

TEST REPORT

of

FCC Part 15 Subpart E §15.407

FCC ID: TQ8-AT140DPAN

Equipment Under Test : DISPLAY CAR SYSTEM

Model Name : AT140DPAN

Applicant : Hyundai MOBIS Co., Ltd.

Manufacturer : Hyundai MOBIS Co., Ltd.

Date of Test(s) : 2015.04.08 ~ 2015.04.22

Date of Issue : 2015.04.27

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

Tested By:

Date:

2015.04.27

Jinhyoung Cho

Approved By:

Date:

2015.04.27

Hyunchae You

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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, 435-837

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1.2. Details of applicant

Applicant : Hyundai MOBIS Co., Ltd.

Address : 203, Teheran-ro, Gangnam-gu, Seoul, 135-977, Korea

Contact Person : Choi, Seung-Hoon

Phone No. : + 82 31 260 0098

1.3. Description of EUT

Kind of Product	DISPLAY CAR SYSTEM
Model Name	AT140DPAN
Power Supply	DC 14.4 V (Vehicle Battery)
Frequency Range	2 402 MHz ~ 2 480 MHz (BT), 2 412 MHz ~ 2 462 MHz (11b/g/n_HT20), 5 745 MHz ~ 5 825 MHz (Band 3: 11a/n_HT20, 11ac_VHT20), 5 755 MHz ~ 5 795 MHz (Band 3: 11n_HT40, 11ac_VHT40), 5 775 MHz (Band 3: 11ac_VHT80), 5 180 MHz ~ 5 240 MHz (Band 1: 11a/n_HT20, 11ac_VHT20), 5 190 MHz ~ 5 230 MHz (Band 1: 11n_HT40, 11ac_VHT40), 5 210 MHz (Band 1: 11ac_VHT80), 5 260 MHz ~ 5 320 MHz (Band 2A: 11a/n_HT20, 11ac_VHT20), 5 270 MHz ~ 5 310 MHz (Band 2A: 11n_HT40, 11ac_VHT40), 5 290 MHz (Band 2A: 11ac_VHT80), 5 500 MHz ~ 5 700 MHz (Band 2C: 11a/n_HT20, 11ac_VHT20), 5 510 MHz ~ 5 670 MHz (Band 2C: 11n_HT40, 11ac_VHT40), 5 530 MHz (Band 2C: 11ac_VHT80)
Modulation Technique	DSSS, OFDM, GFSK, π/4DQPSK, 8DPSK
Number of Channels	79 channel (BT), 11 channel (11b/g/n_HT20), 5 channel (Band 3: 11a/n_HT20, 11ac_VHT20), 2 channel (Band 3: 11n_HT40, 11ac_VHT40), 1 channel (Band 3: 11ac_VHT80), 4 channel (Band 1: 11a/n_HT20, 11ac_VHT20), 2 channel (Band 1: 11n_HT40, 11ac_VHT40), 1 channel (Band 1: 11ac_VHT80), 4 channel (Band 2A: 11a/n_HT20, 11ac_VHT20), 2 channel (Band 2A: 11n_HT40, 11ac_VHT40), 1 channel (Band 2A: 11ac_VHT80), 8 channel (Band 2C: 11a/n_HT20, 11ac_VHT20), 3 channel (Band 2C: 11n_HT40, 11ac_VHT40), 1 channel (Band 2C: 11ac_VHT80)
Operation Temperature	-20 °C ~ 70 °C
Antenna Type	Internal type
Antenna Gain	2 402 MHz ~ 2 480 MHz: 2.29 dB i, 2 412 MHz ~ 2 462 MHz: 4.67 dB i, 5 180 MHz ~ 5 320 MHz: 2.89 dB i, 5 500 MHz ~ 5 700 MHz: 2.51 dB i, 5 745 MHz ~ 5 825 MHz: 5.78 dB i

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A4(210 mm × 297 mm)

1.4. Declaration by the manufacturer

- Client without Radar Detection and TPC.
- EUT is not supported TDWR(5.6 - 5.65 GHz) band.
- WLAN & BT do not transmit simultaneously.

1.5. Test equipment list

Equipment	Manufacturer	Model	S/N	Cal Date	Cal Interval	Cal Due.
Signal Generator	R&S	SMBV100A	255834	Jun. 25, 2014	Annual	Jun. 25, 2015
Signal Generator	R&S	SMR40	100272	Jul. 18, 2014	Annual	Jul. 18, 2015
Spectrum Analyzer	Agilent	N9030A	US53120526	Jul. 17, 2014	Annual	Jul. 17, 2015
Spectrum Analyzer	R&S	FSW43	100637	Jul. 24, 2014	Annual	Jul. 24, 2015
Power Meter	Anritsu	ML2495A	1223004	Jun. 10, 2014	Annual	Jun. 10, 2015
Power Sensor	Anritsu	MA2411B	1207272	Jun. 10, 2014	Annual	Jun. 10, 2015
Attenuator	MCLI	FAS-23-20	23834	Jun. 20, 2014	Annual	Jun. 20, 2015
Low Pass Filter	Mini circuits	NLP-1200+	V8979400903-2	Mar. 12, 2015	Annual	Mar. 12, 2016
Band Reject Filter	Wainwright	WRCJV5150/5350-5130/ 5370-50/16SS	1	Sep. 24, 2014	Annual	Sep. 24, 2015
Band Reject Filter	Wainwright	WRCJV5470/5725-5450/ 5745-50/20SS	1	Sep. 24, 2014	Annual	Sep. 24, 2015
High Pass Filter	Wainwright	WHNX7.5/26.5G-6SS	15	Jul. 02, 2014	Annual	Jul. 02, 2015
DC Power Supply	Agilent	U8002A	MY50060028	Mar. 23, 2015	Annual	Mar. 23, 2016
Preamplifier	H.P.	8447D	2727A05143	Aug. 13, 2014	Annual	Aug. 13, 2015
Preamplifier	R&S	SCU-18	10070	Apr. 02, 2015	Annual	Apr. 02, 2016
Preamplifier	MITEQ Inc.	JS44-18004000-35-8P	1546891	Apr. 28, 2014	Annual	Apr. 28, 2015
Test Receiver	R&S	ESU8	100128	Feb. 05, 2015	Annual	Feb. 05, 2016
Bilog Antenna	TESEQ	CBL6112D	25232	Oct. 24, 2013	Biennial	Oct. 24, 2015
Loop Antenna	SCHWARZBECK MESSELEKTRONIK	FMZB 1519	1519-039	Jul. 09, 2013	Biennial	Jul. 09, 2015
Horn Antenna	R&S	HF906	100564	Dec. 11, 2013	Biennial	Dec. 11, 2015
Horn Antenna	SCHWARZBECK MESSELEKTRONIK	BBHA 9170	BBHA9170431	May 15, 2014	Biennial	May 15, 2016
Antenna Master	INN-CO	MM4000	N/A	N.C.R.	N/A	N.C.R.
Turn Table	INN-CO	DS 1200S	N/A	N.C.R.	N/A	N.C.R.
Anechoic Chamber	SY Corporation	L x W x H (9.6 m x 6.4 m x 6.6 m)	N/A	N.C.R.	N/A	N.C.R.

► Support equipment

Description	Manufacturer	Model	Serial Number / FCC ID
N/A	-	-	-

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A4(210 mm x 297 mm)

1.6. Summary of test result

The EUT has been tested according to the following specifications:

APPLIED STANDARD:FCC Part15 subpart E § 15.407		
Section in FCC 15	Test Item	Result
15.205 15.209 15.407(b)(1) 15.407(b)(2) 15.407(b)(3) 15.407(b)(4)	Transmitter radiated spurious emissions and Conducted spurious emission	Complied
15.407(a)	26 dB Bandwidth & 99% Bandwidth	Complied
15.407(e)	6 dB Bandwidth	Complied
15.407(a)(1) 15.407(a)(2) 15.407(a)(3)	Output power	Complied
15.407(a)(1) 15.407(a)(2) 15.407(a)(3)	Peak power spectral density	Complied

1.7. Test Procedure(s)

The measurement procedures described in the American National Standard for Methods of Measurement of Radio-Noise Emission from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz (ANSI C63.4-2003) and the guidance provided in KDB 789033 D02 v01 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 (dB)

1.9. Test report revision

Revision	Report number	Date of Issue	Description
0	F690501/RF-RTL008654	2015.04.27	Initial

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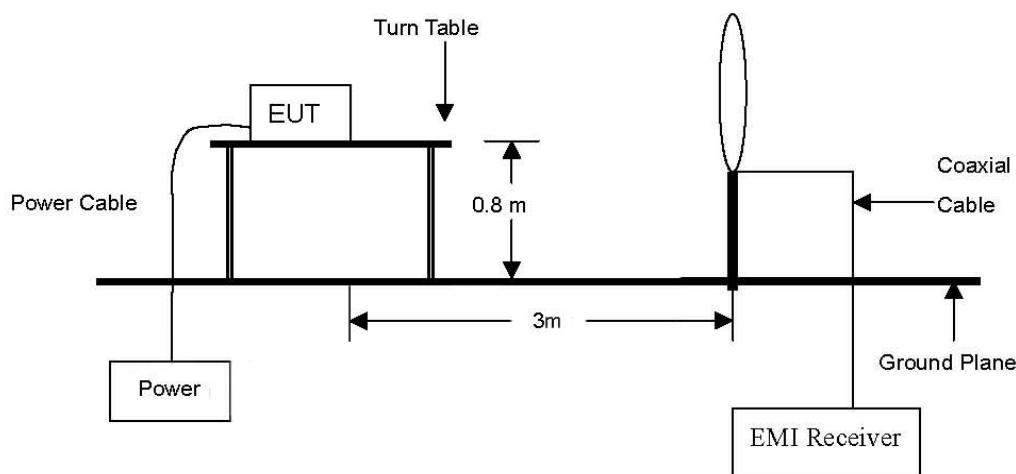
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2. Transmitter radiated spurious emissions and conducted spurious emission

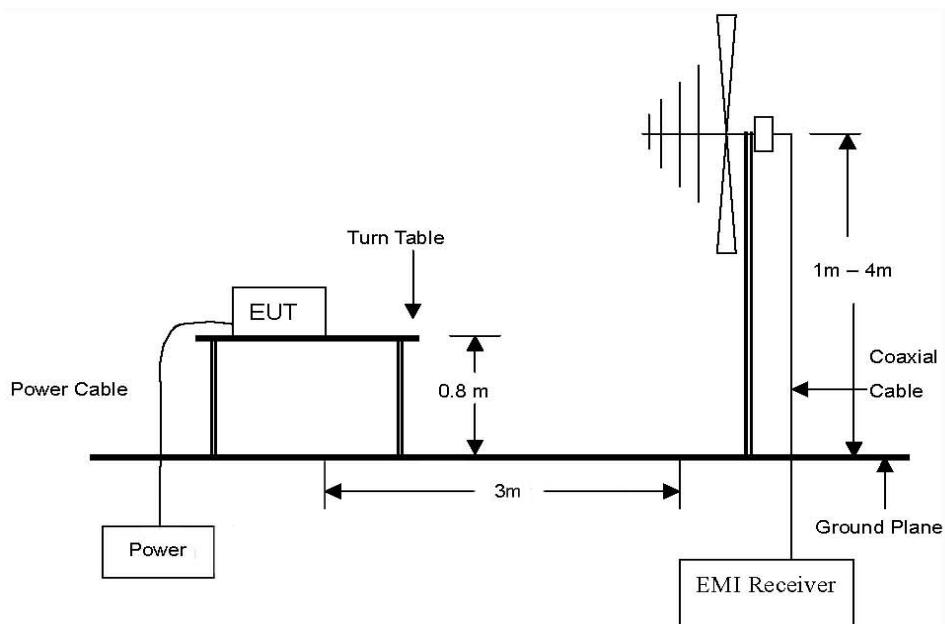
2.1. Test setup

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 Emissions.

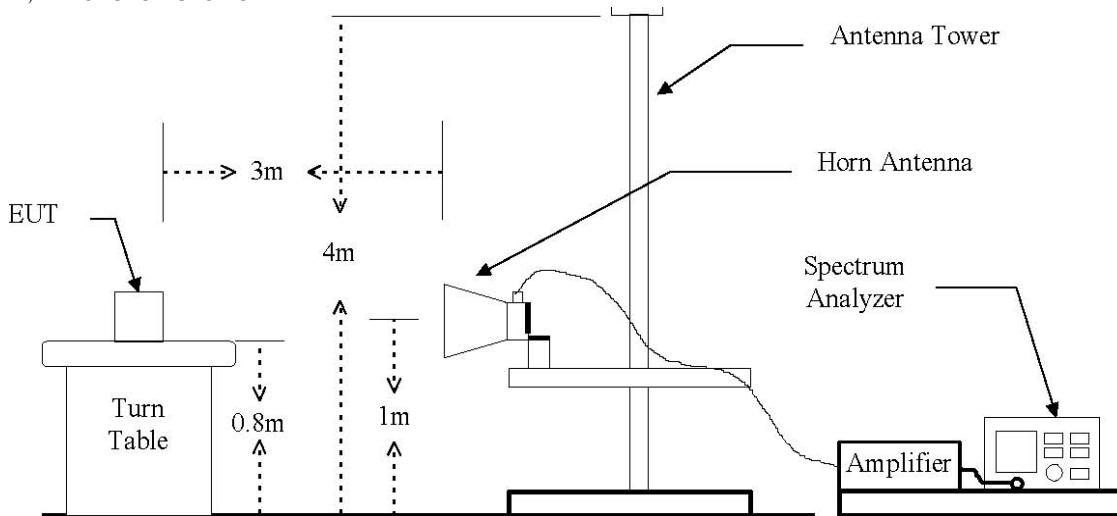


The diagram below shows the test setup that is utilized to make the measurements for emission from 30 MHz to 1 GHz Emissions.



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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

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.

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.

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.

For transmitters operating in the 5.725 ~ 5.78 GHz band: All emissions within the frequency range from the band edge to 10 MHz above or below the band edge shall not exceed an e.i.r.p. of -17 dB m/MHz; for frequencies 10 MHz or greater above or below the band edge, emissions shall not exceed an e.i.r.p. of -27 dB m/MHz.

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)	Distance (Meters)	Field Strength (dB μ N/m)	Field Strength (μ N/m)
0.009 – 0.490	300	20 log (2 400/F(kHz))	2 400/F(kHz)
0.490 – 1.705	30	20 log (24 000/F(kHz))	24 000/F(kHz)
1.705 – 30.0	30	29.54	30
30 - 88	3	40.0	100**
88 – 216	3	43.5	150**
216 – 960	3	46.0	200**
Above 960	3	54.0	500

**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.

2.3. Test procedures

Radiated spurious emissions from the EUT were measured according to the dictates in section G of KDB 789033 D02 v01 and ANSI C63.4-2003.

The emissions of the configuration that produced the worst case emissions are reported in this section.

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2.3.1. Test procedures for radiated spurious emissions

2.3.1.1. 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.

2.3.1.2. 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. 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.

NOTE:

- The measurements for below 1 GHz refer to section II.G.4.
Compliance shall be demonstrated using CISPR quasi-peak detection; however, peak detection is permitted as an alternative to quasi-peak detection.

- The measurements for above 1 GHz II.G.5.

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

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

- The measurements for above 1 GHz II.G.6.

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

Set to RBW = 1 MHz, VBW \geq 3 MHz, Detector = RMS, Averaging type = power(i.e., RMS), Sweep time = auto, Trace mode= trace average of at least 100 traces. 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.

If duty cycle < 98 percent, a correction factor shall be added to the measurement results.

- Averaging (RMS) mode was used above the correction factor is $10 \log(1/x)$, where x is the duty cycle.

- Test orthogonal plan of EUT is X-axis during radiation test.

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2.4. Test result

Ambient temperature : (24 ± 1) °C
Relative humidity : 49 % R.H.

2.4.1. Spurious radiated emission

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

Radiated emissions			Ant	Correction factors		Total	Limit	
Frequency (MHz)	Reading (dB μ V)	Detect Mode	Pol.	AF (dB/m)	Amp gain+CL (dB)	Actual (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)
106.83	46.47	Peak	V	11.88	-25.25	33.10	43.50	10.40
217.31	44.62	Peak	V	11.61	-24.36	31.87	46.00	14.13
265.42	48.40	Peak	V	14.58	-24.10	38.88	46.00	7.12
266.68	48.11	Peak	H	13.87	-24.10	37.88	46.00	8.12
333.32	39.66	Peak	H	14.95	-24.23	30.38	46.00	15.62
400.06	41.60	Peak	H	17.01	-24.50	34.11	46.00	11.89
466.69	39.16	Peak	V	18.38	-24.97	32.57	46.00	13.43
Above 500.00	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 **11a / 6 Mbps / 36 channel** as worst case among other modes.
3. According to § 15.31(o), Emission levels are not reported much lower than the limits by over 20 dB.
4. Radiated spurious emission measurement as below
(Actual = Reading + Antenna Factor + Amp + CL)

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2.4.2. Spurious radiated emission for above 1 GHz

802.11a (Band 1) _6 Mbps

A. Low Channel (5 180 MHz)

Radiated Emissions			Ant.	Correction Factors			Total	FCC Limit	
Frequency (MHz)	Reading (dB μ N)	Detect Mode	Pol.	AF (dB/m)	CL (dB)	Duty (dB)	Actual (dB μ N/m)	Limit (dB μ N/m)	Margin (dB)
*4 500.00	10.70	Peak	V	31.70	8.40	-	50.80	74.00	23.20
*4 500.00	3.55	Average	V	31.70	8.40	0.32	43.97	54.00	10.03
*5 060.30	13.93	Peak	V	33.53	9.02	-	56.48	74.00	17.52
*5 060.30	4.51	Average	V	33.53	9.02	0.32	47.38	54.00	6.62
*5 150.00	12.08	Peak	V	33.59	9.06	-	54.73	74.00	19.27
*5 150.00	3.59	Average	V	33.59	9.06	0.32	46.56	54.00	7.44

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

B. Middle Channel (5 220 MHz)

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

C. High Channel (5 240 MHz)

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

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802.11a (Band 2A) _6 Mbps

A. Low Channel (5 260 MHz)

Radiated Emissions			Ant	Correction Factors		Total	FCC 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)
Above 1 000.00	Not detected	-	-	-	-	-	-	-

B. Middle Channel (5 300 MHz)

Radiated Emissions			Ant	Correction Factors		Total	FCC 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)
Above 1 000.00	Not detected	-	-	-	-	-	-	-

C. High Channel (5 320 MHz)

Radiated Emissions			Ant.	Correction Factors			Total	FCC 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)
*5 350.00	9.57	Peak	V	33.73	9.14	-	52.44	74.00	21.56
*5 350.00	3.05	Average	V	33.73	9.14	0.32	46.24	54.00	7.76
*5 377.72	13.16	Peak	V	33.75	9.15	-	56.06	74.00	17.94
*5 377.72	3.66	Average	V	33.75	9.15	0.32	46.88	54.00	7.12
*5 460.00	8.06	Peak	V	33.80	9.18	-	51.04	74.00	22.96
*5 460.00	2.14	Average	V	33.80	9.18	0.32	45.44	54.00	8.56

Radiated Emissions			Ant	Correction Factors		Total	FCC 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)
Above 1 000.00	Not detected	-	-	-	-	-	-	-

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A4(210 mm x 297 mm)

802.11a (Band 2C) _6 Mbps

A. Low Channel (5 500 MHz)

Radiated Emissions			Ant.	Correction Factors			Total	FCC Limit	
Frequency (MHz)	Reading (dB μ N)	Detect Mode	Pol.	AF (dB/m)	CL (dB)	Duty (dB)	Actual (dB μ N/m)	Limit (dB μ N/m)	Margin (dB)
*5 350.00	9.32	Peak	V	33.73	9.14	-	52.19	74.00	21.81
*5 350.00	1.00	Average	V	33.73	9.14	0.32	44.19	54.00	9.81
*5 449.11	12.81	Peak	V	33.80	9.18	-	55.79	74.00	18.21
*5 449.11	3.17	Average	V	33.80	9.18	0.32	46.47	54.00	7.53
*5 460.00	9.61	Peak	V	33.80	9.18	-	52.59	74.00	21.41
*5 460.00	2.32	Average	V	33.80	9.18	0.32	45.62	54.00	8.38

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

B. Middle Channel (5 580 MHz)

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

C. High Channel (5 700 MHz)

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

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A4(210 mm x 297 mm)

802.11a (Band 3) _6 Mbps

A. Low Channel (5 745 MHz)

Radiated Emissions			Ant.	Correction Factors			Total	FCC 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)
5 706.57	14.06	Peak	V	34.13	9.45	-	57.64	68.23	10.59
5 724.78	17.27	Peak	V	34.15	9.47	-	60.89	78.23	17.34

Radiated Emissions			Ant	Correction Factors		Total	FCC 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)
Above 1 000.00	Not detected	-	-	-	-	-	-	-

B. Middle Channel (5 785 MHz)

Radiated Emissions			Ant	Correction Factors		Total	FCC 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)
Above 1 000.00	Not detected	-	-	-	-	-	-	-

C. High Channel (5 825 MHz)

Radiated Emissions			Ant.	Correction Factors			Total	FCC 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)
5 850.11	14.67	Peak	V	34.33	9.62	-	58.62	78.23	19.61
5 868.70	13.78	Peak	V	34.36	9.64	-	57.78	68.23	10.45

Radiated Emissions			Ant	Correction Factors		Total	FCC 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)
Above 1 000.00	Not detected	-	-	-	-	-	-	-

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RTT5041-20(2014.01.20)(2)

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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	FCC 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)
*4 500.00	12.48	Peak	V	31.70	8.40	-	52.58	74.00	21.42
*4 500.00	3.15	Average	V	31.70	8.40	0.32	43.57	54.00	10.43
*5 029.75	15.08	Peak	V	33.51	9.01	-	57.60	74.00	16.40
*5 029.75	4.57	Average	V	33.51	9.01	0.32	47.41	54.00	6.59
*5 150.00	11.83	Peak	V	33.59	9.06	-	54.48	74.00	19.52
*5 150.00	3.00	Average	V	33.59	9.06	0.32	45.97	54.00	8.03

Radiated Emissions			Ant	Correction Factors		Total	FCC 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)
Above 1 000.00	Not detected	-	-	-	-	-	-	-

B. Middle Channel (5 220 MHz)

Radiated Emissions			Ant	Correction Factors		Total	FCC 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)
Above 1 000.00	Not detected	-	-	-	-	-	-	-

C. High Channel (5 240 MHz)

Radiated Emissions			Ant	Correction Factors		Total	FCC 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)
Above 1 000.00	Not detected	-	-	-	-	-	-	-

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A4(210 mm x 297 mm)

802.11n_HT20 (Band 2A) MCS0**A. Low Channel (5 260 MHz)**

Radiated Emissions			Ant	Correction Factors		Total	FCC 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)
Above 1 000.00	Not detected	-	-	-	-	-	-	-

B. Middle Channel (5 300 MHz)

Radiated Emissions			Ant	Correction Factors		Total	FCC 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)
Above 1 000.00	Not detected	-	-	-	-	-	-	-

C. High Channel (5 320 MHz)

Radiated Emissions			Ant.	Correction Factors			Total	FCC 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)
*5 350.00	11.95	Peak	V	33.73	9.14	-	54.82	74.00	19.18
*5 350.00	2.50	Average	V	33.73	9.14	0.32	45.69	54.00	8.31
*5 357.92	12.19	Peak	V	33.73	9.14	-	55.06	74.00	18.94
*5 357.92	2.69	Average	V	33.73	9.14	0.32	45.88	54.00	8.12
*5 460.00	11.01	Peak	V	33.80	9.18	-	53.99	74.00	20.01
*5 460.00	1.67	Average	V	33.80	9.18	0.32	44.97	54.00	9.03

Radiated Emissions			Ant	Correction Factors		Total	FCC 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)
Above 1 000.00	Not detected	-	-	-	-	-	-	-

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A4(210 mm x 297 mm)

802.11n_HT20 (Band 2C) MCS0**A. Low Channel (5 500 MHz)**

Radiated Emissions			Ant.	Correction Factors			Total	FCC Limit	
Frequency (MHz)	Reading (dB μ N)	Detect Mode	Pol.	AF (dB/m)	CL (dB)	Duty (dB)	Actual (dB μ N/m)	Limit (dB μ N/m)	Margin (dB)
*5 350.00	8.71	Peak	V	33.73	9.14	-	51.58	74.00	22.42
*5 350.00	1.27	Average	V	33.73	9.14	0.32	44.46	54.00	9.54
*5 453.73	12.33	Peak	V	33.80	9.18	-	55.31	74.00	18.69
*5 453.73	2.89	Average	V	33.80	9.18	0.32	46.19	54.00	7.81
*5 460.00	8.46	Peak	V	33.80	9.18	-	51.44	74.00	22.56
*5 460.00	1.99	Average	V	33.80	9.18	0.32	45.29	54.00	8.71

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

B. Middle Channel (5 580 MHz)

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

C. High Channel (5 700 MHz)

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

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A4(210 mm x 297 mm)

802.11n_HT20 (Band 3) MCS0

A. Low Channel (5 745 MHz)

Radiated Emissions			Ant.	Correction Factors			Total	FCC 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)
5 714.06	13.86	Peak	V	34.14	9.46	-	57.46	68.23	10.77
5 724.24	20.63	Peak	V	34.15	9.47	-	64.25	78.23	13.98

Radiated Emissions			Ant	Correction Factors		Total	FCC 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)
Above 1 000.00	Not detected	-	-	-	-	-	-	-

B. Middle Channel (5 785 MHz)

Radiated Emissions			Ant	Correction Factors		Total	FCC 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)
Above 1 000.00	Not detected	-	-	-	-	-	-	-

C. High Channel (5 825 MHz)

Radiated Emissions			Ant.	Correction Factors			Total	FCC 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)
5 853.34	14.16	Peak	V	34.34	9.62	-	58.12	78.23	20.11
5 866.10	14.44	Peak	V	34.36	9.64	-	58.44	68.23	9.79

Radiated Emissions			Ant	Correction Factors		Total	FCC 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)
Above 1 000.00	Not detected	-	-	-	-	-	-	-

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A4(210 mm x 297 mm)

802.11n_HT40 (Band 1)_MCS0**A. Low Channel (5 190 MHz)**

Radiated Emissions			Ant.	Correction Factors			Total	FCC 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)
*4 500.00	13.42	Peak	V	31.70	8.40	-	53.52	74.00	20.48
*4 500.00	3.43	Average	V	31.70	8.40	0.60	44.13	54.00	9.87
*4 693.05	14.79	Peak	V	32.39	8.63	-	55.81	74.00	18.19
*4 693.05	4.84	Average	V	32.39	8.63	0.60	46.46	54.00	7.54
*5 150.00	13.80	Peak	V	33.59	9.06	-	56.45	74.00	17.55
*5 150.00	4.37	Average	V	33.59	9.06	0.60	47.62	54.00	6.38

Radiated Emissions			Ant	Correction Factors		Total	FCC 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)
Above 1 000.00	Not detected	-	-	-	-	-	-	-

B. High Channel (5 230 MHz)

Radiated Emissions			Ant	Correction Factors		Total	FCC 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)
Above 1 000.00	Not detected	-	-	-	-	-	-	-

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A4(210 mm x 297 mm)

802.11n_HT40 (Band 2A) _MCS0**A. Low Channel (5 270 MHz)**

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

B. High Channel (5 310 MHz)

Radiated Emissions			Ant.	Correction Factors			Total	FCC Limit	
Frequency (MHz)	Reading (dBμV)	Detect Mode	Pol.	AF (dB/m)	CL (dB)	Duty (dB)	Actual (dBμV/m)	Limit (dBμV/m)	Margin (dB)
*5 350.00	8.18	Peak	V	33.73	9.14	-	51.05	74.00	22.95
*5 350.00	1.36	Average	V	33.73	9.14	0.60	44.83	54.00	9.17
*5 353.41	13.54	Peak	V	33.73	9.14	-	56.41	74.00	17.59
*5 353.41	2.83	Average	V	33.73	9.14	0.60	46.30	54.00	7.70
*5 460.00	9.75	Peak	V	33.80	9.18	-	52.73	74.00	21.27
*5 460.00	1.29	Average	V	33.80	9.18	0.60	44.87	54.00	9.13

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

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A4(210 mm x 297 mm)

802.11n_HT40 (Band 2C)_MCS0**A. Low Channel (5 510 MHz)**

Radiated Emissions			Ant.	Correction Factors			Total	FCC 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)
*5 350.00	9.32	Peak	V	33.73	9.14	-	52.19	74.00	21.81
*5 350.00	1.51	Average	V	33.73	9.14	0.60	44.98	54.00	9.02
*5 459.67	13.22	Peak	V	33.80	9.18	-	56.20	74.00	17.80
*5 459.67	3.20	Average	V	33.80	9.18	0.60	46.78	54.00	7.22
*5 460.00	10.91	Peak	V	33.80	9.18	-	53.89	74.00	20.11
*5 460.00	2.63	Average	V	33.80	9.18	0.60	46.21	54.00	7.79

Radiated Emissions			Ant	Correction Factors		Total	FCC 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)
Above 1 000.00	Not detected	-	-	-	-	-	-	-

B. Middle Channel (5 550 MHz)

Radiated Emissions			Ant	Correction Factors		Total	FCC 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)
Above 1 000.00	Not detected	-	-	-	-	-	-	-

C. High Channel (5 670 MHz)

Radiated Emissions			Ant	Correction Factors		Total	FCC 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)
Above 1 000.00	Not detected	-	-	-	-	-	-	-

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A4(210 mm x 297 mm)

802.11n_HT40 (Band 3) MCS0

A. Low Channel (5 755 MHz)

Radiated Emissions			Ant.	Correction Factors			Total	FCC 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)
5 712.75	20.26	Peak	V	34.14	9.46	-	63.86	68.23	4.37
5 724.47	19.35	Peak	V	34.15	9.47	-	62.97	78.23	15.26

Radiated Emissions			Ant	Correction Factors			Total	FCC 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)
Above 1 000.00	Not detected	-	-	-	-		-	-	-

B. High Channel (5 795 MHz)

Radiated Emissions			Ant.	Correction Factors			Total	FCC 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)
5 851.40	13.94	Peak	V	34.34	9.62	-	57.90	78.23	20.33
5 869.18	14.63	Peak	V	34.36	9.64	-	58.63	68.23	9.60

Radiated Emissions			Ant	Correction Factors			Total	FCC 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)
Above 1 000.00	Not detected	-	-	-	-		-	-	-

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A4(210 mm x 297 mm)

802.11ac_VHT80 (Band 1)_MCS0

A. Middle Channel (5 210 MHz)

Radiated Emissions			Ant.	Correction Factors			Total	FCC 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)
*4 500.00	13.11	Peak	V	31.70	8.40	-	53.21	74.00	20.79
*4 500.00	3.13	Average	V	31.70	8.40	1.14	44.37	54.00	9.63
*4 663.80	13.95	Peak	V	32.29	8.60	-	54.84	74.00	19.16
*4 663.80	5.64	Average	V	32.29	8.60	1.14	47.67	54.00	6.33
*5 150.00	14.05	Peak	V	33.59	9.06	-	56.70	74.00	17.30
*5 150.00	3.62	Average	V	33.59	9.06	1.14	47.41	54.00	6.59

Radiated Emissions			Ant	Correction Factors		Total	FCC 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)
Above 1 000.00	Not detected	-	-	-	-	-	-	-

802.11ac_VHT80 (Band 2A)_MCS0

A. Middle Channel (5 290 MHz)

Radiated Emissions			Ant.	Correction Factors			Total	FCC 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)
*5 350.00	10.39	Peak	V	33.73	9.14	-	53.26	74.00	20.74
*5 350.00	1.52	Average	V	33.73	9.14	1.14	45.53	54.00	8.47
*5 377.83	15.43	Peak	V	33.75	9.15	-	58.33	74.00	15.67
*5 377.83	4.98	Average	V	33.75	9.15	1.14	49.02	54.00	4.98
*5 460.00	10.30	Peak	V	33.80	9.18	-	53.28	74.00	20.72
*5 460.00	1.90	Average	V	33.80	9.18	1.14	46.02	54.00	7.98

Radiated Emissions			Ant	Correction Factors		Total	FCC 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)
Above 1 000.00	Not detected	-	-	-	-	-	-	-

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A4(210 mm x 297 mm)

802.11ac_VHT80 (Band 2C)_MCS0

A. Middle Channel (5 530 MHz)

Radiated Emissions			Ant.	Correction Factors			Total	FCC 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)
*5 350.00	9.49	Peak	V	33.73	9.14	-	52.36	74.00	21.64
*5 350.00	1.47	Average	V	33.73	9.14	1.14	45.48	54.00	8.52
*5 443.83	15.89	Peak	V	33.79	9.18	-	58.86	74.00	15.14
*5 443.83	5.70	Average	V	33.79	9.18	1.14	49.81	54.00	4.19
*5 460.00	15.42	Peak	V	33.80	9.18	-	58.40	74.00	15.60
*5 460.00	5.00	Average	V	33.80	9.18	1.14	49.12	54.00	4.88

Radiated Emissions			Ant	Correction Factors			Total	FCC 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)	
Above 1 000.00	Not detected	-	-	-	-	-	-	-	-

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A4(210 mm × 297 mm)

802.11ac_VHT80 (Band 3)_MCS0

A. Middle Channel (5 775 MHz)

Radiated Emissions			Ant.	Correction Factors			Total	FCC Limit	
Frequency (MHz)	Reading (dB μ N)	Detect Mode	Pol.	AF (dB/m)	CL (dB)	Duty (dB)	Actual (dB μ N/m)	Limit (dB μ N/m)	Margin (dB)
5 710.83	18.01	Peak	V	34.13	9.45	-	61.59	68.23	6.64
5 715.71	17.26	Peak	V	34.14	9.46	-	60.86	78.23	17.37
5 851.99	13.93	Peak	V	34.34	9.62	-	57.89	78.23	20.34
5 860.44	14.84	Peak	V	34.35	9.63	-	58.82	68.23	9.41

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

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. According to § 15.31(o), Emission levels are not reported much lower than the limits by over 20 dB.
4. Band edge measurement
(Actual = Reading + Antenna Factor + CL + Duty cycle)
5. Radiated spurious emission measurement
(Actual = Reading + Antenna Factor + Amp + CL + Duty cycle)
6. If frequency was out of restricted band, the calculation method for peak limit is same as below:
 $68.23 \text{ dB}\mu\text{N/m} = \text{EIRP} - 20 \log(d) + 104.77 = -27 - 20 \log(3) + 104.77$
7. In case of the frequency between 5 715 MHz ~ 5 725 MHz and 5 850 MHz ~ 5 860 MHz the limit is determined as 78.23 dB μ N/m.
 $78.23 \text{ dB}\mu\text{N/m} = \text{EIRP} - 20 \log(d) + 104.77 = -17 - 20 \log(3) + 104.77$

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3. 26 dB Bandwidth & 99 % Bandwidth

3.1. Test setup



3.2. 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.

3.2.1. 26 dB Bandwidth

1. This measurement settings are specified in section C.1 of KDB 789033 D02 v01.
2. Set RBW: approximately 1% of the emission bandwidth.
3. Set the VBW > RBW.
4. Detector = Peak
5. Trace mode = max hold.
6. Measure the maximum width of the emission that is 26 dB down from the peak of the emission. Compare this with the RBW setting of the analyzer. Readjust RBW and repeat measurement as needed until the RBW/EBW ratio is approximately 1 %

3.2.2. 99 % Bandwidth

1. Set center frequency to the nominal EUT channel center frequency.
2. Set span = 1.5 times to 5.0 times the OBW.
3. Set RBW = 1 % to 5 % of the OBW
4. Set VBW $\geq 3 \cdot \text{RBW}$
5. Video averaging is not permitted. Where practical, a sample detection and single sweep mode shall be used. Otherwise, peak detection and max hold mode (until the trace stabilizes) shall be used.
6. Use the 99 % power bandwidth function of the instrument (if available).
7. If the instrument does not have a 99 % power bandwidth function, the trace data points are recovered and directly summed in power units. The recovered amplitude data points, beginning at the lowest frequency, are placed in a running sum until 0.5 % of the total is reached; that frequency is recorded as the lower frequency. The process is repeated until 99.5 % of the total is reached; that frequency is recorded as the upper frequency. The 99 % occupied bandwidth is the difference between these two frequencies.

In the result,

- DFS requirements are not applicable in the 5 150 MHz - 5 250 MHz

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3.4. Test result

Ambient temperature : $(24 \pm 1)^\circ\text{C}$

Relative humidity : 49 % R.H.

Band	Mode	Frequency (MHz)	Ch.	Data Rate (Mbps)	26 dB Bandwidth (MHz)	99 % Bandwidth (MHz)
U-NII 1	11a	5 180	36	6	21.44	-
		5 220	44	6	21.64	-
		5 240	48	6	21.64	16.95
	11n_HT20	5 180	36	MCS0	21.72	-
		5 220	44	MCS0	21.64	-
		5 240	48	MCS0	21.68	18.03
	11n_HT40	5 190	38	MCS0	40.08	-
		5 230	46	MCS0	39.84	-
	11ac_VHT80	5 210	42	MCS0	81.76	75.72
U-NII 2A	11a	5 260	52	6	21.76	-
		5 300	60	6	21.44	-
		5 320	64	6	21.60	-
	11n_HT20	5 260	52	MCS0	21.76	-
		5 300	60	MCS0	21.76	-
		5 320	64	MCS0	21.64	-
	11n_HT40	5 270	54	MCS0	40.00	-
		5 310	62	MCS0	39.92	-
	11ac_VHT80	5 290	58	MCS0	82.40	-
U-NII 2C	11a	5 500	100	6	21.64	-
		5 580	116	6	21.44	-
		5 700	140	6	21.68	-
	11n_HT20	5 500	100	MCS0	21.64	-
		5 580	116	MCS0	21.96	-
		5 700	140	MCS0	21.72	-
	11n_HT40	5 510	102	MCS0	39.84	-
		5 550	110	MCS0	40.16	-
		5 670	134	MCS0	39.84	-
	11ac_VHT80	5 530	106	MCS0	81.76	-
U-NII 3	11a	5 745	149	6	21.76	-
		5 785	157	6	21.72	-
		5 825	165	6	21.64	-
	11n_HT20	5 745	149	MCS0	21.76	-
		5 785	157	MCS0	21.80	-
		5 825	165	MCS0	21.68	-
	11n_HT40	5 755	151	MCS0	39.68	-
		5 795	159	MCS0	40.08	-
	11ac_VHT80	5 775	155	MCS0	81.92	-

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802.11a (Band 1)

Low Channel (5 180 MHz)



Middle Channel (5 220 MHz)



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A4(210 mm x 297 mm)

High Channel (5 240 MHz)



802.11a (Band 2A)

Low Channel (5 260 MHz)



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Middle Channel (5.300 MHz)



High Channel (5.320 MHz)



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802.11a (Band 2C)

Low Channel (5 500 MHz)



Middle Channel (5 580 MHz)



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A4(210 mm × 297 mm)

High Channel (5 700 MHz)



802.11a (Band 3)

Low Channel (5 745 MHz)



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Middle Channel (5 785 MHz)



High Channel (5 825 MHz)



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802.11n-HT20 (Band 1)

Low Channel (5 180 MHz)



Middle Channel (5 220 MHz)



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High Channel (5 240 MHz)



802.11n-HT20 (Band 2A)

Low Channel (5 260 MHz)



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Middle Channel (5 300 MHz)



High Channel (5 320 MHz)



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802.11n-HT20 (Band 2C)

Low Channel (5 500 MHz)



Middle Channel (5 580 MHz)



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A4(210 mm x 297 mm)

High Channel (5 700 MHz)



802.11n_HT20 (Band 3)

Low Channel (5 745 MHz)



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Middle Channel (5 785 MHz)



High Channel (5 825 MHz)



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802.11n HT40 (Band 1)

Low Channel (5 190 MHz)



High Channel (5 230 MHz)



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802.11n HT40 (Band 2A)

Low Channel (5 270 MHz)



High Channel (5 310 MHz)



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802.11n HT40 (Band 2C)

Low Channel (5 510 MHz)



Middle Channel (5 550 MHz)



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A4(210 mm x 297 mm)

High Channel (5 670 MHz)



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A4(210 mm x 297 mm)

802.11n HT40 (Band 3)

Low Channel (5 755 MHz)



High Channel (5 795 MHz)



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A4(210 mm x 297 mm)

802.11ac_VHT80 (Band 1)

Middle Channel (5 210 MHz)



802.11ac_VHT80 (Band 2A)

Middle Channel (5 290 MHz)



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A4(210 mm x 297 mm)

802.11ac_VHT80 (Band 2C)

Middle Channel (5 530 MHz)

**802.11ac_VHT80 (Band 3)**

Middle Channel (5 775 MHz)



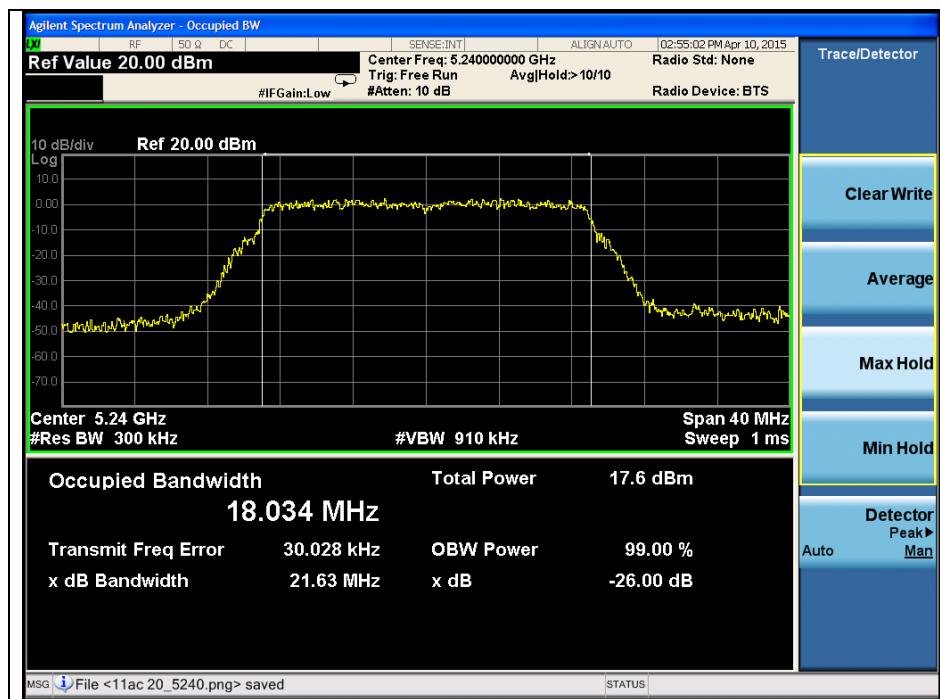
The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This test report cannot be reproduced, except in full, without prior written permission of the Company.

99 % Bandwidth**802.11a (Band 1)**

High Channel (5 240 MHz)

**802.11n_HT20 (Band 1)**

High Channel (5 240 MHz)



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802.11ac_VHT80 (Band 1)

Middle Channel (5 210 MHz)



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A4(210 mm x 297 mm)

4. 6 dB bandwidth

4.1. Test setup



4.2. Limit

Within the 5.725 – 5.85 GHz band, the minimum 6 dB bandwidth of U-NII devices shall be at least 500 kHz.

4.3. 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 C.2 of KDB 789033 D02 v01.
2. Set RBW: 100 kHz.
3. Set the video bandwidth (VBW) $\geq 3 \times$ RBW.
4. Detector = Peak.
5. Trace mode = max hold.
6. Sweep = auto couple.
7. Allow the trace to stabilize.
8. Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

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4.4. Test result

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

Band	Mode	Frequency (MHz)	Ch.	Data Rate (Mbps)	6 dB Bandwidth (MHz)
U-NII 3	11a	5 745	149	6	16.40
		5 785	157		16.40
		5 825	165		16.40
	11n_HT20	5 745	149	MCS0	17.64
		5 785	157		17.68
		5 825	165		17.68
	11n_HT40	5 755	151	MCS0	36.40
		5 795	159		36.24
	11ac_VHT80	5 775	155	MCS0	75.84

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A4(210 mm × 297 mm)

802.11a (Band 3)

Low Channel (5 745 MHz)



Middle Channel (5 785 MHz)



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A4(210 mm × 297 mm)

High Channel (5 825 MHz)



802.11n_HT20 (Band 3)

Low Channel (5 745 MHz)

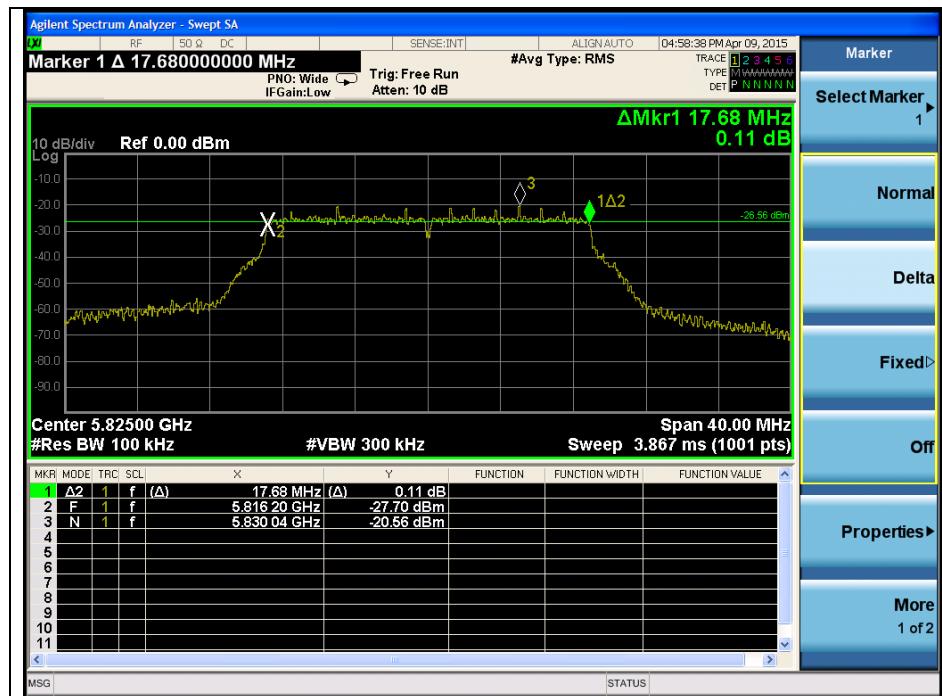


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Middle Channel (5 785 MHz)



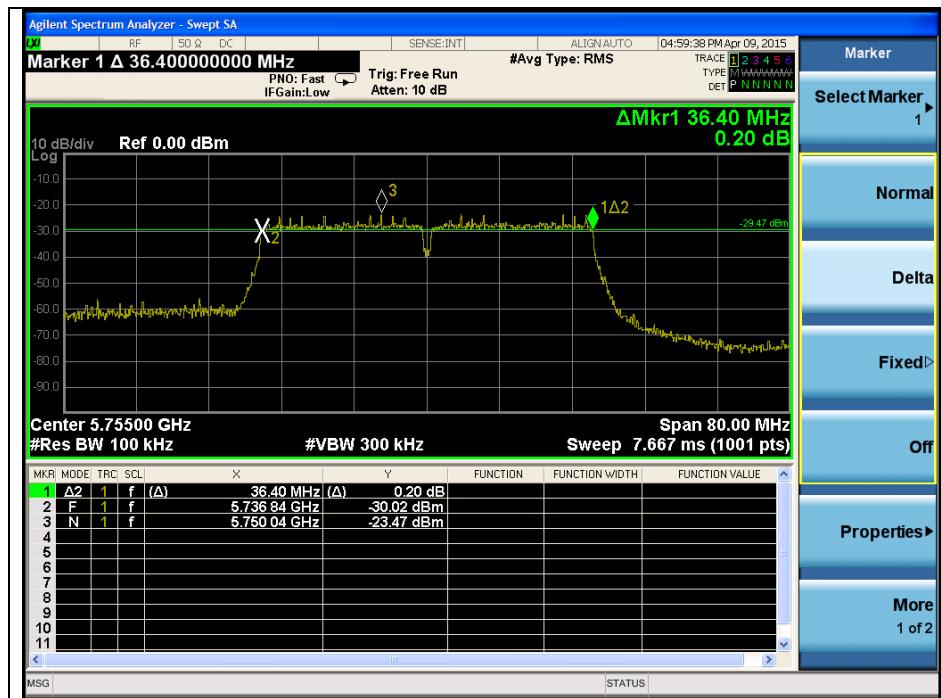
High Channel (5 825 MHz)



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802.11n_HT40 (Band 3)

Low Channel (5 755 MHz)



High Channel (5 795 MHz)



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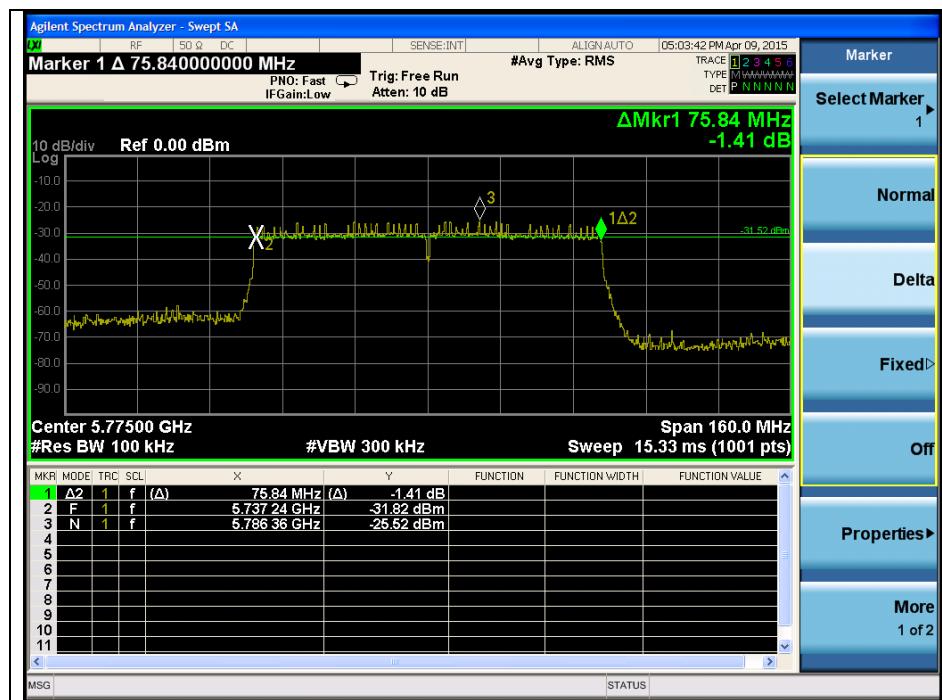
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A4(210 mm x 297 mm)

802.11ac_VHT80 (Band 3)

Middle Channel (5 775 MHz)



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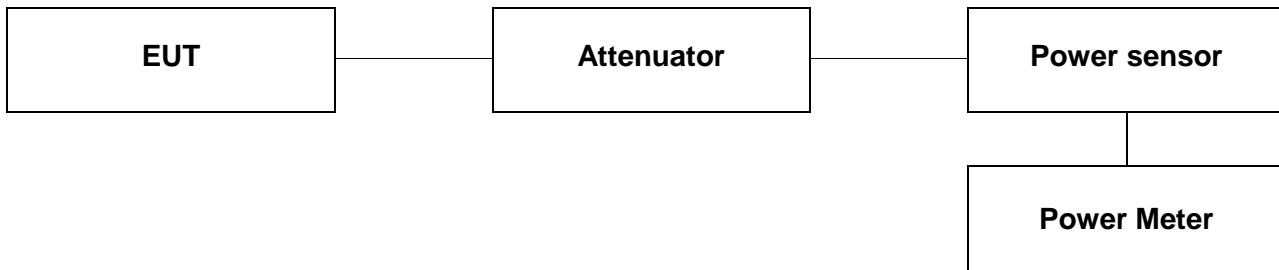
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A4(210 mm × 297 mm)

5. Output power

5.1. Test setup



5.2. Limit

FCC 15.407 (a)(1)(iv)

For mobile and portable 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.

(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.

(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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5.3. Test procedure

1. This measurement settings are specified in section E.3.a of KDB 789033 D02 v01.
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 dB m 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 percent).

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5.4. Test result

Ambient temperature : (24 ± 1) °C
 Relative humidity : 49 % R.H.

- 11a

Band	Power	Frequency (MHz)	Conducted Power (dB m)							
			Data Rate [Mbps]							
			6	9	12	18	24	36	48	54
U-NII 1	Mea. average	5 180	11.89	11.53	11.45	11.21	11.17	10.79	10.58	10.40
	Result		12.21	11.94	12.01	12.02	12.25	12.28	12.38	12.34
	Mea. average	5 220	11.38	11.36	11.31	11.03	10.97	10.63	10.35	10.16
	Result		11.70	11.77	11.87	11.84	12.05	12.12	12.15	12.10
	Mea. average	5 240	11.30	11.07	11.13	10.75	10.66	10.30	10.04	9.89
	Result		11.62	11.48	11.69	11.56	11.74	11.79	11.84	11.83
U-NII 2A	Mea. average	5 260	12.24	12.14	11.98	11.79	11.72	11.32	11.11	10.67
	Result		12.56	12.55	12.54	12.60	12.80	12.81	12.91	12.61
	Mea. average	5 300	12.01	11.84	11.81	11.60	11.49	10.95	10.74	10.57
	Result		12.33	12.25	12.37	12.41	12.57	12.44	12.54	12.51
	Mea. average	5 320	11.91	11.56	11.64	11.42	11.21	10.84	10.56	10.33
	Result		12.23	11.97	12.20	12.23	12.29	12.33	12.36	12.27
U-NII 2C	Mea. average	5 500	10.15	10.07	9.92	9.74	9.56	9.21	8.95	8.64
	Result		10.47	10.48	10.48	10.55	10.64	10.70	10.75	10.58
	Mea. average	5 580	10.57	10.39	10.15	9.94	9.87	9.39	9.25	8.96
	Result		10.89	10.80	10.71	10.75	10.95	10.88	11.05	10.90
	Mea. average	5 700	11.35	11.14	11.01	10.83	10.76	10.28	10.05	9.89
	Result		11.67	11.55	11.57	11.64	11.84	11.77	11.85	11.83
U-NII 3	Mea. average	5 745	10.58	10.49	10.39	10.25	10.07	9.70	9.41	9.11
	Result		10.90	10.90	10.95	11.06	11.15	11.19	11.21	11.05
	Mea. average	5 785	11.12	10.93	10.80	10.62	10.56	10.22	9.83	9.68
	Result		11.44	11.34	11.36	11.43	11.64	11.71	11.63	11.62
	Mea. average	5 825	11.03	10.98	10.83	10.59	10.38	10.10	9.85	9.69
	Result		11.39	11.49	11.49	11.56	11.57	11.71	11.86	11.91

Band	Conducted Power Limit (dB m)					
	Frequency (MHz)	Fixed Limit (dB m)	26 dB BW (MHz)	11+10LogB (dB m)	Antenna gain (dB i)	Limit (dB)
U-NII 1	5 180	24				
	5 220	24				
	5 240	24				
U-NII 2A	5 260	24	21.76	24.38	2.89	24
	5 300	24	21.44	24.31	2.89	24
	5 320	24	21.60	24.34	2.89	24
U-NII 2C	5 500	24	21.64	24.35	2.51	24
	5 580	24	21.44	24.31	2.51	24
	5 700	24	21.68	24.36	2.51	24
U-NII 3	5 745	30				
	5 785	30				
	5 825	30				

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Mode	Duty cycle							
	Data Rate [Mbps]							
11a	6	9	12	18	24	36	48	54
Duty Cycle (%)	93	91	88	83	78	71	66	64
Correction factor (dB)	0.32	0.41	0.56	0.81	1.08	1.49	1.80	1.94

Remark:

1. Result (dB m) = Average (dB m) + Correction factor (dB)
2. Duty cycle (%) = (Tx on time / Tx on + off time) x 100
3. Correction factor (dB) = $10 \log (1/\text{duty cycle (ms)})$

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RTT5041-20(2014.01.20)(2)

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

A4(210 mm x 297 mm)

- 11n-HT20

Band	Power	Frequency (MHz)	Conducted Power (dB m)							
			Data Rate [MCS]							
			0	1	2	3	4	5	6	7
U-NII 1	Mea. average	5 180	11.71	11.48	11.18	11.13	10.79	10.45	10.38	10.19
	Result		12.03	12.08	12.04	12.21	12.22	12.25	12.32	12.27
	Mea. average	5 220	11.46	11.18	10.69	10.83	10.45	10.15	10.05	9.91
	Result		11.78	11.78	11.55	11.91	11.88	11.95	11.99	11.99
	Mea. average	5 240	11.38	11.09	10.85	10.76	10.51	10.06	9.86	9.67
	Result		11.70	11.69	11.71	11.84	11.94	11.86	11.80	11.75
U-NII 2A	Mea. average	5 260	12.01	11.72	11.45	11.58	11.23	10.88	10.77	10.59
	Result		12.33	12.32	12.31	12.66	12.66	12.68	12.71	12.67
	Mea. average	5 300	12.02	11.61	11.35	11.38	11.07	10.71	10.63	10.48
	Result		12.34	12.21	12.21	12.46	12.50	12.51	12.57	12.56
	Mea. average	5 320	11.83	11.59	11.06	11.17	10.83	10.52	10.39	10.28
	Result		12.15	12.19	11.92	12.25	12.26	12.32	12.33	12.36
U-NII 2C	Mea. average	5 500	10.07	9.79	9.49	9.60	9.19	8.79	8.77	8.51
	Result		10.39	10.39	10.35	10.68	10.62	10.59	10.71	10.59
	Mea. average	5 580	10.24	9.97	9.81	9.83	9.52	9.22	8.95	8.82
	Result		10.56	10.57	10.67	10.91	10.95	11.02	10.89	10.90
	Mea. average	5 700	11.27	10.88	10.52	10.79	10.32	9.99	9.87	9.78
	Result		11.59	11.48	11.38	11.87	11.75	11.79	11.81	11.86
U-NII 3	Mea. average	5 745	10.58	10.26	10.03	10.05	9.71	9.36	9.30	9.13
	Result		10.90	10.86	10.89	11.13	11.14	11.16	11.24	11.21
	Mea. average	5 785	11.01	10.67	10.53	10.43	10.22	9.77	9.69	9.55
	Result		11.33	11.27	11.39	11.51	11.65	11.57	11.63	11.63
	Mea. average	5 825	10.89	10.66	10.36	10.50	10.08	9.82	9.69	9.52
	Result		11.21	11.26	11.22	11.58	11.51	11.62	11.63	11.60

Band	Conducted Power Limit (dB m)					
	Frequency (MHz)	Fixed Limit (dB m)	26 dB BW (MHz)	11+10LogB (dB m)	Antenna gain (dB i)	Limit (dB)
U-NII 1	5 180	24				
	5 220	24				
	5 240	24				
U-NII 2A	5 260	24	21.76	24.38	2.89	24
	5 300	24	21.76	24.38	2.89	24
	5 320	24	21.64	24.35	2.89	24
U-NII 2C	5 500	24	21.64	24.35	2.51	24
	5 580	24	21.96	24.42	2.51	24
	5 700	24	21.72	24.37	2.51	24
U-NII 3	5 745	30				
	5 785	30				
	5 825	30				

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RTT5041-20(2014.01.20)(2)

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

A4(210 mm x 297 mm)

Mode	Duty cycle							
	Data Rate [MCS]							
11n_HT20	0	1	2	3	4	5	6	7
Duty Cycle (%)	93	87	82	78	72	66	64	62
Correction factor (dB)	0.32	0.60	0.86	1.08	1.43	1.80	1.94	2.08

Remark:

1. Result (dB m) = Average (dB m) + Correction factor (dB)
2. Duty cycle (%) = (Tx on time / Tx on + off time) x 100
3. Correction factor (dB) = $10 \log (1/\text{duty cycle (ms)})$

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- 11n_HT40

Band	Power	Frequency (MHz)	Conducted Power (dB m)							
			Data Rate [MCS]							
			0	1	2	3	4	5	6	7
U-NII 1	Mea. average	5 190	11.61	11.04	10.66	10.57	10.01	9.62	9.49	9.33
	Result		12.21	12.18	12.15	12.37	12.30	12.38	12.33	12.34
U-NII 2A	Mea. average	5 230	11.30	10.86	10.43	10.28	9.66	9.29	9.09	8.98
	Result		11.90	12.00	11.92	12.08	11.95	12.05	11.93	11.99
U-NII 2A	Mea. average	5 270	11.64	11.12	10.79	10.61	10.11	9.65	9.61	9.28
	Result		12.24	12.26	12.28	12.41	12.40	12.41	12.45	12.29
U-NII 2C	Mea. average	5 310	11.45	10.92	10.56	10.39	9.92	9.39	9.35	9.09
	Result		12.05	12.06	12.05	12.19	12.21	12.15	12.19	12.10
U-NII 2C	Mea. average	5 510	10.08	9.63	9.16	8.87	8.39	7.96	7.87	7.73
	Result		10.68	10.77	10.65	10.67	10.68	10.72	10.71	10.74
U-NII 2C	Mea. average	5 550	10.33	9.83	9.39	9.24	8.78	8.22	8.10	7.94
	Result		10.93	10.97	10.88	11.04	11.07	10.98	10.94	10.95
U-NII 3	Mea. average	5 670	10.71	10.20	9.85	9.57	9.03	8.58	8.46	8.34
	Result		11.31	11.34	11.34	11.37	11.32	11.34	11.30	11.35
U-NII 3	Mea. average	5 755	10.37	9.91	9.58	9.43	8.92	8.49	8.12	8.04
	Result		10.97	11.05	11.07	11.23	11.21	11.25	10.96	11.05
U-NII 3	Mea. average	5 795	10.82	10.36	9.82	9.67	9.17	8.73	8.60	8.48
	Result		11.42	11.50	11.31	11.47	11.46	11.49	11.44	11.49

Band	Conducted Power Limit (dB m)					
	Frequency (MHz)	Fixed Limit (dB m)	26 dB BW (MHz)	11+10LogB (dB m)	Antenna gain (dB i)	Limit (dB)
U-NII 1	5 190	24				
	5 230	24				
U-NII 2A	5 270	24	40.00	27.02	2.89	24
	5 310	24	39.92	27.01	2.89	24
U-NII 2C	5 510	24	39.84	27.00	2.51	24
	5 550	24	40.16	27.04	2.51	24
	5 670	24	39.84	27.00	2.51	24
U-NII 3	5 755	30				
	5 795	30				

Mode	Duty cycle							
	Data Rate [MCS]							
11n_HT40	0	1	2	3	4	5	6	7
Duty Cycle (%)	87	77	71	66	59	53	52	50
Correction factor (dB)	0.60	1.14	1.49	1.80	2.29	2.76	2.84	3.01

Remark:

1. Result (dB m) = Average (dB m) + Correction factor (dB)
2. Duty cycle (%) = (Tx on time / Tx on + off time) x 100
3. Correction factor (dB) = 10 log (1/duty cycle (ms))

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- 11ac_VHT20

Band	Power	Frequency (MHz)	Conducted Power (dB m)								
			Data Rate [MCS]								
			0	1	2	3	4	5	6	7	8
U-NII 1	Mea. average	5 180	11.87	11.56	11.29	11.35	10.97	10.70	10.59	10.41	10.28
	Result		12.19	12.16	12.15	12.37	12.40	12.44	12.46	12.42	12.50
	Mea. average	5 220	11.29	11.01	10.77	10.92	10.62	10.25	10.13	10.03	9.68
	Result		11.61	11.61	11.63	11.94	12.05	11.99	12.00	12.04	11.90
	Mea. average	5 240	11.25	10.93	10.89	10.82	10.41	9.95	9.86	9.75	9.69
	Result		11.57	11.53	11.75	11.84	11.84	11.69	11.73	11.76	11.91
U-NII 2A	Mea. average	5 260	11.98	11.73	11.52	11.60	11.19	10.94	10.86	10.67	10.46
	Result		12.30	12.33	12.38	12.62	12.62	12.68	12.73	12.68	12.68
	Mea. average	5 300	12.03	11.59	11.34	11.48	11.21	10.78	10.66	10.53	10.38
	Result		12.35	12.19	12.20	12.50	12.64	12.52	12.53	12.54	12.60
	Mea. average	5 320	11.62	11.36	11.16	11.21	10.85	10.52	10.42	10.31	10.14
	Result		11.94	11.96	12.02	12.23	12.28	12.26	12.29	12.32	12.36
U-NII 2C	Mea. average	5 500	10.13	9.78	9.49	9.56	9.23	8.91	8.80	8.68	8.39
	Result		10.45	10.38	10.35	10.58	10.66	10.65	10.67	10.69	10.61
	Mea. average	5 580	10.23	9.98	9.72	9.84	9.36	9.05	8.96	8.91	8.64
	Result		10.55	10.58	10.58	10.86	10.79	10.79	10.83	10.92	10.86
	Mea. average	5 700	11.26	10.97	10.63	10.77	10.36	10.05	9.94	9.77	9.62
	Result		11.58	11.57	11.49	11.79	11.79	11.79	11.81	11.78	11.84
U-NII 3	Mea. average	5 745	10.58	10.22	9.89	10.07	9.67	9.31	9.19	9.08	8.90
	Result		10.90	10.82	10.75	11.09	11.10	11.05	11.06	11.09	11.12
	Mea. average	5 785	10.96	10.73	10.45	10.63	10.22	9.80	9.74	9.55	9.39
	Result		11.28	11.33	11.31	11.65	11.65	11.54	11.61	11.56	11.61
	Mea. average	5 825	11.14	10.75	10.36	10.45	10.09	9.79	9.66	9.57	9.36
	Result		11.46	11.35	11.22	11.47	11.52	11.53	11.53	11.58	11.58

Band	Conducted Power Limit (dB m)					
	Frequency (MHz)	Fixed Limit (dB m)	26 dB BW (MHz)	11+10LogB (dB m)	Antenna gain (dB i)	Limit (dB)
U-NII 1	5 180	24				
	5 220	24				
	5 240	24				
U-NII 2A	5 260	24	21.68	24.36	2.89	24
	5 300	24	21.84	24.39	2.89	24
	5 320	24	21.88	24.40	2.89	24
U-NII 2C	5 500	24	21.68	24.36	2.51	24
	5 580	24	21.60	24.34	2.51	24
	5 700	24	21.76	24.38	2.51	24
U-NII 3	5 745	30				
	5 785	30				
	5 825	30				

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RTT5041-20(2014.01.20)(2)

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

A4(210 mm x 297 mm)

Mode	Duty cycle								
	Data Rate [MCS]								
11ac_VHT20	0	1	2	3	4	5	6	7	8
Duty Cycle (%)	93	87	82	79	72	67	65	63	60
Correction factor (dB)	0.32	0.60	0.86	1.02	1.43	1.74	1.87	2.01	2.22

Remark:

1. Result (dB m) = Average (dB m) + Correction factor (dB)
2. Duty cycle (%) = (Tx on time / Tx on + off time) x 100
3. Correction factor (dB) = $10 \log (1/\text{duty cycle (ms)})$

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RTT5041-20(2014.01.20)(2)

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

A4(210 mm x 297 mm)

- 11ac_VHT40

Band	Power	Frequency (MHz)	Conducted Power (dB m)									
			Data Rate [MCS]									
			0	1	2	3	4	5	6	7	8	9
U-NII 1	Mea. average	5 190	11.70	11.05	10.69	10.57	10.07	9.67	9.49	9.30	9.17	9.01
	Result		12.30	12.13	12.12	12.37	12.36	12.35	12.33	12.31	12.27	12.29
	Mea. average	5 230	11.31	10.73	10.39	10.28	9.77	9.33	9.27	9.04	8.85	8.68
	Result		11.91	11.81	11.82	12.08	12.06	12.01	12.11	12.05	11.95	11.96
U-NII 2A	Mea. average	5 270	11.68	11.17	10.76	10.64	10.10	9.65	9.62	9.36	9.15	8.98
	Result		12.28	12.25	12.19	12.44	12.39	12.33	12.46	12.37	12.25	12.26
	Mea. average	5 310	8.98	11.56	10.86	10.55	10.44	9.85	9.51	9.36	9.11	9.03
	Result		12.16	11.94	11.98	12.24	12.14	12.19	12.20	12.12	12.13	12.04
U-NII 2C	Mea. average	5 510	10.09	9.44	9.11	8.98	8.43	8.04	7.94	7.77	7.60	7.43
	Result		10.69	10.52	10.54	10.78	10.72	10.72	10.78	10.78	10.70	10.71
	Mea. average	5 550	10.26	9.73	9.46	9.18	8.73	8.27	8.22	8.08	7.76	7.59
	Result		10.86	10.81	10.89	10.98	11.02	10.95	11.06	11.09	10.86	10.87
U-NII 3	Mea. average	5 670	10.65	10.16	9.77	9.64	9.17	8.67	8.54	8.28	8.18	7.98
	Result		11.25	11.24	11.20	11.44	11.46	11.35	11.38	11.29	11.28	11.26
	Mea. average	5 755	10.47	9.96	9.53	9.35	8.91	8.51	8.35	8.29	7.89	7.83
	Result		11.07	11.04	10.96	11.15	11.20	11.19	11.19	11.30	10.99	11.11
	Mea. average	5 795	10.71	10.15	9.84	9.64	9.28	8.76	8.64	8.49	8.33	8.25
	Result		11.31	11.23	11.27	11.44	11.57	11.44	11.48	11.50	11.43	11.53

Band	Conducted Power Limit (dB m)					
	Frequency (MHz)	Fixed Limit (dB m)	26 dB BW (MHz)	11+10LogB (dB m)	Antenna gain (dB i)	Limit (dB)
U-NII 1	5 190	24				
	5 230	24				
U-NII 2A	5 270	24	40.40	27.06	2.89	24
	5 310	24	39.92	27.01	2.89	24
U-NII 2C	5 510	24	39.84	27.00	2.51	24
	5 550	24	39.60	26.98	2.51	24
	5 670	24	39.84	27.00	2.51	24
U-NII 3	5 755	30				
	5 795	30				

Mode	Duty cycle									
	Data Rate [MCS]									
11ac_VHT40	0	1	2	3	4	5	6	7	8	9
Duty Cycle (%)	87	78	72	66	59	54	52	50	49	47
Correction factor (dB)	0.60	1.08	1.43	1.80	2.29	2.68	2.84	3.01	3.10	3.28

Remark:

1. Result (dB m) = Average (dB m) + Correction factor (dB)
2. Duty cycle (%) = (Tx on time / Tx on + off time) x 100
3. Correction factor (dB) = 10 log (1/duty cycle (ms))

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A4(210 mm x 297 mm)

- 11ac_VHT80

Band	Power	Frequency (MHz)	Conducted Power (dB m)									
			Data Rate [MCS]									
			0	1	2	3	4	5	6	7	8	9
U-NII 1	Mea. Average	5 210	11.21	9.03	9.93	9.87	9.48	9.11	9.01	8.87	8.76	8.58
	Result		12.35	12.70	12.30	12.63	12.76	12.68	12.68	12.64	12.74	12.67
U-NII 2A	Mea. Average	5 290	10.91	8.60	9.63	9.61	9.05	8.74	8.57	8.45	8.31	8.14
	Result		12.05	12.27	12.00	12.37	12.33	12.31	12.24	12.22	12.29	12.23
U-NII 2C	Mea. Average	5 530	9.41	7.25	8.24	8.21	7.69	7.38	7.25	7.13	6.88	6.72
	Result		10.55	10.92	10.61	10.97	10.97	10.95	10.92	10.90	10.86	10.81
U-NII 3	Mea. Average	5 775	10.01	7.83	8.81	8.77	8.26	7.97	7.83	7.74	7.43	7.39
	Result		11.15	11.50	11.18	11.53	11.54	11.54	11.50	11.51	11.41	11.48

Band	Conducted Power Limit (dB m)					
	Frequency (MHz)	Fixed Limit (dB m)	26 dB BW (MHz)	11+10LogB (dB m)	Antenna gain (dB i)	Limit (dB)
U-NII 1	5 210	24				
U-NII 2A	5 290	24	82.40	30.16	2.89	24
U-NII 2C	5 530	24	81.76	30.13	2.51	24
U-NII 3	5 775	30				

Mode	Duty cycle									
	Data Rate [MCS]									
11ac_VHT80	0	1	2	3	4	5	6	7	8	9
Duty Cycle (%)	77	43	58	53	47	44	43	42	40	39
Correction factor (dB)	1.14	3.67	2.37	2.76	3.28	3.57	3.67	3.77	3.92	4.09

Remark:

1. Result (dB m) = Average (dB m) + Correction factor (dB)
2. Duty cycle (%) = (Tx on time / Tx on + off time) x 100
3. Correction factor (dB) = $10 \log(1/\text{duty cycle (ms)})$

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6. Peak power spectral density

6.1. Test setup



6.2. Limit

FCC 15.407 (a)(1)(iv)

For mobile and portable 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.

(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.

(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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6.3. 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 F of KDB 789033 D02 v01.
2. Create an average power spectrum for the EUT operating mode being tested by following the instructions in section II.E.2. for measuring maximum conducted output power using a spectrum analyzer or EMI receiver: select the appropriate test method (SA-1, SA-2, SA-3, or alternatives to each) and apply it up to, but not including, the step labeled, “Compute power...”. (This procedure is required even if the maximum conducted output power measurement was performed using a power meter, method PM.)
3. Use the peak search function on the instrument to find the peak of the spectrum and record its value.
4. Make the following adjustments to the peak value of the spectrum, if applicable:
 - a) If Method SA-2 or SA-2 Alternative was used, add $10 \log(1/x)$, where x is the duty cycle, to the peak of the spectrum.
 - b) If Method SA-3 Alternative was used and the linear mode was used in step II.E.2.g)(viii), add 1 dB to the final result to compensate for the difference between linear averaging and power averaging.
5. The result is the Maximum PSD over 1 MHz reference bandwidth.
6. For devices operating in the bands 5.15-5.25 GHz, 5.25-5.35 GHz, and 5.47-5.725 GHz, the above procedures make use of 1 MHz RBW to satisfy directly the 1 MHz reference bandwidth specified in § 15.407(a)(5). For devices operating in the band 5.725-5.85 GHz, the rules specify a measurement bandwidth of 500 kHz. Many spectrum analyzers do not have 500 kHz RBW, thus a narrower RBW may need to be used. The rules permit the use of a RBWs less than 1 MHz, or 500 kHz, “provided that the measured power is integrated over the full reference bandwidth” to show the total power over the specified measurement bandwidth (*i.e.*, 1 MHz, or 500 kHz). If measurements are performed using a reduced resolution bandwidth (< 1 MHz, or < 500 kHz) and integrated over 1 MHz, or 500 kHz bandwidth, the following adjustments to the procedures apply:
 - a) Set RBW $\geq 1/T$, where T is defined in section II.B.I.a).
 - b) Set VBW ≥ 3 RBW.
 - c) If measurement bandwidth of Maximum PSD is specified in 500 kHz, add $10\log(500 \text{ kHz}/\text{RBW})$ to the measured result, whereas RBW (< 500 kHz) is the reduced resolution bandwidth of the spectrum analyzer set during measurement.
 - d) If measurement bandwidth of Maximum PSD is specified in 1 MHz, add $10\log(1 \text{ MHz}/\text{RBW})$ to the measured result, whereas RBW (< 1 MHz) is the reduced resolution bandwidth of spectrum analyzer set during measurement.
 - e) Care must be taken to ensure that the measurements are performed during a period of continuous transmission or are corrected upward for duty cycle.

Note: As a practical matter, it is recommended to use reduced RBW of 100 kHz for the sections 5.c) and 5.d) above, since RBW=100 kHz is available on nearly all spectrum analyzers.

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6.4. Test result

Ambient temperature : (24 ± 1) °C
 Relative humidity : 49 % R.H.

Band	Mode	Frequency (MHz)	Ch.	Data Rate (Mbps)	Measured PPSSD (dB m)	Duty Factor (dB)	Final PPSSD (dB m)	Limit (dB m/MHz)
U-NII 1	11a	5 180	36	6	1.30	0.32	1.62	11
		5 220	44	6	1.02	0.32	1.34	11
		5 240	48	6	0.84	0.32	1.16	11
	11n_HT20	5 180	36	MCS0	0.89	0.32	1.21	11
		5 220	44	MCS0	0.62	0.32	0.94	11
		5 240	48	MCS0	0.37	0.32	0.69	11
	11n_HT40	5 190	38	MCS0	-1.56	0.60	-0.96	11
		5 230	46	MCS0	-2.02	0.60	-1.42	11
	11ac_VHT80	5 210	42	MCS0	-4.41	1.14	-3.27	11
U-NII 2A	11a	5 260	52	6	1.60	0.32	1.92	11
		5 300	60	6	1.63	0.32	1.95	11
		5 320	64	6	1.36	0.32	1.68	11
	11n_HT20	5 260	52	MCS0	1.06	0.32	1.38	11
		5 300	60	MCS0	1.23	0.32	1.55	11
		5 320	64	MCS0	0.88	0.32	1.20	11
	11n_HT40	5 270	54	MCS0	-1.61	0.60	-1.01	11
		5 310	62	MCS0	-1.57	0.60	-0.97	11
	11ac_VHT80	5 290	58	MCS0	-5.28	1.14	-4.14	11
U-NII 2C	11a	5 500	134	6	-0.43	0.32	-0.11	11
		5 580	106	6	0.04	0.32	0.36	11
		5 700	140	6	0.74	0.32	1.06	11
	11n_HT20	5 500	100	MCS0	-0.88	0.32	-0.56	11
		5 580	116	MCS0	-0.55	0.32	-0.23	11
		5 700	140	MCS0	0.56	0.32	0.88	11
	11n_HT40	5 510	102	MCS0	-2.86	0.60	-2.26	11
		5 550	110	MCS0	-2.43	0.60	-1.83	11
		5 670	134	MCS0	-2.03	0.60	-1.43	11
	11ac_VHT80	5 530	106	MCS0	-6.33	1.14	-5.19	11
U-NII 3	11a	5 745	149	6	-2.67	0.32	-2.35	30
		5 785	157	6	-1.98	0.32	-1.66	30
		5 825	165	6	-2.19	0.32	-1.87	30
	11n_HT20	5 745	149	MCS0	-3.02	0.32	-2.70	30
		5 785	157	MCS0	-2.52	0.32	-2.20	30
		5 825	165	MCS0	-2.75	0.32	-2.43	30
	11n_HT40	5 755	151	MCS0	-5.30	0.60	-4.70	30
		5 795	159	MCS0	-4.67	0.60	-4.07	30
	11ac_VHT80	5 775	155	MCS0	-8.46	1.14	-7.32	30

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A4(210 mm × 297 mm)

802.11a (Band 1)

Low Channel (5 180 MHz)



Middle Channel (5 220 MHz)



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A4(210 mm x 297 mm)

High Channel (5.240 MHz)



802.11a (Band 2A)

Low Channel (5.260 MHz)



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Middle Channel (5.300 MHz)



High Channel (5.320 MHz)



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802.11a (Band 2C)

Low Channel (5 500 MHz)



Middle Channel (5 580 MHz)



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A4(210 mm x 297 mm)

High Channel (5 700 MHz)



802.11a (Band 3)

Low Channel (5 745 MHz)

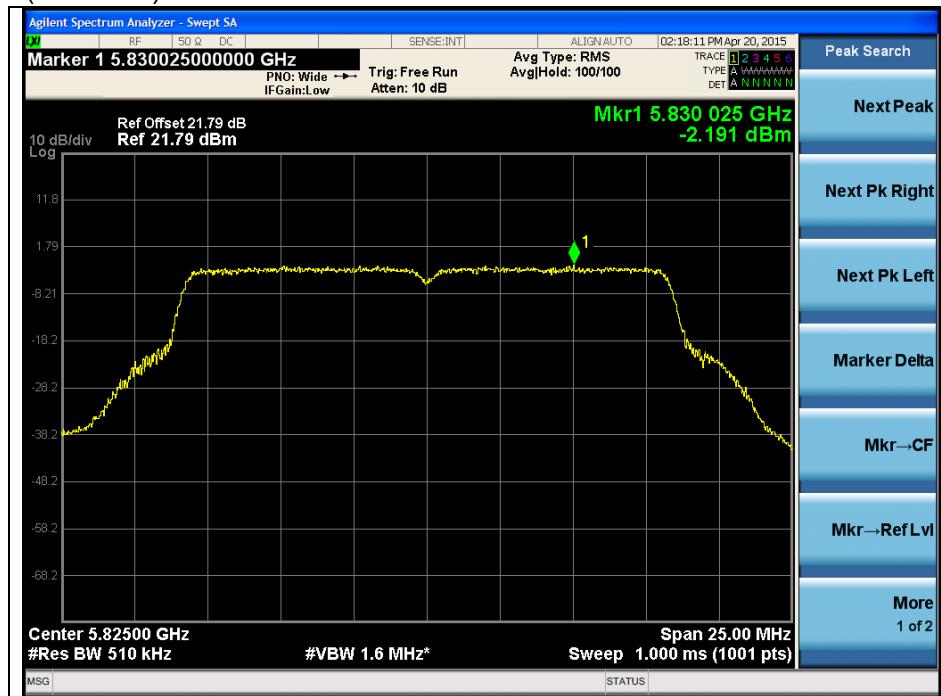


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Middle Channel (5.785 MHz)



High Channel (5.825 MHz)



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802.11n HT20 (Band 1)

Low Channel (5 180 MHz)



Middle Channel (5 220 MHz)



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A4(210 mm × 297 mm)

High Channel (5.240 MHz)



802.11n_HT20 (Band 2A)

Low Channel (5.260 MHz)



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Middle Channel (5.300 MHz)



High Channel (5.320 MHz)



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802.11n HT20 (Band 2C)

Low Channel (5 500 MHz)



Middle Channel (5 580 MHz)



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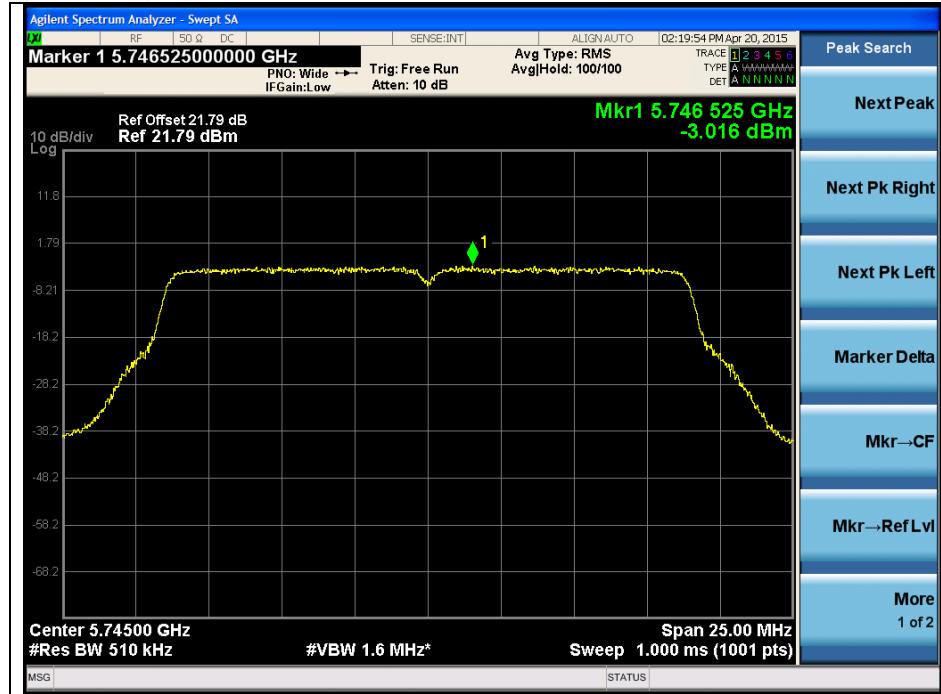
A4(210 mm x 297 mm)

High Channel (5 700 MHz)



802.11n_HT20 (Band 3)

Low Channel (5 745 MHz)

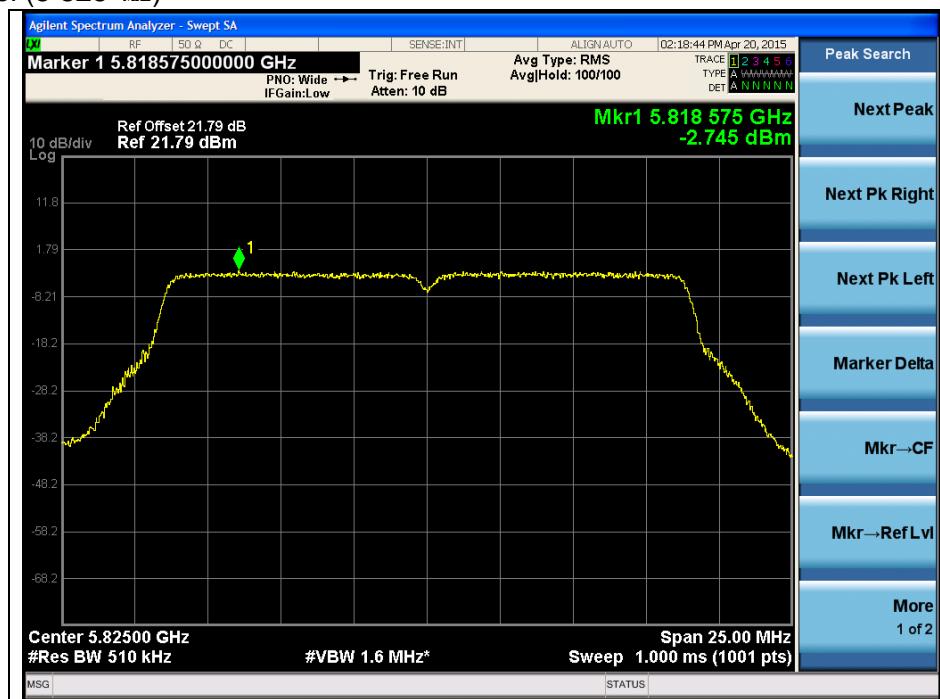


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Middle Channel (5.785 MHz)



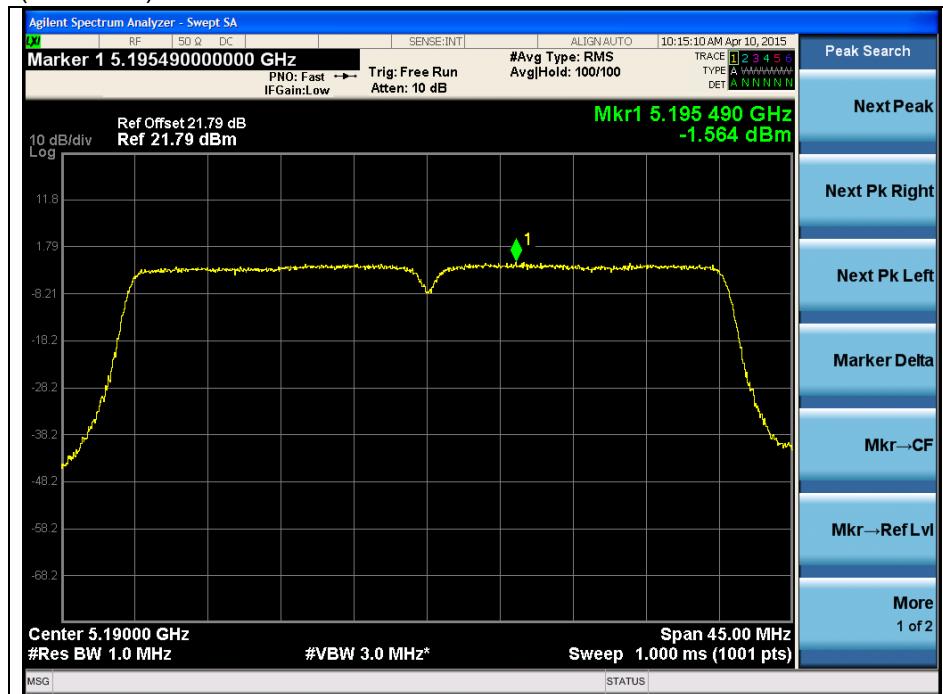
High Channel (5.825 MHz)



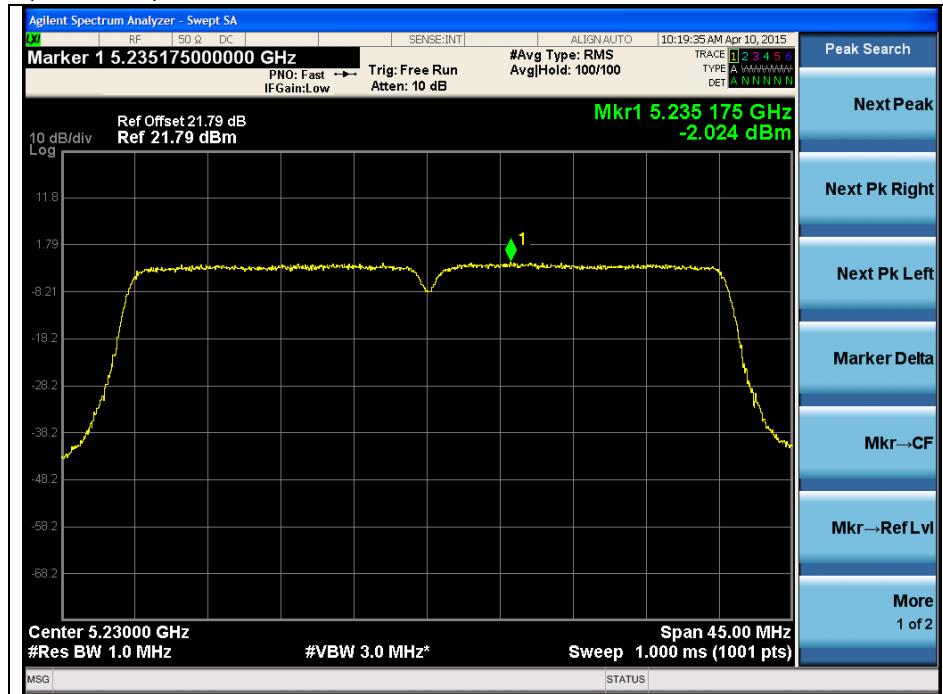
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802.11n HT40 (Band 1)

Low Channel (5 190 MHz)



High Channel (5 230 MHz)



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A4(210 mm x 297 mm)

802.11n HT40 (Band 2A)

Low Channel (5 270 MHz)



High Channel (5 310 MHz)



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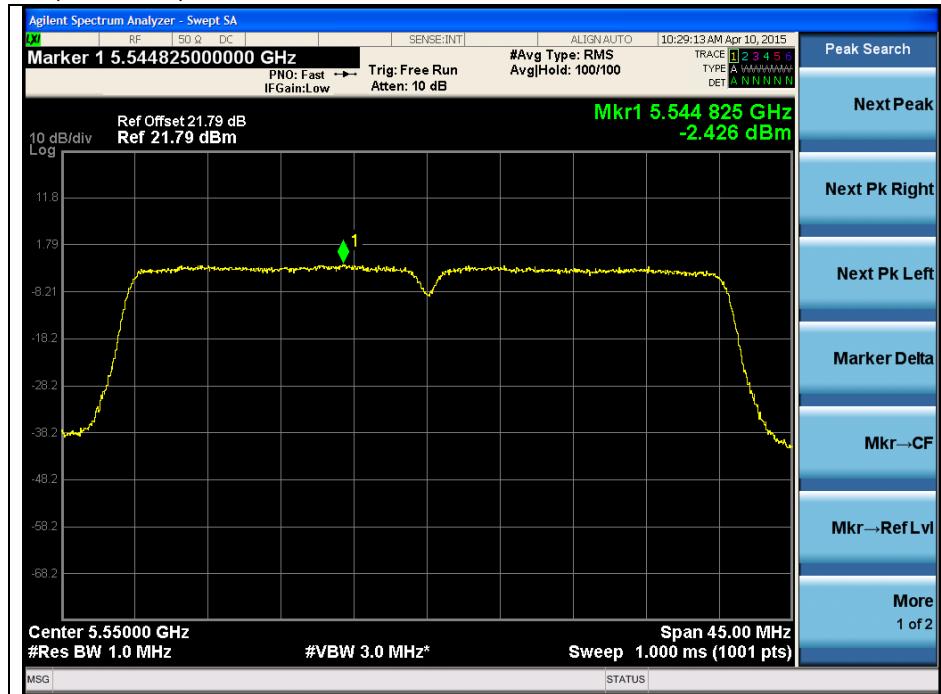
A4(210 mm x 297 mm)

802.11n HT40 (Band 2C)

Low Channel (5 510 MHz)



Middle Channel (5 550 MHz)



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High Channel (5 670 MHz)



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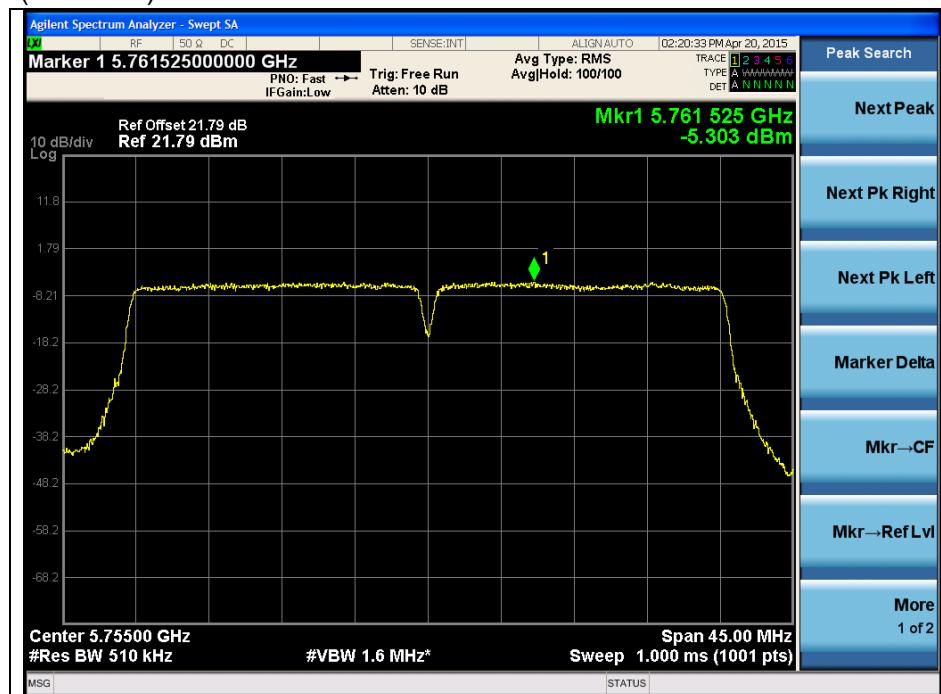
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A4(210 mm x 297 mm)

802.11n HT40 (Band 3)

Low Channel (5 755 MHz)



High Channel (5 795 MHz)



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802.11ac_VHT80 (Band 1)

Middle Channel (5 210 MHz)

**802.11ac_VHT80 (Band 2A)**

Middle Channel (5 290 MHz)



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A4(210 mm x 297 mm)

802.11ac_VHT80 (Band 2C)

Middle Channel (5 530 MHz)

**802.11ac_VHT80 (Band 3)**

Middle Channel (5 775 MHz)



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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 §15.407 (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.

7.2. Antenna Connected Construction

Antenna used in this product is Integral antenna and peak max gain of antenna as below.

Band	5 180 MHz – 5 320 MHz	5 500 MHz – 5 700 MHz	5 745 MHz – 5 825 MHz
Mode	11a/n_HT20, HT40, 11ac_VHT20, VHT40, VHT80		
Gain	2.89 dB i	2.51 dB i	5.78 dB i

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