9. 100 kHz BANDWIDTH OUTSIDE THE FREQUENCY BAND

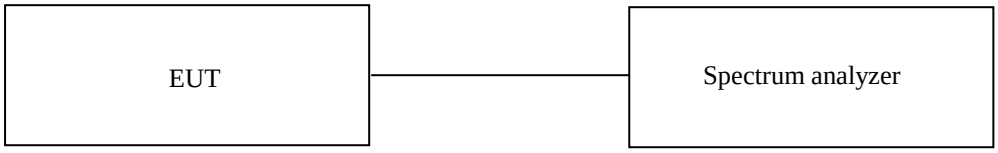
9.1 Operating environment

Temperature : 23 °C

Relative humidity : 41 % R.H.

9.2 Test set-up for conducted measurement

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



9.3 Test set-up for radiated measurement

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.

9.4 Test equipment used

	Model Number	Manufacturer	Description	Serial Number	Last Cal.
■ -	FSV40	Rohde & Schwarz	Signal Analyzer	101009	Mar. 11, 2019 (1Y)
■ -	ESW	Rohde & Schwarz	EMI Test Receiver	101851	Aug. 07, 2019 (1Y)
■ -	310N	Sonoma Instrument	Pre-Amplifier	312544	Mar. 18, 2019 (1Y)
■ -	BBV 9718B	Schwarzbeck	Amplifier	009	Mar. 20, 2019 (1Y)
■	SCU40A	Rohde & Schwarz	Signal Conditioning unit	100436	Mar. 11, 2019 (1Y)
■	SCU18	Rohde & Schwarz	Signal Conditioning unit	102266	Jul. 24, 2019 (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	777	Apr. 13, 2018 (2Y)
■ -	BBHA9120D	Schwarzbeck	Horn Antenna	9120D-1366	Jul. 16, 2019 (1Y)
■ -	BBHA9170	Schwarzbeck	Horn Antenna	BBHA9170178	Jan. 07, 2020 (1Y)

All test equipment used is calibrated on a regular basis.

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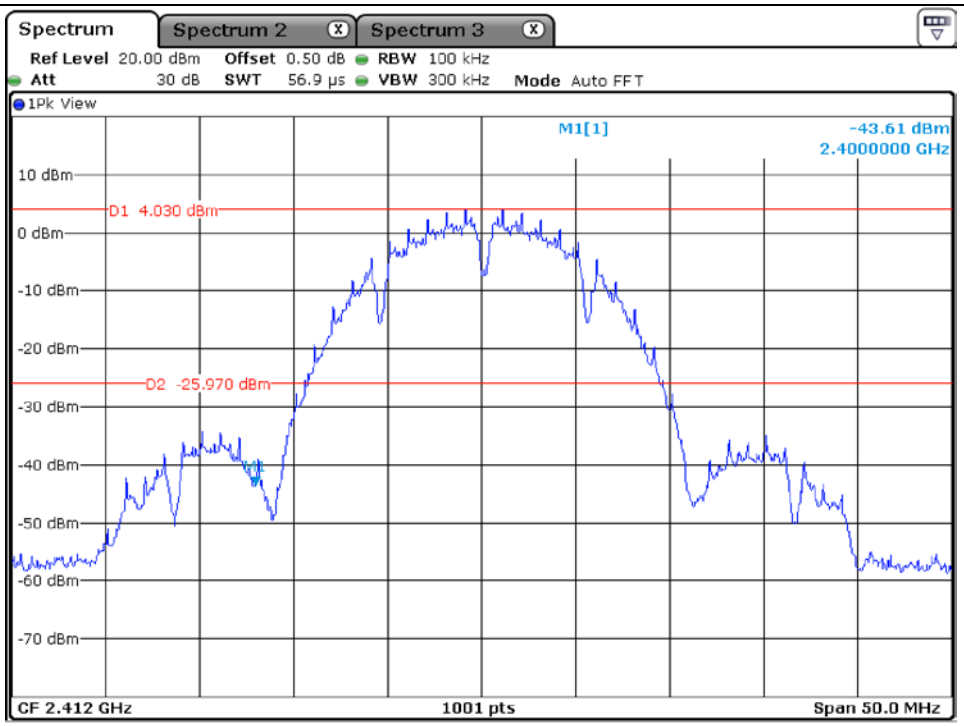
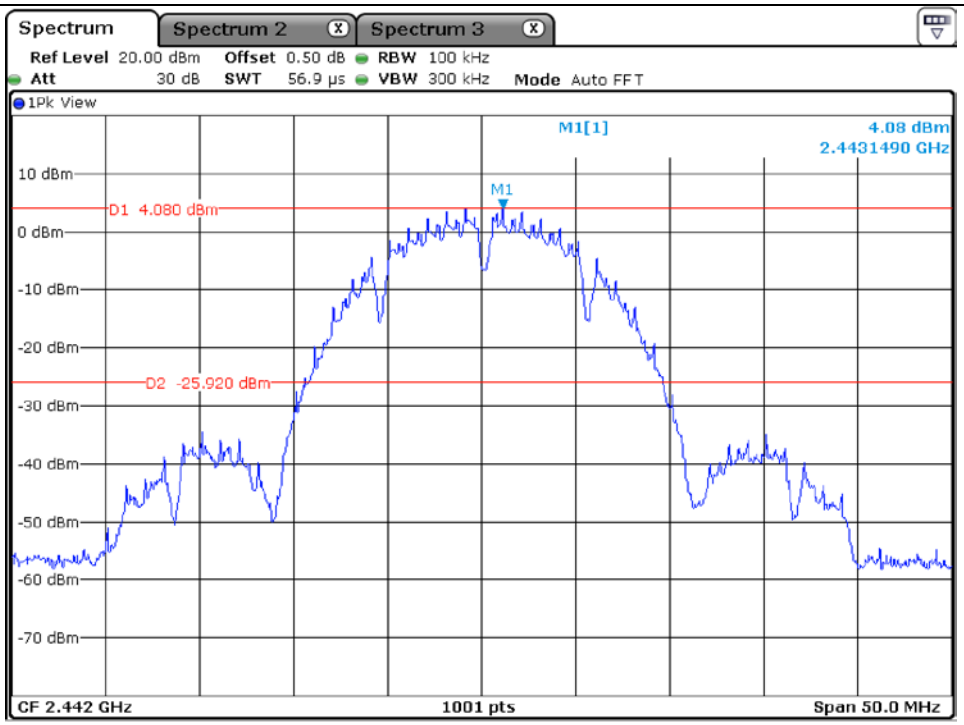
9.5 Test data for conducted emission

9.5.1 Test data for 802.11b WLAN Mode

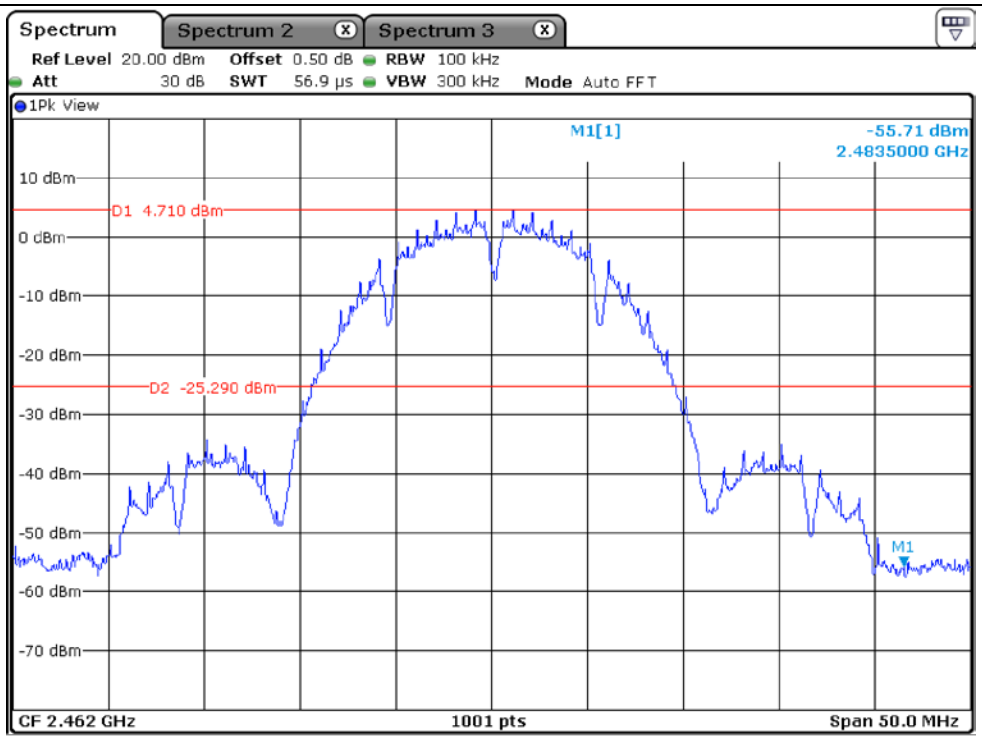
9.5.1.1 Test data for Antenna 0



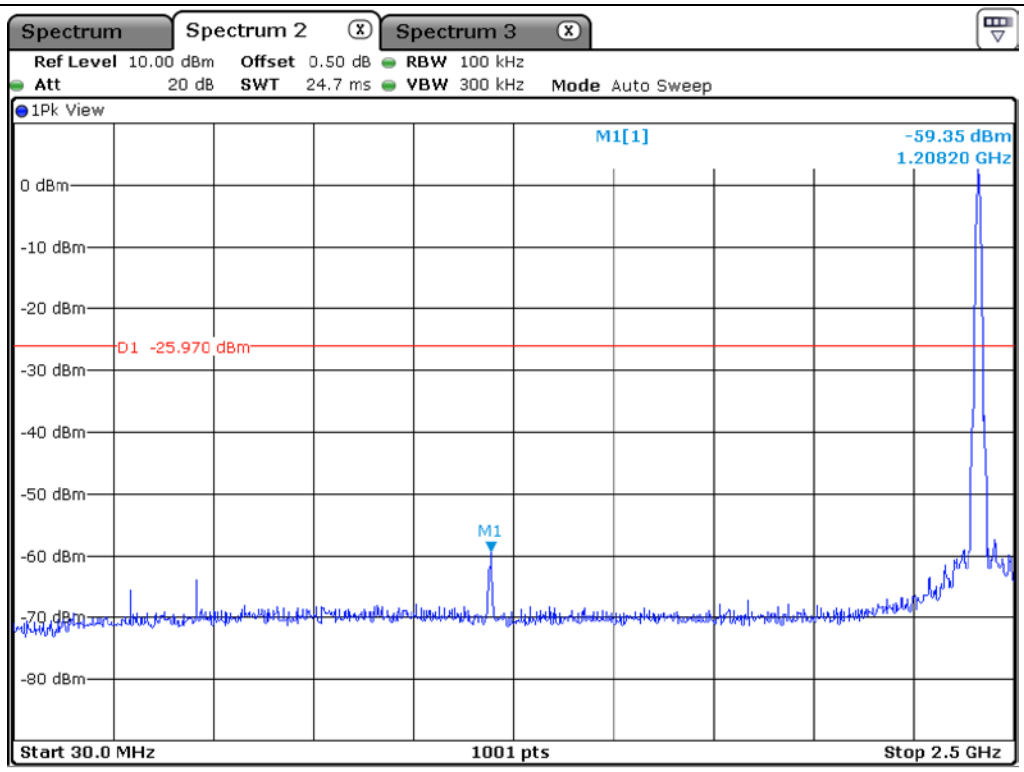
Low Channel



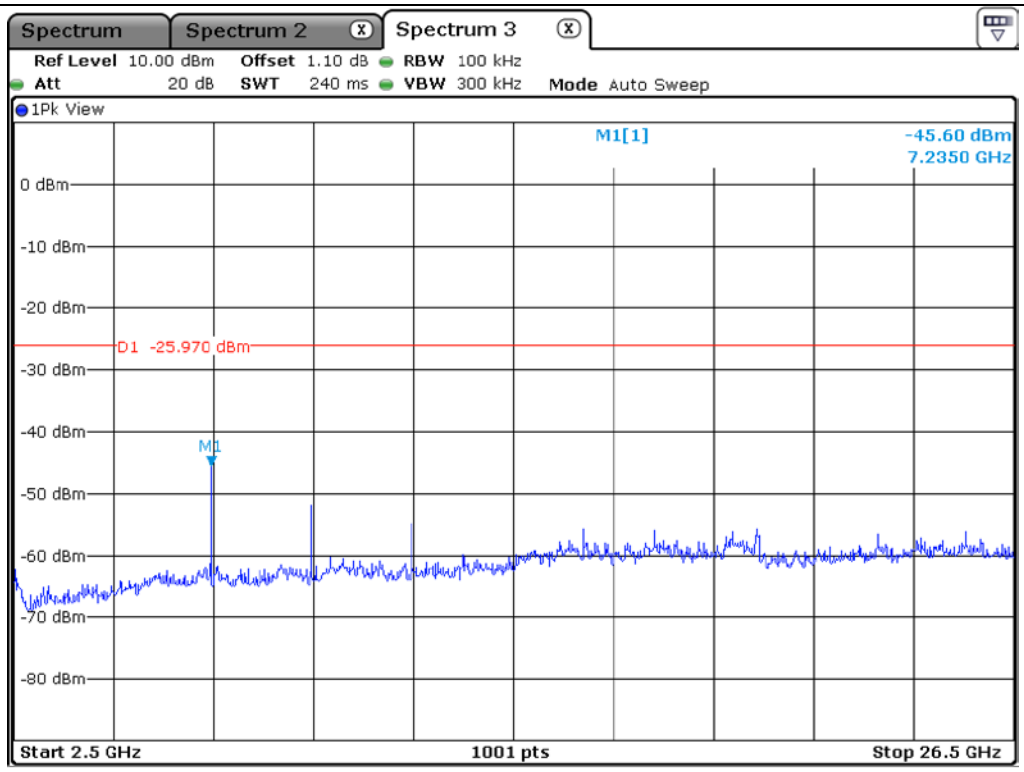
Middle Channel



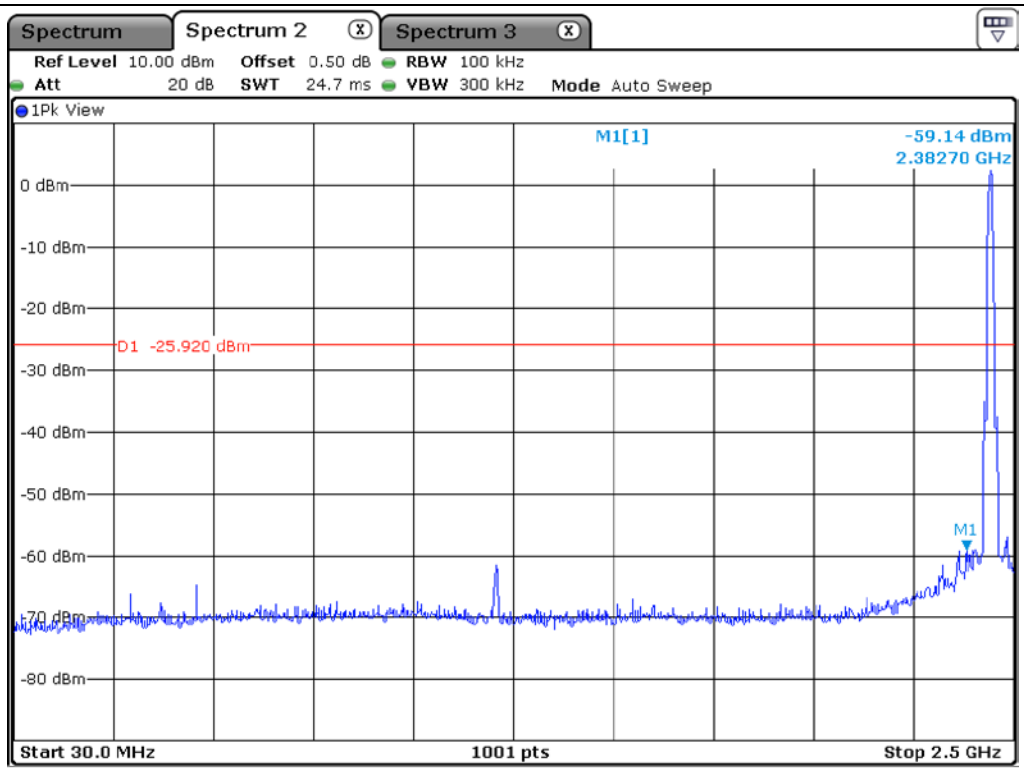
High Channel



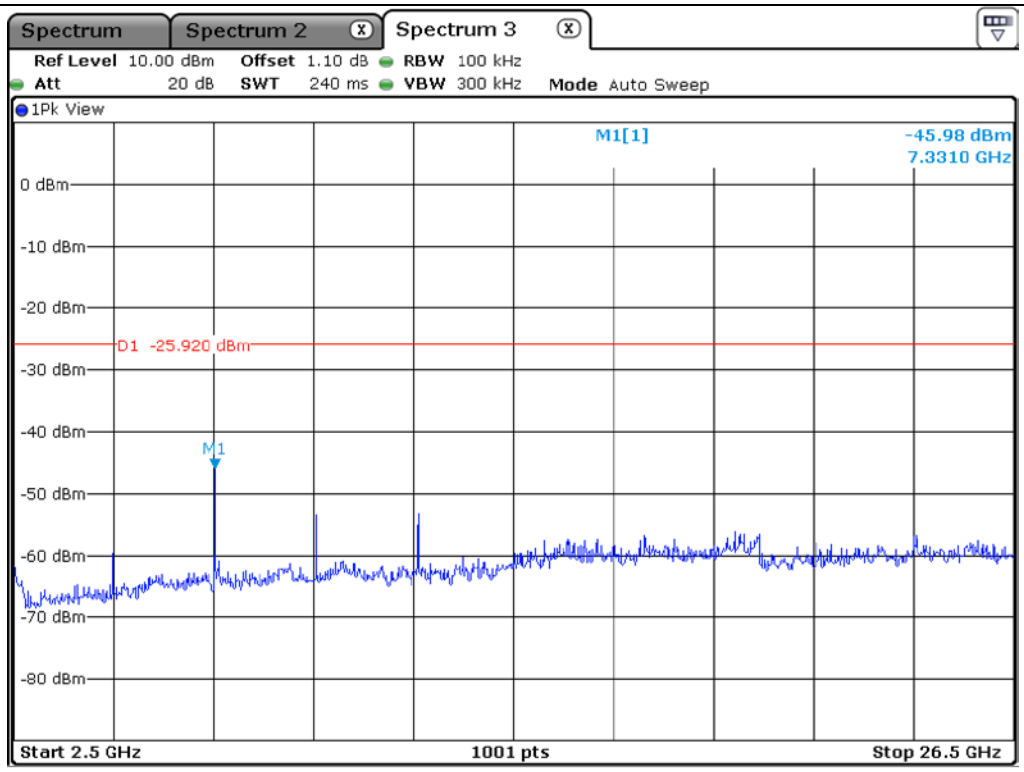
Low Channel



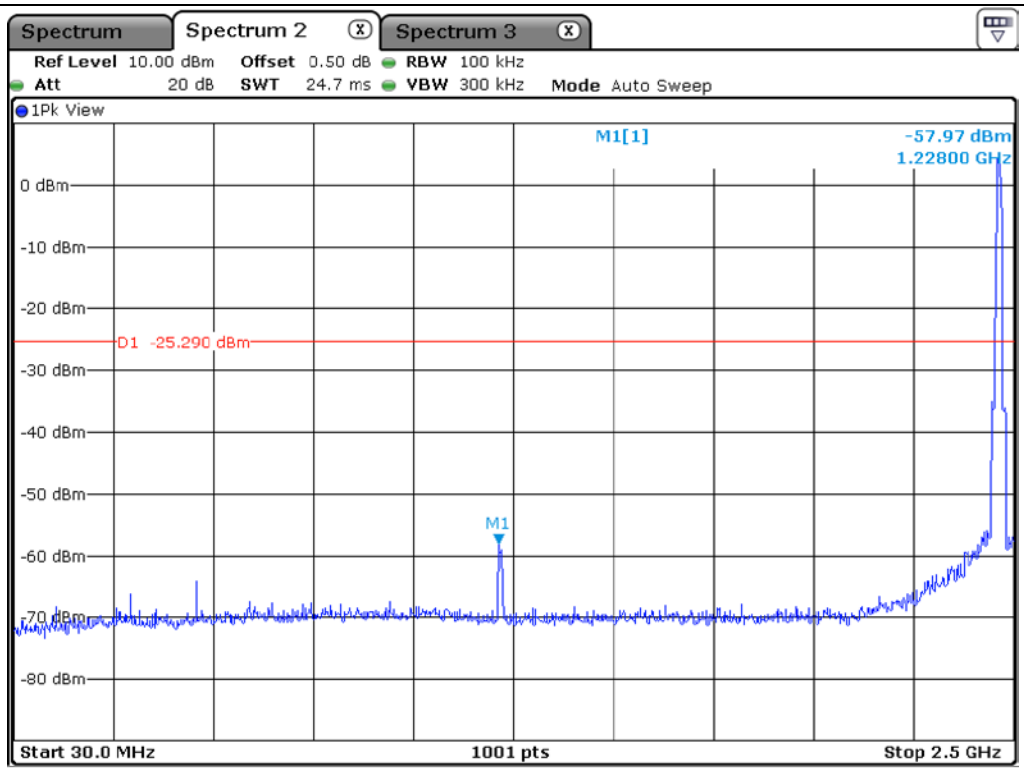
Low Channel



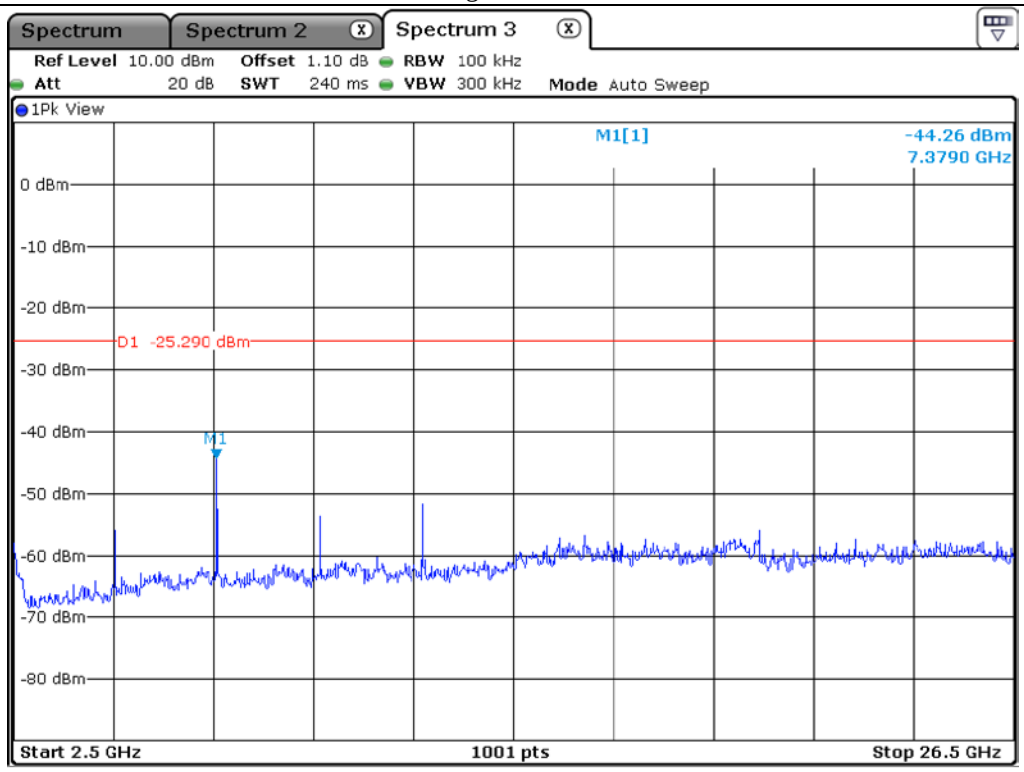
Middle Channel



Middle Channel

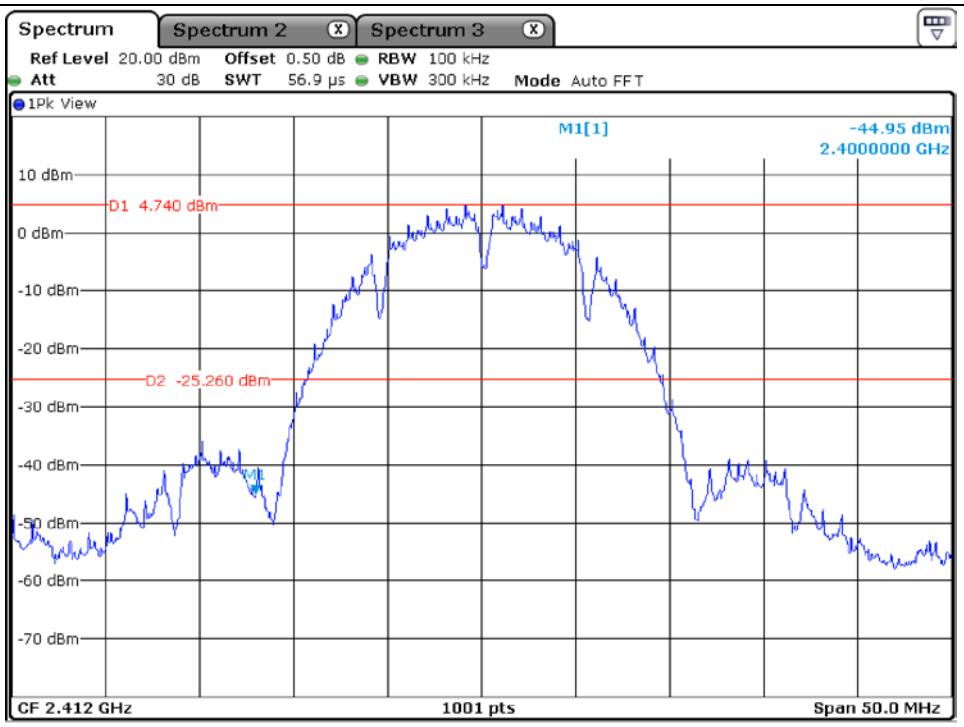


High Channel

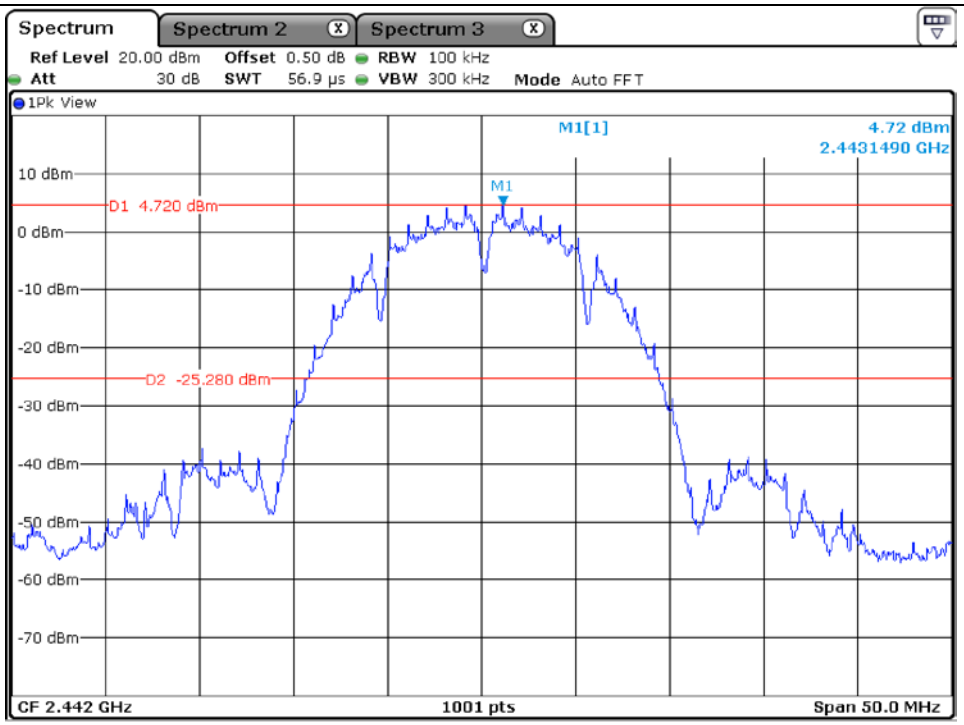


High Channel

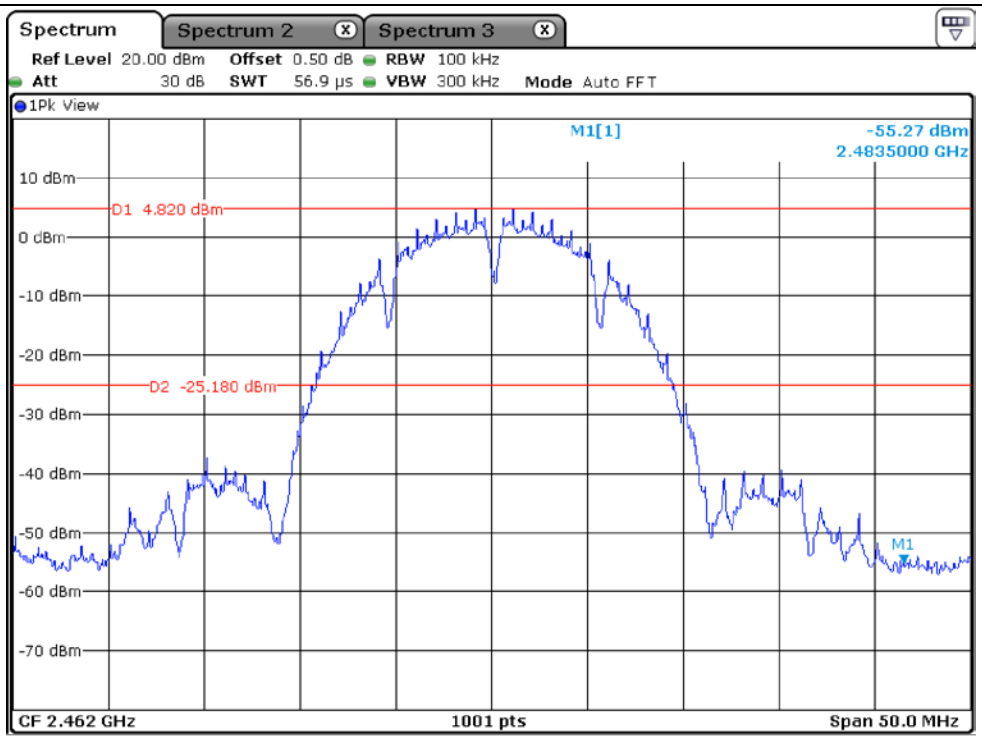
9.5.1.2 Test data for Antenna 1



Low Channel



Middle Channel



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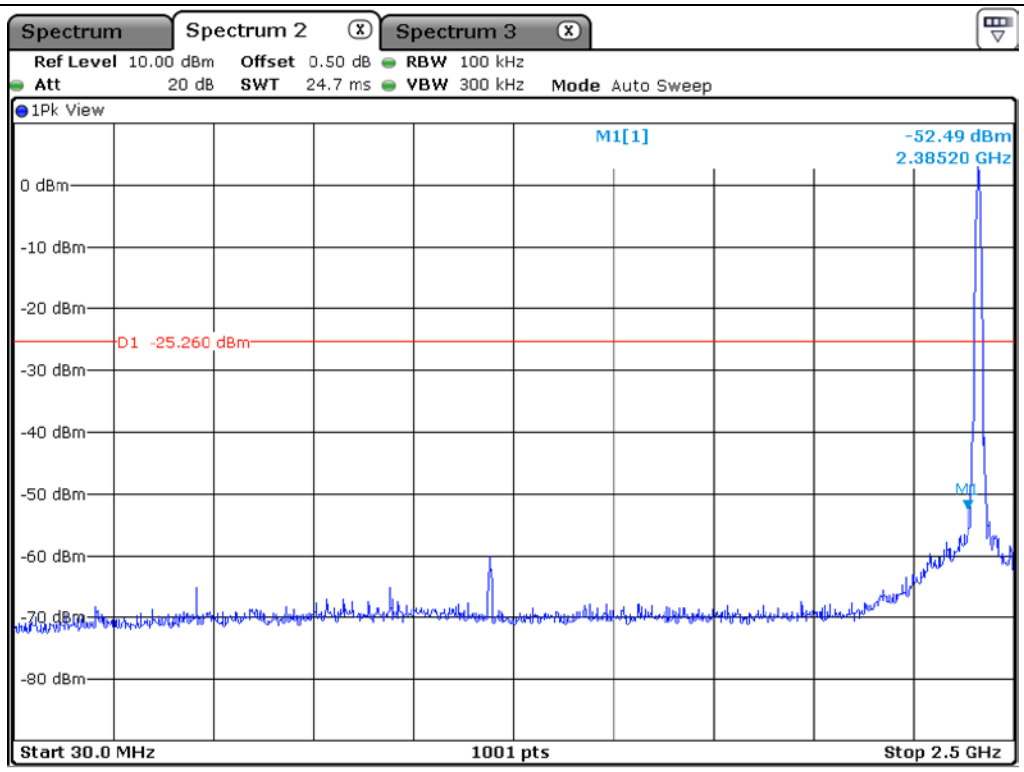
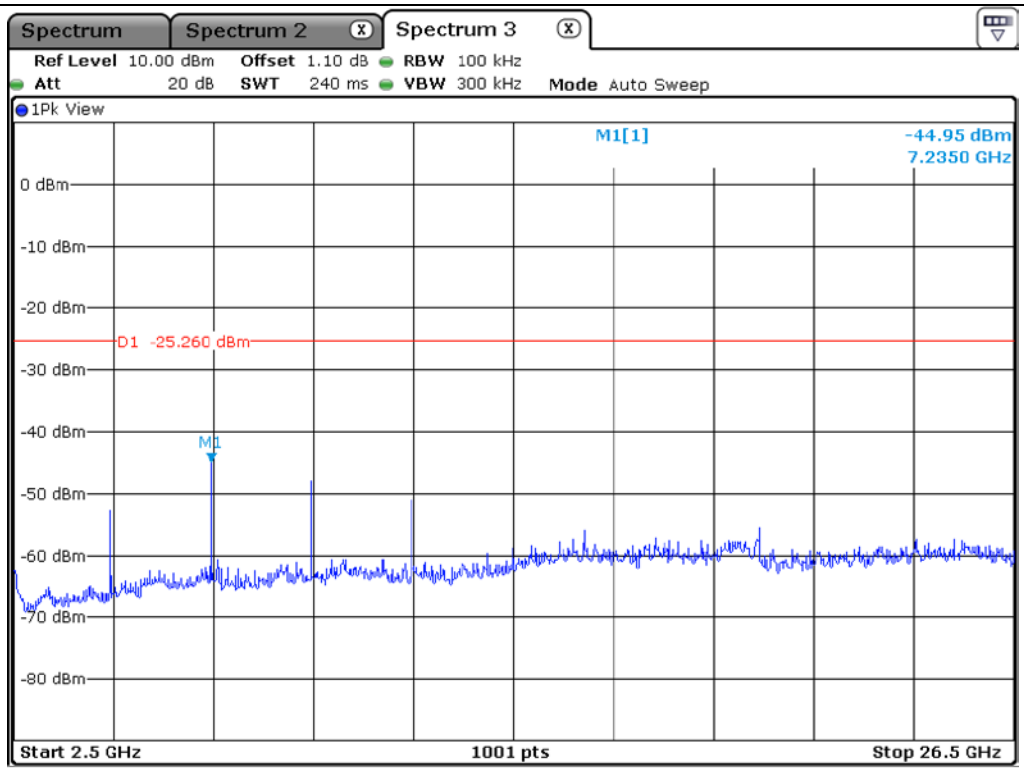
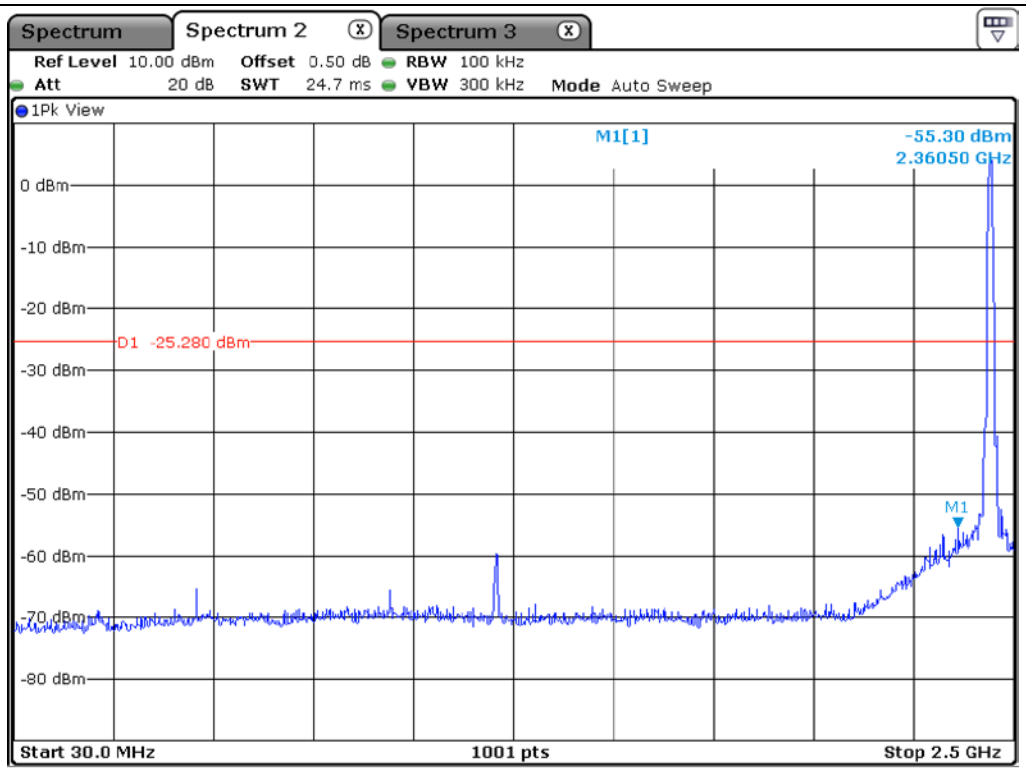


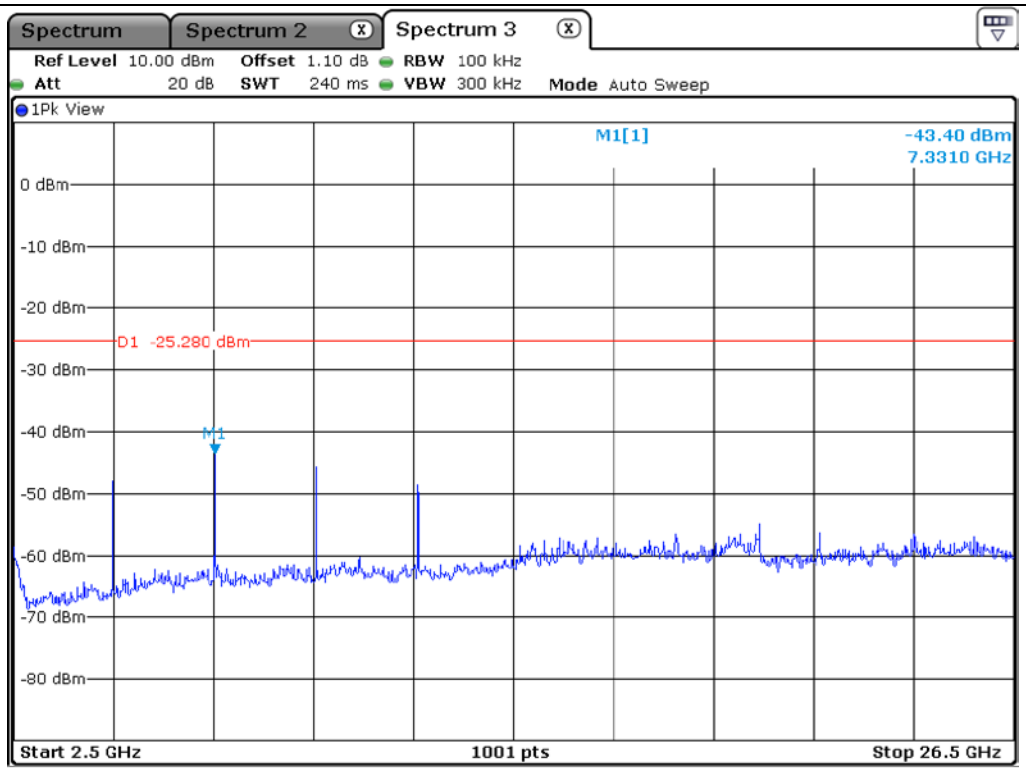
Low Channel



Low Channel



Middle Channel



Middle Channel

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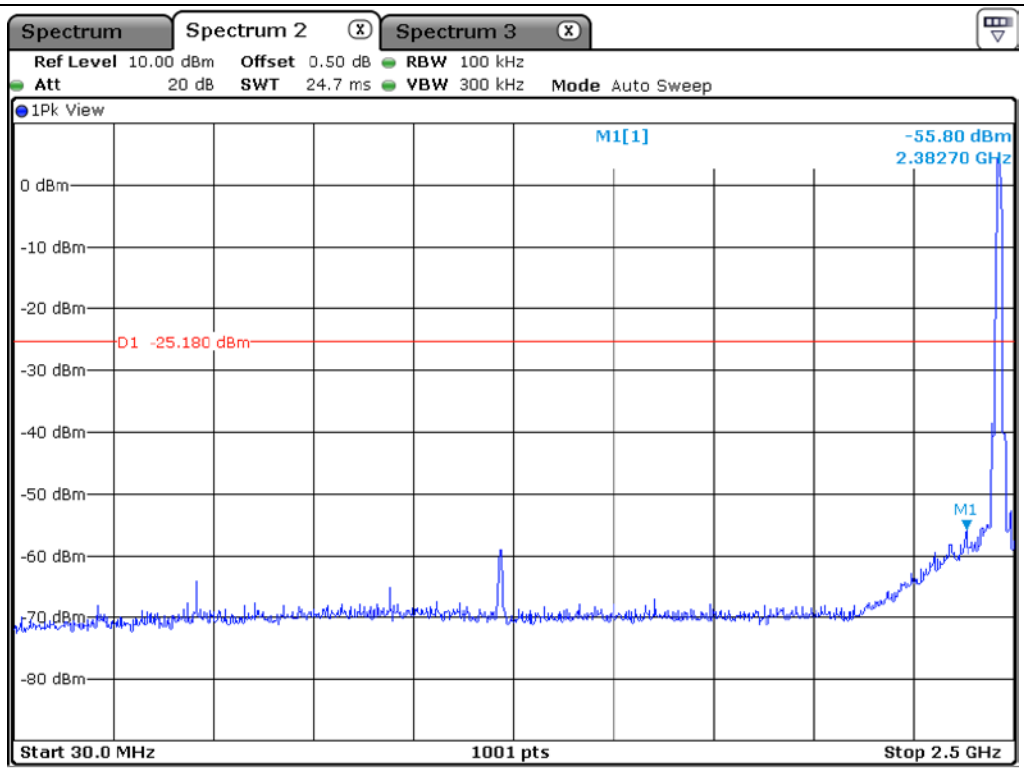

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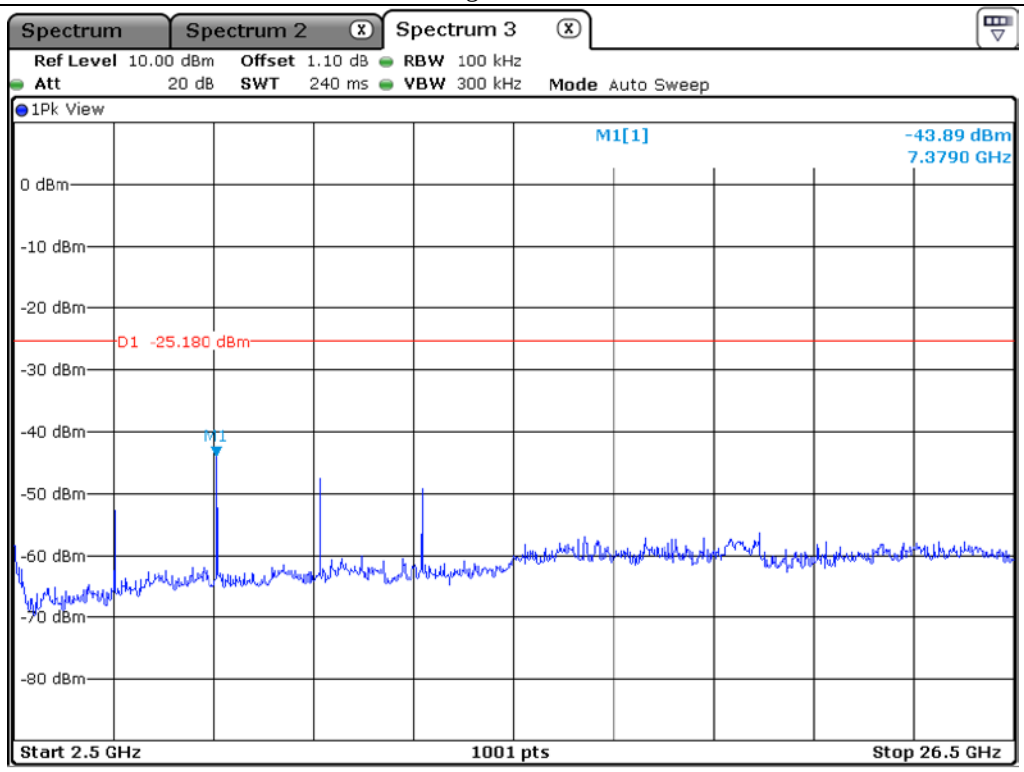
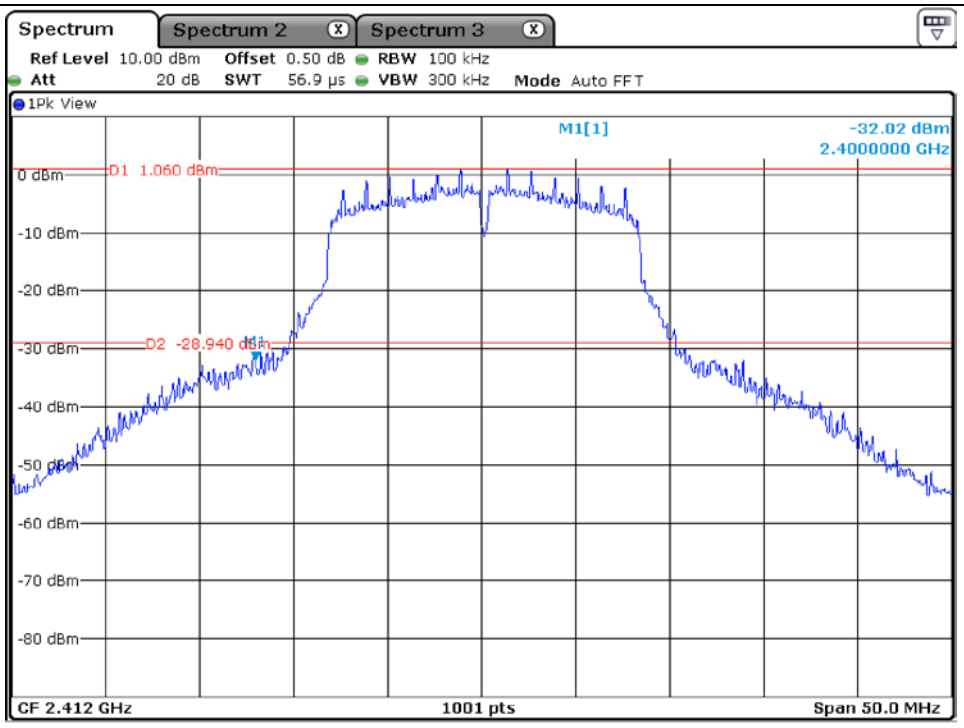


High Channel

9.5.2 Test data for 802.11g WLAN Mode

9.5.2.1 Test data for Antenna 0



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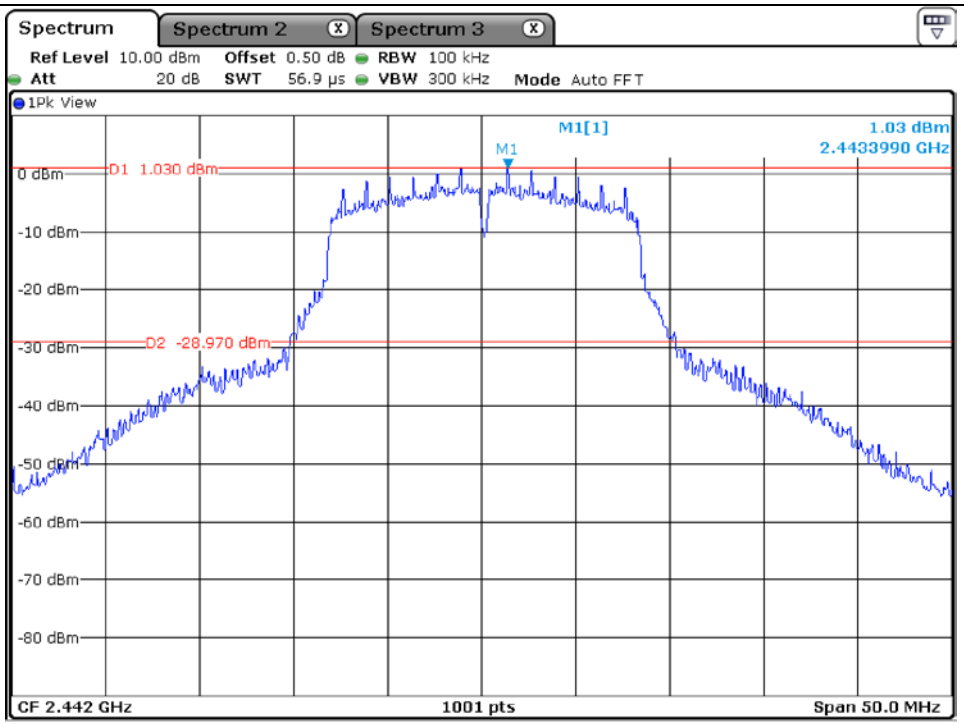

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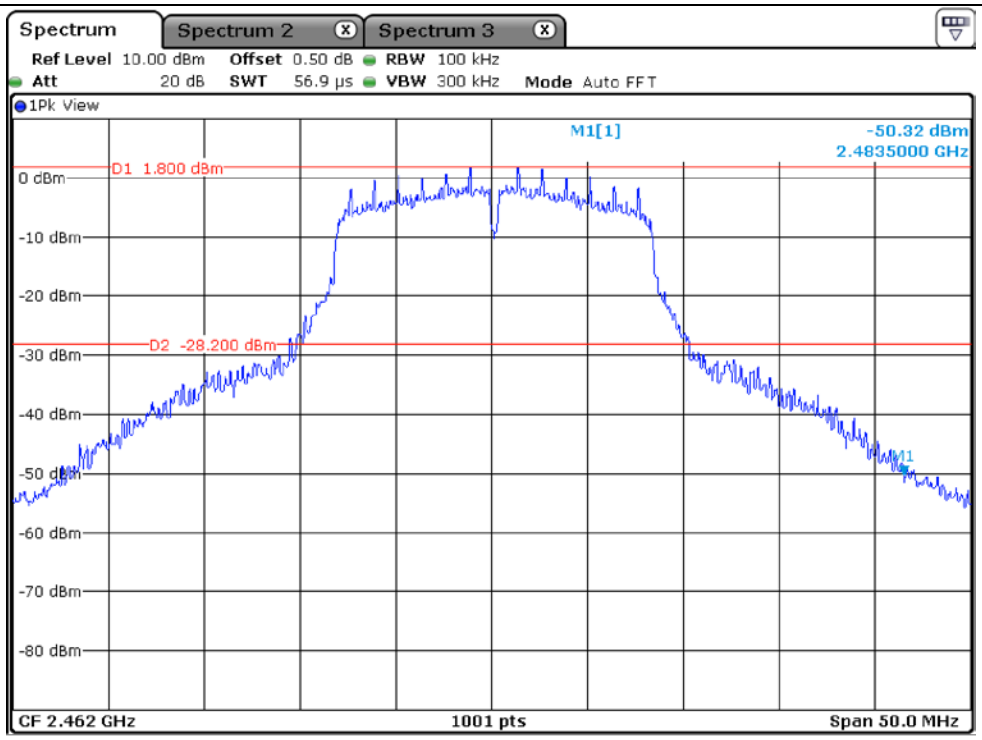

High Channel

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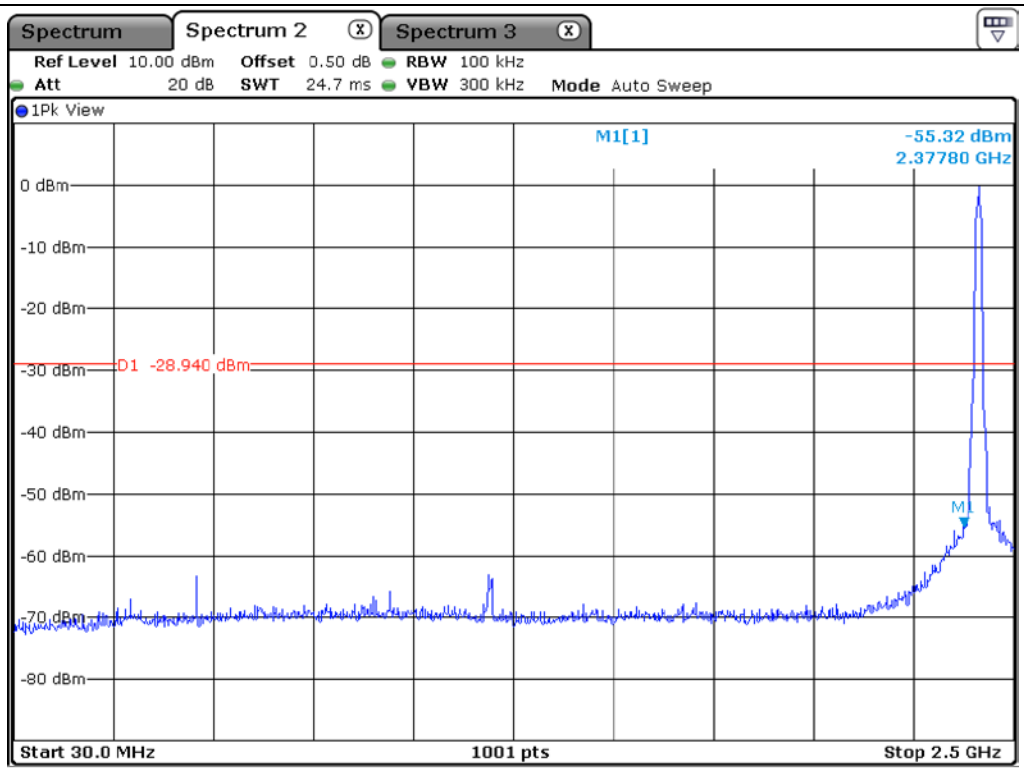

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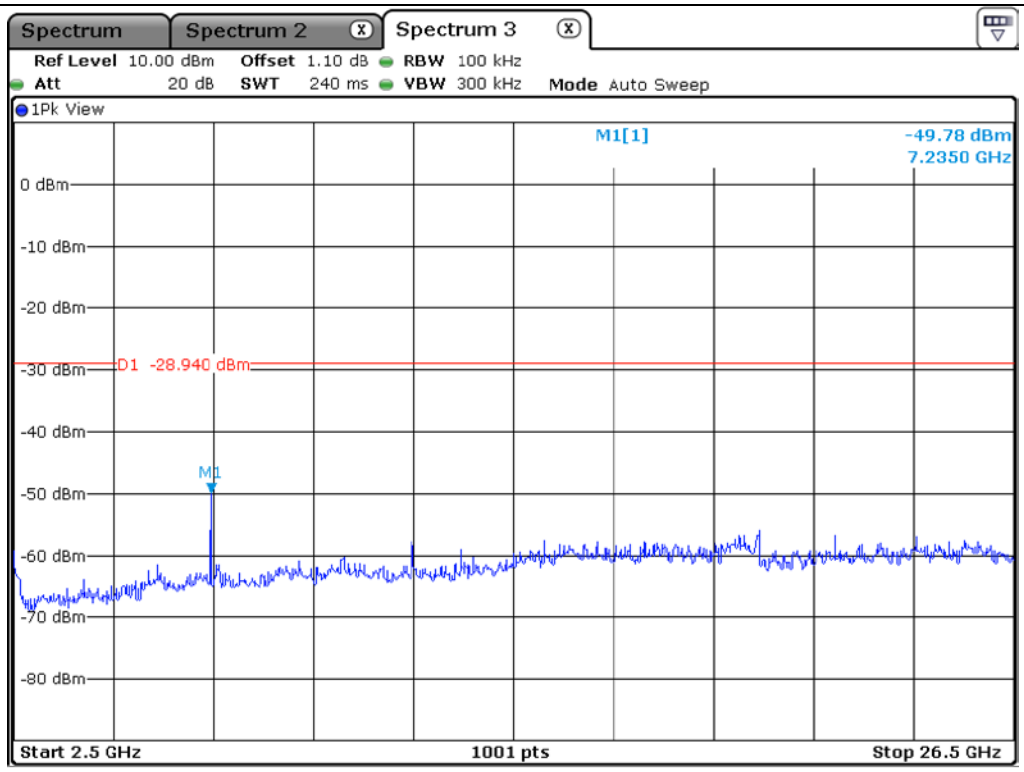
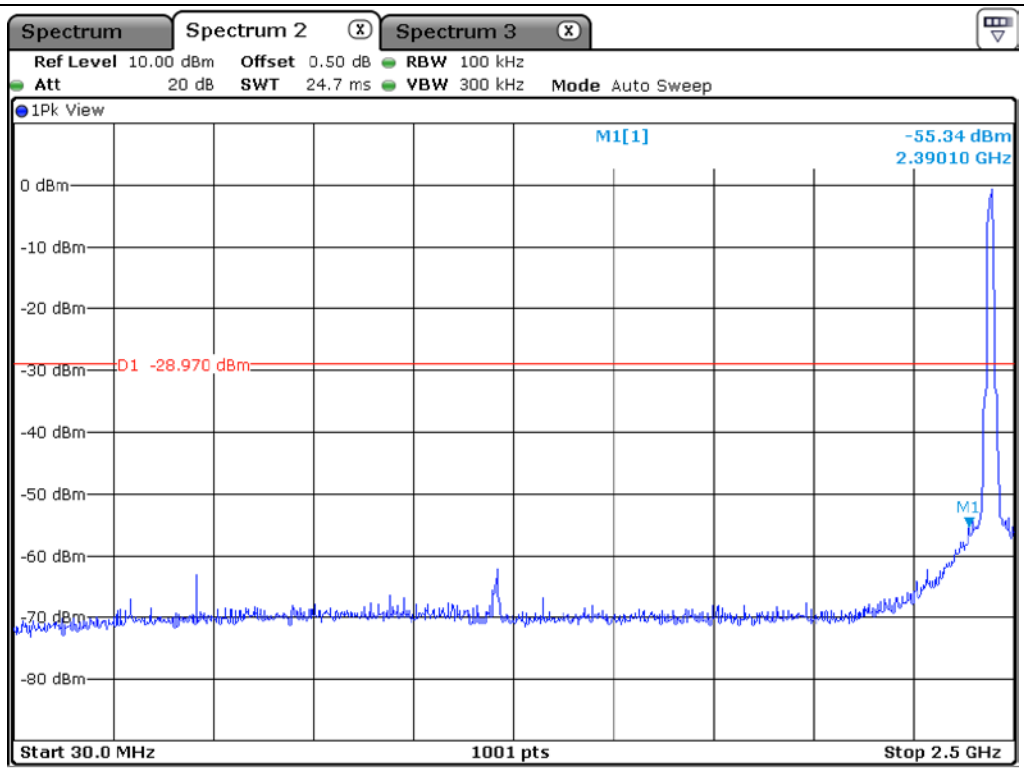
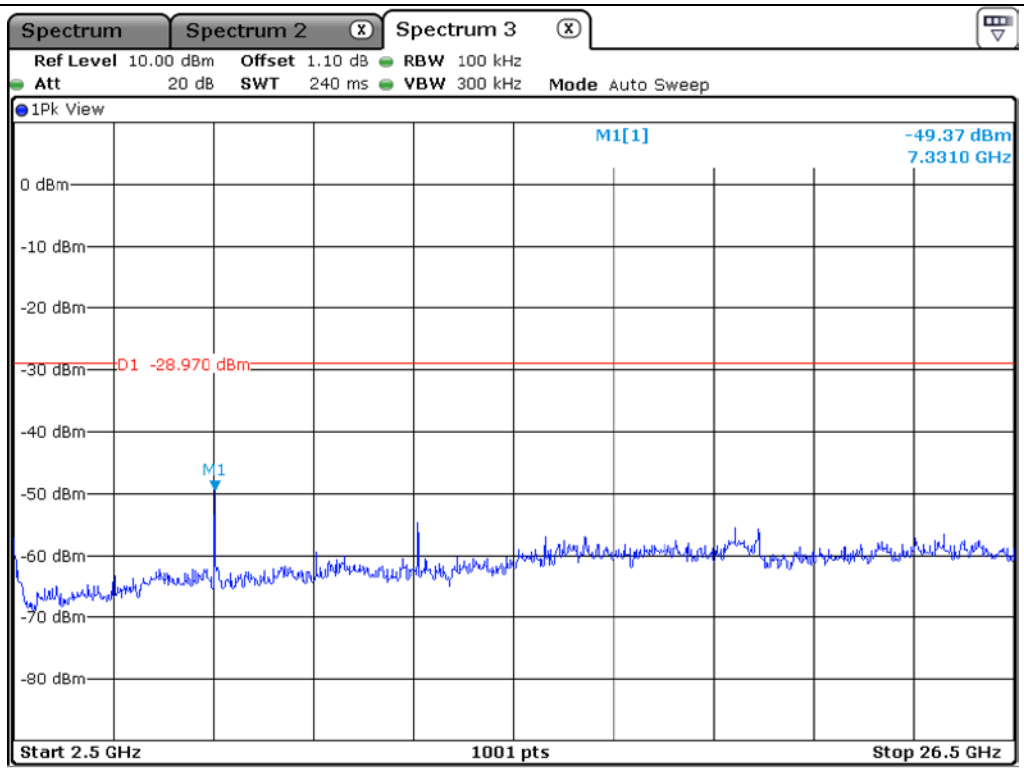


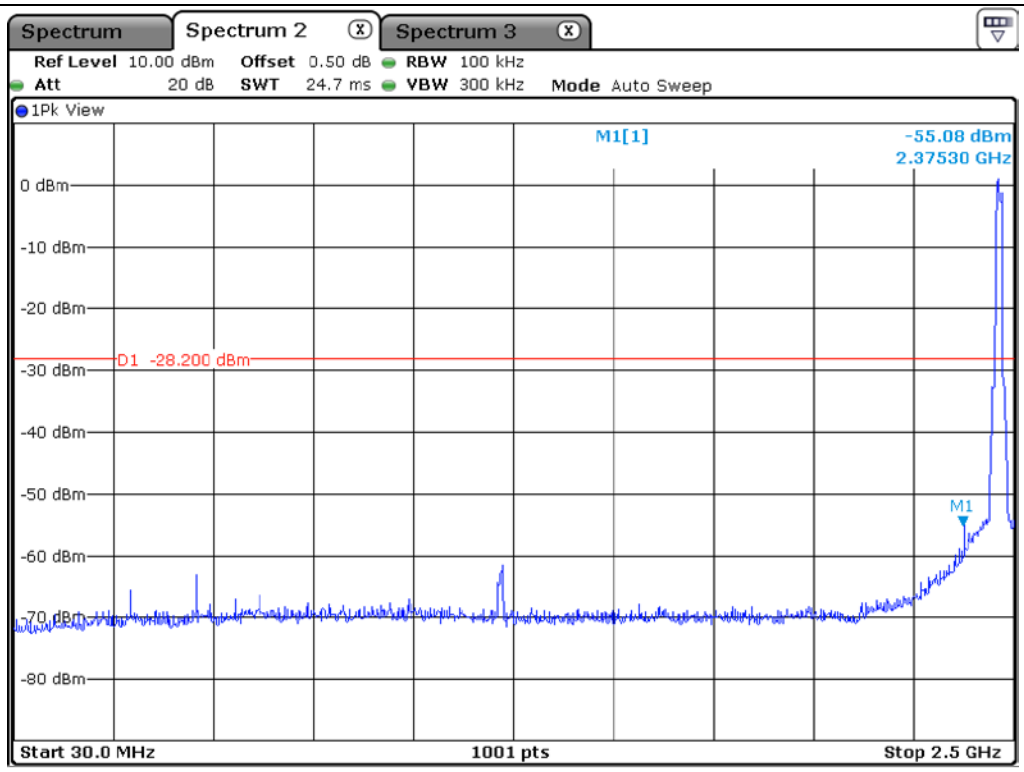
Low Channel



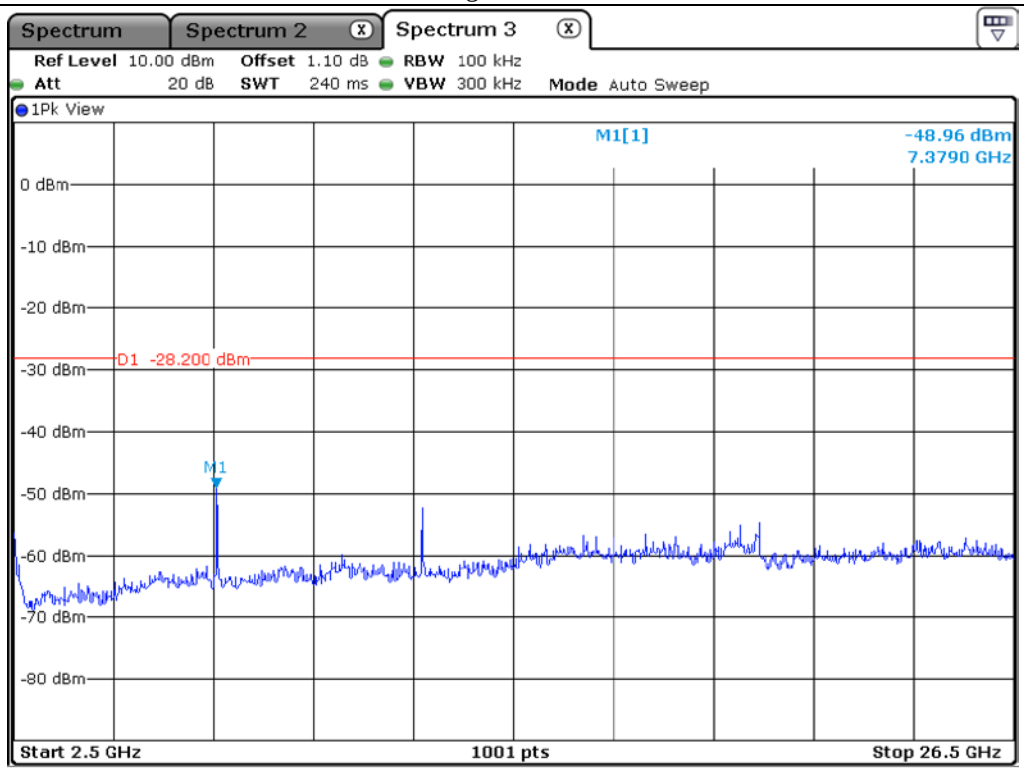
Middle Channel



Middle Channel

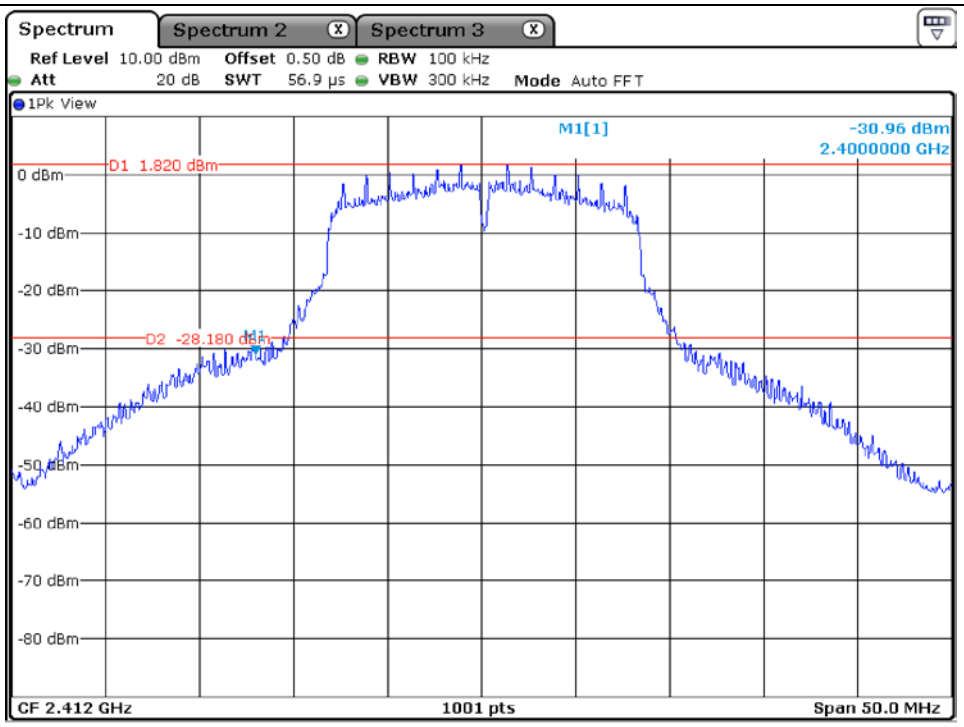


High Channel

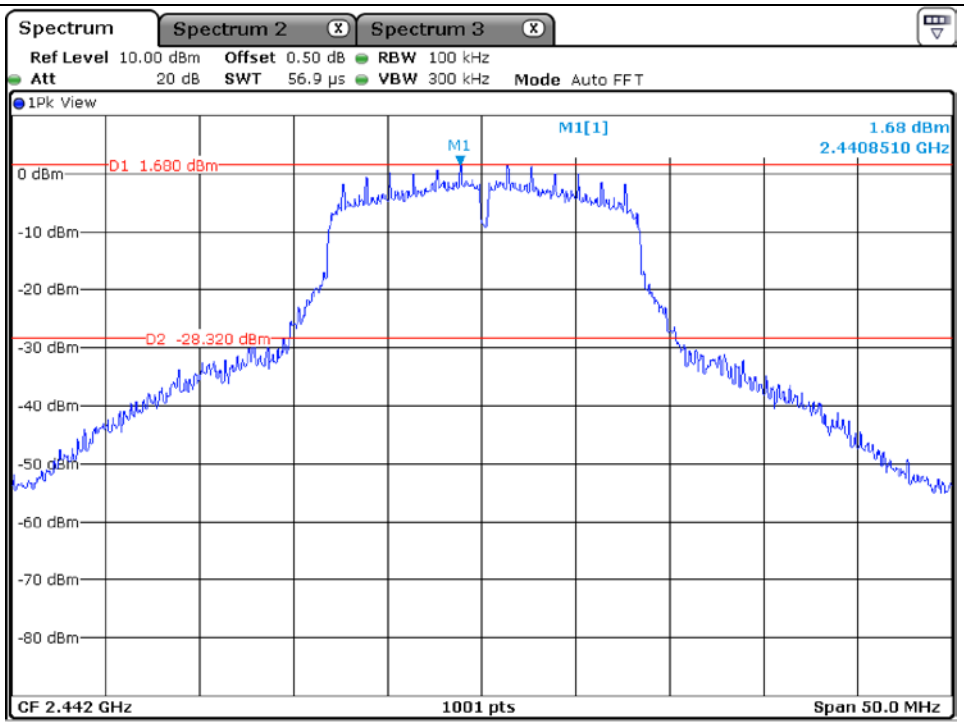


High Channel

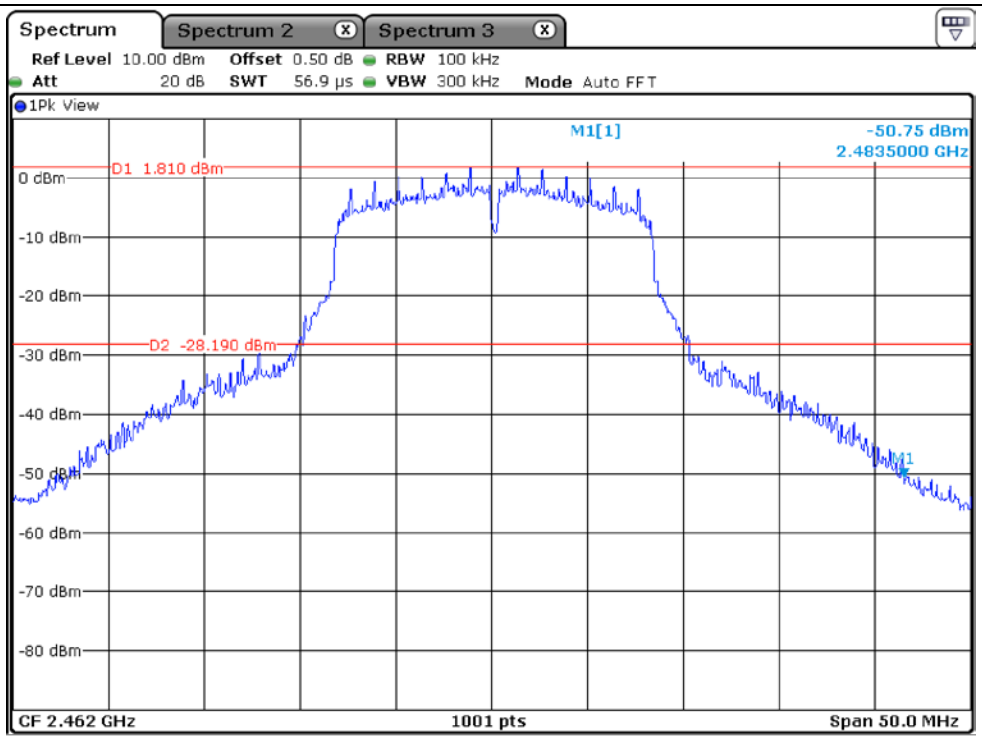
9.5.2.2 Test data for Antenna 1



Low Channel



Middle Channel



High Channel

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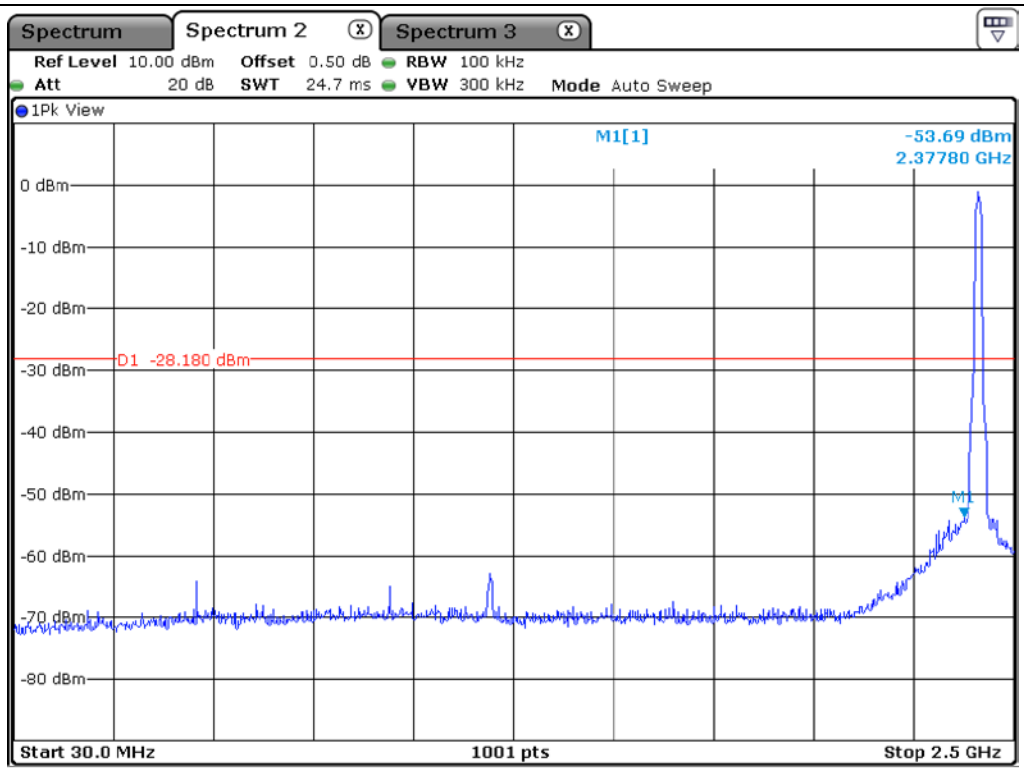
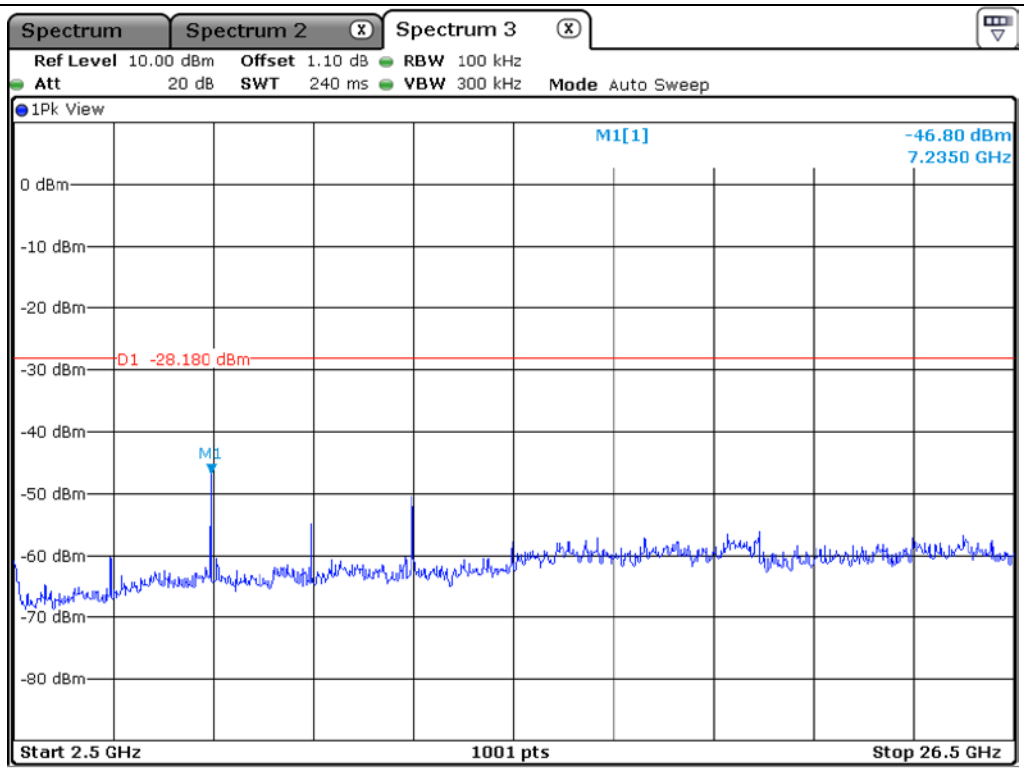


Low Channel



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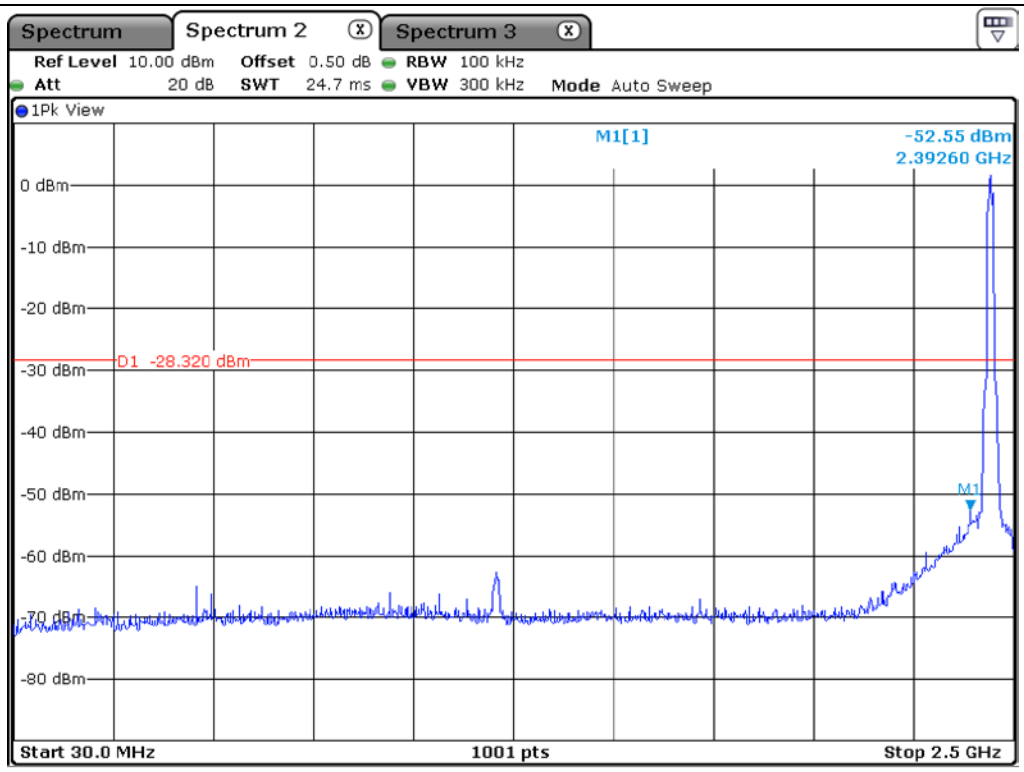
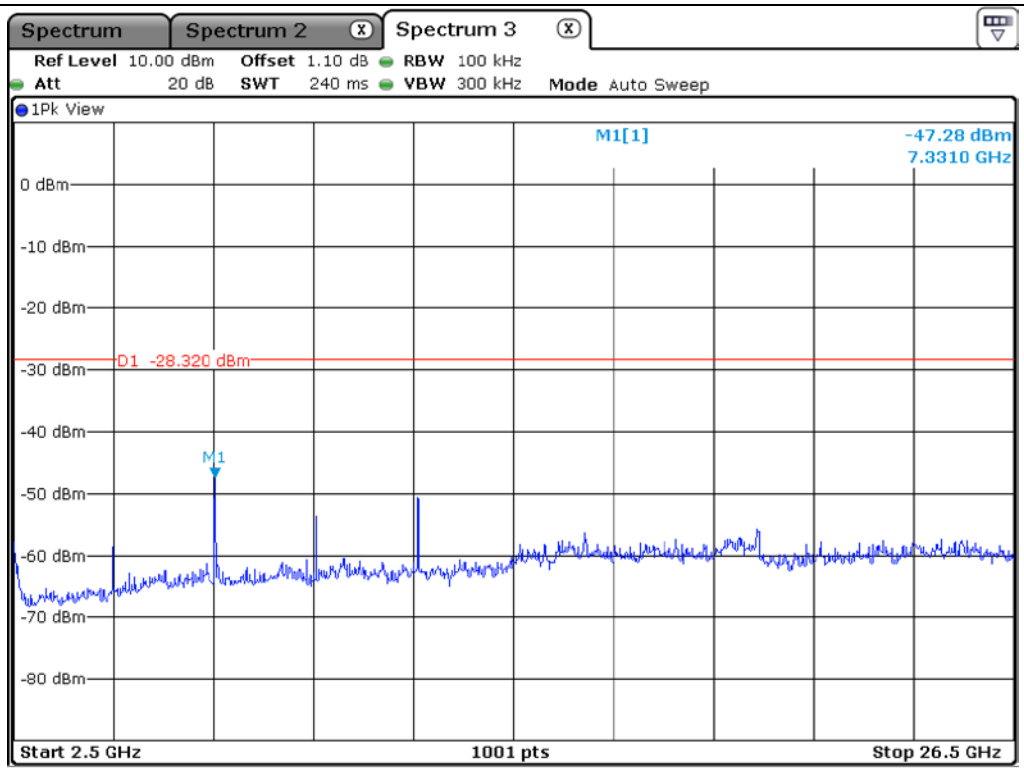
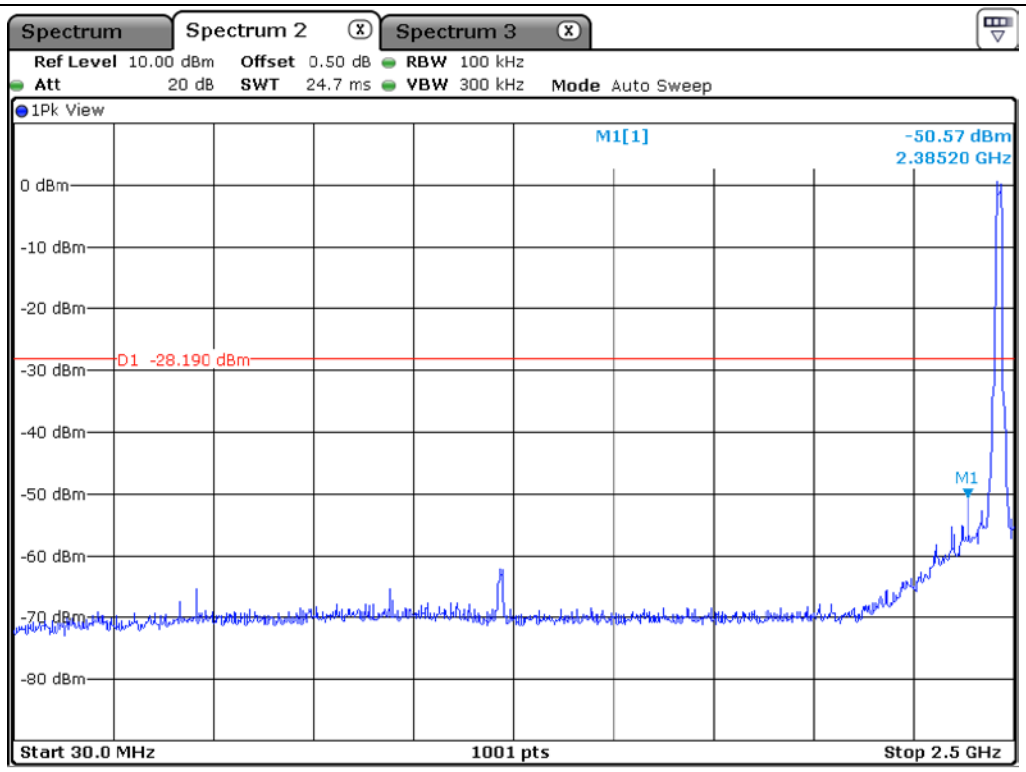


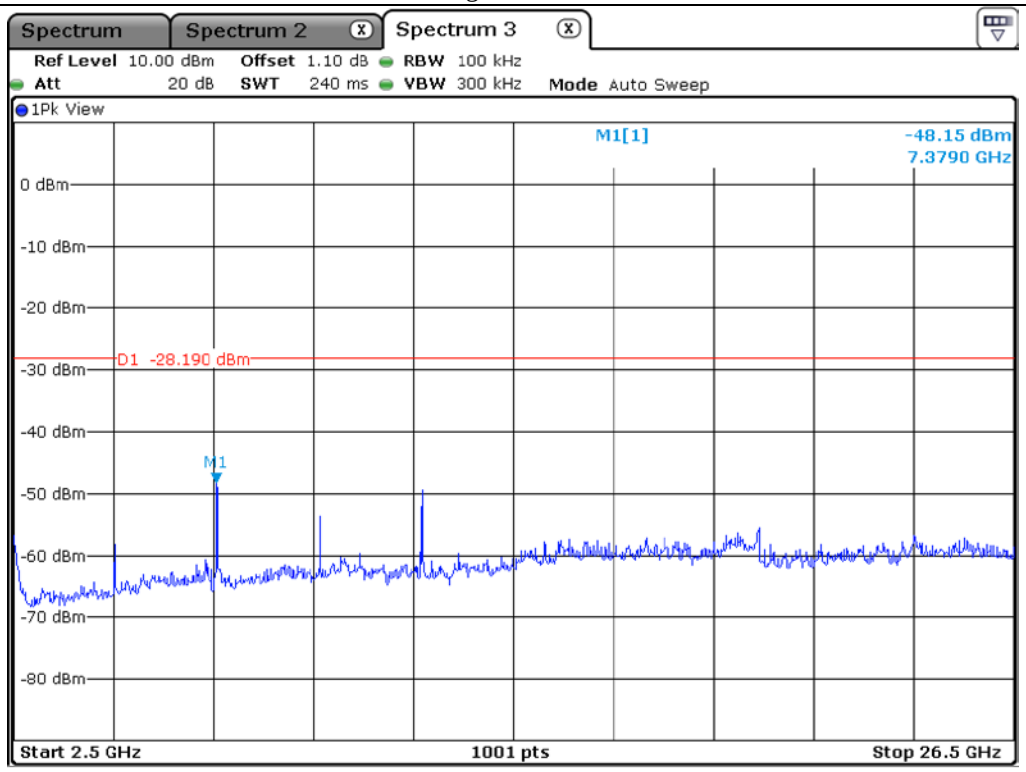
Middle Channel



Middle Channel



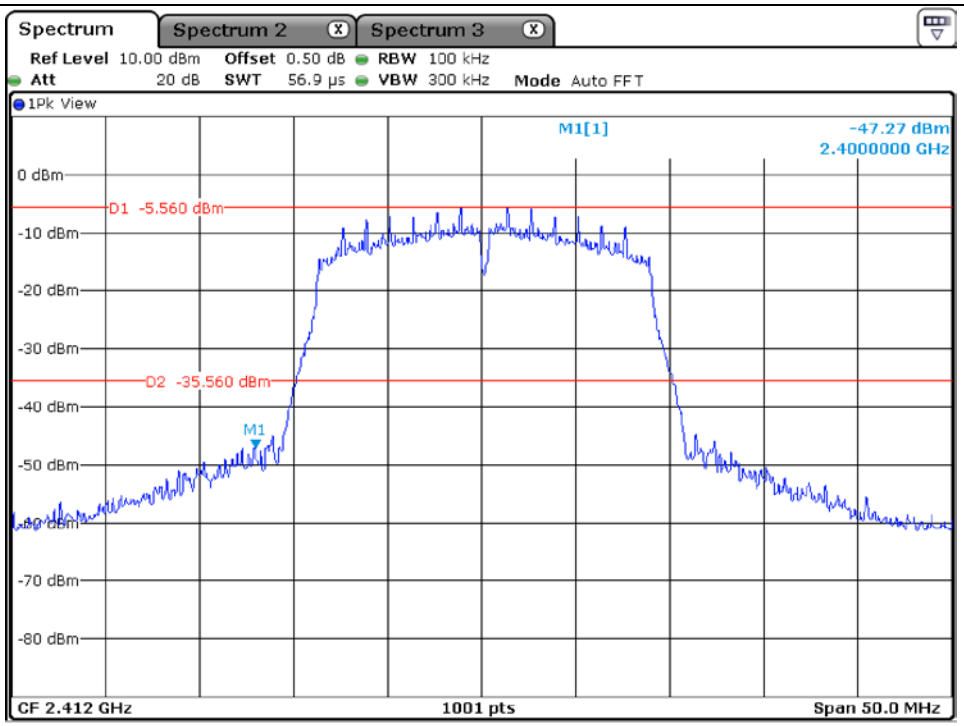
High Channel



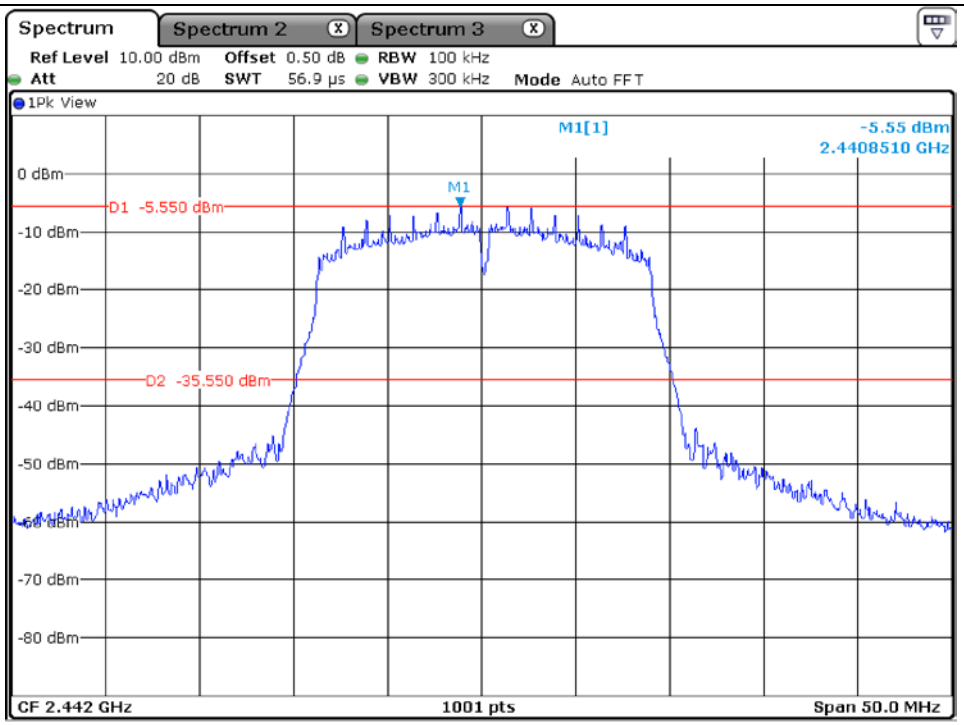
High Channel

9.5.3 Test data for 802.11n_HT20 WLAN Mode

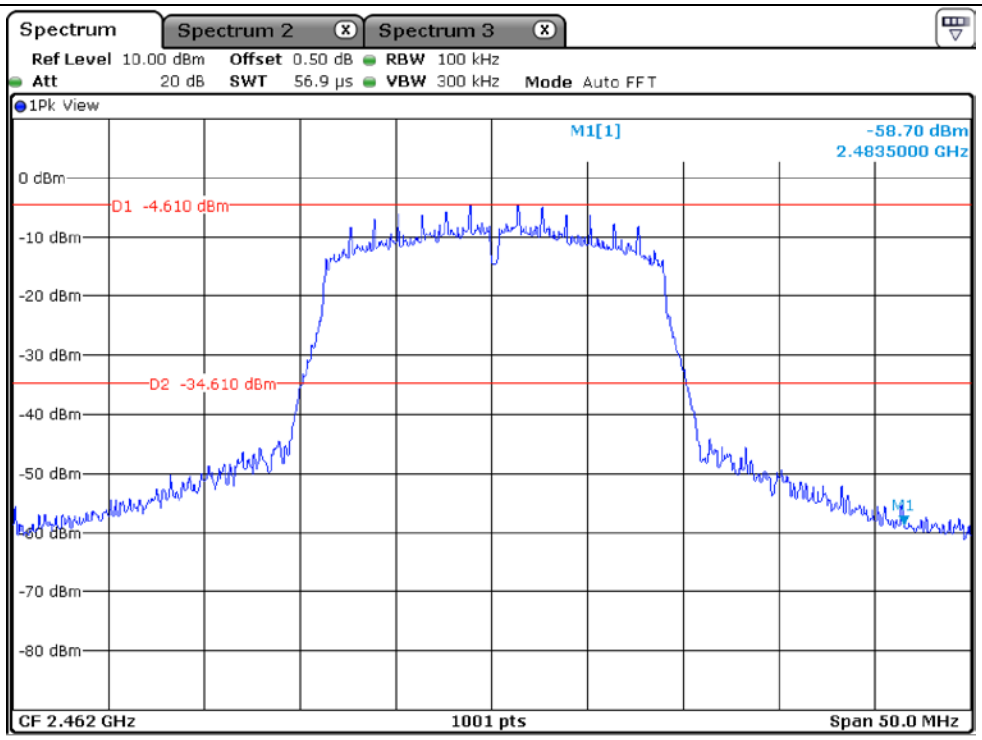
9.5.3.1 Test data for Antenna 0



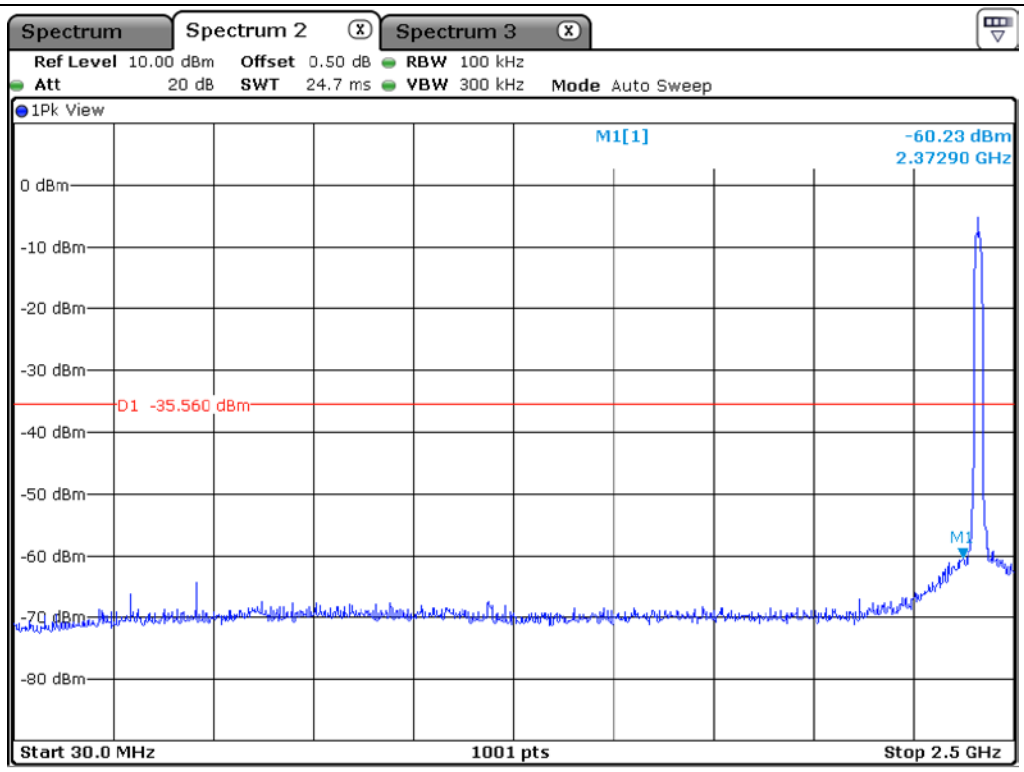
Low Channel



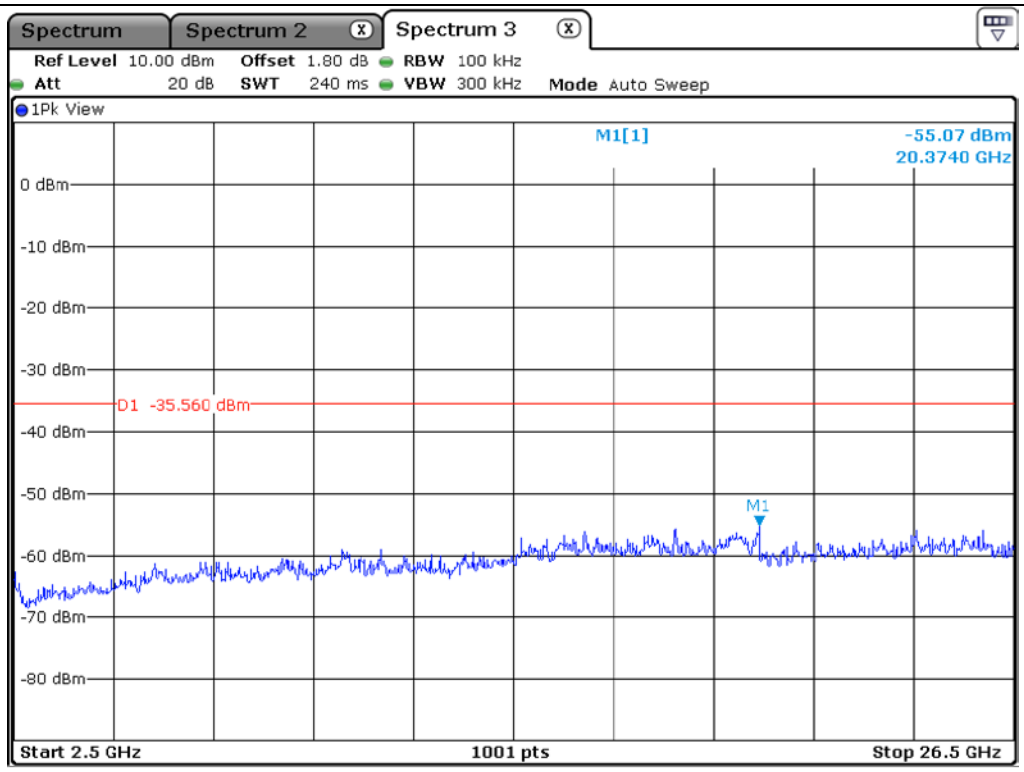
Middle Channel



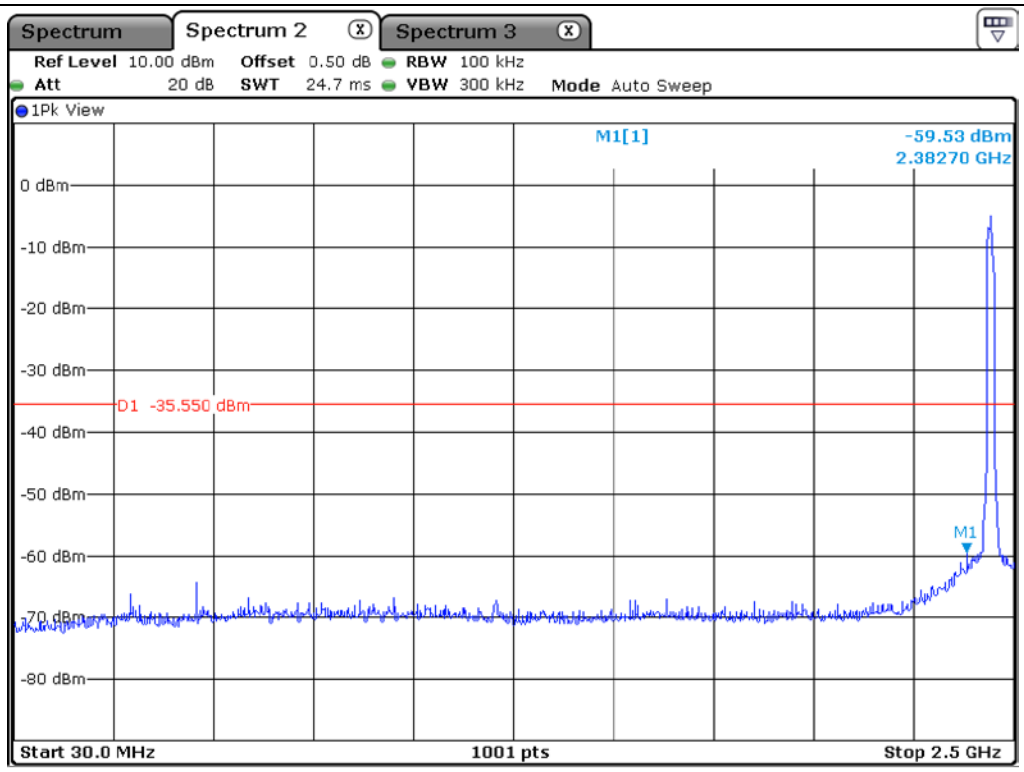
High Channel



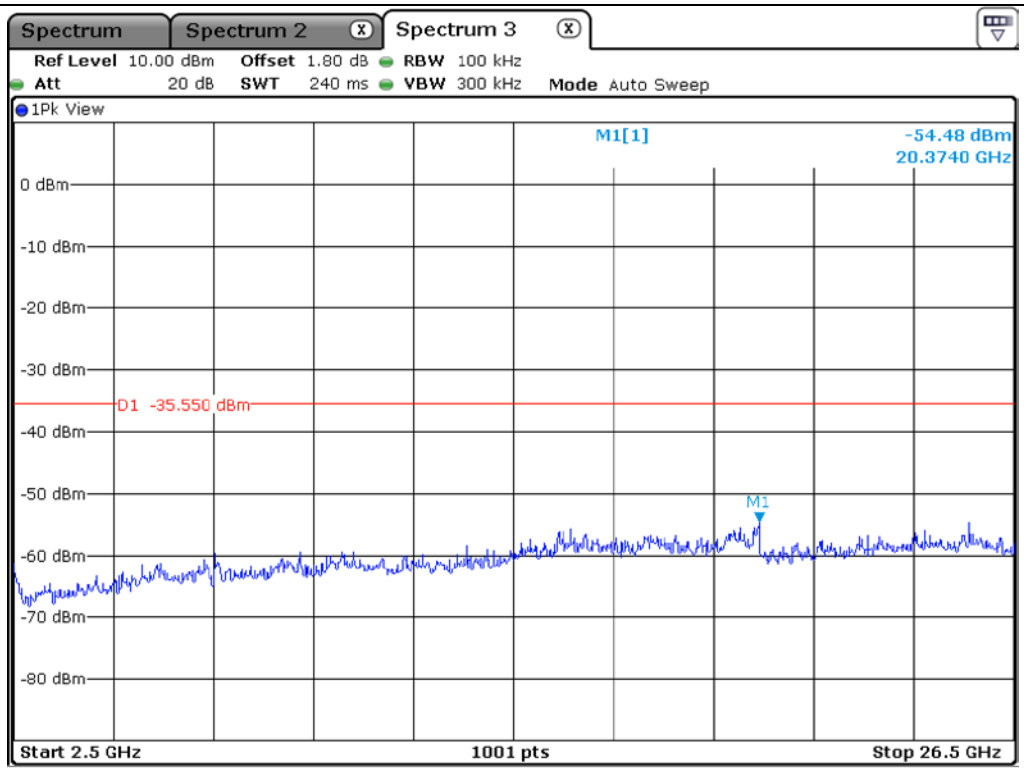
Low Channel



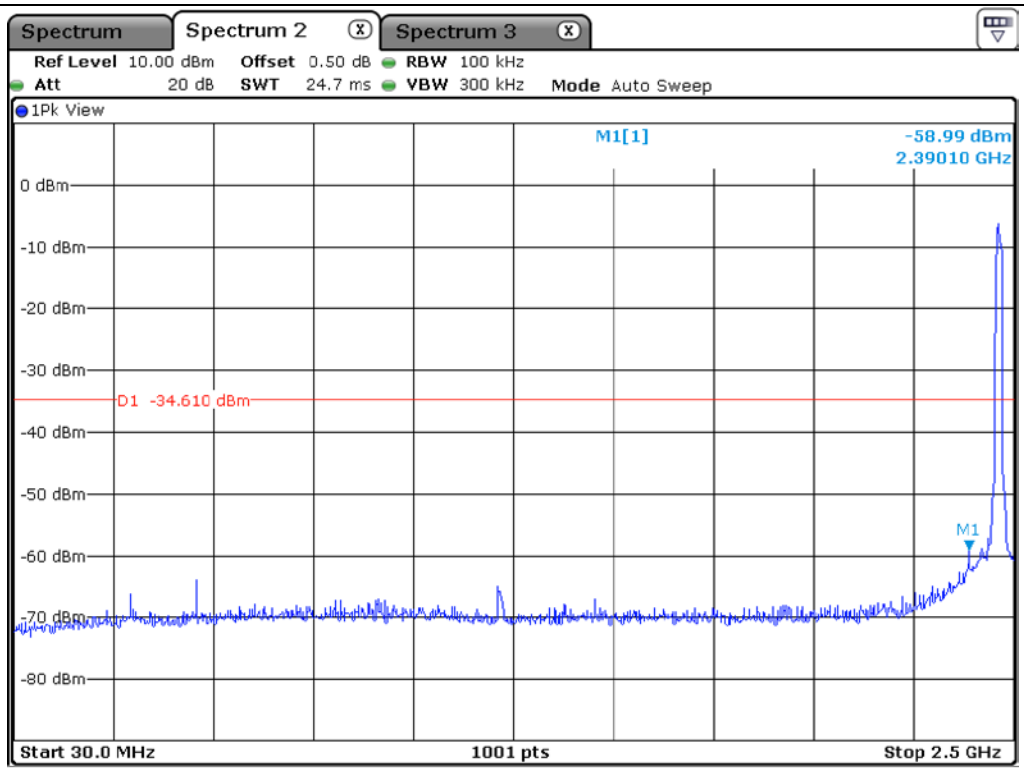
Low Channel



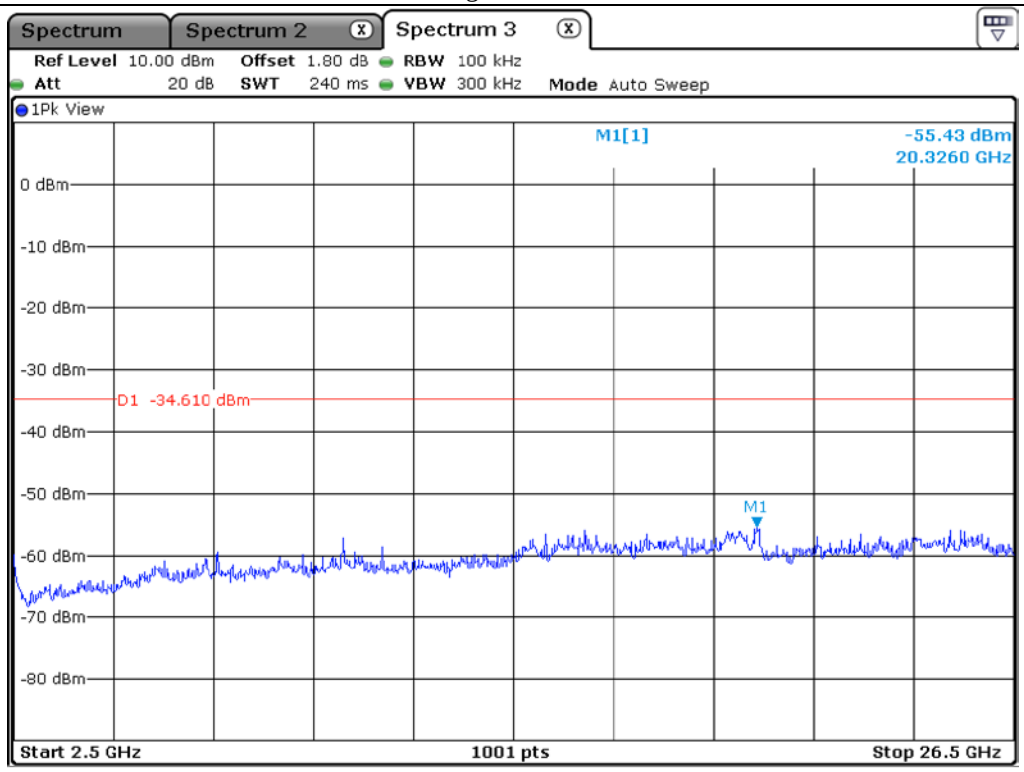
Middle Channel



Middle Channel

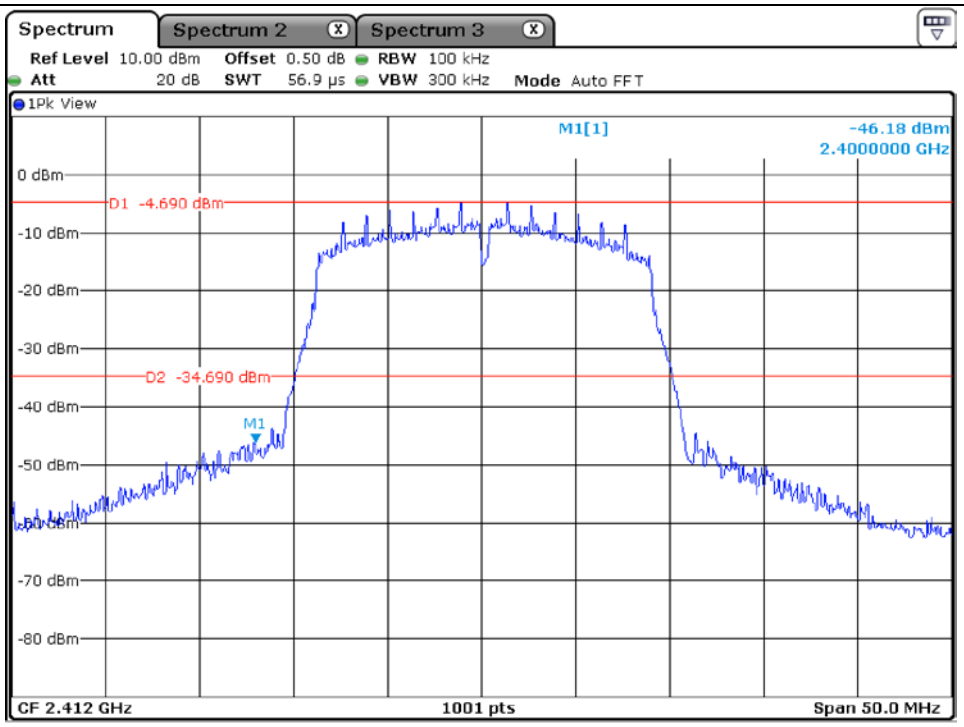


High Channel

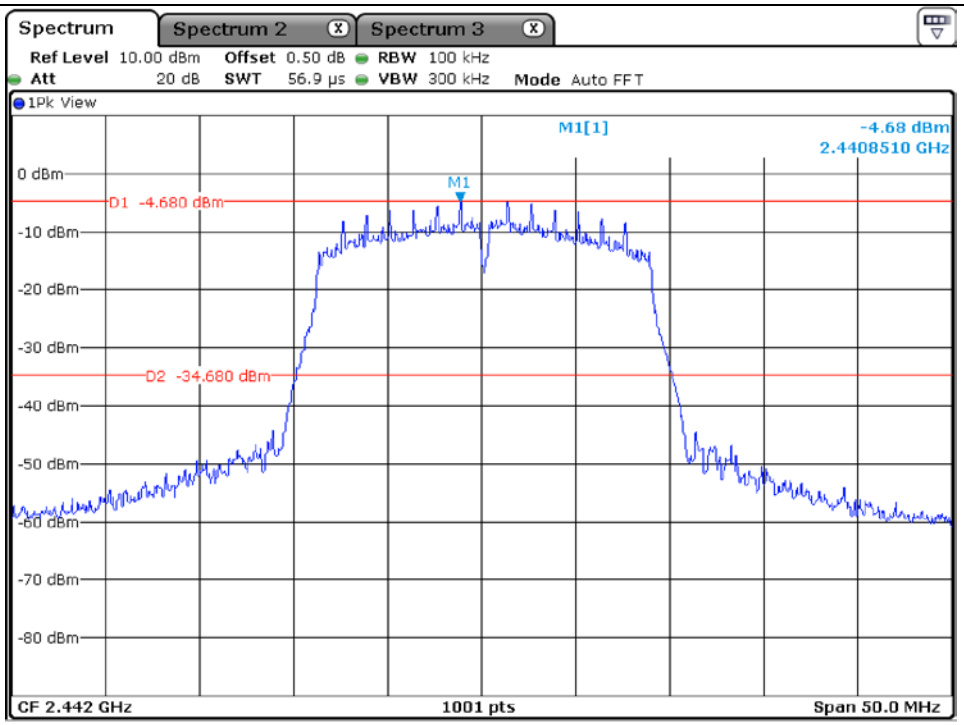


High Channel

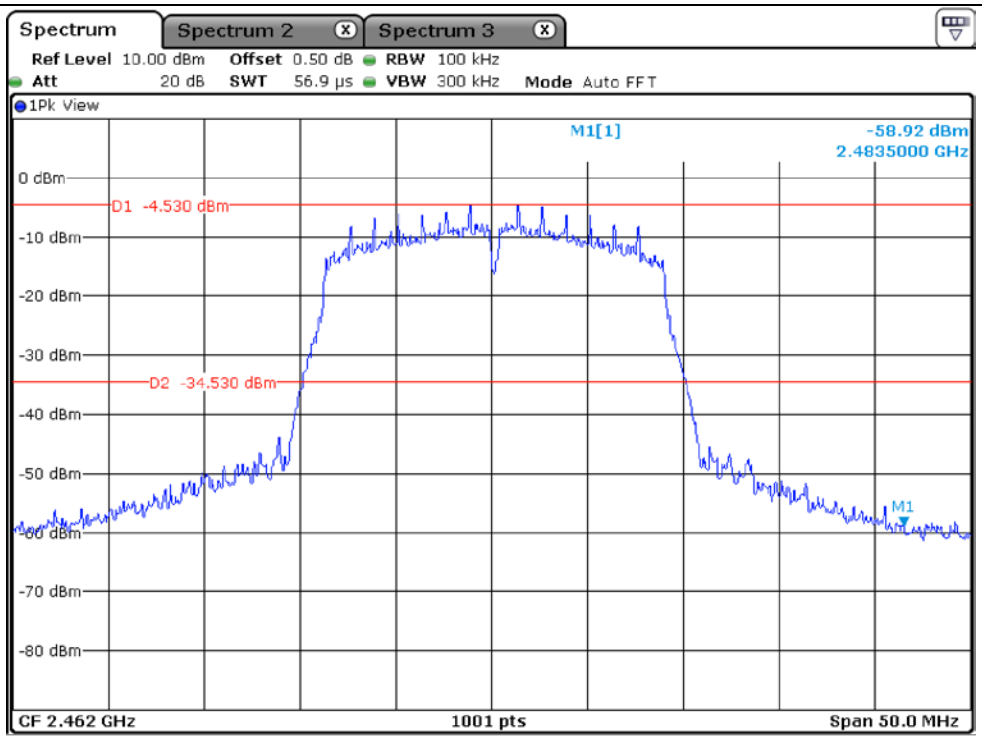
9.5.3.2 Test data for Antenna 1



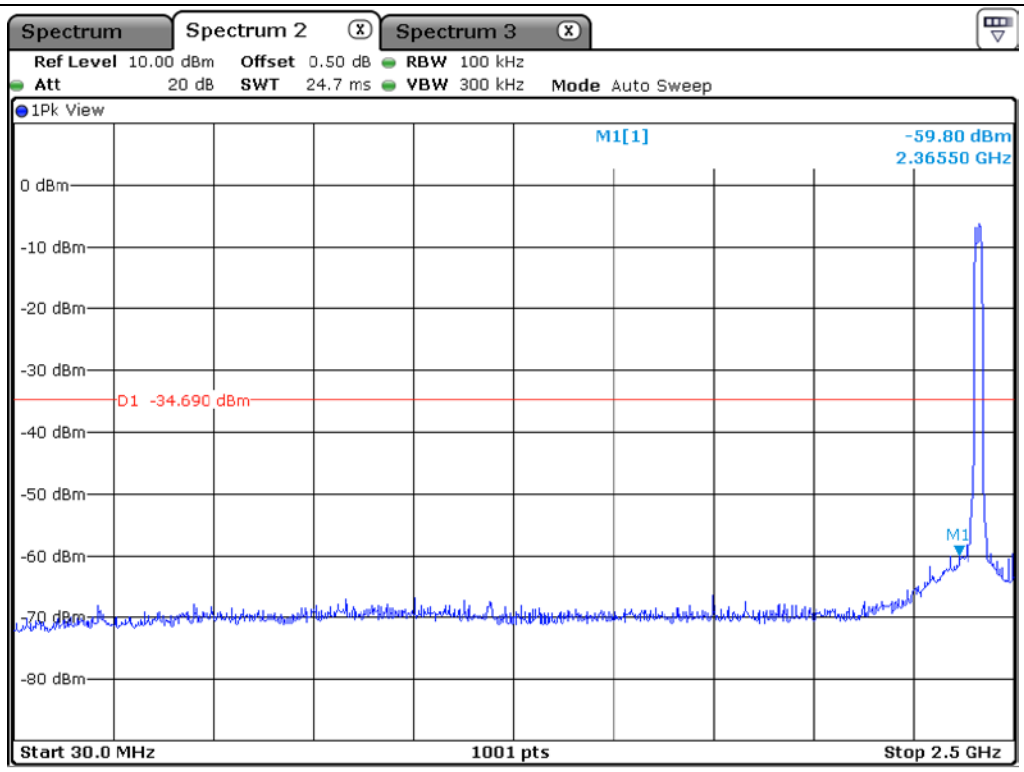
Low Channel



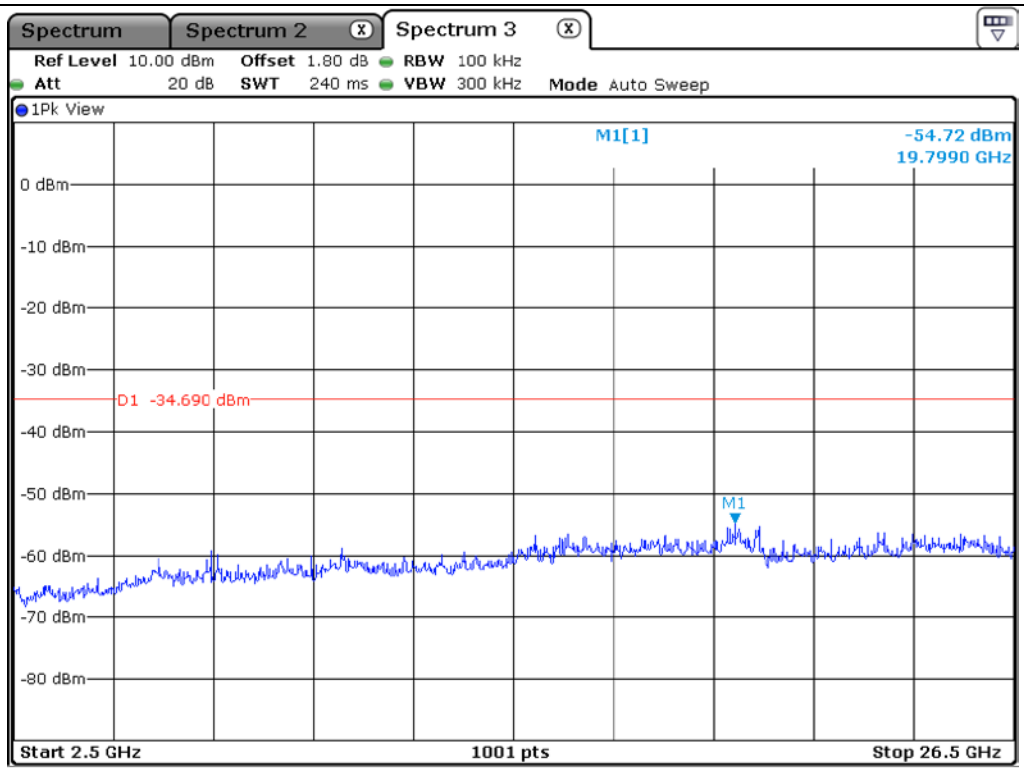
Middle Channel



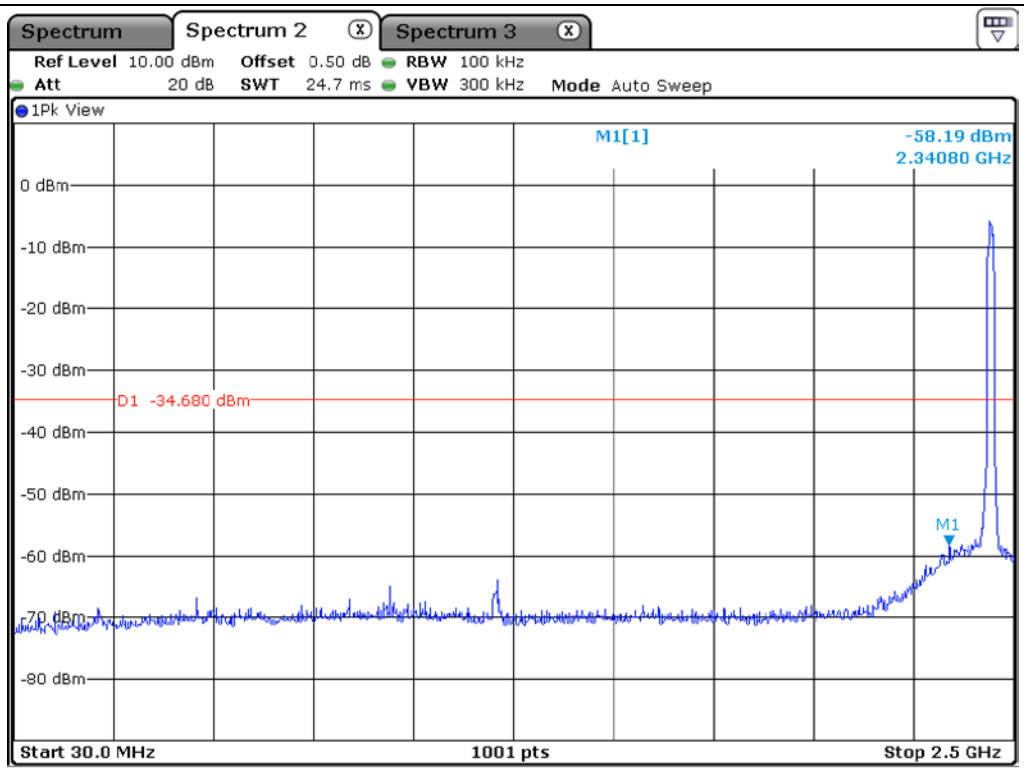
High Channel



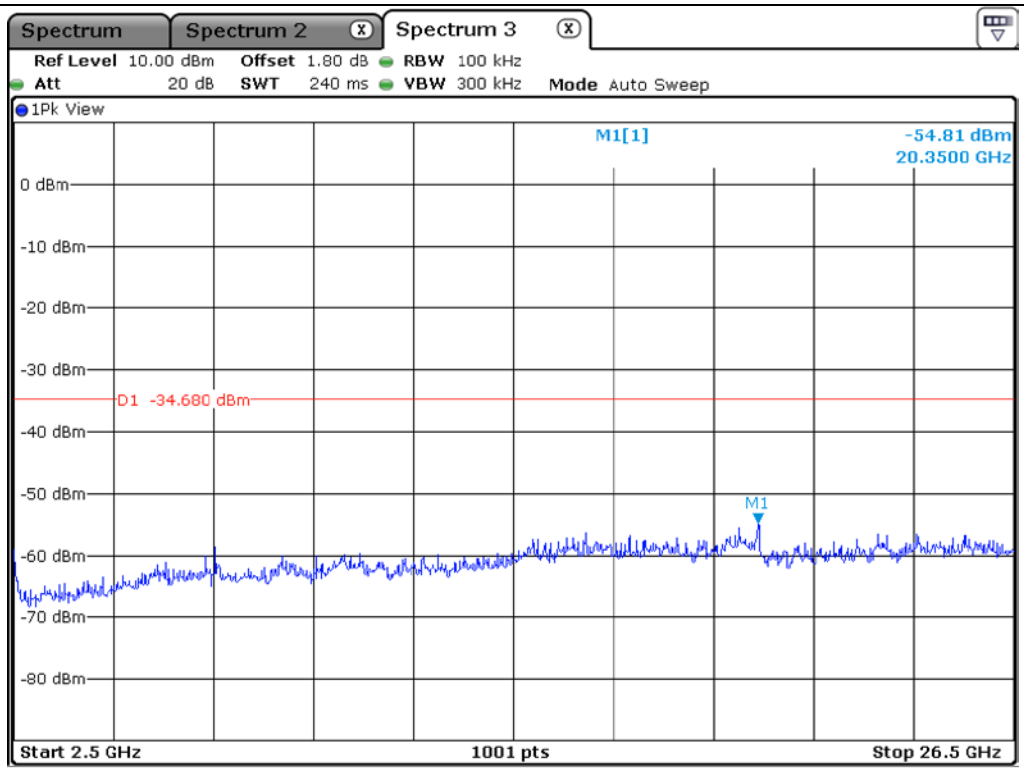
Low Channel



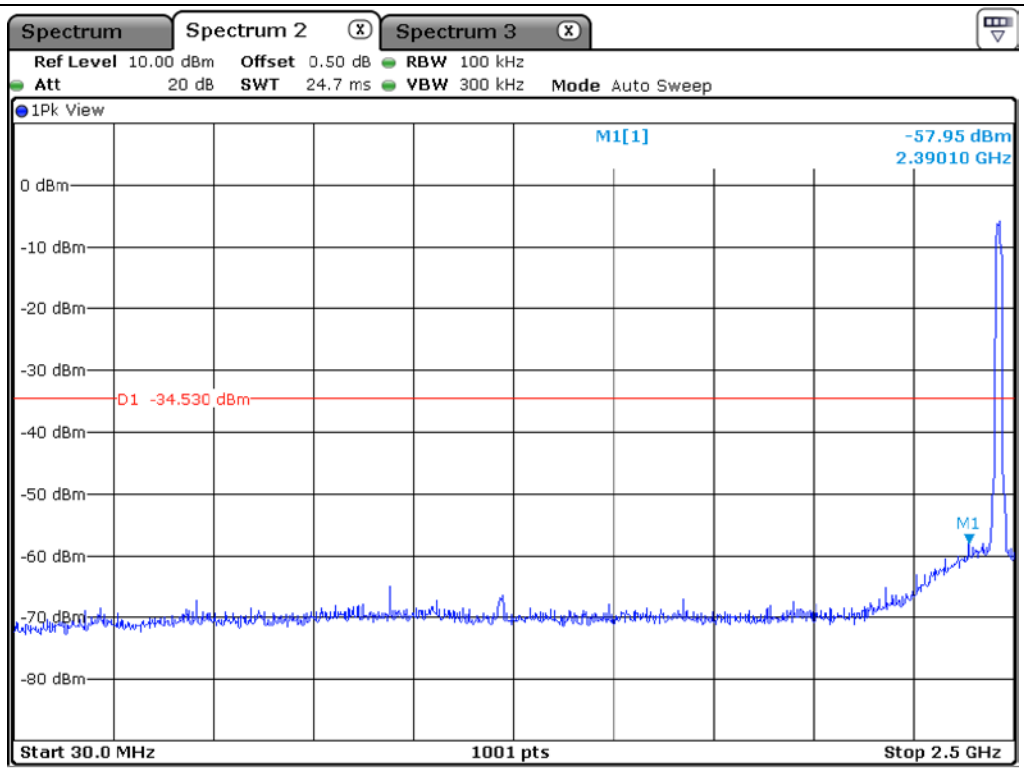
Low Channel



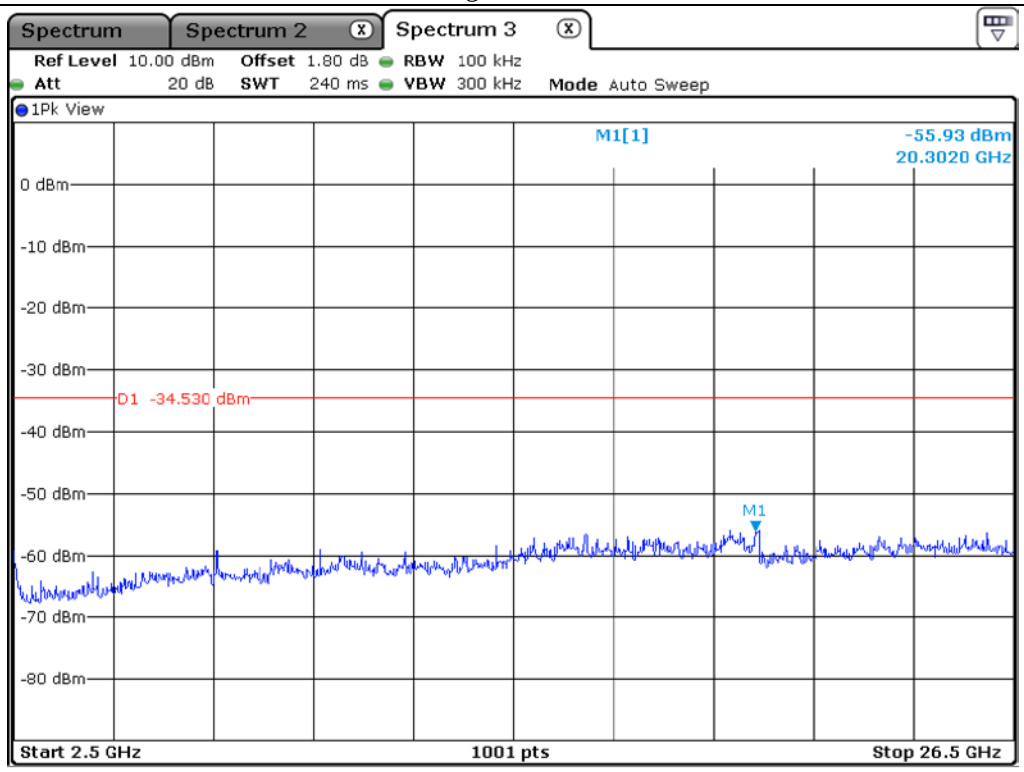
Middle Channel



Middle Channel



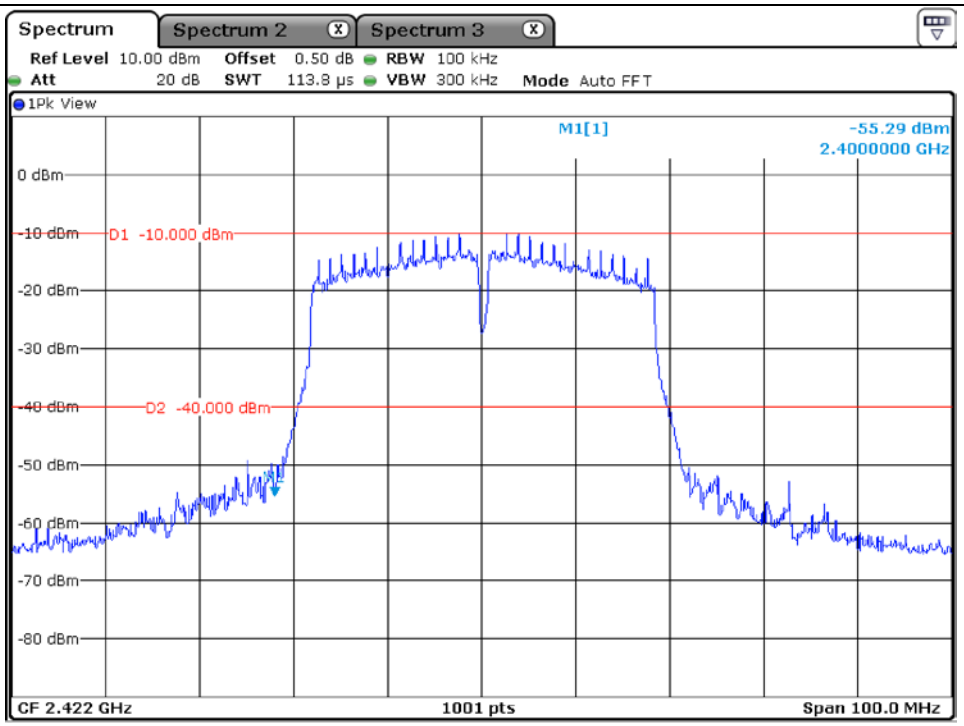
High Channel



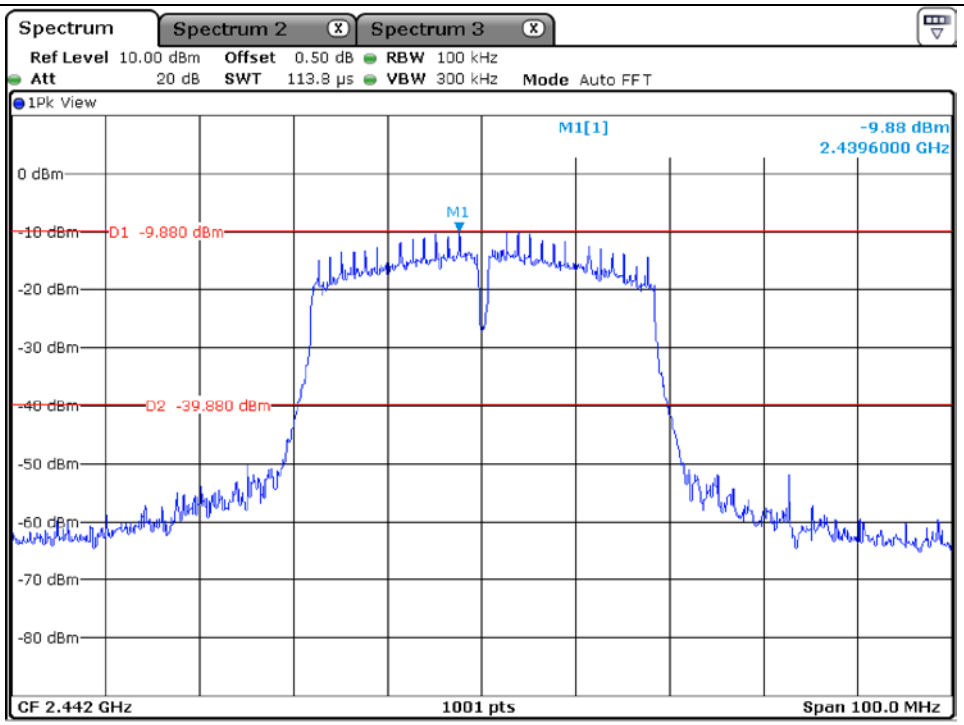
High Channel

9.5.4 Test data for 802.11n_HT40 WLAN Mode

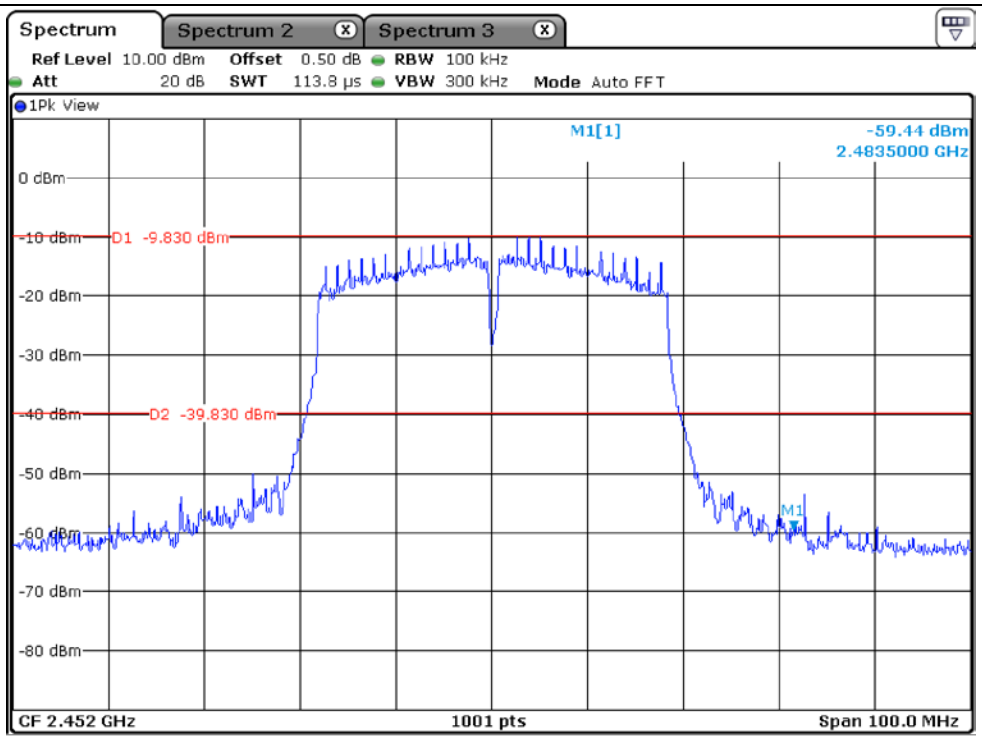
9.5.4.1 Test data for Antenna 0



Low Channel



Middle Channel



High Channel

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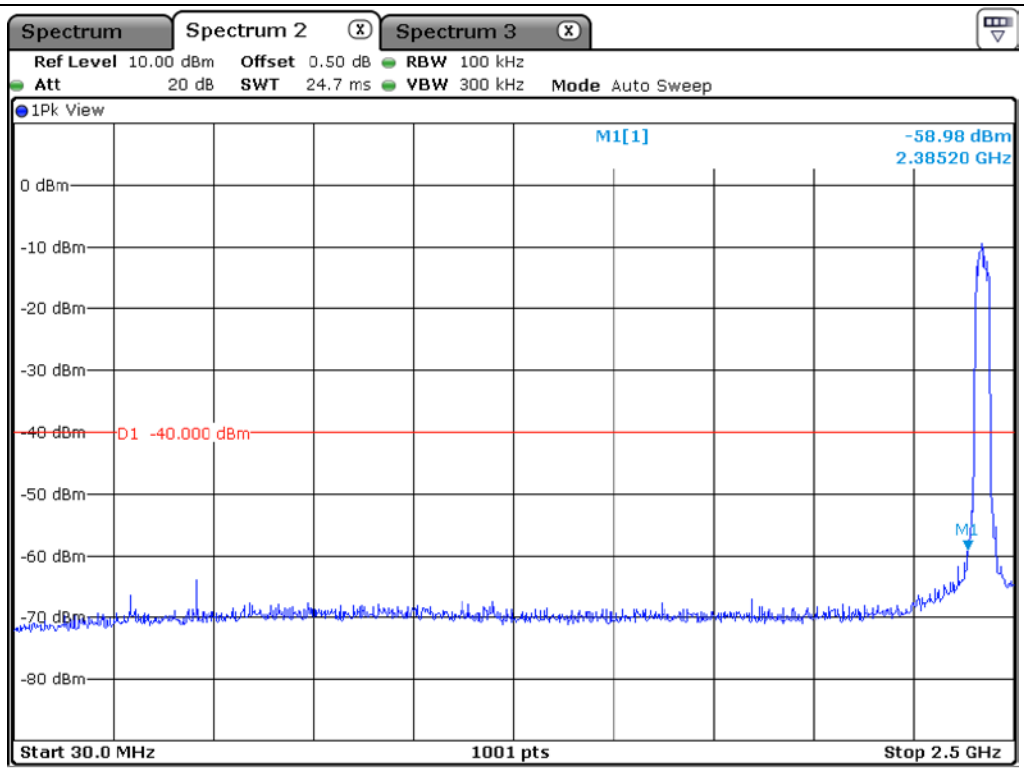
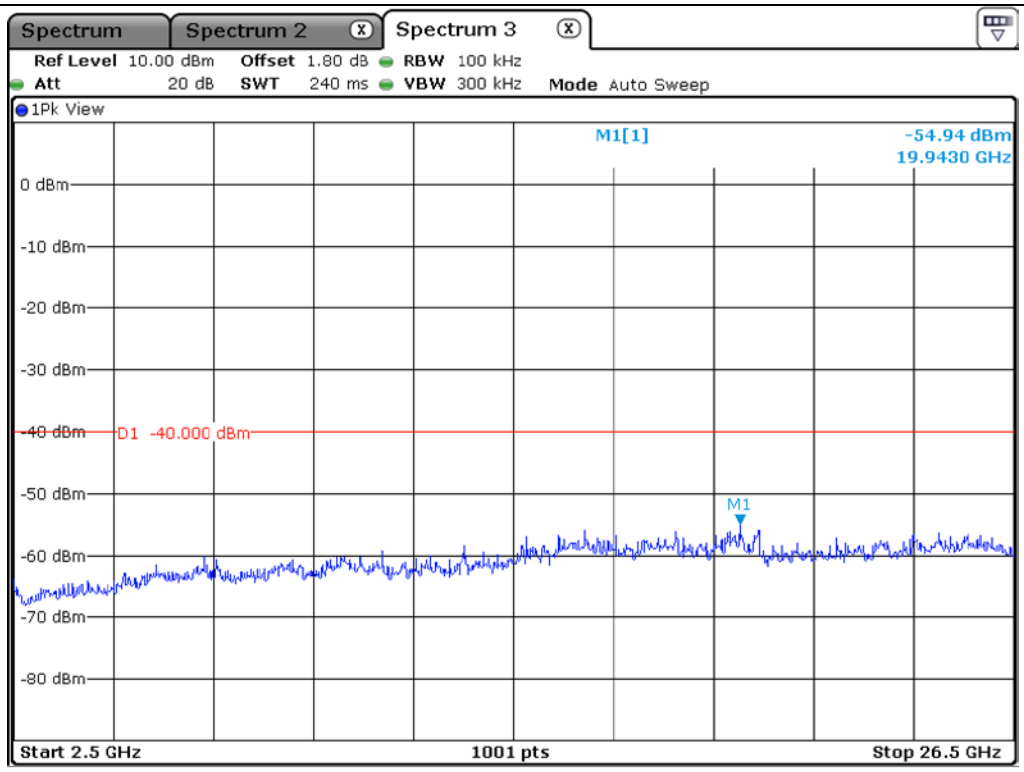
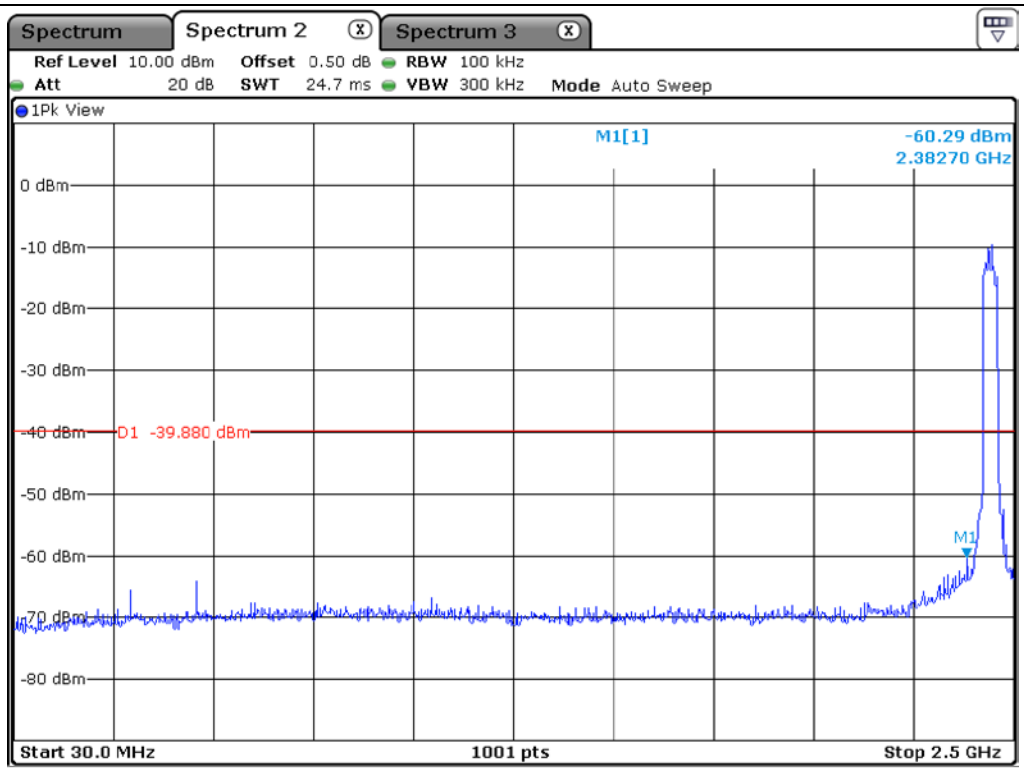


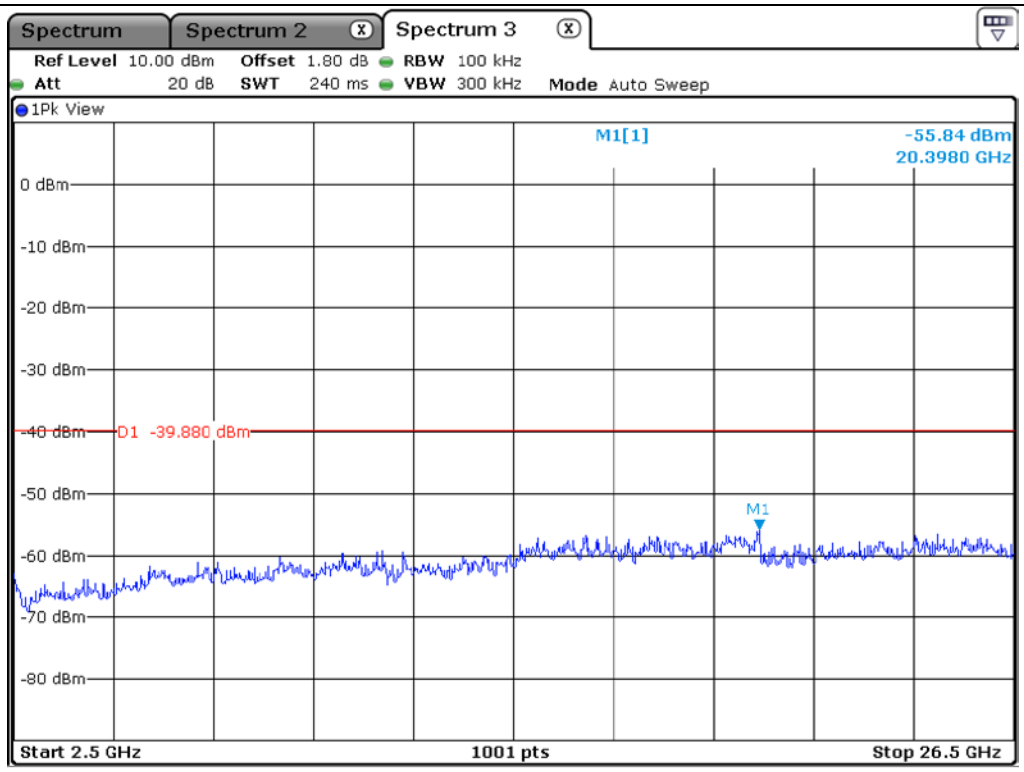
Low Channel



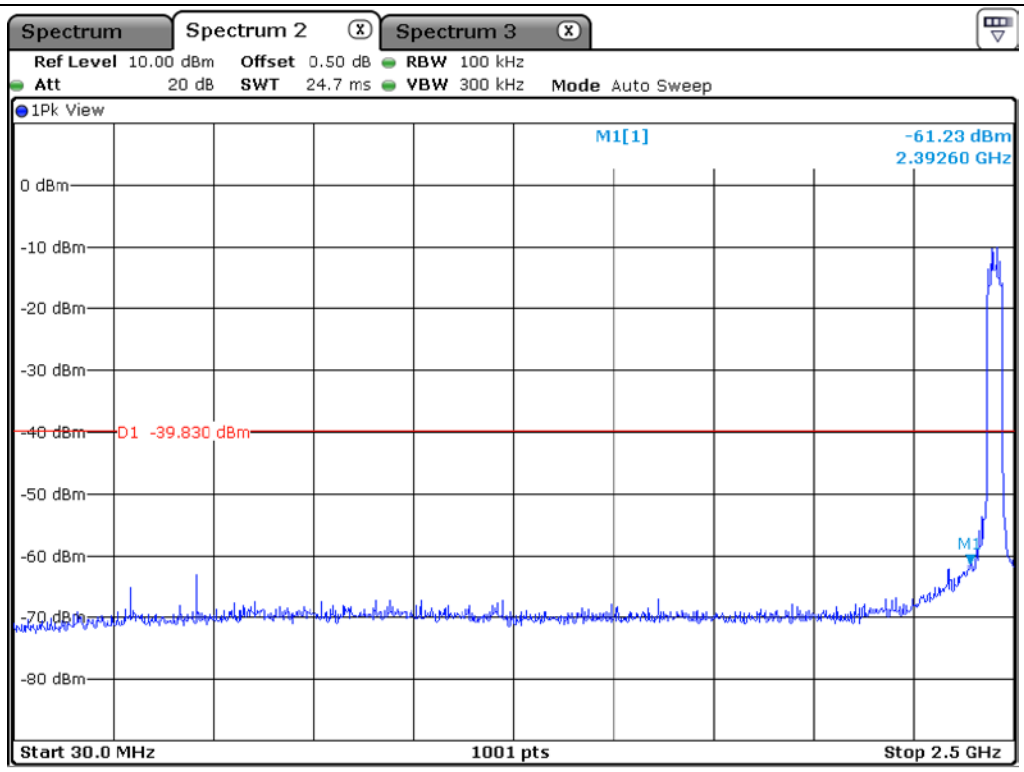
Low Channel



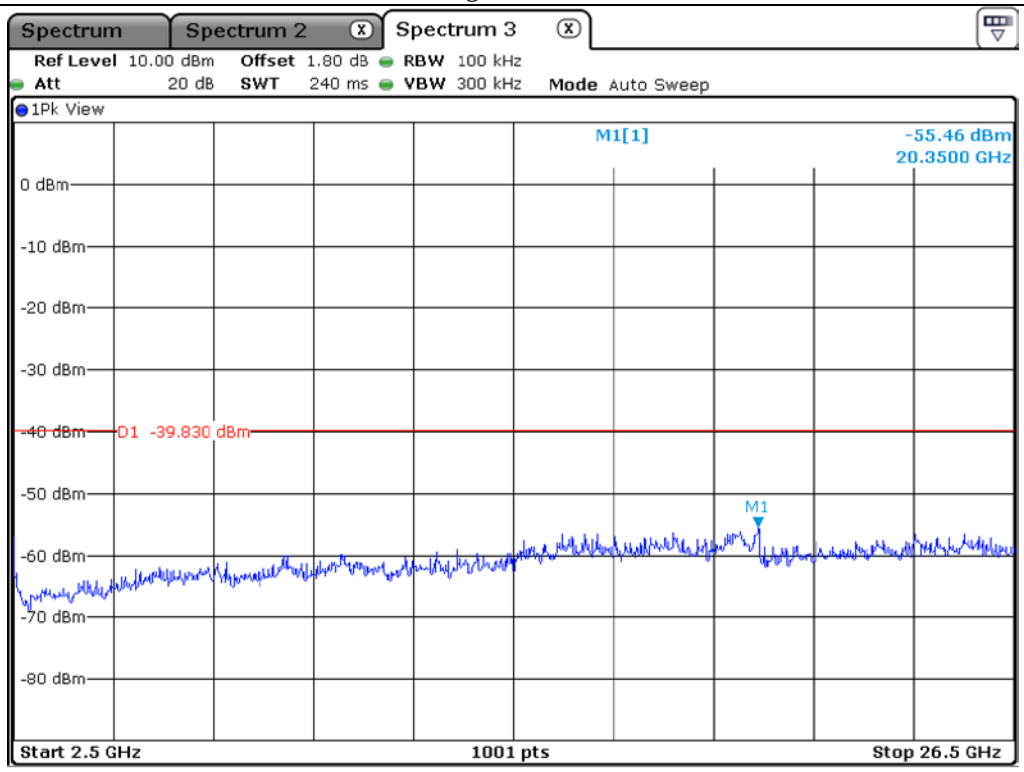
Middle Channel



Middle Channel

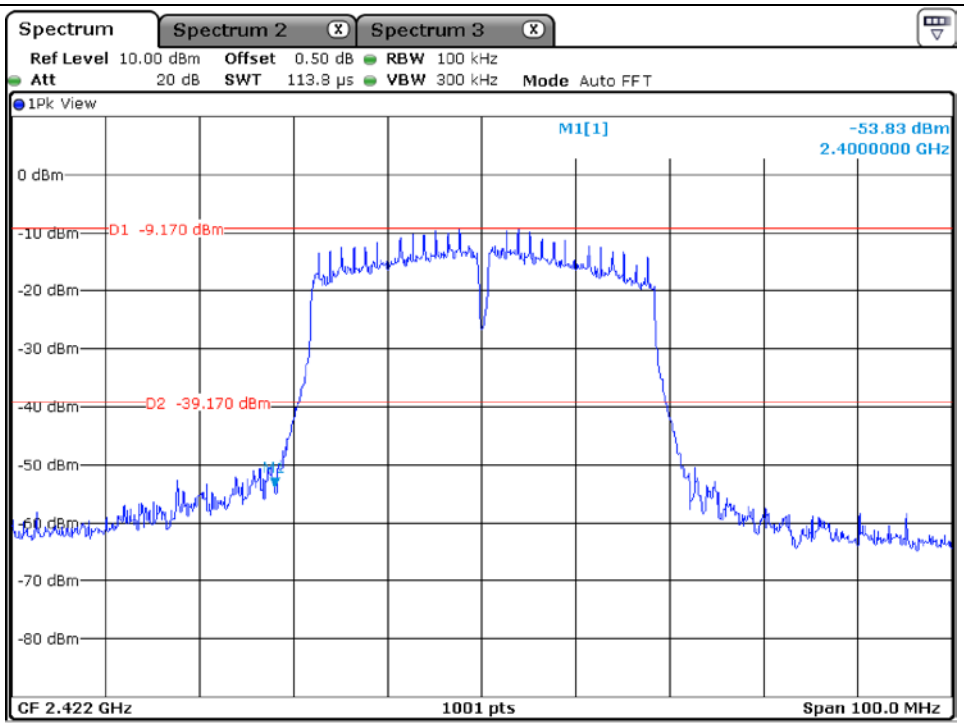


High Channel

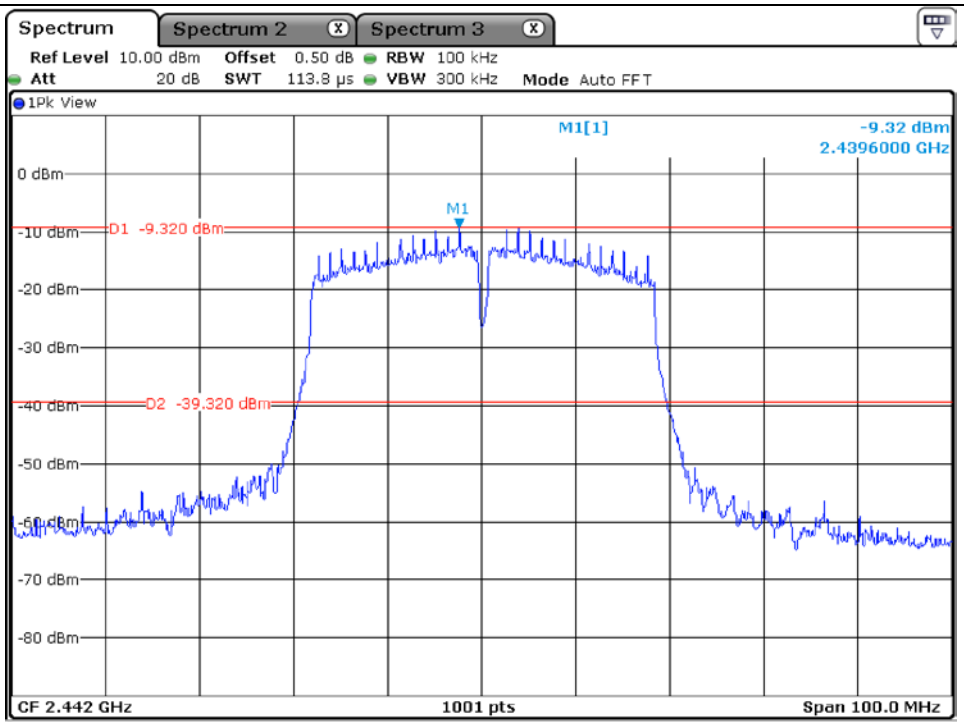


High Channel

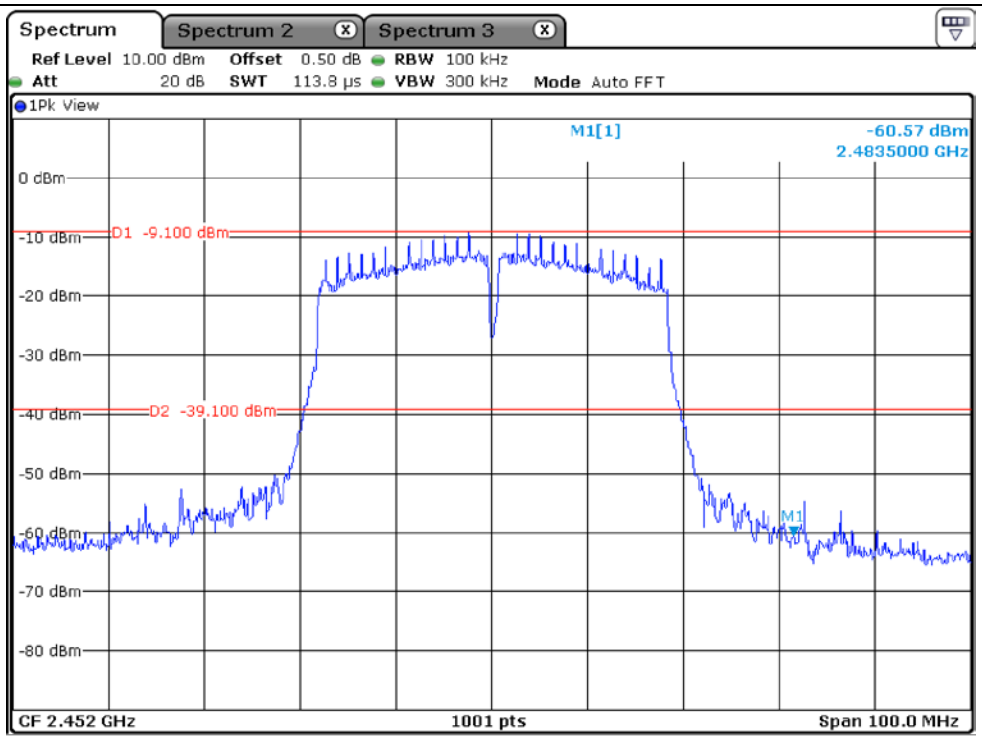
9.5.4.2 Test data for Antenna 1



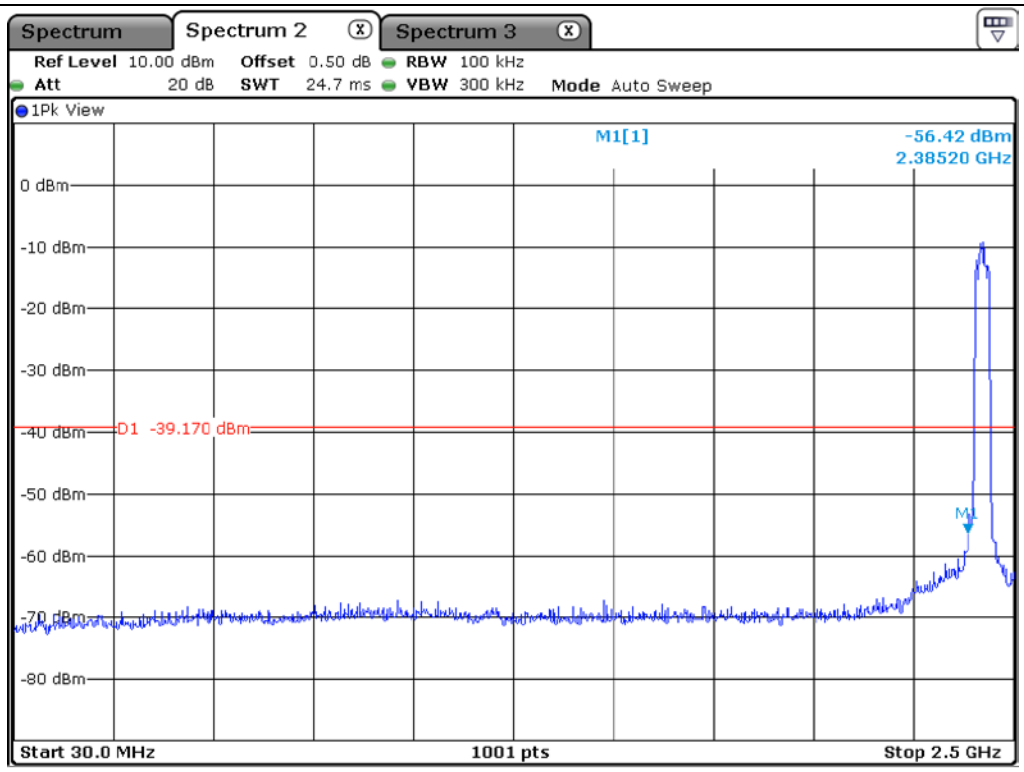
Low Channel



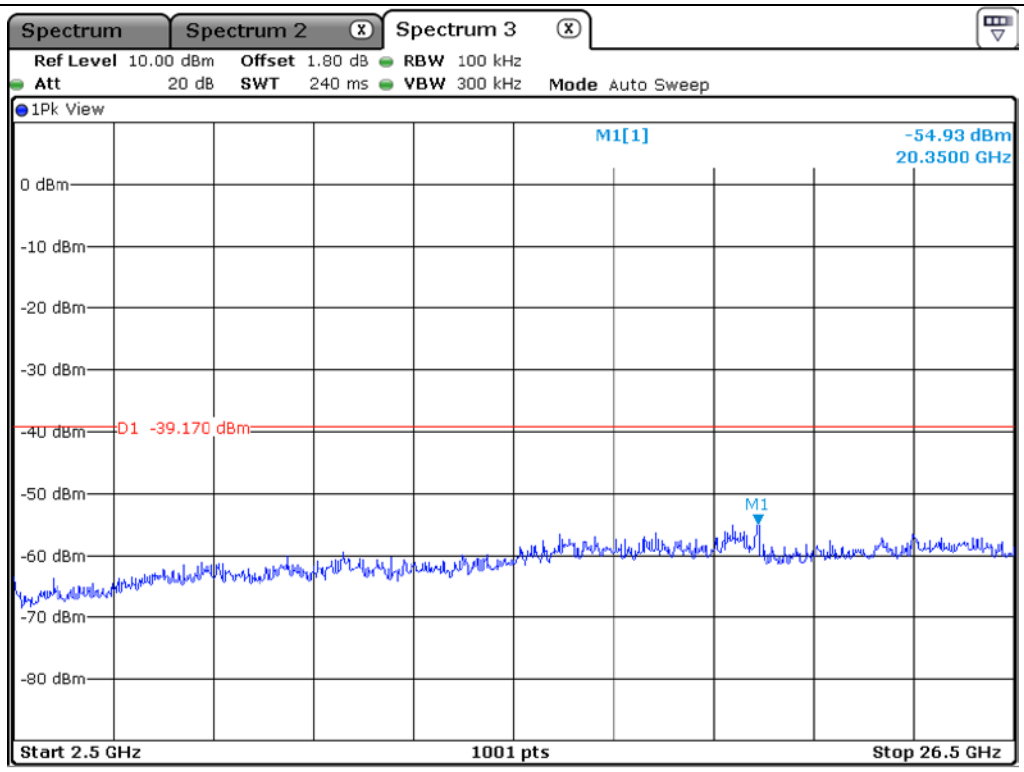
Middle Channel



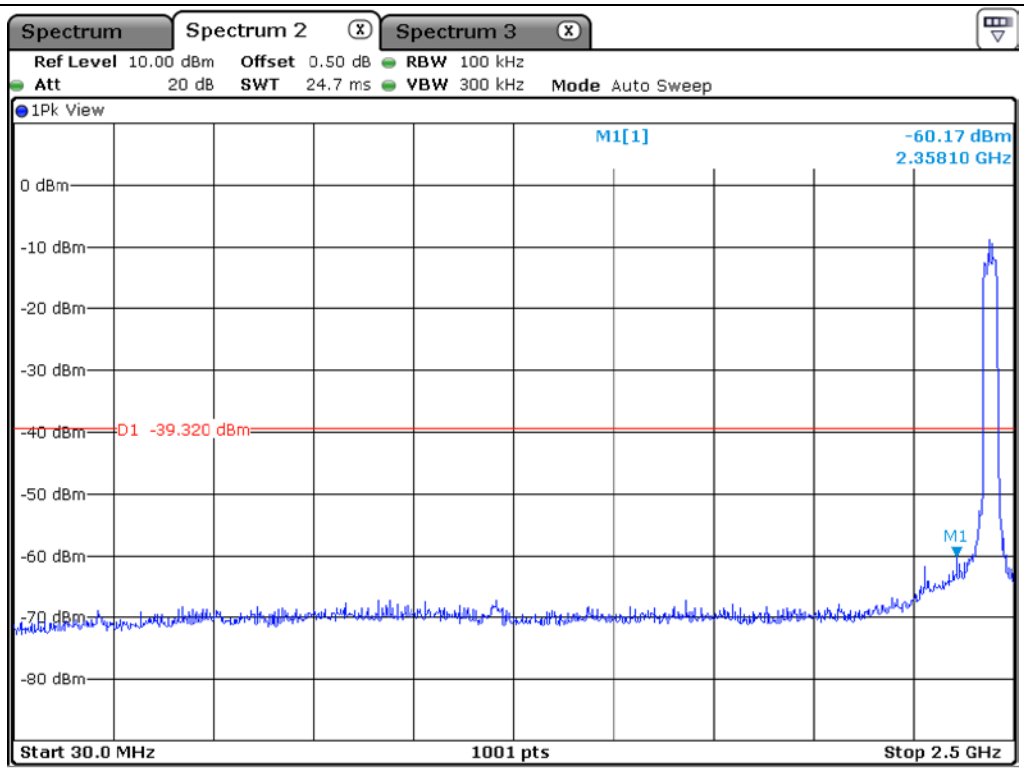
High Channel



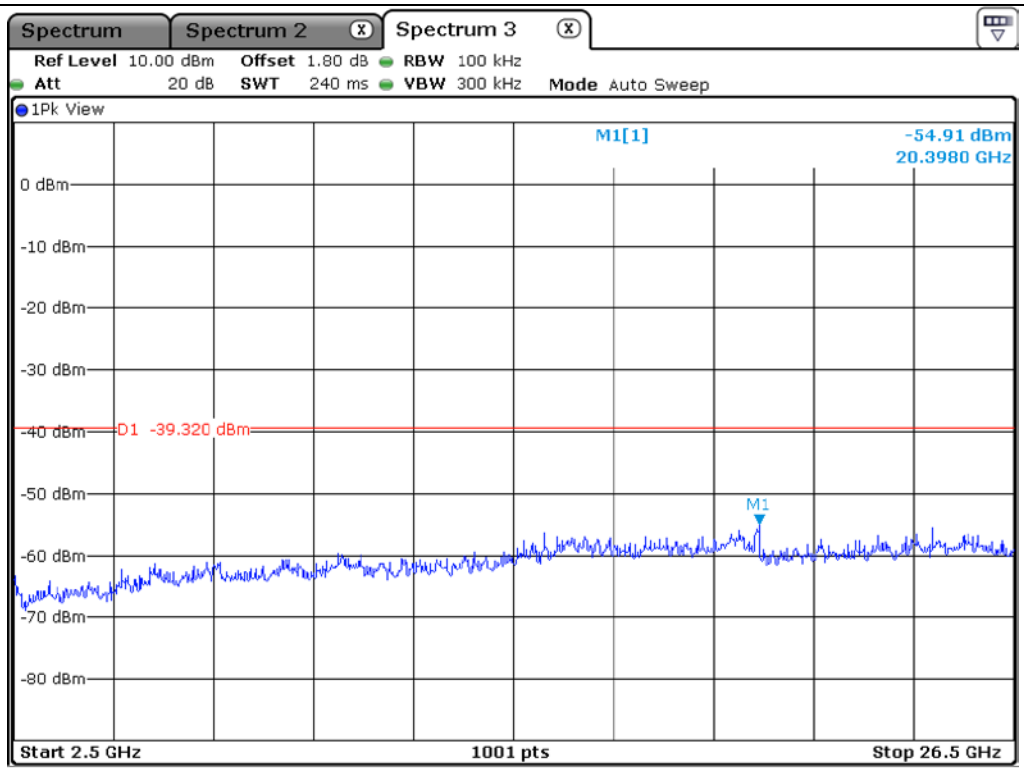
Low Channel



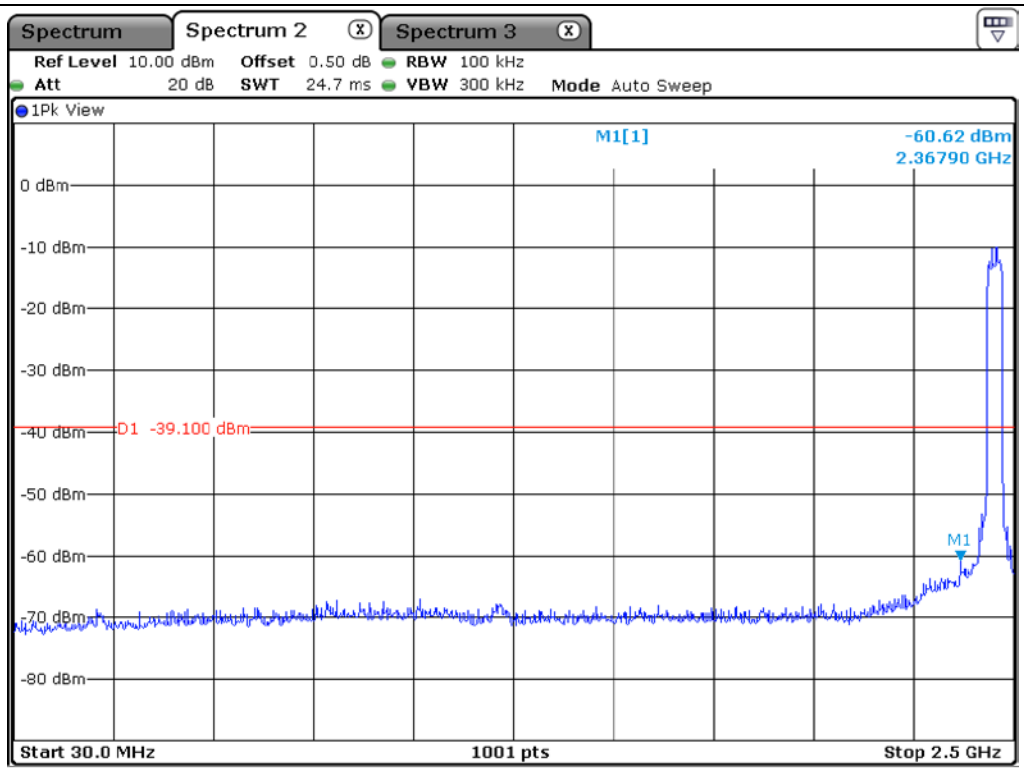
Low Channel



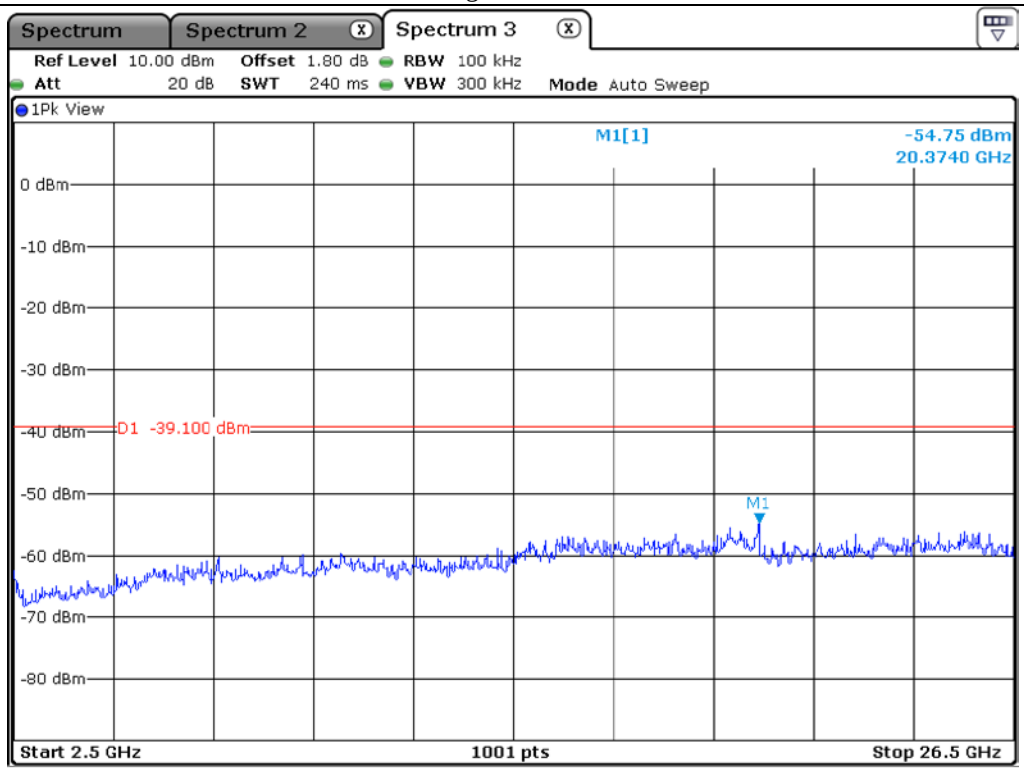
Middle Channel



Middle Channel



High Channel



High Channel

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 : January 06, 2020 ~ January 16, 2020

-. 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 : 97.30 %

-. Result : PASSED

Frequency (MHz)	Reading (dBμV)	Detector Mode	Ant. Pol. (H/V)	Ant. Factor	Cable Loss	Correction Factor (dB)	Total (dBμV/m)	Limits (dBμV/m)	Margin (dB)
Test Data for Low Channel									
2 388.122	17.35	Peak	H	26.90	3.07	-	47.32	74.00	26.68
2 383.806	15.84	Average	H			0.12	45.93	54.00	8.07
2 388.042	13.47	Peak	V			-	43.44	74.00	30.56
2 386.444	11.26	Average	V			0.12	41.35	54.00	12.65
Test Data for High Channel									
2 488.931	13.37	Peak	H	26.60	3.16	-	43.13	74.00	30.87
2 499.464	10.12	Average	H			0.12	40.00	54.00	14.00
2 494.354	10.95	Peak	V			-	40.71	74.00	33.29
2 499.547	7.10	Average	V			0.12	36.98	54.00	17.02

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 + Correction Factor

Tested by: Hyung-Kwon, Oh / Manager

9.6.1.1.2 Test data for Antenna 1

-. Test Date : January 06, 2020 ~ January 16, 2020

-. 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 : 97.30 %

-. Result : PASSED

Frequency (MHz)	Reading (dBµV)	Detector Mode	Ant. Pol. (H/V)	Ant. Factor	Cable Loss	Correction Factor (dB)	Total (dBµV/m)	Limits (dBµV/m)	Margin (dB)
Test Data for Low Channel									
2 383.407	16.94	Peak	H	26.90	3.07	-	46.91	74.00	27.09
2 388.681	14.06	Average	H			0.12	44.15	54.00	9.85
2 345.045	13.69	Peak	V			-	43.66	74.00	30.34
2 377.732	10.12	Average	V			0.12	40.21	54.00	13.79
Test Data for High Channel									
2 489.113	13.25	Peak	H	26.60	3.16	-	43.01	74.00	30.99
2 489.113	9.98	Average	H			0.12	39.86	54.00	14.14
2 492.541	10.55	Peak	V			-	40.31	74.00	33.69
2 489.080	6.67	Average	V			0.12	36.55	54.00	17.45

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 + Correction Factor

Tested by: Hyung-Kwon, Oh / Manager

9.6.1.2 Test data for 802.11g WLAN Mode

9.6.1.2.1 Test data for Antenna 0

-. Test Date : January 06, 2020 ~ January 16, 2020

-. 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 : 95.55 %

-. Result : PASSED

Frequency (MHz)	Reading (dBµV)	Detector Mode	Ant. Pol. (H/V)	Ant. Factor	Cable Loss	Correction Factor (dB)	Total (dBµV/m)	Limits (dBµV/m)	Margin (dB)
Test Data for Low Channel									
2 389.880	21.39	Peak	H	26.90	3.07	-	51.36	74.00	22.64
2 389.960	19.39	Average	H			0.20	49.56	54.00	4.44
2 389.720	19.90	Peak	V			-	49.87	74.00	24.13
2 389.640	17.56	Average	V			0.20	47.73	54.00	6.27
Test Data for High Channel									
2 483.508	16.86	Peak	H	26.60	3.16	-	46.62	74.00	27.38
2 483.508	14.13	Average	H			0.20	44.09	54.00	9.91
2 483.508	12.15	Peak	V			-	41.91	74.00	32.09
2 483.508	10.20	Average	V			0.20	40.16	54.00	13.84

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 + Correction Factor

Tested by: Hyung-Kwon, Oh / Manager

9.6.1.2.2 Test data for Antenna 1

-. Test Date : January 06, 2020 ~ January 16, 2020

-. 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 : 95.55 %

-. Result : PASSED

Frequency (MHz)	Reading (dBµV)	Detector Mode	Ant. Pol. (H/V)	Ant. Factor	Cable Loss	Correction Factor (dB)	Total (dBµV/m)	Limits (dBµV/m)	Margin (dB)
Test Data for Low Channel									
2 389.960	20.26	Peak	H	26.90	3.07	-	50.23	74.00	23.77
2 389.640	18.51	Average	H			0.20	48.68	54.00	5.32
2 389.800	17.94	Peak	V			-	47.91	74.00	26.09
2 389.960	15.90	Average	V			0.20	46.07	54.00	7.93
Test Data for High Channel									
2 483.508	15.82	Peak	H	26.60	3.16	-	45.58	74.00	28.42
2 483.508	12.76	Average	H			0.20	42.72	54.00	11.28
2 483.508	13.75	Peak	V			-	43.51	74.00	30.49
2 483.508	9.78	Average	V			0.20	39.74	54.00	14.26

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 + Correction Factor

Tested by: Hyung-Kwon, Oh / 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 : January 06, 2020 ~ January 16, 2020

-. 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 : 88.51 %

-. Result : PASSED

Frequency (MHz)	Reading (dBμV)	Detector Mode	Ant. Pol. (H/V)	Ant. Factor	Cable Loss	Correction Factor (dB)	Total (dBμV/m)	Limits (dBμV/m)	Margin (dB)
Test Data for Low Channel									
2 389.800	24.30	Peak	H	26.90	3.07	-	54.27	74.00	19.73
2 389.880	20.93	Average	H			0.53	51.43	54.00	2.57
2 389.960	21.88	Peak	V			-	51.85	74.00	22.15
2 389.880	17.43	Average	V			0.53	47.93	54.00	6.07
Test Data for High Channel									
2 483.508	18.46	Peak	H	26.60	3.16	-	48.22	74.00	25.78
2 483.508	15.66	Average	H			0.53	45.95	54.00	8.05
2 483.508	16.88	Peak	V			-	46.64	74.00	27.36
2 483.508	12.82	Average	V			0.53	43.11	54.00	10.89

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 + Correction Factor

Tested by: Hyung-Kwon, Oh / 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 : January 06, 2020 ~ January 16, 2020

-. 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 : 93.48 %

-. Result : PASSED

Frequency (MHz)	Reading (dBµV)	Detector Mode	Ant. Pol. (H/V)	Ant. Factor	Cable Loss	Correction Factor (dB)	Total (dBµV/m)	Limits (dBµV/m)	Margin (dB)
Test Data for Low Channel									
2 389.880	21.72	Peak	H	26.90	3.07	-	51.69	74.00	22.31
2 389.560	19.44	Average	H			0.29	49.70	54.00	4.30
2 388.921	17.89	Peak	V			-	47.86	74.00	26.14
2 389.481	16.63	Average	V			0.29	46.89	54.00	7.11
Test Data for High Channel									
2 485.288	15.39	Peak	H	26.60	3.16	-	45.15	74.00	28.85
2 484.909	13.31	Average	H			0.29	43.36	54.00	10.64
2 483.690	12.40	Peak	V			-	42.16	74.00	31.84
2 484.893	10.64	Average	V			0.29	40.69	54.00	13.31

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 + Correction Factor

Tested by: Hyung-Kwon, Oh / 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 : January 06, 2020 ~ January 16, 2020

-. 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 : 97.30 %

-. Result : PASSED

Frequency (MHz)	Reading (dBµV)	Detector Mode	Ant. Pol. (H/V)	Ant. Factor	Cable Loss	Correction Factor (dB)	Total (dBµV/m)	Limits (dBµV/m)	Margin (dB)
Test Data for Low Channel									
4 824.00	21.20	Peak	H	28.20	4.85	-	54.25	74.00	19.75
	9.73	Average	H			0.12	42.90	54.00	11.10
	20.45	Peak	V			-	53.50	74.00	20.50
	9.03	Average	V			0.12	42.20	54.00	11.80
Test Data for Middle Channel									
4 884.00	21.03	Peak	H	28.30	4.91	-	54.24	74.00	19.76
	9.17	Average	H			0.12	42.50	54.00	11.50
	20.31	Peak	V			-	53.52	74.00	20.48
	8.26	Average	V			0.12	41.59	54.00	12.41
Test Data for High Channel									
4 924.00	21.30	Peak	H	28.60	5.04	-	54.94	74.00	19.06
	9.26	Average	H			0.12	43.02	54.00	10.98
	20.11	Peak	V			-	53.75	74.00	20.25
	8.20	Average	V			0.12	41.96	54.00	12.04

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 + Correction Factor

Tested by: Hyung-Kwon, Oh / Manager

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9.6.2.1.2 Test data for Antenna 1

-. Test Date : January 06, 2020 ~ January 16, 2020

-. 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 : 97.30 %

-. Result : PASSED

Frequency (MHz)	Reading (dBµV)	Detector Mode	Ant. Pol. (H/V)	Ant. Factor	Cable Loss	Correction Factor (dB)	Total (dBµV/m)	Limits (dBµV/m)	Margin (dB)
Test Data for Low Channel									
4 824.00	21.95	Peak	H	28.20	4.85	-	55.00	74.00	19.00
	8.85	Average	H			0.12	42.02	54.00	11.98
	20.05	Peak	V			-	53.10	74.00	20.90
	8.13	Average	V			0.12	41.30	54.00	12.70
Test Data for Middle Channel									
4 884.00	21.37	Peak	H	28.30	4.91	-	54.58	74.00	19.42
	9.45	Average	H			0.12	42.78	54.00	11.22
	20.19	Peak	V			-	53.40	74.00	20.60
	8.75	Average	V			0.12	42.08	54.00	11.92
Test Data for High Channel									
4 924.00	21.45	Peak	H	28.60	5.04	-	55.09	74.00	18.91
	9.75	Average	H			0.12	43.51	54.00	10.49
	20.51	Peak	V			-	54.15	74.00	19.85
	8.16	Average	V			0.12	41.92	54.00	12.08

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 + Correction Factor

Tested by: Hyung-Kwon, Oh / Manager

9.6.2.2 Test data for 802.11g WLAN Mode

9.6.2.2.1 Test data for Antenna 0

-. Test Date : January 06, 2020 ~ January 16, 2020

-. 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 : 95.55 %

-. Result : PASSED

Frequency (MHz)	Reading (dBµV)	Detector Mode	Ant. Pol. (H/V)	Ant. Factor	Cable Loss	Correction Factor (dB)	Total (dBµV/m)	Limits (dBµV/m)	Margin (dB)
Test Data for Low Channel									
4 824.00	21.39	Peak	H	28.20	4.85	-	54.44	74.00	19.56
	9.14	Average	H			0.20	42.39	54.00	11.61
	20.57	Peak	V			-	53.62	74.00	20.38
	8.17	Average	V			0.20	41.42	54.00	12.58
Test Data for Middle Channel									
4 884.00	21.30	Peak	H	28.30	4.91	-	54.51	74.00	19.49
	9.21	Average	H			0.20	42.62	54.00	11.38
	20.16	Peak	V			-	53.37	74.00	20.63
	8.29	Average	V			0.20	41.70	54.00	12.30
Test Data for High Channel									
4 924.00	21.25	Peak	H	28.60	5.04	-	54.89	74.00	19.11
	9.93	Average	H			0.20	43.77	54.00	10.23
	20.20	Peak	V			-	53.84	74.00	20.16
	8.82	Average	V			0.20	42.66	54.00	11.34

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 + Correction Factor

Tested by: Hyung-Kwon, Oh / Manager

9.6.2.2.2 Test data for Antenna 1

-. Test Date : January 06, 2020 ~ January 16, 2020

-. 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 : 95.55 %

-. Result : PASSED

Frequency (MHz)	Reading (dBµV)	Detector Mode	Ant. Pol. (H/V)	Ant. Factor	Cable Loss	Correction Factor (dB)	Total (dBµV/m)	Limits (dBµV/m)	Margin (dB)
Test Data for Low Channel									
4 824.00	21.58	Peak	H	28.20	4.85	-	54.63	74.00	19.37
	9.30	Average	H			0.20	42.55	54.00	11.45
	20.48	Peak	V			-	53.53	74.00	20.47
	8.74	Average	V			0.20	41.99	54.00	12.01
Test Data for Middle Channel									
4 884.00	21.77	Peak	H	28.30	4.91	-	54.98	74.00	19.02
	9.26	Average	H			0.20	42.67	54.00	11.33
	20.76	Peak	V			-	53.97	74.00	20.03
	8.50	Average	V			0.20	41.91	54.00	12.09
Test Data for High Channel									
4 924.00	21.59	Peak	H	28.60	5.04	-	55.23	74.00	18.77
	9.82	Average	H			0.20	43.66	54.00	10.34
	20.09	Peak	V			-	53.73	74.00	20.27
	8.81	Average	V			0.20	42.65	54.00	11.35

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 + Correction Factor

Tested by: Hyung-Kwon, Oh / 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 : January 06, 2020 ~ January 16, 2020

-. 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 : 88.51 %

-. Result : PASSED

Frequency (MHz)	Reading (dBμV)	Detector Mode	Ant. Pol. (H/V)	Ant. Factor	Cable Loss	Correction Factor (dB)	Total (dBμV/m)	Limits (dBμV/m)	Margin (dB)
Test Data for Low Channel									
4 824.00	21.34	Peak	H	28.20	4.85	-	54.39	74.00	19.61
	9.55	Average	H			0.53	43.13	54.00	10.87
	20.84	Peak	V			-	53.89	74.00	20.11
	8.33	Average	V			0.53	41.91	54.00	12.09
Test Data for Middle Channel									
4 884.00	21.82	Peak	H	28.30	4.91	-	55.03	74.00	18.97
	9.06	Average	H			0.53	42.80	54.00	11.20
	20.80	Peak	V			-	54.01	74.00	19.99
	8.64	Average	V			0.53	42.38	54.00	11.62
Test Data for High Channel									
4 924.00	21.91	Peak	H	28.60	5.04	-	55.55	74.00	18.45
	9.18	Average	H			0.53	43.35	54.00	10.65
	20.80	Peak	V			-	54.44	74.00	19.56
	8.92	Average	V			0.53	43.09	54.00	10.91

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 + Correction Factor

Tested by: Hyung-Kwon, Oh / 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 : January 06, 2020 ~ January 16, 2020

-. 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 : 93.48 %

-. Result : PASSED

Frequency (MHz)	Reading (dBµV)	Detector Mode	Ant. Pol. (H/V)	Ant. Factor	Cable Loss	Correction Factor (dB)	Total (dBµV/m)	Limits (dBµV/m)	Margin (dB)
Test Data for Low Channel									
4 844.00	21.23	Peak	H	28.20	4.85	-	54.28	74.00	19.72
	9.02	Average	H			0.29	42.36	54.00	11.64
	20.79	Peak	V			-	53.84	74.00	20.16
	8.21	Average	V			0.29	41.55	54.00	12.45
Test Data for Middle Channel									
4 884.00	21.71	Peak	H	28.30	4.91	-	54.92	74.00	19.08
	9.39	Average	H			0.29	42.89	54.00	11.11
	20.19	Peak	V			-	53.40	74.00	20.60
	8.34	Average	V			0.29	41.84	54.00	12.16
Test Data for High Channel									
4 904.00	21.59	Peak	H	28.60	5.04	-	55.23	74.00	18.77
	9.56	Average	H			0.29	43.49	54.00	10.51
	20.76	Peak	V			-	54.40	74.00	19.60
	8.26	Average	V			0.29	42.19	54.00	11.81

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 + Correction Factor

Tested by: Hyung-Kwon, Oh / Manager

10. PEAK POWER SPECTRUL DENSITY

10.1 Operating environment

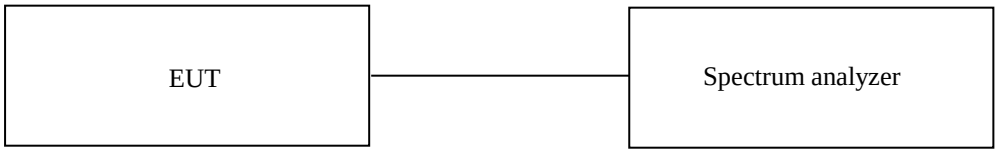
Temperature : 23 °C

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 kHz ≤ RBW ≤100 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. 11, 2019 (1Y)

All test equipment used is calibrated on a regular basis.

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10.4 Test data for 802.11b WLAN Mode

10.4.1 Test data for Antenna 0

-. Test Date : January 06, 2020 ~ January 16, 2020

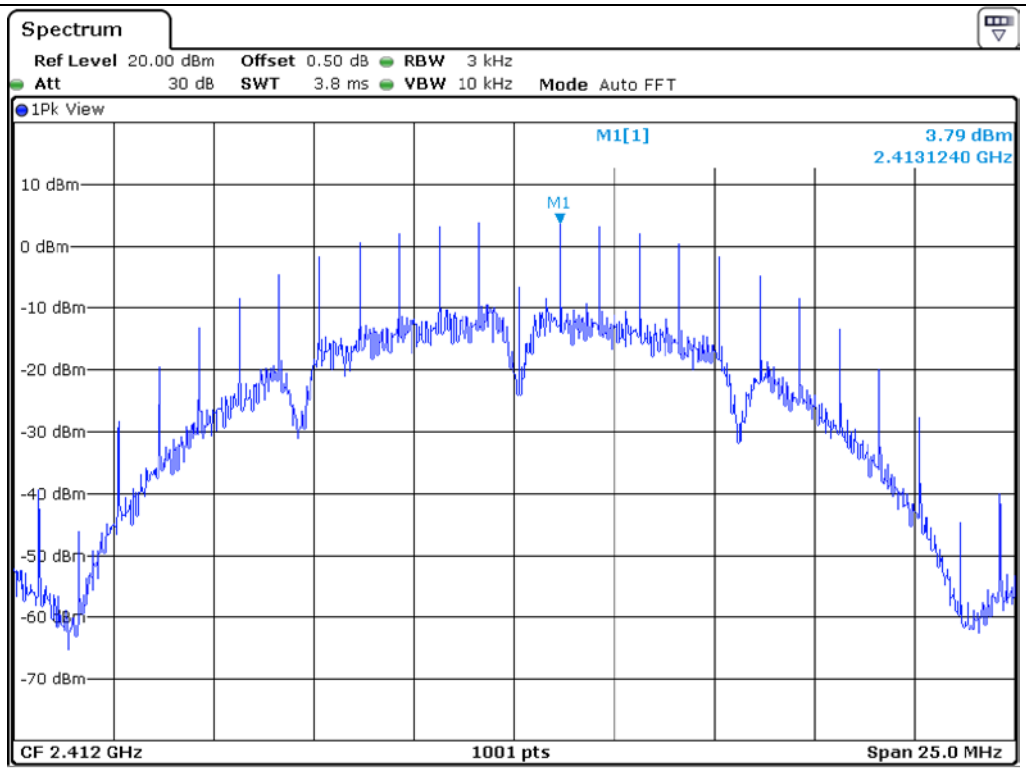
-. Test Result : Pass

-. Operating Condition : Continuous transmitting mode

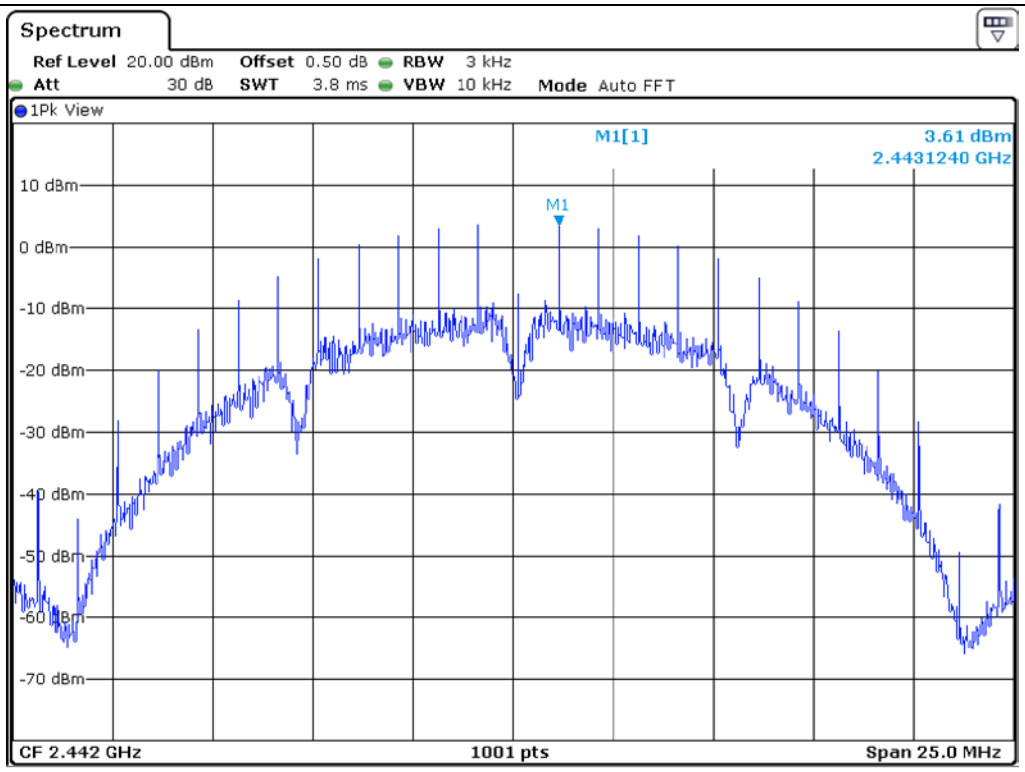
CHANNEL	FREQUENCY(MHz)	MEASURED VLAUE (dBm)	LIMIT (dBm)	MARGIN (dB)
Low	2 412.00	3.79	8.00	4.21
Middle	2 442.00	3.61	8.00	4.39
High	2 462.00	4.25	8.00	3.75

Remark. Margin = Limit – Measured value

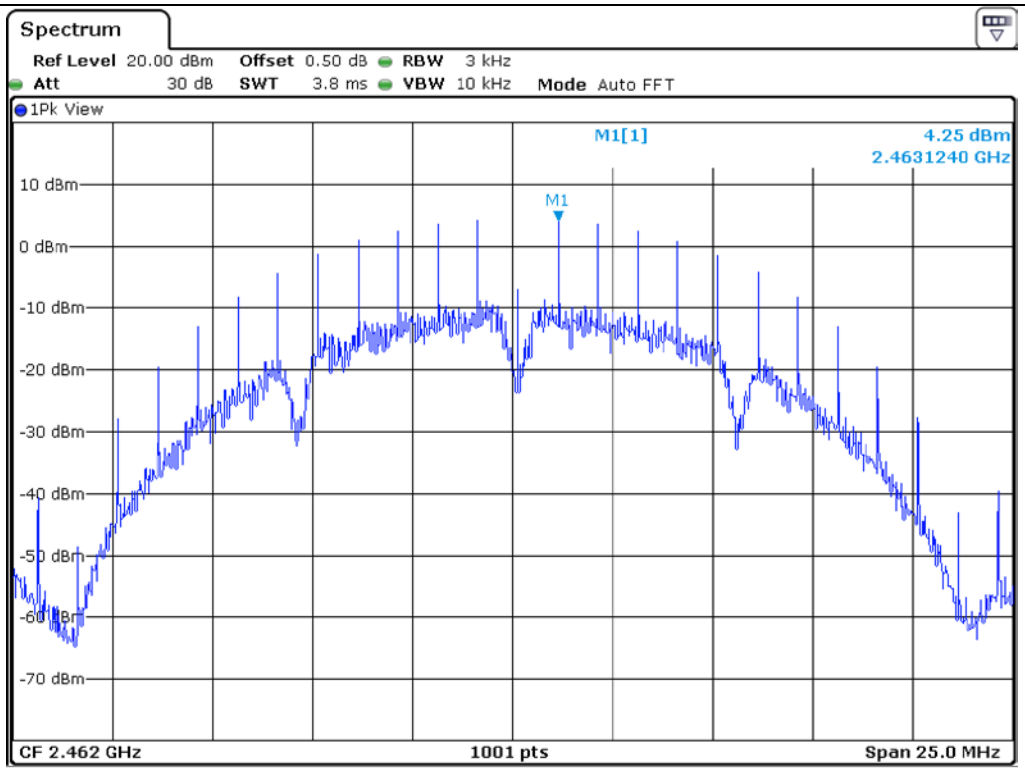
Tested by: Hyung-Kwon, Oh / Manager



Low Channel



Middle Channel



High Channel

10.4.2 Test data for Antenna 1

-. Test Date : January 06, 2020 ~ January 16, 2020

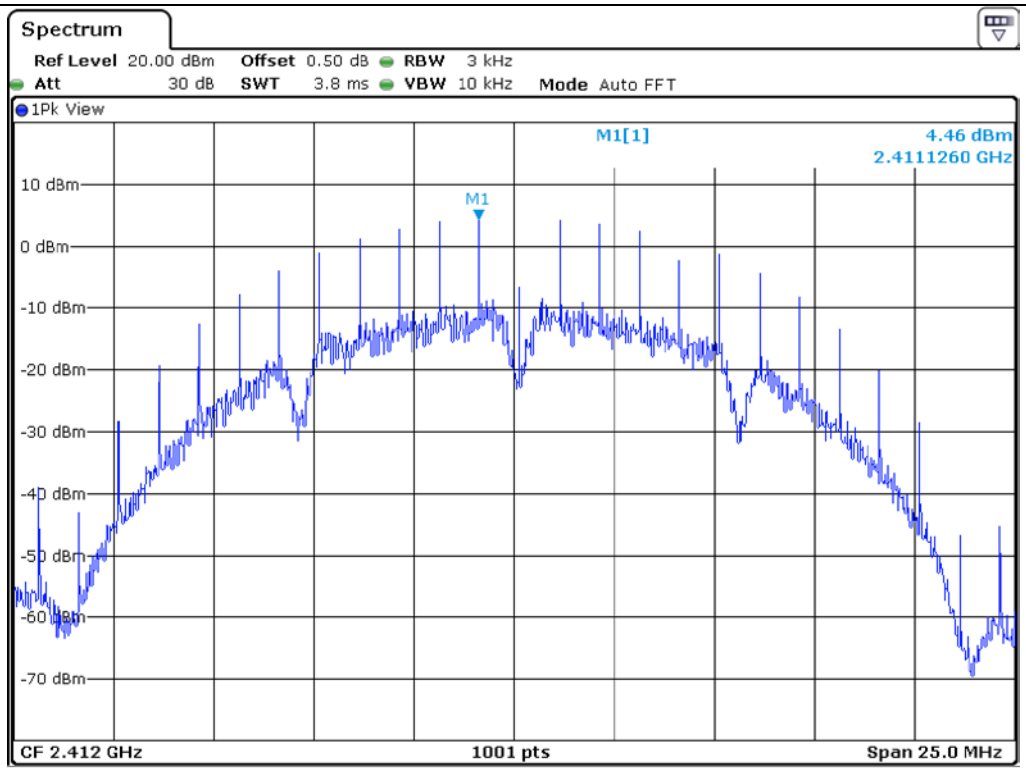
-. Test Result : Pass

-. Operating Condition : Continuous transmitting mode

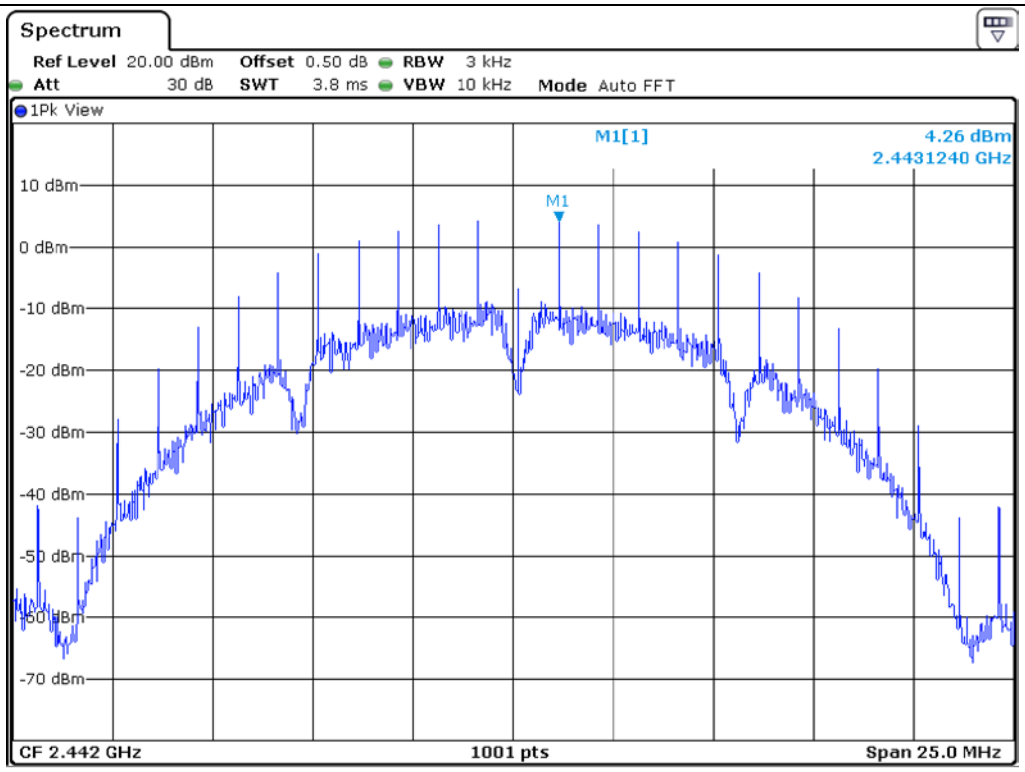
CHANNEL	FREQUENCY(MHz)	MEASURED VLAUE (dBm)	LIMIT (dBm)	MARGIN (dB)
Low	2 412.00	4.46	8.00	3.54
Middle	2 442.00	4.26	8.00	3.74
High	2 462.00	4.57	8.00	3.43

Remark. Margin = Limit – Measured value

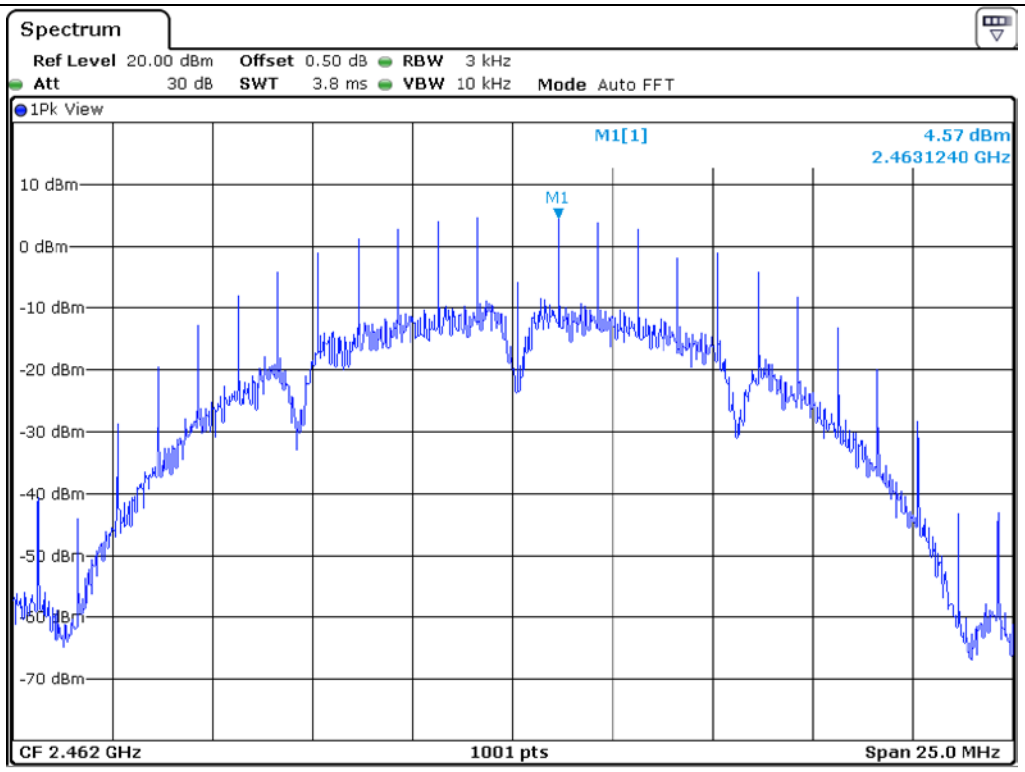
Tested by: Hyung-Kwon, Oh / Manager



Low Channel



Middle Channel



High Channel

10.5 Test data for 802.11g WLAN Mode

10.5.1 Test data for Antenna 0

-. Test Date : January 06, 2020 ~ January 16, 2020

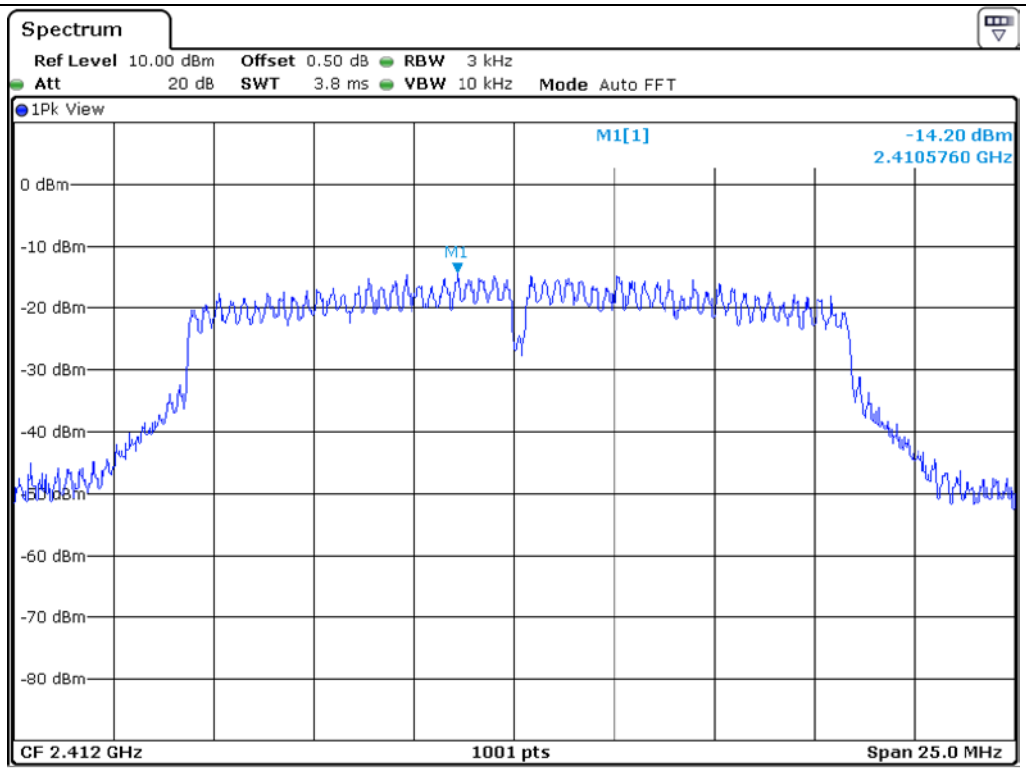
-. Test Result : Pass

-. Operating Condition : Continuous transmitting mode

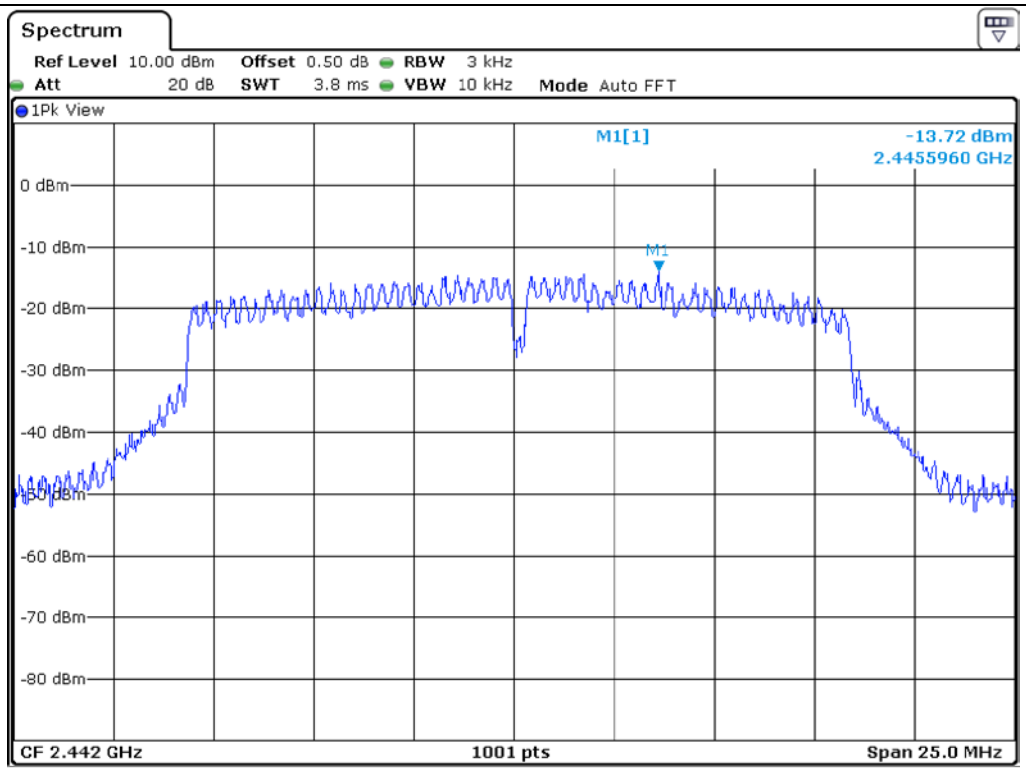
CHANNEL	FREQUENCY(MHz)	MEASURED VLAUE (dBm)	LIMIT (dBm)	MARGIN (dB)
Low	2 412.00	-14.20	8.00	22.20
Middle	2 442.00	-13.72	8.00	21.72
High	2 462.00	-13.07	8.00	21.07

Remark. Margin = Limit – Measured value

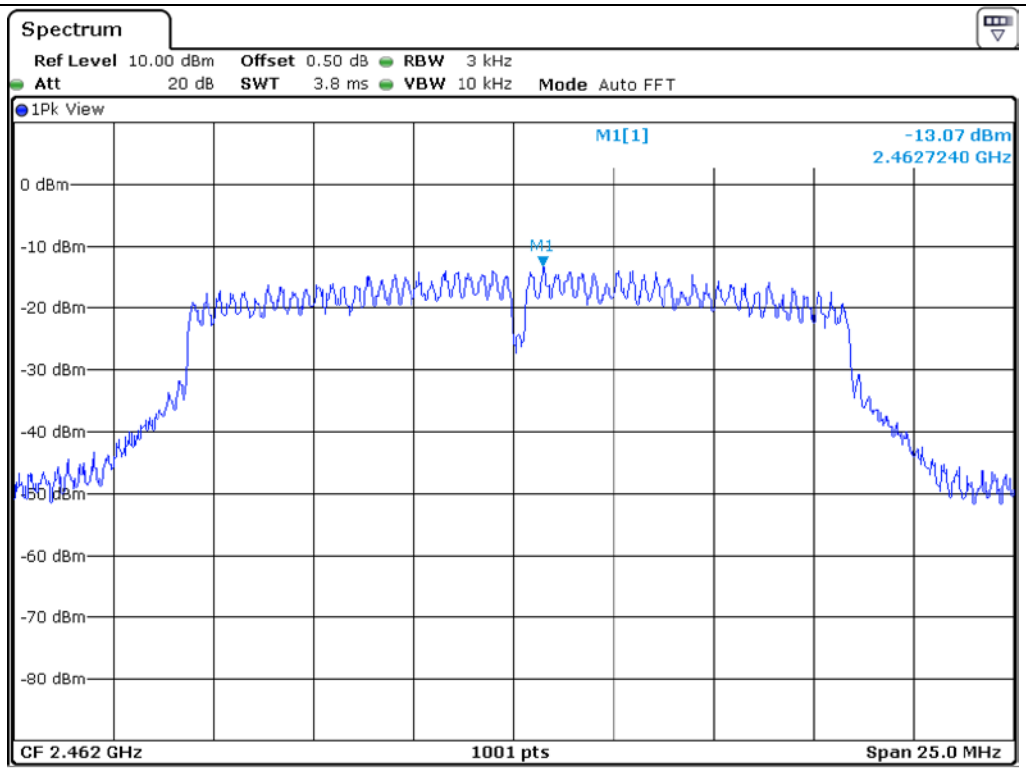
Tested by: Hyung-Kwon, Oh / Manager



Low Channel



Middle Channel



High Channel

10.5.2 Test data for Antenna 1

-. Test Date : January 06, 2020 ~ January 16, 2020

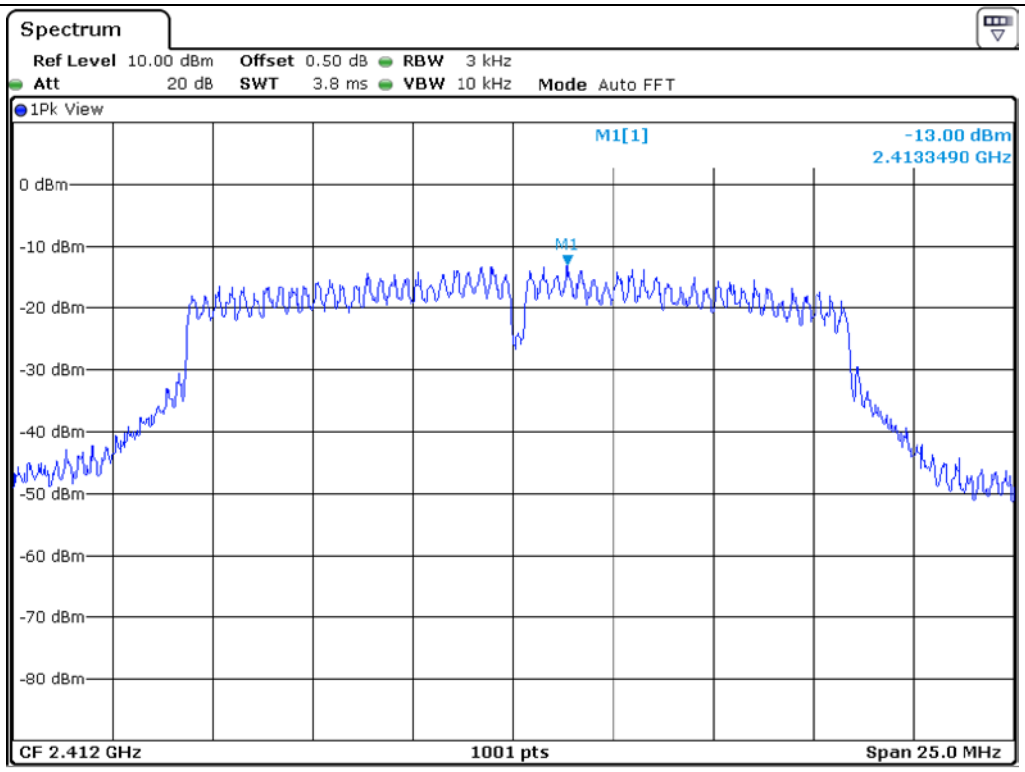
-. Test Result : Pass

-. Operating Condition : Continuous transmitting mode

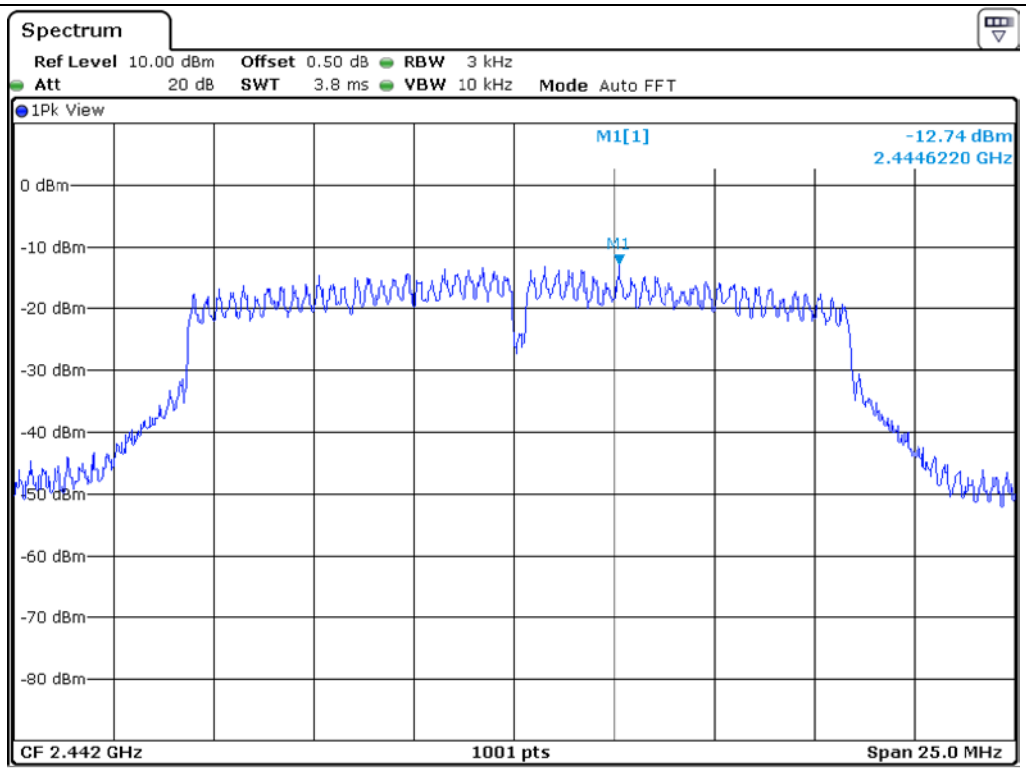
CHANNEL	FREQUENCY(MHz)	MEASURED VLAUE (dBm)	LIMIT (dBm)	MARGIN (dB)
Low	2 412.00	-13.00	8.00	21.00
Middle	2 442.00	-12.74	8.00	20.74
High	2 462.00	-13.00	8.00	21.00

Remark. Margin = Limit – Measured value

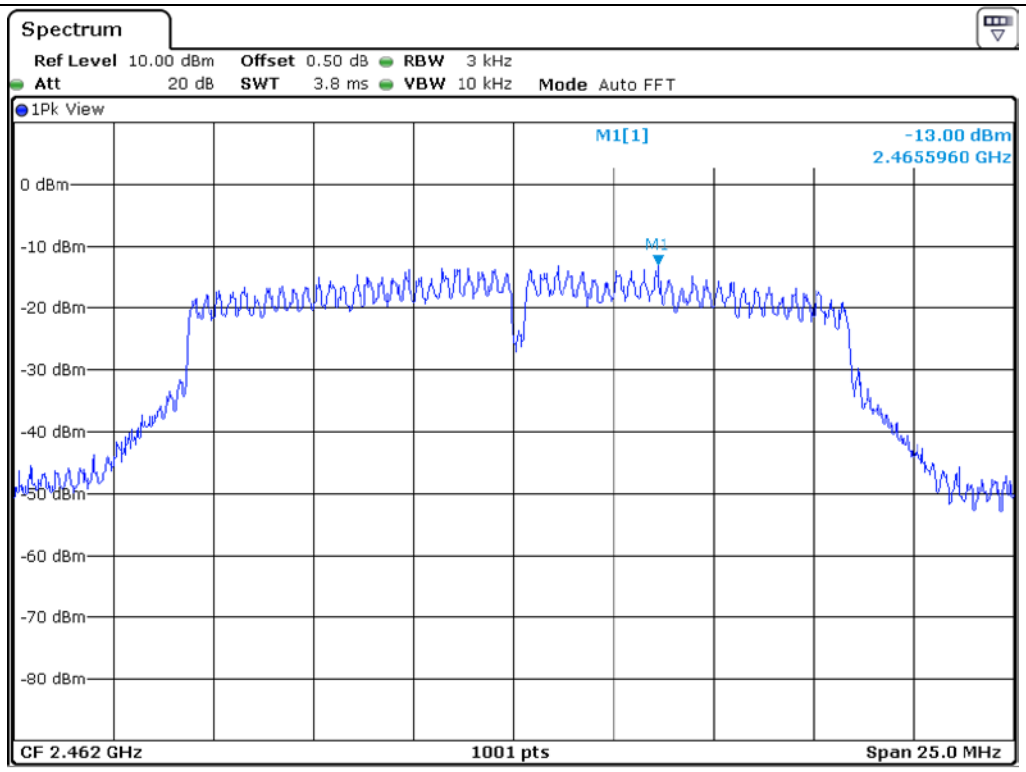
Tested by: Hyung-Kwon, Oh / Manager



Low Channel



Middle Channel



High Channel

10.6 Test data for 802.11n_HT20 WLAN Mode

10.6.1 Test data for Antenna 0

-. Test Date : January 06, 2020 ~ January 16, 2020

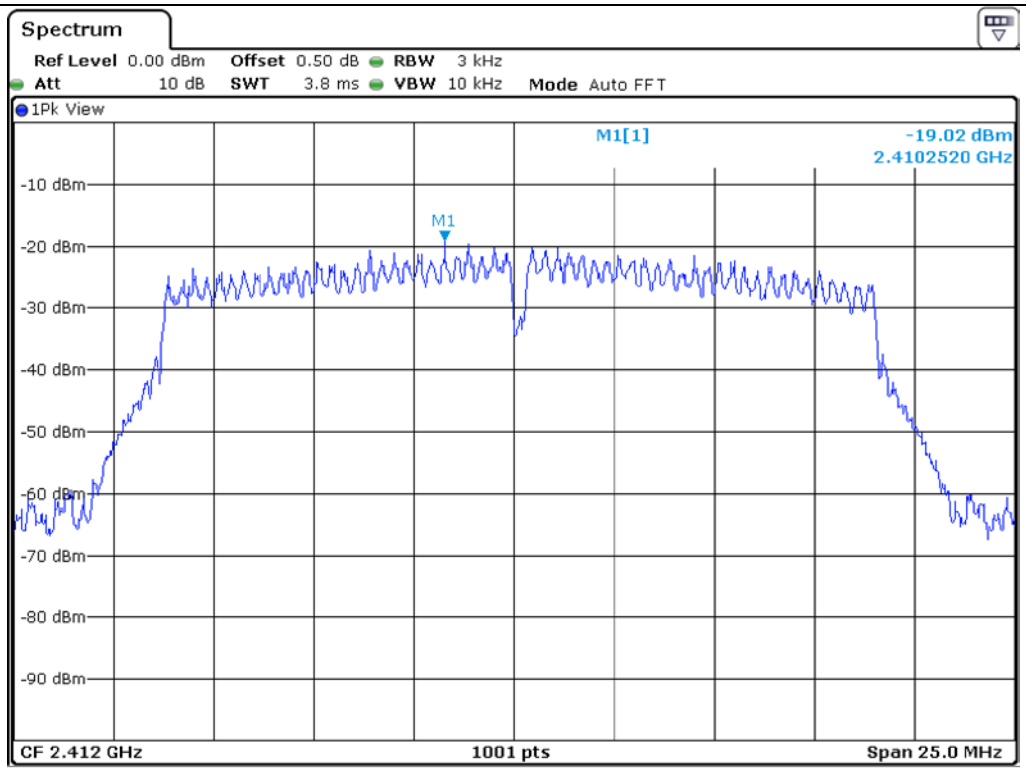
-. Test Result : Pass

-. Operating Condition : Continuous transmitting mode

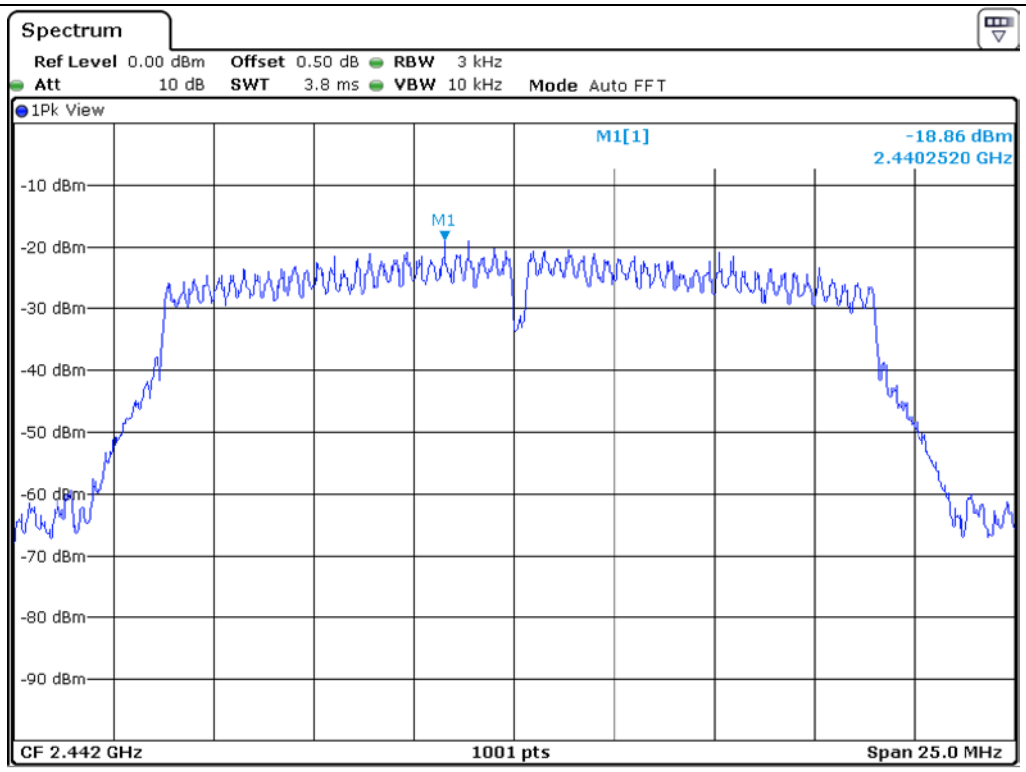
CHANNEL	FREQUENCY(MHz)	MEASURED VLAUE (dBm)	LIMIT (dBm)	MARGIN (dB)
Low	2 412.00	-19.02	8.00	27.02
Middle	2 442.00	-18.86	8.00	26.86
High	2 462.00	-19.89	8.00	27.89

Remark. Margin = Limit – Measured value

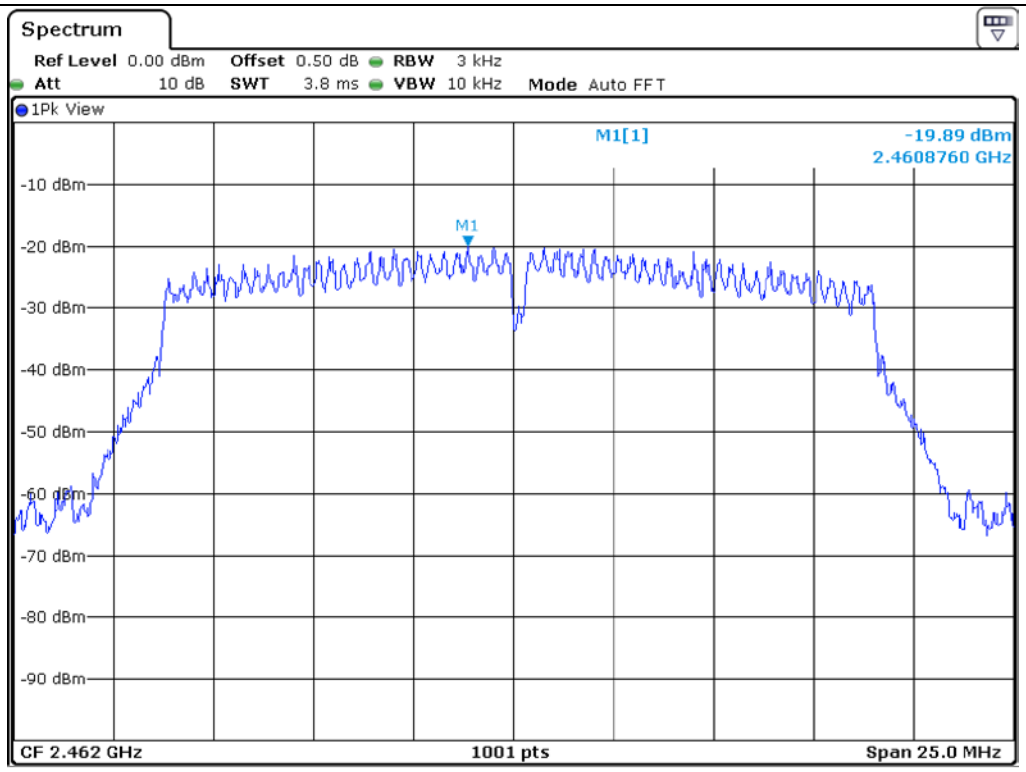
Tested by: Hyung-Kwon, Oh / Manager



Low Channel



Middle Channel



High Channel

10.6.2 Test data for Antenna 1

-. Test Date : January 06, 2020 ~ January 16, 2020

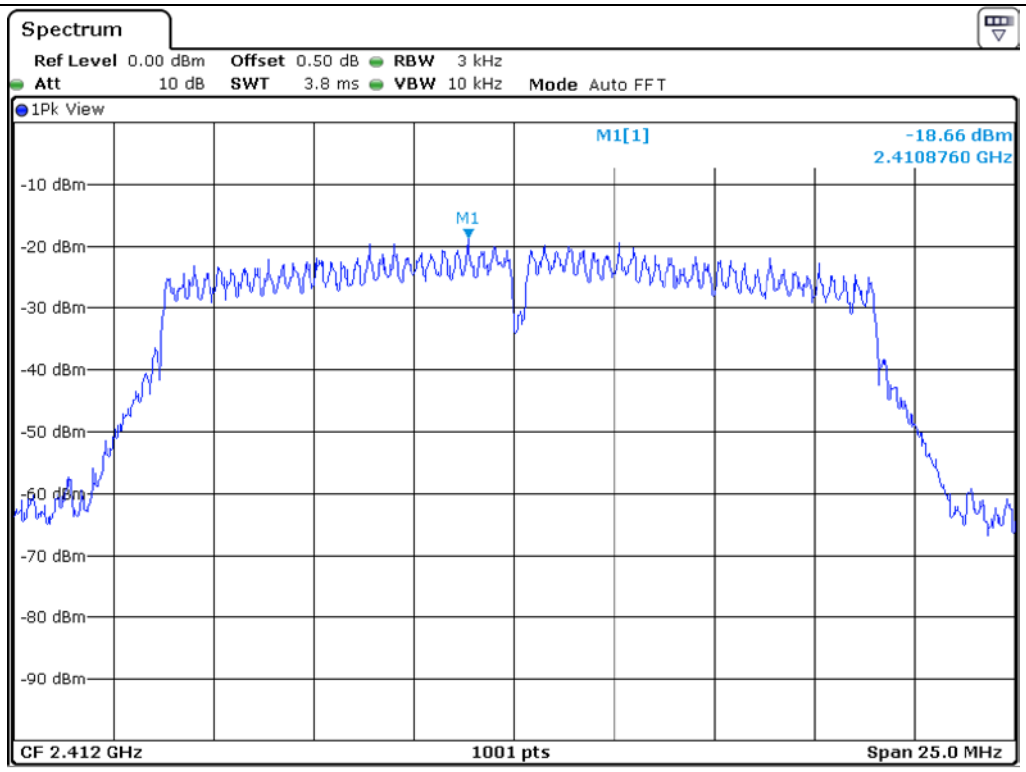
-. Test Result : Pass

-. Operating Condition : Continuous transmitting mode

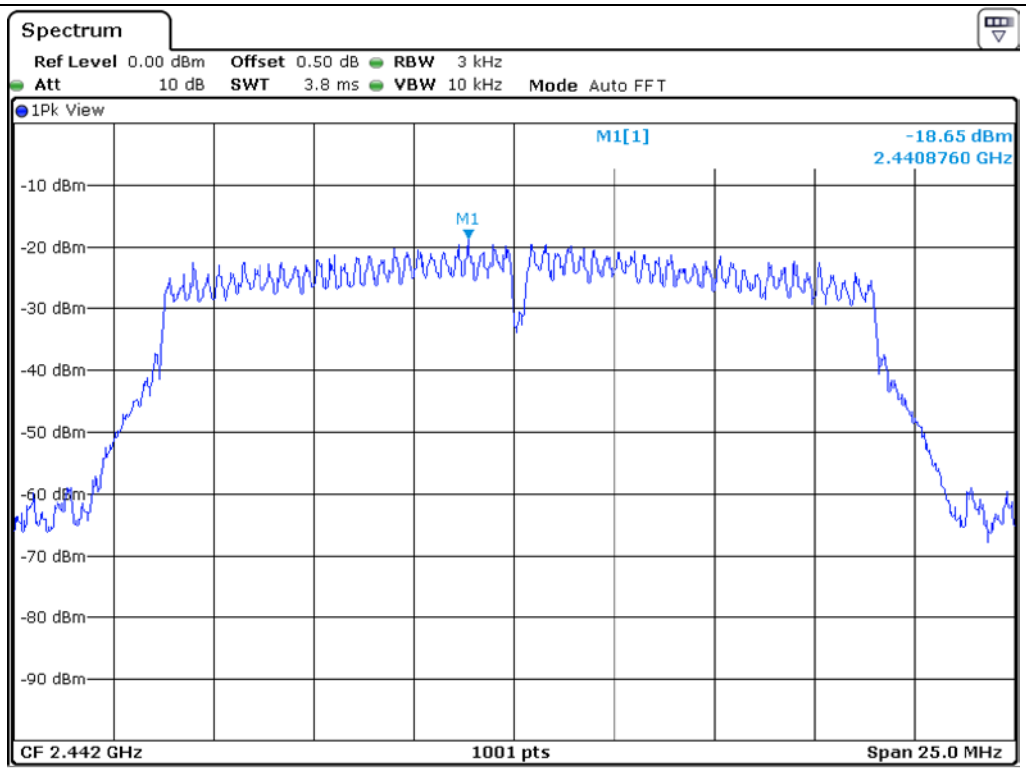
CHANNEL	FREQUENCY(MHz)	MEASURED VLAUE (dBm)	LIMIT (dBm)	MARGIN (dB)
Low	2 412.00	-18.66	8.00	26.66
Middle	2 442.00	-18.65	8.00	26.65
High	2 462.00	-18.63	8.00	26.63

Remark. Margin = Limit – Measured value

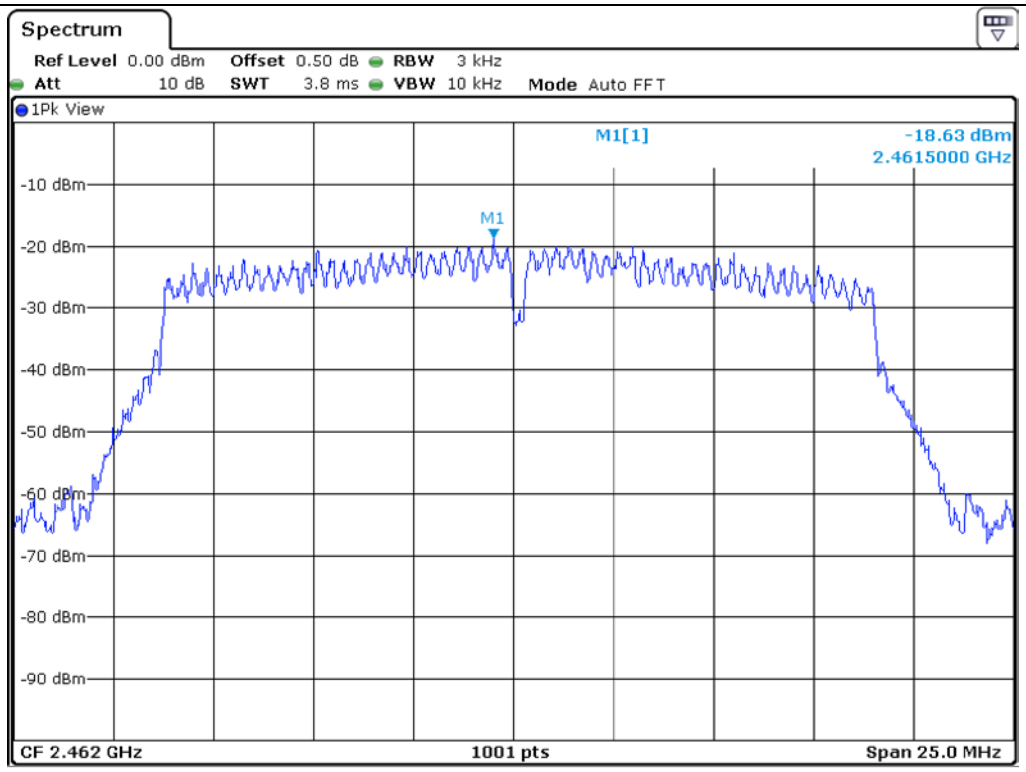
Tested by: Hyung-Kwon, Oh / Manager



Low Channel



Middle Channel



High Channel

10.6.3 Test data for Multiple Transmit

-. Test Date : January 06, 2020 ~ January 16, 2020

-. Test Result : Pass

-. Operating Condition : Continuous transmitting mode

CHANNEL	FREQUENCY(MHz)	MEASURED VLAUE (dBm)	LIMIT (dBm)	MARGIN (dB)
Low	2 412.00	-15.83	8.00	23.83
Middle	2 442.00	-15.74	8.00	23.74
High	2 462.00	-16.20	8.00	24.20

Remark 1 : Margin = Limit – Measured value

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

Tested by: Hyung-Kwon, Oh / Manager

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10.7 Test data for 802.11n_HT40 WLAN Mode

10.7.1 Test data for Antenna 0

-. Test Date : January 06, 2020 ~ January 16, 2020

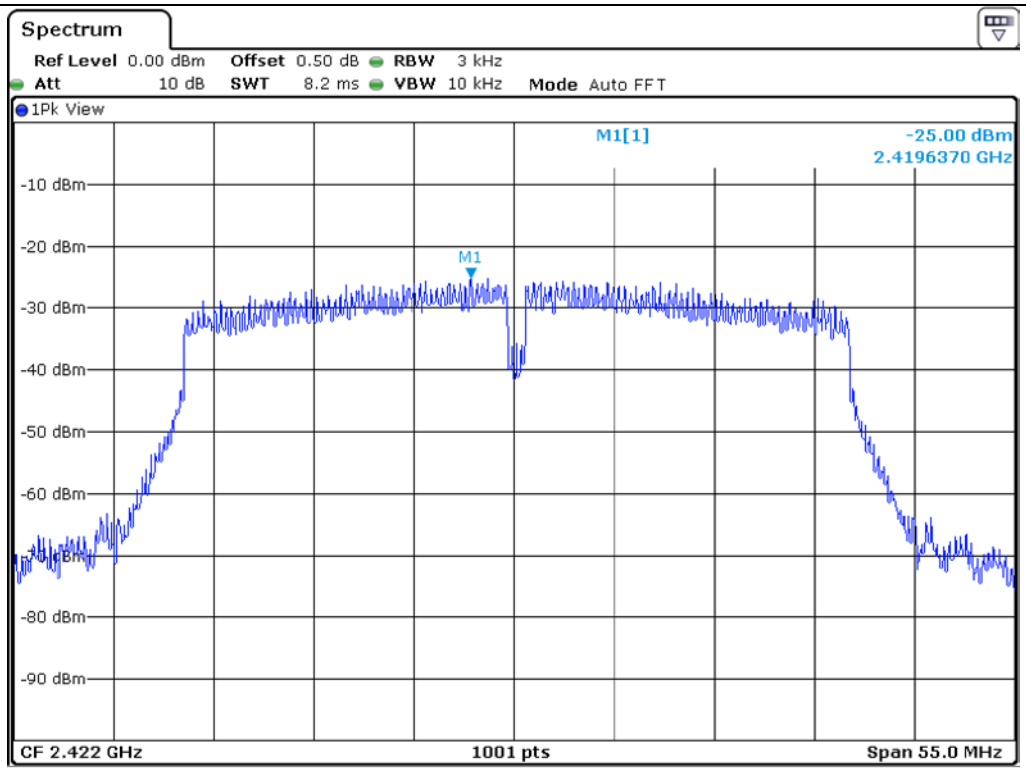
-. Test Result : Pass

-. Operating Condition : Continuous transmitting mode

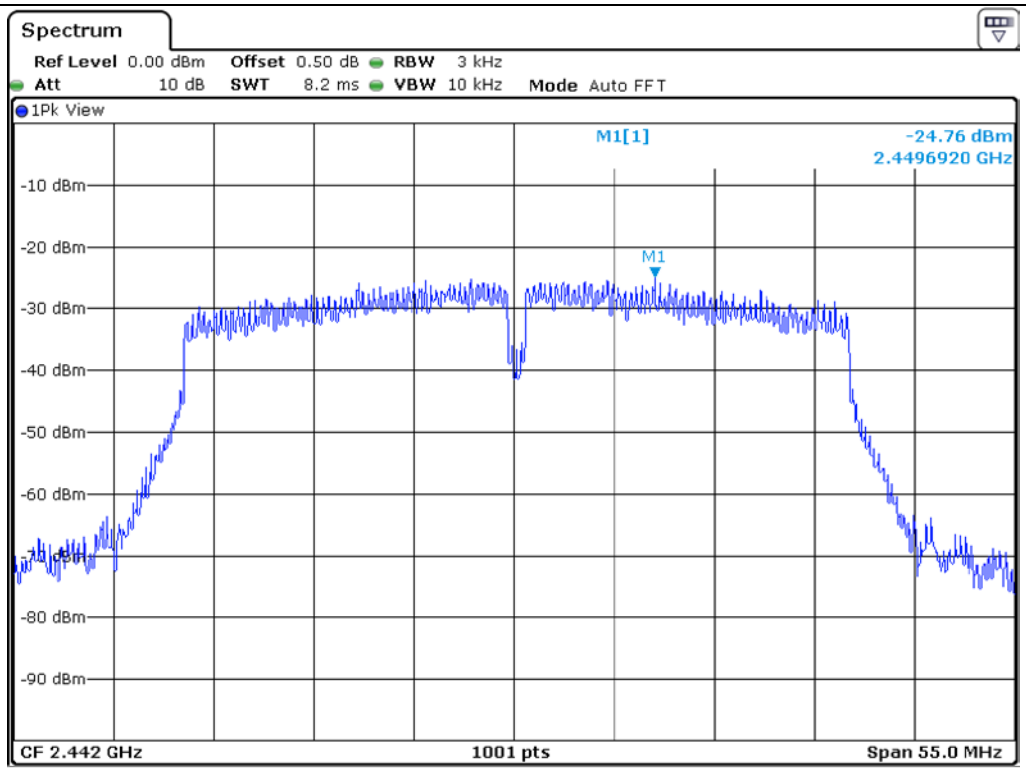
CHANNEL	FREQUENCY(MHz)	MEASURED VLAUE (dBm)	LIMIT (dBm)	MARGIN (dB)
Low	2 422.00	-25.00	8.00	33.00
Middle	2 442.00	-24.76	8.00	32.76
High	2 452.00	-24.42	8.00	32.42

Remark. Margin = Limit – Measured value

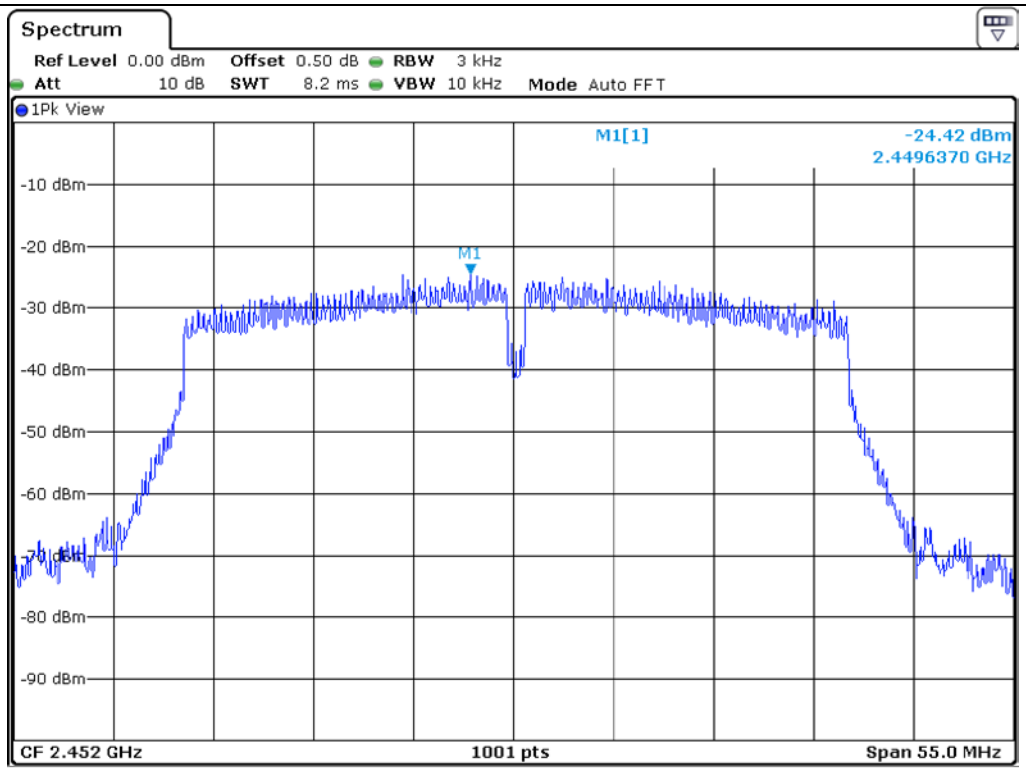
Tested by: Hyung-Kwon, Oh / Manager



Low Channel



Middle Channel



High Channel

10.7.2 Test data for Antenna 1

-. Test Date : January 06, 2020 ~ January 16, 2020

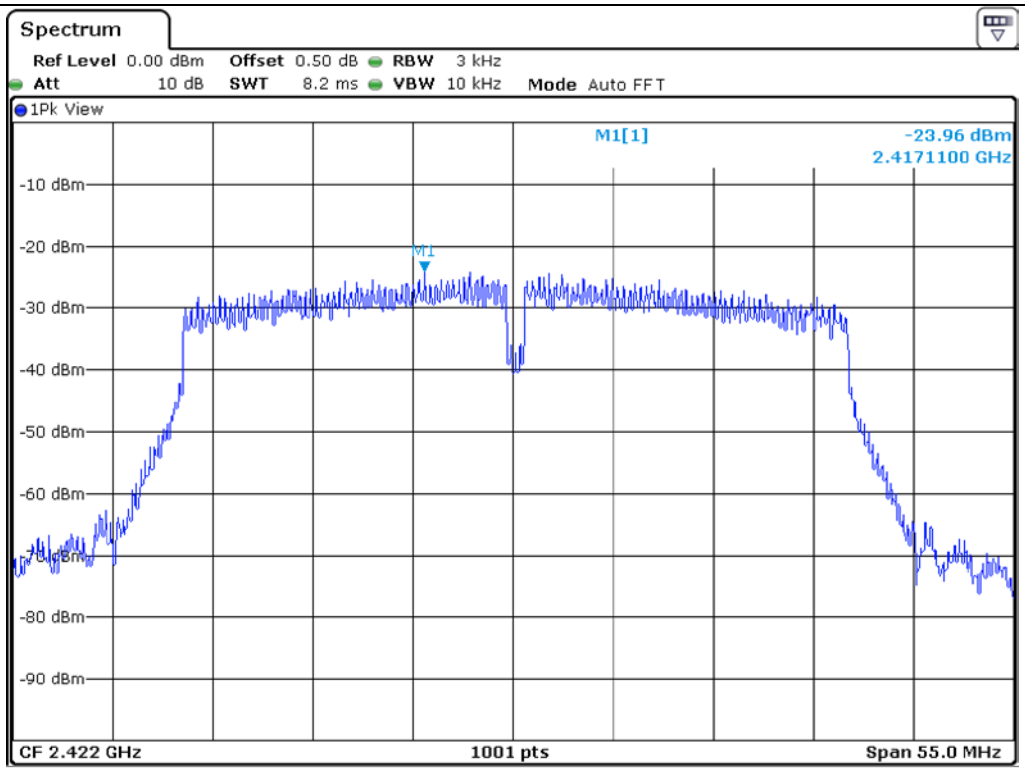
-. Test Result : Pass

-. Operating Condition : Continuous transmitting mode

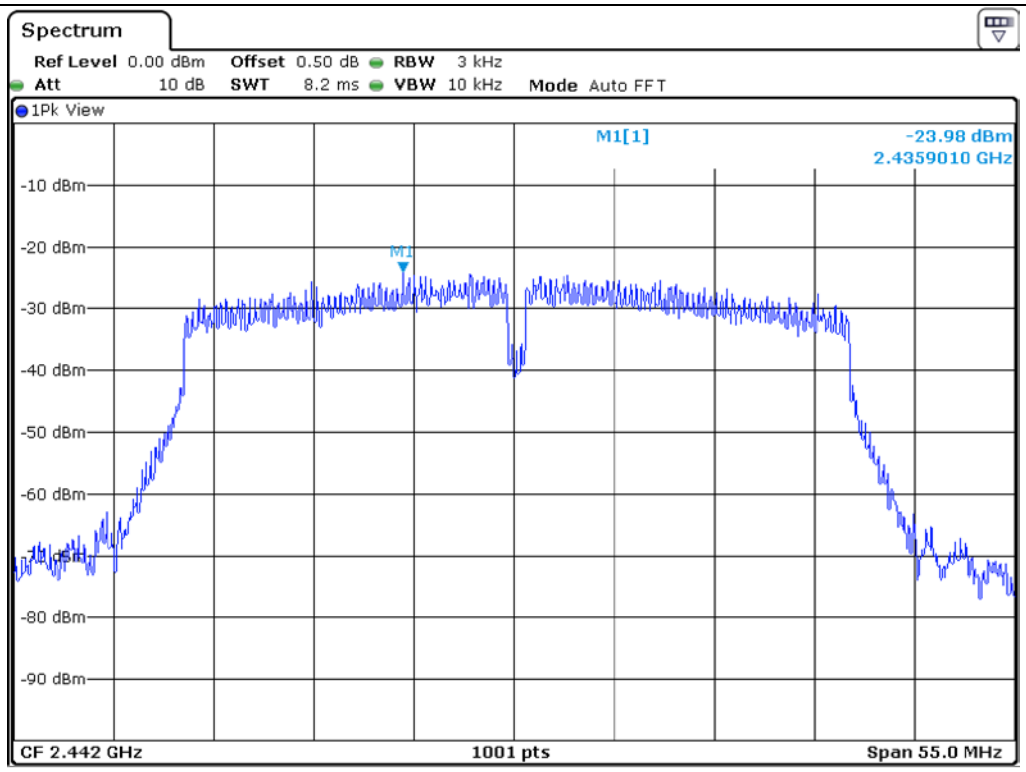
CHANNEL	FREQUENCY(MHz)	MEASURED VLAUE (dBm)	LIMIT (dBm)	MARGIN (dB)
Low	2 422.00	-23.96	8.00	31.96
Middle	2 442.00	-23.98	8.00	31.98
High	2 452.00	-23.68	8.00	31.68

Remark. Margin = Limit – Measured value

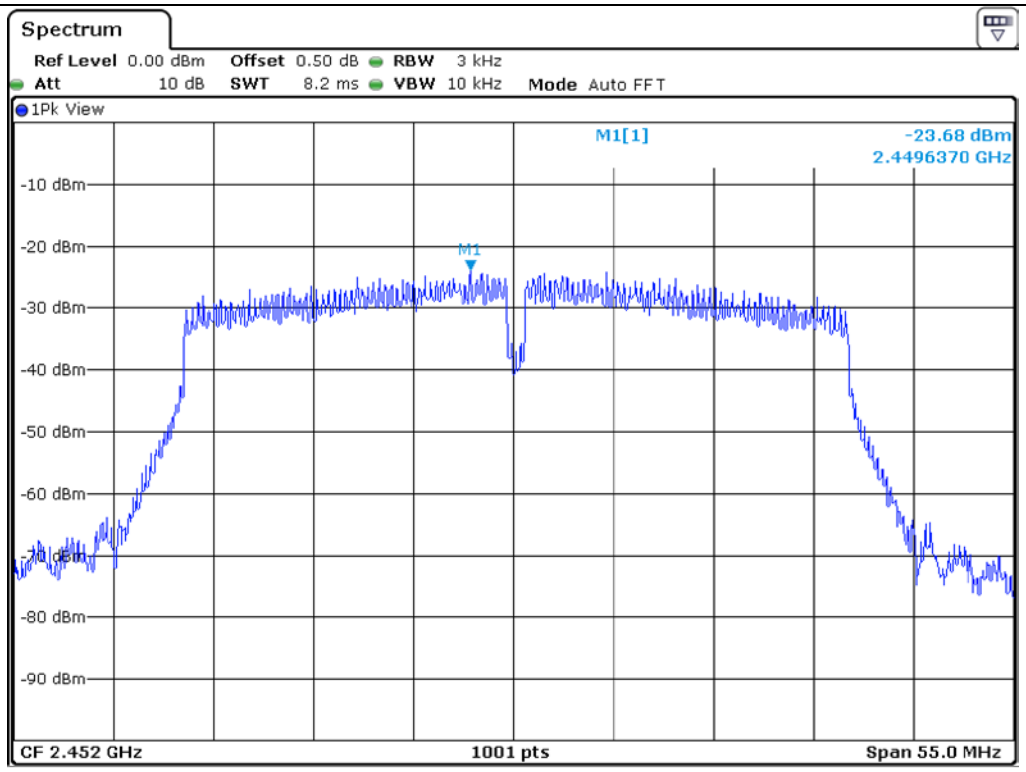
Tested by: Hyung-Kwon, Oh / Manager



Low Channel



Middle Channel



High Channel

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10.7.3 Test data for Multiple Transmit

-. Test Date : January 06, 2020 ~ January 16, 2020

-. Test Result : Pass

-. Operating Condition : Continuous transmitting mode

CHANNEL	FREQUENCY(MHz)	MEASURED VLAUE (dBm)	LIMIT (dBm)	MARGIN (dB)
Low	2 422.00	-21.44	8.00	29.44
Middle	2 442.00	-21.34	8.00	29.34
High	2 452.00	-21.02	8.00	29.02

Remark 1 : Margin = Limit – Measured value

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

Tested by: Hyung-Kwon, Oh / Manager

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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.
■ -	FSV40	Rohde & Schwarz	Signal Analyzer	101009	Mar. 11, 2019 (1Y)
■ -	ESW	Rohde & Schwarz	EMI Test Receiver	101851	Aug. 07, 2019 (1Y)
■ -	310N	Sonoma Instrument	Pre-Amplifier	312544	Mar. 18, 2019 (1Y)
■ -	BBV 9718B	Schwarzbeck	Amplifier	009	Mar. 20, 2019 (1Y)
■	SCU40A	Rohde & Schwarz	Signal Conditioning unit	100436	Mar. 11, 2019 (1Y)
■	SCU18	Rohde & Schwarz	Signal Conditioning unit	102266	Jul. 24, 2019(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	777	Apr. 13, 2018 (2Y)
■ -	BBHA9120D	Schwarzbeck	Horn Antenna	9120D-1366	Jul. 16, 2019 (1Y)
■ -	BBHA9170	Schwarzbeck	Horn Antenna	BBHA9170178	Jan. 07, 2020 (1Y)

All test equipment used is calibrated on a regular basis.

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11.4 Test data

11.4.1 Test data for 30 MHz ~ 1 000 MHz

Humidity Level : 44 % R.H. Temperature: 25 °C

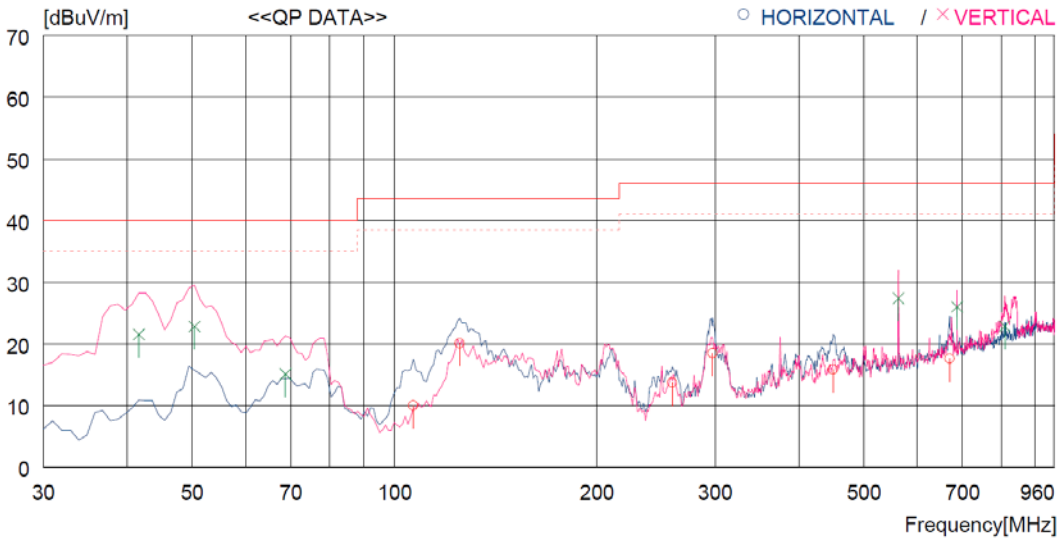
Limits apply to : FCC CFR 47, PART 15, SUBPART C, SECTION 15.247

Result : PASSED

EUT EUT : OTT BOX Date: January 06, 2020 ~ January 16, 2020

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 [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	106.630	28.8	11.8	2.4	33.0	10.0	43.5	33.5	300	113
2	125.060	40.8	9.7	2.6	33.0	20.1	43.5	23.4	300	113
3	258.920	30.0	12.8	3.8	32.9	13.7	46.0	32.3	200	148
4	297.720	34.1	13.4	4.0	33.0	18.5	46.0	27.5	100	359
5	450.011	27.9	16.1	4.9	33.1	15.8	46.0	30.2	100	359
6	670.196	25.0	19.9	6.0	33.3	17.6	46.0	28.4	200	319
----- Vertical ------										
7	41.640	38.8	14.3	1.5	33.1	21.5	40.0	18.5	100	25
8	50.370	40.1	14.1	1.7	33.1	22.8	40.0	17.2	100	8
9	68.800	36.4	9.8	2.0	33.1	15.1	40.0	24.9	200	359
10	562.529	36.4	18.8	5.5	33.3	27.4	46.0	18.6	100	264
11	687.655	33.3	20.0	6.0	33.3	26.0	46.0	20.0	200	359
12	809.872	28.0	21.3	6.6	33.0	22.9	46.0	23.1	100	2

Tested by: Hyung-Kwon, Oh / Manager

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11.4.2 Test data for Below 30 MHz

-. Test Date : January 06, 2020 ~ January 16, 2020

-. 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 : January 06, 2020 ~ January 16, 2020

-. 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 / 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 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.

12.3 Test equipment used

	Model Number	Manufacturer	Description	Serial Number	Last Cal. (Interval)
■ -	ESCI	Rohde & Schwarz	Test Receiver	101012	Oct. 22, 2019 (1Y)
□ -	ESU	Rohde & Schwarz	Test Receiver	100261	Mar. 28, 2019 (1Y)
□ -	NSLK8128	Schwarzbeck	AMN	8128-216	Mar. 20, 2019 (1Y)
■ -	NSLK8126	Schwarzbeck	AMN	8126-404	Mar. 19, 2019 (1Y)
□ -	3825/2	EMCO	AMN	9109-1869	Mar. 19, 2019 (1Y)
■ -	3825/2	EMCO	AMN	9109-1867	Mar. 27, 2019 (1Y)

All test equipment used is calibrated on a regular basis.

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12.4 Test data

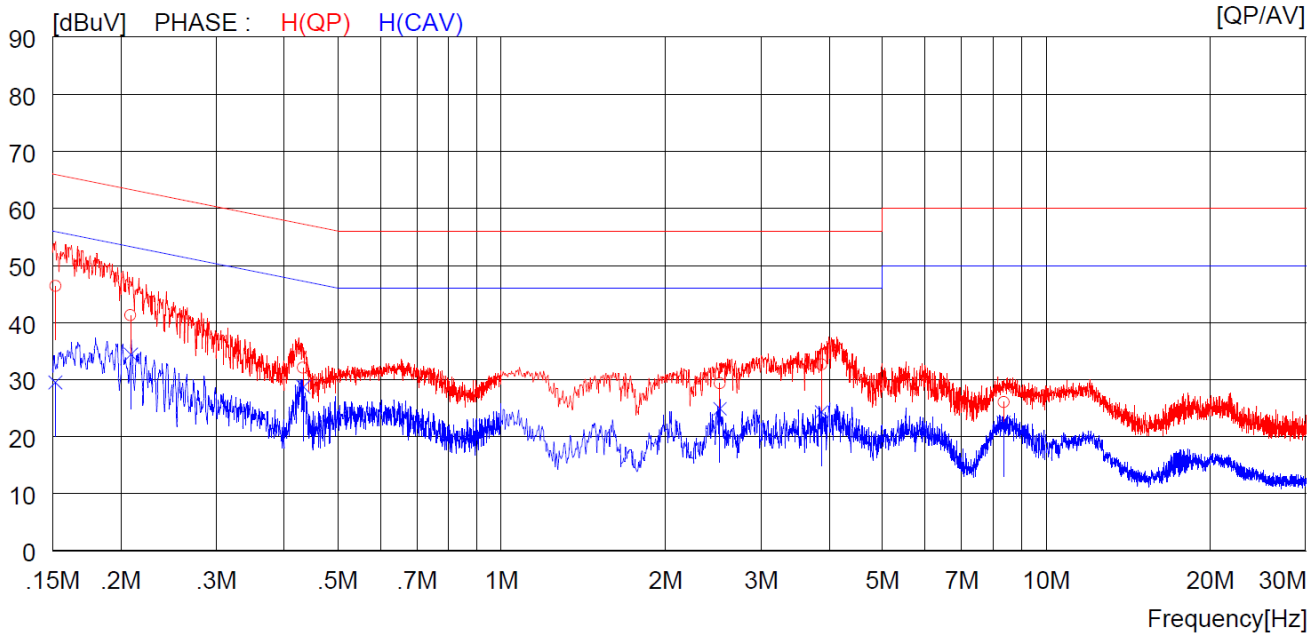
-. Test Date : January 06, 2020 ~ January 16, 2020

-. 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 QP [dBuV]	READING AV [dBuV]	C.FACTOR [dB]	RESULT QP [dBuV]	RESULT AV [dBuV]	LIMIT QP [dBuV]	LIMIT AV [dBuV]	MARGIN QP [dBuV]	MARGIN AV [dBuV]	PHASE
1	0.15200	36.4	----	10.0	46.4	----	65.9	----	19.5	----	H(QP)
2	0.20900	31.2	----	10.0	41.2	----	63.2	----	22.0	----	H(QP)
3	0.43300	22.1	----	10.0	32.1	----	57.2	----	25.1	----	H(QP)
4	2.52000	19.2	----	10.1	29.3	----	56.0	----	26.7	----	H(QP)
5	3.87200	22.5	----	10.1	32.6	----	56.0	----	23.4	----	H(QP)
6	8.35500	15.8	----	10.2	26.0	----	60.0	----	34.0	----	H(QP)
7	0.15200	----	19.5	10.0	----	29.5	----	55.9	----	26.4	H(CAV)
8	0.20900	----	24.4	10.0	----	34.4	----	53.2	----	18.8	H(CAV)
9	0.43300	----	18.7	10.0	----	28.7	----	47.2	----	18.5	H(CAV)
10	2.52000	----	14.8	10.1	----	24.9	----	46.0	----	21.1	H(CAV)
11	3.87200	----	14.2	10.1	----	24.3	----	46.0	----	21.7	H(CAV)
12	8.35500	----	12.2	10.2	----	22.4	----	50.0	----	27.6	H(CAV)

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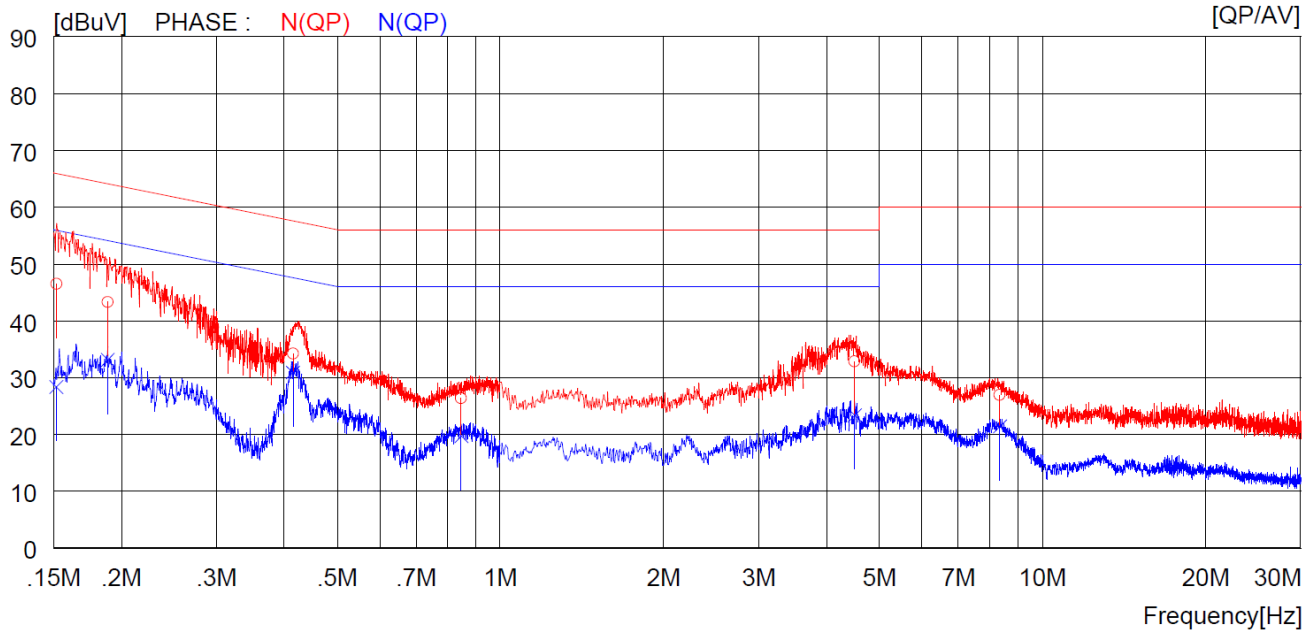
-. Tested Line : NEUTRAL LINE



NO	FREQ [MHz]	READING QP [dBuV]	READING AV [dBuV]	C.FACTOR [dB]	RESULT QP [dBuV]	RESULT AV [dBuV]	LIMIT QP [dBuV]	LIMIT AV [dBuV]	MARGIN QP [dBuV]	MARGIN AV [dBuV]	PHASE
1	0.15200	36.5	----	10.0	46.5	----	65.9	----	19.4	----	N(QP)
2	0.18900	33.3	----	10.0	43.3	----	64.1	----	20.8	----	N(QP)
3	0.41500	24.2	----	10.0	34.2	----	57.5	----	23.3	----	N(QP)
4	0.84800	16.4	----	10.0	26.4	----	56.0	----	29.6	----	N(QP)
5	4.50800	22.7	----	10.1	32.8	----	56.0	----	23.2	----	N(QP)
6	8.35000	16.7	----	10.2	26.9	----	60.0	----	33.1	----	N(QP)
7	0.15200	----	18.4	10.0	----	28.4	----	55.9	----	27.5	N(CAV)
8	0.18900	----	23.1	10.0	----	33.1	----	54.1	----	21.0	N(CAV)
9	0.41500	----	20.9	10.0	----	30.9	----	47.5	----	16.6	N(CAV)
10	0.84800	----	9.7	10.0	----	19.7	----	46.0	----	26.3	N(CAV)
11	4.50800	----	13.3	10.1	----	23.4	----	46.0	----	22.6	N(CAV)
12	8.35000	----	11.2	10.2	----	21.4	----	50.0	----	28.6	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 / Manager

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