TEST REPORT

Report No. :	5166F-B-2
Date :	15th February 2006
Applicant :	Victor Company of Japan, Limited.
	1-10-1,Ohwatari-machi,Maebashi-Shi,Gunma-ken
	371-8543, Japan
EUT :	WIRELESS TRANSMITTER
FCC ID :	ASIV1U001
Model No. :	VFT-001
Serial No. :	061X0006
Receipt date of tested sample :	31st January 2006
Date of measurement :	31st January, 1st February 2006
Test location :	TAIYO YUDEN CO.,LTD. EMC Center
	5607-2, Nakamuroda,Haruna-machi,
	Gunma-Gun, Gunma , 370-3347,Japan.
Applied standard :	47 CFR Part 15 Subpart C Section15.239 (10-1-05 Edition)
Procedure :	ANSI C63.4-2003
Test results:	PASS

* Note : This test report is the revised version of 5166F-B.
Revised item : Clause 4 Antenna Requirement
The report 5166F-B is not effective any more by the publication of this report.

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Approved by : Manager / Kenzo Furuta

Reviewed by : Chief Engineer / Takeshi Matsumura

Tested by : Engineer / Shin Itakura

: Assistant / Yasuko Hirata

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1 Test report

(1) This report summarizes the result of a single investigation and test result relate only to tested sample.
(2) The report shall not be reproduced except in full without the written approval of the Taiyo Yuden Co.,Ltd.
(3) This test report must not be used by the client to claim product endorsement by NVLAP or any government agency.
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(5) When the test report concerns with the NVLAP accreditation test t he first page of the test report is signed by NVLAP Approved Signatory accompanied by the NVLAP logo.

2 General Information

2.1 Product Description

EUT : WIRELESS TRANSMITTER
Model No. : VFT-001
Serial No. : 061X0006
FCC ID : ASIV1U001
Production stage : Pre Production
Summary of EUT : Sound transmitter on FM wave
Modulation : FM
Power supply : Rated Voltage DC 3.0V (AA/R6 type battery × 2)
Weight : 0.05kg
Dimensions of EUT : W 78mm × D 35mm × H 55mm
The clock frequencies used in this EUT:
7.6MHz : This clock is used for
(1) FM-Stereo (convert to 36kHz)
(2) Pilot (convert to 19kHz)
(3) PLL (convert to 19kHz)

< Remark >
The frequencies used under the operating (transmitting)
P1: 88.1MHz
P2: 88.3MHz
P3: 88.5MHz
P4: 88.7MHz
P5: 107.1MHz
P6: 107.3MHz
P7: 107.5MHz
P8: 107.7MHz

2.2 Summary of Test and Inspection Result

No.	Item	Test Procedure	Specification	Remarks	Deviation	Margin (Worst Case)	Results
1	Field strength of Fundamental Emissions	ANSI C63.4:2003	FCC 15.239(b)	Radiated	N/A	1.7dB (Operating Channel : P4 (88.7MHz) Detector : Average EUT Direction : YZ Antenna Polarization : Horizontal)	Pass
2	20dB Bandwidth		FCC 15.239(a) FCC15.215(c)		N/A	4.7kHz (Operating Channel : P8 (107.7MHz))	Pass
3	Radiated Emission		FCC 15.239(c) FCC 15.209		N/A	20.3dB (Observed frequency : 176.095MHz Operating Channel : P1 (88.1MHz) Detector : Quasi Peak EUT Direction : XY Antenna Polarization : Horizontal)	Pass

2.3 Test Methodology

Interference measurements were made in accordance with ANSI C63.4-2003 Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz.

2.4 Test Facility

1. FCC 47CFR, Part 15, Section 15.239 regulation test was performed on the 10 meter semi-anechoic chamber located at Taiyo Yuden Co.,Ltd. EMC Center, 5607-2 Nakamuroda Haruna-Machi Gunma-Gun Gunma, 370-3347 Japan.
2. This Laboratory is 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.
3. These criteria encompass the requirements of ISO/IEC 17025:1999 and the relevant requirements of ISO 9002:1994 as suppliers of calibration or test results. Accreditation awarded for specific services, listed on the Scope of Accreditation for: ELECTROMAGNETIC COMPATIBILITY AND TELECOMMUNICATIONS FCC. (NVLAP LAB CODE: 200607-0). Refer to Appendix 1.

3 System Test Configuration

3.1 Justification

1. Emission tests were performed with no deviation from the ANSI C63.4-2003 and FCC 47CFR, Part 15.
2. The system was configured for testing a typical fashion. (as a customer would normally use it.)
3. Radiate testing in the range of 30 MHz to 1000 MHz was performed at an antenna to EUT distance of 3 meters under the 15.209 (e) and 15.31(f)(1).
4. All tests were performed with the representative channel operation as follows.

a. Lowest frequency channel : P1 88.1MHz
b. Middle frequency channel 1: P4 88.7MHz
c. Middle frequency channel 2: P5 107.1MHz
d. Highest frequency channel : P8 107.7MHz

3.2 Operating modes

The test was performed with EUT transmitting the sound signal at each channel shown on the following table. The sound source, that is 1kHz/-11.5dB sine wave, was supplied from the portable audio player connected with the signal cable continuously.

Operating Channel
P1 (88.1MHz)
P4 (88.7MHz)
P5 (107.1MHz)
P8 (107.7MHz)

3.3 List of accessories

	Product name	M/N	S/N	Manufacturer	Notes	FCC ID / DoC
a	Digital Audio Player	XA-MP51W	130S6590	JVC	—	DoC

3.4 Interface cables

	Cable Type	M/N	Connection	Ferrite core	Shielded	Material of connector	Length	Treatment for the extra length
1	Signal cable	-	a⇔EUT	No	Yes	Metal	0.076m	-

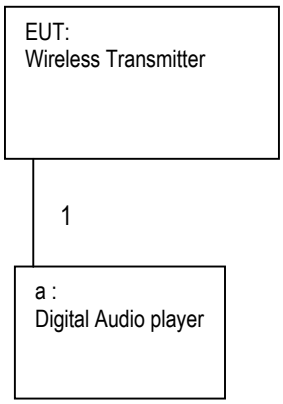
3.5 Special Test Condition

Unwanted emission search. Refer to clause 6.4.3

3.6 Equipment Modifications

No modification has been carried out by the test laboratory.

3.7 Configuration of Tested System



These numbers and the marks in the picture above are corresponding to the numbers and the mark in Table 3.3 and 3.4 on page 5.

3.8 Power Supply to EUT

The Rated Voltage 3.0V is supplied to EUT from two AA size batteries. The new batteries were used to EUT during the test, and the supplied voltage was investigated right before and right after the test. The result table below is showing no abnormal voltage supply to EUT during the test.

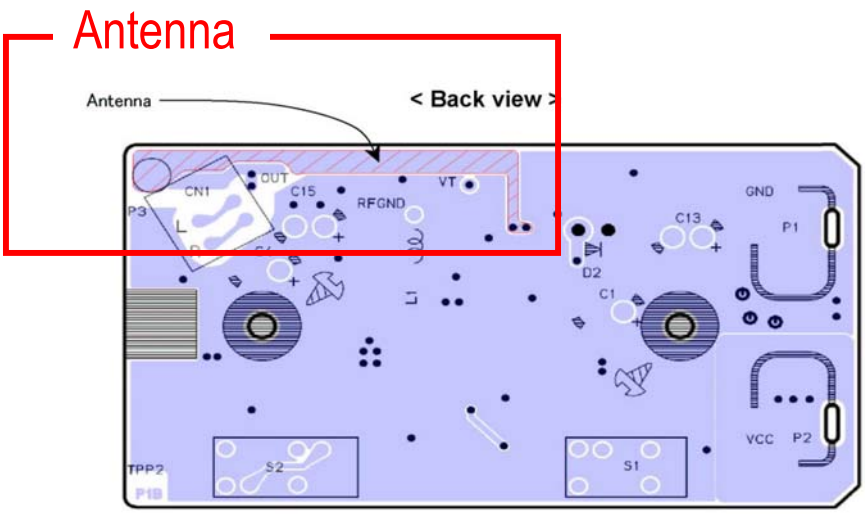
Supplied Power to EUT	
before the test	after the test
3.40V	3.26V

Facility/ Equipment	Manufacturer	Model No.	Serial No.	Frequency Range	Calibration Date	Next Calibration Due
Digital Multimeter	ADVANTEST	R6451A	67840312	-	2005/5/30	2006/5/29

4 Antenna Requirement

Section 15.203. : 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 figure shown below is the Printed Circuit Board of the EUT and the pattern antenna to transmit the FM signal is found on the back of the Printed Circuit Board. Therefore, the EUT complies the antenna requirement described at the FCC regulation Section 15.203.



5 AC Conducted Emission Test

N/A

6 Radiated Emission Test

6.1 Test Setup

The test setup was made according to ANSI STD C63.4-2003 clause 8 on the 10 meter semi-anechoic chamber, which allows a 3m distance measurement.
EUT was placed on non-conductive wooden table. The height of this table was 0.8 m.
The measurement has been conducted with both horizontal and vertical antenna polarization.
The turntable has been fully rotated. The highest radiation of the equipment has been recorded.
For further description of the configuration refer to the pictures of this report.

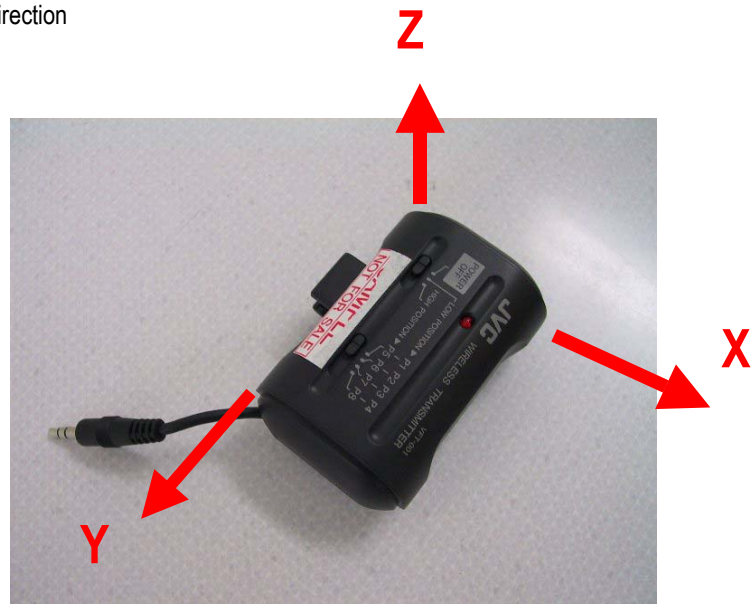
Distance between equipment and antenna : 3m (30MHz to 1.077GHz*)

* 1.077GHz is tenth harmonic frequency of EUT's fundamental clock regulated as an upper frequency in FCC regulation Section 15.33(a)(1)

Spectrum Analyzer Setting

30～1000MHz	Detector : Quasi-Peak Bandwidth : 120kHz
1～1.077GHz	Detector : Peak and Average Bandwidth : 1MHz

Axial Direction



6.2 Test Instrumentation

Facility/ Equipment	Manufacturer	Model No.	Serial No.	Frequency Range	Calibration Date	Next Calibration Due
10m anechoic chamber	TDK Co.,Ltd	DA-06912	-	-	14th-18th.3.2005.	13th.3.2006.
EMI Test Receiver	R&S	ESCS30	100148	30-1000MHz	11th.8.2005.	10th.8.2006.
Spectrum Analyzer	Agilent Technologies	8563E	3416A02230	30-1000MHz	5th.4.2005.	4th.4.2006.
		E4446A	US42070181	1-40GHz	14th.11.2005.	13th.11.2006.
Amplifier		8449B	3008A00571	1-26.5GHz	1st.3.2005.	28th.2.2006.
		8447D	2944A06812	30-1000MHz	5th.4.2005.	5th.4.2006.
RF Selector	TDK Co.,Ltd	NS4900	0302-010	-	6th.4.2005.	5th.4.2006.
RF Cable	SUHNER	RG214	RG 1	30-1000MHz	6th.4.2005.	5th.4.2006.
		RG214	RG 3	30-1000MHz	6th.4.2005.	5th.4.2006.
		RG214	RG 8	30-1000MHz	6th.4.2005.	5th.4.2006.
		RG214	RG 5	30-1000MHz	6th.4.2005.	5th.4.2006.
		RG214	RG 6	30-1000MHz	6th.4.2005.	5th.4.2006.
		SUCOFLEX 106	SU1	1-18GHz	1st.3.2005.	28th.2.2006.
		SUCOFLEX 104	SU4	1-18GHz	1st.3.2005.	28th.2.2006.
Attenuator	KYORITSU	KPD-602	220142	30-1000MHz	6th.4.2005.	5th.4.2006.
Antenna	Schwarzbeck	BBA9106	No.4	30-300MHz	1st.3.2005.	28th.2.2006.
		UHALP9108-A	160	300-1000MHz	1st 3.2005.	28th.2.2006
	EMCO	3115	9403-4232	1-18GHz	1st.4.2005.	31st.3.2007.
Software	TOYO Corporation	EP5/RE Ver.2.0	0208086	-	-	-

6.3 Radiated Emission 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:

c.f.= AF + CF +AL – AG
RE = RA + c.f.

Where c.f. = Correction Factor (dB/m)
RE = Radiated Emission (Emission Level - Result) (dBuV/m)
RA = Receiver Amplitude (Reading Level) (dBuV)
AF = Antenna Factor (dB/m)
CF = Cable Attenuation Loss (dB)
AG = Amplifier Gain (dB)
AL = Attenuator Loss (dB)

Assume a receiver reading of 43.4 dBuV is obtained. The Correction Factor of –10.2 dB/m is added, giving a Radiated Emission of 33.2 dBuV/m. The 33.2 dBuV/m value was mathematically converted to its corresponding level in uV/m.

RE = 43.4 + (-10.2) = 33.2 dBuV/m

Level in uV/m = Common Antilogarithm [(33.2 dBuV/m)/20] = 45.7 uV/m

6.4 Test Results

6.4.1 Field Strength of Fundamental Emissions

Section 15.239(b) : The field strength of any emissions within the permitted 200 kHz band shall not exceed 250 microvolts/meter at 3 meters. The emission limit in this paragraph is based on measurement instrumentation employing an average detector. The provisions in Section 15.35 for limiting peak emissions apply.

Serial No. : 061X0006
Temperature : 22℃
Humidity : 34%

Axial Direction : XY-Plane

CH	Frequency [MHz]	Antenna Polarization	Reading level [dBuV]		Factor [dB/m]	Field strength level [dBuV/m]		Limit [dBuV/m]		Margin [dB]	
			Peak	Average		Peak	Average	Peak	Average	Peak	Average
P1	88.1	Horizontal	62.5	59.4	-14.1	48.4	45.3	67.9	47.9	19.5	2.6
		Vertical	52.0	48.8	-14.1	37.9	34.7	67.9	47.9	30.0	13.2
P4	88.7	Horizontal	62.6	59.6	-13.9	48.7	45.7	67.9	47.9	19.2	2.2
		Vertical	52.1	48.8	-13.9	38.2	34.9	67.9	47.9	29.7	13.0
P5	107.1	Horizontal	57.3	53.4	-9.8	47.5	43.6	67.9	47.9	20.4	4.3
		Vertical	46.3	42.1	-9.8	36.5	32.3	67.9	47.9	31.4	15.6
P8	107.7	Horizontal	56.9	53.1	-9.7	47.2	43.4	67.9	47.9	20.7	4.5
		Vertical	45.7	41.5	-9.7	36.0	31.8	67.9	47.9	31.9	16.1

Axial Direction : YZ-Plane

CH	Frequency [MHz]	Antenna Polarization	Reading level [dBuV]		Factor [dB/m]	Field strength level [dBuV/m]		Limit [dBuV/m]		Margin [dB]	
			Peak	Average		Peak	Average	Peak	Average	Peak	Average
P1	88.1	Horizontal	62.9	59.8	-14.1	48.8	45.7	67.9	47.9	19.1	2.2
		Vertical	53.9	50.8	-14.1	39.8	36.7	67.9	47.9	28.1	11.2
P4	88.7	Horizontal	62.9	60.1	-13.9	49.0	46.2	67.9	47.9	18.9	1.7
		Vertical	55.3	52.3	-13.9	41.4	38.4	67.9	47.9	26.5	9.5
P5	107.1	Horizontal	57.6	53.8	-9.8	47.8	44.0	67.9	47.9	20.1	3.9
		Vertical	46.7	42.5	-9.8	36.9	32.7	67.9	47.9	31.0	15.2
P8	107.7	Horizontal	57.2	53.5	-9.7	47.5	43.8	67.9	47.9	20.4	4.1
		Vertical	46.5	42.2	-9.7	36.8	32.5	67.9	47.9	31.1	15.4

Axial Direction : ZX-Plane

CH	Frequency [MHz]	Antenna Polarization	Reading level [dBuV]		Factor [dB/m]	Field strength level [dBuV/m]		Limit [dBuV/m]		Margin [dB]	
			Peak	Average		Peak	Average	Peak	Average	Peak	Average
P1	88.1	Horizontal	59.7	56.6	-14.1	45.6	42.5	67.9	47.9	22.3	5.4
		Vertical	61.1	58.0	-14.1	47.0	43.9	67.9	47.9	20.9	4.0
P4	88.7	Horizontal	57.4	54.3	-13.9	43.5	40.4	67.9	47.9	24.4	7.5
		Vertical	61.3	58.2	-13.9	47.4	44.3	67.9	47.9	20.5	3.6
P5	107.1	Horizontal	53.6	49.8	-9.8	43.8	40.0	67.9	47.9	24.1	7.9
		Vertical	53.3	49.4	-9.8	43.5	39.6	67.9	47.9	24.4	8.3
P8	107.7	Horizontal	53.4	49.6	-9.7	43.7	39.9	67.9	47.9	24.2	8.0
		Vertical	52.9	48.9	-9.7	43.2	39.2	67.9	47.9	24.7	8.7

6.4.2 20dB Bandwidth

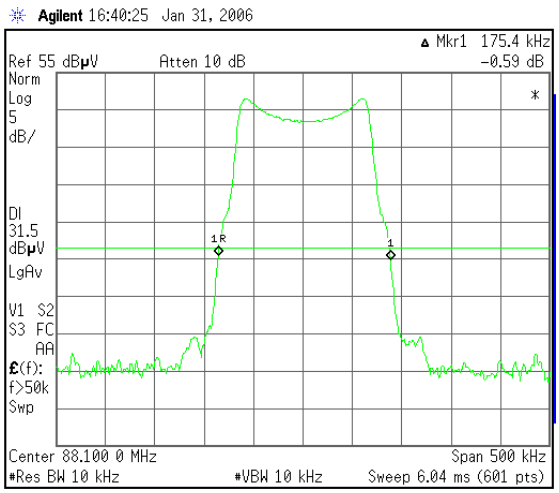
Section 15.239(a) : Emissions from the intentional radiator shall be confined within a band 200 kHz wide centered on the operating frequency. The 200 kHz band shall lie wholly within the frequency range of 88–108 MHz.

Section 15.215(c) : Intentional radiators operating under the alternative provisions to the general emission limits, as contained in Section 15.217 through 15.257 and in Subpart E of this part, must be designed to ensure that the 20 dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated.

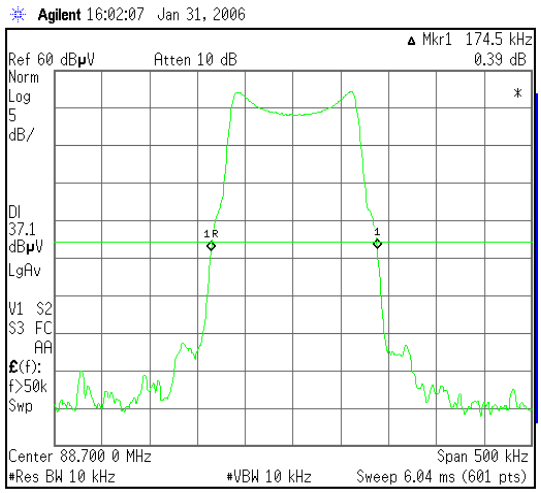
Serial No. : 061X0006
Temperature : 22℃
Humidity : 34%

CH	Frequency [MHz]	20dB Bandwidth [kHz]	Limit [kHz]
P1	88.1	175.4	200
P4	88.7	174.5	200
P5	107.1	195.3	200
P8	107.7	195.3	200

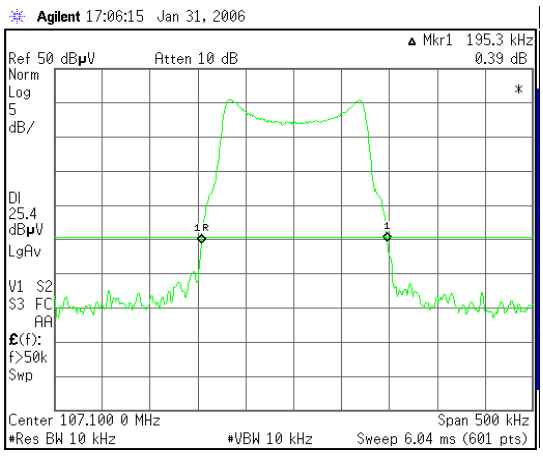
Operating channel : P1 (88.1MHz)



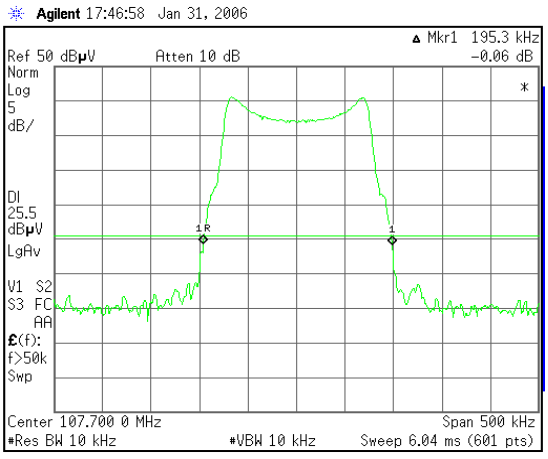
Operating channel : P4 (88.7MHz)



Operating channel : P5 (107.1MHz)



Operating channel : P8 (107.7MHz)



6.4.3 Radiated Emission

Section 15.239(c) : The field strength of any emissions radiated on any frequency outside of the specified 200 kHz band shall not exceed the general radiated emission limits in Section 15.209.

Section 15.209 : Except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified.

The unwanted emissions from 30MHz to 1000MHz are supposed to be measured by Quasi-Peak detector with 120kHz bandwidth according to ANSI C63.4-2003.

However, it is difficult to pick up unwanted emissions in adjacent carrier frequency area by using the 120KHz bandwidth receiver, because a lot of energy was picked up from the carrier signal. Therefore, in adjacent carrier frequenct area only(+/- 300KHz), the unwanted emissions were searched by narrower bandwidth(10KHz) in advance. The results of this measuremnt were : No unwanted emission or only very low level wanted emission(more than 20dB margin). (Refer to Appendix 2)

Section 15.33(a)(1) says that if the intentional radiator operates below 10 GHz: to the tenth harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower. The highest fundamental frequency of EUT is 107.7MHz. Therefore, the unwanted emissions were searched up to 1077MHz.

(1) CH P1 (88.1MHz)

Serial No. : 061X0006
Temperature : 22℃
Humidity : 34%

Axial Direction : XY-Plane

Frequency [MHz]	Antenna Polarization	Meter Reading [dB(uV)] QP	Factor [dB/m]	Emission Level [dB(uV/m)] QP	Limits [dB(uV/m)]	Margin [dB]
176.095	Horizontal	27.7	-4.5	23.2	43.5	20.3
264.300	Horizontal	< 19.5	-1.7	< 17.8	46.0	> 28.2
352.400	Horizontal	< 20.0	-4.4	< 15.6	46.0	> 30.4
440.500	Horizontal	< 21.0	-3.1	< 17.9	46.0	> 28.1
528.600	Horizontal	< 21.1	-1.6	< 19.5	46.0	> 26.5
616.700	Horizontal	< 21.0	0.1	< 21.1	46.0	> 24.9

Axial Direction : YZ-Plane

Frequency [MHz]	Antenna Polarization	Meter Reading [dB(uV)] QP	Factor [dB/m]	Emission Level [dB(uV/m)] QP	Limits [dB(uV/m)]	Margin [dB]
176.102	Horizontal	27.3	-4.5	22.8	43.5	20.7
264.300	Horizontal	< 19.5	-1.7	< 17.8	46.0	> 28.2
352.400	Horizontal	< 20.0	-4.4	< 15.6	46.0	> 30.4
440.500	Horizontal	< 21.0	-3.1	< 17.9	46.0	> 28.1
528.600	Horizontal	< 21.1	-1.6	< 19.5	46.0	> 26.5
616.700	Horizontal	< 21.0	0.1	< 21.1	46.0	> 24.9

Axial Direction : ZX-Plane

Frequency [MHz]	Antenna Polarization	Meter Reading [dB(uV)]	Factor [dB/m]	Emission Level [dB(uV/m)]	Limits [dB(uV/m)]	Margin [dB]
		QP		QP		
176.121	Horizontal	24.8	-4.6	20.3	43.5	23.2
264.300	Horizontal	< 19.5	-1.7	< 17.8	46.0	> 28.2
352.400	Horizontal	< 20.0	-4.4	< 15.6	46.0	> 30.4
440.500	Horizontal	< 21.0	-3.1	< 17.9	46.0	> 28.1
528.600	Horizontal	< 21.1	-1.6	< 19.5	46.0	> 26.5
616.700	Horizontal	< 21.0	0.1	< 21.1	46.0	> 24.9

(2) CH P4 (88.7MHz)

Serial No. : 061X0006
Temperature : 22℃
Humidity : 34 %

Axial Direction : XY-Plane

Frequency [MHz]	Antenna Polarization	Meter Reading [dB(uV)] QP	Factor [dB/m]	Emission Level [dB(uV/m)] QP	Limits [dB(uV/m)]	Margin [dB]
88.480	Vertical	25.7	-14.0	11.7	43.5	31.8
177.446	Horizontal	26.9	-4.5	22.4	43.5	21.1
266.100	Horizontal	< 19.6	-1.5	< 18.1	46.0	> 27.9
354.800	Horizontal	< 20.0	-4.4	< 15.6	46.0	> 30.4
443.500	Horizontal	< 21.0	-3.1	< 17.9	46.0	> 28.1
532.200	Horizontal	< 21.2	-1.6	< 19.6	46.0	> 26.4

Axial Direction : YZ-Plane

Frequency [MHz]	Antenna Polarization	Meter Reading [dB(uV)] QP	Factor [dB/m]	Emission Level [dB(uV/m)] QP	Limits [dB(uV/m)]	Margin [dB]
88.480	Vertical	26.3	-14.0	12.3	43.5	31.2
177.388	Horizontal	27.1	-4.5	22.6	43.5	20.9
266.100	Horizontal	< 19.6	-1.5	< 18.1	46.0	> 27.9
354.800	Horizontal	< 20.0	-4.4	< 15.6	46.0	> 30.4
443.500	Horizontal	< 21.0	-3.1	< 17.9	46.0	> 28.1
532.200	Horizontal	< 21.2	-1.6	< 19.6	46.0	> 26.4

Axial Direction : ZX-Plane

Frequency [MHz]	Antenna Polarization	Meter Reading [dB(uV)] QP	Factor [dB/m]	Emission Level [dB(uV/m)] QP	Limits [dB(uV/m)]	Margin [dB]
177.515	Horizontal	24.3	-4.5	19.8	43.5	23.7
266.100	Horizontal	< 19.6	-1.5	< 18.1	46.0	> 27.9
354.800	Horizontal	< 20.0	-4.4	< 15.6	46.0	> 30.4
443.500	Horizontal	< 21.0	-3.1	< 17.9	46.0	> 28.1
532.200	Horizontal	< 21.2	-1.6	< 19.6	46.0	> 26.4
620.900	Horizontal	< 21.0	0.2	< 21.2	46.0	> 24.8

(3) CH P5 (107.1MHz)

Serial No. : 061X0006
Temperature : 22℃
Humidity : 34%

Axial Direction : XY-Plane

Frequency [MHz]	Antenna Polarization	Meter Reading [dB(uV)]		Factor [dB/m]	Emission Level [dB(uV/m)]		Limits [dB(uV/m)]	Margin [dB]	
		QP			QP				
214.200	Horizontal	< 20.7		-2.9	< 17.8		43.5	> 25.7	
321.300	Horizontal	< 19.8		-5.2	< 14.6		46.0	> 31.4	
428.400	Horizontal	< 20.7		-3.2	< 17.5		46.0	> 28.5	
535.500	Horizontal	< 22.3		-1.5	< 20.8		46.0	> 25.2	
642.600	Horizontal	< 20.7		0.5	< 21.2		46.0	> 24.8	
Frequency [MHz]	Antenna Polarization	Meter Reading [dB(uV)]		Factor [dB/m]	Emission Level [dB(uV/m)]		Limits [dB(uV/m)]	Margin [dB]	
		Average	Peak		Average	Peak		Average	Peak
1071.000	Horizontal	-	< 48.7	-13.6	-	< 35.1	74.0	-	> 38.9
		< 37.5	-		< 23.9	-	54.0	> 30.1	-

Axial Direction : YZ-Plane

Frequency [MHz]	Antenna Polarization	Meter Reading [dB(uV)]		Factor [dB/m]	Emission Level [dB(uV/m)]		Limits [dB(uV/m)]	Margin [dB]	
		QP			QP				
214.200	Horizontal	< 20.7		-2.9	< 17.8		43.5	> 25.7	
321.300	Horizontal	< 19.8		-5.2	< 14.6		46.0	> 31.4	
428.400	Horizontal	< 20.7		-3.2	< 17.5		46.0	> 28.5	
535.500	Horizontal	< 22.3		-1.5	< 20.8		46.0	> 25.2	
642.600	Horizontal	< 20.7		0.5	< 21.2		46.0	> 24.8	
Frequency [MHz]	Antenna Polarization	Meter Reading [dB(uV)]		Factor [dB/m]	Emission Level [dB(uV/m)]		Limits [dB(uV/m)]	Margin [dB]	
		Average	Peak		Average	Peak		Average	Peak
1071.000	Horizontal	-	< 48.7	-13.6	-	< 35.1	74.0	-	> 38.9
		< 37.5	-		< 23.9	-	54.0	> 30.1	-

Axial Direction : ZX-Plane

Frequency [MHz]	Antenna Polarization	Meter Reading [dB(uV)]	Factor [dB/m]	Emission Level [dB(uV/m)]	Limits [dB(uV/m)]	Margin [dB]
		QP		QP		
214.200	Horizontal	< 20.7	-2.9	< 17.8	43.5	> 25.7
321.300	Horizontal	< 19.8	-5.2	< 14.6	46.0	> 31.4
428.400	Horizontal	< 20.7	-3.2	< 17.5	46.0	> 28.5
535.500	Horizontal	< 22.3	-1.5	< 20.8	46.0	> 25.2
642.600	Horizontal	< 20.7	0.5	< 21.2	46.0	> 24.8

Frequency [MHz]	Antenna Polarization	Meter Reading [dB(uV)]		Factor [dB/m]	Emission Level [dB(uV/m)]		Limits [dB(uV/m)]	Margin [dB]	
		Average	Peak		Average	Peak		Average	Peak
1071.000	Horizontal	-	< 48.7	-13.6	-	< 35.1	74.0	-	> 38.9
		< 37.5	-		< 23.9	-	54.0	> 30.1	-

(4) CH P8 (107.7MHz)

Serial No. : 061X0006
Temperature : 22℃
Humidity : 34%

Axial Direction : XY-Plane

Frequency [MHz]	Antenna Polarization	Meter Reading [dB(uV)]		Factor [dB/m]	Emission Level [dB(uV/m)]		Limits [dB(uV/m)]	Margin [dB]	
		QP			QP				
215.400	Horizontal	< 20.6		-2.9	< 17.7		43.5	> 25.8	
323.100	Horizontal	< 19.6		-5.1	< 14.5		46.0	> 31.5	
430.800	Horizontal	< 20.6		-3.2	< 17.4		46.0	> 28.6	
538.500	Horizontal	< 21.7		-1.4	< 20.3		46.0	> 25.7	
646.200	Horizontal	< 20.6		0.5	< 21.1		46.0	> 24.9	
Frequency [MHz]	Antenna Polarization	Meter Reading [dB(uV)]		Factor [dB/m]	Emission Level [dB(uV/m)]		Limits [dB(uV/m)]	Margin [dB]	
		Average	Peak		Average	Peak		Average	Peak
1077.000	Horizontal	-	< 47.8	-13.5	-	< 34.3	74.0	-	> 39.7
		< 36.7	-		< 23.2	-	54.0	> 30.8	-

Axial Direction : YZ-Plane

Frequency [MHz]	Antenna Polarization	Meter Reading [dB(uV)]		Factor [dB/m]	Emission Level [dB(uV/m)]		Limits [dB(uV/m)]	Margin [dB]	
		QP			QP				
215.400	Horizontal	< 20.6		-2.9	< 17.7		43.5	> 25.8	
323.100	Horizontal	< 19.6		-5.1	< 14.5		46.0	> 31.5	
430.800	Horizontal	< 20.6		-3.2	< 17.4		46.0	> 28.6	
538.500	Horizontal	< 21.7		-1.4	< 20.3		46.0	> 25.7	
646.200	Horizontal	< 20.6		0.5	< 21.1		46.0	> 24.9	
Frequency [MHz]	Antenna Polarization	Meter Reading [dB(uV)]		Factor [dB/m]	Emission Level [dB(uV/m)]		Limits [dB(uV/m)]	Margin [dB]	
		Average	Peak		Average	Peak		Average	Peak
1077.000	Horizontal	-	< 47.8	-13.5	-	< 34.3	74.0	-	> 39.7
		< 36.7	-		< 23.2	-	54.0	> 30.8	-

Axial Direction : ZX-Plane

Frequency [MHz]	Antenna Polarization	Meter Reading [dB(uV)]	Factor [dB/m]	Emission Level [dB(uV/m)]	Limits [dB(uV/m)]	Margin [dB]
		QP		QP		
215.400	Horizontal	< 20.6	-2.9	< 17.7	43.5	> 25.8
323.100	Horizontal	< 19.6	-5.1	< 14.5	46.0	> 31.5
430.800	Horizontal	< 20.6	-3.2	< 17.4	46.0	> 28.6
538.500	Horizontal	< 21.7	-1.4	< 20.3	46.0	> 25.7
646.200	Horizontal	< 20.6	0.5	< 21.1	46.0	> 24.9

Frequency [MHz]	Antenna Polarization	Meter Reading [dB(uV)]		Factor [dB/m]	Emission Level [dB(uV/m)]		Limits [dB(uV/m)]	Margin [dB]	
		Average	Peak		Average	Peak		Average	Peak
1077.000	Horizontal	-	< 47.8	-13.5	-	< 34.3	74.0	-	> 39.7
		< 36.7	-		< 23.2	-	54.0	> 30.8	-

7 e.i.r.p. Calculation from Field Strength of Fundamental Emissions

e.i.r.p. can be calculated from Field Strength by using following conversion formula. (Refer to Appendix 3 about derivation of a conversion formula.)

$$\text{e.i.r.p.}[\text{dBm}] \quad = \quad E[\text{dB}\mu\text{V/m}] \; - \; 95.2$$

From the result of Field Strength at a 3m distance described at the Section 6.4.1 on page 12 of this report, the maximum e.i.r.p. value of EUT was calculated by substituting the maximum Field Strength value 49.0 [dBuV/m] to the conversion formula.

$$\text{e.i.r.p.} \quad = \quad -46.2[\text{dBm}] \quad \approx \quad 2.4 \times 10^{-5}\,[\text{mW}]$$

Derived e.i.r.p. value is very small. In addition, according to FCC regulation Section 2.1093, This EUT is categorically excluded from routine environmental evaluation for RF exposure prior to equipment authorization or use. Therefore, it is demonstrated that this EUT gives little electromagnetic effect on the public.

8 PHOTOS OF TESTED EUT

8.1 External Photos

Top View of EUT

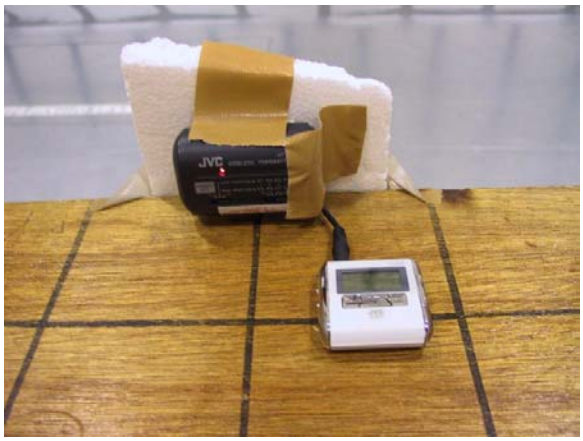
Bottom View of EUT

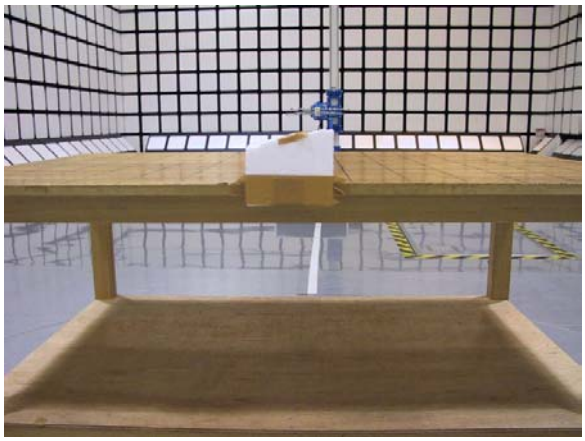
9 PHOTOS OF TEST SETUP

9.1 Photos of Radiated Measurement

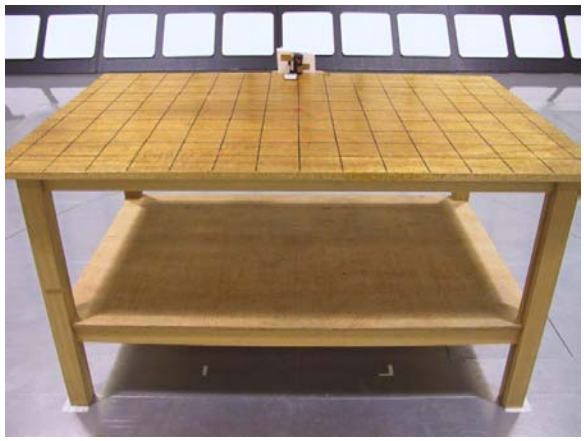
Axial Direction : XY-Plane

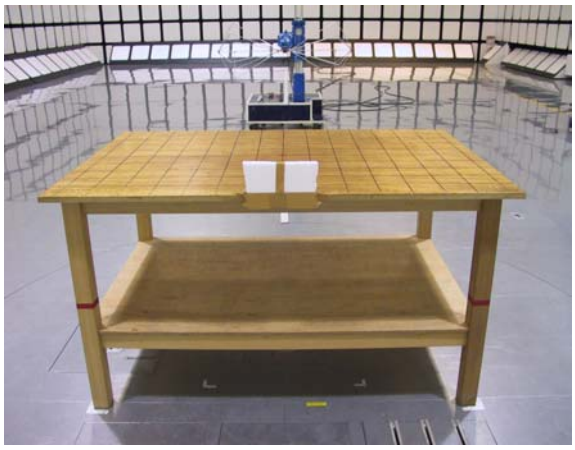
Axial Direction : YZ-Plane



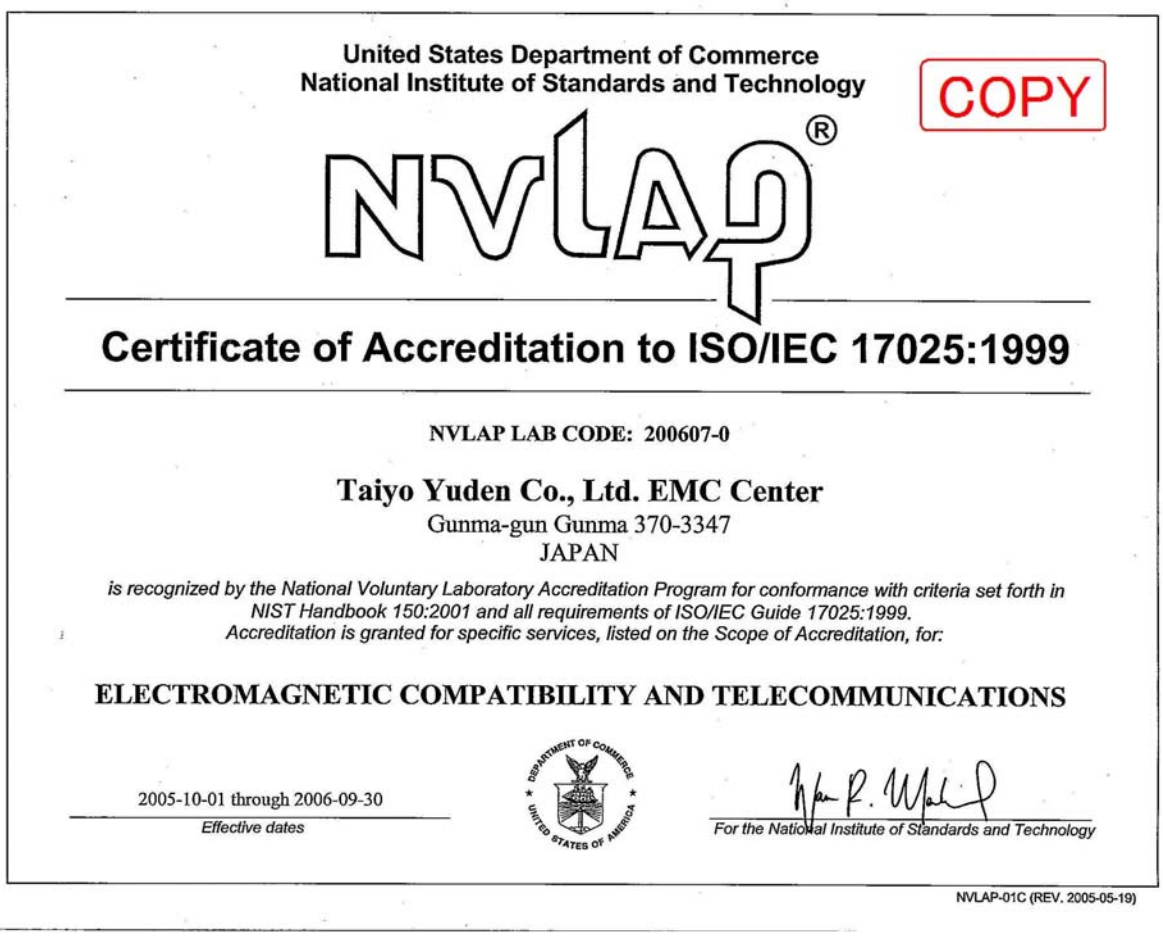


Axial Direction : ZX-Plane





APPENDIX 1 Certificate of NVLAP Accreditation



United States Department of Commerce
National Institute of Standards and Technology

COPY

NVLAP®

Certificate of Accreditation to ISO/IEC 17025:1999

NVLAP LAB CODE: 200607-0

Taiyo Yuden Co., Ltd. EMC Center
Gunma-gun Gunma 370-3347
JAPAN

is recognized by the National Voluntary Laboratory Accreditation Program for conformance with criteria set forth in NIST Handbook 150:2001 and all requirements of ISO/IEC Guide 17025:1999.
Accreditation is granted for specific services, listed on the Scope of Accreditation, for:

ELECTROMAGNETIC COMPATIBILITY AND TELECOMMUNICATIONS

2005-10-01 through 2006-09-30
Effective dates

For the National Institute of Standards and Technology

NVLAP-01C (REV. 2005-05-19)

APPENDIX 2 The unwanted emissions in adjacent carrier frequency area

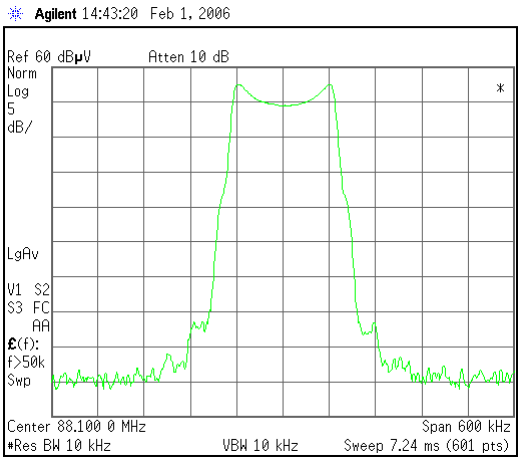
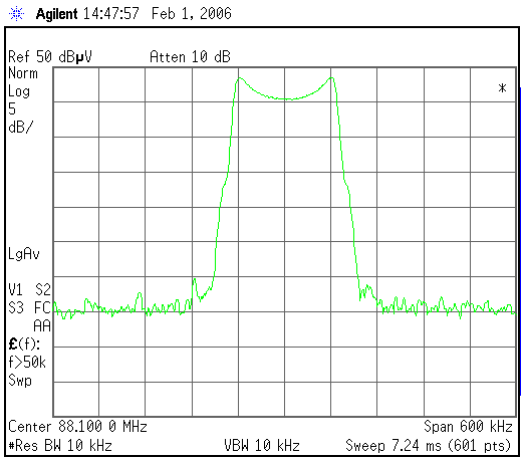
The unwanted emissions in adjancent carrier frequency area were searched with the spectrum analyzer by following settings before scanning from 30MHz to 1.077GHz.

Center Frequency : Carrier frequency
Detector : Peak
RBW : 10kHz
VBW : 10kHz
Span : 600kHz

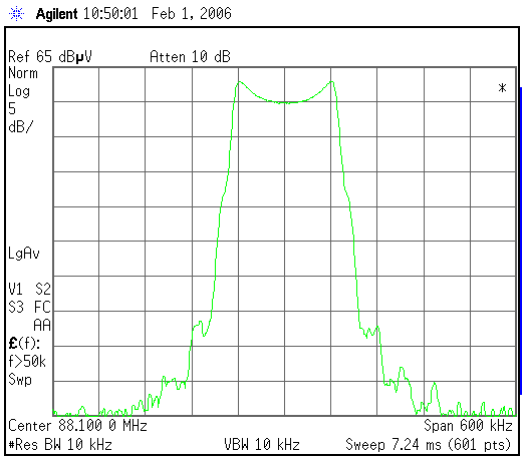
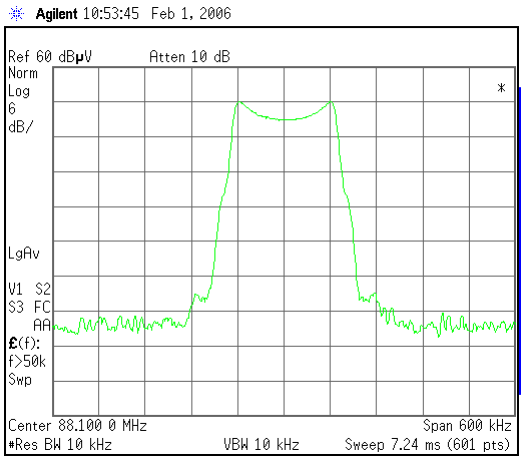
(1) CH P1 (88.1MHz)

Serial No. : 061X0006
Temperature : 22℃
Humidity : 34%

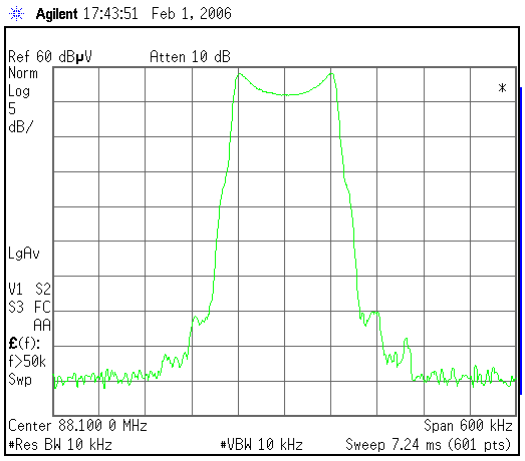
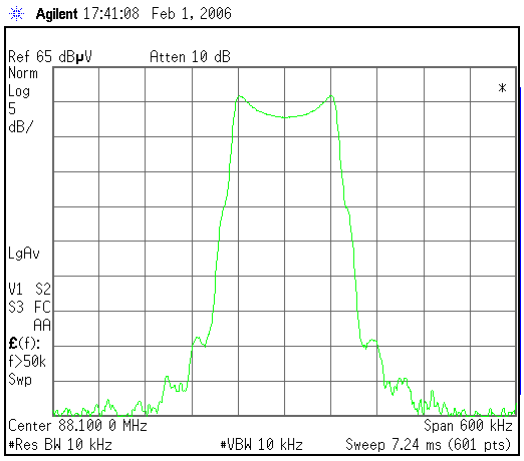
Axial Direction : XY-Plane

Horizontal	Vertical
	

Axial Direction : YZ-Plane

Horizontal	Vertical
	

Axial Direction : ZX-Plane

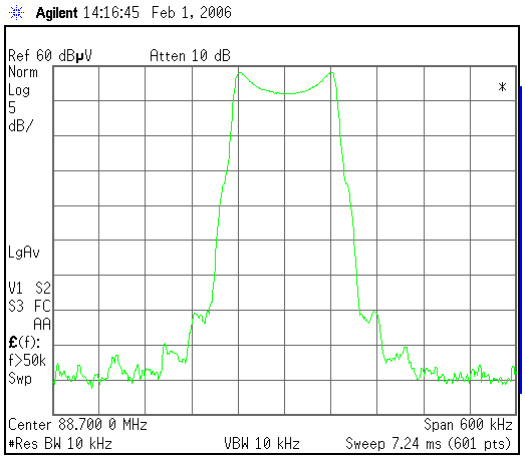
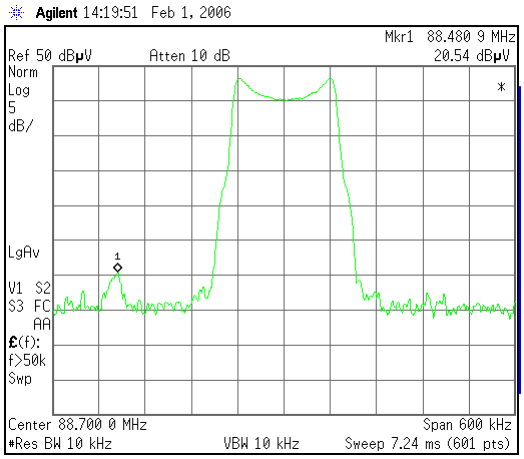
Horizontal	Vertical
	

No unwanted emissions were found.

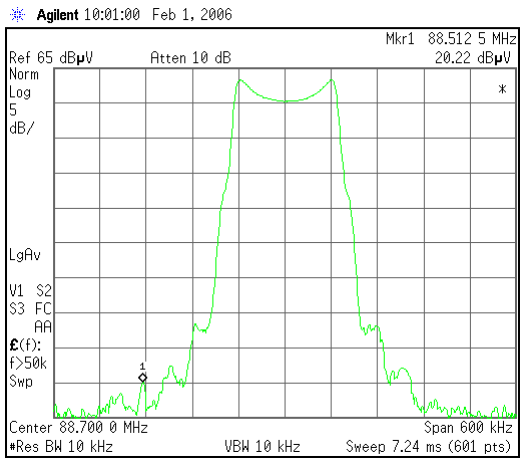
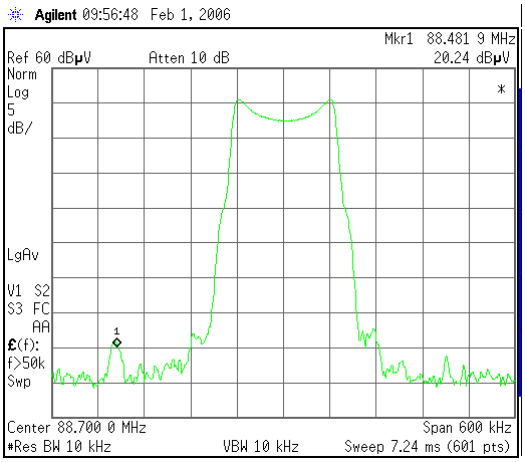
(2) CH P4 (88.7MHz)

Serial No. : 061X0006
Temperature : 22℃
Humidity : 34%

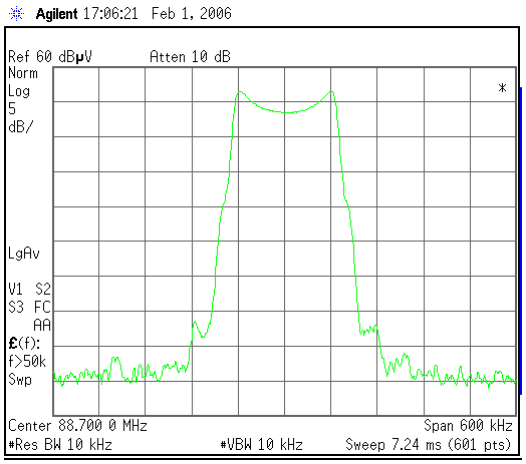
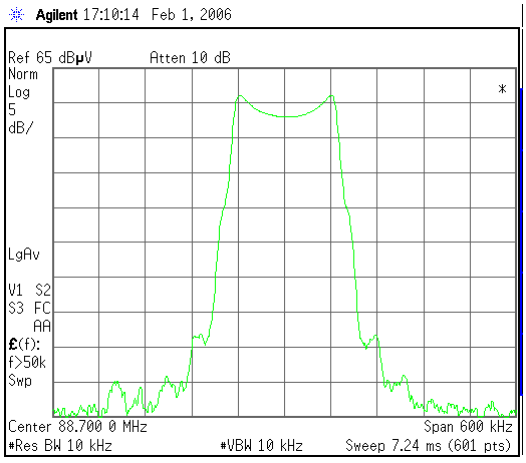
Axial Direction : XY-Plane

Horizontal	Vertical *
	

Axial Direction : YZ-Plane

Horizontal	Vertical *
	

Axial Direction : ZX-Plane

Horizontal	Vertical
	

* The unwanted emissions were observed at 88.48MHz. However, QP values of these emissions measured with 120kHz bandwidth were far below the limit value as the following table. These results were also described at the section 6.4.3 of this report.

Axial Direction : XY-Plane

Frequency [MHz]	Antenna Polarization	Meter Reading [dB(uV)]	Factor [dB/m]	Emission Level [dB(uV/m)]	Limits [dB(uV/m)]	Margin [dB]
		QP		QP		
88.480	Vertical	25.7	-14.0	11.7	43.5	31.8

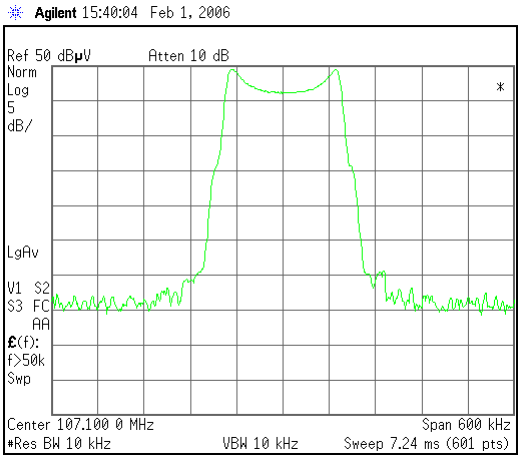
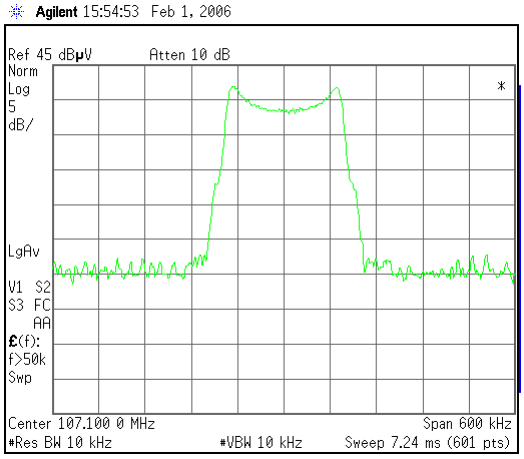
Axial Direction : YZ-Plane

Frequency [MHz]	Antenna Polarization	Meter Reading [dB(uV)]	Factor [dB/m]	Emission Level [dB(uV/m)]	Limits [dB(uV/m)]	Margin [dB]
		QP		QP		
88.480	Vertical	26.3	-14.0	12.3	43.5	31.2

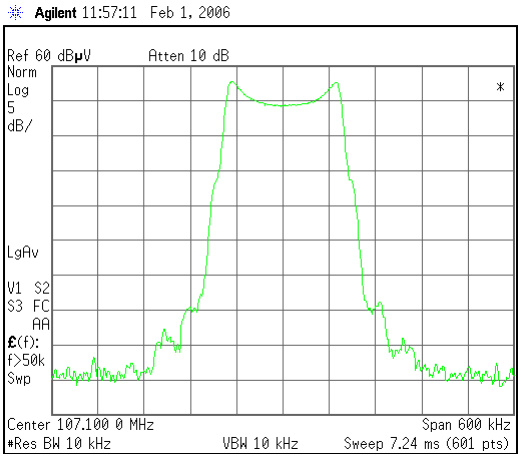
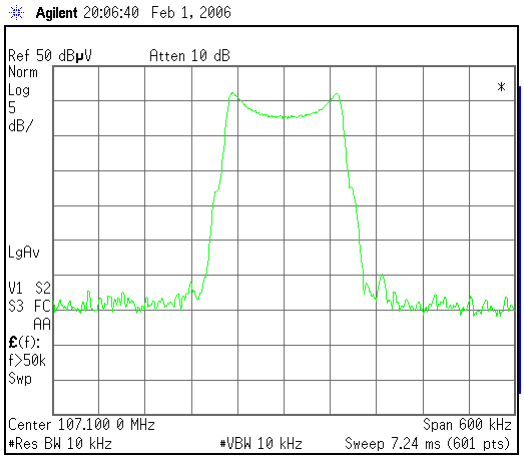
(3) CH P5 (107.1MHz)

Serial No. : 061X0006
Temperature : 22℃
Humidity : 34%

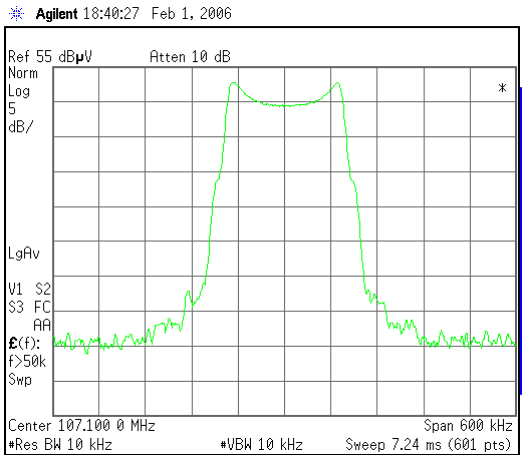
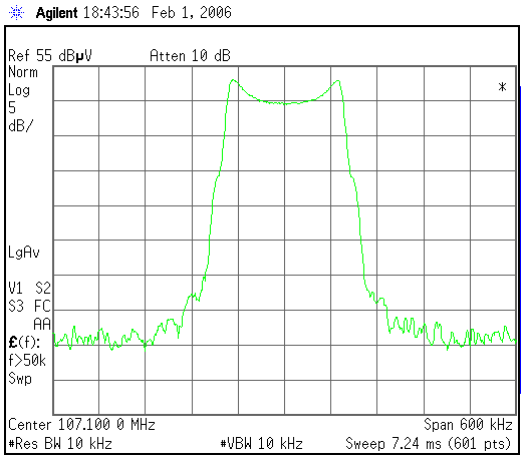
Axial Direction : XY-Plane

Horizontal	Vertical
	

Axial Direction : YZ-Plane

Horizontal	Vertical
	

Axial Direction : ZX-Plane

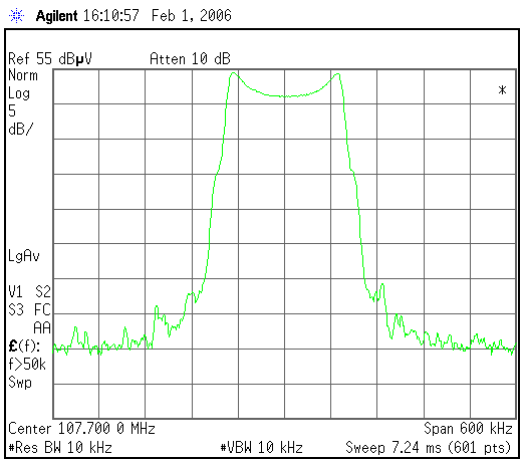
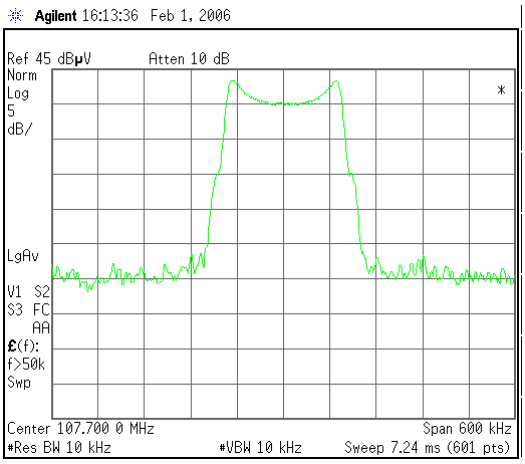
Horizontal	Vertical
	

No unwanted emissions were found.

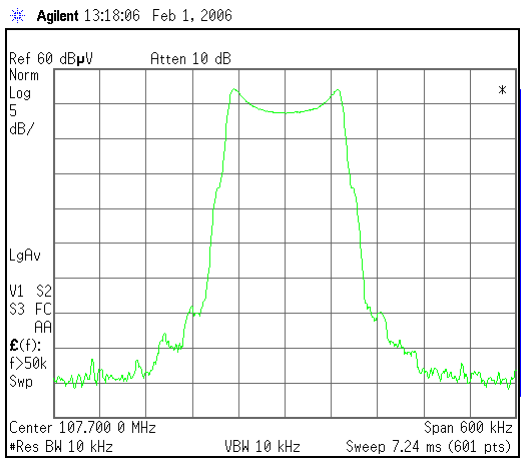
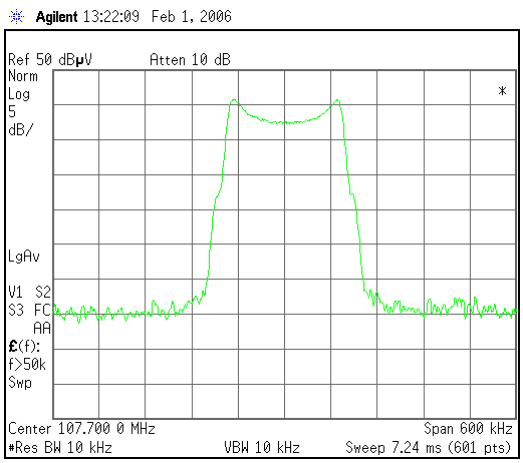
(4) CH P8 (107.7MHz)

Serial No. : 061X0006
Temperature : 22℃
Humidity : 34%

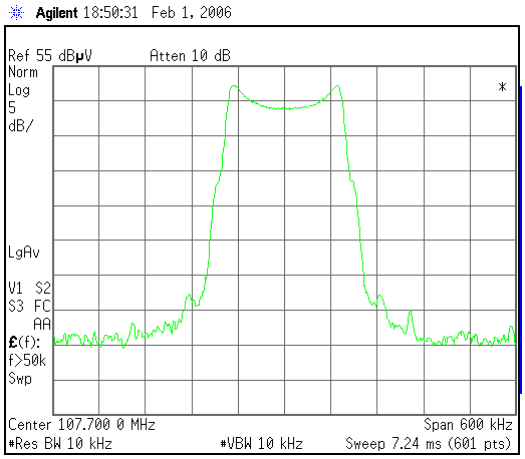
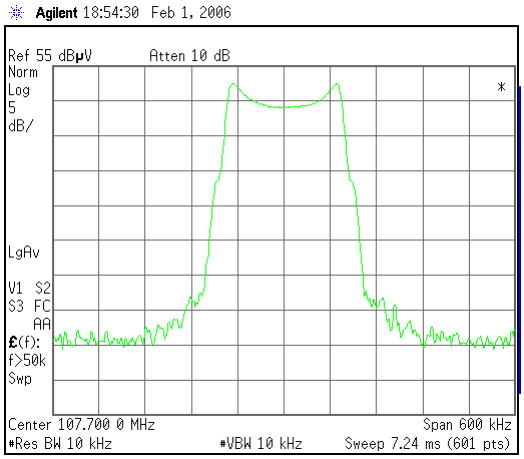
Axial Direction : XY-Plane

Horizontal	Vertical
	

Axial Direction : YZ-Plane

Horizontal	Vertical
	

Axial Direction : ZX-Plane

Horizontal	Vertical
	

No unwanted emissions were found.

APPENDIX 3 Conversion from Field Strength to e.i.r.p.

Let the radiator that has the antenna gain G emit the power P_g isotropically. The power density ρ at a r distance from the radiator is described as the following formula according to the electromagnetic theory.

$$\rho = \frac{GP_g}{4\pi r^2} = \frac{\text{e.i.r.p.}}{4\pi r^2} \quad \text{——————} \quad (1)$$

$$\text{where,} \quad \text{e.i.r.p.} \equiv GP_g$$

On the other hand, the formula which shows the relationship between the electric field strength E and the power density ρ, is as follows.

$$\rho = \frac{E^2}{Z_0} = \frac{E^2}{120\pi} \quad \text{——————} \quad (2)$$

Where Z_0 is the wave impedance of the free space, and equals 120 π.
Combining the formula (1) and (2), the following formula is leaded.

$$\text{e.i.r.p.} = \frac{r^2E^2}{30} \quad \text{——————} \quad (3)$$

The unit conversions from [W] to [dBm] about e.i.r.p. and from [V/m] to [dB μ V/m] about the electric field strength E are as follows.

$$\text{e.i.r.p.[dBm]} = 10\log(10^3 \times \text{e.i.r.p.}) = 10\log \text{e.i.r.p.} + 30 \quad \text{——} \quad (4)$$

$$E[\text{dB}\mu\text{V/m}] = 20\log(10^6 \times E) = 20\log E + 120 \quad \text{————} \quad (5)$$

From the formula (3), (4) and (5), e.i.r.p. of the radiator and the electric field strength E at a r distance from the radiator can be related as the following formula in dB format.

$$\begin{aligned}\text{e.i.r.p.[dBm]} &= 20\log r + E[\text{dB}\mu\text{V/m}] - 90 - 10\log 30 \\ &= 20\log r + E[\text{dB}\mu\text{V/m}] - 100 - 10\log 3 \quad \text{————} \quad (6)\end{aligned}$$

If the distance r is 3m, then the relationship between e.i.r.p. and the field strength E can be expressed by the easier formula shown below.

$$\begin{aligned}\text{e.i.r.p.[dBm]} &= 20\log 3 + E[\text{dB}\mu\text{V/m}] - 100 - 10\log 3 \\ &= E[\text{dB}\mu\text{V/m}] - 100 + 10\log 3 \\ &\approx E[\text{dB}\mu\text{V/m}] - 95.2 \quad \text{——————} \quad (7)\end{aligned}$$