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.: KR25-SRF0081-B Page (1) of (64)	eurofins | KCTL

1. Applicant

◦ Name : Samsung Electronics Co., Ltd.

◦ Address : 129, Samsung-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Rep. of Korea

2. Use of Report : Certification

3. Type of Equipment / Model : HASS Converter / MIM-S10UN

4. FCC ID : A3LMIMS10UN

5. IC Certificate No. : 649E-MIMS10UN

6. Date of Test : 2025-02-25 to 2025-03-21

Date of Issuing : 2025-04-15

7. Test Standard(method) used : FCC Part 15 Subpart E, 15.407
RSS-247 Issue 3 August 2023
RSS-Gen Issue 5 February 2021

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

Affirmation	Tested by Name : Hosung Lee (Signature)	Technical Manager Name : Harim Lee (Signature)

2025-04-15

Eurofins KCTL Co.,Ltd.

REPORT REVISION HISTORY

Date	Revision	Page No
2025-03-28	Originally issued	-
2025-04-10	Updated	17, 20
2025-04-15	Updated	3, 10, 15, 64, 66

Note. The report No. KR25-SRF0081-A is superseded by the report No. KR25-SRF0081-B.

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	:	SAMSUNG ELECTRONICS VIETNAM CO.,LTD.(SEV)
Address	:	Khu Cong nghiep Yen Phong 1, Yen Trung, Yen Phong, Bac Ninh, Viet Nam
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	:	HASS Converter		
Model	:	MIM-S10UN		
Derivative Model	:	VCTRL13P-1, MIM-S10N		
Modulation technique	:	WIFI(802.11a/n)	:	DSSS, 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 12.0 V		
Antenna specification	:	PCB Antenna		
Antenna gain	:	UNII-1	:	2.46 ㏈i
		UNII-2A	:	2.99 ㏈i
		UNII-2C	:	3.70 ㏈i
		UNII-3	:	3.81 ㏈i
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	:	DB92-00001A/18.05.16		
Hardware version	:	v0.5		
Test device serial No.	:	Conducted	:	07DB8104692ADVNAXC90013
	:	Radiated	:	07DB8104692ADVNAXC90010
Operation temperature	:	-10 ℃ ~ 50 ℃		

2.1. Frequency/channel operations

This device contains the following capabilities:
WLAN (11a/n_HT20)

UNII-1

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

Table 2.1-1. 802.11a/n(HT20)

UNII-2A

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

Table 2.1-2. 802.11a/n(HT20)

UNII-2C

Ch.	Frequency (㎒)
100	5 500
.	.
.	.
120	5 580
.	.
.	.
144	5 720

Table 2.1-3. 802.11a/n(HT20)

UNII-3

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

Table 2.1-4. 802.11a/n(HT20)

2.2. Information about derivative model

The difference between basic model and alternative model is as below.

Model Name	Information
VCTRL13P-1, MIM-S10N	Marketing difference

2.3. RF power setting in TEST SW

Test Program	Test mode
AmebaD_mptool_3V0	802.11a/n_HT20

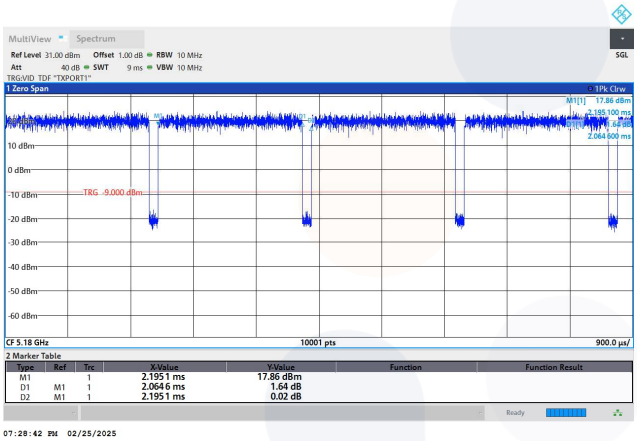
Mode	Frequency Band	RF Power setting value
802.11a (6 Mbps)	UNII-1	107
	UNII-2A	112
	UNII-2C	107
	UNII-3	117
802.11n(HT20) (MCS0)	UNII-1	108
	UNII-2A	111
	UNII-2C	105
	UNII-3	114

2.4. Duty Cycle Factor

Test mode	Period (ms)	T_{on} time (ms)	Duty cycle		Duty cycle factor (dB)
			(Linear)	(%)	
802.11a	2.195	2.065	0.940 5	94.05	0.27
802.11n_HT20	2.051	1.921	0.936 4	93.64	0.29

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 PCB Antenna (Internal antenna) on board.
- The E.U.T Complies with the requirement of §15.203, §15.247, §15.407.

3.1 Antenna information

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.

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

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
		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. EUT was investigated in three orthogonal orientations X, Y and Z. it was determined that **X** orientation was worst-case orientation. Therefore, all final radiated testing was performed with the EUT in **X** orientation.
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 (±)	
Maximum Peak Output Power	0.9 dB	
Peak Power Spectral Density	1.0 dB	
Channel Bandwidth	0.1 %	
Occupied Bandwidth	0.1 %	
Conducted spurious emission	2.0 dB	
Radiated spurious Emissions (Bandedge, restricted band)	Below 30 ㎒	2.3 dB
	30 ㎒ to 1 000 ㎒	2.6 dB
	1 000 ㎒ to 18 000 ㎒	4.8 dB
	Above 18 000 ㎒	4.8 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	9.78	6 300	12.08
50	9.86	6 400	12.13
100	9.98	6 500	12.16
200	10.15	6 600	12.17
300	10.26	6 700	12.19
400	10.41	6 800	12.22
500	10.45	6 900	12.24
600	10.58	7 000	12.29
700	10.68	8 000	12.23
800	10.75	9 000	12.26
900	10.82	10 000	12.35
1 000	10.86	11 000	12.52
2 000	11.41	12 000	12.49
2 400	11.54	13 000	12.57
3 000	11.74	14 000	12.68
4 000	11.94	15 000	12.73
5 000	12.01	16 000	12.79
5 100	12.03	17 000	12.81
5 200	12.06	18 000	13.04
5 300	12.06	19 000	13.05
5 400	12.08	20 000	13.29
5 500	12.07	21 000	13.23
5 580	12.04	22 000	13.18
5 720	10.06	23 000	13.42
5 800	12.06	24 000	13.11
5 900	12.11	25 000	13.34
6 000	12.08	26 000	13.51
6 100	12.09	26 500	13.52
6 200	12.09		

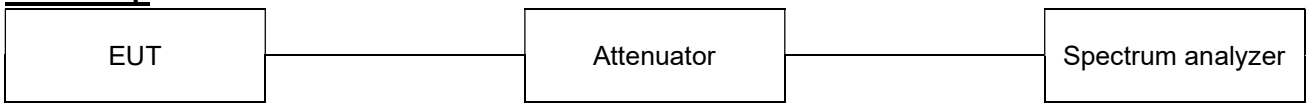
Notes:

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

7. Test results

7.1. Maximum conducted output power

Test setup



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 dB m)
		Indoor access point	
		Fixed point-to-point access point	
	√	Client device	250 mW (23.98 dB m)
UNII-2A	√		250 mW or 11 dB m + 10logB[1)]
UNII-2C	√		250 mW or 11 dB m + 10logB[1)]
UNII-3	√		1 W (30 dB m)

IC

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

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, 14.2
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%.

Test results

Conducted Output Power

Test mode	Band	Frequency (㎒)	Measured output power			FCC Limit (dB m)	IC Limit (dB m)
			Reading (dB m)	DCF (dB)	Result (dB m)		
802.11a	UNII 1	5 180	16.70	0.27	16.97	23.98	22.27
		5 200	16.74		17.01	23.98	22.27
		5 240	16.84		17.11	23.98	22.27
	UNII 2A	5 260	19.13		19.40	23.98	23.34
		5 280	19.23		19.50	23.98	23.34
		5 320	18.94		19.21	23.98	23.34
	UNII 2C	5 500	16.87		17.14	23.98	23.25
		5 580	15.33		15.60	23.98	23.25
		5 720	16.78		17.05	23.98	23.25
	UNII 3	5 745	18.26		18.53	30.00	30.00
		5 785	17.48		17.75	30.00	30.00
		5 825	17.25		17.52	30.00	30.00
802.11n HT20	UNII 1	5 180	12.26	0.29	12.55	23.98	22.49
		5 200	12.71		13.00	23.98	22.49
		5 240	12.91		13.20	23.98	22.49
	UNII 2A	5 260	18.95		19.24	23.98	23.34
		5 280	18.91		19.20	23.98	23.34
		5 320	18.72		19.01	23.98	23.34
	UNII 2C	5 500	16.33		16.62	23.98	23.25
		5 580	16.33		16.62	23.98	23.25
		5 720	15.98		16.27	23.98	23.25
	UNII 3	5 745	17.48		17.77	30.00	30.00
		5 785	16.57		16.86	30.00	30.00
		5 825	16.30		16.59	30.00	30.00

Note:

1. Conducted Output power(dB m) = Average Reading (dB m) + DCF(dB)

E.I.R.P.

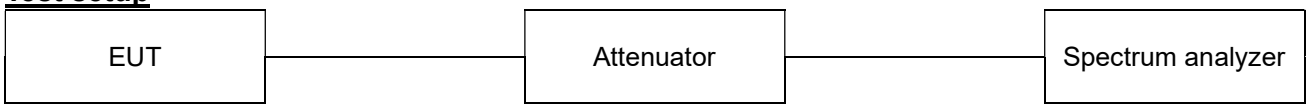
Test mode	Band	Frequency (㎒)	Measured output power			MAX e.i.r.p Limit (dB m)
			Conducted output power (dB m)	ANT gain (dB i)	MAX e.i.r.p (dB m)	
802.11a	UNII 1	5 180	16.97	2.46	19.43	22.27
		5 200	17.01		19.47	22.27
		5 240	17.11		19.57	22.27
	UNII 2A	5 260	19.40	2.99	22.39	29.34
		5 280	19.50		22.49	29.34
		5 320	19.21		22.20	29.34
	UNII 2C	5 500	17.14	3.70	20.84	29.25
		5 580	15.60		19.30	29.25
		5 720	17.05		20.75	29.25
	UNII 3	5 745	18.53	3.81	22.34	30.00
		5 785	17.75		21.56	30.00
		5 825	17.52		21.33	30.00
802.11n HT20	UNII 1	5 180	12.55	2.46	15.01	22.49
		5 200	13.00		15.46	22.49
		5 240	13.20		15.66	22.49
	UNII 2A	5 260	19.24	2.99	22.23	29.55
		5 280	19.20		22.19	29.55
		5 320	19.01		22.00	29.55
	UNII 2C	5 500	16.62	3.70	20.32	29.52
		5 580	16.62		20.32	29.52
		5 720	16.27		19.97	29.52
	UNII 3	5 745	17.77	3.81	21.58	30.00
		5 785	16.86		20.67	30.00
		5 825	16.59		20.40	30.00

Notes:

1. E.I.R.P. Calculation: E.I.R.P. (dB m) = Conducted output power (dB m) + Antenna gain (dB i)

7.2. Maximum Power Spectral Density

Test setup



Limit

FCC

According to §15.407(a)

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

IC

According to RSS-247(6.2)

Band	e.i.r.p. spectral density	Limit
UNII 1	√	10 dB m/㎒

Band	Power spectral density	Limit
UNII 2A	√	11 dB m /㎒
UNII 2C	√	11 dB m /㎒
UNII 3	√	30 dB m /500 ㎑

Test procedure

ANSI C63.10-2013 Section 12.3.2.2, 14.3.2.2
KDB 789033 D02 v02r01 – Section E and 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:

- 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.
- Method SA-2 is used.

Test results

Power spectral density

Test mode	Band	Frequency (㎒)	Measured PSD (dB m/㎒)	DCF (dB)	Maximum PSD (dB m/㎒)	Limit (dB m/㎒)
802.11a	UNII 1	5 180	5.89	0.27	6.16	11.00
		5 200	5.83		6.10	11.00
		5 240	5.99		6.26	11.00
	UNII 2A	5 260	8.22		8.49	11.00
		5 280	8.31		8.58	11.00
		5 320	8.05		8.32	11.00
	UNII 2C	5 500	5.88		6.15	11.00
		5 580	4.43		4.70	11.00
		5 720	5.97		6.24	11.00
802.11n HT20	UNII 1	5 180	1.29	0.29	1.58	11.00
		5 200	1.57		1.86	11.00
		5 240	1.79		2.08	11.00
	UNII 2A	5 260	8.10		8.39	11.00
		5 280	8.06		8.35	11.00
		5 320	7.87		8.16	11.00
	UNII 2C	5 500	5.30		5.59	11.00
		5 580	5.34		5.63	11.00
		5 720	4.80		5.09	11.00

Test mode	Band	Frequency (㎒)	Measured PSD (dB m/㎒)	DCF (dB)	Maximum PSD (dB m/㎒)	Limit (dB m /500 ㎑)
802.11a	UNII 3	5 745	4.57	0.27	4.84	30.00
		5 785	3.74		4.01	30.00
		5 825	3.39		3.66	30.00
802.11n HT20		5 745	3.56	0.29	3.85	30.00
		5 785	2.76		3.05	30.00
		5 825	2.38		2.67	30.00

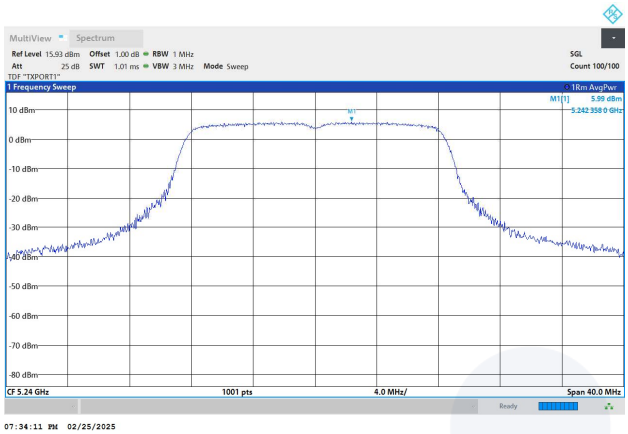
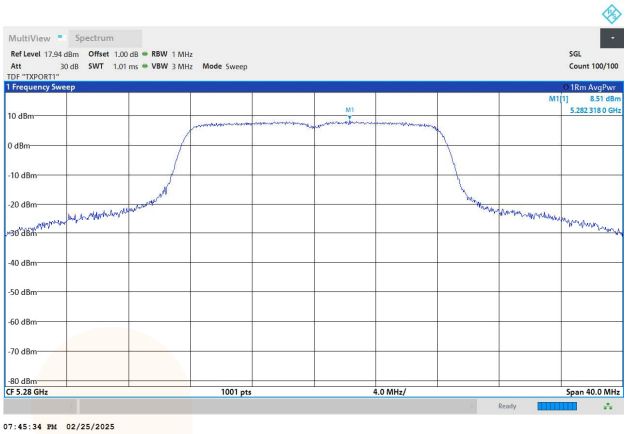
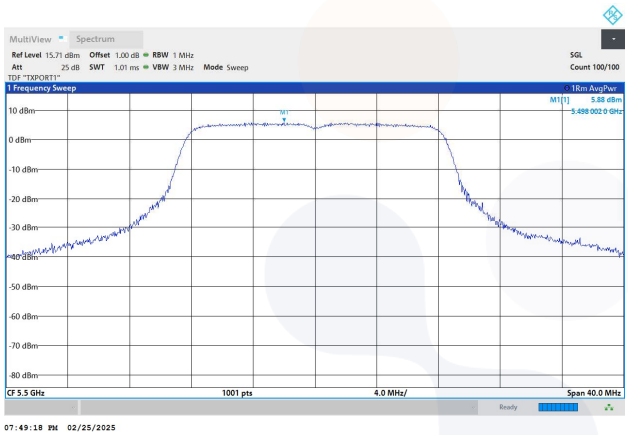
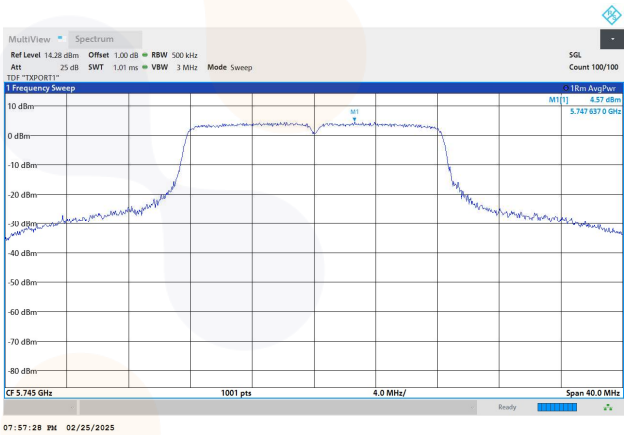
e.i.r.p spectral density

Test mode	Band	Frequency (㎒)	Measured PSD (dB m/㎒)	DCF (dB)	Maximum PSD (dB m/㎒)	ANT Gain (dB i)	E.I.R.P. PSD (dB m/㎒)	Limit (dB m/㎒)
802.11a	UNII 1	5 180	5.89	0.27	6.16	2.46	8.62	10.00
		5 200	5.83		6.10		8.56	
		5 240	5.99		6.26		8.72	
802.11n HT20	UNII 1	5 180	1.29	0.29	1.58	2.46	4.04	10.00
		5 200	1.57		1.86		4.32	
		5 240	1.79		2.08		4.54	

Notes:

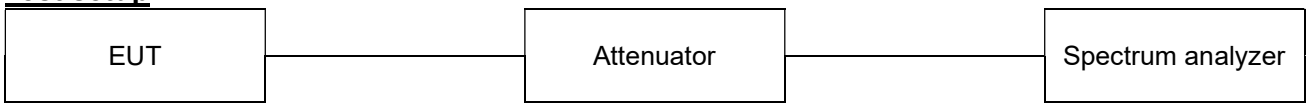
1. Maximum PSD(dB m/㎒) = Measured PSD(dB m/㎒) + D.C.F(dB)
2. E.I.R.P PSD (dB m/㎒) = Maximum PSD (dB m/㎒) + Antenna gain (dB i)

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

UNII-1 / 802.11a / High ch.	UNII-2A / 802.11a / Mid ch.
	
UNII-2C / 802.11a / Low ch.	**UNII-3 / 802.11a / 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 (26 dB 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

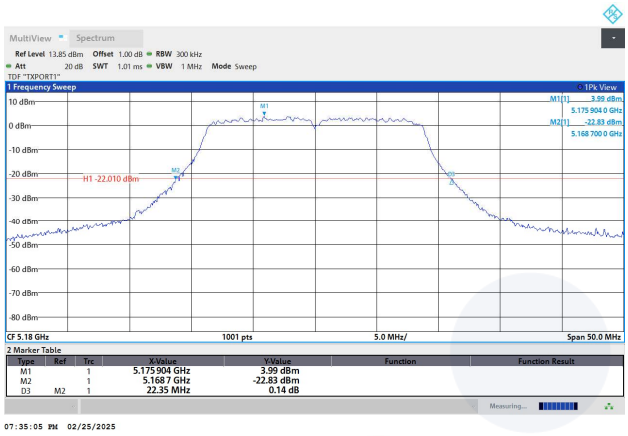
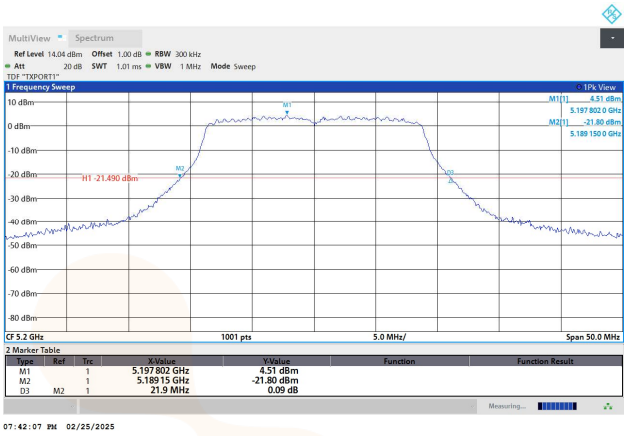
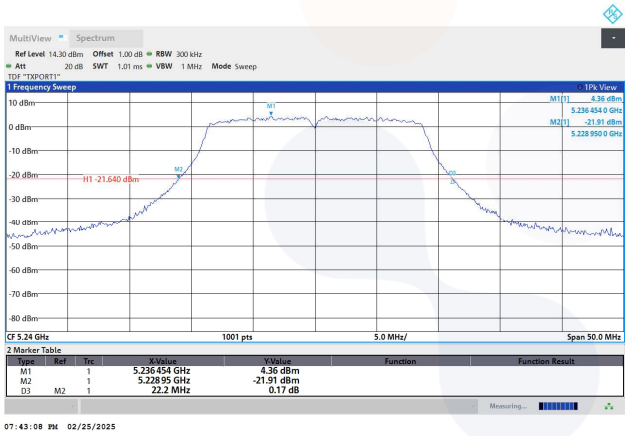
a. Set center frequency to the nominal EUT channel center frequency.
b. Set span = 1.5 times to 5.0 times the OBW.
c. Set RBW = 1% to 5% of the OBW
d. Set VBW ≥ 3 x RBW
e. Video averaging is not permitted. Where practical, a sample detection and single sweep mode shall be used. Otherwise, peak detection 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 dB bandwidth (㎒)	99% bandwidth (㎒)
802.11a	UNII 1	5 180	21.65	16.93
		5 200	21.55	16.87
		5 240	21.80	16.91
	UNII 2A	5 260	27.70	17.19
		5 280	28.15	17.15
		5 320	30.10	17.18
	UNII 2C	5 500	21.70	16.86
		5 580	21.45	16.80
		5 720	22.95	16.97
802.11n HT20	UNII 1	5 180	22.35	17.88
		5 200	21.90	17.73
		5 240	22.20	17.87
	UNII 2A	5 260	25.25	18.11
		5 280	27.85	18.03
		5 320	23.95	17.97
	UNII 2C	5 500	22.10	17.95
		5 580	22.35	17.88
		5 720	22.50	18.08

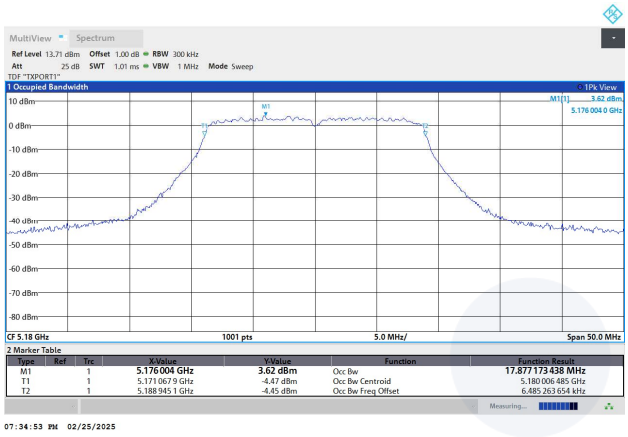
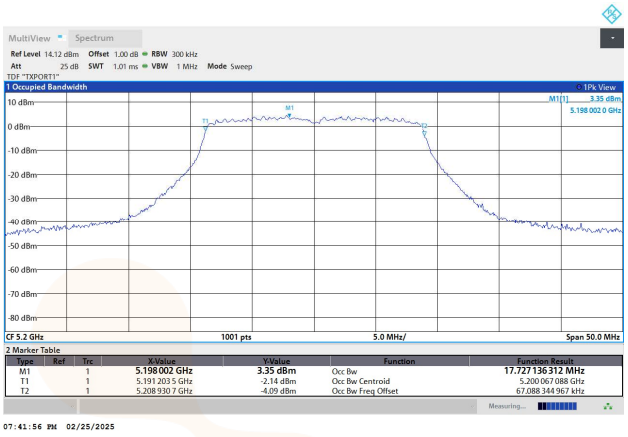
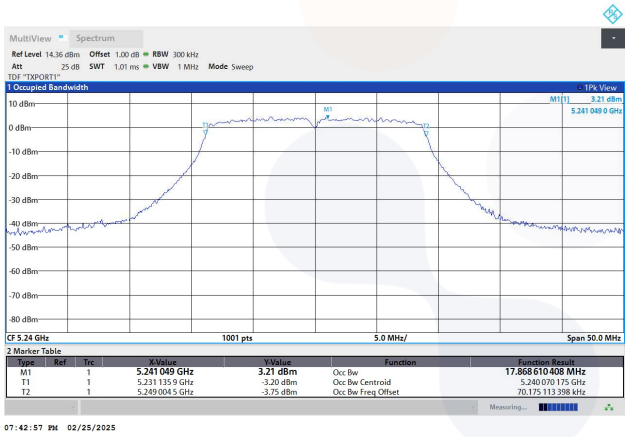
In order to simplify the report, only n mode test plots are attached.

26 dB bandwidth

UNII-1 / 802.11n HT20 / Low ch.	UNII-1 / 802.11n HT20 / Mid ch.
	
UNII-1 / 802.11n HT20 / High ch.	
	Blank

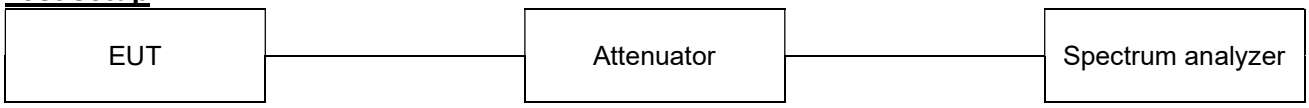
In order to simplify the report, only n mode test plots are attached.

99% bandwidth

UNII-1 / 802.11n HT20 / Low ch.	UNII-1 / 802.11n HT20 / Mid ch.
	
UNII-1 / 802.11n HT20 / High ch.	
	Blank

7.4. 6 dB Bandwidth & 99% Bandwidth

Test setup



Limit

According to §15.407(e),

Within the 5.725-5.850 ㎓ band, 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 ㎓ band. The following procedure shall be used for measuring this Bandwidth:

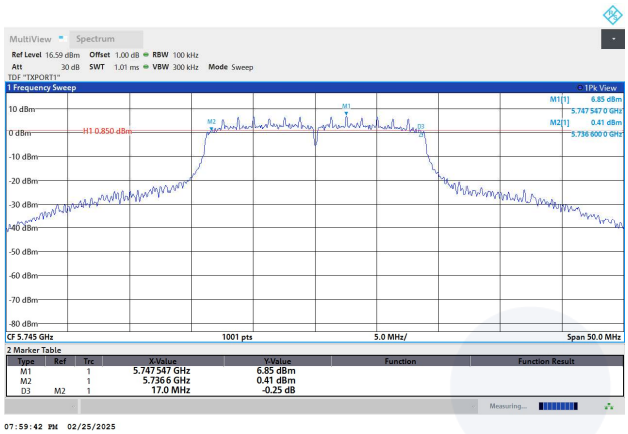
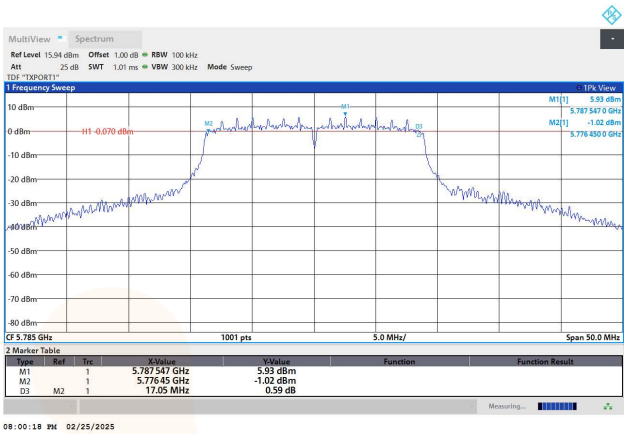
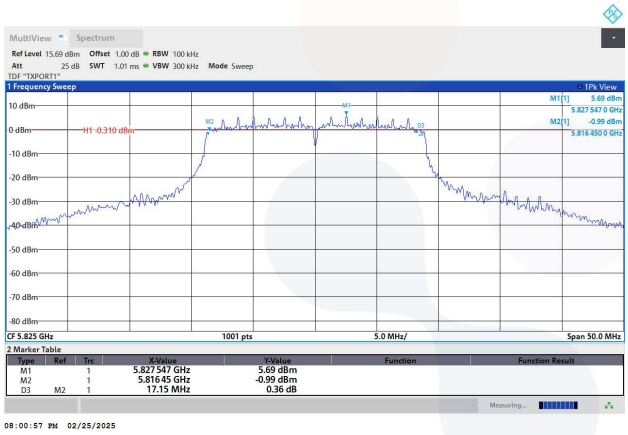
1. Set RBW = 100 ㎑.
2. Set the video bandwidth (VBW) ≥ 3 RBW.
3. Detector = Peak.
4. Trace mode = max hold.
5. Sweep = auto couple.
6. Allow the trace to stabilize.
7. Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper 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 (㎒)	99% bandwidth (㎒)
802.11a	UNII-3	5 745	16.40	0.50	17.07
		5 785	16.40	0.50	17.03
		5 825	16.40	0.50	16.95
802.11n HT20	UNII-3	5 745	17.00	0.50	18.01
		5 785	17.05	0.50	18.00
		5 825	17.15	0.50	17.86

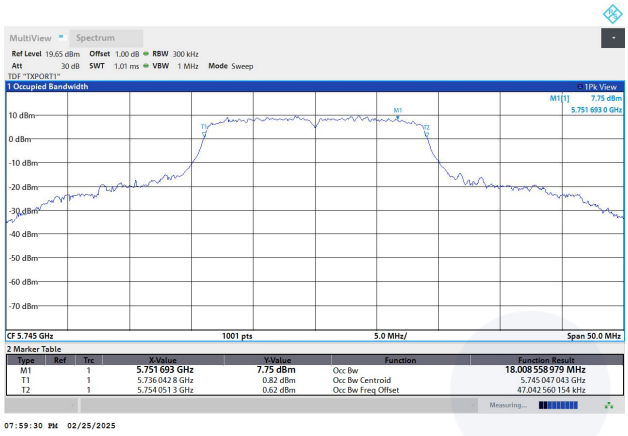
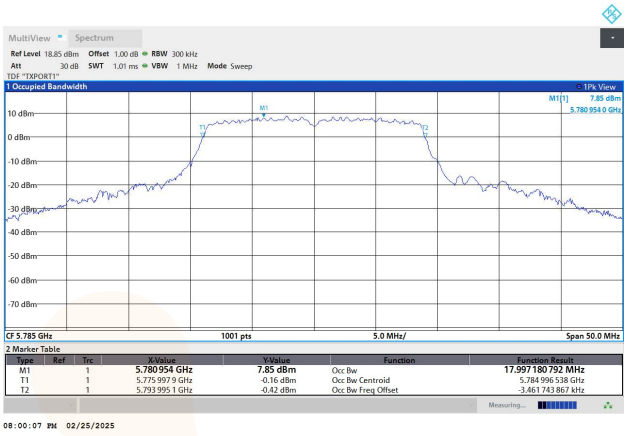
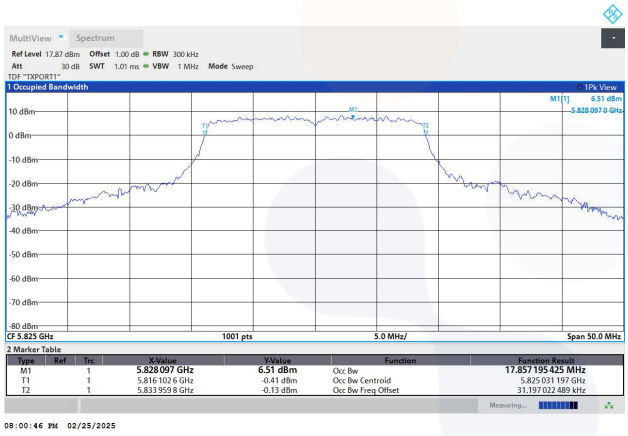
In order to simplify the report, only n mode test plots are attached.

6 dB bandwidth

UNII-3 / 802.11n HT20 / Low ch.	UNII-3 / 802.11n HT20 / Mid ch.
	
UNII-3 / 802.11n HT20 / High ch.	
	Blank

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

99% bandwidth

UNII-3 / 802.11n HT20 / Low ch.	UNII-3 / 802.11n HT20 / Mid ch.
	
UNII-3 / 802.11n HT20 / High ch.	
	Blank

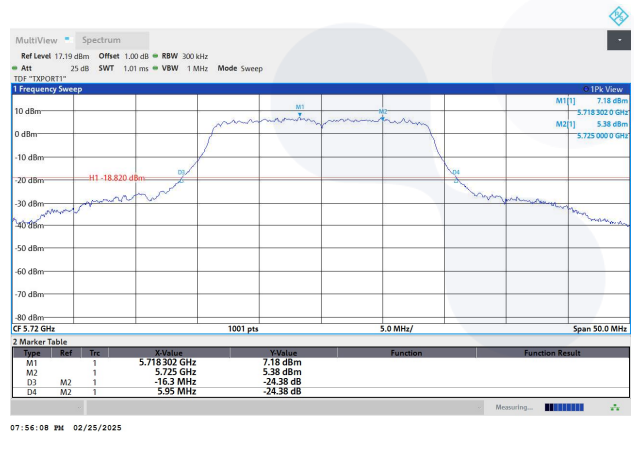
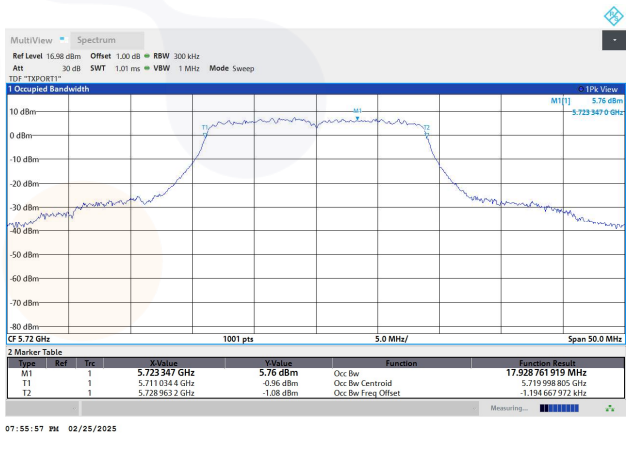
7.5. Straddle channel

26 dB bandwidth & 99% Bandwidth

Test mode	Band	Frequency(㎒)	26 dB Bandwidth (㎒)
802.11a	UNII 2C	5 720	15.85
802.11n HT20			16.30
802.11a	UNII 3	5 720	6.05
802.11n HT20			5.95

Test mode	Band	Frequency(㎒)	99% bandwidth (㎒)
802.11a	UNII 2C	5 720	16.97
802.11n HT20			17.93

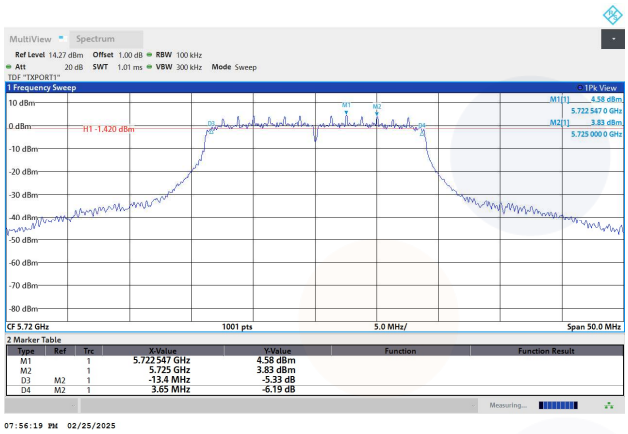
In order to simplify the report, only n mode test plots are attached

26 dB Bandwidth	99% bandwidth
UNII-2C / 802.11n HT20	UNII-2C / 802.11n HT20
	

6 dB bandwidth

Test mode	Band	Frequency (㎒)	6 dB Bandwidth (㎒)	Limit (㎒)
802.11a	UNII 3	5 720	3.25	0.50
802.11n HT20			3.65	0.50

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

UNII-3 / 802.11n HT20	
	Blank

Output Power

Conducted output power

Test mode	Band	Frequency (㎒)	Measured output power			Limit (dB m)
			Reading (dB m)	DCF (dB)	Result (dB m)	
802.11a	UNII 2C	5 720	15.09	0.27	15.36	23.98
802.11n HT20			14.42	0.29	14.71	23.98
802.11a	UNII 3	5 720	8.69	0.27	8.96	30.00
802.11n HT20			8.56	0.29	8.85	30.00

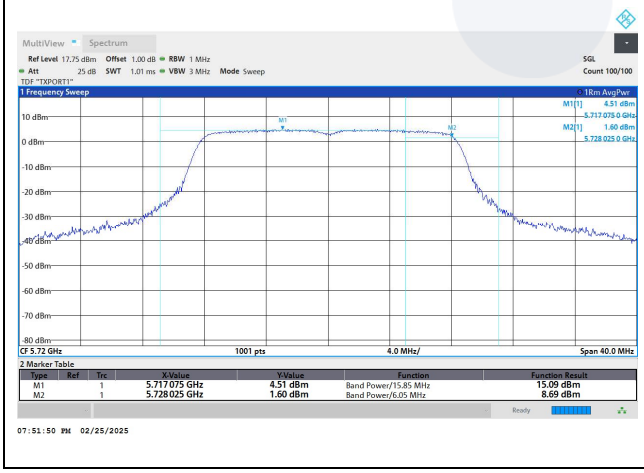
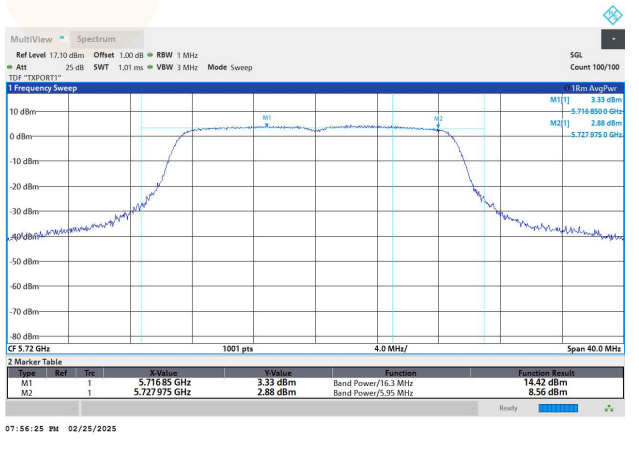
E.I.R.P.

Test mode	Band	Frequency (㎒)	Measured output power			Limit (dB m)
			Conducted output Power (dB m)	ANT gain (dB i)	MAX e.i.r.p (dB m)	
802.11a	UNII 2C	5 720	15.36	3.81	19.17	29.52
802.11n HT20			14.71		12.77	29.52
802.11a	UNII 3	5 720	8.96	3.81	18.52	30.00
802.11n HT20			8.85		12.66	30.00

Notes:

1. Conducted Output power(dB m) = Reading 10log($10^{(ANT1/10)}$ + $10^{(ANT2/10)}$) (dB m) + D.C.F (dB)
2. 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 the worst case per bandwidth

UNII-2C / 802.11a	UNII-2C / 802.11n HT20
	

Power Spectral Density

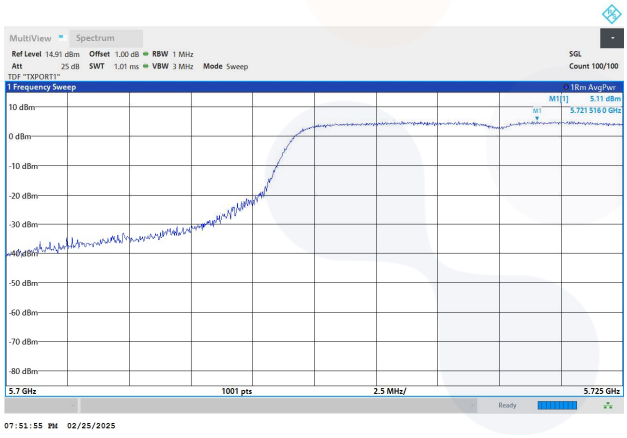
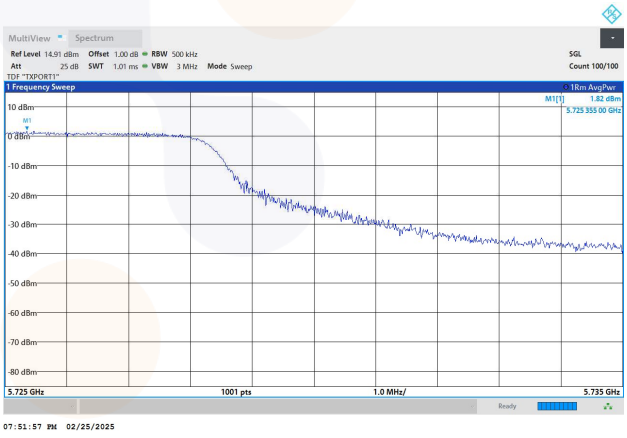
Test mode	Band	Frequency (㎒)	Measured PSD (dB m/㎒)	DCF (dB)	Maximum PSD (dB m/㎒)	Limit (dB m/㎒)
802.11a	UNII 2C	5 720	5.11	0.27	5.38	11.00
802.11n HT20			4.36	0.29	4.65	

Test mode	Band	Frequency (㎒)	Measured PSD (dB m/500 ㎑)	DCF (dB)	Maximum PSD (dB m/500 ㎑)	Limit (dB m /500 ㎑)
802.11a	UNII 3	5 720	1.82	0.27	2.09	30.00
802.11n HT20			1.18	0.29	1.47	

Notes:

1. Maximum PSD(㏈ m/㎒) = 10log($10^{(ANT1/10)}$ + $10^{(ANT2/10)}$) (㏈ m/㎒) + D.C.F(㏈)

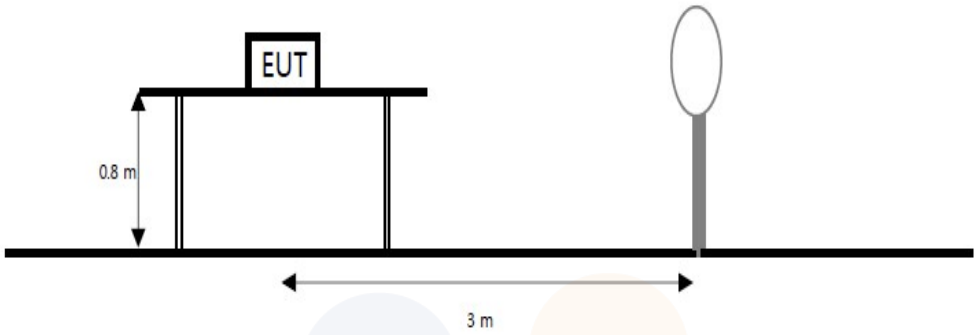
In order to simplify the report, attached plots were the worst case per bandwidth

UNII 2C / 802.11a	UNII-3 / 802.11a
	

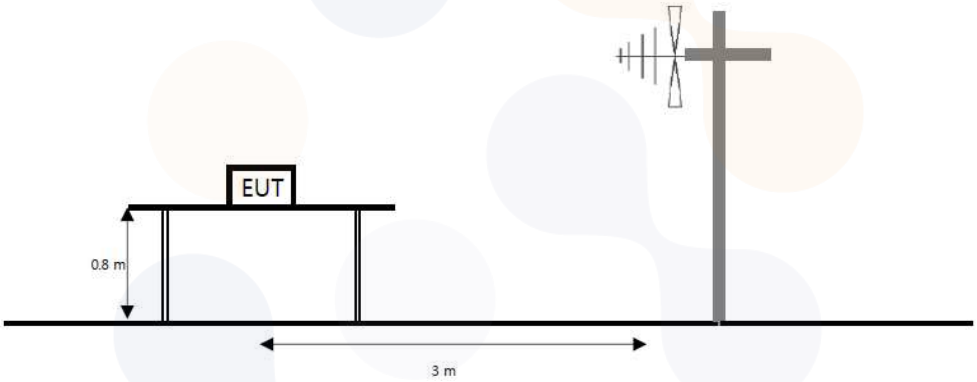
7.6. Spurious Emission, Band Edge and Restricted bands

Test setup

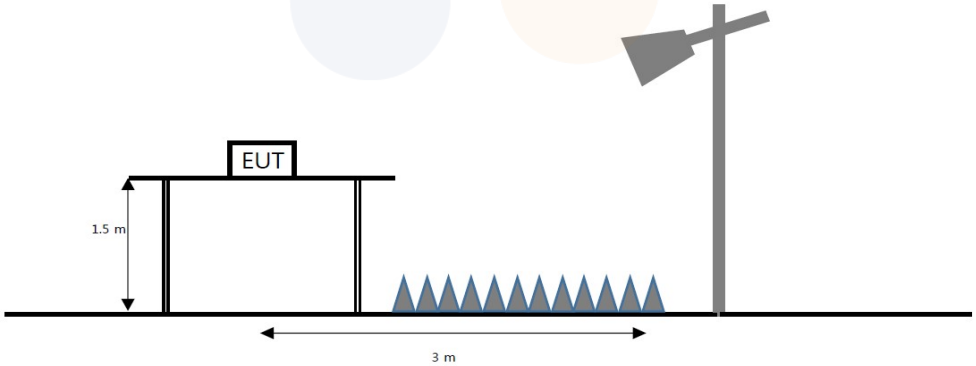
The diagram below shows the test setup that is utilized to make the measurements for emission from 9 ㎑ to 30 ㎒ Emissions



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



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



Limit

FCC

According to section 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 (㎒)	Field strength (㎶/m)	Measurement distance (m)
0.009 - 0.490	2 400/F(㎑)	300
0.490 - 1.705	24 000/F(㎑)	30
1.705 - 30	30	30
30 - 88	100**	3
88 - 216	150**	3
216 - 960	200**	3
Above 960	500	3

**Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this section shall not be located in the frequency bands 54–72 ㎒, 76–88 ㎒, 174–216 ㎒ or 470–806 ㎒. However, operation within these frequency bands is permitted under other sections of this part, e.g., Section15.231 and 15.241.

According to section 15.205(a) and (b),

only spurious emissions are permitted in any of the frequency bands listed below:

㎒	㎒	㎒	㎓
0.009 - 0.110	16.42 - 16.423	399.9 - 410	4.5 - 5.15
0.495 - 0.505	16.694 75 - 16.695 25	608 - 614	5.35 - 5.46
2.173 5 - 2.190 5	16.804 25 - 16.804 75	960 – 1 240	7.25 - 7.75
4.125 - 4.128	25.5 - 25.67	1 300 – 1 427	8.025 - 8.5
4.177 25 - 4.177 75	37.5 - 38.25	1 435 – 1 626.5	9.0 - 9.2
4.207 25 - 4.207 75	73 - 74.6	1 645.5 – 1 646.5	9.3 - 9.5
6.215 - 6.218	74.8 - 75.2	1 660 – 1 710	10.6 - 12.7
6.267 75 - 6.268 25	108 - 121.94	1 718.8 – 1 722.2	13.25 - 13.4
6.311 75 - 6.312 25	123 - 138	2 200 – 2 300	14.47 - 14.5
8.291 - 8.294	149.9 - 150.05	2 310 – 2 390	15.35 - 16.2
8.362 - 8.366	156.524 75 - 156.525 25	2 483.5 – 2 500	17.7 - 21.4
8.376 25 - 8.386 75		2 690 – 2 900	22.01 - 23.12
8.414 25 - 8.414 75	156.7 - 156.9	3 260 – 3 267	23.6 - 24.0
12.29 - 12.293	162.012 5 - 167.17	3 332 – 3 339	31.2 - 31.8
12.519 75 - 12.520 25	167.72 - 173.2	3 345.8 – 3 358	36.43 - 36.5
12.576 75 - 12.577 25	240 - 285	3 600 – 4 400	Above 38.6
13.36 - 13.41	322 - 335.4		

The field strength of emissions appearing within these frequency bands shall not exceed the limits shown in section 15.209. At frequencies equal to or less than 1 000 ㎒, compliance with the limits in section 15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1 000 ㎒, compliance with the emission limits in section 15.209 shall be demonstrated based on the average value of the measured emissions. The provisions in section 15.35 apply to these measurements.

According to section 15.407(b),

undesirable emission limits. Except as shown in paragraph (b)(7) of this section, the maximum emissions outside of the frequency bands of operation shall be attenuated in accordance with the following limits:

For transmitters operating in the 5.15-5.25 ㎓ band: All emissions outside of the 5.15-5.35 ㎓ band shall not exceed an e.i.r.p. of −27 ㏈m/㎒

For transmitters operating in the 5.25-5.35 ㎓ band: All emissions outside of the 5.15-5.35 ㎓ band shall not exceed an e.i.r.p. of −27 ㏈m/㎒.

For transmitters operating in the 5.47-5.725 ㎓ band: All emissions outside of the 5.15-5.35 ㎓ band shall not exceed an e.i.r.p. of −27 ㏈m/㎒.

For transmitters operating in the 5.725-5.85 ㎓ band: All emissions shall be limited to a level of -27 ㏈m/㎒ at 75 ㎒ or more above or below the band edge increasing linearly to 10 ㏈m/㎒ at 25 ㎒ above or below the band edge, and form 25 ㎒ above or below the band edge increasing linearly to a level of 15.6 ㏈m/㎒ at 5 ㎒ above or below the band edge, and from 5 ㎒ above or below the band edge increasing linearly to a level of 27 ㏈m/㎒ at the band edge.

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According to RSS-247(5.5),

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

According to RSS-Gen(8.9),

Except where otherwise indicated in the applicable RSS, radiated emissions shall comply with the field strength limits shown in table 5 and table 6. Additionally, the level of any transmitter unwanted emission shall not exceed the level of the transmitter's fundamental emission.

Table 5- General field strength limits at frequencies above 30 ㎒

Frequency(㎒)	Field strength (㎶/m at 3 m)
30 to 88	100
88 to 216	150
216 to 960	200
Above 960	500

Table 6- General field strength limits at frequencies below 30 ㎒

Frequency	Magnetic field strength (H-Field) (㎂/m)	Measurement distance(m)
9 – 490 ㎑ 1)	6.37/F (F in ㎑)	300
490 – 1705 ㎑	63.7/F (F in ㎑)	30
1.705 - 30 ㎒	0.08	30

According to RSS-Gen(8.10),

Restricted frequency bands, identified in table 7, are designated primarily for safety-of-life services (distress calling and certain aeronautical activities), certain satellite downlinks, radio astronomy and some government uses. Except where otherwise indicated, the following conditions related to the restricted frequency bands apply:

(a) The transmit frequency, including fundamental components of modulation, of licence-exempt radio apparatus shall not fall within the restricted frequency bands listed in table 7 except for apparatus compliant with RSS-287, Emergency Position Indicating Radio Beacons (EPIRB), Emergency Locator Transmitters (ELT), Personal Locator Beacons (PLB), and Maritime Survivor Locator Devices (MSLD).

(b) Unwanted emissions that fall into restricted frequency bands listed in table 7 shall comply with the limits specified in table 5 and table 6.

(c) Unwanted emissions that do not fall within the restricted frequency bands listed in table 7 shall comply either with the limits specified in the applicable RSS or with those specified in table 5 and table 6.

Table 7- Restricted frequency bands*

MHz	MHz	GHz
0.090 - 0.110	149.9 - 150.05	9.0 - 9.2
0.495 - 0.505	156.52475 - 156.52525	9.3 - 9.5
2.1735 - 2.1905	156.7 - 156.9	10.6 - 12.7
3.020 - 3.026	162.0125 - 167.17	13.25 - 13.4
4.125 - 4.128	167.72 - 173.2	14.47 - 14.5
4.17725 - 4.17775	240 - 285	15.35 - 16.2
4.20725 - 4.20775	322 - 335.4	17.7 - 21.4
5.677 - 5.683	399.9 - 410	22.01 - 23.12
6.215 - 6.218	608 - 614	23.6 - 24.0
6.26775 - 6.26825	960 - 1427	31.2 - 31.8
6.31175 - 6.31225	1435 - 1626.5	36.43 - 36.5
8.291 - 8.294	1645.5 - 1646.5	Above 38.6
8.362 - 8.366	1660 - 1710	
8.37625 - 8.38675	1718.8 - 1722.2	
8.41425 - 8.41475	2200 - 2300	
12.29 - 12.293	2310 - 2390	
12.51975 - 12.52025	2483.5 - 2500	
12.57675 - 12.57725	2655 - 2900	
13.36 - 13.41	3260 - 3267	
16.42 - 16.423	3332 - 3339	
16.69475 - 16.69525	3345.8 - 3358	
16.80425 - 16.80475	3500 - 4400	
25.5 - 25.67	4500 - 5150	
37.5 - 38.25	5350 - 5460	
73 - 74.6	7250 - 7750	
74.8 - 75.2	8025 - 8500	
108 - 138	--	

* Certain frequency bands listed in table 7 and in bands above 38.6 GHz are designated for licence-exempt applications. These frequency bands and the requirements that apply to related devices are set out in the 200 and 300 series of RSSs.

Test procedure

ANSI C63.10-2013 Section 12.7.7.2, 12.7.5, 12.7.6
KDB 789033 D02 v02r01 – Section G

Test settings

Peak field strength measurements

1. Analyzer center frequency was set to the frequency of the radiated spurious emission of interest
2. RBW = as specified in table
3. VBW ≥ (3×RBW)
4. Detector = peak
5. Sweep time = auto
6. Trace mode = max hold
7. Allow sweeps to continue until the trace stabilizes

Table. RBW as a function of frequency

Frequency	RBW
9 ㎑ to 150 ㎑	200 ㎐ to 300 ㎐