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.: KR24-SRF0074-A Page(1) of (73)	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 : 2024-04-12

2. Use of Report : Certification

3. Name of Product / Model : Smart Wearable / SM-R861

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

5. FCC ID : A3LSMR861

6. Date of Test : 2024-04-14 to 2024-05-01

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

8. Test method used : FCC Part 15 Subpart E, 15.407

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

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

2024-05-13

Eurofins KCTL Co.,Ltd.

REPORT REVISION HISTORY

Date	Revision	Page No
2024-05-03	Originally issued	-
2024-05-13	Changed the antenna gain	4

Note. The report No. KR24-SRF0074 is superseded by the report No. KR24-SRF0074-A.

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

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 1	:	Lot G3, Que Vo Industrial Park(Expanded Area), Nam son Ward, Bac Ninh Province, Vietnam
Factory 2	:	ALMUS VINA
Address 2	:	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

.	:	Smart Wearable		
Model	:	SM-R861		
Modulation technique	:	WIFI(802.11a/n)	: OFDM	
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	: -5.4 dBi	
		UNII 2A	: -6.5 dBi	
		UNII 2C	: -8.9 dBi	
		UNII 3	: -8.4 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	:	R861.001		
Hardware version	:	REV1.0		
Test device serial No.	:	Conducted	: R3AX400G5EN	
		Radiated	: R3AX400G68K, R3AX400G6NM, R3AX400G6QP, R3AX400G6FL	
Operation temperature	:	0 ℃ ~ 35 ℃		

2.1. Accessory information

Equipment	Manufacturer	Model	Serial No.	Power source	FCC ID & IC
Wireless charger	SAMSUNG	EP-OR825	-	5.0 V, 1.0 A	FCC ID : A3LEPOR825 IC : 649E-EPOR825

2.2. Frequency/channel operations

This device contains the following capabilities:
WLAN (11a/n)

UNII 1		UNII 2A		UNII 2C		UNII 3	
Ch.	Frequency (㎒)	Ch.	Frequency (㎒)	Ch.	Frequency (㎒)	Ch.	Frequency (㎒)
36	5 180	52	5 260	100	5 500	149	5 745
40	5 200	56	5 280	120	5 600	157	5 785
48	5 240	64	5 320	140	5 700	165	5 825
				144	5 720		

Table 2.2-1. 802.11a/n HT20 mode

Notes:

1. The device supports DFS bands between UNII 2A and UNII 2C and operates as a slave device controlled by master

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 low energy, 5 ㎓ bands simultaneously.

Simultaneous Tx condition – not RSDB

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

Notes.

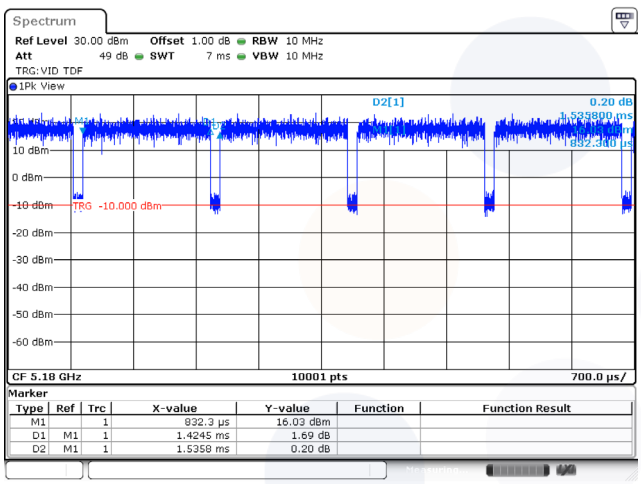
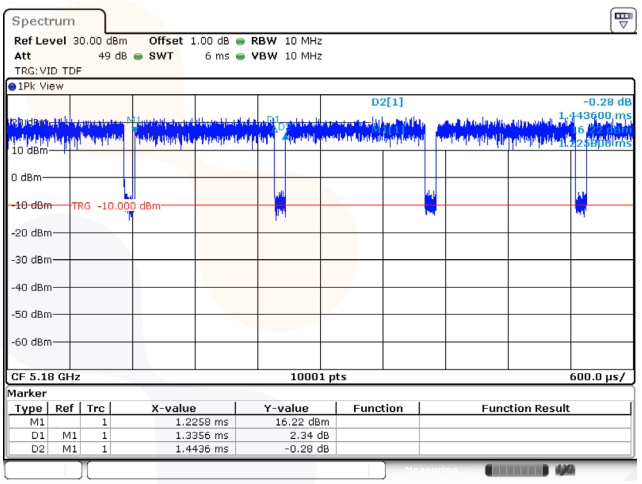
Simultaneous condition was performed as a worst case which is configured as a combination of lowest margin for each mode during radiated spurious emission.

2.4. Duty Cycle Factor

Test mode	Period (ms)	Ton time (ms)	Duty cycle		Duty cycle factor (dB)
			(Linear)	(%)	
802.11a	1.536	1.425	0.927 7	92.77	0.33
802.11n_HT20	1.444	1.336	0.925 2	92.52	0.34

Notes.

1. Duty cycle (Linear) = Ton 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.

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

4. Summary of tests

FCC Part section(s)	Parameter	Test Condition	Test results
15.407(a)	Maximum conducted output power	Conducted	Pass
15.407(a)	Maximum power spectral density		Pass
15.407(a)	26 dB Channel Bandwidth		Pass
15.407(e)	6 dB Channel Bandwidth		Pass
15.207(a)	AC Conducted Emissions		Pass
15.407(h)	DFS -Channel closing transmission time -Channel move time -Non occupied period		Pass
15.407(b) 15.205(a) 15.209(a)	Spurious emission	Radiated	Pass
	Band-edge, restricted band		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
4. All configurations have been performed (Stand-alone, Stand-alone with TA and Strap).

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	-	-	O	-
	Without strap	-	-	-	-
UNII-3	With strap	-	-	O	-
	Without strap	-	-	-	-

5. The device does not support radar detection feature.
6. The test procedure(s) in this report were performed in accordance as following.
   - ANSI C63.10-2013
   - KDB 789033 D02 v02r01
   - KDB 905462 D02 UNII DFS compliance procedure new rules.
   - KDB 905462 D03 UNII client without radar detection new rules.
7. 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	1.9 dB	
Radiated spurious emissions	Below 30 ㎒:	2.3 dB
	30 ㎒ ~ 1 000 ㎒	2.5 dB
	1 000 ㎒ ~ 18 000 ㎒	4.7 dB
	Above 18 000 ㎒	4.8 dB
Conducted emissions	9 ㎑ ~ 150 ㎑	2.8 dB
	150 ㎑ ~ 30 ㎒	2.8 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.

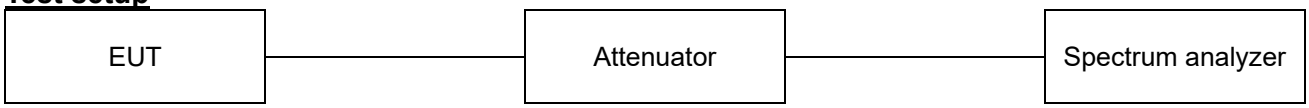
Frequency (㎒)	Factor(㏈)	Frequency (㎒)	Factor(㏈)
30	9.94	9 000	13.16
50	10.03	10 000	13.21
100	10.14	11 000	13.41
200	10.26	12 000	13.47
300	10.41	13 000	13.51
400	10.49	14 000	13.32
500	10.47	15 000	13.41
600	10.59	16 000	13.73
700	10.64	17 000	13.77
800	10.66	18 000	13.86
900	10.72	19 000	13.53
1 000	10.66	20 000	13.74
2 000	11.13	21 000	13.86
3 000	11.51	22 000	13.93
4 000	11.58	23 000	14.32
5 000	12.00	24 000	13.84
6 000	12.21	25 000	14.05
7 000	13.05	26 000	14.70
8 000	13.09	26 500	14.88

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

7. Test results

7.1. Maximum conducted output power

Test setup



Limit

According to §15.407(a),

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)

Note:

1) Limit B is the 26 dB 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)

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%.

Test results

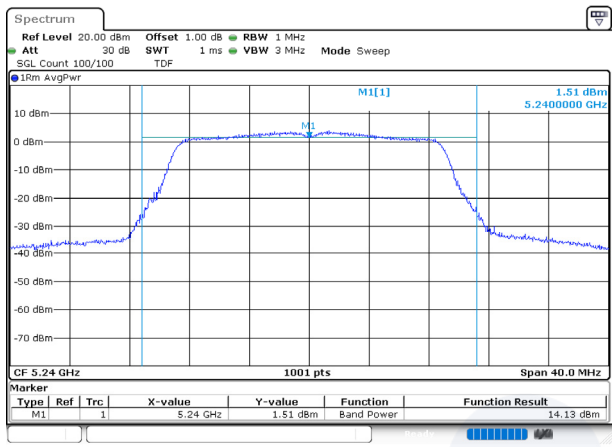
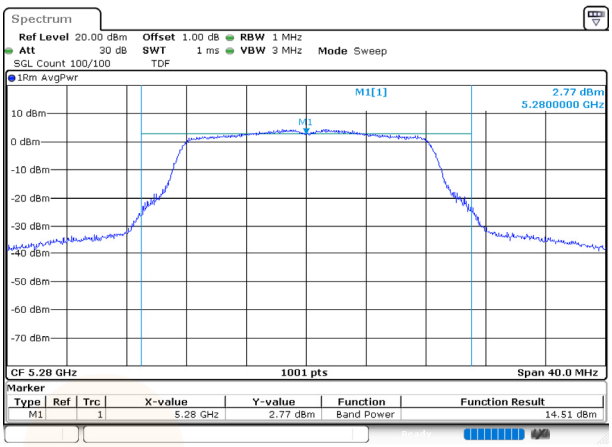
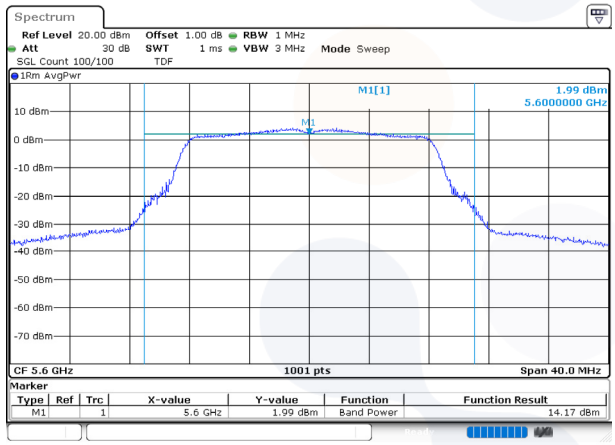
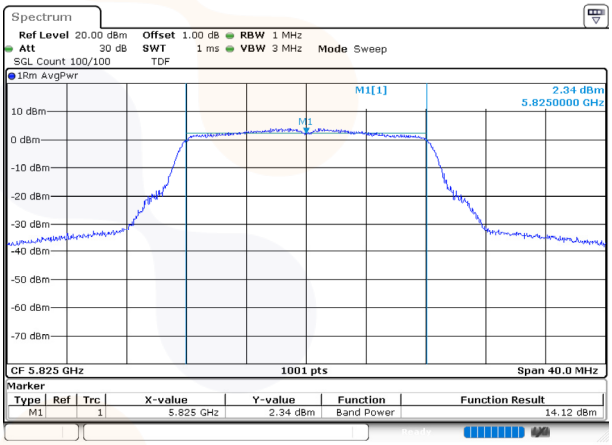
Conducted Output Power

Test mode	Band	Frequency (㎒)	Measured output power (dBm)			Limit (dBm)
			Reading (dBm)	DCF (dB)	Result (dBm)	
802.11a	UNII 1	5 180	13.94	0.33	14.27	23.98
		5 200	14.04		14.37	
		5 240	14.09		14.42	
	UNII 2A	5 260	13.99		14.32	23.98
		5 280	14.51		14.84	
		5 320	14.04		14.37	
	UNII 2C	5 500	13.97		14.30	23.98
		5 600	14.17		14.50	
		5 700	13.86		14.19	
	UNII 3	5 745	13.98		14.31	30.00
		5 785	13.95		14.28	
		5 825	14.12		14.45	
802.11n HT20	UNII 1	5 180	13.86	0.34	14.20	23.98
		5 200	13.90		14.24	
		5 240	14.13		14.47	
	UNII 2A	5 260	13.98		14.32	23.98
		5 280	14.25		14.59	
		5 320	13.94		14.28	
	UNII 2C	5 500	13.73		14.07	23.98
		5 600	13.90		14.24	
		5 700	13.79		14.13	
	UNII 3	5 745	14.10		14.44	30.00
		5 785	13.67		14.01	
		5 825	14.01		14.35	

Note:

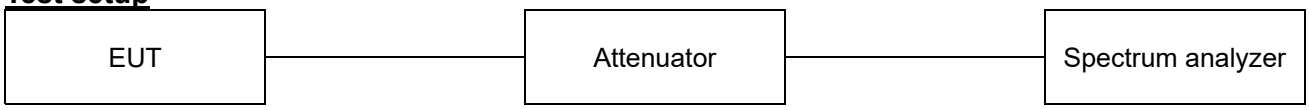
1. Result (dBm) = Reading (dBm) + D.C.F (dB)

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

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

7.2. Maximum Power Spectral Density

Test setup



Limit

According to §15.407(a),

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

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 12.3.2.4
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 1㎒ reference bandwidth
5. For devices operating in the bands 5.15-5.25 ㎓, 5.25-5.35 ㎓, and 5.47-5.725 ㎓, the preceding procedures make use of 1 ㎒ RBW to satisfy directly the 1 ㎒ reference bandwidth specified in Section 15.407(a)(5). For devices operating in the band 5.725-5.85 ㎓, the rules

specify a measurement bandwidth of 500 ㎑. Many spectrum analyzers do not have 500 ㎑ RBW, thus a narrower RBW may need to be used. The rules permit the use of RBWs less than 1㎒, or 500 ㎑, "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 ㎒, or 500 ㎑). If measurements are performed using a reduced resolution bandwidth (< 1 ㎒, or < 500 ㎑) and integrated over 1 ㎒, or 500 ㎑ 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 ㎑, add 10 log (500 ㎑ /RBW) to the measured result, whereas RBW (<500 ㎑) is the reduced resolution bandwidth of the spectrum analyzer set during measurement.
d) If measurement bandwidth of Maximum PSD is specified in 1 ㎒, add 10 log (1㎒/RBW) to the measured result, whereas RBW (< 1 ㎒) 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:

1. As a practical matter, it is recommended to use reduced RBW of 100 ㎑ for the II.F.5.c) and II.F.5.d), since RBW=100 ㎑ is available on nearly all spectrum analyzers.
2. Method SA-2 is used.

Test results

Power spectral density

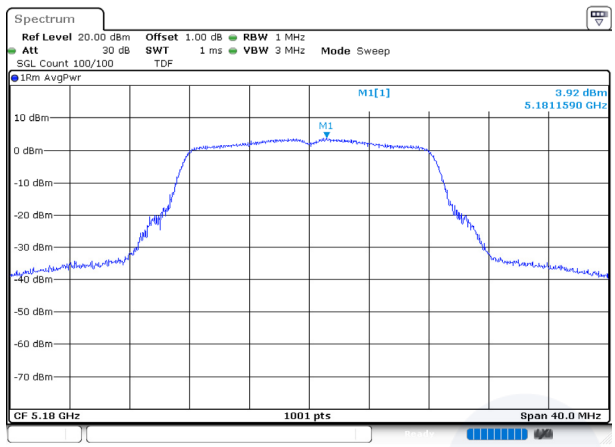
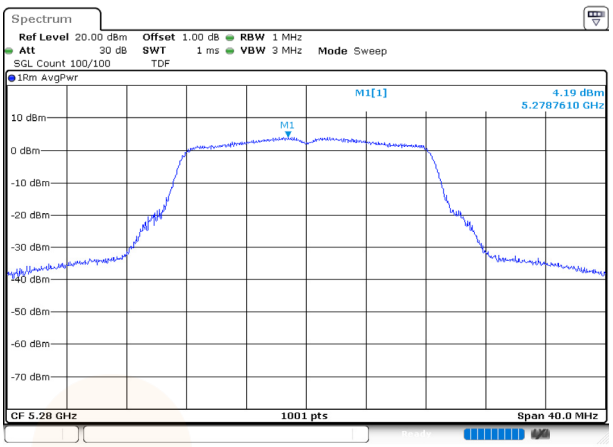
Test mode	Band	Frequency (㎒)	Measured PSD (dBm/㎒)	DCF (dB)	Maximum PSD (dB m/㎒)	Limit (dBm/㎒)
802.11a	UNII 1	5 180	3.92	0.33	4.25	11.00
		5 200	3.82		4.15	
		5 240	3.74		4.07	
	UNII 2A	5 260	3.91		4.24	11.00
		5 280	4.19		4.52	
		5 320	3.74		4.07	
	UNII 2C	5 500	3.72		4.05	11.00
		5 600	4.18		4.51	
		5 700	3.61		3.94	
802.11n HT20	UNII 1	5 180	3.61	0.34	3.95	11.00
		5 200	3.53		3.87	
		5 240	3.41		3.75	
	UNII 2A	5 260	3.44		3.78	11.00
		5 280	3.44		3.78	
		5 320	3.54		3.88	
	UNII 2C	5 500	3.25		3.59	11.00
		5 600	3.86		4.20	
		5 700	3.51		3.85	

Test mode	Band	Frequency (㎒)	Measured PSD (dBm /500 ㎑)	DCF (dB)	Maximum PSD (dBm /500 ㎑)	Limit (dBm /500 ㎑)
802.11a	UNII 3	5 745	1.02	0.33	1.35	30.00
		5 785	1.18		1.51	
		5 825	1.04		1.37	
802.11n HT20		5 745	1.02	0.34	1.36	
		5 785	0.43		0.77	
		5 825	0.91		1.25	

Notes:

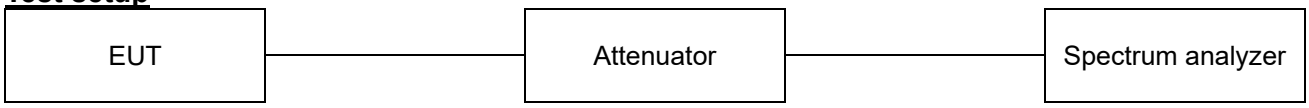
1. Maximum PSD(dB m/500 ㎑) = Reading (dB m/500 ㎑) + D.C.F(dB)

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

UNII 1 / 802.11a / Low ch.	UNII 2A / 802.11a / Mid ch.
	
UNII 2C / 802.11a / Mid ch.	**UNII 3 / 802.11a / Low ch.**
	

7.3. 26 dB Bandwidth

Test setup



Limit

N/A

Test procedure

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

Test settings

1. 26 dB Bandwidth

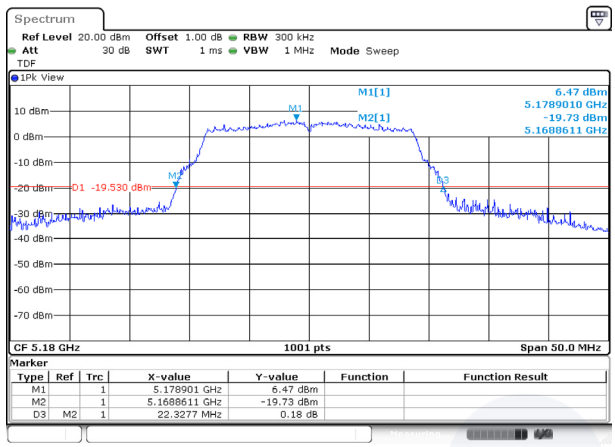
a. Set RBW = approximately 1% of the emission bandwidth.
b. Set the VBW > RBW.
c. Detector = Peak.
d. Trace mode = max hold.
e. Measure the maximum width of the emission that is 26 dB down from the maximum of the emission. Compare this with the RBW setting of the analyzer. Readjust RBW and repeat measurement as needed until the RBW/EBW ratio is approximately 1%.

Test results

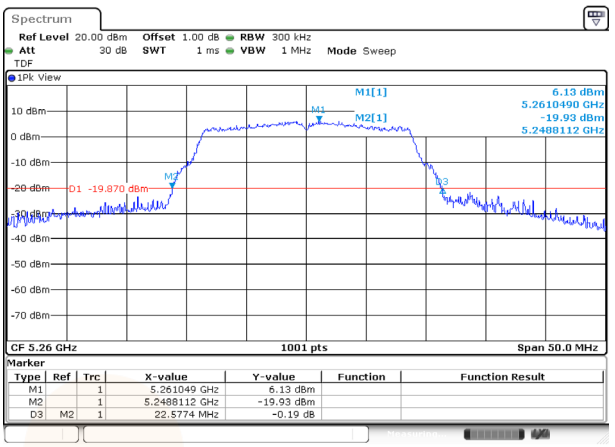
Test mode	Band	Frequency(㎒)	26 ㏈ bandwidth (㎒)
802.11a	UNII 1	5 180	21.98
		5 200	22.03
		5 240	22.03
	UNII 2A	5 260	21.98
		5 280	22.03
		5 320	22.03
	UNII 2C	5 500	22.03
		5 600	22.08
		5 700	21.98
802.11n HT20	UNII 1	5 180	22.33
		5 200	22.28
		5 240	22.38
	UNII 2A	5 260	22.58
		5 280	22.18
		5 320	22.28
	UNII 2C	5 500	22.48
		5 600	22.53
		5 700	22.68

In order to simplify the report, only n mode test plots are attached

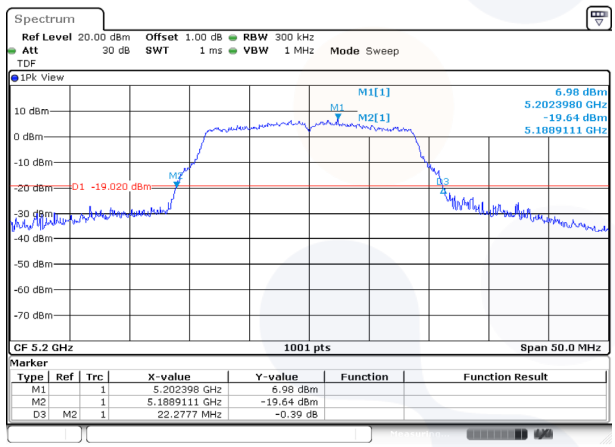
UNII 1 / 802.11n HT20 / Low ch.



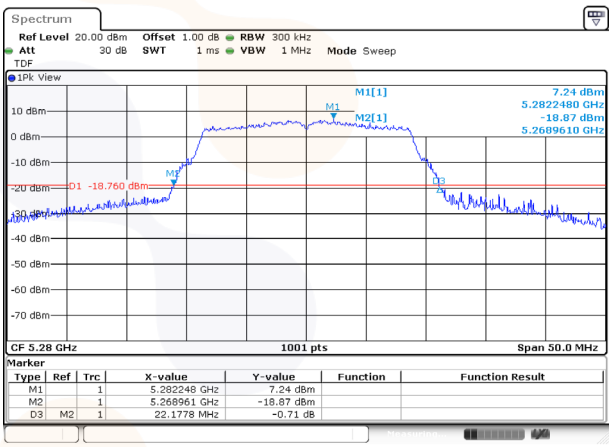
UNII 2A / 802.11n HT20 / Low ch.



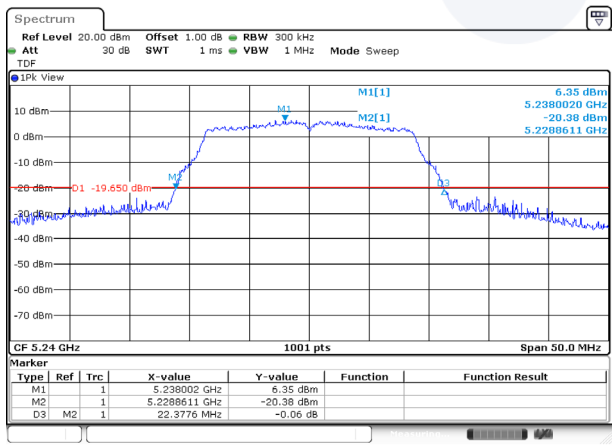
UNII 1 / 802.11n HT20 / Mid ch.



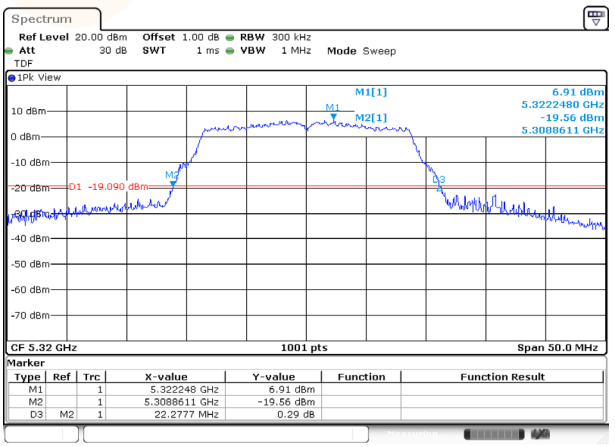
UNII 2A / 802.11n HT20 / Mid ch.

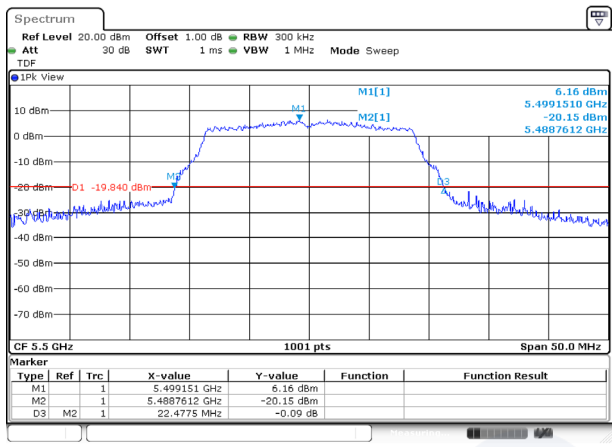
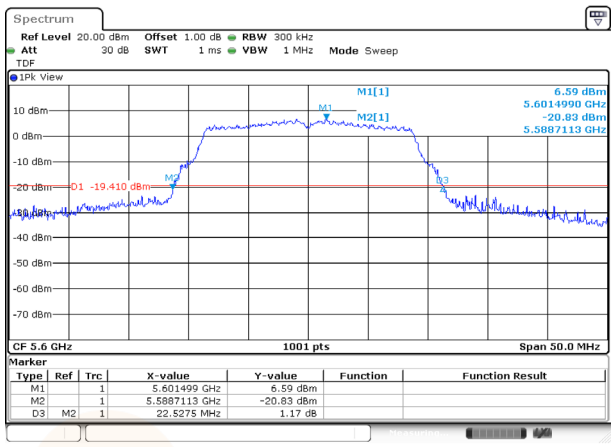
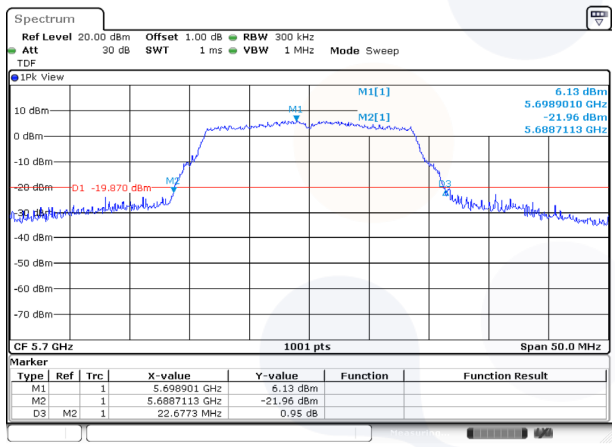


UNII 1 / 802.11n HT20 / High ch.



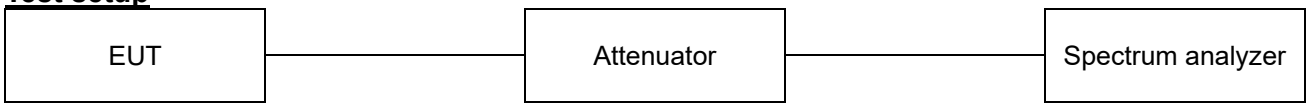
UNII 2A / 802.11n HT20 / High ch.



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),

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 5.725−5.85 ㎓ band. 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.

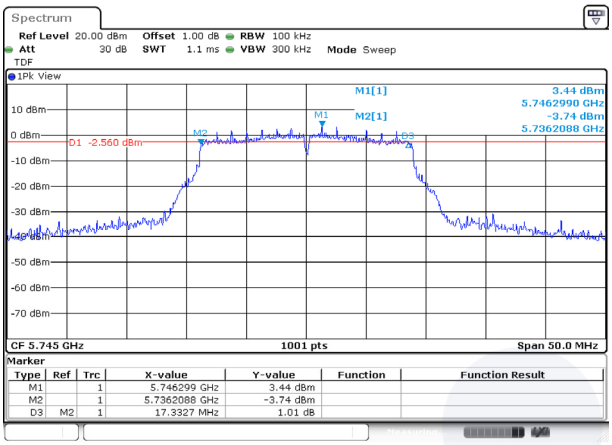
Test results

Test mode	Band	Frequency (㎒)	6㏈ bandwidth (㎒)	Limit (㎒)
802.11a	UNII 3	5 745	15.93	0.50
		5 785	16.33	
		5 825	16.13	
802.11n HT20	UNII 3	5 745	17.33	
		5 785	17.38	
		5 825	17.38	

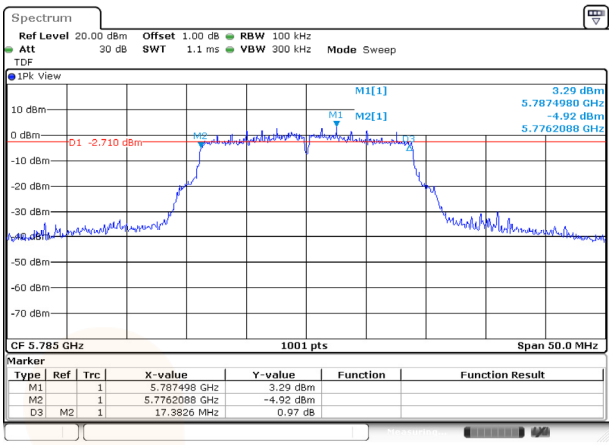
In order to simplify the report, only n mode test plots are attached

6 dB bandwidth

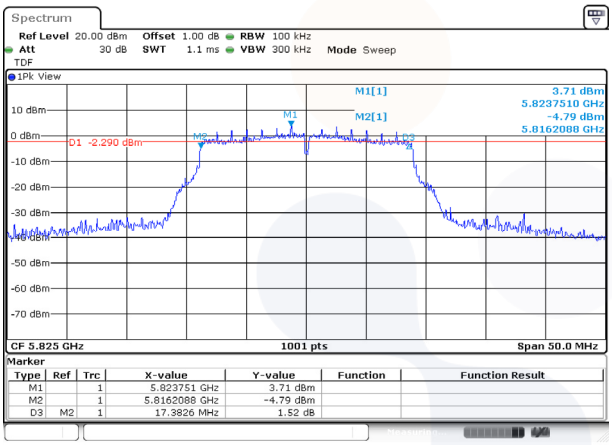
UNII 3 / 802.11n 20 / Low ch.



UNII 3 / 802.11n 20 / Mid ch.



UNII 3 / 802.11n 20 / High ch.



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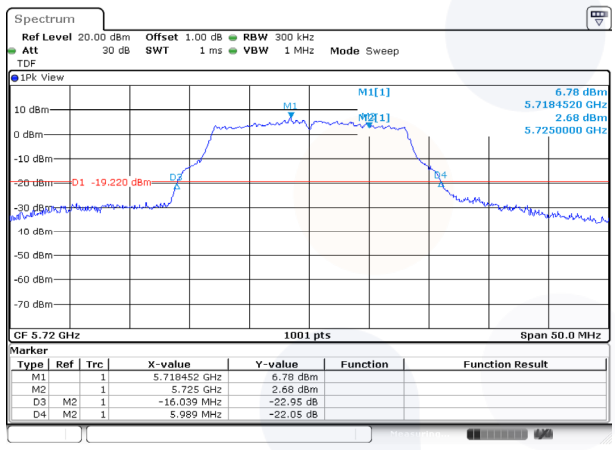
7.5. Straddle channel

26dB bandwidth

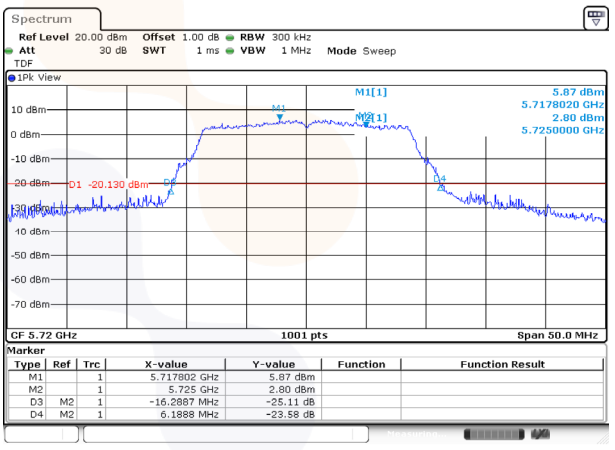
Test mode	Band	Frequency (MHz)	26dB Bandwidth (MHz)
802.11a	UNII 2C	5 720	16.04
802.11n HT20			16.29
802.11a	UNII 3	5 720	5.99
802.11n HT20			6.19

26dB bandwidth

802.11a

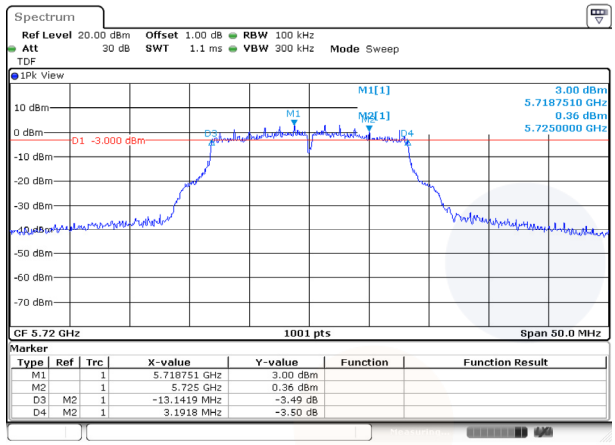
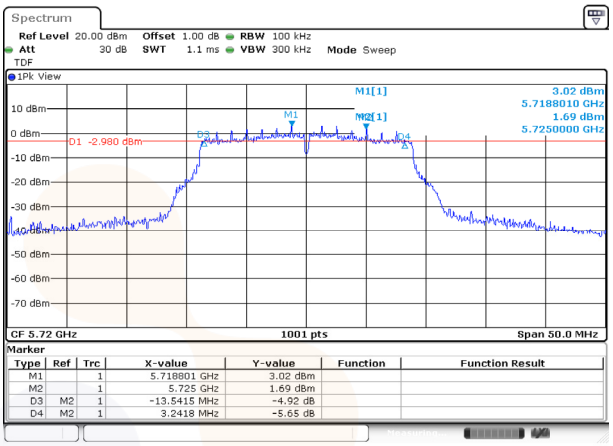


802.11n HT20



6dB bandwidth

Test mode	Band	Frequency (㎒)	6dB Bandwidth (㎒)	Limit (㎒)
802.11a	UNII 3	5 720	3.19	0.50
802.11n HT20			3.24	0.50

802.11a	802.11n HT20
	

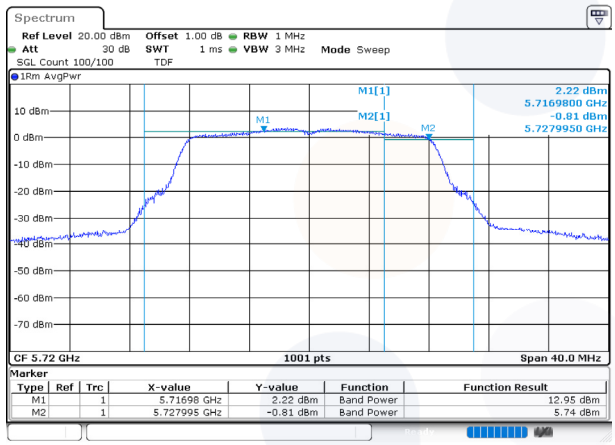
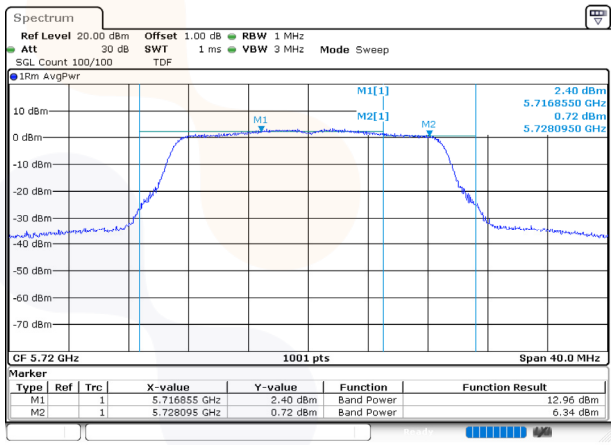
Output Power

Conducted output power

Test mode	Band	Frequency (㎒)	Measured output power (dBm)			Limit (dBm)
			Reading (dBm)	DCF (dB)	Result (dBm)	
802.11a	UNII 2C	5 720	12.95	0.33	13.28	23.05
802.11n HT20			12.96	0.34	13.30	23.12
802.11a	UNII 3	5 720	5.74	0.33	6.07	30.00
802.11n HT20			6.34	0.34	6.68	30.00

Notes:

1. Result (dBm) = Reading (dBm) + D.C.F (dB)

802.11a	802.11n HT20
	

Power Spectral Density

Test mode	Band	Frequency (㎒)	Measured PSD (dBm/㎒)	DCF (dB)	Maximum PSD (dB m/㎒)	Limit (dBm/㎒)
802.11a	UNII 2C	5 720	3.63	0.33	3.96	11.00
802.11n HT20			3.39	0.34	3.73	

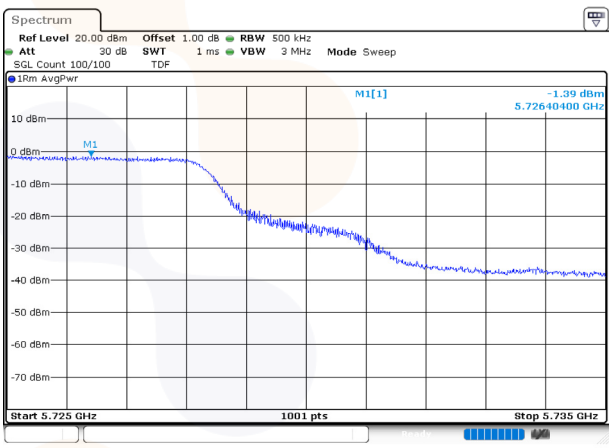
Test mode	Band	Frequency (㎒)	Measured PSD (dBm/㎒)	DCF (dB)	Maximum PSD (dB m /500 ㎑)	Limit (dBm /500 ㎑)
802.11a	UNII 3	5 720	-1.39	0.33	-1.06	30.00
802.11n HT20			-1.56	0.34	-1.22	

Notes:

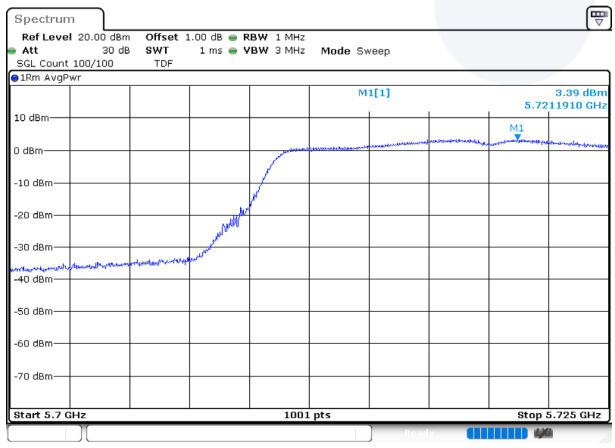
1. Maximum PSD(dB m/㎒) = Reading (dB m/㎒) + D.C.F(dB)

UNII 2C / 802.11a

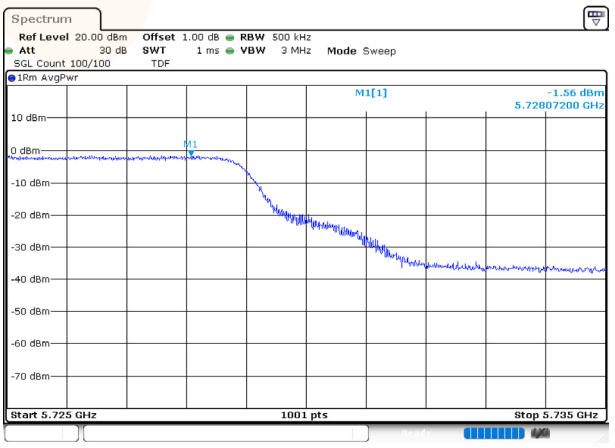
UNII 3 / 802.11a



UNII 2C / 802.11n HT20



UNII 3 / 802.11n HT20



7.6. DFS (Dynamic Frequency Selection)

Test description

- Applicability of DFS requirements prior to use of a channel

Requirement	Operational Mode		
	Master	Client (without radar detection)	Client (with radar detection)
Non-Occupancy Period	Yes	Not required	Yes
DFS Detection Threshold	Yes	Not required	Yes
Channel Availability Check Time	Yes	Not required	Not required
U-NII Detection Bandwidth	Yes	Not required	Yes

- Applicability of DFS requirements during normal operation

Requirement	Operational Mode	
	Master Device or Client with Radar Detection	Client Without Radar Detection
DFS Detection Threshold	Yes	Not required
Channel Closing Transmission Time	Yes	Yes
Channel Move Time	Yes	Yes
Bandwidth	Yes	Not required

Additional requirements for devices with multiple bandwidth modes	Master Device or Client with Radar Detection	Client Without Radar Detection
U-NII Detection Bandwidth and Statistical Performance Check	All BW modes must be tested	Not required
Channel Move Time and Channel Closing Transmission Time	Test using widest BW mode available	Test using the widest BW mode available for the link
All other tests	Any single BW mode	Not required

Note: Frequencies selected for statistical performance check (Section 7.8.4) should include several frequencies within the radar detection bandwidth and frequencies near the edge of the radar detection bandwidth. For 802.11 devices it is suggested to select frequencies in each of the bonded 20 ㎒ channels and the channel center frequency.

- Requirements of client devices

a) A Client Device will not transmit before having received appropriate control signals from a Master Device.
b) A Client Device will stop all its transmissions whenever instructed by a Master Device to which it is associated and will meet the Channel Move Time and Channel Closing Transmission Time requirements. The Client Device will not resume any transmissions until it has again received control signals from a Master Device.
c) If a Client Device is performing In-Service Monitoring and detects a Radar Waveform above the DFS Detection Threshold, it will inform the Master Device. This is equivalent to the Master Device detecting the Radar Waveform and d) through f) of section 5.1.1 apply.
d) Irrespective of Client Device or Master Device detection the Channel Move Time and Channel Closing Transmission Time requirements remain the same.
e) The client test frequency must be monitored to ensure no transmission of any type has occurred for 30 minutes. Note: If the client moves with the master, the device is considered compliant if nothing appears in the client non-occupancy

- DFS Response requirement values

Parameter	Value
Non-occupancy period	Minimum 30 minutes
Channel Availability Check Time	60 seconds
Channel Move Time	10 seconds See Note 1.
Channel Closing Transmission Time	200 milliseconds + an aggregate of 60 milliseconds over remaining 10 second period. See Notes 1 and 2.
Note 1: Channel Move Time and the Channel Closing Transmission Time should be performed with Radar Type 0. The measurement timing begins at the end of the Radar Type 0 burst. Note 2: The Channel Closing Transmission Time is comprised of 200 milliseconds starting at the beginning of the Channel Move Time plus any additional intermittent control signals required to facilitate a Channel move (an aggregate of 60 milliseconds) during the remainder of the 10 second period. The aggregate duration of control signals will not count quiet periods in between transmissions.	

- Interference Threshold values, Master or Client incorporating In-Service Monitoring

Maximum Transmit Power	Value (see note)
≥ 200 milliwatt	-64 dBm
< 200 milliwatt power spectral density < 10 dBm/MHz	-62 dBm
EIRP < 200 milliwatt that do not meet the power spectral density requirement	-64 dBm
Note 1: This is the level at the input of the receiver assuming a 0 dBi receive antenna Note 2: Throughout these test procedures an additional 1 dB has been added to the amplitude of the test transmission waveforms to account for variations in measurement equipment. This will ensure that the test signal is at or above the detection threshold level to trigger a DFS response. Note3: EIRP is based on the highest antenna gain. For MIMO devices refer to KDB Publication 662911 D01.	

- Radar test waveforms

Type	Pulse Width (μsec)	PRI (μsec)	Number of Pulses	Minimum Percentage of Successful Detection	Minimum Number of Trials
0	1	1428	18	See Note 1	See Note 1
1	1	Test A: 15 unique PRI values randomly selected from the list of 23 PRI values in Table 5a	$\text{Roundup}\left\{\left(\frac{1}{360}\right)\cdot\left(\frac{19\cdot10^6}{PRI_{\mu sec}}\right)\right\}$	60%	30
		Test B: 15 unique PRI values randomly selected within the range of 518-3066 μsec, with a minimum increment of 1 μsec, excluding PRI values selected in Test A			
2	1-5	150-230	23-29	60%	30
3	6-10	200-500	16-18	60%	30
4	11-20	200-500	12-16	60%	30
Aggregate (Radar Types 1-4)				80%	120
Note 1: Short Pulse Radar Type 0 should be used for the detection bandwidth test, channel move time, and channel closing time tests. Note 2: This report was applied Short Pulse Radar Type 0.					

*Short Pulse Radar Test Waveforms

Radar Type	Pulse Width (μs)	Chirp Width (㎒)	PRI (μs)	Number of Pulses per Burst	Number of Bursts	Minimum percentage of Successful Detection	Minimum Number of Trials
5	50-100	5-20	1000-2000	1-3	8-20	80%	30

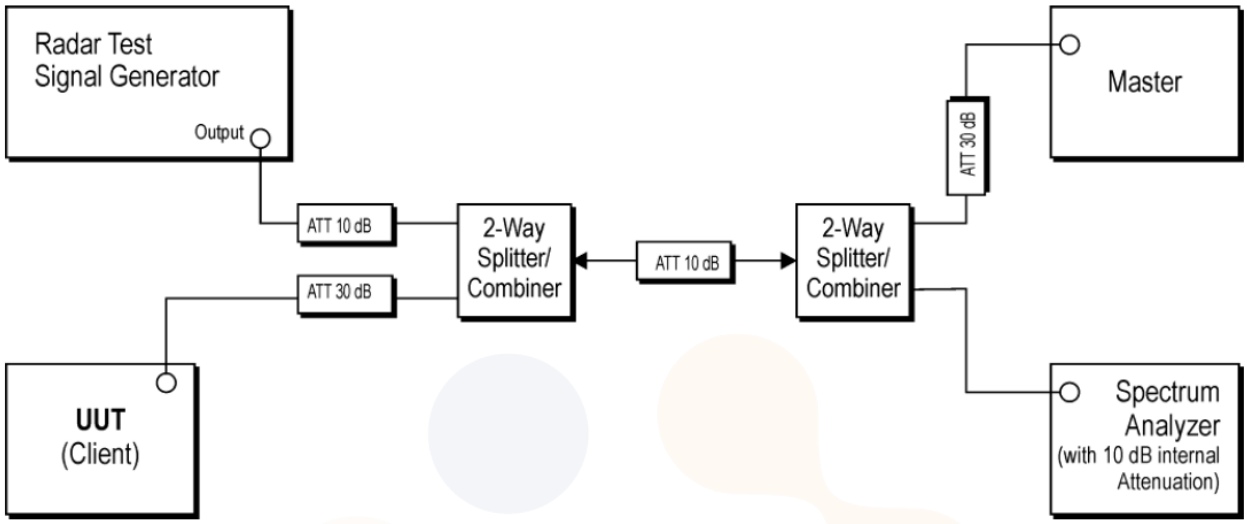
*Long Pulse Radar Test Waveform

Radar Waveform	Pulse Width (μsec)	PRI (μsec)	Pulses per Hop	Hopping Rate (㎑)	Hopping Sequence Length (μs)	Minimum Percentage of Successful Detection	Minimum Trials
6	1	333	9	0.333	300	70%	30

*Frequency Hopping Radar Test Waveform

Test setup

- Setup for Client with injection at the Master



- Spectrum analyzer setting parameter

This setting parameter is shown below and it according to the 905462 D02 UNII DFS Compliance Procedures New Rules.

1) RBW/VBW ≥ 3 ㎒
2) Detector = peak
3) Span = zero span

- Conducted test procedure

1) One frequency will be chosen from the Operating Channels of the UUT within the 5 250-5 350 ㎒ or 5 470-5 725 ㎒ bands.
2) The Client Device (EUT) is set up the above diagram and communications between the Master device and the Client is established.
3) Stream the channel loading test file from the Master Device to the Client Device on the test Channel for the entire period of the test.
4) An additional 1 ㏈ is added to the radar test signal to ensure it is at or above the DFS Detection Threshold, accounting for equipment variations/errors.
5) Observe the transmissions of the UUT at the end of the Burst on the Operating Channel for duration greater than 12 seconds for Radar Type 0 to ensure detection occurs.
6) After the initial radar burst the channel is monitored for 30 minutes to ensure no transmissions or beacons occur. A second monitoring setup is used to verify that the Master and Client have both moved to different channels.

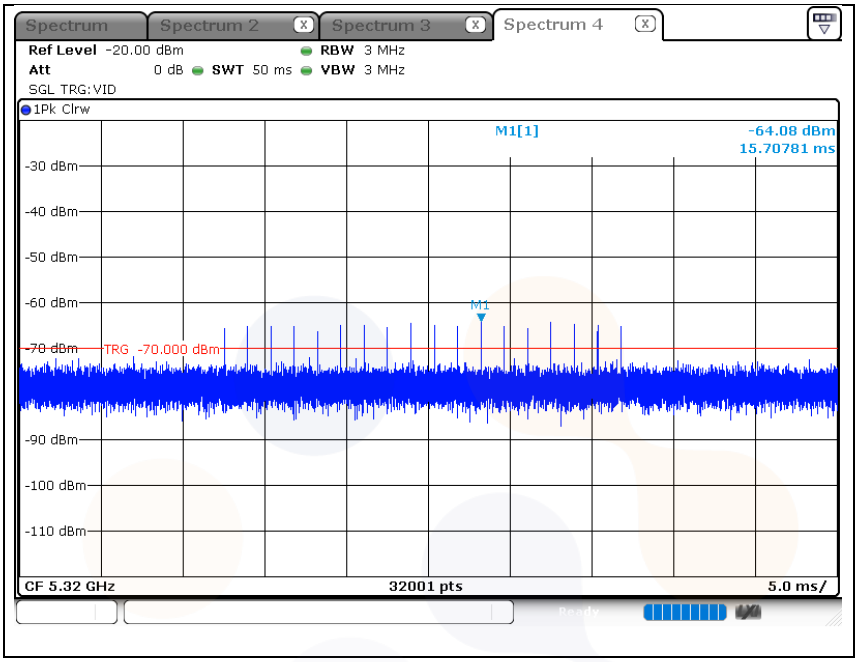
- Master device information

Equipment Name	Manufacturer	Model No.	Serial No.	FCC ID
Access Point	ASUSTeK Computer Inc	RT-AXE11000	M6IAJF203393	MSQ-RTAXJF00

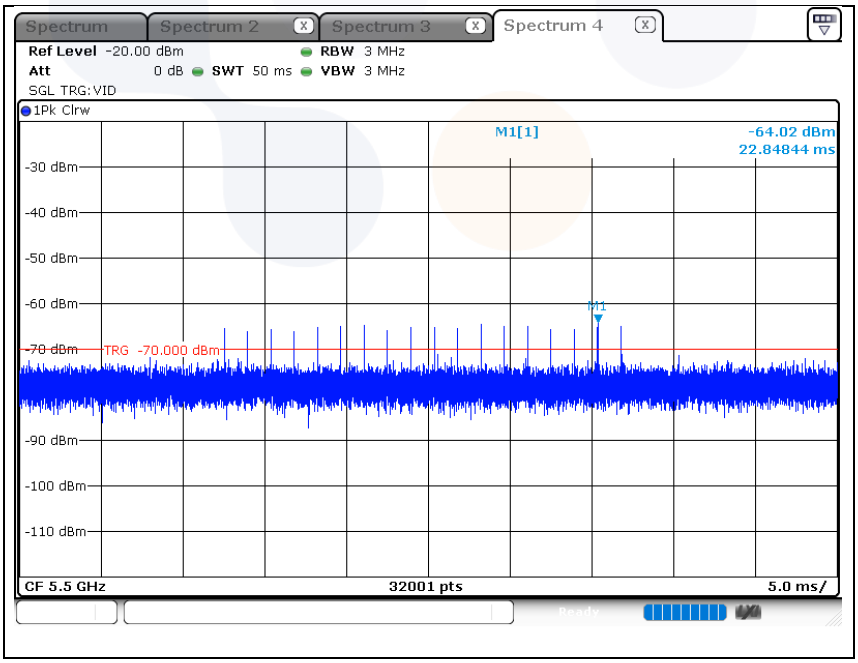
Test result

Plot of radar waveform

5 320 ㎒

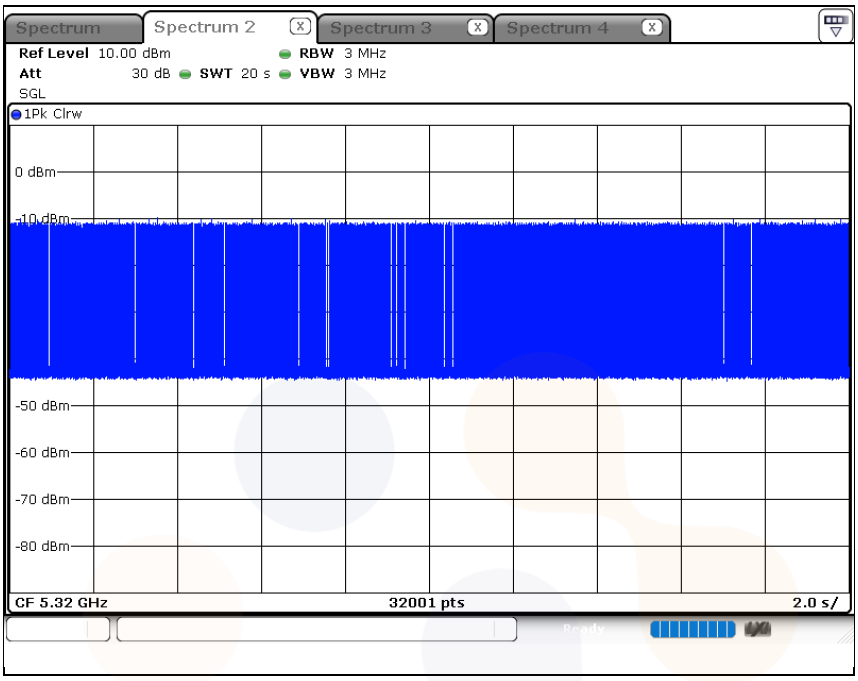


5 500 ㎒

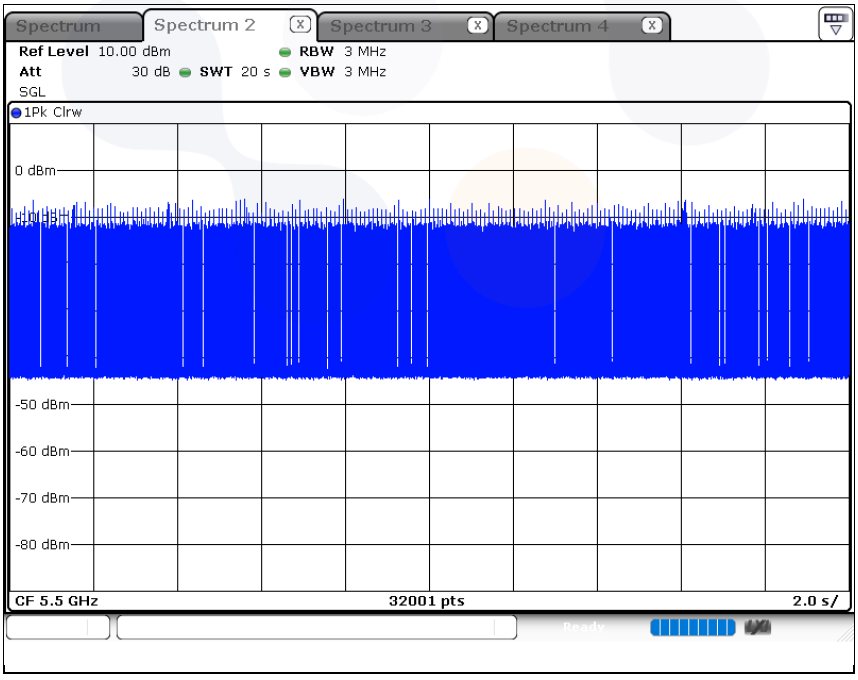


Plot of LAN traffic

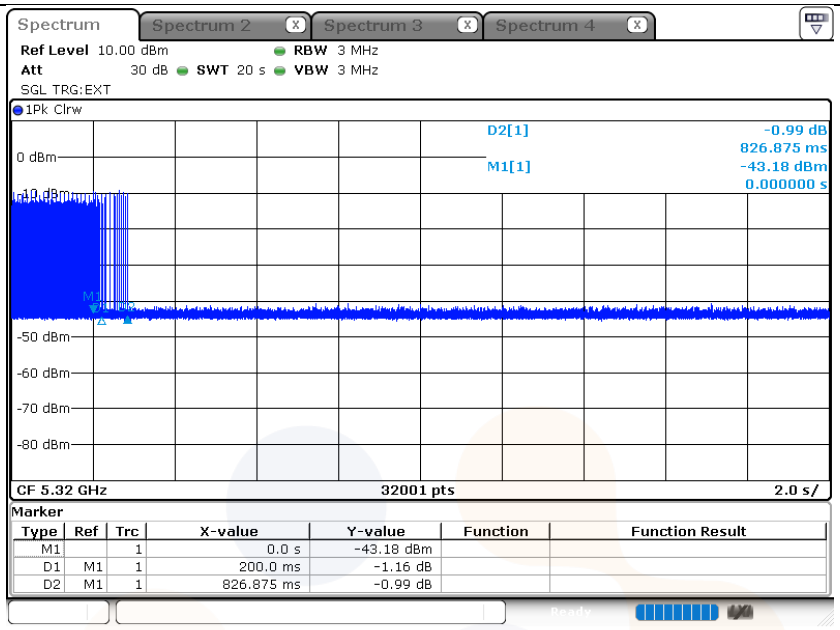
5 320 ㎒



5 500 ㎒

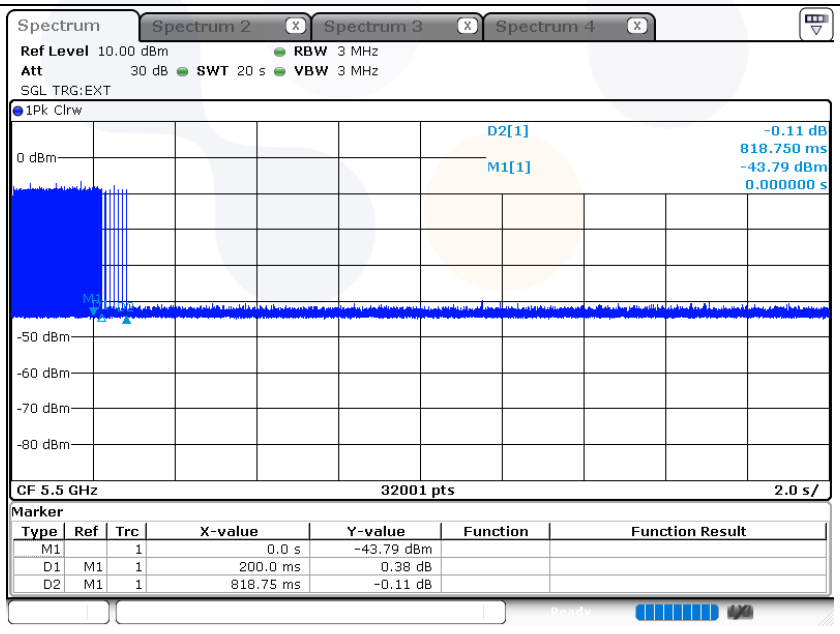


Plot of channel move time and aggregate time



Channel move time = 0.826 875 s
Closing time = 0.000 625 s x 25 = 0.015 625 s
(Closing time : Burst unit time(20 s / 32 001 points) * Number of burst(between 2 markers))

UNII 2A: 802.11 a, 5 320 ㎒

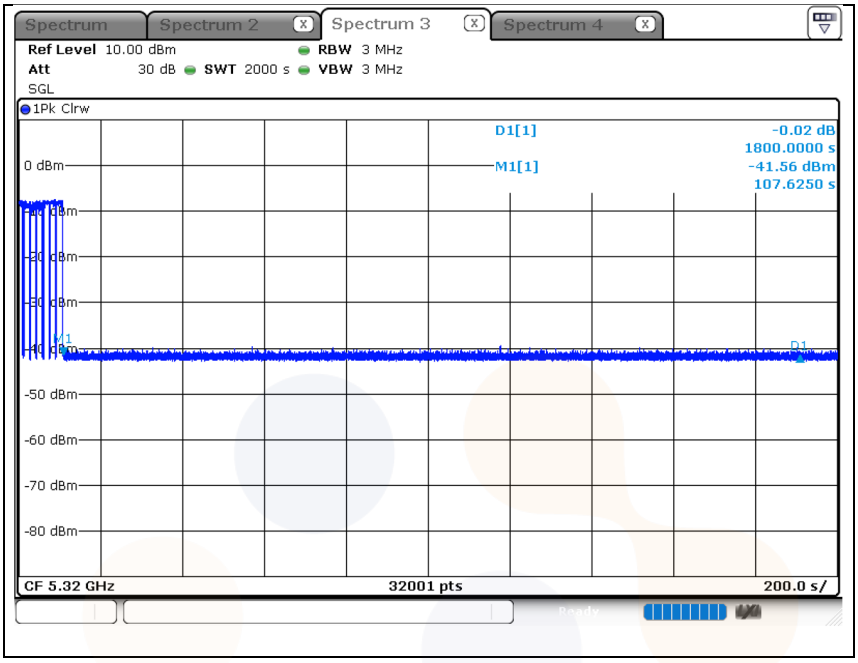


Channel move time = 0.818 750 s
Closing time = 0.000 625 s x 15 = 0.009 375 s
(Closing time : Burst unit time(20 s / 32 001 points) * Number of burst(between 2 markers))

UNII 2C: 802.11 a, 5 500 ㎒

Plot of Non-occupancy period

5 320 ㎒



5 500 ㎒