



MEASUREMENT / TECHNICAL REPORT

Applicant : U-shin Ltd.
5217, Nakaze, Hamamatsu-shi, Shizuoka-ken, 434-0012, Japan

Kind of Equipment : Keyless Entry System Transmitter for Vehicles

Trademark : U-shin

Model Number : H7027*-00-00

Standards : Federal Communication Commission Rules & Regulations
Part 15 C

Date Received : September 11, 2006

Date Tasted : September 11, 2006 – September 21, 2006

Date Report Issued : September 27, 2006

Report Number : EMCV06914

The measurements covered by this document have been performed in accordance with NVLAP requirements, which include the requirements of ISO/IEC 17025:1999 and are traceable to national or international standards of measurement.

This report summarizes the result of a signal investigation performed on the described test object and test results relate only to tested sample.

The report shall not be reproduced except in full without the written approval of the IPS Corporation.

TESTED SUPERVISED BY :

A handwritten signature in blue ink, appearing to read 'M. Horigane'.

Mikitomo Horigane

APPROVED BY :

A handwritten signature in blue ink, appearing to read 'N. Kuwazawa'.

Nobuyuki Kuwazawa / Manager

IPS Corporation

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URL: <http://www.ips-emc.co.jp>

FCC ID: OBIH7027TX

Table of contents

1	Introduction.....	3
2	Test laboratory.....	3
3	Applicant information.....	3
4	Product description.....	3
5	Test result.....	4
6	Operation description.....	4
6.1	Test System Details.....	4
6.2	EUT configuration and measurement description.....	4
6.3	Configuration of Tested System.....	5
7	Radiated emissions.....	5
7.1	Test Facility.....	5
7.2	Description of Measurement Procedure.....	5
7.3	Radiated emissions test frequency and characteristics.....	6
7.4	Instrumentation.....	7
7.5	Field Strength Calculation.....	8
7.6	Measurement Data.....	8
8	Bandwidth.....	13
8.1	Regulation	13
8.2	Calculation of the 20 dB bandwidth limit.....	13
8.3	Test Result.....	13
8.4	Measurement Data.....	13
9	Periodic operation characteristics.....	14
9.1	Regulation.....	14
9.2	Test Result.....	14
9.3	Measurement Data.....	14
10	Test Configuration Photo.....	15

Report No. EMCV06914
Model: H7027*-00-00



FCC ID: OBIH7027TX

1 Introduction

U-shin model H7027*-00-00 was tested for compliance with FCC Regulation Part 15, subpart C. The tests were performed at the IPS Corporation, Test Range following the procedures described in ANSI C63.4-2003 "Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical Equipment in the Range of 9 kHz to 40GHz"

2 Test laboratory

Company name	: IPS Corporation
Address	: 1878-1 Harumiya Ono Tatsuno-machi Kamiina-gun 399-0601
Country	: Japan
Test Facility	: EMC Center (NVLAP Code: 200012-0, FCC Registration Number: 93663)
Phone	: +81-266-44-5200
Fax	: +81-266-44-5300
Web	: http://www.ips-emc.co.jp

3 Applicant Information

Company name	: U-shin Ltd.
Address	: 5217, Nakaze, Hamamatsu-shi, Shizuoka-ken, 434-0012
Country	: Japan
Phone	: +81-53-588-4600
Fax	: +81-53-588-4603
Web	: http://www.u-shin.co.jp

4 Product Description

Samples of the following apparatus were submitted for testing:

Type of equipment	: Keyless Entry System Transmitter for Vehicles
Category	: Security Remote Control
Model No.	: H7027*-00-00
Operating Frequency	: 315 MHz
Highest Frequency used in the EUT	: 315 MHz
Lowest Frequency used in the EUT	: 1 MHz
Method of Frequency Generation	: Crystal (for 315 MHz)
Power Rating	: DC 3.0V (Battery) *1
Product Type	: Pre-Production
Serial No.	: No.11
FCC ID	: OBIH7027TX

Note: *1 - This test was Performed with the new battery.

FCC ID: OBIH7027TX

5 Test result

Test Specification : FCC Part15 Subpart C: 2005
Test Procedure : ANSI C63.4: 2003

FCC Section	Requirements	Test result
15.231 (b)	Field Strength of Fundamental Emission	Pass
15.205 (b) 15.209	Radiated Spurious Emission	Pass
15.207 (a)	Conducted Emission	N/A *1
15.231 (a) (1)	Periodic operation characteristics	Pass
15.231 (c)	Bandwidth of the Emission (20 dB bandwidth)	Pass

Note: *1 – This test is not applicable since the EUT does not have AC power port.

6 Operation description

6.1 Tested System Details

EUT

Equipment		Manufacturer	Model No.	Serial No.	Note
A	Keyless Entry System Transmitter	U-shin	H7027*-00-00	No.11	Power used battery*1

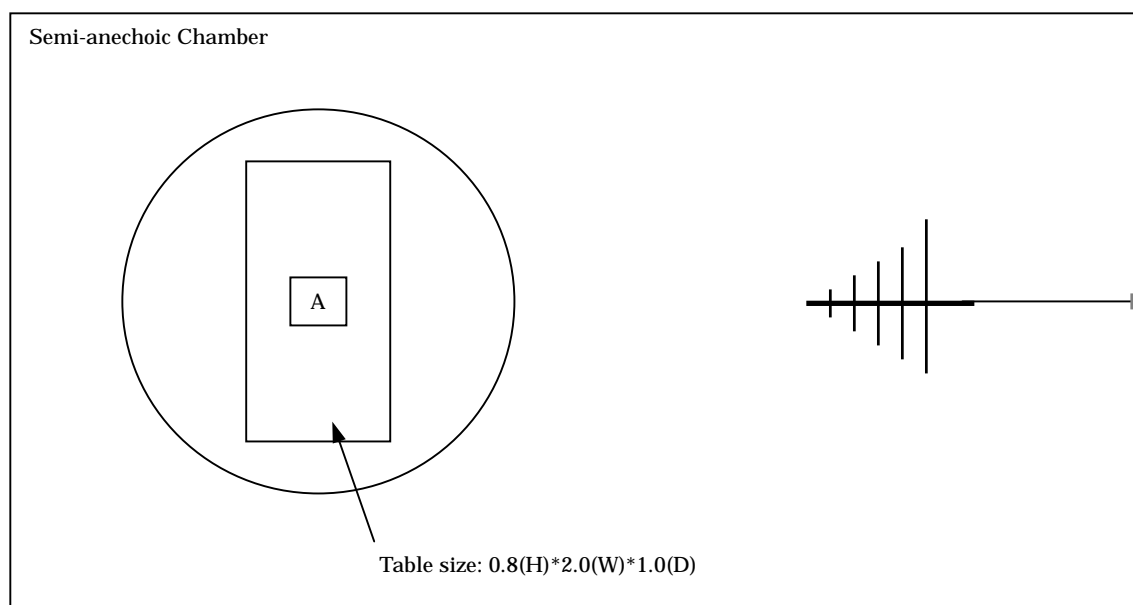
Note: *1 Battery - Manufacturer : Panasonic Type : CR2032
The Tested System dose not have peripherals and cable.

6.2 EUT configuration and measurement description

The EUT is a 315MHz transmitter. The device is actuated via mechanical keys, and contains an antenna on the PCB. Therefore, the equipment complies with the antenna requirement (FCC part 15.203). During Emission tests the EUT was operated in the continuous transmitting for worst emission investigation.

This test were performed with no deviation from the ANSI C63.4-2003
There were no modifications made to the EUT by IPS Corp.

6.3 Configuration of Tested System



Note: This figure shows Radiated Emission Test as a representative figure.
Refer to figure / photos of each test for actual test arrangement.

7 Radiated emissions

7.1 Test Facility

Test Facility located at EMC Center of IPS Corporation.

-No.2 and No.3 semi - anechoic chamber

(NVLAP Code: 200012-0, FCC Registration Number: 93663)

7.2 Description of Measurement Procedure

The test was made according to ANSI C63.4: 2003 on the semi-anechoic chamber, which is 3 m distance measurement.

The test performed in 3m of distance from EUT to an antenna.

The EUT is placed on a turntable which is 0.8m above the ground.

The antenna to ground distance was adjusted between 1 m to 4 m in height above 30 MHz measurement.

Exploratory test

- EUT and system are set up to "IPS measurement procedure" and "ANSI C63.4: 2003".
- The position of the EUT was changed in difference axis.
- The operator selects an antenna from following depend on the measurement frequency.
 - Broadband Antenna (from 30 to1000 MHz)
 - Guide Horn Antenna (above 1000 MHz)
 - Loop Antenna (below 30 MHz)
- The Spectrum analyzer is controlled by PC EMI software as follows:
 - Set to peak detector mode Max-Hold mode.
 - Sweep measurement frequency range.

FCC ID: OBIH7027TX

- Followings are also controlled by PC EMI soft ware
 - Turntable: rotate from 0 deg to 360 deg
 - Antenna polarization: horizontal and vertical (above 30 MHz)
 - Antenna height: from 1 m to 4 m (above 30 MHz)
 - Loop Antenna angle: 0 deg and 90 deg (below 30MHz)
- The operator performs following operations
 - Print out the Spectrum chart from PC EMI software.
 - Records frequency with minimum margins.

Final test

- EUT is operated in the axis determined during exploratory test.
- Dipole Antenna is used for the test. (from 30 MHz to 1000MHz)
- Following operation is performed by the operator :
 - EMC test receiver is set to the system bandwidth and detection mode specified by the test standard.
- The operator controls turntable, antenna height and antenna polarization, antenna angle determine the combination where maximum emission is detected.
- The operator enters the reading value displayed on EMC test receiver into PC EMI software.
 - The measurement result value is calculated by PC EMI software. Same procedure is repeated for all Phase that should be measured.

7.3 Radiated emissions test frequency and characteristics

The radiated emissions measurements were made with the following detector function of the test receiver.

Frequency Band	1 MHz - 30 MHz	30 MHz -1000 MHz	1 GHz - 3.15 GHz
Detector Type	QP	QP	PK
IF Bandwidth	9 kHz	120 kHz	1 MHz

Note: FCC section 15.33 Frequency range of radiated measurement.

- (a) Unless otherwise noted in the specific rule section under which the equipment operates
 - For an intentional radiator the spectrum shall be investigated from the lowest radio Frequency signal generated in the device, without going 9 kHz, up to at least the frequency Shown in this paragraph:
- (1) If the intentional radiator operates below 10 GHz: to the tenth harmonic of the highest Fundamental frequency or to 40 GHz, whichever is lower

This EUT is used the following frequency -

The lowest frequency is 1 MHz.

The highest frequency is 315MHz (for fundamental frequency).

FCC ID: OBIH7027TX

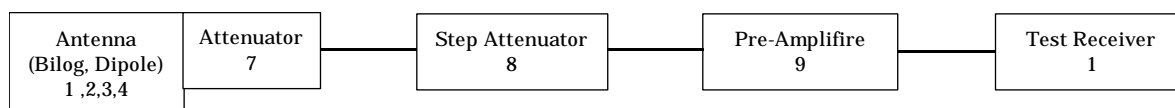
7.4 Instrumentation

Test instruments used

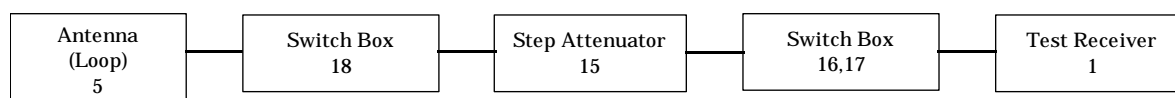
No.	Equipment	Model	S/N	Manufacturer	Calibration		Remark
					Date	NEXT	
1	Test Receiver	ESIB 40	100208	Rhode & Schwarz	2006/7/10	2007/7/31	
2	Bilog Antenna	CBL6112B	2698	Chase	2006/1/30	2007/1/31	
3	Tunable Dipole Antenna	VHA9103	91031586	Schwarzbeck	2006/4/15	2007/4/15	
4	Tunable Dipole Antenna	UHA9105	91052125	Schwarzbeck	2006/4/15	2007/4/15	
5	Loop Antenna	HLA6120	1131	Chase	2006/8/29	2007/8/31	
6	No.2, 3m semi-anechoic chamber	N/A	N/A	Otsuka Science Co., Ltd.	2006/2/10	2007/2/28	
7	Attenuator	MP721A (1/7)	M48971	Anritsu	Calibrated with the cable system		
8	Step Attenuator	HP8494B (4/7)	3308A37638	Agilent Technologies	Calibrated with the cable system		
9	Pre-Amplifier	HP8347A (6/7)	3307A01780	Hewlett Packard	Calibrated with the cable system		
10	Cable System	1/7 Attenuator, 4/7 Step Attenuator, 6/7 Pre-Amplifier, 2/7, 3/7, 5/7 and 7/7 cables		IPS Corporation	2006/2/25	2007/2/25	
11	Guide Horn	3115	9512-4647	EMCO	2005/10/4	2006/10/31	
12	Pre-Amplifier	83051A	3332A00375	Hewlett Packard	2006/7/28	2007/7/31	
13	Cable System (1-40GHz)	Sucoflex102	18145/2	SUHNER	Calibrated with the cable system		
14	No.3, 10m semi-anechoic chamber	N/A	N/A	Otsuka Science Co., Ltd.	2006/2/9	2007/2/28	
15	Step Attenuator	HP8494B (7/11)	3308A37637	Agilent Technologies	Calibrated with the cable system		
16	Switch Box	MP59B (3/11)	M63782	Anritsu	Calibrated with the cable system		
17	Switch Box	MP59B (4/11)	M67885	Anritsu	Calibrated with the cable system		
18	Switch Box	MP59B (10/11)	M65282	Anritsu	Calibrated with the cable system		
19	Cable System	3/11, 4/11 and 10/11 Switch Box, 7/11 Step Attenuator, 1/11, 2/11, 5/11, 6/11, 8/11, 9/11 and 11/11 cables		IPS Corporation	2006/2/25	2007/2/28	

Configuration of Instruments System

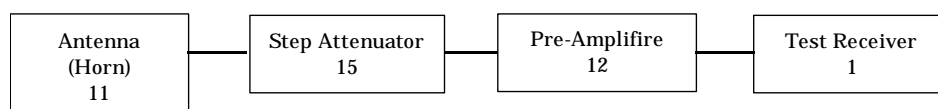
[30 – 1000 MHz]



[1-30 MHz]



[Above 1000 MHz]



FCC ID: OBIH7027TX

7.5 Field Strength Calculation

The field strength 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:

$$c. f. = AF + CL - AG$$

$$FS = RA + c. f.$$

Where	c. f.	= Correction Factor
	FS	= Field Strength (Emission Level – Result)
	RS	= Receiver Amplitude (Reading Level)
	AF	= Antenna Factor
	CL	= Cable Loss
	AG	= Amplifier Gain

Assume a receiver reading of 52.5 dBuV is obtained. The Antenna Factor of 7.4 dB/m and a Cable Loss of 1.1 dB is added. The Amplifier Gain of 29.0 dB is subtracted, giving a field strength of 32.0 dBuV/m.

The 32.0 dBuV/m value was mathematically converted to its corresponding level in uV/m.

$$FS = 52.5 \text{ dBuV/m} + 7.4 \text{ dB/m} + 1.1 \text{ dB} - 29.0 \text{ dB} = 32.0 \text{ dBuV/m}$$

$$\text{Level in uV/m} = \text{Common Antilogarithm} [(32.0 \text{ dBuV/m})/20] = 39.8 \text{ dBuV/m}$$

Software for calculation: TOYO EMI measurement software EP5/RE Ver 3.0.20
Toyo Corporation.

7.6 Measurement Data

Environmental Condition

Test Date : <u>2006 - 9 - 11</u>	Temperature : <u>25 °C</u>	Humidity : <u>59%</u>
Test Date : <u>2006 - 9 - 13</u>	Temperature : <u>21 °C</u>	Humidity : <u>56%</u>
Test Date : <u>2006 - 9 - 14</u>	Temperature : <u>23 °C</u>	Humidity : <u>56%</u>

Test Result : PASS

Summary of the measurement result (Worst measurement)

[30 - 1000 MHz]

Horizontal Polarization, 315.000 MHz, 72.6 dB(uV/m) Quasi-Peak Value and it has 3.0 dB margin from the limit (75.6 dB(uV/m)).

[1 - 3.15 GHz]

Horizontal Polarization, 3150.001 MHz, 54.0 dB(uV/m) Peak Value and it has 1.6 dB margin from the average limit (55.6 dB(uV/m)).

Vertical Polarization, 3150.001 MHz, 54.0 dB(uV/m) Peak Value and it has 1.6 dB margin from the average limit (55.6 dB(uV/m)).

Refer to measurement data

FCC ID: OBIH7027TX

Measurement Data (Final Data List)

Standard : FCC Part15 Subpart C

Date : 2006/9/11, 2006/9/14

Model : H7027*-00-00

S/N : No.11

Product Name : Transmitter

Temp / Humi : 25 degrees C / 59 %, 23 degrees C / 56%

Power Source : DC 3V from Battery

Remarks :

Operator : M.HORIGANE

Frequency	Antenna	Detecotor	Reading	c.f.	Result	Limit	Margin	EUT
[MHz]	Polarization	type	dB(uV)	dB	dB(uV/m)	dB(uV/m)	dB	axis
315.000	Hor.	QP	81.9	-9.3	72.6	75.6	3.0	X
315.000	Ver.	QP	78.7	-9.3	69.4	75.6	6.2	Z
630.000	Hor.	QP	35.7	-1.1	34.6	55.6	21.0	X
630.000	Ver.	QP	36.8	-1.1	35.7	55.6	19.9	X
945.000	Hor.	QP	35.3	3.0	38.3	55.6	17.3	X
945.000	Ver.	QP	35.9	3.0	38.9	55.6	16.7	X
1,259.995	Hor.	PK	46.1	-3.5	42.6	55.6	13.0	X
1,259.997	Ver.	PK	47.4	-3.5	43.9	55.6	11.7	Z
1,575.000	Hor.	PK	42.8	-3.1	39.7	54.0	14.3	X
1,575.000	Ver.	PK	42.1	-3.1	39.0	54.0	15.0	X
1,890.001	Hor.	PK	47.1	1.5	48.6	55.6	7.0	X
1,889.998	Ver.	PK	49.1	1.5	50.6	55.6	5.0	Z
2,205.000	Hor.	PK	41.2	3.2	44.4	54.0	9.6	X
2,205.000	Ver.	PK	42.0	3.2	45.2	54.0	8.8	X
2,519.998	Hor.	PK	43.5	4.4	47.9	55.6	7.7	X
2,519.998	Ver.	PK	42.7	4.4	47.1	55.6	8.5	X
2,834.999	Hor.	PK	46.8	5.5	52.3	54.0	1.7	Z
2,834.999	Ver.	PK	43.5	5.5	49.0	54.0	5.0	X
3,150.001	Hor.	PK	46.2	7.8	54.0	55.6	1.6	Y
3,150.001	Ver.	PK	46.2	7.8	54.0	55.6	1.6	Y

Note: FCC Section 15.31 (O): The amplitude of spurious emissions from intentional radiators and Emissions from unintentional radiators which are attenuated more than 20dB below the Permissible value need not be reported unless specifically required elsewhere in this part.

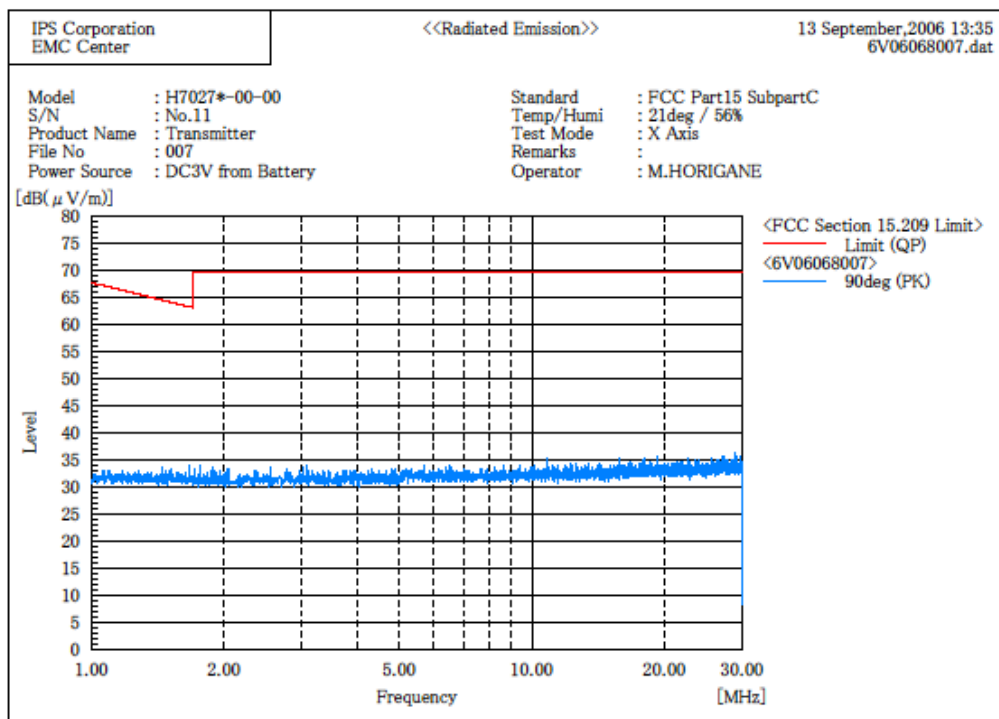
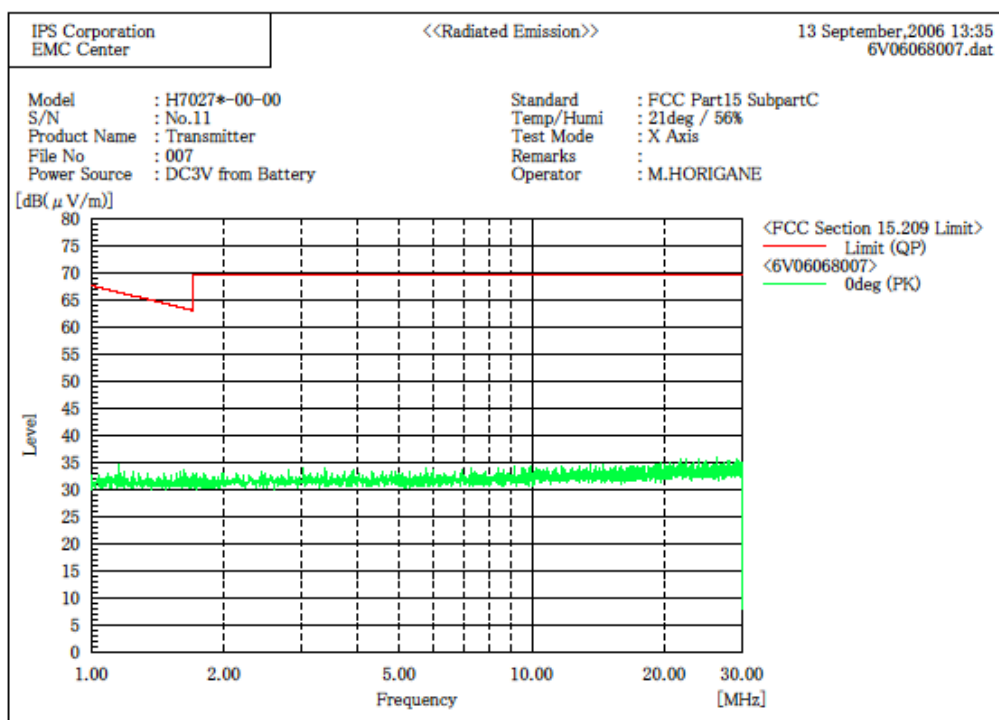
The frequency ranges 1 - 30 MHz satisfy the requirement stipulated in FCC Rules Part 15, Section 15.31 Measurement standards, clause (o).

Report No. EMCV06914

Model: H7027*-00-00

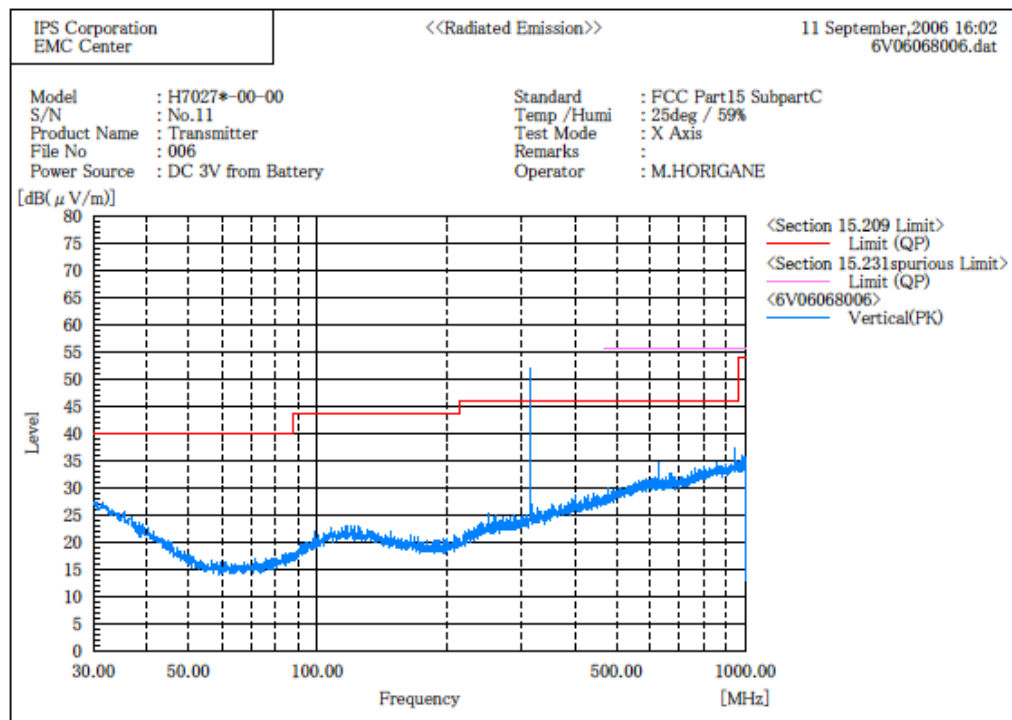
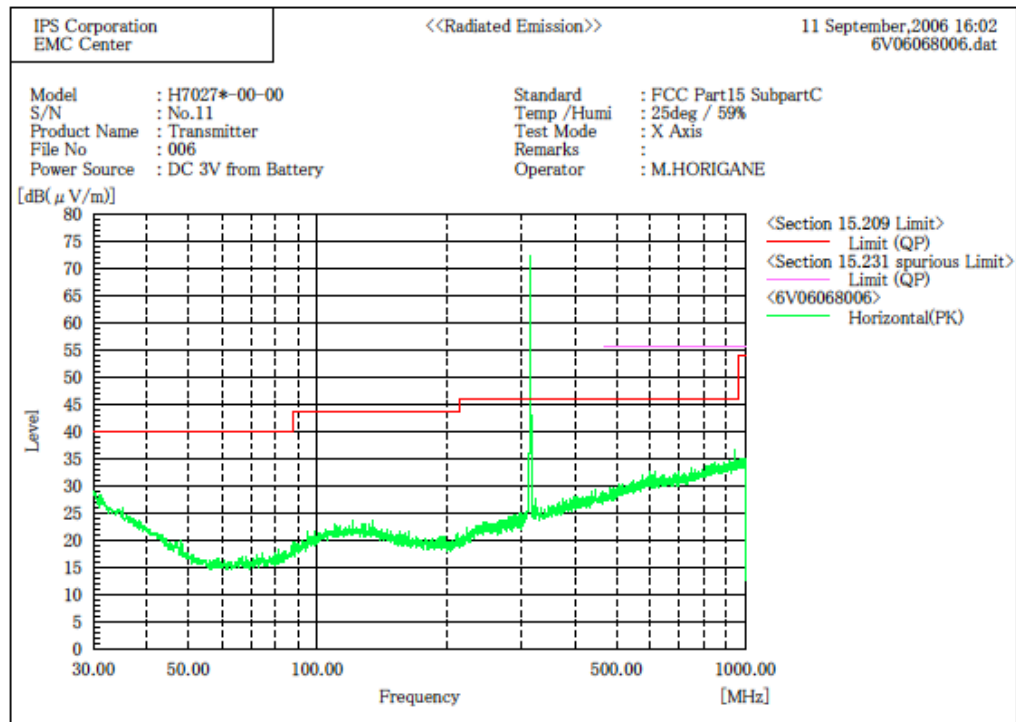
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Figure 7.1 Emission spectrum of the EUT (below 30MHz)



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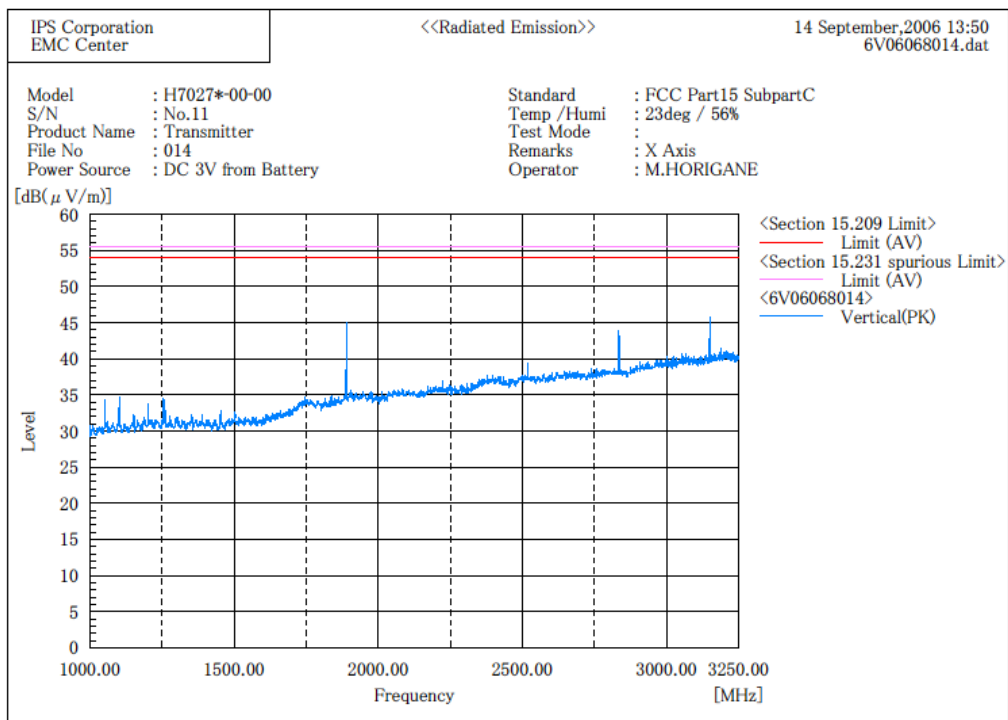
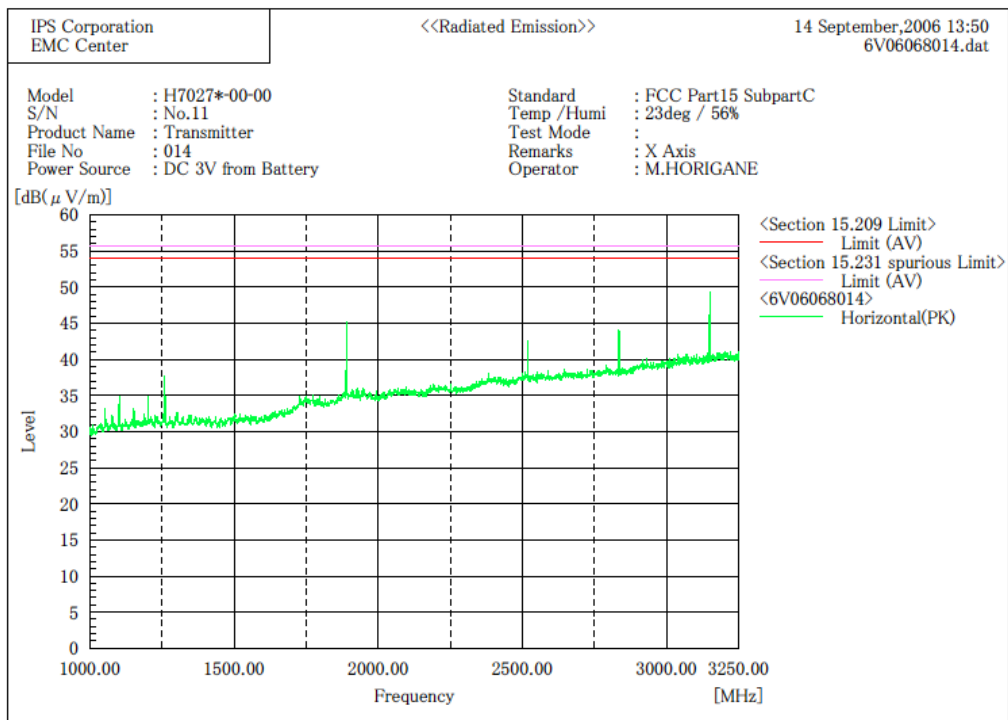
Figure 7.2 Emission spectrum of the EUT (From 30MHz to 1000 MHz)



Report No. EMCV06914
Model: H7027*-00-00

FCC ID: OBIH7027TX

Figure 7.3 Emission spectrum of the EUT (Above 1000MHz)



FCC ID: OBIH7027TX

8 Bandwidth

8.1 Regulation

FCC part15 section 15.231 (c) The bandwidth of the emission shall be no wider than 0.25% of the center frequency for devices operating above 70 MHz and below 900 MHz. For devices operating above 900 MHz, the emission shall be no wider than 0.5% of the center frequency. Bandwidth is determined at the points 20 dB down from the modulated carrier.

8.2 Calculation of the 20 dB bandwidth limit

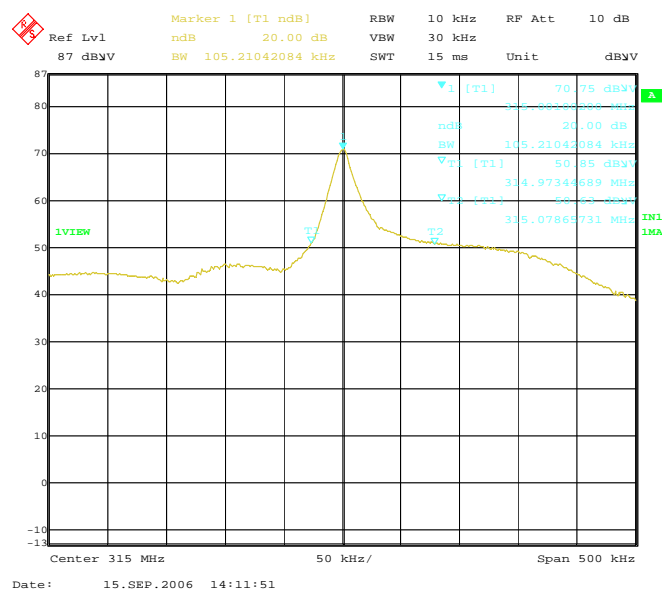
The 20 dB bandwidth limit = $0.0025 \times 315 \text{ MHz} = 0.7875 \text{ MHz} = 787.5 \text{ kHz}$

8.3 Test Result

Test Result : PASS

The equipment meets the requirement. Refer to measurement data

8.4 Measurement Data



[-20dB Bandwidth : 105.21 kHz < 787.5 kHz]

Report No. EMCV06914
Model: H7027*-00-00

FCC ID: OBIH7027TX

9 Periodic operation characteristics

9.1 Regulation

15.231 (a) The provisions of this section are restricted to periodic operation within the band 40.66-40.70 MHz and above 70 MHz. Except as shown in paragraph (e) of this section, the intentional radiator is restricted to the transmission of a control signal such as those used with alarm systems, door openers, remote switches, etc. Continuous transmissions, voice, video and the radio control of toys are not permitted. Data is permitted to be sent with a control signal. The following conditions shall be met to comply with the provisions for this periodic operation:

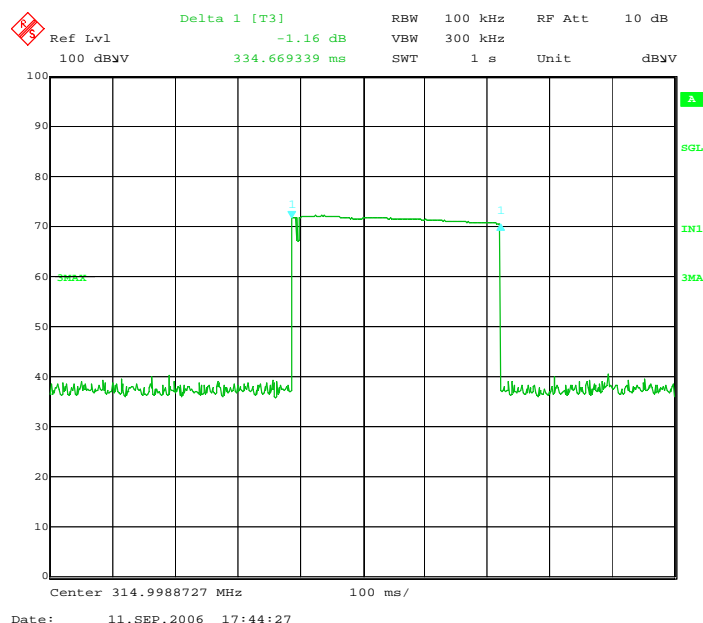
15.231 (a) (1) A manually operated transmitter shall employ a switch that will automatically deactivate the transmitter within not more than 5 seconds of being released.

9.2 Test Result

Test Result : PASS

The equipment meets the requirement. Refer to measurement data

9.3 Measurement Data



[ON Time : 335ms < 5 seconds]