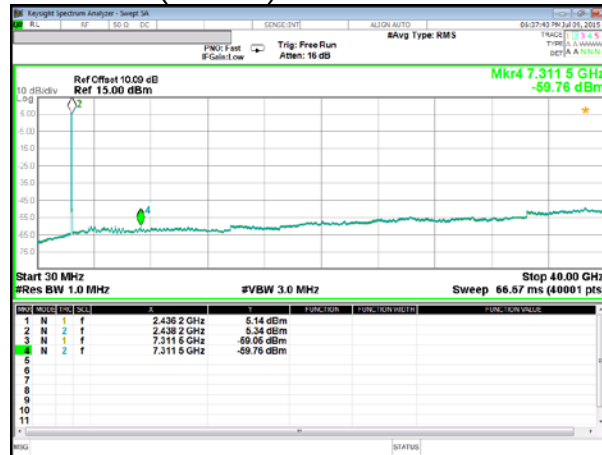
802.11g Mode + 802.11ac VHT80 Mode



Trace	TX Configuration	Detect Mode	Trace Mode	Unwanted Emission
Trace 1	2.4 GHz only	RMS	Average	3 rd Harmonic
Trace 2	2.4 GHz + 5GHz	RMS	Average	3 rd Harmonic

- New emission in not observed.

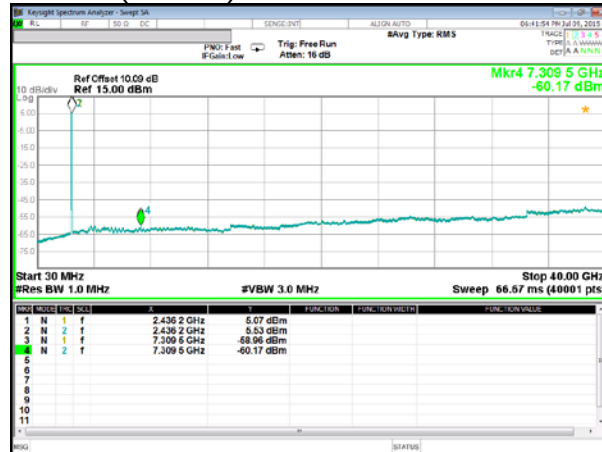
802.11n (2.4GHz) Mode + 802.11a Mode



Trace	TX Configuration	Detect Mode	Trace Mode	Unwanted Emission
Trace 1	2.4 GHz only	RMS	Average	3 rd Harmonic
Trace 2	2.4 GHz + 5GHz	RMS	Average	3 rd Harmonic

- New emission in not observed.

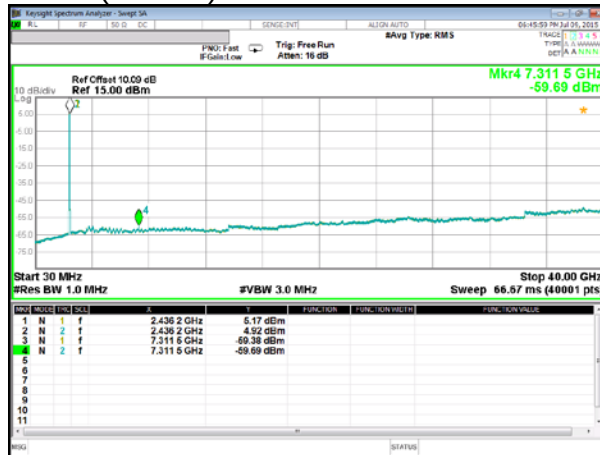
802.11n (2.4GHz) Mode + 802.11n HT40 Mode



Trace	TX Configuration	Detect Mode	Trace Mode	Unwanted Emission
Trace 1	2.4 GHz only	RMS	Average	3 rd Harmonic
Trace 2	2.4 GHz + 5GHz	RMS	Average	3 rd Harmonic

- New emission in not observed.

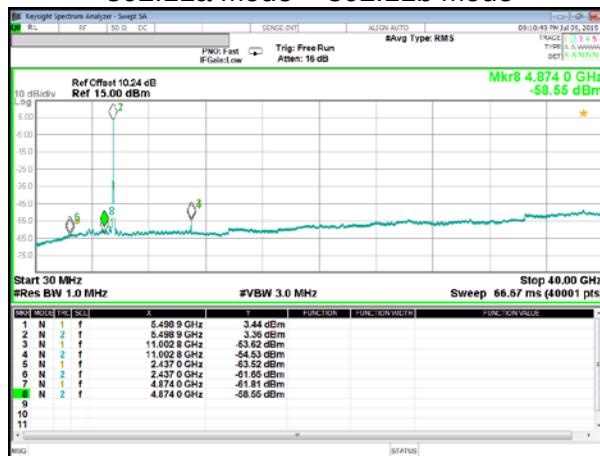
802.11n (2.4GHz) Mode + 802.11ac VHT80 Mode



Trace	TX Configuration	Detect Mode	Trace Mode	Unwanted Emission
Trace 1	2.4 GHz only	RMS	Average	3 rd Harmonic
Trace 2	2.4 GHz + 5GHz	RMS	Average	3 rd Harmonic

- New emission in not observed.

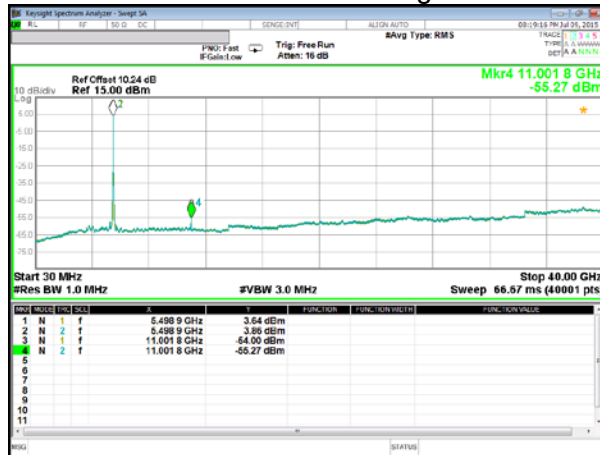
802.11a Mode + 802.11b Mode



Trace	TX Configuration	Detect Mode	Trace Mode	Unwanted Emission
Trace 1	5 GHz only	RMS	Average	2 nd Harmonic
Trace 2	5GHz + 2.4 GHz	RMS	Average	2 nd Harmonic

- New emission in not observed.

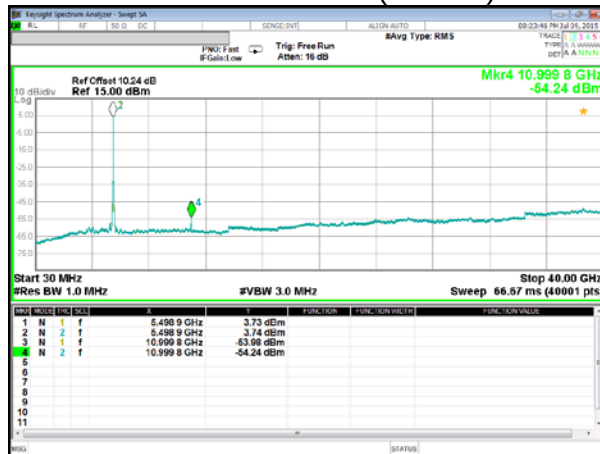
802.11a Mode + 802.11g Mode



Trace	TX Configuration	Detect Mode	Trace Mode	Unwanted Emission
Trace 1	5 GHz only	RMS	Average	2 nd Harmonic
Trace 2	5GHz + 2.4 GHz	RMS	Average	2 nd Harmonic

- New emission in not observed.

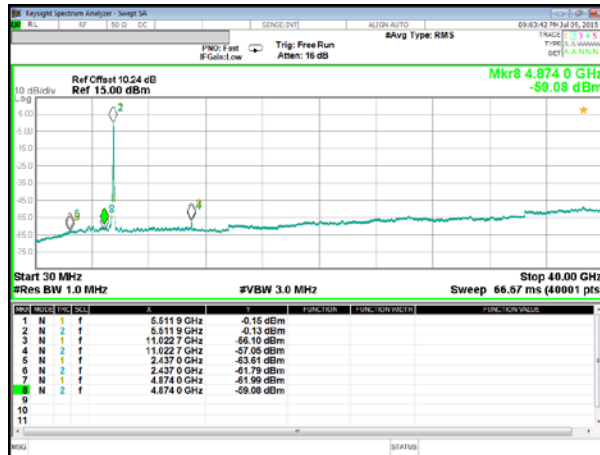
802.11a Mode + 802.11n (2.4GHz) Mode



Trace	TX Configuration	Detect Mode	Trace Mode	Unwanted Emission
Trace 1	5 GHz only	RMS	Average	2 nd Harmonic
Trace 2	5GHz + 2.4 GHz	RMS	Average	2 nd Harmonic

- New emission in not observed.

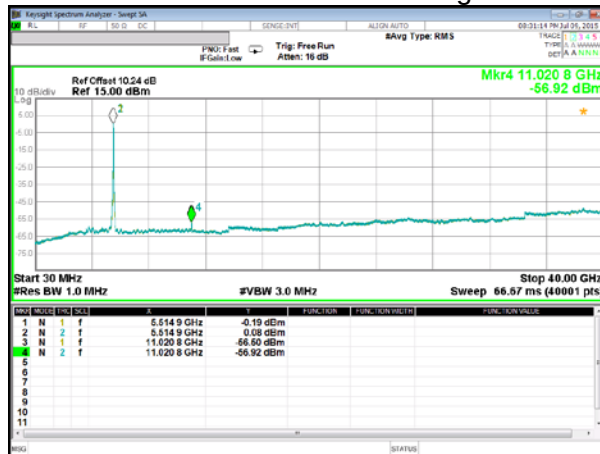
802.11n HT40 Mode + 802.11b Mode



Trace	TX Configuration	Detect Mode	Trace Mode	Unwanted Emission
Trace 1	5 GHz only	RMS	Average	2 nd Harmonic
Trace 2	5GHz + 2.4 GHz	RMS	Average	2 nd Harmonic

- New emission in not observed.

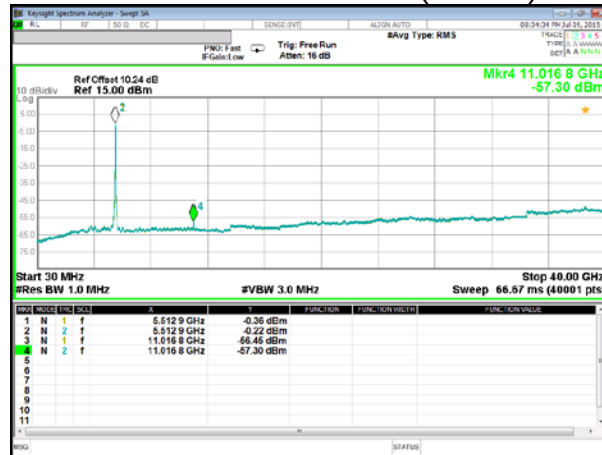
802.11n HT40 Mode + 802.11g Mode



Trace	TX Configuration	Detect Mode	Trace Mode	Unwanted Emission
Trace 1	5 GHz only	RMS	Average	2 nd Harmonic
Trace 2	5GHz + 2.4 GHz	RMS	Average	2 nd Harmonic

- New emission in not observed.

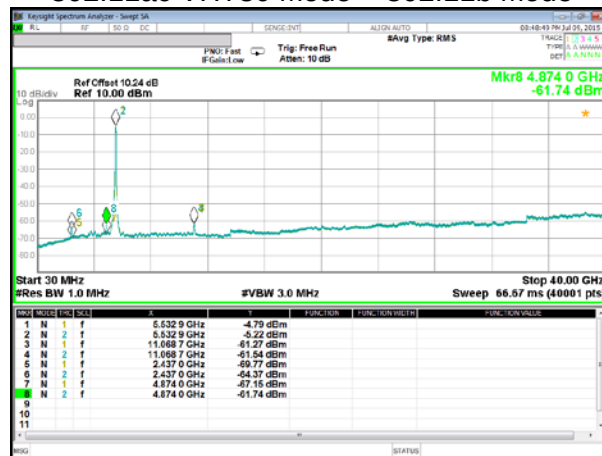
802.11n HT40 Mode + 802.11n (2.4GHz) Mode



Trace	TX Configuration	Detect Mode	Trace Mode	Unwanted Emission
Trace 1	5 GHz only	RMS	Average	2 nd Harmonic
Trace 2	5GHz + 2.4 GHz	RMS	Average	2 nd Harmonic

- New emission in not observed.

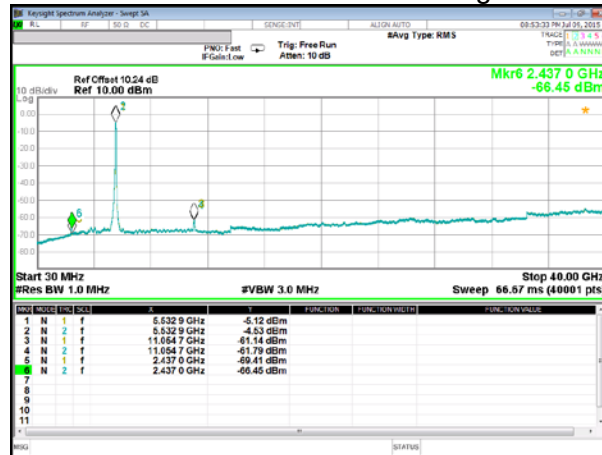
802.11ac VHT80 Mode + 802.11b Mode



Trace	TX Configuration	Detect Mode	Trace Mode	Unwanted Emission
Trace 1	5 GHz only	RMS	Average	2 nd Harmonic
Trace 2	5GHz + 2.4 GHz	RMS	Average	2 nd Harmonic

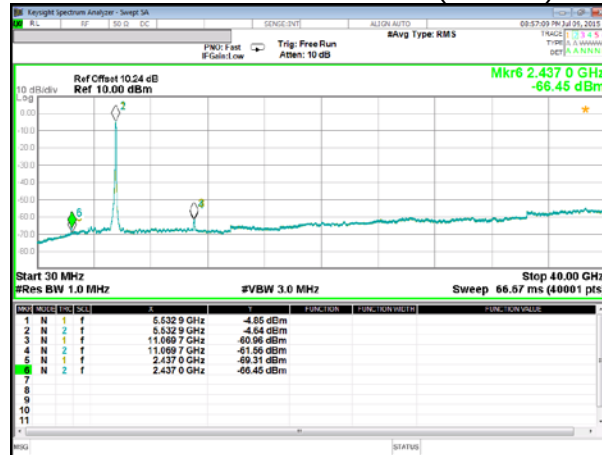
- New emission in not observed.

802.11ac VHT80 Mode + 802.11g Mode



- New emission in not observed.

802.11ac VHT80 Mode + 802.11n (2.4GHz) Mode



- New emission in not observed.

11. RADIATED TEST RESULTS

11.1. LIMITS AND PROCEDURE

LIMITS

FCC §15.205 and §15.209

Frequency Range (MHz)	Field Strength Limit (uV/m) at 3 m	Field Strength Limit (dBuV/m) at 3 m
30 - 88	100	40
88 - 216	150	43.5
216 - 960	200	46
Above 960	500	54

TEST PROCEDURE

The EUT is placed on a non-conducting table 80 cm above the ground plane. The antenna to EUT distance is 3 meters.

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. Duty cycle factor= $10\log(1/x)$ For this sample B mode = 0dB (duty cycle >98%); G mode = 0.30dB; N mode = 0.32dB.

The spectrum from 30 MHz to 40 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in each applicable band.

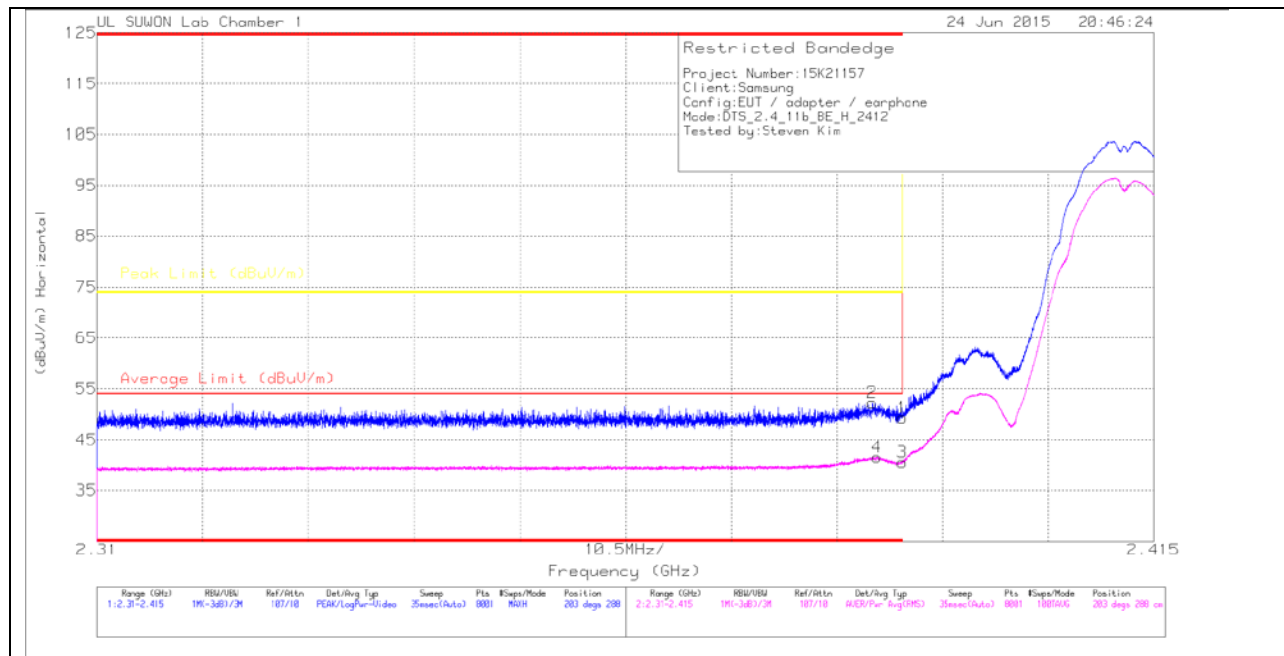
The frequency range of interest is monitored at a fixed antenna height and EUT azimuth. The EUT is rotated through 360 degrees to maximize emissions received. The antenna is scanned from 1 to 4 meters above the ground plane to further maximize the emission. Measurements are made with the antenna polarized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

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

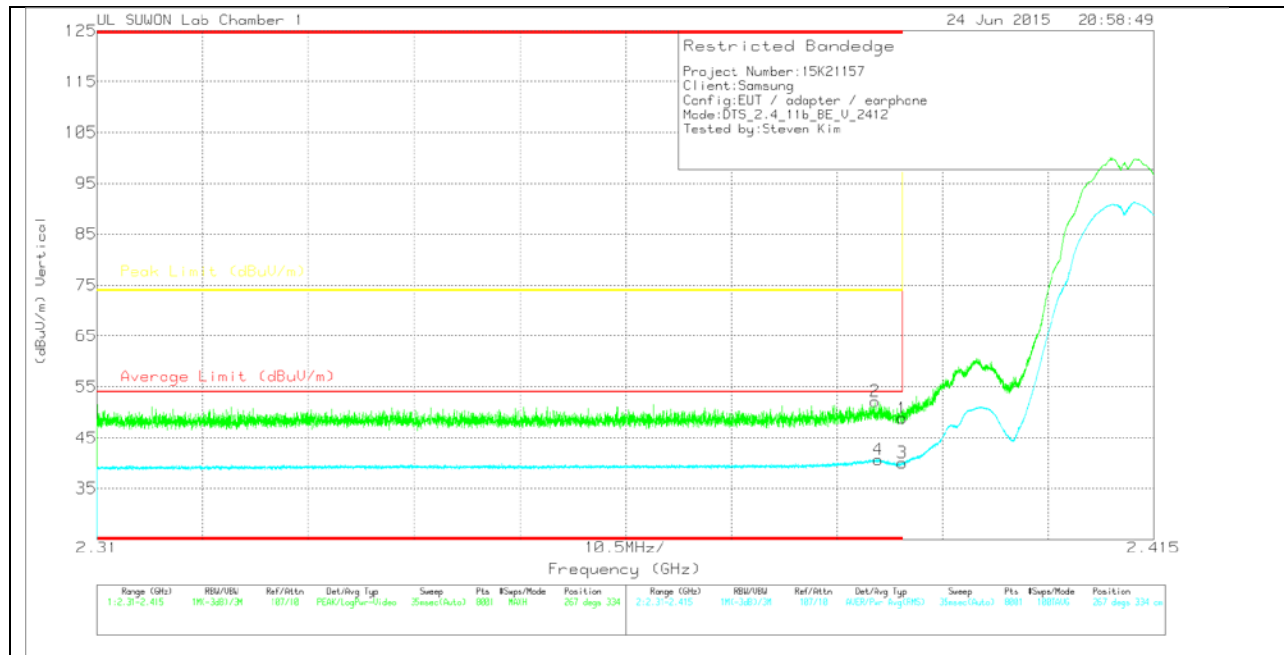
s	Frequency (GHz)	Meter Reading (dBuV)	Det	3117(001687 17)_150619	Path_2_10d B	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.39	40.28	Pk	31.8	-22.8	0	49.28	-	-	74	-24.72	203	288	H
2	* 2.387	43.29	Pk	31.8	-22.8	0	52.29	-	-	74	-21.71	203	288	H
3	* 2.39	31.5	RMS	31.8	-22.8	0	40.5	54	-13.5	-	-	203	288	H
4	* 2.387	32.6	RMS	31.8	-22.8	0	41.6	54	-12.4	-	-	203	288	H

* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

Pk - Peak detector

RMS - RMS detection

VERTICAL PEAK AND AVERAGE PLOT



VERTICAL DATA

TRACE MARKERS

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	3117(00168 717)_15061 9	Path_2_10d 8	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	39.79	Pk	31.8	-22.8	0	48.79	-	-	74	-25.21	267	334	V
2	* 2.387	43.16	Pk	31.8	-22.8	0	52.16	-	-	74	-21.84	267	334	V
3	* 2.39	31.05	RMS	31.8	-22.8	0	40.05	54	-13.95	-	-	267	334	V
4	* 2.388	31.7	RMS	31.8	-22.8	0	40.7	54	-13.3	-	-	267	334	V

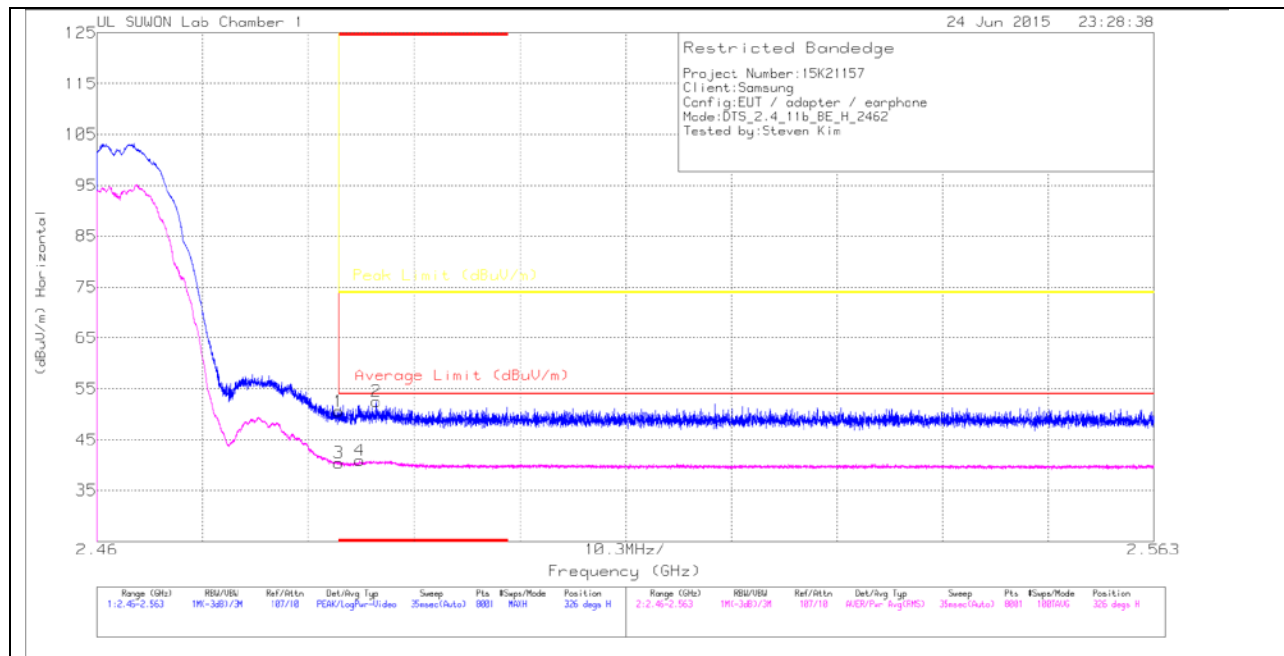
* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

Pk - Peak detector

RMS - RMS detection

AUTHORIZED BANDEDGE (HIGH CHANNEL)

HORIZONTAL PEAK AND AVERAGE PLOT



HORIZONTAL DATA

TRACE MARKERS

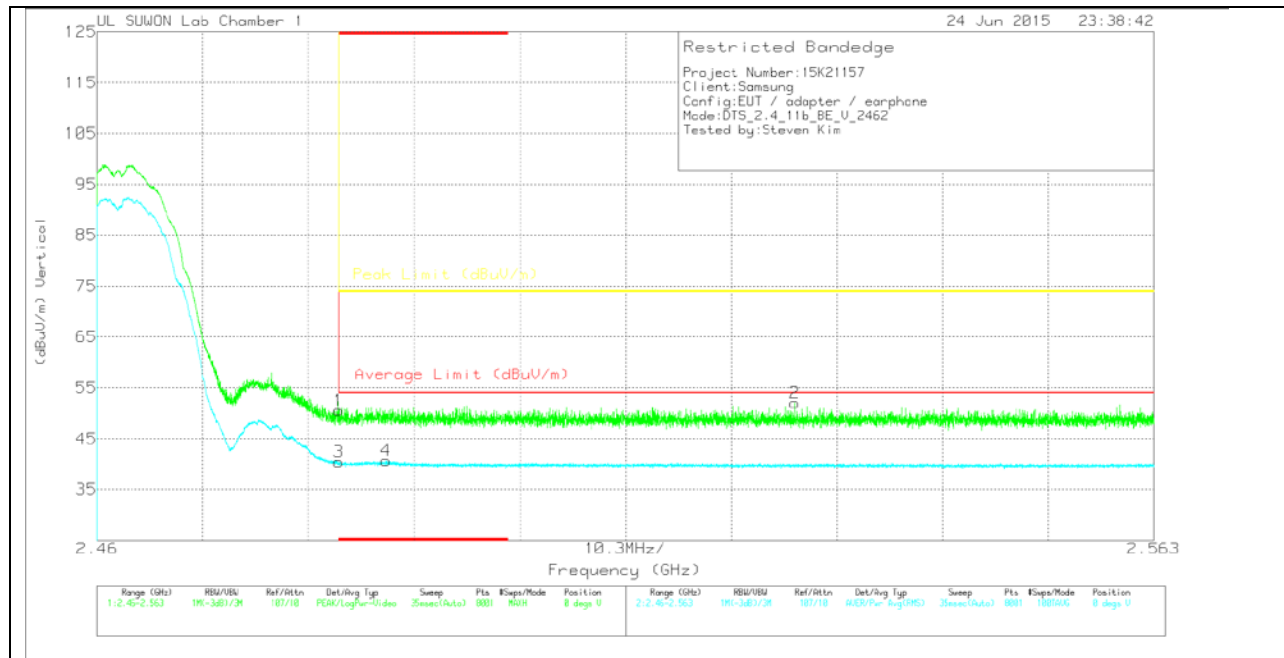
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	3117/00168 7171_15061 9	Path_2_10d B	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.484	41.16	Pk	32	-22.6	0	50.56	-	-	74	-23.44	326	290	H
2	* 2.487	43.14	Pk	32	-22.6	0	52.54	-	-	74	-21.46	326	290	H
3	* 2.484	31	RMS	32	-22.6	0	40.4	54	-13.6	-	-	326	290	H
4	* 2.486	31.51	RMS	32	-22.6	0	40.91	54	-13.09	-	-	326	290	H

* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

Pk - Peak detector

RMS - RMS detection

VERTICAL PEAK AND AVERAGE PLOT



VERTICAL DATA

TRACE MARKERS

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	3117(00168 717)_15061 9	Path_2_10d B	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	41.18	Pk	32	-22.6	0	50.58	-	-	74	-23.42	0	338	V
2	2.528	42.63	Pk	32	-22.6	0	52.03	-	-	74	-21.97	0	338	V
3	* 2.484	30.98	RMS	32	-22.6	0	40.38	54	-13.62	-	-	0	338	V
4	* 2.488	31.26	RMS	32	-22.6	0	40.66	54	-13.34	-	-	0	338	V

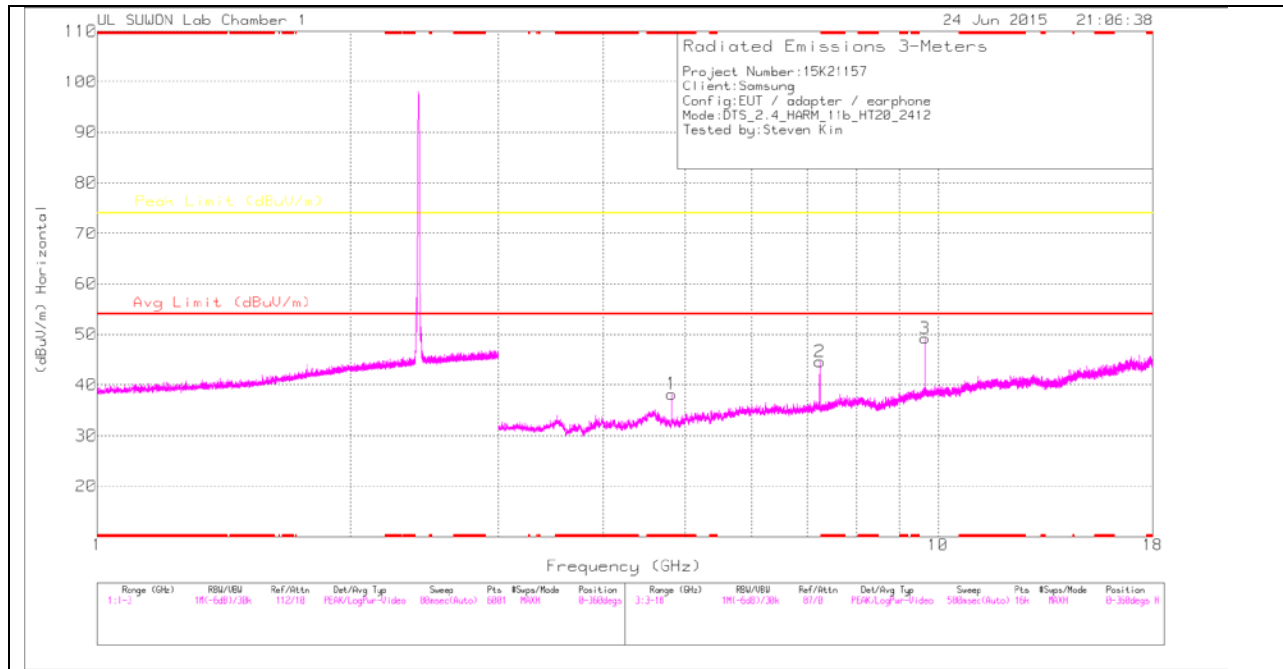
* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

Pk - Peak detector

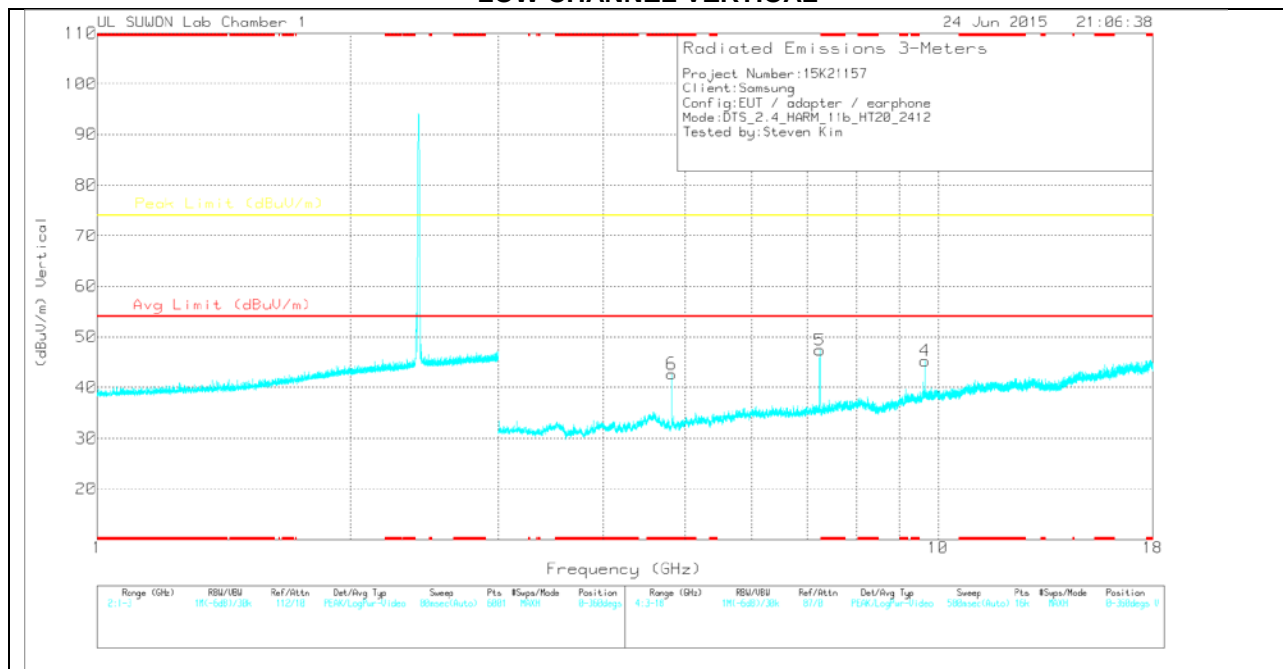
RMS - RMS detection

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	3117(001687 17)_150619	Path_3_3GHP	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	* 4.824	33.83	PK	34	-29.6	0	38.23	-	-	74	-35.77	0-360	200	H
2	7.235	34.45	PK	35.7	-25.5	0	44.65	-	-	-	-	0-360	200	H
3	9.648	32.92	PK	37.1	-20.8	0	49.22	-	-	-	-	0-360	200	H
4	9.648	28.95	PK	37.1	-20.8	0	45.25	-	-	-	-	0-360	200	V
5	7.235	37.19	PK	35.7	-25.5	0	47.39	-	-	-	-	0-360	200	V
6	* 4.824	38.28	PK	34	-29.6	0	42.68	-	-	74	-31.32	0-360	100	V

* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

PK – Peak detector

Radiated Emissions

Frequency (GHz)	Meter Reading (dBuV)	Det	3117(001 68717)_1 50619	Path_3_3 GHP	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
* 4.824	41.91	PK2	34	-29.6	0	46.31	-	-	74	-27.69	175	277	H
* 4.824	33.35	MAv1	34	-29.6	0	37.75	54	-16.25	-	-	175	277	H
7.235	43.57	PK2	35.7	-25.5	0	53.77	-	-	-	-	248	237	H
7.237	33.48	MAv1	35.7	-25.5	0	43.68	-	-	-	-	248	237	H
9.649	38.12	PK2	37.1	-20.8	0	54.42	-	-	-	-	250	200	H
9.649	32.52	MAv1	37.1	-20.8	0	48.82	-	-	-	-	250	200	H
9.649	36.54	PK2	37.1	-20.8	0	52.84	-	-	-	-	227	191	V
9.648	29.76	MAv1	37.1	-20.8	0	46.06	-	-	-	-	227	191	V
7.235	44.77	PK2	35.7	-25.5	0	54.97	-	-	-	-	185	268	V
7.235	33.38	MAv1	35.7	-25.5	0	43.58	-	-	-	-	185	268	V
* 4.824	45.08	PK2	34	-29.6	0	49.48	-	-	74	-24.52	186	330	V
* 4.824	38.81	MAv1	34	-29.6	0	43.21	54	-10.79	-	-	186	330	V

* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

PK2 - KDB558074 Method: Maximum Peak

MAv1 - KDB558074 Option 1 Maximum RMS Average