

9 MAXIMUM PEAK OUTPUT POWER

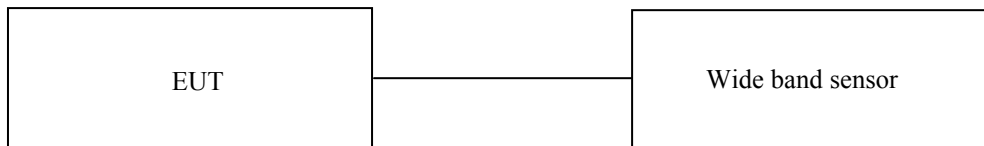
9.1 Operating environment

Temperature : 23 °C

Relative humidity : 41 % R.H.

9.2 Test set-up

The maximum peak output power was measured with the wide band sensor connected to the antenna output of the EUT. The Wide Band Sensor is measured when the EUT is transmitting at the appropriate center frequency its maximum power control level as described in Section E. 3.(KDB 789033 D02 General UNII Test Procedures New Rules v01r04). Since this measurement is made only during the ON time of the transmitter, no duty cycle correction is required.



9.3 Test equipment used

Model Number	Manufacturer	Description	Serial Number	Last Cal.
■ - NRP-Z81	Rohde & Schwarz	Wide band Sensor	101975	Apr. 04, 2017 (1Y)

All test equipment used is calibrated on a regular basis.

9.4 Test data for 802.11a RLAN Mode

9.4.1 Test data for Antenna 0

- Test Date : September 20, 2017 ~ September 27, 2017

- Test Result : Pass

FREQUENCY RANGE (MHz)	CHANNEL	FREQUENCY (MHz)	MEASURED VLAUE (dBm)	LIMIT (dBm)	MARGIN (dB)
5 150 ~ 5 250	Low	5 180.00	18.32	30.00	11.68
	Middle	5 220.00	18.20	30.00	11.80
	High	5 240.00	18.70	30.00	11.30
5 725 ~ 5 850	Low	5 745.00	22.39	29.12	6.73
	Middle	5 785.00	22.12	29.12	7.00
	High	5 825.00	22.15	29.12	6.97

Remark. Margin = Limit – Measured Value (=Receiver Reading + Cable Loss)

9.4.2 Test data for Antenna 1

- Test Date : September 20, 2017 ~ September 27, 2017

- Test Result : Pass

FREQUENCY RANGE (MHz)	CHANNEL	FREQUENCY (MHz)	MEASURED VLAUE (dBm)	LIMIT (dBm)	MARGIN (dB)
5 150 ~ 5 250	Low	5 180.00	18.36	30.00	11.64
	Middle	5 220.00	18.17	30.00	11.83
	High	5 240.00	18.56	30.00	11.44
5 725 ~ 5 850	Low	5 745.00	22.33	29.38	7.05
	Middle	5 785.00	22.05	29.38	7.33
	High	5 825.00	22.21	29.38	7.17

Remark. Margin = Limit – Measured Value (=Receiver Reading + Cable Loss)



Tested by: Hyung-Kwon, Oh / Assistant Manager

9.4.3 Test data for Antenna 2

- Test Date : September 20, 2017 ~ September 27, 2017
- Test Result : Pass

FREQUENCY RANGE (MHz)	CHANNEL	FREQUENCY (MHz)	MEASURED VLAUE (dBm)	LIMIT (dBm)	MARGIN (dB)
5 150 ~ 5 250	Low	5 180.00	18.40	30.00	11.60
	Middle	5 220.00	18.22	30.00	11.78
	High	5 240.00	18.64	30.00	11.36
5 725 ~ 5 850	Low	5 745.00	22.43	29.15	6.72
	Middle	5 785.00	22.17	29.15	6.98
	High	5 825.00	22.22	29.15	6.93

Remark. Margin = Limit – Measured Value (=Receiver Reading + Cable Loss)

9.4.4 Test data for Antenna 3

- Test Date : September 20, 2017 ~ September 27, 2017
- Test Result : Pass

FREQUENCY RANGE (MHz)	CHANNEL	FREQUENCY (MHz)	MEASURED VLAUE (dBm)	LIMIT (dBm)	MARGIN (dB)
5 150 ~ 5 250	Low	5 180.00	18.33	30.00	11.67
	Middle	5 220.00	18.25	30.00	11.75
	High	5 240.00	18.66	30.00	11.34
5 725 ~ 5 850	Low	5 745.00	22.31	29.04	6.73
	Middle	5 785.00	22.10	29.04	6.94
	High	5 825.00	22.09	29.04	6.95

Remark. Margin = Limit – Measured Value (=Receiver Reading + Cable Loss)



Tested by: Hyung-Kwon, Oh / Assistant Manager

9.5 Test data for 802.11n_HT20 RLAN Mode

9.5.1 Test data for Antenna 0

- Test Date : September 20, 2017 ~ September 27, 2017

- Test Result : Pass

FREQUENCY RANGE (MHz)	CHANNEL	FREQUENCY (MHz)	MEASURED VLAUE (dBm)	LIMIT (dBm)	MARGIN (dB)
5 150 ~ 5 250	Low	5 180.00	8.50	30.00	21.50
	Middle	5 220.00	8.34	30.00	21.66
	High	5 240.00	8.39	30.00	21.61
5 725 ~ 5 850	Low	5 745.00	13.27	29.12	15.85
	Middle	5 785.00	12.98	29.12	16.14
	High	5 825.00	12.94	29.12	16.18

Remark. Margin = Limit – Measured Value (=Receiver Reading + Cable Loss)

9.5.2 Test data for Antenna 1

- Test Date : September 20, 2017 ~ September 27, 2017

- Test Result : Pass

FREQUENCY RANGE (MHz)	CHANNEL	FREQUENCY (MHz)	MEASURED VLAUE (dBm)	LIMIT (dBm)	MARGIN (dB)
5 150 ~ 5 250	Low	5 180.00	8.53	30.00	21.47
	Middle	5 220.00	8.31	30.00	21.69
	High	5 240.00	8.42	30.00	21.58
5 725 ~ 5 850	Low	5 745.00	13.31	29.38	16.07
	Middle	5 785.00	12.96	29.38	16.42
	High	5 825.00	12.99	29.38	16.39

Remark. Margin = Limit – Measured Value (=Receiver Reading + Cable Loss)



Tested by: Hyung-Kwon, Oh / Assistant Manager

9.5.3 Test data for Antenna 2

- Test Date : September 20, 2017 ~ September 27, 2017
- Test Result : Pass

FREQUENCY RANGE (MHz)	CHANNEL	FREQUENCY (MHz)	MEASURED VLAUE (dBm)	LIMIT (dBm)	MARGIN (dB)
5 150 ~ 5 250	Low	5 180.00	8.47	30.00	21.53
	Middle	5 220.00	8.30	30.00	21.70
	High	5 240.00	8.44	30.00	21.56
5 725 ~ 5 850	Low	5 745.00	13.25	29.15	15.90
	Middle	5 785.00	13.04	29.15	16.11
	High	5 825.00	12.96	29.15	16.19

Remark. Margin = Limit – Measured Value (=Receiver Reading + Cable Loss)

9.5.4 Test data for Antenna 3

- Test Date : September 20, 2017 ~ September 27, 2017
- Test Result : Pass

FREQUENCY RANGE (MHz)	CHANNEL	FREQUENCY (MHz)	MEASURED VLAUE (dBm)	LIMIT (dBm)	MARGIN (dB)
5 150 ~ 5 250	Low	5 180.00	8.55	30.00	21.45
	Middle	5 220.00	8.28	30.00	21.72
	High	5 240.00	8.36	30.00	21.64
5 725 ~ 5 850	Low	5 745.00	13.29	29.04	15.75
	Middle	5 785.00	12.99	29.04	16.05
	High	5 825.00	12.96	29.04	16.08

Remark. Margin = Limit – Measured Value (=Receiver Reading + Cable Loss)



Tested by: Hyung-Kwon, Oh / Assistant Manager

9.5.5 Test data for Multiple Transmit

- Test Date : September 20, 2017 ~ September 27, 2017
- Test Result : Pass

FREQUENCY RANGE (MHz)	CHANNEL	FREQUENCY (MHz)	MEASURED VLAUE (dBm)	LIMIT (dBm)	MARGIN (dB)
5 150 ~ 5 250	Low	5 180.00	14.53	22.38	7.85
	Middle	5 220.00	14.33	22.38	8.05
	High	5 240.00	14.42	22.38	7.96
5 725 ~ 5 850	Low	5 745.00	19.30	21.15	1.85
	Middle	5 785.00	19.01	21.15	2.14
	High	5 825.00	18.98	21.15	2.17

Remark 1: Margin = Limit – Measured Value (=Receiver Reading + Cable Loss)

Remark 2: Calculated Output Power= $10\log (10^{(\text{Antenna0 Output Power}/10)}+10^{(\text{Antenna1 Output Power}/10)}+10^{(\text{Antenna2 Output Power}/10)}+10^{(\text{Antenna3 Output Power}/10)})$



Tested by: Hyung-Kwon, Oh / Assistant Manager

9.6 Test data for 802.11n_HT40 RLAN Mode

9.6.1 Test data for Antenna 0

- Test Date : September 20, 2017 ~ September 27, 2017

- Test Result : Pass

FREQUENCY RANGE (MHz)	CHANNEL	FREQUENCY (MHz)	MEASURED VLAUE (dBm)	LIMIT (dBm)	MARGIN (dB)
5 150 ~ 5 250	Low	5 190.00	8.57	30.00	21.43
	High	5 230.00	8.27	30.00	21.73
5 725 ~ 5 850	Low	5 755.00	13.01	29.12	16.11
	High	5 795.00	12.76	29.12	16.36

Remark. Margin = Limit – Measured Value (=Receiver Reading + Cable Loss)

9.6.2 Test data for Antenna 1

- Test Date : September 20, 2017 ~ September 27, 2017

- Test Result : Pass

FREQUENCY RANGE (MHz)	CHANNEL	FREQUENCY (MHz)	MEASURED VLAUE (dBm)	LIMIT (dBm)	MARGIN (dB)
5 150 ~ 5 250	Low	5 190.00	8.62	30.00	21.38
	High	5 230.00	8.30	30.00	21.70
5 725 ~ 5 850	Low	5 755.00	13.05	29.38	16.33
	High	5 795.00	12.64	29.38	16.74

Remark. Margin = Limit – Measured Value (=Receiver Reading + Cable Loss)



Tested by: Hyung-Kwon, Oh / Assistant Manager

9.6.3 Test data for Antenna 2

- Test Date : September 20, 2017 ~ September 27, 2017
- Test Result : Pass

FREQUENCY RANGE (MHz)	CHANNEL	FREQUENCY (MHz)	MEASURED VLAUE (dBm)	LIMIT (dBm)	MARGIN (dB)
5 150 ~ 5 250	Low	5 190.00	8.55	30.00	21.45
	High	5 230.00	8.21	30.00	21.79
5 725 ~ 5 850	Low	5 755.00	13.02	29.15	16.13
	High	5 795.00	12.75	29.15	16.40

Remark. Margin = Limit – Measured Value (=Receiver Reading + Cable Loss)

9.6.4 Test data for Antenna 3

- Test Date : September 20, 2017 ~ September 27, 2017
- Test Result : Pass

FREQUENCY RANGE (MHz)	CHANNEL	FREQUENCY (MHz)	MEASURED VLAUE (dBm)	LIMIT (dBm)	MARGIN (dB)
5 150 ~ 5 250	Low	5 190.00	8.41	30.00	21.59
	High	5 230.00	8.16	30.00	21.84
5 725 ~ 5 850	Low	5 755.00	12.95	29.04	16.09
	High	5 795.00	12.57	29.04	16.47

Remark. Margin = Limit – Measured Value (=Receiver Reading + Cable Loss)



Tested by: Hyung-Kwon, Oh / Assistant Manager

9.6.5 Test data for Multiple Transmit

- Test Date : September 20, 2017 ~ September 27, 2017
- Test Result : Pass

FREQUENCY RANGE (MHz)	CHANNEL	FREQUENCY (MHz)	MEASURED VLAUE (dBm)	LIMIT (dBm)	MARGIN (dB)
5 150 ~ 5 250	Low	5 190.00	14.56	22.38	7.82
	High	5 230.00	14.26	22.38	8.12
5 725 ~ 5 850	Low	5 755.00	19.03	21.15	2.12
	High	5 795.00	18.70	21.15	2.45

Remark 1: Margin = Limit – Measured Value (=Receiver Reading + Cable Loss)

Remark 2: Calculated Output Power= $10\log (10^{(\text{Antenna0 Output Power}/10)}+10^{(\text{Antenna1 Output Power}/10)}+10^{(\text{Antenna2 Output Power}/10)}+10^{(\text{Antenna3 Output Power}/10)})$



Tested by: Hyung-Kwon, Oh / Assistant Manager

9.7 Test data for 802.11ac_HT80 RLAN Mode

9.7.1 Test data for Antenna 0

-. Test Date : September 20, 2017 ~ September 27, 2017

-. Test Result : Pass

FREQUENCY RANGE (MHz)	CHANNEL	FREQUENCY (MHz)	MEASURED VLAUE (dBm)	LIMIT (dBm)	MARGIN (dB)
5 150 ~ 5 250	Middle	5 210.00	11.44	30.00	18.56
5 725 ~ 5 850	Middle	5 775.00	12.86	29.12	16.26

Remark. Margin = Limit – Measured Value (=Receiver Reading + Cable Loss)

9.7.2 Test data for Antenna 1

-. Test Date : September 20, 2017 ~ September 27, 2017

-. Test Result : Pass

FREQUENCY RANGE (MHz)	CHANNEL	FREQUENCY (MHz)	MEASURED VLAUE (dBm)	LIMIT (dBm)	MARGIN (dB)
5 150 ~ 5 250	Middle	5 210.00	11.38	30.00	18.62
5 725 ~ 5 850	Middle	5 775.00	12.92	29.38	16.46

Remark. Margin = Limit – Measured Value (=Receiver Reading + Cable Loss)

9.7.3 Test data for Antenna 2

-. Test Date : September 20, 2017 ~ September 27, 2017

-. Test Result : Pass

FREQUENCY RANGE (MHz)	CHANNEL	FREQUENCY (MHz)	MEASURED VLAUE (dBm)	LIMIT (dBm)	MARGIN (dB)
5 150 ~ 5 250	Middle	5 210.00	11.40	30.00	18.60
5 725 ~ 5 850	Middle	5 775.00	12.81	29.15	16.34

Remark. Margin = Limit – Measured Value (=Receiver Reading + Cable Loss)



Tested by: Hyung-Kwon, Oh / Assistant Manager

9.7.4 Test data for Antenna 3

- Test Date : September 20, 2017 ~ September 27, 2017
- Test Result : Pass

FREQUENCY RANGE (MHz)	CHANNEL	FREQUENCY (MHz)	MEASURED VLAUE (dBm)	LIMIT (dBm)	MARGIN (dB)
5 150 ~ 5 250	Middle	5 210.00	11.50	30.00	18.50
5 725 ~ 5 850	Middle	5 775.00	12.84	29.07	16.23

Remark. Margin = Limit – Measured Value (=Receiver Reading + Cable Loss)

9.7.5 Test data for Multiple Transmit

- Test Date : September 20, 2017 ~ September 27, 2017
- Test Result : Pass

FREQUENCY RANGE (MHz)	CHANNEL	FREQUENCY (MHz)	MEASURED VLAUE (dBm)	LIMIT (dBm)	MARGIN (dB)
5 150 ~ 5 250	Middle	5 210.00	17.45	22.38	4.93
5 725 ~ 5 850	Middle	5 775.00	18.88	21.15	2.27

Remark 1: Margin = Limit – Measured Value (=Receiver Reading + Cable Loss)

Remark 2: Calculated Output Power= $10\log (10^{(\text{Antenna0 Output Power}/10)}+10^{(\text{Antenna1 Output Power}/10)}+10^{(\text{Antenna2 Output Power}/10)}+10^{(\text{Antenna3 Output Power}/10)})$



Tested by: Hyung-Kwon, Oh / Assistant Manager

10. PEAK POWER SPECTRUL DENSITY

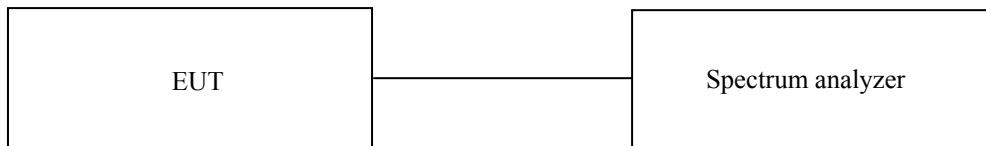
10.1 Operating environment

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 1 MHz, the video bandwidth is set to 3 times the resolution bandwidth. The maximum level form the EUT in 1 MHz bandwidth was measured with above condition.



10.3 Test equipment used

Model Number	Manufacturer	Description	Serial Number	Last Cal.
■ - FSV40	Rohde & Schwarz	Signal Analyzer	101009	Apr. 05, 2017 (1Y)

All test equipment used is calibrated on a regular basis.

10.4 Test data for 802.11a RLAN Mode

10.4.1 Test data for Antenna 0

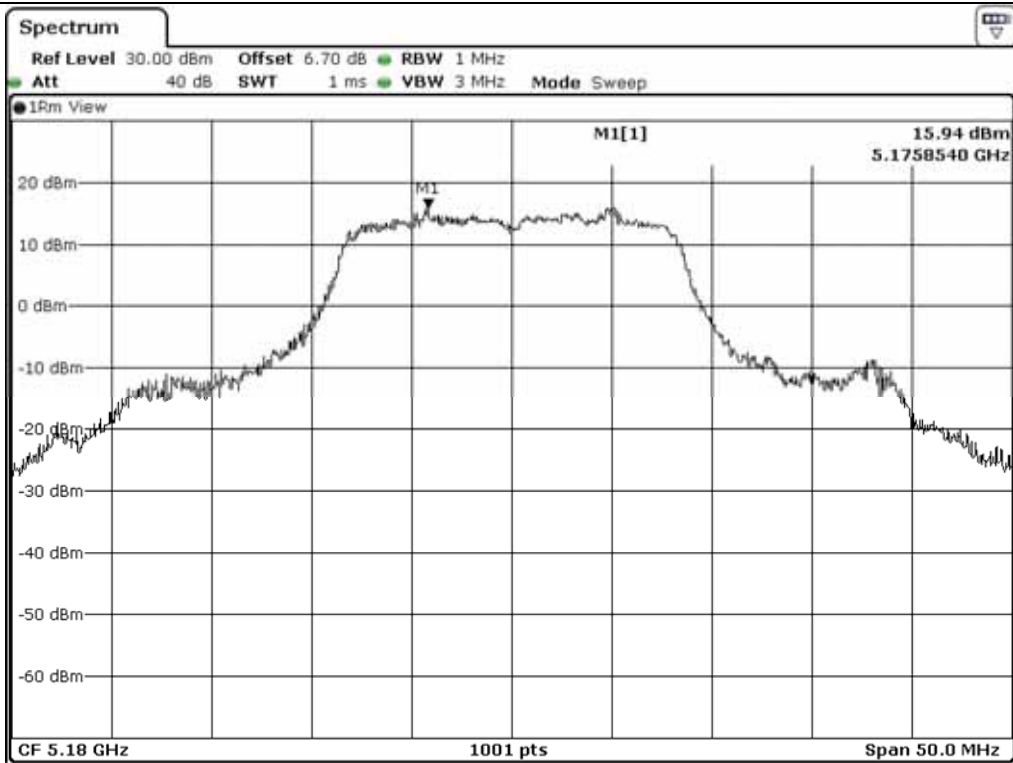
- Test Date : September 20, 2017 ~ September 27, 2017
- Operating condition : Highest Output Power Transmitting Mode
- Test Result : Pass

FREQUENCY RANGE (MHz)	CHANNEL	FREQUENCY (MHz)	MEASURED VALUE (dBm)	LIMIT (dBm)	MARGIN (dB)
5 150 ~ 5 250	Low	5 180.00	15.94	17.00	1.06
	Middle	5 220.00	15.80	17.00	1.20
	High	5 240.00	15.84	17.00	1.16
5 725 ~ 5 850	Low	5 745.00	16.34	29.12	12.78
	Middle	5 785.00	16.33	29.12	12.79
	High	5 825.00	16.89	29.12	12.23

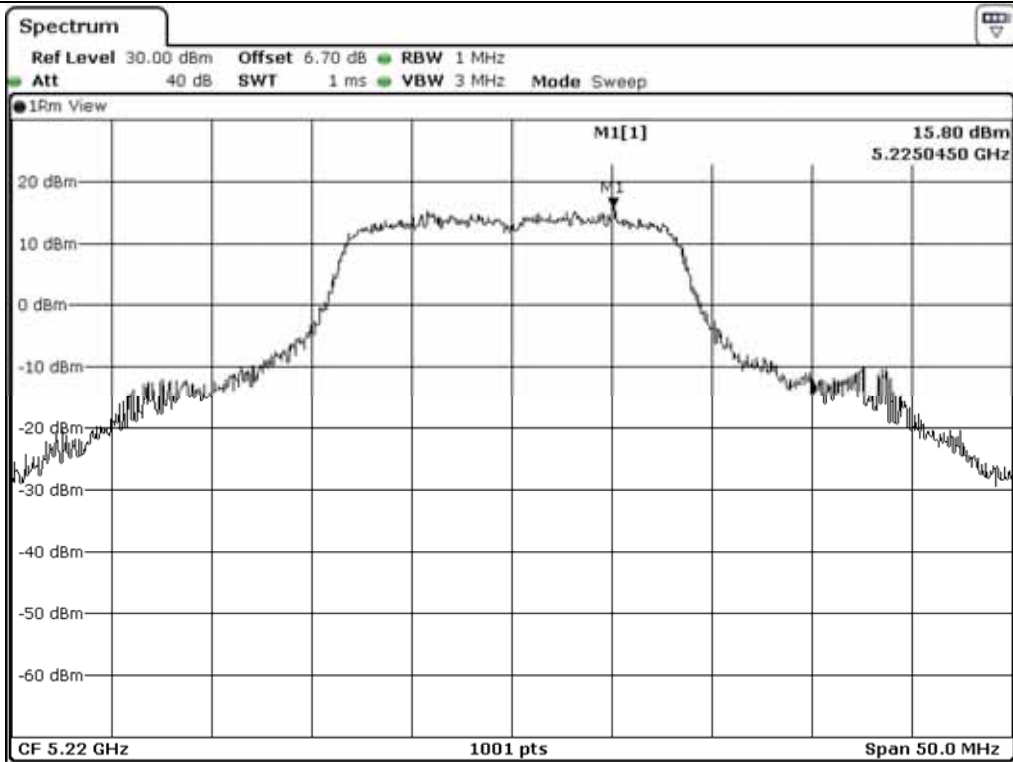
Remark: See next page for measurement data.



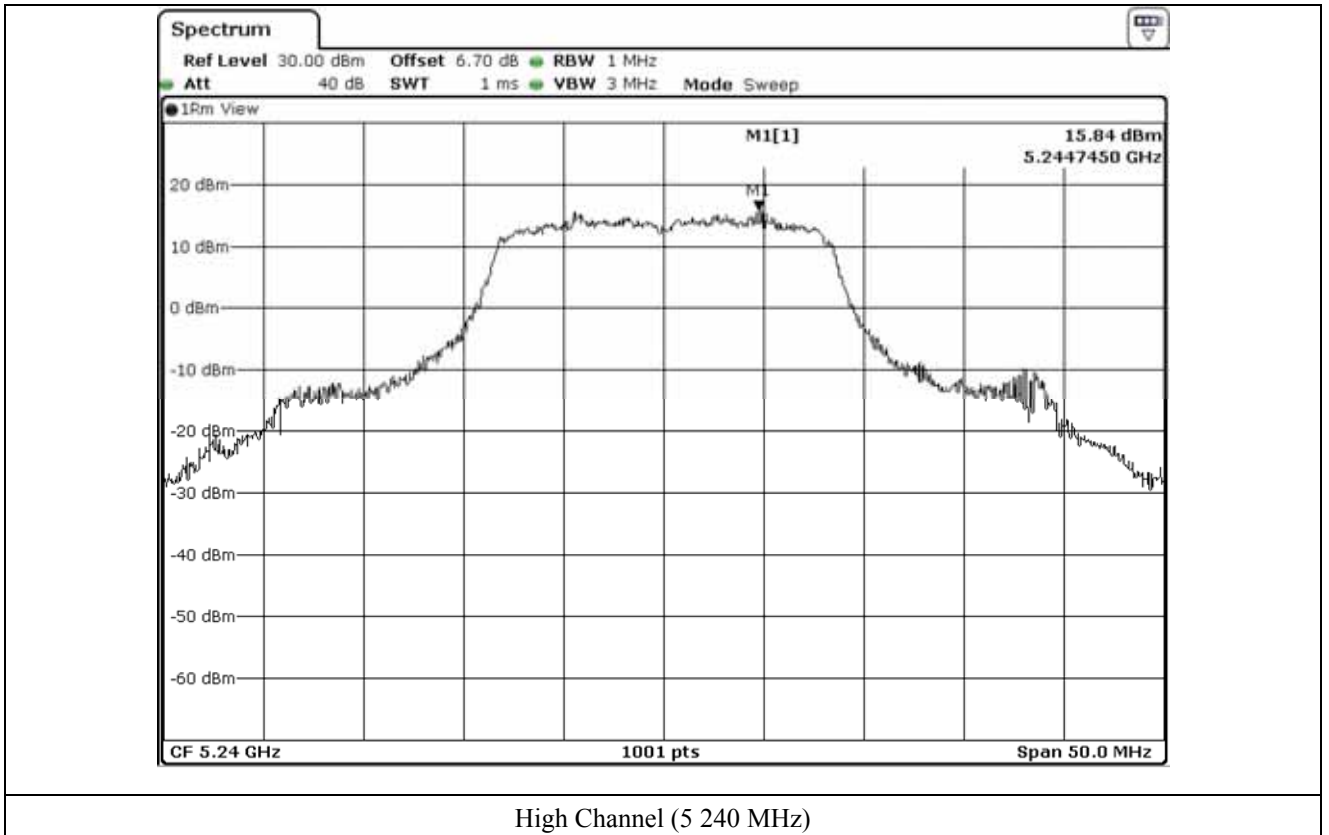
Tested by: Hyung-Kwon, Oh / Assistant Manager

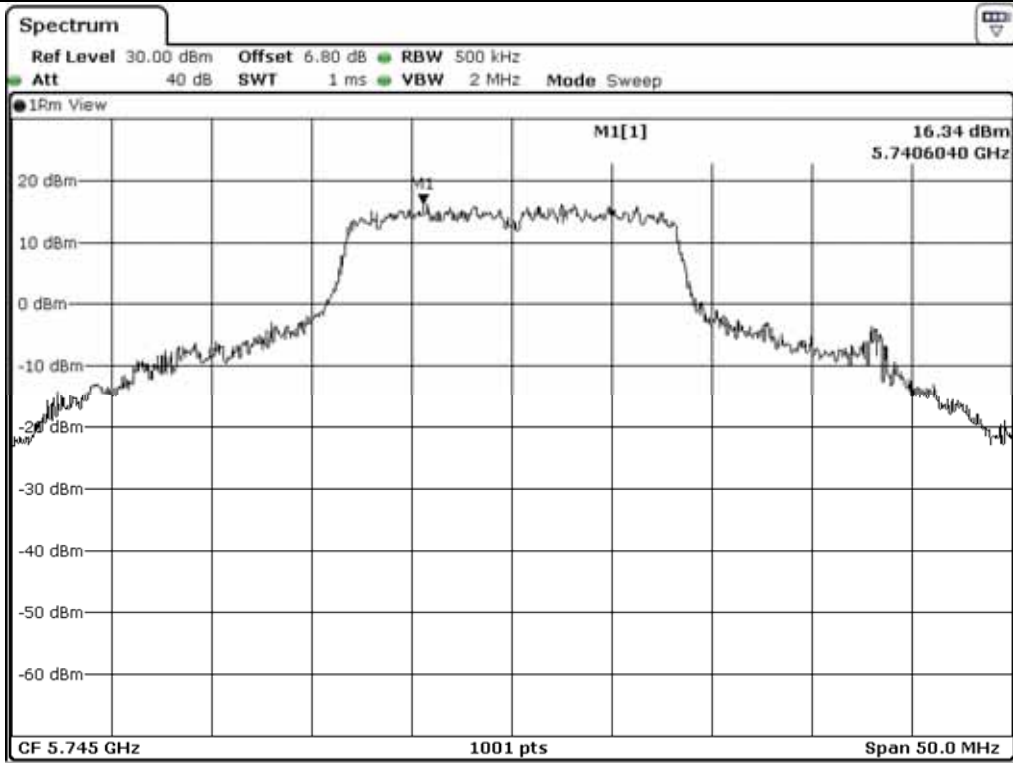


Low Channel (5 180 MHz)

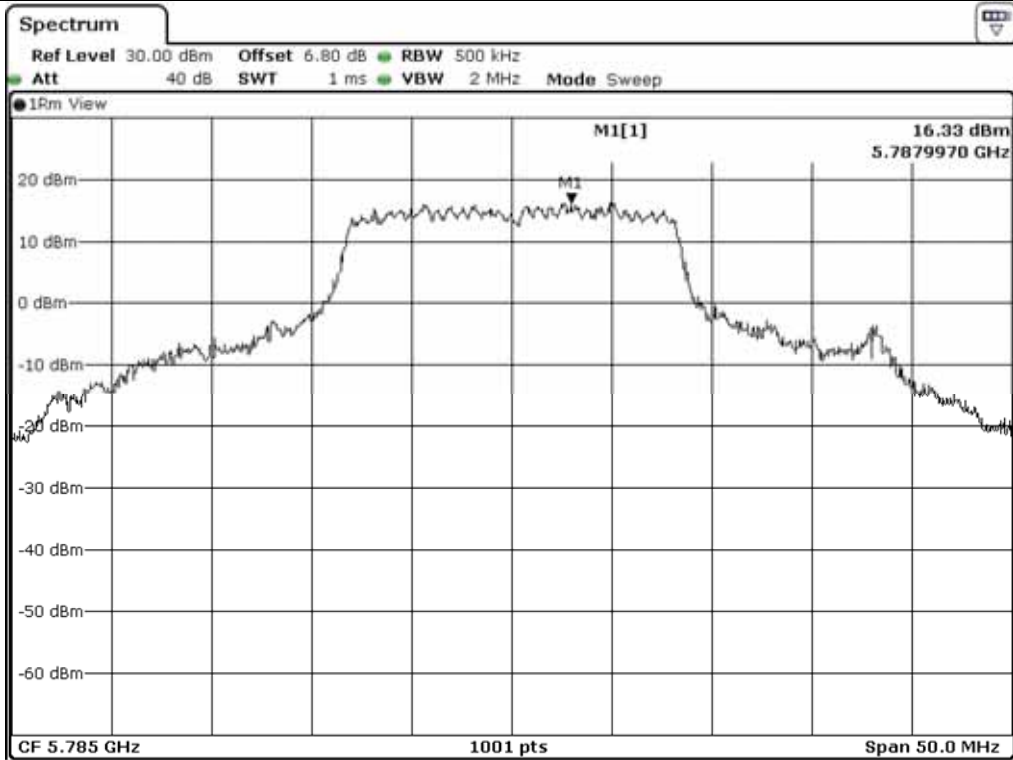


Middle Channel (5 220 MHz)

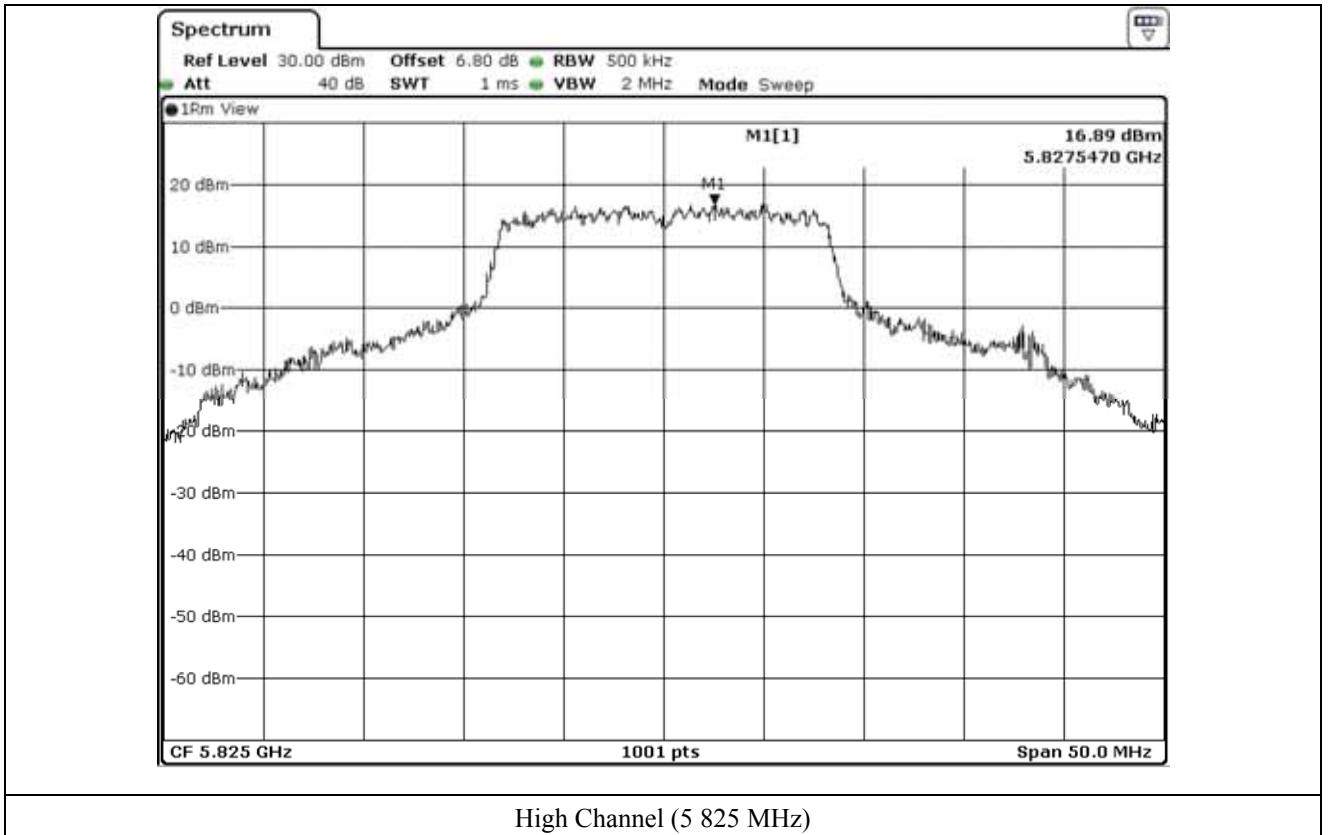




Low Channel (5.745 MHz)



Middle Channel (5.785 MHz)



High Channel (5 825 MHz)

10.4.2 Test data for Antenna 1

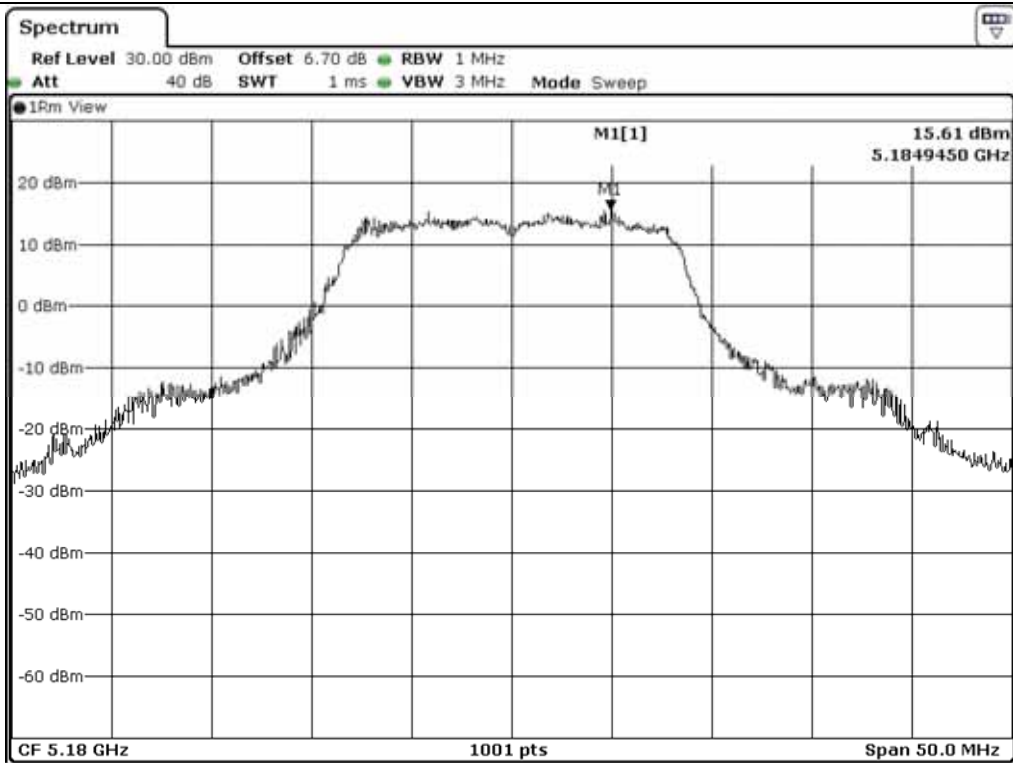
- Test Date : September 20, 2017 ~ September 27, 2017
- Operating condition : Highest Output Power Transmitting Mode
- Test Result : Pass

FREQUENCY RANGE (MHz)	CHANNEL	FREQUENCY (MHz)	MEASURED VALUE (dBm)	LIMIT (dBm)	MARGIN (dB)
5 150 ~ 5 250	Low	5 180.00	15.61	17.00	1.39
	Middle	5 220.00	15.68	17.00	1.32
	High	5 240.00	15.26	17.00	1.74
5 725 ~ 5 850	Low	5 745.00	17.10	29.38	12.28
	Middle	5 785.00	17.28	29.38	12.10
	High	5 825.00	17.18	29.38	12.20

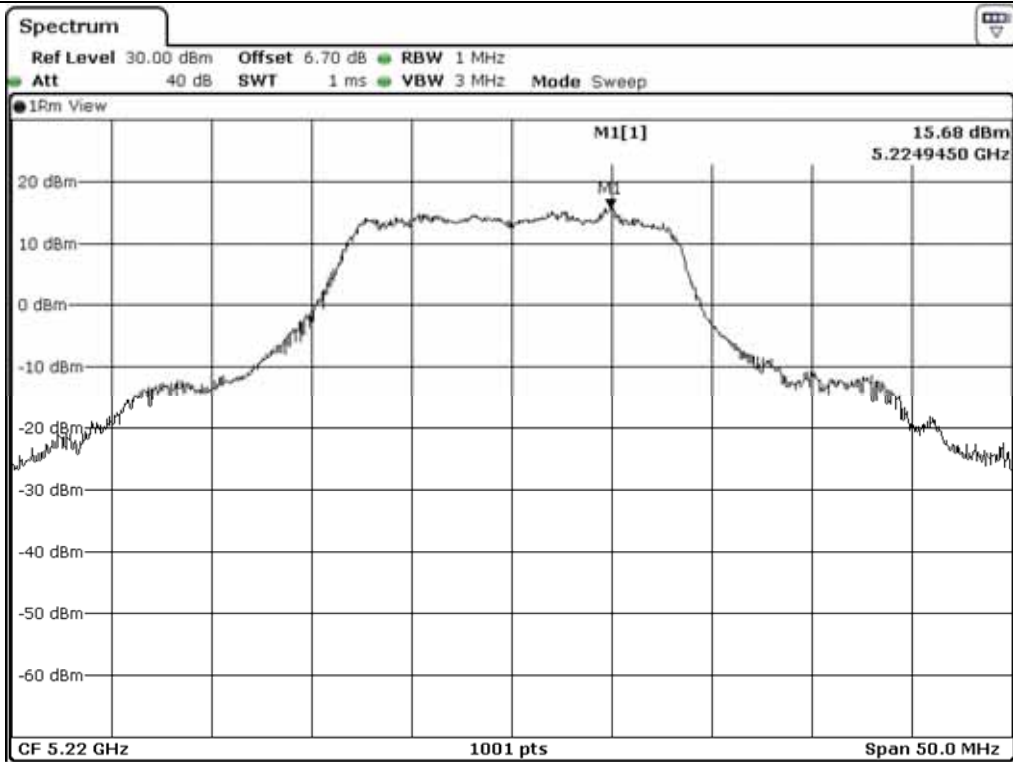
Remark: See next page for measurement data.



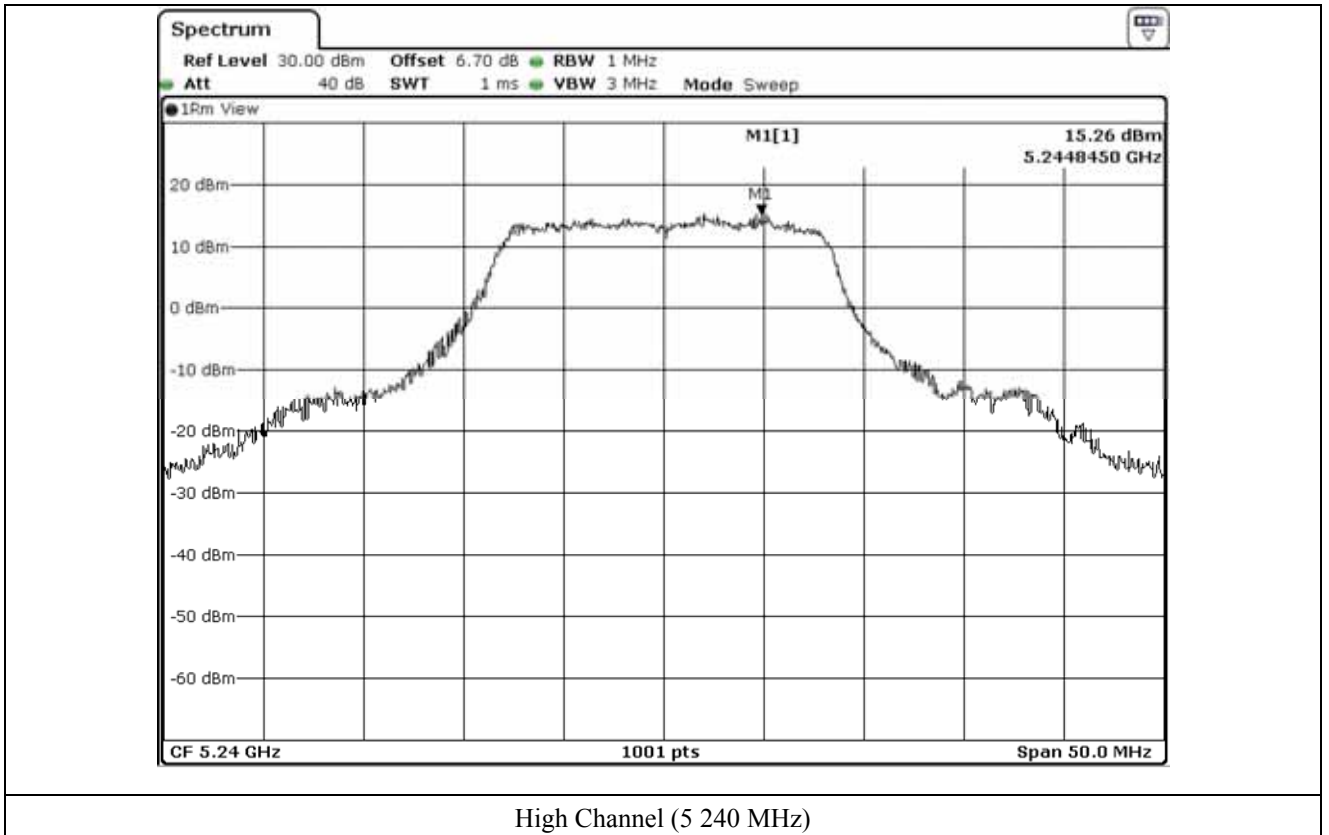
Tested by: Hyung-Kwon, Oh / Assistant Manager

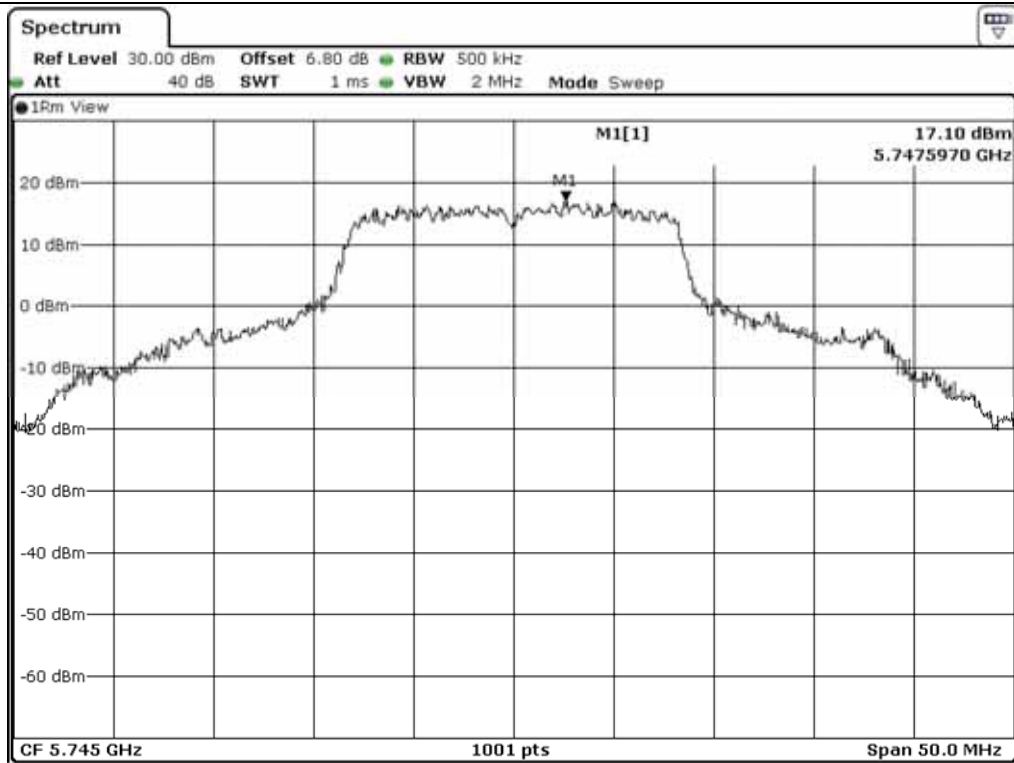


Low Channel (5 180 MHz)

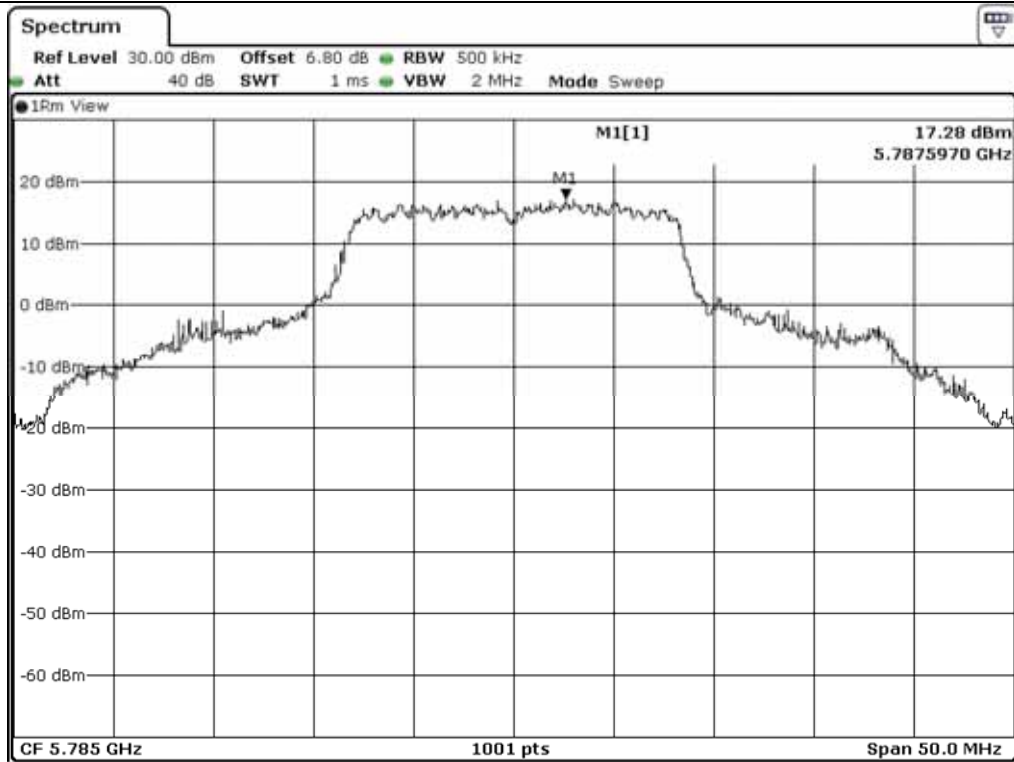


Middle Channel (5 220 MHz)

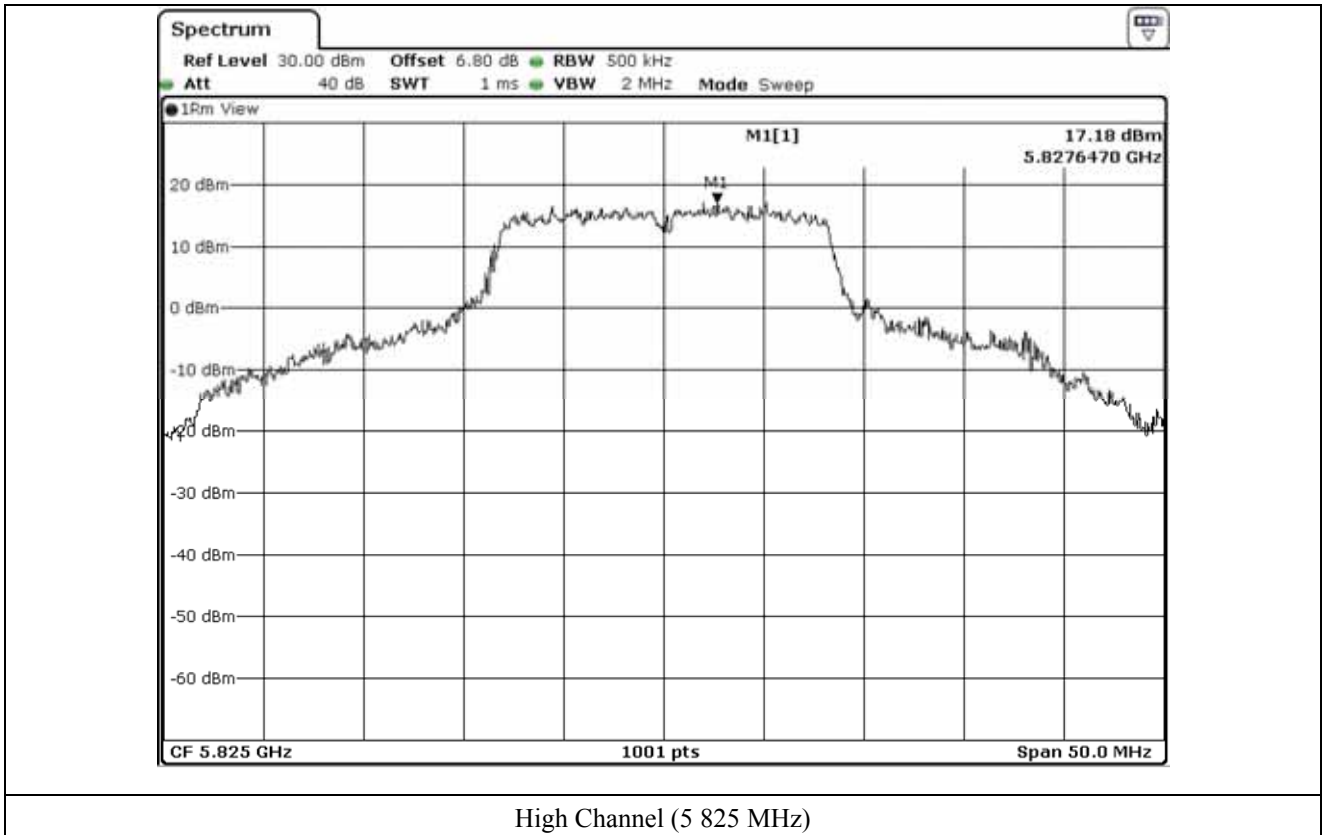




Low Channel (5.745 MHz)



Middle Channel (5.785 MHz)



10.4.3 Test data for Antenna 2

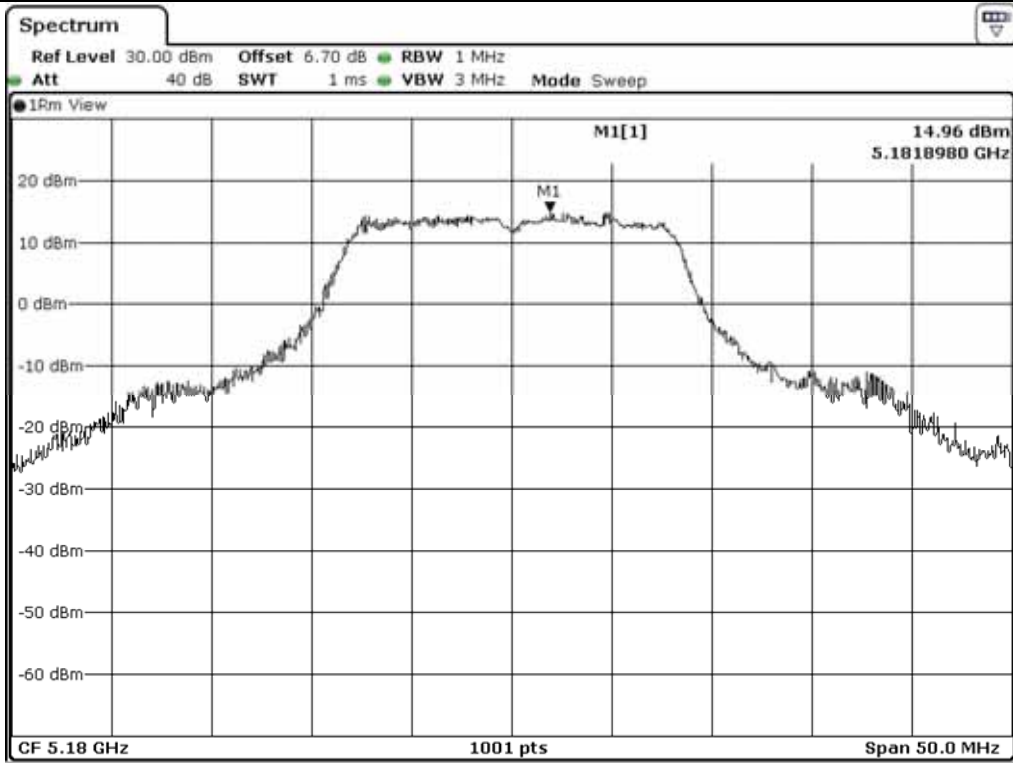
- Test Date : September 20, 2017 ~ September 27, 2017
- Operating condition : Highest Output Power Transmitting Mode
- Test Result : Pass

FREQUENCY RANGE (MHz)	CHANNEL	FREQUENCY (MHz)	MEASURED VALUE (dBm)	LIMIT (dBm)	MARGIN (dB)
5 150 ~ 5 250	Low	5 180.00	14.96	17.00	2.04
	Middle	5 220.00	14.89	17.00	2.11
	High	5 240.00	14.49	17.00	2.51
5 725 ~ 5 850	Low	5 745.00	17.30	29.15	11.85
	Middle	5 785.00	17.80	29.15	11.35
	High	5 825.00	16.66	29.15	12.49

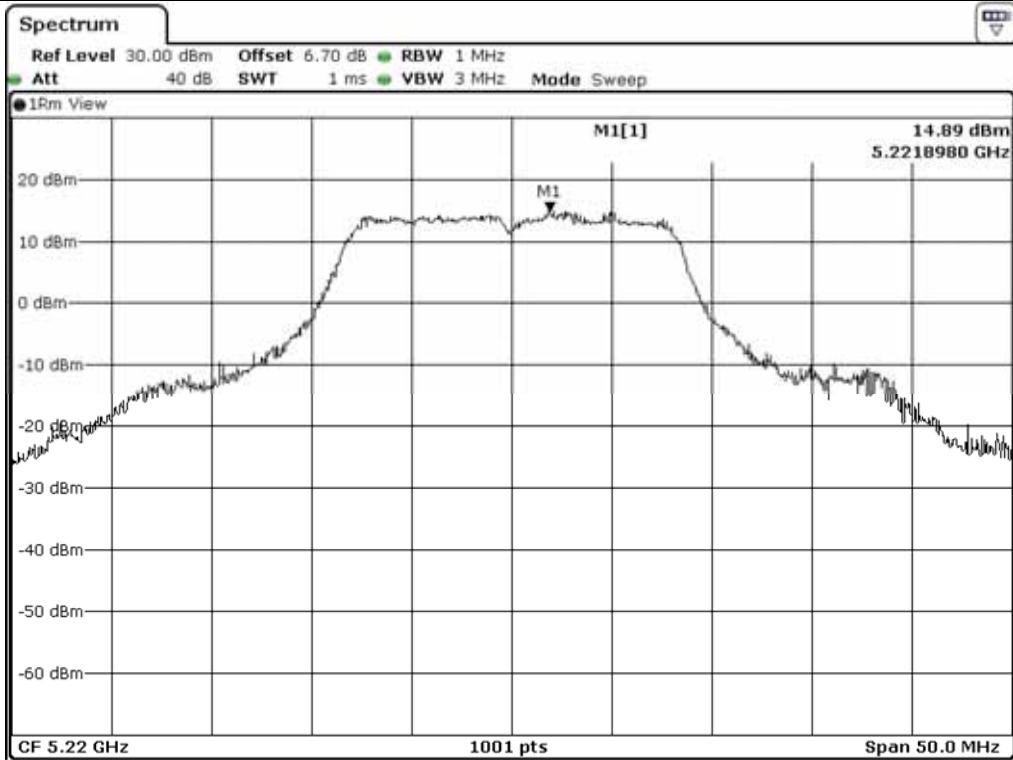
Remark: See next page for measurement data.



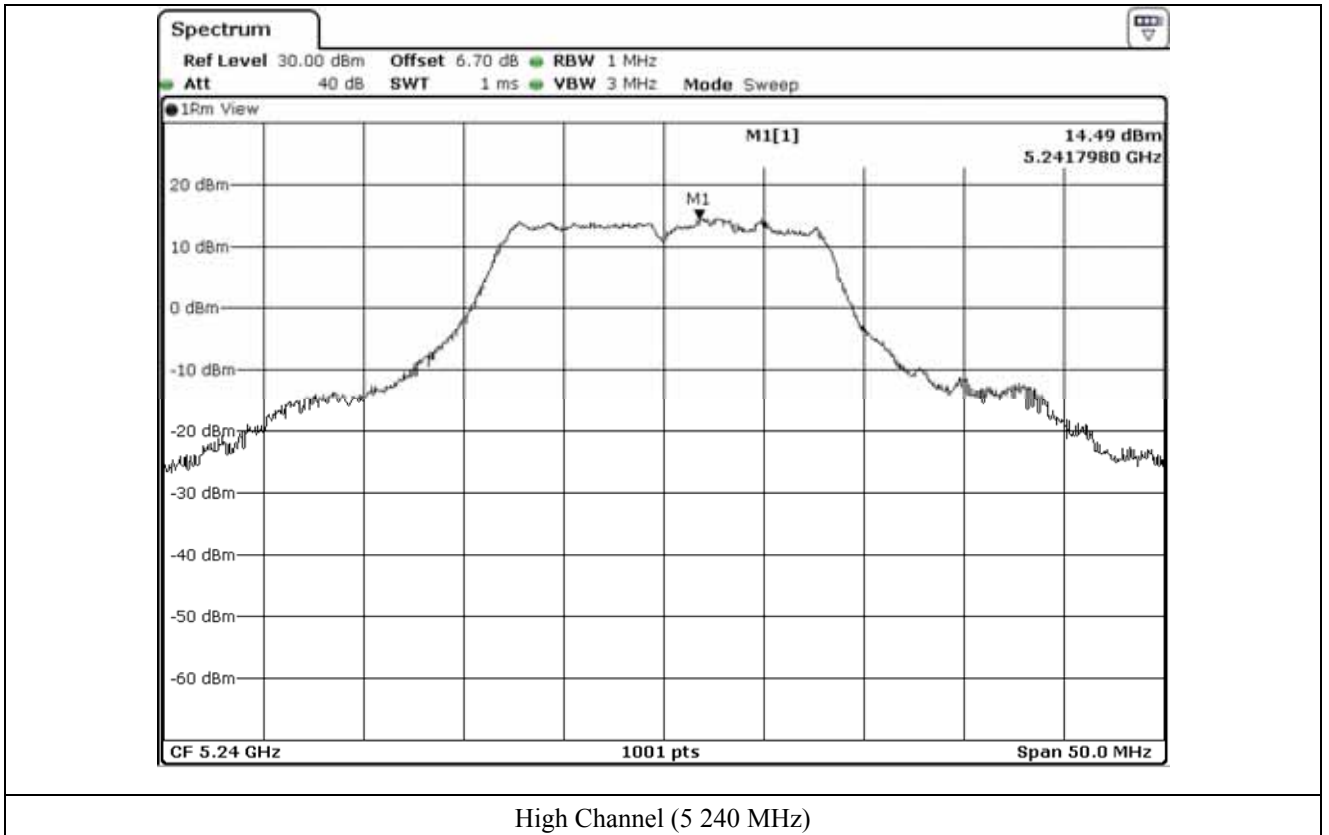
Tested by: Hyung-Kwon, Oh / Assistant Manager



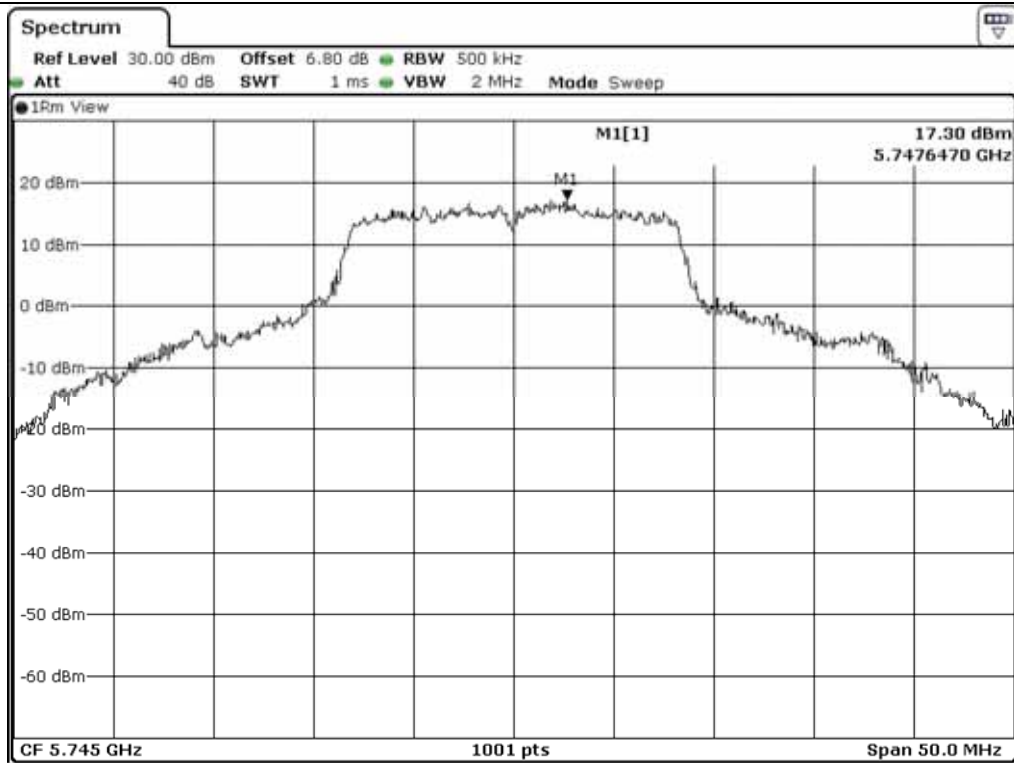
Low Channel (5 180 MHz)



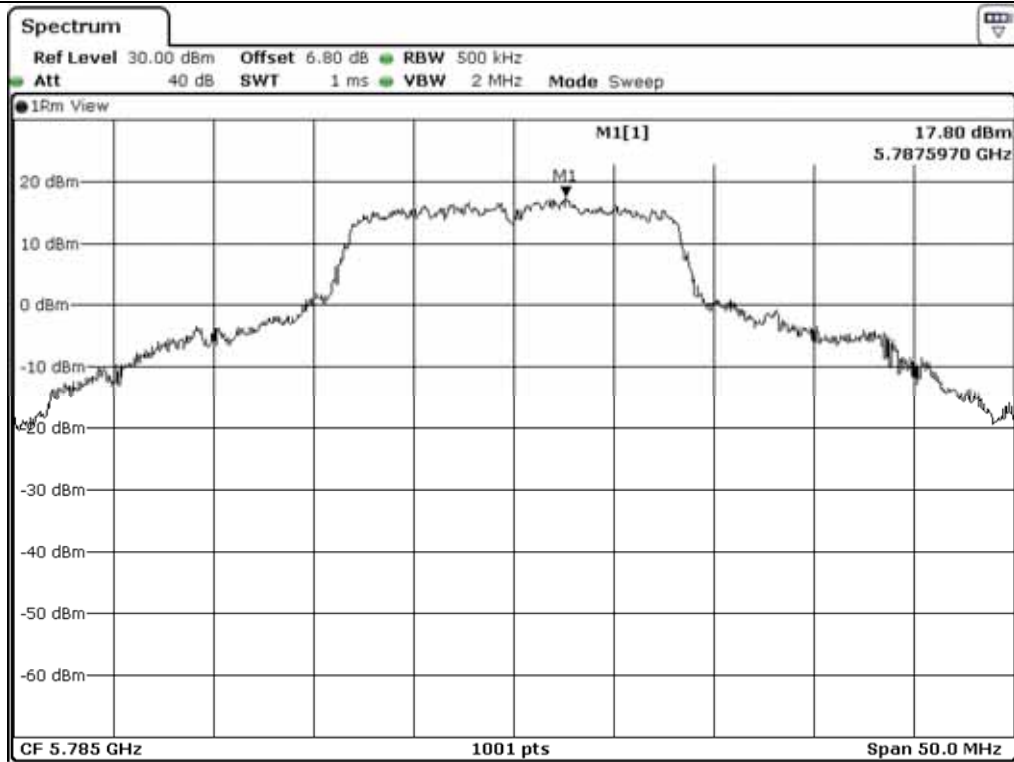
Middle Channel (5 220 MHz)



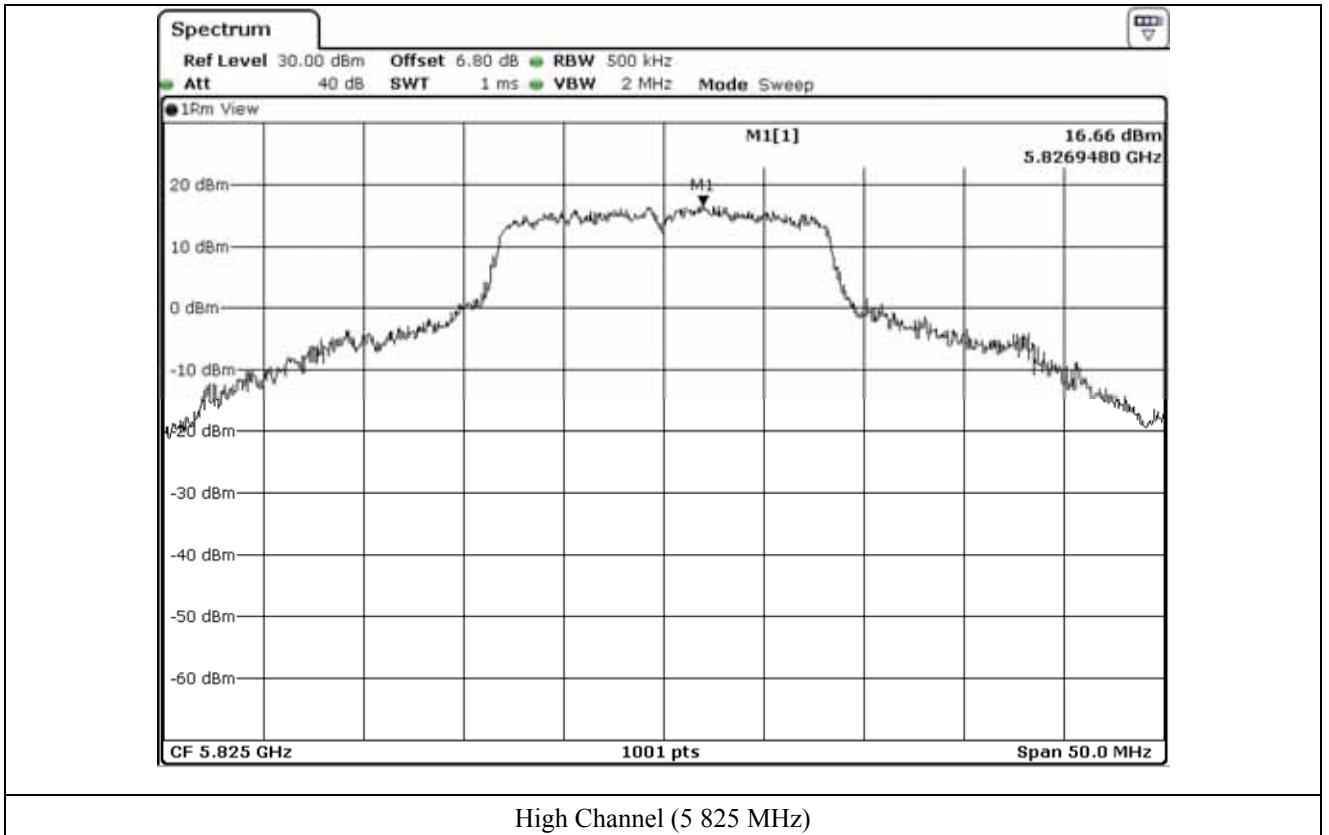
High Channel (5 240 MHz)



Low Channel (5.745 MHz)



Middle Channel (5.785 MHz)



10.4.4 Test data for Antenna 3

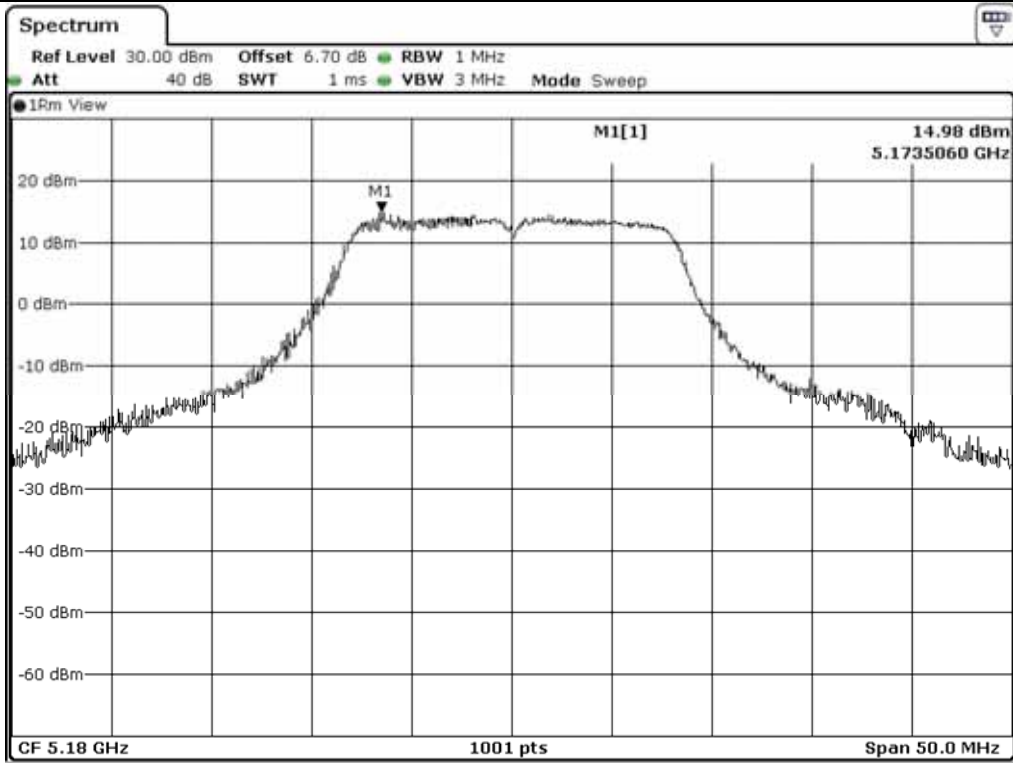
- Test Date : September 20, 2017 ~ September 27, 2017
- Operating condition : Highest Output Power Transmitting Mode
- Test Result : Pass

FREQUENCY RANGE (MHz)	CHANNEL	FREQUENCY (MHz)	MEASURED VALUE (dBm)	LIMIT (dBm)	MARGIN (dB)
5 150 ~ 5 250	Low	5 180.00	14.98	17.00	2.02
	Middle	5 220.00	14.64	17.00	2.36
	High	5 240.00	14.27	17.00	2.73
5 725 ~ 5 850	Low	5 745.00	16.81	29.04	12.23
	Middle	5 785.00	16.44	29.04	12.60
	High	5 825.00	16.23	29.04	12.81

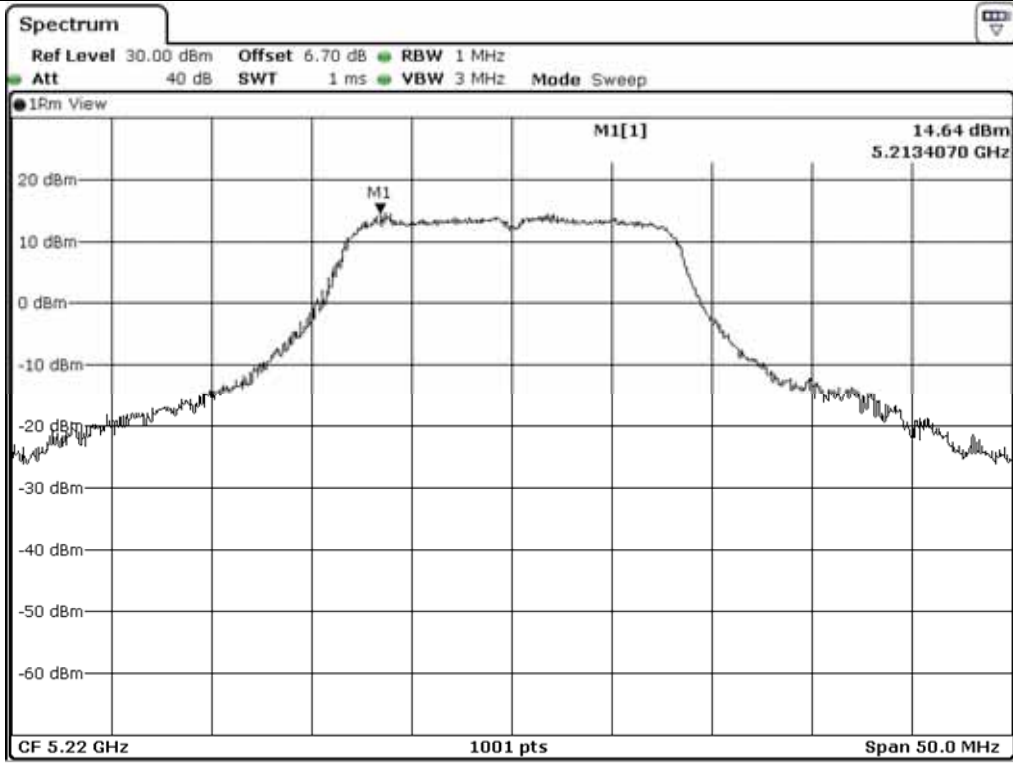
Remark: See next page for measurement data.



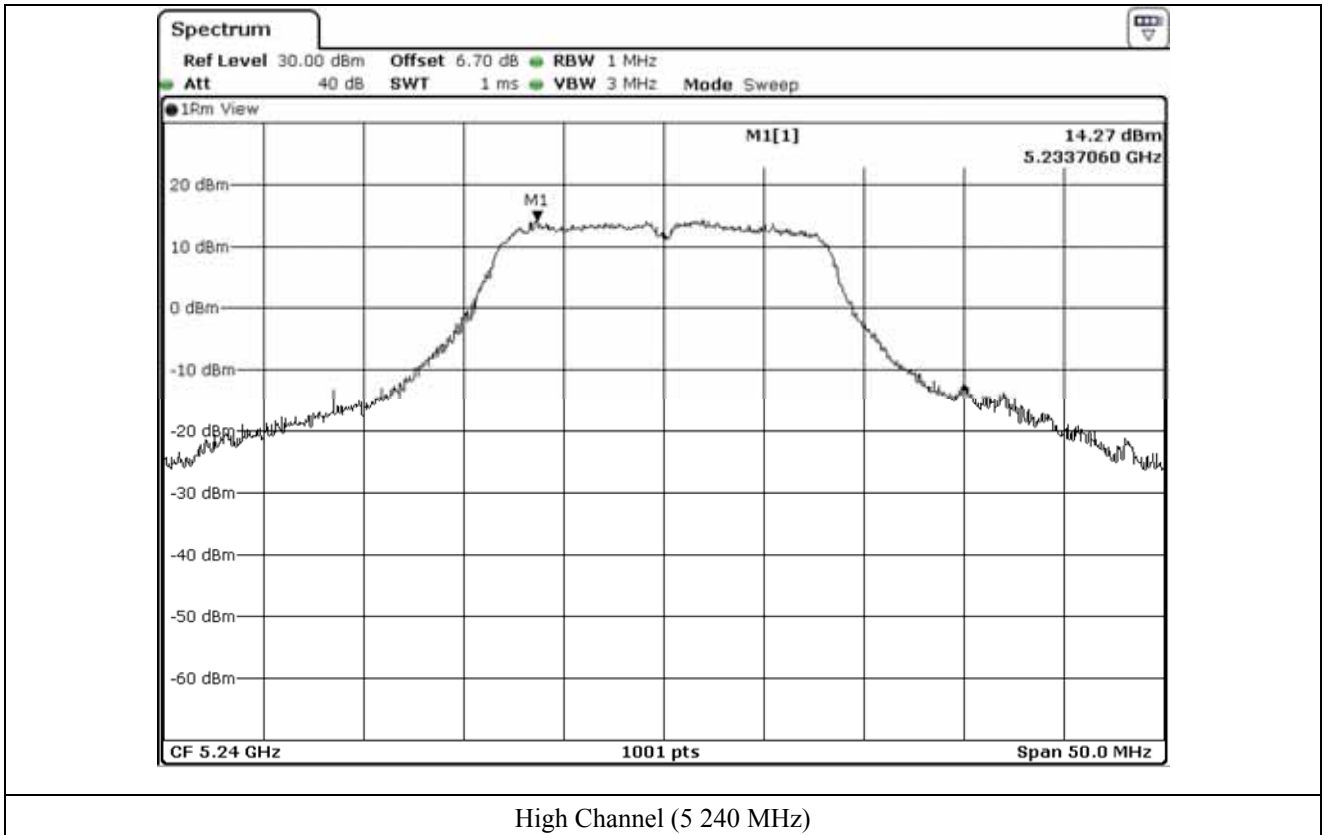
Tested by: Hyung-Kwon, Oh / Assistant Manager



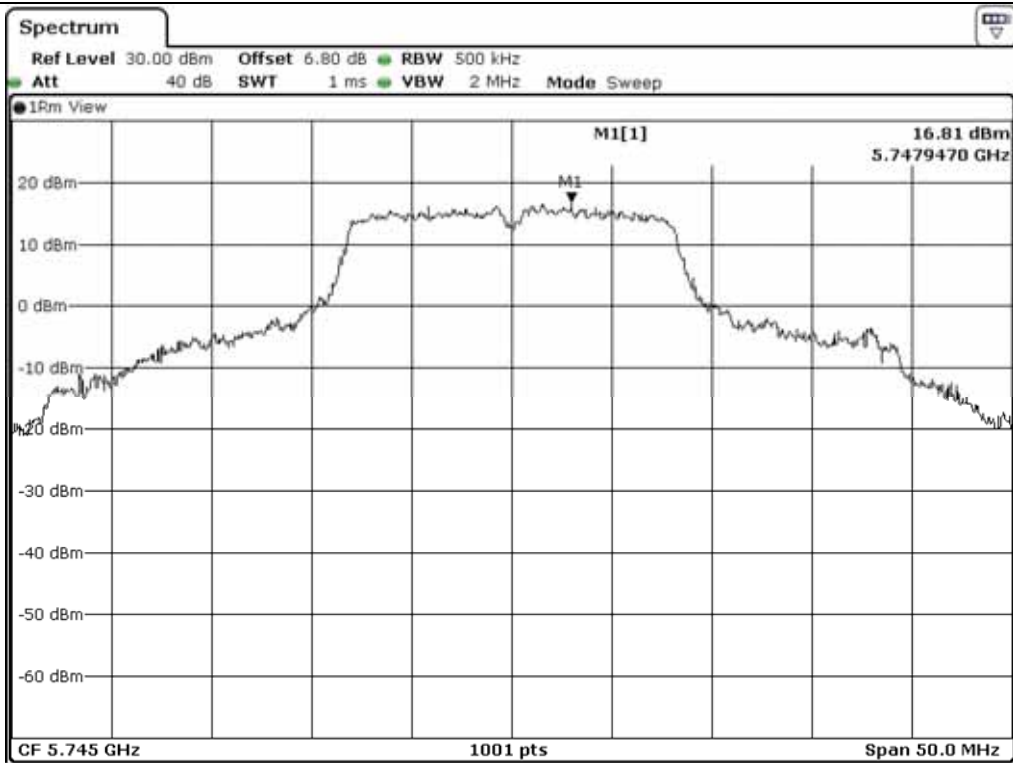
Low Channel (5 180 MHz)



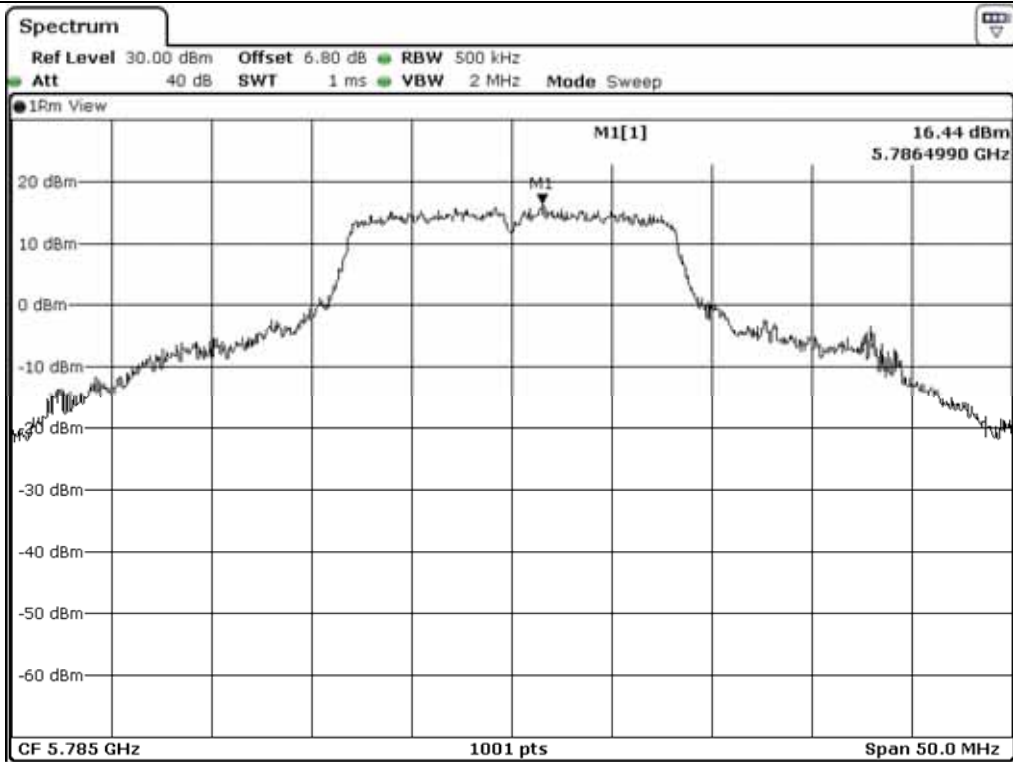
Middle Channel (5 220 MHz)



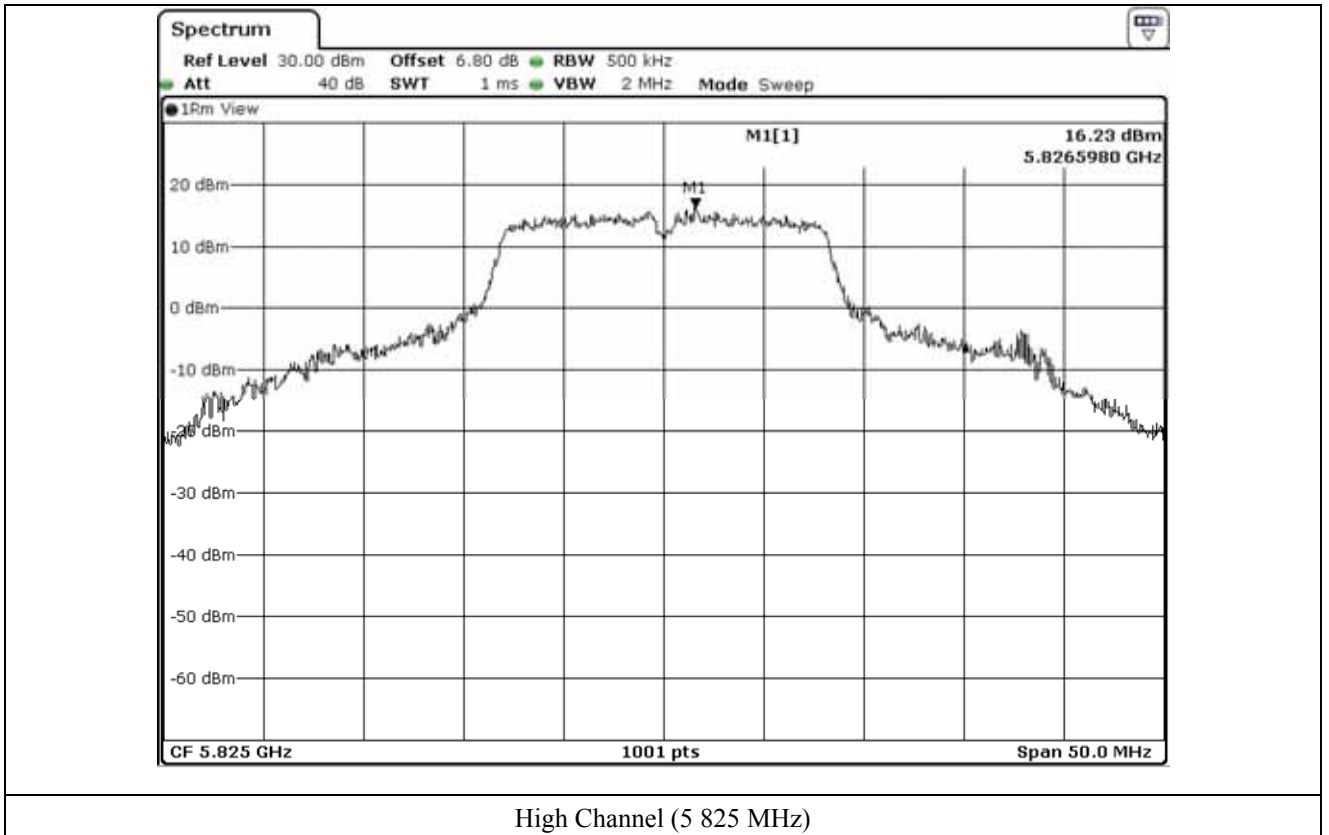
High Channel (5 240 MHz)



Low Channel (5.745 MHz)



Middle Channel (5.785 MHz)



10.5 Test data for 802.11n_HT20 RLAN Mode

10.5.1 Test data for Antenna 0

- Test Date : September 20, 2017 ~ September 27, 2017

- Operating condition : Highest Output Power Transmitting Mode

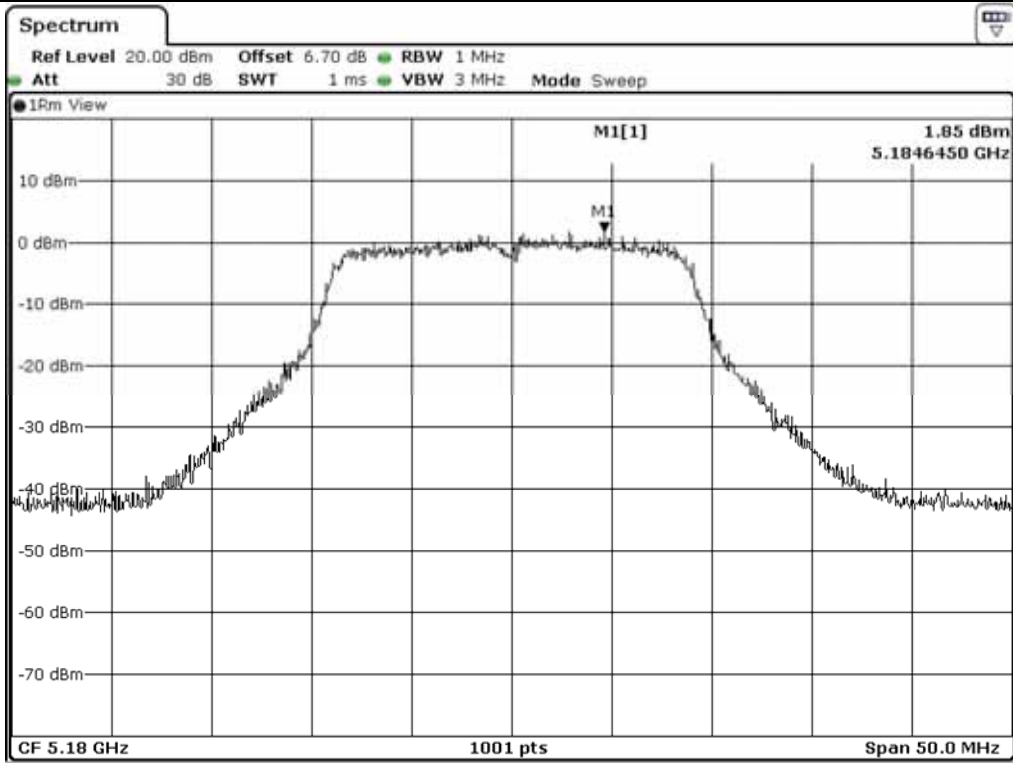
- Test Result : Pass

FREQUENCY RANGE (MHz)	CHANNEL	FREQUENCY (MHz)	MEASURED VALUE (dBm)	LIMIT (dBm)	MARGIN (dB)
5 150 ~ 5 250	Low	5 180.00	1.85	17.00	15.15
	Middle	5 220.00	1.78	17.00	15.22
	High	5 240.00	2.09	17.00	14.91
5 725 ~ 5 850	Low	5 745.00	13.49	29.12	15.63
	Middle	5 785.00	13.85	29.12	15.27
	High	5 825.00	13.91	29.12	15.21

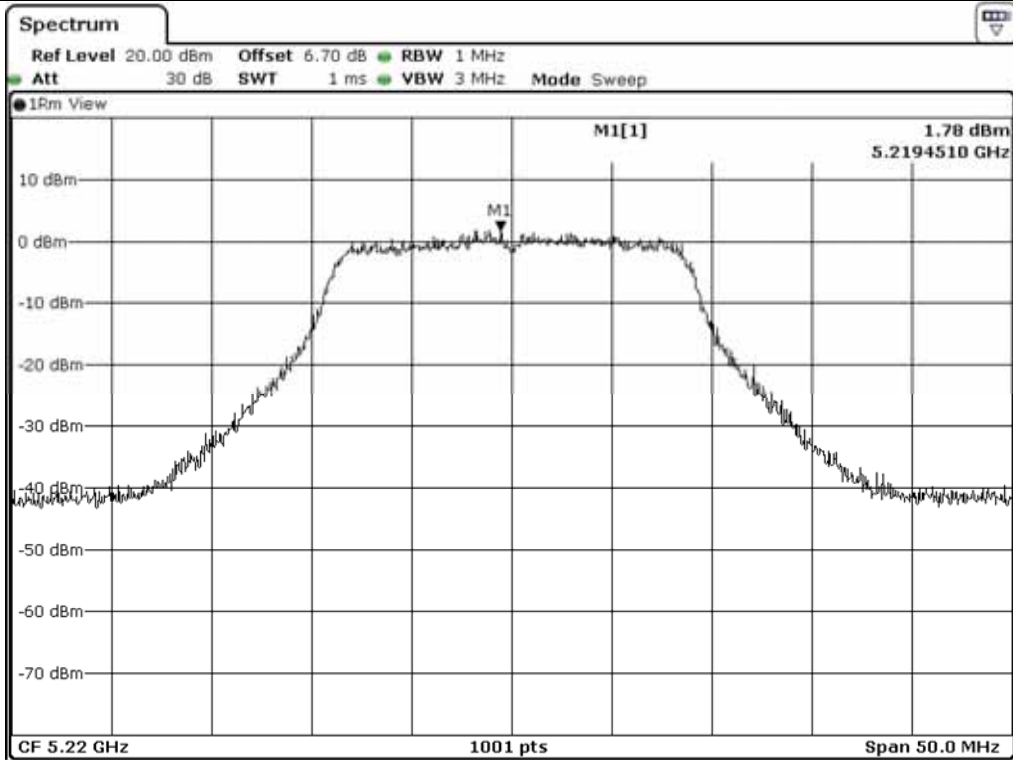
Remark: See next page for measurement data.



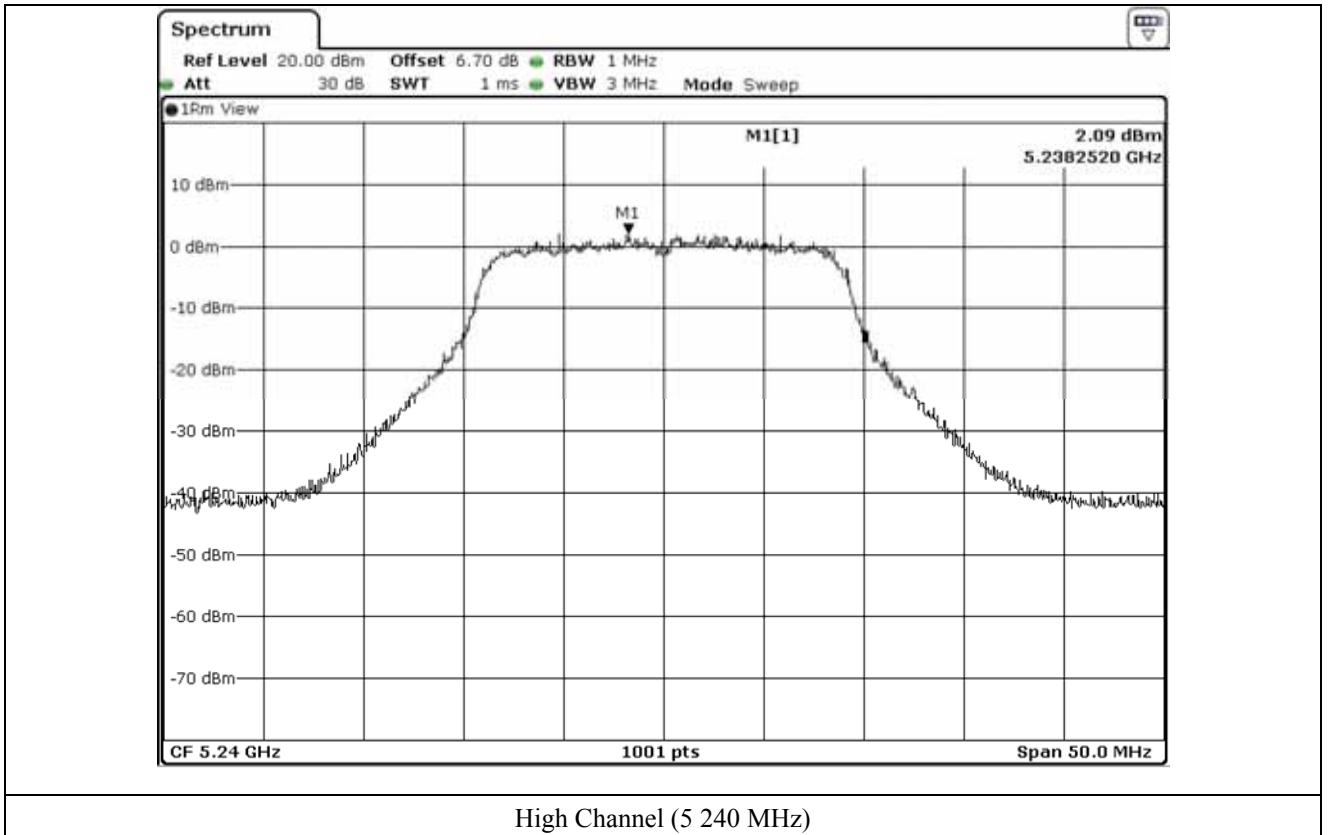
Tested by: Hyung-Kwon, Oh / Assistant Manager



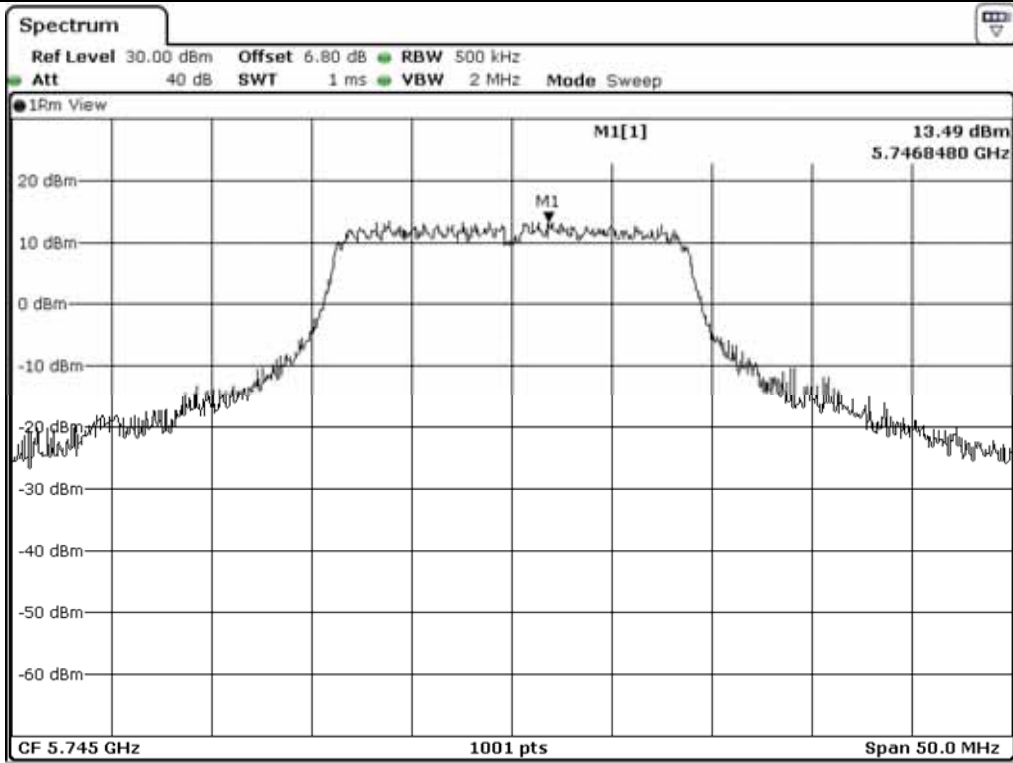
Low Channel (5 180 MHz)



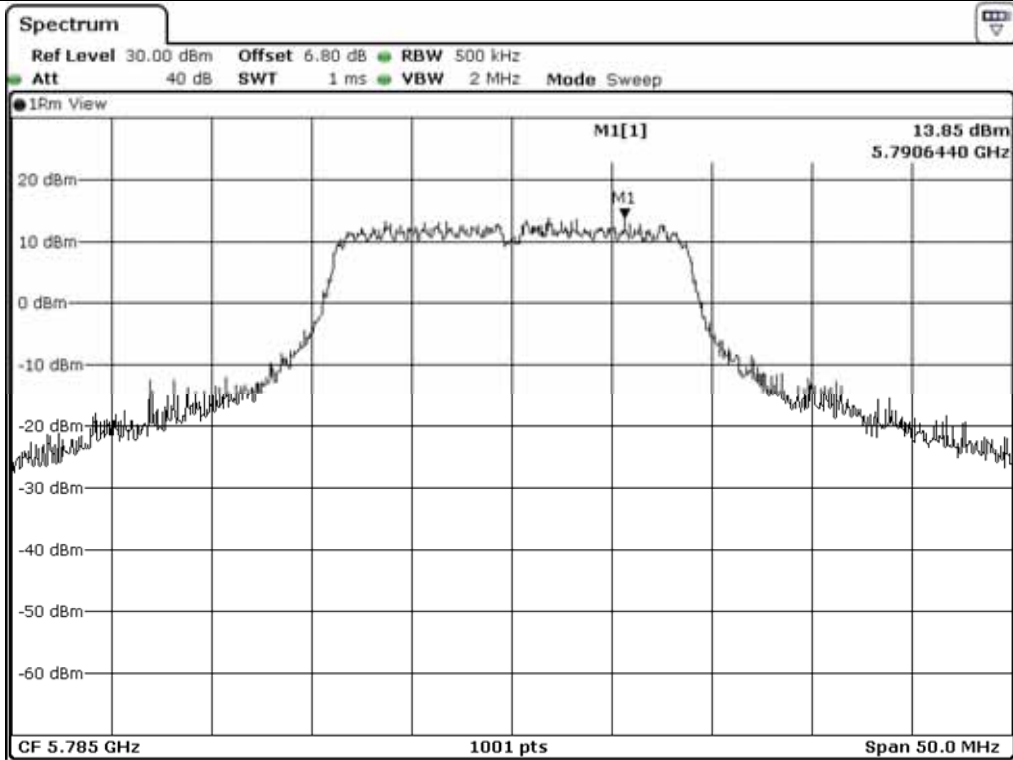
Middle Channel (5 220 MHz)



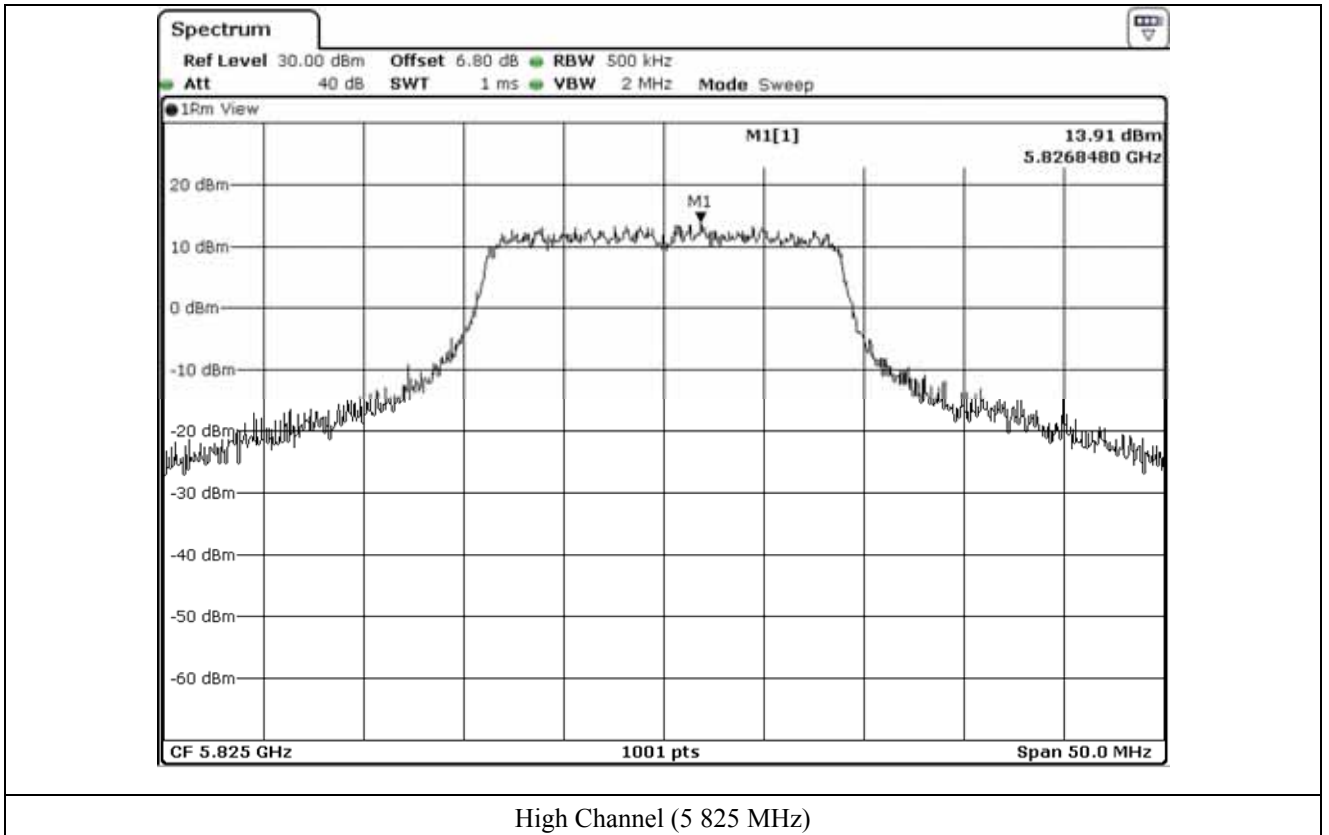
High Channel (5 240 MHz)



Low Channel (5.745 MHz)



Middle Channel (5.785 MHz)



10.5.2 Test data for Antenna 1

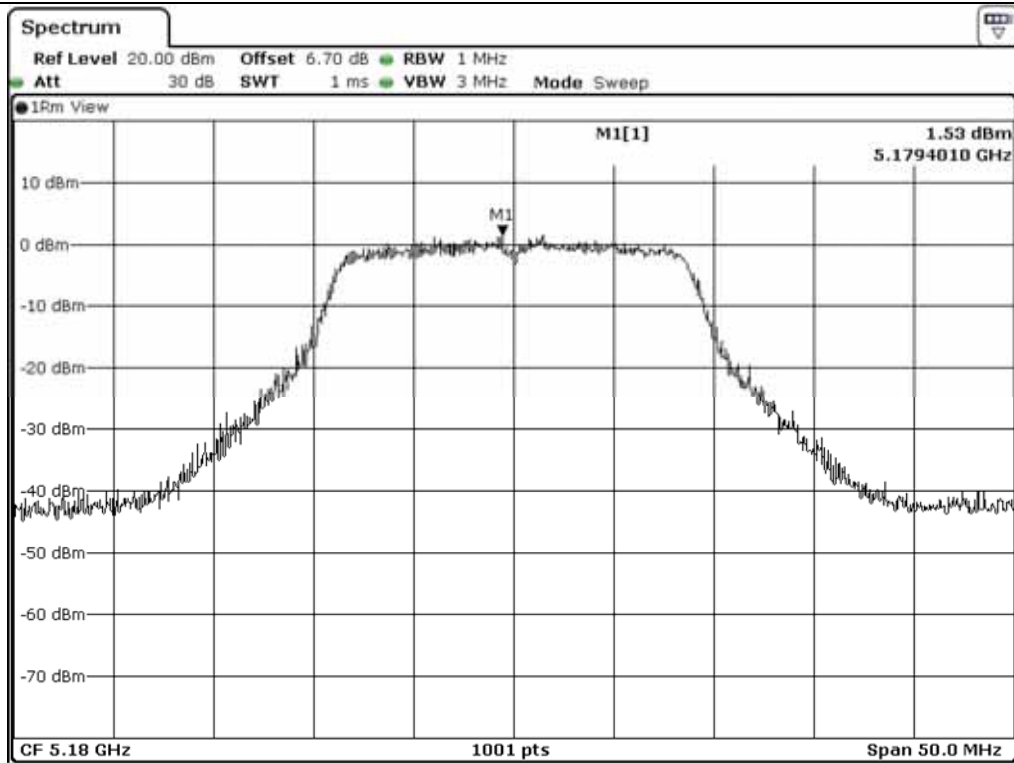
- Test Date : September 20, 2017 ~ September 27, 2017
- Operating condition : Highest Output Power Transmitting Mode
- Test Result : Pass

FREQUENCY RANGE (MHz)	CHANNEL	FREQUENCY (MHz)	MEASURED VALUE (dBm)	LIMIT (dBm)	MARGIN (dB)
5 150 ~ 5 250	Low	5 180.00	1.53	17.00	15.47
	Middle	5 220.00	1.97	17.00	15.03
	High	5 240.00	2.15	17.00	14.85
5 725 ~ 5 850	Low	5 745.00	13.51	29.38	15.87
	Middle	5 785.00	14.03	29.38	15.35
	High	5 825.00	13.32	29.38	16.06

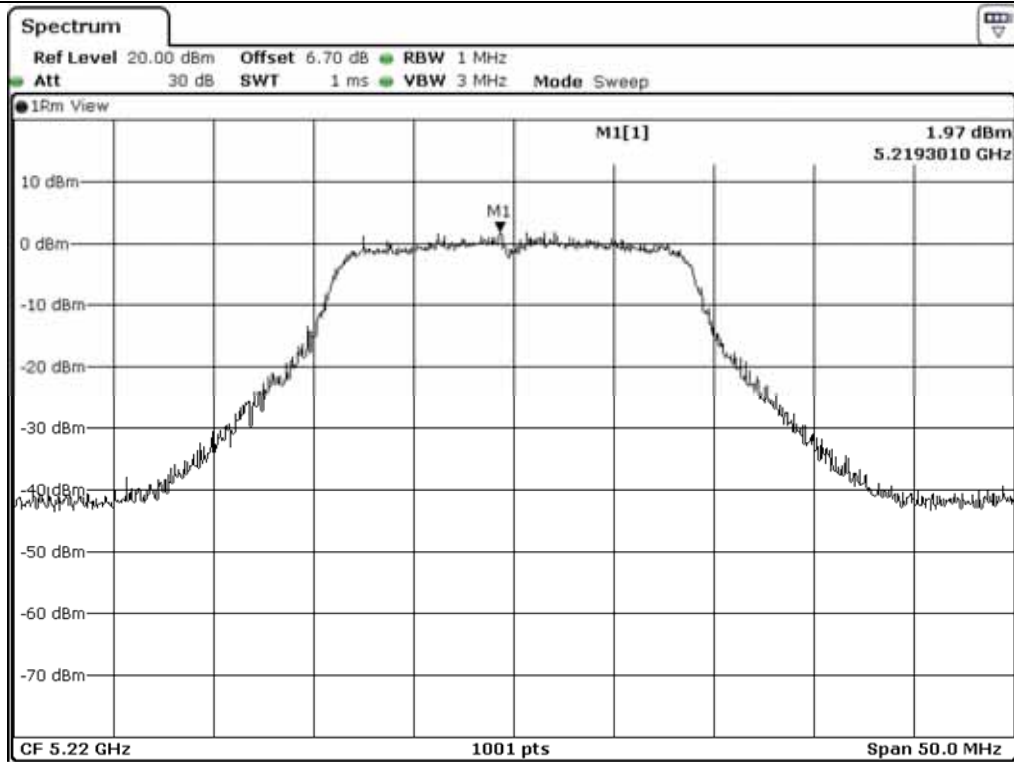
Remark: See next page for measurement data.



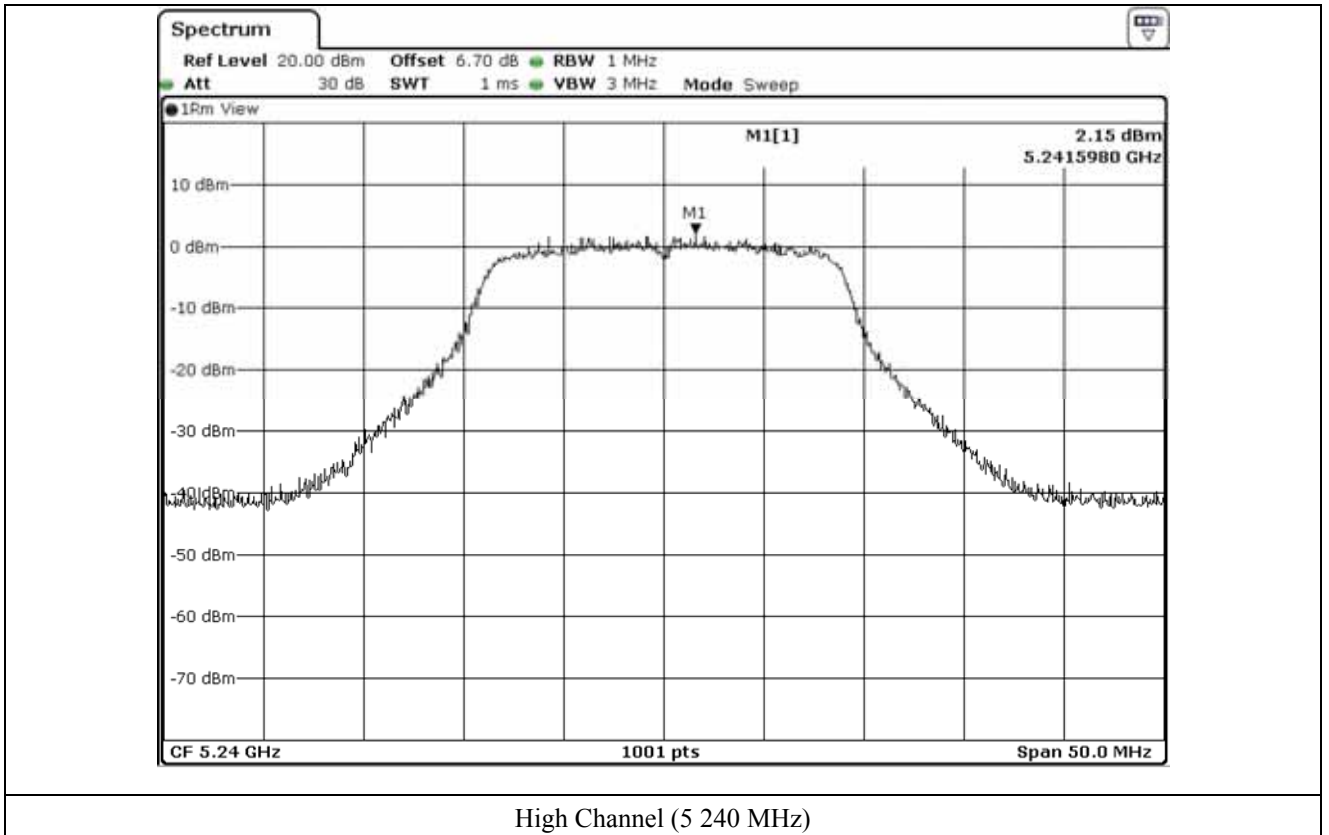
Tested by: Hyung-Kwon, Oh / Assistant Manager

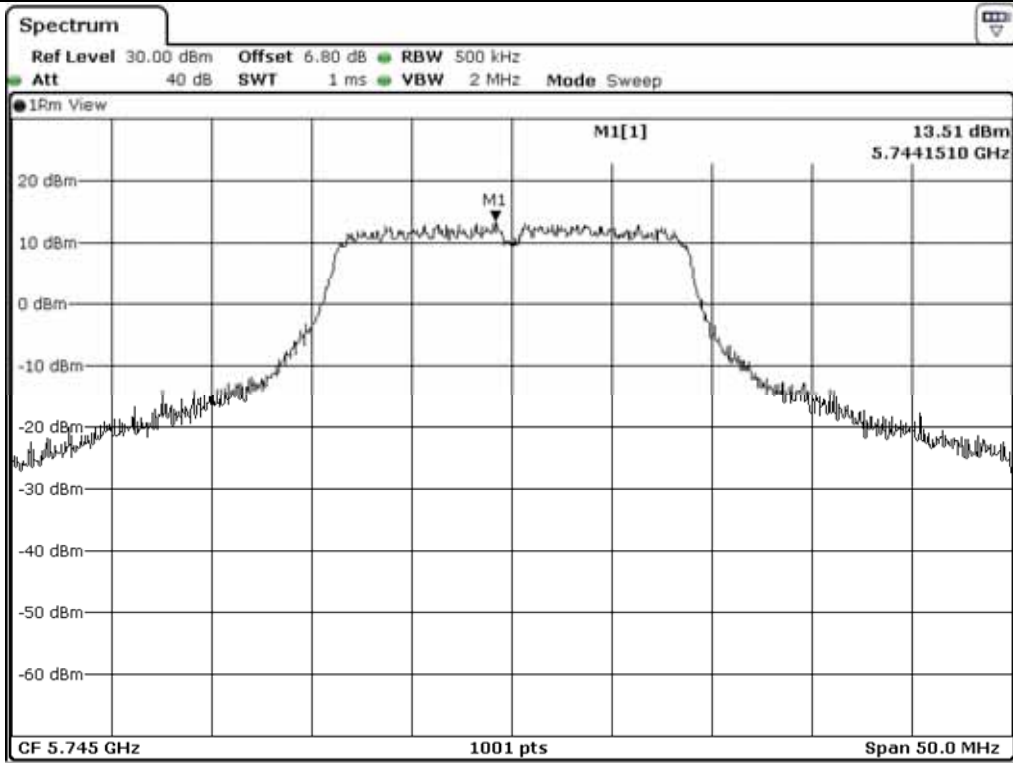


Low Channel (5 180 MHz)

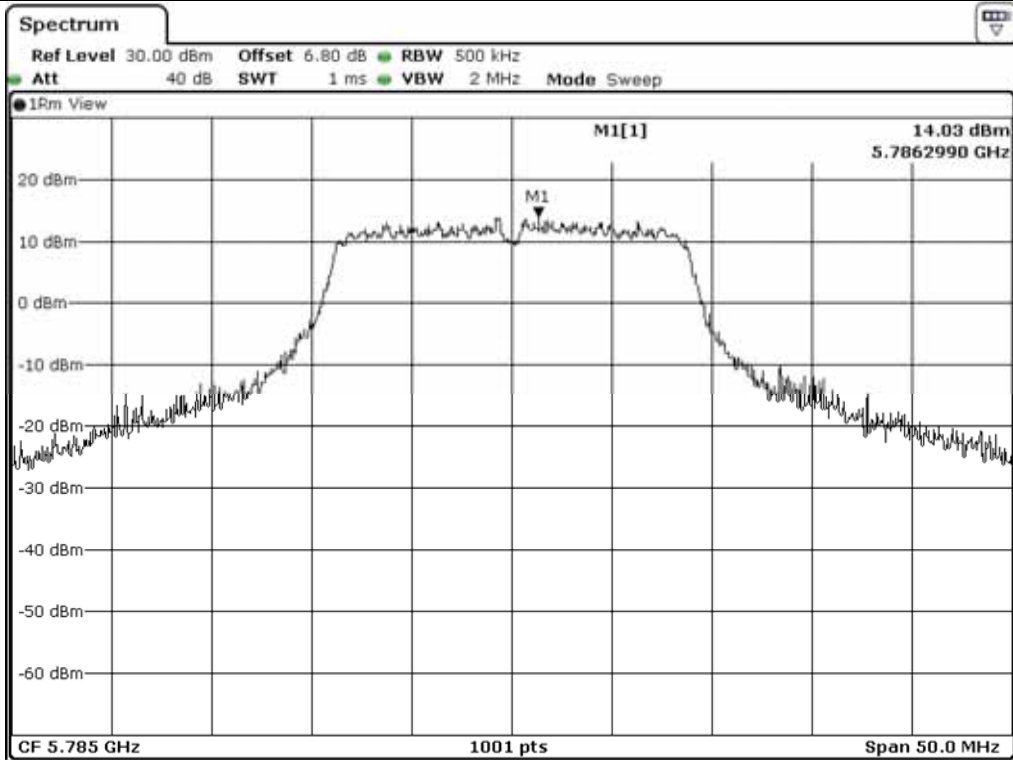


Middle Channel (5 220 MHz)

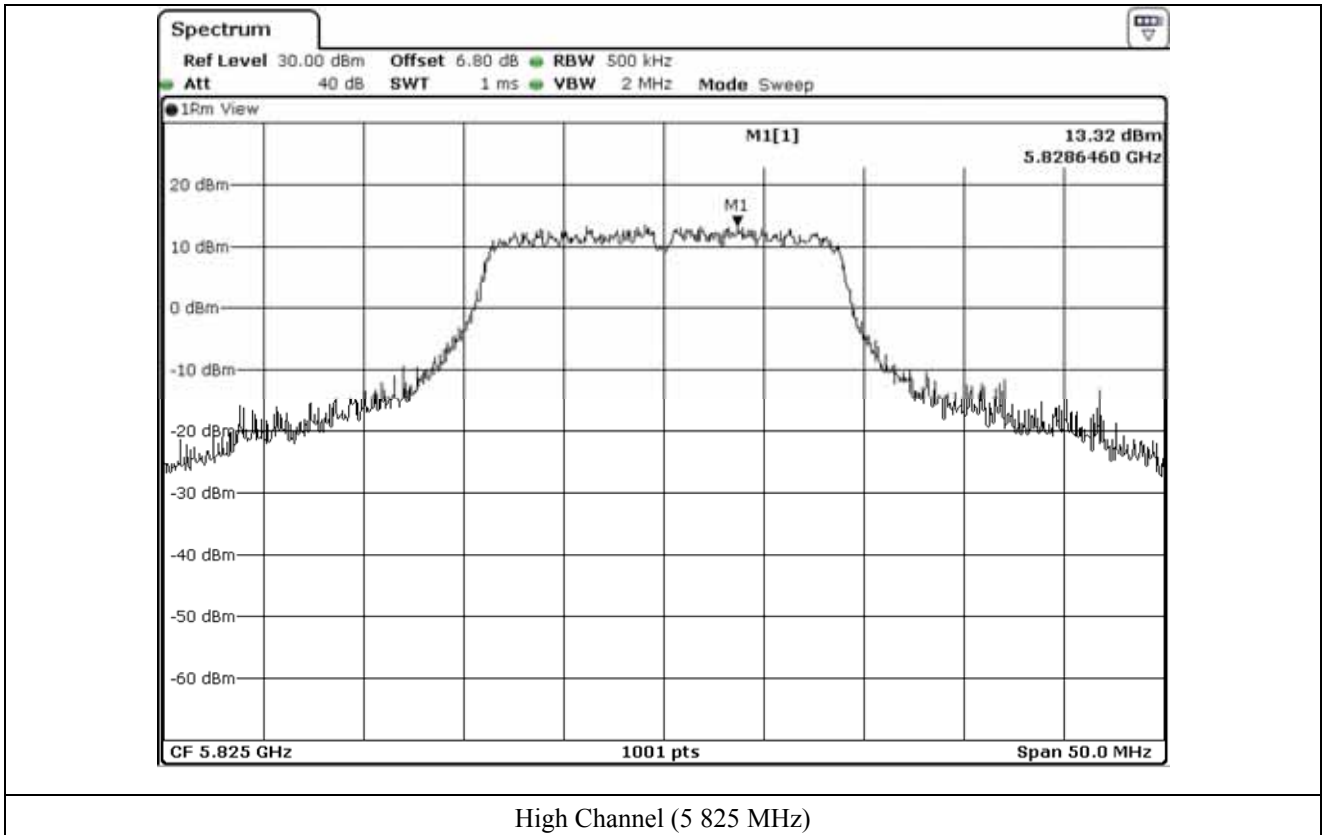




Low Channel (5.745 MHz)



Middle Channel (5.785 MHz)



High Channel (5 825 MHz)

10.5.3 Test data for Antenna 2

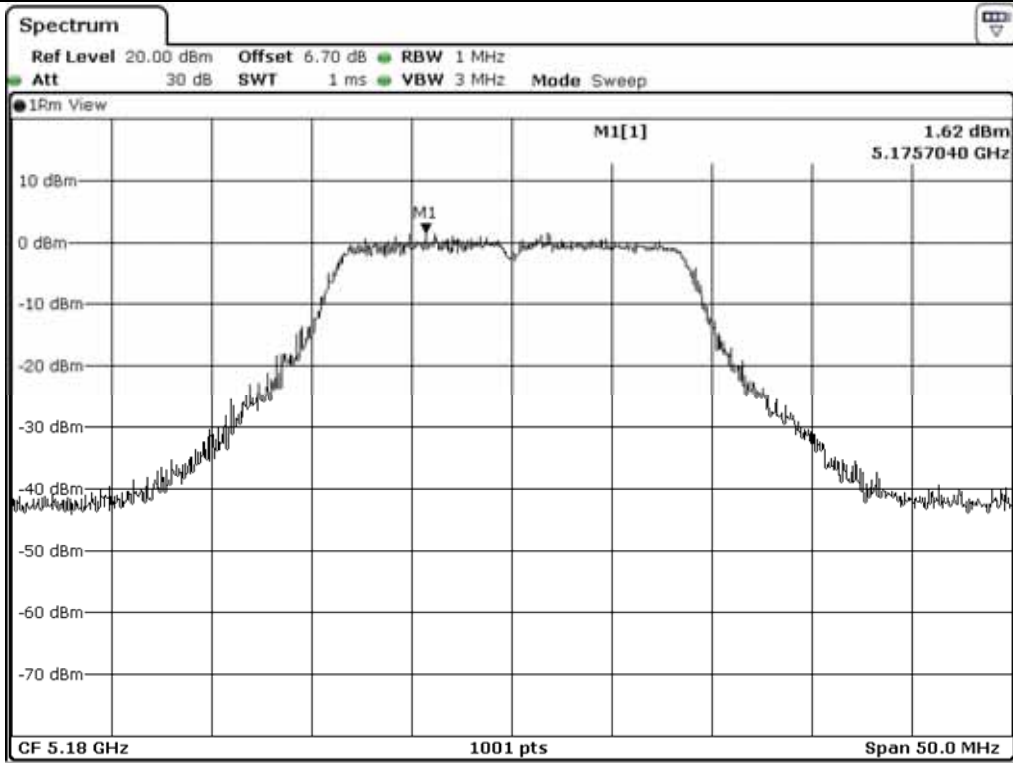
- Test Date : September 20, 2017 ~ September 27, 2017
- Operating condition : Highest Output Power Transmitting Mode
- Test Result : Pass

FREQUENCY RANGE (MHz)	CHANNEL	FREQUENCY (MHz)	MEASURED VALUE (dBm)	LIMIT (dBm)	MARGIN (dB)
5 150 ~ 5 250	Low	5 180.00	1.62	17.00	15.38
	Middle	5 220.00	1.43	17.00	15.57
	High	5 240.00	1.91	17.00	15.09
5 725 ~ 5 850	Low	5 745.00	13.05	29.15	16.10
	Middle	5 785.00	13.03	29.15	16.12
	High	5 825.00	13.13	29.15	16.02

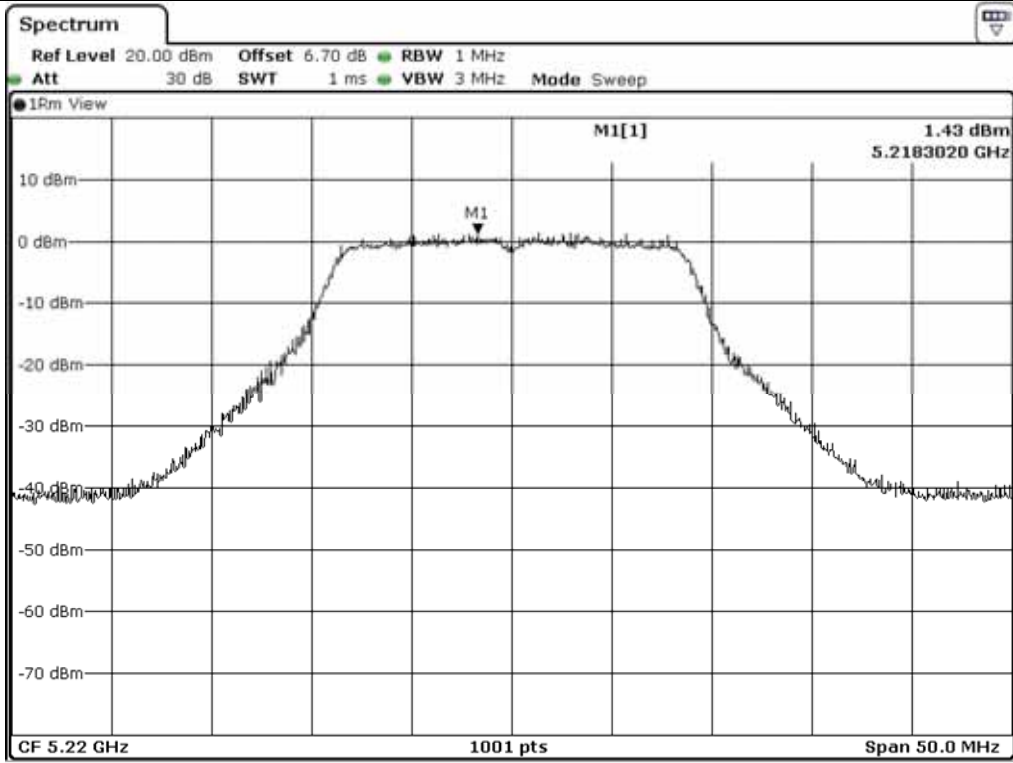
Remark: See next page for measurement data.



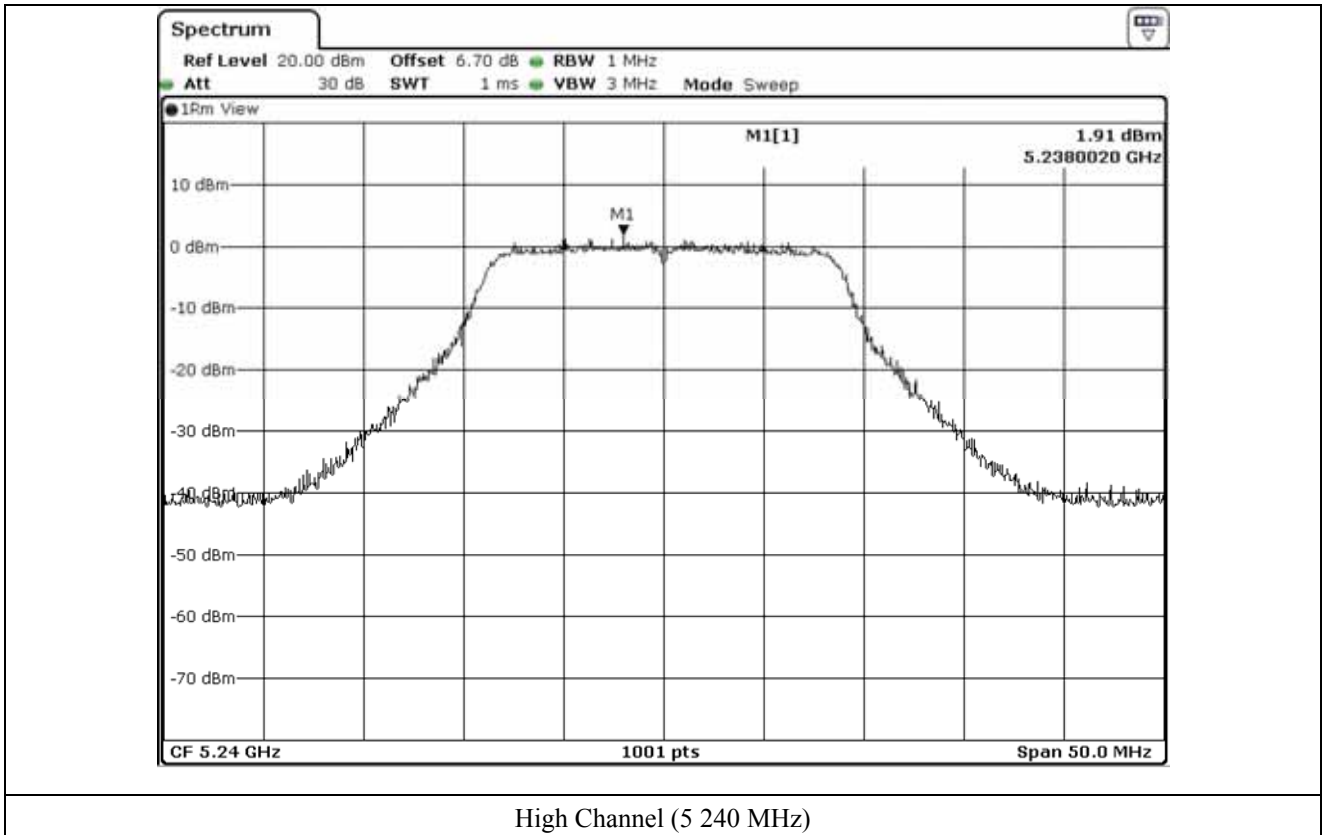
Tested by: Hyung-Kwon, Oh / Assistant Manager

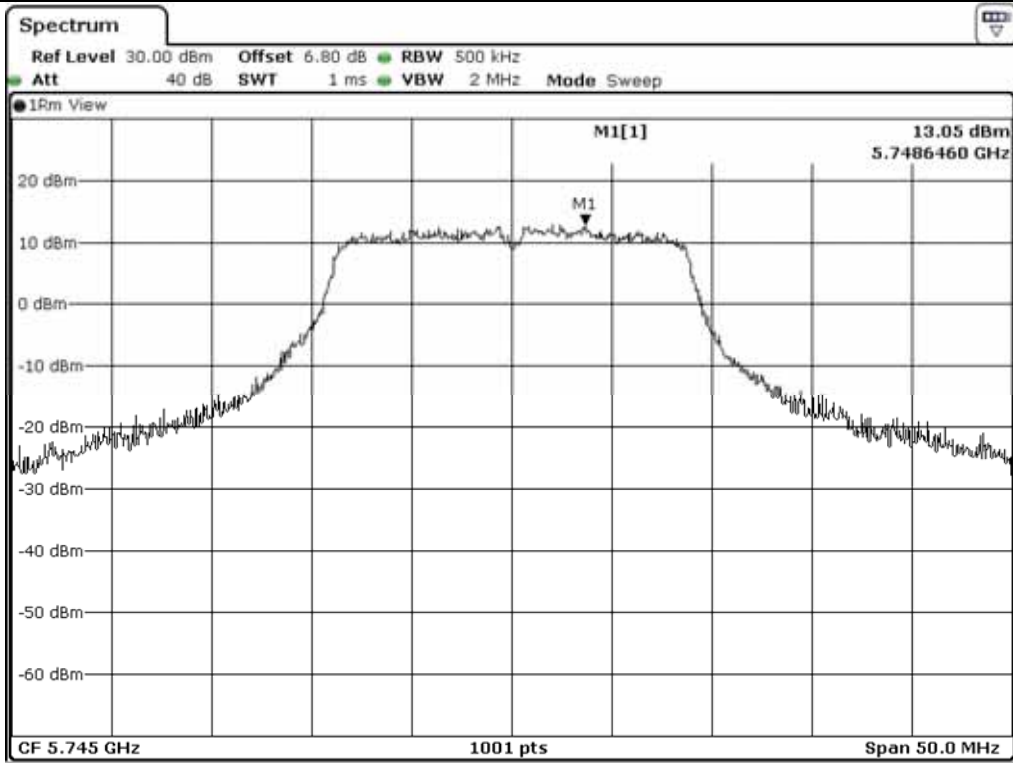


Low Channel (5 180 MHz)

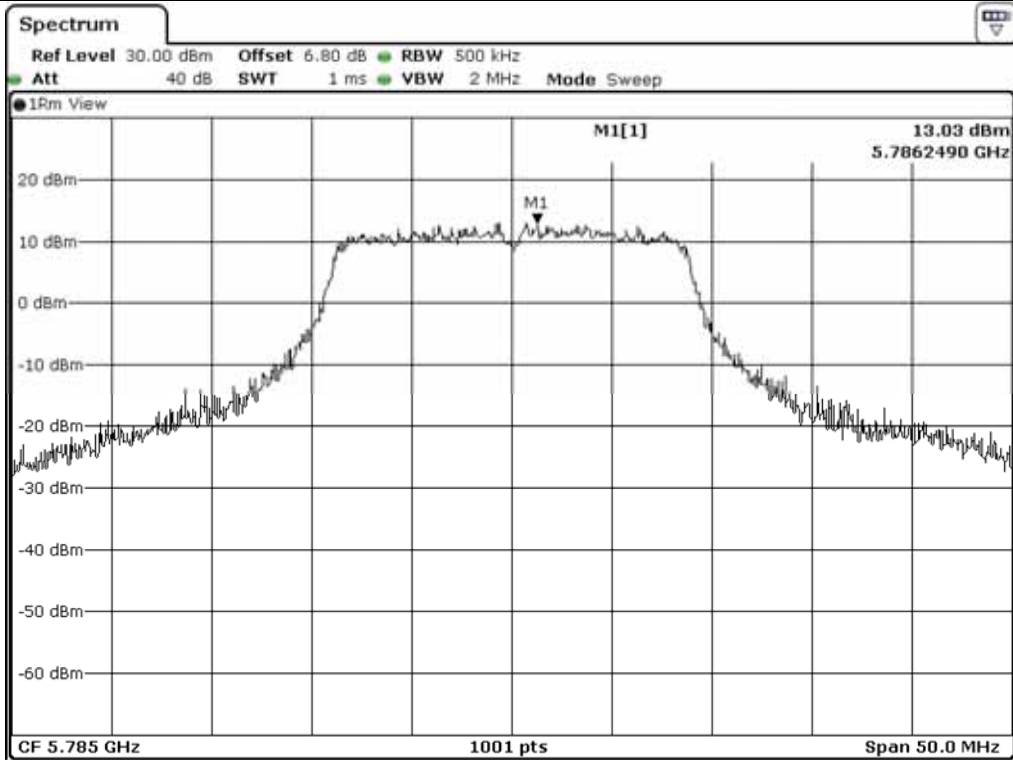


Middle Channel (5 220 MHz)

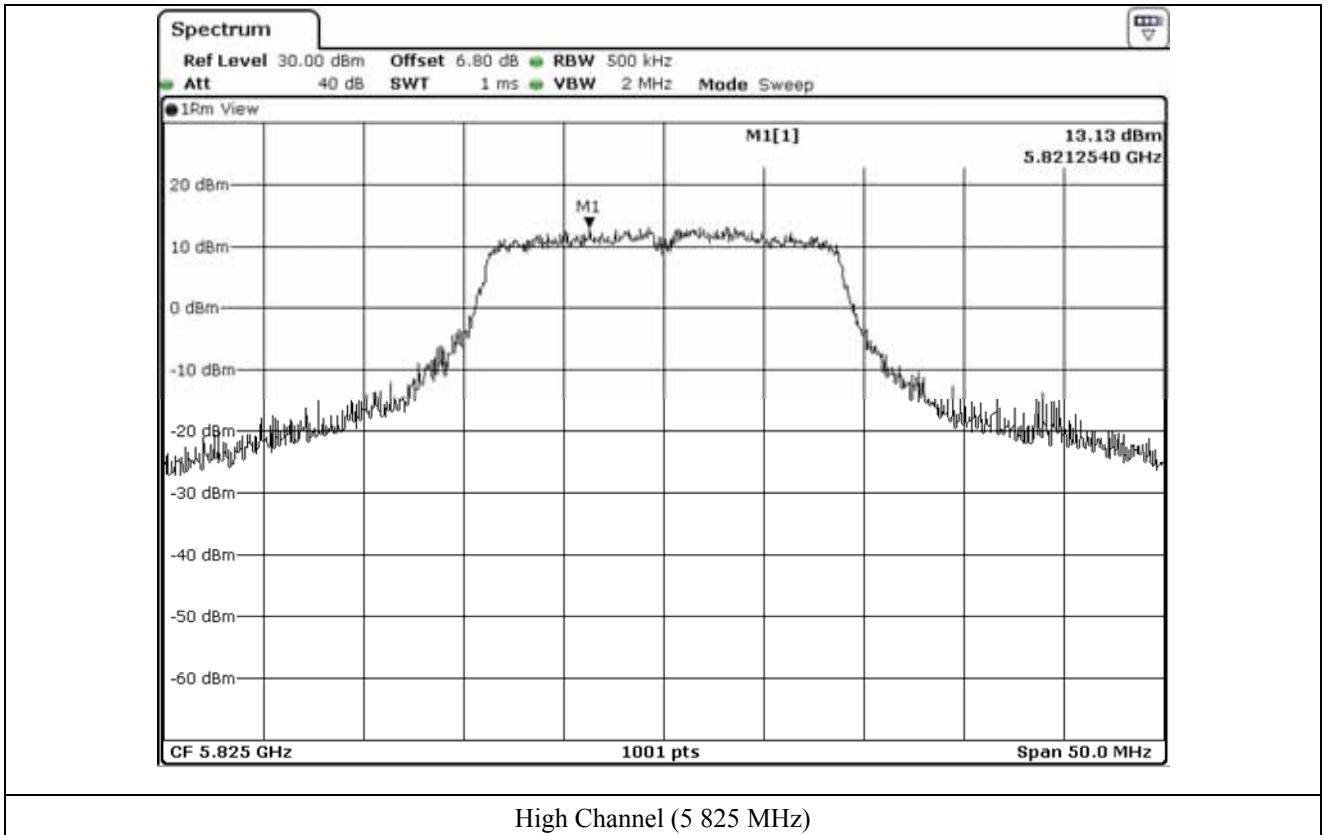




Low Channel (5.745 MHz)



Middle Channel (5.785 MHz)



High Channel (5 825 MHz)

10.5.4 Test data for Antenna 3

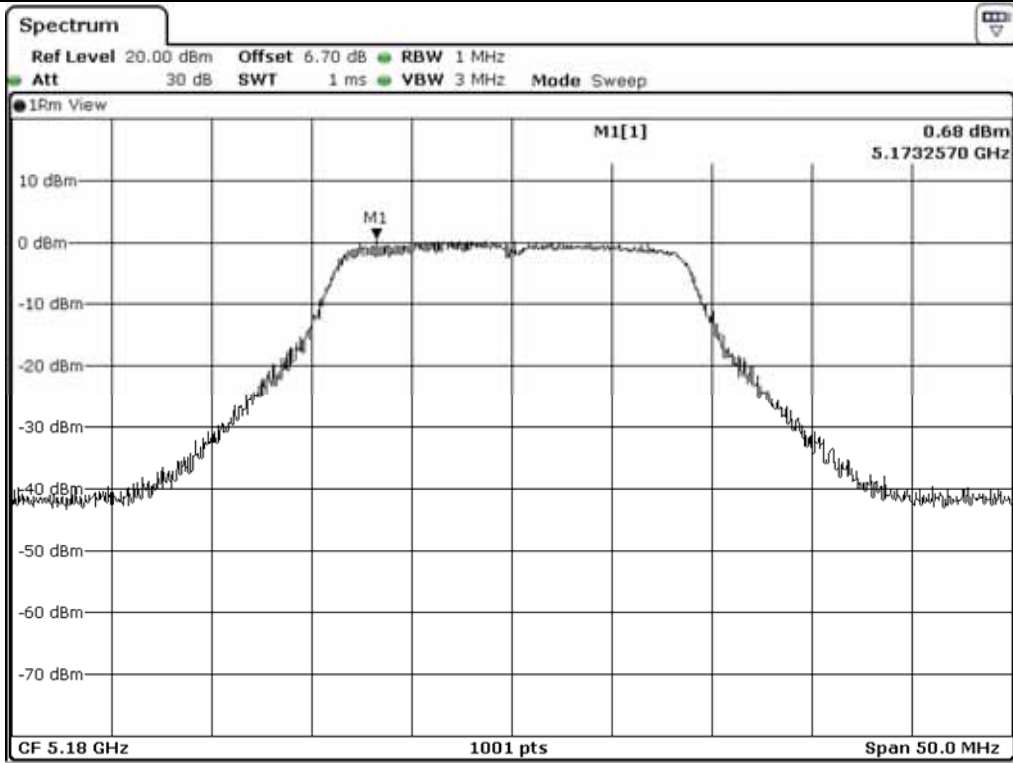
- Test Date : September 20, 2017 ~ September 27, 2017
- Operating condition : Highest Output Power Transmitting Mode
- Test Result : Pass

FREQUENCY RANGE (MHz)	CHANNEL	FREQUENCY (MHz)	MEASURED VALUE (dBm)	LIMIT (dBm)	MARGIN (dB)
5 150 ~ 5 250	Low	5 180.00	0.68	17.00	16.32
	Middle	5 220.00	1.11	17.00	15.89
	High	5 240.00	1.68	17.00	15.32
5 725 ~ 5 850	Low	5 745.00	13.14	29.04	15.90
	Middle	5 785.00	13.70	29.04	15.34
	High	5 825.00	13.45	29.04	15.59

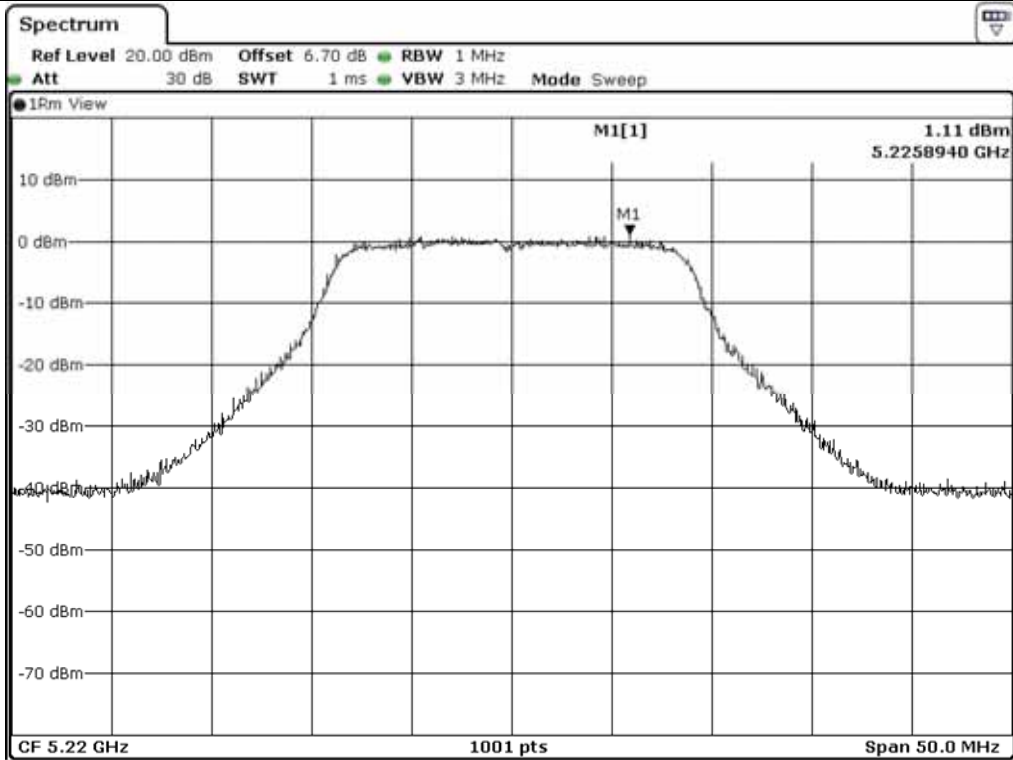
Remark: See next page for measurement data.



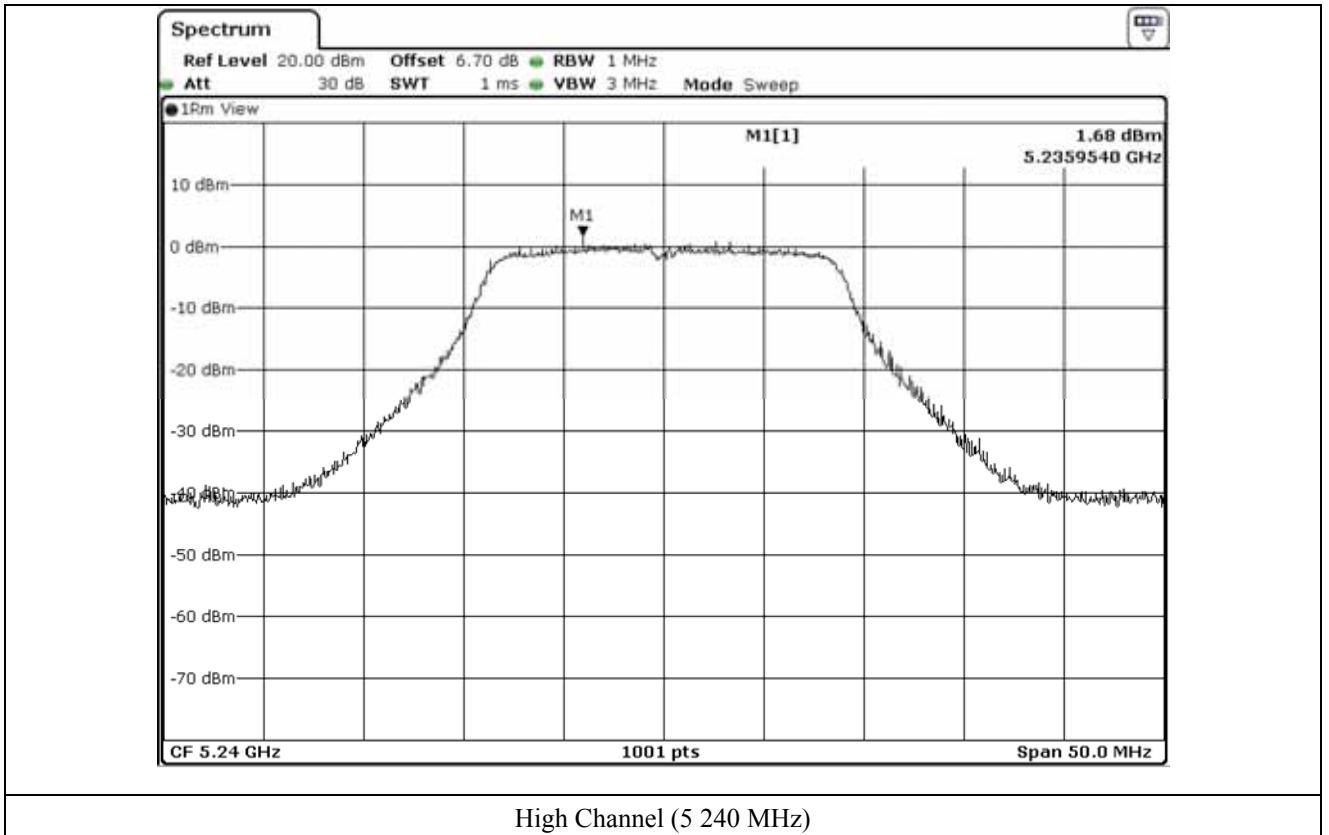
Tested by: Hyung-Kwon, Oh / Assistant Manager

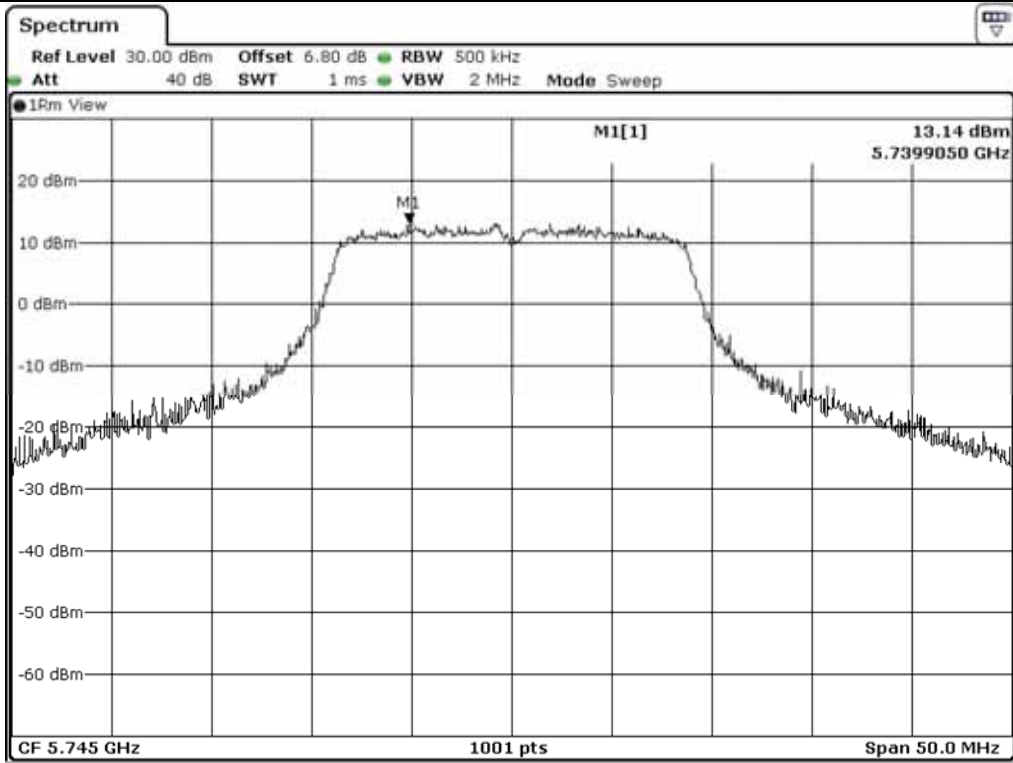


Low Channel (5 180 MHz)

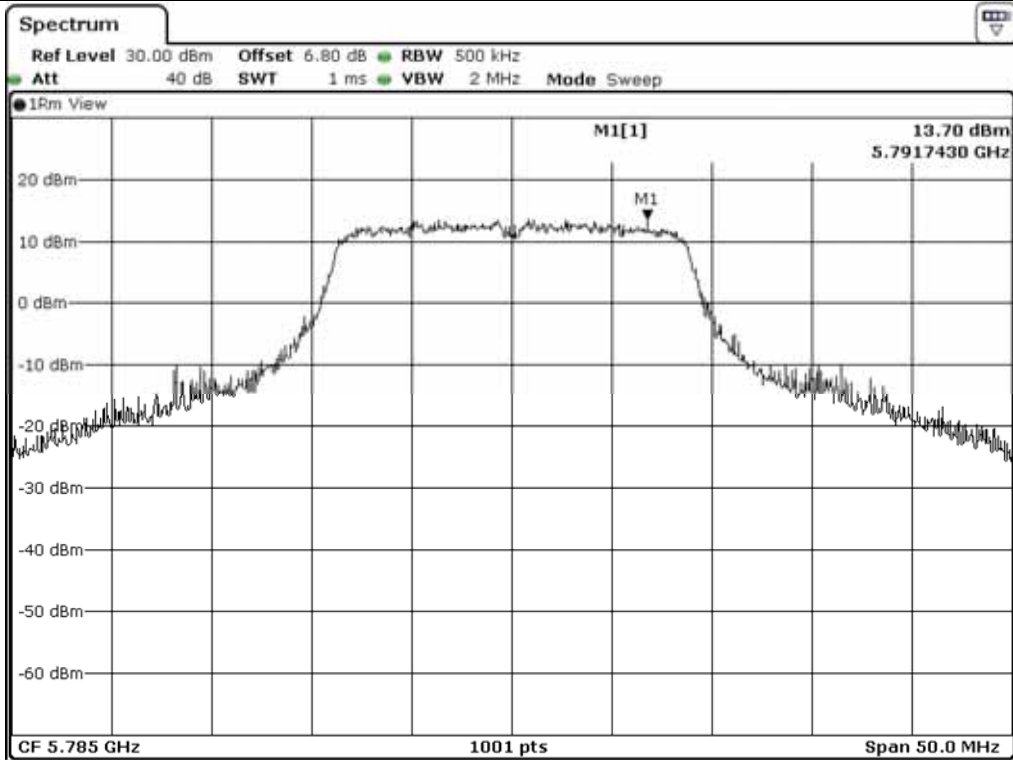


Middle Channel (5 220 MHz)

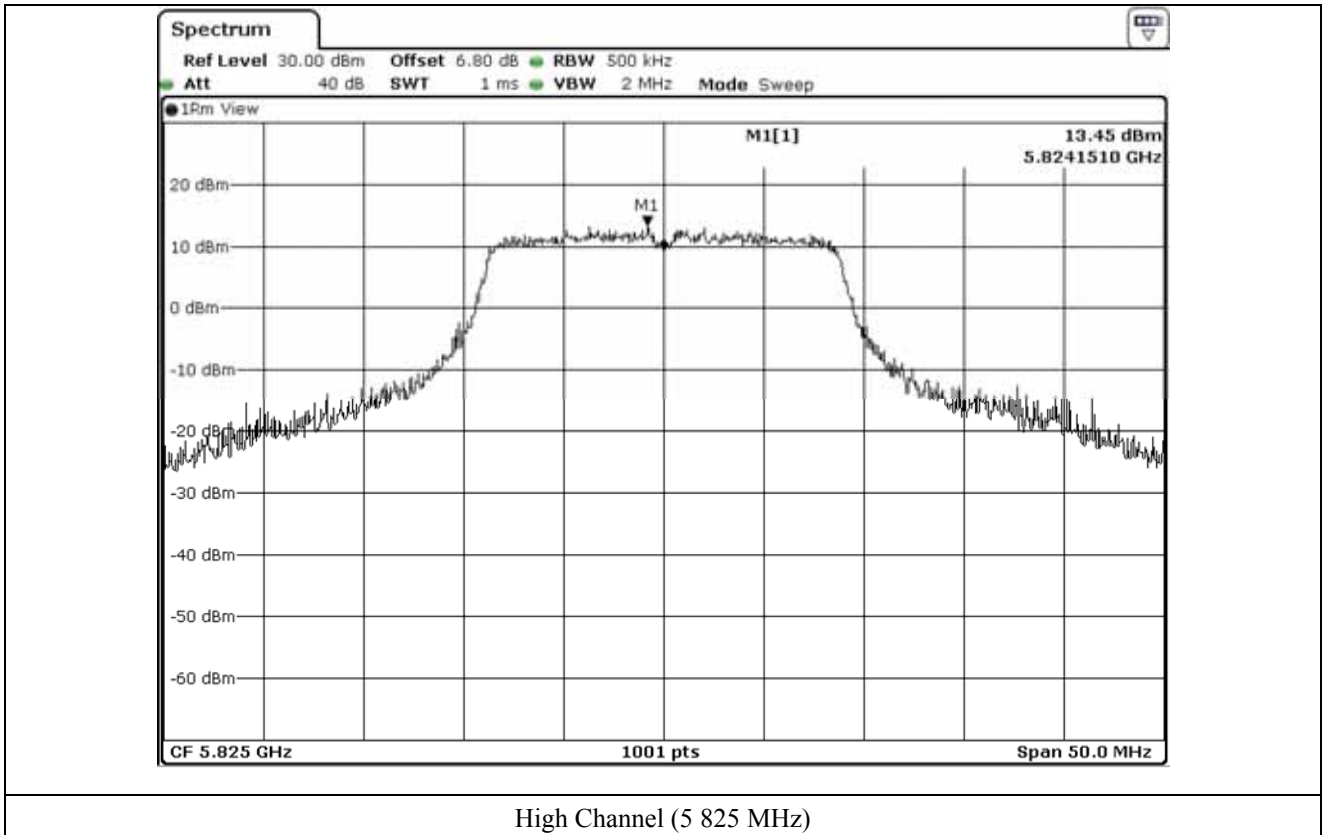




Low Channel (5.745 MHz)



Middle Channel (5.785 MHz)



10.5.5 Test data for Multiple Transmit

- Test Date : September 20, 2017 ~ September 27, 2017
- Operating condition : Highest Output Power Transmitting Mode
- Test Result : Pass

FREQUENCY RANGE (MHz)	CHANNEL	FREQUENCY (MHz)	MEASURED VALUE (dBm)	LIMIT (dBm)	MARGIN (dB)
5 150 ~ 5 250	Low	5 180.00	7.46	9.38	1.92
	Middle	5 220.00	7.61	9.38	1.77
	High	5 240.00	7.98	9.38	1.40
5 725 ~ 5 850	Low	5 745.00	19.32	21.15	1.83
	Middle	5 785.00	19.69	21.15	1.46
	High	5 825.00	19.48	21.15	1.67

Remark 1 : Margin = Limit – Measured value

Remark 2 : Calculated Power Density = $10 \log (10^{(\text{Antenna0 Power Density}/10)} + 10^{(\text{Antenna1 Power Density}/10)} + 10^{(\text{Antenna2 Power Density}/10)} + 10^{(\text{Antenna3 Power Density}/10)})$



Tested by: Hyung-Kwon, Oh / Assistant Manager

10.6 Test data for 802.11n_HT40 RLAN Mode

10.6.1 Test data for Antenna 0

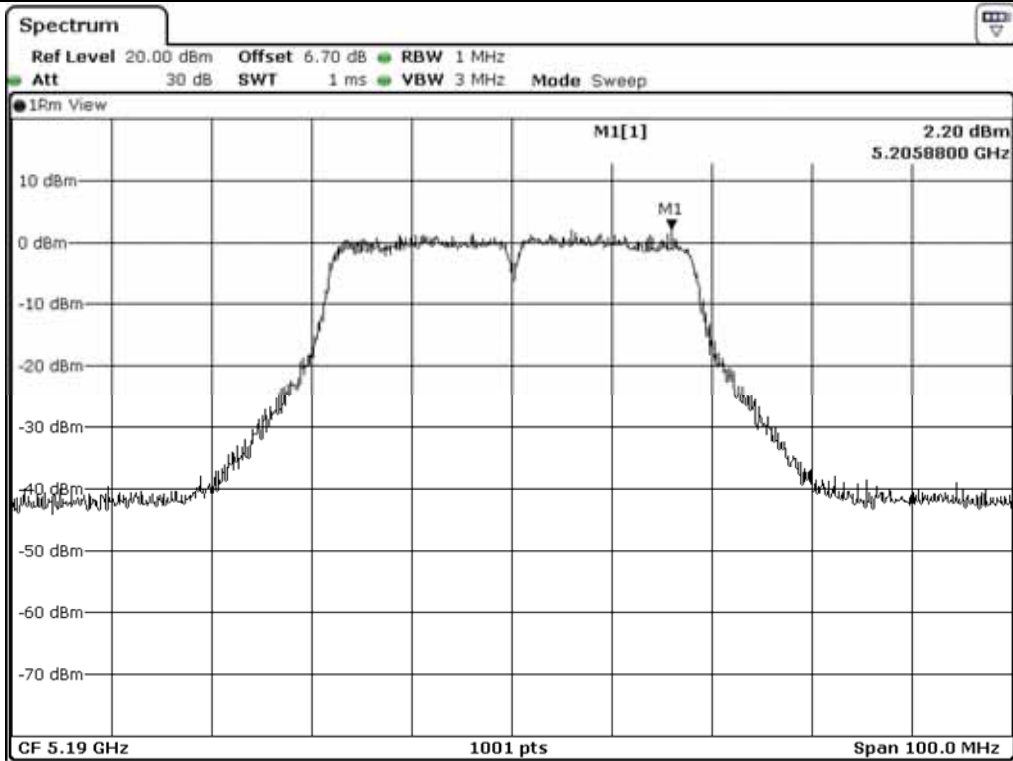
- Test Date : September 20, 2017 ~ September 27, 2017
- Operating condition : Highest Output Power Transmitting Mode
- Test Result : Pass

FREQUENCY RANGE (MHz)	CHANNEL	FREQUENCY (MHz)	MEASURED VALUE (dBm)	LIMIT (dBm)	MARGIN (dB)
5 150 ~ 5 250	Low	5 190.00	2.20	17.00	14.80
	High	5 230.00	2.60	17.00	14.40
5 725 ~ 5 850	Low	5 755.00	13.64	29.12	15.48
	High	5 795.00	13.24	29.12	15.88

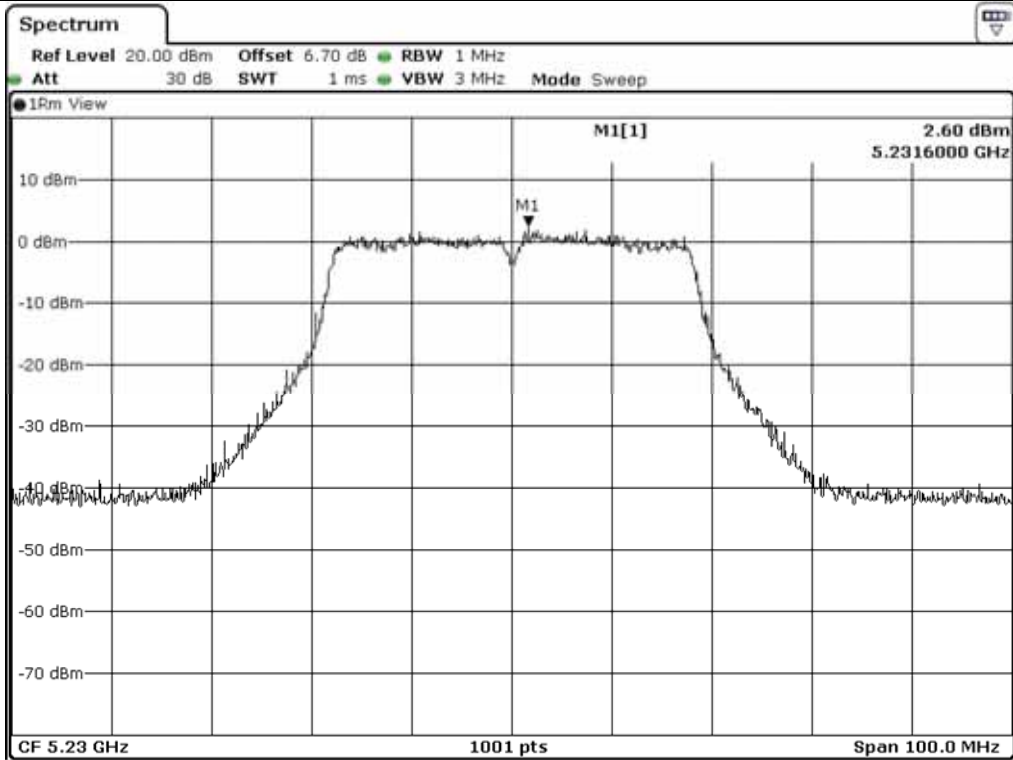
Remark: See next page for measurement data.



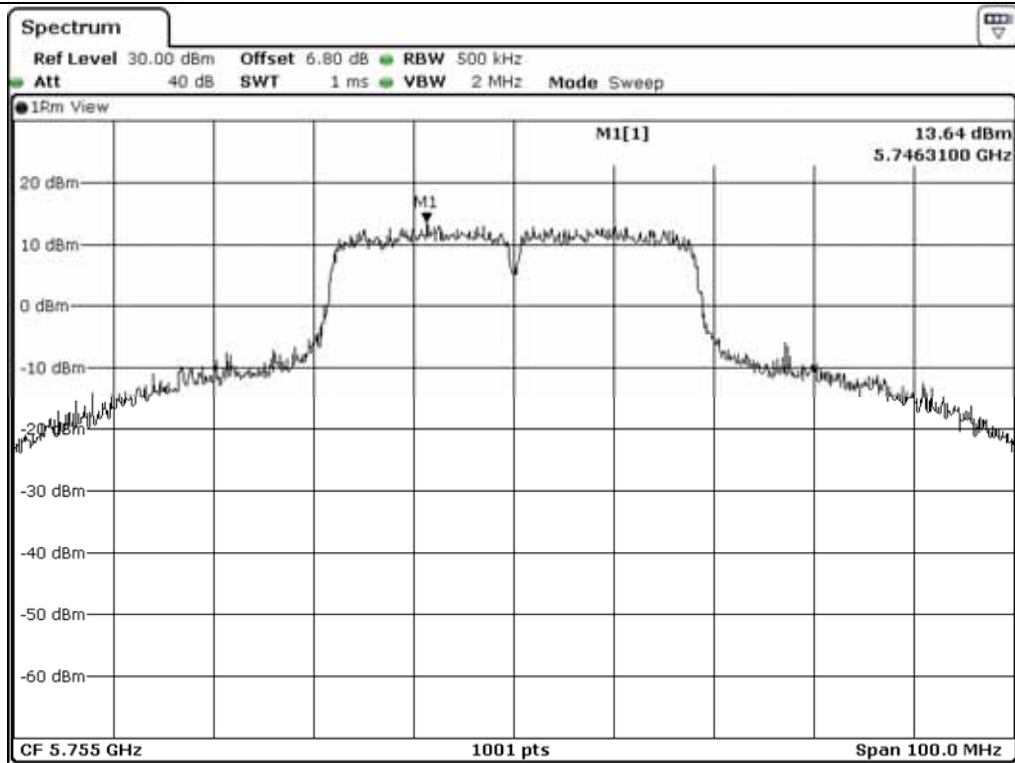
Tested by: Hyung-Kwon, Oh / Assistant Manager



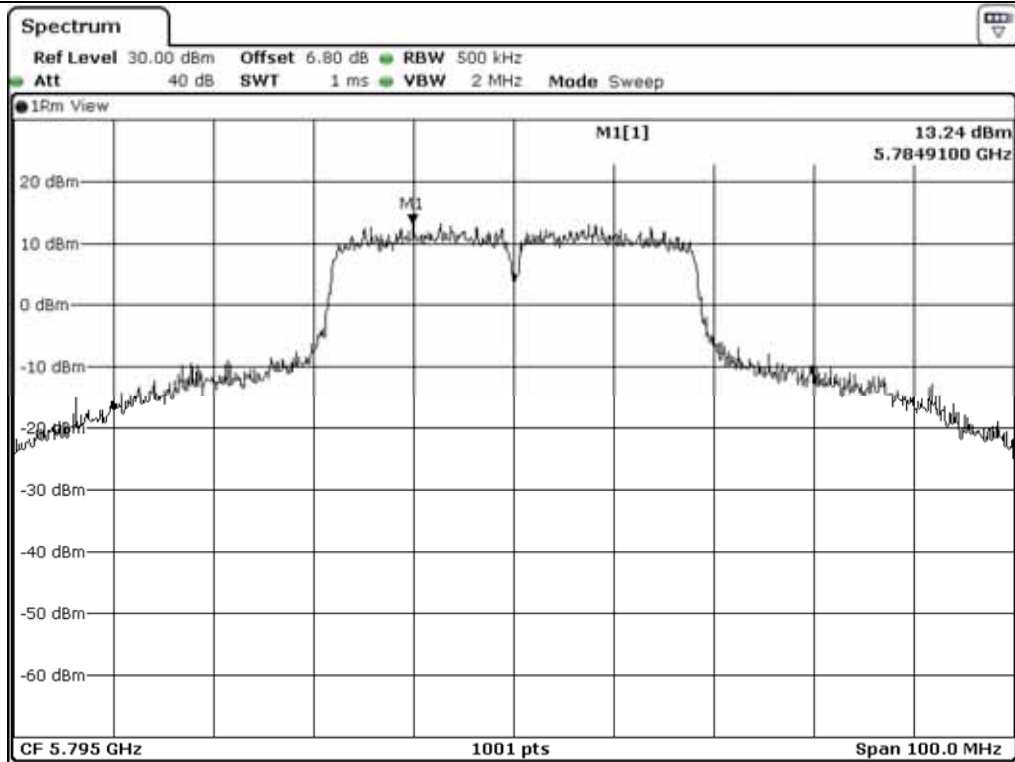
Low Channel (5 190 MHz)



High Channel (5 230 MHz)



Low Channel (5.755 MHz)



High Channel (5.795 MHz)

10.6.2 Test data for Antenna 1

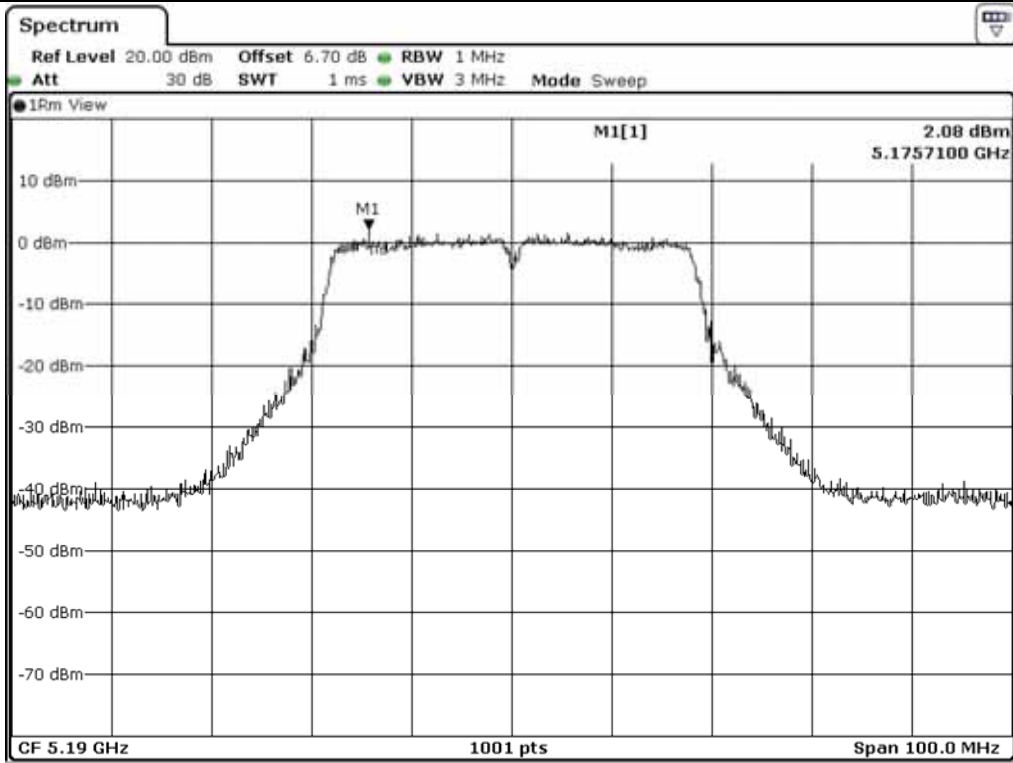
- Test Date : September 20, 2017 ~ September 27, 2017
- Operating condition : Highest Output Power Transmitting Mode
- Test Result : Pass

FREQUENCY RANGE (MHz)	CHANNEL	FREQUENCY (MHz)	MEASURED VALUE (dBm)	LIMIT (dBm)	MARGIN (dB)
5 150 ~ 5 250	Low	5 190.00	2.08	17.00	14.92
	High	5 230.00	2.24	17.00	14.76
5 725 ~ 5 850	Low	5 755.00	12.68	29.38	16.70
	High	5 795.00	13.05	29.38	16.33

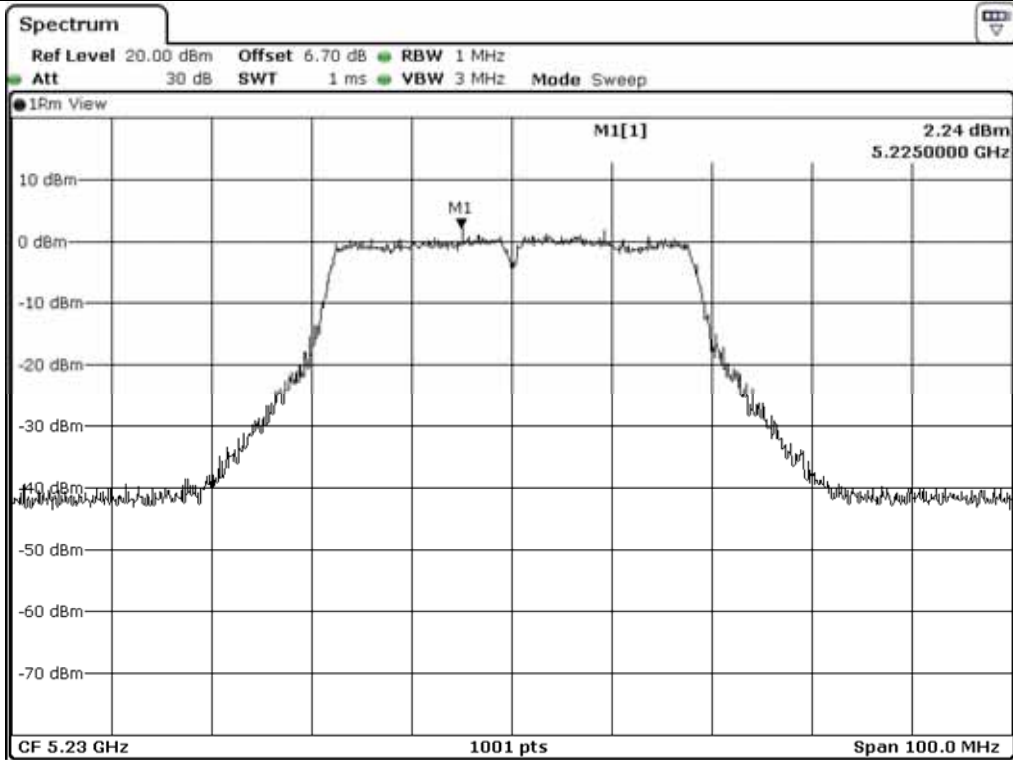
Remark: See next page for measurement data.



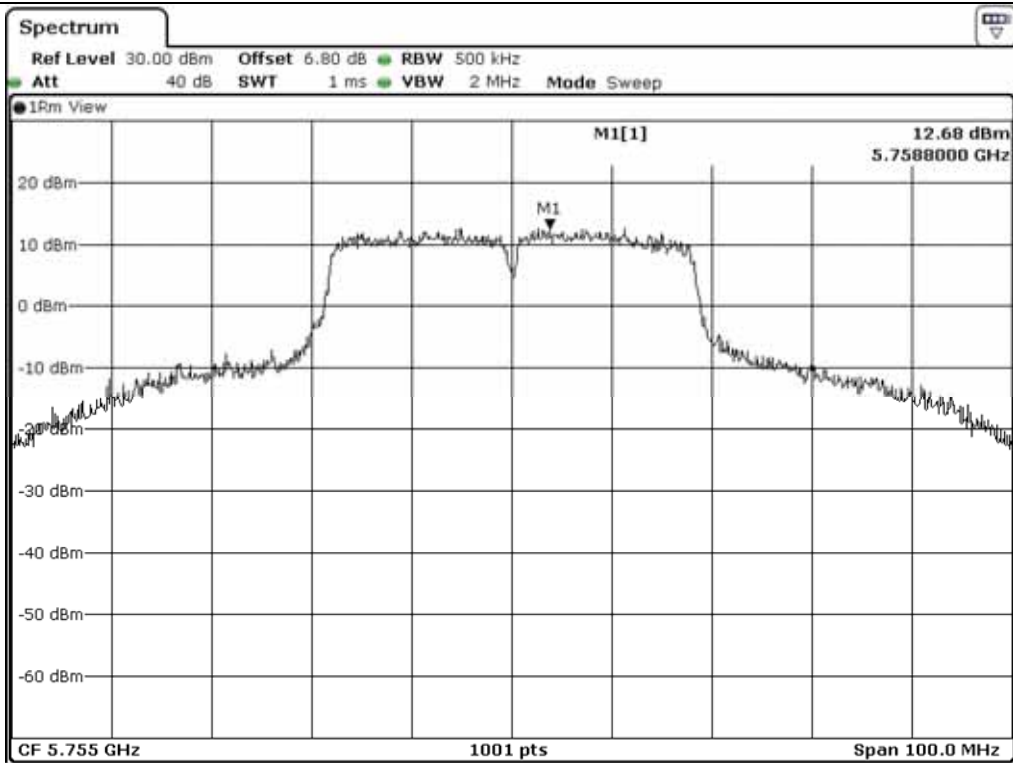
Tested by: Hyung-Kwon, Oh / Assistant Manager



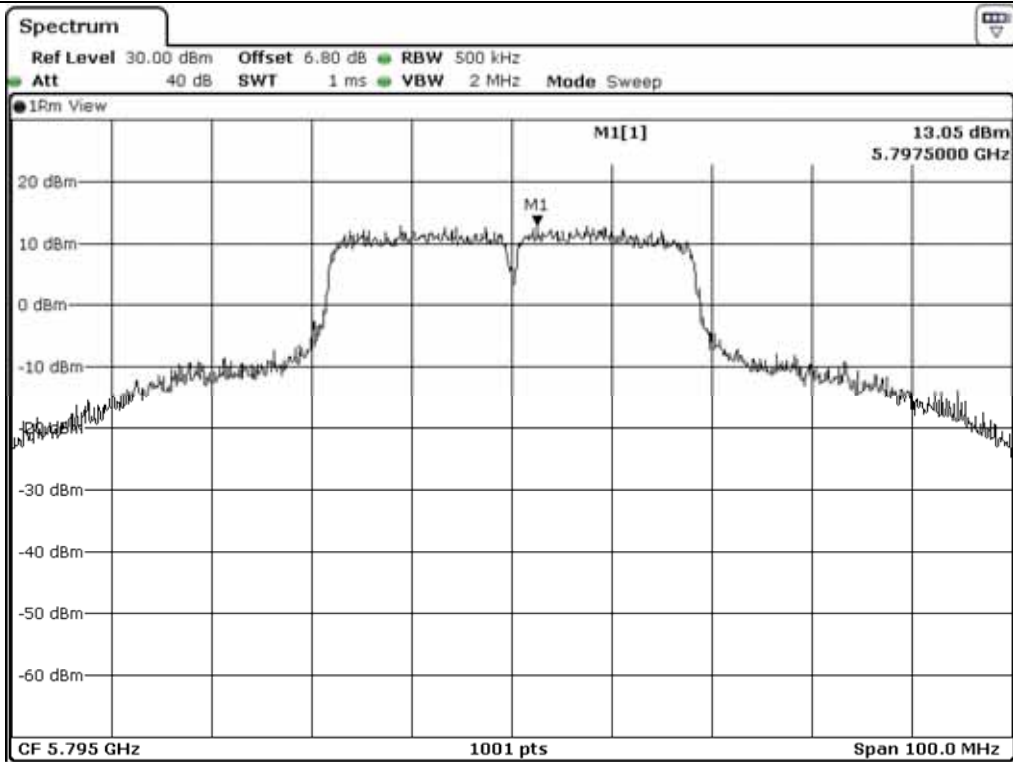
Low Channel (5 190 MHz)



High Channel (5 230 MHz)



Low Channel (5 755 MHz)



High Channel (5 795 MHz)

10.6.3 Test data for Antenna 2

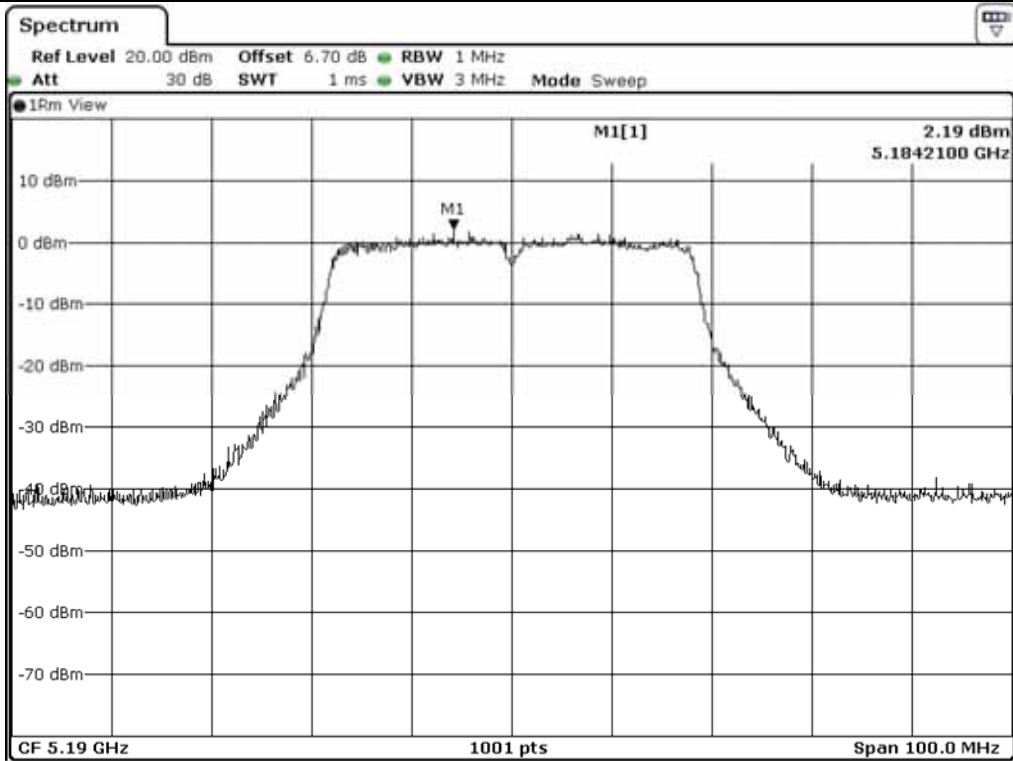
- Test Date : September 20, 2017 ~ September 27, 2017
- Operating condition : Highest Output Power Transmitting Mode
- Test Result : Pass

FREQUENCY RANGE (MHz)	CHANNEL	FREQUENCY (MHz)	MEASURED VALUE (dBm)	LIMIT (dBm)	MARGIN (dB)
5 150 ~ 5 250	Low	5 190.00	2.19	17.00	14.81
	High	5 230.00	2.60	17.00	14.40
5 725 ~ 5 850	Low	5 755.00	12.62	29.15	16.53
	High	5 795.00	12.81	29.15	16.34

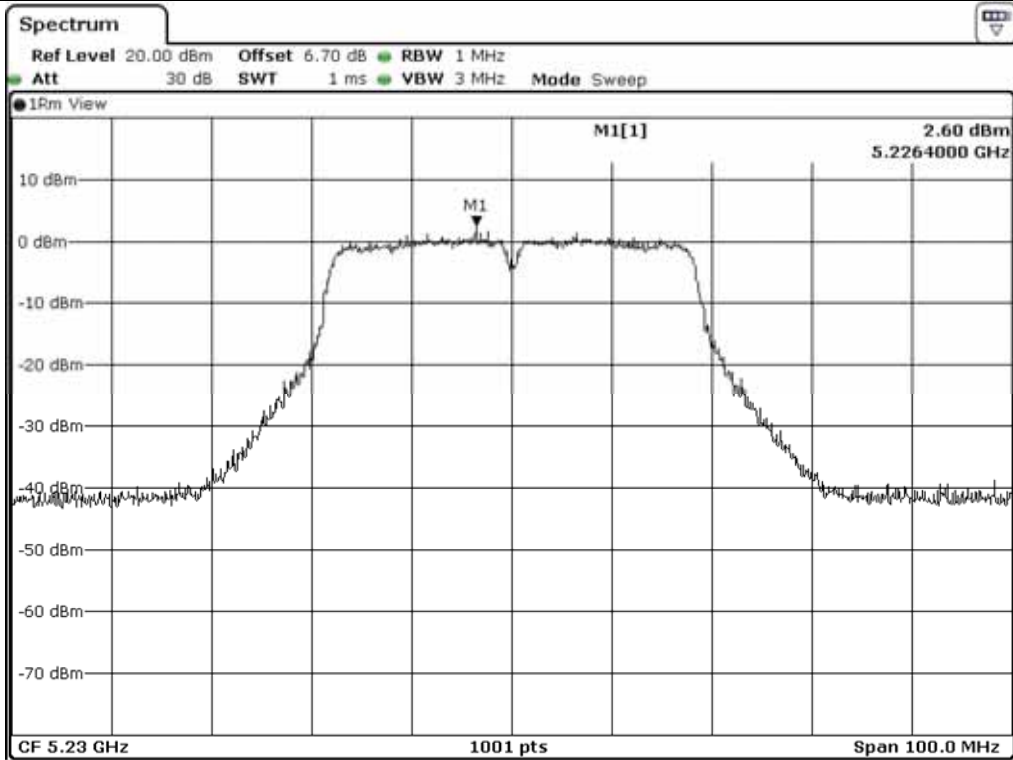
Remark: See next page for measurement data.



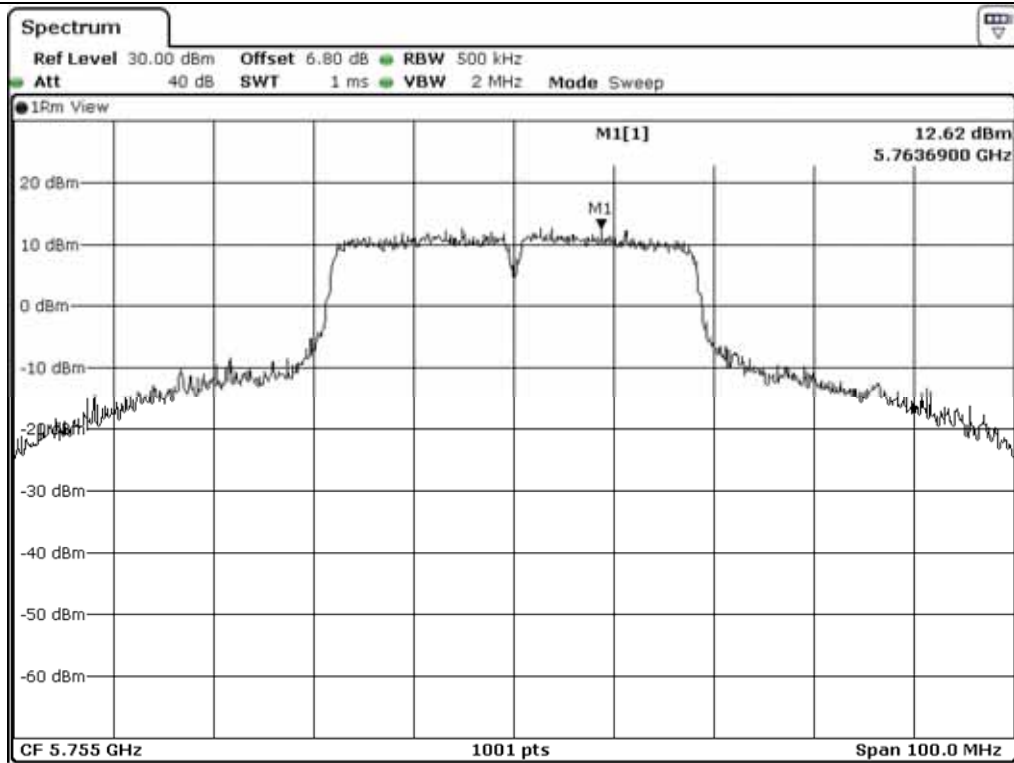
Tested by: Hyung-Kwon, Oh / Assistant Manager



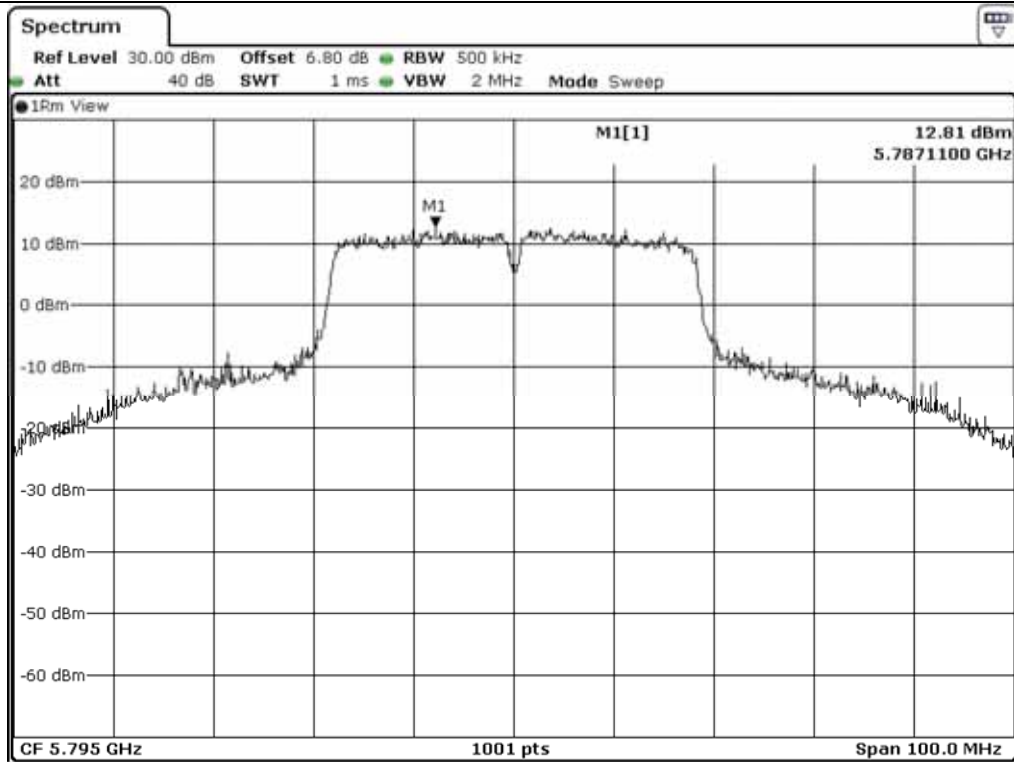
Low Channel (5 190 MHz)



High Channel (5 230 MHz)



Low Channel (5 755 MHz)



High Channel (5 795 MHz)

10.6.4 Test data for Antenna 3

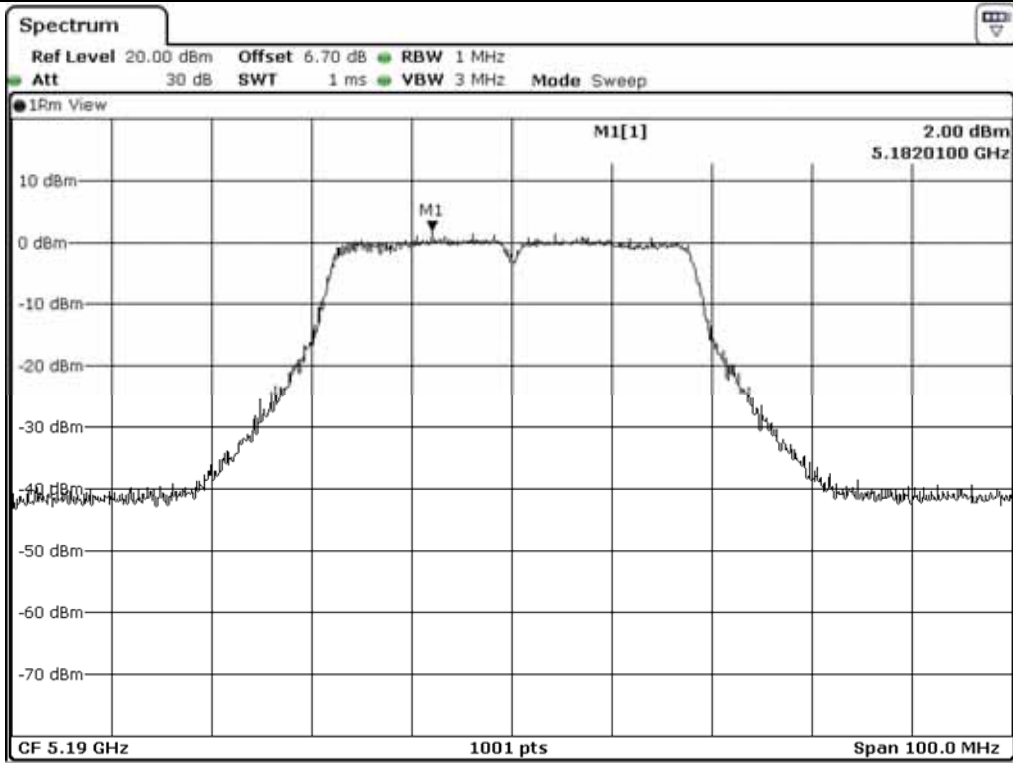
- Test Date : September 20, 2017 ~ September 27, 2017
- Operating condition : Highest Output Power Transmitting Mode
- Test Result : Pass

FREQUENCY RANGE (MHz)	CHANNEL	FREQUENCY (MHz)	MEASURED VALUE (dBm)	LIMIT (dBm)	MARGIN (dB)
5 150 ~ 5 250	Low	5 190.00	2.00	17.00	15.00
	High	5 230.00	1.13	17.00	15.87
5 725 ~ 5 850	Low	5 755.00	13.26	29.04	15.78
	High	5 795.00	13.42	29.04	15.62

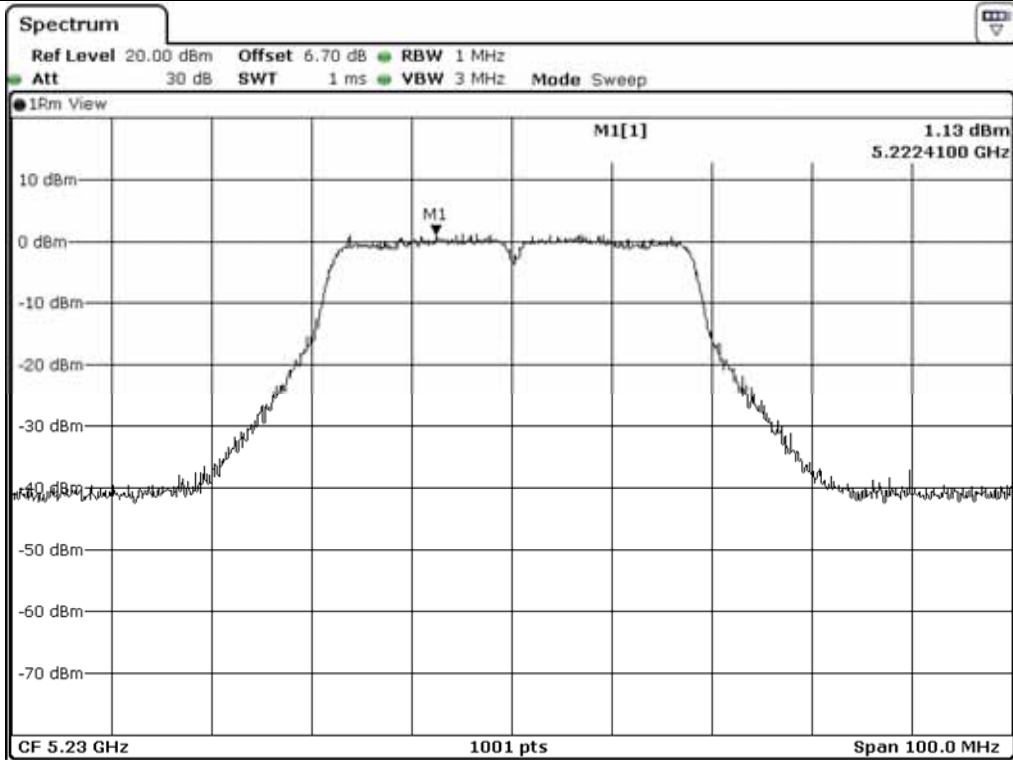
Remark: See next page for measurement data.



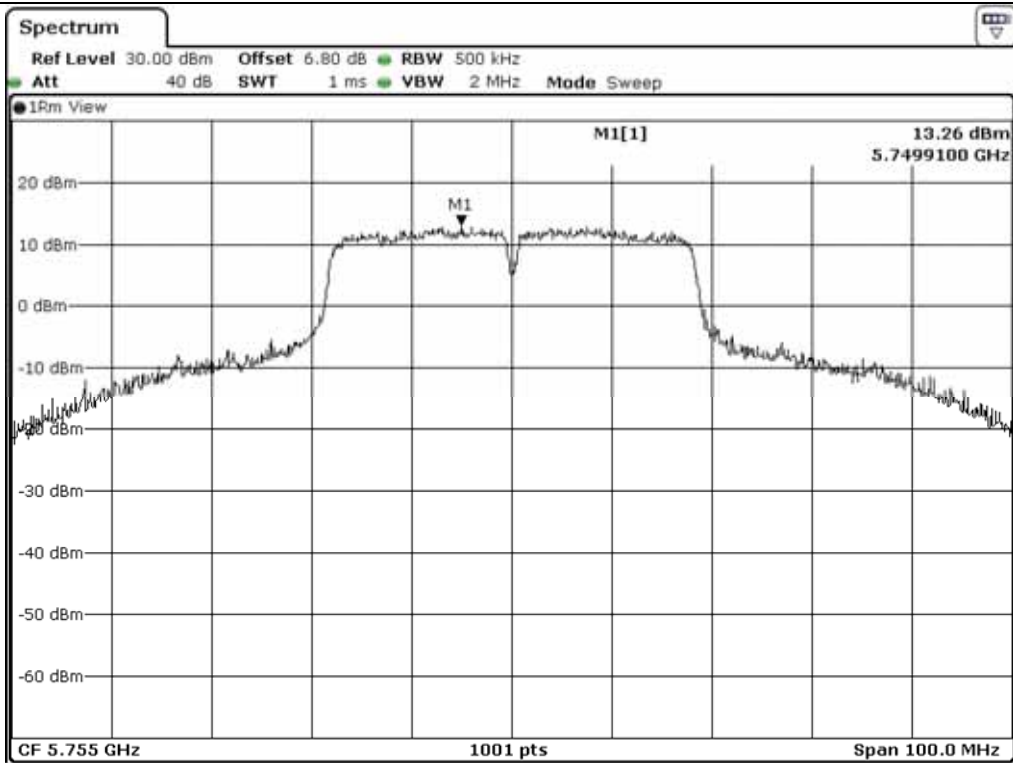
Tested by: Hyung-Kwon, Oh / Assistant Manager



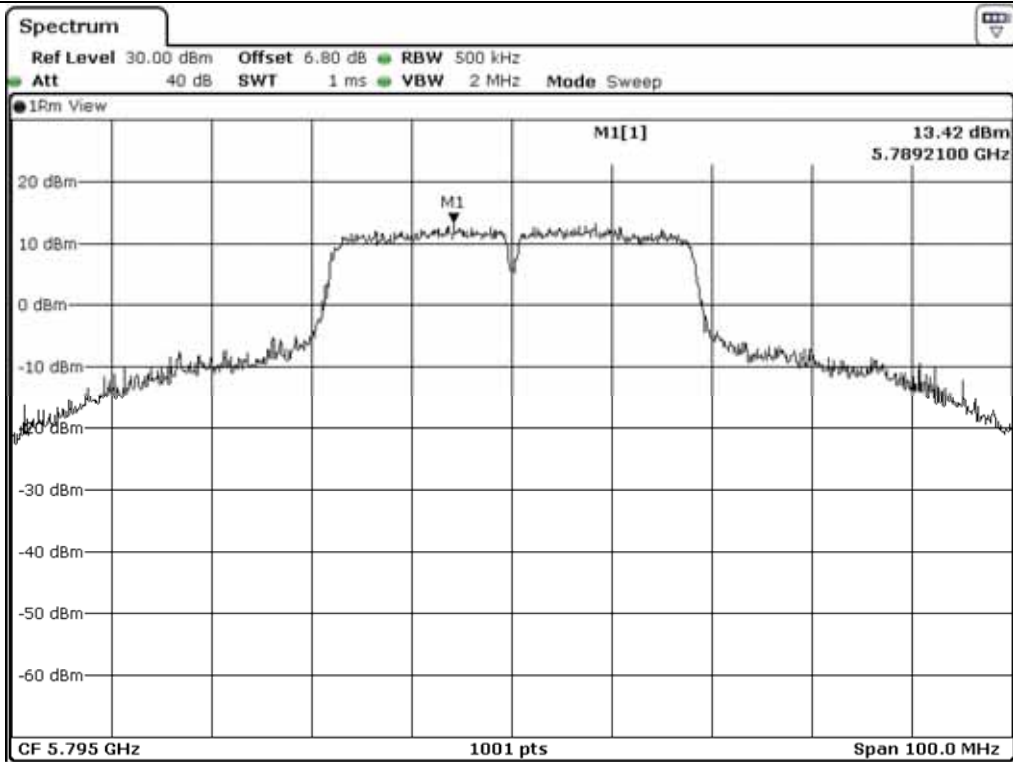
Low Channel (5 190 MHz)



High Channel (5 230 MHz)



Low Channel (5 755 MHz)



High Channel (5 795 MHz)

10.6.5 Test data for Multiple Transmit

- Test Date : September 20, 2017 ~ September 27, 2017
- Operating condition : Highest Output Power Transmitting Mode
- Test Result : Pass

FREQUENCY RANGE (MHz)	CHANNEL	FREQUENCY (MHz)	MEASURED VALUE (dBm)	LIMIT (dBm)	MARGIN (dB)
5 150 ~ 5 250	Low	5 190.00	8.14	9.38	1.24
	High	5 230.00	8.20	9.38	1.18
5 725 ~ 5 850	Low	5 755.00	19.09	21.15	2.06
	High	5 795.00	19.16	21.15	1.99

Remark 1 : Margin = Limit – Measured value

Remark 2 : Calculated Power Density = $10 \log (10^{(\text{Antenna0 Power Density}/10)} + 10^{(\text{Antenna1 Power Density}/10)} + 10^{(\text{Antenna2 Power Density}/10)} + 10^{(\text{Antenna3 Power Density}/10)})$



Tested by: Hyung-Kwon, Oh / Assistant Manager

10.7 Test data for 802.11ac_HT80 RLAN Mode

10.7.1 Test data for Antenna 0

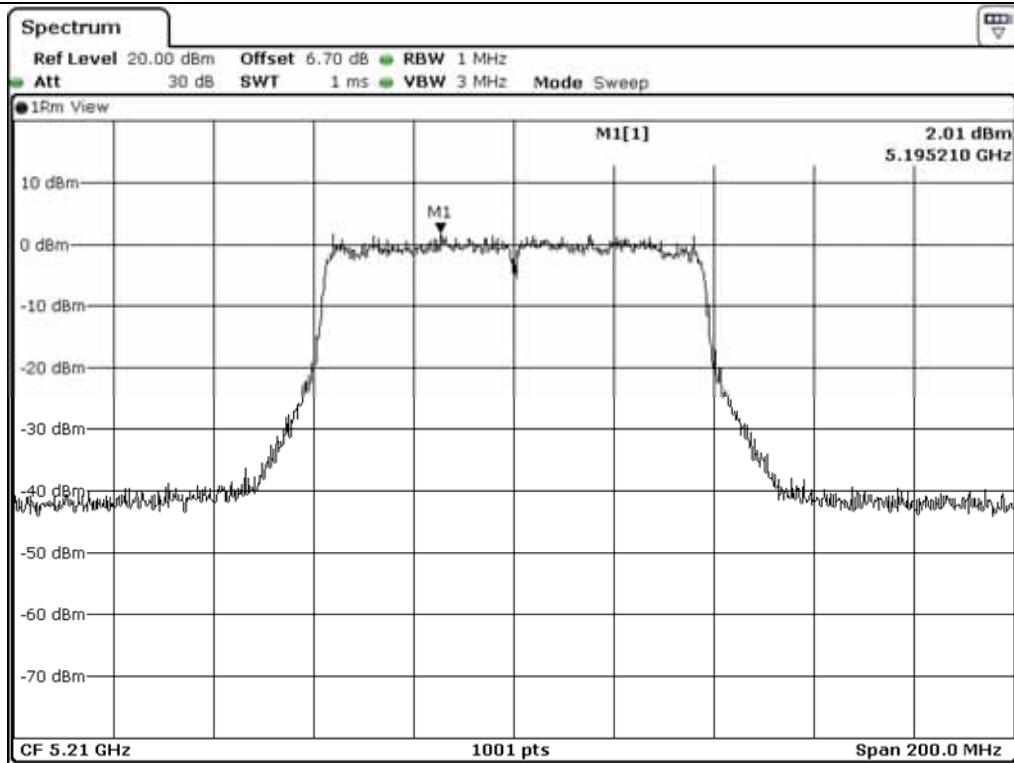
- Test Date : September 20, 2017 ~ September 27, 2017
- Operating condition : Highest Output Power Transmitting Mode
- Test Result : Pass

FREQUENCY RANGE (MHz)	CHANNEL	FREQUENCY (MHz)	MEASURED VALUE (dBm)	LIMIT (dBm)	MARGIN (dB)
5 150 ~ 5 250	Middle	5 210.00	2.01	17.00	14.99
5 725 ~ 5 850	Middle	5 775.00	11.49	29.12	17.63

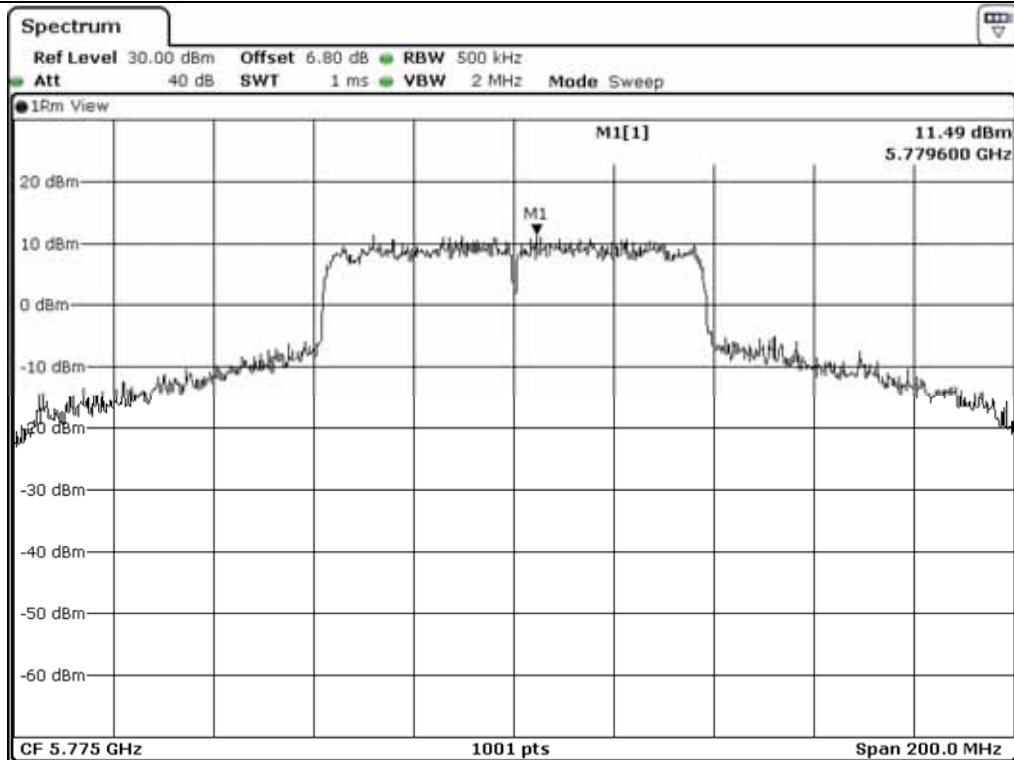
Remark: See next page for measurement data.



Tested by: Hyung-Kwon, Oh / Assistant Manager



Middle Channel (5 210 MHz)



Middle Channel (5 775 MHz)

10.7.2 Test data for Antenna 1

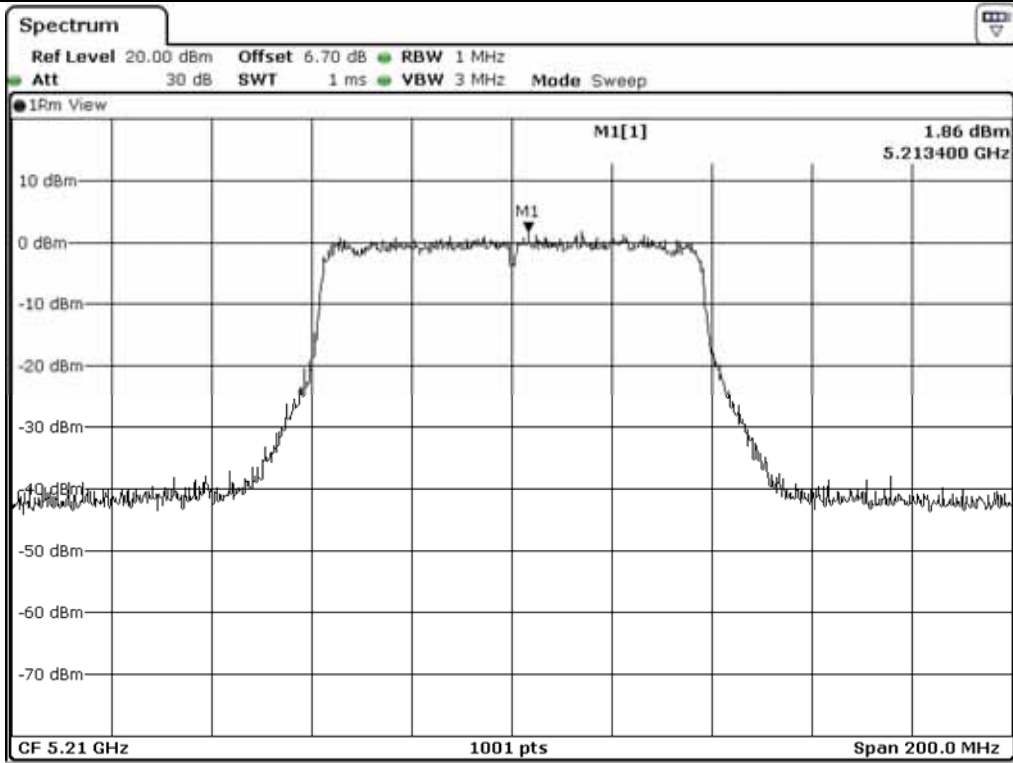
- Test Date : September 20, 2017 ~ September 27, 2017
- Operating condition : Highest Output Power Transmitting Mode
- Test Result : Pass

FREQUENCY RANGE (MHz)	CHANNEL	FREQUENCY (MHz)	MEASURED VALUE (dBm)	LIMIT (dBm)	MARGIN (dB)
5 150 ~ 5 250	Middle	5 210.00	1.86	17.00	15.14
5 725 ~ 5 850	Middle	5 775.00	10.81	29.38	18.57

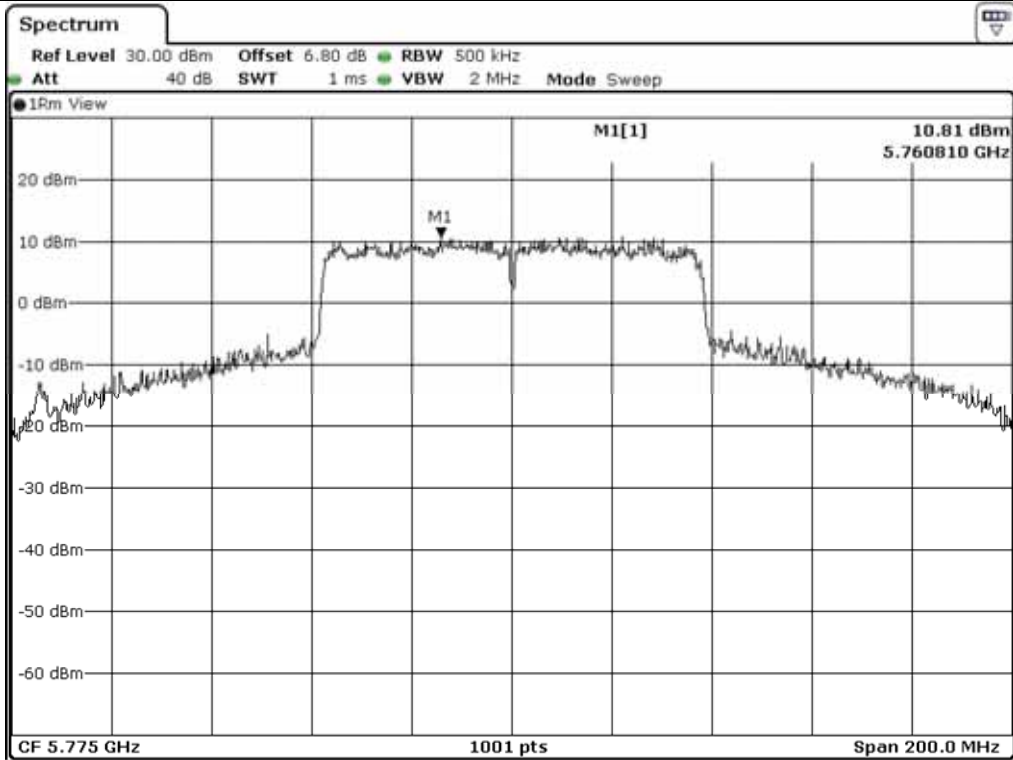
Remark: See next page for measurement data.



Tested by: Hyung-Kwon, Oh / Assistant Manager



Middle Channel (5 210 MHz)



Middle Channel (5 775 MHz)

10.7.3 Test data for Antenna 2

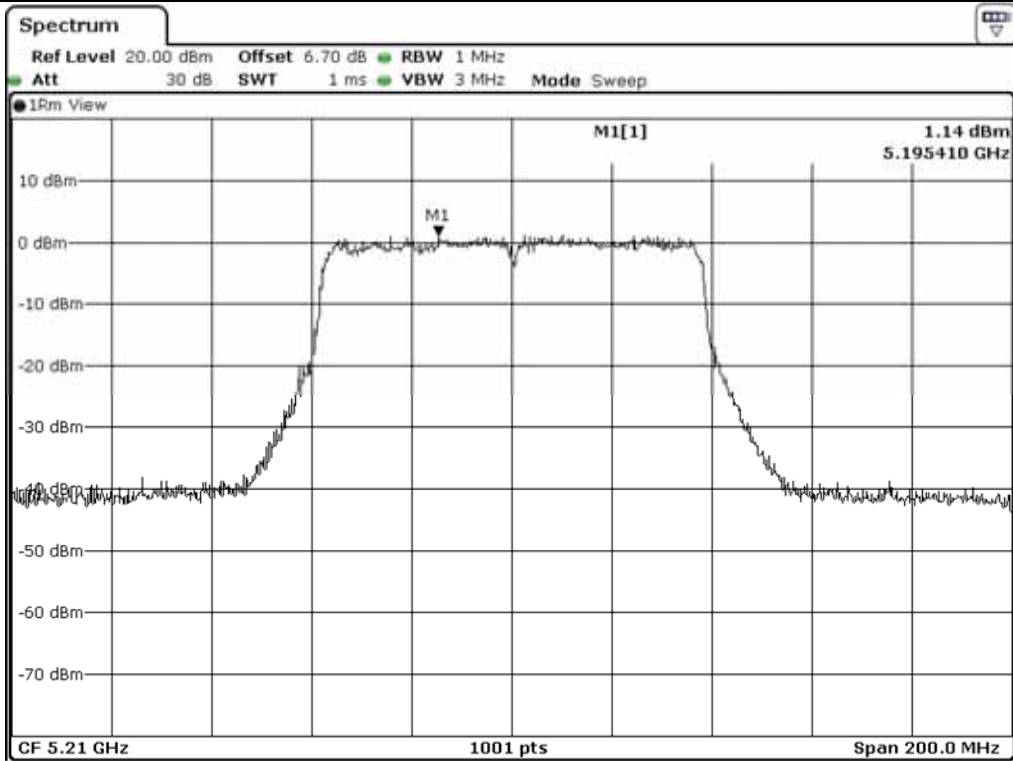
- Test Date : September 20, 2017 ~ September 27, 2017
- Operating condition : Highest Output Power Transmitting Mode
- Test Result : Pass

FREQUENCY RANGE (MHz)	CHANNEL	FREQUENCY (MHz)	MEASURED VALUE (dBm)	LIMIT (dBm)	MARGIN (dB)
5 150 ~ 5 250	Middle	5 210.00	1.14	17.00	15.86
5 725 ~ 5 850	Middle	5 775.00	10.91	29.15	18.24

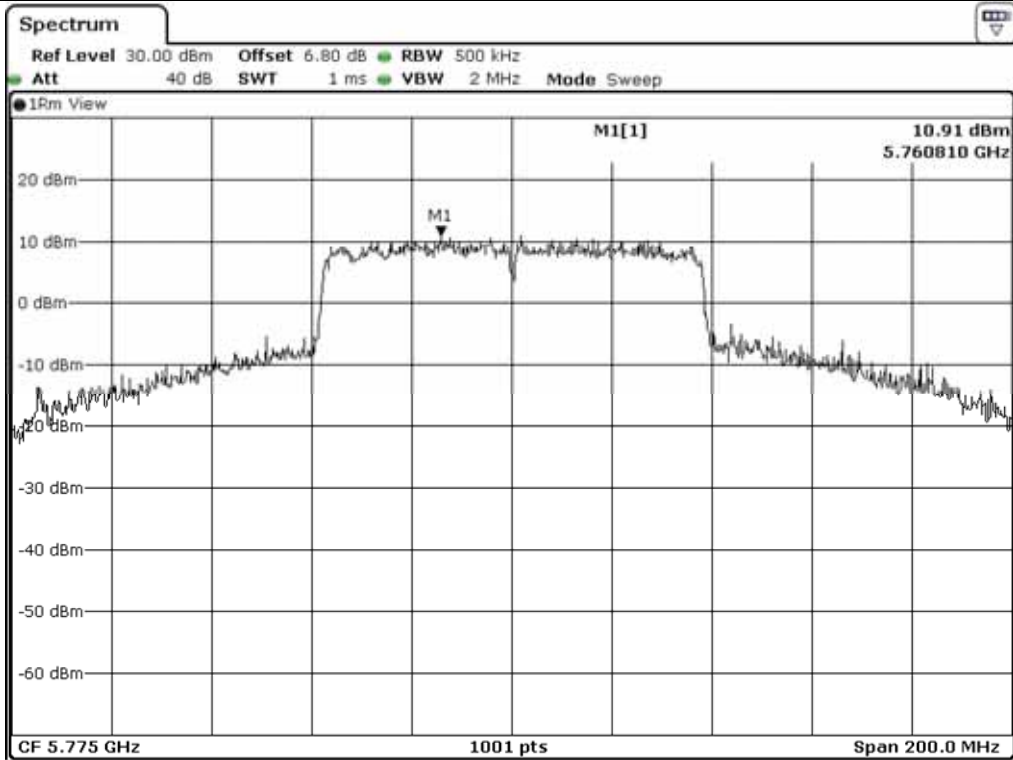
Remark: See next page for measurement data.



Tested by: Hyung-Kwon, Oh / Assistant Manager



Middle Channel (5 210 MHz)



Middle Channel (5 775 MHz)

10.7.4 Test data for Antenna 3

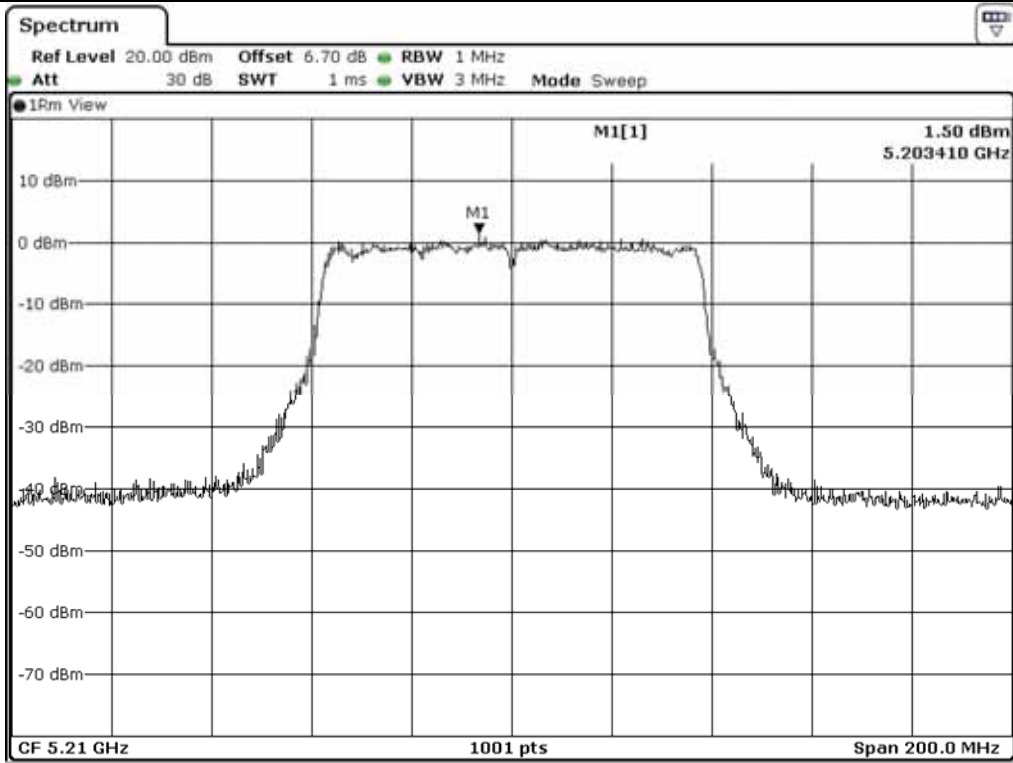
- Test Date : September 20, 2017 ~ September 27, 2017
- Operating condition : Highest Output Power Transmitting Mode
- Test Result : Pass

FREQUENCY RANGE (MHz)	CHANNEL	FREQUENCY (MHz)	MEASURED VALUE (dBm)	LIMIT (dBm)	MARGIN (dB)
5 150 ~ 5 250	Middle	5 210.00	1.50	17.00	15.50
5 725 ~ 5 850	Middle	5 775.00	10.10	29.04	18.94

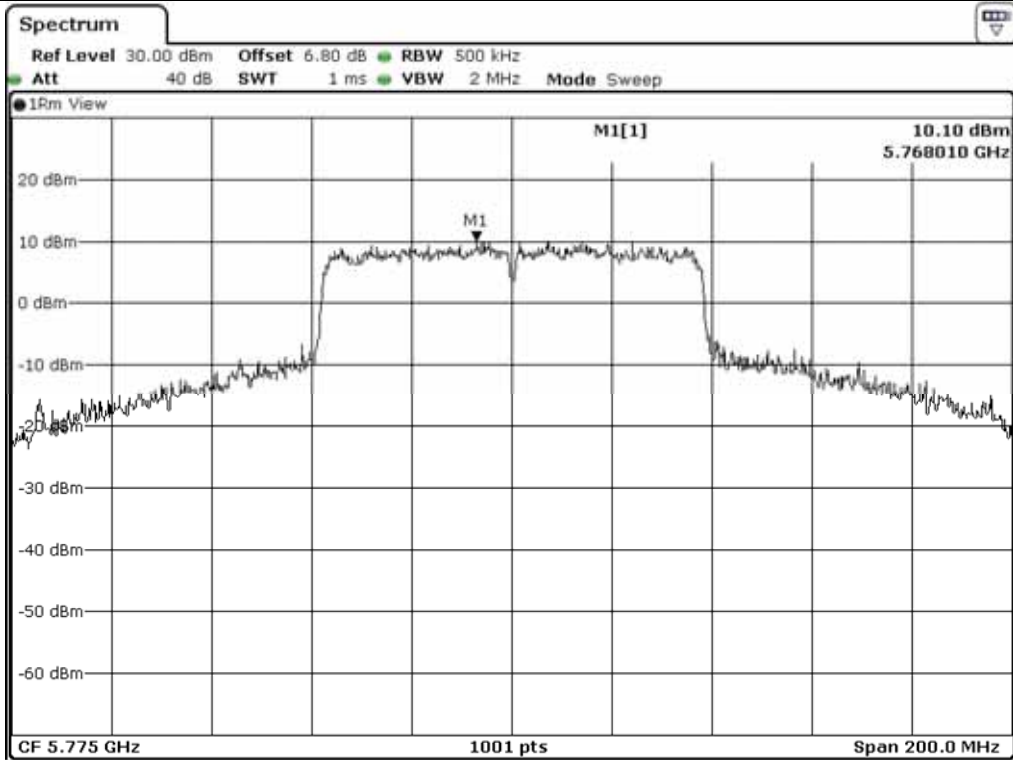
Remark: See next page for measurement data.



Tested by: Hyung-Kwon, Oh / Assistant Manager



Middle Channel (5 210 MHz)



Middle Channel (5 775 MHz)

10.7.5 Test data for Multiple Transmit

- Test Date : September 20, 2017 ~ September 27, 2017
- Operating condition : Highest Output Power Transmitting Mode
- Test Result : Pass

FREQUENCY RANGE (MHz)	CHANNEL	FREQUENCY (MHz)	MEASURED VALUE (dBm)	LIMIT (dBm)	MARGIN (dB)
5 150 ~ 5 250	Middle	5 210.00	7.66	9.38	1.72
5 725 ~ 5 850	Middle	5 775.00	16.88	21.15	4.27

Remark 1 : Margin = Limit – Measured value

Remark 2 : Calculated Power Density = $10\log (10^{(\text{Antenna0 Power Density}/10)}+10^{(\text{Antenna1 Power Density}/10)}+10^{(\text{Antenna2 Power Density}/10)}+10^{(\text{Antenna3 Power Density}/10)})$



Tested by: Hyung-Kwon, Oh / Assistant Manager

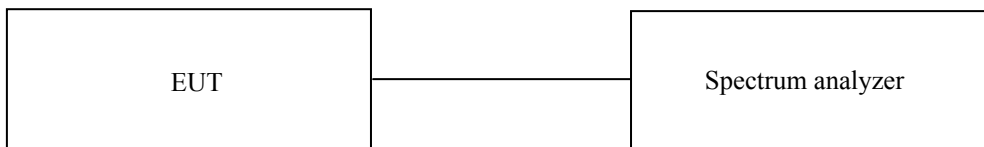
11. FREQUENCY STABILITY WITH TEMPERATURE VARIATION

11.1 Operating environment

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

11.2 Test set-up

Turn EUT off and set chamber temperature to -20 °C and then allow sufficient time (approximately 20 min to 30 min after chamber reach the assigned temperature) for EUT to stabilize. Turn on the EUT and measure the EUT operating frequency and then turn off the EUT after the measurement. The temperature in the chamber was raised 10 °C step from -20 °C to +50 °C. Repeat above method for frequency measurements every 10 °C step and then record all measured frequencies on each temperature step.



11.3 Test equipment used

Model Number	Manufacturer	Description	Serial Number	Last Cal.(Interval)
■ - FSV40	Rohde & Schwarz	Signal Analyzer	101009	Apr. 05, 2017 (1Y)
■ - SSE-43CI-A	Samkun Tech	Humidity Chamber	60712	Apr. 06, 2017 (1Y)
■ - DRP-305DN	DIGITAL Elec.	DC Power supply	4030195	Sep. 01, 2017 (1Y)

All test equipment used is calibrated on a regular basis.


11.4 Test Data for U-NII-1

- Test Date : September 20, 2017 ~ September 27, 2017

- Result : Pass

Temperature (°C)	Carrier Freq. (Hz)	Measured Freq. (Hz)	Freequency Error (kHz)
-20	5 180 000 000	5 179 982 108	-17.892
-10		5 179 981 945	-18.055
0		5 179 981 315	-18.685
10		5 179 980 592	-19.408
20		5 179 980 203	-19.797
30		5 179 979 849	-20.151
40		5 179 976 586	-23.414
50		5 179 974 557	-25.443
-20		5 220 000 000	5 219 982 361
-10	5 219 981 979		-18.021
0	5 219 981 191		-18.809
10	5 219 980 717		-19.283
20	5 219 980 123		-19.877
30	5 219 979 762		-20.238
40	5 219 976 931		-23.069
50	5 219 975 577		-24.423
-20	5 240 000 000		5 239 982 760
-10		5 239 981 906	-18.094
0		5 239 981 194	-18.806
10		5 239 980 964	-19.036
20		5 239 980 190	-19.810
30		5 239 979 036	-20.964
40		5 239 976 537	-23.463
50		5 239 974 173	-25.827

Note : While maintaining a constant temperature inside the environmental chamber, turn the EUT ON and record the operating frequency at startup, and at 2 minutes, 5 minutes, and 10 minutes after the EUT is energized. Four measurements in total are made.(ANSI C63.10-2013)


Tested by: Hyung-Kwon, Oh / Assistant Manager

11.5 Test Data for U-NII-3

- Test Date : September 20, 2017 ~ September 27, 2017

- Result : Pass

Temperature (°C)	Carrier Freq. (Hz)	Measured Freq. (Hz)	Frequency Error (kHz)
-20	5 745 000 000	5 744 982 588	-17.412
-10		5 744 981 732	-18.268
0		5 744 981 429	-18.571
10		5 744 980 805	-19.195
20		5 744 980 224	-19.776
30		5 744 979 645	-20.355
40		5 744 976 870	-23.130
50		5 744 974 817	-25.183
-20		5 785 000 000	5 784 982 991
-10	5 784 981 725		-18.275
0	5 784 981 491		-18.509
10	5 784 980 971		-19.029
20	5 784 980 062		-19.938
30	5 784 978 361		-21.639
40	5 784 977 951		-22.049
50	5 784 974 415		-25.585
-20	5 825 000 000		5 824 982 446
-10		5 824 981 960	-18.040
0		5 824 981 433	-18.567
10		5 824 980 915	-19.085
20		5 824 980 401	-19.599
30		5 824 978 293	-21.707
40		5 824 977 959	-22.041
50		5 824 975 889	-24.111

Note : While maintaining a constant temperature inside the environmental chamber, turn the EUT ON and record the operating frequency at startup, and at 2 minutes, 5 minutes, and 10 minutes after the EUT is energized. Four measurements in total are made.(ANSI C63.10-2013)



Tested by: Hyung-Kwon, Oh / Assistant Manager

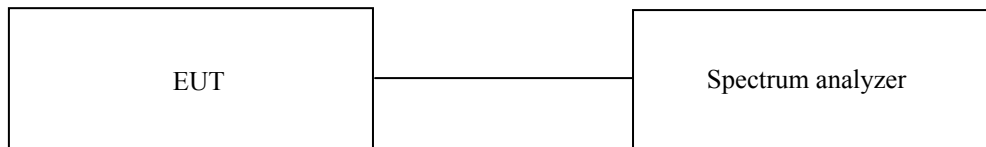
12. FREQUENCY STABILITY WITH VOLTAGE VARIATION

12.1 Operating environment

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

12.2 Test set-up

An external DC power supply was connected to the input of the EUT. The voltage of EUT set to 115 % of the nominal value and then was reduced to 85 % of nominal voltage. The output frequency was recorded at each step.



12.3 Test equipment used

Model Number	Manufacturer	Description	Serial Number	Last Cal.(Interval)
■ - FSV40	Rohde & Schwarz	Signal Analyzer	101009	Apr. 05, 2017 (1Y)
■ - DRP-305DN	DIGITAL Elec.	DC Power supply	4030195	Sep. 01, 2017 (1Y)

All test equipment used is calibrated on a regular basis.

12.4 Test Data for U-NII-1

- Test Date : September 20, 2017 ~ September 27, 2017

- Result : Pass

Voltage (Vdc)	Carrier Freq. (Hz)	Measured Freq. (Hz)	Freequency Error (kHz)
13.2	5 180 000 000	5 179 979 151	-20.849
12.0		5 179 977 451	-22.549
10.8		5 179 976 161	-23.839
13.2	5 220 000 000	5 219 978 491	-21.509
12.0		5 219 977 117	-22.883
10.8		5 219 976 275	-23.725
13.2	5 240 000 000	5 239 978 804	-21.196
12.0		5 239 977 422	-22.578
10.8		5 239 975 061	-24.939

12.5 Test Data for U-NII-3

- Test Date : September 20, 2017 ~ September 27, 2017

- Result : Pass

Voltage (Vdc)	Carrier Freq. (Hz)	Measured Freq. (Hz)	Freequency Error (kHz)
13.2	5 745 000 000	5 744 979 898	-20.102
12.0		5 744 976 771	-23.229
10.8		5 744 975 811	-24.189
13.2	5 785 000 000	5 784 978 527	-21.473
12.0		5 784 977 351	-22.649
10.8		5 784 975 538	-24.462
13.2	5 825 000 000	5 824 978 835	-21.165
12.0		5 824 976 631	-23.369
10.8		5 824 975 592	-24.408



Tested by: Hyung-Kwon, Oh / Assistant Manager

13. RADIATED SPURIOUS EMISSIONS

13.1 Operating environment

Temperature : (24 ~ 25) °C
 Relative humidity : (45 ~ 46) % R.H.

13.2 Test set-up

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

13.3 Test equipment used

Model Number	Manufacturer	Description	Serial Number	Last Cal.(Interval)
■ - FSV40	Rohde & Schwarz	Signal Analyzer	101009	Apr. 05, 2017 (1Y)
■ - ESCI	Rohde & Schwarz	Test Receiver	101012	Nov. 01, 2016 (1Y)
■ - 310N	Sonoma Instrument	Pre-Amplifier	312544	Apr. 05, 2017 (1Y)
■ - SCU-18	Rohde & Schwarz	Pre-Amplifier	10041	Nov. 23, 2016 (1Y)
■ - DT3000	Innco System	Turn Table	930611	N/A
■ - MA4000-EP	Innco System	Antenna Master	3320611	N/A
■ - VULB9163	Schwarzbeck	TRILOG Broadband Antenna	9163-421	Apr. 15, 2016 (2Y)
■ - BBHA9120D	Schwarzbeck	Horn Antenna	BBHA9120D295	May 26, 2017 (2Y)
■ - BBHA 9170	Schwarzbeck	Horn Antenna	BBHA9170179	Jul. 28, 2017 (2Y)
■ - HFH2-Z2	Rohde & Schwarz	Loop Antenna	879285/26	Dec. 09, 2016 (2Y)
■ - SCU40A	Rohde & Schwarz	Signal Conditioning unit	100436	Apr 04, 2017 (1Y)

All test equipment used is calibrated on a regular basis.

13.5 Test data for Below 30 MHz

- Test Date : September 25, 2017
- 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.									



Tested by: Hyung-Kwon, Oh / Assistant Manager

13.6 Test data for 30 MHz ~ 1 GHz

13.6.1 Test data for Frequency U-NII-1

Humidity Level : (45 ~ 46) % R.H. Temperature: (24 ~ 25) °C

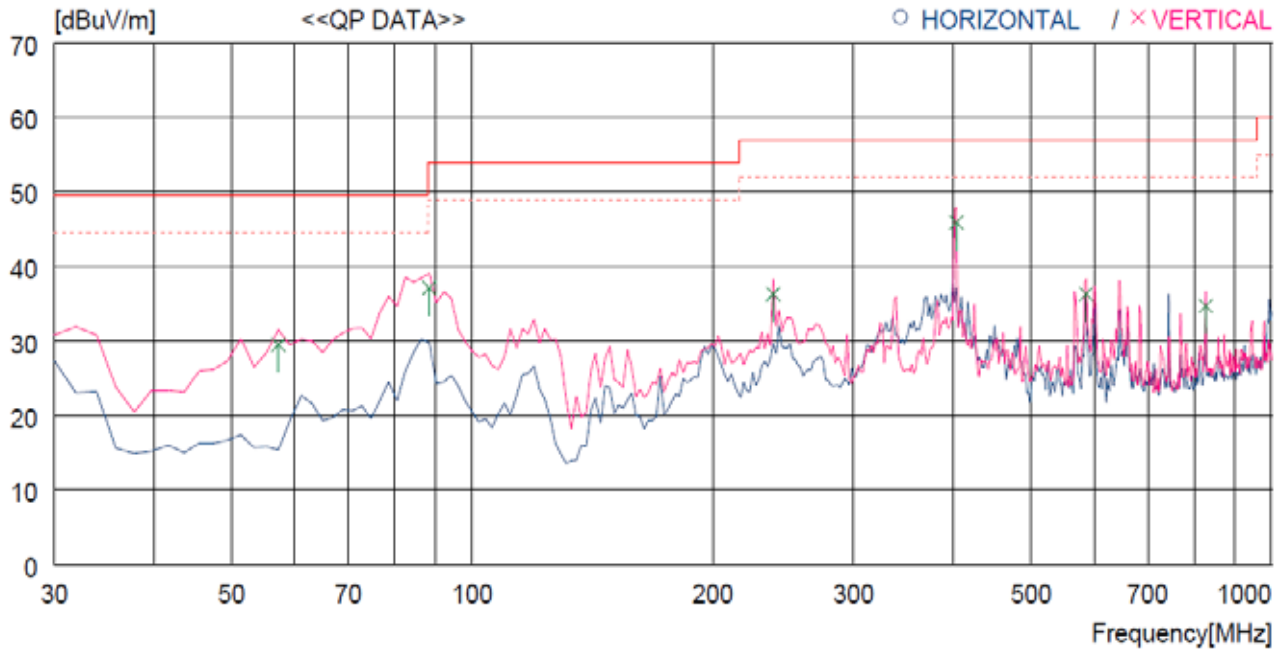
Limits apply to : FCC CFR 47, PART 15, SUBPART C, SECTION 15.247

Result : PASSED

EUT : Wi-Fi Router Date: September 25, 2017

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

Note : 5 GHz operating mode were tested, but the worst data were recorded.
(802.11a RLAN Mode)



No.	FREQ [MHz]	READING QP [dBuV]	ANT FACTOR [dB]	LOSS [dB]	GAIN [dB]	RESULT [dBuV/m]	LIMIT [dBuV/m]	MARGIN [dB]	ANTENNA [cm]	TABLE [DEG]
----- Vertical -----										
1	57.214	29.5	0.0	0.0	0.0	29.5	49.5	20.0	100	207
2	88.317	37.1	0.0	0.0	0.0	37.1	54.0	16.9	200	262
3	237.996	36.3	0.0	0.0	0.0	36.3	56.9	20.6	100	197
4	403.226	45.9	0.0	0.0	0.0	45.9	56.9	11.0	100	1
5	585.952	36.3	0.0	0.0	0.0	36.3	56.9	20.6	100	197
6	826.997	34.7	0.0	0.0	0.0	34.7	56.9	22.2	100	207

Tested by: Hyung-Kwon, Oh / Assistant Manager

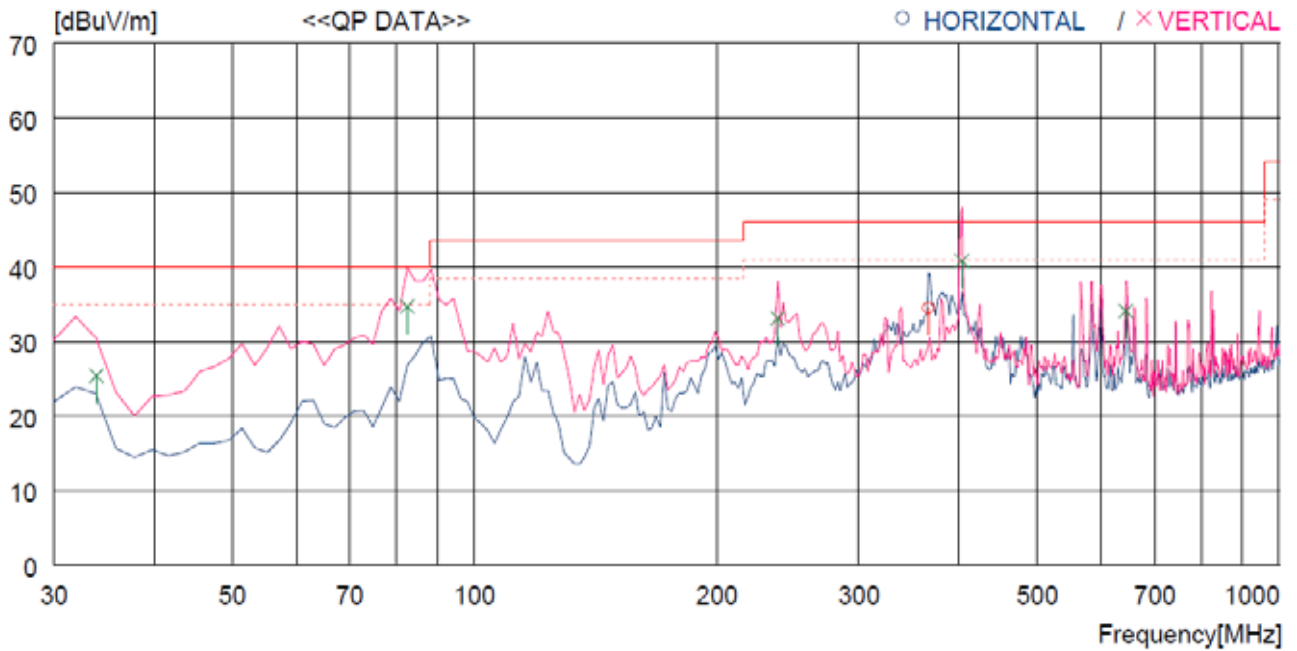
13.6.2 Test data for Frequency U-NII-3

Humidity Level : (45 ~ 46) % R.H. Temperature: (24 ~ 25) °C
 Limits apply to : FCC CFR 47, PART 15, SUBPART C, SECTION 15.247
 Result : PASSED

EUT : Wi-Fi Router Date: September 25, 2017

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

Note : 5 GHz operating mode were tested, but the worst data were recorded.
 (802.11a RLAN Mode)



No.	FREQ [MHz]	READING QP [dBuV]	ANT FACTOR [dB]	LOSS [dB]	GAIN [dB]	RESULT [dBuV/m]	LIMIT [dBuV/m]	MARGIN [dB]	ANTENNA [cm]	TABLE [DEG]
----- Horizontal -----										
1	366.292	41.7	14.9	5.9	28.0	34.5	46.0	11.5	100	0
----- Vertical -----										
2	33.888	39.8	12.1	1.9	28.4	25.4	40.0	14.6	100	88
3	82.485	52.4	7.9	2.7	28.3	34.7	40.0	5.3	200	290
4	237.996	44.3	11.8	4.6	27.6	33.1	46.0	12.9	100	191
5	403.226	47.1	15.8	6.2	28.3	40.8	46.0	5.2	100	359
6	644.269	36.0	19.1	7.8	28.8	34.1	46.0	11.9	100	359

Tested by: Hyung-Kwon, Oh / Assistant Manager

13.7 Test data for Frequency U-NII-1

13.7.1 Test data for 802.11a RLAN Mode

13.7.1.1 Test data for Antenna 0

- Test Date : September 25, 2017
- 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 ~ 40 GHz
- Measurement distance : 3 m
- Duty Cycle : > 98 %
- Operating mode : Transmitting mode

Frequency (MHz)	Reading (dBμV)	Detector Mode	Ant. Pol. (H/V)	Ant. Factor	Cable Loss	Amp Gain	Total (dBμV/m)	Limits (dBμV/m)	Margin (dB)
Low Channel									
10 360.00	30.02	Peak	H	39.66	26.38	34.74	61.32	68.20	6.88
	29.41	Peak	V				60.71	68.20	7.49
Middle Channel									
10 440.00	28.28	Peak	H	39.84	26.74	34.76	60.10	68.20	8.10
	27.53	Peak	V				59.35	68.20	8.85
High Channel									
10 480.00	31.96	Peak	H	40.02	27.09	34.77	64.30	68.20	3.90
	28.35	Peak	V				60.69	68.20	7.51

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

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



Tested by: Hyung-Kwon, Oh / Assistant Manager

13.7.1.2 Test data for Antenna 1

- Test Date : September 25, 2017
- 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 ~ 40 GHz
- Measurement distance : 3 m
- Duty Cycle : > 98 %
- Operating mode : Transmitting mode

Frequency (MHz)	Reading (dBμV)	Detector Mode	Ant. Pol. (H/V)	Ant. Factor	Cable Loss	Amp Gain	Total (dBμV/m)	Limits (dBμV/m)	Margin (dB)
Low Channel									
10 360.00	29.15	Peak	H	39.66	26.38	34.74	60.45	68.20	7.75
	28.79	Peak	V				60.09	68.20	8.11
Middle Channel									
10 440.00	28.06	Peak	H	39.84	26.74	34.76	59.88	68.20	8.32
	27.91	Peak	V				59.73	68.20	8.47
High Channel									
10 480.00	33.61	Peak	H	40.02	27.09	34.77	65.95	68.20	2.25
	28.55	Peak	V				60.89	68.20	7.31

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

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



Tested by: Hyung-Kwon, Oh / Assistant Manager

13.7.1.3 Test data for Antenna 2

- Test Date : September 25, 2017
- 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 ~ 40 GHz
- Measurement distance : 3 m
- Duty Cycle : > 98 %
- Operating mode : Transmitting mode

Frequency (MHz)	Reading (dBμV)	Detector Mode	Ant. Pol. (H/V)	Ant. Factor	Cable Loss	Amp Gain	Total (dBμV/m)	Limits (dBμV/m)	Margin (dB)
Low Channel									
10 360.00	32.82	Peak	H	39.66	26.38	34.74	64.12	68.20	4.08
	29.64	Peak	V				60.94	68.20	7.26
Middle Channel									
10 440.00	28.19	Peak	H	39.84	26.74	34.76	60.01	68.20	8.19
	27.59	Peak	V				59.41	68.20	8.79
High Channel									
10 480.00	33.42	Peak	H	40.02	27.09	34.77	65.76	68.20	2.44
	28.12	Peak	V				60.46	68.20	7.74

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

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



Tested by: Hyung-Kwon, Oh / Assistant Manager

13.7.1.4 Test data for Antenna 3

- Test Date : September 25, 2017
- 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 ~ 40 GHz
- Measurement distance : 3 m
- Duty Cycle : > 98 %
- Operating mode : Transmitting mode

Frequency (MHz)	Reading (dBμV)	Detector Mode	Ant. Pol. (H/V)	Ant. Factor	Cable Loss	Amp Gain	Total (dBμV/m)	Limits (dBμV/m)	Margin (dB)
Low Channel									
10 360.00	29.07	Peak	H	39.66	26.38	34.74	60.37	68.20	7.83
	28.35	Peak	V				59.65	68.20	8.55
Middle Channel									
10 440.00	31.13	Peak	H	39.84	26.74	34.76	62.95	68.20	5.25
	30.17	Peak	V				61.99	68.20	6.21
High Channel									
10 480.00	33.05	Peak	H	40.02	27.09	34.77	65.39	68.20	2.81
	28.39	Peak	V				60.73	68.20	7.47

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

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



Tested by: Hyung-Kwon, Oh / Assistant Manager

13.7.2 Test data for 802.11n_HT20 RLAN Mode (4 Tx Multiple Transmit (Worst case))

- Test Date : September 25, 2017
- 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 ~ 40 GHz
- Measurement distance : 3 m
- Duty Cycle : > 98 %
- Operating mode : Transmitting mode

Frequency (MHz)	Reading (dBμV)	Detector Mode	Ant. Pol. (H/V)	Ant. Factor	Cable Loss	Amp Gain	Total (dBμV/m)	Limits (dBμV/m)	Margin (dB)
Low Channel									
10 360.00	33.03	Peak	H	39.66	26.38	34.74	64.33	68.20	3.87
	31.29	Peak	V				62.59	68.20	5.61
Middle Channel									
10 440.00	30.95	Peak	H	39.84	26.74	34.76	62.77	68.20	5.43
	29.72	Peak	V				61.54	68.20	6.66
High Channel									
10 480.00	33.35	Peak	H	40.02	27.09	34.77	65.69	68.20	2.51
	31.16	Peak	V				63.50	68.20	4.70

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

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



Tested by: Hyung-Kwon, Oh / Assistant Manager

13.7.3 Test data for 802.11n_HT40 RLAN Mode (4 Tx Multiple Transmit (Worst case))

- Test Date : September 25, 2017
- 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 ~ 40 GHz
- Measurement distance : 3 m
- Duty Cycle : > 98 %
- Operating mode : Transmitting mode

Frequency (MHz)	Reading (dBμV)	Detector Mode	Ant. Pol. (H/V)	Ant. Factor	Cable Loss	Amp Gain	Total (dBμV/m)	Limits (dBμV/m)	Margin (dB)
Low Channel									
10 380.00	33.40	Peak	H	39.93	26.88	34.74	65.47	68.20	2.73
	31.19	Peak	V				63.26	68.20	4.94
High Channel									
10 460.00	33.94	Peak	H	40.02	27.05	34.76	66.25	68.20	1.95
	31.76	Peak	V				64.06	68.20	4.14

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

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



Tested by: Hyung-Kwon, Oh / Assistant Manager

13.7.4 Test data for 802.11ac_HT80 RLAN Mode (4 Tx Multiple Transmit (Worst case))

- Test Date : September 25, 2017
- 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 ~ 40 GHz
- Measurement distance : 3 m
- Duty Cycle : > 98 %
- Operating mode : Transmitting mode

Frequency (MHz)	Reading (dBμV)	Detector Mode	Ant. Pol. (H/V)	Ant. Factor	Cable Loss	Amp Gain	Total (dBμV/m)	Limits (dBμV/m)	Margin (dB)
Middle Channel									
10 420.00	31.10	Peak	H	39.98	26.97	34.76	63.29	68.20	4.91
	28.41	Peak	V				60.60	68.20	7.60

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

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



Tested by: Hyung-Kwon, Oh / Assistant Manager

13.8 Test data for Frequency U-NII-3

13.8.1 Test data for 802.11a RLAN Mode

13.8.1.1 Test data for Antenna 0

- Test Date : September 25, 2017
- 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 ~ 40 GHz
- Measurement distance : 3 m
- Duty Cycle : > 98 %
- Operating mode : Transmitting mode

Frequency (MHz)	Reading (dBμV)	Detector Mode	Ant. Pol. (H/V)	Ant. Factor	Cable Loss	Amp Gain	Total (dBμV/m)	Limits (dBμV/m)	Margin (dB)
Low Channel									
11 490.00	27.99	Peak	H	40.07	28.32	33.75	62.63	73.98	11.35
	16.04	Average	H				50.68	53.98	3.30
	27.10	Peak	V				61.74	73.98	12.24
	15.12	Average	V				49.76	53.98	4.22
Middle Channel									
11 570.00	27.32	Peak	H	39.78	28.94	33.64	62.40	73.98	11.58
	15.37	Average	H				50.45	53.98	3.53
	27.06	Peak	V				62.14	73.98	11.84
	14.11	Average	V				49.19	53.98	4.79
High Channel									
11 650.00	27.18	Peak	H	39.49	29.56	33.61	62.62	73.98	11.36
	15.86	Average	H				51.30	53.98	2.68
	27.07	Peak	V				62.51	73.98	11.47
	15.83	Average	V				51.27	53.98	2.71

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

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



Tested by: Hyung-Kwon, Oh / Assistant Manager

13.8.1.2 Test data for Antenna 1

- Test Date : September 25, 2017
- 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 ~ 40 GHz
- Measurement distance : 3 m
- Duty Cycle : > 98 %
- Operating mode : Transmitting mode

Frequency (MHz)	Reading (dBμV)	Detector Mode	Ant. Pol. (H/V)	Ant. Factor	Cable Loss	Amp Gain	Total (dBμV/m)	Limits (dBμV/m)	Margin (dB)
Low Channel									
11 490.00	27.37	Peak	H	40.07	28.32	33.75	62.01	73.98	11.97
	16.05	Average	H				50.69	53.98	3.29
	27.45	Peak	V				62.09	73.98	11.89
	15.93	Average	V				50.57	53.98	3.41
Middle Channel									
11 570.00	28.28	Peak	H	39.78	28.94	33.64	63.36	73.98	10.62
	15.67	Average	H				50.75	53.98	3.23
	26.83	Peak	V				61.91	73.98	12.07
	14.85	Average	V				49.93	53.98	4.05
High Channel									
11 650.00	28.16	Peak	H	39.49	29.56	33.61	63.60	73.98	10.38
	16.27	Average	H				51.71	53.98	2.27
	27.47	Peak	V				62.91	73.98	11.07
	15.69	Average	V				51.13	53.98	2.85

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

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



Tested by: Hyung-Kwon, Oh / Assistant Manager

13.8.1.3 Test data for Antenna 2

- Test Date : September 25, 2017
- 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 ~ 40 GHz
- Measurement distance : 3 m
- Duty Cycle : > 98 %
- Operating mode : Transmitting mode

Frequency (MHz)	Reading (dBμV)	Detector Mode	Ant. Pol. (H/V)	Ant. Factor	Cable Loss	Amp Gain	Total (dBμV/m)	Limits (dBμV/m)	Margin (dB)
Low Channel									
11 490.00	28.73	Peak	H	40.07	28.32	33.75	63.37	73.98	10.61
	15.43	Average	H				50.07	53.98	3.91
	27.54	Peak	V				62.18	73.98	11.80
	15.96	Average	V				50.60	53.98	3.38
Middle Channel									
11 570.00	27.30	Peak	H	39.78	28.94	33.64	62.38	73.98	11.60
	14.67	Average	H				49.75	53.98	4.23
	26.35	Peak	V				61.43	73.98	12.55
	13.79	Average	V				48.87	53.98	5.11
High Channel									
11 650.00	27.35	Peak	H	39.49	29.56	33.61	62.79	73.98	11.19
	15.44	Average	H				50.88	53.98	3.10
	27.89	Peak	V				63.33	73.98	10.65
	14.76	Average	V				50.20	53.98	3.78

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

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



Tested by: Hyung-Kwon, Oh / Assistant Manager

13.8.1.4 Test data for Antenna 3

- Test Date : September 25, 2017
- 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 ~ 40 GHz
- Measurement distance : 3 m
- Duty Cycle : > 98 %
- Operating mode : Transmitting mode

Frequency (MHz)	Reading (dBμV)	Detector Mode	Ant. Pol. (H/V)	Ant. Factor	Cable Loss	Amp Gain	Total (dBμV/m)	Limits (dBμV/m)	Margin (dB)
Low Channel									
11 490.00	27.26	Peak	H	40.07	28.32	33.75	61.90	73.98	12.08
	15.58	Average	H				50.22	53.98	3.76
	26.92	Peak	V				61.56	73.98	12.42
	14.97	Average	V				49.61	53.98	4.37
Middle Channel									
11 570.00	26.64	Peak	H	39.78	28.94	33.64	61.72	73.98	12.26
	15.69	Average	H				50.77	53.98	3.21
	26.21	Peak	V				61.29	73.98	12.69
	13.34	Average	V				48.42	53.98	5.56
High Channel									
11 650.00	27.05	Peak	H	39.49	29.56	33.61	62.49	73.98	11.49
	15.36	Average	H				50.80	53.98	3.18
	26.58	Peak	V				62.02	73.98	11.96
	15.19	Average	V				50.63	53.98	3.35

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

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



Tested by: Hyung-Kwon, Oh / Assistant Manager

13.8.2 Test data for 802.11n_HT20 RLAN Mode (4 Tx Multiple Transmit (Worst case))

- Test Date : September 25, 2017
- 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 ~ 40 GHz
- Measurement distance : 3 m
- Duty Cycle : > 98 %
- Operating mode : Transmitting mode

Frequency (MHz)	Reading (dBμV)	Detector Mode	Ant. Pol. (H/V)	Ant. Factor	Cable Loss	Amp Gain	Total (dBμV/m)	Limits (dBμV/m)	Margin (dB)
Low Channel									
11 490.00	27.94	Peak	H	40.07	28.32	33.75	62.58	73.98	11.40
	16.64	Average	H				51.28	53.98	2.70
	26.99	Peak	V				61.63	73.98	12.35
	15.06	Average	V				49.70	53.98	4.28
Middle Channel									
11 570.00	27.57	Peak	H	39.78	28.94	33.64	62.65	73.98	11.33
	15.37	Average	H				50.45	53.98	3.53
	26.58	Peak	V				61.66	73.98	12.32
	14.88	Average	V				49.96	53.98	4.02
High Channel									
11 650.00	28.17	Peak	H	39.49	29.56	33.61	63.61	73.98	10.37
	15.99	Average	H				51.43	53.98	2.55
	26.24	Peak	V				61.68	73.98	12.30
	15.56	Average	V				51.00	53.98	2.98

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

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



Tested by: Hyung-Kwon, Oh / Assistant Manager

13.8.3 Test data for 802.11n_HT40 RLAN Mode (4 Tx Multiple Transmit (Worst case))

- Test Date : September 25, 2017
- 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 ~ 40 GHz
- Measurement distance : 3 m
- Duty Cycle : > 98 %
- Operating mode : Transmitting mode

Frequency (MHz)	Reading (dBμV)	Detector Mode	Ant. Pol. (H/V)	Ant. Factor	Cable Loss	Amp Gain	Total (dBμV/m)	Limits (dBμV/m)	Margin (dB)
Low Channel									
11 510.00	27.18	Peak	H	39.78	28.94	33.63	62.27	73.98	11.71
	16.40	Average	H				51.49	53.98	2.49
	27.74	Peak	V				62.83	73.98	11.15
	14.83	Average	V				49.92	53.98	4.06
High Channel									
11 590.00	27.98	Peak	H	39.66	29.19	33.62	63.21	73.98	10.77
	16.19	Average	H				51.42	53.98	2.56
	26.94	Peak	V				62.17	73.98	11.81
	14.61	Average	V				49.84	53.98	4.14

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

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



Tested by: Hyung-Kwon, Oh / Assistant Manager

13.8.4 Test data for 802.11ac_HT80 RLAN Mode (4 Tx Multiple Transmit (Worst case))

- Test Date : September 25, 2017
- 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 ~ 40 GHz
- Measurement distance : 3 m
- Duty Cycle : > 98 %
- Operating mode : Transmitting mode

Frequency (MHz)	Reading (dBμV)	Detector Mode	Ant. Pol. (H/V)	Ant. Factor	Cable Loss	Amp Gain	Total (dBμV/m)	Limits (dBμV/m)	Margin (dB)
Middle Channel									
11 550.00	27.25	Peak	H	39.78	28.94	33.63	62.34	73.98	11.64
	16.41	Average	H				51.50	53.98	2.48
	27.13	Peak	V				62.22	73.98	11.76
	15.10	Average	V				50.19	53.98	3.79

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

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



Tested by: Hyung-Kwon, Oh / Assistant Manager

14. RADIATED RESTRICTED BAND EDGE MEASUREMENTS

14.1 Operating environment

Temperature : (24 ~ 25) °C
 Relative humidity : (45 ~ 46) % R.H.

14.2 Test set-up

The radiated emissions measurements were performed on the 3 m semi anechoic chamber. The EUT was placed on turntable approximately 1.5 m above the ground plane.

The frequency spectrum from 30 MHz to 26.5 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.

14.3 Test equipment used

Model Number	Manufacturer	Description	Serial Number	Last Cal.(Interval)
■ - FSV40	Rohde & Schwarz	Signal Analyzer	101009	Apr. 05, 2017 (1Y)
■ - ESCI	Rohde & Schwarz	Test Receiver	101012	Nov. 01, 2016 (1Y)
■ - 310N	Sonoma Instrument	Pre-Amplifier	312544	Apr. 05, 2017 (1Y)
■ - SCU-18	Rohde & Schwarz	Pre-Amplifier	10041	Nov. 23, 2016 (1Y)
■ - DT3000	Innco System	Turn Table	930611	N/A
■ - MA4000-EP	Innco System	Antenna Master	3320611	N/A
■ - VULB9163	Schwarzbeck	TRILOG Broadband Antenna	9163-421	Apr. 15, 2016 (2Y)
■ - BBHA9120D	Schwarzbeck	Horn Antenna	BBHA9120D295	May 26, 2017 (2Y)
■ - BBHA 9170	Schwarzbeck	Horn Antenna	BBHA9170179	Jul. 28, 2017 (2Y)

All test equipment used is calibrated on a regular basis.

14.4 Test data for Frequency U-NII-1

14.4.1 Test data for 802.11a RLAN Mode

14.4.1.1 Test data for Antenna 0

- Test Date : September 25, 2017
- 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
- Measurement distance : 3 m
- Duty Cycle : > 98 %
- Result : Pass

Frequency (GHz)	Reading (dBμV)	Detector Mode	Ant. Pol. (H/V)	Ant. Factor	Cable Loss	Amp Gain	Total (dBμV/m)	Limits (dBμV/m)	Margin (dB)
5 150.00	44.04	Peak	H	31.28	12.65	36.01	51.96	74.00	22.04
	35.21	Average	H				43.13	54.00	10.87
	37.80	Peak	V				45.72	74.00	28.28
	28.97	Average	V				36.89	54.00	17.11

Tabulated test data for Restricted Band

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

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



Tested by: Hyung-Kwon, Oh / Assistant Manager

14.4.1.2 Test data for Antenna 1

- Test Date : September 25, 2017
- 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
- Measurement distance : 3 m
- Duty Cycle : > 98 %
- Result : Pass

Frequency (GHz)	Reading (dBμV)	Detector Mode	Ant. Pol. (H/V)	Ant. Factor	Cable Loss	Amp Gain	Total (dBμV/m)	Limits (dBμV/m)	Margin (dB)
5 150.00	46.32	Peak	H	31.28	12.65	36.01	54.24	74.00	19.76
	37.58	Average	H				45.50	54.00	8.50
	38.74	Peak	V				46.66	74.00	27.34
	27.54	Average	V				35.46	54.00	18.54

Tabulated test data for Restricted Band

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

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



Tested by: Hyung-Kwon, Oh / Assistant Manager

14.4.1.3 Test data for Antenna 2

- Test Date : September 25, 2017
- 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
- Measurement distance : 3 m
- Duty Cycle : > 98 %
- Result : Pass

Frequency (GHz)	Reading (dBμV)	Detector Mode	Ant. Pol. (H/V)	Ant. Factor	Cable Loss	Amp Gain	Total (dBμV/m)	Limits (dBμV/m)	Margin (dB)
5 150.00	42.86	Peak	H	31.28	12.65	36.01	50.78	74.00	23.22
	35.46	Average	H				43.38	54.00	10.62
	39.10	Peak	V				47.02	74.00	26.98
	29.07	Average	V				36.99	54.00	17.01

Tabulated test data for Restricted Band

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

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



Tested by: Hyung-Kwon, Oh / Assistant Manager

14.4.1.4 Test data for Antenna 3

- Test Date : September 25, 2017
- 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
- Measurement distance : 3 m
- Duty Cycle : > 98 %
- Result : Pass

Frequency (GHz)	Reading (dBμV)	Detector Mode	Ant. Pol. (H/V)	Ant. Factor	Cable Loss	Amp Gain	Total (dBμV/m)	Limits (dBμV/m)	Margin (dB)
5 150.00	42.69	Peak	H	31.28	12.65	36.01	50.61	74.00	23.39
	36.96	Average	H				44.88	54.00	9.12
	36.00	Peak	V				43.92	74.00	30.08
	31.22	Average	V				39.14	54.00	14.86

Tabulated test data for Restricted Band

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

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



Tested by: Hyung-Kwon, Oh / Assistant Manager

14.4.2 Test data for 802.11n_HT20 RLAN Mode (4 Tx Multiple Transmit (Worst case))

- Test Date : September 25, 2017
- 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
- Measurement distance : 3 m
- Duty Cycle : > 98 %
- Result : Pass

Frequency (GHz)	Reading (dBμV)	Detector Mode	Ant. Pol. (H/V)	Ant. Factor	Cable Loss	Amp Gain	Total (dBμV/m)	Limits (dBμV/m)	Margin (dB)
5 150.00	51.75	Peak	H	31.28	12.65	36.01	59.67	74.00	14.33
	42.22	Average	H				50.14	54.00	3.86
	52.26	Peak	V				60.18	74.00	13.82
	40.10	Average	V				48.02	54.00	5.98

Tabulated test data for Restricted Band

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

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



Tested by: Hyung-Kwon, Oh / Assistant Manager

14.4.3 Test data for 802.11n_HT40 RLAN Mode (4 Tx Multiple Transmit (Worst case))

- Test Date : September 25, 2017
- 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
- Measurement distance : 3 m
- Duty Cycle : > 98 %
- Result : Pass

Frequency (GHz)	Reading (dBμV)	Detector Mode	Ant. Pol. (H/V)	Ant. Factor	Cable Loss	Amp Gain	Total (dBμV/m)	Limits (dBμV/m)	Margin (dB)
5 150.00	50.99	Peak	H	31.28	12.65	36.01	58.91	74.00	15.09
	41.36	Average	H				49.28	54.00	4.72
	49.36	Peak	V				57.28	74.00	16.72
	39.30	Average	V				47.22	54.00	6.78

Tabulated test data for Restricted Band

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

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



Tested by: Hyung-Kwon, Oh / Assistant Manager

14.4.4 Test data for 802.11ac_HT80 RLAN Mode (4 Tx Multiple Transmit (Worst case))

- Test Date : September 25, 2017
- 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
- Measurement distance : 3 m
- Duty Cycle : > 98 %
- Result : Pass

Frequency (GHz)	Reading (dBμV)	Detector Mode	Ant. Pol. (H/V)	Ant. Factor	Cable Loss	Amp Gain	Total (dBμV/m)	Limits (dBμV/m)	Margin (dB)
5 150.00	50.12	Peak	H	31.28	12.65	36.01	58.04	74.00	15.96
	42.41	Average	H				50.33	54.00	3.67
	47.17	Peak	V				55.09	74.00	18.91
	41.39	Average	V				49.31	54.00	4.69

Tabulated test data for Restricted Band

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

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



Tested by: Hyung-Kwon, Oh / Assistant Manager

14.5 Test data for Frequency U-NII-3

14.5.1 Test data for 802.11a RLAN Mode

14.5.1.1 Test data for Antenna 0

- Test Date : September 25, 2017
- 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
- Measurement distance : 3 m
- Duty Cycle : > 98 %
- Result : Pass

Frequency (GHz)	Reading (dBμV)	Detector Mode	Ant. Pol. (H/V)	Ant. Factor	Cable Loss	Amp Gain	Total (dBμV/m)	Limits (dBμV/m)	Margin (dB)
Low Channel									
5 725.00	44.78	Peak	H	32.17	12.09	35.59	53.45	124.38	70.93
	47.59	Peak	V				56.26	124.38	68.12
5 715.00	44.87	Peak	H				53.54	111.58	58.04
	48.77	Peak	V				57.44	111.58	54.14
High Channel									
5 850.00	58.35	Peak	H	32.17	12.09	35.43	67.18	124.38	57.20
	64.63	Peak	V				73.46	124.38	50.92
5 860.00	54.59	Peak	H				63.42	111.58	48.16
	59.25	Peak	V				68.08	111.58	43.50

Tabulated test data for Restricted Band

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

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



Tested by: Hyung-Kwon, Oh / Assistant Manager

14.5.1.2 Test data for Antenna 1


- Test Date : September 25, 2017
- 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
- Measurement distance : 3 m
- Duty Cycle : > 98 %
- Result : Pass

Frequency (GHz)	Reading (dBμV)	Detector Mode	Ant. Pol. (H/V)	Ant. Factor	Cable Loss	Amp Gain	Total (dBμV/m)	Limits (dBμV/m)	Margin (dB)
Low Channel									
5 725.00	45.61	Peak	H	32.17	12.09	35.59	54.28	124.38	70.10
	49.95	Peak	V				58.62	124.38	65.76
5 715.00	45.31	Peak	H				53.98	111.58	57.60
	48.26	Peak	V				56.93	111.58	54.65
High Channel									
5 850.00	56.37	Peak	H	32.17	12.09	35.43	65.20	124.38	59.18
	63.94	Peak	V				72.77	124.38	51.61
5 860.00	56.10	Peak	H				64.93	111.58	46.65
	60.79	Peak	V				69.62	111.58	41.96

Tabulated test data for Restricted Band

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

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



Tested by: Hyung-Kwon, Oh / Assistant Manager

14.5.1.3 Test data for Antenna 2


- Test Date : September 25, 2017
- 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
- Measurement distance : 3 m
- Duty Cycle : > 98 %
- Result : Pass

Frequency (GHz)	Reading (dBμV)	Detector Mode	Ant. Pol. (H/V)	Ant. Factor	Cable Loss	Amp Gain	Total (dBμV/m)	Limits (dBμV/m)	Margin (dB)
Low Channel									
5 725.00	43.33	Peak	H	32.17	12.09	35.59	52.00	124.38	72.38
	47.42	Peak	V				56.09	124.38	68.29
5 715.00	43.37	Peak	H				52.04	111.58	59.54
	48.61	Peak	V				57.28	111.58	54.30
High Channel									
5 850.00	58.79	Peak	H	32.17	12.09	35.43	67.62	124.38	56.76
	63.95	Peak	V				72.78	124.38	51.60
5 860.00	57.34	Peak	H				66.17	111.58	45.41
	60.81	Peak	V				69.64	111.58	41.94

Tabulated test data for Restricted Band

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

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



Tested by: Hyung-Kwon, Oh / Assistant Manager

14.5.1.4 Test data for Antenna 3


- Test Date : September 25, 2017
- 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
- Measurement distance : 3 m
- Duty Cycle : > 98 %
- Result : Pass

Frequency (GHz)	Reading (dBμV)	Detector Mode	Ant. Pol. (H/V)	Ant. Factor	Cable Loss	Amp Gain	Total (dBμV/m)	Limits (dBμV/m)	Margin (dB)
Low Channel									
5 725.00	42.22	Peak	H	32.17	12.09	35.59	50.89	124.38	73.49
	47.87	Peak	V				56.54	124.38	67.84
5 715.00	45.45	Peak	H				54.12	111.58	57.46
	49.84	Peak	V				58.51	111.58	53.07
High Channel									
5 850.00	60.96	Peak	H	32.17	12.09	35.43	69.79	124.38	54.59
	65.07	Peak	V				73.90	124.38	50.48
5 860.00	56.74	Peak	H				65.57	111.58	46.01
	58.39	Peak	V				67.22	111.58	44.36

Tabulated test data for Restricted Band

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

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



Tested by: Hyung-Kwon, Oh / Assistant Manager

14.5.2 Test data for 802.11n_HT20 RLAN Mode (4 Tx Multiple Transmit (Worst case))

- Test Date : September 25, 2017
- 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
- Measurement distance : 3 m
- Duty Cycle : > 98 %
- Result : Pass

Frequency (GHz)	Reading (dBμV)	Detector Mode	Ant. Pol. (H/V)	Ant. Factor	Cable Loss	Amp Gain	Total (dBμV/m)	Limits (dBμV/m)	Margin (dB)
Low Channel									
5 725.00	53.70	Peak	H	32.17	12.09	35.59	62.37	124.38	62.01
	57.39	Peak	V				66.06	124.38	58.32
5 715.00	45.30	Peak	H				53.97	111.58	57.61
	49.97	Peak	V				58.64	111.58	52.94
High Channel									
5 850.00	77.01	Peak	H	32.17	12.09	35.43	85.84	124.38	38.54
	72.77	Peak	V				81.60	124.38	42.78
5 860.00	65.86	Peak	H				74.69	111.58	36.89
	64.01	Peak	V				72.84	111.58	38.74

Tabulated test data for Restricted Band

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

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



Tested by: Hyung-Kwon, Oh / Assistant Manager

14.5.3 Test data for 802.11n_HT40 RLAN Mode (4 Tx Multiple Transmit (Worst case))

- Test Date : September 25, 2017
- 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
- Measurement distance : 3 m
- Duty Cycle : > 98 %
- Result : Pass

Frequency (GHz)	Reading (dBμV)	Detector Mode	Ant. Pol. (H/V)	Ant. Factor	Cable Loss	Amp Gain	Total (dBμV/m)	Limits (dBμV/m)	Margin (dB)
Low Channel									
5 725.00	53.63	Peak	H	32.17	12.09	35.59	62.30	124.38	62.08
	58.38	Peak	V				67.05	124.38	57.33
5 715.00	46.08	Peak	H				54.75	111.58	56.83
	50.66	Peak	V				59.33	111.58	52.25
High Channel									
5 850.00	44.66	Peak	H	32.17	12.09	35.43	53.49	124.38	70.89
	47.90	Peak	V				56.73	124.38	67.65
5 860.00	45.21	Peak	H				54.04	111.58	57.54
	49.11	Peak	V				57.94	111.58	53.64

Tabulated test data for Restricted Band

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

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



Tested by: Hyung-Kwon, Oh / Assistant Manager

14.5.4 Test data for 802.11ac_HT80 RLAN Mode (4 Tx Multiple Transmit (Worst case))

- Test Date : September 25, 2017
- 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
- Measurement distance : 3 m
- Duty Cycle : > 98 %
- Result : Pass

Frequency (GHz)	Reading (dBμV)	Detector Mode	Ant. Pol. (H/V)	Ant. Factor	Cable Loss	Amp Gain	Total (dBμV/m)	Limits (dBμV/m)	Margin (dB)
Low Channel									
5 725.00	53.47	Peak	H	32.17	12.09	35.59	62.14	124.38	62.24
	57.06	Peak	V				65.73	124.38	58.65
5 715.00	46.19	Peak	H				54.86	111.58	56.72
	49.97	Peak	V				58.64	111.58	52.94
High Channel									
5 850.00	44.15	Peak	H	32.17	12.09	35.43	52.98	124.38	71.40
	47.99	Peak	V				56.82	124.38	67.56
5 860.00	44.76	Peak	H				53.59	111.58	57.99
	48.71	Peak	V				57.54	111.58	54.04

Tabulated test data for Restricted Band

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

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



Tested by: Hyung-Kwon, Oh / Assistant Manager

15. CONDUCTED EMISSION TEST

15.1 Operating environment

Temperature : (24 ~ 25) °C
 Relative humidity : (45 ~ 46) % R.H.

15.2 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.

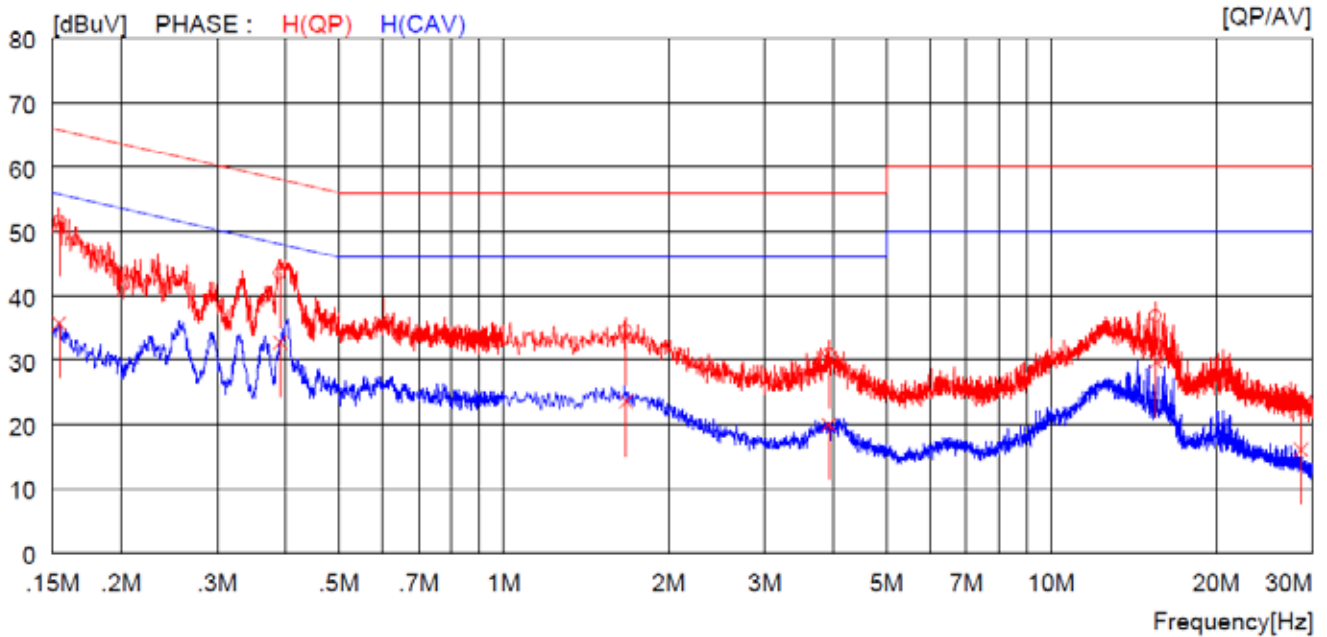
15.3 Test equipment used

Model Number	Manufacturer	Description	Serial Number	Last Cal. (Interval)
■ - ESPI	Rohde & Schwarz	Test Receiver	101012	Nov. 01, 2016 (1Y)
□ - ESHS10	Rohde & Schwarz	Test Receiver	834467/007	Apr. 03, 2017 (1Y)
□ - NSLK8128	Schwarzbeck	AMN	8128-216	Apr. 05, 2017 (1Y)
■ - NSLK8126	Schwarzbeck	AMN	8126-404	Apr. 03, 2017 (1Y)
□ - 3825/2	EMCO	AMN	9109-1869	Apr. 06, 2017 (1Y)
■ - 3825/2	EMCO	AMN	9109-1867	Apr. 07, 2017 (1Y)

All test equipment used is calibrated on a regular basis.

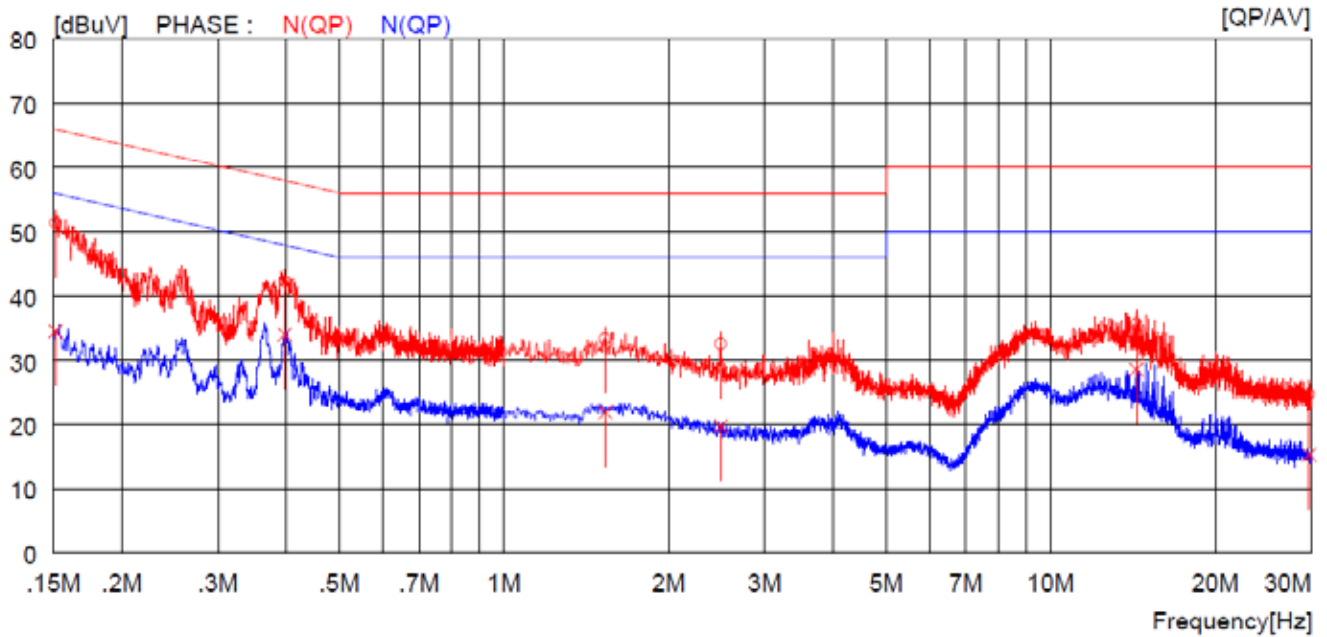
15.4 Test data for Frequency U-NII-1

- Test Date : September 25, 2017
- Resolution bandwidth : 9 kHz
- Frequency range : 0.15 MHz ~ 30 MHz
- Note : 5 GHz operating mode were tested, but the worst data were recorded.
(802.11a RLAN Mode)
- Tested Line : HOT 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	0.15400	41.6	----	10.0	51.6	----	65.8	----	14.2	----	H (QP)
2	0.39000	33.5	----	10.0	43.5	----	58.1	----	14.6	----	H (QP)
3	1.67200	24.5	----	10.1	34.6	----	56.0	----	21.4	----	H (QP)
4	3.92000	20.8	----	10.2	31.0	----	56.0	----	25.0	----	H (QP)
5	15.51000	26.3	----	10.6	36.9	----	60.0	----	23.1	----	H (QP)
6	28.55000	12.3	----	10.8	23.1	----	60.0	----	36.9	----	H (QP)
7	0.15400	----	25.7	10.0	----	35.7	----	55.8	----	20.1	H (CAV)
8	0.39000	----	22.8	10.0	----	32.8	----	48.1	----	15.3	H (CAV)
9	1.67200	----	13.5	10.1	----	23.6	----	46.0	----	22.4	H (CAV)
10	3.92000	----	9.8	10.2	----	20.0	----	46.0	----	26.0	H (CAV)
11	15.51000	----	19.0	10.6	----	29.6	----	50.0	----	20.4	H (CAV)
12	28.55000	----	5.3	10.8	----	16.1	----	50.0	----	33.9	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	0.15100	41.3	----	10.0	51.3	----	65.9	----	14.6	----	N (QP)
2	0.39700	32.2	----	10.0	42.2	----	57.9	----	15.7	----	N (QP)
3	1.53200	23.2	----	10.1	33.3	----	56.0	----	22.7	----	N (QP)
4	2.49200	22.4	----	10.1	32.5	----	56.0	----	23.5	----	N (QP)
5	14.34000	25.0	----	10.6	35.6	----	60.0	----	24.4	----	N (QP)
6	29.70000	13.9	----	10.8	24.7	----	60.0	----	35.3	----	N (QP)
7	0.15100	----	24.5	10.0	----	34.5	----	55.9	----	21.4	N (CAV)
8	0.39700	----	24.0	10.0	----	34.0	----	47.9	----	13.9	N (CAV)
9	1.53200	----	11.8	10.1	----	21.9	----	46.0	----	24.1	N (CAV)
10	2.49200	----	9.6	10.1	----	19.7	----	46.0	----	26.3	N (CAV)
11	14.34000	----	18.0	10.6	----	28.6	----	50.0	----	21.4	N (CAV)
12	29.70000	----	4.5	10.8	----	15.3	----	50.0	----	34.7	N (CAV)

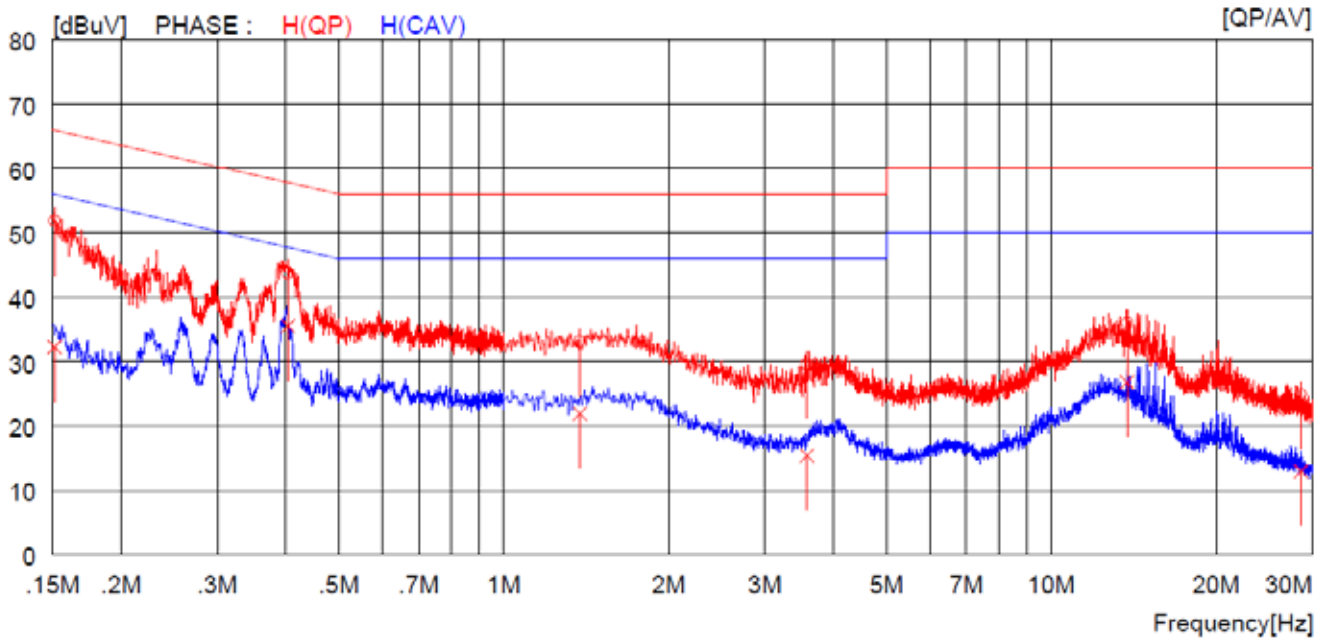
Remark: Margin (dB) = Limit – Level (Result)

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

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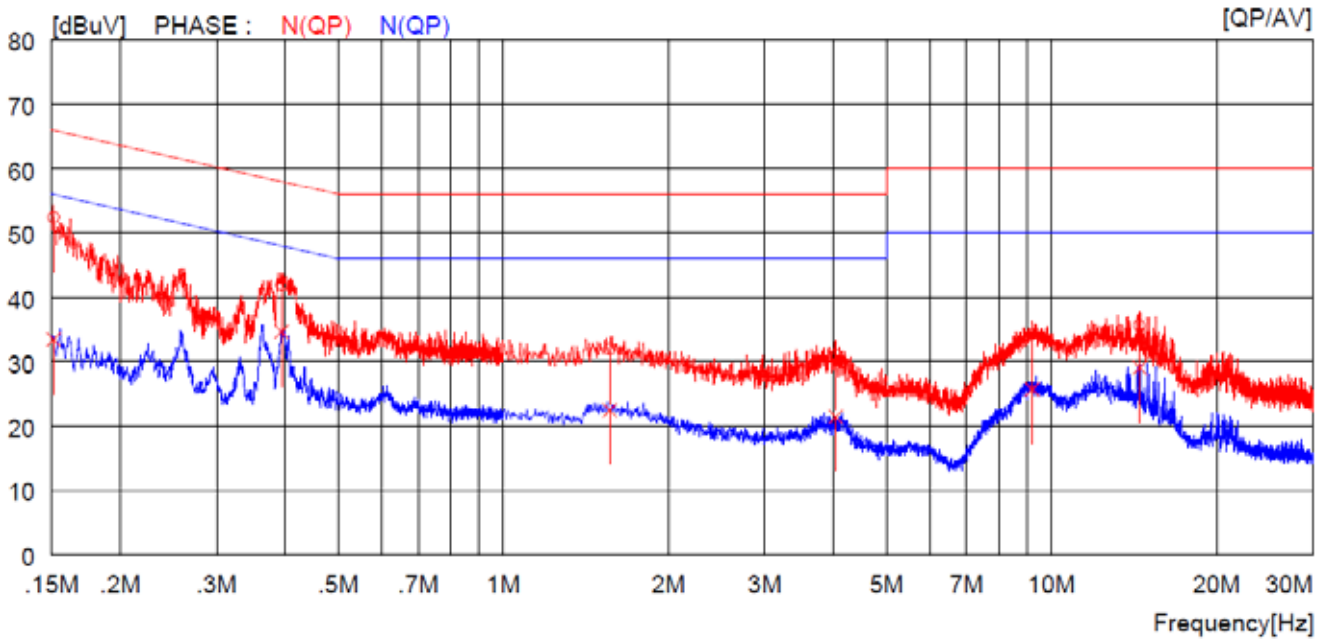
15.4 Test data for Frequency U-NII-3

- Test Date : September 25, 2017
- Resolution bandwidth : 9 kHz
- Frequency range : 0.15 MHz ~ 30 MHz
- Note : 5 GHz operating mode were tested, but the worst data were recorded.
(802.11a RLAN Mode)
- Tested Line : HOT 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	0.15100	41.8	----	10.0	51.8	----	65.9	----	14.1	----	H (QP)
2	0.40300	33.8	----	10.0	43.8	----	57.8	----	14.0	----	H (QP)
3	1.37600	23.0	----	10.1	33.1	----	56.0	----	22.9	----	H (QP)
4	3.57600	19.4	----	10.2	29.6	----	56.0	----	26.4	----	H (QP)
5	13.76000	25.4	----	10.6	36.0	----	60.0	----	24.0	----	H (QP)
6	28.57000	14.1	----	10.8	24.9	----	60.0	----	35.1	----	H (QP)
7	0.15100	----	22.3	10.0	----	32.3	----	55.9	----	23.6	H (CAV)
8	0.40300	----	25.5	10.0	----	35.5	----	47.8	----	12.3	H (CAV)
9	1.37600	----	11.8	10.1	----	21.9	----	46.0	----	24.1	H (CAV)
10	3.57600	----	5.2	10.2	----	15.4	----	46.0	----	30.6	H (CAV)
11	13.76000	----	16.2	10.6	----	26.8	----	50.0	----	23.2	H (CAV)
12	28.57000	----	2.2	10.8	----	13.0	----	50.0	----	37.0	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	0.15100	42.3	----	10.0	52.3	----	65.9	----	13.6	----	N(QP)
2	0.39400	31.9	----	10.0	41.9	----	58.0	----	16.1	----	N(QP)
3	1.56400	21.8	----	10.1	31.9	----	56.0	----	24.1	----	N(QP)
4	4.04400	20.8	----	10.2	31.0	----	56.0	----	25.0	----	N(QP)
5	9.22000	23.8	----	10.4	34.2	----	60.0	----	25.8	----	N(QP)
6	14.48000	25.0	----	10.6	35.6	----	60.0	----	24.4	----	N(QP)
7	0.15100	----	23.4	10.0	----	33.4	----	55.9	----	22.5	N(CAV)
8	0.39400	----	24.6	10.0	----	34.6	----	48.0	----	13.4	N(CAV)
9	1.56400	----	12.4	10.1	----	22.5	----	46.0	----	23.5	N(CAV)
10	4.04400	----	11.3	10.2	----	21.5	----	46.0	----	24.5	N(CAV)
11	9.22000	----	15.3	10.4	----	25.7	----	50.0	----	24.3	N(CAV)
12	14.48000	----	18.4	10.6	----	29.0	----	50.0	----	21.0	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