9.6.1.4 Test data for 802.11n_HT40 WLAN Mode

-. Test Date : April 04, 2014

-. Resolution bandwidth : 1 MHz for Peak and Average Mode

-. Video bandwidth : 1 MHz for Peak Mode, 10 Hz for Average Mode

-. Frequency range : 30 MHz ~ 26.5 GHz

-. Measurement distance : 3 m

-. Result : PASSED

Frequency (MHz)	Reading (dBµV)	Detector Mode	Ant. Pol. (H/V)	Ant. Factor	Cable Loss	Amp Gain	Total (dBµV/m)	Limits (dBµV/m)	Margin (dB)
Test Data for Low Channel									
2 390.00	77.79	Peak	H	27.00	7.50	43.00	69.29	74.00	4.71
	38.88	Average	H				30.38	54.00	23.62
	61.60	Peak	V				53.10	74.00	20.90
	35.53	Average	V				27.03	54.00	26.97
Test Data for High Channel									
2 483.50	76.74	Peak	H	27.40	7.70	43.00	68.84	74.00	5.16
	38.47	Average	H				30.57	54.00	23.43
	58.69	Peak	V				50.79	74.00	23.21
	34.78	Average	V				26.88	54.00	27.12

Tabulated test data for Restricted Band

Remark: “H”: Horizontal, “V”: Vertical

Margin (dB) = Limits (dBµV/m) - Total Level (dBµV/m)

Total Level = Reading + Antenna Factor + Cable Loss – Pre-Amplifier Gain

Tested by: Tae-Ho, Kim / Project Engineer

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9.6.2 Spurious & Harmonic Radiated Emission

9.6.2.1 Test data for 802.11b WLAN Mode

-. Test Date : April 04, 2014

-. Resolution bandwidth : 1 MHz for Peak and Average Mode for the emissions fall in restricted band,
100 kHz for Peak Mode for the emissions outside restricted band

-. Video bandwidth : 1 MHz for Peak Mode, 10 Hz for Average Mode

-. Frequency range : 1 GHz ~ 26.5 GHz

-. Measurement distance : 3 m

-. Result : PASSED

Frequency (GHz)	Reading (dBµV)	Detector Mode	Ant. Pol. (H/V)	Ant. Factor	Cable Loss	Amp Gain	Total (dBµV/m)	Limits (dBµV/m)	Margin (dB)
Test Data for Low Channel									
2 412.00	105.14	Peak	H	27.20	7.50	42.80	97.04	113.98	16.94
	63.93	Average	H				55.83	93.98	38.15
	97.58	Peak	V				89.48	113.98	24.50
	60.58	Average	V				52.48	93.98	41.50
4 824.00	47.52	Peak	H	30.70	11.10	42.50	46.82	73.98	27.16
	33.51	Average	H				32.81	53.98	21.17
	43.18	Peak	V				42.48	73.98	31.50
	34.25	Average	V				33.55	53.98	20.43
Test Data for Middle Channel									
2 442.00	104.25	Peak	H	27.30	7.60	42.90	96.25	113.98	17.73
	63.75	Average	H				55.75	93.98	38.23
	97.66	Peak	V				89.66	113.98	24.32
	61.25	Average	V				53.25	93.98	40.73
4 884.00	47.63	Peak	H	30.70	11.20	42.40	47.13	73.98	26.85
	33.21	Average	H				32.71	53.98	21.27
	43.58	Peak	V				43.08	73.98	30.90
	34.11	Average	V				33.61	53.98	20.37

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Test Data for High Channel									
2 462.00	103.40	Peak	H	27.40	7.70	42.90	95.60	113.98	18.38
	61.99	Average	H				54.19	93.98	39.79
	95.06	Peak	V				87.26	113.98	26.72
	58.23	Average	V				50.43	93.98	43.55
4 924.00	47.74	Peak	H	30.80	11.80	42.30	48.04	73.98	25.94
	33.05	Average	H				33.35	53.98	20.63
	43.98	Peak	V				44.28	73.98	29.70
	34.83	Average	V				35.13	53.98	18.85

Tabulated test data for Restricted Band

Remark: “H”: Horizontal, “V”: Vertical

Margin (dB) = Limits (dBμV/m) - Total Level (dBμV/m)

Total Level = Reading + Antenna Factor + Cable Loss – Pre-Amplifier Gain

Tested by: Tae-Ho, Kim / Project Engineer

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9.6.2.2 Test data for 802.11g WLAN Mode

-. Test Date : April 04, 2014

-. Resolution bandwidth : 1 MHz for Peak and Average Mode for the emissions fall in restricted band,
100 kHz for Peak Mode for the emissions outside restricted band

-. Video bandwidth : 1 MHz for Peak Mode, 10 Hz for Average Mode

-. Frequency range : 1 GHz ~ 26.5 GHz

-. Measurement distance : 3 m

-. Result : PASSED

Frequency (GHz)	Reading (dBµV)	Detector Mode	Ant. Pol. (H/V)	Ant. Factor	Cable Loss	Amp Gain	Total (dBµV/m)	Limits (dBµV/m)	Margin (dB)
Test Data for Low Channel									
2 412.00	100.40	Peak	H	27.20	7.50	42.80	92.30	113.98	21.68
	46.05	Average	H				37.95	93.98	56.03
	96.88	Peak	V				88.78	113.98	25.20
	44.10	Average	V				36.00	93.98	57.98
4 824.00	46.95	Peak	H	30.70	11.10	42.50	46.25	73.98	27.73
	33.77	Average	H				33.07	53.98	20.91
	44.38	Peak	V				43.68	73.98	30.30
	34.58	Average	V				33.88	53.98	20.10
Test Data for Middle Channel									
2 442.00	100.25	Peak	H	27.30	7.60	42.90	92.25	113.98	21.73
	46.28	Average	H				38.28	93.98	55.70
	96.74	Peak	V				88.74	113.98	25.24
	44.39	Average	V				36.39	93.98	57.59
4 884.00	47.05	Peak	H	30.70	11.20	42.50	46.45	73.98	27.53
	33.81	Average	H				33.21	53.98	20.77
	44.21	Peak	V				43.61	73.98	30.37
	34.68	Average	V				34.08	53.98	19.90

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Test Data for High Channel									
2 462.00	99.32	Peak	H	27.40	7.70	42.90	91.52	113.98	22.46
	45.10	Average	H				37.30	93.98	56.68
	94.29	Peak	V				86.49	113.98	27.49
	43.67	Average	V				35.87	93.98	58.11
4 924.00	46.83	Peak	H	30.80	11.80	42.50	46.93	73.98	27.05
	33.42	Average	H				33.52	53.98	20.46
	44.05	Peak	V				44.15	73.98	29.83
	34.74	Average	V				34.84	53.98	19.14

Tabulated test data for Restricted Band

Remark: “H”: Horizontal, “V”: Vertical

Margin (dB) = Limits (dBμV/m) - Total Level (dBμV/m)

Total Level = Reading + Antenna Factor + Cable Loss – Pre-Amplifier Gain

Tested by: Tae-Ho, Kim / Project Engineer

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9.6.2.3 Test data for 802.11n_HT20 WLAN Mode

-. Test Date : April 04, 2014

-. Resolution bandwidth : 1 MHz for Peak and Average Mode for the emissions fall in restricted band,
100 kHz for Peak Mode for the emissions outside restricted band

-. Video bandwidth : 1 MHz for Peak Mode, 10 Hz for Average Mode

-. Frequency range : 1 GHz ~ 26.5 GHz

-. Measurement distance : 3 m

-. Result : PASSED

Frequency (GHz)	Reading (dBµV)	Detector Mode	Ant. Pol. (H/V)	Ant. Factor	Cable Loss	Amp Gain	Total (dBµV/m)	Limits (dBµV/m)	Margin (dB)
Test Data for Low Channel									
2 412.00	101.63	Peak	H	27.20	7.50	42.80	93.53	113.98	20.45
	52.55	Average	H				44.45	93.98	49.53
	94.21	Peak	V				86.11	113.98	27.87
	51.03	Average	V				42.93	93.98	51.05
4 824.00	47.39	Peak	H	31.10	11.80	42.50	47.79	73.98	26.19
	33.08	Average	H				33.48	53.98	20.50
	44.73	Peak	V				45.13	73.98	28.85
	34.07	Average	V				34.47	53.98	19.51
Test Data for Middle Channel									
2 442.00	100.84	Peak	H	27.30	7.60	42.90	92.84	113.98	21.14
	52.15	Average	H				44.15	93.98	49.83
	94.08	Peak	V				86.08	113.98	27.90
	50.48	Average	V				42.48	93.98	51.50
4 884.00	47.36	Peak	H	31.20	11.70	42.50	47.76	73.98	26.22
	33.22	Average	H				33.62	53.98	20.36
	44.94	Peak	V				45.34	73.98	28.64
	34.21	Average	V				34.61	53.98	19.37

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Test Data for High Channel									
2 462.00	100.40	Peak	H	27.40	7.70	42.90	92.60	113.98	21.38
	52.28	Average	H				44.48	93.98	49.50
	91.59	Peak	V				83.79	113.98	30.19
	49.38	Average	V				41.58	93.98	52.40
4 924.00	47.25	Peak	H	31.30	11.80	42.50	47.85	73.98	26.13
	33.28	Average	H				33.88	53.98	20.10
	44.23	Peak	V				44.83	73.98	29.15
	34.08	Average	V				34.68	53.98	19.30

Tabulated test data for Restricted Band

Remark: “H”: Horizontal, “V”: Vertical

Margin (dB) = Limits (dBμV/m) - Total Level (dBμV/m)

Total Level = Reading + Antenna Factor + Cable Loss – Pre-Amplifier Gain

Tested by: Tae-Ho, Kim / Project Engineer

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9.6.2.4 Test data for 802.11n_HT40 WLAN Mode

-. Test Date : April 04, 2014

-. Resolution bandwidth : 1 MHz for Peak and Average Mode for the emissions fall in restricted band,
100 kHz for Peak Mode for the emissions outside restricted band

-. Video bandwidth : 1 MHz for Peak Mode, 10 Hz for Average Mode

-. Frequency range : 1 GHz ~ 26.5 GHz

-. Measurement distance : 3 m

-. Result : PASSED

Frequency (GHz)	Reading (dBµV)	Detector Mode	Ant. Pol. (H/V)	Ant. Factor	Cable Loss	Amp Gain	Total (dBµV/m)	Limits (dBµV/m)	Margin (dB)
Test Data for Low Channel									
2 422.00	97.64	Peak	H	27.20	7.50	42.80	89.54	113.98	24.44
	43.29	Average	H				35.19	93.98	58.79
	92.54	Peak	V				84.44	113.98	29.54
	42.22	Average	V				34.12	93.98	59.86
4 844.00	46.14	Peak	H	31.10	11.80	42.50	46.54	73.98	27.44
	33.52	Average	H				33.92	53.98	20.06
	43.28	Peak	V				43.68	73.98	30.30
	33.57	Average	V				33.97	53.98	20.01
Test Data for Middle Channel									
2 442.00	97.45	Peak	H	27.30	7.60	42.90	89.45	113.98	24.53
	43.22	Average	H				35.22	93.98	58.76
	92.83	Peak	V				84.83	113.98	29.15
	42.68	Average	V				34.68	93.98	59.30
4 884.00	46.28	Peak	H	31.20	11.70	42.50	46.68	73.98	27.30
	33.14	Average	H				33.54	53.98	20.44
	43.25	Peak	V				43.65	73.98	30.33
	33.21	Average	V				33.61	53.98	20.37

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Test Data for High Channel									
2 452.00	97.27	Peak	H	27.40	7.70	42.90	89.47	113.98	24.51
	43.46	Average	H				35.66	93.98	58.32
	88.86	Peak	V				81.06	113.98	32.92
	42.03	Average	V				34.23	93.98	59.75
4 904.00	46.92	Peak	H	31.30	11.80	42.50	47.52	73.98	26.46
	33.06	Average	H				33.66	53.98	20.32
	43.64	Peak	V				44.24	73.98	29.74
	33.01	Average	V				33.61	53.98	20.37

Tabulated test data for Restricted Band

Remark: “H”: Horizontal, “V”: Vertical

Margin (dB) = Limits (dBμV/m) - Total Level (dBμV/m)

Total Level = Reading + Antenna Factor + Cable Loss – Pre-Amplifier Gain

Tested by: Tae-Ho, Kim / Project Engineer

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10. SPURIOUS EMISSION - RECEIVER

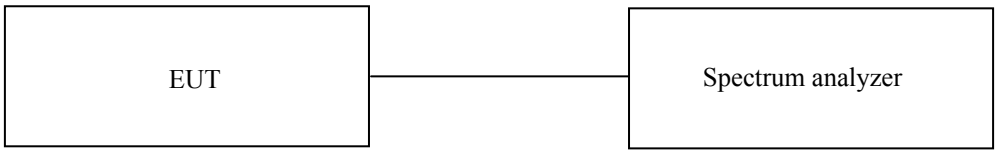
10.1 Operating environment

Temperature : 22 °C

Relative humidity : 41 % R.H.

10.2 Test set-up for conducted measurement

The antenna output of the EUT was connected to the spectrum analyzer. The resolution and video bandwidth is set to 100 kHz, and peak detection was used.



10.3 Test set-up for radiated measurement

The radiated emissions measurements were performed on the 3 m, open-field test site. The EUT was placed on a non-conductive turntable approximately 0.8 m above the ground plane. The frequency spectrum from 30 MHz to 40 GHz was scanned and maximum emission levels at each frequency recorded. The system was rotated 360°, and the antenna was varied in the height between 1.0 m and 4.0 m in order to determine the maximum emission levels. This procedure was performed for horizontal and vertical polarization of the receiving antenna.

10.4 Test equipment used

	Model Number	Manufacturer	Description	Serial Number	Last Cal.(Interval)
■ -	8564E	HP	Spectrum Analyzer	3650A00756	May 03, 2013(1Y)
■ -	ESU	Rohde & Schwarz	EMI Test Receiver	100261	May 27, 2013(1Y)
■-	310N	Sonoma Instrument	AMPLIFIER	312544	May 21, 2013(1Y)
■ -	83051A	Agilent	Microwave System Preamplifer	3950M00201	May 22, 2013(1Y)
■ -	FSV30	Rohde & Schwarz	Signal Analyzer	101372	May 20, 2013(1Y)
■ -	SCU-18	Rohde & Schwarz	PRE-AMPLIFIER	10041	Nov. 07, 2013(1Y)
■ -	MA220	HD	Turn Table	N/A	N/A
■ -	HD240	HD	Antenna Mast	N/A	N/A
■ -	VULB9163	Schwarzbeck	TRILOG Broadband Antenna	9163-421	Jun. 21, 2012(2Y)
■ -	BBHA9120D	Schwarzbeck	Horn Antenna	BBHA9120D294	Sep. 30, 2013 (2Y)
■ -	BBHA9170	Schwarzbeck	Horn Antenna	BBHA9170178	Jun. 17, 2013 (2Y)

All test equipment used is calibrated on a regular basis.

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10.5 Test data for 802.11b WLAN Mode

10.5.1 Test data – Conducted

-. Test Date : April 01, 2014

-. Resolution bandwidth : 120 kHz / 1 MHz

-. Frequency range : 30 MHz ~ 26.5 GHz

-. Test Result : Pass

Frequency (MHz)	Spectrum Reading (dBm)	Cable Loss (dB)	Total (dBm)
Test result for Low Channel			
915.10	-91.14	0.33	-90.81
19 654.00	-71.08	3.20	-67.88
Test result for Middle Channel			
901.00	-90.73	0.33	-90.40
19 618.00	-71.11	3.20	-67.91
Test result for High Channel			
881.40	-90.37	0.32	-90.05
19 618.00	-71.28	3.20	-68.08

Tested by: Tae-Ho, Kim / Project Engineer

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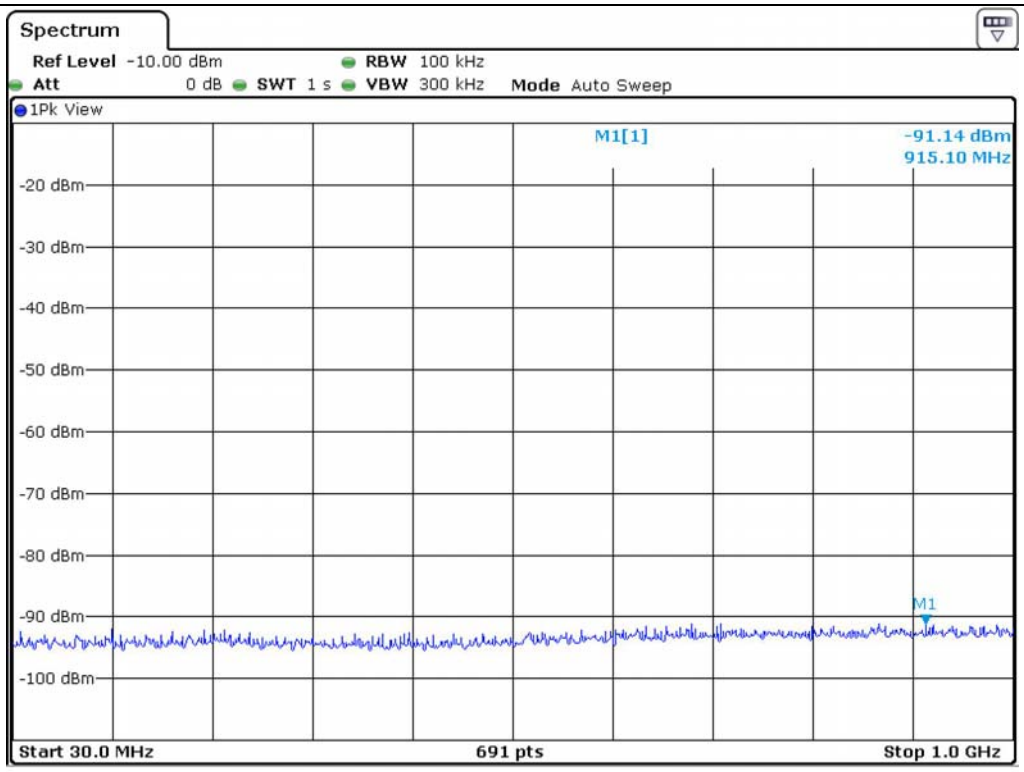
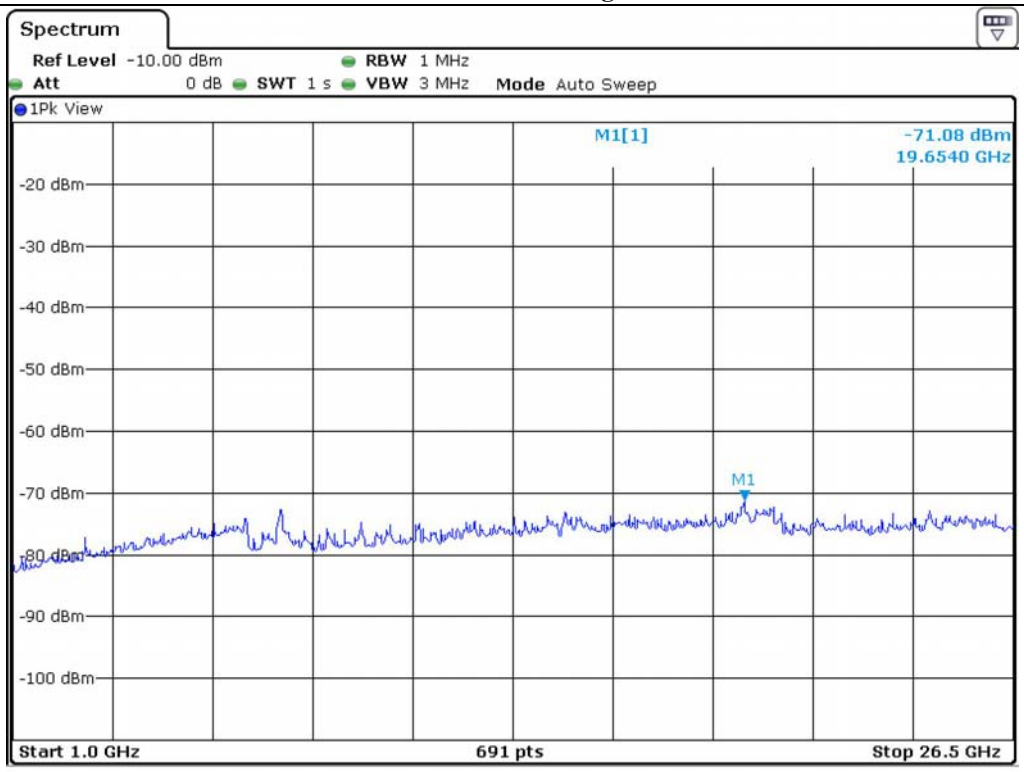


Low Channel - Receiving Mode



Low Channel - Receiving Mode

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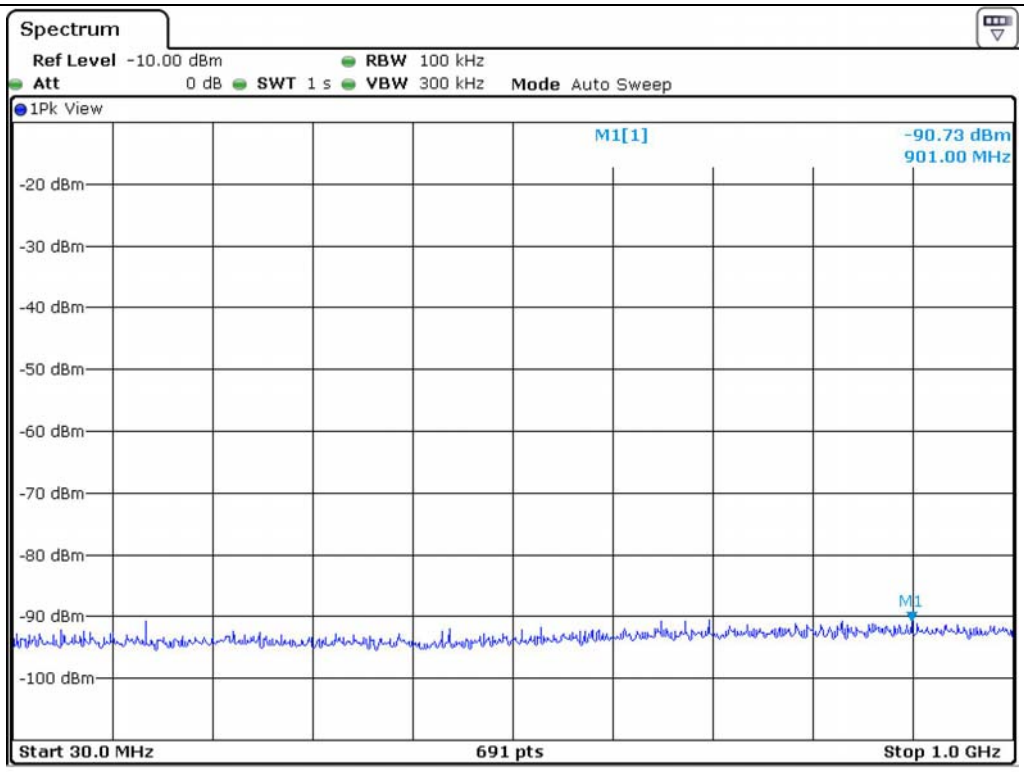
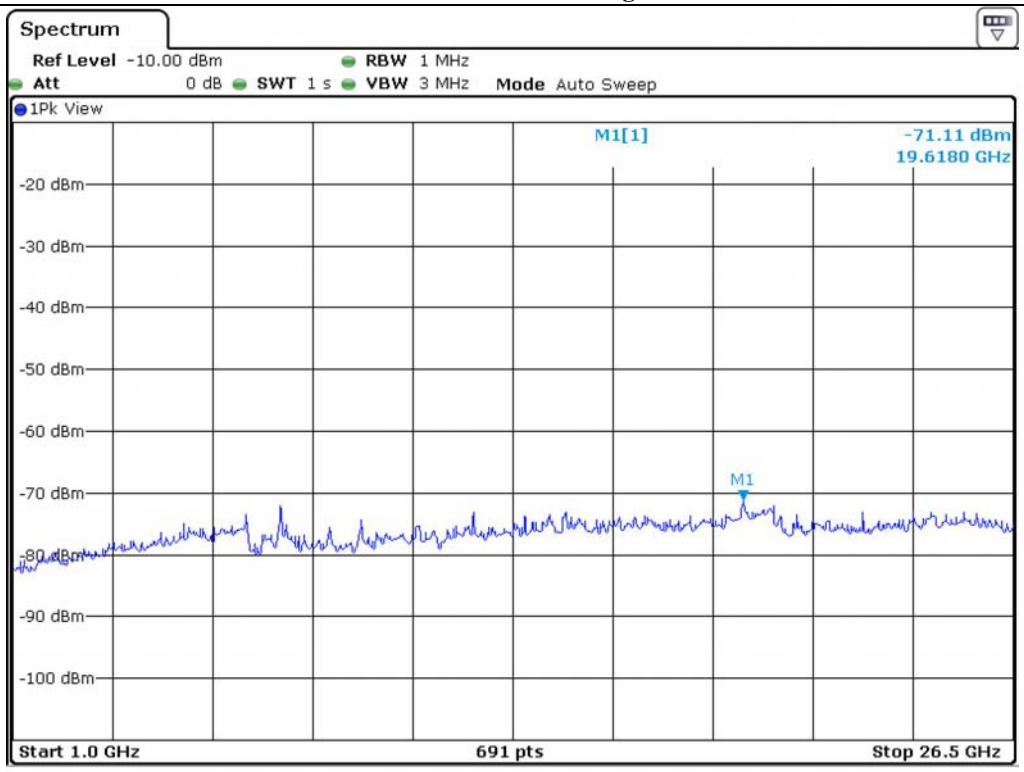


Middle Channel - Receiving Mode



Middle Channel - Receiving Mode

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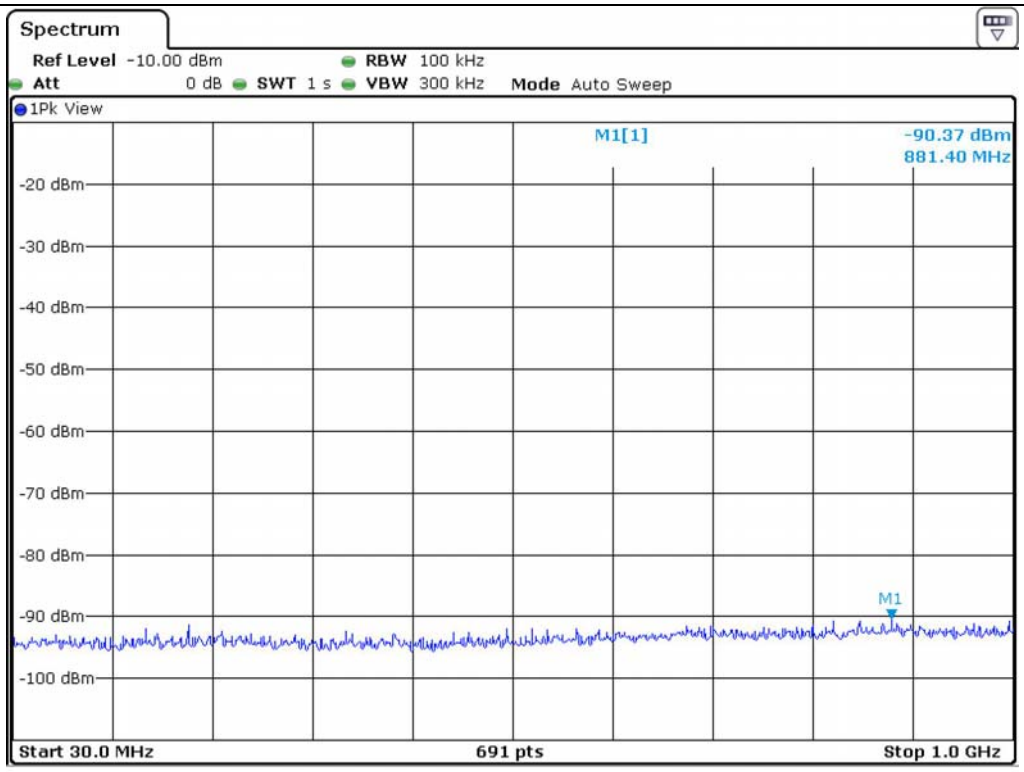
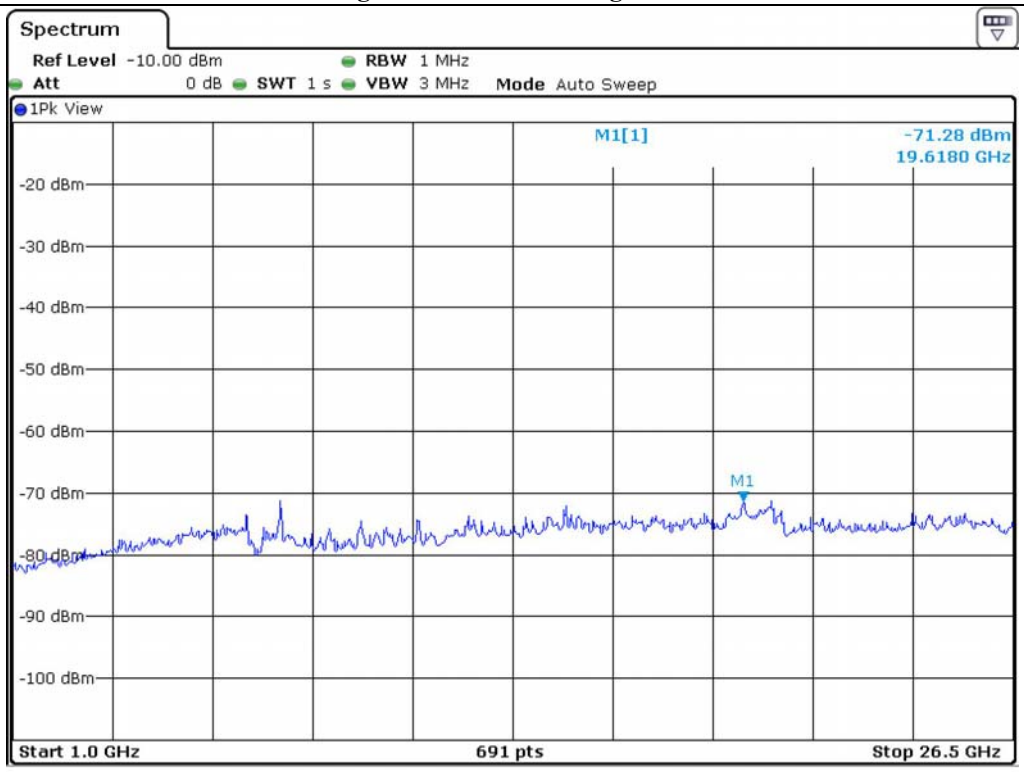


High Channel - Receiving Mode



High Channel - Receiving Mode

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10.5.2 Test data - Radiated

10.5.2.1 Test data for Below 30 MHz

-. Test Date : April 04, 2014

-. Resolution bandwidth : 200 Hz (from 9 kHz to 0.15 MHz), 9 kHz (from 0.15 MHz to 30 MHz)

-. Frequency range : 9 kHz ~ 30 MHz

-. Measurement distance : 3 m

Frequency (MHz)	Reading (dBµV)	Ant. Pol. (H/V)	Ant. Factor (dB/m)	Cable Loss	Amp Gain	Emission Level(dBµV/m)	Limits (dBµV/m)	Margin (dB)
It was not observed any emissions from the EUT.								

Tested by: Tae-Ho, Kim / Project Engineer

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10.5.2.2 Test data for 30 MHz ~ 1 000 MHz

-. Test Date : April 04, 2014

-. Resolution bandwidth : 120 kHz

-. Frequency range : 30 MHz ~ 1 000 MHz

-. Measurement distance : 3 m

Frequency (MHz)	Reading (dBμV)	Ant. Pol. (H/V)	Ant. Factor (dB/m)	Cable Loss	Amp Gain	Emission Level(dBμV/m)	Limits (dBμV/m)	Margin (dB)
Test Data for Low Channel								
48.43	37.60	V	15.20	7.40	33.20	27.00	40.00	13.00
53.28	38.90	H	14.80	7.40	33.20	27.90	40.00	12.10
204.60	47.00	H	12.40	8.80	33.00	35.20	43.50	8.30
240.49	45.60	H	13.30	9.10	33.00	35.00	46.00	11.00
304.51	46.50	H	14.90	9.50	33.00	37.90	46.00	8.10
480.08	40.50	H	18.10	10.50	33.10	36.00	46.00	10.00
Test Data for Middle Channel								
48.43	37.30	V	15.20	7.40	33.20	26.70	40.00	13.30
53.28	38.70	H	14.80	7.40	33.20	27.70	40.00	12.30
204.60	46.40	H	12.40	8.80	33.00	34.60	43.50	8.90
240.49	46.20	H	13.30	9.10	33.00	35.60	46.00	10.40
304.51	46.70	H	14.90	9.50	33.00	38.10	46.00	7.90
480.08	40.70	H	18.10	10.50	33.10	36.20	46.00	9.80
Test Data for High Channel								
48.43	36.60	V	15.20	7.40	33.20	26.00	40.00	14.00
53.28	39.00	H	14.80	7.40	33.20	28.00	40.00	12.00
204.60	47.60	H	12.40	8.80	33.00	35.80	43.50	7.70
240.49	44.70	H	13.30	9.10	33.00	34.10	46.00	11.90
304.51	45.50	H	14.90	9.50	33.00	36.90	46.00	9.10
480.08	41.50	H	18.10	10.50	33.10	37.00	46.00	9.00

Tabulated test data for Radiated Electromagnetic Field

Remark: “H”: Horizontal, “V”: Vertical

Margin (dB) = Limits (dBμV/m) - Emission Level (dBμV/m)

Tested by: Tae-Ho, Kim / Project Engineer

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10.5.2.3 Test data for above 1 GHz

-. Test Date : April 04, 2014

-. Resolution bandwidth : 1 MHz for Peak and Average Mode

-. Video bandwidth : 1 MHz for Peak Mode, 10 Hz for Average Mode

-. Frequency range : 1 GHz ~ 26.5 GHz

-. Measurement distance : 3 m

Frequency (MHz)	Reading (dBµV)	Ant. Pol. (H/V)	Ant. Factor (dB/m)	Cable Loss	Amp Gain	Emission Level(dBµV/m)	Limits (dBµV/m)	Margin (dB)
It was not observed any emissions from the EUT.								

Tested by: Tae-Ho, Kim / Project Engineer

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10.6 Test data for 802.11g WLAN Mode

10.6.1 Test data – Conducted

-. Test Date : April 01, 2014

-. Resolution bandwidth : 120 kHz / 1 MHz

-. Frequency range : 30 MHz ~ 26.5 GHz

-. Test Result : Pass

Frequency (MHz)	Spectrum Reading (dBm)	Cable Loss (dB)	Total (dBm)
Test result for Low Channel			
905.18	-91.18	0.33	-90.85
19 618.00	-71.09	3.20	-67.89
Test result for Middle Channel			
975.40	-90.56	0.35	-90.21
19 618.00	-71.33	3.20	-68.13
Test result for High Channel			
971.20	-90.33	0.35	-89.98
19 618.00	-71.60	3.20	-68.40

Tested by: Tae-Ho, Kim / Project Engineer

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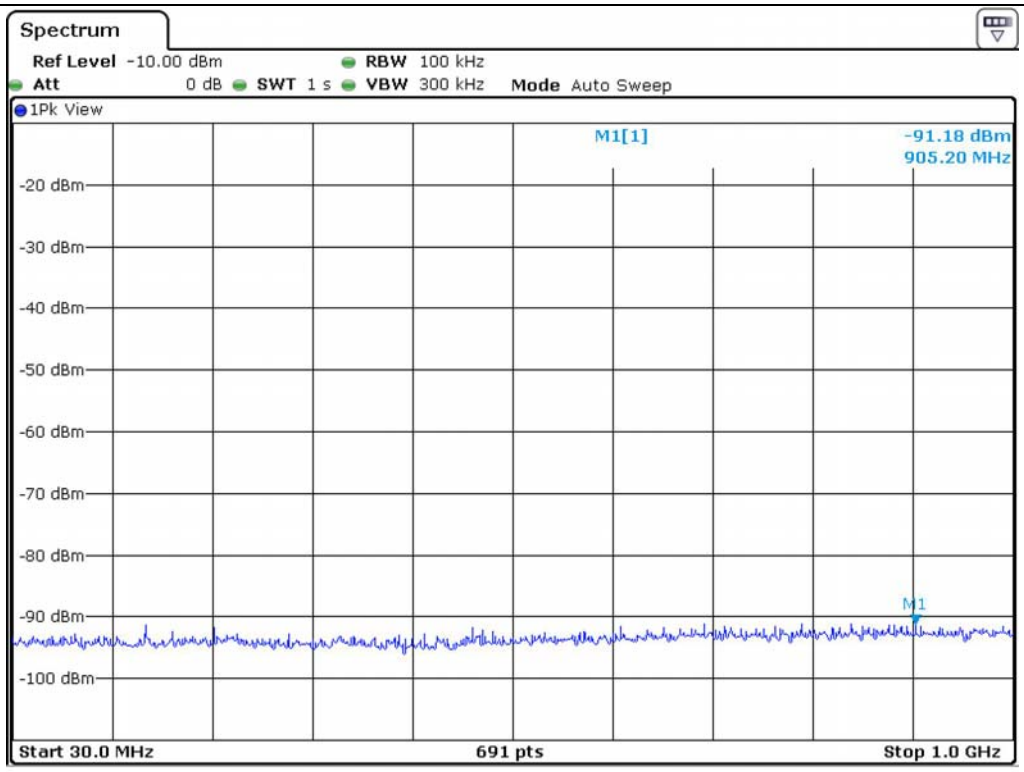
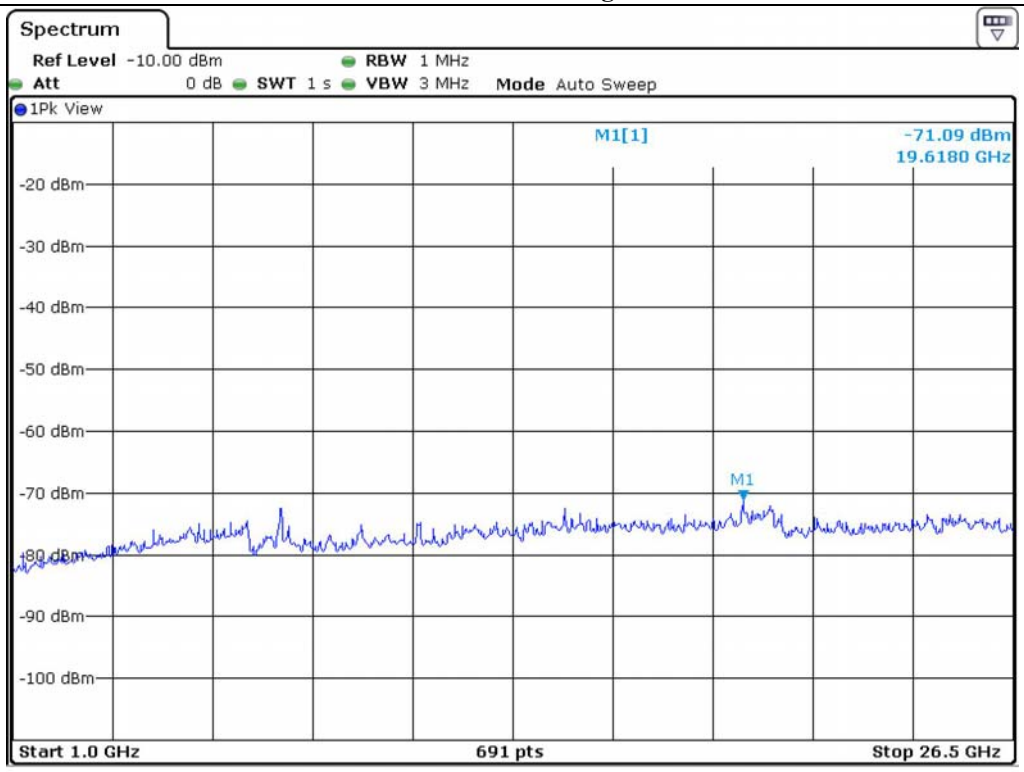


Low Channel - Receiving Mode



Low Channel - Receiving Mode

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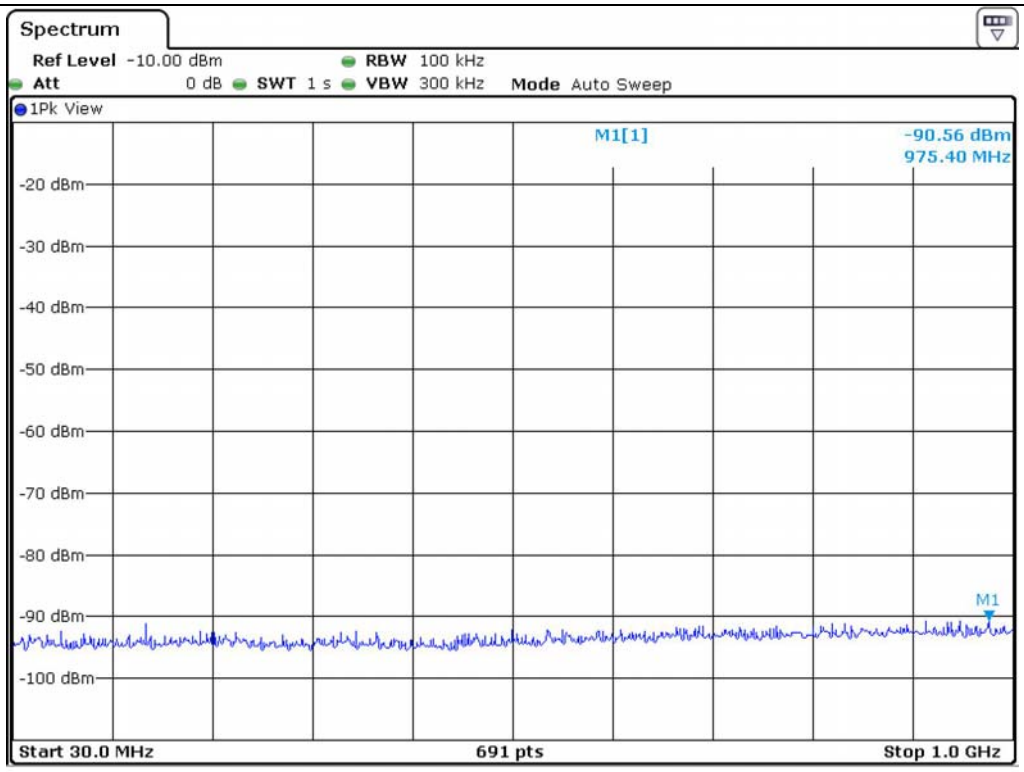
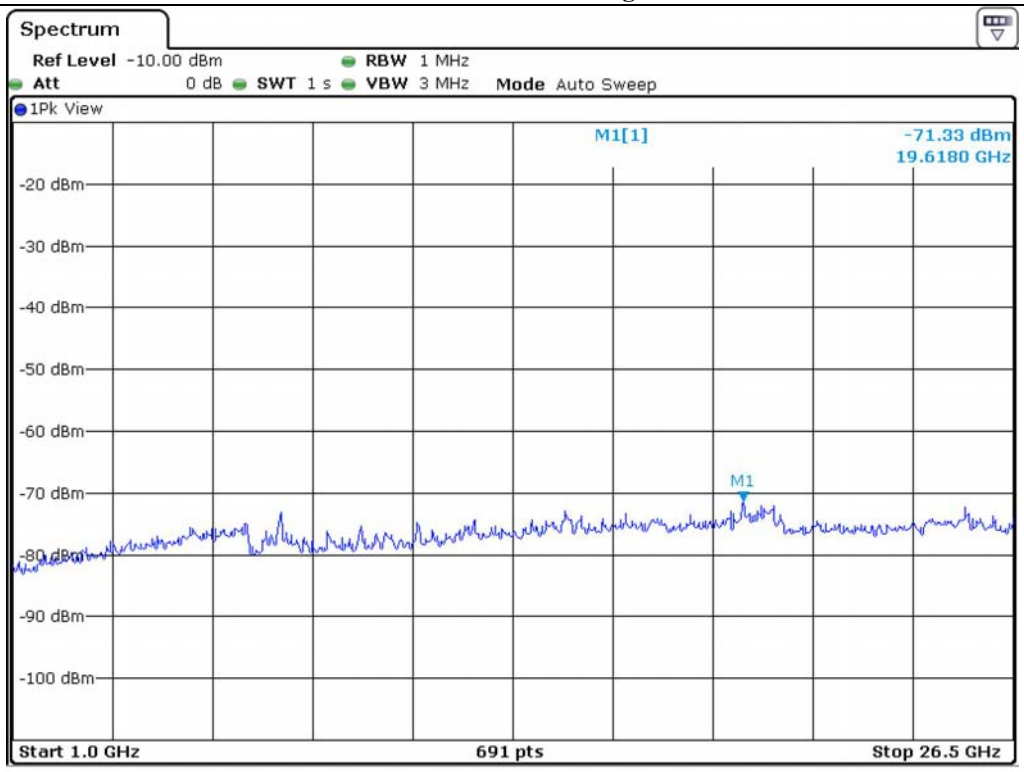


Middle Channel - Receiving Mode



Middle Channel - Receiving Mode

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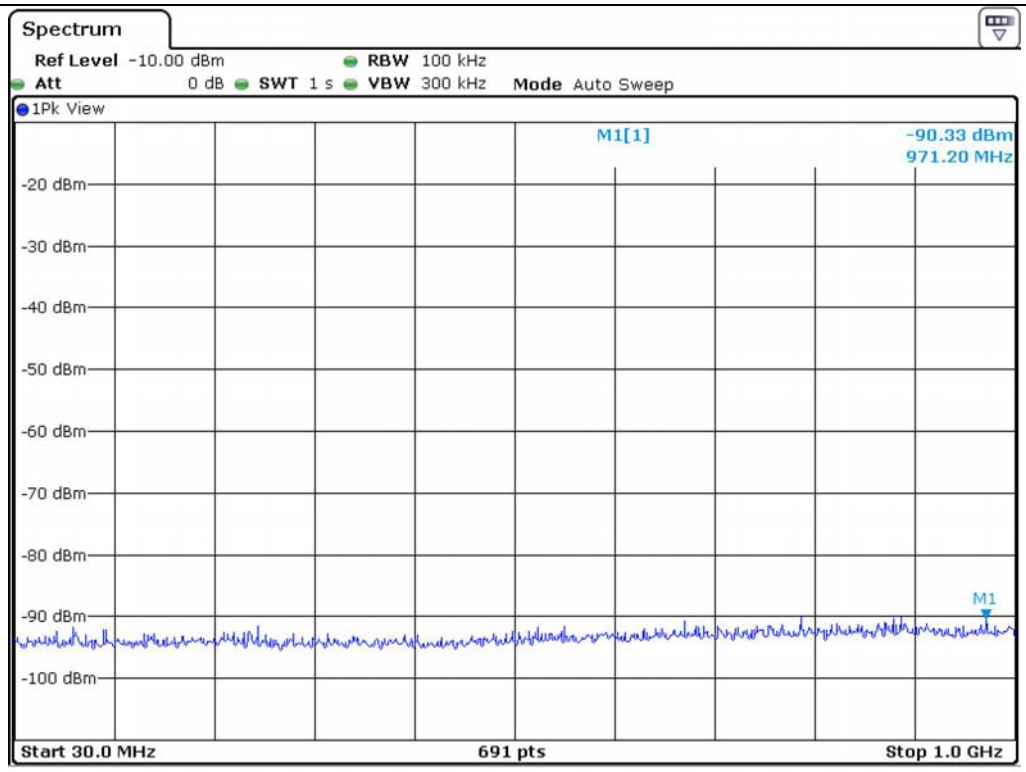
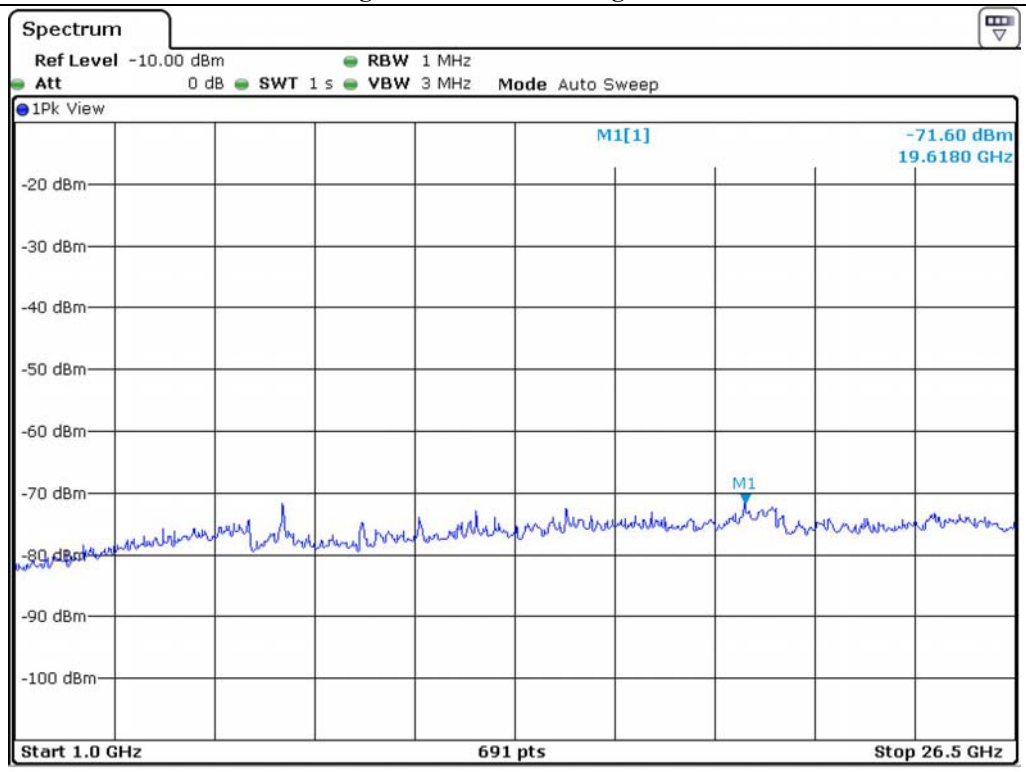


High Channel - Receiving Mode



High Channel - Receiving Mode

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10.6.2 Test data - Radiated

10.6.2.1 Test data for Below 30 MHz

-. Test Date : April 04, 2014

-. Resolution bandwidth : 200 Hz (from 9 kHz to 0.15 MHz), 9 kHz (from 0.15 MHz to 30 MHz)

-. Frequency range : 9 kHz ~ 30 MHz

-. Measurement distance : 3 m

Frequency (MHz)	Reading (dBµV)	Ant. Pol. (H/V)	Ant. Factor (dB/m)	Cable Loss	Amp Gain	Emission Level(dBµV/m)	Limits (dBµV/m)	Margin (dB)
It was not observed any emissions from the EUT.								

Tested by: Tae-Ho, Kim / Project Engineer

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10.6.2.2 Test data for 30 MHz ~ 1 000 MHz

-. Test Date : April 04, 2014

-. Resolution bandwidth : 120 kHz

-. Frequency range : 30 MHz ~ 1 000 MHz

-. Measurement distance : 3 m

Frequency (MHz)	Reading (dBµV)	Ant. Pol. (H/V)	Ant. Factor (dB/m)	Cable Loss	Amp Gain	Emission Level(dBµV/m)	Limits (dBµV/m)	Margin (dB)
Test Data for Low Channel								
48.43	38.10	V	15.20	7.40	33.20	27.50	40.00	12.50
53.28	37.90	H	14.80	7.40	33.20	26.90	40.00	13.10
204.60	46.50	H	12.40	8.80	33.00	34.70	43.50	8.80
240.49	45.80	H	13.30	9.10	33.00	35.20	46.00	10.80
304.51	46.00	H	14.90	9.50	33.00	37.40	46.00	8.60
480.08	40.90	H	18.10	10.50	33.10	36.40	46.00	9.60
Test Data for Middle Channel								
48.43	38.20	V	15.20	7.40	33.20	27.60	40.00	12.40
53.28	38.20	H	14.80	7.40	33.20	27.20	40.00	12.80
204.60	47.50	H	12.40	8.80	33.00	35.70	43.50	7.80
240.49	46.50	H	13.30	9.10	33.00	35.90	46.00	10.10
304.51	45.80	H	14.90	9.50	33.00	37.20	46.00	8.80
480.08	39.70	H	18.10	10.50	33.10	35.20	46.00	10.80
Test Data for High Channel								
48.43	37.50	V	15.20	7.40	33.20	26.90	40.00	13.10
53.28	38.40	H	14.80	7.40	33.20	27.40	40.00	12.60
204.60	47.10	H	12.40	8.80	33.00	35.30	43.50	8.20
240.49	45.90	H	13.30	9.10	33.00	35.30	46.00	10.70
304.51	46.10	H	14.90	9.50	33.00	37.50	46.00	8.50
480.08	40.40	H	18.10	10.50	33.10	35.90	46.00	10.10

Tabulated test data for Radiated Electromagnetic Field

Remark: “H”: Horizontal, “V”: Vertical

Margin (dB) = Limits (dBµV/m) - Emission Level (dBµV/m)

Tested by: Tae-Ho, Kim / Project Engineer

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10.6.2.3 Test data for above 1 GHz

-. Test Date : April 04, 2014

-. Resolution bandwidth : 1 MHz for Peak and Average Mode

-. Video bandwidth : 1 MHz for Peak Mode, 10 Hz for Average Mode

-. Frequency range : 1 GHz ~ 26.5 GHz

-. Measurement distance : 3 m

Frequency (MHz)	Reading (dBµV)	Ant. Pol. (H/V)	Ant. Factor (dB/m)	Cable Loss	Amp Gain	Emission Level(dBµV/m)	Limits (dBµV/m)	Margin (dB)
It was not observed any emissions from the EUT.								

Tested by: Tae-Ho, Kim / Project Engineer

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10.7 Test data for 802.11n_HT20 WLAN Mode

10.7.1 Test data – Conducted

-. Test Date : April 01, 2014

-. Resolution bandwidth : 120 kHz / 1 MHz

-. Frequency range : 30 MHz ~ 26.5 GHz

-. Test Result : Pass

Frequency (MHz)	Spectrum Reading (dBm)	Cable Loss (dB)	Total (dBm)
Test result for Low Channel			
905.20	-90.49	0.33	-90.16
19 618.00	-71.37	3.20	-68.17
Test result for Middle Channel			
871.60	-90.34	0.32	-90.02
19 618.00	-71.26	3.20	-68.06
Test result for High Channel			
943.20	-90.32	0.34	-89.98
19 618.00	-71.62	3.20	-68.42

Tested by: Tae-Ho, Kim / Project Engineer

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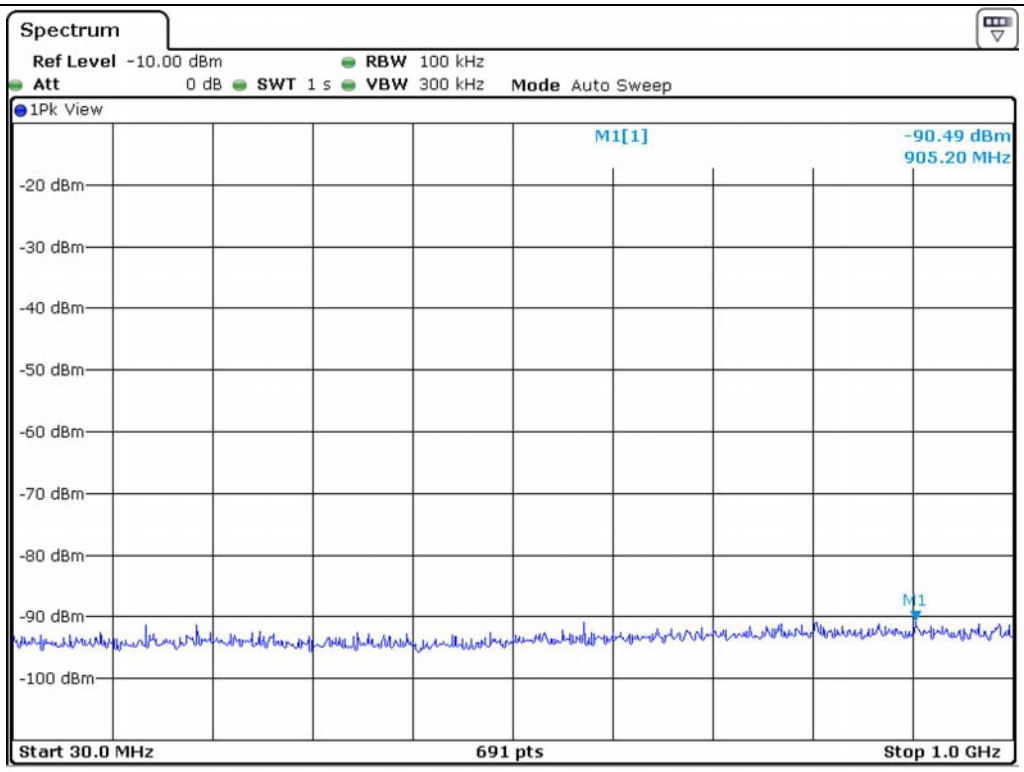
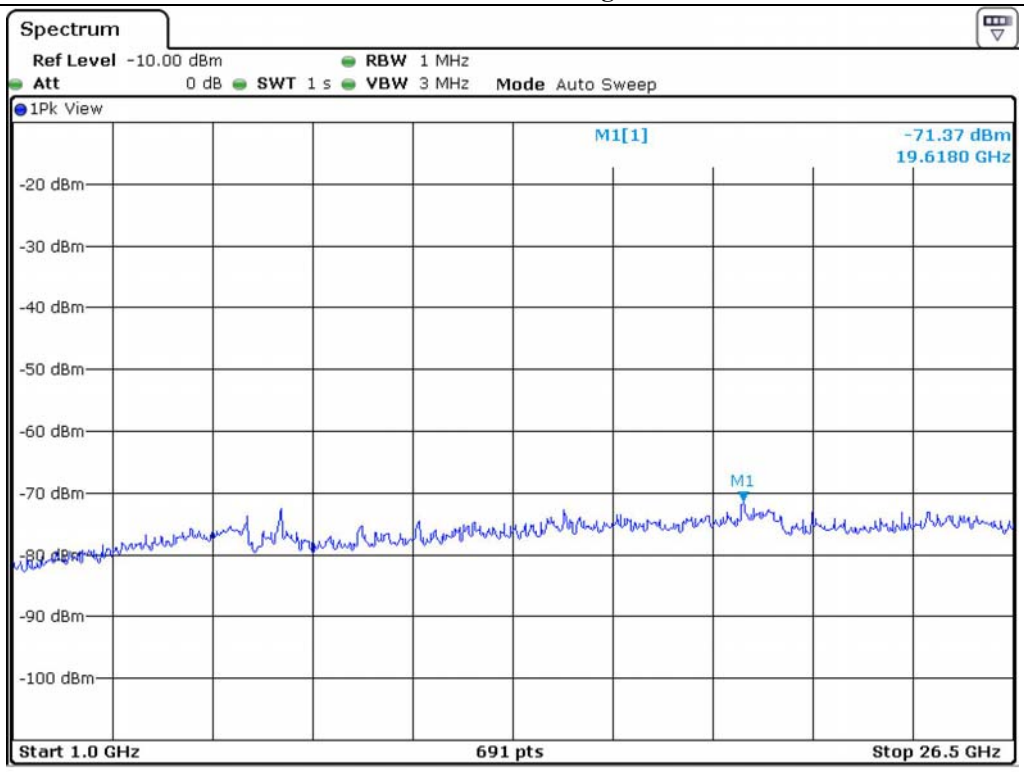


Low Channel - Receiving Mode



Low Channel - Receiving Mode

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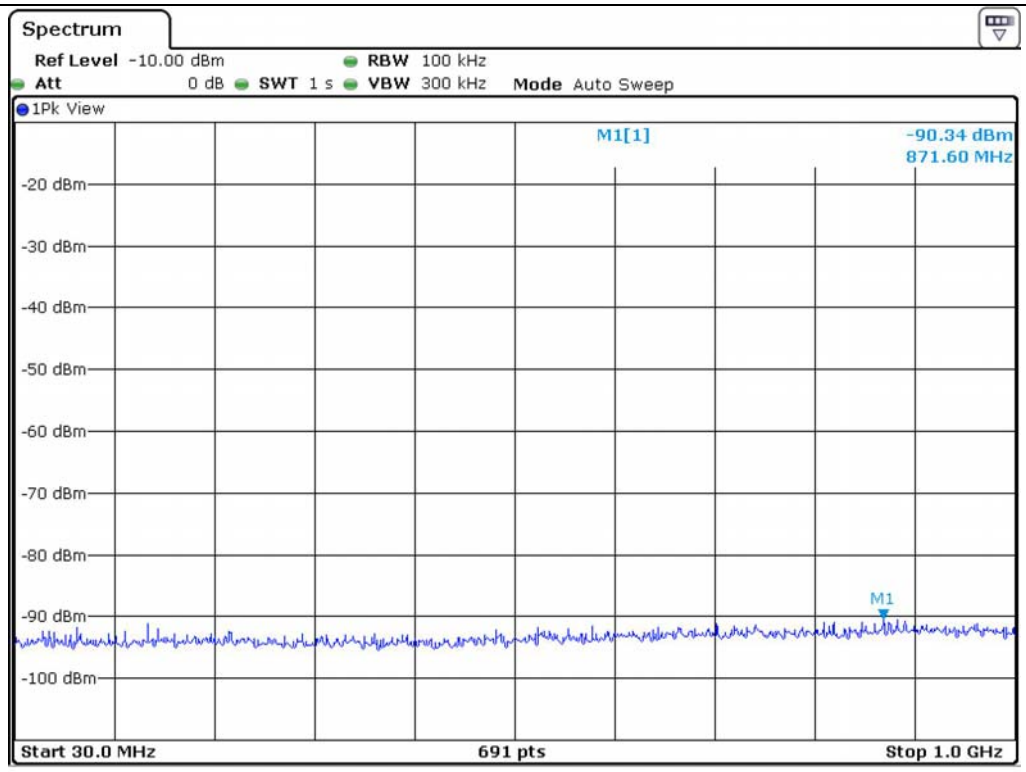
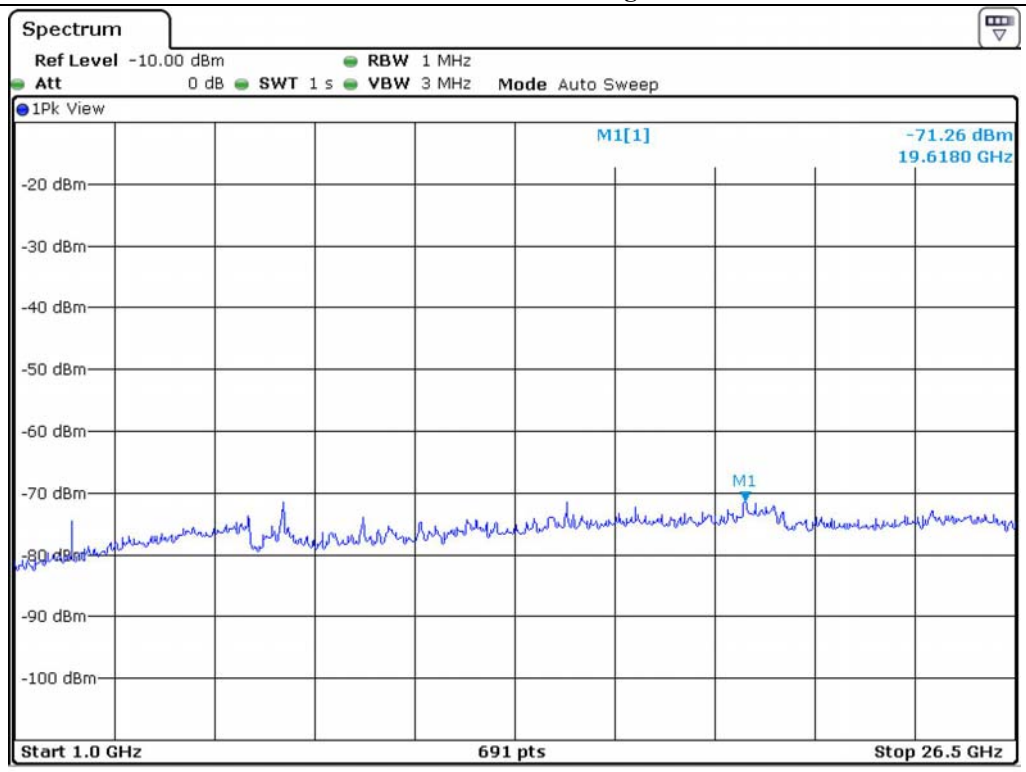


Middle Channel - Receiving Mode



Middle Channel - Receiving Mode

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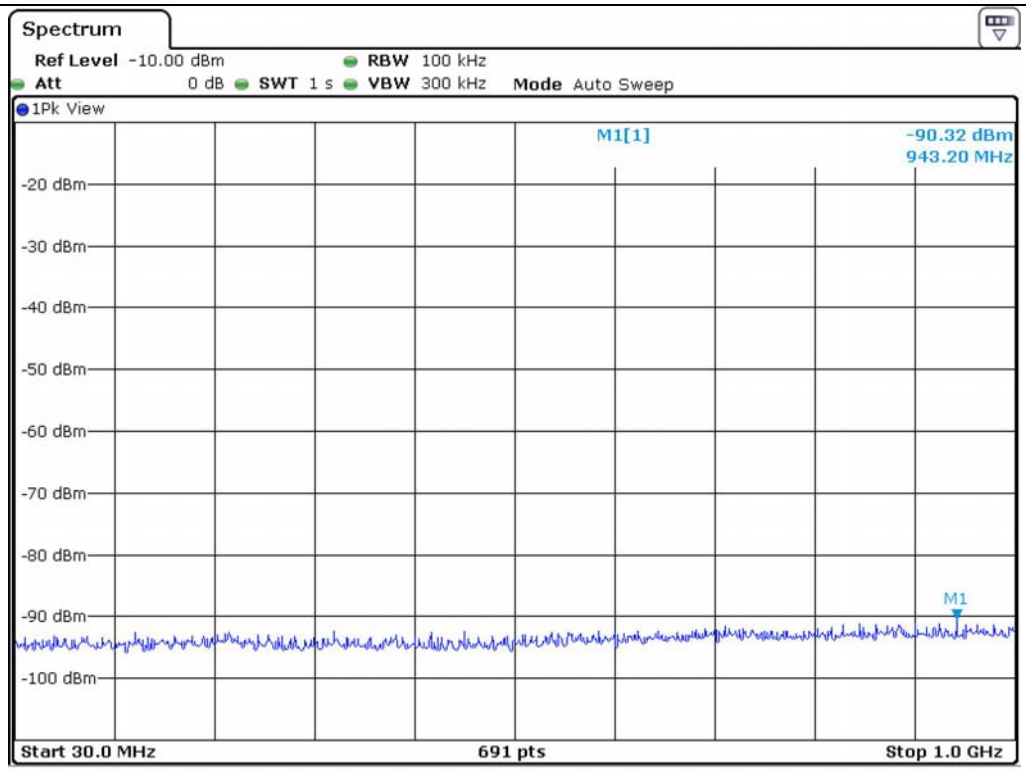
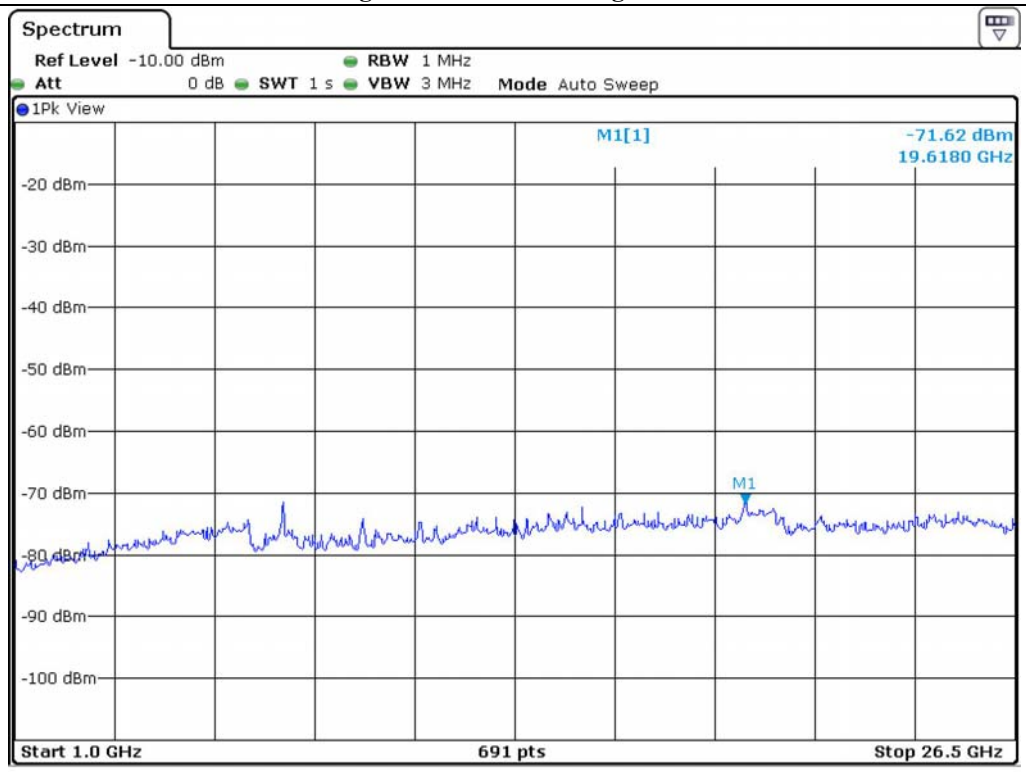


High Channel - Receiving Mode



High Channel - Receiving Mode

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10.7.2 Test data - Radiated

10.7.2.1 Test data for Below 30 MHz

-. Test Date : April 04, 2014

-. Resolution bandwidth : 200 Hz (from 9 kHz to 0.15 MHz), 9 kHz (from 0.15 MHz to 30 MHz)

-. Frequency range : 9 kHz ~ 30 MHz

-. Measurement distance : 3 m

Frequency (MHz)	Reading (dBμV)	Ant. Pol. (H/V)	Ant. Factor (dB/m)	Cable Loss	Amp Gain	Emission Level(dBμV/m)	Limits (dBμV/m)	Margin (dB)
It was not observed any emissions from the EUT.								

Tested by: Tae-Ho, Kim / Project Engineer

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10.7.2.2 Test data for 30 MHz ~ 1 000 MHz

-. Test Date : April 04, 2014

-. Resolution bandwidth : 120 kHz

-. Frequency range : 30 MHz ~ 1 000 MHz

-. Measurement distance : 3 m

Frequency (MHz)	Reading (dBμV)	Ant. Pol. (H/V)	Ant. Factor (dB/m)	Cable Loss	Amp Gain	Emission Level(dBμV/m)	Limits (dBμV/m)	Margin (dB)
Test Data for Low Channel								
48.43	38.80	V	15.20	7.40	33.20	28.20	40.00	11.80
53.28	39.70	H	14.80	7.40	33.20	28.70	40.00	11.30
204.60	45.50	H	12.40	8.80	33.00	33.70	43.50	9.80
240.49	45.00	H	13.30	9.10	33.00	34.40	46.00	11.60
304.51	45.70	H	14.90	9.50	33.00	37.10	46.00	8.90
480.08	42.30	H	18.10	10.50	33.10	37.80	46.00	8.20
Test Data for Middle Channel								
48.43	38.40	V	15.20	7.40	33.20	27.80	40.00	12.20
53.28	37.70	H	14.80	7.40	33.20	26.70	40.00	13.30
204.60	47.30	H	12.40	8.80	33.00	35.50	43.50	8.00
240.49	46.00	H	13.30	9.10	33.00	35.40	46.00	10.60
304.51	46.00	H	14.90	9.50	33.00	37.40	46.00	8.60
480.08	40.30	H	18.10	10.50	33.10	35.80	46.00	10.20
Test Data for High Channel								
48.43	37.10	V	15.20	7.40	33.20	26.50	40.00	13.50
53.28	38.30	H	14.80	7.40	33.20	27.30	40.00	12.70
204.60	48.70	H	12.40	8.80	33.00	36.90	43.50	6.60
240.49	44.70	H	13.30	9.10	33.00	34.10	46.00	11.90
304.51	45.80	H	14.90	9.50	33.00	37.20	46.00	8.80
480.08	40.80	H	18.10	10.50	33.10	36.30	46.00	9.70

Tabulated test data for Radiated Electromagnetic Field

Remark: “H”: Horizontal, “V”: Vertical

Margin (dB) = Limits (dBμV/m) - Emission Level (dBμV/m)

Tested by: Tae-Ho, Kim / Project Engineer

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10.7.2.3 Test data for above 1 GHz

-. Test Date : April 04, 2014

-. Resolution bandwidth : 1 MHz for Peak and Average Mode

-. Video bandwidth : 1 MHz for Peak Mode, 10 Hz for Average Mode

-. Frequency range : 1 GHz ~ 26.5 GHz

-. Measurement distance : 3 m

Frequency (MHz)	Reading (dBµV)	Ant. Pol. (H/V)	Ant. Factor (dB/m)	Cable Loss	Amp Gain	Emission Level(dBµV/m)	Limits (dBµV/m)	Margin (dB)
It was not observed any emissions from the EUT.								

Tested by: Tae-Ho, Kim / Project Engineer

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10.8 Test data for 802.11n_HT40 WLAN Mode

10.8.1 Test data– Conducted

-. Test Date : April 01, 2014

-. Resolution bandwidth : 120 kHz / 1 MHz

-. Frequency range : 30 MHz ~ 26.5 GHz

-. Test Result : Pass

Frequency (MHz)	Spectrum Reading (dBm)	Cable Loss (dB)	Total (dBm)
Test result for Low Channel			
992.84	-90.84	0.35	-90.49
19 618.00	-70.15	3.20	-66.95
Test result for Middle Channel			
861.70	-90.76	0.32	-90.44
19 618.00	-70.73	3.20	-67.53
Test result for High Channel			
996.50	-90.32	0.35	-89.97
19 618.00	-70.90	3.20	-67.70

Tested by: Tae-Ho, Kim / Project Engineer

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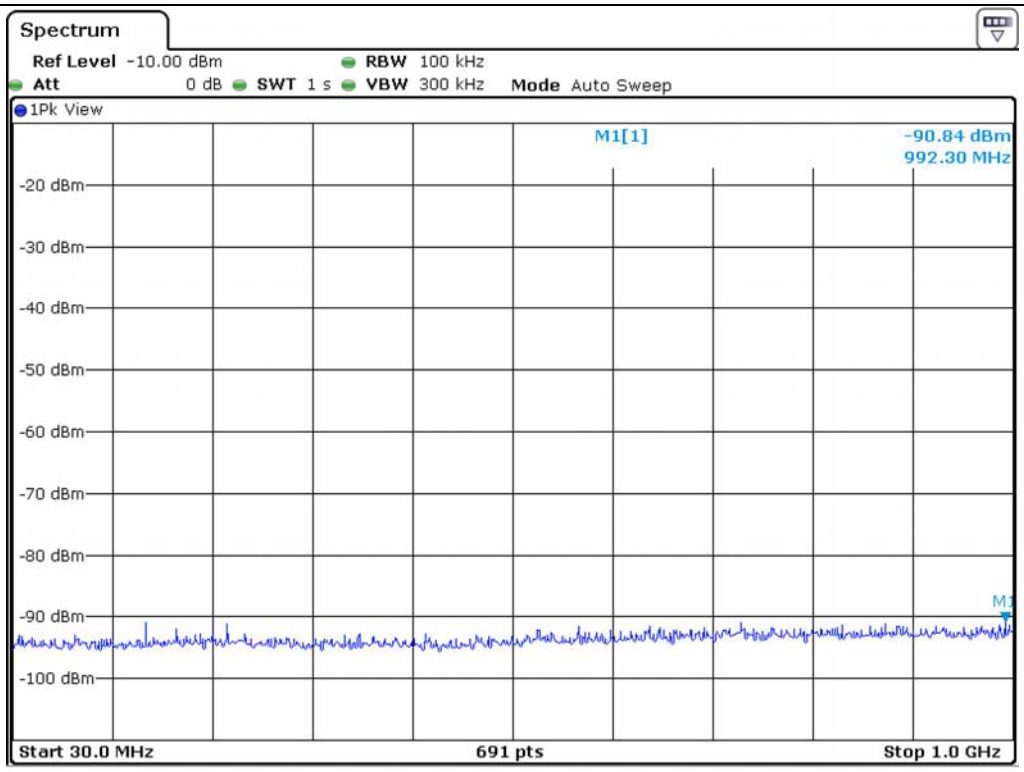
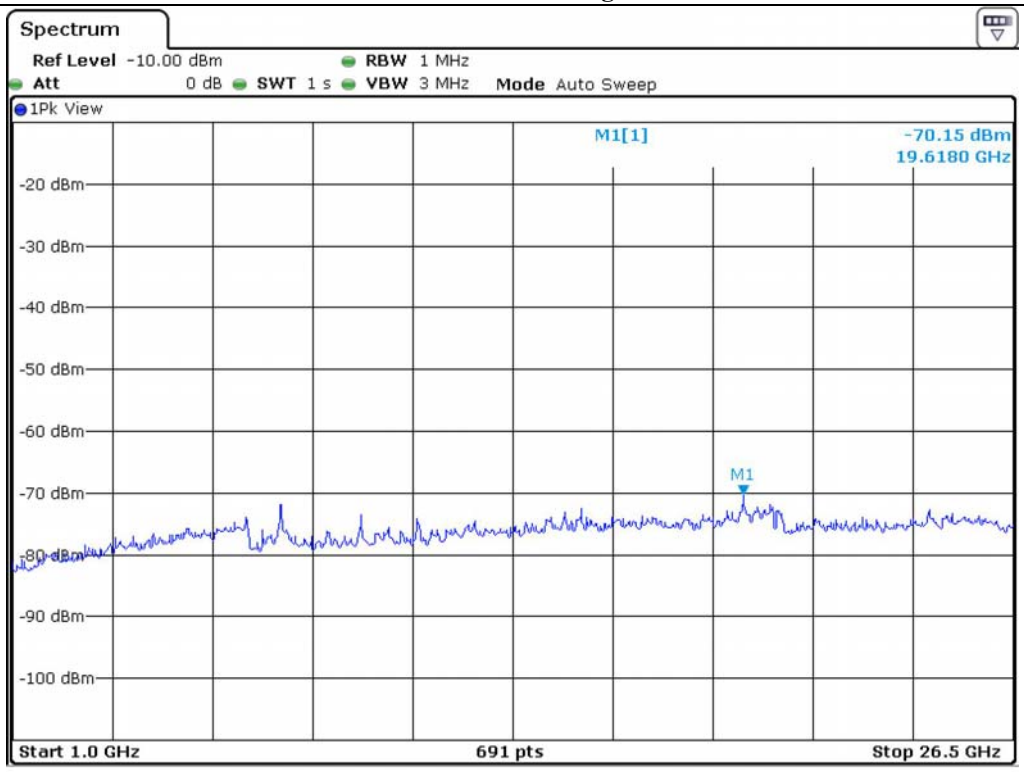


Low Channel - Receiving Mode



Low Channel - Receiving Mode

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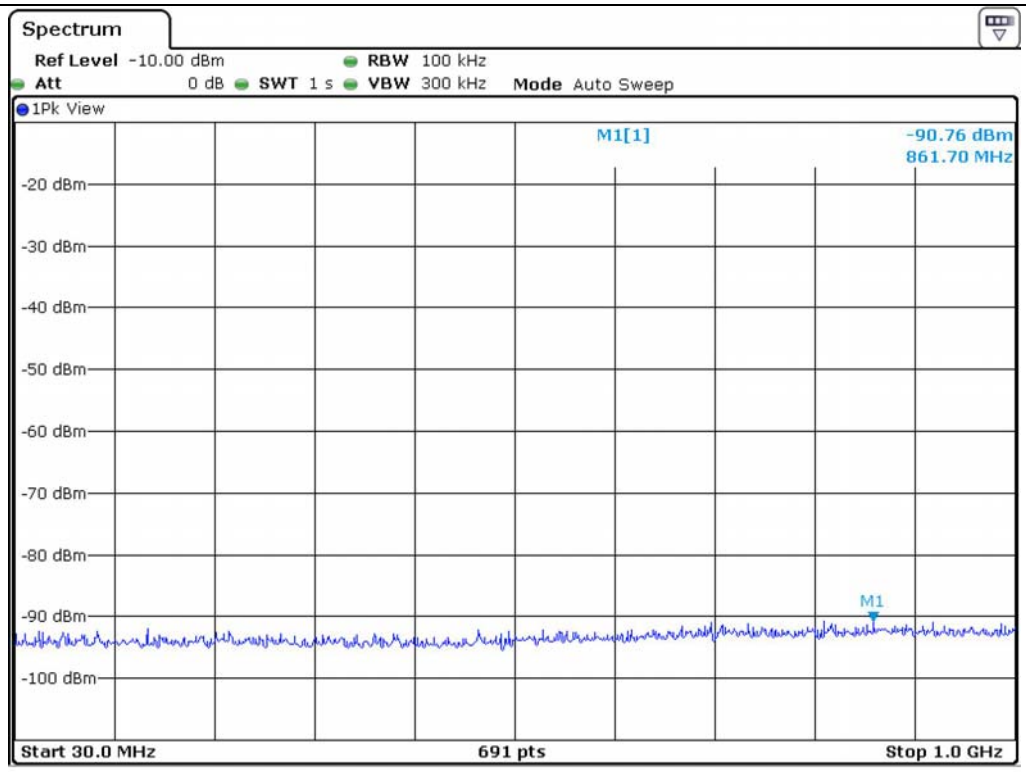
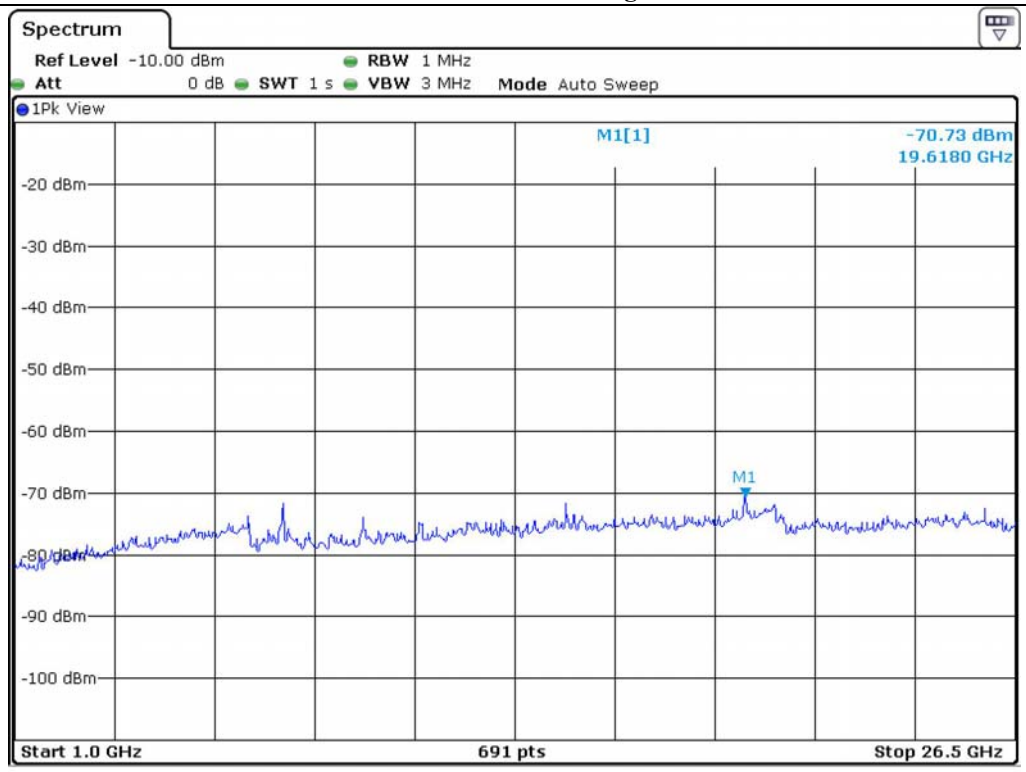


Middle Channel - Receiving Mode



Middle Channel - Receiving Mode

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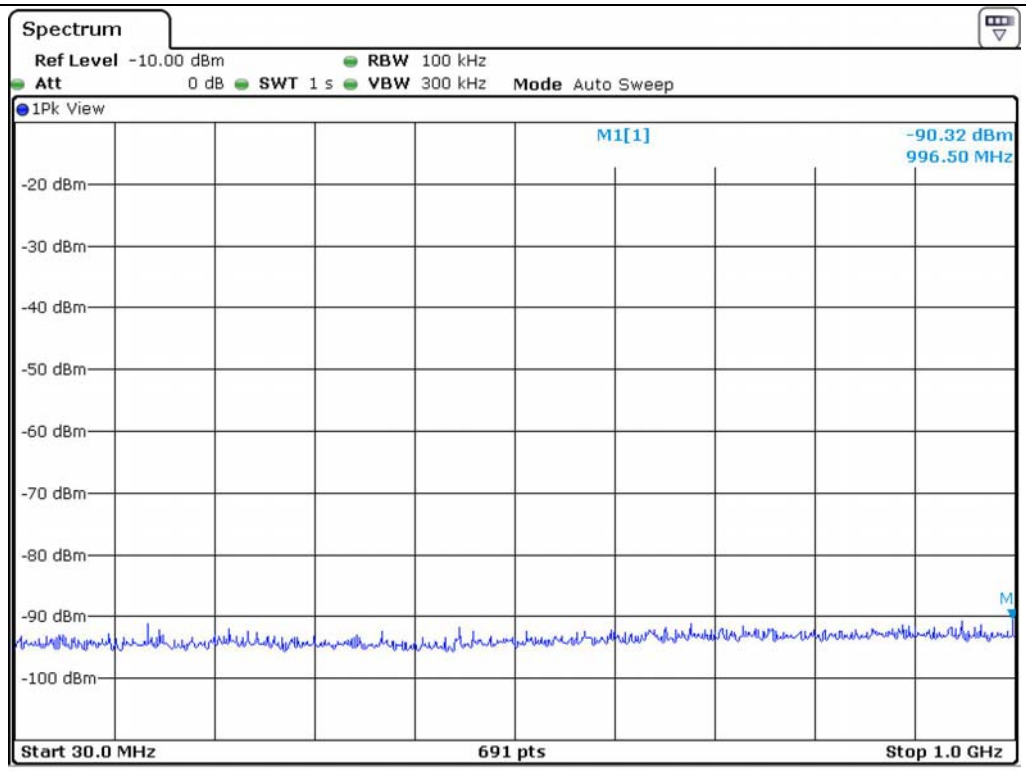
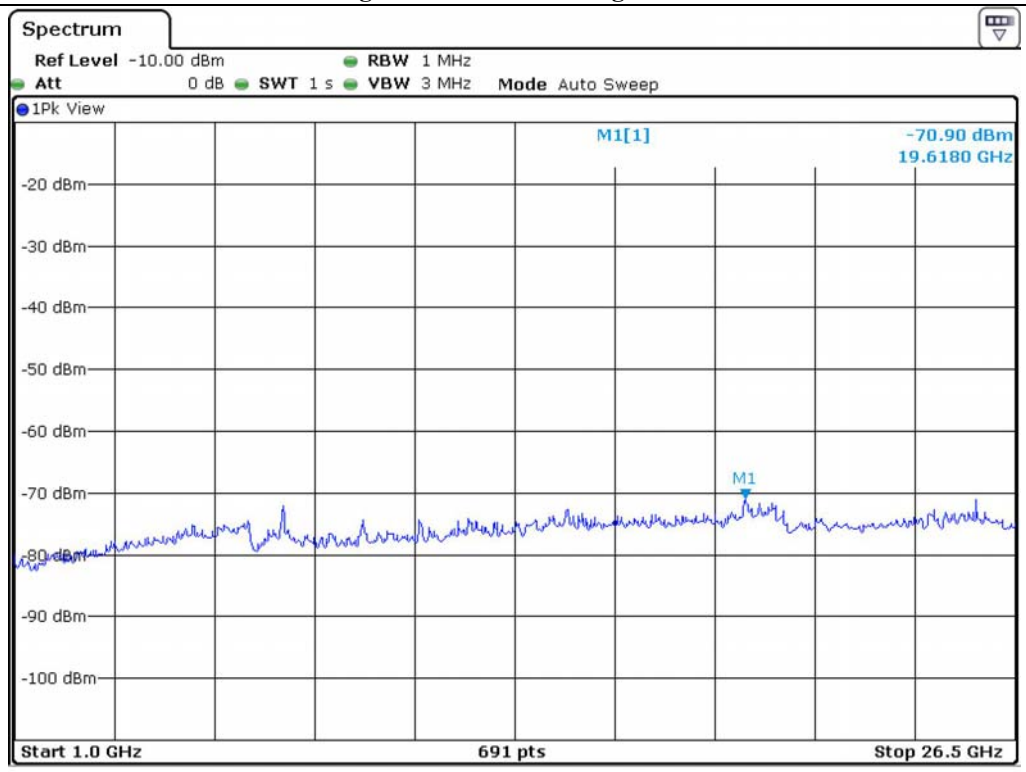


High Channel - Receiving Mode



High Channel - Receiving Mode

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10.8.2 Test data - Radiated

10.8.2.1 Test data for Below 30 MHz

-. Test Date : April 04, 2014

-. Resolution bandwidth : 200 Hz (from 9 kHz to 0.15 MHz), 9 kHz (from 0.15 MHz to 30 MHz)

-. Frequency range : 9 kHz ~ 30 MHz

-. Measurement distance : 3 m

Frequency (MHz)	Reading (dBμV)	Ant. Pol. (H/V)	Ant. Factor (dB/m)	Cable Loss	Amp Gain	Emission Level(dBμV/m)	Limits (dBμV/m)	Margin (dB)
It was not observed any emissions from the EUT.								

Tested by: Tae-Ho, Kim / Project Engineer

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10.8.2.2 Test data for 30 MHz ~ 1 000 MHz

-. Test Date : April 04, 2014

-. Resolution bandwidth : 120 kHz

-. Frequency range : 30 MHz ~ 1 000 MHz

-. Measurement distance : 3 m

Frequency (MHz)	Reading (dBμV)	Ant. Pol. (H/V)	Ant. Factor (dB/m)	Cable Loss	Amp Gain	Emission Level(dBμV/m)	Limits (dBμV/m)	Margin (dB)
Test Data for Low Channel								
48.43	38.60	V	15.20	7.40	33.20	28.00	40.00	12.00
53.28	39.50	H	14.80	7.40	33.20	28.50	40.00	11.50
204.60	47.40	H	12.40	8.80	33.00	35.60	43.50	7.90
240.49	45.90	H	13.30	9.10	33.00	35.30	46.00	10.70
304.51	47.10	H	14.90	9.50	33.00	38.50	46.00	7.50
480.08	41.10	H	18.10	10.50	33.10	36.60	46.00	9.40
Test Data for Middle Channel								
48.43	36.70	V	15.20	7.40	33.20	26.10	40.00	13.90
53.28	39.20	H	14.80	7.40	33.20	28.20	40.00	11.80
204.60	46.60	H	12.40	8.80	33.00	34.80	43.50	8.70
240.49	46.20	H	13.30	9.10	33.00	35.60	46.00	10.40
304.51	46.90	H	14.90	9.50	33.00	38.30	46.00	7.70
480.08	40.10	H	18.10	10.50	33.10	35.60	46.00	10.40
Test Data for High Channel								
48.43	37.50	V	15.20	7.40	33.20	26.90	40.00	13.10
53.28	39.30	H	14.80	7.40	33.20	28.30	40.00	11.70
204.60	46.90	H	12.40	8.80	33.00	35.10	43.50	8.40
240.49	45.70	H	13.30	9.10	33.00	35.10	46.00	10.90
304.51	46.80	H	14.90	9.50	33.00	38.20	46.00	7.80
480.08	41.30	H	18.10	10.50	33.10	36.80	46.00	9.20

Tabulated test data for Radiated Electromagnetic Field

Remark: “H”: Horizontal, “V”: Vertical

Margin (dB) = Limits (dBμV/m) - Emission Level (dBμV/m)

Tested by: Tae-Ho, Kim / Project Engineer

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10.8.2.3 Test data for above 1 GHz

-. Test Date : April 04, 2014

-. Resolution bandwidth : 1 MHz for Peak and Average Mode

-. Video bandwidth : 1 MHz for Peak Mode, 10 Hz for Average Mode

-. Frequency range : 1 GHz ~ 26.5 GHz

-. Measurement distance : 3 m

Frequency (MHz)	Reading (dBμV)	Ant. Pol. (H/V)	Ant. Factor (dB/m)	Cable Loss	Amp Gain	Emission Level(dBμV/m)	Limits (dBμV/m)	Margin (dB)
It was not observed any emissions from the EUT.								

Tested by: Tae-Ho, Kim / Project Engineer

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11. PEAK POWER SPECTRUL DENSITY

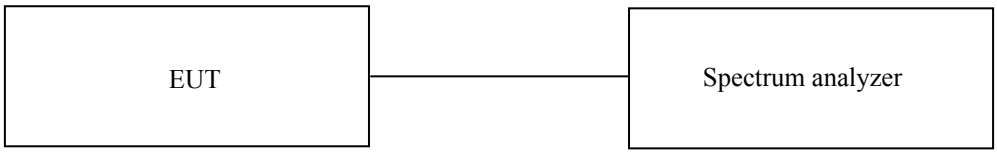
11.1 Operating environment

Temperature : 22 °C

Relative humidity : 41 % R.H.

11.2 Test set-up

The antenna output of the EUT was connected to the spectrum analyzer. The resolution bandwidth is set to 3 kHz, the video bandwidth is set to 3 times the resolution bandwidth.



11.3 Test equipment used

	Model Number	Manufacturer	Description	Serial Number	Last Cal.
■ -	FSV30	R/S	Spectrum Analyzer	101372	May 20, 2013

All test equipment used is calibrated on a regular basis.

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11.4 Test data for 802.11b WLAN Mode

-. Test Date : April 01, 2014

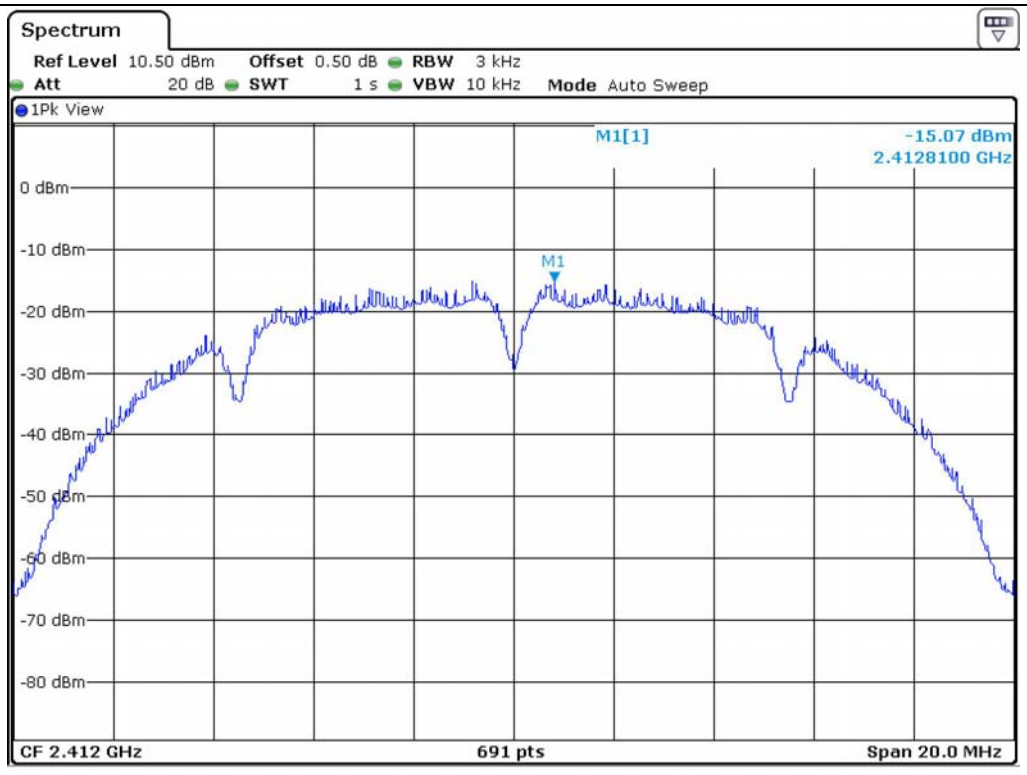
-. Test Result : Pass

-. Operating Condition : Continuous transmitting mode

CHANNEL	FREQUENCY(MHz)	MEASURED VLAUE (dBm)	LIMIT (dBm)	MARGIN (dB)
Low	2 412	-15.07	8.00	23.07
Middle	2 442	-14.37	8.00	22.37
High	2 462	-14.51	8.00	22.51

Remark. Margin = Limit – Measured value

Tested by: Tae-Ho, Kim / Project Engineer



Low Channel

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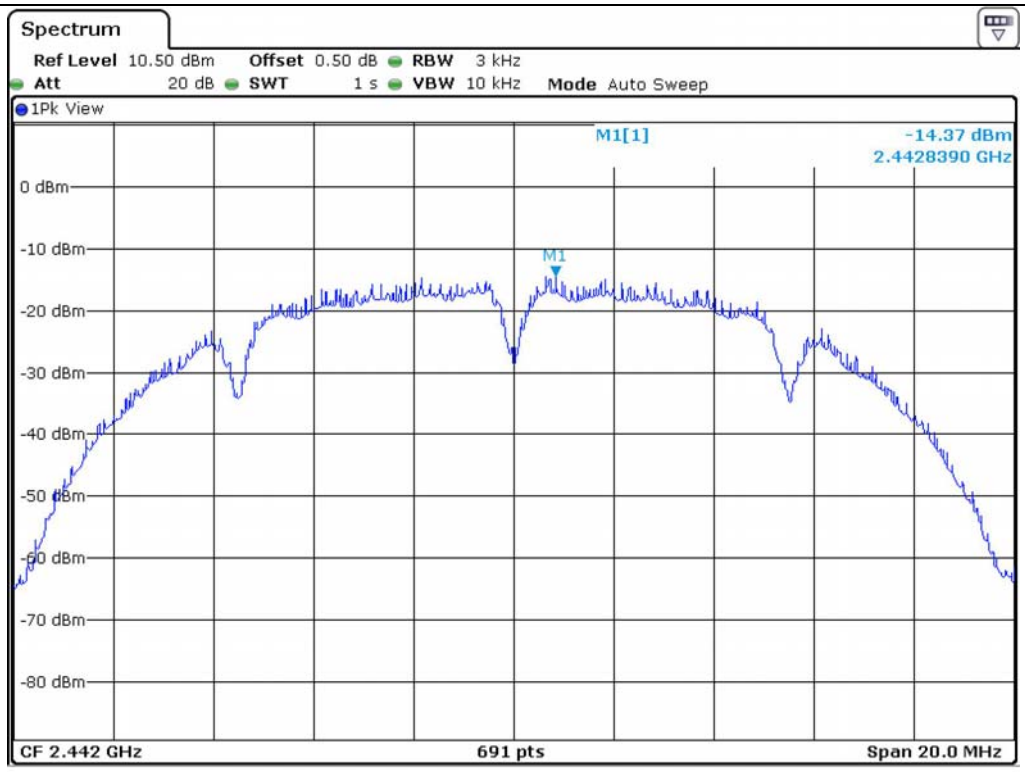
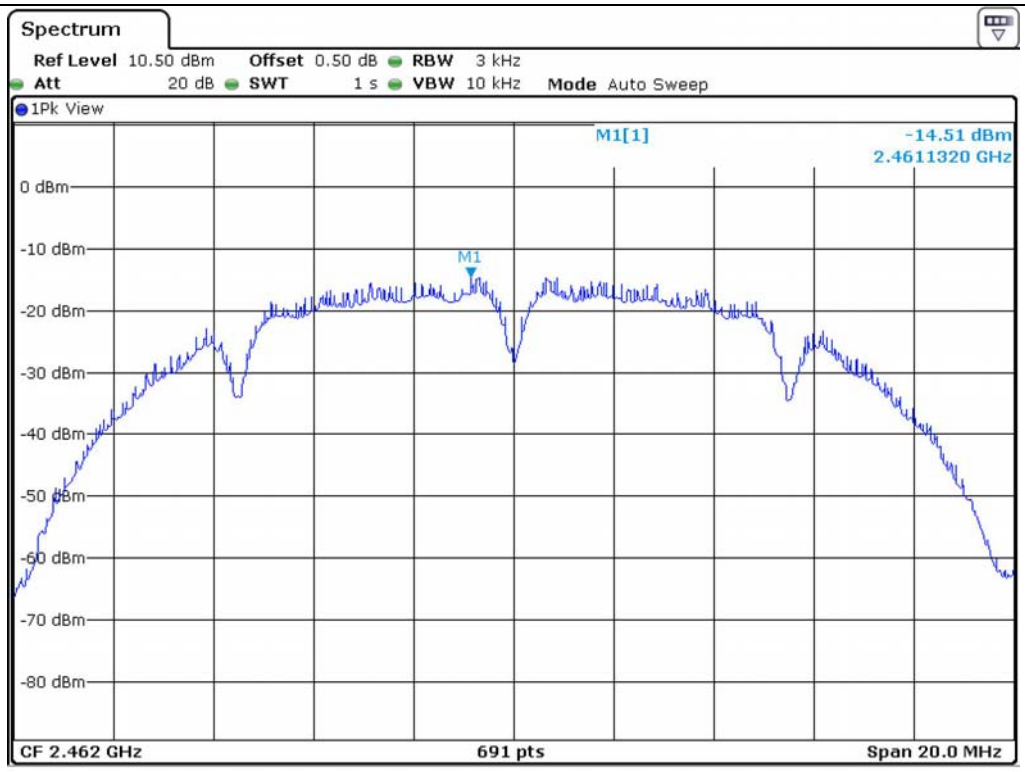


Middle Channel



High Channel

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11.5 Test data for 802.11g WLAN Mode

-. Test Date : April 01, 2014

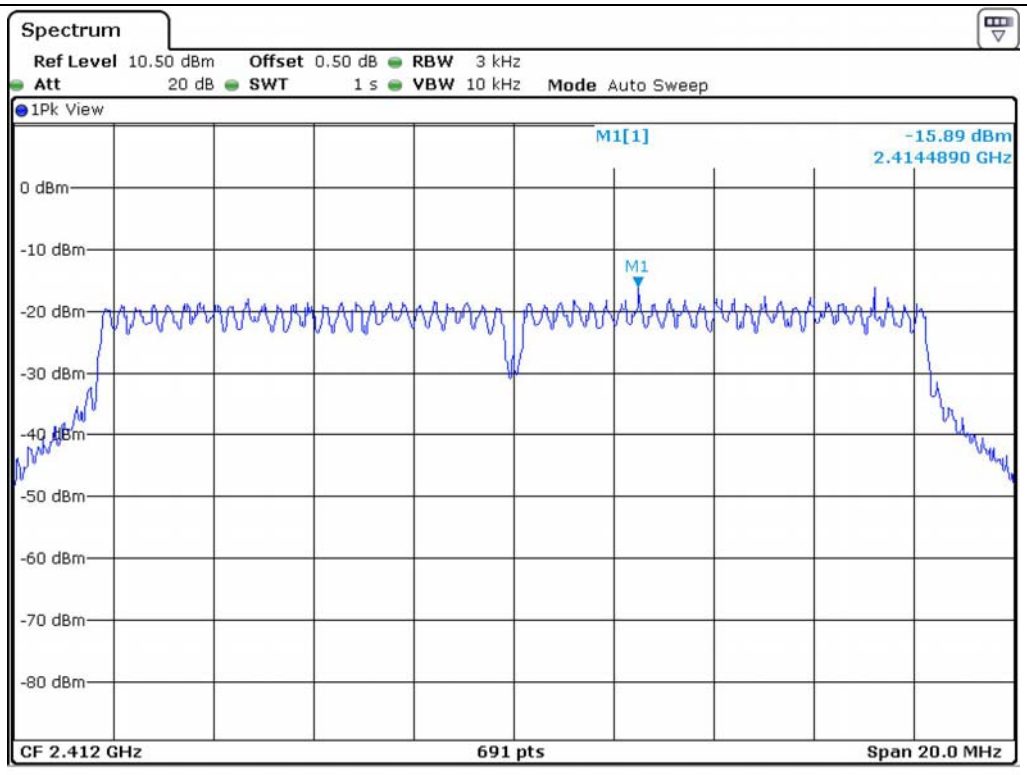
-. Test Result : Pass

-. Operating Condition : Continuous transmitting mode

CHANNEL	FREQUENCY(MHz)	MEASURED VLAUE (dBm)	LIMIT (dBm)	MARGIN (dB)
Low	2 412	-15.89	8.00	23.89
Middle	2 442	-16.23	8.00	24.23
High	2 462	-16.52	8.00	24.52

Remark. Margin = Limit – Measured value

Tested by: Tae-Ho, Kim / Project Engineer



Low Channel

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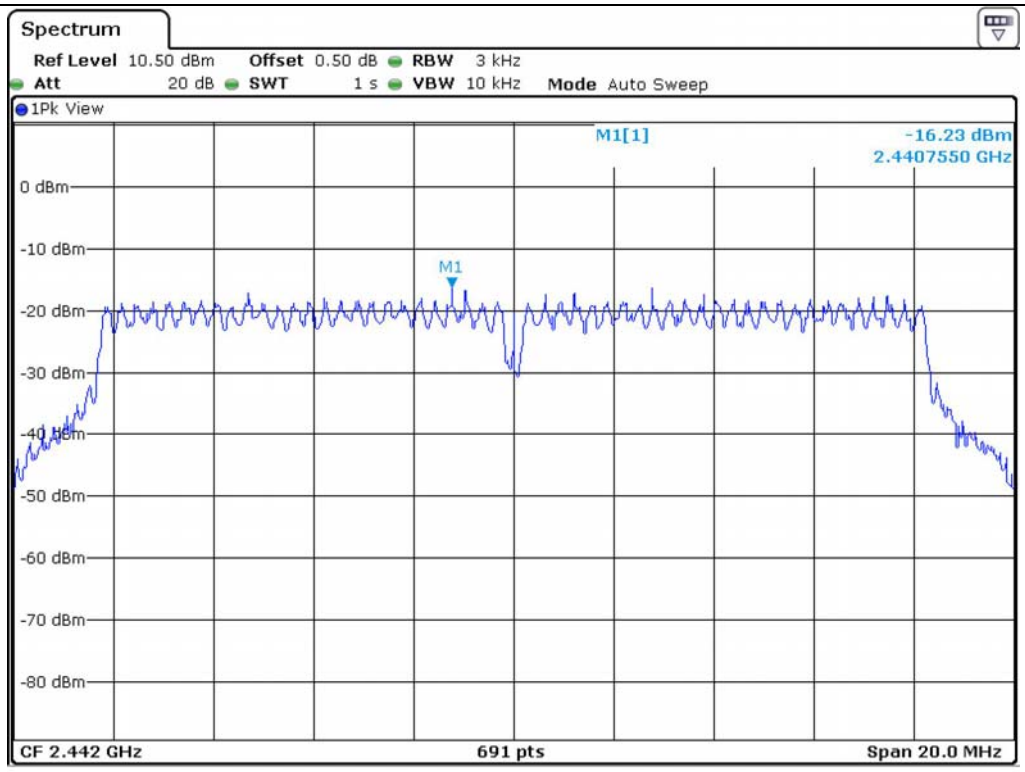
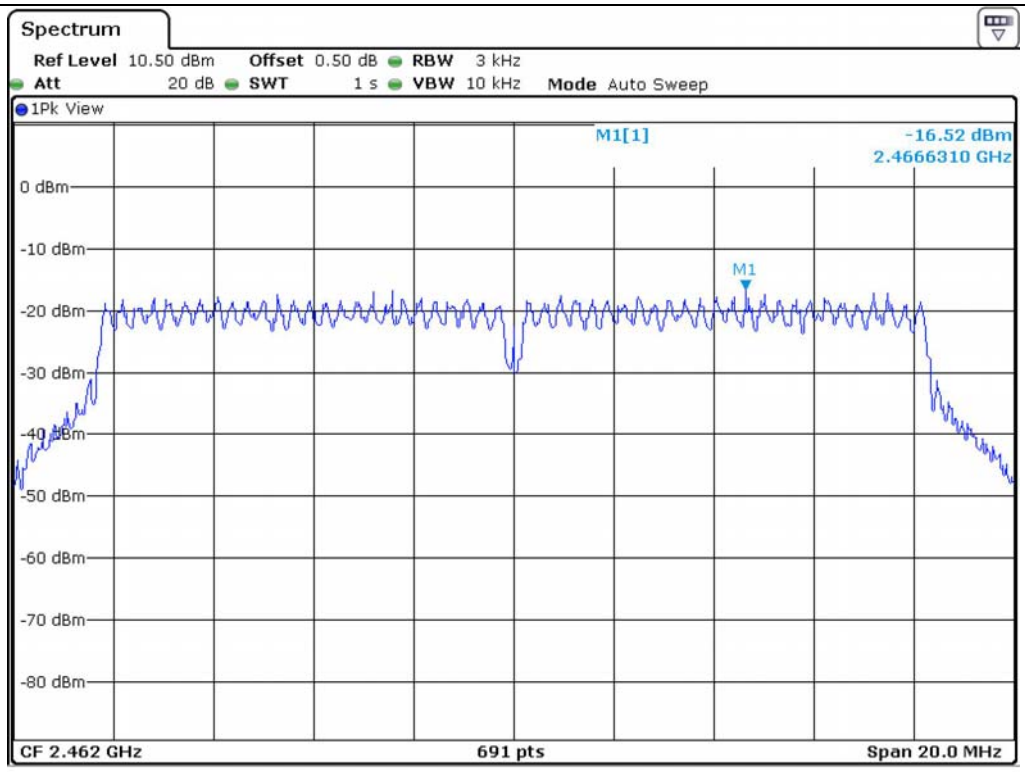


Middle Channel



High Channel

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11.6 Test data for 802.11n_HT20 WLAN Mode

-. Test Date : April 01, 2014

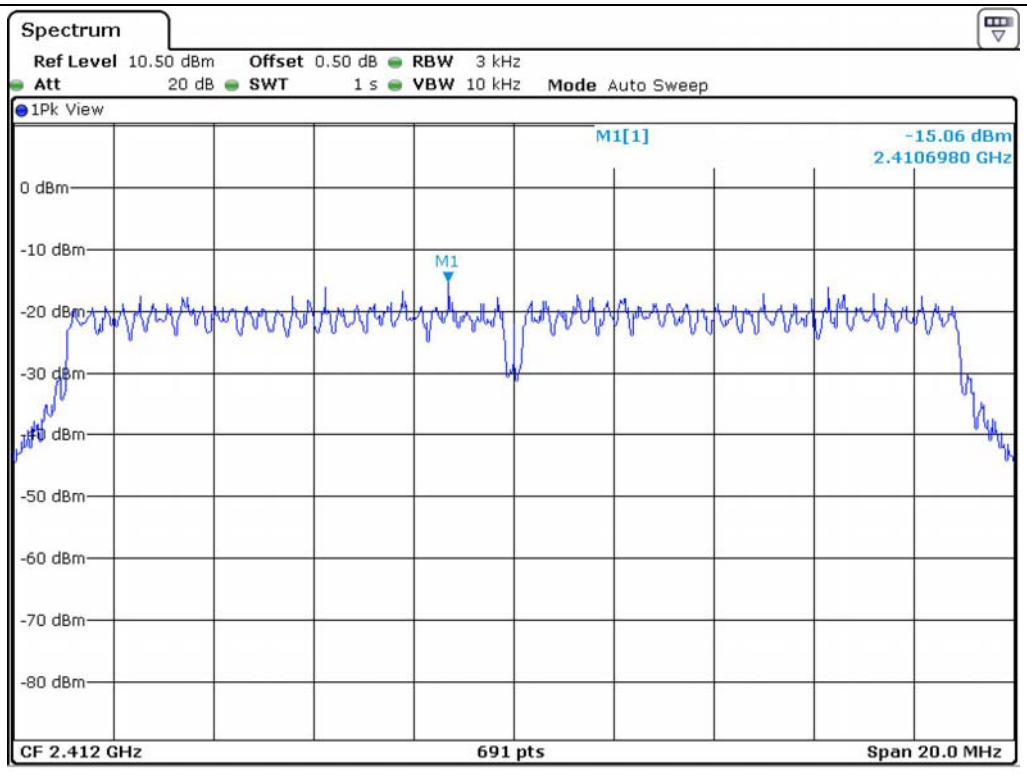
-. Test Result : Pass

-. Operating Condition : Continuous transmitting mode

CHANNEL	FREQUENCY(MHz)	MEASURED VLAUE (dBm)	LIMIT (dBm)	MARGIN (dB)
Low	2 412	-15.06	8.00	23.06
Middle	2 442	-15.94	8.00	23.94
High	2 462	-16.45	8.00	24.45

Remark. Margin = Limit – Measured value

Tested by: Tae-Ho, Kim / Project Engineer



Low Channel

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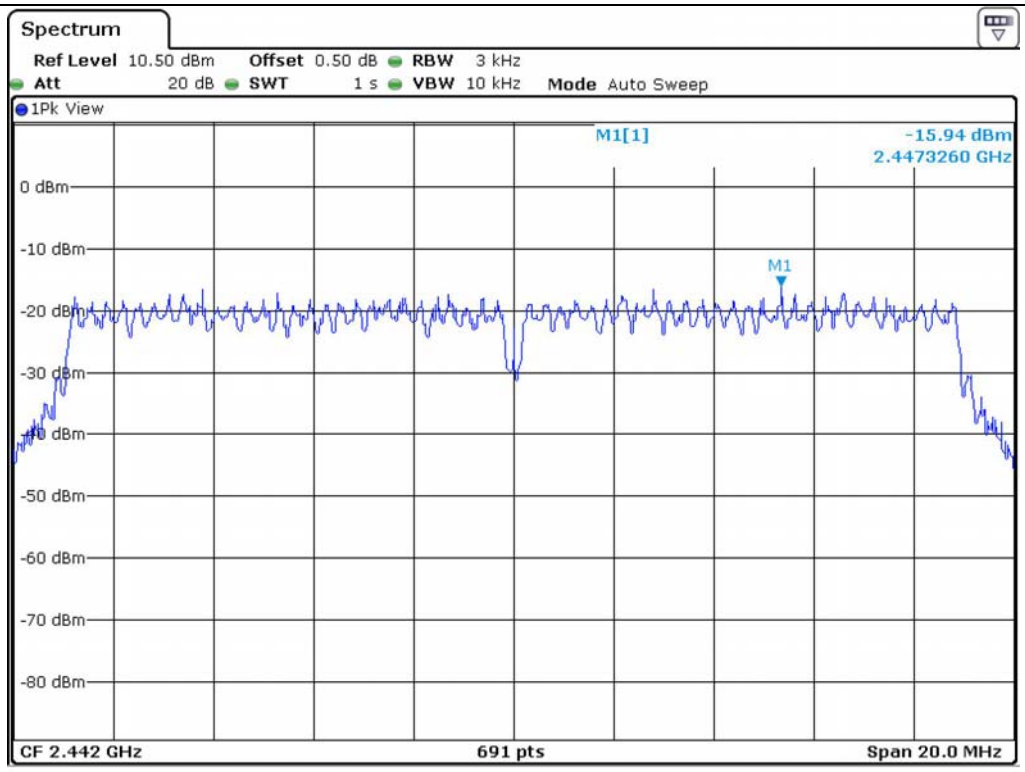
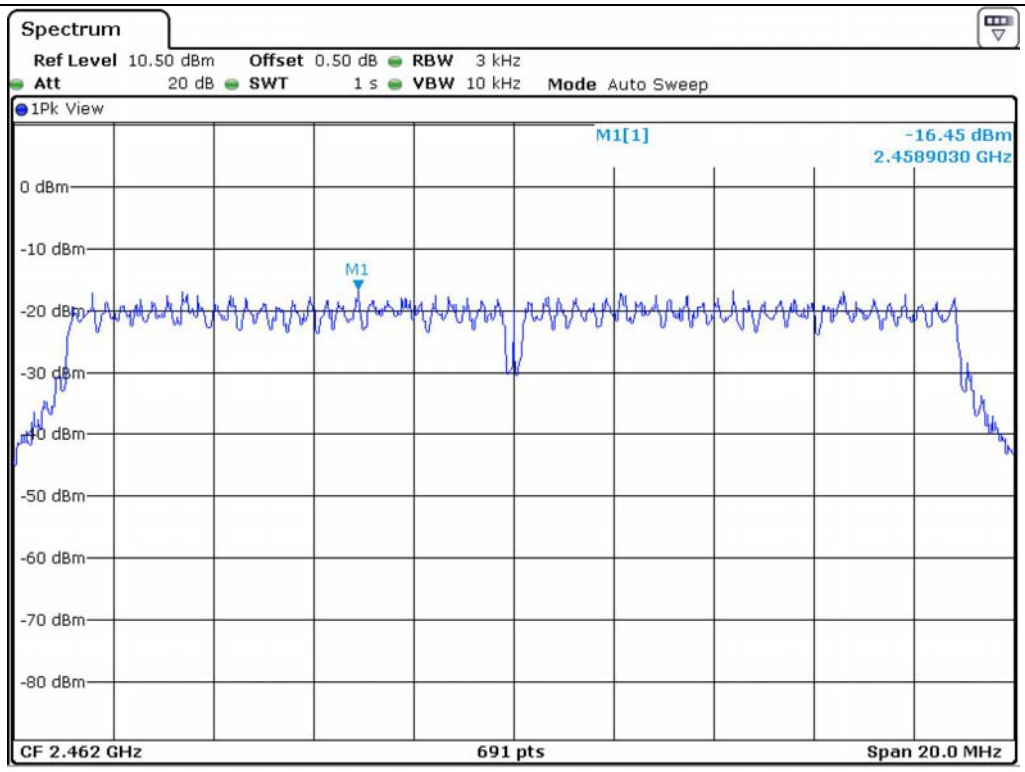


Middle Channel



High Channel

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11.7 Test data for 802.11n_HT40 WLAN Mode

-. Test Date : April 01, 2014

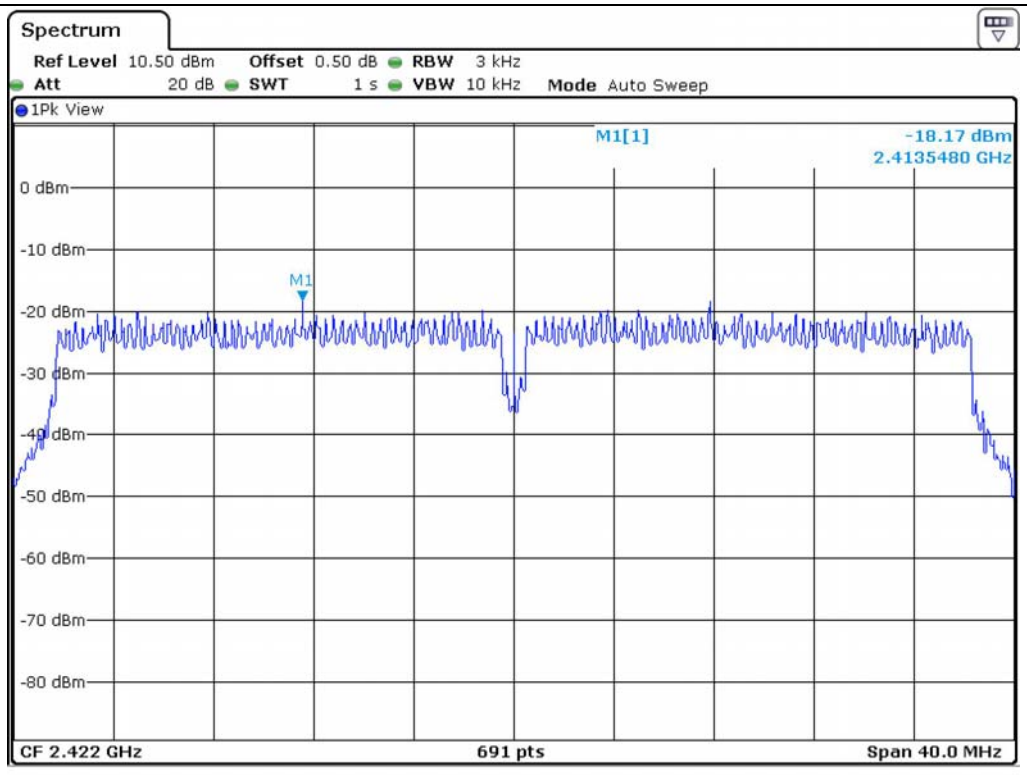
-. Test Result : Pass

-. Operating Condition : Continuous transmitting mode

CHANNEL	FREQUENCY(MHz)	MEASURED VLAUE (dBm)	LIMIT (dBm)	MARGIN (dB)
Low	2 422	-18.17	8.00	26.17
Middle	2 442	-20.11	8.00	28.11
High	2 452	-19.35	8.00	27.35

Remark. Margin = Limit – Measured value

Tested by: Tae-Ho, Kim / Project Engineer



Low Channel

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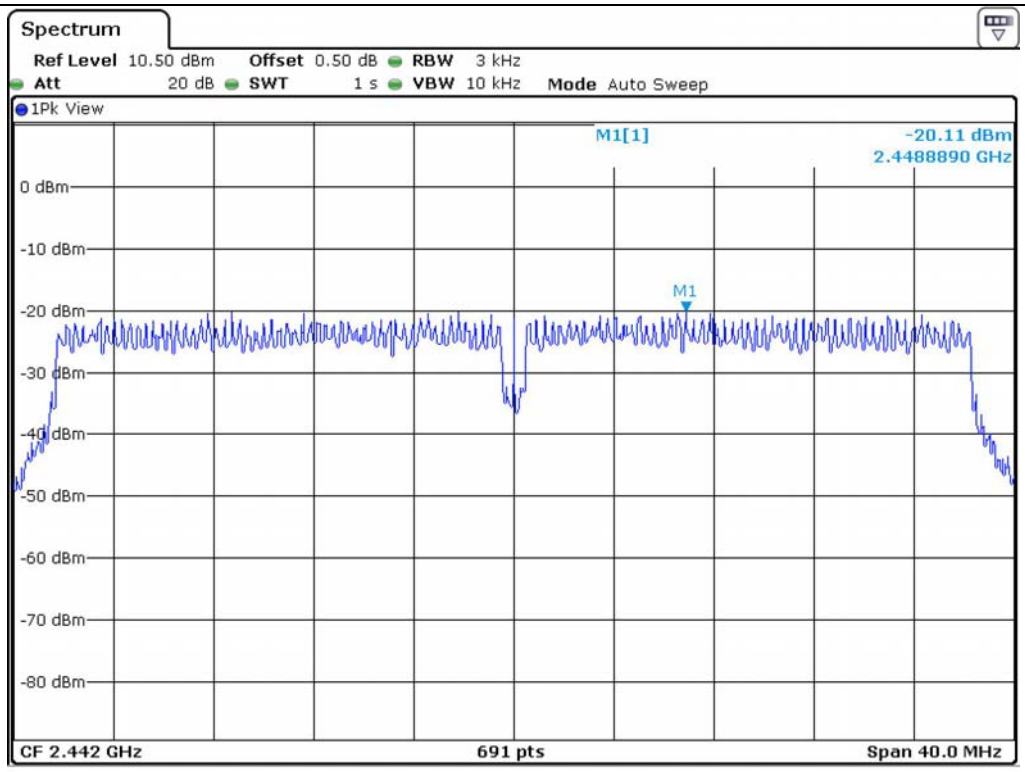
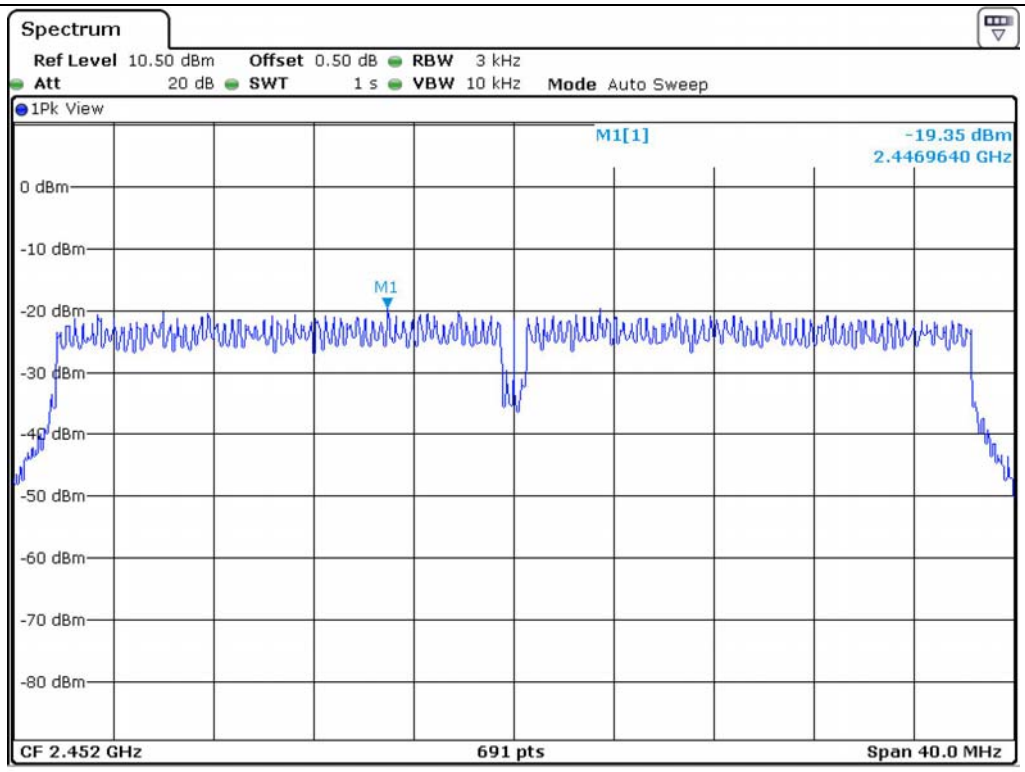


Middle Channel



High Channel

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12. RADIATED EMISSION TEST

12.1 Operating environment

Temperature : 24 °C

Relative humidity : 44 % R.H.

12.2 Test set-up

The radiated emissions measurements were on the 3 m, open-field test site. The EUT and other support equipment were placed on a non-conductive turntable above the ground plane. The interconnecting cables from outside test site were inserted into ferrite clamps at the point where the cables reach the turntable.

The frequency spectrum from 30 MHz to 26.5 GHz was scanned and emission levels maximized at each frequency recorded. The system was rotated 360°, and the antenna was varied in height between 1.0 m and 4.0 m in order to determine the maximum emission levels. This procedure was performed for both horizontal and vertical polarization of the receiving antenna.

12.3 Test equipment used

	Model Number	Manufacturer	Description	Serial Number	Last Cal.(Interval)
■ -	8564E	HP	Spectrum Analyzer	3650A00756	May 03, 2013(1Y)
■ -	ESU	Rohde & Schwarz	EMI Test Receiver	100261	May 27, 2013(1Y)
■-	310N	Sonoma Instrument	AMPLIFIER	312544	May 21, 2013(1Y)
■ -	83051A	Agilent	Microwave System Preamplifer	3950M00201	May 22, 2013(1Y)
■ -	FSV30	Rohde & Schwarz	Signal Analyzer	101372	May 20, 2013(1Y)
■ -	SCU-18	Rohde & Schwarz	PRE-AMPLIFIER	10041	Nov. 07, 2013(1Y)
■ -	MA220	HD	Turn Table	N/A	N/A
■ -	HD240	HD	Antenna Mast	N/A	N/A
■ -	VULB9163	Schwarzbeck	TRILOG Broadband Antenna	9163-421	Jun. 21, 2012(2Y)
■ -	BBHA9120D	Schwarzbeck	Horn Antenna	BBHA9120D294	Sep. 30, 2013 (2Y)
■ -	BBHA9170	Schwarzbeck	Horn Antenna	BBHA9170178	Jun. 17, 2013 (2Y)

All test equipment used is calibrated on a regular basis.

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12.4 Test data for 802.11b WLAN Mode

12.4.1 Test data for Below 30 MHz

-. Test Date : April 04, 2014

-. Resolution bandwidth : 200 Hz (from 9 kHz to 0.15 MHz), 9 kHz (from 0.15 MHz to 30 MHz)

-. Frequency range : 9 kHz ~ 30 MHz

-. Measurement distance : 3 m

-.Operating mode : Transmitting mode

Frequency (MHz)	Reading (dBµV)	Ant. Pol. (H/V)	Ant. Factor (dB/m)	Cable Loss	Amp Gain	Emission Level(dBµV/m)	Limits (dBµV/m)	Margin (dB)
It was not observed any emissions from the EUT.								

Tested by: Tae-Ho, Kim / Project Engineer

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12.4.2 Test data for 30 MHz ~ 1 000 MHz

-. Test Date : April 04, 2014

-. Resolution bandwidth : 120 kHz

-. Frequency range : 30 MHz ~ 1 000 MHz

-. Measurement distance : 3 m

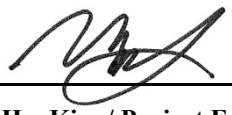
-.Operating mode : Transmitting mode

Frequency (MHz)	Reading (dBμV)	Ant. Pol. (H/V)	Ant. Factor (dB/m)	Cable Loss	Amp Gain	Emission Level(dBμV/m)	Limits (dBμV/m)	Margin (dB)
Test Data for Low Channel								
98.87	45.90	V	13.40	8.00	33.10	34.20	43.50	9.30
132.82	47.00	V	10.00	8.20	33.10	32.10	43.50	11.40
215.27	48.30	H	12.70	9.00	33.00	37.00	43.50	6.50
304.51	46.80	V	14.90	9.50	33.00	38.20	46.00	7.80
480.08	36.30	H	18.10	10.50	33.10	31.80	46.00	14.20
720.63	33.30	H	21.10	11.70	33.30	32.80	46.00	13.20
Test Data for Middle Channel								
98.87	45.50	V	13.40	8.00	33.10	33.80	43.50	9.70
132.82	47.20	V	10.00	8.20	33.10	32.30	43.50	11.20
211.39	42.80	V	12.60	8.50	33.00	30.90	43.50	12.60
216.24	49.30	H	12.70	8.50	33.00	37.50	46.00	8.50
480.08	37.50	H	18.10	10.50	33.10	33.00	46.00	13.00
720.63	32.40	H	21.10	11.70	33.30	31.90	46.00	14.10
Test Data for High Channel								
99.84	45.10	V	13.60	8.00	33.10	33.60	43.50	9.90
132.82	46.50	V	10.00	8.20	33.10	31.60	43.50	11.90
205.57	48.80	H	12.40	8.90	33.00	37.10	43.50	6.40
433.52	35.00	V	17.40	10.30	33.00	29.70	46.00	16.30
480.08	37.70	H	18.10	10.50	33.10	33.20	46.00	12.80
629.46	32.30	V	20.50	11.20	33.30	30.70	46.00	15.30

Tabulated test data for Radiated Electromagnetic Field

Remark: “H”: Horizontal, “V”: Vertical

Margin (dB) = Limits (dBμV/m) - Emission Level (dBμV/m)



Tested by: Tae-Ho, Kim / Project Engineer

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12.4.3 Test data for above 1 GHz

-. Test Date : April 04, 2014

-. Resolution bandwidth : 1 MHz for Peak and Average Mode

-. Video bandwidth : 1 MHz for Peak Mode, 10 Hz for Average Mode

-. Frequency range : 1 GHz ~ 26.5 GHz

-. Measurement distance : 3 m

-.Operating mode : Transmitting mode

Frequency (MHz)	Reading (dBµV)	Ant. Pol. (H/V)	Ant. Factor (dB/m)	Cable Loss	Amp Gain	Emission Level(dBµV/m)	Limits (dBµV/m)	Margin (dB)
It was not observed any emissions from the EUT.								

Tested by: Tae-Ho, Kim / Project Engineer

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12.5 Test data for 802.11g WLAN Mode

12.5.1 Test data for Below 30 MHz

-. Test Date : April 04, 2014

-. Resolution bandwidth : 200 Hz (from 9 kHz to 0.15 MHz), 9 kHz (from 0.15 MHz to 30 MHz)

-. Frequency range : 9 kHz ~ 30 MHz

-. Measurement distance : 3 m

-.Operating mode : Transmitting mode

Frequency (MHz)	Reading (dBµV)	Ant. Pol. (H/V)	Ant. Factor (dB/m)	Cable Loss	Amp Gain	Emission Level(dBµV/m)	Limits (dBµV/m)	Margin (dB)
It was not observed any emissions from the EUT.								

Tested by: Tae-Ho, Kim / Project Engineer

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12.5.2 Test data for 30 MHz ~ 1 000 MHz

-. Test Date : April 04, 2014

-. Resolution bandwidth : 120 kHz

-. Frequency range : 30 MHz ~ 1 000 MHz

-. Measurement distance : 3 m

-.Operating mode : Transmitting mode

Frequency (MHz)	Reading (dBμV)	Ant. Pol. (H/V)	Ant. Factor (dB/m)	Cable Loss	Amp Gain	Emission Level(dBμV/m)	Limits (dBμV/m)	Margin (dB)
Test Data for Low Channel								
98.87	46.00	V	13.40	8.00	33.10	34.30	43.50	9.20
132.82	46.60	V	10.00	8.20	33.10	31.70	43.50	11.80
215.27	47.90	H	12.70	9.00	33.00	36.60	43.50	6.90
304.51	46.60	V	14.90	9.50	33.00	38.00	46.00	8.00
480.08	37.10	H	18.10	10.50	33.10	32.60	46.00	13.40
720.63	33.40	H	21.10	11.70	33.30	32.90	46.00	13.10
Test Data for Middle Channel								
98.87	44.90	V	13.40	8.00	33.10	33.20	43.50	10.30
132.82	47.40	V	10.00	8.20	33.10	32.50	43.50	11.00
211.39	41.80	V	12.60	8.50	33.00	29.90	43.50	13.60
216.24	50.00	H	12.70	8.50	33.00	38.20	46.00	7.80
480.08	37.10	H	18.10	10.50	33.10	32.60	46.00	13.40
720.63	32.00	H	21.10	11.70	33.30	31.50	46.00	14.50
Test Data for High Channel								
99.84	45.30	V	13.60	8.00	33.10	33.80	43.50	9.70
132.82	45.70	V	10.00	8.20	33.10	30.80	43.50	12.70
205.57	49.70	H	12.40	8.90	33.00	38.00	43.50	5.50
433.52	35.40	V	17.40	10.30	33.00	30.10	46.00	15.90
480.08	37.10	H	18.10	10.50	33.10	32.60	46.00	13.40
629.46	31.40	V	20.50	11.20	33.30	29.80	46.00	16.20

Tabulated test data for Radiated Electromagnetic Field

Remark: “H”: Horizontal, “V”: Vertical

Margin (dB) = Limits (dBμV/m) - Emission Level (dBμV/m)

Tested by: Tae-Ho, Kim / Project Engineer

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12.5.3 Test data for above 1 GHz

-. Test Date : April 04, 2014

-. Resolution bandwidth : 1 MHz for Peak and Average Mode

-. Video bandwidth : 1 MHz for Peak Mode, 10 Hz for Average Mode

-. Frequency range : 1 GHz ~ 26.5 GHz

-. Measurement distance : 3 m

-.Operating mode : Transmitting mode

Frequency (MHz)	Reading (dBµV)	Ant. Pol. (H/V)	Ant. Factor (dB/m)	Cable Loss	Amp Gain	Emission Level(dBµV/m)	Limits (dBµV/m)	Margin (dB)
It was not observed any emissions from the EUT.								

Tested by: Tae-Ho, Kim / Project Engineer

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12.6 Test data for 802.11n_HT20 WLAN Mode

12.6.1Test data for Below 30 MHz

-. Test Date : April 04, 2014

-. Resolution bandwidth : 200 Hz (from 9 kHz to 0.15 MHz), 9 kHz (from 0.15 MHz to 30 MHz)

-. Frequency range : 9 kHz ~ 30 MHz

-. Measurement distance : 3 m

-.Operating mode : Transmitting mode

Frequency (MHz)	Reading (dBµV)	Ant. Pol. (H/V)	Ant. Factor (dB/m)	Cable Loss	Amp Gain	Emission Level(dBµV/m)	Limits (dBµV/m)	Margin (dB)
It was not observed any emissions from the EUT.								

Tested by: Tae-Ho, Kim / Project Engineer

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12.6.2 Test data for 30 MHz ~ 1 000 MHz

-. Test Date : April 04, 2014

-. Resolution bandwidth : 120 kHz

-. Frequency range : 30 MHz ~ 1 000 MHz

-. Measurement distance : 3 m

-.Operating mode : Transmitting mode

Frequency (MHz)	Reading (dBμV)	Ant. Pol. (H/V)	Ant. Factor (dB/m)	Cable Loss	Amp Gain	Emission Level(dBμV/m)	Limits (dBμV/m)	Margin (dB)
Test Data for Low Channel								
98.87	46.60	V	13.40	8.00	33.10	34.90	43.50	8.60
132.82	46.60	V	10.00	8.20	33.10	31.70	43.50	11.80
215.27	48.70	H	12.70	9.00	33.00	37.40	43.50	6.10
304.51	46.40	V	14.90	9.50	33.00	37.80	46.00	8.20
480.08	36.60	H	18.10	10.50	33.10	32.10	46.00	13.90
720.63	32.60	H	21.10	11.70	33.30	32.10	46.00	13.90
Test Data for Middle Channel								
98.87	44.80	V	13.40	8.00	33.10	33.10	43.50	10.40
132.82	48.00	V	10.00	8.20	33.10	33.10	43.50	10.40
211.39	42.90	V	12.60	8.50	33.00	31.00	43.50	12.50
216.24	49.70	H	12.70	8.50	33.00	37.90	46.00	8.10
480.08	37.00	H	18.10	10.50	33.10	32.50	46.00	13.50
720.63	32.30	H	21.10	11.70	33.30	31.80	46.00	14.20
Test Data for High Channel								
99.84	45.70	V	13.60	8.00	33.10	34.20	43.50	9.30
132.82	46.40	V	10.00	8.20	33.10	31.50	43.50	12.00
205.57	49.00	H	12.40	8.90	33.00	37.30	43.50	6.20
433.52	34.20	V	17.40	10.30	33.00	28.90	46.00	17.10
480.08	37.60	H	18.10	10.50	33.10	33.10	46.00	12.90
629.46	33.40	V	20.50	11.20	33.30	31.80	46.00	14.20

Tabulated test data for Radiated Electromagnetic Field

Remark: “H”: Horizontal, “V”: Vertical

Margin (dB) = Limits (dBμV/m) - Emission Level (dBμV/m)

Tested by: Tae-Ho, Kim / Project Engineer

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12.6.3 Test data for above 1 GHz

-. Test Date : April 04, 2014

-. Resolution bandwidth : 1 MHz for Peak and Average Mode

-. Video bandwidth : 1 MHz for Peak Mode, 10 Hz for Average Mode

-. Frequency range : 1 GHz ~ 26.5 GHz

-. Measurement distance : 3 m

-.Operating mode : Transmitting mode

Frequency (MHz)	Reading (dBµV)	Ant. Pol. (H/V)	Ant. Factor (dB/m)	Cable Loss	Amp Gain	Emission Level(dBµV/m)	Limits (dBµV/m)	Margin (dB)
It was not observed any emissions from the EUT.								

Tested by: Tae-Ho, Kim / Project Engineer

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12.7 Test data for 802.11n_HT40 WLAN Mode

12.7.1 Test data for Below 30 MHz

-. Test Date : April 04, 2014

-. Resolution bandwidth : 200 Hz (from 9 kHz to 0.15 MHz), 9 kHz (from 0.15 MHz to 30 MHz)

-. Frequency range : 9 kHz ~ 30 MHz

-. Measurement distance : 3 m

-.Operating mode : Transmitting mode

Frequency (MHz)	Reading (dBµV)	Ant. Pol. (H/V)	Ant. Factor (dB/m)	Cable Loss	Amp Gain	Emission Level(dBµV/m)	Limits (dBµV/m)	Margin (dB)
It was not observed any emissions from the EUT.								

Tested by: Tae-Ho, Kim / Project Engineer

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12.7.2 Test data for 30 MHz ~ 1 000 MHz

-. Test Date : April 04, 2014

-. Resolution bandwidth : 120 kHz

-. Frequency range : 30 MHz ~ 1 000 MHz

-. Measurement distance : 3 m

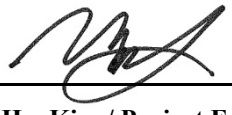
-.Operating mode : Transmitting mode

Frequency (MHz)	Reading (dBμV)	Ant. Pol. (H/V)	Ant. Factor (dB/m)	Cable Loss	Amp Gain	Emission Level(dBμV/m)	Limits (dBμV/m)	Margin (dB)
Test Data for Low Channel								
98.87	45.10	V	13.40	8.00	33.10	33.40	43.50	10.10
132.82	47.90	V	10.00	8.20	33.10	33.00	43.50	10.50
215.27	47.90	H	12.70	9.00	33.00	36.60	43.50	6.90
304.51	47.30	V	14.90	9.50	33.00	38.70	46.00	7.30
480.08	37.00	H	18.10	10.50	33.10	32.50	46.00	13.50
720.63	32.60	H	21.10	11.70	33.30	32.10	46.00	13.90
Test Data for Middle Channel								
98.87	46.50	V	13.40	8.00	33.10	34.80	43.50	8.70
132.82	46.80	V	10.00	8.20	33.10	31.90	43.50	11.60
211.39	42.20	V	12.60	8.50	33.00	30.30	43.50	13.20
216.24	49.80	H	12.70	8.50	33.00	38.00	46.00	8.00
480.08	37.90	H	18.10	10.50	33.10	33.40	46.00	12.60
720.63	33.10	H	21.10	11.70	33.30	32.60	46.00	13.40
Test Data for High Channel								
99.84	45.80	V	13.60	8.00	33.10	34.30	43.50	9.20
132.82	46.70	V	10.00	8.20	33.10	31.80	43.50	11.70
205.57	49.80	H	12.40	8.90	33.00	38.10	43.50	5.40
433.52	34.50	V	17.40	10.30	33.00	29.20	46.00	16.80
480.08	38.20	H	18.10	10.50	33.10	33.70	46.00	12.30
629.46	31.60	V	20.50	11.20	33.30	30.00	46.00	16.00

Tabulated test data for Radiated Electromagnetic Field

Remark: “H”: Horizontal, “V”: Vertical

Margin (dB) = Limits (dBμV/m) - Emission Level (dBμV/m)



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12.7.3 Test data for above 1 GHz

-. Test Date : April 04, 2014

-. Resolution bandwidth : 1 MHz for Peak and Average Mode

-. Video bandwidth : 1 MHz for Peak Mode, 10 Hz for Average Mode

-. Frequency range : 1 GHz ~ 26.5 GHz

-. Measurement distance : 3 m

-.Operating mode : Transmitting mode

Frequency (MHz)	Reading (dBµV)	Ant. Pol. (H/V)	Ant. Factor (dB/m)	Cable Loss	Amp Gain	Emission Level(dBµV/m)	Limits (dBµV/m)	Margin (dB)
It was not observed any emissions from the EUT.								

Tested by: Tae-Ho, Kim / Project Engineer

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13. CONDUCTED EMISSION TEST

13.1 Operating environment

Temperature : (23 ~ 24) °C

Relative humidity : (44 ~ 45) % R.H.

13.2 Test set-up

The EUT was placed on a wooden table, 0.8 m height above the floor. Power was fed to the EUT through a 50 Ω / 50 μH + 5 Ω Artificial Mains Network (AMN). The ground plane was electrically bonded to the reference ground system and all power lines were filtered from ambient.

13.3 Test equipment used

	Model Number	Manufacturer	Description	Serial Number	Last Cal. (Interval)
■	- ESCI	Rohde & Schwarz	Test Receiver	101012	Nov. 18, 2013 (1Y)
☐	- ESHS10	Rohde & Schwarz	Test Receiver	834467/007	Jul. 02, 2013 (1Y)
■	- LT 32C	AFJ INSTRUMENTS	AMN	32031306157	May 29, 2013 (1Y)
☐	- NSLK 8126	Schwarzbeck	AMN	8126-404	May 29, 2013 (1Y)
■	- 3825/2	EMCO	AMN	9109-1869	May 20, 2013 (1Y)
☐	- 3825/2	EMCO	AMN	9109-1867	May 20, 2013 (1Y)

All test equipment used is calibrated on a regular basis.

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EMC Testing Div. : 307-51 Daessangnyeong-ri, Chowol-eup, Gwangju-si, Gyeonggi-do 464-862 Korea (TEL: 82-31-765-8289, FAX: 82-31-766-2904)

13.4 Test data for 802.11b WLAN Mode

-. Test Date : April 04, 2014

-. Resolution bandwidth : 9 kHz

-. Frequency range : 0.15 MHz ~ 30 MHz

Frequency (MHz)	Line	Quasi-Peak (dBµV)		Margin (dB)
		Emission level	Q.P Limits	
0.16	N	57.50	65.60	8.10
0.27	N	48.10	61.10	13.00
0.48	H	42.20	56.40	14.20
0.65	N	40.10	56.00	15.90
2.48	N	37.20	56.00	18.80
13.50	N	47.90	60.00	12.10
Frequency (MHz)	**Line**	**Average (dBµV)**		**Margin (dB)**
		Emission level	**Limits**	
0.48	H	36.10	46.40	10.30
0.65	N	24.40	46.00	21.60
13.36	H	31.50	50.00	18.50
13.50	N	32.50	50.00	17.50

Line Conducted Emissions Tabulated Data

Remark : "H": Hot Line, "N": Neutral Line

See next page for an overview sweep performed with quasi-peak and average detector modes.

Margin (dB) = Limits (dBuV) – Emission Level (dBuV)

Emission Level = Receiver reading + Cable loss + Insertion loss of AMN

Tested by: Tae-Ho, Kim / Project Engineer

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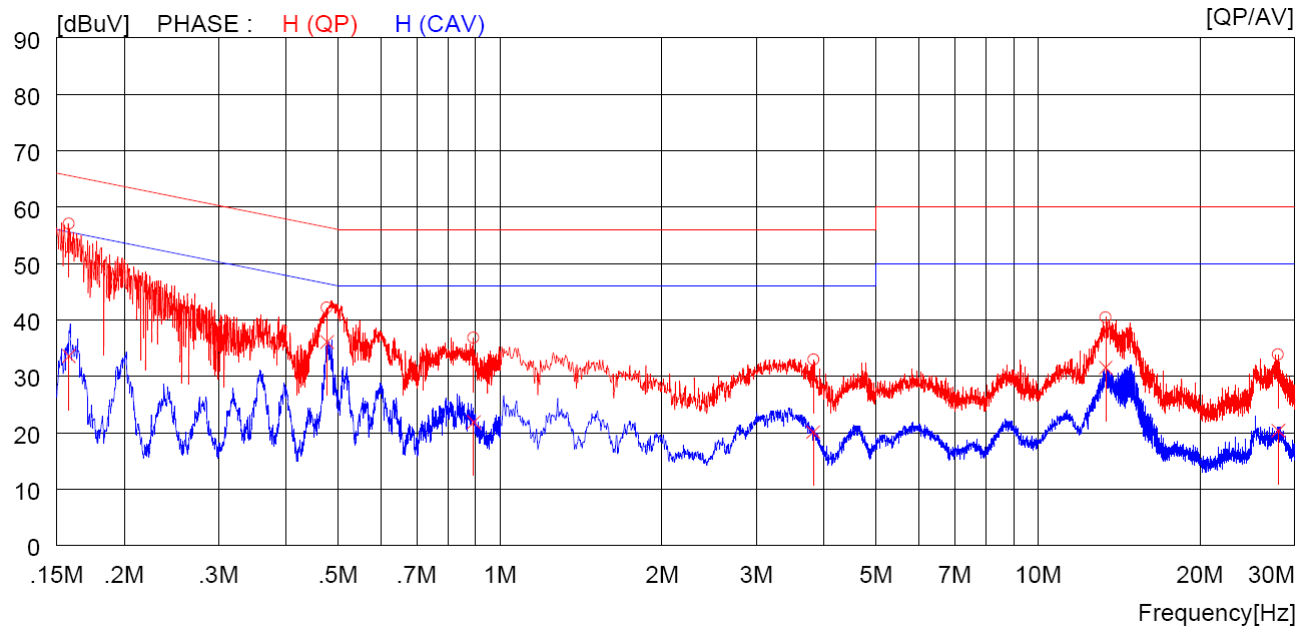
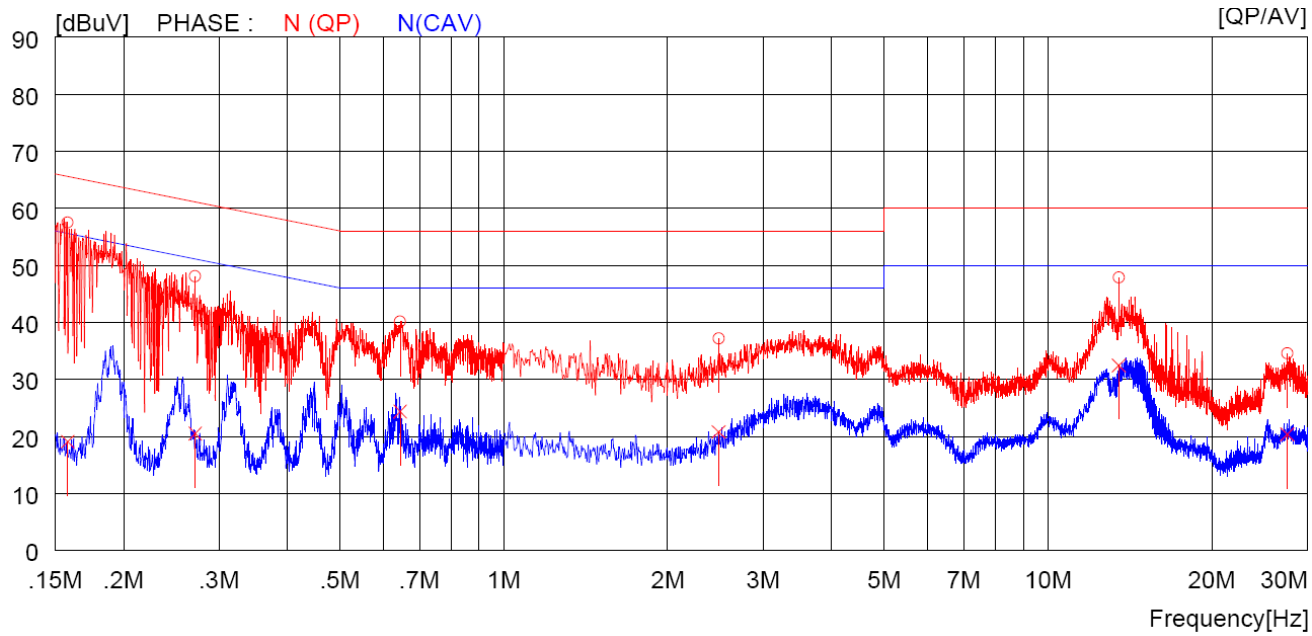
Graphical representation of Conducted Emission



HOT LINE



NEUTRAL LINE

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13.5 Test data for 802.11g WLAN Mode

-. Test Date : April 04, 2014

-. Resolution bandwidth : 9 kHz

-. Frequency range : 0.15 MHz ~ 30 MHz

Frequency (MHz)	Line	Quasi-Peak (dBµV)		Margin (dB)
		Emission level	Q.P Limits	
0.17	N	55.60	64.90	9.30
0.18	H	53.60	64.40	10.80
0.37	H	41.40	58.40	17.00
0.47	N	43.00	56.60	13.60
0.49	H	43.60	56.10	12.50
13.40	N	41.40	60.00	18.60
Frequency (MHz)	**Line**	**Average (dBµV)**		**Margin (dB)**
		Emission level	**Limits**	
0.37	H	30.30	48.40	18.10
0.47	N	31.90	46.60	14.70
0.49	H	32.80	46.10	13.30
13.40	N	31.40	50.00	18.60

Line Conducted Emissions Tabulated Data

Remark : "H": Hot Line, "N": Neutral Line

See next page for an overview sweep performed with quasi-peak and average detector modes.

Margin (dB) = Limits (dBuV) – Emission Level (dBuV)

Emission Level = Receiver reading + Cable loss + Insertion loss of AMN

Tested by: Tae-Ho, Kim / Project Engineer

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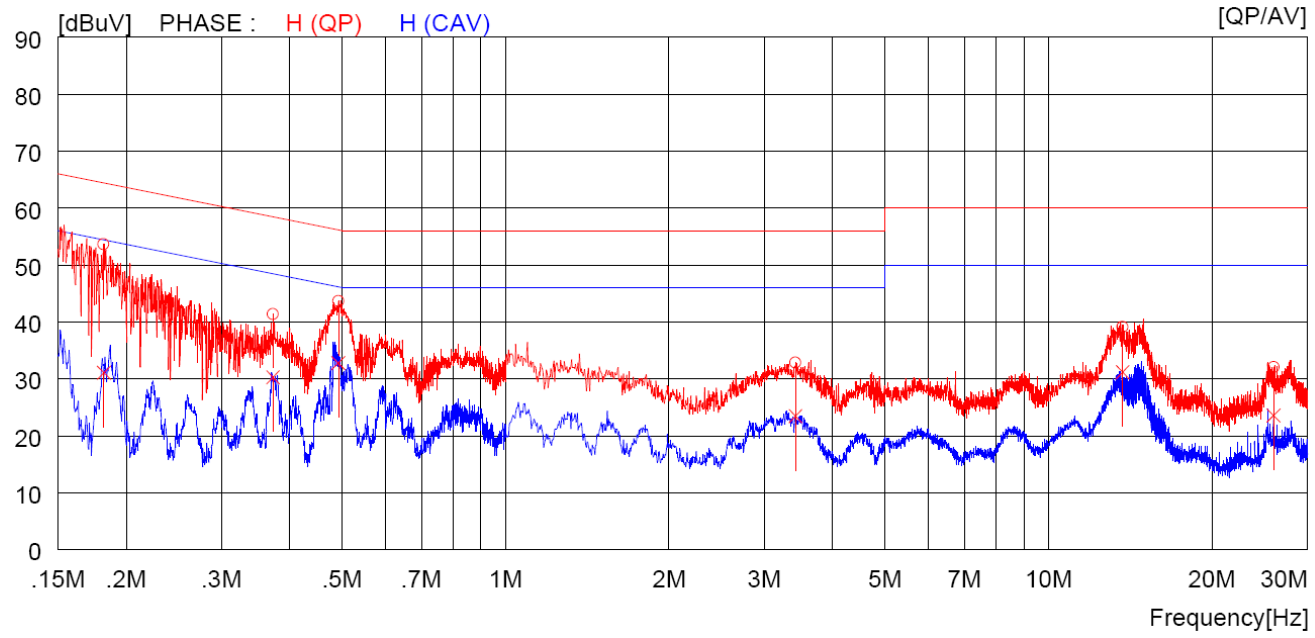
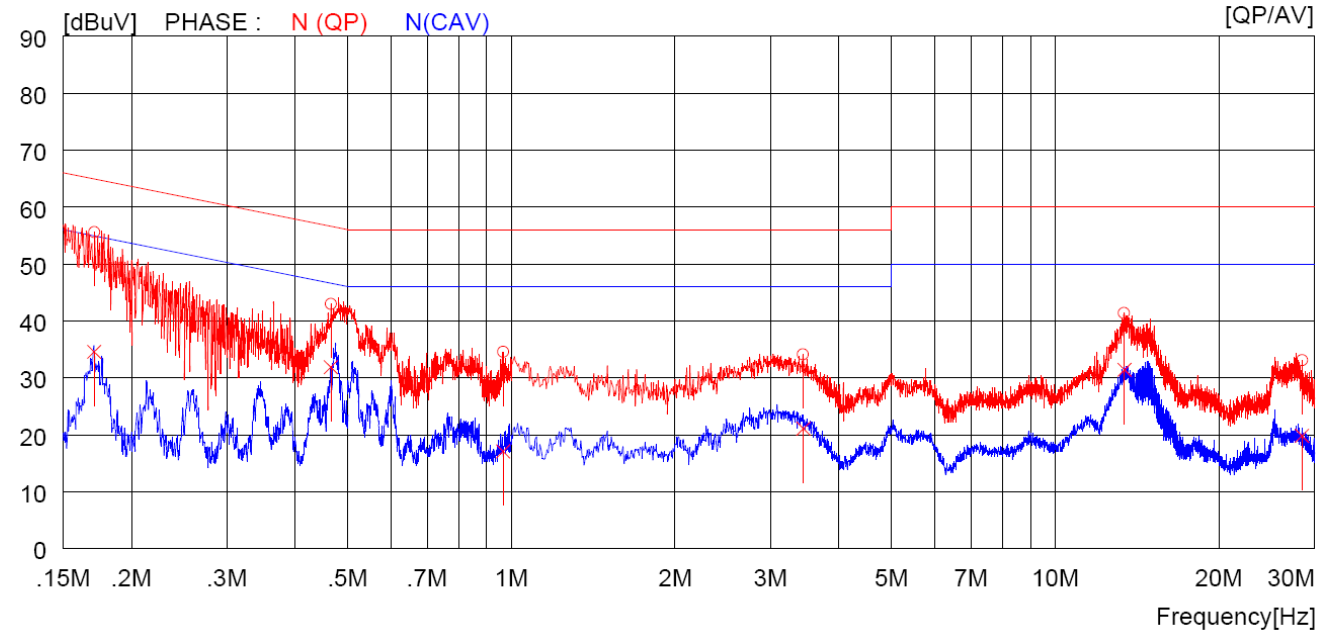
Graphical representation of Conducted Emission



HOT LINE



NEUTRAL LINE

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13.6 Test data for 802.11n_HT20 WLAN Mode

-. Test Date : April 04, 2014

-. Resolution bandwidth : 9 kHz

-. Frequency range : 0.15 MHz ~ 30 MHz

Frequency (MHz)	Line	Quasi-Peak (dBµV)		Margin (dB)
		Emission level	Q.P Limits	
0.16	N	58.50	65.60	7.10
0.17	H	52.60	64.90	12.30
0.46	N	42.40	56.60	14.20
0.49	H	42.10	56.20	14.10
0.56	N	41.90	56.00	14.10
0.63	H	37.80	56.00	18.20
Frequency (MHz)	**Line**	**Average (dBµV)**		**Margin (dB)**
		Emission level	**Limits**	
0.46	N	35.20	46.60	11.40
0.49	H	37.00	46.20	9.20
0.56	N	29.60	46.00	16.40
14.48	H	31.90	50.00	18.10

Line Conducted Emissions Tabulated Data

Remark : "H": Hot Line, "N": Neutral Line

See next page for an overview sweep performed with quasi-peak and average detector modes.

Margin (dB) = Limits (dBuV) – Emission Level (dBuV)

Emission Level = Receiver reading + Cable loss + Insertion loss of AMN

Tested by: Tae-Ho, Kim / Project Engineer

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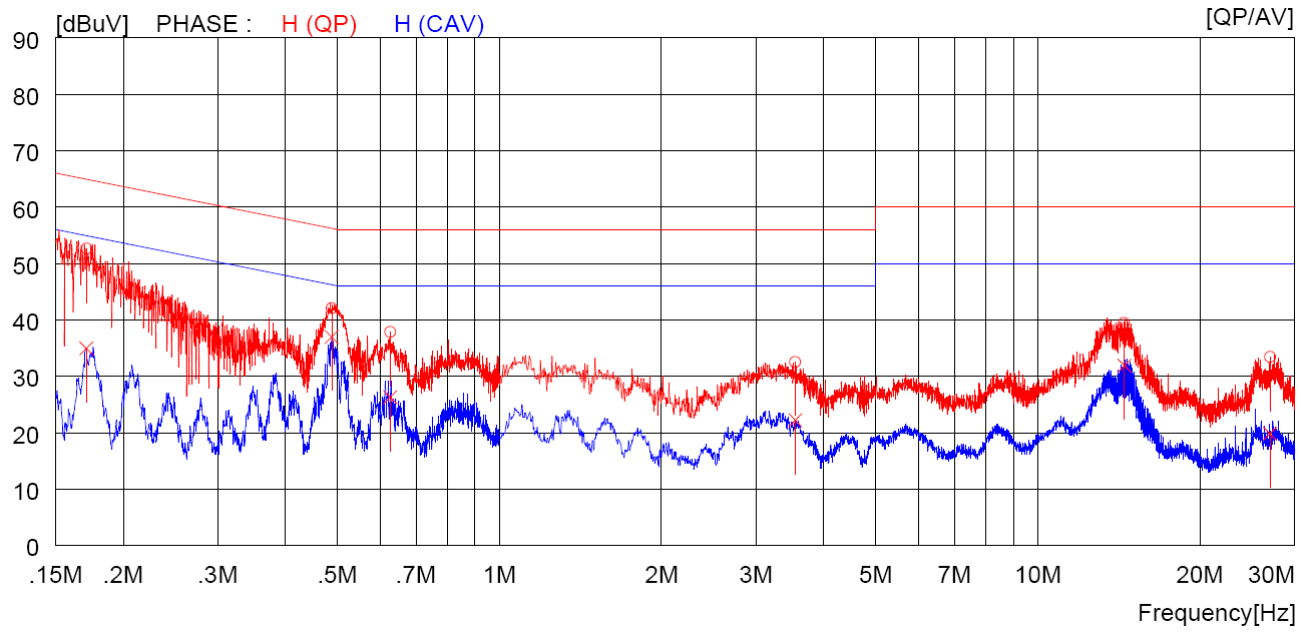
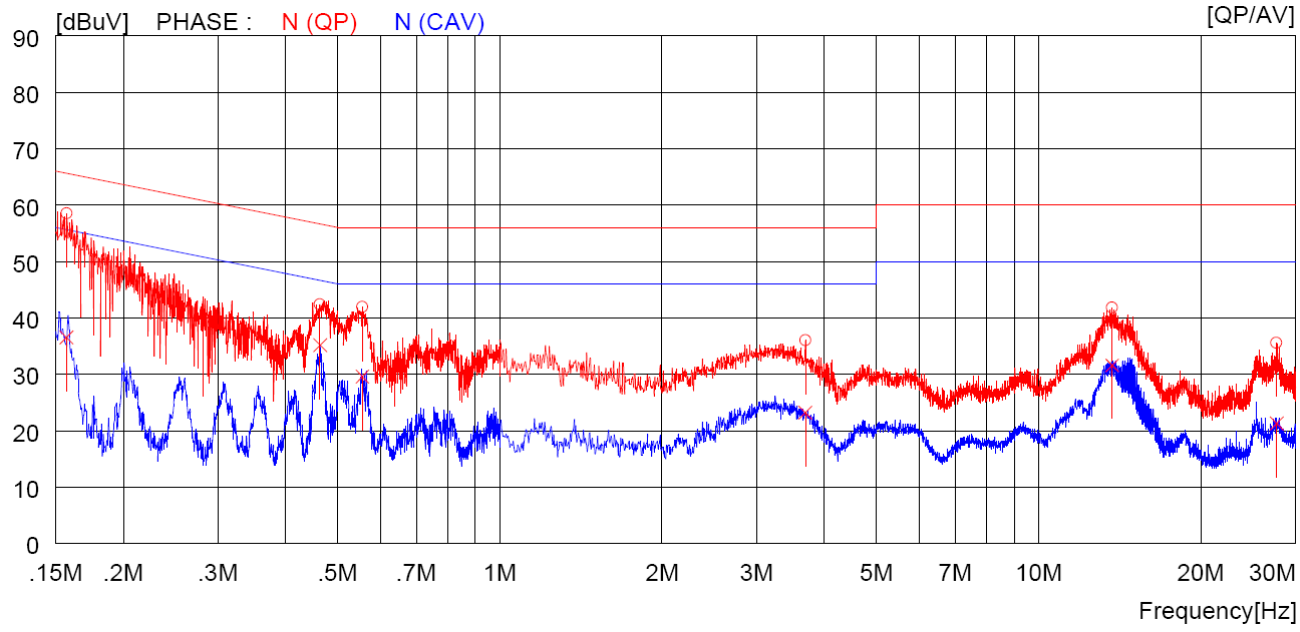
Graphical representation of Conducted Emission



HOT LINE



NEUTRAL LINE

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13.7 Test data for 802.11n_HT40 WLAN Mode

-. Test Date : April 04, 2014

-. Resolution bandwidth : 9 kHz

-. Frequency range : 0.15 MHz ~ 30 MHz

Frequency (MHz)	Line	Quasi-Peak (dBµV)		Margin (dB)
		Emission level	Q.P Limits	
0.16	N	56.20	65.60	9.40
0.17	H	54.20	65.20	11.00
0.34	N	43.00	59.30	16.30
0.48	N	43.00	56.30	13.30
0.49	H	42.70	56.10	13.40
13.57	N	41.30	60.00	18.70
Frequency (MHz)	**Line**	**Average (dBµV)**		**Margin (dB)**
		Emission level	**Limits**	
0.17	H	36.10	55.20	19.10
0.49	H	35.20	46.10	10.90
13.57	N	30.50	50.00	19.50
14.58	H	32.30	50.00	17.70

Line Conducted Emissions Tabulated Data

Remark : "H": Hot Line, "N": Neutral Line

See next page for an overview sweep performed with quasi-peak and average detector modes.

Margin (dB) = Limits (dBuV) – Emission Level (dBuV)

Emission Level = Receiver reading + Cable loss + Insertion loss of AMN

Tested by: Tae-Ho, Kim / Project Engineer

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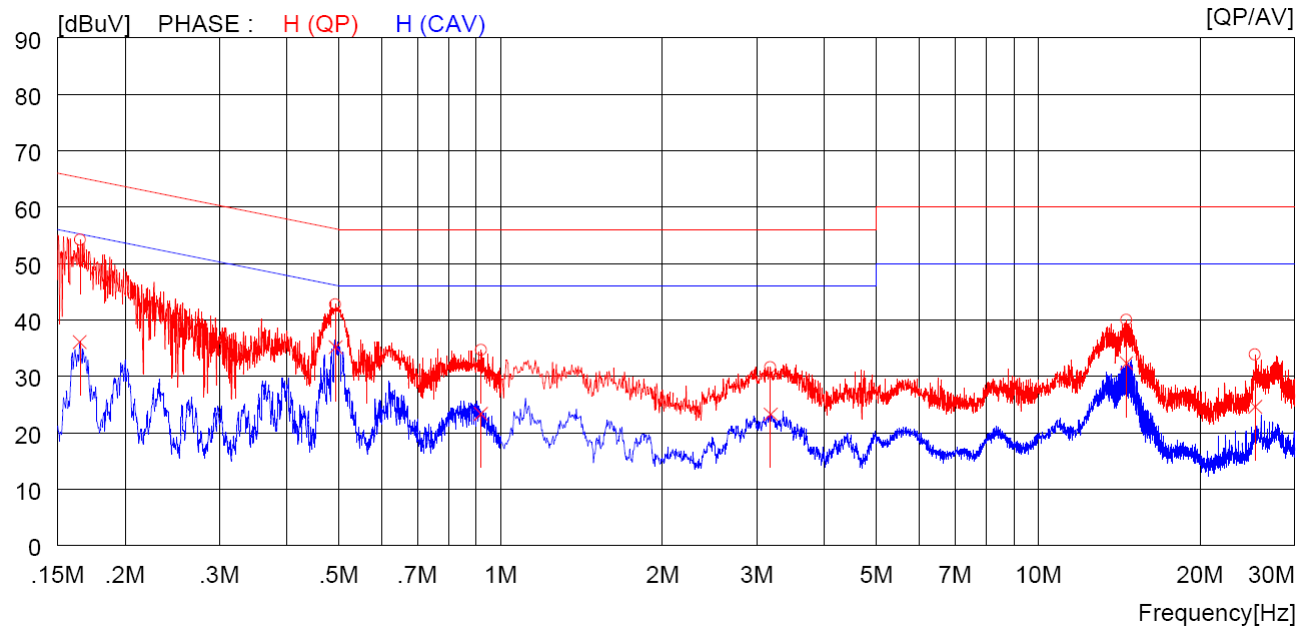
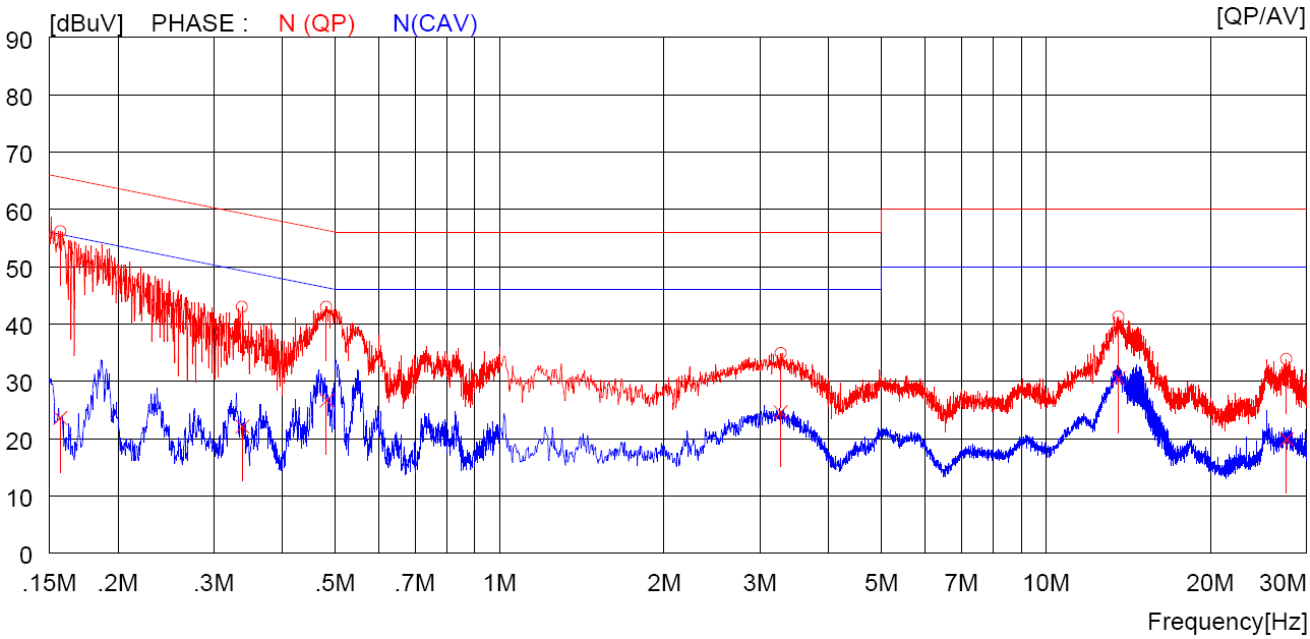
Graphical representation of Conducted Emission



HOT LINE



NEUTRAL LINE

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14. MAXIMUM PERMISSIBLE EXPOSURE

14.1 RF Exposure Calculation

According to the FCC rule 1.1310 table 1B, and IC rule RSS-102 Section 2.4.1, the limit for the maximum permissible RF exposure for an uncontrolled environment are f/1500 mW/cm² for the frequency range between 300 MHz and 1 500 MHz and 1.0 mW/cm² for the frequency range between 1 500 MHz and 100 000 MHz.

The electric field generated for a 1 mW/cm² exposure is calculated as follows:

$E = \sqrt{(30 * P * G)} / d$, and $S = E^2 / Z = E^2 / 377$, because 1 mW/cm² = 10 W/m²

Where

S = Power density in mW/cm², Z = Impedance of free space, 377 Ω

E = Electric filed strength in V/m, G = Numeric antenna gain, and d = distance in meter

Combing equations and rearranging the terms to express the distance as a function of the remaining variable

$d = \sqrt{(30 * P * G) / (377 * 10 S)}$

Changing to units of mW and cm, using P (mW) = P (W) / 1 000, d (cm) = 0.01 * d (m)

$d = 0.282 * \sqrt{(P * G) / S}$

Where

d = distance in cm, P = Power in mW, G = Numeric antenna gain, and S = Power density in mW/cm²

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14.2 Calculated MPE Safe Distance

14.2.1 Test data

According to above equation, the following result was obtained.

Operating Freq. Band (MHz)	Operating Mode	Peak Output Power		Antenna Gain		Safe Distance (cm)	Power Density (mW/cm²) @ 20 cm Separation	Limit (mW/cm²)
		(dBm)	(mW)	Log	Linear			
2 400 ~ 2 483.5	802.11b	11.99	15.81	2.00	1.58	1.41	0.005	1.00
	802.11g	11.47	14.03			1.33	0.004	1.00
	802.11n_ HT20	11.59	14.42			1.35	0.005	1.00
	802.11n_HT40	9.38	8.67			1.05	0.003	1.00

According to above table, for example 802.11b mode of 2 400 ~ 2 483.5 MHz Band, safe distance,

$D = 0.282 * \sqrt{(15.81 * 1.58)/1.00} = 1.41$ cm.

For getting power density at 20 cm separation in above table, following formula was used.

$S = P * G / (4\pi * R^2) = 15.81 * 1.58 / (4 * 3.14 * 20^2) = 0.005$

Where:

S = Power Density,

P = Power input to the external antenna (Output power from the EUT antenna port (dBm) – cable loss (dB)),

G = Gain of Transmit Antenna (linear gain), R = Distance from Transmitting Antenna

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