

## KANSAI ELECTRONIC INDUSTRY DEVELOPMENT CENTER

HEAD OFFICE  
6-8-7 NISHITENMA  
KITA-KU OSAKA 530-0047 JAPAN



Corporate Juridical Person

IKOMA TESTING LABORATORY  
12128 TAKAYAMA-CHO  
IKOMA-CITY NARA 630-0101 JAPAN

TEST REPORT

Report No. A-004-07-C

Date: 16 March 2007

This test report is to certify that the tested device properly complies with the requirements of:

FCC Rules and Regulations Part 15 Subpart C Intentional Radiators

All the tests necessary to show compliance to the requirements were performed and these results met the specifications of requirement. The results of this report should not be construed to imply compliance of equipment other than that, which was tested. Unless the laboratory permission, this report should not be copied in part.

**1. Applicant**

Company Name : SANWA ELECTRONIC INSTRUMENT CO., LTD.  
Mailing Address : 1-2-50 Yoshidahonmachi, higashiosaka, Osaka 578-0982

**2. Identification of Tested Device**

Type of Device : Direct Sequence Spread Spectrum Transmitter  
Type of Modulation : ☐ FHSS ☒ DSSS ☐ Other method  
Kind of Equipment Authorization : ☐ DoC ☒ Certification ☐ Verification  
FCC ID : AXYATX038  
Device Name : Module for radio control model  
Trade Name : Airtronics  
Model Number : 93724  
Serial Number : -  
☐ Production ☒ Pre-production ☐ Prototype  
Date of Manufacture : February 2007

**3. Test Items and Procedure**

☒ 6dB Bandwidth Measurement  
☒ Peak Output Power Measurement  
☒ Band Edge RF Conducted Emission Measurement  
☒ Spurious RF Conducted Emission Measurement  
☒ Power Density Measurement  
☒ Radiated Spurious Emission Measurement  
☐ AC Power Line Conducted Emission Measurement

Above all tests were performed under: ANSI C63.4-2003

☒ without deviation, ☐ with deviation (details are found inside of this report)

**4. Date of Test**

Receipt of Test Sample : 20 February 2007  
Condition of Test Sample : ☒ Damage is not found on the set.  
☐ Damage is found on the set. (Details are described in this report)  
Test Completed on : 6 March 2007


  
Seichi Izumi  
General Manager / Ikoma Testing Laboratory

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## 0. LABORATORY ACCREDITATION AND MEASUREMENT UNCERTAINTY

### 0.1. Laboratory Accreditation

KEC is accredited by the National Voluntary Laboratory Accreditation Program (NVLAP) for the specific scope of accreditation under Lab Code: 200207-0.

When the test report concerns with the NVLAP accreditation test, the first page of the test report is signed by NVLAP Approved Signatory accompanied by the NVLAP logo.

The report must not be used by the client to claim product endorsement by NVLAP or any agency of the U.S. Government.

### 0.2. Measurement Uncertainty

The result of a measurement is only an approximation or estimate of the value of a specific quantity. And thus the measurand is complete only when a statement of uncertainty is given.

KEC quotes Measurement Uncertainty (U)

- of  $\pm 3 \times 10^{-9}$  for 6dB Bandwidth Measurement
- of  $\pm 0.7$  dB for Peak Output Power Measurement
- of  $\pm 0.7$  dB for Band Edge RF Conducted Measurement
- of  $\pm 0.7$  dB for Spurious RF Conducted Emission Measurement
- of  $\pm 0.7$  dB for Power Density
- of  $\pm 4.9$  dB for Radiated Emissions
- of  $\pm 2.2$  dB for Conducted Emissions

## 1. CERTIFICATION OF THE COMPLIANCE

This test report is to certify that the tested device properly complies with the requirements of FCC Rules and Regulations Part 15 Subpart C Intentional Radiators.

## 2. GENERAL INFORMATION

### 2.1. Product Description

The Airtronics Model No. 93724 (referred to as the EUT in this report) is a radio controller module of 2.4GHz band.

#### (1) Technical Specification

- Access type : Direct Sequence Spread Spectrum Method
- Tx Frequency range : 2402 ~ 2478MHz (76ch)
- Output power : 0.01W (typical)
- Antenna : Built in antenna, Antenna Gain 1.1 ~ 1.9dBi  
Impedance 50Ω (Unbalanced)

#### (2) Used Oscillators Frequencies

- RF TRANSCEIVER IC Clock : 13.000MHz
- CPU Clock : 24.000MHz

#### (3) Provided Terminals

- 6 PIN Connector : for connected Ni-Cd battery

#### (4) Rated Power Supply : DC 10V

The rated power is supplied from Ni-Cd battery.

## 2.2. Description for Equipment Authorization

(1) Type of device	: <input checked="" type="checkbox"/> Intentional Radiators
(2) Reference Rule and Specification	: FCC Rule Part 15 Subpart C, Section 15.247 Operation with in the bands 902 ~ 928MHz, 2400 ~ 2483.5MHz, and 5725 ~ 5850MHz
(3) Kind of Equipment Authorization	: <input type="checkbox"/> DoC <input checked="" type="checkbox"/> Certification <input type="checkbox"/> Verification
(4) Procedure of Application	: <input checked="" type="checkbox"/> Original Equipment <input type="checkbox"/> Modification
(5) Highest Frequency used in the Device	: 2402 ~ 2478MHz
(6) Upper Frequency of Radiated Emission Measurement Range :	<input type="checkbox"/> 1000MHz <input type="checkbox"/> 2000MHz <input type="checkbox"/> 5000MHz <input checked="" type="checkbox"/> Tenth harmonics of the highest fundamental frequency

## 2.3. Test Facility

All tests described in this report were performed by:	
Name:	KANSAI ELECTRONIC INDUSTRY DEVELOPMENT CENTER (KEC) IKOMA TESTING LABORATORY
Open Area Test Site	<input type="checkbox"/> No.1 <input type="checkbox"/> No.4
Anechoic Chamber	<input checked="" type="checkbox"/> No.1 <input checked="" type="checkbox"/> No.3
Shielded Room	<input checked="" type="checkbox"/> No.1 <input type="checkbox"/> No.2 <input type="checkbox"/> No.4 <input type="checkbox"/> No.5 <input checked="" type="checkbox"/> No.6
Address:	12128, Takayama-cho Ikoma-city, Nara, 630-0101 Japan
<p>These test facilities have been filed with the FCC under the criteria of ANSI C63.4-2003.  The KEC has been accredited by the NVLAP (Lab. Code: 200207-0) based on ISO/IEC 17025.  Also the laboratory has been authorized by TUV SUD JAPAN and TUV Rheinland Japan based on their criteria for testing laboratory (ISO/IEC 17025).  EMC M.C. Anechoic Chamber No.3 has been filed with the Industry Canada under the criteria of RSS212, issue 1. (File number : IC4149-3)</p>	

### 3. TESTED SYSTEM

#### 3.1. Test Mode

The compliance test was performed under test modes.

Op-mode 1: Transmitting continuous data at 2402MHz with modulation

Op-mode 2: Transmitting continuous data at 2442MHz with modulation

Op-mode 3: Transmitting continuous data at 2478MHz with modulation

The EUT is designed both of a horizontally placed and vertically place. In radiated emission measurement, each condition was conducted.

As a result, the emission that produce the maximum operation modes were reported.

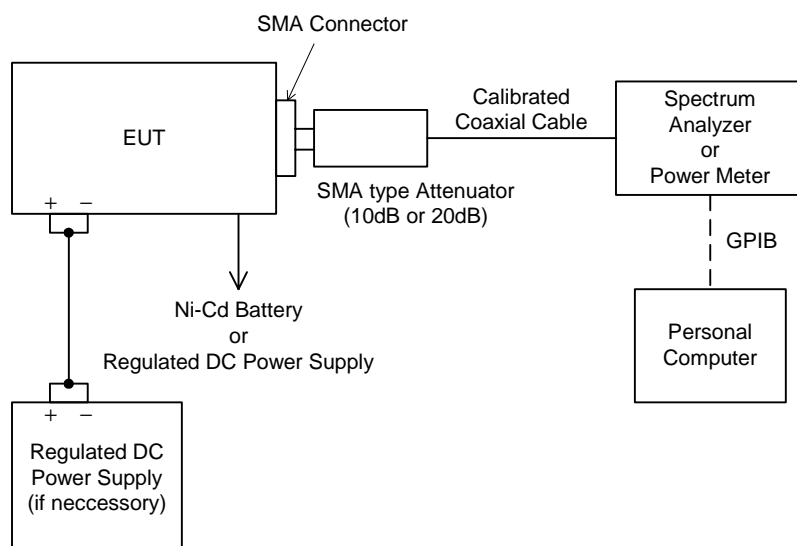
- |   |                                      |
|---|--------------------------------------|
| a) 20dB Bandwidth measurement                 | : Op-mode 1, Op-mode 2 and Op-mode 3 |
| b) Peak Output Power measurement              | : Op-mode 1 ,Op-mode 2 and Op-mode 3 |
| c) Band Edge RF Conducted measurement         | : Op-mode 1 and Op-mode 3            |
| d) Spurious RF Conducted emission measurement | : Op-mode 1 ,Op-mode 2 and Op-mode 3 |
| e) Power Density measurement                  | : Op-mode 1 ,Op-mode 2 and Op-mode 3 |
| f) Radiated Emission measurement              | : Op-mode 1 ,Op-mode 2 and Op-mode 3 |

#### 3.2. Characterization and condition of EUT System

☒ normal, ☐ not normal (that is )

### 3.3. Test Setup Diagram

- 6dB Bandwidth
- Peak Output Power
- Band Edge RF Conducted Emission
- Spurious RF Conducted Emission
- Peak Power Density



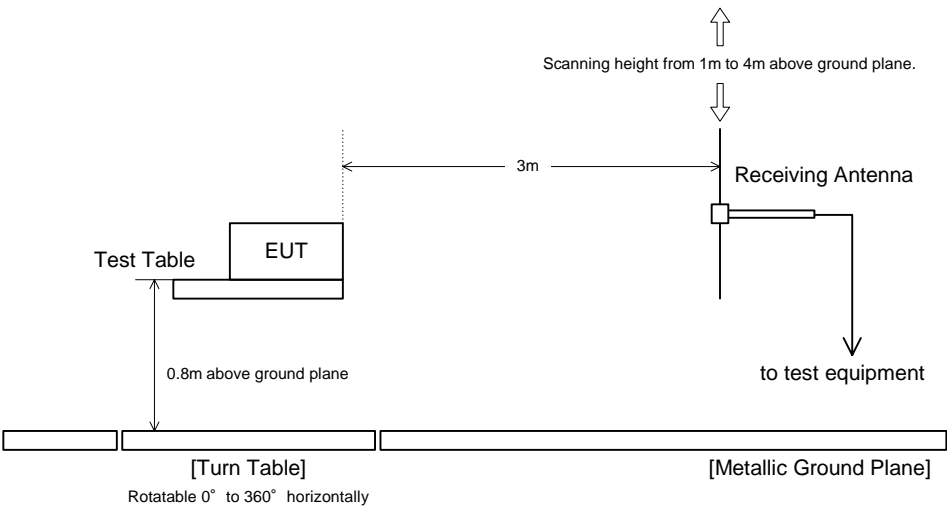
[Note]

Regulated DC Power Supply is not used in this report.

- Continued -

· Radiated Emission Measurement

[Open Area Test Site or Anechoic Chamber]

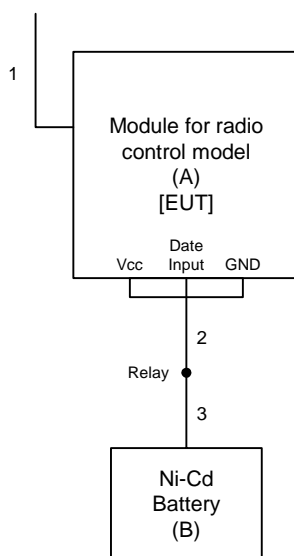


[Note]

- Test Table size : 1.0m × 1.0m, Height 0.8m, Material : Expanded Polystyrene
- Receiving Antenna : Tuned dipole antenna, Biconical antenna (30-300MHz) or Log-periodic antenna (30-1000MHz) or Standard gain horn antenna (Above 1GHz)  
Scan from 1.0m to 4.0m above ground plane expect for vertical polarization the minimum height of center of antenna is increased so that the lowest point of the bottom of the antenna clears the ground surface by at least 25cm.
- Interconnecting cables : Excess part of the interconnecting cables longer than 1meter are bundled in the center. Cables that hang closer than 40cm to the ground plane is folded back and forth forming bundled 30 to 40 cm long, hanging approx, in the middle between the ground plane and table.
- AC Power Cables : All AC Power cord drape to the floor and are routed over the receptacle. In case of floor-Standing Equipment, Excess power cords are bundled in the center or shortened to appropriate length.
- Floor-Standing Equipment : EUT and all cables are insulated from the ground plane by 3mm to 12mm of insulating material



## 3.4. Block Diagram of EUT System



[Note]

See 3.5. List of EUT System and 3.6. List of Cables

## 3.5. List of EUT System

No	Device Name	Model Number (Serial Number)	FCC ID (Trade Name)	Note
A	Module for radio control model	93724 ( - )	AXYATX038 (Airtronics)	EUT
B	8 cell Ni-Cd Battery	8KR-1100AAU ( - )	N/A (Cadnica)	

[Attention]

N/A : Not Applicable

## 3.6. List of Cables

No	Cable Name	Shielded (Y/N)	Length (m)	Note	Remark
1	Antenna Cable	Y	0.1		
2	Relay Cord	N	0.25		
3	Relay Cord	N	0.1		

## 4. 6dB BANDWIDTH MEASUREMENT (§15.247 (a) (2))

## 4.1. Test Procedure

- (1) Connect the EUT RF output port to spectrum analyzer via calibrated coaxial cable and suitable attenuator (if necessary).
- (2) Activates the EUT System and execute the software prepared for test, if necessary.
- (3) To find out the maximum emission condition, the transmitting data rate of EUT is set to maximum data rate.
- (4) The Spectrums are scanned and allow the trace stabilized.
- (5) The both side of 6dB down value from peak power were measured by using delta-maker function of the spectrum analyzer (\*1).
- (6) Above measurement were performed under low-band hopping frequency, mid-band hopping frequency and high band hopping frequency.

## [Note]

- (\*1) Spectrum Analyzer Set Up Conditions
- |                      |              |
|----------------------|--------------|
| Frequency Span       | : 5MHz       |
| Resolution bandwidth | : 100kHz     |
| Video bandwidth      | : $\geq$ RBW |
| Sweep                | : Auto       |
| Detector function    | : Peak       |
| Trace Mode           | : Max Hold   |

## 4.2. Test Results

Measured Frequency [ MHz ]	Measured Bandwidth [ kHz ]	Limit [ kHz ]
2402	935	>500
2442	925	>500
2478	935	>500

## [Note]

- (1) See next page figure 1 to 3.  
(2) The worst case of data rate : 2 Mbps.

## [Test Condition]

EUT operation : Data transmission  
EUT channel : 0, 40, 76 (2402, 2442, 2478MHz)

## [Environment]

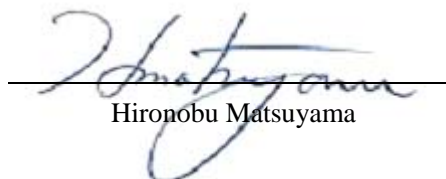
Temperature: 23 °C

Humidity: 45 %

## [Tested Date / Tester]

6 March 2007

Signature



Hironobu Matsuyama

Spectrum Chart

figure 1

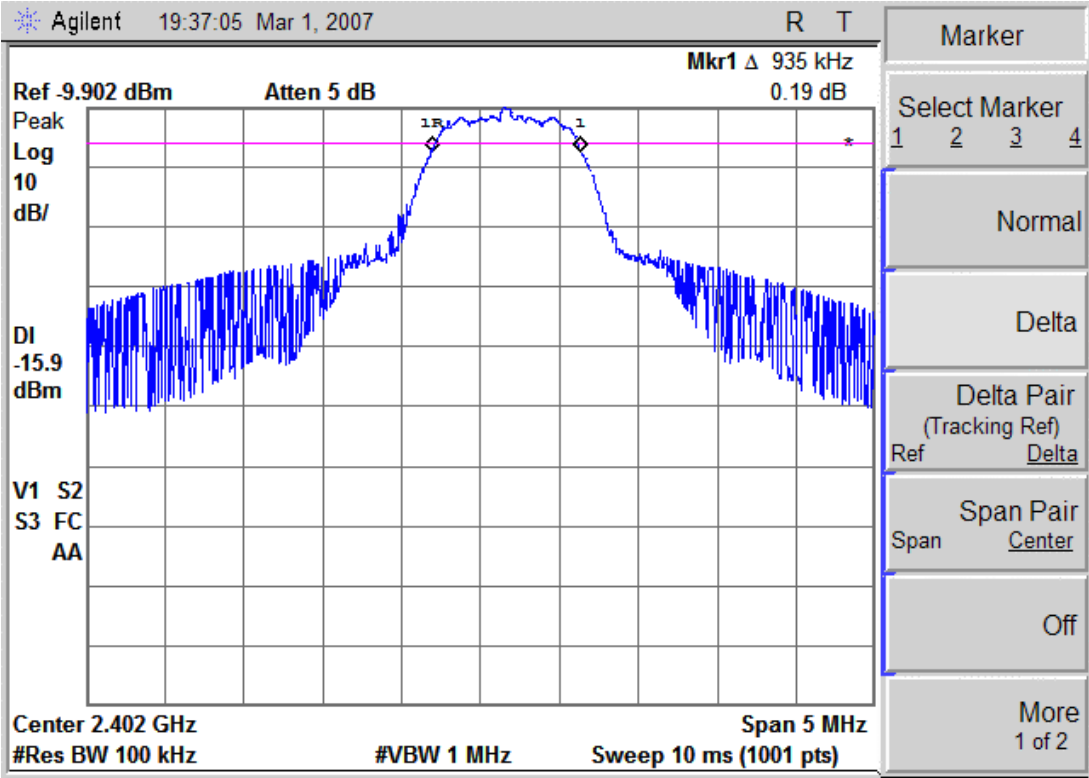
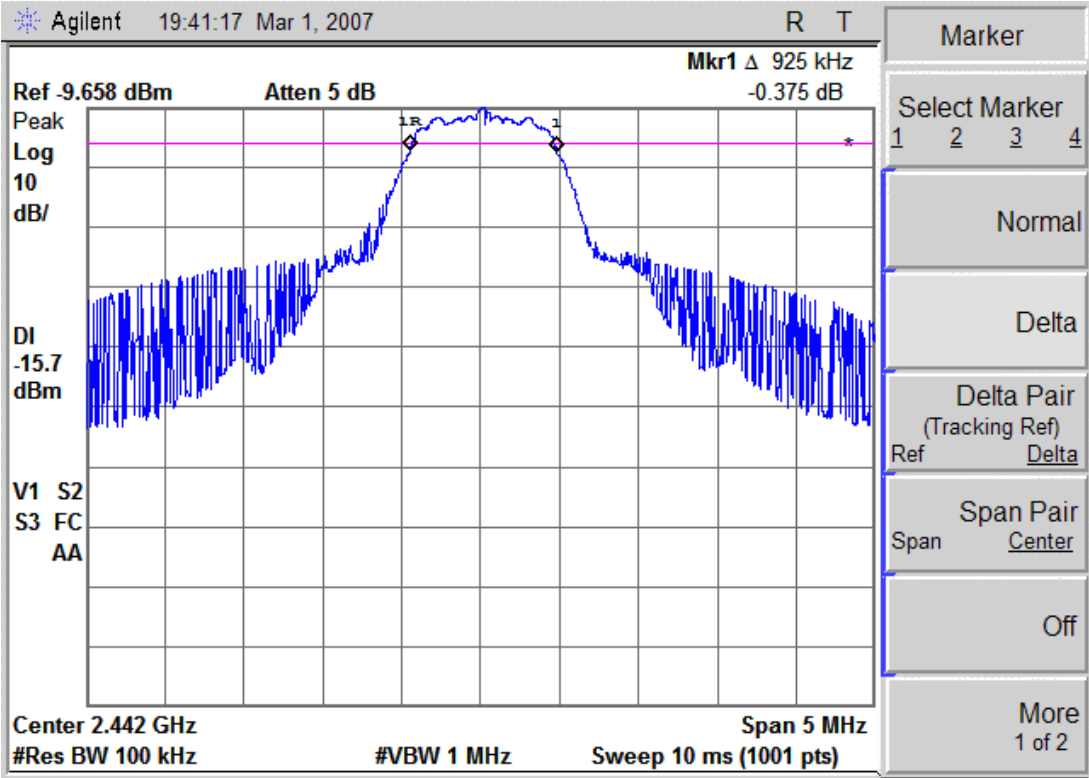
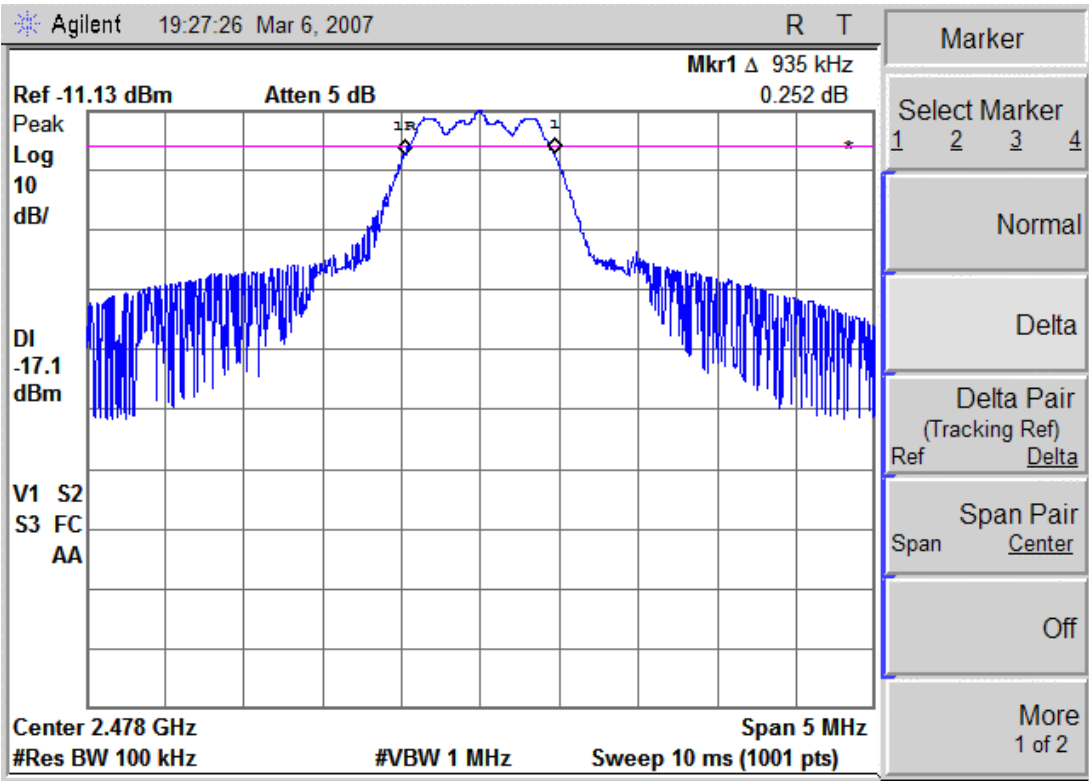


figure 2



- Continued -

figure 3



## 5. PEAK OUTPUT POWER MEASUREMENT (§15.247 (b) (3))

### 5.1. Test Procedure

- (1) Connect the EUT RF output port to spectrum analyzer via calibrated coaxial cable and suitable attenuator (if necessary).
- (2) Activates the EUT System and executes the software prepared for test, if necessary.
- (3) To find out the worst case, the transmitting data rate of EUT is varied with the different modes of operation. The final test condition is recorded in this report.
- (4) The spectrums are scanned and allow the trace to stabilize.
- (5) The peak output power was determined by using the marker-data function of spectrum analyzer (\*1) or peak type power meter.

#### [Note]

##### (\*1) Spectrum Analyzer Set Up Conditions

Frequency Span	: 20dB bandwidth of the emission being measured
Resolution bandwidth	: $\geq 5\text{MHz}$
Video bandwidth	: $\geq \text{RBW}$
Sweep	: Auto
Detector function	: Peak
Trace Mode	: Max Hold

## 5.2. Test Results

Measured Frequency [ MHz ]	Correction Factor [ dB ]	Meter Reading [ dBm ]	Output Power [ dBm ]	Limit [ dBm ]	Margin for Limit [ dB ]
2402	20.4	-8.0	12.4	30.0	17.6
2442	20.4	-8.4	12.0	30.0	18.0
2478	20.4	-10.1	10.3	30.0	19.7

## [Note]

- (1) Correction Factor includes the both loss of attenuator and cable used in the measurement.
- (2) The measurement was performed by peak type power meter.
- (3) See next page figure 4 to 6.

## [Calculation method]

Peak Output Power (dBm) = Meter Reading (dBm) + Correction Factor (dB)

## [Test Condition]

EUT operation : Data transmission  
EUT channel : 0, 40, 76 (2402, 2442, 2478MHz)

## [Environment]


Temperature: 24 °C

Humidity: 38 %

## [Tested Date / Tester]

6 March 2007

Signature

  
 Hironobu Matsuyama

Spectrum Chart

figure 4

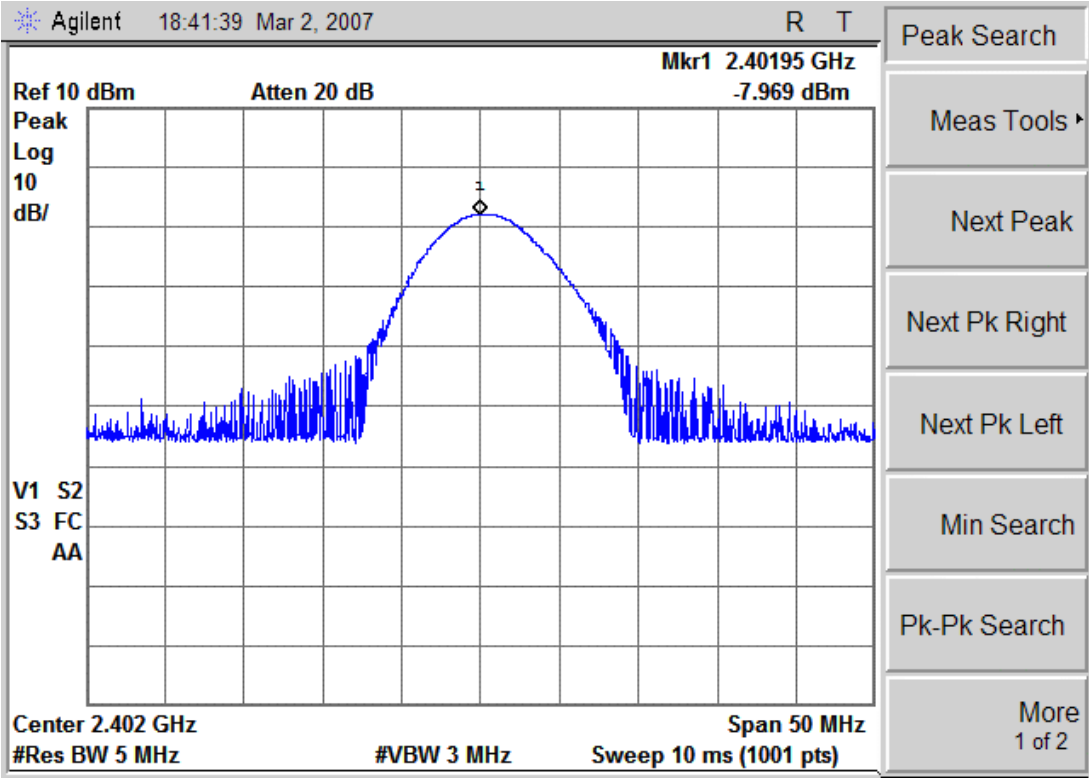
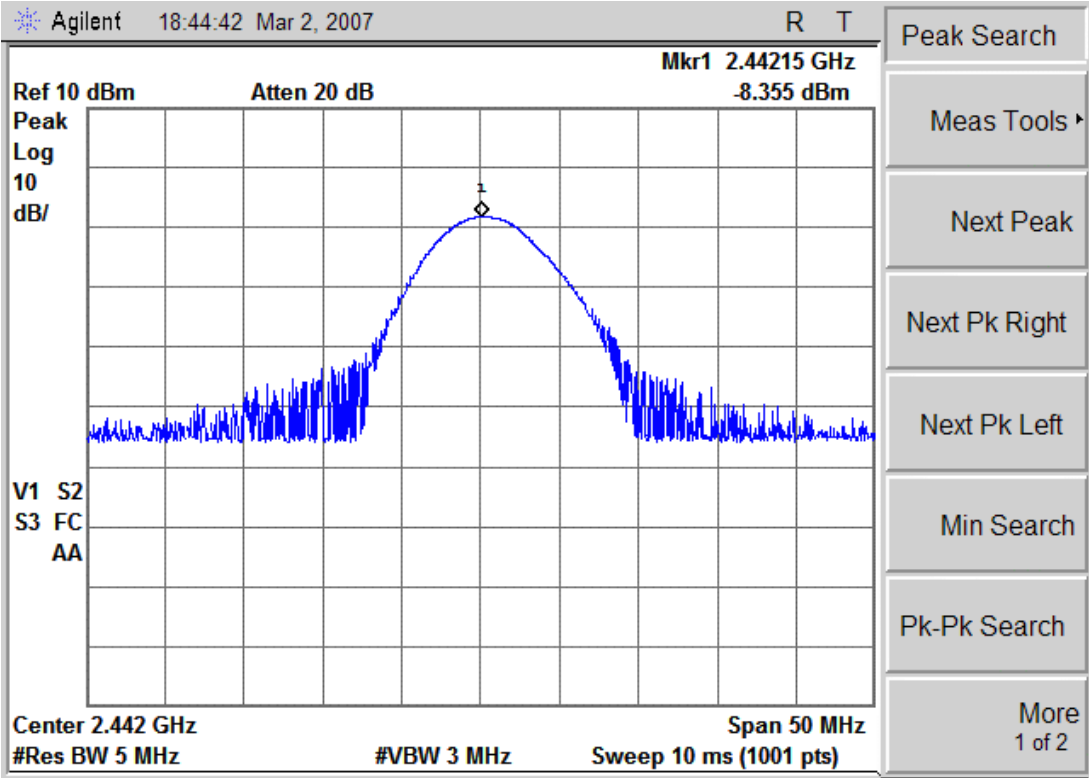


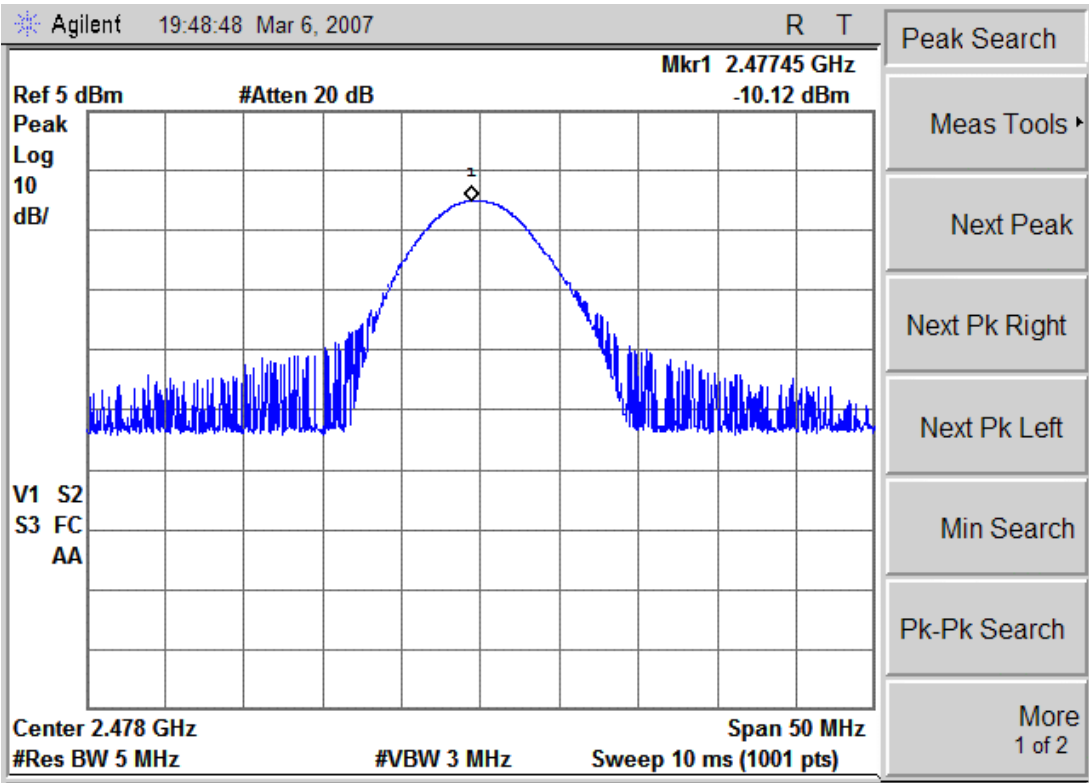
figure 5





- Continued -

figure 6



## 6. BAND EDGE RF CONDUCTED EMISSION MEASUREMENT (§15.247 (c))

## 6.1. Test Procedure

- (1) Connect the EUT RF output port to the spectrum analyzer via calibrated coaxial cable and suitable attenuator (if necessary).
- (2) Activates the EUT System and executes the software prepared for test, if necessary.
- (3) To find out the maximum emission condition, the transmitting data rate of EUT is set to maximum data rate.
- (4) The spectrum are scanned.
- (5) The emission at the band edge or the highest modulation product outside of band were measured by using the marker function of spectrum analyzer (\*1).
- (6) The peak of the in-band emission were measured by using the marker to peak function of spectrum analyzer.
- (7) Above measurement were repeated at other side band edge.

## [Note]

## (\*1) Spectrum Analyzer Set Up Conditions

Frequency Span	: Wide enough to capture the peak level of emission on the closest to the band edge
Resolution bandwidth	: 100kHz
Video bandwidth	: $\geq$ RBW
Sweep	: Auto
Detector function	: Peak
Trace Mode	: Max Hold

## 6.2. Test Results

Measured Frequency [ MHz ]	Measured Separation From Carrier [ dBc ]	Limit [ dBc ]	Margin For Limit [ dB ]
2390.00	51.8	20	> 31.8
2483.50	42.9	20	> 22.9

## [Note]

See next page figure 7 to 8.

## [Test Condition]

EUT operation : Data transmission  
EUT channel : 0, 40, 76 (2402, 2442, 2478MHz)

## [Environment]

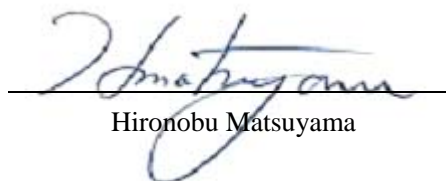
Temperature: 24 °C

Humidity: 38 %

## [Tested Date / Tester]

6 March 2007

Signature



Hironobu Matsuyama

Spectrum Chart

figure 7

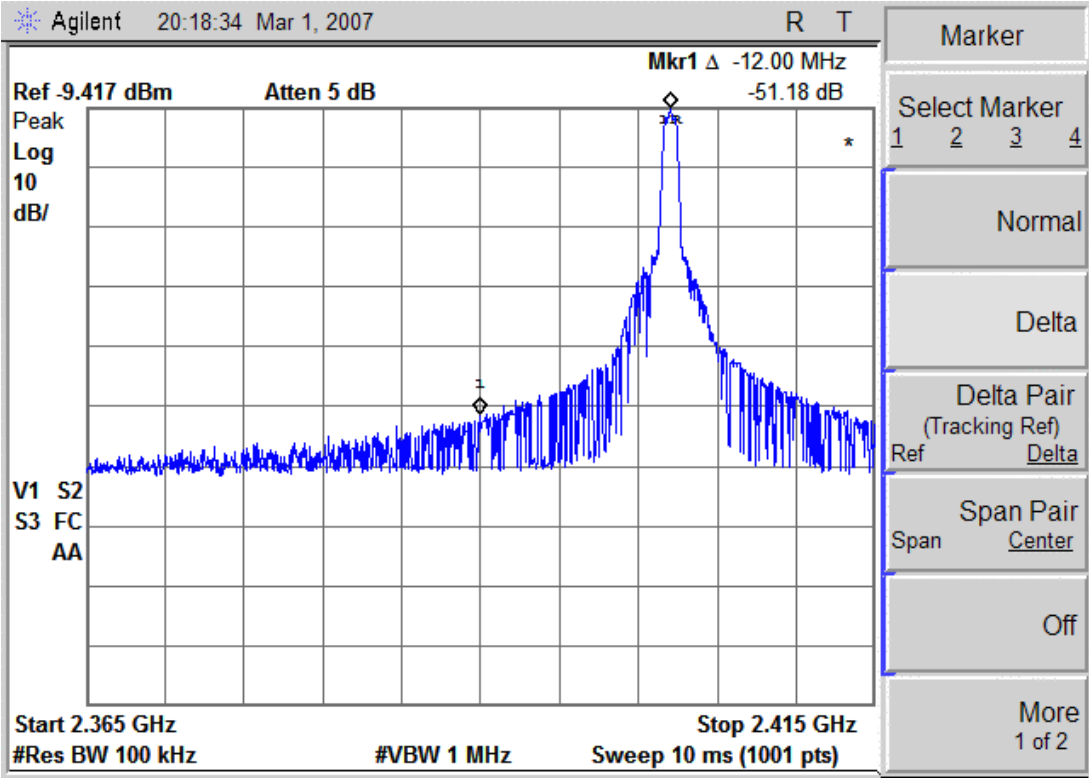
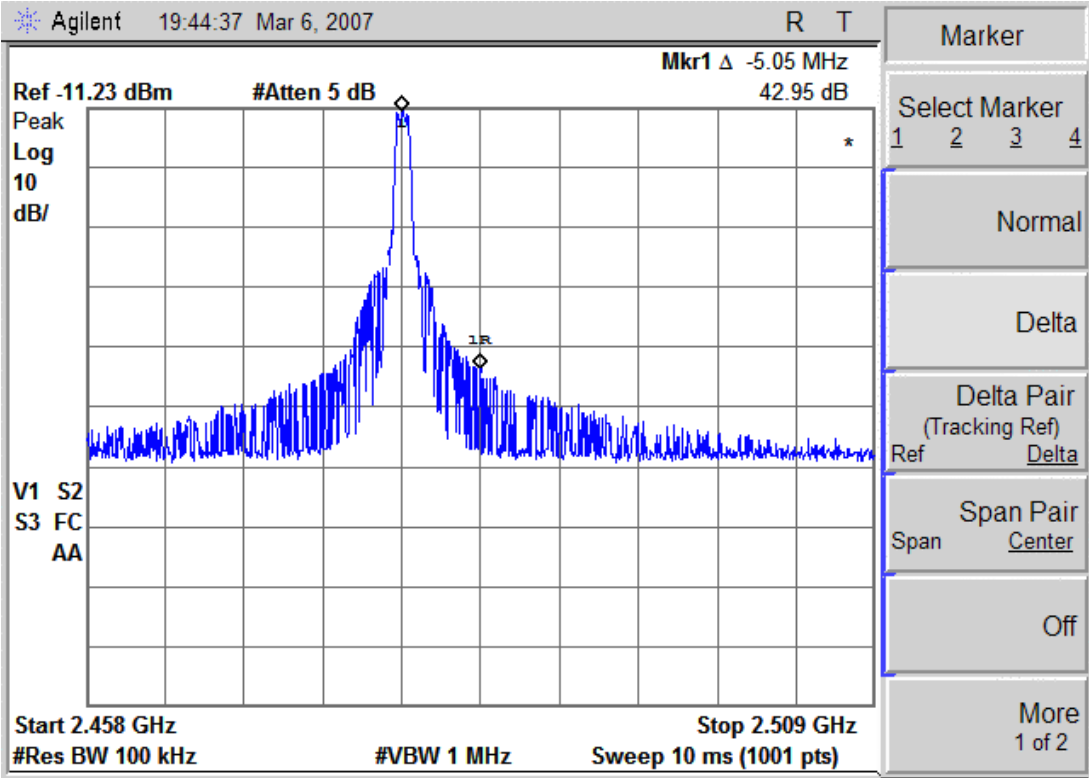


figure 8



## 7. SPURIOUS RF CONDUCTED EMISSION MEASUREMENT (§15.247 (c))

### 7.1. Test Procedure

- (1) Connect the EUT RF output port to the spectrum analyzer via calibrated coaxial cable and suitable attenuator (if necessary).
- (2) Activates the EUT System and executes the software prepared for test, if necessary.
- (3) The Spectrums are scanned from the lowest generated frequency of EUT up to the 10th harmonics by using the spectrum analyzer (\*1).

[Note]

- (\*1) Spectrum Analyzer Set Up Conditions
- |                      |              |
|----------------------|--------------|
| Resolution bandwidth | : 100kHz     |
| Video bandwidth      | : $\geq$ RBW |
| Sweep                | : Auto       |
| Detector function    | : Peak       |
| Trace Mode           | : Max Hold   |

## 7.2. Test Results

Measured Frequency [ MHz ]	Correction Factor [ dB ]	Meter Reading [ dBm ]	Conducted Spurious [ dBm ]	Separation From Carrier [ dBc ]	Limit [ dBc ]
[ Fc =2402MHz, Carrier Power : -10.77dBm ]					
4804.00	20.6	< -70.0	> -49.4	> 38.6	> 20.0
[ Fc =2442MHz, Carrier Power : -10.95dBm ]					
4884.00	20.6	< -70.0	> -49.4	> 38.5	> 20.0
[ Fc =2478MHz, Carrier Power : -11.00dBm ]					
4956.00	20.6	< -70.0	> -49.4	> 38.4	> 20.0

## [Note]

- (1) No other spurious emission found above noise level.
- (2) Correction factor includes both of a cable loss and attenuator loss.
- (3) See next page figure 9 to 11.
- (4) The worst case of data rate : 2Mbps.

## [Calculation method]

Spurious RF Emission (dBm) = Meter Reading (dBm) + Correction Factor (dB)

Separation From Carrier (dBc) = Spurious RF Emission (dBm) – Per Output Power (dBm)

## [Test Condition]

EUT operation : Data transmission

EUT channel : 0, 40, 76 (2402, 2442, 2478MHz)

## [Environment]

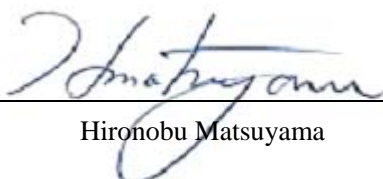
Temperature: 23 °C

Humidity: 45 %

## [Tested Date / Tester]

6 March 2007

Signature



Hironobu Matsuyama

Spectrum Chart

figure 9

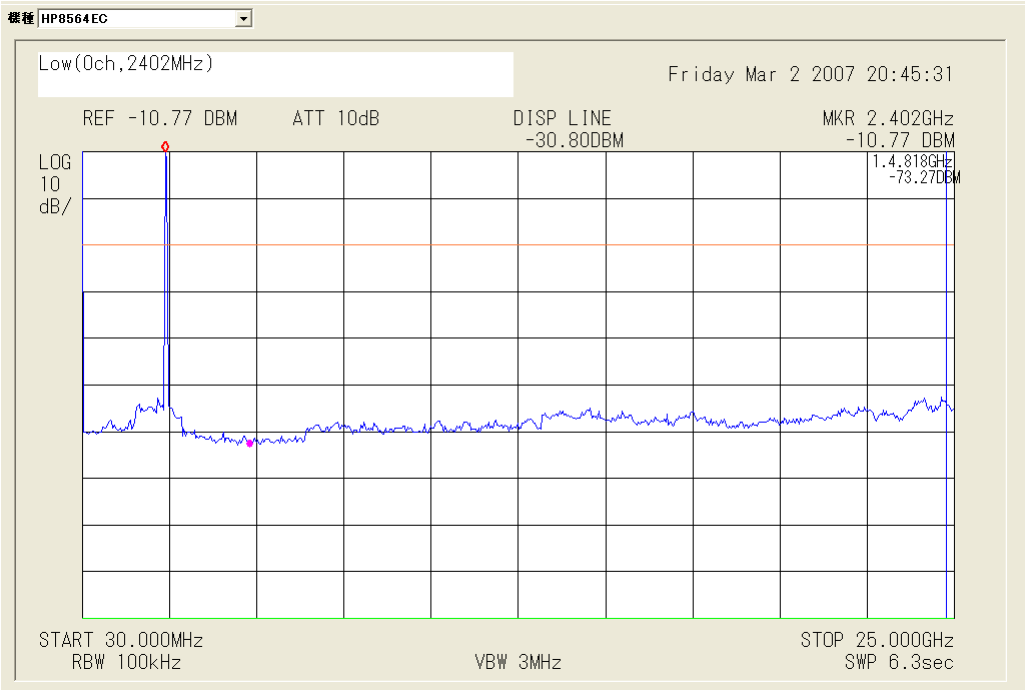
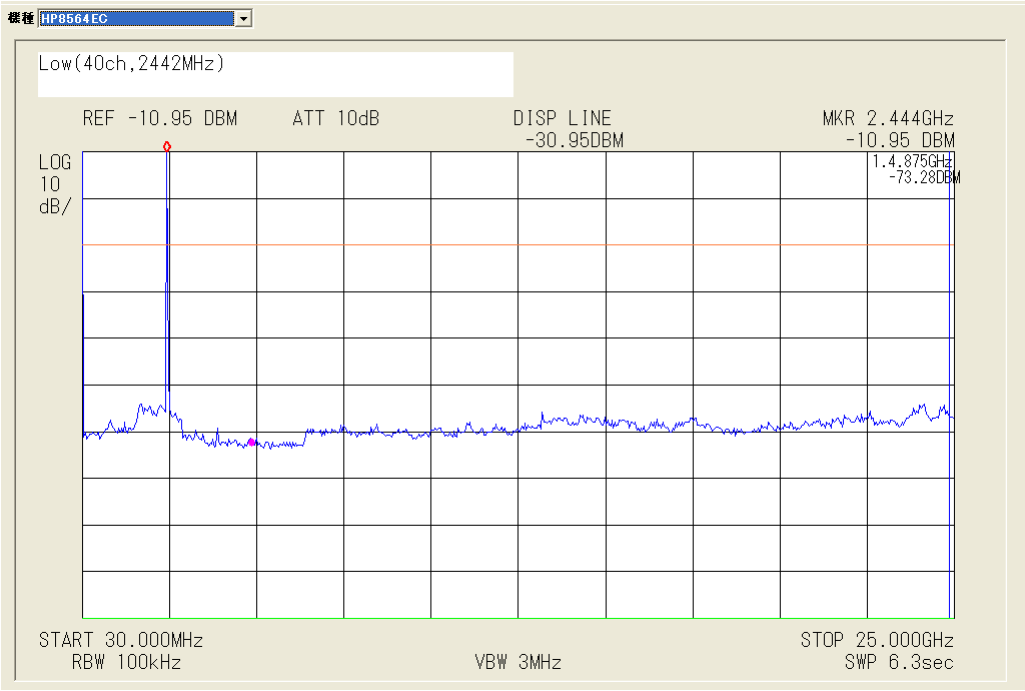
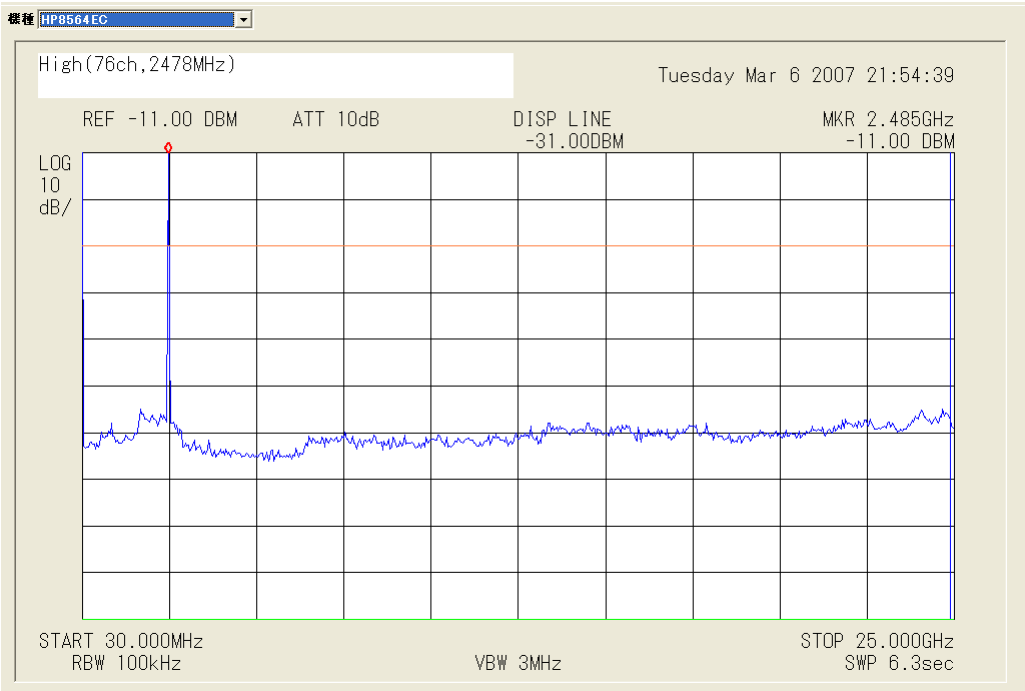


figure 10



- Continued -

figure 11





## 8. PEAK POWER DENSITY MEASUREMENT (§15.247 (d))

### 8.1. Test Procedure

- (1) Connect the EUT RF output port to spectrum analyzer via calibrated coaxial cable and suitable attenuator (if necessary).
- (2) Activates the EUT System and executes the software prepared for test, if necessary.
- (3) To find out the worst case, the transmitting data rate of EUT is varied with the different modes of operation. The final test condition is recorded in this report.
- (4) The spectrums are scanned and allow the trace to stabilize.
- (5) The peak output power was determined by using the marker-data function of spectrum analyzer (\*1).

#### [Note]

##### (\*1) Spectrum Analyzer Set Up Conditions

Frequency Span	: 2MHz
Resolution bandwidth	: 3kHz
Video bandwidth	: $\geq$ RBW
Sweep	: Auto
Detector function	: Peak
Trace Mode	: Max Hold

## 8.2. Test Results

Measured Frequency [ MHz ]	Correction Factor [ dB ]	Meter Reading [ dBm/3kHz ]	Output Power [ dBm ]	Limit [ dBm ]	Margin for Limit [ dB ]
2402	20.4	-19.2	1.2	8.0	6.8
2442	20.4	-19.3	1.1	8.0	6.9
2478	20.4	-22.5	-2.1	8.0	10.1

## [Note]

- (1) Correction factor includes both of a cable loss and attenuator loss.  
 (2) See next page figure 12 to 14.

## [Calculation method]

Power Density [dBm/3kHz] = Meter Reading (dBm) + Correction Factor (dB)

## [Test Condition]

EUT operation : Data transmission  
 EUT channel : 0, 40, 76 (2402, 2442, 2478MHz)

## [Environment]


Temperature: 24 °C

Humidity: 38 %

## [Tested Date / Tester]

6 March 2007

Signature

  
 Hironobu Matsuyama

Spectrum Chart

figure 12

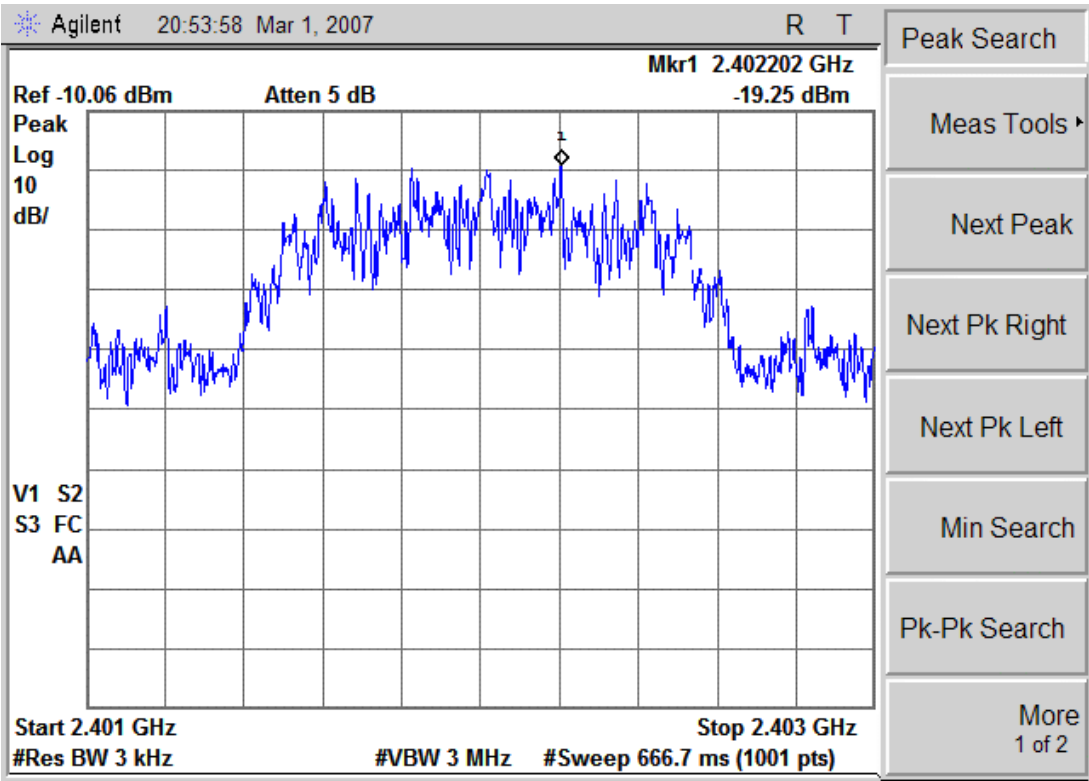
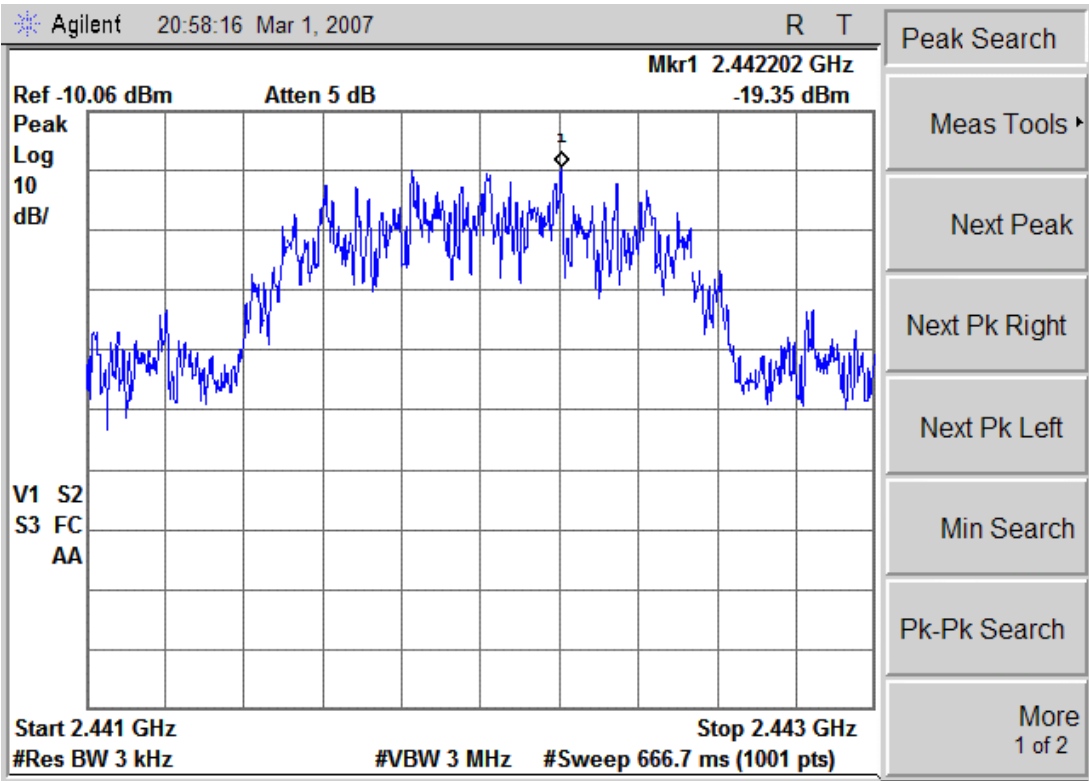
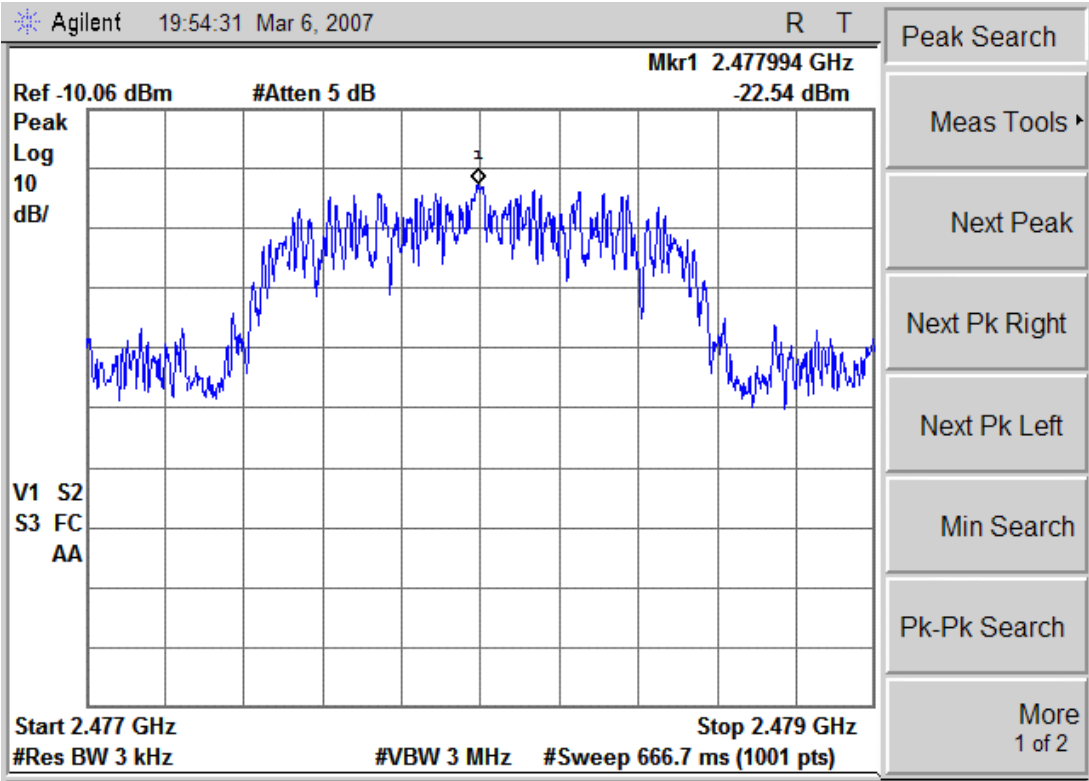


figure 13



- Continued -

figure 14



## 9. RADIATED EMISSION MEASUREMENT (§15.247 (c)), (§15.209 (a))

## 9.1. Test Procedure

- (1) Configure the EUT System in accordance with ANSI C63.4-2003 section 8.  
☒: without deviation, ☐: with deviation (details are found below)  
 See also the block diagram and the photographs of EUT System configuration in this report.
- (2) If the EUT system is connected to a public power network, all power cords for the EUT System are connected the receptacle on the turntable.
- (3) Warm up the EUT System.
- (4) Activate the EUT System and run the prepared software for the test, if necessary.
- (5) Preliminary Measurement.  
 To find out the emissions of the EUT System, preliminary radiated measurement are performed at a closer distance than that specified for final radiated measurement using the spectrum analyzer (\*1) with pre-amplifier and the broad band antenna.  
 In the frequency above 1GHz, it is performed using the spectrum analyzer (\*2) and the horn antenna.
- (6) To find out an EUT System condition, which produces the maximum emission, the configuration of EUT System, the position of the cables, and the operation mode, are changed under normal usage of the EUT.
- (7) The spectrums are scanned from 30MHz to the upper frequency of measurement range with rotated the turn table from 0 to 360 degree, and collect the six highest emissions minimum on the spectrum analyzer relative to the limits in the whole range.
- (8) Final Measurement.  
 The EUT is operated in the worst case condition where maximum emission is detected by the preliminary test. The six highest emissions minimum, recorded above, are measured at the specified distance using the broad band antenna or the tuned dipole antenna and the test receiver (\*3). In the frequency above 1GHz, the measurements are performed by the horn antenna and  
☐ the test receiver (\*4).  
☒ the spectrum analyzer (\*2) or (\*5) with pre-amplifier.
- (9) So that maximum field strength, the turntable azimuth and receiving antenna are adjusted the position.

## [Note]

- (\*1) Spectrum Analyzer Set Up Conditions
 

Frequency range	: 30 - 1000MHz
Resolution bandwidth	: 100kHz
Detector function	: Peak mode
- (\*2) Spectrum Analyzer Set Up Conditions (Peak detector Measurement)
 

Frequency range	: 1GHz - Upper frequency of measurement range
Resolution bandwidth	: 2MHz (Impulse Bandwidth $\div$ 1MHz)
Video bandwidth	: 1MHz
Attenuator	: 10dB
Detector function	: Peak mode
- (\*3) Test Receiver Set Up Conditions
 

Detector function	: Quasi-Peak
IF bandwidth	: 120kHz

 The test receiver is complied with the specification of CISPR Publication 16.
- (\*4) Test Receiver Set Up Conditions
 

Detector function	: Average
IF bandwidth	: 1MHz
- (\*5) Spectrum Analyzer Set Up Conditions (Average detector Measurement)
 

Frequency range	: 1GHz - Upper frequency of measurement range
Resolution bandwidth	: 2MHz (Impulse Bandwidth $\div$ 1MHz)
Video bandwidth	: 10Hz or 30Hz
Attenuator	: 10dB
Y axis	: Liner

## 9.2. Test Results

(1) In the Frequency Range : below 1GHz

Measurement Distance ☒: 3m ☐: 10m

Measured Frequency ( MHz )	Antenna Factor ( dB/m )	Meter Reading		Maximum Field Strength ( dB $\mu$ V/m )	Limit ( dB $\mu$ V/m )	Margin for Limit ( dB )
		Horizontal Polarization ( dB $\mu$ V )	Vertical Polarization ( dB $\mu$ V )			
30.00	22.3	<0.0	<0.0	<22.3	40.0	>17.7
80.00	11.5	<0.0	<0.0	<11.5	40.0	>28.5
216.00	22.1	<0.0	<0.0	<22.1	43.5	>21.4
230.00	22.7	<0.0	<0.0	<22.7	46.0	>23.3
619.40	27.1	10.0	6.8	37.1	46.0	8.9
625.81	27.2	11.1	4.5	38.3	46.0	7.7
732.79	28.8	5.7	1.8	34.5	46.0	11.5
733.11	28.8	4.0	3.4	32.8	46.0	13.2

## [Note]

For spurious emission measurement, the compliance tests were performed both of horizontally placed and vertically placed in EUT. As a results, the data of operation mode that produce the maximum emission were reported.

- Continued -

(2) In the Frequency Range : above 1 GHz (Restricted Bands)

Measurement Distance ☒: 3m ☐: 10m

Fc = 2402 MHz (Ch.0) Transmitting operation

Measured Frequency  ( MHz )	Antenna Factor  ( dB/m )	Meter Reading		Maximum Field Strength  ( dBμV/m )	Limit  ( dBμV/m )	Margin for Limit  ( dB )
		Horizontal Polarization  ( dBμV )	Vertical Polarization  ( dBμV )			
[ Peak Detector Measurement ]						
2402.00	24.8	83.1	84.5	109.3	-	-
4804.00	-4.8	49.3	51.3	46.5	74.0	27.5
7206.00	-0.9	49.5	50.1	49.2	74.0	24.8
9608.00	2.5	46.2	45.8	48.7	74.0	25.3
12010.00	6.3	<45.0	<45.0	<51.3	74.0	>22.7
14412.00	7.6	<45.0	<45.0	<52.6	74.0	>21.4
16814.00	9.4	<45.0	<45.0	<54.4	74.0	>19.6
19216.00	4.7	<45.0	<45.0	<49.7	74.0	>24.3
21618.00	4.9	<45.0	<45.0	<49.9	74.0	>24.1
24020.00	6.3	<45.0	<45.0	<51.3	74.0	>22.7
[ Average Detector Measurement ] (*1)						
4804.00	-4.8	39.5	41.5	36.7	54.0	17.3
7206.00	-0.9	39.2	40.4	39.5	54.0	14.5
9608.00	2.5	36.4	35.7	38.9	54.0	15.1
12010.00	6.3	<35.0	<35.0	<41.3	54.0	>12.7
14412.00	7.6	<35.0	<35.0	<42.6	54.0	>11.4
16814.00	9.4	<35.0	<35.0	<44.4	54.0	>9.6
19216.00	4.7	<35.0	<35.0	<39.7	54.0	>14.3
21618.00	4.9	<35.0	<35.0	<39.9	54.0	>14.1
24020.00	6.3	<35.0	<35.0	<41.3	54.0	>12.7

[Note]

For spurious emission measurement, the compliance tests were performed both of horizontally placed and vertically placed in EUT. As a results, the data of operation mode that produce the maximum emission were reported.

- Continued -

Measurement Distance ☒: 3m ☐: 10m

Fc = 2442 MHz (Ch.40) Transmitting operation

Measured Frequency  ( MHz )	Antenna Factor  ( dB/m )	Meter Reading		Maximum Field Strength  ( dBμV/m )	Limit  ( dBμV/m )	Margin for Limit  ( dB )
		Horizontal Polarization  ( dBμV )	Vertical Polarization  ( dBμV )			
[ Peak Detector Measurement ]						
2442.00	24.7	81.8	83.6	108.3	-	-
4884.00	-4.6	48.7	51.2	46.6	74.0	27.4
7326.00	-0.9	48.9	49.3	48.4	74.0	25.6
9768.00	2.5	47.6	46.7	50.1	74.0	23.9
12210.00	6.8	45.0	45.0	<51.8	74.0	>22.2
14652.00	7.7	<45.0	<45.0	<52.7	74.0	>21.3
17094.00	9.8	<45.0	<45.0	<54.8	74.0	>19.2
19536.00	4.8	<45.0	<45.0	<49.8	74.0	>24.2
21978.00	4.9	<45.0	<45.0	<49.9	74.0	>24.1
24420.00	6.1	<45.0	<45.0	<51.1	74.0	>22.9
[ Average Detector Measurement ] (*1)						
4884.00	-4.6	38.6	41.0	36.4	54.0	17.6
7326.00	-0.9	38.7	39.2	38.3	54.0	15.7
9768.00	2.5	37.6	36.5	40.1	54.0	13.9
12210.00	6.8	35.0	35.0	<41.8	54.0	>12.2
14652.00	7.7	<35.0	<35.0	<42.7	54.0	>11.3
17094.00	9.8	<35.0	<35.0	<44.8	54.0	>9.2
19536.00	4.8	<35.0	<35.0	<39.8	54.0	>14.2
21978.00	4.9	<35.0	<35.0	<39.9	54.0	>14.1
24420.00	6.1	<35.0	<35.0	<41.1	54.0	>12.9

[Note]

For spurious emission measurement, the compliance tests were performed both of horizontally placed and vertically placed in EUT. As a results, the data of operation mode that produce the maximum emission were reported.



- Continued -

Measurement Distance ☒: 3m ☐: 10m

Fc = 2478 MHz (ch.76) Transmitting operation

Measured Frequency  ( MHz )	Antenna Factor  ( dB/m )	Meter Reading		Maximum Field Strength  ( dBμV/m )	Limit  ( dBμV/m )	Margin for Limit  ( dB )
		Horizontal Polarization  ( dBμV )	Vertical Polarization  ( dBμV )			
[ Peak Detector Measurement ]						
2478.00	24.7	82.1	83.7	108.4	-	-
4956.00	-4.3	49.3	53.0	48.7	74.0	25.3
7434.00	-0.9	47.9	50.3	49.4	74.0	24.6
9912.00	2.7	48.4	47.9	51.1	74.0	22.9
12390.00	6.1	<45.0	<45.0	<51.1	74.0	>22.9
14868.00	7.8	<45.0	<45.0	<52.8	74.0	>21.2
17346.00	10.1	<45.0	<45.0	<55.1	74.0	>18.9
19824.00	5.0	<45.0	<45.0	<50.0	74.0	>24.0
22302.00	5.1	<45.0	<45.0	<50.1	74.0	>23.9
24780.00	5.9	<45.0	<45.0	<50.9	74.0	>23.1
[ Average Detector Measurement ] (*1)						
4956.00	-4.3	40.2	43.1	38.8	54.0	15.2
7434.00	-0.9	37.8	38.8	37.9	54.0	16.1
9912.00	2.7	38.3	37.3	41.0	54.0	13.0
12390.00	6.1	<35.0	<35.0	<41.1	54.0	>12.9
14868.00	7.8	<35.0	<35.0	<42.8	54.0	>11.2
17346.00	10.1	<35.0	<35.0	<45.1	54.0	>8.9
19824.00	5.0	<35.0	<35.0	<40.0	54.0	>14.0
22302.00	5.1	<35.0	<35.0	<40.1	54.0	>13.9
24780.00	5.9	<35.0	<35.0	<40.9	54.0	>13.1

[Note]

For spurious emission measurement, the compliance tests were performed both of horizontally placed and vertically placed in EUT. As a results, the data of operation mode that produce the maximum emission were reported.

Measurement Distance ☒: 3m ☐: 10m

Measured Frequency  ( MHz )	Antenna Factor  ( dB/m )	Meter Reading		Maximum Field Strength  ( dBμV/m )	Limit  ( dBμV/m )	Margin for Limit  ( dB )
		Horizontal Polarization  ( dBμV )	Vertical Polarization  ( dBμV )			
[ Average Detector (Band Edge) Measurement ]						
(*1) 2390.00	24.8	23.0	23.6	48.4	54.0	5.6
(*1) 2483.50	24.7	22.9	23.0	47.7	54.0	6.3
[ Peak Detector (Band Edge) Measurement ]						
2390.00	24.8	45.8	48.2	73.0	74.0	1.0
2483.50	24.7	47.9	48.7	73.4	74.0	0.6

- Continued -

<p>[Remark]</p> <p>(*1) : Spectrum analyzer setup condition.</p> <p>Detector : Peak</p> <p>RBW : 1MHz</p> <p>VBW : 30Hz</p>
<p>[Note]</p> <p>(1) The measurement were performed both of transmitting operation and receiving operation.</p> <p>(2) Antenna Factor includes both of the cable loss, Pre-amplifier gain and BEF loss.</p> <p>(3) See next page figure 15 to 22.</p> <p>(4) Above 1GHz, antenna factor includes both of the cable loss and pre-amplifier gain.</p> <p>(5) In frequency range 1to 2GHz and 3 to 4GHz, the band eliminate filter (Cut off frequency 2.4GHz) was used.</p>
<p>[Calculation method at Peak detector]</p> <p>Maximum Field Strength (dB<math>\mu</math>V/m)</p> <p>= Meter Reading (at maximum level of Horizontal or Vertical) (dB<math>\mu</math>V) + Antenna Factor (dB/m)</p>

[Environment]

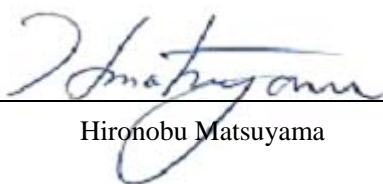
Temperature: 23 °C

Humidity: 45 %

[Tested Date / Tester]

6 March 2007

Signature



Hironobu Matsuyama

Spectrum Chart

figure 15: Horizontal [Peak Detector Measurement]

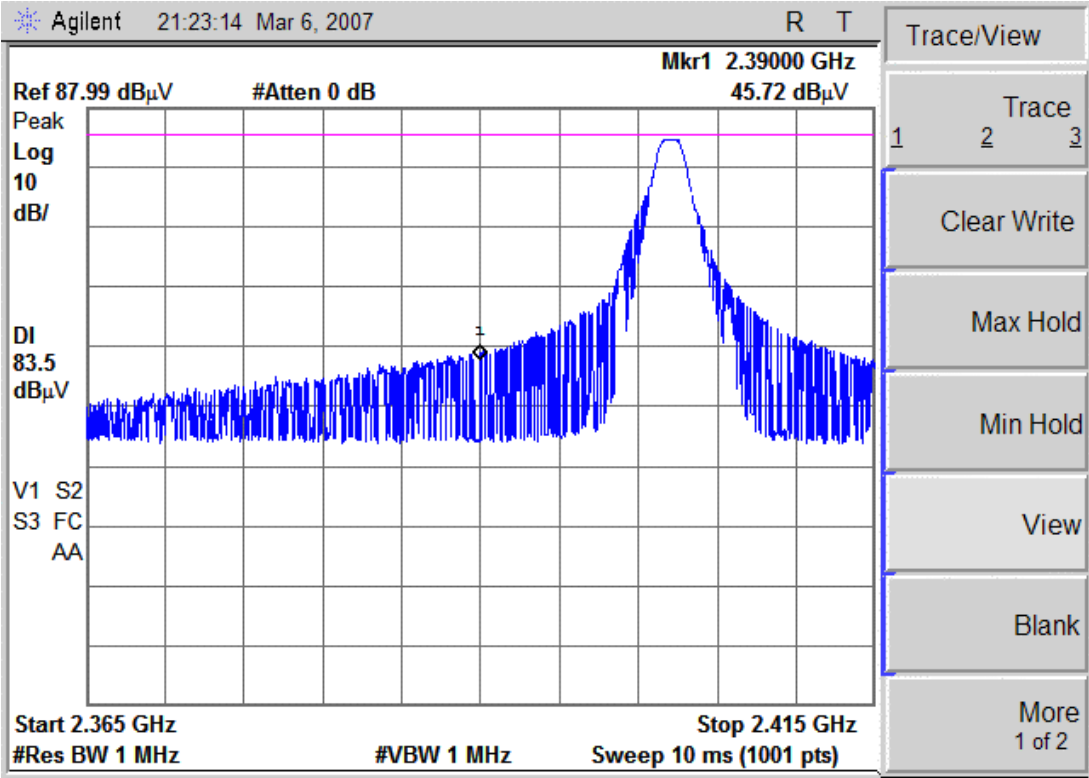
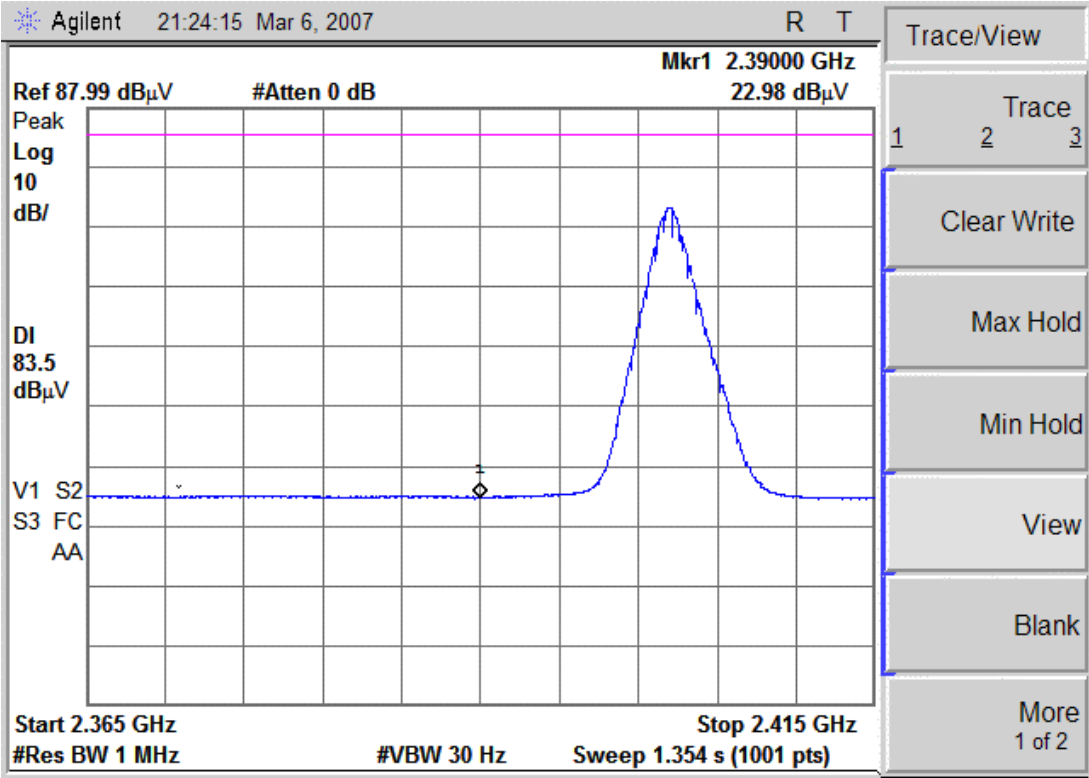


figure 16: Horizontal [Average Detector Measurement]



- Continued -

figure 17: Vertical [Peak Detector Measurement]

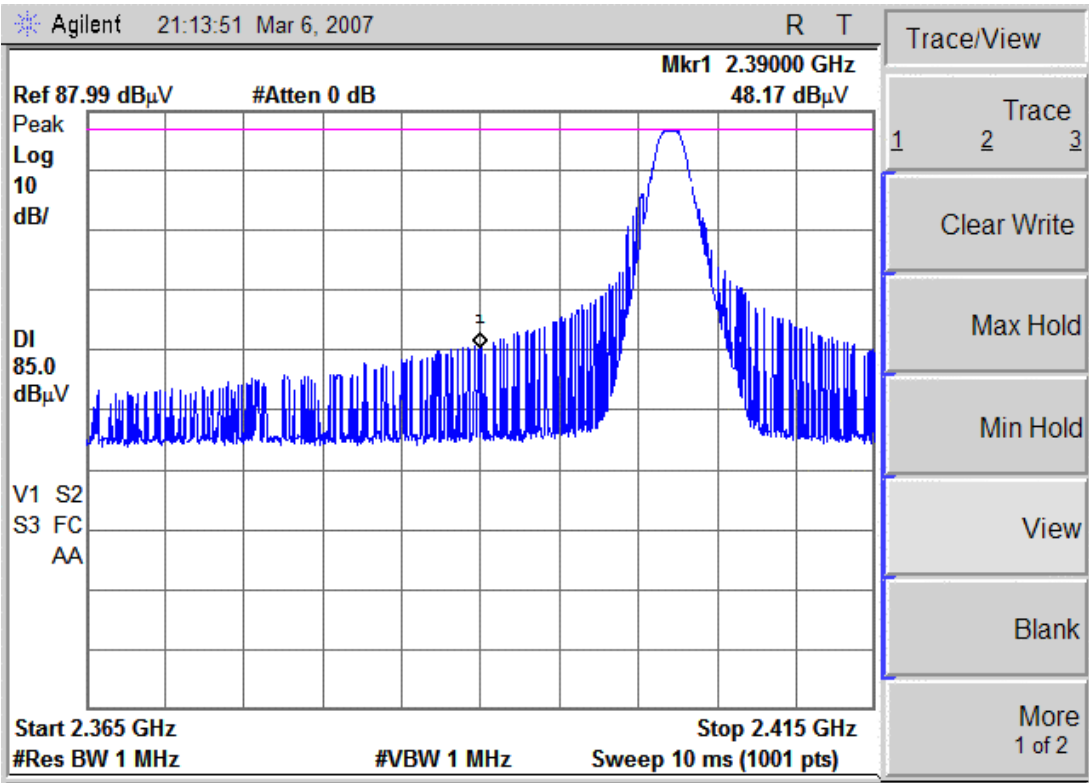
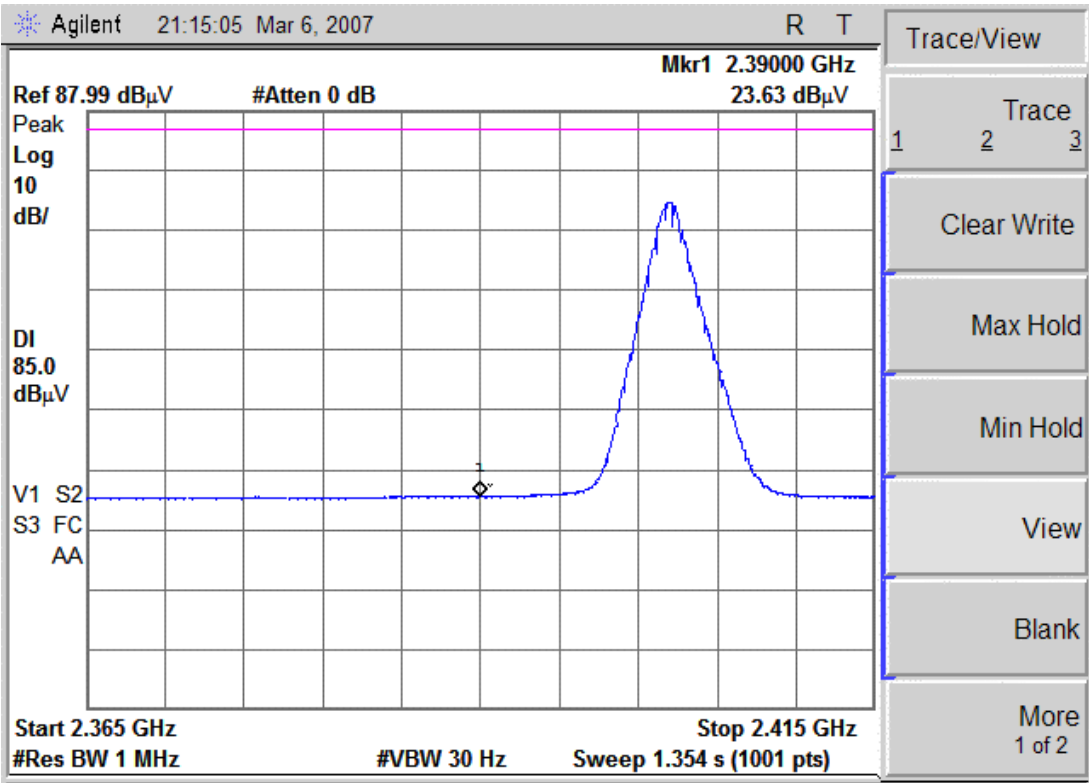


figure 18: Vertical [Average Detector Measurement]



- Continued -

figure 19: Horizontal [Peak Detector Measurement]

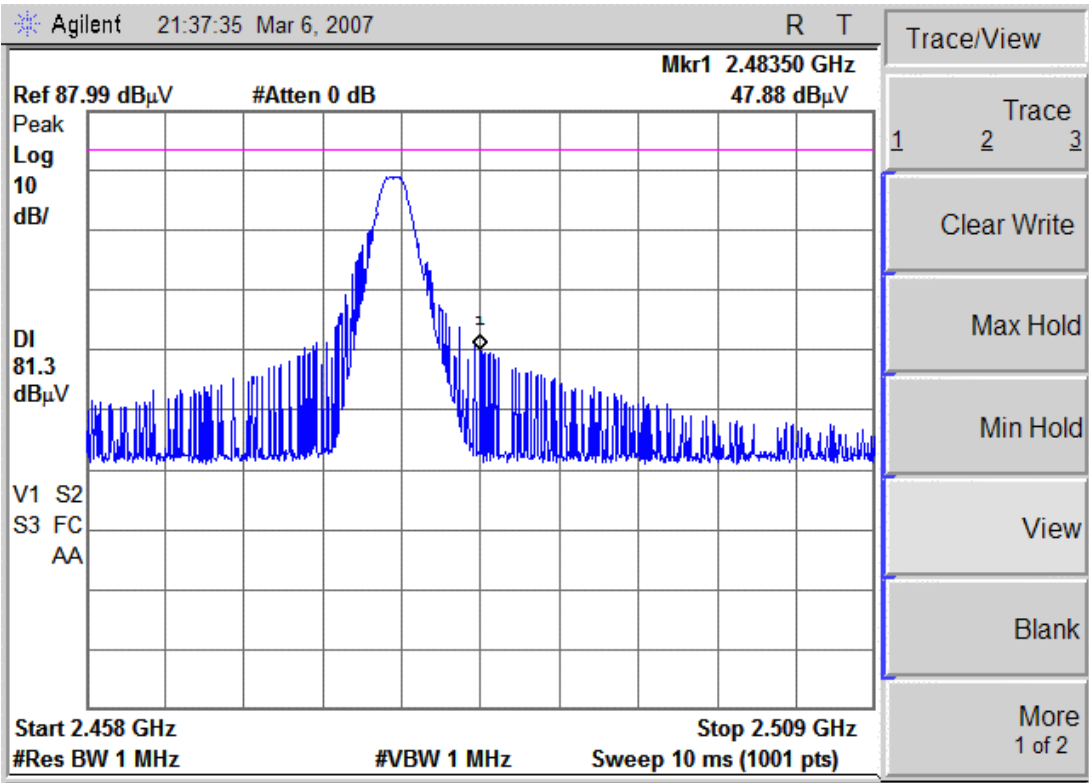
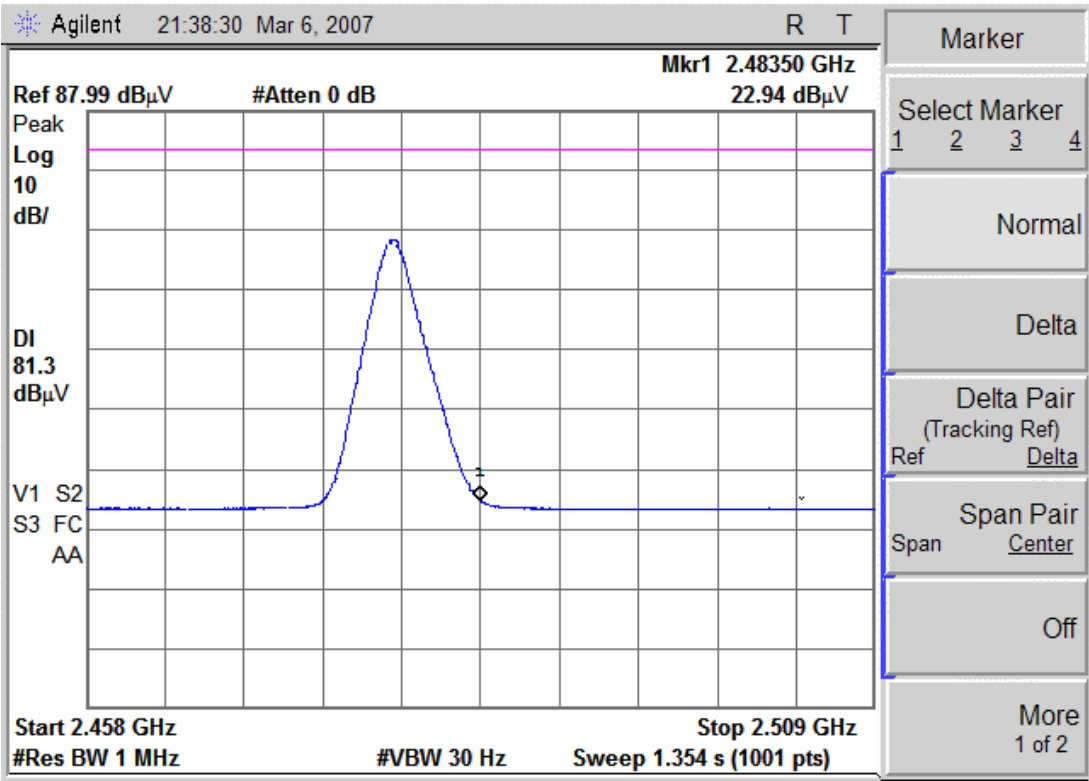


figure 20: Horizontal [Average Detector Measurement]



- Continued -

figure 21: Vertical [Peak Detector Measurement]

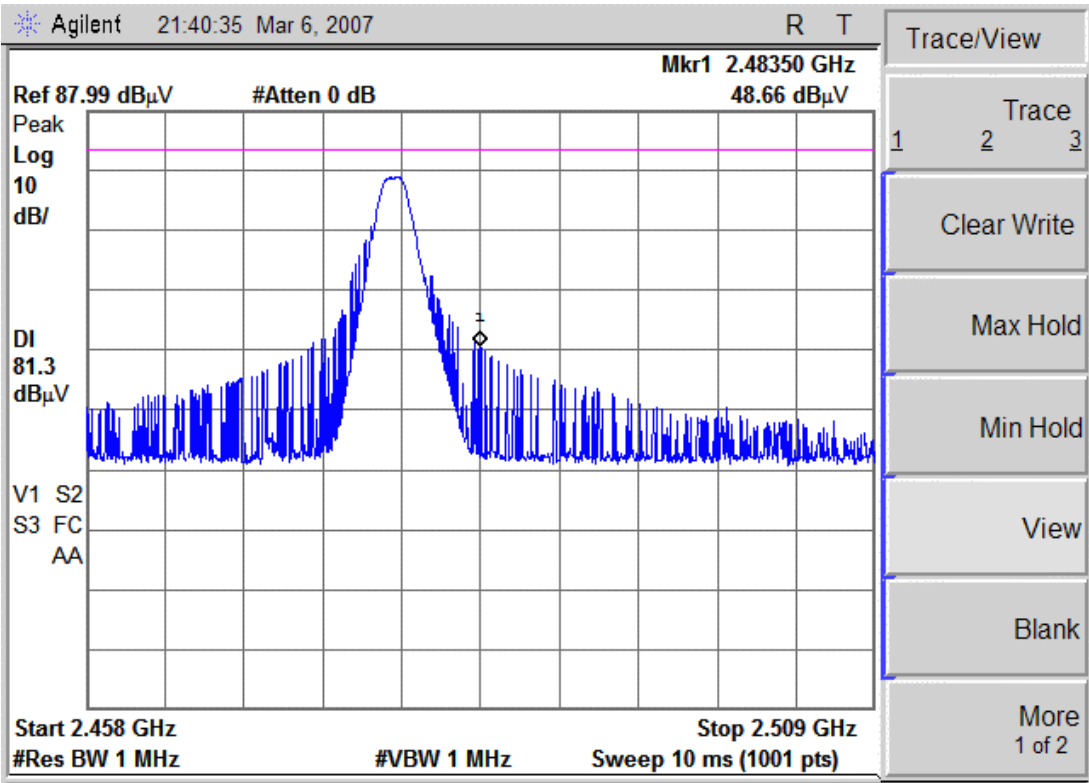
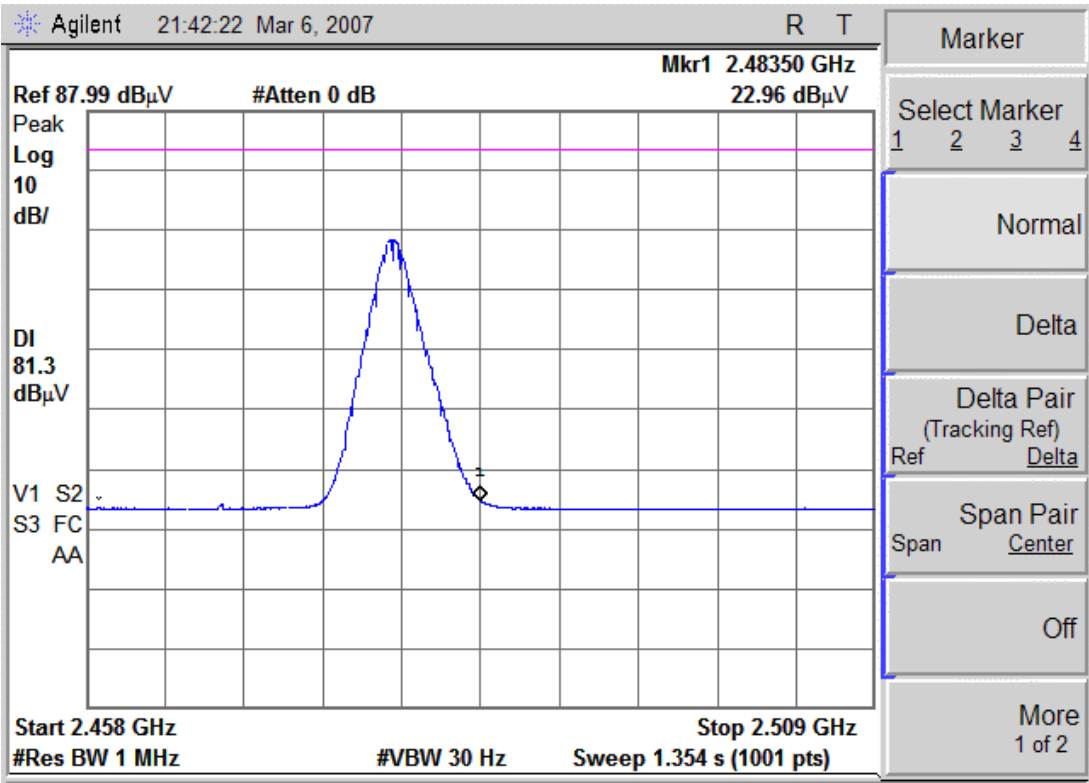


figure 22: Vertical [Average Detector Measurement]



## 10. USED TEST EQUIPMENTS AND CALIBRATION STATUS

KEC No.	Equipment	Manufacturer	Model No.	Last Cal.	Next Cal.
SA-039	Spectrum Analyzer	Agilent Technologies	8564E	2006/04	2007/04
SA-035		Rhode & Schwarz	FSA	2006/05	2007/05
SA-048		Agilent Technologies	E4403B	2006/06	2007/06
FS-081	Test Receiver	Rhode & Schwarz	ESVS10	2006/03	2007/03
AM-052	Pre-Amplifier	Hewlett Packard	8449B	2007/02	2008/02
AM-044			8447D	2006/06	2007/06
AN-219	Biconical Antenna	Schwarzbeck	VHA9103	2006/02	2007/03
AN-216	Log Periodic Dipole Array Antenna	Schwarzbeck	UHAL9108A	2006/03	2007/03
AN-135	Tuned Dipole Antenna	Kyoritsu	KBA-511AS	2005/02	2007/03
AN-137			KBA-611S	2005/02	2007/03
AN-211	Standard Gain Horn Antenna	Raven	91888-2	2005/10	2007/10
AN-212			91889-2	2005/10	2007/10
AN-142		Scientific Atlanta	12-3.9	2005/10	2007/10
AN-104			12-5.8	2005/10	2007/10
AN-210			12-8.2	2005/10	2007/10
AN-145			12-12.0	2005/10	2007/10
AN-200			12-18.0	2007/02	2009/02
VV-039	Power Meter	Rhode & Schwarz	E4419B	2006/11	2007/11
VV-039-1	Power Sensor	Hewlett Packard	E4412A	2006/10	2007/10
AT-040-3	Precision Attenuator	Hewlett Packard	HP33340C010	2007/01	2008/01
AT-040-4			HP33340C020	2007/01	2008/01
FL-174	Band Eliminate Filter	MICRO-TRONICS	BRM12294	2006/02	2008/02
CH-031	Low Temperature Chamber	TABAI	MC-710	2006/07	2007/07

- Continued -

KEC No.	Equipment	Manufacturer	Model No.	Last Cal.	Next Cal.
CL-046	Coaxial Cable	SUHNER	SUCOFLEX	2006/03	2007/03
CL-042				2006/03	2007/03
CL-621				2007/02	2008/02
CL-619				2007/02	2008/02

The overall program of calibration and verification of equipment is designed and operated so as to ensure that measurements made by KEC are traceable to national standards of measurement or equivalent abroad.