

TEST REPORT For FCC

FCC Standards : FCC 47CFR part 15 subpart E

Test Report No. : CTK-2017-00791
Date of Issue : 2017-04-29
FCC ID : 2ALVHS07
Model/Type No. : S07
Kind of Product : Android Module
Applicant : CLABSYS Co., Ltd.
Applicant Address : A-Dong, 2floor., 895-20, Sicheong-ro, Platan-myeon,
Hwaseong-si, Gyeonggi-do, Republic of Korea
Manufacturer : CLABSYS Co., Ltd.
Manufacturer Address : A-Dong, 2floor., 895-20, Sicheong-ro, Platan-myeon,
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Received Date : 2017-04-07
Test period : Start : 2017-04-10 End : 2017-04-29

The test results presented in this report relate only to the object tested.

Tested by



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Date: 2017-04-29

Reviewed by



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Date: 2017-04-29

REPORT REVISION HISTORY

Date	Revision	Page No
2017-04-29	Issued (CTK-2017-00791)	All

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1.0 General Product Description

Equipment model name	SO7			
Serial number	Prototype			
EUT condition	Pre-production, not damaged			
Frequency Range	UNII 1 : 5180 MHz – 5240 MHz (20 MHz_BW) 5190 MHz – 5230 MHz (40 MHz_BW) UNII 3 : 5745 MHz – 5825 MHz (20 MHz_BW) 5755 MHz – 5795 MHz (40 MHz_BW)			
RF output power :				
Band	Mode	Channel Bandwidth (MHz)	Frequency Range (MHz)	RF output power (dBm)
UNII 1	802.11a	20	5180 – 5240	10.80
	802.11n	20	5180 – 5240	11.80
	802.11n	40	5190 – 5230	10.56
UNII 3	802.11a	20	5745 – 5825	14.37
	802.11n	20	5745 – 5825	14.80
	802.11n	40	5755 – 5795	16.48
Transfer Rate	802.11a : 54 / 48 / 36 / 24 / 18 / 12 / 9 / 6 Mbps 802.11n : up to 150 Mbps			
Type of Modulation	OFDM			
Power Source	DC 12 V			
Duty Cycle	802.11a : 94.2 % 802.11n_HT20 : 94.3 % 802.11n_HT40 : 89.5 %			
Antenna Type	PCB antenna			
Antenna Gain*	3.73 dBi			
Hardware Rev	V0.3			
Software Rev	Android-6.0.1			
Firmware Rev	r2			

1.1 Test mode

Test Item	Modulation	Data Rate
6 dB/26 dB/99% Bandwidth	802.11a	6 Mbps
Conducted Output Power	802.11n	MCS 0
Power Spectral Density		
Frequency Stability		
Undesirable emission		
Radiated Emissions Above 1GHz	Nomal Mode	Auto
Radiated Emissions Below 1GHz		
AC Conducted Emissions		

1.2 EUT Operation Test Setup

For WLAN function, the engineering test program was provided and enabled to make EUT continuous transmit/receive.

1.3 Tested Frequency

802.11a, 802.11n_HT20

Frequency (MHz)	LOW	MID	HIGH
UNII 1	5180	5200	5240
UNII 3	5745	5785	5825

802.11n_HT40

Frequency (MHz)	LOW	MID	HIGH
UNII 1	5190	-	5230
UNII 3	5755	-	5795

1.4 Device Modifications

The following modifications were necessary for compliance:

Not applicable

1.5 Peripheral Devices

Device	Manufacturer	Model No.	Serial No.
Note Computer	HP	ProBook 650 G1	5CG5114KD2
AC ADAPTER	HP	PPP012D-S	-
AC / DC ADAPTER	Shenzhen Simsukian Electronics Technology CO., LTD	SK02T-1200100K	-





1.6 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.

1.7 Test Facility

The measurement facility is located at (Ho-dong), 113, Yejik-ro, Cheoin-gu, Yongin-si, Gyeonggi-do, 17142, Korea. The sites are constructed in conformance with the requirements of ANSI C63.7, ANSI C63.4 and CISPR Publication 22.

1.8 Laboratory Accreditations and Listings

Country	Agency	Scope of Accreditation	Registration Number	Logo
USA	FCC	FCC Part 15 & 18 EMI (Electromagnetic Interference / Emission)	805871	
CANADA	IC	IC EMI (3/10m test site)	8737A-2	
JAPAN	VCCI	VCCI V-3 EMI (Electromagnetic Interference / Emission)	C-986 T-1843 R-3627 G-387	
KOREA	MSIP	EMI (Electromagnetic Interference / Emission) EMS (Electromagnetic Susceptibility / Immunity)	KR0025	

2.0 Summary of tests

FCC Part Section(s)	Parameter	Limit	Test Condition	Status (note 1)
15.407(e)	6 dB Bandwidth	> 500 kHz	Conducted	C
15.407(a)	26 dB Bandwidth and 99% Bandwidth	NA		C
15.407(a)(1)	Conducted Output Power	< 250 mW (5150 – 5250 MHz) < 1 W (5725 – 5850 MHz)		C
15.407(a)(1)	Power Spectral Density	< 11 dBm/MHz (5150 – 5250 MHz) < 30 dBm/500KHz (5725 – 5850 MHz)		C
15.407(g)	Frequency Stability	NA		C
15.407 (b)	Undesirable emission	< -27 dBm/MHz EIRP (5150 – 5250 MHz) < -17 dBm/MHz EIRP (5850 – 5860 MHz) < -27 dBm/MHz EIRP outside (5715 - 5850 MHz)	Radiated	C
15.205, 15.407 (b)(5),(6)	Radiated Spurious Emission	15.209(a)		C
15.207	AC Conducted Emissions	15.207(a)	Line Conducted	C

Note 1: C=Complies NC=Not Complies NT=Not Tested NA=Not Applicable

Note 2: The data in this test report are traceable to the national or international standards.

The sample was tested according to the following specification:
- FCC Part 15.407, ANSI C63.10-2013

The tests were performed according to the method of measurements prescribed in
KDB No.789033

2.1 Technical Characteristic Test

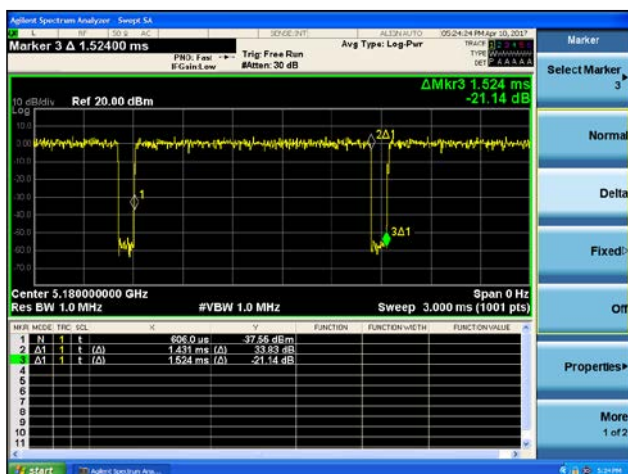
2.1.1 ON Time, Duty Cycle

Procedure:

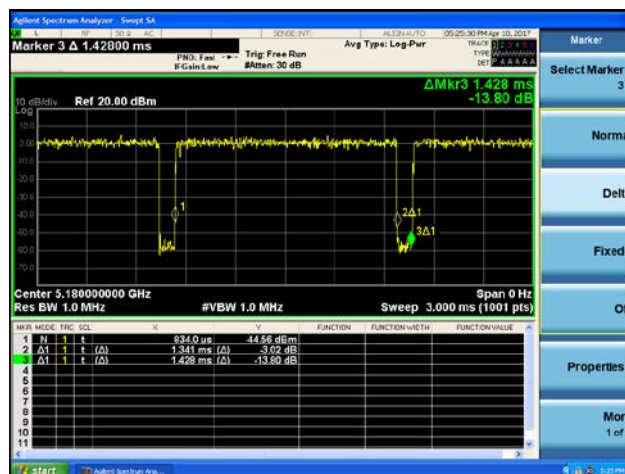
KDB 789033 Zero-Span Spectrum Analyzer Method.

Test Data:

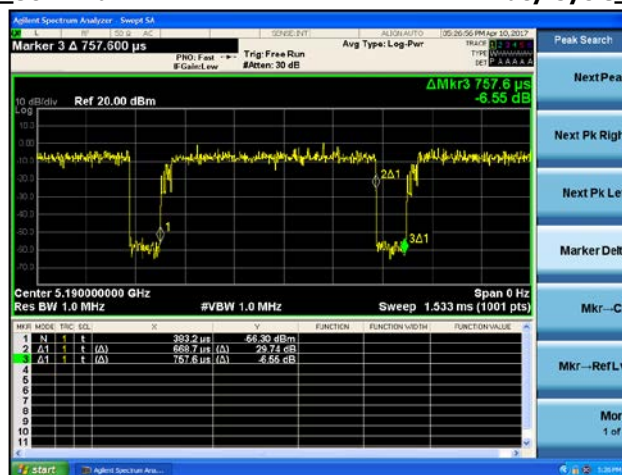
	ON Time (ms)	Period (ms)	TX OFF (ms)	Duty Cycle (linear)	Duty Cycle (%)
802.11a	1.431	1.524	0.093	0.942	94.2
802.11n_HT20	1.341	1.428	0.087	0.943	94.3
802.11n_HT40	0.669	0.758	0.089	0.895	89.5



Duty Cycle_802.11a



Duty Cycle_802.11n_HT20



Duty Cycle_802.11n_HT40

2.1.2 6 dB 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 Settings :

Center frequency = the highest, middle and the lowest channels

a) RBW = 100 kHz

b) VBW $\geq 3 \times$ RBW

c) Detector = peak

d) Trace mode = Max hold

e) Sweep = auto couple

f) Allow the trace to stabilize

g) 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.

Minimum Standard:

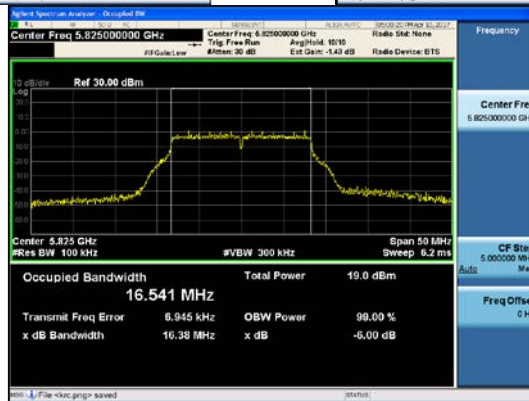
6 dB Bandwidth > 500kHz

Test Data:

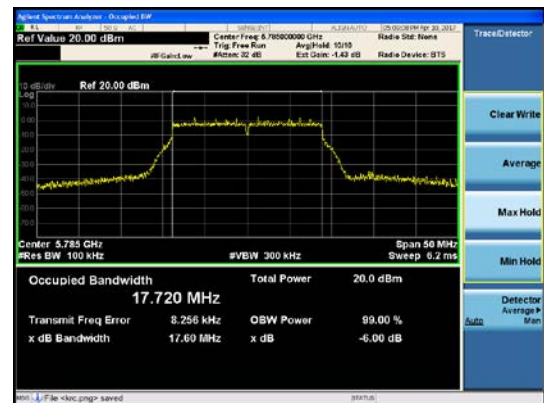
	6 dB Bandwidth (MHz)	
Mode	802.11a	802.11n_HT20
Frequency		
5745 MHz	16.41	17.59
5785 MHz	16.42	17.60
5825 MHz	16.38	17.61
Measurement uncertainty	± 3 dB	

	6 dB Bandwidth (MHz)	
Mode	802.11n_HT40	
Frequency		
5755 MHz	36.38	
5795 MHz	36.37	
Measurement uncertainty	± 3 dB	

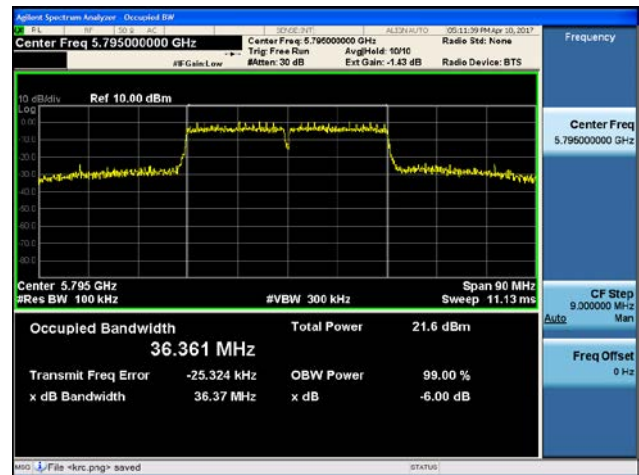
See next pages for actual measured spectrum plots.



802.11a



802.11n_HT20



802.11n_HT40

2.1.3 26 dB Bandwidth and 99% 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 26 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 = approximately 1 % of the emission bandwidth
- b) VBW \geq 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%.

Minimum Standard:

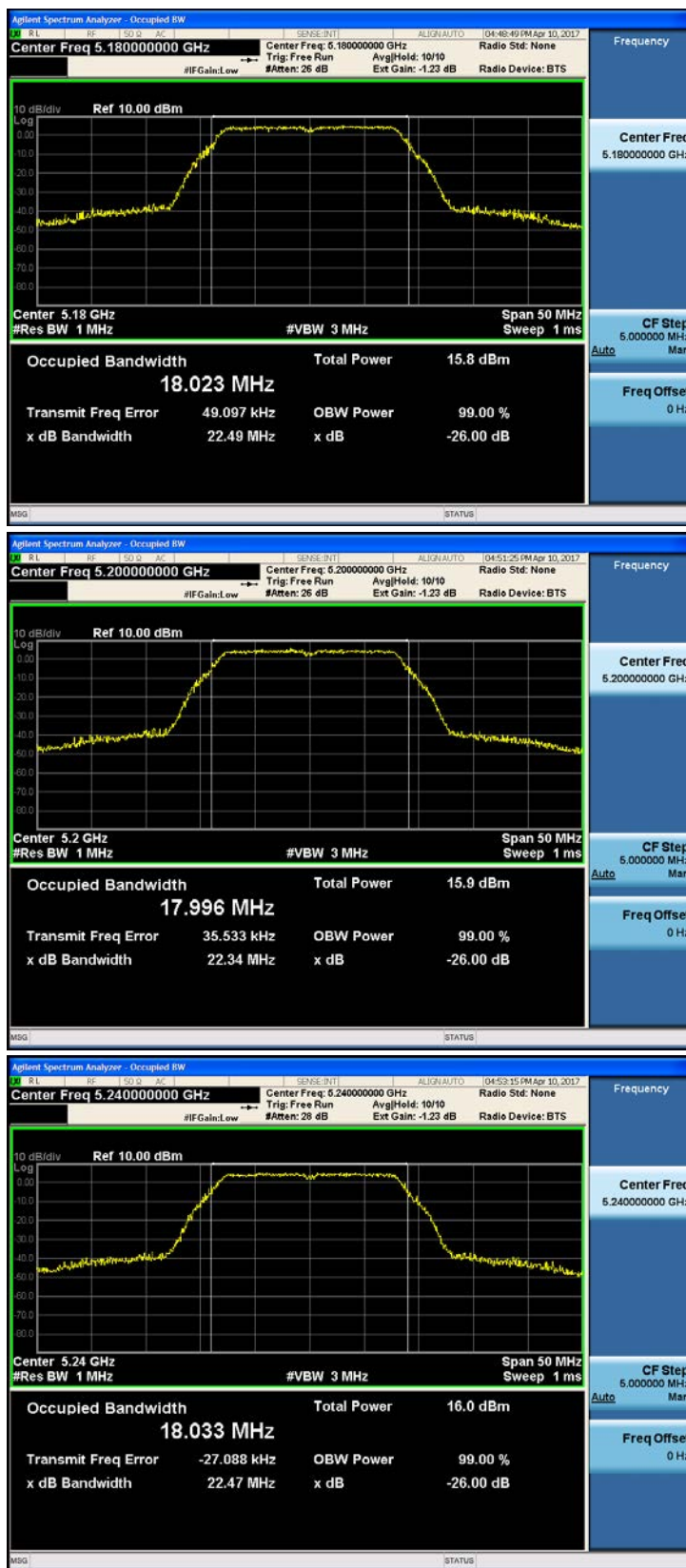
NA

Test Data:

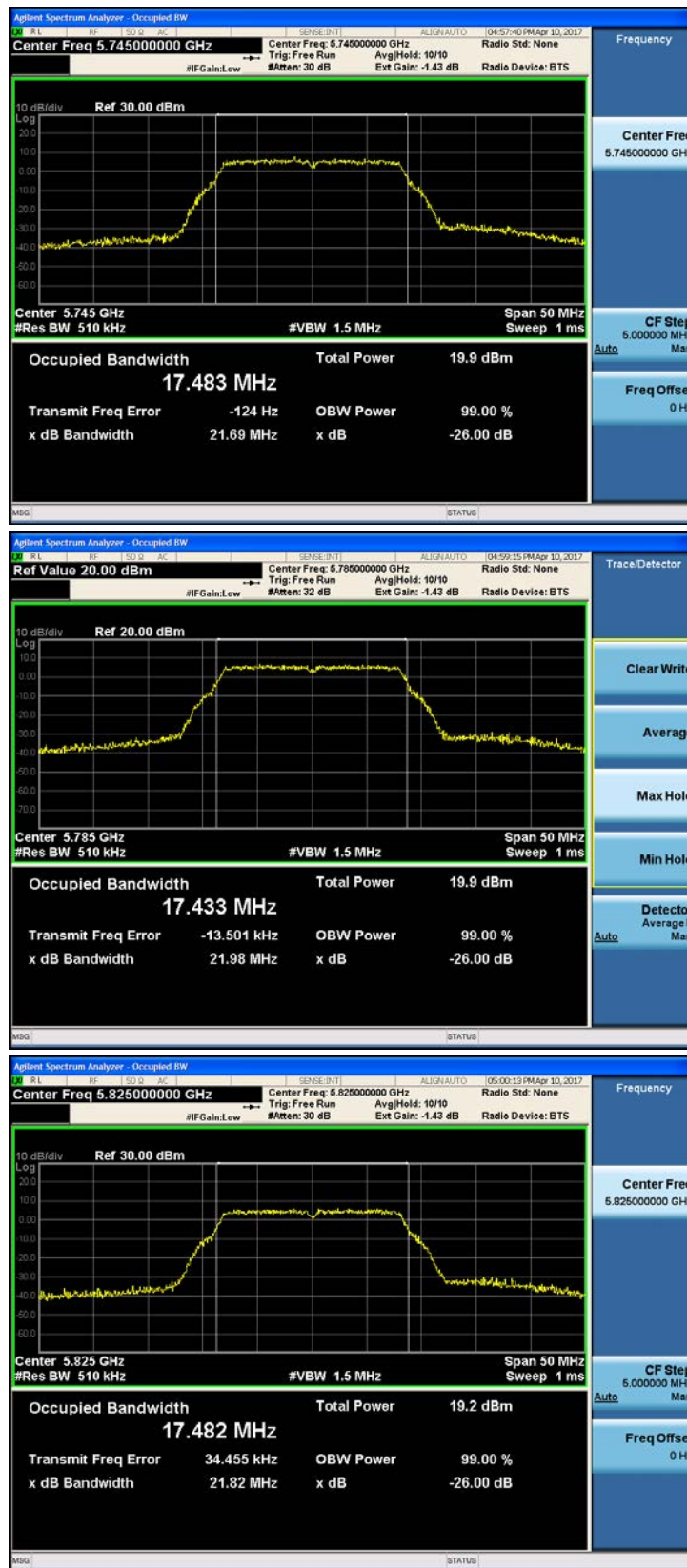
	26 dB Bandwidth and 99% Bandwidth (MHz)			
Mode	802.11a		802.11n_HT20	
Frequency	26 dB	99 %	26 dB	99 %
5180 MHz	22.49	18.02	22.54	18.92
5200 MHz	22.34	18.00	22.98	18.95
5240 MHz	22.47	18.03	22.54	18.90
5745 MHz	21.69	17.48	22.05	18.36
5785 MHz	21.98	17.43	22.00	18.51
5825 MHz	21.82	17.48	22.35	18.46
Measurement uncertainty	± 3 dB			

	26 dB Bandwidth and 99% Bandwidth (MHz)	
Mode	802.11n_HT40	
Frequency	26 dB	99 %
5190 MHz	40.00	36.60
5230 MHz	40.67	36.65
5755 MHz	50.00	36.51
5795 MHz	49.69	36.48
Measurement uncertainty	± 3 dB	

See next pages for actual measured spectrum plots.



802.11a_UNII-1



802.11a_UNII-3



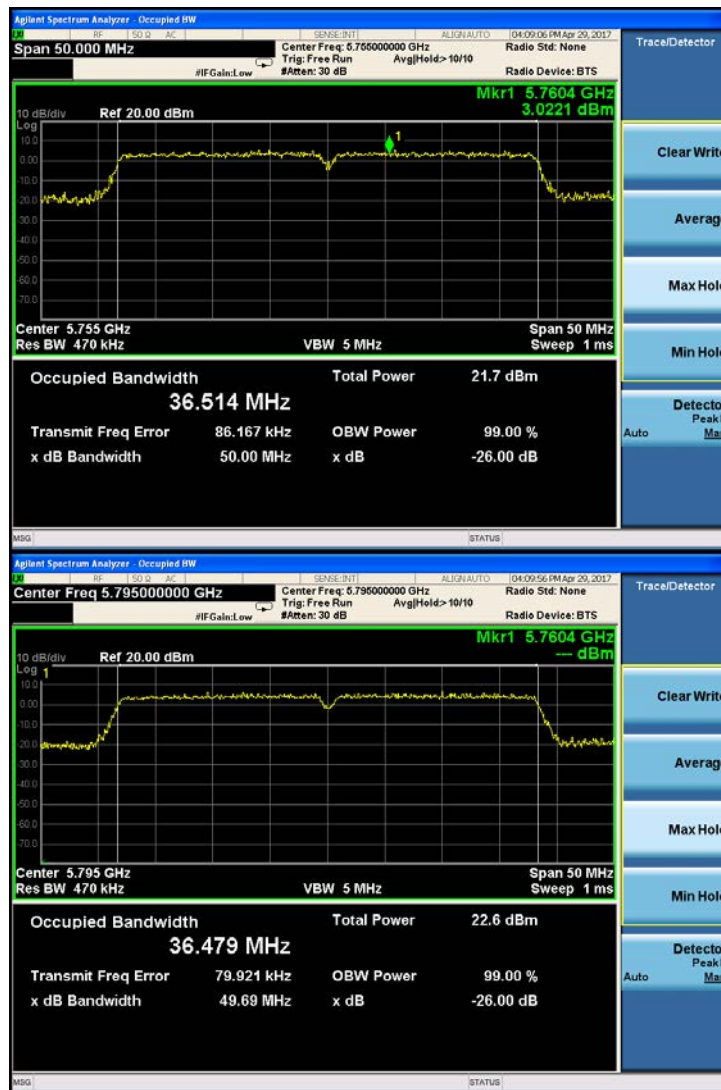
802.11n_HT20_UNII-1



802.11n_HT20_UNII-3



802.11n_HT40_UNII-1



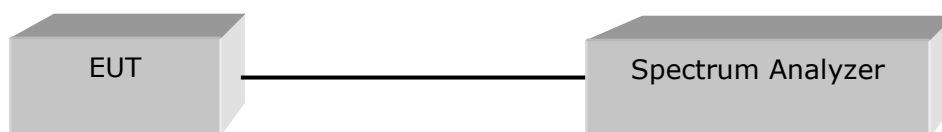
802.11n_HT40_UNII-3

2.1.4 OUTPUT POWER

Test Procedures

Maximum Conducted Output Power(KDB 789033, Method SA-1)

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) RBW = 1 MHz
- b) VBW $\geq 3 \times$ RBW
- c) Sweep time = auto
- d) Detector = power averaging (rms)
- e) Trace mode = Average at least 100

Limit

Band	Mode	ANT Gain (dBi)	Limit (dBm)
UNII 1	802.11a/n	3.73	24
UNII 3			30

Test Data

	Measured Output Power (dBm)	
Mode	802.11a	802.11n_HT20
Frequency		
5180 MHz	10.55	11.62
5200 MHz	10.68	11.80
5240 MHz	10.80	11.69
5745 MHz	14.37	14.80
5785 MHz	13.89	14.59
5825 MHz	13.68	14.20
Measurement uncertainty	± 3 dB	

	Measured Output Power (dBm)	
Mode	802.11n_HT40	
Frequency		
5190 MHz	10.13	
5230 MHz	10.56	
5755 MHz	16.48	
5795 MHz	16.20	
Measurement uncertainty	± 3 dB	

See next pages for actual measured spectrum plots.



802.11a_UNII-1



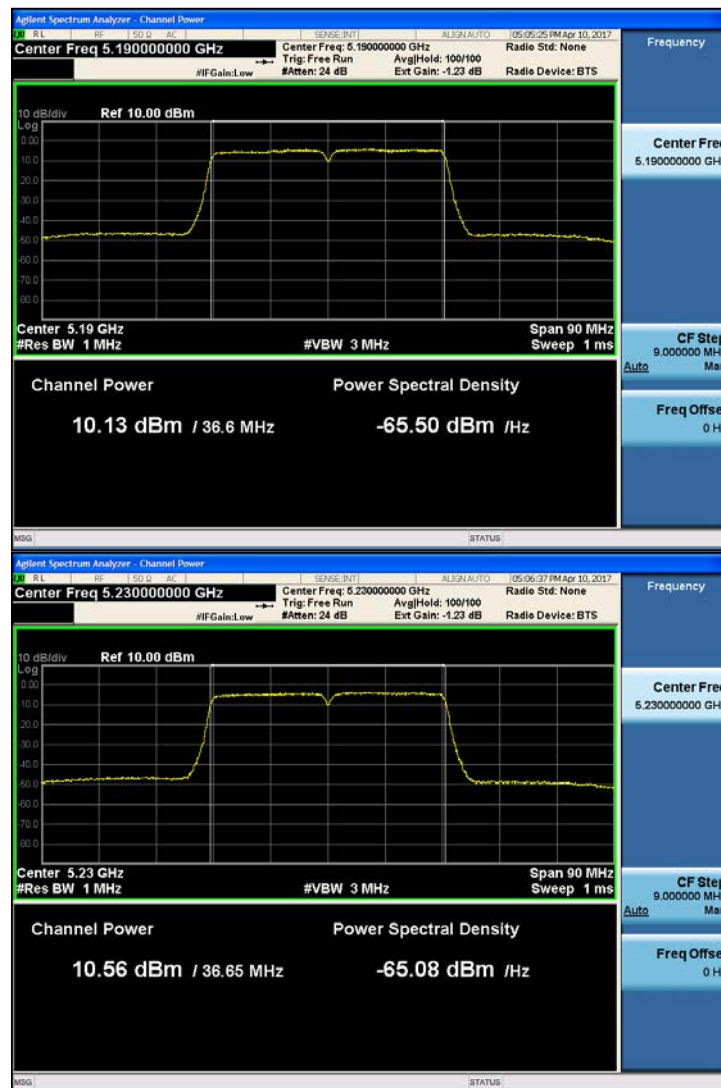
802.11a_UNII-3



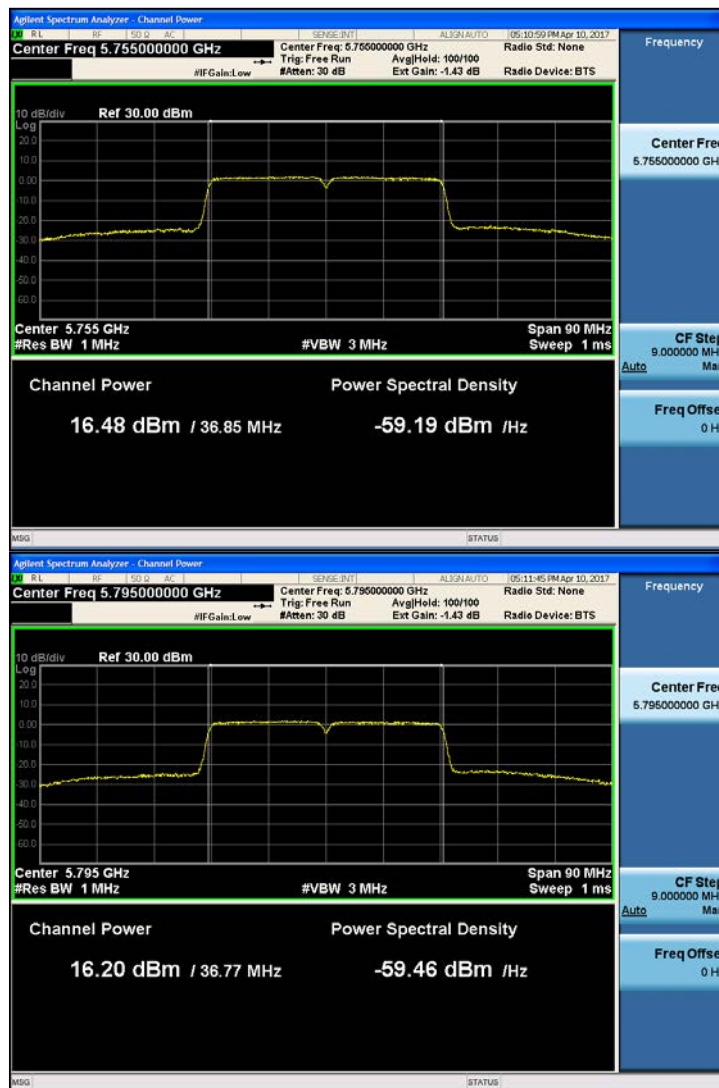
802.11n_HT20_UNII-1



802.11n_HT20_UNII-3



802.11n_HT40_UNII-1



802.11n_HT40_UNII-3

2.1.5 Power Spectral Density

Procedures

Maximum Power Spectral Density (KDB 789033, Method SA-1)

The peak power density is measured with a spectrum analyzer connected to the antenna terminal while the EUT is operating in transmission mode at the appropriate frequencies.

Test Settings :

Center frequency = the highest, middle and the lowest channels

- a) RBW = 1 MHz, 500 KHz (UNII 3)
- b) VBW = 3 MHz, 1.5 MHz (UNII 3)
- c) Sweep time = auto
- d) Detector = power averaging (rms)
- e) Trace mode = Average at least 100

Limit

Band	Mode	ANT Gain (dBi)	Limit (dBm)
UNII 1	802.11a/n	3.73	11
UNII 3			30/500KHz

Test Data

	Measured Power Density (dBm)	
Mode	802.11a	802.11n_HT20
Frequency		
5180 MHz	-0.658	0.161
5200 MHz	-0.432	0.340
5240 MHz	-0.402	0.043
5745 MHz	0.364	0.508
5785 MHz	0.116	0.211
5825 MHz	-0.417	-0.027
Measurement uncertainty	± 3 dB	

	Measured Power Density (dBm)	
Mode	802.11n_HT40	
Frequency		
5190 MHz	-4.037	
5230 MHz	-3.652	
5755 MHz	-0.656	
5795 MHz	-0.983	
Measurement uncertainty	± 3 dB	

See next pages for actual measured spectrum plots.



802.11a_UNII-1



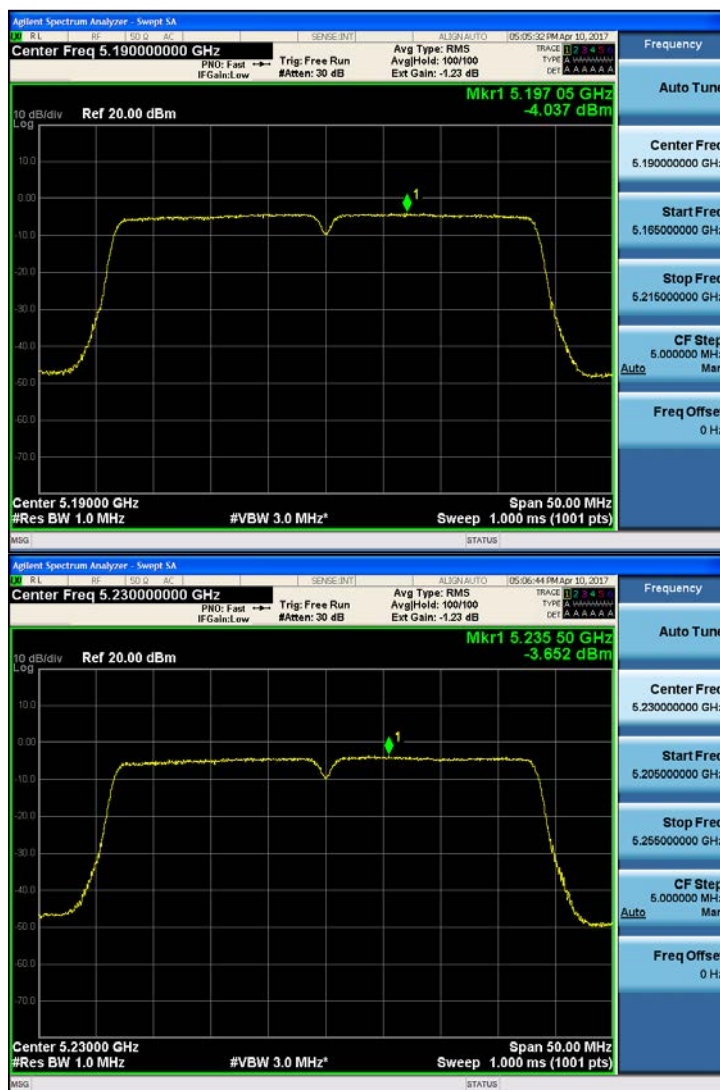
802.11a_UNII-3



802.11n_UNII-1



802.11n_HT20_UNII-3



802.11n_HT40_UNII-1



802.11n_HT40_UNII-3

2.1.6 Frequency Stability

Procedure:

The EUT was placed inside of an environmental chamber as the temperature in the chamber was varied between -10℃ and +70℃ (Declaration by the Manufacturer). The temperature was incremented by 10℃ intervals and the unit was allowed to stabilize at each temperature before each measurement. The center frequency of the transmitting channel was evaluated at each temperature and the frequency deviation from the channel's center frequency was recorded.

Data for the worst case channel is shown below.

Temperature (℃)	-10	0	10	20	30	40
Frequency	Measured Frequency Error (kHz)					
5180 MHz	84.666	127.69	111.39	106.95	84.576	88.797
5200 MHz	74.332	115.84	120.29	90.319	87.148	73.872
5240 MHz	82.942	115.82	113.34	100.71	96.441	81.284
5745 MHz	96.226	138.86	124.28	109.63	95.471	84.602
5785 MHz	92.238	128.83	129.63	113.07	100.00	84.796
5825 MHz	90.504	130.75	119.00	106.55	91.929	82.961

Temperature (℃)	50	60	70
Frequency	Measured Frequency Error (kHz)		
5180 MHz	71.121	77.089	89.663
5200 MHz	61.423	69.052	100.70
5240 MHz	71.850	76.614	107.85
5745 MHz	73.652	86.695	105.07
5785 MHz	82.889	90.217	107.83
5825 MHz	76.254	84.246	110.44

Note :

Based on the results of the frequency stability test shown above the frequency deviation results measured are very small. As such it is determined that the channels at the band edge would remain in-band when the maximum measured frequency deviation noted during the frequency stability tests is applied. Therefore the device is determined to remain operating in band over the temperature range as tested.

2.1.7 Unwanted 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 Test Antenna is positioned with its plane vertical at 1m distance from the EUT. 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.

Test Settings:

Frequency Range = 9 kHz ~ 40 GHz

- a) RBW = 1 MHz for $f \geq 1$ GHz, 120 kHz for $f < 1$ GHz, 9 kHz for $f < 30$ MHz
b) VBW \geq RBW
c) Sweep time = auto

Limit

- 15.209(a)

Frequency(MHz)	Field Strength uV/m@3m	Field Strength dBuV/m@3m	Deasurement Distance (meters)
0.009-0.490	2400/F(kHz)	-	300
0.490-1.705	24000/F(kHz)	-	30
1.705-30	30	-	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.

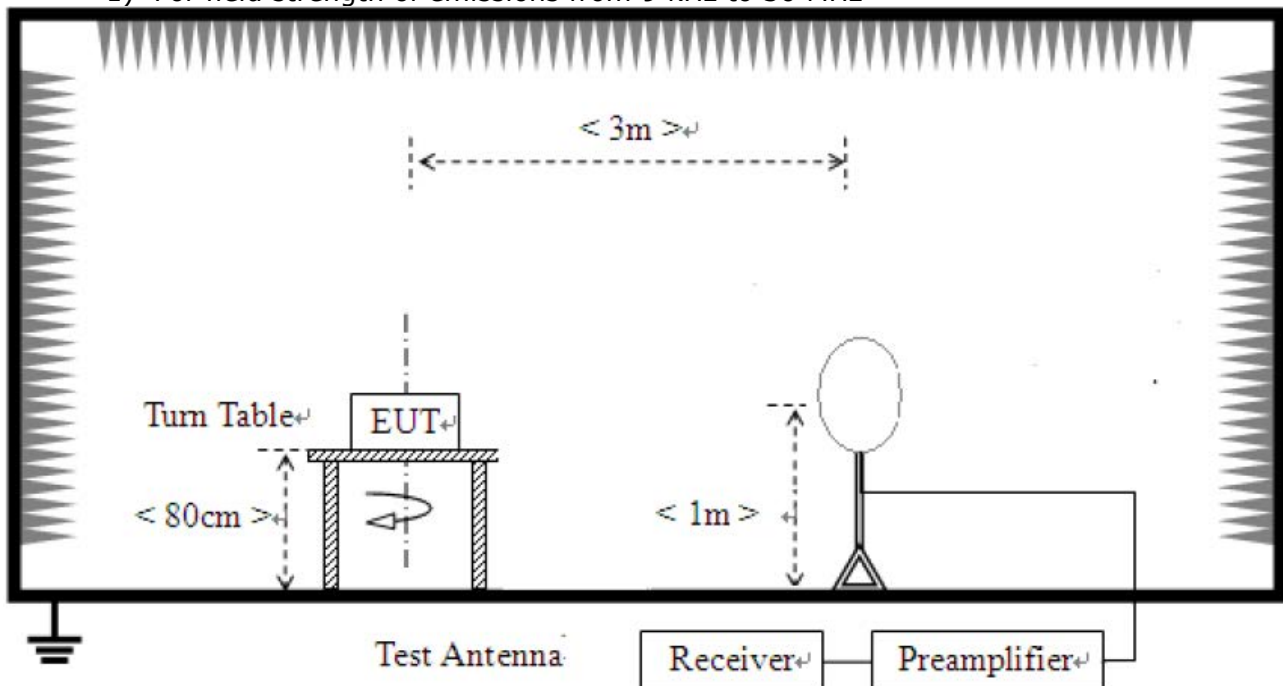
- 15.407, KDB 789033

E.I.R.P -27 dBm/MHz

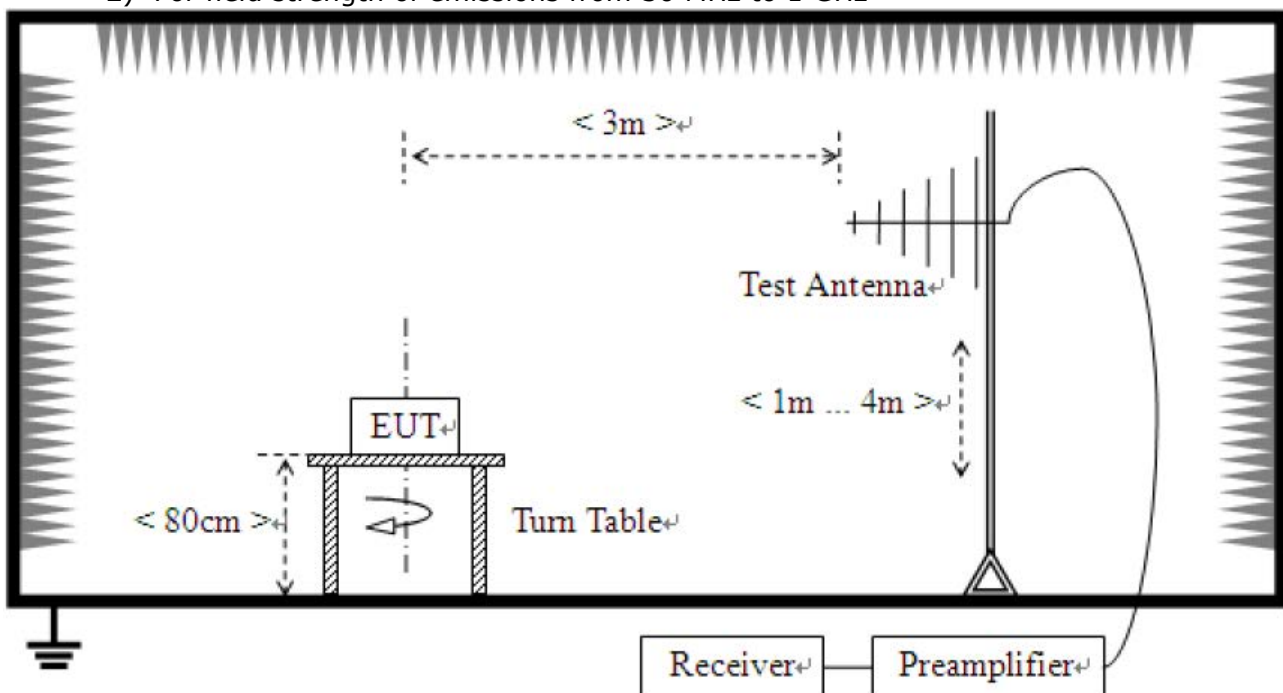
$E[\text{dBuV/m}] = \text{EIRP}[\text{dBm}] + 95.2$, for $d = 3\text{m}$

Test Setup:

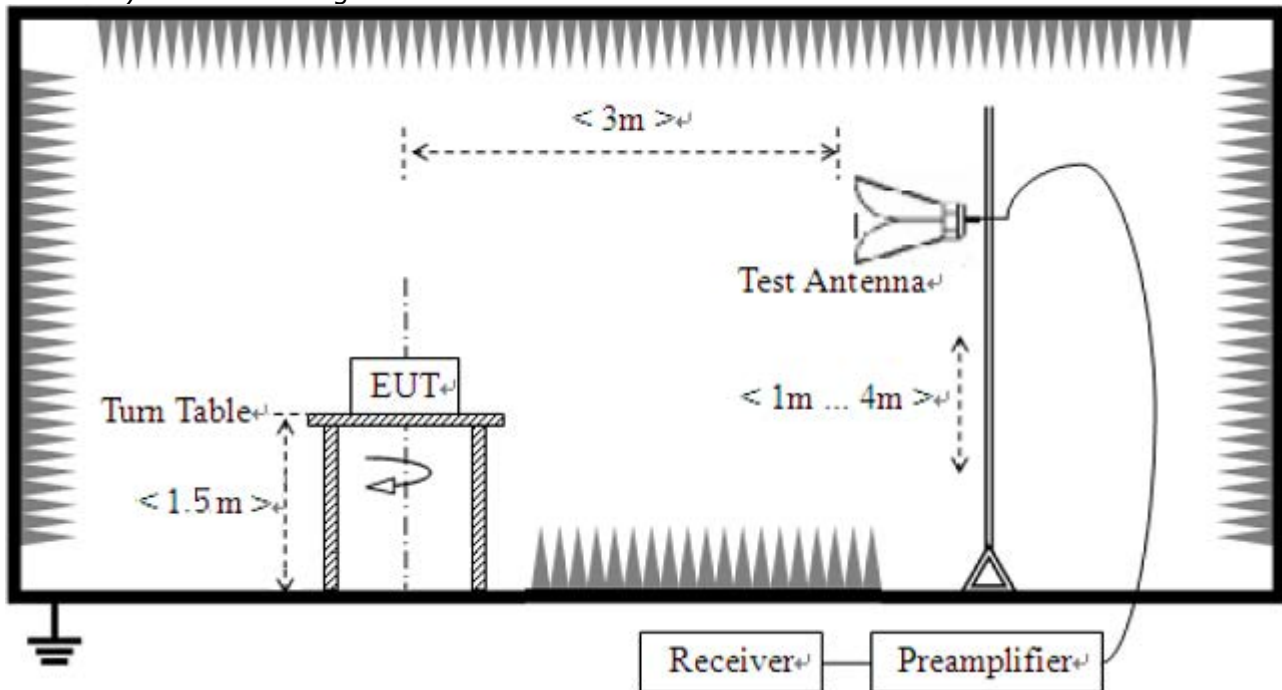
- 1) For field strength of emissions from 9 kHz to 30 MHz



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



3) For field strength of emissions above 1 GHz



Test Mode

The worst-case antenna configuration are determined to be as follows for each mode.

802.11n_HT20 mode

Test Results

1) 9 kHz to 30 MHz

EUT	Android Module	Measurement Detail	
Model	S07	Frequency Range	9 kHz – 30 MHz
Test mode	802.11n_HT20	Detector function	Quasi-Peak

The requirements are:

☒ Complies

Frequency (MHz)	Measured Data (dBuV/m)	Margin (dB)	Remark
-	-	-	See note

Note :

The amplitude of spurious emissions that are attenuated by more than 20 dB below the permissible value has no need to be reported.

Distance extrapolation factor = $40 \log (\text{specific distance} / \text{test distance})$ (dB)

2) 30 MHz to 1 GHz

Test mode : 802.11n_HT20(Worst Case)

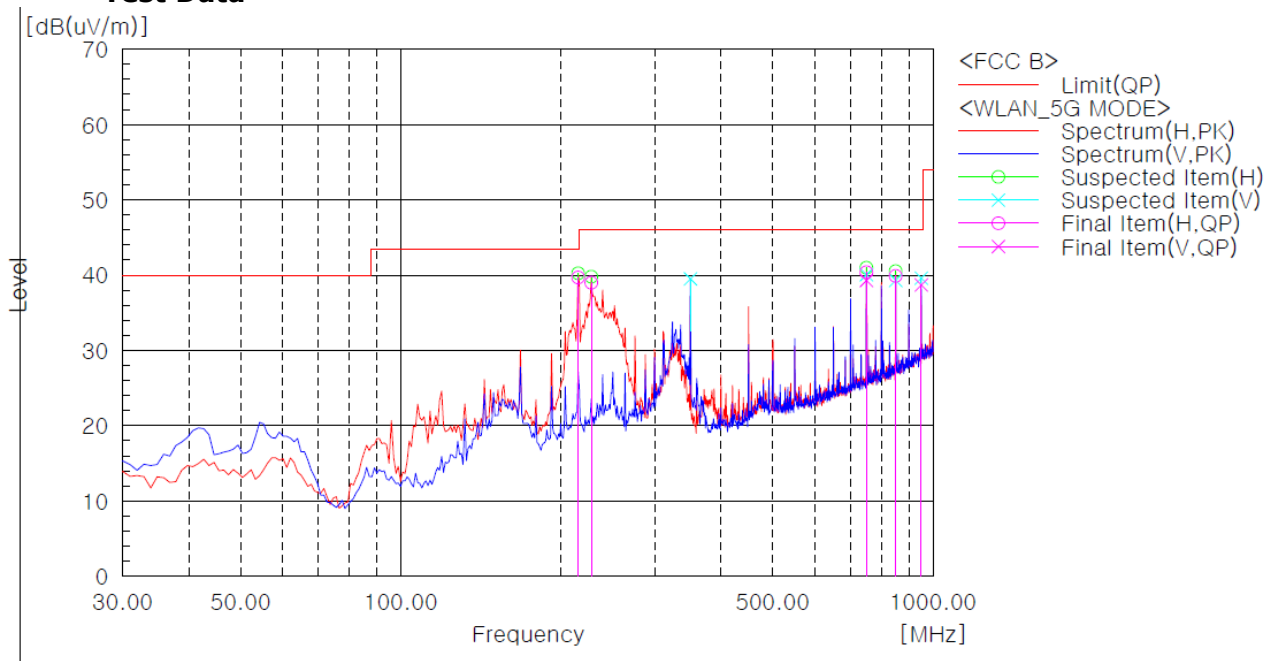
EUT	Android Module	Measurement Detail	
Model	SO7	Frequency Range	Below 1000MHz
Test mode	802.11n_HT20	Detector function	Quasi-Peak

The requirements are:

☒ Complies

Frequency (MHz)	Measured Data (dBuV/m)	Margin (dB)	Remark
215.270	39.7	3.8	Quasi-Peak

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]	Angle [deg]
1	215.270	H	54.3	-14.6	39.7	43.5	3.8	280.9
2	227.880	H	53.3	-14.3	39.0	46.0	7.0	280.9
3	749.740	H	44.4	-4.0	40.4	46.0	5.6	310.0
4	749.740	V	43.3	-4.0	39.3	46.0	6.7	357.8
5	850.620	H	42.3	-2.4	39.9	46.0	6.1	15.2
6	950.530	V	39.2	-0.5	38.7	46.0	7.3	76.8

Remark :

1. The field strength of spurious emission was measured in the following position: EUT and antenna stand-up position(Z axis), lie-down position(X,Y axis). The worst emission was found in stand-up position(Z axis) and the worst case was recorded.

3) above 1 GHz_Radiated Spurious Emission Measurements

Test mode : 802.11a

EUT	Android Module	Measurement Detail	
Model	SO7	Frequency Range	1-40GHz
Mode	802.11a	Detector function	Average / Peak

Remarks

We have tested three mode (X, Y, Z). The worst mode (Z axis) for final test.

The requirements are:

☒ Complies

Frequency (MHz)	Measured Data (dBuV/m)	Margin (dB)	Remark
15540.00	53.11	0.89	Average

Ch.36(5180 MHz)

Frequency [MHz]	(P)	Limit AV [dB(uV/m)]	Limit PK [dB(uV/m)]	Level AV [dB(uV/m)]	Level PK [dB(uV/m)]	Margin AV [dB]	Margin PK [dB]
15540.00	H	54.00	74.00	53.06	62.99	0.94	11.01
15540.00	V	54.00	74.00	53.11	62.54	0.89	11.46
1066.00	H	54.00	74.00	38.33	40.86	15.67	33.14
1066.00	V	54.00	74.00	42.01	43.44	11.99	30.56
2132.00	H	54.00	74.00	45.35	47.57	8.65	26.43
2132.00	V	54.00	74.00	42.77	45.70	11.23	28.30
3198.00	H	54.00	74.00	43.62	47.92	10.38	26.08
3198.00	V	54.00	74.00	40.50	46.45	13.50	27.55
7462.00	H	54.00	74.00	49.56	55.50	4.44	18.50
7462.00	V	54.00	74.00	43.06	52.35	10.94	21.65

Ch.40(5200 MHz)

Frequency [MHz]	(P)	Limit AV [dB(uV/m)]	Limit PK [dB(uV/m)]	Level AV [dB(uV/m)]	Level PK [dB(uV/m)]	Margin AV [dB]	Margin PK [dB]
15600.00	H	54.00	74.00	52.99	62.30	1.01	11.70
15600.00	V	54.00	74.00	52.15	62.13	1.85	11.87
1066.00	H	54.00	74.00	38.00	41.52	16.00	32.48
1066.00	V	54.00	74.00	42.09	44.24	11.91	29.76
2132.00	H	54.00	74.00	45.73	47.73	8.27	26.27
2132.00	V	54.00	74.00	43.06	45.64	10.94	28.36
3198.00	H	54.00	74.00	43.81	47.79	10.19	26.21
3198.00	V	54.00	74.00	40.87	46.19	13.13	27.81
7462.00	H	54.00	74.00	49.46	55.46	4.54	18.54
7462.00	V	54.00	74.00	43.07	52.28	10.93	21.72

Ch.48(5240 MHz)

Frequency [MHz]	(P)	Limit AV [dB(uV/m)]	Limit PK [dB(uV/m)]	Level AV [dB(uV/m)]	Level PK [dB(uV/m)]	Margin AV [dB]	Margin PK [dB]
1066.00	H	54.00	74.00	38.62	41.32	15.38	32.68
1066.00	V	54.00	74.00	41.89	43.73	12.11	30.27
2132.00	H	54.00	74.00	45.43	47.42	8.57	26.58
2132.00	V	54.00	74.00	43.24	45.63	10.76	28.37
3198.00	H	54.00	74.00	43.81	47.94	10.19	26.06
3198.00	V	54.00	74.00	40.75	46.35	13.25	27.65
7462.00	H	54.00	74.00	49.27	55.74	4.73	18.26
7462.00	V	54.00	74.00	43.27	51.95	10.73	22.05

Ch.149(5745 MHz)

Frequency [MHz]	(P)	Limit AV [dB(uV/m)]	Limit PK [dB(uV/m)]	Level AV [dB(uV/m)]	Level PK [dB(uV/m)]	Margin AV [dB]	Margin PK [dB]
1066.00	H	54.00	74.00	38.53	41.36	15.47	32.64
1066.00	V	54.00	74.00	42.50	44.43	11.50	29.57
2132.00	H	54.00	74.00	46.70	49.01	7.30	24.99
2132.00	V	54.00	74.00	42.17	45.62	11.83	28.38
3198.00	H	54.00	74.00	43.62	47.53	10.38	26.47
3198.00	V	54.00	74.00	40.62	46.36	13.38	27.64
7462.00	H	54.00	74.00	49.91	56.04	4.09	17.96
7462.00	V	54.00	74.00	42.15	52.25	11.85	21.75

Ch.157(5785 MHz)

Frequency [MHz]	(P)	Limit AV [dB(uV/m)]	Limit PK [dB(uV/m)]	Level AV [dB(uV/m)]	Level PK [dB(uV/m)]	Margin AV [dB]	Margin PK [dB]
1066.00	H	54.00	74.00	38.77	41.65	15.23	32.35
1066.00	V	54.00	74.00	42.51	44.42	11.49	29.58
2132.00	H	54.00	74.00	46.36	48.55	7.64	25.45
2132.00	V	54.00	74.00	42.74	45.17	11.26	28.83
3198.00	H	54.00	74.00	43.31	47.81	10.69	26.19
3198.00	V	54.00	74.00	40.84	45.98	13.16	28.02
7462.00	H	54.00	74.00	50.15	56.37	3.85	17.63
7462.00	V	54.00	74.00	42.31	51.77	11.69	22.23

Ch.165(5825 MHz)

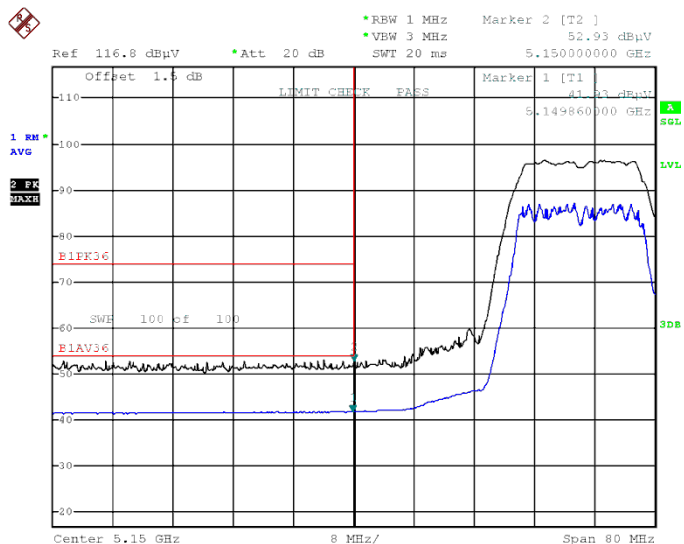
Frequency [MHz]	(P)	Limit AV [dB(uV/m)]	Limit PK [dB(uV/m)]	Level AV [dB(uV/m)]	Level PK [dB(uV/m)]	Margin AV [dB]	Margin PK [dB]
1066.00	H	54.00	74.00	38.68	41.07	15.32	32.93
1066.00	V	54.00	74.00	43.05	45.03	10.95	28.97
2132.00	H	54.00	74.00	45.99	48.21	8.01	25.79
2132.00	V	54.00	74.00	42.09	44.97	11.91	29.03
3198.00	H	54.00	74.00	43.25	47.64	10.75	26.36
3198.00	V	54.00	74.00	40.44	45.99	13.56	28.01
7462.00	H	54.00	74.00	49.80	55.62	4.20	18.38
7462.00	V	54.00	74.00	42.92	52.18	11.08	21.82

Restricted band edge test data

Measured frequency range : 4500-5150MHz, 5850-6250MHz

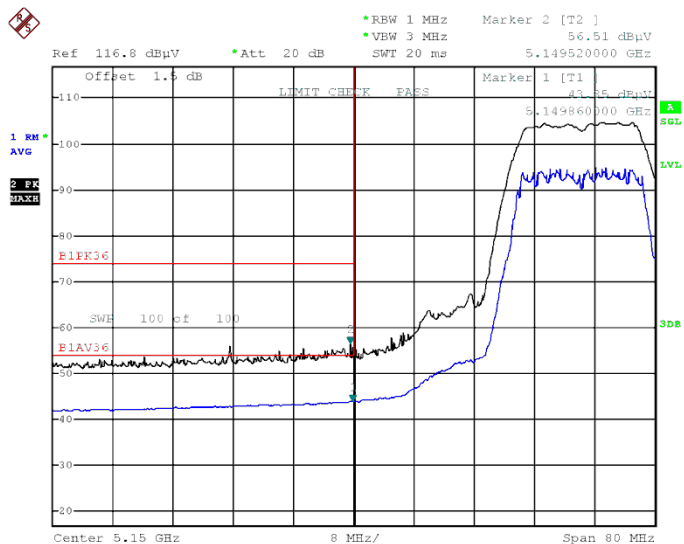
Frequency [MHz]	(P)	Limit AV [dB(uV/m)]	Limit PK [dB(uV/m)]	Level AV [dB(uV/m)]	Level PK [dB(uV/m)]	Margin AV [dB]	Margin PK [dB]
5150.00	H	54.00	74.00	41.93	52.93	12.07	21.07
5150.00	V	54.00	74.00	43.85	56.51	10.15	17.49
5850.00	H	-	78.20	-	57.83	-	20.37
5850.00	V	-	78.20	-	63.67	-	14.53

Worst Case Mode :	802.11a
Worst Case Transfer Rate :	6 Mbps
Distance of Measurements :	3 Meters
Operating Frequency :	5180 MHz
Channel :	36



Date: 21.APR.2017 15:38:23

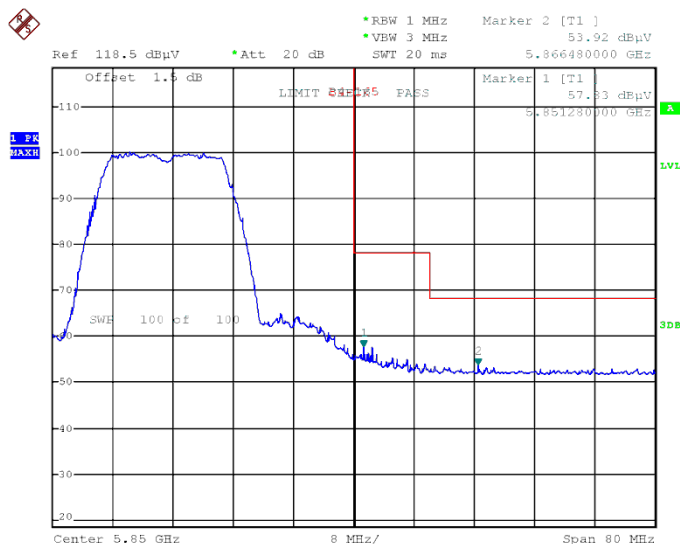
Radiated Restricted Lower Band Edge Plot (Antenna-Horizontal)



Date: 21.APR.2017 15:30:46

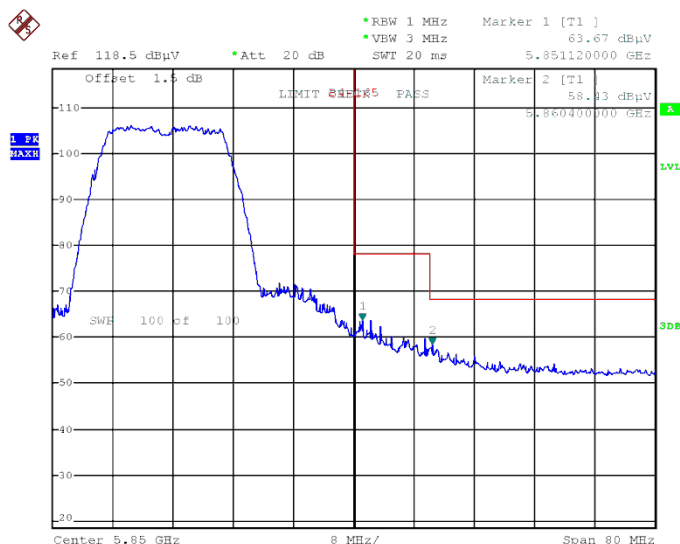
Radiated Restricted Lower Band Edge Plot (Antenna-Vertical)

Worst Case Mode :	802.11a
Worst Case Transfer Rate :	6 Mbps
Distance of Measurements :	3 Meters
Operating Frequency :	5825 MHz
Channel :	165



Date: 21.APR.2017 16:47:15

Radiated Restricted Upper Band Edge Plot (Antenna-Horizontal)



Date: 21.APR.2017 16:43:05

Radiated Restricted Upper Band Edge Plot (Antenna-Vertical)

Test mode : 802.11n_HT20

EUT	Android Module	Measurement Detail	
Model	SO7	Frequency Range	1-40GHz
Mode	802.11n_HT20	Detector function	Average / Peak

Remarks

We have tested three mode (X, Y, Z). The worst mode (Z axis) for final test.

The requirements are:

☒ Complies

Frequency (MHz)	Measured Data (dBuV/m)	Margin (dB)	Remark
15600.00	52.97	1.03	Average

Ch.36(5180 MHz)

Frequency [MHz]	(P)	Limit AV [dB(uV/m)]	Limit PK [dB(uV/m)]	Level AV [dB(uV/m)]	Level PK [dB(uV/m)]	Margin AV [dB]	Margin PK [dB]
15540.00	H	54.00	74.00	52.10	62.37	1.90	11.63
15540.00	V	54.00	74.00	52.83	62.54	1.17	11.46
1066.00	H	54.00	74.00	38.73	41.14	15.27	32.86
1066.00	V	54.00	74.00	41.96	43.93	12.04	30.07
2132.00	H	54.00	74.00	46.06	47.85	7.94	26.15
2132.00	V	54.00	74.00	42.69	45.42	11.31	28.58
3198.00	H	54.00	74.00	42.85	47.98	11.15	26.02
3198.00	V	54.00	74.00	40.10	46.36	13.90	27.64
7462.00	H	54.00	74.00	49.86	55.83	4.14	18.17
7462.00	V	54.00	74.00	42.44	51.45	11.56	22.55

Ch.40(5200 MHz)

Frequency [MHz]	(P)	Limit AV [dB(uV/m)]	Limit PK [dB(uV/m)]	Level AV [dB(uV/m)]	Level PK [dB(uV/m)]	Margin AV [dB]	Margin PK [dB]
15600.00	H	54.00	74.00	52.97	62.39	1.03	11.61
15600.00	V	54.00	74.00	52.08	62.55	1.92	11.45
1066.00	H	54.00	74.00	38.61	41.50	15.39	32.50
1066.00	V	54.00	74.00	42.32	44.59	11.68	29.41
2132.00	H	54.00	74.00	45.70	47.68	8.30	26.32
2132.00	V	54.00	74.00	41.20	44.52	12.80	29.48
3198.00	H	54.00	74.00	43.00	47.74	11.00	26.26
3198.00	V	54.00	74.00	40.10	46.07	13.90	27.93
7462.00	H	54.00	74.00	50.21	56.23	3.79	17.77
7462.00	V	54.00	74.00	43.34	51.92	10.66	22.08

Ch.48(5240 MHz)

Frequency [MHz]	(P)	Limit AV [dB(uV/m)]	Limit PK [dB(uV/m)]	Level AV [dB(uV/m)]	Level PK [dB(uV/m)]	Margin AV [dB]	Margin PK [dB]
1066.00	H	54.00	74.00	38.87	41.69	15.13	32.31
1066.00	V	54.00	74.00	42.41	44.14	11.59	29.86
2132.00	H	54.00	74.00	45.83	47.94	8.17	26.06
2132.00	V	54.00	74.00	41.36	44.58	12.64	29.42
3198.00	H	54.00	74.00	42.98	47.48	11.02	26.52
3198.00	V	54.00	74.00	40.49	46.13	13.51	27.87
7462.00	H	54.00	74.00	50.00	55.72	4.00	18.28
7462.00	V	54.00	74.00	43.41	51.79	10.59	22.21

Ch.149(5745 MHz)

Frequency [MHz]	(P)	Limit AV [dB(uV/m)]	Limit PK [dB(uV/m)]	Level AV [dB(uV/m)]	Level PK [dB(uV/m)]	Margin AV [dB]	Margin PK [dB]
1066.00	V	54.00	74.00	42.32	44.34	11.68	29.66
2132.00	H	54.00	74.00	45.96	47.92	8.04	26.08
2132.00	V	54.00	74.00	40.99	44.29	13.01	29.71
3198.00	H	54.00	74.00	43.15	47.19	10.85	26.81
3198.00	V	54.00	74.00	40.30	46.10	13.70	27.90
7462.00	H	54.00	74.00	49.86	55.75	4.14	18.25
7462.00	V	54.00	74.00	43.34	52.00	10.66	22.00
1066.00	V	54.00	74.00	42.32	44.34	11.68	29.66

Ch.157(5785 MHz)

Frequency [MHz]	(P)	Limit AV [dB(uV/m)]	Limit PK [dB(uV/m)]	Level AV [dB(uV/m)]	Level PK [dB(uV/m)]	Margin AV [dB]	Margin PK [dB]
1066.00	H	54.00	74.00	38.57	41.07	15.43	32.93
1066.00	V	54.00	74.00	42.47	44.24	11.53	29.76
2132.00	H	54.00	74.00	45.99	47.78	8.01	26.22
2132.00	V	54.00	74.00	41.17	44.38	12.83	29.62
3198.00	H	54.00	74.00	43.05	47.47	10.95	26.53
3198.00	V	54.00	74.00	40.10	45.80	13.90	28.20
7462.00	H	54.00	74.00	50.35	55.90	3.65	18.10
7462.00	V	54.00	74.00	43.56	52.16	10.44	21.84

Ch.165(5825 MHz)

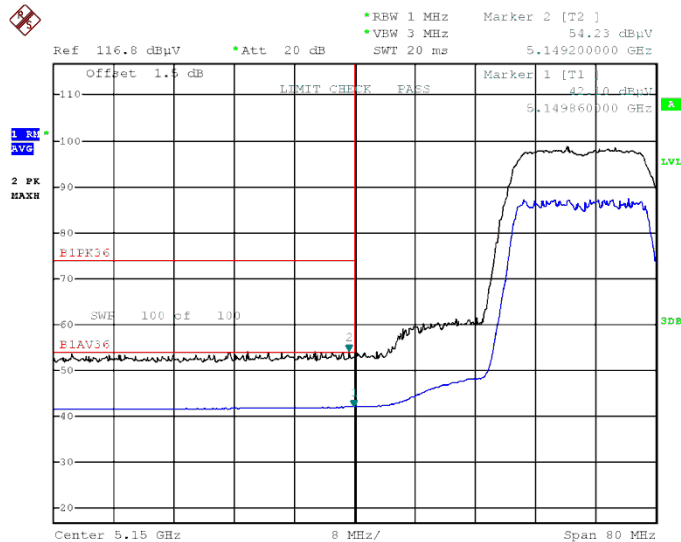
Frequency [MHz]	(P)	Limit AV [dB(uV/m)]	Limit PK [dB(uV/m)]	Level AV [dB(uV/m)]	Level PK [dB(uV/m)]	Margin AV [dB]	Margin PK [dB]
1066.00	H	54.00	74.00	39.13	42.37	14.87	31.63
1066.00	V	54.00	74.00	42.35	44.01	11.65	29.99
2132.00	H	54.00	74.00	45.65	47.60	8.35	26.40
2132.00	V	54.00	74.00	41.64	44.58	12.36	29.42
3198.00	H	54.00	74.00	42.89	46.96	11.11	27.04
3198.00	V	54.00	74.00	40.45	45.75	13.55	28.25
7462.00	H	54.00	74.00	49.98	56.08	4.02	17.92
7462.00	V	54.00	74.00	43.00	51.64	11.00	22.36

Restricted band edge test data

Measured frequency range : 4500-5150MHz, 5850-6250MHz

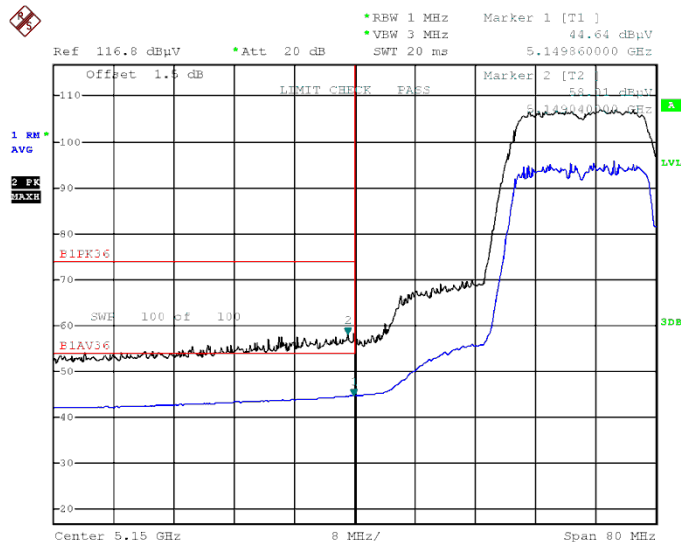
Frequency [MHz]	(P)	Limit AV [dB(uV/m)]	Limit PK [dB(uV/m)]	Level AV [dB(uV/m)]	Level PK [dB(uV/m)]	Margin AV [dB]	Margin PK [dB]
5150.00	H	54.00	74.00	42.10	54.23	11.90	19.77
5150.00	V	54.00	74.00	44.64	58.01	9.36	15.99
5850.00	H	-	78.20	-	62.16	-	16.04
5850.00	V	-	78.20	-	67.62	-	10.58

Worst Case Mode :	802.11n_HT20
Worst Case Transfer Rate :	MCS 0
Distance of Measurements :	3 Meters
Operating Frequency :	5180 MHz
Channel :	36



Date: 21.APR.2017 15:51:09

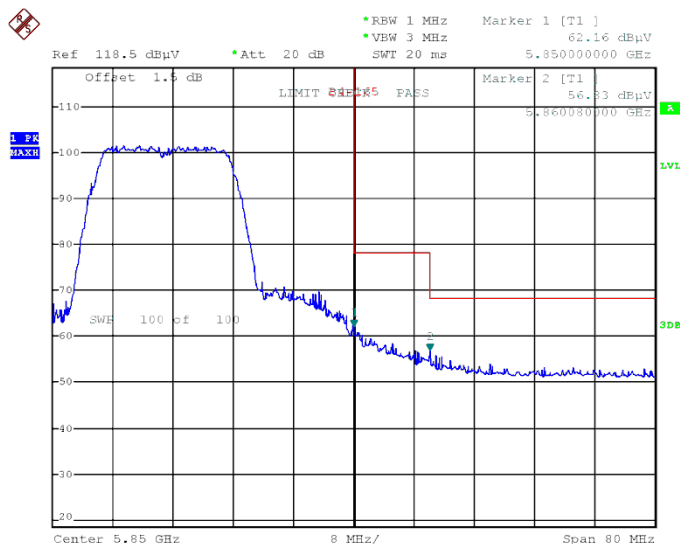
Radiated Restricted Lower Band Edge Plot (Antenna-Horizontal)



Date: 21.APR.2017 15:52:45

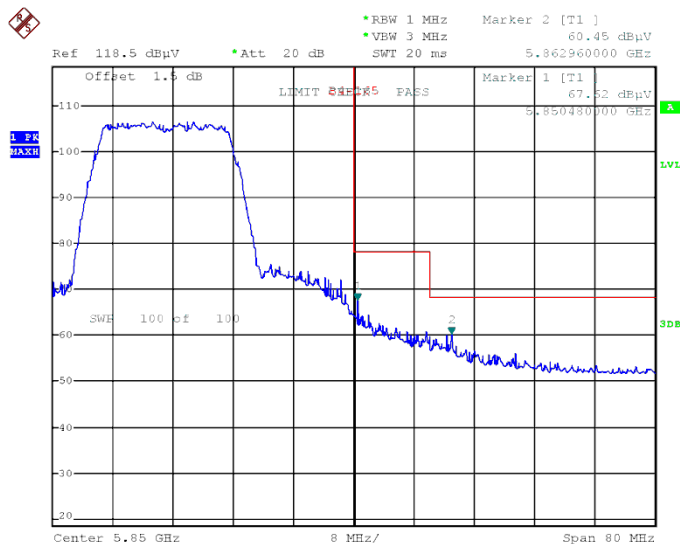
Radiated Restricted Lower Band Edge Plot (Antenna-Vertical)

Worst Case Mode :	802.11n_HT20
Worst Case Transfer Rate :	MCS 0
Distance of Measurements :	3 Meters
Operating Frequency :	5825 MHz
Channel :	165



Date: 21.APR.2017 16:05:52

Radiated Restricted Upper Band Edge Plot (Antenna-Horizontal)



Date: 21.APR.2017 16:07:06

Radiated Restricted Upper Band Edge Plot (Antenna-Vertical)

Test mode : 802.11n_HT40

EUT	Android Module	Measurement Detail	
Model	SO7	Frequency Range	1-40GHz
Mode	802.11n_HT40	Detector function	Average / Peak

Remarks

We have tested three mode (X, Y, Z). The worst mode (Z axis) for final test.

The requirements are:

☒ Complies

Frequency (MHz)	Measured Data (dBuV/m)	Margin (dB)	Remark
7462.00	50.16	3.84	Average

Ch.36(5190 MHz)

Frequency [MHz]	(P)	Limit AV [dB(uV/m)]	Limit PK [dB(uV/m)]	Level AV [dB(uV/m)]	Level PK [dB(uV/m)]	Margin AV [dB]	Margin PK [dB]
1066.00	H	54.00	74.00	38.27	40.83	15.73	33.17
1066.00	V	54.00	74.00	42.74	44.52	11.26	29.48
2132.00	H	54.00	74.00	43.84	46.58	10.16	27.42
2132.00	V	54.00	74.00	42.12	45.07	11.88	28.93
3198.00	H	54.00	74.00	44.02	47.96	9.98	26.04
3198.00	V	54.00	74.00	40.66	46.01	13.34	27.99
7462.00	H	54.00	74.00	49.89	55.71	4.11	18.29
7462.00	V	54.00	74.00	44.08	52.09	9.92	21.91

Ch.48(5230 MHz)

Frequency [MHz]	(P)	Limit AV [dB(uV/m)]	Limit PK [dB(uV/m)]	Level AV [dB(uV/m)]	Level PK [dB(uV/m)]	Margin AV [dB]	Margin PK [dB]
1066.00	H	54.00	74.00	37.73	41.33	16.27	32.67
1066.00	V	54.00	74.00	42.16	44.07	11.84	29.93
2132.00	H	54.00	74.00	44.15	46.69	9.85	27.31
2132.00	V	54.00	74.00	41.73	45.12	12.27	28.88
3198.00	H	54.00	74.00	44.27	48.13	9.73	25.87
3198.00	V	54.00	74.00	40.76	46.23	13.24	27.77
7462.00	H	54.00	74.00	50.16	55.74	3.84	18.26
7462.00	V	54.00	74.00	44.14	52.14	9.86	21.86

Ch.149(5755 MHz)

Frequency [MHz]	(P)	Limit AV [dB(uV/m)]	Limit PK [dB(uV/m)]	Level AV [dB(uV/m)]	Level PK [dB(uV/m)]	Margin AV [dB]	Margin PK [dB]
1066.00	H	54.00	74.00	38.51	40.83	15.49	33.17
1066.00	V	54.00	74.00	42.82	43.86	11.18	30.14
2132.00	H	54.00	74.00	44.04	46.46	9.96	27.54
2132.00	V	54.00	74.00	41.88	44.69	12.12	29.31
3198.00	H	54.00	74.00	44.22	48.21	9.78	25.79
3198.00	V	54.00	74.00	40.65	46.09	13.35	27.91
7462.00	H	54.00	74.00	50.02	55.97	3.98	18.03
7462.00	V	54.00	74.00	44.03	52.61	9.97	21.39

Ch.157(5795 MHz)

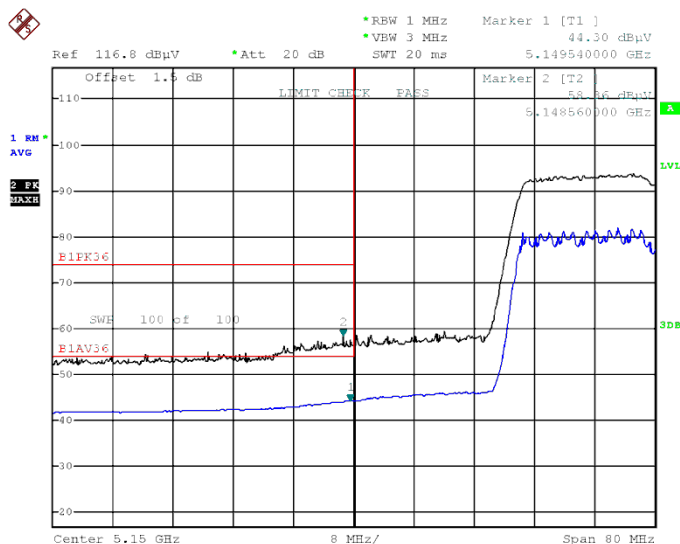
Frequency [MHz]	(P)	Limit AV [dB(uV/m)]	Limit PK [dB(uV/m)]	Level AV [dB(uV/m)]	Level PK [dB(uV/m)]	Margin AV [dB]	Margin PK [dB]
1066.00	H	54.00	74.00	37.75	40.77	16.25	33.23
1066.00	V	54.00	74.00	42.09	43.96	11.91	30.04
2132.00	H	54.00	74.00	44.10	46.26	9.90	27.74
2132.00	V	54.00	74.00	41.62	44.41	12.38	29.59
3198.00	H	54.00	74.00	44.26	48.06	9.74	25.94
3198.00	V	54.00	74.00	40.64	45.92	13.36	28.08
7462.00	H	54.00	74.00	50.04	56.04	3.96	17.96
7462.00	V	54.00	74.00	44.09	52.13	9.91	21.87

Restricted band edge test data

Measured frequency range : 4500-5150MHz, 5850-6250MHz

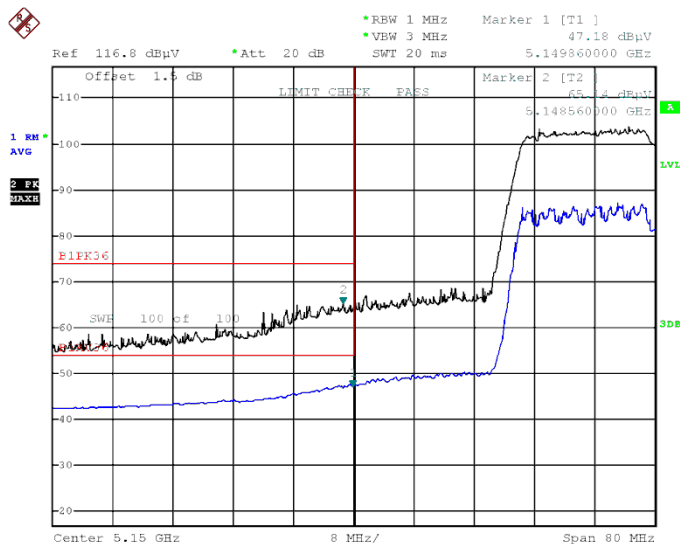
Frequency [MHz]	(P)	Limit AV [dB(uV/m)]	Limit PK [dB(uV/m)]	Level AV [dB(uV/m)]	Level PK [dB(uV/m)]	Margin AV [dB]	Margin PK [dB]
5150.00	H	54.00	74.00	44.30	58.86	9.70	15.14
5150.00	V	54.00	74.00	47.18	65.14	6.82	8.86
5850.00	H	-	78.20	-	59.89	-	18.31
5850.00	V	-	78.20	-	63.57	-	14.63

Worst Case Mode :	802.11n_HT40
Worst Case Transfer Rate :	MCS 0
Distance of Measurements :	3 Meters
Operating Frequency :	5190 MHz
Channel :	38



Date: 21.APR.2017 15:59:46

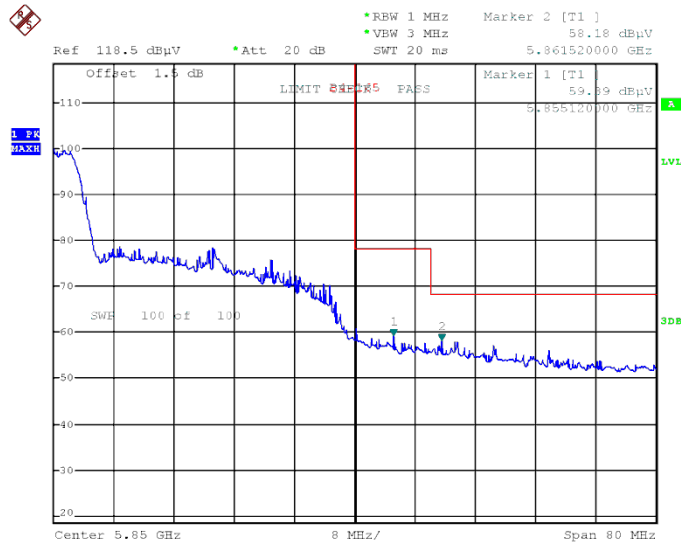
Radiated Restricted Lower Band Edge Plot (Antenna-Horizontal)



Date: 21.APR.2017 15:57:31

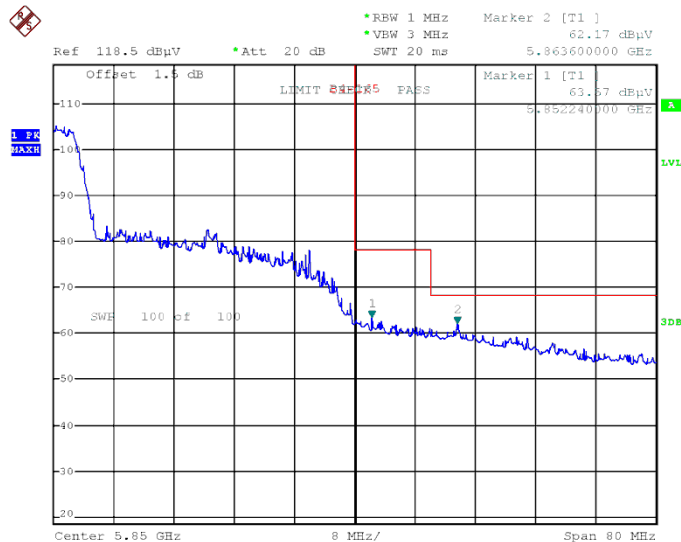
Radiated Restricted Lower Band Edge Plot (Antenna-Vertical)

Worst Case Mode :	802.11n_HT40
Worst Case Transfer Rate :	MCS 0
Distance of Measurements :	3 Meters
Operating Frequency :	5795 MHz
Channel :	159



Date: 21.APR.2017 16:04:24

Radiated Restricted Upper Band Edge Plot (Antenna-Horizontal)



Date: 21.APR.2017 16:03:07

Radiated Restricted Upper Band Edge Plot (Antenna-Vertical)

2.1.8 AC Conducted Emissions

Test Location

Shielded Room

Frequency Range of Measurement

150 kHz to 30 MHz

Instrument Settings

IF Band Width: 9 kHz

Test Procedures

The EUT was placed on a non-metallic table 0.8m above the metallic, grounded floor and 0.4m from the reference ground plane wall. The distance to other metallic surfaces was at least 0.8m.

Amplitude measurements were performed with a quasi-peak detector and an average detector.

Limit

- 15.207(a)

Frequency (MHz)	Conducted Limit (dBuV)	
	Quasi-peak	Average
0.15 ~ 0.5	66 to 56*	56 to 46*
0.5 ~ 5	56	46
5 ~ 30	60	50

* Decreases with the logarithm of the frequency.

Test Results

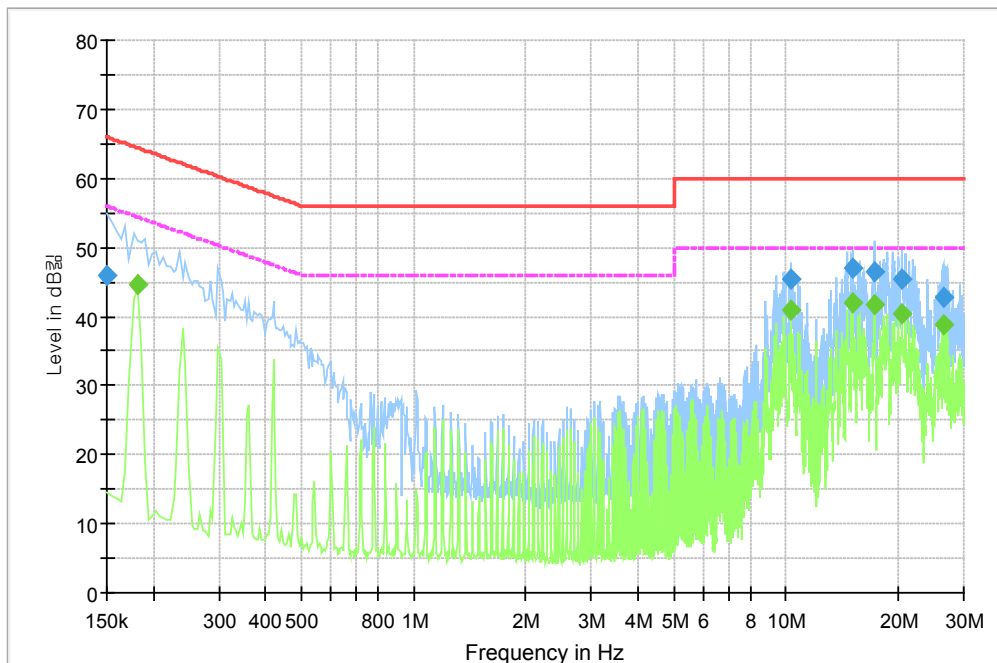
The requirements are:

☒ Complies

Frequency (MHz)	Measured Data (dBuV/m)	Margin (dB)	Remark
15.135 000	42.4	7.6	Average

Test Data

[LINE]
3CE_Class B_L1



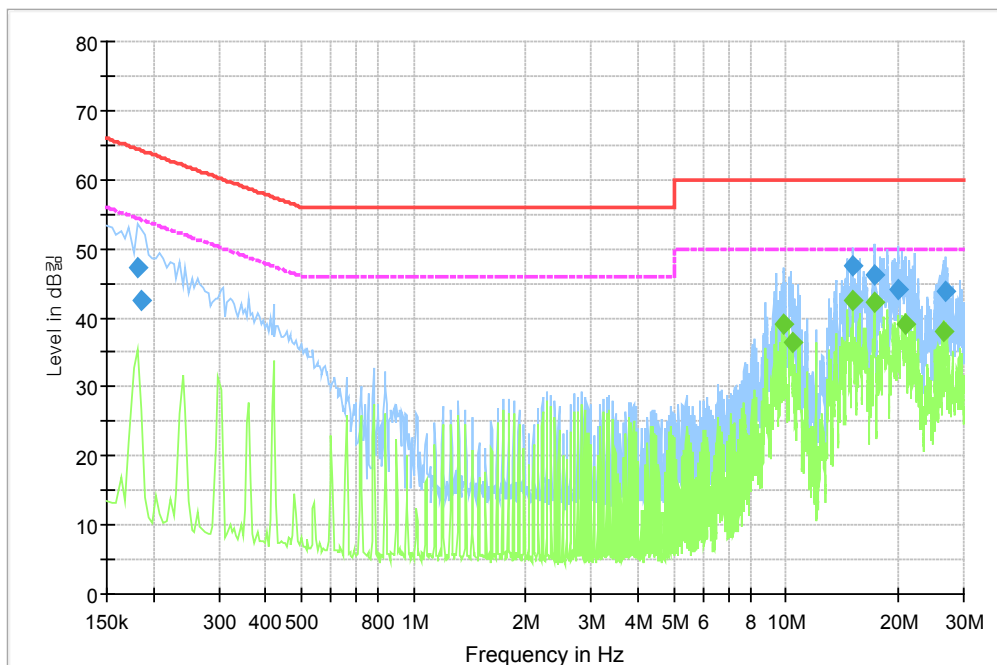
Final Result 1

Frequency (MHz)	QuasiPeak (dBuV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBuV)
0.150000	45.9	1000.0	9.000	On	L1	9.8	20.1	66.0
10.324500	45.3	1000.0	9.000	On	L1	10.0	14.7	60.0
15.135000	47.0	1000.0	9.000	On	L1	10.0	13.0	60.0
17.245500	46.6	1000.0	9.000	On	L1	10.1	13.4	60.0
20.409000	45.4	1000.0	9.000	On	L1	10.1	14.6	60.0
26.389500	42.9	1000.0	9.000	On	L1	10.1	17.1	60.0

Final Result 2

Frequency (MHz)	CAverage (dBuV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBuV)
0.181500	44.6	1000.0	9.000	On	L1	9.9	9.8	54.4
10.329000	40.8	1000.0	9.000	On	L1	10.0	9.2	50.0
15.135000	42.0	1000.0	9.000	On	L1	10.0	8.0	50.0
17.245500	41.6	1000.0	9.000	On	L1	10.1	8.4	50.0
20.413500	40.3	1000.0	9.000	On	L1	10.1	9.7	50.0
26.371500	38.9	1000.0	9.000	On	L1	10.1	11.1	50.0

[NEUTRAL]
3CE_Class B_N



Final Result 1

Frequency (MHz)	QuasiPeak (dBuV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBuV)
0.181500	47.4	1000.0	9.000	On	N	9.9	17.1	64.4
0.186000	42.4	1000.0	9.000	On	N	9.9	21.8	64.2
15.130500	47.5	1000.0	9.000	On	N	10.1	12.5	60.0
17.250000	46.3	1000.0	9.000	On	N	10.2	13.7	60.0
19.932000	44.2	1000.0	9.000	On	N	10.2	15.8	60.0
26.947500	43.8	1000.0	9.000	On	N	10.3	16.2	60.0

Final Result 2

Frequency (MHz)	CAverage (dBuV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBuV)
9.856500	39.0	1000.0	9.000	On	N	10.0	11.0	50.0
10.441500	36.5	1000.0	9.000	On	N	10.0	13.5	50.0
15.135000	42.4	1000.0	9.000	On	N	10.1	7.6	50.0
17.241000	42.2	1000.0	9.000	On	N	10.2	7.8	50.0
20.989500	39.1	1000.0	9.000	On	N	10.2	10.9	50.0
26.376000	38.1	1000.0	9.000	On	N	10.3	11.9	50.0

APPENDIX A – Test Equipment Used For Tests

	Name of Equipment	Manufacturer	Model No.	Serial No.	Cal Date	Due Date
1	Signal Analyzer	Agilent	N9020A	MY48011598	2016-11-01	2017-11-01
2	Spectrum Analyzer	Rohde & Schwarz	FSP-30	100994	2016-11-01	2017-11-01
3	Signal Generator	Rohde & Schwarz	SMB100A	175528	2016-11-01	2017-11-01
4	EMI Test Receiver	Rohde & Schwarz	ESCI7	100032	2017-02-02	2018-02-02
5	LISN	Rohde & Schwarz	ENV216	101235	2016-05-14	2017-05-14
6	EMI Test Receiver	Rohde & Schwarz	ESCI7	100814	2016-11-01	2017-11-01
7	Bilog Antenna	Schaffner	CBL6111C	2551	2016-05-13	2018-05-13
8	Active Loop Antenna	SCHWARZBECK	FMZB 1513	1513-126	2016-05-25	2018-05-25
9	6dB Attenuator	R&S	DNF	272.4110.50-2	2016-11-01	2017-11-01
10	6dB Attenuator	R&S	DNF	272.4110.50-1	2017-02-03	2018-02-03
11	AMPLIFIER	SONOMA	310	291721	2017-02-02	2018-02-02
12	EMI Test Receiver	Rohde & Schwarz	ESU40	100336	2015-05-14	2017-05-14
13	Preamplifier	Agilent	8449B	3008A02011	2016-12-01	2017-12-01
14	Horn Antenna	ETS-Lindgren	3115	00078894	2015-09-02	2017-09-02
15	Horn Antenna	ETS-Lindgren	3116	00062504	2015-09-04	2017-09-04
16	Horn Antenna	ETS-Lindgren	3117	00154525	2015-09-02	2017-09-02
17	Band Reject Filter	Micro Tronics	BRM50702	G233	2017-02-03	2018-02-03
18	Band Reject Filter	Micro Tronics	BRM50716	G184	2017-02-03	2018-02-03
19	Temp&Humi Chamber	ESPEC CORP.	SH-241	92000872	2017-02-02	2018-02-02