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TEST REPORT

Eurofins KCTL Co.,Ltd. 65, Sinwon-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Korea TEL: 82-70-5008-1021 FAX: 82-505-299-8311 www.kctl.co.kr	Report No.: KR23-SRF0158 Page (1) of (69)	eurofins KCTL

1. Client

- Name : Samsung Electronics Co., Ltd.
- Address : 129, Samsung-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Rep. of Korea
- Date of Receipt : 2023-03-23

2. Use of Report : Certification

3. Name of Product / Model : Smart wearable / SM-R965U (FCC), SM-R965F (ISED)

4. Manufacturer / Country of Origin : Samsung Electronics Co., Ltd. / Vietnam

5. FCC ID : A3LSMR965 (SM-R965U, SM-R965F)

6. IC Certificate No. : 649E-SMR965 (SM-R965F)

7. Date of Test : 2023-03-29 to 2023-05-17

8. Location of Test : ■ Permanent Testing Lab ☐ On Site Testing
(Address:65, Sinwon-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Korea)

9. Test method used : FCC Part 15 Subpart E, 15.407
RSS-247 Issue 2 February 2017
RSS-Gen Issue 5 February 2021

10. Test Result : Refer to the test result in the test report

	Tested by	Technical Manager
Affirmation	Name : Kwonse Kim (Signature)	Name : Seungyong Kim (Signature)

2023-05-22

Eurofins KCTL Co.,Ltd.

As a test result of the sample which was submitted from the client, this report does not guarantee the whole product quality. This test report should not be used and copied without a written agreement by Eurofins KCTL Co.,Ltd.

REPORT REVISION HISTORY

Date	Revision	Page No
2023-05-22	Originally issued	-

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General remarks for test reports

Statement concerning the uncertainty of the measurement systems used for the tests

(may be required by the product standard or client)

☐ **Internal procedure used for type testing through which traceability of the measuring uncertainty has been established:**

Procedure number, issue date and title:

Calculations leading to the reported values are on file with the testing laboratory that conducted the testing.

☒ **Statement not required by the standard or client used for type testing**

CONTENTS

1. General information 4
2. Device information 4
2.1. Accessory information 5
2.2. Frequency/channel operations 5
2.3. Simultaneous Tx Condition 5
2.4. Duty Cycle Factor 6
3. Antenna requirement 7
4. Summary of tests 8
5. Measurement uncertainty 9
6. Measurement results explanation example 10
7. Test results 11
7.1. Maximum conducted output power 11
7.2. Maximum Power Spectral Density 16
7.3. 26 dB Bandwidth & 99% Bandwidth 20
7.4. 6 dB Bandwidth 26
7.5. Straddle channel 29
7.6. Spurious Emission, Band Edge and Restricted bands 33
7.7. AC Conducted emission 67
8. Measurement equipment 69

1. General information

Client	:	Samsung Electronics Co., Ltd.
Address	:	129, Samsung-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Rep. of Korea
Manufacturer	:	Samsung Electronics Co., Ltd.
Address	:	129, Samsung-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Rep. of Korea
Factory 1	:	AG TECH CO.,LTD
Address	:	Lot G3, Que Vo Industrial Park(Expanded Area), Nam son Ward, Bac Ninh Province, Vietnam
Factory 2	:	ALMUS VINA
Address	:	Lot CN07A, Phu Ha Industrial Park, Ha Thach Commune, Phu Tho Town, Phu Tho Province, Vietnam
Laboratory	:	Eurofins KCTL Co.,Ltd.
Address	:	65, Sinwon-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Korea
Accreditations	:	FCC Site Designation No: KR0040, FCC Site Registration No: 687132 VCCI Registration No. : R-20080, G-20078, C-20059, T-20056 CAB Identifier: KR0040 ISED Number: 8035A KOLAS No.: KT231

2. Device information

Equipment under test	:	Smart wearable
Model	:	SM-R965U(FCC), SM-R965F(ISED)
Derivative model	:	SM-R965F(FCC)
Modulation technique		OFDM [WIFI(802.11a/n)]
Number of channels		UNII-1 : 4 ch (20 ㎒) UNII-2A : 4 ch (20 ㎒) UNII-2C : 12 ch (20 ㎒) UNII-3 : 5 ch (20 ㎒)
Power source	:	DC 3.88 V
Antenna specification	:	LDS Antenna
Antenna gain	:	UNII-1 : -4.60 dBi UNII-2A : -4.00 dBi UNII-2C : -4.00 dBi UNII-3 : -6.00 dBi
Frequency range		UNII-1 : 5 180 ㎒ ~ 5 240 ㎒ (802.11a/n_HT20) UNII-2A : 5 260 ㎒ ~ 5 320 ㎒ (802.11a/n_HT20) UNII-2C : 5 500 ㎒ ~ 5 720 ㎒ (802.11a/n_HT20) UNII-3 : 5 745 ㎒ ~ 5 825 ㎒ (802.11a/n_HT20)
Software version	:	SM-R965U_R965U.001, SM-R965F_R965F.001
Hardware version	:	REV1.0
Test device serial No.	:	Conducted : R3AW30125TP Radiated : R3AW3011Y7P, R3AW3011YMF, R3AW3011YGW
Operation temperature	:	-20 ℃ ~ 50 ℃

Note.

1. Due to marketing purpose, the model SM-R965F will be filed for ISED approval and the test reports remain valid for Model SM-R965F ISED submission.
2. The product equality letter includes detailed information about the differences between SM-R965U and SM-R965F model.

2.1. Accessory information

Equipment	Manufacturer	Model	Serial No.	Power source	FCC ID & IC
Wireless charger	Samsung Electronics Co., Ltd.	EP-OR900	-	5.0 V, 2.0 A	FCC ID : A3LEPOR900 IC : 649E-EPOR900

2.2. Frequency/channel operations

This device contains the following capabilities:
WLAN (11a/b/g/n), Bluetooth (BDR/EDR/BLE), LTE B2/4/5/7/12/13/25/26/66/71, WCDMA 850/1700/1900

UNII-1

Ch.	Frequency (㎒)
36	5 180
40	5 200
48	5 240

UNII-2A

Ch.	Frequency (㎒)
52	5 260
56	5 280
64	5 320

UNII-2C

Ch.	Frequency (㎒)
100	5 500
120	5 600
140	5 700
144	5 720

UNII-3

Ch.	Frequency (㎒)
149	5 745
157	5 785
165	5 825

Table 2.2.1. 802.11a/n HT20 mode

2.3. Simultaneous Tx Condition

The device supports simultaneous transmission operation, which allows for two channels to operate independent of one another in the Bluetooth, 5 ㎓ bands simultaneously

Simultaneous Tx condition – not RSDB

Mode	# of TX	WLAN 5 ㎓	Bluetooth
Bluetooth + 5G WLAN	2	O	O

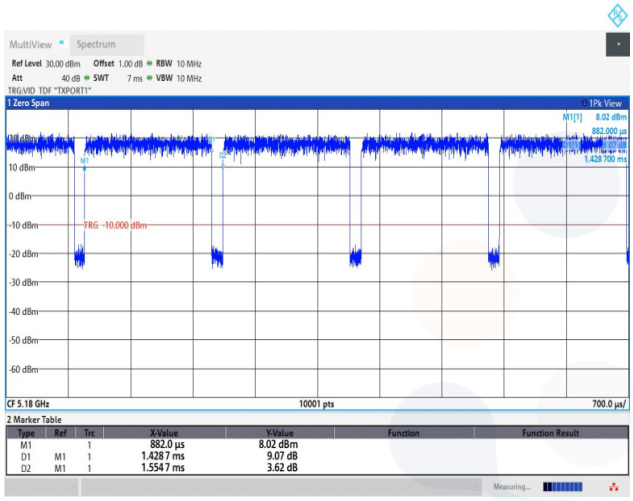
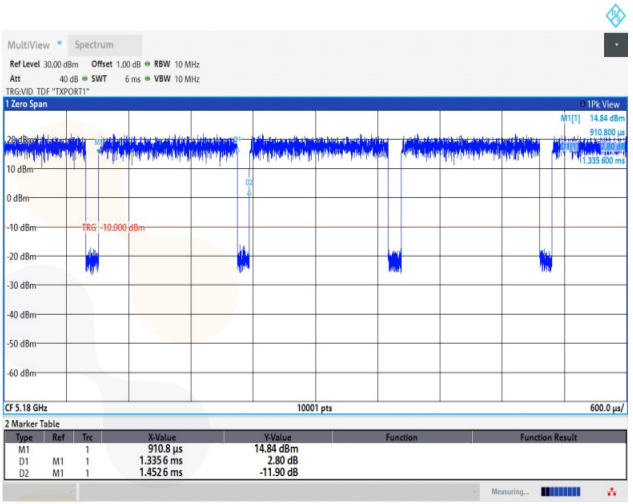
Notes.
Simultaneous condition was performed as a worst case which is configured as a combination of lowest margin for each mode during radiated spurious emission.

2.4. Duty Cycle Factor

Test mode	Period (ms)	T_{on} time (ms)	Duty cycle		Duty cycle factor (dB)
			(Linear)	(%)	
802.11a	1.555	1.429	0.919 0	91.90	0.37
802.11n_HT20	1.453	1.336	0.919 5	91.95	0.36

Notes.

1. Duty cycle (Linear) = T_{on} time / Period
2. DCF(Duty cycle factor) = 10log(1/duty cycle)
3. DCF is not compensated to average result if duty cycle is more than 98%

802.11a	802.11n_HT20
	

3. Antenna requirement

Requirement of FCC part 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. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section.

Requirement of RSS-Gen Section 6.8:

The applicant for equipment certification shall provide a list of all antenna types that may be used with the transmitter, where applicable (i.e. for transmitters with detachable antenna), indicating the maximum permissible antenna gain (in dBi) and the required impedance for each antenna. The test report shall demonstrate the compliance of the transmitter with the limit for maximum equivalent isotropically radiated power (e.i.r.p.) specified in the applicable RSS, when the transmitter is equipped with any antenna type, selected from this list.

For expediting the testing, measurements may be performed using only the antenna with highest gain of each combination of transmitter and antenna type, with the transmitter output power set at the maximum level. However, the transmitter shall comply with the applicable requirements under all operational conditions and when in combination with any type of antenna from the list provided in the test report (and in the notice to be included in the user manual, provided below).

When measurements at the antenna port are used to determine the RF output power, the effective gain of the device's antenna shall be stated, based on a measurement or on data from the antenna's manufacturer.

The test report shall state the RF power, output power setting and spurious emission measurements with each antenna type that is used with the transmitter being tested.

Immediately following the above notice, the manufacturer shall provide a list of all antenna types which can be used with the transmitter, indicating the maximum permissible antenna gain (in dBi) and the required impedance for each antenna type.

- The transmitter has permanently attached LDS Antenna (Internal antenna) on board.
- The E.U.T Complies with the requirement of §15.203, §15.247, §15.407.

4. Summary of tests

FCC Part section(s)	IC Rule Reference	Parameter	Test Condition	Test results
15.407(a)	RSS-247 Issue 2, 6.2	Maximum conducted output power	Conducted	Pass
15.407(a)	RSS-247 Issue 2, 6.2	Maximum power spectral density		Pass
15.407(a)	RSS-Gen Issue 5, 6.7	26 dB Channel Bandwidth		Pass
15.407(e)	RSS-247 Issue 2, 6.2.4	6 dB Channel Bandwidth		Pass
-	RSS-Gen Issue 5, 6.7	Occupied Bandwidth		Pass
15.207(a)	RSS-Gen Issue 5, 8.8	AC Conducted Emissions		Pass
15.407(b), 15.205(a), 15.209(a)	RSS-Gen Issue 5, 8.9, 8.10 RSS-247 Issue 2, 6.2,	Spurious emission	Radiated	Pass

Notes:

1. All modes of operation and data rates were investigated. The test results shown in the following sections represent the worst case emissions.
2. According to exploratory test no any obvious emission were detected from 9 ㎑ to 30 ㎒. Although these tests were performed other than open field site, adequate comparison measurements were confirmed against 30 m open field site. Therefore sufficient tests were made to demonstrate that the alternative site produces results that correlate with the ones of tests made in an open field based on KDB 414788.
3. The fundamental of the EUT was investigated in three orthogonal orientations X, Y and Z and all of the radiated tests have been performed with the accessories as below. It was determined that below orientation was worst case orientation for each band.

Band	Strap	With charger	Without charger		
		X-axis	X-axis	Y-axis	Z-axis
UNII-1	With strap	-	-	O	-
	Without strap	-	-	-	-
UNII-2A	With strap	-	-	-	O
	Without strap	-	-	-	-
UNII-2C	With strap	-	-	-	-
	Without strap	-	-	O	-
UNII-3	With strap	-	-	-	-
	Without strap	-	-	O	-

4. The test procedure(s) in this report were performed in accordance as following.
   - ANSI C63.10-2013
   - KDB 789033 D02 v02r01
5. Based on the baseline scan, the worst-case data rates were:
   802.11a mode: 6Mbps
   802.11n HT20 mode: MCS0

5. Measurement uncertainty

The measurement uncertainties shown below were calculated in accordance with the requirements of ANSI C63.10-2013.

All measurement uncertainty values are shown with a coverage factor of k=2 to indicated a 95 % level of confidence. The measurement data shown herein meets of exceeds the U_{CISPR} measurement uncertainty values specified in CISPR 16-4-2 and thus, can be compared directly to specified limits to determine compliance.

Parameter	Expanded uncertainty (±)	
Conducted RF power	0.9 dB	
Conducted spurious emissions	1.3 dB	
Radiated spurious emissions	Below 30 MHz:	2.3 dB
	30 MHz ~ 1 000 MHz	2.5 dB
	1 000 MHz ~ 18 000 MHz	4.7 dB
	Above 18 000 MHz	4.8 dB
Conducted emissions	9 kHz ~ 150 kHz	2.7 dB
	150 kHz ~ 30 MHz	2.7 dB

6. Measurement results explanation example

The offset level is set in the spectrum analyzer to compensate the RF cable loss factor between EUT conducted output port and spectrum analyzer.
With the offset compensation, the spectrum analyzer reading level is exactly the EUT RF output level.

Frequency (㎒)	Factor(㏈)	Frequency (㎒)	Factor(㏈)
30	10.07	9 000	12.62
50	10.08	10 000	12.66
100	10.11	11 000	12.56
200	10.24	12 000	12.67
300	10.31	13 000	13.22
400	10.35	14 000	12.88
500	10.48	15 000	13.02
600	10.46	16 000	13.17
700	10.54	17 000	13.49
800	10.58	18 000	13.22
900	10.58	19 000	13.54
1 000	10.66	20 000	13.53
2 000	10.99	21 000	13.80
3 000	11.19	22 000	13.54
4 000	11.38	23 000	13.63
5 000	11.65	24 000	13.56
6 000	11.89	25 000	13.92
7 000	11.99	26 000	14.00
8 000	12.26	26 500	14.07

Notes:
Offset(㏈) = RF cable loss(㏈) + Attenuator(㏈)

7. Test results

7.1. Maximum conducted output power

Test setup

EUT	—	Attenuator	—	Spectrum analyzer

Limit

According to §15.407(a), RSS-247(6.2)

FCC

Band	EUT category		Conducted output power limit
UNII-1		Outdoor access point	1 W (30 dBm)
		Indoor access point	
		Fixed point-to-point access point	
	√	Client device	250 mW (23.98 dBm)
UNII-2A	√		250 mW or 11 dBm + 10logB[1)]
UNII-2C	√		250 mW or 11 dBm + 10logB[1)]
UNII-3	√		1 W (30 dBm)

IC

Band	Maximum e.i.r.p. limit
UNII-1	200 mW or 10 + 10 log10B[2)], dBm
UNII-2A	1 W or 17 dBm + 10logB[2)]
UNII-2C	1 W or 17 dBm + 10logB[2)]
UNII-3	1 W (30 dBm)

Note:

1) Conducted output power limit B is the 26 dB emission bandwidth.
2) Maximum e.i.r.p. limit B is the 99% emission bandwidth.

Test procedure

ANSI C63.10-2013-Section 12.3.2.4 or 12.3.3.1
KDB 789033 D02 v02r01 - Section E.2.d) or E.3.a)

Test settings
Used test method is Section E.2.d)

◆ **KDB 789033 D02 v02r01**

Section E.2.d)
Method SA-2 (trace averaging across on and off times of the EUT transmissions, followed by duty cycle correction):

(i) Measure the duty cycle, x, of the transmitter output signal as described in II.B.
(ii) Set span to encompass the EBW (or, alternatively, the entire 99% occupied bandwidth) of the signal.
(iii) Set RBW = 1 ㎒
(iv) Set RBW ≥ 3 ㎒
(v) Number of points in sweep ≥ 2×span/RBW. (This ensures that bin-to-bin spacing is ≤ RBW/2, so that narrowband signals are not lost between frequency bins.)
(vi) Sweep time = auto.
(vii) Detector = power averaging (rms), if available. Otherwise use sample detector mode.
(viii) Do not use sweep triggering. Allow the sweep to "free run."
(ix) Trace average at least 100 traces in power averaging (rms) mode; however, the number of traces to be averaged shall be increased above 100 as needed to ensure that the average accurately represents the true average over the on and off periods of the transmitter.
(x) Compute power by integrating the spectrum across the EBW (or, alternatively, the entire 99% occupied bandwidth) of the signal using the instrument's band power measurement function with band limits set equal to the EBW (or occupied bandwidth) band edges. If the instrument does not have a band power function, sum the spectrum levels (in power units) at 1 ㎒ intervals extending across the EBW (or, alternatively, the entire 99% occupied bandwidth) of the signal.
(xi) Add 10 log (1/x), where x is the duty cycle, to the measured power in order to compute the average power during the actual transmission times (because the measurement represents an average over both the on and off times of the transmission). For example, add 10 log(1/0,25) = 6 ㏈ if the duty cycle is 25%.

Section E.3.a)
Method PM (Measurement using an RF average power meter):

(i) 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 constant 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

(ii) If the transmitter does not transmit continuously, measure the duty cycle, x, of the transmitter output signal as described in II
(iii) Measure the average power of the transmitter. This measurement is an average over both the on and off periods of the transmitter.
(iv) Adjust the measurement in ㏈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%).

Test results

Conducted output power

Test mode	Band	Frequency (MHz)	Measured output power			Limit (dBm)
			Reading (dBm)	DCF (dB)	Result (dBm)	
802.11a	UNII-1	5 180	16.37	0.37	16.74	23.98
		5 200	15.95		16.32	
		5 240	16.52		16.89	
	UNII-2A	5 260	15.43		15.80	23.98
		5 280	15.86		16.23	
		5 320	16.16		16.53	
	UNII-2C	5 500	15.46		15.83	23.98
		5 600	15.95		16.32	
		5 700	16.27		16.64	
	UNII-3	5 745	16.49		16.86	30.00
		5 785	16.45		16.82	
		5 825	16.00		16.37	
802.11n HT20	UNII-1	5 180	16.14	0.36	16.50	23.98
		5 200	16.13		16.49	
		5 240	16.52		16.88	
	UNII-2A	5 260	15.53		15.89	23.98
		5 280	15.44		15.80	
		5 320	16.06		16.42	
	UNII-2C	5 500	15.88		16.24	23.98
		5 600	16.07		16.43	
		5 700	15.83		16.19	
	UNII-3	5 745	16.52		16.88	30.00
		5 785	16.56		16.92	
		5 825	16.32		16.68	

Notes:

1. Average result(dBm) = Average Reading (dBm) + DCF(dB)

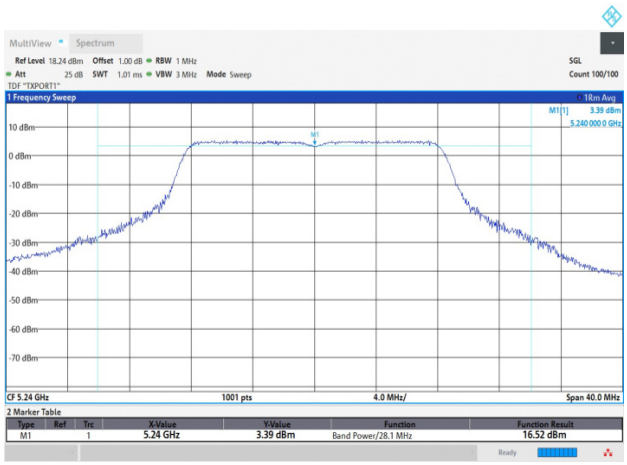
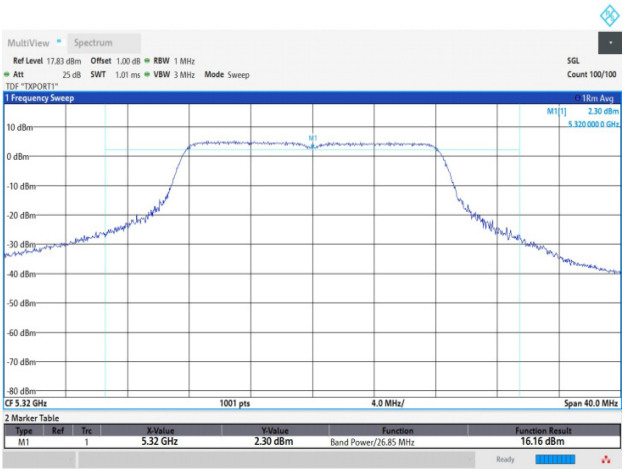
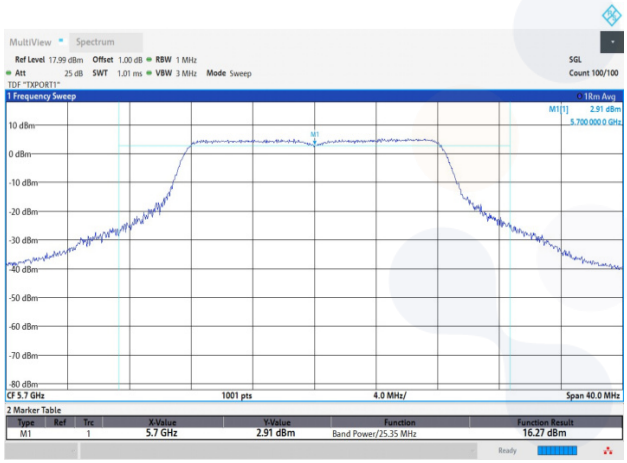
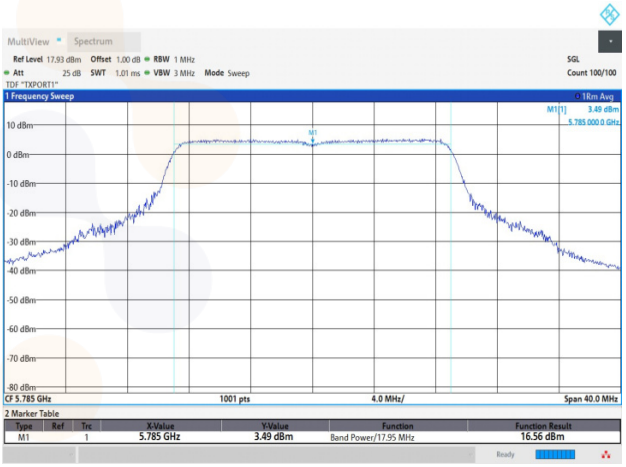
e.i.r.p

Test mode	Band	Frequency (MHz)	Measured output power			MAX. e.i.r.p Limit (dBm)
			Conducted output power (dBm)	ANT gain (dBi)	MAX. e.i.r.p (dBm)	
802.11a	UNII-1	5 180	16.74	-4.60	12.14	22.61
		5 200	16.32		11.72	
		5 240	16.89		12.29	
	UNII-2A	5 260	15.80	-4.00	11.80	29.61
		5 280	16.23		12.23	
		5 320	16.53		12.53	
	UNII-2C	5 500	15.83	-4.00	11.83	29.59
		5 600	16.32		12.32	
		5 700	16.64		12.64	
	UNII-3	5 745	16.86	-6.00	10.86	30.00
		5 785	16.82		10.82	
		5 825	16.37		10.37	
802.11n HT20	UNII-1	5 180	16.50	-4.60	11.90	23.01
		5 200	16.49		11.89	
		5 240	16.88		12.28	
	UNII-2A	5 260	15.89	-4.00	11.89	30.00
		5 280	15.80		11.80	
		5 320	16.42		12.42	
	UNII-2C	5 500	16.24	-4.00	12.24	30.00
		5 600	16.43		12.43	
		5 700	16.19		12.19	
	UNII-3	5 745	16.88	-6.00	10.88	30.00
		5 785	16.92		10.92	
		5 825	16.68		10.68	

Notes:

1. e.i.r.p. Calculation:
   e.i.r.p. (dB m) = Conducted output power (dB m) + Antenna gain (dB i)

In order to simplify the report, attached plots were only worst bandwidth

UNII-1 / 802.11a / High ch.	UNII-2A / 802.11a / High ch.
	
UNII-2C / 802.11a / High ch.	**UNII-3 / 802.11n HT20 / Mid ch.**
	

7.2. Maximum Power Spectral Density

Test setup

EUT	—	Attenuator	—	Spectrum analyzer

Limit

According to §15.407(a), RSS-247(6.2)

Band	EUT category		Limit
UNII-1		Outdoor access point	17dBm/MHz
		Indoor access point	
		Fixed point-to-point access point	
	√	Client device	11 dBm /MHz
UNII-2A	√		11 dBm /MHz
UNII-2C	√		11 dBm /MHz
UNII-3	√		30 dBm /500 kHz

Notes:

If transmitting antennas of directional gain greater than 6 dBi are used, both the peak transmit power And the peak power spectral density shall be reduced by the amount in dB that the directional gain if the antenna exceed 6 dBi

Test procedure

ANSI C63.10-2013 Section 12.3.2.2, 14.3.2.2
KDB 789033 D02 v02r01 - Section F

Test settings

Section F

The rules requires "maximum power spectral density" measurements where the intent is to measure the maximum value of the time average of the power spectral density measured during a period of continuous transmission. Refer to III.A for additional guidance for devices that use channel aggregation.

1. Create an average power spectrum for the EUT operating mode being tested by following the instructions in 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.)
2. Search function on the instrument to find the peak of the spectrum and record its value.
3. 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 II.E.2.g) (viii), add 1 dB to the final result to compensate for the difference between linear averaging and power averaging.
4. The result is the Maximum PSD over 1MHz reference bandwidth
5. For devices operating in the bands 5.15-5.25 GHz, 5.25-5.35 GHz, and 5.47-5.725 GHz, the preceding procedures make use of 1 MHz RBW to satisfy directly the 1 MHz reference

bandwidth specified in Section 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 RBWs less than 1MHz, 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≥1/T, where T is defined in 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 kHz /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 (1MHz/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 II.F.5.c) and II.F.5.d), since RBW=100 kHz is available on nearly all spectrum analyzers.

Test results

Test mode	Band	Frequency (㎒)	Measured PSD (dBm/㎒)	DCF (dB)	Maximum PSD (dB m/㎒)	Limit (dBm/㎒)
802.11a	UNII 1	5 180	5.06	0.37	5.43	11.00
		5 200	4.52		4.89	
		5 240	4.98		5.35	
	UNII 2A	5 260	3.36		3.73	11.00
		5 280	4.19		4.56	
		5 320	4.48		4.85	
	UNII 2C	5 500	4.23		4.60	11.00
		5 600	5.41		5.78	
		5 700	5.29		5.66	
802.11n HT20	UNII 1	5 180	4.74	0.36	5.10	11.00
		5 200	4.20		4.56	
		5 240	4.75		5.11	
	UNII 2A	5 260	4.40		4.76	11.00
		5 280	4.66		5.02	
		5 320	5.40		5.76	
	UNII 2C	5 500	4.61		4.97	11.00
		5 600	5.38		5.74	
		5 700	5.71		6.07	

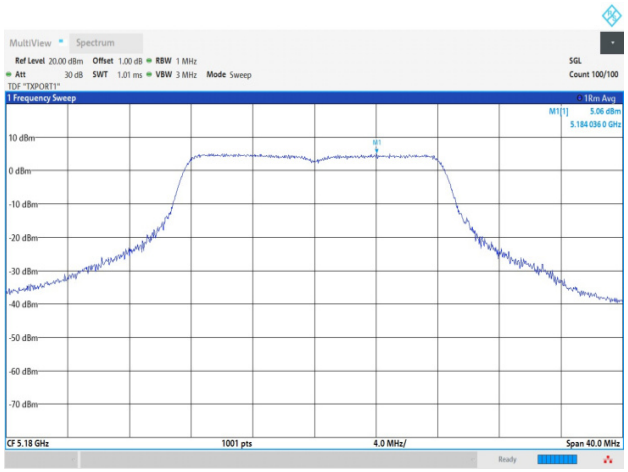
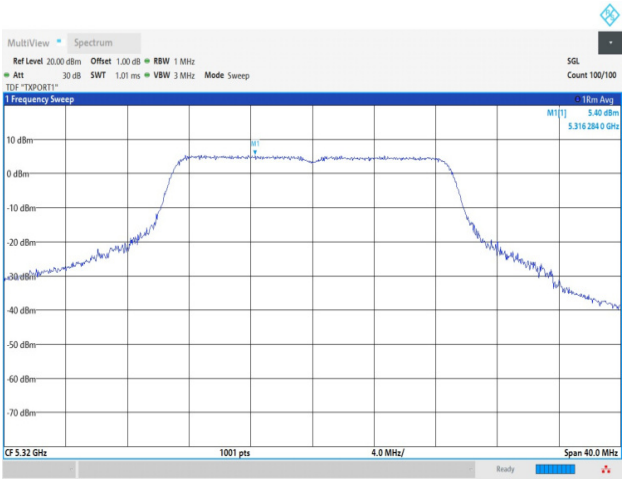
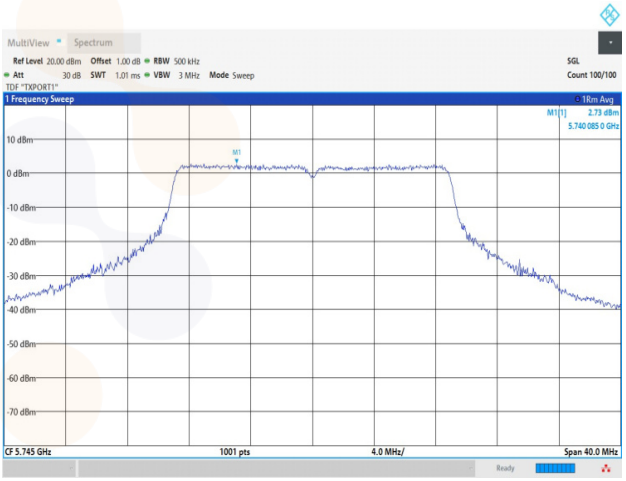
Test mode	Band	Frequency (㎒)	Measured PSD (dBm /500 ㎑)	DCF (dB)	Maximum PSD (dBm /500 ㎑)	Limit (dBm /500 ㎑)
802.11a	UNII 3	5 745	2.25	0.37	2.62	30.00
		5 785	2.17		2.54	
		5 825	1.63		2.00	
802.11n HT20		5 745	2.73	0.36	3.09	
		5 785	2.29		2.65	
		5 825	1.79		2.15	

Notes:

1. Maximum PSD calculation

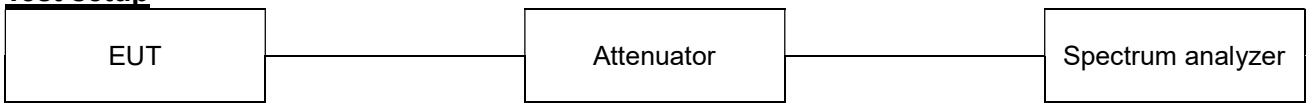
- Maximum PSD = Measured PSD + D.C.F

In order to simplify the report, attached plots were only worst bandwidth

UNII-1 / 802.11a / Low ch.	UNII-2A / 802.11n HT20 / High ch.
	
UNII-2C / 802.11n HT20 / High ch.	**UNII-3 / 802.11n HT20 / Low ch.**
	

7.3. 26 dB Bandwidth & 99% Bandwidth

Test setup



Limit

N/A

Test procedure

ANSI C63.10-2013 Section 12.4
KDB 789033 D02 v02r01 - Section C.1 (26dB bandwidth)
KDB 789033 D02 v02r01 - Section D (99% bandwidth)

Test settings

1. 26 dB Bandwidth

a. Set RBW = approximately 1% of the emission bandwidth.
b. Set the VBW > RBW.
c. Detector = Peak.
d. Trace mode = max hold.
e. Measure the maximum width of the emission that is 26 dB down from the maximum 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%.

2. 99% Occupied Bandwidth

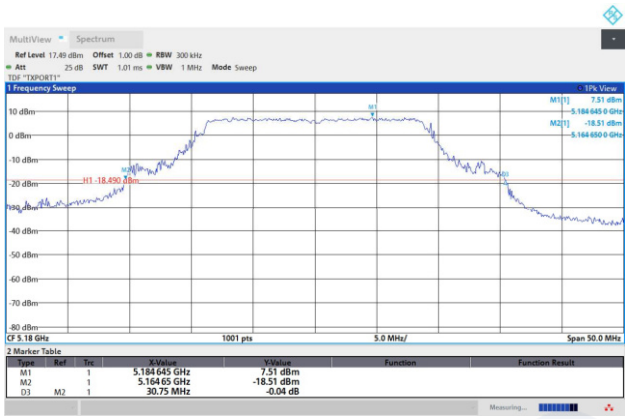
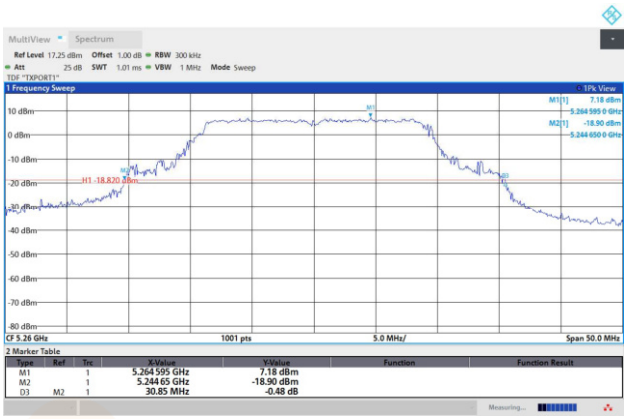
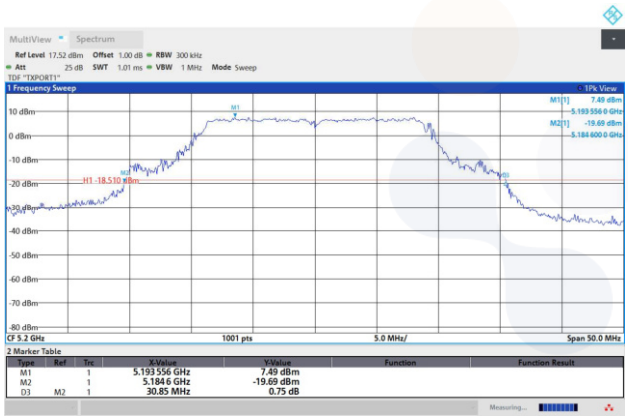
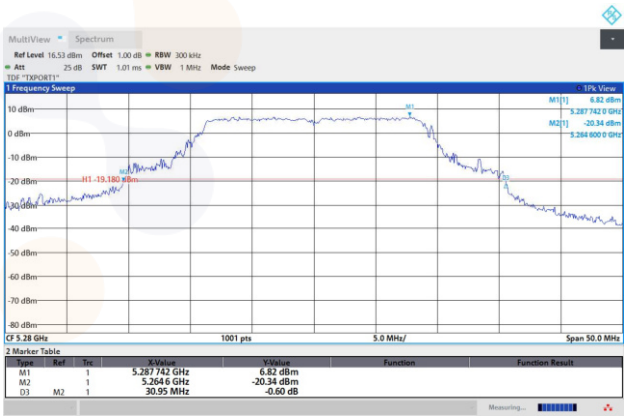
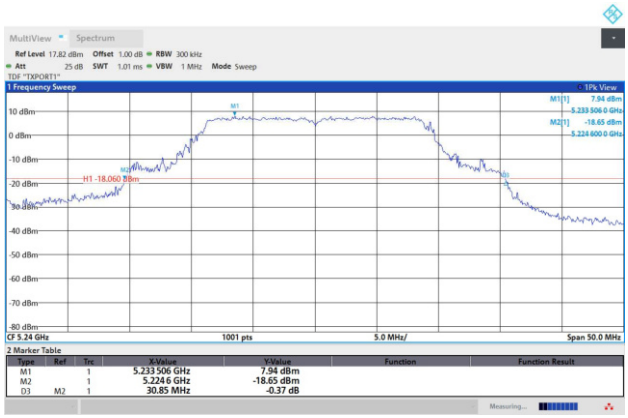
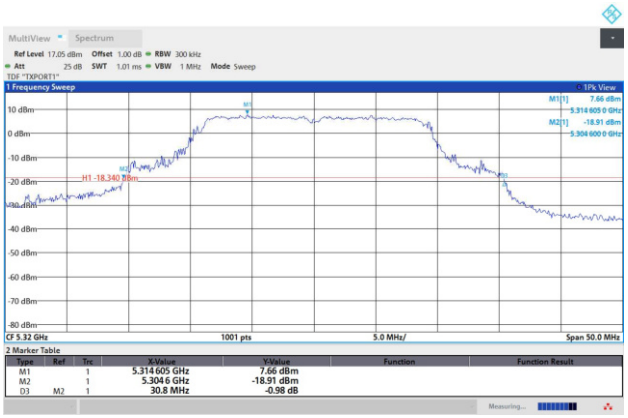
a. Set center frequency to the nominal EUT channel center frequency.
b. Set span = 1.5 times to 5.0 times the OBW.
c. Set RBW = 1% to 5% of the OBW
d. Set VBW ≥ 3 x RBW
e. Video averaging is not permitted. Where practical, a sample detection and single sweep mode shall be used. Otherwise, peak detection and max hold mode (until the trace stabilizes) shall be used.
f. Use the 99% power bandwidth function of the instrument (if available).
g. 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.

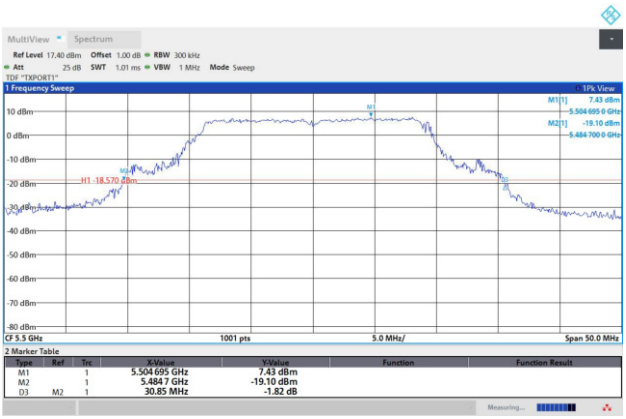
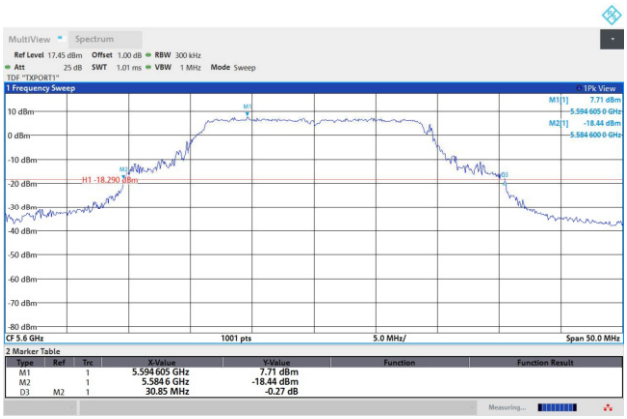
Test results

Test mode	Band	Frequency(㎒)	26 ㏈ bandwidth (㎒)	99% bandwidth (㎒)
802.11a	UNII-1	5 180	27.20	18.22
		5 200	27.35	18.28
		5 240	28.10	18.33
	UNII-2A	5 260	26.90	18.25
		5 280	26.35	18.27
		5 320	26.85	18.27
	UNII-2C	5 500	26.75	18.32
		5 600	25.15	18.22
		5 700	25.35	18.17
802.11n HT20	UNII-1	5 180	30.75	20.25
		5 200	30.85	20.23
		5 240	30.85	20.34
	UNII-2A	5 260	30.85	20.34
		5 280	30.95	20.29
		5 320	30.80	20.09
	UNII-2C	5 500	30.85	20.29
		5 600	30.85	20.11
		5 700	30.95	20.20

26 dB bandwidth

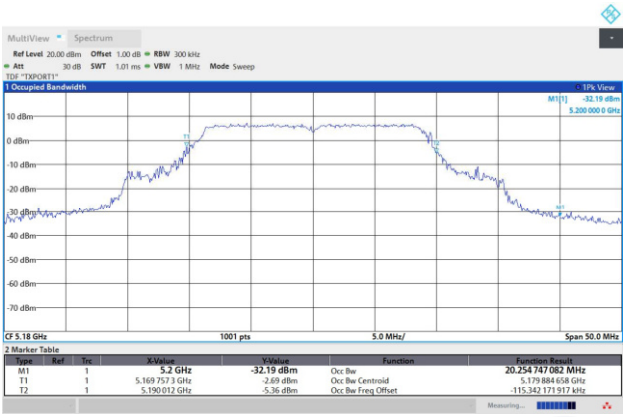
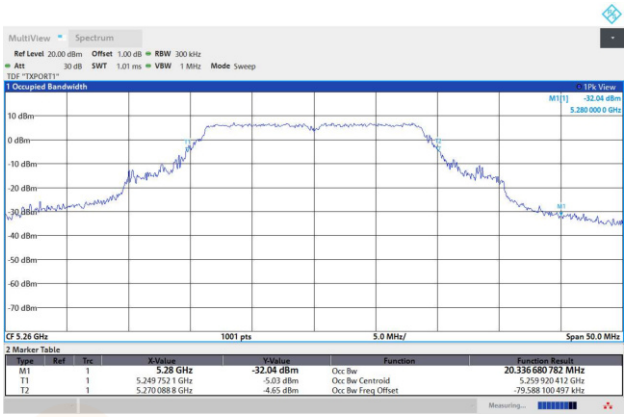
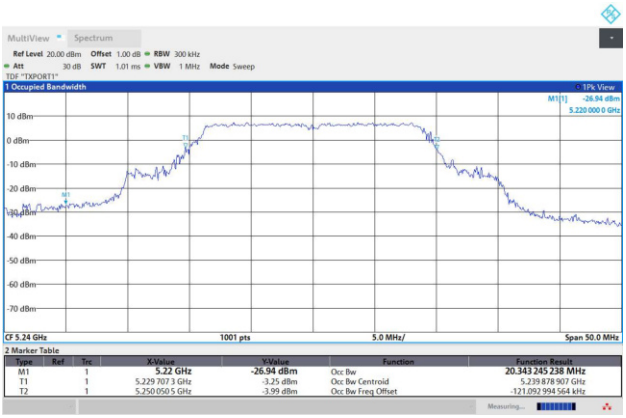
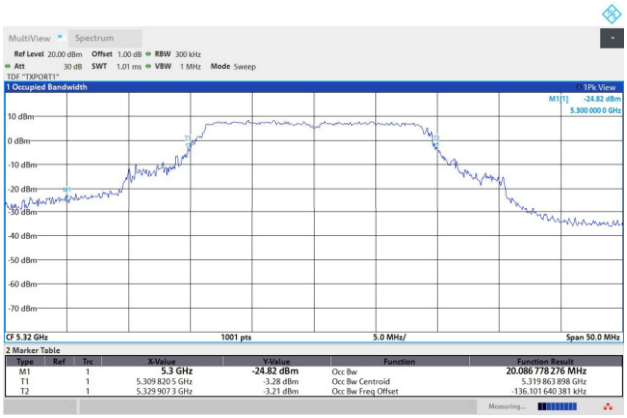
In order to simplify the report, attached plots were only worst bandwidth

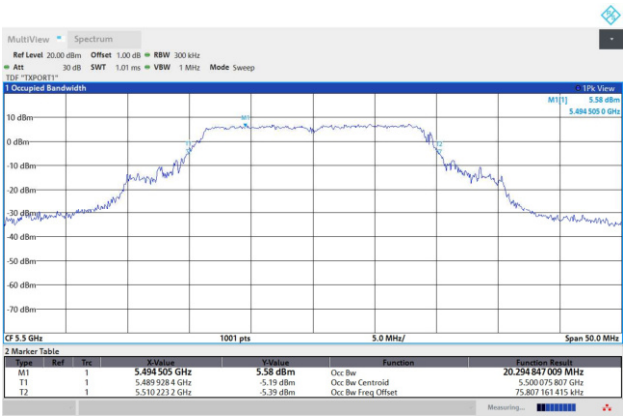
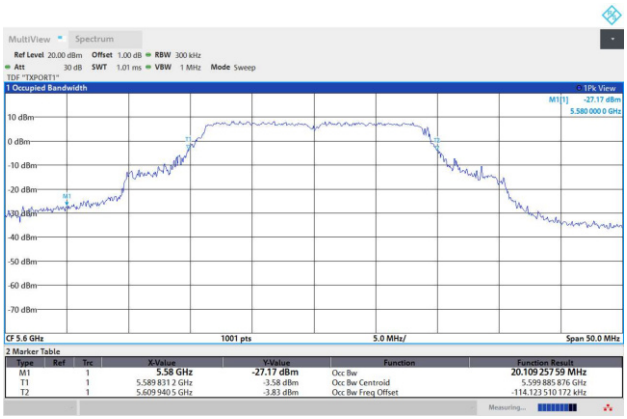
UNII-1 / 802.11n HT20 / Low ch.	UNII-2A / 802.11n HT20 / Low ch.
	
UNII-1 / 802.11n HT20 / Mid ch.	**UNII-2A / 802.11n HT20 / Mid ch.**
	
UNII-1 / 802.11n HT20 / High ch.	**UNII-2A / 802.11n HT20 / High ch.**
	

UNII-2C / 802.11n HT20 / Low ch.	UNII-2C / 802.11n HT20 / Mid ch.
	
UNII-2C / 802.11n HT20 / High ch.	
	Blank

99% Bandwidth

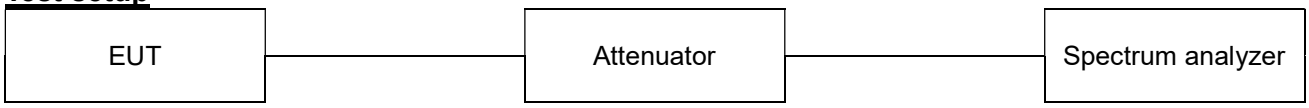
In order to simplify the report, attached plots were only worst bandwidth

UNII-1 / 802.11n HT20 / Low ch.	UNII-2A / 802.11n HT20 / Low ch.
	
UNII-1 / 802.11n HT20 / Mid ch.	**UNII-2A / 802.11n HT20 / Mid ch.**
UNII-1 / 802. 11n HT20 / High ch.	**UNII-2A / 802.11n HT20 / High ch.**
	

UNII-2C / 802.11n HT20 / Low ch.	UNII-2C / 802.11n HT20 / Mid ch.
	
UNII-2C / 802.11n HT20 / High ch.	
	Blank

7.4. 6 dB Bandwidth

Test setup



Limit

According to §15.407(e), RSS-247(6.2.4), Within the 5.725-5.850 ㎓ bands, the minimum 6 ㏈ bandwidth of U-NII devices shall be at least 500㎑.

Test procedure

ANSI C63.10-2013 Section 6.9.2
KDB 789033 D02 v02r01 - Section C.2

Test settings

Minimum Emission Bandwidth for the band 5.725−5.85 ㎓

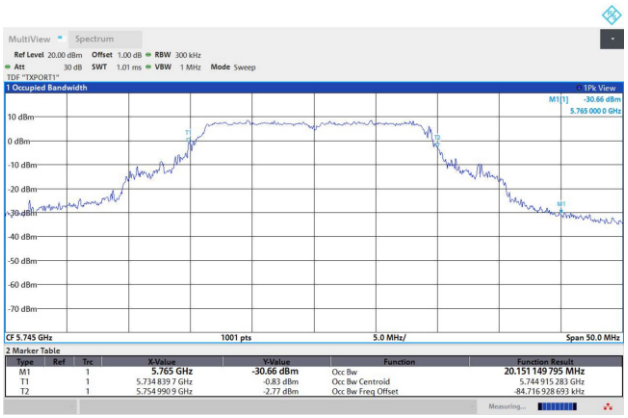
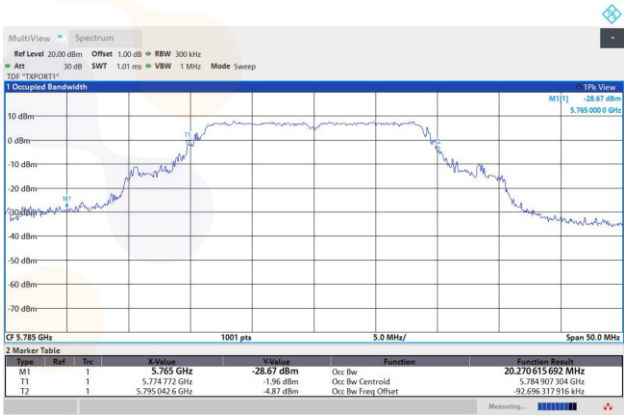
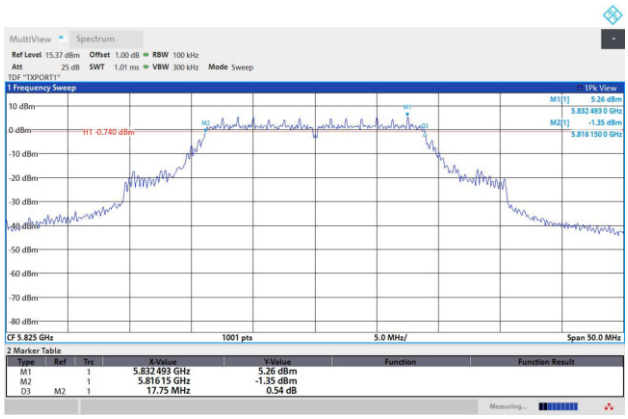
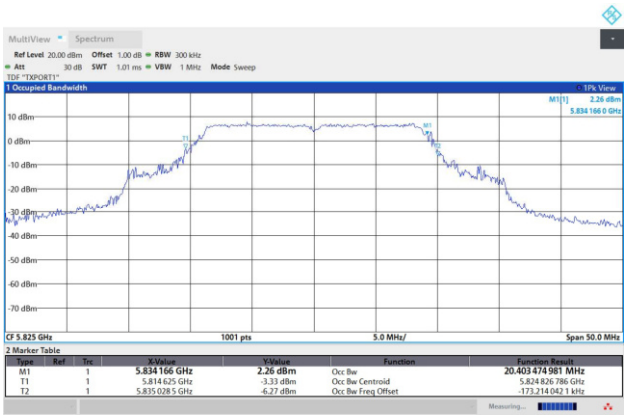
Section 15.407(e) specifies the minimum 6 ㏈ emission bandwidth of at least 500 ㎑ for the band 5.725−5.85 ㎓. The following procedure shall be used for measuring this Bandwidth:

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

Test results

Test mode	Band	Frequency (MHz)	6dB bandwidth (MHz)	Limit (MHz)	99% bandwidth (MHz)
802.11a	UNII-3	5 745	16.50	0.50	18.24
		5 785	16.50	0.50	18.28
		5 825	16.50	0.50	18.31
802.11n HT20	UNII-3	5 745	18.00	0.50	20.15
		5 785	17.95	0.50	20.27
		5 825	17.75	0.50	20.40

In order to simplify the report, attached plots were only worst bandwidth

6 dB bandwidth	99% bandwidth
UNII-3 / 802.11n HT 20 / Low ch.	**UNII-3 / 802.11n HT 20 / Low ch.**
	
UNII-3 / 802.11n HT 20 / Mid ch.	**UNII-3 / 802.11n HT 20 / Mid ch.**
	
UNII-3 / 802.11n HT 20 / High ch.	**UNII-3 / 802.11n HT 20 / High ch.**
	

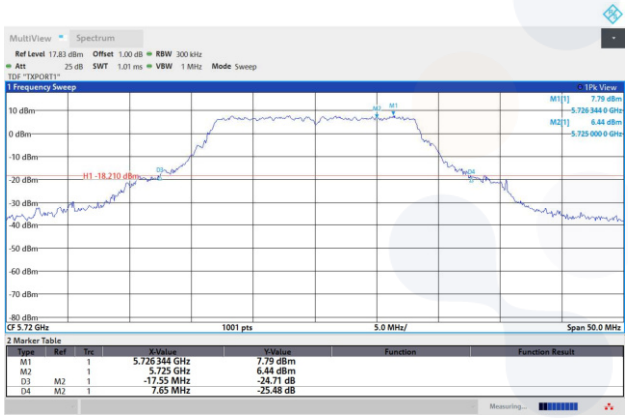
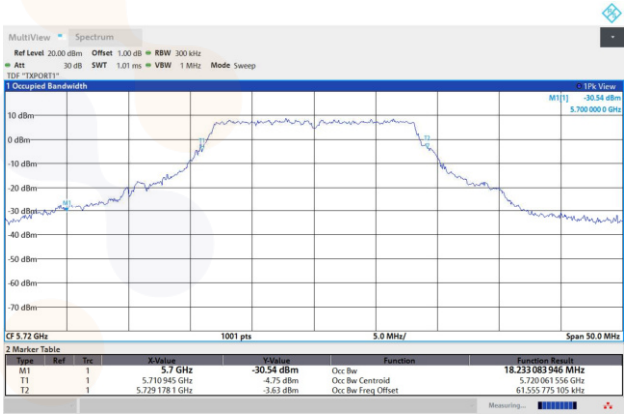
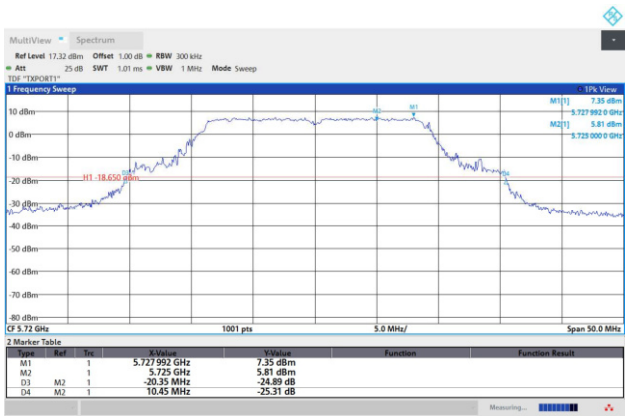
7.5. Straddle channel

26dB bandwidth & 99% Bandwidth

Test mode	Band	Frequency (MHz)	26dB Bandwidth (MHz)	99% Bandwidth (MHz)
802.11a	UNII-2C	5 720	17.55	14.06
802.11n HT20			20.35	15.20
802.11a	UNII-3	5 720	7.65	4.18
802.11n HT20			10.45	5.04

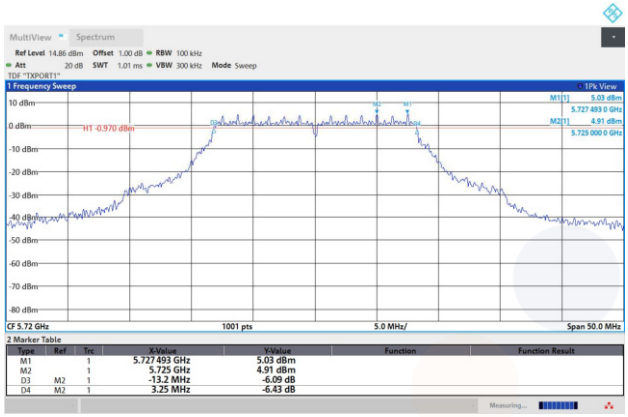
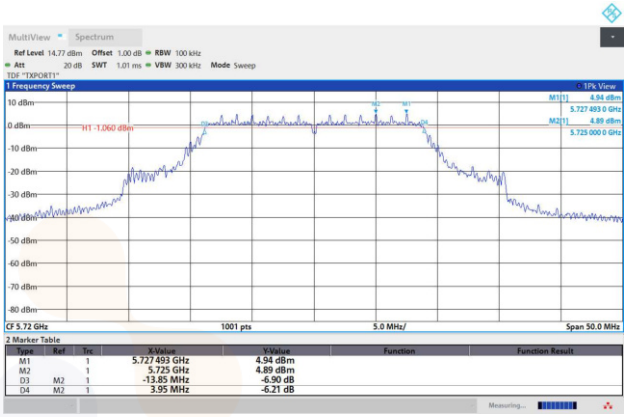
Notes:

1. For 99% Bandwidth, measured 99% occupied bandwidth is separated as below
   - For UNII band 2C = 5725 MHz – T1(measured frequency on the marker table)
   - For UNII band 3 = T2(measured frequency on the marker table) – 5725 MHz

26 dB bandwidth	99% bandwidth
802.11a	**802.11a**
	
802.11n HT20	**802.11n HT20**
	

6dB bandwidth

Test mode	Band	Frequency (MHz)	6dB Bandwidth (MHz)	Limit (MHz)
802.11a	UNII-3	5 720	3.25	0.50
802.11n HT20			3.95	0.50

802.11a	802.11n HT20
	

Conducted Output Power

Test mode	Band	Frequency (MHz)	Measured output power			Limit (dBm)
			Reading (dBm)	DCF (dB)	Result (dBm)	
802.11a	UNII-2C	5 720	15.22	0.37	15.59	23.44
	UNII-3		9.26		9.63	30.00
802.11n HT20	UNII-2C	5 720	14.94	0.36	15.30	23.98
	UNII-3		9.75		10.11	30.00

Notes:

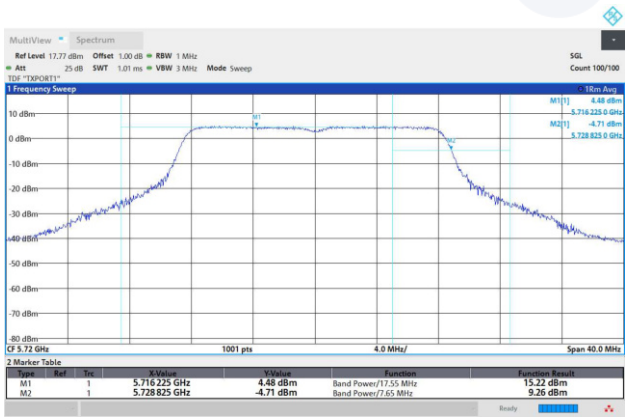
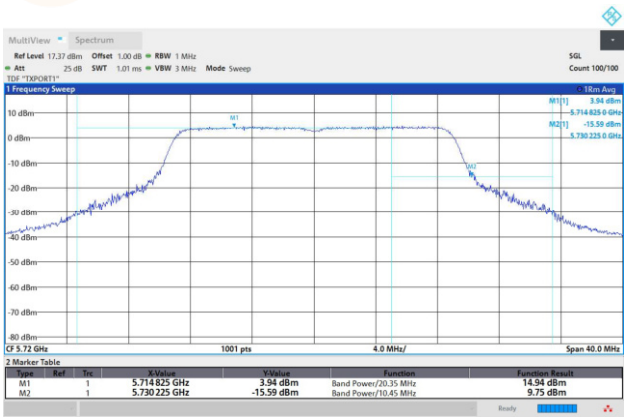
1. Average result(dBm) = Average Reading (dBm) + DCF(dB)

E.I.R.P

Test mode	Band	Frequency (MHz)	Measured output power			MAX. e.i.r.p Limit (dBm)
			Conducted output power (dBm)	ANT gain (dBi)	MAX. e.i.r.p (dBm)	
802.11a	UNII-2C	5 720	15.59	-4.00	11.59	28.48
	UNII-3		9.63	-6.00	5.63	30.00
802.11n HT20	UNII-2C	5 720	15.30	-4.00	11.30	28.82
	UNII-3		10.11	-6.00	6.11	30.00

Notes:

1. e.i.r.p. Calculation:
   e.i.r.p. (dBm) = Conducted output power (dBm) + Antenna gain (dBi)

802.11a	802.11n HT20
	

Power Spectral Density

Test mode	Band	Frequency (MHz)	Measured PSD (dBm/MHz)	DCF (dB)	Maximum PSD (dB m/MHz)	Limit (dBm/MHz)
802.11a	UNII-2C	5 720	5.70	0.37	6.07	11.00
802.11n HT20			4.81	0.36	5.17	

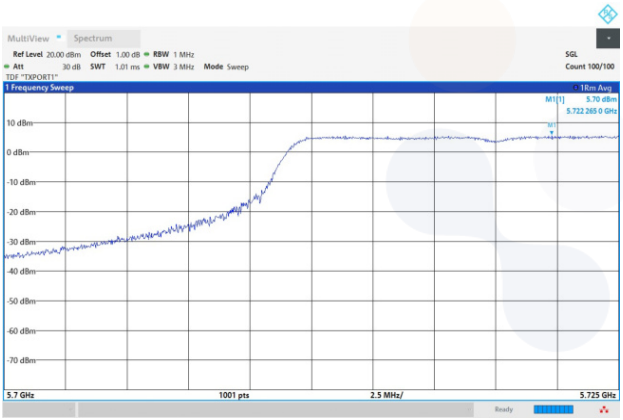
Test mode	Band	Frequency (MHz)	Measured PSD (dBm/ 500 kHz)	DCF (dB)	Maximum PSD (dBm/ 500 kHz)	Limit (dBm /500 kHz)
802.11a	UNII-3	5 720	2.84	0.37	3.21	30.00
802.11n HT20			1.98	0.36	2.34	

Notes:

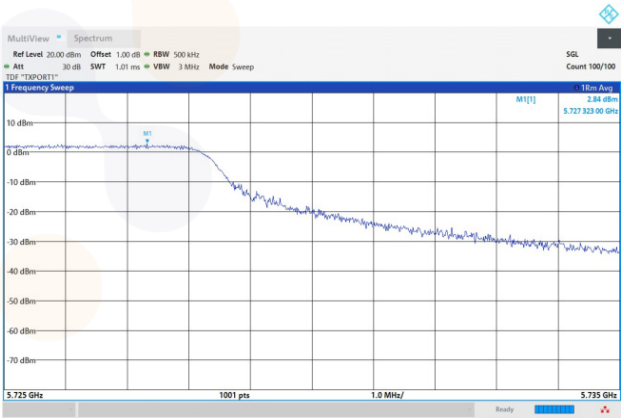
1. Maximum PSD calculation

- Maximum PSD = Measured PSD + D.C.F

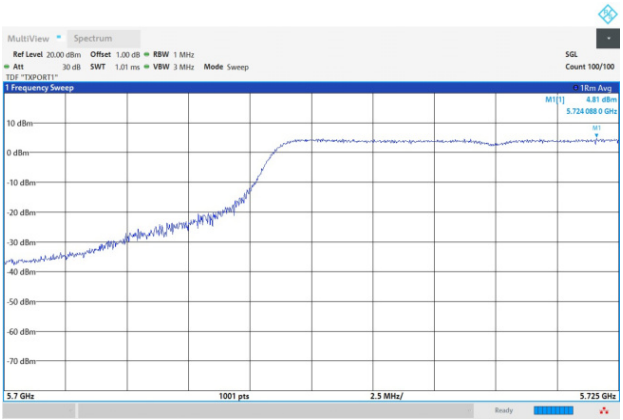
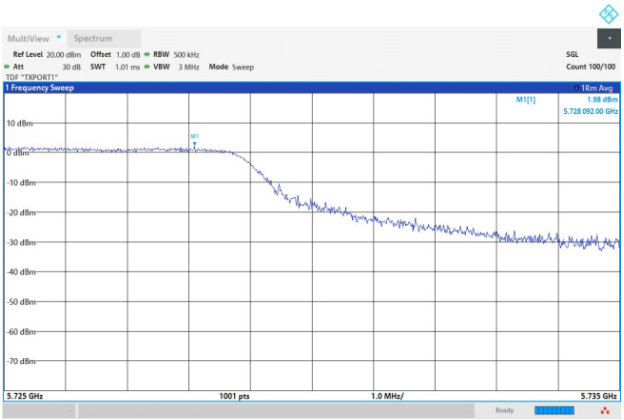
UNII-2C / 802.11a



UNII-3 / 802.11a



UNII-2C / 802.11n HT20



UNII-3 / 802.11n HT20