FCC Test Report

FCC ID	**:**	**BKMAE-E92**
Equipment	**:**	**11nabg 2x2 USB RF module**
Model No.	**:**	**DNUK-E92**
Brand Name	**:**	**EPSON**
Applicant	**:**	**Seiko Epson Corporation**
Address	**:**	**3-3-5 Owa,Suwa-shi,Nagano 392-8502 Japan**
Standard	**:**	**47 CFR FCC Part 15.407**
Received Date	**:**	**Jan. 09, 2014**
Tested Date	**:**	**Jan. 09 ~ Jan. 23, 2014**

We, International Certification Corp., would like to declare that the tested sample has been evaluated and in compliance with the requirement of the above standards. The test results contained in this report refer exclusively to the product. It may be duplicated completely for legal use with the approval of the applicant. It shall not be reproduced except in full without the written approval of our laboratory.

Approved & Reviewed by:

Gary Chang / Manager

Testing Laboratory
2732

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Release Record

Report No.	Version	Description	Issued Date
FR410802AN	Rev. 01	Initial issue	Feb. 14, 2014

Summary of Test Results

FCC Rules	Test Items	Measured	Result
15.207	Conducted Emissions	[dBuV]: 0.155MHz 46.10 (Margin 9.64dB) - AV	Pass
15.407(b) 15.209	Radiated Emissions	[dBuV/m at 3m]: 5150.00MHz 48.59 (Margin 5.41dB) - AV	Pass
15.407(a)	Emission Bandwidth	Meet the requirement of limit	Pass
15.407(a)	RF Output Power	Power [dBm]: 11a: 14.38 HT20: 15.38 HT40: 15.36	Pass
15.407(a)	Peak Power Spectral Density	Meet the requirement of limit	Pass
15.407(a)	Peak Excursion	Meet the requirement of limit	Pass
15.407(g)	Frequency Stability	Meet the requirement of limit	Pass
15.203	Antenna Requirement	Meet the requirement of limit	Pass

1 General Description

1.1 Information

1.1.1 Specification of the Equipment under Test (EUT)

RF General Information					
IEEE Std. 802.11	Frequency Range (MHz)	Ch. Freq. (MHz)	Channel Number	Transmit Chains (N_{TX})	Data Rate / MCS
a	5150-5250	5180-5240	36-48 [4]	1	6-54 Mbps
n (HT20)	5150-5250	5180-5240	36-48 [4]	1	MCS 0-7
n (HT20)	5150-5250	5180-5240	36-48 [4]	2	MCS 8-15
n (HT40)	5150-5250	5190-5230	38-46 [2]	1	MCS 0-7
n (HT40)	5150-5250	5190-5230	38-46 [2]	2	MCS 8-15
Note 1: RF output power specifies that Maximum Conducted Output Power. Note 2: 802.11a/n uses a combination of OFDM-BPSK, QPSK, 16QAM, 64QAM modulation.					

1.1.2 Antenna Details

Ant. No.	Model	Type	Connector	Operating Frequencies (MHz) / Antenna Gain (dBi)				
				2400~2483.5	5150~5250	5250~5350	5470~5725	5725~5850
1	S203L ANT1	PIFA	NA	2.98	2.35	2.81	2.24	0.89
2	S203L ANT2	PIFA	NA	3.43	2.29	2.34	2.11	1.92

1.1.3 Power Supply Type of Equipment under Test (EUT)

Power Supply Type	5Vdc from Host

1.1.4 Accessories

N/A

1.1.5 Channel List

802.11 a / HT20		HT40	
Channel	Frequency(MHz)	Channel	Frequency(MHz)
36	5180	38	5190
40	5200	46	5230
44	5220	---	---
48	5240	---	---

1.1.6 Test Tool and Duty Cycle

Test Tool	Realtek MP Tool V0.0023.1101.2013		
Duty Cycle and Duty Factor	**Mode**	**Duty cycle (%)**	**Duty factor (dB)**
	11a	91.47%	0.39
	HT20	82.66%	0.83
	HT40	68.35%	1.65

1.1.7 Power Setting

Modulation Mode	Test Frequency (MHz)	Power Set
11a	5180	53
11a	5200	53
11a	5240	53
HT20	5180	51/48
HT20	5200	52/48
HT20	5240	54/50
HT40	5190	52/49
HT40	5230	50/47

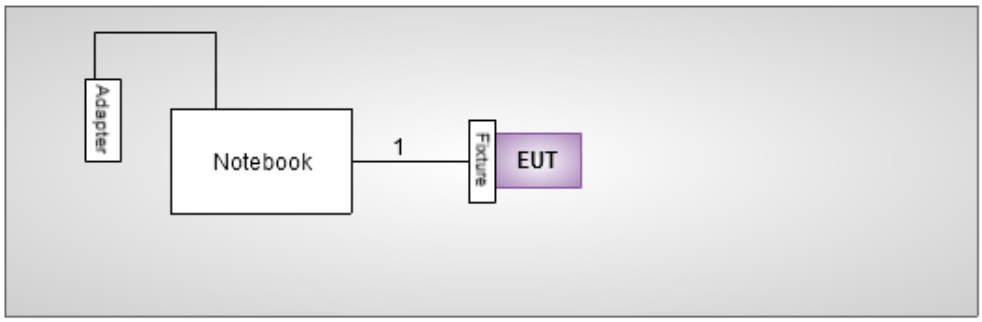
1.2 Local Support Equipment List

Support Equipment List						
No.	**Equipment**	**Brand**	**Model**	**S/N**	**FCC ID**	**Signal cable / Length (m)**
1	Notebook	DELL	E6430	---	DoC	---
2	Fixture	---	---	---	---	USB, 1.8m shielded w/o core

Note: No. 2 was supplied by applicant.

1.3 Test Setup Chart

Test Setup Diagram



1. USB, 1.8m shielded w/o core

1.4 The Equipment List

Test Item	Conducted Emission				
Test Site	Conduction room 1 / (CO01-WS)				
Instrument	**Manufacturer**	**Model No.**	**Serial No.**	**Calibration Date**	**Calibration Until**
EMC Receiver	R&S	ESCS 30	100169	Oct. 15, 2013	Oct. 14, 2014
LISN	SCHWARZBECK MESS-ELEKTRONIK	Schwarzbeck 8127	8127-667	Nov. 23, 2013	Nov. 22, 2014
LISN (Support Unit)	SCHWARZBECK MESS-ELEKTRONIK	Schwarzbeck 8127	8127-666	Dec. 04, 2013	Dec. 03, 2014
RF Cable-CON	Woken	CFD200-NL	CFD200-NL-001	Apr. 24, 2013	Apr. 23, 2014
50 ohm terminal (Support Unit)	NA	50	04	Apr. 22, 2013	Apr. 21, 2014
Note: Calibration Interval of instruments listed above is one year.					

Test Item	Radiated Emission above 1GHz				
Test Site	966 chamber 2 / (03CH02-WS)				
Instrument	**Manufacturer**	**Model No.**	**Serial No.**	**Calibration Date**	**Calibration Until**
Spectrum Analyzer	R&S	FSV40	101499	Jan. 28, 2013	Jan. 27, 2014
Receiver	R&S	ESR3	101657	Jan. 30,2013	Jan. 29, 2014
Bilog Antenna	ScHwarzbeck	VULB9168	VULB9168-524	Jan. 08, 2014	Jan. 07, 2015
Horn Antenna 1G-18G	SCHWARZBECK	BBHA 9120D	BBHA 9120 D 1095	Jan. 07, 2014	Jan. 06, 2015
Horn Antenna 18G-40G	SCHWARZBECK	BBHA 9170	BBHA 9170517	Dec. 27, 2013	Dec. 26, 2014
Amplifier	Burgeon	BPA-530	100218	Dec. 09, 2013	Dec. 08, 2014
Amplifier	Agilent	83017A	MY39501309	Dec. 09, 2013	Dec. 08, 2014
RF Cable	HUBER+SUHNER	SUCOFLEX104	MY16140/4	Dec. 17, 2013	Dec. 16, 2014
RF Cable	HUBER+SUHNER	SUCOFLEX104	MY16018/4	Dec. 17, 2013	Dec. 16, 2014
RF Cable	HUBER+SUHNER	SUCOFLEX104	MY16015/4	Dec. 17, 2013	Dec. 16, 2014
RF Cable-R03m	Woken	CFD400NL-LW	CFD400NL-003	Dec. 17, 2013	Dec. 16, 2014
RF Cable-R10m	Woken	CFD400NL-LW	CFD400NL-004	Dec. 17, 2013	Dec. 16, 2014
control	EM Electronics	EM1000	060608	N/A	N/A
Note: Calibration Interval of instruments listed above is one year.					

Loop Antenna	R&S	HFH2-Z2	100330	Nov. 15, 2012	Nov. 14, 2014
Amplifier	EM	EM18G40G	060572	Jun. 20, 2013	Jun. 19, 2015
Note: Calibration Interval of instruments listed above is two year.					

Test Item	RF Conducted				
Test Site	(TH01-WS)				
Instrument	**Manufacturer**	**Model No.**	**Serial No.**	**Calibration Date**	**Calibration Until**
Spectrum Analyzer	R&S	FSV 40	101063	Feb. 18, 2013	Feb. 17, 2014
TEMP&HUMIDITY CHAMBER	GIANT FORCE	GCT-225-40-SP-SD	MAF1212-002	Dec. 11, 2013	Dec. 10, 2014
Power Meter	Anritsu	ML2495A	1241002	Oct. 24, 2013	Oct. 23, 2014
Power Sensor	Anritsu	MA2411B	1027366	Oct. 24, 2013	Oct. 23, 2014
Note: Calibration Interval of instruments listed above is one year.					

1.5 Testing Applied Standards

According to the specification of EUT, the EUT must comply with following standards and KDB documents.

47 CFR FCC Part 15.407
ANSI C63.10-2009
FCC KDB 412172
FCC KDB 789033 D01 General UNII Test procedures v01r03
FCC KDB 662911 D01 Multiple Transmitter Output v02r01

Note: The EUT has been tested and complied with FCC part 15B requirement. FCC Part 15B test results are issued to another report.

1.6 Measurement Uncertainty

ISO/IEC 17025 requires that an estimate of the measurement uncertainties associated with the emissions test results be included in the report. The measurement uncertainties given below are based on a 95% confidence level (based on a coverage factor (k=2)

Measurement Uncertainty	
Parameters	**Uncertainty**
Bandwidth	±74.147 Hz
Conducted power	±0.717 dB
Power density	±2.687 dB
Frequency error	±74.147 Hz
Temperature	±0.3 ^{o}C
AC conducted emission	±2.43 dB
Radiated emission	±2.49 dB

2 Test Configuration

2.1 Testing Condition

Test Item	Test Site	Ambient Condition	Tested By
AC Conduction	CO01-WS	20°C / 70%	Skys Huang
Radiated Emissions	03CH02-WS	20°C / 62%	Aska Huang
RF Conducted	TH01-WS	22°C / 60%	Felix Sung

- FCC site registration No.: 657002
- IC site registration No.: 10807A-2

2.2 The Worst Test Modes and Channel Details

Test item	Modulation Mode	Test Frequency (MHz)	Data Rate (Mbps) / MCS	Test Configuration
Conducted Emissions	HT20	5180	MCS 8	---
Radiated Emissions <1GHz	HT20	5180	MCS 8	---
RF Output Power	11a	5180 / 5200 / 5240	6 Mbps	---
	HT20	5180 / 5200 / 5240	MCS 8	---
	HT40	5190 / 5230	MCS 8	---
Radiated Emissions >1GHz Emission Bandwidth Peak Power Spectral Density	11a	5180 / 5200 / 5240	6 Mbps	---
	HT20	5180 / 5200 / 5240	MCS 8	---
	HT40	5190 / 5230	MCS 8	---
Peak Excursion	11a	5240	6 Mbps	---
	HT20	5240	MCS 8	---
	HT40	5230	MCS 8	---
Frequency Stability	Un-modulation	5200	---	---

3 Transmitter Test Results

3.1 Conducted Emissions

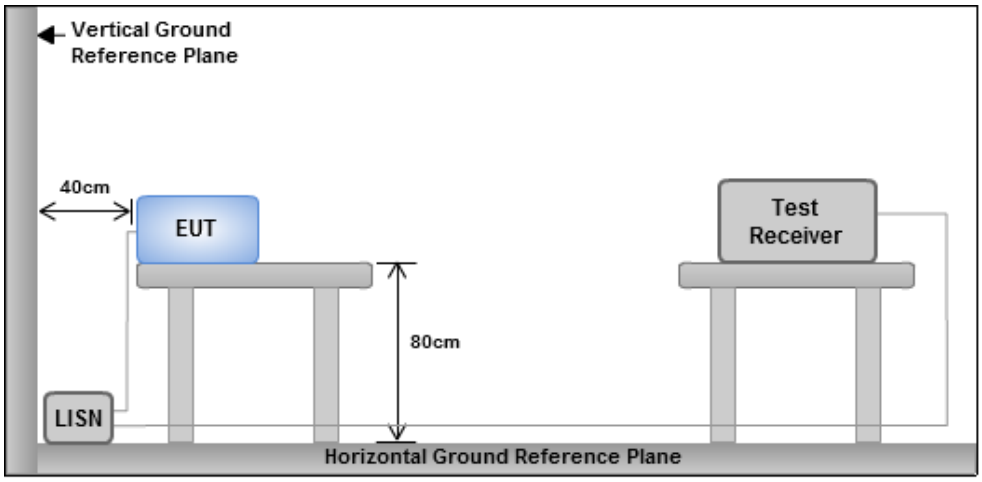
3.1.1 Limit of Conducted Emissions

Conducted Emissions Limit		
Frequency Emission (MHz)	**Quasi-Peak**	**Average**
0.15-0.5	66 - 56 *	56 - 46 *
0.5-5	56	46
5-30	60	50
Note 1: * Decreases with the logarithm of the frequency.		

3.1.2 Test Procedures

1. The device is placed on a test table, raised 80 cm above the reference ground plane. The vertical conducting plane is located 40 cm to the rear of the device.
2. The device is connected to line impedance stabilization network (LISN) and other accessories are connected to other LISN. Measured levels of AC power line conducted emission are across the 50 Ω LISN port.
3. AC conducted emission measurements is made over frequency range from 150 kHz to 30 MHz.
4. This measurement was performed with AC 120V / 60Hz.

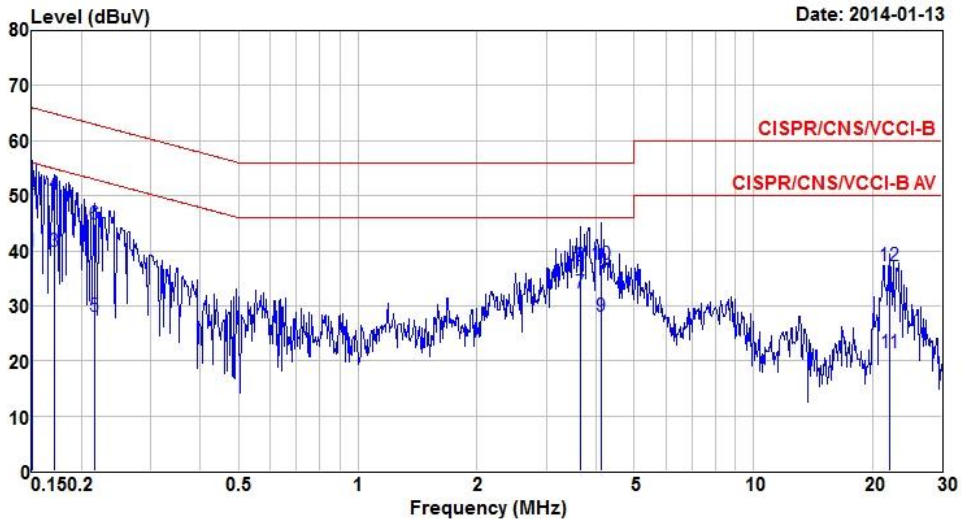
3.1.3 Test Setup



Note: 1. Support units were connected to second LISN.
2. Both of LISNs (AMN) are 80 cm from EUT and at least 80 cm from other units and other metal planes

3.1.4 Test Result of Conducted Emissions

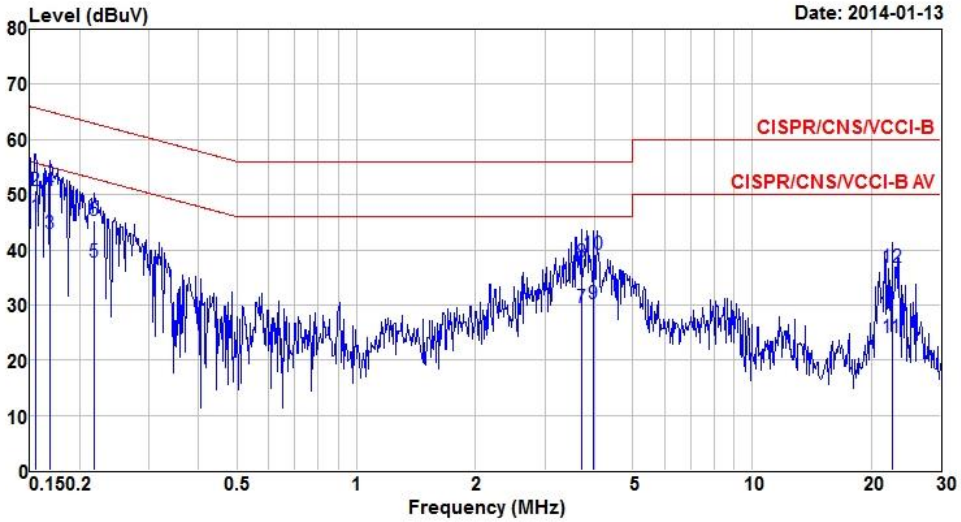
Modulation	HT20	Test Freq. (MHz)	5180
Power Phase	Line		



		Freq MHz	Level dBuV	Limit Line dBuV	Over Limit dB	Read Level dBuV	LISN factor dB	cable loss dB	Remark
1		0.151	39.85	55.96	-16.11	39.39	0.40	0.06	Average
2		0.151	50.34	65.96	-15.62	49.88	0.40	0.06	QP
3		0.171	39.91	54.90	-14.99	39.40	0.40	0.11	Average
4		0.171	50.32	64.90	-14.58	49.81	0.40	0.11	QP
5		0.216	28.08	52.96	-24.88	27.53	0.39	0.16	Average
6		0.216	44.88	62.96	-18.08	44.33	0.39	0.16	QP
7	*	3.661	32.26	46.00	-13.74	31.57	0.46	0.23	Average
8		3.661	37.38	56.00	-18.62	36.69	0.46	0.23	QP
9		4.114	28.03	46.00	-17.97	27.33	0.46	0.24	Average
10		4.114	37.53	56.00	-18.47	36.83	0.46	0.24	QP
11		22.180	21.50	50.00	-28.50	20.62	0.55	0.33	Average
12		22.180	37.27	60.00	-22.73	36.39	0.55	0.33	QP

Note 1: Level (dBuV) = Read Level (dBuV) + LISN Factor (dB) + Cable Loss (dB).
2: Over Limit (dB) = Limit Line (dBuV) – Level (dBuV).

Modulation	HT20	Test Freq. (MHz)	5180
Power Phase	Neutral		



		Freq MHz	Level dBuV	Limit Line dBuV	Over Limit dB	Read Level dBuV	LISN factor dB	cable loss dB	Remark
1	*	0.155	46.10	55.74	-9.64	45.55	0.48	0.07	Average
2		0.155	50.82	65.74	-14.92	50.27	0.48	0.07	QP
3		0.169	42.85	55.03	-12.18	42.26	0.48	0.11	Average
4		0.169	50.65	65.03	-14.38	50.06	0.48	0.11	QP
5		0.219	37.86	52.88	-15.02	37.22	0.48	0.16	Average
6		0.219	45.21	62.88	-17.67	44.57	0.48	0.16	QP
7		3.700	29.45	46.00	-16.55	28.70	0.52	0.23	Average
8		3.700	37.87	56.00	-18.13	37.12	0.52	0.23	QP
9		3.985	30.32	46.00	-15.68	29.56	0.52	0.24	Average
10		3.985	39.10	56.00	-16.90	38.34	0.52	0.24	QP
11		22.535	24.13	50.00	-25.87	23.22	0.55	0.36	Average
12		22.535	36.76	60.00	-23.24	35.85	0.55	0.36	QP

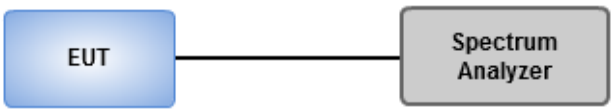
Note 1: Level (dBuV) = Read Level (dBuV) + LISN Factor (dB) + Cable Loss (dB).
2: Over Limit (dB) = Limit Line (dBuV) – Level (dBuV).

3.2 Emission Bandwidth

3.2.1 Test Procedures

1. Set RBW = approximately 1% of the emission bandwidth.
2. Set the VBW > RBW, Detector = Peak.
3. Trace mode = max hold.
4. Measure the maximum width of the emission that is 26 dB down from the peak of the emission.

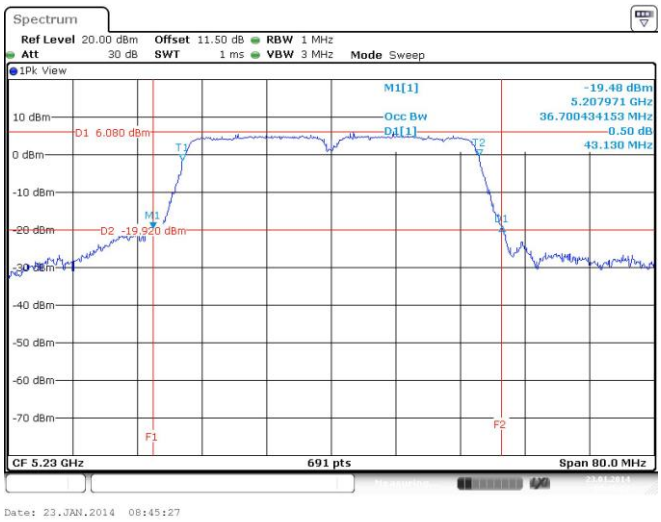
3.2.2 Test Setup



3.2.3 Test Result of Emission Bandwidth

Emission Bandwidth										
Mode	N_{TX}	Freq. (MHz)	26dB Bandwidth (MHz)			99% Bandwidth (MHz)			Power Limit (dBm)	
			Chain 0	Chain 1	Chain 2	Chain 0	Chain 1	Chain 2	26dB BW	99% BW
11a	1	5180	23.83	---	---	17.13	---	---	17.00	16.34
11a	1	5200	24.81	---	---	17.19	---	---	17.00	16.35
11a	1	5240	25.45	---	---	17.19	---	---	17.00	16.35
HT20	1	5180	23.83	23.25	---	18.12	17.89	---	17.00	16.53
HT20	1	5200	24.00	23.54	---	18.18	17.89	---	17.00	16.53
HT20	1	5240	23.94	23.42	---	18.12	17.89	---	17.00	16.53
HT40	1	5190	43.71	42.09	---	36.58	36.47	---	17.00	17.00
HT40	1	5230	43.13	42.32	---	36.70	36.47	---	17.00	17.00

Worst Plots



3.3 RF Output Power

3.3.1 Limit of RF Output Power

	Frequency Band (GHz)	Limit
☒	5.15~5.25	50mW or 4dBm+10 log B
☐	5.25~5.35	250mW or 11dBm+10 log B
☐	5.47~5.725	250mW or 11dBm+10 log B
Note: “B” is the 26dB emission bandwidth in MHz.		

3.3.2 Test Procedures

☒ **Method PM-G (Measurement using a gated RF average power meter)**

☒ Measurements may is performed using a wideband gated RF power meter provided that the gate parameters are adjusted such that the power is measured only when the EUT is transmitting at its maximum power control level. Since the measurement is made only during the ON time of the transmitter, no duty cycle correction factor is required.

3.3.3 Test Setup

3.3.4 Test Result of Maximum Conducted Output Power

RF Output Power (dBm)								
Mode	**N_{TX}**	**Freq. (MHz)**	**Chain 0**	**Chain 1**	**Chain 2**	**Total Power (mW)**	**Total Power (dBm)**	**Limit**
11a	1	5180	14.18	---	---	26.182	14.18	17.00
11a	1	5200	14.27	---	---	26.730	14.27	17.00
11a	1	5240	14.38	---	---	27.416	14.38	17.00
HT20	2	5180	12.42	12.31	---	34.480	15.38	17.00
HT20	2	5200	12.29	12.14	---	33.312	15.23	17.00
HT20	2	5240	12.48	12.18	---	34.221	15.34	17.00
HT40	2	5190	12.31	12.39	---	34.360	15.36	17.00
HT40	2	5230	12.29	12.01	---	32.829	15.16	17.00

3.4 Peak Power Spectral Density

3.4.1 Limit of Peak Power Spectral Density

	Frequency Band (GHz)	Limit (dBm)
☒	5.15~5.25	4
☐	5.25~5.35	11
☐	5.47~5.725	11

3.4.2 Test Procedures

☐ Method SA-1

1. Set RBW = 1 MHz, VBW = 3 MHz, Sweep time = auto, Detector = RMS.
2. Trace average 100 traces.
3. Use the peak marker function to determine the maximum amplitude level.

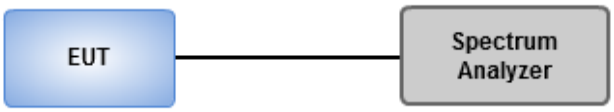
☐ Method SA-2

1. Set RBW = 1 MHz, VBW = 3 MHz, Sweep time = auto, Detector = RMS.
2. Trace average at 100 traces
3. Use the peak marker function to determine the maximum amplitude level.
4. Add 10 log(1/x), where x is the duty cycle

☒ Method SA-2 Alternative

1. Set RBW = 1 MHz, VBW = 3 MHz, Detector = RMS.
2. Set sweep time ≥ 10 * (number of points in sweep) * (total on/off period of the transmitted signal).
3. Perform a single sweep.
4. Use the peak marker function to determine the maximum amplitude level.
5. Add 10 log(1/x), where x is the duty cycle.

3.4.3 Test Setup

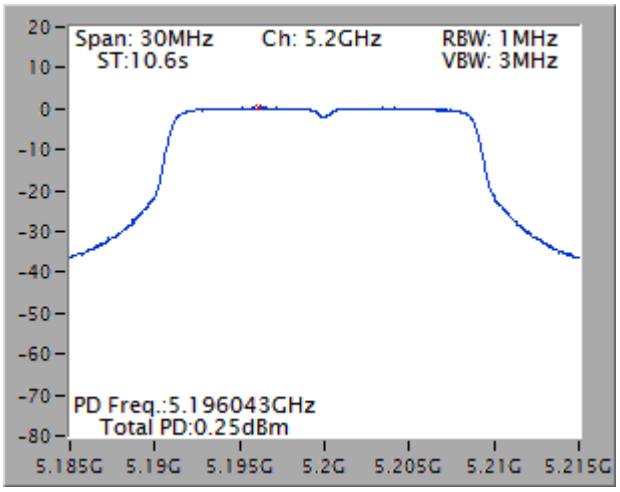


3.4.4 Test Result of Peak Power Spectral Density

Condition			Peak Power Spectral Density (dBm)			
Modulation Mode	N_{TX}	Freq. (MHz)	PPSD w/o D.F (dBm)	Duty factor (dB)	PPSD with D.F (dBm)	PPSD Limit (dBm)
11a	1	5180	0.31	0.39	0.70	4
11a	1	5200	0.20	0.39	0.59	4
11a	1	5240	0.16	0.39	0.55	4
HT20	1	5180	0.15	0.83	0.98	4
HT20	1	5200	0.25	0.83	1.08	4
HT20	1	5240	0.03	0.83	0.86	4
HT40	1	5190	-2.72	1.65	-1.07	4
HT40	1	5230	-3.40	1.65	-1.75	4

Note: D.F is duty factor

Worst Plots



Note: Plot is without duty factor

3.5 Peak Excursion

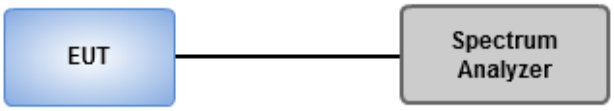
3.5.1 Peak Excursion Limit

Peak excursion of the modulation envelope shall not exceed 13 dB across any 1 MHz bandwidth.

3.5.2 Test Procedures

1. Set RBW = 1 MHz, VBW = 3 MHz, Detector = peak.
2. Trace mode = max-hold. Allow the sweeps to continue until the trace stabilizes.
3. Use the peak search function to find the peak of the spectrum.
4. Use the procedure of section 3.4.2 to measure the PPSD.
5. Compute the ratio of the maximum of the peak-max-hold spectrum to the PPSD

3.5.3 Test Setup

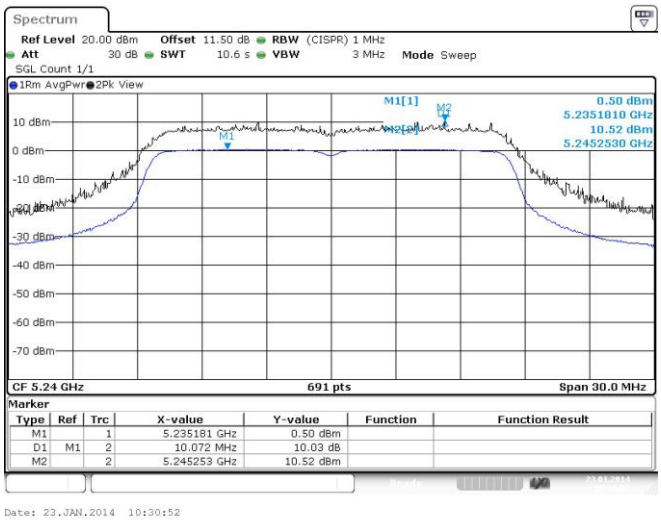


3.5.4 Test Result of Peak Excursion

Frequency band(MHz)		5150~5250					
Mode	**Modulation Mode**	**N_{TX}**	**Freq. (MHz)**	**Measured value(dB)**	**Duty factor (dB)**	**Peak Excursion (dB)**	**Limit**
11a	BPSK	1	5240	8.36	0.39	7.97	13
11a	QPSK	1	5240	10.03	0.71	9.32	13
11a	16QAM	1	5240	10.32	1.22	9.10	13
11a	64QAM	1	5240	12.86	4.06	8.80	13
HT20	BPSK	1	5240	8.79	0.83	7.96	13
HT20	QPSK	1	5240	10.21	1.61	8.60	13
HT20	16QAM	1	5240	11.23	3.94	7.29	13
HT20	64QAM	1	5240	14.77	6.11	8.66	13
HT40	BPSK	1	5230	10.61	1.65	8.96	13
HT40	QPSK	1	5230	11.38	4.14	7.24	13
HT40	16QAM	1	5230	13.42	6.23	7.19	13
HT40	64QAM	1	5230	14.42	7.80	6.62	13

Note: Measured value = Peak-max-hold spectrum to the maximum of the average spectrum for continuous transmission. Since the duty cycle is < 98 %, duty factor is required to average spectrum
Peak exclusion = Measured value – duty factor

Worst Plots



Note: Measured value = Mark 2 – Mark 1

3.6 Transmitter Radiated and Band Edge Emissions

3.6.1 Limit of Transmitter Radiated and Band Edge Emissions

Restricted Band Emissions Limit			
Frequency Range (MHz)	**Field Strength (uV/m)**	**Field Strength (dBuV/m)**	**Measure Distance (m)**
0.009~0.490	2400/F(kHz)	48.5 - 13.8	300
0.490~1.705	24000/F(kHz)	33.8 - 23	30
1.705~30.0	30	29	30
30~88	100	40	3
88~216	150	43.5	3
216~960	200	46	3
Above 960	500	54	3

Note 1:
Qusai-Peak value is measured for frequency below 1GHz except for 9–90 kHz, 110–490 kHz frequency band. Peak and average value are measured for frequency above 1GHz. The limit on average radio frequency emission is as above table. The limit on peak radio frequency emissions is 20 dB above the maximum permitted average emission limit
Note 2:
Measurements may be performed at a distance other than what is specified provided. When performing measurements at a distance other than that specified, the results shall be extrapolated to the specified distance using an extrapolation factor as below, Frequency at or above 30 MHz: 20 dB/decade Frequency below 30 MHz: 40 dB/decade.

Un-restricted band emissions above 1GHz Limit	
Operating Band	**Limit**
5.15 - 5.25 GHz	e.i.r.p. -27 dBm [68.2 dBuV/m@3m]
5.25 - 5.35 GHz	e.i.r.p. -27 dBm [68.2 dBuV/m@3m]
5.47 - 5.725 GHz	e.i.r.p. -27 dBm [68.2 dBuV/m@3m]
5.725 - 5.825 GHz	5.715 5.725 GHz: e.i.r.p. -17 dBm [78.2 dBuV/m@3m] 5.825 5.835 GHz: e.i.r.p. -17 dBm [78.2 dBuV/m@3m] Other un-restricted band: e.i.r.p. -27 dBm [68.2 dBuV/m@3m]

Note 1: Measurements may be performed at a distance other than the limit distance provided they are not performed in the near field and the emissions to be measured can be detected by the measurement equipment. When performing measurements at a distance other than that specified, the results shall be extrapolated to the specified distance using an extrapolation factor of 20 dB/decade (inverse of linear distance for field-strength measurements, inverse of linear distance-squared for power-density measurements).

3.6.2 Test Procedures

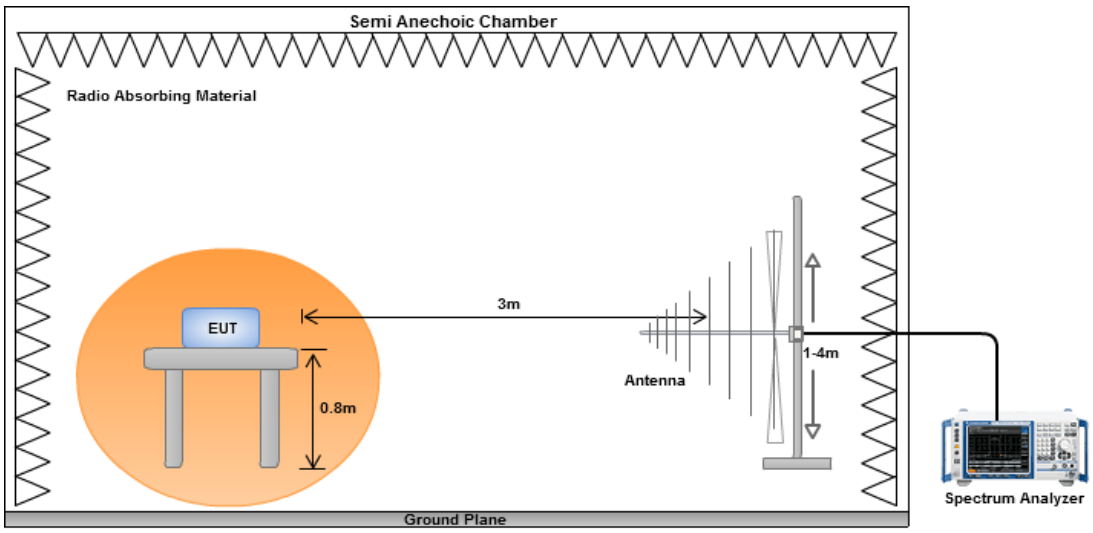
1. Measurement is made at a semi-anechoic chamber that incorporates a turntable allowing a EUT rotation of 360°. A continuously-rotating, remotely-controlled turntable is installed at the test site to support the EUT and facilitate determination of the direction of maximum radiation for each EUT emission frequency. The EUT is placed at a height of 0.8 m test table above the ground plane.
2. Measurement is made with the antenna positioned in both the horizontal and vertical planes of polarization. The measurement antenna is varied in height (1m ~ 4m) above the reference ground plane to obtain the maximum signal strength. Distance between EUT and antenna is 3 m.
3. This investigation is performed with the EUT rotated 360°, the antenna height scanned between 1 m and 4 m, and the antenna rotated to repeat the measurements for both the horizontal and vertical antenna polarizations.

Note:

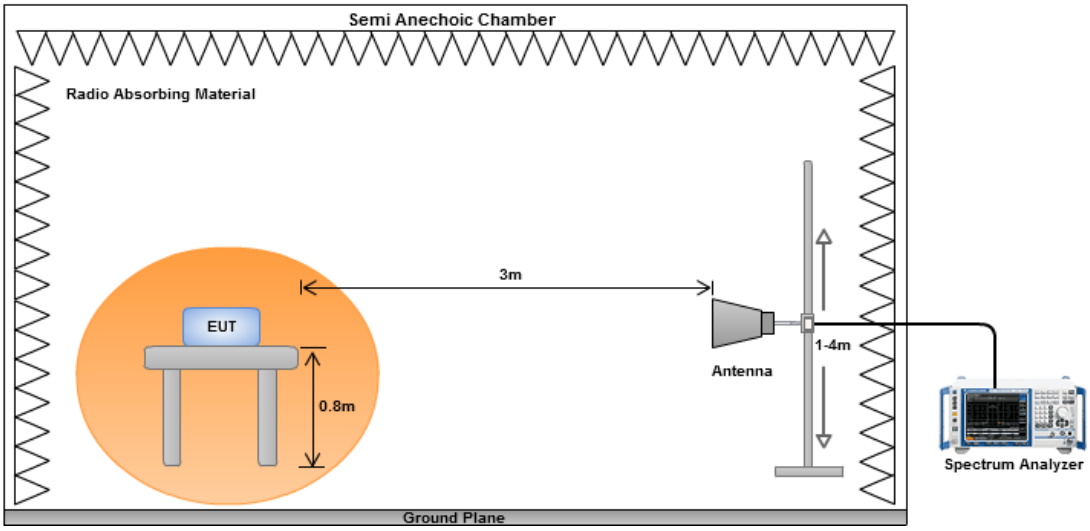
1. 120kHz measurement bandwidth of test receiver and Quasi-peak detector is for radiated emission below 1GHz.
2. RBW=1MHz, VBW=3MHz and Peak detector is for peak measured value of radiated emission above 1GHz.
3. RBW=1MHz, VBW=1/T and Peak detector is for average measured value of radiated emission above 1GHz.

3.6.3 Test Setup

Radiated Emissions below 1 GHz

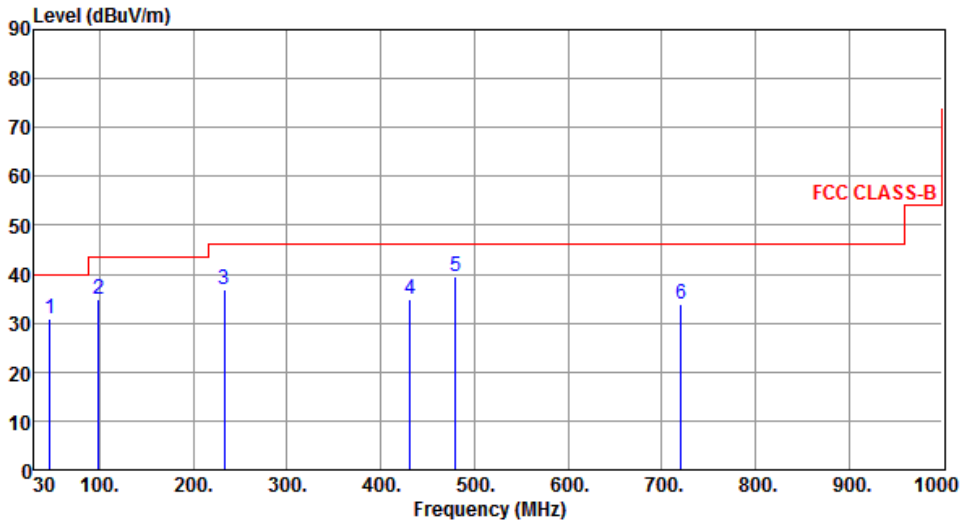


Radiated Emissions above 1 GHz



3.6.4 Transmitter Radiated Unwanted Emissions (Below 1GHz)

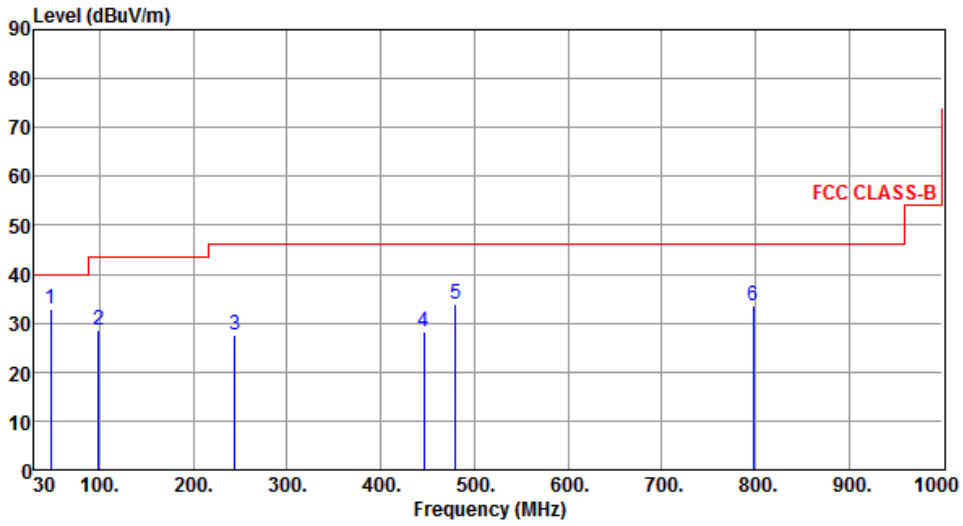
Modulation	HT20	**Test Freq. (MHz)**	5180
Polarization	Horizontal		



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	46.49	30.80	40.00	-9.20	47.44	-16.64	Peak	---	---
2	98.87	34.94	43.50	-8.56	56.90	-21.96	Peak	---	---
3	232.73	36.80	46.00	-9.20	55.24	-18.44	Peak	---	---
4	431.58	34.90	46.00	-11.10	47.81	-12.91	Peak	---	---
5	480.08	39.53	46.00	-6.47	51.49	-11.96	Peak	---	---
6	720.64	33.93	46.00	-12.07	41.78	-7.85	Peak	---	---

Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)
*Factor includes antenna factor , cable loss and amplifier gain
Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

Modulation	HT20	Test Freq. (MHz)	5180
Polarization	Vertical		

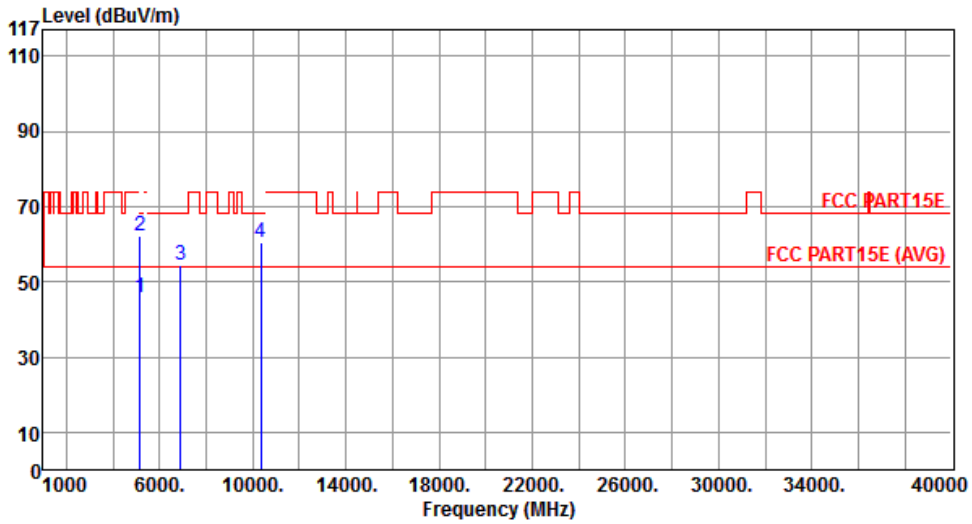


	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	47.46	33.02	40.00	-6.98	49.62	-16.60	Peak	---	---
2	98.87	28.56	43.50	-14.94	50.52	-21.96	Peak	---	---
3	244.37	27.46	46.00	-18.54	45.47	-18.01	Peak	---	---
4	446.13	28.06	46.00	-17.94	40.66	-12.60	Peak	---	---
5	480.08	33.78	46.00	-12.22	45.74	-11.96	Peak	---	---
6	798.24	33.46	46.00	-12.54	40.25	-6.79	Peak	---	---

Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)
*Factor includes antenna factor , cable loss and amplifier gain
Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

3.6.5 Transmitter Radiated Unwanted Emissions (Above 1GHz) for 11a

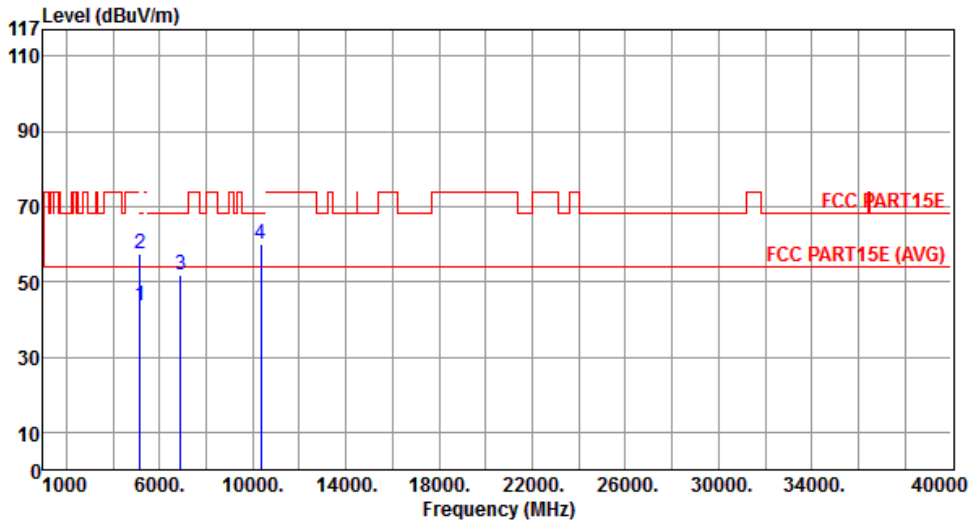
Modulation	11a	**Test Freq. (MHz)**	5180
Polarization	Horizontal		



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	5150.00	45.67	54.00	-8.33	38.65	7.02	Average	---	---
2	5150.00	62.39	74.00	-11.61	55.37	7.02	Peak	---	---
3	6906.66	54.51	68.20	-13.69	43.24	11.27	Peak	---	---
4	10360.00	60.30	68.20	-7.90	47.01	13.29	Peak	---	---

Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)
*Factor includes antenna factor , cable loss and amplifier gain
Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

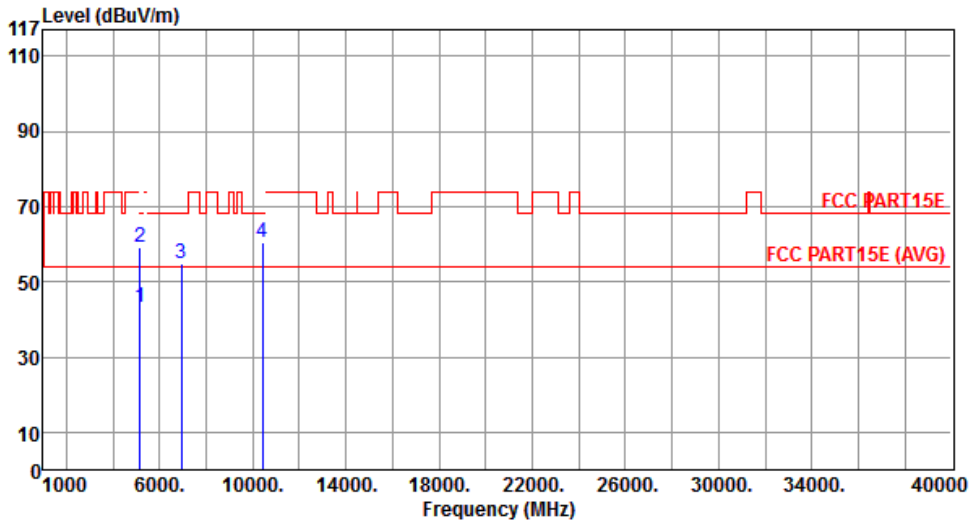
Modulation	11a	Test Freq. (MHz)	5180
Polarization	Vertical		



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	5150.00	43.50	54.00	-10.50	36.48	7.02	Average	---	---
2	5150.00	57.29	74.00	-16.71	50.27	7.02	Peak	---	---
3	6906.66	51.65	68.20	-16.55	40.38	11.27	Peak	---	---
4	10360.00	59.86	68.20	-8.34	46.57	13.29	Peak	---	---

Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)
*Factor includes antenna factor , cable loss and amplifier gain
Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

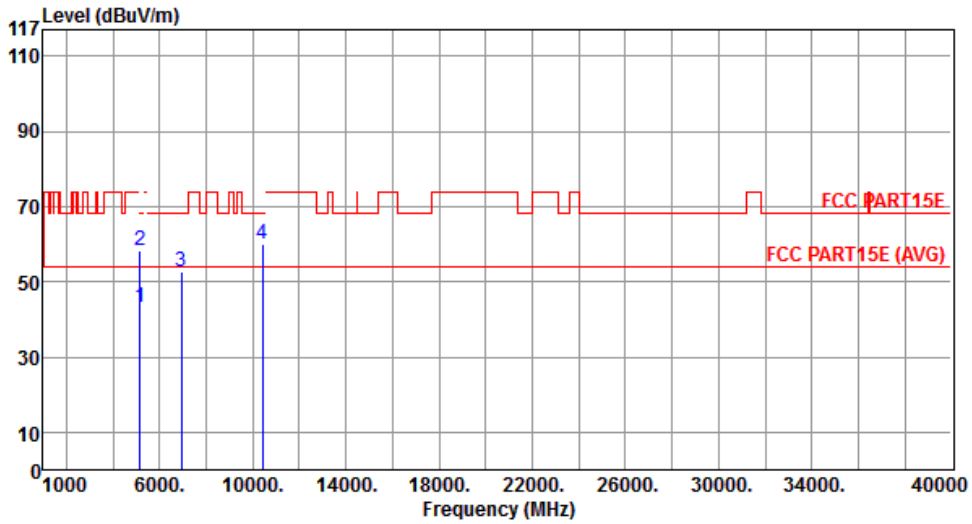
Modulation	11a	Test Freq. (MHz)	5200
Polarization	Horizontal		



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	5150.00	43.26	54.00	-10.74	36.24	7.02	Average	---	---
2	5150.00	59.31	74.00	-14.69	52.29	7.02	Peak	---	---
3	6933.33	54.74	68.20	-13.46	43.37	11.37	Peak	---	---
4	10400.00	60.26	68.20	-7.94	46.98	13.28	Peak	---	---

Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)
*Factor includes antenna factor , cable loss and amplifier gain
Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

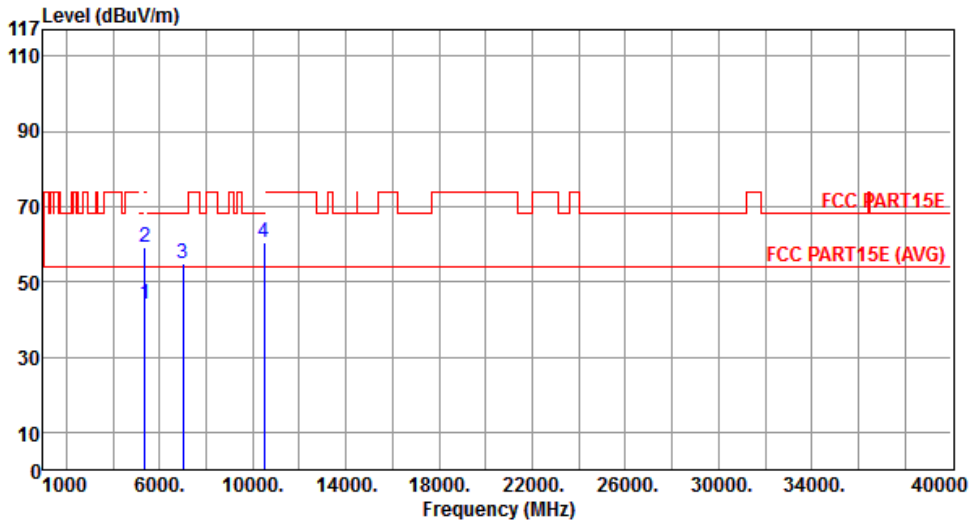
Modulation	11a	Test Freq. (MHz)	5200
Polarization	Vertical		



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	5150.00	43.30	54.00	-10.70	36.28	7.02	Average	---	---
2	5150.00	58.37	74.00	-15.63	51.35	7.02	Peak	---	---
3	6933.33	52.62	68.20	-15.58	41.25	11.37	Peak	---	---
4	10400.00	59.86	68.20	-8.34	46.58	13.28	Peak	---	---

Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)
*Factor includes antenna factor , cable loss and amplifier gain
Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

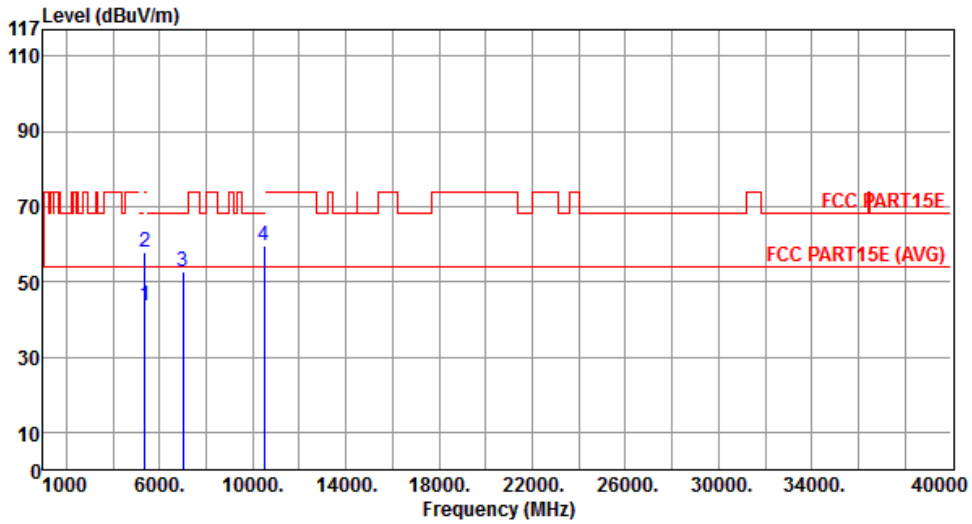
Modulation	11a	Test Freq. (MHz)	5240
Polarization	Horizontal		



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	5350.00	44.06	54.00	-9.94	36.48	7.58	Average	---	---
2	5350.00	59.15	74.00	-14.85	51.57	7.58	Peak	---	---
3	6986.66	54.84	68.20	-13.36	43.29	11.55	Peak	---	---
4	10480.00	60.47	68.20	-7.73	47.20	13.27	Peak	---	---

Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)
*Factor includes antenna factor , cable loss and amplifier gain
Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

Modulation	11a	Test Freq. (MHz)	5240
Polarization	Vertical		

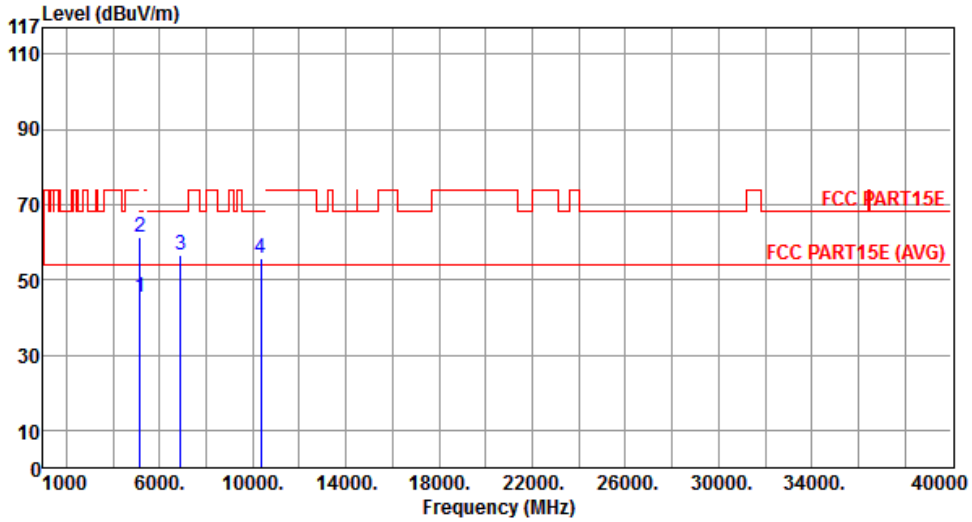


	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	5350.00	43.81	54.00	-10.19	36.23	7.58	Average	---	---
2	5350.00	58.02	74.00	-15.98	50.44	7.58	Peak	---	---
3	6986.66	52.81	68.20	-15.39	41.26	11.55	Peak	---	---
4	10480.00	59.79	68.20	-8.41	46.52	13.27	Peak	---	---

Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)
*Factor includes antenna factor , cable loss and amplifier gain
Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

3.6.6 Transmitter Radiated Unwanted Emissions (Above 1GHz) for HT20

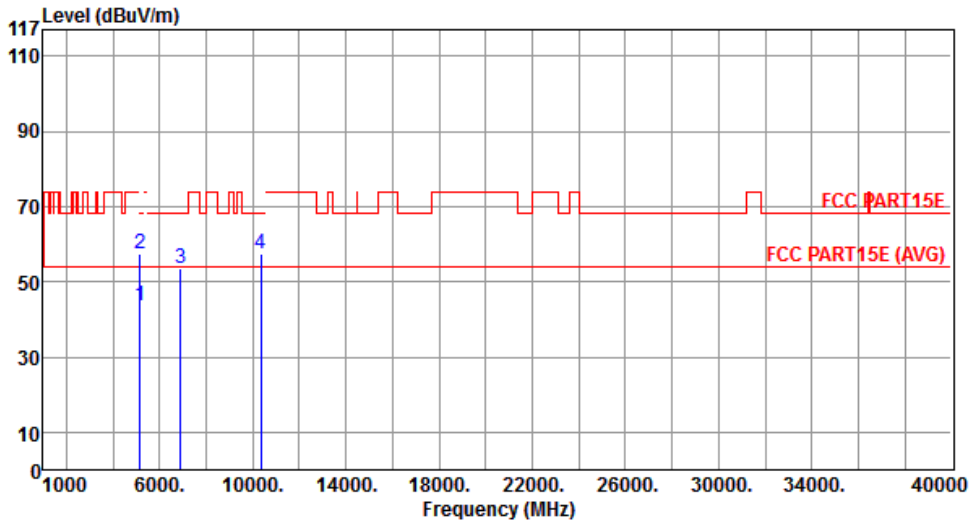
Modulation	HT20	**Test Freq. (MHz)**	5180
Polarization	Horizontal		



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	5150.00	45.17	54.00	-8.83	38.15	7.02	Average	---	---
2	5150.00	61.33	74.00	-12.67	54.31	7.02	Peak	---	---
3	6906.66	56.62	68.20	-11.58	45.35	11.27	Peak	---	---
4	10360.00	55.53	68.20	-12.67	42.24	13.29	Peak	---	---

Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)
*Factor includes antenna factor , cable loss and amplifier gain
Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

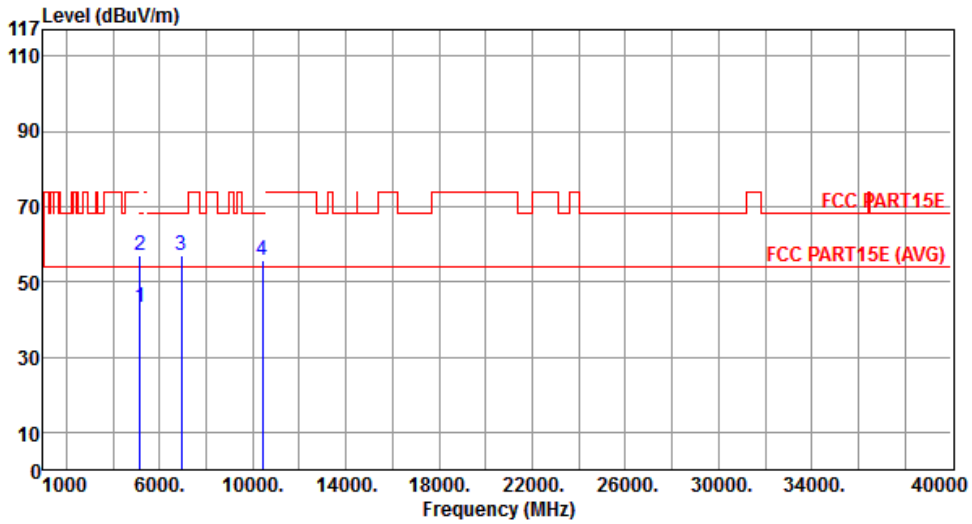
Modulation	HT20	Test Freq. (MHz)	5180
Polarization	Vertical		



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	5150.00	43.50	54.00	-10.50	36.48	7.02	Average	---	---
2	5150.00	57.49	74.00	-16.51	50.47	7.02	Peak	---	---
3	6906.66	53.61	68.20	-14.59	42.34	11.27	Peak	---	---
4	10360.00	57.59	68.20	-10.61	44.30	13.29	Peak	---	---

Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)
*Factor includes antenna factor , cable loss and amplifier gain
Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

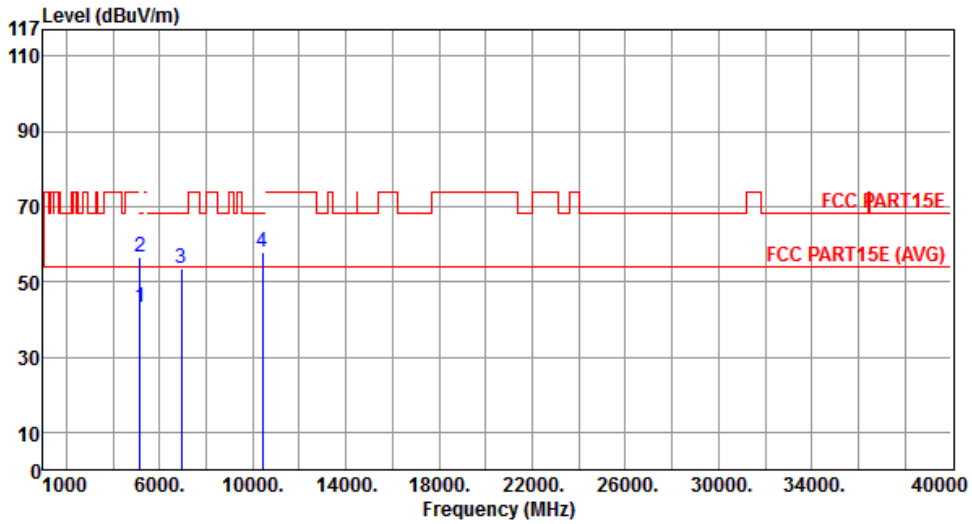
Modulation	HT20	Test Freq. (MHz)	5200
Polarization	Horizontal		



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	5150.00	43.26	54.00	-10.74	36.24	7.02	Average	---	---
2	5150.00	57.15	74.00	-16.85	50.13	7.02	Peak	---	---
3	6933.33	57.04	68.20	-11.16	45.67	11.37	Peak	---	---
4	10400.00	55.53	68.20	-12.67	42.25	13.28	Peak	---	---

Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)
*Factor includes antenna factor , cable loss and amplifier gain
Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

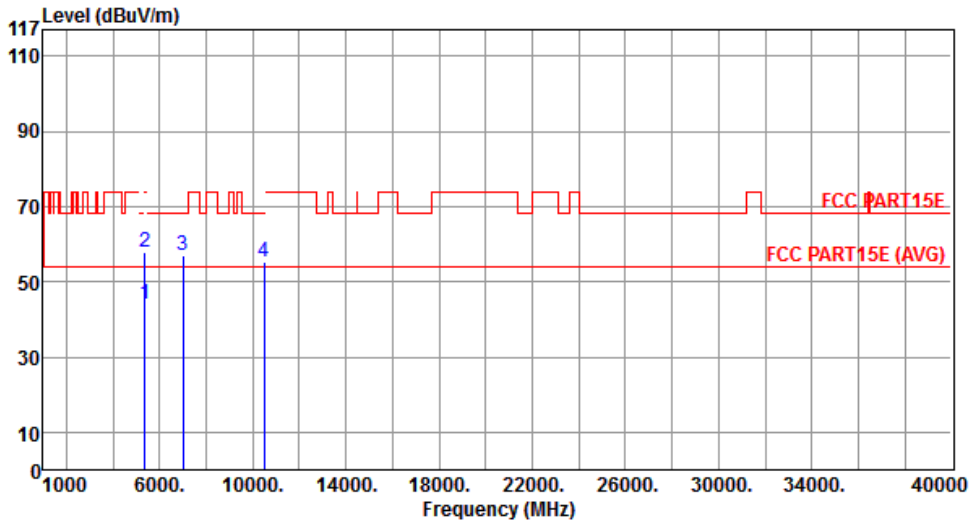
Modulation	HT20	Test Freq. (MHz)	5200
Polarization	Vertical		



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	5150.00	43.17	54.00	-10.83	36.15	7.02	Average	---	---
2	5150.00	56.37	74.00	-17.63	49.35	7.02	Peak	---	---
3	6933.33	53.70	68.20	-14.50	42.33	11.37	Peak	---	---
4	10400.00	57.97	68.20	-10.23	44.69	13.28	Peak	---	---

Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)
*Factor includes antenna factor , cable loss and amplifier gain
Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

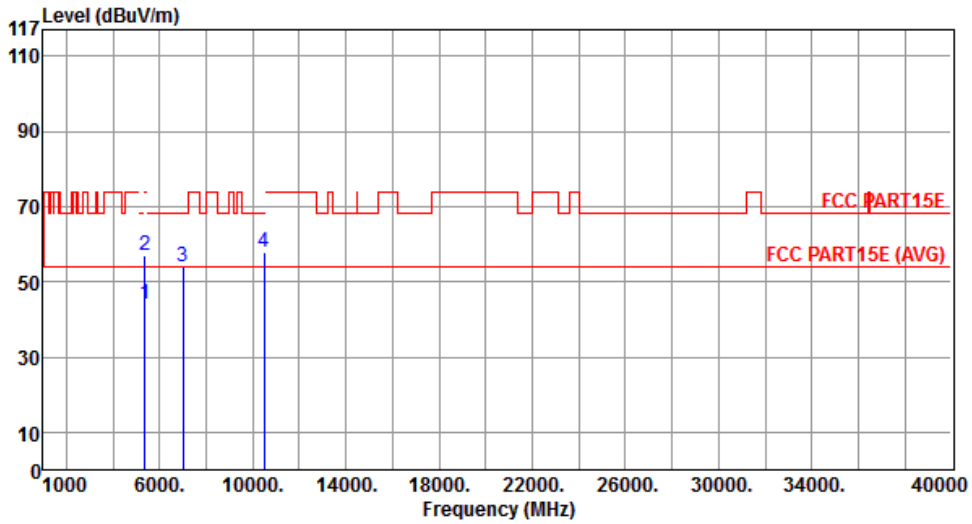
Modulation	HT20	Test Freq. (MHz)	5240
Polarization	Horizontal		



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	5350.00	43.91	54.00	-10.09	36.33	7.58	Average	---	---
2	5350.00	57.72	74.00	-16.28	50.14	7.58	Peak	---	---
3	6986.66	57.07	68.20	-11.13	45.52	11.55	Peak	---	---
4	10480.00	55.11	68.20	-13.09	41.84	13.27	Peak	---	---

Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)
*Factor includes antenna factor , cable loss and amplifier gain
Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

Modulation	HT20	Test Freq. (MHz)	5240
Polarization	Vertical		

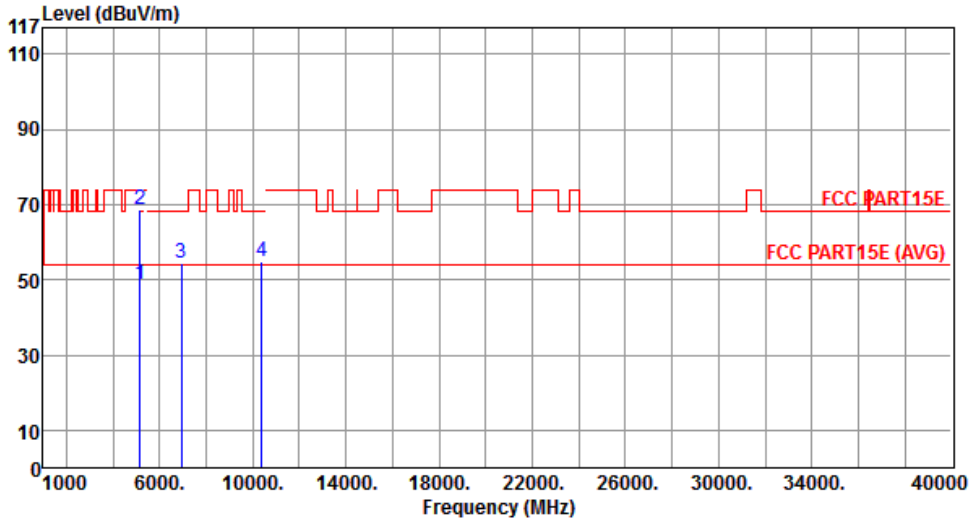


	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	5350.00	43.83	54.00	-10.17	36.25	7.58	Average	---	---
2	5350.00	56.96	74.00	-17.04	49.38	7.58	Peak	---	---
3	6986.66	54.13	68.20	-14.07	42.58	11.55	Peak	---	---
4	10480.00	57.73	68.20	-10.47	44.46	13.27	Peak	---	---

Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)
*Factor includes antenna factor , cable loss and amplifier gain
Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

3.6.7 Transmitter Radiated Unwanted Emissions (Above 1GHz) for HT40

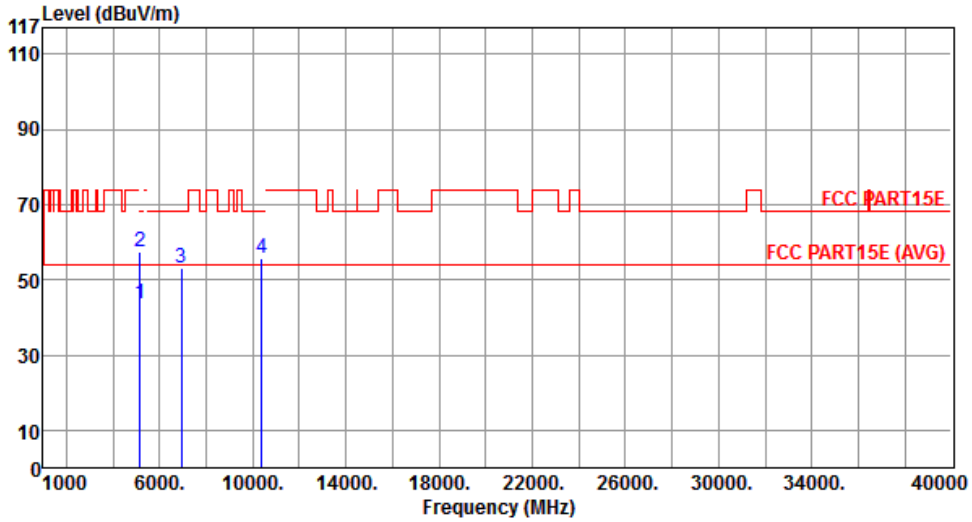
Modulation	HT40	**Test Freq. (MHz)**	5190
Polarization	Horizontal		



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	5150.00	48.59	54.00	-5.41	41.57	7.02	Average	---	---
2	5150.00	68.86	74.00	-5.14	61.84	7.02	Peak	---	---
3	6920.00	54.50	68.20	-13.70	43.18	11.32	Peak	---	---
4	10380.00	54.81	68.20	-13.39	41.53	13.28	Peak	---	---

Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)
*Factor includes antenna factor , cable loss and amplifier gain
Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

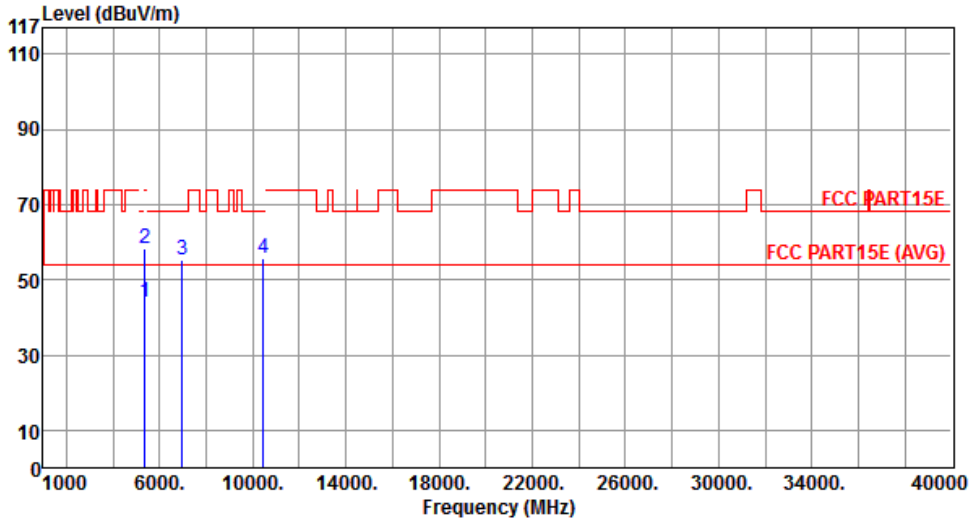
Modulation	HT40	Test Freq. (MHz)	5190
Polarization	Vertical		



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	5150.00	43.57	54.00	-10.43	36.55	7.02	Average	---	---
2	5150.00	57.50	74.00	-16.50	50.48	7.02	Peak	---	---
3	6920.00	53.17	68.20	-15.03	41.85	11.32	Peak	---	---
4	10380.00	55.66	68.20	-12.54	42.38	13.28	Peak	---	---

Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)
*Factor includes antenna factor , cable loss and amplifier gain
Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

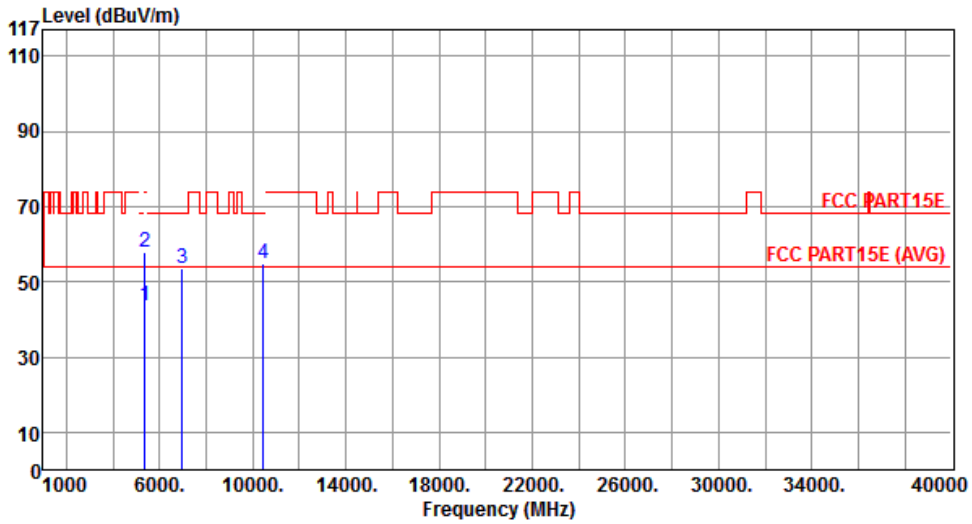
Modulation	HT40	Test Freq. (MHz)	5230
Polarization	Horizontal		



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	5350.00	44.06	54.00	-9.94	36.48	7.58	Average	---	---
2	5350.00	58.21	74.00	-15.79	50.63	7.58	Peak	---	---
3	6973.33	55.11	68.20	-13.09	43.59	11.52	Peak	---	---
4	10460.00	55.84	68.20	-12.36	42.57	13.27	Peak	---	---

Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)
*Factor includes antenna factor , cable loss and amplifier gain
Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

Modulation	HT40	Test Freq. (MHz)	5230
Polarization	Vertical		



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	5350.00	43.79	54.00	-10.21	36.21	7.58	Average	---	---
2	5350.00	58.02	74.00	-15.98	50.44	7.58	Peak	---	---
3	6973.33	53.72	68.20	-14.48	42.20	11.52	Peak	---	---
4	10460.00	54.65	68.20	-13.55	41.38	13.27	Peak	---	---

Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)
*Factor includes antenna factor , cable loss and amplifier gain
Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

3.7 Frequency Stability

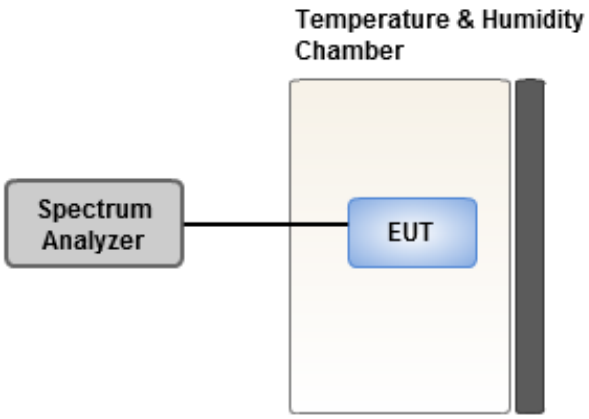
3.7.1 Limit of Frequency Stability

Manufacturers of U-NII devices are responsible for ensuring frequency stability such that an emission is maintained within the band of operation under all conditions of normal operation as specified in the user's manual.

3.7.2 Test Procedures

1. The EUT is installed in an environment test chamber with external power source.
2. Set the chamber to operate at 50 centigrade and external power source to output at nominal voltage of EUT.
3. A sufficient stabilization period at each temperature is used prior to each frequency measurement.
4. When temperature is stabled, measure the frequency stability.
5. The test shall be performed under -30 to 50 centigrade and 85 to 115 percent of the nominal voltage. Change setting of chamber and external power source to complete all conditions.

3.7.3 Test Setup



3.7.4 Test Result of Frequency Stability

Frequency: 5200 MHz	Frequency Drift (ppm)			
Temperature (°C)	**0 minute**	**2 minutes**	**5 minutes**	**10 minutes**
T20°CVmax	0.50	0.99	0.76	0.39
T20°CVmin	1.89	5.34	6.12	6.23
T60°CVnom	2.58	2.94	4.13	5.43
T50°CVnom	3.68	3.54	3.73	4.03
T40°CVnom	-0.47	-0.73	-0.39	-0.74
T30°CVnom	-0.08	-0.36	-0.09	0.26
T20°CVnom	1.99	2.22	2.22	1.62
T10°CVnom	1.82	2.05	1.47	2.29
T0°CVnom	1.58	1.39	1.58	2.45
T-10°CVnom	0.74	1.00	1.64	0.93
T-20°CVnom	1.30	1.68	1.46	1.17
T-30°CVnom	0.15	0.55	0.88	-0.28
Vnom [V]: 110		Vmax [V]: 126.5		Vmin [V]: 93.5
Tnom [°C]: 20		Tmax [°C]: 60		Tmin [°C]: -30

4 Test laboratory information

Established in 2012, ICC provides foremost EMC & RF Testing and advisory consultation services by our skilled engineers and technicians. Our services employ a wide variety of advanced edge test equipment and one of the widest certification extents in the business.

International Certification Corp, it is our definitive objective is to institute long term, trust-based associations with our clients. The expectation we set up with our clients is based on outstanding service, practical expertise and devotion to a certified value structure. Our passion is to grant our clients with best EMC / RF services by oriented knowledgeable and accommodating staff.

Our Test sites are located at Linkou District and Kwei Shan Hsiang. Location map can be found on our website http://www.icertifi.com.tw.

Linkou

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No. 30-2, Ding Fwu Tsuen, Lin Kou District, New Taipei City, Taiwan, R.O.C.

Kwei Shan

Tel: 886-3-271-8666

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If you have any suggestion, please feel free to contact us as below information

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