

Test Report

FCC Part15 Subpart C

Product Name : Wi-Fi Smart Plug With Energy Monitoring
Model No. : HS110
FCC ID : TE7HS110

Applicant : TP-LINK TECHNOLOGIES CO., LTD.
Address : Building 24(floors1,3,4,5) and 28(floors1-4) Central
Science and Technology Park, Shennan Rd, Nanshan,
Shenzhen, China

Date of Receipt : Sep. 16, 2015
Test Date : Oct. 19, 2015~ Nov. 18, 2015
Issued Date : Nov. 19, 2015
Report No. : 1590447R-RF-US-P06V01
Report Version : V1.0

The test results relate only to the samples tested.

The test results shown in the test report are traceable to the national/international standard through the calibration of the equipment and evaluated measurement uncertainty herein.

This report must not be used to claim product endorsement by TAF or any agency of the government.

The test report shall not be reproduced without the written approval of Quietek Corporation.

Test Report Certification

Issued Date : Nov. 19, 2015

Report No. : 1590447R-RF-US-P06V01



Product Name : Wi-Fi Smart Plug With Energy Monitoring
Applicant : TP-LINK TECHNOLOGIES CO., LTD.
Address : Building 24(floors1,3,4,5) and 28(floors1-4) Central Science and Technology Park, Shennan Rd, Nanshan,Shenzhen, China
Manufacturer : TP-LINK TECHNOLOGIES CO., LTD.
Address : Building 24(floors1,3,4,5) and 28(floors1-4) Central Science and Technology Park, Shennan Rd, Nanshan,Shenzhen, China
Model No. : HS110
FCC ID : TE7HS110
EUT Voltage : 100-120V~50/60Hz
Brand Name : TP-LINK
Applicable Standard : FCC CFR Title 47 Part 15 Subpart C: 2015
ANSI C63.4:2014;
ANSI C63.10:2013;
KDB 558074 D01v03r03
Test Result : Complied
Performed Location : Suzhou EMC Laboratory
No.99 Hongye Rd., Suzhou Industrial Park, Suzhou,215006, Jiangsu, China
TEL: +86-512-6251-5088 / FAX: +86-512-6251-5098
FCC Registration Number: 800392;

Documented By

: Elanrenong

Reviewed By

: Frank he

Approved By

: Harry zhou

Laboratory Information

We, **Quietek Corporation**, are an independent EMC and safety consultancy that was established the whole facility in our laboratories. The test facility has been accredited/accepted(audited or listed) by the following related bodies in compliance with ISO 17025, EN 45001 and specified testing scope:

Taiwan R.O.C.	:	BSMI, NCC, TAF
USA	:	FCC
Japan	:	VCCI
China	:	CNAS

The related certificate for our laboratories about the test site and management system can be downloaded from Quietek Corporation's Web Site :<http://www.quietek.com/tw/ctg/cts/accreditations.htm>

The address and introduction of Quietek Corporation's laboratories can be founded in our Web site :
<http://www.quietek.com/>

If you have any comments, Please don't hesitate to contact us. Our contact information is as below:

HsinChu Testing Laboratory :

No.75-2, 3rd Lin, Wangye Keng, Yonghxing Tsuen, Qionglin Shiang, Hsinchu County 307, Taiwan, R.O.C.
TEL:+886-3-592-8858 / FAX:+886-3-592-8859 E-Mail : service@quietek.com

LinKou Testing Laboratory :

No.5-22, Ruishukeng, Linkou Dist., New Taipei City 24451, Taiwan, R.O.C.
TEL : 886-2-8601-3788 / FAX : 886-2-8601-3789 E-Mail : service@quietek.com

Suzhou Testing Laboratory :

No.99 Hongye Rd., Suzhou Industrial Park, Suzhou,215006, Jiangsu, China
TEL : +86-512-6251-5088 / FAX : 86-512-6251-5098 E-Mail : service@quietek.com

TABLE OF CONTENTS

Description	Page
1. General Information.....	7
1.1. EUT Description	7
1.2. Mode of Operation.....	11
1.3. Tested System Details	12
1.4. Configuration of Tested System.....	13
1.5. EUT Exercise Software.....	14
2. Technical Test.....	15
2.1. Summary of Test Result.....	15
2.2. Test Environment.....	16
3. Conducted Emission.....	17
3.1. Test Equipment.....	17
3.2. Test Setup.....	17
3.3. Limit.....	18
3.4. Test Procedure	18
3.5. Uncertainty	19
3.6. Test Result.....	20
4. Radiated Emission.....	22
4.1. Test Equipment.....	22
4.2. Test Setup.....	23
4.3. Limit.....	24
4.4. Test Procedure	24
4.5. Uncertainty	25
4.6. Test Result.....	26
5. RF Antenna Conducted Spurious	33
5.1. Test Equipment.....	33
5.2. Test Setup.....	33
5.3. Limit.....	33
5.4. Test Procedure	34
5.5. Uncertainty	34
5.6. Test Result.....	35
6. Radiated Emission Band Edge	137
6.1. Test Equipment.....	137
6.2. Test Setup.....	138
6.3. Limit.....	138
6.4. Test Procedure	138
6.5. Uncertainty	139
6.6. Test Result.....	140

7.	Occupied Bandwidth.....	170
7.1.	Test Equipment.....	170
7.2.	Test Setup.....	170
7.3.	Limit.....	170
7.4.	Test Procedure	170
7.5.	Uncertainty	171
7.6.	Test Result.....	172
8.	Power Output.....	180
8.1.	Test Equipment.....	180
8.2.	Test Setup.....	180
8.3.	Limit.....	180
8.4.	Test Procedure	181
8.5.	Uncertainty	181
8.6.	Test Result.....	182
9.	Power Spectral Density	184
9.1.	Test Equipment.....	184
9.2.	Test Setup.....	184
9.3.	Limit.....	184
9.4.	Test Procedure	185
9.5.	Uncertainty	185
9.6.	Test Result.....	186

History of This Test Report

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
1590447R-RF-US-P06V01	V1.0	Initial Issued Report	Nov. 19, 2015

1. General Information

1.1. EUT Description

Product Name	Wi-Fi Smart Plug With Energy Monitoring
Brand Name	TP-LINK
Model No.	HS110
EUT Voltage	100-120V~50/60Hz
Frequency Range	For 2.4GHz Band 802.11b/g/n(20MHz): 2412~2462MHz 802.11n(40MHz): 2422~2452MHz
Channel Number	For 2.4GHz Band 802.11b/g/n(20MHz): 11 802.11n(40MHz): 7
Type of Modulation	802.11b: DSSS 802.11/g/n: OFDM
Data Rate	802.11g: 6/9/12/18/24/36/48/54 Mbps 802.11b: 1/2/5.5/11 Mbps 802.11n: up to 150 Mbps
Channel Control	Auto
Antenna Delivery	1*Tx +1*Rx for 2.4GHz
Antenna Type	Reference to Antenna List
Peak Antenna Gain	Reference to Antenna List

For 2.4GHz Band

802.11b/g/n(20MHz) Working Frequency of Each Channel:

Channel	Frequency	Channel	Frequency	Channel	Frequency	Channel	Frequency
01	2412 MHz	02	2417 MHz	03	2422 MHz	04	2427 MHz
05	2432 MHz	06	2437 MHz	07	2442 MHz	08	2447 MHz
09	2452 MHz	10	2457 MHz	11	2462 MHz	N/A	N/A

802.11n(40MHz) Working Frequency of Each Channel:

Channel	Frequency	Channel	Frequency	Channel	Frequency	Channel	Frequency
03	2422 MHz	04	2427 MHz	05	2432 MHz	06	2437 MHz
07	2442 MHz	08	2447 MHz	09	2452 MHz	N/A	N/A

Antenna List

Antenna	Type	Model No.	Peak Gain
Antenna 1	PIFA (Printed)	N/A	2.4GHz band:2.69dBi

. Power Parameter Value of the test software

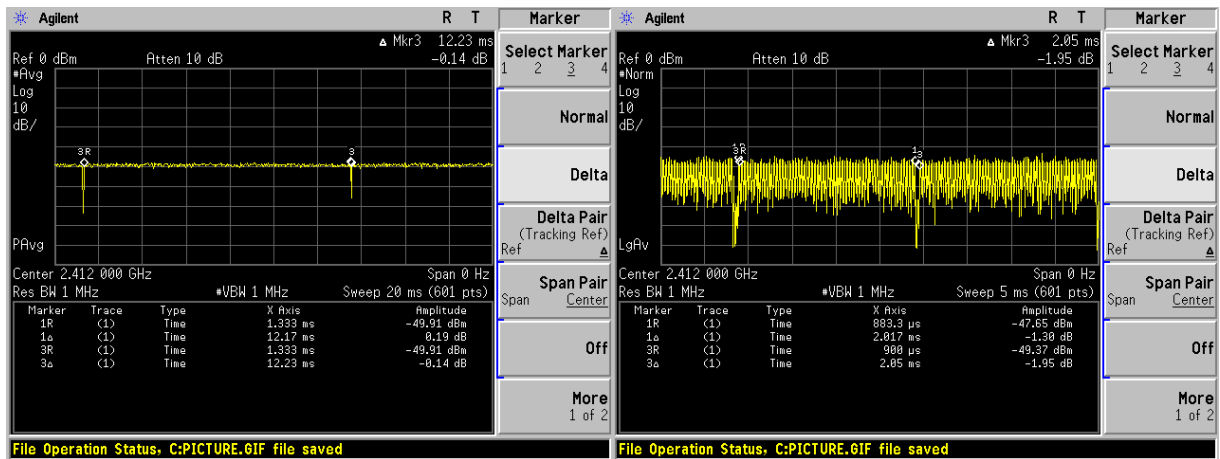
Test Mode	Test Channel	Power setting
802.11b	2412	11
	2437	15
	2462	14.5
802.11g	2412	13
	2437	20
	2462	14
802.11n(20MHz)	2412	12
	2437	22
	2462	13.5
802.11n(40MHz)	2422	15
	2437	18
	2452	13.5

Duty Cycle
2.4GHz Band

Test Mode	Ant 1
802.11b	99.51%
802.11g	98.39%
802.11n(20MHz)	97.41%
802.11n(40MHz)	94.85%

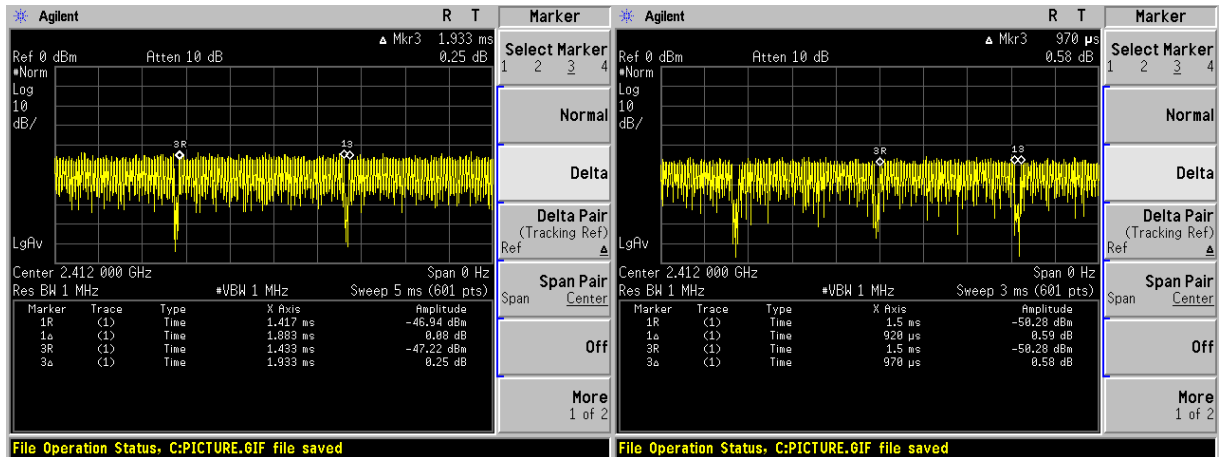
802.11 b

802.11 g



802.11 n(20MHz)

802.11 n(40MHz)



1.2. Mode of Operation

QuieTek has verified the construction and function in typical operation. All the test modes were carried out with the EUT in normal operation, which was shown in this test report and defined as:

Test Mode
Mode 1: Transmit by 802.11b
Mode 2: Transmit by 802.11g
Mode 3: Transmit by 802.11n(20MHz)
Mode 4: Transmit by 802.11n(40MHz)

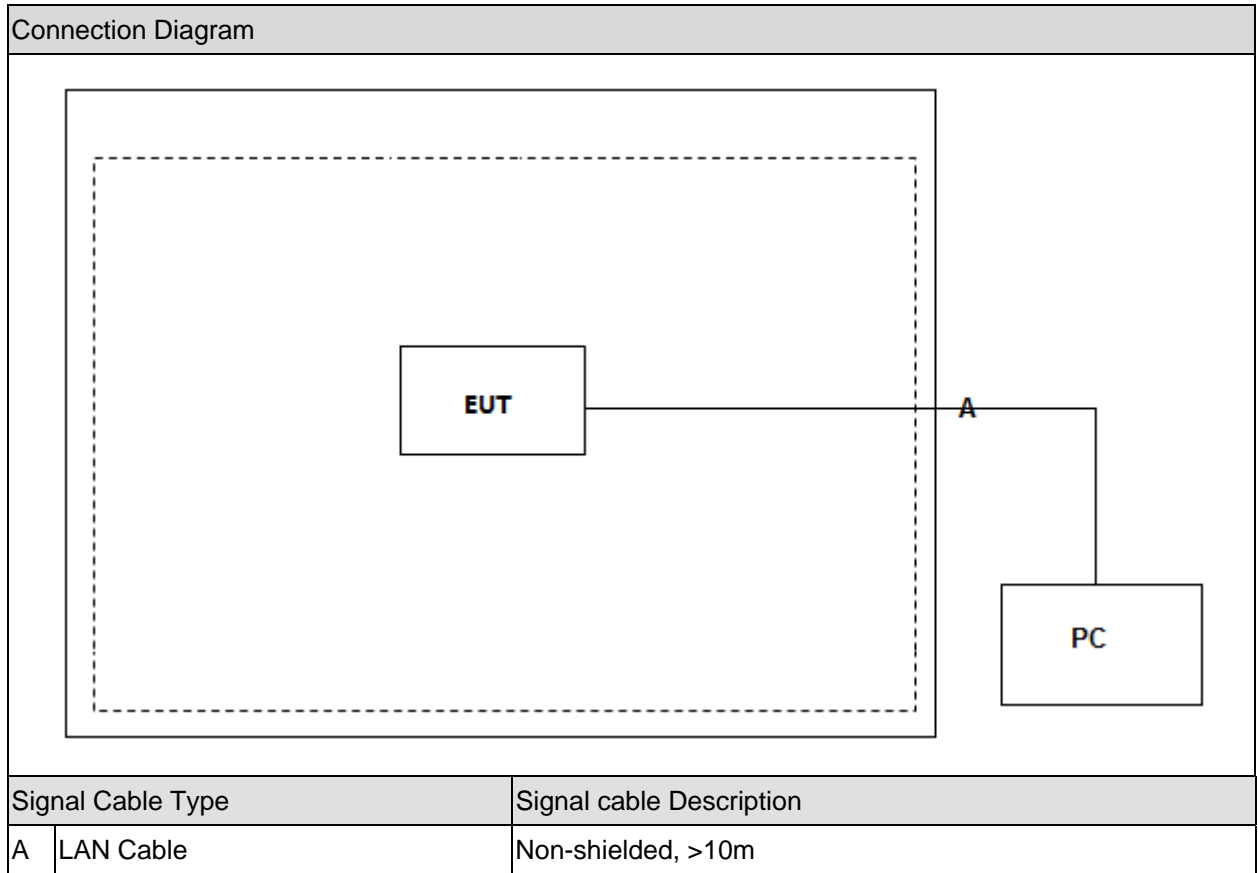
Note: Regards to the frequency band operation: the lowest, middle and highest frequency of channel were selected to perform the test, and be shown on this report.

1.3. Tested System Details

The types for all equipments, plus descriptions of all cables used in the tested system (including inserted cards) are:

Product		Manufacturer	Model No.	Serial No.	Power Cord
1	Notebook	Lenovo	Think pad x220	SUA0600195	Non-shielded

1.4. Configuration of Tested System



1.5. EUT Exercise Software

1	Setup the EUT and simulators as shown on above.
2	Turn on the power of equipment.
3	Input launch command, and set the test mode and channel, then press OK to start continue Transmit or receive.

2. Technical Test

2.1. Summary of Test Result

- No deviations from the test standards
 Deviations from the test standards as below description:

For FCC

Performed Test Item	Normative References	Test Performed	Deviation
Conducted Emission	FCC CFR Title 47 Part 15 Subpart C: 2015 Section 15.207	Yes	No
Radiated Emission	FCC CFR Title 47 Part 15 Subpart C: 2015 Section 15.209	Yes	No
RF Antenna Conducted Spurious	FCC CFR Title 47 Part 15 Subpart C: 2015 Section 15.247(d)	Yes	No
Radiated Emission Band Edge	FCC CFR Title 47 Part 15 Subpart C: 2015 15.247(d)	Yes	No
Operation Frequency Range of 20dB Bandwidth	FCC CFR Title 47 Part 15 Subpart C: 2015 15.215(c)	Yes	No
Occupied Bandwidth	FCC CFR Title 47 Part 15 Subpart C: 2015 Section 15.247(a)(2)	Yes	No
Power Output	FCC CFR Title 47 Part 15 Subpart C: 2015 Section 15.247(b)(3)	Yes	No
Power Spectral Density	FCC CFR Title 47 Part 15 Subpart C: 2015 Section 15.247(e)	Yes	No

2.2. Test Environment

Items	Required (IEC 68-1)	Actual
Temperature (°C)	15-35	21
Humidity (%RH)	25-75	50
Barometric pressure (mbar)	860-1060	950-1000

3. Conducted Emission

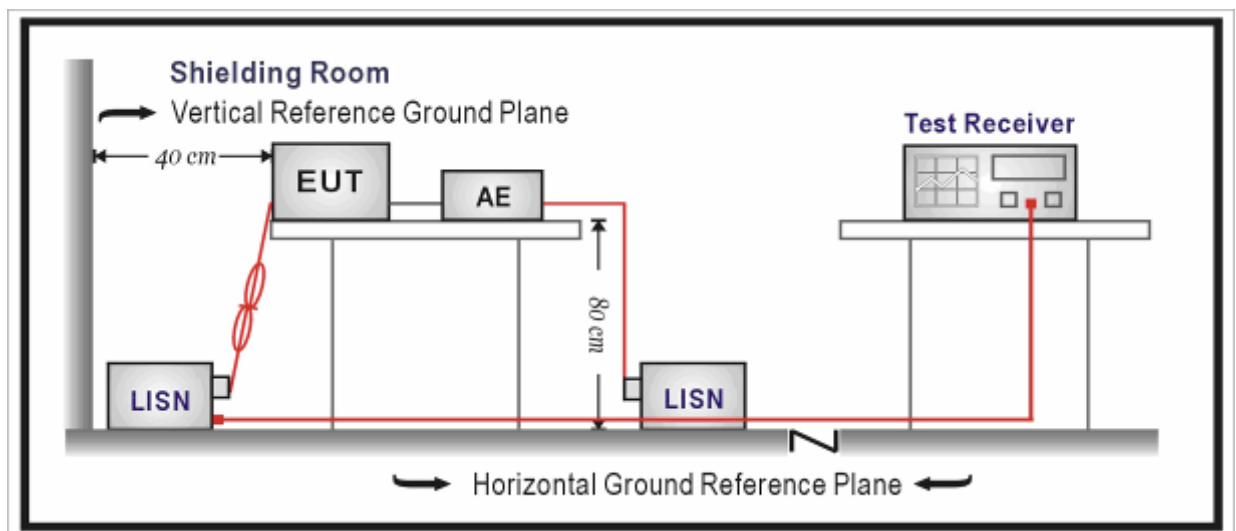
3.1. Test Equipment

Conducted Emission / TR-1

Instrument	Manufacturer	Type No.	Serial No.	Cal. Due Date
EMI Test Receiver	R&S	ESCI	100726	2016.03.28
Two-Line V-Network	R&S	ENV216	100043	2016.03.28
Two-Line V-Network	R&S	ENV216	100044	2016.09.16
50ohm Coaxial Switch	Anritsu	MP59B	6200464462	2016.03.01
50ohm Termination	SHX	TF2	07081401	2016.09.16
Temperature/Humidity Meter	zhichen	ZC1-2	TR1-TH	2016.01.08

Note: All equipments are calibrated with traceable calibrations. Each calibration is traceable to the national or international standards.

3.2. Test Setup



3.3. Limit

FCC Part 15 Subpart C Paragraph 15.207 Limits		
Frequency (MHz)	QP (dBuV)	AV (dBuV)
0.15 - 0.50	66 - 56	56 – 46
0.50 - 5.0	56	46
5.0 - 30	60	50

Note 1: The lower limit shall apply at the transition frequencies.

Note 2: The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.5 MHz.

3.4. Test Procedure

According to FCC ANSI C63.4: 2014 & ANSI C63.10: 2013& FCC 47CFR 15.247& KDB 558074 D01v03r03

According to KDB 174176 D01 Line Conducted FAQ v01r01, it is required to perform the AC power-line conducted emissions testing and demonstrate compliance with the AC power-line emission requirements in Sections 15.107 or 15.207.

FCC

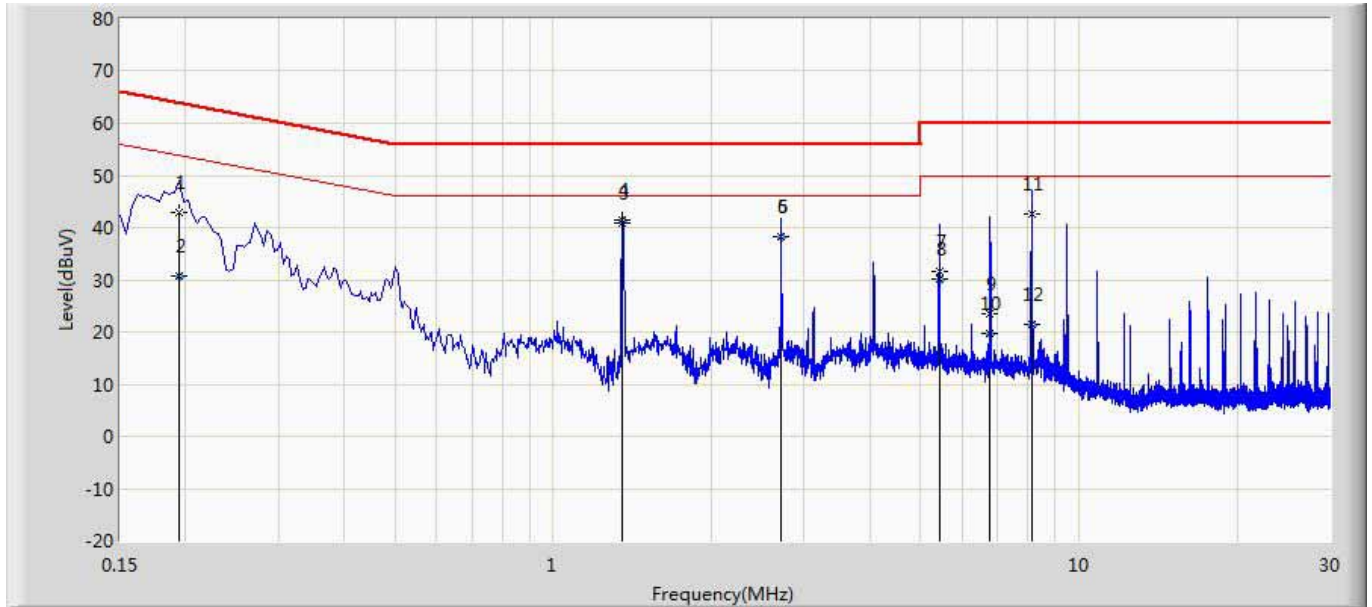
The EUT was setup according to ANSI C63.4, 2014 for compliance to FCC 47CFR 15.247 requirements. The EUT was placed on a platform of nominal size, 1 m by 1.5 m, raised 80 cm above the conducting ground plane. The vertical conducting plane was located 40 cm to the rear of the EUT. All other surfaces of EUT were at least 80 cm from any other grounded conducting surface. The EUT and simulators are connected to the main power through a line impedance stabilization network (LISN). The LISN provides a 50 ohm /50uH coupling impedance for the measuring equipment. The peripheral devices are also connected to the main power through a LISN. (Please refer to the block diagram of the test setup and photographs) Each current-carrying conductor of the EUT power cord, except the ground (safety) conductor, was individually connected through a LISN to the input power source. The excess length of the power cord between the EUT and the LISN receptacle were folded back and forth at the center of the lead to form a bundle not exceeding 40 cm in length. Conducted emissions were investigated over the frequency range from 0.15MHz to 30MHz using a receiver bandwidth of 9 kHz.

3.5. Uncertainty

The measurement uncertainty is defined as ± 2.02 dB

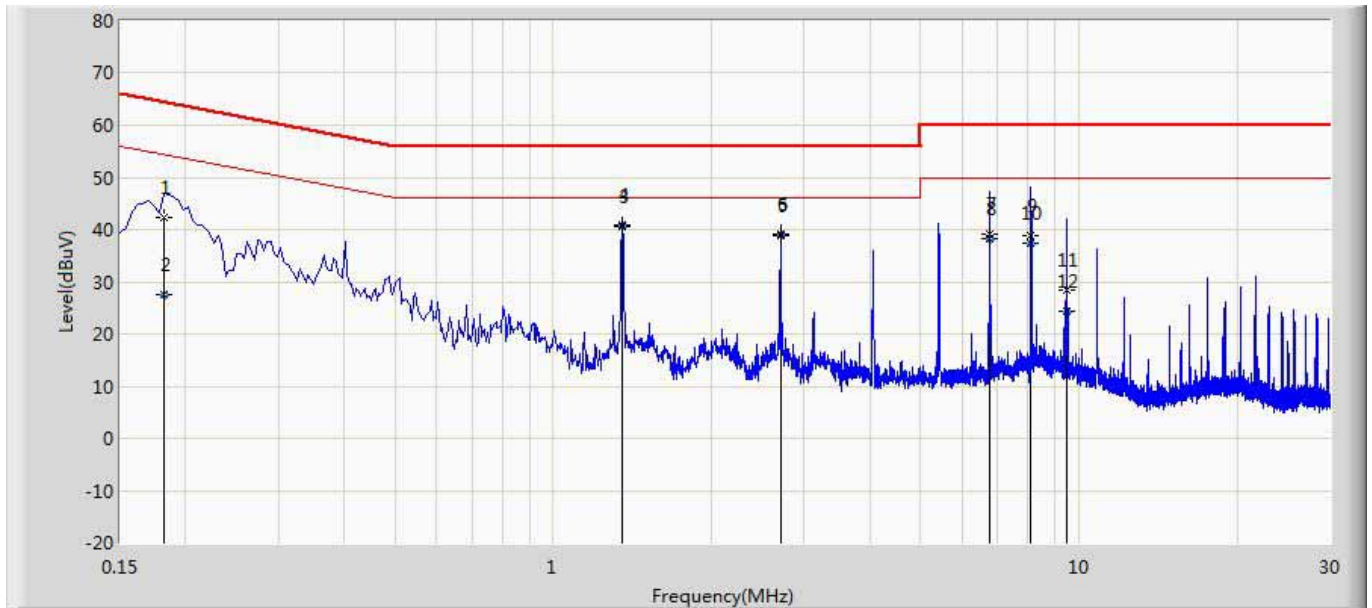
3.6. Test Result

Site: TR5	Time: 2015/09/23
Limit: FCC_Part15.107_CE_AC Power_ClassB	Margin: 0
Probe: ENV216_101044(0.009-30MHz)	Polarity: Line
EUT: Wi-Fi Smart Plug With Energy Monitoring	Power: AC 120V/60Hz
Note: Mode 1: Transmit at CH2412 by 802.11b	



No	Mark	Frequency (MHz)	Measure Level (dBuV)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV)	Factor (dB)	Type
1		0.194	42.916	33.088	-20.948	63.864	9.828	QP
2		0.194	30.721	20.893	-23.143	53.864	9.828	AV
3		1.354	40.958	31.174	-15.042	56.000	9.784	QP
4	*	1.354	41.313	31.529	-4.687	46.000	9.784	AV
5		2.710	38.216	28.421	-17.784	56.000	9.795	QP
6		2.710	38.317	28.523	-7.683	46.000	9.794	AV
7		5.422	31.700	21.844	-28.300	60.000	9.856	QP
8		5.422	30.186	20.330	-19.814	50.000	9.856	AV
9		6.778	23.538	13.645	-36.462	60.000	9.893	QP
10		6.778	19.787	9.894	-30.213	50.000	9.893	AV
11		8.114	42.634	32.721	-17.366	60.000	9.913	QP
12		8.114	21.418	11.504	-28.582	50.000	9.914	AV

Site: TR5	Time: 2015/09/23
Limit: FCC_Part15.107_CE_AC Power_ClassB	Margin: 0
Probe: ENV216_101044(0.009-30MHz)	Polarity: Neutral
EUT: Wi-Fi Smart Plug With Energy Monitoring	Power: AC 120V/60Hz
Note: Mode 1: Transmit at CH2412 by 802.11b	



No	Mark	Frequency (MHz)	Measure Level (dBuV)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV)	Factor (dB)	Type
1		0.182	42.358	32.448	-22.036	64.394	9.910	QP
2		0.182	27.668	17.759	-26.725	54.394	9.909	AV
3		1.354	40.571	30.582	-15.429	56.000	9.989	QP
4	*	1.354	40.819	30.830	-5.181	46.000	9.989	AV
5		2.706	38.845	28.872	-17.155	56.000	9.973	QP
6		2.706	38.992	29.019	-7.008	46.000	9.973	AV
7		6.758	39.137	28.946	-20.863	60.000	10.191	QP
8		6.758	38.170	27.979	-11.830	50.000	10.191	AV
9		8.110	38.953	28.706	-21.047	60.000	10.247	QP
10		8.110	37.405	27.158	-12.595	50.000	10.247	AV
11		9.474	28.295	17.991	-31.705	60.000	10.304	QP
12		9.474	24.415	14.111	-25.585	50.000	10.304	AV

4. Radiated Emission

4.1. Test Equipment

Radiated Emission / AC-2

Instrument	Manufacturer	Type No.	Serial No.	Cal. Due Date
EMI Test Receiver	R&S	ESCI	100573	2016.03.28
Loop Antenna	R&S	HFH2-Z2	833799/003	2015.11.17
Bilog Chainenna	Teseq GmbH	CBL6112D	27611	2016.10.15
Coaxial Cable	Huber+Suhner	SUCOFLEX 106	AC2-C	2016.03.01
Temperature/Humidity Meter	Zhicheng	ZC1-2	AC2-TH	2016.01.08

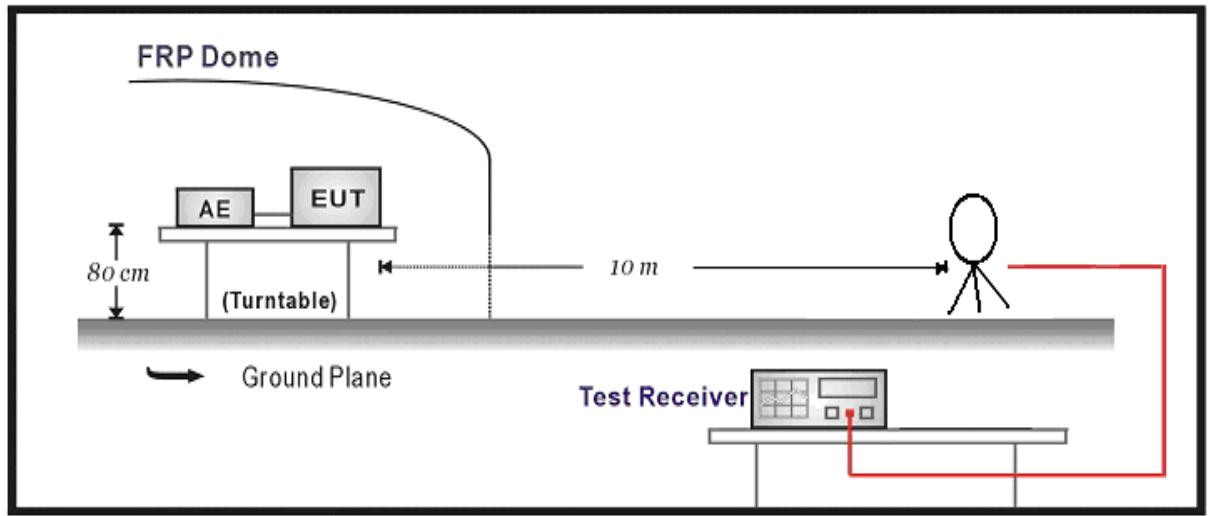
Radiated Emission / AC-5

Instrument	Manufacturer	Type No.	Serial No.	Cal. Due Date
Spectrum Analyzer	Agilent	N9020A	MY49100159	2016.03.28
Spectrum Analyzer	Agilent	E4446A	MY45300103	2016.01.07
Preamplifier	Miteq	NSP1800-25	1364185	2016.05.05
Preamplifier	Quietek	AP-040G	CHM-0906001	2016.05.05
DRG Horn	ETS-Lindgren	3117	00123988	2016.01.21
Broad-Band Horn Antenna	Schwarzbeck	BBHA9170	294	2015.11.24
Coaxial Cable	Huber+Suhner	SUCOFLEX 106	AC5-C1	2016.03.01
Coaxial Cable	Huber+Suhner	SUCOFLEX 106	AC5-C2	2016.03.01
Coaxial Cable	Huber+Suhner	SUCOFLEX 102	AC5-C3	2016.03.01
EMI Receiver	Agilent	N9038A	MY51210196	2016.06.09
Temperature/Humidity Meter	Zhichen	ZC1-2	AC5-TH	2016.01.08

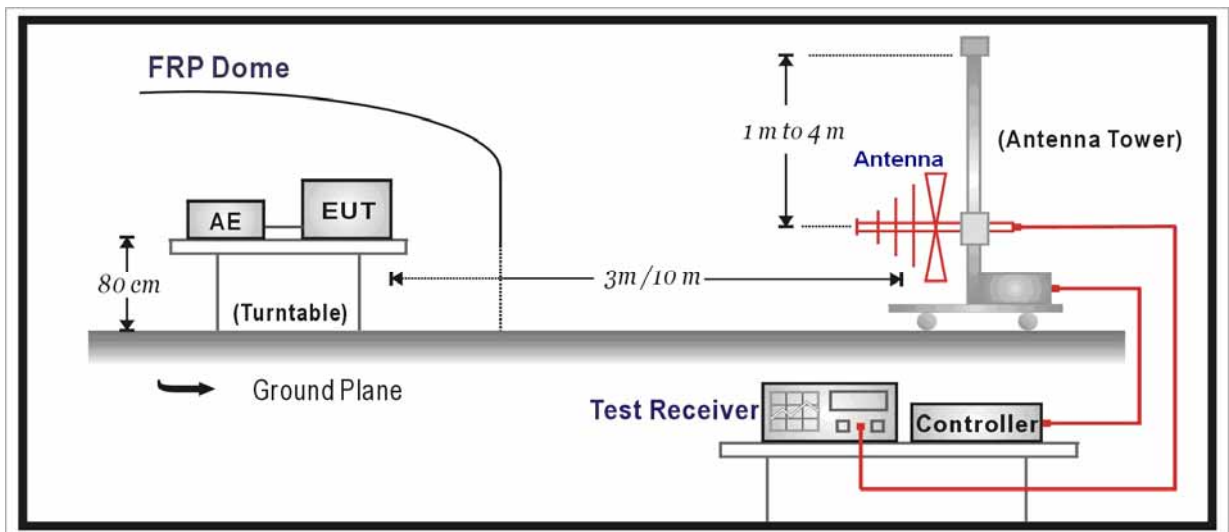
Note 1: All equipments are calibrated with traceable calibrations. Each calibration is traceable to the national or international standards.

4.2. Test Setup

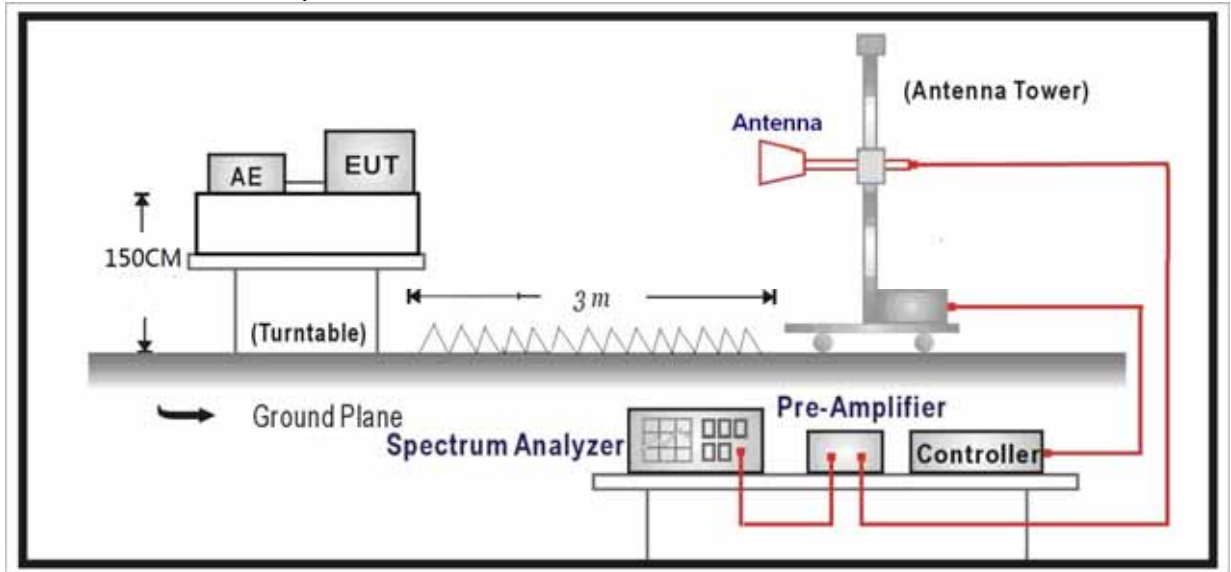
Below 30MHz Test Setup:



Below 1GHz Test Setup:



Above 1GHz Test Setup:



4.3. Limit

FCC Part 15 Subpart C Paragraph 15.209		
Frequency (MHz)	Distance (m)	Level (dBuV/m)
30 - 88	3	40
88 - 216	3	43.5
216 - 960	3	46
Above 960	3	54

Note 1: The lower limit shall apply at the transition frequency.

Note 2: Distance refers to the distance in meters between the measuring instrument Antenna and the closed point of any part of the device or system.

Note 3: E field strength (dBuV/m) = 20 log E field strength (uV/m)

4.4. Test Procedure

According to FCC ANSI C63.4: 2014 & ANSI C63.10: 2013& FCC 47CFR 15.247& KDB 558074 D01v03r03

FCC

The EUT is placed on a turn table which is 1.5 meter above ground. The turn table is rotated 360 degrees to determine the position of the maximum emission level. The EUT was positioned

such that the distance from Antenna to the EUT was 3 meters.

The antenna is scanned from 1 meter to 4 meters to find out the maximum emission level. This is repeated for both horizontal and vertical polarization of the Antenna. In order to find the maximum emission, all of the interface cables were manipulated according to ANSI C63.4:2014 on radiated measurement.

The resolution bandwidth below 1GHz setting on the field strength meter is 120 kHz and above 1GHz is 1MHz.

The frequency range from 30MHz to 10th harmonic is checked.

Note: When doing emission measurement above 1GHz, the horn Antenna will be bended down a little (as horn Antenna has the narrow beamwidth) in order to keeping the Antenna in the “cone of radiation” of EUT. The 3dB beamwidth is 10~60 degrees for H-plane and 10~90 degrees for E-plane.

4.5. Uncertainty

The measurement uncertainty above 1G is defined as ± 3.9 dB

below 1G is defined as ± 3.8 dB

4.6. Test Result

All of the test result shown indicates the worst case, and spectrum analyzer parameters setting as shown below:

Peak detector: RBW = 1MHz, VBW = 3MHz, sweep time = 200ms;

If duty cycle $\geq 98\%$, Average detector: RBW = 1MHz, VBW = 10Hz, sweep time = auto.

If duty cycle $< 98\%$, Average detector: RBW = 1MHz, VBW $\geq 1/T$, sweep time = auto.

Measure Level = Reading Level + Cable Loss + Antenna Factor - Preamplifier Gain

Mode1: Transmit by 802.11b

CH	Antenna	Frequency (MHz)	Reading Level (dBuV)	Factor (dB)	Measure Level (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Type
1	H	4823.86	44.88	8.01	52.90	54	-1.11	AV
	H	4825.00	47.54	8.02	55.55	74	-18.45	PK
	H	7236.00	32.06	12.92	44.98	54(note3)	-9.02	PK
	H	9648.00	34.89	14.96	49.86	54(note3)	-4.14	PK
	V	4825.00	49.72	7.32	57.05	74.00	-16.96	PK
	V	4825.00	45.37	7.32	52.69	54.00	-1.31	AV
	V	4825.00	42.54	8.02	50.56	54(note3)	-3.44	PK
	V	7236.00	32.87	12.92	45.79	54(note3)	-8.22	PK
6	H	4874.02	45.13	8.16	53.29	54	-0.71	AV
	H	4876.00	48.82	8.18	57.01	74	-16.99	PK
	H	7236.00	31.93	12.92	44.85	54(note3)	-9.15	PK
	H	9748.00	36.87	14.95	51.82	54(note3)	-2.18	PK
	V	4874.04	43.96	8.16	52.12	54	-1.88	AV
	V	4876.00	46.97	8.18	55.15	74	-18.85	PK
	V	7311.00	35.68	12.52	48.20	54(note3)	-5.80	PK
	V	9748.00	37.01	14.95	51.96	54(note3)	-2.04	PK
11	H	4924.00	44.43	8.29	52.72	54	-1.28	AV
	H	4927.00	47.07	8.30	55.36	74	-18.64	PK
	H	7386.00	33.06	12.63	45.68	54(note3)	-8.32	PK
	H	9848.00	36.95	15.39	52.34	54(note3)	-1.66	PK
	V	4924.04	43.95	8.29	52.24	54	-1.76	AV
	V	4927.00	48.54	8.30	56.84	74	-17.16	PK
	V	7386.00	33.91	12.63	46.54	54(note3)	-7.46	PK
	V	9848.00	36.40	15.39	51.80	54(note3)	-2.20	PK

- Note: 1. Measure Level = Reading Level + Factor.
2. The test frequency range, 9kHz~30MHz, 18GHz~25GHz, both of the worst case are at least 6dB below the limits, therefore no data appear in the report.
 3. This limit applies for using average detector, if the test result on peak is lower than average limit, then average measurement needn't be performed.

Mode2: Transmit by 802.11g

CH	Antenna	Frequency (MHz)	Reading Level (dBuV/m)	Factor (dB)	Measure Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	H	4823.92	36.14	8.02	44.16	54	-9.85	AV
	H	4825.00	47.26	8.02	55.27	74	-18.73	PK
	H	7236.00	33.48	12.92	46.40	54(note3)	-7.60	PK
	H	9648.00	30.44	16.19	46.63	54(note3)	-7.38	PK
	V	4824.75	45.86	8.02	53.88	54.00	-0.13	AV
	V	4825.00	48.12	8.02	56.14	74.00	-17.86	PK
	V	4825.00	42.42	8.02	50.44	54(note3)	-3.56	PK
	V	7236.00	33.69	12.92	46.61	54(note3)	-7.39	PK
6	H	4873.77	39.95	8.16	48.11	54	-5.89	AV
	H	4884.50	48.74	8.24	56.98	74	-17.03	PK
	H	7307.00	39.22	12.39	51.61	54(note3)	-2.39	PK
	H	9748.00	30.82	16.03	46.85	54(note3)	-7.15	PK
	V	4876.00	50.84	8.18	59.03	74	-14.97	PK
	V	4876.00	38.89	8.18	47.07	54	-6.93	AV
	V	7315.50	38.97	12.67	51.64	54(note3)	-2.36	PK
	V	9748.00	30.52	16.03	46.56	54(note3)	-7.44	PK
11	H	4927.00	53.36	8.30	61.66	74.00	-12.34	PK
	H	4927.00	39.29	8.30	47.59	54.00	-6.41	AV
	H	7356.00	31.95	13.25	45.20	54(note3)	-8.80	PK
	H	9808.00	30.05	16.10	46.15	54(note3)	-7.85	PK
	V	4927.00	44.98	8.30	53.28	54(note3)	-0.73	PK
	V	7356.00	32.46	13.25	45.71	54(note3)	-8.29	PK
	V	9808.00	30.17	16.10	46.28	54(note3)	-7.73	PK

Note: 1. Measure Level = Reading Level + Factor.

2. The test frequency range, 9kHz~30MHz, 18GHz~25GHz, both of the worst case are at least 6dB below the limits, therefore no data appear in the report.

3. This limit applies for using average detector, if the test result on peak is lower than average limit, then average measurement needn't be performed.

Mode3: Transmit by 802.11n(20MHz)

CH	Antenna	Frequency (MHz)	Reading Level (dBuV/m)	Factor (dB)	Measure Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	H	4824.13	39.90	8.02	47.92	54.00	-6.08	AV
	H	4825.00	54.32	8.02	62.34	74.00	-11.66	PK
	H	7236.00	32.47	12.92	45.39	54(note3)	-8.61	PK
	H	9648.00	30.08	16.19	46.27	54(note3)	-7.73	PK
	V	4825.00	45.84	8.02	53.86	54(note3)	-0.14	PK
	V	7236.00	32.40	12.92	45.32	54(note3)	-8.68	PK
	V	9648.00	30.28	16.19	46.47	54(note3)	-7.53	PK
6	H	4867.50	46.76	8.09	54.85	74	-19.15	PK
	H	4874.00	37.27	8.16	45.43	54	-8.57	AV
	H	7311.00	35.50	12.52	48.01	54(note3)	-5.99	PK
	H	9748.00	31.15	16.03	47.19	54(note3)	-6.82	PK
	V	4867.50	53.36	8.09	61.45	74.00	-12.55	PK
	V	4867.50	40.58	8.09	48.67	54.00	-5.33	AV
	V	7311.00	31.86	12.52	44.38	54(note3)	-9.62	PK
	V	9748.00	29.85	16.03	45.89	54(note3)	-8.11	PK
11	H	4927.00	59.14	8.30	67.44	74.00	-6.56	PK
	H	4927.00	44.50	8.30	52.80	54.00	-1.20	AV
	H	7386.00	32.81	12.63	45.44	54(note3)	-8.56	PK
	H	9848.00	30.38	16.47	46.85	54(note3)	-7.15	PK
	V	4918.50	50.07	8.28	58.35	74.00	-15.65	PK
	V	4918.50	36.22	8.28	44.50	54.00	-9.50	AV
	V	7386.00	33.57	12.63	46.19	54(note3)	-7.81	PK
	V	9848.00	30.84	16.47	47.31	54(note3)	-6.69	PK

Note: 1. Measure Level = Reading Level + Factor.

2. The test frequency range, 9kHz~30MHz, 18GHz~25GHz, both of the worst case are at least 6dB below the limits, therefore no data appear in the report.

3. This limit applies for using average detector, if the test result on peak is lower than average limit, then average measurement needn't be performed.

Mode4: Transmit by 802.11n(40MHz)

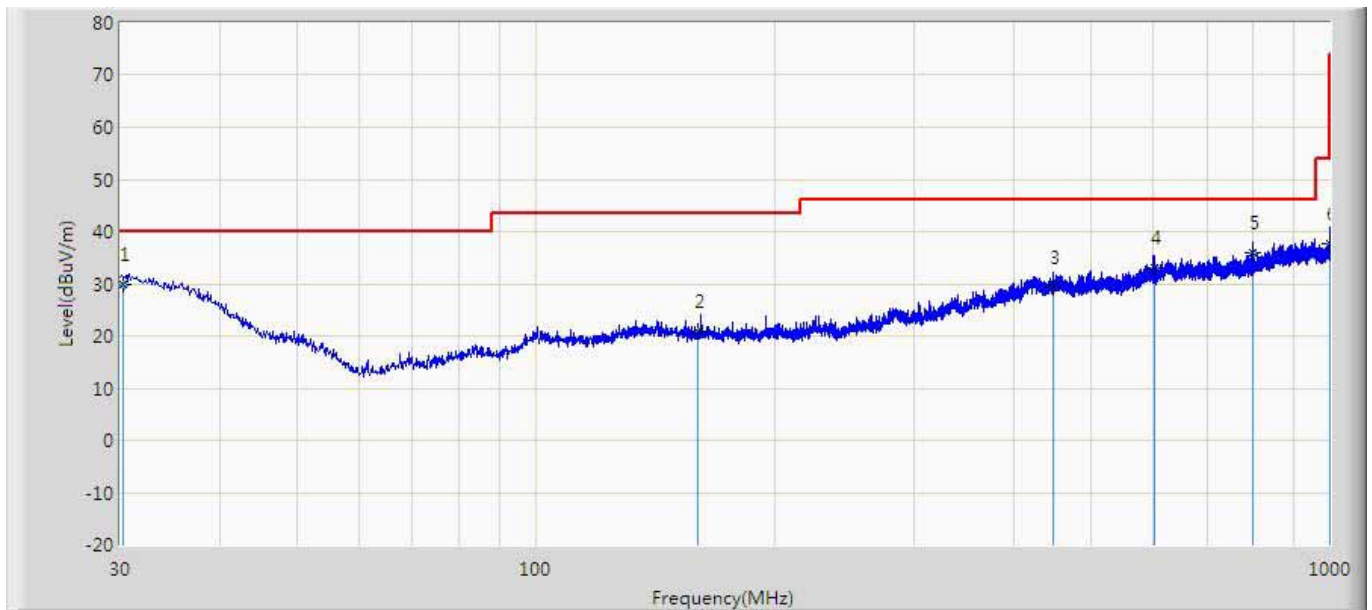
CH	Antenna	Frequency (MHz)	Reading Level (dBuV/m)	Factor (dB)	Measure Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
3	H	4825.00	53.37	8.02	61.39	74	-12.61	PK
	H	4825.26	33.27	8.02	41.29	54	-12.72	AV
	H	7236.00	32.64	12.92	45.56	54(note3)	-8.44	PK
	H	9648.00	30.72	16.19	46.90	54(note3)	-7.10	PK
	V	4825.50	33.00	8.02	41.02	54	-12.98	AV
	V	4833.50	45.66	8.13	53.79	74	-20.21	PK
	V	7236.00	32.58	12.92	45.50	54(note3)	-8.50	PK
	V	9648.00	30.69	16.19	46.88	54(note3)	-7.12	PK
5	H	4893.00	47.50	8.29	55.78	74	-18.22	PK
	H	4893.00	34.33	8.29	42.62	54	-11.38	AV
	H	7386.00	32.30	12.63	44.93	54(note3)	-9.07	PK
	H	9648.00	29.96	16.19	46.15	54(note3)	-7.85	PK
	V	4850.00	39.15	8.13	47.28	54	-6.72	AV
	V	4850.50	47.24	8.13	55.36	74	-18.64	PK
	V	7266.00	32.20	12.72	44.92	54(note3)	-9.08	PK
	V	9688.00	30.34	15.90	46.24	54(note3)	-7.76	PK
9	H	4905.00	43.71	8.54	52.25	54	-1.75	AV
	H	4905.00	45.53	8.53	54.06	74	-19.94	PK
	H	7356.00	32.92	13.22	46.14	54(note3)	-7.86	PK
	H	9808.00	30.74	16.06	46.80	54(note3)	-7.20	PK
	V	4904.65	43.40	8.54	51.94	54	-2.06	AV
	V	4905.00	45.66	8.53	54.19	74	-19.81	PK
	V	7356.00	34.22	13.22	47.44	54(note3)	-6.56	PK
	V	9808.00	30.63	16.06	46.69	54(note3)	-7.31	PK

Note: 1. Measure Level = Reading Level + Factor.

2. The test frequency range, 9kHz~30MHz, 18GHz~25GHz, both of the worst case are at least 6dB below the limits, therefore no data appear in the report.
3. This limit applies for using average detector, if the test result on peak is lower than average limit, then average measurement needn't be performed.

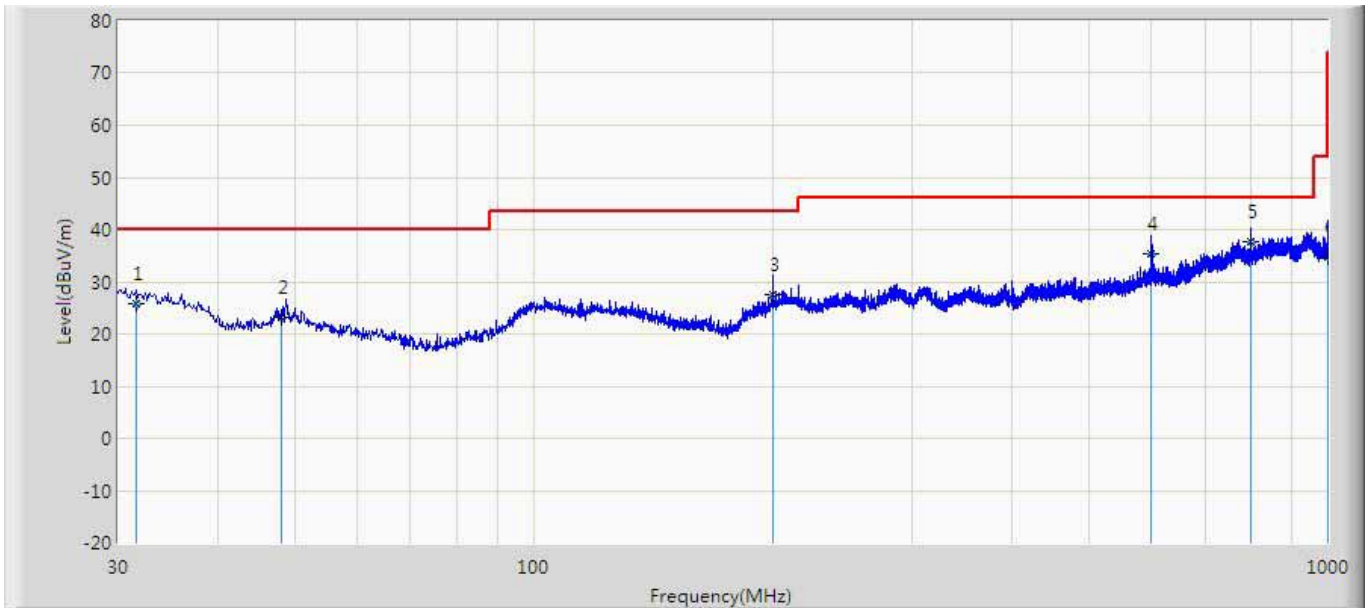
The worst case of Radiated Emission below 1GHz:

Site: AC3	Time: 2015/09/24
Limit: FCC_Part15.109_RE(3m)_ClassB	Margin: 0
Probe: AC3_10m (30-1000MHz)	Polarity: Horizontal
EUT: Wi-Fi Smart Plug With Energy Monitoring	Power: AC 120V/60Hz
Note: Mode 1: Transmit at CH2412 by 802.11b	



No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		30.265	29.851	2.033	-10.149	40.000	27.818	QP
2		160.265	20.780	3.465	-22.720	43.500	17.315	QP
3		447.766	29.415	2.565	-16.585	46.000	26.850	QP
4		600.265	33.172	5.015	-12.828	46.000	28.157	QP
5	*	800.457	35.945	6.226	-10.055	46.000	29.719	QP
6		999.987	37.566	5.157	-16.434	54.000	32.409	QP

Site: AC3	Time: 2015/09/24
Limit: FCC_Part15.109_RE(3m)_ClassB	Margin: 0
Probe: AC3_10m (30-1000MHz)	Polarity: Vertical
EUT: Wi-Fi Smart Plug With Energy Monitoring	Power: AC 120V/60Hz
Note: Mode 1: Transmit at CH2412 by 802.11b	



No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		31.666	25.665	2.100	-14.335	40.000	23.565	QP
2		48.235	23.204	5.356	-16.796	40.000	17.848	QP
3		200.032	27.493	5.032	-16.007	43.500	22.461	QP
4		600.033	35.433	8.165	-10.567	46.000	27.268	QP
5	*	800.655	37.707	6.022	-8.293	46.000	31.685	QP
6		999.999	34.749	2.200	-19.251	54.000	32.549	QP

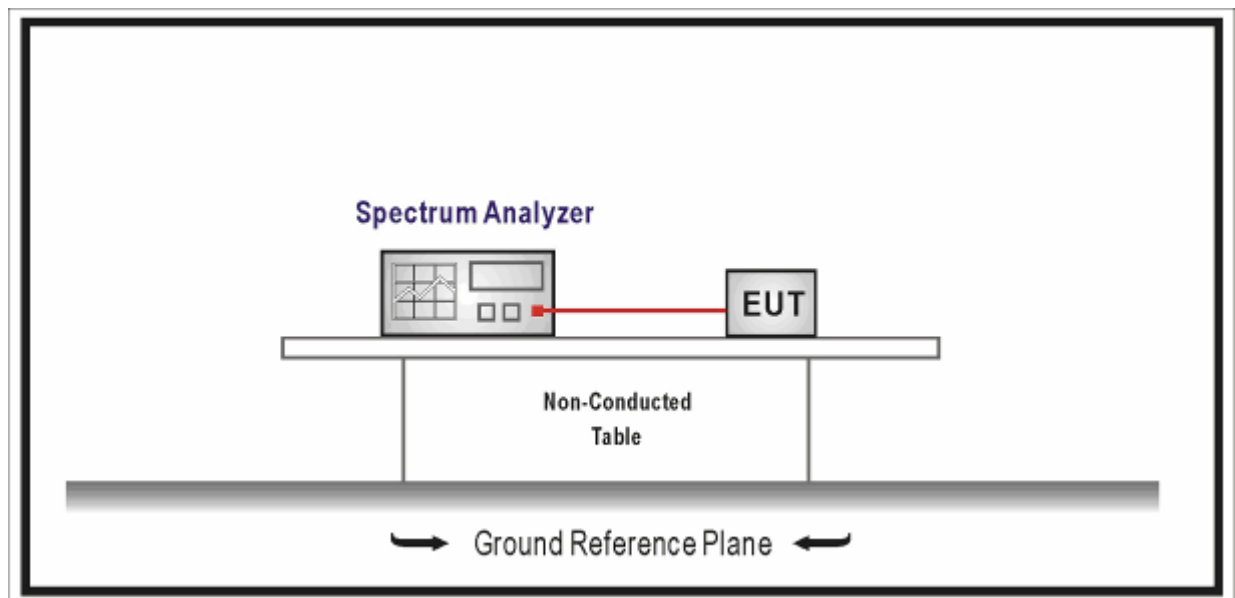
5. RF Antenna Conducted Spurious
5.1. Test Equipment

RF Antenna Conducted Spurious / TR-8

Instrument	Manufacturer	Type No.	Serial No.	Cal. Due Date
Spectrum Analyzer	Agilent	E4446A	MY45300103	2016.01.07
Temperature/Humidity Meter	zhichen	ZC1-2	TR8-TH	2016.04.09

Note: All equipments are calibrated with traceable calibrations. Each calibration is traceable to the national or international standards.

5.2. Test Setup



5.3. Limit

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum 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.

If maximum conducted (average) output power was used to determine compliance as described in 11.9.2, then the peak power in any 100 kHz bandwidth outside of the authorized frequency band shall be attenuated by at least 30 dB relative to the maximum in-band peak PSD level in 100 kHz (i.e., 30 dBc)

5.4. Test Procedure

According to FCC ANSI C63.4: 2014 & ANSI C63.10: 2013& FCC 47CFR 15.247& KDB
558074 D01v03r03

Set RBW = 100 kHz, Set VBW > RBW, scan up through 10th harmonic.

5.5. Uncertainty

The measurement uncertainty is defined as ± 1.27 dB

5.6. Test Result

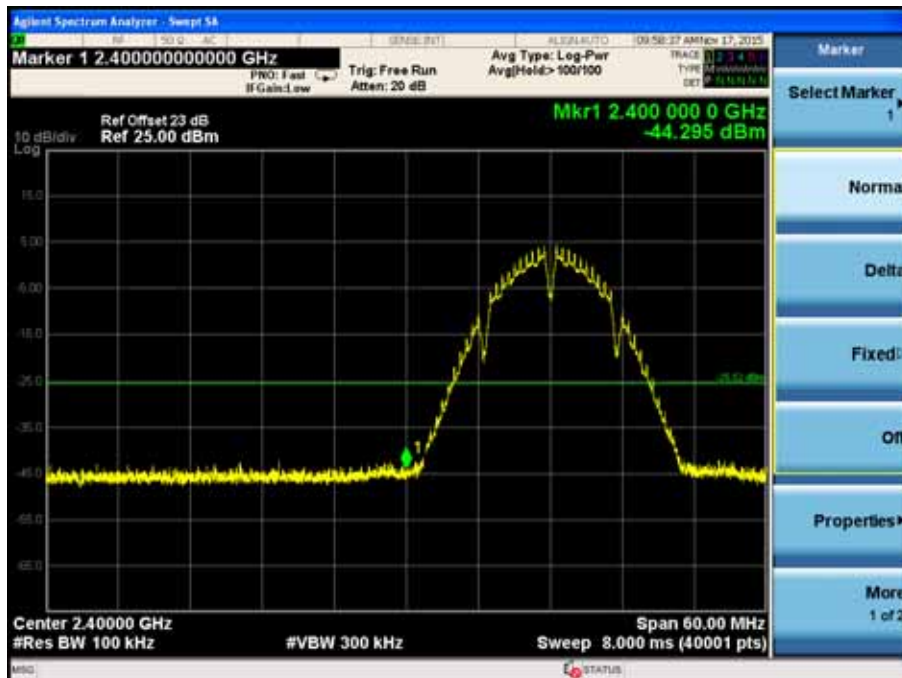
Product	:	Wi-Fi Smart Plug With Energy Monitoring
Test Item	:	RF Antenna Conducted Spurious
Test Site	:	TR-8
Test Mode	:	Mode 1: Transmit by 802.11b

Channel 01 (2412MHz)

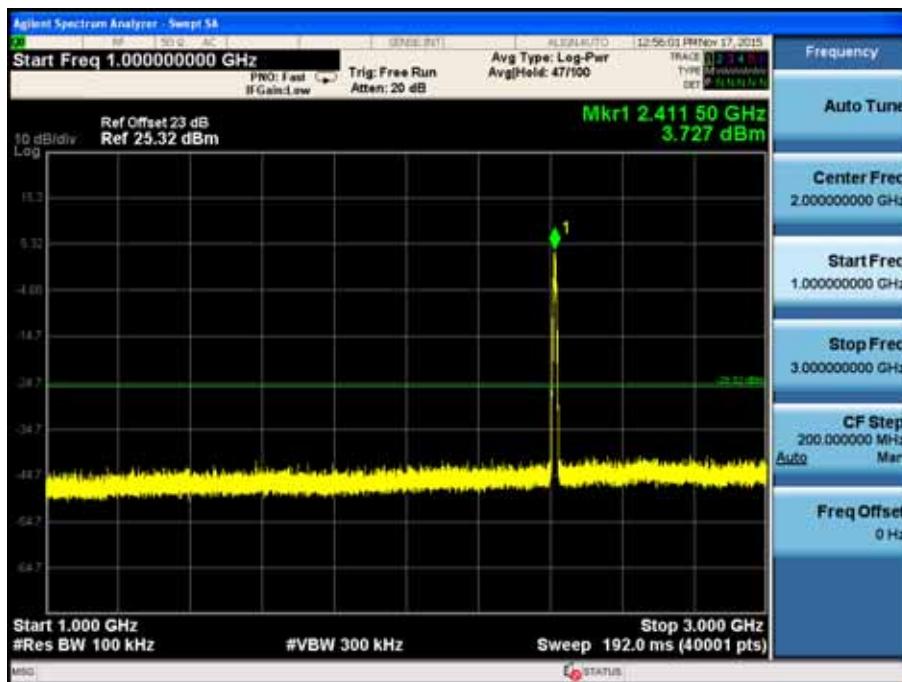
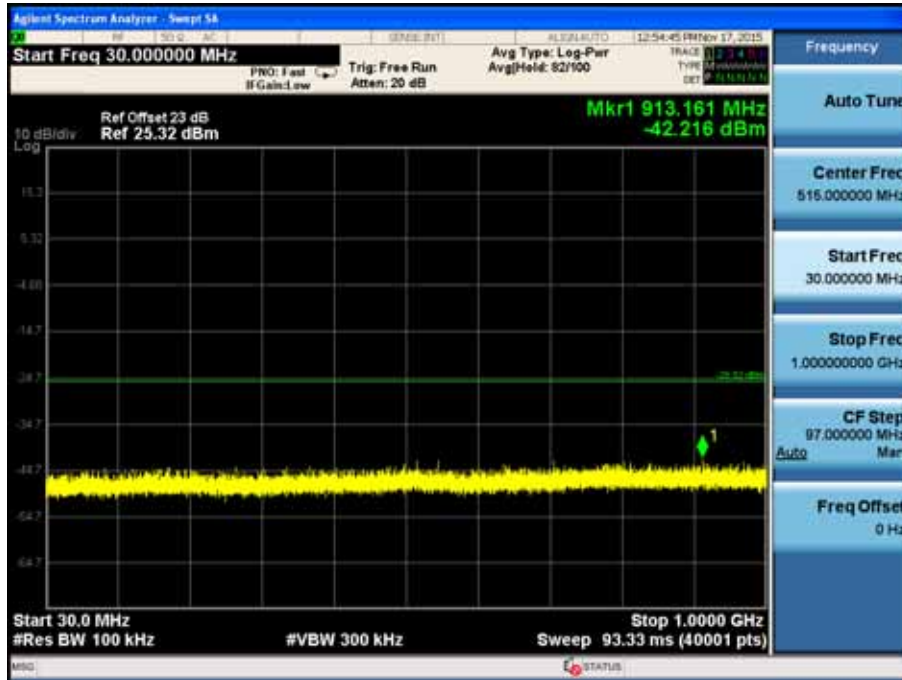
Reference Level – Frequency L



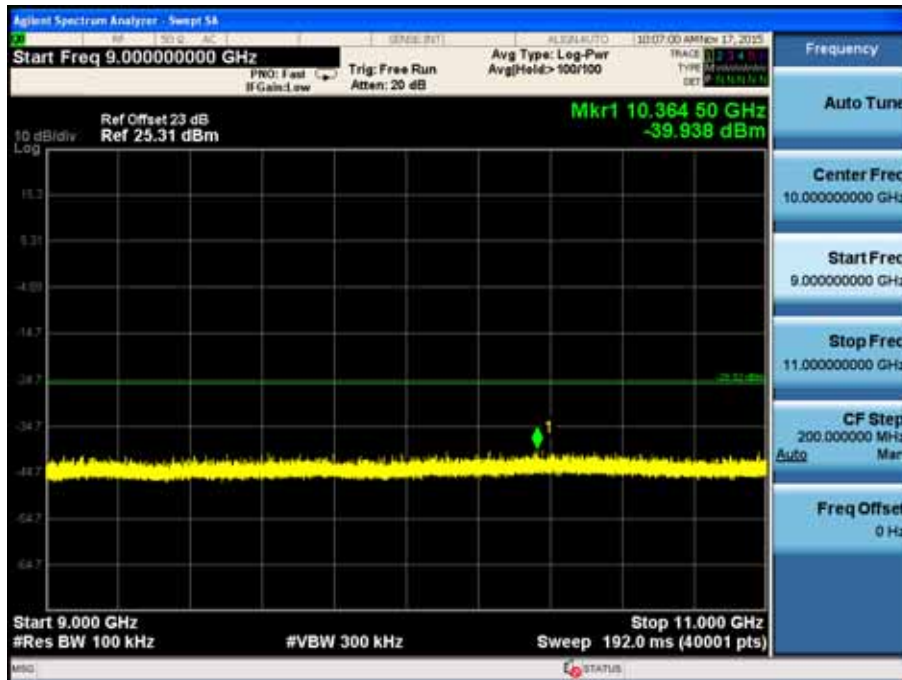
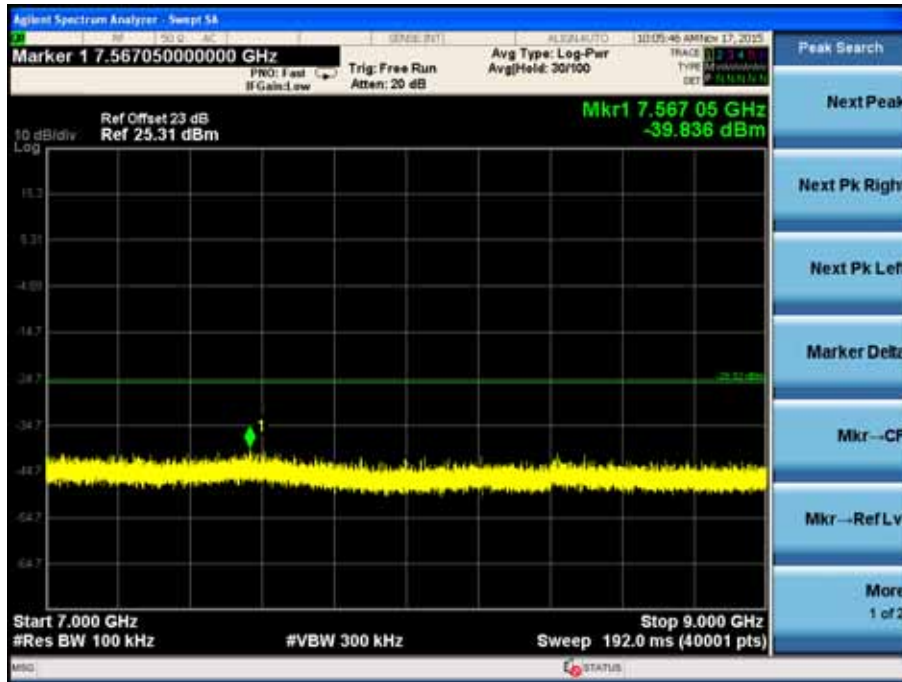
Low Band Edge - Frequency L

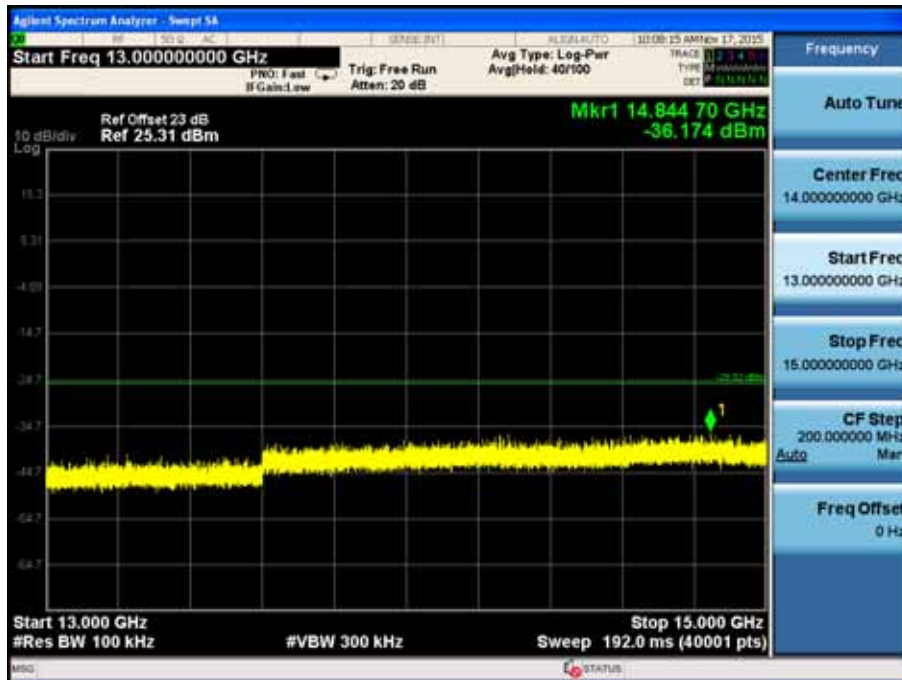
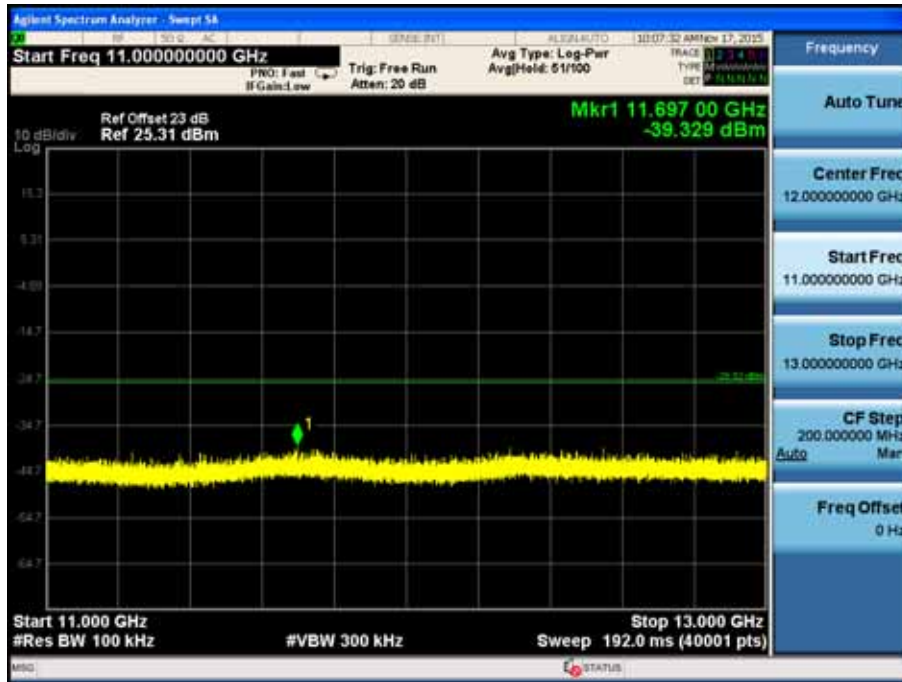


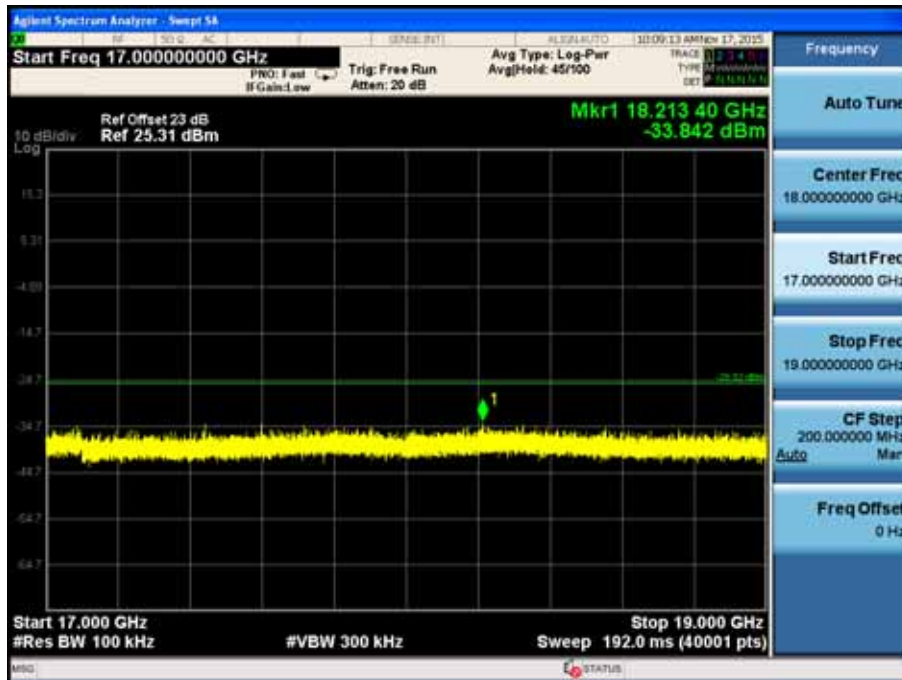
Spurious Emission 30MHz ~ 25GHz - Frequency L

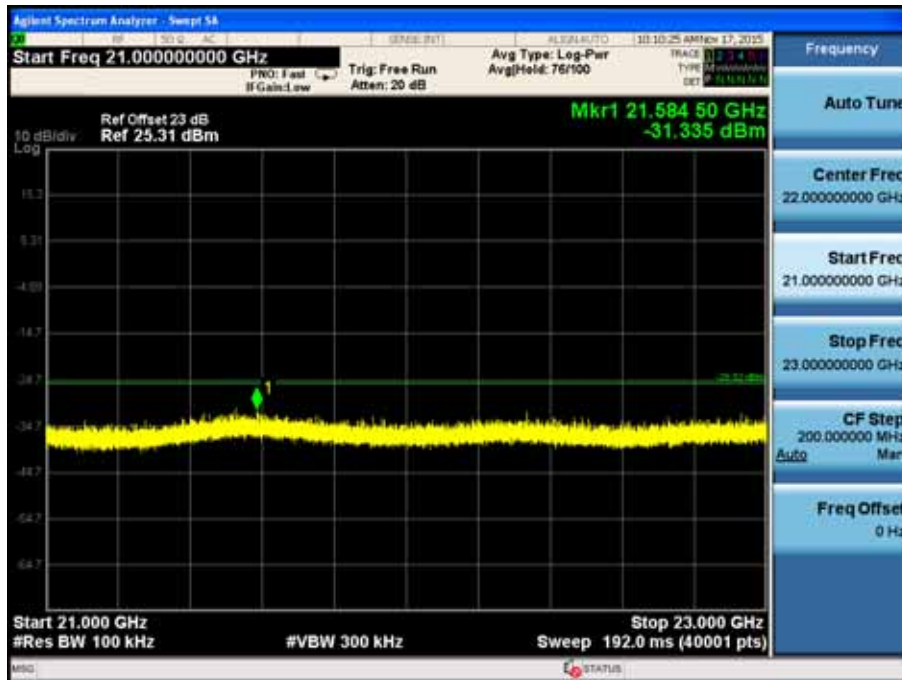
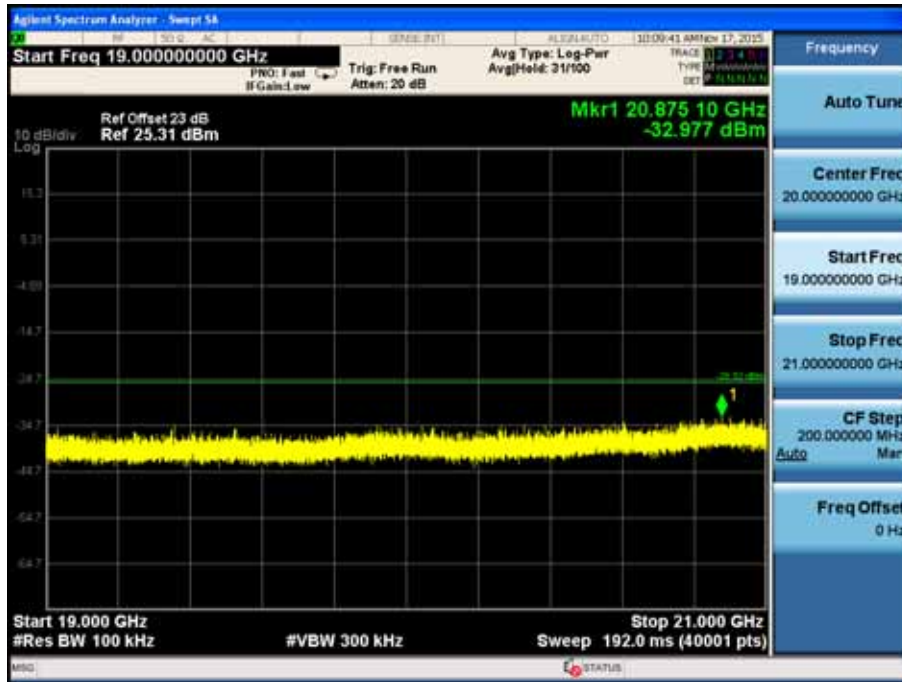


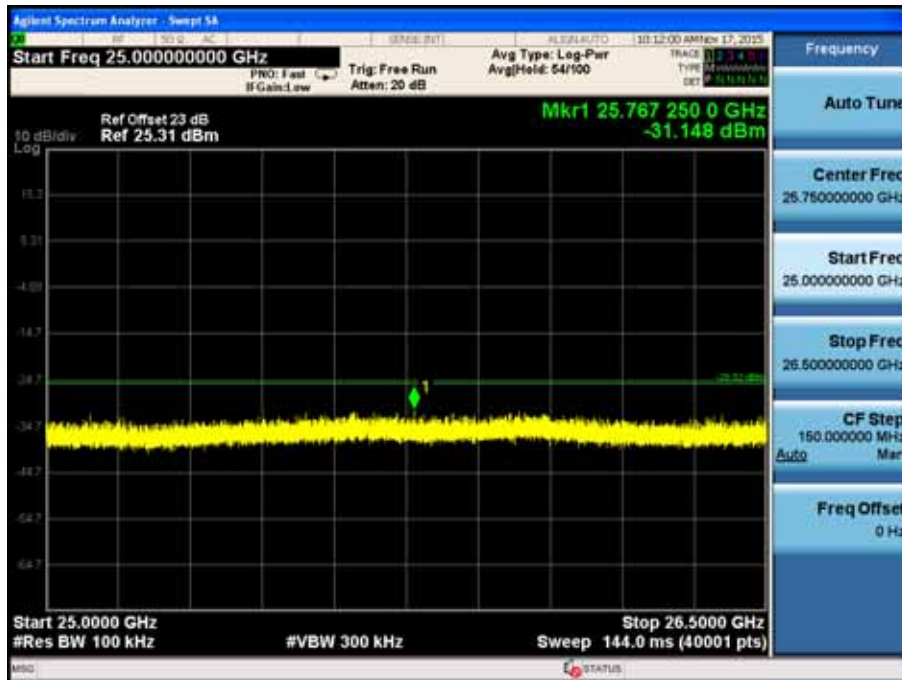








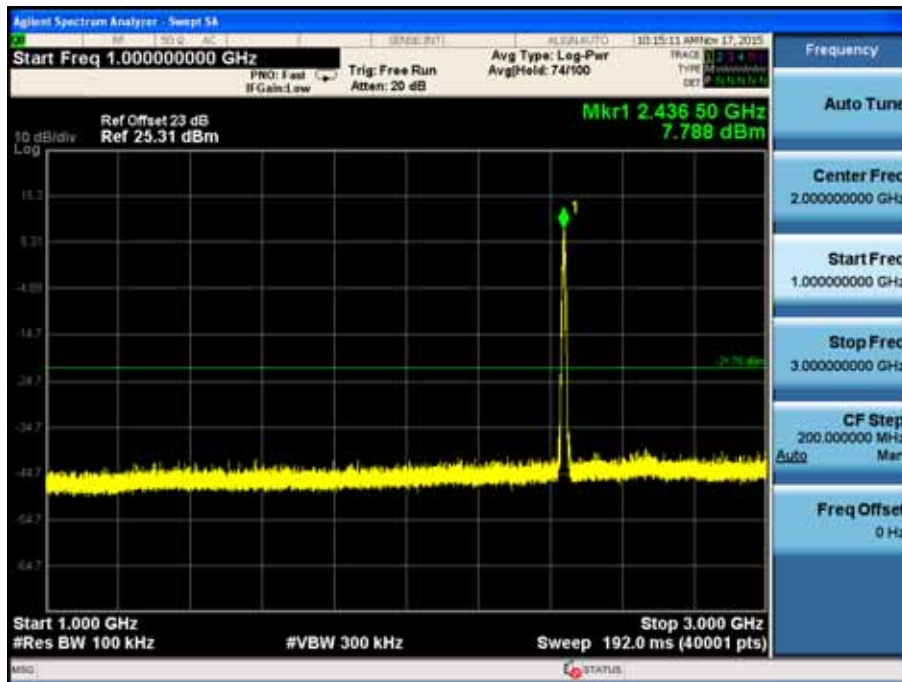
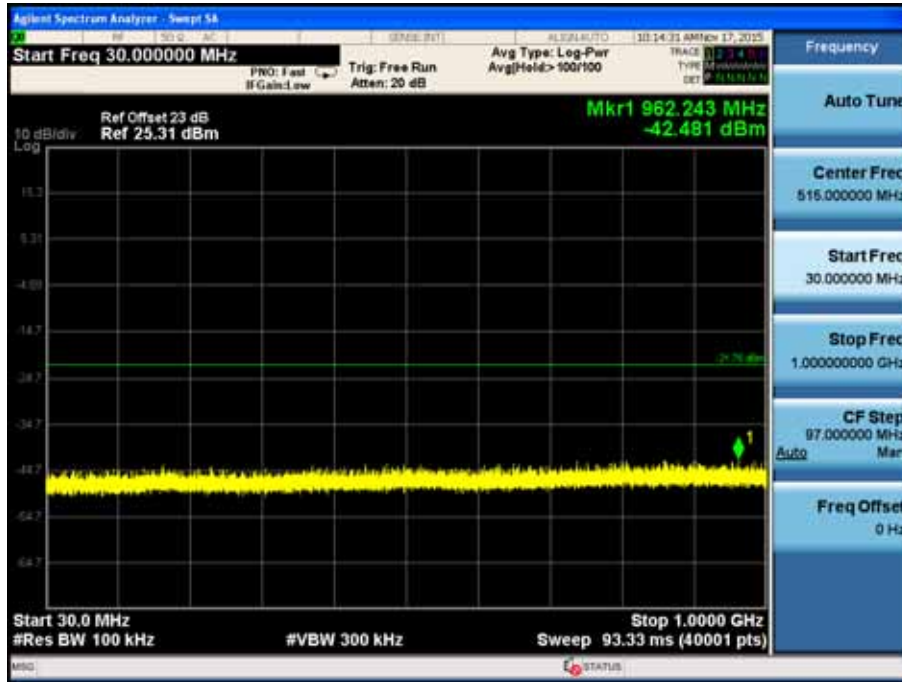


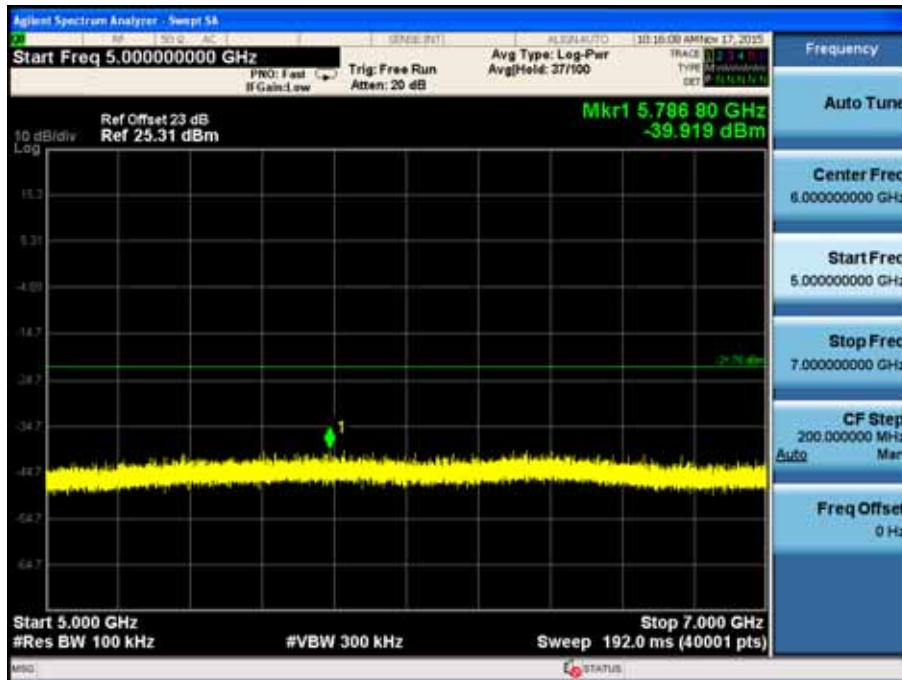
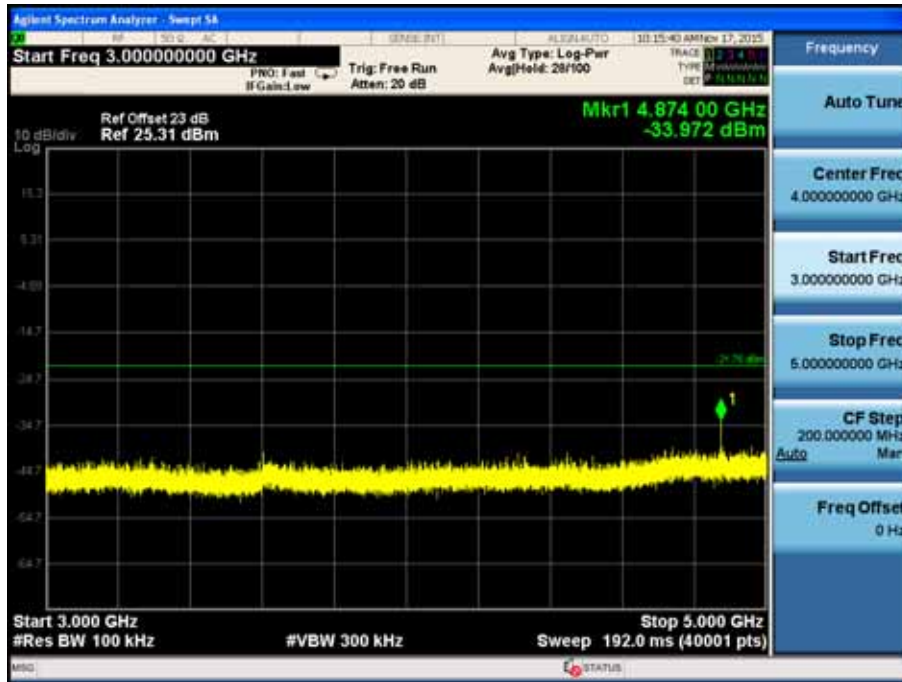


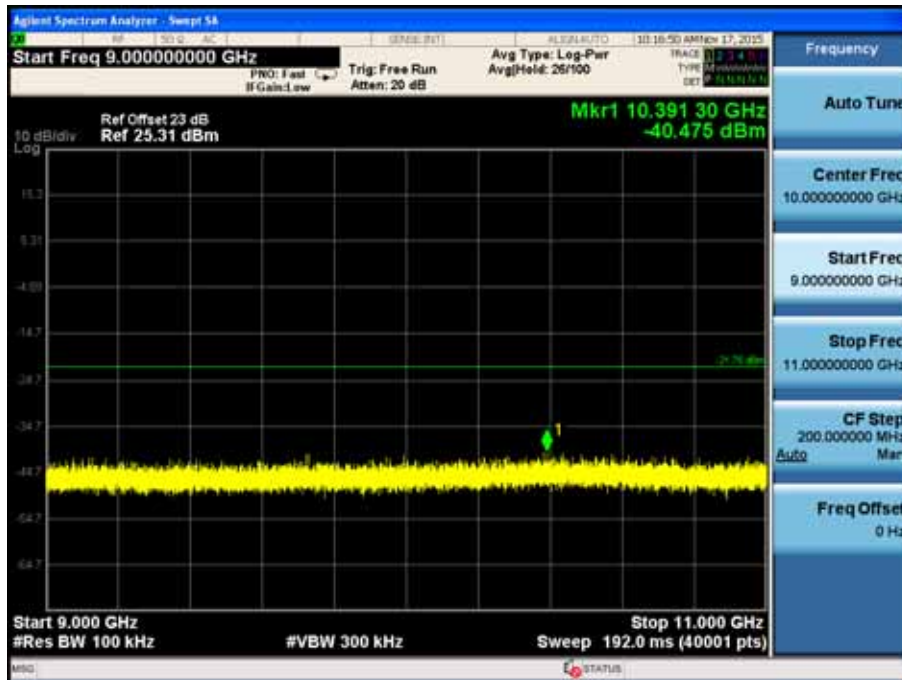
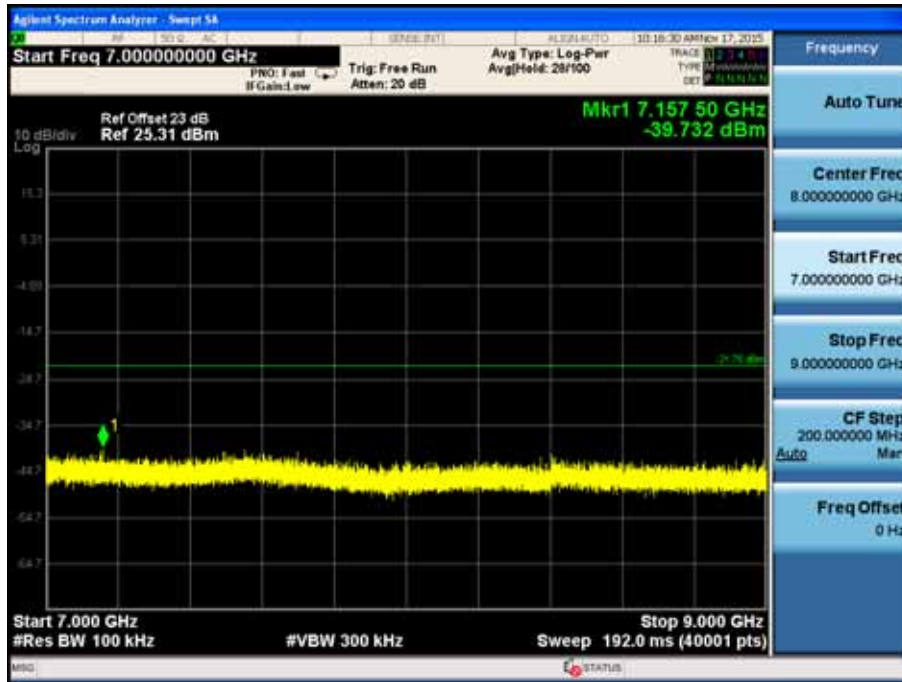
Channel 06 (2437MHz)
 Reference Level – Frequency M

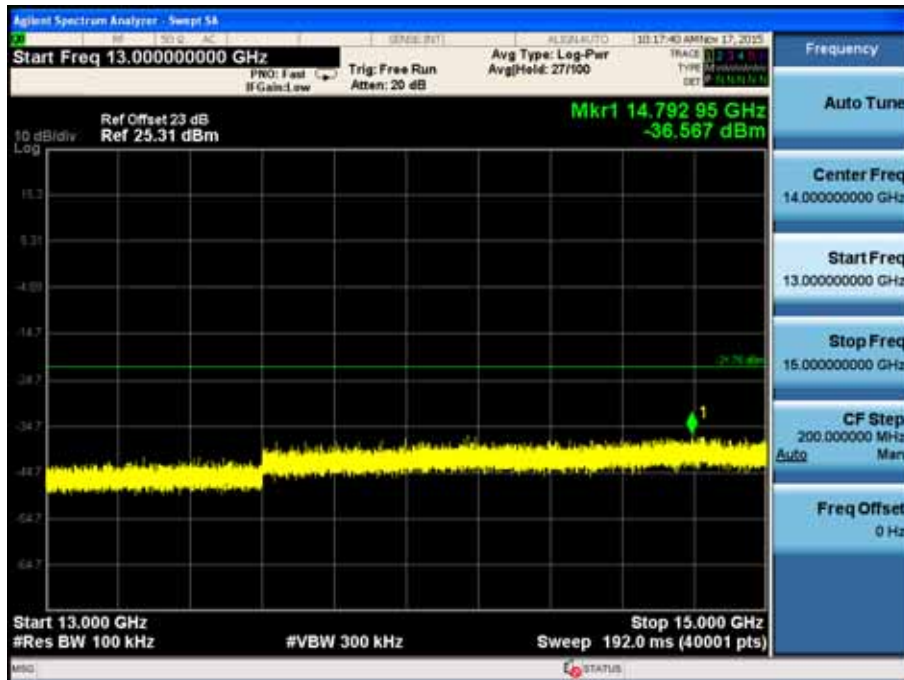
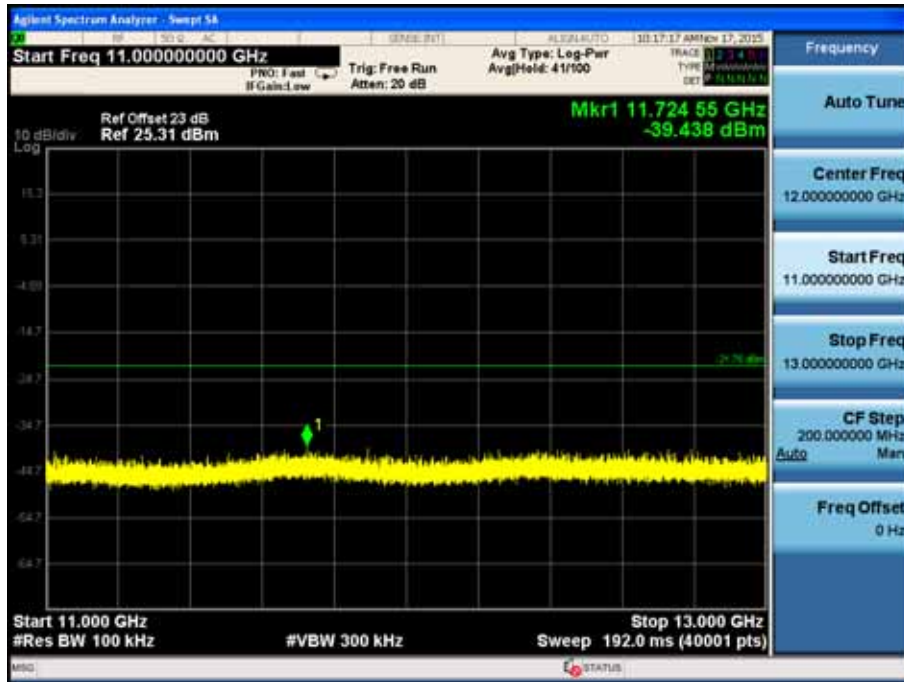


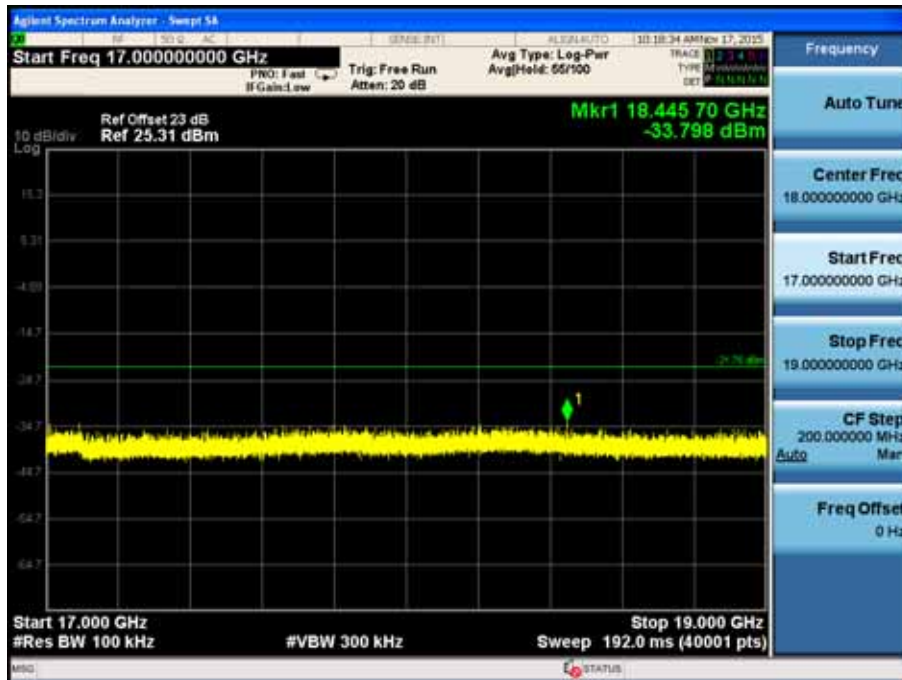
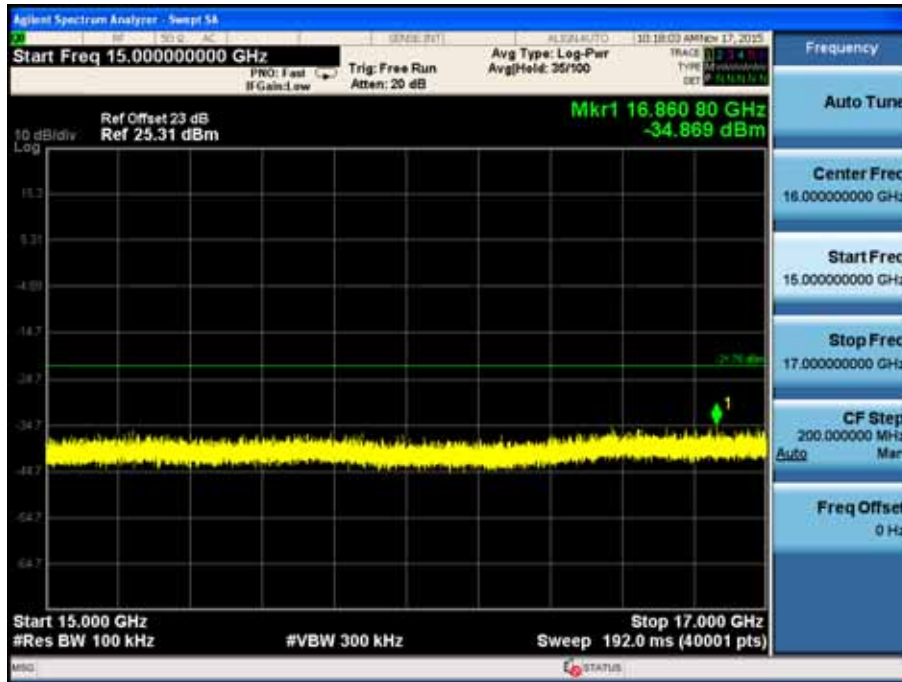
Spurious Emission 30MHz ~ 25GHz - Frequency M

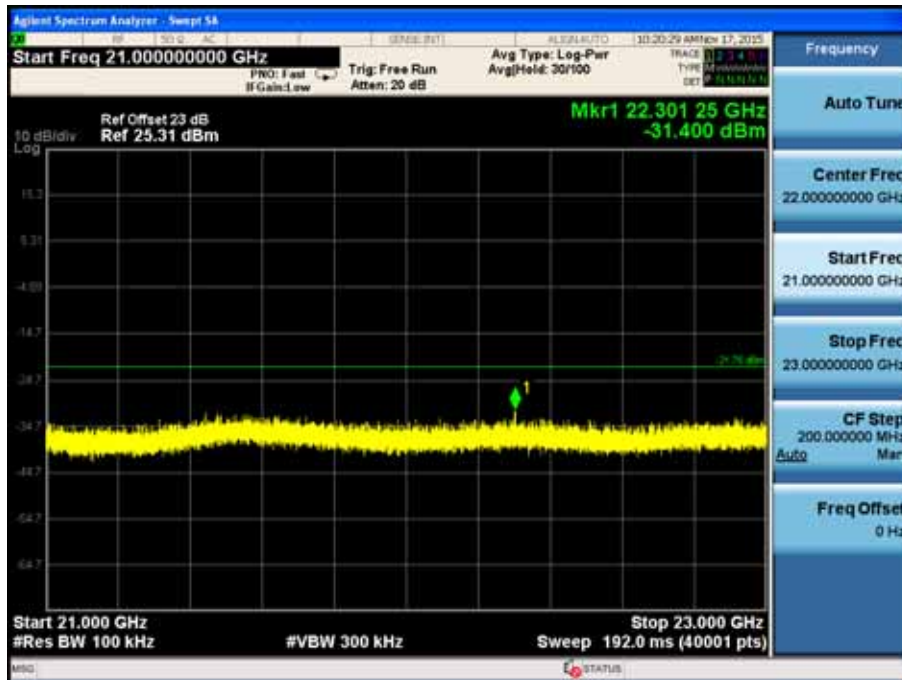


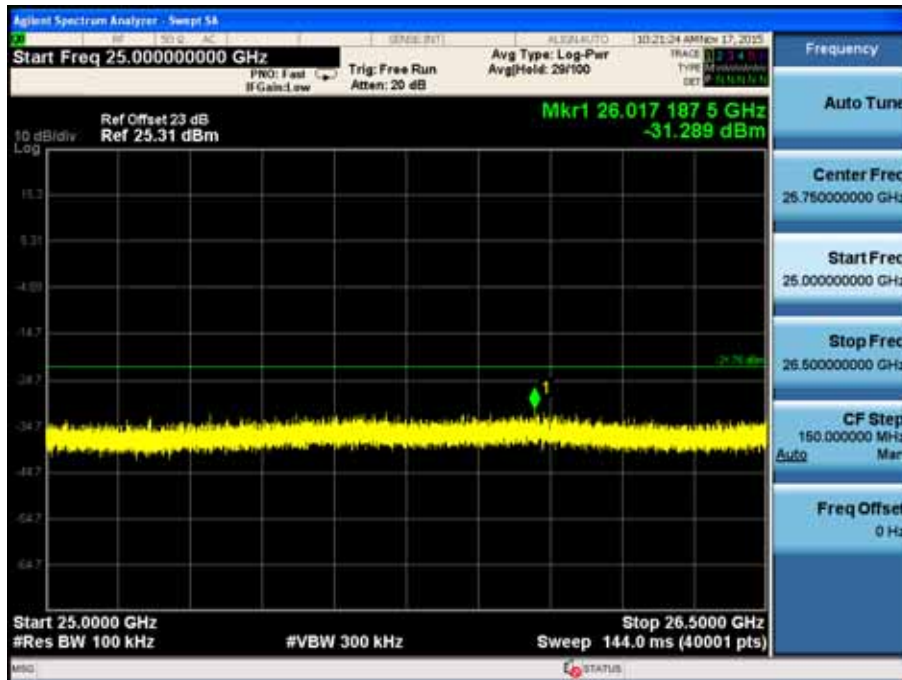
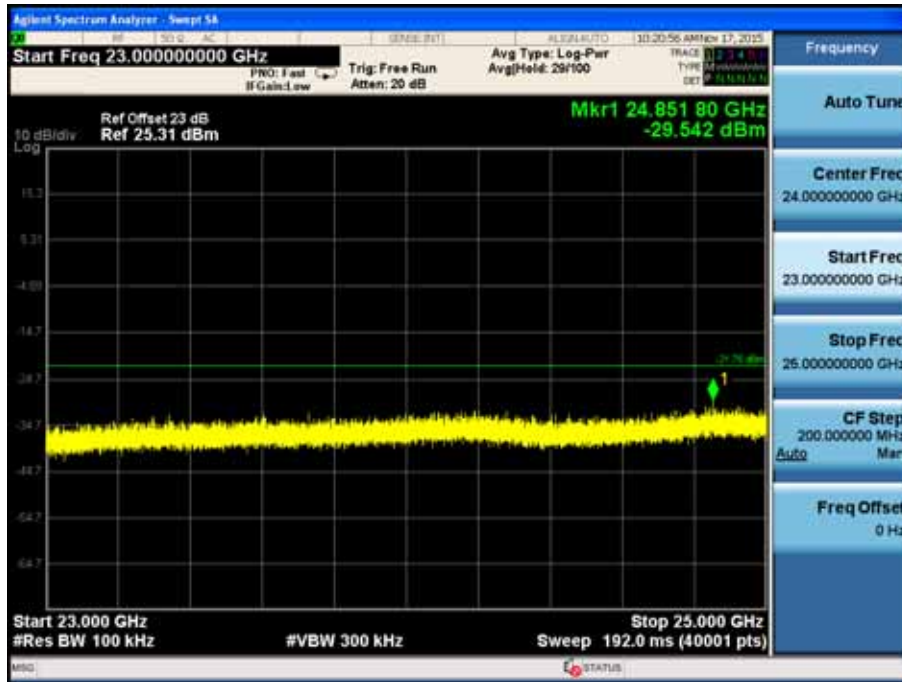












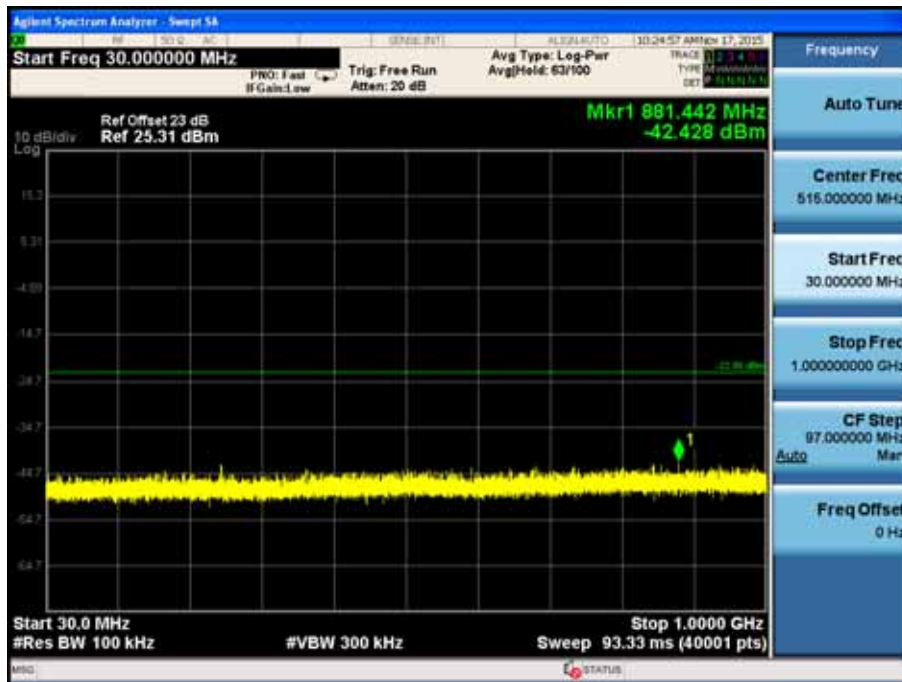
Channel 11 (2462MHz)
 Reference Level – Frequency H

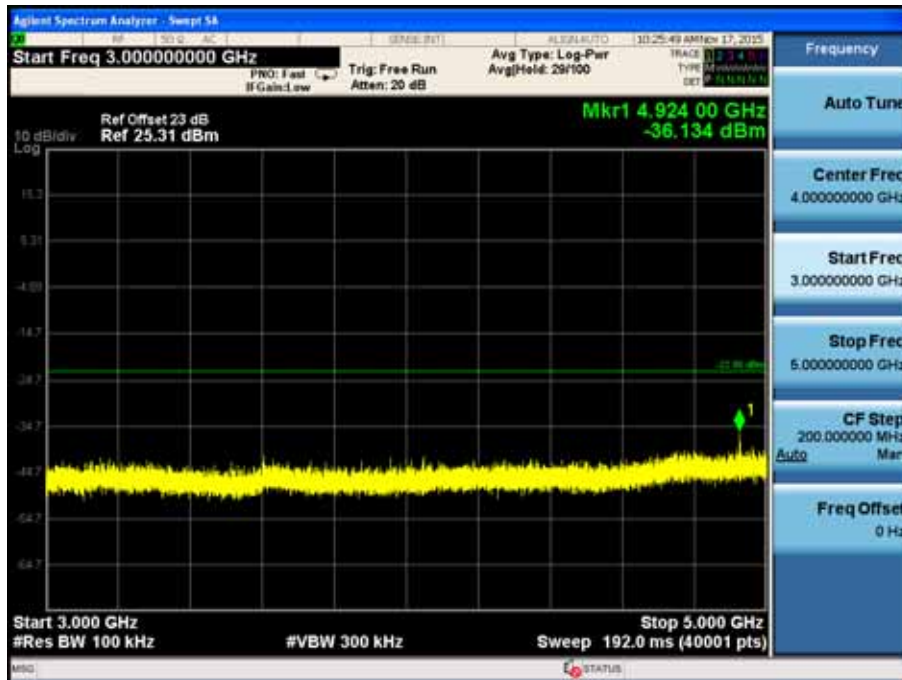
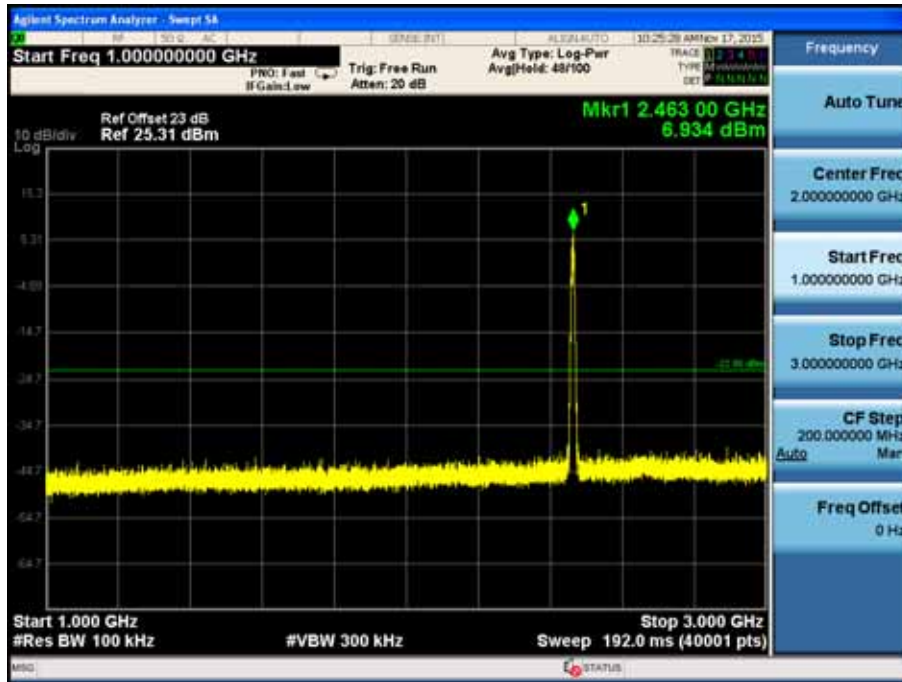


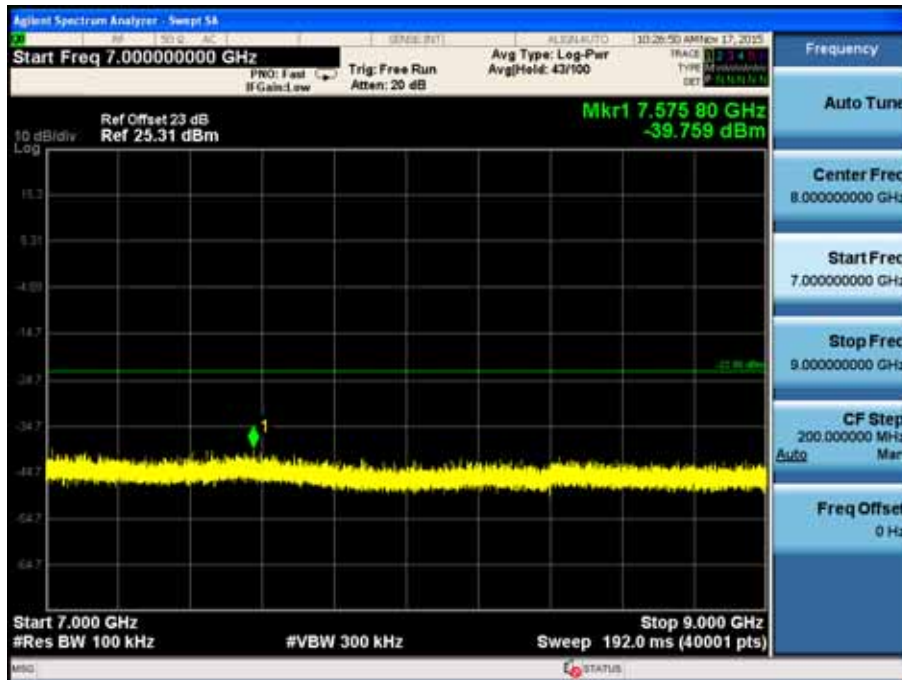
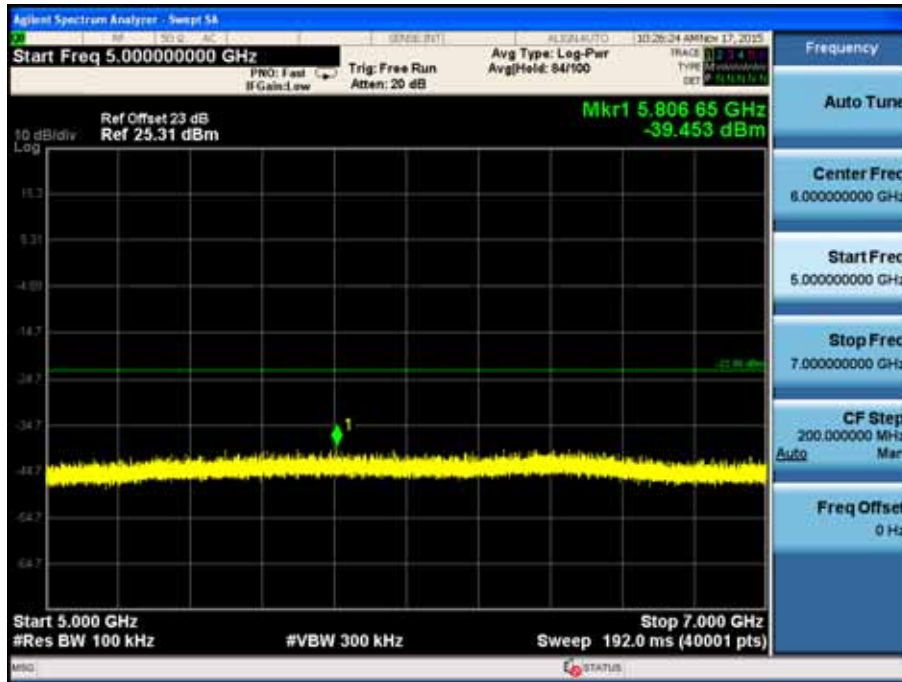
High Band Edge - Frequency H

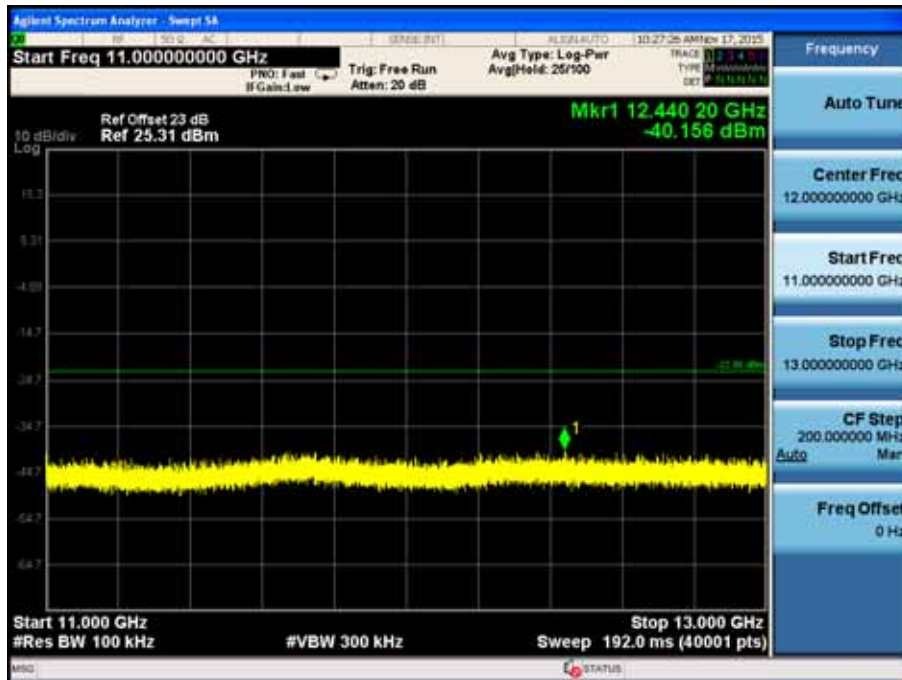
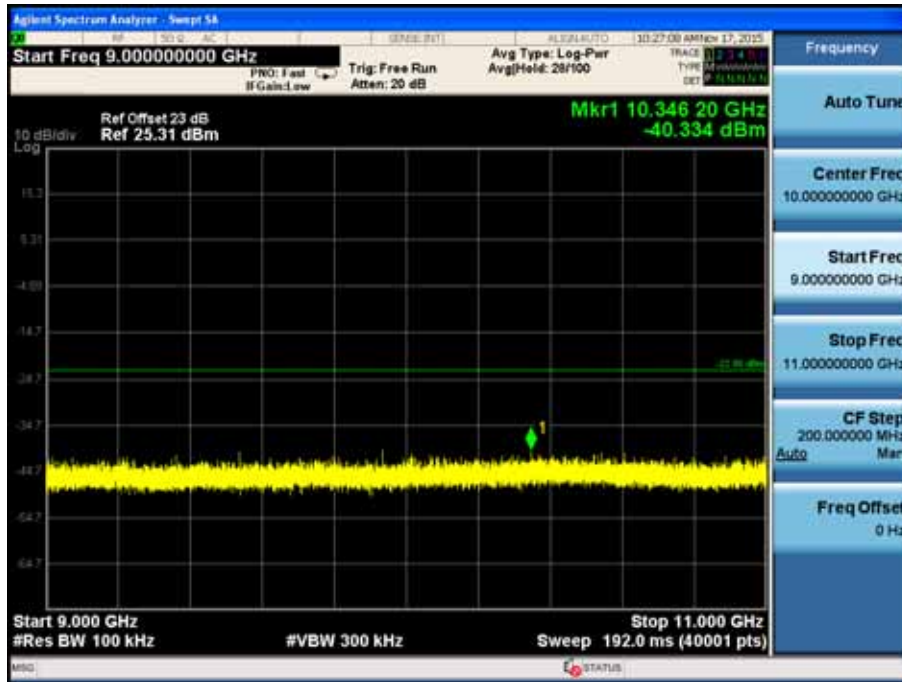


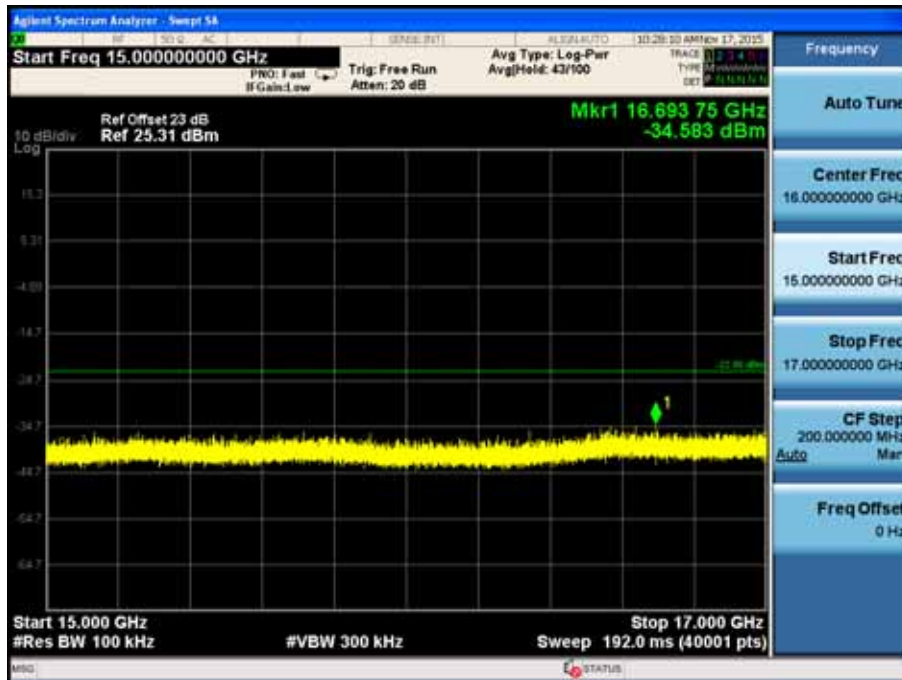
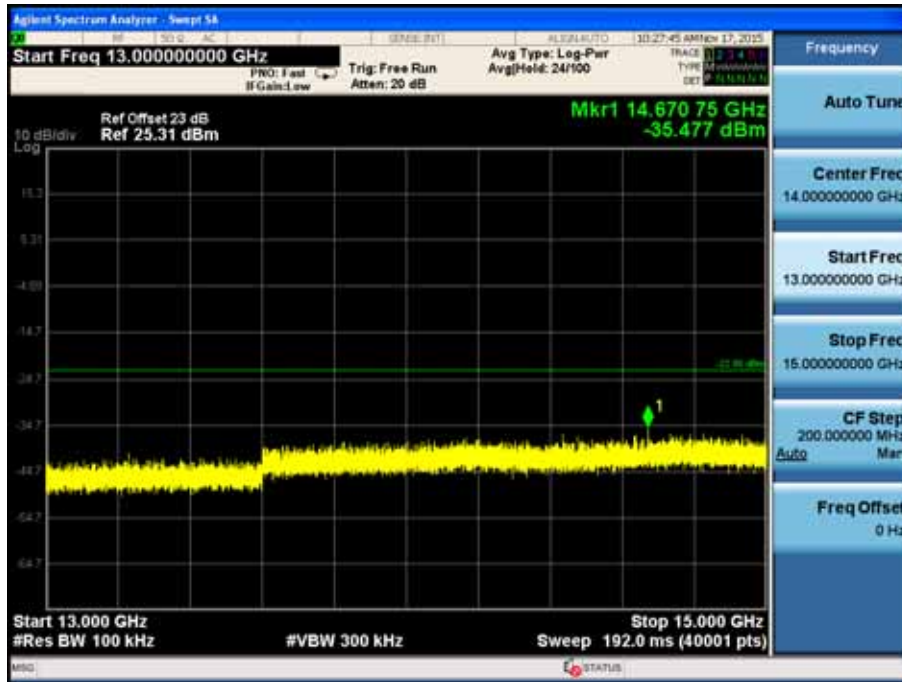
Spurious Emission 30MHz ~ 25GHz - Frequency H

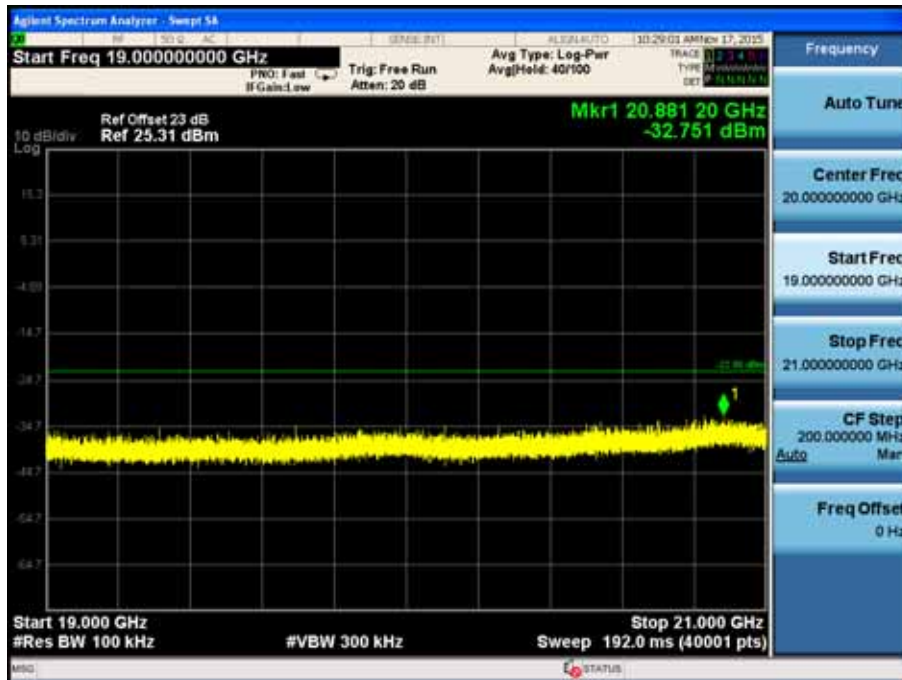
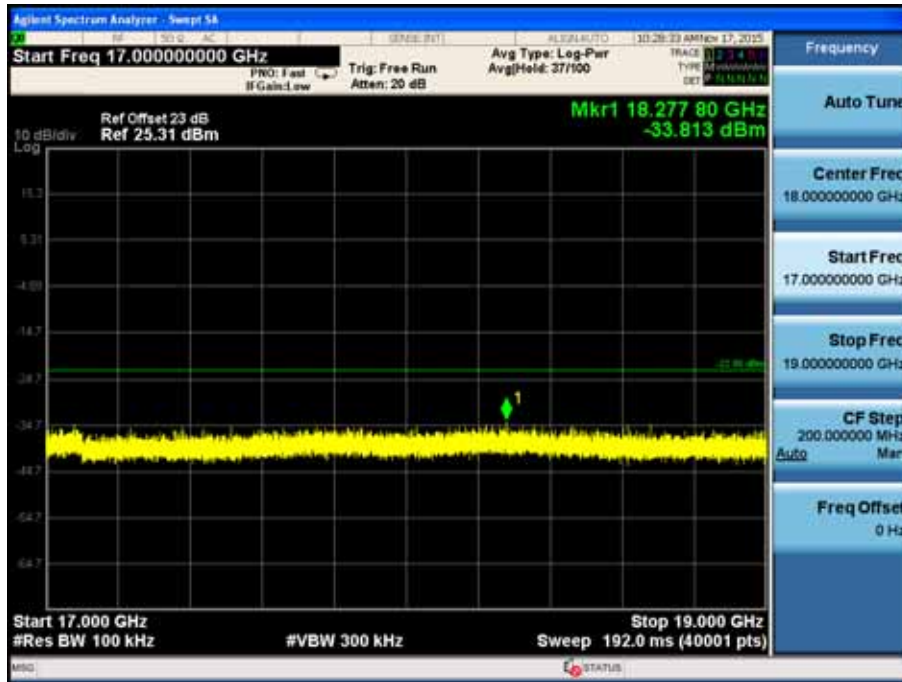


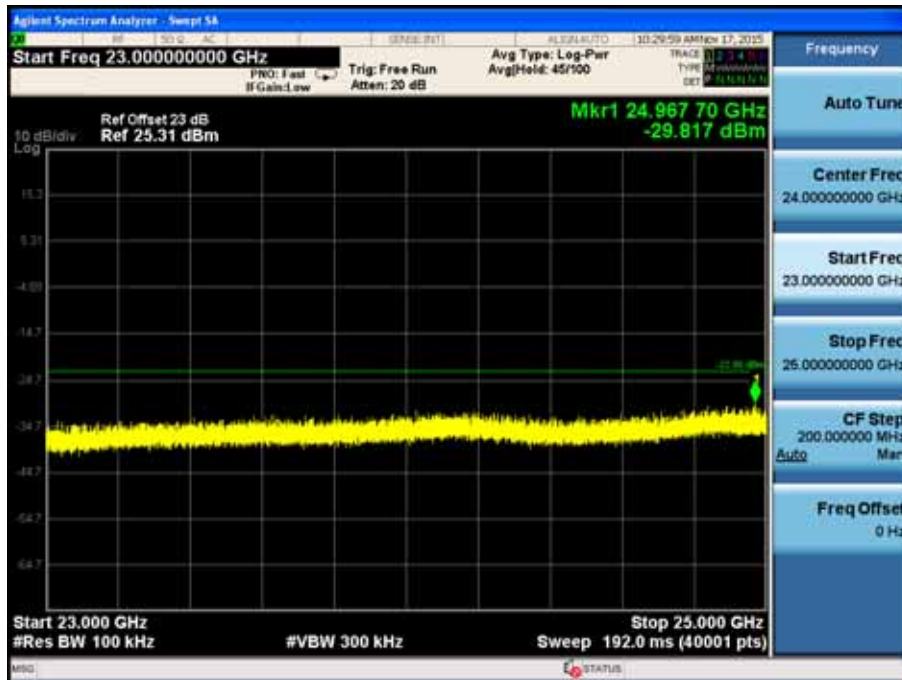


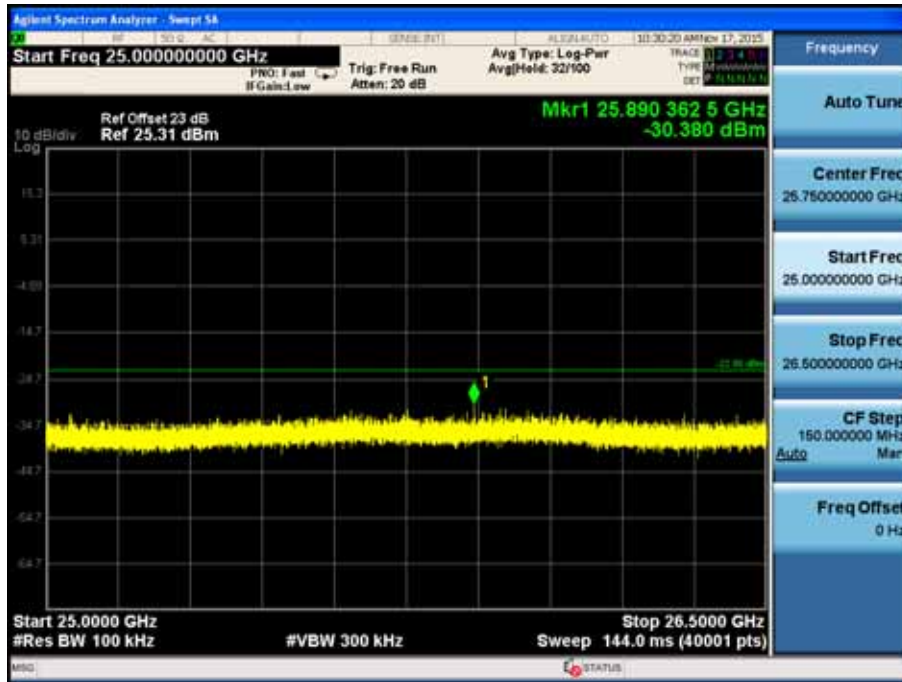






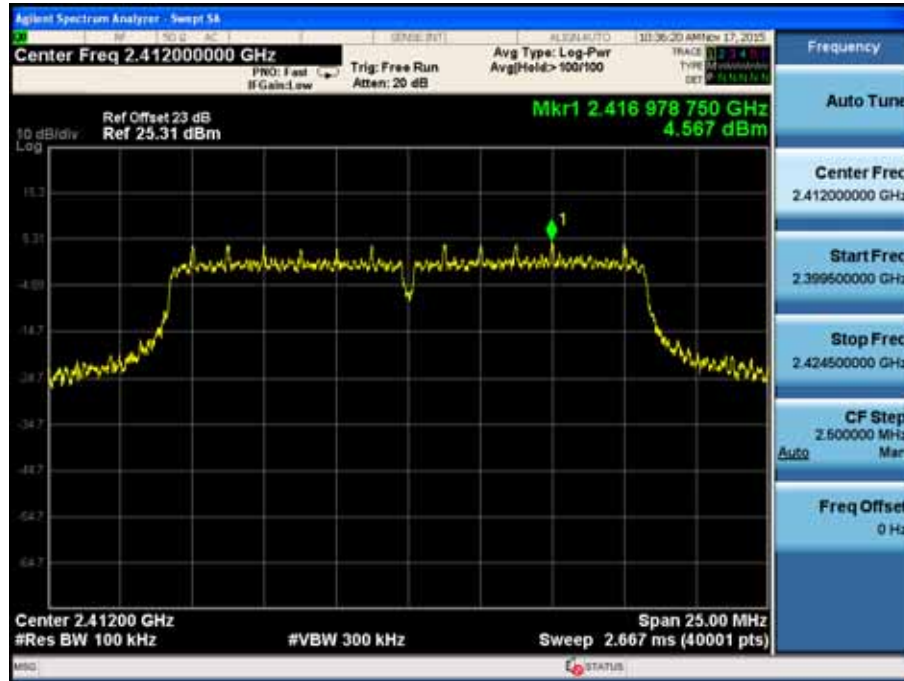




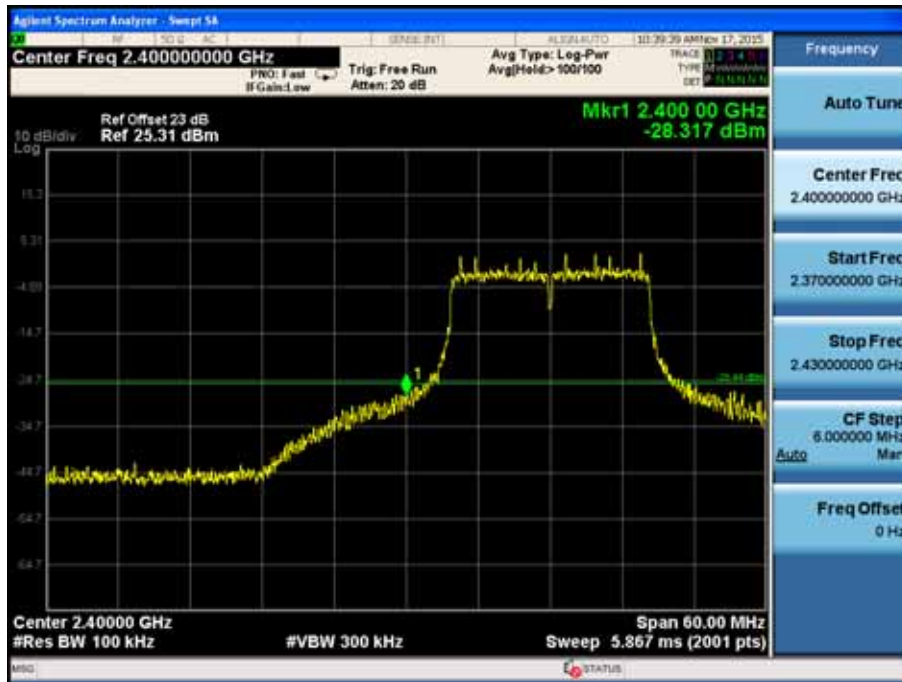


Product	:	Wi-Fi Smart Plug With Energy Monitoring
Test Item	:	RF Antenna Conducted Spurious
Test Site	:	TR-8
Test Mode	:	Mode 2: Transmit by 802.11g

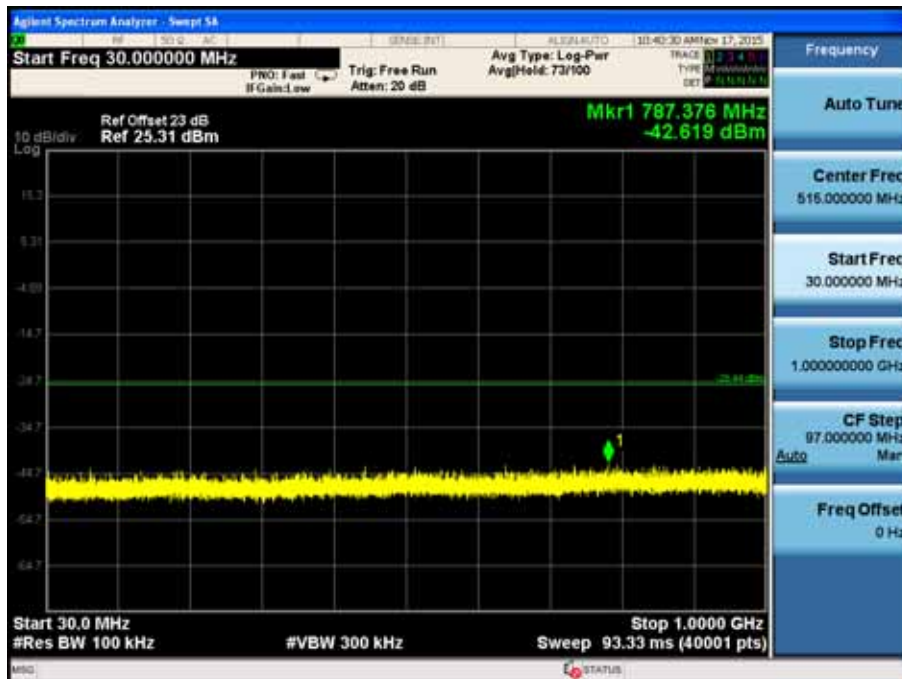
Channel 01 (2412MHz)
 Reference Level – Frequency L

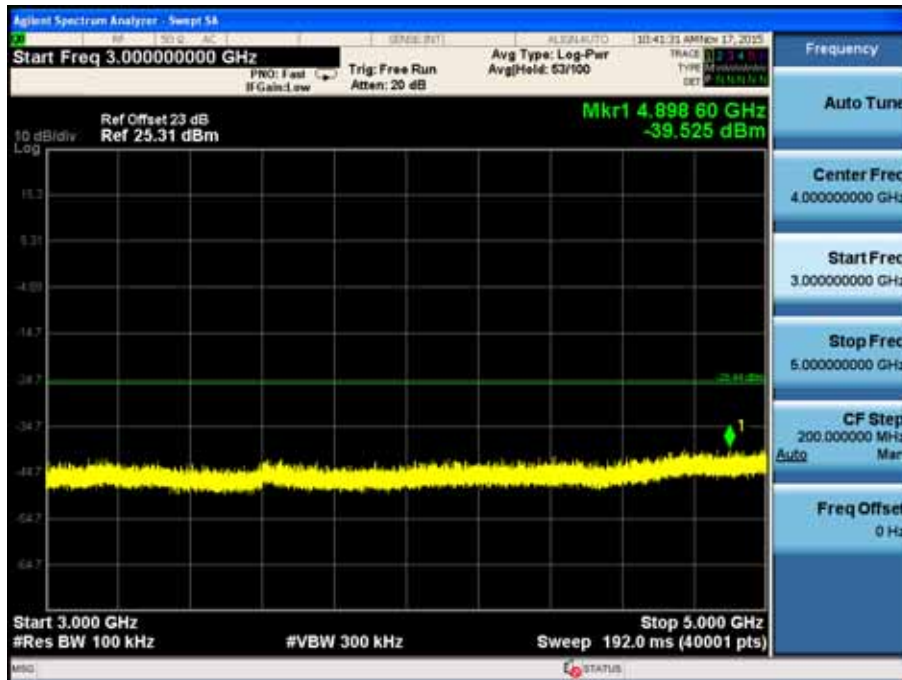
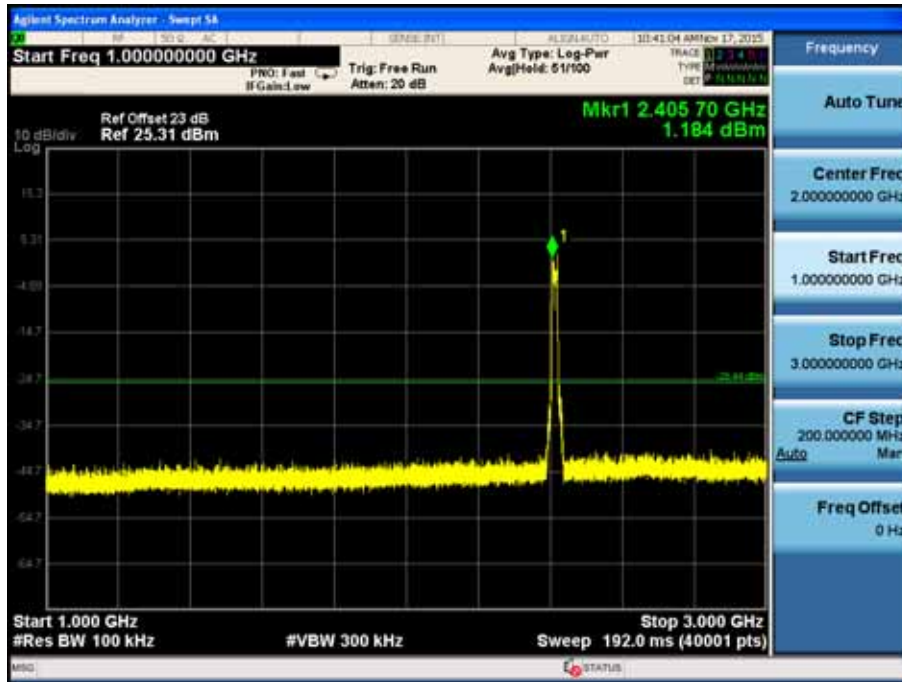


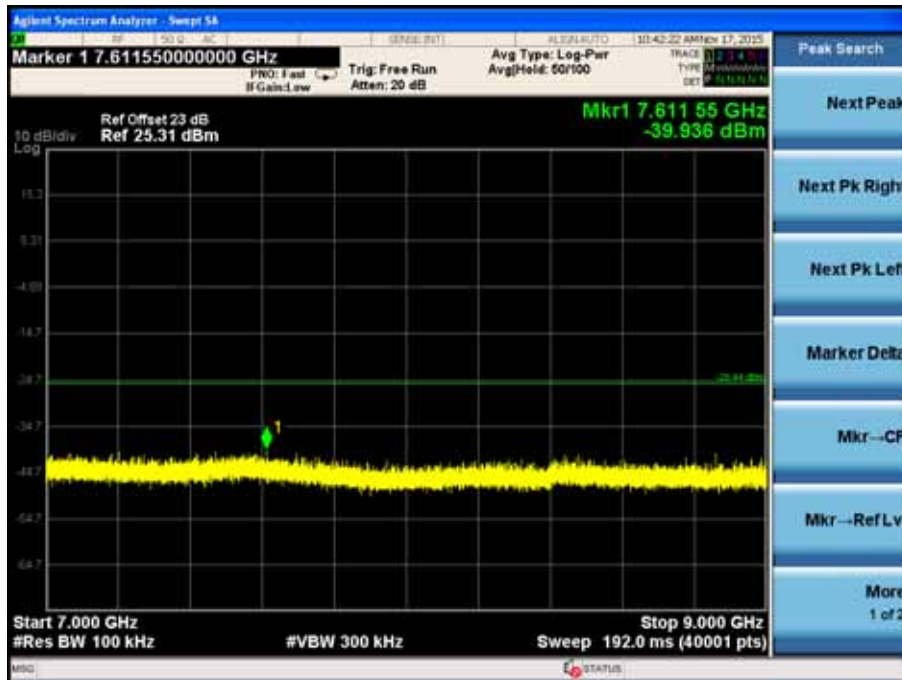
Low Band Edge - Frequency L

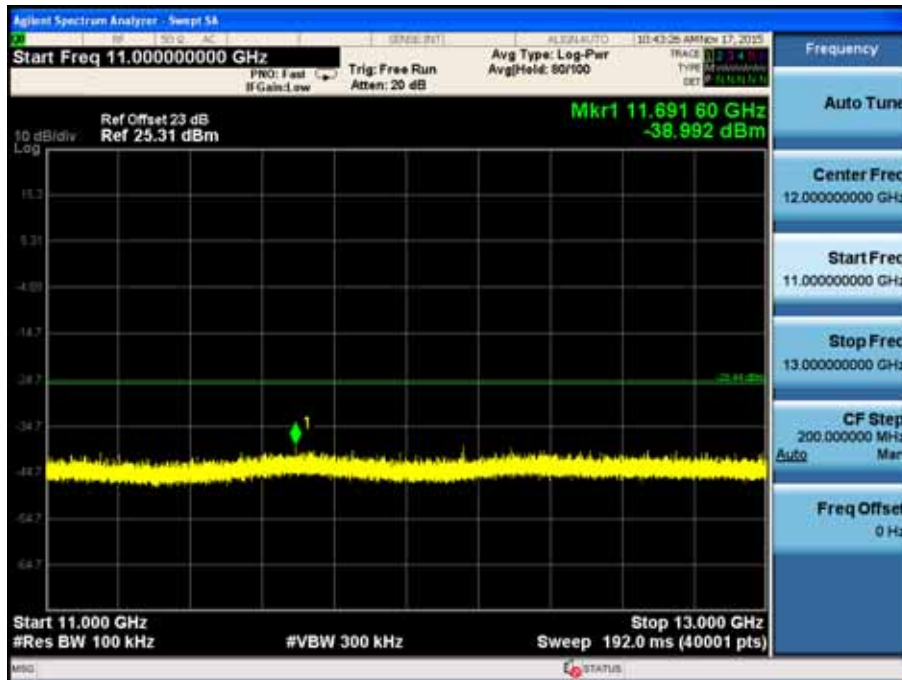
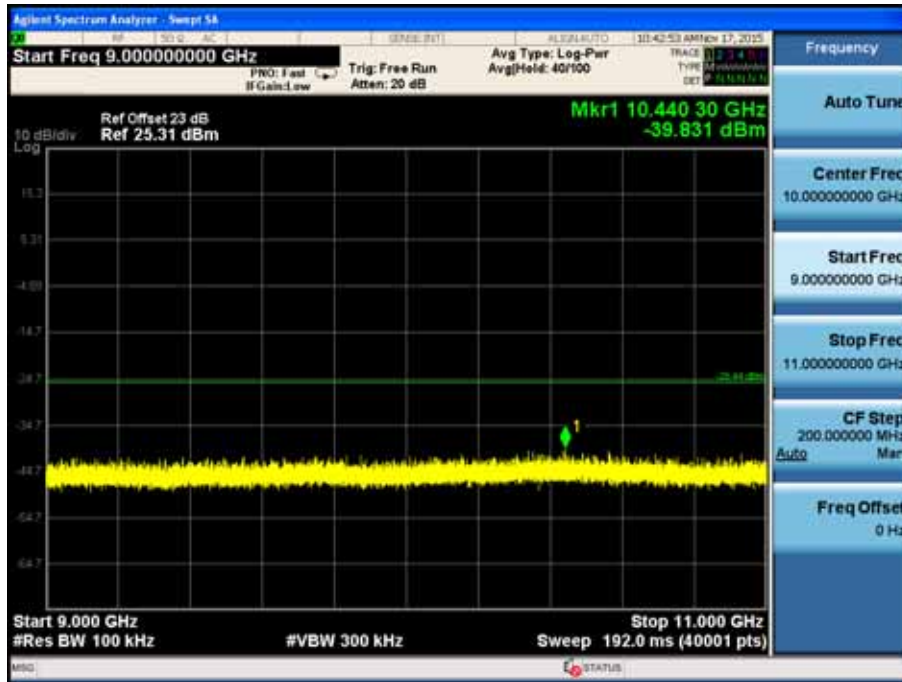


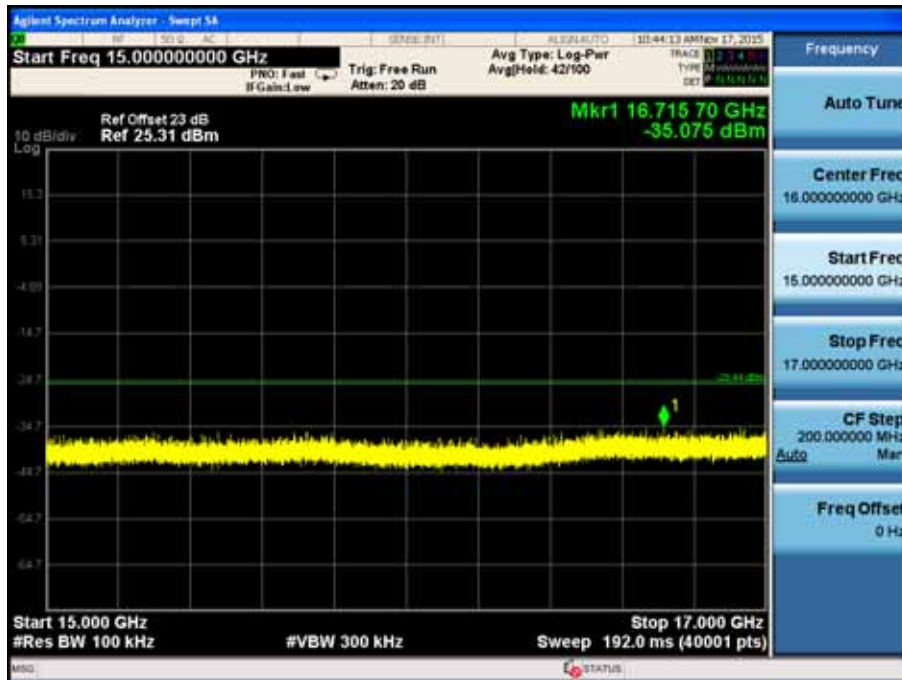
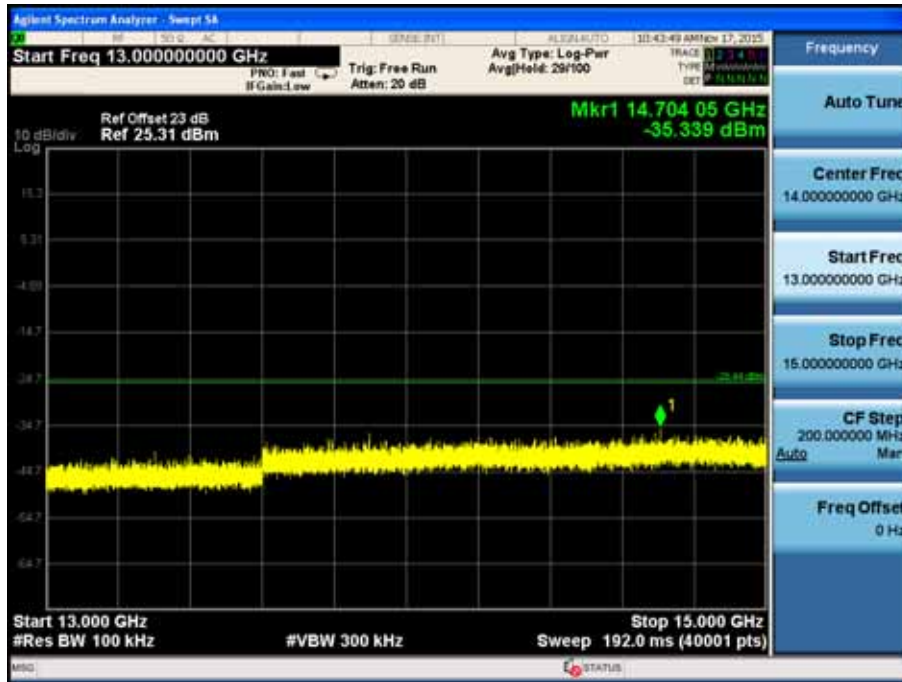
Spurious Emission 30MHz ~ 25GHz - Frequency L

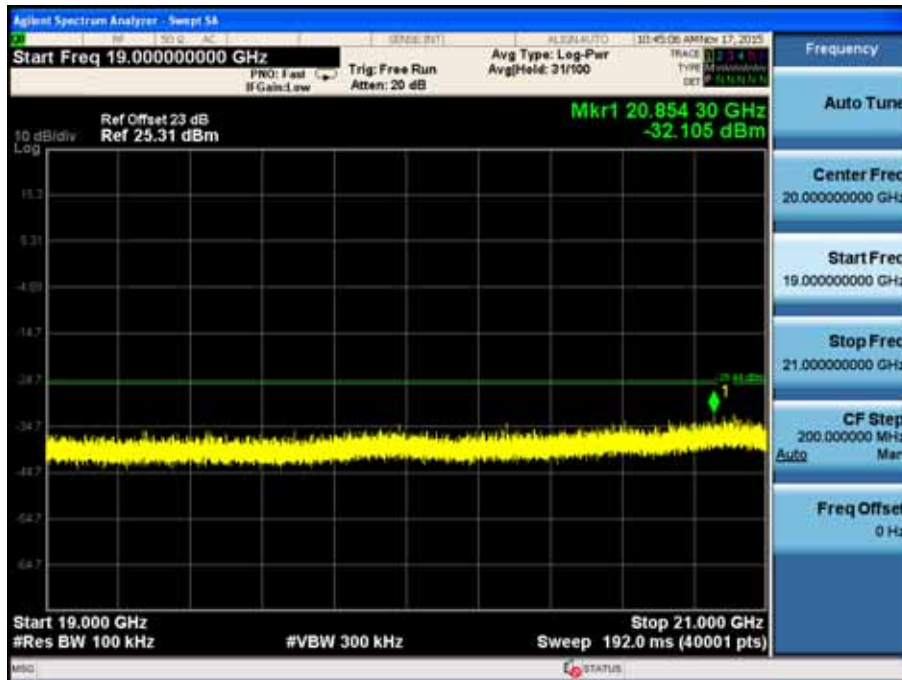
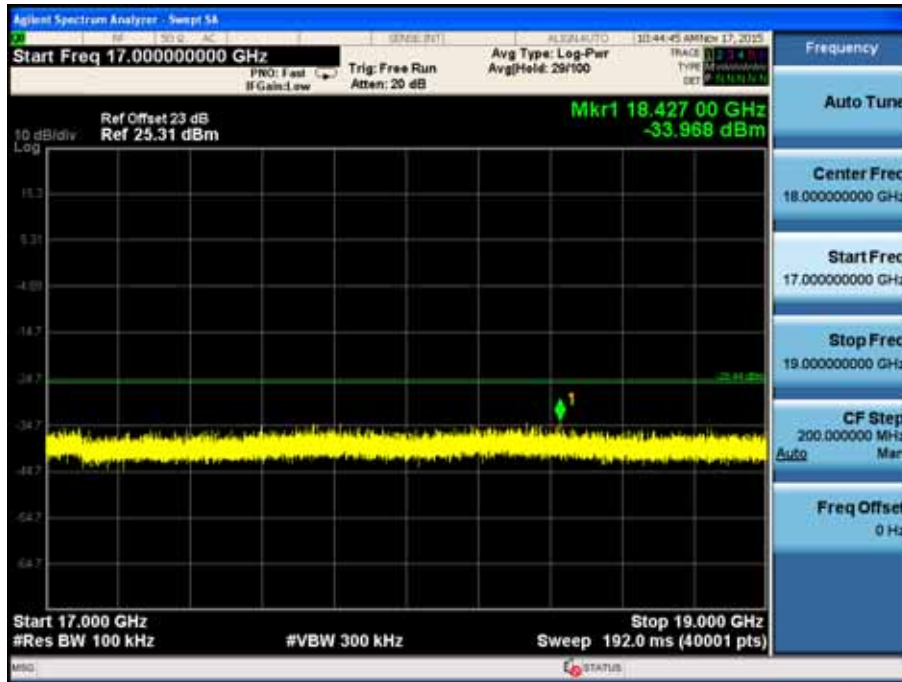


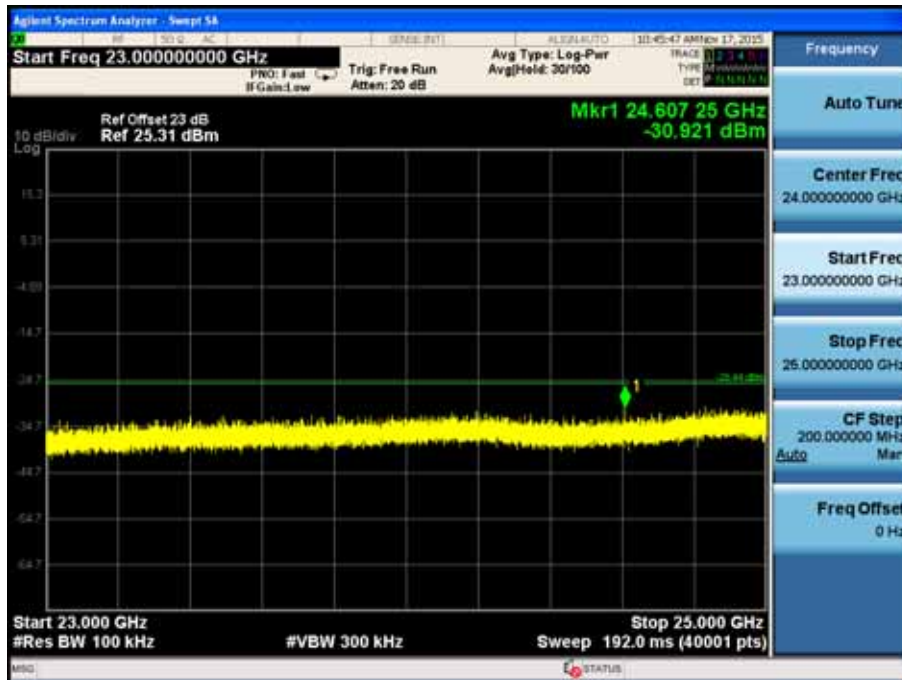
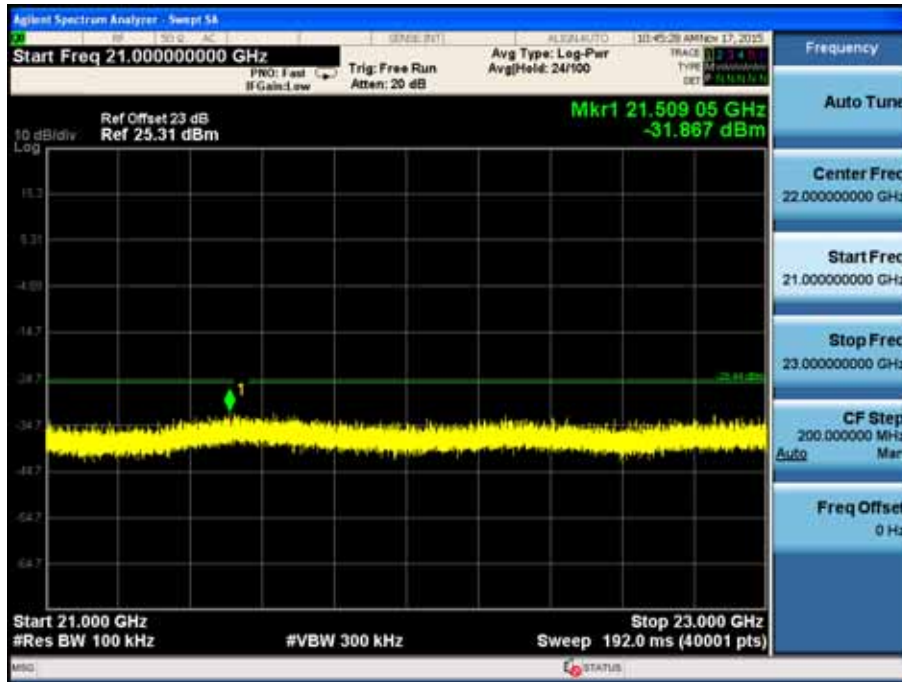


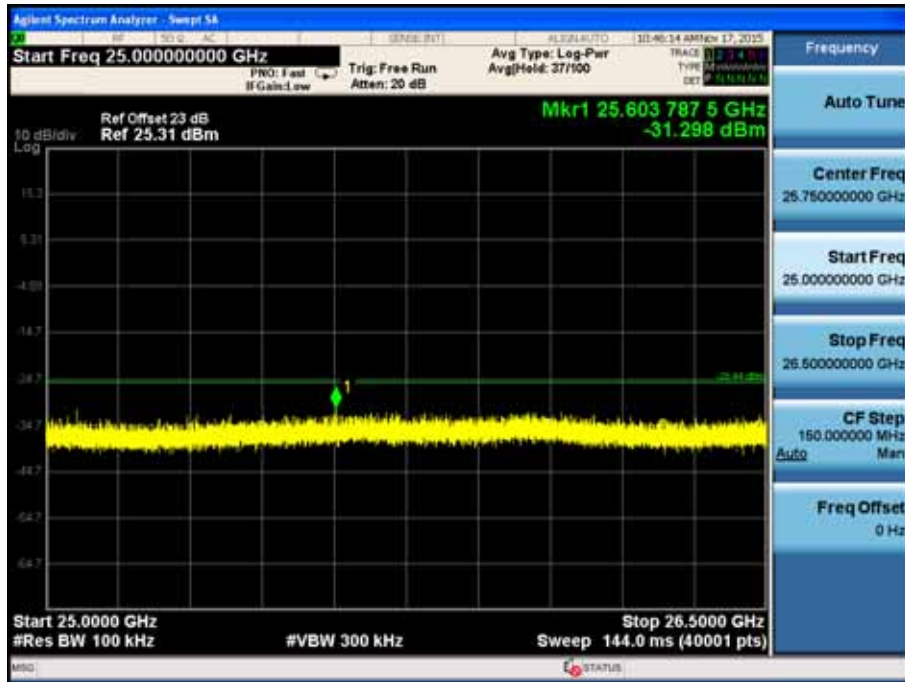




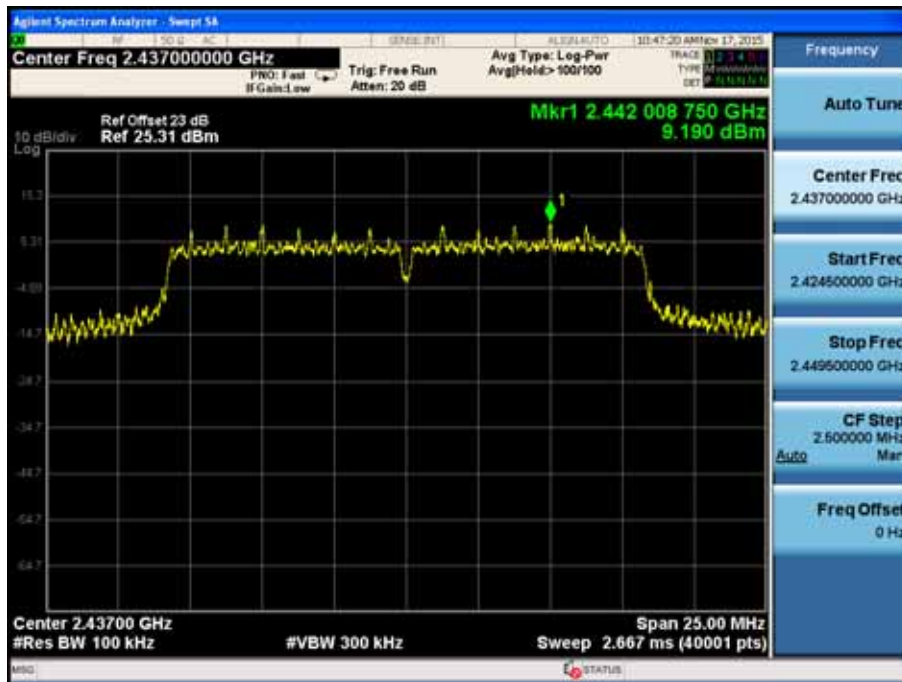




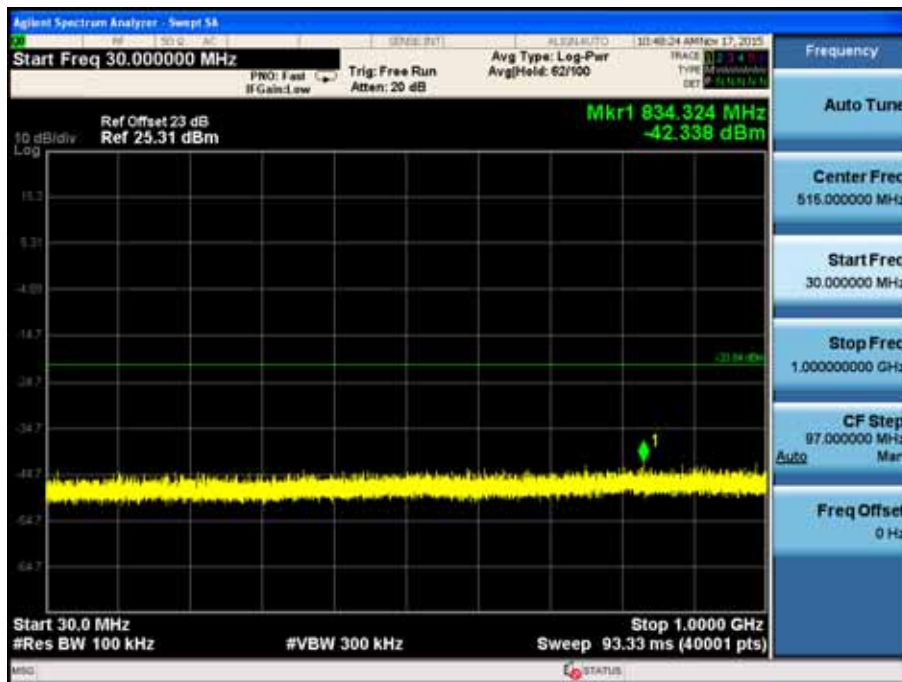


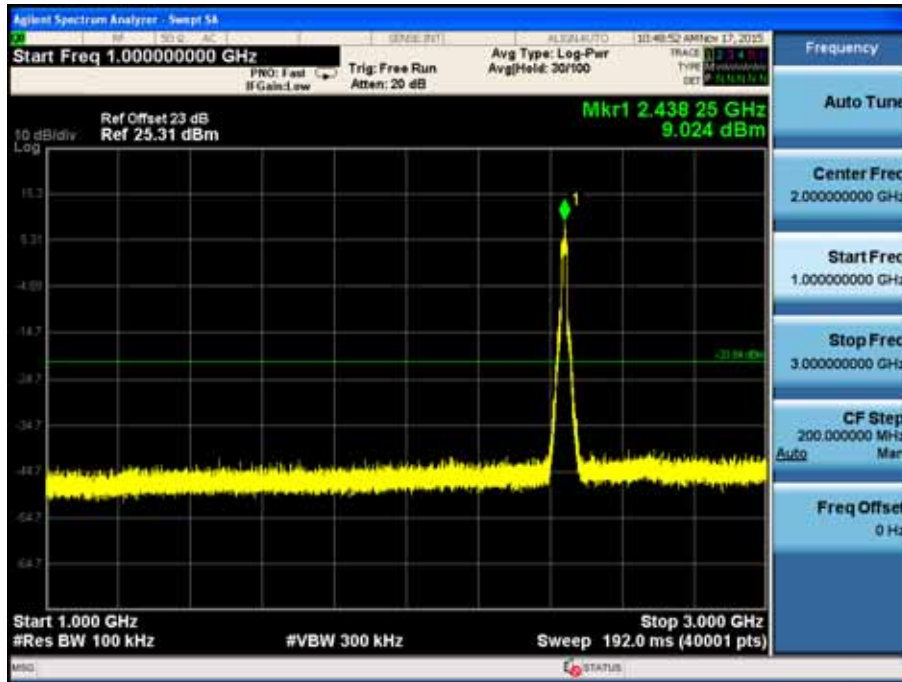


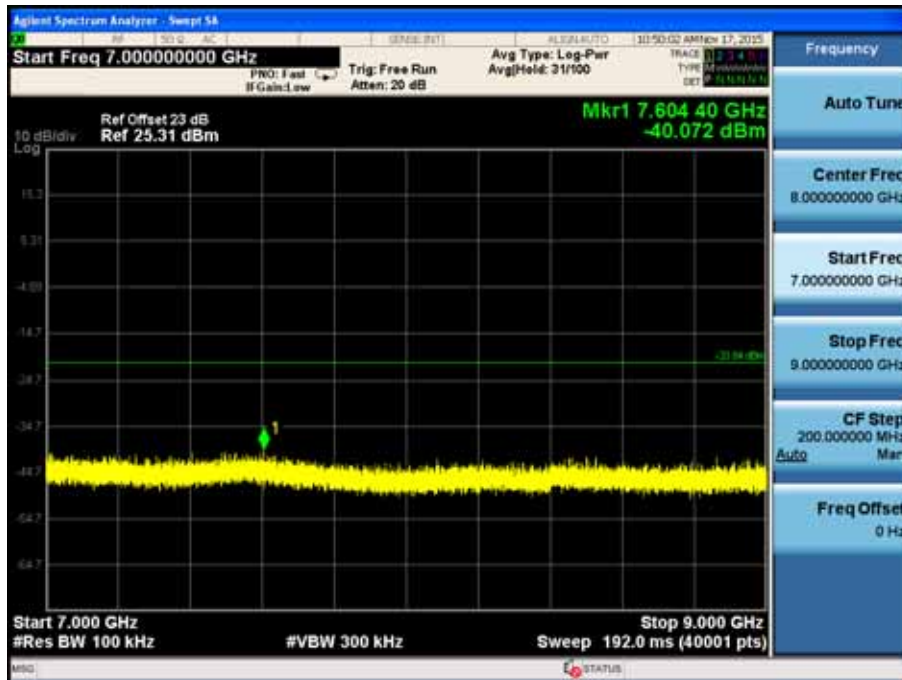
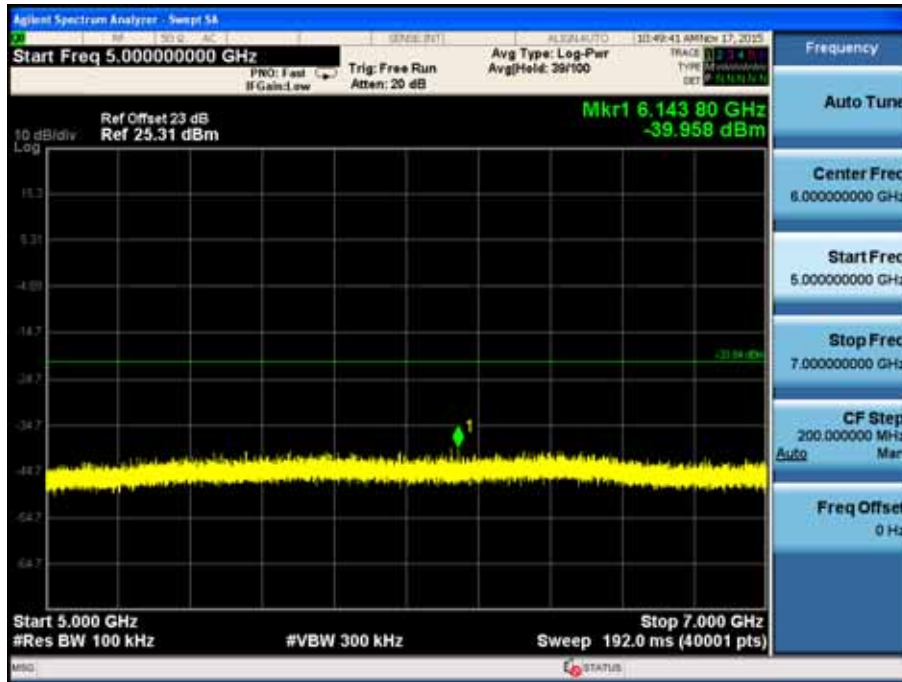
Channel 06 (2437MHz)
 Reference Level – Frequency M

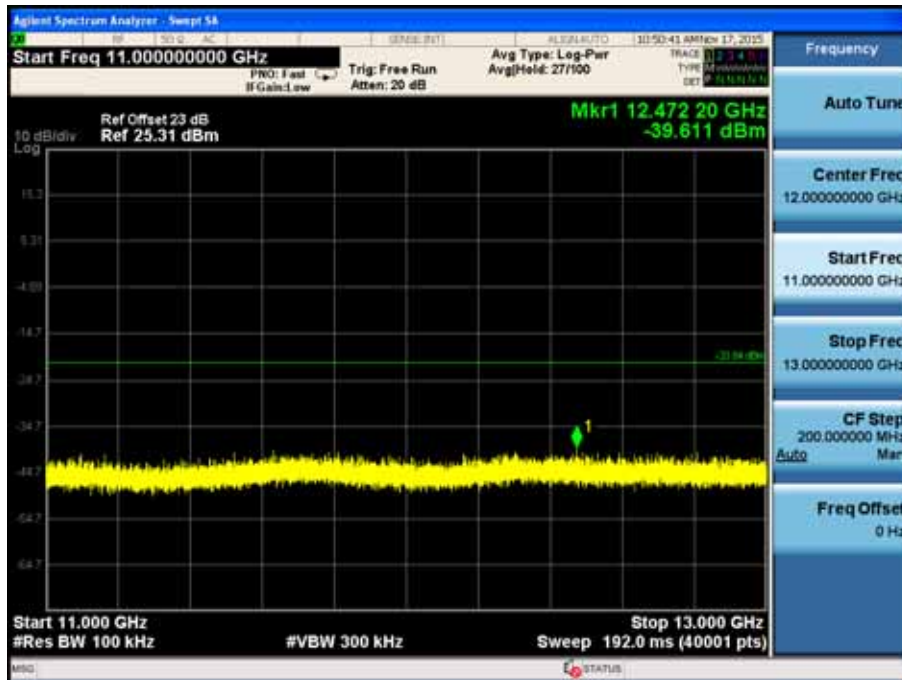
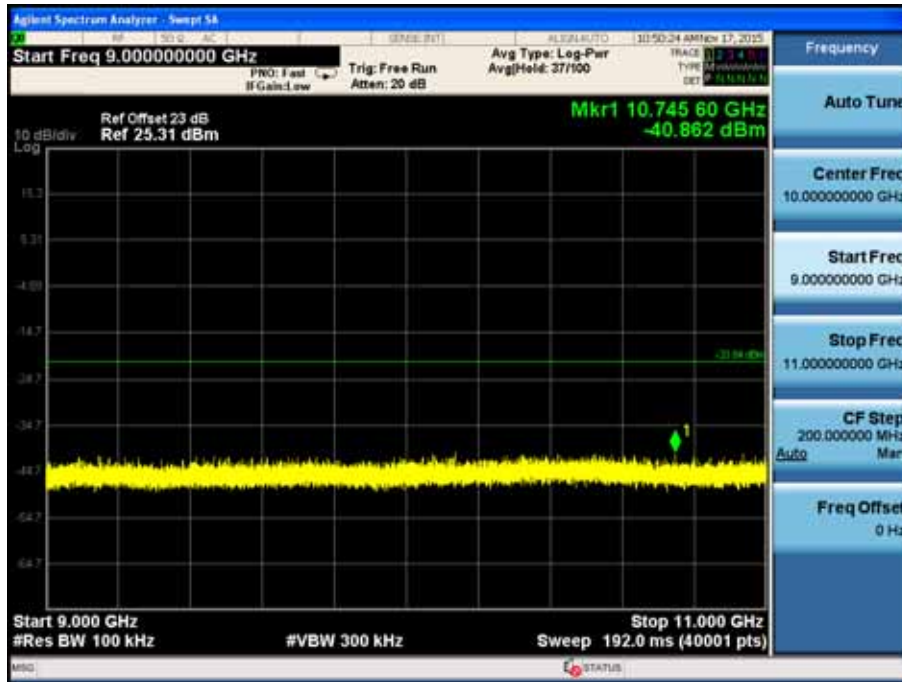


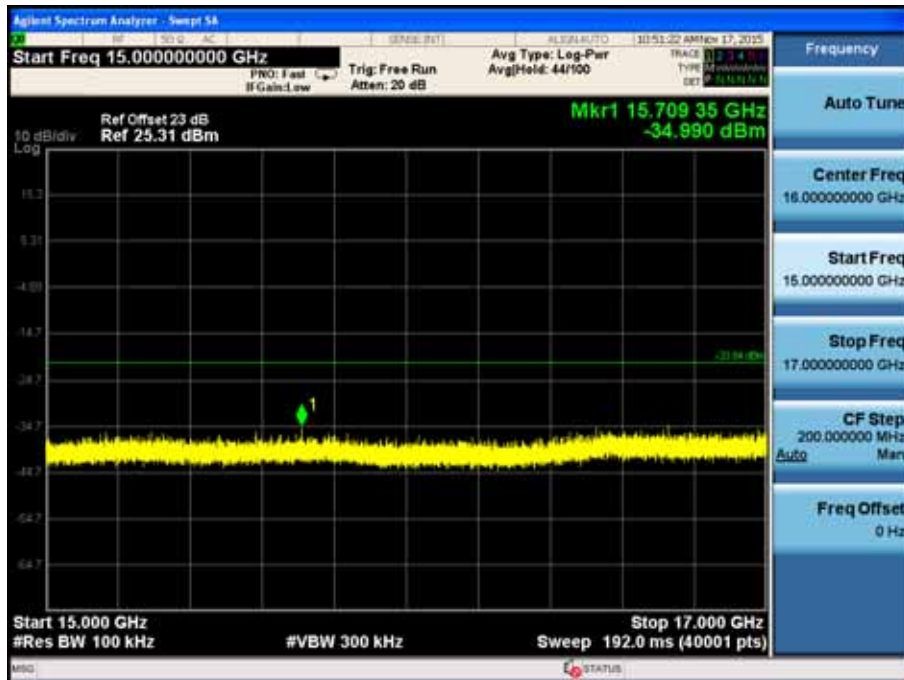
Spurious Emission 30MHz ~ 25GHz - Frequency M

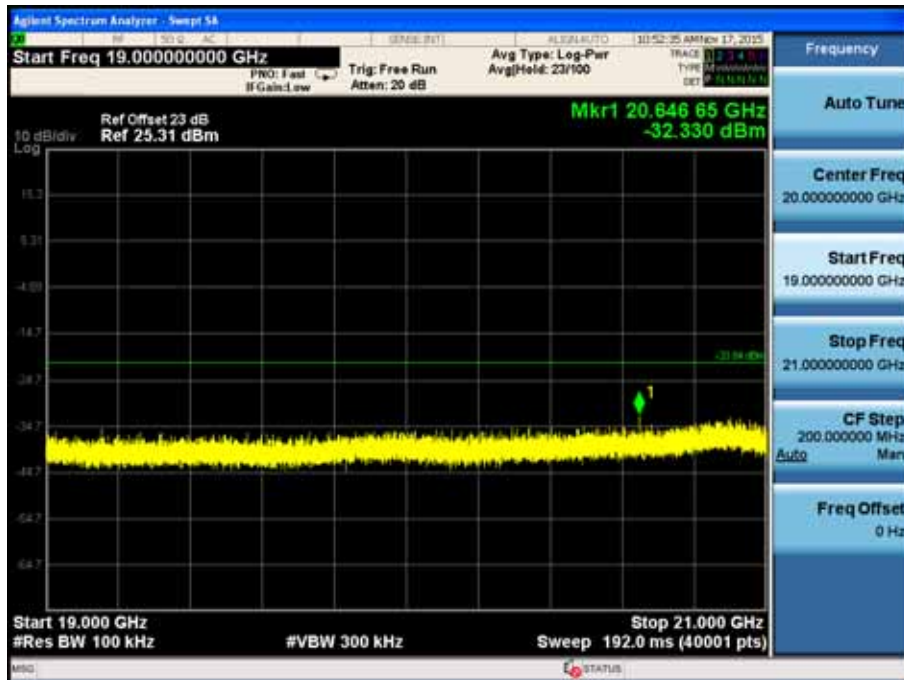


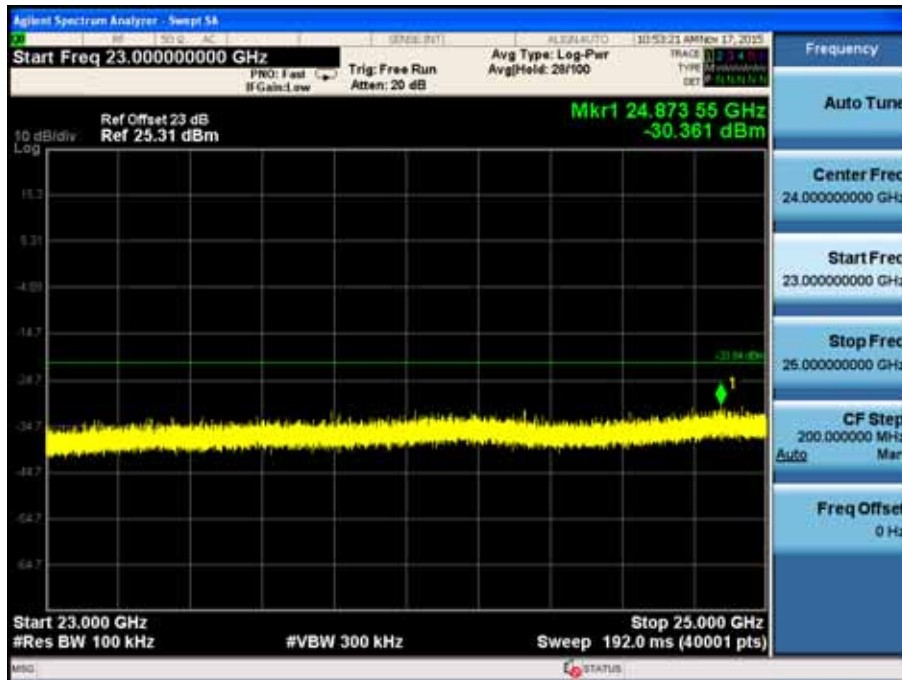


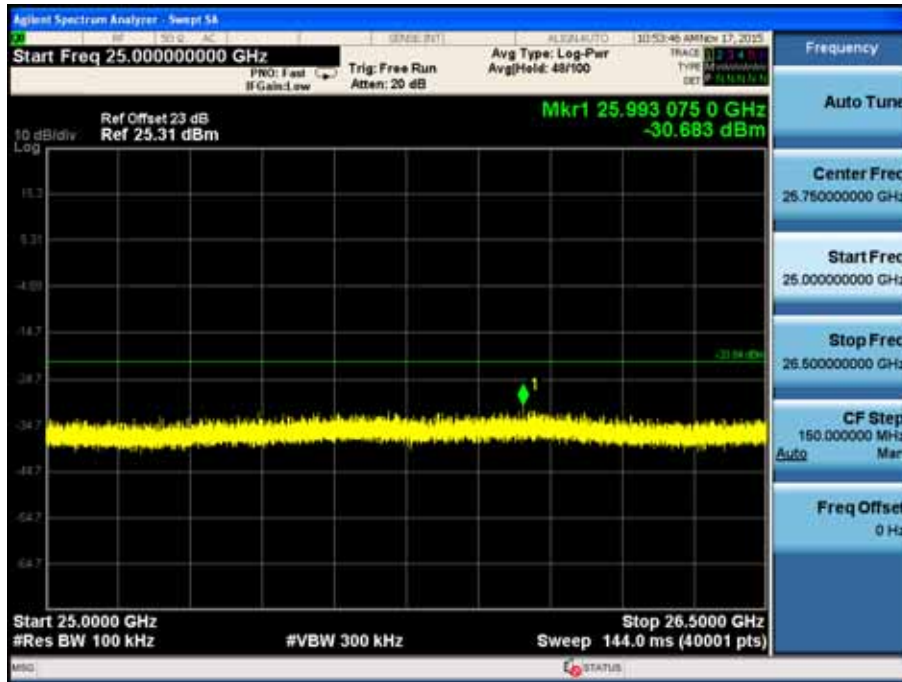




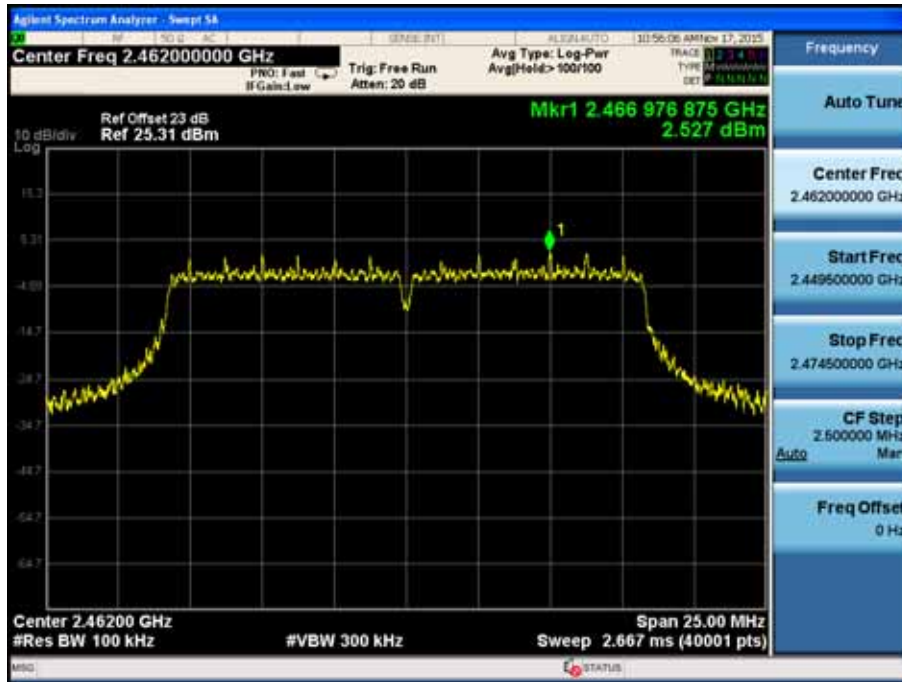




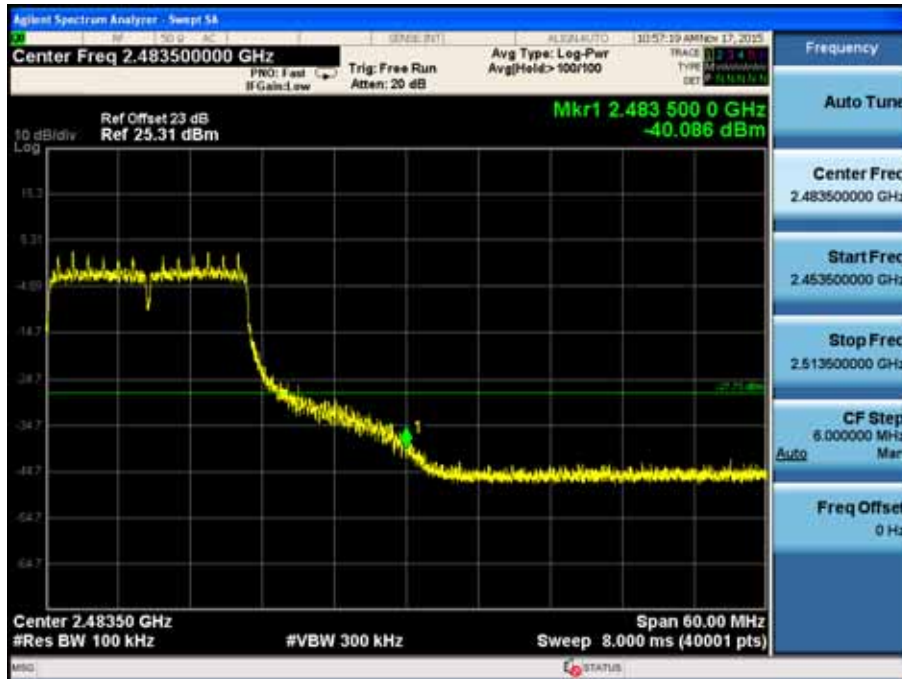




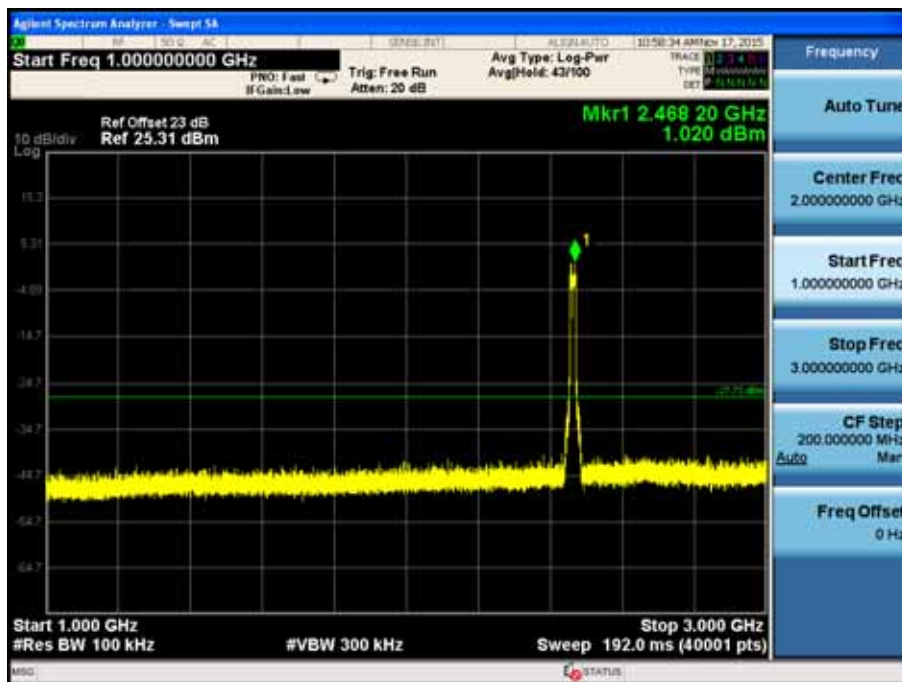
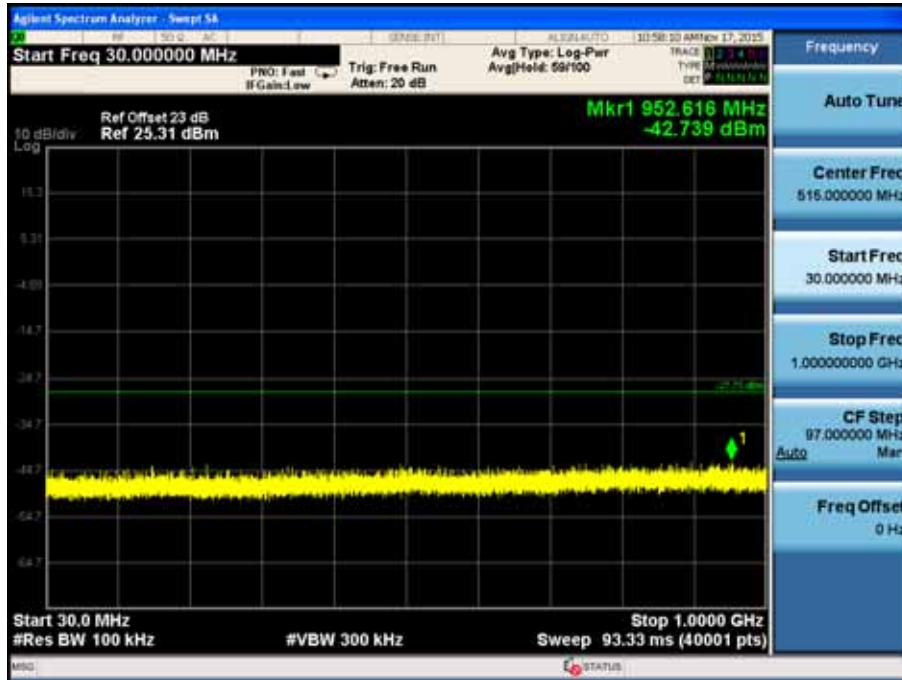
Channel 11 (2462MHz) Reference Level – Frequency H

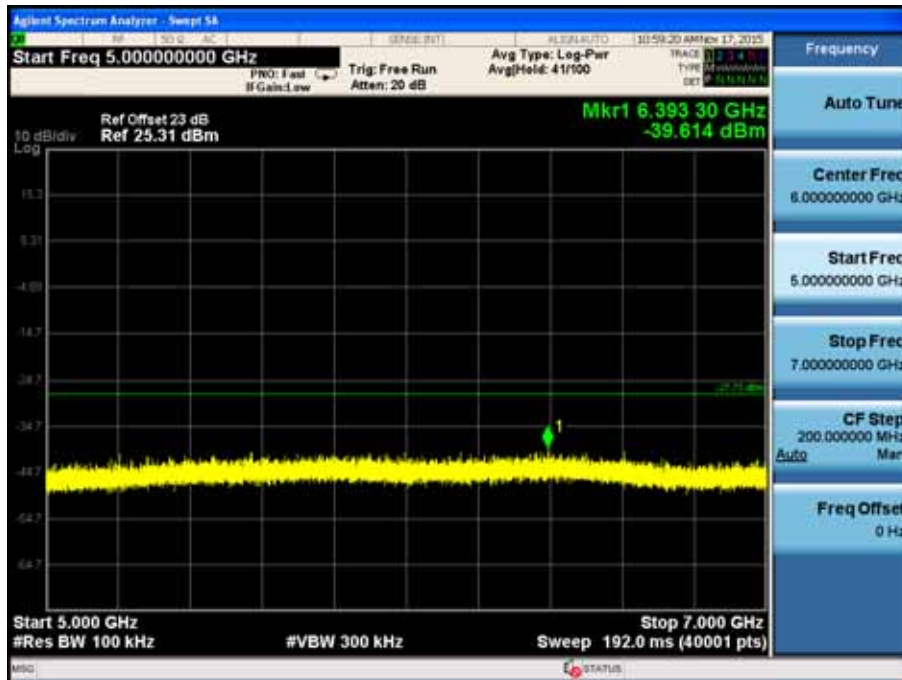


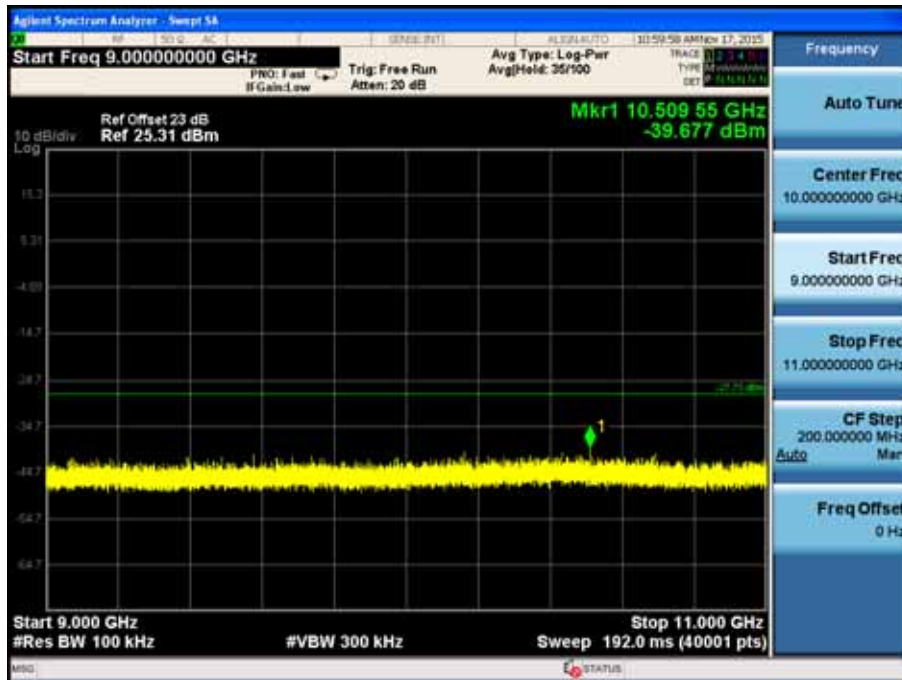
High Band Edge - Frequency H

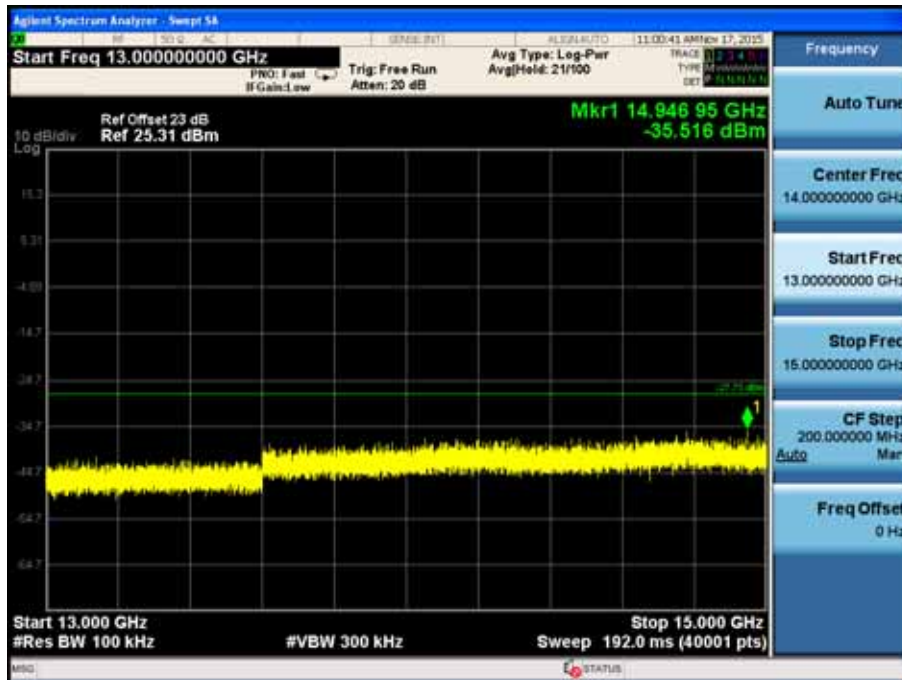


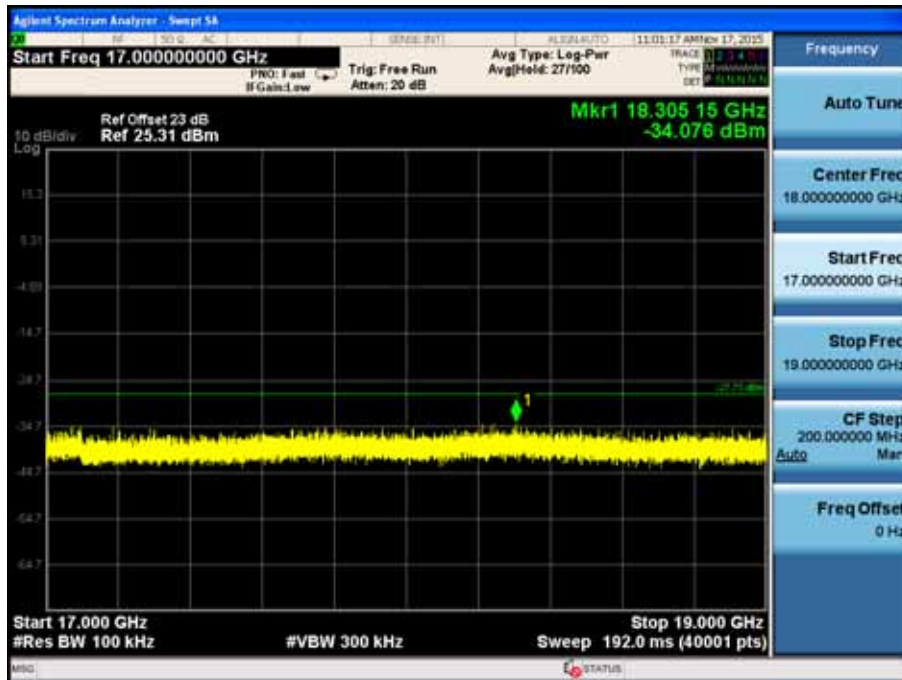
Spurious Emission 30MHz ~ 25GHz - Frequency H

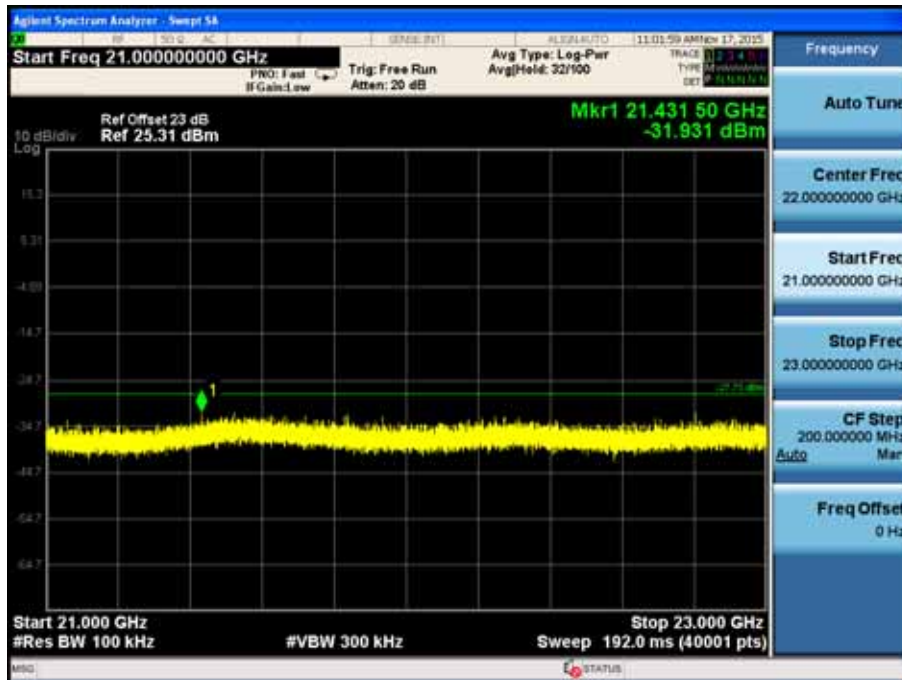


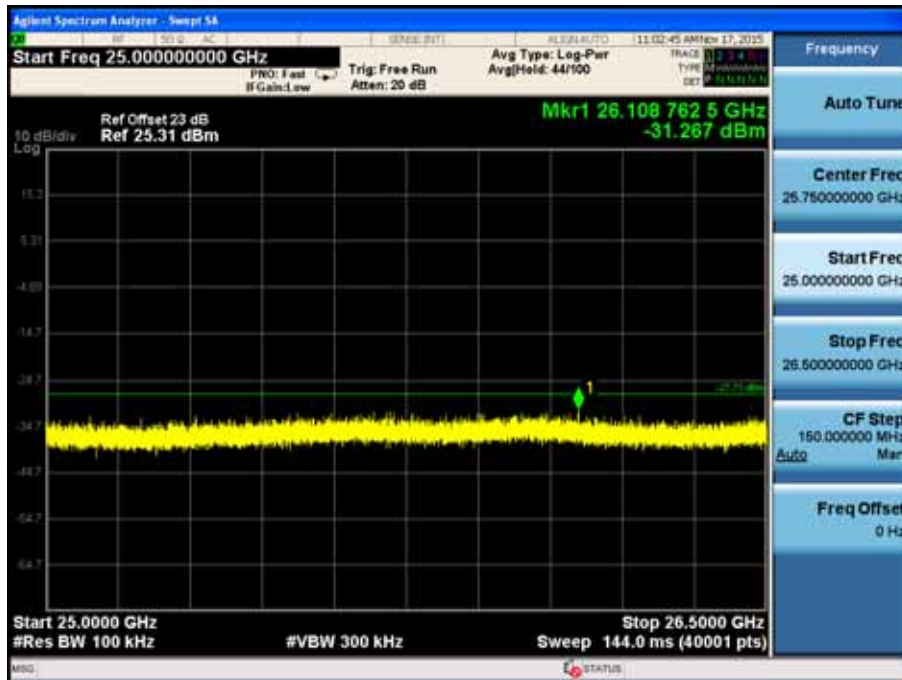










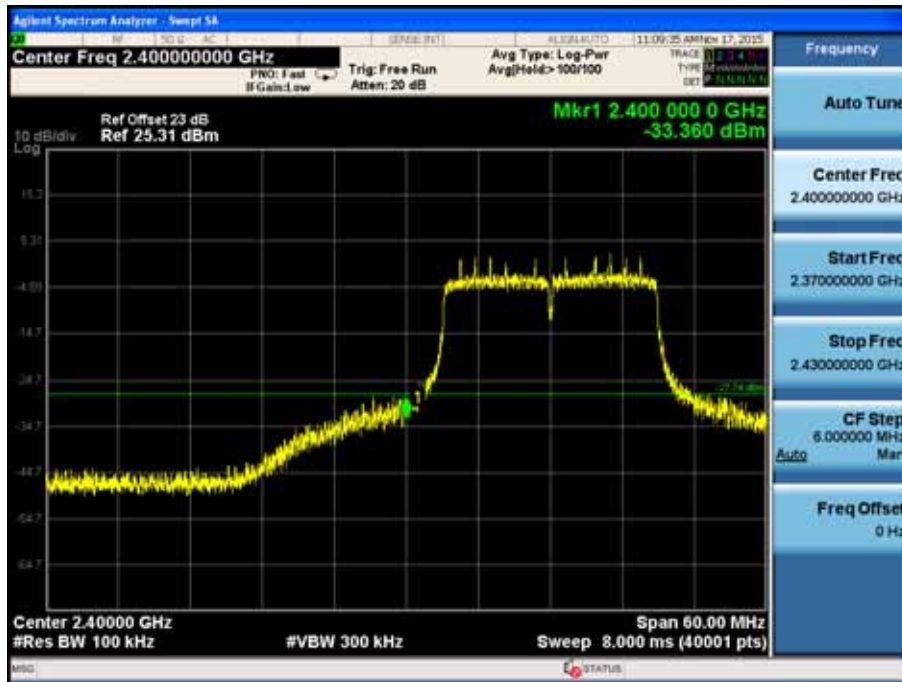


Product	:	Wi-Fi Smart Plug With Energy Monitoring
Test Item	:	RF Antenna Conducted Spurious
Test Site	:	TR-8
Test Mode	:	Mode 3: Transmit by 802.11n(20MHz)

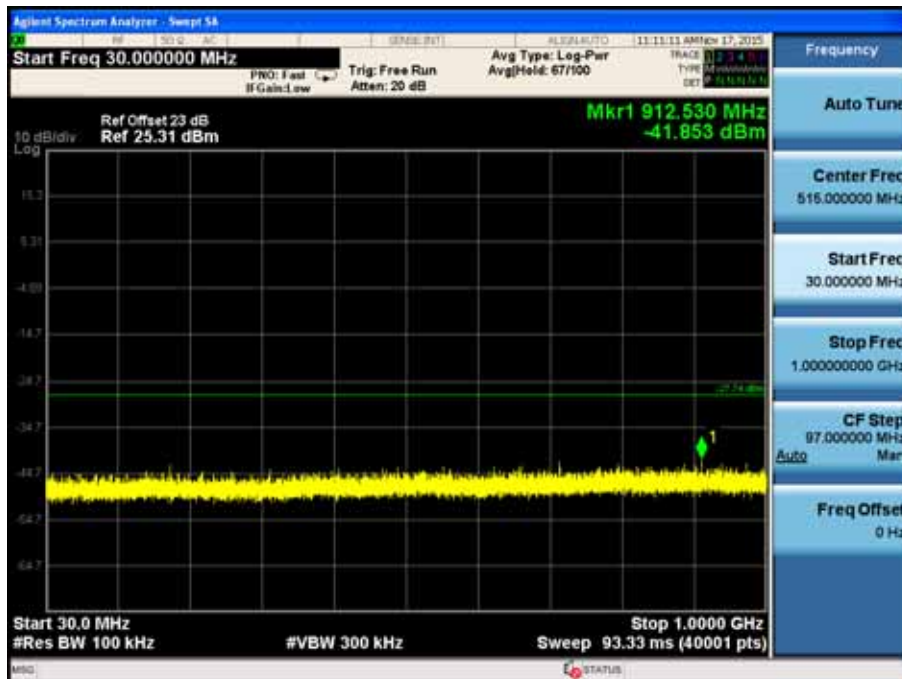
Channel 01 (2412MHz)
Reference Level – Frequency L

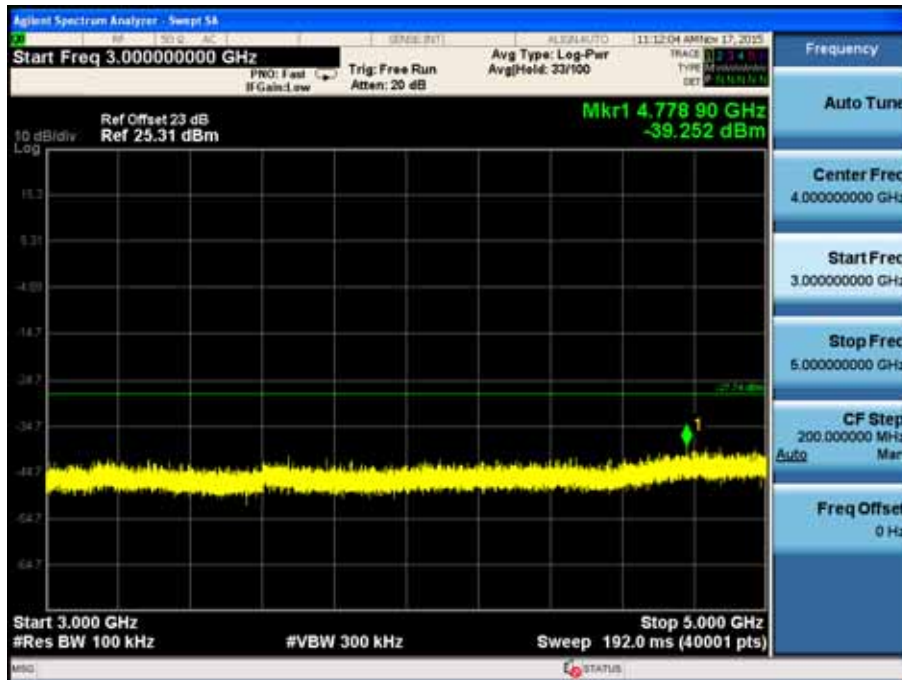
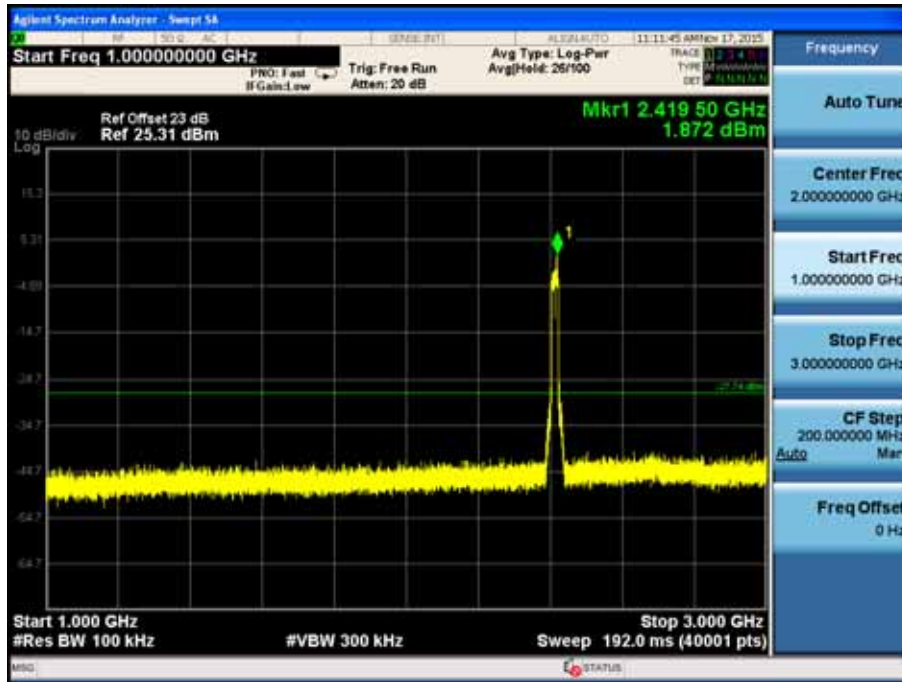


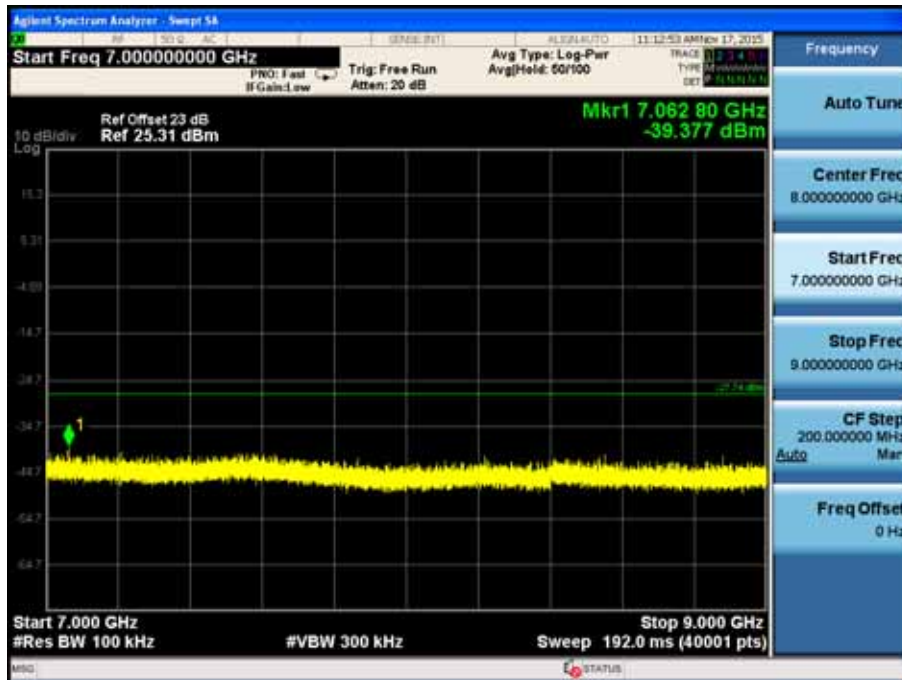
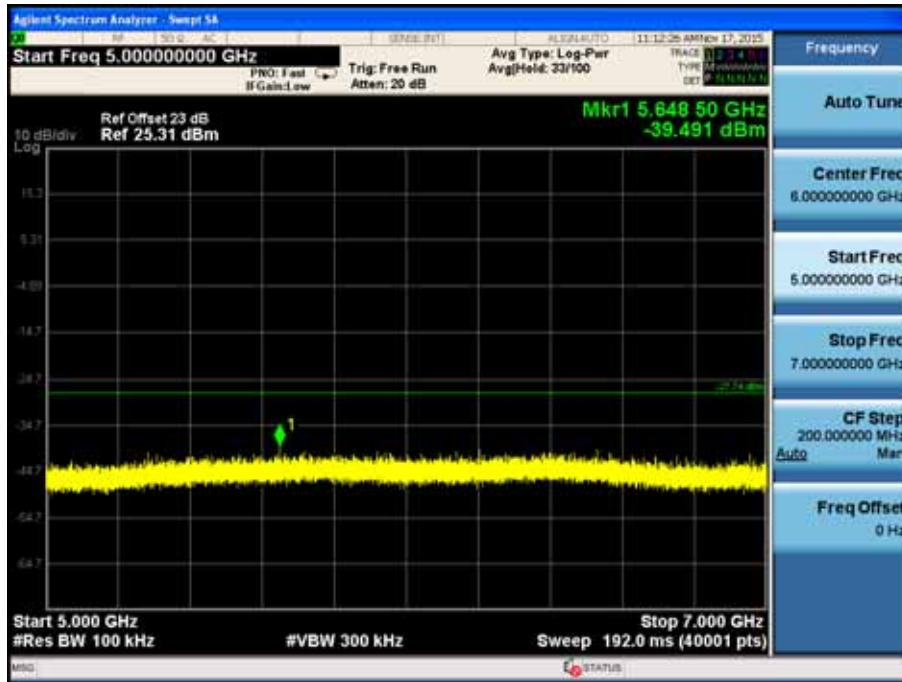
Low Band Edge - Frequency L

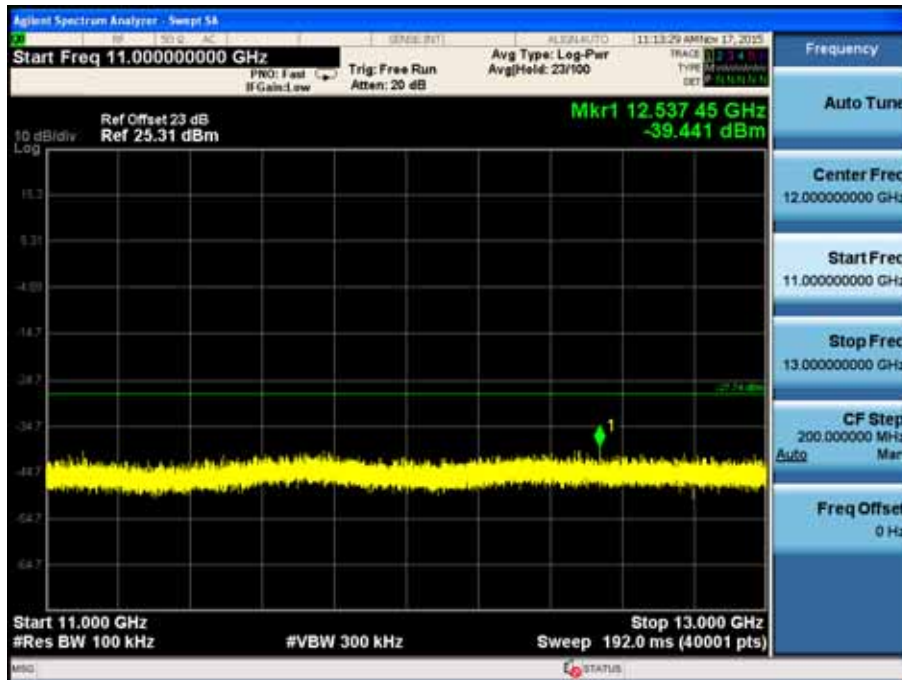
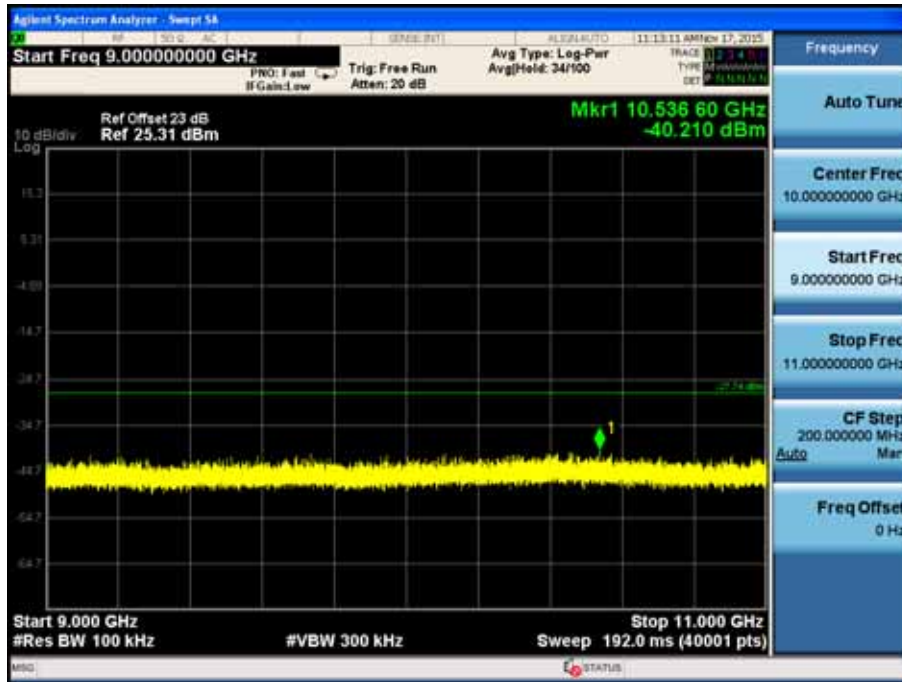


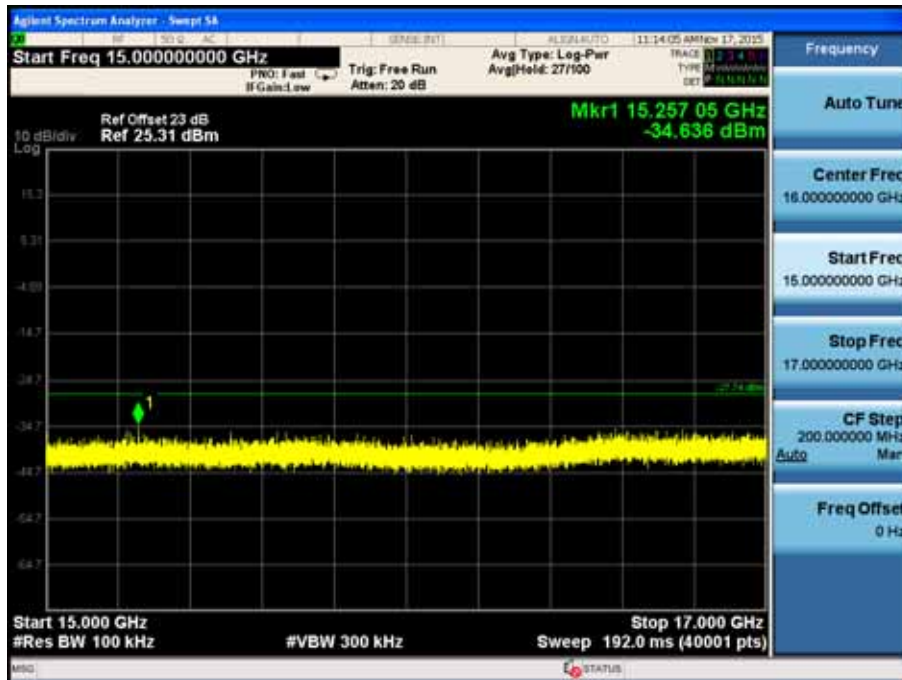
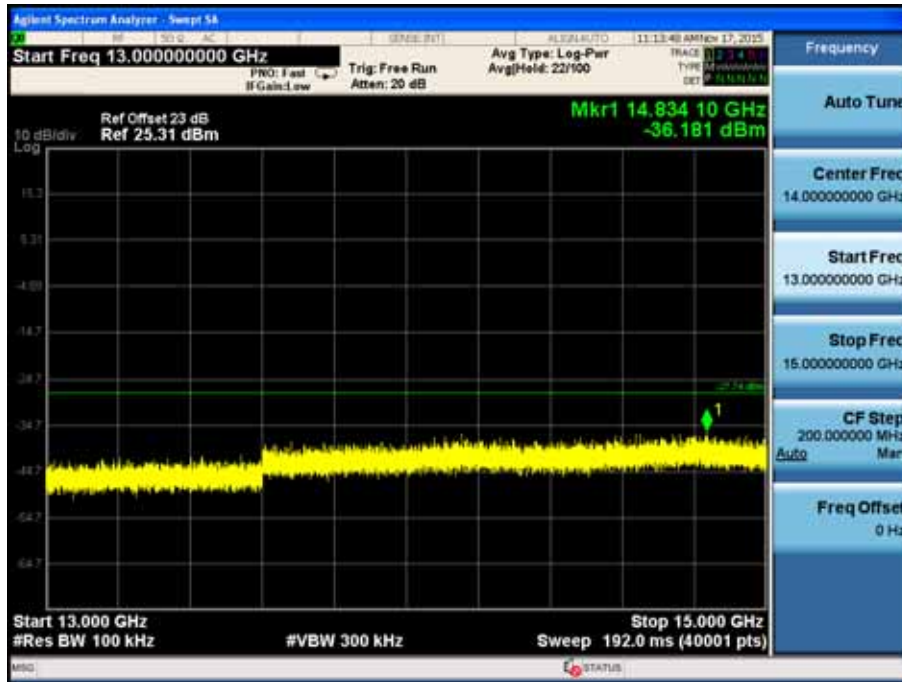
Spurious Emission 30MHz ~ 25GHz - Frequency L

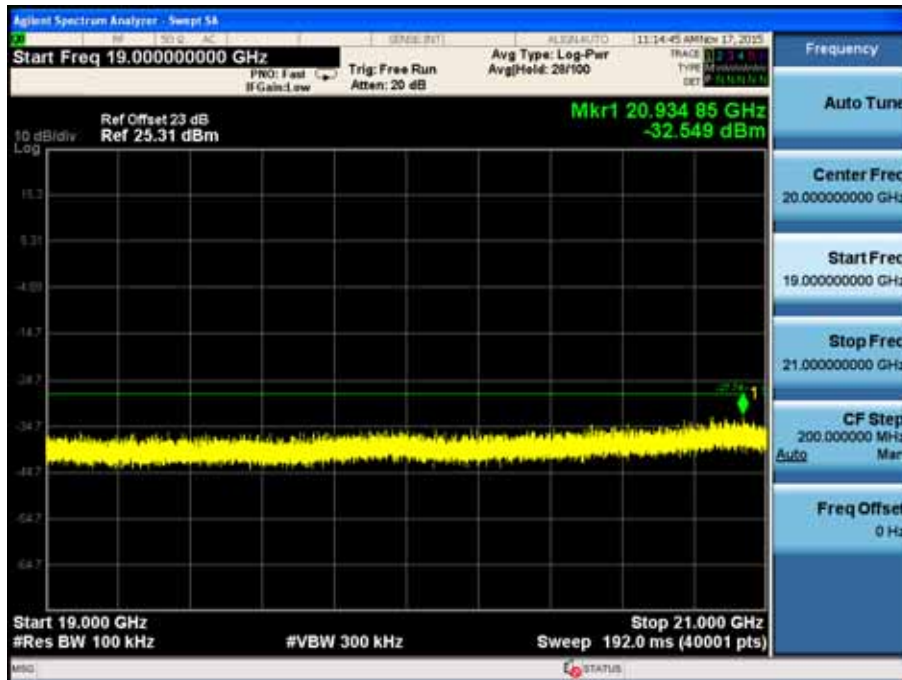


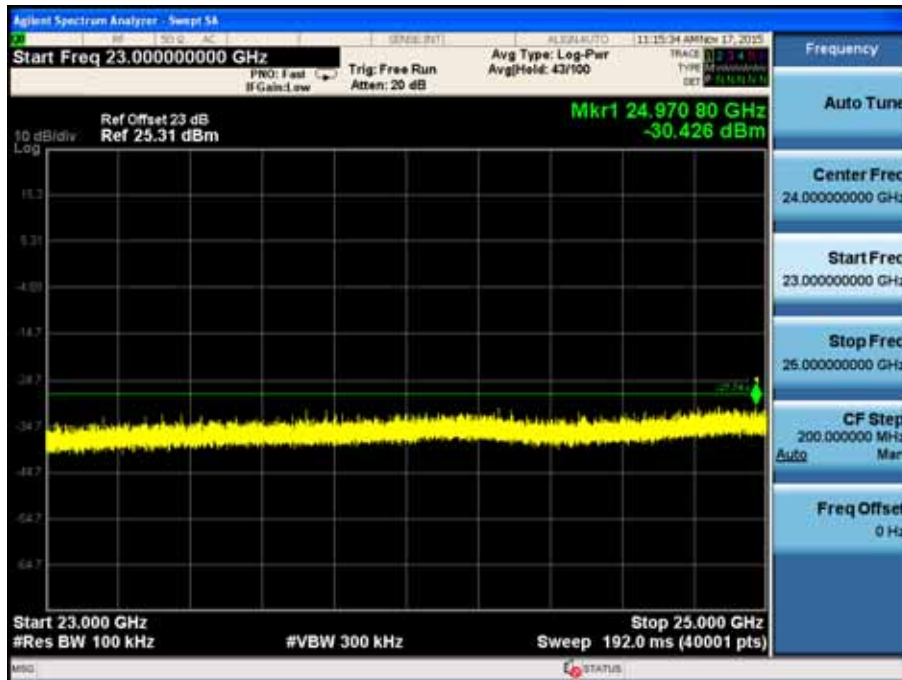
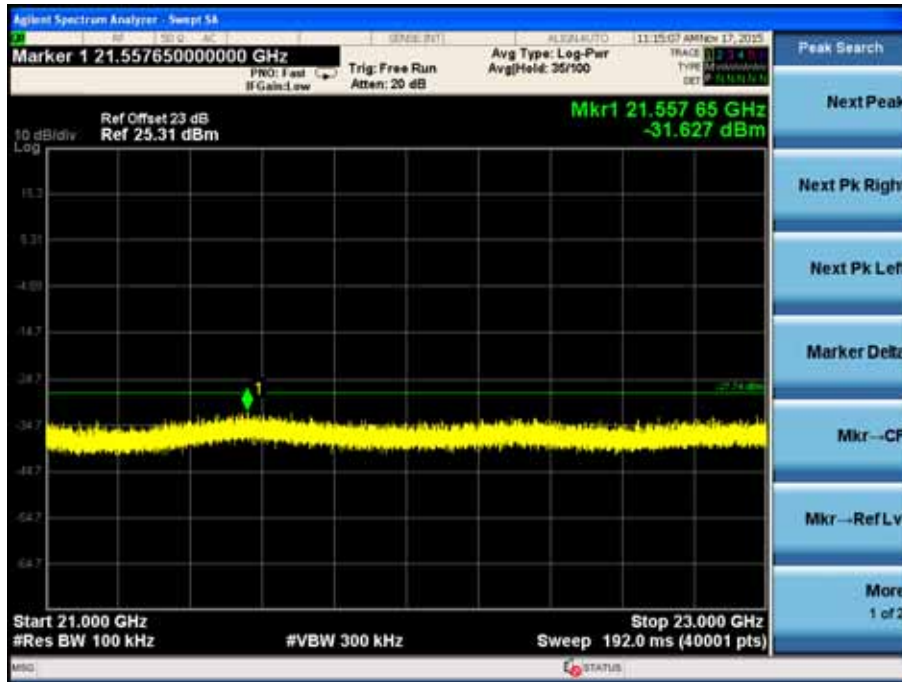


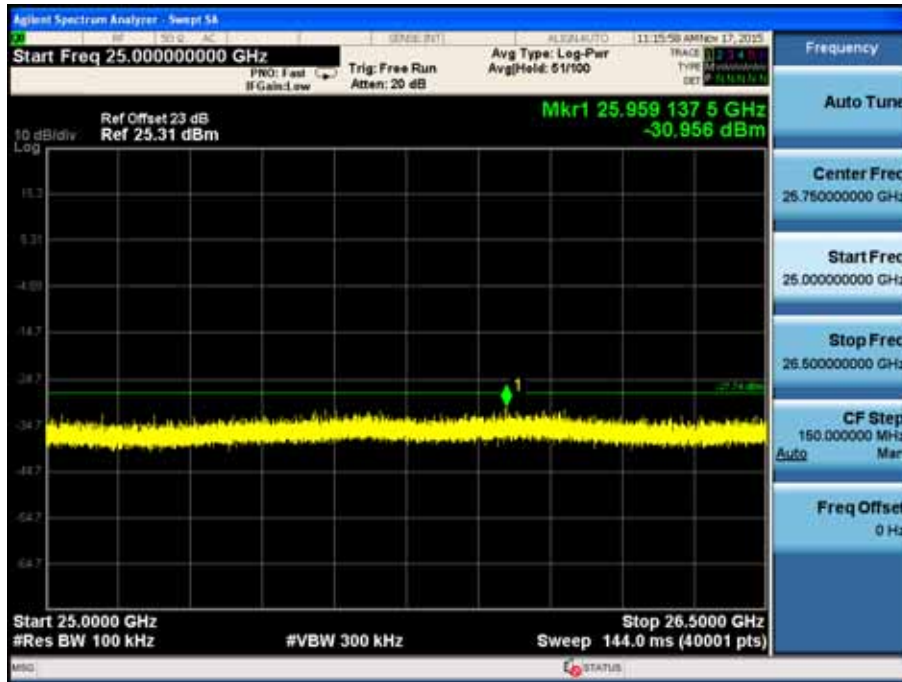




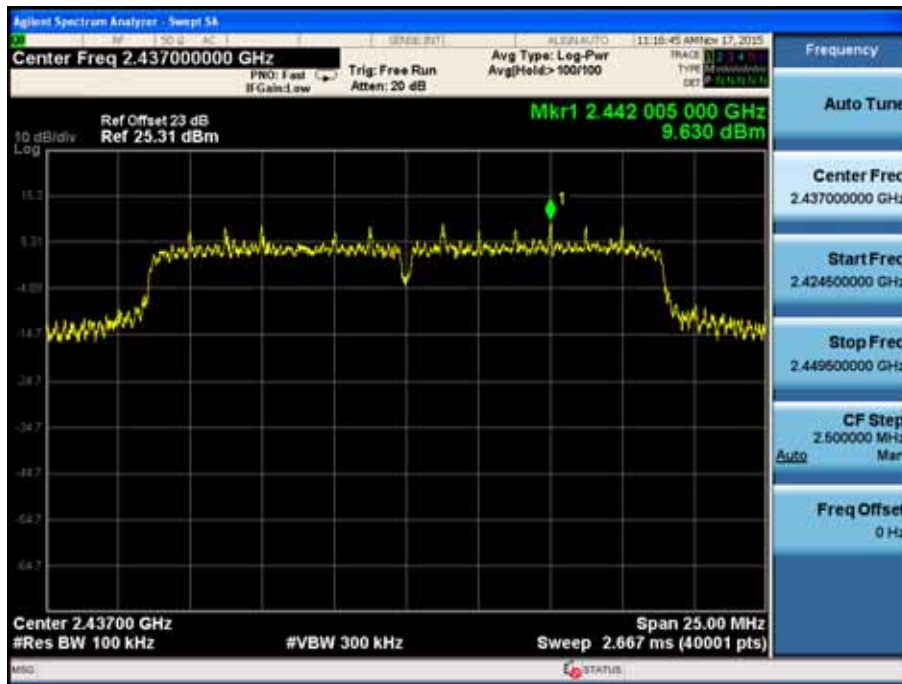








Channel 06(2437MHz)
 Reference Level – Frequency M



Spurious Emission 30MHz ~ 25GHz - Frequency M

