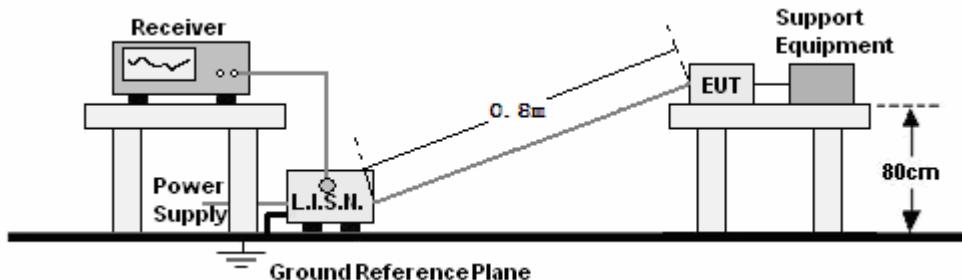


## 14. AC POWER LINE CONDUCTED EMISSIONS

### 14.1 TEST SETUP



### 14.2 LIMITS

Frequency range (MHz)	Limits dB( $\mu$ V)	
	Quasi-peak	Average
0,15 to 0,50	66 to 56	56 to 46
0,50 to 5	56	46
5 to 30	60	50

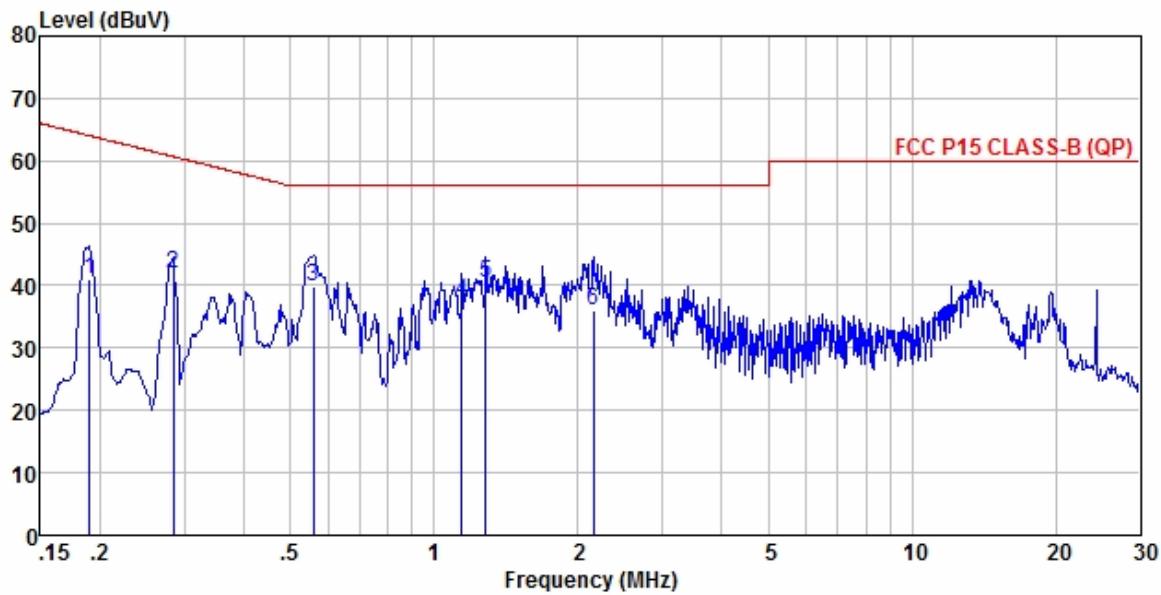
**NOTE:** 1. The lower limit shall apply at the transition frequencies.  
 2. The limit decreases linearly with the logarithm of the frequency in the range 0.15 to 0.50 MHz.

### 14.3 TEST PROCEDURE

According to description of ANSI C63.4: 2009 sec.13.1.3, the AC power line preliminary conducted emissions measurements were carried out. The preliminary conducted measurements were performed using the spectrum analyzer to observe the emission characteristics of the EUT. The EUT configuration, cable configuration and mode of operation were determined for producing the maximum level of emissions. These configurations were used for final AC power line conducted emissions measurements. The EUT is placed on a non-metallic table 0.8m above the horizontal metal reference ground plane. The EUT is connected to LISN and LISN is connected to the reference ground. All other supplemental devices are connected with EUT through other LISN. The distance between EUT and LISN is 80cm. A radio link is established between EUT and the tester. The output power of the EUT is controlled by the tester and driven to maximum value. An initial pre-scan was performed on the live L line and neutral line with peak detector (9kHz RBW). Both average detector and quasi-peak detector are performed at the frequencies with maximized peak emission.

Conducted emissions were invested over the frequency range from 0.15MHz to 30MHz using a receiver bandwidth of 9kHz.

## 14.4 RESULTS & PERFORMANCE



Site : shielding room 3

Condition : FCC P15 CLASS-B (QP) ENV216(N)-20120730 NEUTRAL

EUT : GIS Data collector

Model Name : loka/XF300/XF200/MG868H

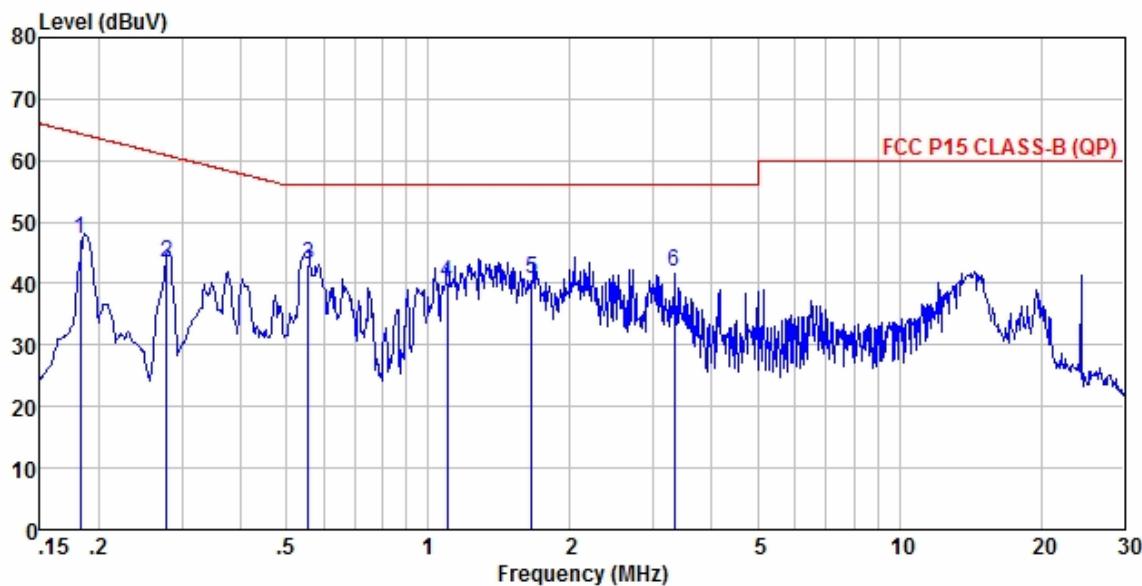
Temp/Humi : 20°C /56%

Power Rating: DC 3.8V

Mode : Bluetooth

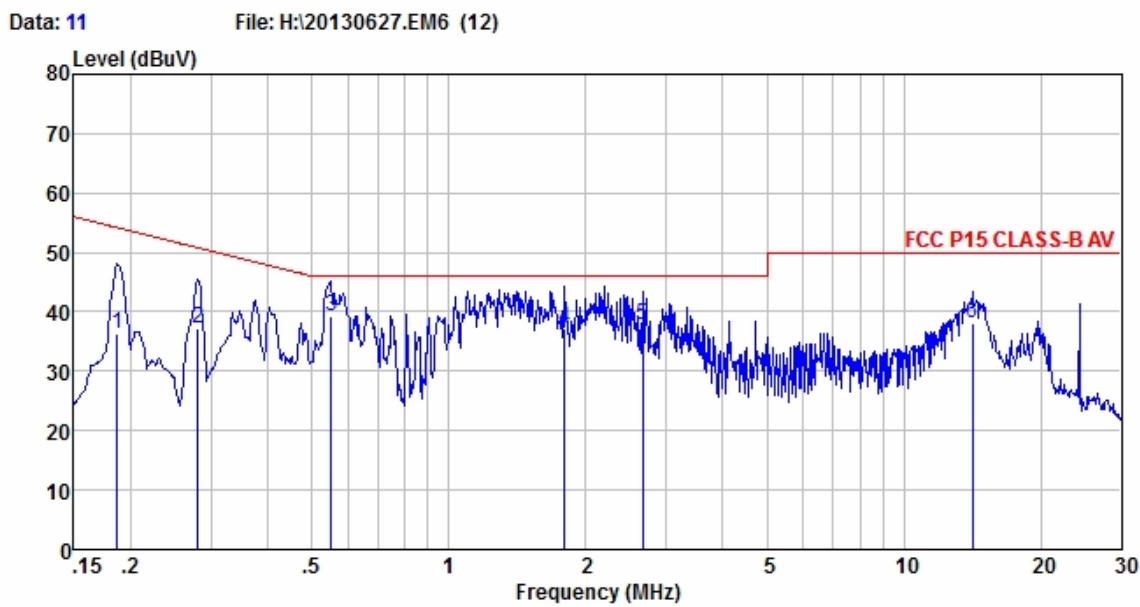
Memo :

	Freq	Read Level	LISN Factor	Cable Loss	Preamp Factor	Limit Level	Line Limit	Over Limit	Remark
	MHz	dBuV	dB	dB	dB	dBuV	dBuV	dB	
1	0.19	30.54	10.33	0.23	0.00	41.10	64.02	-22.92	QP
2	0.28	31.20	10.43	0.19	0.00	41.82	60.68	-18.86	QP
3	0.56	29.40	10.38	0.11	0.00	39.89	56.00	-16.11	QP
4	1.14	27.15	10.31	0.14	0.00	37.60	56.00	-18.40	QP
5 pp	1.28	30.11	10.31	0.14	0.00	40.56	56.00	-15.44	QP
6	2.16	25.60	10.31	0.15	0.00	36.06	56.00	-19.94	QP



Site : shielding room 3  
 Condition : FCC P15 CLASS-B (QP) ENV216(L)-20120730 LINE  
 EUT : GIS Data collector  
 Model Name : loka/XF300/XF200/MG868H  
 Temp/Humi : 20°C /56%  
 Power Rating: DC 3.8V  
 Mode : Bluetooth  
 Memo :

	Freq	Read Level	LISN Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dB	dB	dBuV	dBuV	dB	
1	0.18	36.37	10.51	0.23	0.00	47.11	64.35	-17.24	QP
2	0.28	32.72	10.47	0.19	0.00	43.38	60.85	-17.47	QP
3 pp	0.56	32.40	10.51	0.11	0.00	43.02	56.00	-12.98	QP
4	1.10	29.50	10.52	0.14	0.00	40.16	56.00	-15.84	QP
5	1.66	30.20	10.52	0.15	0.00	40.87	56.00	-15.13	QP
6	3.33	31.17	10.52	0.15	0.00	41.84	56.00	-14.16	QP



Site : shielding room 3  
 Condition : FCC P15 CLASS-B AV ENV216(L)-20120730 LINE

EUT : GIS Data collector

Model Name : loka/XF300/XF200/MG868H

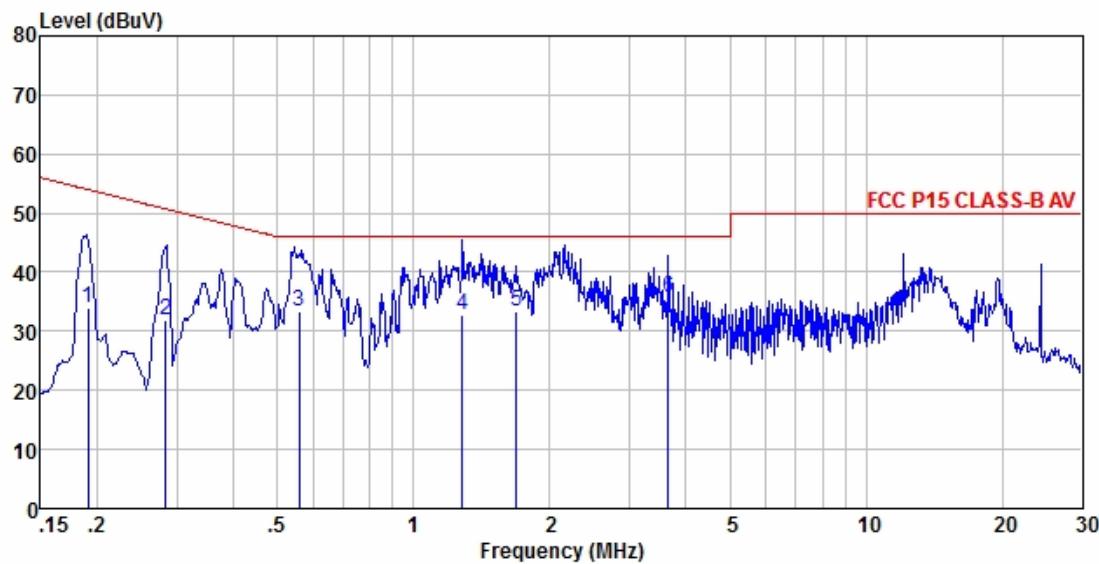
Temp/Humi : 20°C /56%

Power Rating: DC 3.8V

Mode : Bluetooth

Memo :

	Read Freq	LISN Level	Cable Factor	Preamp Loss	Preamp Factor	Limit Level	Line Limit	Over Limit	Remark
	MHz	dBuV	dB	dB	dB	dBuV	dBuV	dB	
1	0.19	25.50	10.49	0.23	0.00	36.22	54.20	-17.98	Average
2	0.28	26.60	10.48	0.19	0.00	37.27	50.81	-13.54	Average
3 pp	0.55	28.60	10.51	0.11	0.00	39.22	46.00	-6.78	Average
4	1.80	26.60	10.52	0.15	0.00	37.27	46.00	-8.73	Average
5	2.66	27.20	10.52	0.15	0.00	37.87	46.00	-8.13	Average
6	14.14	27.51	10.50	0.18	0.00	38.19	50.00	-11.81	Average



Site : shielding room 3

Condition : FCC P15 CLASS-B AV ENV216(N)-20120730 NEUTRAL

EUT : GIS Data collector

Model Name : loka/XF300/XF200/MG868H

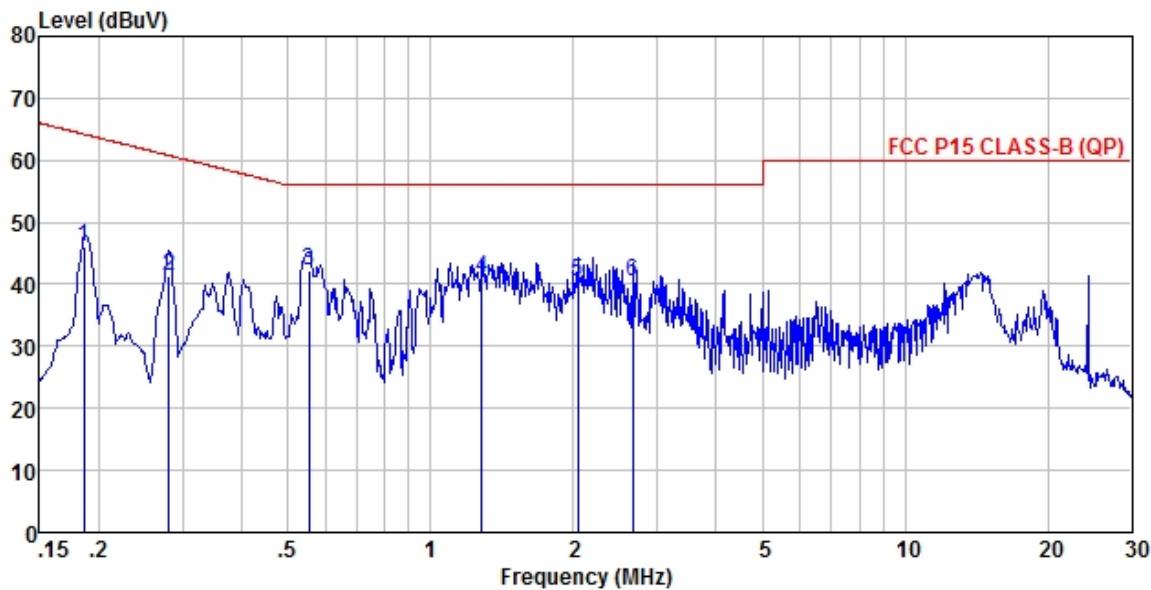
Temp/Humi : 20°C /56%

Power Rating: DC 3.8V

Mode : Bluetooth

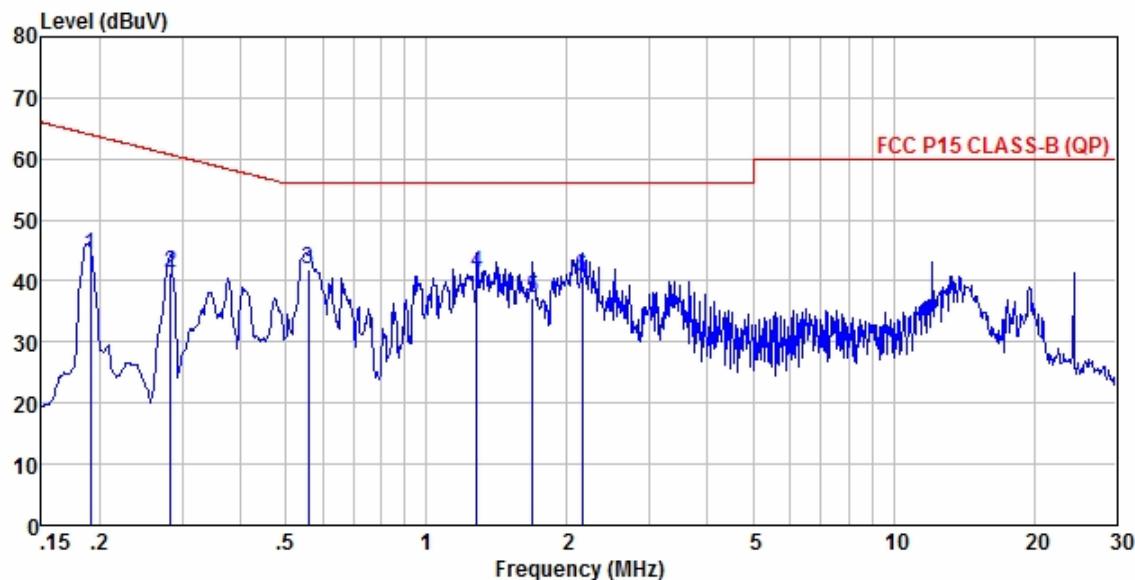
Memo :

	Freq	Read MHz	LISN Level dBuV	Cable Factor	Preamp Loss dB	Limit Level dBuV	Line Limit dBuV	Over Limit dB	Remark
		MHz	dBuV		dB		dBuV		
1		0.19	23.45	10.34	0.23	0.00	34.02	53.99	-19.97 Average
2		0.28	21.18	10.43	0.19	0.00	31.80	50.70	-18.90 Average
3		0.56	22.84	10.38	0.11	0.00	33.33	46.00	-12.67 Average
4		1.28	22.23	10.31	0.14	0.00	32.68	46.00	-13.32 Average
5		1.69	22.96	10.31	0.15	0.00	33.42	46.00	-12.58 Average
6 pp		3.66	25.17	10.32	0.14	0.00	35.63	46.00	-10.37 Average



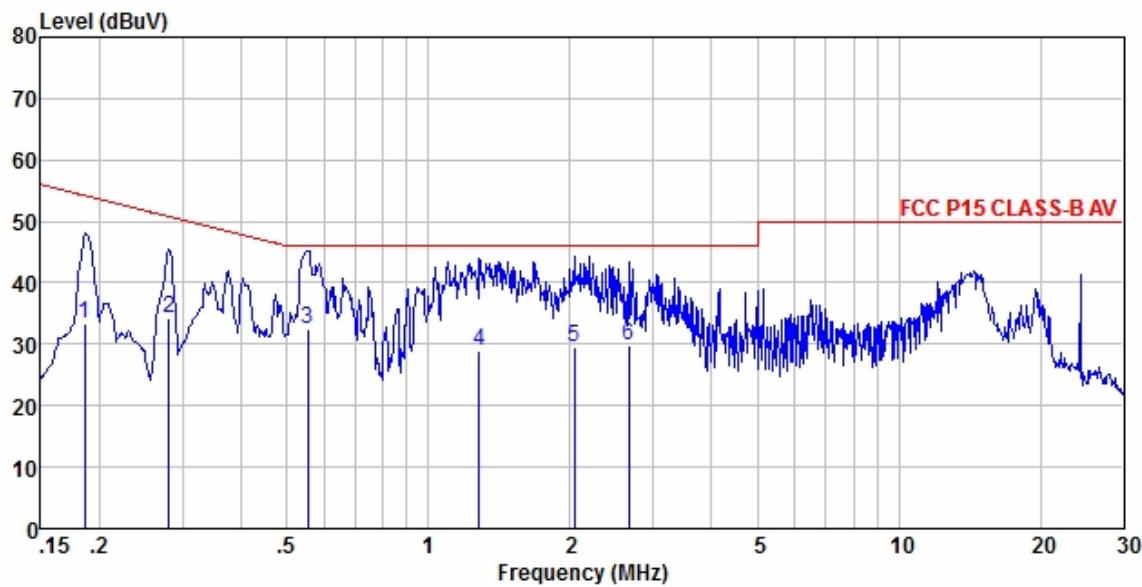
Site : shielding room 3  
 Condition : FCC P15 CLASS-B (QP) ENV216(L)-20120730 LINE  
 EUT : GIS Data collector  
 Model Name : loka/XF300/XF200/MG868H  
 Temp/Humi : 20°C /56%  
 Power Rating: DC 3.8V  
 Mode : data exchanging  
 Memo :

	Freq	Read Level	LISN Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dB	dB	dBuV	dBuV	dB	
1	0.19	35.37	10.50	0.23	0.00	46.10	64.21	-18.11	QP
2	0.28	30.71	10.48	0.19	0.00	41.38	60.79	-19.41	QP
3 pp	0.56	31.62	10.51	0.11	0.00	42.24	56.00	-13.76	QP
4	1.28	30.44	10.52	0.14	0.00	41.10	56.00	-14.90	QP
5	2.04	29.67	10.52	0.15	0.00	40.34	56.00	-15.66	QP
6	2.66	29.64	10.52	0.15	0.00	40.31	56.00	-15.69	QP



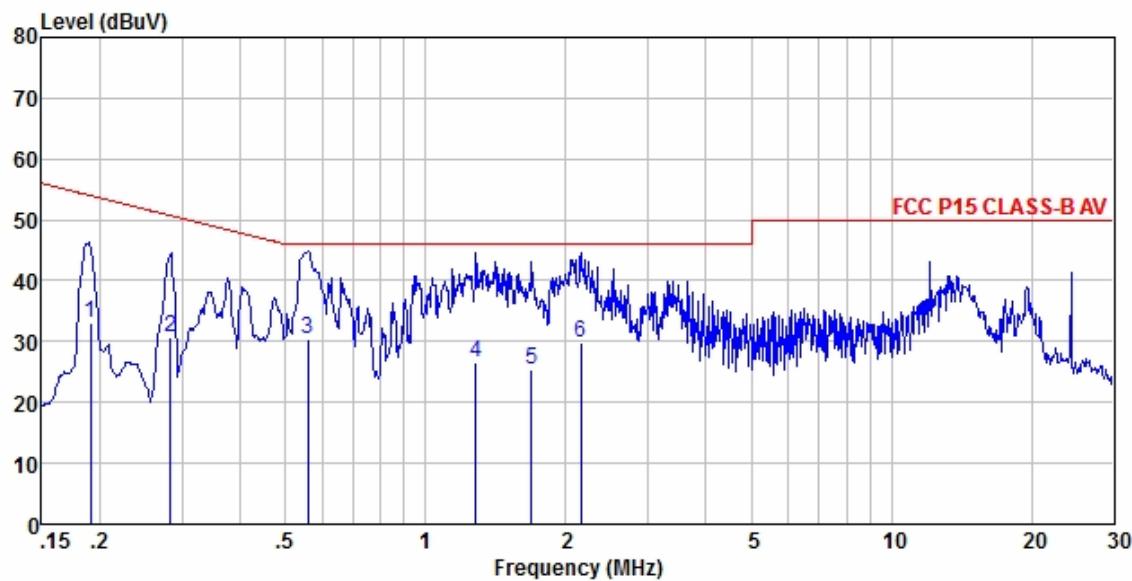
Site : shielding room 3  
 Condition : FCC P15 CLASS-B (QP) ENV216(N)-20120730 NEUTRAL  
 EUT : GIS Data collector  
 Model Name : loka/XF300/XF200/MG868H  
 Temp/Humi : 20°C /56%  
 Power Rating: DC 3.8V  
 Mode : data exchanging  
 Memo :

	Freq	Read Level	LISN Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dB	dB	dBuV	dBuV	dB	
1	0.19	33.69	10.34	0.23	0.00	44.26	63.99	-19.73	QP
2	0.28	30.82	10.43	0.19	0.00	41.44	60.70	-19.26	QP
3 pp	0.56	31.48	10.38	0.11	0.00	41.97	56.00	-14.03	QP
4	1.28	30.98	10.31	0.14	0.00	41.43	56.00	-14.57	QP
5	1.69	26.62	10.31	0.15	0.00	37.08	56.00	-18.92	QP
6	2.16	30.22	10.31	0.15	0.00	40.68	56.00	-15.32	QP



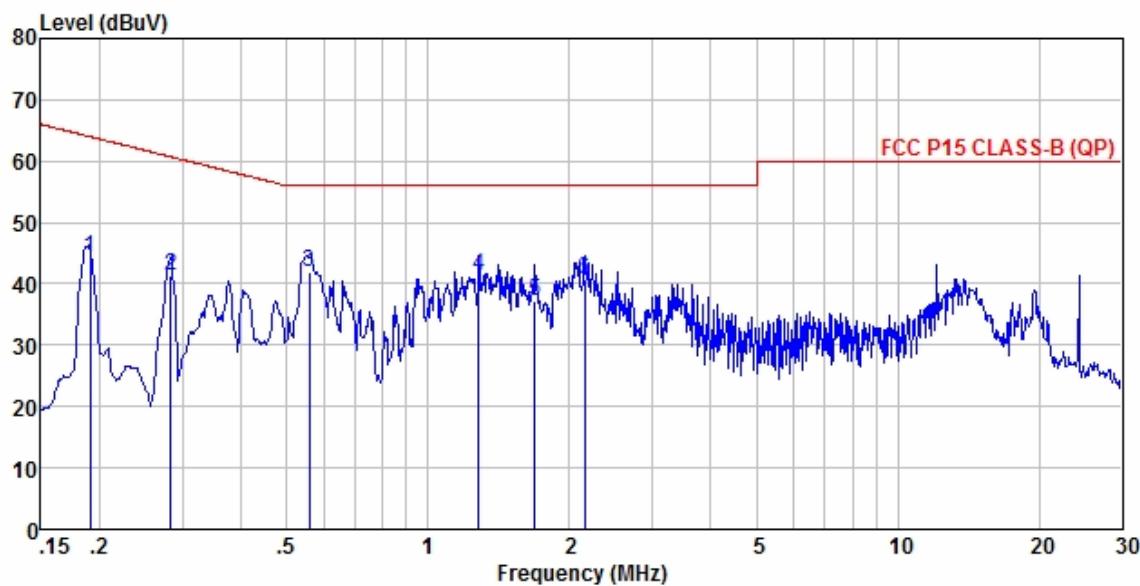
Site : shielding room 3  
 Condition : FCC P15 CLASS-B AV ENV216(L)-20120730 LINE  
 EUT : GIS Data collector  
 Model Name : loka/XF300/XF200/MG868H  
 Temp/Humi : 20°C /56%  
 Power Rating: DC 3.8V  
 Mode : data exchanging  
 Memo :

	Freq	Read Level	LISN Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dB	dB	dBuV	dBuV	dB	
1	0.19	22.53	10.50	0.23	0.00	33.26	54.21	-20.95	Average
2	0.28	23.69	10.48	0.19	0.00	34.36	50.79	-16.43	Average
3 pp	0.56	21.87	10.51	0.11	0.00	32.49	46.00	-13.51	Average
4	1.28	18.35	10.52	0.14	0.00	29.01	46.00	-16.99	Average
5	2.04	18.81	10.52	0.15	0.00	29.48	46.00	-16.52	Average
6	2.66	19.25	10.52	0.15	0.00	29.92	46.00	-16.08	Average



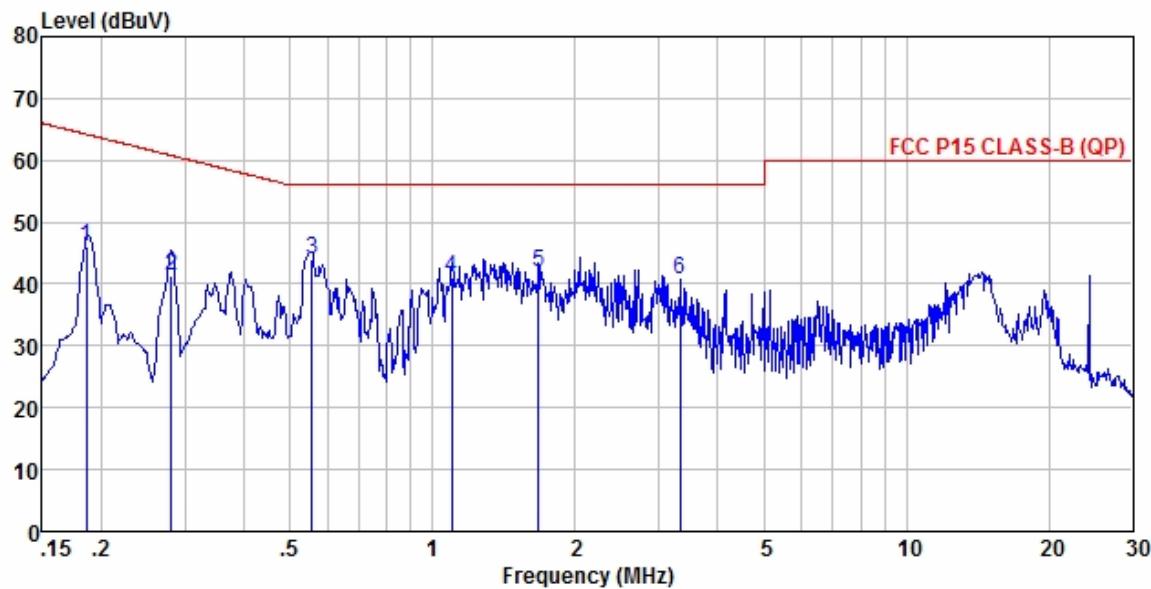
Site : shielding room 3  
 Condition : FCC P15 CLASS-B AV ENV216(N)-20120730 NEUTRAL  
 EUT : GIS Data collector  
 Model Name : loka/XF300/XF200/MG868H  
 Temp/Humi : 20°C /56%  
 Power Rating: DC 3.8V  
 Mode : data exchanging  
 Memo :

	Read Freq	LISN Level	Cable Factor	Preamp Loss	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dB	dBuV	dBuV	dB	
1	0.19	22.45	10.34	0.23	0.00	33.02	53.99	-20.97 Average
2	0.28	20.18	10.43	0.19	0.00	30.80	50.70	-19.90 Average
3 pp	0.56	19.84	10.38	0.11	0.00	30.33	46.00	-15.67 Average
4	1.28	16.23	10.31	0.14	0.00	26.68	46.00	-19.32 Average
5	1.69	14.96	10.31	0.15	0.00	25.42	46.00	-20.58 Average
6	2.16	19.37	10.31	0.15	0.00	29.83	46.00	-16.17 Average



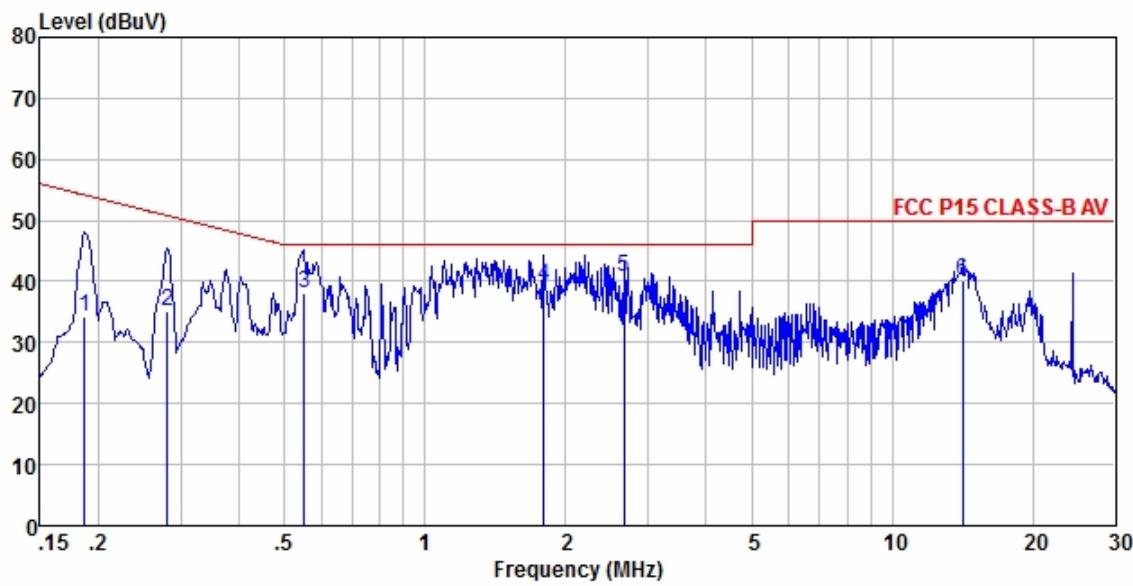
Site : shielding room 3  
 Condition : FCC P15 CLASS-B (QP) ENV216(N)-20120730 NEUTRAL  
 EUT : GIS Data collector  
 Model Name : loka/XF300/XF200/MG868H  
 Temp/Humi : 20°C /56%  
 Power Rating: DC 3.8V  
 Mode : WiFi  
 Memo :

Freq	Read	LISN	Cable	Preamp	Level	Limit	Over	Remark
	Freq	Level	Factor	Loss		Line	Limit	
	MHz	dBuV	dB	dB	dB	dBuV	dBuV	dB
1	0.19	33.69	10.34	0.23	0.00	44.26	63.99	-19.73 QP
2	0.28	30.82	10.43	0.19	0.00	41.44	60.70	-19.26 QP
3 pp	0.56	31.48	10.38	0.11	0.00	41.97	56.00	-14.03 QP
4	1.28	30.98	10.31	0.14	0.00	41.43	56.00	-14.57 QP
5	1.69	26.62	10.31	0.15	0.00	37.08	56.00	-18.92 QP
6	2.16	30.22	10.31	0.15	0.00	40.68	56.00	-15.32 QP



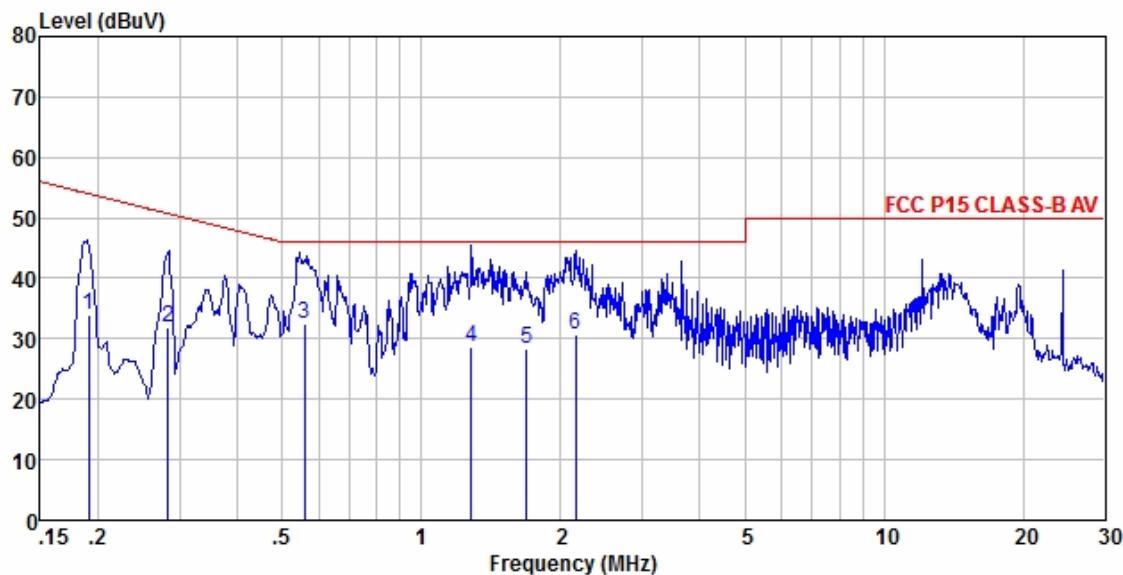
Site : shielding room 3  
 Condition : FCC P15 CLASS-B (QP) ENV216(L)-20120730 LINE  
 EUT : GIS Data collector  
 Model Name : loka/XF300/XF200/MG868H  
 Temp/Humi : 20°C /56%  
 Power Rating: DC 3.8V  
 Mode : WiFi  
 Memo :

Freq	Read	LISN	Cable	Preamp	Limit	Over	Limit	Remark
	MHz	Level	Factor	Loss				
1	0.19	35.37	10.50	0.23	0.00	46.10	64.21	-18.11 QP
2	0.28	30.71	10.48	0.19	0.00	41.38	60.79	-19.41 QP
3 pp	0.56	33.40	10.51	0.11	0.00	44.02	56.00	-11.98 QP
4	1.10	30.50	10.52	0.14	0.00	41.16	56.00	-14.84 QP
5	1.67	31.20	10.52	0.15	0.00	41.87	56.00	-14.13 QP
6	3.33	30.17	10.52	0.15	0.00	40.84	56.00	-15.16 QP



Site : shielding room 3  
 Condition : FCC P15 CLASS-B AV ENV216(L)-20120730 LINE  
 EUT : GIS Data collector  
 Model Name : loka/XF300/XF200/MG868H  
 Temp/Humi : 20°C /56%  
 Power Rating: DC 3.8V  
 Mode : WiFi  
 Memo :

	Read Freq	LISN Level	Cable Factor	Preamp Loss	Level Factor	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dB	dBuV	dBuV	dB	
1	0.19	23.50	10.49	0.23	0.00	34.22	54.20	-19.98 Average
2	0.28	24.60	10.48	0.19	0.00	35.27	50.81	-15.54 Average
3	0.55	27.60	10.51	0.11	0.00	38.22	46.00	-7.78 Average
4	1.80	28.60	10.52	0.15	0.00	39.27	46.00	-6.73 Average
5 pp	2.66	30.20	10.52	0.15	0.00	40.87	46.00	-5.13 Average
6	14.14	29.51	10.50	0.18	0.00	40.19	50.00	-9.81 Average



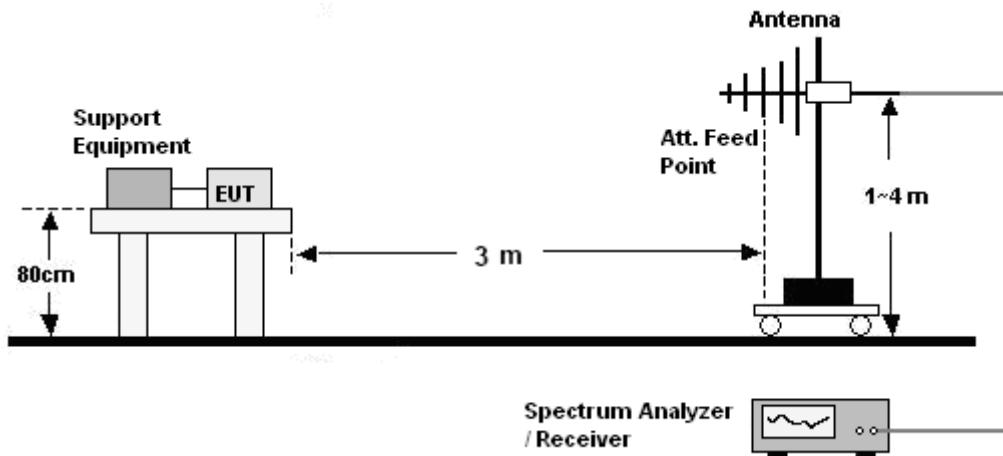
Site : shielding room 3  
 Condition : FCC P15 CLASS-B AV ENV216(N)-20120730 NEUTRAL  
 EUT : GIS Data collector  
 Model Name : loka/XF300/XF200/MG868H  
 Temp/Humi : 20°C /56%  
 Power Rating: DC 3.8V  
 Mode : WiFi  
 Memo :

	Freq	Read MHz	LISN Level dBuV	Cable Factor	Preamp Loss dB	Limit Level dBuV	Line dBuV	Over Limit dB	Remark
		MHz	dBuV	dB	dB	dBuV	dBuV	dB	
1		0.19	23.45	10.34	0.23	0.00	34.02	53.99	-19.97 Average
2		0.28	21.18	10.43	0.19	0.00	31.80	50.70	-18.90 Average
3 pp		0.56	21.84	10.38	0.11	0.00	32.33	46.00	-13.67 Average
4		1.28	18.23	10.31	0.14	0.00	28.68	46.00	-17.32 Average
5		1.69	17.96	10.31	0.15	0.00	28.42	46.00	-17.58 Average
6		2.16	20.37	10.31	0.15	0.00	30.83	46.00	-15.17 Average

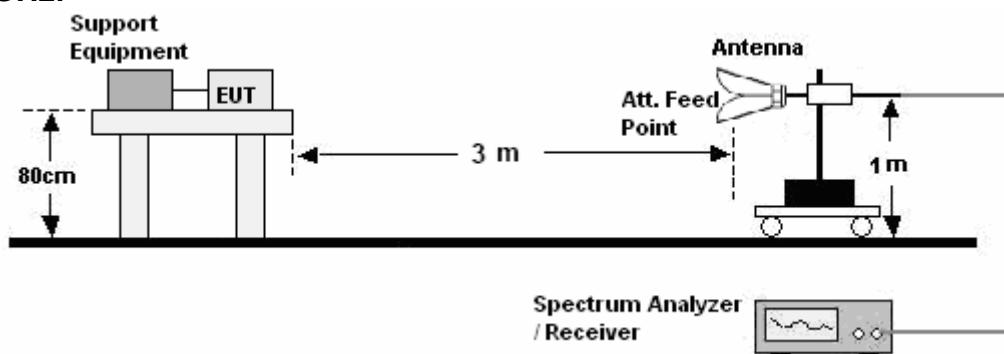
## 15. RADIATED EMISSIONS

### 15.1 TEST SETUP

**30MHz ~ 1GHz:**



**Above 1GHz:**



### 15.2 LIMITS

Limits for Class B digital devices

Frequency (MHz)	limits at 3m dB( $\mu$ V/m)
30-88	40.0
88-216	43.5
216-960	46.0
Above 960	54.0

**NOTE:** 1. The lower limit shall apply at the transition frequency.

2. The limits shown above are based on measuring equipment employing a CISPR quasi-peak detector function for frequencies below or equal to 1000MHz.
3. The limits shown above are based on measuring equipment employing an average detector function for frequencies above 1000MHz.

### 15.3 TEST PROCEDURE

#### 30MHz ~ 1GHz:

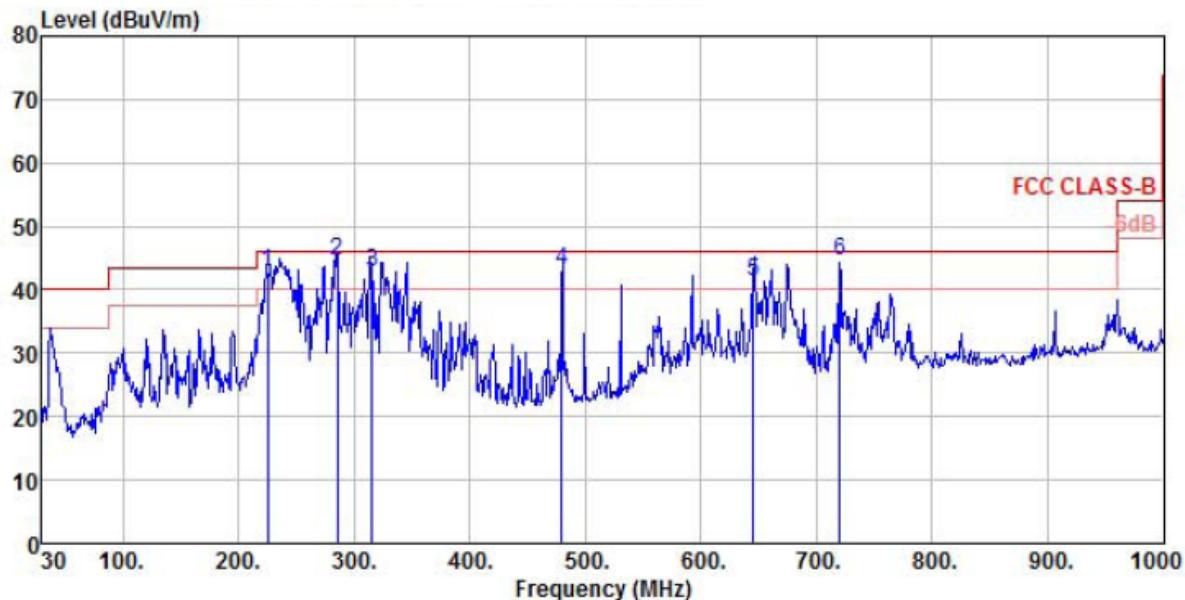
- a. The EUT and support equipment were placed on the non-conductive turntable 0.8/0.1m above the horizontal metal ground plane at a chamber. The EUT was set 3 meters away from the receiving antenna, which was mounted on an antenna tower. Broadband antenna (Calibrated Bilog Antenna) was used as receiving antenna.
- b. The frequency range from 30MHz to 1GHz was checked. The RBW of the receiver was set at 120kHz. Set the receiver in Peak detector, Max Hold mode. Record the maximum field strength of all the pre-scan process in the full band when the antenna is varied between 1~4 m in both horizontal and vertical, and the turntable is rotated from 0 to 360 degrees.
- c. For each frequency whose maximum record was higher or close to limit, measure its QP value: vary the antenna's height and rotate the turntable from 0 to 360 degrees to find the height and degree where EUT radiated the maximum emission, then set the test frequency receiver to QP Detector and record the maximum value.

#### Above 1GHz:

- a. The EUT and support equipment were placed on the non-conductive turntable 0.8/0.1m above the ground at a chamber. The EUT was set 3 meters away from the receiving antenna, which was mounted on an antenna tower. Horn antenna was used as receiving antenna.
- b. Set the spectrum analyzer/receiver in Peak detector, Max Hold mode, and 1MHz RBW. Record the maximum field strength of all the pre-scan process in the full band when the antenna is varied in both horizontal and vertical, and the turntable is rotated from 0 to 360 degrees.
- c. For each frequency whose maximum record was higher or close to limit, measure its Average value: rotate the turntable from 0 to 360 degrees to find the degree where EUT radiated the maximum emission, then set the test frequency receiver to EMI Average Detector and record the maximum value.

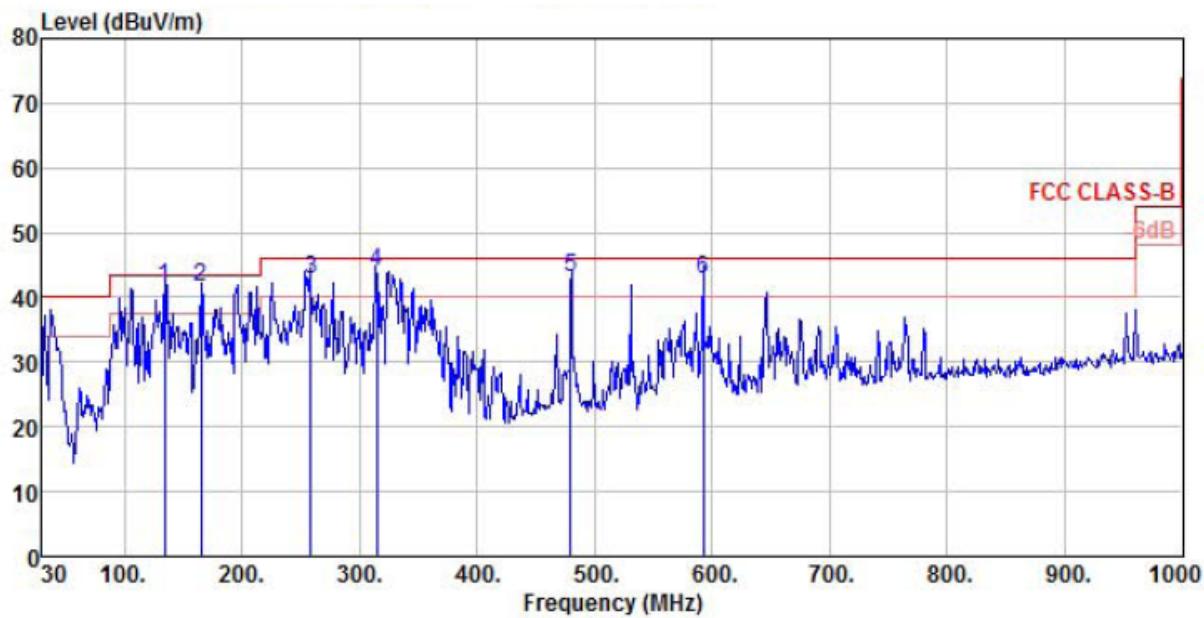
## 15.4 TEST RESULT

30MHz ~ 1GHz:



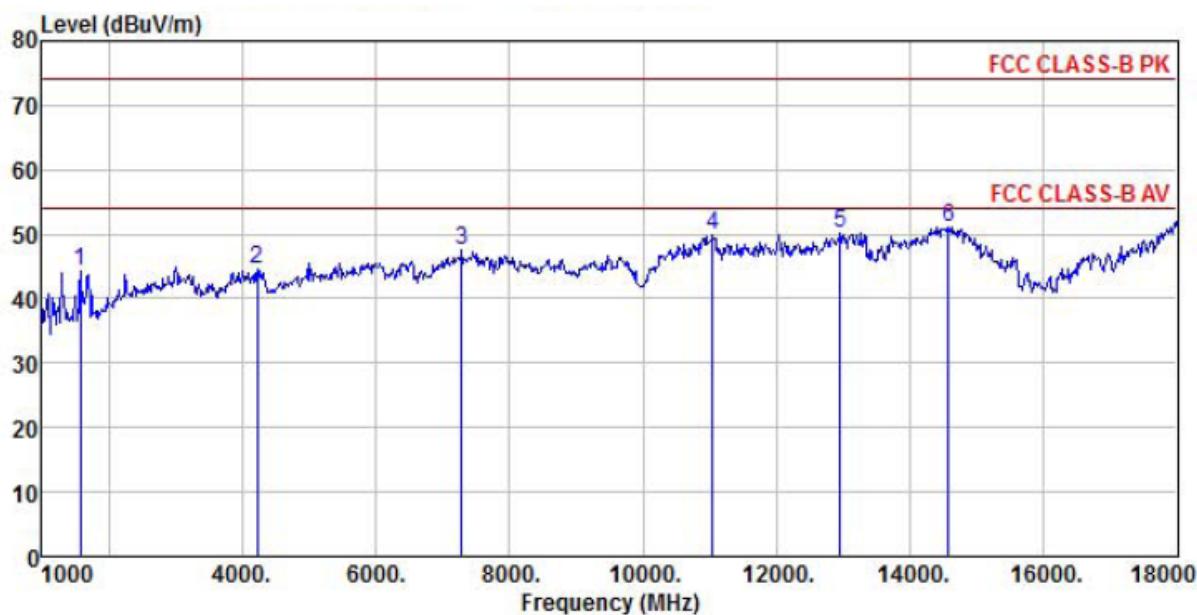
Site : chamber  
 Condition : FCC CLASS-B 3m VULB9160 HORIZONTAL  
 EUT : GIS Data collector  
 Model Name : loka/XF300/XF200/MG868H  
 Temp/Humi : 21°C /52%  
 Power Rating: DC 3.8V  
 Mode : data exchanging  
 Memo :

Freq	ReadAntenna		Cable		Preamp Loss Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB/m	dB					
1 !	225.20	29.86	10.95	2.08	0.00	42.89	46.00	-3.11	QP
2 !	285.20	29.28	12.92	2.23	0.00	44.43	46.00	-1.57	QP
3 !	315.10	26.75	13.56	2.52	0.00	42.83	46.00	-3.17	QP
4 !	480.00	23.29	16.89	3.00	0.00	43.18	46.00	-2.82	QP
5 !	645.70	18.35	19.53	3.53	0.00	41.41	46.00	-4.59	QP
6 pp	720.00	20.23	20.52	3.70	0.00	44.45	46.00	-1.55	QP



Site : chamber  
 Condition : FCC CLASS-B 3m VULB9160 VERTICAL  
 EUT : GIS Data collector  
 Model Name : loka/XF300/XF200/MG868H  
 Temp/Humi : 21°C /52%  
 Power Rating: DC 3.8V  
 Mode : data exchanging  
 Memo :

Freq	ReadAntenna	Cable	Preamp	Limit	Over	Limit	Remark	
	Freq	Level	Factor					
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB
1 !	134.50	26.97	12.92	1.62	0.00	41.51	43.50	-1.99 QP
2 pp	164.90	26.21	13.55	1.76	0.00	41.52	43.50	-1.98 QP
3 !	258.30	28.56	12.09	2.18	0.00	42.83	46.00	-3.17 QP
4 !	314.60	27.77	13.56	2.52	0.00	43.85	46.00	-2.15 QP
5 !	480.00	23.29	16.89	3.00	0.00	43.18	46.00	-2.82 QP
6 !	592.50	20.49	18.94	3.33	0.00	42.76	46.00	-3.24 QP

**Above 1G:**

Site : chamber

Condition : FCC CLASS-B PK 3m BBHA9120D(942) HORIZONTAL

EUT : GIS Data collector

Model Name : loka/XF300?XF200?MG868H

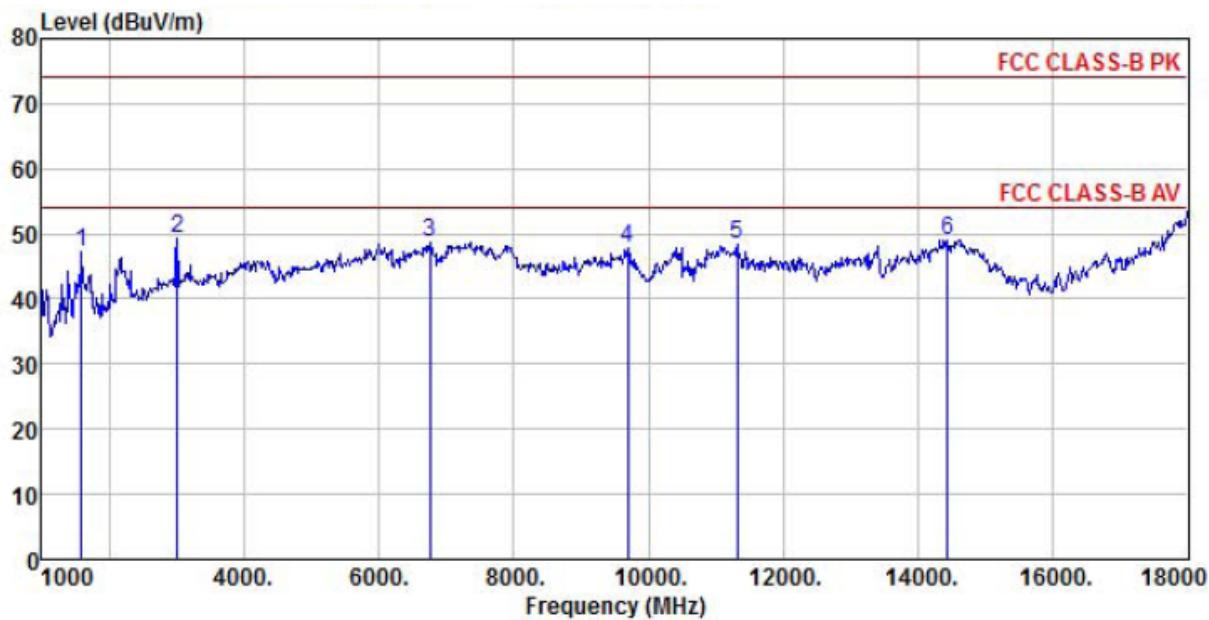
Temp/Humi : 21°C /52%

Power Rating: DC 3.8V

Mode : data exchanging

Memo :

Freq	ReadAntenna	Cable	Preamp	Limit	Over	Line	Limit	Remark
	Level	Factor	Loss					
MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
1	1578.00	51.99	25.02	5.73	38.46	44.28	74.00	-29.72 Peak
2	4230.00	42.04	30.28	9.56	37.41	44.47	74.00	-29.53 Peak
3	7290.00	35.69	36.48	12.64	37.31	47.50	74.00	-26.50 Peak
4	11047.00	32.48	40.19	16.10	38.93	49.84	74.00	-24.16 Peak
5	12951.00	31.88	39.38	17.39	38.45	50.20	74.00	-23.80 Peak
6 pp	14583.00	28.15	42.46	18.68	38.12	51.17	74.00	-22.83 Peak



Site : chamber  
 Condition : FCC CLASS-B PK 3m BBHA9120D(942) VERTICAL  
 EUT : GIS Data collector  
 Model Name : loka/XF300?XF200?MG868H  
 Temp/Humi : 21°C /52%  
 Power Rating: DC 3.8V  
 Mode : data exchanging  
 Memo :

Freq	ReadAntenna	Cable	Preamp	Limit	Over	Remark	
	Freq	Level Factor	Loss Factor				
	MHz	dBuV	dB/m	dB	dBuV/m	dBuV/m	dB
1	1595.00	54.94	24.98	5.71	38.46	47.17	74.00 -26.83 Peak
2 pp	3006.00	50.72	28.53	8.07	38.10	49.22	74.00 -24.78 Peak
3	6763.00	38.16	34.47	12.38	36.42	48.59	74.00 -25.41 Peak
4	9687.00	35.24	38.25	14.38	39.96	47.91	74.00 -26.09 Peak
5	11319.00	31.24	40.02	16.11	39.06	48.31	74.00 -25.69 Peak
6	14430.00	26.39	42.52	18.52	38.28	49.15	74.00 -24.85 Peak

## APPENDIX 1 PHOTOGRAHPS OF TEST SETUP

### Peak Output Power Test Setup Photos

Description: Bluetooth measurement setup



Description: WiFi measurement setup



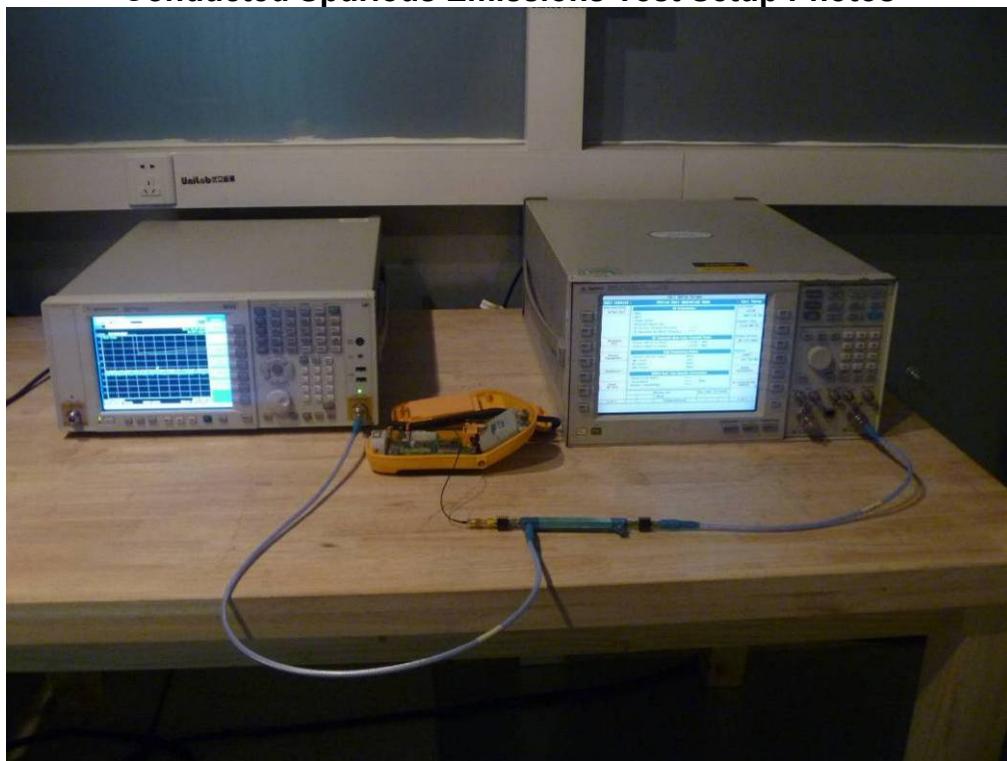
**occupied bandwidth**

Description: Bluetooth measurement setup



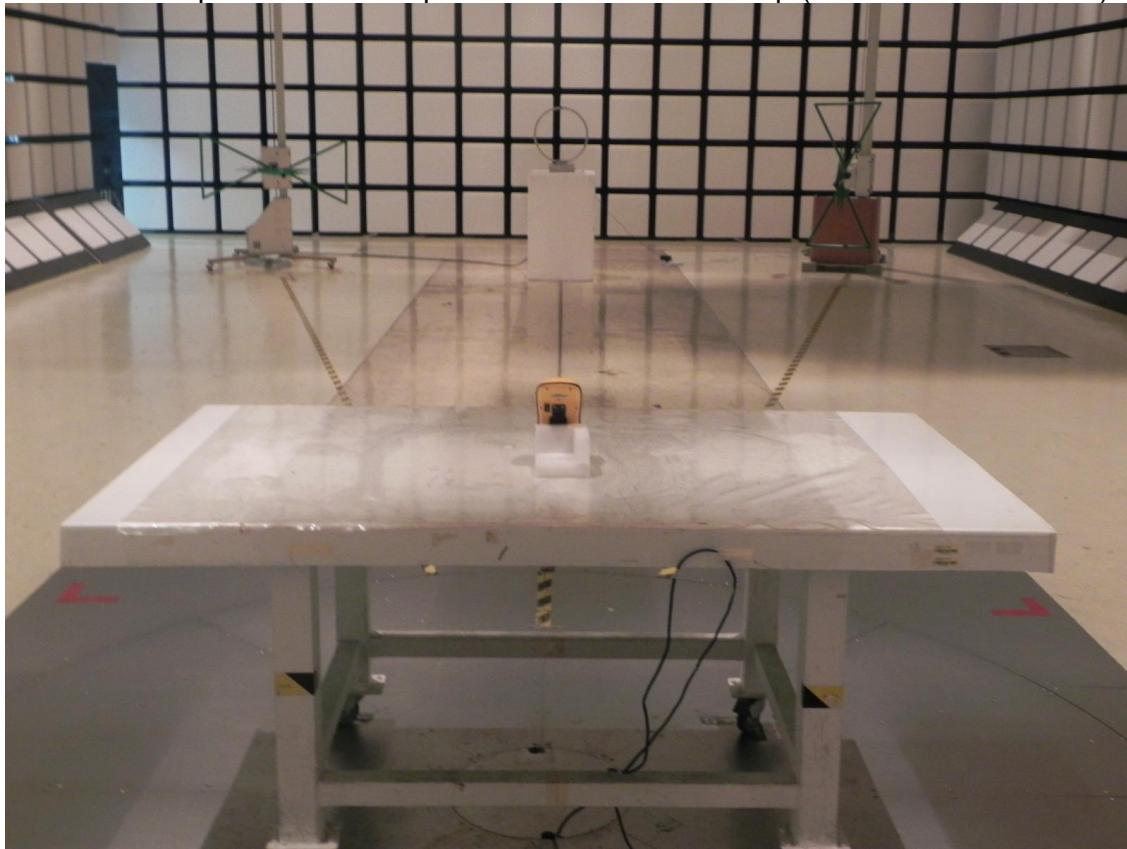
Description: WiFi measurement setup



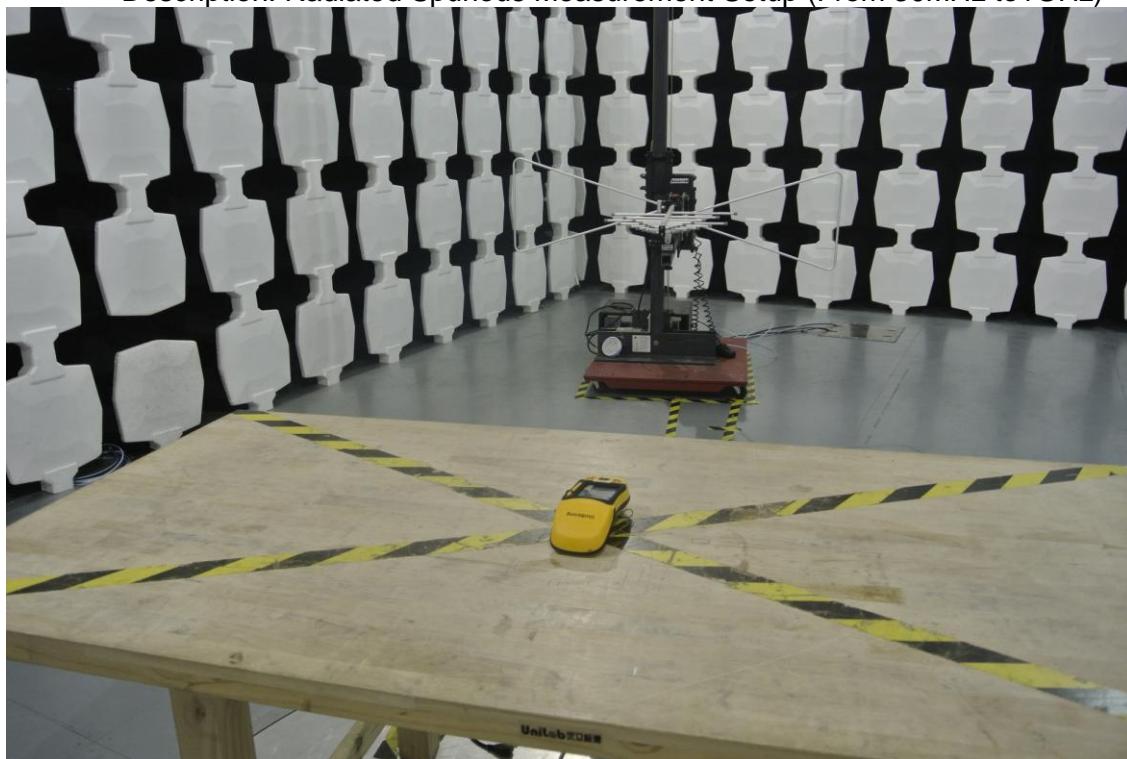
**Conducted Spurious Emissions Test Setup Photos**

### Spurious Emissions Test Setup Photos

Description: Radiated Spurious Measurement Setup (From 9KHz to 30MHz)



Description: Radiated Spurious Measurement Setup (From 30MHz to1GHz)



Description: Radiated Spurious Measurement Setup (Above 1GHz)



**Radiated emission**  
30M-1000M



**Above 1G****Conducted emission**

## APPENDIX 2 PHOTOGRAPHS OF EUT

View of EUT-1



View of EUT-2



View of EUT-3



View of EUT-4



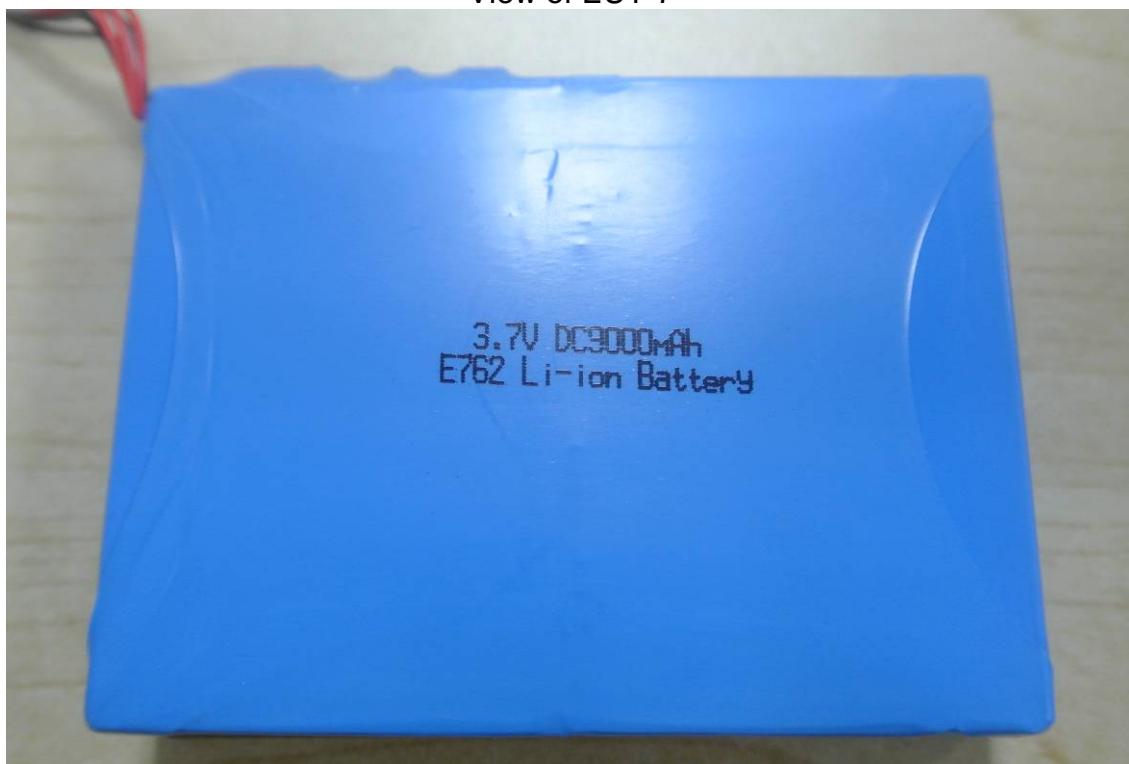
View of EUT-5



View of EUT-6



View of EUT-7



View of EUT-8



View of EUT-9



View of EUT-10



View of EUT-11



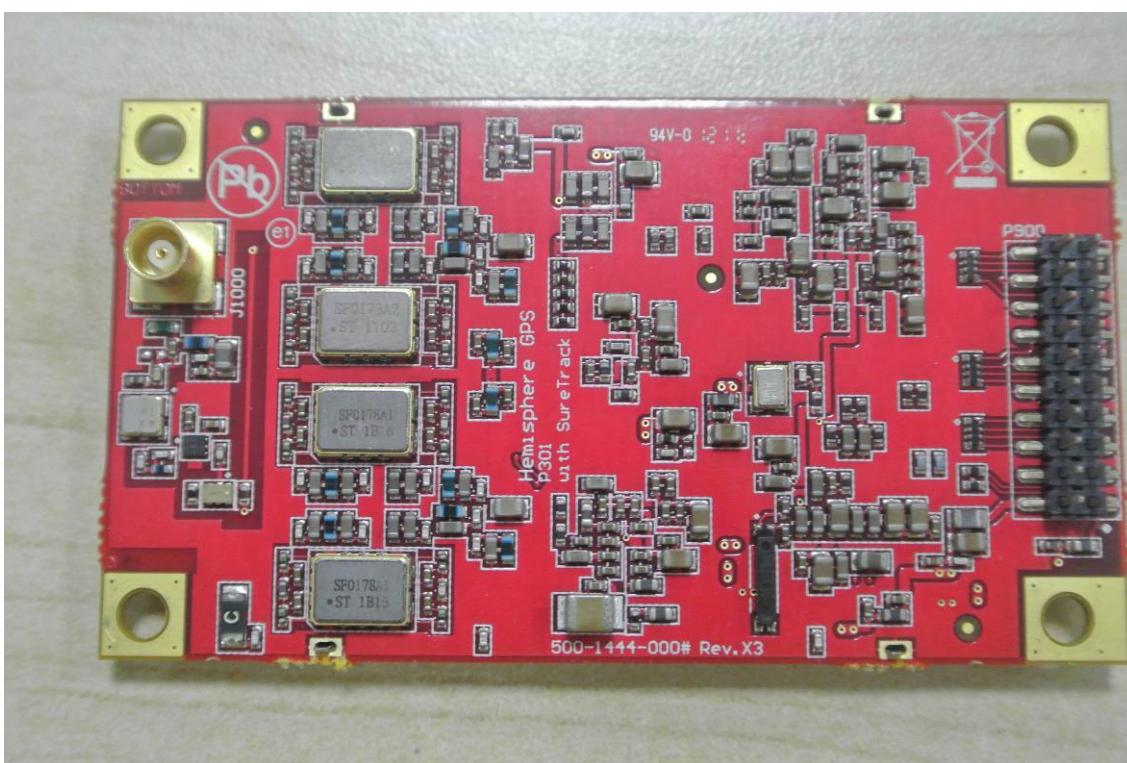
View of EUT-12



View of EUT-13



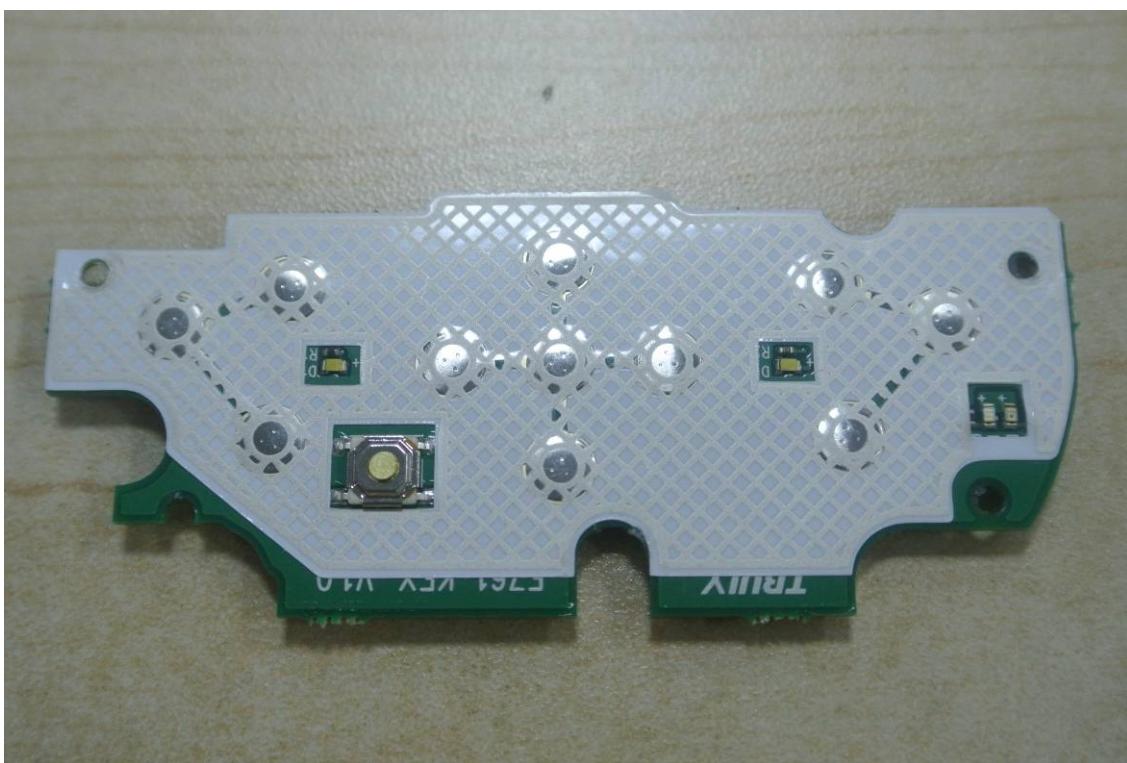
View of EUT-14



View of EUT-15



View of EUT-16



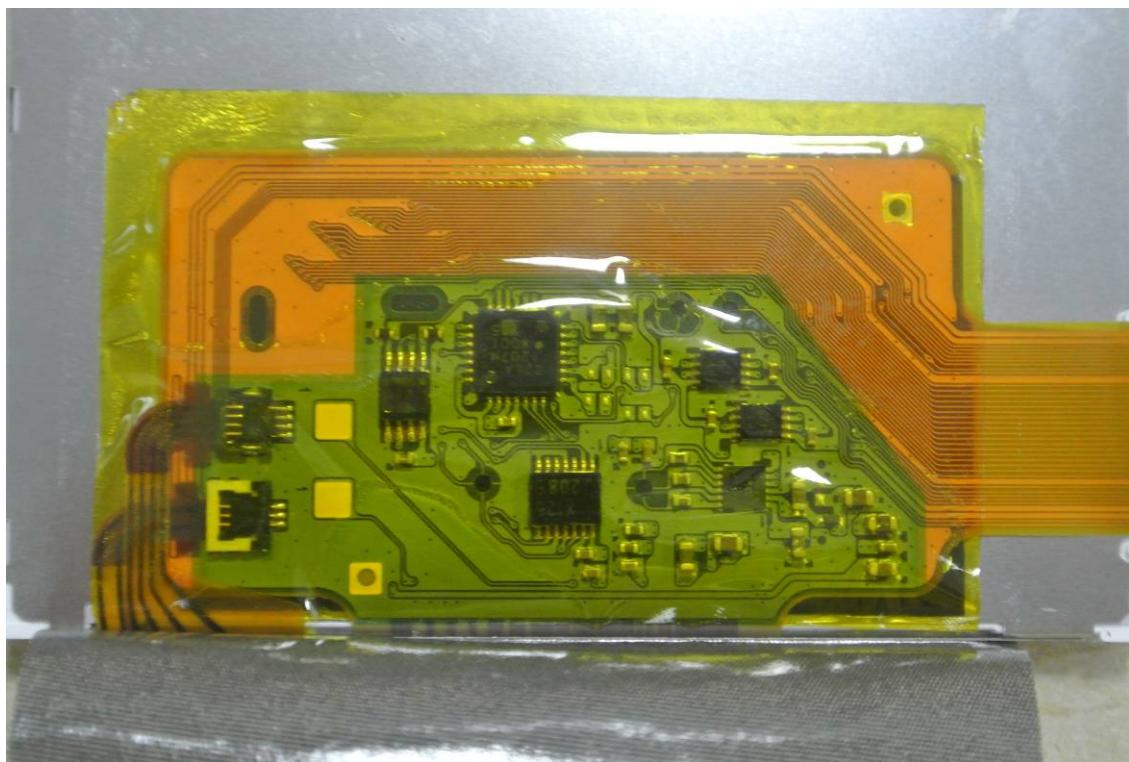
View of EUT-17



View of EUT-18



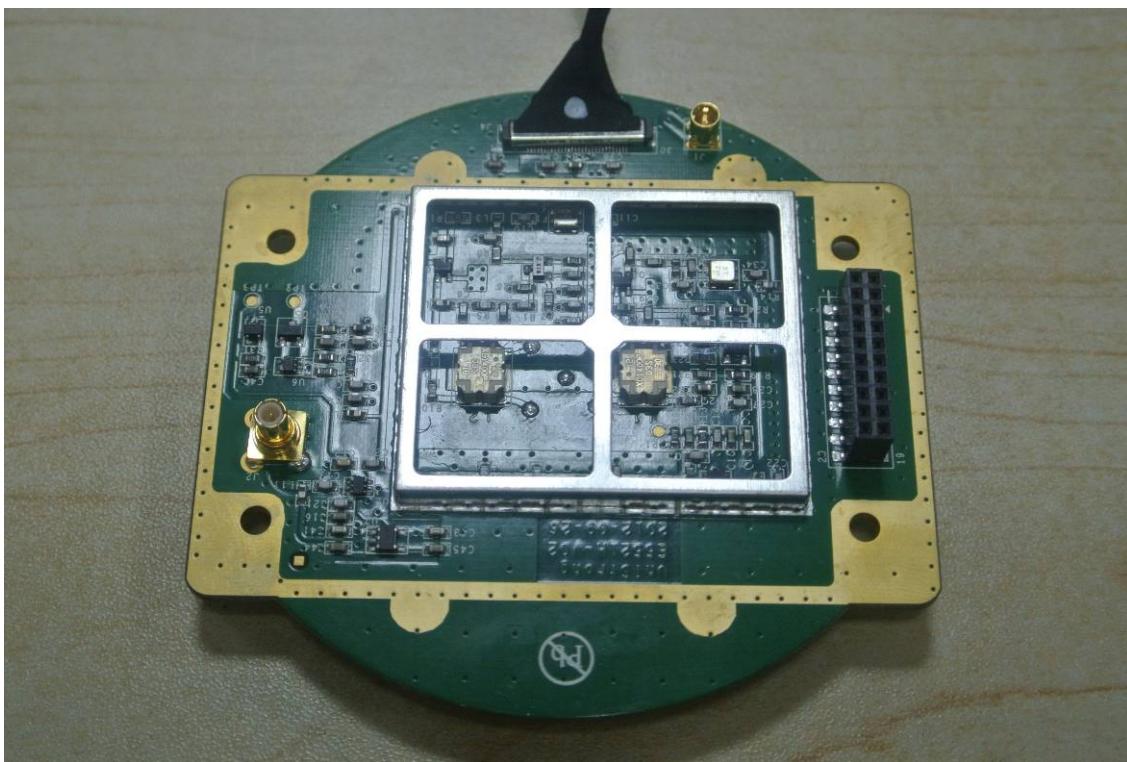
View of EUT-19



View of EUT-20



View of EUT-21



View of EUT-22



----End of the report----