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-SRF0243-B Page(1) of (20)	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 : 2023-09-05

2. Use of Report : Certification

3. Name of Product / Model : Tablet PC / SM-X300

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

5. FCC ID : A3LSMX300

6. Date of Test : 2023-10-23 to 2023-11-08

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 C, 15.247

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

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

2023-12-01

Eurofins KCTL Co.,Ltd.

REPORT REVISION HISTORY

Date	Revision	Page No
2023-11-14	Originally issued	-
2023-11-24	Updated	10
2023-12-01	Updated	10

Note. The report No. KR23-SRF0243-A is superseded by the report No. KR23-SRF0243-B.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 Thai Nguyen Co., Ltd
Address	:	Yen Binh Industrial Park, Dong Tien Ward, Pho Yen Town, Thai Nguyen 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	:	Tablet PC		
Model	:	SM-X300		
Modulation technique	:	WIFI(802.11b/g/n/ax)	:	DSSS, OFDM, OFDMA
Number of channels	:	13 ch (20 ㎒)		
Power source	:	DC 3.85 V		
Antenna specification	:	Antenna 1 : LDS Antenna		
		Antenna 2 : LDS Antenna		
Antenna gain	:	Antenna 1 : -4.00 dBi		
		Antenna 2 : -4.00 dBi		
Frequency range	:	2 412 ㎒ ~ 2 472 ㎒		(802.11b/g/n/ax_HT20/HE20)
Software version	:	X300.001		
Hardware version	:	REV1.0		
Test device serial No.	:	Conducted	:	R32W9001LQT
		Radiated	:	R32W9001L0M
Operation temperature	:	0 ℃ ~ 35 ℃		

2.1. Frequency/channel operations

This device contains the following capabilities:
WLAN (11a/b/g/n/ac/ax), Bluetooth (BDR/EDR/BLE), NFC, Digitizer

Ch.	Frequency (㎒)
01	2 412
..	..
06	2 437
..	..
11	2 462
12	2 467
13	2 472

Table 2.1-1. 802.11ax HE20 mode

2.2. RU allocations

BW (㎒)	Tones (T)	RU offset	Test RU offset		
			Low	Mid	High
20	26	0 ~ 8	0	4	8
	52	37 ~ 40	37	38	40
	106	53 ~ 54	53	-	54
	242	61 / SU	-	61 / -	-

2.3. Duty Cycle Factor

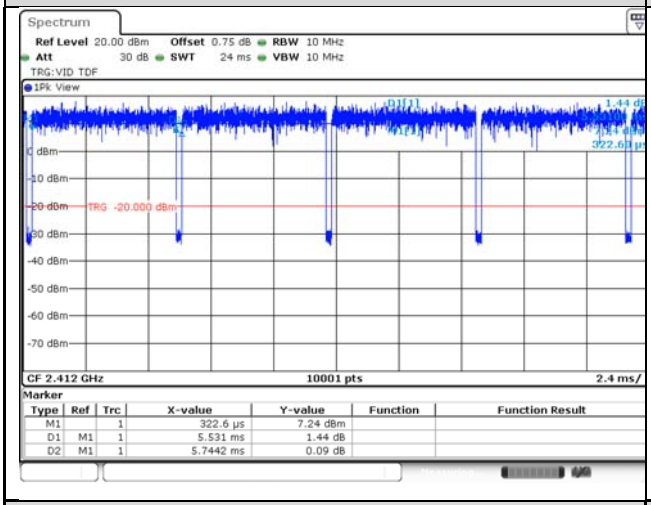
Test mode	Tone	Period (㎳)	On time (㎳)	Duty cycle		Duty Cycle Factor (㏈)
				(Linear)	(%)	
802.11ax HE 20 SISO	26T	5.744	5.531	0.962 9	96.29	0.16
	52T	5.226	5.125	0.980 7	98.07	0.08
	106T	2.533	2.433	0.960 5	96.05	0.17
	242T	1.195	1.097	0.918 0	91.80	0.37
	SU	1.194	1.093	0.915 4	91.54	0.38
802.11ax HE 20 MIMO	26T	5.232	5.131	0.980 7	98.07	0.08
	52T	2.699	2.599	0.962 9	96.29	0.16
	106T	1.346	1.247	0.926 4	92.64	0.33
	242T	0.687	0.588	0.855 9	85.59	0.68
	SU	0.684	0.583	0.852 3	85.23	0.69

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%

SISO

26T



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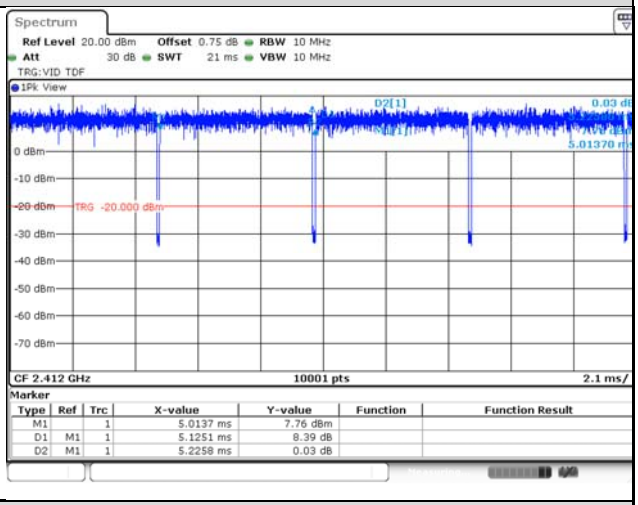

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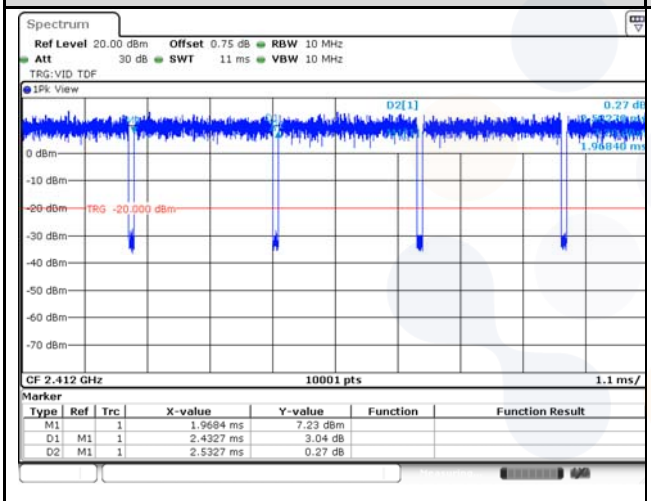

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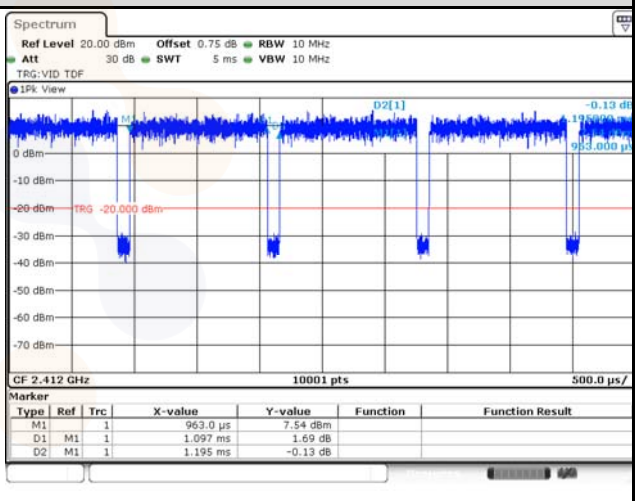

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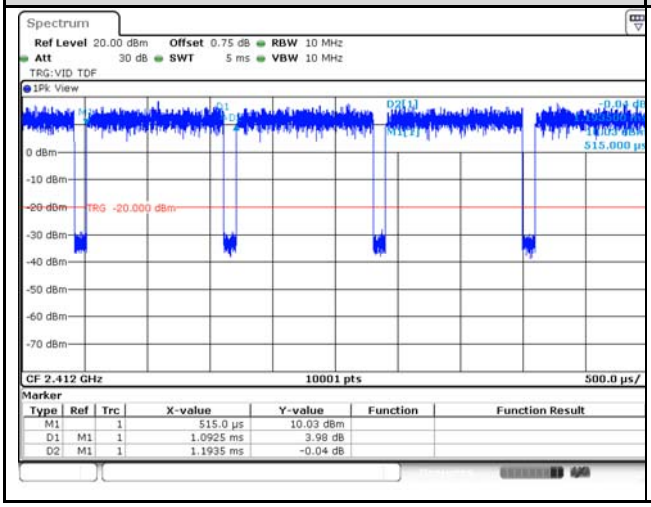

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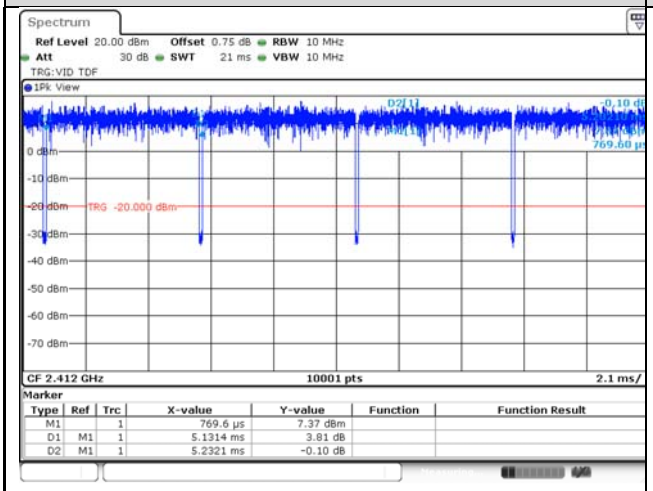
MIMO

26T



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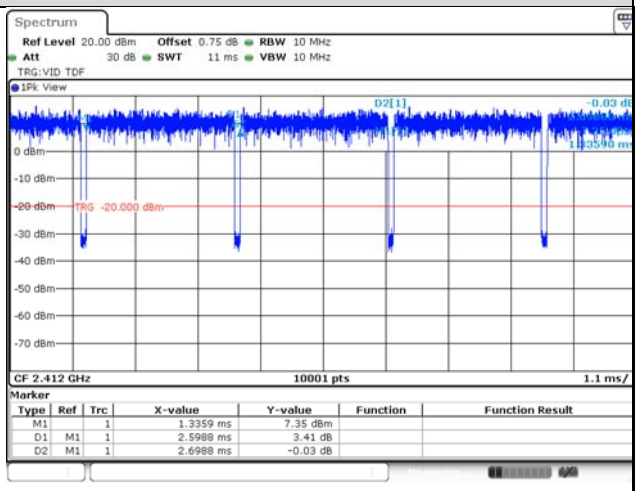

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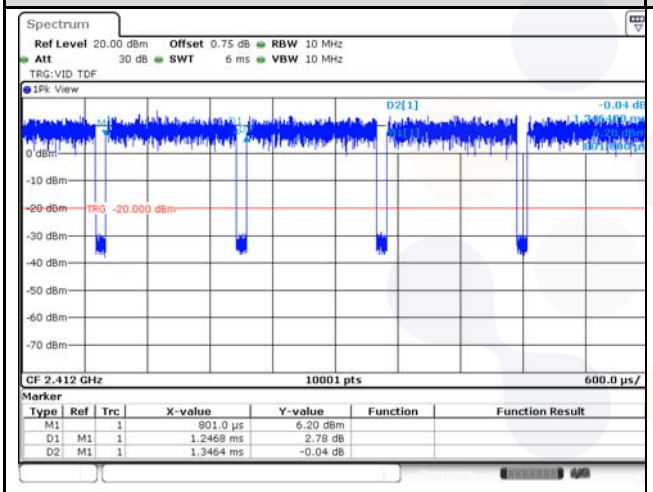

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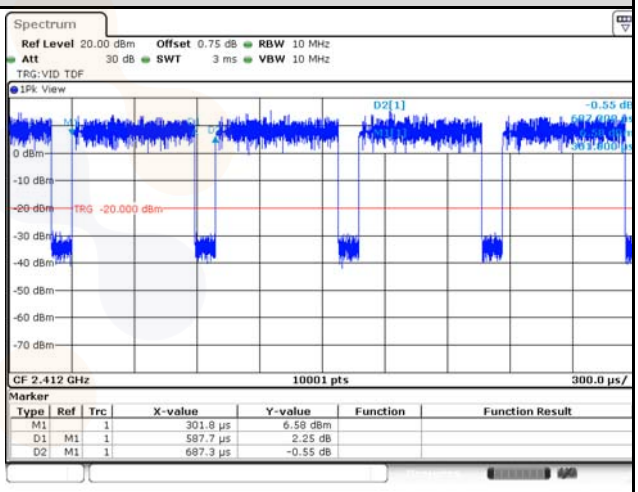

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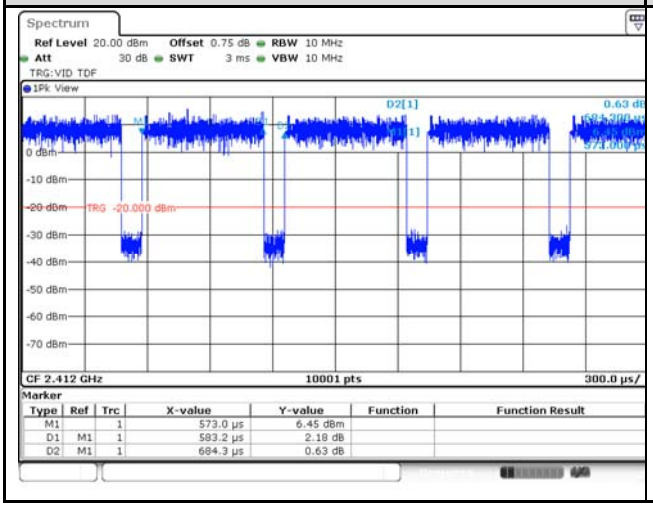

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3. Antenna requirement

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, §15.247.

3.1 Antenna information

Mode	SISO		CDD	SDM
	ANT 1	ANT 2	ANT 1 + 2	ANT 1 + 2
802.11ax HE20	√	×	×	√

√ = Support, × = Not support

3.2 Directional Gain Calculations

According to clause F), 2), d), (ii) of KDB 662911 D01 Multiple Transmitter Output, Directional gain may be calculated by using the formulas as below.

Directional Antenna Gain

ANT 1 Gain (dBi)	ANT 2 Gain (dBi)	Combined Gain (dBi)
-4.00	-4.00	-4.00

Note.

Unequal antenna gains, with equal transmit powers. For antenna gains given by G_1, G_2, …, G_N dBi
Directional gain = $10 \log[(10^{G1/10} + 10^{G2/10} + \ldots + 10^{GN/10}) / N_{ANT}]$ dBi

Sample calculation

Directional gain = $10 \log[(10^{-4.00/10} + 10^{-4.00/10}) / 2] = -4.00$ dBi

4. Introduction

This report referenced from the FCC ID: A3LSMX306B
Based on their similarity, the FCC Part 15C (equipment class: DTS) reuse the original model's result and do spot-check, following the FCC KDB 484596 D01 v02r01.
And the applicant takes full responsibility that the test data as referenced in this report represent compliance for this FCC ID.

4.1 Difference

The FCC ID: A3LSMX300 share the same enclosure and circuit board as FCC ID: A3LSMX306B. The WIFI/BT/BLE antenna and surrounding circuitry and layout are identical between these two units.
As for all bands, they have been verified and the parent model test results under
FCC ID : A3LSMX306B shall remain representative of FCC ID: A3LSMX300.
.
Note. The difference between the parent and variant is that the RF circuit for GSM/WCDMA/LTE/NR bands in the parent model SM-X306B is removed from the variant model SM-X300.

4.2 Spot check verification data (Band-edge & Spurious emission)

Test band	Test item	Test mode	Channel	Measured frequency (㎒)	SM-X306B (dB㎶)		SM-X300 (dB㎶)		Deviation (dB)		Deviation (%)	
					Avg	Peak	Avg	Peak	Avg	Peak	Avg	Peak
2.4G WIFI	Band edge	802.11ax HE20 RU 26T offset 8 SISO	13	2 483.5 ~ 2 500	49.09	71.86	49.22	71.82	0.13	-0.04	1.51	-0.46
	RSE	802.11ax HE20 RU 52T Offset 40 MIMO	1	7 229.40	-	46.47	-	45.17	-	-1.30	-	-13.90

Notes:
1. FCC ID: A3LSMX300 have been verified the performance as for WIFI identical with the FCC ID: A3LSMX306B.
2. Comparison of two models, the variant model emissions do not exceed the parent model emissions by more than 25% in linear units and all measurements are below FCC technical limits.
   Deviation (%) = |Spot check data – Reference data| / |Reference data | ≤ 0.25 (25 %)
3. Data reuse is based on KDB 484596 D01 v02r01 and has been approved via FCC KDB inquiry.

4.3 Reference Detail

Reference application that contains the reused reference data in the individual test reports.

Equipment Class	Reference FCC ID	Application Type	Reference Test report Number	Exhibit Type	Variant Test Report Number	Data Re-used
DTS	A3LSMX306B	Original	KR23-SRF0224 (802.11b/g/n)	Test report	KR23-SRF0241	All
			KR23-SRF0226 (802.11ax)	Test report	KR23-SRF0243	All
			KR23-SRF0223 (Bluetooth LE)	Test report	KR23-SRF0240	All
DSS	A3LSMX306B	Original	KR23-SRF0222 (Bluetooth)	Test report	KR23-SRF0239	All
NII	A3LSMX306B	Original	KR23-SRF0225 (802.11a/n/ac)	Test report	KR23-SRF0242	All
			KR23-SRF0227 (802.11ax)	Test report	KR23-SRF0244	All

5. Summary of tests

FCC Part section(s)	Parameter	Test Condition	Test results
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. EUT was investigated in three orthogonal orientations X, Y and Z. it was determined that **Y** orientation was worst-case orientation. Therefore, all final radiated testing was performed with the EUT in **Y** orientation.
4. All configurations have been performed (Stand-alone, Stand-alone with TA, With accessories). Worst case: Stand-alone
5. The maximum production power and tolerance are not impacted by the change. So only spot-check test was done against the worst case from the original model.
6. The test procedure(s) in this report were performed in accordance as following.
   - ANSI C63.10-2013
   - KDB 558074 D01 v05r02
   - KDB 662911 D01 v02r01
7. The worst-case data rate were : MCS0

6. 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.

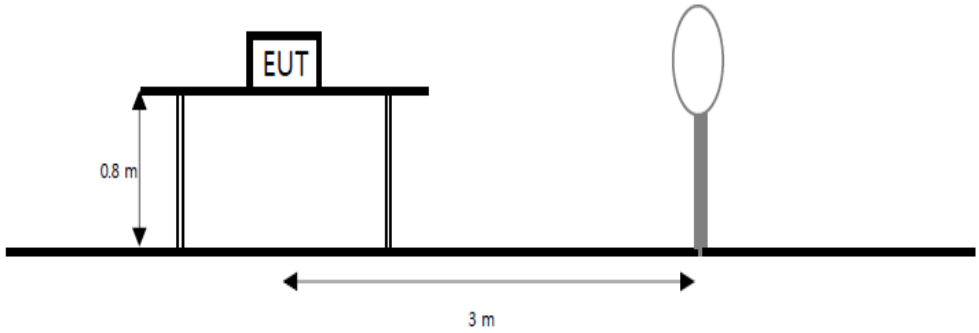
Parameter	Expanded uncertainty (±)	
Radiated spurious emissions	1 000 ㎒ ~ 18 000 ㎒	4.7 ㏈

7. Test results

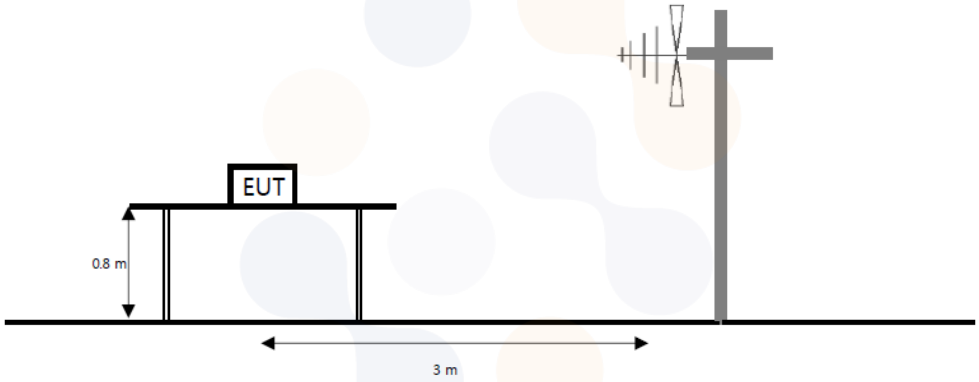
7.1. Spurious Emission, Band Edge and Restricted bands

Test setup

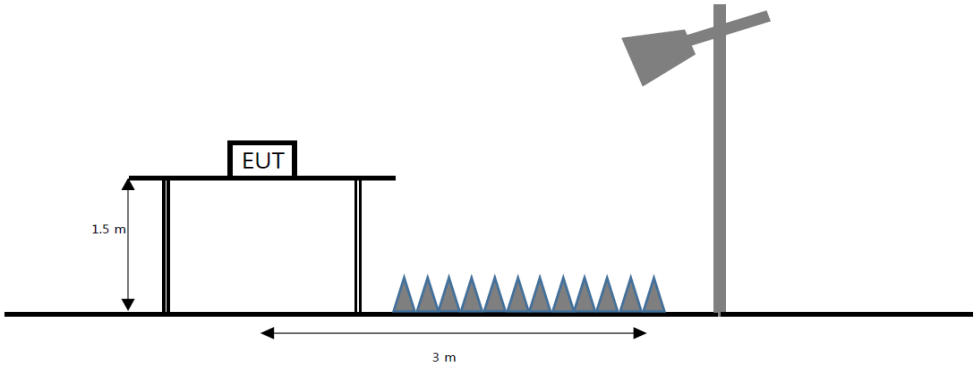
The diagram below shows the test setup that is utilized to make the measurements for emission from 9 ㎑ to 30 ㎒ Emissions



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

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	156.7 - 156.9	2 690 – 2 900	22.01 - 23.12
8.414 25 - 8.414 75	162.012 5 - 167.17	3 260 – 3 267	23.6 - 24.0
12.29 - 12.293	167.72 - 173.2	3 332 – 3 339	31.2 - 31.8
12.519 75 - 12.520 25	240 - 285	3 345.8 – 3 358	36.43 - 36.5
12.576 75 - 12.577 25	322 - 335.4	3 600 – 4 400	Above 38.6
13.36 - 13.41			

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.

Test procedure
ANSI C63.10-2013

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 ㎐
0.15 ㎒ to 30 ㎒	9 ㎑ to 10 ㎑
30 ㎒ to 1 000 ㎒	100 ㎑ to 120 ㎑
> 1 000 ㎒	1 ㎒

Average field strength measurements

Trace averaging with continuous EUT transmission at full power

If the EUT can be configured or modified to transmit continuously (D ≥ 98%), then the average emission levels shall be measured using the following method (with EUT transmitting continuously):

1. RBW = 1 ㎒ (unless otherwise specified).
2. VBW ≥ (3×RBW).
3. Detector = RMS (power averaging), if [span / (# of points in sweep)] ≤ (RBW / 2). Satisfying this condition may require increasing the number of points in the sweep or reducing the span. If this condition cannot be satisfied, then the detector mode shall be set to peak.
4. Averaging type = power (i.e., rms):
   1) As an alternative, the detector and averaging type may be set for linear voltage averaging.
   2) Some instruments require linear display mode to use linear voltage averaging. Log or ㏈ averaging shall not be used.
5. Sweep time = auto.
6. Perform a trace average of at least 100 traces.

Trace averaging across ON and OFF times of the EUT transmissions followed by duty cycle correction

If continuous transmission of the EUT (D ≥ 98%) cannot be achieved and the duty cycle is constant (duty cycle variations are less than ±2%), then the following procedure shall be used:

1. The EUT shall be configured to operate at the maximum achievable duty cycle.
2. Measure the duty cycle D of the transmitter output signal as described in 11.6.
3. RBW = 1 ㎒ (unless otherwise specified).
4. VBW ≥ [3 × RBW].
5. Detector = RMS (power averaging), if [span / (# of points in sweep)] ≤ (RBW / 2). Satisfying this condition may require increasing the number of points in the sweep or reducing the span. If this condition cannot be satisfied, then the detector mode shall be set to peak.
6. Averaging type = power (i.e., rms):

1) As an alternative, the detector and averaging type may be set for linear voltage averaging.
2) Some instruments require linear display mode to use linear voltage averaging. Log or dB averaging shall not be used.

7. Sweep time = auto.
8. Perform a trace average of at least 100 traces.
9. A correction factor shall be added to the measurement results prior to comparing with the emission limit to compute the emission level that would have been measured had the test been performed at 100% duty cycle. The correction factor is computed as follows:
   1) If power averaging (rms) mode was used in step f), then the applicable correction factor is [10 log (1 / D)], where D is the duty cycle.
   2) If linear voltage averaging mode was used in step f), then the applicable correction factor is [20 log (1 / D)], where D is the duty cycle.
   3) If a specific emission is demonstrated to be continuous (D ≥ 98%) rather than turning ON and OFF with with the transmit cycle, then no duty cycle correction is required for that emission.

Notes:

1. *f* <30 ㎒, extrapolation factor of 40 dB/decade of distance. $F_d = 40\log(D_m/Ds)$
   f ≥30 ㎒, extrapolation factor of 20 dB/decade of distance. $F_d = 20\log(D_m/Ds)$
   Where:
   F_d= Distance factor in dB
   D_m= Measurement distance in meters
   D_s= Specification distance in meters
2. Factors(dB) = Antenna factor(dB/m) + Cable loss(dB) + or Amp. gain(dB) + or F_d(dB)
3. The worst-case emissions are reported however emissions whose levels were not within 20 dB of respective limits were not reported.
4. Average test would be performed if the peak result were greater than the average limit.
5. 1) means restricted band.
6. Above 1 ㎓ the worst results between two antenna polarizations (H and V) were documented in the test report.
7. Below 30 ㎒ frequency range, In order to search for the worst result, all orientations about parallel, perpendicular, and ground-parallel were investigated then reported. when the emission level was higher than 20 dB of the limit, then the following statement shall be made: “No spurious emissions were detected within 20 dB of the limit.”

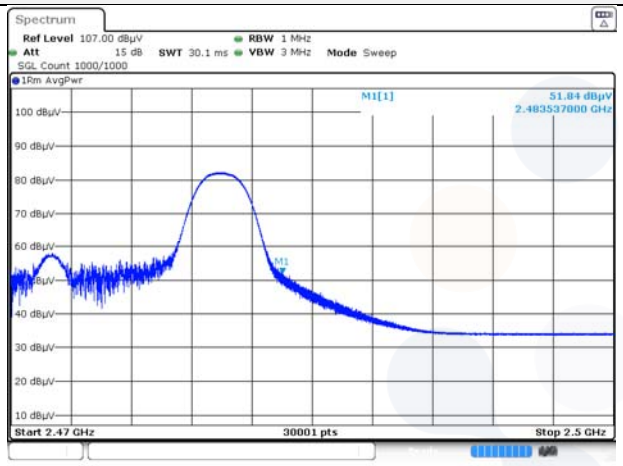
Spot-check Test results

802.11ax HE20 RU mode SISO (26T / RU offset 8) / Band-edge

Highest Channel (2 472 ㎒)

Frequency	Pol.	Reading	Ant. Factor	Amp. + Cable	DCF	Result	Limit	Margin
(㎒)	(V/H)	(dB(㎶))	(dB)	(dB)	(dB)	(dB(㎶/m))	(dB(㎶/m))	(dB)
Peak data								
2 483.54[1)]	V	74.60	27.70	-30.48	-	71.82	74.00	2.18
Average Data								
2 483.54[1)]	V	51.84	27.70	-30.48	0.16	49.22	54.00	4.78

Average data



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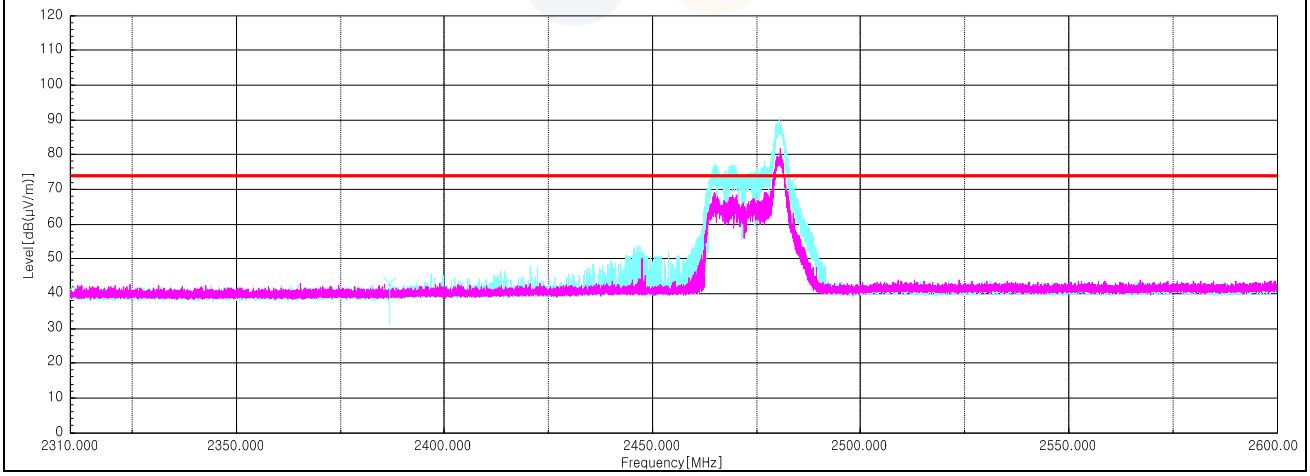
Horizontal/Vertical for Band-edge

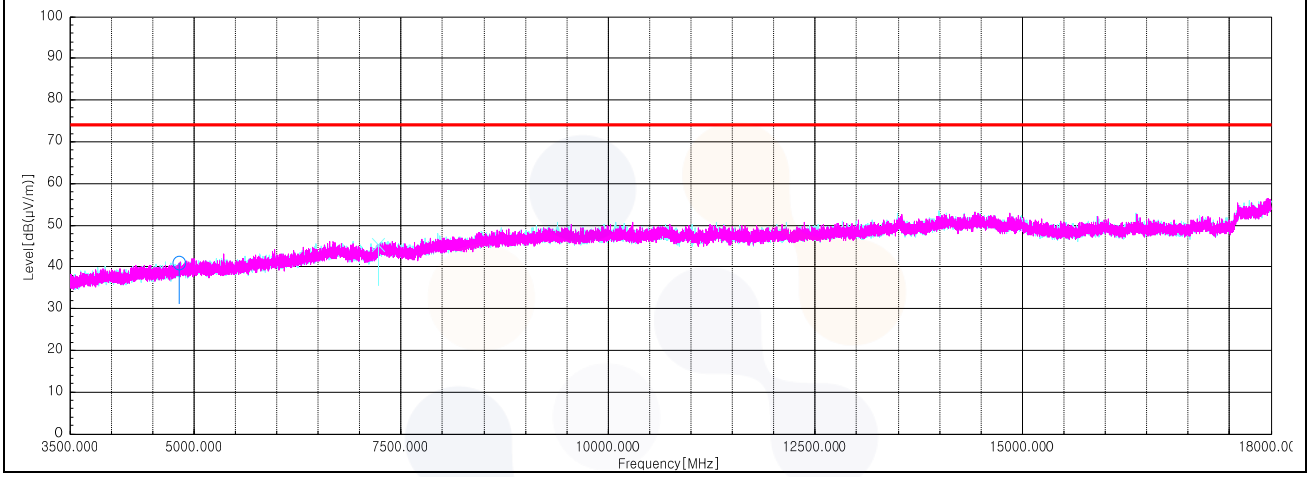


802.11ax HE20 RU mode MIMO (52T / RU offset 40) / Harmonic

Lowest Channel (2 412 ㎒)

Frequency	Pol.	Reading	Ant. Factor	Amp. + Cable	DCF	Result	Limit	Margin
(㎒)	(V/H)	(dB(㎶))	(dB)	(dB)	(dB)	(dB(㎶/m))	(dB(㎶/m))	(dB)
Peak data								
7 228.92	V	52.30	37.16	-44.29	-	45.17	74.00	28.83
Average Data								
No spurious emissions were detected within 20 ㏈ of the limit.								

Horizontal/Vertical for 3.5 ㎓ ~ 18 ㎓



8. Measurement equipment

Equipment Name	Manufacturer	Model No.	Serial No.	Next Cal. Date
Signal Generator	R&S	SMB100A	176206	24.01.19
Vector Signal Generator	R&S	SMBV100A	257566	24.07.04
Spectrum Analyzer	R&S	FSVA40	101575	24.06.19
Broadband PreAmplifier	SCHWARZBECK	BBV9718D	57	24.03.17
Low Noise Amplifier	TESTEK	TK-PA18H	220124-L	24.10.12
Horn Antenna	SCHWARZBECK	BBHA9120D	2763	24.10.18
High Pass Filter	Wainwright Instruments GmbH	WHKX12-2805-3000-18000-40SS	SN58	24.10.16
Controller	INNCO SYSTEMS	CO3000	1441/54370322/P	-
Antenna Mast	INNCO SYSTEMS	MA4640-XP-ET	-	-
Turn Device	INNCO SYSTEMS	DS1200-S-1t	-	-

End of test report