

4.6. Radiated Emissions

4.6.1.1. Test Limits (< 30 MHz)

Frequency (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meter)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30.0	30	30

4.6.1.2. Test Limits (≥ 30 MHz)

FIELD STRENGTH of Fundamental: @3M	FIELD STRENGTH of Harmonics	S15.209	
902-928 MHz		30 - 88 MHz	40 dBuV/m
2.4-2.4835 GHz		88 - 216 MHz	43.5
94 dBμV/m @3m	54 dBμV/m @3m	216 - 960 MHz	46
		ABOVE 960 MHz	54dBuV/m

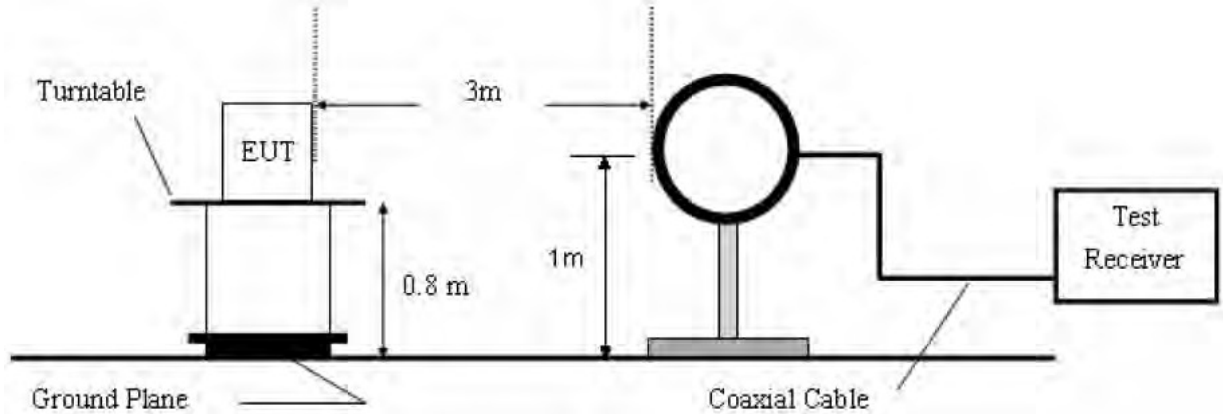
In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)).

Test Equipment

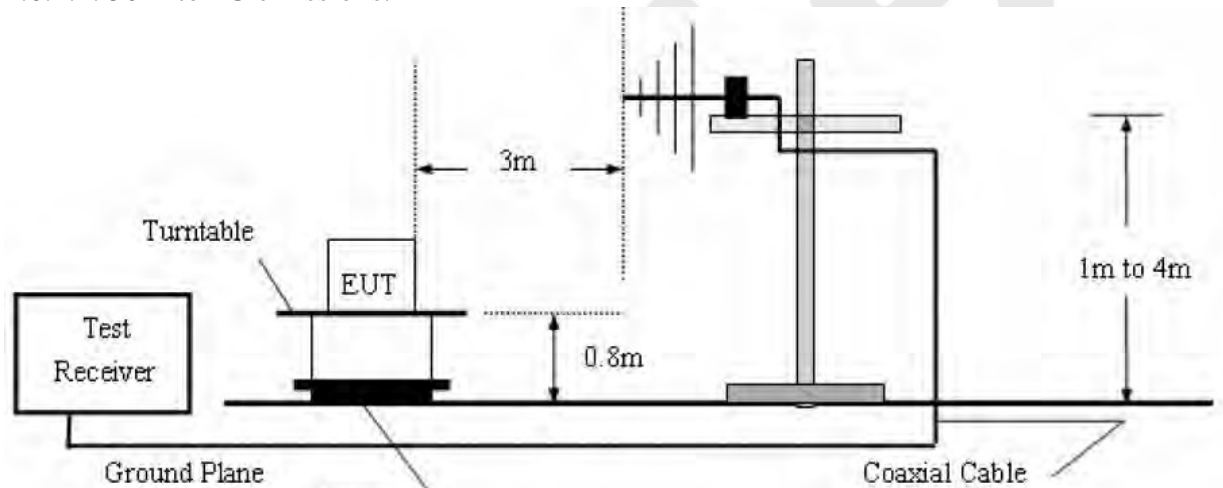
Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	Spectrum Analysis	Agilent	E4407B	US39390582	Apr. 17, 2016	1 Year
2.	Preamplifier	Instruments corporation	EMC011830	980100	Apr. 17, 2016	1 Year
3.	EMI Test Receiver	Rohde & Schwarz	ESPI	101604	Apr. 17, 2016	1 Year
4.	Double Ridged Horn Antenna	Instruments corporation	GTH-0118	351600	Apr. 20, 2016	1 Year
5.	Bilog Broadband Antenna	Schwarzbeck	VULB9163	VULB 9163-289	Apr. 20, 2016	1 Year
6.	Pre-amplifier	SONOMA	310N	186860	Apr. 17, 2016	1 Year
7.	EMI Test Software EZ-EMC	SHURPLE	N/A	N/A	N/A	N/A
8.	Power Sensor	DAER	RPR3006W	15I00041SN046	Jun 30, 2015	1 Year
9.	MXA Spectrum Analysis	Agilent	N9020A	MY51170037	Jun 30, 2015	1 Year
10.	MXG RF Vector Signal Generator	Agilent	N5182A	MY48180656	Jun 30, 2015	1 Year
11.	Signal Generator	Agilent	E4421B	MY41000743	Jun 30, 2015	1 Year
12.	DC Power supply	IV	IV-8080	YQSB0096	Jun 30, 2015	1 Year
13.	TEMP&HUMI PROGRAMMABLE CHAMBER	Bell Group	BE-THK-15 0M8	SE-0137	Mar 16, 2016	1 Year

4.6.2. Test Configuration:

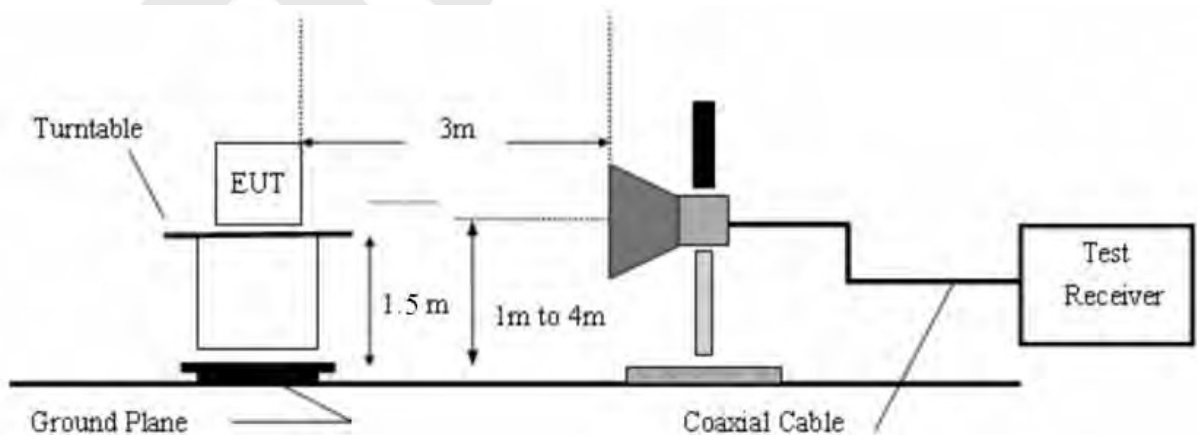
4.6.2.1. 9k to 30MHz emissions:



4.6.2.2. 30M to 1G emissions:



4.6.2.3. 1G to 40G emissions:



4.6.3. Test Procedure

For below 1GHz: The EUT is placed on a turntable, which is 0.8m above the ground plane.
For above 1GHz: The EUT is placed on a turntable, which is 1.5m above the ground plane.
The turn table can rotate 360 degrees to determine the position of the maximum emission level.
The EUT is set 3 meters away from the receiving antenna which is mounted on a antenna tower.
The antenna can be moved up and down from 1 to 4 meters to find out the maximum emission level. Both horizontal and vertical polarization of the antenna are set on test.

Measurements are made on 9KHz to 30MHz and 30MHz to 26GHz range with the transmitter set to the lowest, middle, and highest channels.

All readings from 30MHz to 1GHz are quasi-peak values with a resolution bandwidth of 120kHz. All reading are above 1GHz, peak & average values with a resolution bandwidth of 1MHz.

The EUT is tested in 9*6*6 Chamber. The device is evaluated in xyz orientation.

The test results are listed in Section 4.6.4.

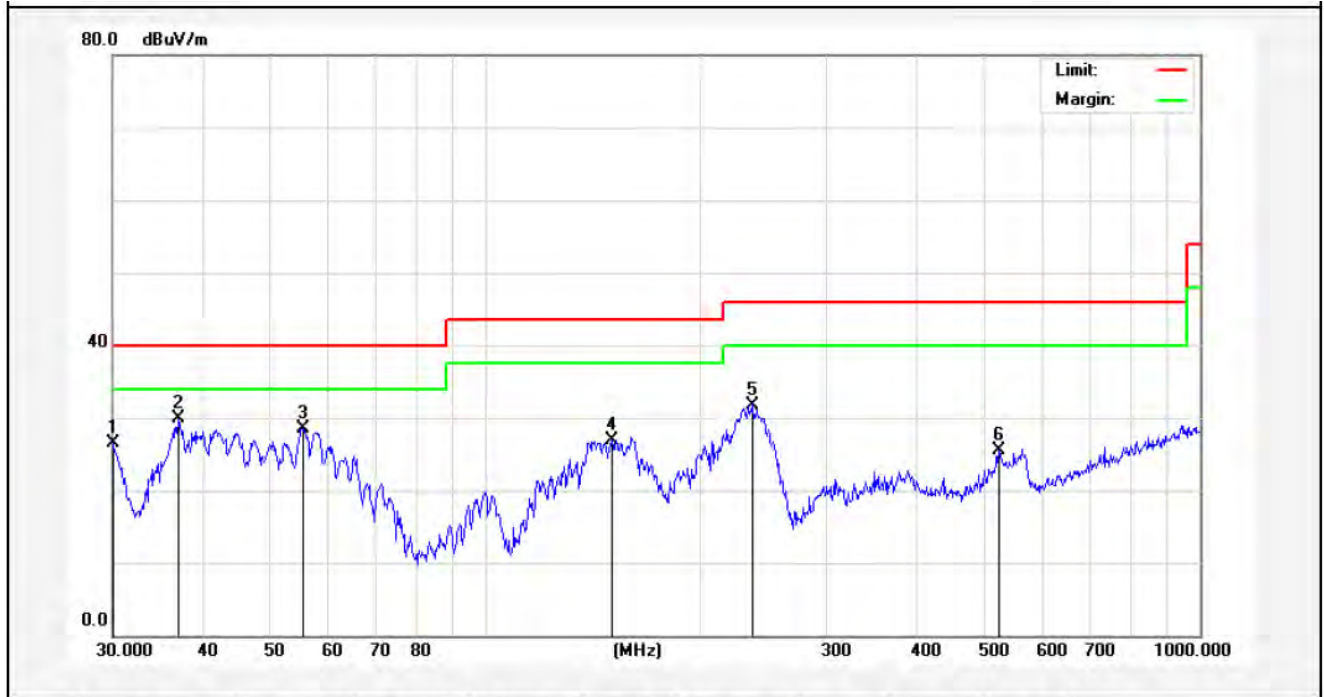
4.6.4. Test Results

The EUT was tested on (Charging, On) modes, only the worst data of (Charging) is attached in the following pages.

Only the worst case (x orientation).

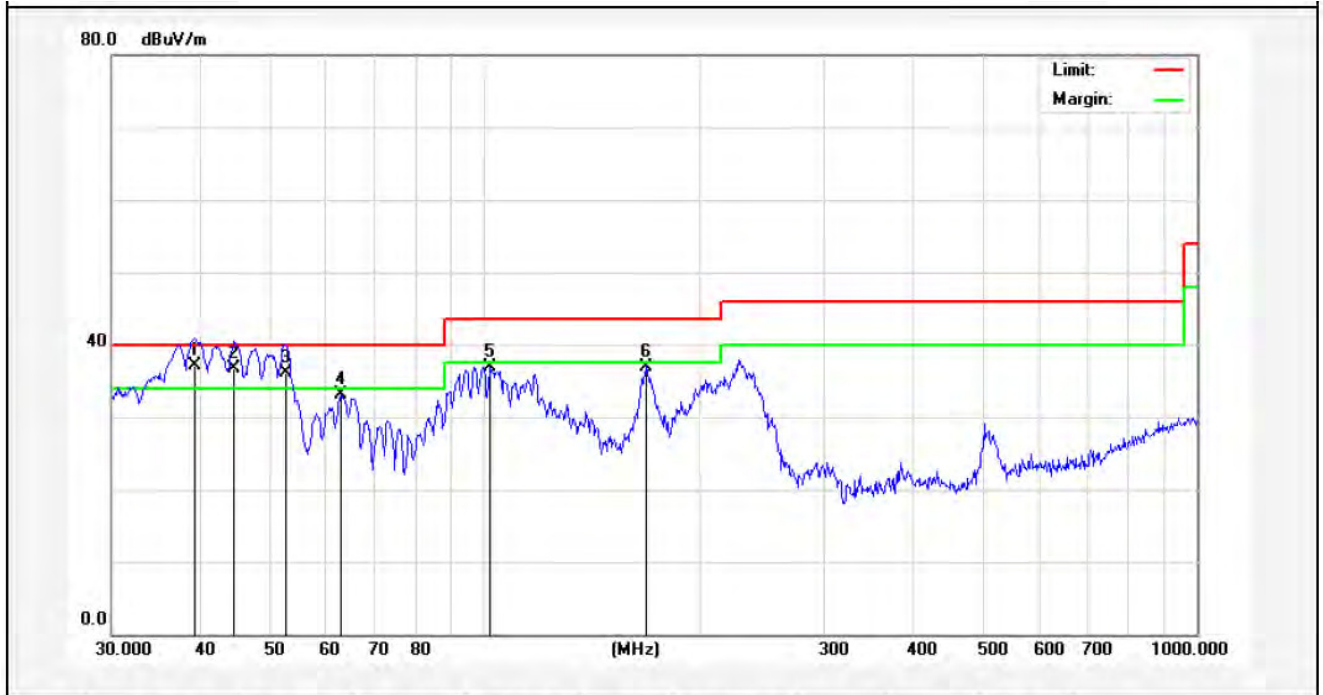
The test results of above 18000MHz are attenuated more than 20dB below the permissible limits, so the results don't record in the report.

Job No.:	011605878I	Plarization:	Horizontal
Standard:	(RE)FCC PART15 C_3m	Power Source:	AC 120V, 60Hz for adapter
Test item:	Radiation Test	Temp.(C)/Hum. (%RH):	24.3(C)/55% RH
Test Mode:	Charging	Distance:	3m



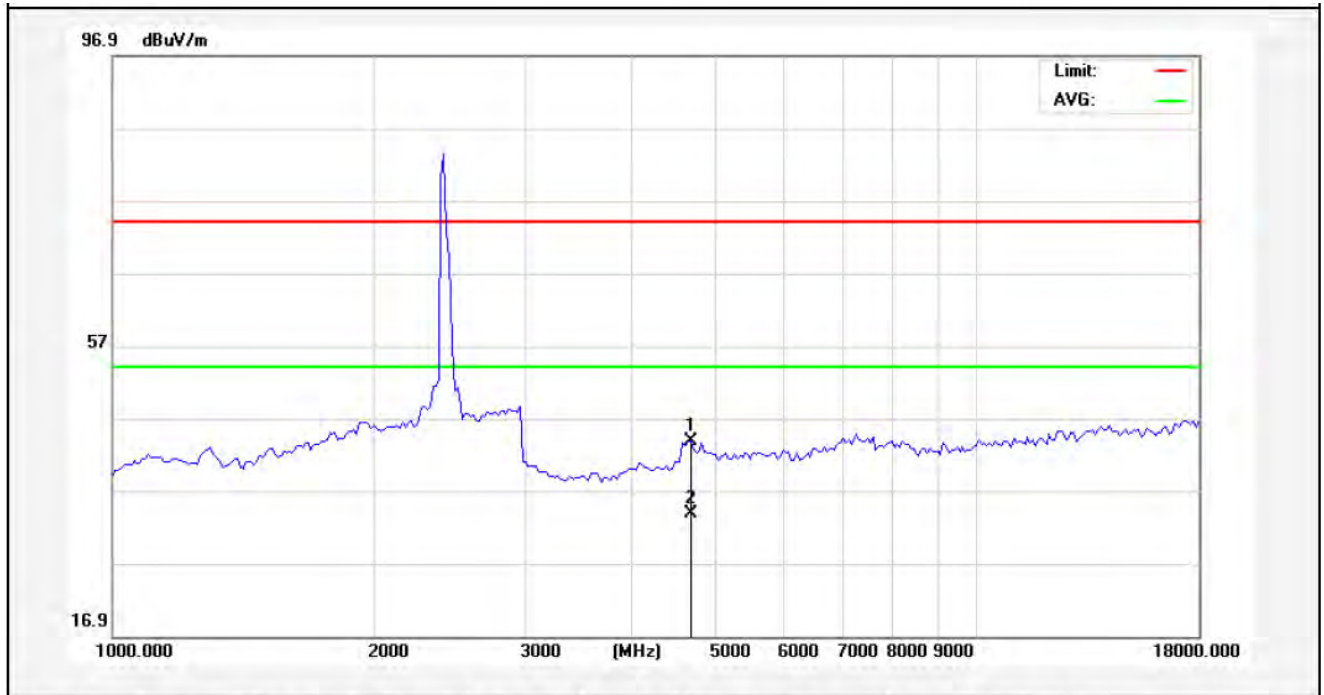
No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/)	Over Limit (dB)	Detector	Height (cm)	degree (deg)	Remark
1	30.0000	43.54	-16.95	26.59	40.00	-13.41	peak			
2	37.1550	42.45	-12.60	29.85	40.00	-10.15	peak			
3	55.4147	43.53	-14.97	28.56	40.00	-11.44	peak			
4	150.0108	50.18	-23.34	26.84	43.50	-16.66	peak			
5	235.8164	50.32	-18.52	31.80	46.00	-14.20	peak			
6	522.7180	36.50	-11.02	25.48	46.00	-20.52	peak			

Job No.:	011605878I	Plarization:	Vertical
Standard:	(RE)FCC PART15 C _3m	Power Source:	AC 120V, 60Hz for adapter
Test item:	Radiation Test	Temp.(C)/Hum.(%RH):	24.3(C)/55% RH
Test Mode:	Charging	Distance:	3m



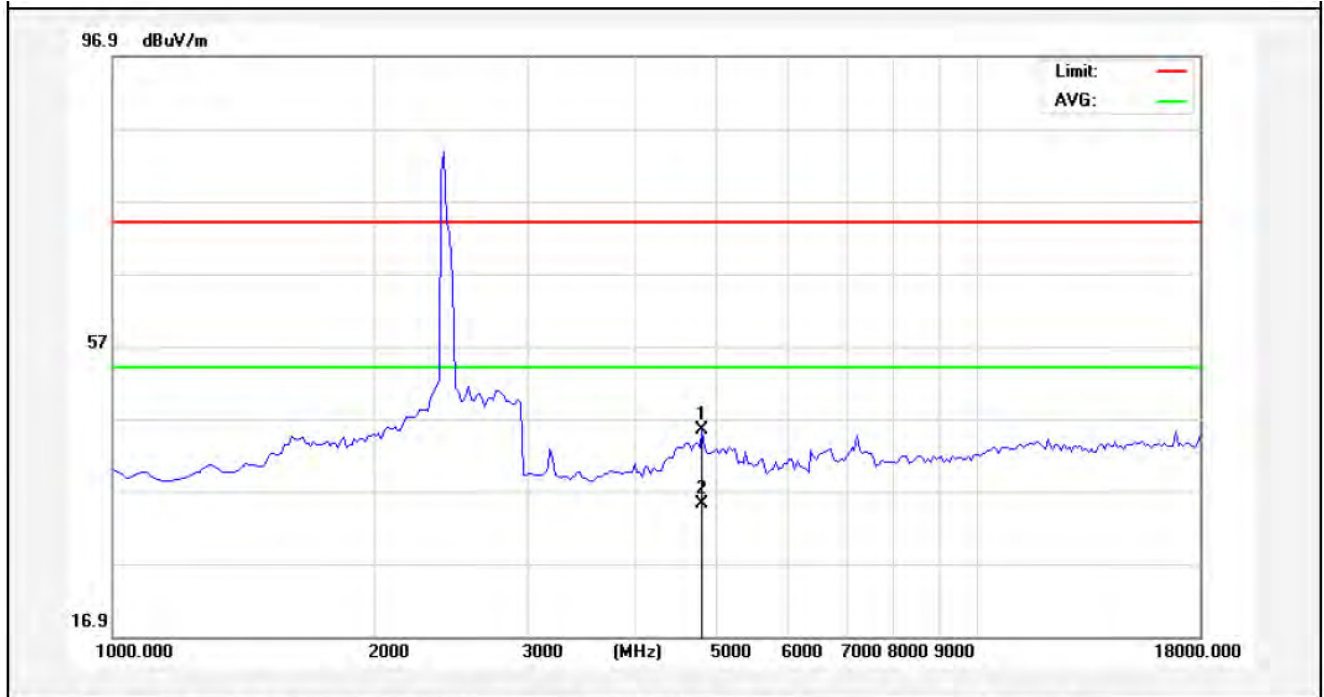
No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/)	Over Limit (dB)	Detector	Height (cm)	degree (deg)	Remark
1	39.2991	48.10	-10.92	37.18	40.00	-3.04	QP	100	0	
2	44.5868	48.93	-12.17	36.76	40.00	-3.24	QP	100	0	
3	52.7600	50.89	-14.77	36.12	40.00	-3.88	peak	100	360	
4	62.8708	49.68	-16.59	33.09	40.00	-6.91	peak			
5	102.0014	52.68	-15.74	36.94	43.50	-6.56	peak			
6	169.0054	54.60	-17.60	37.00	43.50	-6.50	peak			

Job No.:	011605878I	Plarization:	Horizontal
Standard:	(RE)FCC PART15 C _3m	Power Source:	AC 120V, 60Hz for adapter
Test item:	Radiation Test	Temp.(C)/Hum.(%RH):	24.3(C)/55% RH
Note:	802.11b(2412MHz)	Distance:	3m



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/)	Over Limit (dB)	Detector	Height (cm)	degree (deg)	Remark
1	4660.501	40.73	3.05	43.78	74.00	-30.22	peak			
2	4660.501	30.69	3.05	33.74	54.00	-20.26	AVG			

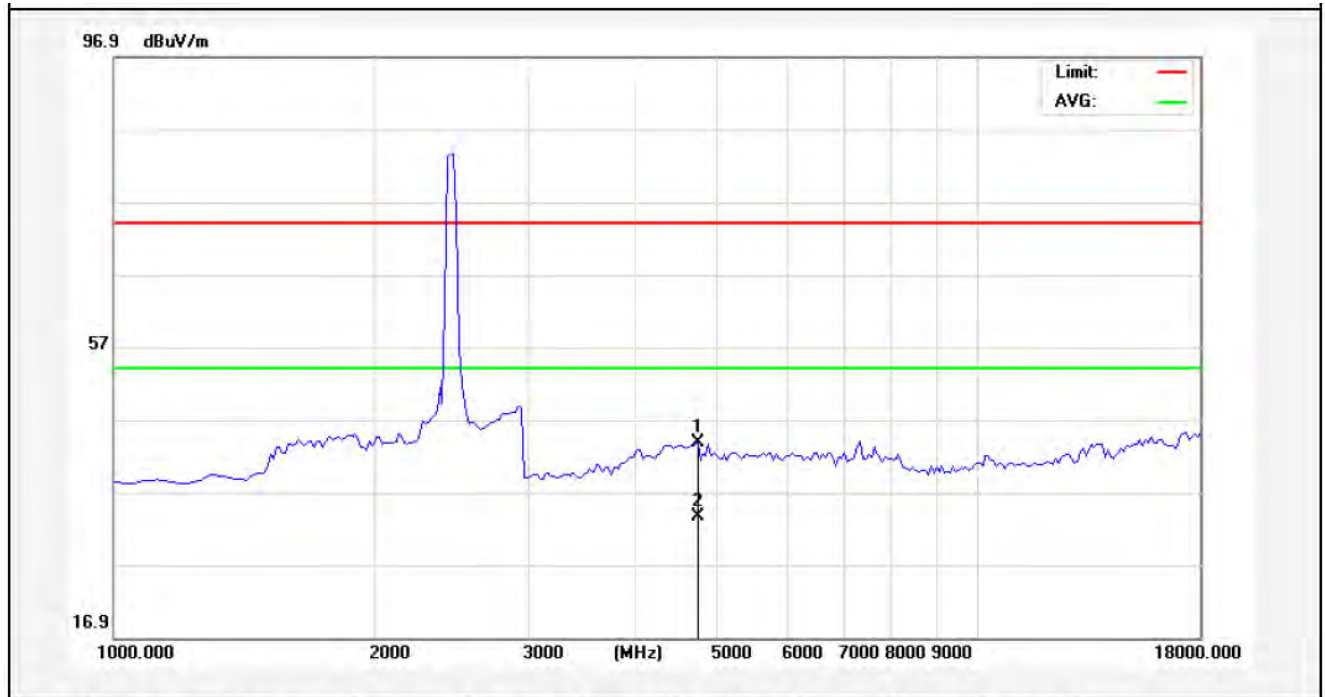
Job No.:	011605878I	Plarization:	Vertical
Standard:	(RE)FCC PART15 C _3m	Power Source:	AC 120V, 60Hz for adapter
Test item:	Radiation Test	Temp.(C)/Hum.(%RH):	24.3(C)/55%RH
Note:	802.11b(2412MHz)	Distance:	3m



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/)	Over Limit (dB)	Detector	Height (cm)	degree (deg)	Remark
1	4825.000	42.04	3.34	45.38	74.00	-28.62	peak			
2	4825.000	31.77	3.34	35.11	54.00	-18.89	AVG			

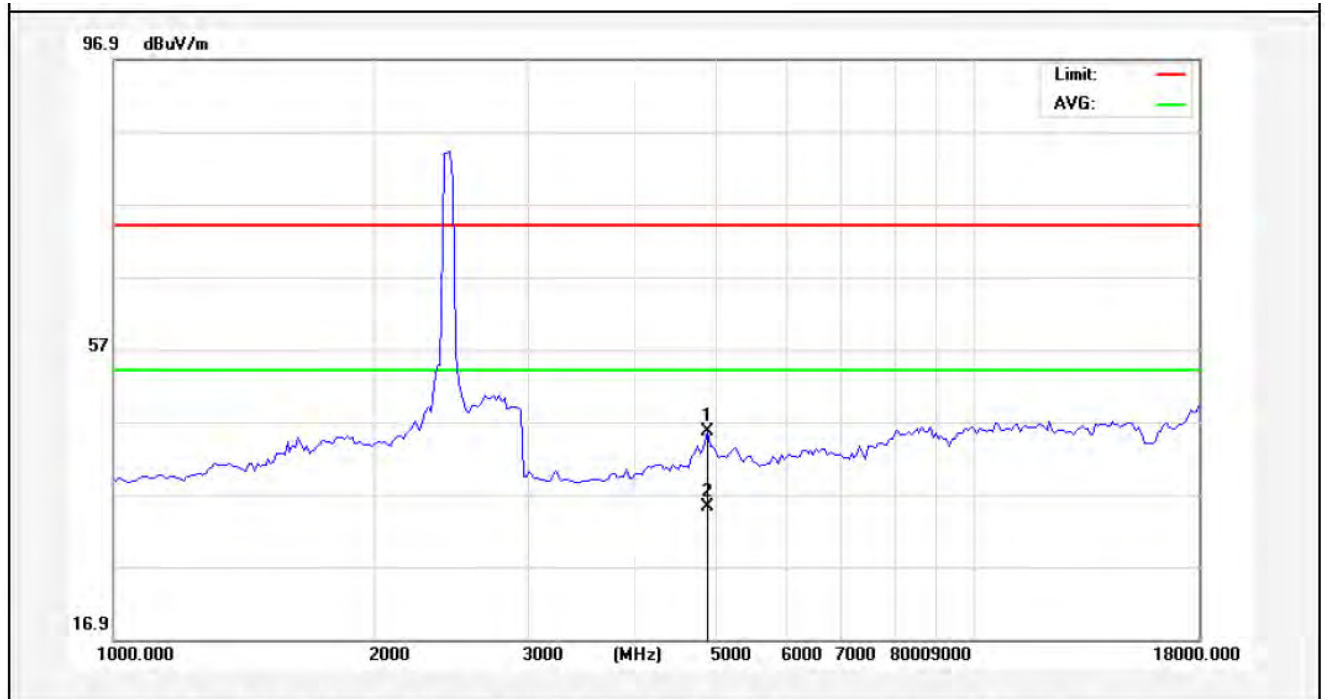
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Job No.:	011605878I	Plarization:	Horizontal
Standard:	(RE)FCC PART15 C _3m	Power Source:	AC 120V, 60Hz for adapter
Test item:	Radiation Test	Temp.(C)/Hum.(%RH):	24.3(C)/55% RH
Note:	802.11b(2437MHz)	Distance:	3m



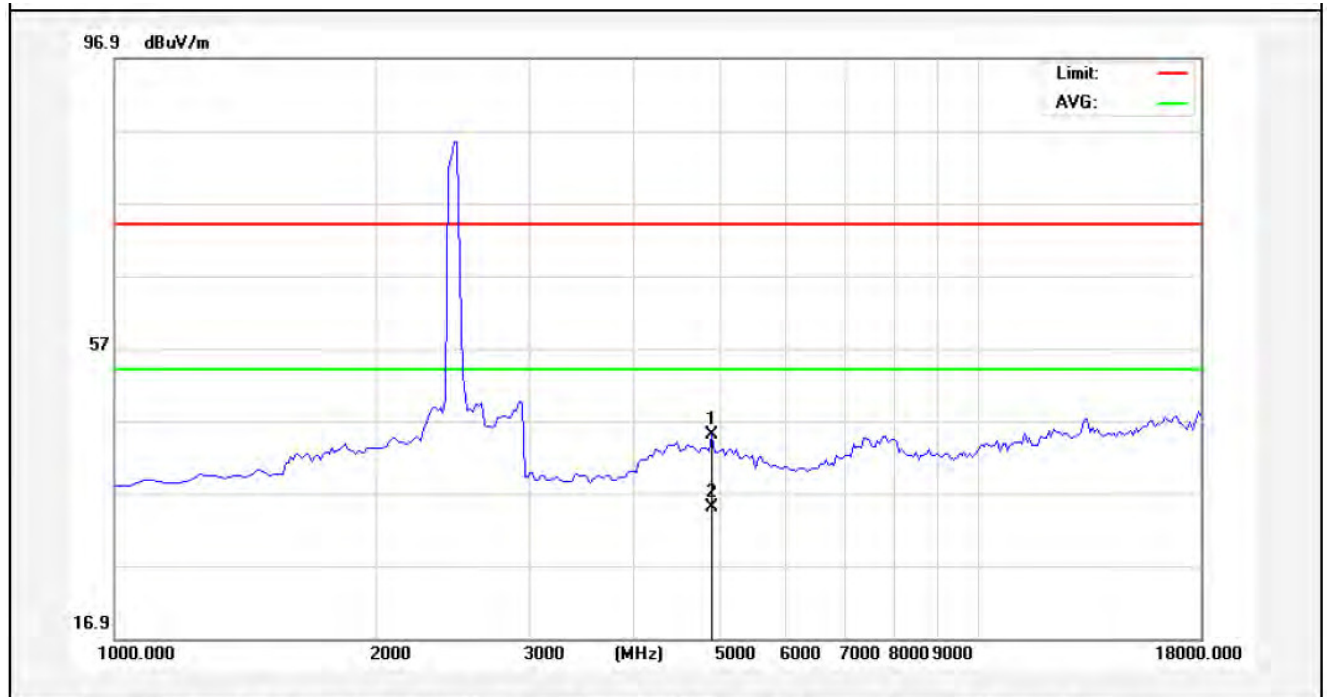
No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/)	Over Limit (dB)	Detector	Height (cm)	degree (deg)	Remark
1	4740.000	40.61	3.19	43.80	74.00	-30.20	peak			
2	4740.000	30.36	3.19	33.55	54.00	-20.45	AVG			

Job No.:	011605878I	Plarization:	Vertical
Standard:	(RE)FCC PART15 C_3m	Power Source:	AC 120V, 60Hz for adapter
Test item:	Radiation Test	Temp.(C)/Hum.(%RH):	24.3(C)/55% RH
Note:	802.11b(2437MHz)	Distance:	3m



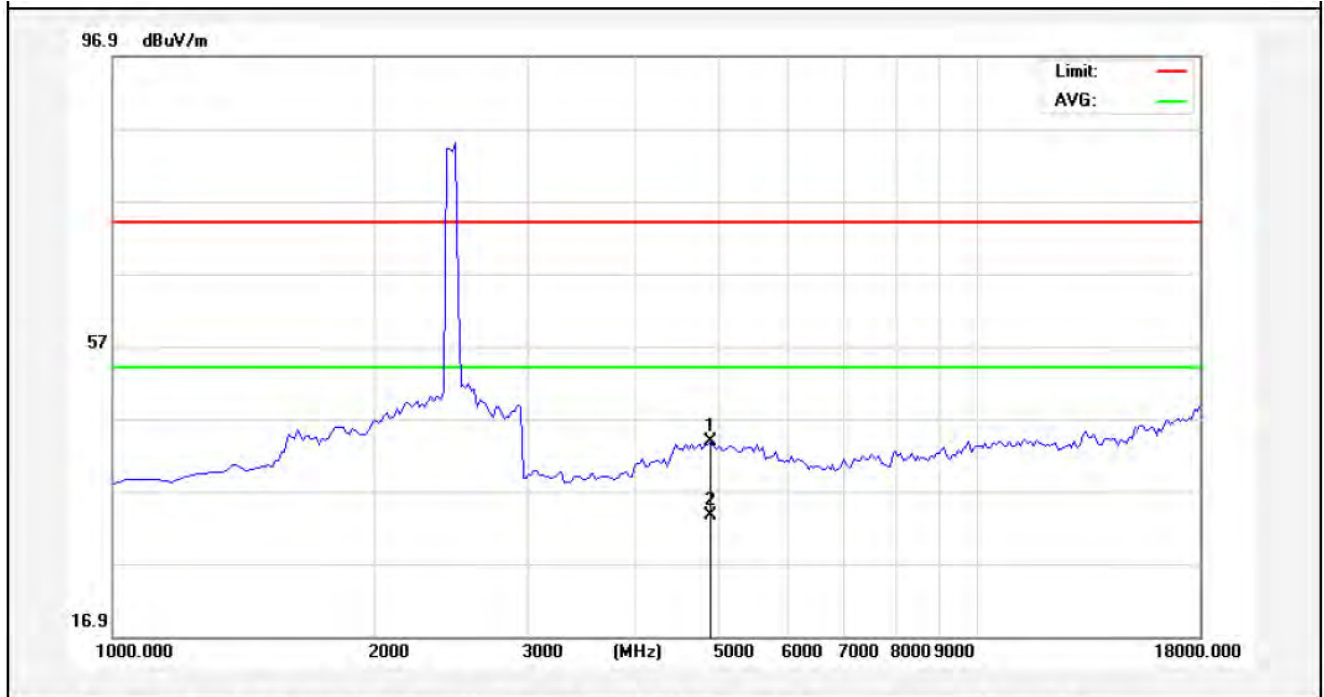
No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/)	Over Limit (dB)	Detector	Height (cm)	degree (deg)	Remark
1	4867.500	42.13	3.41	45.54	74.00	-28.46	peak			
2	4867.500	31.73	3.41	35.14	54.00	-18.86	AVG			

Job No.:	011605878I	Plarization:	Horizontal
Standard:	(RE)FCC PART15 C _3m	Power Source:	AC 120V, 60Hz for adapter
Test item:	Radiation Test	Temp.(C)/Hum.(% RH):	24.3(C)/55% RH
Note:	802.11b(2462MHz)	Distance:	3m



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/)	Over Limit (dB)	Detector	Height (cm)	degree (deg)	Remark
1	4910.000	41.50	3.49	44.99	74.00	-29.01	peak			
2	4910.000	31.47	3.49	34.96	54.00	-19.04	AVG			

Job No.:	011605878I	Plarization:	Vertical
Standard:	(RE)FCC PART15 C_3m	Power Source:	AC 120V, 60Hz for adapter
Test item:	Radiation Test	Temp.(C)/Hum.(%RH):	24.3(C)/55% RH
Note:	802.11b(2462MHz)	Distance:	3m



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/)	Over Limit (dB)	Detector	Height (cm)	degree (deg)	Remark
1	4910.000	40.33	3.49	43.82	74.00	-30.18	peak			
2	4910.000	30.21	3.49	33.70	54.00	-20.30	AVG			

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5. ANTENNA APPLICATION

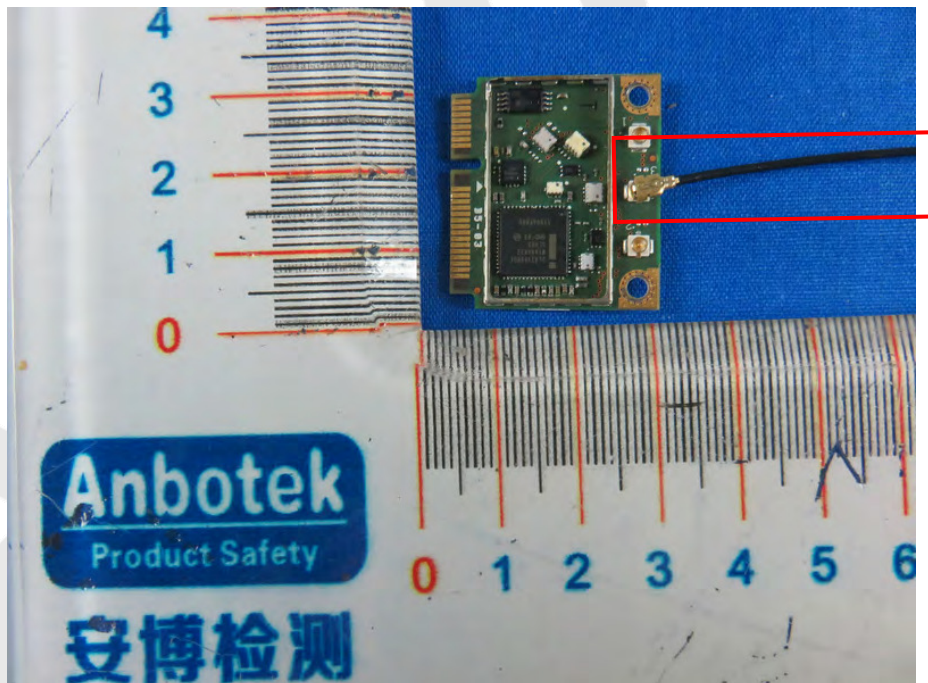
5.1. Antenna requirement

The EUT'S antenna is met the requirement of FCC part 15C section 15.203.

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited. This requirement does not apply to carrier current devices or to devices operated under the provisions of §15.211, §15.213, §15.217, §15.219, or §15.221. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with §15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this part are not exceeded.

5.2. Result

The EUT's antenna used a external antenna which is permanently attached with glue, so it can not be replaced with other antennas, The antenna's gain is 5dBi and meets the requirement.



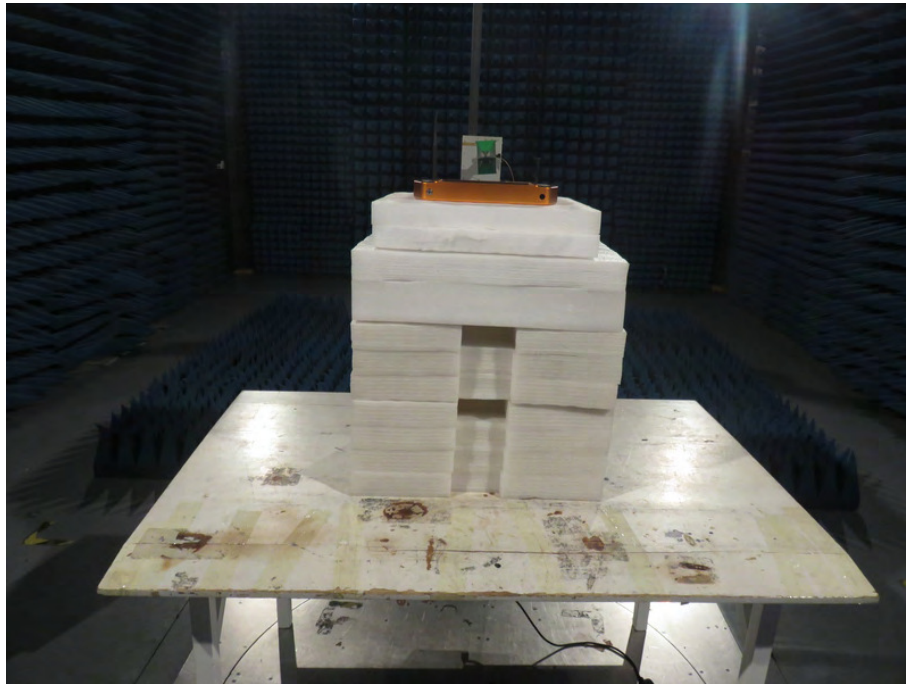
6. PHOTOGRAPH

6.1. Photo of Conducted Emission Measurement



6.2. Photo of Radiation Emission Test





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APPENDIX I (EXTERNAL PHOTOS)

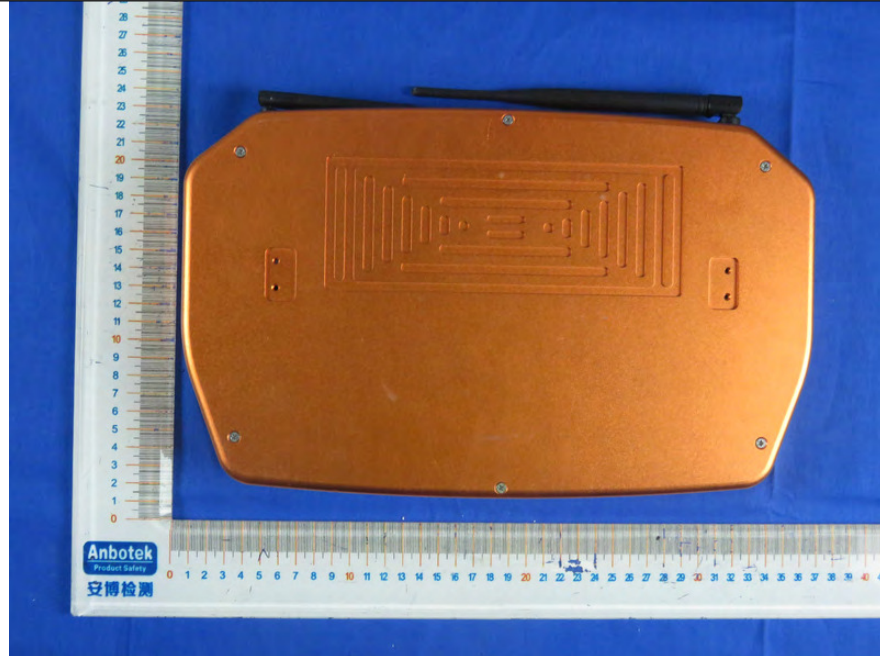
1. Figure
The EUT-Overall View



2. Figure
The EUT-Top View



3. Figure
The EUT-Bottom View



4. Figure
The EUT-Front View



5. Figure
The EUT-Back View



6. Figure
The EUT-Right View

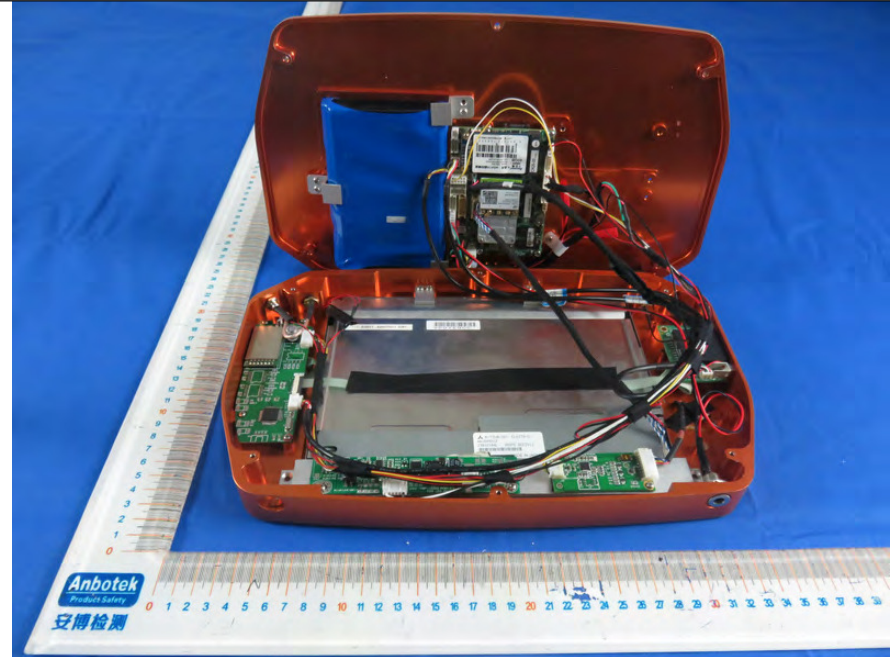


7. Figure
The EUT-Left View

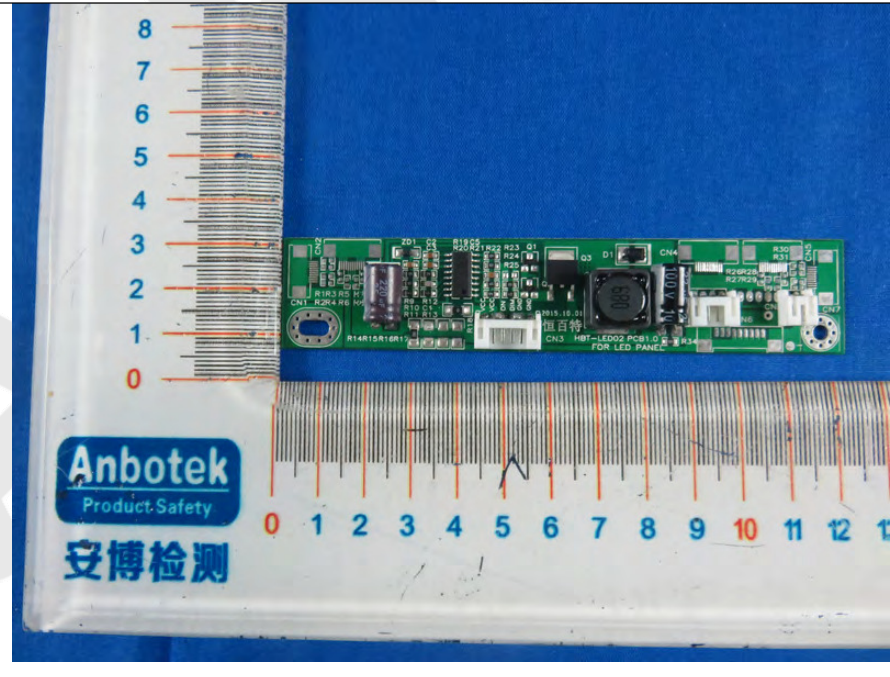


APPENDIX II (INTERNAL PHOTOS)

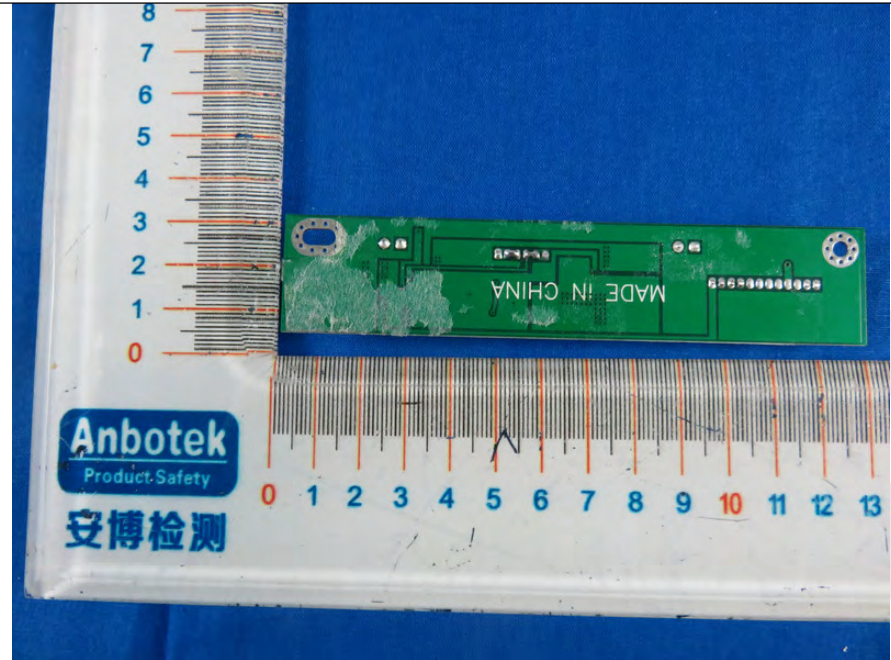
1. Figure
The EUT-Inside View



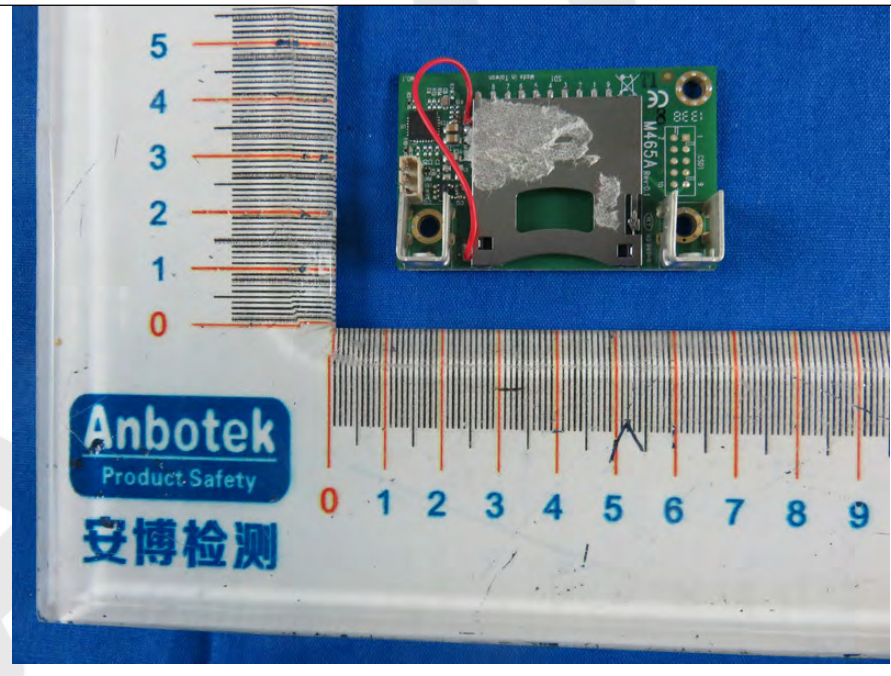
2. Figure
PCB of the EUT-Front View



3. Figure
PCB of the EUT-Back View



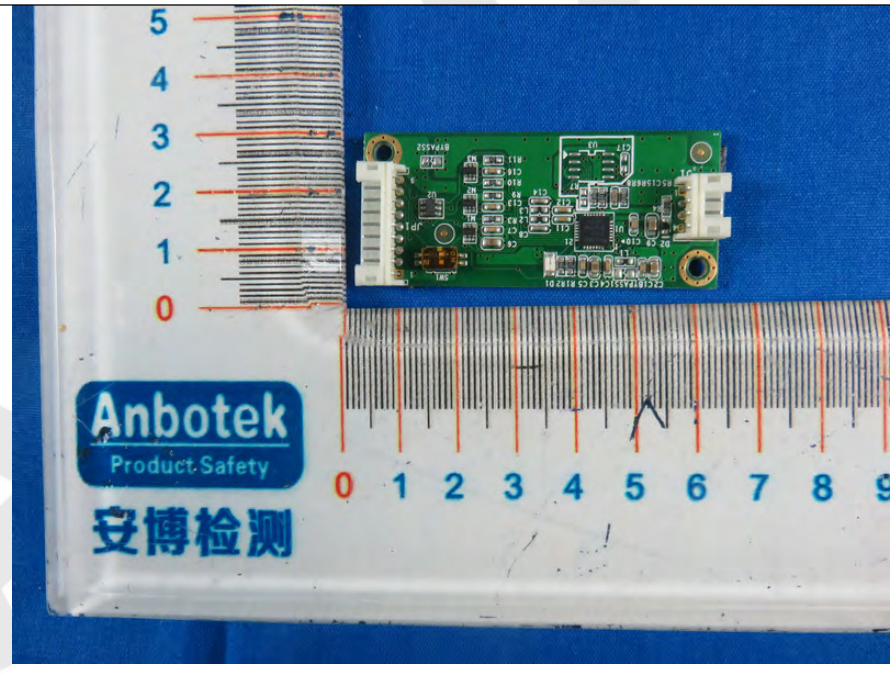
4. Figure
PCB of the EUT-Front View



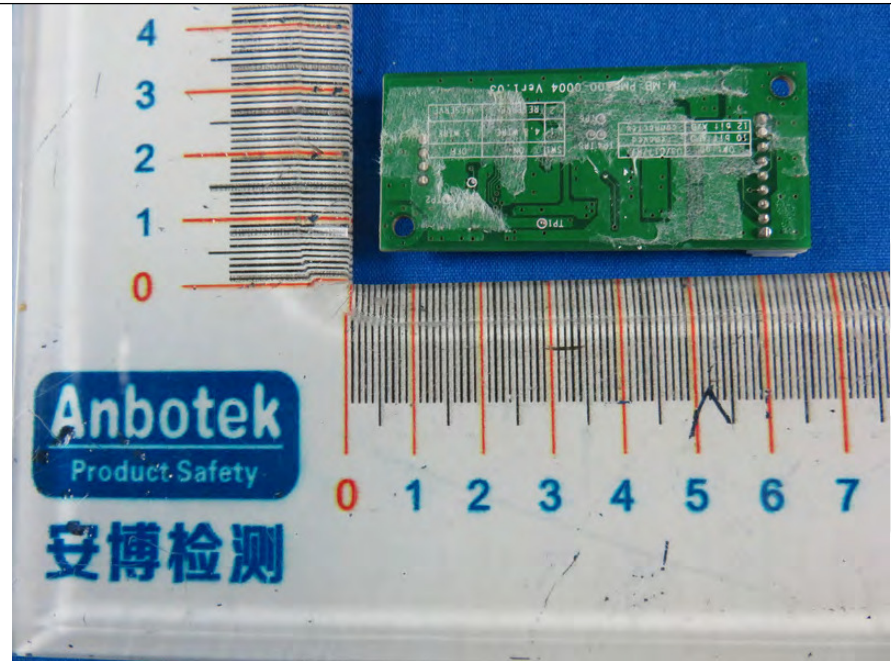
5. Figure
PCB of the EUT-Back View



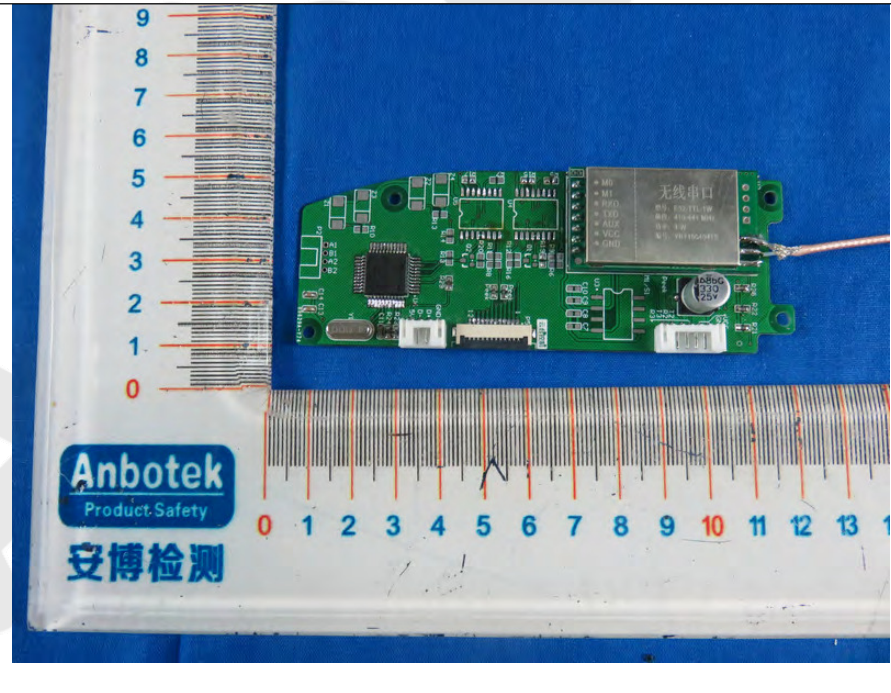
6. Figure
PCB of the EUT-Front View



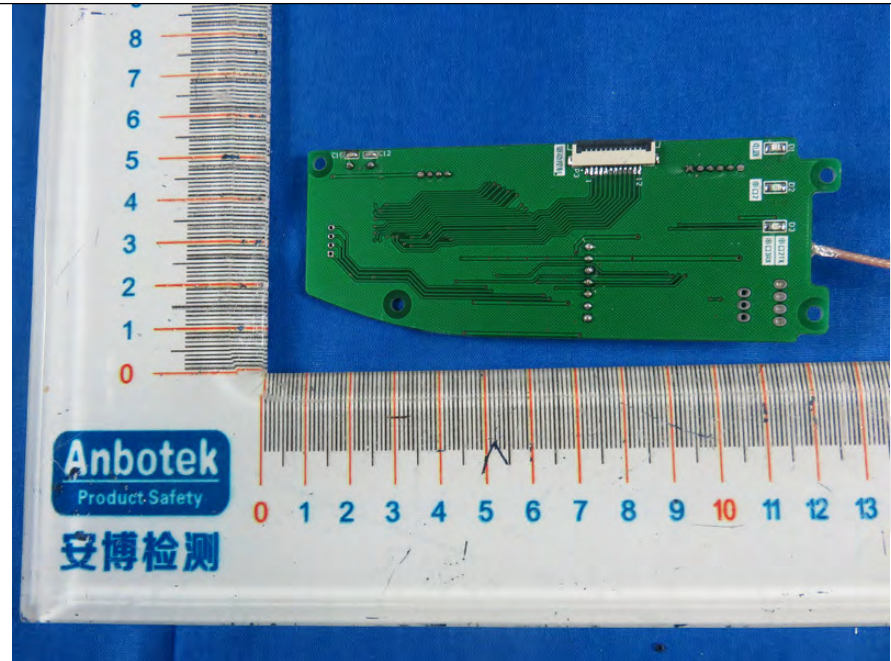
7. Figure
PCB of the EUT-Back View



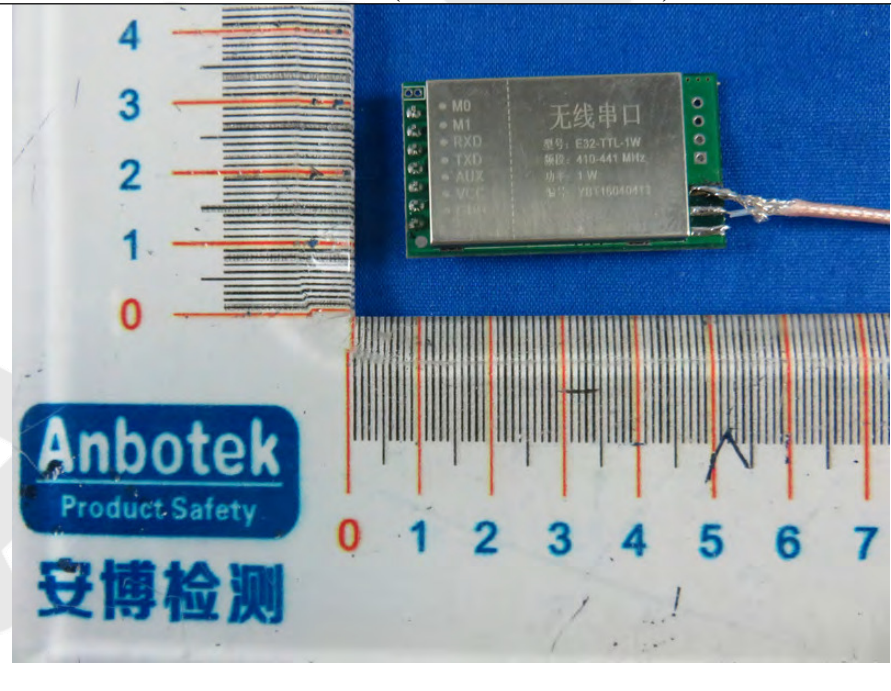
8. Figure
PCB of the EUT-Front View



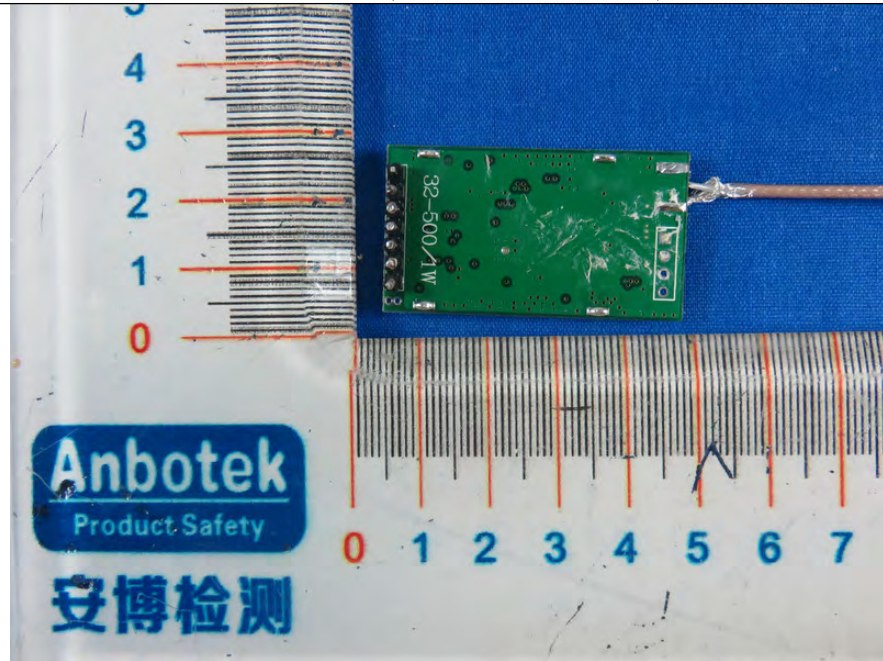
9. Figure
PCB of the EUT-Back View



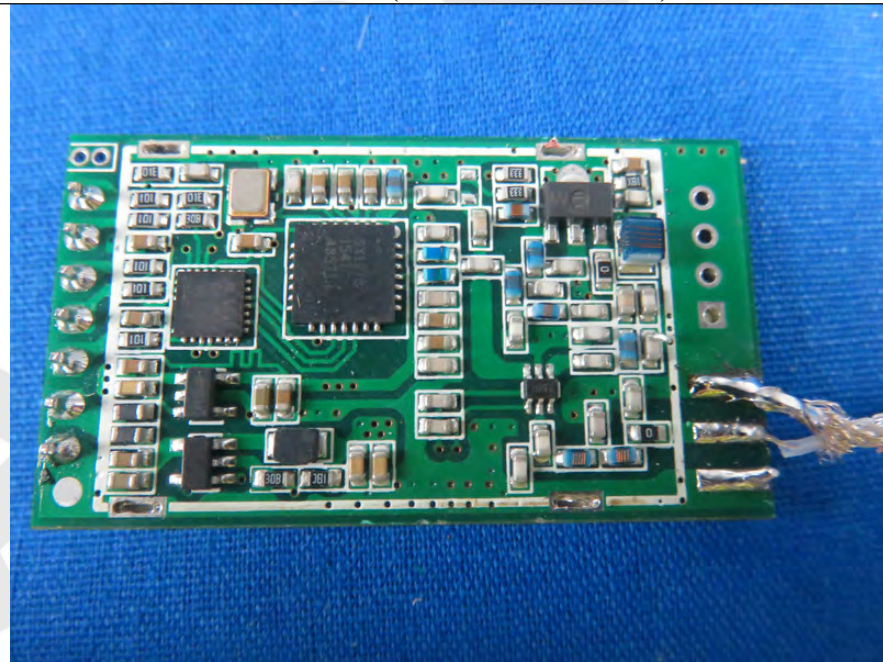
10. Figure
PCB of the EUT-Front View (433.92MHz Module)



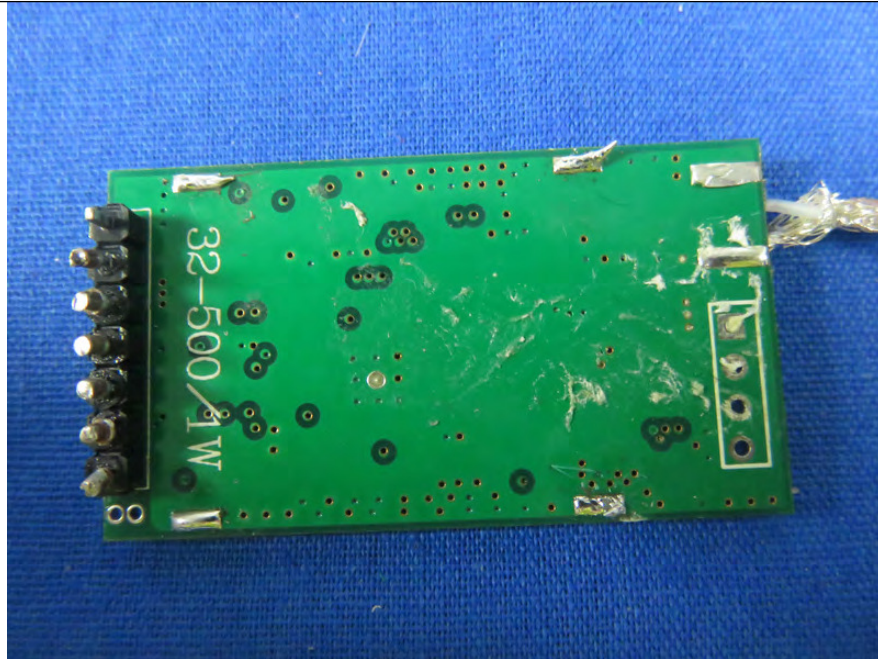
11. Figure
PCB of the EUT-Back View (433.92MHz Module)



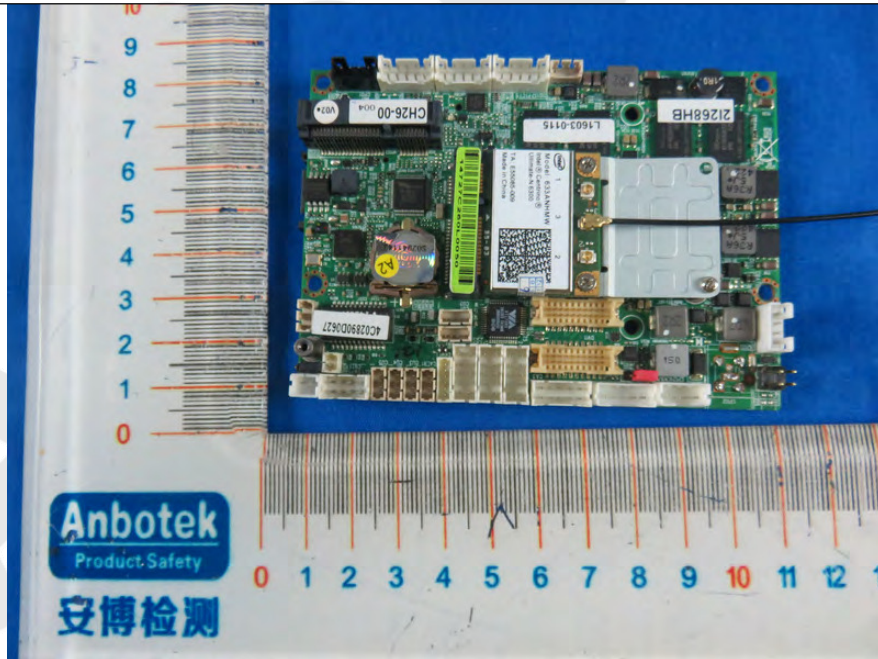
12. Figure
PCB of the EUT-Front View (433.92MHz Module)



13. Figure
PCB of the EUT-Back View (433.92MHz Module)



14. Figure
PCB of the EUT-Front View



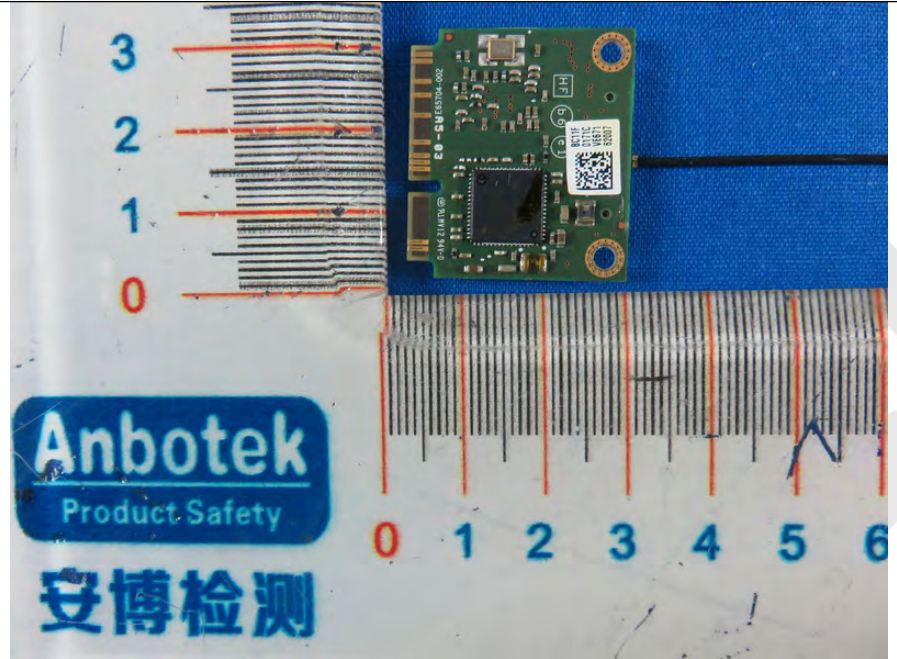
15. Figure
PCB of the EUT-Back View



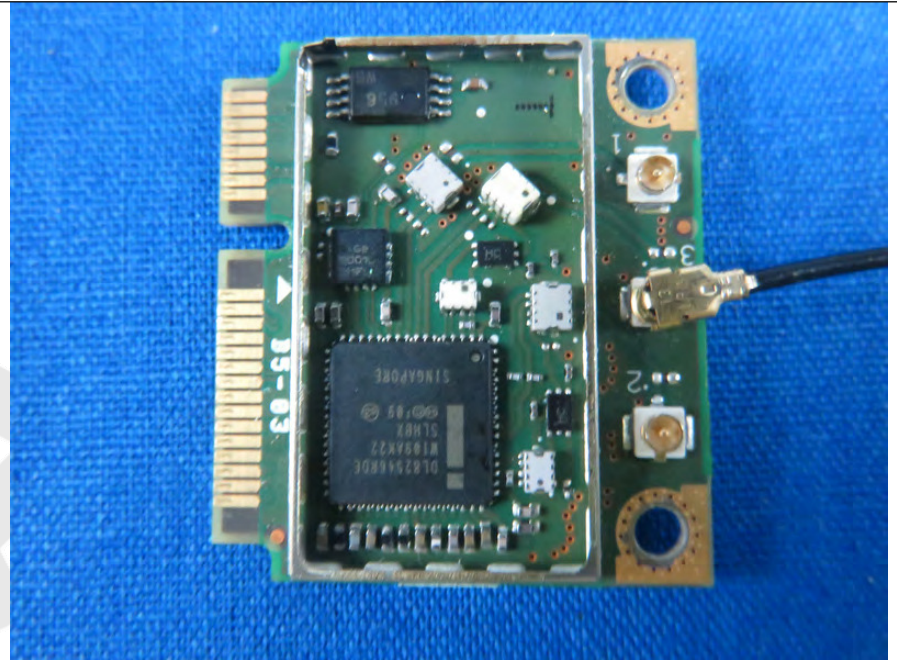
16. Figure
PCB of the EUT-Front View (WiFi Module)



17. Figure
PCB of the EUT-Back View (WiFi Module)



18. Figure
PCB of the EUT-Front View (WiFi Module)



19. Figure
PCB of the EUT-Back View (WiFi Module)

