

TEST REPORT

of

FCC Part 15 Subpart E §15.407

FCC ID: O8HGCUBE-100W

Equipment Under Test : POS PRINTER
Model Name : GCUBE-100W
Variant Model Names : Gcube-****, GCUBE-****, CALLISTO-****
(*: 0 to 9 or A to Z)
Approved Module ID : 2ADXS-WFM60-SFP2501
Applicant : Shin Heung Precision Co., Ltd.
Manufacturer : Shin Heung Precision Co., Ltd.
Date of Receipt : 2019.09.24
Date of Test(s) : 2019.09.24 ~ 2019.11.14
Date of Issue : 2019.12.10

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

Tested By:



Date:

2019.12.10

Murphy Kim

Technical
Manager:



Date:

2019.12.10

Jungmin Yang

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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)

- 10-2, LS-ro 182beon-gil, Gunpo-si, Gyeonggi-do, Korea, 15807
- 4, LS-ro 182beon-gil, Gunpo-si, Gyeonggi-do, Korea, 15807
- Designation number: KR0150

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Phone No. : +82 31 688 0901

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1.2. Details of Applicant

Applicant : Shin Heung Precision Co., Ltd.

Address : 53, Je3gongdan 3-gil, Seoun-myeon, Anseong-si, Gyeonggi-do, Korea, 17605

Contact Person : Ha, Byoung-jo

Phone No. : +82 2 2102 9857

1.3. Details of Manufacturer

Company : Same as applicant

Address : Same as applicant

1.4. Description of EUT

Kind of Product	POS PRINTER
Model Name	GCUBE-100W
Variant Model Names	Gcube-****, GCUBE-****, CALLISTO-**** (*: 0 to 9 or A to Z)
Approved module ID	2ADXS-WFM60-SFP2501
AC Adaptor Model Name	GM60-240250-F
Power Supply	DC 24 V
Frequency Range	5 180 MHz ~ 5 240 MHz (Band 1: 11a/n_HT20) 5 260 MHz ~ 5 320 MHz (Band 2A: 11a/n_HT20) 5 500 MHz ~ 5 700 MHz (Band 2C: 11a/n_HT20) 5 745 MHz ~ 5 825 MHz (Band 3: 11a/n_HT20)
Modulation Technique	OFDM
Number of Channels	4 channels (Band 1: 11a/n_HT20) 4 channels (Band 2A: 11a/n_HT20) 8 channels (Band 2C: 11a/n_HT20) 5 channels (Band 3: 11a/n_HT20)
Antenna Type	WIFI Dual band PCB Antenna
Antenna Gain	5 150 MHz ~ 5 250 MHz: 2.90 dB i 5 250 MHz ~ 5 350 MHz: 3.50 dB i 5 470 MHz ~ 5 725 MHz: 3.34 dB i 5 725 MHz ~ 5 850 MHz: 3.01 dB i

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1.5. Declaration by the Manufacturer

- The EUT is a slave without radar detection and TPC.
- The EUT is not supported TDWR(5.6 - 5.65 GHz) band.

1.6. Automatically Discontinue Transmission

1.6.1. Limit of Automatically Discontinue Transmission

The device shall automatically discontinue transmission in case of either absence of information to transmit or operating failure. These provisions are not intended to preclude the transmission of control or signaling information or the use of repetitive codes used by certain digital technologies to complete frame or burst intervals. Applicants shall include in their application for equipment authorization to describe how this requirement is met.

1.6.2. Test Result of Automatically Discontinue Transmission

While the EUT is not transmitting any information, the EUT can automatically discontinue transmission and become standby mode for power saving. The EUT can detect the controlling signal of ACK message transmitting from remote device and verify whether it shall resend or discontinue transmission.

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1.7. Test Equipment List

Equipment	Manufacturer	Model	S/N	Cal. Date	Cal. Interval	Cal. Due
Signal Generator	R&S	SMR40	100272	Jun. 07, 2019	Annual	Jun. 07, 2020
Signal Generator	R&S	SMBV100A	255834	Jun. 10, 2019	Annual	Jun. 10, 2020
Spectrum Analyzer	Agilent	N9020A	MY53421758	Sep. 11, 2019	Annual	Sep. 11, 2020
Spectrum Analyzer	Agilent	N9030A	US51350132	Sep. 11, 2019	Annual	Sep. 11, 2020
Power Meter	Anritsu	ML2495A	1223004	Jun. 05, 2019	Annual	Jun. 05, 2020
Power Sensor	Anritsu	MA2411B	1207272	Jun. 05, 2019	Annual	Jun. 05, 2020
Attenuator	MCLI	FAS-12-10	2	Jun. 07, 2019	Annual	Jun. 07, 2020
Low Pass Filter	Mini-Circuits	NLP-1200+	V 8979400903-2	Feb. 19, 2019	Annual	Feb. 19, 2020
High Pass Filter	Wainwright Instrument GmbH	WHKX6.0/18G-10SS	51	Jun. 07, 2019	Annual	Jun. 07, 2020
High Pass Filter	Wainwright Instrument GmbH	WHNX7.5/26.5G-6SS	15	Jun 05, 2019	Annual	Jun 05, 2020
DC Power Supply	R&S	HMP2020	019258024	Nov. 06, 2018	Annual	Nov. 06, 2019
Preamplifier	H.P.	8447F	2944A03909	Aug. 07, 2019	Annual	Aug. 07, 2020
Signal Conditioning Unit	R&S	SCU-18	10117	Jun. 12, 2019	Annual	Jun. 12, 2020
Preamplifier	MITEQ Inc.	JS44-18004000-35-8P	1546891	May 13, 2019	Annual	May 13, 2020
Loop Antenna	Schwarzbeck Mess-Elektronik	FMZB 1519	1519-039	Aug. 22, 2019	Biennial	Aug. 22, 2020
Bilog Antenna	Schwarzbeck Mess-Elektronik	VULB 9163	396	Mar. 21, 2019	Biennial	Mar. 21, 2021
Horn Antenna	R&S	HF906	100326	Feb. 14, 2018	Biennial	Feb. 14, 2020
Horn Antenna	Schwarzbeck Mess-Elektronik	BBHA 9170	BBHA9170431	Sep. 10, 2018	Biennial	Sep. 10, 2020
Test Receiver	R&S	ESCI 7	100911	Feb. 20, 2019	Annual	Feb. 20, 2020
Two-Line V-Network	R&S	ENV216	100190	May 14, 2019	Annual	May 14, 2020
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.
Test Receiver	R&S	ESU26	100109	Jan. 31, 2019	Annual	Jan. 31, 2020
Turn Table	Innco systems GmbH	DS 1200 S	N/A	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.
Antenna Mast	Innco systems GmbH	MA4640-XP-ET	MA4640/536/383 30516/L	N.C.R.	N/A	N.C.R.
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. 20, 2019	Semi-annual	Jan. 20, 2020
Coaxial Cable	SUCOFLEX	104 (10 m)	MY3145814	Jul. 20, 2019	Semi-annual	Jan. 20, 2020

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1.8. Summary of Test Result

The EUT has been tested according to the following specifications:

APPLIED STANDARD: FCC Part 15 Subpart E		
Section	Test Item(s)	Result
15.205(a) 15.209(a) 15.407(b)(1) 15.407(b)(2) 15.407(b)(3) 15.407(b)(4)	Transmitter Radiated Spurious Emissions	Complied
15.407(a)	26 dB Bandwidth & 99 % Bandwidth	Complied ¹⁾
15.407(e)	6 dB Bandwidth	Complied ¹⁾
15.407(a)(1) 15.407(a)(2) 15.407(a)(3)	Maximum Conducted Output Power	Complied
15.407(a)(1) 15.407(a)(2) 15.407(a)(3)	Peak Power Spectral Density	Complied ¹⁾
15.207	AC Power Line Conducted Emissions	Complied

Note ;

1) These conducted test items were omitted due to use of approved modules.
(Approved module FCC ID : 2ADXS-WFM60-SFP2501)

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1.9. Test Procedure(s)

The measurement procedures described in the American National Standard of Procedures for Compliance Testing of unlicensed Wireless Devices (ANSI C63.10-2013) and the guidance provided in KDB 789033 D02 General UNII Test Procedures New Rules v02r01 were used in the measurement of the DUT.

1.10. Sample Calculation

Where relevant, the following sample calculation is provided:

1.10.1. Radiation Test

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

1.11. Measurement Uncertainty

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

Parameter	Uncertainty
RF Output Power	± 0.34 dB
AC Conducted Emission	± 3.30 dB
Radiated Emission, 9 kHz to 30 MHz	± 3.59 dB
Radiated Emission, below 1 GHz	± 5.88 dB
Radiated Emission, above 1 GHz	± 5.94 dB

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

1.12. Test Report Revision

Revision	Report Number	Date of Issue	Description
0	F690501/RF-RTL014560	2019.11.26	Initial
1	F690501/RF-RTL014560-1	2019.12.10	Added the AC adaptor model name

1.13. Description of Variant Models

Model Name	Description
Gcube-100D	- Basic model
Gcube-****, GCUBE-****, CALLISTO-****	- These model names are made for marketing purpose

The suffix “” denote buyer code can be 0 to 9 or A to Z.

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1.14. Duty Cycle of EUT

Regarding to KDB 789033 D02 General UNII Test Procedures New Rules v02r01, B, the maximum duty cycles of all modes were investigated and set the spectrum analyzer as below.

Set RBW ≥ EBW if possible; otherwise, set RBW to the largest available value, Set VBW ≥ 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.

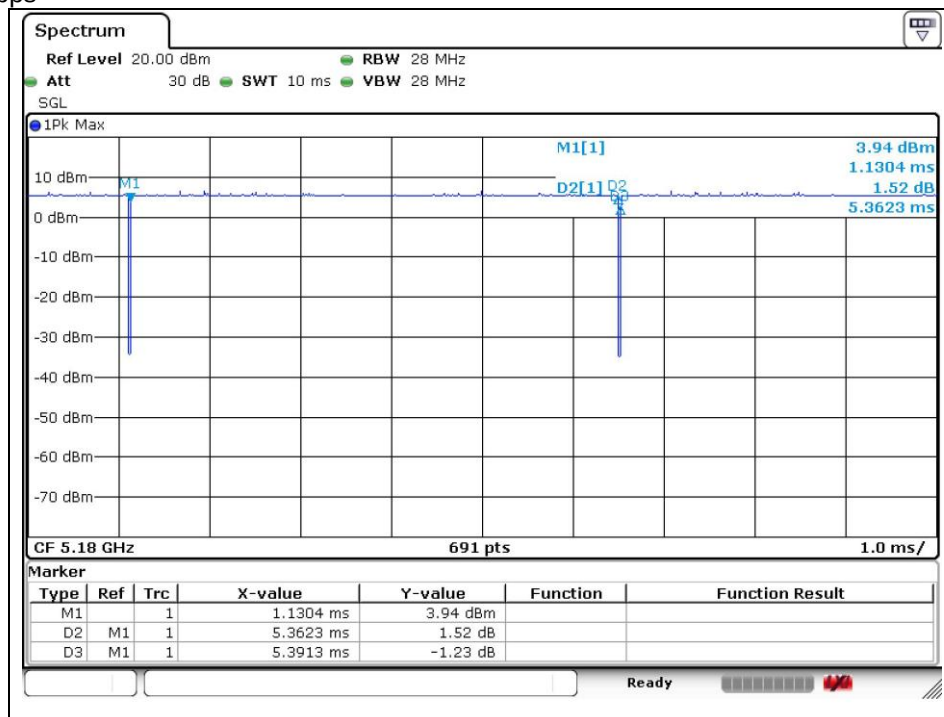
Mode	Data Rate (Mbps)	Duty Cycle (%)	Correction Factor (dB)
11a	6	99.46	0.02
11n_HT20	MCS0	99.44	0.02

Remark;

- 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.
- Duty Cycle (%) = (Tx on time / Tx on + off time) x 100
- Correction Factor (dB) = 10 log (1 / Duty Cycle)

- Test plots

802.11a_6 Mbps



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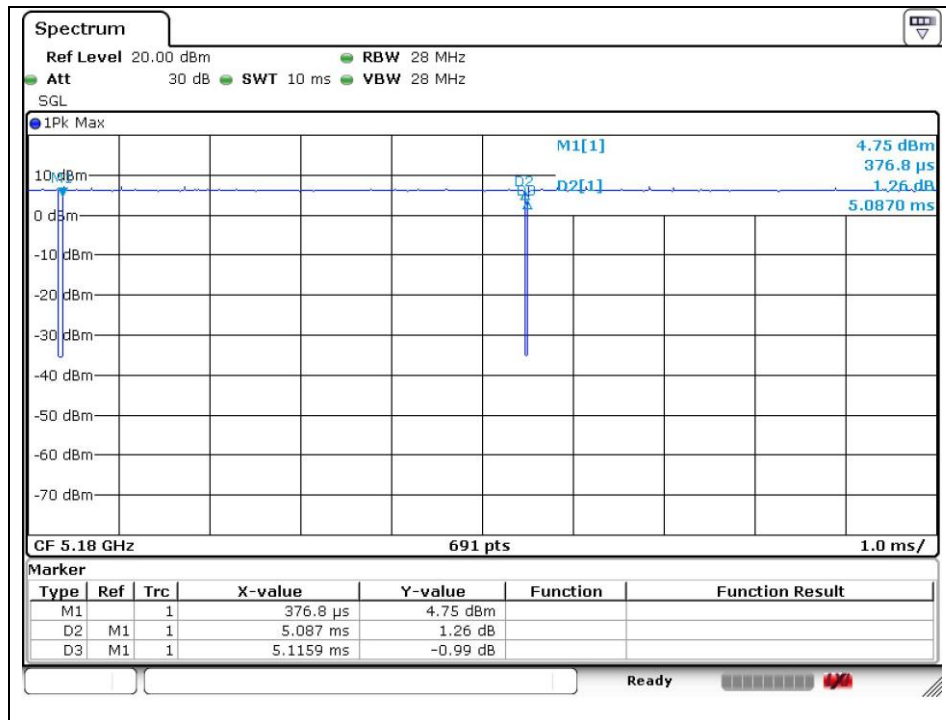
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802.11n_HT20_MCS0



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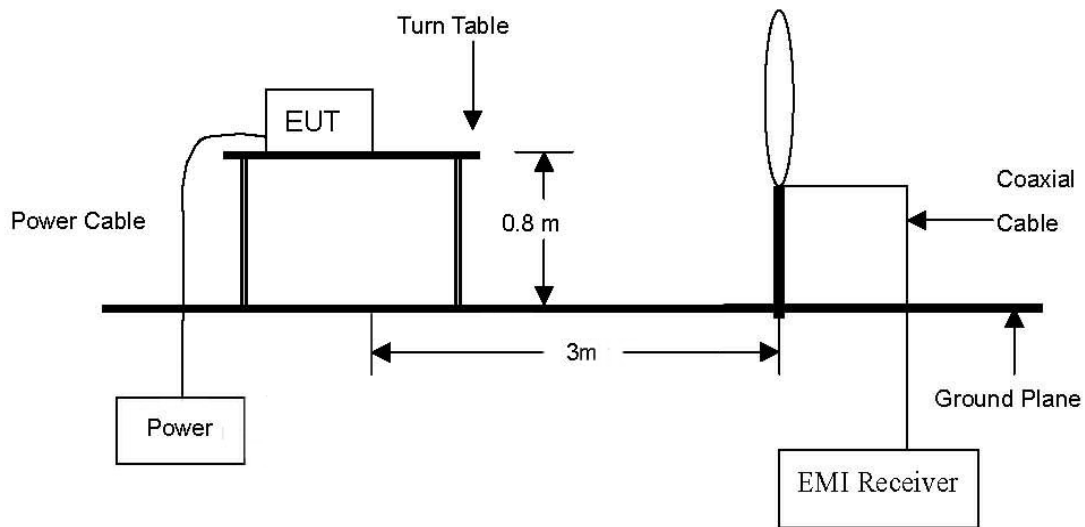
SGS Korea Co., Ltd. (Gunpo Laboratory) 4, LS-ro 182beon-gil, Gunpo-si, Gyeonggi-do, Korea, 15807 <http://www.sgsgroup.kr>

2. Transmitter Radiated Spurious Emissions

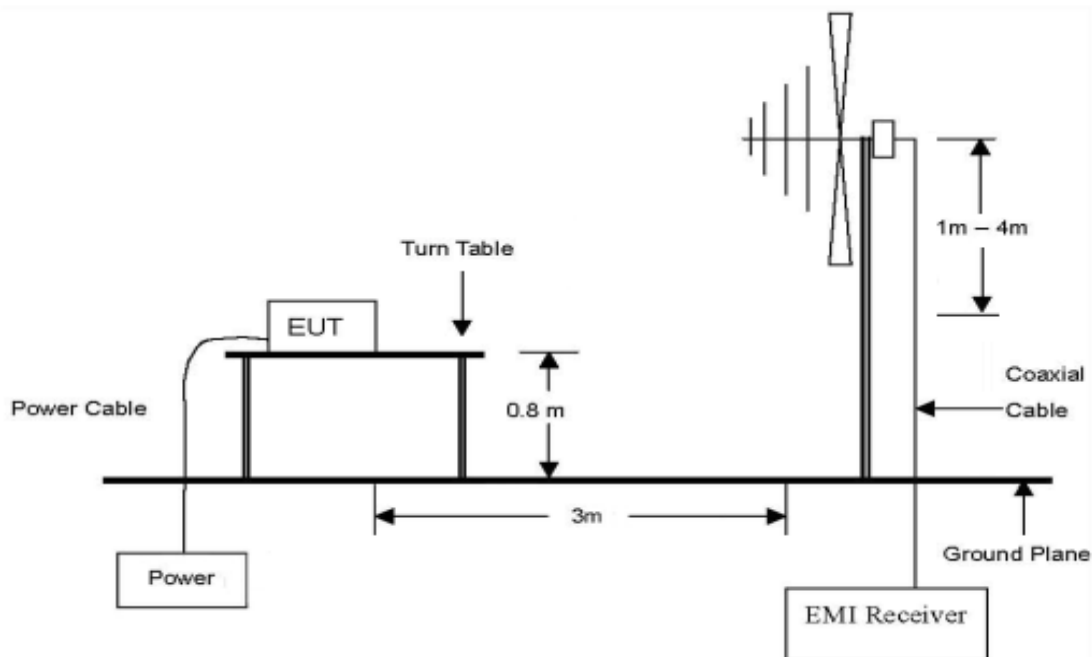
2.1. Test Setup

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 emissions.



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



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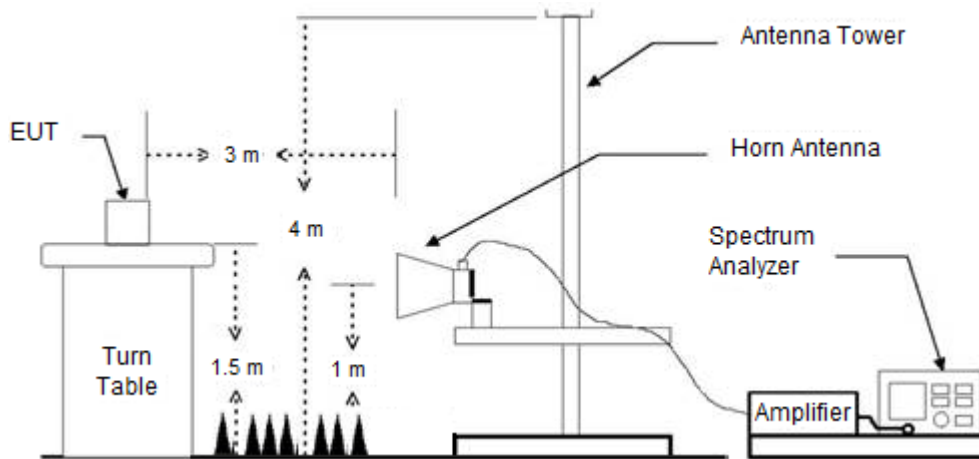
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The diagram below shows the test setup that is utilized to make the measurements for emission. The spurious emissions were investigated from 1 GHz to the 10th harmonic of the highest fundamental frequency or 40 GHz, whichever is lower.



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2.2. Limit

According to § 15.407(b)

- (1) For transmitters operating in the 5.15-5.25 GHz band: All emissions outside of the 5.15-5.35 GHz band shall not exceed an e.i.r.p. of -27 dB m/MHz.
- (2) For transmitters operating in the 5.25-5.35 GHz band: All emissions outside of the 5.15-5.35 GHz band shall not exceed an e.i.r.p. of -27 dB m/MHz.
- (3) For transmitters operating in the 5.47-5.725 GHz band: All emissions outside of the 5.47-5.725 GHz band shall not exceed an e.i.r.p. of -27 dB m/MHz.
- (4) For transmitters operating in the 5.725-5.85 GHz band:
 - (i) All emissions shall be limited to a level of -27 dB m/MHz at 75 MHz or more above or below the band edge increasing linearly to 10 dB m/MHz at 25 MHz above or below the band edge, and from 25 MHz above or below the band edge increasing linearly to a level of 15.6 dB m/MHz at 5 MHz above or below the band edge, and from 5 MHz above or below the band edge increasing linearly to a level of 27 dB m/MHz at the band edge.

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 ($\mu\text{V/m}$)	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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2.3. Test Procedures

Radiated spurious emissions from the EUT were measured according to the dictates in section G of KDB 789033 D02 General UNII Test Procedures New Rules v02r01 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.

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 meter 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.

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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.

- II.G.4. Unwanted emissions measurements below 1 GHz.

Compliance shall be demonstrated using CISPR quasi-peak detection; however, peak detection is permitted as an alternative to quasi-peak detection.

- II.G.5. Unwanted maximum emissions measurements above 1 GHz.

Peak emission levels are measured by setting the analyzer as follows:

Set to RBW = 1 MHz, VBW ≥ 3 MHz, Detector = Peak, Sweep time = auto, Trace mode= Max hold.

- II.G.6. Average unwanted emissions measurements above 1 GHz.

Set to RBW = 1 MHz, VBW ≥ 3 MHz, Detector = power averaging (rms), Averaging type = power averaging (rms), Sweep time = auto, Perform a trace average of at least 100 traces. If the transmission is continuous, If the transmission is not continuous, the number of traces shall be increased by a factor of 1/x, where x is the duty cycle. For example, with 50 % duty cycle, at least 200 traces shall be averaged.

If tests are performed with the EUT transmitting at a duty cycle less than 98 %, 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 % duty cycle. The correction factor is computed as follows:

- If power averaging (rms) mode was used in II.G.6.c)(iv), the correction factor is $10 \log (1/x)$, where x is the duty cycle. For example, if the transmit duty cycle was 50 %, then 3 dB must be added to the measured emission levels.

- Definition of the test orthogonal plan for EUT was described in the test setup photo.

The test orthogonal plan of EUT is **X – axis** during radiation test.

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2.4. Test Result

Ambient temperature : (23 ± 1) °C

Relative humidity : 47 % R.H.

2.4.1. Radiated Spurious Emission below 1 000 MHz

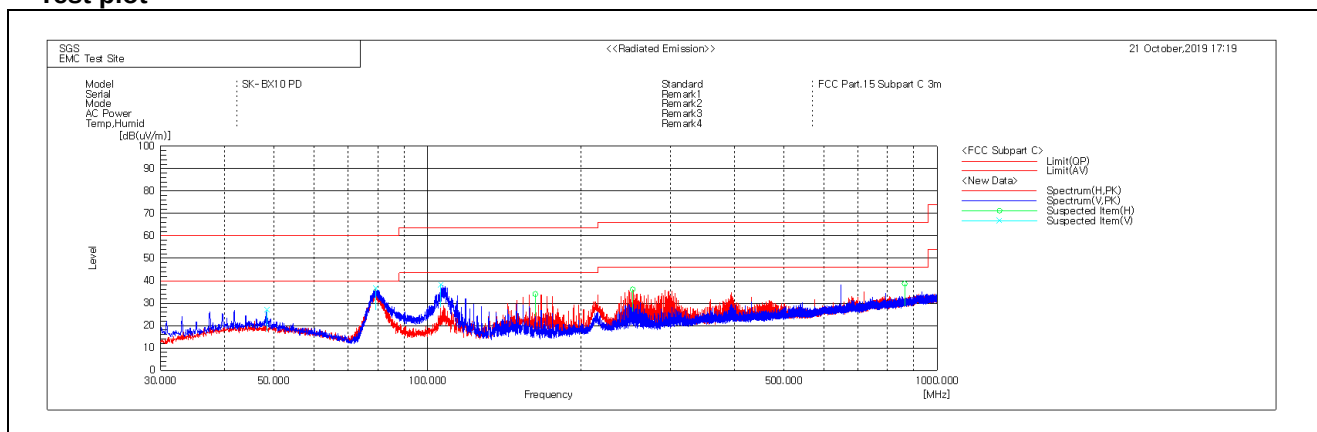
The frequency spectrum from 9 kHz to 1 000 MHz was investigated. All reading values are peak values.

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)
48.47	33.30	Peak	V	20.41	-26.73	26.98	40.00	13.02
79.27	51.40	Peak	V	11.73	-25.96	37.17	40.00	2.83
106.35	47.20	Peak	V	16.90	-25.59	38.51	43.50	4.99
162.97	44.90	Peak	H	14.40	-25.51	33.79	43.50	9.71
253.06	42.30	Peak	H	18.32	-25.44	35.18	46.00	10.82
863.96	34.30	Quasi-Peak	H	27.60	-23.15	38.75	46.00	7.25
Above 900.00	Not detected	-	-	-	-	-	-	-

Remark;

1. Spurious emissions for all channels and modes were investigated and almost the same below 1 GHz.
2. Reported spurious emissions are in **11n (Band 2A) / 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.

- Test plot



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A4(210 mm x 297 mm)

2.4.2. Radiated Spurious Emission above 1 000 MHz

802.11a (Band 1)_6 Mbps

A. Low Channel (5 180 MHz)

Radiated Emissions			Ant.	Correction Factors			Total	Limit	
Frequency (MHz)	Reading (dBμV)	Detect Mode	Pol.	AF (dB/m)	AMP+CL (dB)	DF (dB)	Actual (dBμV/m)	Limit (dBμV/m)	Margin (dB)
*4 500.00	24.01	Peak	H	31.80	-33.18	-	22.63	74.00	51.37
*4 500.00	12.89	Average	H	31.80	-33.18	-	11.51	54.00	42.49
*4 628.25	25.20	Peak	H	31.81	-32.98	-	24.03	74.00	49.97
*5 027.28	15.13	Average	H	33.01	-32.19	-	15.95	54.00	38.05
*5 150.00	25.05	Peak	H	33.30	-32.01	-	26.34	74.00	47.66
*5 150.00	14.58	Average	H	33.30	-32.01	-	15.87	54.00	38.13

Radiated Emissions			Ant.	Correction Factors			Total	Limit	
Frequency (MHz)	Reading (dBμV)	Detect Mode	Pol.	AF (dB/m)	AMP+CL (dB)	DF (dB)	Actual (dBμV/m)	Limit (dBμV/m)	Margin (dB)
10 359.70	41.44	Peak	V	37.40	-27.18	-	51.66	68.23	16.57
Above 10 400.00	Not detected	-	-	-	-	-	-	-	-

B. Middle Channel (5 220 MHz)

Radiated Emissions			Ant.	Correction Factors			Total	Limit	
Frequency (MHz)	Reading (dBμV)	Detect Mode	Pol.	AF (dB/m)	AMP+CL (dB)	DF (dB)	Actual (dBμV/m)	Limit (dBμV/m)	Margin (dB)
10 405.50	42.16	Peak	V	37.40	-27.09	-	52.47	68.23	15.76
Above 10 500.00	Not detected	-	-	-	-	-	-	-	-

C. High Channel (5 240 MHz)

Radiated Emissions			Ant.	Correction Factors			Total	Limit	
Frequency (MHz)	Reading (dBμV)	Detect Mode	Pol.	AF (dB/m)	AMP+CL (dB)	DF (dB)	Actual (dBμV/m)	Limit (dBμV/m)	Margin (dB)
10 478.70	45.17	Peak	V	37.40	-26.81	-	55.76	68.23	12.47
Above 10 500.00	Not detected	-	-	-	-	-	-	-	-

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802.11a (Band 2A)_6 Mbps

A. Low Channel (5 260 MHz)

Radiated Emissions			Ant.	Correction Factors			Total	Limit	
Frequency (MHz)	Reading (dBμV)	Detect Mode	Pol.	AF (dB/m)	AMP+CL (dB)	DF (dB)	Actual (dBμV/m)	Limit (dBμV/m)	Margin (dB)
10 516.80	44.74	Peak	V	37.40	-26.69	-	55.45	68.23	12.78
Above 10 600.00	Not detected	-	-	-	-	-	-	-	-

B. Middle Channel (5 300 MHz)

Radiated Emissions			Ant.	Correction Factors			Total	Limit	
Frequency (MHz)	Reading (dBμV)	Detect Mode	Pol.	AF (dB/m)	AMP+CL (dB)	DF (dB)	Actual (dBμV/m)	Limit (dBμV/m)	Margin (dB)
*10 600.00	42.31	Peak	V	37.40	-26.54	-	53.17	74.00	20.83
*10 599.40	31.53	Average	V	37.40	-26.54	-	42.39	54.00	11.61
Above 10 700.00	Not detected	-	-	-	-	-	-	-	-

C. High Channel (5 320 MHz)

Radiated Emissions			Ant.	Correction Factors			Total	Limit	
Frequency (MHz)	Reading (dBμV)	Detect Mode	Pol.	AF (dB/m)	AMP+CL (dB)	DF (dB)	Actual (dBμV/m)	Limit (dBμV/m)	Margin (dB)
*5 350.00	22.71	Peak	H	33.70	-31.83	-	24.58	74.00	49.42
*5 350.00	13.36	Average	H	33.70	-31.83	-	15.23	54.00	38.77
*5 417.81	25.40	Peak	H	33.64	-31.81	-	27.23	74.00	46.77
*5 398.01	13.77	Average	H	33.60	-31.82	-	15.55	54.00	38.45
*5 460.00	23.29	Peak	H	33.74	-31.81	-	25.22	74.00	48.78
*5 460.00	13.63	Average	H	33.74	-31.81	-	15.56	54.00	38.44

Radiated Emissions			Ant.	Correction Factors			Total	Limit	
Frequency (MHz)	Reading (dBμV)	Detect Mode	Pol.	AF (dB/m)	AMP+CL (dB)	DF (dB)	Actual (dBμV/m)	Limit (dBμV/m)	Margin (dB)
*10 639.80	40.58	Peak	V	37.48	-26.59	-	51.47	74.00	22.53
*10 640.00	30.57	Average	V	37.48	-26.59	-	41.46	54.00	12.54
Above 10 700.00	Not detected	-	-	-	-	-	-	-	-

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802.11a (Band 2C)_6 Mbps

A. Low Channel (5 500 MHz)

Radiated Emissions			Ant.	Correction Factors			Total	Limit	
Frequency (MHz)	Reading (dBμV)	Detect Mode	Pol.	AF (dB/m)	AMP+CL (dB)	DF (dB)	Actual (dBμV/m)	Limit (dBμV/m)	Margin (dB)
*5 350.00	22.06	Peak	H	33.70	-31.83	-	23.93	74.00	50.07
*5 350.00	13.22	Average	H	33.70	-31.83	-	15.09	54.00	38.91
*5 446.28	24.71	Peak	H	33.69	-31.80	-	26.60	74.00	47.40
*5 445.43	14.01	Average	H	33.69	-31.80	-	15.90	54.00	38.10
*5 460.00	22.62	Peak	H	33.74	-31.81	-	24.55	74.00	49.45
*5 460.00	13.77	Average	H	33.74	-31.81	-	15.70	54.00	38.30

Radiated Emissions			Ant.	Correction Factors			Total	Limit	
Frequency (MHz)	Reading (dBμV)	Detect Mode	Pol.	AF (dB/m)	AMP+CL (dB)	DF (dB)	Actual (dBμV/m)	Limit (dBμV/m)	Margin (dB)
*10 996.80	43.89	Peak	V	38.00	-26.44	-	55.45	74.00	18.55
*11 001.70	33.40	Average	V	38.00	-26.43	-	44.97	54.00	9.03
Above 11 100.00	Not detected	-	-	-	-	-	-	-	-

B. Middle Channel (5 580 MHz)

Radiated Emissions			Ant.	Correction Factors			Total	Limit	
Frequency (MHz)	Reading (dBμV)	Detect Mode	Pol.	AF (dB/m)	AMP+CL (dB)	DF (dB)	Actual (dBμV/m)	Limit (dBμV/m)	Margin (dB)
*11 156.60	44.84	Peak	V	38.00	-26.03	-	56.81	74.00	17.19
*11 160.50	34.66	Average	V	38.00	-26.03	-	46.63	54.00	7.37
Above 11 200.00	Not detected	-	-	-	-	-	-	-	-

C. High Channel (5 700 MHz)

Radiated Emissions			Ant.	Correction Factors			Total	Limit	
Frequency (MHz)	Reading (dBμV)	Detect Mode	Pol.	AF (dB/m)	AMP+CL (dB)	DF (dB)	Actual (dBμV/m)	Limit (dBμV/m)	Margin (dB)
*11 399.70	39.48	Peak	V	38.20	-25.85	-	51.83	74.00	22.17
*11 400.00	29.88	Average	V	38.20	-25.85	-	42.23	54.00	11.77
Above 11 500.00	Not detected	-	-	-	-	-	-	-	-

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802.11a (Band 3)_6 Mbps

A. Low Channel (5 745 MHz)

Radiated Emissions			Ant.	Correction Factors		Total	Limit	
Frequency (MHz)	Reading (dB μ V)	Detect Mode	Pol.	AF (dB/m)	AMP+CL (dB)	Actual (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)
5 633.33	26.60	Peak	H	33.70	-31.56	28.74	68.23	39.49
5 669.80	25.86	Peak	H	33.78	-31.57	28.07	82.88	54.81
5 701.81	26.48	Peak	H	33.90	-31.57	28.81	105.73	76.92
5 724.58	27.68	Peak	H	33.90	-31.54	30.04	121.27	91.23

Radiated Emissions			Ant.	Correction Factors			Total	Limit	
Frequency (MHz)	Reading (dB μ V)	Detect Mode	Pol.	AF (dB/m)	AMP+CL (dB)	DF (dB)	Actual (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)
*11 487.00	39.37	Peak	V	38.45	-25.52	-	52.30	74.00	21.70
*11 489.90	28.59	Average	V	38.46	-25.51	-	41.54	54.00	12.46
Above 11 500.00	Not detected	-	-	-	-	-	-	-	-

B. Middle Channel (5 785 MHz)

Radiated Emissions			Ant.	Correction Factors			Total	Limit	
Frequency (MHz)	Reading (dB μ V)	Detect Mode	Pol.	AF (dB/m)	AMP+CL (dB)	DF (dB)	Actual (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)
*11 568.10	38.69	Peak	V	38.60	-25.56	-	51.73	74.00	22.27
*11 570.20	25.14	Average	V	38.60	-25.56	-	38.18	54.00	15.82
Above 11 600.00	Not detected	-	-	-	-	-	-	-	-

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A4(210 mm x 297 mm)

C. High Channel (5 825 MHz)

Radiated Emissions			Ant.	Correction Factors			Total	Limit	
Frequency (MHz)	Reading (dB μ V)	Detect Mode	Pol.	AF (dB/m)	AMP+CL (dB)	DF (dB)	Actual (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)
5 852.40	26.49	Peak	H	34.01	-31.28		29.22	116.76	87.54
5 867.60	25.80	Peak	H	34.11	-31.30		28.61	107.30	78.69
5 879.40	25.93	Peak	H	34.18	-31.30		28.81	101.97	73.16
5 935.80	26.24	Peak	H	34.37	-31.29		29.32	68.23	38.91

Radiated Emissions			Ant.	Correction Factors			Total	Limit	
Frequency (MHz)	Reading (dB μ V)	Detect Mode	Pol.	AF (dB/m)	AMP+CL (dB)	DF (dB)	Actual (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)
*11 645.30	37.87	Peak	V	38.51	-25.53	-	50.85	74.00	23.15
*11 650.00	27.12	Average	V	38.50	-25.52	-	40.10	54.00	13.90
Above 11 700.00	Not detected	-	-	-	-	-	-	-	-

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A4(210 mm x 297 mm)

802.11n_HT20 (Band 1)_MCS0

A. Low Channel (5 180 MHz)

Radiated Emissions			Ant.	Correction Factors			Total	Limit	
Frequency (MHz)	Reading (dBμV)	Detect Mode	Pol.	AF (dB/m)	AMP+CL (dB)	DF (dB)	Actual (dBμV/m)	Limit (dBμV/m)	Margin (dB)
*4 500.00	23.22	Peak	H	31.80	-33.18	-	21.84	74.00	52.16
*4 500.00	12.90	Average	H	31.80	-33.18	-	11.52	54.00	42.48
*5 075.92	25.67	Peak	H	33.20	-32.16	-	26.71	74.00	47.29
*5 049.84	15.12	Average	H	33.10	-32.13	-	16.09	54.00	37.91
*5 150.00	24.66	Peak	H	33.30	-32.01	-	25.95	74.00	48.05
*5 150.00	14.98	Average	H	33.30	-32.01	-	16.27	54.00	37.73

Radiated Emissions			Ant.	Correction Factors			Total	Limit	
Frequency (MHz)	Reading (dBμV)	Detect Mode	Pol.	AF (dB/m)	AMP+CL (dB)	DF (dB)	Actual (dBμV/m)	Limit (dBμV/m)	Margin (dB)
10 358.60	43.33	Peak	V	37.40	-27.18	-	53.55	68.23	14.68
Above 10 400.00	Not detected	-	-	-	-	-	-	-	-

B. Middle Channel (5 220 MHz)

Radiated Emissions			Ant.	Correction Factors			Total	Limit	
Frequency (MHz)	Reading (dBμV)	Detect Mode	Pol.	AF (dB/m)	AMP+CL (dB)	DF (dB)	Actual (dBμV/m)	Limit (dBμV/m)	Margin (dB)
10 400.70	44.88	Peak	V	37.40	-27.11	-	55.17	68.23	13.06
Above 10 500.00	Not detected	-	-	-	-	-	-	-	-

C. High Channel (5 240 MHz)

Radiated Emissions			Ant.	Correction Factors			Total	Limit	
Frequency (MHz)	Reading (dBμV)	Detect Mode	Pol.	AF (dB/m)	AMP+CL (dB)	DF (dB)	Actual (dBμV/m)	Limit (dBμV/m)	Margin (dB)
10 479.10	47.85	Peak	V	37.40	-26.81	-	58.44	68.23	9.79
Above 10 500.00	Not detected	-	-	-	-	-	-	-	-

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802.11n_HT20 (Band 2A)_MCS0

A. Low Channel (5 260 MHz)

Radiated Emissions			Ant.	Correction Factors			Total	Limit	
Frequency (MHz)	Reading (dB μ V)	Detect Mode	Pol.	AF (dB/m)	AMP+CL (dB)	DF (dB)	Actual (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)
10 519.00	46.51	Peak	V	37.40	-26.69	-	57.22	68.23	11.01
Above 10 600.00	Not detected	-	-	-	-	-	-	-	-

B. Middle Channel (5 300 MHz)

Radiated Emissions			Ant.	Correction Factors			Total	Limit	
Frequency (MHz)	Reading (dB μ V)	Detect Mode	Pol.	AF (dB/m)	AMP+CL (dB)	DF (dB)	Actual (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)
*10 601.00	44.88	Peak	V	37.40	-26.54	-	55.74	74.00	18.26
*10 599.70	33.99	Average	V	37.40	-26.54	-	44.85	54.00	9.15
Above 10 700.00	Not detected	-	-	-	-	-	-	-	-

C. High Channel (5 320 MHz)

Radiated Emissions			Ant.	Correction Factors			Total	Limit	
Frequency (MHz)	Reading (dB μ V)	Detect Mode	Pol.	AF (dB/m)	AMP+CL (dB)	DF (dB)	Actual (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)
*5 350.00	24.01	Peak	H	33.70	-31.83	-	25.88	74.00	48.12
*5 350.00	13.61	Average	H	33.70	-31.83	-	15.48	54.00	38.52
*5 387.12	24.85	Peak	H	33.63	-31.83	-	26.65	74.00	47.35
*5 390.92	14.02	Average	H	33.62	-31.82	-	15.82	54.00	38.18
*5 460.00	22.71	Peak	H	33.74	-31.81	-	24.64	74.00	49.36
*5 460.00	13.47	Average	H	33.74	-31.81	-	15.40	54.00	38.60

Radiated Emissions			Ant.	Correction Factors			Total	Limit	
Frequency (MHz)	Reading (dB μ V)	Detect Mode	Pol.	AF (dB/m)	AMP+CL (dB)	DF (dB)	Actual (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)
*10 639.50	42.49	Peak	V	37.48	-26.59	-	53.38	74.00	20.62
*10 640.00	32.15	Average	V	37.48	-26.59	-	43.04	54.00	10.96
Above 10 700.00	Not detected	-	-	-	-	-	-	-	-

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802.11n_HT20 (Band 2C)_MCS0

A. Low Channel (5 500 MHz)

Radiated Emissions			Ant.	Correction Factors			Total	Limit	
Frequency (MHz)	Reading (dB μ V)	Detect Mode	Pol.	AF (dB/m)	AMP+CL (dB)	DF (dB)	Actual (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)
*5 350.00	23.62	Peak	H	33.70	-31.83	-	25.49	74.00	48.51
*5 350.00	12.90	Average	H	33.70	-31.83	-	14.77	54.00	39.23
*5 411.09	25.15	Peak	H	33.62	-31.81	-	26.96	74.00	47.04
*5 456.31	13.90	Average	H	33.73	-31.81	-	15.82	54.00	38.18
*5 460.00	24.52	Peak	H	33.74	-31.81	-	26.45	74.00	47.55
*5 460.00	13.89	Average	H	33.74	-31.81	-	15.82	54.00	38.18

Radiated Emissions			Ant.	Correction Factors			Total	Limit	
Frequency (MHz)	Reading (dB μ V)	Detect Mode	Pol.	AF (dB/m)	AMP+CL (dB)	DF (dB)	Actual (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)
*11 001.40	47.04	Peak	V	38.00	-26.43	-	58.61	74.00	15.39
*10 999.80	35.63	Average	V	38.00	-26.44	-	47.19	54.00	6.81
Above 11 100.00	Not detected	-	-	-	-	-	-	-	-

B. Middle Channel (5 580 MHz)

Radiated Emissions			Ant.	Correction Factors			Total	Limit	
Frequency (MHz)	Reading (dB μ V)	Detect Mode	Pol.	AF (dB/m)	AMP+CL (dB)	DF (dB)	Actual (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)
*11 161.30	47.15	Peak	V	38.00	-26.03	-	59.12	74.00	14.88
*11 160.20	36.13	Average	V	38.00	-26.03	-	48.10	54.00	5.90
Above 11 200.00	Not detected	-	-	-	-	-	-	-	-

C. High Channel (5 700 MHz)

Radiated Emissions			Ant.	Correction Factors			Total	Limit	
Frequency (MHz)	Reading (dB μ V)	Detect Mode	Pol.	AF (dB/m)	AMP+CL (dB)	DF (dB)	Actual (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)
*11 401.50	44.67	Peak	V	38.20	-25.84	-	57.03	74.00	16.97
*11 399.70	32.97	Average	V	38.20	-25.85	-	45.32	54.00	8.68
Above 11 500.00	Not detected	-	-	-	-	-	-	-	-

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802.11n_HT20 (Band 3)_MCS0

A. Low Channel (5 745 MHz)

Radiated Emissions			Ant.	Correction Factors		Total	Limit	
Frequency (MHz)	Reading (dB μ V)	Detect Mode	Pol.	AF (dB/m)	AMP+CL (dB)	Actual (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)
5 645.05	26.12	Peak	H	33.70	-31.56	28.26	68.23	39.97
5 687.29	25.41	Peak	H	33.85	-31.56	27.70	95.82	68.12
5 720.00	26.25	Peak	H	33.90	-31.55	28.60	110.83	82.23
5 721.94	29.69	Peak	H	33.90	-31.54	32.05	115.25	83.20

Radiated Emissions			Ant.	Correction Factors			Total	Limit	
Frequency (MHz)	Reading (dB μ V)	Detect Mode	Pol.	AF (dB/m)	AMP+CL (dB)	DF (dB)	Actual (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)
*11 488.60	42.60	Peak	V	38.45	-25.52	-	55.53	74.00	18.47
*11 489.90	31.10	Average	V	38.46	-25.51	-	44.05	54.00	9.95
Above 11 500.00	Not detected	-	-	-	-	-	-	-	-

B. Middle Channel (5 785 MHz)

Radiated Emissions			Ant.	Correction Factors			Total	Limit	
Frequency (MHz)	Reading (dB μ V)	Detect Mode	Pol.	AF (dB/m)	AMP+CL (dB)	DF (dB)	Actual (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)
*11 570.70	38.20	Peak	V	38.60	-25.56	-	51.24	74.00	22.76
*11 568.50	26.95	Average	V	38.60	-25.56	-	39.99	54.00	14.01
Above 11 600.00	Not detected	-	-	-	-	-	-	-	-

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C. High Channel (5 825 MHz)

Radiated Emissions			Ant.	Correction Factors		Total	Limit	
Frequency (MHz)	Reading (dB μ V)	Detect Mode	Pol.	AF (dB/m)	AMP+CL (dB)	Actual (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)
5 855.00	29.59	Peak	H	34.03	-31.28	32.34	110.83	78.49
5 861.20	25.70	Peak	H	34.07	-31.28	28.49	109.09	80.60
5 921.60	25.83	Peak	H	34.34	-31.31	28.86	70.74	41.88
5 978.60	26.15	Peak	H	34.40	-31.23	29.32	68.56	39.24

Radiated Emissions			Ant.	Correction Factors			Total	Limit	
Frequency (MHz)	Reading (dB μ V)	Detect Mode	Pol.	AF (dB/m)	AMP+CL (dB)	DF (dB)	Actual (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)
*11 648.60	40.54	Peak	V	38.50	-25.52	-	53.52	74.00	20.48
*11 649.40	28.87	Average	V	38.50	-25.52	-	41.85	54.00	12.15
Above 11 700.00	Not detected	-	-	-	-	-	-	-	-

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A4(210 mm x 297 mm)

Remark;

1. “*” means the restricted band.
2. Radiated emissions measured in frequency above 1 000 MHz were made with an instrument using Peak / average detector mode if frequency was in restricted band. Otherwise the frequency was out of restricted band, only peak detector should be used.
3. Actual = Reading + AF + AMP + CL + (DF)
4. If frequency was out of restricted band, the calculation method for peak limit is same as below.

$$68.23 \text{ dB}\mu\text{V/m} = \text{EIRP} - 20 \log(d) + 104.77 = -27 - 20 \log(3) + 104.77$$
5. In case of the emissions within $\pm 75 \text{ MHz}$ from band edge of band 3, limit should be adjusted to emission mask of 15.407(4)(i).
6. According to § 15.31(o), emission levels are not reported much lower than the limits by over 20 dB.
7. The maximized peak measured value complies with the average limit, to perform an average measurement is unnecessary.

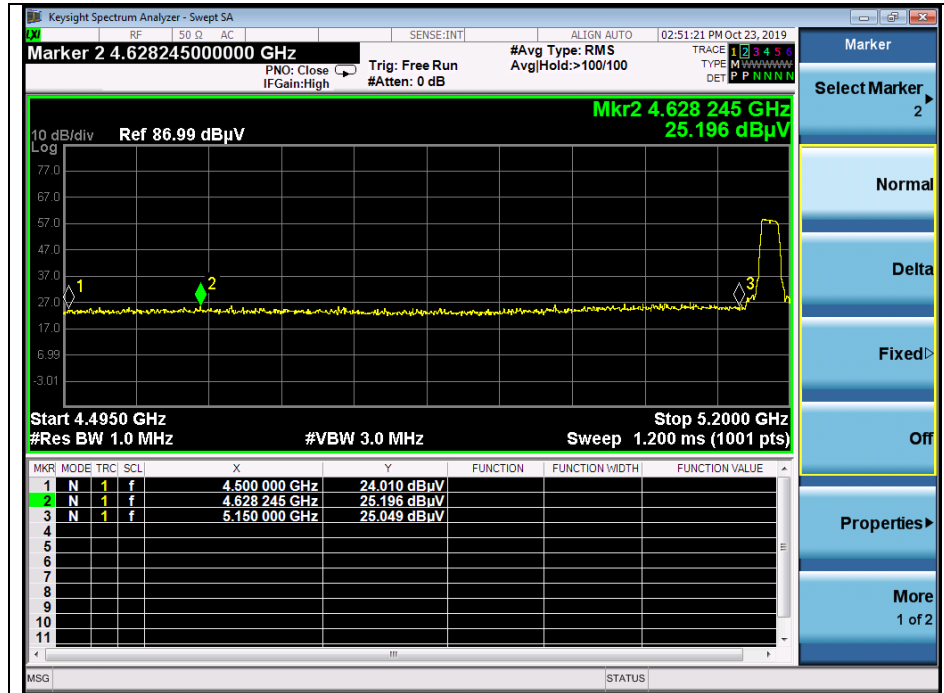
The results of this test report are effective only to the items tested. The SGS Korea is not responsible for the sampling, the results of this test report apply to the sample as received. This test report cannot be reproduced, except in full, without prior written permission of the Company. This test report does not assure KOLAS accreditation.

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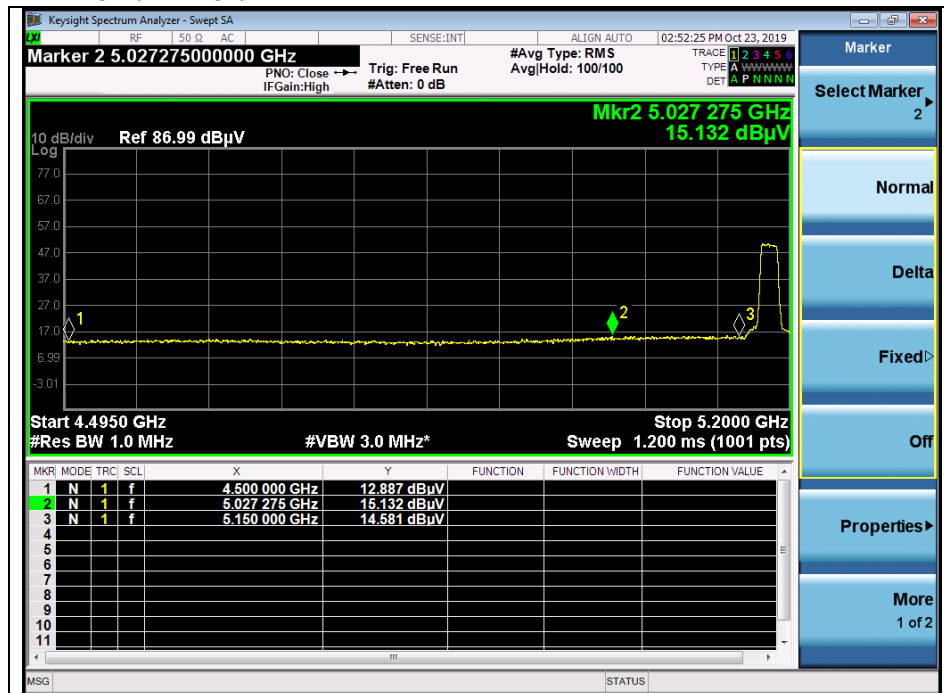
- Test plots

OFDM: 802.11a (6 Mbps)

Low channel Band edge (Peak) - Band 1



Low channel Band edge (Average) - Band 1



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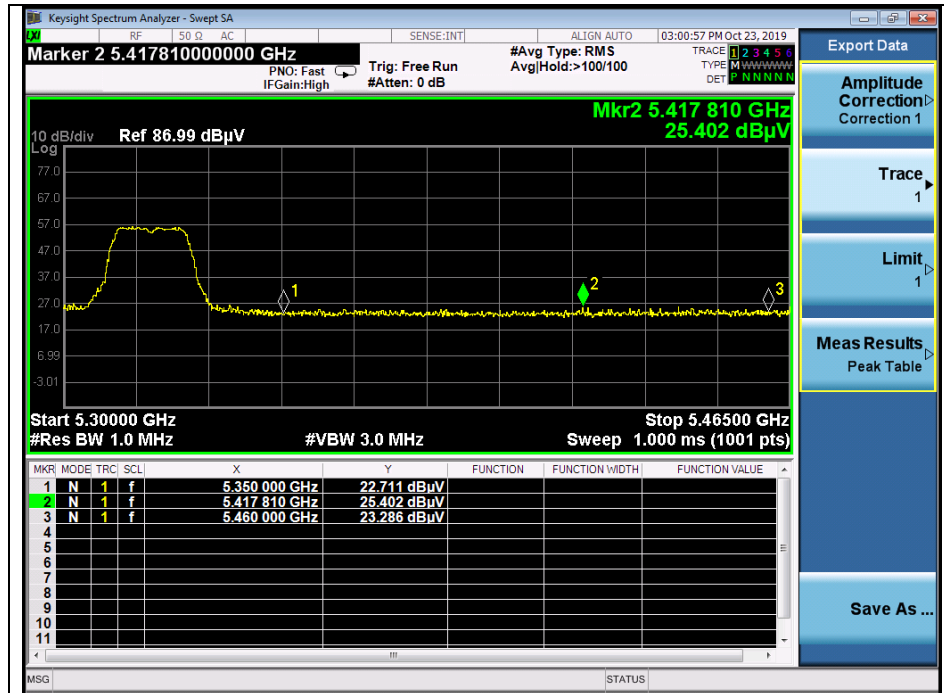
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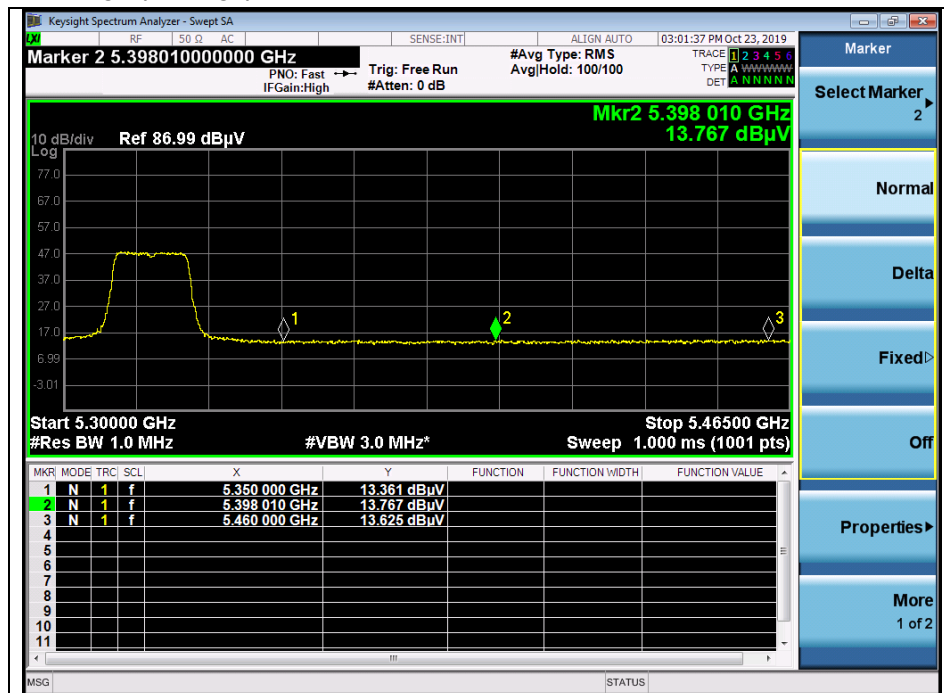
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A4(210 mm x 297 mm)

High channel Band edge (Peak) - Band 2A



High channel Band edge (Average) - Band 2A



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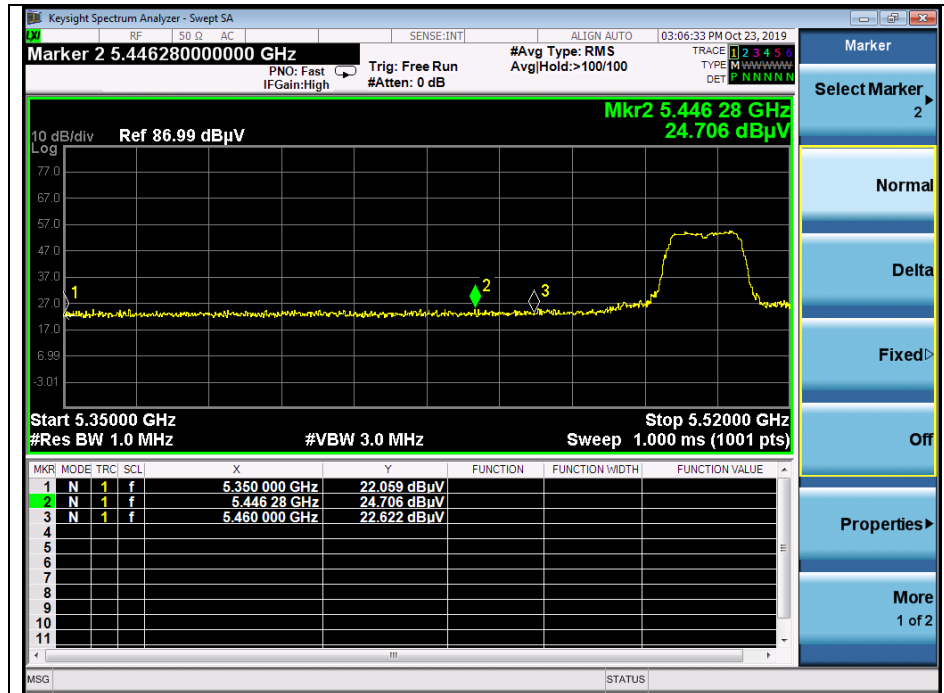
SGS Korea Co., Ltd. (Gunpo Laboratory) 4, LS-ro 182beon-gil, Gunpo-si, Gyeonggi-do, Korea, 15807 <http://www.sgsgroup.kr>

RTT5041-19(2019.04.24)(1)

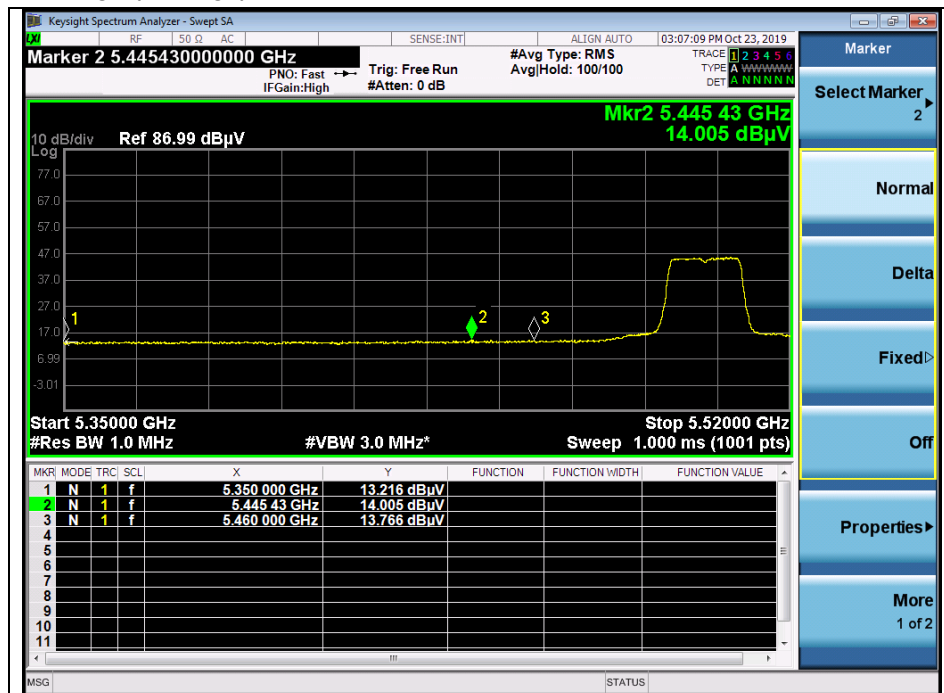
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A4(210 mm x 297 mm)

Low channel Band edge (Peak) - Band 2C



Low channel Band edge (Average) - Band 2C



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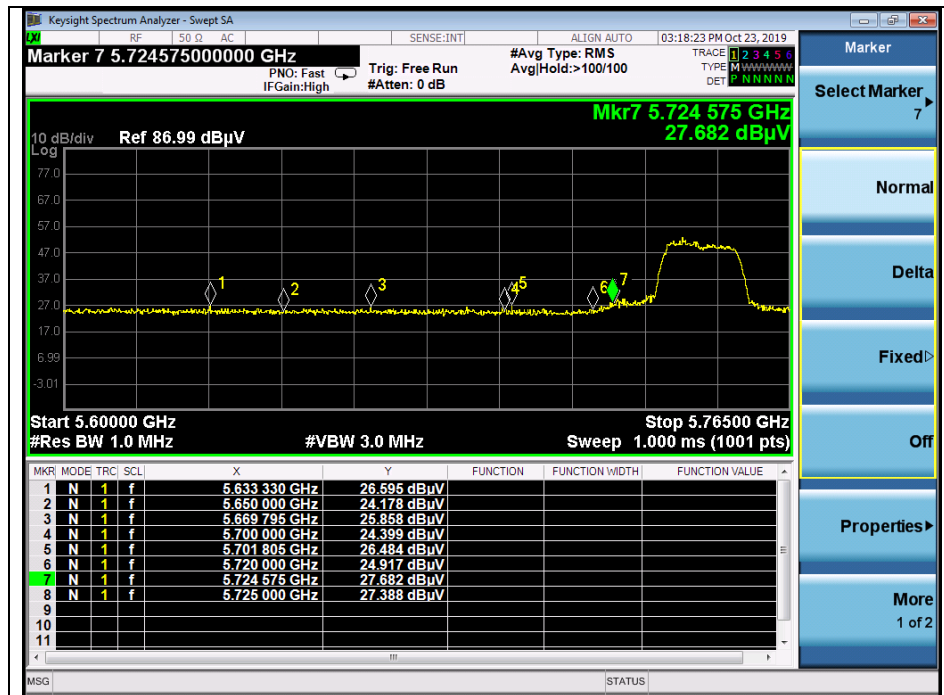
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RTT5041-19(2019.04.24)(1)

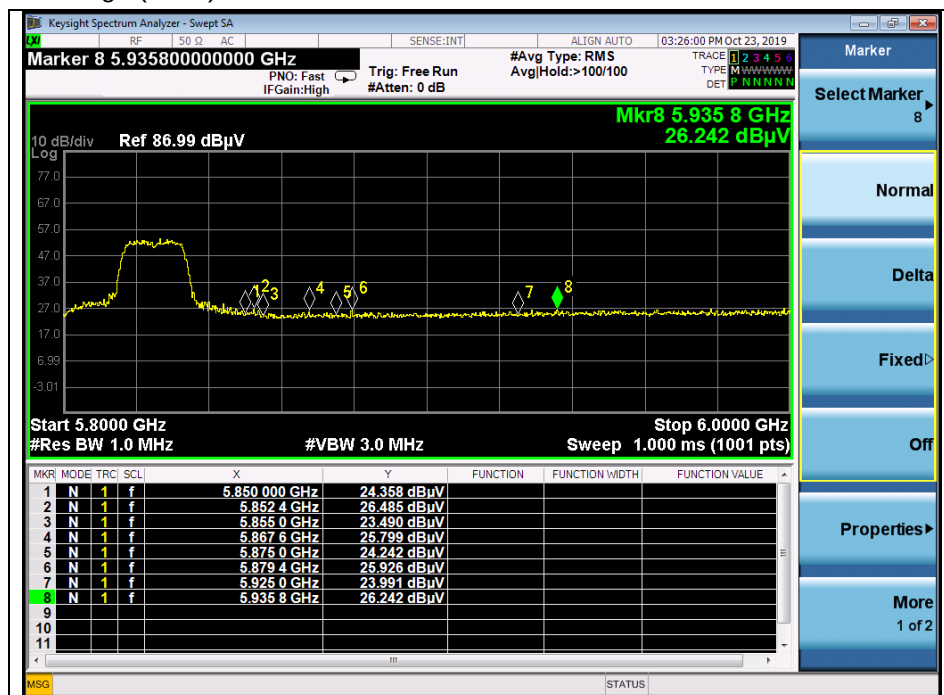
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A4(210 mm x 297 mm)

Low channel Band edge (Peak) - Band 3



High channel Band edge (Peak) - Band 3



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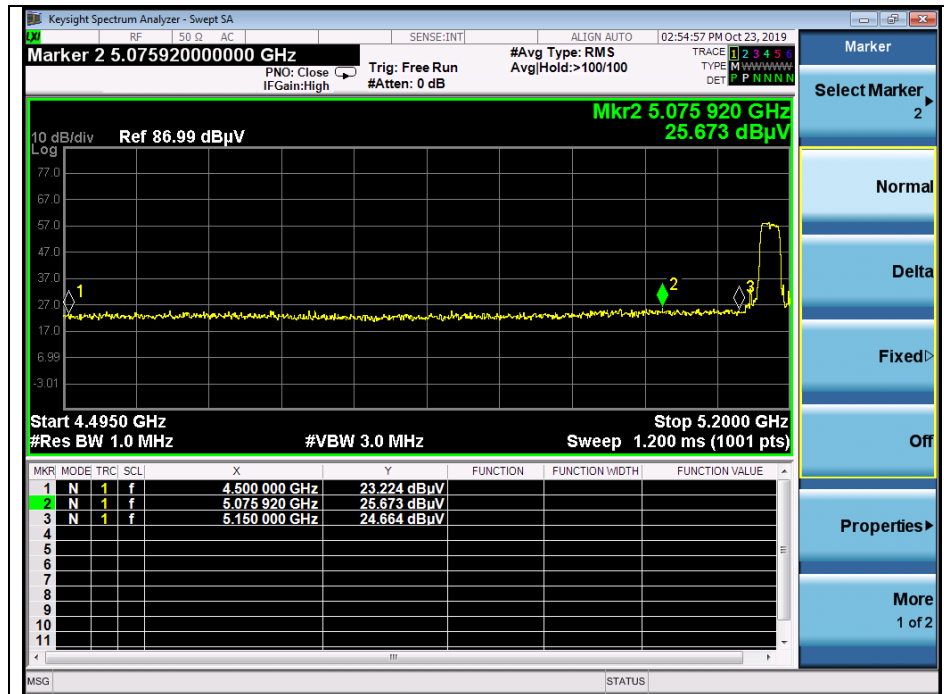
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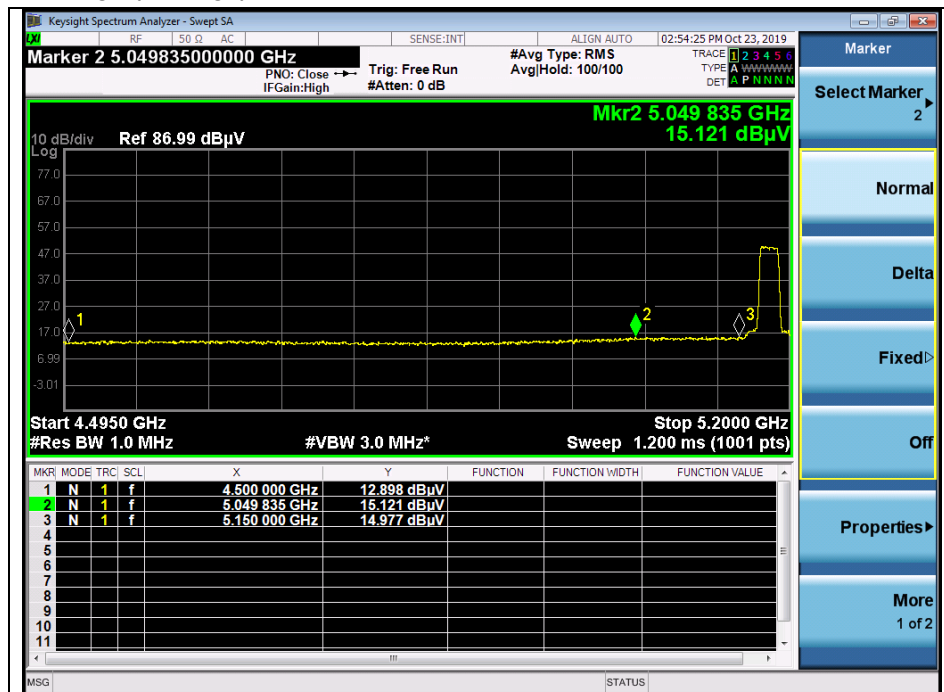
A4(210 mm x 297 mm)

OFDM: 802.11n_HT20 (MCS0)

Low channel Band edge (Peak) - Band 1



Low channel Band edge (Average) - Band 1



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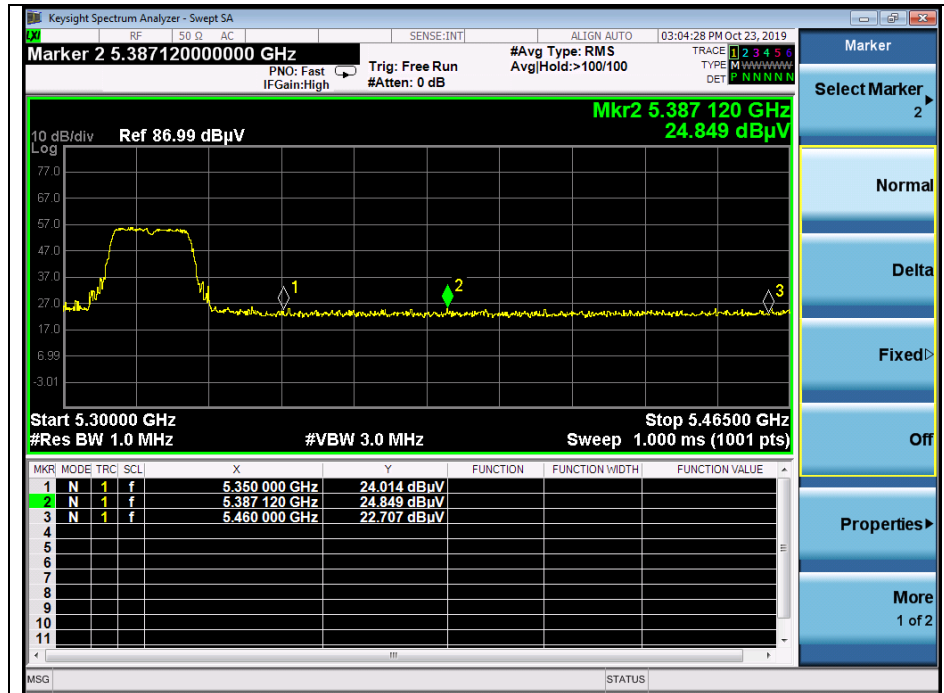
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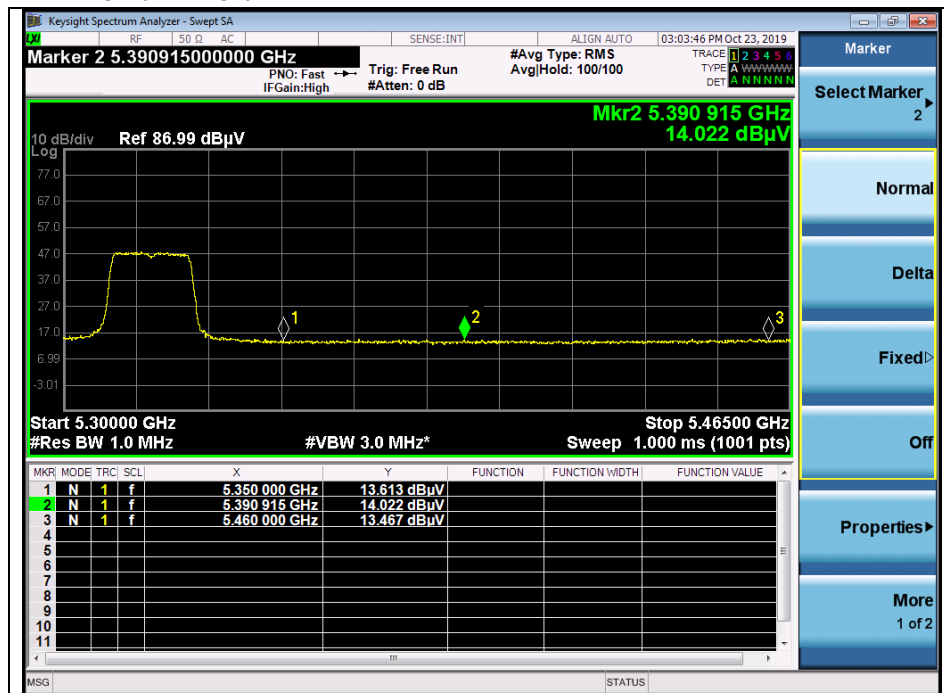
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A4(210 mm x 297 mm)

High channel Band edge (Peak) - Band 2A



High channel Band edge (Average) - Band 2A



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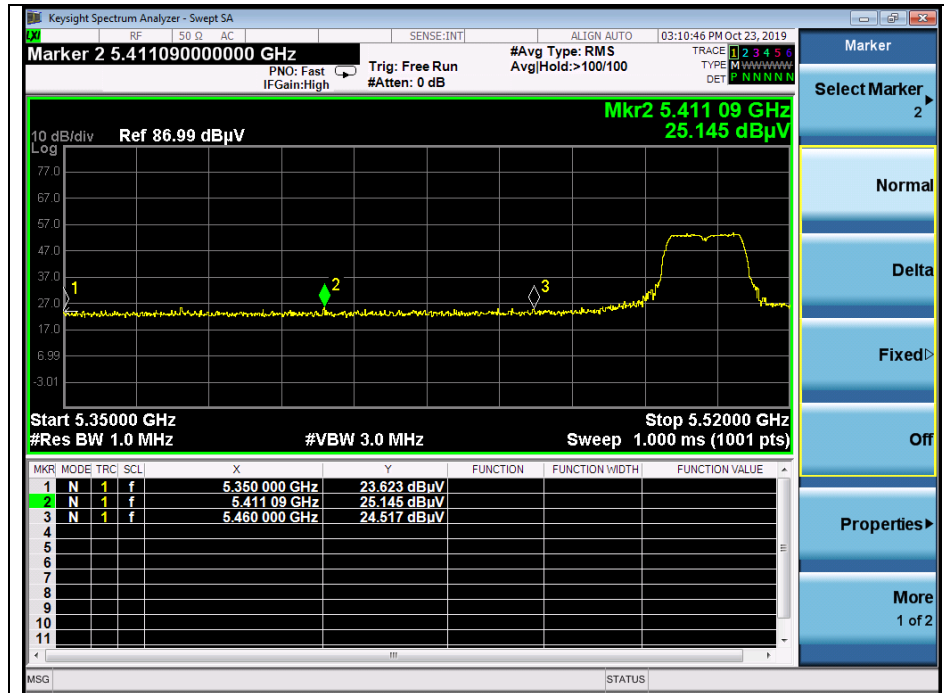
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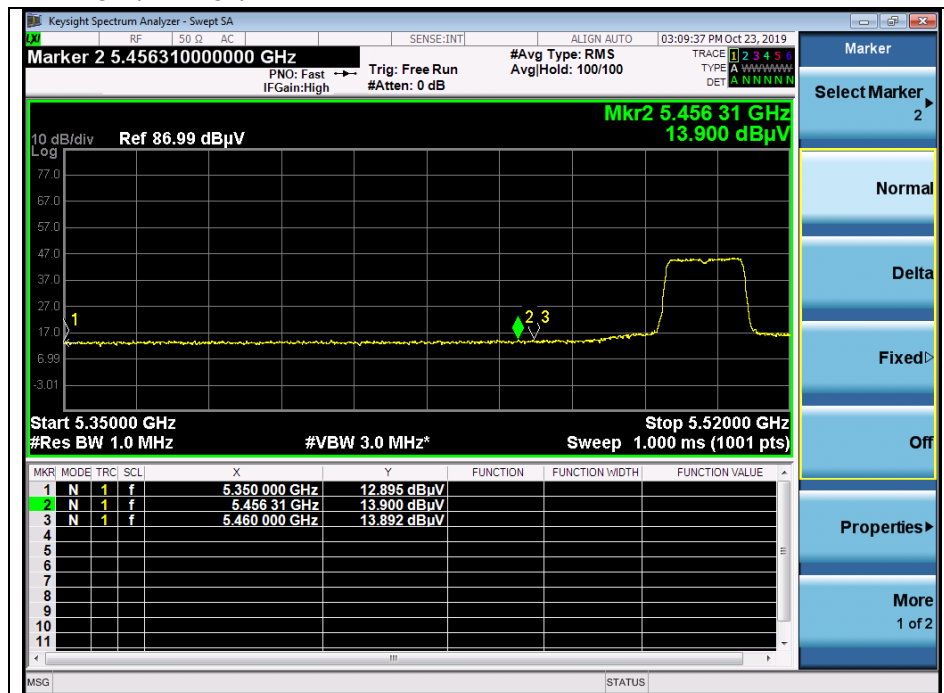
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A4(210 mm x 297 mm)

Low channel Band edge (Peak) - Band 2C



Low channel Band edge (Average) - Band 2C



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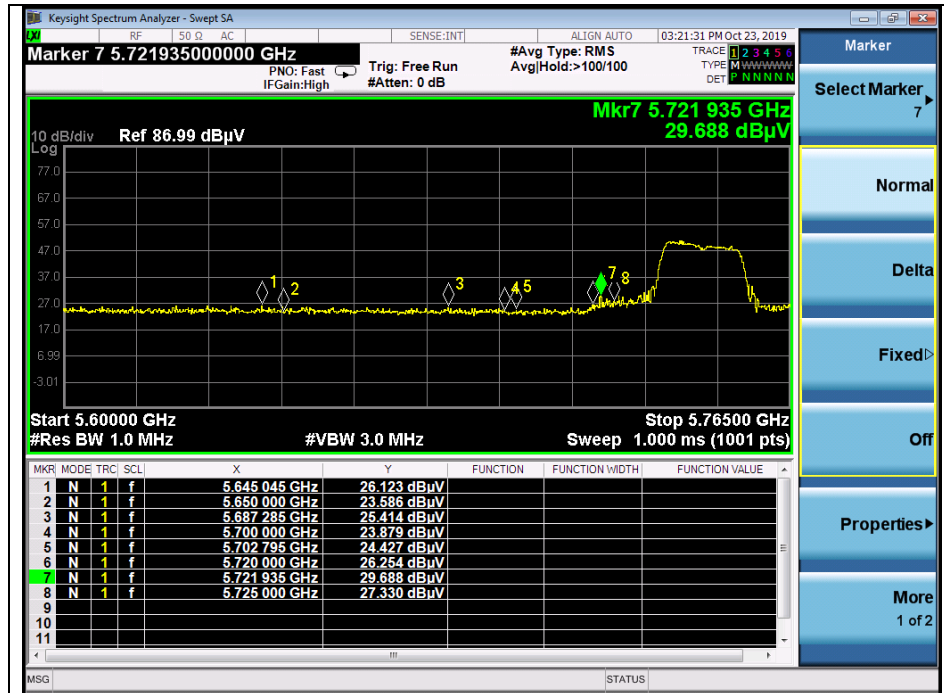
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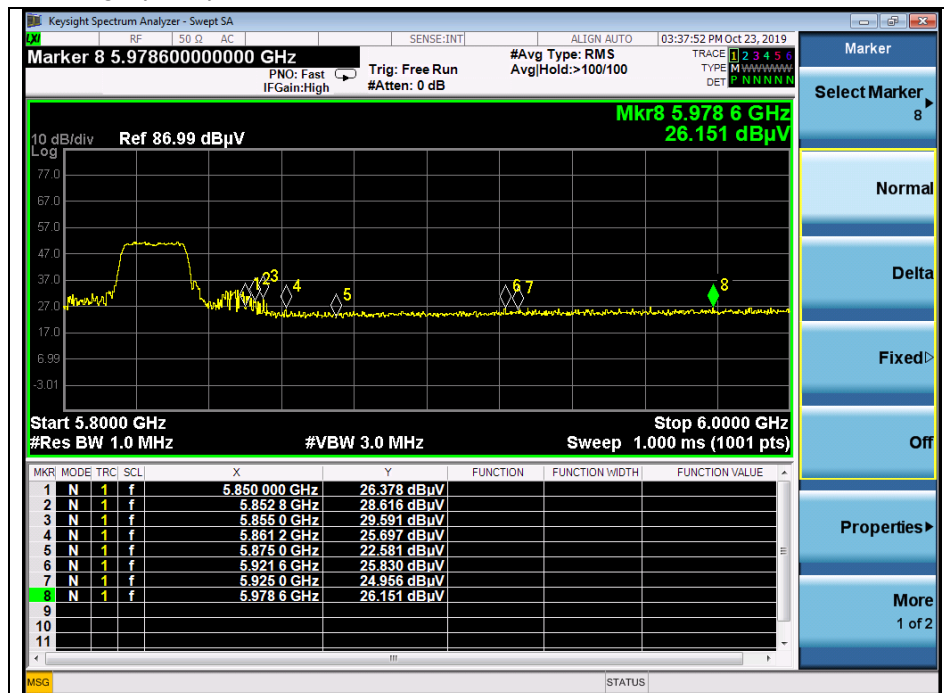
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A4(210 mm x 297 mm)

Low channel Band edge (Peak) - Band 3



High channel Band edge (Peak) - Band 3



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A4(210 mm x 297 mm)

High channel 2nd harmonic (Peak) - Band 1



Low channel 2nd harmonic (Peak) - Band 2A



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A4(210 mm x 297 mm)

Middle channel 2nd harmonic (Peak) - Band 2A



Middle channel 2nd harmonic (Average) - Band 2A



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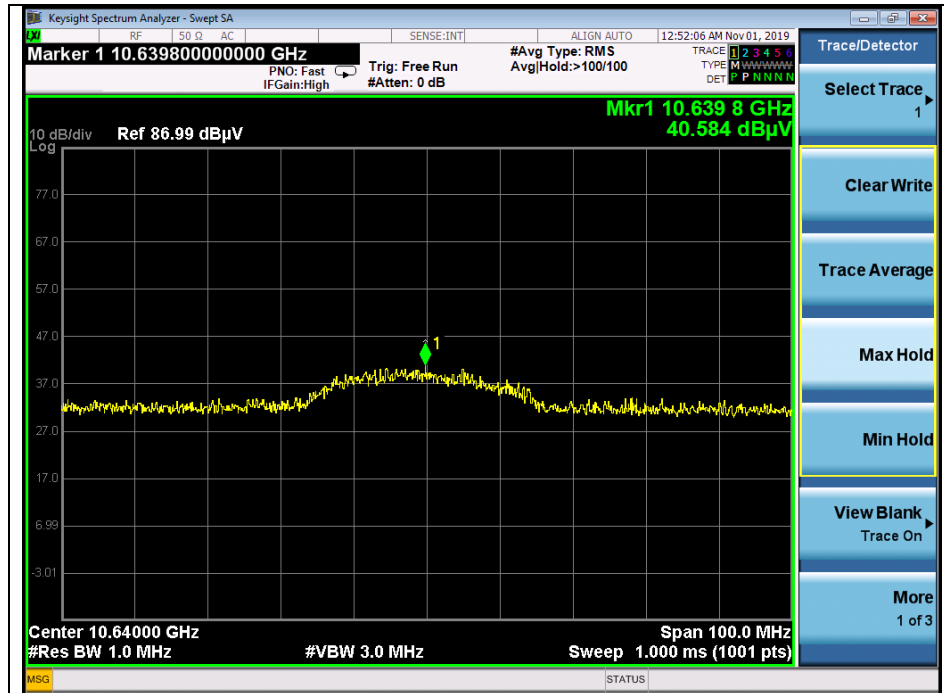
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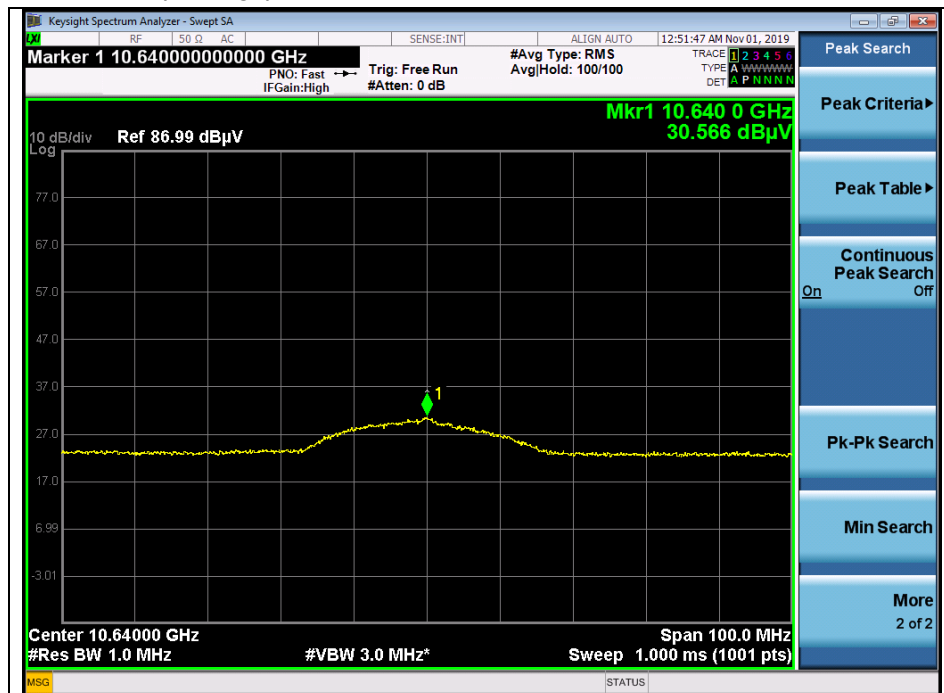
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A4(210 mm x 297 mm)

High channel 2nd harmonic (Peak) - Band 2A



High channel 2nd harmonic (Average) - Band 2A



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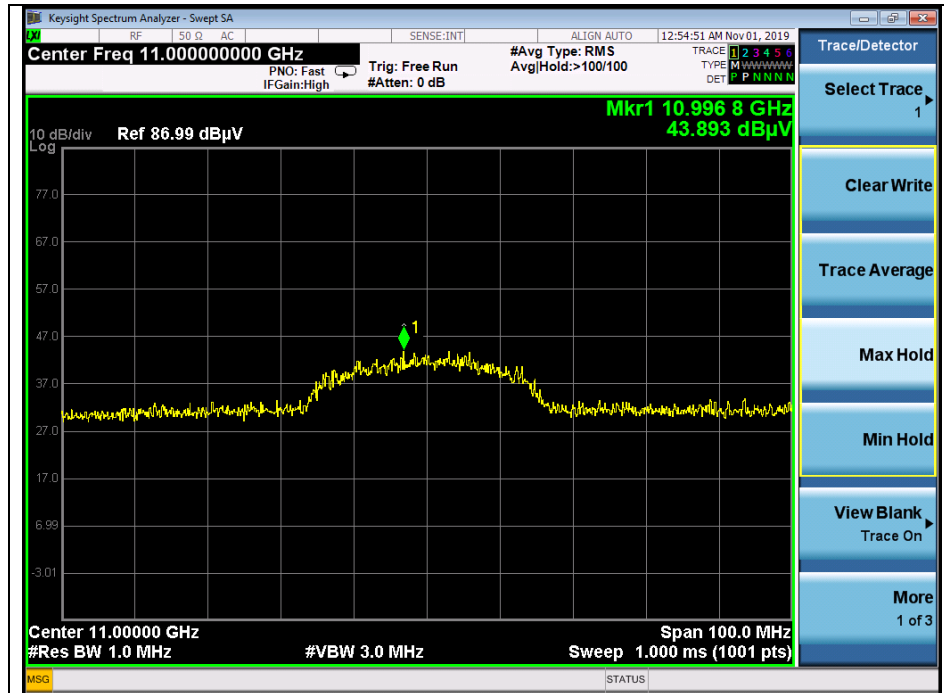
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A4(210 mm x 297 mm)

Low channel 2nd harmonic (Peak) - Band 2C



Low channel 2nd harmonic (Average) - Band 2C



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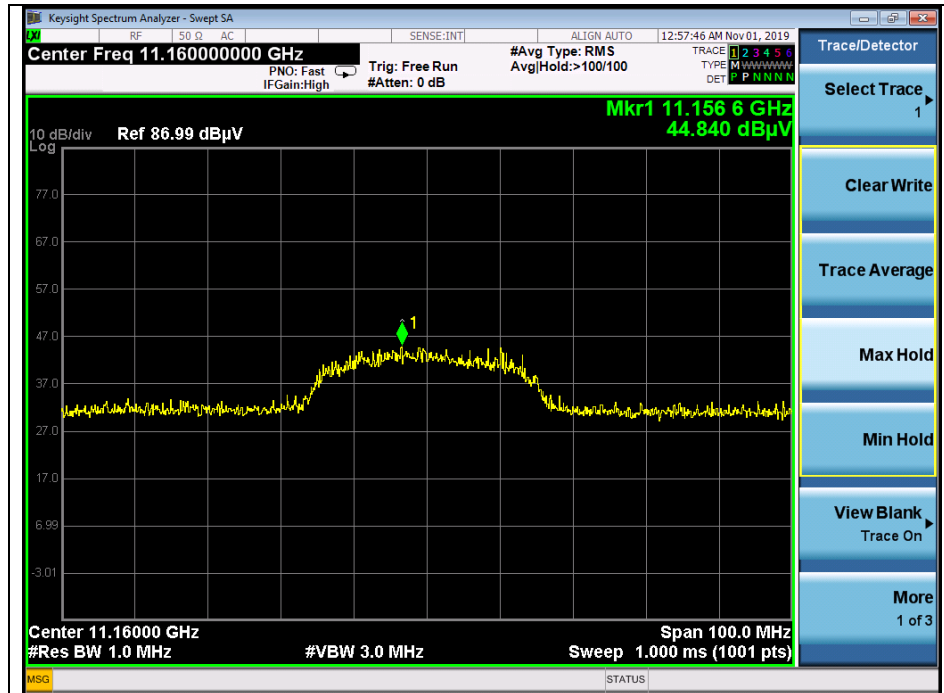
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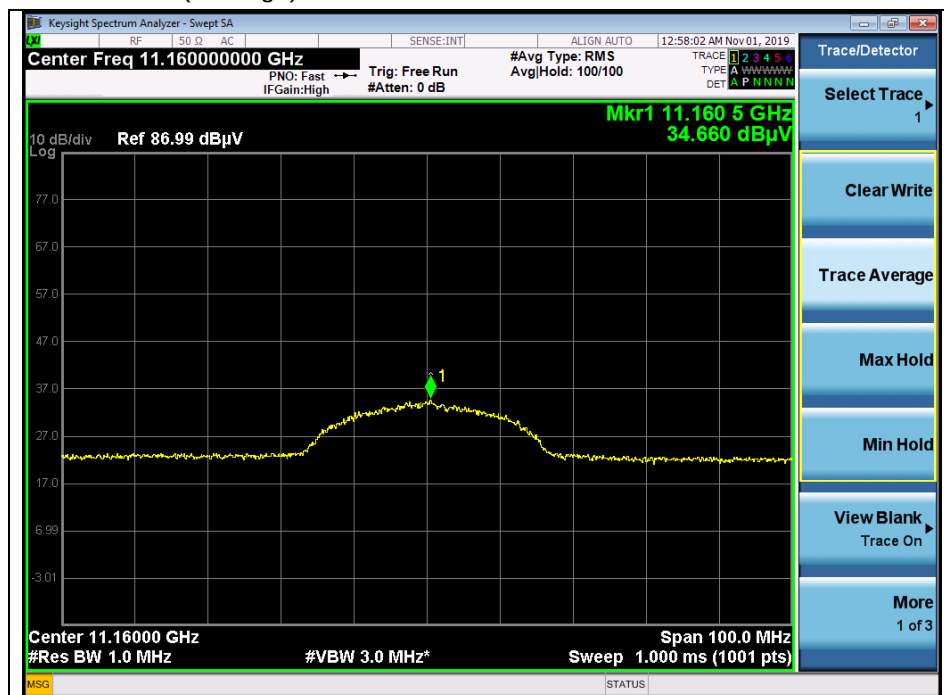
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A4(210 mm x 297 mm)

Middle channel 2nd harmonic (Peak) - Band 2C



Middle channel 2nd harmonic (Average) - Band 2C



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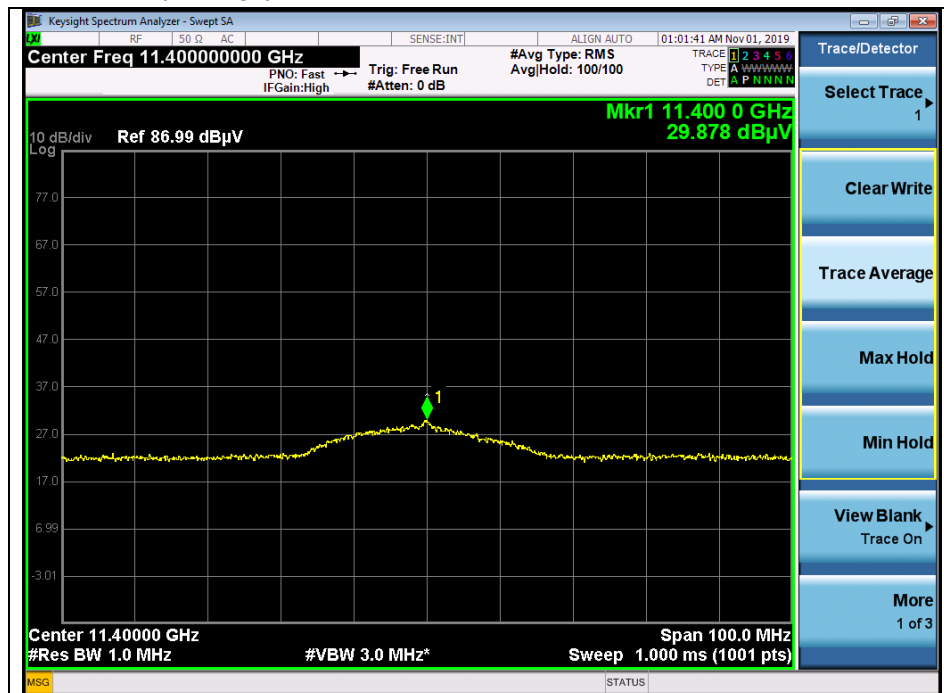
Tel. +82 31 428 5700 / Fax. +82 31 427 2370

A4(210 mm x 297 mm)

High channel 2nd harmonic (Peak) - Band 2C



High channel 2nd harmonic (Average) - Band 2C



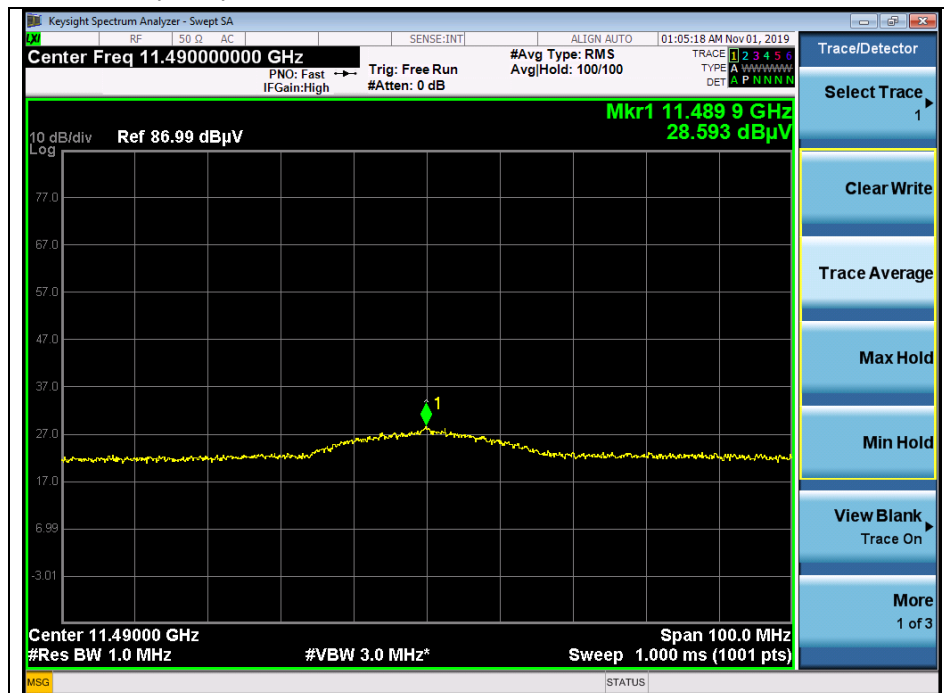
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Low channel 2nd harmonic (Peak) - Band 3



Low channel 2nd harmonic (Peak) - Band 3



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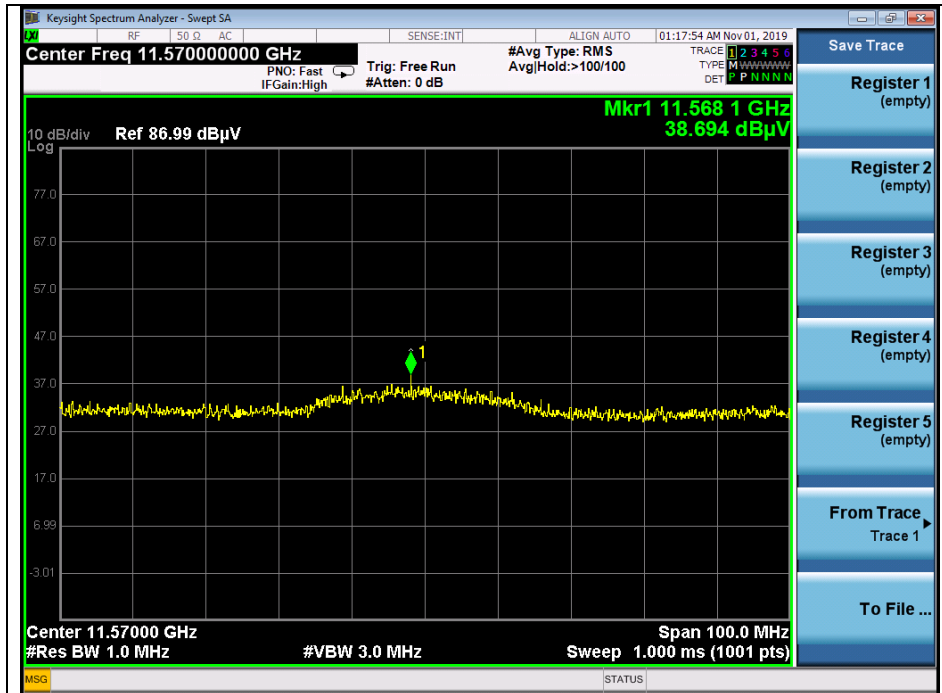
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RTT5041-19(2019.04.24)(1)

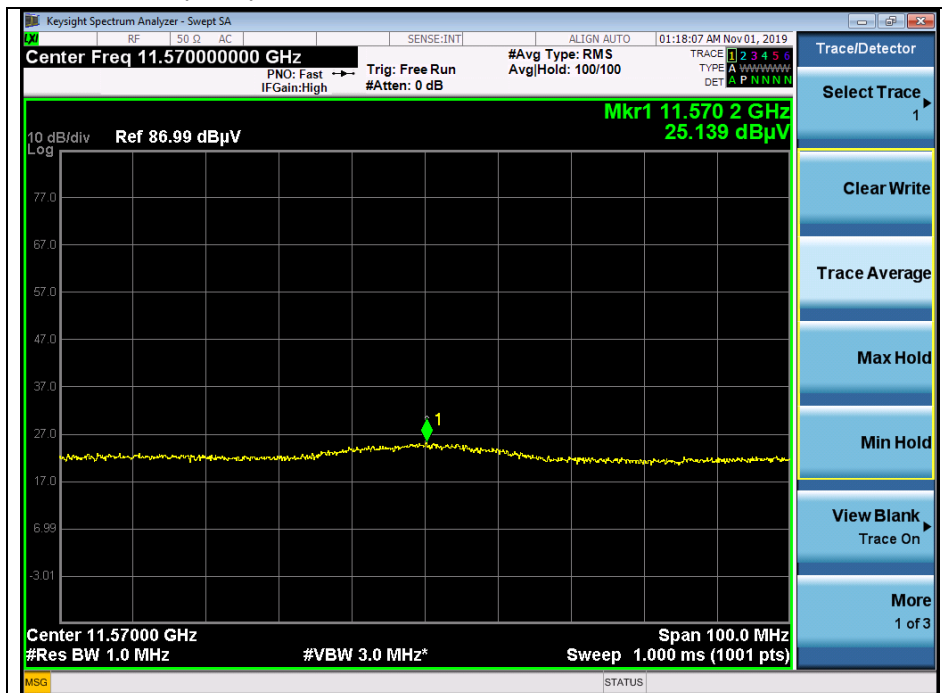
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A4(210 mm x 297 mm)

Middle channel 2nd harmonic (Peak) - Band 3



Middle channel 2nd harmonic (Peak) - Band 3



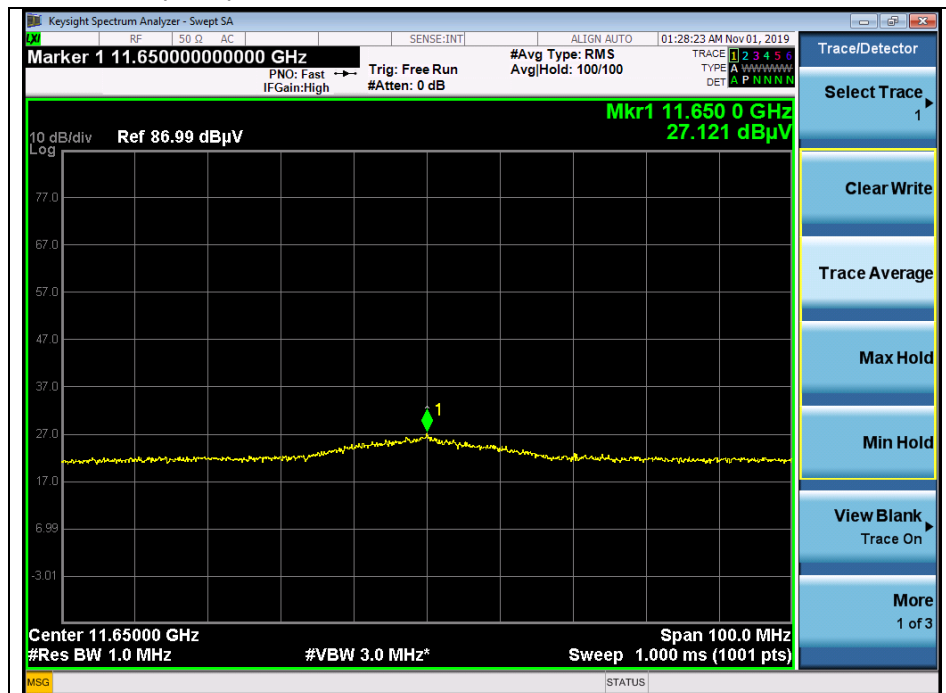
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High channel 2nd harmonic (Peak) - Band 3



High channel 2nd harmonic (Peak) - Band 3



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A4(210 mm x 297 mm)

High channel 2nd harmonic (Peak) - Band 1



Low channel 2nd harmonic (Peak) - Band 2A



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Middle channel 2nd harmonic (Peak) - Band 2A

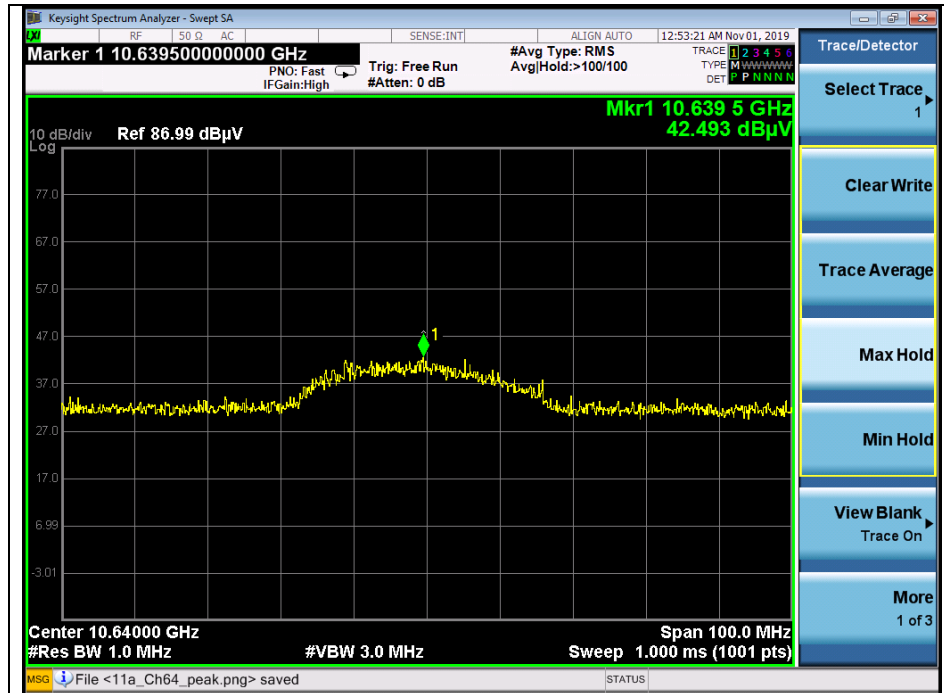


Middle channel 2nd harmonic (Average) - Band 2A



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High channel 2nd harmonic (Peak) - Band 2A



High channel 2nd harmonic (Average) - Band 2A



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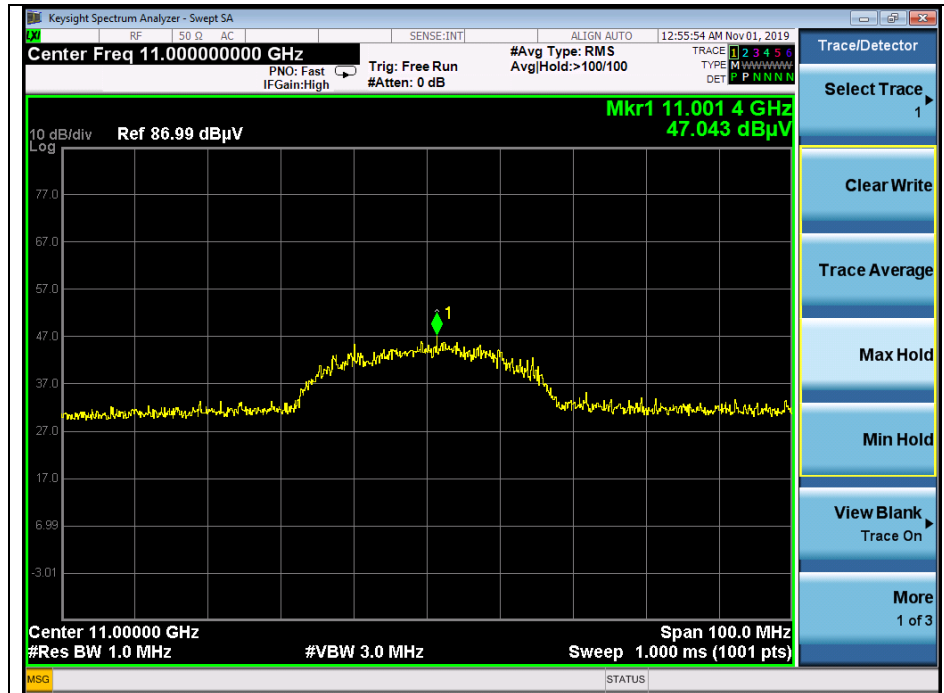
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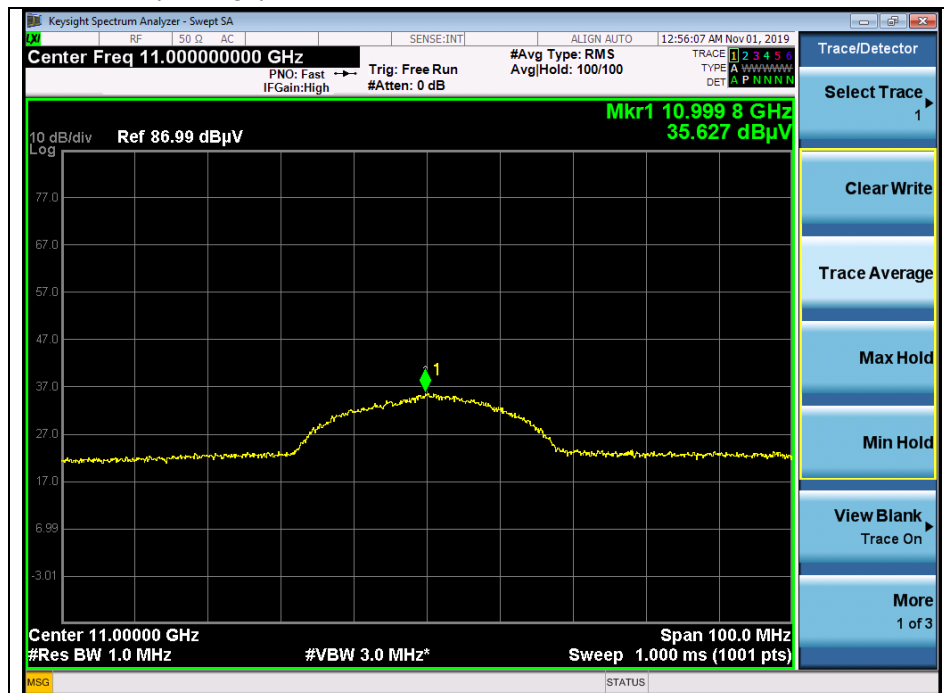
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A4(210 mm x 297 mm)

Low channel 2nd harmonic (Peak) - Band 2C



Low channel 2nd harmonic (Average) - Band 2C



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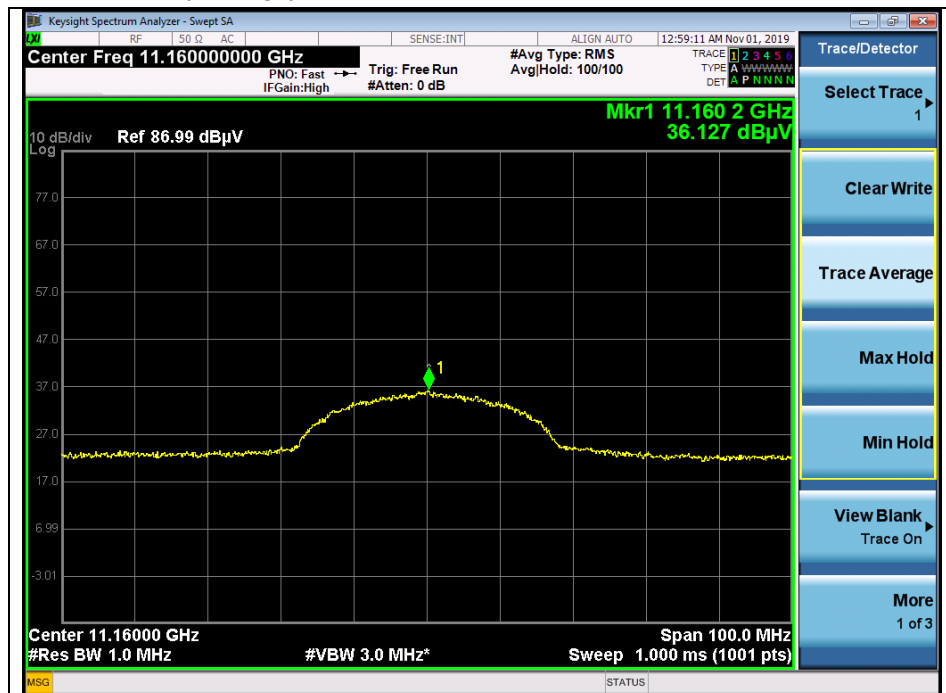
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A4(210 mm x 297 mm)

Middle channel 2nd harmonic (Peak) - Band 2C



Middle channel 2nd harmonic (Average) - Band 2C



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A4(210 mm x 297 mm)

High channel 2nd harmonic (Peak) - Band 2C



High channel 2nd harmonic (Average) - Band 2C



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A4(210 mm x 297 mm)

Low channel 2nd harmonic (Peak) - Band 3



Low channel 2nd harmonic (Peak) - Band 3



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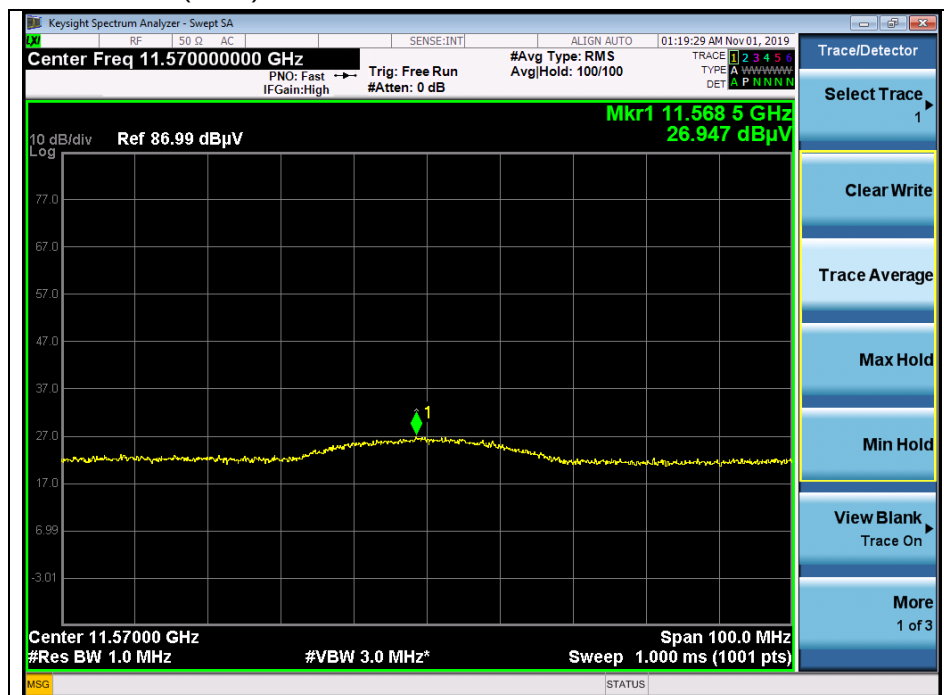
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A4(210 mm x 297 mm)

Middle channel 2nd harmonic (Peak) - Band 3



Middle channel 2nd harmonic (Peak) - Band 3



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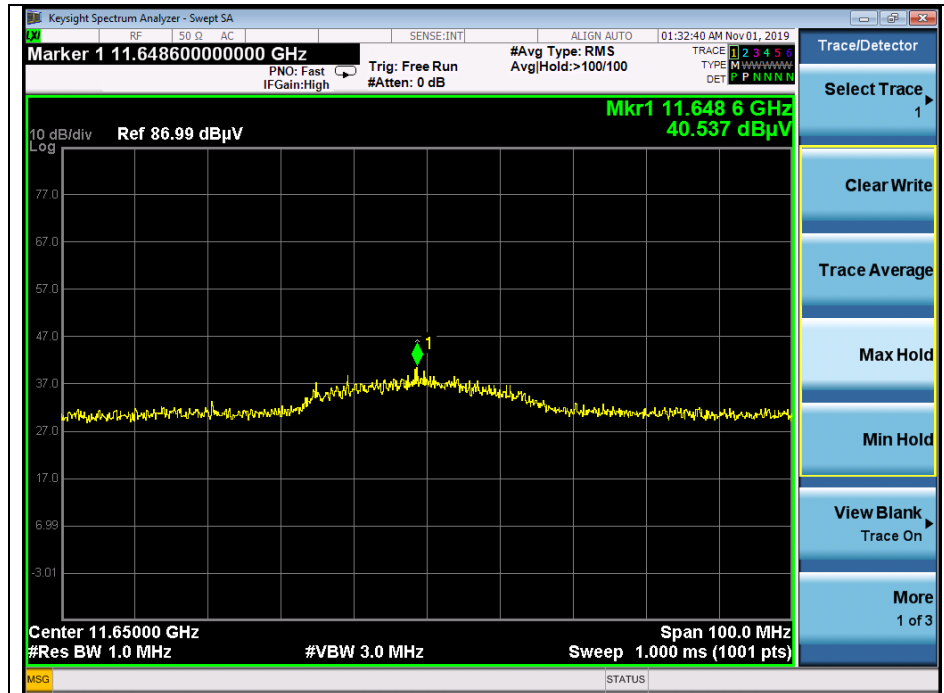
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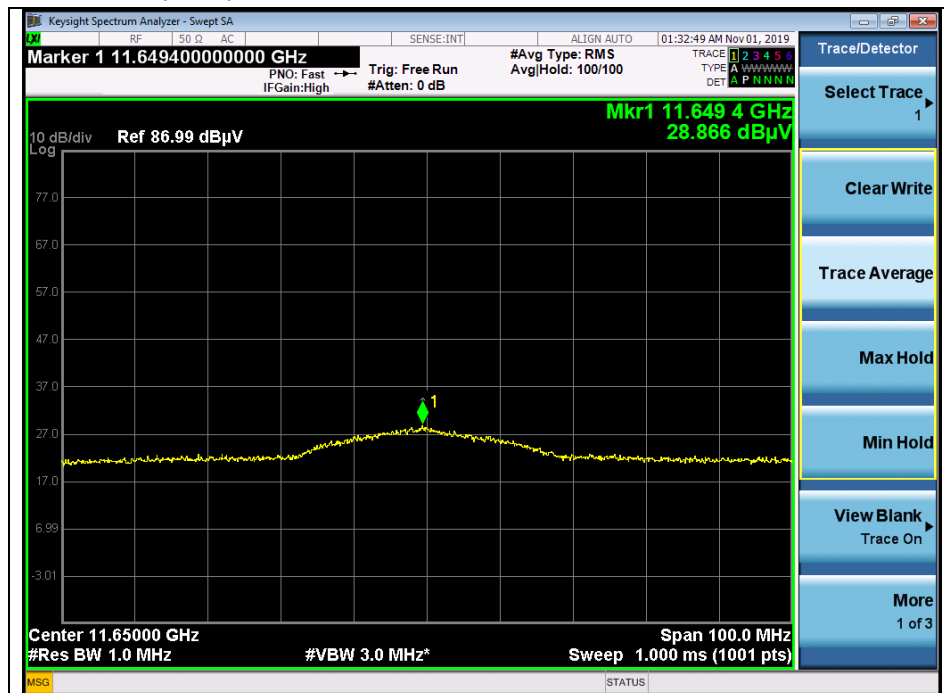
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A4(210 mm x 297 mm)

High channel 2nd harmonic (Peak) - Band 3



High channel 2nd harmonic (Peak) - Band 3



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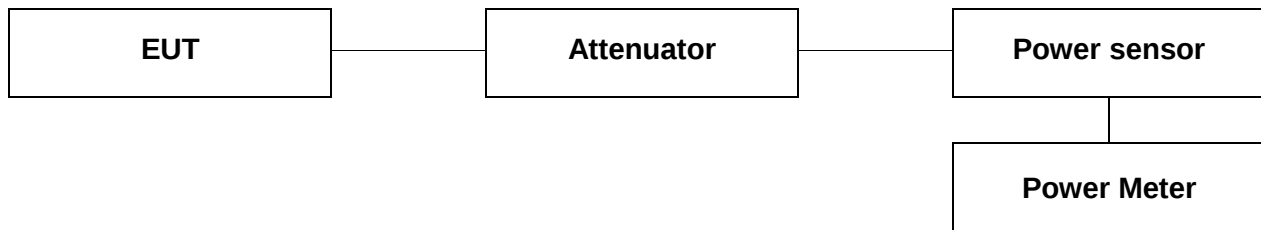
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A4(210 mm x 297 mm)

3. Maximum Conducted Output Power

3.1. Test Setup



3.2. Limit

According to 15.407(a)(1)(iv)

For client devices in the 5.15-5.25 GHz band, the maximum conducted output power over the frequency band of operation shall not exceed 250 mW provided the maximum antenna gain does not exceed 6 dB i. In addition, the maximum power spectral density shall not exceed 11 dB m in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dB i are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dB i.

According to 15.407(a)(2)

For the 5.25-5.35 GHz and 5.47-5.725 GHz bands, the maximum conducted output power over the frequency bands of operation shall not exceed the lesser of 250 mW or 11 dB m + 10 log B, where B is the 26 dB emission bandwidth in megahertz. In addition, the maximum power spectral density shall not exceed 11 dB m in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dB i are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dB i.

According to 15.407(a)(3)

For the band 5.725-5.85 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W. In addition, the maximum power spectral density shall not exceed 30 dB m in any 500-kHz band. If transmitting antennas of directional gain greater than 6 dB i are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dB i. However, fixed point-to-point U-NII devices operating in this band may employ transmitting antennas with directional gain greater than 6 dB i without any corresponding reduction in transmitter conducted power. Fixed, point-to-point operations exclude the use of point-to-multipoint systems, omnidirectional applications, and multiple collocated transmitters transmitting the same information. The operator of the U-NII device, or if the equipment is professionally installed, the installer, is responsible for ensuring that systems employing high gain directional antennas are used exclusively for fixed, point-to-point operations.

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3.3. 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.

1. This measurement settings are specified in section E.3.a of KDB 789033 D02 General UNII Test Procedures New Rules v02r01.
2. Measurements may be performed using a wideband RF power meter with a thermocouple detector or equivalent if all of the conditions listed below are satisfied:
 - The EUT is configured to transmit continuously or to transmit with a consistent duty cycle.
 - At all times when the EUT is transmitting, it must be transmitting at its maximum power control level.
 - The integration period of the power meter exceeds the repetition period of the transmitted signal by at least a factor of five.
3. If the transmitter does not transmit continuously, measure the duty cycle, x , of the transmitter output signal as described in section II.B.
4. Measure the average power of the transmitter. This measurement is an average over both the on and off periods of the transmitter.
5. Adjust the measurement in dBm by adding $10 \log (1/x)$ where x is the duty cycle (e.g., $10 \log (1/0.25)$ if the duty cycle is 25 %).
6. In case of band crossing channels 138, 142 and 144, the measurement is complied with section III.A of KDB 789033 D02 General UNII Test Procedures New Rules v02r01.

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3.4. Test Result

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

Test mode: 11a

Band	Frequency (MHz)	Data Rate (Mbps)	Average Power (dB m)	Duty Cycle Correction Factor (dB)	Average Power Result (dB m)
U-NII 1	5 180	6	12.16	-	12.16
	5 220		12.17		12.17
	5 240		12.35		12.35
U-NII 2A	5 260		12.64		12.64
	5 300		12.73		12.73
	5 320		13.26		13.26
U-NII 2C	5 500		11.77		11.77
	5 580		11.89		11.89
	5 700		10.76		10.76
U-NII 3	5 745		10.56		10.56
	5 785		10.47		10.47
	5 825		10.23		10.23

Band	Limit					
	Frequency (MHz)	Fixed Limit (dB m)	26 dB BW (MHz)	11+10LogB (dB m)	Antenna Gain (dB i)	Limit (dB m)
U-NII 1	5 180	23.98			2.90	23.98
	5 220					
	5 240					
U-NII 2A	5 260	23.98			3.50	23.98
	5 300					
	5 320					
U-NII 2C	5 500	23.98			3.34	23.98
	5 580					
	5 700					
U-NII 3	5 745	30			3.01	30.00
	5 785					
	5 825					

Remark;

1. Average Power Result (dB m) = Average Power (dB m) + Duty Cycle Correction Factor (dB)

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Test mode: 11n_HT20

Band	Frequency (MHz)	Data Rate (Mbps)	Average Power (dB m)	Duty Cycle Correction Factor (dB)	Average Power Result (dB m)
U-NII 1	5 180	MCS0	12.68	-	12.68
	5 200		12.99		12.99
	5 240		13.21		13.21
U-NII 2A	5 260		13.21		13.21
	5 300		13.58		13.58
	5 320		13.69		13.69
U-NII 2C	5 500		13.23		13.23
	5 580		12.75		12.75
	5 700		12.19		12.19
U-NII 3	5 745		11.76		11.76
	5 785		11.23		11.23
	5 825		10.96		10.96

Band	Limit					
	Frequency (MHz)	Fixed Limit (dB m)	26 dB BW (MHz)	11+10LogB (dB m)	Antenna Gain (dB i)	Limit (dB m)
U-NII 1	5 180	23.98			2.90	23.98
	5 220					
	5 240					
U-NII 2A	5 260	23.98			3.50	23.98
	5 300					
	5 320					
U-NII 2C	5 500	23.98			3.34	23.98
	5 580					
	5 720					
U-NII 3	5 745	30			3.01	30
	5 785					
	5 825					

Remark;

1. Average Power Result (dB m) = Average Power (dB m) + Duty Cycle Correction Factor (dB)

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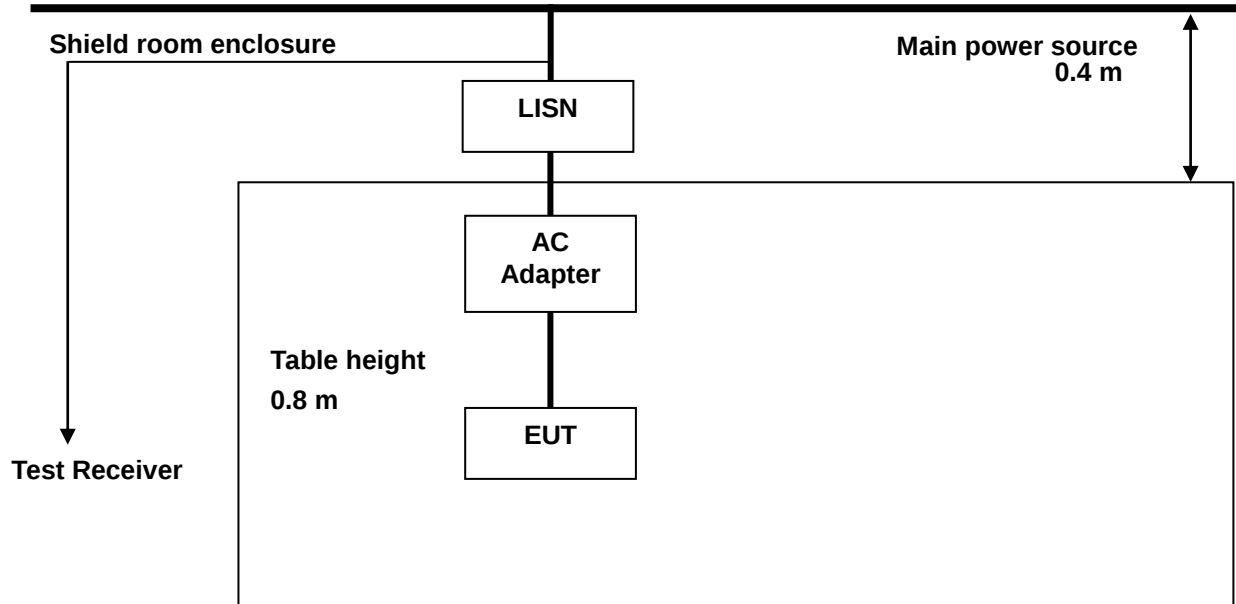
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A4(210 mm x 297 mm)

4. Transmitter AC Power Line Conducted Emission

4.1. Test Setup



4.2. Limit

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 ohms line impedance stabilization network (LISN). Compliance with the provision of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequency ranges.

Frequency of emission (MHz)	Conducted limit (dB μ V)	
	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

* Decreases with the logarithm of the frequency.

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4.3. Test Procedures

AC 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 × 3.5 m × 3.5 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. All peripherals were connected to the second LISN and the chassis ground also bounded to the horizontal ground plane of shielded room.
4. The excess power cable between the EUT and the LISN was bundled. The power cables of peripherals were unbundled. All connecting cables of EUT and peripherals were moved to find the maximum emission.

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4.4. Test Results

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

Ambient temperature : (23 ± 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
0.20	50.90	30.00	N	63.61	53.61	12.71	23.61
0.67	41.90	30.90	N	56.00	46.00	14.10	15.10
2.09	31.70	22.10	N	56.00	46.00	24.30	23.90
4.14	28.90	19.00	N	56.00	46.00	27.10	27.00
5.51	28.80	18.50	N	60.00	50.00	31.20	31.50
20.57	36.00	27.40	N	60.00	50.00	24.00	22.60
0.25	44.10	25.90	H	61.76	51.76	17.66	25.86
0.67	39.50	29.60	H	56.00	46.00	16.50	16.40
1.63	31.50	22.80	H	56.00	46.00	24.50	23.20
2.13	32.50	21.80	H	56.00	46.00	23.50	24.20
2.93	30.60	20.80	H	56.00	46.00	25.40	25.20
20.80	36.50	27.70	H	60.00	50.00	23.50	22.30

Remark;

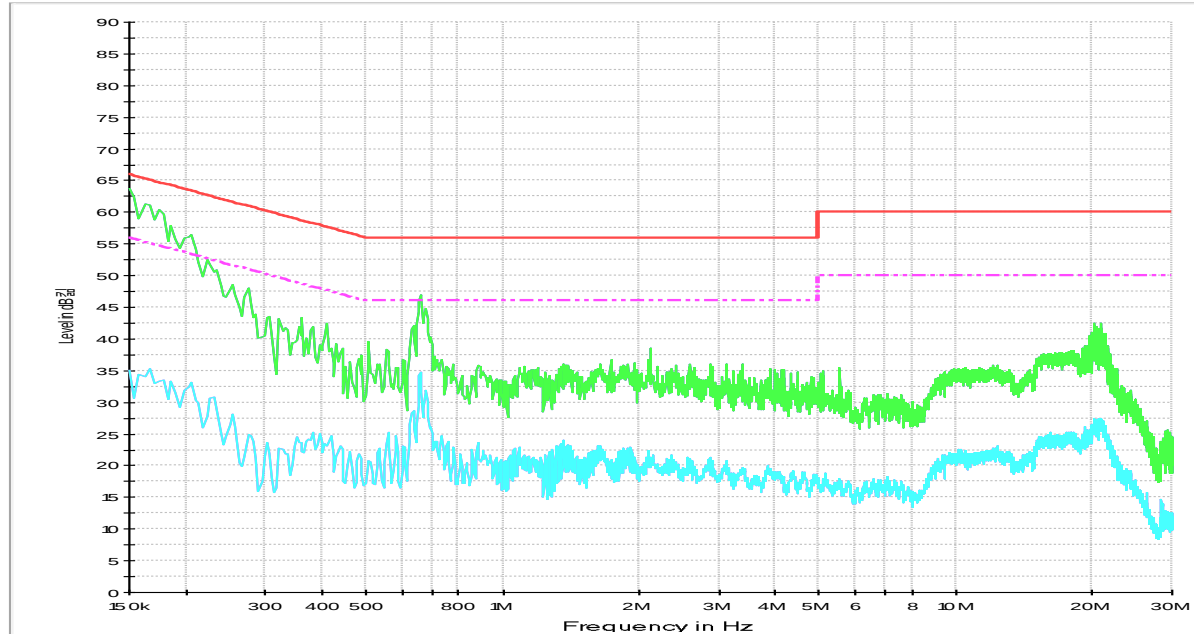
- Line (H): Hot, Line (N): Neutral.
- All modes of operation were investigated and the worst-case emissions were reported using **11n (Band 2A) / MCS0 / High channel.**
- The limit for Class B device(s) from 150 kHz to 30 MHz are specified in Section of the Title 47 CFR.
- Traces shown in plot were made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

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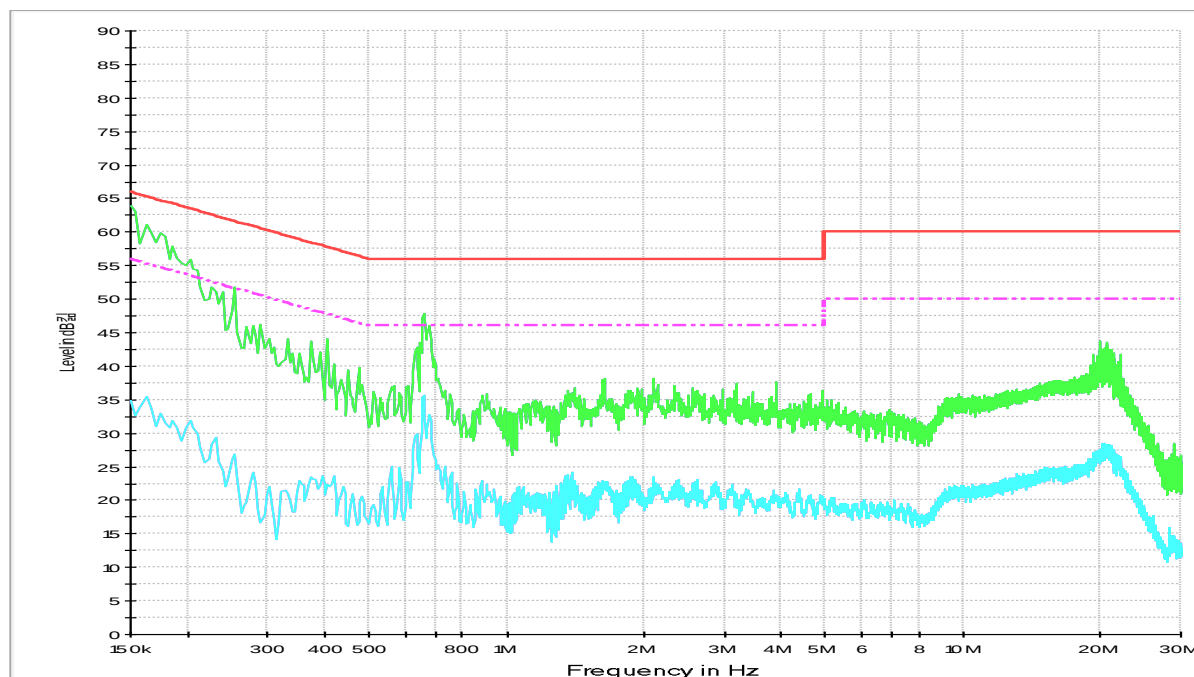
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-Test plots

Test mode: (Neutral)



Test mode: (Hot)



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5. Antenna Requirement

5.1. 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 §15.407(a) 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.

5.2. Antenna Connected Construction

Antenna used in this product is WIFI Dual band PCB Antenna and peak max gain of antenna as below.

Band	5 150 MHz ~ 5 250 MHz	5 250 MHz ~ 5 350 MHz	5 470 MHz ~ 5 725 MHz	5 725 MHz ~ 5 850 MHz
Mode	11a/n_HT20			
Gain	2.90 dB i	3.50 dB i	3.34 dB i	3.01 dB i

- End of the Test Report -

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