

9.6 Test data for radiated emission

9.6.1 Radiated Emission which fall in the Restricted Band

9.6.1.1 Test data for 802.11b WLAN Mode

9.6.1.1.1 Test data for Antenna 0

- Test Date : May 10, 2018 ~ May 17, 2018
- Resolution bandwidth : 1 MHz and Peak Detector for Peak Mode
1 MHz and RMS Detector for Average Mode
- Video bandwidth : 3 MHz for Peak and Average Mode
- Measurement distance : 3 m
- Duty Cycle : > 98 %
- 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									
2 389.64	49.80	Peak	H	26.94	9.20	34.76	51.18	74.00	22.82
2 389.96	38.91	Average	H				40.29	54.00	13.71
2 388.92	46.94	Peak	V				48.32	74.00	25.68
2 389.64	41.15	Average	V				42.53	54.00	11.47
Test Data for High Channel									
2 498.32	47.00	Peak	H	27.47	9.49	35.51	48.45	74.00	25.55
2 483.50	36.16	Average	H				37.61	54.00	16.39
2 483.64	47.61	Peak	V				49.06	74.00	24.94
2 483.50	37.19	Average	V				38.64	54.00	15.36

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: Hyung-Kwon, Oh / Assistant Manager

9.6.1.1.2 Test data for Antenna 1

- Test Date : May 10, 2018 ~ May 17, 2018
- Resolution bandwidth : 1 MHz and Peak Detector for Peak Mode
1 MHz and RMS Detector for Average Mode
- Video bandwidth : 3 MHz for Peak and Average Mode
- Measurement distance : 3 m
- Duty Cycle : > 98 %
- 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									
2 386.84	47.22	Peak	H	26.94	9.20	34.76	48.60	74.00	25.40
2 387.40	37.30	Average	H				38.68	54.00	15.32
2 388.68	46.38	Peak	V				47.76	74.00	26.24
2 387.40	36.75	Average	V				38.13	54.00	15.87
Test Data for High Channel									
2 486.83	47.66	Peak	H	27.47	9.49	35.51	49.11	74.00	24.89
2 483.50	36.86	Average	H				38.31	54.00	15.69
2 486.21	47.38	Peak	V				48.83	74.00	25.17
2 483.50	37.15	Average	V				38.60	54.00	15.40

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: Hyung-Kwon, Oh / Assistant Manager

9.6.1.2 Test data for 802.11g WLAN Mode

9.6.1.2.1 Test data for Antenna 0

- . Test Date : May 10, 2018 ~ May 17, 2018
- . Resolution bandwidth : 1 MHz and Peak Detector for Peak Mode
1 MHz and RMS Detector for Average Mode
- . Video bandwidth : 3 MHz for Peak and Average Mode
- . Measurement distance : 3 m
- . Duty Cycle : > 98 %
- . 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									
2 389.96	53.18	Peak	H	26.94	9.20	34.76	54.56	74.00	19.44
2 389.88	42.24	Average	H				43.62	54.00	10.38
2 389.96	56.00	Peak	V				57.38	74.00	16.62
2 389.96	44.30	Average	V				45.68	54.00	8.32
Test Data for High Channel									
2 483.50	52.34	Peak	H	27.47	9.49	35.51	53.79	74.00	20.21
2 483.50	40.14	Average	H				41.59	54.00	12.41
2 483.62	56.12	Peak	V				57.57	74.00	16.43
2 483.50	42.50	Average	V				43.95	54.00	10.05

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: Hyung-Kwon, Oh / Assistant Manager

9.6.1.2.2 Test data for Antenna 1

- Test Date : May 10, 2018 ~ May 17, 2018
- Resolution bandwidth : 1 MHz and Peak Detector for Peak Mode
1 MHz and RMS Detector for Average Mode
- Video bandwidth : 3 MHz for Peak and Average Mode
- Measurement distance : 3 m
- Duty Cycle : > 98 %
- 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									
2 389.08	54.94	Peak	H	26.94	9.20	34.76	56.32	74.00	17.68
2 389.96	44.25	Average	H				45.63	54.00	8.37
2 387.24	54.61	Peak	V				55.99	74.00	18.01
2 389.96	42.35	Average	V				43.73	54.00	10.27
Test Data for High Channel									
2 485.25	49.99	Peak	H	27.47	9.49	35.51	51.44	74.00	22.56
2 483.50	39.87	Average	H				41.32	54.00	12.68
2 484.25	52.20	Peak	V				53.65	74.00	20.35
2 483.50	40.63	Average	V				42.08	54.00	11.92

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: Hyung-Kwon, Oh / Assistant Manager

9.6.1.3 Test data for 802.11n_HT20 WLAN Mode

9.6.1.3.1 Test data for Multiple Transmit

- Test Date : May 10, 2018 ~ May 17, 2018
- Resolution bandwidth : 1 MHz and Peak Detector for Peak Mode
1 MHz and RMS Detector for Average Mode
- Video bandwidth : 3 MHz for Peak and Average Mode
- Measurement distance : 3 m
- Duty Cycle : > 98 %
- 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									
2 389.96	58.38	Peak	H	26.94	9.20	34.76	59.76	74.00	14.24
2 389.96	47.28	Average	H				48.66	54.00	5.34
2 389.00	58.14	Peak	V				59.52	74.00	14.48
2 389.88	47.26	Average	V				48.64	54.00	5.36
Test Data for High Channel									
2 484.69	57.92	Peak	H	27.47	9.49	35.51	59.37	74.00	14.63
2 483.50	43.61	Average	H				45.06	54.00	8.94
2 483.75	59.15	Peak	V				60.60	74.00	13.40
2 483.50	45.38	Average	V				46.83	54.00	7.17

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: Hyung-Kwon, Oh / Assistant Manager

9.6.1.4 Test data for 802.11n_HT40 WLAN Mode

9.6.1.4.1 Test data for Multiple Transmit

- . Test Date : May 10, 2018 ~ May 17, 2018
- . Resolution bandwidth : 1 MHz and Peak Detector for Peak Mode
1 MHz and RMS Detector for Average Mode
- . Video bandwidth : 3 MHz for Peak and Average Mode
- . Measurement distance : 3 m
- . Duty Cycle : > 98 %
- . 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									
2 385.72	59.94	Peak	H	26.94	9.20	34.76	61.32	74.00	12.68
2 385.88	49.39	Average	H				50.77	54.00	3.23
2 385.64	59.61	Peak	V				60.99	74.00	13.01
2 389.56	49.34	Average	V				50.72	54.00	3.28
Test Data for High Channel									
2 483.50	58.30	Peak	H	27.47	9.49	35.51	59.75	74.00	14.25
2 483.50	43.36	Average	H				44.81	54.00	9.19
2 484.43	59.36	Peak	V				60.81	74.00	13.19
2 483.50	45.18	Average	V				46.63	54.00	7.37

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: Hyung-Kwon, Oh / Assistant Manager

9.6.2 Spurious & Harmonic Radiated Emission

9.6.2.1 Test data for 802.11b WLAN Mode

9.6.2.1.1 Test data for Antenna 0

- Test Date : May 10, 2018 ~ May 17, 2018
- Resolution bandwidth : 1 MHz and Peak Detector for Peak Mode for the emissions fall in restricted band,
1 MHz and RMS Detector for Average Mode for the emissions fall in restricted band
100 kHz for Peak Mode for the emissions outside restricted band
- Video bandwidth : 3 MHz for Peak and Average Mode
- Frequency range : 1 GHz ~ 26.5 GHz
- Measurement distance : 3 m
- Duty Cycle : > 98 %
- 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									
4 824.00	46.21	Peak	H	30.84	12.31	35.74	53.62	74.00	20.38
	34.91	Average	H				42.32	54.00	11.68
	45.92	Peak	V				53.33	74.00	20.67
	34.94	Average	V				42.35	54.00	11.65
Test Data for Middle Channel									
4 884.00	46.35	Peak	H	30.01	12.43	35.80	52.99	74.00	21.01
	34.87	Average	H				41.51	54.00	12.49
	45.88	Peak	V				52.52	74.00	21.48
	34.97	Average	V				41.61	54.00	12.39
Test Data for High Channel									
4 924.00	46.07	Peak	H	31.15	12.81	35.96	54.07	74.00	19.93
	34.86	Average	H				42.86	54.00	11.14
	45.77	Peak	V				53.77	74.00	20.23
	35.01	Average	V				43.01	54.00	10.99

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: Hyung-Kwon, Oh / Assistant Manager

9.6.2.1.2 Test data for Antenna 1

- . Test Date : May 10, 2018 ~ May 17, 2018
- . Resolution bandwidth : 1 MHz and Peak Detector for Peak Mode for the emissions fall in restricted band,
1 MHz and RMS Detector for Average Mode for the emissions fall in restricted band
100 kHz for Peak Mode for the emissions outside restricted band
- . Video bandwidth : 3 MHz for Peak and Average Mode
- . Frequency range : 1 GHz ~ 26.5 GHz
- . Measurement distance : 3 m
- . Duty Cycle : > 98 %
- . 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									
4 824.00	46.35	Peak	H	30.84	12.31	35.74	53.76	74.00	20.24
	33.93	Average	H				41.34	54.00	12.66
	46.58	Peak	V				53.99	74.00	20.01
	34.10	Average	V				41.51	54.00	12.49
Test Data for Middle Channel									
4 884.00	45.44	Peak	H	30.01	12.43	35.80	52.08	74.00	21.92
	35.48	Average	H				42.12	54.00	11.88
	45.49	Peak	V				52.13	74.00	21.87
	35.42	Average	V				42.06	54.00	11.94
Test Data for High Channel									
4 924.00	46.92	Peak	H	31.15	12.81	35.96	54.92	74.00	19.08
	34.89	Average	H				42.89	54.00	11.11
	45.44	Peak	V				53.44	74.00	20.56
	35.60	Average	V				43.60	54.00	10.40

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: Hyung-Kwon, Oh / Assistant Manager

9.6.2.2 Test data for 802.11g WLAN Mode

9.6.2.2.1 Test data for Antenna 0

- Test Date : May 10, 2018 ~ May 17, 2018
- Resolution bandwidth : 1 MHz and Peak Detector for Peak Mode for the emissions fall in restricted band,
1 MHz and RMS Detector for Average Mode for the emissions fall in restricted band
100 kHz for Peak Mode for the emissions outside restricted band
- Video bandwidth : 3 MHz for Peak and Average Mode
- Frequency range : 1 GHz ~ 26.5 GHz
- Measurement distance : 3 m
- Duty Cycle : > 98 %
- 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									
4 824.00	46.17	Peak	H	30.84	12.31	35.74	53.58	74.00	20.42
	35.29	Average	H				42.70	54.00	11.30
	45.83	Peak	V				53.24	74.00	20.76
	34.39	Average	V				41.80	54.00	12.20
Test Data for Middle Channel									
4 884.00	45.80	Peak	H	30.01	12.43	35.80	52.44	74.00	21.56
	35.40	Average	H				42.04	54.00	11.96
	45.70	Peak	V				52.34	74.00	21.66
	35.29	Average	V				41.93	54.00	12.07
Test Data for High Channel									
4 924.00	46.24	Peak	H	31.15	12.81	35.96	54.24	74.00	19.76
	35.29	Average	H				43.29	54.00	10.71
	44.99	Peak	V				52.99	74.00	21.01
	34.28	Average	V				42.28	54.00	11.72

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: Hyung-Kwon, Oh / Assistant Manager

9.6.2.2.2 Test data for Antenna 1

- Test Date : May 10, 2018 ~ May 17, 2018
- Resolution bandwidth : 1 MHz and Peak Detector for Peak Mode for the emissions fall in restricted band,
1 MHz and RMS Detector for Average Mode for the emissions fall in restricted band
100 kHz for Peak Mode for the emissions outside restricted band
- Video bandwidth : 3 MHz for Peak and Average Mode
- Frequency range : 1 GHz ~ 26.5 GHz
- Measurement distance : 3 m
- Duty Cycle : > 98 %
- 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									
4 824.00	46.92	Peak	H	30.84	12.31	35.74	54.33	74.00	19.67
	34.74	Average	H				42.15	54.00	11.85
	46.53	Peak	V				53.94	74.00	20.06
	35.30	Average	V				42.71	54.00	11.29
Test Data for Middle Channel									
4 884.00	46.79	Peak	H	30.01	12.43	35.80	53.43	74.00	20.57
	34.00	Average	H				40.64	54.00	13.36
	46.41	Peak	V				53.05	74.00	20.95
	34.15	Average	V				40.79	54.00	13.21
Test Data for High Channel									
4 924.00	46.19	Peak	H	31.15	12.81	35.96	54.19	74.00	19.81
	35.62	Average	H				43.62	54.00	10.38
	44.83	Peak	V				52.83	74.00	21.17
	35.41	Average	V				43.41	54.00	10.59

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: Hyung-Kwon, Oh / Assistant Manager

9.6.2.3 Test data for 802.11n_HT20 WLAN Mode

9.6.2.3.1 Test data for Multiple Transmit

- Test Date : May 10, 2018 ~ May 17, 2018
- Resolution bandwidth : 1 MHz and Peak Detector for Peak Mode for the emissions fall in restricted band,
1 MHz and RMS Detector for Average Mode for the emissions fall in restricted band
100 kHz for Peak Mode for the emissions outside restricted band
- Video bandwidth : 3 MHz for Peak and Average Mode
- Frequency range : 1 GHz ~ 26.5 GHz
- Measurement distance : 3 m
- Duty Cycle : > 98 %
- 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									
4 824.00	45.35	Peak	H	30.84	12.31	35.74	52.76	74.00	21.24
	35.11	Average	H				42.52	54.00	11.48
	45.28	Peak	V				52.69	74.00	21.31
	35.81	Average	V				43.22	54.00	10.78
Test Data for Middle Channel									
4 884.00	46.81	Peak	H	30.01	12.43	35.80	53.45	74.00	20.55
	35.03	Average	H				41.67	54.00	12.33
	45.46	Peak	V				52.10	74.00	21.90
	34.45	Average	V				41.09	54.00	12.91
Test Data for High Channel									
4 924.00	45.54	Peak	H	31.15	12.81	35.96	53.54	74.00	20.46
	34.80	Average	H				42.80	54.00	11.20
	46.01	Peak	V				54.01	74.00	19.99
	34.63	Average	V				42.63	54.00	11.37

Tabulated test data for Restricted Band

Remark: "H": Horizontal, "V": Vertical

$$\text{Margin (dB)} = \text{Limits (dB}\mu\text{V/m)} - \text{Total Level (dB}\mu\text{V/m)}$$

$$\text{Total Level} = \text{Reading} + \text{Antenna Factor} + \text{Cable Loss} - \text{Pre-Amplifier Gain}$$


Tested by: Hyung-Kwon, Oh / Assistant Manager

9.6.2.4 Test data for 802.11n_HT40 WLAN Mode

9.6.2.4.1 Test data for Multiple Transmit

- Test Date : May 10, 2018 ~ May 17, 2018
- Resolution bandwidth : 1 MHz and Peak Detector for Peak Mode for the emissions fall in restricted band,
1 MHz and RMS Detector for Average Mode for the emissions fall in restricted band
100 kHz for Peak Mode for the emissions outside restricted band
- Video bandwidth : 3 MHz for Peak and Average Mode
- Frequency range : 1 GHz ~ 26.5 GHz
- Measurement distance : 3 m
- Duty Cycle : > 98 %
- 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									
4 844.00	46.19	Peak	H	30.84	12.31	35.76	53.58	74.00	20.42
	35.16	Average	H				42.55	54.00	11.45
	45.49	Peak	V				52.88	74.00	21.12
	34.24	Average	V				41.63	54.00	12.37
Test Data for Middle Channel									
4 884.00	45.38	Peak	H	30.01	12.43	35.80	52.02	74.00	21.98
	34.37	Average	H				41.01	54.00	12.99
	46.04	Peak	V				52.68	74.00	21.32
	35.45	Average	V				42.09	54.00	11.91
Test Data for High Channel									
4 904.00	47.03	Peak	H	31.15	12.81	35.94	55.05	74.00	18.95
	34.95	Average	H				42.97	54.00	11.03
	46.14	Peak	V				54.16	74.00	19.84
	34.99	Average	V				43.01	54.00	10.99

Tabulated test data for Restricted Band

Remark: "H": Horizontal, "V": Vertical

$$\text{Margin (dB)} = \text{Limits (dBμV/m)} - \text{Total Level (dBμV/m)}$$

$$\text{Total Level} = \text{Reading} + \text{Antenna Factor} + \text{Cable Loss} - \text{Pre-Amplifier Gain}$$


Tested by: Hyung-Kwon, Oh / Assistant Manager

10. PEAK POWER SPECTRUL DENSITY

10.1 Operating environment

Temperature : 23 °C
Relative humidity : 41 % R.H.

10.2 Test set-up

The antenna output of the EUT was connected to the spectrum analyzer.

The resolution bandwidth is set to $3 \text{ kHz} \leq \text{RBW} \leq 100 \text{ kHz}$, the video bandwidth is set to 3 times the resolution bandwidth.



10.3 Test equipment used

	Model Number	Manufacturer	Description	Serial Number	Last Cal.
■ -	FSV40	Rohde & Schwarz	Signal Analyzer	101009	Mar. 14, 2018 (1Y)

All test equipment used is calibrated on a regular basis.

10.4 Test data for 802.11b WLAN Mode

10.4.1 Test data for Antenna 0

-. Test Date : May 10, 2018 ~ May 17, 2018

-. Test Result : Pass

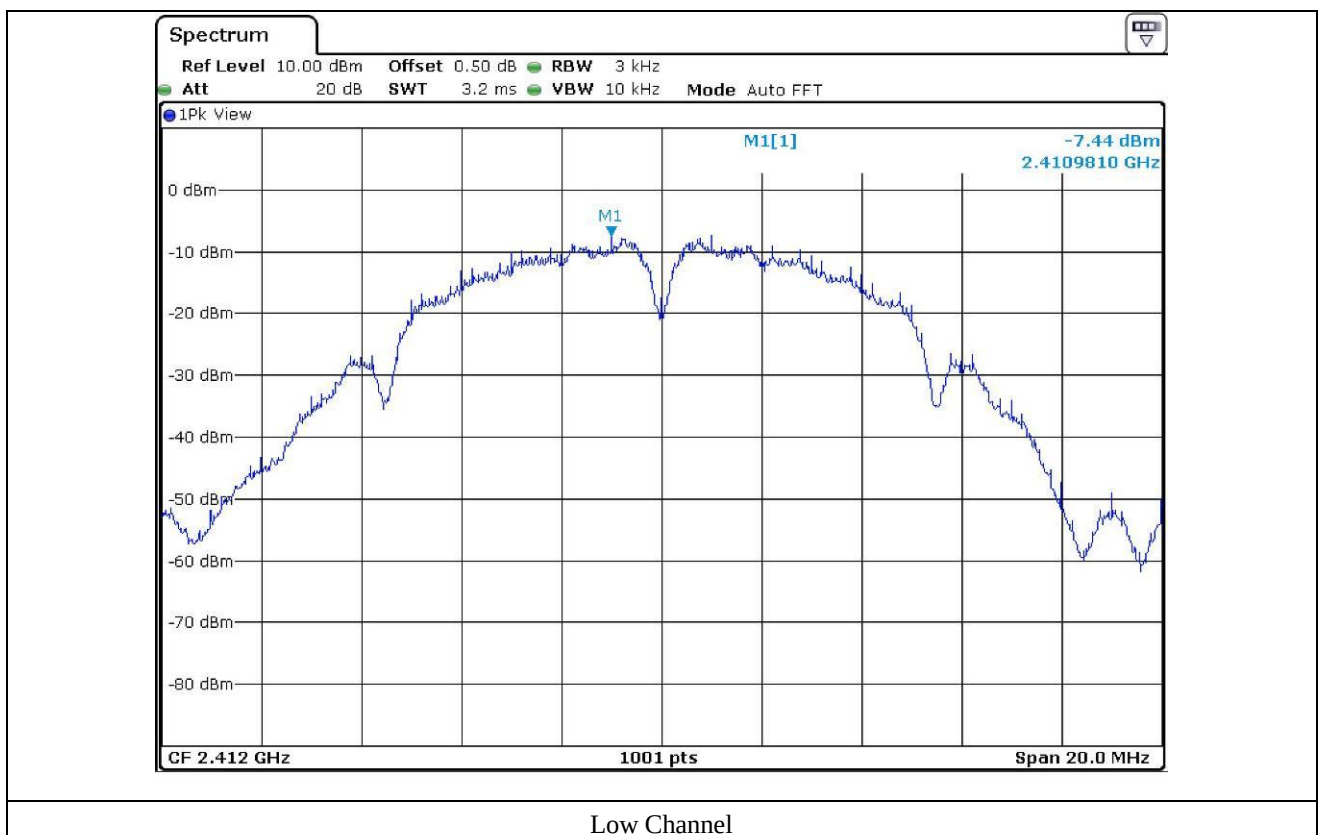
-. Operating Condition : Continuous transmitting mode

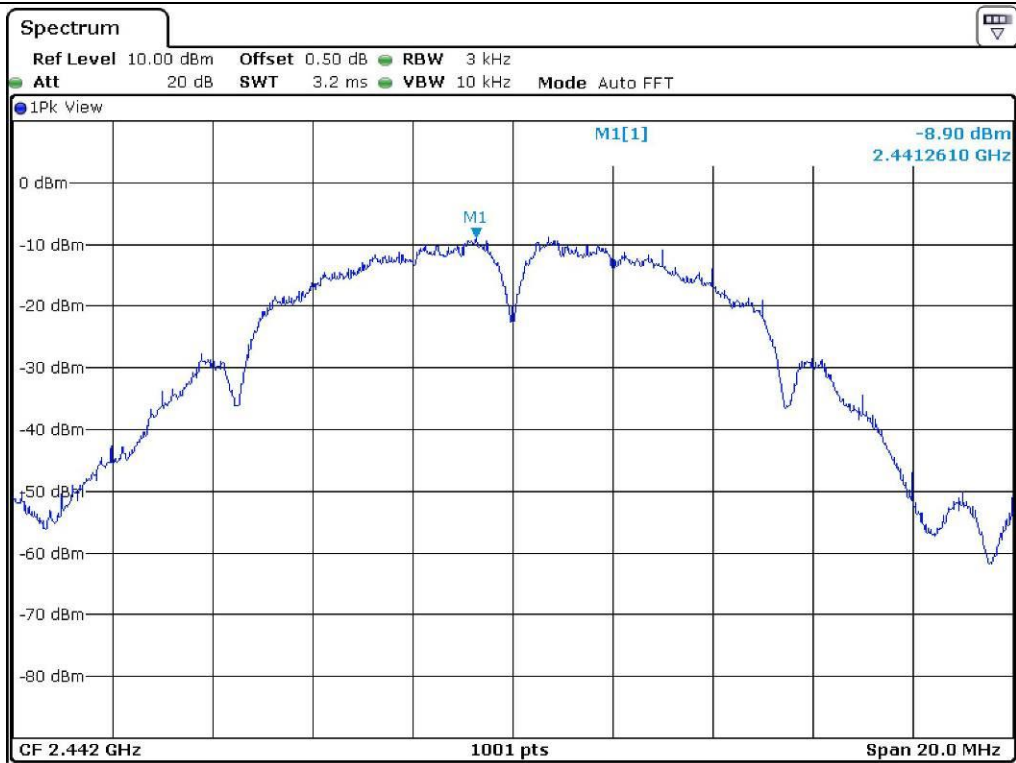
CHANNEL	FREQUENCY(MHz)	MEASURED VLAUE (dBm)	LIMIT (dBm)	MARGIN (dB)
Low	2 412.00	-7.44	8.00	15.44
Middle	2 442.00	-8.90	8.00	16.90
High	2 462.00	-8.24	8.00	16.24

Remark. Margin = Limit – Measured value

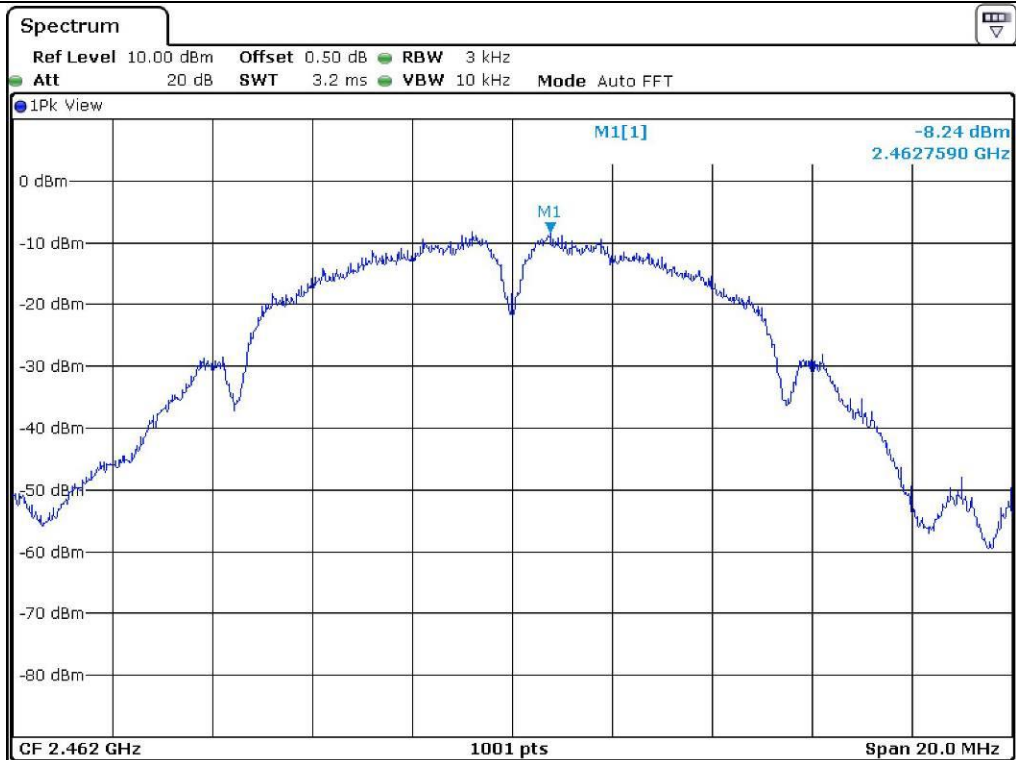


Tested by: Hyung-Kwon, Oh / Assistant Manager





Middle Channel



High Channel

10.4.2 Test data for Antenna 1

-. Test Date : May 10, 2018 ~ May 17, 2018

-. Test Result : Pass

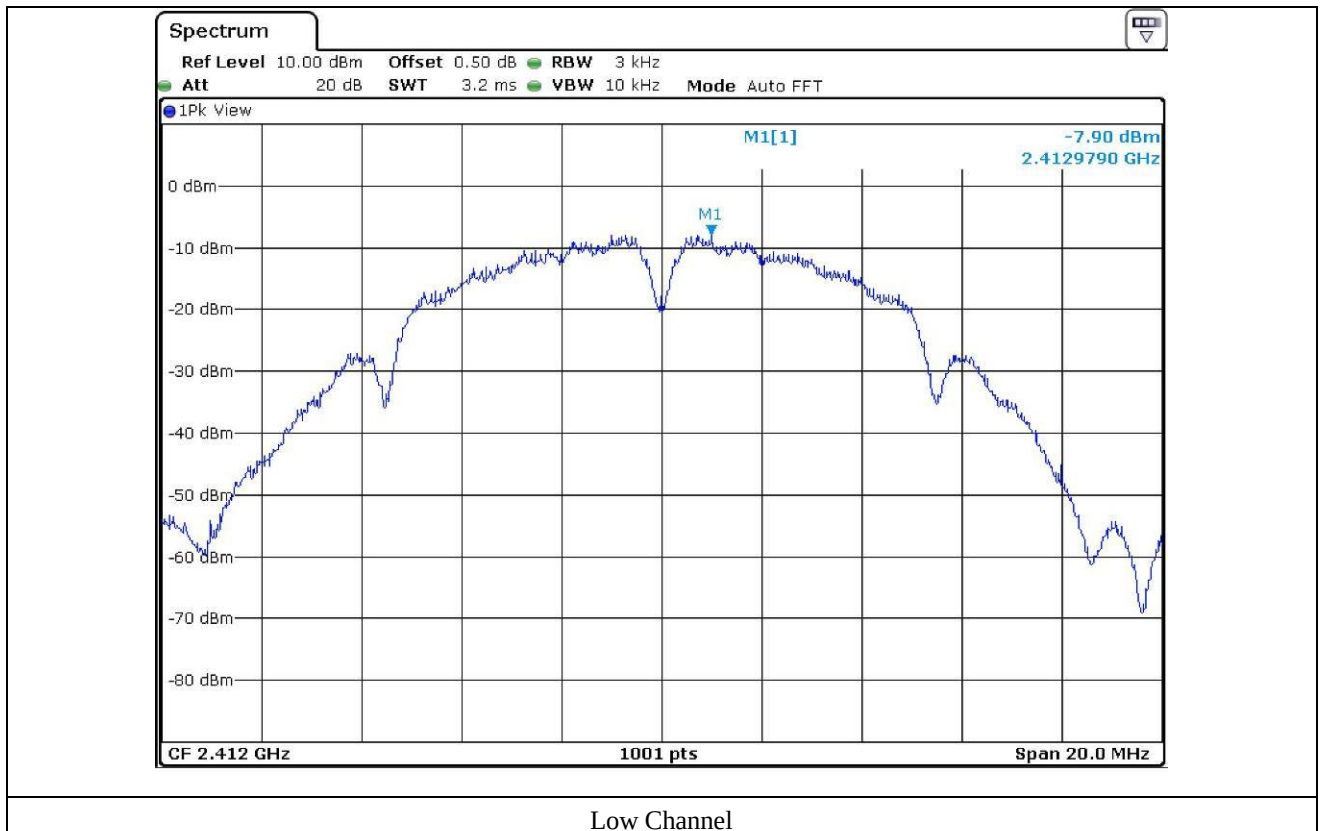
-. Operating Condition : Continuous transmitting mode

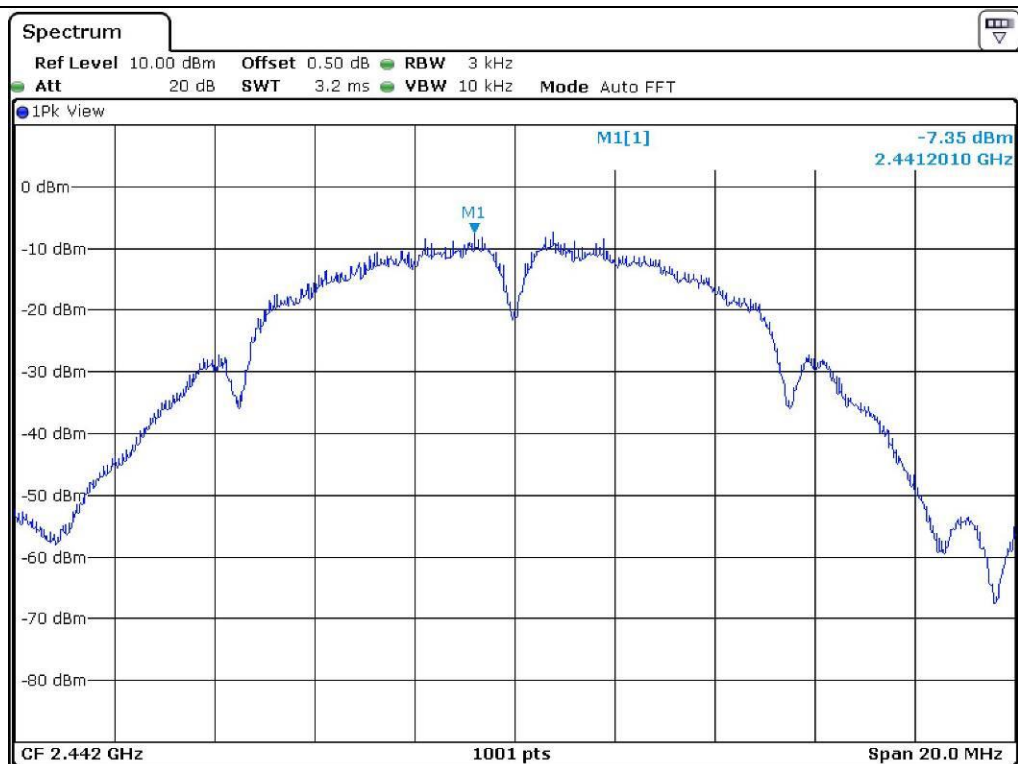
CHANNEL	FREQUENCY(MHz)	MEASURED VLAUE (dBm)	LIMIT (dBm)	MARGIN (dB)
Low	2 412.00	-7.90	8.00	15.90
Middle	2 442.00	-7.35	8.00	15.35
High	2 462.00	-7.91	8.00	15.91

Remark. Margin = Limit – Measured value

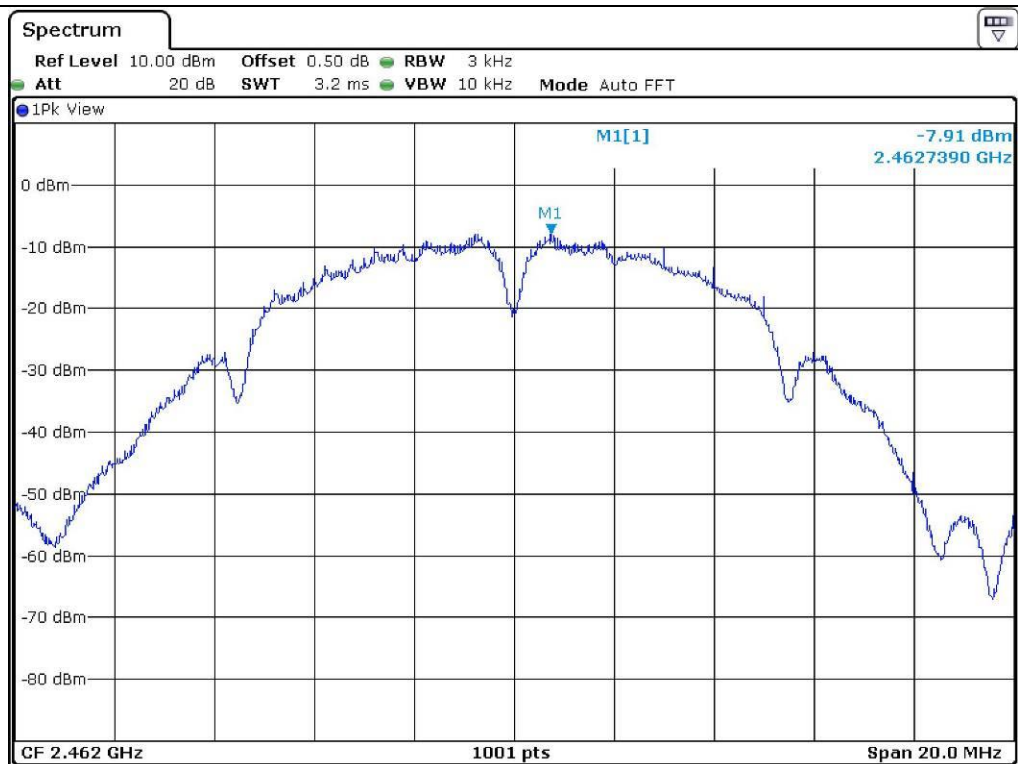


Tested by: Hyung-Kwon, Oh / Assistant Manager





Middle Channel



High Channel

10.5 Test data for 802.11g WLAN Mode

10.5.1 Test data for Antenna 0

-. Test Date : May 10, 2018 ~ May 17, 2018

-. Test Result : Pass

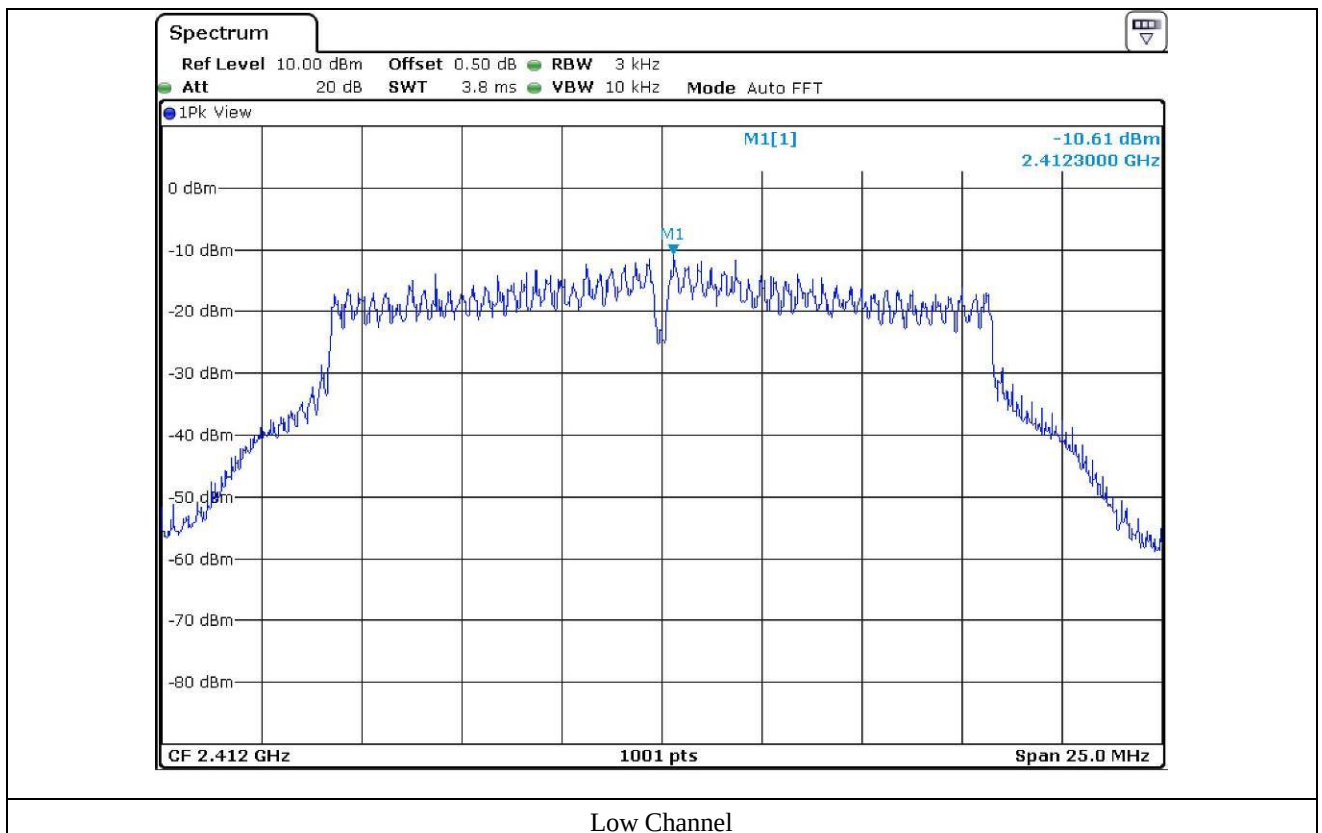
-. Operating Condition : Continuous transmitting mode

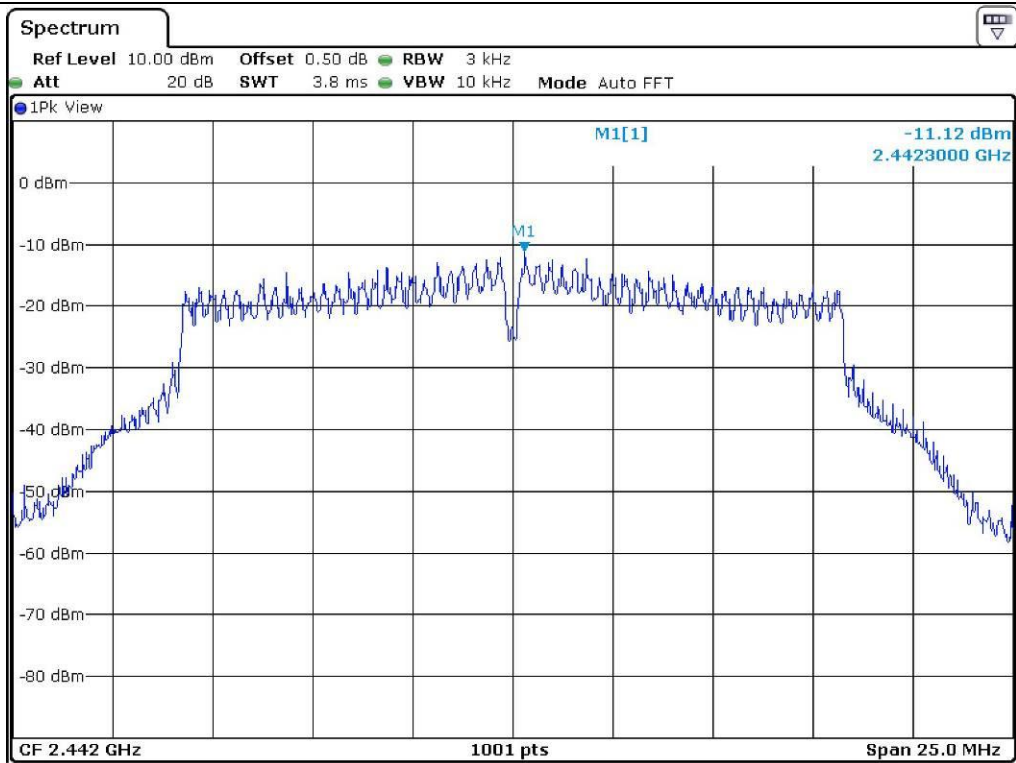
CHANNEL	FREQUENCY(MHz)	MEASURED VLAUE (dBm)	LIMIT (dBm)	MARGIN (dB)
Low	2 412.00	-10.61	8.00	18.61
Middle	2 442.00	-11.12	8.00	19.12
High	2 462.00	-11.20	8.00	19.20

Remark. Margin = Limit – Measured value

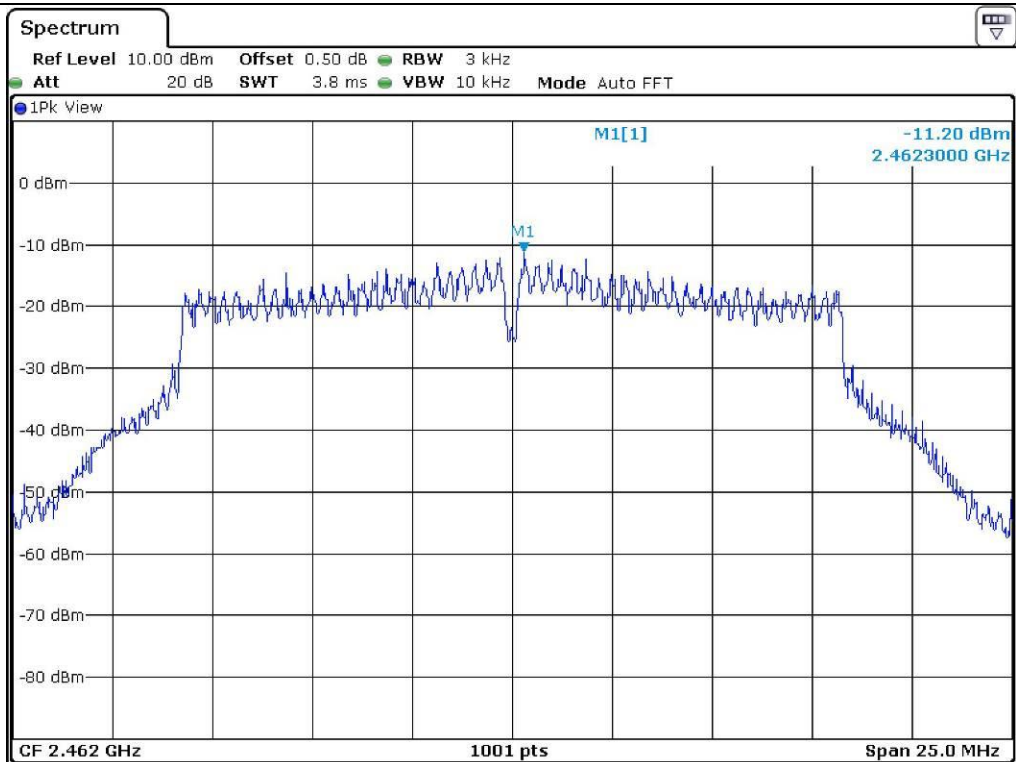


Tested by: Hyung-Kwon, Oh / Assistant Manager





Middle Channel



High Channel

10.5.2 Test data for Antenna 1

-. Test Date : May 10, 2018 ~ May 17, 2018

-. Test Result : Pass

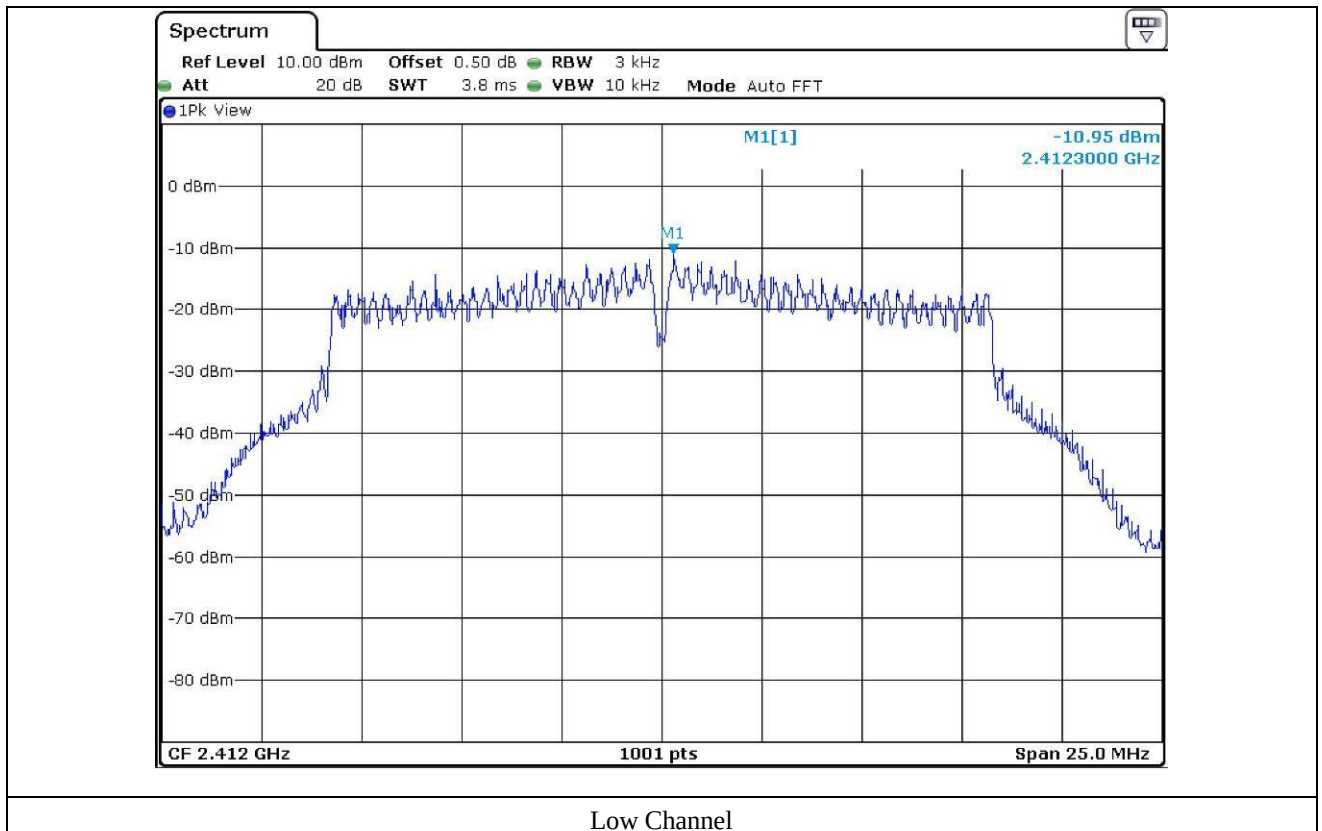
-. Operating Condition : Continuous transmitting mode

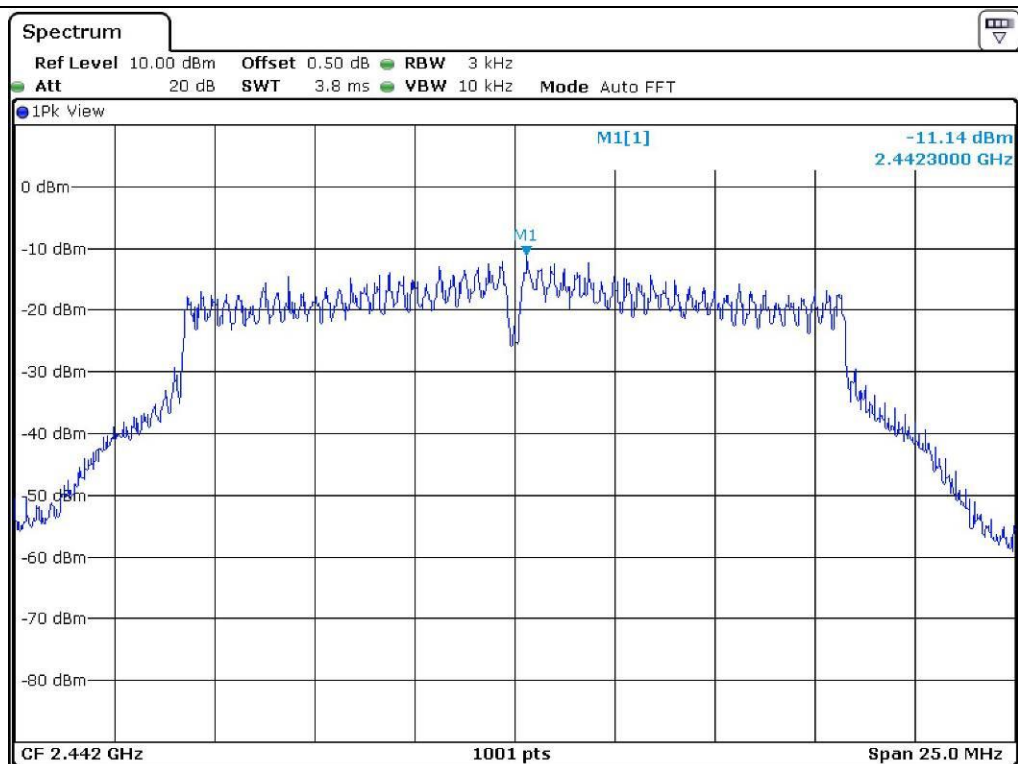
CHANNEL	FREQUENCY(MHz)	MEASURED VLAUE (dBm)	LIMIT (dBm)	MARGIN (dB)
Low	2 412.00	-10.95	8.00	18.95
Middle	2 442.00	-11.14	8.00	19.14
High	2 462.00	-11.10	8.00	19.10

Remark. Margin = Limit – Measured value

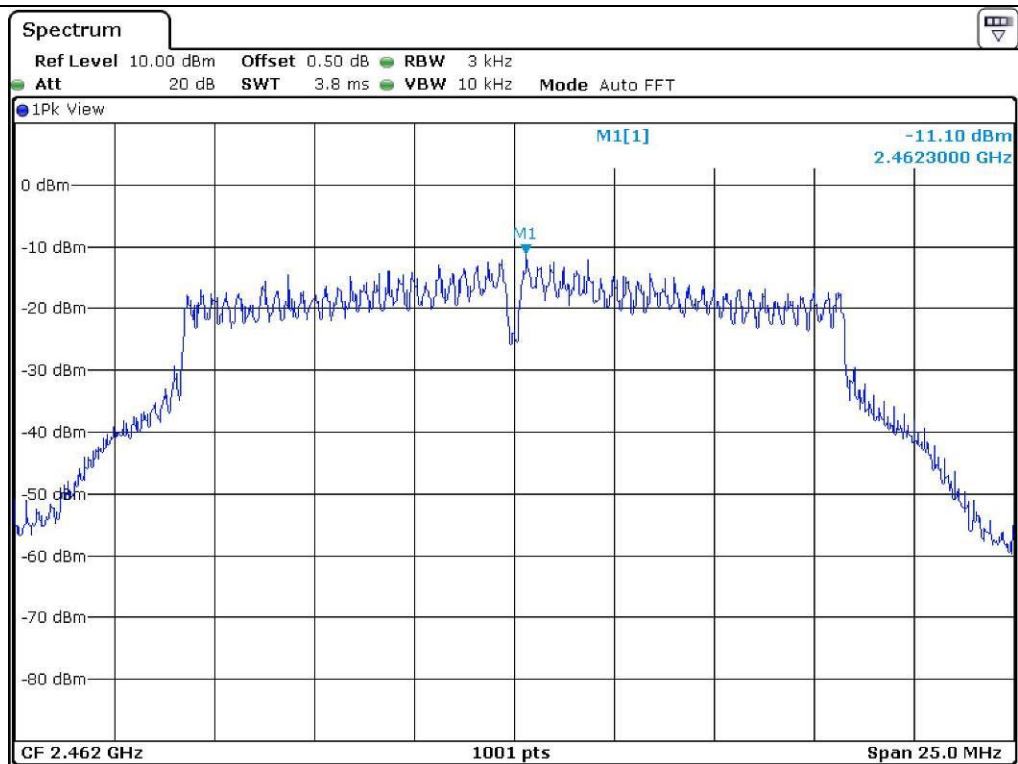


Tested by: Hyung-Kwon, Oh / Assistant Manager





Middle Channel



High Channel

10.6 Test data for 802.11n_HT20 WLAN Mode

10.6.1 Test data for Antenna 0

-. Test Date : May 10, 2018 ~ May 17, 2018

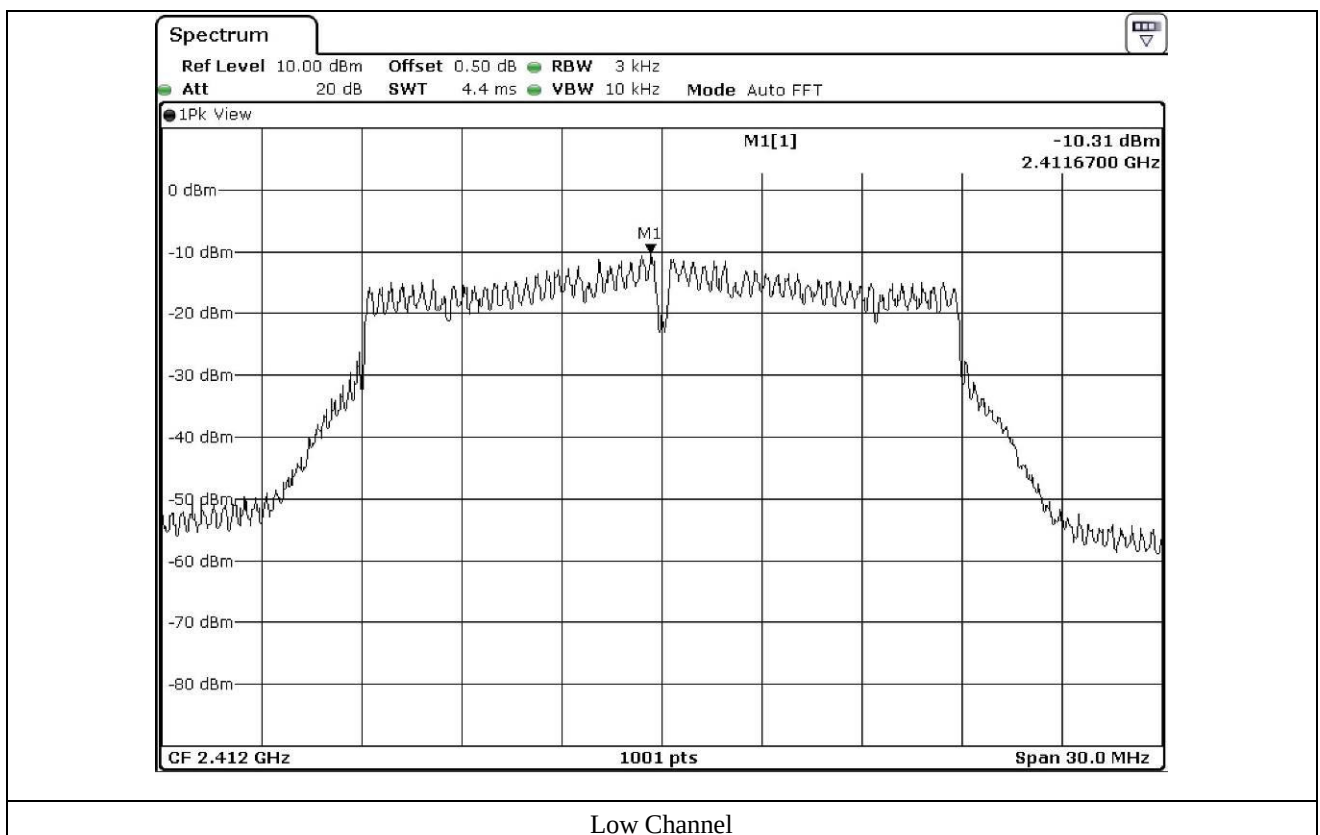
-. Test Result : Pass

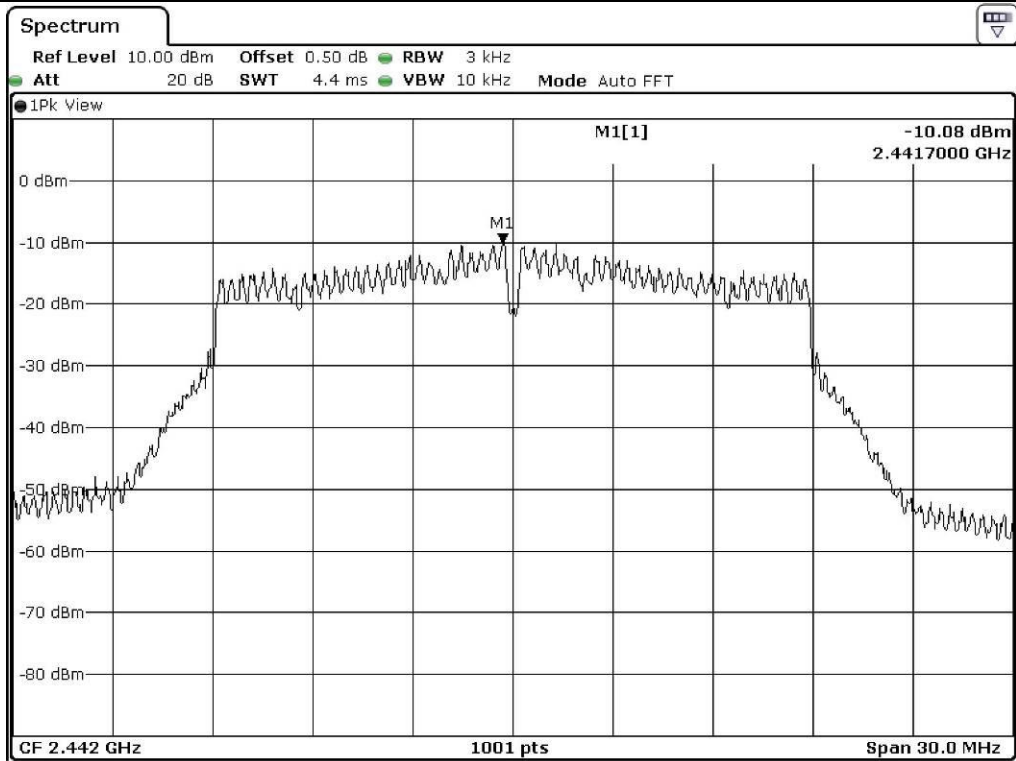
-. Operating Condition : Continuous transmitting mode

CHANNEL	FREQUENCY(MHz)	MEASURED VLAUE (dBm)	LIMIT (dBm)	MARGIN (dB)
Low	2 412.00	-10.31	8.00	18.31
Middle	2 442.00	-10.08	8.00	18.08
High	2 462.00	-9.21	8.00	17.21

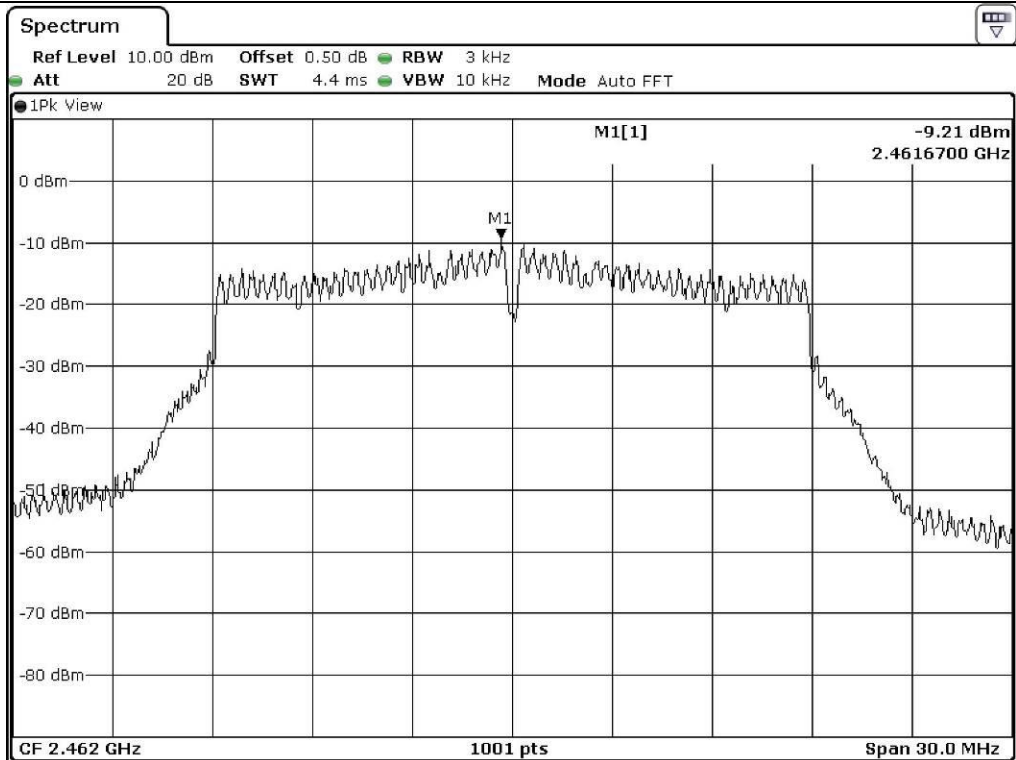
Remark. Margin = Limit – Measured value

Tested by: Hyung-Kwon, Oh / Assistant Manager





Middle Channel



High Channel

10.6.2 Test data for Antenna 1

-. Test Date : May 10, 2018 ~ May 17, 2018

-. Test Result : Pass

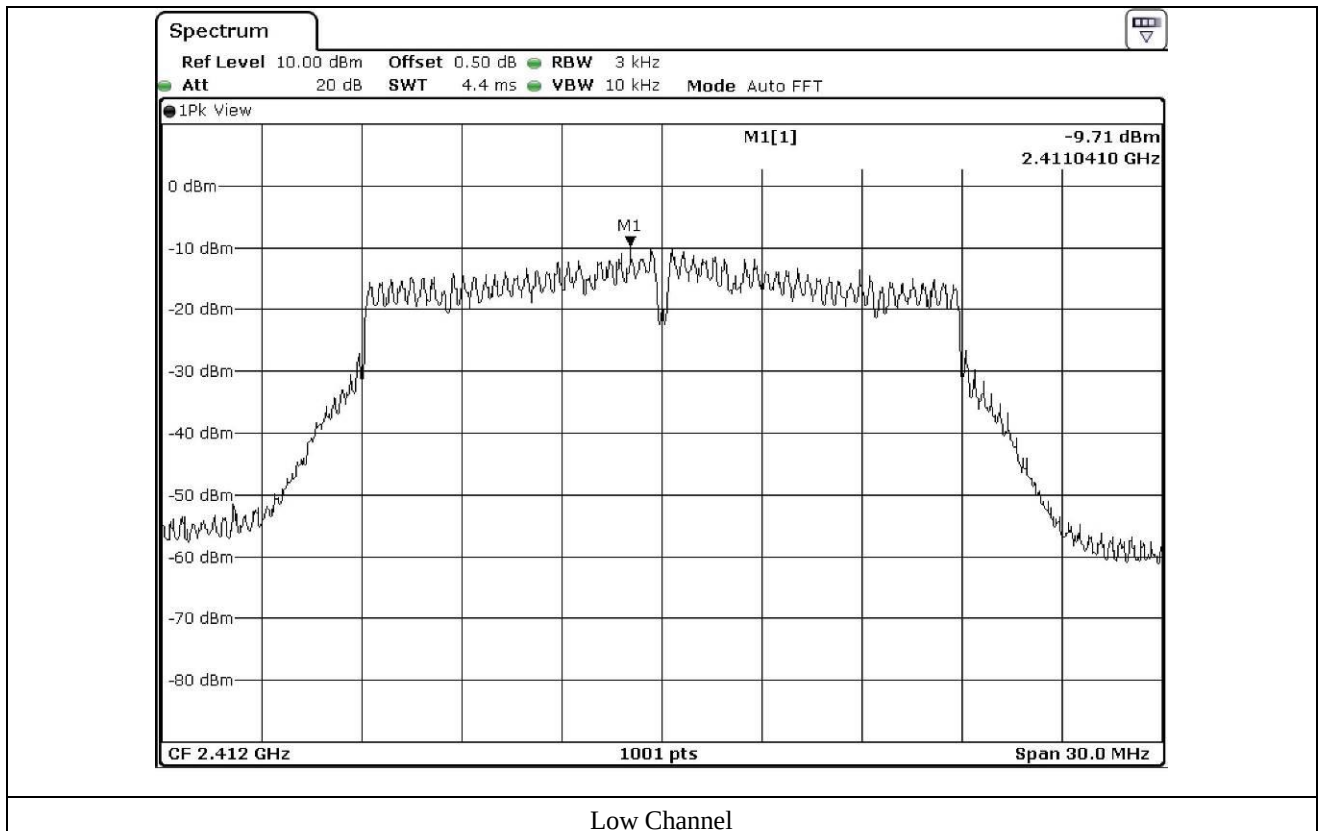
-. Operating Condition : Continuous transmitting mode

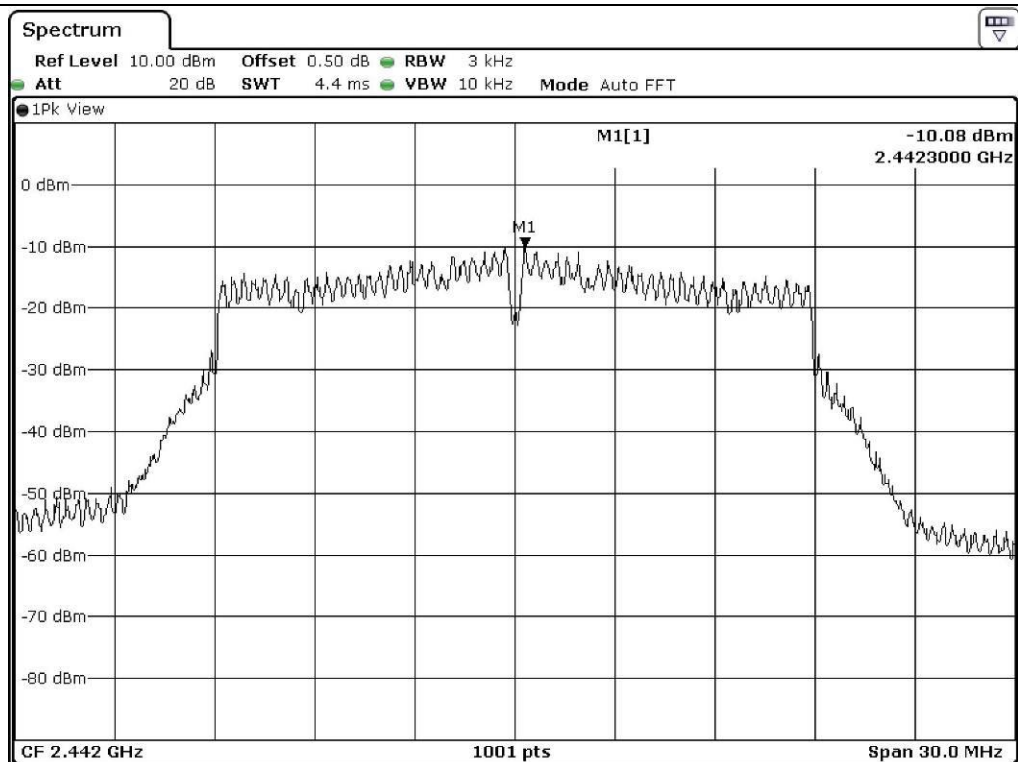
CHANNEL	FREQUENCY(MHz)	MEASURED VLAUE (dBm)	LIMIT (dBm)	MARGIN (dB)
Low	2 412.00	-9.71	8.00	17.71
Middle	2 442.00	-10.08	8.00	18.08
High	2 462.00	-10.29	8.00	18.29

Remark. Margin = Limit – Measured value

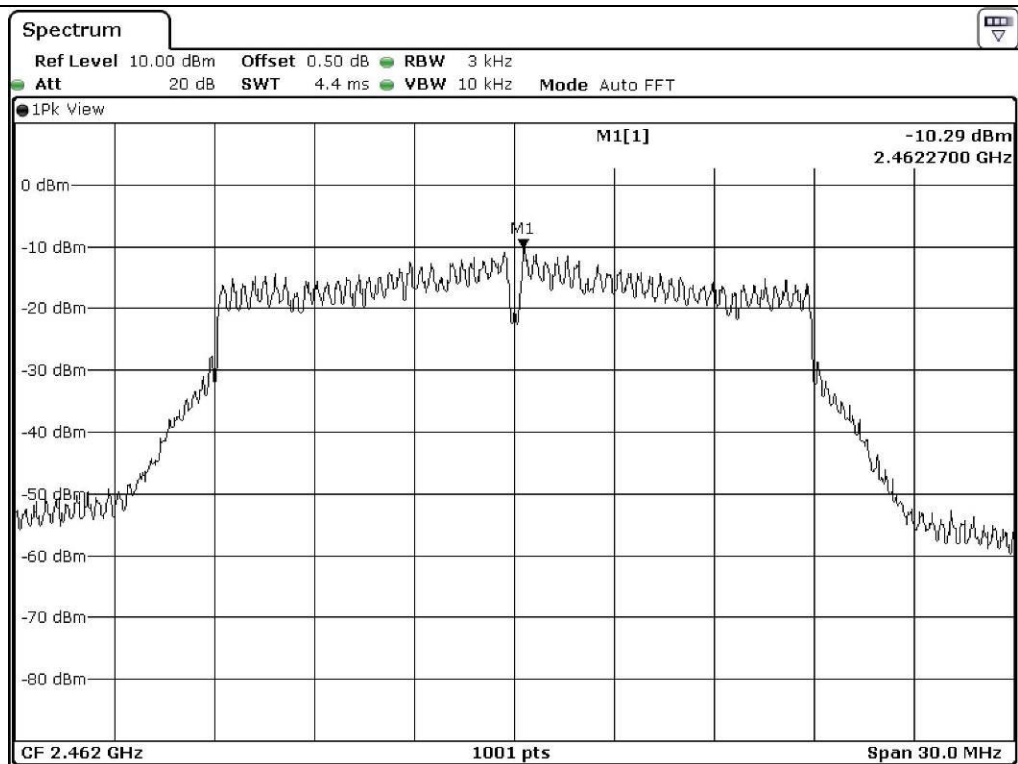


Tested by: Hyung-Kwon, Oh / Assistant Manager





Middle Channel



High Channel

10.6.3 Test data for Multiple Transmit

-. Test Date : May 10, 2018 ~ May 17, 2018

-. Test Result : Pass

-. Operating Condition : Continuous transmitting mode

CHANNEL	FREQUENCY(MHz)	MEASURED VLAUE (dBm)	LIMIT (dBm)	MARGIN (dB)
Low	2 412.00	-6.99	7.51	14.50
Middle	2 442.00	-7.07	7.51	14.58
High	2 462.00	-6.71	7.51	14.22

Remark 1 : Margin = Limit – Measured value

Remark 2 : Calculated Power Density = $10\log(10^{(\text{Antenna 0 Power Density}/10)} + 10^{(\text{Antenna 1 Power Density}/10)})$

Remark 3 : Directional gain = $10*\log[(10^{G0/20} + 10^{G1/20})^2/N]$ dBi

Remark 4 : Limit = 8 dBm – Exceeds Antenna gain

Remark 5 : Exceeds Antenna gain = Above the limits is calculated according to antenna gain.

Because antenna gain is higher than 6 dBi.



Tested by: Hyung-Kwon, Oh / Assistant Manager

10.7 Test data for 802.11n_HT40 WLAN Mode

10.7.1 Test data for Antenna 0

-. Test Date : May 10, 2018 ~ May 17, 2018

-. Test Result : Pass

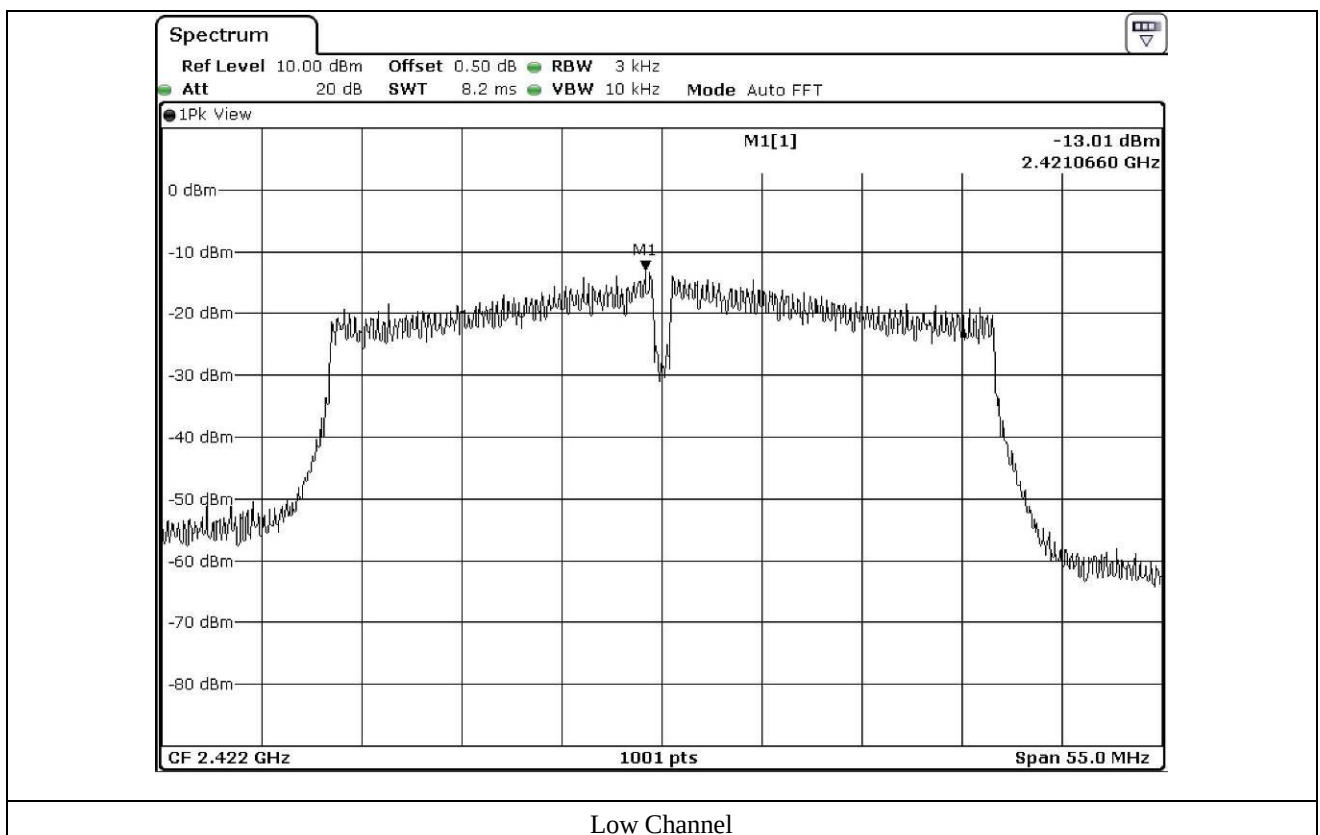
-. Operating Condition : Continuous transmitting mode

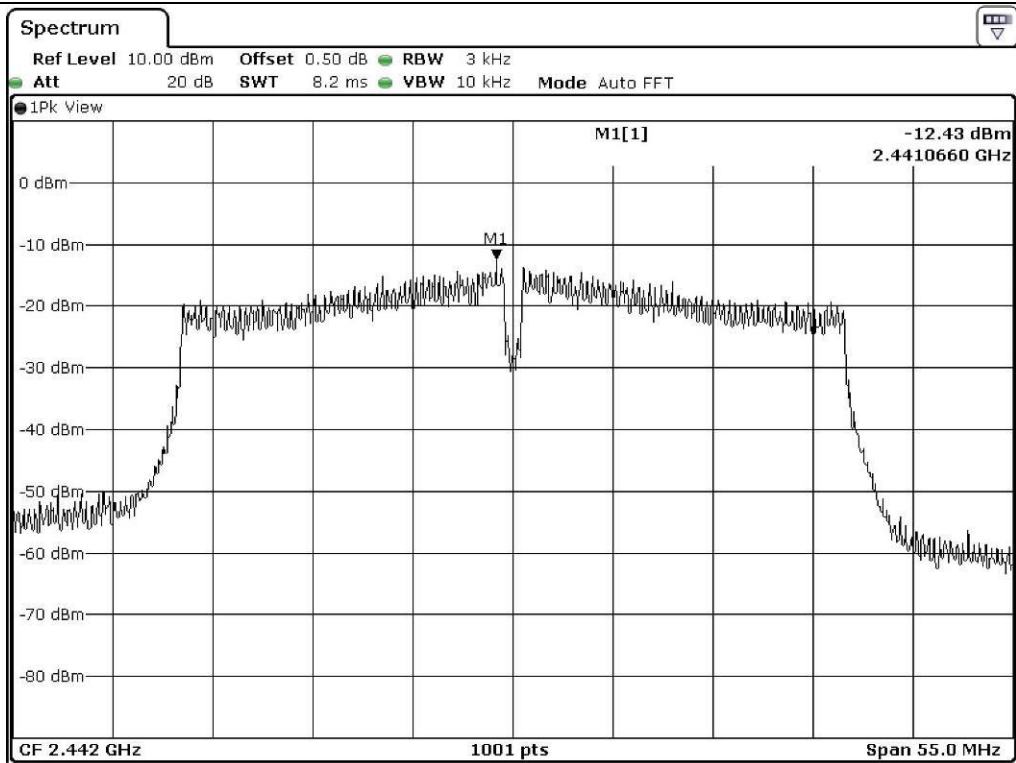
CHANNEL	FREQUENCY(MHz)	MEASURED VLAUE (dBm)	LIMIT (dBm)	MARGIN (dB)
Low	2 422.00	-13.01	8.00	21.01
Middle	2 442.00	-12.43	8.00	20.43
High	2 452.00	-13.18	8.00	21.18

Remark. Margin = Limit – Measured value

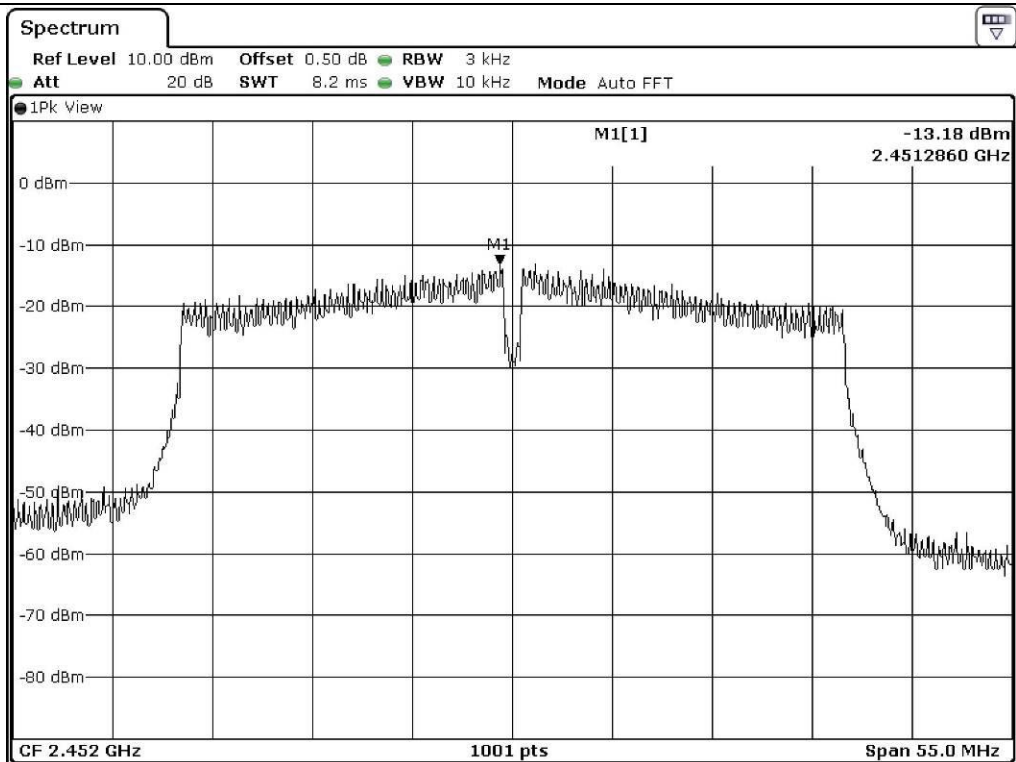


Tested by: Hyung-Kwon, Oh / Assistant Manager





Middle Channel



High Channel

10.7.2 Test data for Antenna 1

-. Test Date : May 10, 2018 ~ May 17, 2018

-. Test Result : Pass

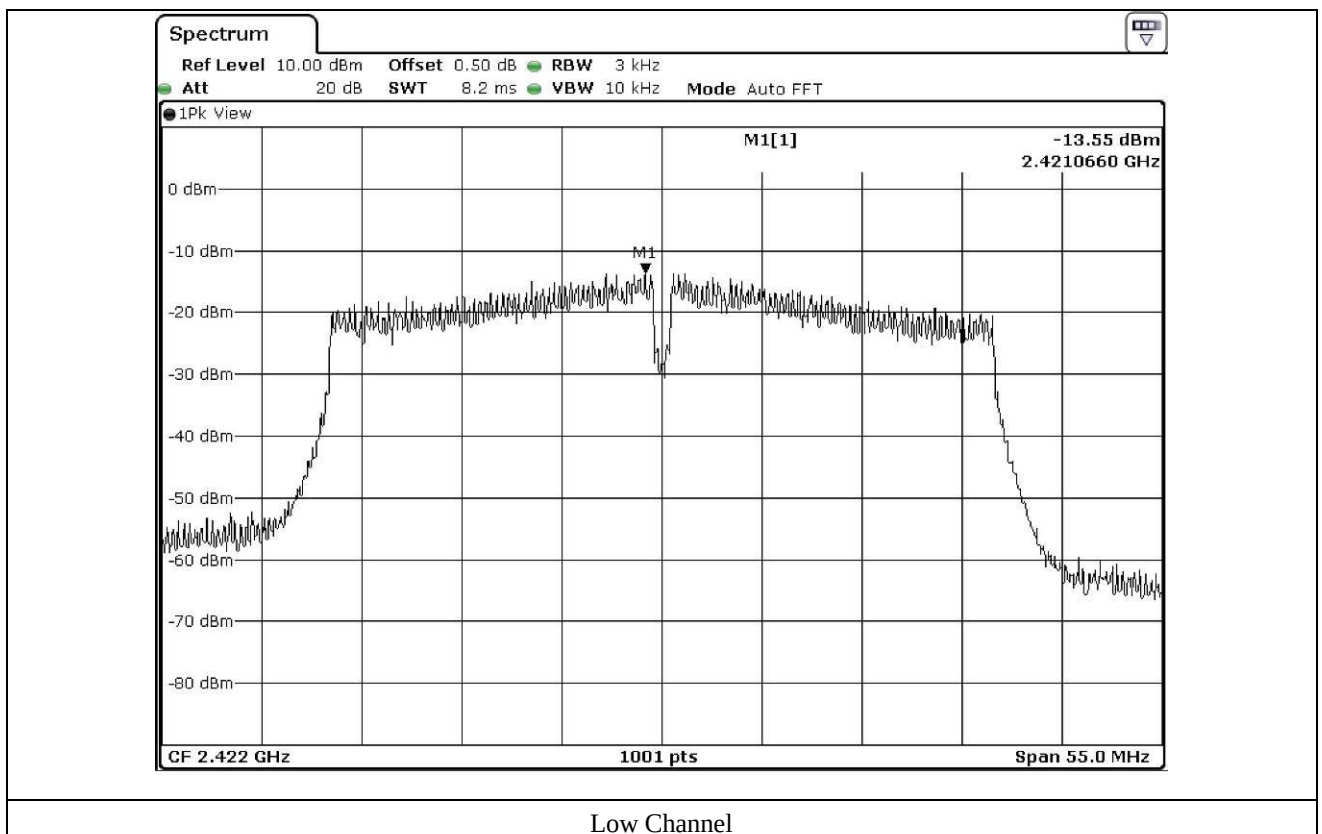
-. Operating Condition : Continuous transmitting mode

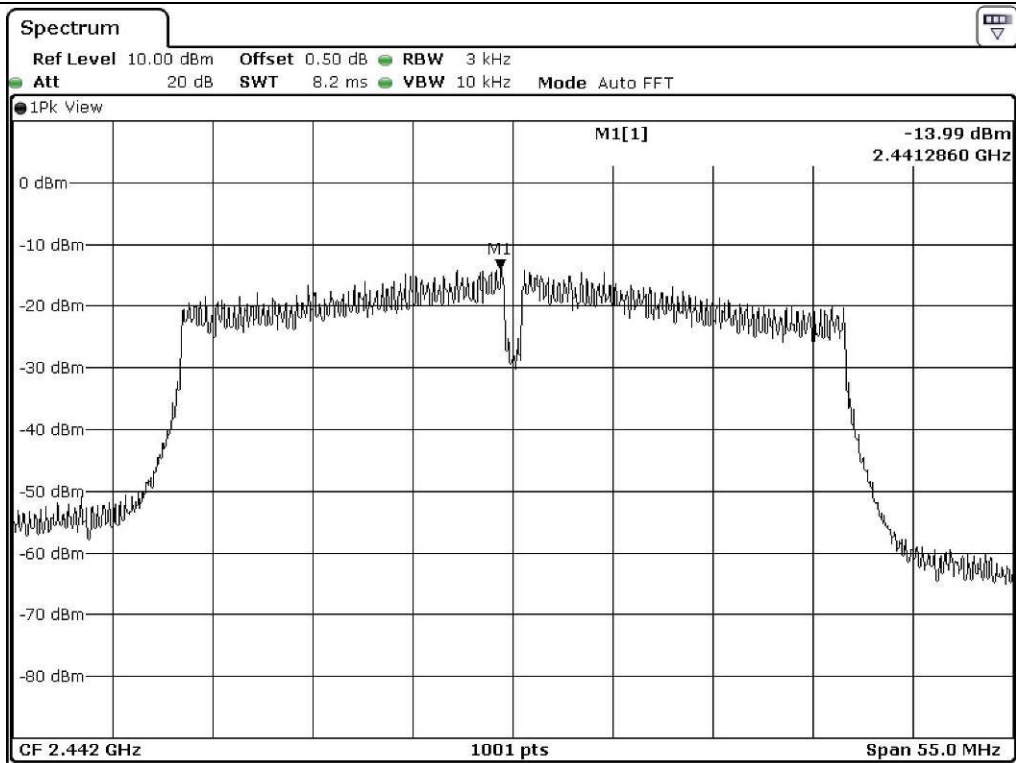
CHANNEL	FREQUENCY(MHz)	MEASURED VLAUE (dBm)	LIMIT (dBm)	MARGIN (dB)
Low	2 422.00	-13.55	8.00	21.55
Middle	2 442.00	-13.99	8.00	21.99
High	2 452.00	-12.79	8.00	20.79

Remark. Margin = Limit – Measured value

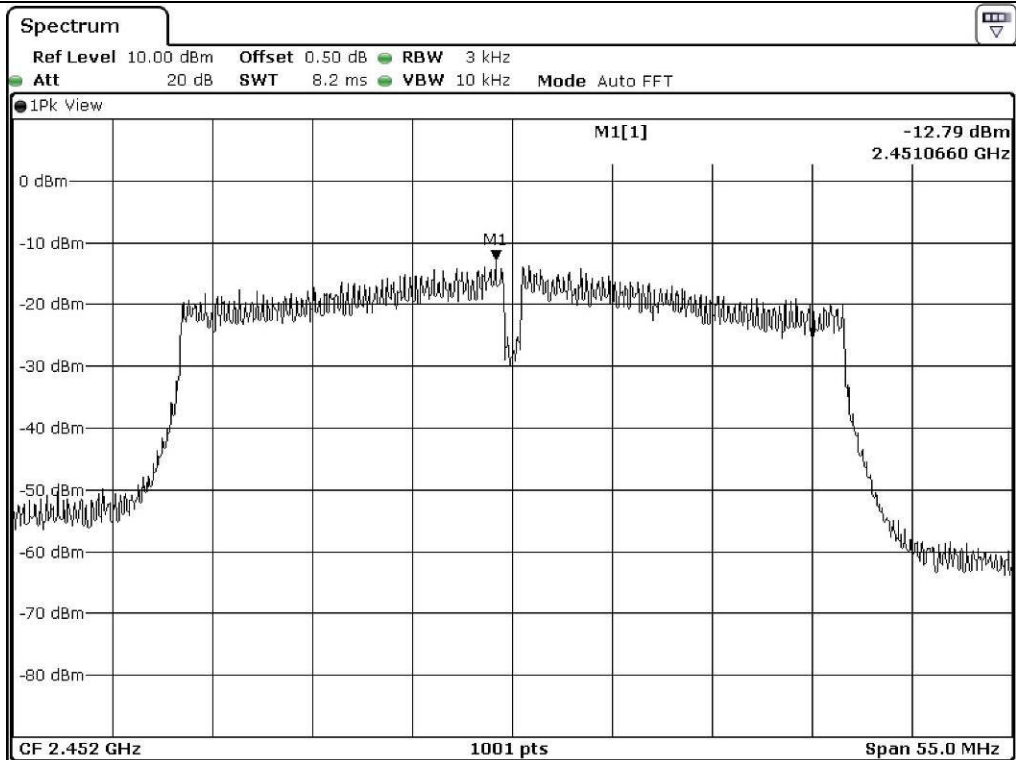


Tested by: Hyung-Kwon, Oh / Assistant Manager





Middle Channel



High Channel

10.7.3 Test data for Multiple Transmit

-. Test Date : May 10, 2018 ~ May 17, 2018

-. Test Result : Pass

-. Operating Condition : Continuous transmitting mode

CHANNEL	FREQUENCY(MHz)	MEASURED VLAUE (dBm)	LIMIT (dBm)	MARGIN (dB)
Low	2 422.00	-10.26	7.51	17.77
Middle	2 442.00	-10.13	7.51	17.64
High	2 452.00	-9.97	7.51	17.48

Remark 1 : Margin = Limit – Measured value

Remark 2 : Calculated Power Density = $10\log(10^{(\text{Antenna 0 Power Density}/10)} + 10^{(\text{Antenna 1 Power Density}/10)})$

Remark 3 : Directional gain = $10*\log[(10^{G0/20} + 10^{G1/20})^2/N]$ dBi

Remark 4 : Limit = 8 dBm – Exceeds Antenna gain

Remark 5 : Exceeds Antenna gain = Above the limits is calculated according to antenna gain.

Because antenna gain is higher than 6 dBi.



Tested by: Hyung-Kwon, Oh / Assistant Manager

11. RADIATED EMISSION TEST

11.1 Operating environment

Temperature : 25 °C
Relative humidity : 44 % R.H.

11.2 Test set-up

The radiated emissions measurements were on the 3 m semi anechoic chamber. The EUT and other support equipment were placed on 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.

11.3 Test equipment used

Model Number	Manufacturer	Description	Serial Number	Last Cal.(Interval)
■ - FSV40	Rohde & Schwarz	Signal Analyzer	101009	Mar. 14, 2018 (1Y)
■ - ESU	Rohde & Schwarz	EMI Test Receiver	100261	Mar. 29, 2018 (1Y)
■ - 310N	Sonoma Instrument	Pre-Amplifier	312544	Mar. 28, 2018 (1Y)
■ - BBV9718	Schwarzbeck	Amplifier	310	Mar. 30, 2018 (1Y)
■ - DT3000-3t	Innco System	Turn Table	DT3000/093	N/A
■ - MA-4000XPET	Innco System	Antenna Master	MA4000/509	N/A
■ - VULB9163	Schwarzbeck	TRILOG Broadband Antenna	9163-419	Aug. 05, 2016 (2Y)
■ - BBHA9120D	Schwarzbeck	Horn Antenna	BBHA9120D295	Aug. 16, 2017 (2Y)
■ - BBHA9170	Schwarzbeck	Horn Antenna	BBHA9170179	Jul. 28, 2017 (2Y)

All test equipment used is calibrated on a regular basis.

11.4 Test data

11.4.1 Test data for 30 MHz ~ 1 000 MHz

Humidity Level : 44 % R.H.

Temperature: 25 °C

Limits apply to : FCC CFR 47, PART 15, SUBPART C, SECTION 15.247

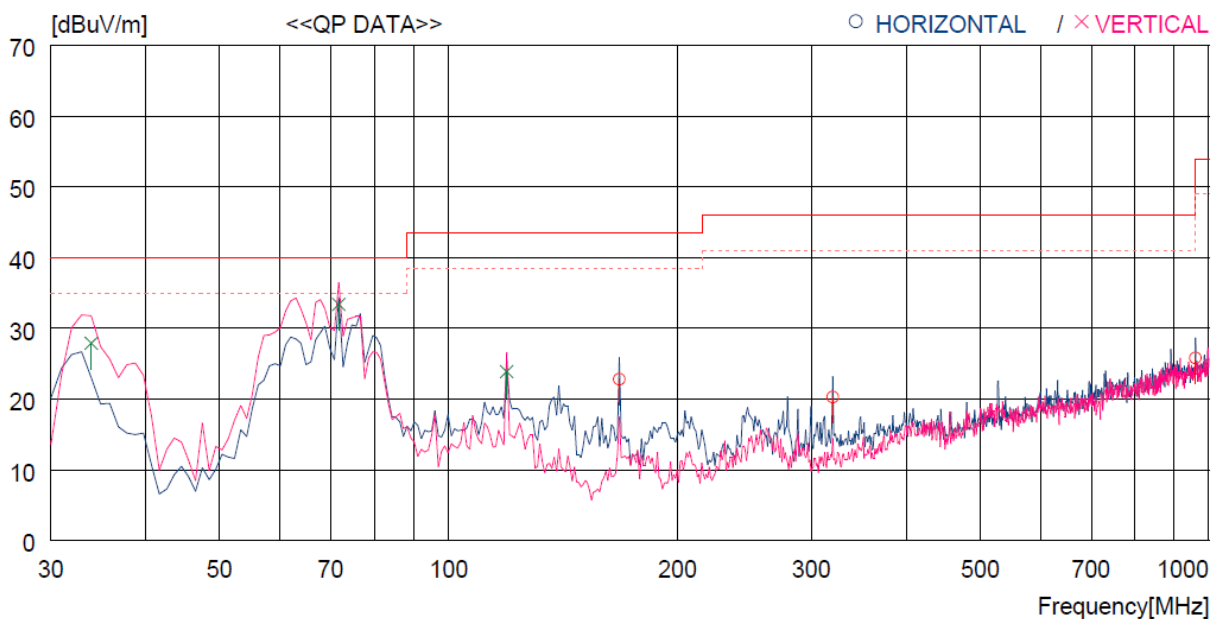
Result : PASSED

EUT EUT : WLAN(802.11a/b/g/n/ac) 2x2 MIMO Module

Date: May 10, 2018 ~ May 17, 2018

Detector : CISPR Quasi-Peak (6 dB Bandwidth: 120 kHz)

-.Antenna 0, Antenna 1 and Multiple transmit tested, but the worst data were recorded.



No.	FREQ	READING	ANT	LOSS	GAIN	RESULT	LIMIT	MARGIN	ANTENNA	TABLE
	[MHz]	QP	FACTOR	[dB]	[dB]	[dBuV/m]	[dBuV/m]	[dB]	[cm]	[DEG]
		[dBuV]	[dB]							
----- Horizontal -----										
1	167.740	43.6	8.8	3.4	33.0	22.8	43.5	20.7	400	112
2	320.030	35.1	13.6	4.7	33.1	20.3	46.0	25.7	400	188
3	960.217	27.6	22.0	8.2	32.0	25.8	54.0	28.2	400	137
----- Vertical -----										
4	33.880	47.4	12.1	1.5	33.1	27.9	40.0	12.1	400	162
5	71.710	55.1	9.2	2.2	33.1	33.4	40.0	6.6	400	162
6	119.240	43.8	10.2	2.9	33.0	23.9	43.5	19.6	400	162

Tested by: Hyung-Kwon, Oh / Assistant Manager

11.4.2 Test data for Below 30 MHz

- . Test Date : May 10, 2018 ~ May 17, 2018
- . 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. Height (m)	Angle (°)	Ant. Factor (dB/m)	Cable Loss	Emission Level(dBμV/m)	Limits (dBμV/m)	Margin (dB)
It was not observed any emissions from the EUT.									

11.4.3 Test data for above 1 GHz

- . Test Date : May 10, 2018 ~ May 17, 2018
- . 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. Height (m)	Angle (°)	Ant. Factor (dB/m)	Cable Loss	Emission Level(dBμV/m)	Limits (dBμV/m)	Margin (dB)
It was not observed any emissions from the EUT.									



Tested by: Hyung-Kwon, Oh / Assistant Manager

12. CONDUCTED EMISSION TEST

12.1 Operating environment

Temperature : 25 °C
Relative humidity : 44 % R.H.

12.2 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 μ H + 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.

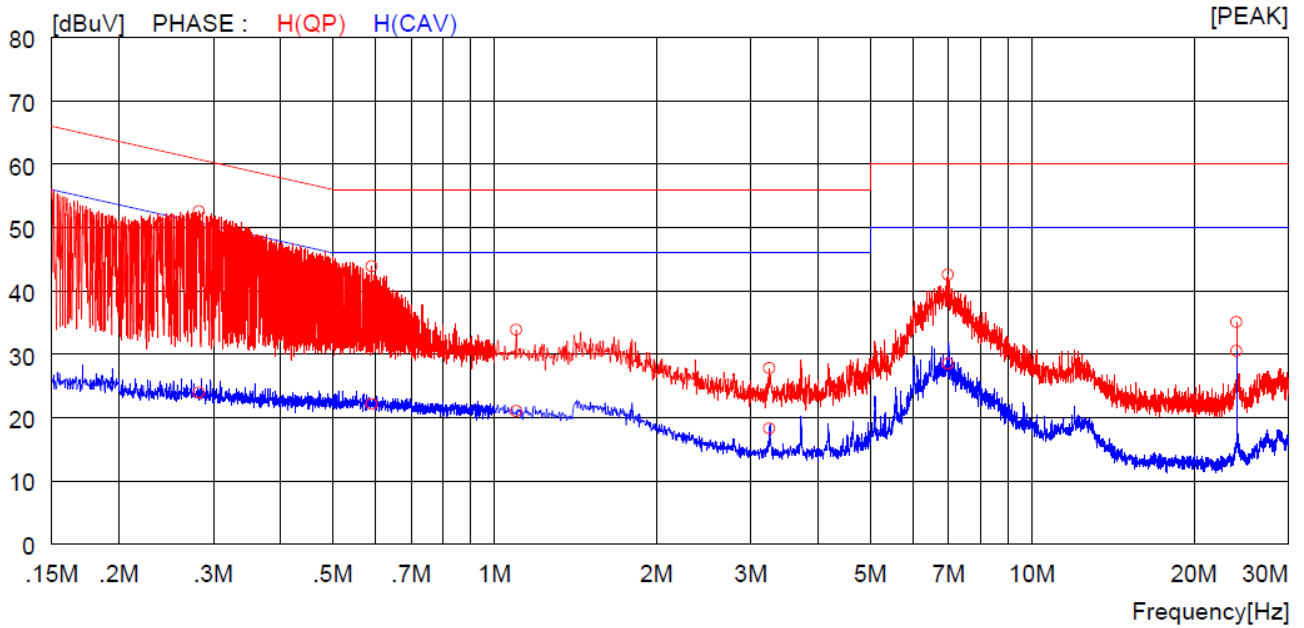
12.3 Test equipment used

	Model Number	Manufacturer	Description	Serial Number	Last Cal. (Interval)
■ -	ESPI	Rohde & Schwarz	Test Receiver	101012	Oct. 27, 2017 (1Y)
□ -	ESHS10	Rohde & Schwarz	Test Receiver	834467/007	Mar. 29, 2018 (1Y)
□ -	NSLK8128	Schwarzbeck	AMN	8128-216	Mar. 29, 2018 (1Y)
■ -	NSLK8126	Schwarzbeck	AMN	8126-404	Apr. 04, 2018 (1Y)
□ -	3825/2	EMCO	AMN	9109-1869	Apr. 11, 2018 (1Y)
■ -	3825/2	EMCO	AMN	9109-1867	Mar. 28, 2018 (1Y)

All test equipment used is calibrated on a regular basis.

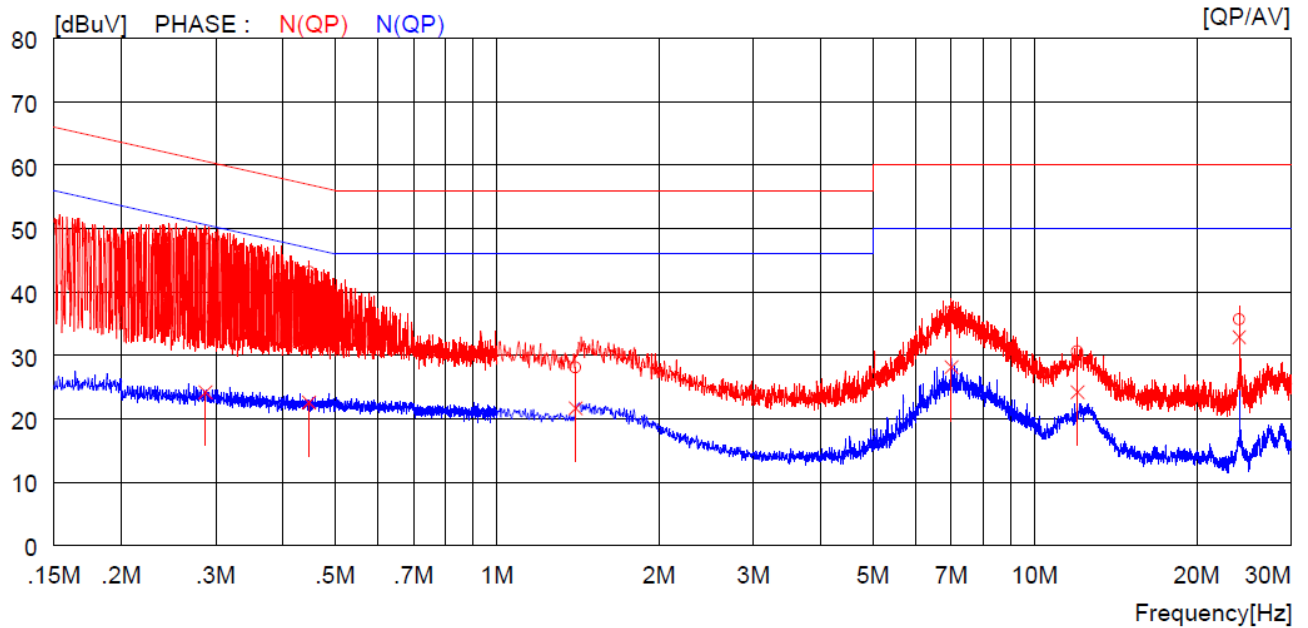
12.4 Test data

- Test Date : May 10, 2018 ~ May 17, 2018
- Resolution bandwidth : 9 kHz
- Frequency range : 0.15 MHz ~ 30 MHz
- Tested Line : HOT LINE
- Antenna 0, Antenna 1 and Multiple transmit tested, but the worst data were recorded.



NO	FREQ [MHz]	READING (PK) [dBuV]	C.F [dB]	RESULT [dBuV]	LIMIT		MARGIN		PHASE
					QP [dBuV]	AV [dBuV]	QP [dB]	AV [dB]	
1	0.28200	42.7	9.9	52.6	60.8	50.8	8.2	-1.8	H (QP)
2	0.59000	33.9	10.0	43.9	56.0	46.0	12.1	2.1	H (QP)
3	1.09600	23.8	10.0	33.8	56.0	46.0	22.2	12.2	H (QP)
4	3.24400	17.6	10.2	27.8	56.0	46.0	28.2	18.2	H (QP)
5	6.97000	32.2	10.3	42.5	60.0	50.0	17.5	7.5	H (QP)
6	24.00000	24.3	10.8	35.1	60.0	50.0	24.9	14.9	H (QP)
7	0.28200	14.0	9.9	23.9	60.8	50.8	36.9	26.9	H (CAV)
8	0.59000	12.2	9.9	22.1	56.0	46.0	33.9	23.9	H (CAV)
9	1.09600	11.0	10.0	21.0	56.0	46.0	35.0	25.0	H (CAV)
10	3.24400	8.1	10.2	18.3	56.0	46.0	37.7	27.7	H (CAV)
11	6.97000	18.2	10.3	28.5	60.0	50.0	31.5	21.5	H (CAV)
12	24.00000	19.7	10.8	30.5	60.0	50.0	29.5	19.5	H (CAV)

-. Tested Line : NEUTRAL LINE



NO	FREQ [MHz]	READING		C. FACTOR [dB]	RESULT		LIMIT		MARGIN		PHASE
		QP [dBuV]	AV [dBuV]		QP [dBuV]	AV [dBuV]	QP [dBuV]	AV [dBuV]	QP [dBuV]	AV [dBuV]	
1	0.28700	38.5	----	9.9	48.4	----	60.6	----	12.2	----	N (QP)
2	0.44700	33.2	----	9.9	43.1	----	56.9	----	13.8	----	N (QP)
3	1.40000	18.1	----	10.0	28.1	----	56.0	----	27.9	----	N (QP)
4	7.00000	26.6	----	10.3	36.9	----	60.0	----	23.1	----	N (QP)
5	12.00000	20.2	----	10.4	30.6	----	60.0	----	29.4	----	N (QP)
6	24.00000	24.9	----	10.8	35.7	----	60.0	----	24.3	----	N (QP)
7	0.28700	----	14.3	9.9	----	24.2	----	50.6	----	26.4	N (CAV)
8	0.44700	----	12.7	9.9	----	22.6	----	46.9	----	24.3	N (CAV)
9	1.40000	----	11.7	10.0	----	21.7	----	46.0	----	24.3	N (CAV)
10	7.00000	----	17.8	10.3	----	28.1	----	50.0	----	21.9	N (CAV)
11	12.00000	----	13.8	10.4	----	24.2	----	50.0	----	25.8	N (CAV)
12	24.00000	----	22.1	10.8	----	32.9	----	50.0	----	17.1	N (CAV)

Remark: Margin (dB) = Limit – Level (Result)

The emission level in above table is included the transducer factor that means insertion loss (LISN), cable loss and attenuator.

Tested by: Hyung-Kwon, Oh / Assistant Manager