

# TEST REPORT

Report number : Z071C-07311

Issue date : October 18, 2007

The device, as described herewith, was tested pursuant to applicable test procedure and complies with the requirements of;

## FCC Part15 Subpart F

The test results are traceable to the international or national standards.

Applicant	:	Japan Radio Co., Ltd. 1-1, Shimorenjaku 5-chome, Mitaka-shi TOKYO 181-8510, Japan Phone: +81-422-45-9330 Fax.: +81-422-45-9539
Equipment under test (EUT)	:	HANDY SEARCH
FCC ID	:	CKEHANDYSEARCH
Trade name	:	JRC
Model number	:	NJJ-95B
Serial number	:	09
EUT condition	:	Prototype

Date of test : September 25, 26, 2007

Test place : OATS

ZACTA Technology Corporation Yonezawa Testing Center  
4149-7 Hachimanpara 5-chome  
Yonezawa-shi Yamagata 992-1128 Japan  
Phone:+81-238-28-2880 Fax:+81-238-28-2888

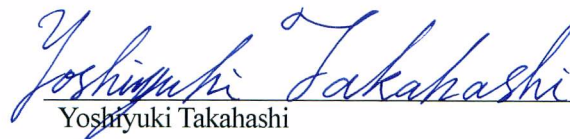
Test results : Complied

Zacta Technology Corporation certifies that no party to the application is subject to a denial of federal benefits that include FCC benefits, pursuant to Section 5301 of the Anti-Drug Abuse Act of 1988, 21U.S.C. 853(a).

The results in this report are applicable only to the samples tested.

This report shall not be re-produced except in full without the written approval of ZACTA Technology Corporation.

Tested by:

  
Yoshiyuki Takahashi

Authorized by:

  
Jun Shimanuki  
General Manager of Technical Division

***Table of contents***

---

	Page
<i>1. Summary of Test</i> .....	3
1.1 Purpose of test.....	3
1.2 Standards.....	3
1.3 Emission measurement .....	3
1.4 Deviation from the standard.....	3
1.5 Modification to the EUT by laboratory .....	3
<i>2. Equipment Under Test</i> .....	4
2.1 EUT information .....	4
2.2 Operating mode .....	4
<i>3. Configuration of equipment</i> .....	5
3.1 Peripheral(s) used .....	5
3.2 Cable(s) used .....	5
3.3 System configuration.....	5
<i>4. Measurement procedure</i> .....	6
4.1 Measurement procedure.....	6
4.2 Test equipment.....	7
4.3 Sample of field strength calculation .....	7
<i>5. Measurement result</i> .....	8
5.1 [§15.509(a)] Operational restrictions.....	8
5.2 [§15.509(d), 15.209] Radiated Emission.....	8
5.3 [§15.509(e)] Radiated Emission .....	9
5.4 [§15.509(f)] Highest radiated emission (fM) .....	9
<i>6. Uncertainty of measurement</i> .....	10
<i>7. Laboratory description</i> .....	10
<i>8. Configuration photographs</i> .....	11
Radiated emission.....	11

**1. Summary of Test**

---

**1.1 Purpose of test**

It is the original test in order to verify conformance to standards listed in section 1.2.

**1.2 Standards**

CFR47 FCC Part 15 Subpart F

**1.3 Emission measurement**

Test Description	FCC Rules Section	Test method	Test
UWB bandwidth <960MHz GPR operated by law enforcement, etc. Eligible for licensing (Part 90) Cease operation 10 seconds after release	15.509 (a)-(c)	FCC 02-48	Applied
Quasi-peak emissions 15.209	15.509(d)	FCC 02-48 ANSI C63.4-2003	Applied
RMS emissions >960MHz	15.509(d)	FCC 02-48	Applied
RMS emissions in GPS bands	15.509(e)	FCC 02-48	Applied
Emission at frequency of highest emission	15.509(f)	FCC 02-48	Applied
Conducted emission	15.207	FCC 02-48	Not applied *1

Note 1: Test was not applied because the EUT is powered by batteries.

**1.4 Deviation from the standard**

None

**1.5 Modification to the EUT by laboratory**

None

## 2. Equipment Under Test

### 2.1 EUT information

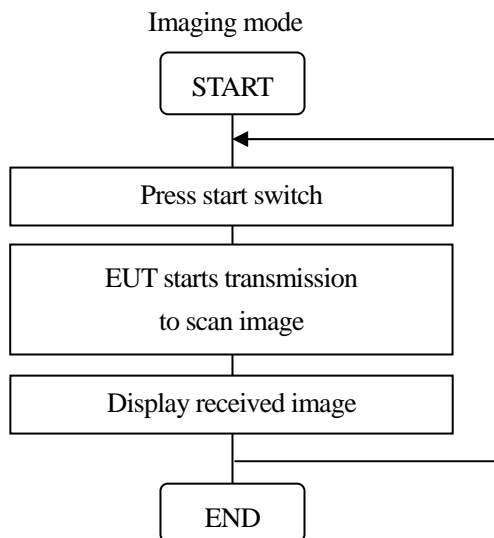
No.	EUT	Company	Model No.	Serial No.	FCC ID	Comment
1	HANDY SEARCH	Japan Radio Co., Ltd.	NJJ-95B	09	CKEHANDYSEARCH	-

Max frequency : 520MHz  
 Power ratings : Primary Power - 7.2Vdc (Battery)  
 Size : (W) 149 x (D) 216 x (H) 147 mm  
 Variation of model(s) : Not applicable

#### [RF Specification]

Frequency Range : 895 – 1249MHz (Single frequency)  
 Antenna (Rx and Tx) : Integral antenna (Pattern antenna)  
 Intended use : Ground penetrating radar

### 2.2 Operating mode



The EUT was operated at a pulse repetition rate (PRR) of 50kHz. The Start switch was configured to turn the transmitter on continuously. Note that the EUT can operate with an external printer, but the printer is not attached during imaging. The Subpart 15F results reported herein apply only to the EUT when in an imaging mode, without a printer.

### ***3. Configuration of equipment***

---

#### **3.1 Peripheral(s) used**

none

#### **3.2 Cable(s) used**

none

#### **3.3 System configuration**

1. HANDY SEARCH (EUT)
-----------------------

**4. Measurement procedure**

**4.1 Measurement procedure**

The radiated emission was measured at an Open Area Test Site (OATS). The EUT was configured above a sand pit of approximately 1m x 1m x 1m. The EUT was set to transmit continuously with its normal operational characteristics.

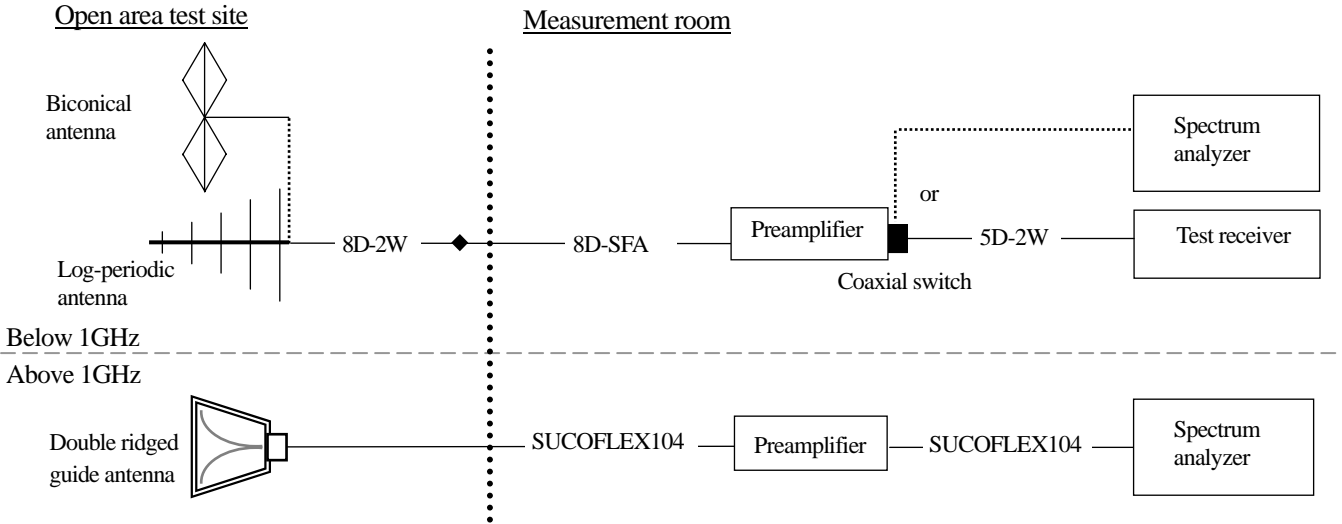
The EUT was configured for testing in a typical fashion (contact with the ground as a customer would normally use it).

Initial testing was performed to maximize emissions. The EUT was rotated every 45°, the antenna height was varied from 1 meter to 4 meters above the ground, and the antenna polarization was changed. The EUT azimuth of maximum emissions was recorded.

During final testing, the antenna height was varied from 1 meter to 4 meters above the ground, and the antenna polarization was changed. The EUT was rotated in 45° increments. This step by step procedure for maximizing emissions led to the data in this report. For measurements above 960MHz using the horn antenna, the horn was tilted to aim at the EUT. Distance from antenna to EUT is 3m below 960MHz, and 1m above 960MHz. The measurement level was re-calculated to a 3m measurement distance with 9.5dB. In measurements above 960MHz, antenna is tilted (55°) to aim at the EUT.

The EIRP limits in dBm were converted to field strength limits in dBuV/m@3m.  
 Example EIRP limit conversion: F.S.=EIRP+95.2

The emissions were scanned from 30MHz to 10GHz.  
 For measurements below 960MHz, the emissions were made using a Quasi-peak detector RBW=120kHz, VBW=100 kHz.  
 For Frequency above 960MHz and outside the below frequency bands, the emissions were measured using RMS detector, RBW=1 MHz, VBW=1 MHz  
 For frequencies fall inside 1164-1240 and 1559-1610MHz, the emissions were measured using EMI RMS Detector, RBW=1KHz, VBW=1MHz



#### 4.2 Test equipment

##### [Testing below 960MHz]

Equipment	Company	Model No.	Serial No.	Cal. due	Cal. date
Spectrum analyzer	Agilent Technologies	E4447A	MY46180188	Jan. 2008	Jan. 9, 2007
Test receiver	ROHDE&SCHWARZ	ESVS10	825475/012	Aug. 2008	Aug. 30, 2007
Biconical antenna	Schwarzbeck	VHA9103/BBA9106	1488	Jun. 2008	Jun. 16, 2007
Log periodic antenna	Schwarzbeck	UHALP9108A	0398	Jun. 2008	Jun. 16, 2007
Coaxial cable	FUJIKURA	8D-SFA/15m	YTCRFC#3R-001	Jun. 2008	Jun. 14, 2007
Coaxial cable	FUJIKURA	8D-SFA/15m	YTCRFC#3R-002	Jun. 2008	Jun. 14, 2007
Coaxial cable	FUJIKURA	8D-2W/8m	YTCRFC#3R-003	Jun. 2008	Jun. 14, 2007
Coaxial cable	FUJIKURA	5D-2W/1m	YTCRFC#3R,3C-001	Jun. 2008	Jun. 14, 2007
Coaxial cable	FUJIKURA	5D-2W/1m	YTCRFC#3R,3C-002	Jun. 2008	Jun. 14, 2007
Preamplifier	ANRITSU	MH648A	M96257	Jun. 2008	Jun. 14, 2007
Coaxial switch	ANRITSU	MP59B	6200331883	Jun. 2008	Jun. 14, 2007
Site attenuation	ZACTA Technology Corp.	N/A	N/A	Jul. 2008	Jul. 15, 2007
PC	IBM	6892-44J	97-43012	N/A	N/A
Software	ZACTA	EMI Data Sheet	Ver.2.80	N/A	N/A

##### [Testing above 960MHz]

Equipment	Company	Model No.	Serial No.	Cal. due	Cal. date
Spectrum analyzer	Agilent Technologies	E4447A	MY46180188	Jan. 2008	Jan. 9, 2007
Preamplifier	Agilent Technologies	8449B	3008A01008	Jan. 2008	Jan. 25, 2006
Double ridged guide antenna	EMCO	3115	5205	Oct. 2008	Oct. 11, 2006
Microwave cable	SUHNER	SUCOFLEX 104 15m	108014/4	Jan. 2008	Jan. 25, 2006
Microwave cable	SUHNER	SUCOFLEX 104 1m	108015/4	Jan. 2008	Jan. 25, 2006
PC	IBM	6892-44J	97-42089	N/A	N/A
Software	ZACTA	EMI Data Sheet	Ver.2.80	N/A	N/A

#### 4.3 Sample of field strength calculation

**Spurious Emission**       $\text{dB}\mu\text{V/m} = 20\log_{10}(\mu\text{V/m})$

Limit @147.6MHz = 150 $\mu\text{V/m}$ = 43.5dB $\mu\text{V/m}$
Reading = 42.8dB $\mu\text{V}$
Ant. Factor + Cable Loss - Amp. Gain = 14.2 + 3.0 - 30.0 = -12.8dB
Total = 42.8 - 12.8 = 30.0dB $\mu\text{V/m}$
Margin = 43.5 - 30.0 = <u>13.5dB</u>

## ***5. Measurement result***

### **5.1 [§15.509(a)] Operational restrictions**

#### **5.1.1 Requirements according to FCC 15.509(a)**

The UWB bandwidth is the frequency band bounded by the points that are 10dB below the highest radiated emission, as based on the complete transmission system including the antenna.

The UWB bandwidth of an imaging system operating under the provisions of this section must be below 10.6GHz.

#### **5.1.2 Test data**

Upper boundary fH: 1249 MHz

Lower boundary fL: 895 MHz

Center frequency fC: 1072 MHz

fM: 962.2 MHz

As for the data of the observed RF profiles, refer to **Appendix A**.

### **5.2 [§15.509(d), 15.209] Radiated Emission**

#### **5.2.1 Limit**

##### **[§15.209]**

The emissions from an intentional radiator shall not exceed the field strength levels specified in the following table;

Frequency (MHz)	Field Strength (iV/m)	Field Strength (dBiV/m)	Measurement distance (m)
0.009 – 0.490	2400/f (kHz)	67.6-20*log(f(kHz))	300
0.490 – 1.705	24000/f(kHz)	87.6-20*log(f(kHz))	30
1.705 – 30.0	30	29.5	30
30 – 88	100	40	3
88 - 216	150	43.5	3
216 - 960	200	46	3

- (a) In the emission table above, the tighter limit applies at the band edges.
- (b) The level of any unwanted emissions from an intentional radiator shall not exceed the level of the fundamental emission.
- (c) The limits in this table are based on the frequency of the unwanted emission and not the fundamental frequency.

##### **[§15.509(d)]**

The radiated emissions above 960MHz from a device operating under the provisions of this section shall not exceed the following average limits when measured using a resolution bandwidth of 1MHz. RMS average field strength measurements, required for all frequencies above 960MHz, shall be made using techniques to obtain true RMS average.

Frequency (MHz)	EIRP (dBm)
960 – 1610	-65.3
1610 – 1990	-53.3
Above 1990	-51.3

#### **5.2.2 Test data**

As for the data of the observed RF profiles, refer to **Appendix B**.



**5.3 [§15.509(e)] Radiated Emission**

**5.3.1 Limit**

The radiated emissions above 960MHz from a device operating under the provisions of this section shall not exceed the following average limits when measured using a resolution bandwidth of 1kHz. RMS average field strength measurements, required for all frequencies above 960MHz, shall be made using techniques to obtain true RMS average.

Frequency (MHz)	EIRP (dBm)
1164 – 1240	-75.3
1559 - 1610	-75.3

**5.3.2 Test data**

As for the data of the observed RF profiles, refer to **Appendix C**.

**5.4 [§15.509(f)] Highest radiated emission (fM)**

**5.4.1 Limit**

For UWB devices where the frequency at which the highest radiated emission occurs, fM, is above 960 MHz, there is a limit on the peak level of the emissions contained within a 50MHz bandwidth centered on fM. That limit is 0dBm EIRP. It is acceptable to employ a different resolution bandwidth, and a correspondingly different peak emission limit, following the procedures described in section 15.521.

**5.4.2 Test data**

The peak emission (using 1 MHz RBW with test procedure as specified in section 4.1) from the EUT is 39.1dBmV/m at 962.20MHz.

**Calculation:**

- Limit 0dBm EIRP at 50MHz (RBW)
- Limit -34dBm EIRP at 1MHz (RBW) [20 log (1/50) = -34dBm]
- Limit -34dBm EIRP = 61.2dBmV/m [-34 (dBm EIRP) + 95.250MHz = 61.2 (dBmV/m)]

Margin to limit: 61.2-39.1 = 22.1dB

## 6. Uncertainty of measurement

Expanded uncertainties stated were calculated with a coverage Factor k=2.

Please note that these results are not taken into account when determining compliance or non-compliance with test result.

Test item	Measurement uncertainty
Radiated emission (30MHz - 1000MHz)	±5.2dB
Radiated emission (1000MHz - 26GHz)	±3.6dB

## 7. Laboratory description

### 1. Location: ZACTA Technology Corporation Yonezawa Testing Center

4149-7 Hachimanpara 5-chome Yonezawa-shi Yamagata 992-1128 Japan

Phone: +81-238-28-2880 Fax: +81-238-28-2888

### 2. Facility filing information:

1) NVLAP accreditation: NVLAP Lab. code: 200306-0

2) FCC Registration Number: 540072

3) Industry Canada Oats site filing: Pursuant to RSS 212, Issue 1(Provisional)

Site name	Sites on file: Oats 3m/10m	Filing date (Terms of validity: 3 years)
Site 1	4224-1	January 11, 2005
Site 2	4224-2	January 11, 2005
Site 3	4224-3	January 11, 2005

4) VCCI site filing: Pursuant to V-5/2006.04 VCCI regulations for registration of measurement facilities

Site name	Radiated emission registration No.	Conducted emission registration No.	Duration of registration
Site 1	R-136	C-132	November 16, 2008
Site 2	R-137	C-133	November 16, 2008
Site 3	R-138	C-134	November 16, 2008
10m Semi-anechoic chamber	R-2480	C-2722	December 19, 2009
3m Semi-anechoic chamber	R-2481	C-2723	December 19, 2009
Shielded room No.1	-	C-2724	December 19, 2009

5) ETL SEMKO authorization:

Authorized as an EMC test laboratory.

6) TUV Rheinland authorization:

Authorized as an EMC test laboratory.

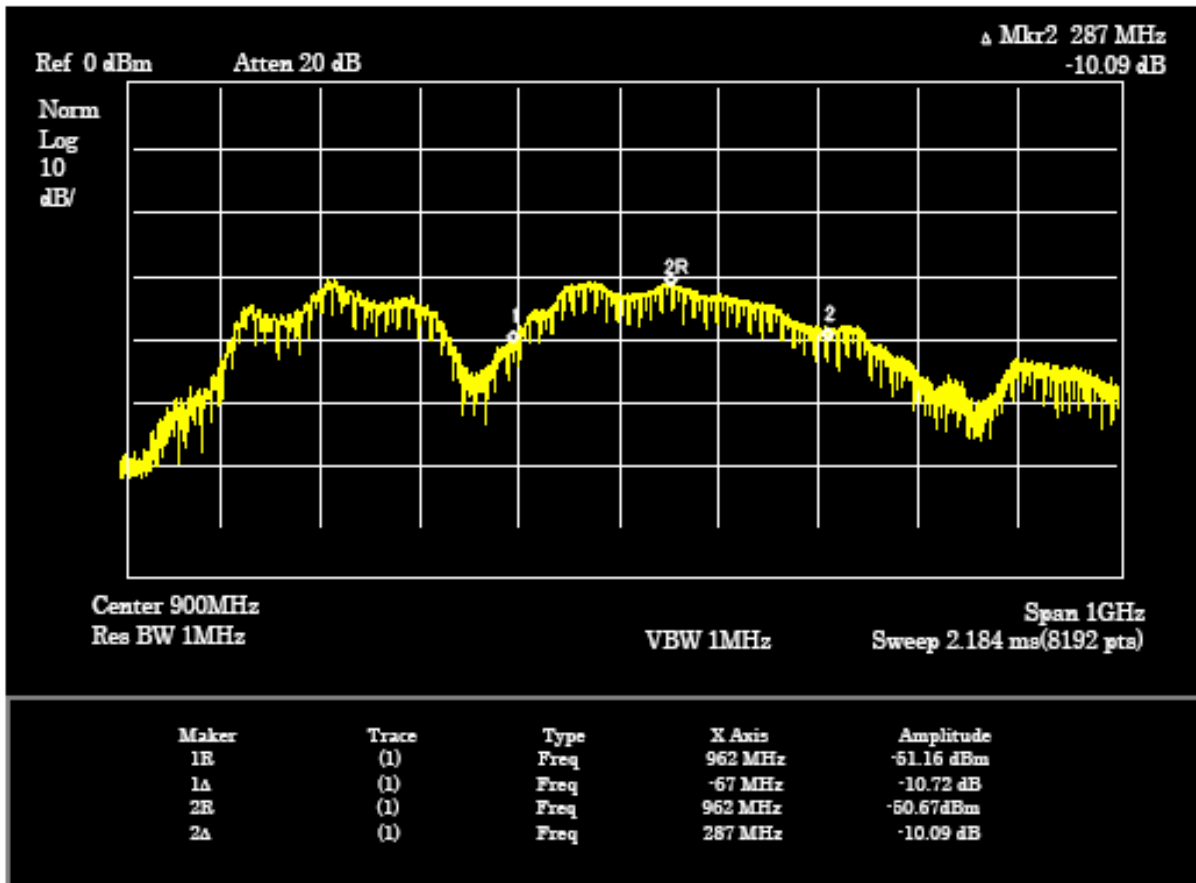
***8. Configuration photographs***

---

**Radiated emission**



## Appendix A



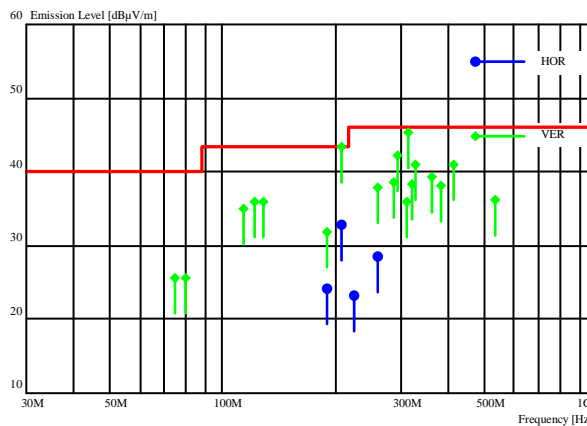
## Appendix B

\*\*\*\*\* RADIATED EMISSION \*\*\*\*\*

Sheet number : 1

Standard : FCC Part 15 Subpart F  
Class : N/A  
Distance [m] : 3  
Date of test : 2007/9/25  
Test site : 3  
Temperature [ ° C] : 22.9  
Humidity [%] : 65.4  
Operator : Y.Takahashi

Company name : Japan Radio Co., Ltd.  
EUT : HANDY SEARCH  
Model number : NJJ-95B  
Serial number : 09  
Test mode : Imaging mode  
Comment :



Antenna Pol.	Antenna Height [m]	Table Radian [Deg.]	Reading Frequency [MHz]	Reading Level [dBuV]	Factor [dB/m]	Emission Level [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Comment
VER	1.0	0	74.58	47.9	-22.3	25.6	40.0	14.4	
VER	1.0	0	79.98	47.8	-22.2	25.6	40.0	14.4	
VER	1.0	135	113.57	50.7	-15.6	35.1	43.5	8.4	
VER	1.0	135	121.33	50.7	-14.8	35.9	43.5	7.6	
VER	1.0	135	129.07	50.3	-14.3	36.0	43.5	7.5	
VER	1.0	225	190.60	43.0	-11.2	31.8	43.5	11.7	
HOR	3.4	0	190.65	35.3	-11.2	24.1	43.5	19.4	
VER	1.0	0	207.97	54.3	-10.9	43.4	43.5	0.1	*
HOR	2.4	270	208.00	43.9	-11.0	32.9	43.5	10.6	
HOR	4.0	0	225.31	33.4	-10.2	23.2	46.0	22.8	
VER	1.0	225	259.96	47.2	-9.2	38.0	46.0	8.0	
HOR	2.6	0	259.98	37.7	-9.2	28.5	46.0	17.5	
VER	1.0	315	285.97	46.9	-8.2	38.7	46.0	7.3	
VER	1.0	0	294.65	49.7	-7.4	42.3	46.0	3.7	
VER	1.0	45	308.64	49.0	-13.0	36.0	46.0	10.0	
VER	1.0	0	311.95	58.3	-12.9	45.4	46.0	0.6	
VER	1.0	225	320.00	51.2	-12.9	38.3	46.0	7.7	
VER	1.0	0	329.28	53.8	-12.8	41.0	46.0	5.0	
VER	1.0	0	363.96	51.3	-11.9	39.4	46.0	6.6	
VER	1.0	225	384.00	49.4	-11.2	38.2	46.0	7.8	
VER	1.0	180	415.97	50.9	-9.9	41.0	46.0	5.0	
VER	1.0	225	537.26	44.0	-7.8	36.2	46.0	9.8	

\* : The worst emission. Factor : Antenna Factor + Cable Loss - Amp Gain Ver.2.80 F3#026

\*\*\*\*\* **RADIATED EMISSION** \*\*\*\*\*

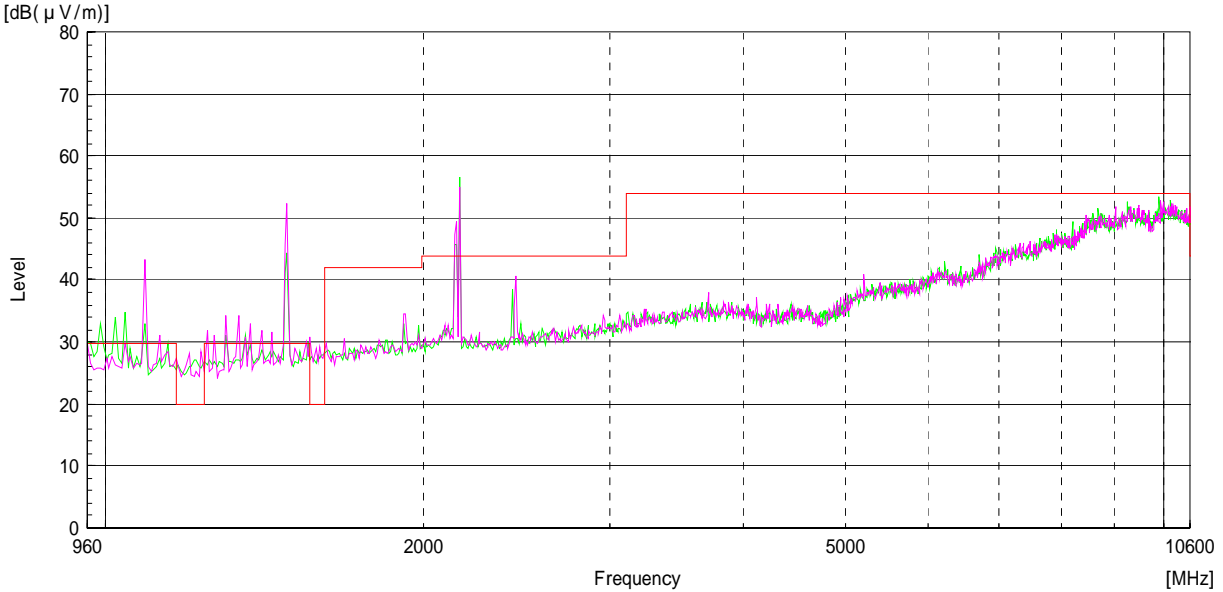
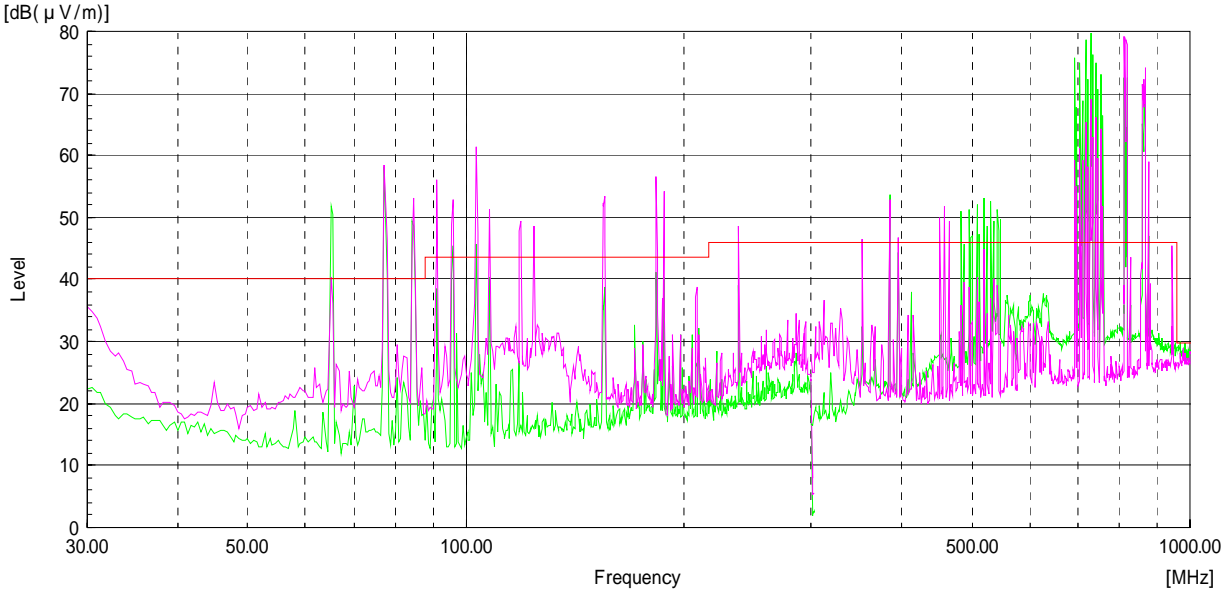
Sheet number : 2

Standard : FCC Part 15 Subpart F  
Class : N/A  
Distance [m] : 3  
Date of test : 2007/9/26  
Test site : 3  
Temperature [ ° C] : 21.7  
Humidity [%] : 51.7  
Operator : Y.Takahashi

Company name : Japan Radio Co., Ltd.  
EUT : HANDY SEARCH  
Model number : NJJ-95B  
Serial number : 09  
Test mode : Imaging mode  
Comment :

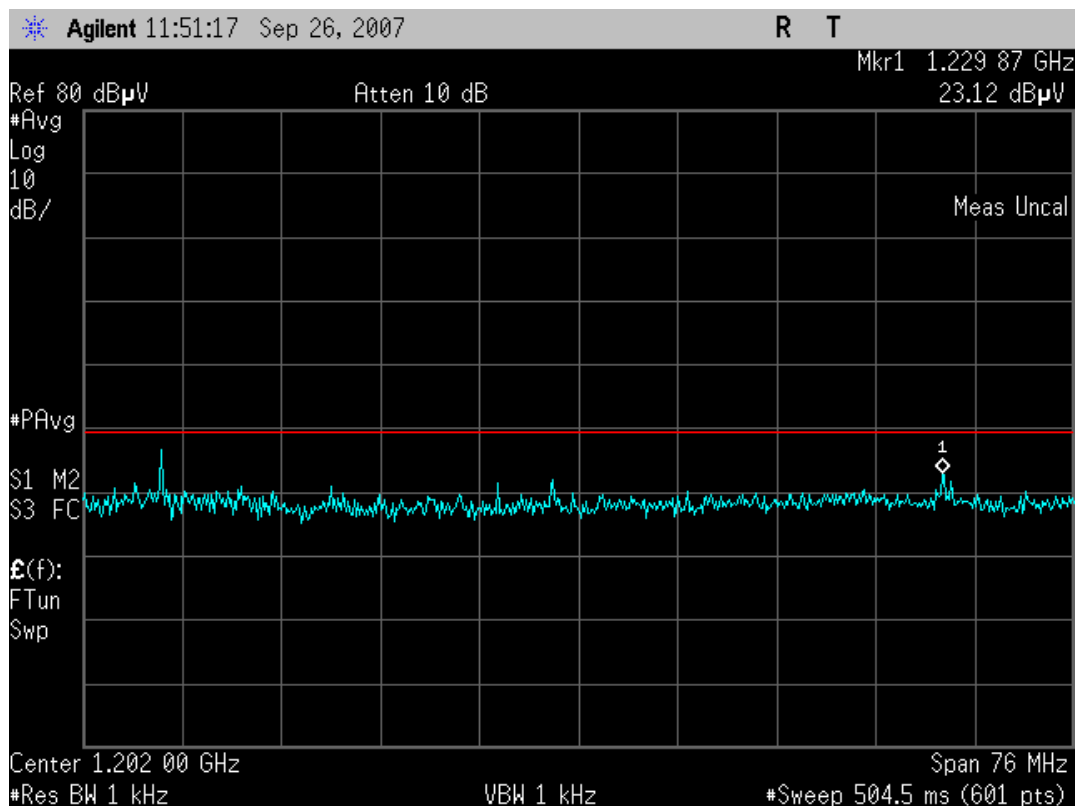
Antenna Pol.	Antenna Height [m]	Table Radian [Deg.]	Reading Frequency [MHz]	Reading Level [dBμV]	Factor [dB/m]	Emission Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Comment
VER	1.0	225	962.07	49.0	-10.1	38.9	39.4	0.5	
HOR	1.0	180	962.20	49.2	-10.1	39.1	39.4	0.3	*
HOR	1.0	180	1047.80	47.9	-10.1	37.8	39.4	1.6	
VER	1.0	135	1049.80	45.4	-10.1	35.3	39.4	4.1	
HOR	1.0	180	1140.30	46.3	-8.9	37.4	39.4	2.0	
HOR	1.0	180	1238.90	45.1	-7.9	37.2	39.4	2.2	
HOR	1.0	180	1984.90	40.6	-3.4	37.2	51.4	14.2	
VER	1.0	180	1985.00	39.2	-3.4	35.8	51.4	15.6	
HOR	1.0	180	2095.00	46.0	-3.1	42.9	53.4	10.5	
VER	1.0	180	2099.00	44.2	-3.1	41.1	53.4	12.3	

-----  
\* : The worst emission. Factor : Antenna Factor + Cable Loss - Amp Gain Ver.2.80 F3#026

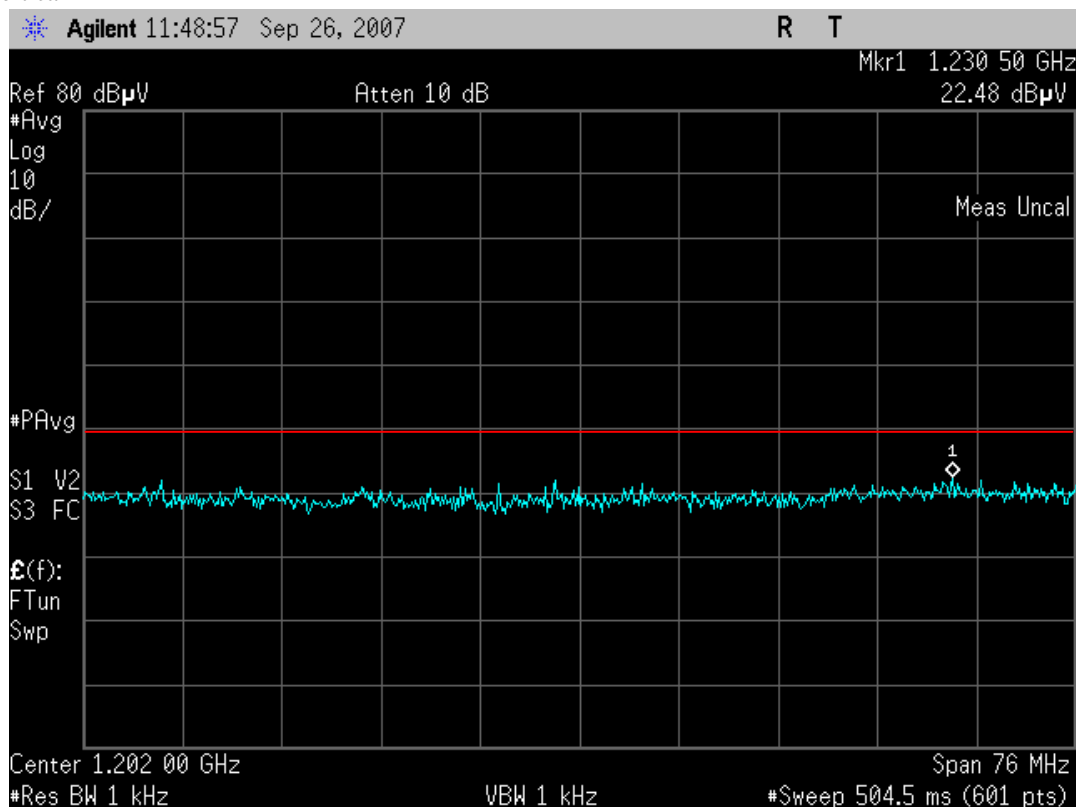


## Appendix C

Horizontal

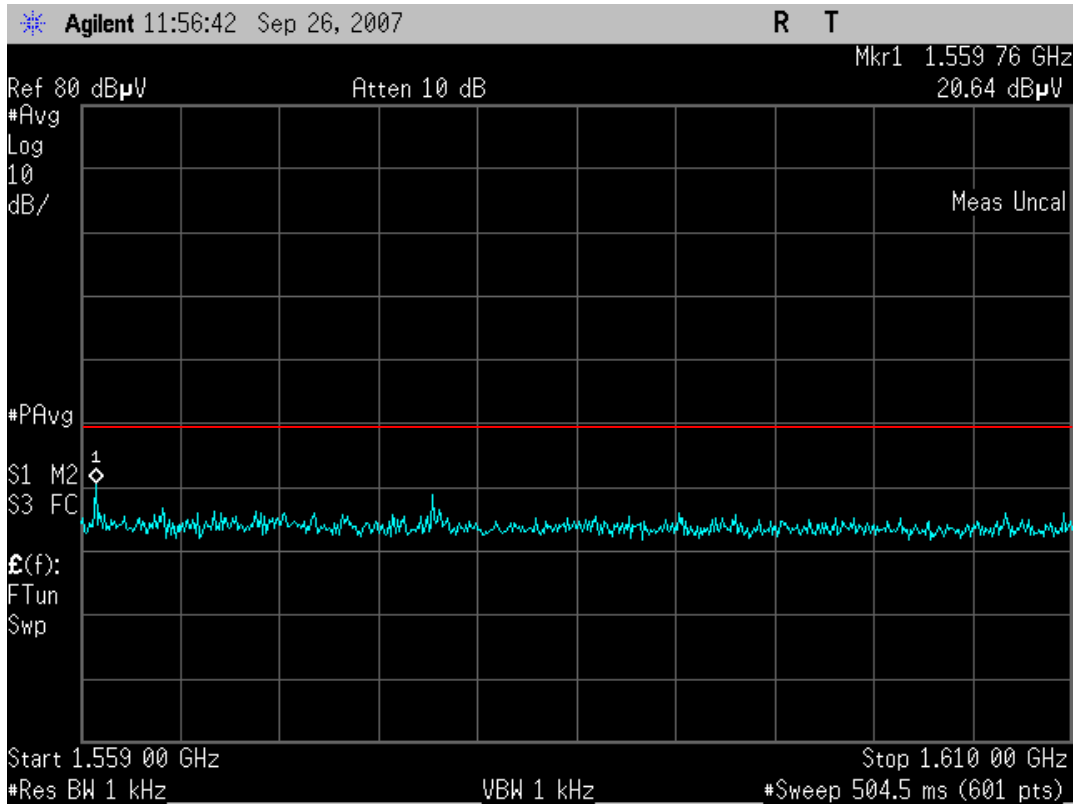


Vertical





Horizontal



Vertical

