



EMC Test Report for FCC

No. 131100391SHA-003

Applicant : Aruba Networks, Inc

1344 Crossman Ave. Sunnyvale, CA,94089

Manufacturer : Aruba Networks, Inc

1344 Crossman Ave. Sunnyvale, CA,94089

Equipment : Access Point

Type/Model : APEX0100, APEX0101

TEST RESULT : Pass

SUMMARY

The equipment complies with the requirements according to the following standard(s):

47CFR Part 15 :2012: Radio Frequency Device: Subpart B; Unintentional radiators class B.

ANSI C63.4 :2009: Interim Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40GHz.

ICES-003 issue 5:2012: Information Technology Equipment (ITE) – Limits and methods of measurement.

Date of issue: Feb 17, 2014

Prepared by:

Wade Zhang (Project engineer)

Approved by:

Daniel Zhao (Reviewer)

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1. GENERAL INFORMATION

1.1 Description of equipment under Test (EUT)

Equipment : Access Point
Type/model : APEX0100, APEX0101
FCC ID : Q9DAPEX0100101
IC : 4675A-APEX0100101
Operation Frequency : 2412~2462 MHz;
Band : 5745~5825 MHz
Type of Modulation : CCK,BPSK,QPSK,DSSS,OFDM
EUT Modes of Modulation : 802.11a/b/g;
802.11n HT20,HT40;
802.11ac VHT80

Channel Number : 11Channel for 2412MHz~2462MHz for 11b,11g,11n HT20;
7 Channel for 2422MHz~2452MHz for 11n HT40;
5 Channel for 5745MHz~5825MHz for 11a,11n HT20;
2 Channel for 5755~5795MHz for 11n HT40;
1 Channel for 5775MHz for 11ac VHT80;

Description of EUT : The EUT is a wireless access point, it have 2 model(s) with different shell and antennas, the device is a MIMO product, it has 4 mode(s) of assembly way with different antennas, they have the same electric mainboard except the antennas types.

Port identification : power port 1;
RJ45 ports 2;
Console USB port 1.
Rating : AC100-240V 50/60Hz 0.6A; DC 48V,0.6A (PoE)
Declared : -40°C ~ 65°C
Temperature range
Category of EUT : Class B
EUT type : ☒ Table top ☐ Floor standing

Sample received date : 2013.10.15
Sample Identification : /
No

Date of test : 2013.10.15~2014.02.13



Antenna Description:

Model	Type	Gain (dBi)	Frequency Band (MHz)
ANT-3X3-2005	Omni	5	2400-2500
		NA	4900-5900
ANT-3X3-5005	Omni	NA	2400-2500
		5	4900-5875
ANT-2X2-D805	Directional	5	2400-2500
		5	4900-5875
ANT-3X3-5712	Directional	NA	2400-2500
		11.5	4900-6000
ANT-2X2-2314	Directional	14	2400-2500
		NA	4900-5875
ANT-2X2-5314	Directional	NA	2400-2500
		14	4900-6000
ANT-2X2-2714	Directional	14	2400-2483
ANT-3X3-5010	Omni	10	4900-5875
ANT-2X2-D607	Directional	7	2400-2500
		7	4900-5875
ANT-3X3-D608	Directional	8	2400-2500
		8	4900-5900
ANT-3X3-D905	Directional	5	2400-2500
		5	4900-5900

MIMO Function Description:

Freq. Band	Modulation	Tx/Rx Function	Beam forming	Beam forming gain	Note
2412-2462MHz	802.11b	3TX/3RX	NO	/	
	802.11g	3TX/3RX	NO	/	
	802.11n HT20	3TX/3RX	YES	3.01	2H, 1V
	802.11n HT40	3TX/3RX	YES	3.01	2H, 1V
5745-5825MHz	802.11a	3TX/3RX	NO	/	
	802.11n HT20	3TX/3RX	YES	3.01	2V, 1H
	802.11n HT40	3TX/3RX	YES	3.01	2V, 1H
	802.11ac VHT80	3TX/3RX	YES	3.01	2V, 1H



1.2 Description of Client

Applicant : Aruba Networks, Inc
1344 Crossman Ave. Sunnyvale, CA,94089
Name of contact : Greg Rocha
Tel : 408-419-4093
Fax : /
Manufacturer : Aruba Networks, Inc
1344 Crossman Ave. Sunnyvale, CA,94089



1.3 Description of Test Facility

Name: Intertek Testing Services Limited Shanghai
Address: Building No.86, 1198 Qinzhou Road(North), Shanghai
200233, P.R. China

FCC Registration Number: 236597
IC Assigned Code: 2042B-1

Name of contact: Steve Li
Tel: +86 21 64956565 ext. 214
Fax: +86 21 54262335 ext. 214

2. TEST SPECIFICATIONS

2.1 Standards

47CFR Part 15 :2012: Radio Frequency Device: Subpart B; Unintentional radiators class B.

ANSI C63.4:2009: Interim Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40GHz.

ICES-003 issue 5:2012: Information Technology Equipment (ITE) – Limits and methods of measurement

2.2 Mode of operation during the test / Test peripherals used

Within this test report, EUT was tested under rating parameters and normal working mode (RJ45 port connect to Smartbits with more than 10% load). We test all modes and list the worst data.

Test peripherals used:

Name	Brand name	Model	ASB code	Valid Until
Smartbits	Spirent	600B	DE7831	2014.8.20

2.3 Instrument list

Selected	Instrument	EC no.	Model	Valid until date
☒	EMI test receiver	EC 2107	ESCS 30	2014-10-20
☒	A.M.N.	EC 3119	ESH2-Z5	2015-1-7
☒	EMI test receiver	EC 3045	ESIB26	2014-10-20
☒	Broadband antenna	EC 4206	CBL 6112D	2015-5-15
☒	Horn antenna	EC 3049	HF906	2014-4-27
☒	Pre-amplifier	EC 3222	pre-amp 18	2014-4-9
☒	Semi anechoic chamber	EC 3048	-	2014-4-23
☒	Shielded room	EC 2838	GB88	2016-1-10
☒	Thermo-Hygrograph	EC 3323	ZJ1-2A	2015-1-5
☒	Thermo-Hygrograph	EC 3783	ZJ1-2A	2015-1-5

2.4. Test Summary

This report applies to tested sample only. This report shall not be reproduced in part without written approval of Intertek Testing Service Shanghai.

TEST ITEM	RESULT	NOTE
Disturbance voltage at a.c. mains terminal	Pass	
Radiated emission	Pass	

3. Conducted disturbance voltage at mains terminals

Test result: **PASS**

3.1 Limits

3.1.1 Limits for conducted disturbance voltage at the mains ports of class A device

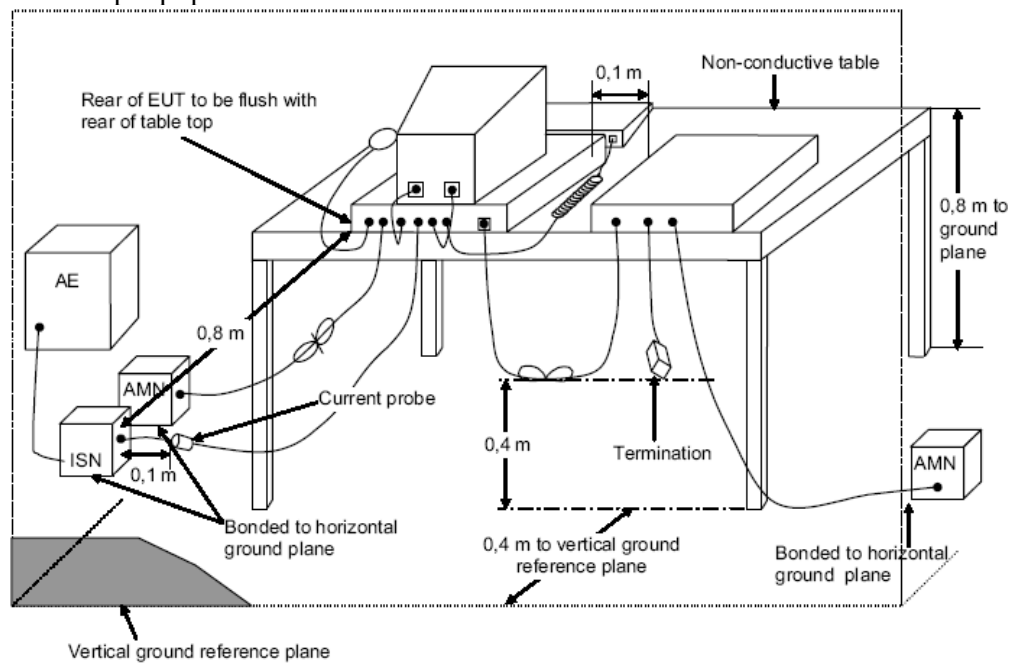
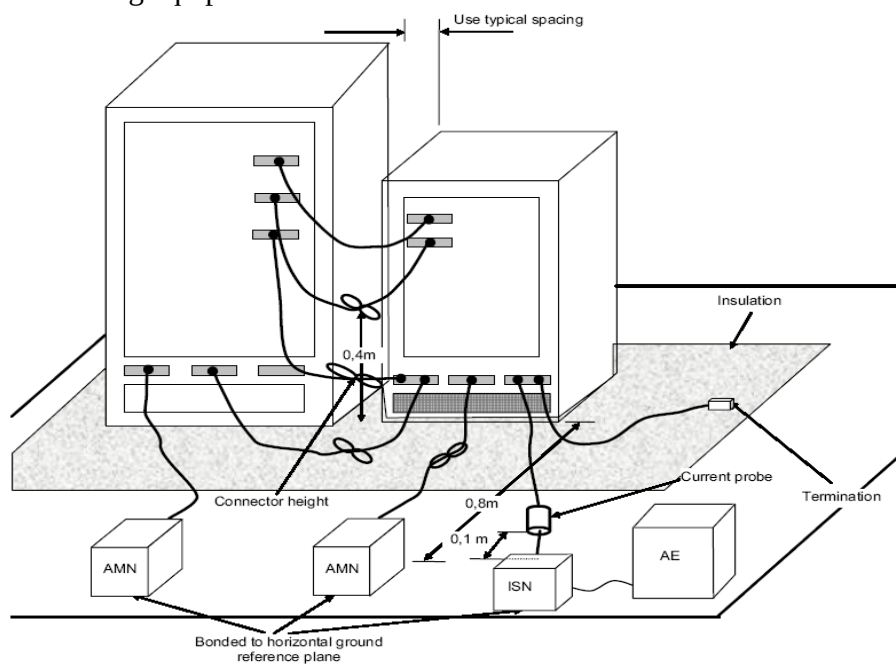
Frequency range (MHz)	Limits dB(μV)	
	Quasi-peak	Average
0.15 ~ 0.5	79	66
0.5 ~ 30	73	60
Note: If the limit for the measurement with the average detector is met when using a receiver with a quasi-peak detector, the equipment under test shall be deemed to meet both limits and the measurement using the receiver with an average detector need not be carried out.		

3.1.2 Limits for conducted disturbance voltage at the mains ports of class B device

Frequency range (MHz)	Limits dB(μV)	
	Quasi-peak	Average
0.15 ~ 0.5	66 ~ 56 *	56 ~ 46 *
0.5 ~ 5	56	46
5 ~ 30	60	50
Note: 1. * Means the limit decreasing linearly with the logarithm of the frequency in the range 0.15MHz to 0.5MHz 2. If the limit for the measurement with the average detector is met when using a receiver with a quasi-peak detector, the equipment under test shall be deemed to meet both limits and the measurement using the receiver with an average detector need not be carried out.		

3.2 Test setup

☒ For table top equipment

☐ For floor standing equipment

3.3 Test Setup and Test Procedure

Measurement was performed in shielded room, and instruments used were following clause 4 and clause 5 of ANSI 63.4.

Detailed test procedure was following clause 7.2 of ANSI 63.4.

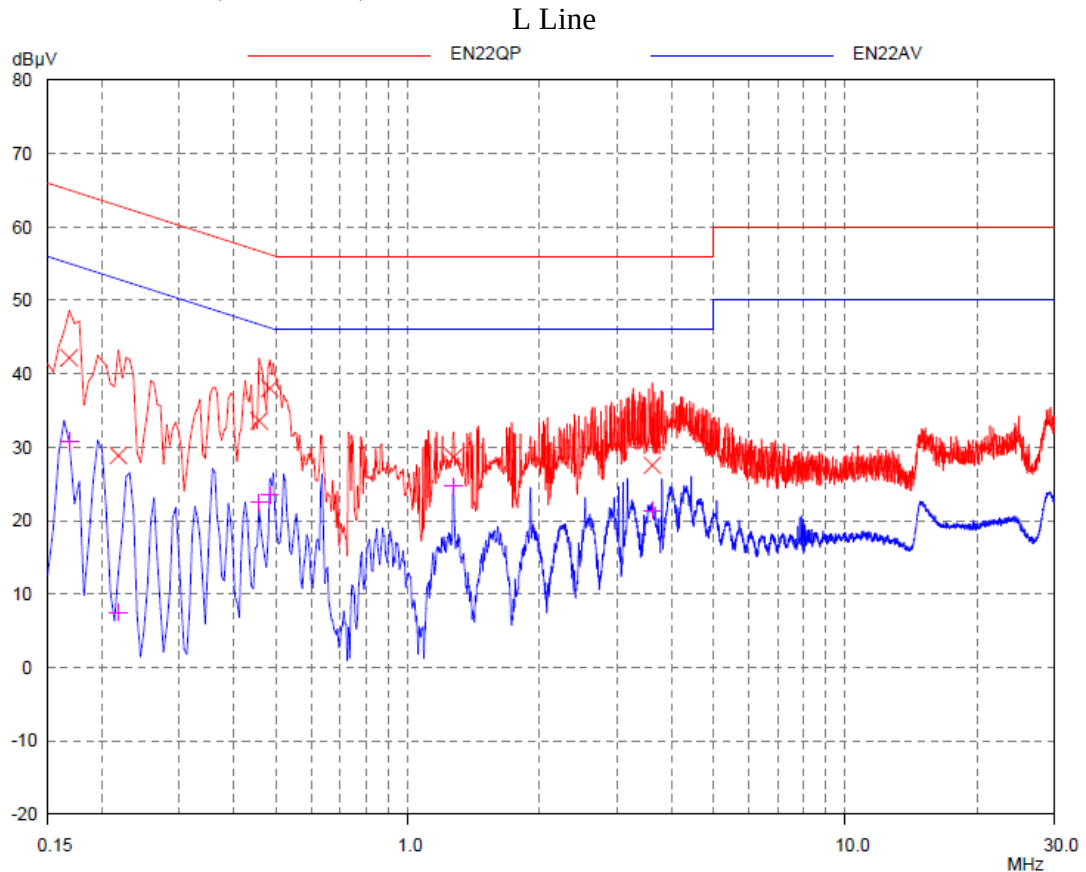
EUT arrangement and operation conditions were according to clause 6 and clause 7 of ANSI 63.4.

Frequency range 150kHz – 30MHz was checked and EMI receiver measurement bandwidth was set to 9 kHz.

3.4 Test Protocol

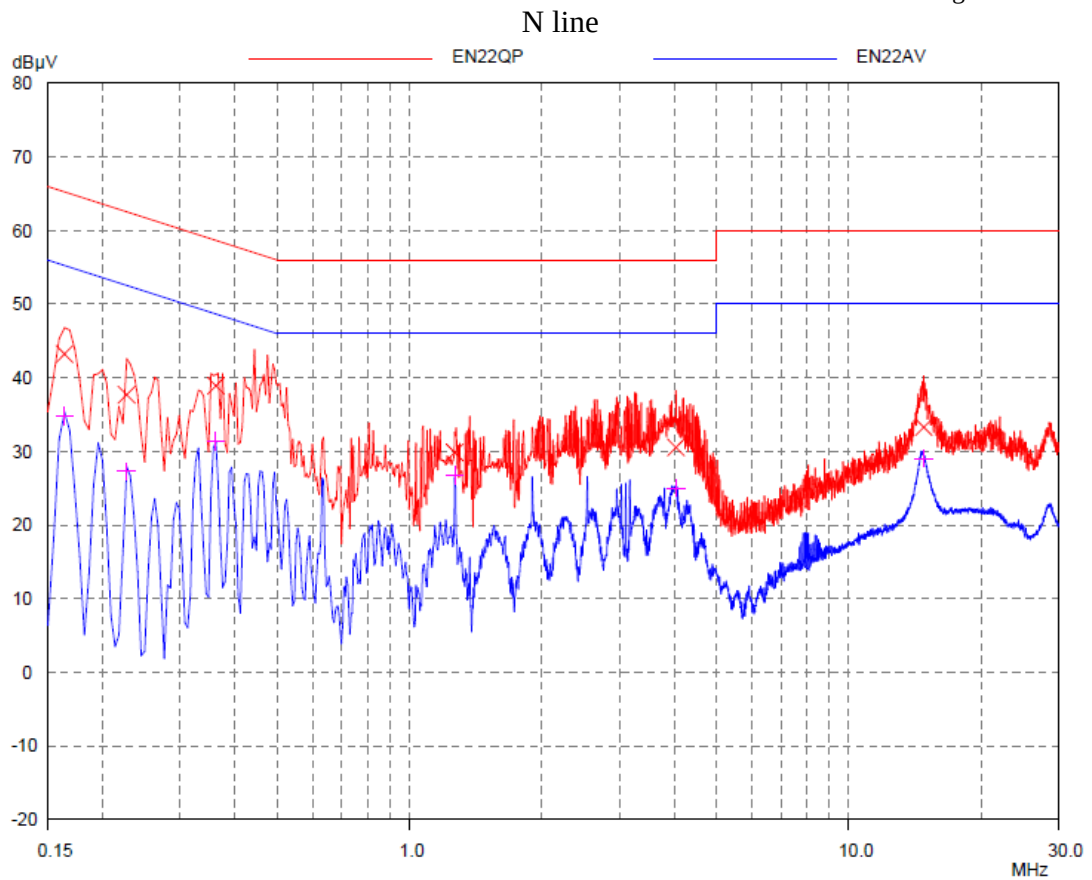
Temperature : 22°C
Relative Humidity : 44%

Worst case data(AC Power):



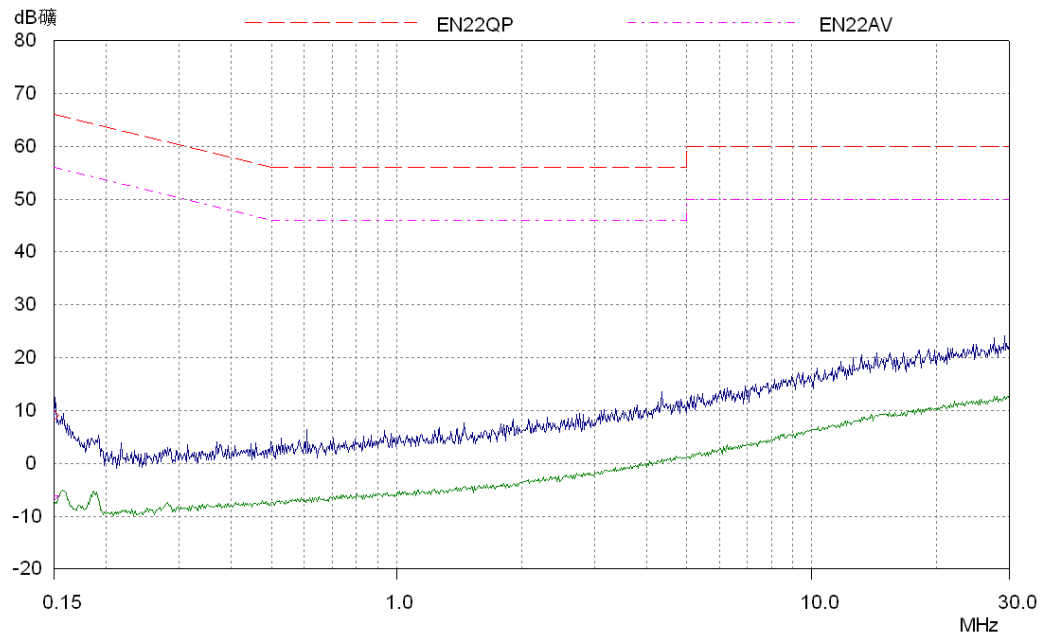
Test Data:

Frequency (MHz)	Quasi-peak			Average		
	level dB(μV)	Limit dB(μV)	Margin (dB)	level dB(μV)	limit dB(μV)	Margin (dB)
0.168	42.2	65.1	22.9	30.8	55.1	24.3
0.218	28.9	62.9	34.0	7.6	52.9	45.3
0.456	33.6	56.8	23.2	22.5	46.8	24.3
0.483	38.0	56.3	18.3	23.4	46.3	22.9
1.271	28.6	56.0	27.4	24.7	46.0	21.3
3.615	27.6	56.0	28.4	21.4	46.0	24.6



Test Data:

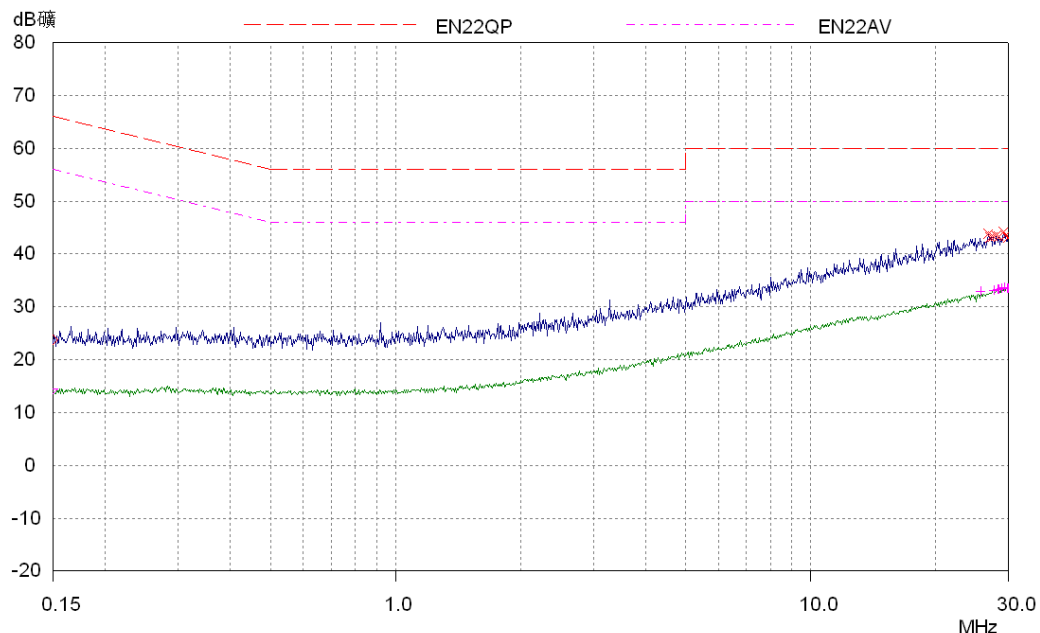
Frequency (MHz)	Quasi-peak			Average		
	level dB(μV)	Limit dB(μV)	Margin (dB)	level dB(μV)	limit dB(μV)	Margin (dB)
0.164	43.2	65.3	22.1	34.9	55.3	20.4
0.227	37.7	62.6	24.9	27.3	52.6	25.3
0.362	38.9	58.7	19.8	31.4	48.7	17.3
1.266	29.9	56.0	26.1	26.8	46.0	19.2
4.038	30.6	56.0	25.4	25.0	46.0	21.0
14.816	33.3	60.0	26.7	29.1	50.0	20.9

Worst case data(POE):
L Line


Frequency (MHz)	Quasi-peak			Average		
	Disturbance level dB(μV)	Permitted limit dB(μV)	Margin (dB)	Disturbance level dB(μV)	Permitted limit dB(μV)	Margin (dB)
0.16	8.45	65.46	57.01	-5.85	55.46	61.31
0.24	4.34	62.10	57.76	-5.96	55.46	61.42
0.55	3.45	56.00	52.55	-8.85	46.00	54.85
1.00	5.11	56.00	50.89	-5.19	46.00	51.19
1.40	6.44	56.00	49.56	-3.86	46.00	49.86
2.00	6.52	56.00	49.48	-3.78	46.00	49.78
3.50	9.88	56.00	46.12	-0.42	46.00	46.42
6.00	12.66	60.00	47.34	2.36	50.00	47.64
10.00	16.32	60.00	43.68	6.02	50.00	43.98
22.00	22.43	60.00	37.57	12.13	50.00	37.87
30.00	23.89	60.00	36.11	13.59	50.00	36.41

Note: * means the emission level 10dB below the relevant limit.

N Line



Frequency (MHz)	Quasi-peak			Average		
	Disturbance level dB(μV)	Permitted limit dB(μV)	Margin (dB)	Disturbance level dB(μV)	Permitted limit dB(μV)	Margin (dB)
0.16	24.55	65.46	40.91	14.22	55.46	41.24
0.24	24.32	62.10	37.78	14.12	55.46	41.34
0.55	25.34	56.00	30.66	15.24	46.00	30.76
1.00	25.32	56.00	30.68	15.12	46.00	30.88
1.40	25.98	56.00	30.02	15.68	46.00	30.32
2.00	26.33	56.00	29.67	16.03	46.00	29.97
3.50	28.93	56.00	27.07	18.63	46.00	27.37
6.00	31.54	60.00	28.46	21.24	50.00	28.76
10.00	36.23	60.00	23.77	25.93	50.00	24.07
22.00	41.33	60.00	18.67	31.03	50.00	18.97
30.00	43.18	60.00	16.82	32.88	50.00	17.12

Note: * means the emission level 10dB below the relevant limit.

Notes:

1. All possible modes of operation were investigated. Only the worst case emissions measured and recorded.

4. Radiated emission

Test result: PASS

4.1 Radiated emission limits

4.1.1 Limits for radiated disturbance of class A device

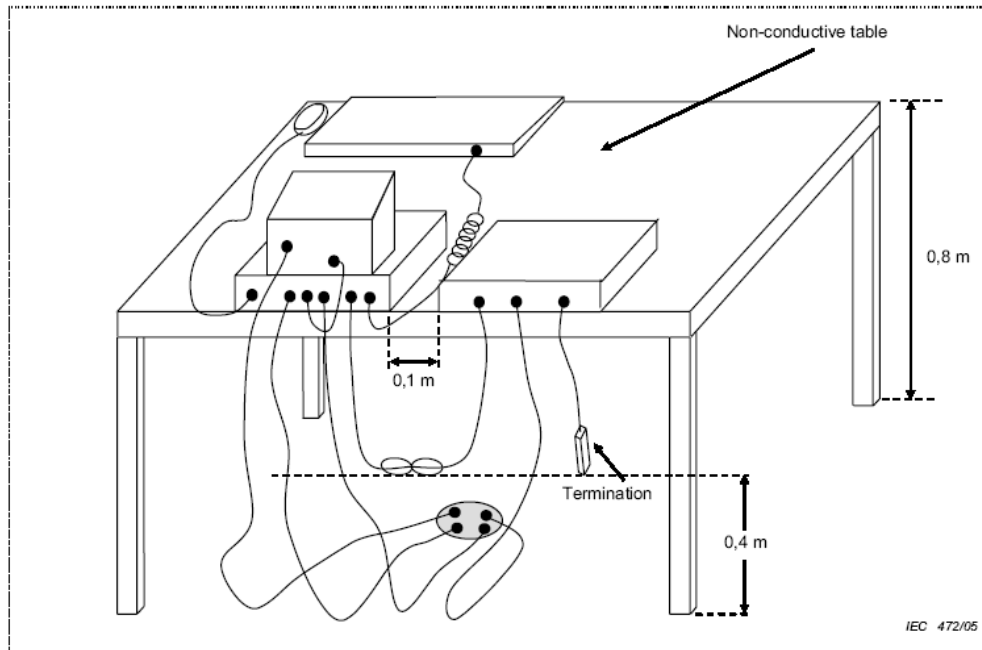
Frequency (MHz)	Permitted limit in dB μ V/m (Quasi-peak) of Measurement Distance 10m
30 – 88	39
88 – 216	43.5
216 – 960	46.4
Above 960	49.5
Note: for the measurement distance other than 3m and 10m, the limit is varied according to 20dB/10 decades.	

4.1.1 Limits for radiated disturbance of class B device

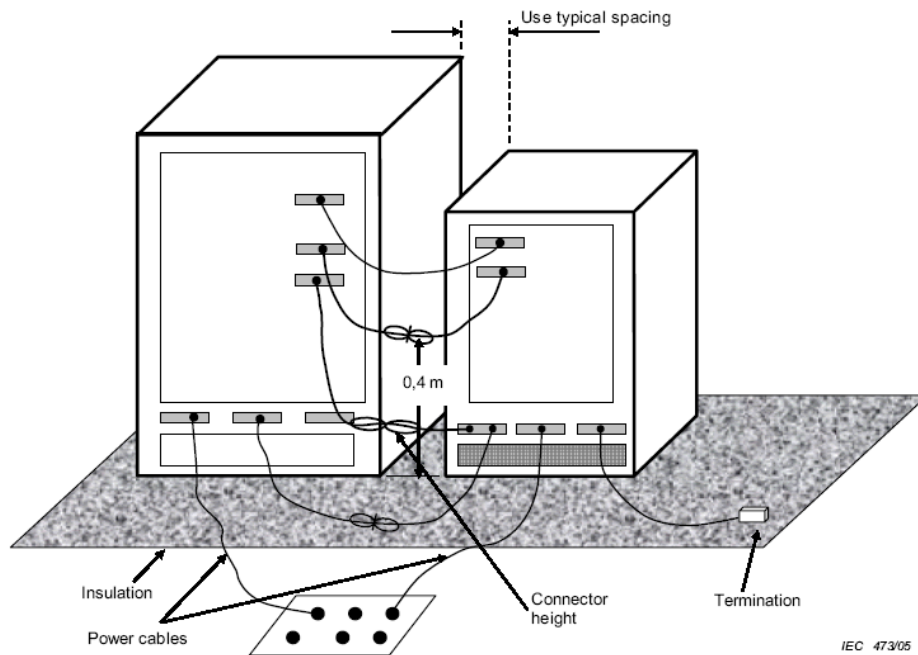
Frequency (MHz)	Permitted limit in dB μ V/m (Quasi-peak) of Measurement Distance 3m
30 – 88	40.0
88 – 216	43.5
216 – 960	46.0
Above 960	54.0
Note: for the measurement distance other than 3m and 10m, the limit is varied according to 20dB/10 decades.	

4.2 Block diagram and test set up

☒ For table top equipment



☐ For floor standing equipment



4.3 Test Setup and Test Procedure

The measurement was performed in a semi-anechoic chamber.

The distance from EUT to receiving antenna is 3 meter.

Measurement was performed according to clause 4 and clause 5 of ANSI 63.4.

Test procedure was according to clause 8.3 of ANSI 63.4.

EUT arrangement and operate condition were according to clause 6 and clause 8 of ANSI 63.4.

The bandwidth setting on R&S Test Receiver ESI26 was 120 kHz.

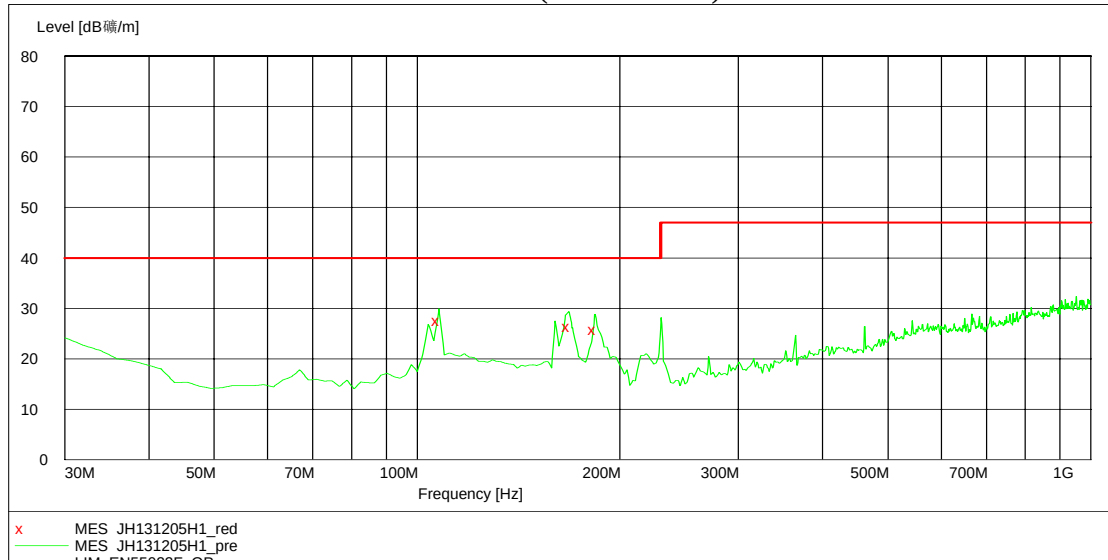
The required measurement frequency range was checked.

4.4 Test Protocol

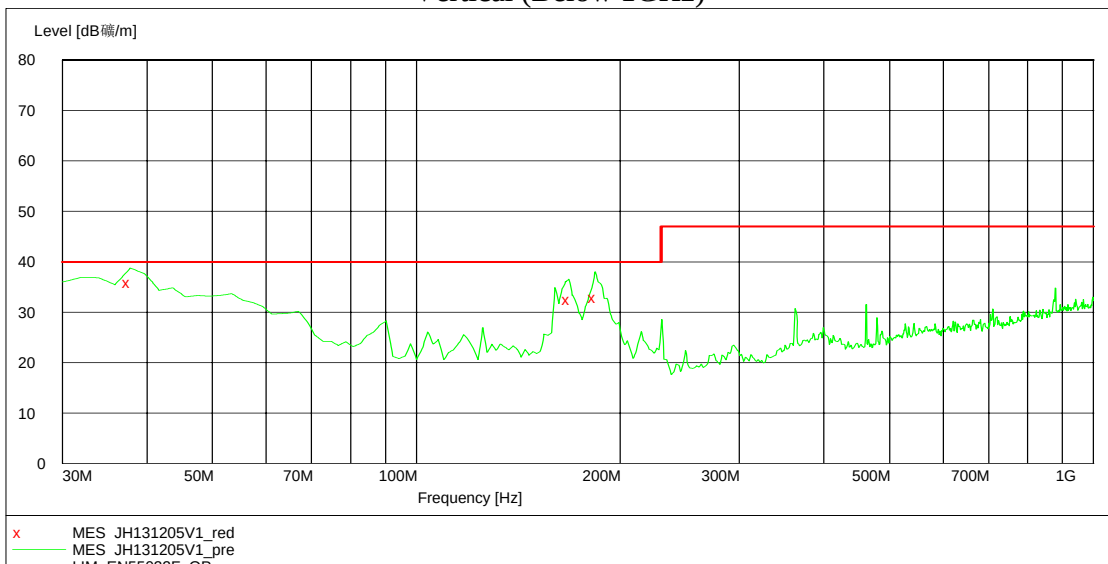
Temperature: 22°C
Relative Humidity: 44%

Worst case Test Curve:

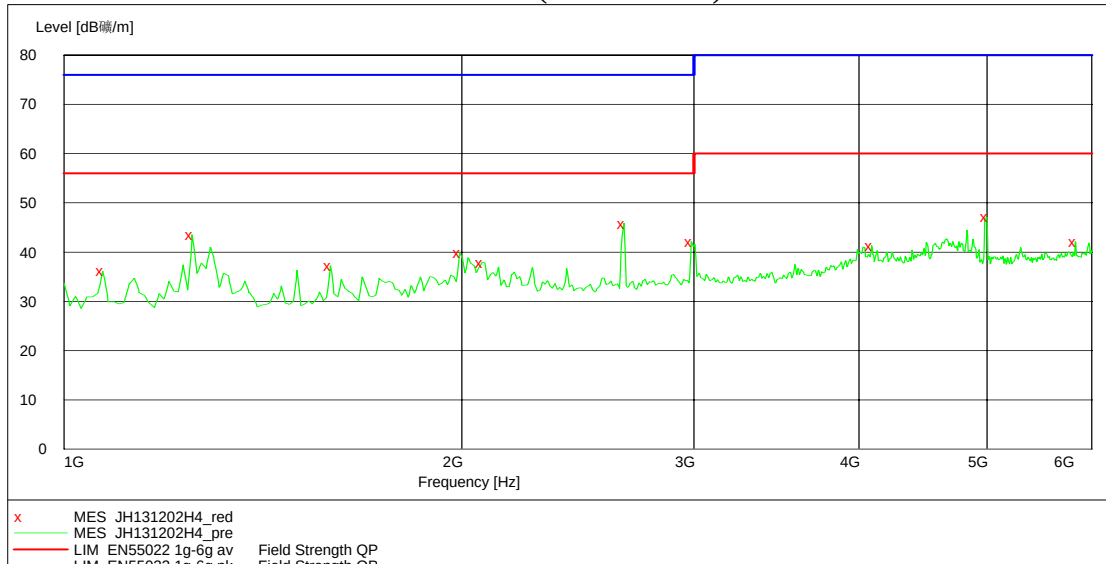
Horizontal (Below 1GHz)



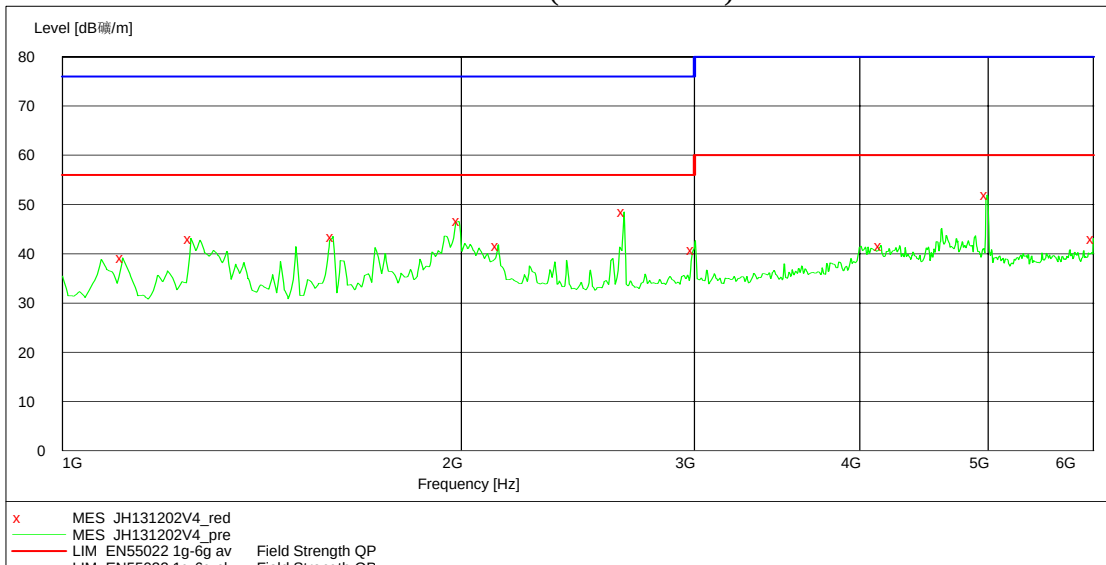
Vertical (Below 1GHz)



Horizontal (Above 1GHz)



Vertical (Above 1GHz)



Test data:

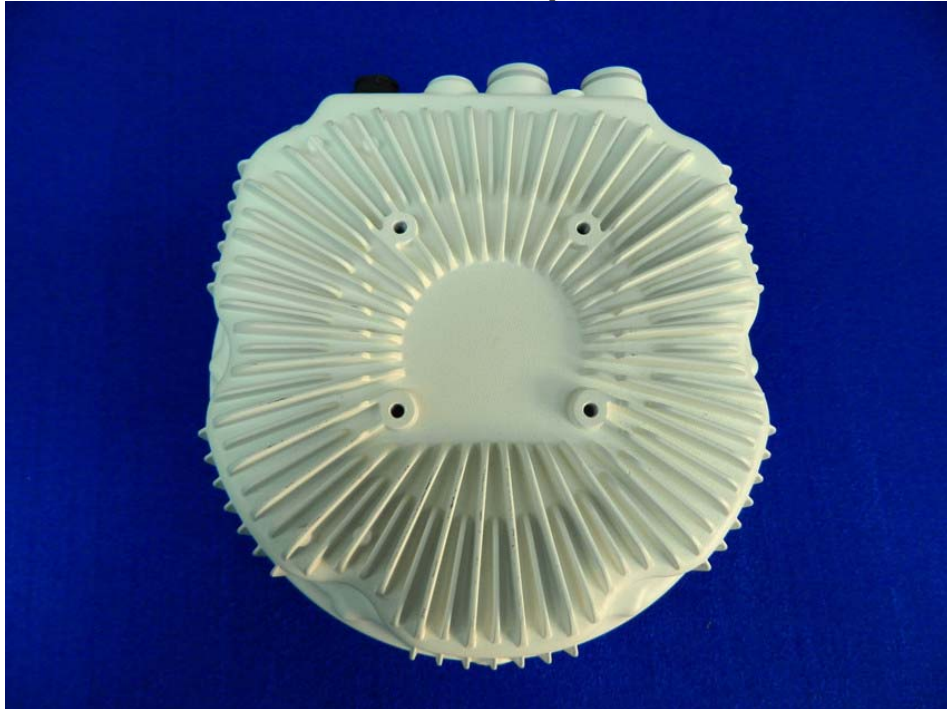
Polarization	Frequency (MHz)	Emission level (dB μ V/m)	Limits (dB μ V/m)	Margin (dB μ V/m)	Detector
H	107.56	27.5	43.5	16.0	PK
	168.02	26.4	43.5	17.1	PK
	183.57	25.9	43.5	17.6	PK
	1070.1	36.2	56.0	19.8	PK
	1250.5	43.5	56.0	12.5	PK
	1591.2	37.2	56.0	18.8	PK
	1992.0	39.8	56.0	16.2	PK
	2072.1	37.9	56.0	18.1	PK
	2653.3	45.8	56.0	10.2	PK
	2984.0	42.1	56.0	13.9	PK
	4086.2	41.3	60.0	18.7	PK
	4998.0	47.1	60.0	12.9	PK
	5829.7	42.1	60.0	17.9	PK
V	37.58	35.8	40.0	4.2	PK
	168.02	32.6	43.5	10.9	PK
	183.57	33.0	43.5	10.5	PK
	1110.2	39.1	56.0	16.9	PK
	1250.5	43.1	56.0	12.9	PK
	1601.2	43.5	56.0	12.5	PK
	1992.0	46.6	56.0	9.4	PK
	2132.3	41.7	56.0	14.3	PK
	2653.3	48.5	56.0	7.5	PK
	2994.0	40.8	56.0	15.2	PK
	4146.3	41.7	60.0	18.3	PK
	4988.0	51.9	60.0	8.1	PK
	6000.0	43.1	60.0	16.9	PK

Notes:

1. All possible modes of operation were investigated. Only the worst case emissions measured and recorded.

Appendix I: Photograph of EUT

APEX0101 Top



APEX0101 Bottom



APEX0101 Front



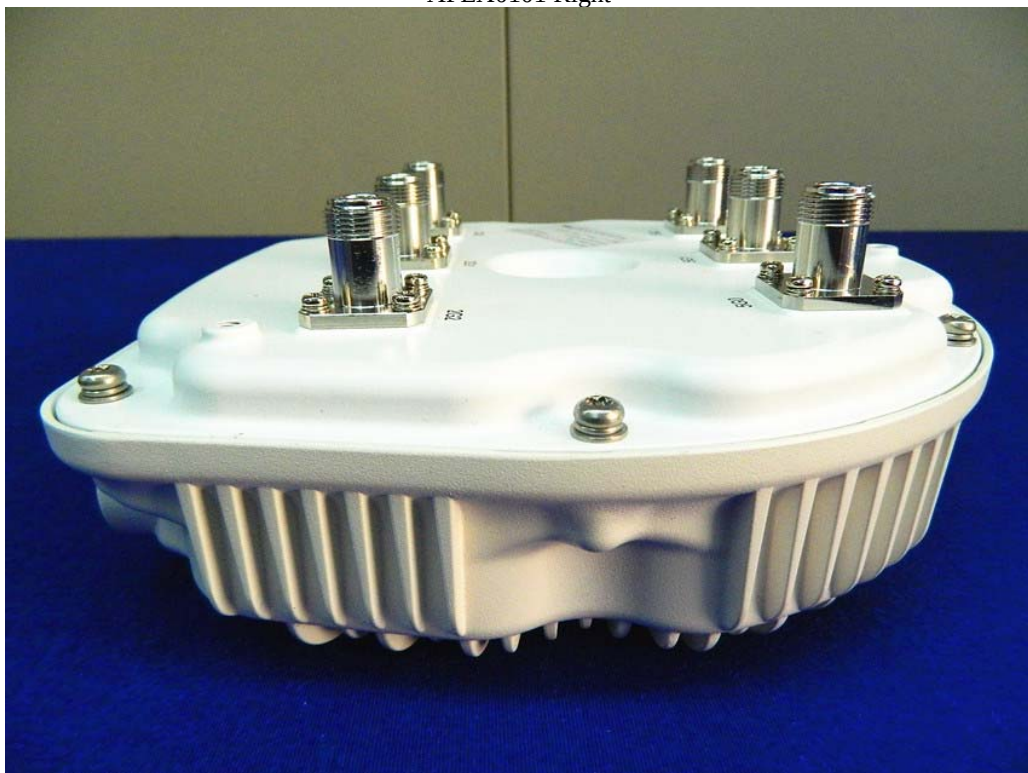
APEX0101 Back



APEX0101 Left



APEX0101 Right



APEX0100 Top



APEX0100 Bottom



APEX0100 Front



APEX0100 Back



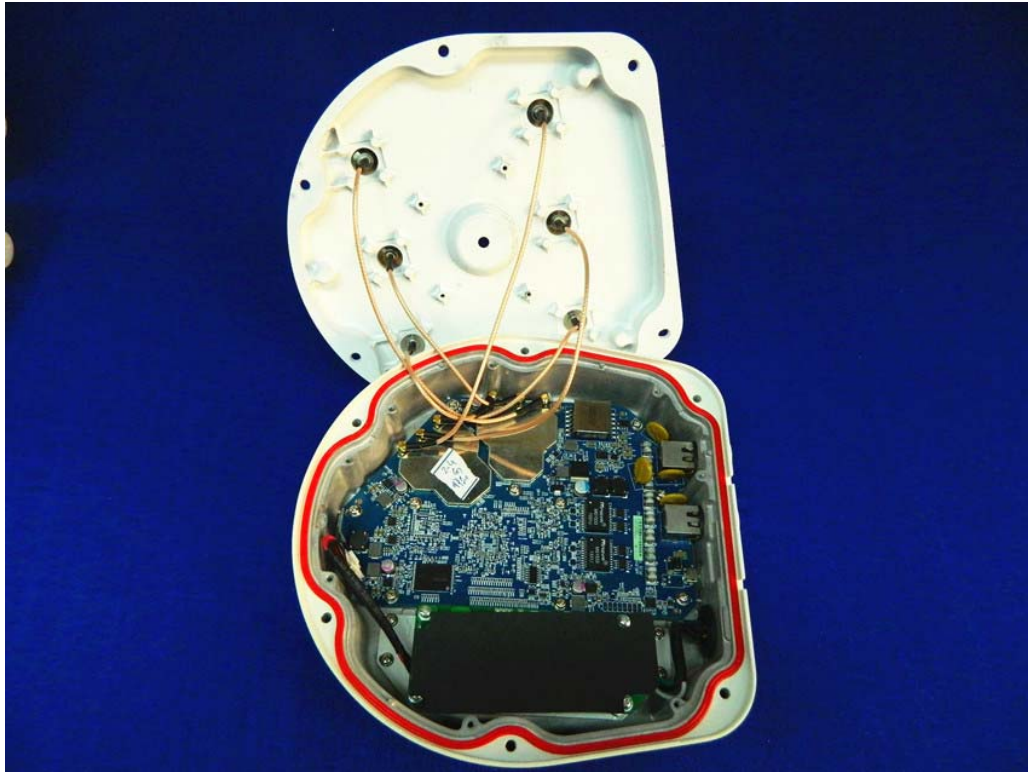
APEX0100 Left



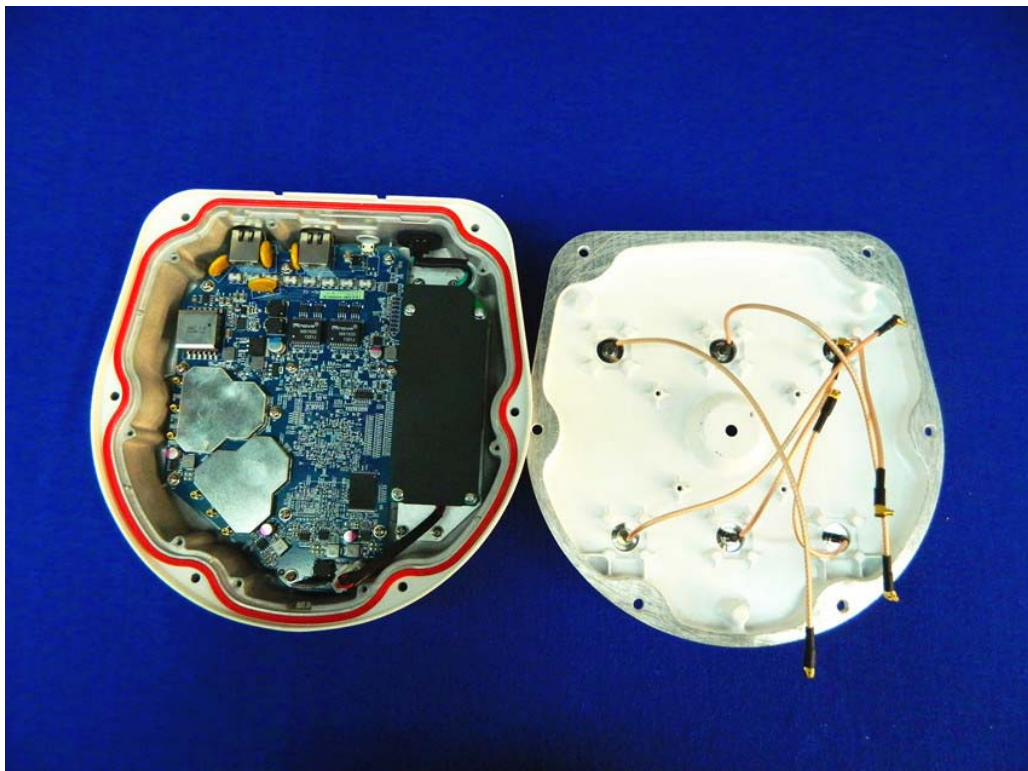
APEX0100 Right



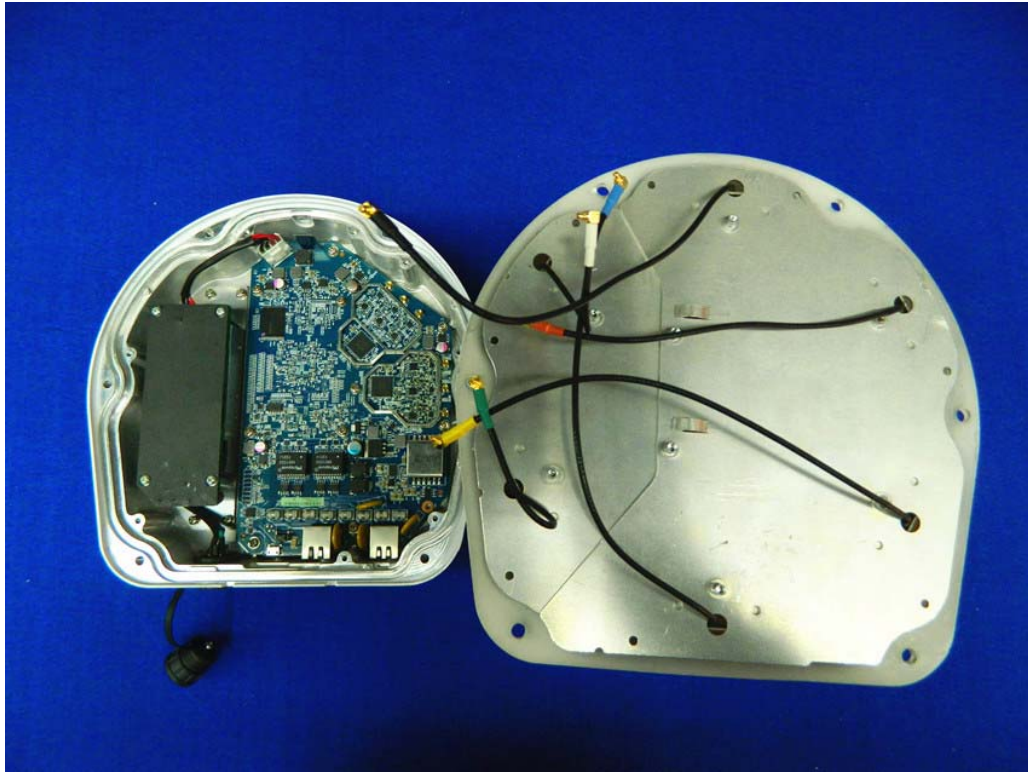
Internal View 1 of APEX0101



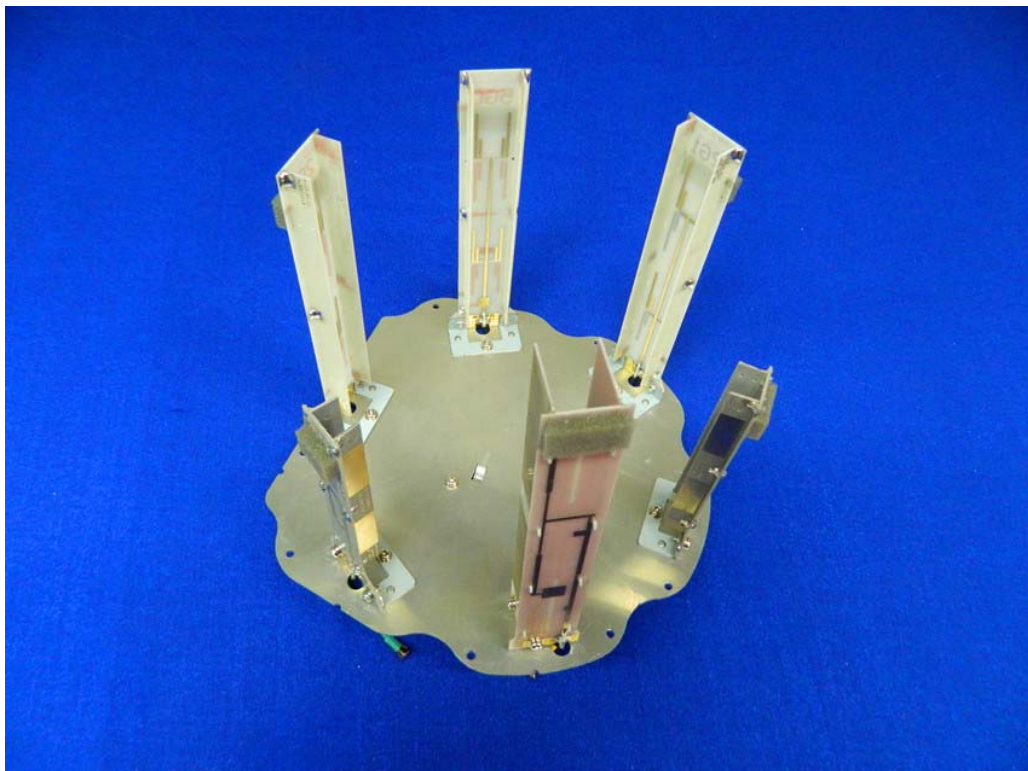
Internal View 2 of APEX0101



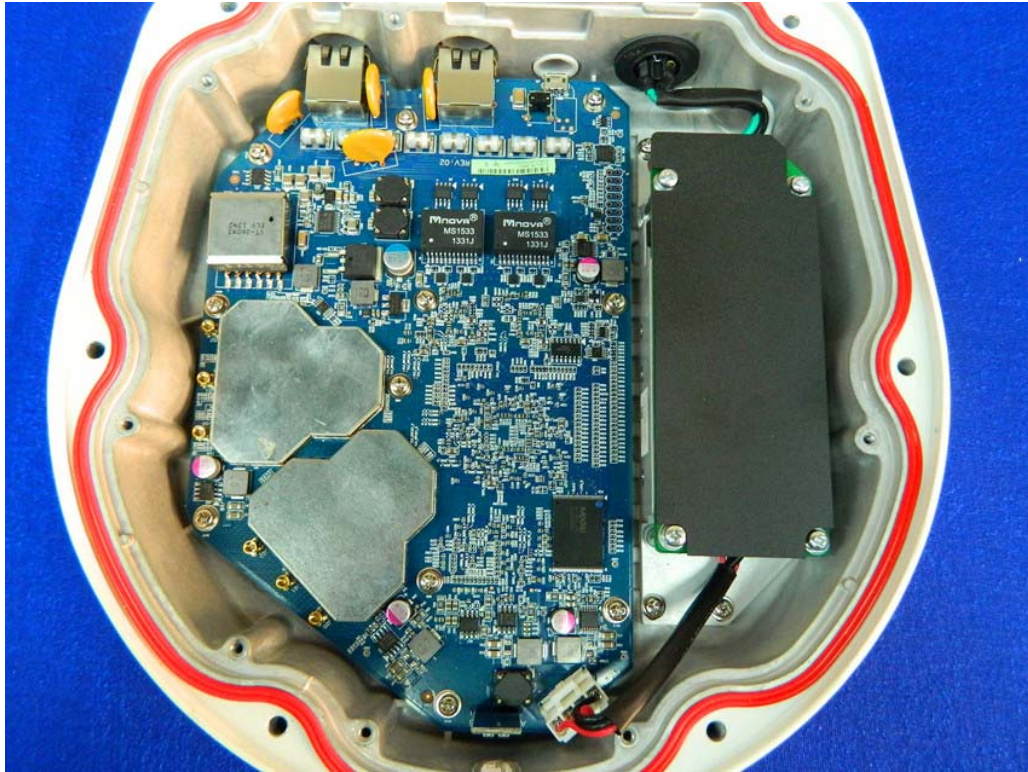
Internal View 1 of APEX0100



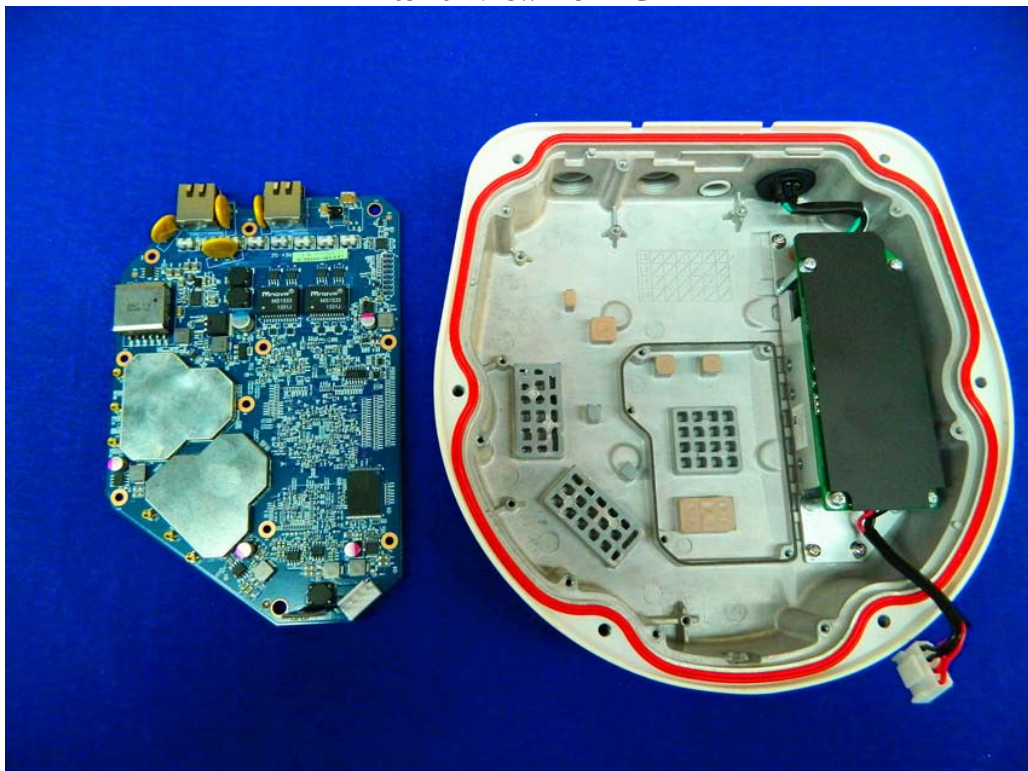
Internal View 2 of APEX0100



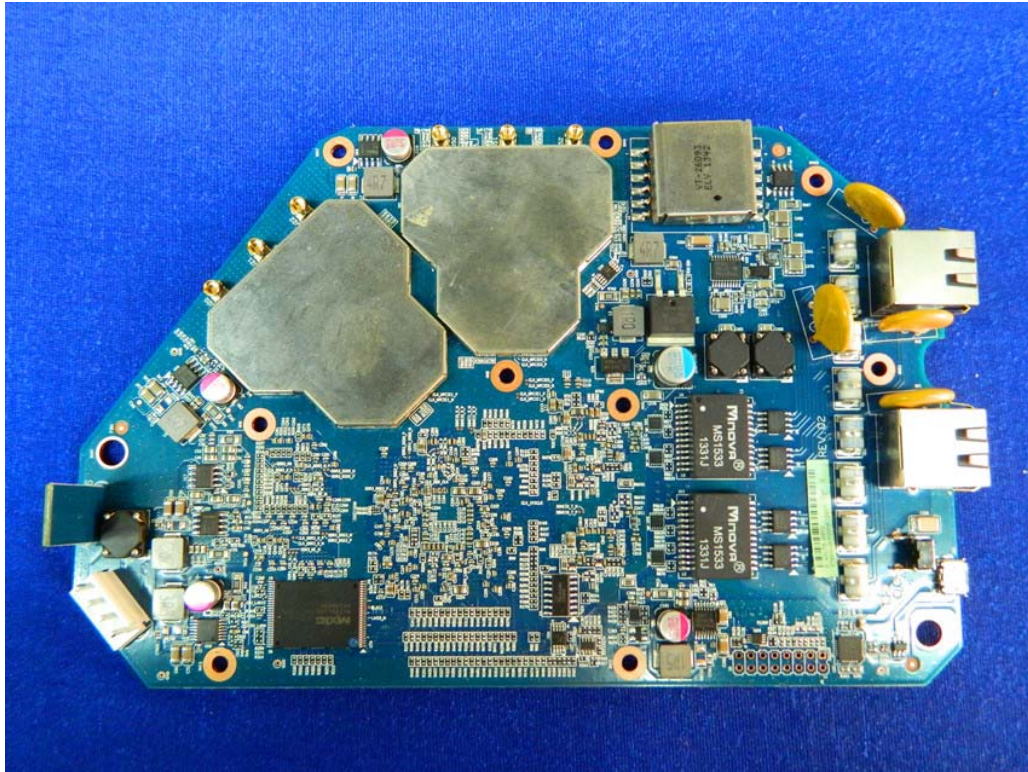
Internal View 1 of PCB



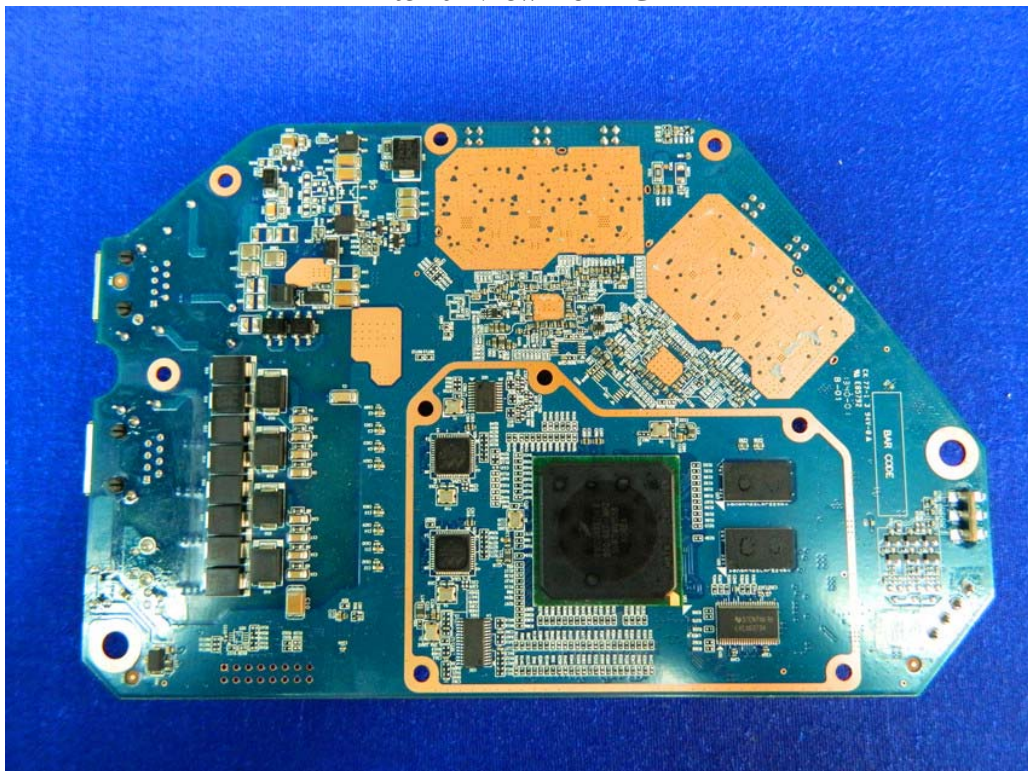
Internal View 2 of PCB



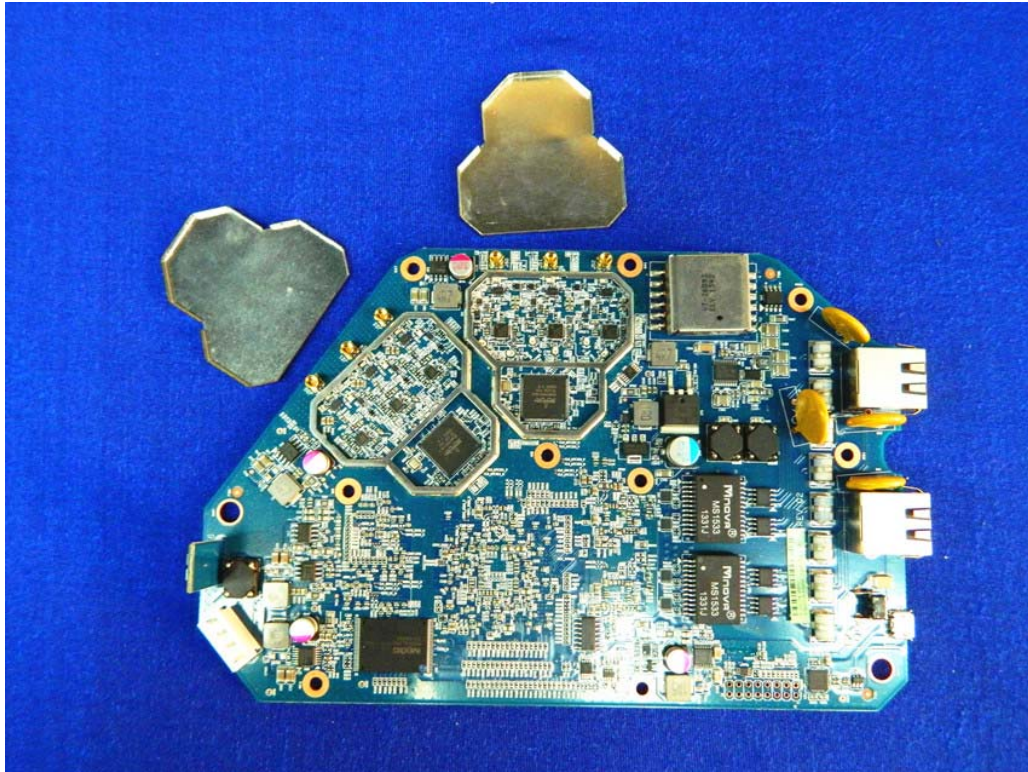
Internal View 3 of PCB



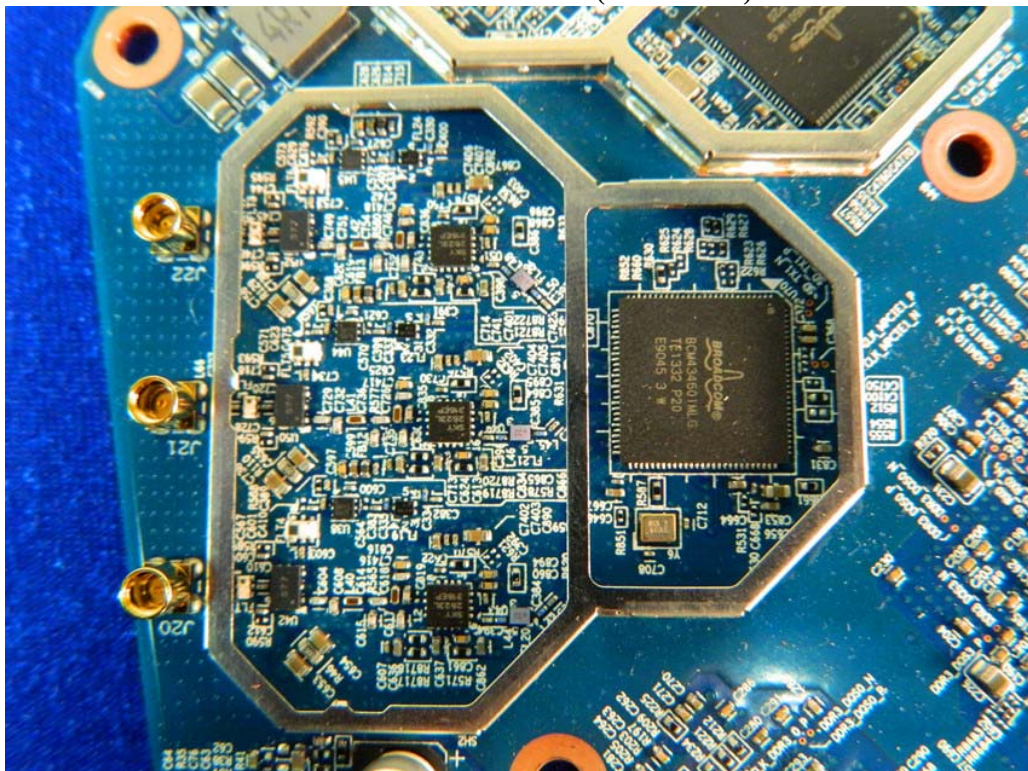
Internal View 4 of PCB



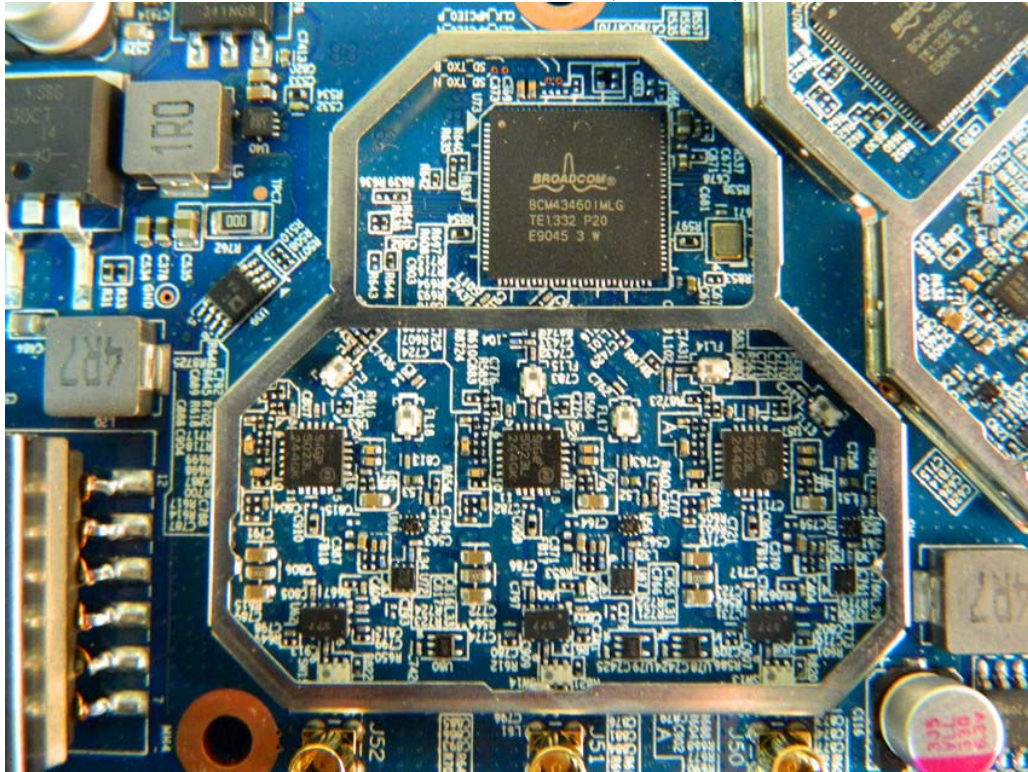
Internal View 5 of PCB



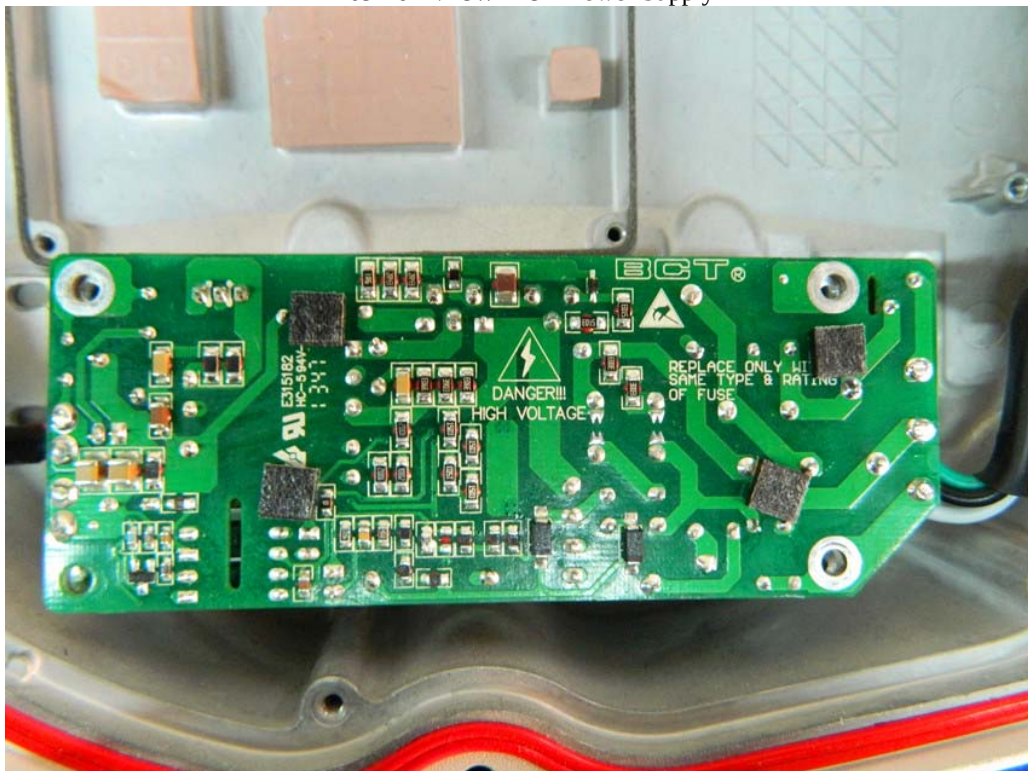
Internal View 6 of PCB (2.4G Module)



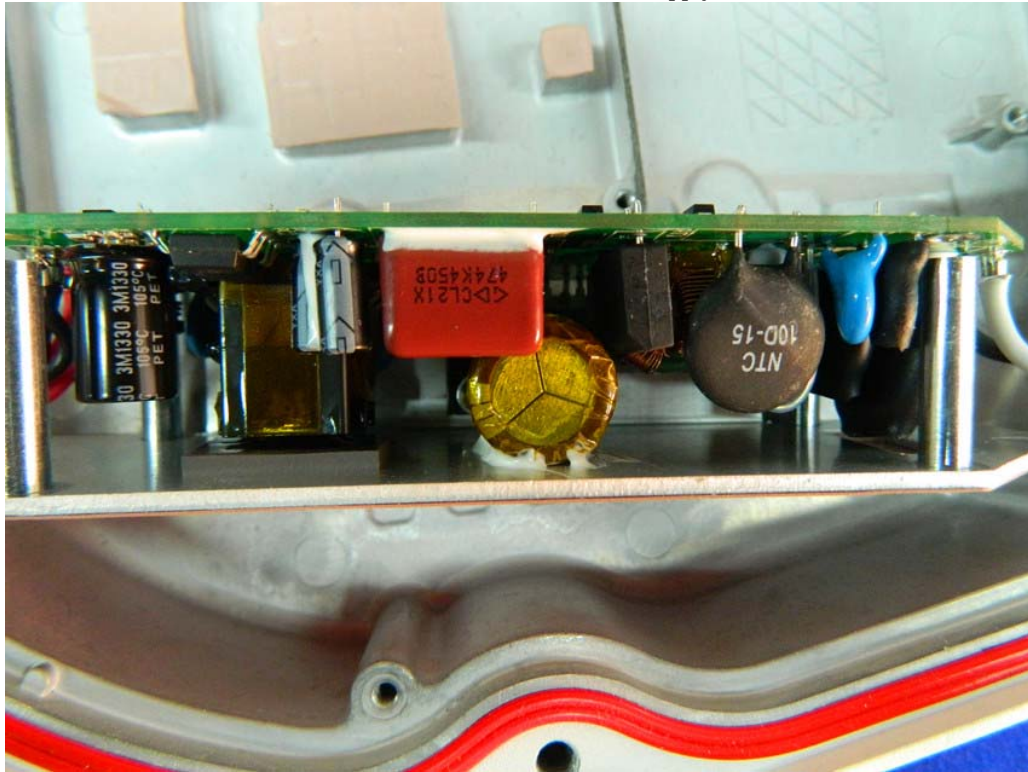
Internal View 1 of PCB (5G Module)



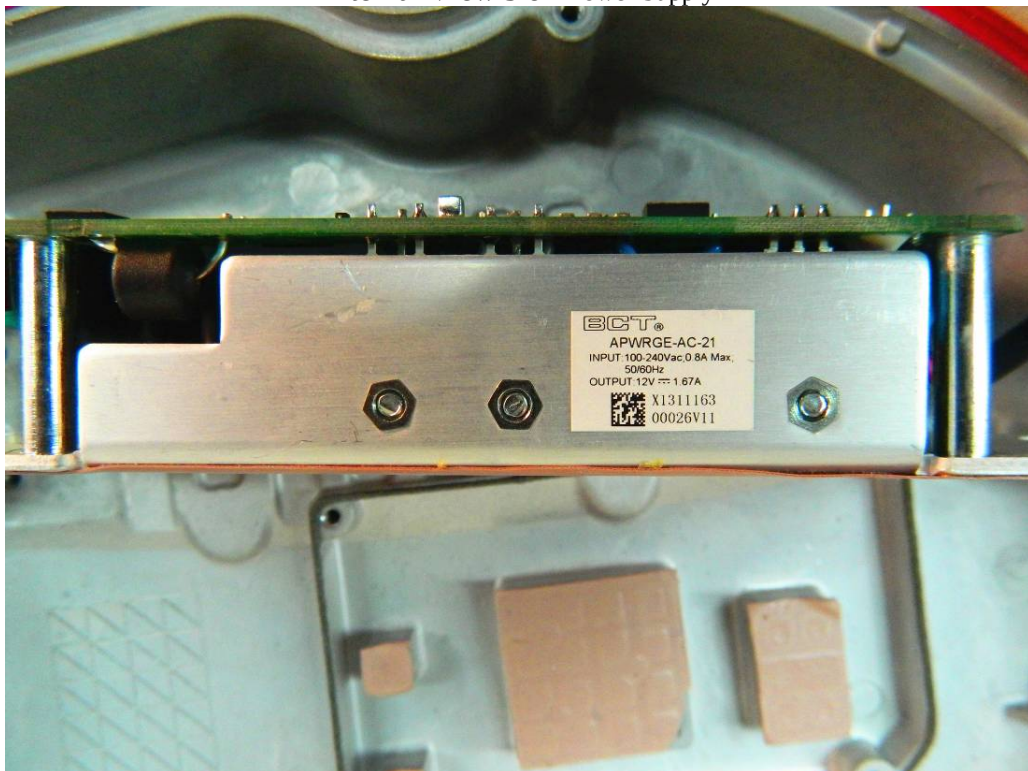
Internal View 1 of Power Supply



Internal View 2 of Power Supply



Internal View 3 of Power Supply



Internal View 4 of Power Supply



Internal View 5 of Power Supply

