

TEST REPORT

of

FCC Part 15 Subpart C §15.247
RSS-247 Issue 2, RSS-Gen Issue 4

FCC ID: BEJ-LCW009
IC Certification: 2703N-LCW009

Equipment Under Test : WLAN Module
Model Name : LCW-009
Applicant : LG Electronics USA
Manufacturer : LG Electronics Inc.
Date of Receipt : 2018.02.08
Date of Test(s) : 2018.02.19 ~ 2018.03.02
Date of Issue : 2018.03.16

In the configuration tested, the EUT complied with the standards specified above.

Tested By:



Patrick Kang

Date:

2018.03.16

Technical
Manager:



Jungmin Yang

Date:

2018.03.16

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A4(210 mm x 297 mm)

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1. General Information

1.1. Testing Laboratory

SGS Korea Co., Ltd. (Gunpo Laboratory)

- Wireless Div. 2FL, 10-2, LS-ro 182beon-gil, Gunpo-si, Gyeonggi-do, Korea, 15807
- Designation number: KR0150

All SGS services are rendered in accordance with the applicable SGS conditions of service available on request and accessible at <http://www.sgs.com/en/Terms-and-Conditions.aspx>.

Phone No. : +82 31 688 0901

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1.2. Details of Applicant

Applicant : LG Electronics USA

Address : 1000 Sylvan Avenue, Englewood Cliffs, New Jersey, United States, 07632

Contact Person : Han, Kyung-Su

Phone No. : +1 201 816 2003

1.3. Details of manufacturer

Company : LG Electronics Inc.

Address : 170, Seongsanpaechong-ro, Seongsan-gu, Changwon-si, Gyeongsangnam-do 51533, Republic of Korea

1.4. Description of EUT

Kind of Product	WLAN Module
Model Name	LCW-009
Power Supply	DC 5.0 V
Frequency Range	2 412 MHz ~ 2 462 MHz (11b/g/n_HT20), 2 422 MHz ~ 2 452 MHz (11n_HT40)
Modulation Technique	DSSS, OFDM
Number of Channels	11 channels (11b/g/n_HT20), 7 channels (11n_HT40)
Antenna Type	PCB Pattern Antenna
Antenna Gain	1.58 dB i
H/W Version	V1.0
S/W Version	V1.0

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1.5. Test Equipment List

Equipment	Manufacturer	Model	S/N	Cal. Date	Cal. Interval	Cal. Due
Signal Generator	R&S	SMR40	100272	Jun. 16, 2017	Annual	Jun. 16, 2018
Signal Generator	R&S	SMBV100A	255834	Jun. 15, 2017	Annual	Jun. 15, 2018
Spectrum Analyzer	R&S	FSV30	103102	Jun. 10, 2017	Annual	Jun. 10, 2018
Spectrum Analyzer	Agilent	N9030A	US51350132	Sep. 26, 2017	Annual	Sep. 26, 2018
Attenuator	AEROFLEX / INMET	18N-20 dB	4	Mar. 19, 2017	Annual	Mar. 19, 2018
High Pass Filter	Wainwright Instrument GmbH	WHK3.0/18G-6SS	344	May 28, 2017	Annual	May 28, 2018
High Pass Filter	Wainwright Instrument GmbH	WHNX7.5/26.5G-6SS	11	May 28, 2017	Annual	May 28, 2018
Low Pass Filter	Mini-Circuits	NLP-1200+	V 8979400903-1	May. 28, 2017	Annual	May 28, 2018
Power Sensor	R&S	NRP-Z81	100748	Jun. 13, 2017	Annual	Jun. 13, 2018
DC Power Supply	Agilent	U8002A	MY50060028	Mar. 16, 2017	Annual	Mar. 16, 2018
Preamplifier	H.P.	8447F	2944A03909	Aug. 11, 2017	Annual	Aug. 11, 2018
Signal Conditioning Unit	R&S	SCU-18	102244	Sep. 22, 2017	Annual	Sep. 22, 2018
Preamplifier	MITEQ Inc.	JS44-18004000-35-8P	1546891	May 15, 2017	Annual	May 15, 2018
Loop Antenna	Schwarzbeck Mess-Elektronik	FMZB 1519	1519-039	Aug. 23, 2017	Biennial	Aug. 23, 2019
Log-Periodic Antenna	R&S	HL223	837942/015	Dec. 01, 2017	Biennial	Dec. 01, 2019
Biconical Antenna	R&S	HK116	8374141/007	Dec. 01, 2017	Biennial	Dec. 01, 2019
Horn Antenna	R&S	HF906	100326	Feb. 14, 2018	Biennial	Feb. 14, 2020
Horn Antenna	Schwarzbeck Mess-Elektronik	BBHA 9170	BBHA9170431	Aug. 25, 2016	Biennial	Aug. 25, 2018
Antenna Master	INNCO systems GmbH	MA4640-XP-ET	MA4640/536/383 30516/L	N.C.R.	N/A	N.C.R.
Controller	INNCO systems GmbH	CONTROLLER CO3000-4P	CO3000/963/383 30516/L	N.C.R.	N/A	N.C.R.
Turn Table	INNCO systems GmbH	DS 1200 S	N/A	N.C.R.	N/A	N.C.R.
Test Receiver	R&S	ESU26	100109	Feb. 07, 2018	Annual	Feb. 07, 2019
Anechoic Chamber	SY Corporation	L × W × H (9.6 m × 6.4 m × 6.6 m)	N/A	N.C.R.	N/A	N.C.R.
Coaxial Cable	SUCOFLEX	104 (3 m)	MY3258414	Jul. 15, 2017	Semi-annual	Jan. 15, 2018
Coaxial Cable	SUCOFLEX	104 (10 m)	MY3145814	Jul. 15, 2017	Semi-annual	Jan. 15, 2018
Coaxial Cable	Rosenberger	LA1-C006-1500	131014 01/20	Sep. 06, 2017	Semi-annual	Mar. 06, 2018
Test Receiver	R&S	ESCI 7	100911	Feb. 20, 2018	Annual	Feb. 20, 2019
Two-Line V-Network	R&S	ENV216	100190	Dec. 08, 2017	Annual	Dec. 08, 2018
Shield Room	SY Corporation	L × W × H (6.5 m × 3.5 m × 3.5 m)	N/A	N.C.R.	N/A	N.C.R.

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1.6. Summary of Test Results

The EUT has been tested according to the following specifications:

APPLIED STANDARD: FCC Part15 Subpart C, RSS-247 Issue 2, RSS-Gen Issue 4			
Standard section		Test Item(s)	Result
15.205(a) 15.209 15.247(d)	RSS-247 Issue 2 5.5 RSS-Gen Issue 4 8.9	Transmitter Radiated Spurious Emissions Conducted Spurious Emission	Complied
15.247(a)(2)	RSS-247 Issue 2 5.2(a) RSS-Gen Issue 4 6.6	6 dB Bandwidth & 99 % Bandwidth	Complied
15.247(b)(3)	RSS-247 Issue 2 5.4(d)	Maximum Peak Conducted Output Power	Complied
15.247(e)	RSS-247 Issue 2 5.2(b)	Power Spectral Density	Complied
15.207	RSS-Gen Issue 4 8.8	AC Power Line Conducted Emissions	Complied

1.7. Test Procedure(s)

The measurement procedures described in the American National Standard of Procedure for Compliance Testing of unlicensed Wireless Devices (ANSI C63.10-2013) and the guidance provided in KDB 558074 D01 DTS Meas Guidance v04 were used in the measurement of the DUT.

1.8. Sample calculation

Where relevant, the following sample calculation is provided:

1.8.1. Conducted test

Offset value (dB) = Attenuator (dB) + Cable loss (dB)

1.8.2. Radiation test

Field strength level (dB μ V/m) = Measured level (dB μ V) + Antenna factor (dB) + Cable loss (dB) - Amplifier gain (dB)

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1.9. Measurement Uncertainty

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus:

Parameter	Uncertainty(dB)
Conducted Disturbance	± 3.30
Radiated Disturbance, 9 kHz to 30 MHz	± 3.59
Radiated Disturbance, below 1 GHz	± 5.88
Radiated Disturbance, above 1 GHz	± 5.94

Uncertainty figures are valid to a confidence level of 95 %.

1.10. Test report revision

Revision	Report number	Date of Issue	Description
0	F690501/RF-RTL012406	2018.03.02	Initial
1	F690501/RF-RTL012406-1	2018.03.16	Added measurement uncertainty

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1.11. Duty Cycle of EUT

Regarding to KDB 558074 D01 DTS Meas Guidance v04, 6.0, the maximum duty cycles of all modes were investigated and set the spectrum analyzer as below;

Set RBW $\geq$ OBW if possible; otherwise, set RBW to the largest available value, Set VBW $\geq$ RBW. Set detector = peak or average. The zero-span measurement method shall not be used unless both RBW and VBW are $> 50/T$ and the number of sweep points across duration T exceeds 100.

Mode	Data Rate	Duty Cycle (%)	Correction factor (dB)
11b	1 Mbps	99.12	0.04
11g	6 Mbps	94.10	0.26
11n_HT20	MCS0	93.66	0.28
11n_HT40	MCS0	87.91	0.56

Remark:

1. As measured duty cycles of EUT, all of mode and data rate keep constant period and are converted to log scale (power averaging) to compensate correction factor to result of average test items.
2. Duty Cycle (%) = (Tx on time / Tx on + off time) x 100
3. Correction factor (dB) = 10 log (1 / Duty Cycle)

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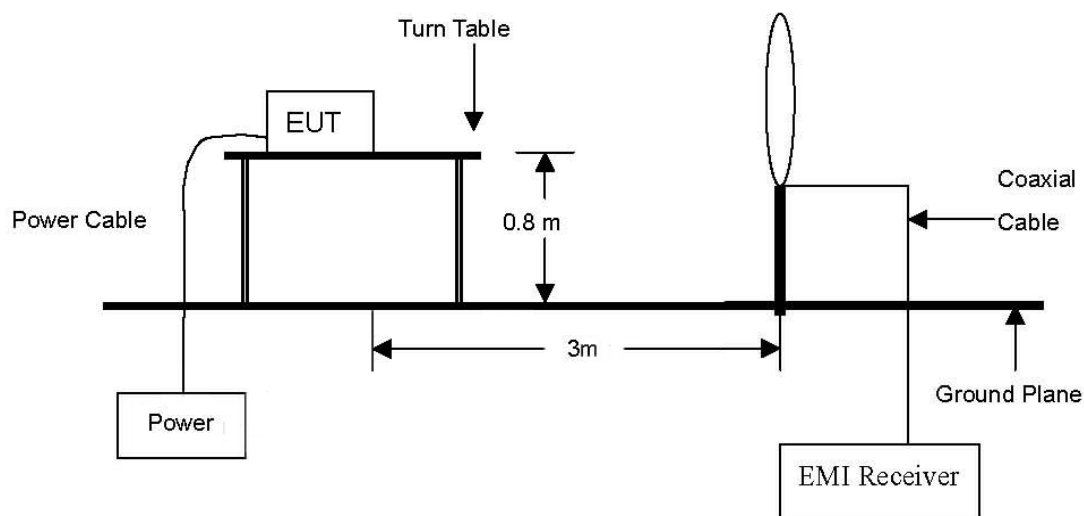
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2. Transmitter Radiated Spurious Emissions and Conducted Spurious Emission

2.1. Test Setup

2.1.1. Transmitter Radiated Spurious Emissions

The diagram below shows the test setup that is utilized to make the measurements for emission from 9 kHz to 30 MHz.



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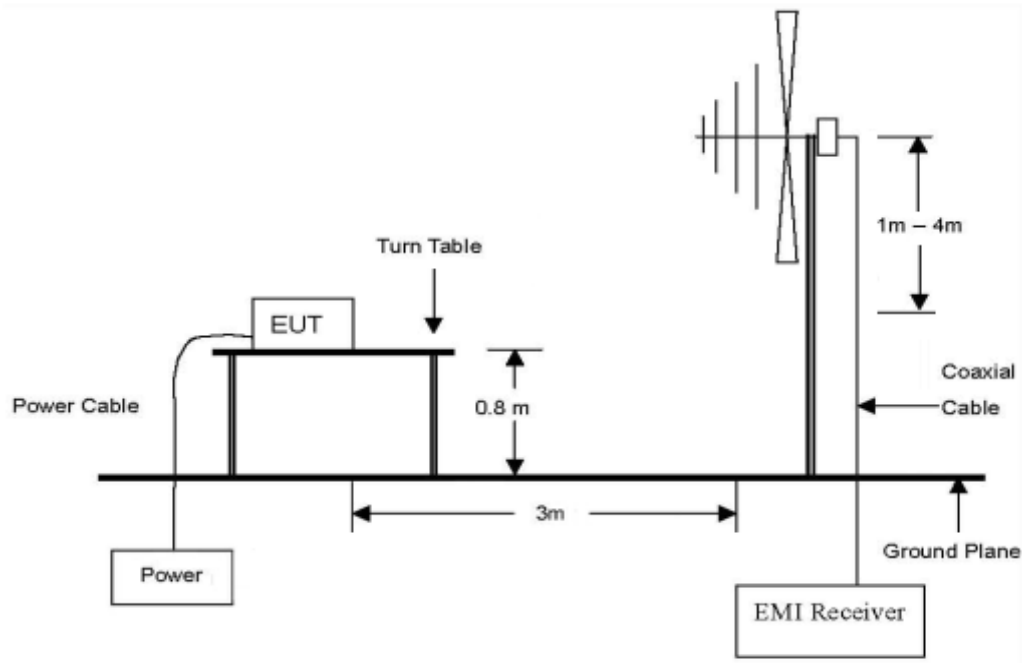
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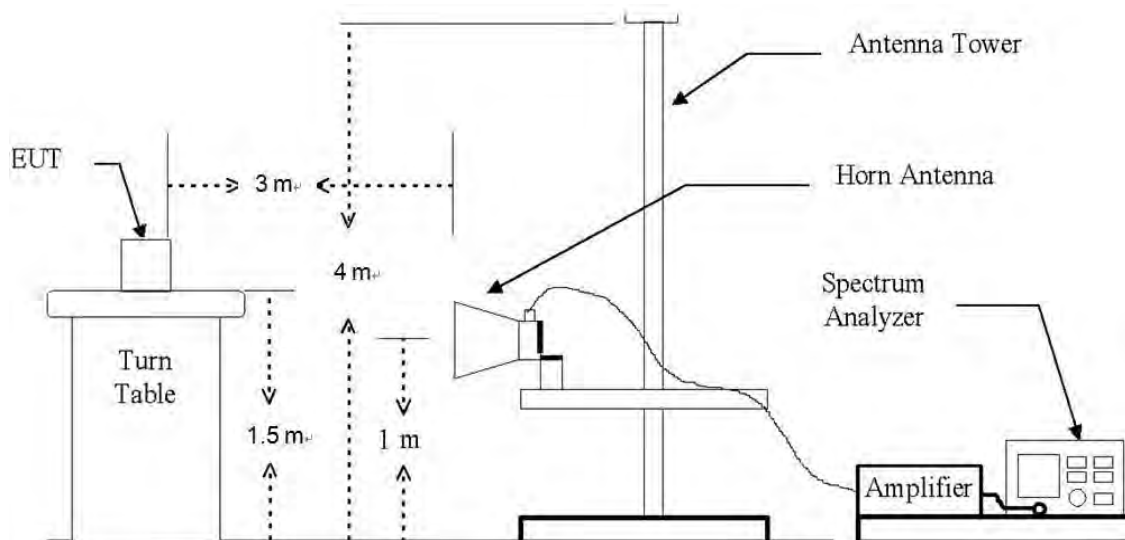
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The diagram below shows the test setup that is utilized to make the measurements for emission from 30 MHz to 1 GHz.



The diagram below shows the test setup that is utilized to make the measurements for emission. The spurious emissions were investigated from 1 GHz to the 10th harmonic of the highest fundamental frequency or 40 GHz, whichever is lower.



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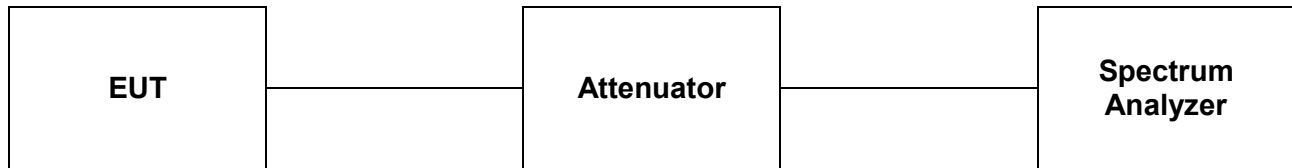
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2.1.2. Conducted Spurious Emission



2.2. Limit

2.2.1. FCC

According to §15.247(d), in any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph(b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in section §15.209(a) is not required. In addition, radiated emission which fall in the restricted bands, as defined in section §15.205(a), must also comply with the radiated emission limits specified in section §15.209(a) (see §15.205(c)).

According to §15.209(a), except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency (MHz)	Field Strength ($\mu V/m$)	Measurement Distance (Meters)
0.009-0.490	2 400/F(kHz)	300
0.490-1.705	24 000/F(kHz)	30
1.705-30.0	30	30
30-88	100**	3
88-216	150**	3
216-960	200**	3
Above 960	500	3

** Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this part, e.g., §§15.231 and 15.241.

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2.2.2. IC

According to RSS-247 Issue 2 5.5, in any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the RF power that is produced shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided that the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of root-mean-square averaging over a time interval, as permitted under section 5.4(d), the attenuation required shall be 30 dB instead of 20 dB. Attenuation below the general field strength limits specified in RSS-Gen is not required.

According to RSS-Gen Issue 4 8.9, except when the requirements applicable to a given device state otherwise, emissions from licence-exempt transmitters shall comply with the field strength limits shown in Table 4 and Table 5 below. Additionally, the level of any transmitter emission shall not exceed the level of the transmitter's fundamental emission.

Table 4 – General Field Strength Limits for Licence-Exempt Transmitters at Frequencies Above 30 MHz

Frequency (MHz)	Field Strength ($\mu V/m$ at 3 metres)
30-88	100
88-216	150
216-960	200
Above 960*	500

* Unless otherwise specified, for all frequencies greater than 1 GHz, the radiated emission limits for licence-exempt radio apparatus stated in applicable RSSs (including RSS-Gen) are based on measurements using a linear average detector function having a minimum resolution bandwidth of 1 MHz. If an average limit is specified for the EUT, then the peak emission shall also be measured with instrumentation properly adjusted for such factors as pulse desensitization to ensure the peak emission is less than 20 dB above the average limit.

Note: Transmitting devices are not permitted in restricted frequency bands unless stated otherwise in the specific RSS.

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Table 5 – General Field Strength Limits for Licence-Exempt Transmitters at Frequencies Below 30 MHz

Frequency	Electric Field Strength ($\mu\text{V/m}$)	Magnetic Field Strength (H-Field) ($\mu\text{A/m}$)	Measurement Distance (meters)
9-490 kHz	2,400/F (F in kHz)	2,400/377F (F in kHz)	300
490-1,705 kHz	24,000/F (F in kHz)	24,000/377F (F in kHz)	30
1.705-30 MHz	30	N/A	30

Note: The emission limits for the bands 9-90 kHz and 110-490 kHz are based on measurements employing a linear average detector. Transmitting devices are not permitted in restricted frequency bands unless stated otherwise in the relevant RSS.

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2.3. Test Procedures

Radiated emissions from the EUT were measured according to the dictates in section 11.0 & 12.0 of KDB 558074 D01 DTS Meas Guidance v04 and ANSI C63.10 2013.

2.3.1. Test Procedures for emission below 30 MHz

1. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter anechoic chamber test site. The table was rotated 360 degrees to determine the position of the highest radiation.
2. Then antenna is a loop antenna is fixed at one meter above the ground to determine the maximum value of the field strength. Both parallel and perpendicular of the antenna are set to make the measurement.
3. For each suspected emission, the EUT was arranged to its worst case and then the table was turned from 0 degrees to 360 degrees to find the maximum reading.
4. The test-receiver system was set to average or quasi peak detect function and Specified Bandwidth with Maximum Hold Mode.

Note;

Although these tests were performed other than open field test site, adequate comparison measurements were confirmed against 30 meter open field test site. Therefore sufficient tests were made to demonstrate that the alternative site produces results that correlate with the ones of tests made in an open field based on KDB 414788 D01 Radiated Test Site v01.

2.3.2. Test Procedures for emission from above 30 MHz

1. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter anechoic chamber test site below 1 GHz and 1.5 meters above the ground at a 3 meter anechoic chamber test site above 1 GHz. The table was rotated 360 degrees to determine the position of the highest radiation.
2. During performing radiated emission below 1 GHz, the EUT was set 3 meters away from the interference receiving antenna, which was mounted on the top of a variable-height antenna tower. During performing radiated emission above 1 GHz, the EUT was set 3 meter away from the interference-receiving antenna.
3. The antenna is a bi-log antenna, a horn antenna and its height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
4. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the table was turned from 0 degrees to 360 degrees to find the maximum reading.
5. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
6. If the emission level of the EUT in peak mode was 10 dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10 dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

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NOTE;

All data rates and modes were investigated for radiated spurious emissions. Only the radiated emissions of the configuration that produced the worst case emissions are reported in this section.

1. Unwanted Emissions into Non-Restricted Frequency Bands

- The Reference Level Measurement refer to section 11.2
Set analyzer center frequency to DTS channel center frequency, SPAN ≥ 1.5 times the DTS bandwidth, the RBW = 100 kHz and VBW $\geq 3 \times$ RBW, Detector = Peak, Sweep time = Auto couple, Trace mode = Max hold.
- Unwanted Emissions Level Measurement refer to section 11.3
Set the center frequency and span to encompass frequency range to be measured, the RBW = 100 kHz and VBW $\geq 3 \times$ RBW, Detector = Peak, Sweep time = Auto couple, Trace mode = Max hold.

2. Unwanted Emissions into Restricted Frequency Bands

- Peak Power measurement procedure refer to section 12.2.4
Set RBW = as specified in Table 1, VBW $\geq 3 \times$ RBW, Detector = Peak, Sweep time = auto, Trace mode = Max hold.

Table 1– RBW as a function of frequency

Frequency	RBW
9 - 150 kHz	200 - 300 Hz
0.15 - 30 MHz	9 - 10 kHz
30 - 1 000 MHz	100 - 120 kHz
> 1 000 MHz	1 MHz

- Average Power measurements procedure refer to section 12.2.5.2
The EUT shall be configured to operate at the maximum achievable duty cycle.
Measure the duty cycle, x, of the transmitter output signal as described in section 6.0.
Set RBW = 1 MHz, VBW $\geq 3 \times$ RBW, Detector = RMS, if span / (# of points in sweep) $\leq$ (RBW/2).
Satisfying this condition may require increasing the number of points in the sweep or reducing the span. If this condition cannot be satisfied then the detector mode shall be set to peak.

Averaging type = power (i.e., RMS).

As an alternative the detector and averaging type may be set for linear voltage averaging.

Some instruments require linear display mode in order to use linear voltage averaging. Log or dB averaging shall not be used. Sweep time = auto, Perform a trace average of at least 100 traces.

A correction factor shall be added to the measurement results prior to comparing to the emission limit in order to compute the emission level that would have been measured had the test been performed at 100 percent duty cycle. The correction factor is computed as follows:

- 1) If power averaging (RMS) mode was used in step f), then the applicable correction factor is $10 \log(1/x)$, where x is the duty cycle.

3. To get a maximum emission level from the EUT, the EUT is manipulated through three orthogonal planes (X, Y, Z). Worst orthogonal plan of EUT is **Z – axis** during radiation test.

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2.3.3. Test Procedures for Conducted Spurious Emissions

All data rates and modes were investigated for radiated spurious emissions. Only the radiated emissions of the configuration that produced the worst case emissions are reported in this section.

Per the guidance of KDB 558074 D01 DTS Meas Guidance v04, section 11.1 & 11.2 & 11.3, the reference level for out of band emissions is established from the plots of this section since the band edge emissions are measured with a RBW of 100 kHz. This reference level is then used as the limit in subsequent plots for out of band spurious emissions shown in section 2.4.3. The limit for out of band spurious emission at the band edge is 20 dB below the fundamental emission level measured in a 100 kHz bandwidth.

1. Conducted Emissions at Band Edge

- The Measurement refer to section 11.2

Set the center frequency and span to encompass frequency range to be measured, the RBW = 100 kHz and VBW $\geq 3 \times$ RBW, Detector = Peak, Sweep time = Auto couple, Trace mode = Max hold, Ensure that the number of measurement points $\geq$ span/RBW, The trace was allowed to stabilize.

2. Conducted Spurious Emissions

- The Measurement refer to section 11.3

Start frequency was set to 9 kHz and stop frequency was set to 26.5 GHz (separated into two plots per channel), RBW = 1 MHz, VBW $\geq 3 \times$ RBW, Detector = Peak, Sweep time = Auto couple, Trace = Max hold, The trace was allowed to stabilize.

3. TDF function

- For plots showing conducted spurious emissions from 9 kHz to 26.5 GHz, all path loss of wide frequency range was investigated and compensated to spectrum analyzer as TDF function. So, the reading values shown in plots were final result.

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A4(210 mm x 297 mm)

2.4. Test Results

Ambient temperature : (23 ± 1) °C

Relative humidity : 47 % R.H.

2.4.1. Radiated Spurious Emission below 1 000 MHz

The frequency spectrum from 9 kHz to 1 000 MHz was investigated. All reading values are peak values.

Radiated Emissions			Ant	Correction Factors		Total	Limit	
Frequency (MHz)	Reading (dBμV)	Detect Mode	Pol.	AF (dB/m)	AMP + CL (dB)	Actual (dBμV/m)	Limit (dBμV/m)	Margin (dB)
75.07	39.70	Peak	H	8.30	-26.55	21.45	40.00	18.55
160.02	46.00	Peak	H	12.30	-25.56	32.74	43.50	10.76
251.09	47.00	Peak	H	15.37	-24.85	37.52	46.00	8.48
296.66	40.70	Peak	H	17.27	-24.44	33.53	46.00	12.47
321.41	48.60	Peak	H	14.64	-24.46	38.78	46.00	7.22
323.30	49.80	Peak	H	14.57	-24.44	39.93	46.00	6.07
323.74	40.50	Peak	V	14.55	-24.43	30.62	46.00	15.38
325.40	49.20	Peak	H	14.49	-24.41	39.28	46.00	6.72
365.33	37.80	Peak	V	14.90	-24.51	28.19	46.00	17.81
558.59	41.50	Peak	H	18.80	-24.89	35.41	46.00	10.59
Above 600.00	Not detected	-	-	-	-	-	-	-

Remark;

1. Spurious emissions for all channels were investigated and almost the same below 1 GHz.
2. Reported spurious emissions are in **11n HT40 / MCS0 / High channel** as worst case among other modes.
3. Radiated spurious emission measurement as below.
(Actual = Reading + AF + AMP + CL)
4. According to §15.31(o), emission levels are not report much lower than the limits by over 20 dB.

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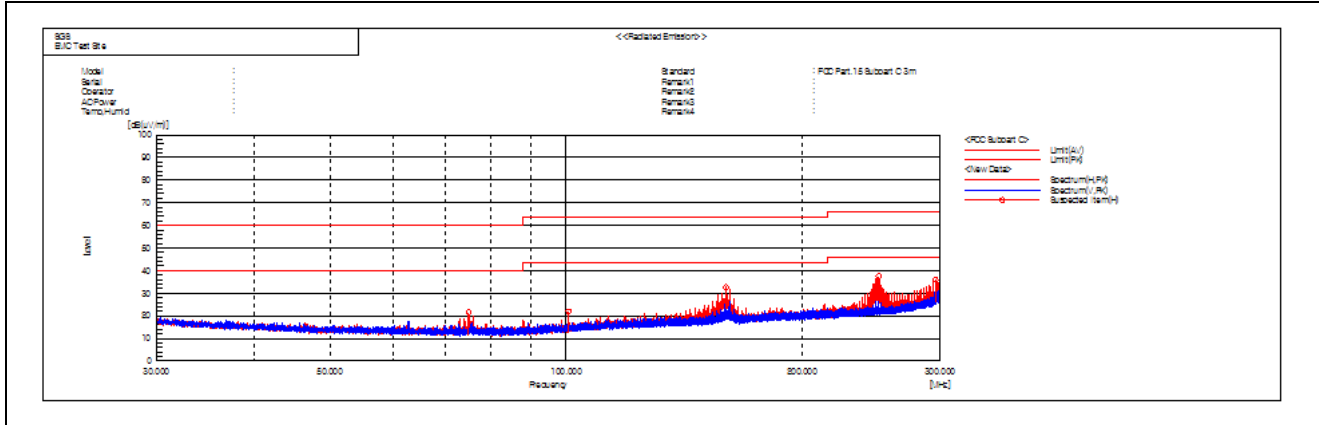
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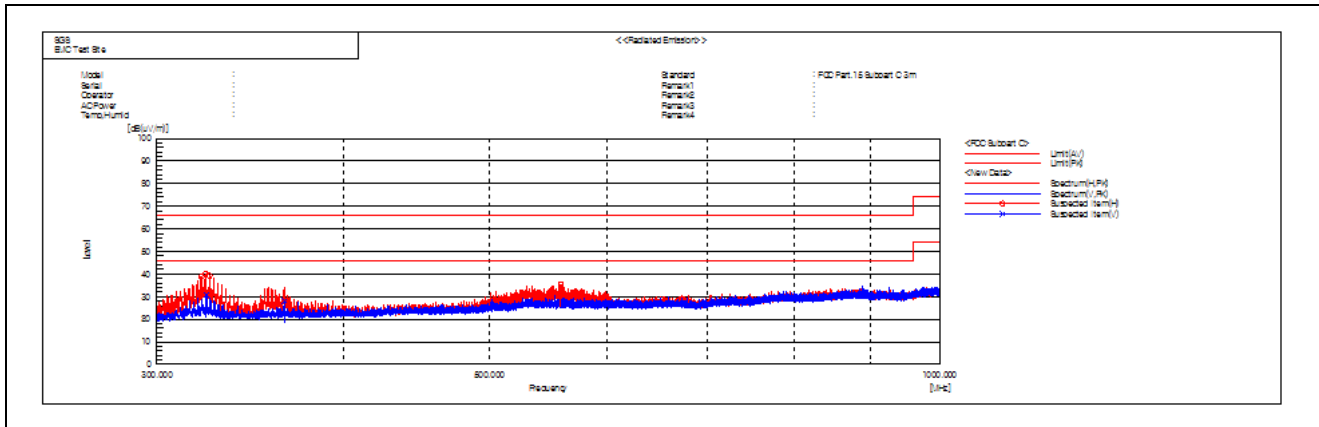
A4(210 mm x 297 mm)

Test plot

30 MHz ~ 300 MHz



300 MHz ~ 1 000 MHz



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A4(210 mm x 297 mm)

2.4.2. Radiated Spurious Emission above 1 000 MHz

The frequency spectrum above 1 000 MHz was investigated. All reading values are peak and average values.

DSSS: 802.11b (1 Mbps)

Low Channel (2 412 MHz)

Radiated Emissions			Ant.	Correction Factors			Total	Limit	
Frequency (MHz)	Reading (dBμV)	Detect Mode	Pol.	AF (dB/m)	CL (dB)	Duty (dB)	Actual (dBμV/m)	Limit (dBμV/m)	Margin (dB)
*2 310.00	19.14	Peak	H	27.82	7.46	-	54.42	74.00	19.58
*2 310.00	8.27	Average	H	27.82	7.46	0.04	43.59	54.00	10.41
*2 389.16	22.91	Peak	H	27.98	7.60	-	58.49	74.00	15.51
*2 389.95	10.99	Average	H	27.98	7.60	0.04	46.61	54.00	7.39
*2 390.00	21.88	Peak	H	27.98	7.60	-	57.46	74.00	16.54
*2 390.00	10.99	Average	H	27.98	7.60	0.04	46.61	54.00	7.39

Radiated Emissions			Ant.	Correction Factors			Total	Limit	
Frequency (MHz)	Reading (dBμV)	Detect Mode	Pol.	AF (dB/m)	AMP+CL (dB)	Duty (dB)	Actual (dBμV/m)	Limit (dBμV/m)	Margin (dB)
*4 824.00	53.84	Peak	H	32.54	-34.30	-	52.08	74.00	21.92
*4 824.00	51.39	Average	H	32.54	-34.30	0.04	49.67	54.00	4.33
Above 4 900.00	Not detected	-	-	-	-	-	-	-	-

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A4(210 mm x 297 mm)

Middle Channel (2 437 MHz)

Radiated Emissions			Ant.	Correction Factors			Total	Limit	
Frequency (MHz)	Reading (dB μ V)	Detect Mode	Pol.	AF (dB/m)	AMP+CL (dB)	Duty (dB)	Actual (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)
*4 874.00	52.61	Peak	H	32.75	-34.11	-	51.25	74.00	22.75
*4 874.04	50.21	Average	H	32.75	-34.11	0.04	48.89	54.00	5.11
Above 4 900.00	Not detected	-	-	-	-	-	-	-	-

High Channel (2 462 MHz)

Radiated Emissions			Ant.	Correction Factors			Total	Limit	
Frequency (MHz)	Reading (dB μ V)	Detect Mode	Pol.	AF (dB/m)	CL (dB)	Duty (dB)	Actual (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)
*2 483.50	19.22	Peak	H	28.00	7.72	-	54.94	74.00	19.06
*2 483.50	8.89	Average	H	28.00	7.72	0.04	44.65	54.00	9.35
*2 483.90	22.40	Peak	H	28.00	7.72	-	58.12	74.00	15.88
*2 484.95	10.02	Average	H	28.00	7.72	0.04	45.78	54.00	8.22
*2 500.00	19.38	Peak	H	28.00	7.69	-	55.07	74.00	18.93
*2 500.00	8.82	Average	H	28.00	7.69	0.04	44.55	54.00	9.45

Radiated Emissions			Ant.	Correction Factors			Total	Limit	
Frequency (MHz)	Reading (dB μ V)	Detect Mode	Pol.	AF (dB/m)	AMP+CL (dB)	Duty (dB)	Actual (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)
*4 924.04	53.67	Peak	H	32.80	-33.92	-	52.55	74.00	21.45
*4 923.96	51.14	Average	H	32.80	-33.92	0.04	50.06	54.00	3.94
Above 5 000.00	Not detected	-	-	-	-	-	-	-	-

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A4(210 mm x 297 mm)

OFDM: 802.11g (6 Mbps)

Low Channel (2 412 MHz)

Radiated Emissions			Ant.	Correction Factors			Total	Limit	
Frequency (MHz)	Reading (dB μ V)	Detect Mode	Pol.	AF (dB/m)	CL (dB)	Duty (dB)	Actual (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)
*2 310.00	18.42	Peak	H	27.82	7.46	-	53.70	74.00	20.30
*2 310.00	8.59	Average	H	27.82	7.46	0.26	44.13	54.00	9.87
*2 389.95	25.11	Peak	H	27.98	7.60	-	60.69	74.00	13.31
*2 389.95	14.33	Average	H	27.98	7.60	0.26	50.17	54.00	3.83
*2 390.00	25.11	Peak	H	27.98	7.60	-	60.69	74.00	13.31
*2 390.00	14.33	Average	H	27.98	7.60	0.26	50.17	54.00	3.83

Radiated Emissions			Ant.	Correction Factors			Total	Limit	
Frequency (MHz)	Reading (dB μ V)	Detect Mode	Pol.	AF (dB/m)	AMP+CL (dB)	Duty (dB)	Actual (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)
*4 821.72	49.42	Peak	H	32.53	-34.29	-	47.66	74.00	26.34
*4 823.64	37.72	Average	H	32.54	-34.30	0.26	36.22	54.00	17.78
Above 4 900.00	Not detected	-	-	-	-	-	-	-	-

Middle Channel (2 437 MHz)

Radiated Emissions			Ant.	Correction Factors			Total	Limit	
Frequency (MHz)	Reading (dB μ V)	Detect Mode	Pol.	AF (dB/m)	AMP+CL (dB)	Duty (dB)	Actual (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)
*4 871.72	49.66	Peak	H	32.74	-34.13	-	48.27	74.00	25.73
*4 873.52	37.87	Average	H	32.75	-34.11	0.26	36.77	54.00	17.23
Above 4 900.00	Not detected	-	-	-	-	-	-	-	-

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A4(210 mm x 297 mm)

High Channel (2 462 MHz)

Radiated Emissions			Ant.	Correction Factors			Total	Limit	
Frequency (MHz)	Reading (dB μ V)	Detect Mode	Pol.	AF (dB/m)	CL (dB)	Duty (dB)	Actual (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)
*2 483.50	26.16	Peak	H	28.00	7.72	-	61.88	74.00	12.12
*2 483.50	12.68	Average	H	28.00	7.72	0.26	48.66	54.00	5.34
*2 483.80	27.11	Peak	H	28.00	7.72	-	62.83	74.00	11.17
*2 383.75	12.77	Average	H	27.97	7.60	0.26	48.60	54.00	5.40
*2 500.00	20.67	Peak	H	28.00	7.69	-	56.36	74.00	17.64
*2 500.00	9.73	Average	H	28.00	7.69	0.26	45.68	54.00	8.32

Radiated Emissions			Ant.	Correction Factors			Total	Limit	
Frequency (MHz)	Reading (dB μ V)	Detect Mode	Pol.	AF (dB/m)	AMP+CL (dB)	Duty (dB)	Actual (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)
*4 921.92	50.68	Peak	H	32.80	-33.93	-	49.55	74.00	24.45
*4 923.48	38.70	Average	H	32.80	-33.93	0.26	37.83	54.00	16.17
Above 5 000.00	Not detected	-	-	-	-	-	-	-	-

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A4(210 mm x 297 mm)

OFDM: 802.11n_HT20 (MCS0)

Low Channel (2 412 MHz)

Radiated Emissions			Ant.	Correction Factors			Total	Limit	
Frequency (MHz)	Reading (dB μ V)	Detect Mode	Pol.	AF (dB/m)	CL (dB)	Duty (dB)	Actual (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)
*2 310.00	18.23	Peak	H	27.82	7.46	-	53.51	74.00	20.49
*2 310.00	8.01	Average	H	27.82	7.46	0.28	43.57	54.00	10.43
*2 389.85	30.84	Peak	H	27.98	7.60	-	66.42	74.00	7.58
*2 389.85	14.08	Average	H	27.98	7.60	0.28	49.94	54.00	4.06
*2 390.00	29.07	Peak	H	27.98	7.60	-	64.65	74.00	9.35
*2 390.00	13.68	Average	H	27.98	7.60	0.28	49.54	54.00	4.46

Radiated Emissions			Ant.	Correction Factors			Total	Limit	
Frequency (MHz)	Reading (dB μ V)	Detect Mode	Pol.	AF (dB/m)	AMP+CL (dB)	Duty (dB)	Actual (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)
*4 824.68	50.55	Peak	H	32.55	-34.30	-	48.80	74.00	25.20
*4 824.20	37.16	Average	H	32.55	-34.30	0.28	35.69	54.00	18.31
Above 4 900.00	Not detected	-	-	-	-	-	-	-	-

Middle Channel (2 437 MHz)

Radiated Emissions			Ant.	Correction Factors			Total	Limit	
Frequency (MHz)	Reading (dB μ V)	Detect Mode	Pol.	AF (dB/m)	AMP+CL (dB)	Duty (dB)	Actual (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)
*4 874.68	50.03	Peak	H	32.75	-34.10	-	48.68	74.00	25.32
*4 873.88	37.07	Average	H	32.75	-34.11	0.28	35.99	54.00	18.01
Above 4 900.00	Not detected	-	-	-	-	-	-	-	-

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A4(210 mm x 297 mm)

High Channel (2 462 MHz)

Radiated Emissions			Ant.	Correction Factors			Total	Limit	
Frequency (MHz)	Reading (dB μ V)	Detect Mode	Pol.	AF (dB/m)	CL (dB)	Duty (dB)	Actual (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)
*2 483.50	34.01	Peak	H	28.00	7.72	-	69.73	74.00	4.27
*2 483.50	12.59	Average	H	28.00	7.72	0.28	48.59	54.00	5.41
*2 483.60	33.21	Peak	H	28.00	7.72	-	68.93	74.00	5.07
*2 483.75	13.49	Average	H	28.00	7.72	0.28	49.49	54.00	4.51
*2 500.00	23.75	Peak	H	28.00	7.69	-	59.44	74.00	14.56
*2 500.00	9.88	Average	H	28.00	7.69	0.28	45.85	54.00	8.15

Radiated Emissions			Ant.	Correction Factors			Total	Limit	
Frequency (MHz)	Reading (dB μ V)	Detect Mode	Pol.	AF (dB/m)	AMP+CL (dB)	Duty (dB)	Actual (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)
*4 924.68	51.81	Peak	H	32.80	-33.92	-	50.69	74.00	23.31
*4 924.24	38.18	Average	H	32.80	-33.92	0.28	37.34	54.00	16.66
Above 5 000.00	Not detected	-	-	-	-	-	-	-	-

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A4(210 mm x 297 mm)

OFDM: 802.11n_HT40 (MCS0)

Low Channel (2 422 MHz)

Radiated Emissions			Ant.	Correction Factors			Total	Limit	
Frequency (MHz)	Reading (dB μ V)	Detect Mode	Pol.	AF (dB/m)	CL (dB)	Duty (dB)	Actual (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)
*2 310.00	18.55	Peak	H	27.82	7.46	-	53.83	74.00	20.17
*2 310.00	8.24	Average	H	27.82	7.46	0.56	44.08	54.00	9.92
*2 385.25	29.36	Peak	H	27.97	7.60	-	64.93	74.00	9.07
*2 389.84	14.70	Average	H	27.98	7.60	0.56	50.84	54.00	3.16
*2 390.00	27.40	Peak	H	27.98	7.60	-	62.98	74.00	11.02
*2 390.00	14.64	Average	H	27.98	7.60	0.56	50.78	54.00	3.22

Radiated Emissions			Ant.	Correction Factors			Total	Limit	
Frequency (MHz)	Reading (dB μ V)	Detect Mode	Pol.	AF (dB/m)	AMP+CL (dB)	Duty (dB)	Actual (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)
Above 1 000.00	Not detected	-	-	-	-	-	-	-	-

Middle Channel (2 437 MHz)

Radiated Emissions			Ant.	Correction Factors			Total	Limit	
Frequency (MHz)	Reading (dB μ V)	Detect Mode	Pol.	AF (dB/m)	AMP+CL (dB)	Duty (dB)	Actual (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)
Above 1 000.00	Not detected	-	-	-	-	-	-	-	-

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A4(210 mm x 297 mm)

High Channel (2 452 MHz)

Radiated Emissions			Ant.	Correction Factors			Total	Limit	
Frequency (MHz)	Reading (dB μ V)	Detect Mode	Pol.	AF (dB/m)	CL (dB)	Duty (dB)	Actual (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)
*2 483.50	25.28	Peak	H	28.00	7.72	-	61.00	74.00	13.00
*2 483.50	12.93	Average	H	28.00	7.72	0.56	49.21	54.00	4.79
*2 487.05	28.40	Peak	H	28.00	7.72	-	64.12	74.00	9.88
*2 483.80	13.24	Average	H	28.00	7.72	0.56	49.52	54.00	4.48
*2 500.00	20.90	Peak	H	28.00	7.69	-	56.59	74.00	17.41
*2 500.00	9.81	Average	H	28.00	7.69	0.56	46.06	54.00	7.94

Radiated Emissions			Ant.	Correction Factors			Total	Limit	
Frequency (MHz)	Reading (dB μ V)	Detect Mode	Pol.	AF (dB/m)	AMP+CL (dB)	Duty (dB)	Actual (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)
*4 899.70	46.45	Peak	H	32.80	-34.03	-	45.22	74.00	28.78
*4 904.16	34.94	Average	H	32.80	-34.01	0.56	34.29	54.00	19.71
Above 5 000.00	Not detected	-	-	-	-	-	-	-	-

Remarks;

1. "*" means the restricted band.
2. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
3. Radiated emissions measured in frequency above 1 000 MHz were made with an instrument using peak/average detector mode.
4. Actual = Reading + AF + AMP + CL or Reading + AF + CL.
5. According to § 15.31(o), emission levels are not reported much lower than the limits by over 20 dB.

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A4(210 mm x 297 mm)

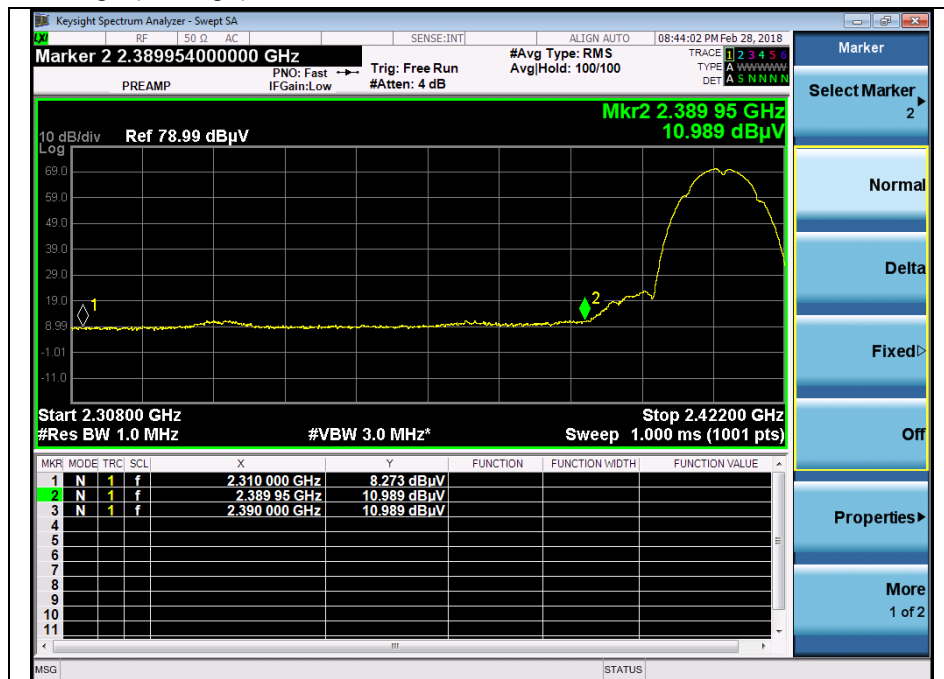
2.4.3. Plot of Transmitter Radiated Spurious Emissions

DSSS: 802.11b (1 Mbps)

Low channel Band edge (Peak)



Low channel Band edge (Average)



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A4(210 mm x 297 mm)

High channel Band edge (Peak)



High channel Band edge (Average)



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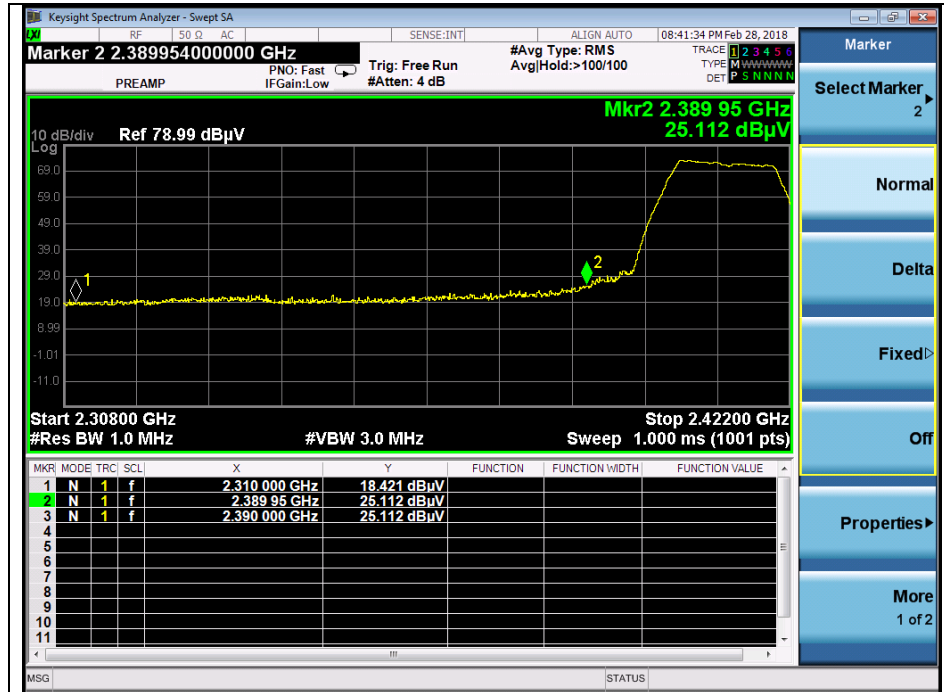
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A4(210 mm x 297 mm)

OFDM: 802.11g (6 Mbps)

Low channel Band edge (Peak)



Low channel Band edge (Average)



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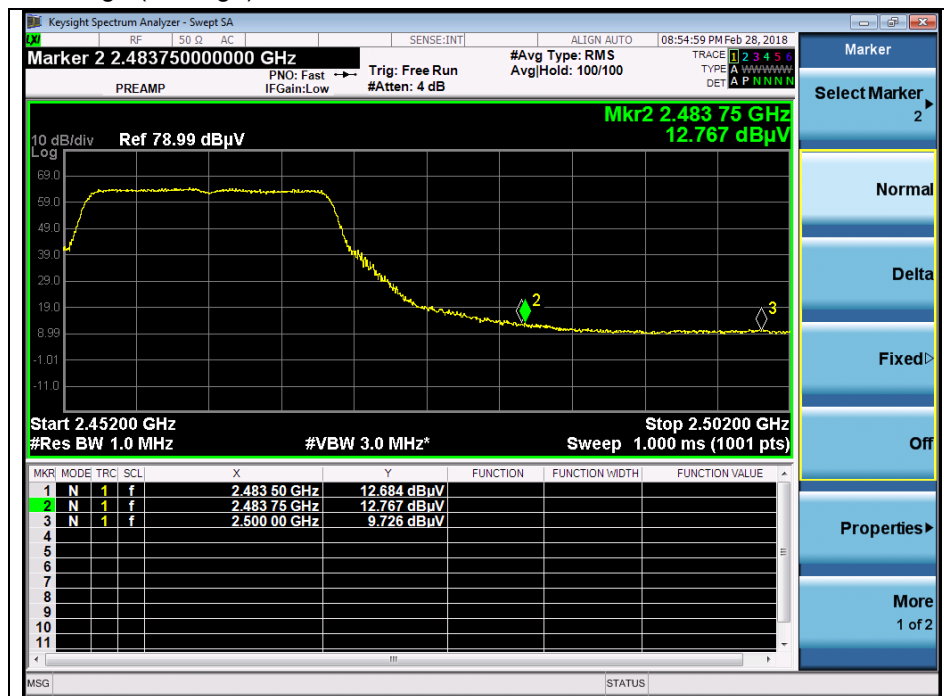
Tel. +82 31 428 5700 / Fax. +82 31 427 2370

A4(210 mm x 297 mm)

High channel Band edge (Peak)



High channel Band edge (Average)



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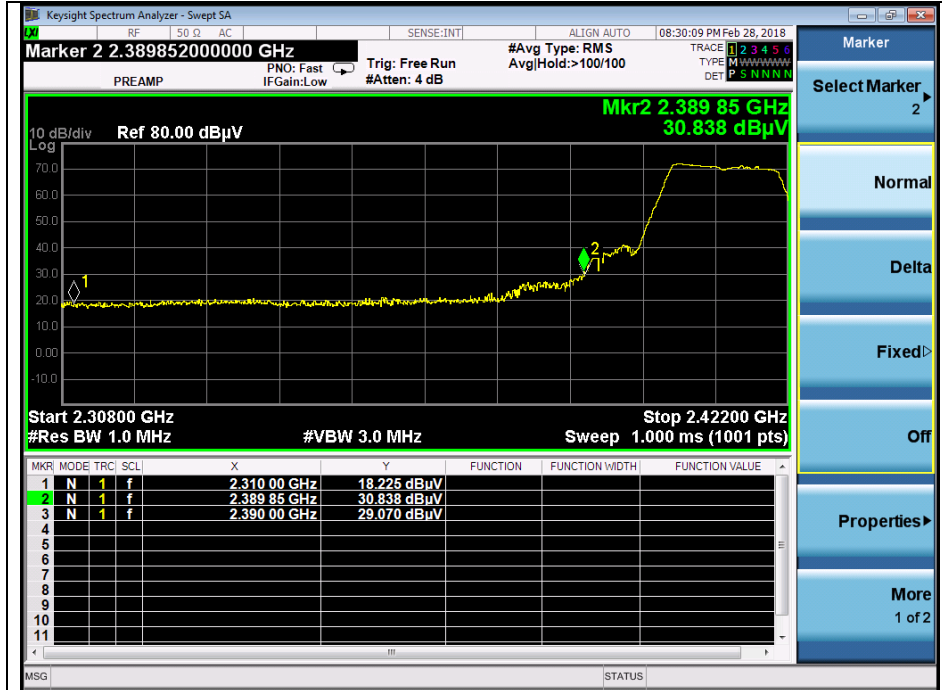
RTT5041-19(2017.07.10)(0)

Tel. +82 31 428 5700 / Fax. +82 31 427 2370

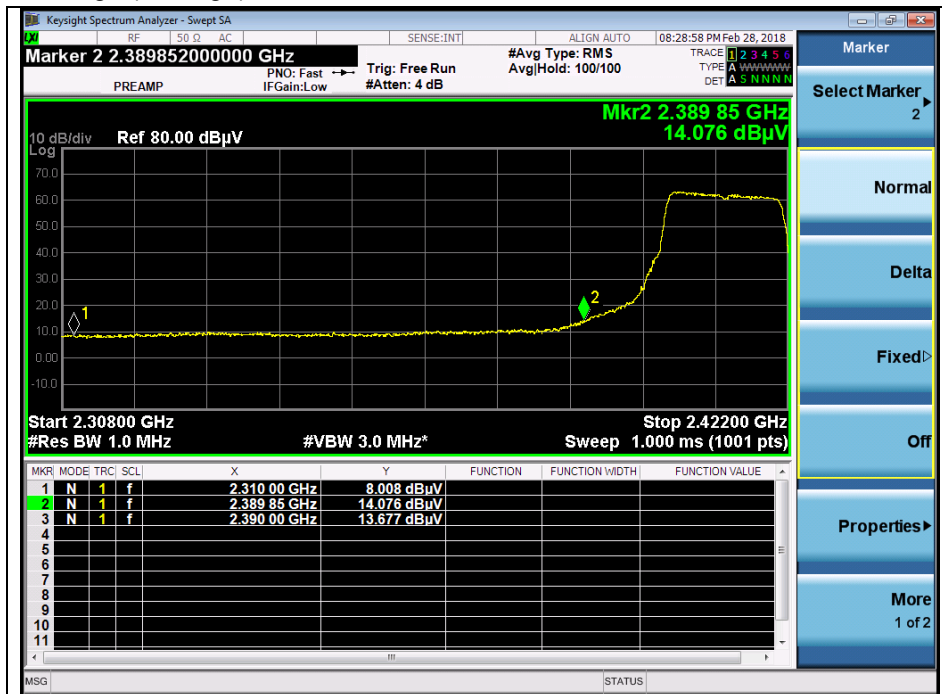
A4(210 mm x 297 mm)

OFDM: 802.11n_HT20 (MCS0)

Low channel Band edge (Peak)



Low channel Band edge (Average)



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RTT5041-19(2017.07.10)(0)

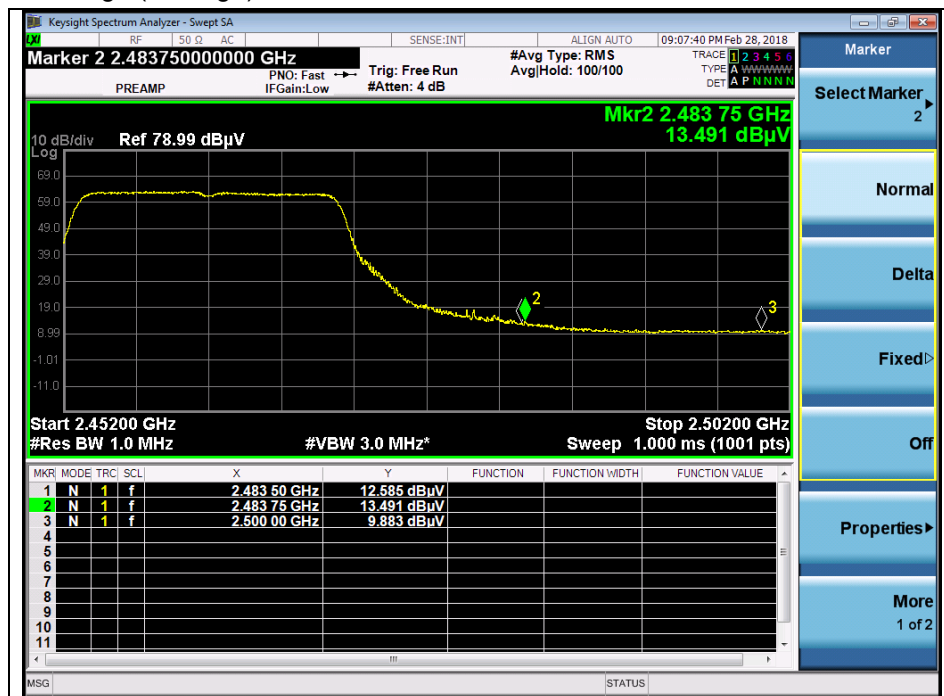
Tel. +82 31 428 5700 / Fax. +82 31 427 2370

A4(210 mm x 297 mm)

High channel Band edge (Peak)



High channel Band edge (Average)



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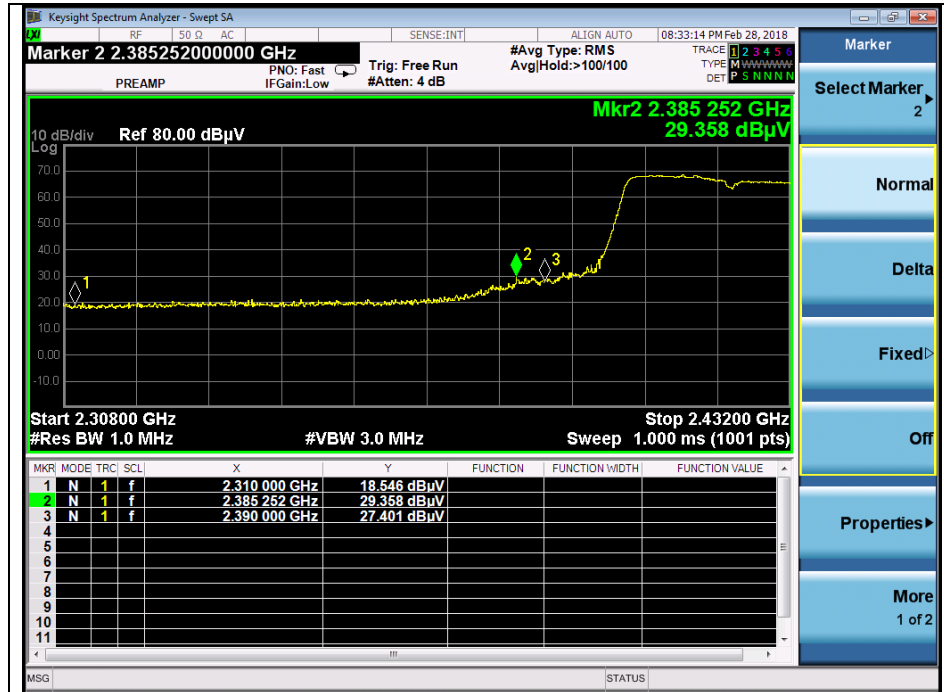
RTT5041-19(2017.07.10)(0)

Tel. +82 31 428 5700 / Fax. +82 31 427 2370

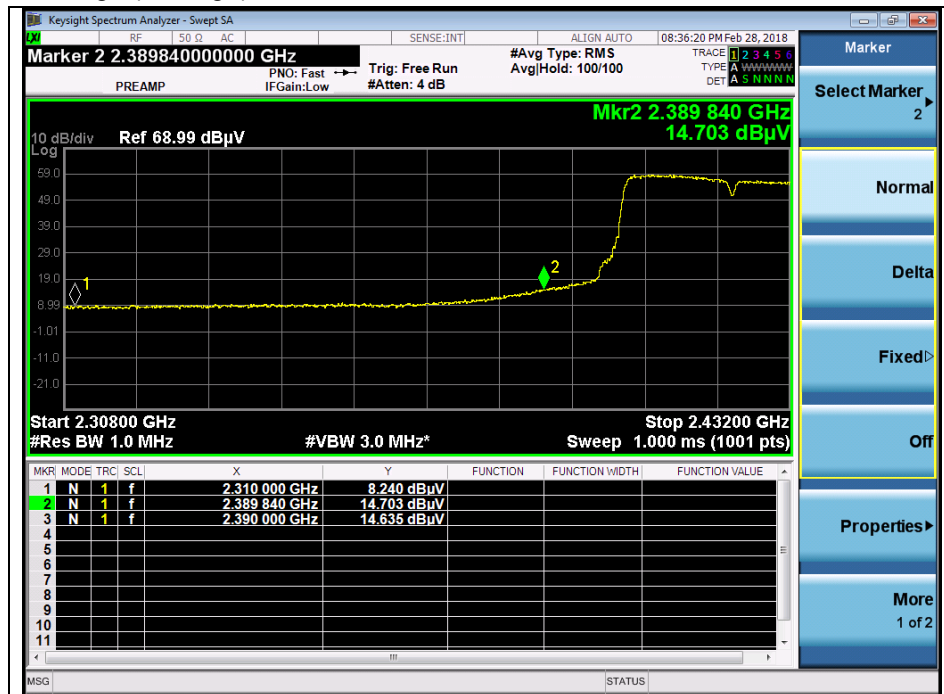
A4(210 mm x 297 mm)

OFDM: 802.11n_HT40 (MCS0)

Low channel Band edge (Peak)



Low channel Band edge (Average)



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RTT5041-19(2017.07.10)(0)

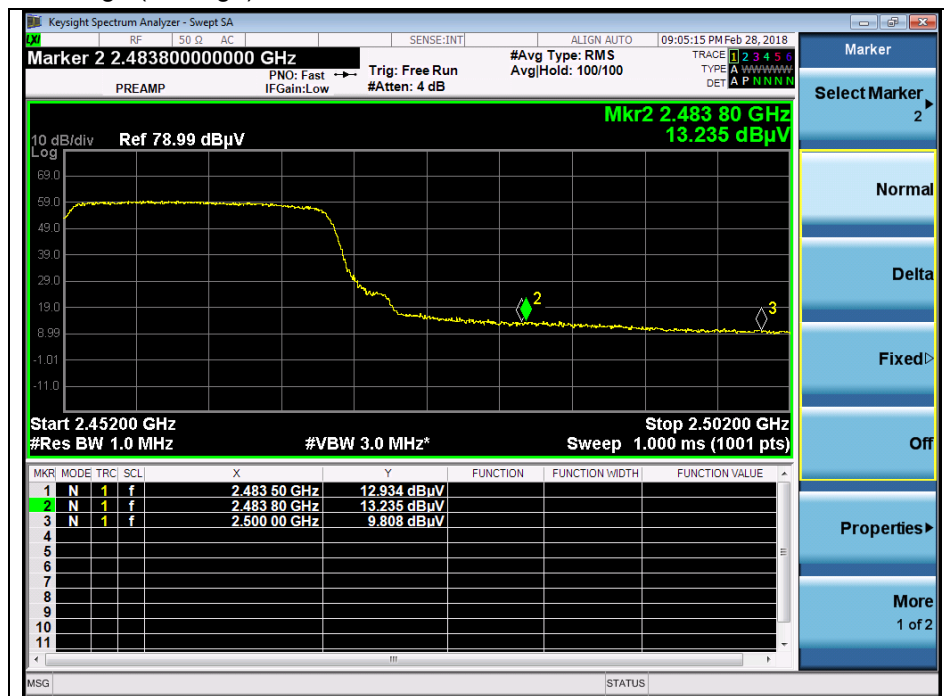
Tel. +82 31 428 5700 / Fax. +82 31 427 2370

A4(210 mm x 297 mm)

High channel Band edge (Peak)



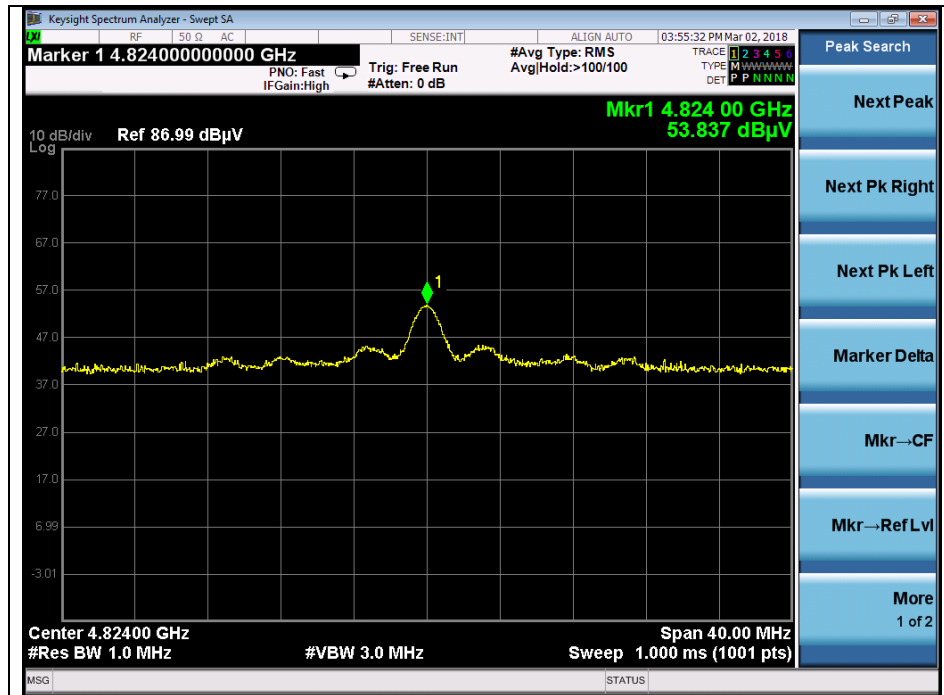
High channel Band edge (Average)



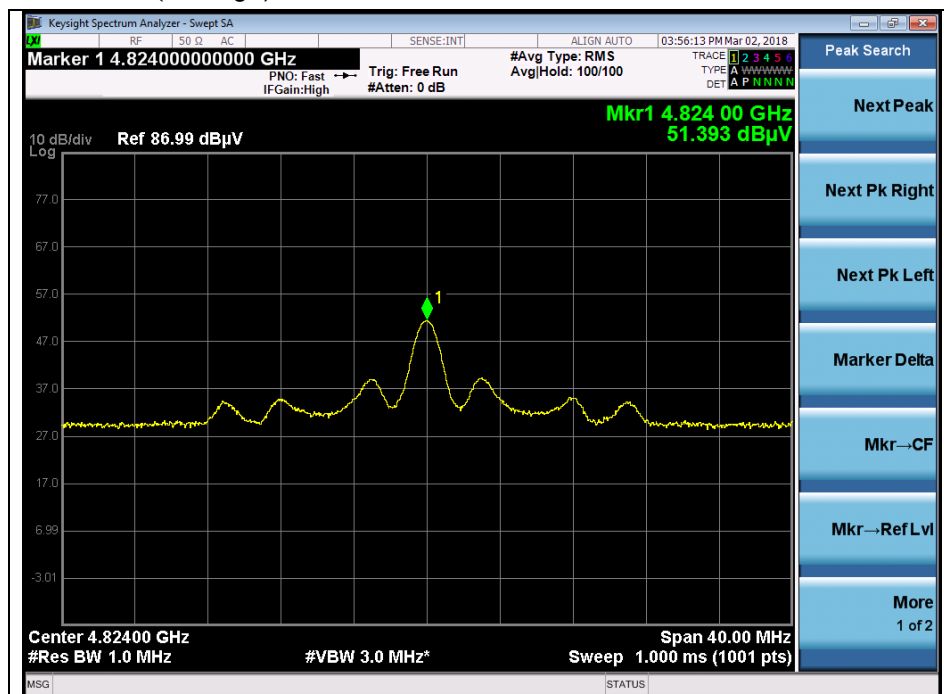
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DSSS: 802.11b (1 Mbps)

Low channel 2nd harmonic (Peak)



Low channel 2nd harmonic (Average)



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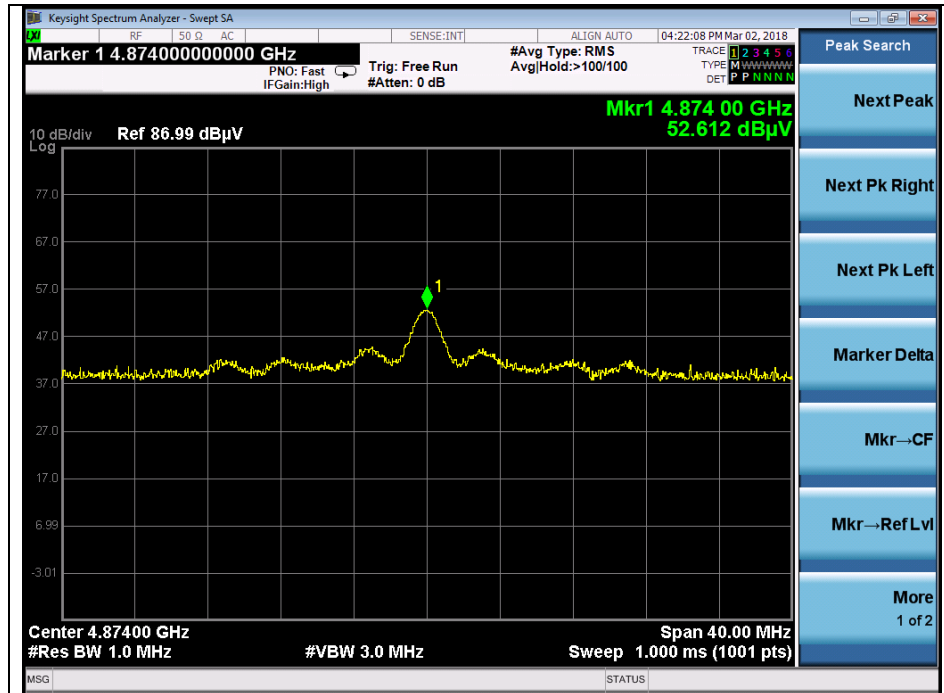
SGS Korea Co., Ltd. (Gunpo Laboratory) 4, LS-ro 182beon-gil, Gunpo-si, Gyeonggi-do, Korea, 15807 <http://www.sgsgroup.kr>

RTT5041-19(2017.07.10)(0)

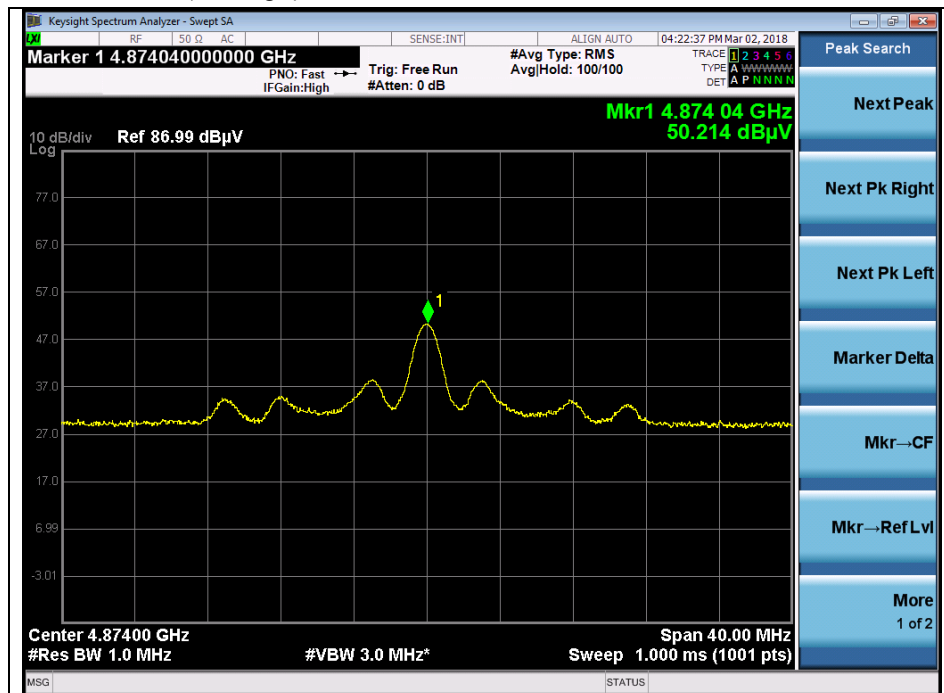
Tel. +82 31 428 5700 / Fax. +82 31 427 2370

A4(210 mm x 297 mm)

Middle channel 2nd harmonic (Peak)



Middle channel 2nd harmonic (Average)



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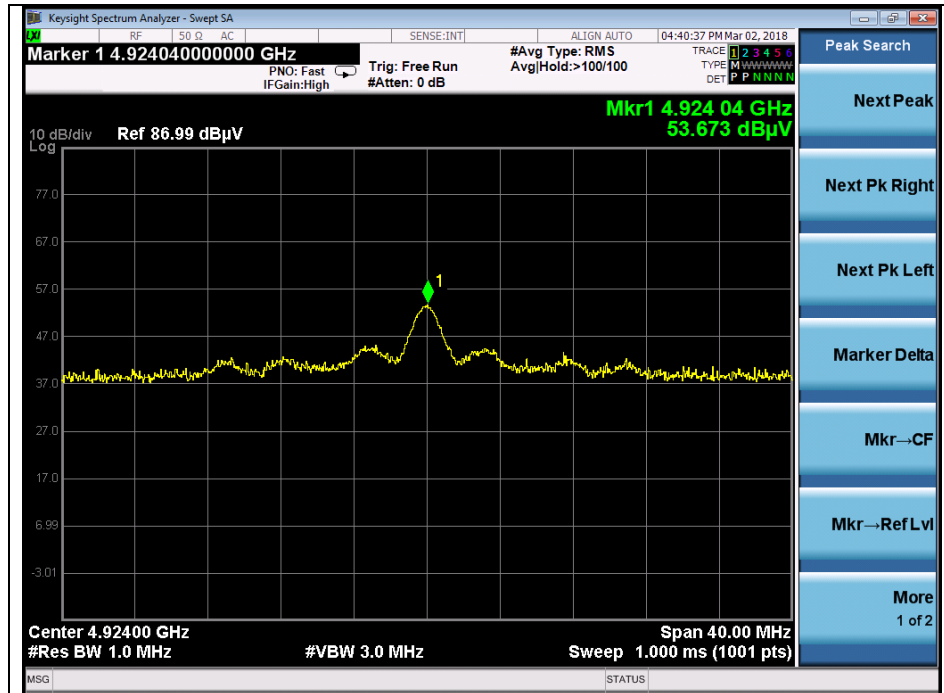
SGS Korea Co., Ltd. (Gunpo Laboratory) 4, LS-ro 182beon-gil, Gunpo-si, Gyeonggi-do, Korea, 15807 <http://www.sgsgroup.kr>

RTT5041-19(2017.07.10)(0)

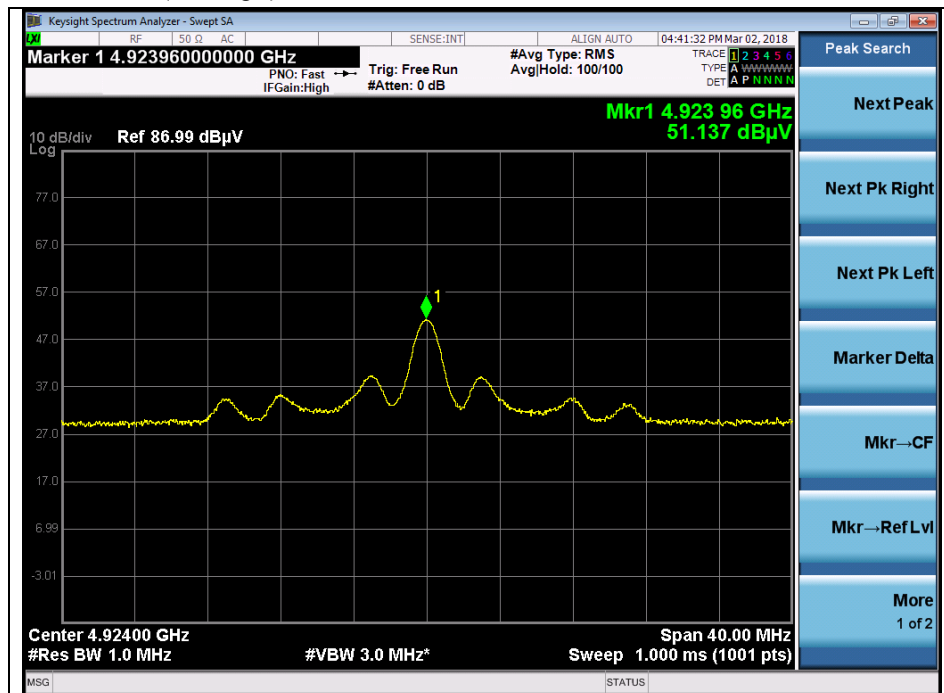
Tel. +82 31 428 5700 / Fax. +82 31 427 2370

A4(210 mm x 297 mm)

High channel 2nd harmonic (Peak)



High channel 2nd harmonic (Average)



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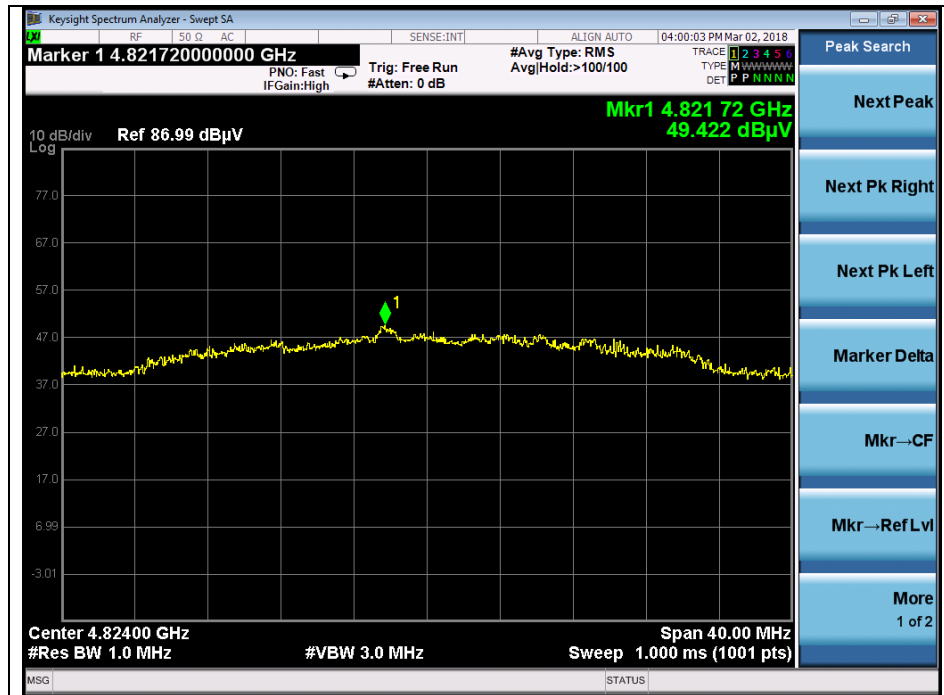
RTT5041-19(2017.07.10)(0)

Tel. +82 31 428 5700 / Fax. +82 31 427 2370

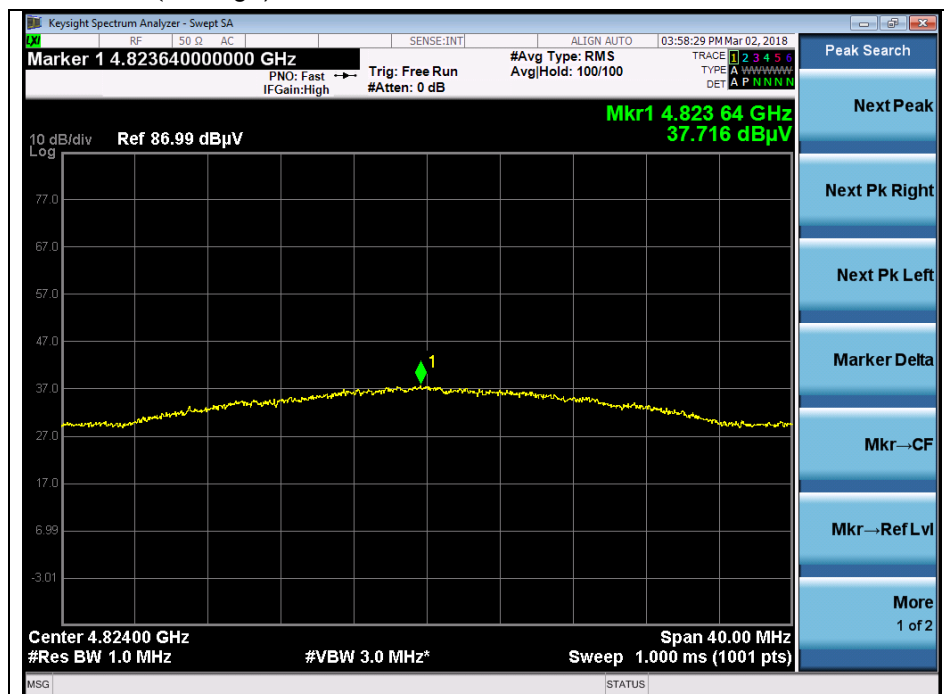
A4(210 mm x 297 mm)

OFDM: 802.11g (6 Mbps)

Low channel 2nd harmonic (Peak)



Low channel 2nd harmonic (Average)



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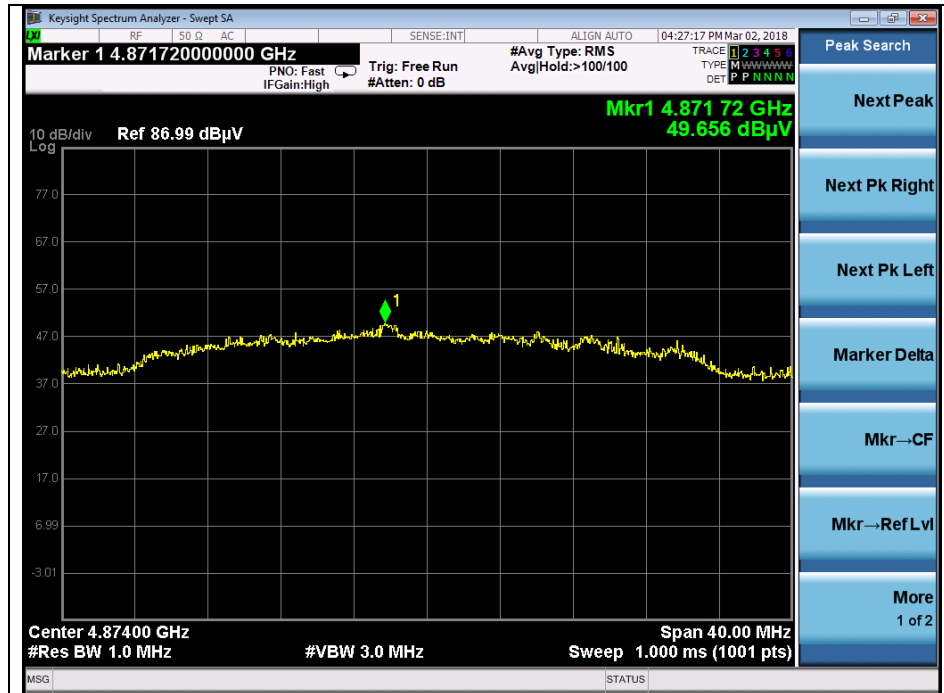
SGS Korea Co., Ltd. (Gunpo Laboratory) 4, LS-ro 182beon-gil, Gunpo-si, Gyeonggi-do, Korea, 15807 <http://www.sgsgroup.kr>

RTT5041-19(2017.07.10)(0)

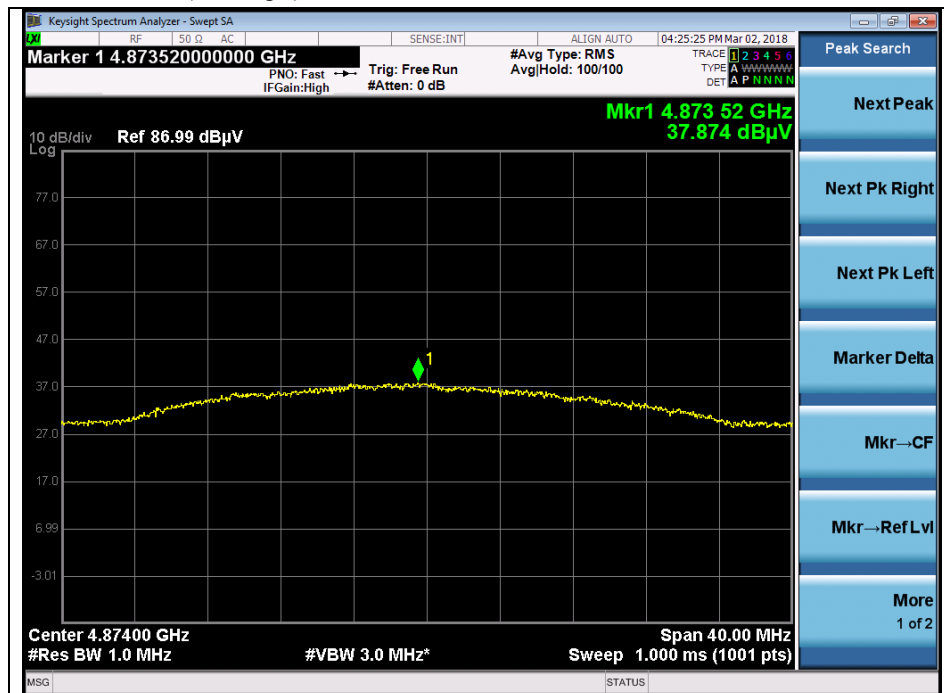
Tel. +82 31 428 5700 / Fax. +82 31 427 2370

A4(210 mm x 297 mm)

Middle channel 2nd harmonic (Peak)



Middle channel 2nd harmonic (Average)



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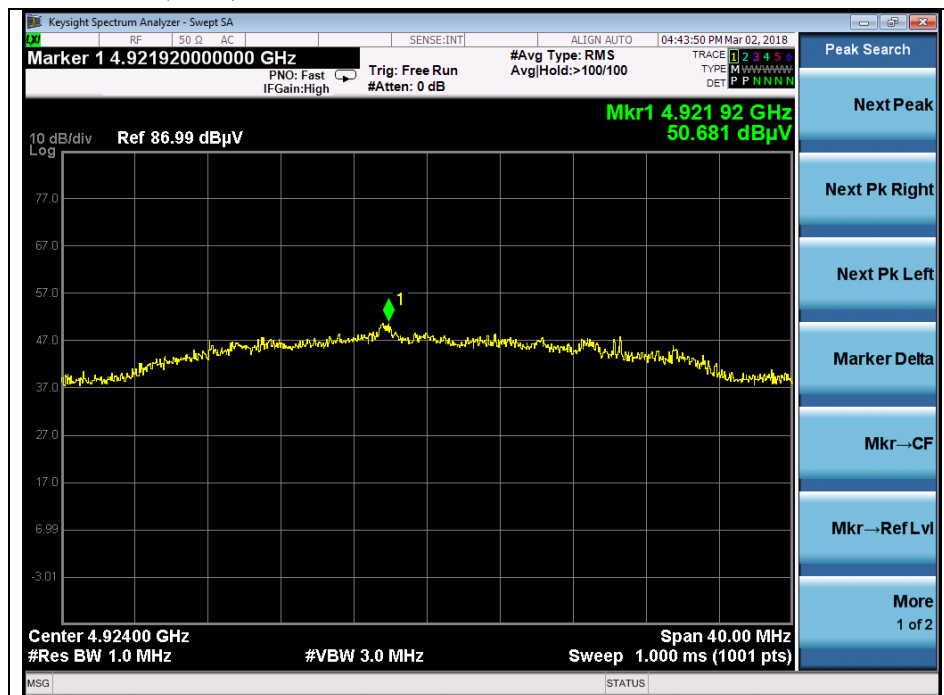
SGS Korea Co., Ltd. (Gunpo Laboratory) 4, LS-ro 182beon-gil, Gunpo-si, Gyeonggi-do, Korea, 15807 <http://www.sgsgroup.kr>

RTT5041-19(2017.07.10)(0)

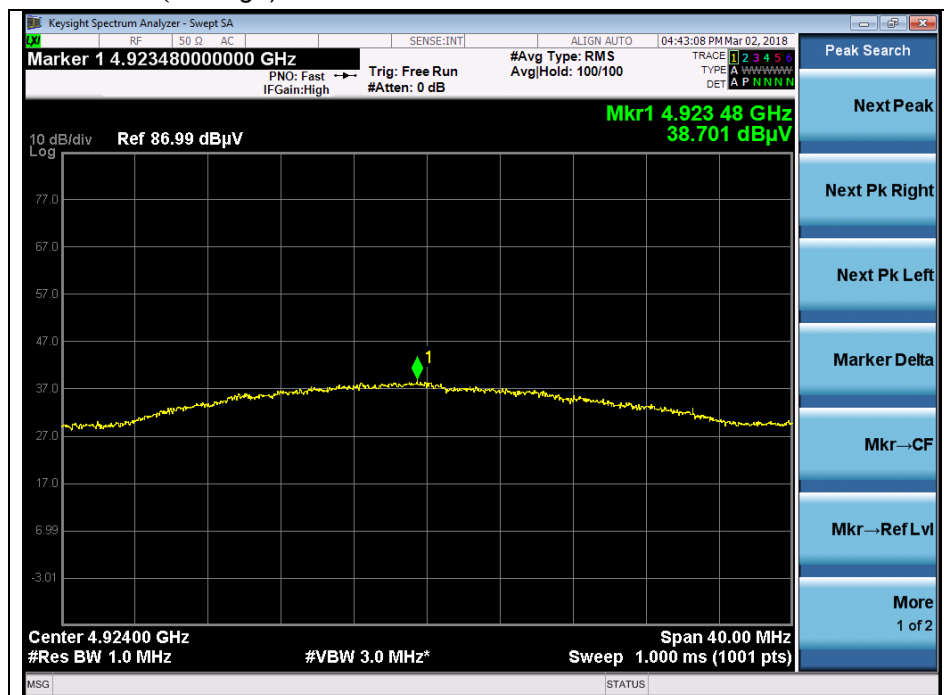
Tel. +82 31 428 5700 / Fax. +82 31 427 2370

A4(210 mm x 297 mm)

High channel 2nd harmonic (Peak)



High channel 2nd harmonic (Average)



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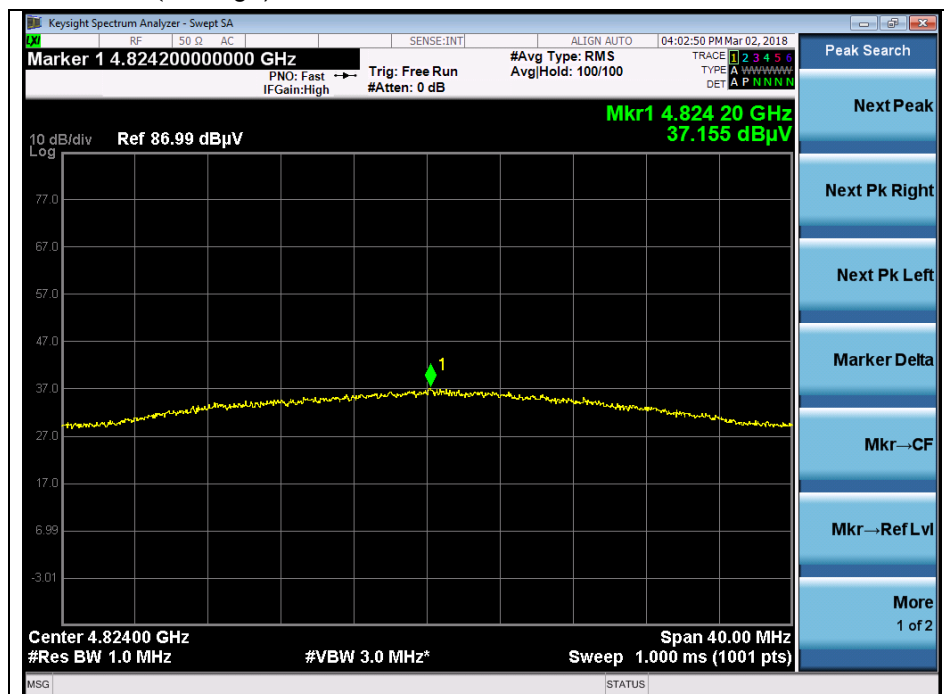
A4(210 mm x 297 mm)

OFDM: 802.11n_HT20 (MCS0)

Low channel 2nd harmonic (Peak)



Low channel 2nd harmonic (Average)



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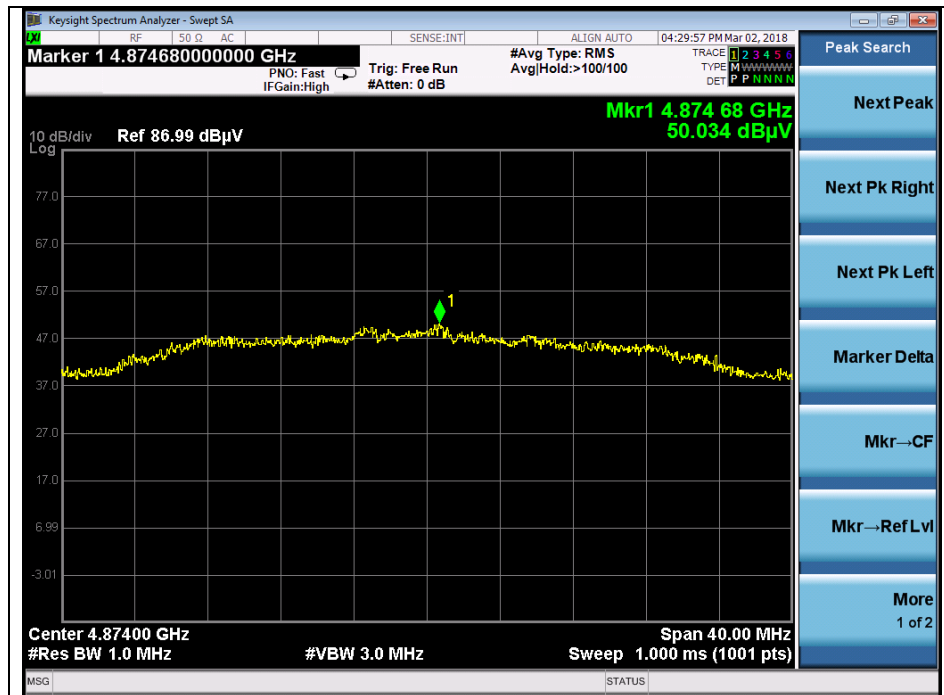
SGS Korea Co., Ltd. (Gunpo Laboratory) 4, LS-ro 182beon-gil, Gunpo-si, Gyeonggi-do, Korea, 15807 <http://www.sgsgroup.kr>

RTT5041-19(2017.07.10)(0)

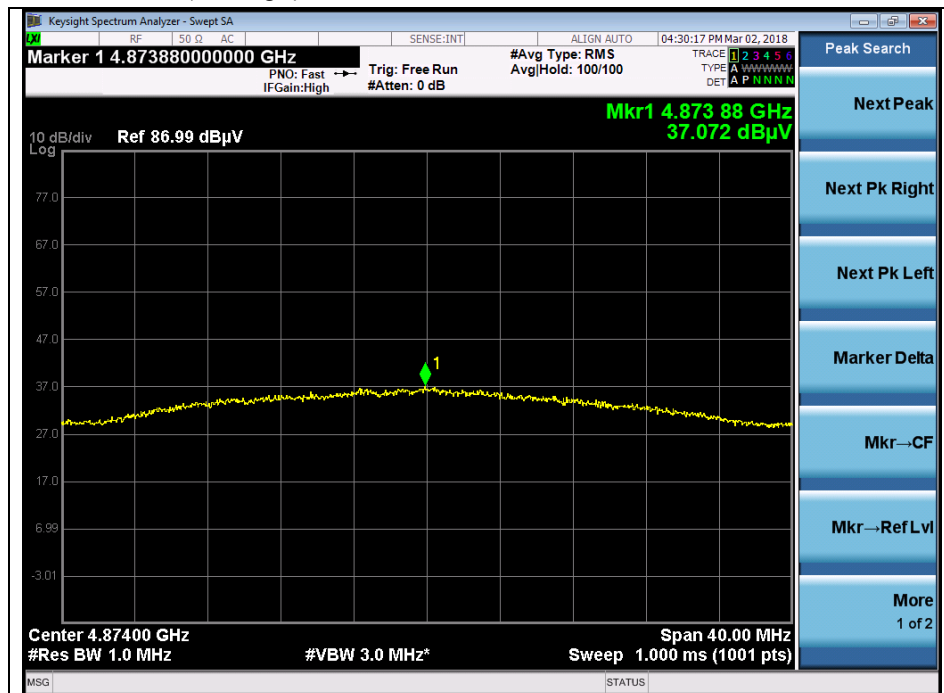
Tel. +82 31 428 5700 / Fax. +82 31 427 2370

A4(210 mm x 297 mm)

Middle channel 2nd harmonic (Peak)



Middle channel 2nd harmonic (Average)



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RTT5041-19(2017.07.10)(0)

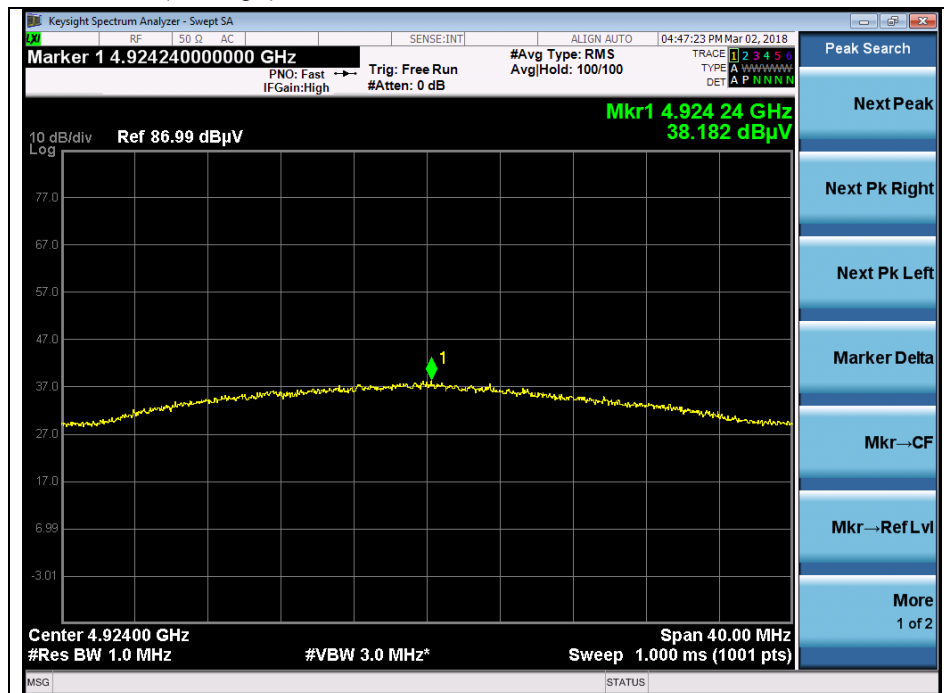
Tel. +82 31 428 5700 / Fax. +82 31 427 2370

A4(210 mm x 297 mm)

High channel 2nd harmonic (Peak)



High channel 2nd harmonic (Average)



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Tel. +82 31 428 5700 / Fax. +82 31 427 2370

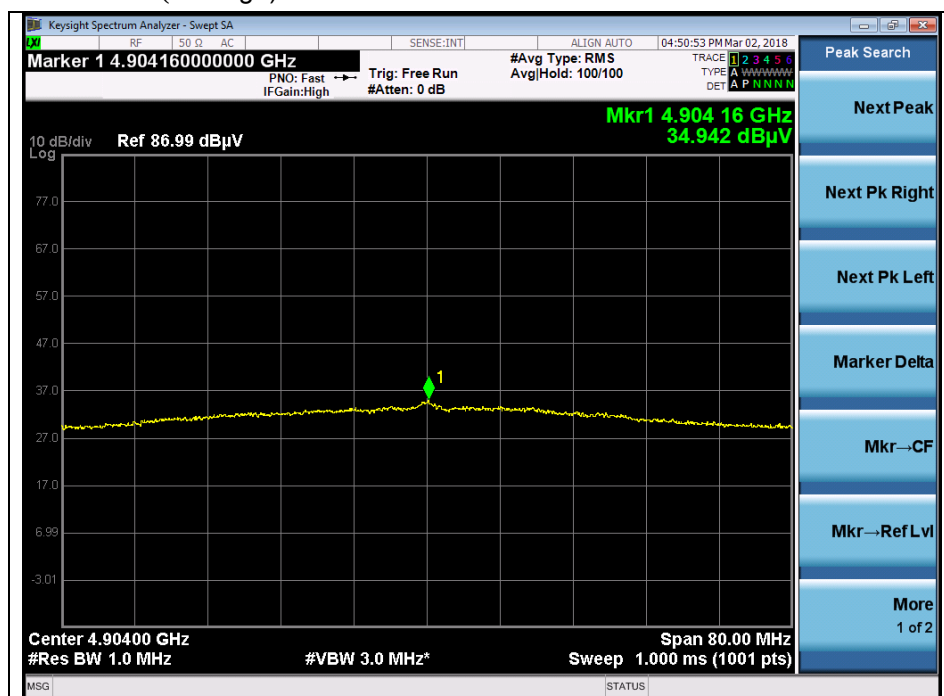
A4(210 mm x 297 mm)

OFDM: 802.11n_HT40 (MCS0)

High channel 2nd harmonic (Peak)



High channel 2nd harmonic (Average)



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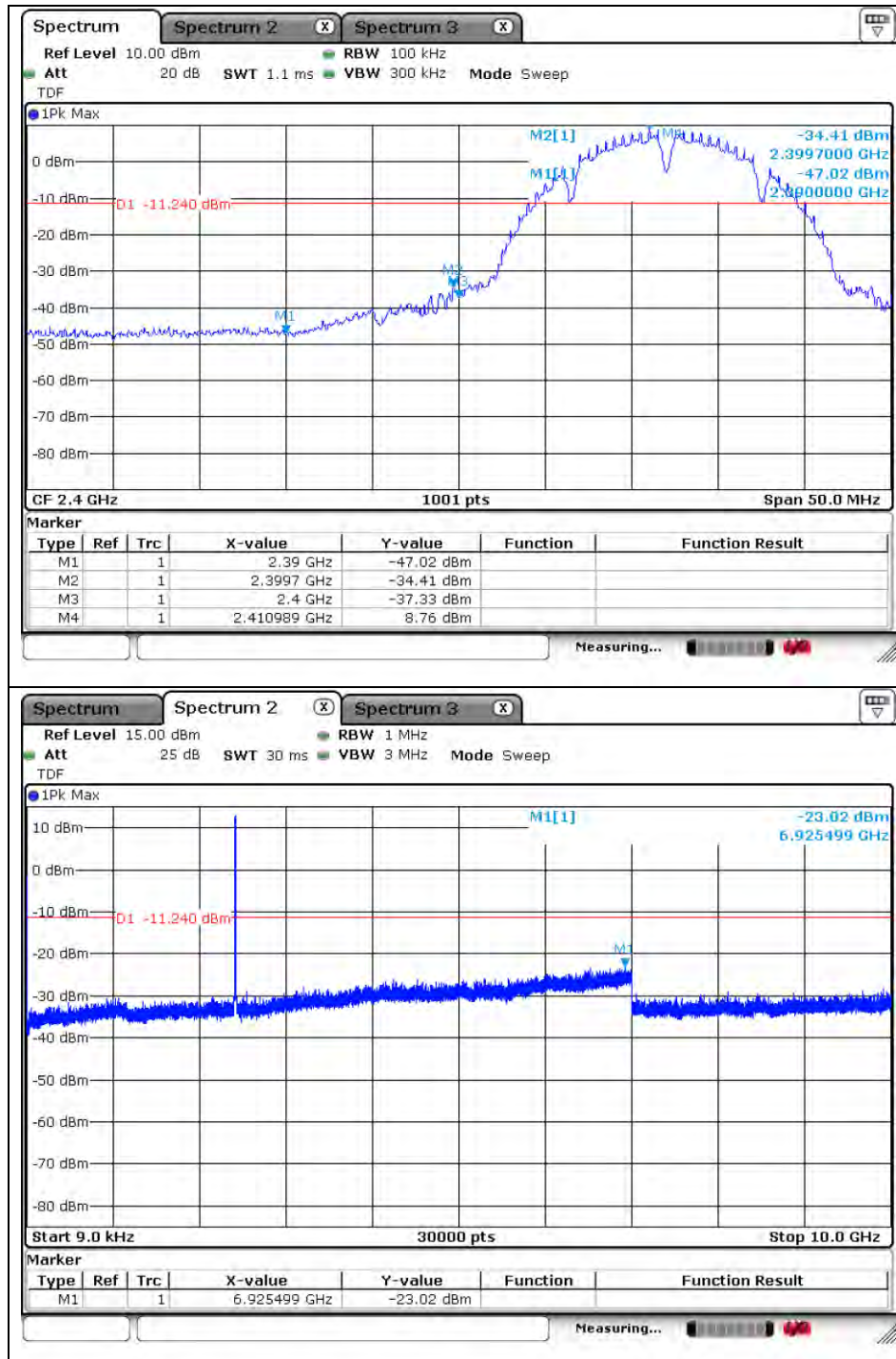
Tel. +82 31 428 5700 / Fax. +82 31 427 2370

A4(210 mm x 297 mm)

2.4.4. Plot of Conducted Spurious Emissions

DSSS: 802.11b (1 Mbps)

Low Channel



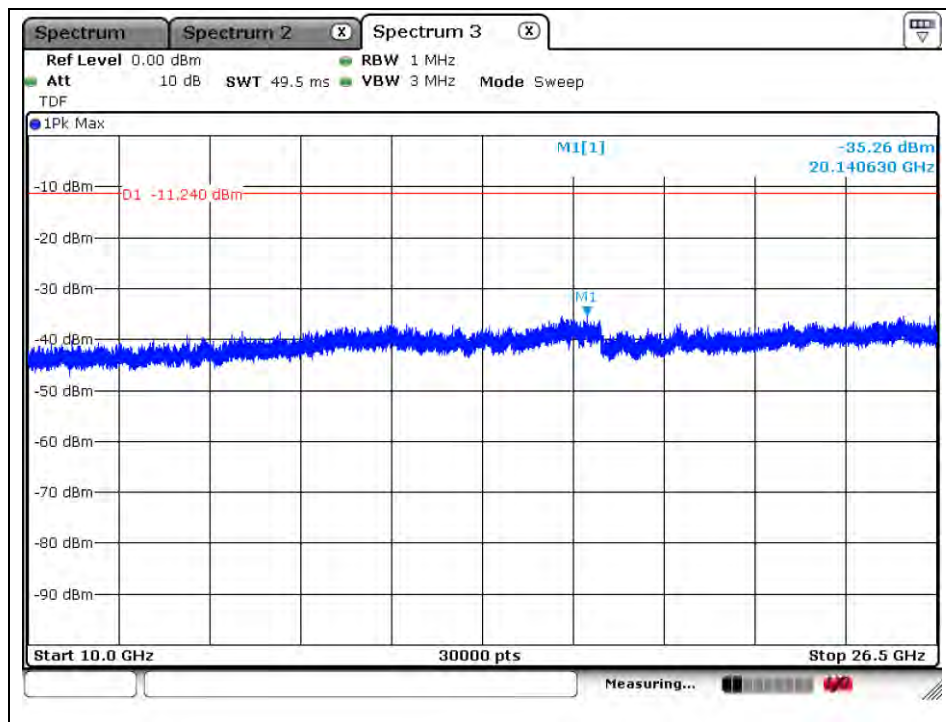
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A4(210 mm x 297 mm)



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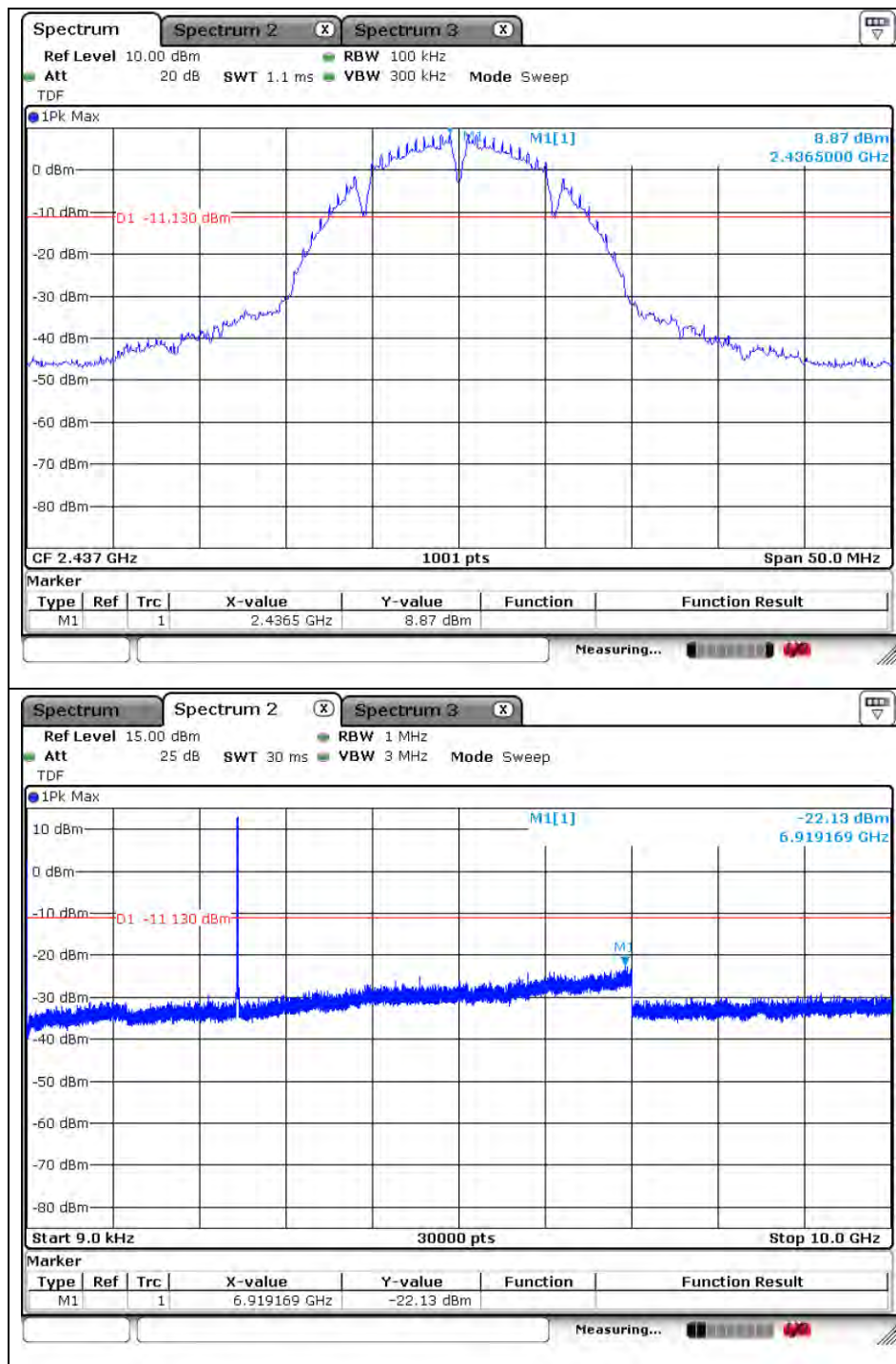
SGS Korea Co., Ltd. (Gunpo Laboratory) 4, LS-ro 182beon-gil, Gunpo-si, Gyeonggi-do, Korea, 15807 <http://www.sgsgroup.kr>

RTT5041-19(2017.07.10)(0)

Tel. +82 31 428 5700 / Fax. +82 31 427 2370

A4(210 mm x 297 mm)

Middle Channel



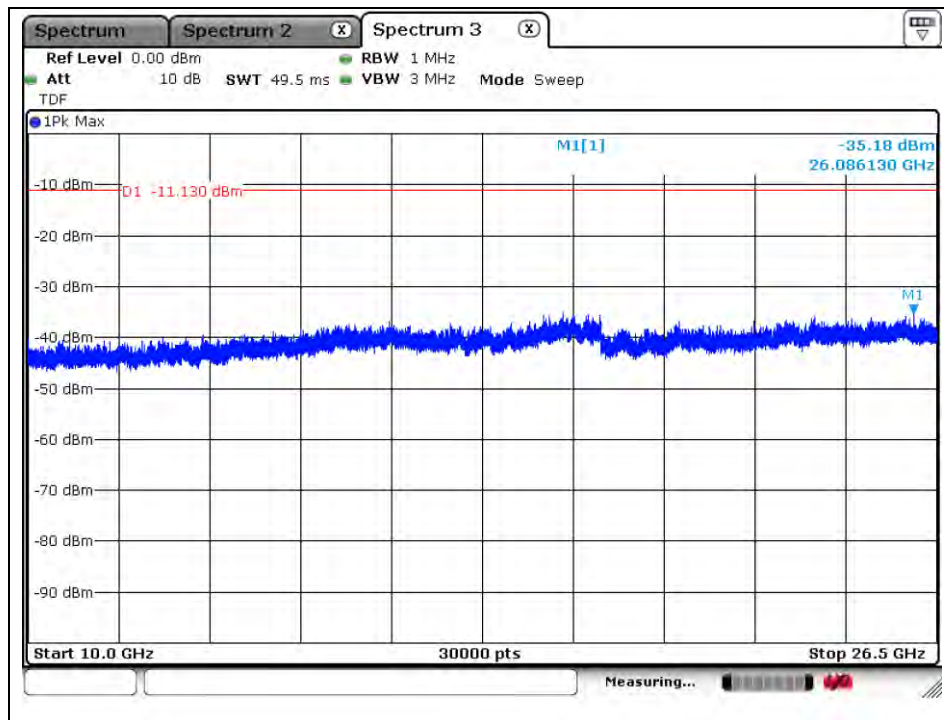
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Tel. +82 31 428 5700 / Fax. +82 31 427 2370

A4(210 mm x 297 mm)



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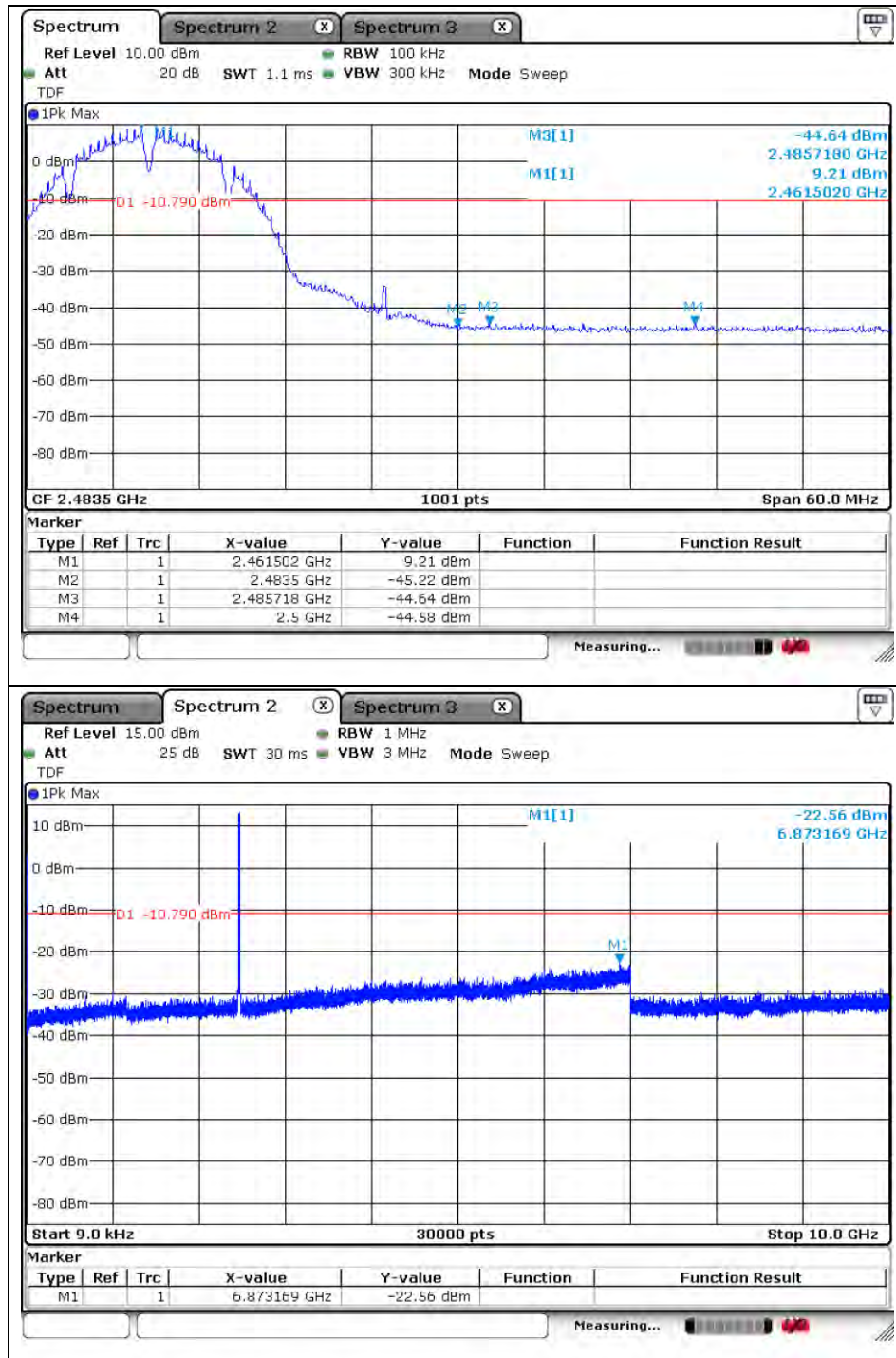
SGS Korea Co., Ltd. (Gunpo Laboratory) 4, LS-ro 182beon-gil, Gunpo-si, Gyeonggi-do, Korea, 15807 <http://www.sgsgroup.kr>

RTT5041-19(2017.07.10)(0)

Tel. +82 31 428 5700 / Fax. +82 31 427 2370

A4(210 mm x 297 mm)

High Channel



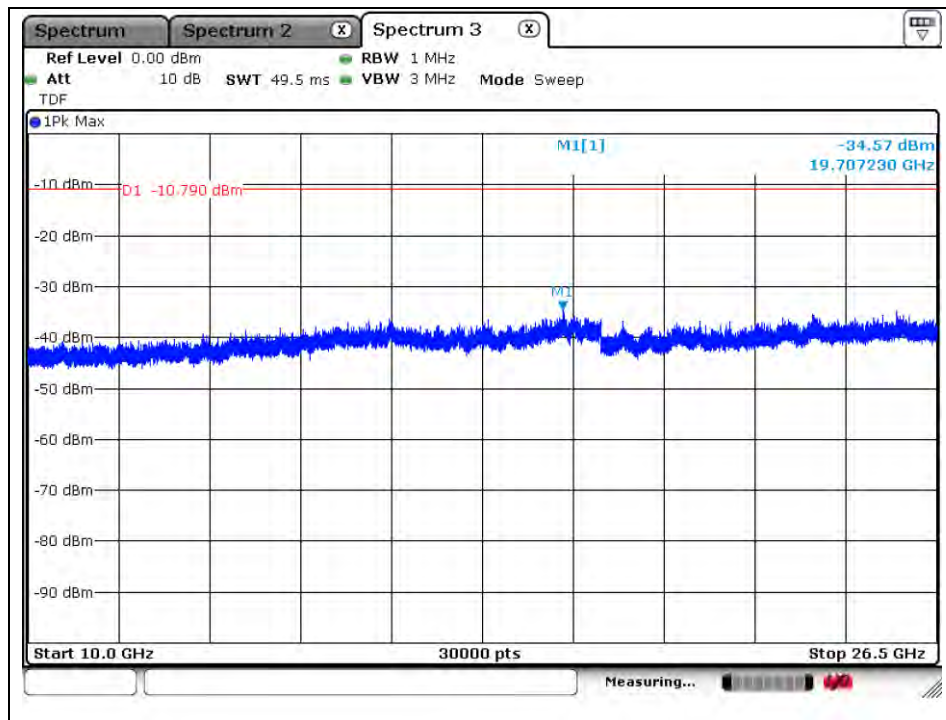
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RTT5041-19(2017.07.10)(0)

Tel. +82 31 428 5700 / Fax. +82 31 427 2370

A4(210 mm x 297 mm)



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SGS Korea Co., Ltd. (Gunpo Laboratory) 4, LS-ro 182beon-gil, Gunpo-si, Gyeonggi-do, Korea, 15807 <http://www.sgsgroup.kr>

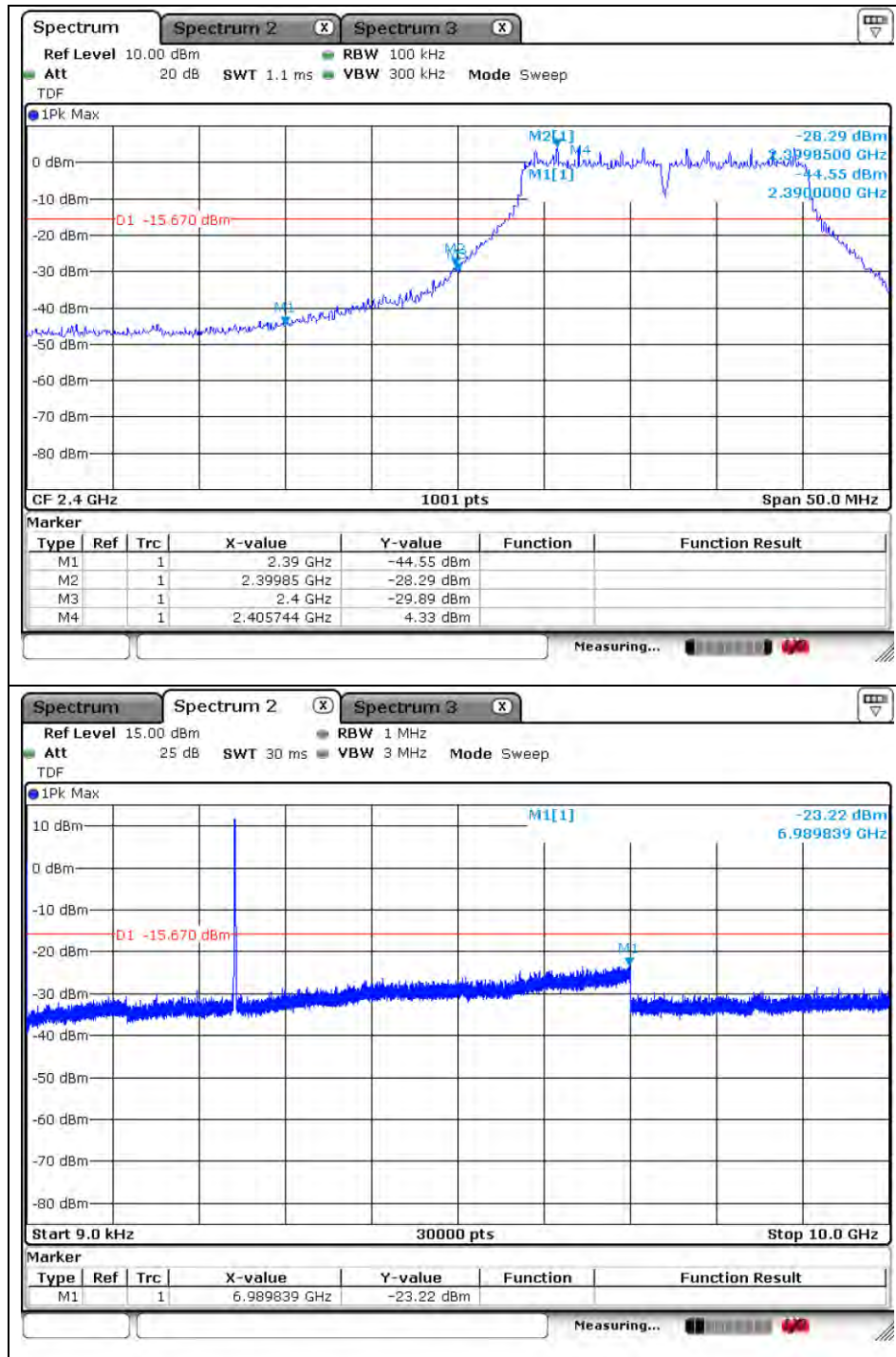
RTT5041-19(2017.07.10)(0)

Tel. +82 31 428 5700 / Fax. +82 31 427 2370

A4(210 mm x 297 mm)

OFDM: 802.11g (6 Mbps)

Low Channel



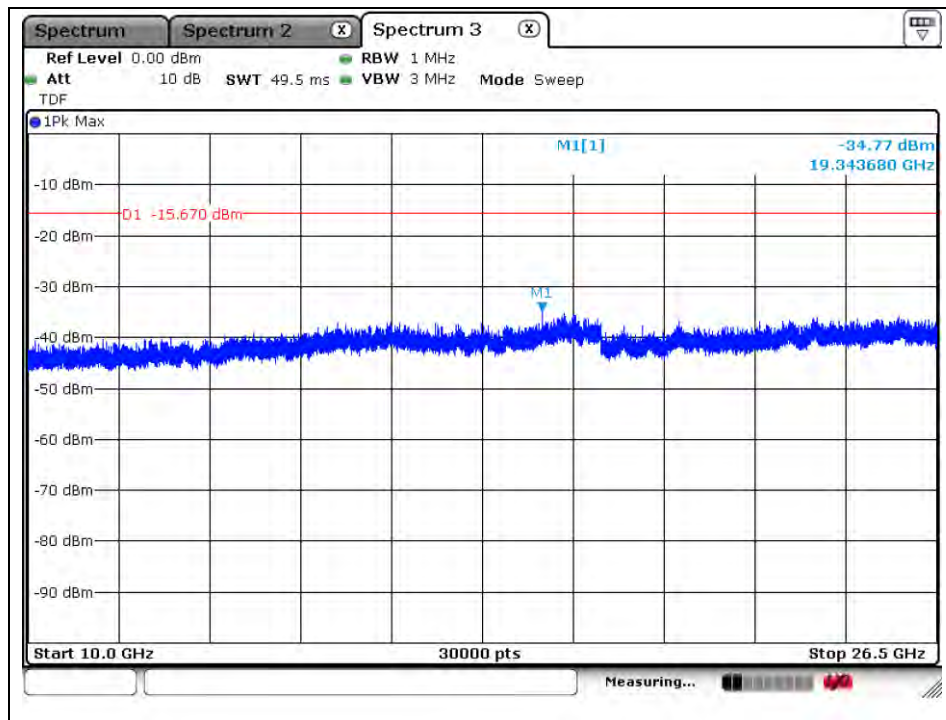
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A4(210 mm x 297 mm)



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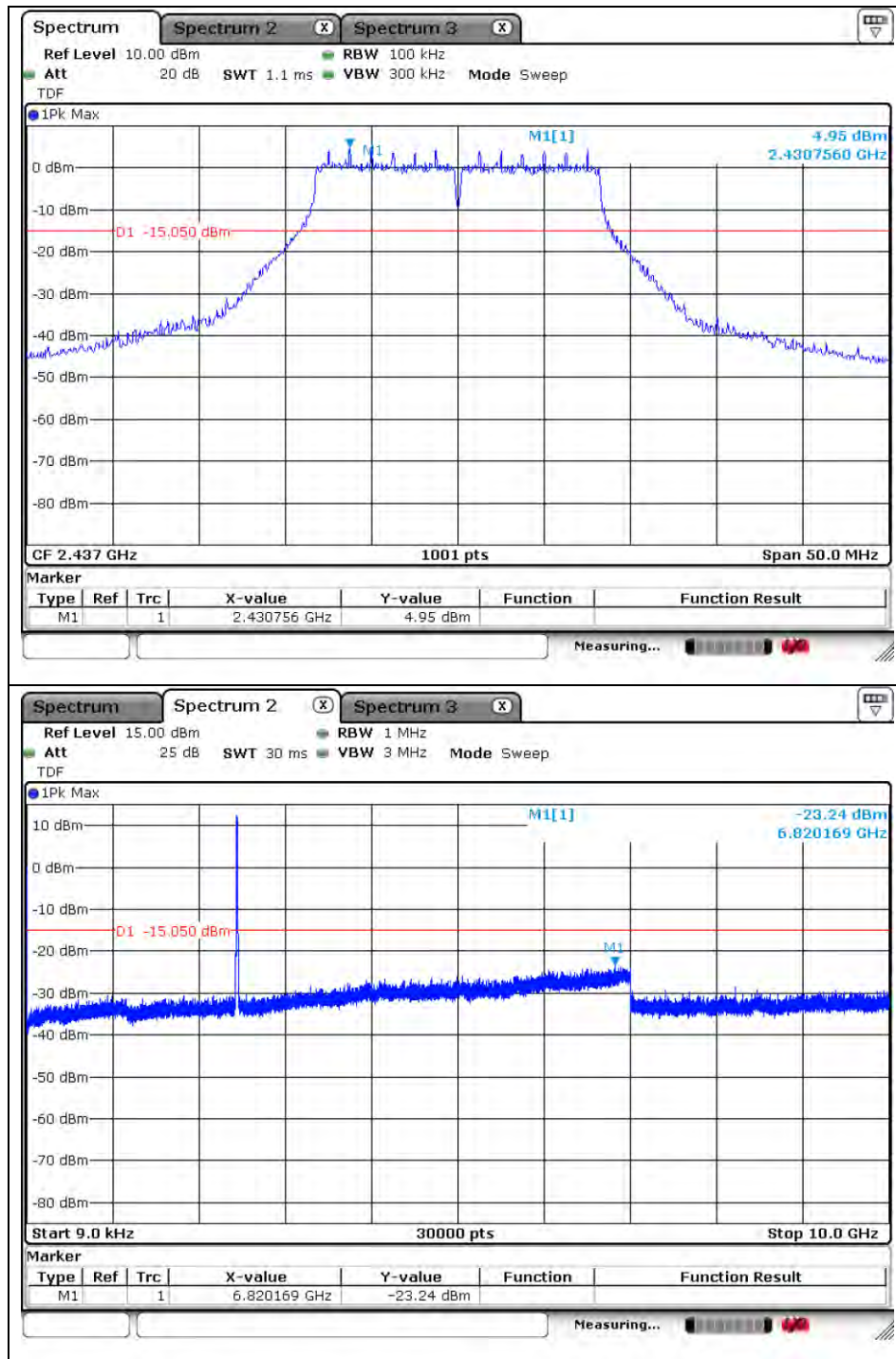
SGS Korea Co., Ltd. (Gunpo Laboratory) 4, LS-ro 182beon-gil, Gunpo-si, Gyeonggi-do, Korea, 15807 <http://www.sgsgroup.kr>

RTT5041-19(2017.07.10)(0)

Tel. +82 31 428 5700 / Fax. +82 31 427 2370

A4(210 mm x 297 mm)

Middle Channel



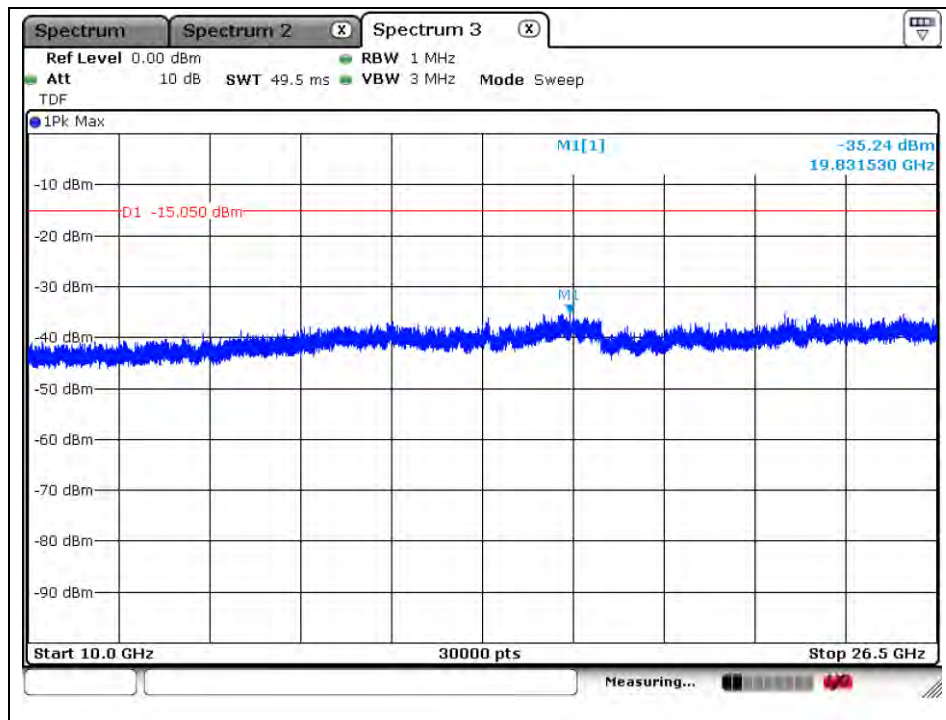
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Tel. +82 31 428 5700 / Fax. +82 31 427 2370

A4(210 mm x 297 mm)



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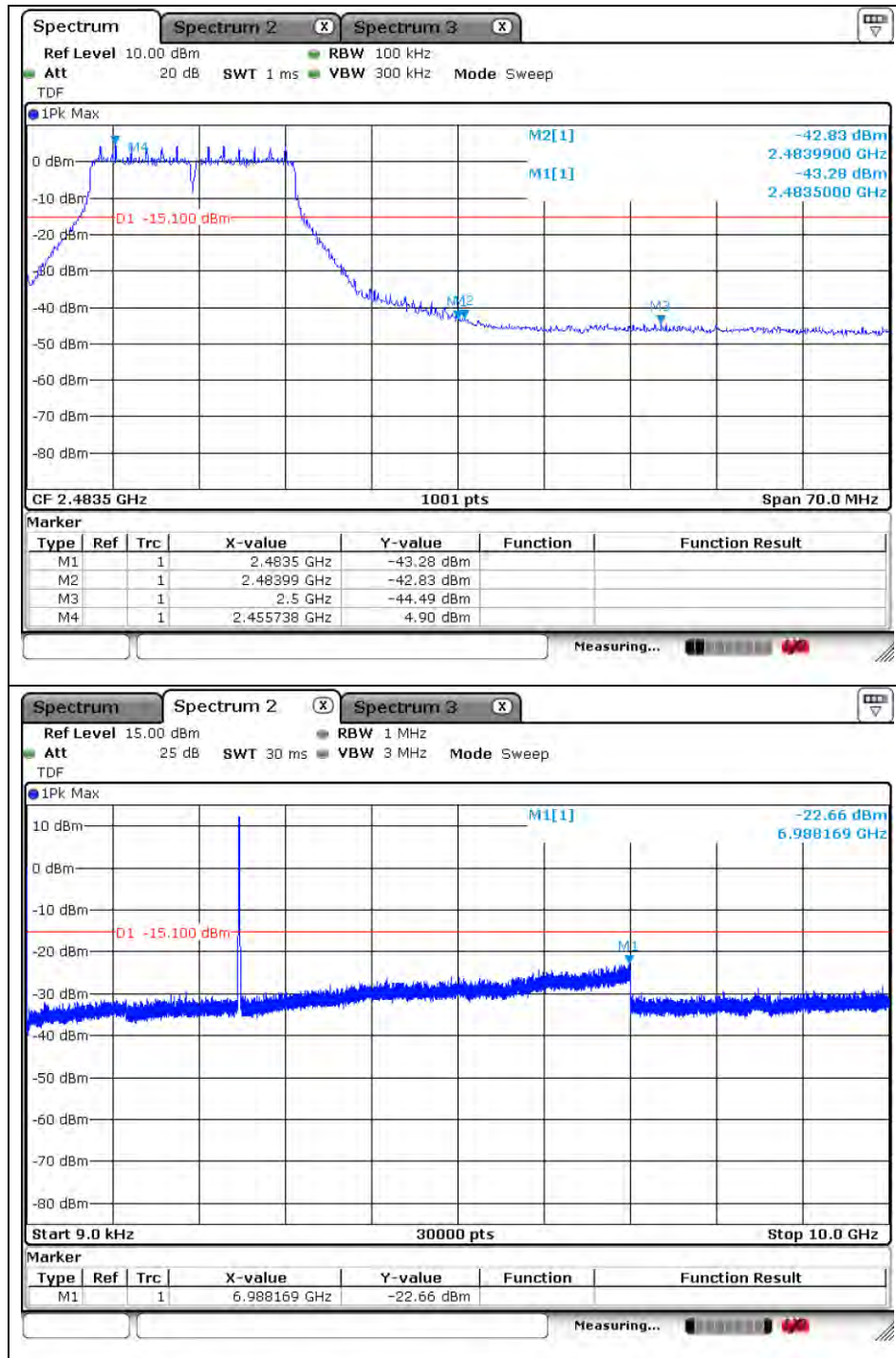
SGS Korea Co., Ltd. (Gunpo Laboratory) 4, LS-ro 182beon-gil, Gunpo-si, Gyeonggi-do, Korea, 15807 <http://www.sgsgroup.kr>

RTT5041-19(2017.07.10)(0)

Tel. +82 31 428 5700 / Fax. +82 31 427 2370

A4(210 mm x 297 mm)

High Channel



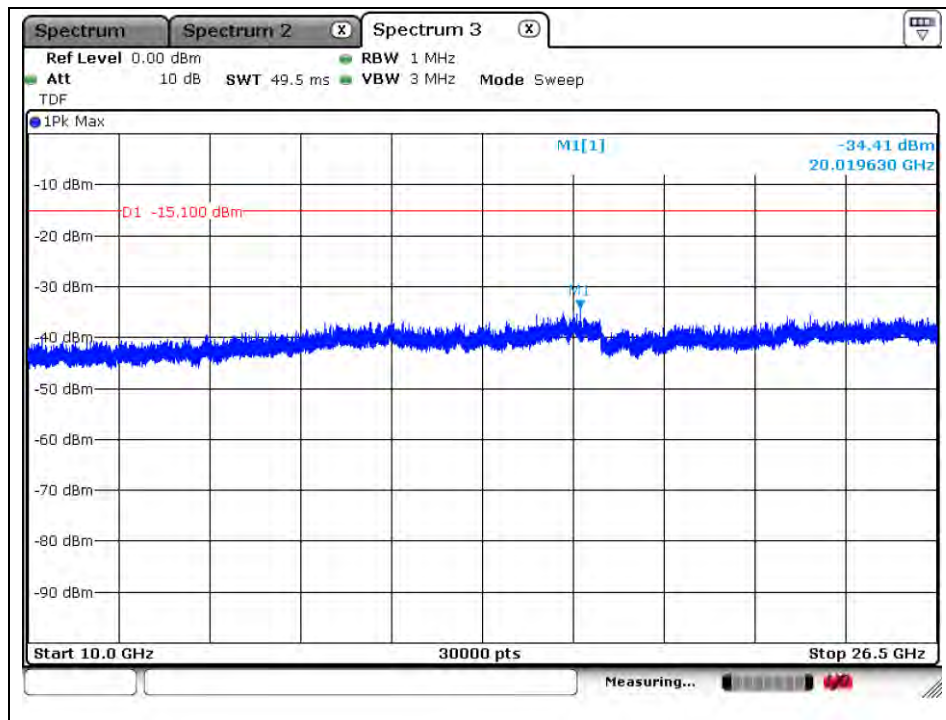
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RTT5041-19(2017.07.10)(0)

Tel. +82 31 428 5700 / Fax. +82 31 427 2370

A4(210 mm x 297 mm)



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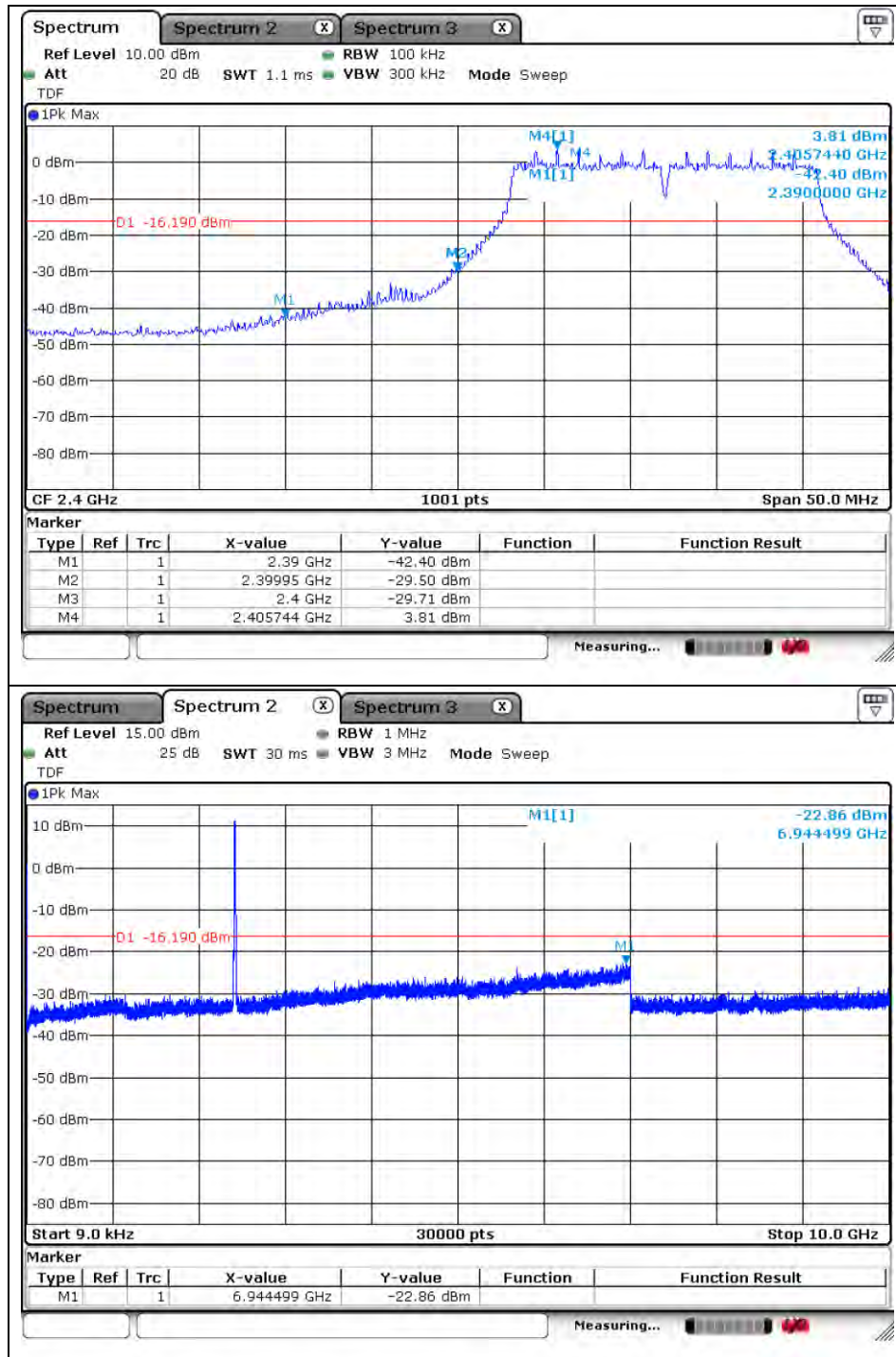
RTT5041-19(2017.07.10)(0)

Tel. +82 31 428 5700 / Fax. +82 31 427 2370

A4(210 mm x 297 mm)

OFDM: 802.11n_HT20 (MCS0)

Low Channel



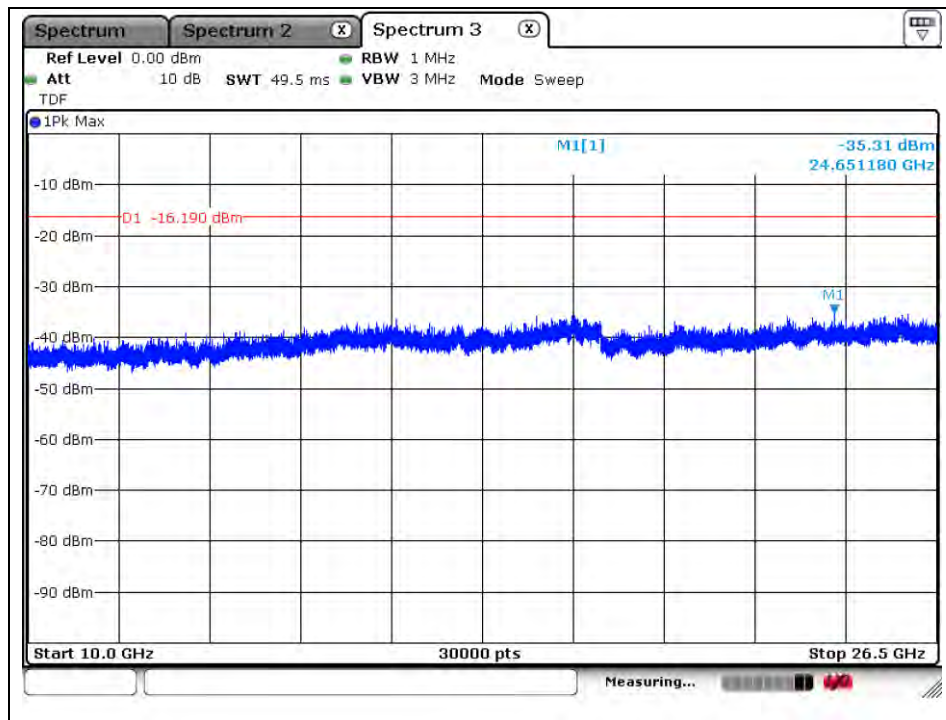
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Tel. +82 31 428 5700 / Fax. +82 31 427 2370

A4(210 mm x 297 mm)



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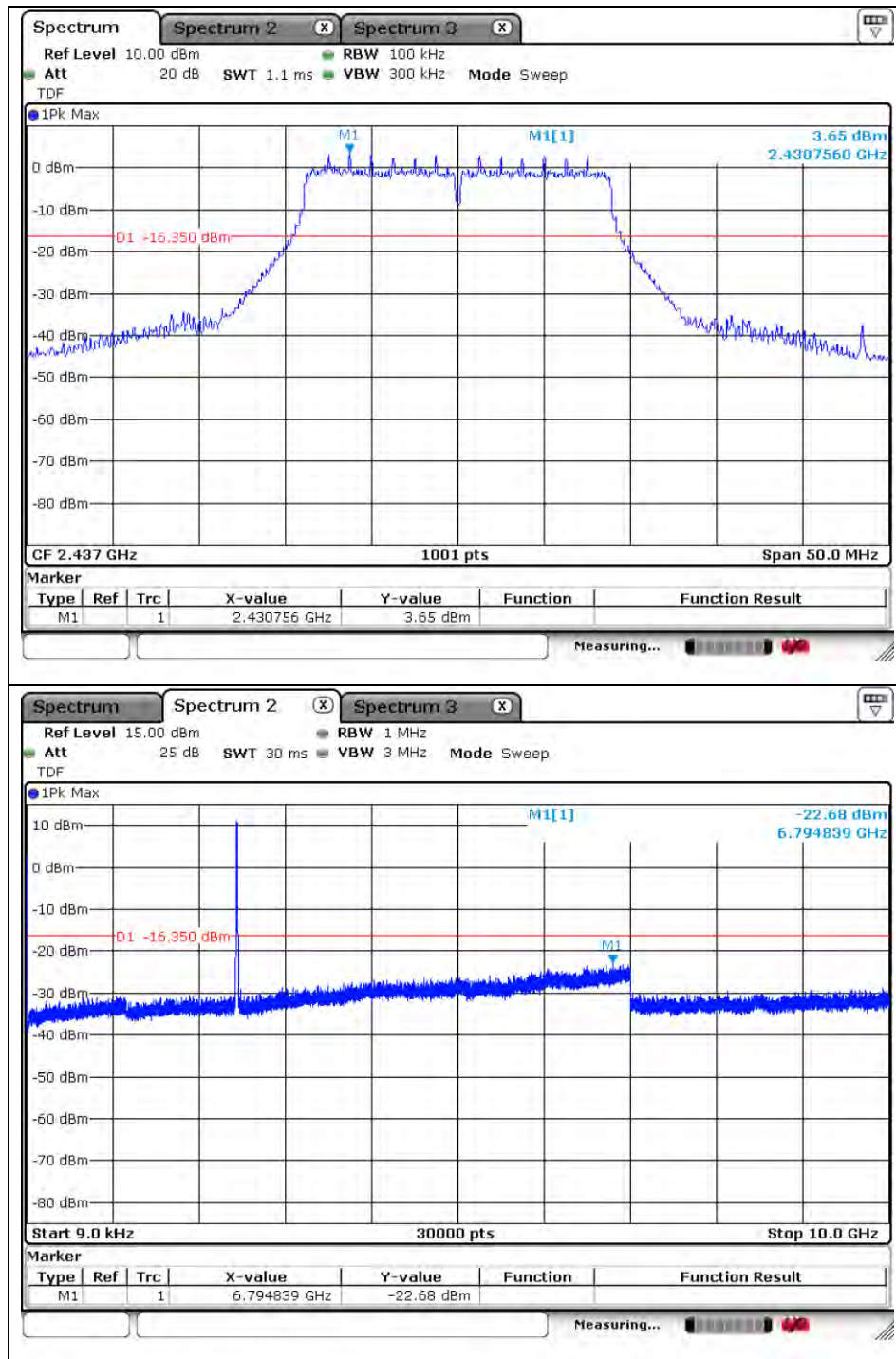
SGS Korea Co., Ltd. (Gunpo Laboratory) 4, LS-ro 182beon-gil, Gunpo-si, Gyeonggi-do, Korea, 15807 <http://www.sgsgroup.kr>

RTT5041-19(2017.07.10)(0)

Tel. +82 31 428 5700 / Fax. +82 31 427 2370

A4(210 mm x 297 mm)

Middle Channel



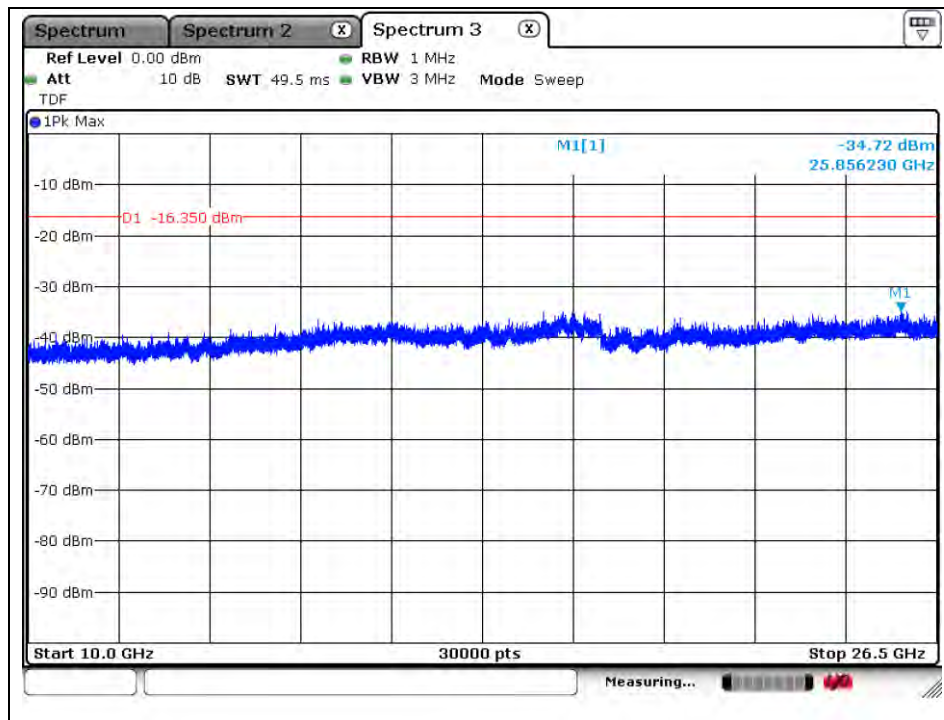
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A4(210 mm x 297 mm)



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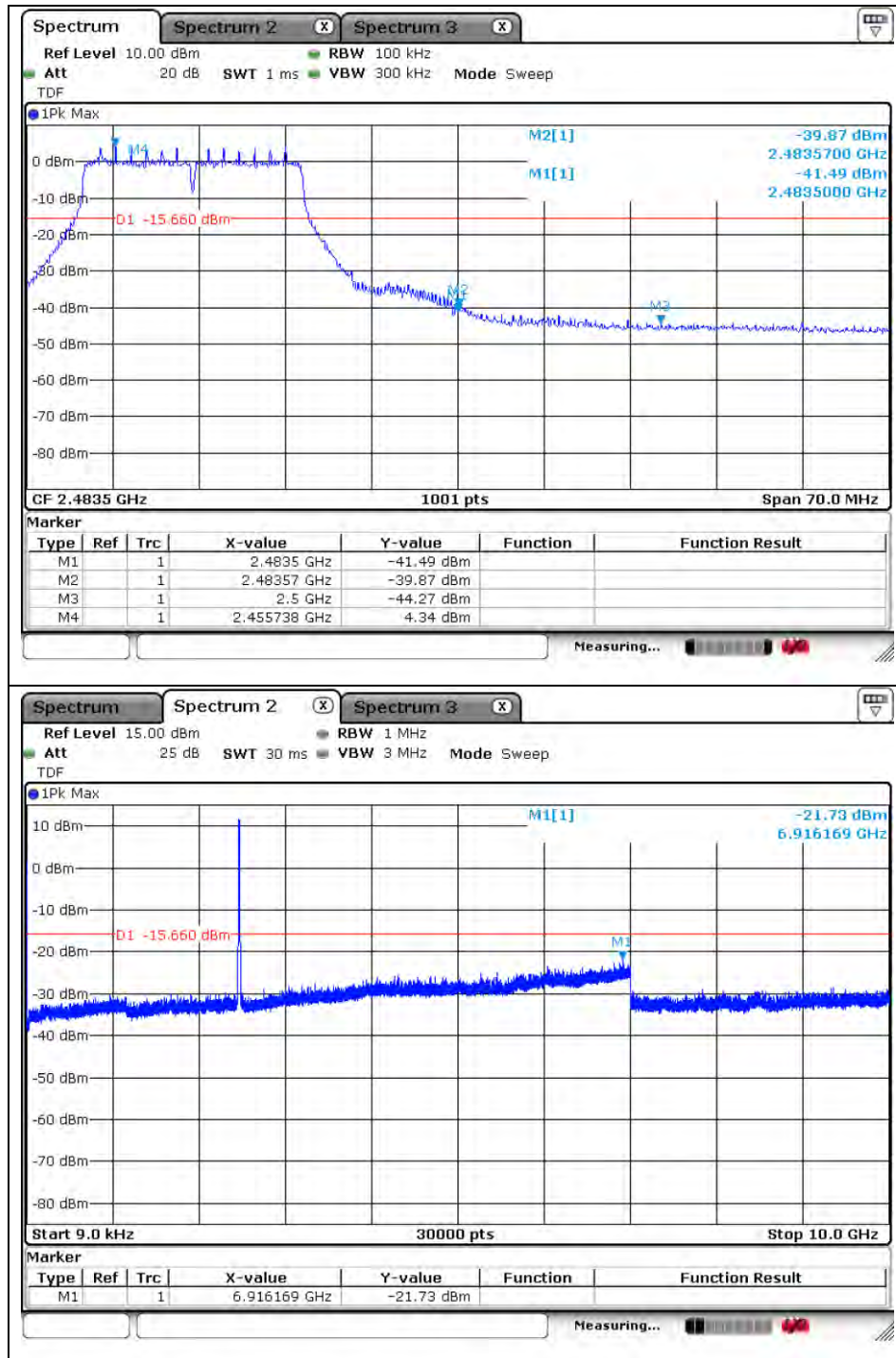
SGS Korea Co., Ltd. (Gunpo Laboratory) 4, LS-ro 182beon-gil, Gunpo-si, Gyeonggi-do, Korea, 15807 <http://www.sgsgroup.kr>

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Tel. +82 31 428 5700 / Fax. +82 31 427 2370

A4(210 mm x 297 mm)

High Channel



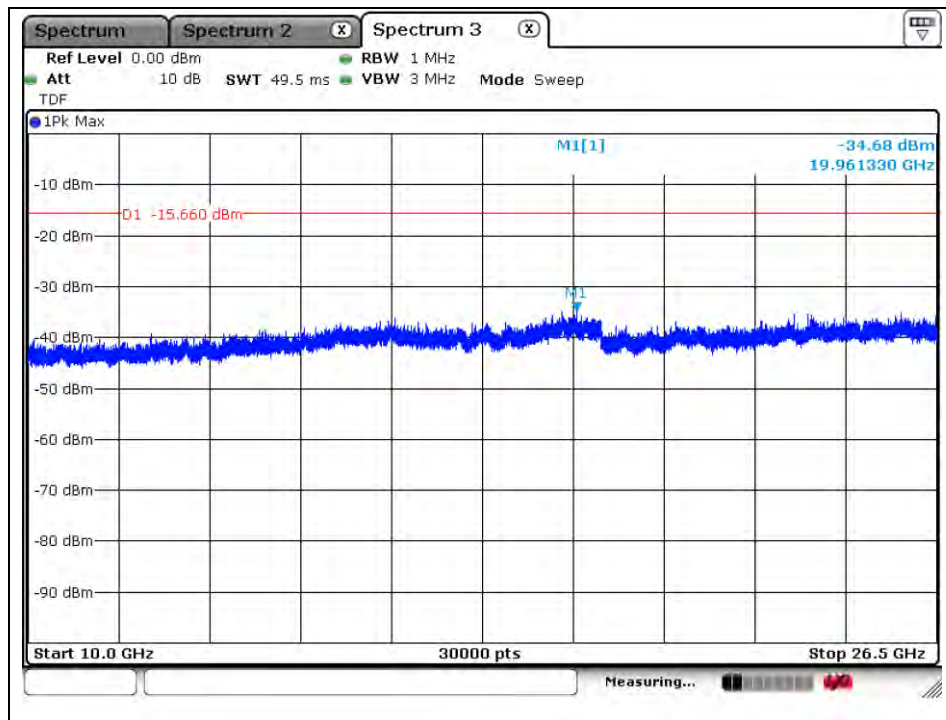
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Tel. +82 31 428 5700 / Fax. +82 31 427 2370

A4(210 mm x 297 mm)



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SGS Korea Co., Ltd. (Gunpo Laboratory) 4, LS-ro 182beon-gil, Gunpo-si, Gyeonggi-do, Korea, 15807 <http://www.sgsgroup.kr>

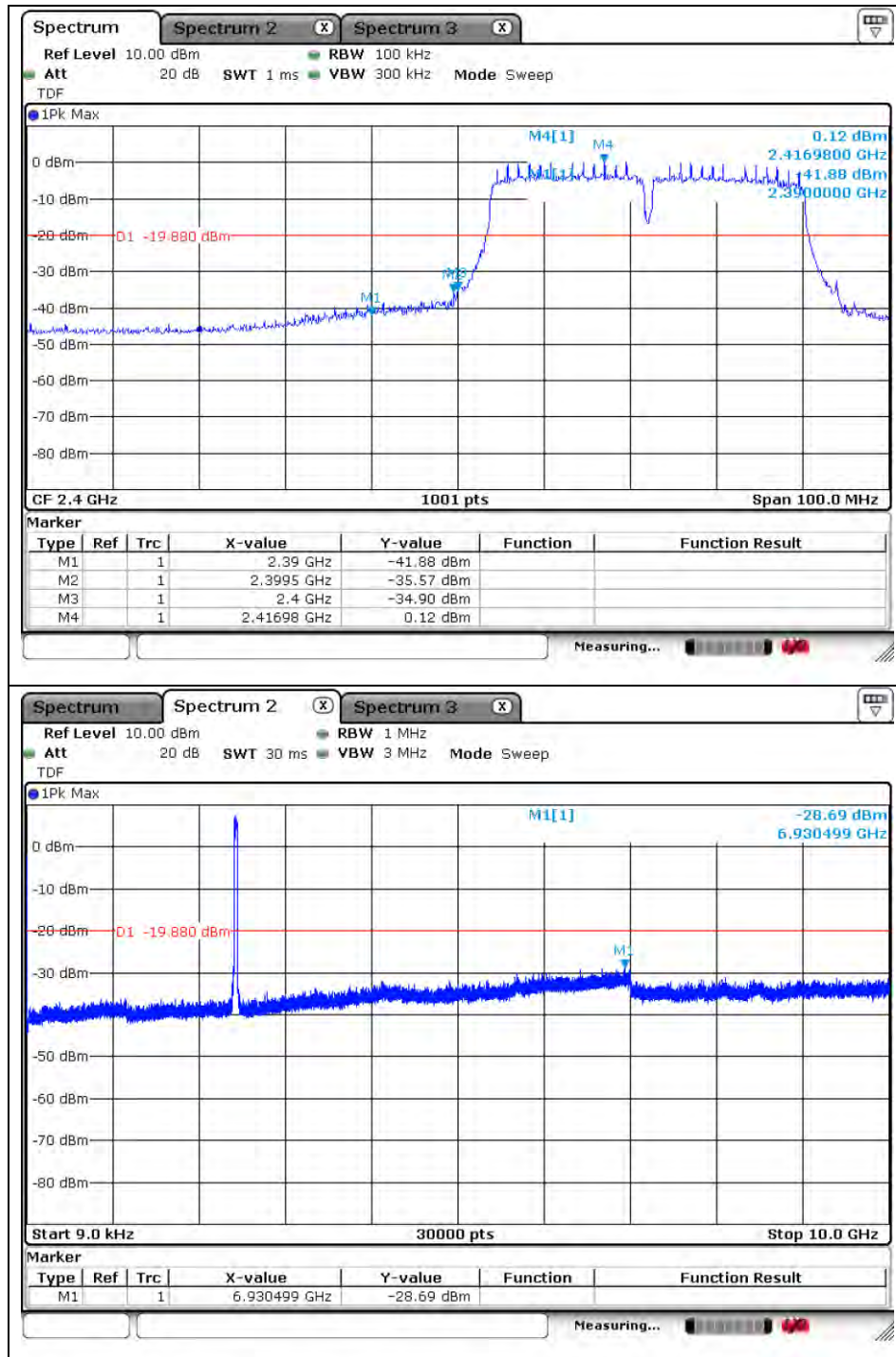
RTT5041-19(2017.07.10)(0)

Tel. +82 31 428 5700 / Fax. +82 31 427 2370

A4(210 mm x 297 mm)

OFDM: 802.11n_HT40 (MCS0)

Low Channel



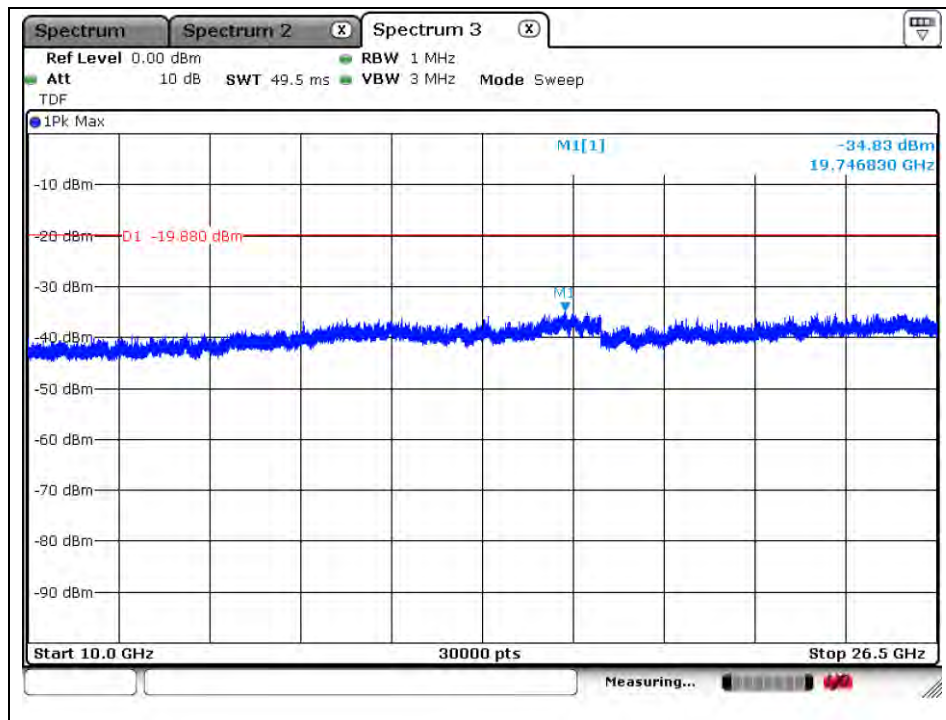
The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This test report cannot be reproduced, except in full, without prior written permission of the Company. This test report does not assure KOLAS accreditation.

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A4(210 mm x 297 mm)



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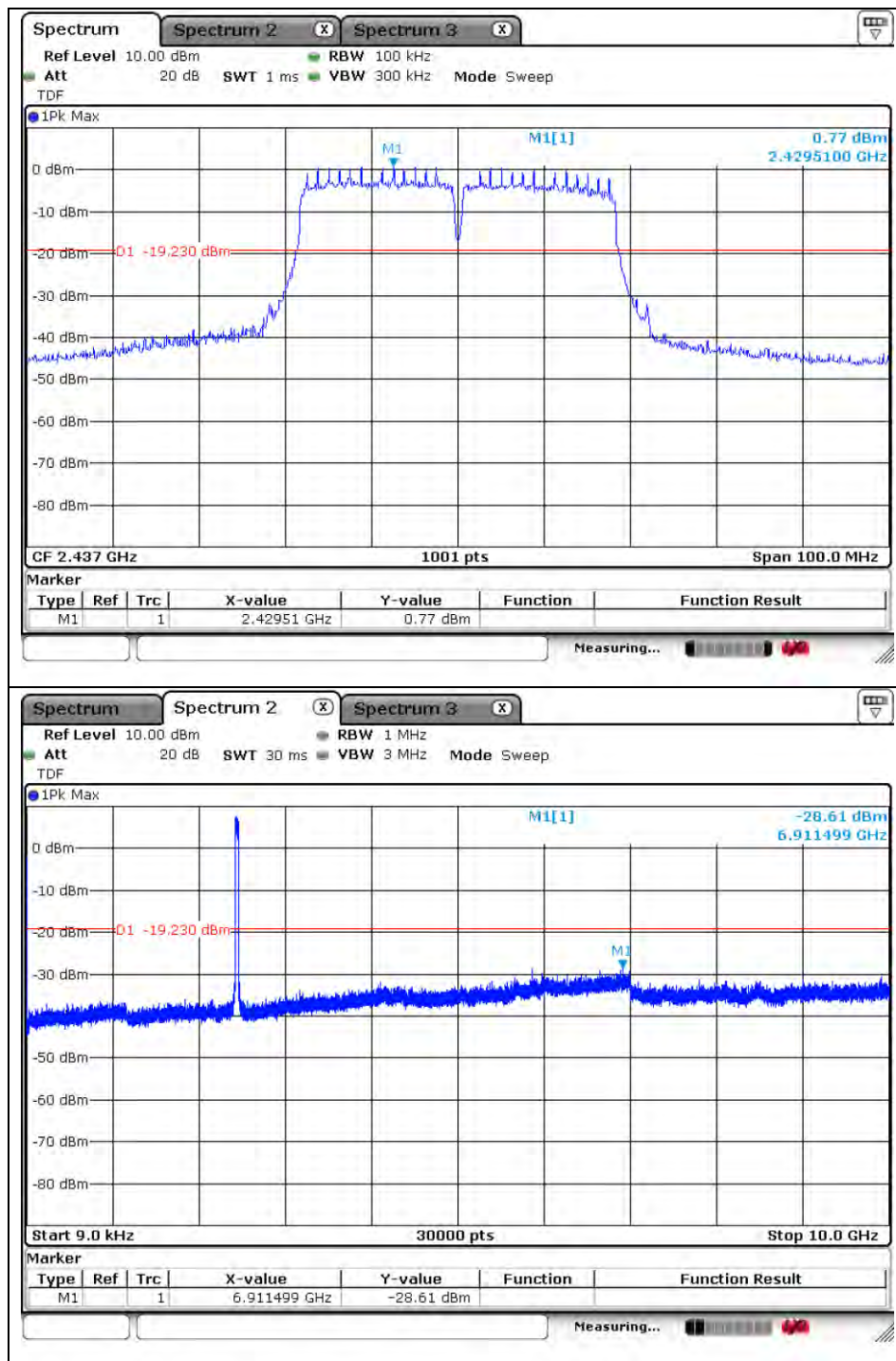
SGS Korea Co., Ltd. (Gunpo Laboratory) 4, LS-ro 182beon-gil, Gunpo-si, Gyeonggi-do, Korea, 15807 <http://www.sgsgroup.kr>

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Tel. +82 31 428 5700 / Fax. +82 31 427 2370

A4(210 mm x 297 mm)

Middle Channel



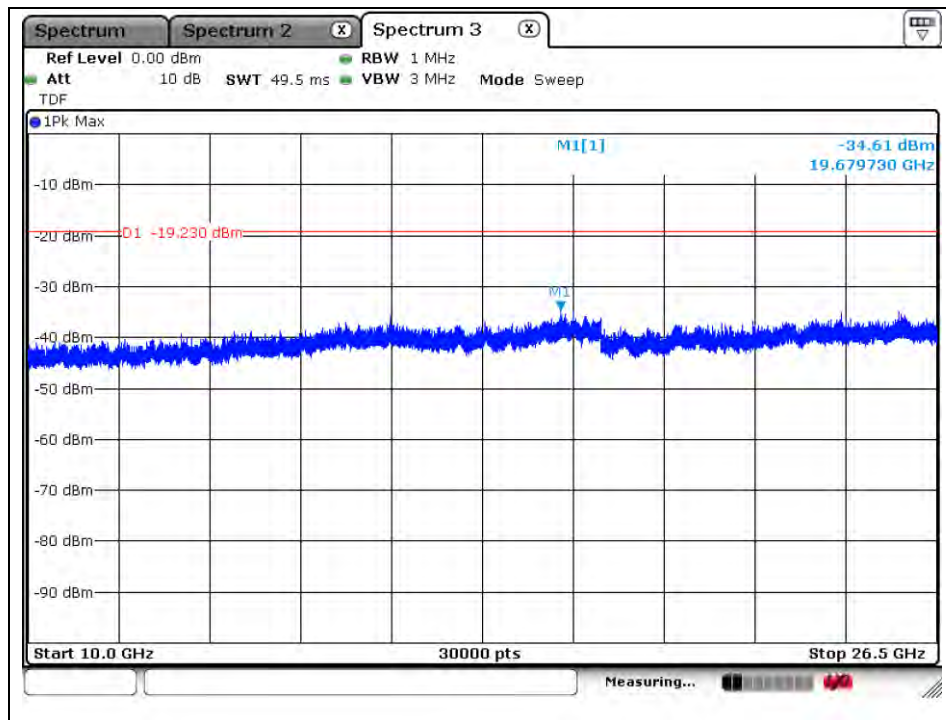
The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This test report cannot be reproduced, except in full, without prior written permission of the Company. This test report does not assure KOLAS accreditation.

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A4(210 mm x 297 mm)



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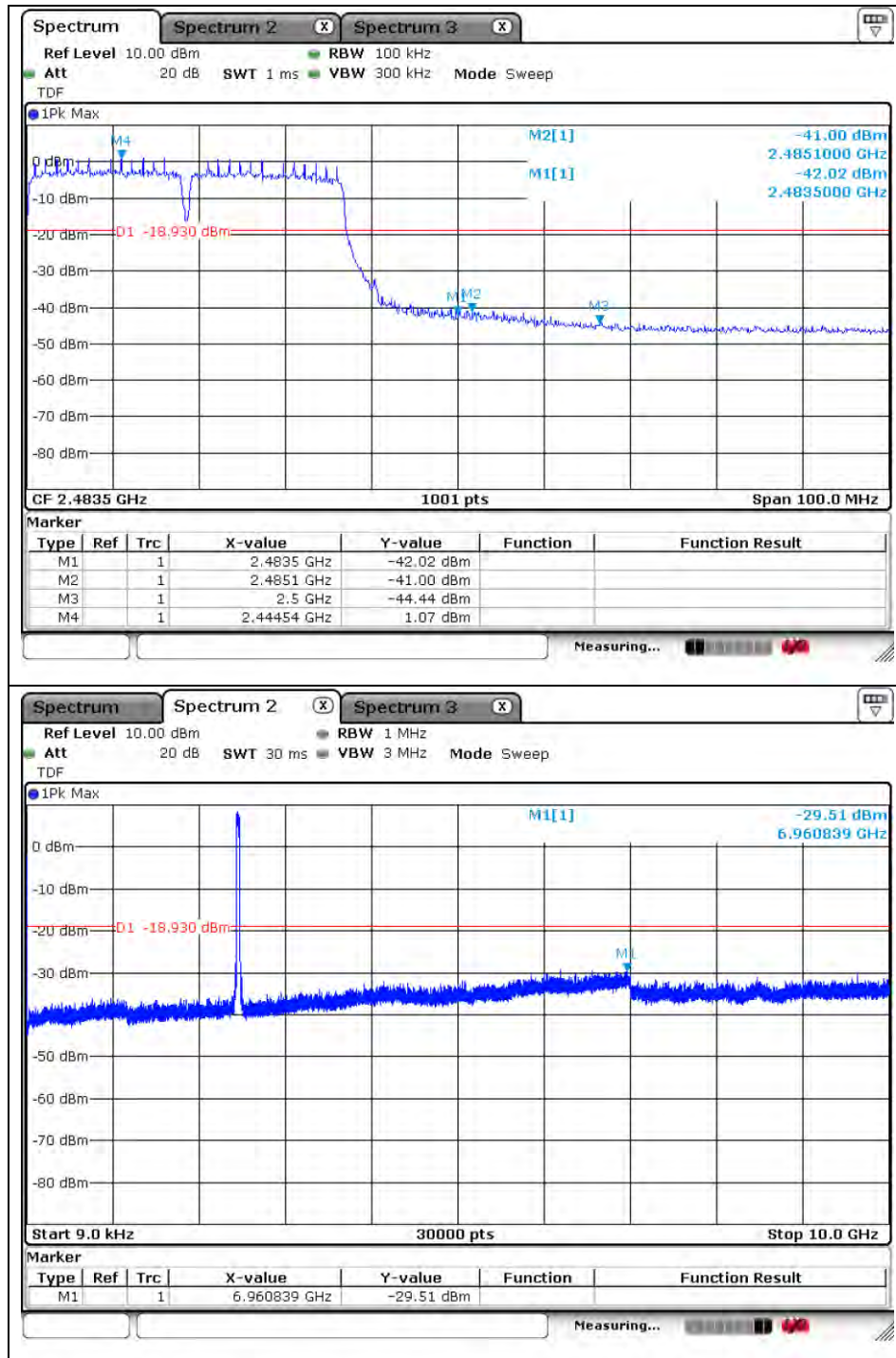
SGS Korea Co., Ltd. (Gunpo Laboratory) 4, LS-ro 182beon-gil, Gunpo-si, Gyeonggi-do, Korea, 15807 <http://www.sgsgroup.kr>

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Tel. +82 31 428 5700 / Fax. +82 31 427 2370

A4(210 mm x 297 mm)

High Channel



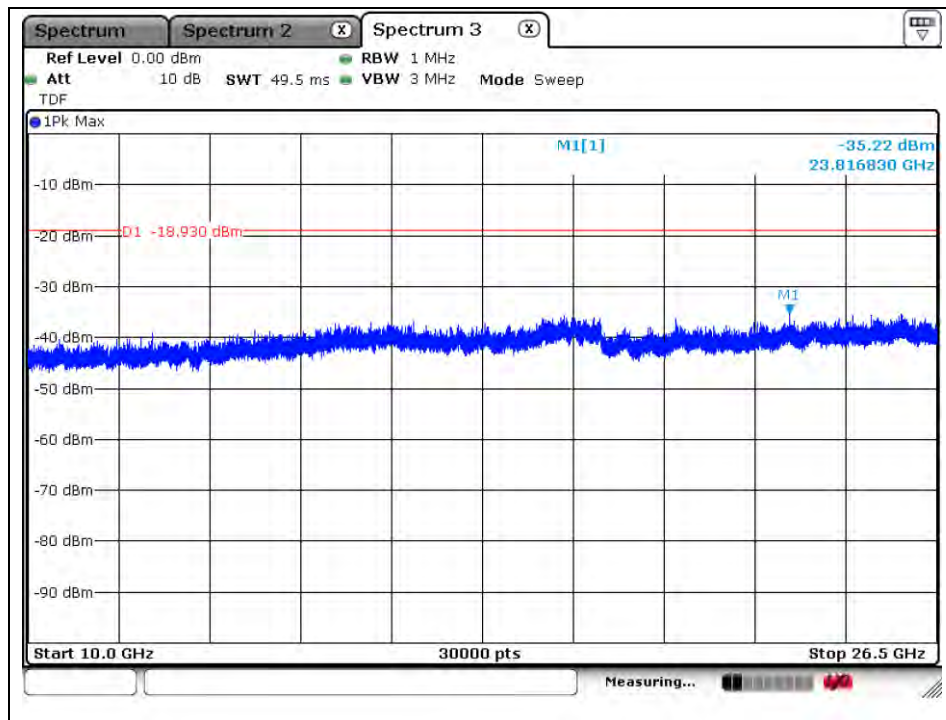
The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This test report cannot be reproduced, except in full, without prior written permission of the Company. This test report does not assure KOLAS accreditation.

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A4(210 mm x 297 mm)



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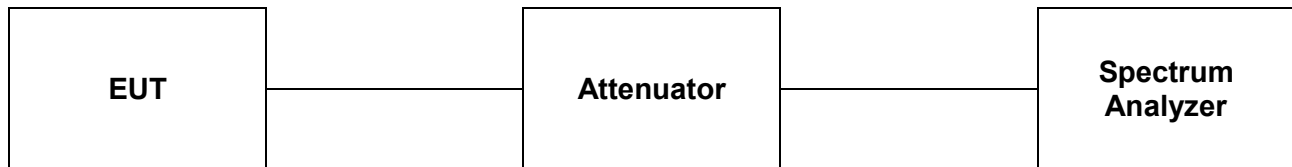
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A4(210 mm x 297 mm)

3. 6 dB Bandwidth & 99 % Bandwidth

3.1. Test Setup



3.2. Limit

3.2.1. FCC

According to §15.247(a)(2), systems using digital modulation techniques may operate in the 902-928 MHz, 2 400-2 483.5 MHz, and 5 725-5 850 MHz bands. The minimum 6 dB Bandwidth shall be at least 500 kHz.

3.2.2. IC

3.3. Test Procedure

3.3.1. 6 dB Bandwidth

All data rates and modes were investigated for this test. The full data for the worst case data rate are reported in this section

The test follows section 8.0 DTS bandwidth of KDB 558074 D01 DTS Meas Guidance v04.

Tests performed using section 8.1 Option 1.

- Option 1:

1. Set RBW = 100 kHz.
2. Set the video bandwidth (VBW) $\geq 3 \times$ RBW.
3. Detector = Peak.
4. Trace mode = max hold.
5. Sweep = auto couple.
6. Allow the trace to stabilize.
7. Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude point (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

3.3.2. 99 % Bandwidth

The span of the analyzer shall be set to capture all products of the modulation process, including the emission skirts.

The resolution bandwidth (RBW) shall be in the range of 1 % to 5 % of the occupied bandwidth (OBW) and video bandwidth (VBW) shall be approximately 3x RBW. Detector = sampling, Trace mode = max hold.

The trace data points are recovered and are directly summed in linear power level terms. The recovered amplitude data points, beginning at the lowest frequency, are placed in a running sum until 0.5 % of the total is reached and that frequency recorded. The process is repeated for the highest frequency data points (starting at the highest frequency, at the right side of the span, and going down in frequency).

This frequency is then recorded.

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RTT5041-19(2017.07.10)(0)

Tel. +82 31 428 5700 / Fax. +82 31 427 2370

A4(210 mm x 297 mm)

3.4. Test Results

Ambient temperature : (23 ± 1) °C

Relative humidity : 47 % R.H.

Operation Mode	Data Rate	Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	99 % Bandwidth (MHz)
DSSS (802.11b)	1 Mbps	Low	2 412	9.111	13.893
		Middle	2 437	9.151	13.835
		High	2 462	9.111	13.893
OFDM (802.11g)	6 Mbps	Low	2 412	16.384	17.482
		Middle	2 437	16.424	17.482
		High	2 462	16.424	17.424
OFDM (802.11n_HT20)	MCS0	Low	2 412	17.662	18.119
		Middle	2 437	17.637	18.177
		High	2 462	17.622	18.234
OFDM (802.11n_HT40)	MCS0	Low	2 422	35.460	36.469
		Middle	2 437	35.619	36.469
		High	2 452	35.604	36.469

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RTT5041-19(2017.07.10)(0)

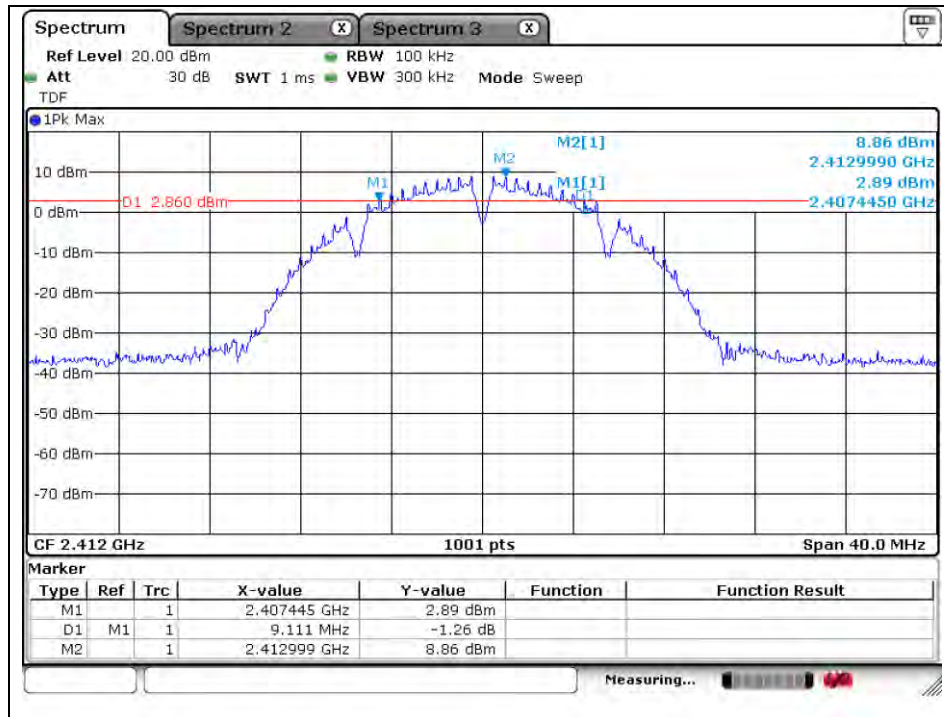
Tel. +82 31 428 5700 / Fax. +82 31 427 2370

A4(210 mm x 297 mm)

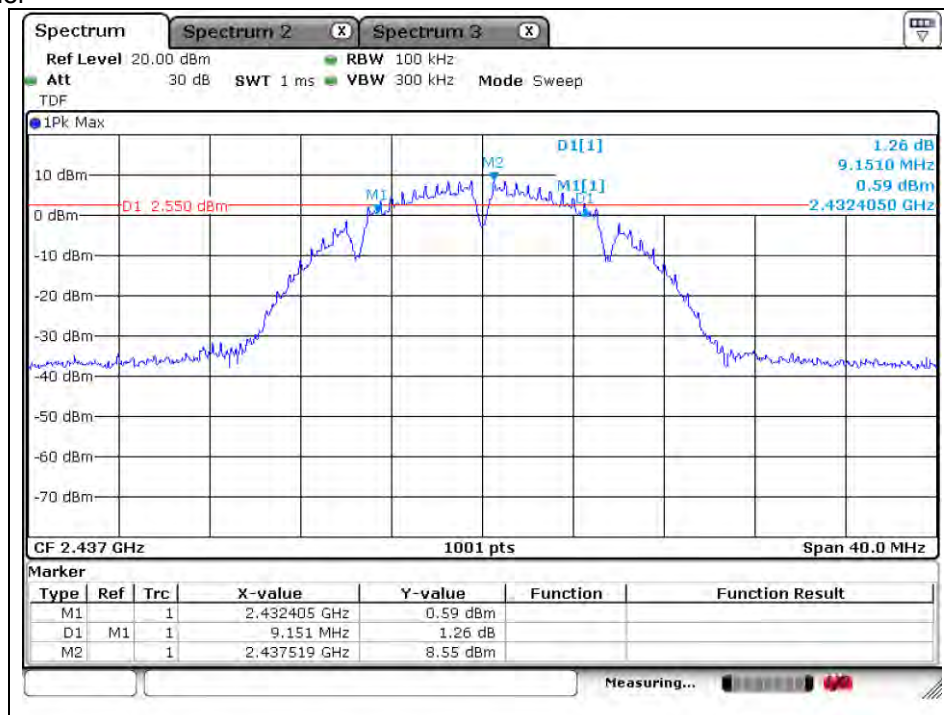
6 dB Bandwidth

DSSS: 802.11b

Low Channel



Middle Channel



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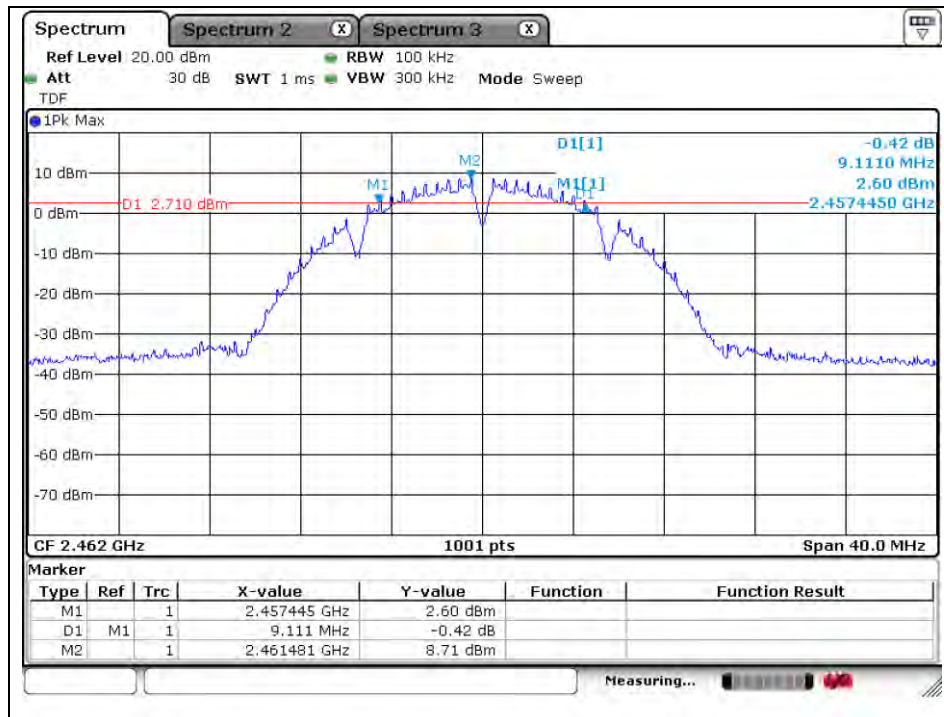
SGS Korea Co., Ltd. (Gunpo Laboratory) 4, LS-ro 182beon-gil, Gunpo-si, Gyeonggi-do, Korea, 15807 <http://www.sgsgroup.kr>

RTT5041-19(2017.07.10)(0)

Tel. +82 31 428 5700 / Fax. +82 31 427 2370

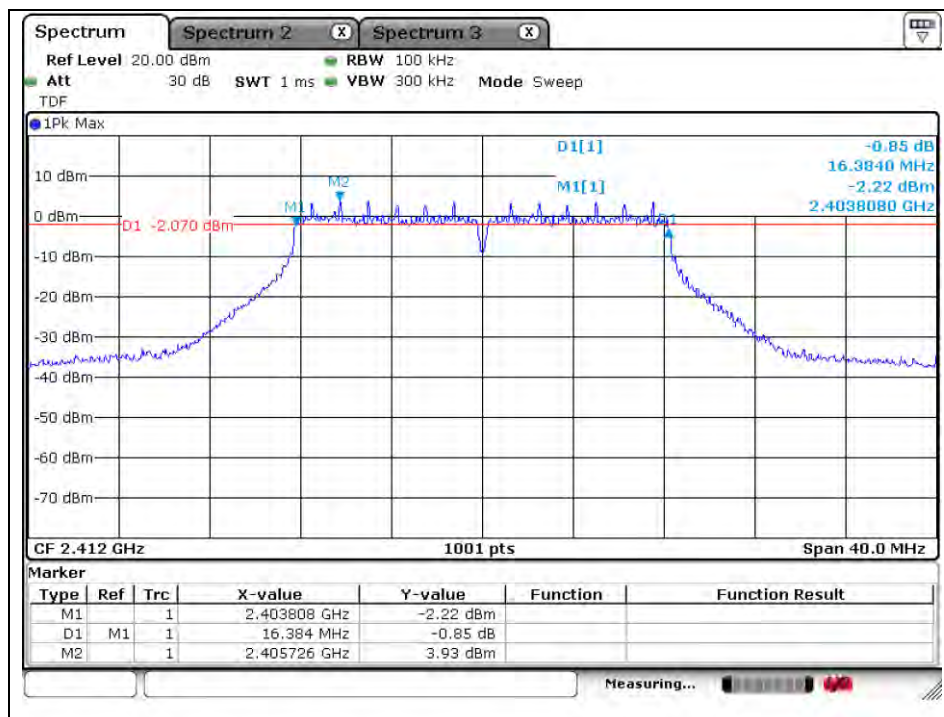
A4(210 mm x 297 mm)

High Channel



OFDM: 802.11g

Low Channel



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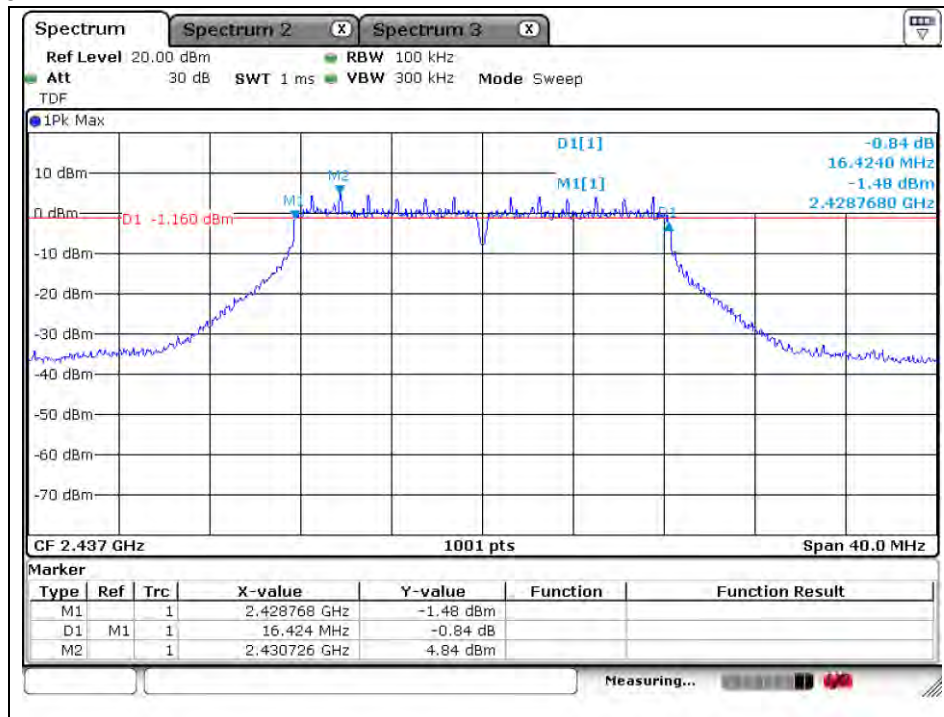
SGS Korea Co., Ltd. (Gunpo Laboratory) 4, LS-ro 182beon-gil, Gunpo-si, Gyeonggi-do, Korea, 15807 <http://www.sgsgroup.kr>

RTT5041-19(2017.07.10)(0)

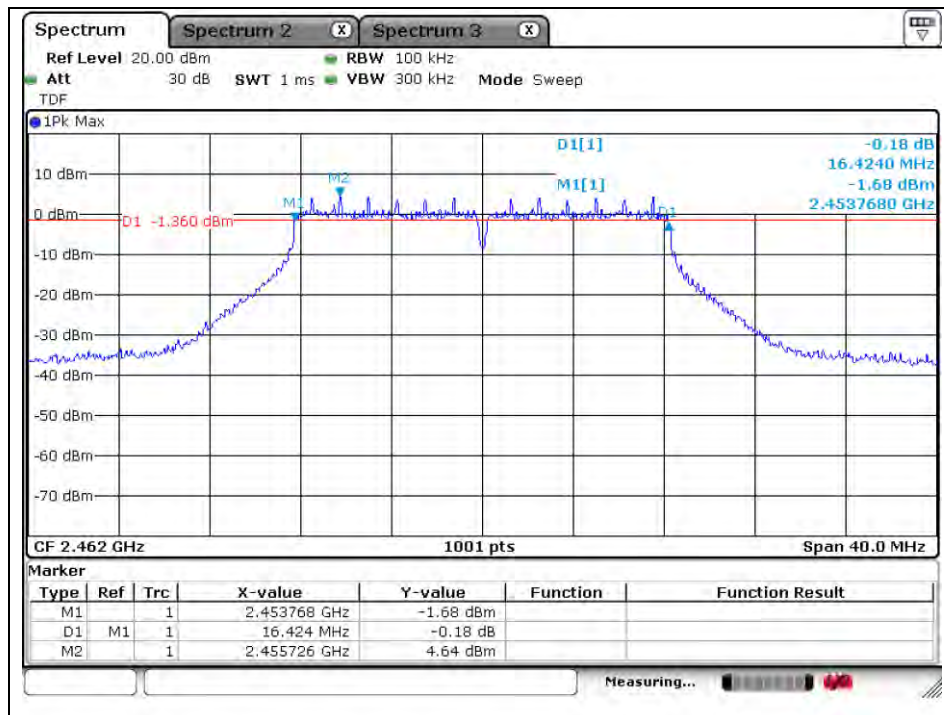
Tel. +82 31 428 5700 / Fax. +82 31 427 2370

A4(210 mm x 297 mm)

Middle Channel



High Channel



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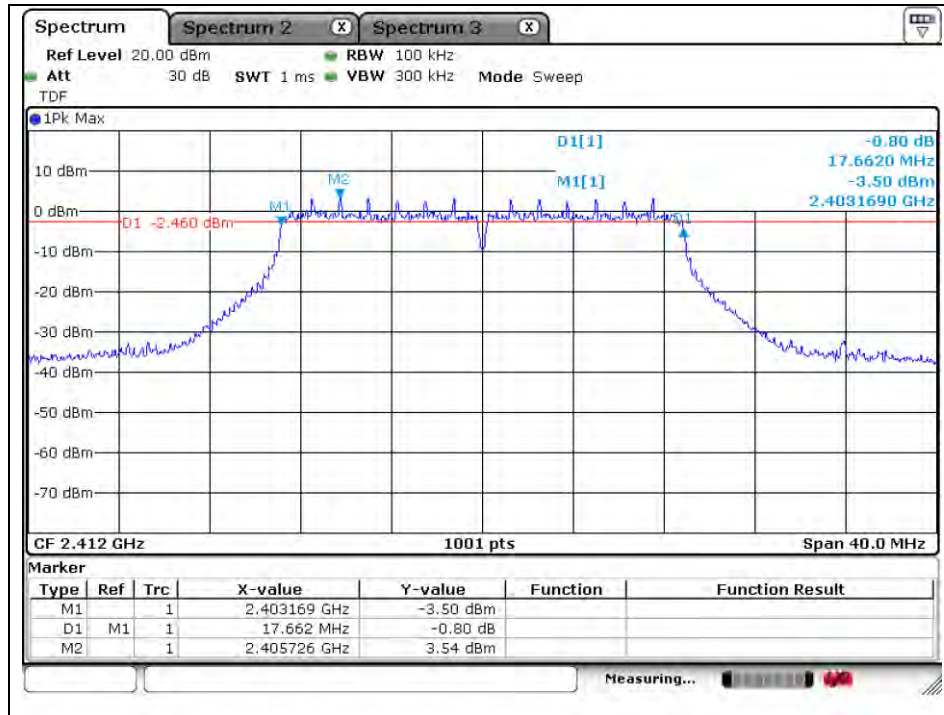
RTT5041-19(2017.07.10)(0)

Tel. +82 31 428 5700 / Fax. +82 31 427 2370

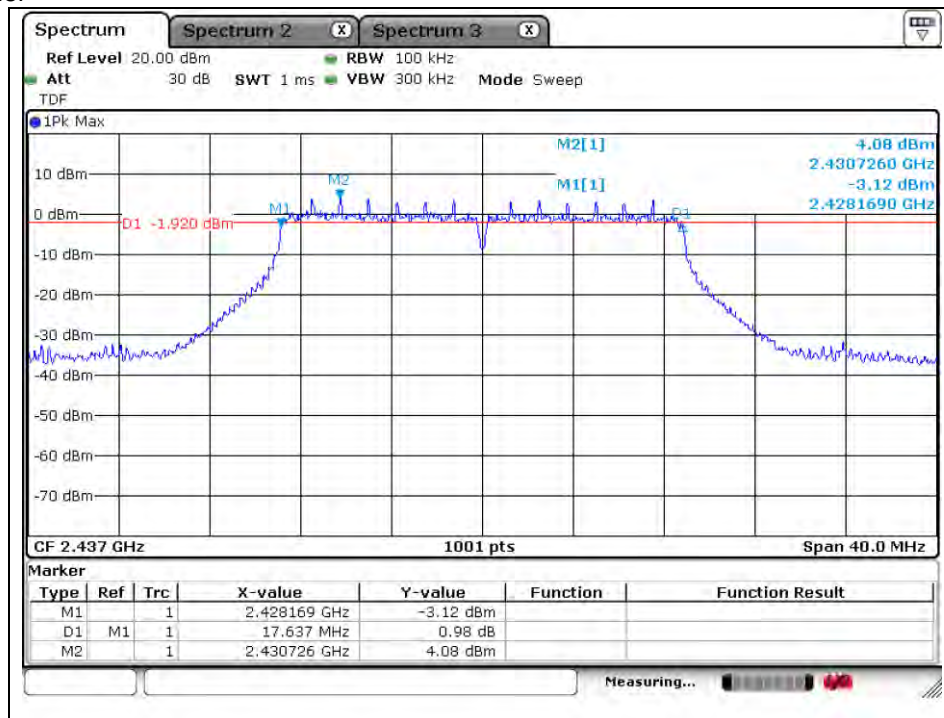
A4(210 mm x 297 mm)

OFDM: 802.11n_HT20

Low Channel



Middle Channel



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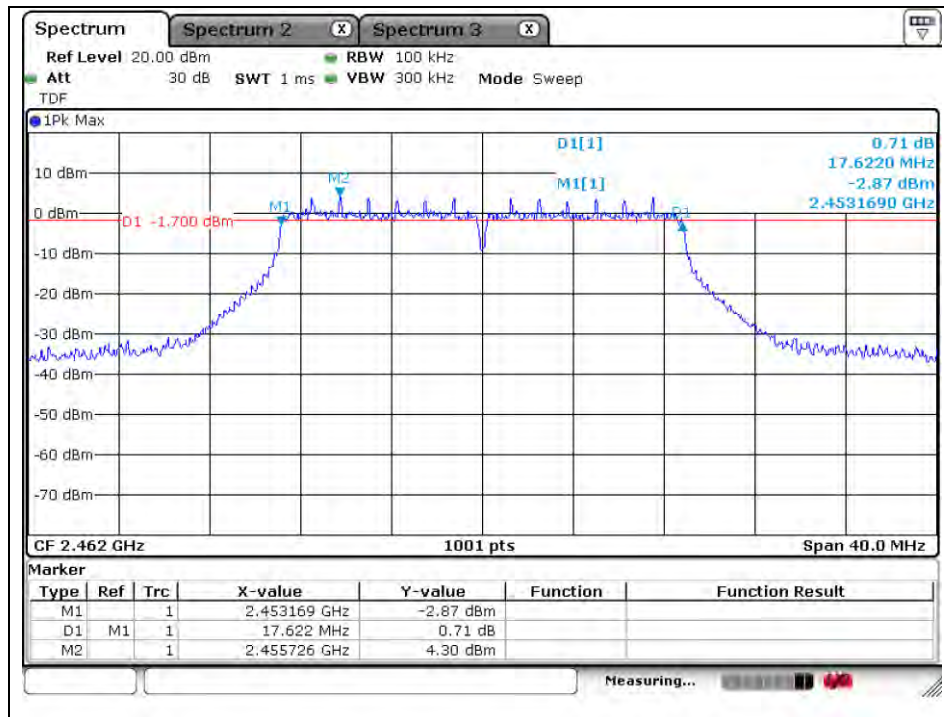
SGS Korea Co., Ltd. (Gunpo Laboratory) 4, LS-ro 182beon-gil, Gunpo-si, Gyeonggi-do, Korea, 15807 <http://www.sgsgroup.kr>

RTT5041-19(2017.07.10)(0)

Tel. +82 31 428 5700 / Fax. +82 31 427 2370

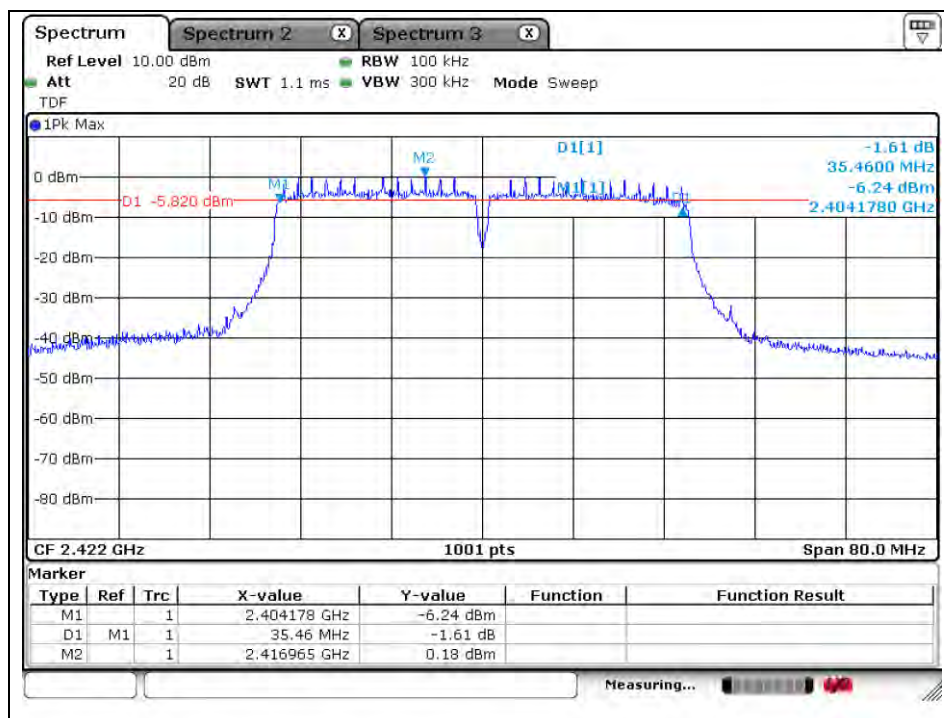
A4(210 mm x 297 mm)

High Channel



OFDM: 802.11n_HT40

Low Channel



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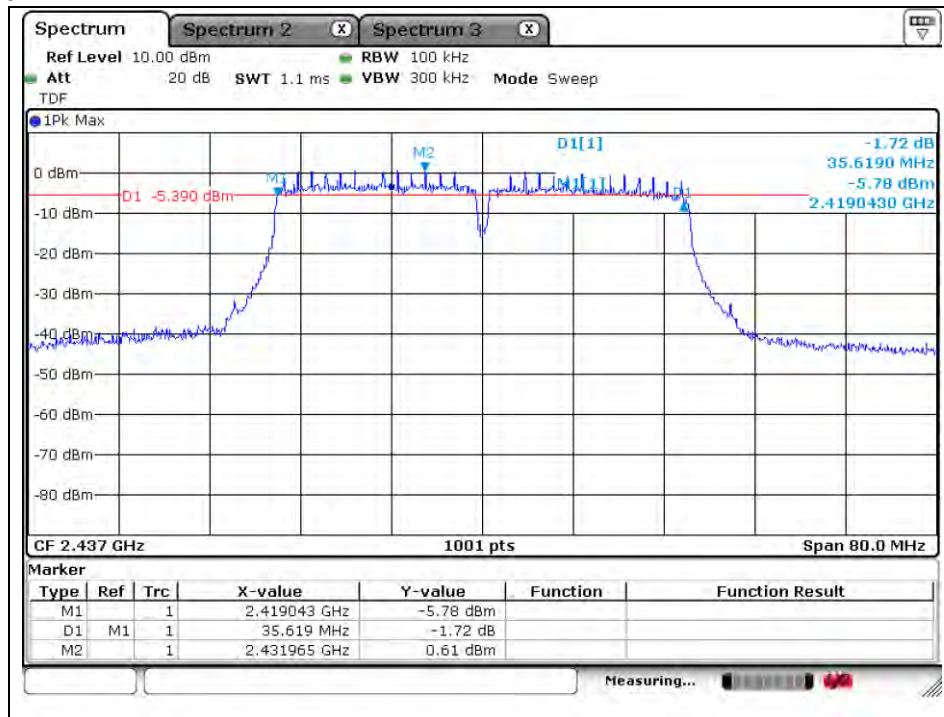
SGS Korea Co., Ltd. (Gunpo Laboratory) 4, LS-ro 182beon-gil, Gunpo-si, Gyeonggi-do, Korea, 15807 <http://www.sgsgroup.kr>

RTT5041-19(2017.07.10)(0)

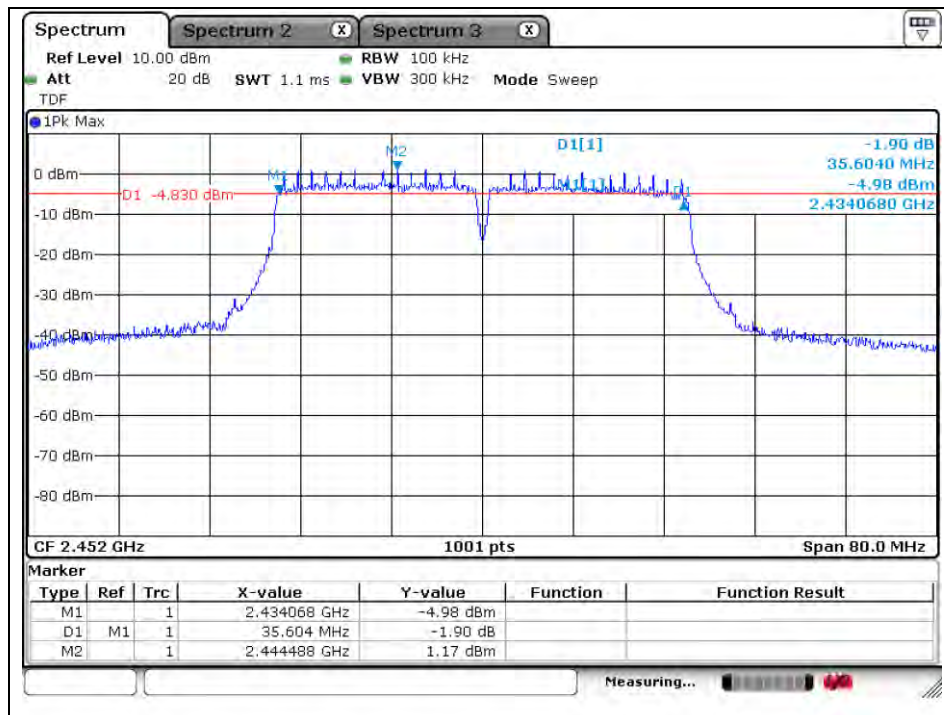
Tel. +82 31 428 5700 / Fax. +82 31 427 2370

A4(210 mm x 297 mm)

Middle Channel



High Channel



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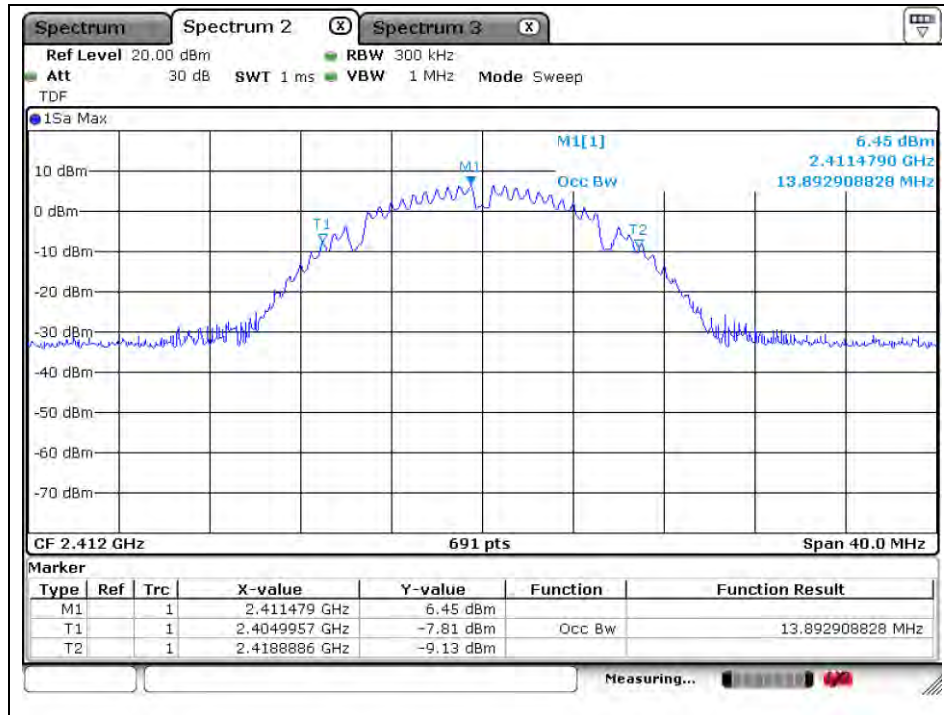
Tel. +82 31 428 5700 / Fax. +82 31 427 2370

A4(210 mm x 297 mm)

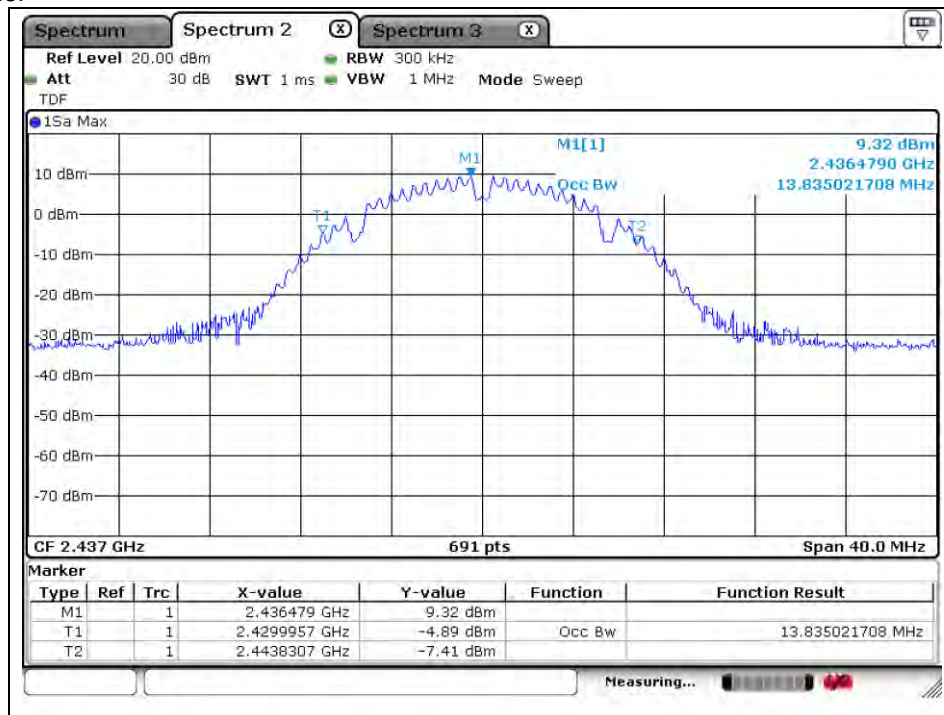
99 % Bandwidth

DSSS: 802.11b

Low Channel



Middle Channel



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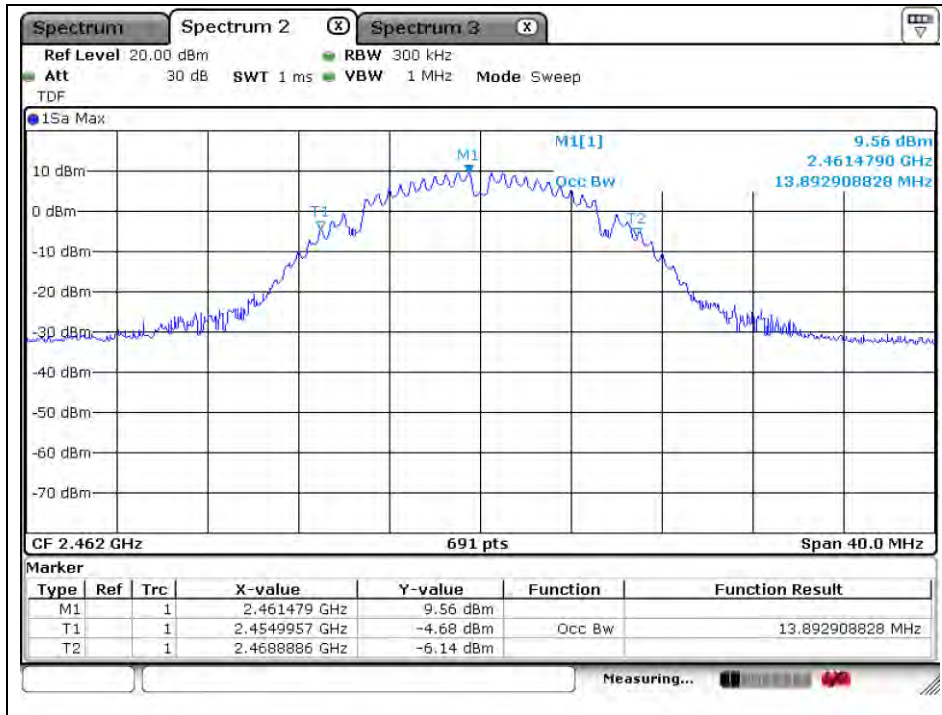
SGS Korea Co., Ltd. (Gunpo Laboratory) 4, LS-ro 182beon-gil, Gunpo-si, Gyeonggi-do, Korea, 15807 <http://www.sgsgroup.kr>

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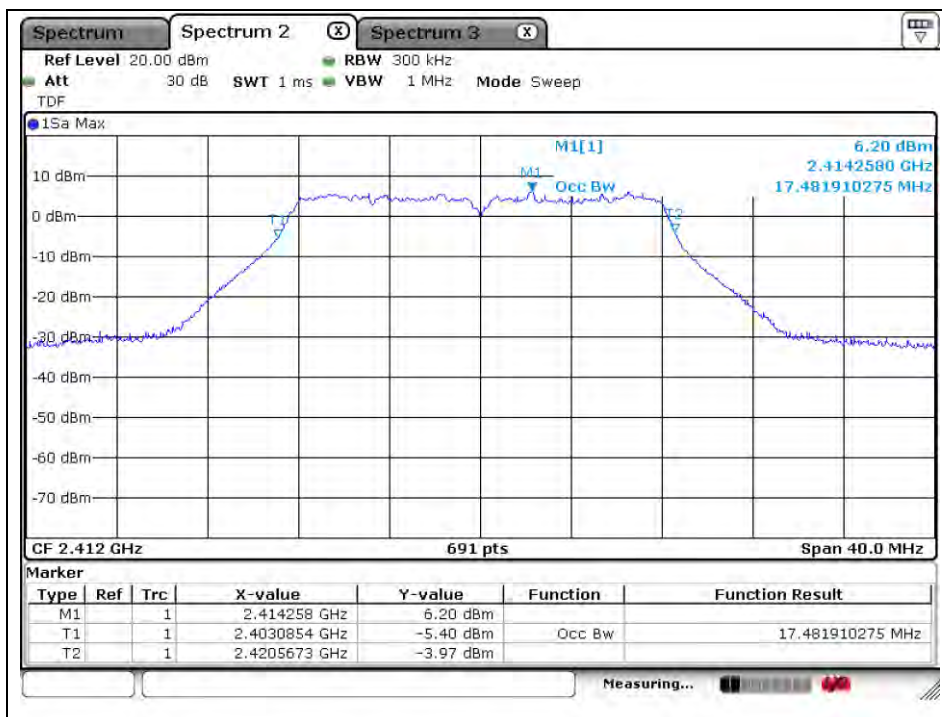
A4(210 mm x 297 mm)

High Channel



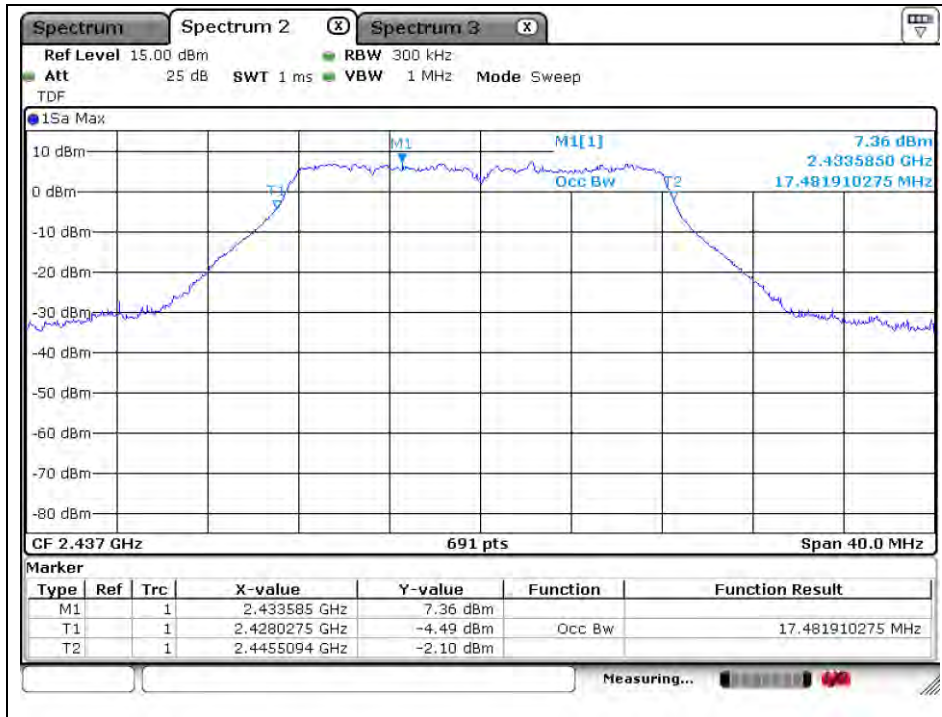
OFDM: 802.11g

Low Channel

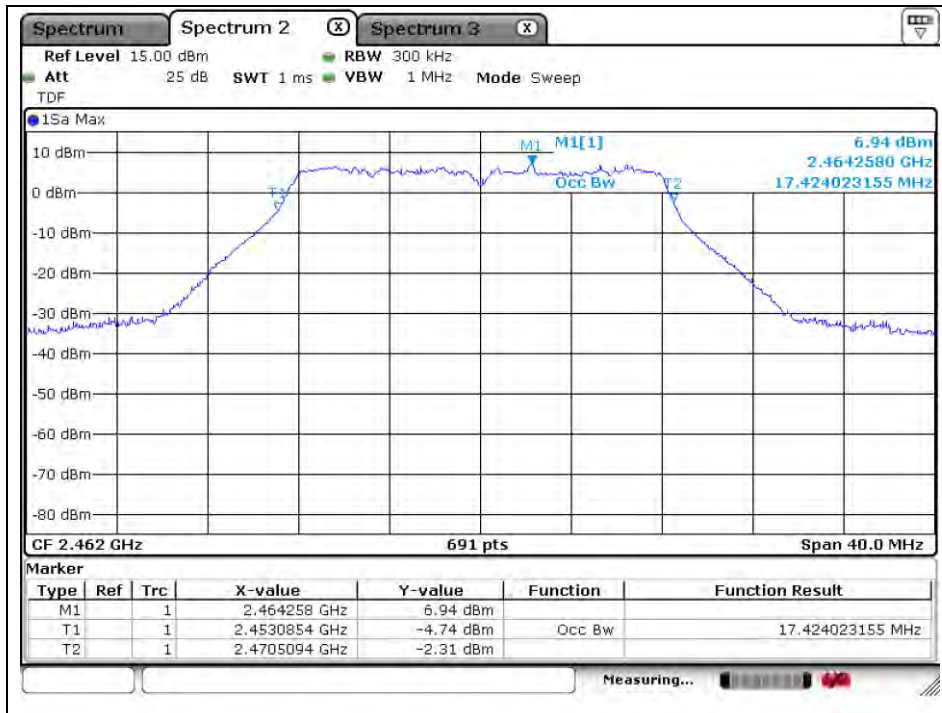


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Middle Channel



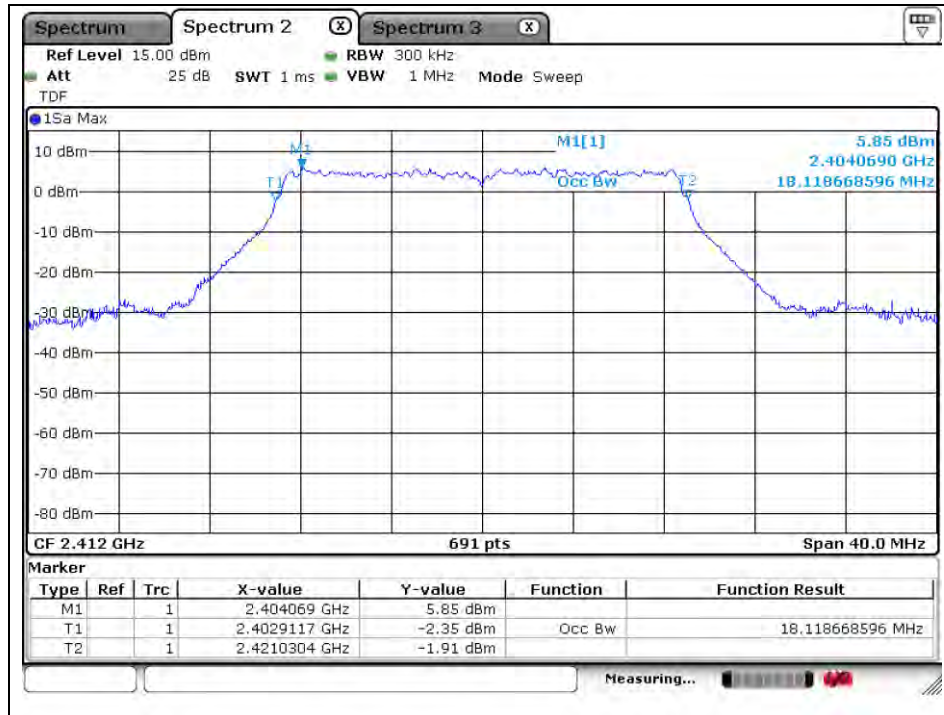
High Channel



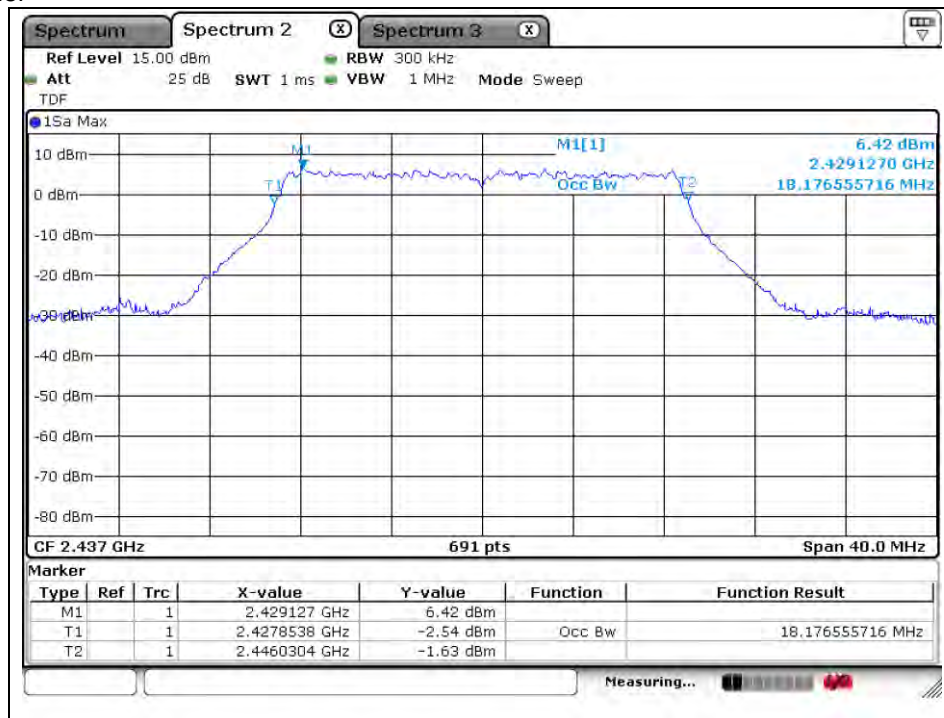
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OFDM: 802.11n_HT20

Low Channel

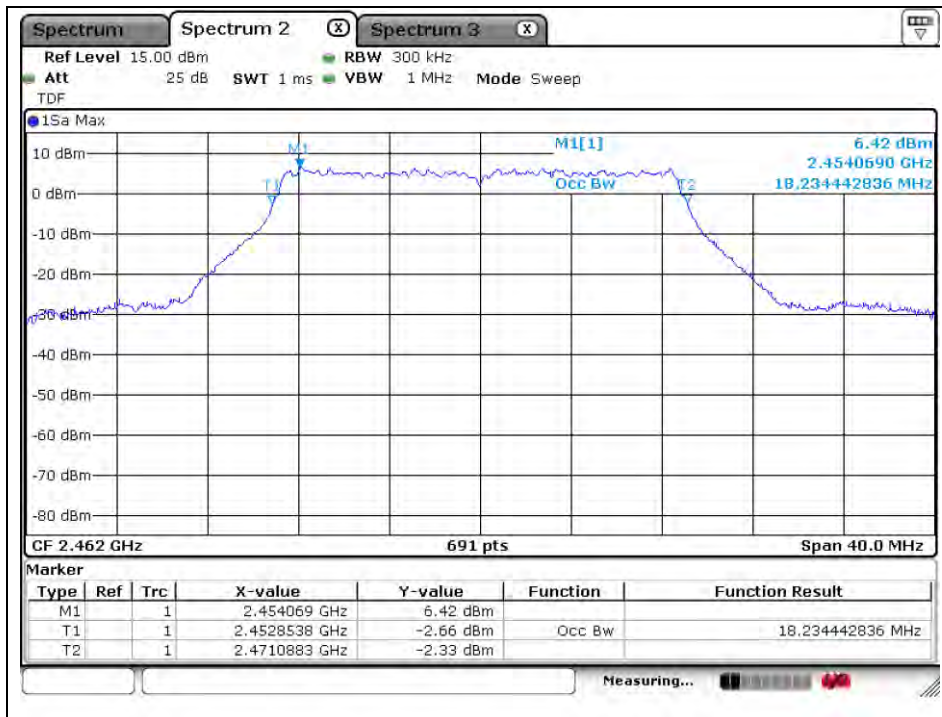


Middle Channel



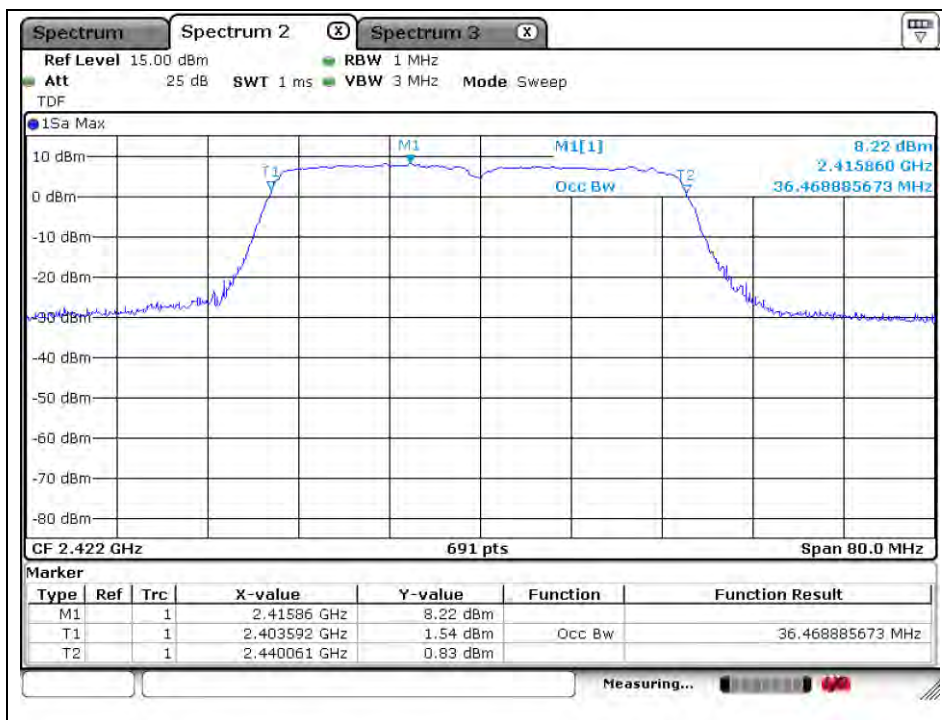
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High Channel



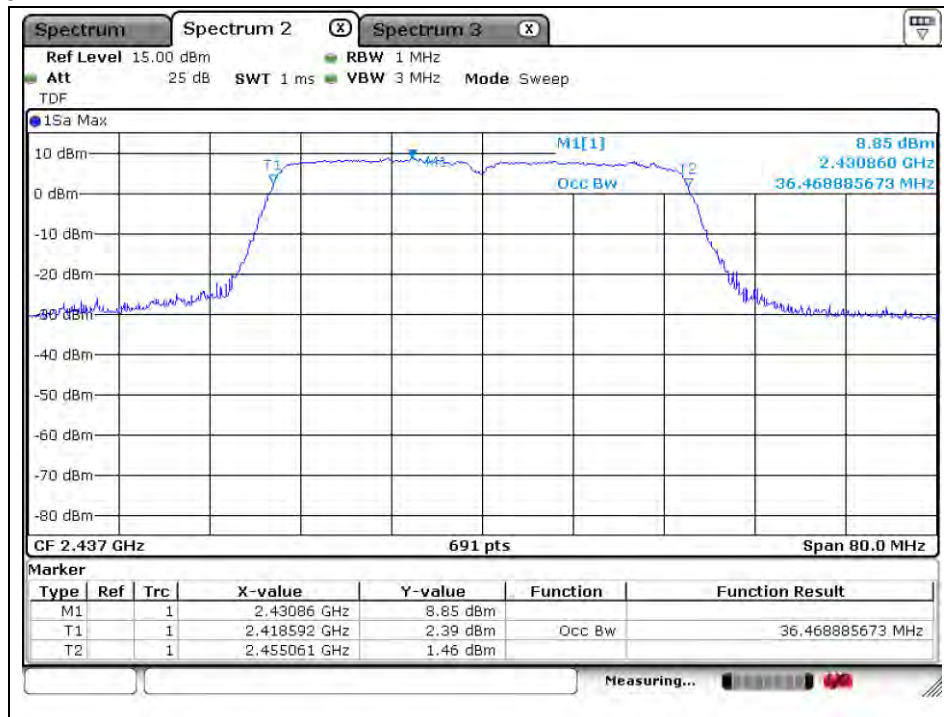
OFDM: 802.11n_HT40

Low Channel

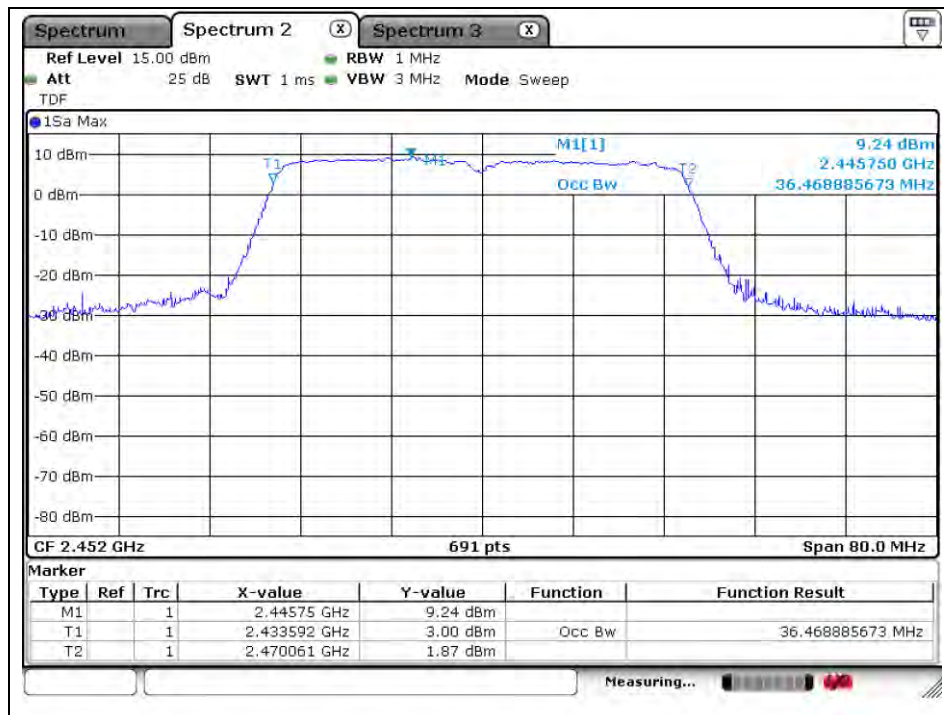


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Middle Channel



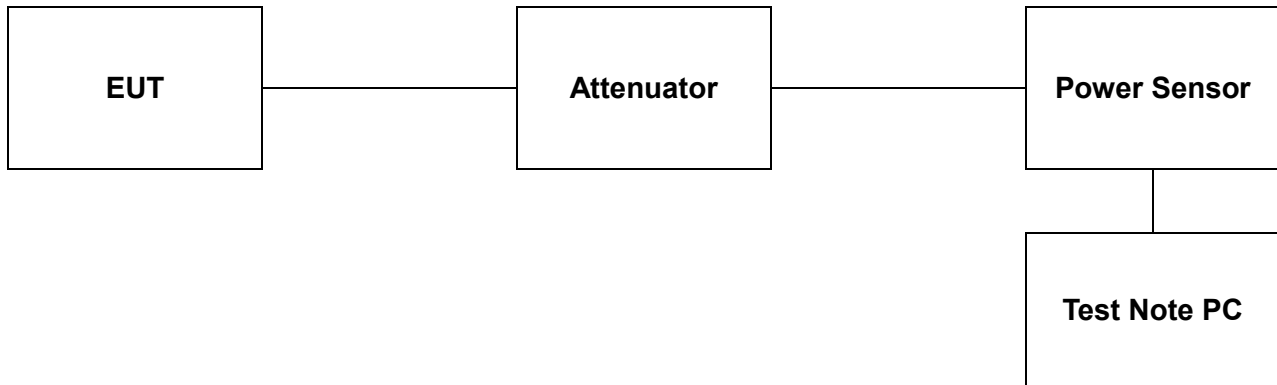
High Channel



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4. Maximum Peak Conducted Output Power

4.1. Test Setup



4.2. Limit

4.2.1. FCC

According to §15.247(b)(3), for systems using digital modulation in the 902-928 MHz, 2 400-2 483.5 MHz, and 5 725-5 850 MHz bands : 1 Watt. As an alternative to a peak power measurement, compliance with the one Watt limit can be based on a measurement of the maximum conducted output power. Maximum Conducted Output Power is defined as the total transmit power delivered to all antennas and antenna elements averaged across all symbols in the signaling alphabet when the transmitter is operating at its maximum power control level. Power must be summed across all antennas and antenna elements. The average must not include any time intervals during which the transmitter is off or is transmitting at a reduced power level. If multiple modes of operation are possible (e.g., alternative modulation methods), the maximum conducted output power is the highest total transmit power occurring in any mode.

According to §15.247(b)(4), the conducted output power limit specified in paragraph (b) of this section is based on the use of antenna with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraph (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

4.2.2. IC

According to RSS-247 Issue 2, 5.4 (d), for DTSs employing digital modulation techniques operating in the bands 902-928 MHz and 2 400-2 483.5 MHz, the maximum peak conducted output power shall not exceed 1 W. The e.i.r.p shall not exceed 4 W, except as provided in section 5.4(e),

As an alternative to a peak measurement, compliance can be based on a measurement of the maximum conducted output power. The maximum conducted output power is the total transmit power delivered to all antennas and antenna elements, averaged across all symbols in the signalling alphabet when the transmitter is operating at its maximum power control level. Power must be summed across all antennas and antenna elements. The average must not include any time intervals during which the transmitter is off or transmitting at a reduced power level. If multiple modes of operation are implemented, the maximum conducted output power is the highest total transmit power occurring in any mode.

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A4(210 mm x 297 mm)

4.3. Test Procedure

The test follows section 9.1.3 of KDB 558074 D01 DTS Meas Guidance v04.

PKPM1 Peak-reading power meter method

- The maximum peak conducted output power may be measured using a broadband peak RF power meter. The power meter shall have a video bandwidth that is greater than or equal to the DTS bandwidth and shall utilize a fast-responding diode detector.

The test follows section 9.2.3.2 of KDB 558074 D01 DTS Meas Guidance v04.

Method AVGPM-G (Measurement using a gated RF average-reading power meter)

- Alternatively, measurements may be performed using a wideband gated RF power meter provided that the gate parameters are adjusted such that the power is measured only when the EUT is transmitting at its maximum power control level. Since this measurement is made only during the ON time of the transmitter, no duty cycle correction is required.

Test program: (S/W name: R&S Power Viewer, Version: 3.2.0)

1. Initially overall offset for attenuator and cable loss is measured per frequency.
2. Measured offset is inserted in test program in advance of measurement for output power.
3. Power for each frequency (channel) of device is investigated as final result.
4. Final result reported on this section from R&S power viewer program includes with several factors and test program shows only final result.

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4.4. Test Results

Ambient temperature : (23 ± 1) °C

Relative humidity : 47 % R.H.

Mode	Channel	Frequency (MHz)	Data Rate	Average Power Result (dB m)	Peak Power Result (dB m)	Peak Power Limit (dB m)
DSSS (802.11b)	Low	2 412	1 Mbps	17.40	20.41	30
	Middle	2 437		16.93	19.69	
	High	2 462		16.94	19.78	
OFDM (802.11g)	Low	2 412	6 Mbps	15.11	24.02	
	Middle	2 437		15.57	24.82	
	High	2 462		15.50	24.63	
OFDM (802.11n_HT20)	Low	2 412	MCS0	14.18	24.24	
	Middle	2 437		14.42	24.71	
	High	2 462		14.53	24.86	
OFDM (802.11n_HT40)	Low	2 422	MCS0	13.61	23.91	
	Middle	2 437		14.15	23.94	
	High	2 452		14.18	24.92	

Remark;

Attenuator and cable offset was compensated in test program (R&S Power Viewer) before measuring.

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5. Power Spectral Density

5.1. Test Setup



5.2. Limit

5.2.1 FCC

According to §15.247(e), for digitally modulated system, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission. This power spectral density shall be determined in accordance with the provisions of paragraph (b) of this section. The same method of determining the conducted output power shall be used to determine the power spectral density.

5.2.2 IC

According to RSS-247 Issue 2, 5.2 (b), the transmitter power spectral density conducted from the transmitter to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission. This power spectral density shall be determined in accordance with the provisions of section 5.4(d), (i.e. the power spectral density shall be determined using the same method as is used to determine the conducted output power).

5.3. Test Procedure

All data rates and modes were investigated for this test. The full data for the worst case data rate are reported in this section.

The measurements are recorded using the PKPSD measurement procedure in section 10.2 of KDB 558074 D01 DTS Meas Guidance v04.

- This procedure shall be used if maximum peak conducted output power was used to demonstrate compliance, and is optional if the maximum conducted (average) output power was used to demonstrate compliance.

1. Set analyzer center frequency to DTS channel center frequency.
2. Set the span to $1.5 \times \text{DTS bandwidth}$.
3. Set the RBW to : $3 \text{ kHz} \leq \text{RBW} \leq 100 \text{ kHz}$.
4. Set the VBW $\geq 3 \times \text{RBW}$.
5. Detector = Peak.
6. Sweep time = auto couple.
7. Trace mode = max hold.
8. Allow trace to fully stabilize.
9. Use the peak marker function to determine the maximum amplitude level within the RBW.
10. If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.

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5.4. Test Results

Ambient temperature : (23 ± 1) °C
Relative humidity : 47 % R.H.

Operation Mode	Data Rate	Channel	Frequency (MHz)	Measured PSD (dB m)	Maximum Limit (dB m)
DSSS (802.11b)	1 Mbps	Low	2 412	1.15	8
		Middle	2 437	4.12	
		High	2 462	4.33	
OFDM (802.11g)	6 Mbps	Low	2 412	-11.82	
		Middle	2 437	-11.88	
		High	2 462	-10.88	
OFDM (802.11n_HT20)	MCS0	Low	2 412	-11.82	
		Middle	2 437	-11.83	
		High	2 462	-11.55	
OFDM (802.11n_HT40)	MCS0	Low	2 422	-15.75	
		Middle	2 437	-15.09	
		High	2 452	-14.77	

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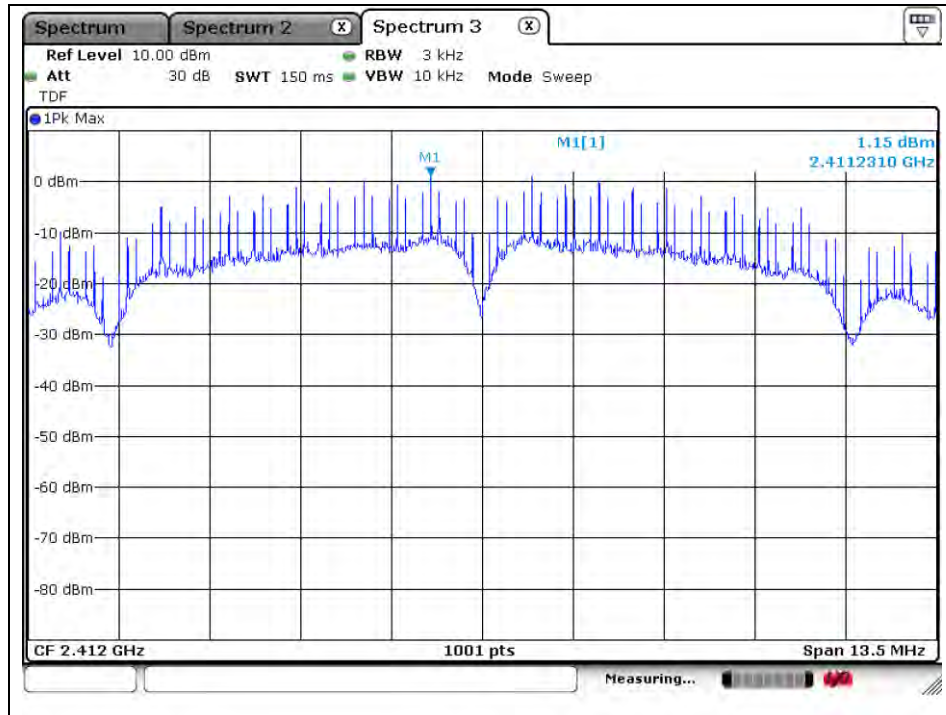
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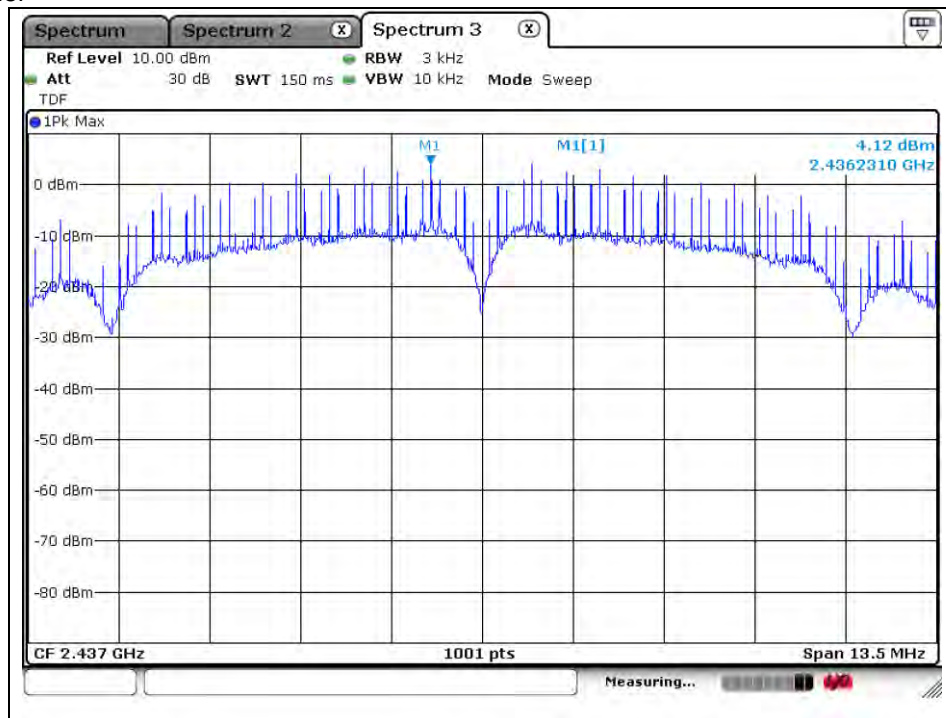
A4(210 mm x 297 mm)

DSSS: 802.11b

Low Channel



Middle Channel



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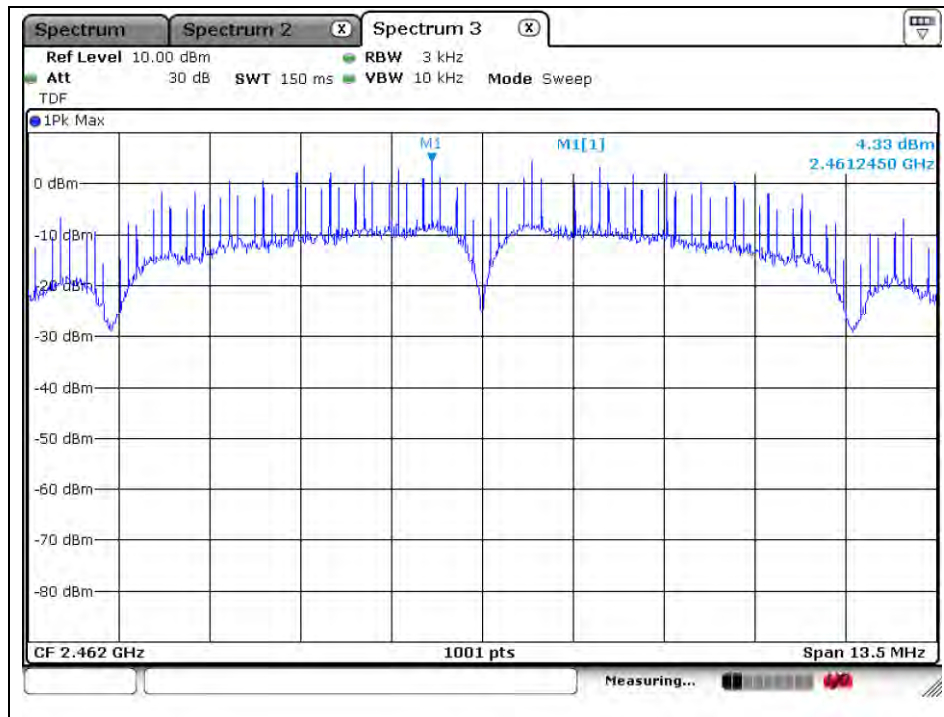
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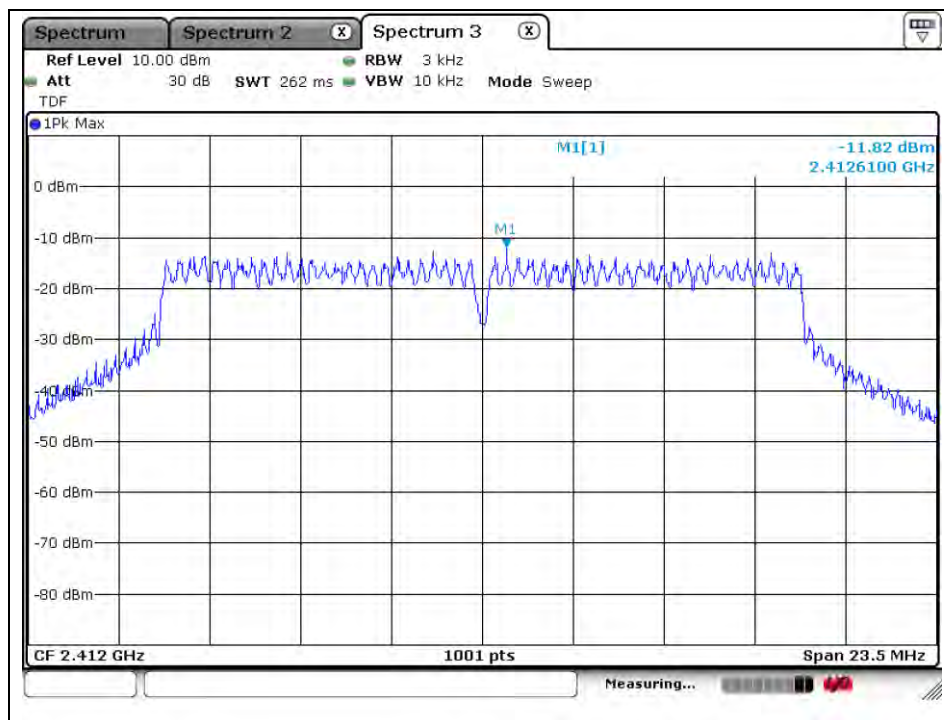
A4(210 mm x 297 mm)

High Channel



OFDM: 802.11g

Low Channel



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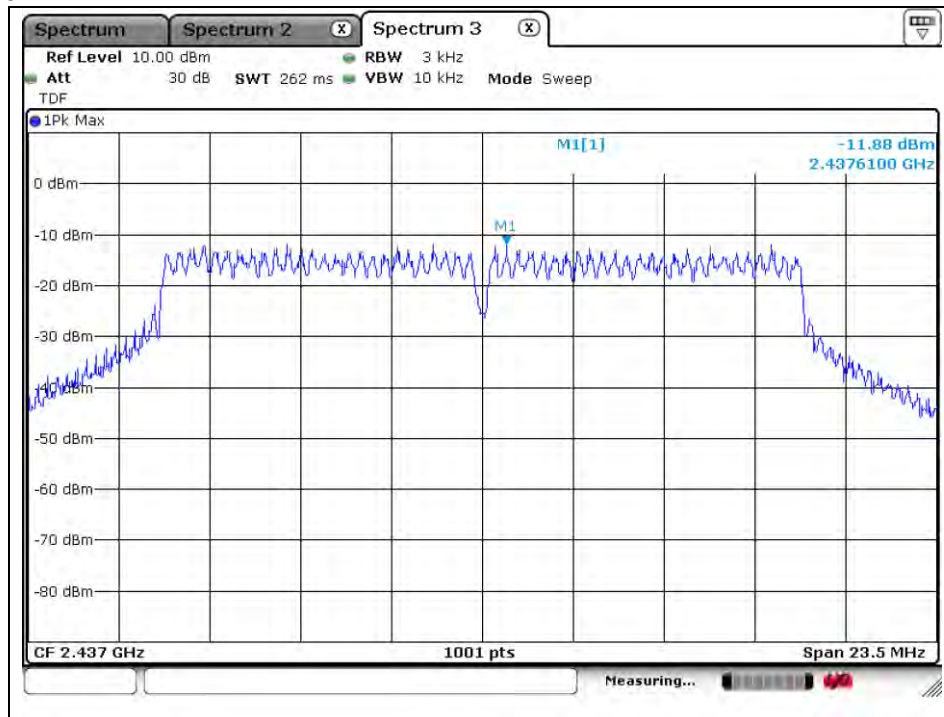
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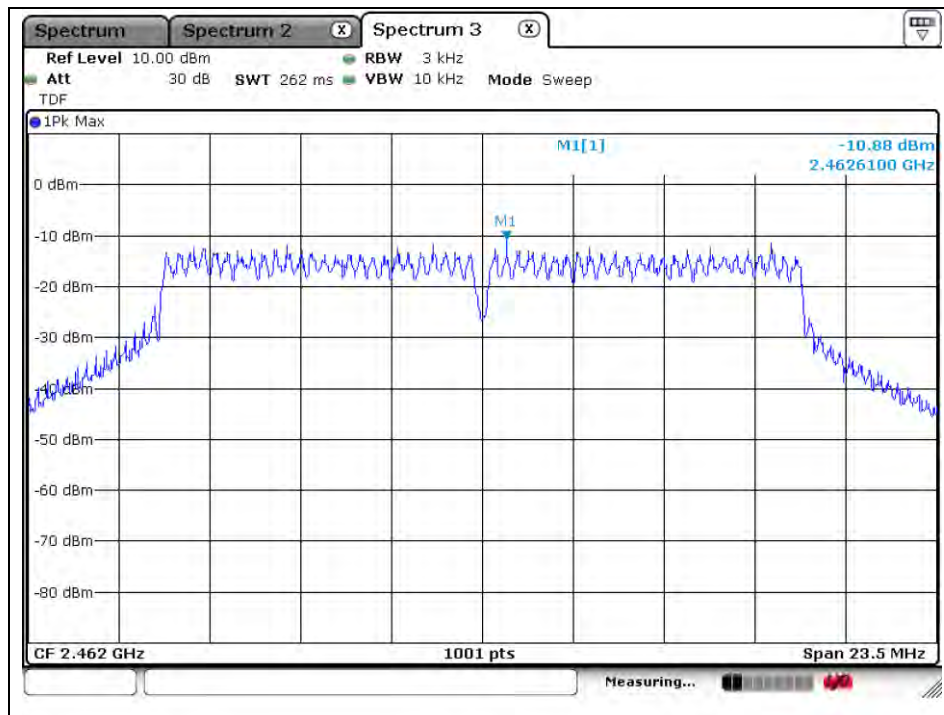
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A4(210 mm x 297 mm)

Middle Channel



High Channel



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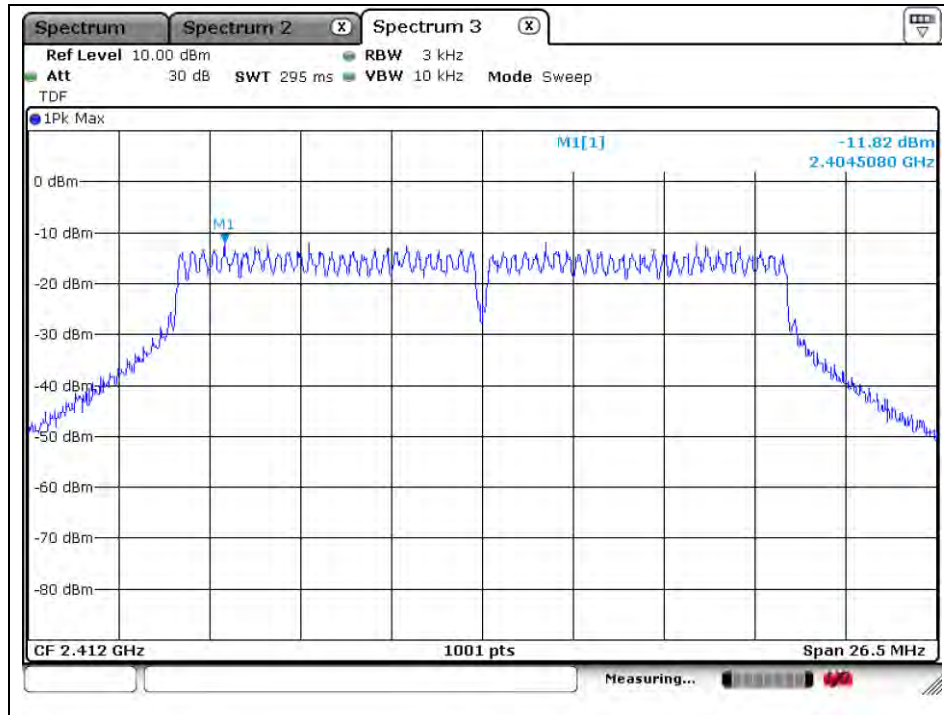
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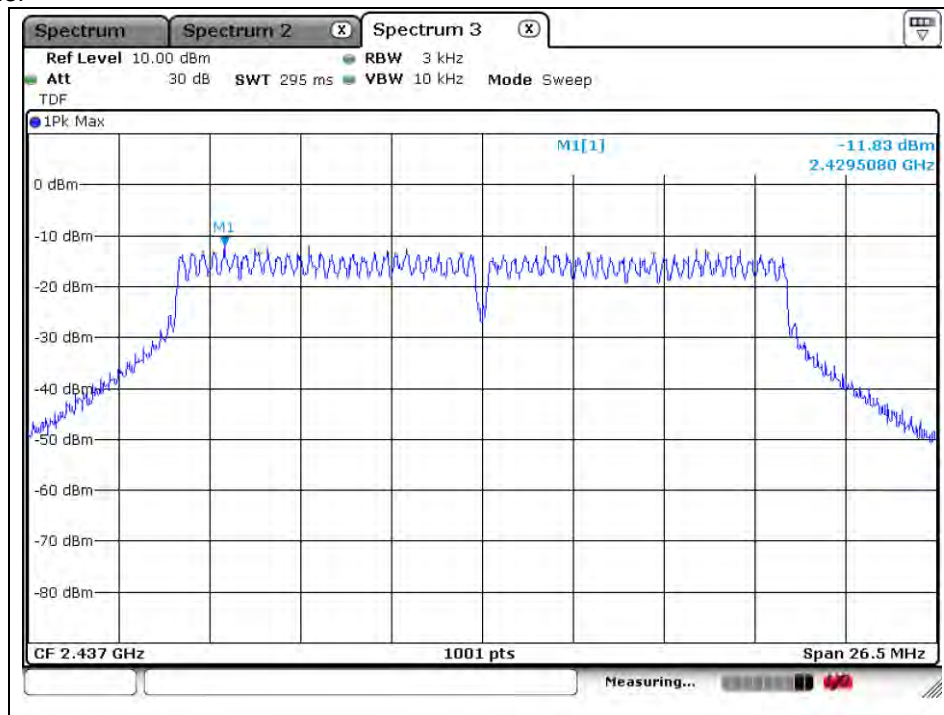
A4(210 mm x 297 mm)

OFDM: 802.11n_HT20

Low Channel



Middle Channel



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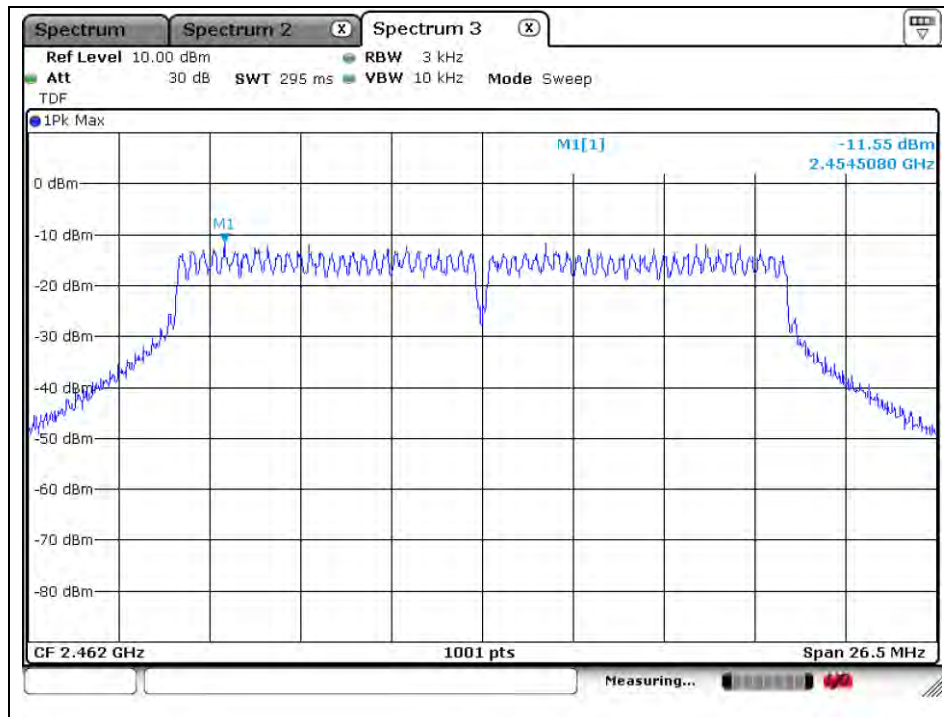
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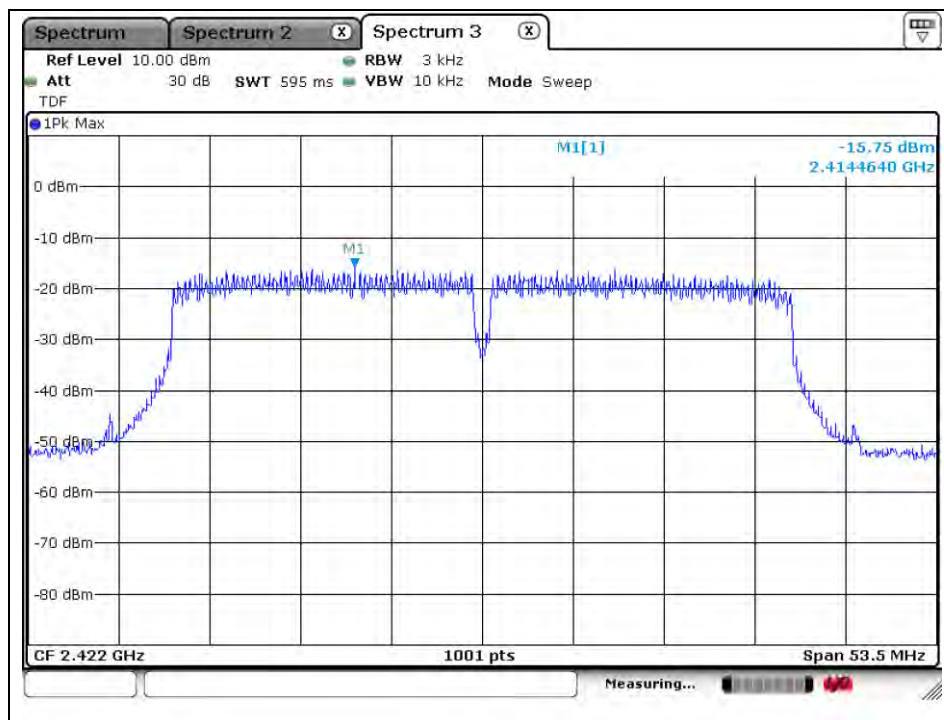
A4(210 mm x 297 mm)

High Channel



OFDM: 802.11n_HT40

Low Channel



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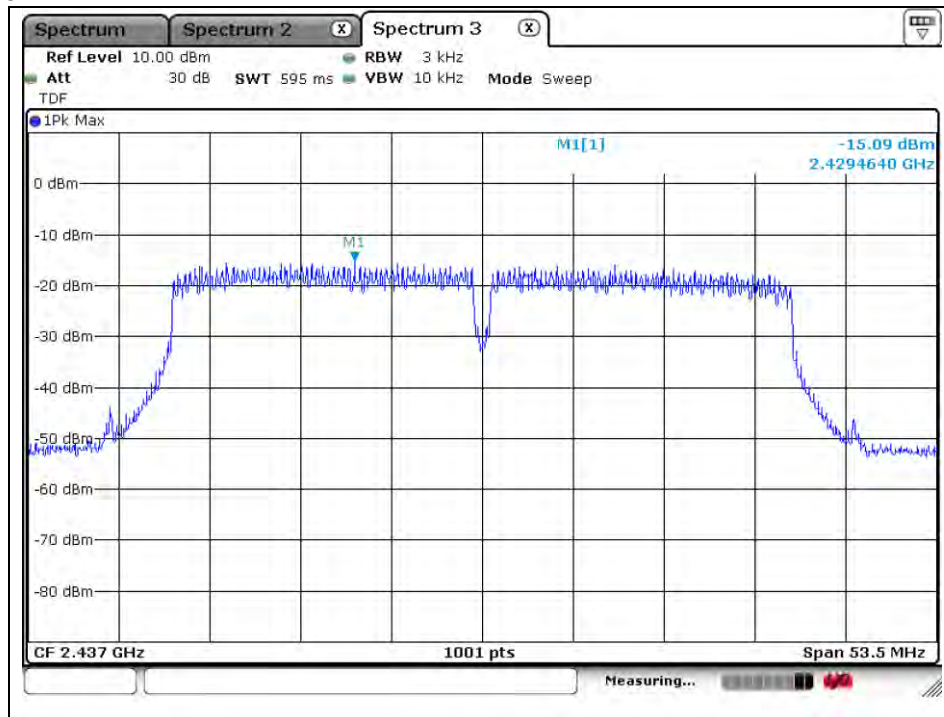
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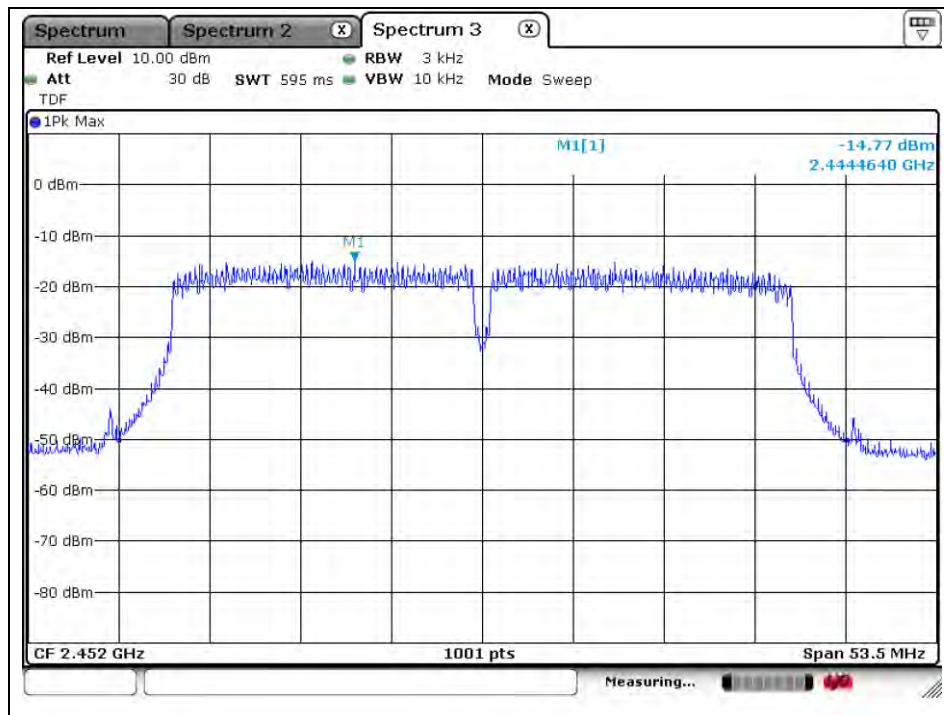
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Middle Channel



High Channel



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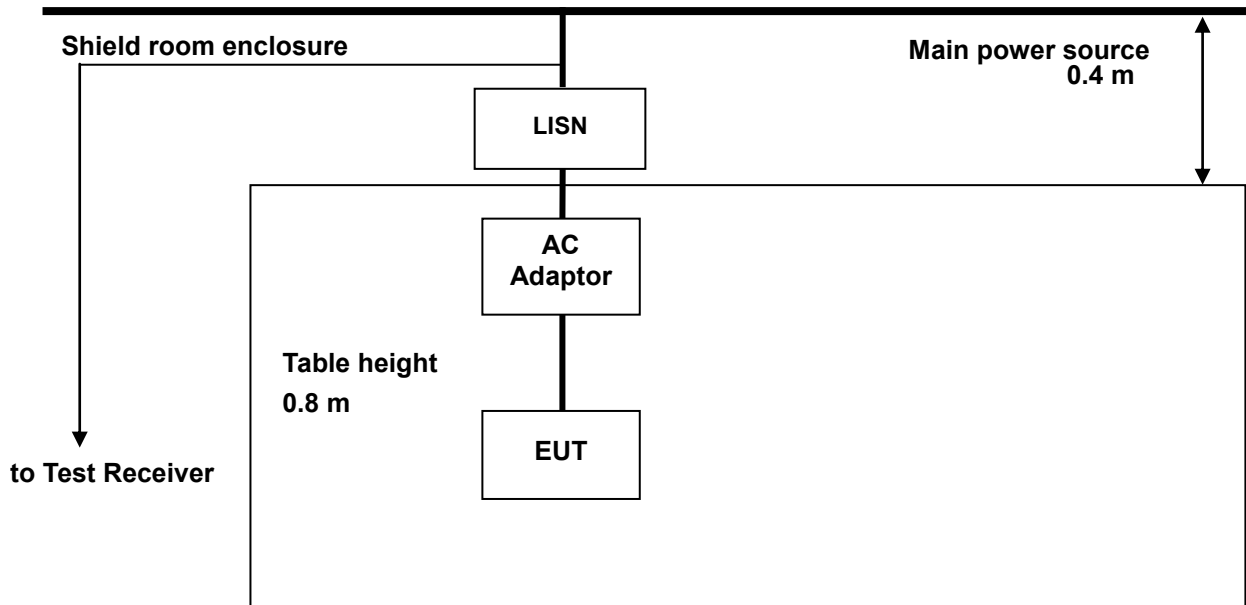
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6. AC Power Line Conducted Emission

6.1. Test Setup



6.2. Limit

6.2.1 FCC

According to §15.207(a) for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 kHz to 30 MHz, shall not exceed the limits in the following table, as measured using a 50 μ H / 50 ohm line impedance stabilization network(LISN).

Compliance with the provision of this paragraph shall on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower applies at the boundary between the frequency ranges.

Frequency of Emission (MHz)	Conducted limit (dB μ V)	
	Quasi-peak	Average**
0.15 - 0.50	66 - 56*	56 - 46*
0.50 - 5.00	56	46
5.00 - 30.0	60	50

* Decreases with the logarithm of the frequency.

** A linear average detector is required.

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6.2.2 IC

RSS-Gen Issue 4, 8.8, a radio apparatus that is designed to be connected to the public utility (AC) power line shall ensure that the radio frequency voltage, which is conducted back onto the AC power line on any frequency or frequencies, within the band 150 kHz to 30 MHz, shall not exceed the limits in Table 3.

Unless the requirements applicable to a given device state otherwise, for any radio apparatus equipped to operate from the public utility AC power supply either directly or indirectly (such as with a battery charger), the radio frequency voltage of emissions conducted back onto the AC power lines in the frequency range of 0.15 MHz to 30 MHz shall not exceed the limits shown in Table 3 below. The more stringent limit applies at the frequency range boundaries.

The conducted emissions shall be measured in accordance with the reference publication mentioned in Section 3.

Table 3 – AC Power Line Conducted Emissions Limits

Frequency (MHz)	Conducted limit (dB μ V)	
	Quasi-peak	Average**
0.15 - 0.50	66 - 56*	56 - 46*
0.50 - 5.00	56	46
5.00 - 30.0	60	50

* Decreases with the logarithm of the frequency.

** A linear average detector is required.

6.3. Test Procedures

All data rates and modes were investigated for this test. The full data for the worst case data rate are reported in this section.

AC line conducted emissions from the EUT were measured according to the dictates of ANSI C63.10-2013

1. The test procedure is performed in a 6.5 m × 3.6 m × 3.6 m (L × W × H) shielded room. The EUT along with its peripherals were placed on a 1.0 m (W) × 1.5 m (L) and 0.8 m in height wooden table and the EUT was adjusted to maintain a 0.4 meter space from a vertical reference plane.
2. The EUT was connected to power mains through a line impedance stabilization network (LISN) which provides 50 ohm coupling impedance for measuring instrument and the chassis ground was bounded to the horizontal ground plane of shielded room.
3. The excess power cable between the EUT and the LISN was bundled. All connecting cables of EUT were moved to find the maximum emission.

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6.4. Test Results

The following table shows the highest levels of conducted emissions on both phase of Hot and Neutral line.

Ambient temperature : (24 ± 1) °C
Relative humidity : 47 % R.H.
Frequency range : 0.15 MHz - 30 MHz
Measured Bandwidth : 9 kHz

FREQ. (MHz)	LEVEL (dBμV)		LINE	LIMIT (dBμV)		MARGIN (dB)	
	Q-Peak	Average		Q-Peak	Average	Q-Peak	Average
0.15	49.9	28.9	N	66.00	56.00	16.10	27.10
0.19	39.1	21.9	N	64.04	54.04	24.94	32.14
0.45	36.6	17.3	N	56.88	46.88	20.28	29.58
0.52	37.2	18.9	N	56.00	46.00	18.80	27.10
8.22	29.3	22.1	N	60.00	50.00	30.70	27.90
20.16	28.2	23.6	N	60.00	50.00	31.80	26.40
0.15	61.6	39.3	H	66.00	56.00	4.40	16.70
0.19	60.2	39.4	H	64.04	54.04	3.84	14.64
0.42	40.7	31.5	H	57.45	47.45	16.75	15.95
0.54	40.2	30.5	H	56.00	46.00	15.80	15.50
8.57	30.1	21.4	H	60.00	50.00	29.90	28.60
21.65	22.8	16.7	H	60.00	50.00	37.20	33.30

Note;

1. Line (H): Hot, Line (N): Neutral.
2. All modes of operation were investigated and the worst-case emissions were reported using 11n_HT40 / MCS0 / High channel.
3. The limit for Class B device(s) from 150 kHz to 30 MHz are specified in Section of the Title 47 CFR.
4. Traces shown in plot were made by using a peak detector and average detector.
5. Deviations to the Specifications: None.

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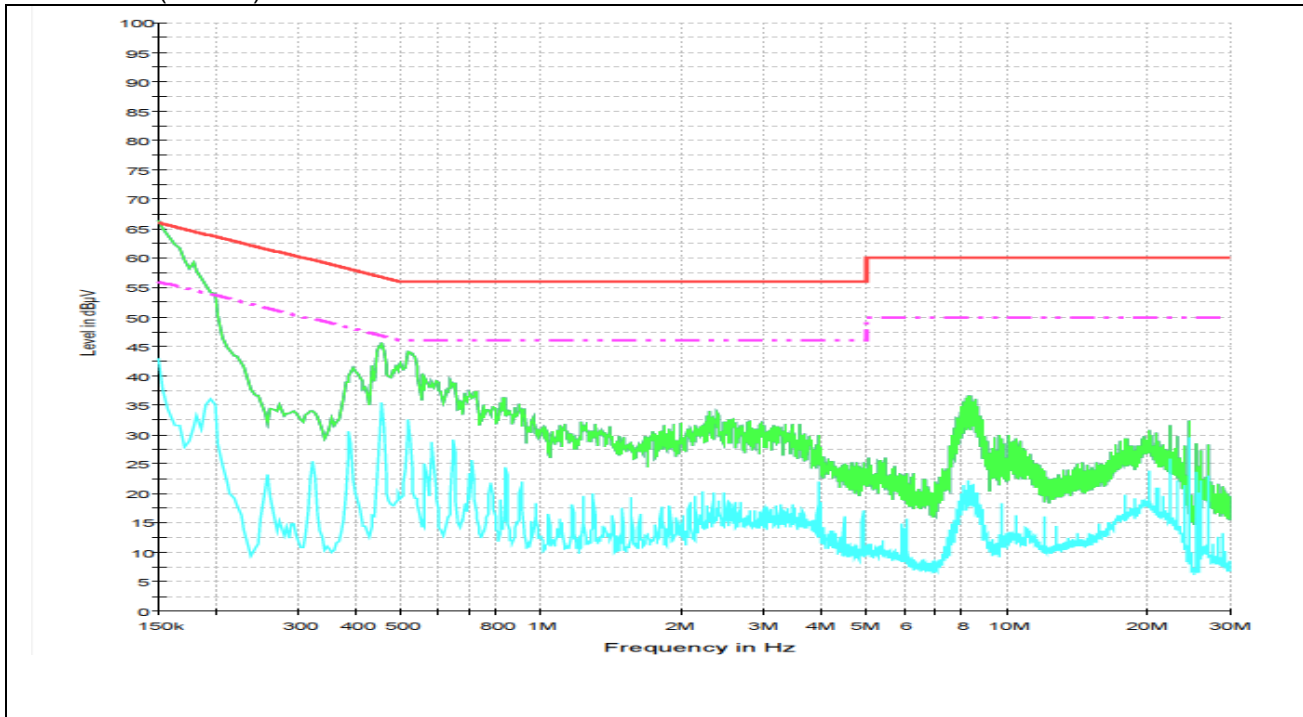
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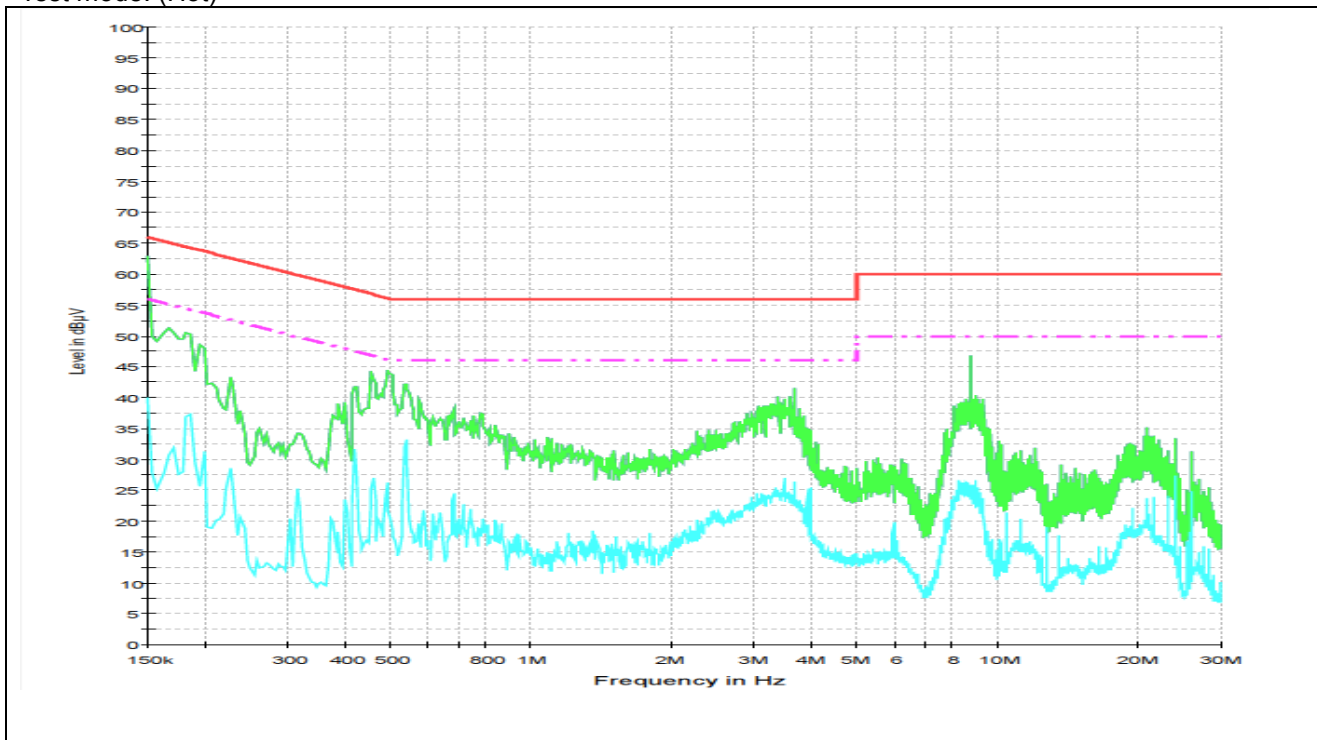
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Test mode: (Neutral)



Test mode: (Hot)



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A4(210 mm x 297 mm)

7. Antenna Requirement

7.1. Standard Applicable

For intentional device, according to FCC 47 CFR 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. And according to FCC 47 CFR Section §15.247 (b) if transmitting antennas of directional gain greater than 6 dB i are used, the power shall be reduced by the amount in dB that the gain of the antenna exceeds 6 dB i.

7.2. Antenna Connected Construction

Antenna used in this product is PCB pattern type with gain of 1.58 dB i.

- End of the Test Report -

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