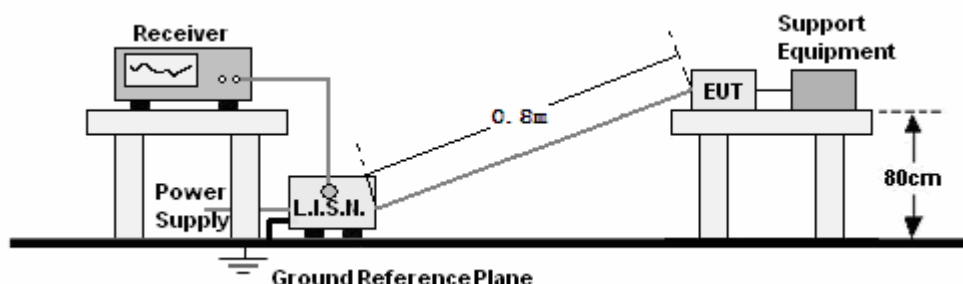


14. AC POWER LINE CONDUCTED EMISSIONS

14.1 TEST SETUP



14.2 LIMITS

Frequency range (MHz)	Limits dB(μV)	
	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

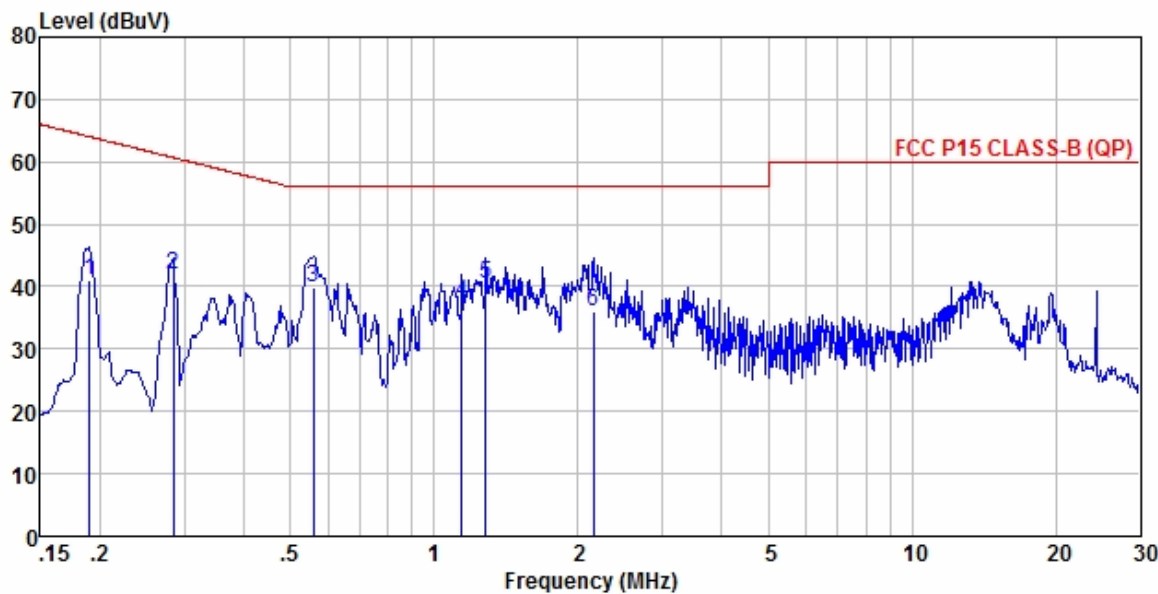
NOTE: 1. The lower limit shall apply at the transition frequencies.
2. The limit decreases linearly with the logarithm of the frequency in the range 0.15 to 0.50 MHz.

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.

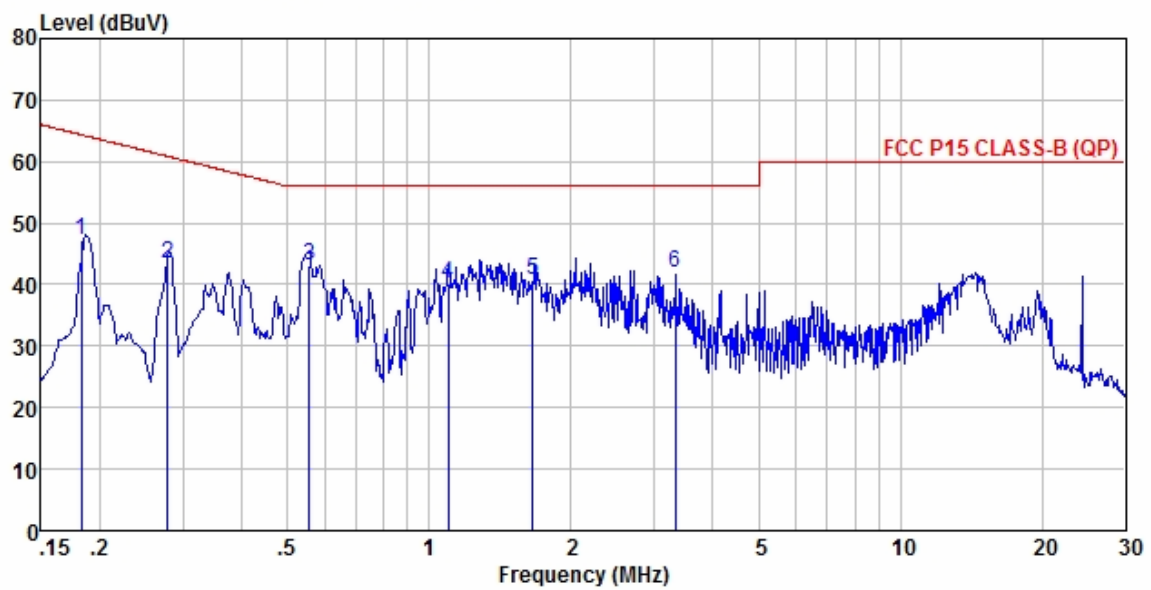
Conducted emissions were investigated over the frequency range from 0.15MHz to 30MHz using a receiver bandwidth of 9kHz.

14.4 RESULTS & PERFORMANCE



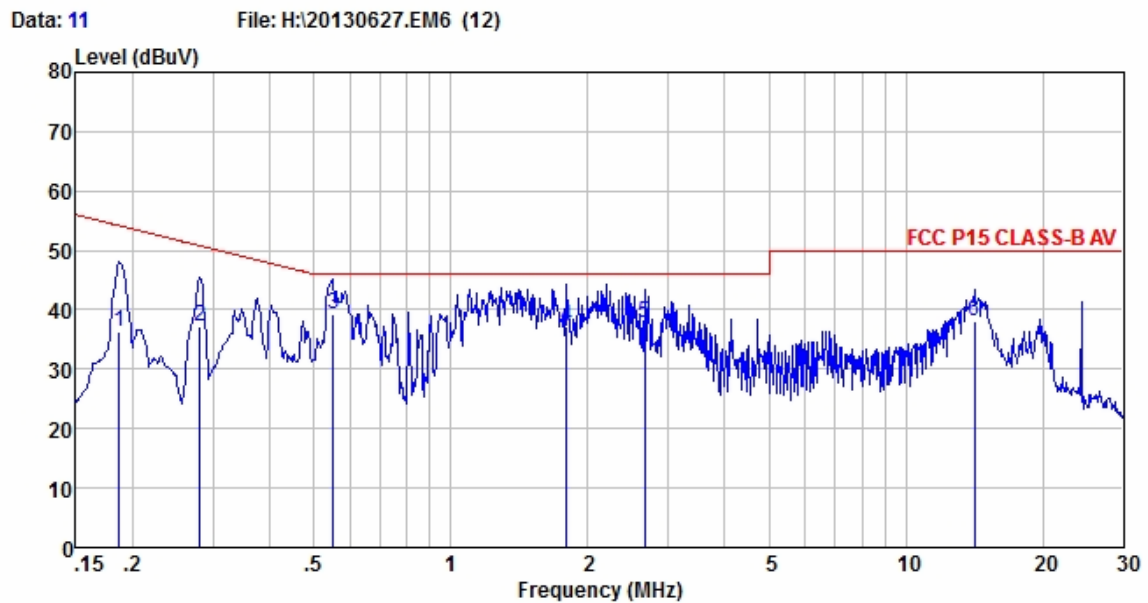
Site : shielding room 3
Condition : FCC P15 CLASS-B (QP) ENV216(N)-20120730 NEUTRAL
EUT : GIS Data collector
Model Name : loka/XF300/XF200/MG868H
Temp/Humi : 20°C /56%
Power Rating: DC 3.8V
Mode : Bluetooth
Memo :

		Read	LISN	Cable	Preamp		Limit	Over	
	Freq	Level	Factor	Loss	Factor	Level	Line	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



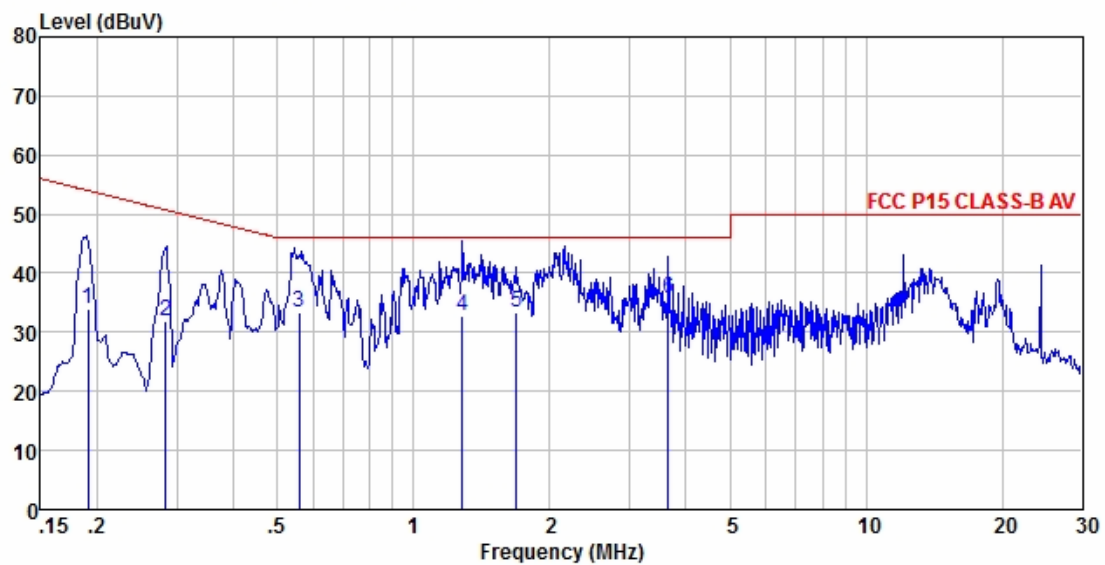
Site : shielding room 3
 Condition : FCC P15 CLASS-B (QP) ENV216(L)-20120730 LINE
 EUT : GIS Data collector
 Model Name : loka/XF300/XF200/MG868H
 Temp/Humi : 20°C /56%
 Power Rating: DC 3.8V
 Mode : Bluetooth
 Memo :

	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



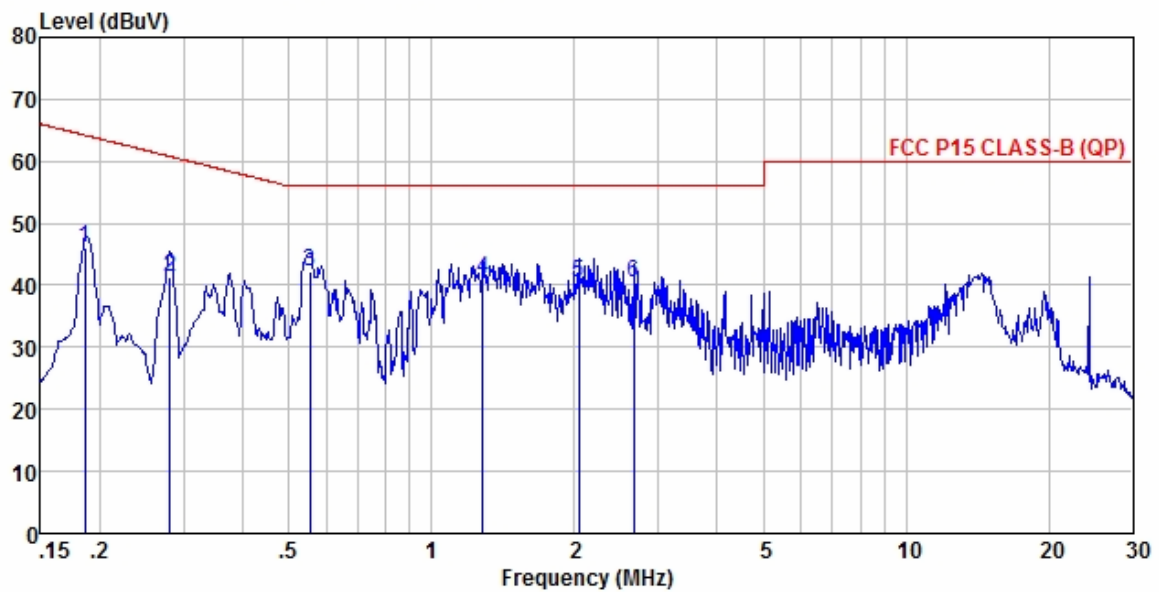
Site : shielding room 3
 Condition : FCC P15 CLASS-B AV ENV216(L)-20120730 LINE
 EUT : GIS Data collector
 Model Name : loka/XF300/XF200/MG868H
 Temp/Humi : 20°C /56%
 Power Rating: DC 3.8V
 Mode : Bluetooth
 Memo :

	Freq	Read Level	LISN Factor	Cable Loss	Preamplifier Factor	Level	Limit Line	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



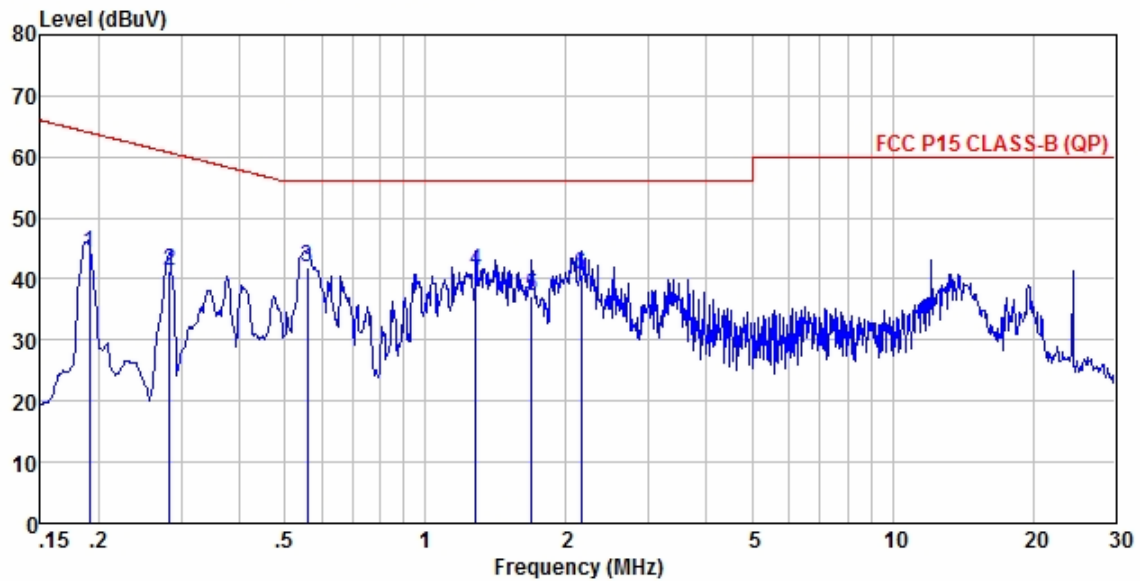
Site : shielding room 3
 Condition : FCC P15 CLASS-B AV ENV216(N)-20120730 NEUTRAL
 EUT : GIS Data collector
 Model Name : loka/XF300/XF200/MG868H
 Temp/Humi : 20°C /56%
 Power Rating: DC 3.8V
 Mode : Bluetooth
 Memo :

	Freq	Read Level	LISN Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	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	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



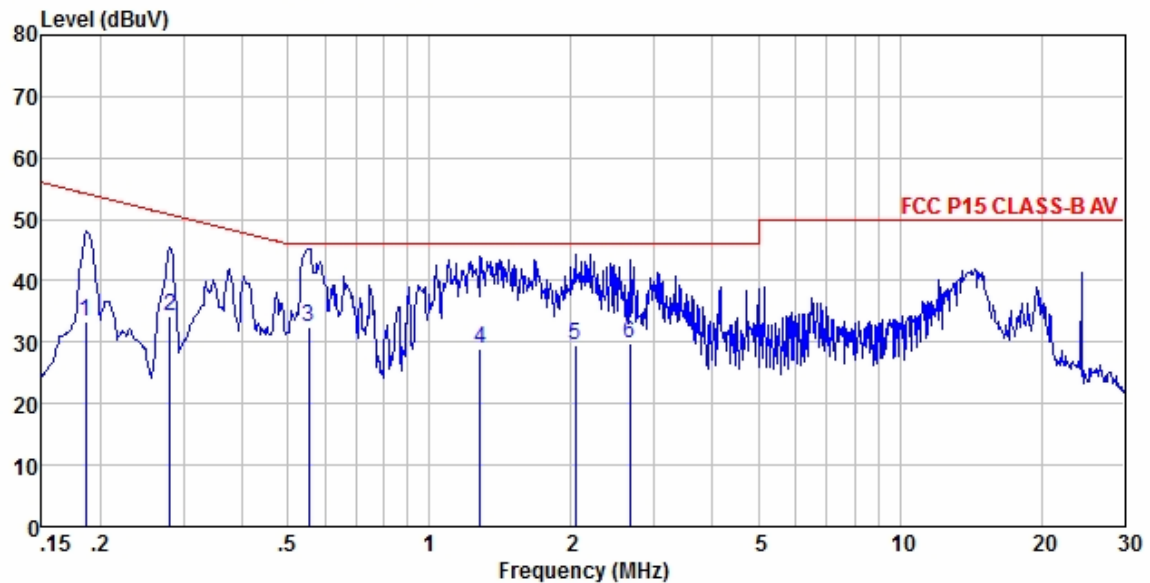
Site : shielding room 3
 Condition : FCC P15 CLASS-B (QP) ENV216(L)-20120730 LINE
 EUT : GIS Data collector
 Model Name : loka/XF300/XF200/MG868H
 Temp/Humi : 20°C /56%
 Power Rating: DC 3.8V
 Mode : data exchanging
 Memo :

		Read	LISN	Cable	Preamp		Limit	Over	
	Freq	Level	Factor	Loss	Factor	Level	Line	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



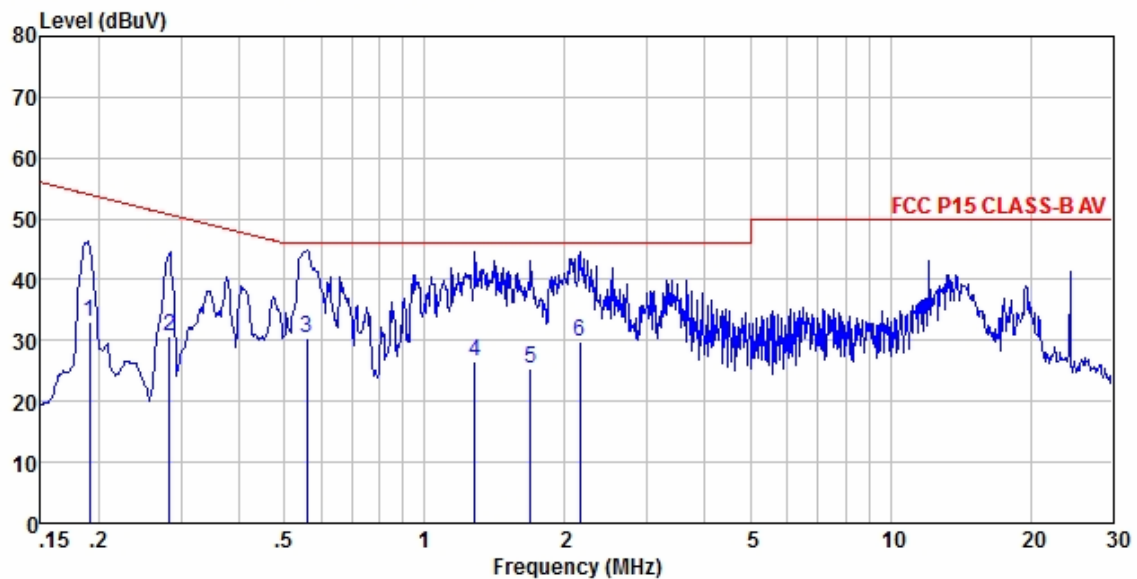
Site : shielding room 3
 Condition : FCC P15 CLASS-B (QP) ENV216(N)-20120730 NEUTRAL
 EUT : GIS Data collector
 Model Name : loka/XF300/XF200/MG868H
 Temp/Humi : 20°C /56%
 Power Rating: DC 3.8V
 Mode : data exchanging
 Memo :

	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



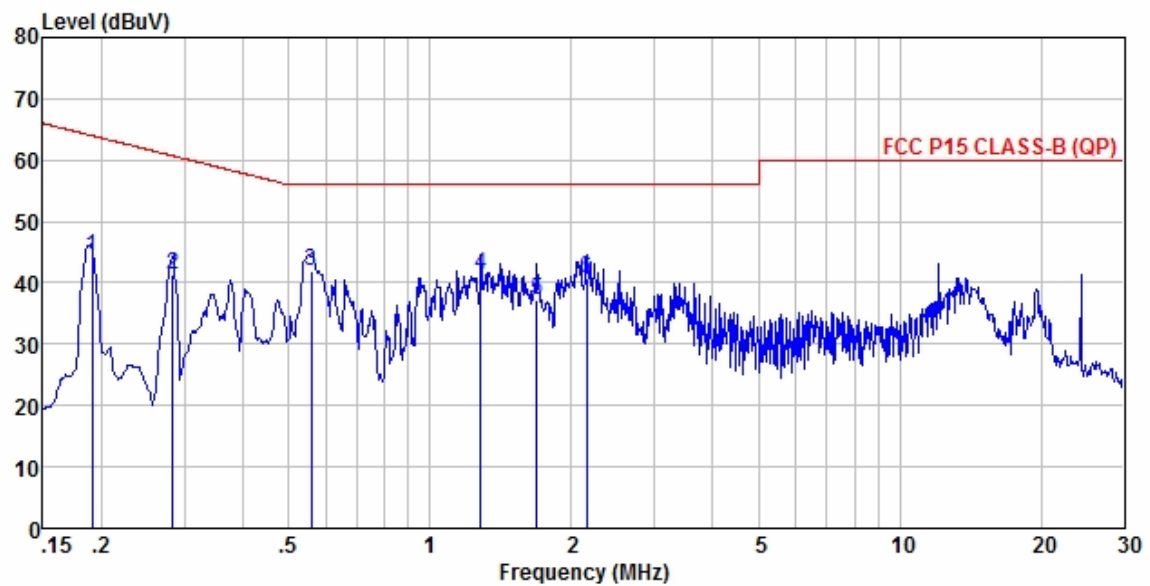
Site : shielding room 3
 Condition : FCC P15 CLASS-B AV ENV216(L)-20120730 LINE
 EUT : GIS Data collector
 Model Name : loka/XF300/XF200/MG868H
 Temp/Humi : 20°C /56%
 Power Rating: DC 3.8V
 Mode : data exchanging
 Memo :

	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



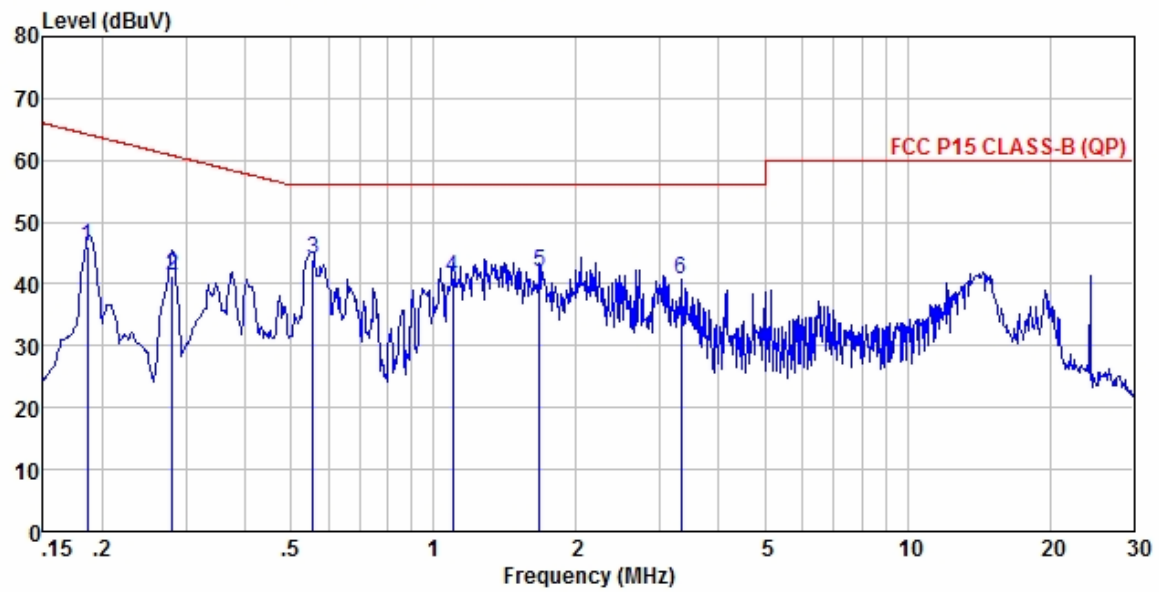
Site : shielding room 3
 Condition : FCC P15 CLASS-B AV ENV216(N)-20120730 NEUTRAL
 EUT : GIS Data collector
 Model Name : loka/XF300/XF200/MG868H
 Temp/Humi : 20°C /56%
 Power Rating: DC 3.8V
 Mode : data exchanging
 Memo :

		Read	LISN	Cable	Preamp		Limit	Over	
	Freq	Level	Factor	Loss	Factor	Level	Line	Limit	Remark
	MHz	dBuV	dB	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



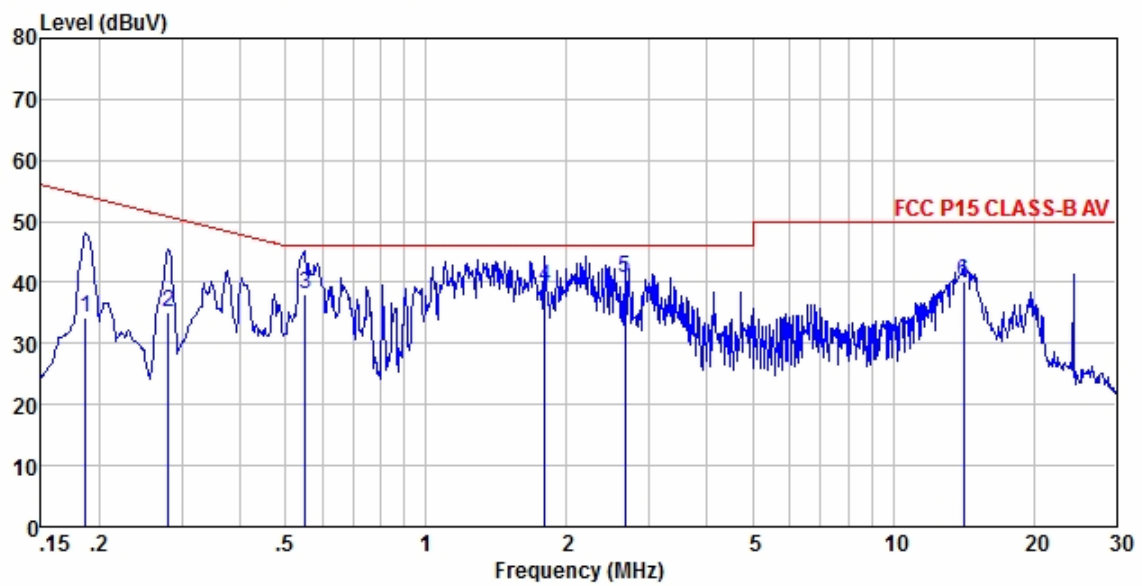
Site : shielding room 3
 Condition : FCC P15 CLASS-B (QP) ENV216(N)-20120730 NEUTRAL
 EUT : GIS Data collector
 Model Name : loka/XF300/XF200/MG868H
 Temp/Humi : 20°C /56%
 Power Rating: DC 3.8V
 Mode : WiFi
 Memo :

	Freq	Read Level	LISN Factor	Cable Loss	Preamplifier 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



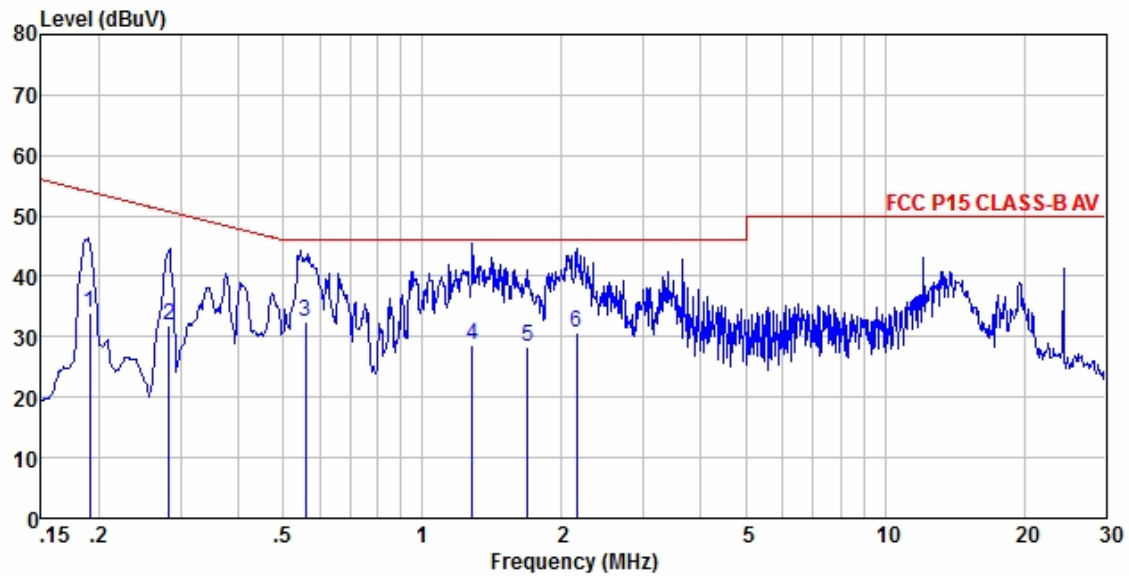
Site : shielding room 3
 Condition : FCC P15 CLASS-B (QP) ENV216(L)-20120730 LINE
 EUT : GIS Data collector
 Model Name : loka/XF300/XF200/MG868H
 Temp/Humi : 20°C /56%
 Power Rating: DC 3.8V
 Mode : WiFi
 Memo :

	Freq	Read Level	LISN Factor	Cable Loss	Preamplifier 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	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 :

	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	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



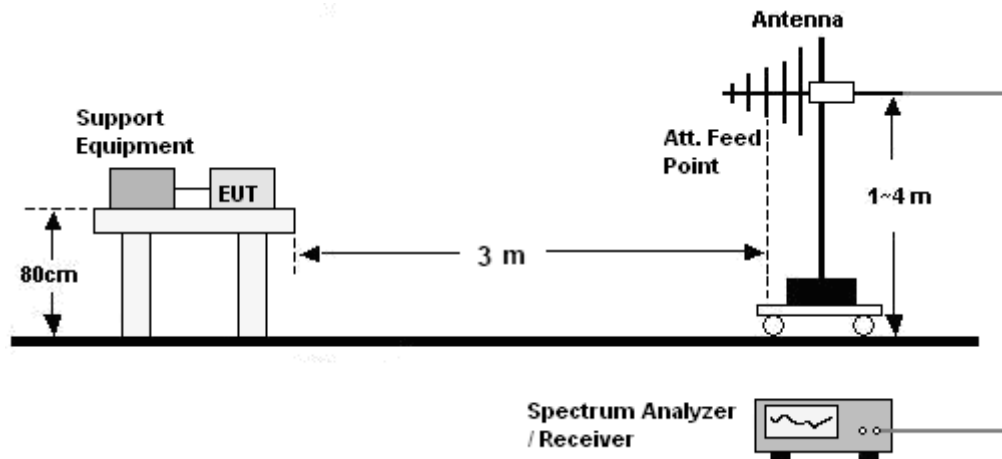
Site : shielding room 3
 Condition : FCC P15 CLASS-B AV ENV216(N)-20120730 NEUTRAL
 EUT : GIS Data collector
 Model Name : loka/XF300/XF200/MG868H
 Temp/Humi : 20°C /56%
 Power Rating: DC 3.8V
 Mode : WiFi
 Memo :

	Freq	Read Level	LISN Factor	Cable Loss	Preamplifier Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	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

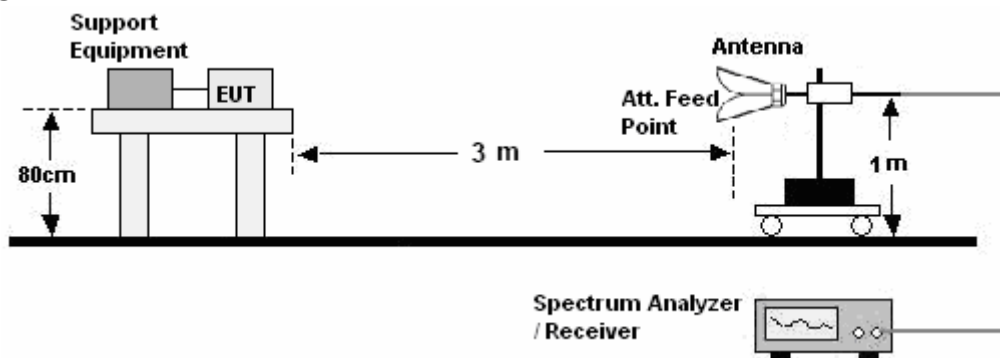
15. RADIATED EMISSIONS

15.1 TEST SETUP

30MHz ~ 1GHz:



Above 1GHz:



15.2 LIMITS

Limits for Class B digital devices

Frequency (MHz)	limits at 3m dB(μV/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:

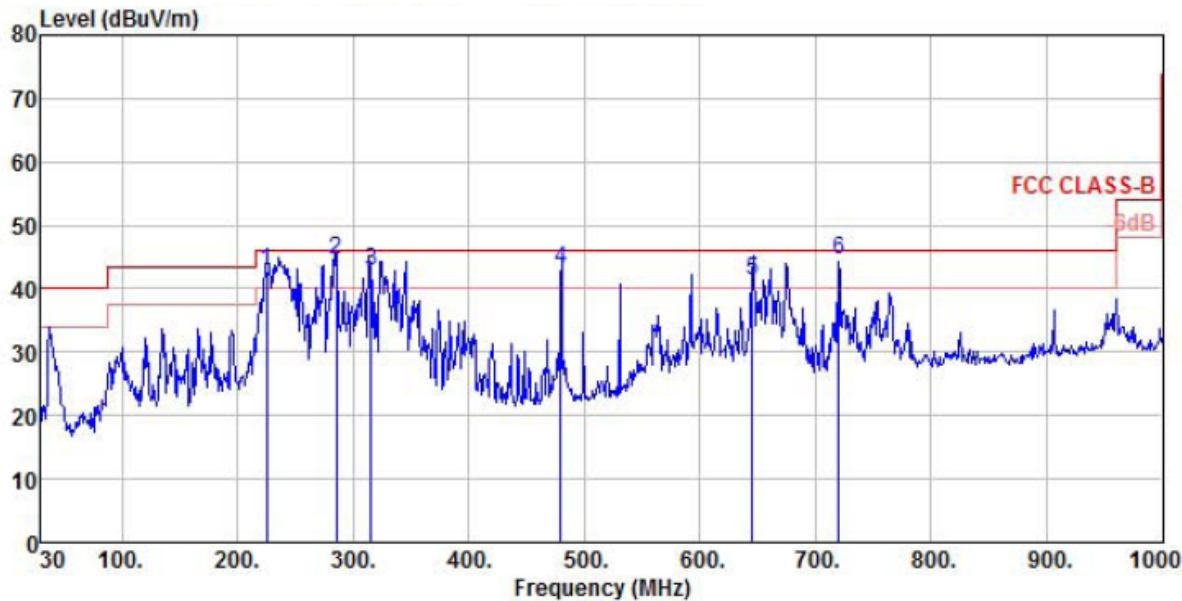
- a. The EUT and support equipment were placed on the non-conductive turntable 0.8/0.1m above the horizontal metal ground plane at a chamber. The EUT was set 3 meters away from the receiving antenna, which was mounted on an antenna tower. Broadband antenna (Calibrated Bilog Antenna) was used as receiving 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.

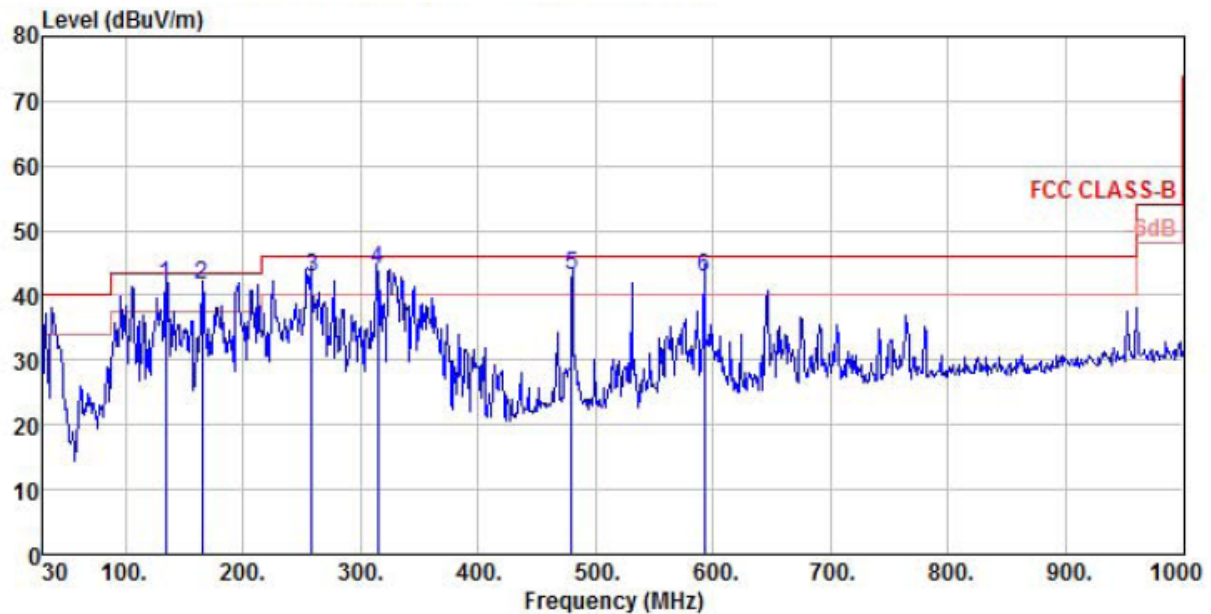
15.4 TEST RESULT

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 :

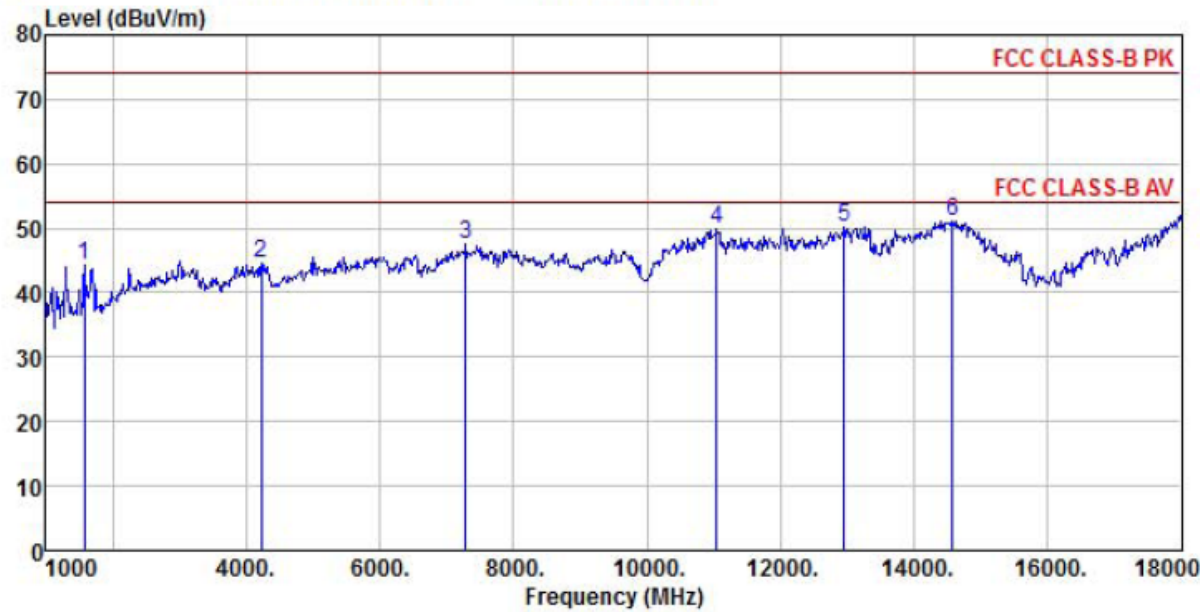
		ReadAntenna	Cable	Preamp		Limit	Over	
	Freq	Level	Factor	Loss	Factor	Level	Line	Limit
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB
1 !	225.20	29.86	10.95	2.08	0.00	42.89	46.00	-3.11 QP
2 !	285.20	29.28	12.92	2.23	0.00	44.43	46.00	-1.57 QP
3 !	315.10	26.75	13.56	2.52	0.00	42.83	46.00	-3.17 QP
4 !	480.00	23.29	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 :

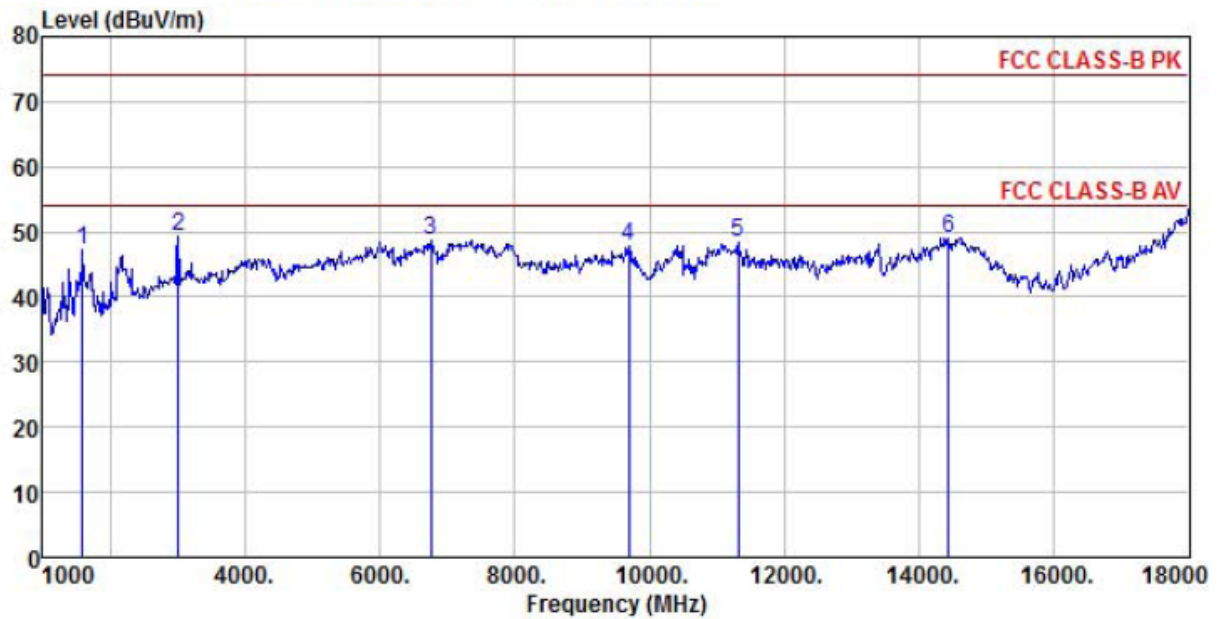
		ReadAntenna		Cable Preamp		Limit	Over	
	Freq	Level	Factor	Loss	Factor	Level	Line	Limit Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB
1 !	134.50	26.97	12.92	1.62	0.00	41.51	43.50	-1.99 QP
2 pp	164.90	26.21	13.55	1.76	0.00	41.52	43.50	-1.98 QP
3 !	258.30	28.56	12.09	2.18	0.00	42.83	46.00	-3.17 QP
4 !	314.60	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 :

		ReadAntenna	Cable	Preamp		Limit	Over	
	Freq	Level	Factor	Loss	Factor	Level	Line	Limit
	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
2	4230.00	42.04	30.28	9.56	37.41	44.47	74.00	-29.53
3	7290.00	35.69	36.48	12.64	37.31	47.50	74.00	-26.50
4	11047.00	32.48	40.19	16.10	38.93	49.84	74.00	-24.16
5	12951.00	31.88	39.38	17.39	38.45	50.20	74.00	-23.80
6 pp	14583.00	28.15	42.46	18.68	38.12	51.17	74.00	-22.83



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 :

		ReadAntenna	Cable	Preamp		Limit	Over	
	Freq	Level	Factor	Loss	Factor	Level	Line	Limit Remark
	MHz	dBuV	dB/m	dB	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 PHOTOGRAPHS OF TEST SETUP

Peak Output Power Test Setup Photos

Description: Bluetooth measurement setup



Description: WiFi measurement setup



occupied bandwidth

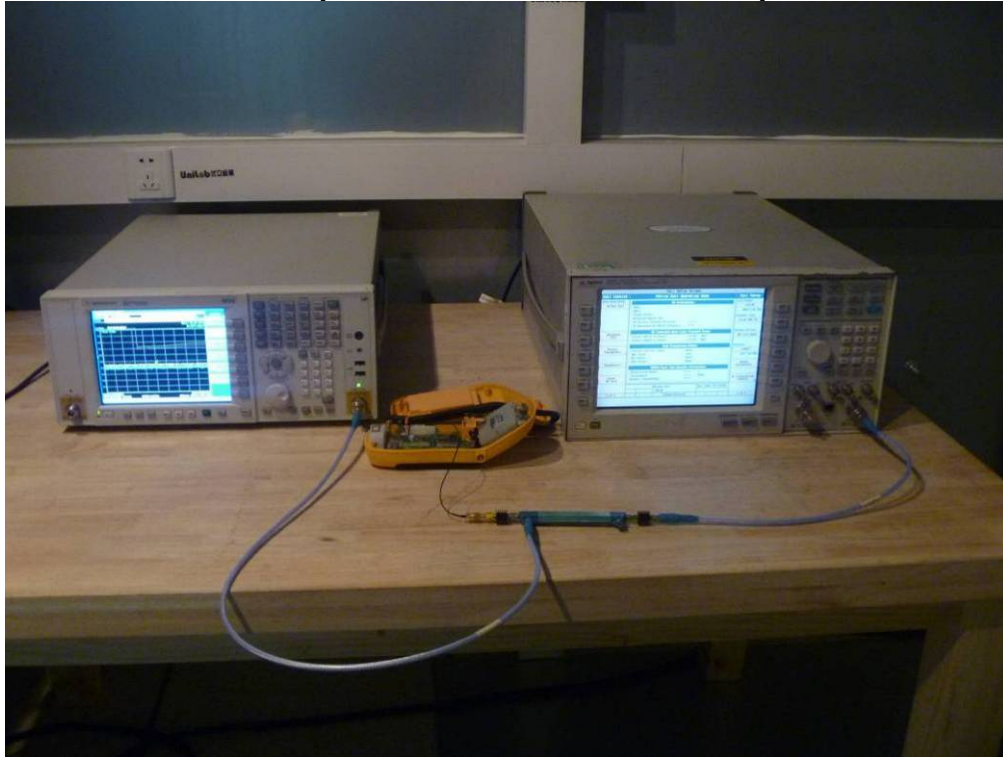
Description: Bluetooth measurement setup



Description: WiFi measurement setup

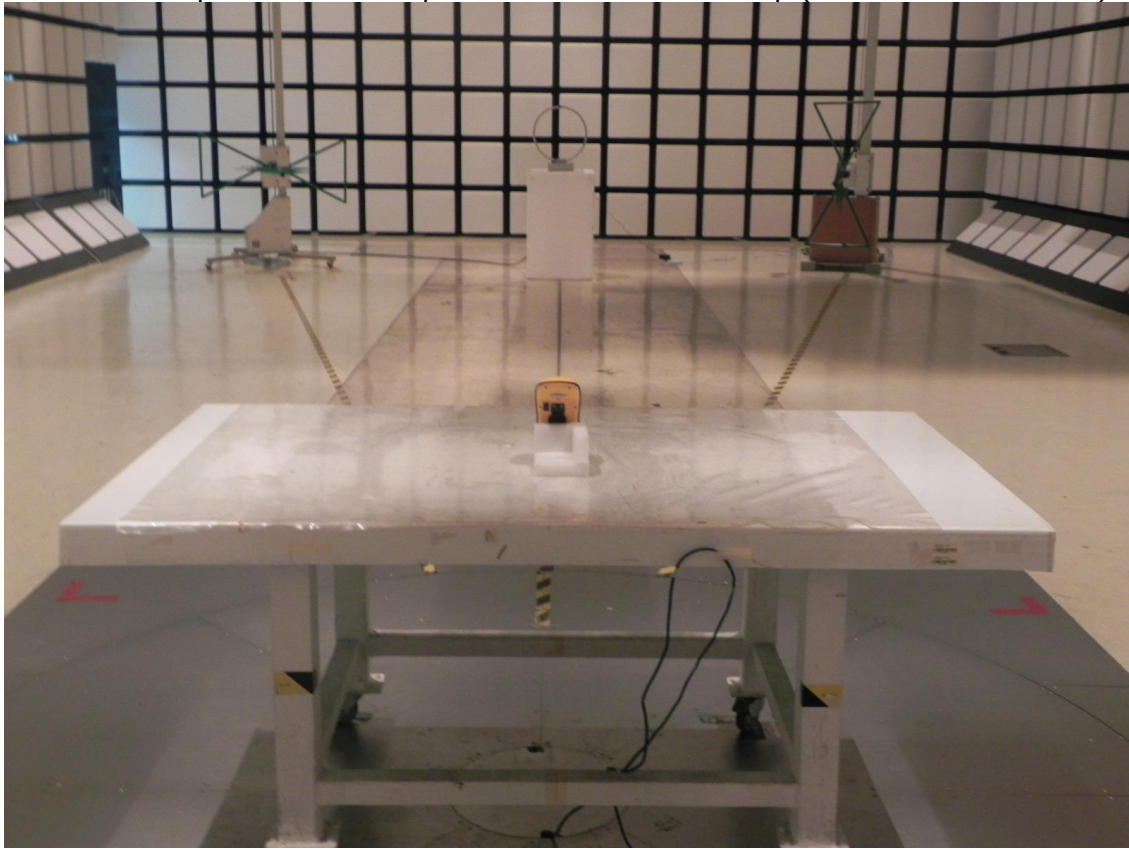


Conducted Spurious Emissions Test Setup Photos

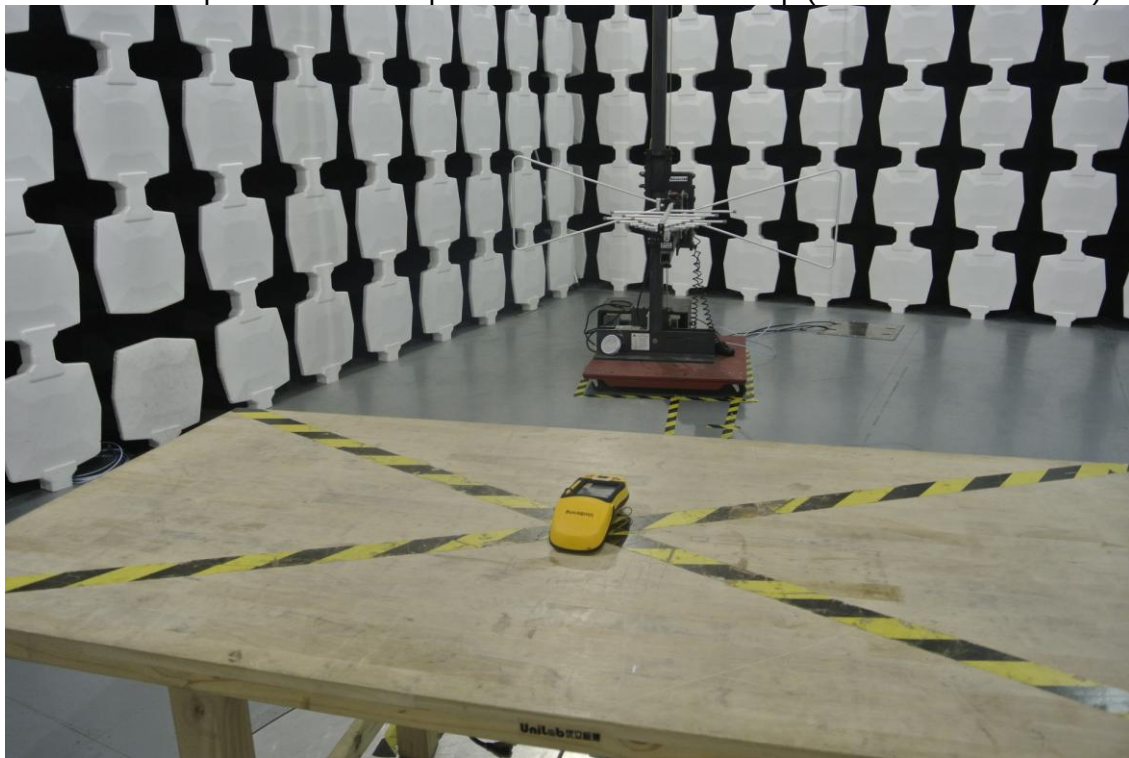


Spurious Emissions Test Setup Photos

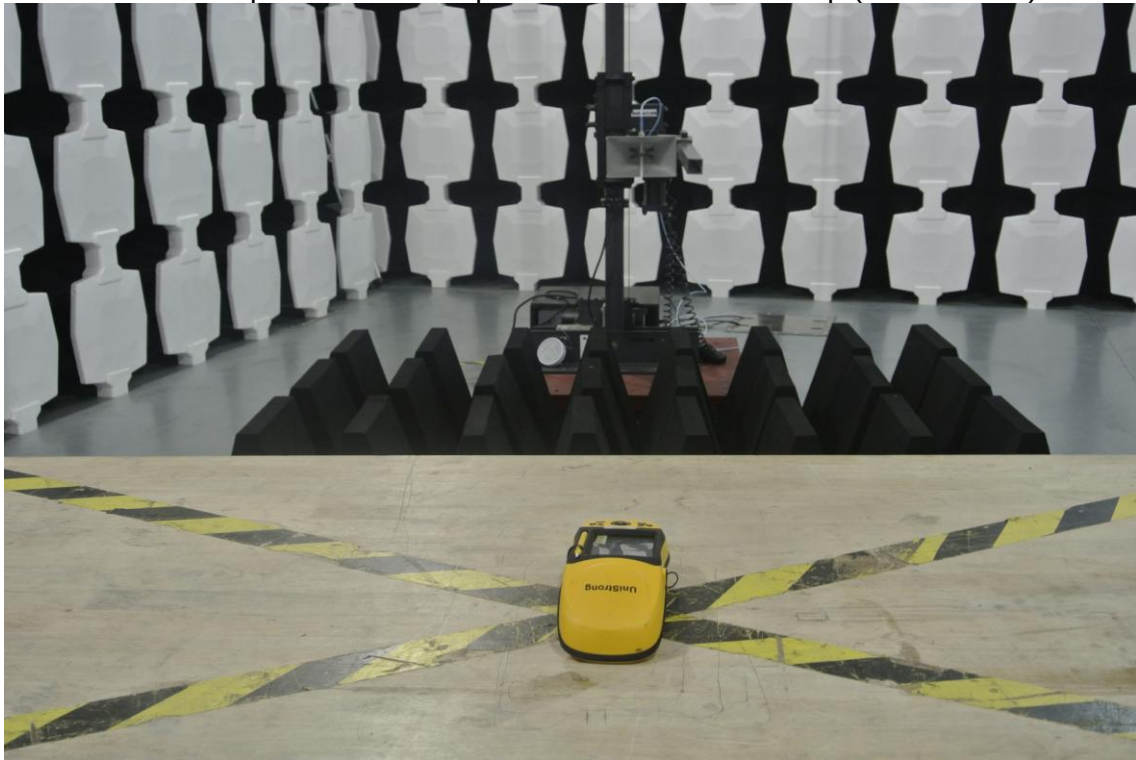
Description: Radiated Spurious Measurement Setup (From 9KHz to 30MHz)



Description: Radiated Spurious Measurement Setup (From 30MHz to 1GHz)



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



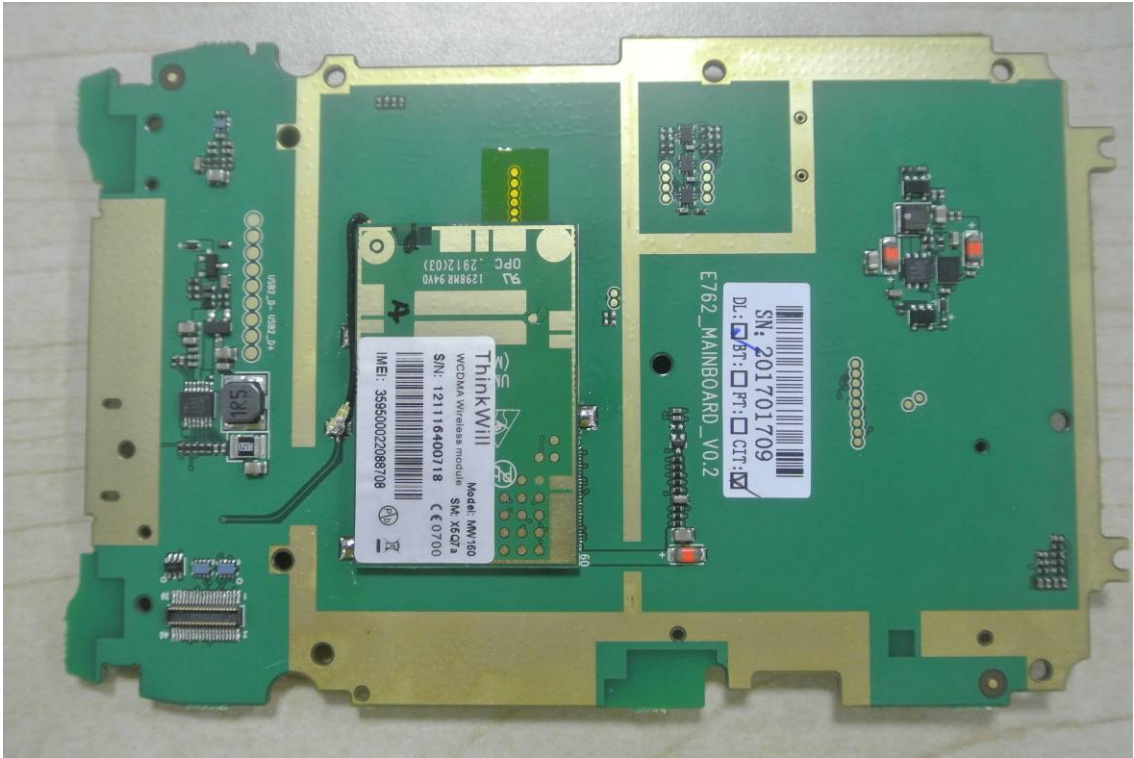
View of EUT-9



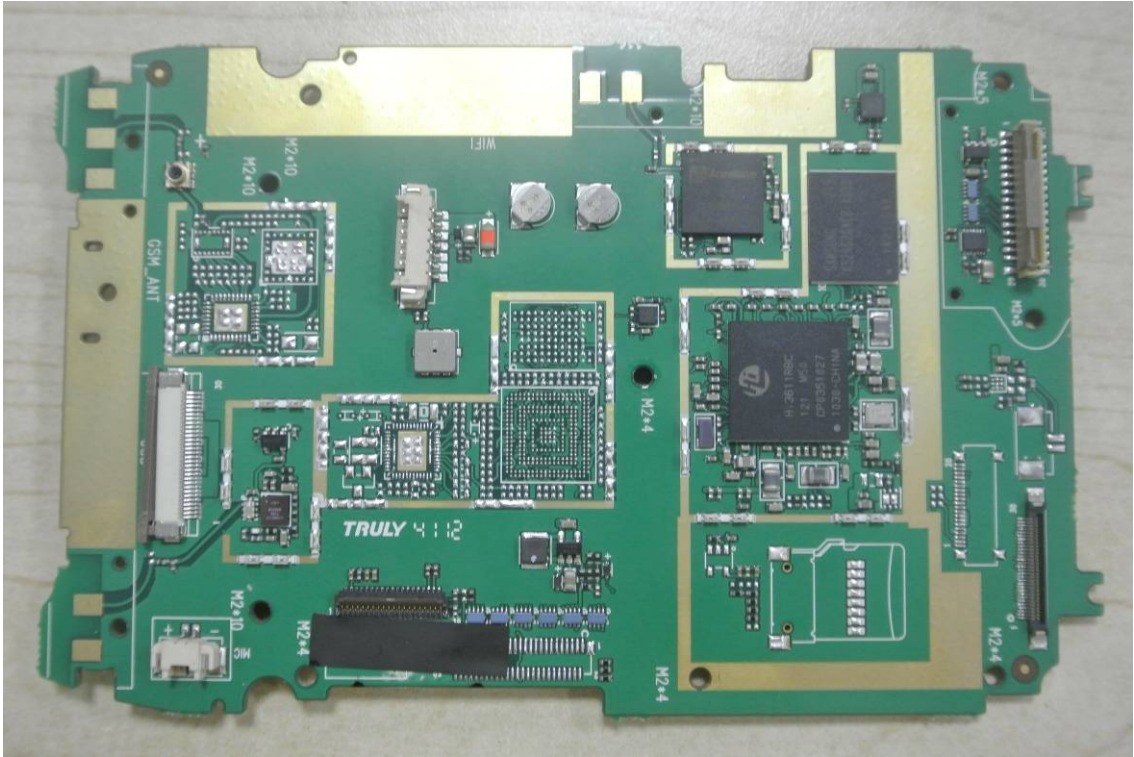
View of EUT-10



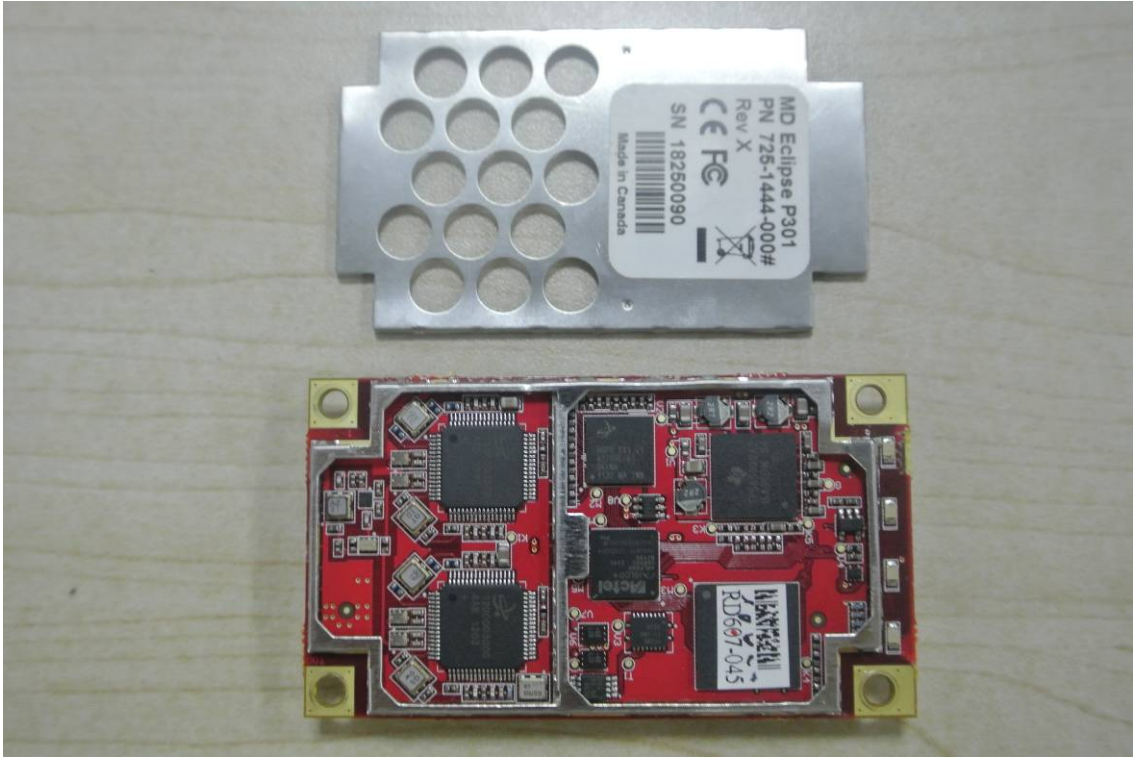
View of EUT-11



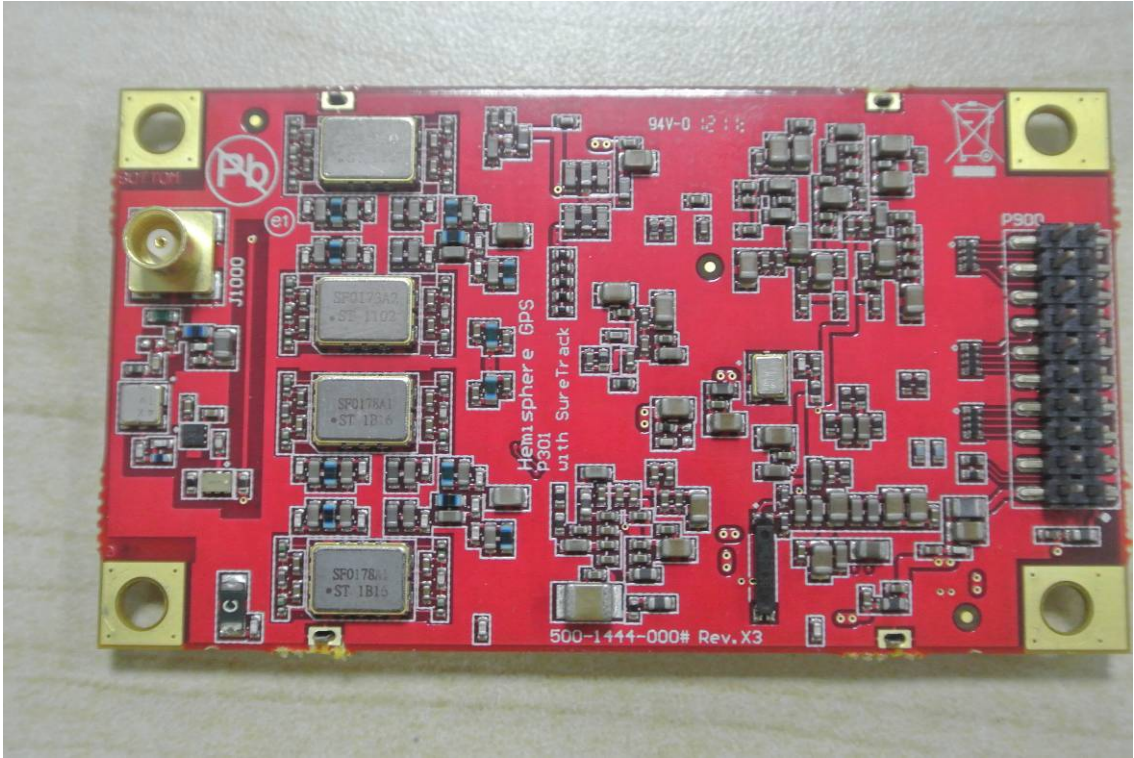
View of EUT-12



View of EUT-13



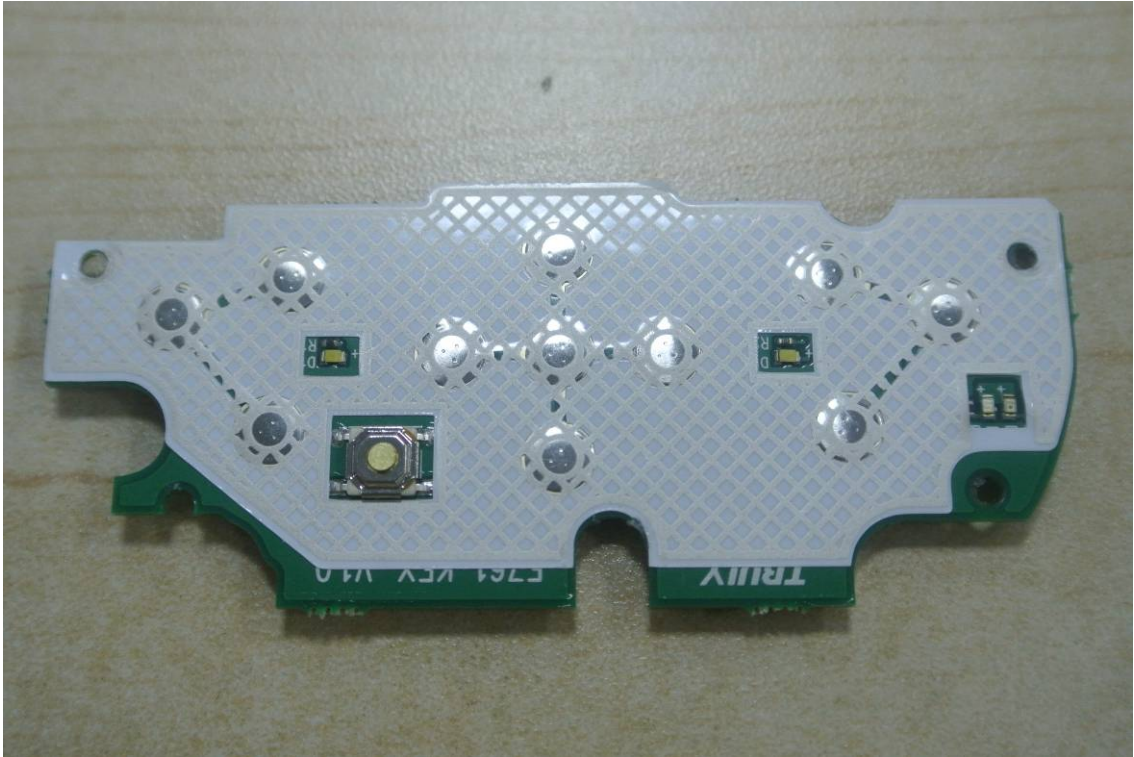
View of EUT-14



View of EUT-15



View of EUT-16



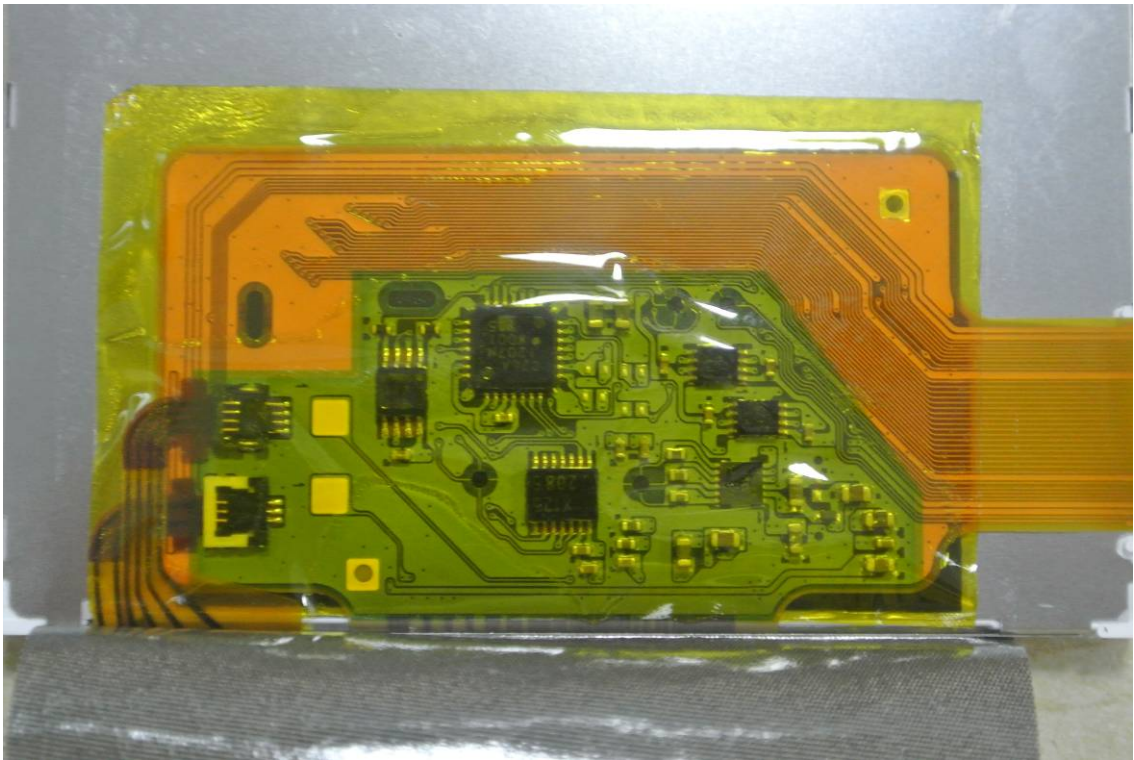
View of EUT-17



View of EUT-18



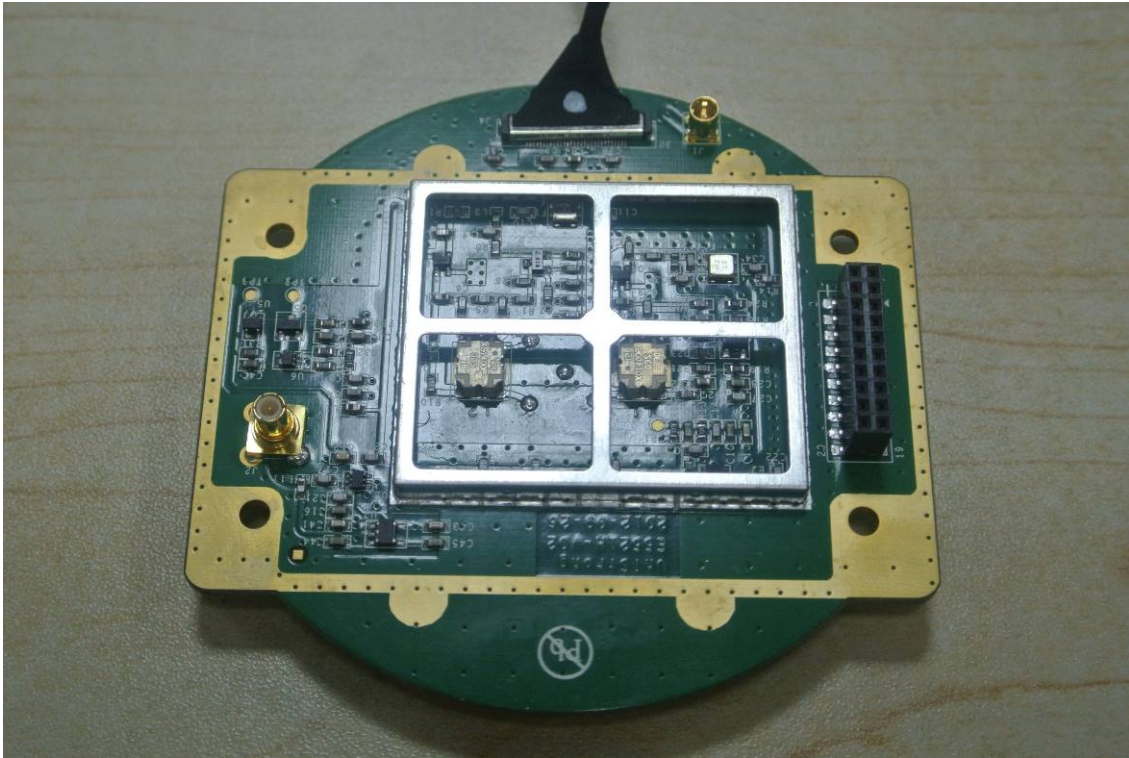
View of EUT-19



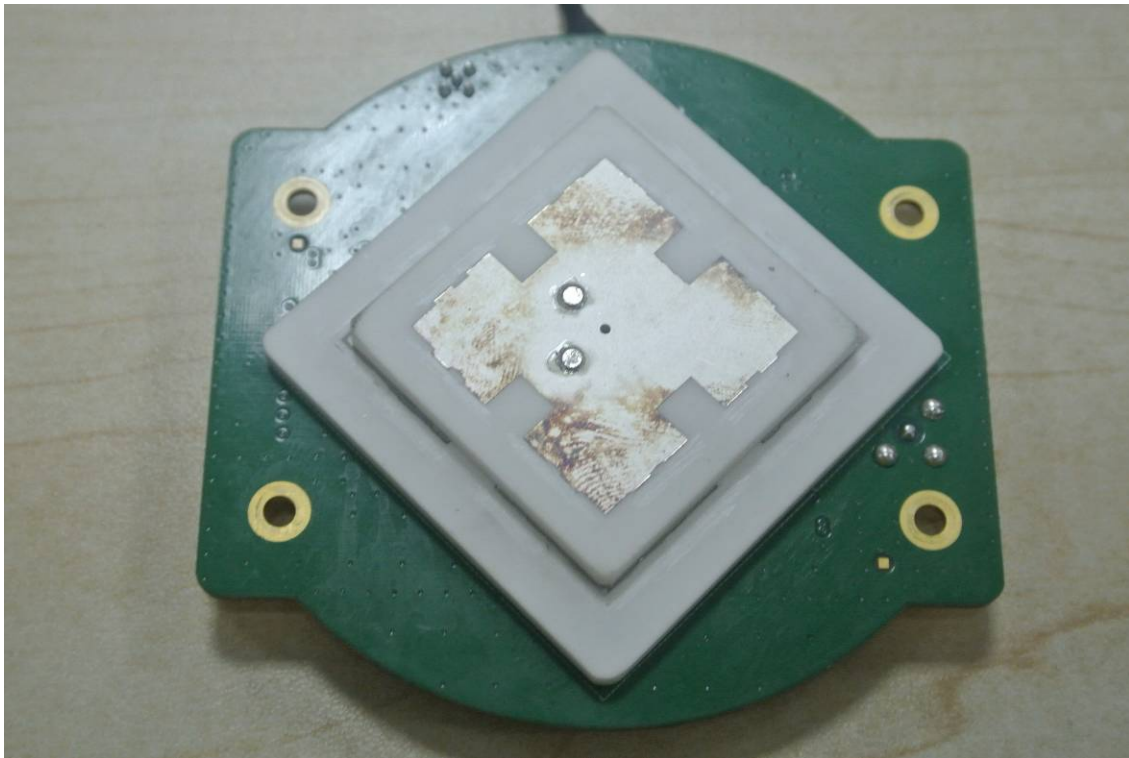
View of EUT-20



View of EUT-21



View of EUT-22



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