

TEST REPORT



CTK Co., Ltd.
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Report No.:
CTK-2020-00263
Page (1) / (43) Pages

1. Client

- Name : Samsung SDS Co., Ltd.
- Address : 125, Olympic-ro 35-gil, Songpa-gu, Seoul, Korea
- Date of Receipt : 2019-12-20

2. Manufacturer

- Name : SEONG JI SAI GON COMPANY LIMITED
- Address : No.2, Road 3A, Bien Hoa 2 IP, Long Binh Tan Ward, Bien Hoa City,
Dong Nai, VIETNAM

3. Use of Report : For FCC Certification

4. Test Sample / Model : Digital Doorlock / SHP-A30

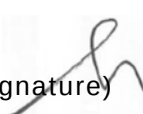
5. Date of Test : 2019-12-31 to 2020-01-14

6. Test Standard(method) used : FCC 47 CFR part 15 subpart C 15.247

7. Testing Environment : Temp.: (23 ± 1) °C, Humidity: (48 ± 5) % R.H.

8. Test Results : Compliance

The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This Test Report cannot be reproduced, except in full.

Affirmation	Tested by	Technical Manager
	Bong-seok Kim: (Signature) 	Young-taek Lee: (Signature) 

2020-01-14

Republic of KOREA **CTK Co., Ltd.**

 CTK Co., Ltd. The Prime Leader of Global Regulatory Certification	CTK Co., Ltd. (Ho-dong), 113, Yejik-ro, Cheoin-gu, Yongin-si, Gyeonggi-do, Korea Tel: +82-31-339-9970 Fax: +82-31-624-9501	Report No.: CTK-2020-00263 Page (2) / (43)Pages	
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REPORT REVISION HISTORY

Date	Revision	Page No
2020-01-14	Issued (CTK-2020-00263)	all

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1. General Product Description

1.1 Client Information

Company	Samsung SDS Co., Ltd.
Contact Point	125, Olympic-ro 35-gil, Songpa-gu, Seoul, Korea
Contact Person	Name : Yu, Seungkwan E-mail : seungkwan.yu@samsung.com Tel : +82-2-6155-6381

1.2 Product Information

FCC ID	P4YSHP-A30
Certification Number ISED	Digital Doorlock
Variant Model name	-
Operating Frequency	2 412 MHz – 2 462 MHz
RF Output Power	802.11b : 17.44 dBm (55.463 mW) 802.11g : 17.63 dBm (57.943 mW) 802.11n-HT20 : 15.99 dBm (39.719 mW)
Antenna type	PCB Antenna
Antenna gain	1.408 dBi
Number of channels	11
Type of Modulation	802.11b : DSSS 802.11g/n : OFDM
Power Source	DC 6 V (AA Battery * 4)
RF Power setting in Test SW	Initial value

1.3 Peripheral Devices

- For Conducted Measurement

Device	Manufacturer	Model No.	Serial No.
Notebook Computer	HP	HP Probook 650 G1	5CG5114K13
AC Adapter	HP	PPP012D-S	677777-003

- For Radiated Measurement

Device	Manufacturer	Model No.	Serial No.
WIRELESS CONNECTIVITY TESTER	R&S	CMW270	101366
Notebook Computer	HP	HP Probook 650 G1	5CG5114K13
AC Adapter	HP	PPP012D-S	677777-003

2.0 Facility and Accreditations

2.1 Test Facility

The measurement facility is located at (Ho-dong), 113, Yejik-ro, Cheoin-gu, Yongin-si, Gyeonggi-do, Korea.

2.2 Laboratory Accreditations and Listings

Country	Agency	Registration Number
USA	FCC	805871
CANADA	ISED	8737A-2
KOREA	NRRA	KR0025

2.3 Calibration Details of Equipment Used for Measurement

Test equipment and test accessories are calibrated on regular basis. The maximum time between calibrations is one year or what is recommended by the manufacturer, whichever is less. All test equipment calibrations are traceable to the Korea Research Institute of Standards and Science (KRISS), therefore, all test data recorded in this report is traceable to KRISS.

3.0 Test Specifications

3.1 Standards

Section in FCC	Requirement(s)	Status (Note 1)	Test Condition
15.247(a)	6 dB Bandwidth	C	Conducted
15.247(e)	Transmitter power spectral density	C	
15.247(b)	Maximum peak conducted output power	C	
15.247(d)	Unwanted emission	C	
15.209	Transmitter emission	C	Radiated
15.207(a)	AC Conducted Emission	NA(Note 3)	Line Conducted
<u>Note 1:</u> C=Complies NC=Not Complies NT=Not Tested NA=Not Applicable			
<u>Note 2:</u> The data in this test report are traceable to the national or international standards.			
<u>Note 3:</u> The equipment is operated on battery power only.			
<u>Note 4:</u> The sample was tested according to the following specification: FCC Part 15.247, ANSI C63.10-2013			
<u>Note 5:</u> The tests were performed according to the method of measurements prescribed in KDB No.558074.			

3.2 Mode of operation during the test

The UUT is operated in a manner representative of the typical of the equipments.
During at testing, system components were manipulated within the confines of typical usage to maximize each emission. The results are only attached worst cases.

Test mode & Worst case

Mode	Worst case(Data rate)
802.11b	1 Mbps
802.11g	6 Mbps
802.11n-HT20	MCS 0

Test Frequency & Bandwidth

Bandwidth	Lowest channel	Middle channel	Highest channel
20 MHz	2 412 MHz	2 437 MHz	2 462 MHz

Duty cycle

Mode	Duty cycle (%)
802.11b	97.0
802.11g	95.0
802.11n-HT20	95.3

3.3 Maximum Measurement Uncertainty

The value of the measurement uncertainty for the measurement of each parameter.
Coverage factor $k = 2$, Confidence levels of 95 %

Description	Uncertainty
Conducted RF Output Power	± 1.5 dB
Power Spectral Density	± 1.5 dB
Occupied Bandwidth	± 0.1 MHz
Unwanted Emission(conducted)	± 3.0 dB
Radiated Emissions ($f \leq 1$ GHz)	± 5.0 dB
Radiated Emissions ($f > 1$ GHz)	± 5.0 dB

4.0 Technical Characteristic Test

4.1 6dB Bandwidth

Test Procedures (ANSI C63.10-2013 6.9.2)

Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

Test Procedures (ANSI C63.10-2013 6.9.3)

The occupied bandwidth is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers are each equal to 0.5% of the total mean power of the given emission.

Use the 99% power bandwidth function of the instrument and report the measured bandwidth.

Test Settings :

Center frequency = the highest, middle and the lowest channels

- a) RBW = 100 kHz (6dB Bandwidth)
- b) RBW = 1% to 5% of the OBW
(99 % Bandwidth)
- c) VBW $\geq 3 \times$ RBW
- d) Detector = peak
- e) Trace mode = Max hold
- f) Sweep = auto couple
- g) Allow trace to fully stabilize
- h) Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

Limit : 6dB Bandwidth

6 dB Bandwidth > 500kHz

Limit : 99 % Bandwidth

N/A

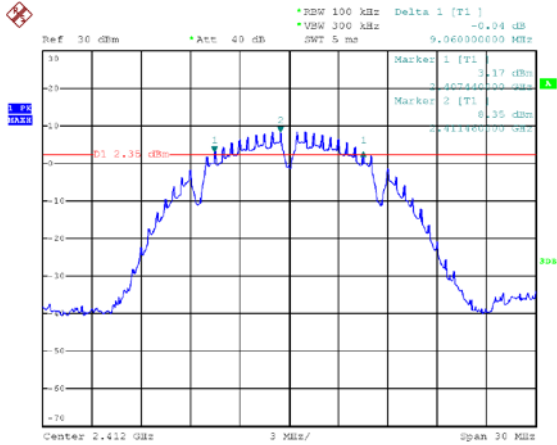
Test Data:

Mode	Channel	Frequency [MHz]	6 dB Bandwidth [MHz]	Result
802.11b	Low	2 412	9.06	Complies
	Middle	2 437	9.12	
	High	2 462	9.54	
802.11g	Low	2 412	15.60	
	Middle	2 437	15.54	
	High	2 462	15.54	
802.11n -HT20	Low	2 412	16.26	
	Middle	2 437	16.32	
	High	2 462	16.32	

See next pages for actual measured spectrum plots.

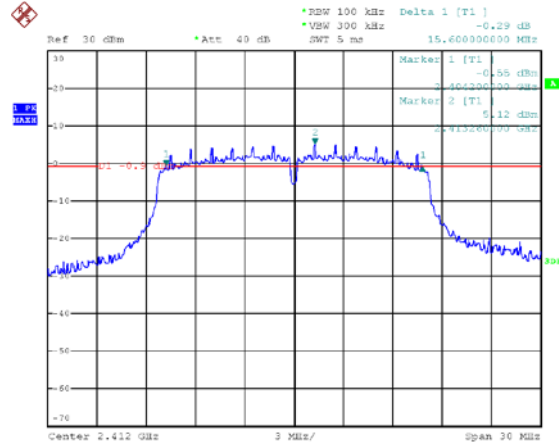
6 dB Bandwidth

Test Mode : 802.11b Low channel



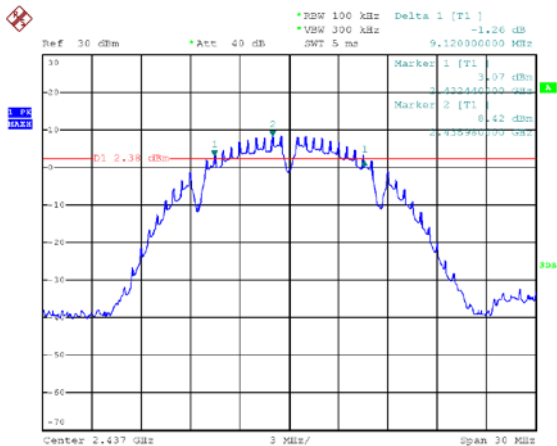
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Test Mode : 802.11g Low channel



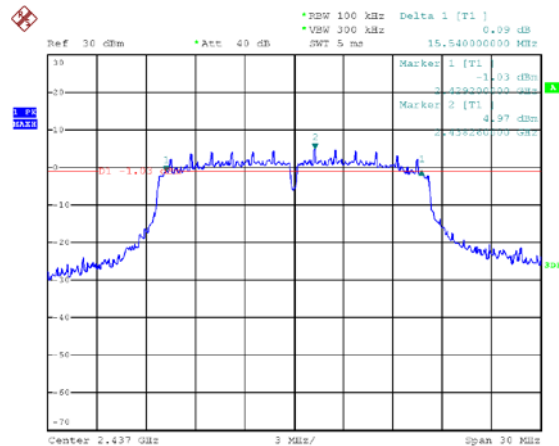
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Middle channel



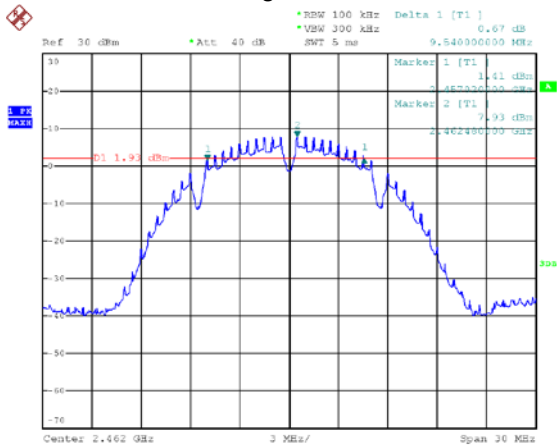
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Middle channel



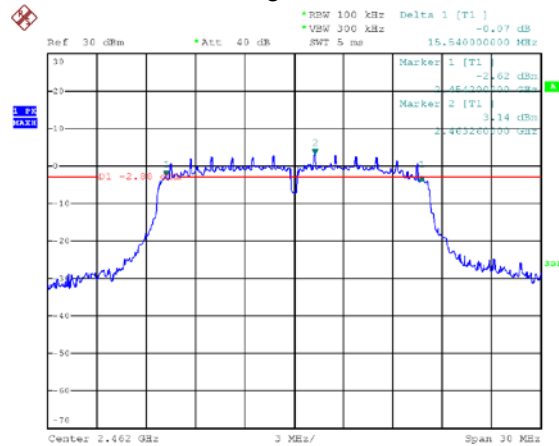
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High channel



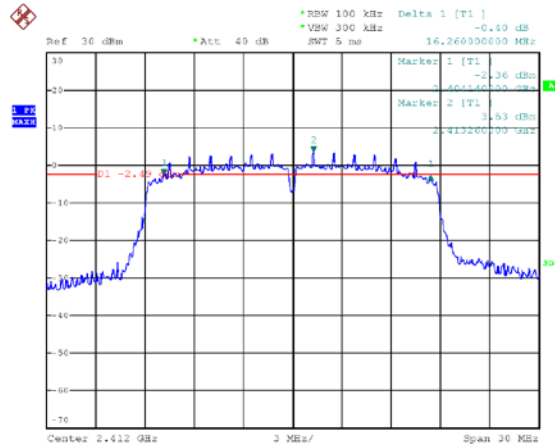
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High channel



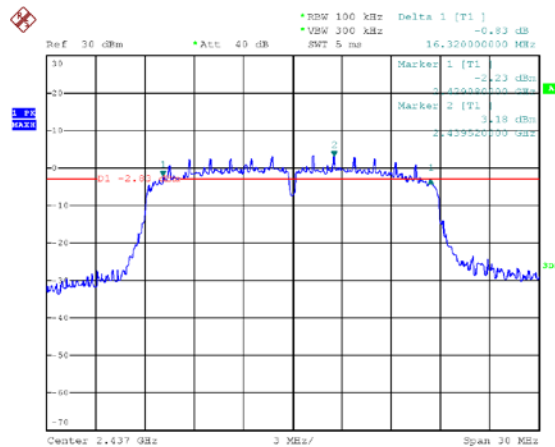
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Test Mode : 802.11n-HT20
Low channel



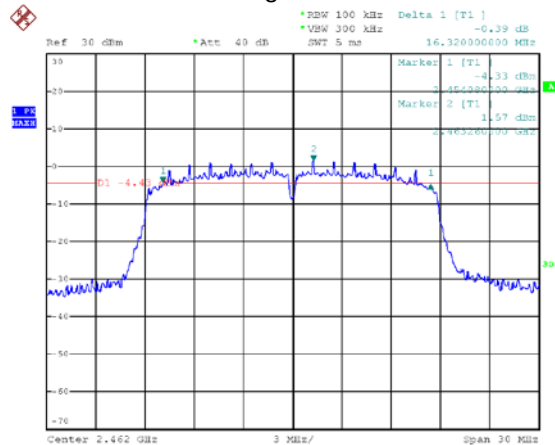
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Middle channel



Date: 6.JAN.2020 13:56:50

High channel

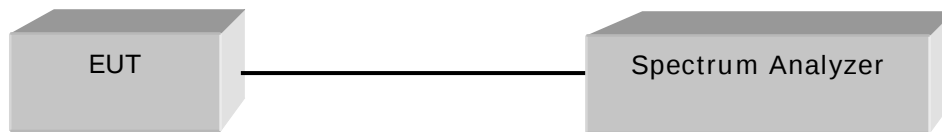


Date: 6.JAN.2020 14:01:47

4.2 Maximum peak Conducted Output Power

Test Procedures(ANSI C63.10-2013 11.9.2.2.2)

The transmitter output is connected to a spectrum analyzer and the analyzer's internal channel power integration function is used to integrate the power over a bandwidth greater than or equal to the 99% bandwidth.



Test Settings:

Center frequency = the highest, middle and the lowest channels

- a) span $\geq 1.5 \times \text{OBW}$
- b) RBW = 1% to 5% of the OBW, not to exceed 1 MHz
- c) VBW $\geq 3 \times \text{RBW}$
- d) Sweep point $\geq (2 \times \text{SPAN} / \text{RBW})$
- e) Detector = RMS
- f) Sweep time = auto
- g) Compute power by integrating the spectrum across the OBW of the signal using the instrument's band power measurement function, with band limits set equal to the OBW band edges.

Limit

Maximum Output Power < 1 W (30 dBm)

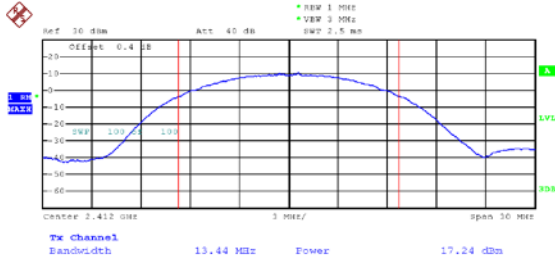
Test Data

Mode	Channel	Frequency [MHz]	Measurement data [dBm]	Limit [dBm]	Result
802.11b	Low	2 412	17.24	30	Complies
	Middle	2 437	17.44		
	High	2 462	16.77		
802.11g	Low	2 412	17.63		
	Middle	2 437	17.51		
	High	2 462	15.79		
802.11n-HT20	Low	2 412	15.99		
	Middle	2 437	15.91		
	High	2 462	14.11		

See next pages for actual measured spectrum plots.

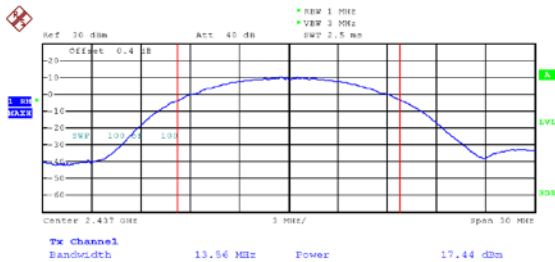
Output Power

Test Mode : 802.11b Low channel



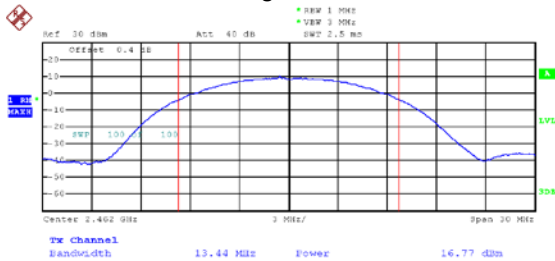
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Middle channel



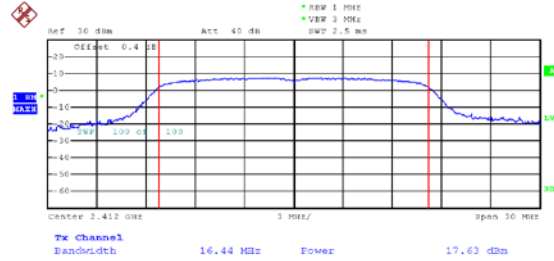
Date: 6.JAN.2020 13:28:37

High channel



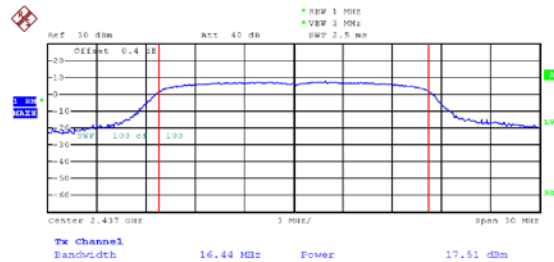
Date: 6.JAN.2020 13:33:13

Test Mode : 802.11g Low channel



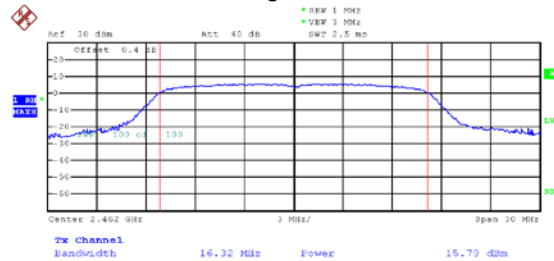
Date: 6.JAN.2020 13:39:56

Middle channel



Date: 6.JAN.2020 13:43:37

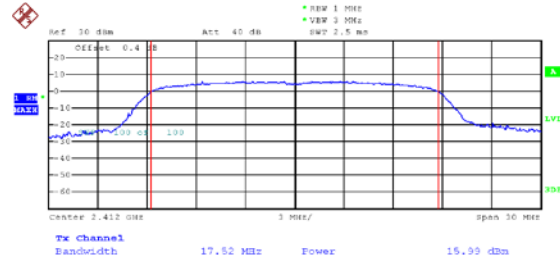
High channel



Date: 6.JAN.2020 13:47:58

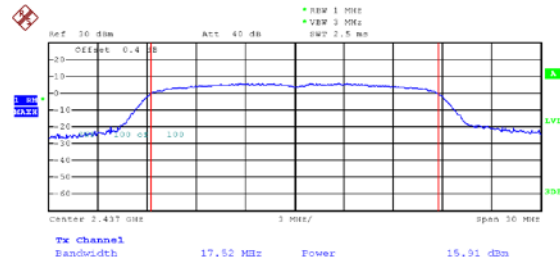
Test Mode : 802.11n-HT20

Low channel



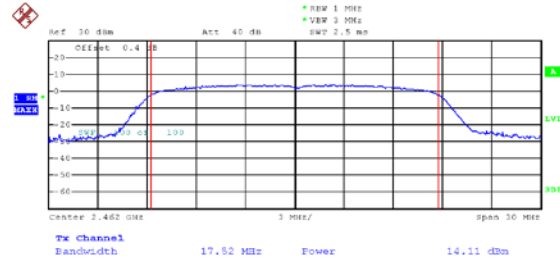
Date: 6.JAN.2020 13:54:12

Middle channel



Date: 6.JAN.2020 13:57:34

High channel



Date: 6.JAN.2020 14:02:22

4.3 Power Spectral Density

Test Procedures(ANSI C63.10-2013 11.10.2)

This procedure shall be used if maximum peak conducted output power was used to demonstrate compliance.

Test Settings:

Center frequency = the highest, middle and the lowest channels

- a) RBW : $3 \text{ kHz} \leq \text{RBW} \leq 100 \text{ kHz}$
- b) VBW $\geq 3 \times \text{RBW}$
- c) span $\geq 1.5 \times \text{DTS bandwidth}$
- d) Sweep time = auto couple
- e) Detector = peak
- f) Trace mode= max hold
- g) Allow trace to fully stabilize
- h) Use the peak marker function to determine the maximum amplitude level within the RBW.

Limit :

Power Spectral Density < 8 dBm @ 3 kHz BW

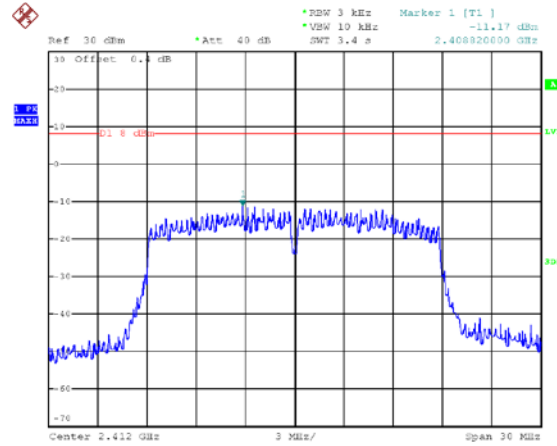
Test Data

Mode	Channel	Frequency [MHz]	Measurement data [dBm]	Limit [dBm]	Result
802.11b	Low	2 412	-6.31	8	Complies
	Middle	2 437	-6.05		
	High	2 462	-2.34		
802.11g	Low	2 412	-9.15		
	Middle	2 437	-8.78		
	High	2 462	-11.00		
802.11n -HT20	Low	2 412	-11.17		
	Middle	2 437	-11.41		
	High	2 462	-14.15		

See next pages for actual measured spectrum plots.

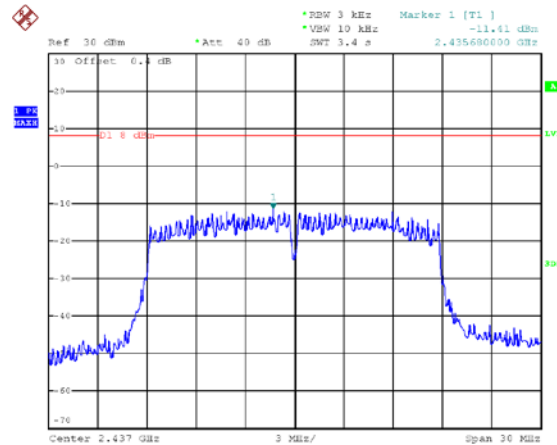
Test Mode : 802.11n-HT20

Low channel



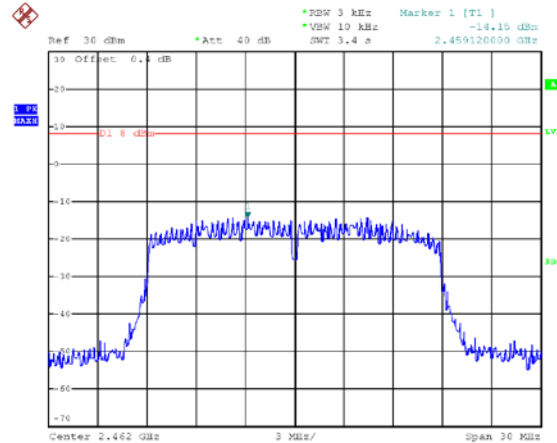
Date: 6.JAN.2020 13:52:35

Middle channel



Date: 6.JAN.2020 13:56:11

High channel



Date: 6.JAN.2020 13:59:19

4.4 Band Edge & Conducted Spurious emission

Test Procedures(ANSI C63.10-2013 11.11.3)

The Unwanted emission from the EUT were measured according to the dictates PKPSD measurement procedure in section 11.11 of ANSI C63.10-2013.

In any 100 kHz 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 dB below that in the 100 kHz 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(4), the attenuation required shall be 30 dB instead of 20 dB.

Test Settings:

Center frequency = the highest, middle and the lowest channels

- a) RBW = 100 kHz
- b) VBW $\geq 3 \times$ RBW
- c) Detector = peak
- d) Sweep time = auto couple
- e) Trace mode= max hold
- f) Allow trace to fully stabilize
- g) Use the peak marker function to determine the maximum amplitude level.

Limit :

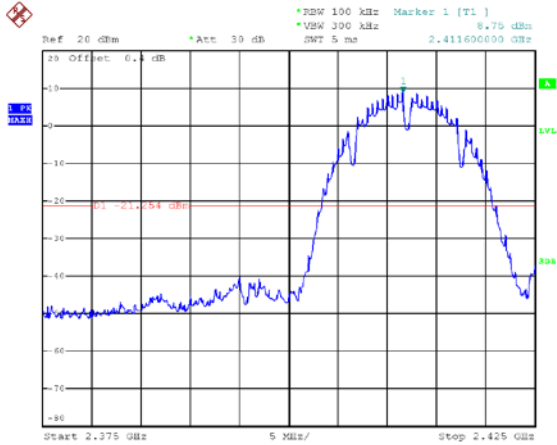
Emission level < 30 dBc

Test Data: Complies

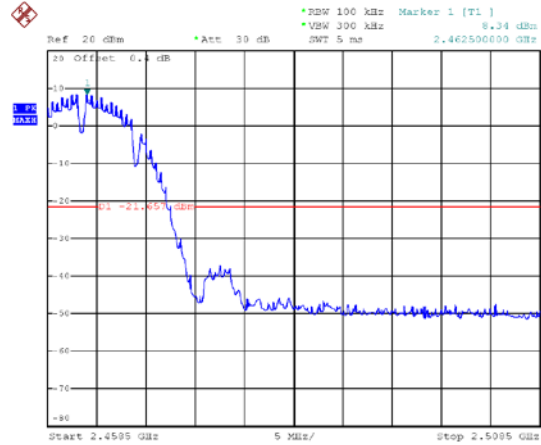
- All conducted emission in any 100 kHz bandwidth outside of the spread spectrum band was at least 30dB lower than the highest in-band spectral density. Therefore the applying equipment meets the requirement.

See next pages for actual measured spectrum plots.

**Band-edge
Test Mode : 802.11b**

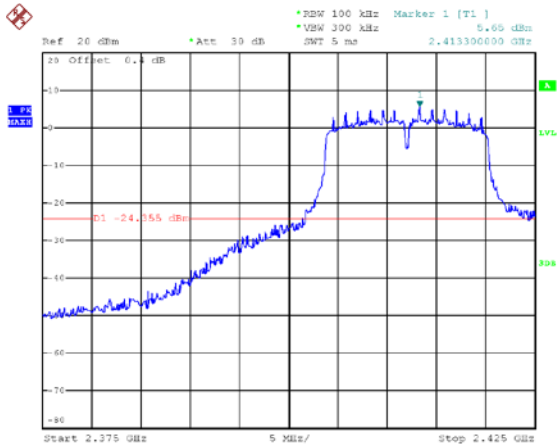


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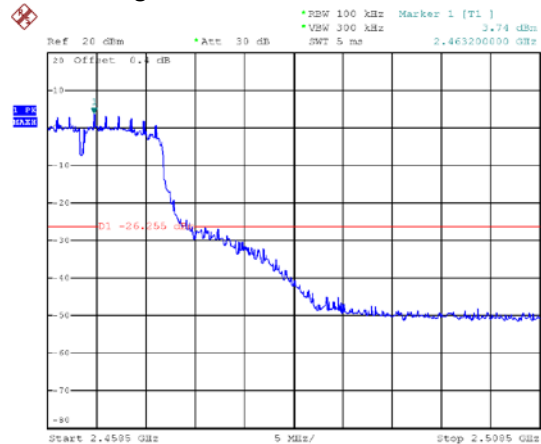


Date: 6.JAN.2020 13:34:01

Test Mode : 802.11g

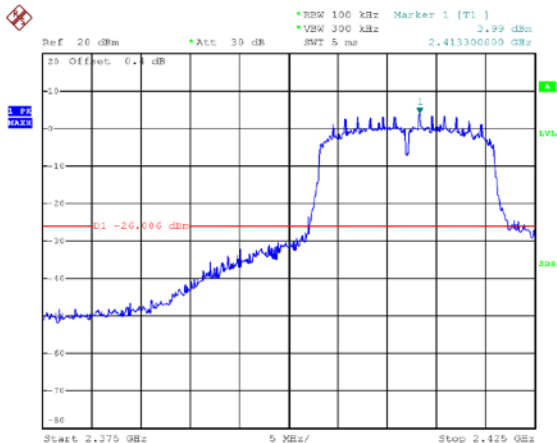


Date: 6.JAN.2020 13:40:45

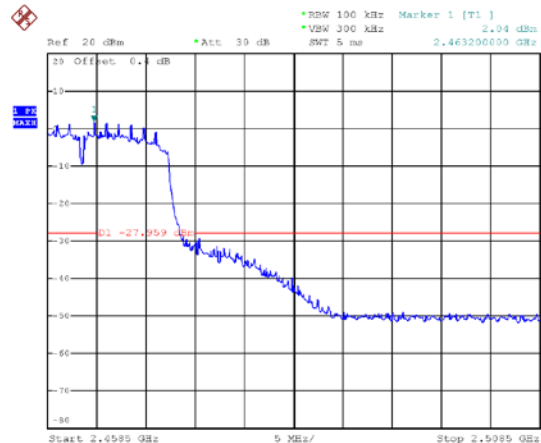


Date: 6.JAN.2020 13:40:47

Test Mode : 802.11n-HT20

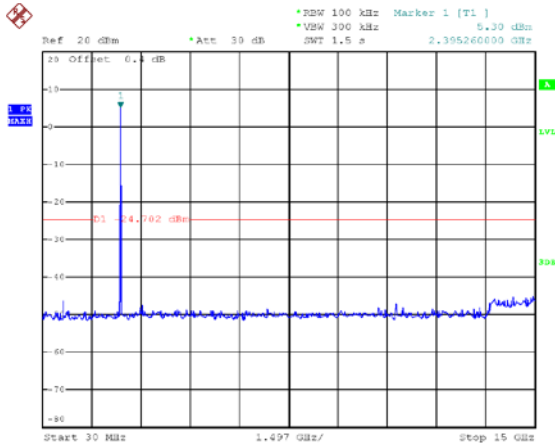


Date: 6.JAN.2020 13:55:00

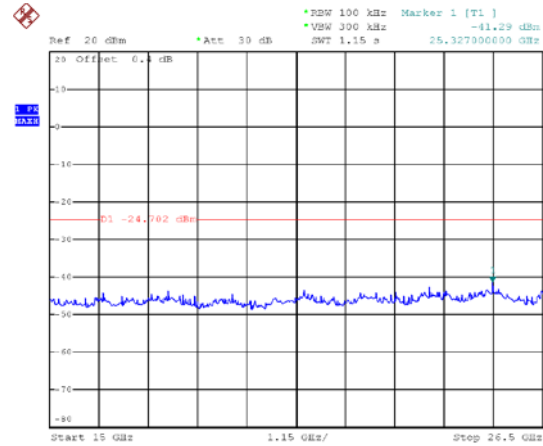


Date: 6.JAN.2020 14:03:11

Spurious Test Mode : 802.11b Low channel

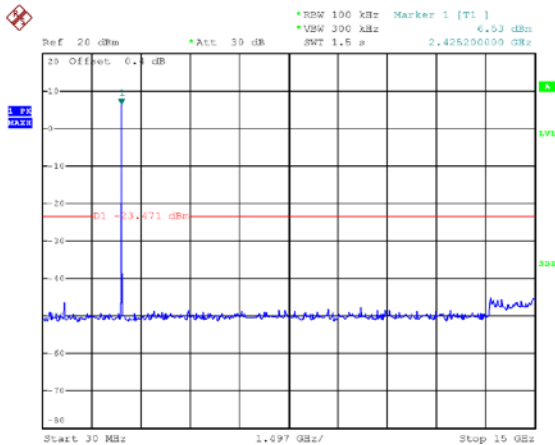


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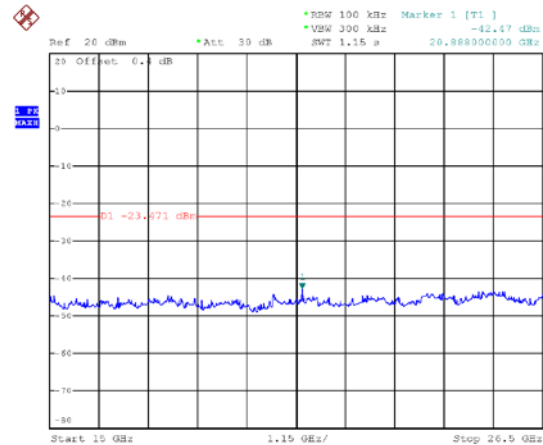


Date: 6.JAN.2020 13:18:30

Middle channel

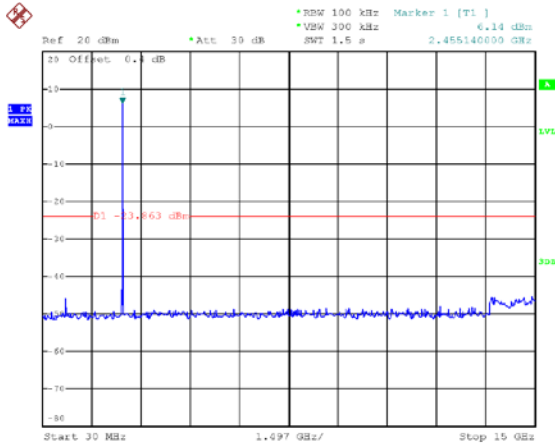


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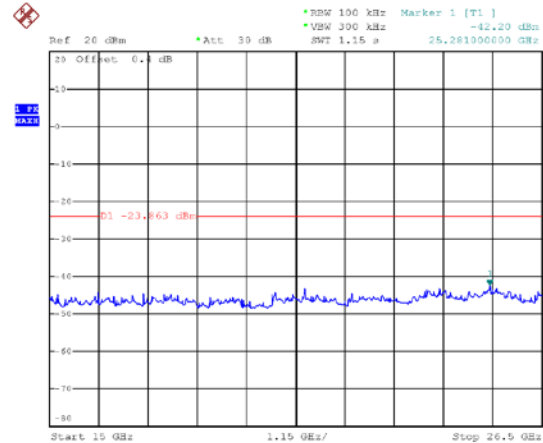


Date: 6.JAN.2020 13:29:09

High channel

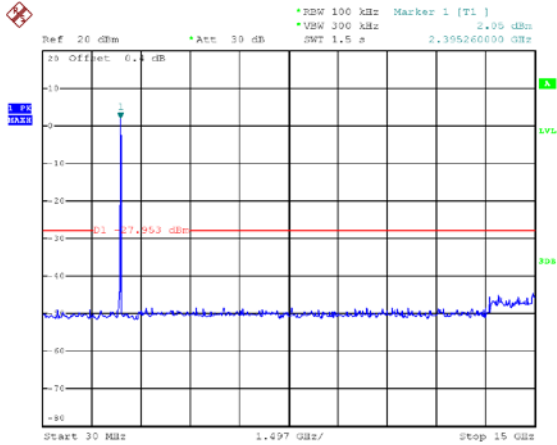


Date: 6.JAN.2020 13:33:30

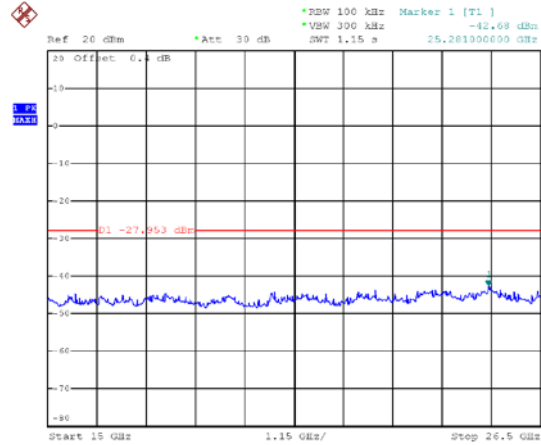


Date: 6.JAN.2020 13:33:45

Test Mode : 802.11g
Low channel

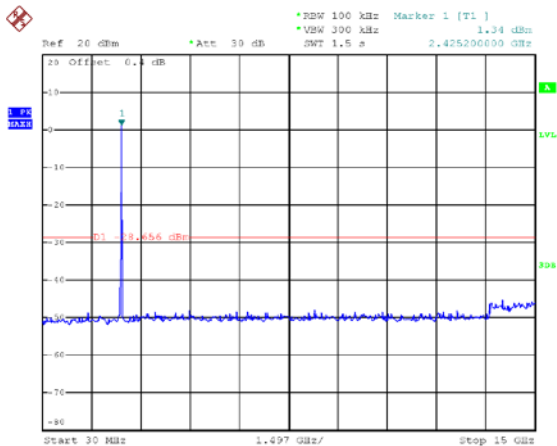


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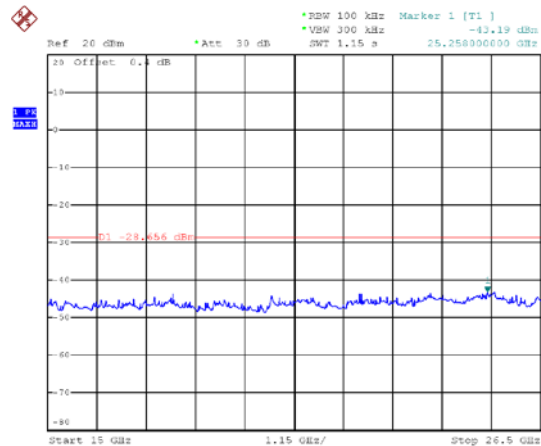


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Middle channel

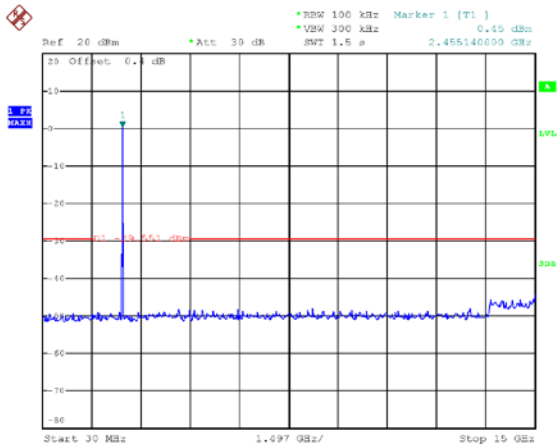


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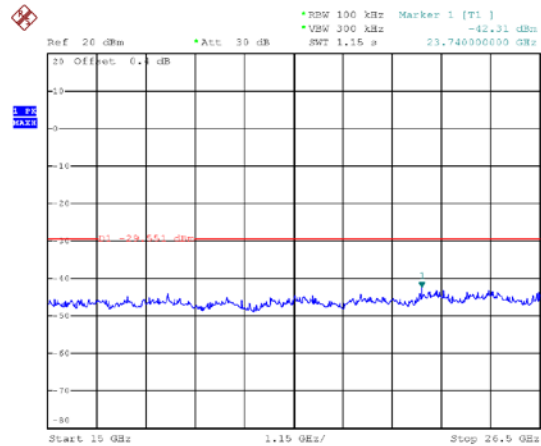


Date: 6.JAN.2020 13:44:09

High channel

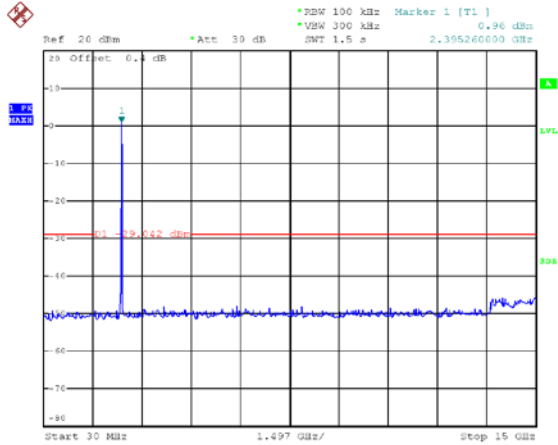


Date: 6.JAN.2020 13:48:15

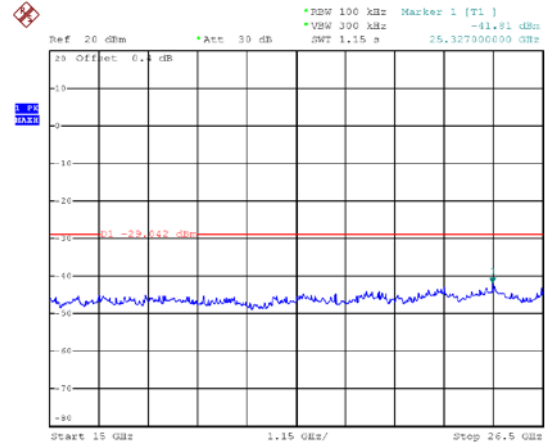


Date: 6.JAN.2020 13:48:30

Test Mode : 802.11n-HT20
Low channel

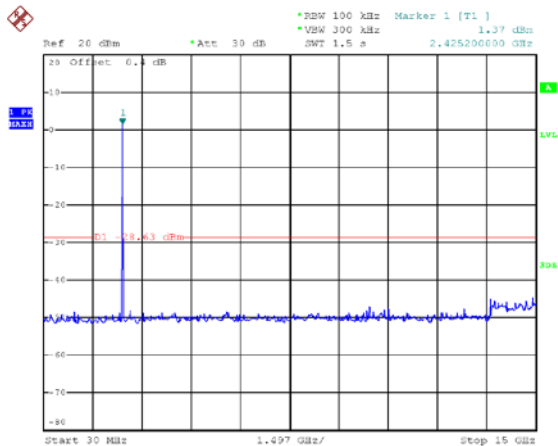


Date: 6.JAN.2020 13:54:29

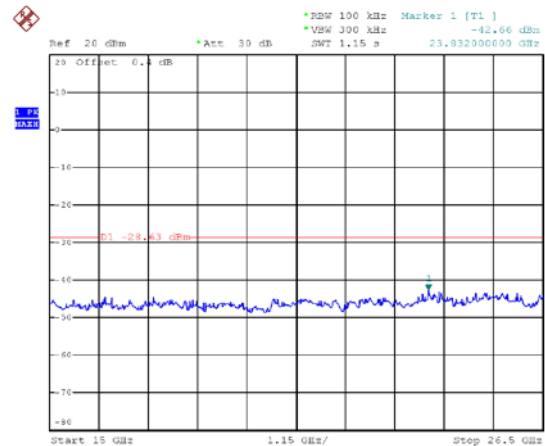


Date: 6.JAN.2020 13:54:43

Middle channel

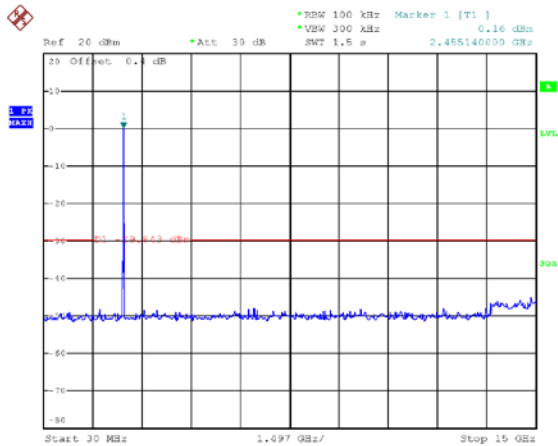


Date: 6.JAN.2020 13:57:51

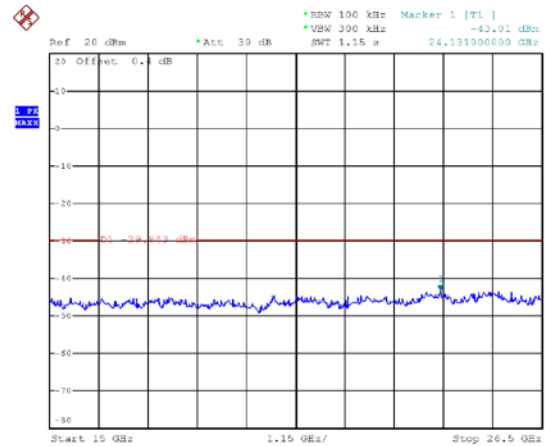


Date: 6.JAN.2020 13:58:05

High channel



Date: 6.JAN.2020 14:02:39



Date: 6.JAN.2020 14:02:54

 CTK Co., Ltd. The Prime Leader of Global Regulatory Certification	CTK Co., Ltd. (Ho-dong), 113, Yejik-ro, Cheoin-gu, Yongin-si, Gyeonggi-do, Korea Tel: +82-31-339-9970 Fax: +82-31-624-9501	Report No.: CTK-2020-00263 Page (23) / (43)Pages	
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4.5 Radiated Emissions

Test Location

- ☒ 10 m SAC (test distance : ☐ 10 m, ☒ 3 m)
☒ 3 m SAC (test distance : 3 m)

Test Procedures

- 1) In the frequency range of 9 kHz to 30 MHz, magnetic field is measured with Loop Antenna. The center of the Loop Test Antenna is 1m above the ground. During the measurement the Loop Test Antenna rotates about its vertical axis for maximum response at each azimuth about the EUT.
- 2) In the frequency range above 30 MHz, Bi-Log Test Antenna(30 MHz to 1 GHz) and Horn Test Antenna(above 1 GHz) are used. Test Antenna is 3m away from the EUT. Test Antenna height is carried from 1m to 4m above the ground to determine the maximum value of the field strength. The emissions levels at both horizontal and vertical polarizations should be tested.

Instrument Settings

Frequency Range = 9 kHz ~ 26.5 GHz (2.4 GHz 10th harmonic)

- a) RBW = 1 MHz for $f \geq 1$ GHz, 100 kHz for $f < 1$ GHz, 9 kHz for $f < 30$ MHz
- b) VBW $\geq$ RBW
- c) Sweep time = auto couple

Limit :

FCC Part 15 § 15.205 (a) Except as shown in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

Table 1. Restricted Frequency Bands*

MHz	MHz	MHz	MHz	MHz	GHz
0.09-0.11	8.37626-8.38675	73-74.6	399.9-410	2690-2900	10.6-12.7
¹ 0.495-0.505	8.41425-8.41475	74.8-75.2	608-614	3260-3267	13.25-13.4
2.1735-2.1905	12.29-12.293	108-121.94	960-1240	3332-3339	14.47-14.5
4.125-4.128	12.51975-12.52025	123-138	1300-1427	3345.8-3358	15.35-16.2
4.17725-4.17775	12.57675-12.57725	149.9-150.05	1435-1626.5	3600-4400	17.7-21.4
4.20725-4.20775	13.36-13.41	156.52475-156.52525	1645.5-1646.5	4500-5150	22.01-23.12
6.215-6.218	16.42-16.423	156.7-156.9	1660-1710	5350-5460	23.6-24
6.26775-6.26825	16.69475-16.69525	162.0125-167.17	1718.8-1722.2	7250-7750	31.2-31.8
6.31175-6.31225	16.80425-16.80475	167.72-173.2	2200-2300	8025-8500	36.43-36.5
8.291-8.294	25.5-25.67	240-285	2310-2390	9000-9200	² Above 38.6
8.362-8.366	37.5-38.25	322-335.4	2483.5-2500	9300-9500	

¹ Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz.

² Above 38.6

§ 15.205 (b) Except as provided in paragraphs (d) and (e), 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 1000 MHz, compliance with the limits in Section 15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1000 MHz, 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.

*Certain frequency bands listed in Table 6 and in band above 38.6 GHz are designated for licence-exempt applications. These frequency bands and the requirements that apply to the devices are set out in the 200- and 300-series of RSSs, such as RSS-210 and RSS-310, which contain the requirements that apply to licence-exempt radio apparatus.

FCC Part 15 § 15.209 (a) Except as provided elsewhere in this Subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table :

Frequency(MHz)	Field Strength uV/m	Field Strength dBuV/m	Deasurement Distance (meters)
0.009-0.490	2400/F(kHz)	-	300
0.490-1.705	24000/F(kHz)	-	30
1.705-30	30	49.5	30
30-88	100 **	40	3
88-216	150 **	43.5	3
216-960	200 **	46	3
Above 960	500	54	3

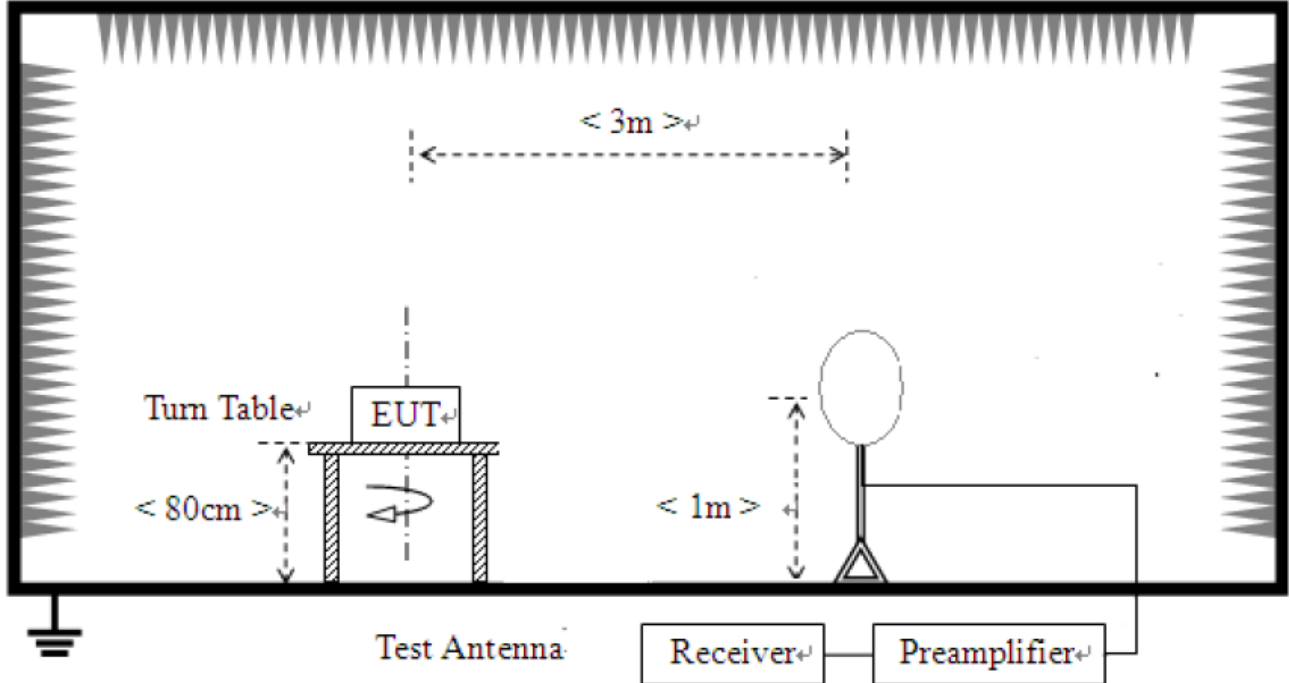
** Except as provided in 15.209(g).fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72MHz, 76-88MHz, 174-216MHz, 470-806MHz. However, operation within these frequency bands is permitted under other sections of this Part, e.g.15.231 and 15.241.

Note :

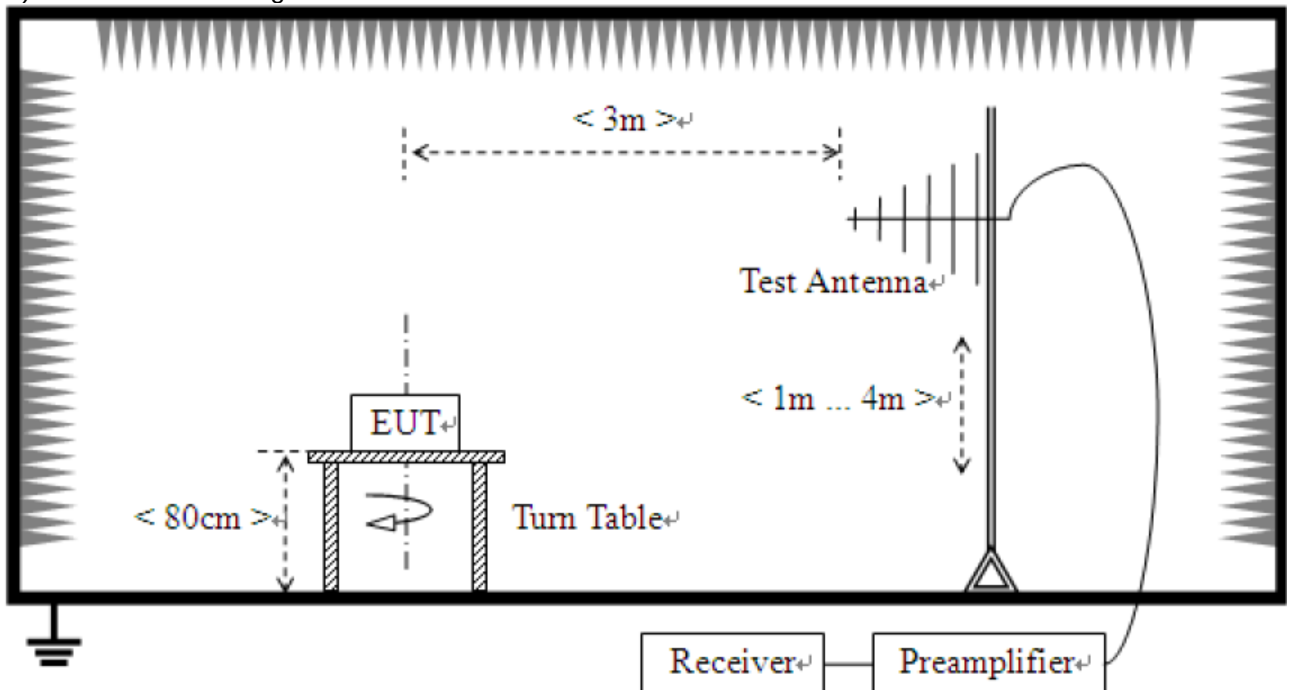
- 1) For above 1 GHz, the emission limit in this paragraph is based on measurement instrumentation employing an average detector, measurement using instrumentation with a peak detector function, corresponding to 20 dB above the maximum permitted average limit.
- 2) For above 1 GHz, limit field strength of harmonics : 54 dBuV/m@3m (AV) and 74 dBuV/m@3m (PK)
- 3) For measurement above 1GHz, the resolution bandwidth is set to 1 MHz and video bandwidth is set to 3 MHz for peak measurement.

Test Setup:

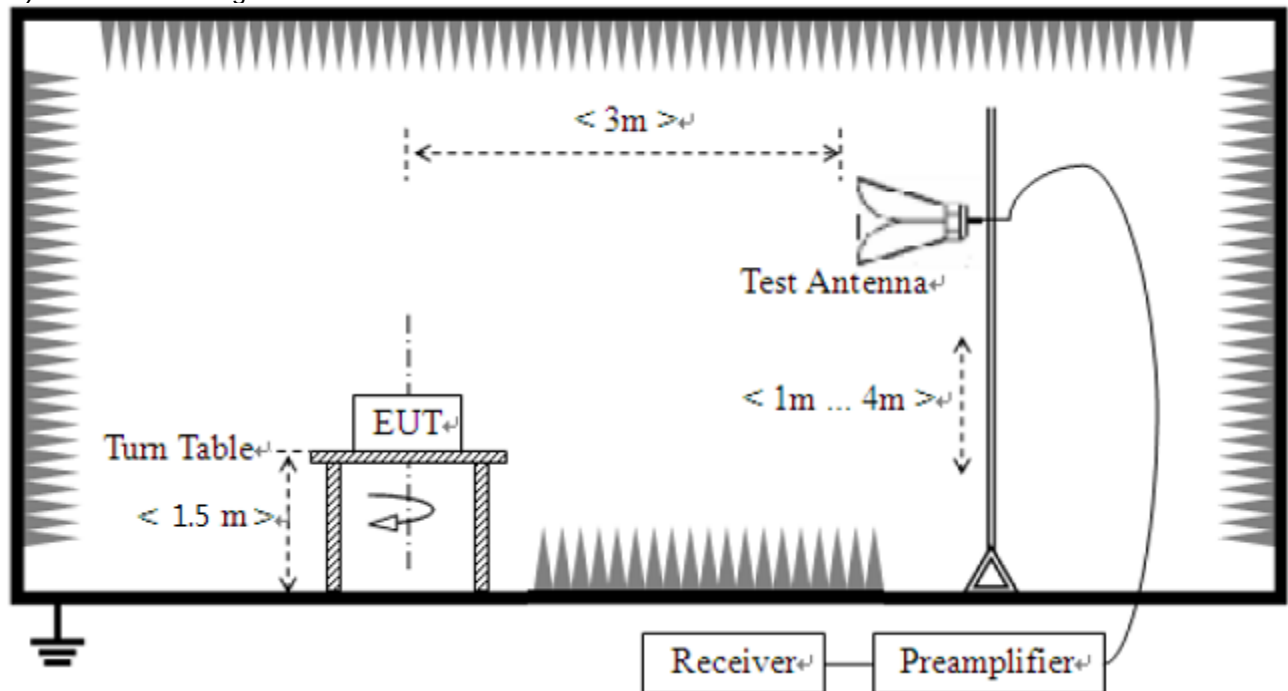
- 1) For field strength of emissions from 9 kHz to 30 MHz



- 2) For field strength of emissions from 30 MHz to 1 GHz



3) For field strength of emissions above 1 GHz

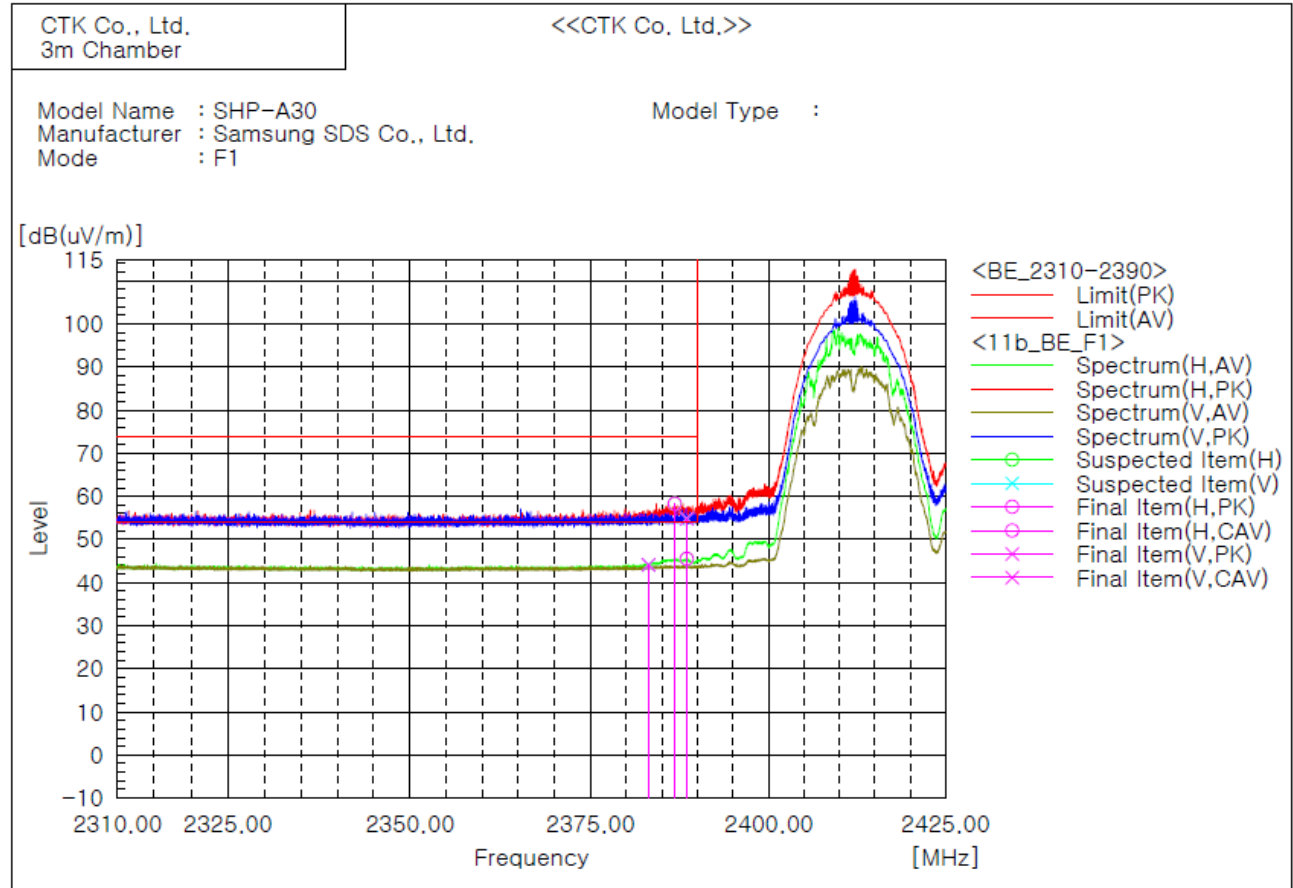


Test results

1) Restricted Frequency Bands

1. 2 310 MHz to 2 390 MHz

Test mode : 802.11b, Low channel



Final Result

No.	Frequency [MHz]	(P)	Reading PK [dB(uV)]	Reading CAV [dB(uV)]	c.f [dB(1/m)]	Result PK [dB(uV/m)]	Result CAV [dB(uV/m)]	Limit PK [dB(uV/m)]	Limit AV [dB(uV/m)]	Margin PK [dB]	Margin CAV [dB]	Height [cm]	Angle [deg]
1	2386.806	H	53.4		4.9	58.3		74.0	54.0	15.7		236.0	207.8
2	2388.488	V	49.9		4.9	54.8		74.0	54.0	19.2		224.5	244.8
3	2388.488	H		40.6	4.9		45.5	74.0	54.0		8.5	236.0	126.3
4	2383.126	V		39.2	4.9		44.1	74.0	54.0		9.9	224.5	0.0

Remarks

1. The Unwanted emission was measured in the following position:
EUT stand-up position(X axis).
2. Result = Reading + c.f(correction factor)
3. Correction factor = Antenna factor + Cable loss - Amp Gain

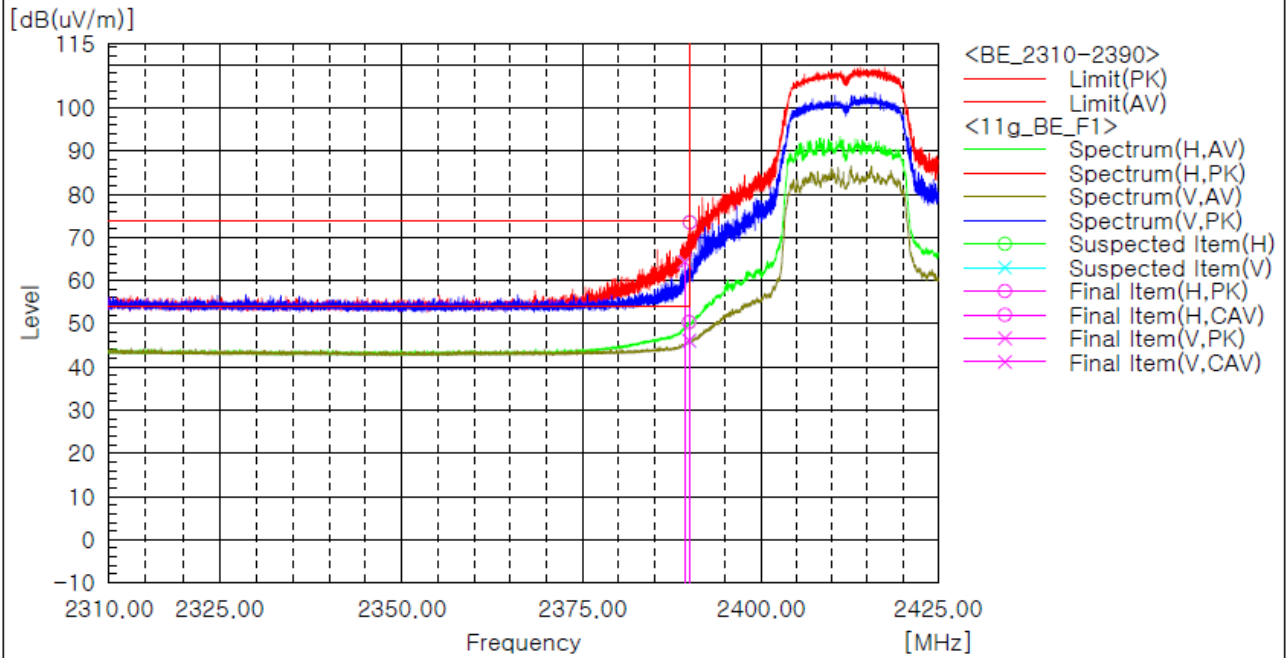
Test mode : 802.11g, Low channel

CTK Co., Ltd.
3m Chamber

<<CTK Co. Ltd.>>

Model Name : SHP-A30
Manufacturer : Samsung SDS Co., Ltd.
Mode : F1

Model Type :



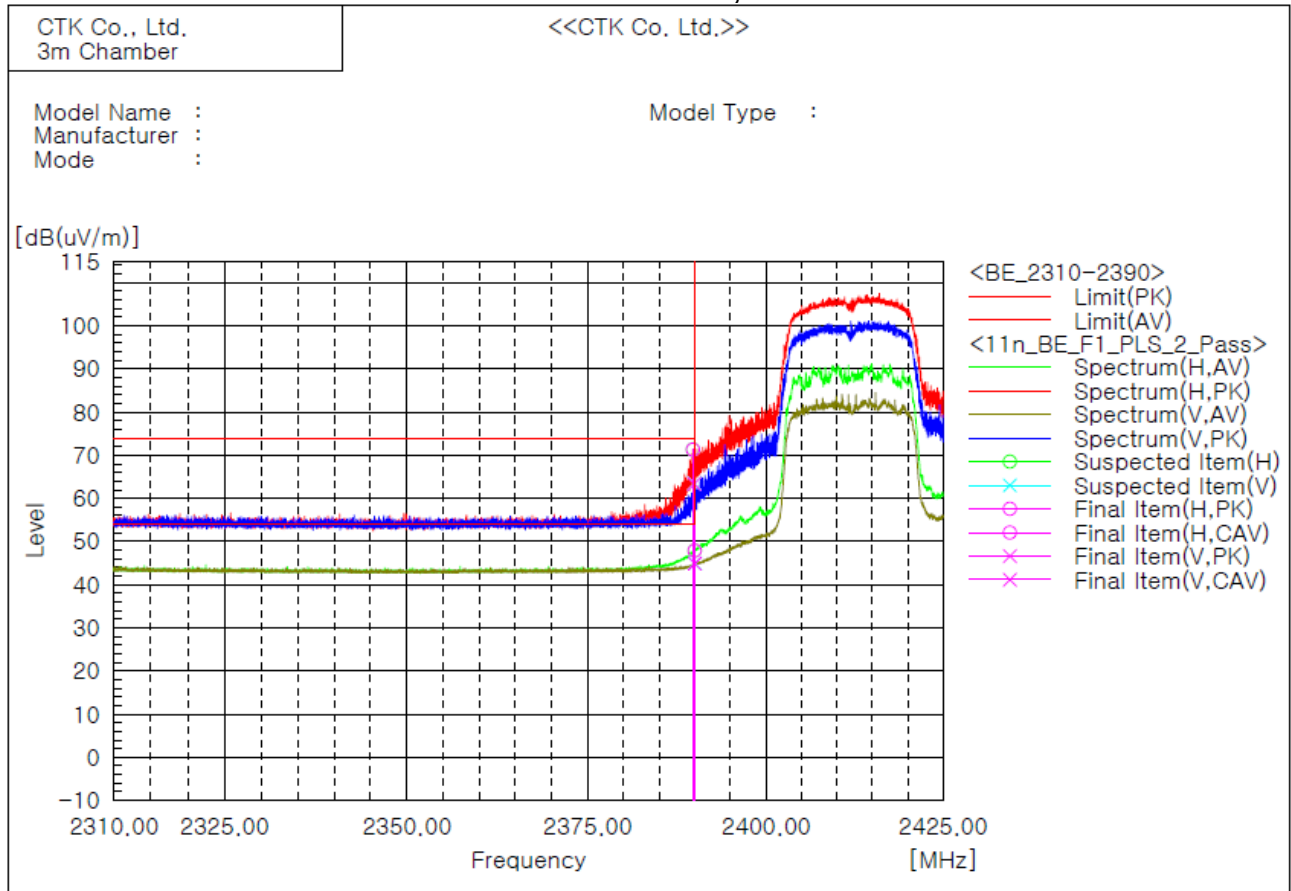
Final Result

No.	Frequency [MHz]	(P)	Reading PK [dB(uV)]	Reading CAV [dB(uV)]	c.f [dB(1/m)]	Result PK [dB(uV/m)]	Result CAV [dB(uV/m)]	Limit PK [dB(uV/m)]	Limit AV [dB(uV/m)]	Margin PK [dB]	Margin CAV [dB]	Height [cm]	Angle [deg]
1	2389.997	H	68.5		5.0	73.5		74.0	54.0	0.5		355.0	185.2
2	2389.307	V	59.4		4.9	64.3		74.0	54.0	9.7		100.0	257.5
3	2389.882	H		45.4	5.0		50.4	74.0	54.0		3.6	100.0	277.3
4	2389.896	V		41.1	5.0		46.1	74.0	54.0		7.9	100.0	0.0

Remarks

1. The Unwanted emission was measured in the following position:
EUT stand-up position(X axis).
2. Result = Reading + c.f(correction factor)
3. Correction factor = Antenna factor + Cable loss - Amp Gain

Test mode : 802.11n-HT20, Low channel



Final Result

No.	Frequency [MHz]	(P)	Reading PK [dB(uV)]	Reading CAV [dB(uV)]	c.f [dB(1/m)]	Result PK [dB(uV/m)]	Result CAV [dB(uV/m)]	Limit PK [dB(uV/m)]	Limit AV [dB(uV/m)]	Margin PK [dB]	Margin CAV [dB]	Height [cm]	Angle [deg]
1	2389.738	H	66.3		5.0	71.3		74.0	54.0	2.7		234.7	193.4
2	2389.925	V	58.4		5.0	63.4		74.0	54.0	10.6		225.6	135.8
3	2389.968	H		42.9	5.0		47.9	74.0	54.0		6.1	99.8	146.8
4	2389.997	V		39.9	5.0		44.9	74.0	54.0		9.1	464.0	246.5

Remarks

1. The Unwanted emission was measured in the following position:
EUT stand-up position(X axis).
2. Result = Reading + c.f(correction factor)
3. Correction factor = Antenna factor + Cable loss - Amp Gain

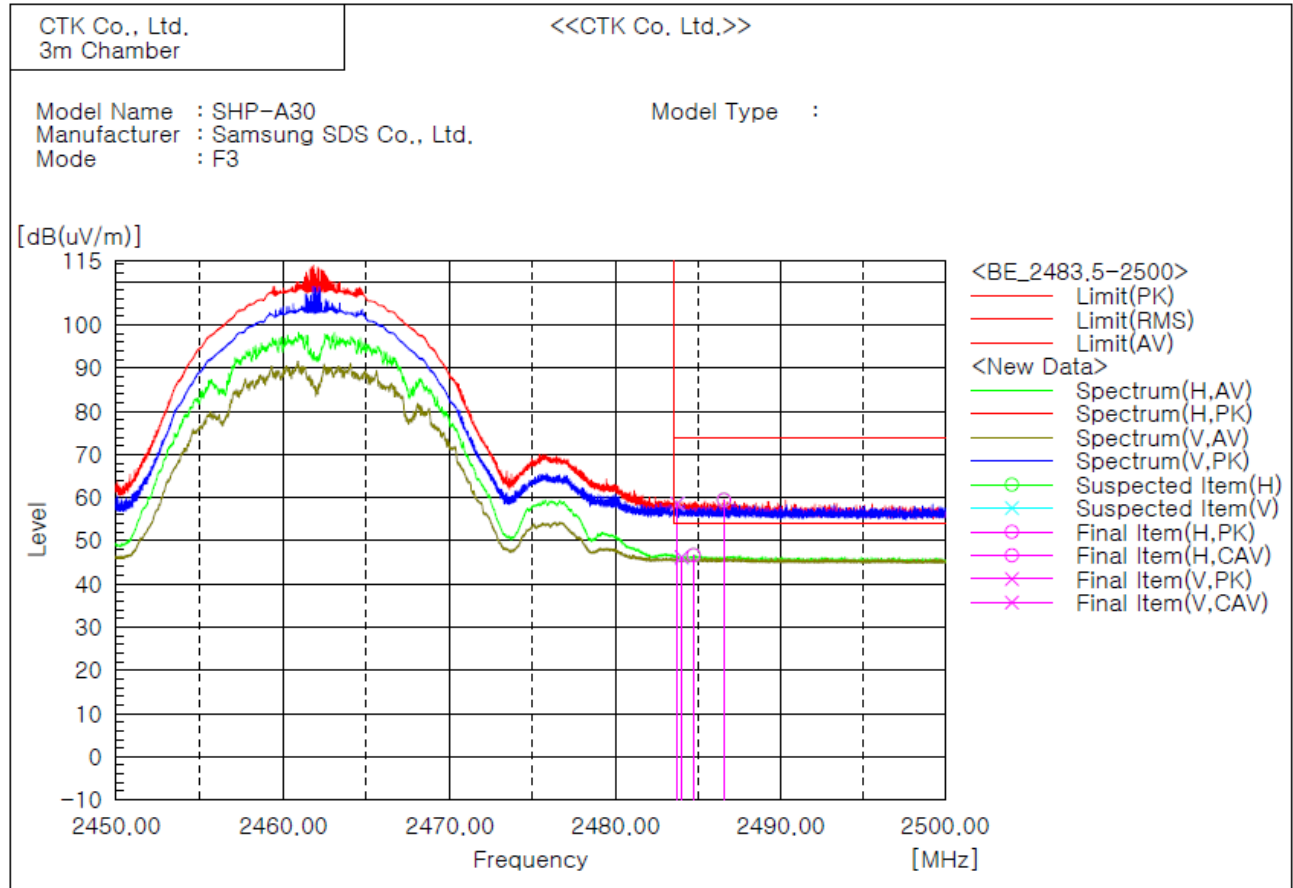
2. 2 483.5 MHz – 2 500 MHz

Test mode : 802.11b, High Channel

The requirements are:

☒ Complies

Test Data



Final Result

No.	Frequency [MHz]	(P)	Reading PK [dB(uV)]	Reading CAV [dB(uV)]	c.f. [dB(1/m)]	Result PK [dB(uV/m)]	Result CAV [dB(uV/m)]	Limit PK [dB(uV/m)]	Limit AV [dB(uV/m)]	Margin PK [dB]	Margin CAV [dB]	Height [cm]	Angle [deg]
1	2486.569	H	52.8		6.7	59.5		74.0	54.0	14.5		99.8	204.8
2	2483.744	V	51.9		6.7	58.6		74.0	54.0	15.4		484.1	69.7
3	2484.731	H		40.0	6.7		46.7	74.0	54.0		7.3	484.1	359.9
4	2484.006	V		39.5	6.7		46.2	74.0	54.0		7.8	484.1	0.0

Remarks

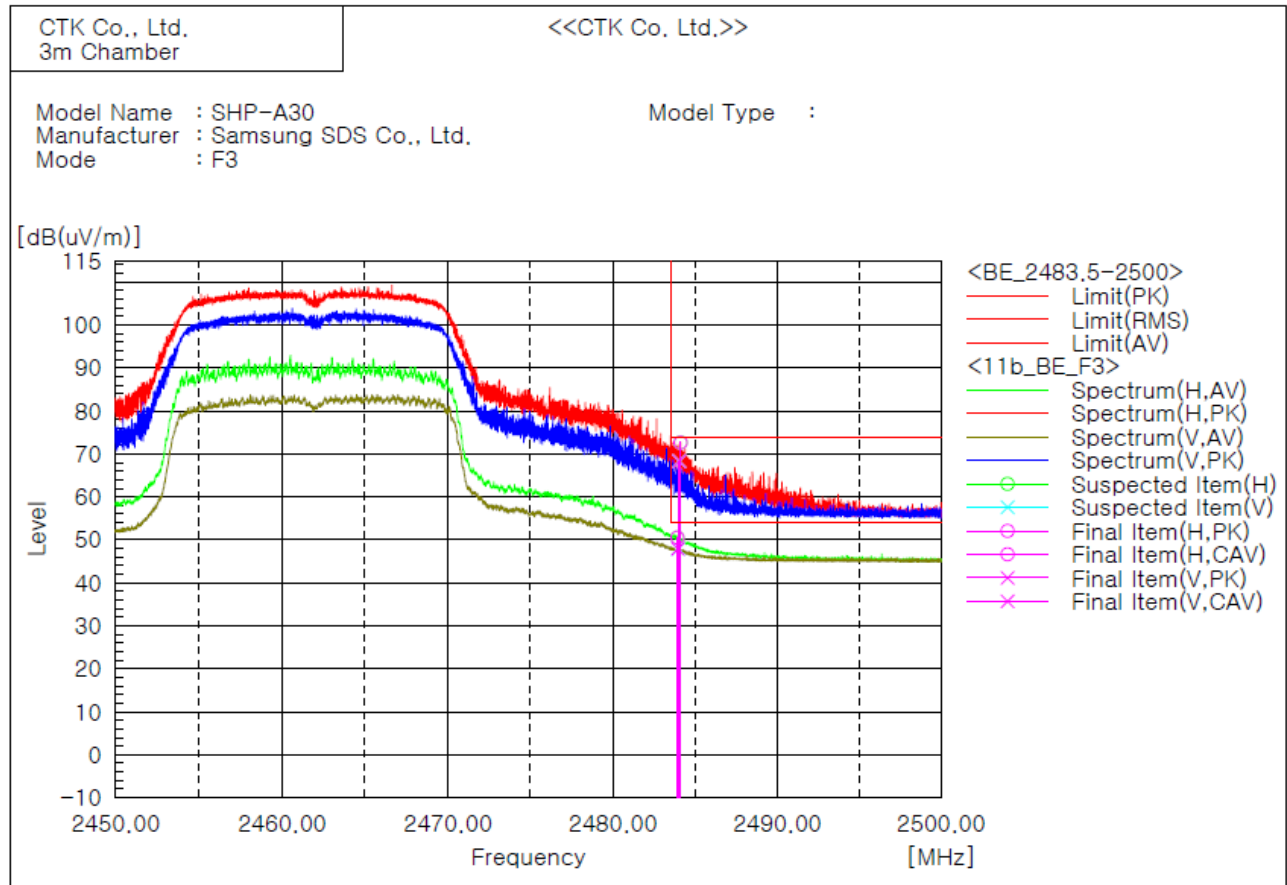
1. The Unwanted emission was measured in the following position:
EUT stand-up position(X axis).
2. Result = Reading + c.f(correction factor)
3. Correction factor = Antenna factor + Cable loss - Amp Gain

Test mode : 802.11g, High Channel

The requirements are:

☒ Complies

Test Data



Final Result

No.	Frequency [MHz]	(P)	Reading PK [dB(uV)]	Reading CAV [dB(uV)]	c.f. [dB(1/m)]	Result PK [dB(uV/m)]	Result CAV [dB(uV/m)]	Limit PK [dB(uV/m)]	Limit AV [dB(uV/m)]	Margin PK [dB]	Margin CAV [dB]	Height [cm]	Angle [deg]
1	2484.125	H	65.9	—	6.7	72.6	—	74.0	54.0	1.4	—	234.0	208.6
2	2484.031	V	61.6	—	6.7	68.3	—	74.0	54.0	5.7	—	464.1	339.2
3	2483.925	H	—	43.8	6.7	—	50.5	74.0	54.0	—	3.5	464.1	359.9
4	2483.962	V	—	41.2	6.7	—	47.9	74.0	54.0	—	6.1	464.1	339.2

Remarks

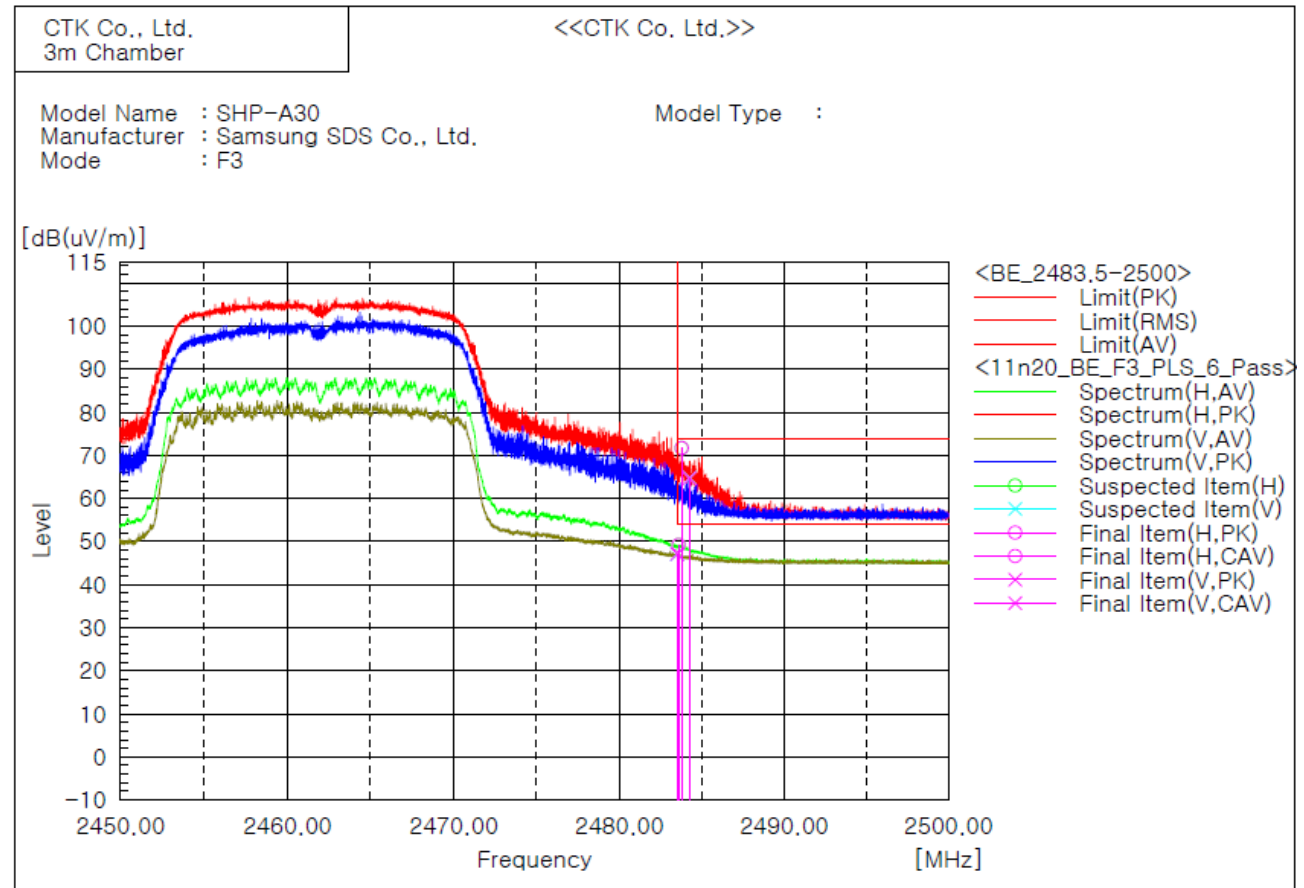
1. The Unwanted emission was measured in the following position:
EUT stand-up position(X axis).
2. Result = Reading + c.f(correction factor)
3. Correction factor = Antenna factor + Cable loss - Amp Gain

Test mode : 802.11n-HT20, High channel

The requirements are:

☒ Complies

Test Data



Final Result

No.	Frequency [MHz]	(P)	Reading PK [dB(uV)]	Reading CAV [dB(uV)]	c.f [dB(1/m)]	Result PK [dB(uV/m)]	Result CAV [dB(uV/m)]	Limit PK [dB(uV/m)]	Limit AV [dB(uV/m)]	Margin PK [dB]	Margin CAV [dB]	Height [cm]	Angle [deg]
1	2483.788	H	65.0	—	6.7	71.7	—	74.0	54.0	2.3	—	99.8	212.8
2	2484.256	V	58.0	—	6.7	64.7	—	74.0	54.0	9.3	—	99.8	236.7
3	2483.600	H	—	42.5	6.7	—	49.2	74.0	54.0	—	4.8	464.2	143.6
4	2483.519	V	—	40.4	6.7	—	47.1	74.0	54.0	—	6.9	464.2	0.0

Remarks

1. The Unwanted emission was measured in the following position:
EUT stand-up position(X axis).
2. Result = Reading + c.f(correction factor)
3. Correction factor = Antenna factor + Cable loss - Amp Gain

2) Spurious

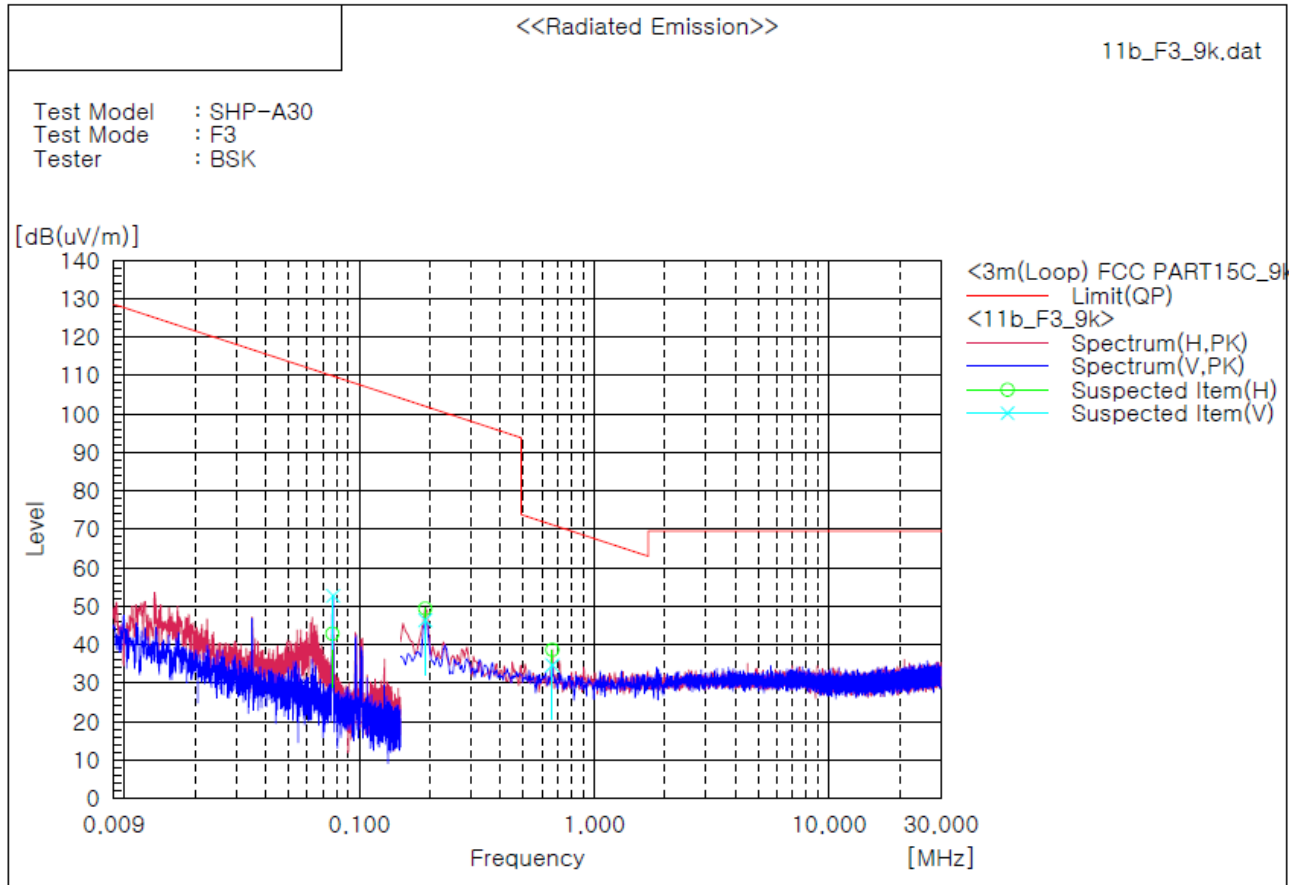
1. 9 kHz to 30 MHz

Test mode : 802.11b, High channel (Worst case)

The requirements are:

☒ Complies

Test Data



Result : There are more than 20 dB of margin compared to the limit.

Remark :

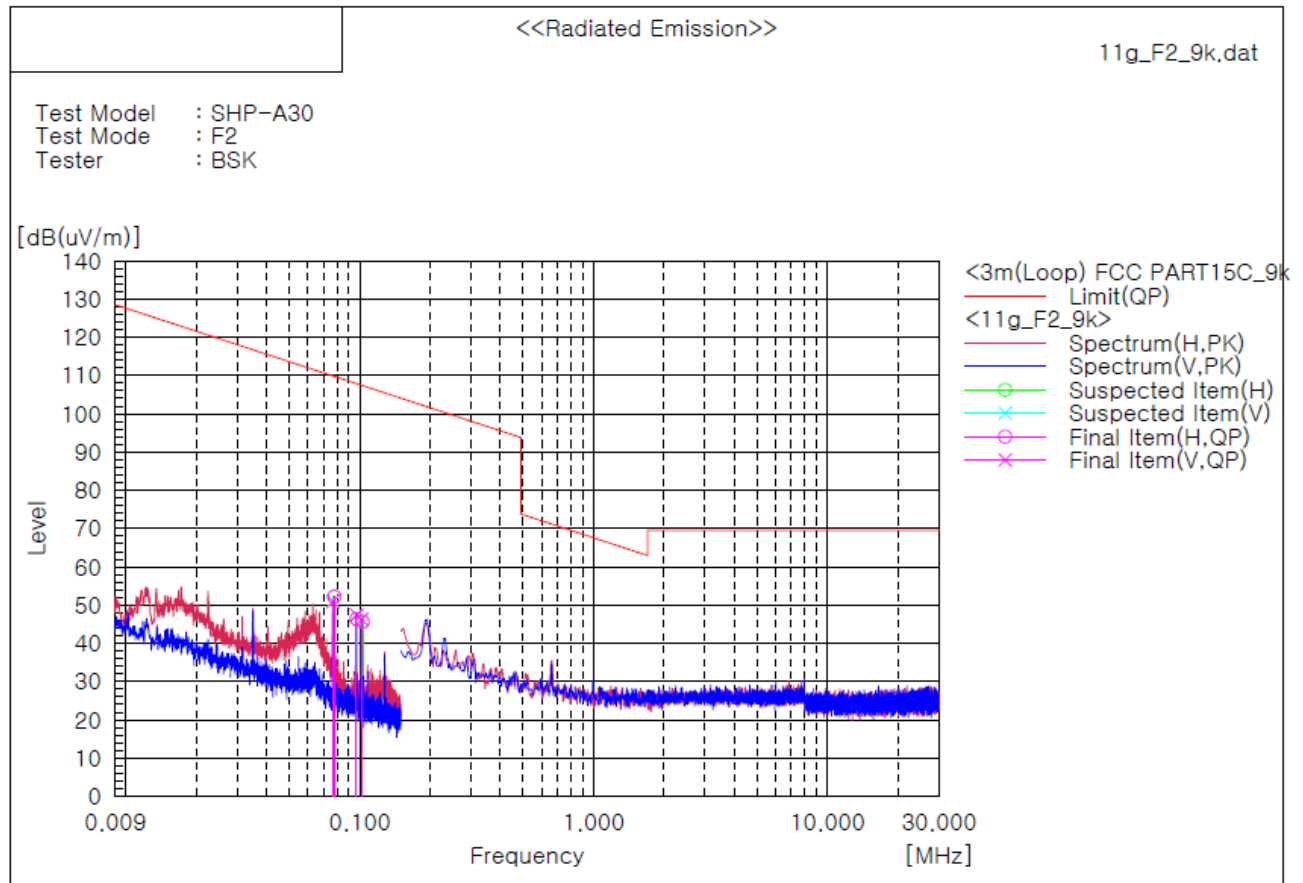
1. The Unwanted emission was measured in the following position:
EUT stand-up position(X axis).
2. Result = Reading + c.f(correction factor)
3. Correction factor = Antenna factor + Cable loss + 6 dB attenuator
4. Distance extrapolation factor = $40 \log (\text{specific distance} / \text{test distance})$ (dB)
5. This data is the Peak(PK) value.

Test mode : 802.11g, Middle channel (Worst case)

The requirements are:

☒ Complies

Test Data



Result : There are more than 20 dB of margin compared to the limit.

Remark :

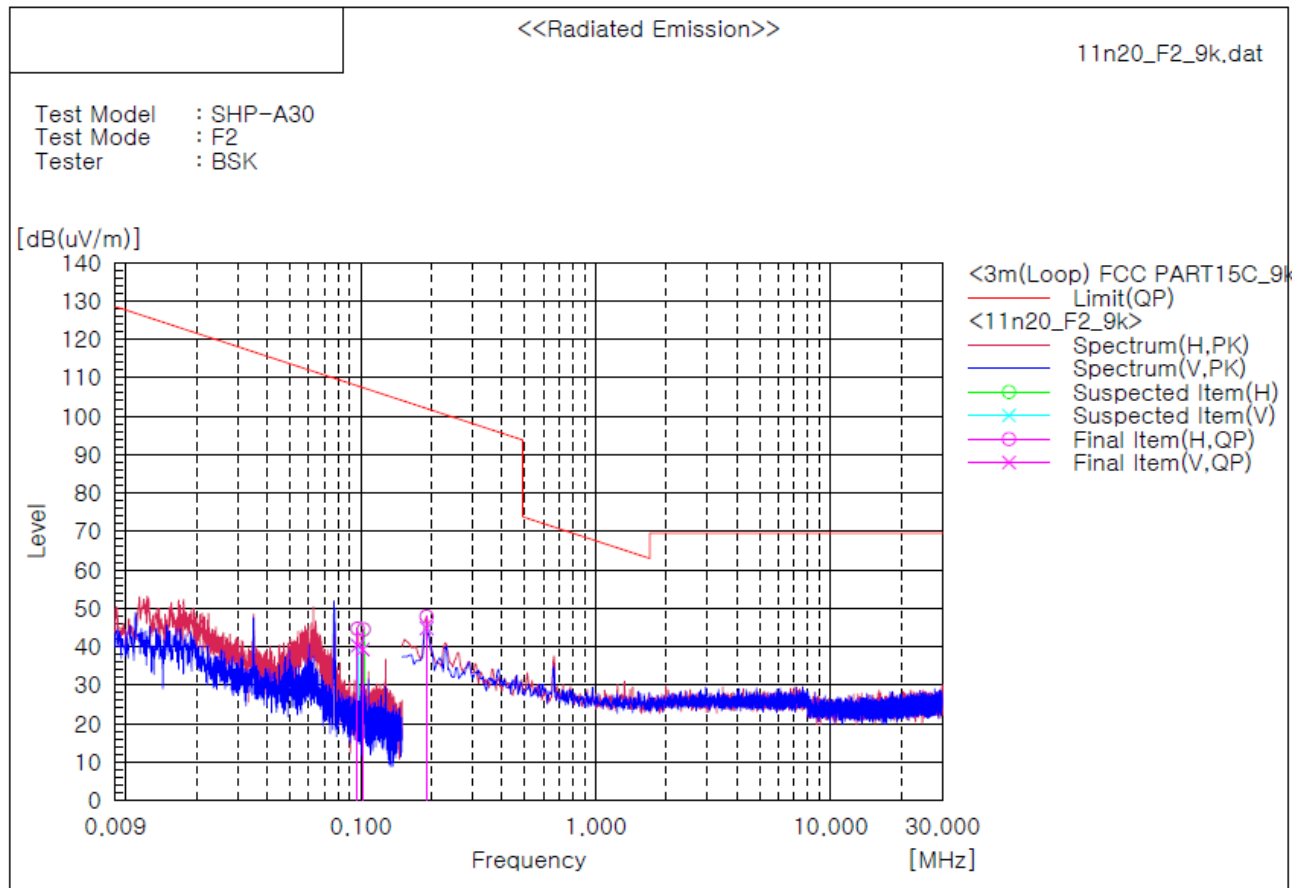
1. The Unwanted emission was measured in the following position:
EUT stand-up position(X axis).
2. Result = Reading + c.f(correction factor)
3. Correction factor = Antenna factor + Cable loss + 6 dB attenuator
4. Distance extrapolation factor = $40 \log (\text{specific distance} / \text{test distance})$ (dB)
5. This data is the Peak(PK) value.

Test mode : 802.11n-HT20, Middle channel (Worst case)

The requirements are:

☒ Complies

Test Data



Result : There are more than 20 dB of margin compared to the limit.

Remark : ✖

1. The Unwanted emission was measured in the following position:
EUT stand-up position(X axis).
2. Result = Reading + c.f(correction factor)
3. Correction factor = Antenna factor + Cable loss + 6 dB attenuator
4. Distance extrapolation factor = 40 log (specific distance / test distance) (dB)
5. This data is the Peak(PK) value.

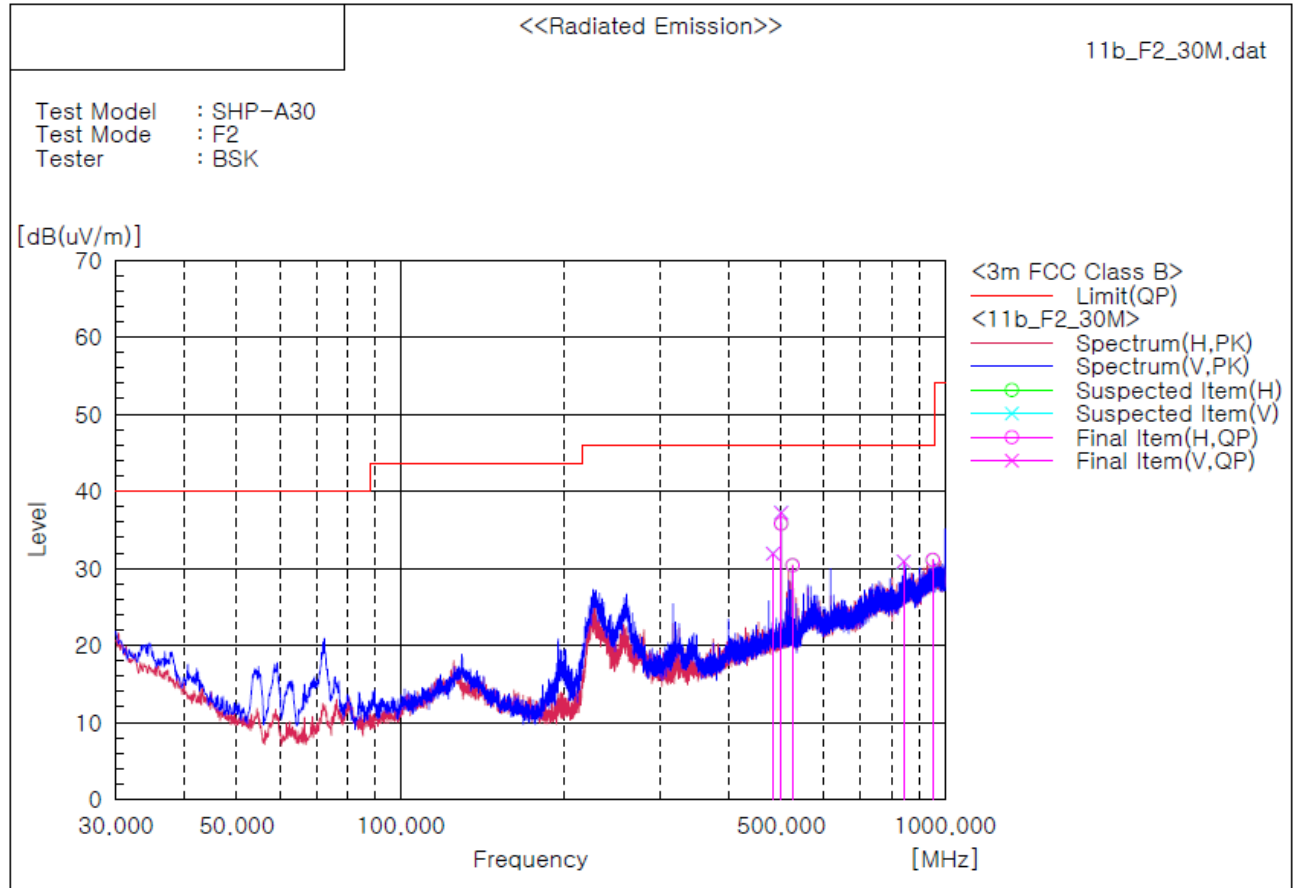
2. 30 MHz to 1 GHz

Test mode : 802.11b, Middle channel (Worst case)

The requirements are:

☒ Complies

Test Data



Final Result

No.	Frequency [MHz]	(P)	Reading QP [dB(uV)]	c.f [dB(1/m)]	Result QP [dB(uV/m)]	Limit QP [dB(uV/m)]	Margin QP [dB]	Height [cm]	Angle [deg]
1	483.354	V	34.7	-2.8	31.9	46.0	14.1	101.0	177.0
2	499.965	V	39.7	-2.5	37.2	46.0	8.8	101.0	53.0
3	499.965	H	38.3	-2.5	35.8	46.0	10.2	205.0	325.0
4	525.064	H	32.7	-2.3	30.4	46.0	15.6	205.0	258.0
5	840.071	V	26.6	4.3	30.9	46.0	15.1	191.0	163.0
6	949.924	H	24.0	7.1	31.1	46.0	14.9	399.0	77.0

Remark :

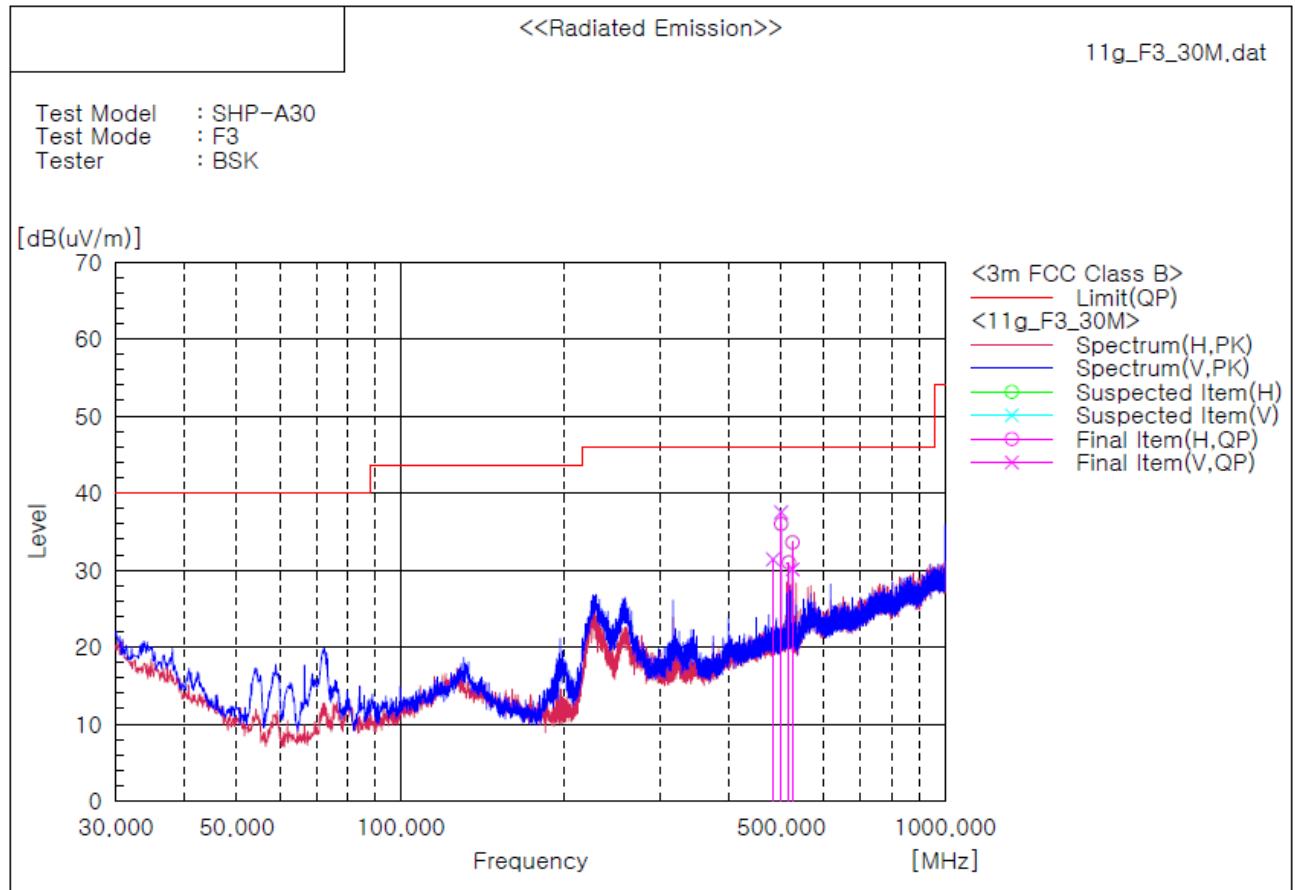
- The Unwanted emission was measured in the following position:
EUT stand-up position(X axis).
- Result = Reading + c.f(Correction factor)
- Correction factor = Antenna factor + Cable loss + 6 dB attenuator - Amp Gain
- This data is the Peak(PK) value.

Test mode : 802.11g, High channel (Worst case)

The requirements are:

☒ Complies

Test Data



Final Result

No.	Frequency [MHz]	(P)	Reading QP [dB(uV)]	c.f [dB(1/m)]	Result QP [dB(uV/m)]	Limit QP [dB(uV/m)]	Margin QP [dB]	Height [cm]	Angle [deg]
1	483.354	V	34.2	-2.8	31.4	46.0	14.6	101.0	70.0
2	499.965	V	40.0	-2.5	37.5	46.0	8.5	101.0	93.0
3	499.965	H	38.5	-2.5	36.0	46.0	10.0	209.0	275.0
4	516.698	H	33.3	-2.3	31.0	46.0	15.0	209.0	251.0
5	525.064	H	35.9	-2.3	33.6	46.0	12.4	209.0	258.0
6	525.064	V	32.4	-2.3	30.1	46.0	15.9	101.0	357.0

Remark :

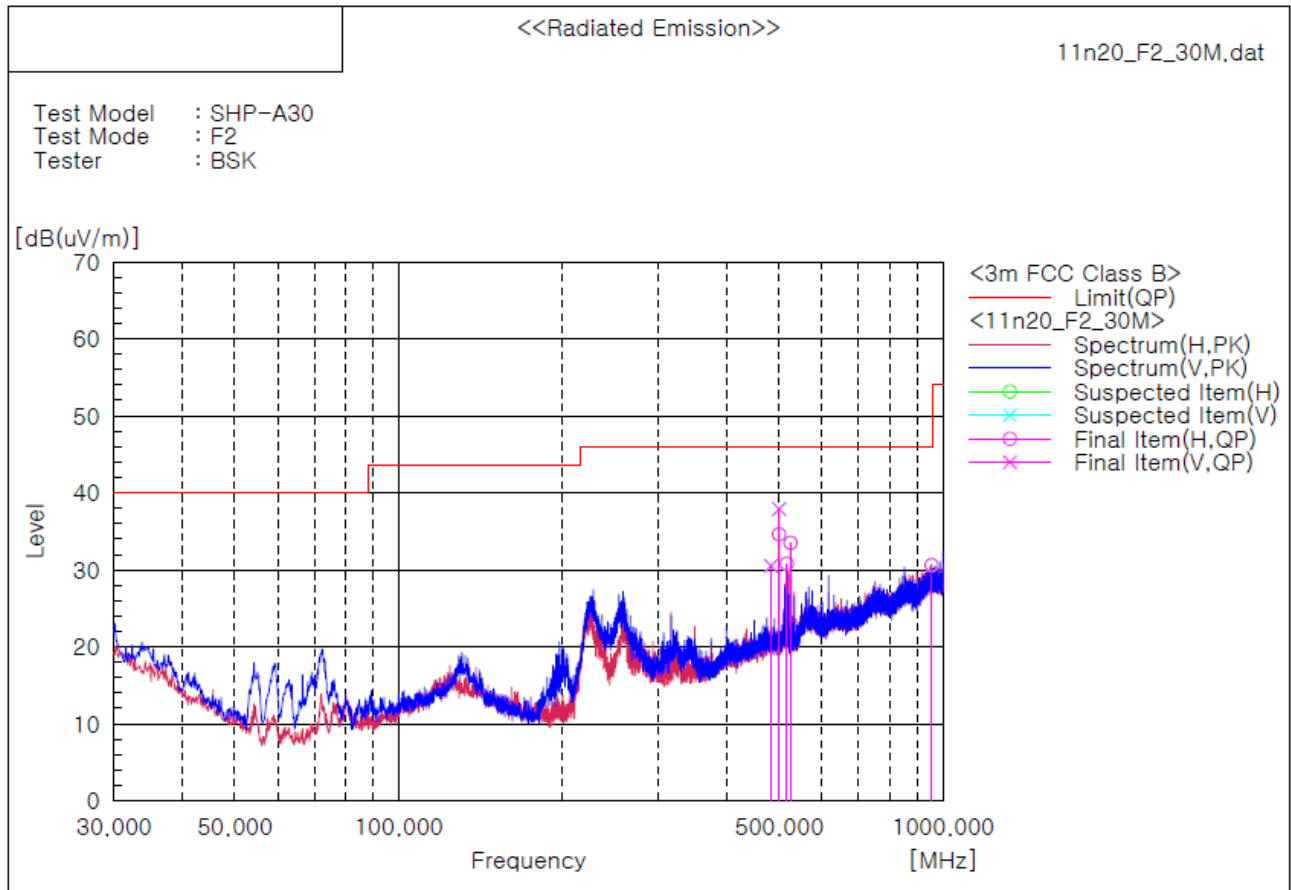
1. The Unwanted emission was measured in the following position:
EUT stand-up position(X axis).
2. Result = Reading + c.f(Correction factor)
3. Correction factor = Antenna factor + Cable loss + 6 dB attenuator - Amp Gain
4. This data is the Peak(PK) value.

Test mode : 802.11n-HT20, Middle channel (Worst case)

The requirements are:

☒ Complies

Test Data



Final Result

No.	Frequency [MHz]	(P)	Reading QP [dB(uV)]	c.f [dB(1/m)]	Result QP [dB(uV/m)]	Limit QP [dB(uV/m)]	Margin QP [dB]	Height [cm]	Angle [deg]
1	483.354	V	33.3	-2.8	30.5	46.0	15.5	101.0	77.0
2	499.965	V	40.4	-2.5	37.9	46.0	8.1	101.0	161.0
3	499.965	H	37.1	-2.5	34.6	46.0	11.4	209.0	258.0
4	516.698	H	33.1	-2.3	30.8	46.0	15.2	209.0	268.0
5	525.064	H	35.8	-2.3	33.5	46.0	12.5	209.0	252.0
6	953.319	H	23.5	7.1	30.6	46.0	15.4	209.0	292.0

Remark :

1. The Unwanted emission was measured in the following position:
EUT stand-up position(X axis).
2. Result = Reading + c.f(Correction factor)
3. Correction factor = Antenna factor + Cable loss + 6 dB attenuator - Amp Gain
4. This data is the Peak(PK) value.

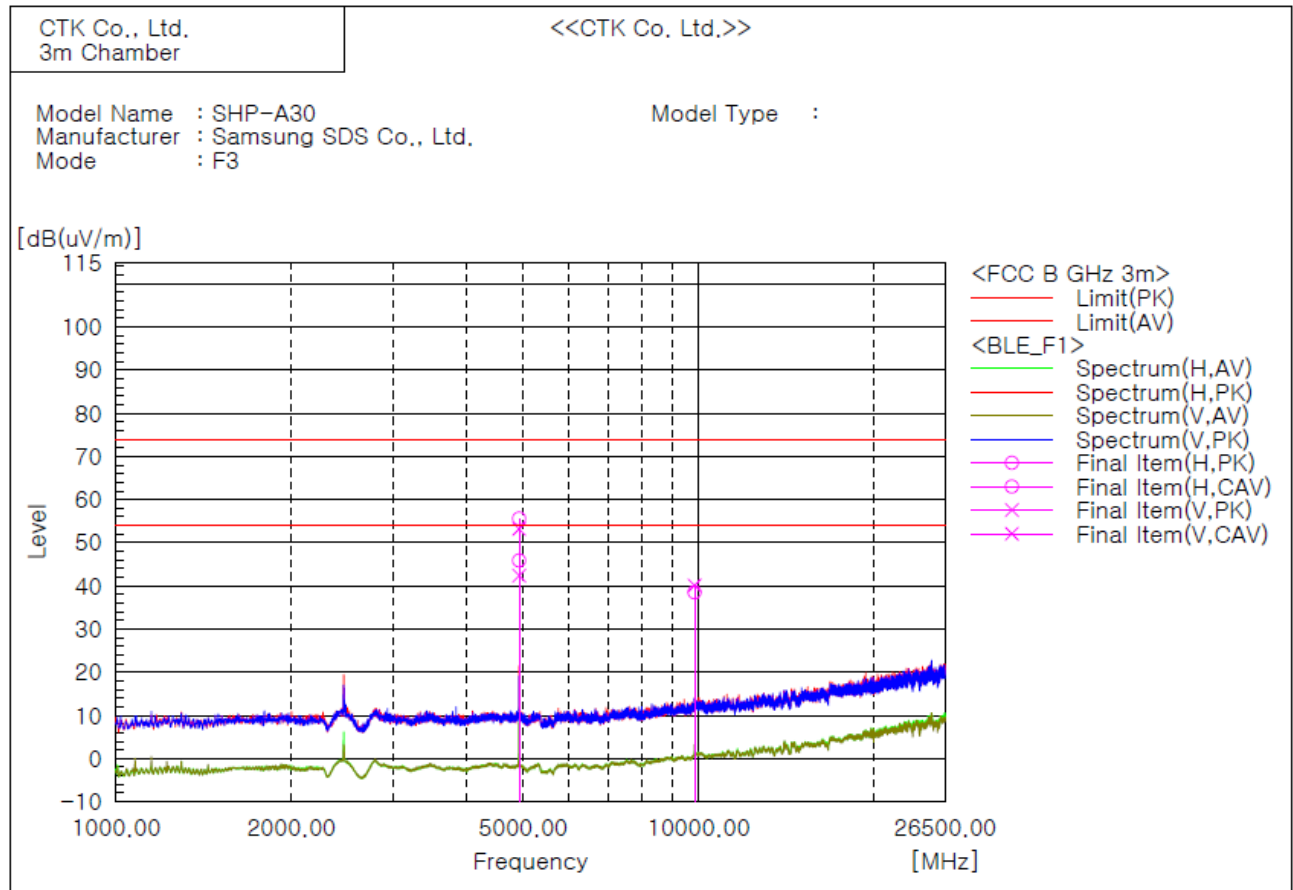
3. 1 GHz to 26.5 GHz

Test mode : 802.11b, High Channel (Worst case)

The requirements are:

☒ Complies

Test Data



Final Result

No.	Frequency [MHz]	(P)	Reading PK [dB(uV)]	Reading CAV [dB(uV)]	c.f [dB(1/m)]	Result PK [dB(uV/m)]	Result CAV [dB(uV/m)]	Limit PK [dB(uV/m)]	Limit AV [dB(uV/m)]	Margin PK [dB]	Margin CAV [dB]	Height [cm]	Angle [deg]
1	4922.750	H	54.2	---	1.4	55.6	---	74.0	54.0	18.4	---	344.9	163.0
2	4922.750	V	51.8	---	1.4	53.2	---	74.0	54.0	20.8	---	464.1	221.3
3	4922.750	H	---	44.5	1.4	---	45.9	74.0	54.0	---	8.1	99.8	355.3
4	4922.750	V	---	41.0	1.4	---	42.4	74.0	54.0	---	11.6	464.1	359.9
5	9848.499	V	---	34.7	5.4	---	40.1	74.0	54.0	---	13.9	354.9	4.9
6	9848.499	H	---	33.1	5.4	---	38.5	74.0	54.0	---	15.5	464.2	49.0

Remarks

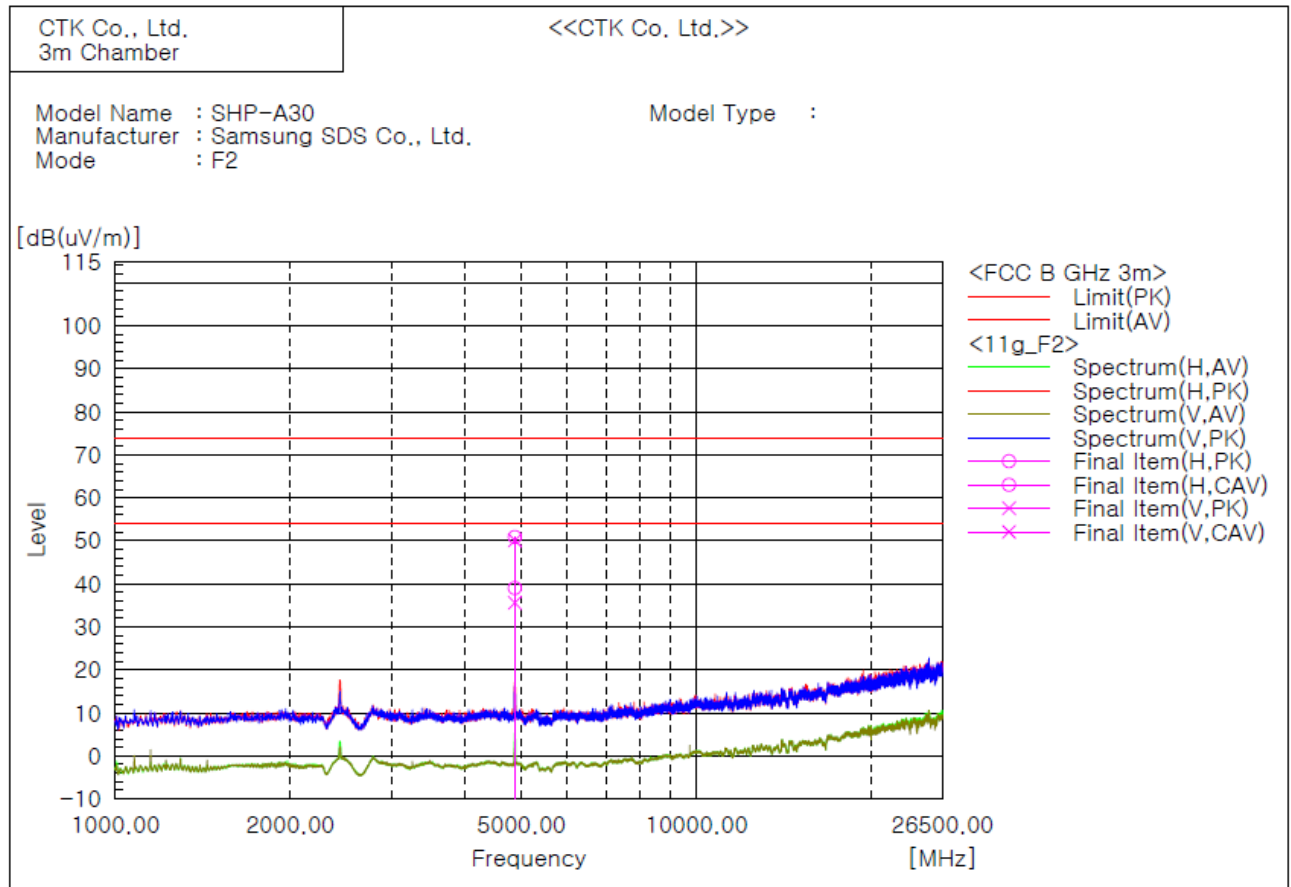
1. The Unwanted emission was measured in the following position:
EUT stand-up position(X axis).
2. Result = Reading + c.f(correction factor)
3. Correction factor = Antenna factor + Cable loss - Amp Gain

Test mode : 802.11g, Middle channel (Worst case)

The requirements are:

☒ Complies

Test Data



Final Result

No.	Frequency [MHz]	(P)	Reading PK [dB(uV)]	Reading CAV [dB(uV)]	c.f. [dB(1/m)]	Result PK [dB(uV/m)]	Result CAV [dB(uV/m)]	Limit PK [dB(uV/m)]	Limit AV [dB(uV/m)]	Margin PK [dB]	Margin CAV [dB]	Height [cm]	Angle [deg]
1	4873.875	V		34.5	1.1		35.6	74.0	54.0		18.4	235.1	359.9
2	4873.875	H		37.9	1.1		39.0	74.0	54.0		15.0	99.9	359.9
3	4871.750	V	49.0		1.1	50.1		74.0	54.0	23.9		464.3	214.3
4	4873.875	H	49.8		1.1	50.9		74.0	54.0	23.1		345.5	163.0

Remarks

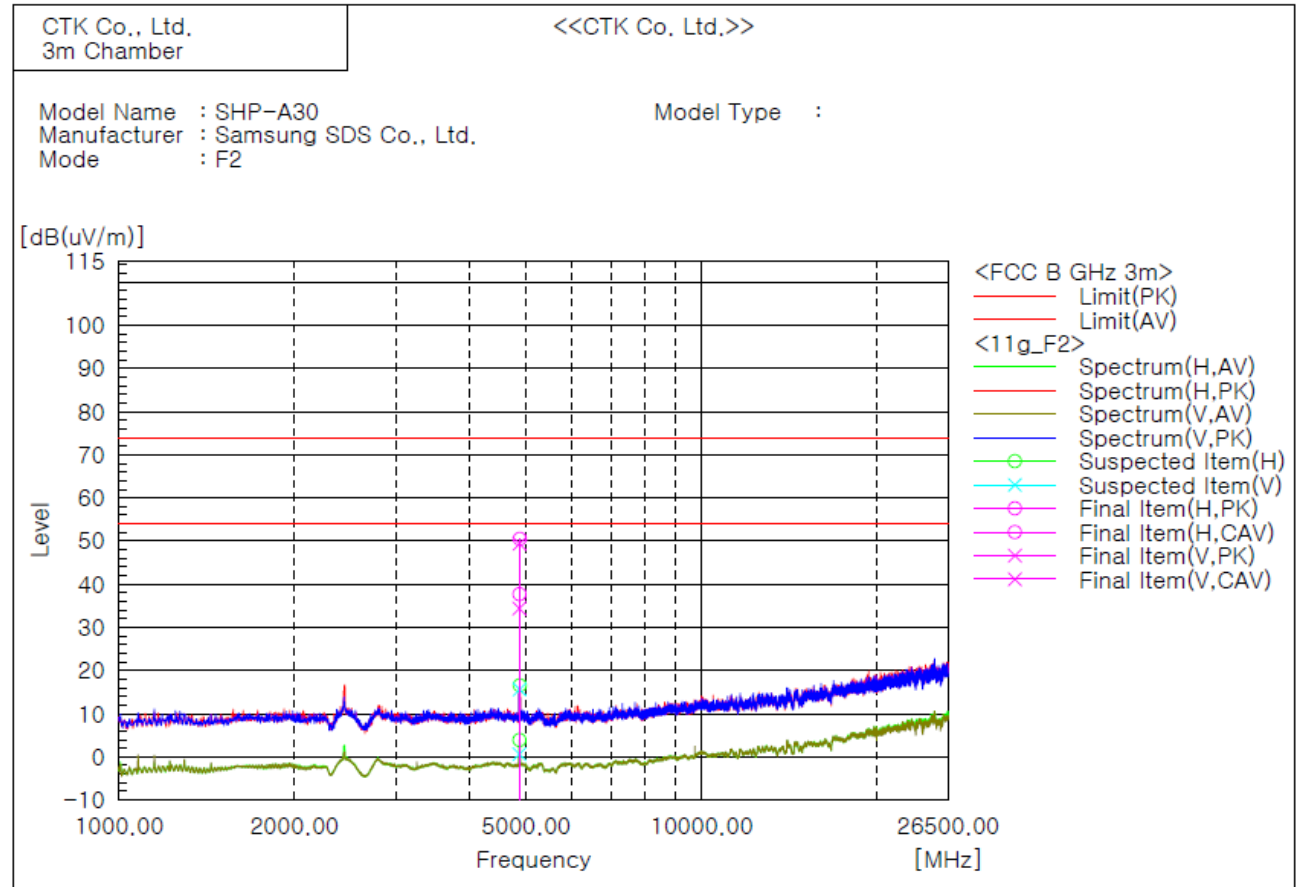
1. The Unwanted emission was measured in the following position:
EUT stand-up position(X axis).
2. Result = Reading + c.f(correction factor)
3. Correction factor = Antenna factor + Cable loss - Amp Gain

Test mode : 802.11n-HT20, Middle channel (Worst case)

The requirements are:

☒ Complies

Test Data



Final Result

No.	Frequency [MHz]	(P)	Reading PK [dB(uV)]	Reading CAV [dB(uV)]	c.f. [dB(1/m)]	Result PK [dB(uV/m)]	Result CAV [dB(uV/m)]	Limit PK [dB(uV/m)]	Limit AV [dB(uV/m)]	Margin PK [dB]	Margin CAV [dB]	Height [cm]	Angle [deg]
1	4869.625	V	33.3	33.3	1.1	34.4	34.4	74.0	54.0	19.6	19.6	234.7	354.8
2	4871.750	H	36.6	36.6	1.1	37.7	37.7	74.0	54.0	16.3	16.3	99.8	359.9
3	4873.875	V	48.3	48.3	1.1	49.4	49.4	74.0	54.0	24.6	24.6	464.1	213.1
4	4878.125	H	49.3	49.3	1.2	50.5	50.5	74.0	54.0	23.5	23.5	226.2	186.7

Remarks

1. The Unwanted emission was measured in the following position:
EUT stand-up position(X axis).
2. Result = Reading + c.f.(correction factor)
3. Correction factor = Antenna factor + Cable loss - Amp Gain

APPENDIX A – Test Equipment Used For Tests

No.	Name of Equipment	Manufacturer	Model No.	Serial No.	Cal Date	Due Date
1	SPECTRUM ANALYZER	R&S	FSP-30	100994	2019-10-16	2020-10-16
2	EMI Test Receiver	Rohde & Schwarz	ESCI7	100814	2019-10-22	2020-10-22
3	Active Loop Antenna	SCHWARZBECK	FMZB 1513	1513-126	2019-01-17	2021-01-17
4	Bilog Antenna	Schaffner	CBL6111C	2551	2019-04-17	2021-04-17
5	AMPLIFIER	SONOMA	310	291721	2019-01-28	2020-01-28
6	6dB Attenuator	R&S	DNF	272.4110.50-2	2019-10-25	2020-10-25
7	EMI Test Receiver	Rohde & Schwarz	ESU40	100336	2019-01-29	2020-01-29
8	Double Ridged Guide Antenna	ETS-Lindgren	3117	00154525	2019-02-22	2021-02-22
9	Double Ridged Guide Antenna	ETS-Lindgren	3116	00062916	2019-04-22	2021-04-22
10	Preamplifier	Agilent	8449B	3008A02011	2018-11-25	2020-11-25
11	Band Reject Filter	Micro Tronics	BRM50702	G233	2019-01-28	2020-01-28
12	Signal Generator	R&S	SMB100A	175528	2019-10-16	2020-10-16
13	DC Power Supply	Agilent	E3632A	MY40011638	2019-10-15	2020-10-15