FCC ID TEST REPORT

Prepared for.....:	Shenzhen Bopengfa Elec&Technology Co., Ltd.
Address.....:	Bldg 56A, 3/F, Baotian RD3, Xixiang Town, Baoan District, Shenzhen, China
Equipment Under Test(E.U.T.):	WIFI AND BLUETOOTH Module
Model.....:	RL-SM02BD-8723BS-V1.3
FCC ID.....:	2AAH78723BSV13
Applicable Standards.....:	FCC CFR Title 47 Part 15 Subpart C Section 15.247:2013 KDB 558074 D01 DTS Meas Guidance v03r02
Test Date.....:	20 Semptember 2014 to 27 October 2014
Issued Date.....:	28 October 2014
Report Number.....:	POCE14082837WRF
Test Engineer.....:	Bill Jing
Reviewed By.....:	Machael Mo
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1.0 General Information

1.1 Client Details

Applicant:	Shenzhen Bopengfa Elec&Technology Co., Ltd.
Address:	Bldg 56A, 3/F, Baotian RD3, Xixiang Town, Baoan District, Shenzhen, China.
Manufacturer:	Shenzhen Bopengfa Elec&Technology Co., Ltd.
Address:	Bldg 56A, 3/F, Baotian RD3, Xixiang Town, Baoan District, Shenzhen, China.

1.2 Test Lab Details

Name :	Shenzhen POCE Technology Co.,Ltd.
Address:	Room 502, Bldg. 1, Xinghua Garden, Baoan Road Xixiang, Baoan District, Shenzhen, China
Telephone:	86-755-29113252
Fax:	86-755-29113135

Site Listed with Federal Communication Commission
Registration Number: 222278
For 3m chamber

1.3 Description of E.U.T.

Product:	WIFI AND BLUETOOTH Module
Model No.:	RL-SM02BD-8723BS-V1.3
Additional Model No.	RL-SM02BD-8723BS-V1.0, RL-SM02BD-8723BS-V1.1, RL-SM02BD-8723BS-V1.2
Brand Name:	N.A.
Operation Frequency:	IEEE 802.11b: 2412-2462 MHz IEEE 802.11g: 2412-2462 MHz IEEE 802.11n: 2412-2462 MHz(HT 20), 2422-2452 MHz(HT 40)
Channel number:	IEEE 802.11b/g: 11, IEEE 802.11n: 11(HT 20), 7(HT 40)
Channel spacing:	5 MHz
Modulation Type:	IEEE 802.11b: DSSS IEEE 802.11g: OFDM IEEE 802.11n: OFDM
Antenna Designation:	An integral antenna and the maximum gain is 0 dBi
Power supply:	DC 3.3V

Tables of carriers frequency

Frequency Band	Channel number	Frequency	Channel number	Frequency
2400-2483.5 MHz	1	2412 MHz	7	2442 MHz
	2	2417 MHz	8	2447 MHz
	3	2422 MHz	9	2452 MHz
	4	2427 MHz	10	2457 MHz
	5	2432 MHz	11	2462 MHz
	6	2437 MHz		

Note: For 20 MHz bandwidth system use Channel 1 to Channel 11;
For 40 MHz bandwidth system use Channel 1 to Channel 9.

Test Information

The test software was used to control E.U.T. work in Continuous Tx mode (>98% duty cycle), and select test channel, wireless mode and data rate.

Test mode, channel and data rate information			
Mode	Channel	Frequency (MHz)	Date Rate (Mbps)
IEEE 802.11b	Low :CH1	2412	1
	Middle: CH6	2437	1
	High: CH11	2462	1
IEEE 802.11g	Low :CH1	2412	6
	Middle: CH6	2437	6
	High: CH11	2462	6
IEEE 802.11n (HT 20)	Low :CH1	2412	MSC0
	Middle: CH6	2437	MSC0
	High: CH11	2462	MSC0
IEEE 802.11n (HT 40)	Low :CH3	2422	MSC0
	Middle: CH6	2437	MSC0
	High: CH9	2452	MSC0
Remark: According to exploratory test, E.U.T. will have maximum output power in those data rate, so those data rate were used for all tests.			

1.4 AE used during the test

Equipment type	Model	Manufacturer	FCC Approval
N.A.			
N.A.			
N.A.			

2.0 Test Summary

Section in CFR 47	Test Item	Result
15.203,15.247(c)	Antenna Requirement	Complies
15.207(a)	AC Power Line Conducted Emission	N/A
15.247(b)(3)	Maximum Peak Output Power	Complies
15.247 (a)(2)	6 dB bandwidth	Complies
15.247(e)	Maximum Power Density	Complies
15.247 (d), 15.205 (a), 15.209 (a)	Band age Measurement	Complies
15.209	Radiated Emission	Complies

3.0 E.U.T. Modification

No modification by *Shenzhen POCE Technology Co., Ltd.*

4.0 Measurement Uncertainty

（95% confidence levels, k=2)

No.	Item	MU
1.	Radio Frequency	$\pm 1\times 10^{-9}$
2.	Temperature	±0.1℃
3.	Humidity	±1.0%
4.	RF power, conducted	±0.34dB
5.	Spurious emissions, conducted	±2.72dB
6.	All emissions, radiated	±3.84dB

5.0 Antenna Requirement

5.1 Standard Applicable

For intentional device, according to FCC 47 CFR Section 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device.

And according to FCC 47 CFR Section 15.247 (b), if transmitter antennas of directional gain greater than 6 dBi are used, the power shall be reduced by the mount in dB that the directional gain of the antenna exceeds 6 dBi.

5.2 Antenna Specification

The E.U.T. has an internal antenna. Therefore the E.U.T. is considered sufficient to comply with the provision.

6.0 Power Line Conducted Emission Test

6.1 Test Equipment

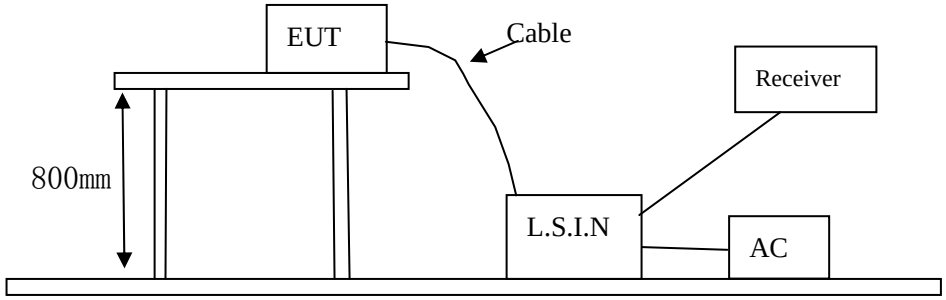
Instrument Type	Model	Serial No.	Manufacturer	Date of Cal.	Due Date
EMI Test Receiver	ESCS30	100139	R&S	Nov. 20, 2013	Nov. 19, 2014
LISN	LS16C	16010222119	AFJ	Nov. 20, 2013	Nov. 19, 2014

6.2 Test Method and test Procedure

The E.U.T. was tested according to ANSI C63.10-2009.The Frequency spectrum From 0.15MHz to 30MHz was investigated.

Test Voltage: 120V~, 60Hz

6.3 Block diagram of Test setup



6.4 E.U.T. Operating Condition

Operating condition is according to ANSI C63.10 -2009

1) Setup the E.U.T. and simulators as shown on the following

2) Enable AF signal and confirm E.U.T. active to normal condition

6.5 Power line conducted Emission Limit according to Paragraph 15.207

Frequency(MHz)	Class A Limits (dB μ V)		Class B Limits (dB μ V)	
	Quasi-peak Level	Average Level	Quasi-peak Level	Average Level
0.15 ～ 0.50	79.0	66.0	66.0～56.0*	56.0～46.0*
0.50 ～ 5.00	73.0	60.0	56.0	46.0
5.00 ～ 30.00	73.0	60.0	60.0	50.0

Notes: 1) *Decreasing linearly with logarithm of frequency.

2) The tighter limit shall apply at the transition frequencies

6.6 Test specification

Environmental conditions: Temperature: 25° C Humidity: 50% Atmospheric pressure: 103kPa

6.7 Test Result

N/A

Conducted Emission on Line Terminal of the power line (150kHz to 30MHz)

E.U.T. Description:	
Operation Mode:	
Tested By:	
Test Date:	

Start Frequency	Stop Frequency	Step	IF BW	Detector	Final M-Time
0.15MHz	30MHz	4.5KHz	10KHz	QP+AV	1s

Frequency (MHz)	Reading(dBμV)				Limit (dBμV)	
	Line		Neutral			
	Quasi-peak	Average	Quasi-peak	Average	Quasi-peak	Average
			--	--		
			--	--		
			--	--		
			--	--		
			--	--		
			--	--		

Conducted Emission on Neutral Terminal of the power line (150kHz to 30MHz)

E.U.T. Description:	
Operation Mode:	
Tested By:	
Test Date:	

Start Frequency	Stop Frequency	Step	IF BW	Detector	Final M-Time
0.15MHz	30MHz	4.5KHz	10KHz	QP+AV	1s

Frequency (MHz)	Reading(dB μ V)				Limit (dB μ V)	
	Live		Neutral			
	Quasi-peak	Average	Quasi-peak	Average	Quasi-peak	Average
	--	--				
	--	--				
	--	--				
	--	--				
	--	--				
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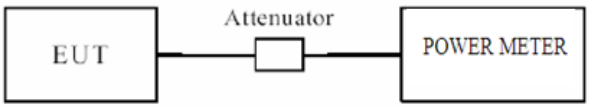
7.0 Maximum Peak Output Power

7.1 Test Equipment

Instrument Type	Manufacturer	Model	Serial No.	Date of Cal.	Due Date
EPM-P Series Power Meter	Agilent	E4416A	MY45101555	Aug. 20, 2014	Aug. 19, 2015
Peak and Avg Power Sensor	Agilent	E9327A	MY44421198	Aug. 20, 2014	Aug. 19, 2015

7.2 Test configuration



7.3 Limits of Maximum Peak Output Power

The Maximum Peak Output Power Measurement is 30dBm.

7.4 Test Procedure

According to KDB 558074 D01 DTS Meas Guidance v03r02，the transmitter output was connected to the Power Meter. The Power Meter has a video bandwidth that is greater than or equal to the DTS bandwidth and utilizes a fast-responding diode detector.

7.5 Test Result

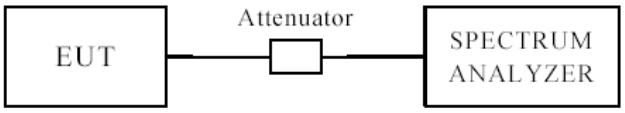
WiFi mode	Test channel	Peak output power (dBm)	Limit (dBm)	Result
IEEE 802.11b	Lowest	15.75	30	Pass
	Middle	15.51	30	Pass
	Highest	16.11	30	Pass
IEEE 802.11g	Lowest	16.06	30	Pass
	Middle	15.71	30	Pass
	Highest	15.85	30	Pass
IEEE 802.11n (HT20)	Lowest	15.41	30	Pass
	Middle	15.15	30	Pass
	Highest	15.21	30	Pass
IEEE 802.11n (HT40)	Lowest	13.91	30	Pass
	Middle	13.44	30	Pass
	Highest	13.53	30	Pass

8.0 6dB Bandwidth Measurement

8.1 Test Equipment

Instrument Type	Model	Serial No.	Manufacturer	Date of Cal.	Due Date
Spectrum Analyzer	FSEM	848597/001	ROHDE&SCHWARZ	Nov. 20, 2013	Nov. 19, 2014

8.2 Test configuration



8.3 Limits of 6dB Bandwidth Measurement

The minimum of 6 dB Bandwidth is >500 kHz

8.4 Test Procedure

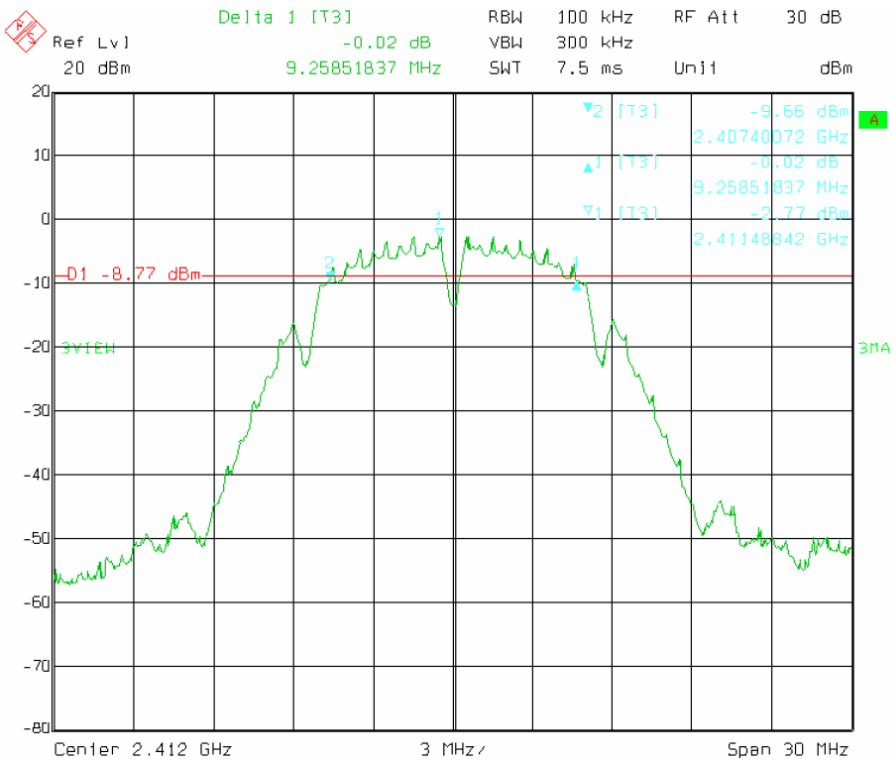
According to KDB 558074 D01 DTS Meas Guidance v03r02，the transmitter output was connected to the spectrum analyzer through an attenuator. The spectrum analyzer is setting as follows: RBW=100 kHz,
VBW=300 kHz, Detector=Peak, Trace mode=max hold, Sweep=auto couple. The 6dB bandwidth is defined as the two outermost amplitude points (upper and lower) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

8.5 Test Result

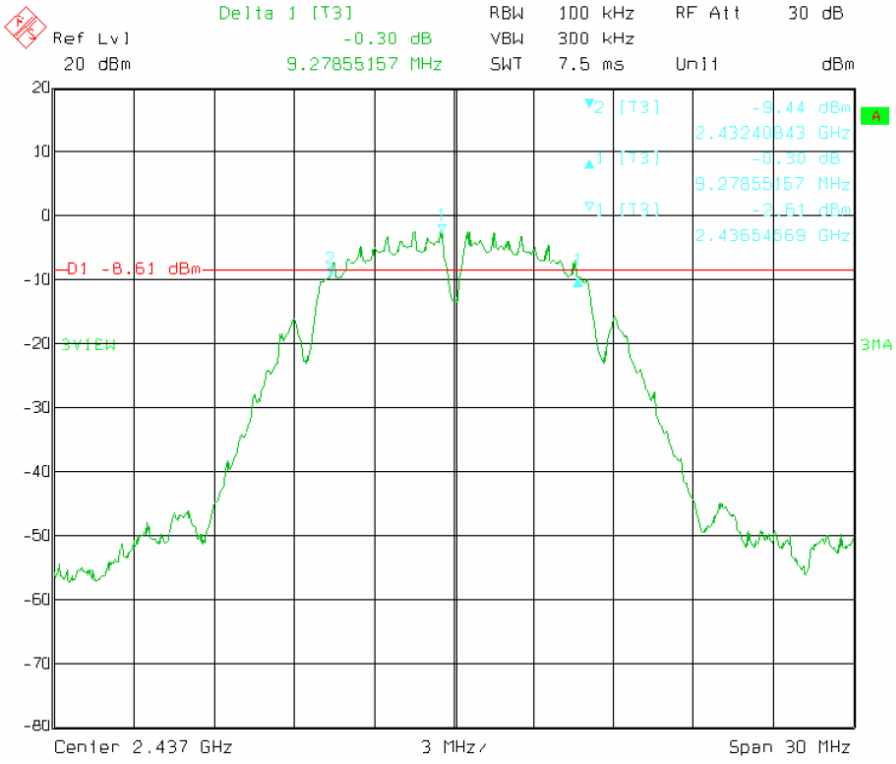
WiFi mode	Test channel	6 dB occupied bandwidth (MHz)	Limit (kHz)	Result
IEEE 802.11b	Lowest	9.26	500	Pass
	Middle	9.28	500	Pass
	Highest	9.28	500	Pass
IEEE 802.11g	Lowest	16.72	500	Pass
	Middle	16.72	500	Pass
	Highest	16.72	500	Pass
IEEE 802.11n (HT20)	Lowest	17.84	500	Pass
	Middle	17.90	500	Pass
	Highest	17.90	500	Pass
IEEE 802.11n (HT40)	Lowest	36.50	500	Pass
	Middle	36.60	500	Pass
	Highest	36.40	500	Pass

IEEE 802.11b mode

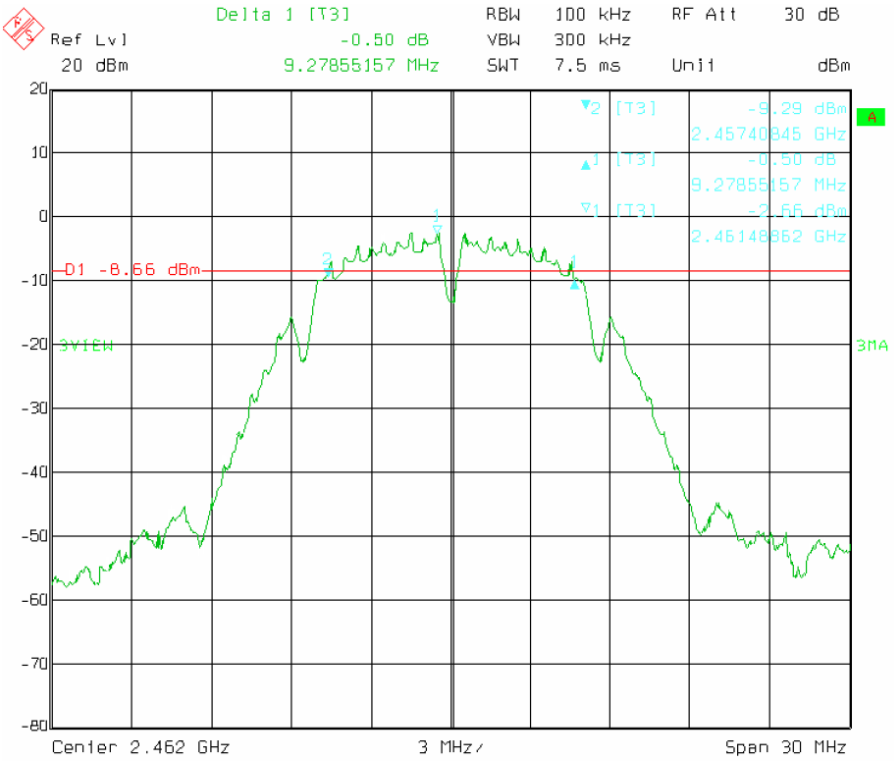
Low channel



Middle channel

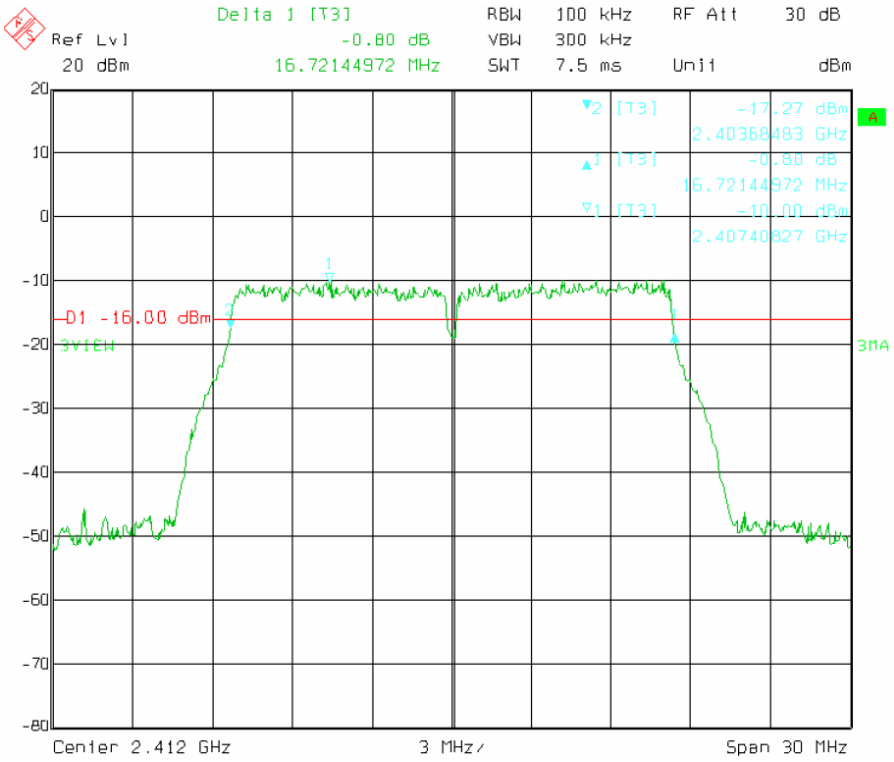


High channel

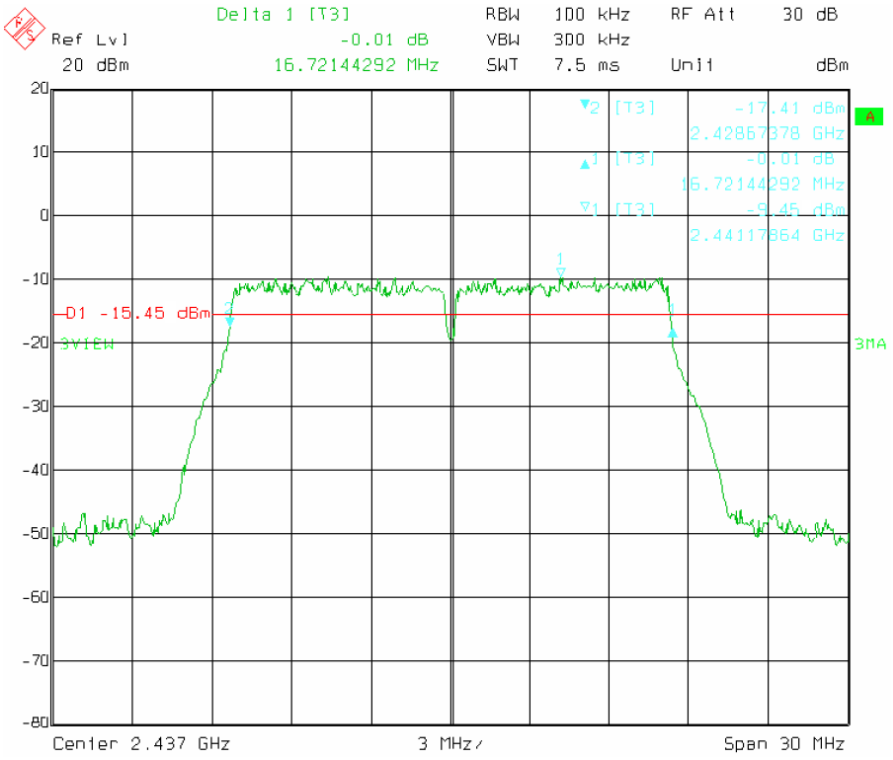


IEEE 802.11g mode

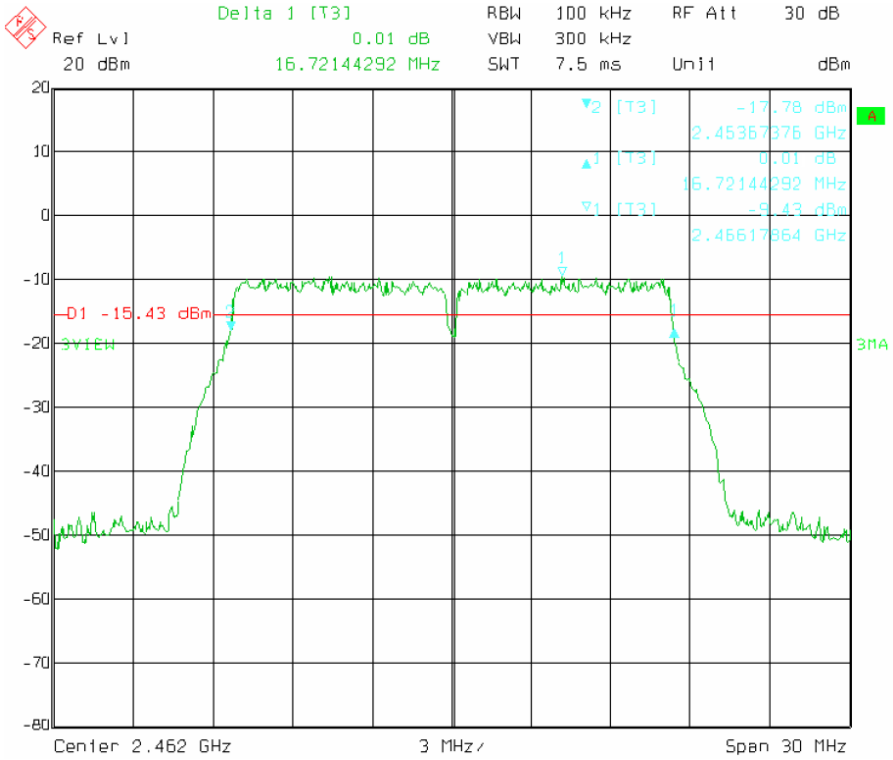
Low channel



Middle channel

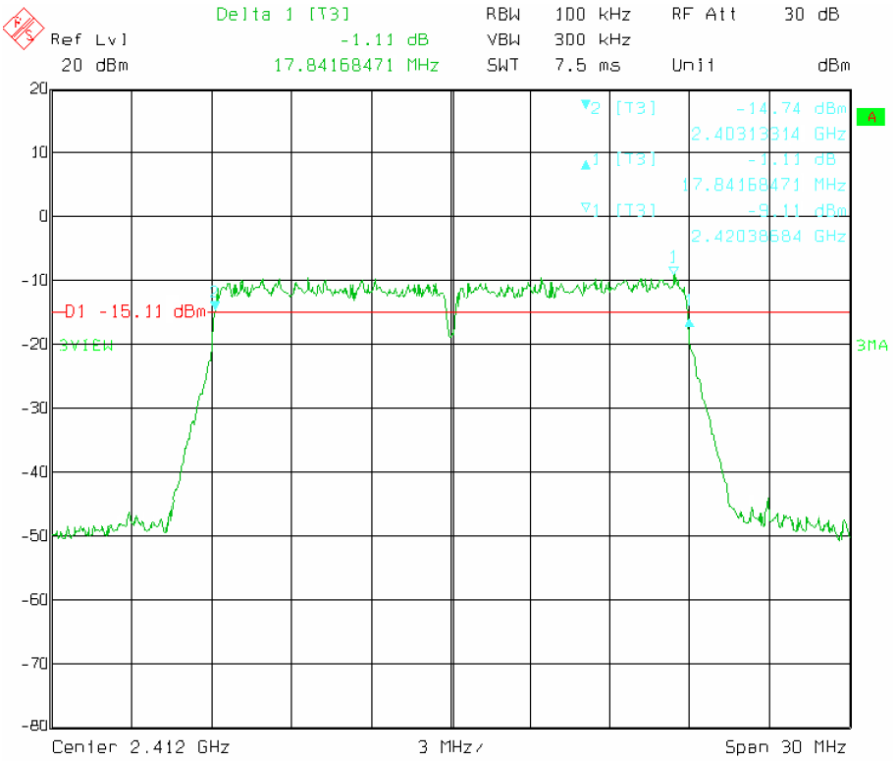


High channel

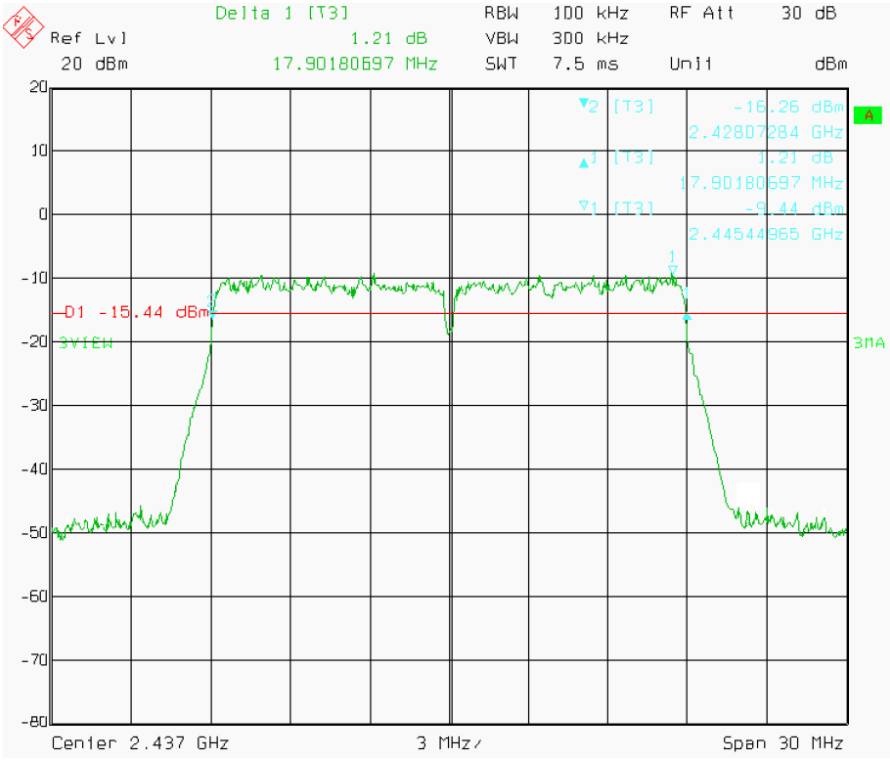


IEEE 802.11n (HT20) mode

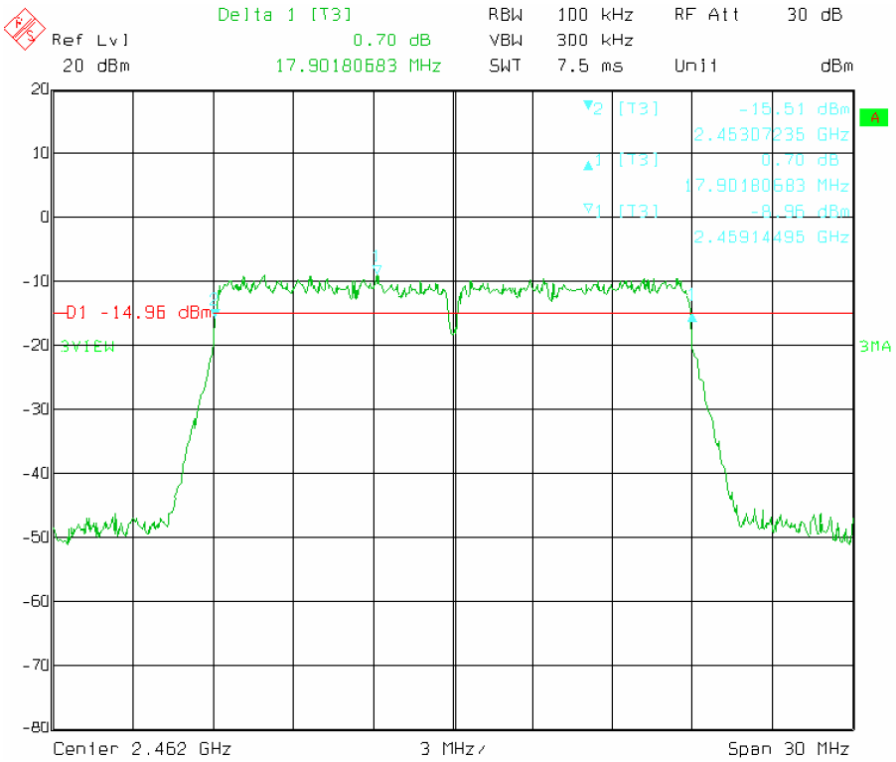
Low channel



Middle channel

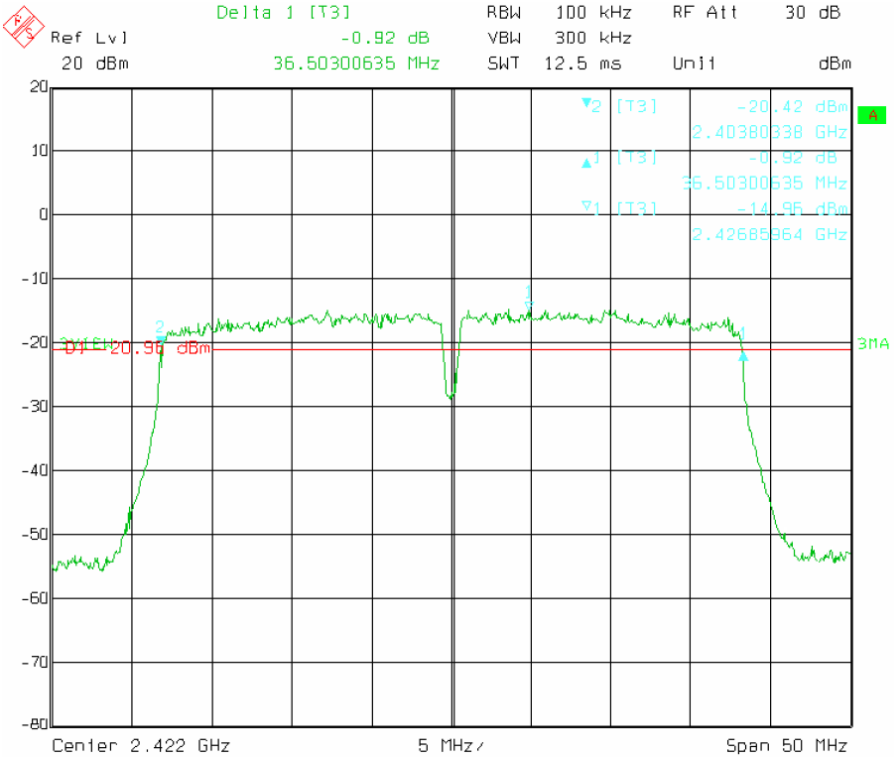


High channel

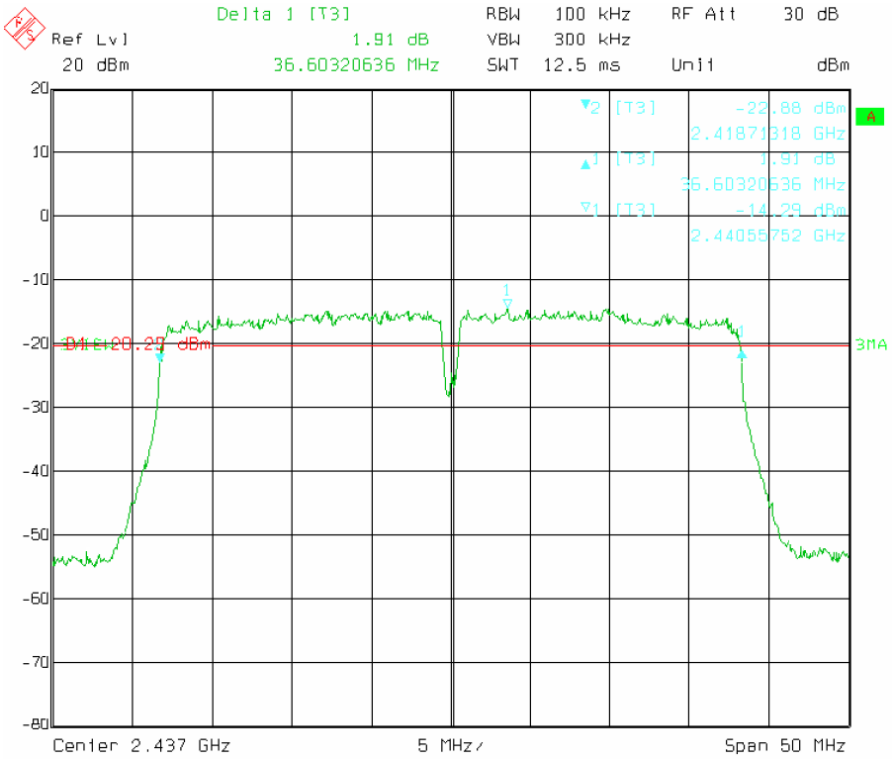


IEEE 802.11n (HT40) mode

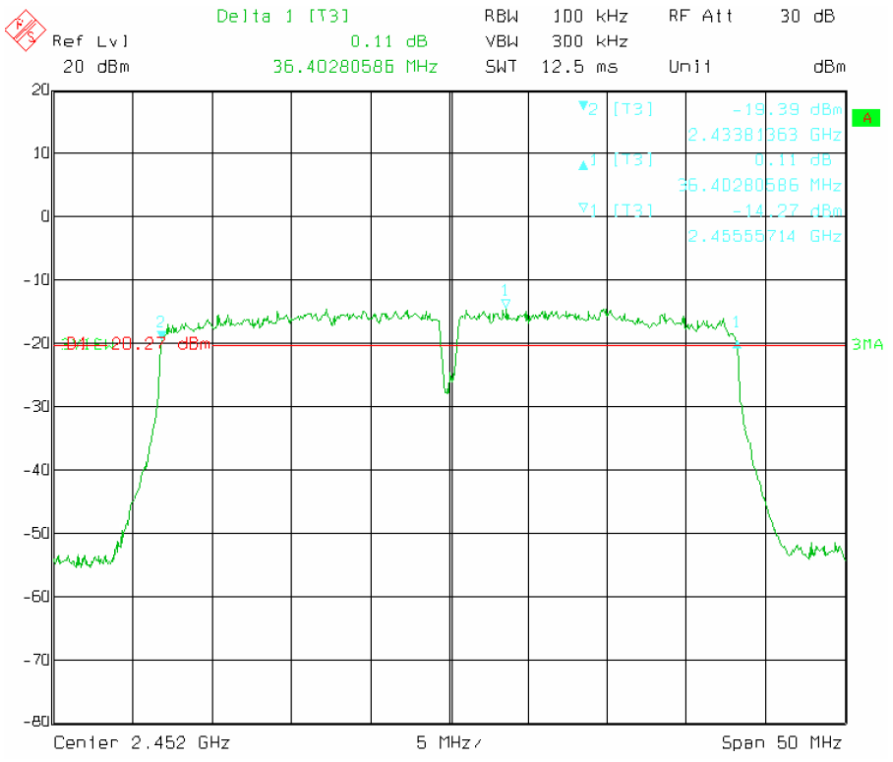
Low channel



Middle channel



High channel

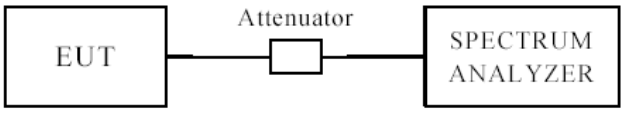


9.0 Power Spectral Density Measurement

9.1 Test Equipment

Instrument Type	Model	Serial No.	Manufacturer	Date of Cal.	Due Date
Spectrum Analyzer	FSEM	848597/001	ROHDE&SCHWARZ	Nov. 20, 2013	Nov. 19, 2014

9.2 Test configuration



9.3 Limits of Power Spectral Density Measurement

The Maximum Power Spectral Density is 8 dBm in any 3 kHz.

9.4 Test Procedure

According to KDB 558074 D01 DTS Meas Guidance v03r02，the transmitter output was connected to the spectrum analyzer through an attenuator.

The spectrum analyzer is setting as follows:

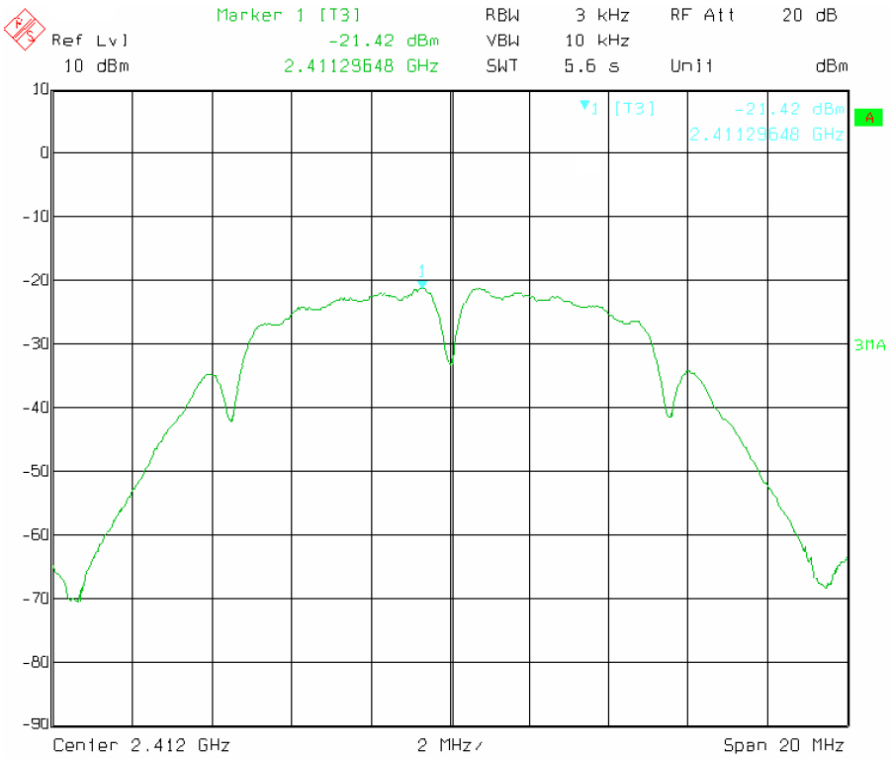
1) Set analyzer centre frequency to DTS channel centre frequency.
2) Set the span to 1.5 times the DTS channel bandwidth.
3) Set the RBW>=3 kHz.
4) Set the VBW>=3*RBW.
5) Detector=peak.
6) Sweep time=auto couple.
7) Trace mode=max hold.
8) Allow trace to fully stabilize.
9) Use the peak marker function to determine the maximum amplitude level.
10) If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.

9.5 Test Result

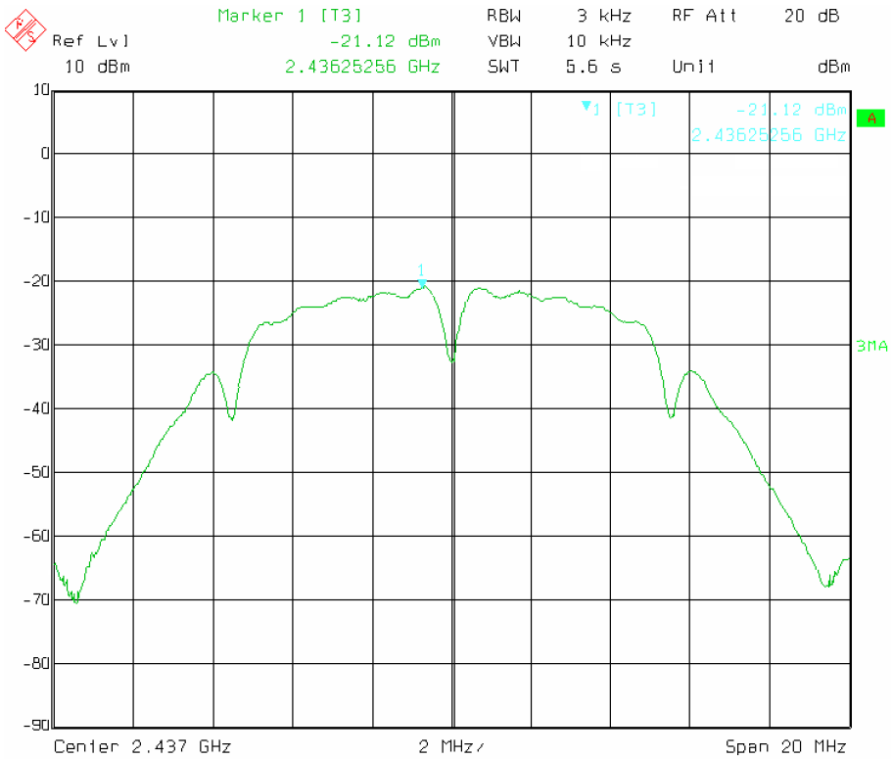
WiFi mode	Test channel	Peak Power Spectral Density (dBm)	Limit (dBm)	Result
IEEE 802.11b	Lowest	-21.42	8	Pass
	Middle	-21.12	8	Pass
	Highest	-21.08	8	Pass
IEEE 802.11g	Lowest	-24.82	8	Pass
	Middle	-24.82	8	Pass
	Highest	-24.12	8	Pass
IEEE 802.11n (HT20)	Lowest	-23.63	8	Pass
	Middle	-22.42	8	Pass
	Highest	-22.92	8	Pass
IEEE 802.11n (HT40)	Lowest	-27.97	8	Pass
	Middle	-28.18	8	Pass
	Highest	-26.92	8	Pass

IEEE 802.11b mode

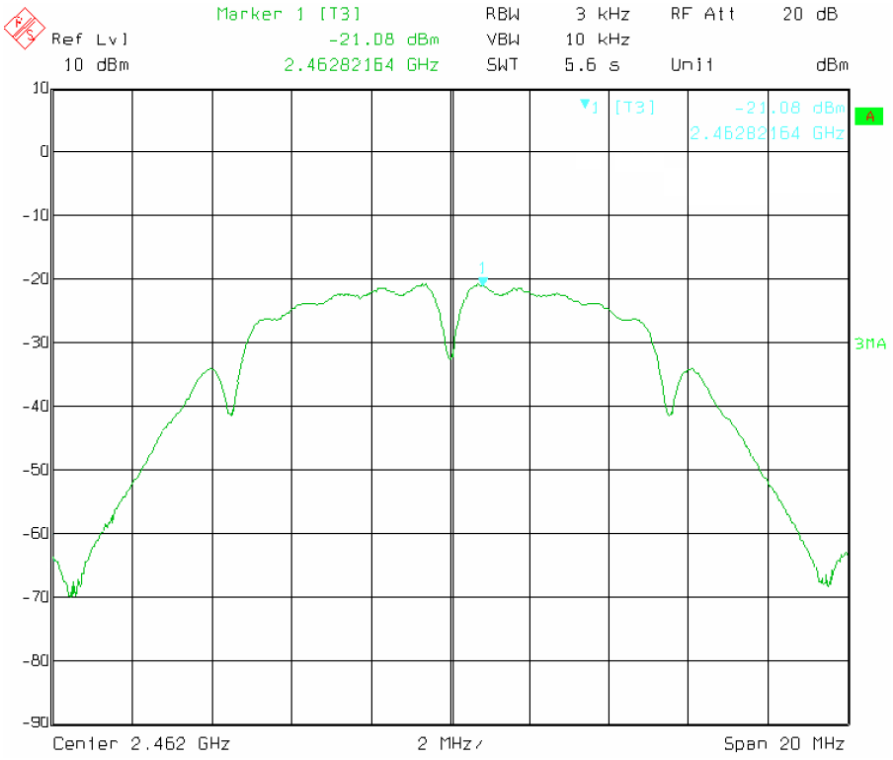
Low channel



Middle channel

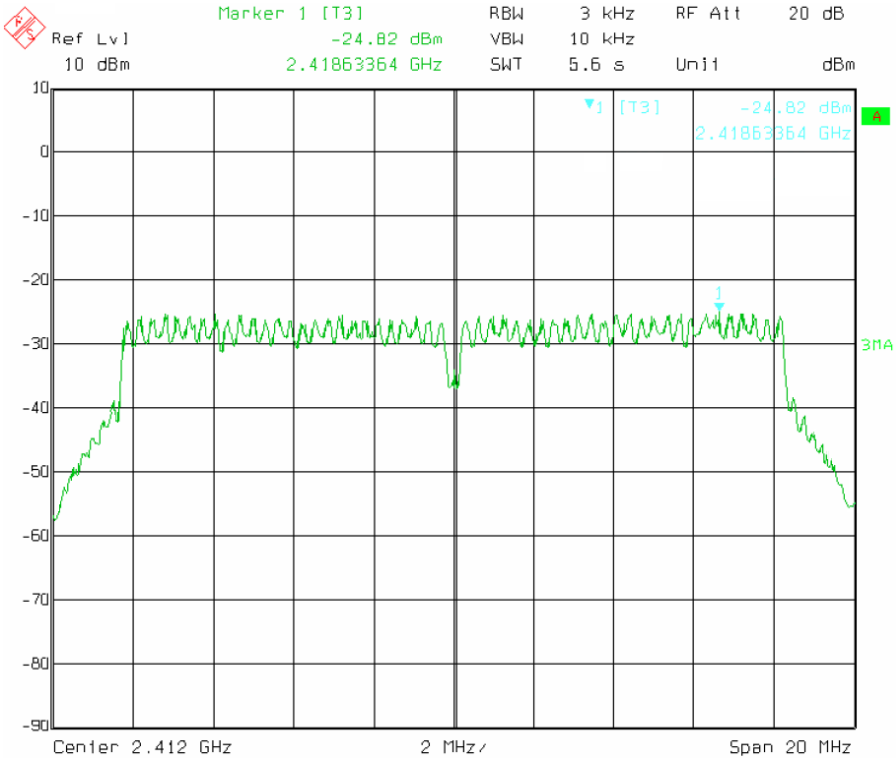


High channel

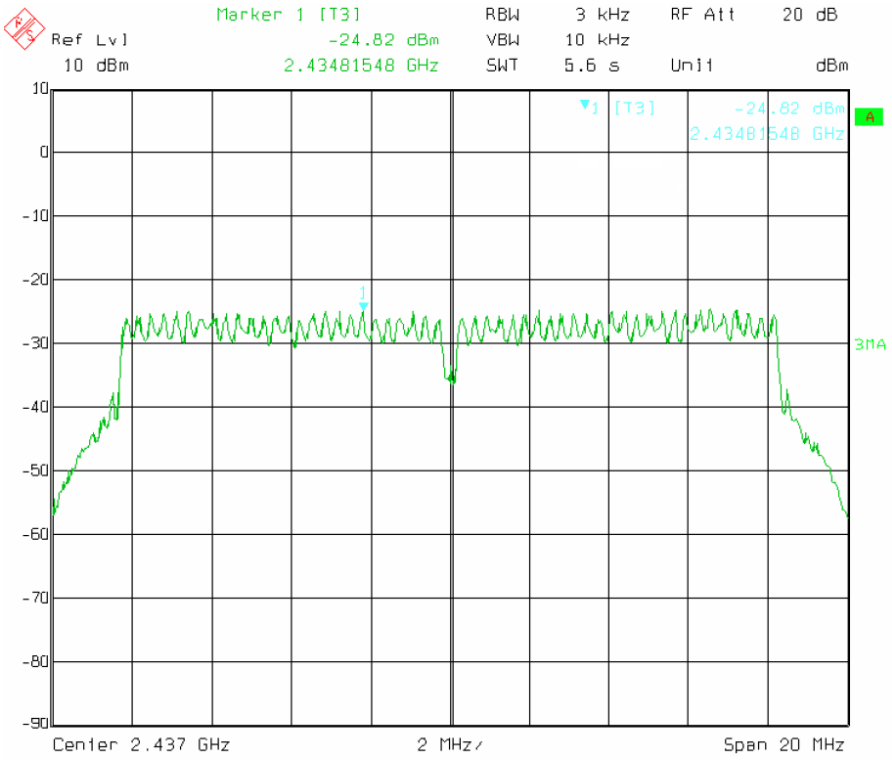


IEEE 802.11g mode

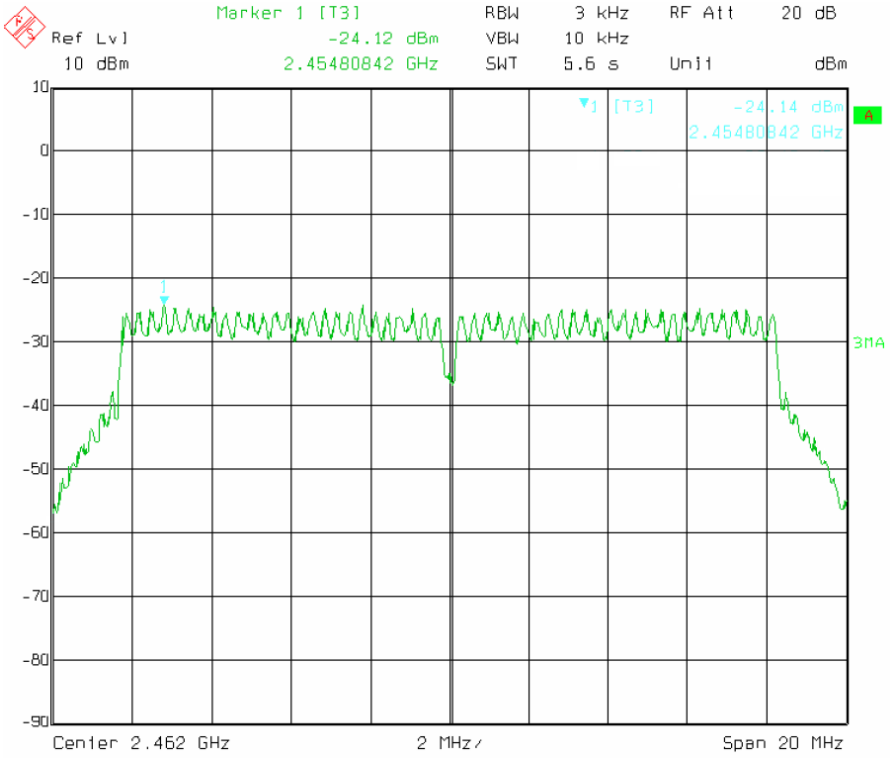
Low channel



Middle channel

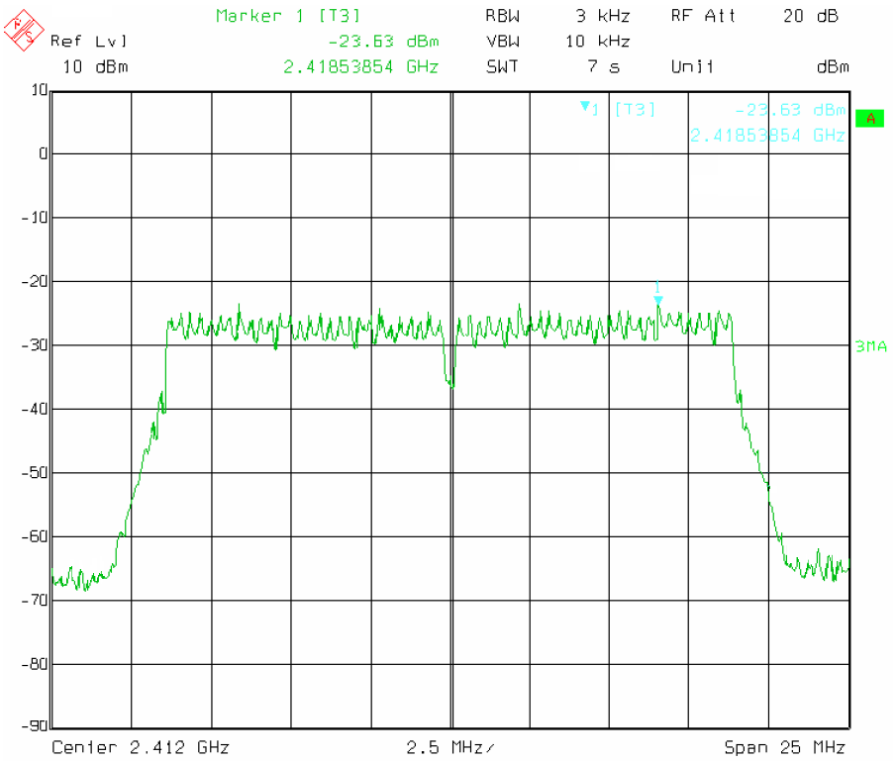


High channel

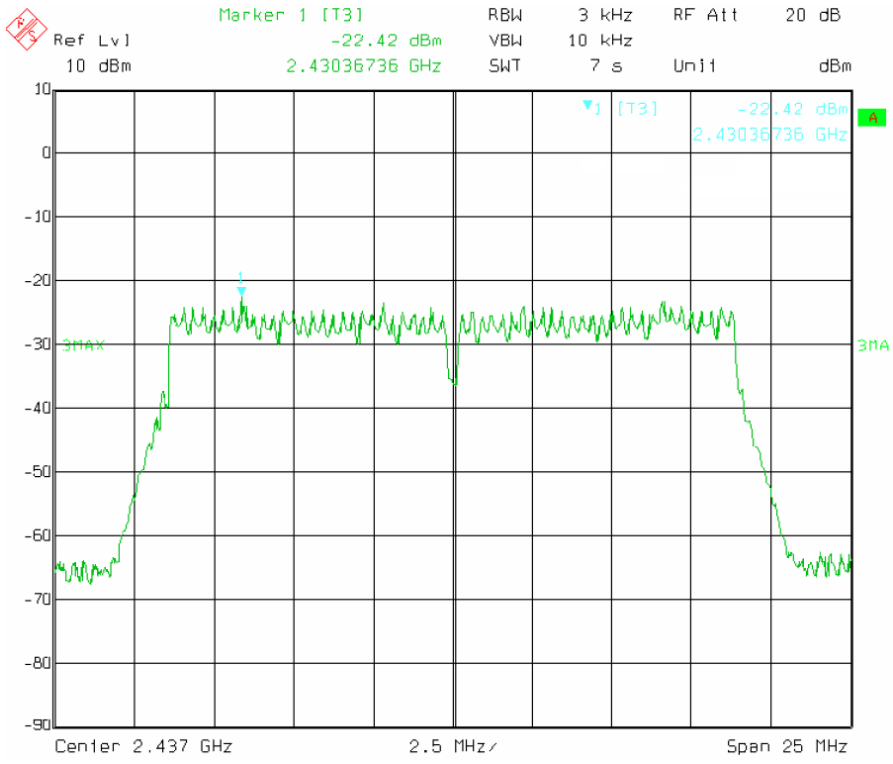


IEEE 802.11n (HT20) mode

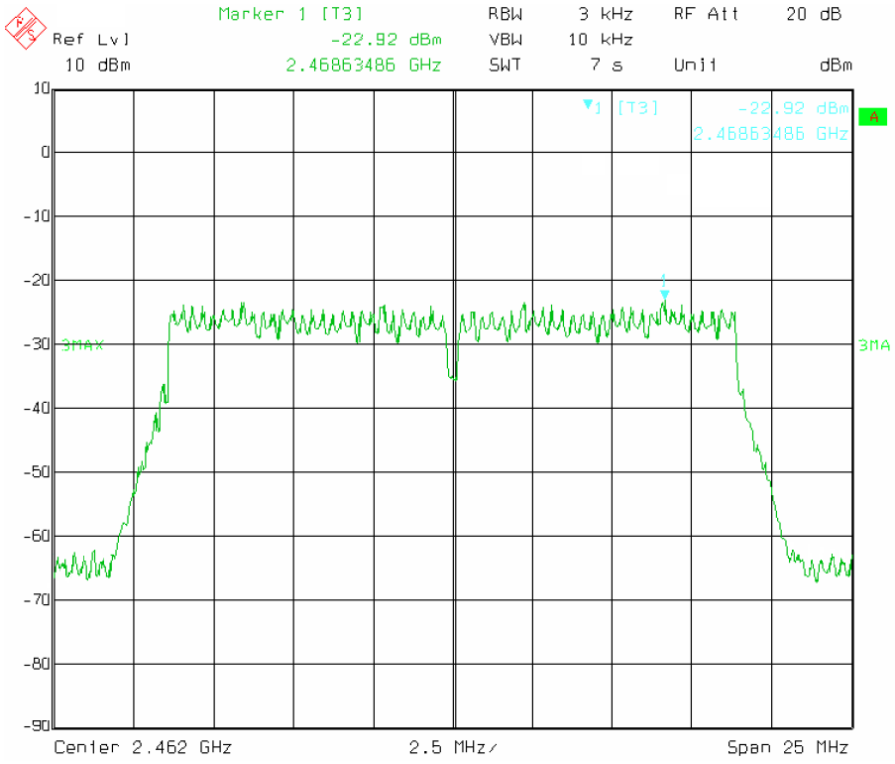
Low channel



Middle channel

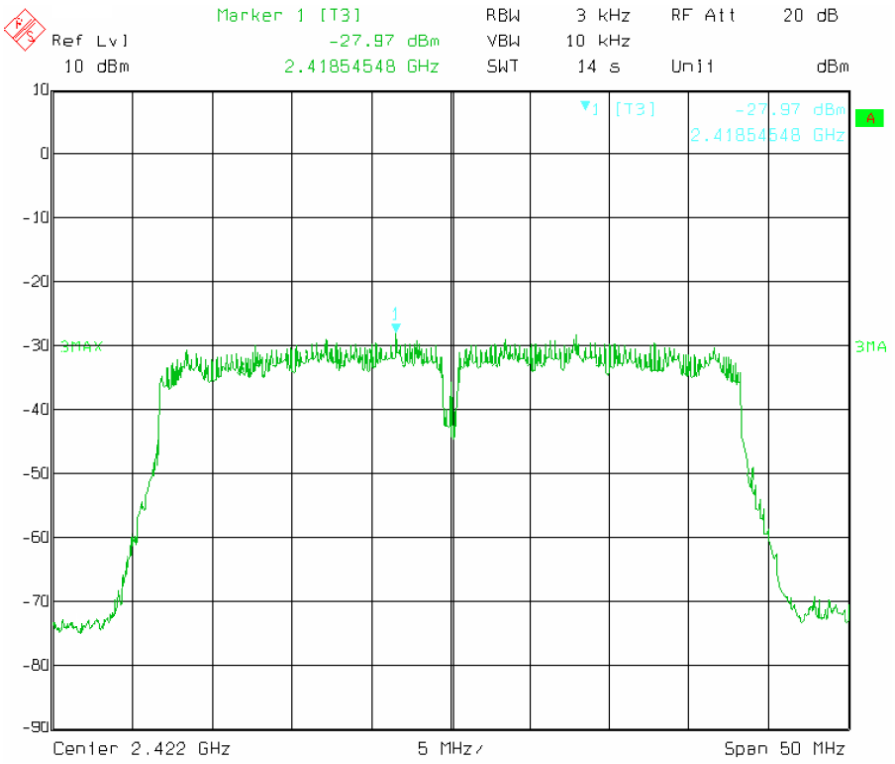


High channel

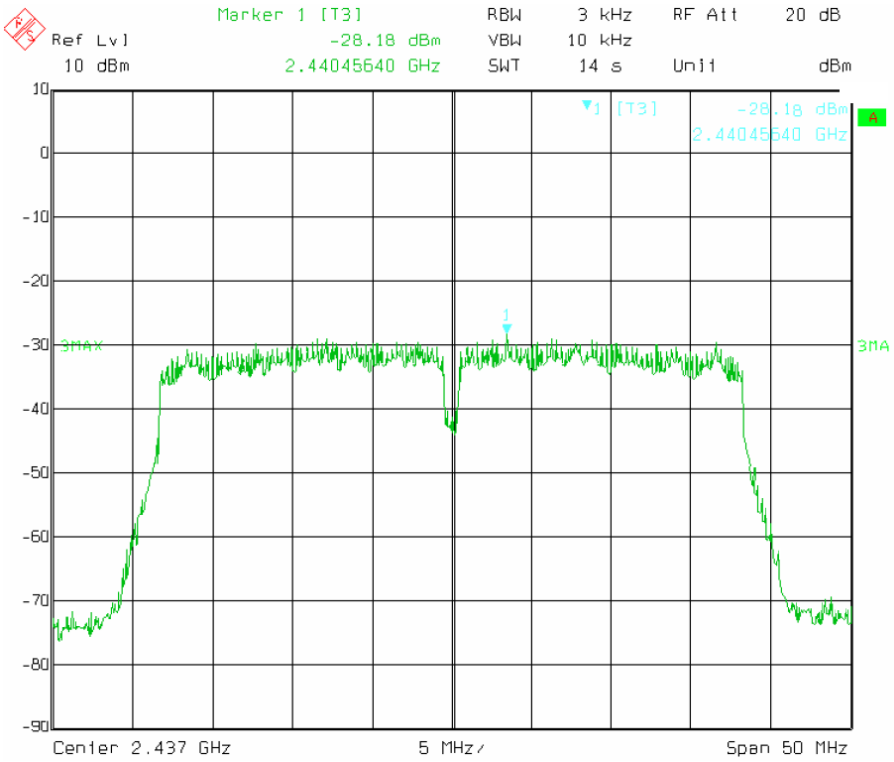


IEEE 802.11n (HT40) mode

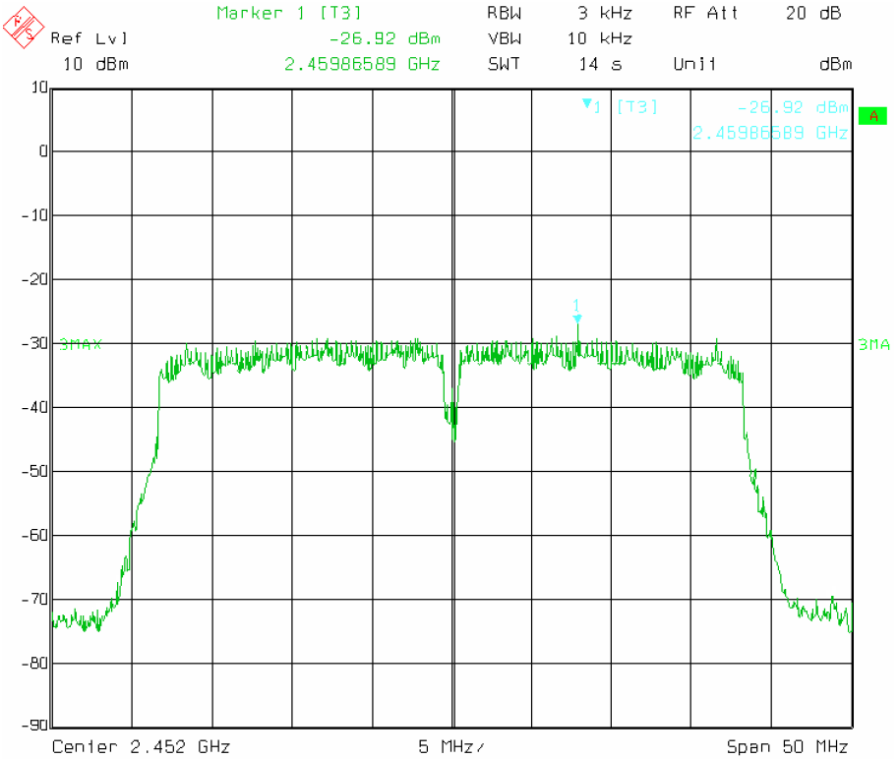
Low channel



Middle channel



High channel



10.0 Band age Measurement

10.1 Test Equipment

Instrument Type	Model	Serial No.	Manufacturer	Date of Cal.	Due Date
Spectrum Analyzer	FSEM	848597/001	ROHDE&SCHWARZ	Nov. 20, 2013	Nov. 19, 2014
Pre-amplifier	8449B	3008A01738	Agilent	Nov. 21, 2013	Nov. 20, 2014
Horn Antenna	3117	--	ETS LINDGREN	Nov. 21, 2013	Nov. 20, 2014

10.2 Limit

Radiated emissions which fall in the restricted bands, as defined in section 15.205(a), must also comply with The radiated emission limits specified in 15.209(a)

10.3 Test specification

Environmental conditions: Temperature 22° C Humidity: 50% Atmospheric pressure: 103kPa

10.4 Test Procedure

The E.U.T. was setup according to ANSI C63.10:2009 and tested according to ANSI 63.10:2009 for compliance to FCC 47 CFR 15.247 requirements. The E.U.T. is placed on a turn table which is 0.8 m above ground. The turn table is rotated 360 degrees to determine to the position of the maximum emission level. The E.U.T. was positioned such That the distance from antenna to the E.U.T. was 3 metres. The antenna is scanned from 1 metre to 4 metres 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 C63.10:2009 on radiated measurement.

Spectrum analyzer parameters setting as shown below:

1): Peak: RBW=1MHz, VBW=1MHz, Sweep=Auto

2): Average: RBW=1MHz, VBW=10Hz, Sweep=Auto

10.5 Test Result

IEEE 802.11b mode, Low channel							
Frequency (MHz)	Peak Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Peak Final Level (dBuV/m)	Average Limits (dBuV/m)	Antenna Polarity
2310	46.82	27.34	2.32	32.14	44.34	54.00	Horizontal
2387.23	48.61	28.29	2.45	32.33	47.02	54.00	Horizontal
2390	52.89	28.29	2.45	32.33	51.3	54.00	Horizontal
2310	41.36	27.34	2.32	32.14	38.88	54.00	Vertical
2387.23	47.24	28.29	2.45	32.33	45.65	54.00	Vertical
2390	48.77	28.29	2.45	32.33	47.18	54.00	Vertical
IEEE 802.11b mode, High channel							
Frequency (MHz)	Peak Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Peak Final Level (dBuV/m)	Average Limits (dBuV/m)	Antenna Polarity
2483.5	52.64	28.29	2.67	32.33	51.27	54.00	Horizontal
2491.95	51.47	28.29	2.67	32.33	50.1	54.00	Horizontal
2500	45.18	28.29	2.67	32.33	43.81	54.00	Horizontal
2483.5	51.29	28.29	2.67	32.33	49.92	54.00	Vertical
2491.95	45.43	28.29	2.67	32.33	44.06	54.00	Vertical
2500	40.66	28.29	2.67	32.33	39.29	54.00	Vertical

IEEE 802.11g mode, Low channel							
Frequency (MHz)	Peak Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Peak Final Level (dBuV/m)	Average Limits (dBuV/m)	Antenna Polarity
2310	46.81	27.34	2.32	32.14	44.33	54.00	Horizontal
2387.23	48.37	28.29	2.45	32.33	46.78	54.00	Horizontal
2390	53.66	28.29	2.45	32.33	52.07	54.00	Horizontal
2310	42.19	27.34	2.32	32.14	39.71	54.00	Vertical
2387.23	47.32	28.29	2.45	32.33	45.73	54.00	Vertical
2390	48.47	28.29	2.45	32.33	46.88	54.00	Vertical
IEEE 802.11g mode, High channel							
Frequency (MHz)	Peak Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Peak Final Level (dBuV/m)	Average Limits (dBuV/m)	Antenna Polarity
2483.5	52.48	28.29	2.67	32.33	51.11	54.00	Horizontal
2491.95	50.65	28.29	2.67	32.33	49.28	54.00	Horizontal
2500	44.49	28.29	2.67	32.33	43.12	54.00	Horizontal
2483.5	52.62	28.29	2.67	32.33	51.25	54.00	Vertical
2491.95	45.17	28.29	2.67	32.33	43.8	54.00	Vertical
2500	40.36	28.29	2.67	32.33	38.99	54.00	Vertical

IEEE 802.11n (HT20) mode, Low channel							
Frequency (MHz)	Peak Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Peak Final Level (dBuV/m)	Average Limits (dBuV/m)	Antenna Polarity
2310	46.52	27.34	2.32	32.14	44.04	54.00	Horizontal
2387.23	48.26	28.29	2.45	32.33	46.67	54.00	Horizontal
2390	52.95	28.29	2.45	32.33	51.36	54.00	Horizontal
2310	42.14	27.34	2.32	32.14	39.66	54.00	Vertical
2387.23	46.75	28.29	2.45	32.33	45.16	54.00	Vertical
2390	48.26	28.29	2.45	32.33	46.67	54.00	Vertical
IEEE 802.11n (HT20) mode, High channel							
Frequency (MHz)	Peak Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Peak Final Level (dBuV/m)	Average Limits (dBuV/m)	Antenna Polarity
2483.5	52.34	28.29	2.67	32.33	50.97	54.00	Horizontal
2491.95	51.26	28.29	2.67	32.33	49.89	54.00	Horizontal
2500	44.97	28.29	2.67	32.33	43.6	54.00	Horizontal
2483.5	52.51	28.29	2.67	32.33	51.14	54.00	Vertical
2491.95	45.22	28.29	2.67	32.33	43.85	54.00	Vertical
2500	41.24	28.29	2.67	32.33	39.87	54.00	Vertical

IEEE 802.11n (HT40) mode, Low channel							
Frequency (MHz)	Peak Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Peak Final Level (dBuV/m)	Average Limits (dBuV/m)	Antenna Polarity
2310	45.86	27.34	2.32	32.14	43.38	54.00	Horizontal
2387.23	48.11	28.29	2.45	32.33	46.52	54.00	Horizontal
2390	52.37	28.29	2.45	32.33	50.78	54.00	Horizontal
2310	42.16	27.34	2.32	32.14	39.68	54.00	Vertical
2387.23	47.61	28.29	2.45	32.33	46.02	54.00	Vertical
2390	48.33	28.29	2.45	32.33	46.74	54.00	Vertical
IEEE 802.11n (HT40) mode, High channel							
Frequency (MHz)	Peak Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Peak Final Level (dBuV/m)	Average Limits (dBuV/m)	Antenna Polarity
2483.5	52.32	28.29	2.67	32.33	50.95	54.00	Horizontal
2491.95	51.39	28.29	2.67	32.33	50.02	54.00	Horizontal
2500	44.27	28.29	2.67	32.33	42.9	54.00	Horizontal
2483.5	52.14	28.29	2.67	32.33	50.77	54.00	Vertical
2491.95	45.31	28.29	2.67	32.33	43.94	54.00	Vertical
2500	40.37	28.29	2.67	32.33	39	54.00	Vertical

Remark:

1) According to section 15.35(b), the peak limit is 20dB higher than the average limit

2) If the peak measured value complies with the average limit, it is unnecessary to perform an average measurement.

3) The emission levels of other frequencies are very lower than the limit and not shown in the report.

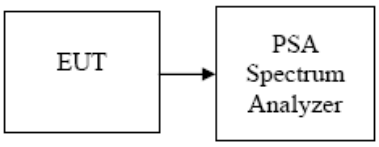
11.0 Spurious Emission Test

11.1 Conducted emissions Measurement

11.1.1 Test Equipment

Instrument Type	Model	Serial No.	Manufacturer	Date of Cal.	Due Date
Spectrum Analyzer	FSEM	848597/001	ROHDE&SCHWARZ	Nov. 20, 2013	Nov. 19, 2014

11.1.2 Test configuration



11.1.3 Limit

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)).

11.1.4 Test procedure

Conducted RF measurements of the transmitter output were made to confirm that the E.U.T. antenna port conducted emissions meet the specified limit and to identify any spurious signals that require further investigation or measurements on the radiated emissions site. The transmitter output is connected to the spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 100 kHz. Measurements are made over the 30MHz to 25 GHz range with the transmitter set to the lowest, middle, and highest channels.

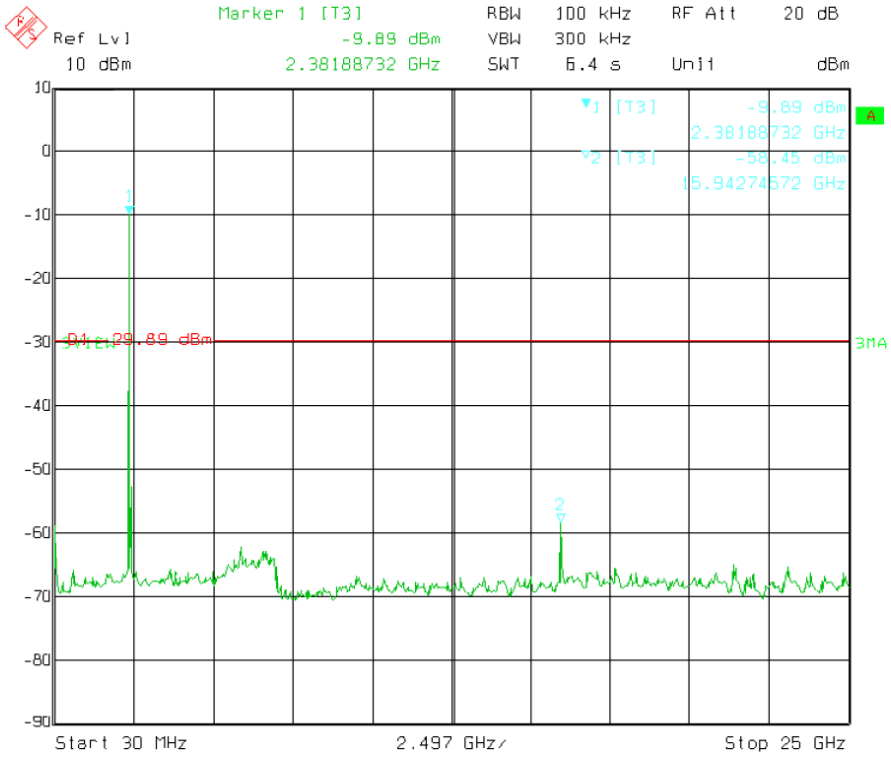
11.1.5 Test Result

Test plots please refer to next pages.

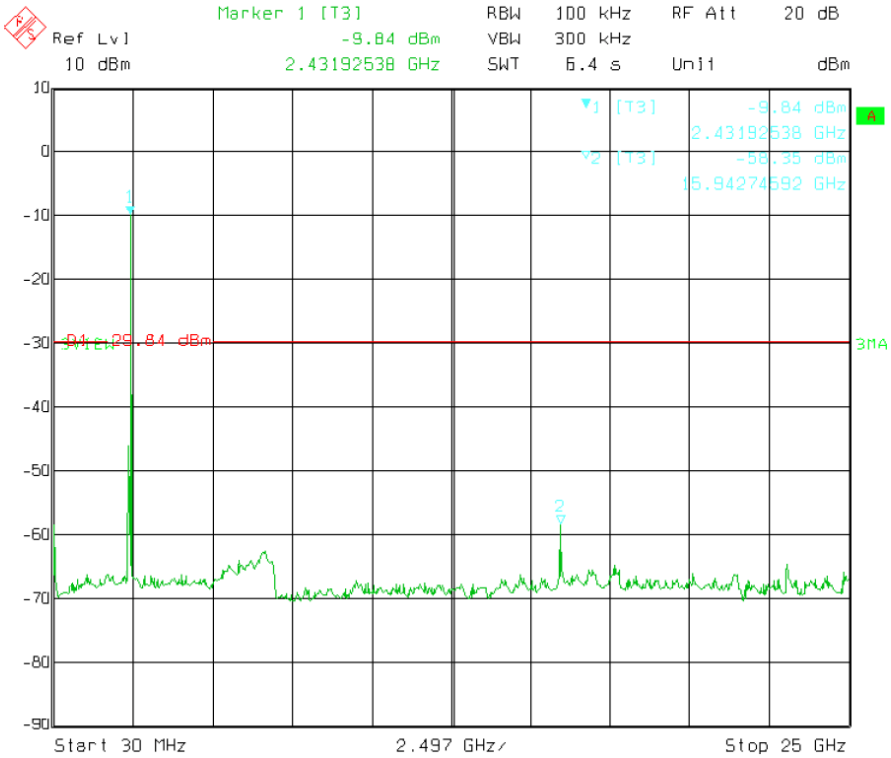
Note: Conducted emissions measurements below 30 MHz were made, and the maximum peak was detected, which is much less the limit. So it is not submitted in the report.

IEEE 802.11b mode

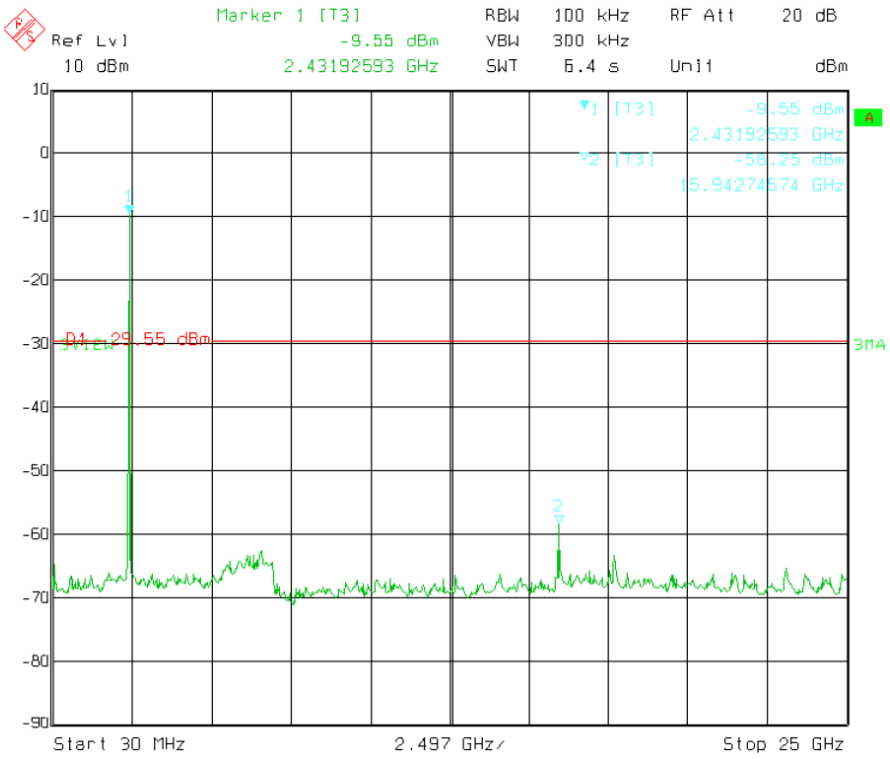
Low channel



Middle channel

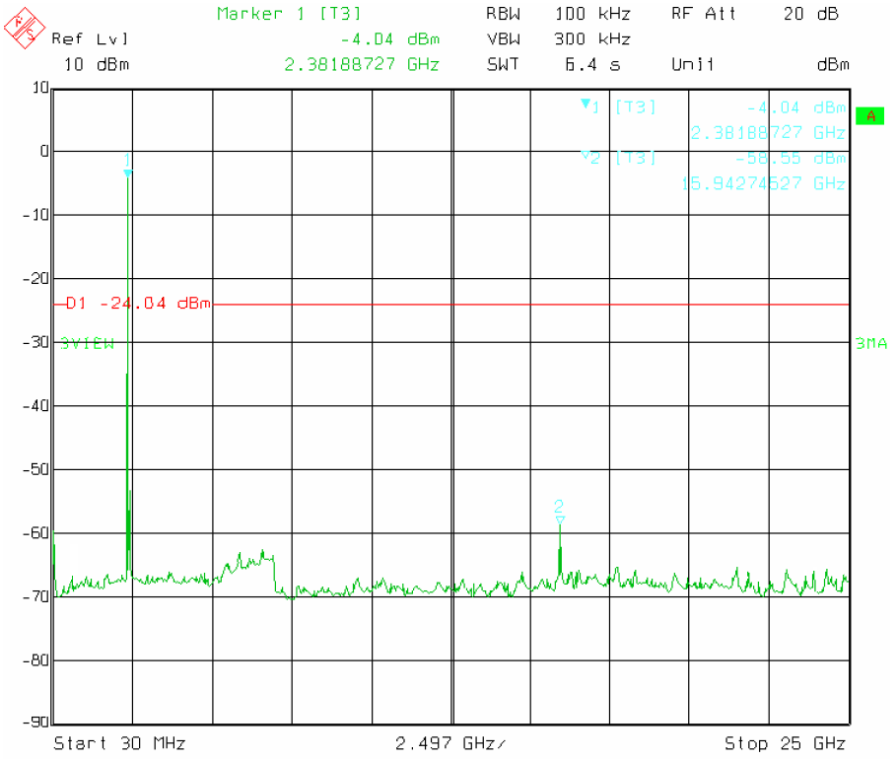


High channel

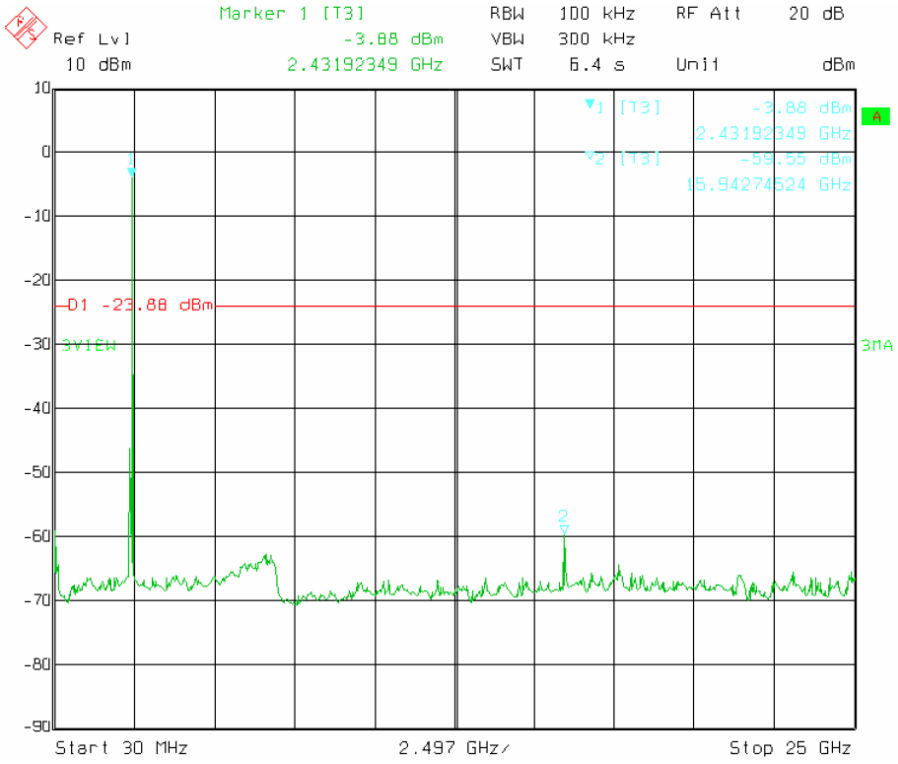


IEEE 802.11g mode

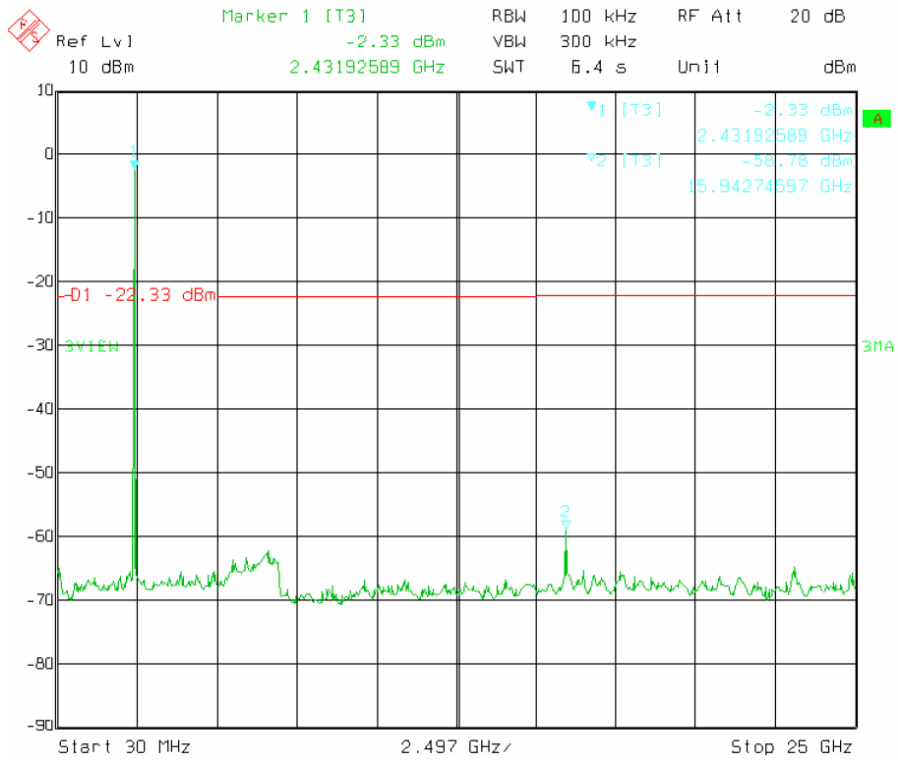
Low channel



Middle channel

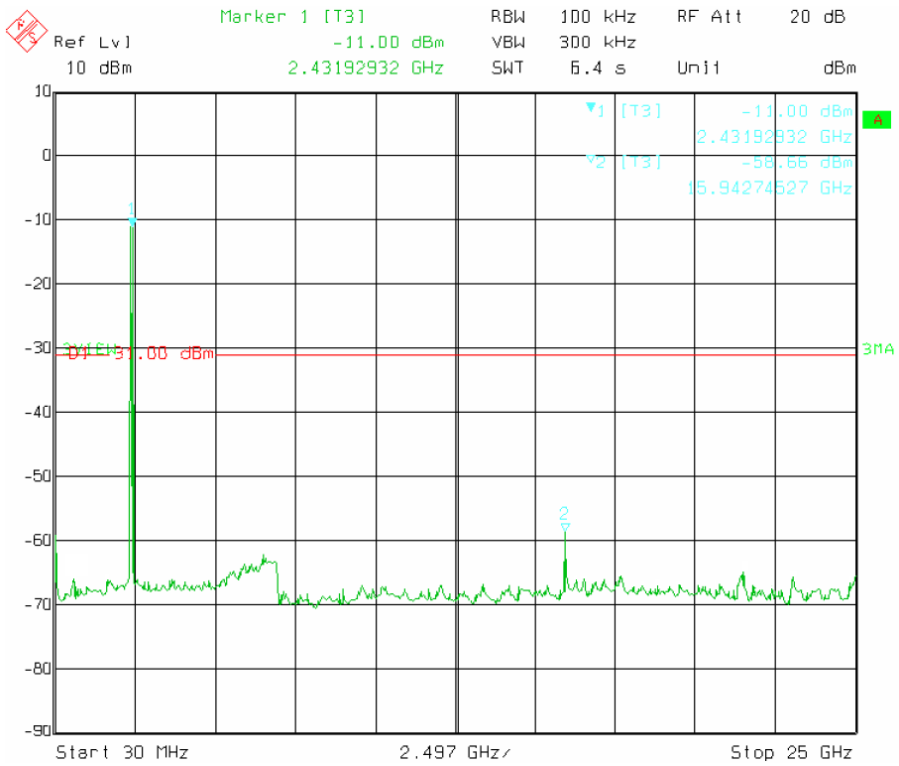


High channel

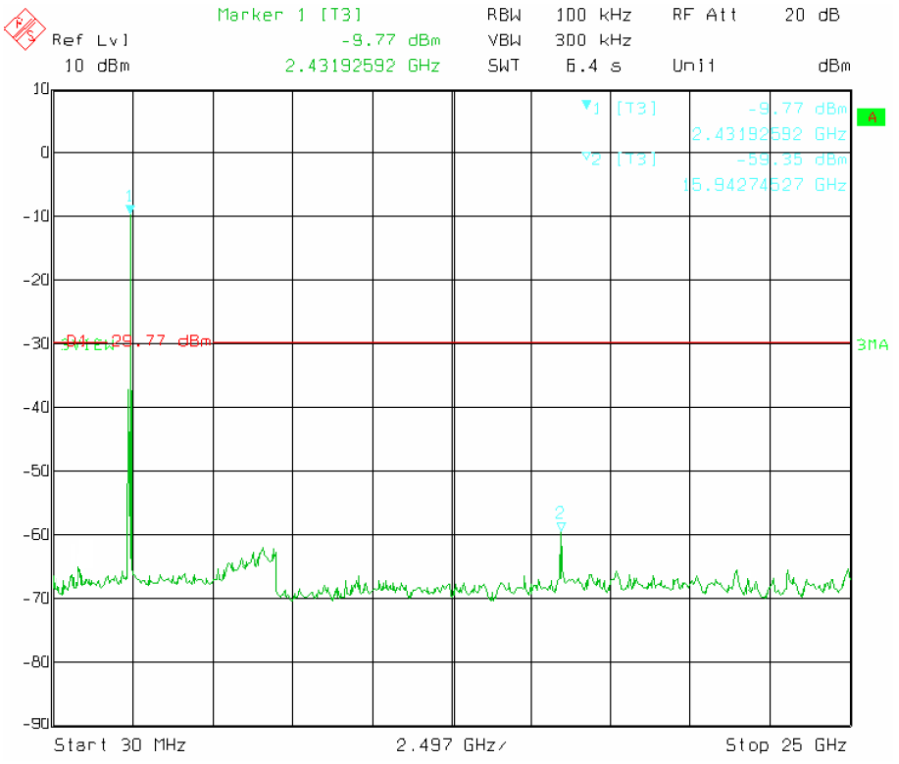


IEEE 802.11n (HT20) mode

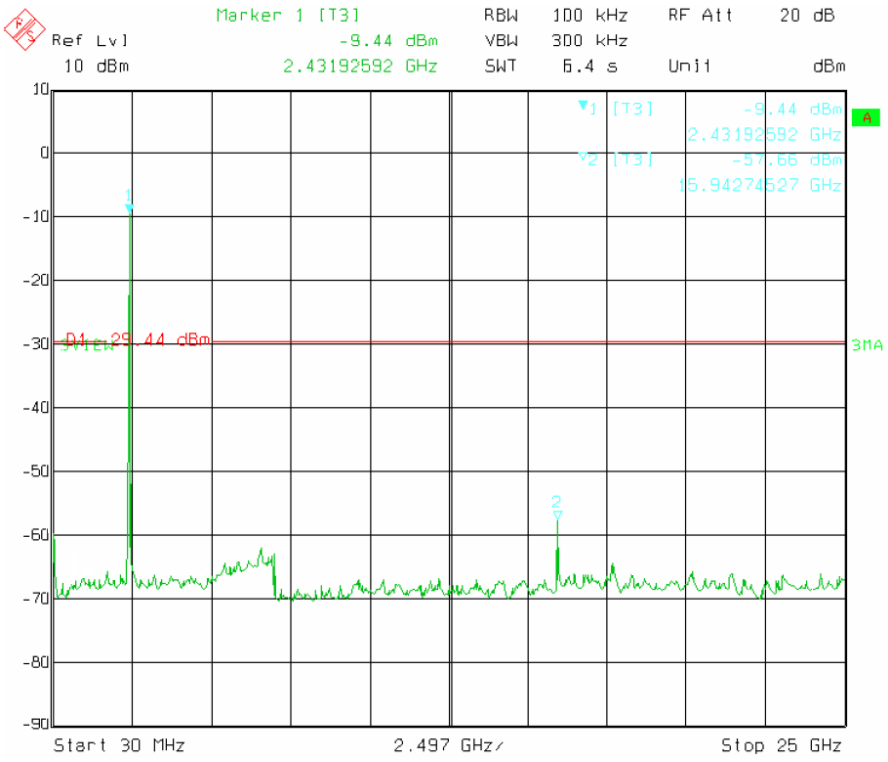
Low channel



Middle channel

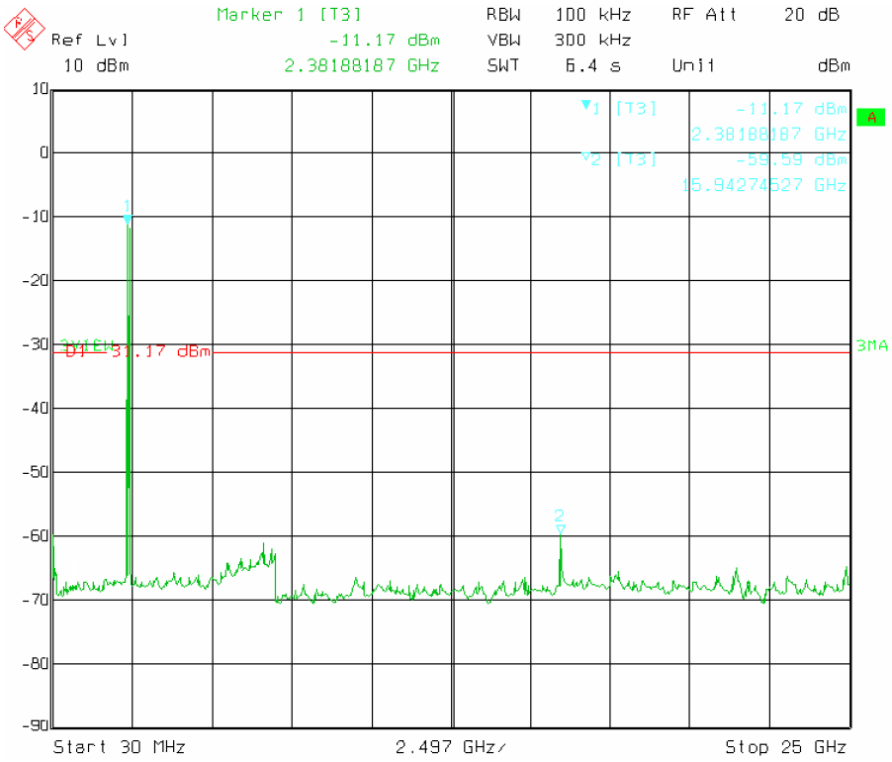


High channel

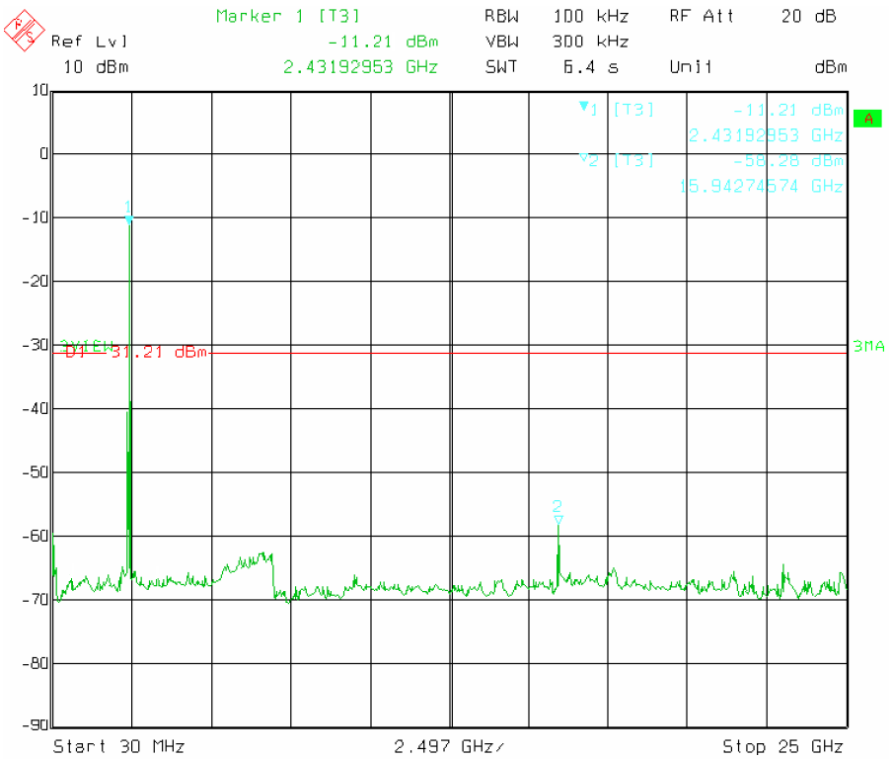


IEEE 802.11n (HT40) mode

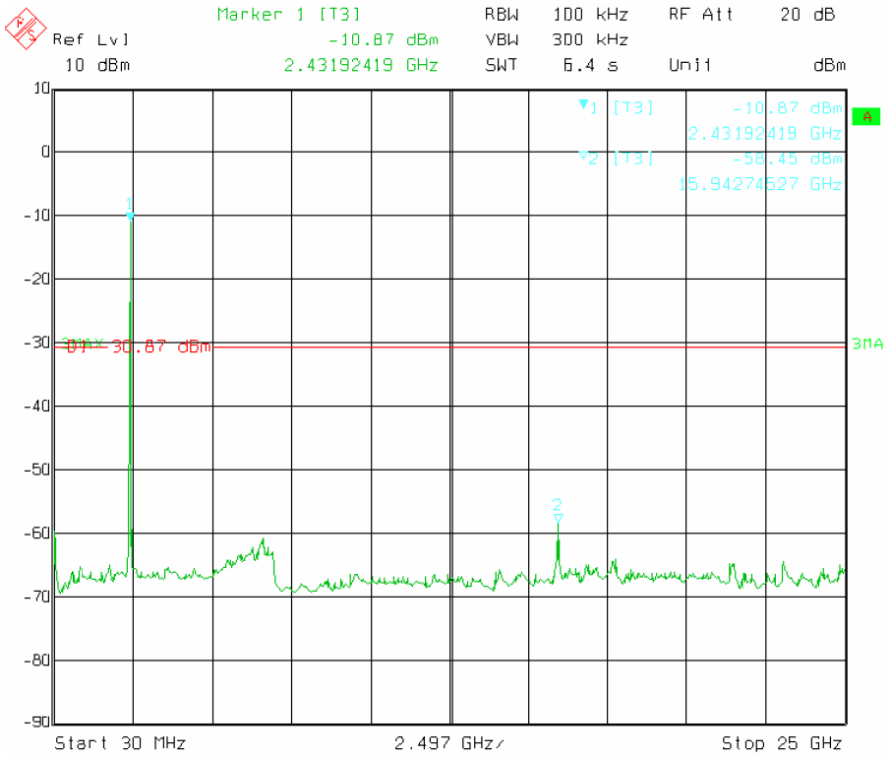
Low channel



Middle channel



High channel



11.2 Radiated emissions Measurement

11.2.1 Test Equipment

Instrument Type	Model	Serial No.	Manufacturer	Date of Cal.	Due Date
ESPI Test Receiver	ESPI 3	100379	ROHDE&SCHWARZ	Nov. 20, 2013	Nov. 19, 2014
Spectrum Analyzer	FSEM	848597/001	ROHDE&SCHWARZ	Nov. 20, 2013	Nov. 19, 2014
Pre-amplifier	LNA6900	--	Teseq	Nov. 21, 2013	Nov. 20, 2014
Pre-amplifier	8447D	83153007374	Agilent	Nov. 21, 2013	Nov. 20, 2014
Pre-amplifier	8449B	3008A01738	Agilent	Nov. 21, 2013	Nov. 20, 2014
Loop antenna	PLA-1030/B	1029	A.R.A.	Nov. 21, 2013	Nov. 20, 2014
Ultra Broadband ANT	HL562	100157	ROHDE&SCHWARZ	Nov. 21, 2013	Nov. 20, 2014
Horn Antenna	3117	--	ETS LINDGREN	Nov. 21, 2013	Nov. 20, 2014
Horn Antenna	3160	--	ETS LINDGREN	Nov. 21, 2013	Nov. 20, 2014

11.2.2 Radiated Emission Limit

All emission from a digital device, including any network of conductors and apparatus connected thereto, shall not exceed the level of field strength specified below:

Frequencies in restricted band are complied to limit on Paragraph 15.209.

Frequency Range (MHz)	Distance (m)	Field strength (dBμV/m)
0.009-0.490	3	20log 2400/F (kHz) + 80
0.490-1.705	3	20log 24000/F (kHz) + 40
1.705-30	3	20log 30 + 40
30-88	3	40.0
88-216	3	43.5
216-960	3	46.0
Above 960	3	54.0

Note: 1) RF Voltage (dBuV) = 20 log RF Voltage (uV)

2) In the Above Table, the tighter limit applies at the band edges.

3) Distance refers to the distance in meters between the measuring instrument antenna and the E.U.T.

4) This is a handhold device. The radiated emissions should be tested under 3-axes position (Lying, Side, and Stand), After pre-test. It was found that the worse radiated emission was get at the lying position.

5) All scanning using PK detector. And the final emission level was get using QP detector for frequency range from 30-1000MHz. As to 1G-25G, the final emission level got using PK and AV detector.

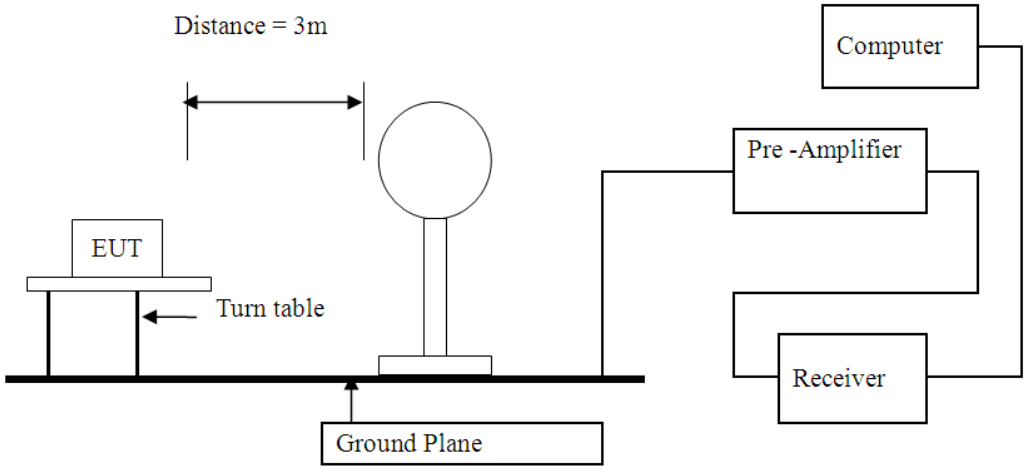
6) If measurement is made at 3m distance, then F.S Limitation at 3m distance is adjusted by using the formula Ld1 = Ld2 * (d2/d1)

11.2.3 E.U.T. Operating Condition

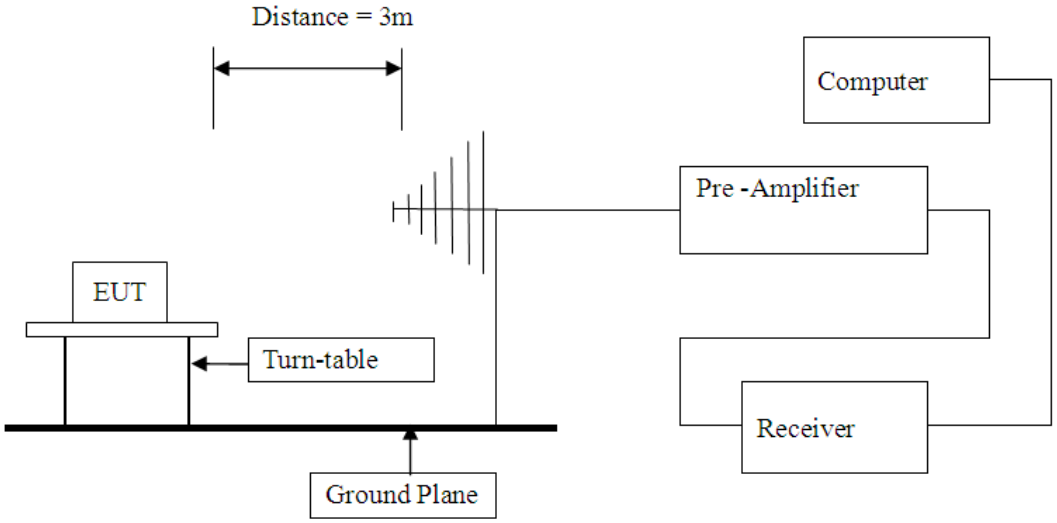
Operating condition is according to ANSI C63.10 -2009

11.2.4 Block diagram of Test setup

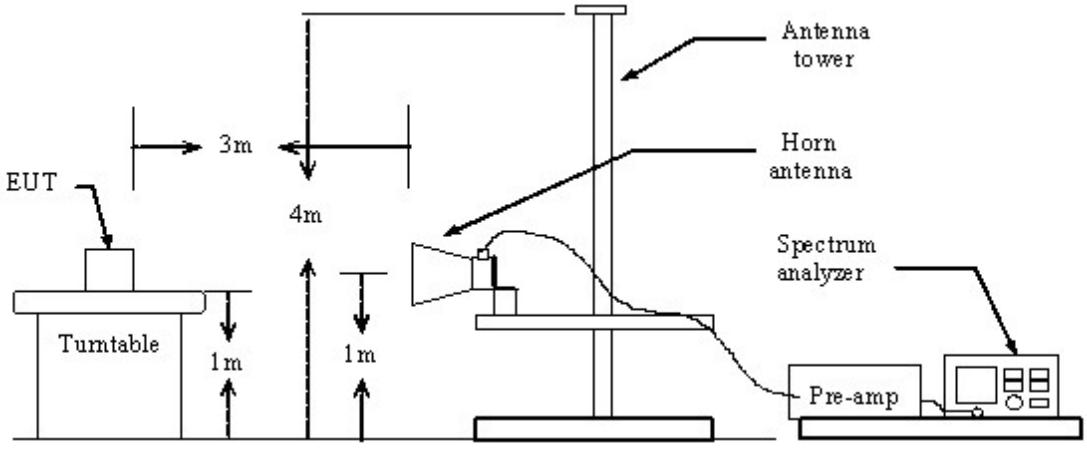
Below 30 MHz



30 MHz to 1000 MHz



Above 1000 MHz



11.2.5 Test Method and test Procedure

1) The E.U.T. was tested according to ANSI C63.10 –2009.
2) The E.U.T., peripherals were put on the turntable which table size is 1m x 1.5 m, table high 0.8 m. All set up is according to ANSI C63.10-2009.
3) The frequency spectrum from 30 MHz to 25 GHz was investigated. All readings from 30 MHz to 1 GHz quasi-peak values with a resolution bandwidth of 120 kHz. All readings are above 1 GHz, peak values with a resolution bandwidth of 1 MHz . Measurements were made at 3 meters.
4) The antenna high is varied from 1 m to 4 m high to find the maximum emission for each frequency.
5) The antenna polarization: Vertical polarization and Horizontal polarization.

11.2.6 Test specification

Environmental conditions: Temperature 22° C Humidity: 51% Atmospheric pressure: 103kPa

11.2.7 Test result

Radiated Emission (9 kHz-30 MHz)

Result: Pass

Frequency (MHz)	Level@3m (dBμV/m)	Limit@3m (dBμV/m)
--	--	--
--	--	--
--	--	--
--	--	--

Note: 1) Emission Level=Reading+ Cable loss+ Antenna factor-Amp factor

2) The emission levels are 20 dB below the limit value, which are not reported. It is deemed to comply with the requirement

Radiated Emission (30MHz-1000MHz)

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp (dB)	Final Level (dBuV/m)	Limit (dBuV/m)	Antenna Polarity
42.5218	33.82	13.22	0.35	26.68	20.71	40.00	Horizontal
66.3691	29.64	14.52	0.46	26.84	17.78	40.00	Horizontal
95.3473	26.46	14.86	0.51	26.72	15.11	43.50	Horizontal
108.0216	27.77	15.24	0.58	26.81	16.78	43.50	Horizontal
255.6287	26.21	16.82	0.84	26.91	16.96	46.00	Horizontal
879.2594	37.63	19.67	1.76	26.75	32.31	46.00	Vertical
36.2248	32.27	13.52	0.33	26.54	19.58	40.00	Vertical
42.9267	28.36	13.94	0.42	26.82	15.9	40.00	Vertical
103.9816	27.19	14.86	0.59	26.91	15.73	43.50	Vertical
240.2546	26.85	16.64	0.78	26.34	17.93	46.00	Vertical

Remark:

1) Final Level= Read Level+Antenna Factor+Cable Loss-Preamp

2) The measurements were conducted in all WiFi modes(b/g/n) in all three channels (Low/Middle/High) and the worst case (b mode in Low channel) was reportted only.

Harmonics Radiated Emission Data (1000MHz-25000MHz)

IEEE 802.11b mode, Low channel							
Frequency (MHz)	Peak Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Peak Final Level (dBuV/m)	Average Limits (dBuV/m)	Antenna Polarity
4824	49.51	30.56	5.60	33.53	52.14	54.00	Horizontal
7236	39.24	35.41	7.24	33.82	48.07	54.00	Horizontal
9648					--	54.00	Horizontal
12060					--	54.00	Horizontal
14472					--	54.00	Horizontal
16884					--	54.00	Horizontal
19296					--	54.00	Horizontal
21708					--	54.00	Horizontal
24120					--	54.00	Horizontal
4824	46.15	30.56	5.60	33.53	48.78	54.00	Vertical
7236	36.37	35.41	7.24	33.82	45.2	54.00	Vertical
9648					--	54.00	Vertical
12060					--	54.00	Vertical
14472					--	54.00	Vertical
16884					--	54.00	Vertical
19296					--	54.00	Vertical
21708					--	54.00	Vertical
24120					--	54.00	Vertical
IEEE 802.11b mode, Middle channel							
Frequency (MHz)	Peak Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Peak Final Level (dBuV/m)	Average Limits (dBuV/m)	Antenna Polarity
4874	50.12	30.56	5.60	33.53	52.75	54.00	Horizontal
7311	38.68	35.41	7.24	33.82	47.51	54.00	Horizontal
9748					--	54.00	Horizontal
12185					--	54.00	Horizontal
14622					--	54.00	Horizontal
17059					--	54.00	Horizontal
19496					--	54.00	Horizontal
21933					--	54.00	Horizontal
24370					--	54.00	Horizontal
4874	48.13	30.56	5.60	33.53	50.76	54.00	Vertical
7311	36.29	35.41	7.24	33.82	45.12	54.00	Vertical
9748					--	54.00	Vertical
12185					--	54.00	Vertical
14622					--	54.00	Vertical
17059					--	54.00	Vertical
19496					--	54.00	Vertical
21933					--	54.00	Vertical
24370					--	54.00	Vertical

IEEE 802.11b mode, High channel							
Frequency (MHz)	Peak Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Peak Final Level (dBuV/m)	Average Limits (dBuV/m)	Antenna Polarity
4924	49.28	30.56	5.60	33.53	51.91	54.00	Horizontal
7386	38.64	35.41	7.24	33.82	47.47	54.00	Horizontal
9848					--	54.00	Horizontal
12310					--	54.00	Horizontal
14772					--	54.00	Horizontal
17234					--	54.00	Horizontal
19696					--	54.00	Horizontal
22158					--	54.00	Horizontal
24620					--	54.00	Horizontal
4924	47.19	30.56	5.60	33.53	49.82	54.00	Vertical
7386	35.31	35.41	7.24	33.82	44.14	54.00	Vertical
9848					--	54.00	Vertical
12310					--	54.00	Vertical
14772					--	54.00	Vertical
17234					--	54.00	Vertical
19696					--	54.00	Vertical
22158					--	54.00	Vertical
24620					--	54.00	Vertical
IEEE 802.11g mode, Low channel							
Frequency (MHz)	Peak Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Peak Final Level (dBuV/m)	Average Limits (dBuV/m)	Antenna Polarity
4824	48.75	30.56	5.60	33.53	51.38	54.00	Horizontal
7236	37.24	35.41	7.24	33.82	46.07	54.00	Horizontal
9648					--	54.00	Horizontal
12060					--	54.00	Horizontal
14472					--	54.00	Horizontal
16884					--	54.00	Horizontal
19296					--	54.00	Horizontal
21708					--	54.00	Horizontal
24120					--	54.00	Horizontal
4824	44.62	30.56	5.60	33.53	47.25	54.00	Vertical
7236	35.39	35.41	7.24	33.82	44.22	54.00	Vertical
9648					--	54.00	Vertical
12060					--	54.00	Vertical
14472					--	54.00	Vertical
16884					--	54.00	Vertical
19296					--	54.00	Vertical
21708					--	54.00	Vertical
24120					--	54.00	Vertical

IEEE 802.11g mode, Middle channel							
Frequency (MHz)	Peak Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Peak Final Level (dBuV/m)	Average Limits (dBuV/m)	Antenna Polarity
4874	49.67	30.56	5.60	33.53	52.3	54.00	Horizontal
7311	36.95	35.41	7.24	33.82	45.78	54.00	Horizontal
9748					--	54.00	Horizontal
12185					--	54.00	Horizontal
14622					--	54.00	Horizontal
17059					--	54.00	Horizontal
19496					--	54.00	Horizontal
21933					--	54.00	Horizontal
24370					--	54.00	Horizontal
4874	45.13	30.56	5.60	33.53	47.76	54.00	Vertical
7311	36.29	35.41	7.24	33.82	45.12	54.00	Vertical
9748					--	54.00	Vertical
12185					--	54.00	Vertical
14622					--	54.00	Vertical
17059					--	54.00	Vertical
19496					--	54.00	Vertical
21933					--	54.00	Vertical
24370					--	54.00	Vertical
IEEE 802.11g mode, High channel							
Frequency (MHz)	Peak Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Peak Final Level (dBuV/m)	Average Limits (dBuV/m)	Antenna Polarity
4924	49.14	30.56	5.60	33.53	51.77	54.00	Horizontal
7386	37.34	35.41	7.24	33.82	46.17	54.00	Horizontal
9848					--	54.00	Horizontal
12310					--	54.00	Horizontal
14772					--	54.00	Horizontal
17234					--	54.00	Horizontal
19696					--	54.00	Horizontal
22158					--	54.00	Horizontal
24620					--	54.00	Horizontal
4924	45.28	30.56	5.60	33.53	47.91	54.00	Vertical
7386	36.11	35.41	7.24	33.82	44.94	54.00	Vertical
9848					--	54.00	Vertical
12310					--	54.00	Vertical
14772					--	54.00	Vertical
17234					--	54.00	Vertical
19696					--	54.00	Vertical
22158					--	54.00	Vertical
24620					--	54.00	Vertical

IEEE 802.11n (HT20) mode, Low channel							
Frequency (MHz)	Peak Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Peak Final Level (dBuV/m)	Average Limits (dBuV/m)	Antenna Polarity
4824	48.93	30.56	5.60	33.53	51.56	54.00	Horizontal
7236	37.64	35.41	7.24	33.82	46.47	54.00	Horizontal
9648					--	54.00	Horizontal
12060					--	54.00	Horizontal
14472					--	54.00	Horizontal
16884					--	54.00	Horizontal
19296					--	54.00	Horizontal
21708					--	54.00	Horizontal
24120					--	54.00	Horizontal
4824	46.33	30.56	5.60	33.53	48.96	54.00	Vertical
7236	35.97	35.41	7.24	33.82	44.8	54.00	Vertical
9648					--	54.00	Vertical
12060					--	54.00	Vertical
14472					--	54.00	Vertical
16884					--	54.00	Vertical
19296					--	54.00	Vertical
21708					--	54.00	Vertical
24120					--	54.00	Vertical
IEEE 802.11n (HT20) mode, Middle channel							
Frequency (MHz)	Peak Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Peak Final Level (dBuV/m)	Average Limits (dBuV/m)	Antenna Polarity
4874	48.62	30.56	5.60	33.53	51.25	54.00	Horizontal
7311	36.22	35.41	7.24	33.82	45.05	54.00	Horizontal
9748					--	54.00	Horizontal
12185					--	54.00	Horizontal
14622					--	54.00	Horizontal
17059					--	54.00	Horizontal
19496					--	54.00	Horizontal
21933					--	54.00	Horizontal
24370					--	54.00	Horizontal
4874	44.37	30.56	5.60	33.53	47.00	54.00	Vertical
7311	35.18	35.41	7.24	33.82	44.01	54.00	Vertical
9748					--	54.00	Vertical
12185					--	54.00	Vertical
14622					--	54.00	Vertical
17059					--	54.00	Vertical
19496					--	54.00	Vertical
21933					--	54.00	Vertical
24370					--	54.00	Vertical

IEEE 802.11n (HT20) mode, High channel							
Frequency (MHz)	Peak Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Peak Final Level (dBuV/m)	Average Limits (dBuV/m)	Antenna Polarity
4924	50.01	30.56	5.60	33.53	52.64	54.00	Horizontal
7386	38.13	35.41	7.24	33.82	46.96	54.00	Horizontal
9848					--	54.00	Horizontal
12310					--	54.00	Horizontal
14772					--	54.00	Horizontal
17234					--	54.00	Horizontal
19696					--	54.00	Horizontal
22158					--	54.00	Horizontal
24620					--	54.00	Horizontal
4924	46.34	30.56	5.60	33.53	48.97	54.00	Vertical
7386	35.26	35.41	7.24	33.82	44.09	54.00	Vertical
9848					--	54.00	Vertical
12310					--	54.00	Vertical
14772					--	54.00	Vertical
17234					--	54.00	Vertical
19696					--	54.00	Vertical
22158					--	54.00	Vertical
24620					--	54.00	Vertical
IEEE 802.11n (HT40) mode, Low channel							
Frequency (MHz)	Peak Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Peak Final Level (dBuV/m)	Average Limits (dBuV/m)	Antenna Polarity
4844	49.64	30.56	5.60	33.53	52.27	54.00	Horizontal
7266	37.73	35.41	7.24	33.82	46.56	54.00	Horizontal
9688					--	54.00	Horizontal
12110					--	54.00	Horizontal
14532					--	54.00	Horizontal
16954					--	54.00	Horizontal
17176					--	54.00	Horizontal
21798					--	54.00	Horizontal
24220					--	54.00	Horizontal
4844	45.38	30.56	5.60	33.53	48.01	54.00	Vertical
7266	35.15	35.41	7.24	33.82	43.98	54.00	Vertical
9688					--	54.00	Vertical
12110					--	54.00	Vertical
14532					--	54.00	Vertical
16954					--	54.00	Vertical
17176					--	54.00	Vertical
21798					--	54.00	Vertical
24220					--	54.00	Vertical

IEEE 802.11n (HT40) mode , Middle channel							
Frequency (MHz)	Peak Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Peak Final Level (dBuV/m)	Average Limits (dBuV/m)	Antenna Polarity
4874	49.27	30.56	5.60	33.53	51.9	54.00	Horizontal
7311	36.67	35.41	7.24	33.82	45.5	54.00	Horizontal
9748					--	54.00	Horizontal
12185					--	54.00	Horizontal
14622					--	54.00	Horizontal
17059					--	54.00	Horizontal
19496					--	54.00	Horizontal
21933					--	54.00	Horizontal
24370					--	54.00	Horizontal
4874	46.31	30.56	5.60	33.53	48.94	54.00	Vertical
7311	35.55	35.41	7.24	33.82	44.38	54.00	Vertical
9748					--	54.00	Vertical
12185					--	54.00	Vertical
14622					--	54.00	Vertical
17059					--	54.00	Vertical
19496					--	54.00	Vertical
21933					--	54.00	Vertical
24370					--	54.00	Vertical
IEEE 802.11n (HT40) mode , High channel							
Frequency (MHz)	Peak Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Peak Final Level (dBuV/m)	Average Limits (dBuV/m)	Antenna Polarity
4904	49.29	30.56	5.60	33.53	51.92	54.00	Horizontal
7356	37.63	35.41	7.24	33.82	46.46	54.00	Horizontal
9808					--	54.00	Horizontal
12260					--	54.00	Horizontal
14712					--	54.00	Horizontal
17164					--	54.00	Horizontal
19616					--	54.00	Horizontal
22068					--	54.00	Horizontal
24520					--	54.00	Horizontal
4904	45.37	30.56	5.60	33.53	48.00	54.00	Vertical
7356	36.12	35.41	7.24	33.82	44.95	54.00	Vertical
9808					--	54.00	Vertical
12260					--	54.00	Vertical
14712					--	54.00	Vertical
17164					--	54.00	Vertical
19616					--	54.00	Vertical
22068					--	54.00	Vertical
24520					--	54.00	Vertical

Remark:
1) According to section 15.35(b), the peak limit is 20dB higher than the average limit
2) If the peak measured value complies with the average limit, it is unnecessary to perform an average measurement.
3) "--" means this data is too weak to be able to test.
4) The emission levels of other frequencies are very lower than the limit and not shown in the report.

**********END OF REPORT**********