EMC TEST REPORT

Applicant	: Miwa Lock Co., Ltd 3-1-12,Shiba, Minato-ku, Tokyo, Japan, 105-8510
Type of Equipment	: ALV2P
Model Number	: ALV2(P)
FCC ID	: VBU-ALV2P
Standard	: 47 CFR Part 15 Subpart C Section 15.225
Receipt Date of Sample	: 2010-07-22 and 2011-03-17
Date Tested	: 2010-07-25,08-02 and 2011-03-17
Date Report Issued	: 2011-03-24
Report Number	: EMC11084

APPROVED by:

Tetsushi Yamaguchi / Manager

TESTS SUPERVISED by:

Hidemasa Fujimoto

IPS Corporation
1878-1 Harumiya Ono Tatsuno-machi, Kamiina-gun, Nagano-ken, 399-0601, Japan.
Phone: +81-266-44-5200 Fax: +81-266-44-5300

TM

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1 GENERAL INFORMATION

1.1 Product Description and Specification

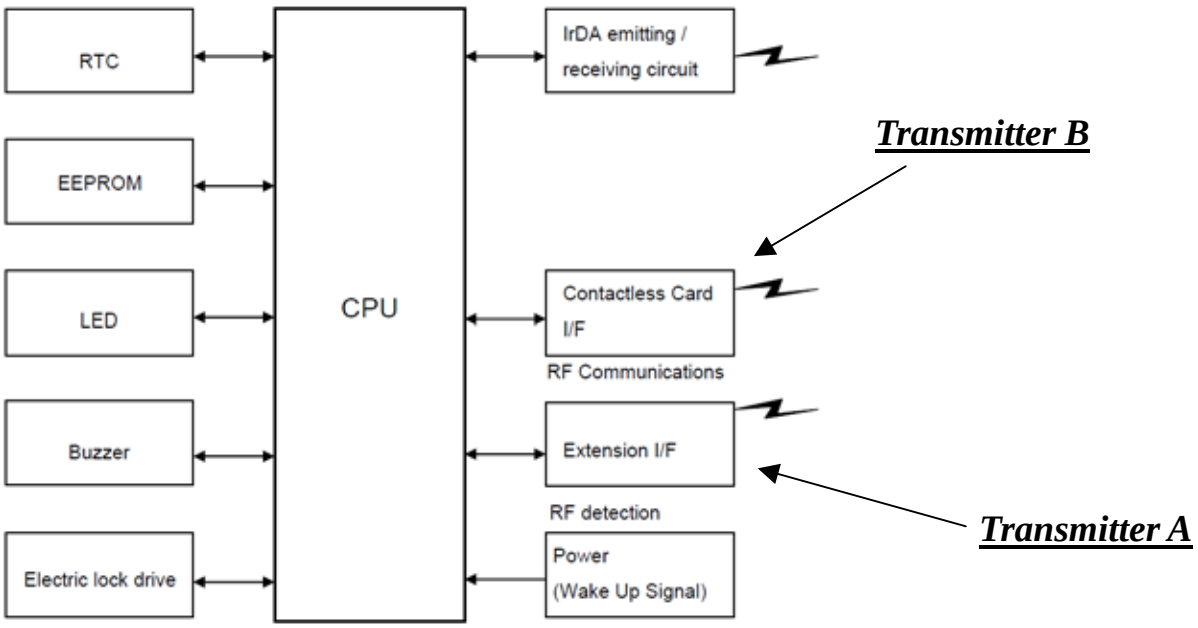
The **E**quipment **U**nder **T**est (EUT) Model: ALV2(P) is a low power transmitter for hotel card lock and its fundamental frequency is 13.56MHz. Its has two 13.56MHz transmitters. One is for detection of the approach of RFID card, the other is for communication with RFID card. They do not work simultaneity.

Model No.	ALV2P
Serial No.	Sample 5
Product Type	Pre-production
Rated Power	3.0VDC (AA type Alkaline batteries)
Transmitting Frequency	Transmitter A : 13.56MHz Transmitter B : 13.56MHz
Modulation	Transmitter A : Non modulation Transmitter B : ASK

Operation mode

Detection mode	Detecting the approach of RFID card (by using transmitter A)
Communication mode	Communication with RFID card (by using transmitter B)

< Block Diagram >



1.2 Summary of Test Result

Transmitter A (Detection mode)

Item	Specification	Deviation	Worst Margin	Results	Remarks
Radiated Emission (Fundamental)	15.225(a)	N/A	56.4dB	PASS	
	15.225(b)	N/A	54.4dB	PASS	
	15.225(c)	N/A	43.4dB	PASS	
Radiated Emission (Spurious)	15.225(d) 15.209	N/A	23.6dB	PASS	
Frequency Stability	15.225(e)	N/A	0.00028%	PASS	

Tansmitter B (Communication mode)

Item	Specification	Deviation	Worst Margin	Results	Remarks
Radiated Emission (Fundamental)	15.225(a)	N/A	46.8dB	PASS	
	15.225(b)	N/A	54.4dB	PASS	
	15.225(c)	N/A	43.4dB	PASS	
Radiated Emission (Spurious)	15.225(d) 15.209	N/A	17.0dB	PASS	
Frequency Stability	15.225(e)	N/A	0.00046%	PASS	

1.3 Measurement Uncertainty

Radiated Emission Test	Antenna	Frequency range	Polarization	10m U (dB)	3m U (dB)
Radiated Emission	Biconical (BBA9106)	30MHz-300MHz	Horizontal	3.9	3.9
			Vertical	4.1	4.0
	Log.-Periodic (UHALP9108-A)	300MHz-1GHz	Horizontal	4.1	4.1
			Vertical	4.2	4.2
Magnetic Field Emission	Loop (HLA6120)	9kHz-30MHz	-	-	2.6

Note : Coverage factor k=2

1.4 Tested Systems Details

EUT

Equipment		Manufacturer	Model No.	Serial No.	Note
ID	Name				
A	ALV2P	MIWA	ALV2(P)	Sample5	

Peripherals

Equipment		Manufacturer	Model No.	Serial No.	FCC ID & Note
ID	Name				
B	DC Power supply	KIKUSUI	PAN35-5A	-----	----

1.5 Test Facility

The test facilities are located in following places of IPS Corporation.

- EMC Center
  1878-1 Harumiya Ono, Tatsuno-machi, Kamiina-gun, Nagano-ken 399-0601 Japan.

Above facilities have been registered at FCC with registration number 171180. Also test facilities are accredited under the National Voluntary Laboratory Accreditation Program (NVLAP) by United States Department of Commerce, National Institute of Standard and Technology (NIST) for satisfactory compliance with criteria established in Title 15, Part 285 Code of Federal Regulations. These criteria encompass the requirements of ISO/IEC 17025 and the relevant requirements of ISO 9002:1994 as suppliers of calibration or test results. Accreditation awarded for specific services, ANSI C63.4 with FCC 47CFR Part 15B and other, listed on the Scope of Accreditation for: ELECTROMAGNETIC COMPATIBILITY AND TELECOMMUNICATIONS.
NVLAP LAB CODE: 200012-0 Effective until: December 31, 2011.

2 SYSTEM TEST CONFIGURATION

2.1 Justification

- All tests were performed without any deviation from the ANSI C63.4:2003.
- The system was configured for testing a typical fashion (as a customer would normally use it). The test data Radiated emission are presented for the "worst case" measurements, that test program as clause 2.2 should be working and the cable routing was attempted to maximize the emission.
- EUT was tested in three orthogonal orientation for Radiated emission in order to present "the worst case".
- EUT was set to transmit continuously during test by using one of two RF circuit.

2.2 Special Accessories

None.

2.3 Equipment Conditions

The condition at the time of receipt of EUT: Good
The condition at the time of return of EUT: Good
Limited conditions: None

EUT has a DIP switch which can control to set to transmit 13.56MHz continuously.
This DIP switch has placed for test purpose only.

3 RADIATED EMISSION TEST 0.15MHz-30MHz (Part15.225(a),(b),(c))

3.1 Test Setup

- The test setup was made according to ANSI C63.4:2003.
- The table size was 0.8 m high×1.8 m wide×1.0 m deep.

3.2 Testing Instrumentation

Test Date: 2010-08-02

Equipment	Manufacturer	Model	S/N	Calibration	
				Date	Due
Semi-Anechoic Chamber	Otsuka Science	10m	No.3	2010-02-04	2011-02-28
EMI Test Receiver	Rohde & Schwarz	ESCS30	836858/002	2010-04-21	2011-04-30
Spectrum Analyzer	ADVANTEST	R3132	131201410	2009-11-26	2010-11-30
Loop Antenna	Chase	HLA6120	1131	2010-04-01	2011-04-30
Cable System	IPS Corporation	CE(1)	N/A	2009-10-28	2010-10-31

Test Date:2011-03-17

Equipment	Manufacturer	Model	S/N	Calibration	
				Date	Due
Semi-Anechoic Chamber	Otsuka Science	10m	No.3	2011-02-07	2012-02-28
EMI Test Receiver	Rohde & Schwarz	ESCS30	836858/002	2010-04-21	2011-04-30
Spectrum Analyzer	Agilent	N9020A	MY49100247	2010-06-02	2012-06-30
Loop Antenna	Chase	HLA6120	1131	2010-04-01	2011-04-30
Cable System	IPS Corporation	RE(28)	N/A	2011-02-04	2012-02-28

3.3 Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Loss, and subtracting the Amplifier Gain (if any) from the measured reading. The basic equation with a sample calculation is as follows:-

$$F S = RA + c.f. = RA + AF + CL – AG$$

c.f.	Correction Factor	AF	Antenna Factor
FS	Field Strength (Emission Level - Result)	CL	Cable Loss
RA	Receiver Amplitude (Reading Level)	AG	Amplifier Gain or Attenuator Loss

This measurement was performed at distance of 3m. The limit was extrapolated by using the square of an inverse linear distance extrapolation factor (40 dB/decade).Also the field strength is calculated by converting 30m and 3m distance limit.

3.4 Test Detail

Test data and spectrum chart : Refer to section 6.1. and 6.2

Test configuration photo: Refer to section 7.1

4 RADIATED EMISSION TEST 30MHz – 1000MHz (Part 15.209, 225(d))

4.1 Test Setup

- The test setup was made according to ANSI C63.4:2003.
- The table size was 0.8 m high×1.8 m wide×1.0 m deep.

4.2 Test Instrumentation (Test Date:2010-08-02)

Equipment	Manufacturer	Model	S/N	Calibration	
				Date	Due
Semi-Anechoic Chamber	Otsuka Science	3m	No.2	2009-12-25	2010-12-31
EMI Test Receiver	Rohde & Schwarz	ESIB40	100208	2010-06-04	2011-06-30
Biconical Antenna	Schwarzbeck	BBA9106	1586	2010-05-08	2011-05-31
Log.-Periodic Antenna	Schwarzbeck	UHALP9108-A	0942	2010-06-03	2011-06-30
Cable System	IPS Corporation	RE(33)	N/A	2010-02-24	2011-02-28

4.3 Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Loss, and subtracting the Amplifier Gain (if any) from the measured reading. The basic equation with a sample calculation is as follows:-

$$F S = RA + c.f. = RA + AF + CL – AG$$

c.f.	Correction Factor	AF	Antenna Factor
FS	Field Strength (Emission Level - Result)	CL	Cable Loss
RA	Receiver Amplitude (Reading Level)	AG	Amplifier Gain or Attenuator Loss

4.4 Test Detail

4.4.1 Detection Mode

EUT was tested in three orthogonal orientations and it was found that “Pattern 2” orientation is the worst-case orientation.

No.	Frequency [MHz]	Reading [dB(uV)]	c.f. [dB]	Result [dB(uV/m)]	Limit [dB(uV/m)]	Margin [dB]	H/V	Height [cm]	Angle [°]	Axial
1	92.004	21.2	-11.3	9.9	43.5	33.6	H	299.6	326.0	Pattern 2
2	94.924	21.1	-10.6	10.5	43.5	33.0	H	100.0	0	Pattern 2
3	230.532	24.2	-1.8	22.4	46.0	13.3	H	130.9	87.0	Pattern 2
4	94.925	21.1	-10.6	10.5	43.5	33.0	V	100.0	5.0	Pattern 2
5	122.044	21.1	-5.4	15.7	43.5	27.8	V	100.0	271.0	Pattern 2
6	230.532	20.9	-1.8	19.1	46.0	26.9	V	100.0	160.0	Pattern 2

4.4.1 Detection Mode (Continued)

Individual test data and spectrum chart : Refer to section 6.3.

Test configuration photo: Refer to section 7.2

4.4.2 Communication Mode

EUT was tested in three orthogonal orientations and it was found that “Pattern 2” orientation is the worst-case orientation.

No.	Frequency [MHz]	Reading [dB(uV)]	c.f. [dB]	Result [dB(uV/m)]	Limit [dB(uV/m)]	Margin [dB]	H/V	Height [cm]	Angle [°]	Axial
1	92.924	32.7	-10.6	22.1	43.5	21.4	H	180.2	260.0	Pattern 2
2	94.925	26.7	-10.6	16.1	43.5	27.4	V	100.0	39.0	Pattern 2
3	122.048	29.2	-5.4	23.8	43.5	19.7	H	239.3	261.0	Pattern 2
4	189.842	25.1	-2.6	22.5	43.5	21.0	H	169.3	265.0	Pattern 2
5	203.404	28.8	-2.3	26.5	43.5	17.0	H	156.5	84.0	Pattern 2
6	216.960	29.6	-2.1	27.5	46.0	18.5	H	145.6	83.0	Pattern 2
7	203.404	27.4	-2.3	25.1	43.5	18.4	H	152.9	90.0	Pattern 1
8	203.407	28.1	-2.3	25.8	43.5	17.7	H	151.5	90.0	Pattern 3

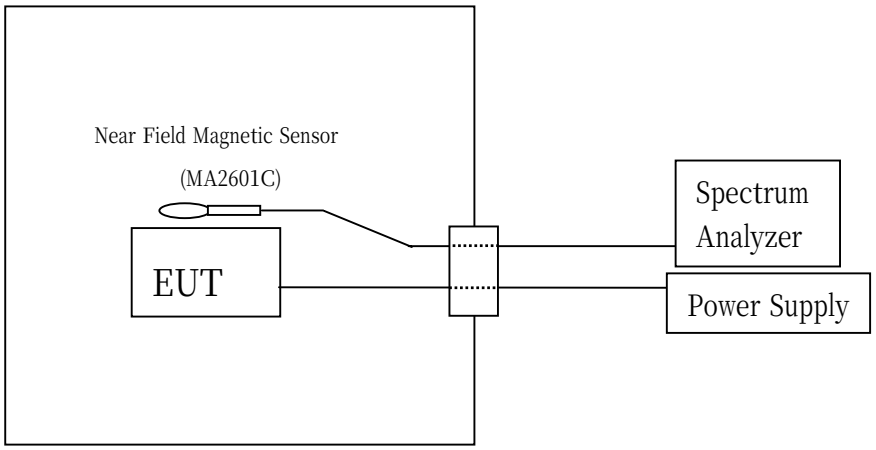
Individual test data and spectrum chart : Refer to section 6.3.

Test configuration photo: Refer to section 7.2

5 FREQUENCY STABILITY TEST (Part 15.225(e))

5.1 Test Setup

- The test setup was made according to ANSI C63.4:2003.
- The EUT was placed in a temperature and humidity chamber.
  The near field magnetic sensor was placed near the EUT inside the chamber.



Temperature & Humidity chamber

5.2 Test Instrumentation (Test Date:2010-07-25)

Equipment	Manufacturer	Model	S/N	Calibration	
				Date	Due
Temp. & Humi. Chamber	IPS Corporation	N/A	N/A	Non Calibration	
Near Field Magnetic Sensor	Anritsu	MA2601C	MA-01	2010-01-07	2011-01-31
Spectrum Analyzer	ADVANTEST	R3132	131201410	2009-11-26	2010-11-30
Power supply	Rohde & Schwarz	ESH2-Z5	846953/012	2009-10-16	2010-10-31

5.3 Test Detail

Test configuration photo: Refer to section 7.3

5.3.1 Detection Mode

Frequency stability "Diviation"/"Carrier Frequency"	0.000281%

Temperature	Time				Diviation (Max)-(Min)
-20℃	start up	2.min.	5min.	10min	
Frequency (MHz)	13.559969	13.559965	13.559961	13.559965	0.000008
Frequency stability : "Diviation"/"Carrier Frequency" @ -20℃					0.000059%

Temperature	Time				Diviation (Max)-(Min)
20℃	start up	2.min.	5min.	10min	
Frequency (MHz)	13.559971	13.559979	13.559981	13.559979	0.000010
Frequency stability : "Diviation"/"Carrier Frequency" @ 20℃					0.000074%

Temperature	Time				Diviation (Max)-(Min)
50℃	start up	2.min.	5min.	10min	
Frequency (MHz)	13.559943	13.559945	13.559943	13.559945	0.000002
Frequency stability : "Diviation"/"Carrier Frequency" @ 50℃					0.000015%

5.3.2 Communication Mode

Frequency stability "Diviation"/"Carrier Frequency"	0.000458%

Temperature	Time				Diviation (Max)-(Min)
-20℃	start up	2.min.	5min.	10min	
Frequency (MHz)	13.560099	13.560091	13.560091	13.560087	0.000012
Frequency stability : "Diviation"/"Carrier Frequency" @ -20℃					0.000089%

Temperature	Time				Diviation (Max)-(Min)
20℃	start up	2.min.	5min.	10min	
Frequency (MHz)	13.560103	13.560095	13.560087	13.560081	0.000022
Frequency stability : "Diviation"/"Carrier Frequency" @ 20℃					0.000163%

Temperature	Time				Diviation (Max)-(Min)
50℃	start up	2.min.	5min.	10min	
Frequency (MHz)	13.560043	13.560041	13.560043	13.560045	0.000004
Frequency stability : "Diviation"/"Carrier Frequency" @ 50℃					0.000030%

6 TEST DATA

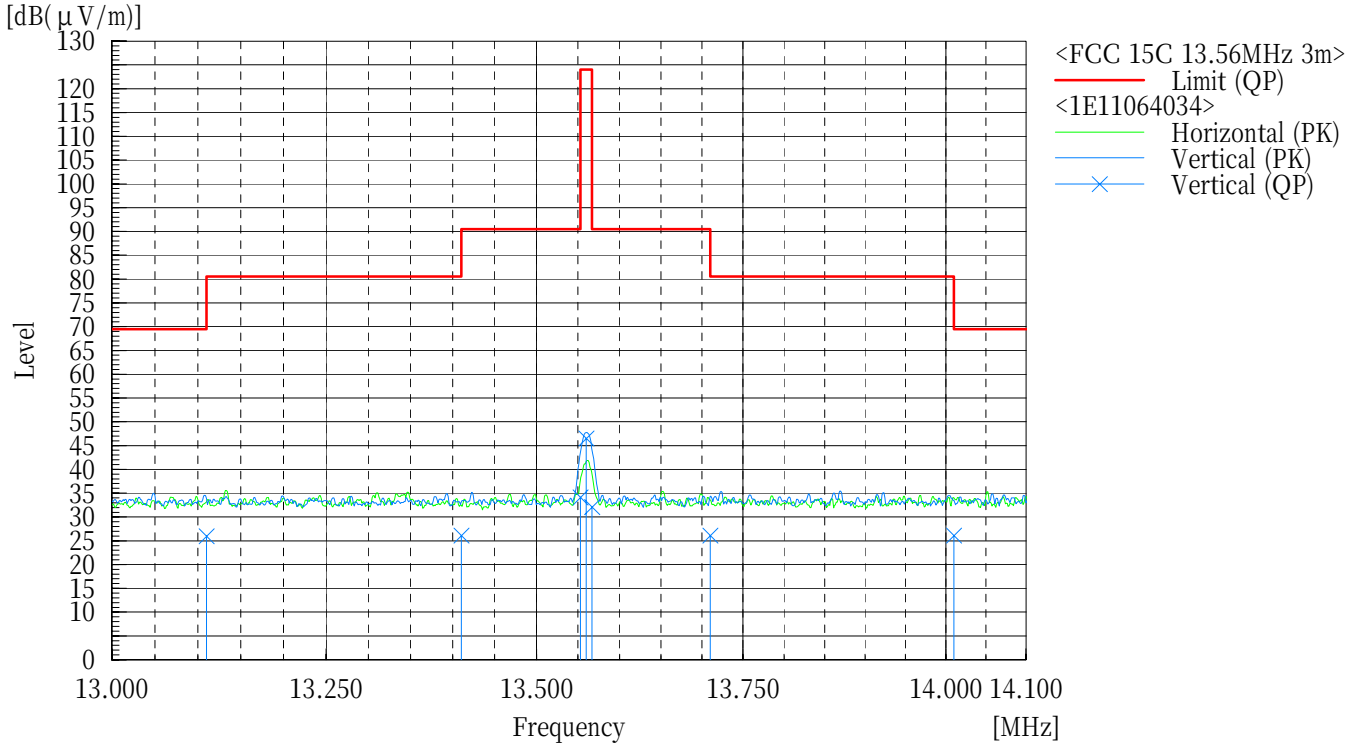
6.1 Radiated Emission 0.15MHz – 30MHz Detection mode

IPS Corporation
EMC Center

<<Radiated Emission>>

17 March,2011 10:14
1E11064034.dat

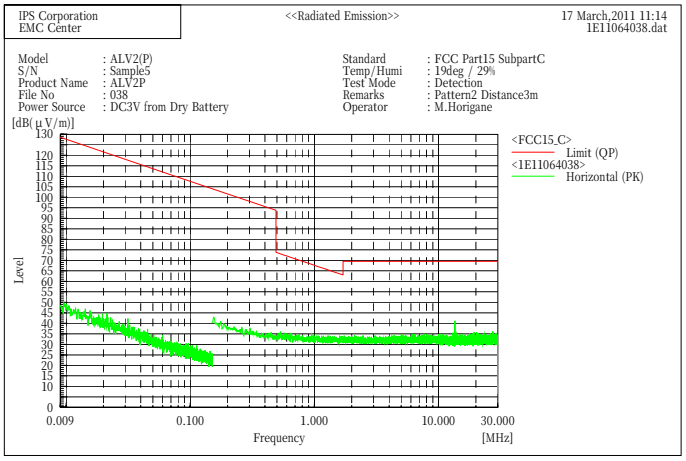
Model	: ALV2(P)	Standard	: FCC 15C 13.56MHz 3m
S/N	: Sample5	Temp/Humi	: 27deg / 29%
Product Name	: ALV2P	Test Mode	: Detection
File No	: 034	Remarks	: Pattern2 Distance3m
Power Source	: DC3V from Dry Battery	Operator	: M.Horigane

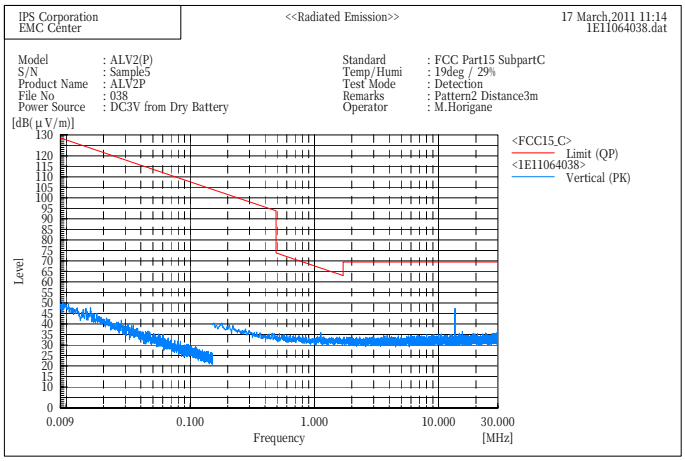


Final Result

--- Vertical Polarization (QP)---

No.	Frequency [MHz]	Reading [dB(μV)]	c.f [dB(1/m)]	Result [dB(μV/m)]	Limit [dB(μV/m)]	Margin [dB]	Height [cm]	Angle [°]
1	13.110	4.0	22.0	26.0	69.5	43.5	100.0	4.0
2	13.410	4.0	22.1	26.1	80.5	54.4	100.0	4.0
3	13.553	12.0	22.1	34.1	90.5	56.4	100.0	4.0
4	13.560	24.4	22.1	46.5	124.0	77.5	100.0	4.0
5	13.567	10.0	22.1	32.1	90.5	58.4	100.0	4.0
6	13.710	4.0	22.1	26.1	80.5	54.4	100.0	4.0
7	14.010	4.0	22.1	26.1	69.5	43.4	100.0	4.0





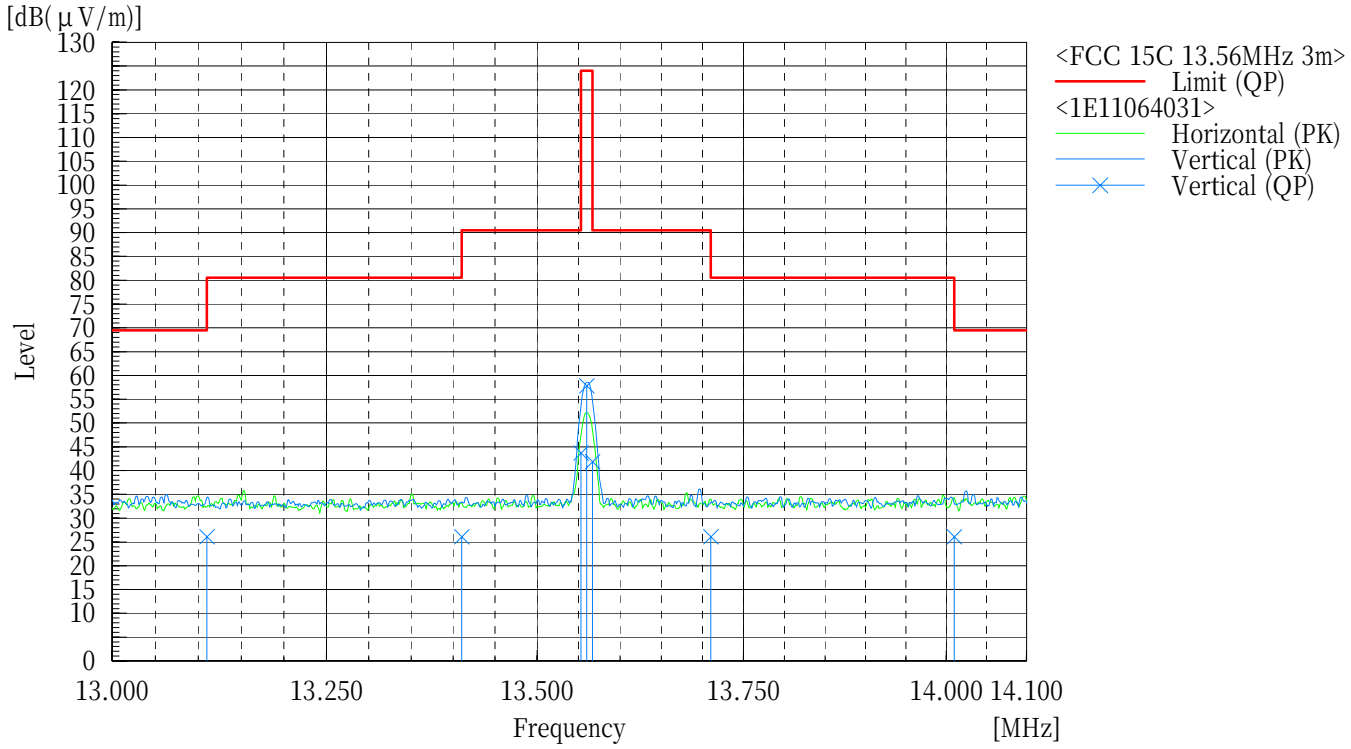
6.2 Radiated Emission 0.15MHz – 30MHz Communication mode

IPS Corporation
EMC Center

<<Radiated Emission>>

17 March,2011 09:26
1E11064031.dat

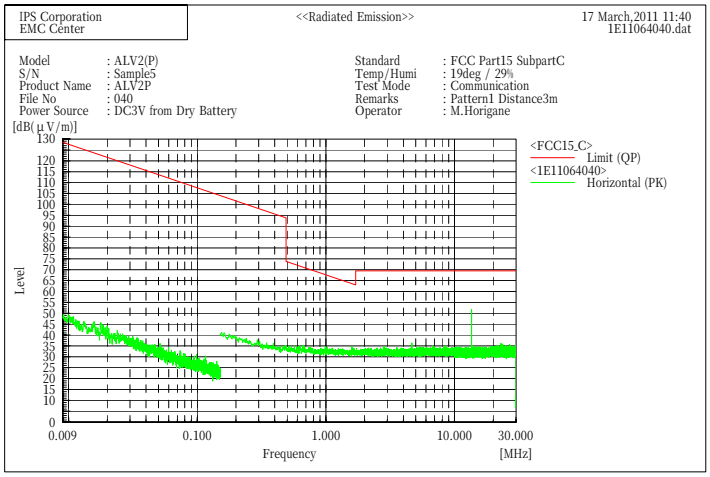
Model	: ALV2(P)	Standard	: FCC 15C 13.56MHz 3m
S/N	: Sample5	Temp/Humi	: 27deg / 29%
Product Name	: ALV2P	Test Mode	: Communication
File No	: 031	Remarks	: Pattern1 Distance3m
Power Source	: DC3V from Dry Battery	Operator	: M.Horigane

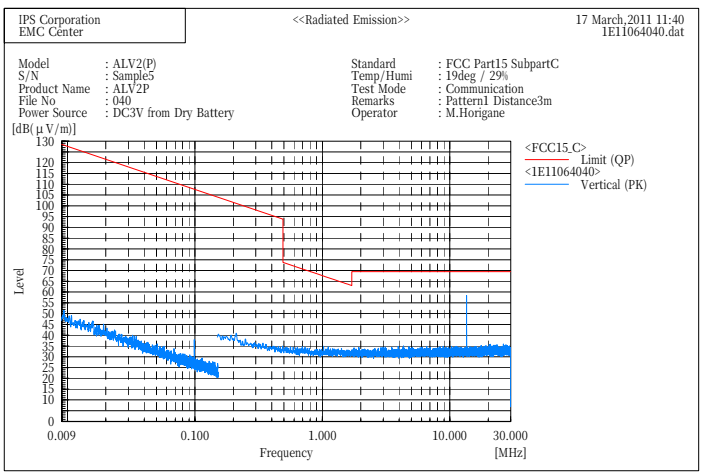


Final Result

--- Vertical Polarization (QP)---

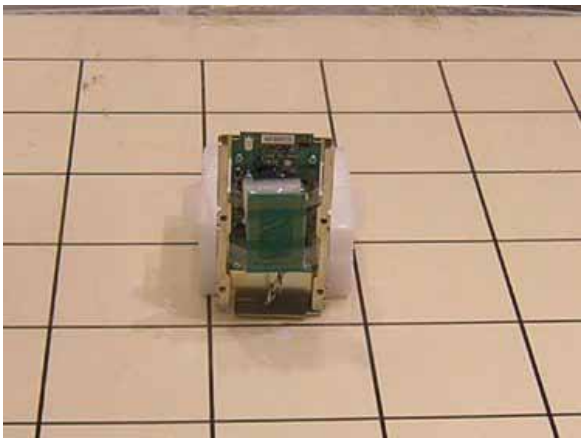
No.	Frequency [MHz]	Reading [dB(μV)]	c.f [dB(1/m)]	Result [dB(μV/m)]	Limit [dB(μV/m)]	Margin [dB]	Height [cm]	Angle [°]
1	13.110	4.1	22.0	26.1	69.5	43.4	100.0	17.0
2	13.410	4.0	22.1	26.1	80.5	54.4	100.0	17.0
3	13.553	21.6	22.1	43.7	90.5	46.8	100.0	17.0
4	13.560	35.7	22.1	57.8	124.0	66.2	100.0	17.0
5	13.567	19.8	22.1	41.9	90.5	48.6	100.0	17.0
6	13.710	4.0	22.1	26.1	80.5	54.4	100.0	17.0
7	14.010	4.0	22.1	26.1	69.5	43.4	100.0	17.0

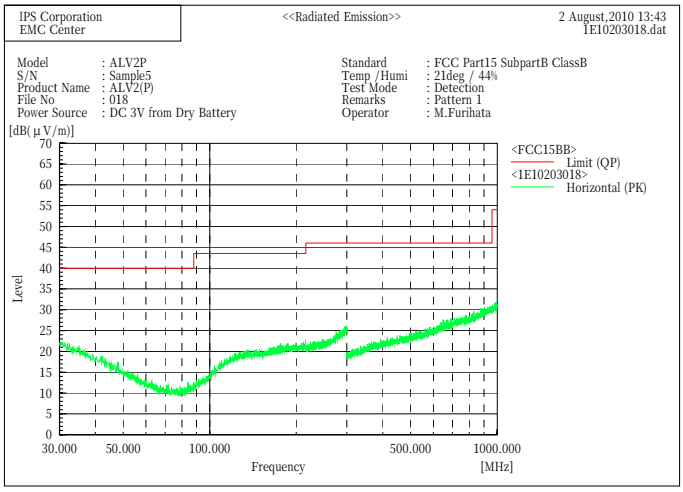


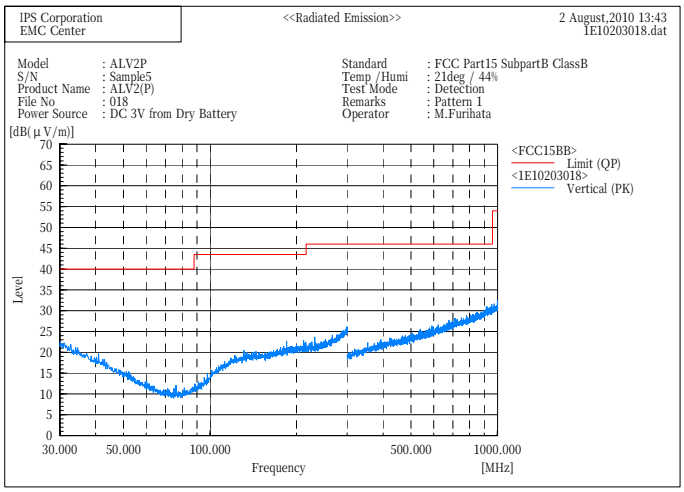


6.3 Radiated Emission 30MHz – 1000MHz Detection mode

Axial Direction of EUT : Pattern 1

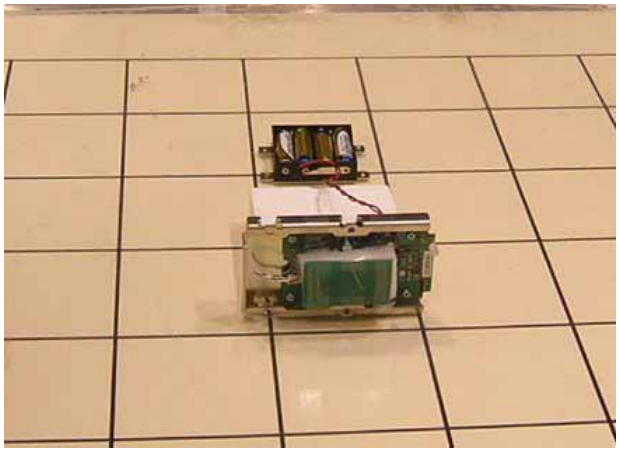






The emission level of the above is definitely lower than the limit.

Axial Direction of EUT : Pattern 2



********** IPS Corporation **********
<<Radiated Emission>> 2 August,2010 13:20
1E10203017.dat

Standard : FCC Part15 SubpartB ClassB
Model : ALV2P
S/N : Sample5
Product Name : ALV2(P)
File No : 017
Power Source : DC 3V from Dry Battery
Temp /Humi : 21deg / 44%
Test Mode : Detection
Remarks : Pattern 2
Operator : M.Furihata
****

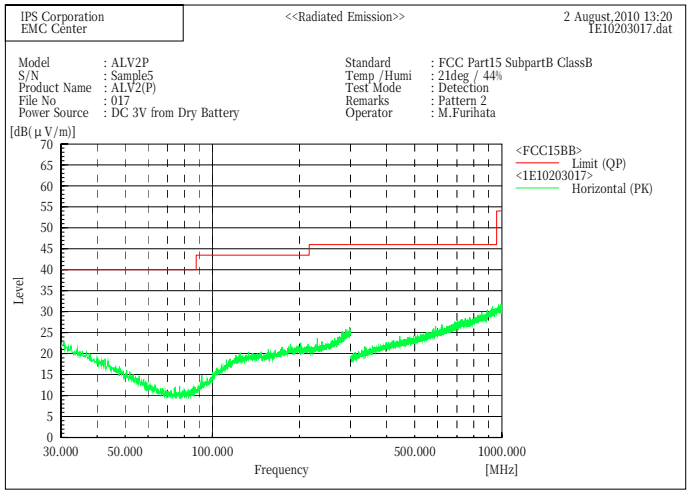
Final Result

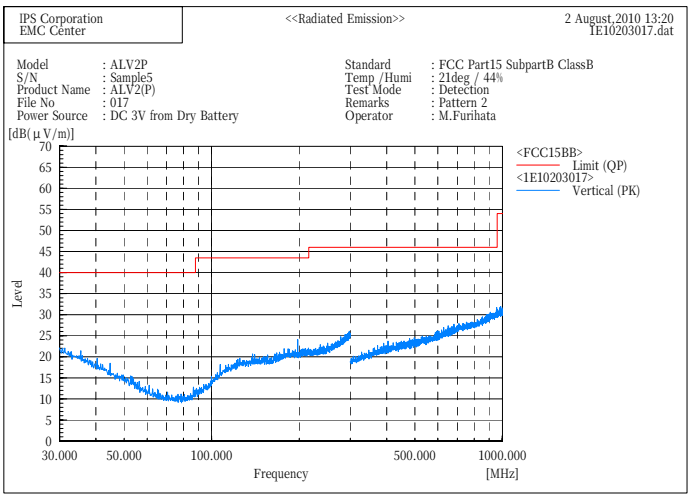
--- Horizontal Polarization (QP)---

No.	Frequency [MHz]	Reading [dB(μV)]	c.f [dB(1/m)]	Result [dB(μV/m)]	Limit [dB(μV/m)]	Margin [dB]	Height [cm]	Angle [°]
1	92.004	21.2	-11.3	9.9	43.5	33.6	299.6	326.0
2	94.924	21.1	-10.6	10.5	43.5	33.0	100.0	0.0
3	230.532	24.2	-1.8	22.4	46.0	23.6	130.9	87.0

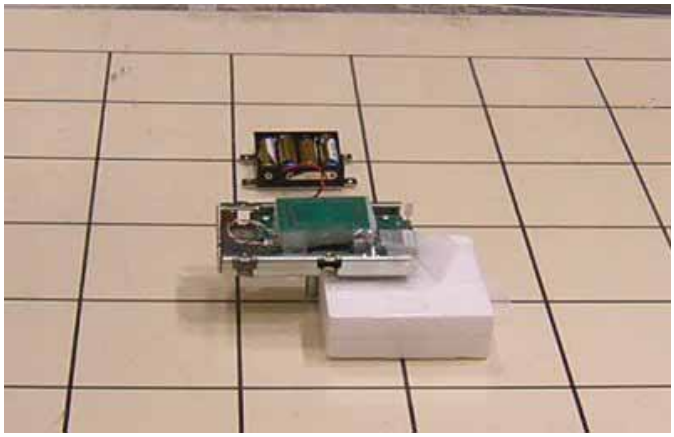
--- Vertical Polarization (QP)---

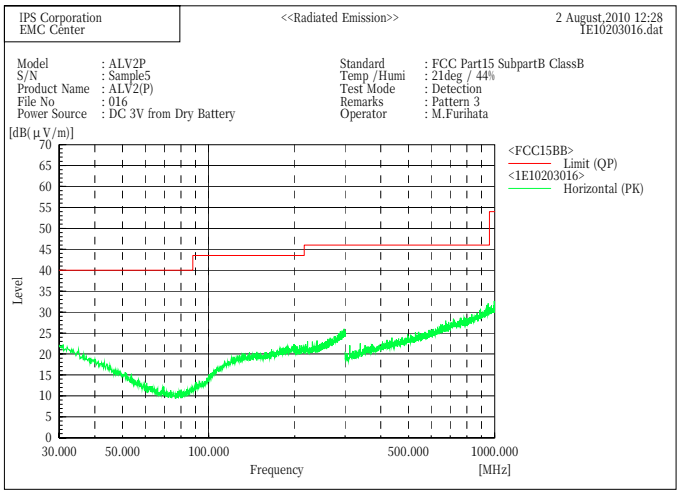
No.	Frequency [MHz]	Reading [dB(μV)]	c.f [dB(1/m)]	Result [dB(μV/m)]	Limit [dB(μV/m)]	Margin [dB]	Height [cm]	Angle [°]
1	94.925	21.1	-10.6	10.5	43.5	33.0	100.0	5.0
2	122.044	21.1	-5.4	15.7	43.5	27.8	100.0	271.0
3	230.532	20.9	-1.8	19.1	46.0	26.9	100.0	160.0

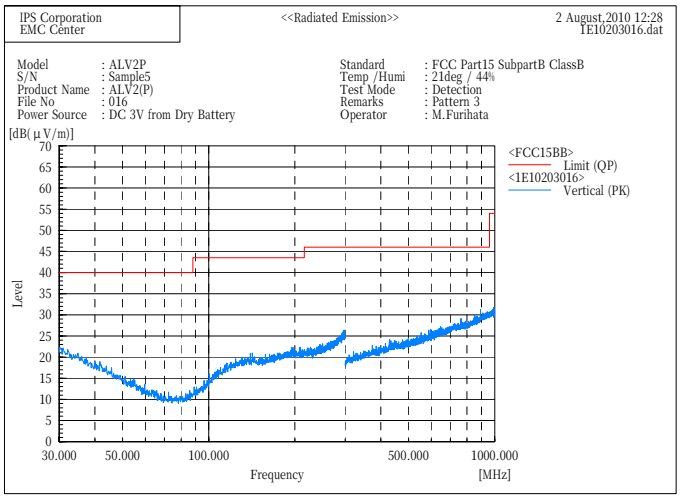




Axial Direction of EUT : Pattern 3



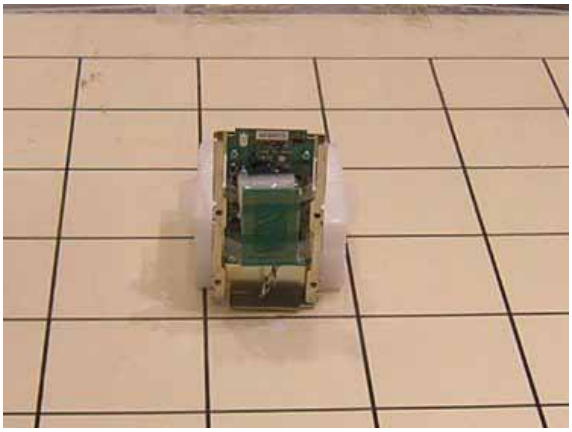




The emission level of the above is definitely lower than the limit.

6.4 Radiated Emission 30MHz – 1000MHz Communication mode

Axial Direction of EUT : Pattern 1



********** IPS Corporation **********
<<Radiated Emission>> 2 August,2010 09:31
1E10203013.dat

Standard : FCC Part15 SubpartB ClassB
Model : ALV2P
S/N : Sample5
Product Name : ALV2(P)
File No : 013
Power Source : DC 3V from Dry Battery
Temp /Humi : 21deg / 44%
Test Mode : Communication
Remarks : Pattern 1
Operator : M.Furihata
****

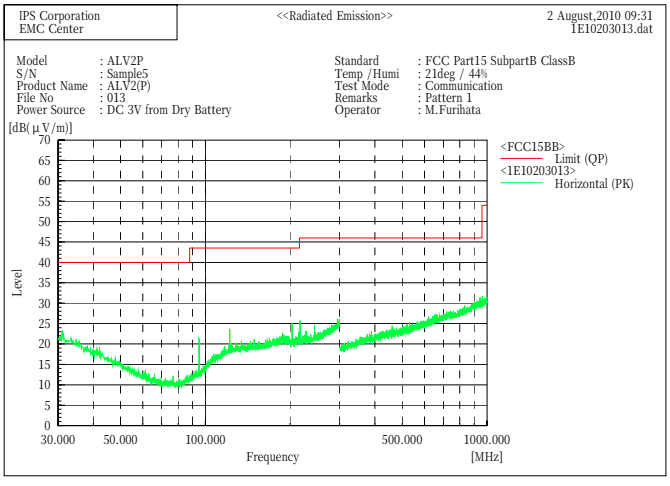
Final Result

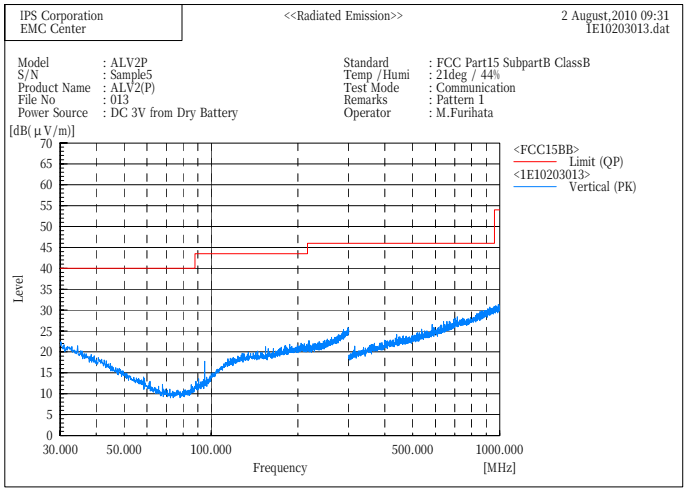
--- Horizontal Polarization (QP)---

No.	Frequency [MHz]	Reading [dB(μV)]	c.f [dB(1/m)]	Result [dB(μV/m)]	Limit [dB(μV/m)]	Margin [dB]	Height [cm]	Angle [°]
1	94.924	31.5	-10.6	20.9	43.5	22.6	192.2	93.0
2	122.044	28.1	-5.4	22.7	43.5	20.8	229.1	90.0
3	203.404	27.4	-2.3	25.1	43.5	18.4	152.9	90.0
4	216.967	28.2	-2.1	26.1	46.0	19.9	150.8	261.0
5	244.088	25.6	-1.5	24.1	46.0	21.9	134.8	265.0

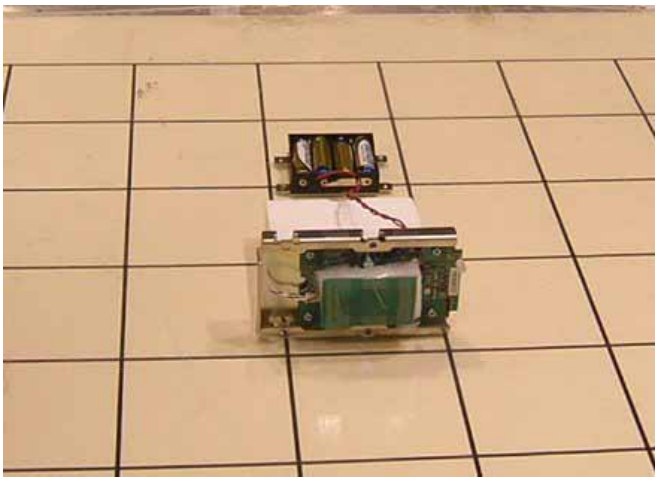
--- Vertical Polarization (QP)---

No.	Frequency [MHz]	Reading [dB(μV)]	c.f [dB(1/m)]	Result [dB(μV/m)]	Limit [dB(μV/m)]	Margin [dB]	Height [cm]	Angle [°]
1	94.924	27.3	-10.6	16.7	43.5	26.8	100.0	24.0





Axial Direction of EUT : Pattern 2



********** IPS Corporation **********
<<Radiated Emission>> 2 August,2010 10:34
1E10203014.dat

Standard : FCC Part15 SubpartB ClassB
Model : ALV2P
S/N : Sample5
Product Name : ALV2(P)
File No : 014
Power Source : DC 3V from Dry Battery
Temp /Humi : 21deg / 44%
Test Mode : Communication
Remarks : Pattern 2
Operator : M.Furihata
****

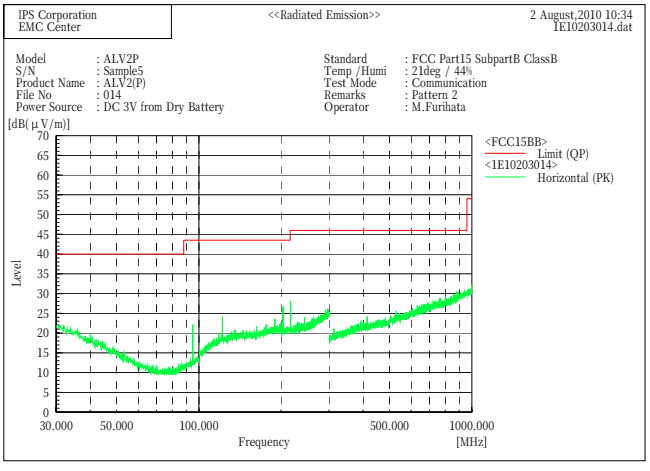
Final Result

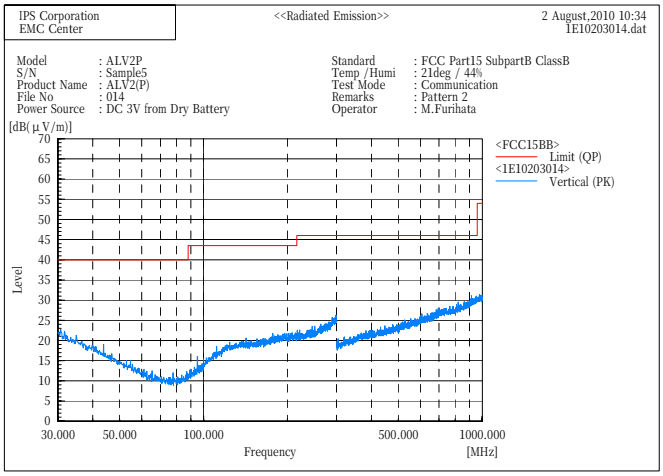
--- Horizontal Polarization (QP)---

No.	Frequency [MHz]	Reading [dB(μV)]	c.f [dB(1/m)]	Result [dB(μV/m)]	Limit [dB(μV/m)]	Margin [dB]	Height [cm]	Angle [°]
1	94.924	32.7	-10.6	22.1	43.5	21.4	180.2	260.0
2	122.048	29.2	-5.4	23.8	43.5	19.7	239.3	261.0
3	189.842	25.1	-2.6	22.5	43.5	21.0	169.3	265.0
4	203.404	28.8	-2.3	26.5	43.5	17.0	156.5	84.0
5	216.960	29.6	-2.1	27.5	46.0	18.5	145.6	83.0

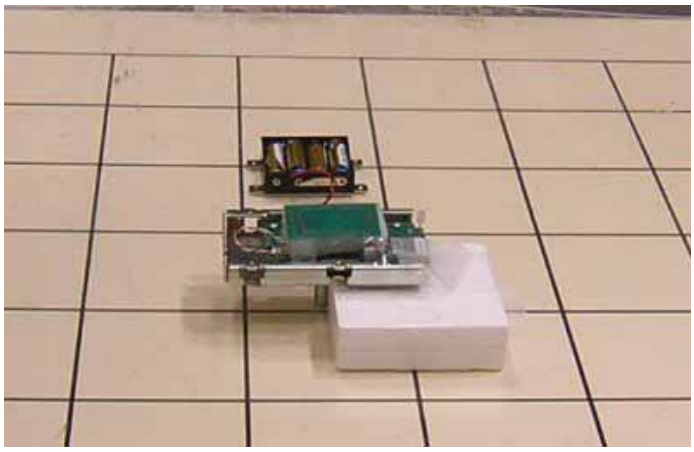
--- Vertical Polarization (QP)---

No.	Frequency [MHz]	Reading [dB(μV)]	c.f [dB(1/m)]	Result [dB(μV/m)]	Limit [dB(μV/m)]	Margin [dB]	Height [cm]	Angle [°]
1	94.925	26.7	-10.6	16.1	43.5	27.4	100.0	39.0





Axial Direction of EUT : Pattern 3



********** IPS Corporation **********
<<Radiated Emission>> 2 August,2010 11:29
1E10203015.dat

Standard : FCC Part15 SubpartB ClassB
Model : ALV2P
S/N : Sample5
Product Name : ALV2(P)
File No : 015
Power Source : DC 3V from Dry Battery
Temp /Humi : 21deg / 44%
Test Mode : Communication
Remarks : Pattern 3
Operator : M.Furihata

****

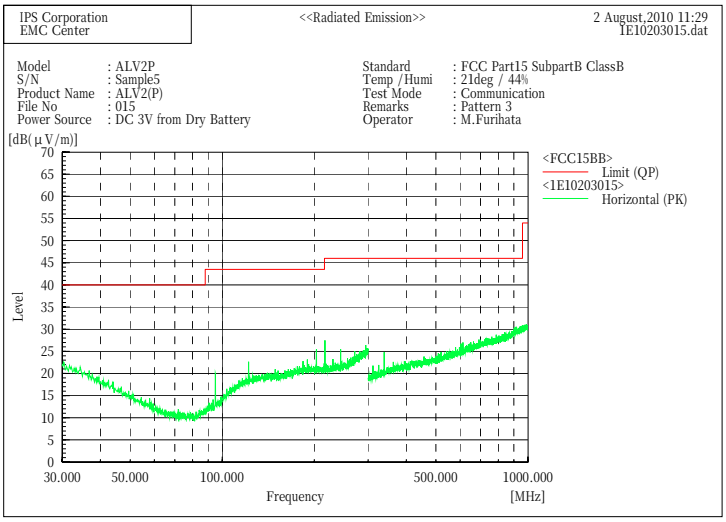
Final Result

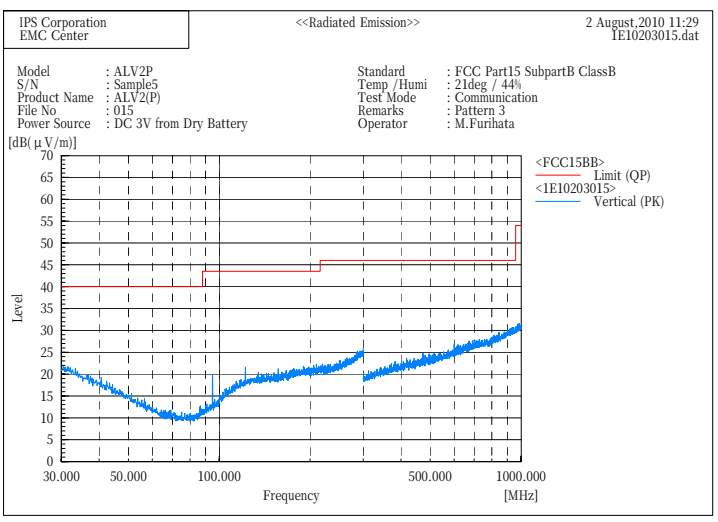
--- Horizontal Polarization (QP)---

No.	Frequency [MHz]	Reading [dB(μV)]	c.f [dB(1/m)]	Result [dB(μV/m)]	Limit [dB(μV/m)]	Margin [dB]	Height [cm]	Angle [°]
1	94.925	30.6	-10.6	20.0	43.5	23.5	184.6	271.0
2	122.047	27.9	-5.4	22.5	43.5	21.0	243.1	260.0
3	203.407	28.1	-2.3	25.8	43.5	17.7	151.5	90.0
4	216.966	30.3	-2.1	28.2	46.0	17.8	140.9	260.0

--- Vertical Polarization (QP)---

No.	Frequency [MHz]	Reading [dB(μV)]	c.f [dB(1/m)]	Result [dB(μV/m)]	Limit [dB(μV/m)]	Margin [dB]	Height [cm]	Angle [°]
1	94.924	29.8	-10.6	19.2	43.5	24.3	100.0	308.0
2	122.046	25.2	-5.4	19.8	43.5	23.7	100.0	236.0





7 TEST CONFIGURATION PHOTOS

TEST CONFIGURATION PHOTOS

were separated from this report