FCC 47 CFR PART 15 SUBPART E: 2012 AND ANSI C63.4:2009 TEST REPORT

For

AC750 Portable Router and Charger

Model: DIR-510L

Brand Name : D-Link

Issued for

D-Link Corporation

No.289 , Sinhu 3rd Rd. , Neihu District , Taipei City 114 , Taiwan R.O.C.

Issued by

Compliance Certification Services Inc.
Tainan Lab.
No.8,Jiucengling, Xinhua Dist., Tainan City 712, Taiwan (R.O.C.)
TEL: 886-6-580-2201
FAX: 886-6-580-2202

Issued Date: December 16, 2013

Revision History

Rev.	Issue Date	Revisions	Effect Page	Revised By
00	December 16, 2013	Initial Issue	ALL	Sunny Chang

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TITLE PAGE NO.

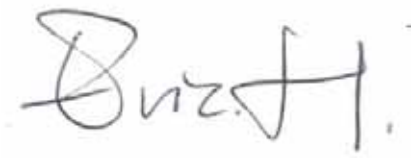
1. TEST REPORT CERTIFICATION

Applicant	：D-Link Corporation
Address	：No.289 , Sinhu 3rd Rd. , Neihu District , Taipei City 114 , Taiwan R.O.C.
Manufacturer	：Advance Multimedia Internet Technology Inc.
Address	：No.28, Lane 31 , Sec. 1 , Huandong Rd. , Sinshih District , Tainan City 74146 , Taiwan
Equipment Under Test	：AC750 Portable Router and Charger
Model	：DIR-510L
Trade Name	：D-Link
Tested Date	：September 25, 2013 ~ December 15, 2013

APPLICABLE STANDARD	
Standard	**Test Result**
FCC Part 15 Subpart E: 2012 AND ANSI C63.4: 2009	PASS

WE HEREBY CERTIFY THAT: The above equipment has been tested by Compliance Certification Services Inc., and found compliance with the requirements set forth in the technical standards mentioned above. The results of testing in this report apply only to the product/system, which was tested. Other similar equipment will not necessarily produce the same results due to production tolerance and measurement uncertainties.

Approved by: ***Reviewed by:***



Jeter Wu
Assistant Manager

Eric Huang
Assistant Section Manager

2. EUT DESCRIPTION

Product Name	AC750 Portable Router and Charger
Model Number	DIR-510L
Brand Name	D-Link
Identify Number	T130909N91
Received Date	September 09, 2013
Frequency Range	IEEE 802.11a, 802.11n HT20 : 5180MHz ~ 5240MHz, IEEE 802.11n HT40 : 5190MHz ~ 5230MHz, IEEE 802.11ac VHT80 : 5210MHz,
Transmit Power	IEEE 802.11a : 5180MHz ~ 5240MHz : 12.51dBm IEEE 802.11n HT20 : 5180MHz ~ 5240MHz : 12.51dBm IEEE 802.11n HT40 : 5190MHz ~ 5230MHz : 14.50dBm IEEE 802.11ac VHT80 : 5210MHz : 12.38dBm
Channel Spacing	IEEE 802.11a, 802.11n HT20 : 20MHz IEEE 802.11n HT40, 11ac VHT80 : 20MHz
Channel Number	IEEE 802.11a, 802.11n HT20 : 5180MHz ~ 5240MHz : 4 Channels IEEE 802.11n HT40 : 5190MHz ~ 5230MHz : 2 Channels IEEE 802.11ac VHT80 : 5210MHz : 1 Channels
Transmit Data Rate	IEEE 802.11a：54, 48 ,36, 24, 18, 12, 9, 6 Mbps IEEE 802.11n HT20：65, 58.5, 52, 39, 26, 19.5, 13, 6.5Mbps IEEE 802.11n HT40：150, 135, 120, 90, 60, 45, 30, 15 Mbps IEEE 802.11ac (HT20):78, 65, 58.5, 52, 39, 26, 19.5, 13, 6.5 Mbps (HT40):180, 162, 135, 121.5, 108, 81, 54, 40, 27, 13.5 Mbps (VHT80):433.3, 390, 351, 292.5, 263.3, 234, 175.5, 117, 87, 58.5, 29.3 Mbps
Type of Modulation	IEEE 802. 11n HT20/11n HT40: BPSK, QPSK, 16QAM, 64QAM, and OFDM
	IEEE 802.11n HT20/40 : OFDM (64QAM, 16QAM, QPSK, BPSK)
	IEEE 802.11 ac: BPSK, QPSK, 16QAM, 64QAM, 256QAM and OFDM
Antenna Type	**5GHz Antenna*1pcs (1T1R)** Manufacture: WHA YU INDUSTRIAL CO., LTD Type: Dipole Model / Gain: C381-510225-A peak gain 4.88dBi
RF Exposure Evaluation	Since the EUT is classed portable device, and the maximum peak power is 14.50 dBm (>13.6dBm), the MPE evaluation is not required and has SAR consideration applied
Power Rating	5Vdc; 2A(Powered from Adapter)
Test Voltage	120Vac, 60Hz

Power Adapter :

No.	Manufacturer	Model No.	Power Input	Power Output
1	D-Link	PSAA10R-050	100-240Vac~21-29VA, 50/60Hz, 300mA	5Vdc, 2A

Operation Frequency:

IEEE 802.11a, 802.11n HT20

UNLICENSED NATIONAL INFORMATION INFRASTRUCTURE (U-NII)			
CHANNEL	**MHz**	**CHANNEL**	**MHz**
36	5180	44	5220
40	5200	48	5240

IEEE 802.11n HT40

UNLICENSED NATIONAL INFORMATION INFRASTRUCTURE (U-NII)			
CHANNEL	**MHz**	**CHANNEL**	**MHz**
38	5190	46	5230

IEEE 802.11ac VHT80

UNLICENSED NATIONAL INFORMATION INFRASTRUCTURE (U-NII)			
CHANNEL	**MHz**	**CHANNEL**	**MHz**
42	5210		

Remark :

1. Client consigns only one model sample to test (Model Number: DIR-510L).

2.The sample selected for test was engineering sample that approximated to production product and was provided by manufacturer.

3. For more details, please refer to the User's manual of the EUT.

*4. This submittal(s) (test report) is intended for FCC ID: **KA2IR510LA1** filing to comply with Section 15.407, of the FCC Part 15, Subpart E Rules.*

5.The listed models(EMG2626-R10A, Keenetic Ultra)are all the same of the original model(DIR-510L), design, except for different models name and is just for the marketing purpose.

3. DESCRIPTION OF TEST MODES

Conducted Emission / Radiated Emission Test (Below 1 GHz)

1. The following test modes were scanned during the preliminary test:

No.	Pre-Test Mode
1	TX Mode

2. After the preliminary scan, the following test mode was found to produce the highest emission level.

Final Test Mode		
Emission	Radiated Emission	TX Mode
	Conducted Emission	TX Mode

Remark : *Then, the above highest emission mode of the configuration of the EUT and cable was chosen for all final test items.*

Conducted / Radiated Emission Test (Above 1 GHz)

IEEE 802.11a, 802.11n HT20 mode / 5180MHz ~ 5240MHz

The EUT had been tested under operating condition.

There are three channels have been tested as following :

Channel	Frequency (MHz)
Low	5180
Middle	5200
High	5240

IEEE 802.11a mode : 6Mbps data rate (worst case) were chosen for full testing.

IEEE 802.11n HT20 mode : 6.5Mbps data rate (worst case) were chosen for full testing.

IEEE 802.11n HT40 mode / 5190MHz ~ 5230MHz

The EUT had been tested under operating condition.

There are three channels have been tested as following :

Channel	Frequency (MHz)
Low	5190
High	5230

IEEE 802.11n HT40 mode : 13.5Mbps data rate (worst case) were chosen for full testing.

IEEE 802.11ac VHT80 mode / 5210MHz

The EUT had been tested under operating condition.

There are three channels have been tested as following :

Channel	Frequency (MHz)
Middle	5210

IEEE 802.11n HT40 mode : 29.3Mbps data rate (worst case) were chosen for full testing.

4. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.4: 2003 and FCC CFR 47, 15.207, 15.209 and 15.407.

5. FACILITIES AND ACCREDITATION

5.1 FACILITIES

All measurement facilities used to collect the measurement data are located at

No.8,Jiucengling, Xinhua Dist., Tainan City 712, Taiwan (R.O.C.)

The sites are constructed in conformance with the requirements of ANSI C63.7, ANSI C63.4 and CISPR Publication 22.

5.2 ACCREDITATIONS

Our laboratories are accredited and approved by the following accreditation body according to ISO/IEC 17025.

Taiwan	TAF 1109

The measuring facility of laboratories has been authorized or registered by the following approval agencies.

Canada	Industry Canada
Germany	TUV NORD
Taiwan	BSMI
USA	FCC TW1037

Copies of granted accreditation certificates are available for downloading from our web site, http:///www.ccsrf.com

5.3 MEASUREMENT UNCERTAINTY

The following table is for the measurement uncertainty, which is calculated as per the document CISPR 16-4-2.

PARAMETER	UNCERTAINTY
Radiated Emission, 30 to 200 MHz Test Site : OATS-6	±3.38dB
Radiated Emission, 200 to 1000 MHz Test Site : OATS-6	±3.04dB
Radiated Emission, 1 to 26.5 GHz	± 3.20dB
Power Line Conducted Emission	± 2.01dB

Uncertainty figures are valid to a confidence level of 95%, K=2

6. SETUP OF EQUIPMENT UNDER TEST

SUPPORT EQUIPMENT

For RF test

No.	Product	Manufacturer	Model No.	Certify No.	Signal cable
1	Note Book	IBM	T43	DoC	Power cable, unshd, 1.6m

No.	Signal cable description	
A	DC Power	Unshielded, 1.0m, 1pcs, with one core
B	DC Power	Unshielded, 1.0m, 1pcs, with one core

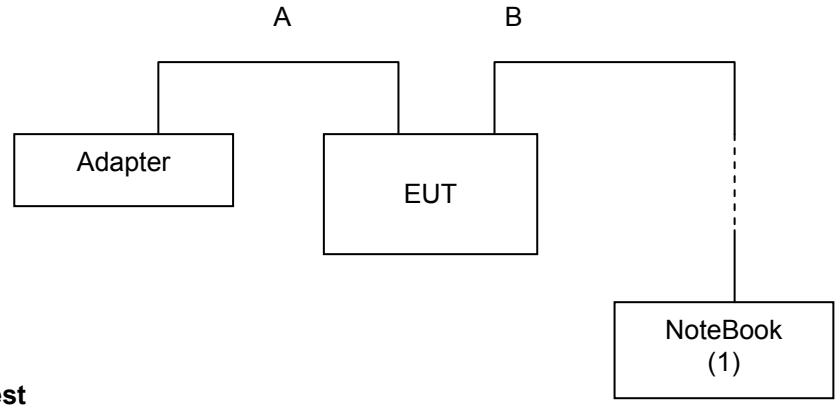
For EMI test

No.	Product	Manufacturer	Model No.	Certify No.	Signal cable
1	Notebook	IBM	R50E	DOC	Power cable, unshd, 1.6m
2	Notebook	Acer	AS 3830TG	DOC	Power cable, unshd, 1.6m
3	Flash Disk	Kingston	DRI/512	DOC	N/A
4	3G Modem	NOVATEL	Qualcomm 3G CDMA	PKRNVWMC727	N/A

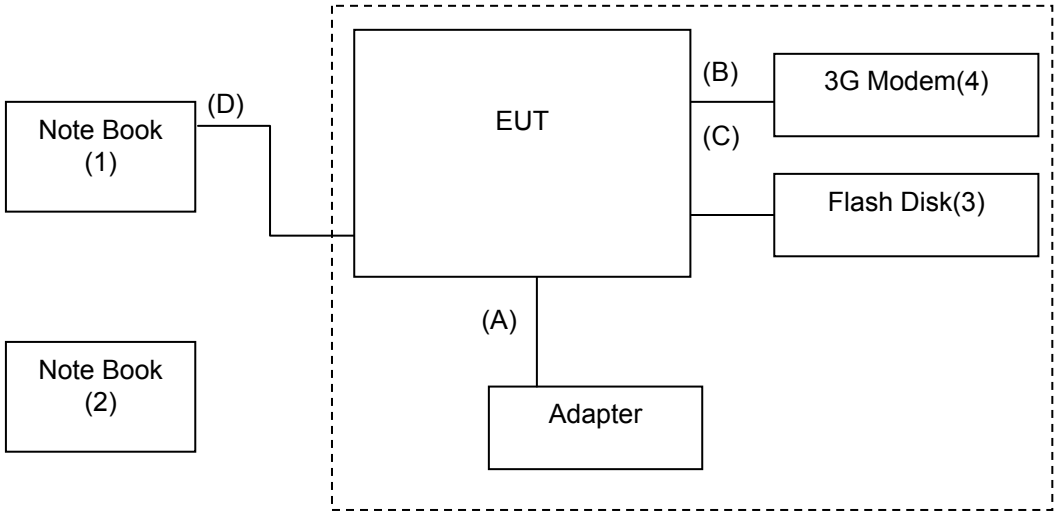
No.	Signal cable description	
A	Power	Unshielded, 1.2m, 1pcs. with one core
B	USB	Shielded, 0.15m, 1pcs.
C	USB	Shielded, 0.15m, 1pcs.
D	LAN	Unshielded, 10m, 1pcs.

SETUP DIAGRAM FOR TESTS

For RF test



For EMI test



EUT OPERATING CONDITION

RF Setup

1. Set up all computers like the setup diagram.
2. The Ralink QA Test Program for “MT76xx QA(AP) ac V2.0.5.0 [0401]” software was used for testing
   The EUT driver software installed in the host support equipment during testing was Ralink QA Test Program for “MT76xx QA(AP) ac V2.0.5.0 [0401]” Drive

TX Mode:

- ⇨ **Tx Mode:**
- ⇨ **OFDM、HT MixMode** (Bandwidth: 20、40)、VHT Mode (Bandwidth: 80)
- ⇨ **Tx Data Rate: 6Mbps** (IEEE 802.11a mode ,chain 0 TX)
  6.5Mbps (IEEE 802.11n HT20 mode ,chain 0 TX)
  13.5Mbps (IEEE 802.11n HT40 mode, chain 0 TX)
  29.3Mbps (IEEE 802.11ac VHT80 mode, chain 0 TX)

Power control mode
Target Power:
IEEE 802.11a Lower Sub-Band Channel Low (5180MHz) = 10 **(Chain 0)**
IEEE 802.11a Lower Sub-Band Channel Middle (5200MHz) = 10 **(Chain 0)**
IEEE 802.11a Lower Sub-Band Channel High (5240MHz) = 0F **(Chain 0)**
Target Power:
IEEE 802.11n HT20 Lower Sub-Band Channel Low (5180MHz) = 10 **(Chain 0)**
IEEE 802.11n HT20 Lower Sub-Band Channel Middle (5200MHz) = 10 **(Chain 0)**
IEEE 802.11n HT20 Lower Sub-Band Channel High (5240MHz) = 0F **(Chain 0)**
Target Power:
IEEE 802.11n HT40 Lower Sub-Band Channel Low (5190MHz) = 15 **(Chain 0)**
IEEE 802.11n HT40 Lower Sub-Band Channel High (5230MHz) = 14 **(Chain 0)**
Target Power:
IEEE 802.11ac HT80 Lower Sub-Band Channel Middle (5210MHz) = 11 **(Chain 0)**

RX Mode：

MAC Address: FFFFFFFFFFFF

Start RX

3. All of the function are under run.
4. Start test.

Normal Link Setup

1. Set up all computers like the setup diagram.
2. All of the function are under run.
3. Notebook PC (2) ping 192.168.0.10 –t to Notebook PC (1).
4. Notebook PC (1) ping 192.168.0.20 –t to Notebook PC (2).
5. Notebook PC (1) ping 192.168.0.50 –t to Wireless Access Point (3).

Start test.

7. FCC PART 15.407 REQUIREMENTS

7.1 26dB BANDWIDTH

LIMITS

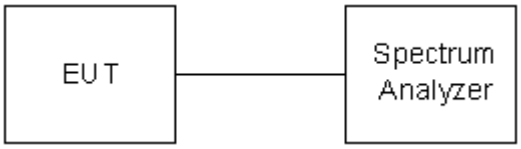
§ 15.303 (c) (2), For purposes of this subpart, the emission bandwidth shall be determined by measuring the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, that are 26 dB down relative to the maximum level of the modulated carrier. Determination of the emissions bandwidth is based on the use of measurement instrumentation employing a peak detector function with an instrument resolutions bandwidth approximately equal to 1.0 percent of the emission bandwidth of the device under measurement.

TEST EQUIPMENT

Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
Spectrum Analyzer	R&S	FSU	200789	JUL. 01, 2014

Remark: *Each piece of equipment is scheduled for calibration once a year*

TEST SETUP



TEST PROCEDURE

1. Place the EUT on the table and set it in the transmitting mode.
2. Remove the antenna from the EUT and then connect a low-loss RF cable from the antenna port to the spectrum analyzer.
3. Set the spectrum analyzer as RBW > 1%EBW, VBW > RBW, Span = 50MHz and Sweep = auto.
4. Mark the –26dBc (upper and lower) frequency of the peak value.
5. Repeat until all the rest channels were investigated.

TEST RESULTS

IEEE 802.11a Mode

Channel	Channel Frequency (MHz)	26dB Bandwidth (MHz)	Pass / Fail
Low	5180	20.10	PASS
Middle	5200	20.14	PASS
High	5240	19.86	PASS

IEEE 802.11n HT20 Mode

Channel	Channel Frequency (MHz)	26dB Bandwidth (MHz)	Pass / Fail
Low	5180	20.34	PASS
Middle	5200	20.29	PASS
High	5240	20.43	PASS

IEEE 802.11n HT40 Mode

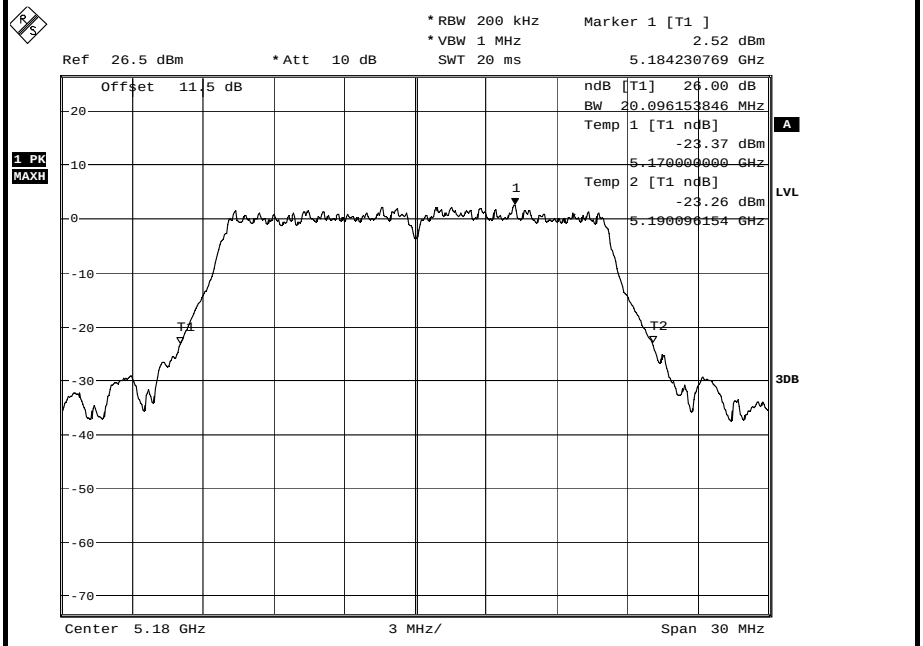
Channel	Channel Frequency (MHz)	26dB Bandwidth (MHz)	Pass / Fail
Low	5190	41.44	PASS
High	5230	41.25	PASS

IEEE 802.11ac VHT80 Mode

Channel	Channel Frequency (MHz)	26dB Bandwidth (MHz)	Pass / Fail
Middle	5210	82.69	PASS

26dB BANDWIDTH

CH Low (IEEE 802.11a Mode)



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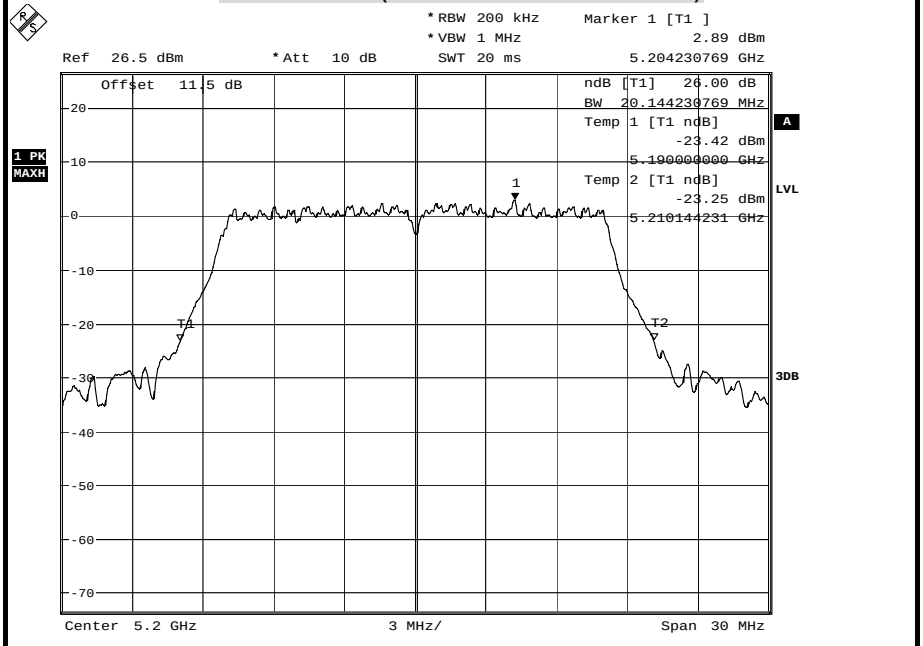
CH Middle (IEEE 802.11a Mode)



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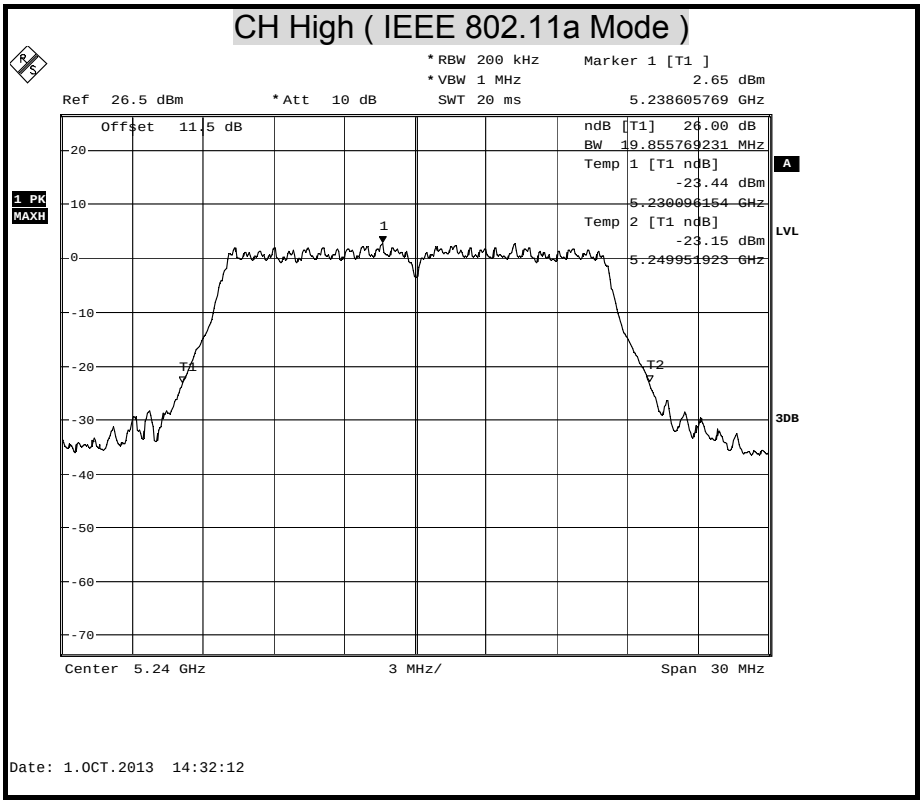
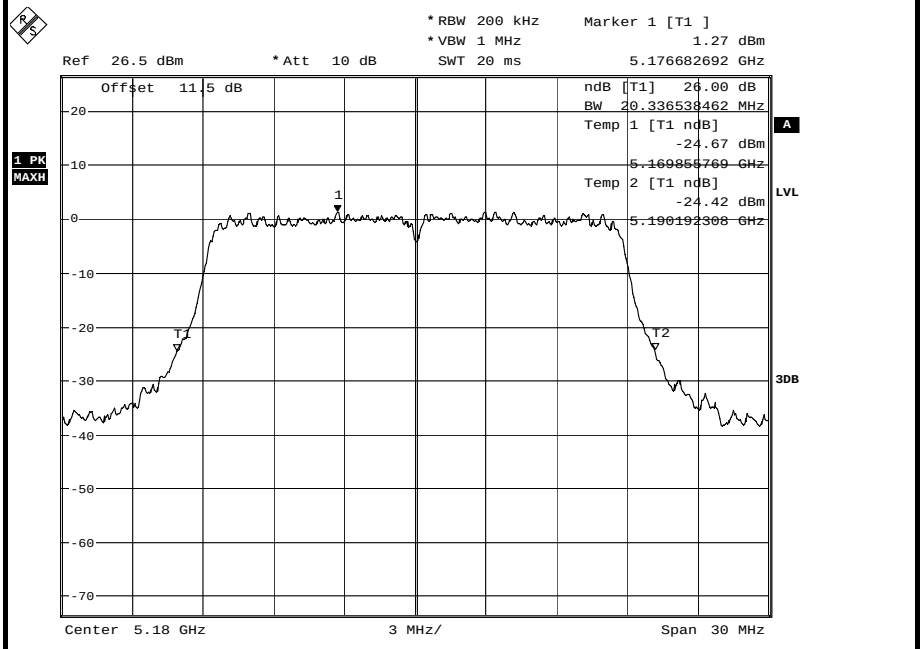
CH High (IEEE 802.11a Mode)



CH Low (IEEE 802.11n HT20 Mode / Chain 0)



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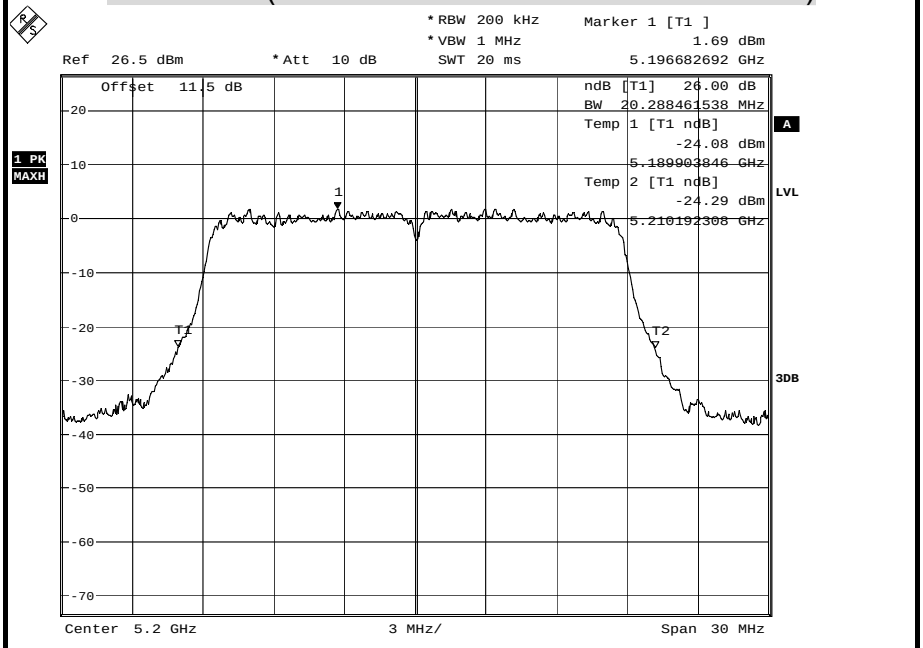
CH Middle (IEEE 802.11n HT20 Mode / Chain 0)



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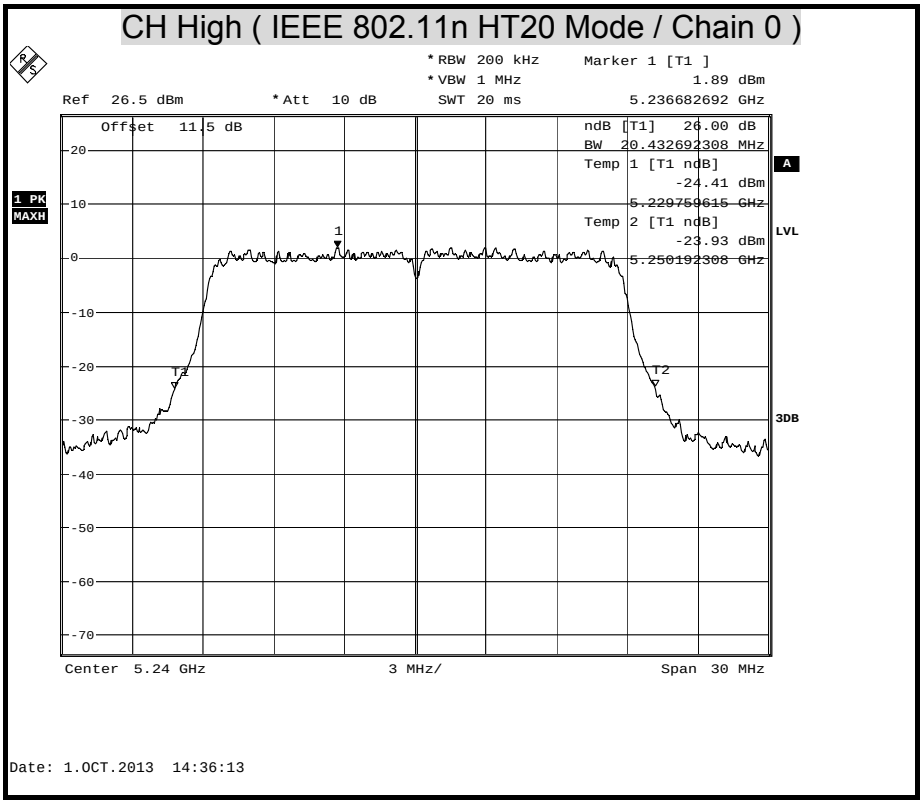
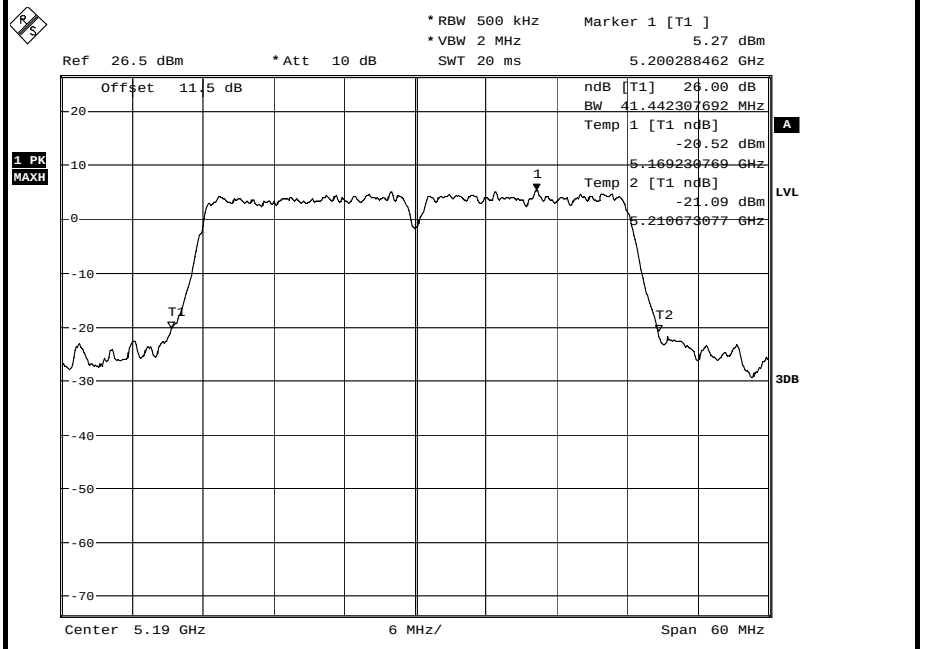
CH High (IEEE 802.11n HT20 Mode / Chain 0)



CH Low (IEEE 802.11n HT40 Mode / Chain 0)



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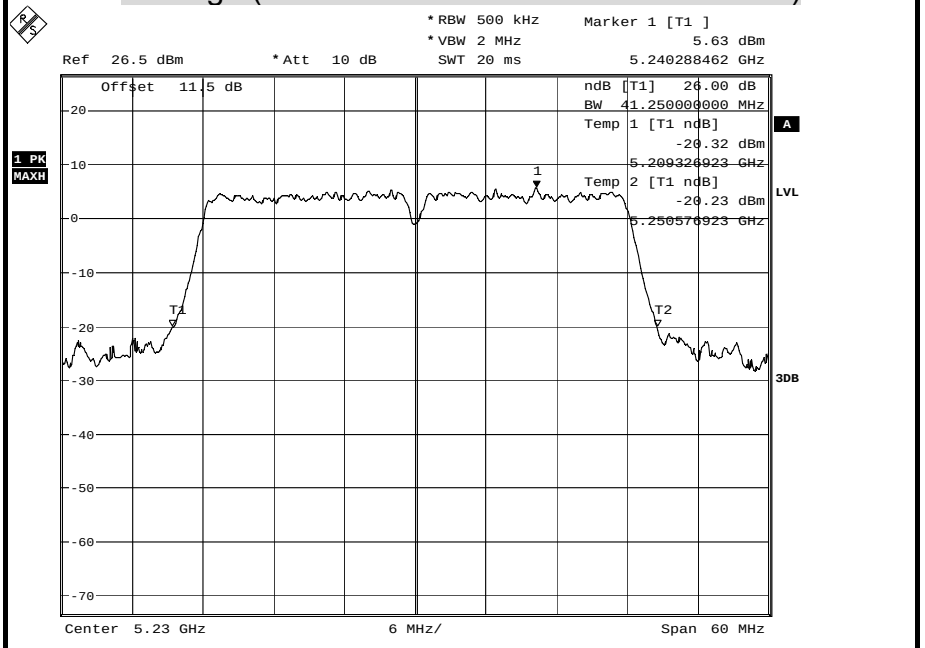
CH High (IEEE 802.11n HT40 Mode / Chain 0)



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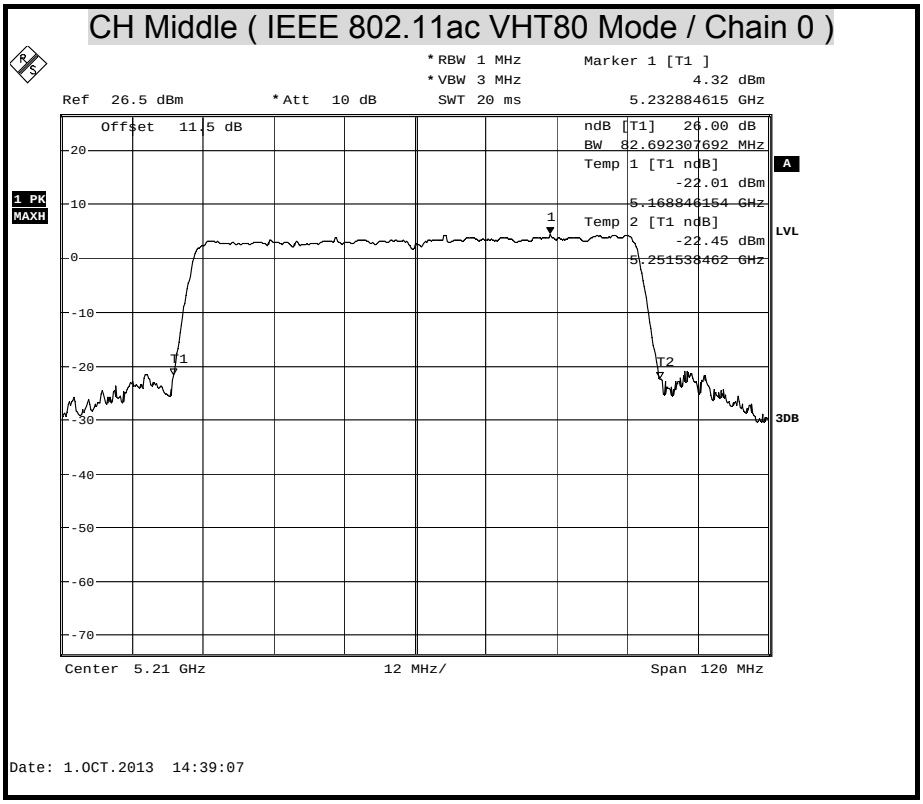
CH Middle (IEEE 802.11ac VHT80 Mode / Chain 0)



7.2 MAXIMUM CONDUCTED OUTPUT POWER

LIMITS

§ 15.407(a)

(1) For the band 5.15-5.25 GHz, the peak transmit power over the frequency band of operation shall not exceed the lesser of 50mW (17dBm) or 4dBm + 10log B, where B is the 26dB emission bandwidth in MHz. In addition, the peak power spectral density shall not exceed 4dBm in any 1 MHz band.

(2) For the 5.25-5.35 GHz and 5.47-5.725 GHz bands, the maximum conducted output power over the frequency bands of operation shall not exceed the lesser of 250 mW or 11 dBm + 10log B, where B is the 26 dB emission bandwidth in MHz.

If transmitting antennas of directional gain greater than 6dBi are used, both the peak transmit power and the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

The peak power shall not exceeded the limit as follows:

IEEE 802.11a mode

Channel	Channel Frequency (MHz)	26dB Bandwidth (B) (MHz)	10 Log B (dB)	4dBm + 10 Log B (dBm)	Maximum Conducted Output Power Limit (dBm)
Low	5180	20.10	13.03	17.03	17.00
Middle	5200	20.14	13.04	17.04	17.00
High	5240	19.86	12.98	16.98	16.98

IEEE 802.11n HT20 mode

Channel	Channel Frequency (MHz)	26dB Bandwidth (B) (MHz)	10 Log B (dB)	4dBm + 10 Log B (dBm)	Maximum Conducted Output Power Limit (dBm)
Low	5180	20.34	13.08	17.08	17.00
Middle	5200	20.29	13.07	17.07	17.00
High	5240	20.43	13.10	17.10	17.00

IEEE 802.11n HT40 mode

Channel	Channel Frequency (MHz)	26dB Bandwidth (B) (MHz)	10 Log B (dB)	4dBm + 10 Log B (dBm)	Maximum Conducted Output Power Limit (dBm)
Low	5190	41.44	16.17	20.17	17.00
High	5230	41.25	16.15	20.15	17.00

IEEE 802.11ac VHT80 mode

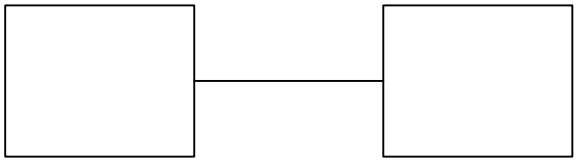
Channel	Channel Frequency (MHz)	26dB Bandwidth (B) (MHz)	10 Log B (dB)	4dBm + 10 Log B (dBm)	Maximum Conducted Output Power Limit (dBm)
Middle	5210	82.69	19.17	23.17	17.00

TEST EQUIPMENT

Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
Spectrum Analyzer	R&S	FSU	200789	JUL. 01, 2014

Remark: *Each piece of equipment is scheduled for calibration once a year*

TEST SETUP



TEST PROCEDURE

1. Set span to encompass the entire emission bandwidth (EBW) of the signal.
2. Set RBW = 1 MHz.
3. Set VBW ≥ 3 MHz.
4. Number of points in sweep ≥ 2 Span / RBW. (This ensures that bin-to-bin spacing is ≤ RBW/2, so that narrowband signals are not lost between frequency bins.)
5. Manually set sweep time ≥ 10 * (number of points in sweep) * (symbol period of the transmitted signal).
6. Set detector = RMS.
7. The EUT must be operated at 100 percent duty cycle.
8. Perform a single sweep.
9. Compute power by integrating the spectrum across the 26 dB EBW of the signal using the spectrum analyzer's band power measurement function with band limits set equal to the EBW band edges. If the spectrum analyzer does not have a band power function, sum the spectrum levels (in power units) at 1 MHz intervals extending across the 26 dB EBW of the spectrum.

EUT

Sp
An

TEST RESULTS

IEEE 802.11a Mode

Channel	Channel Frequency (MHz)	Peak Power (dBm)	Peak Power Limit (dBm)	Pass / Fail
Low	5180	12.10	17.00	PASS
Middle	5200	12.35	17.00	PASS
High	5240	12.51	16.98	PASS

Remark:

1. *At finial test to get the worst-case emission at 6Mbps.*
2. *The cable assembly insertion loss of 11.5dB (including 10 dB pad and 1.5 dB cable) was Entered as an offset in the spectrum analyzer to allow for direct reading of power.*

IEEE 802.11n HT20 Mode

Channel	Channel Frequency (MHz)	Peak Power (dBm)	Peak Power Limit (dBm)	Pass / Fail
Low	5180	11.91	17.00	PASS
Middle	5200	12.32	17.00	PASS
High	5240	12.51	17.00	PASS

Remark:

1. *At finial test to get the worst-case emission at 6.5Mbps.*
2. *The cable assembly insertion loss of 11.5dB (including 10 dB pad and 1.5 dB cable) was Entered as an offset in the spectrum analyzer to allow for direct reading of power.*

IEEE 802.11n HT40 Mode

Channel	Channel Frequency (MHz)	Peak Power (dBm)	Peak Power Limit (dBm)	Pass / Fail
Low	5190	14.46	17.00	PASS
High	5230	14.50	17.00	PASS

Remark:

1. *At finial test to get the worst-case emission at 13.5Mbps.*
2. *The cable assembly insertion loss of 11.5dB (including 10 dB pad and 1.5 dB cable) was Entered as an offset in the spectrum analyzer to allow for direct reading of power.*

IEEE 802.11n HT40 Mode

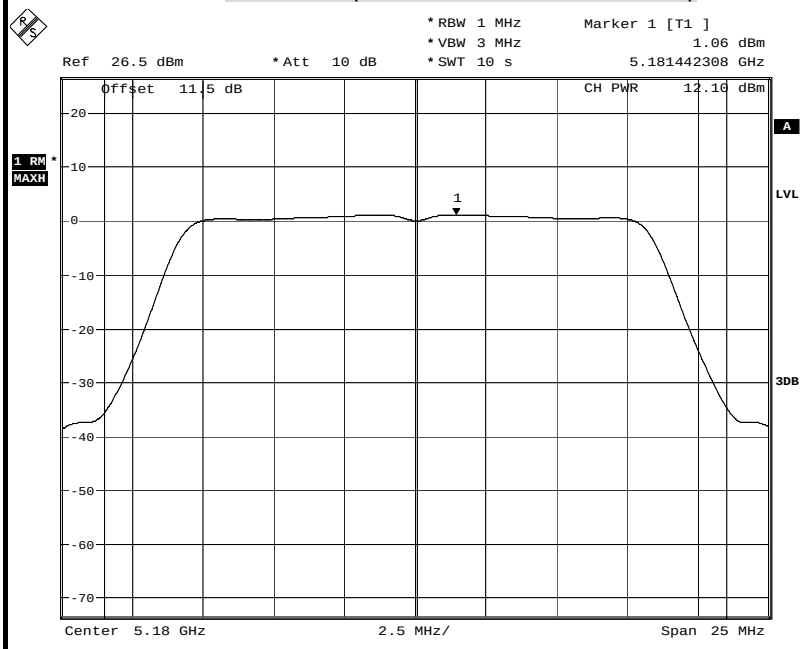
Channel	Channel Frequency (MHz)	Peak Power (dBm)	Peak Power Limit (dBm)	Pass / Fail
Middle	5210	12.38	17.00	PASS

Remark:

1. *At finial test to get the worst-case emission at 29.3Mbps.*
2. *The cable assembly insertion loss of 11.5dB (including 10 dB pad and 1.5 dB cable) was Entered as an offset in the spectrum analyzer to allow for direct reading of power.*

MAXIMUM CONDUCTED OUTPUT POWER

CH Low (IEEE 802.11a Mode)



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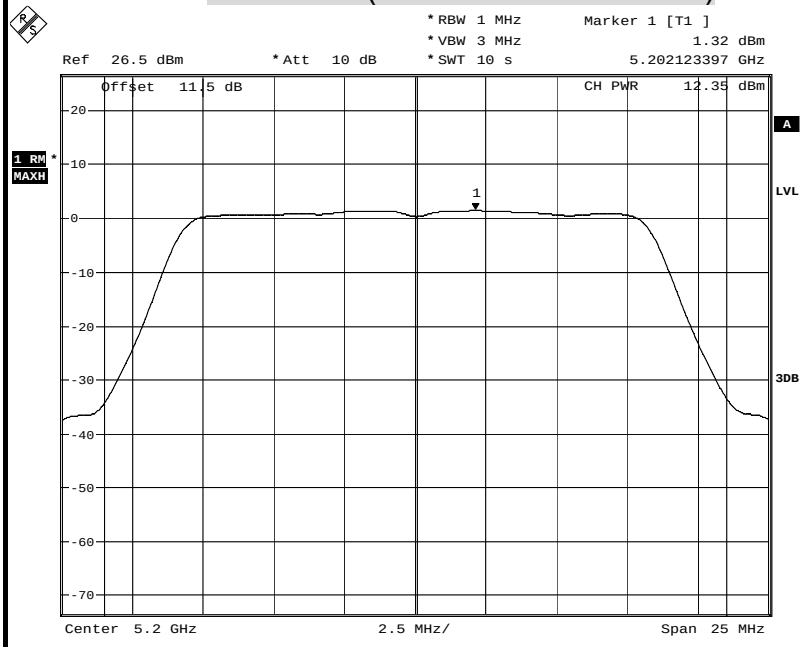
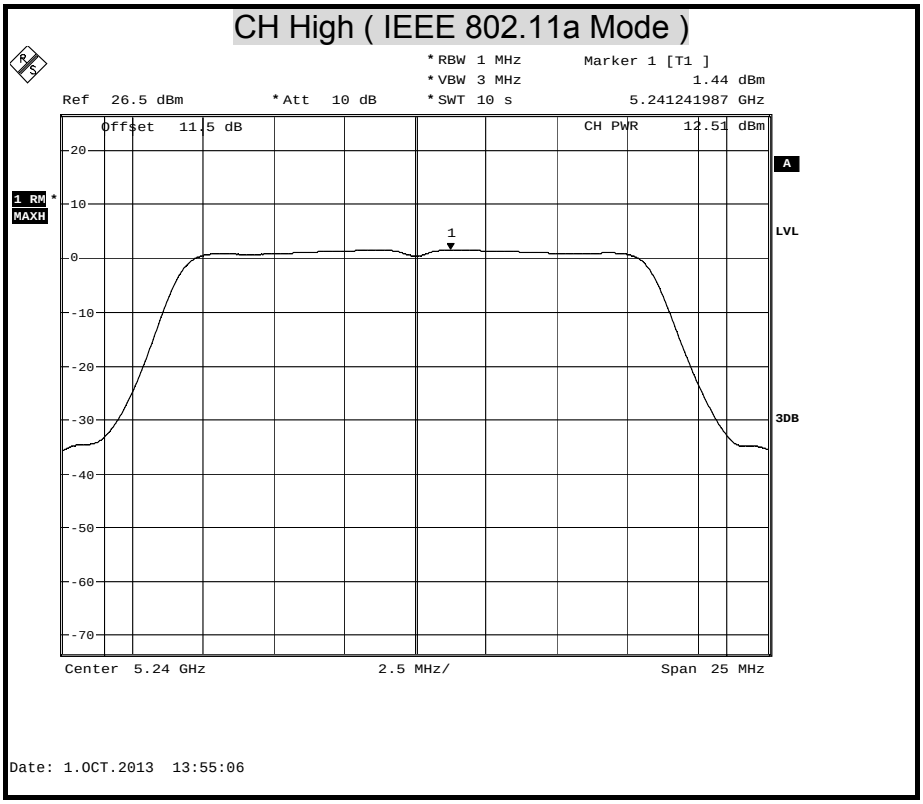
CH Middle (IEEE 802.11a Mode)

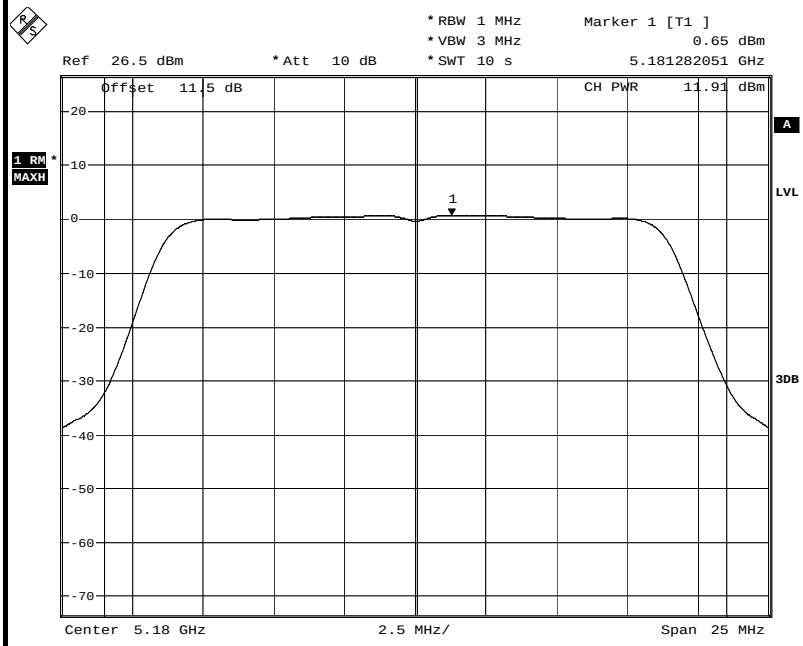


Date: 1.OCT.2013 13:54:05

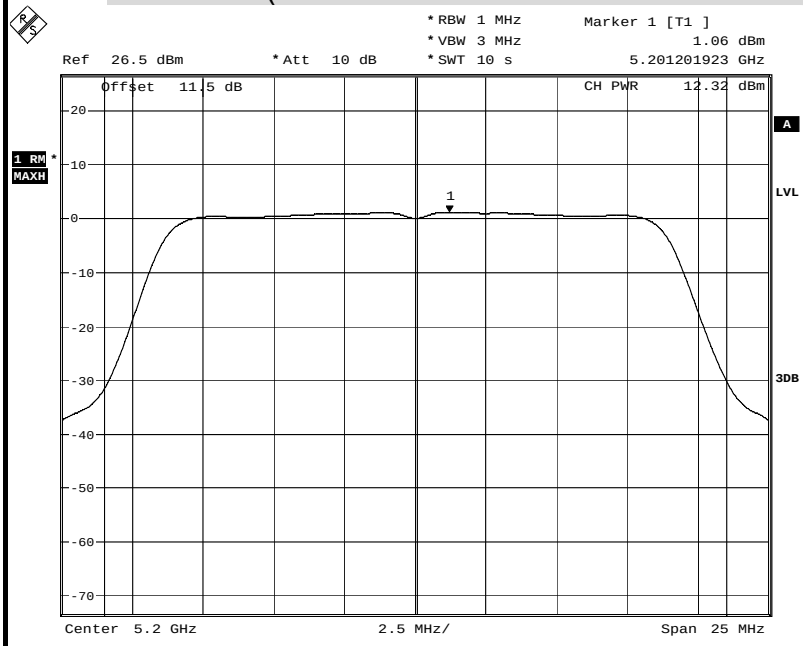
CH High (IEEE 802.11a Mode)



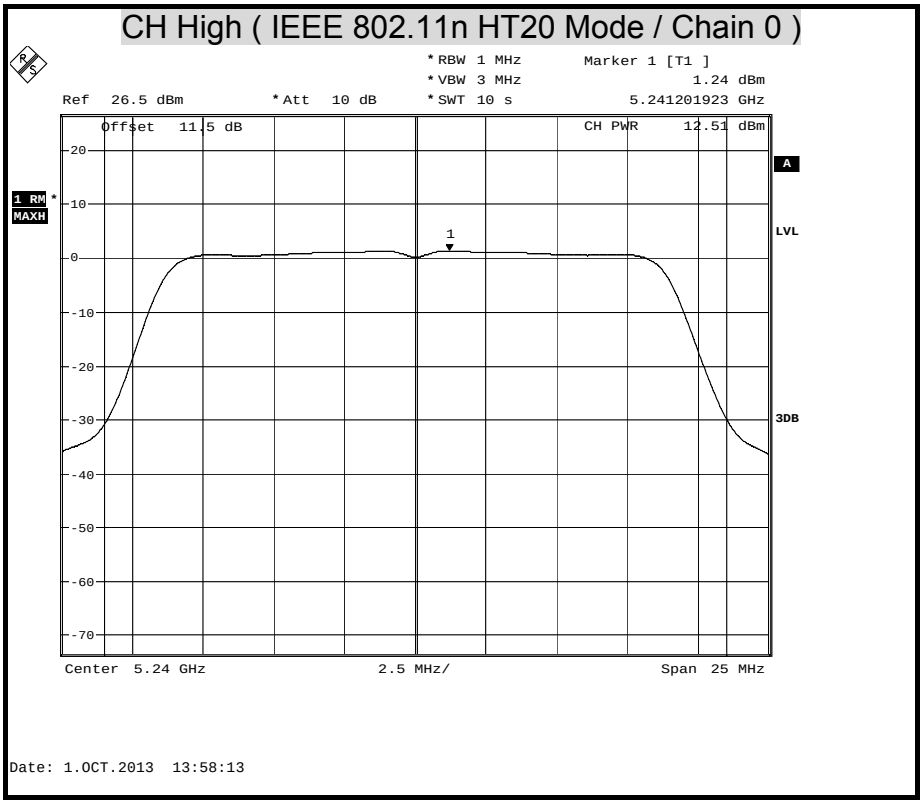
CH Low (IEEE 802.11n HT20 Mode / Chain 0)



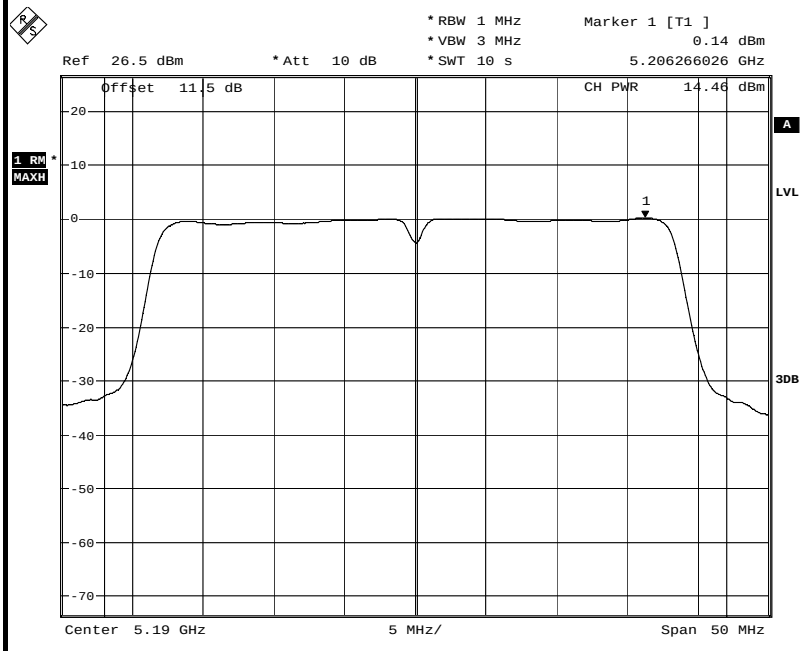
CH Middle (IEEE 802.11n HT20 Mode / Chain 0)



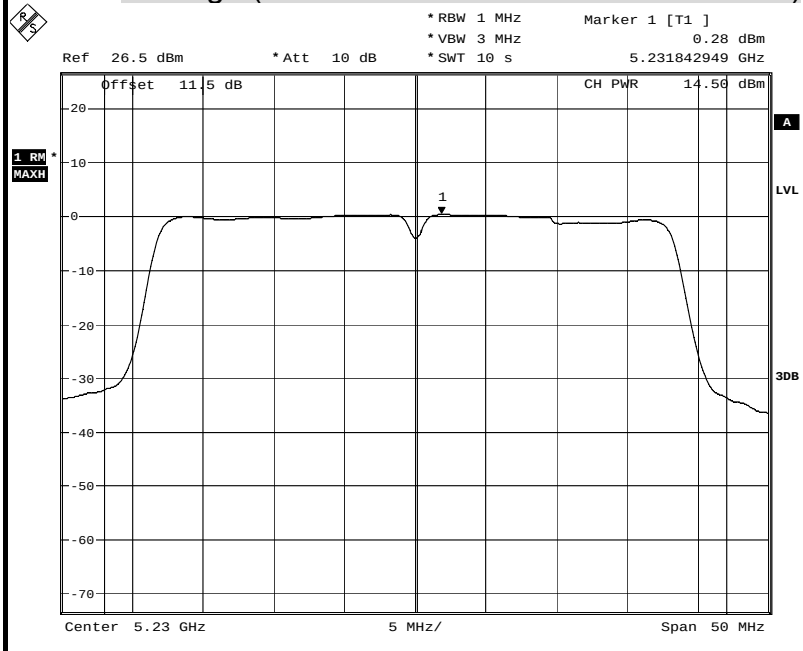
CH High (IEEE 802.11n HT20 Mode / Chain 0)



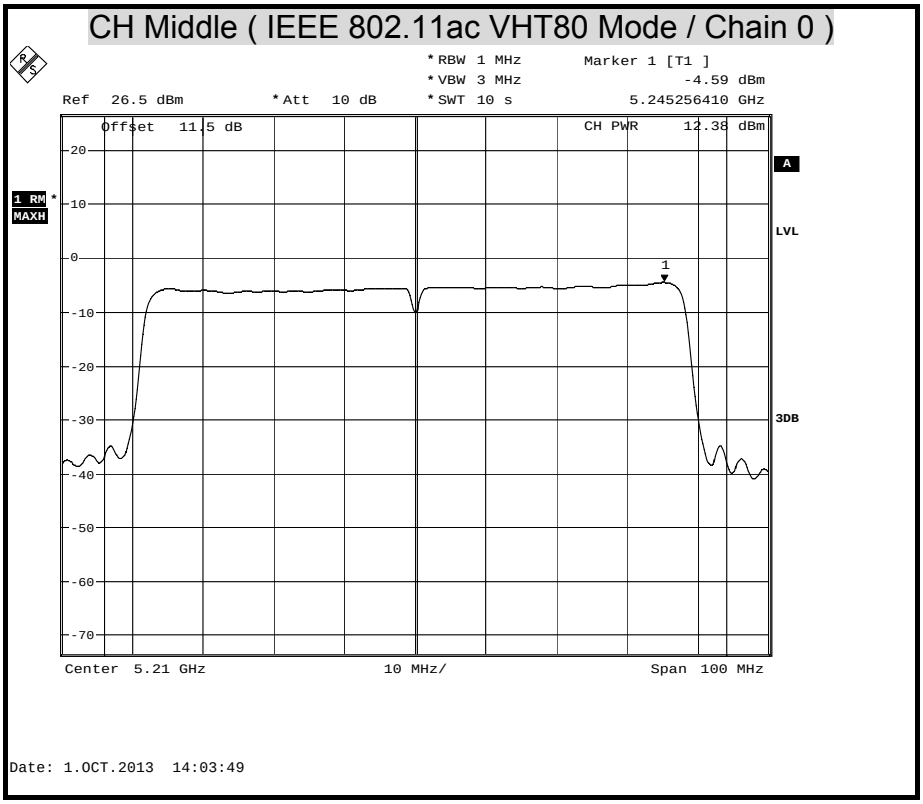
CH Low (IEEE 802.11n HT40 Mode / Chain 0)



CH High (IEEE 802.11n HT40 Mode / Chain 0)



CH Middle (IEEE 802.11ac VHT80 Mode / Chain 0)



7.3 PEAK POWER SPECTRAL DENSITY

LIMITS

§ 15.407 (a)

(1) For the band 5.15-5.25 GHz, the peak power spectral density shall not exceed 4dBm in any 1MHz band.

(2) For the band 5.25-5.35 GHz and 5.47-5725 GHz, the peak power spectral density shall not exceed 11dBm in any 1MHz band.

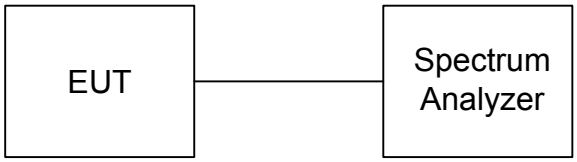
If transmitting antennas of directional gain greater than 6dBi are used, both the peak transmit power and the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

TEST EQUIPMENT

Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
Spectrum Analyzer	R&S	FSU	200789	JUL. 01, 2014

Remark: *Each piece of equipment is scheduled for calibration once a year.*

TEST SETUP



TEST PROCEDURE

1. Set span to encompass the entire emission bandwidth (EBW) of the signal.
2. Set RBW = 1 MHz.
3. Set VBW ≥ 3 MHz.
4. Number of points in sweep ≥ 2 Span / RBW. (This ensures that bin-to-bin spacing is ≤ RBW/2, so that narrowband signals are not lost between frequency bins.)
5. Manually set sweep time ≥ 10 * (number of points in sweep) * (symbol period of the transmitted signal).
6. Set detector = RMS.
7. The EUT must be operated at 100 percent duty cycle.
8. Perform a single sweep.
9. Compute power by integrating the spectrum across the 26 dB EBW of the signal using the spectrum analyzer's band power measurement function with band limits set equal to the EBW band edges. If the spectrum analyzer does not have a band power function, sum the spectrum levels (in power units) at 1 MHz intervals extending across the 26 dB EBW of the spectrum.

TEST RESULTS

IEEE 802.11a Mode

Channel	Channel Frequency (MHz)	PPSD (dBm)	Limit (dBm)	Margin (dB)	Pass / Fail
Low	5180	1.06	4.00	-2.94	PASS
Middle	5200	1.32		-2.68	PASS
High	5240	1.44		-2.56	PASS

Remark:

1. *At finial test to get the worst-case emission at 6Mbps.*
2. *The cable assembly insertion loss of 11.5dB (including 10 dB pad and 1.5 dB cable) was Entered as an offset in the spectrum analyzer to allow for direct reading of power.*

IEEE 802.11n HT20 Mode

Channel	Channel Frequency (MHz)	PPSD (dBm)	Limit (dBm)	Margin (dB)	Pass / Fail
Low	5180	0.65	4.00	-3.35	PASS
Middle	5200	1.06		-2.94	PASS
High	5240	1.24		-2.76	PASS

Remark:

1. *At finial test to get the worst-case emission at 6.5Mbps*
2. *The cable assembly insertion loss of 11.5dB (including 10 dB pad and 1.5 dB cable) was Entered as an offset in the spectrum analyzer to allow for direct reading of power.*

IEEE 802.11n HT40 Mode

Channel	Channel Frequency (MHz)	PPSD (dBm)	Limit (dBm)	Margin (dB)	Pass / Fail
Low	5190	0.14	4.00	-3.86	PASS
High	5230	0.28		-3.72	PASS

Remark:

1. *At finial test to get the worst-case emission at 13.5Mbps*
2. *The cable assembly insertion loss of 11.5dB (including 10 dB pad and 1.5 dB cable) was Entered as an offset in the spectrum analyzer to allow for direct reading of power.*

IEEE 802.11ac VHT80 Mode

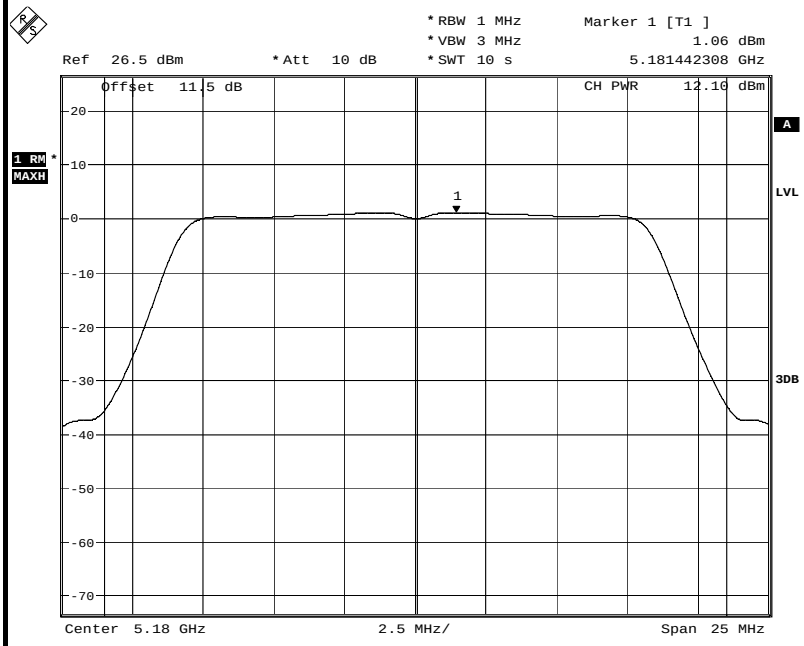
Channel	Channel Frequency (MHz)	PPSD (dBm)	Limit (dBm)	Margin (dB)	Pass / Fail
Middle	5210	-4.59	4.00	-8.59	PASS

Remark:

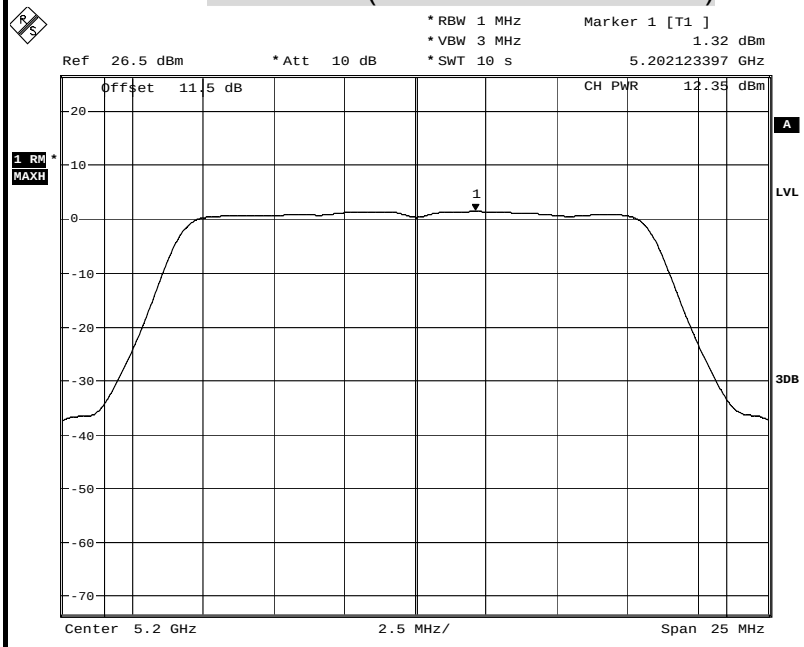
1. *At finial test to get the worst-case emission at 29.3Mbps*
2. *The cable assembly insertion loss of 11.5dB (including 10 dB pad and 1.5 dB cable) was Entered as an offset in the spectrum analyzer to allow for direct reading of power.*

PEAK POWER SPECTRAL DENSITY

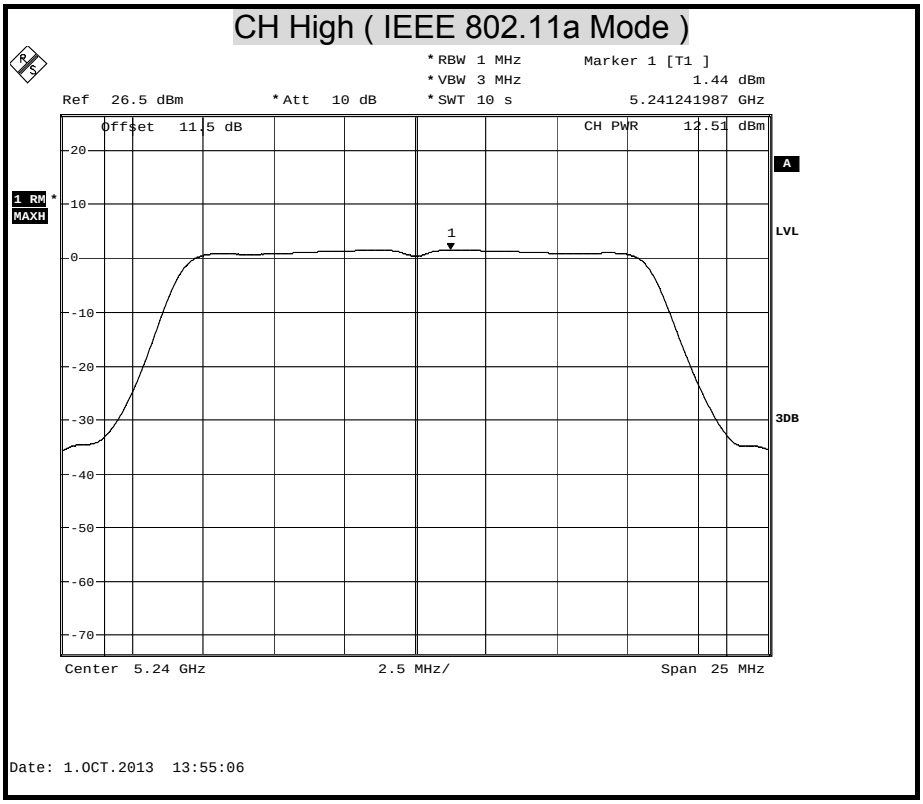
CH Low (IEEE 802.11a Mode)



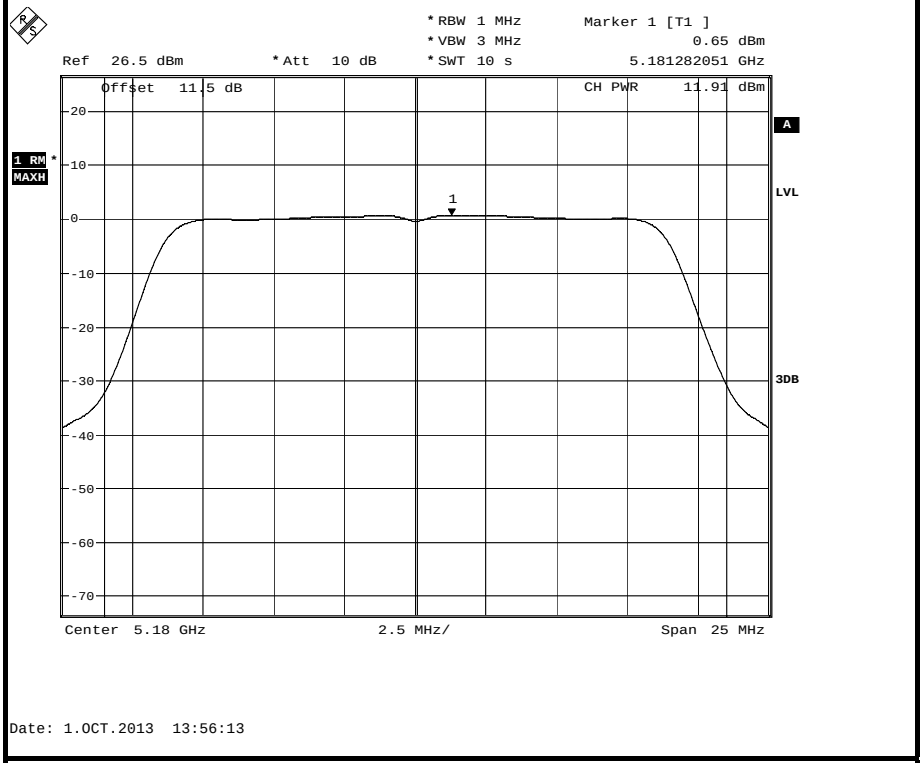
CH Middle (IEEE 802.11a Mode)



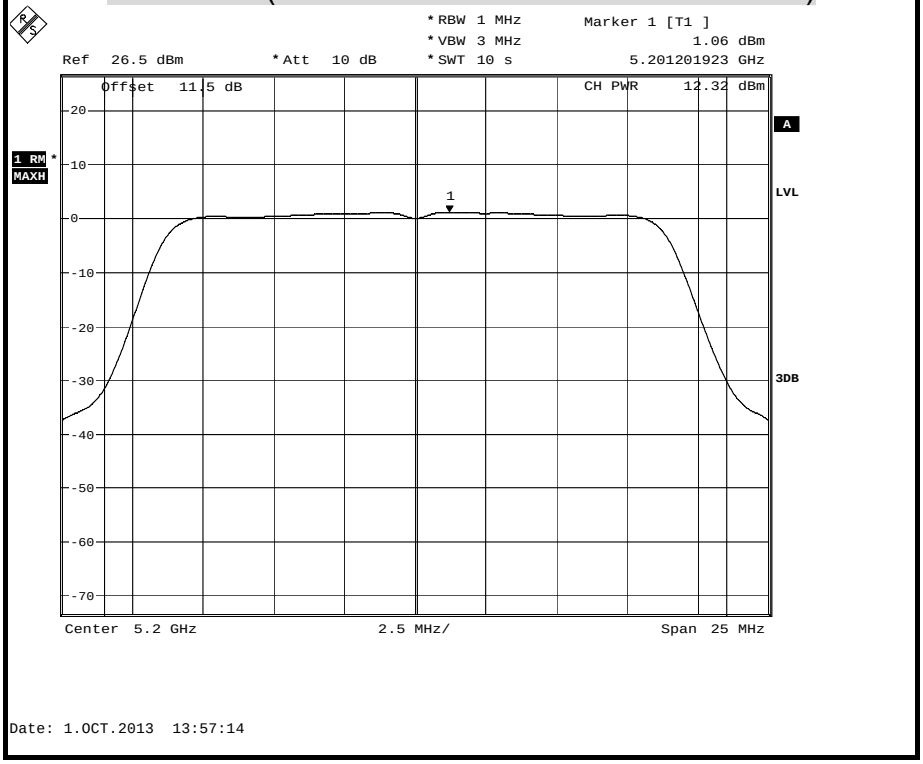
CH High (IEEE 802.11a Mode)



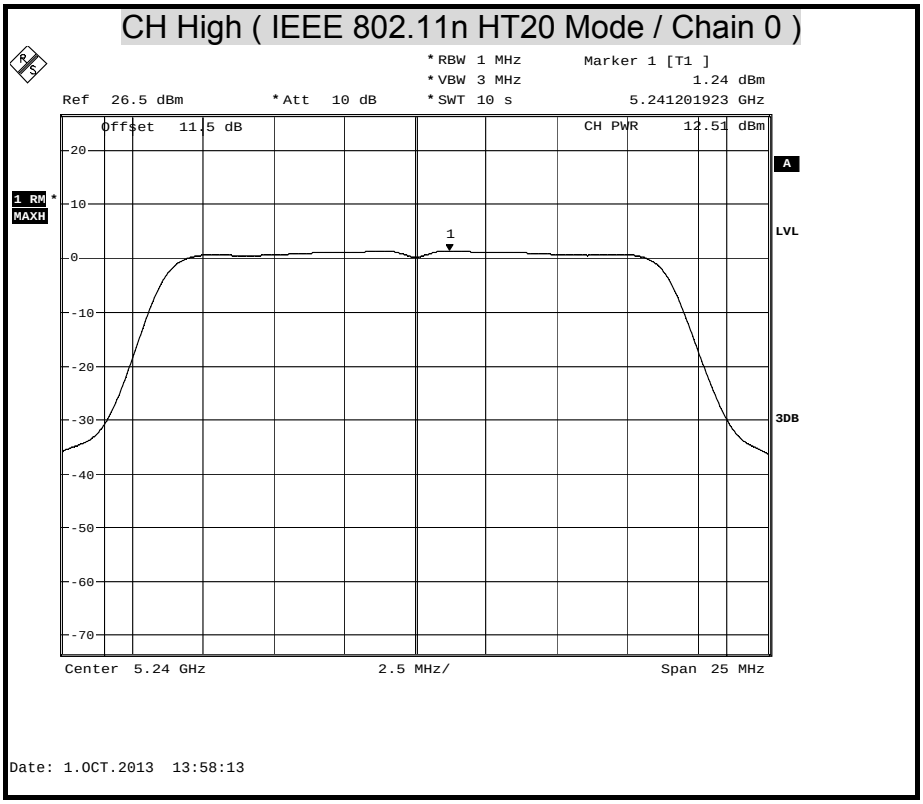
CH Low (IEEE 802.11n HT20 Mode / Chain 0)



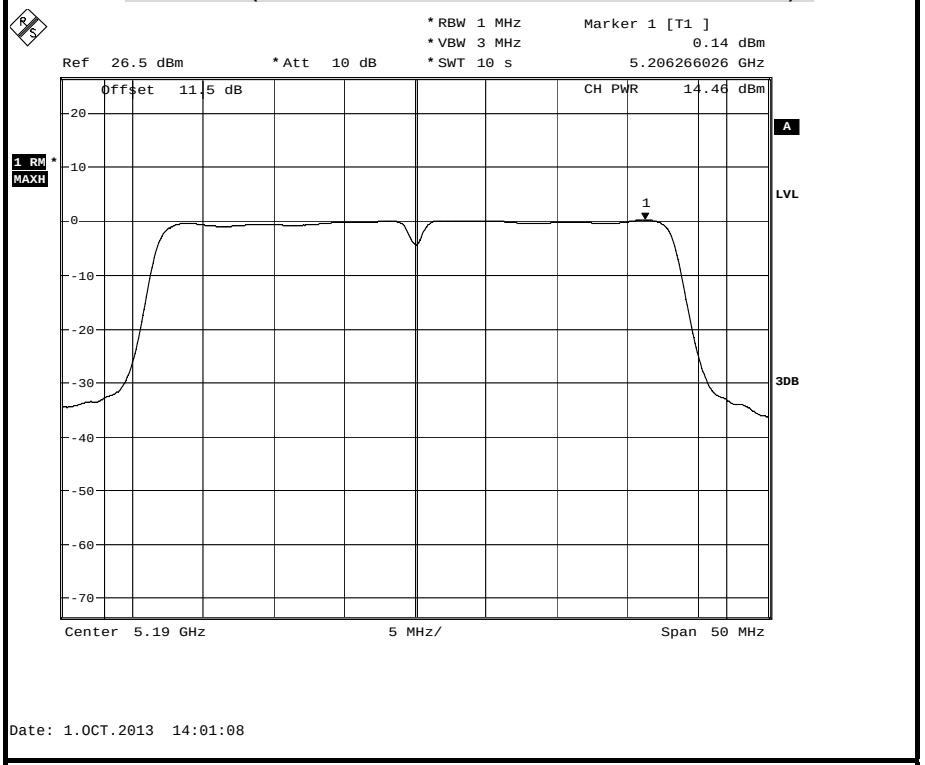
CH Middle (IEEE 802.11n HT20 Mode / Chain 0)



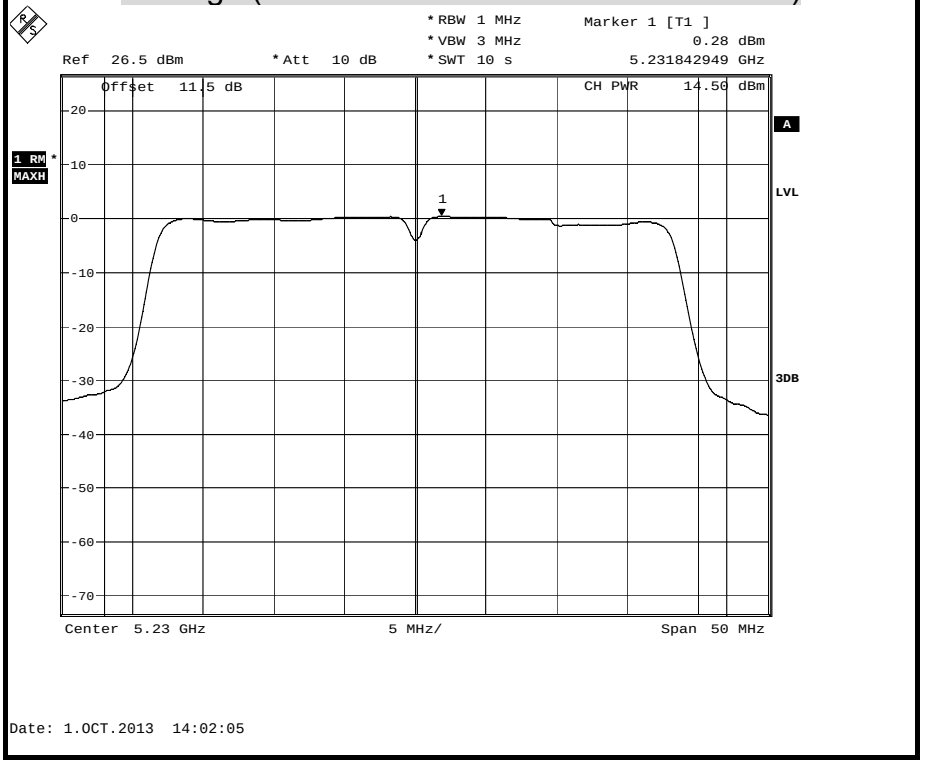
CH High (IEEE 802.11n HT20 Mode / Chain 0)



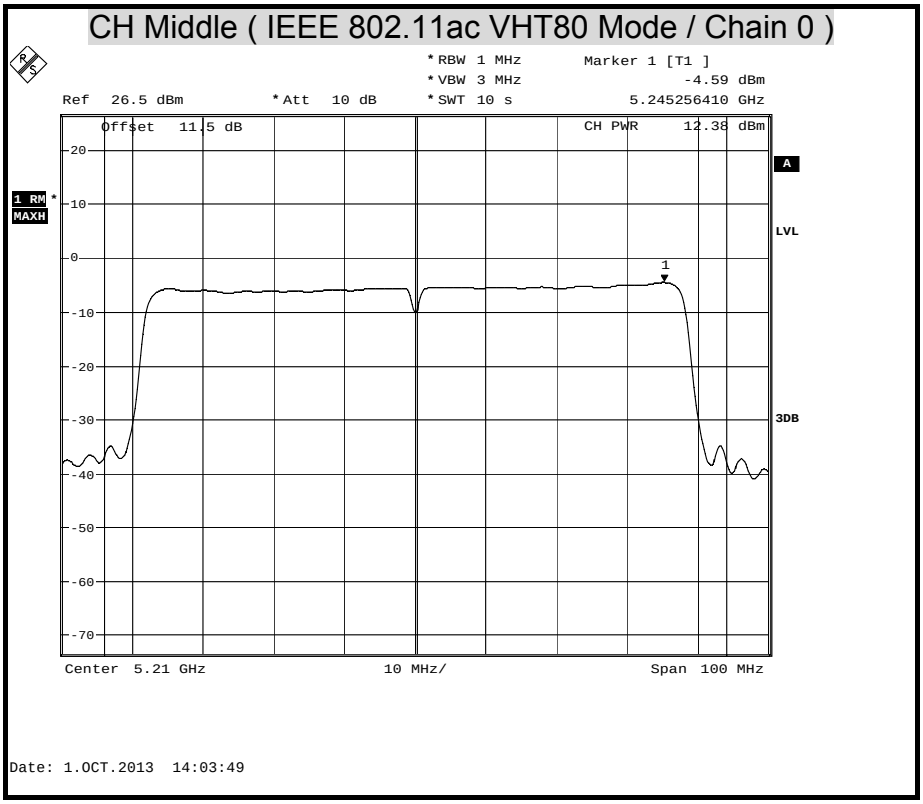
CH Low (IEEE 802.11n HT40 Mode / Chain 0)



CH High (IEEE 802.11n HT40 Mode / Chain 0)



CH Middle (IEEE 802.11ac VHT80 Mode / Chain 0)



7.4 PEAK EXCURSION

LIMITS

§ 15.407 (a) (6), the ratio of the peak excursion of the modulation envelope (measured using a peak hold function) to the peak transmit power (measured as specified above) shall not exceed 13 dB across any 1 MHz bandwidth or the emission bandwidth whichever is less.

TEST EQUIPMENT

Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
Spectrum Analyzer	R&S	FSEK 30	835253/002	JUL. 01, 2014

Remark: *Each piece of equipment is scheduled for calibration once a year*

TEST SETUP

TEST PROCEDURE

The test is performed in accordance with <FCC Public Notice: APPENDIX A Guidelines for Assessing Unlicensed National Information Infrastructure (U-NII) Devices> – Part 15, Subpart E, August 2002.

1. Place the EUT on the table and set it in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to spectrum.
3. Trace A, Set RBW =1MHz, VBW = 3MHz, Span > 26dB Bandwidth, Max. hold.
   Trace B, Set RBW =1MHz, VBW = 3MHz, Span > 26dB Bandwidth, Setup RMS detector and power average mode, to scan 100 times with average.
4. Delta Mark trace A Maximum frequency and trace B same frequency.
5. Repeat the above procedure until measurements for all frequencies were complete.

TEST RESULTS

IEEE 802.11a Mode

Channel	Channel Frequency (MHz)	Peak Excursion (dB)	Limit (dBm)	Margin (dB)	Pass / Fail
Low	5180	8.69	13.00	-4.31	PASS
Middle	5200	8.81		-4.19	PASS
High	5240	8.31		-4.69	PASS

Remark:

1. *At finial test to get the worst-case emission at 6Mbps.*
2. *The cable assembly insertion loss of 11.5dB (including 10 dB pad and 1.5 dB cable) was Entered as an offset in the spectrum analyzer to allow for direct reading of power.*

IEEE 802.11n HT20 Mode / Chain 0

Channel	Channel Frequency (MHz)	Peak Excursion (dB)	Limit (dBm)	Margin (dB)	Pass / Fail
Low	5180	8.89	13.00	-4.11	PASS
Middle	5200	8.94		-4.06	PASS
High	5240	8.86		-4.14	PASS

Remark:

1. *At finial test to get the worst-case emission at 6.5Mbps.*
2. *The cable assembly insertion loss of 11.5dB (including 10 dB pad and 1.5 dB cable) was Entered as an offset in the spectrum analyzer to allow for direct reading of power.*

IEEE 802.11n HT40 Mode / Chain 0

Channel	Channel Frequency (MHz)	Peak Excursion (dB)	Limit (dBm)	Margin (dB)	Pass / Fail
Low	5190	8.80	13.00	-4.20	PASS
High	5230	8.80		-4.20	PASS

1. *At finial test to get the worst-case emission at 13.5Mbps.*
2. *The cable assembly insertion loss of 11.5dB (including 10 dB pad and 1.5 dB cable) was Entered as an offset in the spectrum analyzer to allow for direct reading of power.*

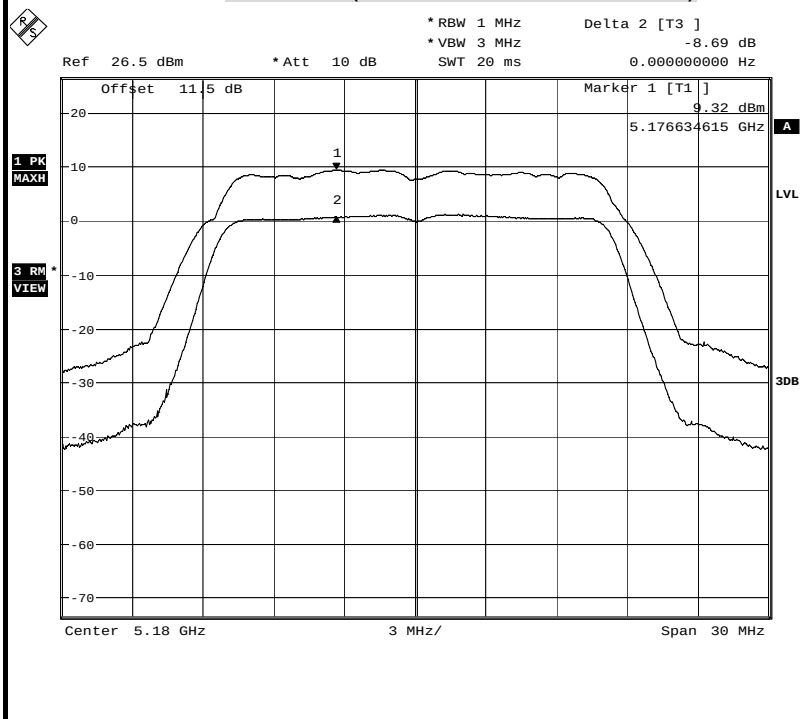
IEEE 802.11ac VHT80 Mode / Chain 0

Channel	Channel Frequency (MHz)	Peak Excursion (dB)	Limit (dBm)	Margin (dB)	Pass / Fail
Middle	5210	9.39	13.00	-3.61	PASS

1. *At finial test to get the worst-case emission at 29.3Mbps.*
2. *The cable assembly insertion loss of 11.5dB (including 10 dB pad and 1.5 dB cable) was Entered as an offset in the spectrum analyzer to allow for direct reading of power.*

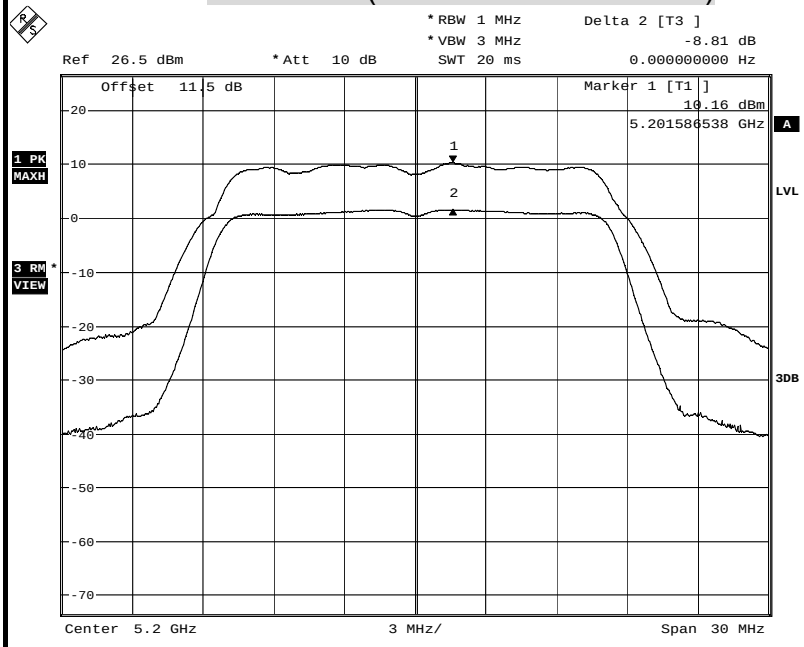
PEAK EXCURSION

CH Low (IEEE 802.11a Mode)



Date: 1.OCT.2013 14:59:48

CH Middle (IEEE 802.11a Mode)



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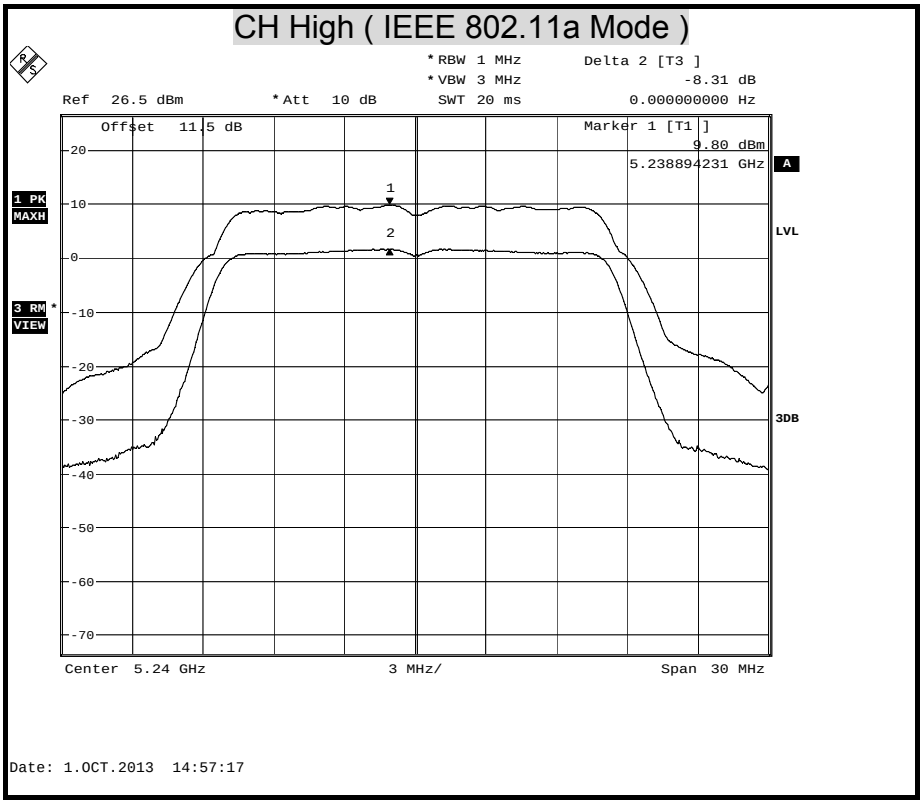
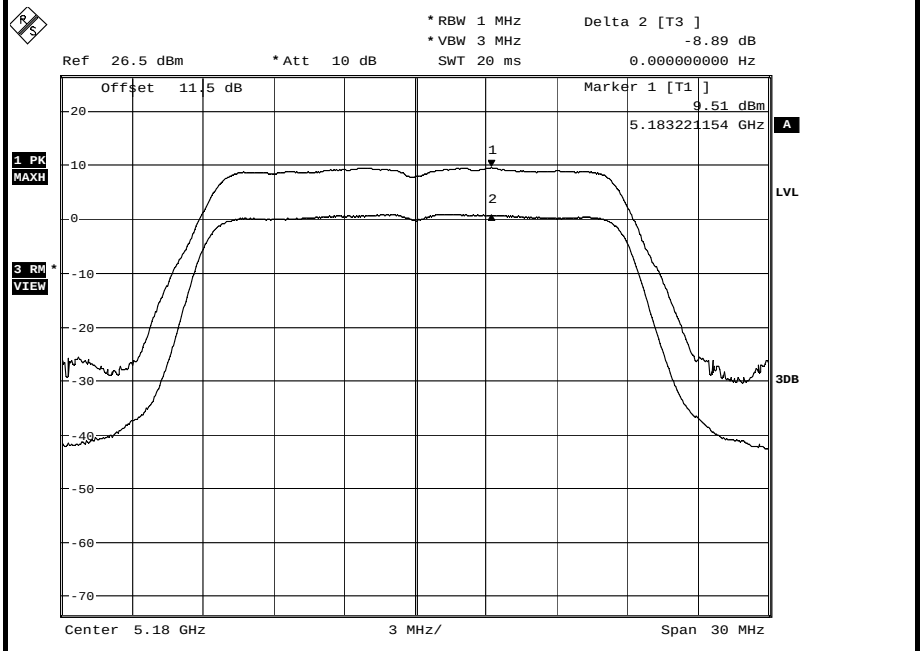
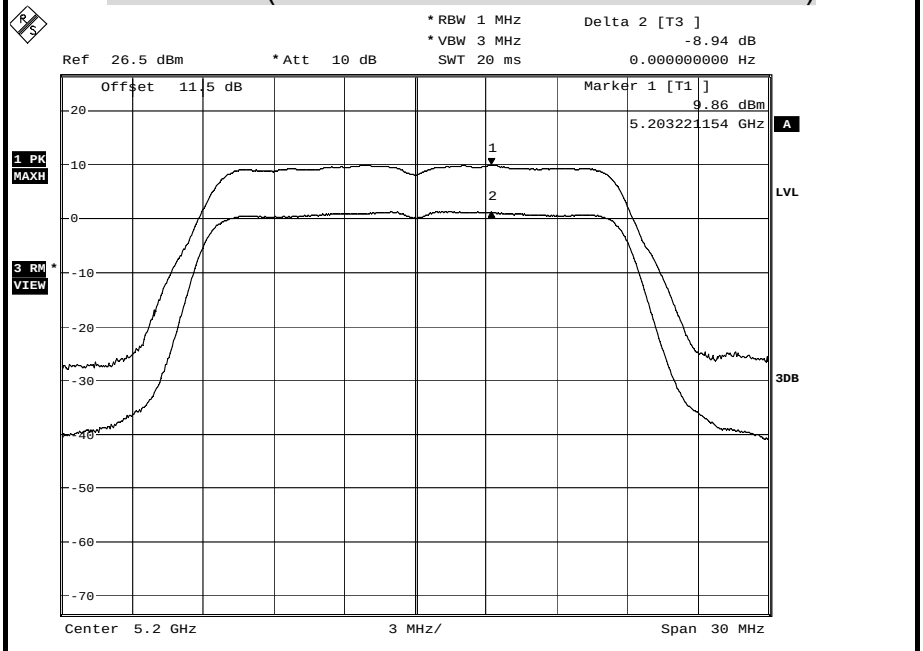
CH High (IEEE 802.11a Mode)



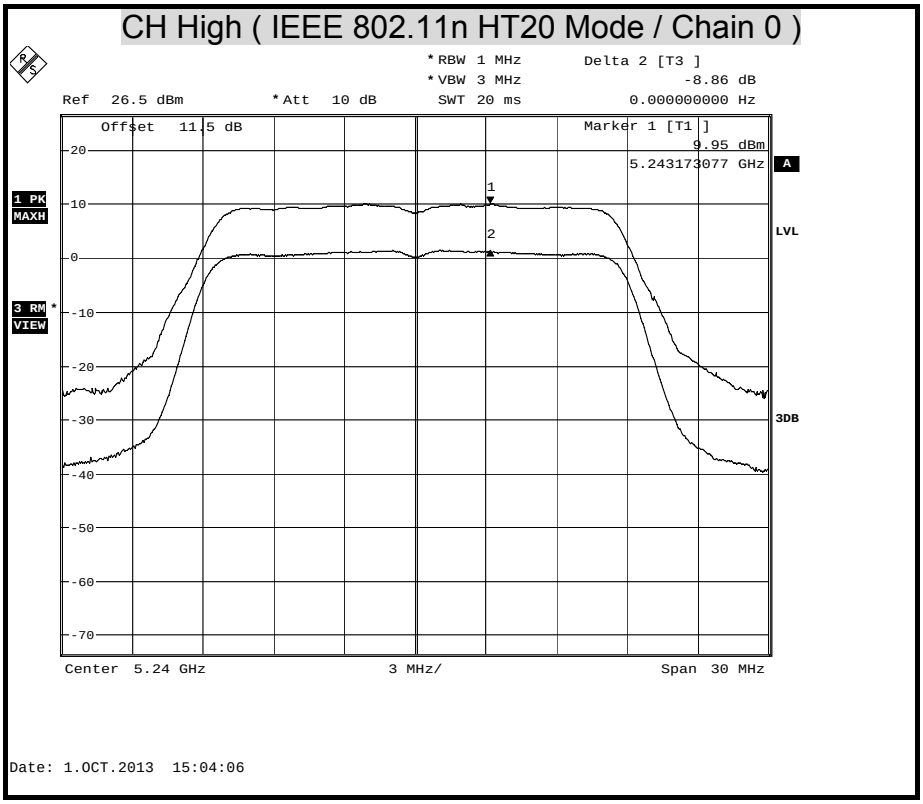
CH Low (IEEE 802.11n HT20 Mode / Chain 0)



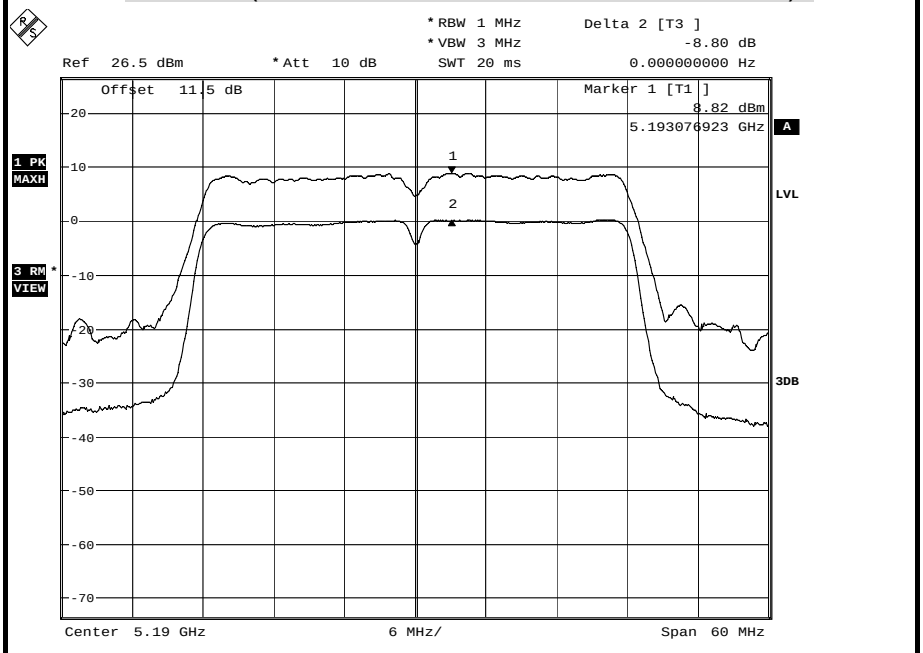
CH Middle (IEEE 802.11n HT20 Mode / Chain 0)



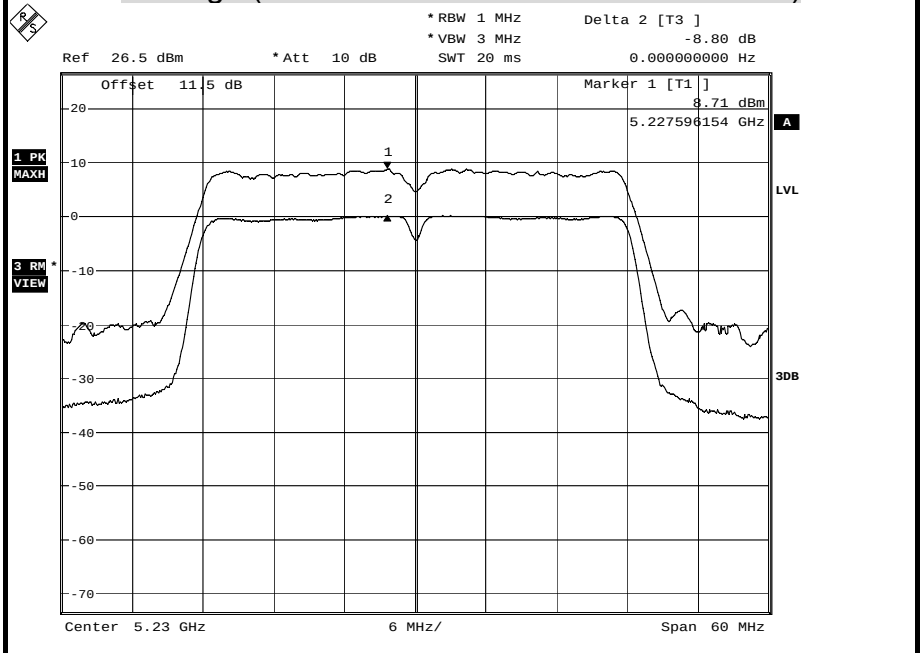
CH High (IEEE 802.11n HT20 Mode / Chain 0)



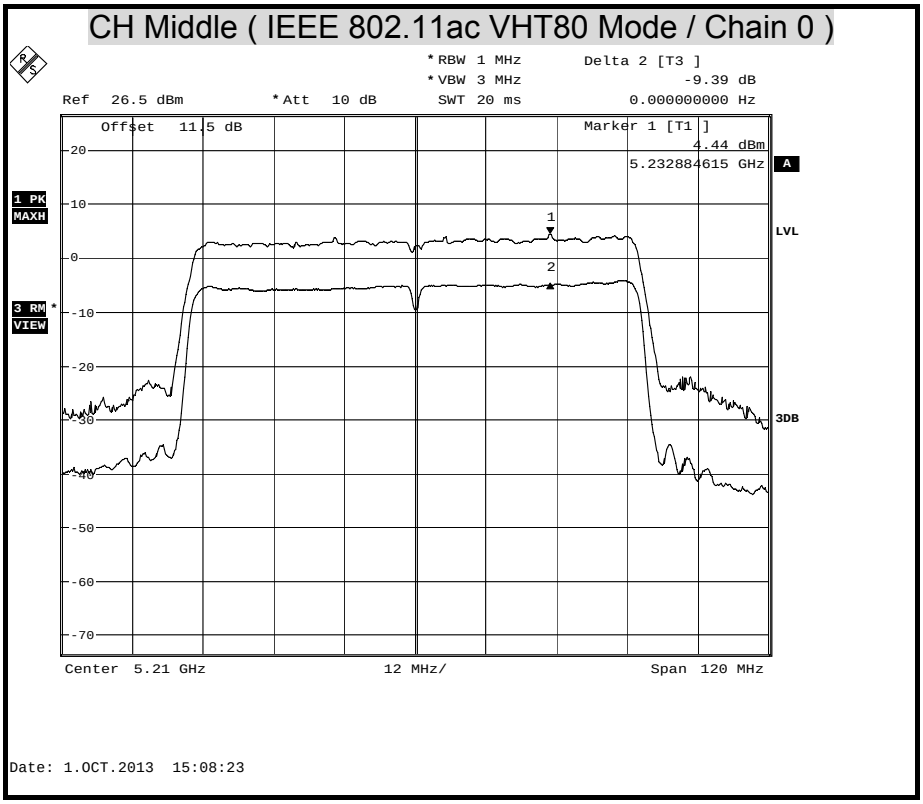
CH Low (IEEE 802.11n HT40 Mode / Chain 0)



CH High (IEEE 802.11n HT40 Mode / Chain 0)



CH Middle (IEEE 802.11ac VHT80 Mode / Chain 0)



7.5 CONDUCTED SPURIOUS EMISSION

LIMITS

§ 15.407 (b),

(1) For transmitters operating in the 5.15-5.25 GHz band: all emissions outside of the 5.15-5.35 GHz band shall not exceed an EIRP of -27 dBm/MHz.

(2) For transmitters operating in the 5.25-5.35 GHz band: all emissions outside of the 5.15-5.35 GHz band shall not exceed an EIRP of -27 dBm/MHz. Devices operating in the 5.25-5.35 GHz band that generate emissions in the 5.15-5.25 GHz band must meet all applicable technical requirements for operation in the 5.15-5.25 GHz band (including indoor use) or alternatively meet an out-of-band emission EIRP limit of -27 dBm/MHz in the 5.15-5.25 GHz band.

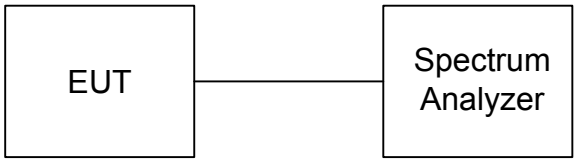
The provisions of § 15.205 apply to intentional radiators operating under this section.

TEST EQUIPMENT

Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
Spectrum Analyzer	R&S	FSU	200789	JUL. 01, 2014
Spectrum Analyzer	R&S	FSEK 30	835253/002	SEP. 28, 2014

Remark: *Each piece of equipment is scheduled for calibration once a year*

TEST SETUP



TEST PROCEDURE

Conducted RF measurements of the transmitter output were made to confirm that the EUT antenna port conducted emissions meet the specified limit and to identify any spurious signals that require further investigation of measurements on the radiated emissions site.

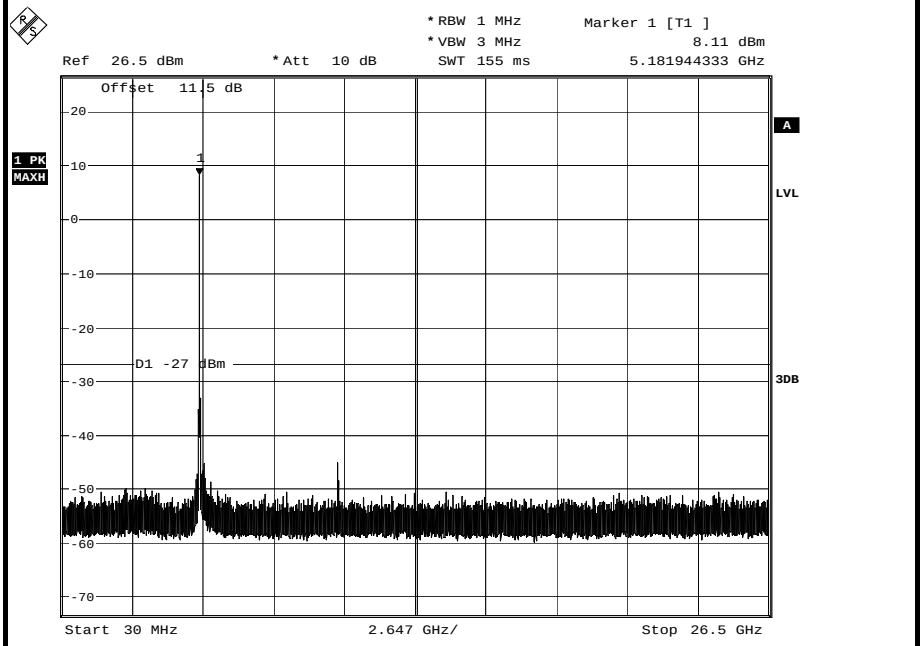
The transmitter output is connected to the spectrum analyzer. The resolution bandwidth is set to 1MHz. The video bandwidth is set to 1MHz. Peak detection measurements are compared to the average EIRP limit, adjusted for the maximum antenna gain. If necessary, additional average detection measurements are made.

Measurements are made over the 30 MHz to 40 GHz range with the transmitter set to the lowest, middle, and highest channels.

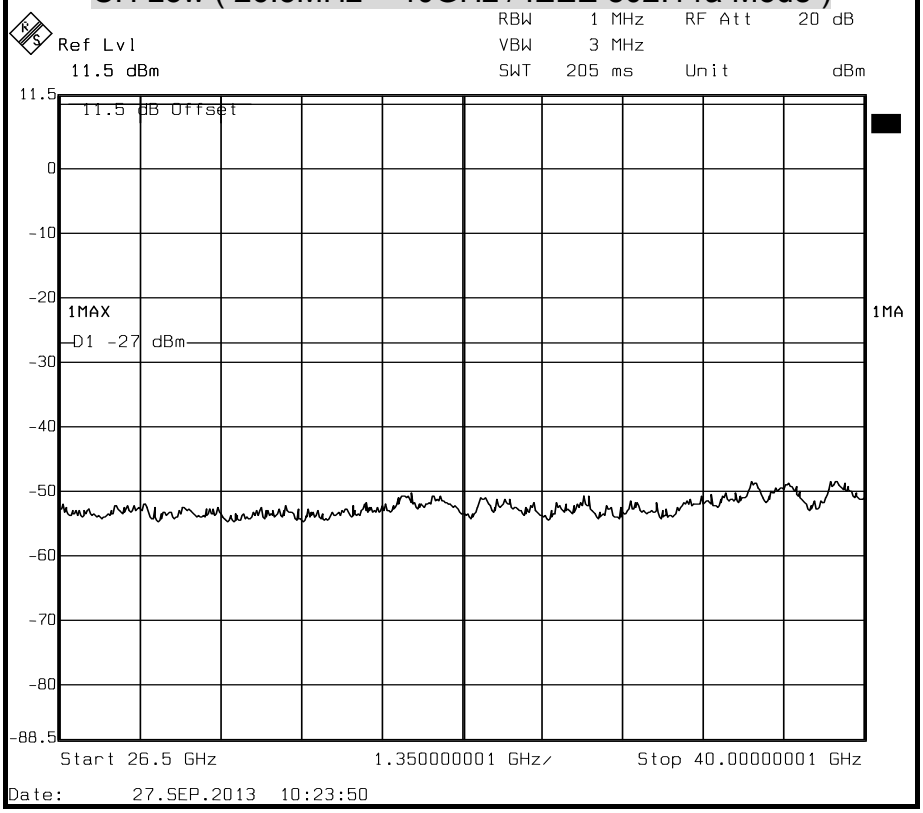
TEST RESULTS

OUT-OF-BAND SPURIOUS EMISSIONS-CONDUCTED MEASUREMENT
(802.11a MODE)

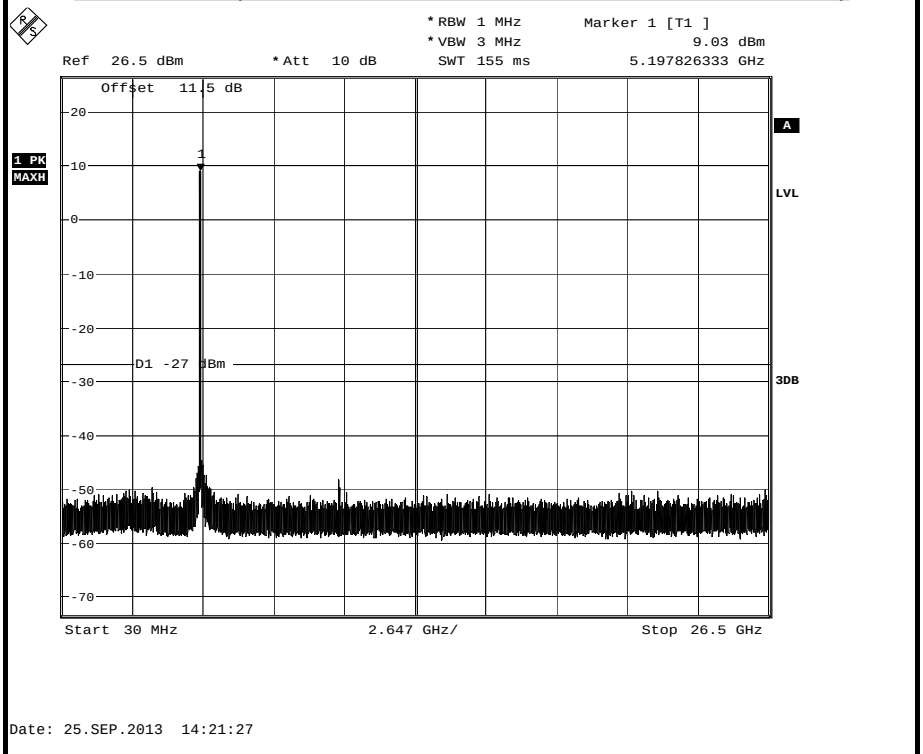
CH Low (30MHz ~ 26.5GHz / IEEE 802.11a Mode)



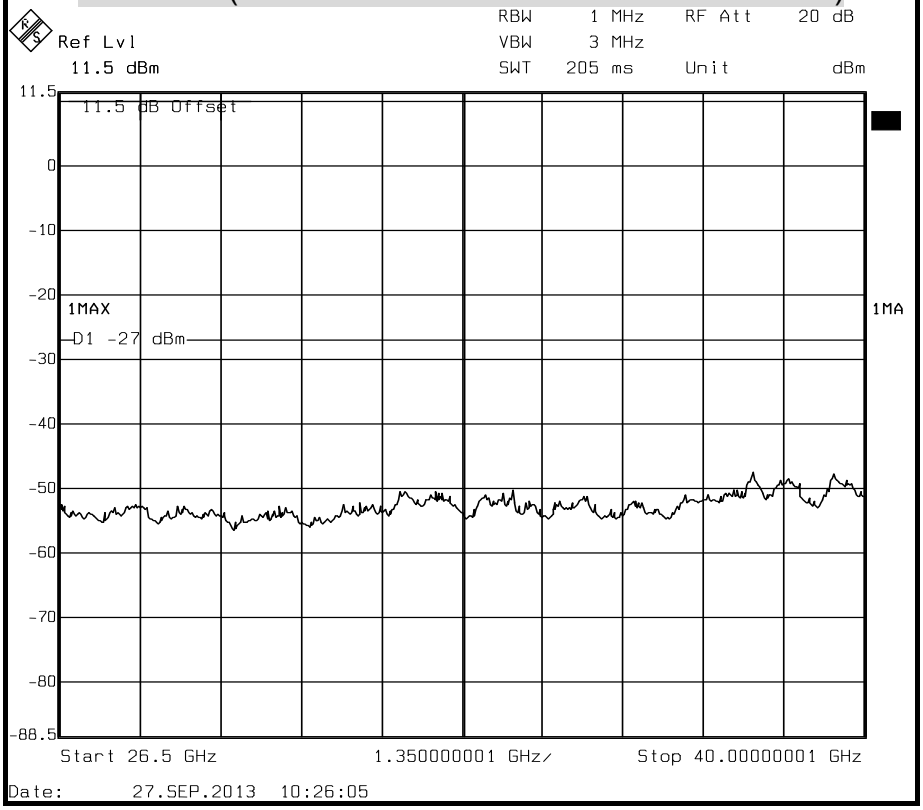
CH Low (26.5MHz ~ 40GHz / IEEE 802.11a Mode)



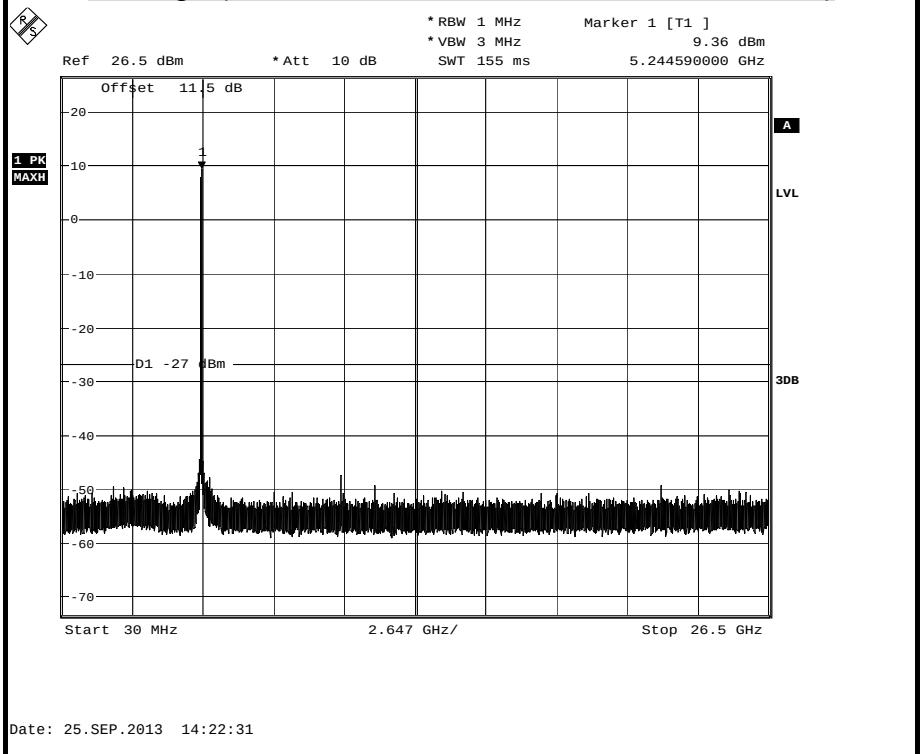
CH Middle (30MHz ~ 26.5GHz / IEEE 802.11a Mode)



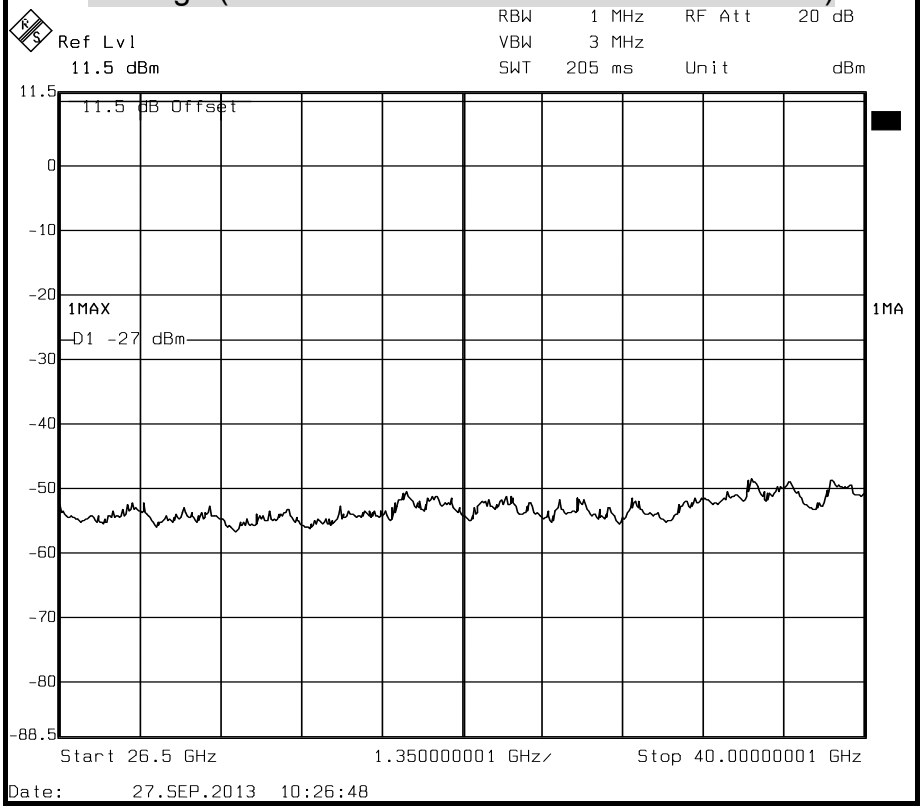
CH Middle(26.5MHz ~ 40GHz / IEEE 802.11a Mode)



CH High (30MHz ~ 26.5GHz / IEEE 802.11a Mode)

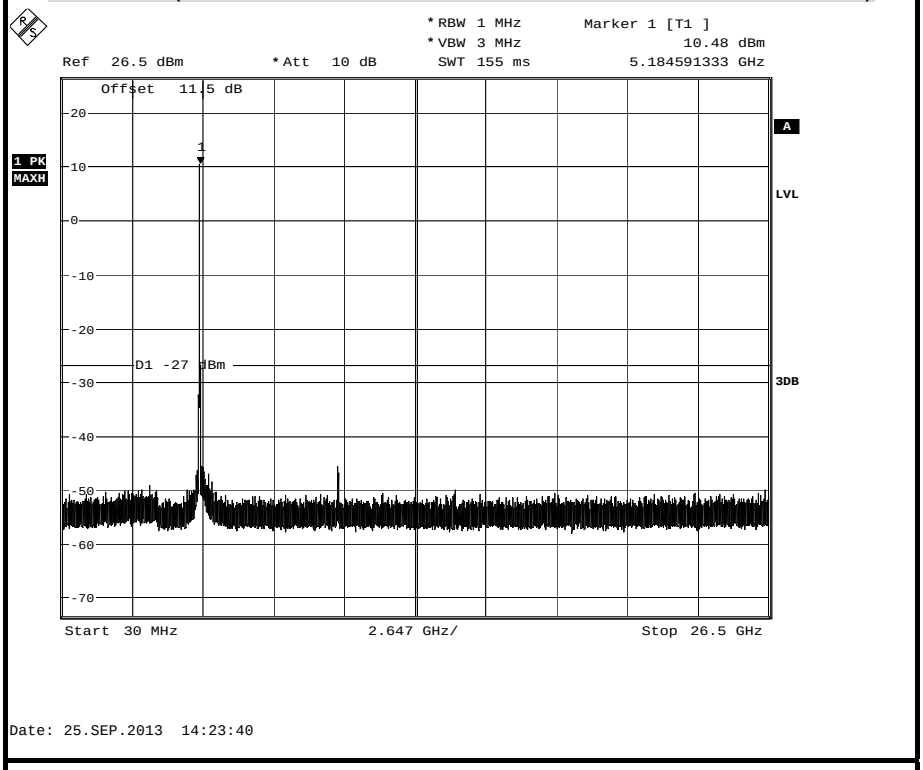


CH High (26.5MHz ~ 40GHz / IEEE 802.11a Mode)

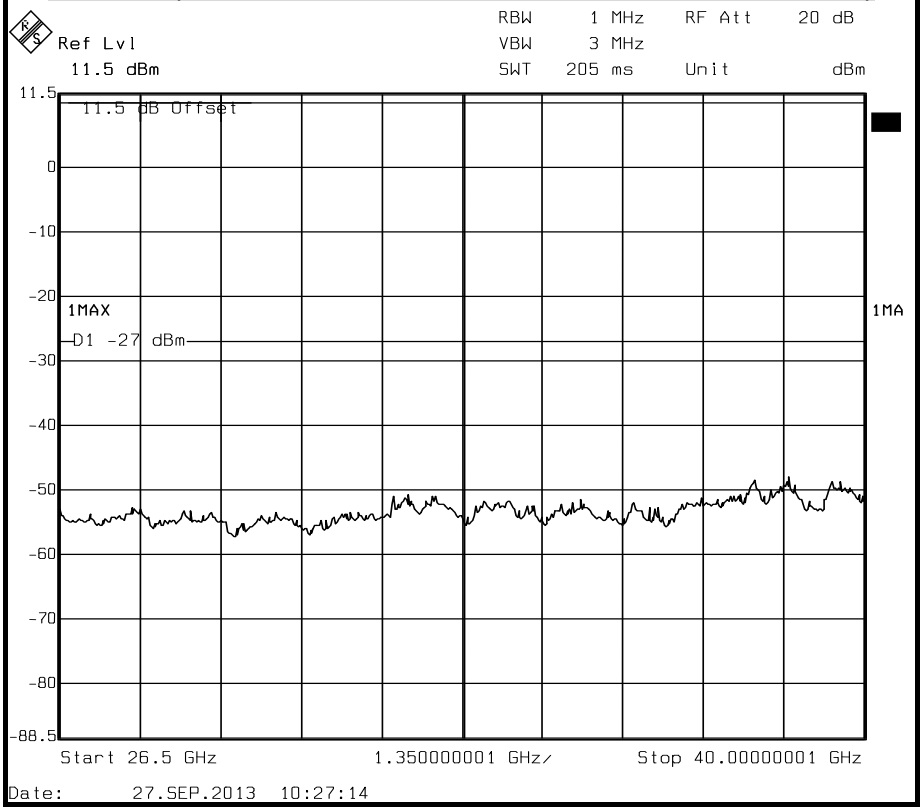


OUT-OF-BAND SPURIOUS EMISSIONS-CONDUCTED MEASUREMENT
(IEEE 802.11n HT20 Mode / Chain 0)

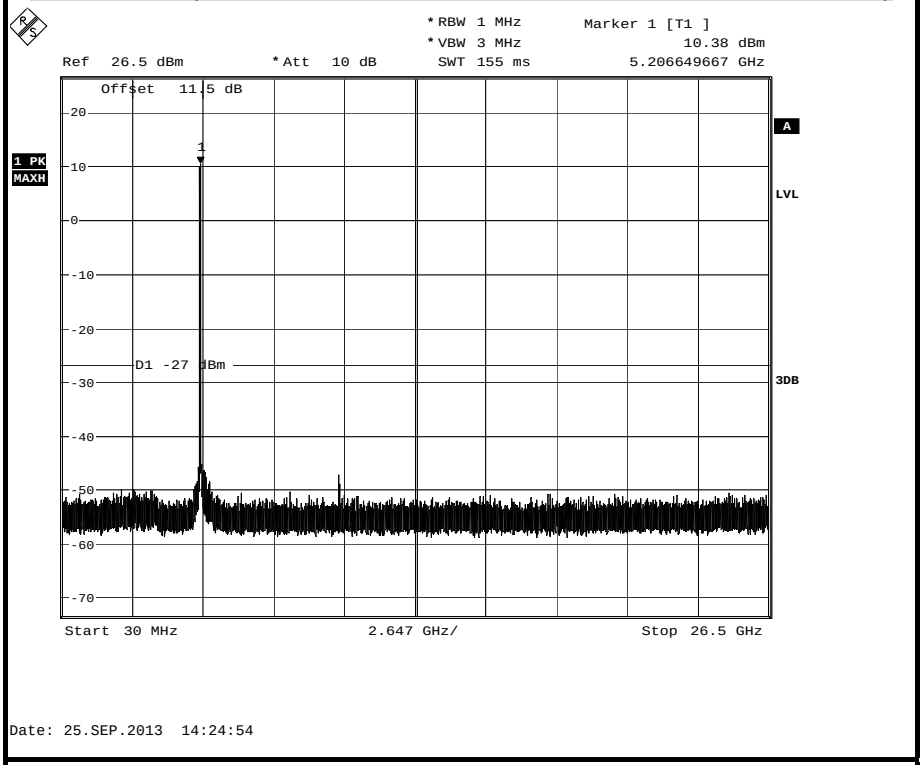
CH Low (30MHz ~ 26.5GHz / IEEE 802.11n HT20 Mode)



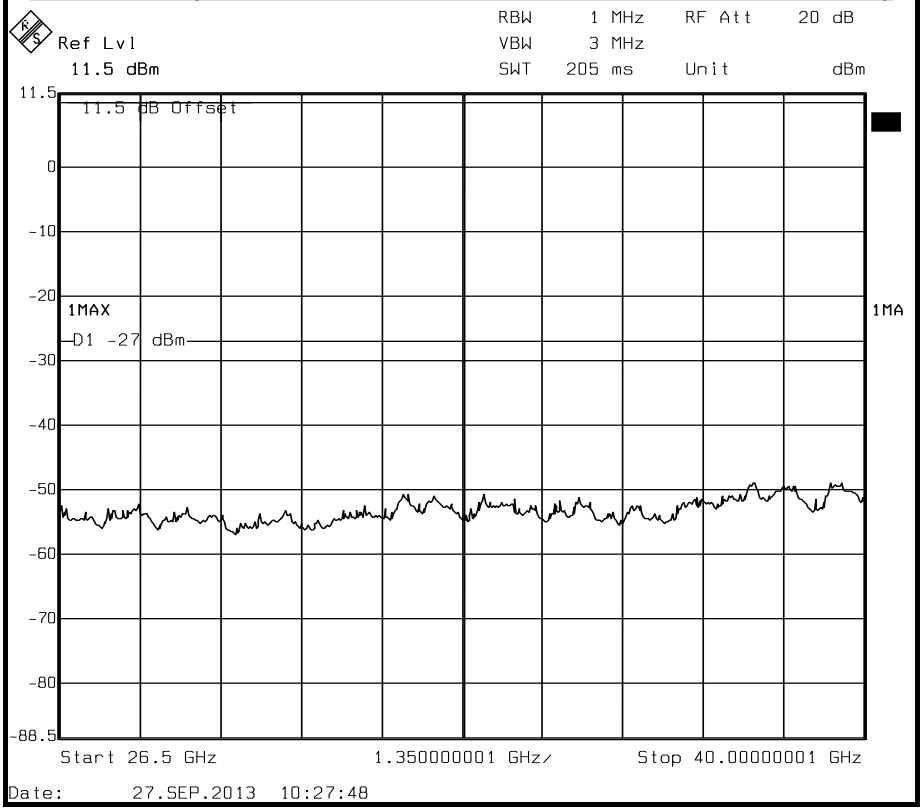
CH Low (26.5MHz ~ 40GHz / IEEE 802.11n HT20 Mode)



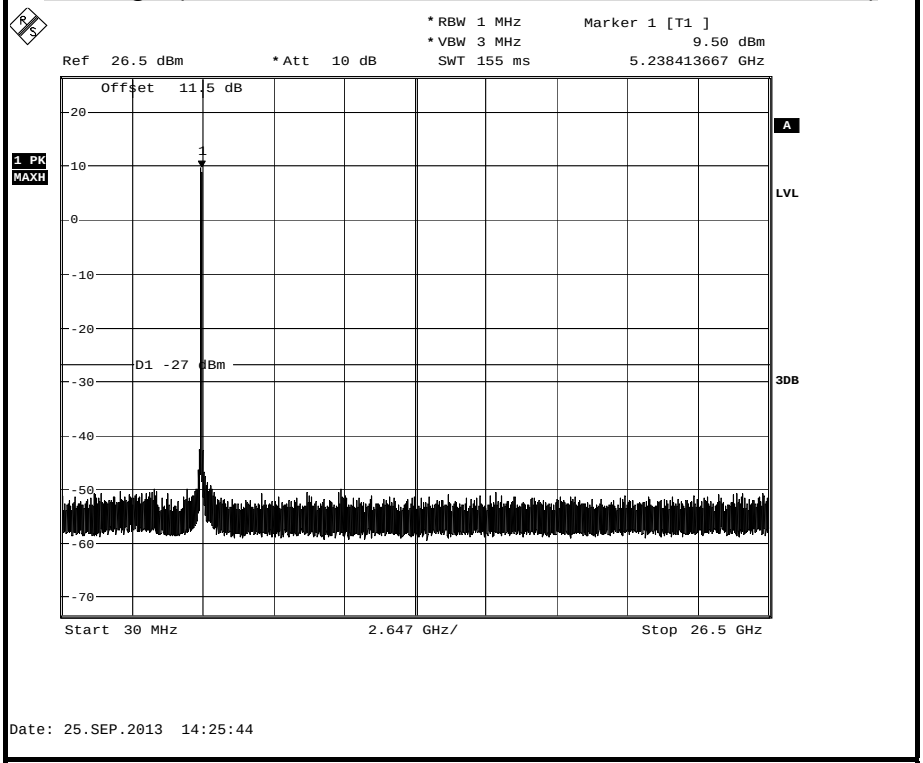
CH Middle (30MHz ~ 26.5GHz / IEEE 802.11n HT20 Mode)



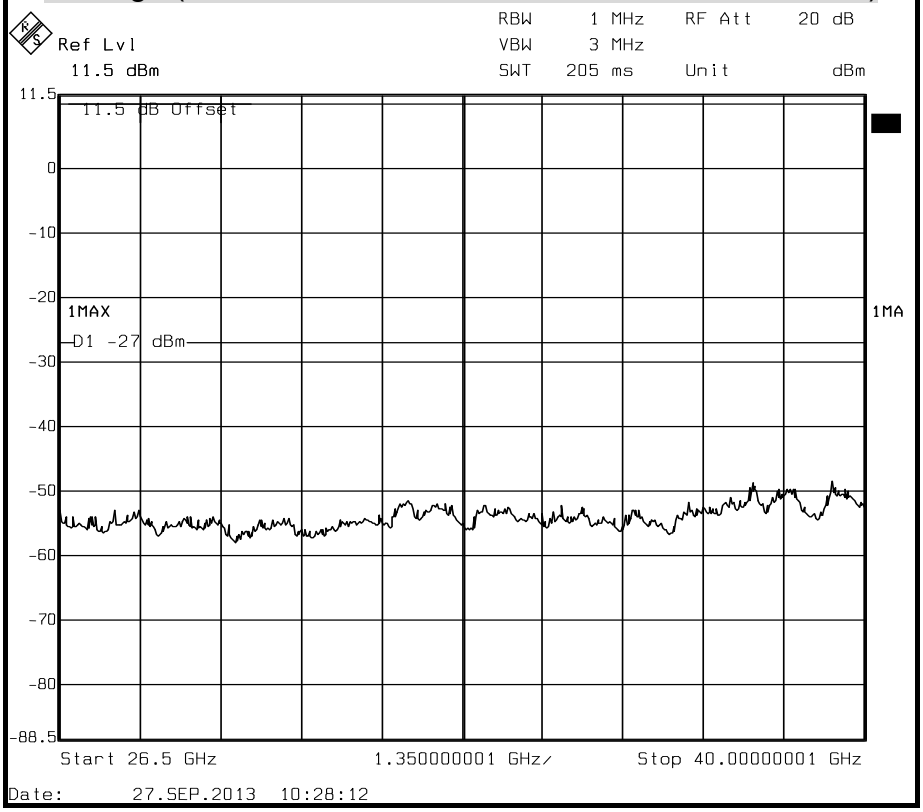
CH Middle (26.5MHz ~ 40GHz / IEEE 802.11n HT20 Mode)



CH High (30MHz ~ 26.5GHz / IEEE 802.11n HT20 Mode)

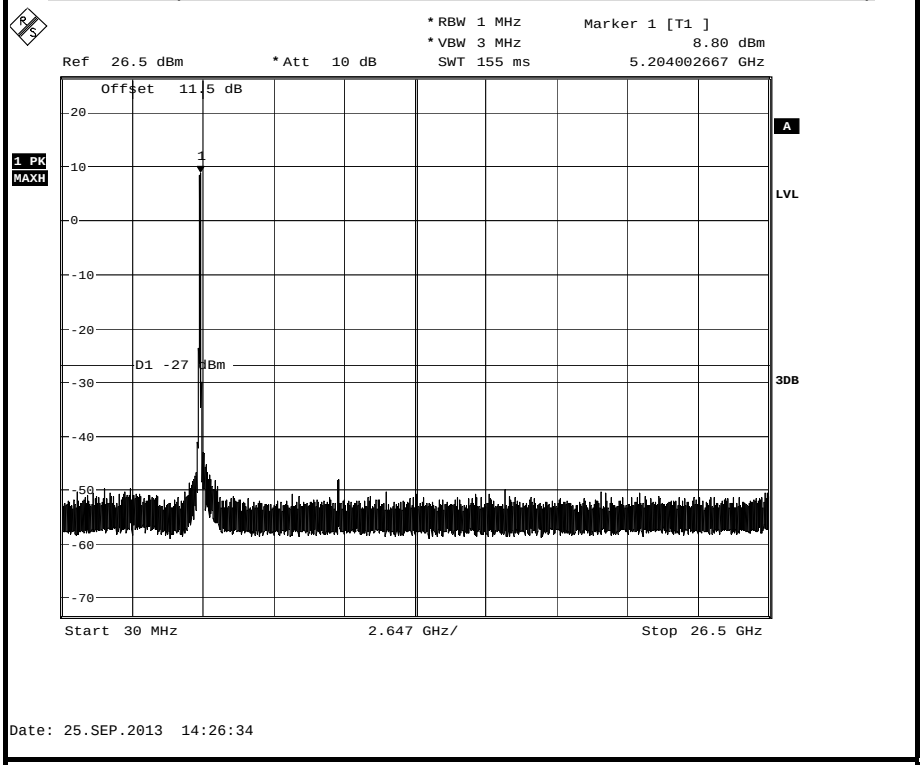


CH High (26.5MHz ~ 40GHz / IEEE 802.11n HT20 Mode)

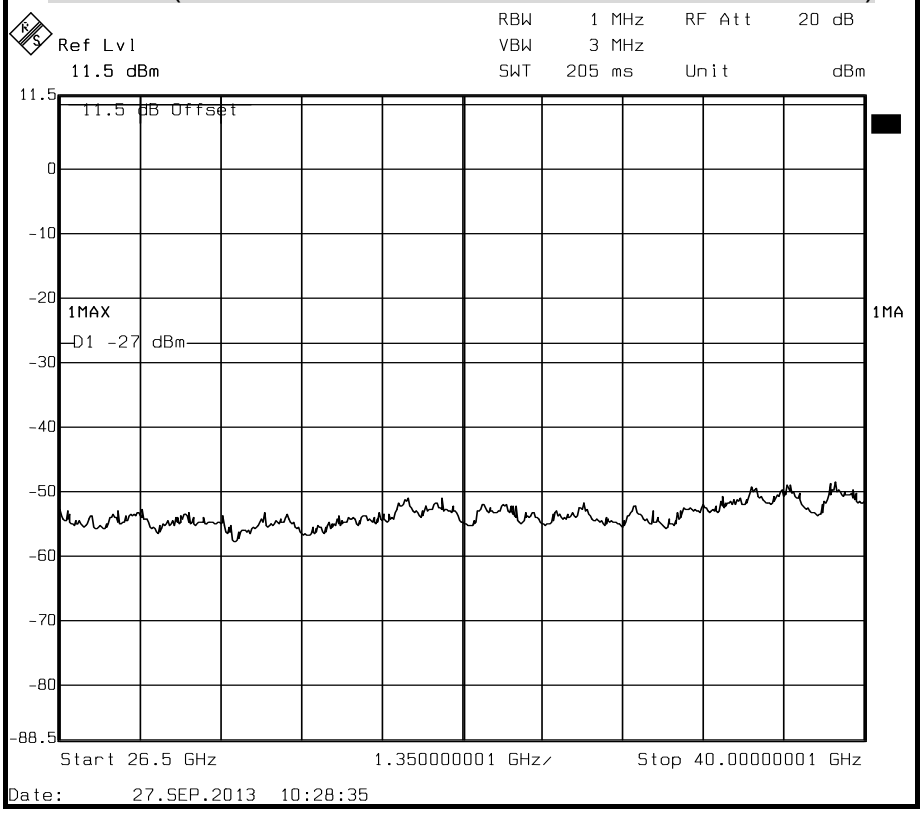


OUT-OF-BAND SPURIOUS EMISSIONS-CONDUCTED MEASUREMENT
(IEEE 802.11n HT40 Mode / Chain 0)

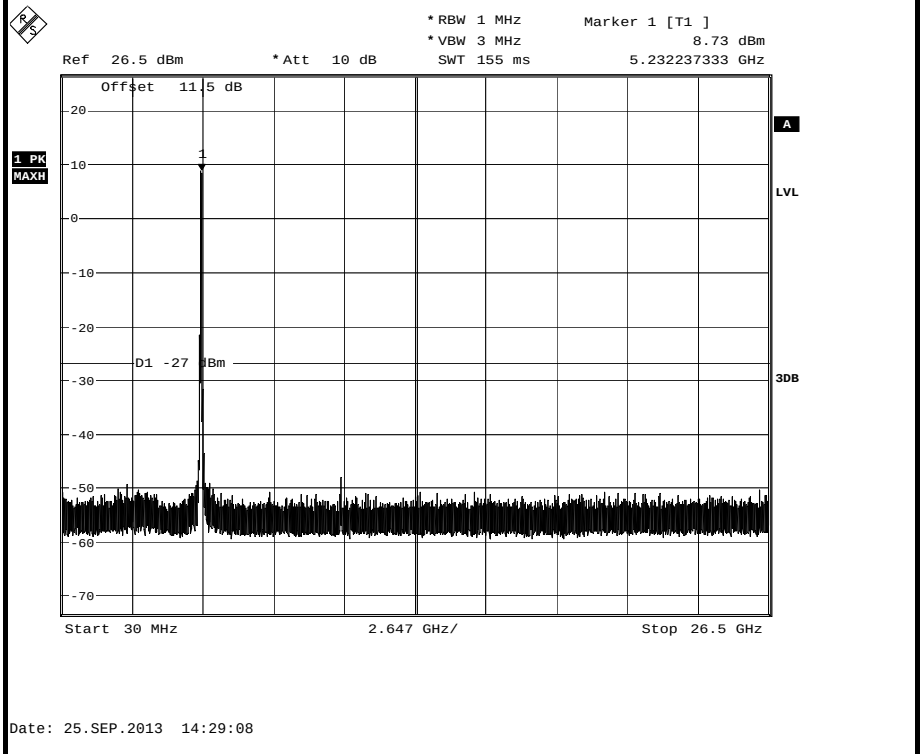
CH Low (30MHz ~ 26.5GHz / IEEE 802.11n HT40 Mode)



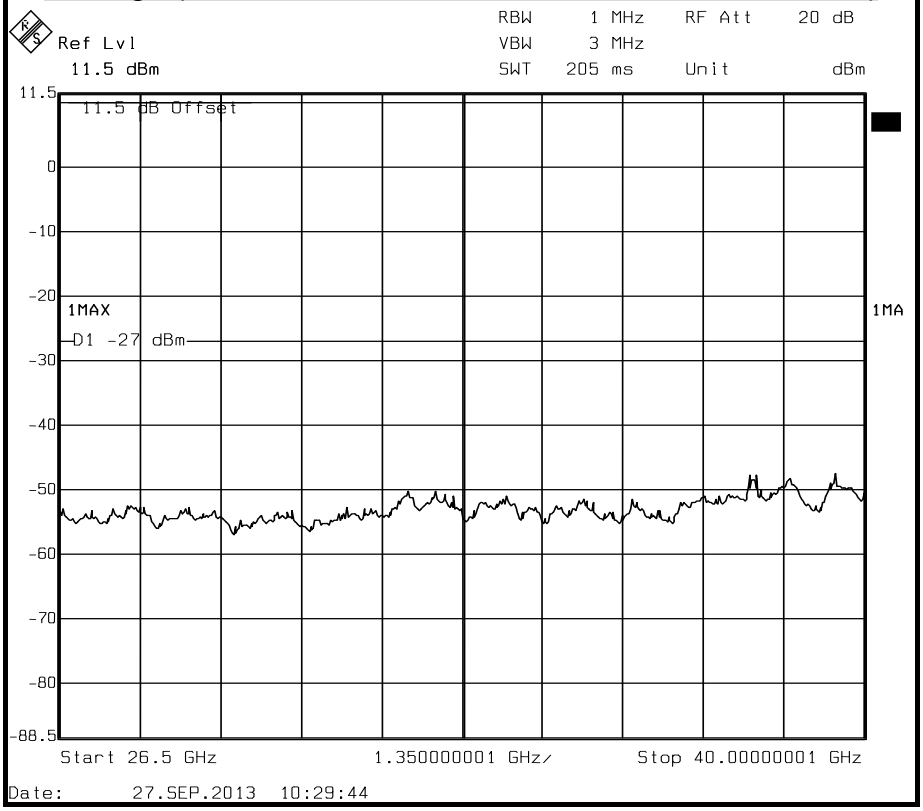
CH Low (26.5MHz ~ 40GHz / IEEE 802.11n HT40 Mode)



CH High (30MHz ~ 26.5GHz / IEEE 802.11n HT40 Mode)

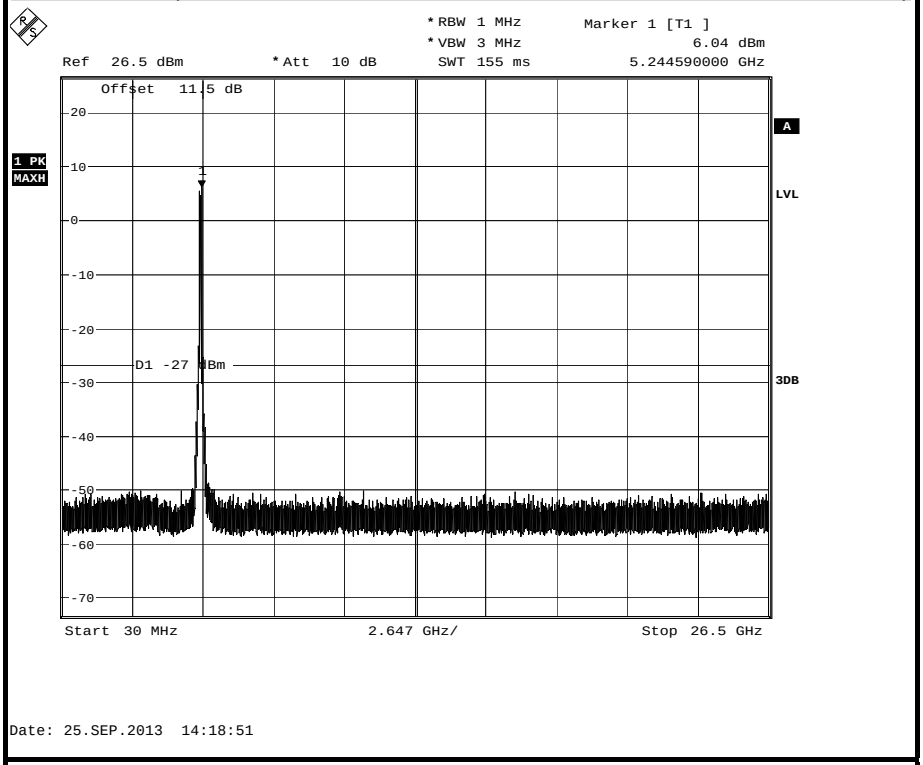


CH High (26.5MHz ~ 40GHz / IEEE 802.11n HT40 Mode)

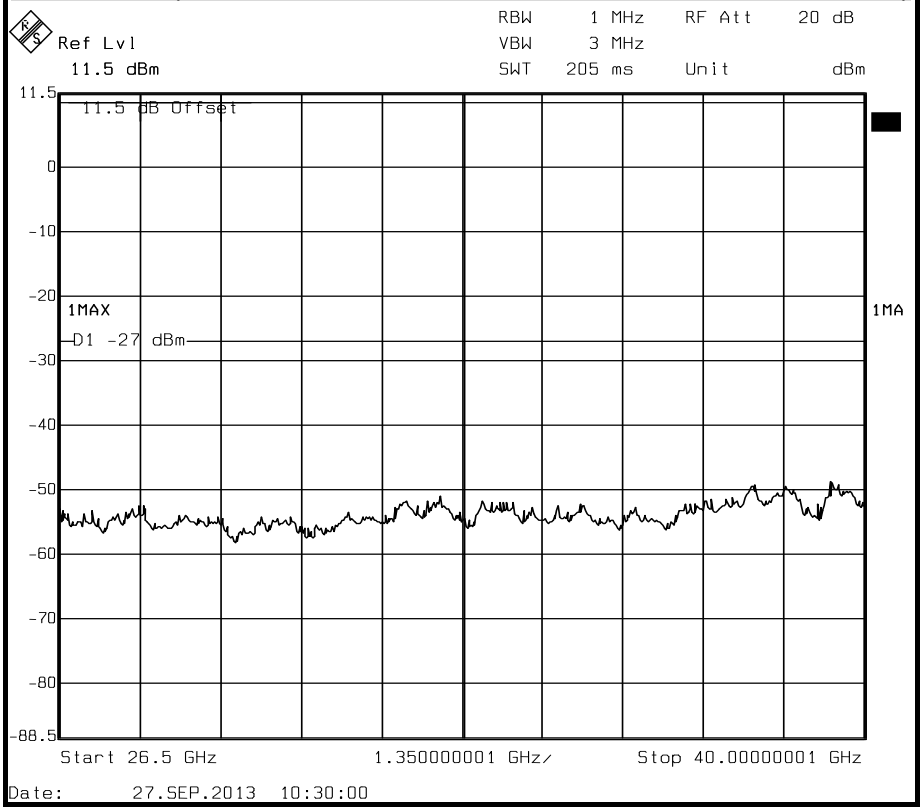


OUT-OF-BAND SPURIOUS EMISSIONS-CONDUCTED MEASUREMENT
(IEEE 802.11ac VHT80 Mode / Chain 0)

CH Middle (30MHz ~ 26.5GHz / IEEE 802.11ac VHT80 Mode)



CH Middle (26.5MHz ~ 40GHz / IEEE 802.11ac VHT80 Mode)



7.6 RADIATED EMISSION

LIMITS

(1) According to § 15.205 (a) Except as shown in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.090 - 0.110	16.42 - 16.423	399.9 - 410	4.5 - 5.15
[1]0.495 - 0.505	16.69475 - 16.69525	608 - 614	5.35 - 5.46
2.1735 - 2.1905	16.80425 - 16.80475	960 - 1240	7.25 - 7.75
4.125 - 4.128	25.5 - 25.67	1300 - 1427	8.025 - 8.5
4.17725 - 4.17775	37.5 - 38.25	1435 - 1626.5	9.0 - 9.2
4.20725 - 4.20775	73 - 74.6	1645.5 - 1646.5	9.3 - 9.5
6.215 - 6.218	74.8 - 75.2	1660 -1710	10.6 -12.7
6.26775 - 6.26825	108 -121.94	1718.8 - 1722.2	13.25 -13.4
6.31175 - 6.31225	123 - 138	2200 - 2300	14.47 – 14.5
8.291 - 8.294	149.9 - 150.05	2310 - 2390	15.35 -16.2
8.362 - 8.366	156.52475 - 156.52525	2483.5 - 2500	17.7 - 21.4
8.37625 - 8.38675	156.7 - 156.9	2655 - 2900	22.01 - 23.12
8.41425 - 8.41475	162.0125 - 167.17	3260 - 3267	23.6 - 24.0
12.29 - 12.293	167.72 - 173.2	3332 - 3339	31.2 - 31.8
12.51975 - 12.52025	240 - 285	3345.8 - 3338	36.43 - 36.5
12.57675 - 12.57725	322 -335.4	3600 - 4400	([2])
13.36 - 13.41			

Remark:
1. [1] Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz.
2. [2] Above 38.6

(2) According to § 15.205 (b) Except as provided in paragraphs (d) and (e), the field strength of emissions appearing within these frequency bands shall not exceed the limits shown is Section 15.209. At frequencies equal to or less than 1000 MHz, compliance with the limits in Section 15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1000 MHz, compliance with the emission limits in Section 15.209 shall be demonstrated based on the average value of the measured emissions. The provisions in Section 15.35 apply to these measurements.

(3) According to § 15.209 (a) Except as provided elsewhere in this Subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table :

Frequency (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
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

Remark: ***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., Sections 15.231 and 15.241.*

(4) According to § 15.209 (b) In the emission table above, the tighter limit applies at the band edges.

TEST EQUIPMENT

The following test equipments are utilized in making the measurements contained in this report.

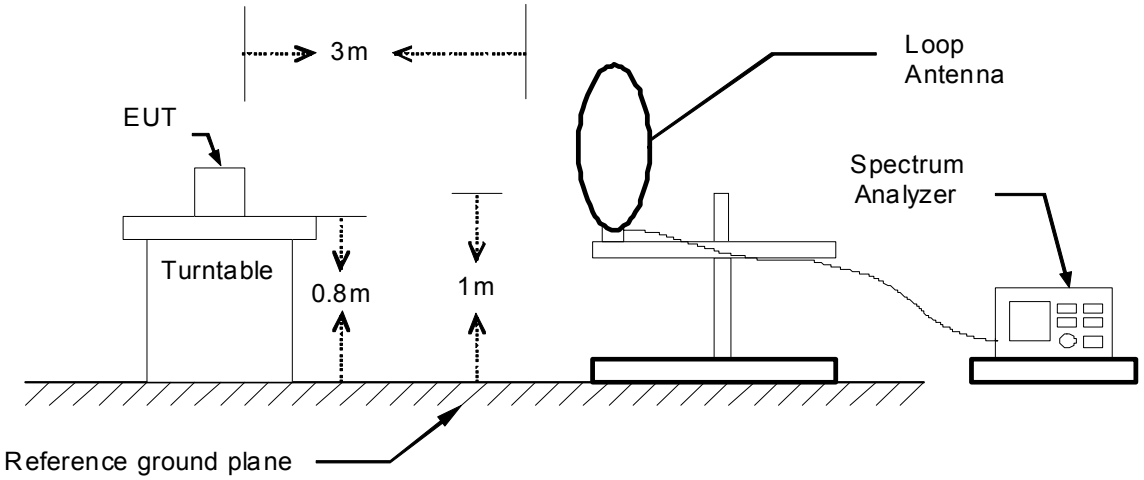
Open Area Test Site # 6				
Name of Equipment	**Manufacturer**	**Model**	**Serial Number**	**Calibration Due**
TYPE N COAXIAL CABLE	SUHNER	CHA9513	6	DEC. 18, 2013
BI-LOG Antenna	Sunol	JB1	A070506-2	SEP. 09, 2014
LOOP ANTENNA	EMCO	6502	8905-2356	JUN. 10, 2014
Pre-Amplifier	HP	8447F	2944A03817	DEC. 18, 2013
Pre-Amplifier	EMCI	EMC 012645	980097	DEC. 20, 2013
EMI Receiver	R&S	ESVS10	833206/012	JUN. 26, 2014
Horn Antenna	Com-Power	AH-118	071032	DEC. 05, 2014
3116 Double Ridge Antenna (40G)	ETS-LINDGREN	3116	00078900	DEC. 27, 2014
Turn Table	Yo Chen	001	----------	N.C.R.
Antenna Tower	AR	TP1000A	309874	N.C.R.
Controller	CT	SC101	----------	N.C.R.
RF Swicth	E-INSTRUMENT TELH LTD	ERS-180A	EC1204141	N.C.R
Power Meter	Anritsu	ML2487A	6K00003888	JUN. 24, 2014
Power Sensor	Anritsu	MA2491A	33265	JUN. 24, 2014
Temp./Humidity Chamber	K.SON	THS-M1	242	AUG. 08, 2014
DC Power Source	LOKO	DSP-5050	L1507009282	N.C.R
Spectrum Analyzer	R&S	FSU	200789	JUL. 01, 2014
Spectrum Analyzer	R&S	FSEK 30	835253/002	SEP. 28, 2014

Remark: *1. Each piece of equipment is scheduled for calibration once a year.*
2. N.C.R = No Calibration Request.

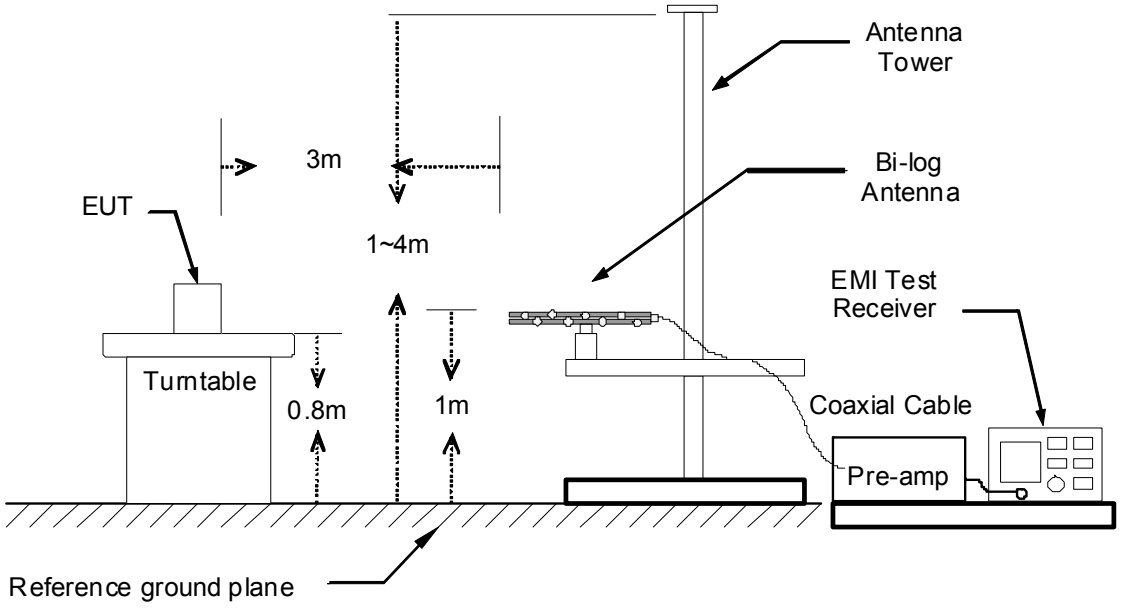
TEST SETUP

The diagram below shows the test setup that is utilized to make the measurements for emission from below 1GHz.

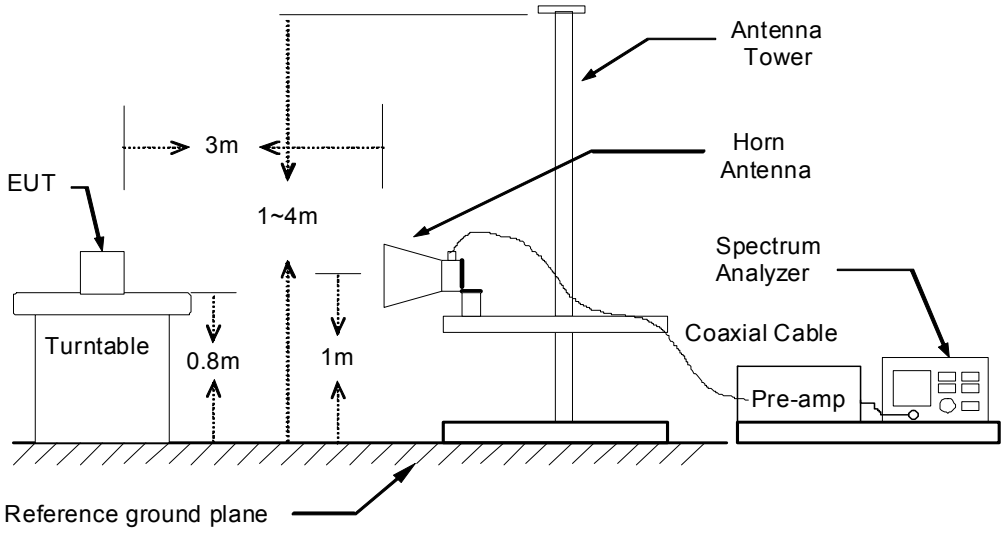
9kHz ~ 30MHz



30MHz ~ 1GHz



The diagram below shows the test setup that is utilized to make the measurements for emission above 1GHz.



TEST PROCEDURE

1. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 10 meter open area test site. The table was rotated 360 degrees to determine the position of the highest radiation.
2. While measuring the radiated emission below 1GHz, the EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower. While measuring the radiated emission above 1GHz, the EUT was set 3 meters away from the interference-receiving antenna.
3. The antenna is a broadband antenna, and its height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarization of the antenna are set to make the measurement.
4. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the table was turned from 0 degrees to 360 degrees to find the maximum reading.
5. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
6. If the emission level of the EUT in peak mode was 10 dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10 dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

Remark：

1. *The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120 KHz for Peak detection (PK) and Quasi-peak detection (QP) at frequency below 1GHz.*
2. *The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 1 MHz for Peak detection and frequency above 1GHz.*
3. *The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 10 Hz for Average detection (AV) at frequency above 1GHz.*

TEST RESULTS

Below 1 GHz (9kHz ~ 30MHz)

No emission found between lowest internal used/generated frequency to 30MHz.

Below 1 GHz (30MHz ~ 1GHz)

Model	DIR-510L	Test By	John Chen
Test Mode	TX Mode	Test Date	2013/10/13
TEMP & Humidity	27.9°C, 55%		

Horizontal

Frequency	Meter Reading	Antenna Factor	Cable Loss	Emission Level	Limits	Margin	Detector Mode
(MHz)	(dBμV)	(dB/M)	(dB)	(dBμV/M)	(dBμV/M)	(dB)	PK/QP
82.78	16.27	8.07	2.45	26.78	40.00	-13.22	QP
181.63	15.73	12.14	3.52	31.40	43.50	-12.10	QP
325.08	14.68	14.84	4.35	33.87	46.00	-12.13	QP
375.13	13.92	15.98	4.64	34.54	46.00	-11.46	QP
483.32	13.89	18.12	5.46	37.47	46.00	-8.53	QP
676.67	12.17	20.50	5.77	38.44	46.00	-7.56	QP

Vertical

Frequency	Meter Reading	Antenna Factor	Cable Loss	Emission Level	Limits	Margin	Detector Mode
(MHz)	(dBμV)	(dB/M)	(dB)	(dBμV/M)	(dBμV/M)	(dB)	PK/QP
78.86	20.96	8.20	2.35	31.51	40.00	-8.49	QP
125.13	15.67	14.12	3.12	32.91	43.50	-10.59	QP
325.13	15.51	14.84	4.35	34.70	46.00	-11.30	QP
375.13	12.60	15.98	4.64	33.22	46.00	-12.78	QP
483.66	12.26	18.12	5.47	35.85	46.00	-10.15	QP
676.60	12.18	20.50	5.77	38.45	46.00	-7.55	QP

REMARK: Emission level (dBμV/m) =Antenna Factor (dB/m) + Cable loss (dB) + Meter Reading (dBμV).

Above 1 GHz

Model	DIR-510L	Test By	John Chen
TEMP & Humidity	27.1°C, 52%	Test Date	2013/12/15
Test Mode	IEEE 802.11a TX / CH Low		

	Measurement Distance at 3m Horizontal polarity									
	Freq.	Reading	AF	Cable Loss	Pre-amp	Filter	Level	Limit	Margin	Mark
	(MHz)	(dBμV)	(dB/m)	(dB)	(dB)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	(P/Q/A)
*	1160.22	64.18	25.41	1.89	44.96	0.30	46.82	74.00	-27.18	P
*	1160.22	58.83	25.41	1.89	44.96	0.30	41.47	54.00	-12.53	A
	10361.15	58.17	39.32	5.84	43.00	0.50	60.83	74.00	-13.17	P
	10361.15	46.89	39.32	5.84	43.00	0.50	49.55	54.00	-4.45	A

	Measurement Distance at 3m Vertical polarity									
	Freq.	Reading	AF	Cable Loss	Pre-amp	Filter	Level	Limit	Margin	Mark
	(MHz)	(dBμV)	(dB/m)	(dB)	(dB)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	(P/Q/A)
*	1159.28	63.77	25.41	1.89	44.96	0.30	46.41	74.00	-27.59	P
*	1159.28	56.28	25.41	1.89	44.96	0.30	38.92	54.00	-15.08	A
	10361.35	60.16	39.32	5.84	43.00	0.50	62.82	74.00	-11.18	P
	10361.35	49.28	39.32	5.84	43.00	0.50	51.94	54.00	-2.06	A

REMARK:

1. *AF: Antenna Factor, Cable: Cable Loss, Pre-Amp: Preamplifier gain, Filter: High Pass Filter Insertion Loss*
2. *Spectrum analyzer setting P(Peak): RBW=1MHz, VBW=1MHz, A(Average): RBW=1MHz, VBW=10Hz*
3. *The result basic equation calculation is as follow:*
   Level = Reading + AF + Cable – Preamp + Filter , Margin = Level-Limit
4. *The other emission levels were 20dB below the limit*
5. *The test limit distance is 3M limit.*
6. ** means: the frequency is under 15.205 restricted bands.*

Model	DIR-510L	Test By	John Chen
TEMP & Humidity	27.1°C, 52%	Test Date	2013/12/15
Test Mode	IEEE 802.11a TX / CH Middle		

	Measurement Distance at 3m Horizontal polarity									
	Freq.	Reading	AF	Cable Loss	Pre-amp	Filter	Level	Limit	Margin	Mark
	(MHz)	(dBμV)	(dB/m)	(dB)	(dB)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	(P/Q/A)
*	1158.75	64.27	25.40	1.89	44.96	0.30	46.90	74.00	-27.10	P
*	1158.75	57.78	25.40	1.89	44.96	0.30	40.41	54.00	-13.59	A
	10402.93	58.78	39.34	5.85	43.01	0.50	61.46	74.00	-12.54	P
	10402.93	47.54	39.34	5.85	43.01	0.50	50.22	54.00	-3.78	A

	Measurement Distance at 3m Vertical polarity									
	Freq.	Reading	AF	Cable Loss	Pre-amp	Filter	Level	Limit	Margin	Mark
	(MHz)	(dBμV)	(dB/m)	(dB)	(dB)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	(P/Q/A)
*	1159.62	62.81	25.41	1.89	44.96	0.30	45.45	74.00	-28.55	P
*	1159.62	55.88	25.41	1.89	44.96	0.30	38.52	54.00	-15.48	A
	10401.82	60.86	39.34	5.85	43.01	0.50	63.54	74.00	-10.46	P
	10401.82	49.56	39.34	5.85	43.01	0.50	52.24	54.00	-1.76	A

REMARK:

1. *AF: Antenna Factor, Cable: Cable Loss, Pre-Amp: Preamplifier gain, Filter: High Pass Filter Insertion Loss*
2. *Spectrum analyzer setting P(Peak): RBW=1MHz, VBW=1MHz, A(Average): RBW=1MHz, VBW=10Hz*
3. *The result basic equation calculation is as follow:*
   Level = Reading + AF + Cable – Preamp + Filter , Margin = Level-Limit
4. *The other emission levels were 20dB below the limit*
5. *The test limit distance is 3M limit.*
6. ** means: the frequency is under 15.205 restricted bands.*

Model	DIR-510L	Test By	John Chen
TEMP & Humidity	27.1°C, 52%	Test Date	2013/12/15
Test Mode	IEEE 802.11a TX / CH High		

	Measurement Distance at 3m Horizontal polarity									
	Freq.	Reading	AF	Cable Loss	Pre-amp	Filter	Level	Limit	Margin	Mark
	(MHz)	(dBμV)	(dB/m)	(dB)	(dB)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	(P/Q/A)
*	1161.22	63.70	25.41	1.89	44.96	0.30	46.35	74.00	-27.65	P
*	1161.22	56.92	25.41	1.89	44.96	0.30	39.57	54.00	-14.43	A
	10481.18	58.06	39.39	5.88	43.04	0.50	60.78	74.00	-13.22	P
	10481.18	47.57	39.39	5.88	43.04	0.50	50.29	54.00	-3.71	A

	Measurement Distance at 3m Vertical polarity									
	Freq.	Reading	AF	Cable Loss	Pre-amp	Filter	Level	Limit	Margin	Mark
	(MHz)	(dBμV)	(dB/m)	(dB)	(dB)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	(P/Q/A)
*	1159.29	62.18	25.41	1.89	44.96	0.30	44.82	74.00	-29.18	P
*	1159.29	55.46	25.41	1.89	44.96	0.30	38.10	54.00	-15.90	A
	10481.19	60.72	39.39	5.88	43.04	0.50	63.44	74.00	-10.56	P
	10481.19	49.55	39.39	5.88	43.04	0.50	52.27	54.00	-1.73	A

REMARK:

1. *AF: Antenna Factor, Cable: Cable Loss, Pre-Amp: Preamplifier gain, Filter: High Pass Filter Insertion Loss*
2. *Spectrum analyzer setting P(Peak): RBW=1MHz, VBW=1MHz, A(Average): RBW=1MHz, VBW=10Hz*
3. *The result basic equation calculation is as follow:*
   Level = Reading + AF + Cable – Preamp + Filter , Margin = Level-Limit
4. *The other emission levels were 20dB below the limit*
5. *The test limit distance is 3M limit.*
6. ** means: the frequency is under 15.205 restricted bands.*

Model	DIR-510L	Test By	John Chen
TEMP & Humidity	27.1°C, 52%	Test Date	2013/12/15
Test Mode	IEEE 802.11n HT20 TX / CH Low		

	Measurement Distance at 3m Horizontal polarity									
	Freq.	Reading	AF	Cable Loss	Pre-amp	Filter	Level	Limit	Margin	Mark
	(MHz)	(dBμV)	(dB/m)	(dB)	(dB)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	(P/Q/A)
*	1161.22	64.82	25.41	1.89	44.96	0.30	47.47	74.00	-26.53	P
*	1161.22	57.45	25.41	1.89	44.96	0.30	40.10	54.00	-13.90	A
	10359.89	58.71	39.32	5.84	43.00	0.50	61.37	74.00	-12.63	P
	10359.89	47.64	39.32	5.84	43.00	0.50	50.30	54.00	-3.70	A

	Measurement Distance at 3m Vertical polarity									
	Freq.	Reading	AF	Cable Loss	Pre-amp	Filter	Level	Limit	Margin	Mark
	(MHz)	(dBμV)	(dB/m)	(dB)	(dB)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	(P/Q/A)
*	1159.30	62.41	25.41	1.89	44.96	0.30	45.05	74.00	-28.95	P
*	1159.30	55.90	25.41	1.89	44.96	0.30	38.54	54.00	-15.46	A
	10359.78	60.62	39.32	5.84	43.00	0.50	63.28	74.00	-10.72	P
	10359.78	49.01	39.32	5.84	43.00	0.50	51.67	54.00	-2.33	A

REMARK:

1. *AF: Antenna Factor, Cable: Cable Loss, Pre-Amp: Preamplifier gain, Filter: High Pass Filter Insertion Loss*
2. *Spectrum analyzer setting P(Peak): RBW=1MHz, VBW=1MHz, A(Average): RBW=1MHz, VBW=10Hz*
3. *The result basic equation calculation is as follow:*
   Level = Reading + AF + Cable – Preamp + Filter , Margin = Level-Limit
4. *The other emission levels were 20dB below the limit*
5. *The test limit distance is 3M limit.*
6. ** means: the frequency is under 15.205 restricted bands.*

Model	DIR-510L	Test By	John Chen
TEMP & Humidity	27.1°C, 52%	Test Date	2013/12/15
Test Mode	IEEE 802.11n HT20 TX / CH Middle		

	Measurement Distance at 3m Horizontal polarity									
	Freq.	Reading	AF	Cable Loss	Pre-amp	Filter	Level	Limit	Margin	Mark
	(MHz)	(dBμV)	(dB/m)	(dB)	(dB)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	(P/Q/A)
*	1161.25	64.72	25.41	1.89	44.96	0.30	47.37	74.00	-26.63	P
*	1161.25	57.79	25.41	1.89	44.96	0.30	40.44	54.00	-13.56	A
	10400.82	58.42	39.34	5.85	43.01	0.50	61.10	74.00	-12.90	P
	10400.82	47.02	39.34	5.85	43.01	0.50	49.70	54.00	-4.30	A

	Measurement Distance at 3m Vertical polarity									
	Freq.	Reading	AF	Cable Loss	Pre-amp	Filter	Level	Limit	Margin	Mark
	(MHz)	(dBμV)	(dB/m)	(dB)	(dB)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	(P/Q/A)
*	1159.36	63.72	25.41	1.89	44.96	0.30	46.36	74.00	-27.64	P
*	1159.36	56.01	25.41	1.89	44.96	0.30	38.65	54.00	-15.35	A
	10401.38	60.24	39.34	5.85	43.01	0.50	62.92	74.00	-11.08	P
	10401.38	48.64	39.34	5.85	43.01	0.50	51.32	54.00	-2.68	A

REMARK:

1. *AF: Antenna Factor, Cable: Cable Loss, Pre-Amp: Preamplifier gain, Filter: High Pass Filter Insertion Loss*
2. *Spectrum analyzer setting P(Peak): RBW=1MHz, VBW=1MHz, A(Average): RBW=1MHz, VBW=10Hz*
3. *The result basic equation calculation is as follow:*
   Level = Reading + AF + Cable – Preamp + Filter , Margin = Level-Limit
4. *The other emission levels were 20dB below the limit*
5. *The test limit distance is 3M limit.*
6. ** means: the frequency is under 15.205 restricted bands.*

Model	DIR-510L	Test By	John Chen
TEMP & Humidity	27.1°C, 52%	Test Date	2013/12/15
Test Mode	IEEE 802.11n HT20 TX / CH High		

	Measurement Distance at 3m Horizontal polarity									
	Freq.	Reading	AF	Cable Loss	Pre-amp	Filter	Level	Limit	Margin	Mark
	(MHz)	(dBμV)	(dB/m)	(dB)	(dB)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	(P/Q/A)
*	1158.26	65.62	25.40	1.89	44.96	0.30	48.25	74.00	-25.75	P
*	1158.26	56.82	25.40	1.89	44.96	0.30	39.45	54.00	-14.55	A
	10480.78	58.84	39.39	5.88	43.04	0.50	61.56	74.00	-12.44	P
	10480.78	47.62	39.39	5.88	43.04	0.50	50.34	54.00	-3.66	A

	Measurement Distance at 3m Vertical polarity									
	Freq.	Reading	AF	Cable Loss	Pre-amp	Filter	Level	Limit	Margin	Mark
	(MHz)	(dBμV)	(dB/m)	(dB)	(dB)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	(P/Q/A)
*	1159.61	63.37	25.41	1.89	44.96	0.30	46.01	74.00	-27.99	P
*	1159.61	56.29	25.41	1.89	44.96	0.30	38.93	54.00	-15.07	A
	10481.57	59.56	39.39	5.88	43.04	0.50	62.28	74.00	-11.72	P
	10481.57	47.67	39.39	5.88	43.04	0.50	50.39	54.00	-3.61	A

REMARK:

1. *AF: Antenna Factor, Cable: Cable Loss, Pre-Amp: Preamplifier gain, Filter: High Pass Filter Insertion Loss*
2. *Spectrum analyzer setting P(Peak): RBW=1MHz, VBW=1MHz, A(Average): RBW=1MHz, VBW=10Hz*
3. *The result basic equation calculation is as follow:*
   Level = Reading + AF + Cable – Preamp + Filter , Margin = Level-Limit
4. *The other emission levels were 20dB below the limit*
5. *The test limit distance is 3M limit.*
6. ** means: the frequency is under 15.205 restricted bands.*

Model	DIR-510L	Test By	John Chen
TEMP & Humidity	27.1°C, 52%	Test Date	2013/12/15
Test Mode	IEEE 802.11n HT40 TX / CH Low		

	Measurement Distance at 3m Horizontal polarity									
	Freq.	Reading	AF	Cable Loss	Pre-amp	Filter	Level	Limit	Margin	Mark
	(MHz)	(dBμV)	(dB/m)	(dB)	(dB)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	(P/Q/A)
*	1159.49	62.69	25.41	1.89	44.96	0.30	45.33	74.00	-28.67	P
*	1159.49	57.85	25.41	1.89	44.96	0.30	40.49	54.00	-13.51	A
	10380.85	56.26	39.33	5.85	43.00	0.50	58.93	74.00	-15.07	P
	10380.85	46.27	39.33	5.85	43.00	0.50	48.94	54.00	-5.06	A

	Measurement Distance at 3m Vertical polarity									
	Freq.	Reading	AF	Cable Loss	Pre-amp	Filter	Level	Limit	Margin	Mark
	(MHz)	(dBμV)	(dB/m)	(dB)	(dB)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	(P/Q/A)
*	1159.76	63.67	25.41	1.89	44.96	0.30	46.31	74.00	-27.69	P
*	1159.76	56.11	25.41	1.89	44.96	0.30	38.75	54.00	-15.25	A
	10380.59	58.76	39.33	5.85	43.00	0.50	61.43	74.00	-12.57	P
	10380.59	46.97	39.33	5.85	43.00	0.50	49.64	54.00	-4.36	A

REMARK:

1. *AF: Antenna Factor, Cable: Cable Loss, Pre-Amp: Preamplifier gain, Filter: High Pass Filter Insertion Loss*
2. *Spectrum analyzer setting P(Peak): RBW=1MHz, VBW=1MHz, A(Average): RBW=1MHz, VBW=10Hz*
3. *The result basic equation calculation is as follow:*
   Level = Reading + AF + Cable – Preamp + Filter , Margin = Level-Limit
4. *The other emission levels were 20dB below the limit*
5. *The test limit distance is 3M limit.*
6. ** means: the frequency is under 15.205 restricted bands.*

Model	DIR-510L	Test By	John Chen
TEMP & Humidity	27.1°C, 52%	Test Date	2013/12/15
Test Mode	IEEE 802.11n HT40 TX / CH High		

	Measurement Distance at 3m Horizontal polarity									
	Freq.	Reading	AF	Cable Loss	Pre-amp	Filter	Level	Limit	Margin	Mark
	(MHz)	(dBμV)	(dB/m)	(dB)	(dB)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	(P/Q/A)
*	1161.70	65.66	25.41	1.89	44.96	0.30	48.31	74.00	-25.69	P
*	1161.70	58.35	25.41	1.89	44.96	0.30	41.00	54.00	-13.00	A
	10460.74	57.36	39.38	5.87	43.04	0.50	60.07	74.00	-13.93	P
	10460.74	46.68	39.38	5.87	43.04	0.50	49.39	54.00	-4.61	A

	Measurement Distance at 3m Vertical polarity									
	Freq.	Reading	AF	Cable Loss	Pre-amp	Filter	Level	Limit	Margin	Mark
	(MHz)	(dBμV)	(dB/m)	(dB)	(dB)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	(P/Q/A)
*	1160.22	62.35	25.41	1.89	44.96	0.30	44.99	74.00	-29.01	P
*	1160.22	57.68	25.41	1.89	44.96	0.30	40.32	54.00	-13.68	A
	10460.28	59.20	39.38	5.87	43.03	0.50	61.91	74.00	-12.09	P
	10460.28	47.54	39.38	5.87	43.03	0.50	50.25	54.00	-3.75	A

REMARK:

1. *AF: Antenna Factor, Cable: Cable Loss, Pre-Amp: Preamplifier gain, Filter: High Pass Filter Insertion Loss*
2. *Spectrum analyzer setting P(Peak): RBW=1MHz, VBW=1MHz, A(Average): RBW=1MHz, VBW=10Hz*
3. *The result basic equation calculation is as follow:*
   Level = Reading + AF + Cable – Preamp + Filter , Margin = Level-Limit
4. *The other emission levels were 20dB below the limit*
5. *The test limit distance is 3M limit.*
6. ** means: the frequency is under 15.205 restricted bands.*

Model	DIR-510L	Test By	John Chen
TEMP & Humidity	27.1°C, 52%	Test Date	2013/12/15
Test Mode	IEEE 802.11ac VHT80 TX / CH Middle		

	Measurement Distance at 3m Horizontal polarity									
	Freq.	Reading	AF	Cable Loss	Pre-amp	Filter	Level	Limit	Margin	Mark
	(MHz)	(dBμV)	(dB/m)	(dB)	(dB)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	(P/Q/A)
*	1159.78	63.69	25.41	1.89	44.96	0.30	46.33	74.00	-27.67	P
*	1159.78	56.73	25.41	1.89	44.96	0.30	39.37	54.00	-14.63	A
	10418.46	56.20	39.35	5.86	43.02	0.50	58.89	74.00	-15.11	P
	10418.46	46.16	39.35	5.86	43.02	0.50	48.85	54.00	-5.15	A

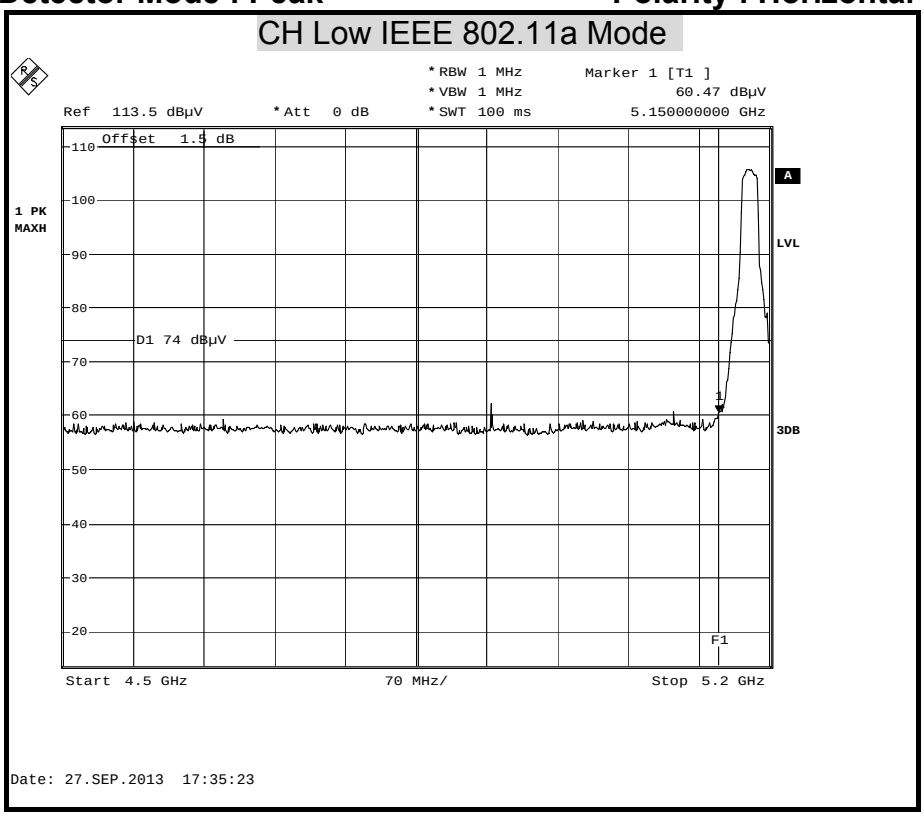
	Measurement Distance at 3m Vertical polarity									
	Freq.	Reading	AF	Cable Loss	Pre-amp	Filter	Level	Limit	Margin	Mark
	(MHz)	(dBμV)	(dB/m)	(dB)	(dB)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	(P/Q/A)
*	1160.89	63.56	25.41	1.89	44.96	0.30	46.21	74.00	-27.79	P
*	1160.89	55.55	25.41	1.89	44.96	0.30	38.20	54.00	-15.80	A
	10419.49	56.25	39.35	5.86	43.02	0.50	58.94	74.00	-15.06	P
	10419.49	46.84	39.35	5.86	43.02	0.50	49.53	54.00	-4.47	A

REMARK:

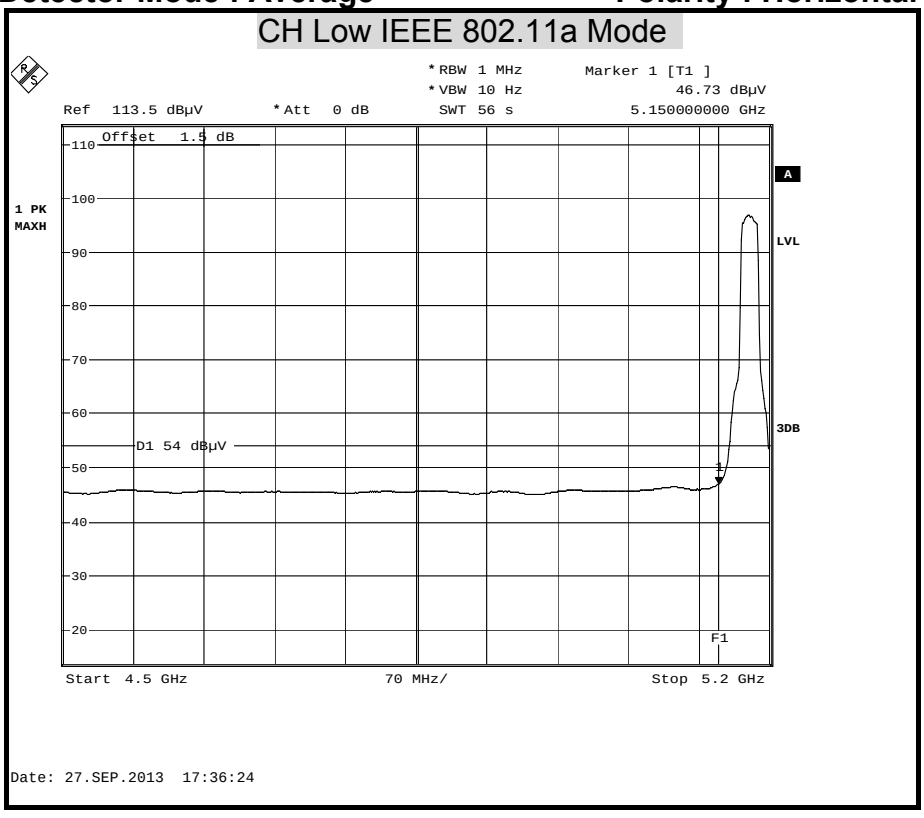
1. *AF: Antenna Factor, Cable: Cable Loss, Pre-Amp: Preamplifier gain, Filter: High Pass Filter Insertion Loss*
2. *Spectrum analyzer setting P(Peak): RBW=1MHz, VBW=1MHz, A(Average): RBW=1MHz, VBW=10Hz*
3. *The result basic equation calculation is as follow:*
   Level = Reading + AF + Cable – Preamp + Filter , Margin = Level-Limit
4. *The other emission levels were 20dB below the limit*
5. *The test limit distance is 3M limit.*
6. ** means: the frequency is under 15.205 restricted bands.*

Restricted Band Edges

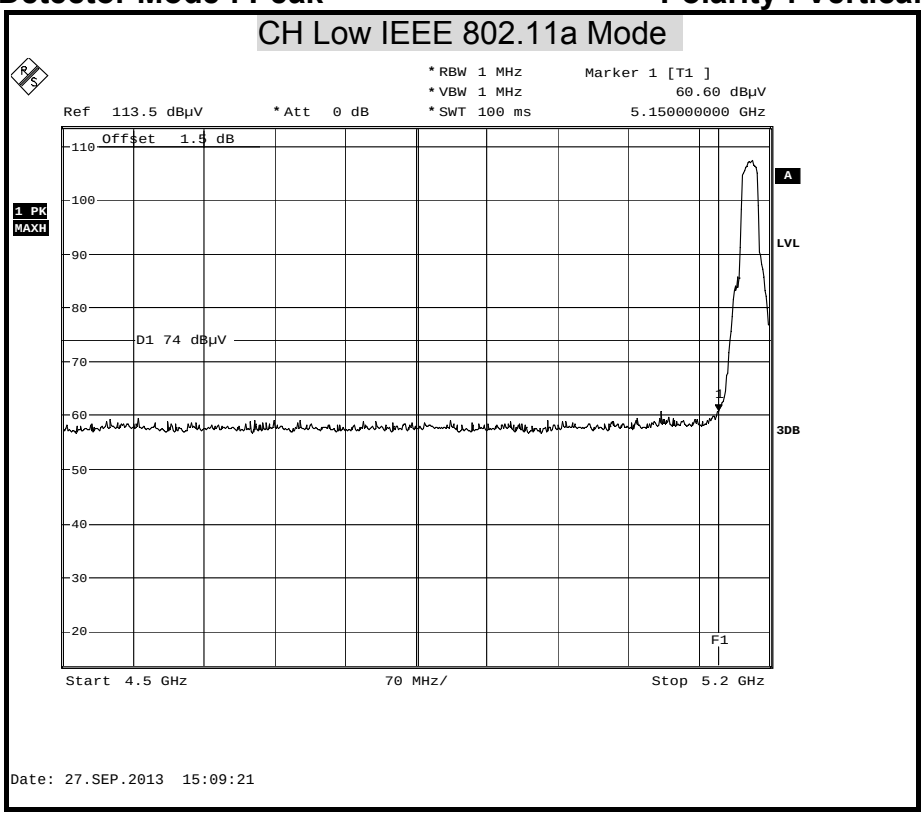
Detector Mode : Peak **Polarity : Horizontal**



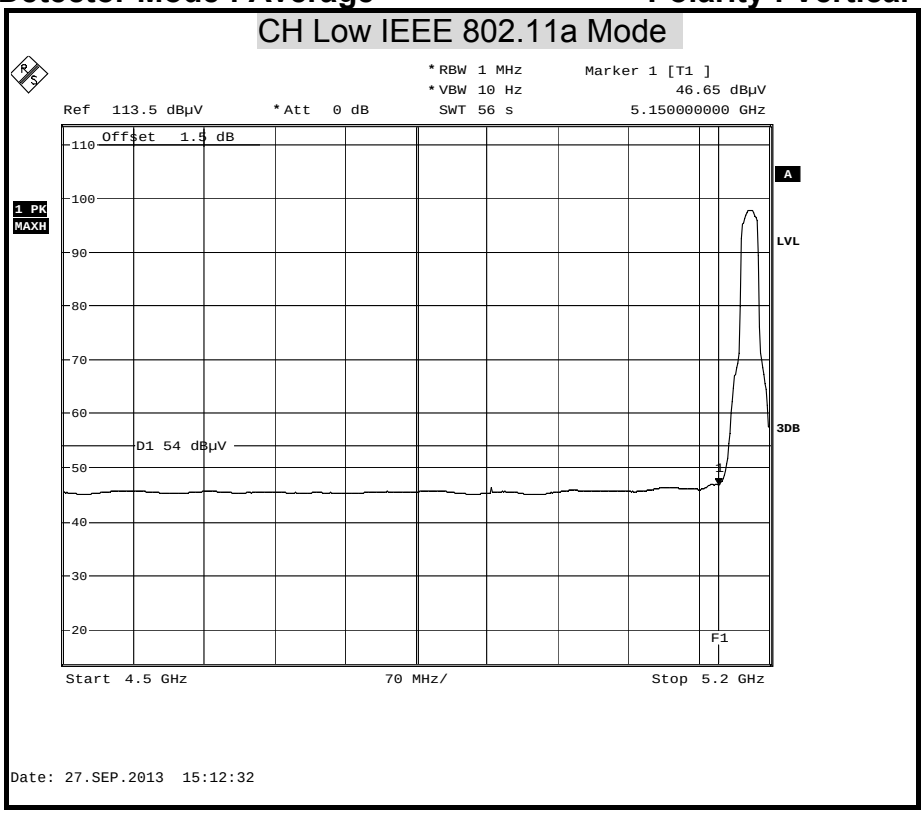
Detector Mode : Average **Polarity : Horizontal**



Detector Mode : Peak **Polarity : Vertical**

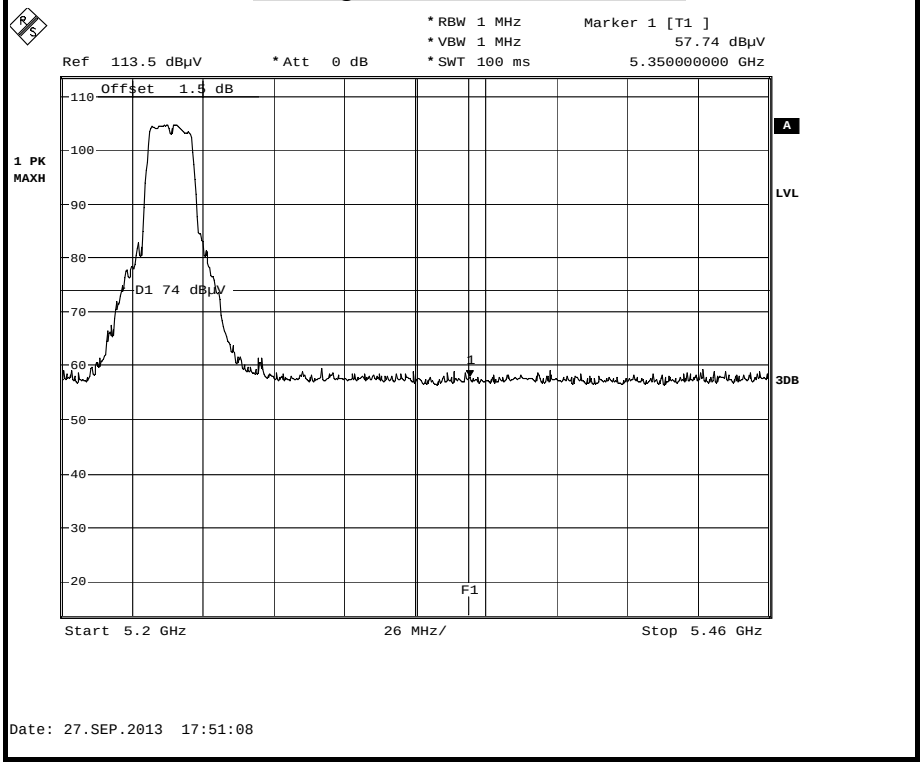


Detector Mode : Average **Polarity : Vertical**



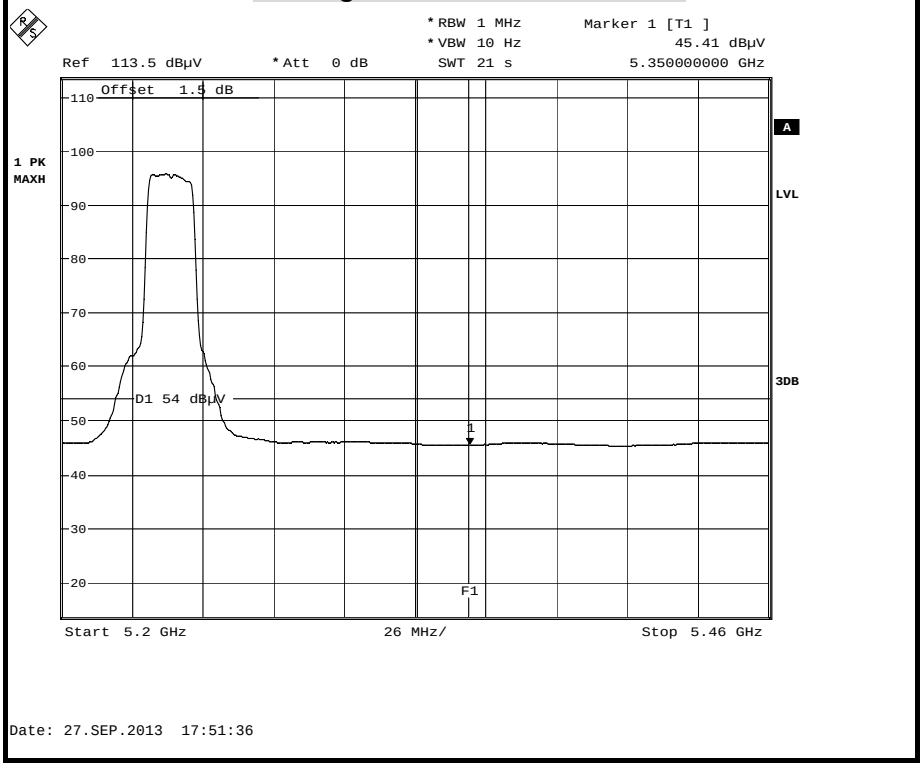
Detector Mode : Peak **Polarity : Horizontal**

CH High IEEE 802.11a Mode



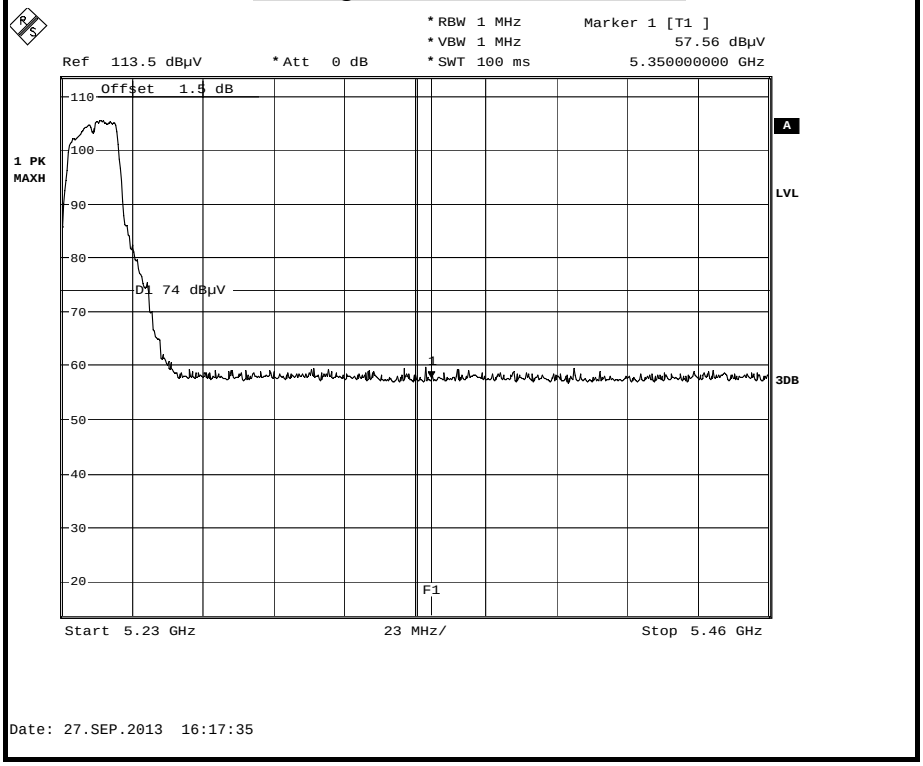
Detector Mode : Average **Polarity : Horizontal**

CH High IEEE 802.11a Mode



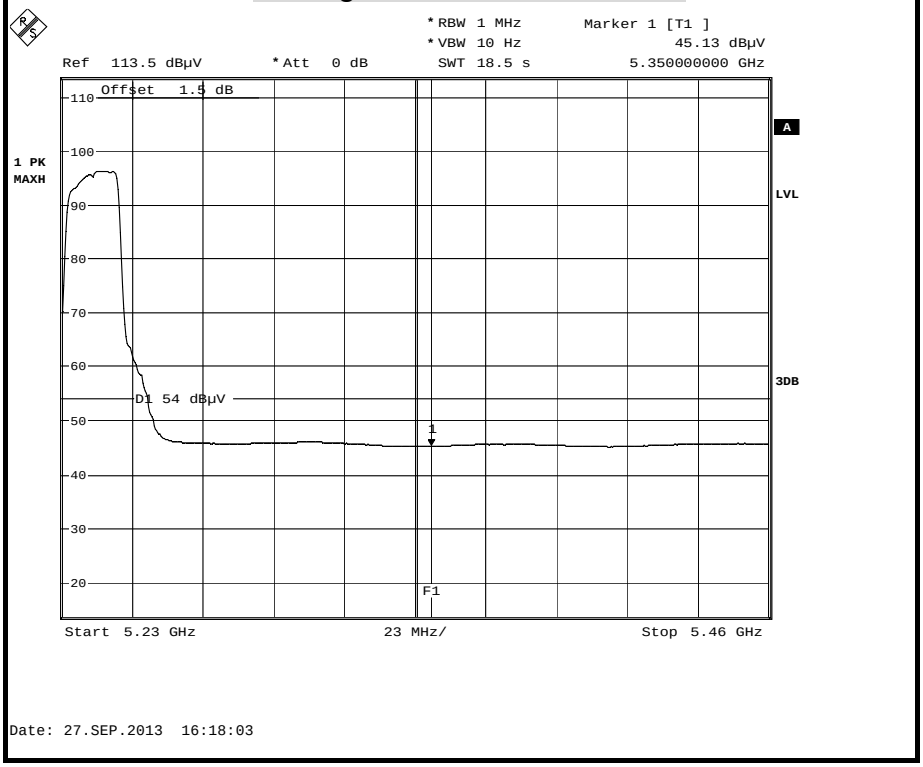
Detector Mode : Peak **Polarity : Vertical**

CH High IEEE 802.11a Mode

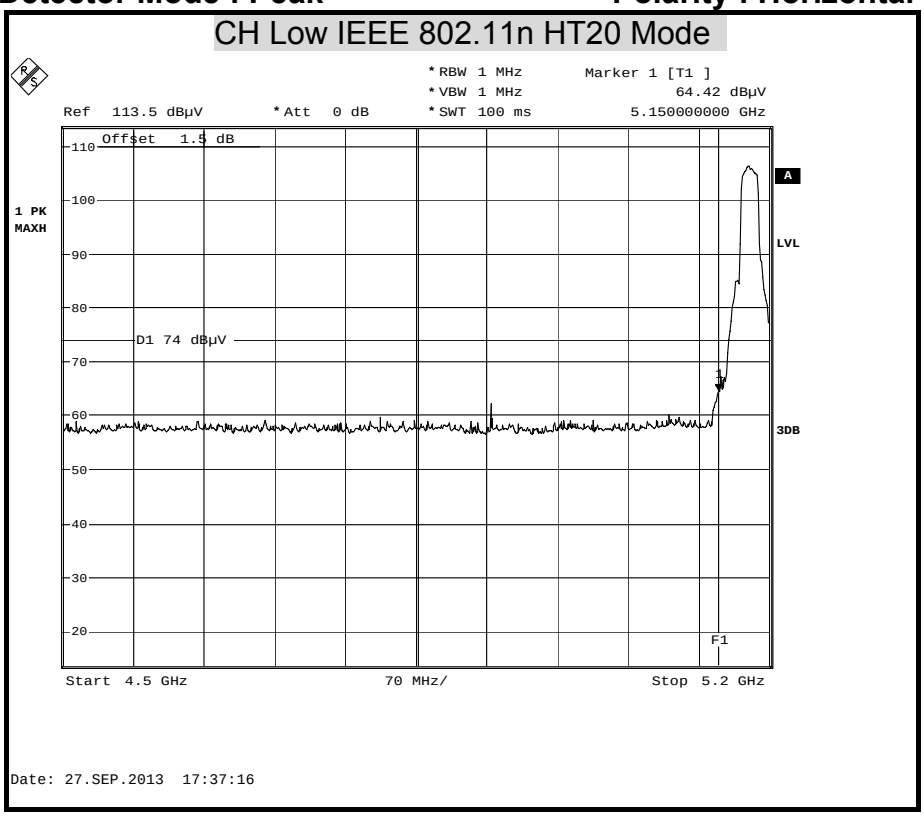


Detector Mode : Average **Polarity : Vertical**

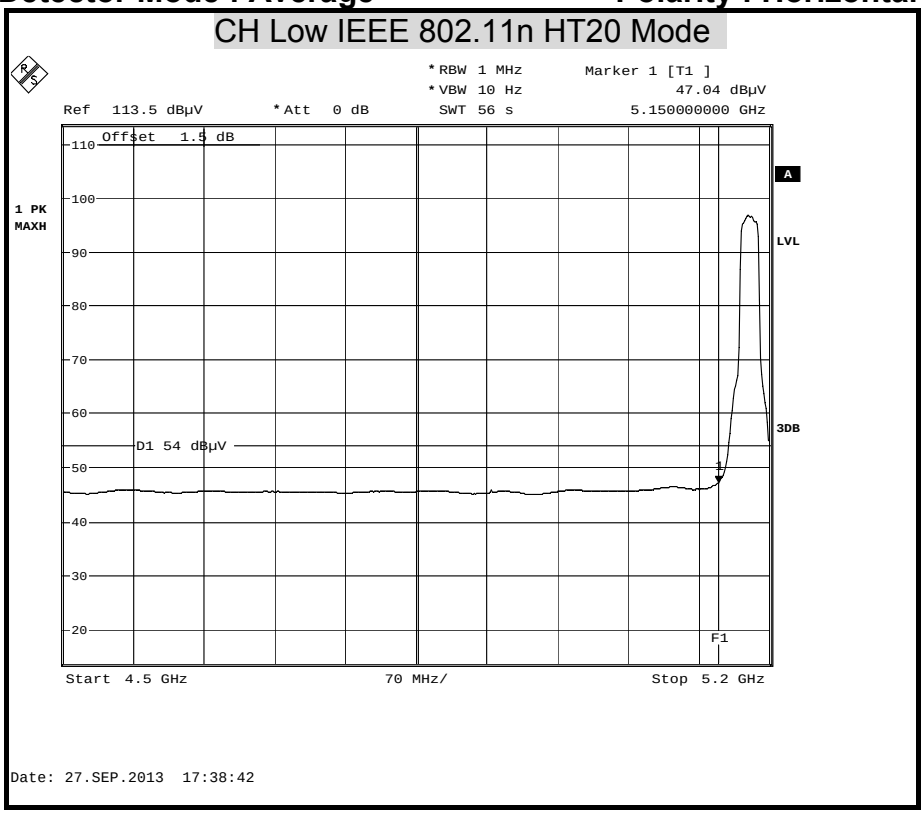
CH High IEEE 802.11a Mode



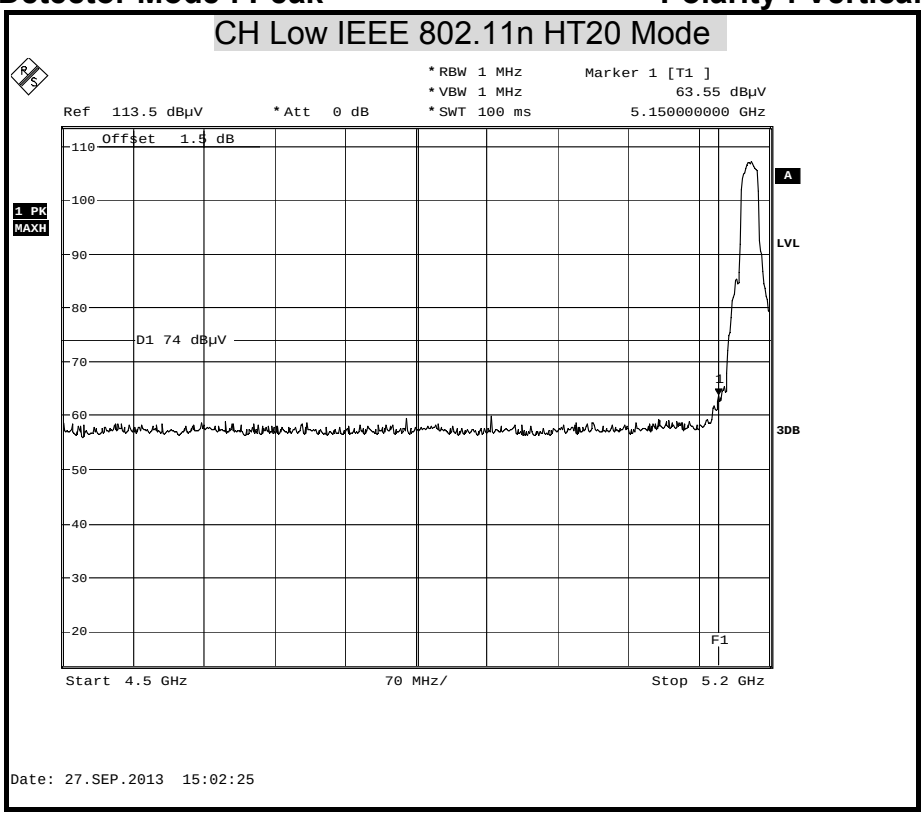
Detector Mode : Peak **Polarity : Horizontal**



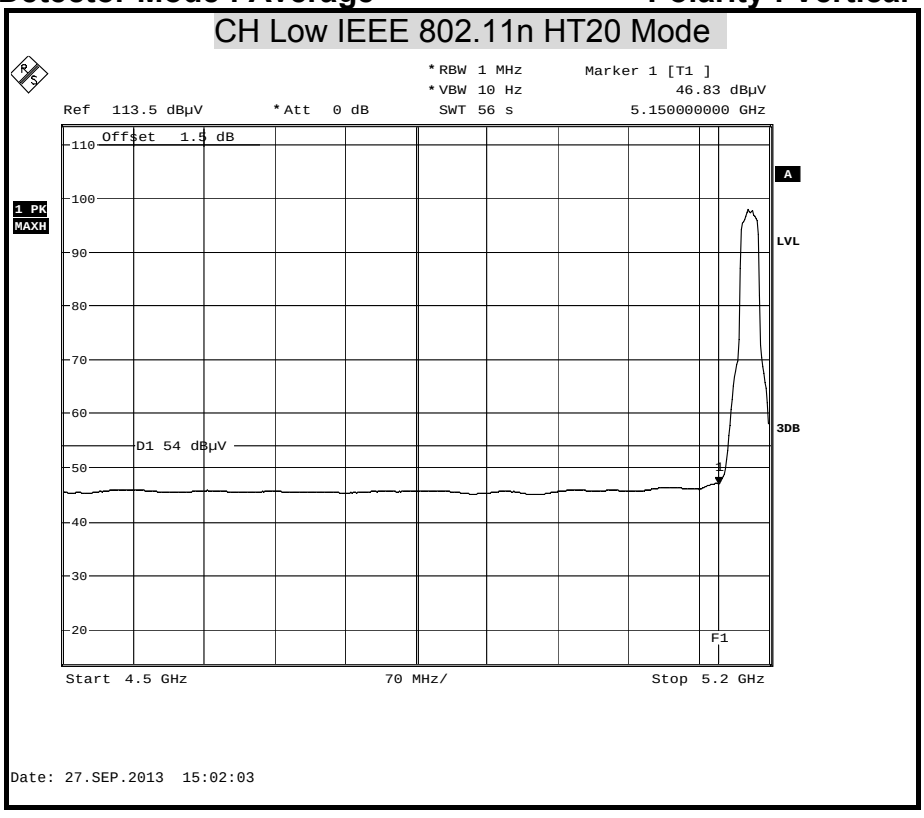
Detector Mode : Average **Polarity : Horizontal**



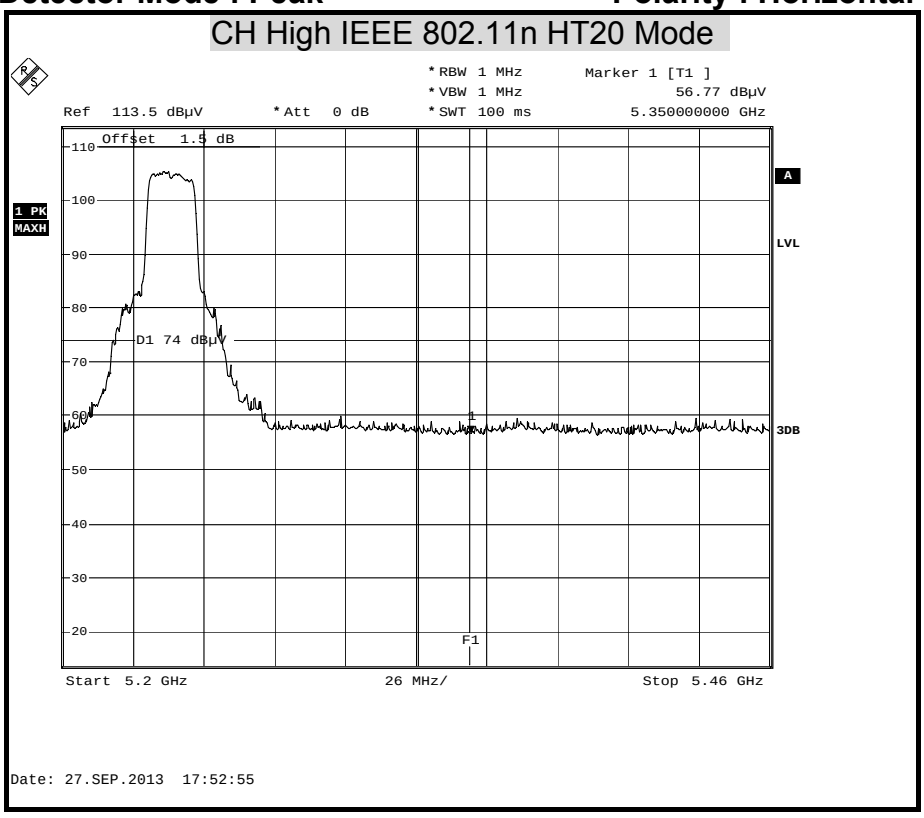
Detector Mode : Peak **Polarity : Vertical**



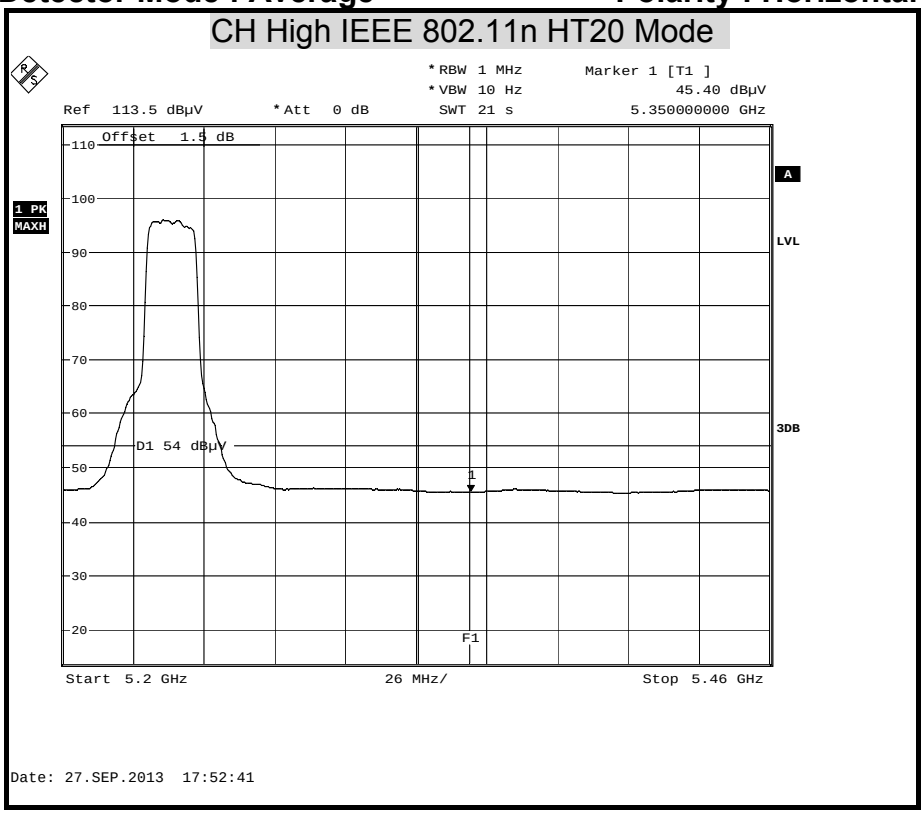
Detector Mode : Average **Polarity : Vertical**



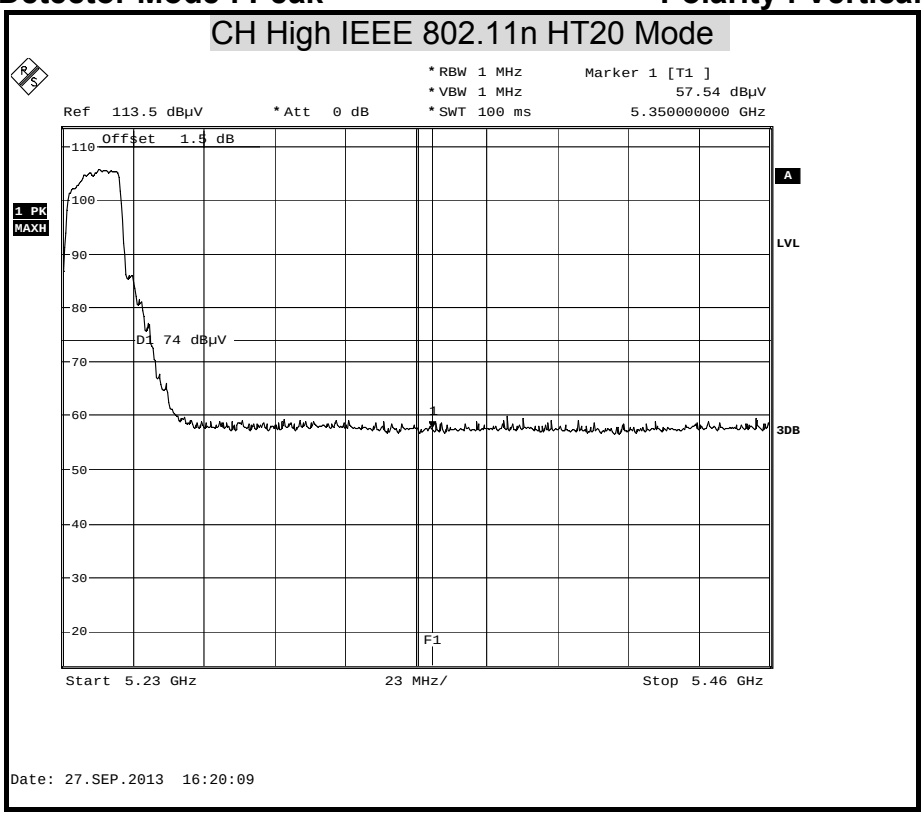
Detector Mode : Peak **Polarity : Horizontal**



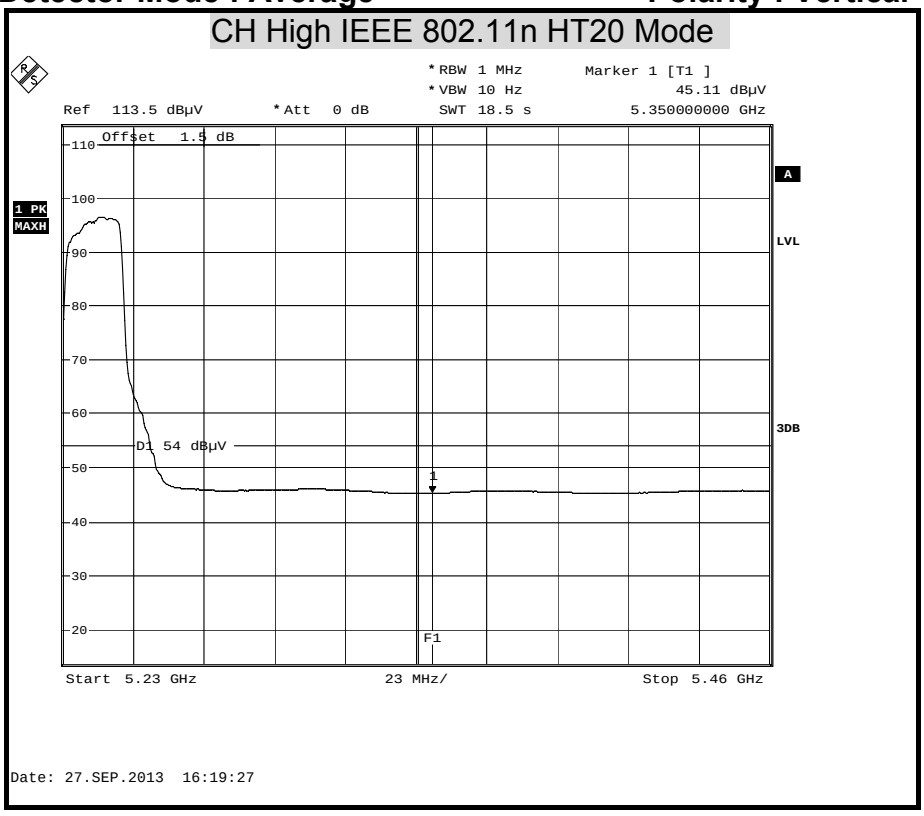
Detector Mode : Average **Polarity : Horizontal**



Detector Mode : Peak **Polarity : Vertical**

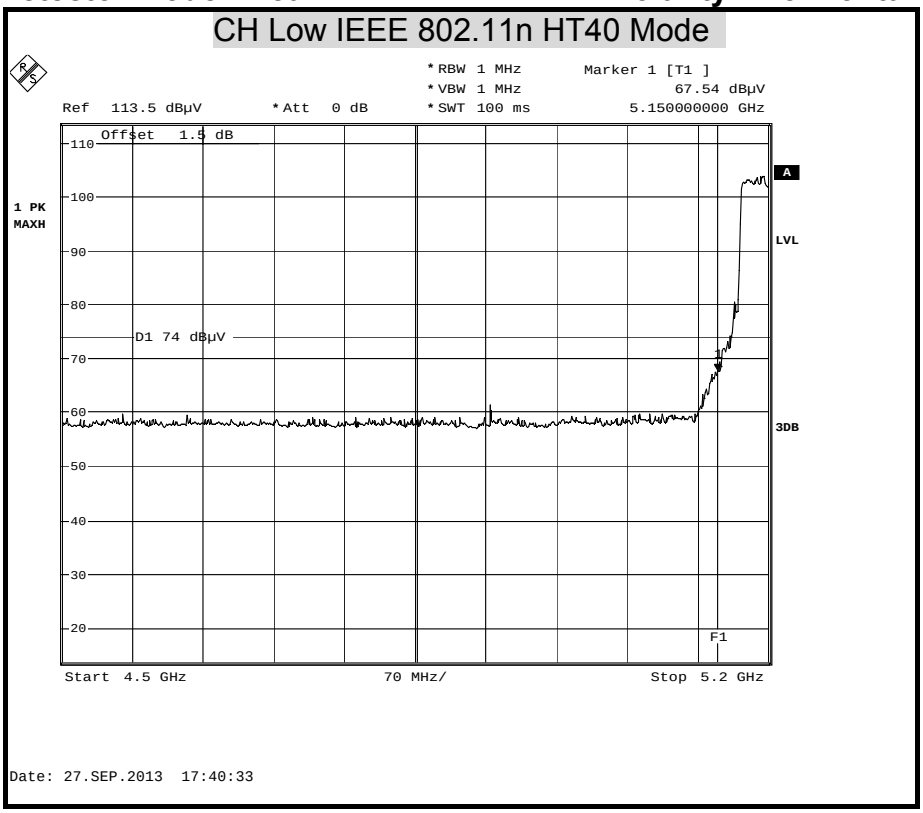


Detector Mode : Average **Polarity : Vertical**



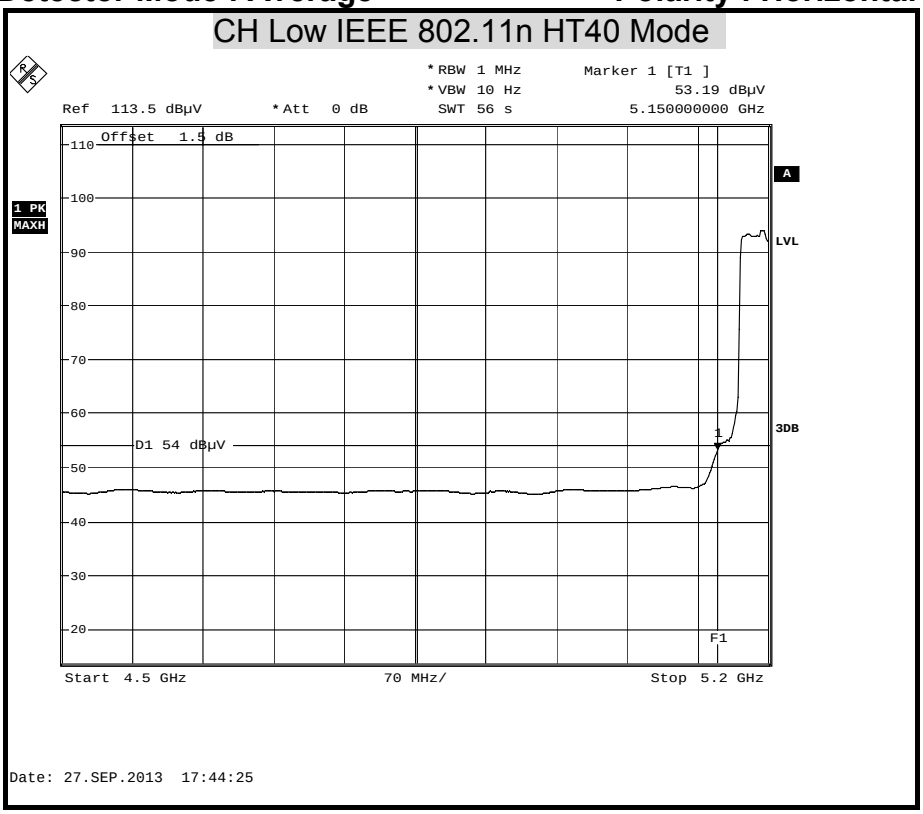
Detector Mode : Peak **Polarity : Horizontal**

CH Low IEEE 802.11n HT40 Mode

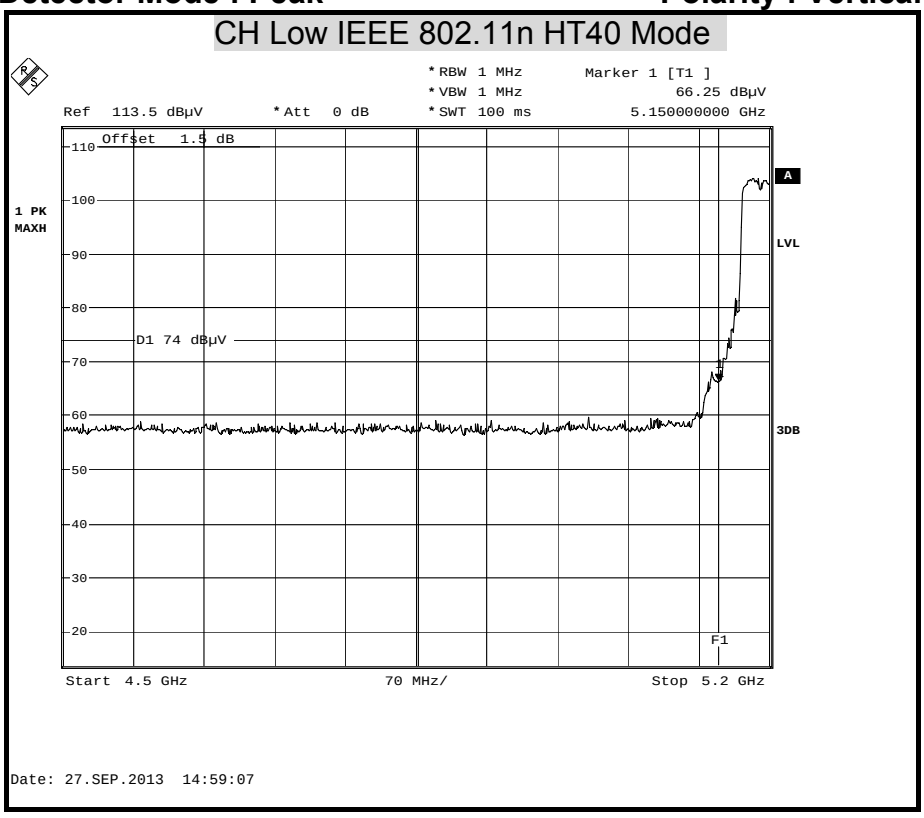


Detector Mode : Average **Polarity : Horizontal**

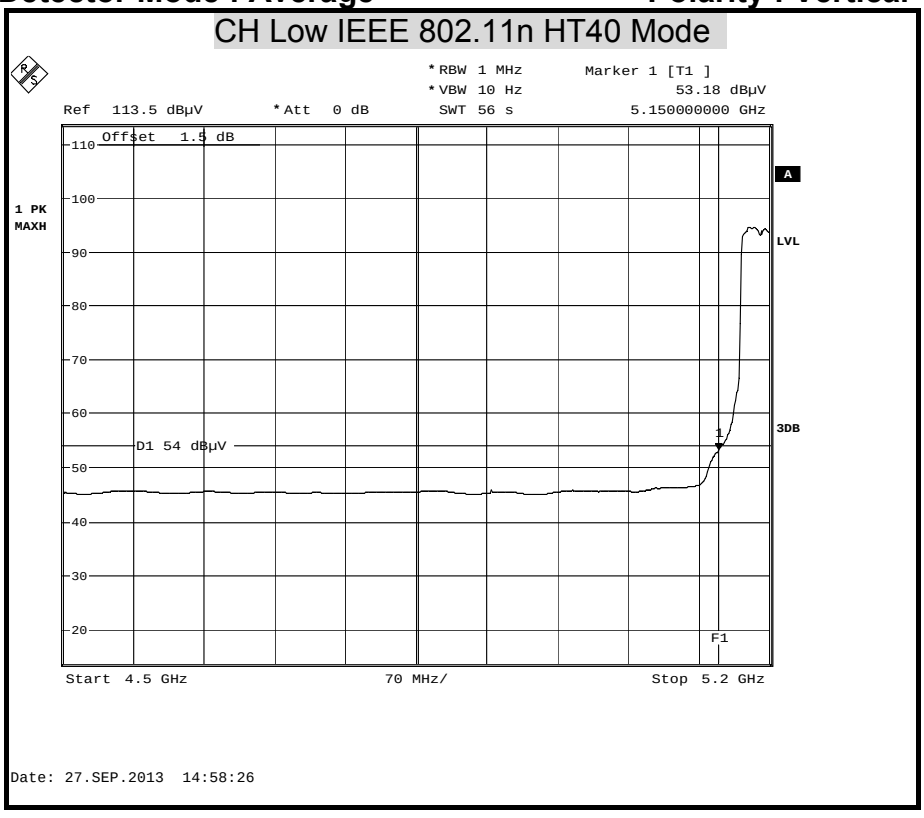
CH Low IEEE 802.11n HT40 Mode



Detector Mode : Peak **Polarity : Vertical**

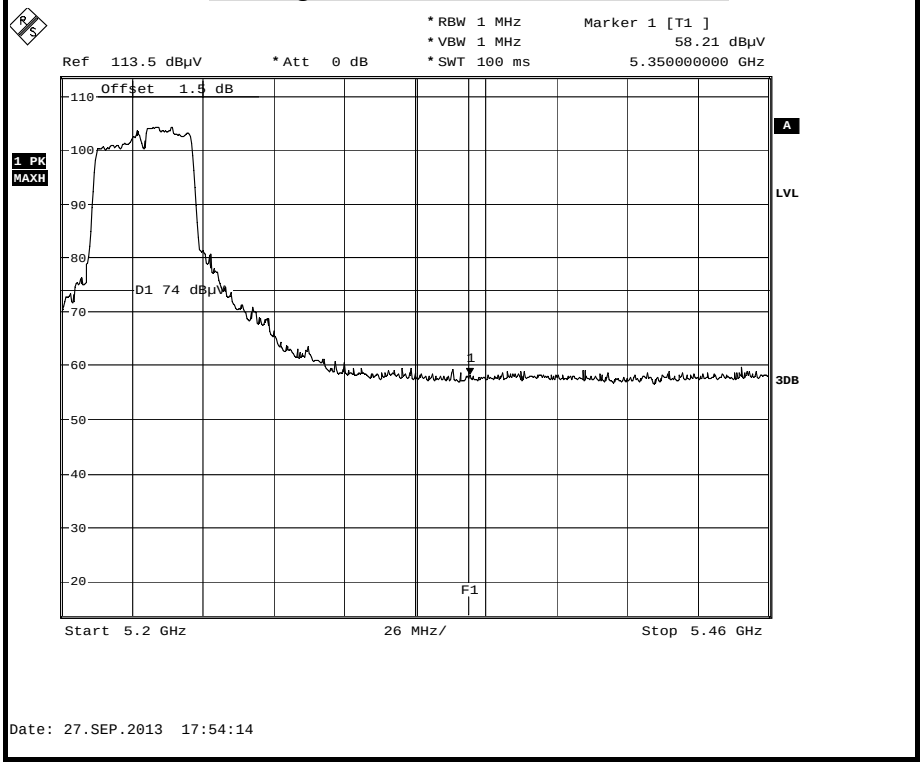


Detector Mode : Average **Polarity : Vertical**



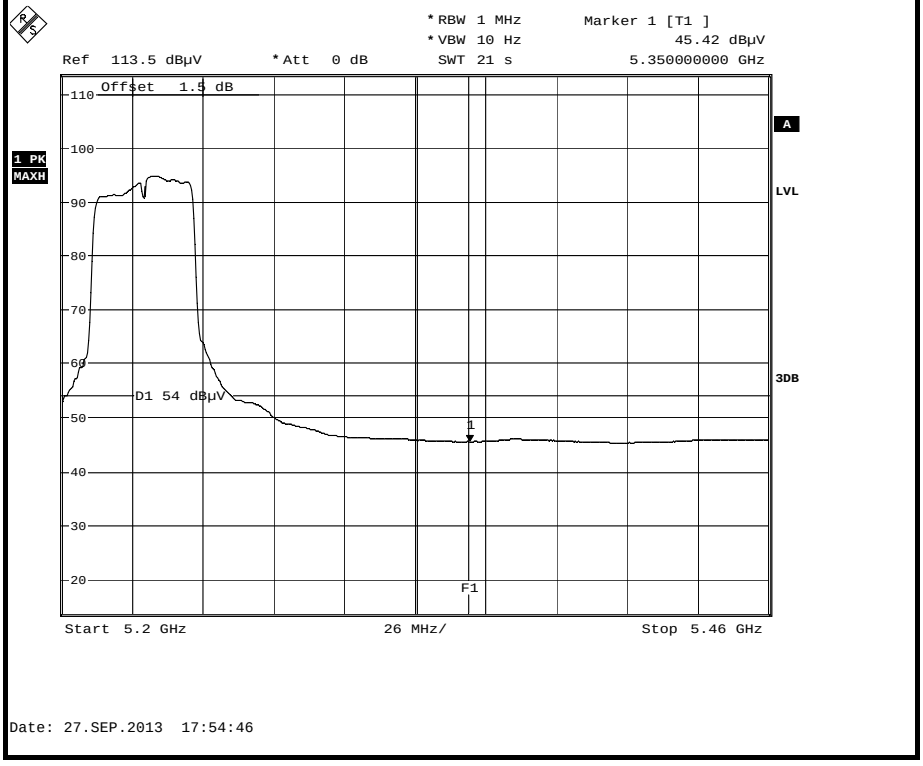
Detector Mode : Peak **Polarity : Horizontal**

CH High IEEE 802.11n HT40 Mode

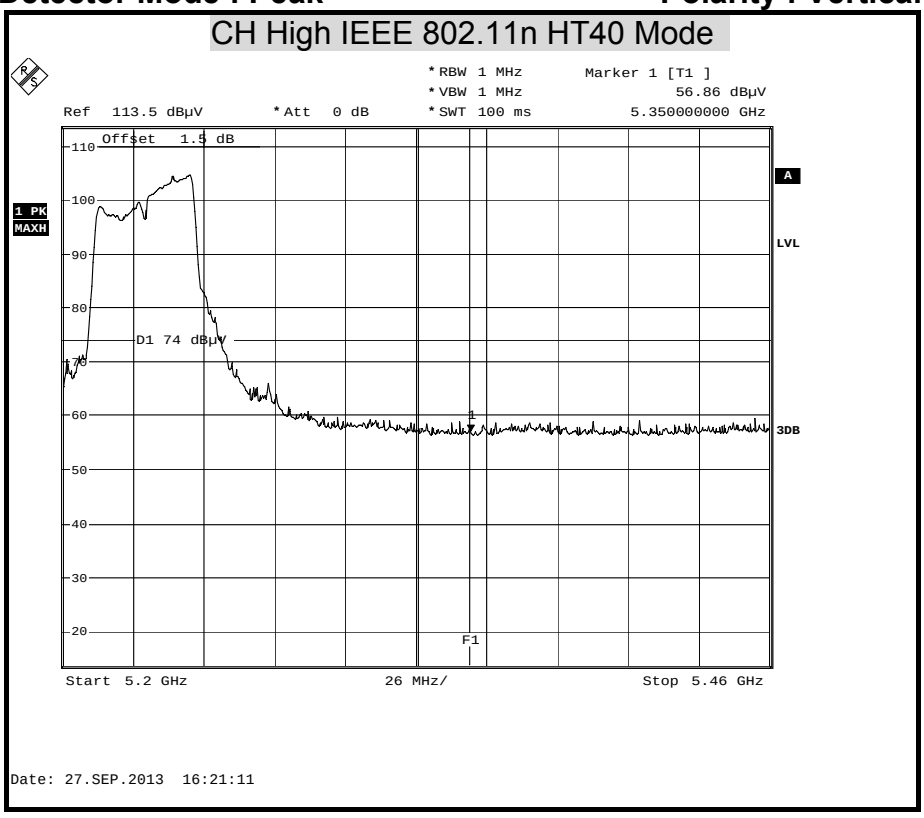


Detector Mode : Average **Polarity : Horizontal**

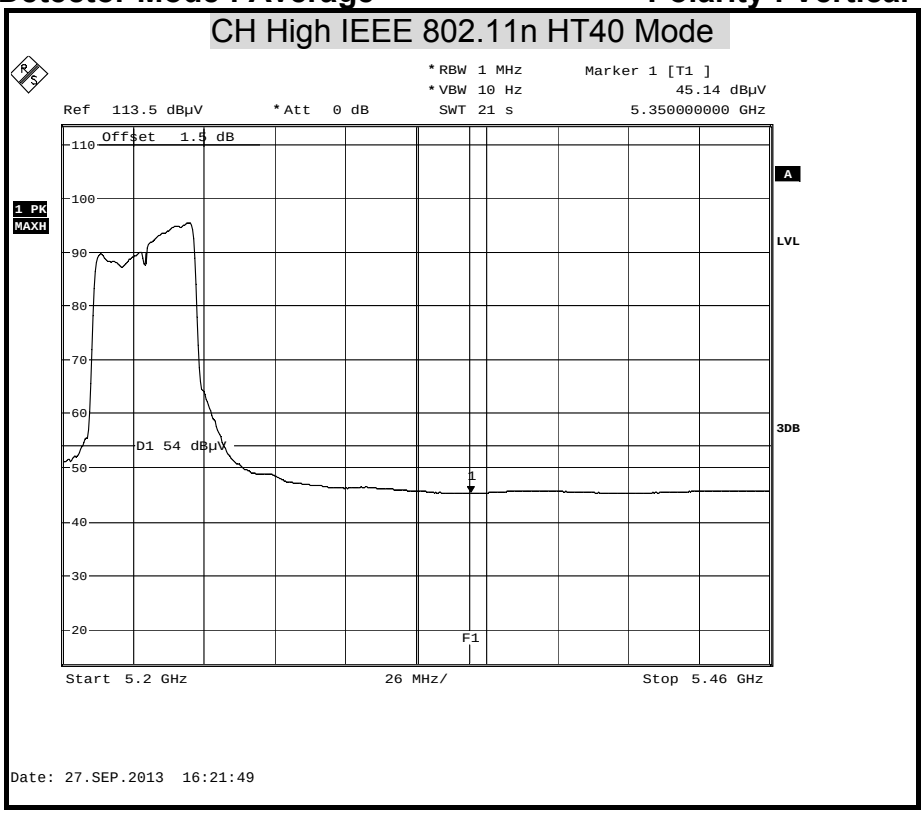
CH High IEEE 802.11n HT40 Mode



Detector Mode : Peak **Polarity : Vertical**

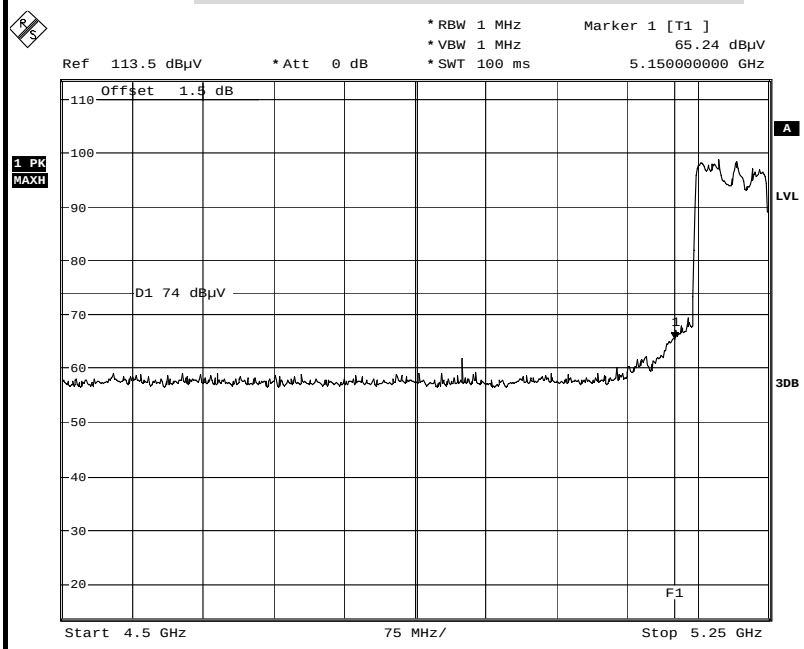


Detector Mode : Average **Polarity : Vertical**



Detector Mode : Peak **Polarity : Horizontal**

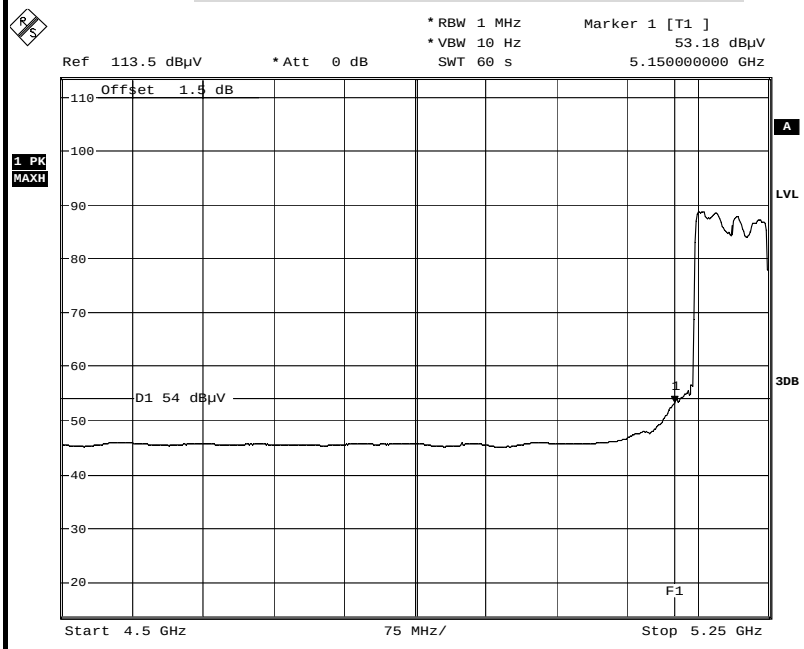
CH Low IEEE 802.11ac VHT80 Mode



Date: 27.SEP.2013 17:45:44

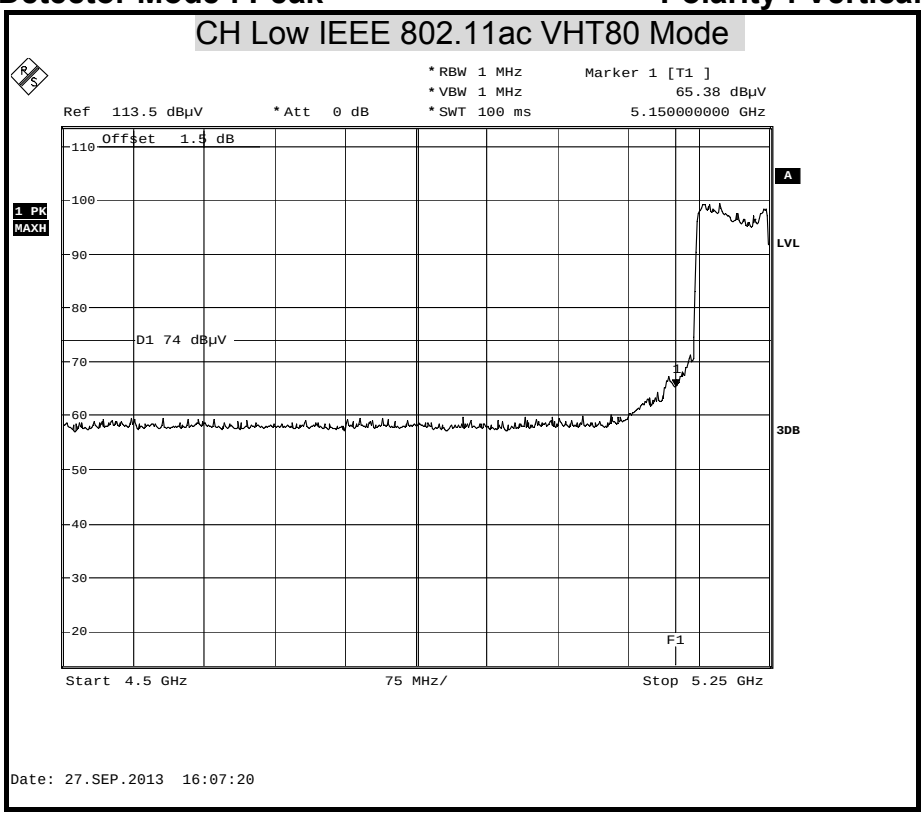
Detector Mode : Average **Polarity : Horizontal**

CH Low IEEE 802.11ac VHT80 Mode

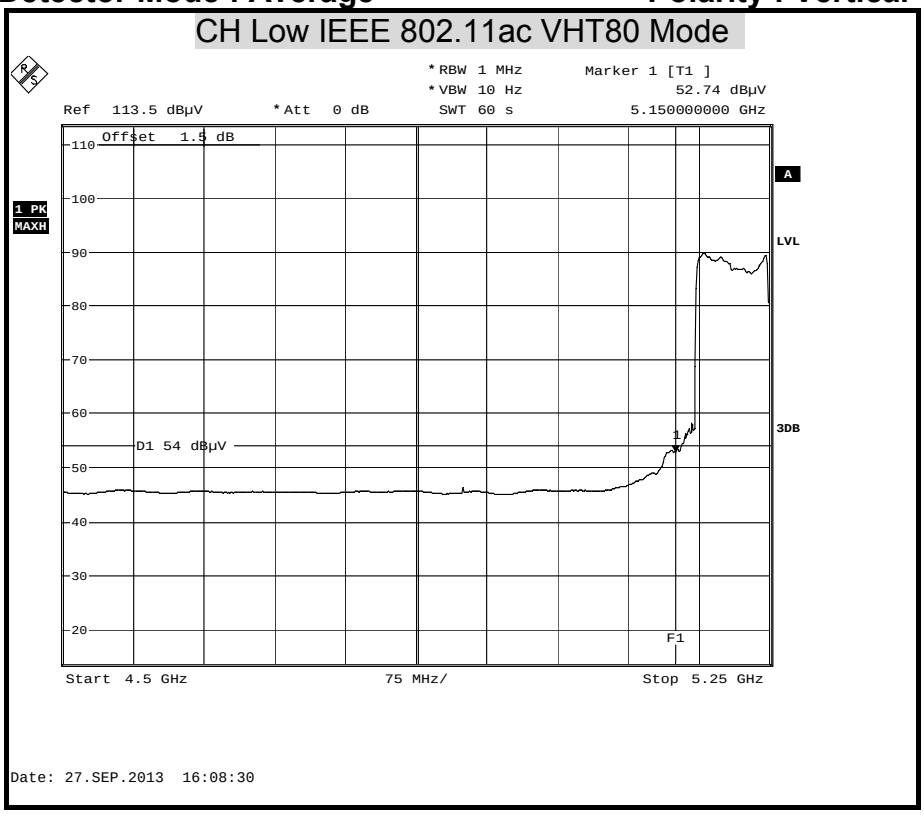


Date: 27.SEP.2013 17:47:06

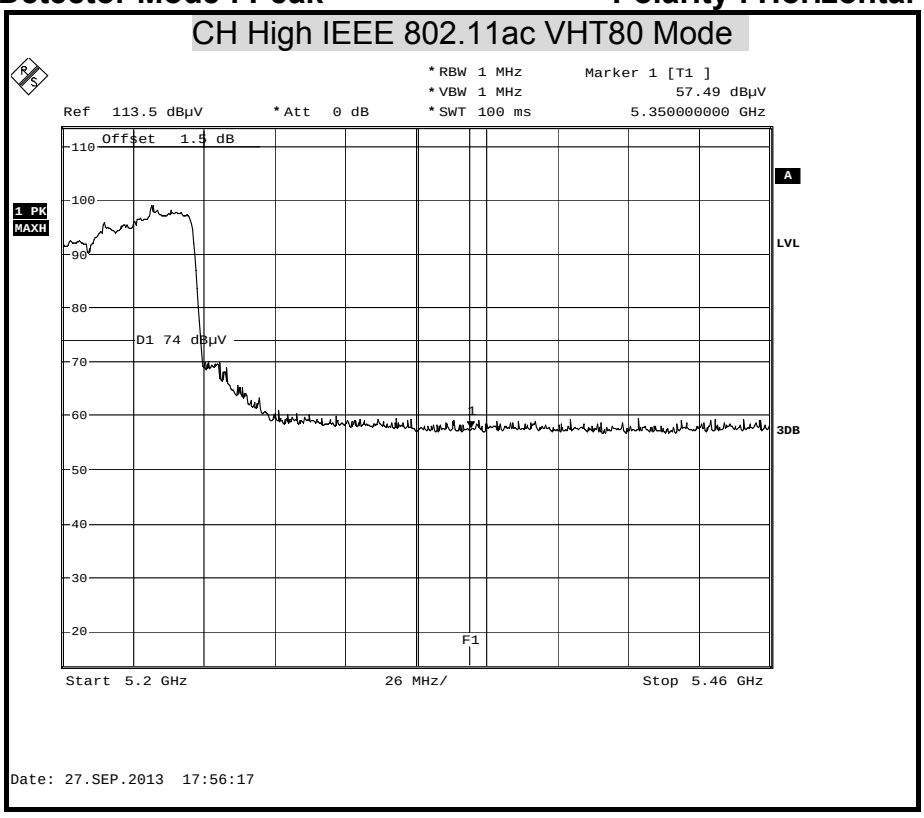
Detector Mode : Peak **Polarity : Vertical**



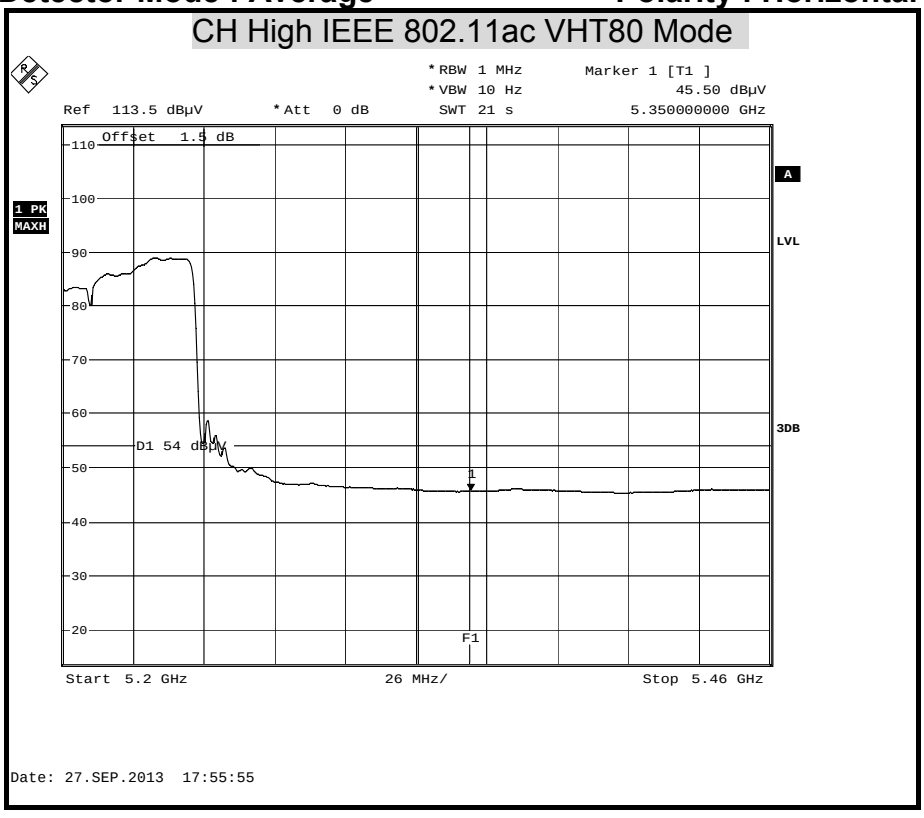
Detector Mode : Average **Polarity : Vertical**



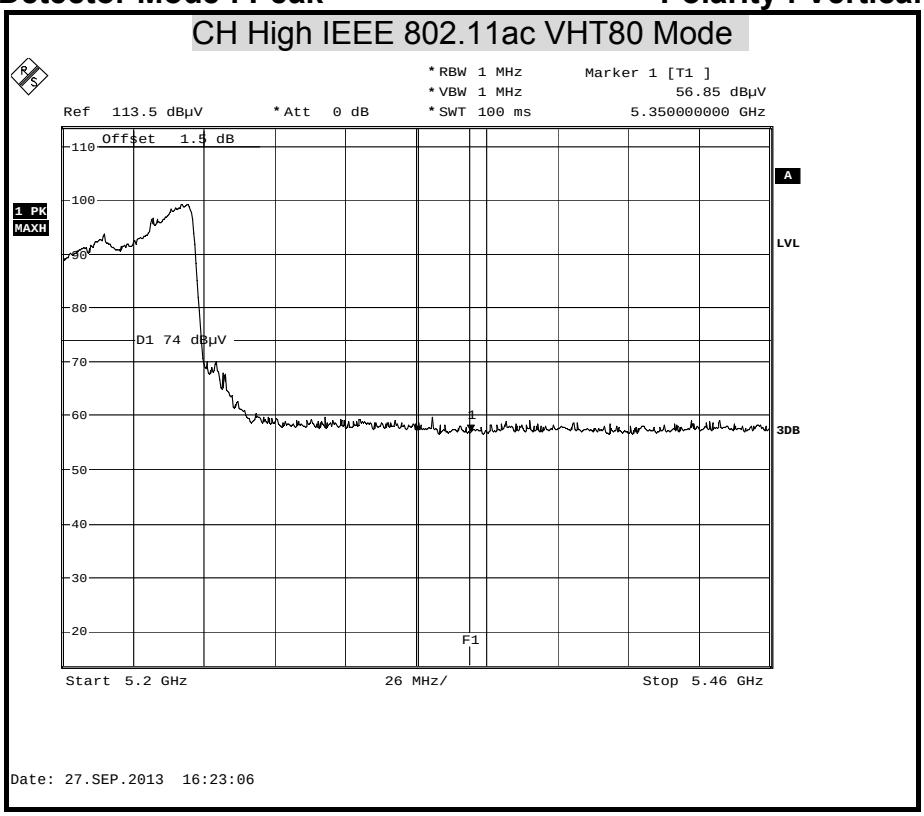
Detector Mode : Peak **Polarity : Horizontal**



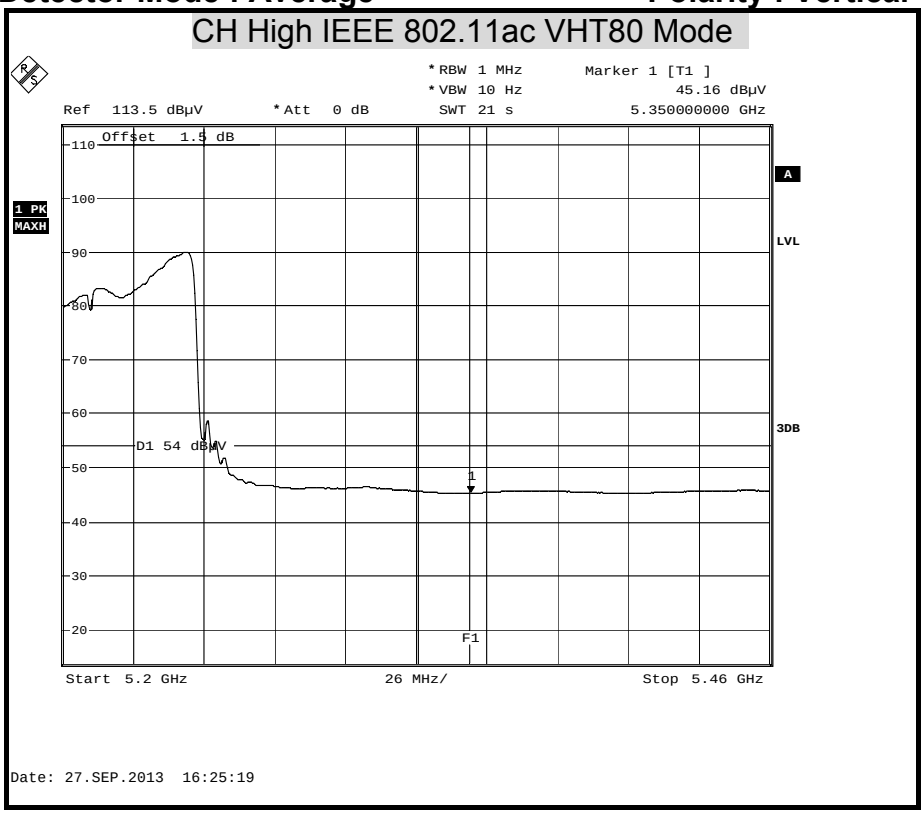
Detector Mode : Average **Polarity : Horizontal**



Detector Mode : Peak **Polarity : Vertical**



Detector Mode : Average **Polarity : Vertical**



7.7 CONDUCTED EMISSION

LIMITS

§ 15.207 (a) Except as shown in paragraph (b) and (c) this section, for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table, as measured using a 50 μH/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequency ranges.

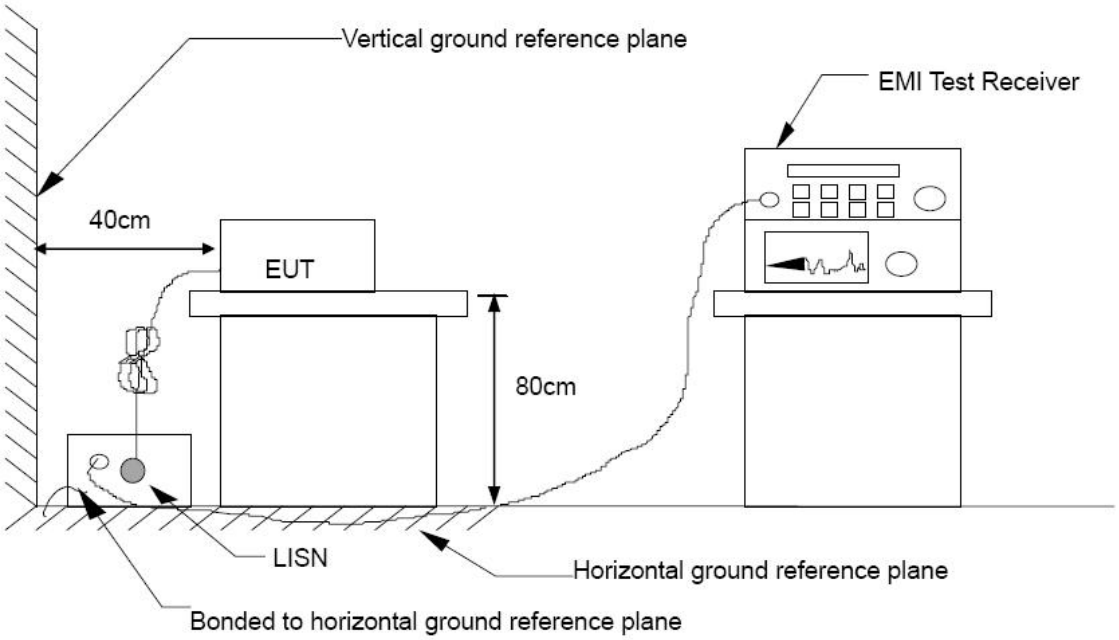
Frequency Range (MHz)	Conducted Limit (dBμv)	
	Quasi-peak	Average
0.15 - 0.50	66 to 56	56 to 46
0.50 - 5.00	56	46
5.00 - 30.0	60	50

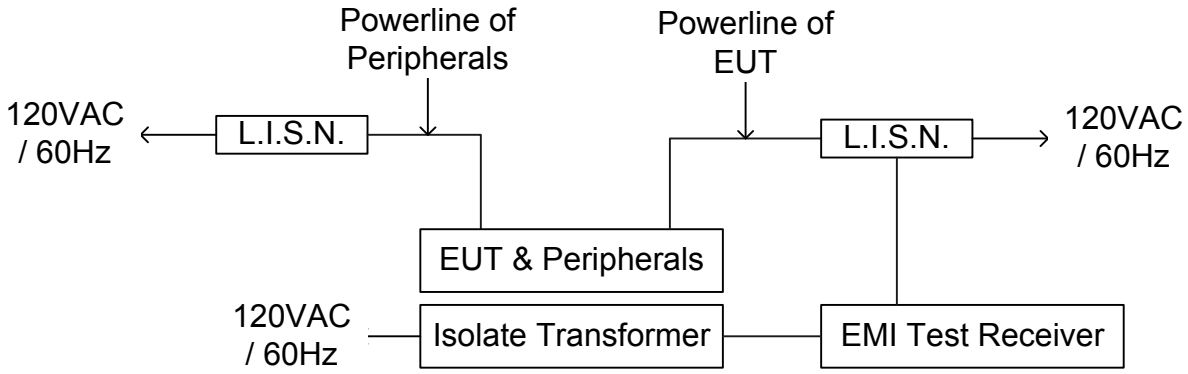
TEST EQUIPMENT

Conducted Emission room #1				
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
L.I.S.N.	SCHWARZBECK	NNLK 8130	8130124	AUG. 12, 2014
	Rohde & Schwarz	ESH 3-Z5	840062/021	SEP. 09, 2014
TEST RECEIVER	Rohde & Schwarz	ESCS 30	100348	AUG. 09, 2014
BNC COAXIAL CABLE	CCS	BNC50	11	OCT. 30, 2013
Test S/W	e-3 (5.04211c) R&S (2.27)			

Remark: *Each piece of equipment is scheduled for calibration once a year.*

TEST SETUP





TEST PROCEDURE

The basic test procedure was in accordance with ANSI C63.4:2003.

The test procedure is performed in a 4m × 3m × 2.4m (L×W×H) shielded room.

The EUT along with its peripherals were placed on a 1.0m (W) × 1.5m (L) and 0.8m in height wooden table and the EUT was adjusted to maintain a 0.4 meter space from a vertical reference plane.

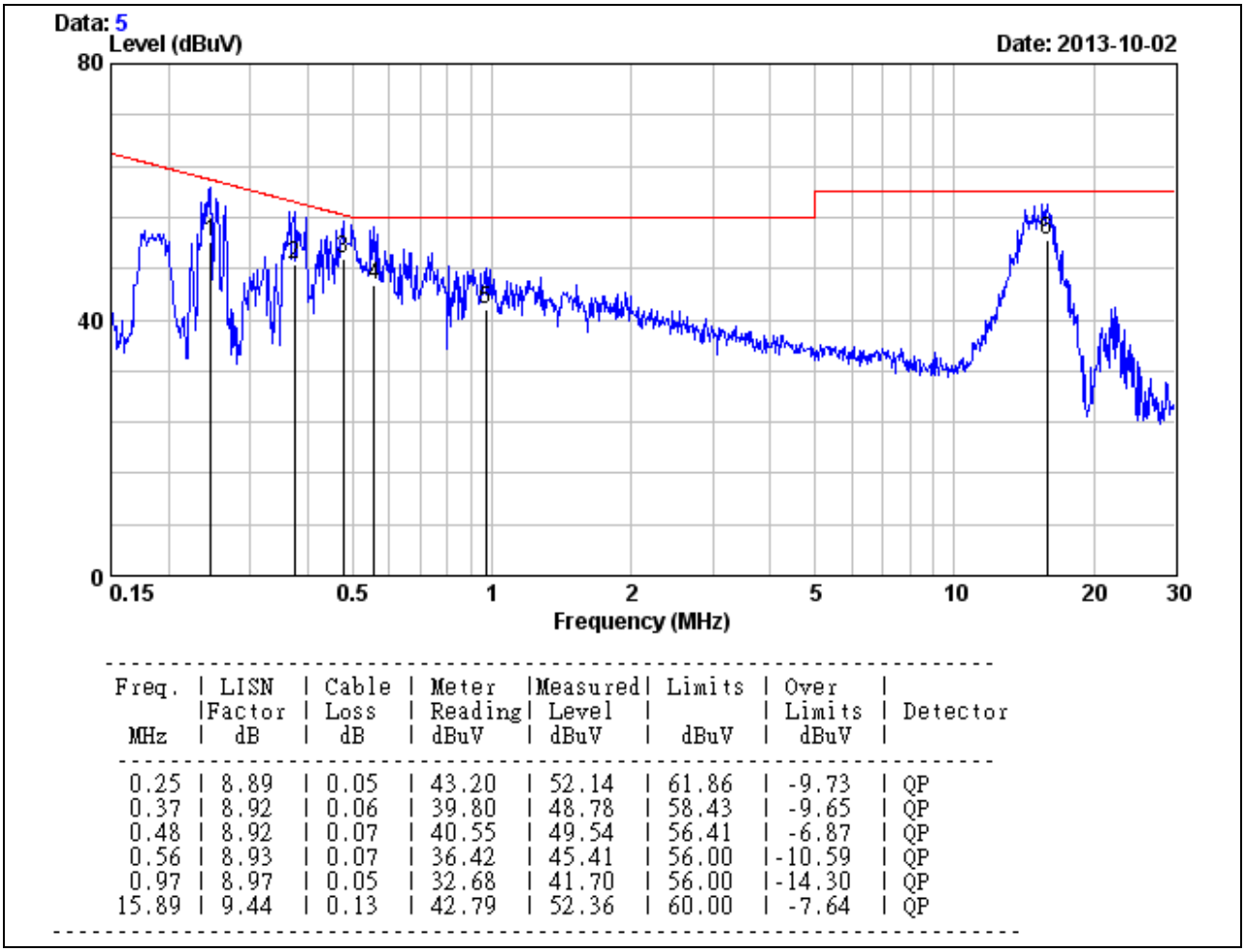
The EUT was connected to power mains through a line impedance stabilization network (LISN) which provides 50 ohm coupling impedance for measuring instrument and the chassis ground was bounded to the horizontal ground plane of shielded room. All peripherals were connected to the second LISN and the chassis ground also bounded to the horizontal ground plane of shielded room.

The EUT was located so that the distance between the boundary of the EUT and the closest surface of the LISN is 0.8 m. Where a mains flexible cord was provided by the manufacturer shall be 1 m long, or if in excess of 1 m, the excess cable was folded back and forth as far as possible so as to form a bundle not exceeding 0.4 m in length.

TEST RESULTS

Product Name	AC750 Portable Router and Charger	Test By	Shiang Su
Model	DIR-510L	Test Date	2013/10/02
Test Mode	Y axis_WAN mode	Temp. & Humidity	25.5°C, 48%

LINE



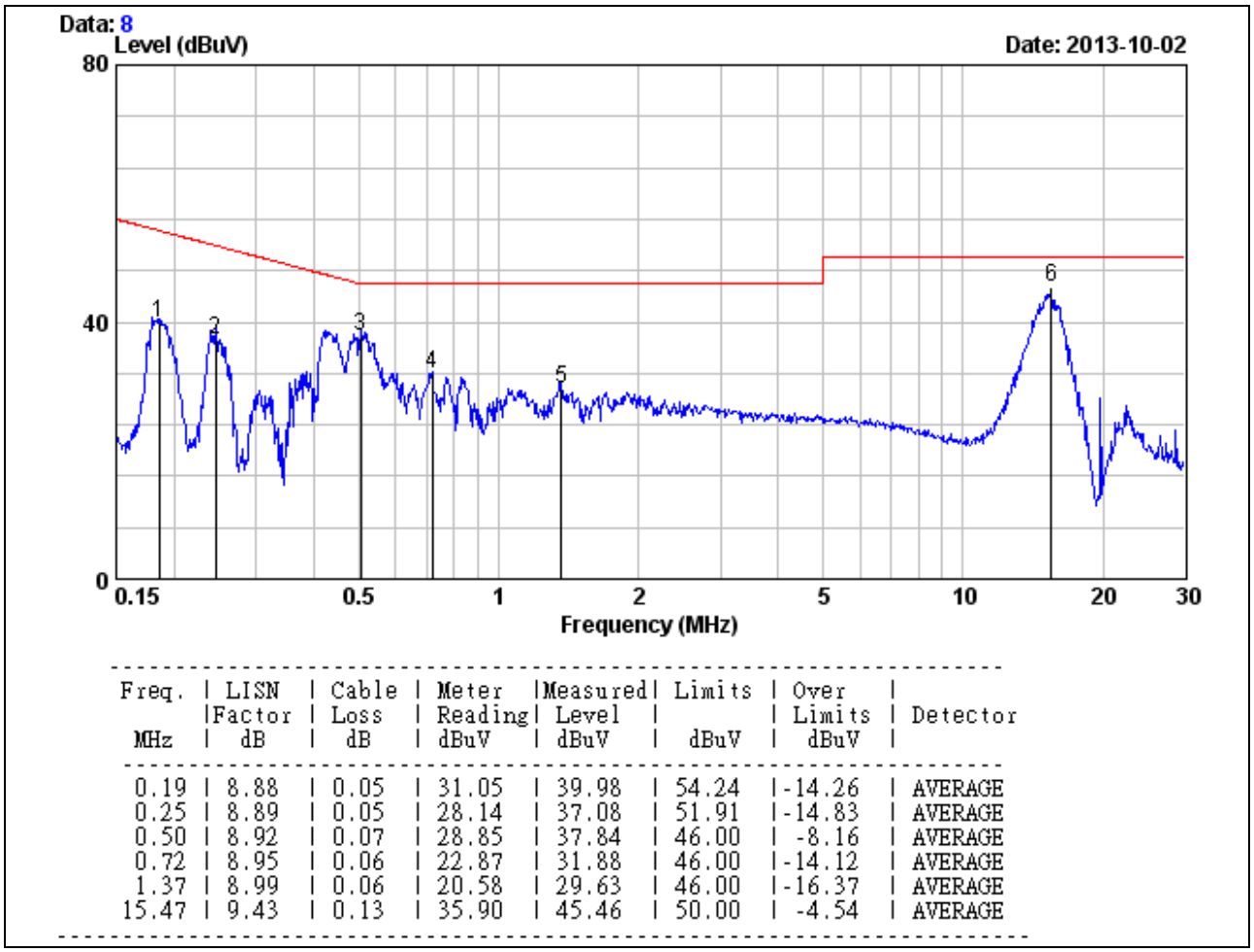
Freq. MHz	LISN Factor dB	Cable Loss dB	Meter Reading dBuV	Measured Level dBuV	Limits dBuV	Over Limits dBuV	Detector
0.25	8.89	0.05	43.20	52.14	61.86	-9.73	QP
0.37	8.92	0.06	39.80	48.78	58.43	-9.65	QP
0.48	8.92	0.07	40.55	49.54	56.41	-6.87	QP
0.56	8.93	0.07	36.42	45.41	56.00	-10.59	QP
0.97	8.97	0.05	32.68	41.70	56.00	-14.30	QP
15.89	9.44	0.13	42.79	52.36	60.00	-7.64	QP

Remark:

1. Correction Factor = Insertion loss + Cable loss
2. Emission level = Reading Value + Correction factor
3. Margin value = Emission level – Limit value

Product Name	AC750 Portable Router and Charger	Test By	Shiang Su
Model	DIR-510L	Test Date	2013/10/02
Test Mode	Y axis_WAN mode	Temp. & Humidity	25.5°C, 48%

LINE



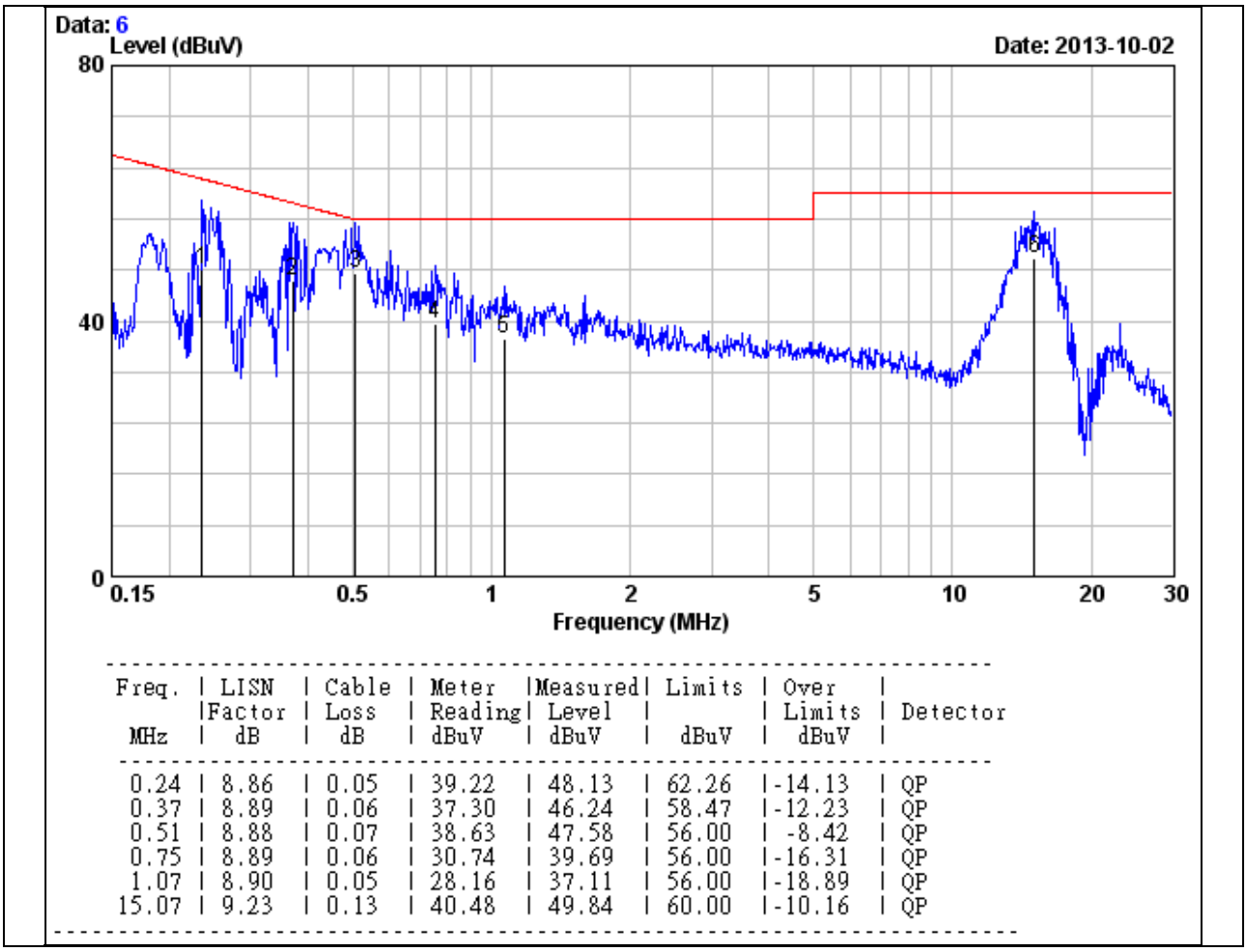
Freq. MHz	LISN Factor dB	Cable Loss dB	Meter Reading dBuV	Measured Level dBuV	Limits dBuV	Over Limits dBuV	Detector
0.19	8.88	0.05	31.05	39.98	54.24	-14.26	AVERAGE
0.25	8.89	0.05	28.14	37.08	51.91	-14.83	AVERAGE
0.50	8.92	0.07	28.85	37.84	46.00	-8.16	AVERAGE
0.72	8.95	0.06	22.87	31.88	46.00	-14.12	AVERAGE
1.37	8.99	0.06	20.58	29.63	46.00	-16.37	AVERAGE
15.47	9.43	0.13	35.90	45.46	50.00	-4.54	AVERAGE

Remark:

1. *Correction Factor = Insertion loss + Cable loss*
2. *Emission level = Reading Value + Correction factor*
3. *Margin value = Emission level – Limit value*

Product Name	AC750 Portable Router and Charger	Test By	Shiang Su
Model	DIR-510L	Test Date	2013/10/02
Test Mode	Y axis_WAN mode	Temp. & Humidity	25.5°C, 48%

NEUTRAL



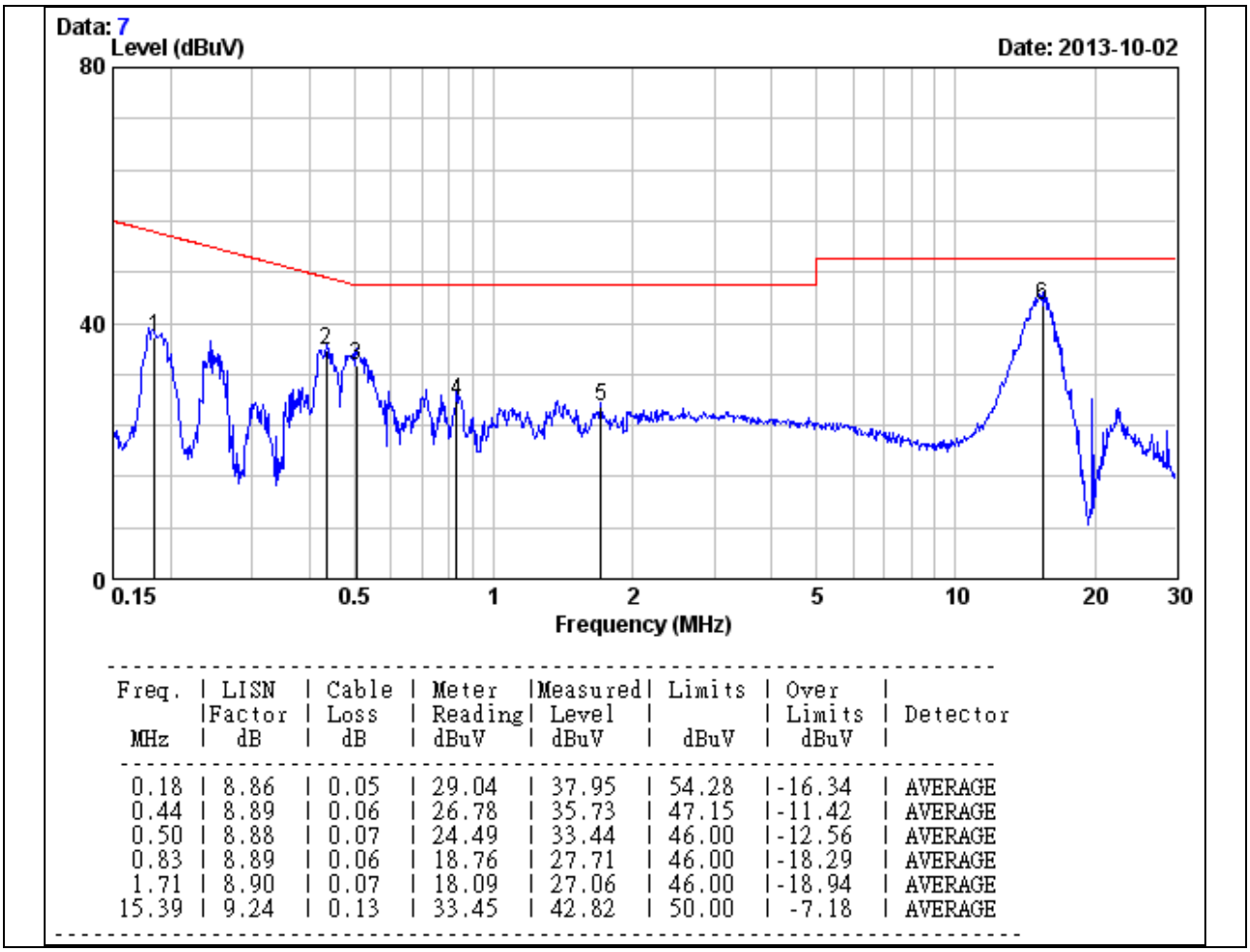
Freq. MHz	LISN Factor dB	Cable Loss dB	Meter Reading dBuV	Measured Level dBuV	Limits dBuV	Over Limits dBuV	Detector
0.24	8.86	0.05	39.22	48.13	62.26	-14.13	QP
0.37	8.89	0.06	37.30	46.24	58.47	-12.23	QP
0.51	8.88	0.07	38.63	47.58	56.00	-8.42	QP
0.75	8.89	0.06	30.74	39.69	56.00	-16.31	QP
1.07	8.90	0.05	28.16	37.11	56.00	-18.89	QP
15.07	9.23	0.13	40.48	49.84	60.00	-10.16	QP

Remark:

1. Correction Factor = Insertion loss + Cable loss
2. Emission level = Reading Value + Correction factor
3. Margin value = Emission level – Limit value

Product Name	AC750 Portable Router and Charger	Test By	Shiang Su
Model	DIR-510L	Test Date	2013/10/02
Test Mode	Y axis_WAN mode	Temp. & Humidity	25.5°C, 48%

NEUTRAL



Freq. MHz	LISN Factor dB	Cable Loss dB	Meter Reading dBuV	Measured Level dBuV	Limits dBuV	Over Limits dBuV	Detector
0.18	8.86	0.05	29.04	37.95	54.28	-16.34	AVERAGE
0.44	8.89	0.06	26.78	35.73	47.15	-11.42	AVERAGE
0.50	8.88	0.07	24.49	33.44	46.00	-12.56	AVERAGE
0.83	8.89	0.06	18.76	27.71	46.00	-18.29	AVERAGE
1.71	8.90	0.07	18.09	27.06	46.00	-18.94	AVERAGE
15.39	9.24	0.13	33.45	42.82	50.00	-7.18	AVERAGE

Remark:

1. Correction Factor = Insertion loss + Cable loss
2. Emission level = Reading Value + Correction factor
3. Margin value = Emission level – Limit value

7.8 FREQUENCY STABILITY

LIMITS

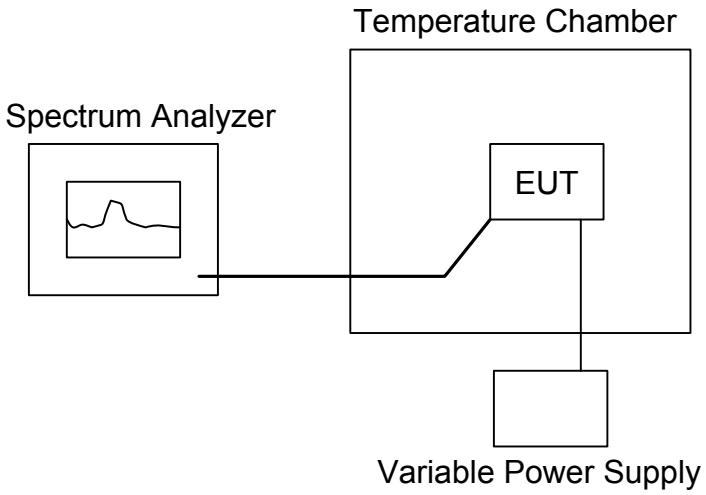
§ 15.407 (g) manufacturers of U-NII devices are responsible for ensuring frequency stability such that an emission is maintained within the band of operation under all conditions of normal operation as specified in the user's manual.

TEST EQUIPMENT

Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
Spectrum Analyzer	R&S	FSU	200789	JUL. 01, 2014
Temp./Humidity Chamber	K.SON	THS-M1	242	AUG. 08, 2014

Remark: *Each piece of equipment is scheduled for calibration once a year*

TEST SETUP



TEST PROCEDURE

The equipment under test was connected to an external AC or DC power supply and input rated voltage. RF output was connected to a frequency counter or spectrum analyzer via feed through attenuators. The EUT was placed inside the temperature chamber. Set the spectrum analyzer RBW low enough to obtain the desired frequency resolution and measure EUT 20℃ operating frequency as reference frequency. Turn EUT off and set the chamber temperature to -20℃. After the temperature stabilized for approximately 30 minutes recorded the frequency. Repeat step measure with 10℃ increased per stage until the highest temperature of +50℃ reached.

TEST RESULTS

IEEE 802.11a mode

CH Low				
Environment Temperature (°C)	Voltage (V)	Measured Frequency (MHz)	Limit Range	Test Result
50	120	5180.054	5150-5250	PASS
40		5180.063	5150~5250	
30		5180.061	5150~5250	
20		5180.059	5150~5250	
10		5180.054	5150~5250	
0		5180.055	5150~5250	
-10		5180.058	5150~5250	
-20		5180.053	5150~5250	
20	108	5180.052	5150~5250	PASS
	120	5180.054	5150~5250	
	132	5180.056	5150~5250	

CH Middle				
Environment Temperature (°C)	Voltage (V)	Measured Frequency (MHz)	Limit Range	Test Result
50	120	5200.061	5150~5250	PASS
40		5200.062	5150~5250	
30		5200.058	5150~5250	
20		5200.057	5150~5250	
10		5200.055	5150~5250	
0		5200.055	5150~5250	
-10		5200.059	5150~5250	
-20		5200.057	5150~5250	
20	108	5200.061	5150~5250	PASS
	120	5200.057	5150~5250	
	132	5200.058	5150~5250	

CH High				
Environment Temperature (°C)	**Voltage (V)**	**Measured Frequency (MHz)**	**Limit Range**	**Test Result**
50	120	5240.053	5150~5250	PASS
40		5240.049	5150~5250	
30		5240.049	5150~5250	
20		5240.052	5150~5250	
10		5240.054	5150~5250	
0		5240.055	5150~5250	
-10		5240.057	5150~5250	
-20		5240.056	5150~5250	
20	108	5240.056	5150~5250	PASS
	120	5240.058	5150~5250	
	132	5540.057	5150~5250	

IEEE 802.11n HT20 mode

CH Low				
Environment Temperature (°C)	Voltage (V)	Measured Frequency (MHz)	Limit Range	Test Result
50	120	5180.061	5150~5250	PASS
40		5180.064	5150~5250	
30		5180.054	5150~5250	
20		5180.053	5150~5250	
10		5180.055	5150~5250	
0		5180.057	5150~5250	
-10		5180.058	5150~5250	
-20		5180.059	5150~5250	
20	108	5180.055	5150~5250	PASS
	120	5180.058	5150~5250	
	132	5180.061	5150~5250	

CH Middle				
Environment Temperature (°C)	Voltage (V)	Measured Frequency (MHz)	Limit Range	Test Result
50	120	5200.063	5150~5250	PASS
40		5200.057	5150~5250	
30		5200.058	5150~5250	
20		5200.059	5150~5250	
10		5200.060	5150~5250	
0		5200.061	5150~5250	
-10		5200.053	5150~5250	
-20		5200.057	5150~5250	
20	108	5200.058	5150~5250	PASS
	120	5200.054	5150~5250	
	132	5200.056	5150~5250	

CH High				
Environment Temperature (°C)	**Voltage (V)**	**Measured Frequency (MHz)**	**Limit Range**	**Test Result**
50	120	5240.059	5150~5250	PASS
40		5240.061	5150~5250	
30		5240.053	5150~5250	
20		5240.062	5150~5250	
10		5240.064	5150~5250	
0		5240.059	5150~5250	
-10		5240.055	5150~5250	
-20		5240.057	5150~5250	
20	108	5240.061	5150~5250	PASS
	120	5240.058	5150~5250	
	132	5240.054	5150~5250	

IEEE 802.11n HT40 mode

CH Low				
Environment Temperature (°C)	Voltage (V)	Measured Frequency (MHz)	Limit Range	Test Result
50	120	5190.058	5150~5250	PASS
40		5190.052	5150~5250	
30		5190.052	5150~5250	
20		5190.054	5150~5250	
10		5190.060	5150~5250	
0		5190.059	5150~5250	
-10		5190.058	5150~5250	
-20		5190.059	5150~5250	
20	108	5190.062	5150~5250	PASS
	120	5190.060	5150~5250	
	132	5190.061	5150~5250	

CH High				
Environment Temperature (°C)	Voltage (V)	Measured Frequency (MHz)	Limit Range	Test Result
50	120	5230.062	5150~5250	PASS
40		5230.063	5150~5250	
30		5230.055	5150~5250	
20		5230.054	5150~5250	
10		5230.054	5150~5250	
0		5230.057	5150~5250	
-10		5230.056	5150~5250	
-20		5230.058	5150~5250	
20	108	5230.053	5150~5250	PASS
	120	5230.059	5150~5250	
	132	5230.057	5150~5250	

IEEE 802.11ac VHT80 mode

CH Middle				
Environment Temperature (°C)	**Voltage (V)**	**Measured Frequency (MHz)**	**Limit Range**	**Test Result**
50	120	5210.054	5150~5250	PASS
40		5210.057	5150~5250	
30		5210.061	5150~5250	
20		5210.058	5150~5250	
10		5210.059	5150~5250	
0		5210.062	5150~5250	
-10		5210.060	5150~5250	
-20		5210.056	5150~5250	
20	108	5210.056	5150~5250	PASS
	120	5210.057	5150~5250	
	132	5210.057	5150~5250	

APPENDIX I MAXIMUM PERMISSIBLE EXPOSURE

According to FCC 1.1310 : The criteria listed in the following table shall be used to evaluate theenvironment impact of human exposure to radio frequency (RF) radiation as specified in 1.1307(b)LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm^2)	Average Time
(A) Limits for Occupational / Control Exposures				
300-1,500	--	--	F/300	6
1,500-100,000	--	--	5	6
(B) Limits for General Population / Uncontrol Exposures				
300-1,500	--	--	F/1500	6
1,500-100,000	--	--	1	30

CALCULATIONS

Given $E = \frac{\sqrt{30 \times P \times G}}{d}$ & $S = \frac{E^2}{3770}$

Where E = Field strength in Volts / meter
P = Power in Watts
G = Numeric antenna gain
d = Distance in meters
S = Power density in milliwatts / square centimeter

Combining equations and re-arranging the terms to express the distance as a function of the remaining variables yields:

$$S = \frac{30 \times P \times G}{3770 d^2}$$

Changing to units of mW and cm, using:

P (mW) = P (W) / 1000 and
d (cm) = d(m) / 100

Yields

$$S = \frac{30 \times (P/1000) \times G}{3770 \times (d/100)^2} = 0.0796 \times \frac{P \times G}{d^2}$$

Where d = Distance in cm
P = Power in mW
G = Numeric antenna gain
S = Power density in mW / cm2

LIMIT

Power Density Limit, S=1.0mW/cm^2

TEST RESULTS

※Since the EUT is classed portable device, and the maximum peak power is 14.50 dBm (>13.6d Bm), the MPE evaluation is not required and has SAR consideration applied.