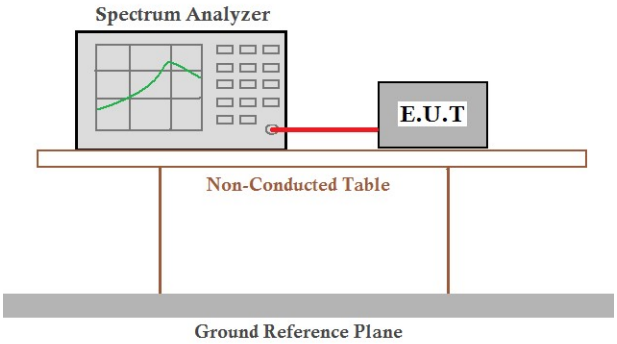
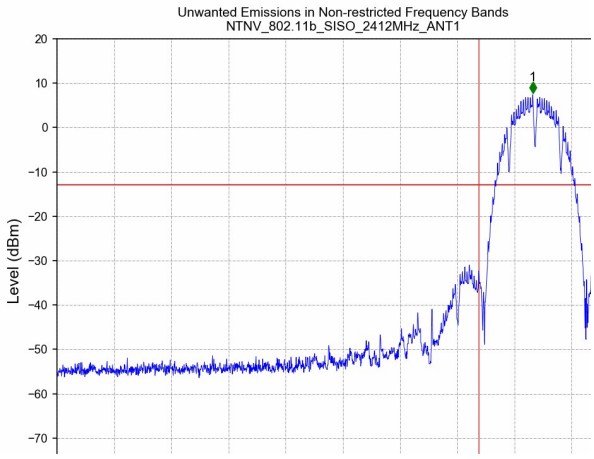
6.5. Band Edge

6.5.1. Conducted Emission Method

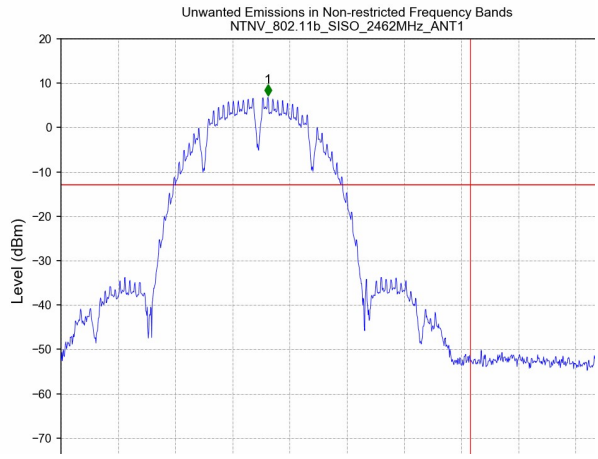
Test Requirement:	FCC Part15 C Section 15.247 (d)					
Test Method:	KDB558074 D01 15.247 Meas Guidance v05r02					
Limit:	In any 100 kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator 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.					
Test setup:						
Test Instruments:	Refer to section 6.0 for details					
Test mode:	Refer to section 5.2 for details					
Test results:	Pass					
Test environment:	Temp.:	25 °C	Humid.:	52%	Press.:	1012mbar

Test plot as follows:

Test mode:	802.11b

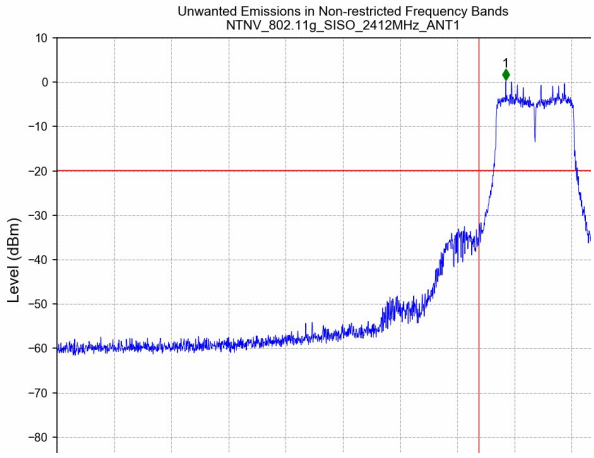


Lowest channel

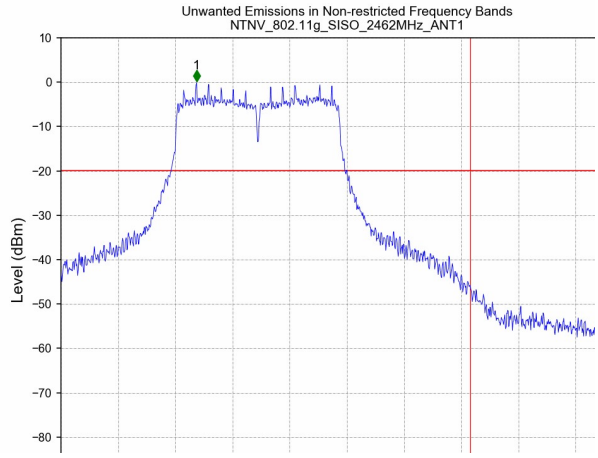


Highest channel

Test mode:	802.11g

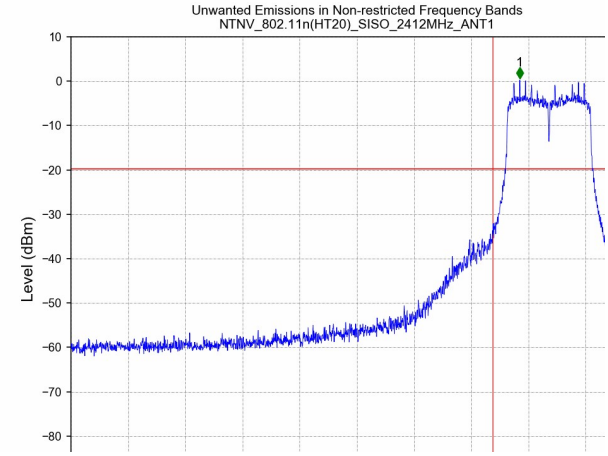


Lowest channel

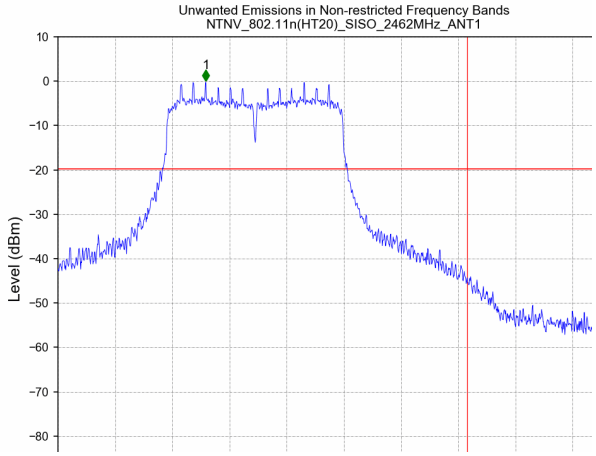


Highest channel

Test mode:	802.11n(HT20)

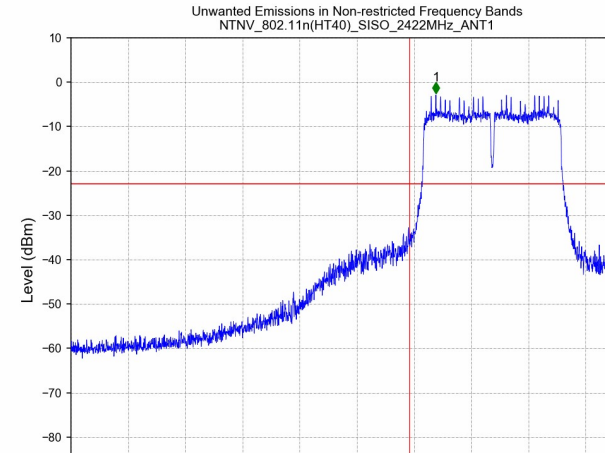


Lowest channel

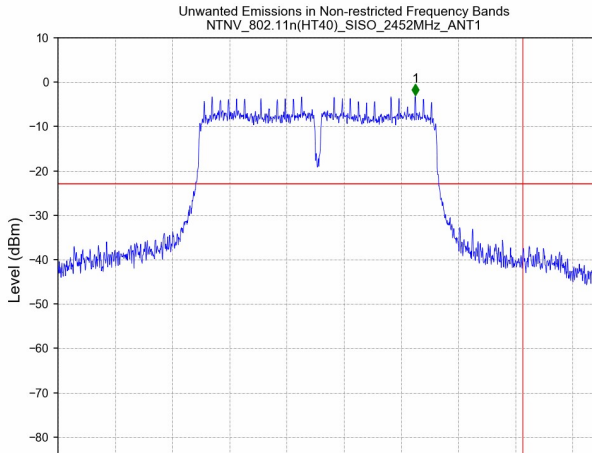


Highest channel

Test mode:	802.11n(HT40)



Lowest channel



Highest channel

6.5.2. Radiated Emission Method

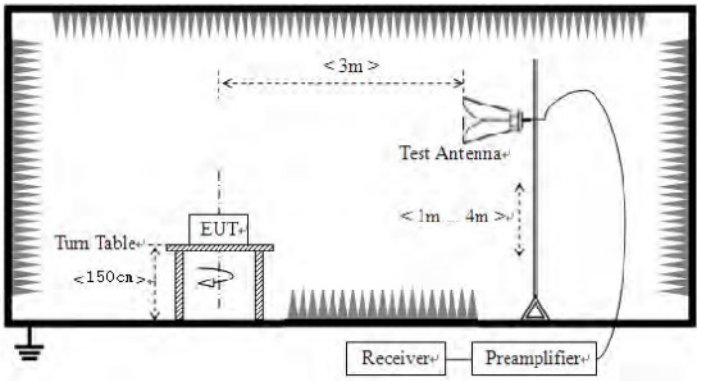
Test Requirement:	FCC Part15 C Section 15.209 and 15.205
Test Method:	ANSI C63.10: 2013
Test Frequency Range:	All of the restrict bands were tested, only the worst band's (2310MHz to 2500MHz) data was showed.
Test site:	Measurement Distance: 3m
Receiver setup:	

Frequency	Detector	RBW	VBW	Remark
Above 1GHz	Peak	1MHz	3MHz	Peak Value
	Peak	1MHz	10Hz	Average Value

Limit:

Frequency	Limit (dBuV/m @3m)	Remark
Above 1GHz	54.00	Average Value
	74.00	Peak Value

Test setup:



Test Procedure:

1. The EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter camber. The table was rotated 360 degrees to determine the position of the highest radiation.
2. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
3. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
4. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rota table was turned from 0 degrees to 360 degrees to find the maximum reading.
5. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
6. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

Test Instruments:	Refer to section 6.0 for details					
Test mode:	Refer to section 5.2 for details					
Test results:	Pass					
Test environment:	Temp.:	25 °C	Humid.:	52%	Press.:	1012mbar

Measurement Data

Remark: During the test, pre-scan the 802.11b/802.11g/802.11n (H20)/802.11n (H40) modulation, and found the 802.11b modulation which it is worse case.

Test mode:	802.11b	Test channel:	Lowest

Horizontal (Worst case)

Frequency	Meter Reading	Antenna Factor	Cable Loss	Preamp Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB/m)	(dB)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
2390	61.35	26.2	5.72	33.3	59.97	74	-14.03	peak
2390	47.8	26.2	5.72	33.3	46.42	54	-7.58	AVG

Vertical:

Frequency	Meter Reading	Antenna Factor	Cable Loss	Preamp Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB/m)	(dB)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
2390	58.88	26.2	5.72	33.3	57.5	74	-16.5	peak
2390	46.36	26.2	5.72	33.3	44.98	54	-9.02	AVG

Test mode:	802.11b	Test channel:	Highest

Horizontal (Worst case)

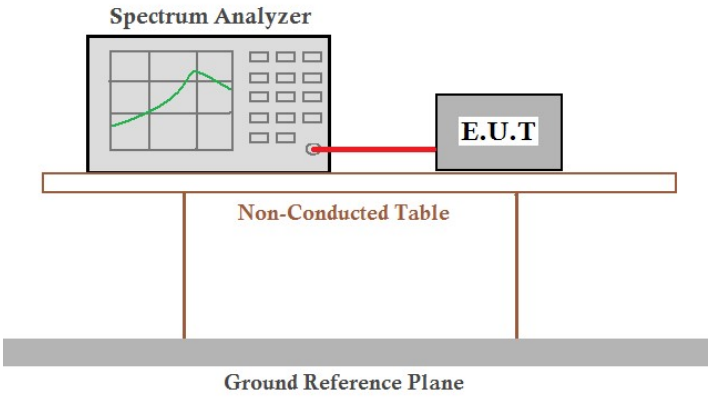
Frequency	Meter Reading	Antenna Factor	Cable Loss	Preamp Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB/m)	(dB)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
2483.5	56.09	28.6	6.97	32.7	58.96	74	-15.04	peak
2483.5	41.88	28.6	6.97	32.7	44.75	54	-9.25	AVG

Vertical:

Frequency	Meter Reading	Antenna Factor	Cable Loss	Preamp Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB/m)	(dB)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
2483.5	57.08	28.6	6.97	32.7	59.95	74	-14.05	peak
2483.5	43.08	28.6	6.97	32.7	45.95	54	-8.05	AVG

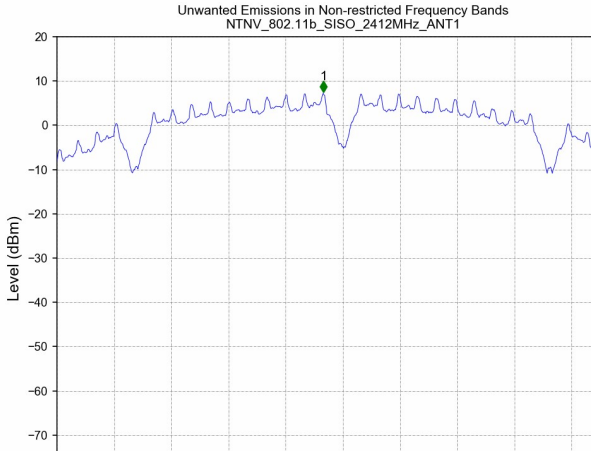
6.6. Spurious Emission

6.6.1. Conducted Emission Method

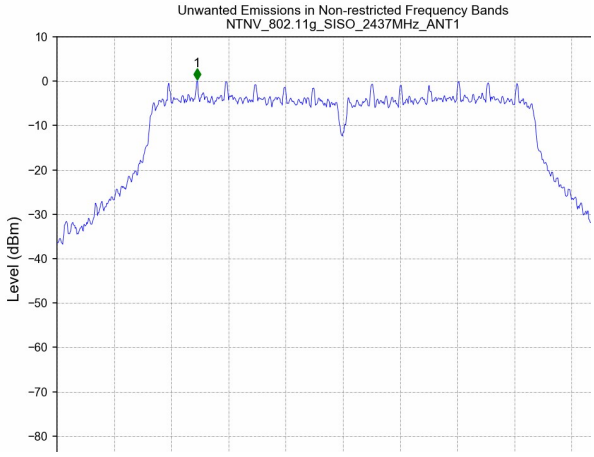
Test Requirement:	FCC Part15 C Section 15.247 (d)					
Test Method:	KDB558074 D01 15.247 Meas Guidance v05r02					
Limit:	In any 100 kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator 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.					
Test setup:						
Test Instruments:	Refer to section 6.0 for details					
Test mode:	Refer to section 5.2 for details					
Test results:	Pass					
Test environment:	Temp.:	25 °C	Humid.:	52%	Press.:	1012mbar

Measurement Data:

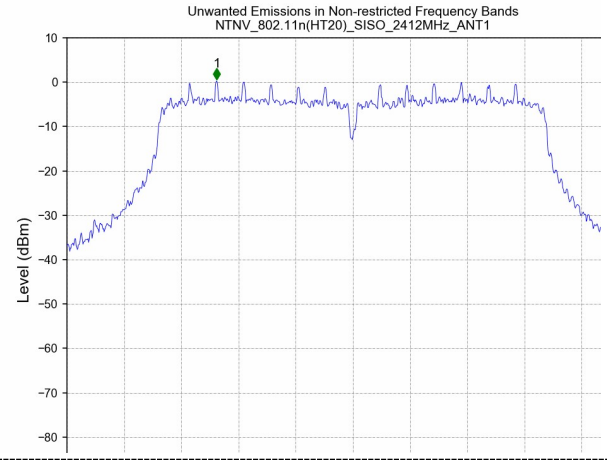
Reference



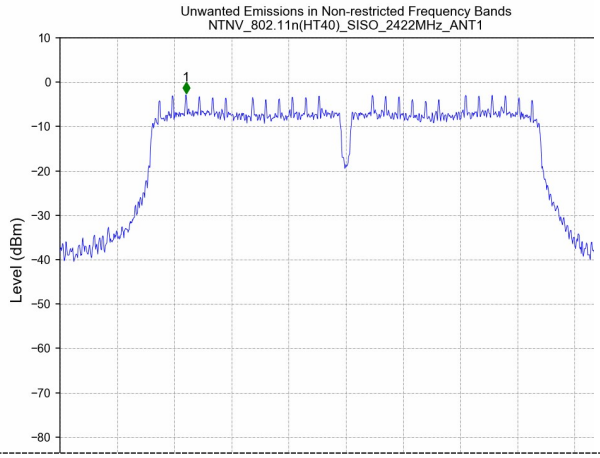
802.11b



802.11g



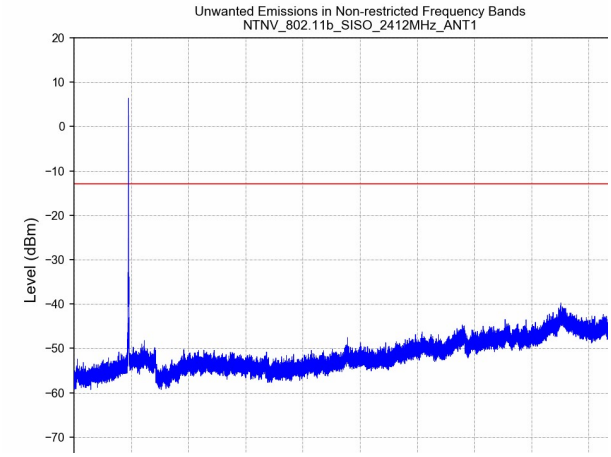
802.11n(HT20)

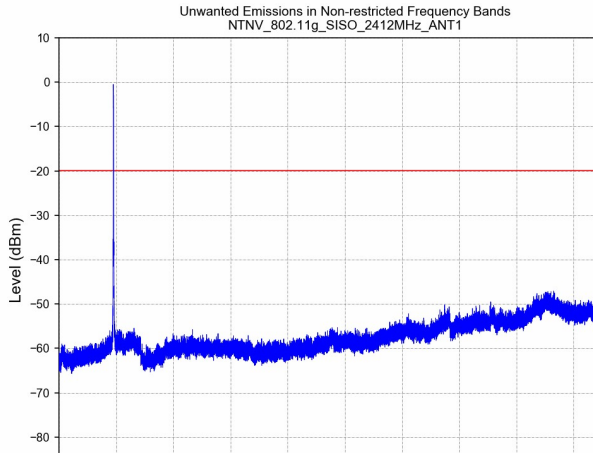

Unwanted Emissions in Non-restricted Frequency Bands
NTNV_802.11n(HT40)_SISO_2422MHz_ANT1
Level (dBm)
10
0
−10
−20
−30
−40
−50
−60
−70
−80
1

802.11n(HT40)

802.11b	802.11g

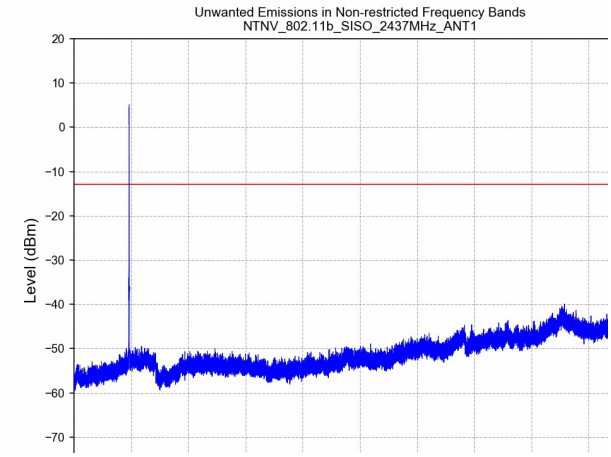
Lowest channel

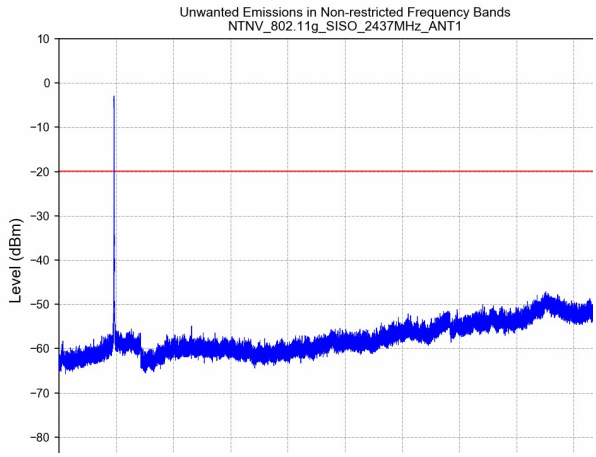




30MHz~25GHz

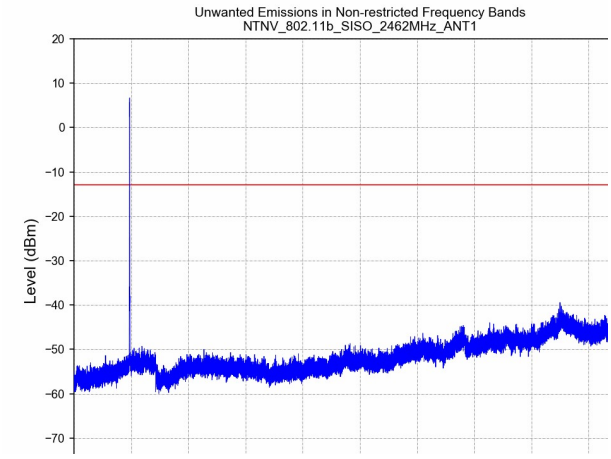
Middle channel

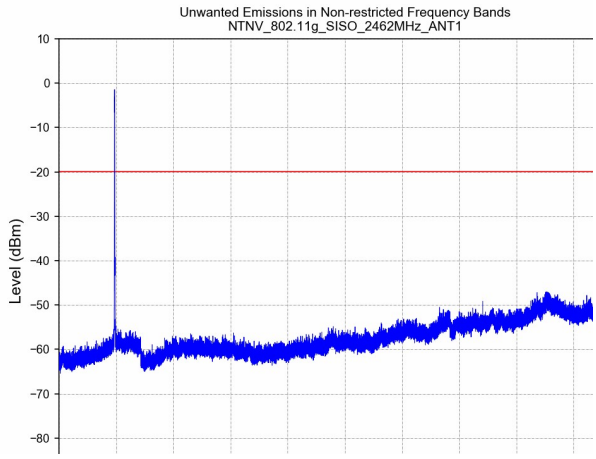




30MHz~25GHz

Highest channel

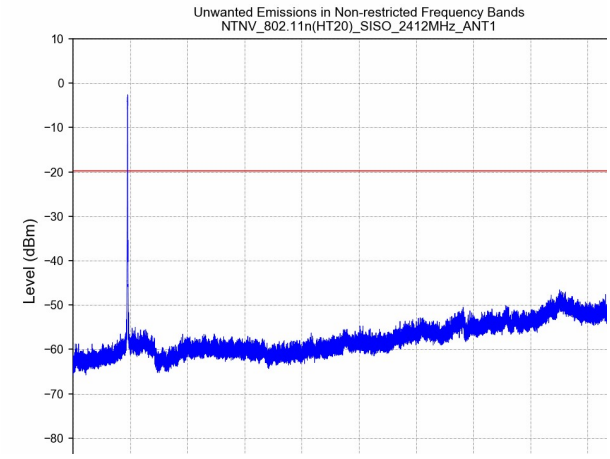


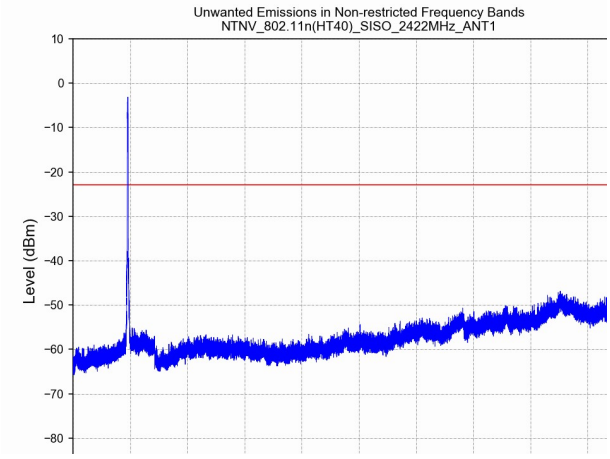


30MHz~25GHz

802.11n(HT20)	802.11n(HT40)

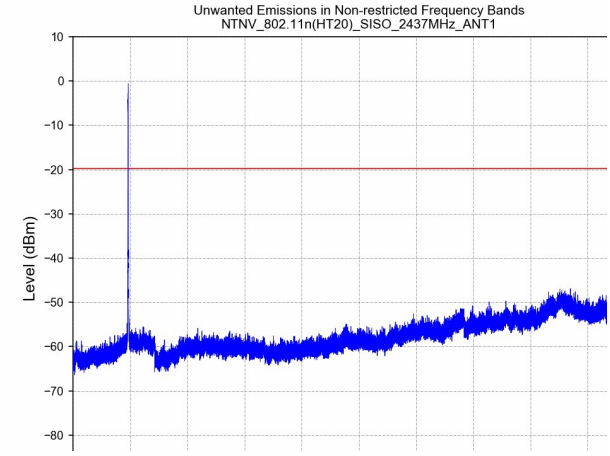
Lowest channel

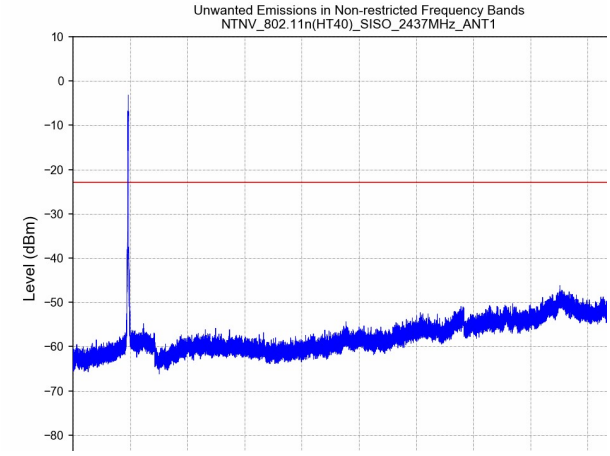




30MHz~25GHz

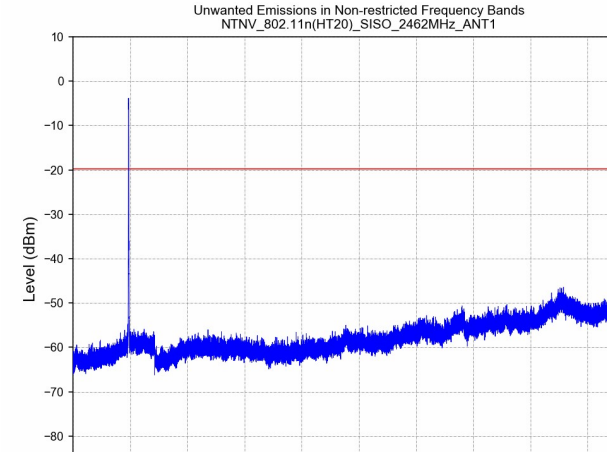
Middle channel

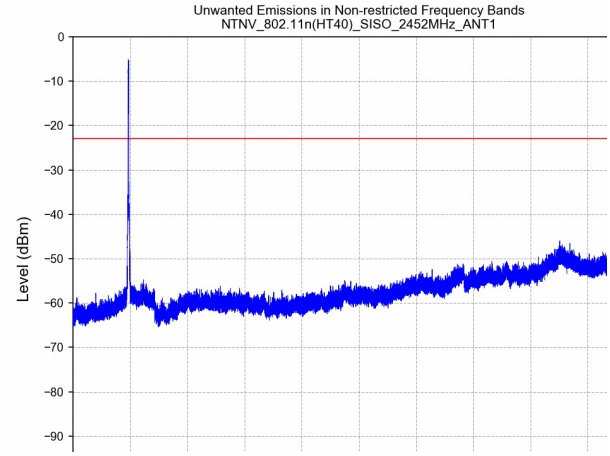




30MHz~25GHz

Highest channel





30MHz~25GHz

6.6.2. Radiated Emission Method

Test Requirement:	FCC Part15 C Section 15.209
Test Method:	ANSI C63.10:2013
Test Frequency Range:	9kHz to 25GHz
Test site:	Measurement Distance: 3m

Receiver setup:

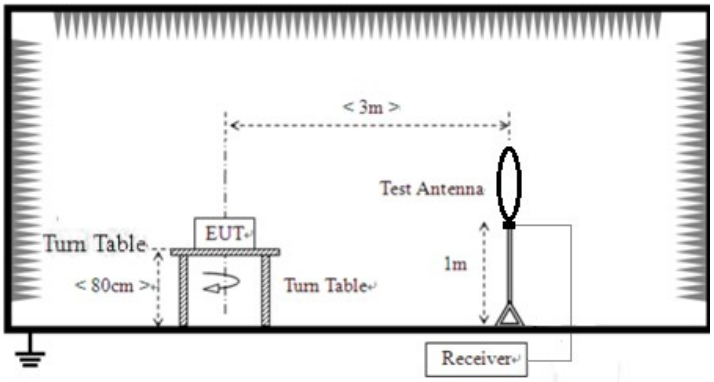
Frequency	Detector	RBW	VBW	Value
9KHz-150KHz	Quasi-peak	200Hz	600Hz	Quasi-peak
150KHz-30MHz	Quasi-peak	9KHz	30KHz	Quasi-peak
30MHz-1GHz	Quasi-peak	120KHz	300KHz	Quasi-peak
Above 1GHz	Peak	1MHz	3MHz	Peak
	Peak	1MHz	10Hz	Average

Limit:

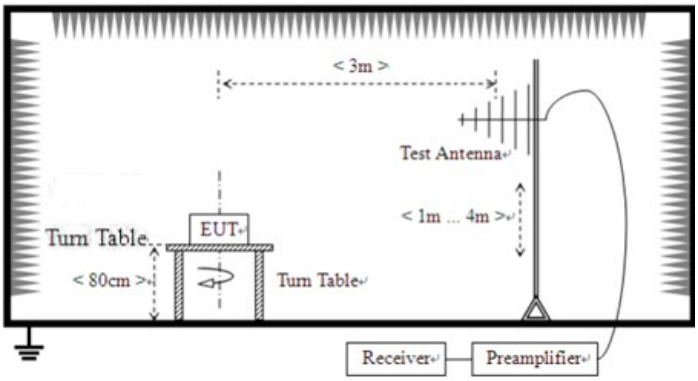
Frequency	Limit (uV/m)	Value	Measurement Distance
0.009MHz-0.490MHz	2400/F(KHz)	QP	300m
0.490MHz-1.705MHz	24000/F(KHz)	QP	30m
1.705MHz-30MHz	30	QP	30m
30MHz-88MHz	100	QP	3m
88MHz-216MHz	150	QP	
216MHz-960MHz	200	QP	
960MHz-1GHz	500	QP	
Above 1GHz	500	Average	
	5000	Peak	

Test setup:

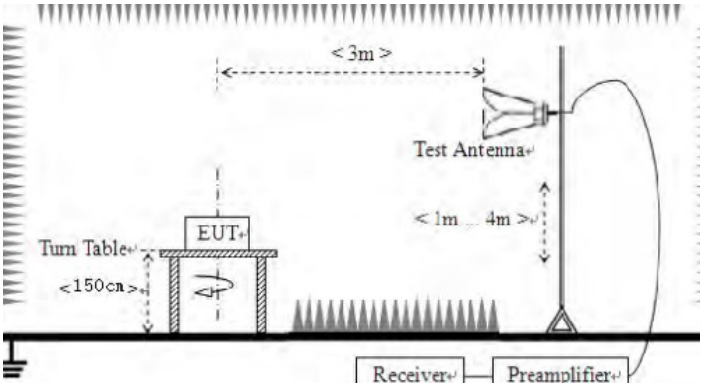
For radiated emissions from 9kHz to 30MHz



For radiated emissions from 30MHz to1GHz



For radiated emissions above 1GHz



Test Procedure:	1. The EUT was placed on the top of a rotating table (0.8m for below 1G and 1.5m for above 1G) above the ground at a 3 meter camber. The table was rotated 360 degrees to determine the position of the highest radiation. 2. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower. 3. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement. 4. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rota table was turned from 0 degrees to 360 degrees to find the maximum reading. 5. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode. 6. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.
Test Instruments:	Refer to section 6.0 for details
Test mode:	Refer to section 5.2 for details

Test environment:	Temp.:	25 °C	Humid.:	52%	Press.:	1012mbar

Test voltage:	AC 120V, 60Hz
Test results:	Pass

Remarks:
1.Only the worst case Main Antenna test data.
2.Pre-scan all kind of the place mode (X-axis, Y-axis, Z-axis), and found the Y-axis which it is worse case.

Measurement data:

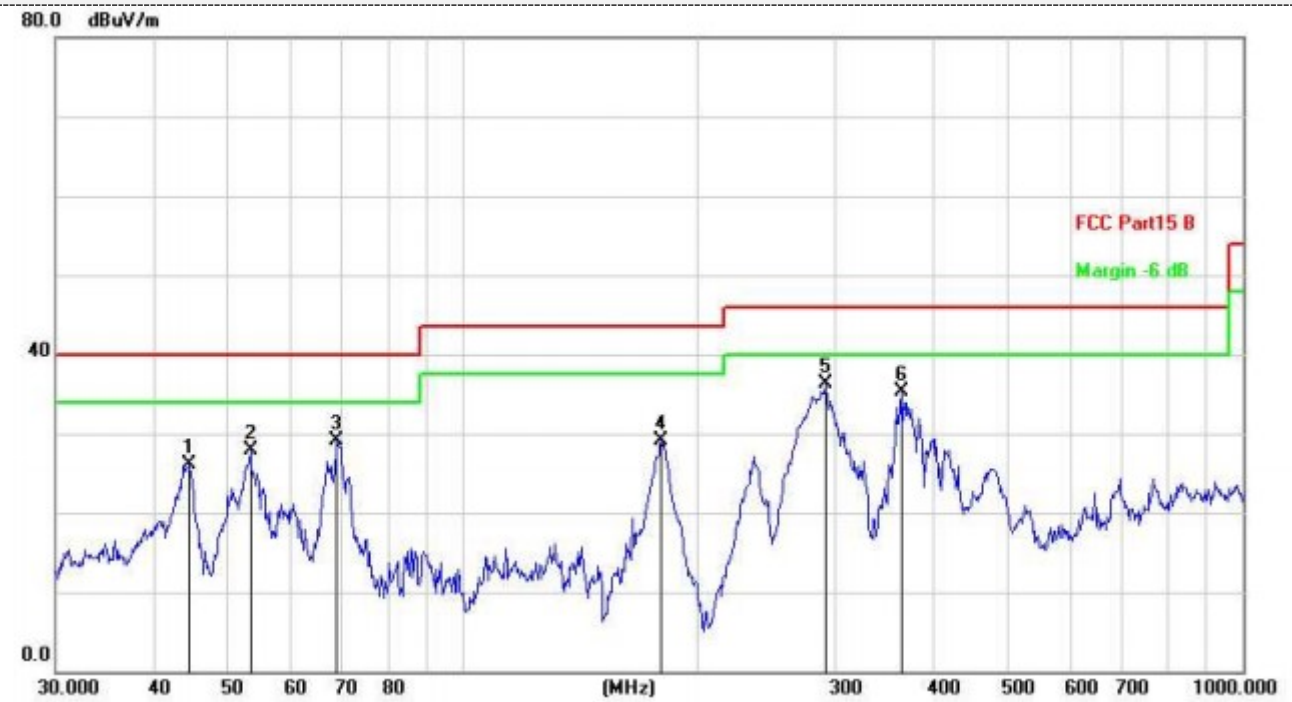
- **9kHz~30MHz**

  The emission from 9 kHz to 30MHz was pre-tested and found the result was 20dB lower than the limit, and according to 15.31(o) & RSS-Gen 6.13, the test result no need to reported.

■ **Below 1GHz**

Pre-scan all test modes, found worst case at 802.11b 2437MHz, and so only show the test result of 802.11b 2437MHz

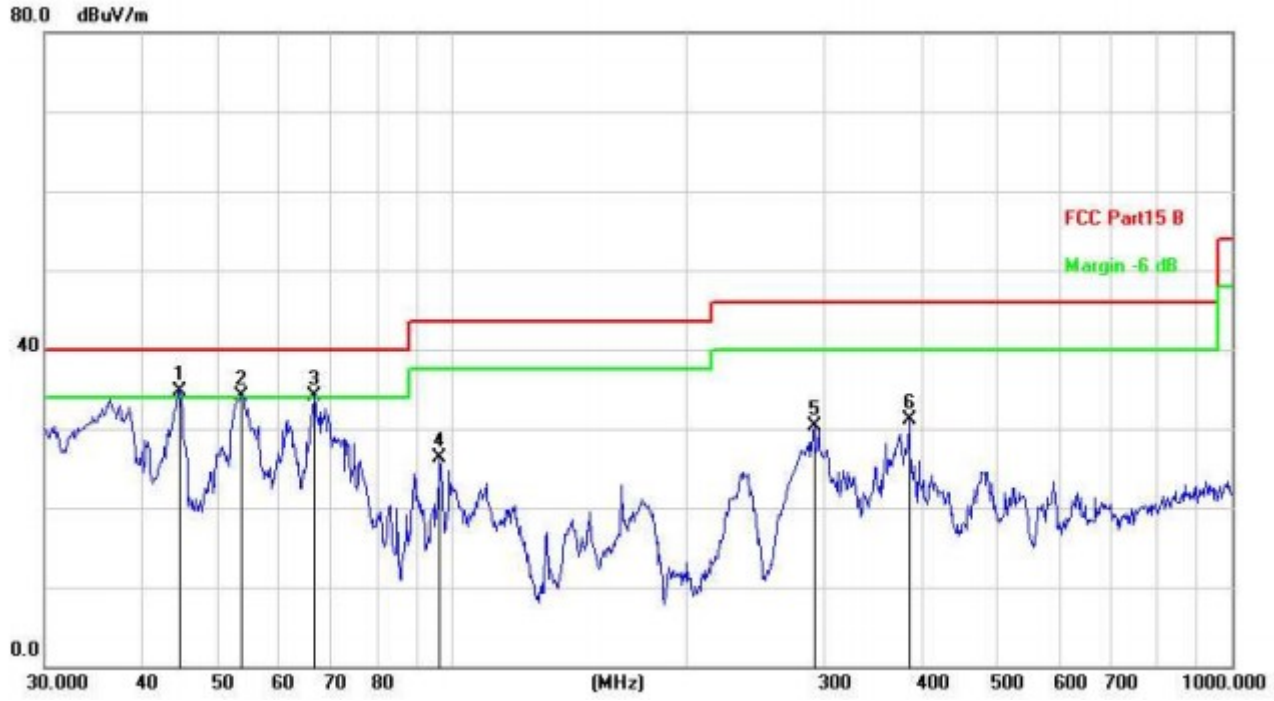
Horizontal



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB	dBuV/m	dB/m	dB	Detector
1		44.5868	43.38	-17.24	26.14	40.00	-13.86	QP
2		53.3179	45.33	-17.50	27.83	40.00	-12.17	QP
3		68.8721	48.80	-19.76	29.04	40.00	-10.96	QP
4		179.3863	48.56	-19.40	29.16	43.50	-14.34	QP
5	*	292.0583	53.57	-17.30	36.27	46.00	-9.73	QP
6		364.2595	52.62	-17.25	35.37	46.00	-10.63	QP

Final Level =Receiver Read level + Correct Factor

Vertical



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB	dBuV/m	dB/m	dB	Detector
1	*	44.7433	52.13	-17.42	34.71	40.00	-5.29	QP
2	!	53.6931	51.73	-17.54	34.19	40.00	-5.81	QP
3	!	66.4989	53.33	-19.32	34.01	40.00	-5.99	QP
4		96.4362	47.53	-21.27	26.26	43.50	-17.24	QP
5		291.0360	47.66	-17.29	30.37	46.00	-15.63	QP
6		385.2805	46.82	-15.65	31.17	46.00	-14.83	QP

Final Level =Receiver Read level + Correct Factor

■ **Above 1GHz**

Note: During the test, pre-scan the 802.11b/802.11g/802.11n (H20)/802.11n (H40) modulation, and found the 802.11b modulation which it is worse case.

802.11b:Lowest

Horizontal:

Frequency (MHz)	Meter Reading (dBμV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
4824	53.19	31.40	8.18	31.50	61.27	74.00	-12.73	peak
4824	38.57	31.40	8.18	31.50	46.65	54.00	-7.35	AVG
7236	41.92	35.80	10.83	31.40	57.15	74.00	-16.85	peak
7236	27.67	35.80	10.83	31.40	42.90	54.00	-11.10	AVG
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Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.								

Vertical:

Frequency (MHz)	Meter Reading (dBμV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
4824	52.30	31.40	8.18	31.50	60.38	74.00	-13.62	peak
4824	36.91	31.40	8.18	31.50	44.99	54.00	-9.01	AVG
7236	45.82	35.80	10.83	31.40	61.05	74.00	-12.95	peak
7236	27.91	35.80	10.83	31.40	43.14	54.00	-10.86	AVG
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Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.								

802.11b:Middle

Horizontal:

Frequency (MHz)	Meter Reading (dBμV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
4874	52.39	31.40	9.17	32.10	60.86	74.00	-13.14	peak
4874	37.15	31.40	9.17	32.10	45.62	54.00	-8.38	AVG
7311	43.08	35.80	10.83	31.40	58.31	74.00	-15.69	peak
7311	28.11	35.80	10.83	31.40	43.34	54.00	-10.66	AVG
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Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.								

Vertical:

Frequency (MHz)	Meter Reading (dBμV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
4874	52.68	31.40	9.17	32.10	61.15	74.00	-12.85	peak
4874	38.71	31.40	9.17	32.10	47.18	54.00	-6.82	AVG
7311	45.06	35.80	10.83	31.40	60.29	74.00	-13.71	peak
7311	27.81	35.80	10.83	31.40	43.04	54.00	-10.96	AVG
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Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.								

802.11b:Highest

Horizontal:

Frequency (MHz)	Meter Reading (dBμV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
4924	52.22	31.40	9.17	32.10	60.69	74	-13.31	peak
4924	37.15	31.40	9.17	32.10	45.62	54	-8.38	AVG
7386	45.15	35.80	10.83	31.40	60.38	74	-13.62	peak
7386	27.66	35.80	10.83	31.40	42.89	54	-11.11	AVG
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Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.								

Vertical:

Frequency (MHz)	Meter Reading (dBμV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
4924	49.5	31.40	9.17	32.10	57.97	74	-16.03	peak
4924	37.15	31.40	9.17	32.10	45.62	54	-8.38	AVG
7386	45.02	35.80	10.83	31.40	60.25	74	-13.75	peak
7386	28.1	35.80	10.83	31.40	43.33	54	-10.67	AVG
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Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.								

Remark：
(1) Data of measurement within this frequency range shown “--- ” in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
(2) When the test results of Peak Detected below the limits of Average Detected, the Average Detected is not need completed.

7. Test Setup Photo

Reference to the **appendix I** for details.

8. EUT Constructional Details

Reference to the **appendix II** for details.

------End------