

ELECTROMAGNETIC EMISSION COMPLIANCE REPORT FOR LOW-POWER, NON-LICENSED TRANSMITTER

Test Report No. : OT-194-RWD-014

AGR No. : A194A-029

Applicant : Telit Communications S.p.A.
Address : Viale Stazione di Prosecco 5/b, Trieste, Italy, 34010

Manufacturer : Telit Communications S.p.A.
Address : Viale Stazione di Prosecco 5/b, Trieste, Italy, 34010

Type of Equipment : RF Module

FCC ID. : RI7WE866C3

Model Name : WE866C3-P

Multiple Model Name : N/A

Serial number : N/A

Total page of Report : 49 pages (including this page)

Date of Incoming : March 20, 2019

Date of issue : April 03, 2019

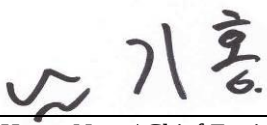
SUMMARY

The equipment complies with the regulation; **FCC PART 15 SUBPART C Section 15.247**

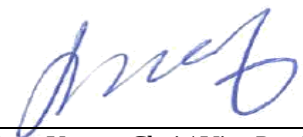
This test report only contains the result of a single test of the sample supplied for the examination.

It is not a generally valid assessment of the features of the respective products of the mass-production.

Reviewed by:


Ki-Hong, Nam / Chief Engineer
ONETECH Corp.

Approved by:


Keun-Young, Choi / Vice President
ONETECH Corp.

CONTENTS

PAGE

1. VERIFICATION OF COMPLIANCE	5
2. TEST SUMMARY	6
2.1 TEST ITEMS AND RESULTS	6
2.2 ADDITIONS, DEVIATIONS, EXCLUSIONS FROM STANDARDS.....	6
2.3 RELATED SUBMITTAL(S) / GRANT(S)	6
2.4 PURPOSE OF THE TEST	6
2.5 TEST METHODOLOGY.....	6
2.6 TEST FACILITY.....	6
3. GENERAL INFORMATION.....	7
3.1 PRODUCT DESCRIPTION.....	7
3.2 ALTERNATIVE TYPE(S)/MODEL(S); ALSO COVERED BY THIS TEST REPORT.....	7
4. EUT MODIFICATIONS.....	7
5. SYSTEM TEST CONFIGURATION	8
5.1 JUSTIFICATION.....	8
5.2 PERIPHERAL EQUIPMENT	8
5.3 MODE OF OPERATION DURING THE TEST	9
5.4 CONFIGURATION OF TEST SYSTEM.....	21
5.5 ANTENNA REQUIREMENT	21
6. PRELIMINARY TEST	21
6.1 AC POWER LINE CONDUCTED EMISSIONS TESTS.....	21
6.2 GENERAL RADIATED EMISSIONS TESTS	21
7. 100 KHZ BANDWIDTH OUTSIDE THE FREQUENCY BAND.....	22
7.1 OPERATING ENVIRONMENT	22
7.2 TEST SET-UP FOR CONDUCTED MEASUREMENT	22
7.3 TEST SET-UP FOR RADIATED MEASUREMENT.....	22
7.4 TEST EQUIPMENT USED	22
7.5 TEST DATA FOR RADIATED EMISSION.....	23
7.5.1 Radiated Emission which fall in the Restricted Band.....	23
7.5.2 Spurious & Harmonic Radiated Emission.....	33
8. RADIATED EMISSION TEST	47
8.1 OPERATING ENVIRONMENT	47

8.2 TEST SET-UP	47
8.3 TEST EQUIPMENT USED	47
8.4 TEST DATA.....	48
<i>8.4.1 Test data for 30 MHz ~ 960 MHz.....</i>	<i>48</i>
<i>8.4.2 Test data for Below 30 MHz</i>	<i>49</i>
<i>8.4.3 Test data for above 1 GHz</i>	<i>49</i>

Revision History

Rev. No.	Issue Report No.	Issued Date	Revisions	Section Affected
0	OT-194-RWD-014	April 03, 2019	Initial Release	All

1. VERIFICATION OF COMPLIANCE

Applicant : Telit Communications S.p.A.
Address : Viale Stazione di Prosecco 5/b, Trieste, Italy, 34010
Contact Person : Ken Bednasz
Telephone No. : +1 919 415 1517
FCC ID : RI7WE866C3
Model Name : WE866C3-P
Serial Number : N/A
Date : April 03, 2019

EQUIPMENT CLASS	DTS – DIGITAL TRNSMISSION SYSTEM
E.U.T. DESCRIPTION	Modular Transmitter, RF Module
THIS REPORT CONCERNS	Original Grant
MEASUREMENT PROCEDURES	ANSI C63.10: 2013
TYPE OF EQUIPMENT TESTED	Pre-Production
KIND OF EQUIPMENT AUTHORIZATION REQUESTED	Certification
EQUIPMENT WILL BE OPERATED UNDER FCC RULES PART(S)	FCC PART 15 SUBPART C Section 15.247 558074 D01 15.247 Meas Guidance v05r01
Modifications on the Equipment to Achieve Compliance	None
Final Test was Conducted On	3 m, Semi Anechoic Chamber

-. The above equipment was tested by ONETECH Corp. for compliance with the requirement set forth in the FCC Rules and Regulations. This said equipment in the configuration described in this report, shows the maximum emission levels emanating from equipment are within the compliance requirements.

2. TEST SUMMARY

2.1 Test items and results

SECTION	TEST ITEMS	RESULTS
15.247 (a) (2)	Minimum 6 dB Bandwidth	N/T (Note1)
15.247 (b) (3)	Maximum Peak Conducted Output Power	N/T (Note1)
15.247 (d)	100 kHz Bandwidth Outside the Frequency Band	N/T (Note1)
15.247 (d)	Radiated Emission which fall in the Restricted Band	Met the Limit / PASS
15.247 (e)	Peak Power Spectral Density	N/T (Note1)
15.209	Radiated Emission Limits	Met the Limit / PASS
15.207	Conducted Limits	N/A (See Note2)
15.203	Antenna Requirement	Met requirement / PASS

Note1 - According to the Applicant request, it is not RF conducted tested.

Note2 - This test is not performed because the EUT is operated by DC Power.

2.2 Additions, deviations, exclusions from standards

No additions, deviations or exclusions have been made from standard.

2.3 Related Submittal(s) / Grant(s)

Original submittal only

2.4 Purpose of the test

To determine whether the equipment under test fulfills the requirements of the regulation stated in FCC PART 15 SUBPART C Section 15.247.

2.5 Test Methodology

Both conducted and radiated testing was performed according to the procedures in ANSI C63.10: 2013. Radiated testing was performed at a distance of 3 m from EUT to the antenna.

2.6 Test Facility

The Onetech Corp. has been designated to perform equipment testing in compliance with ISO/IEC 17025.

The Electromagnetic compatibility measurement facilities are located at 43-14, Jinsaegol-gil, Chowol-eup, Gwangju-si, Gyeonggi-do, 12735, Korea

-. Site Filing:

VCCI (Voluntary Control Council for Interference) – Registration No. R-4112/ C-14617/ G-10666 / T-1842

IC (Industry Canada) – Registration No. Site# 3736A-3

-. Site Accreditation:

KOLAS (Korea Laboratory Accreditation Scheme) - Accreditation NO. KT085

FCC (Federal Communications Commission) - Accreditation No. KR0013

RRA (Radio Research Agency) – Designation No. KR0013

It should not be reproduced except in full, without the written approval of ONETECH Corp.

EMC-003 (Rev.2)

ONETECH Corp.: 43-14, Jinsaegol-gil, Chowol-eup, Gwangju-si, Gyeonggi-do, 12735, Korea (TEL: 82-31-799-9500, FAX: 82-31-799-9599)

3. GENERAL INFORMATION

3.1 Product Description

The Telit Communications S.p.A., Model WE866C3-P (referred to as the EUT in this report) is a RF Module. Product specification information described herein was obtained from product data sheet or user's manual.

DEVICE TYPE	RF Module
Temperature Range	-40 °C ~ 85 °C
OPERATING FREQUENCY	2 412 MHz ~ 2 462 MHz (802.11n(HT20))
	2 422 MHz ~ 2 452 MHz (802.11n(HT40))
MODULATION TYPE	OFDM Modulation(BPSK/QPSK/16QAM/64QAM)
RF OUTPUT POWER'	Wi-Fi 802.11n(HT20) (14.40 dBm)
	Wi-Fi 802.11n(HT40) (9.00 dBm)
ANTENNA TYPE	Dipole Antenna
ANTENNA GAIN	2.50 dBi
List of each Osc. or crystal Freq.(Freq. >= 1 MHz)	48 MHz
RATED SUPPLY VOLTAGE	DC 3.3 V

3.2 Alternative type(s)/model(s); also covered by this test report.

-. None

4. EUT MODIFICATIONS

-. None

5. SYSTEM TEST CONFIGURATION

5.1 Justification

This device was configured for testing in a typical way as a normal customer is supposed to be used. During the test, the following components were installed inside of the EUT.

DEVICE TYPE	MANUFACTURER	MODEL/PART NUMBER	FCC ID
Main Board	TELIT	WE866C3-P	-
Jig Board	TELIT	N/A	-

5.2 Peripheral equipment

Defined as equipment needed for correct operation of the EUT, but not considered as tested:

Model	Manufacturer	Description	Connected to
WE866C3-P	TELIT	RF Module(EUT)	-
N/A	TELIT	Jig Board	EUT
Pavilion g6	HP	Notebook	Jig Board

5.3 Mode of operation during the test

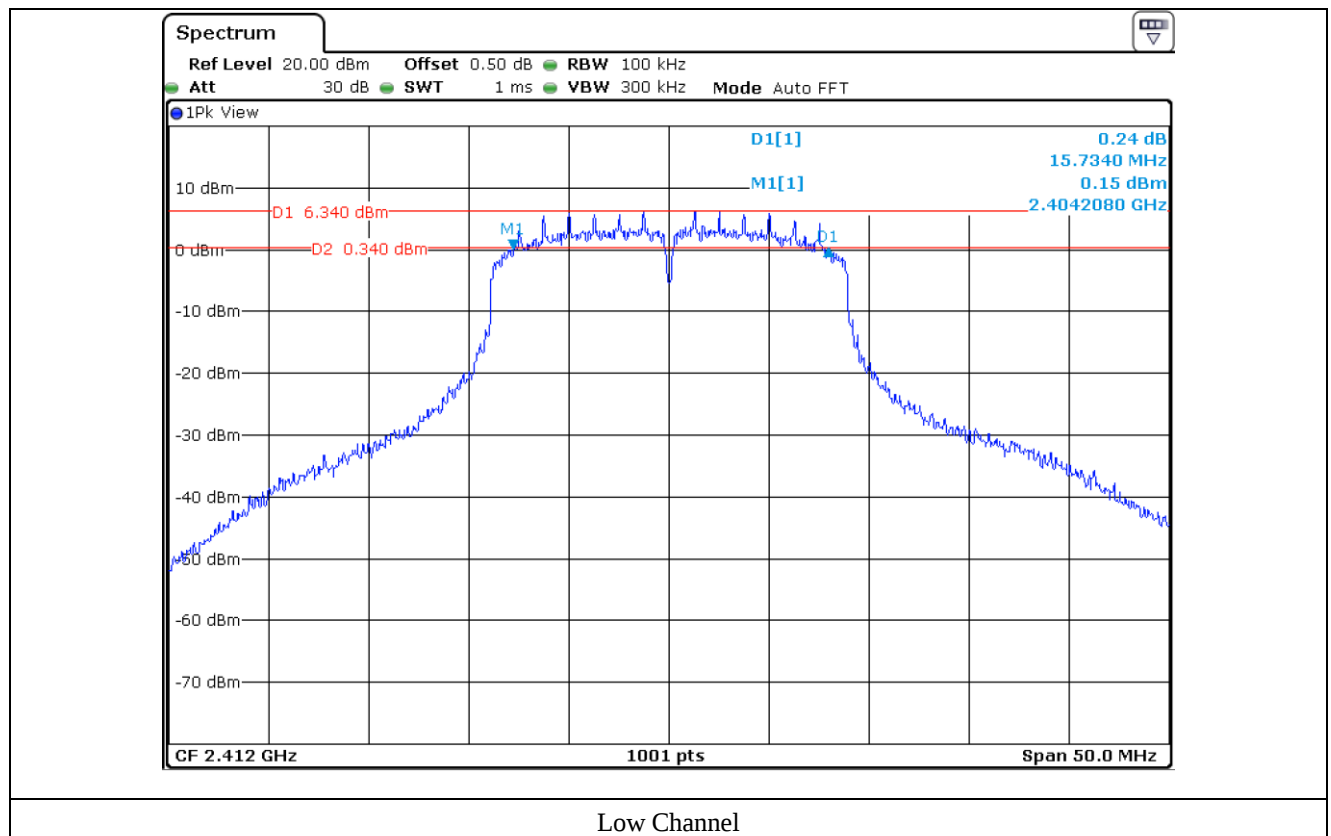
-. For the testing, software used to control the EUT for staying in continuous transmitting mode is programmed.

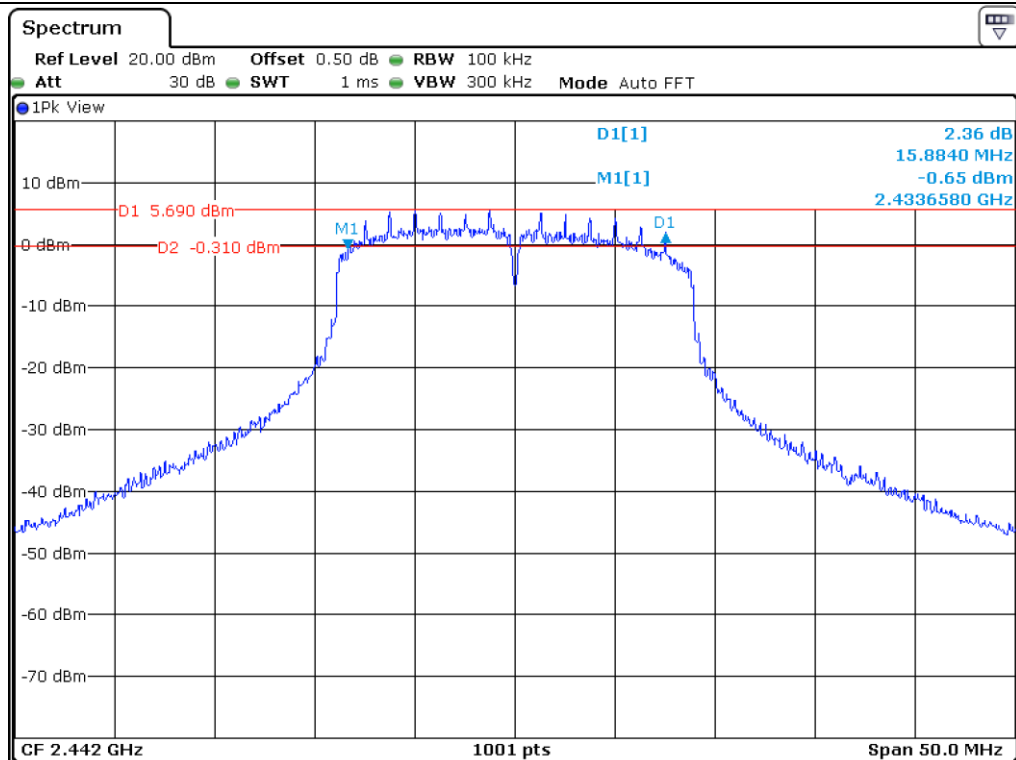
-. Output Power by Data Rate Performed According to the procedures in Ansi C63.10:2013.

(Section 11.8 DTS bandwidth & 11.9 Fundamental Emission Output Power)

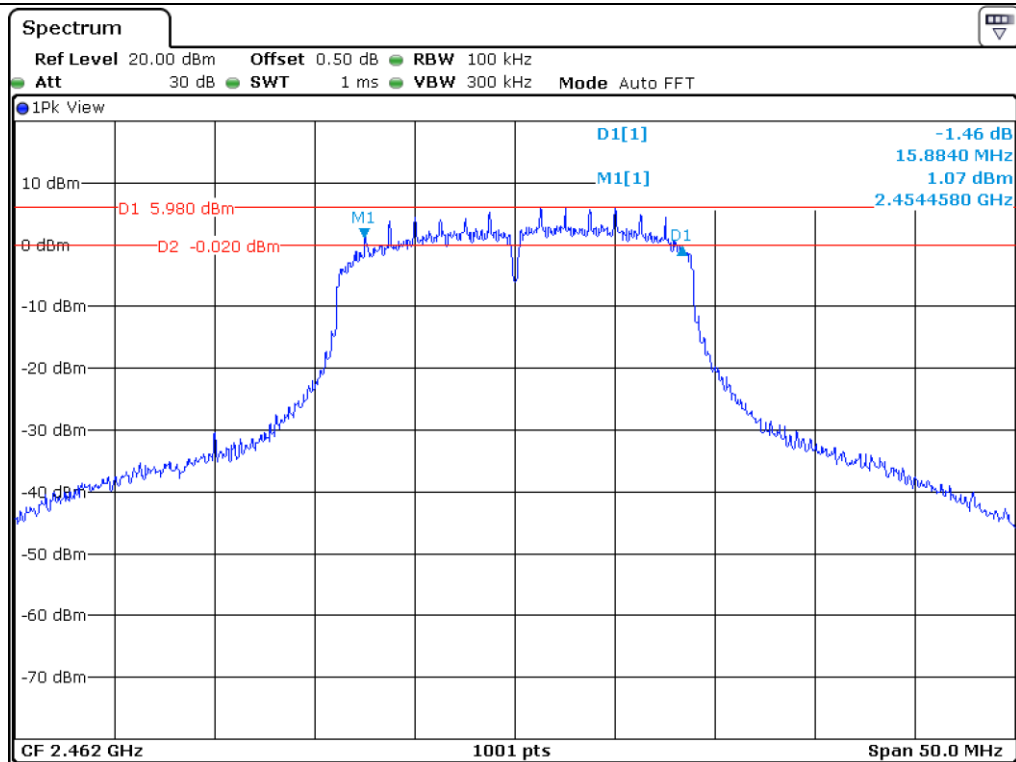
-. DTS BANDWIDTH

Modulation	CHANNEL	FREQUENCY (MHz)	DTS BANDWIDTH (MHz)
HT 20	Low	2 412	15.73
	Middle	2 442	15.88
	High	2 462	15.88



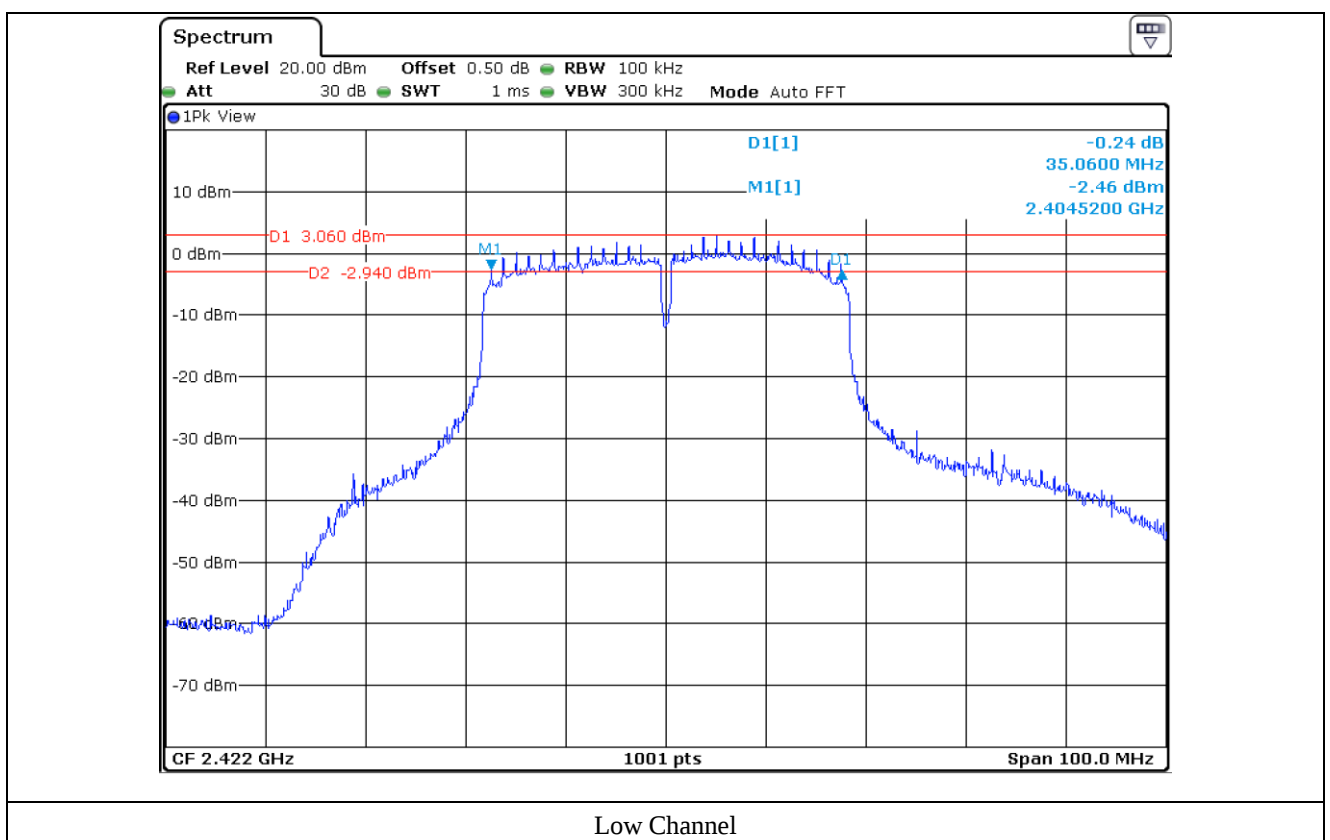


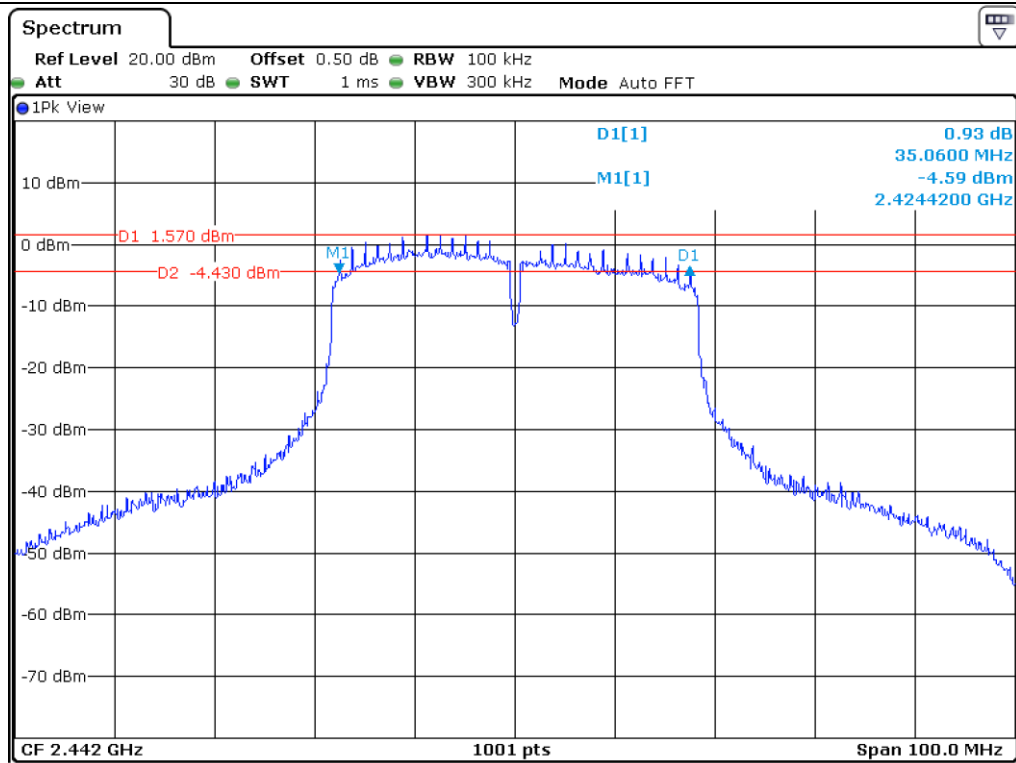
Middle Channel



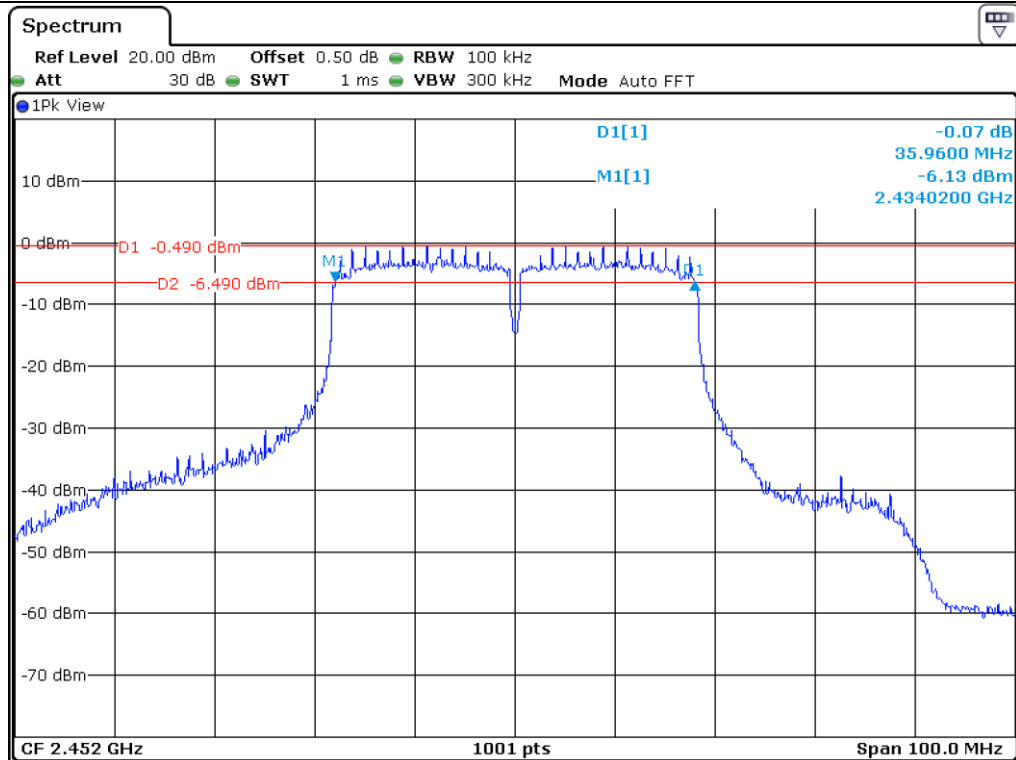
High Channel

Modulation	CHANNEL	FREQUENCY (MHz)	DTS BANDWIDTH (MHz)
HT 40	Low	2 422	35.06
	Middle	2 442	35.06
	High	2 452	35.96





Middle Channel



High Channel

- . PEAK OUTPUT POWER

Modulation	CHANNEL	FREQUENCY (MHz)	DTS BANDWIDTH (MHz)	MEASURED VLAUE (dBm)
HT 20	Low	2 412	15.73	25.57
	Middle	2 442	15.88	24.66
	High	2 462	15.88	24.91
HT 40	Low	2 422	35.06	25.07
	Middle	2 442	35.06	23.74
	High	2 452	35.96	22.84

- . OUTPUT POWER BY DATA RATE

Modulation	DATA RATE	OUTPUT POWER[dBm]
HT 20 (Middle Channel)	6.5 Mbps	24.66
	13 Mbps	23.43
	19.5 Mbps	24.35
	26 Mbps	24.32
	39 Mbps	23.17
	52 Mbps	23.86
	58.5 Mbps	24.30
	65 Mbps	23.27
HT 40 (Middle Channel)	13.5 Mbps	23.74
	27 Mbps	23.58
	40.5 Mbps	23.65
	54 Mbps	23.51
	81 Mbps	23.37
	108 Mbps	23.60
	121.5 Mbps	23.61
	135 Mbps	23.56

The worse case data rate for each modulation is determined 6.5 Mbps for HT20, 13.5 Mbps for HT40.

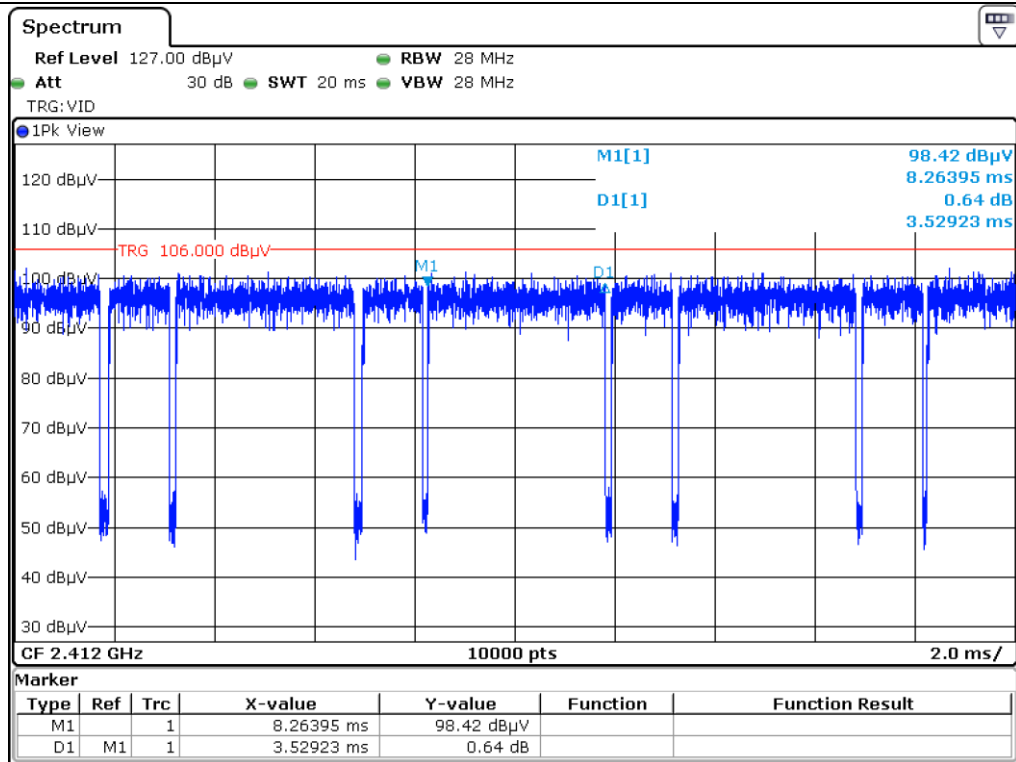
-. Duty Cycle

Mode	Tx On Time [ms]	Tx Off Time [ms]	Duty Cycle [%]	Correction Factor [dB]
802.11n(HT20)	4.71 (3.53 + 1.18)	0.29 (0.14 + 0.15)	94.20	0.26
802.11n(HT40)	2.29 (1.72 + 0.57)	0.29 (0.16 + 0.13)	88.76	0.52

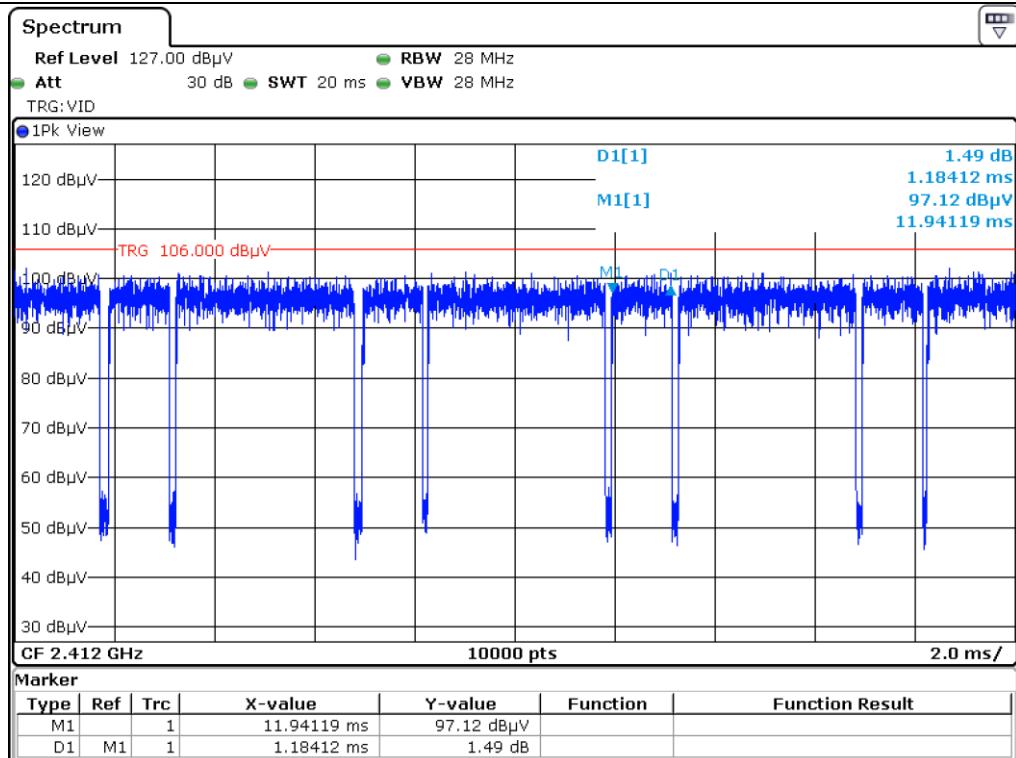
Note – Duty Cycle : (Tx On Time / (Tx On Time + Tx Off Time)) * 100

Correction Factor : $10 * \log(1 / (\text{Duty Cycle} / 100))$

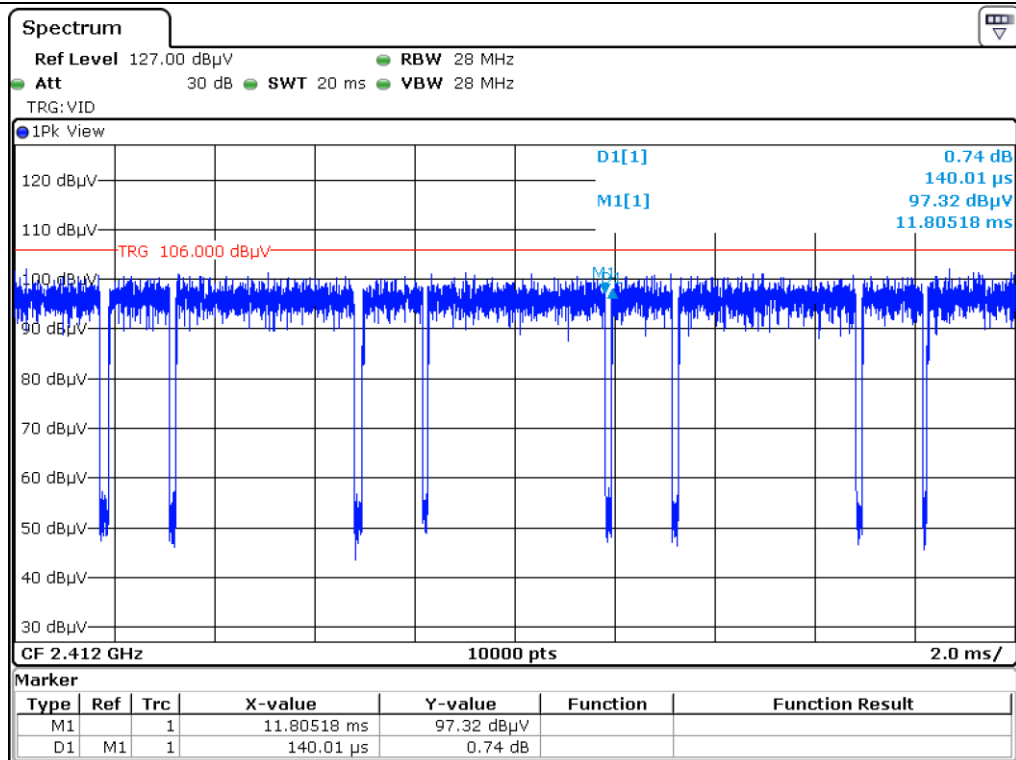
802.11n(HT20)



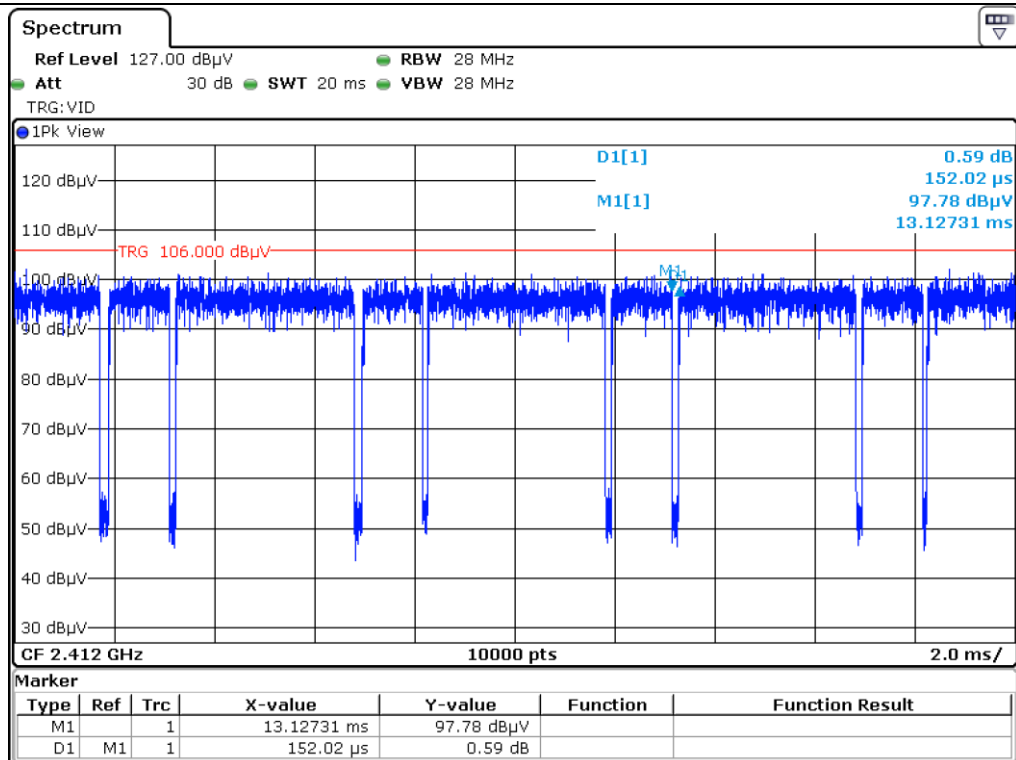
Low Channel_Tx On Time



Low Channel_Tx On Time 1

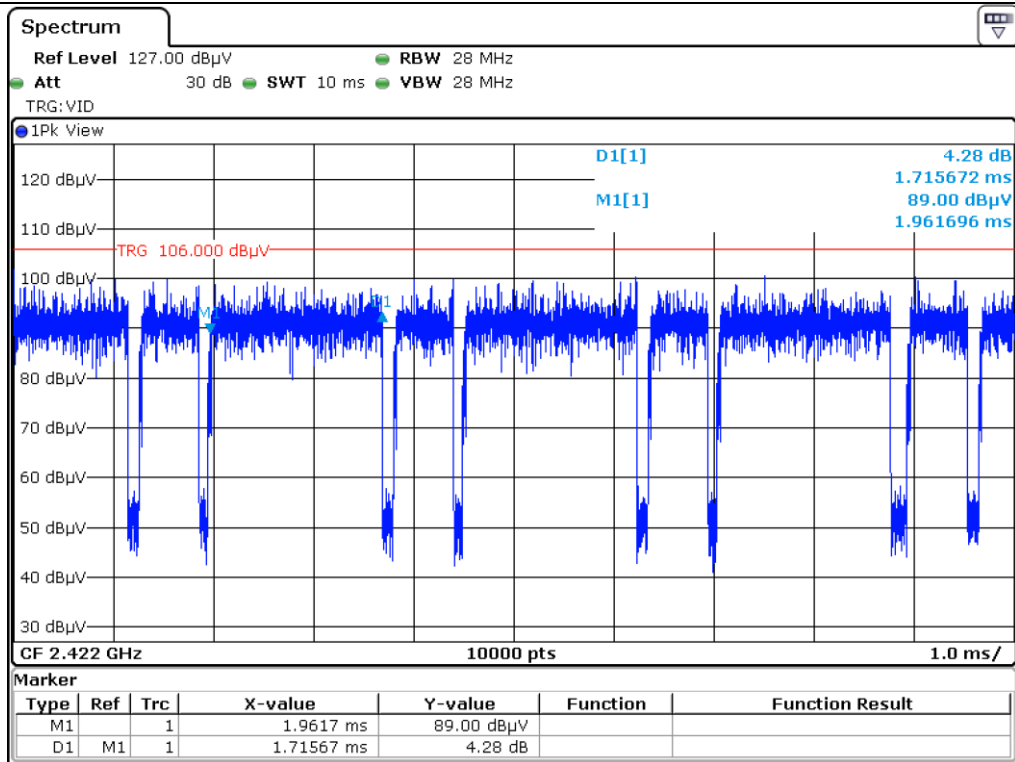


Low Channel_Tx Off Time

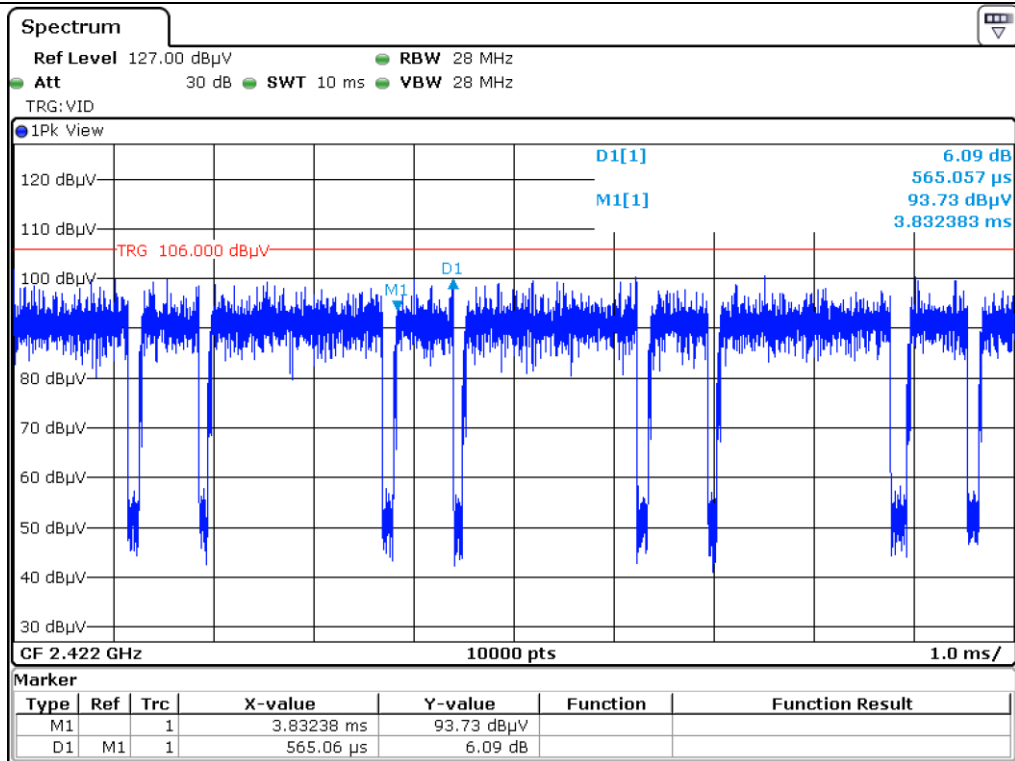


Low Channel_Tx Off Time 1

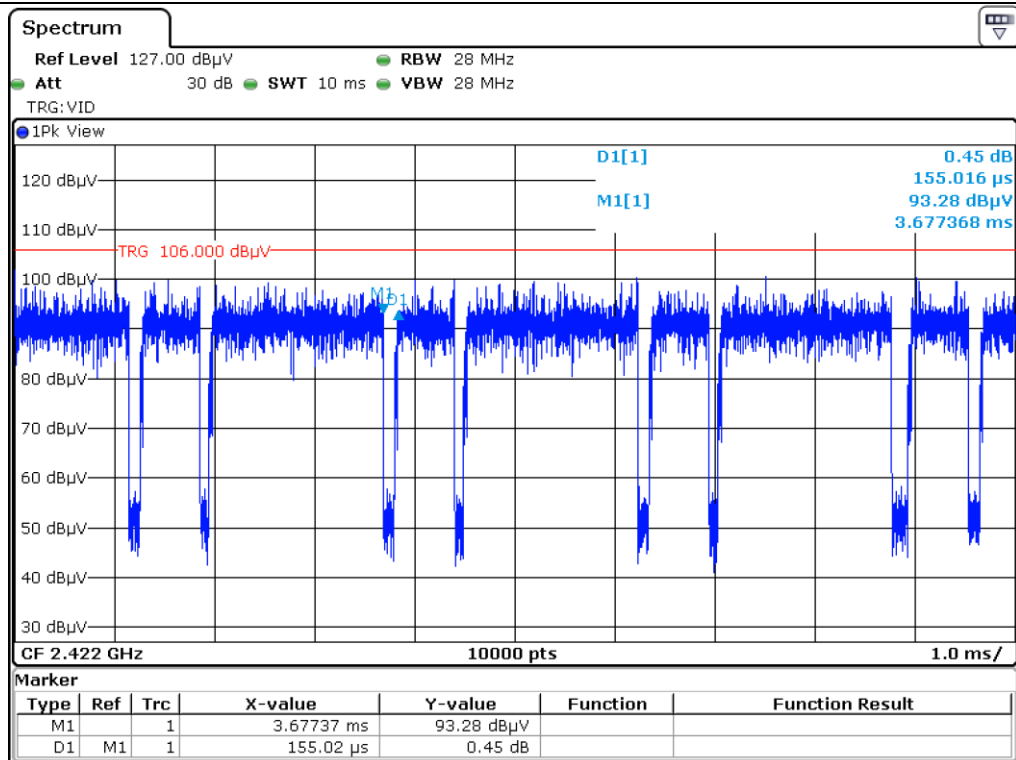
802.11n(HT40)



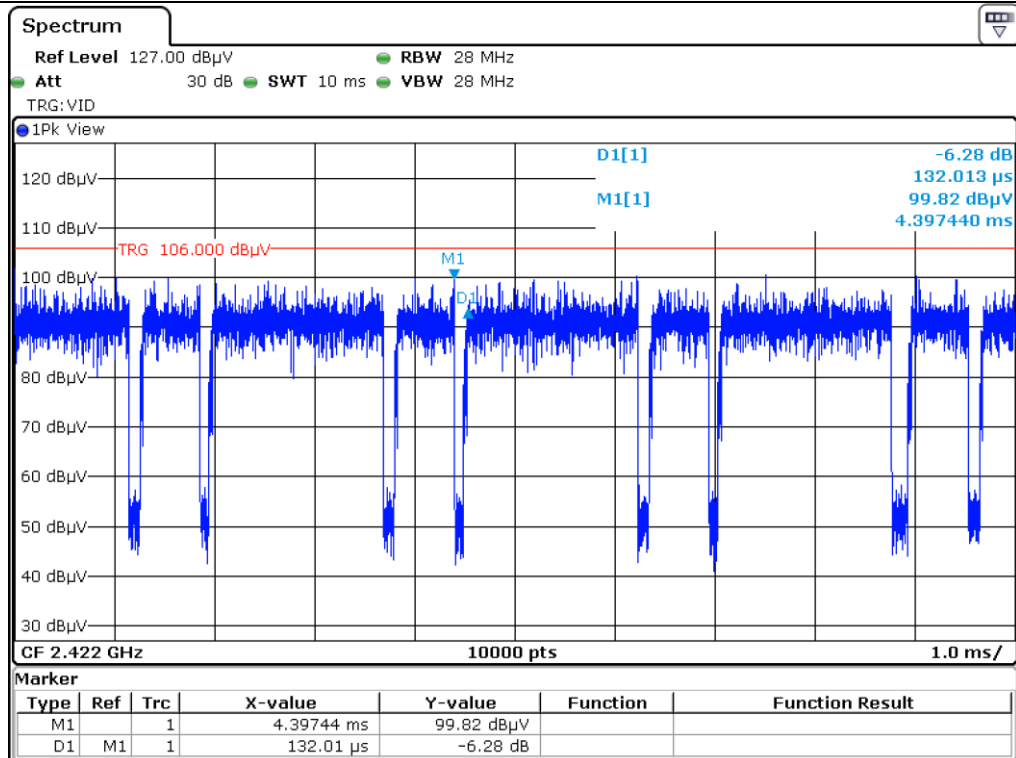
Low Channel_Tx On Time



Low Channel_Tx On Time



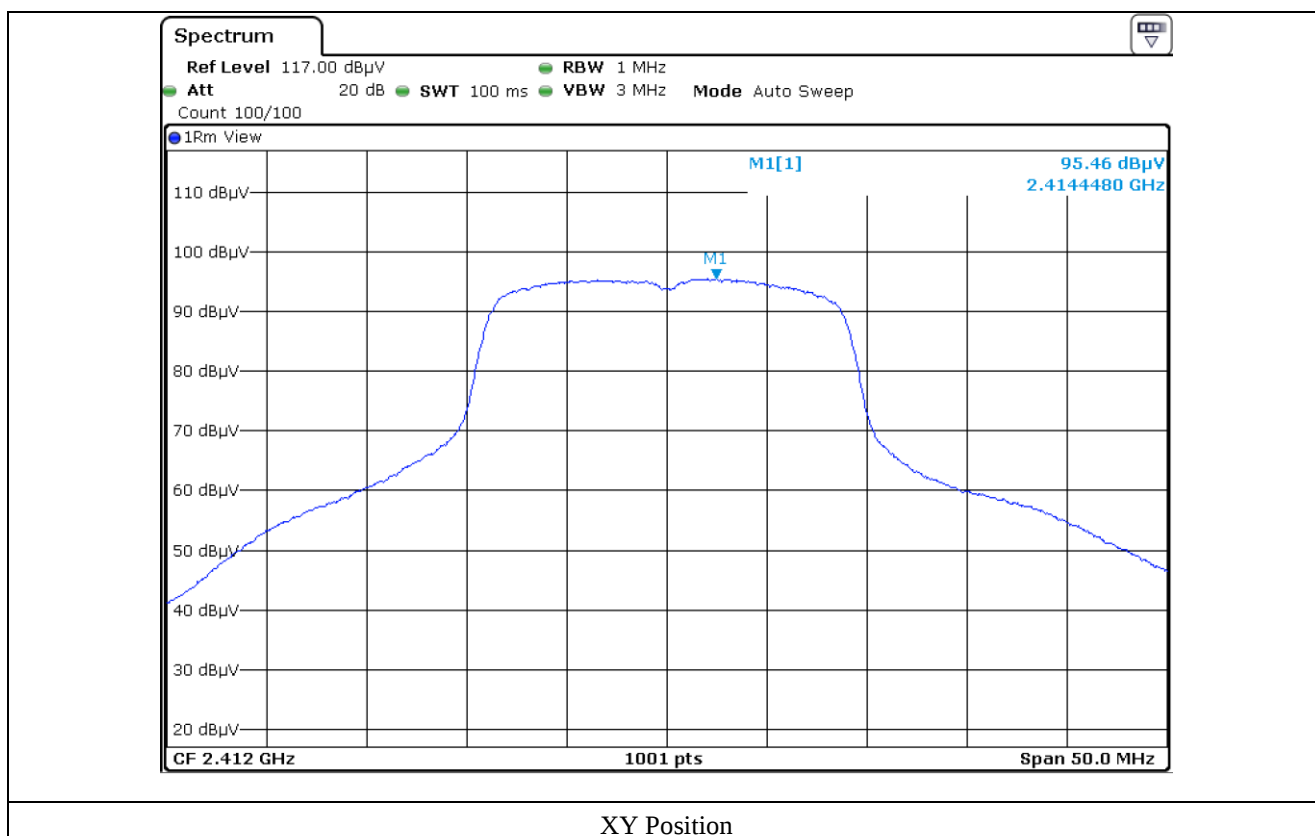
Low Channel_Tx Off Time

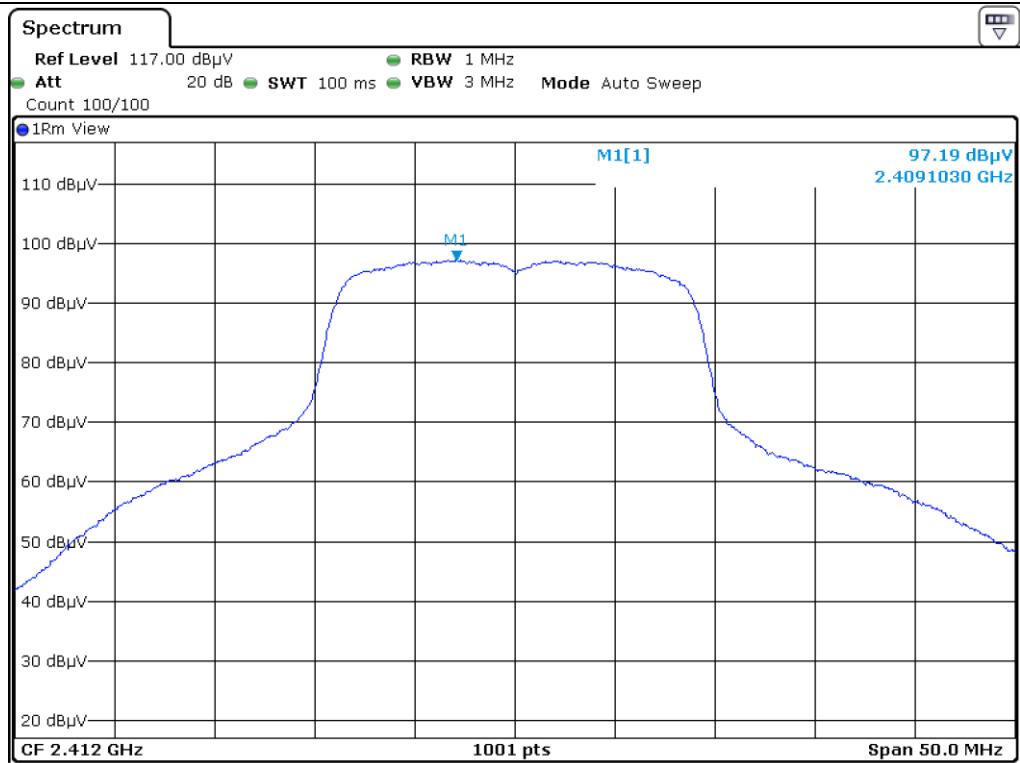


Low Channel_Tx Off Time 1

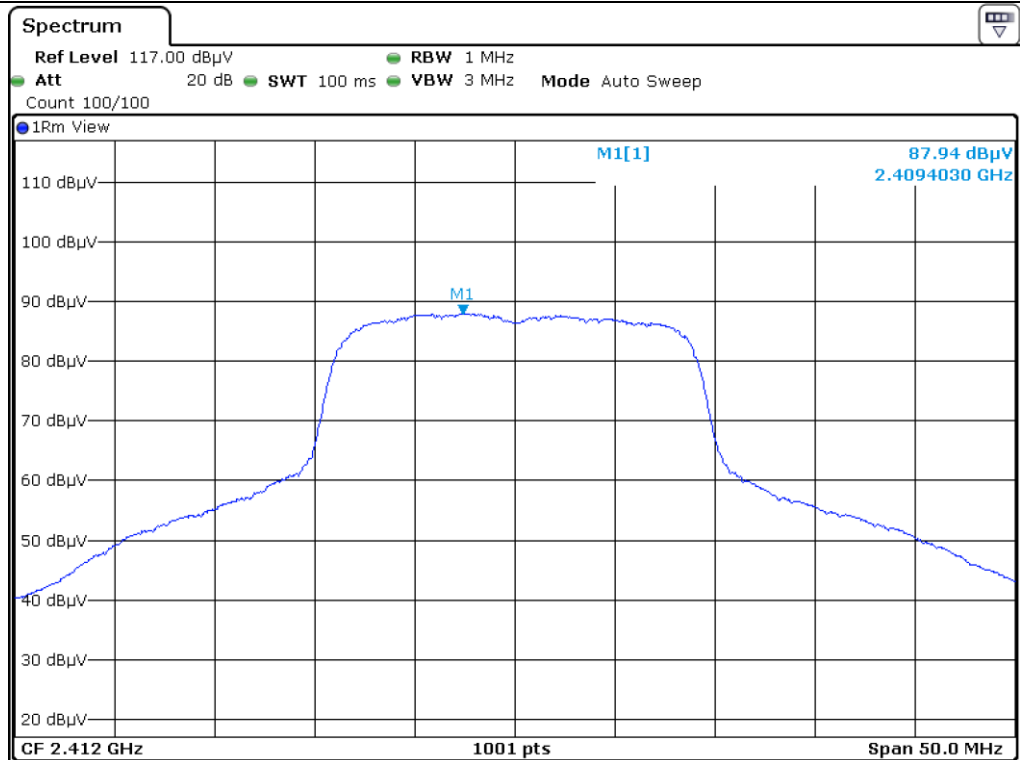
-. EUT Position Planes

Position	Emission Level [dBuV]
XY	95.46
XZ	97.19
YZ	87.94





XZ Position



YZ Position

-. To get a maximum emission levels from the EUT, the EUT was moved throughout the XY, XZ, and YZ planes and the worst case is "XZ" axis.

5.4 Configuration of Test System

- Line Conducted Test:** It is not need to test this requirement, because the EUT shall be operated by DC Power.
- Radiated Emission Test:** Preliminary radiated emissions test were conducted using the procedure in ANSI C63.10: 2013 to determine the worse operating conditions. Final radiated emission tests were conducted at 3 meter Semi Anechoic Chamber.
- The turntable was rotated through 360 degrees and the EUT was tested by positioned three orthogonal planes to obtain the highest reading on the field strength meter. Once maximum reading was determined, the search antenna was raised and lowered in both vertical and horizontal polarization.

5.5 Antenna Requirement

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

Antenna Construction:

The transmitter external antenna of the EUT is Dipole Antenna. The manufacturer has designed a structure that connects to the antenna using a unique coupling connector of the SMA type. so no consideration of replacement by the user.

6. PRELIMINARY TEST

6.1 AC Power line Conducted Emissions Tests

During Preliminary Tests, the following operating mode was investigated

Operation Mode	The Worse operating condition (Please check one only)
It is not need to test this requirement, because the power of the EUT is supplied by DC Power.	

6.2 General Radiated Emissions Tests

During Preliminary Test, the following operating mode was investigated.

Operation Mode	The Worse operating condition (Please check one only)
Transmitting Mode	X

7. 100 kHz BANDWIDTH OUTSIDE THE FREQUENCY BAND

7.1 Operating environment

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

7.2 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.



7.3 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.

7.4 Test equipment used

Model Number	Manufacturer	Description	Serial Number	Last Cal.
■ - FSV40	Rohde & Schwarz	Signal Analyzer	101009	Mar. 11, 2019 (1Y)
■ - ESR	Rohde & Schwarz	EMI Test Receiver	101470	Oct. 22, 2019 (1Y)
■ - 310N	Sonoma Instrument	Pre-Amplifier	312544	Mar. 18, 2019 (1Y)
■ - BBV 9718	Schwarzbeck	Amplifier	009	Mar. 30, 2019 (1Y)
■ - SCU40A	Rohde & Schwarz	Signal Conditioning unit	100436	Mar. 11, 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	9163-419	Oct. 17, 2019 (2Y)
■ - BBHA9120D	Schwarzbeck	Horn Antenna	BBHA9120D295	Aug. 16, 2019 (2Y)
■ - BBHA9170	Schwarzbeck	Horn Antenna	BBHA9170179	Jan. 16, 2019 (1Y)

All test equipment used is calibrated on a regular basis.

7.5 Test data for radiated emission

7.5.1 Radiated Emission which fall in the Restricted Band

7.5.1.1 Test data for 802.11n_HT20 WLAN Mode

- Test Date : March 30, 2019 ~ April 02, 2019
- Resolution bandwidth : 1 MHz and Peak Detector for Peak Mode
1 MHz and RMS Detector for Average Mode
- Video bandwidth : 3 MHz for Peak and Average Mode
- Measurement distance : 3 m
- Duty Cycle : < 98 %
- Result : PASSED

Frequency (MHz)	Reading (dBμV)	Detector Mode	Ant. Pol. (H/V)	Ant. Factor	Cable Loss	Amp Gain	Correction Factor	Total (dBμV/m)	Limits (dBμV/m)	Margin (dB)
Test Data for Low Channel										
2 389.880	62.52	Peak	H	26.94	9.20	34.76	0.26	64.16	74.00	9.84
2 389.960	50.31	Average	H					51.95	54.00	2.05
2 389.880	56.37	Peak	V					58.01	74.00	15.99
2 389.880	45.61	Average	V					47.25	54.00	6.75
Test Data for High Channel										
2 483.640	64.48	Peak	H	27.47	9.49	35.51	0.26	66.19	74.00	7.81
2 483.558	50.89	Average	H					52.60	54.00	1.40
2 483.525	59.85	Peak	V					61.56	74.00	12.44
2 483.541	45.88	Average	V					47.59	54.00	6.41

Tabulated test data for Restricted Band

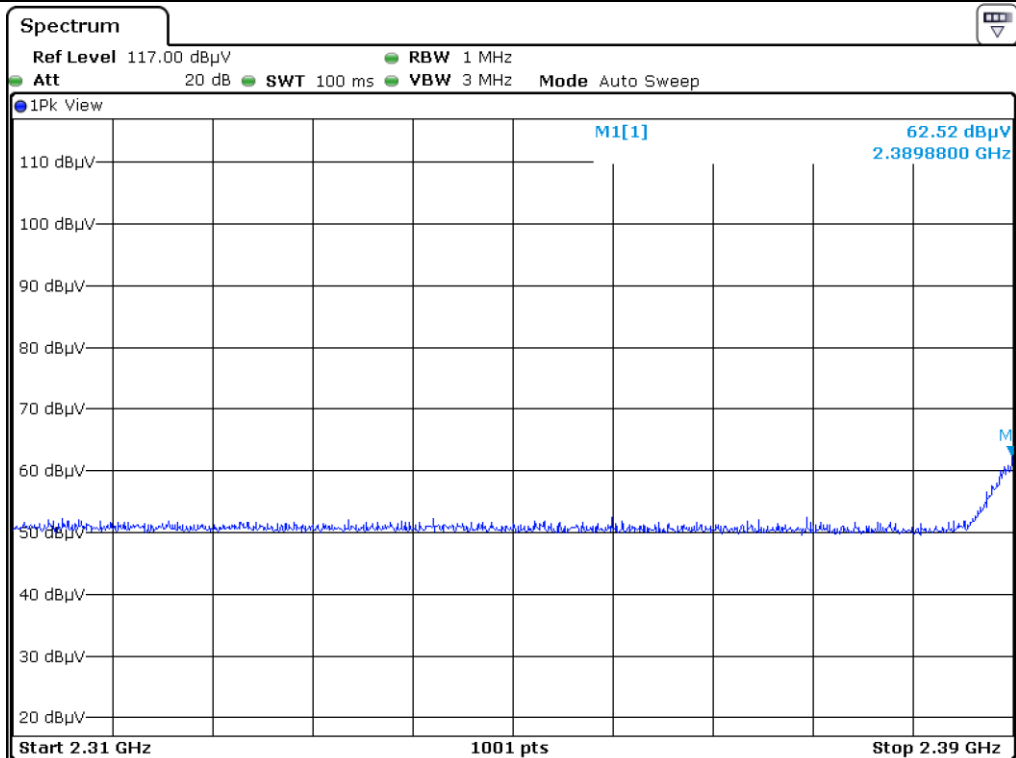
Remark : “H”: Horizontal, “V”: Vertical

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

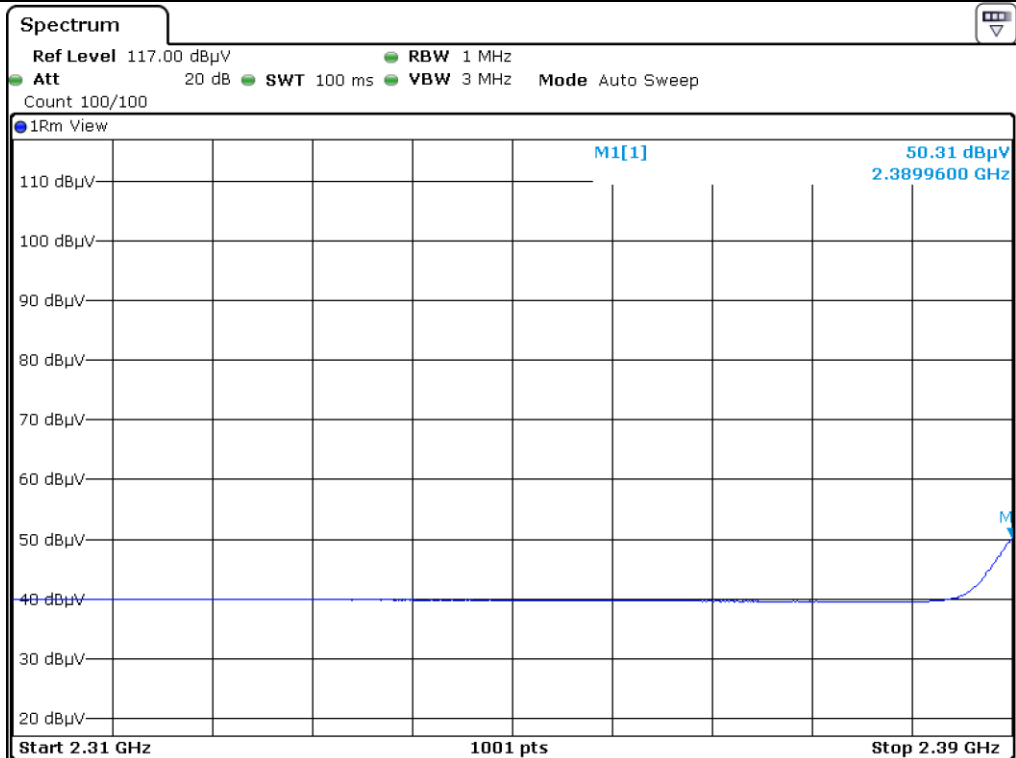
Total Level = Reading + Antenna Factor + Cable Loss + Correction Factor – Pre-Amplifier Gain



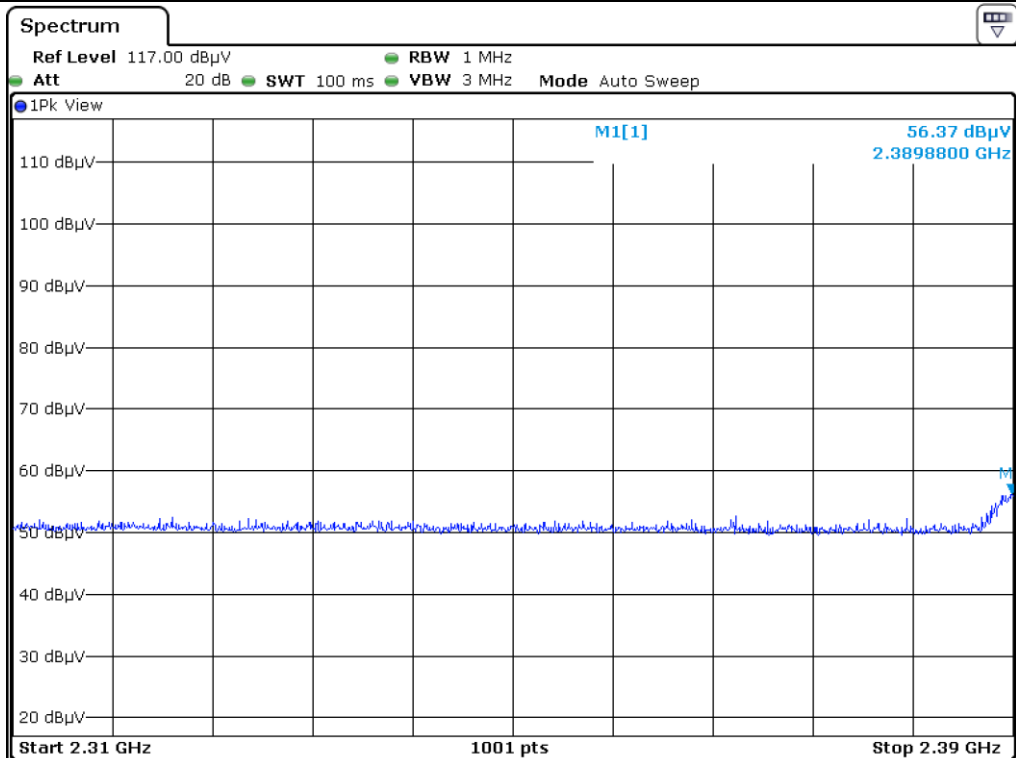
Tested by: Hyung-Kwon, Oh / Assistant Manager



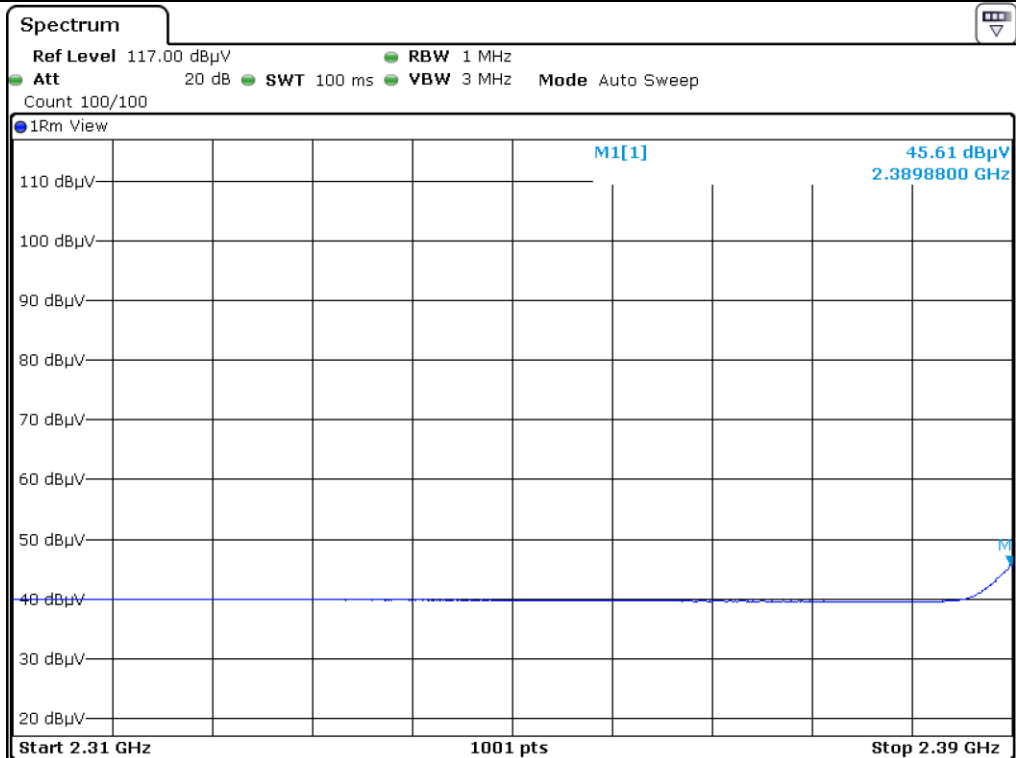
Low Channel_Peak_H



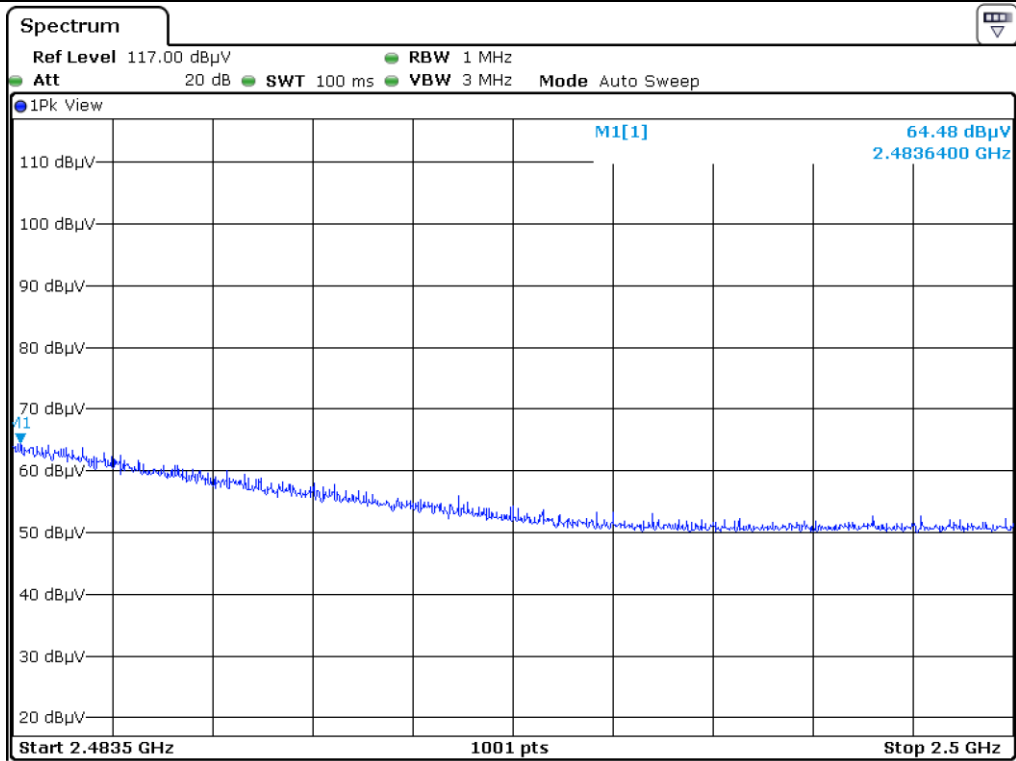
Low Channel_Average_H



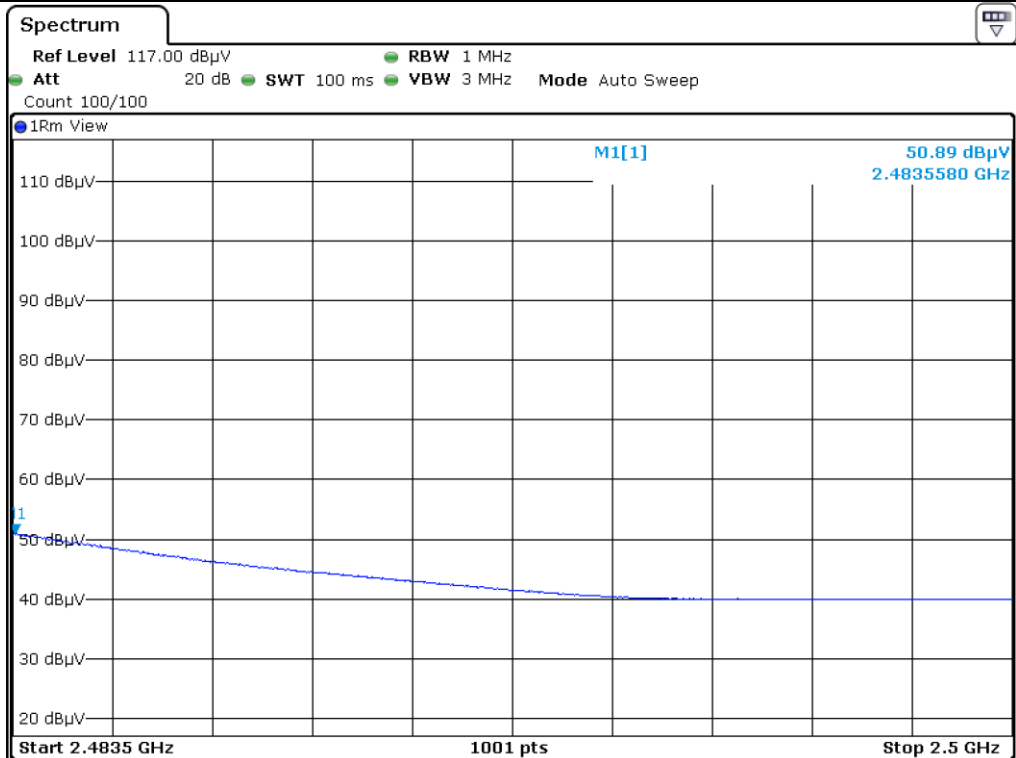
Low Channel_Peak_V



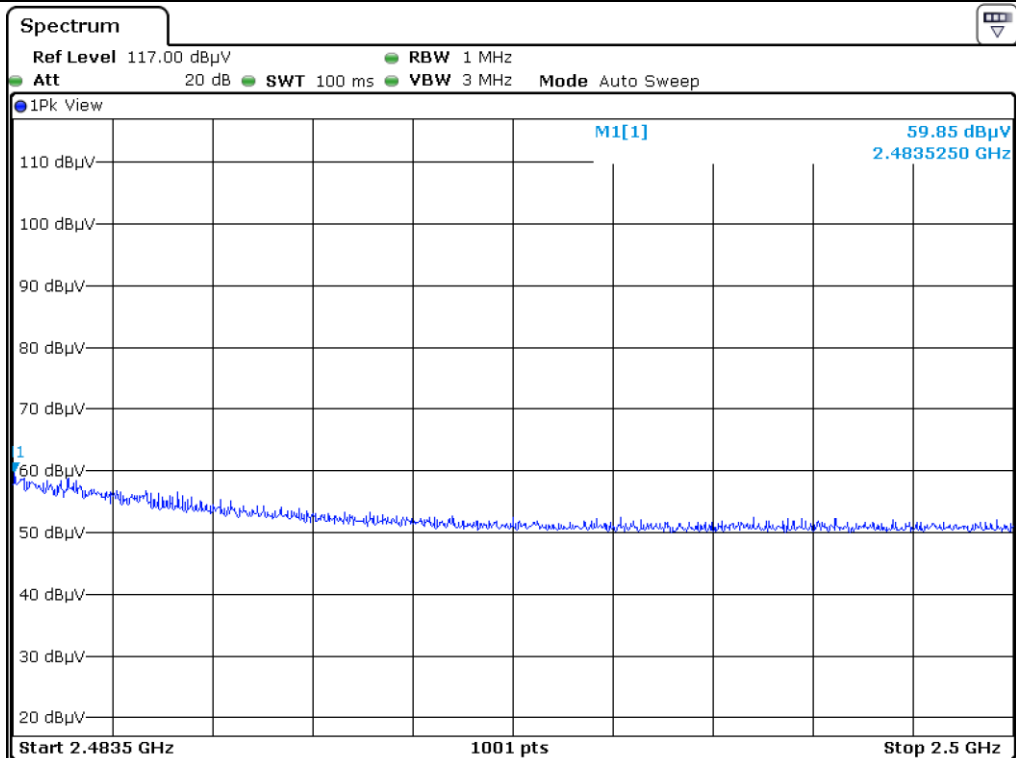
Low Channel_Average_V



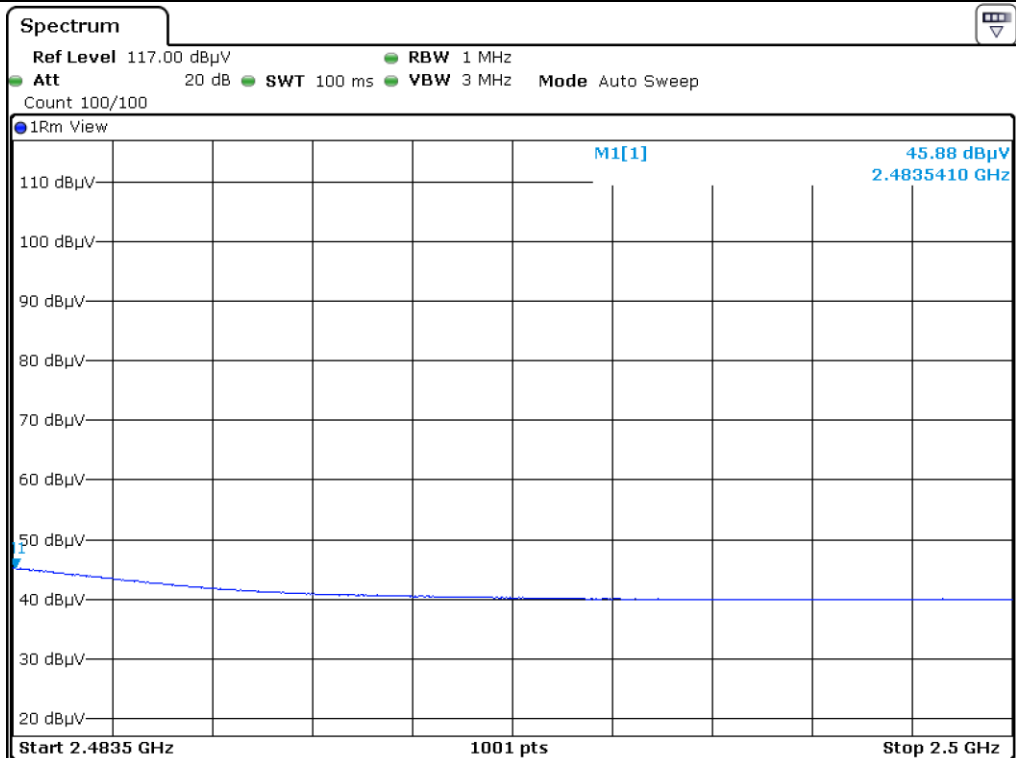
High Channel_Peak_H



High Channel_Average_H



High Channel_Peak_V



High Channel_Average_V

7.5.1.2 Test data for 802.11n_HT40 WLAN Mode

- Test Date : March 30, 2019 ~ April 02, 2019
- Resolution bandwidth : 1 MHz and Peak Detector for Peak Mode
1 MHz and RMS Detector for Average Mode
- Video bandwidth : 3 MHz for Peak and Average Mode
- Measurement distance : 3 m
- Duty Cycle : < 98 %
- Result : PASSED

Frequency (MHz)	Reading (dBμV)	Detector Mode	Ant. Pol. (H/V)	Ant. Factor	Cable Loss	Amp Gain	Correction Factor	Total (dBμV/m)	Limits (dBμV/m)	Margin (dB)
Test Data for Low Channel										
2 389.800	63.45	Peak	H	26.94	9.20	34.76	0.52	65.35	74.00	8.65
2 389.800	48.31	Average	H					50.21	54.00	3.79
2 389.800	59.67	Peak	V					61.57	74.00	12.43
2 389.960	43.25	Average	V					45.15	54.00	8.85
Test Data for High Channel										
2 484.959	64.91	Peak	H	27.47	9.49	35.51	0.52	66.88	74.00	7.12
2 485.420	48.63	Average	H					50.60	54.00	3.40
2 484.728	59.70	Peak	V					61.67	74.00	12.33
2 483.525	44.38	Average	V					46.35	54.00	7.65

Tabulated test data for Restricted Band

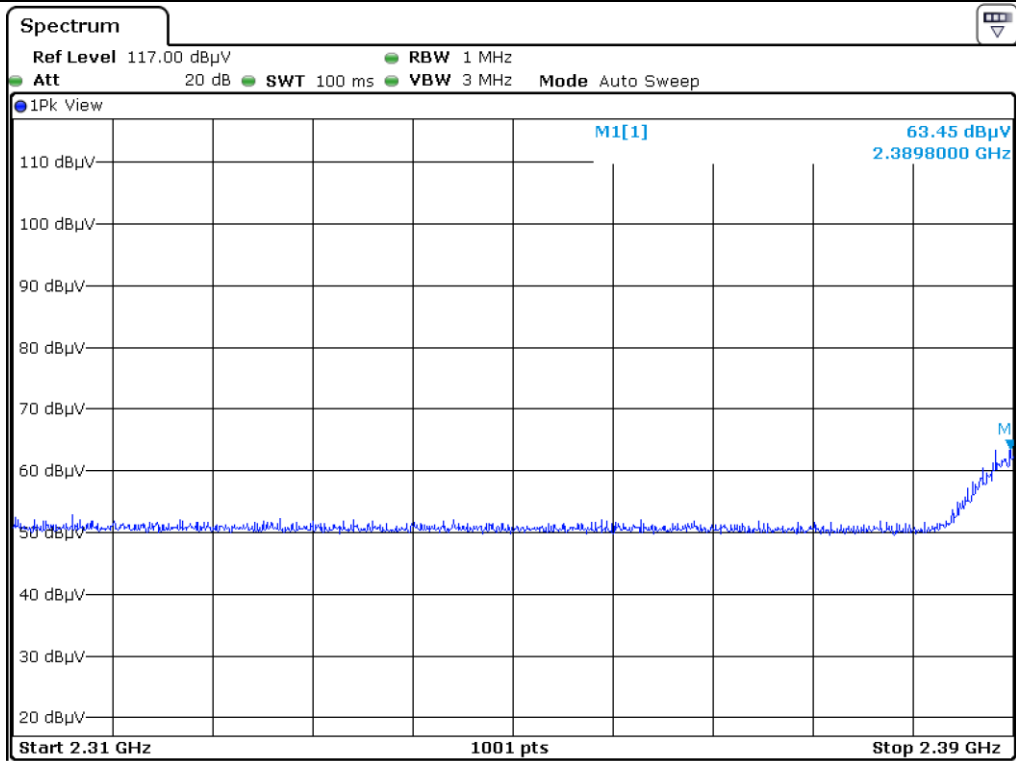
Remark : “H”: Horizontal, “V”: Vertical

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

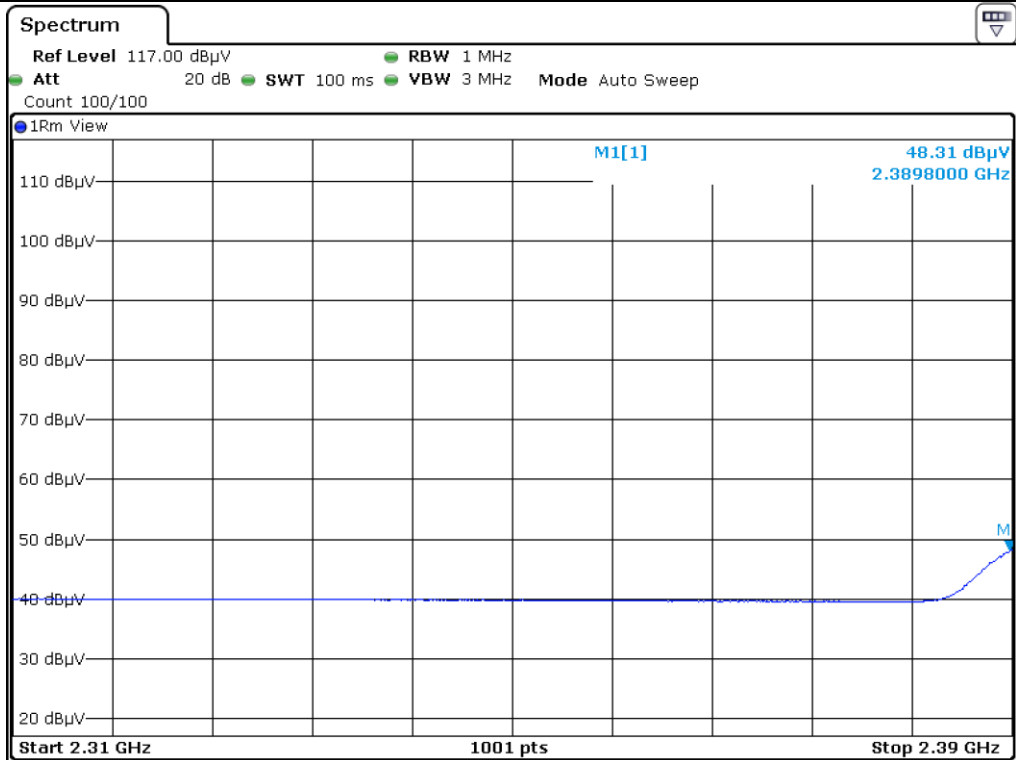
Total Level = Reading + Antenna Factor + Cable Loss + Correction Factor – Pre-Amplifier Gain



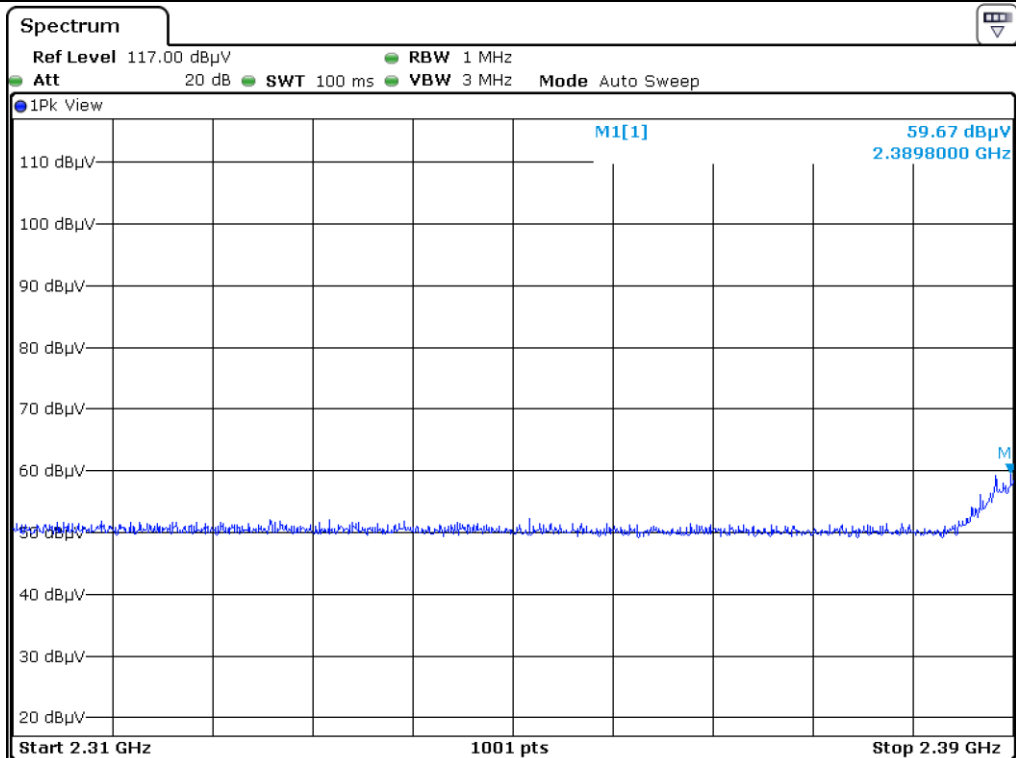
Tested by: Hyung-Kwon, Oh / Assistant Manager



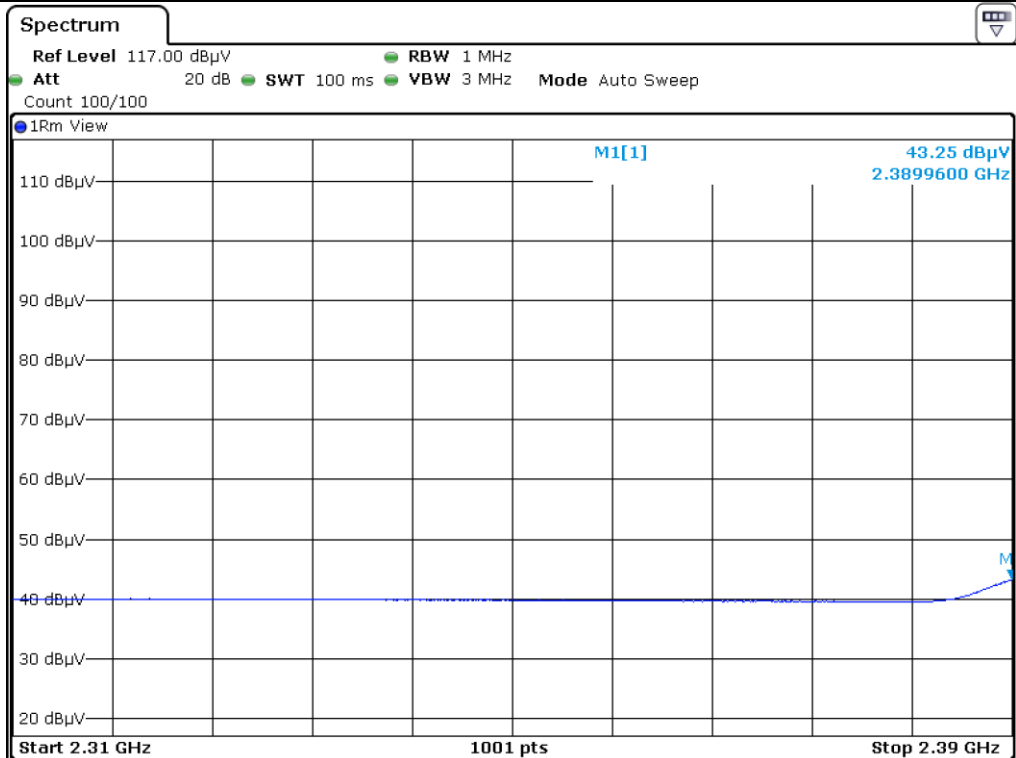
Low Channel_Peak_H



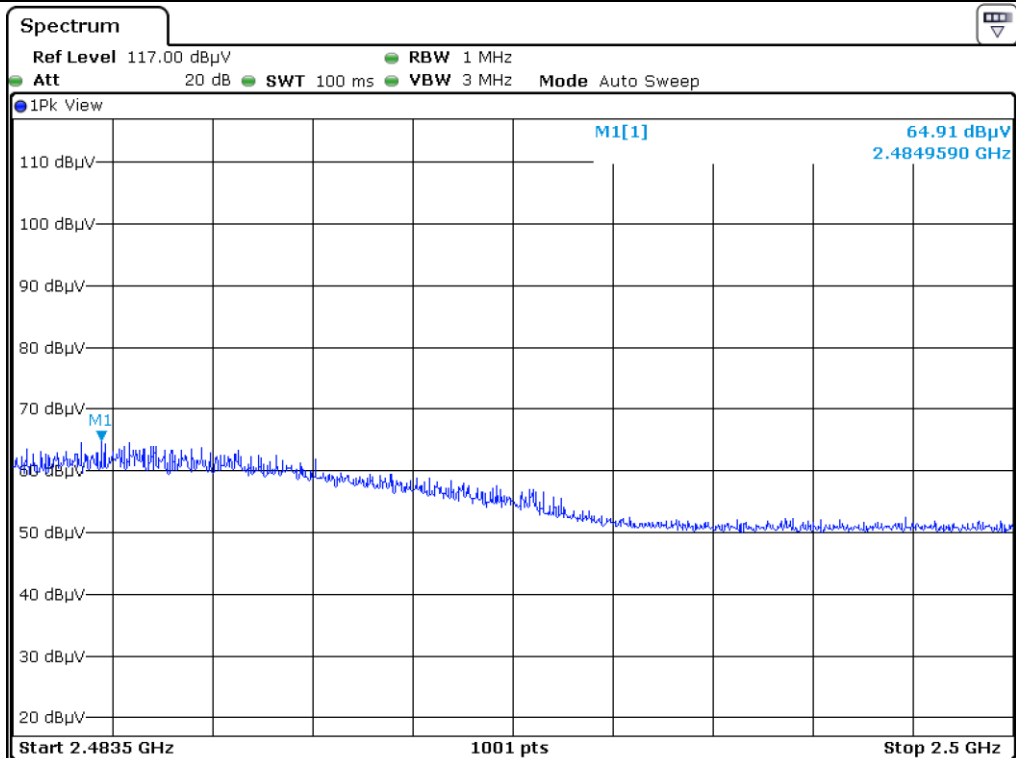
Low Channel_Average_H



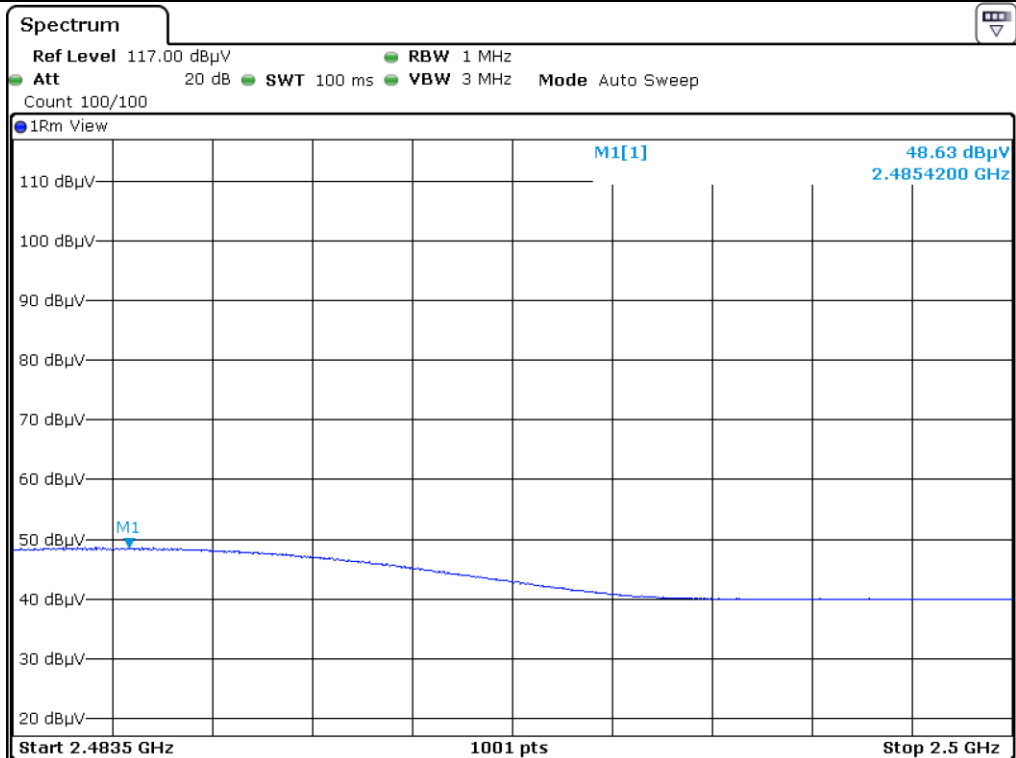
Low Channel_Peak_V



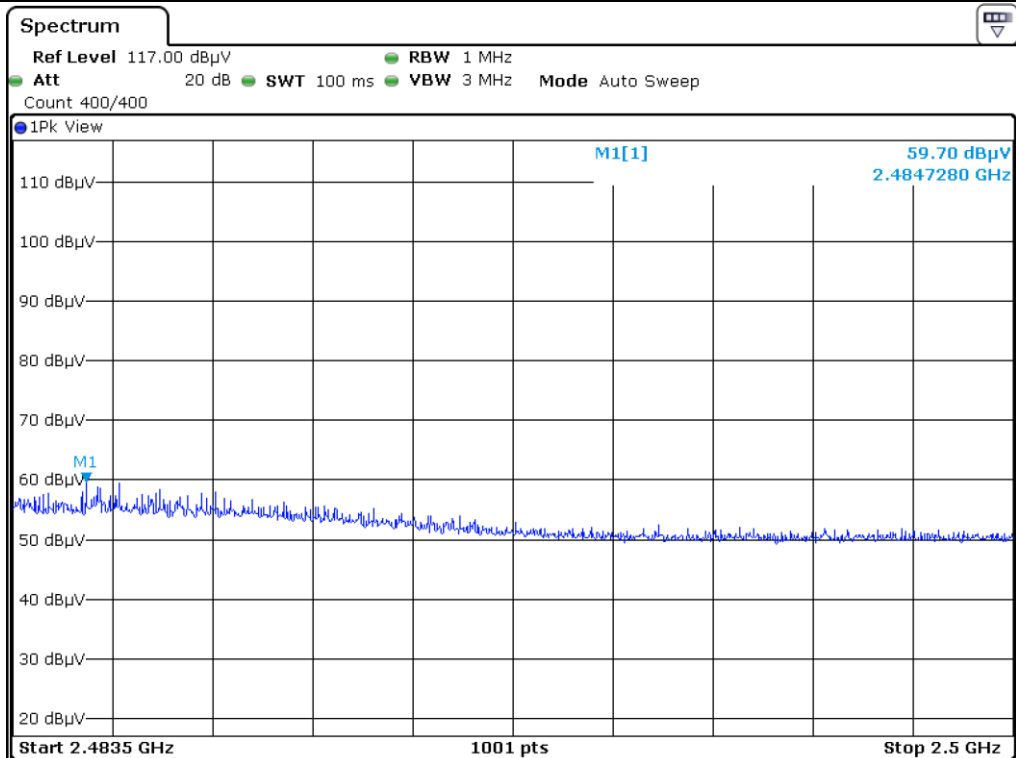
Low Channel_Average_V



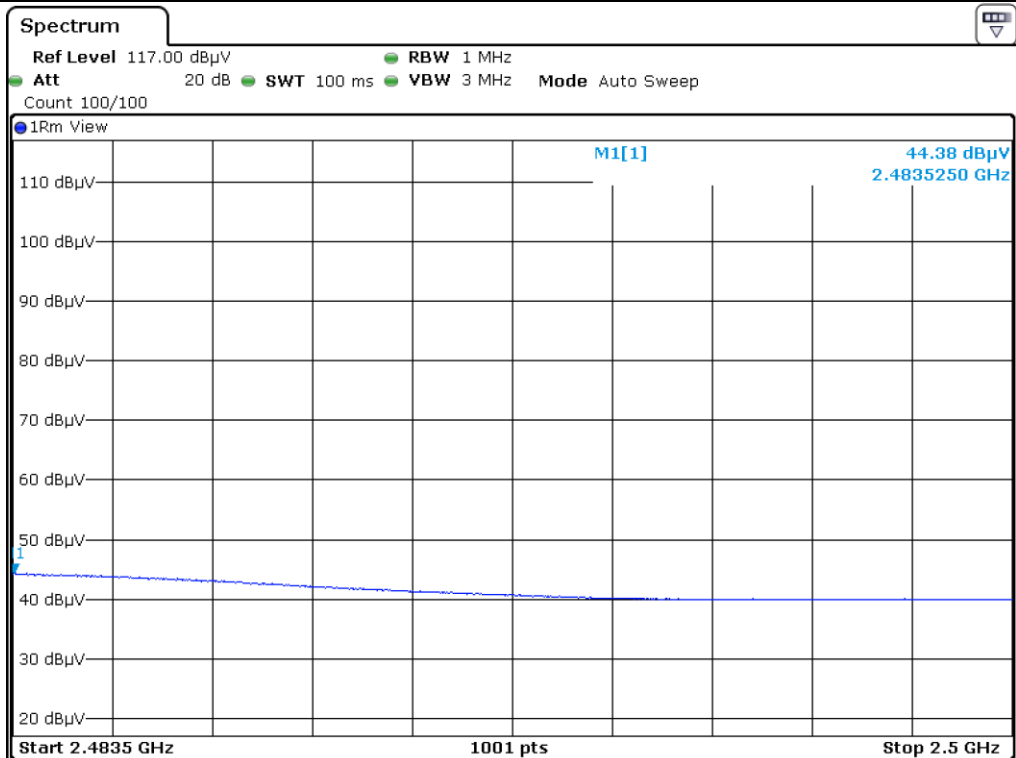
High Channel_Peak_H



High Channel_Average_H



High Channel_Peak_V



High Channel_Average_V

7.5.2 Spurious & Harmonic Radiated Emission

7.5.2.1 Test data for 802.11n_HT20 WLAN Mode

- Test Date : March 30, 2019 ~ April 02, 2019
- Resolution bandwidth : 1 MHz and Peak Detector for Peak Mode for the emissions fall in restricted band,
1 MHz and RMS Detector for Average Mode for the emissions fall in restricted band
100 kHz for Peak Mode for the emissions outside restricted band
- Video bandwidth : 3 MHz for Peak and Average Mode
- Frequency range : 1 GHz ~ 26.5 GHz
- Measurement distance : 3 m
- Duty Cycle : < 98 %
- Result : PASSED

Frequency (GHz)	Reading (dBμV)	Detector Mode	Ant. Pol. (H/V)	Ant. Factor	Cable Loss	Amp Gain	Correction Factor	Total (dBμV/m)	Limits (dBμV/m)	Margin (dB)
Test Data for Low Channel										
4 824.00	40.46	Peak	H	30.84	12.31	35.74	0.26	48.13	74.00	25.87
	28.37	Average	H					36.04	54.00	17.96
	40.59	Peak	V					48.26	74.00	25.74
	28.38	Average	V					36.05	54.00	17.95
Test Data for Middle Channel										
4 884.00	39.76	Peak	H	30.01	12.43	35.80	0.26	46.66	74.00	27.34
	27.65	Average	H					34.55	54.00	19.45
	40.44	Peak	V					47.34	74.00	26.66
	27.67	Average	V					34.57	54.00	19.43
Test Data for High Channel										
4 924.00	40.34	Peak	H	31.15	12.81	35.96	0.26	48.60	74.00	25.40
	28.59	Average	H					36.85	54.00	17.15
	40.26	Peak	V					48.52	74.00	25.48
	28.60	Average	V					36.86	54.00	17.14

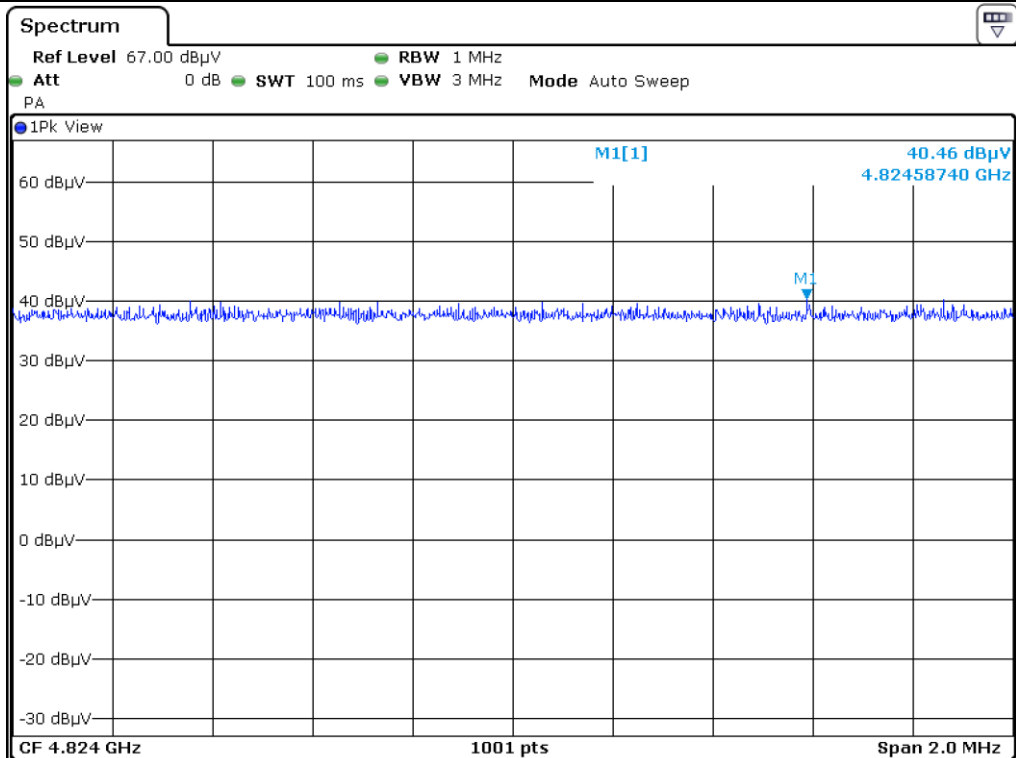
Tabulated test data for Restricted Band

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

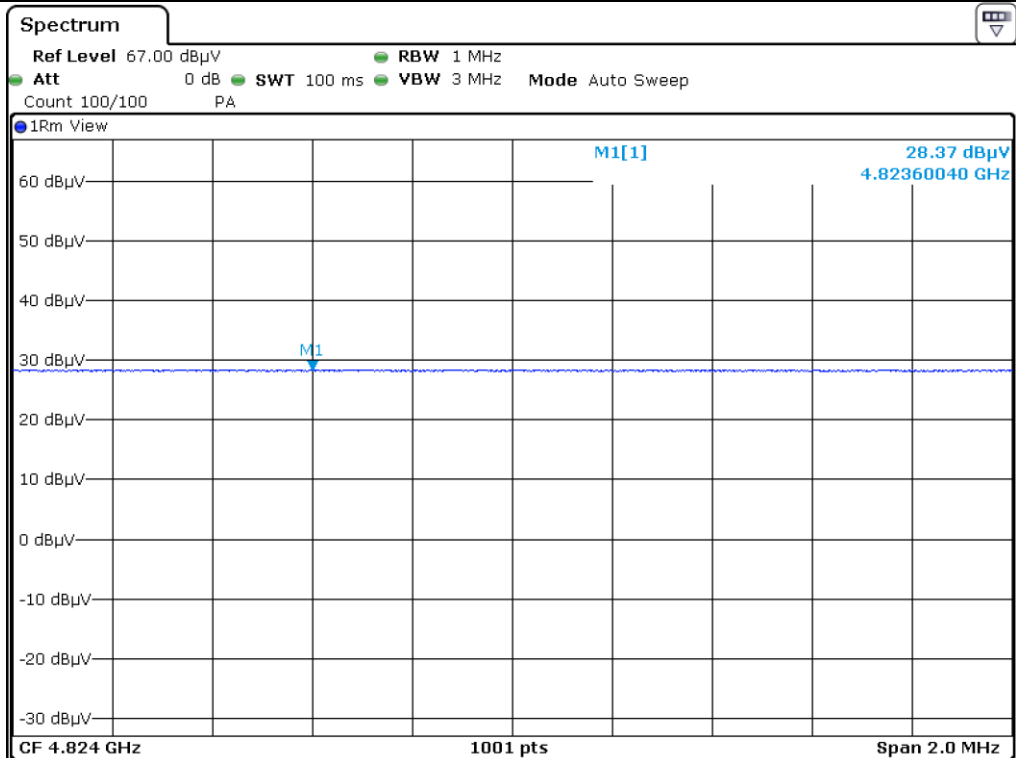
Margin (dB) = Limits (dBμV/m) - Total Level (dBμV/m)

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

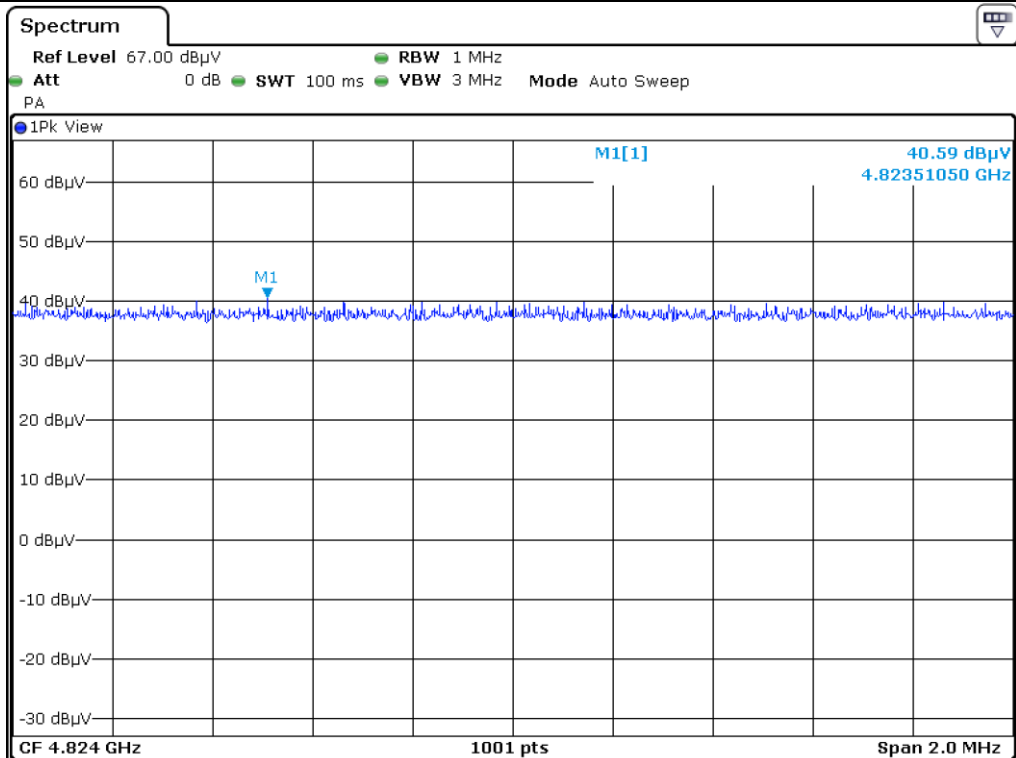

Tested by: Hyung-Kwon, Oh / Assistant Manager



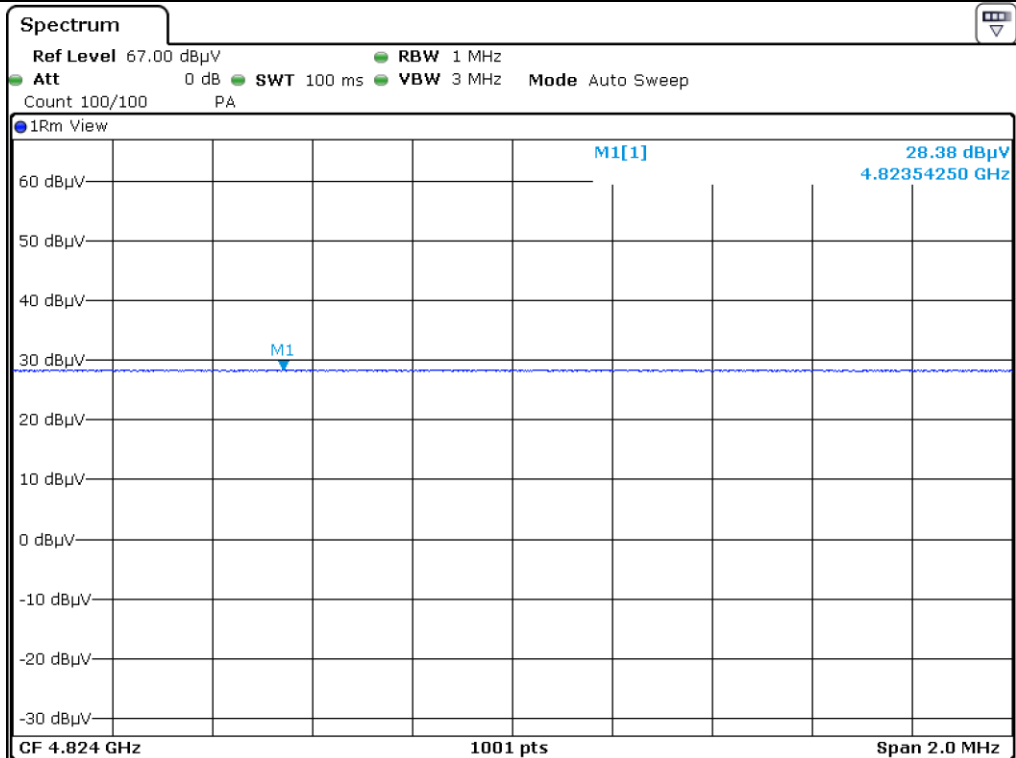
Low Channel_Peak_H



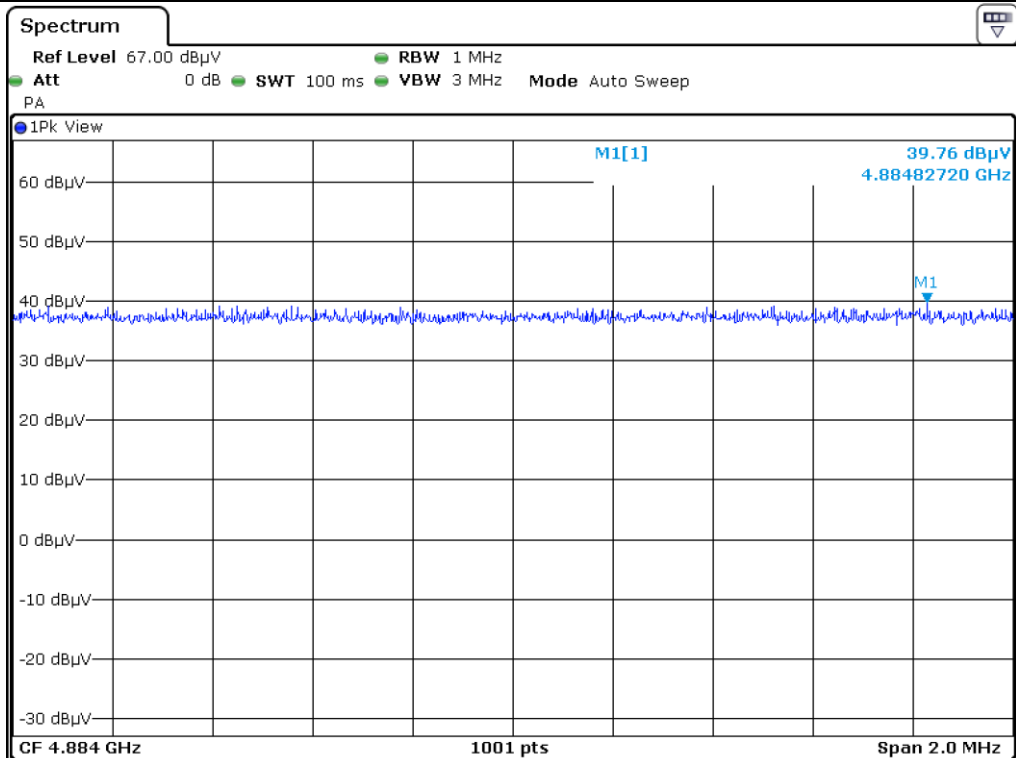
Low Channel_Average_H



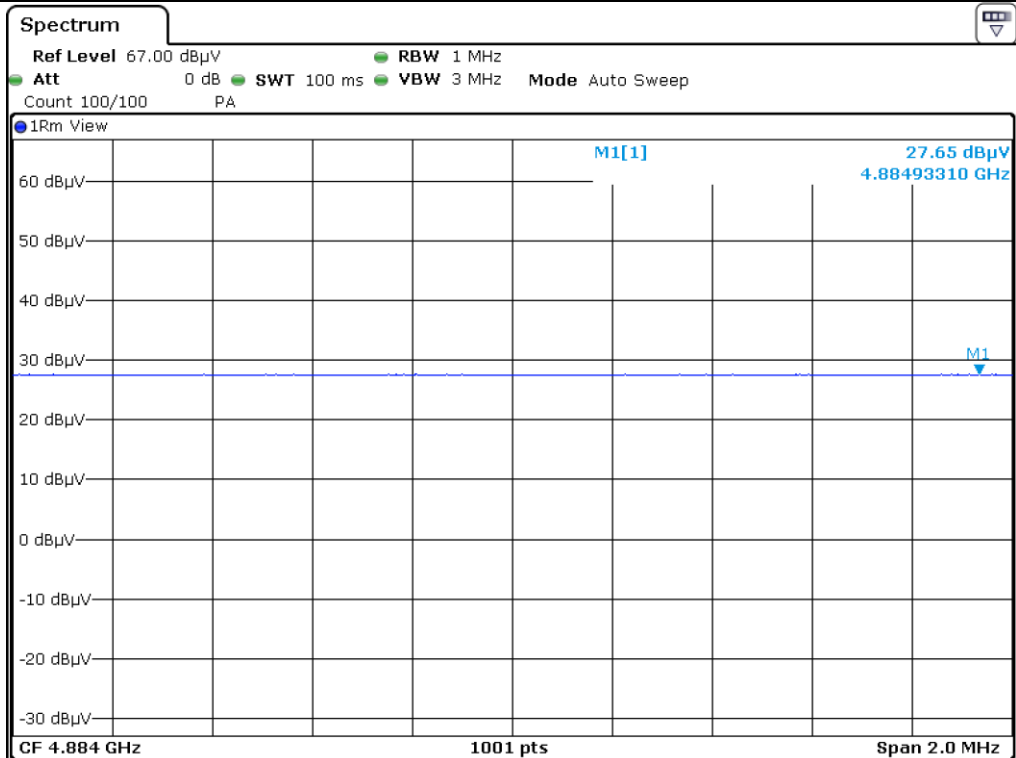
Low Channel_Peak_V



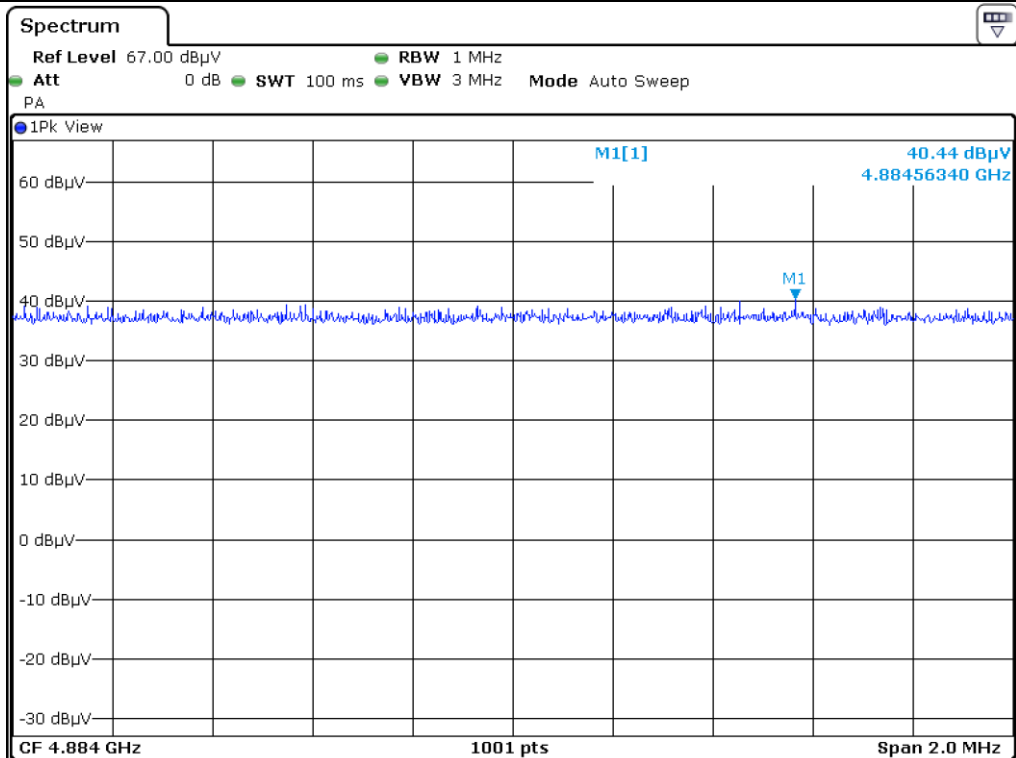
Low Channel_Average_V



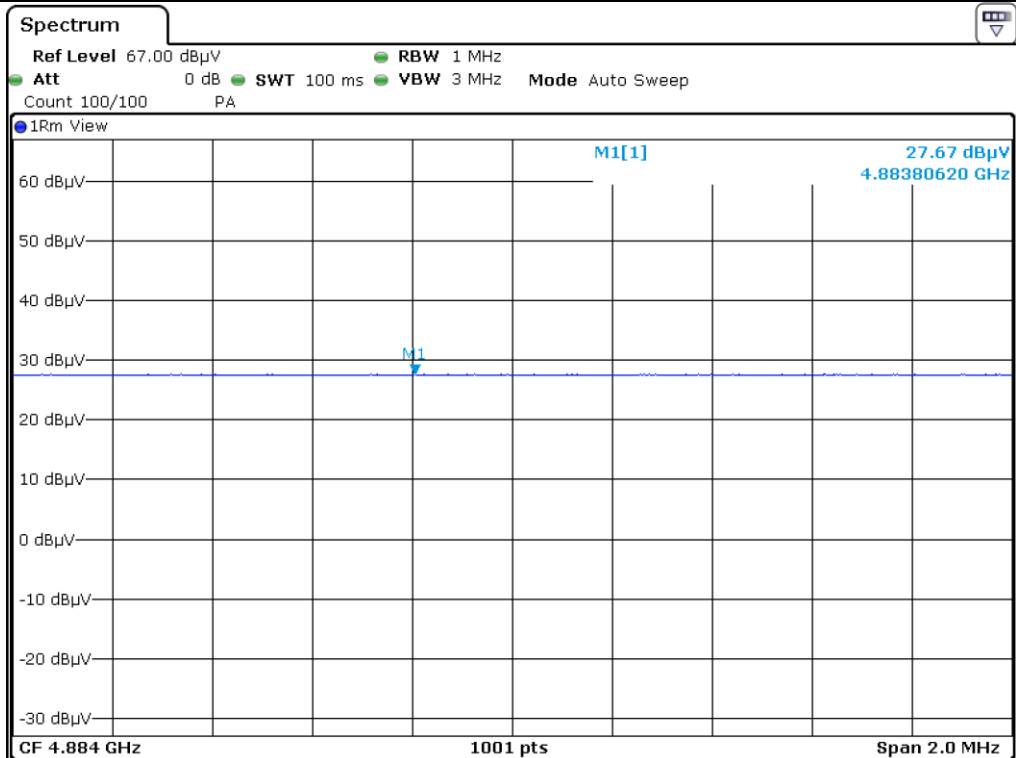
Middle Channel_Peak_H



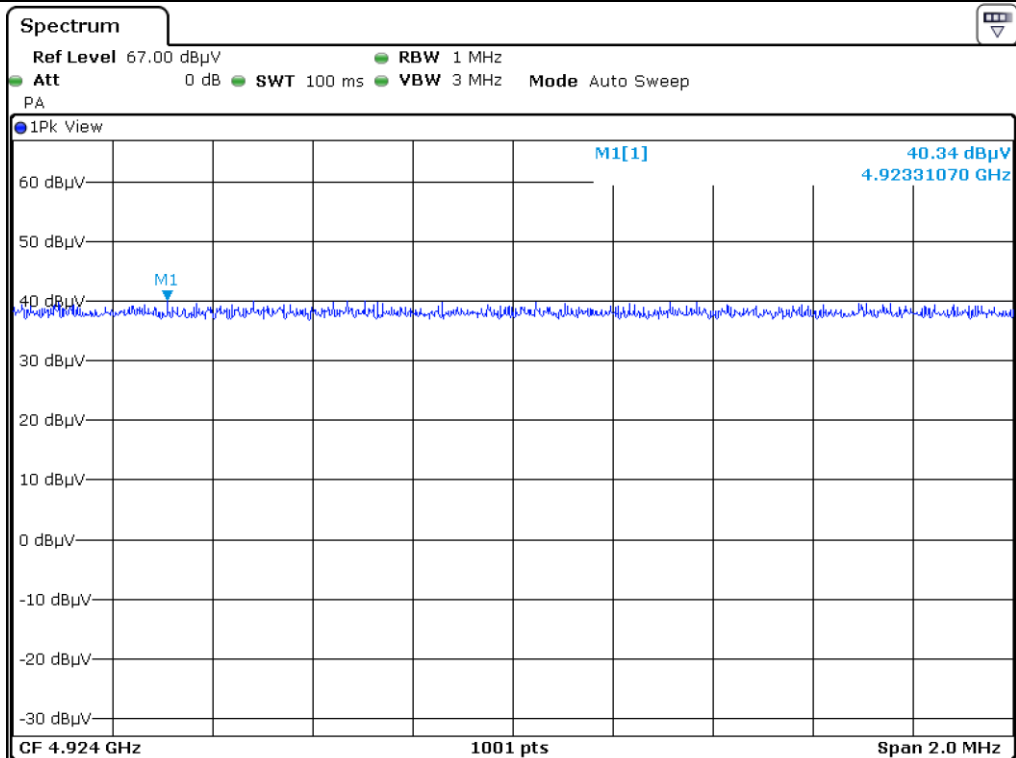
Middle Channel_Average_H



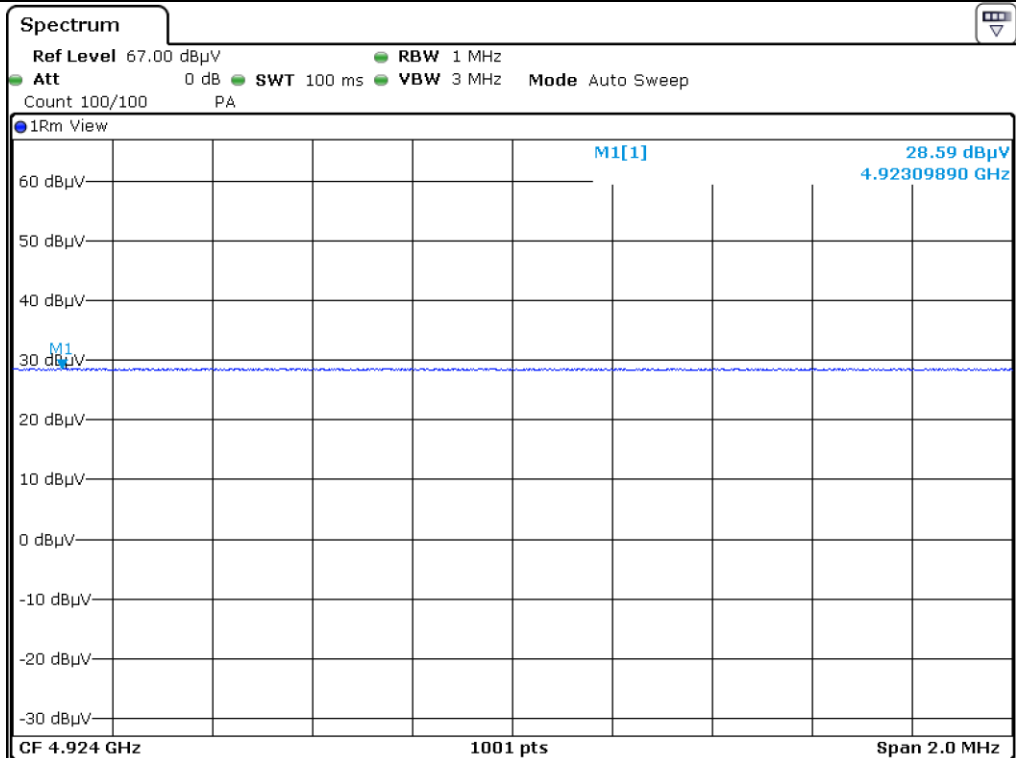
Middle Channel_Peak_V



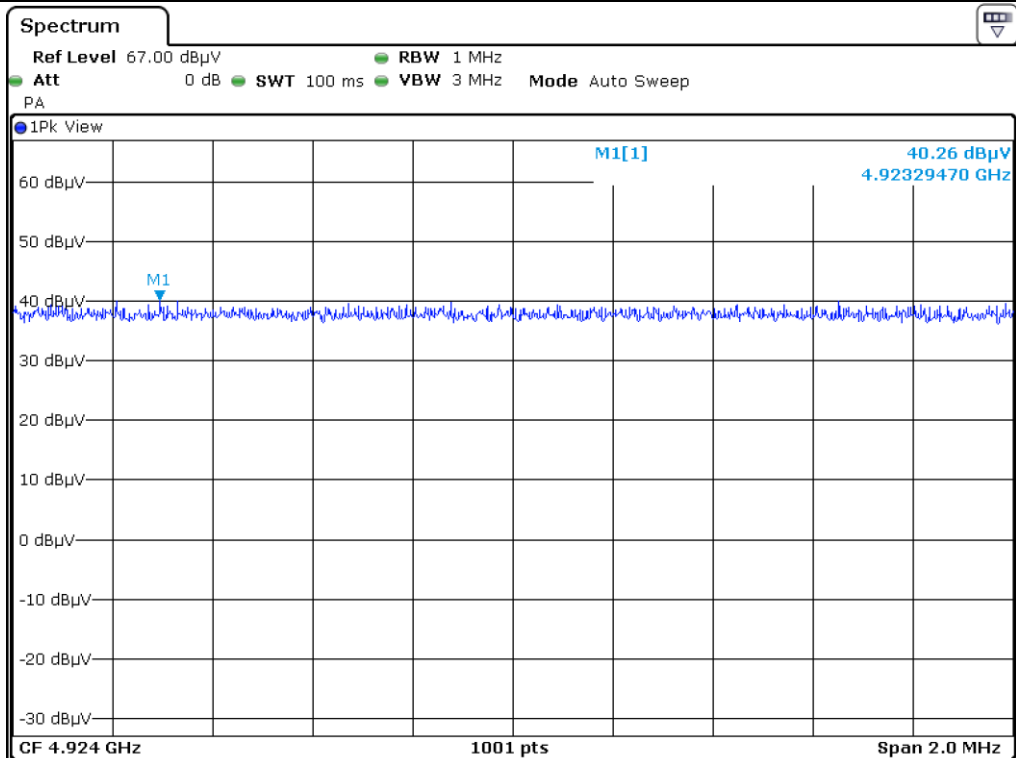
Middle Channel_Average_V



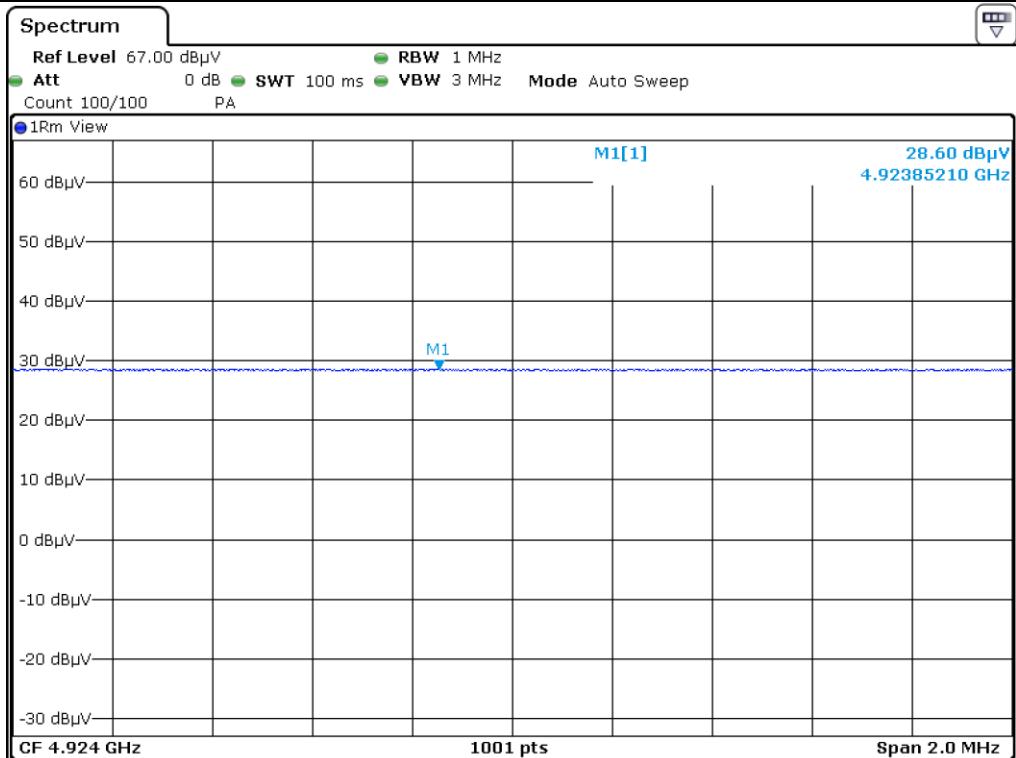
High Channel_Peak_H



High Channel_Average_H



High Channel_Peak_V



High Channel_Average_V

7.5.2.2 Test data for 802.11n_HT40 WLAN Mode

- . Test Date : March 30, 2019 ~ April 02, 2019
- . Resolution bandwidth : 1 MHz and Peak Detector for Peak Mode for the emissions fall in restricted band,
1 MHz and RMS Detector for Average Mode for the emissions fall in restricted band
100 kHz for Peak Mode for the emissions outside restricted band
- . Video bandwidth : 3 MHz for Peak and Average Mode
- . Frequency range : 1 GHz ~ 26.5 GHz
- . Measurement distance : 3 m
- . Duty Cycle : < 98 %
- . Result : PASSED

Frequency (GHz)	Reading (dBμV)	Detector Mode	Ant. Pol. (H/V)	Ant. Factor	Cable Loss	Amp Gain	Correction Factor	Total (dBμV/m)	Limits (dBμV/m)	Margin (dB)
Test Data for Low Channel										
4 844.00	40.91	Peak	H	30.84	12.31	35.74	0.52	48.84	74.00	25.16
	28.47	Average	H					36.40	54.00	17.60
	40.39	Peak	V					48.32	74.00	25.68
	28.50	Average	V					36.43	54.00	17.57
Test Data for Middle Channel										
4 884.00	40.08	Peak	H	30.01	12.43	35.80	0.52	47.24	74.00	26.76
	27.72	Average	H					34.88	54.00	19.12
	39.80	Peak	V					46.96	74.00	27.04
	27.70	Average	V					34.86	54.00	19.14
Test Data for High Channel										
4 904.00	40.31	Peak	H	31.15	12.81	35.96	0.52	48.83	74.00	25.17
	28.27	Average	H					36.79	54.00	17.21
	40.10	Peak	V					48.62	74.00	25.38
	28.27	Average	V					36.79	54.00	17.21

Tabulated test data for Restricted Band

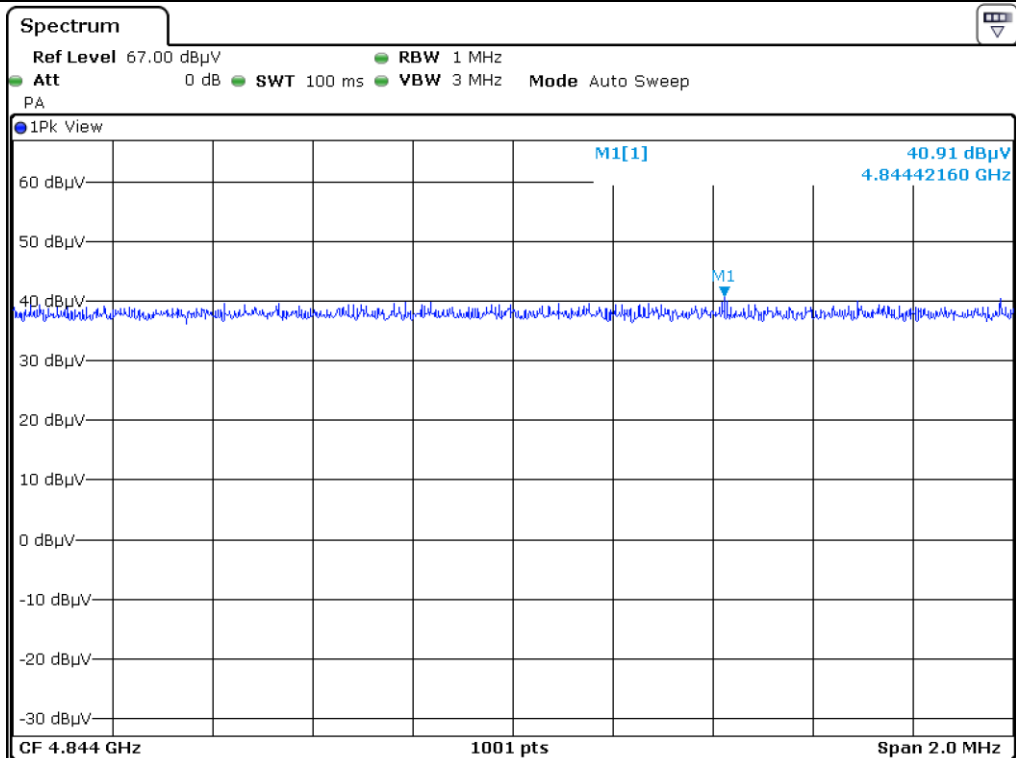
Remark: "H": Horizontal, "V": Vertical

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

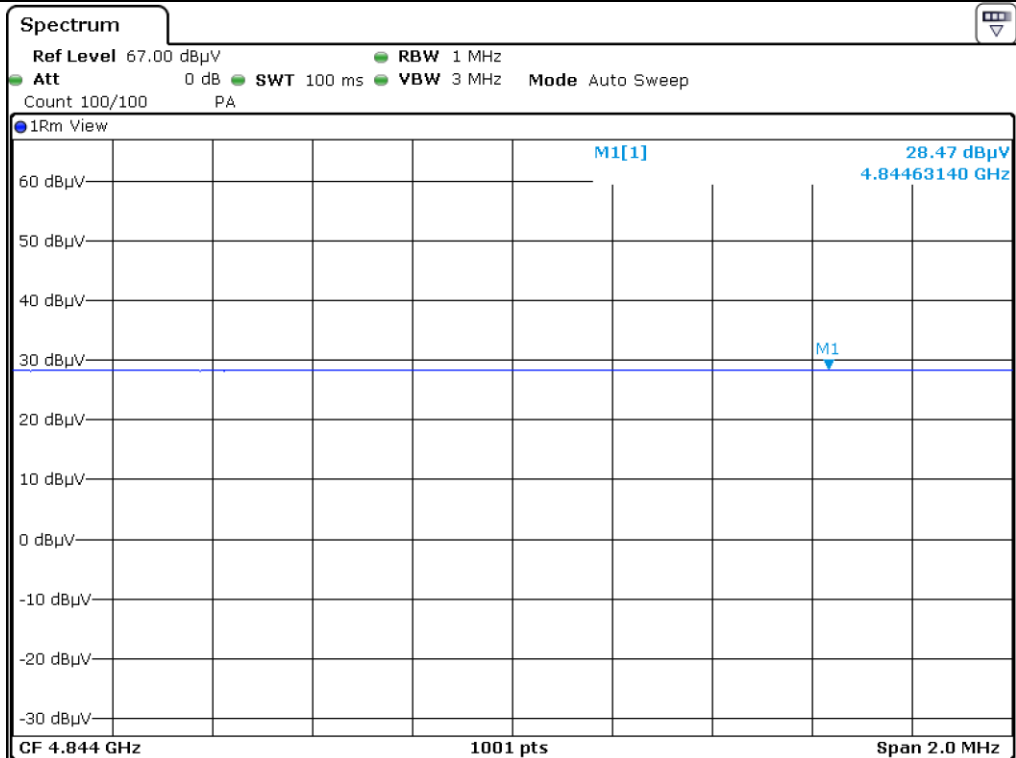
$$\text{Total Level} = \text{Reading} + \text{Antenna Factor} + \text{Cable Loss} + \text{Correction Factor} - \text{Pre-Amplifier Gain}$$



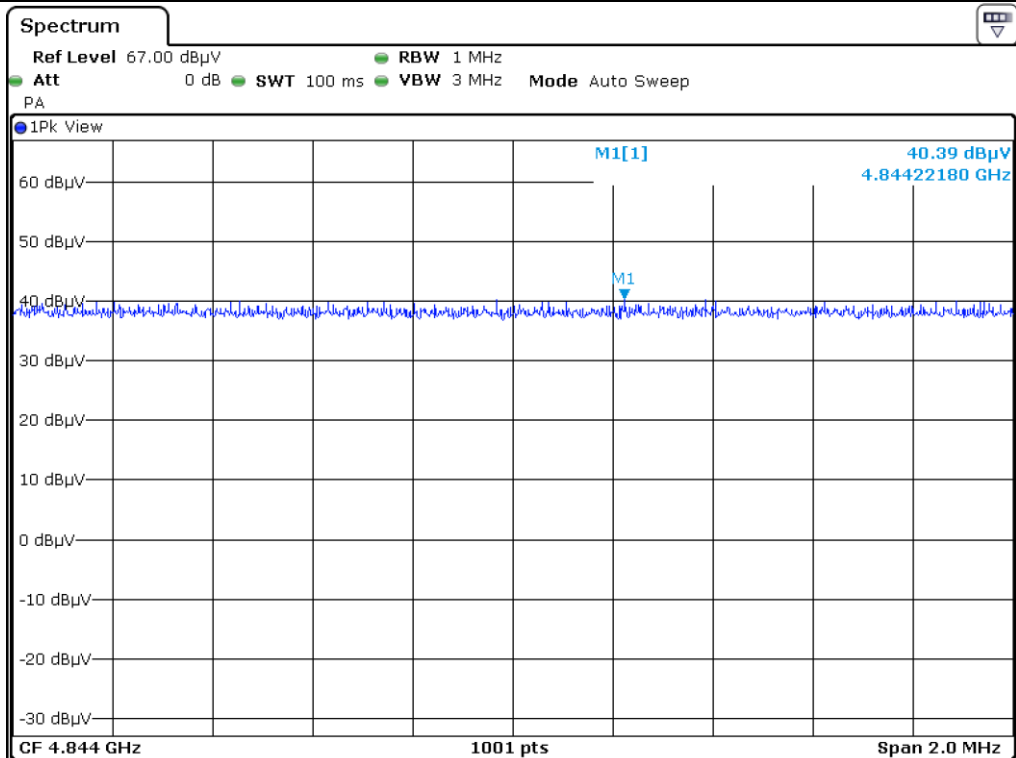
Tested by: Hyung-Kwon, Oh / Assistant Manager



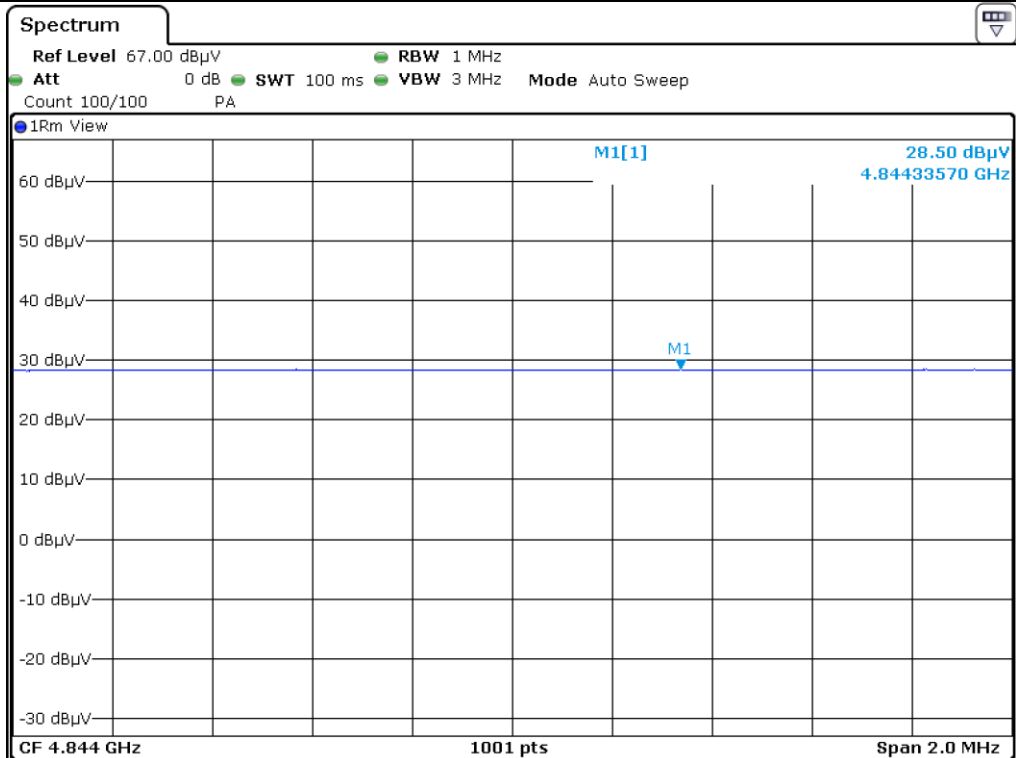
Low Channel_Peak_H



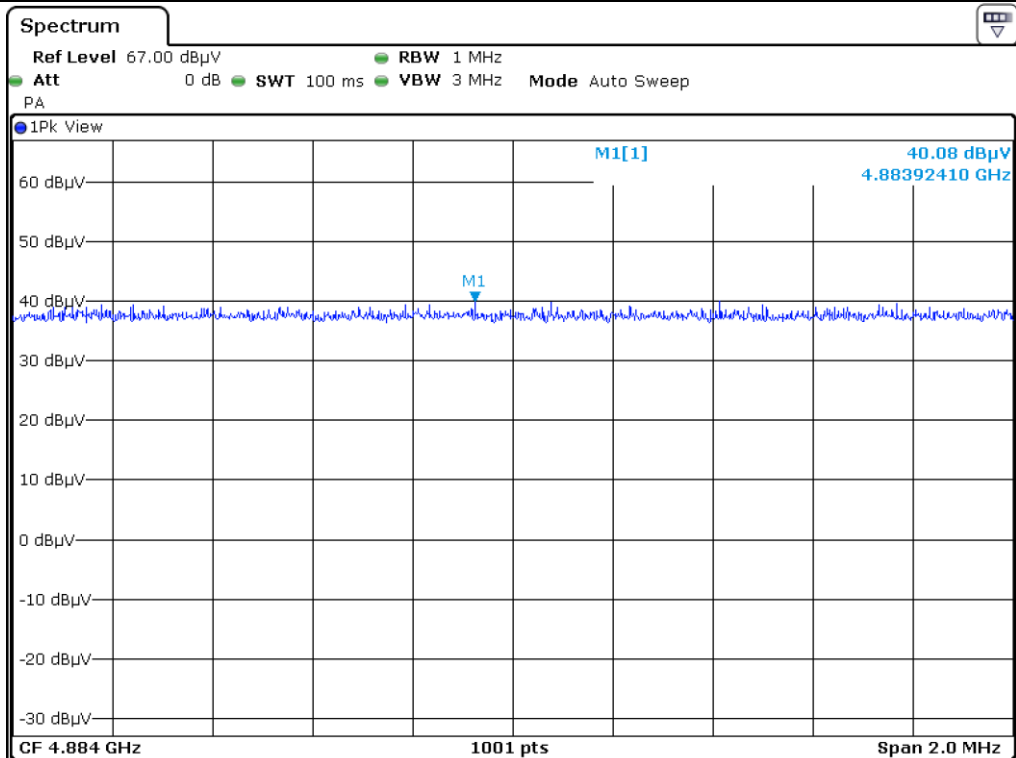
Low Channel_Average_H



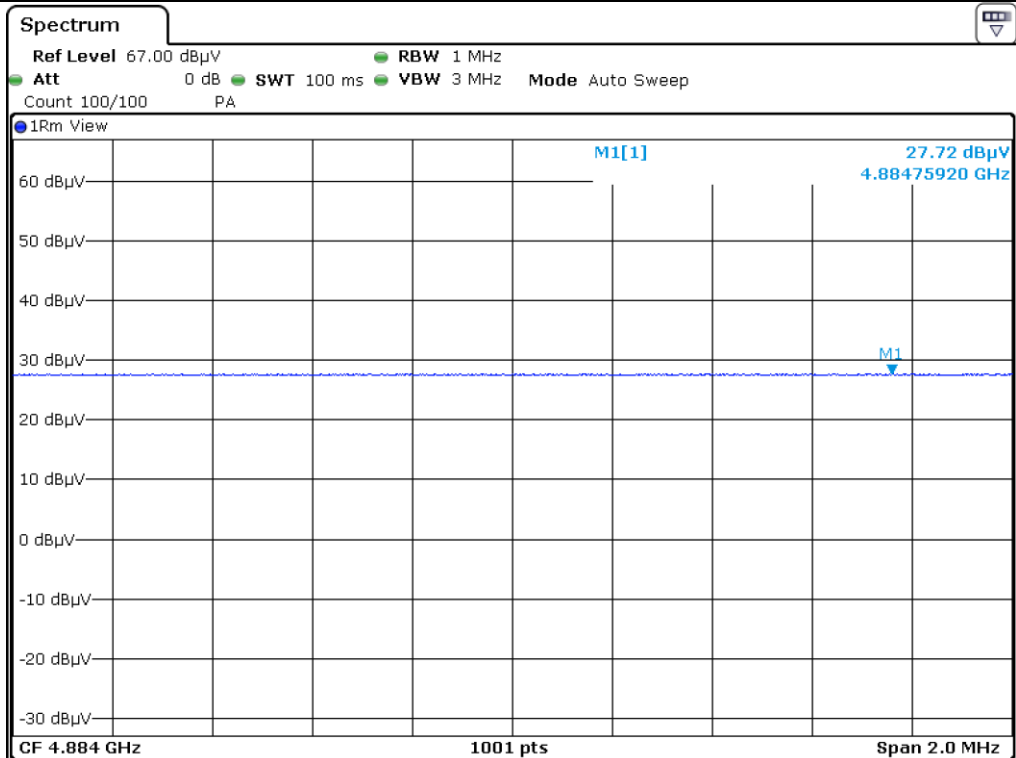
Low Channel_Peak_V



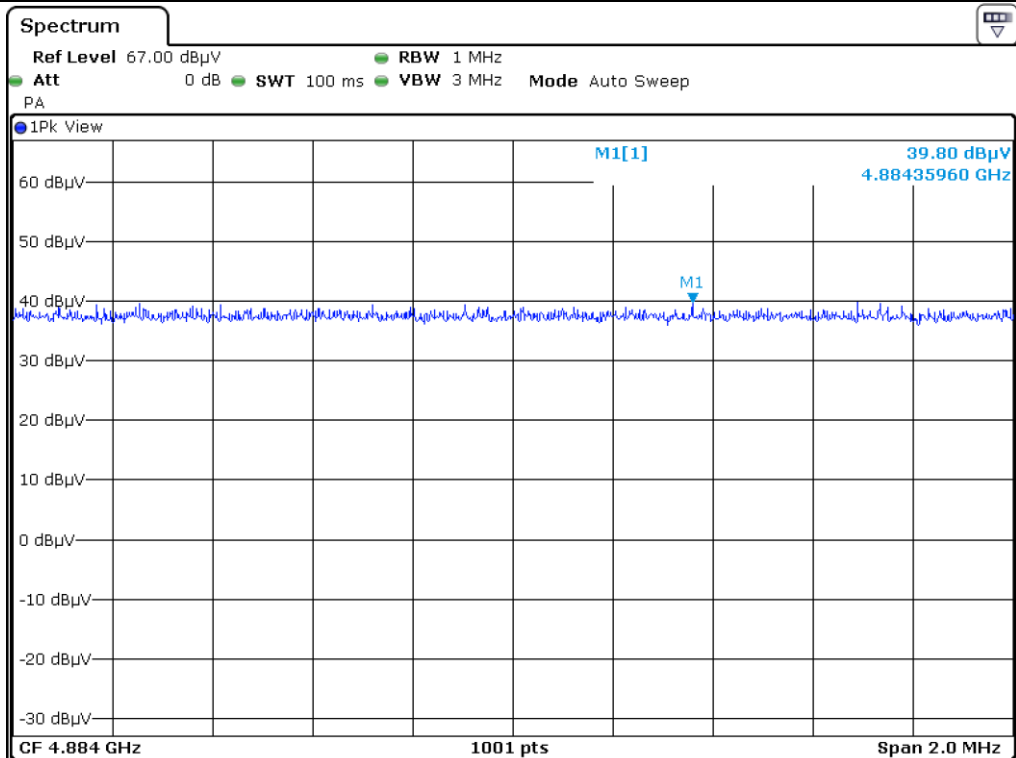
Low Channel_Average_V



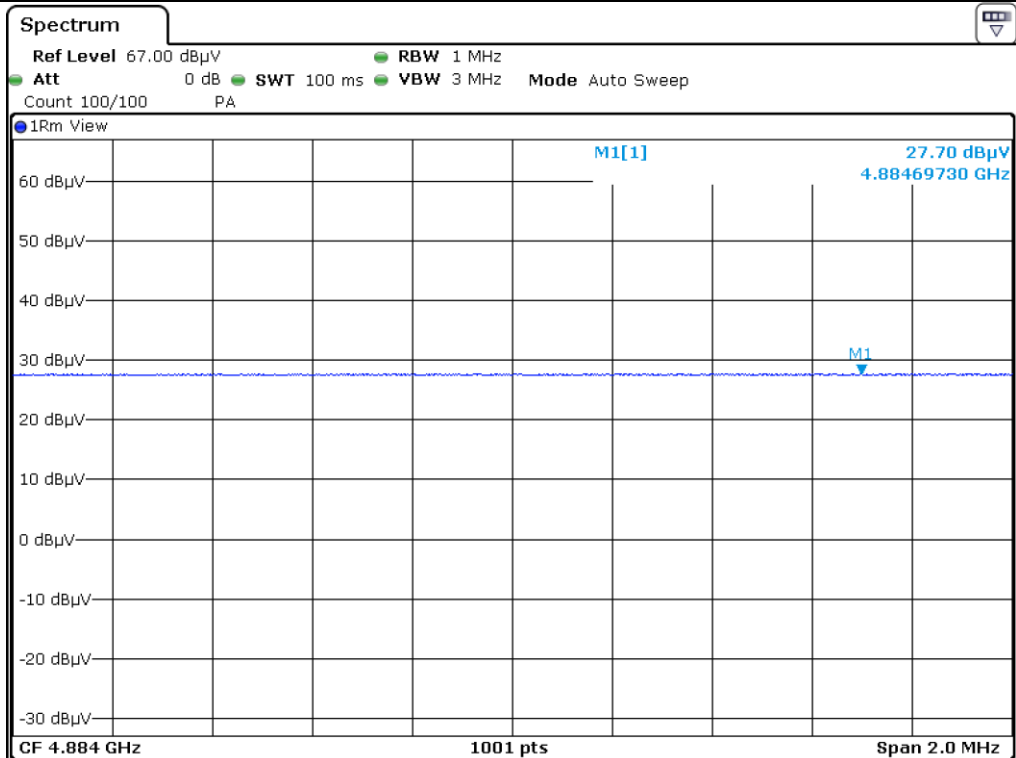
Middle Channel_Peak_H



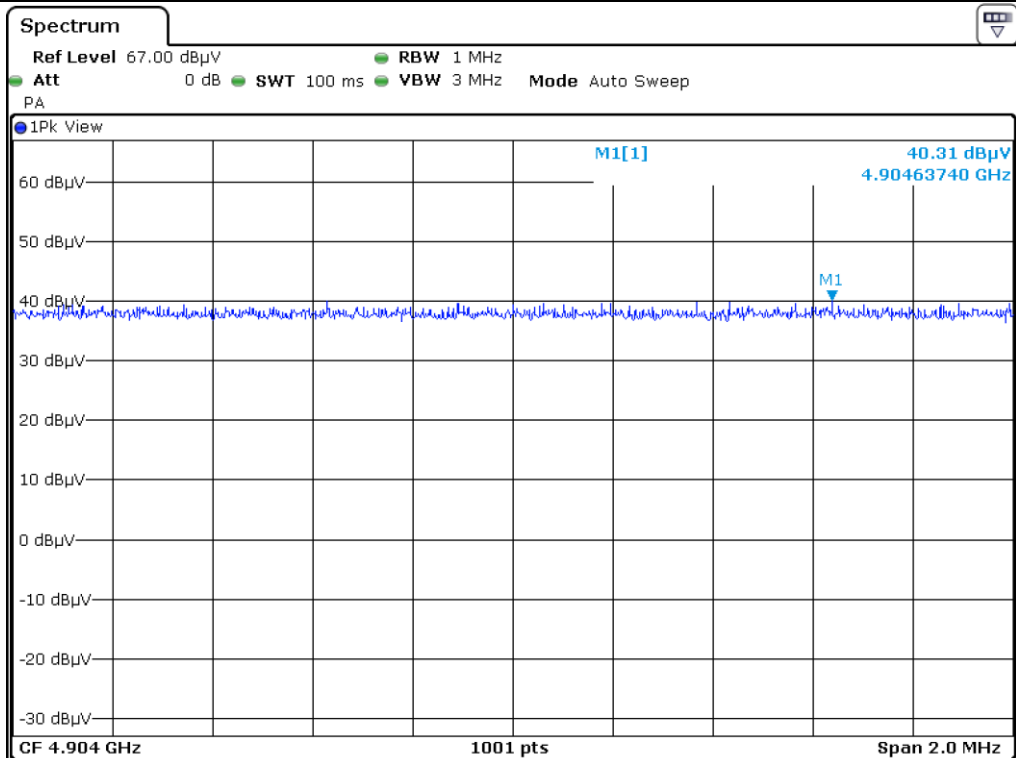
Middle Channel_Average_H



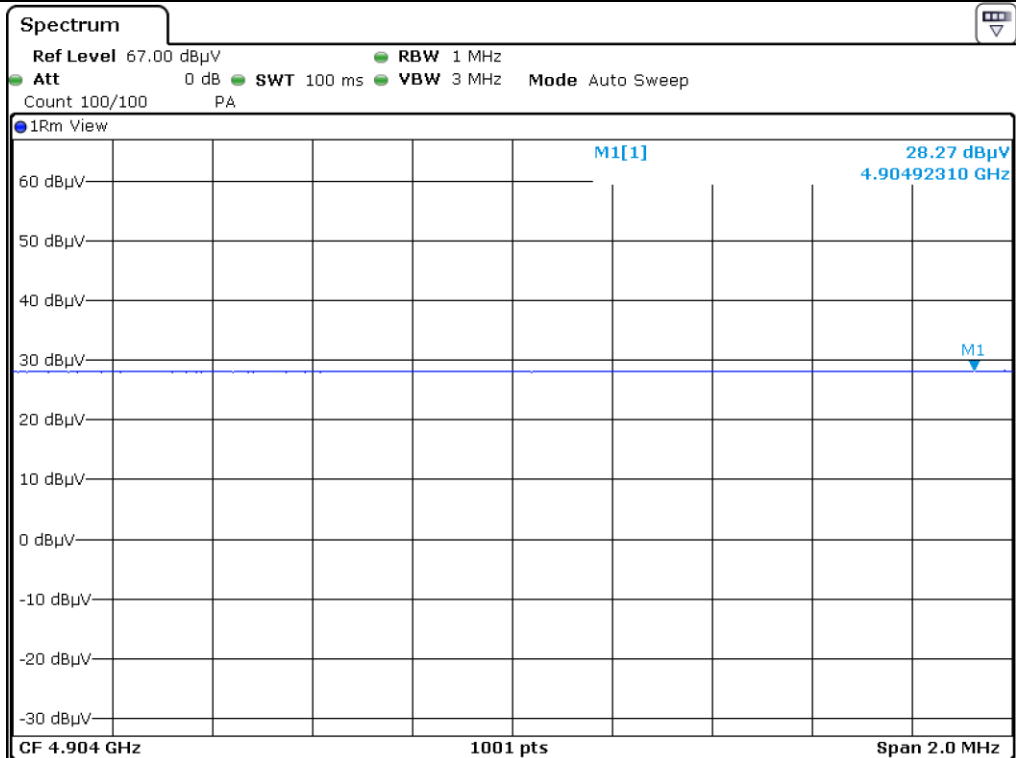
Middle Channel_Peak_V



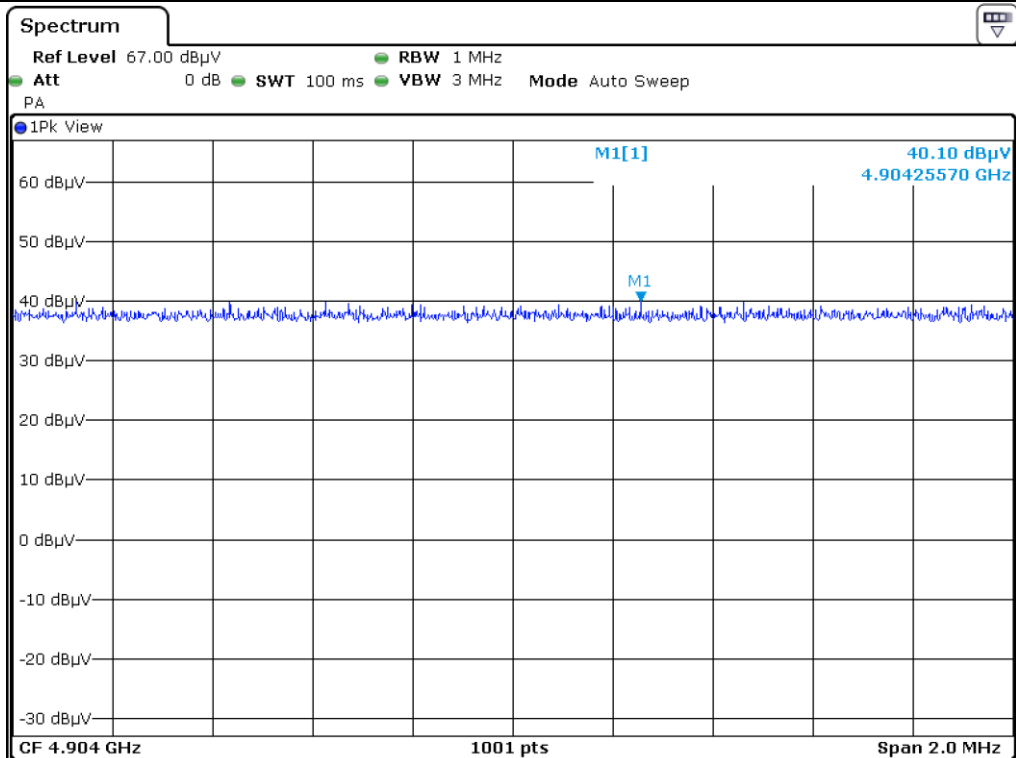
Middle Channel_Average_V



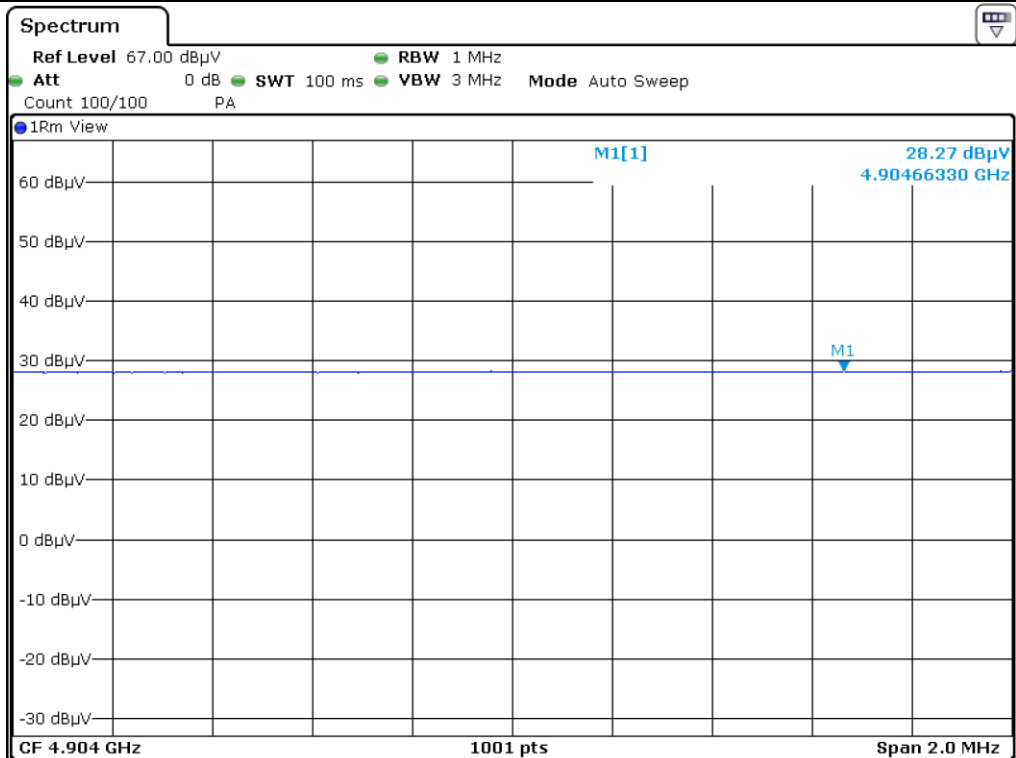
High Channel_Peak_H



High Channel_Average_H



High Channel_Peak_V



High Channel_Average_V

8. RADIATED EMISSION TEST

8.1 Operating environment

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

8.2 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.

8.3 Test equipment used

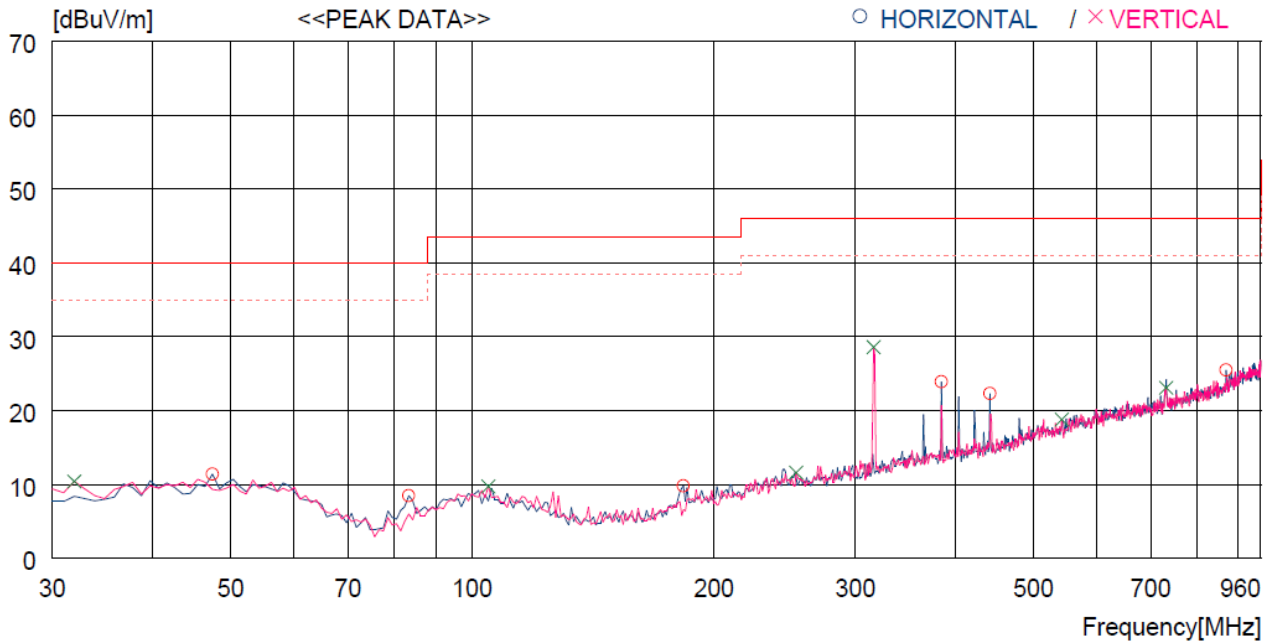
	Model Number	Manufacturer	Description	Serial Number	Last Cal.
■ -	FSV40	Rohde & Schwarz	Signal Analyzer	101009	Mar. 11, 2019 (1Y)
■ -	ESR	Rohde & Schwarz	EMI Test Receiver	101470	Oct. 22, 2019 (1Y)
■ -	310N	Sonoma Instrument	Pre-Amplifier	312544	Mar. 18, 2019 (1Y)
■ -	BBV 9718	Schwarzbeck	Amplifier	009	Mar. 30, 2019 (1Y)
■	SCU40A	Rohde & Schwarz	Signal Conditioning unit	100436	Mar. 11, 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	9163-419	Oct. 17, 2019 (2Y)
■ -	BBHA9120D	Schwarzbeck	Horn Antenna	BBHA9120D295	Aug. 16, 2019 (2Y)
■ -	BBHA9170	Schwarzbeck	Horn Antenna	BBHA9170179	Jan. 16, 2019 (1Y)

All test equipment used is calibrated on a regular basis.

8.4 Test data

8.4.1 Test data for 30 MHz ~ 960 MHz

- . Test Date : March 30, 2019 ~ April 02, 2019
- . Resolution bandwidth : 120 kHz
- . Frequency range : 30 MHz ~ 960 MHz
- . Measurement distance : 3 m



No.	FREQ [MHz]	READING PEAK [dBuV]	ANT FACTOR [dB]	LOSS [dB]	GAIN [dB]	RESULT [dBuV/m]	LIMIT [dBuV/m]	MARGIN [dB]	ANTENNA [cm]	TABLE [DEG]
----- Horizontal -----										
1	47.460	28.9	13.8	1.8	33.1	11.4	40.0	28.6	200	322
2	83.350	30.8	8.3	2.4	33.0	8.5	40.0	31.5	100	359
3	183.260	29.6	9.8	3.5	33.1	9.8	43.5	33.7	300	21
4	384.050	36.7	15.4	5.0	33.2	23.9	46.0	22.1	100	359
5	441.281	33.5	16.6	5.4	33.2	22.3	46.0	23.7	100	359
6	869.040	29.2	21.4	7.8	32.9	25.5	46.0	20.5	100	233
----- Vertical -----										
7	31.940	30.4	11.7	1.4	33.1	10.4	40.0	29.6	100	0
8	104.690	28.1	12.0	2.6	33.0	9.7	43.5	33.8	200	339
9	253.100	28.2	12.4	4.1	33.1	11.6	46.0	34.4	100	55
10	316.150	43.4	13.5	4.7	33.0	28.6	46.0	17.4	100	48
11	542.160	28.5	17.5	6.1	33.3	18.8	46.0	27.2	400	359
12	731.304	29.3	20.0	7.2	33.4	23.1	46.0	22.9	100	230

Tested by: Hyung-Kwon, Oh / Assistant Manager

8.4.2 Test data for Below 30 MHz

- . Test Date : March 30, 2019 ~ April 02, 2019
- . 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.									

8.4.3 Test data for above 1 GHz

- . Test Date : March 30, 2019 ~ April 02, 2019
- . Resolution bandwidth : 1 MHz for Peak and Average Mode
- . Video bandwidth : 1 MHz for Peak Mode, 10 Hz for Average Mode
- . Frequency range : 1 GHz ~ 26.5 GHz
- . Measurement distance : 3 m
- . Operating mode : Transmitting mode

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


 Tested by: Hyung-Kwon, Oh / Assistant Manager