JAPAN QUALITY ASSURANCE ORGANIZATION
KITA-KANSAI TESTING CENTER
7-7, Ishimaru 1-Chome, Minoh-shi, Osaka 562-0027 Japan. Phone. +81-727-29-2243/Facsimile. +81-727-28-6848



# *EMC EMISSION* - TEST REPORT

JQA APPLICATION No. : KL80010467

Name of Product : 2.4GHz Frequency Hopping Spread Spectrum Cordless Telephone (Handset)

Model/Type No. : KX-TG2730

FCC ID : ACJ96NKX-TG2730

Applicant : Kyushu Matsushita Electric Co., Ltd.

Address : 1-62, 4-chome, Minoshima, Hakata-ku, Fukuoka 812-8531, Japan

Manufacturer : Kyushu Matsushita Electric Co., Ltd.

Address : 1-62, 4-chome, Minoshima, Hakata-ku, Fukuoka 812-8531, Japan

Receive date of EUT : December 3, 2001

***Final Judgement*** : **Passed**

***TEST RESULTS IN THIS REPORT*** are obtained in use of equipment that is traceable to National Institute of Advanced Industrial Science and Technology (AIST) under METI Japan and Communications Research Lab. (CRL) under MPHPT Japan.

***THE TEST RESULTS*** only responds to the test sample. This test report shall not be reproduced except in full.

# DIRECTORY

# TEST REGULATION

FCC Rules and Regulations Part 15 Subpart A and C (February 28, 2001)

○ - Class A Digital Device
○ - Class B Digital Device
● - Intentional Radiator (Sec.15.247)
○ - Receiver

**Test items:**

○ - Sec.15.203 : Antenna requirement
● - Sec.15.205 : Restricted bands of operation
○ - Sec.15.207 : Conducted limits
● - Sec.15.209 : Radiated emission limits general requirements
○ - Sec.15.214 : Cordless Telephones
● - Sec.15.247 : Operation within the bands 902-928MHz, 2400-2483.5MHz, 5725-5875MHz, and 24.0-24.25GHz

**Test procedure:**

Radiated emission test was performed according to the procedures in ANSI C63.4-1992.

# GENERAL INFORMATION

**Test facility:**

1) Test Facility located at Kita-Kansai : 1st and 2nd Open Sites (3 m Site)
Test Facility located at Kameoka : 1st Open Site (3, 10 and 30 m, on common plane)
: 2nd Open Site (3 and 10 m, on common plane)
**FCC filing No. : 31040/SIT 1300F2**

2) KITA-KANSAI TESTING CENTER is recognized under the National Voluntary Laboratory Accreditation Program for satisfactory compliance established in Title 15, Part 285 Code of Federal Regulations.
**NVLAP Lab Code: 200191-0**

3) Average Measurement Method
**FCC filing No. : 950523A 1300F2**

**Definitions for symbols used in this test report:**

● - Black box indicates that the listed condition, standard or equipment is applicable for this Report.
○ - Blank box indicates that the listed condition, standard or equipment is not applicable for this Report.

## Description of the Equipment Under Test (EUT):

| | | |
|---|---|---|
| 1) | Name | : 2.4GHz Frequency Hopping Spread Spectrum Cordless Telephone (Handset) |
| 2) | Model/Type No. | : KX-TG2730 |
| 3) | Product Type | : Pre-Production |
| 4) | Category | : Intentional Radiator |
| 5) | EUT Authorization | : ○ - Verification ● - Certification ○ - D.o.C. |
| 6) | Transmitting Frequency | : 2400.916645 MHz (01ch) - 2480.293161 MHz (90ch) |
| 7) | Receiving Frequency | : 2400.916645 MHz (01ch) - 2480.293161 MHz (90ch) |
| 8) | Method/System | : Frequency Hopping Spread Spectrum (FHSS) |
| 9) | Type of Antenna | : J-Type Antenna |
| 10) | Antenna Gain | : 2.15 dBi |
| 11) | Measured MAX Output Power | : 208 mW (EIRP) |
| 12) | Power Rating | : DC 3.6 V (Ni-Cd Battery Pack : N4HKGMA0001) |

## Detailed Transmitter portion (Channel plan):

Transmitting frequency : 2400.916645 MHz (01ch) - 2480.293161 MHz (90ch)
Number of channel : 90
Channel Separation : 891.871 kHz

| CH | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | -- | 2400.916645 | 2401.808516 | 2402.700387 | 2403.592258 | 2404.484129 | 2405.376000 | 2406.267871 | 2407.159742 | 2408.051613 |
| 10 | 2408.943484 | 2409.835355 | 2410.727226 | 2411.619097 | 2412.510968 | 2413.402839 | 2414.294710 | 2415.186581 | 2416.078452 | 2416.970323 |
| 20 | 2417.862194 | 2418.754065 | 2419.645935 | 2420.537806 | 2421.429677 | 2422.321548 | 2423.213419 | 2424.105290 | 2424.997161 | 2425.889032 |
| 30 | 2426.780903 | 2427.672774 | 2428.564645 | 2429.456516 | 2430.348387 | 2431.240258 | 2432.132129 | 2433.024000 | 2433.915871 | 2434.807742 |
| 40 | 2435.699613 | 2436.591484 | 2437.483355 | 2438.375226 | 2439.267097 | 2440.158968 | 2441.050839 | 2441.942710 | 2442.834581 | 2443.726452 |
| 50 | 2444.618323 | 2445.510194 | 2446.402065 | 2447.293935 | 2448.185806 | 2449.077677 | 2449.969548 | 2450.861419 | 2451.753290 | 2452.645161 |
| 60 | 2453.537032 | 2454.428903 | 2455.320774 | 2456.212645 | 2457.104516 | 2457.996387 | 2458.888258 | 2459.780129 | 2460.672000 | 2461.563871 |
| 70 | 2462.455742 | 2463.347613 | 2464.239484 | 2465.131355 | 2466.023226 | 2466.915097 | 2467.806968 | 2468.698839 | 2469.590710 | 2470.482581 |
| 80 | 2471.374452 | 2472.266323 | 2473.158194 | 2474.050065 | 2474.941935 | 2475.833806 | 2476.725677 | 2477.617548 | 2478.509419 | 2479.401290 |
| 90 | 2480.293161 | -- | -- | -- | -- | -- | -- | -- | -- | -- |

## Modulation System Information:

Spread Spectrum Method : Frequency Hopping
Modulation : GFSK (Gaussian-shaped Binary Frequency Shift Keying)
Hop Rate : 100 hops/sec.
Bit Rate : 576 kBit/sec.
Digital Security Code : 40 Bit

## Detailed Receiver portion:

Receiving frequency : 2400.916645 MHz (01ch) - 2480.293161 MHz (90ch)

Local frequency : 2390.214194 MHz (01ch) - 2469.590710 MHz (90ch)

Intermediate frequency : 10.702 MHz

## Other used (generated) frequencies in the EUT:

Reference Clock : 13.824 MHz

# TEST CONDITIONS

**AC Powerline Conducted Emission Measurement (Sec.15.207(a))**
was performed in the following test site.

**Test location:**

KITA-KANSAI Testing Center
7-7, Ishimaru, 1-Chome, Mino-Shi, Osaka, 562-0027, Japan
○ - Shielded room
KAMEOKA EMC Branch
9-1, Ozaki, Inukanno, Nishibetsuin-Cho, Kameoka-Shi, Kyoto, 621-0126, Japan
○ - Shielded room
○ - On metal plane of open site

**Used test instruments and sites:**

| Model No. | Device ID | Last Cal. Date | Cal. Interval |
|---|---|---|---|
| ○ - ESCS 30 | A - 1 | | |
| ○ - ESH 2 | A - 2 | | |
| ○ - ESH 2 | A - 3 | | |
| ○ - KNW-407 | D - 6 | | |
| ○ - KNW-408 | D - 11 | | |
| ○ - KNW-242 | D - 7 | | |
| ○ - ESH3-Z5 | D - 12 | | |
| ○ - KNW-341C | D - 13 | | |
| ○ - KNW-408 | D - 14 | | |
| ○ - KNW-244C | D - 77 | | |
| ○ - KNW-408 | D - 78 | | |
| ○ - ESH2-Z5 | D - 10 | | |
| ○ - ESH2-Z3 | D - 17 | | |
| ○ - 65 BNC-50-0-1 | H - 26 | | |
| ○ - 65 BNC-50-0-1 | H - 27 | | |
| ○ - Cable | H - 7 | | |
| ○ - Cable | H - 8 | | |

**Environmental conditions:**

Temperature: _____°C Humidity: _____%

**Magnetic Field Radiated Emission Measurement (Sec.15.247(c),15.205(a),15.209(a))**
was performed in the frequency range of 9 kHz - 30 MHz, in the following test site.

**Test location:**

KITA-KANSAI Testing Center
7-7, Ishimaru, 1-Chome, Mino-Shi, Osaka, 562-0027, Japan
● - 1st open test site (3 meters)
○ - 2nd open test site (3 meters)
KAMEOKA EMC Branch
9-1, Ozaki, Inukanno, Nishibetsuin-Cho, Kameoka-Shi, Kyoto, 621-0126, Japan
○ - 1st open test site ○ - 3 m ○ - 10 m ○ - 30 m
○ - 2nd open test site ○ - 3 m ○ - 10 m

**Used test instruments:**

| Model No. | Device ID | Last Cal. Date | Cal. Interval |
|---|---|---|---|
| ● - ESCS 30 | A - 1 | August, 2001 | 1 Year |
| ○ - ESH 2 | A - 2 | | |
| ○ - ESH 2 | A - 3 | | |
| ● - HFH2-Z2 | C - 2 | July, 2001 | 1 Year |
| ○ - HFH2-Z2 | C - 3 | | |

**Environmental conditions:**

Temperature: 21 °C Humidity: 49 %

**Electromagnetic Field Radiated Emission Measurement (Sec.15.247(c),15.205(a),15.209(a))** was performed in horizontal and vertical polarization, in the frequency range of 30 MHz - 1000 MHz, in the following test site.

**Test location:**

KITA-KANSAI Testing Center
7-7, Ishimaru, 1-Chome, Mino-Shi, Osaka, 562-0027, Japan
○ - 1st open test site (3 meters)
● - 2nd open test site (3 meters)
KAMEOKA EMC Branch
9-1, Ozaki, Inukanno, Nishibetsuin-Cho, Kameoka-Shi, Kyoto, 621-0126, Japan
○ - 1st open test site ○ - 3 m ○ - 10 m ○ - 30 m
○ - 2nd open test site ○ - 3 m ○ - 10 m

**Validation of Site Attenuation:**

1) Last Confirmed Date : October 9, 2001
2) Interval : 1 Year

**Used test instruments:**

| Model No. | Device ID | Last Cal. Date | Cal. Interval |
|---|---|---|---|
| ○ - ESV/ESV-Z3 | A - 7 / A - 17 | | |
| ● - ESV/ESV-Z3 | A - 6 / A - 18 | December, 2000 | 1 Year |
| ○ - ESV/ESV-Z3 | A - 4 / A - 20 | | |
| ○ - ESV/ESV-Z3 | A - 8 / A - 19 | | |
| ○ - ESVS 10 | A - 5 | | |
| ○ - KBA-511A | C - 12 | | |
| ○ - KBA-611 | C - 22 | | |
| ● - KBA-511A | C - 13 | November, 2001 | 1 Year |
| ● - KBA-611 | C - 19 | November, 2001 | 1 Year |
| ○ - KBA-511A | C - 11 | | |
| ○ - KBA-611 | C - 21 | | |
| ○ - Cable | H - 1 | | |
| ○ - Cable | H - 2 | | |
| ○ - Cable | H - 5 | | |
| ● - Cable | H - 6 | November, 2001 | 1 Year |
| ○ - Cable | H - 9 | | |

**Environmental conditions:**

Temperature: 13 °C Humidity: 54 %

**Electromagnetic Field Radiated Emission Measurement (Sec.15.247(c),15.205(a),15.209(a))**
**Maximum Peak Power (EIRP) Measurement (Sec.15.247(b)(1))**
was performed in horizontal and vertical polarization, in the frequency range of 1 GHz - 25 GHz, in the following test site.

**Test location:**

KITA-KANSAI Testing Center
7-7, Ishimaru, 1-Chome, Mino-Shi, Osaka, 562-0027, Japan
● - 1st open test site (3 meters)
○ - 2nd open test site (3 meters)
KAMEOKA EMC Branch
9-1, Ozaki, Inukanno, Nishibetsuin-Cho, Kameoka-Shi, Kyoto, 621-0126, Japan
○ - 1st open test site ○ - 3 m ○ - 10 m ○ - 30 m
○ - 2nd open test site ○ - 3 m ○ - 10 m

**Used test instruments:**

| Model No. | Device ID | Last Cal. Date | Cal. Interval |
|---|---|---|---|
| ● - ESCS 30 | A - 1 | August, 2001 | 1 Year |
| ● - 8566B | A - 13 | December, 2000 | 1 Year |
| ○ - 8593A | A - 15 | | |
| ○ - ESV | A - 6 | | |
| ● - 4T-10 | D - 73 | May, 2001 | 1 Year |
| ○ - 4T-10 | D - 74 | | |
| ● - WJ-6611-513 | A - 23 | May, 2001 | 1 Year |
| ● - WJ-6882-824 | A - 21 | May, 2001 | 1 Year |
| ● - DBL-0618N515 | A - 33 | May, 2001 | 1 Year |
| ● - 91888-2 | C - 41 - 1 | May, 2001 | 1 Year |
| ● - 91889-2 | C - 41 - 2 | May, 2001 | 1 Year |
| ○ - 94613-1 | C - 41 - 3 | | |
| ○ - 91891-2 | C - 41 - 4 | | |
| ○ - 94614-1 | C - 41 - 5 | | |
| ○ - 3160-04 | C - 55 | | |
| ● - 3160-05 | C - 56 | May, 2001 | 1 Year |
| ● - 3160-06 | C - 57 | May, 2001 | 1 Year |
| ● - 3160-07 | C - 58 | May, 2001 | 1 Year |
| ● - 3160-08 | C - 59 | May, 2001 | 1 Year |
| ● - 3160-09 | C - 48 | November, 2001 | 1 Year |
| ● - 355C | D - 22 | March, 2001 | 1 Year |
| ● - 355D | D - 23 | March, 2001 | 1 Year |
| ● - MZ5010C | D - 81 | November, 2001 | 1 Year |
| ● - 8673D | B - 2 | April, 2001 | 1 Year |
| ● - Cable | C - 40 - 11 | May, 2001 | 1 Year |
| ● - Cable | C - 40 - 12 | May, 2001 | 1 Year |

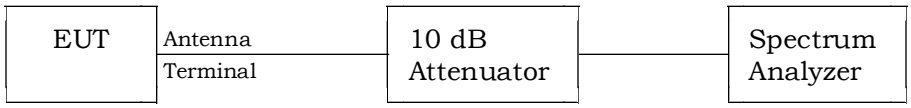
**Environmental conditions:**

Temperature: 22 °C Humidity: 48 %

## Transmitter Power (TP) Measurement (Sec.15.247(b)(1))

### Test Procedure :

The measurement test-setup is shown in the figure. The modulation is set to page 15.




The setting of the spectrum analyzer are shown as follows :

| | | |
|---|---|---|
| Res. Bandwidth | : | 1 MHz |
| Video Bandwidth | : | 3 MHz |
| Span | : | 0 Hz |
| Sweep Time | : | 20 msec |
| Trace | : | Max. hold |

### Test location :

KITA-KANSAI Testing Center
7-7, Ishimaru, 1-Chome, Mino-Shi, Osaka, 562-0027, Japan
● - Shielded room
KAMEOKA EMC Branch
9-1, Ozaki, Inukanno, Nishibetsuin-Cho, Kameoka-Shi, Kyoto, 621-0126, Japan
○ - Shielded room

### Used test instruments and sites :

| Model No. | Device ID | Last Cal. Date | Cal. Interval |
|---|---|---|---|
| ● - 8566B | A - 13 | December, 2000 | 1 Year |
| ○ - 432B/8478B | B - 24/B-43 | | |
| ○ - 6-20 | D - 27 | | |
| ● - 2-10 | D - 79 | September, 2001 | 1 Year |
| ○ - 4T-10 | D - 73 | | |
| ○ - 4T-10 | D - 74 | | |
| ○ - 8593A | A - 15 | | |

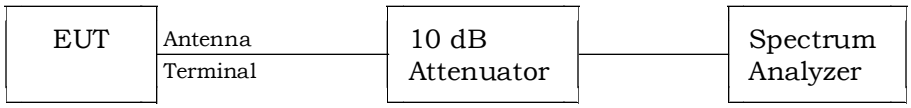
### Environmental conditions :

Temperature: 23 °C Humidity: 48 %

## -20dB Bandwidth Measurement (Sec.15.247(a)(1)(ii))

### Test Procedure :

The measurement test-setup is shown in the figure. The modulation is set to page 15.




The setting of the spectrum analyzer are shown as follows :

| | | |
|---|---|---|
| Res. Bandwidth | : | 10 kHz |
| Video Bandwidth | : | 30 kHz |
| Span | : | 2 MHz |
| Sweep Time | : | AUTO |
| Trace | : | Max. hold |

### Test location :

KITA-KANSAI Testing Center
7-7, Ishimaru, 1-Chome, Mino-Shi, Osaka, 562-0027, Japan
● - Shielded room
KAMEOKA EMC Branch
9-1, Ozaki, Inukanno, Nishibetsuin-Cho, Kameoka-Shi, Kyoto, 621-0126, Japan
○ - Shielded room

### Used test instruments:

| Model No. | Device ID | Last Cal. Date | Cal. Interval |
|---|---|---|---|
| ● - 8566B | A - 13 | December, 2000 | 1 Year |
| ● - 2-10 | D - 79 | September, 2001 | 1 Year |
| ○ - 4T-10 | D - 73 | | |
| ○ - 4T-10 | D - 74 | | |

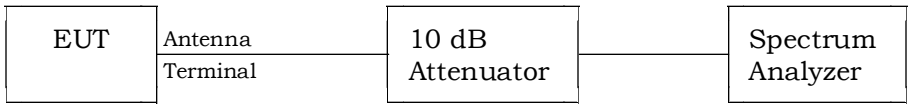
### Environmental conditions:

Temperature: 23 °C Humidity: 48 %

## Band-edge Emission Measurement (Sec.15.247(c))

### Test Procedure :

The measurement test-setup is shown in the figure. The modulation is set to page 15.




The setting of the spectrum analyzer are shown as follows :

| | | |
|---|---|---|
| Center Frequency | : | 2400 MHz / 2483.5 MHz |
| Res. Bandwidth | : | 100 kHz |
| Video Bandwidth | : | 300 kHz |
| Span | : | 2 MHz |
| Sweep Time | : | AUTO |
| Trace | : | Max. hold |

### Used test instruments:

| Model No. | Device ID | Last Cal. Date | Cal. Interval |
|---|---|---|---|
| ● - 8566B | A - 13 | December, 2000 | 1 Year |
| ● - 2-10 | D - 79 | September, 2001 | 1 Year |
| ○ - 4T-10 | D - 73 | | |
| ○ - 4T-10 | D - 74 | | |

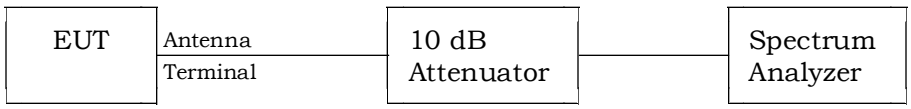
### Environmental conditions:

Temperature: 23 °C Humidity: 48 %

## Carrier Frequency Separation Measurement (Sec.15.247(a)(1))

### Test Procedure :

The measurement test-setup is shown in the figure. The modulation is set to page 15.
The transmitting frequency is set to 2440.158968 MHz (45ch) and 2441.050839 MHz (46ch).




The setting of the spectrum analyzer are shown as follows :

| | | |
|---|---|---|
| Center Frequency | : | 2440.6 MHz |
| Res. Bandwidth | : | 100 kHz |
| Video Bandwidth | : | 300 kHz |
| Span | : | 10 MHz |
| Sweep Time | : | AUTO |
| Trace | : | Max. hold |

### Used test instruments:

| Model No. | Device ID | Last Cal. Date | Cal. Interval |
|---|---|---|---|
| ● - 8566B | A - 13 | December, 2000 | 1 Year |
| ● - 2-10 | D - 79 | September, 2001 | 1 Year |
| ○ - 4T-10 | D - 73 | | |
| ○ - 4T-10 | D - 74 | | |

### Environmental conditions:

Temperature: 23 °C Humidity: 48 %

# CONFIGURATION OF EUT

**The Equipment Under Test (EUT) consists of:**

| Description | Grantee/Distributor | Model No. (Serial No.) | FCC ID |
|---|---|---|---|
| 2.4GHz FHSS Cordless Telephone (Handset) | Kyushu Matsushita Electric Co., Ltd. | KX-TG2730 (--) | ACJ96NKX-TG2730 |

**The measurement was carried out with the following equipment connected:**

| Description | Applicant (Manufacturer) | Model No. (Serial No.) | FCC ID |
|---|---|---|---|
| Headset | Kyushu Matsushita Electric Co., Ltd. | KX-TCA88 (--) | N/A |

**Type of Interference Cable(s) and the AC Power Cord used with the EUT:**

| | Description | Port | Shielded Cable | Shell Material | Ferrite Core | Cable Length |
|---|---|---|---|---|---|---|
| 1 | EUT | Headset | NO | -- | NO | 1.4 m |
| | Headset | -- | | -- | | |

## Operation - mode of the EUT:

The EUT was operated during the test under the following specification:

Transmitting
Modulation signal : TDMA/TDD Burst Type (FSK 164kHz dev.)

For operating condition of the EUT, the typical modulating signal is not used and inputted because the occupied bandwidth of the EUT is subject to restriction due to the bit rate of preamble data other than audio data in the transmitting data .

## Test system:

The EUT has a headset port.

## Special accessories:

None

## EUT Modification

● - No modifications were conducted by JQA to achieve compliance to applied levels.

○ - To achieve compliance to applied levels, the following change(s) were made by JQA during the compliance test.

The modification(s) will be implemented in all production models of this equipment.

Applicant : N/A Date : N/A

Typed Name : N/A Position : N/A

## Responsible Party

Responsible Party of Test Item(Product)

Responsible party :

Contact Person :

Signatory

## Deviation from Standard

● - No deviations from the standard described in page 3.

○ - The following deviations were employed from the standard described in page 3.

# TEST RESULTS

## AC Powerline Conducted Emission 450 kHz - 30 MHz (Sec.15.207(a))

The requirements are ○ - Passed ○ - Not Passed

Min. limit margin _____ dB at _____ MHz

Max. limit exceeding _____ dB at _____ MHz

Uncertainty of measurement results _____ dB(2σ) _____ dB(2σ)

**Remarks:** Not Applicable

## Electromagnetic Field Radiated Emission 9 kHz - 25 GHz

## Maximum Peak Power (EIRP) (Sec.15.247(b)(1))

The requirements are ● - Passed ○ - Not Passed

Maximum Peak Power (EIRP) 0.208 W at 2400.916645 MHz

Min. limit margin 6.8 dB at 2400.916645 MHz

Max. limit exceeding _____ dB at _____ MHz

## Spurious (Sec.15.247(c),15.205(a),15.209(a))

The requirements are ● - Passed ○ - Not Passed

Min. limit margin 5.4 dB at 317.9 MHz

Max. limit exceeding _____ dB at _____ MHz

| | | |
|---|---|---|
| Uncertainty of measurement results (≤ 30 MHz) | + 2.5 dB(2σ) | - 2.5 dB(2σ) |
| Uncertainty of measurement results (30 MHz - 1000 MHz) | + 4.9 dB(2σ) | - 5.0 dB(2σ) |
| Uncertainty of measurement results (≥ 1000 MHz) | + 3.1 dB(2σ) | - 3.2 dB(2σ) |

**Remarks:**

## Transmitter Power (TP) (Sec.15.247(b)(1))

The requirements are ● - Passed ○ - Not Passed

The transmitter power is 0.115 W at 2400.916645 MHz

Min. limit margin 9.4 dB at 2400.916645 MHz

Max. limit exceeding _____ dB at _____ MHz

Uncertainty of measurement results ± 0.6 dB(2σ)

**Remarks:** _____

## Antenna Gain of the EUT (Sec.15.247(b)(3)(i))

The antenna gain is 2.57 dBi at 2400.916645 MHz

**Remarks:** _____

## -20dB Bandwidth (Sec.15.247(a)(1)(ii))

The requirements are ● - Passed ○ - Not Passed

The -20dB Bandwidth is 632.0 kHz at 2480.913161 MHz

The results Refer to pages 35 - 37

Min. limit margin 368.0 kHz at 2480.913161 MHz

Max. limit exceeding _____ kHz at _____ MHz

Uncertainty of measurement results at Frequency ±0.05 ppm(2σ)
Uncertainty of measurement results at Amplitude ± 0.6 dB(2σ)

**Remarks:** _____

**Band-edge Emission (Sec.15.247(c))**

The requirements are ● **- Passed** ○ **- Not Passed**

The results Refer to pages 38 - 39

Uncertainty of measurement results at Frequency ±0.05 ppm(2σ)
Uncertainty of measurement results at Amplitude ± 0.6 dB(2σ)

**Remarks:** _____

_____

**Carrier Frequency Separation (Sec.15.247(a)(1))**

The requirements are ● **- Passed** ○ **- Not Passed**

Channel Separation 890 kHz

The results Refer to page 41

Uncertainty of measurement results at Frequency ±0.05 ppm(2σ)
Uncertainty of measurement results at Amplitude ± 0.6 dB(2σ)

**Remarks:** _____

_____

# SUMMARY

## GENERAL REMARKS :

The EUT was tested according to the requirements of FCC Rules and Regulations Part 15 Subpart A and C (February 28, 2001) under the test configuration, as shown in page 21.

The conclusion for the test items of which are required by the applied regulation is indicated under the final judgement.

## FINAL JUDGEMENT :

The "as received" sample;

● - fulfill the test requirements of the regulation mentioned on page 3.

○ - fulfill the test requirements of the regulation mentioned on page 3, but with certain qualifications.

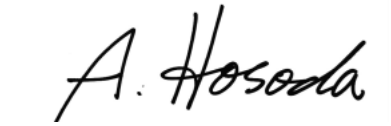
○ - doesn't fulfill the test regulation mentioned on page 3.

Begin of testing : December 4, 2001

End of testing : December 5, 2001

- JAPAN QUALITY ASSURANCE ORGANIZATION -

Approved by :

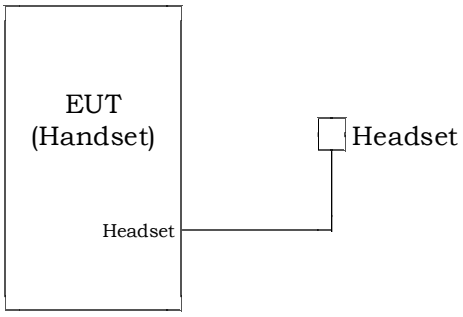


Akio Hosoda
Manager
EMC Div.
JQA KITA-KANSAI Testing Center

Issued by :

Shigeru Kinoshita
Deputy Manager
EMC Div.
JQA KITA-KANSAI Testing Center

## Test System-Arrangement (Drawings)

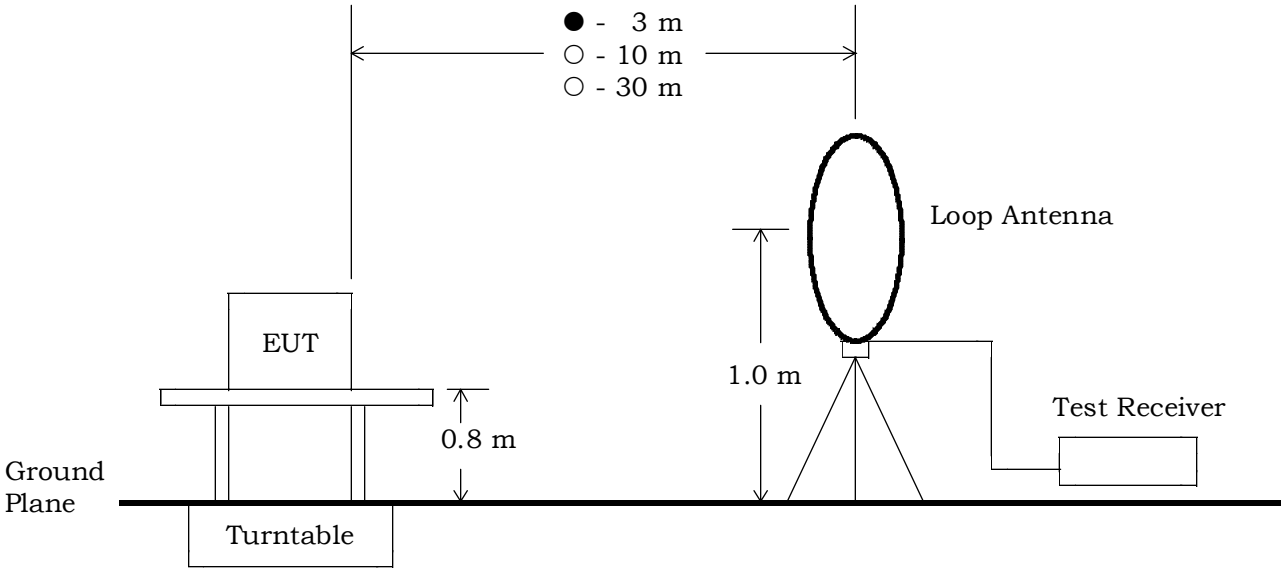



Power Supply : DC3.6V (Ni-Cd Batterry Pack : N4HKGMA0001)

## Preliminary Test and Test-setup(Drawings)

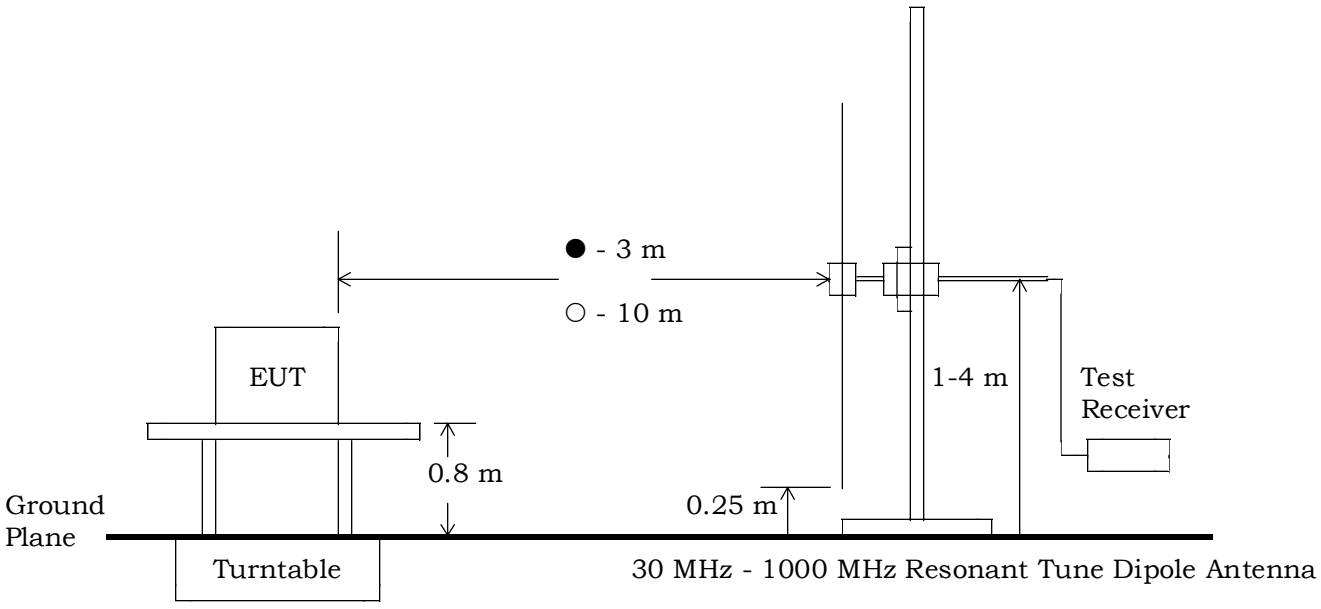
Radiated Emission (Magnetic Field) 9 kHz - 30 MHz:

The preliminary test was performed according to the description of ANSI C63.4-1992 Sec.8.3.1.1 (Preliminary Radiated Emissions Tests) and Sec.6.2.1 (Tabletop Equipment Tests).
The preliminary test was carried out to investigate the frequency of the emission that has the highest amplitude relative to the limits within normal operating modes, cable positions, and a typical system configuration. In order to find out to the maximum emission, the preliminary test and a final test were performed in accordance with the following steps.
Step 1: One operation mode of the test system was setting.
Step 2: In order to investigate the frequencies of maximum emissions, the loop antenna position was approached to the EUT and the significant frequency of the emission's circumstance from the test system were investigated. These data were recorded in the specified frequency band (9 kHz - 30 MHz).
Step 3: Using a test receiver and a loop antenna, the emission's circumstance from the test system was measured in according with ANSI C63.4-1992 Sec.8.3.1.2 (Final Radiated Emissions Tests) at each frequency which was found the higher emission referred to level vs. frequency on the list and which was measured by the loop antenna. The maximum emission was found by rotating three orthogonal axes or by changing the cable positions or cable manipulation under a typical system configuration.
Step 4: Return to step 1, if the other operation mode was possible to be setting.
Step 5: The worst result was reported arranging data of which was obtained and performed by one or plural operation modes as the final test.
At the worst point that has the highest amplitude relative to the limit the repeatability of the level was reconfirmed. The photographs of the tests system setup on the worst point were taken and recorded.



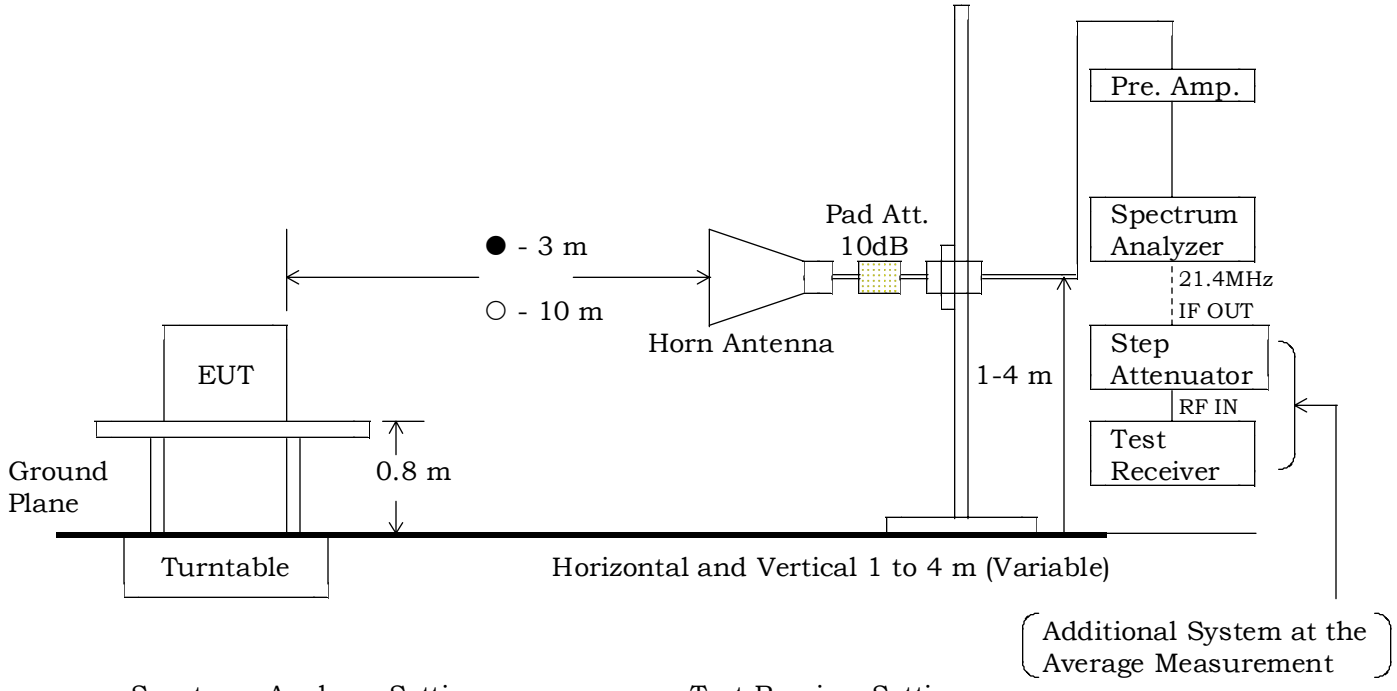
Electromagnetic Field Radiated Emission 30 MHz - 1000 MHz:

The preliminary test was performed according to the description of ANSI C63.4-1992 Sec.8.3.1.1 (Preliminary Radiated Emissions Tests) and Sec.6.2.1 (Tabletop Equipment Tests).
The preliminary test was carried out to investigate the frequency of the emission that has the highest amplitude relative to the limits within normal operating modes, cable positions, and a typical system configuration. In order to find out to the maximum emission, the preliminary test and a final test were performed in accordance with the following steps.
Step 1: One operation mode of the test system was setting.
Step 2: Using a test receiver and a test antenna probe, the significant frequency of the emission's circumstance from the test system were investigated. These data were recorded every one of 22 divided bands in the specified frequency band (30 MHz - 1000 MHz).
Step 3: Using a test receiver and a resonant tuned dipole antenna, the emission's circumstance from the test system was measured in according with ANSI C63.4-1992 Sec.8.3.1.2 (Final Radiated Emissions Tests) at each frequency which was found the higher emission referred to level vs. frequency on the list and which was measured by the resonant tuned dipole antenna. The maximum emission was found by rotating three orthogonal axes or by changing the cable positions or cable manipulation under a typical system configuration.
Step 4: Return to step 1, if the other operation mode was possible to be setting.
Step 5: The worst result was reported arranging data of which was obtained and performed by one or plural operation modes as the final test.
At the worst point that has the highest amplitude relative to the limit the repeatability of the level was reconfirmed. The photographs of the tests system setup on the worst point were taken and recorded.



Electromagnetic Field Radiated Emission 1 GHz - 25 GHz:

The preliminary test was performed according to the description of ANSI C63.4-1992 Sec.8.3.1.1 (Preliminary Radiated Emissions Tests) and Sec.6.2.1 (Tabletop Equipment Tests).
The preliminary test was carried out to investigate the frequency of the emission that has the highest amplitude relative to the limits within normal operating modes, cable positions, and a typical system configuration. In order to find out to the maximum emission, the preliminary test and a final test were performed in accordance with the following steps.
Step 1: One operation mode of the test system was setting.
Step 2: In order to investigate the frequencies of maximum emissions, the horn antenna position was approached to the EUT and the significant frequency of the emission's circumstance from the test system were investigated. These data were recorded in the specified frequency band (1 GHz - 25 GHz).
Step 3: The emission's circumstance from the test system was measured in accordance with ANSI C63.4-1992, Sec.8.3.1.2 (Final Radiated Emissions Tests) at each frequency which was found higher emission referred to level vs. frequency on the list and which was measured in the specified distance using the horn antenna. The maximum emission was found by rotating three orthogonal axes or by changing the cable positions or cable manipulation under a typical system configuration.
Step 4: Return to step 1, if the other operation mode was possible to be setting.
Step 5: The worst result was reported arranging data of which was obtained and performed by one or plural operation modes as the final test.
At the worst point that has the highest amplitude relative to the limit the repeatability of the level was reconfirmed. The photographs of the tests system setup on the worst point were taken and recorded.




Spectrum Analyzer Setting:

| | |
|---|---|
| Detector | *)Peak/Average |
| RES BW | 1 MHz |
| VIDEO BW | 1 MHz |
| SPAN | 0 Hz |

Test Receiver Setting:

| | | |
|---|---|---|
| SCALE | LINEAR | LINEAR |
| I.F.B.W. | 1 MHz | 1 MHz |
| Detector | Average | Peak |

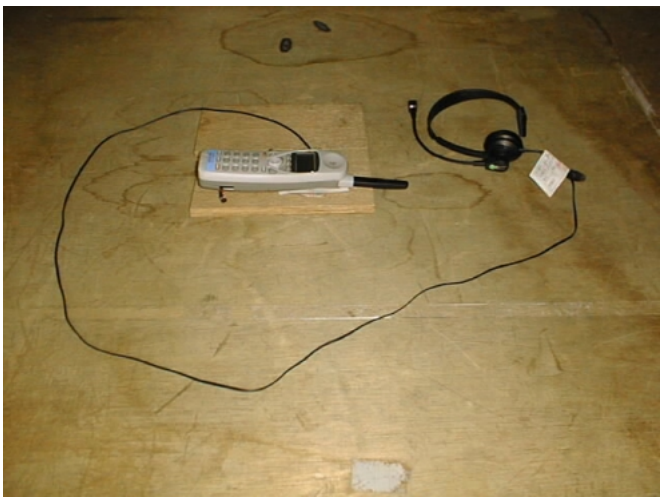
*) For the average measurement, it is made using a test receiver and a step attenuator.

## Test-Setup (Photographs) at worst case

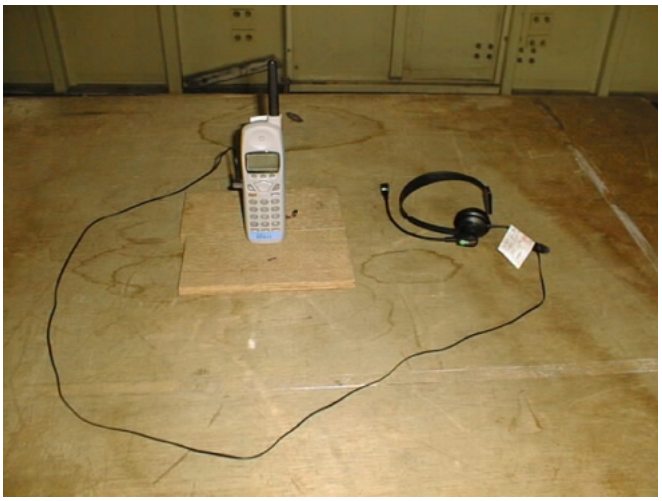
Conducted Emission 450kHz - 30MHz:

Not Applicable

Radiated Emission 9kHz - 25GHz:



Horizontal Polarization



Vertical Polarization

# Electromagnetic Field Radiated Emission Measurement

Intentional Radiator

Spurious emission except fundamental and harmonics (9 kHz - 1 GHz)

Test Date: December 5, 2001

Temp.: 13 °C ; Humi.: 54 %

**Transmitting Frequency : 2440.158968 MHz (45 ch)**

| Frequency [MHz] | Antenna Factor [dB(1/m)] | Cable Loss [dB] | Meter Readings [dB(μV)] Hori. | Meter Readings [dB(μV)] Vert. | Limits [dB(μV/m)] | Results [dB(μV/m)] Hori. | Results [dB(μV/m)] Vert. | Margin [dB] | Remarks (Note 2) |
|---|---|---|---|---|---|---|---|---|---|
| 106.5 | 9.4 | 0.9 | 22.0 | 17.0 | 43.5 | 32.3 | 27.3 | +11.2 | C |
| 110.6 | 9.8 | 0.9 | 23.0 | 18.0 | 43.5 | 33.7 | 28.7 | + 9.8 | C |
| 124.4 | 10.8 | 0.9 | 25.0 | 19.0 | 43.5 | 36.7 | 30.7 | + 6.8 | C |
| 138.3 | 11.7 | 1.0 | 23.0 | 18.0 | 43.5 | 35.7 | 30.7 | + 7.8 | C |
| 235.0 | 16.3 | 1.4 | 18.0 | 9.0 | 46.0 | 35.7 | 26.7 | +10.3 | C |
| 262.7 | 17.3 | 1.5 | 19.0 | 8.0 | 46.0 | 37.8 | 26.8 | + 8.2 | C |
| 317.9 | 19.0 | 1.6 | 20.0 | 15.0 | 46.0 | 40.6 | 35.6 | + 5.4 | C |
| 525.3 | 23.7 | 2.2 | 9.0 | 7.0 | 46.0 | 34.9 | 32.9 | +11.1 | C |
| 732.7 | 26.9 | 2.7 | 5.0 | 3.0 | 46.0 | 34.6 | 32.6 | +11.4 | C |
| 801.8 | 27.8 | 2.9 | 4.0 | 2.0 | 46.0 | 34.7 | 32.7 | +11.3 | C |

Sample of calculated result at 317.9 MHz, as the Minimum Margin point:

| | | | |
|---|---|---|---|
| | Antenna Factor | = | 19.0 dB(1/m) |
| +) | Cable Loss | = | 1.6 dB |
| | Meter Reading | = | 20.0 dB(μV) |
| | Result | = | 40.6 dB(μV/m) |

Minimum Margin : 46.0 - 40.6 = 5.4(dB)

The point shown on "____" is the Minimum Margin Point.

Note 1:

1)The highest frequency generated or used in the EUT: 2480.293161 MHz

2)The upper frequency of measurement range : 25 GHz

3)The spectrum was scanned 9 kHz to 1 GHz and all emissions not reported were more than 20 dB below the applied limits.

**Remarks**:

| Note 2 | Detector Function | IF Bandwidth |
|---|---|---|
| A | CISPR QP | 200 Hz |
| B | CISPR QP | 9 kHz |
| C | CISPR QP | 120 kHz |
| D | Average | 200 Hz |
| E | Average | 10 kHz |
| F | Average | 120 kHz |

Tester : Yasuhisa Sakai

# Electromagnetic Field Radiated Emission Measurement

Intentional Radiator

Fundamental and Spurious (above 1 GHz )

Test Date: December 4, 2001
Temp.: 22 °C ; Humi.: 48 %

**Transmitting Frequency : 2400.916645 MHz (01ch)**

| | Frequency [MHz] | Antenna Factor [dB(1/m)] | Corr. Factor [dB] | Meter Readings at 3m [dB(µV)] Hori. | Meter Readings at 3m [dB(µV)] Vert. | Limits [dB(µV/m)] | Results at 3m [dB(µV/m)] Hori. | Results at 3m [dB(µV/m)] Vert. | Margin [dB] | Remarks (Note 2) |
|---|---|---|---|---|---|---|---|---|---|---|
| **Fundamental** | | | | | | | | | | |
| | 2400.916645 | 21.6 | 10.8 | 86.0 | 86.0 | --- | 118.4 | 118.4 | --- | B |
| **Spurious at Peak Detector** | | | | | | | | | | |
| * | 4801.833290 | 27.3 | -31.2 | 63.0 | 62.0 | 74.0 | 59.1 | 58.1 | +14.9 | D |
| | 7202.749935 | 29.9 | -29.5 | 54.0 | 53.0 | 98.4 | 54.4 | 53.4 | +44.0 | B |
| | 9603.666580 | 33.4 | -27.5 | 40.0 | 42.0 | 98.4 | 45.9 | 47.9 | +50.5 | B |
| * | 12004.583225 | 33.6 | -26.7 | < 40.0 | < 40.0 | 74.0 | < 46.9 | < 46.9 | > +27.1 | D |
| | 14405.499870 | 37.1 | -26.3 | 41.0 | 42.0 | 98.4 | 51.8 | 52.8 | +45.6 | B |
| | 16806.416515 | 37.2 | -27.0 | < 40.0 | < 40.0 | 98.4 | < 50.2 | < 50.2 | > +48.2 | D |
| * | 19207.333160 | 40.2 | -28.0 | < 40.0 | < 40.0 | 74.0 | < 52.2 | < 52.2 | > +21.8 | B |
| | 21608.249805 | 40.3 | -28.2 | < 40.0 | < 40.0 | 98.4 | < 52.1 | < 52.1 | > +46.3 | B |
| | 24009.166450 | 40.4 | -28.2 | < 40.0 | < 40.0 | 98.4 | < 52.2 | < 52.2 | > +46.2 | B |
| **Spurious at Average Detector** | | | | | | | | | | |
| * | 4801.833290 | 27.3 | -31.2 | 42.0 | 41.0 | 54.0 | 38.1 | 37.1 | +15.9 | C |
| * | 12004.583225 | 33.6 | -26.7 | < 30.0 | < 30.0 | 54.0 | < 36.9 | < 36.9 | > +17.1 | C |
| * | 19207.333160 | 40.2 | -28.0 | < 30.0 | < 30.0 | 54.0 | < 42.2 | < 42.2 | > +11.8 | C |

**Transmitting Frequency : 2440.158968 MHz (45ch)**

| | Frequency [MHz] | Antenna Factor [dB(1/m)] | Corr. Factor [dB] | Meter Readings at 3m [dB(μV)] Hori. | Vert. | Limits [dB(μV/m)] | Results at 3m [dB(μV/m)] Hori. | Vert. | Margin [dB] | Remarks (Note 2) |
|---|---|---|---|---|---|---|---|---|---|---|
| **Fundamental** | | | | | | | | | | |
| | 2440.158968 | 21.5 | 10.8 | 83.0 | 85.0 | --- | 115.3 | 117.3 | --- | B |
| **Spurious at Peak Detector** | | | | | | | | | | |
| * | 4880.317936 | 27.3 | -31.2 | 62.0 | 63.0 | 74.0 | 58.1 | 59.1 | +14.9 | D |
| * | 7320.476904 | 29.9 | -29.4 | 53.0 | 50.0 | 74.0 | 53.5 | 50.5 | +20.5 | D |
| | 9760.635872 | 33.5 | -27.4 | < 40.0 | < 40.0 | 97.3 | < 46.1 | < 46.1 | > +51.2 | B |
| * | 12200.794840 | 33.6 | -26.6 | < 40.0 | < 40.0 | 74.0 | < 47.0 | < 47.0 | > +27.0 | D |
| | 14640.953808 | 37.1 | -26.4 | < 40.0 | < 40.0 | 97.3 | < 50.7 | < 50.7 | > +46.6 | B |
| | 17081.112776 | 37.2 | -27.1 | < 40.0 | < 40.0 | 97.3 | < 50.1 | < 50.1 | > +47.2 | B |
| * | 19521.271744 | 40.3 | -27.8 | < 40.0 | < 40.0 | 74.0 | < 52.5 | < 52.5 | > +21.5 | D |
| | 21961.430712 | 40.3 | -27.9 | < 40.0 | < 40.0 | 97.3 | < 52.4 | < 52.4 | > +44.9 | B |
| | 24401.589680 | 40.4 | -28.7 | < 40.0 | < 40.0 | 97.3 | < 51.7 | < 51.7 | > +45.6 | B |
| **Spurious at Average Detector** | | | | | | | | | | |
| * | 4880.317936 | 27.3 | -31.2 | 40.0 | 41.0 | 54.0 | 36.1 | 37.1 | +16.9 | C |
| * | 7320.476904 | 29.9 | -29.4 | 31.0 | < 30.0 | 54.0 | 31.5 | < 30.5 | +22.5 | C |
| * | 12200.794840 | 33.6 | -26.6 | < 30.0 | < 30.0 | 54.0 | < 37.0 | < 37.0 | > +17.0 | C |
| * | 19521.271744 | 40.3 | -27.8 | < 30.0 | < 30.0 | 54.0 | < 42.5 | < 42.5 | > +11.5 | C |

**Transmitting Frequency : 2480.913161 MHz (90ch)**

| | Frequency [MHz] | Antenna Factor [dB(1/m)] | Corr. Factor [dB] | Meter Readings at 3m [dB(µV)] Hori. | Vert. | Limits [dB(µV/m)] | Results at 3m [dB(µV/m)] Hori. | Vert. | Margin [dB] | Remarks (Note 2) |
|---|---|---|---|---|---|---|---|---|---|---|
| **Fundamental** | | | | | | | | | | |
| | 2480.913161 | 21.4 | 10.8 | 84.0 | 83.0 | --- | 116.2 | 115.2 | --- | B |
| **Spurious at Peak Detector** | | | | | | | | | | |
| * | 4961.826322 | 27.3 | -31.2 | 68.0 | 68.0 | 74.0 | 64.1 | 64.1 | + 9.9 | D |
| * | 7442.739483 | 30.0 | -29.4 | 60.0 | 58.0 | 74.0 | 60.6 | 58.6 | +13.4 | D |
| | 9923.652644 | 33.5 | -27.4 | 46.0 | 47.0 | 96.2 | 52.1 | 53.1 | +43.1 | B |
| * | 12404.565805 | 37.0 | -26.6 | < 40.0 | 43.0 | 74.0 | < 50.4 | 53.4 | +20.6 | D |
| | 14885.478966 | 37.1 | -26.4 | 42.0 | 44.0 | 96.2 | 52.7 | 54.7 | +41.5 | B |
| | 17366.392127 | 37.2 | -27.1 | < 40.0 | < 40.0 | 96.2 | < 50.1 | < 50.1 | > +46.1 | B |
| * | 19847.305288 | 40.3 | -27.4 | < 40.0 | < 40.0 | 74.0 | < 52.9 | < 52.9 | > +21.1 | D |
| * | 22328.218449 | 40.4 | -27.6 | < 40.0 | < 40.0 | 96.2 | < 52.8 | < 52.8 | > +43.4 | D |
| | 24809.131610 | 40.4 | -28.8 | < 40.0 | < 40.0 | 96.2 | < 51.6 | < 51.6 | > +44.6 | B |
| **Spurious at Average Detector** | | | | | | | | | | |
| * | 4961.826322 | 27.3 | -31.2 | 45.0 | 45.0 | 54.0 | 41.1 | 41.1 | +12.9 | C |
| * | 7442.739483 | 30.0 | -29.4 | 36.0 | 34.0 | 54.0 | 36.6 | 34.6 | +17.4 | C |
| * | 12404.565805 | 37.0 | -26.6 | < 30.0 | < 30.0 | 54.0 | < 40.4 | < 40.4 | > +13.6 | C |
| * | 19847.305288 | 40.3 | -27.4 | < 30.0 | < 30.0 | 54.0 | < 42.9 | < 42.9 | > +11.1 | C |
| * | 22328.218449 | 40.4 | -27.6 | < 30.0 | < 30.0 | 54.0 | < 42.8 | < 42.8 | > +11.2 | C |

Sample of calculated result at 4961.826322 MHz, as the Minimum Margin point:

| | | | |
|---|---|---|---|
| | Antenna Factor | = | 27.3 dB(1/m) |
| | Corr. Factor | = | -31.2 dB |
| +) | Meter Reading | = | 68.0 dB(μV) |
| | Result | = | 64.1 dB(μV/m) |

Minimum Margin : 74.0 - 64.1 = 9.9(dB)
The point shown on "____" is the Minimum Margin Point.

Note 1:
1)The highest frequency generated or used in the EUT: 2480.293161 MHz
2)The upper frequency of measurement range : 25 GHz
3)The spectrum was scanned 1 GHz to 25 GHz and all emissions not reported were more than 20 dB below the applied limits.
4)Symbol '*' : Restricted bands of operation in Sec.15.205.
5)Corr. Factor (Fundamental) = Cable Loss + 10 dB Pad Attenuator [dB]
Corr. Factor (≤ 18 GHz except Fundamental) = Cable Loss + 10 dB Pad Attenuator - Amp. Gain [dB]
Corr. Factor (≥ 18 GHz) = Cable Loss - Amp. Gain + Mixer Conversion Loss(at IF=8GHz)[dB]

**Remarks**:

| Note 2 | Detector Function | RES. B.W. | V.B.W. | Sweep T | Span |
|---|---|---|---|---|---|
| A | Peak (SP) | 1 MHz | 1 MHz | 20 msec | 0 Hz |
| B | Peak (SP) | 100 kHz | 300 kHz | 20 msec | 0 Hz |
| *) C | Average (Receiver) | 1 MHz (1 MHz) | 3 MHz | 20 msec | 0 Hz |
| D | Peak | 1 MHz | 3 MHz | 20 msec | 0 Hz |

( ):Setting of spectrum analyzer
*)For the average/peak measurement method, it is made measurement using a test receiver, a step attenuator or and a spectrum analyzer(FCC REPLY No. 950523A).

Tester : Yasuhisa Sakai

# Maximum Peak Power (EIRP) Measurement

Fundamental Emission

Test Date: December 4, 2001
Temp.: 22 °C ; Humi.: 48 %

Measurement Results:

**Radiated Emission Measurement at 3m**

| Frequency [MHz] | Antenna Factor [dB(1/m)] | Corr. Factor [dB] | Meter Readings at 3m [dB(μV)] Hori. | Vert. | Results at 3m [dB(μV/m)] Hori. | Vert. | Remarks (Note 1) |
|---|---|---|---|---|---|---|---|
| **Fundamental** | | | | | | | |
| 2400.916645 | 21.6 | 10.8 | 86.0 | 86.0 | 118.4 | 118.4 | A |
| 2440.158968 | 21.6 | 10.8 | 83.0 | 85.0 | 115.4 | 117.4 | A |
| 2480.293161 | 21.4 | 10.8 | 84.0 | 83.0 | 116.2 | 115.2 | A |

**Remarks**:

| Note 1 | Detector Function | RES. B.W. | V.B.W. | Sweep T | Span |
|---|---|---|---|---|---|
| A | Peak | 1 MHz | 3 MHz | 20 msec | 0 Hz |

Calculated Results:

| CH No. | Frequency (MHz) | Maximum Peak Power EIRP(W) Hori. | Vert. | Limits (W) | Margin (dB) |
|---|---|---|---|---|---|
| 01 | 2400.916645 | 0.208 | 0.208 | 1.000 | + 6.8 |
| 45 | 2440.158968 | 0.102 | 0.161 | 1.000 | + 7.9 |
| 90 | 2480.293161 | 0.125 | 0.099 | 1.000 | + 9.0 |

The EUT is placed at 3 m away from the receiving antenna and the EIRP is calculated using the following formula:

$E^2 / (120\pi) = EIRP / (4\pi d^2)$ where $EIRP = P_h \cdot G_h$, E : Field Strength at d (distance) m [μV/m]
$EIRP = (d \cdot E)^2 / 30$ $G_h$ = Substituted Antenna [dBi]
$EIRP\ [W] = (3 \times E\ [\mu V/m] \times 10^{-6})^2 / 30$ $P_h$ = Input power at the Substituted Antenna [W]

The point shown on "____" is the Minimum Margin Point.
Minimum Margin Point, as 2400.916645 MHz : 10log(1.000 / 0.208 ) = 6.8 (dB )

Tester : Yasuhisa Sakai

# Transmitter Power(TP) Measurement

Test Date: December 4, 2001
Temp.: 23 °C ; Humi.: 48 %

Measurement Results:

| CH No. | Frequency (MHz) | Corr. Factor (dB) | Meter Reading (dBm) | Result (dBm) | Result (W) | Limits (W) | Margin (dB) | Remarks (Note 1) |
|---|---|---|---|---|---|---|---|---|
| 01 | 2400.916645 | 10.8 | 9.8 | 20.6 | 0.115 | 1.000 | + 9.4 | A |
| 45 | 2440.158968 | 10.8 | 9.1 | 19.9 | 0.098 | 1.000 | +10.1 | A |
| 90 | 2480.293161 | 10.8 | 7.8 | 18.6 | 0.072 | 1.000 | +11.4 | A |

Sample of calculated result at 2400.916645 MHz, as the Minimum Margin point:

Correction Factor = 10.8 dB
+) Meter Reading = 9.8 dBm
Result = 20.6 dBm : $10^{(20.6/10)} \times 10^{-3} = 0.115$ (W)

Minimum Margin : 30.0 - 20.6 = 9.4(dB)
The point shown on "____" is the Minimum Margin Point.

Note : 1. The correction factor includes the attenuator loss and the cable loss.

**Remarks**:

| Note 2 | Detector Function | RES. B.W. | V.B.W. | Sweep T | Span |
|---|---|---|---|---|---|
| A | Peak | 1 MHz | 3 MHz | 20 msec | 0 Hz |

Tester : Yasuhisa Sakai

# Calculated Antenna gain of the EUT

Calculated Results:

Antenna gain of the integrated antenna of the EUT : $G_{EUT}$ (dB)
Transmitter power (Measured) : TP (dBm)
EIRP (Measured) : EIRP (dBm)

If the antenna gain ($G_{EUT}$) is met the equations as follows.

$EIRP = TP \times G_{EUT}$
$G_{EUT}$ (Numeric) = EIRP / TP
$G_{EUT}$ (dB) = $10\log_{10}$(EIRP / TP)

| CH No. | Frequency (MHz) | EIRP (W) | TP (W) | $G_{EUT}$ (dBi) |
|---|---|---|---|---|
| 01 | 2400.916645 | 0.208 | 0.115 | 2.57 |
| 45 | 2440.158968 | 0.161 | 0.098 | 2.16 |
| 90 | 2480.293161 | 0.125 | 0.072 | 2.40 |

Sample of calculated result at 2440.158968 MHz, as the Maximum point:

EIRP = 23.18 dBm = $10\log_{10}(0.208) + 30$
-) TP = 20.61 dBm = $10\log_{10}(0.115) + 30$
Result = 2.57 dBi

The point shown on "____" is the Maximum Point.

# -20dB bandwidth and Band-edge Emission Measurement

Fundamental Emission

Test Date: December 4, 2001
Temp.: 23 °C ; Humi.: 48 %

1) -20dB bandwidth measurement

Measurement Results:

| CH No. | Frequency (MHz) | -20dB bandwidth (kHz) | Attached graph page |
|---|---|---|---|
| 00 | 2400.916645 | 622 | page 35 |
| 46 | 2440.158968 | 624 | page 36 |
| 91 | 2480.293161 | 632 | page 37 |

The point shown on "____" is the Minimum Margin Point.

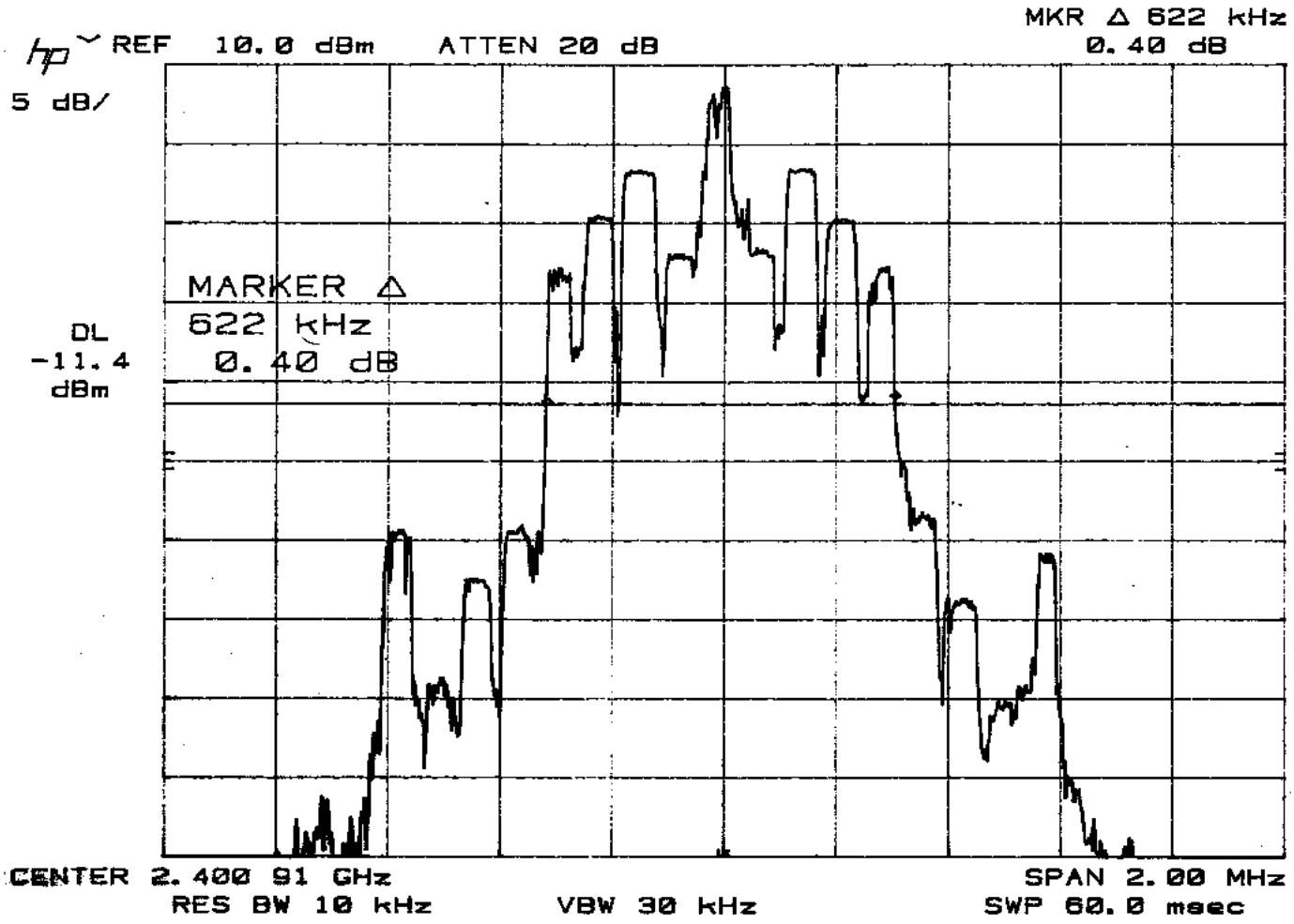
2) Band-edge Emission measurement

Measurement Results:

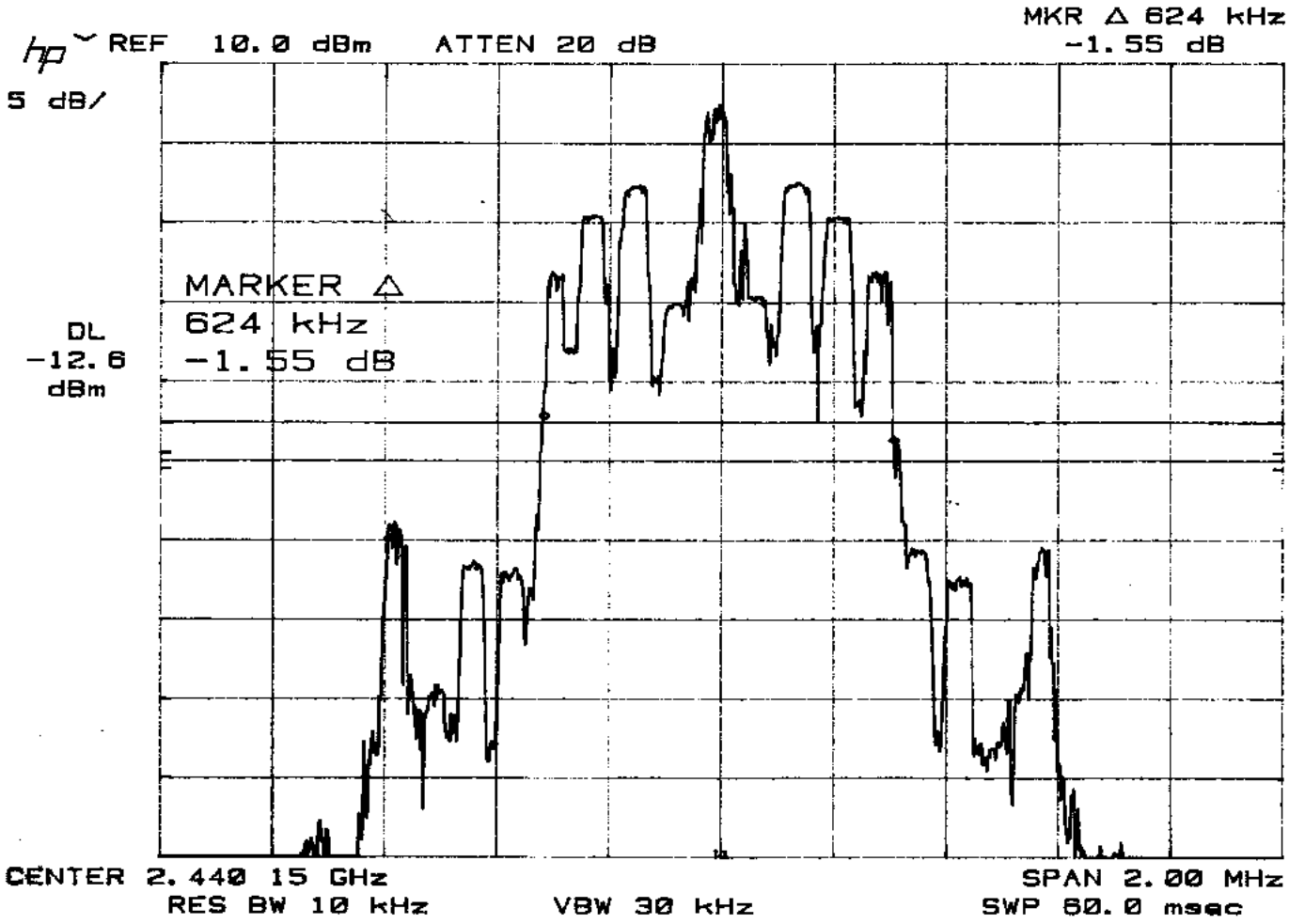
| CH No. | Frequency (MHz) | Band-edge Frequency (MHz) | Attached graph page |
|---|---|---|---|
| 00 | 2400.916645 | 2400.000 | page 38 |
| 91 | 2480.293161 | 2483.500 | page 39 |

Tester : Yasuhisa Sakai

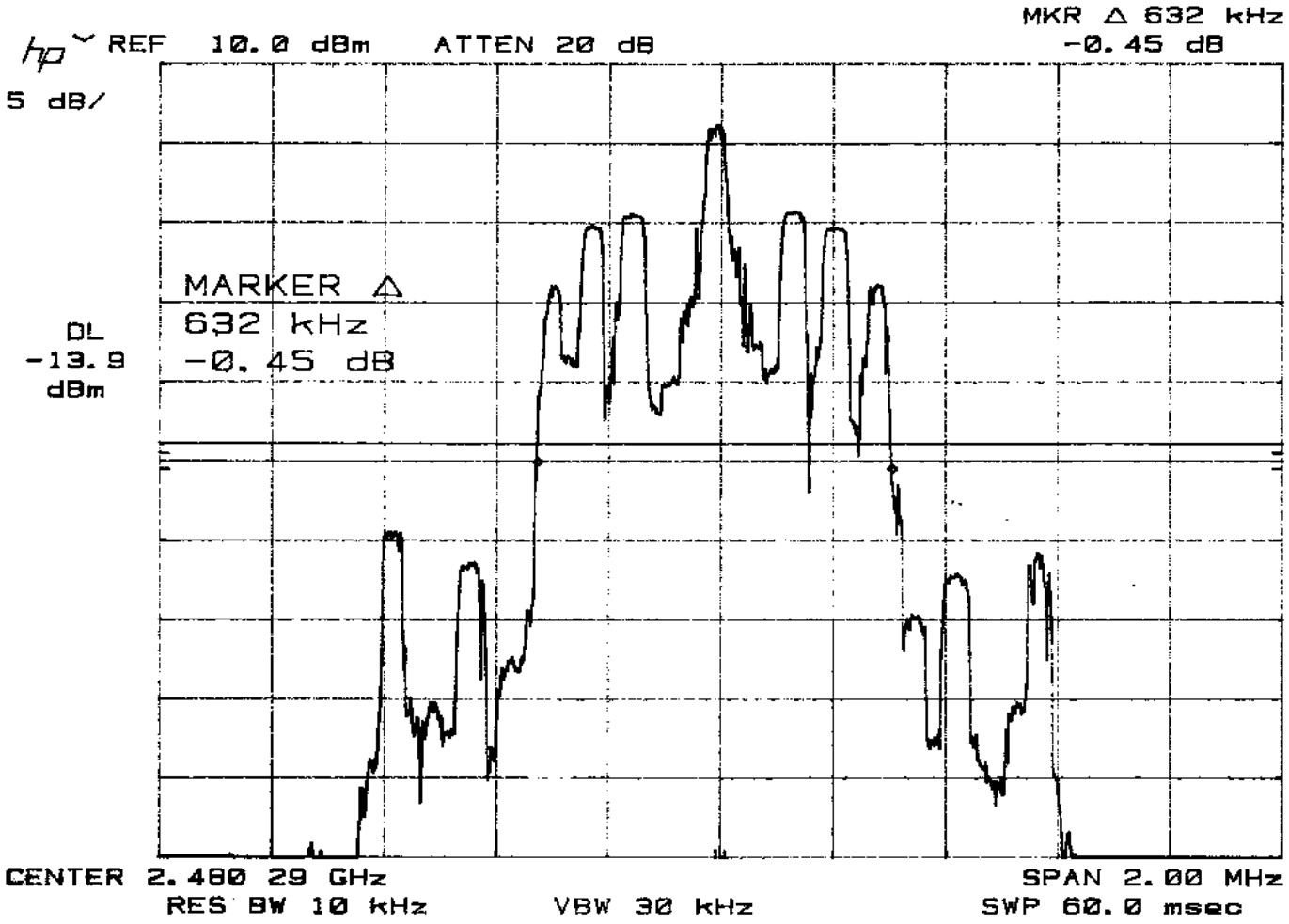
**-20dB Bandwidth Measurement**
**Transmitting Frequency : 2400.916645 MHz (01 ch)**



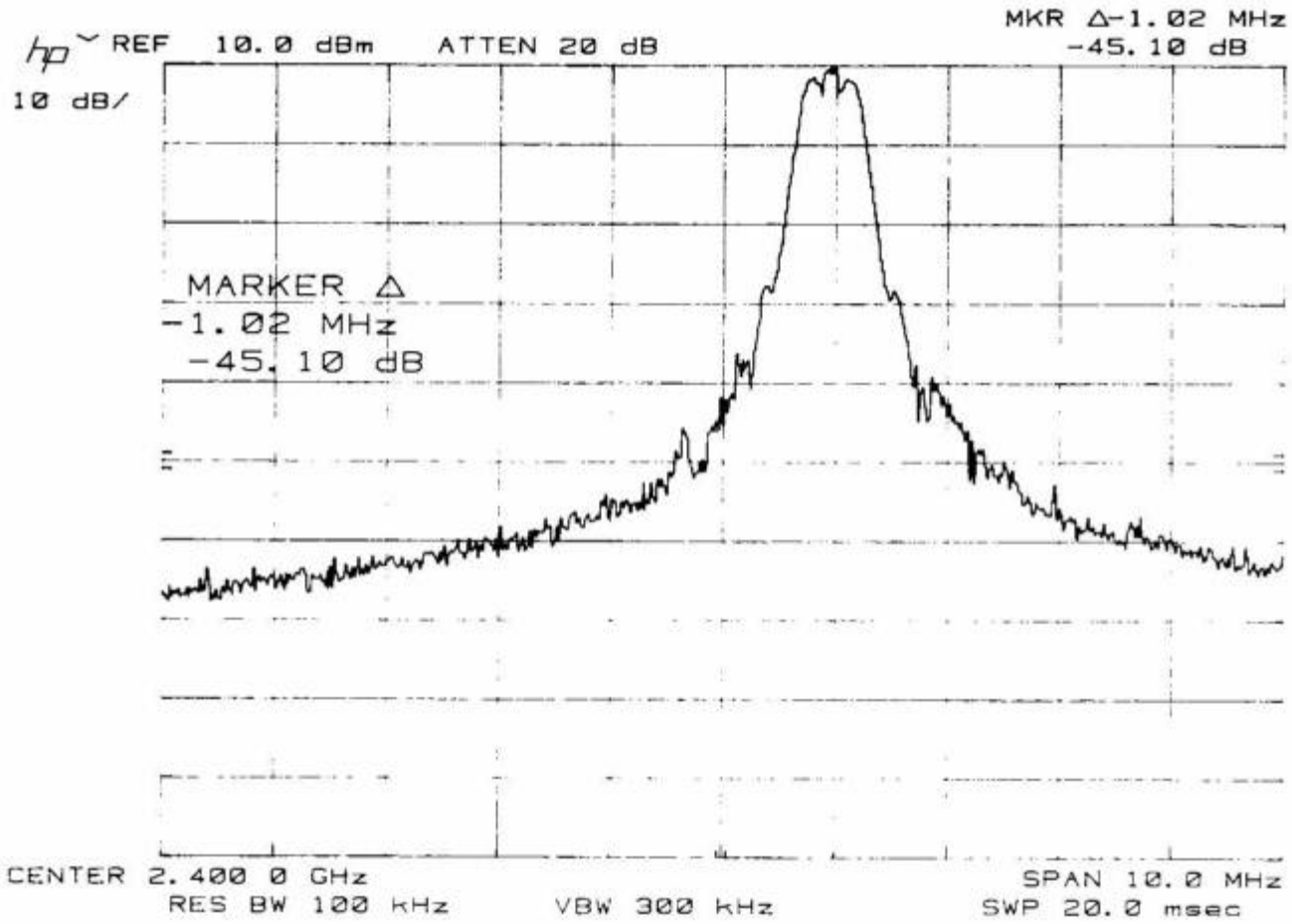
**-20dB Bandwidth Measurement**
**Transmitting Frequency : 2440.158968 MHz (45 ch)**



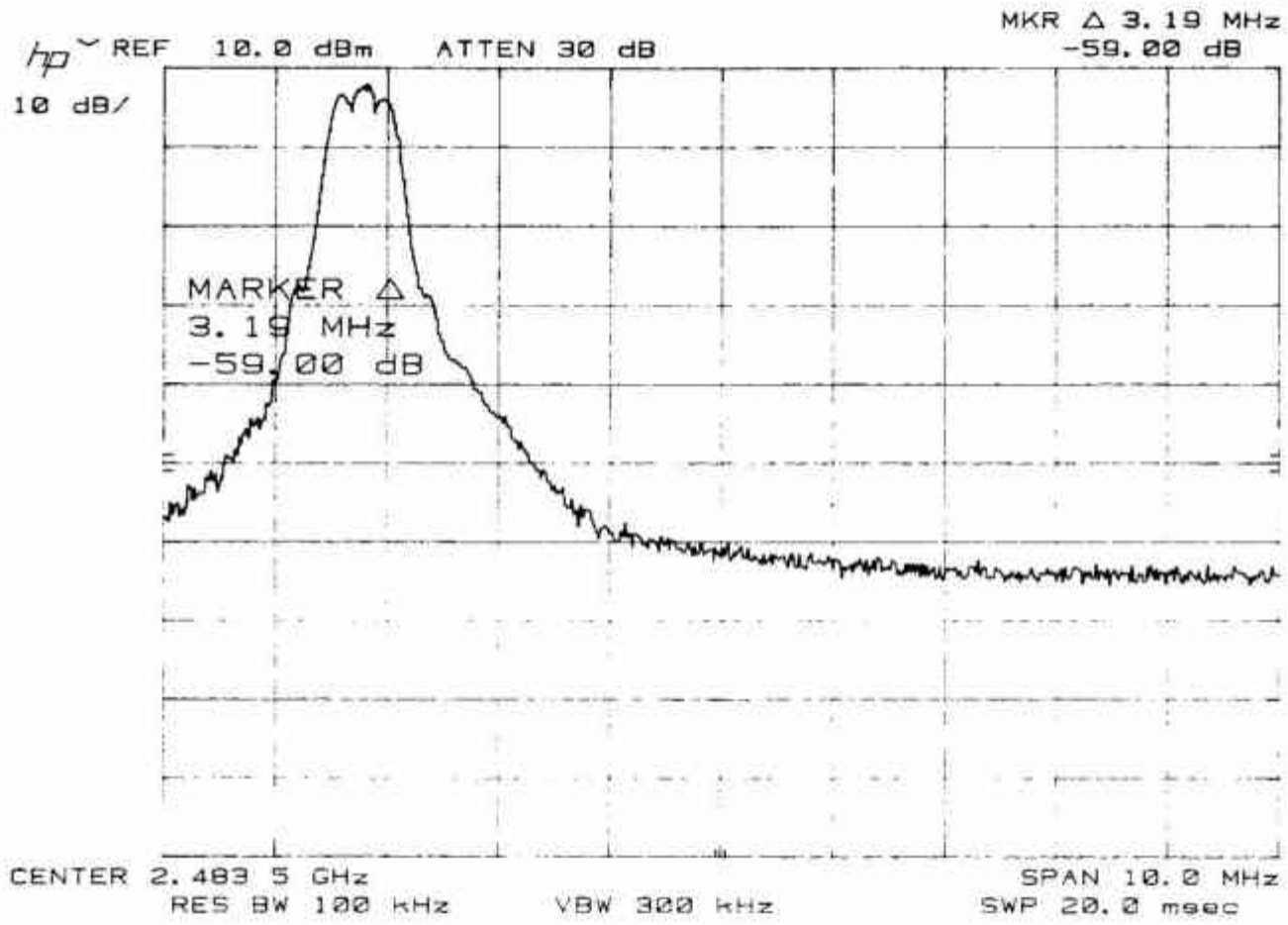
**-20dB Bandwidth Measurement**
**Transmitting Frequency : 2480.293161 MHz (90 ch)**



**Band-edge Emission Measurement**
**Transmitting Frequency : 2400.916645 MHz (01 ch)**
**Band-edge Frequency : 2400.000 MHz**



**Band-edge Emission Measurement**
**Transmitting Frequency : 2480.158968 MHz (90 ch)**
**Band-edge Frequency : 2483.500 MHz**



# Carrier Frequency Separation Measurement

Fundamental Emission

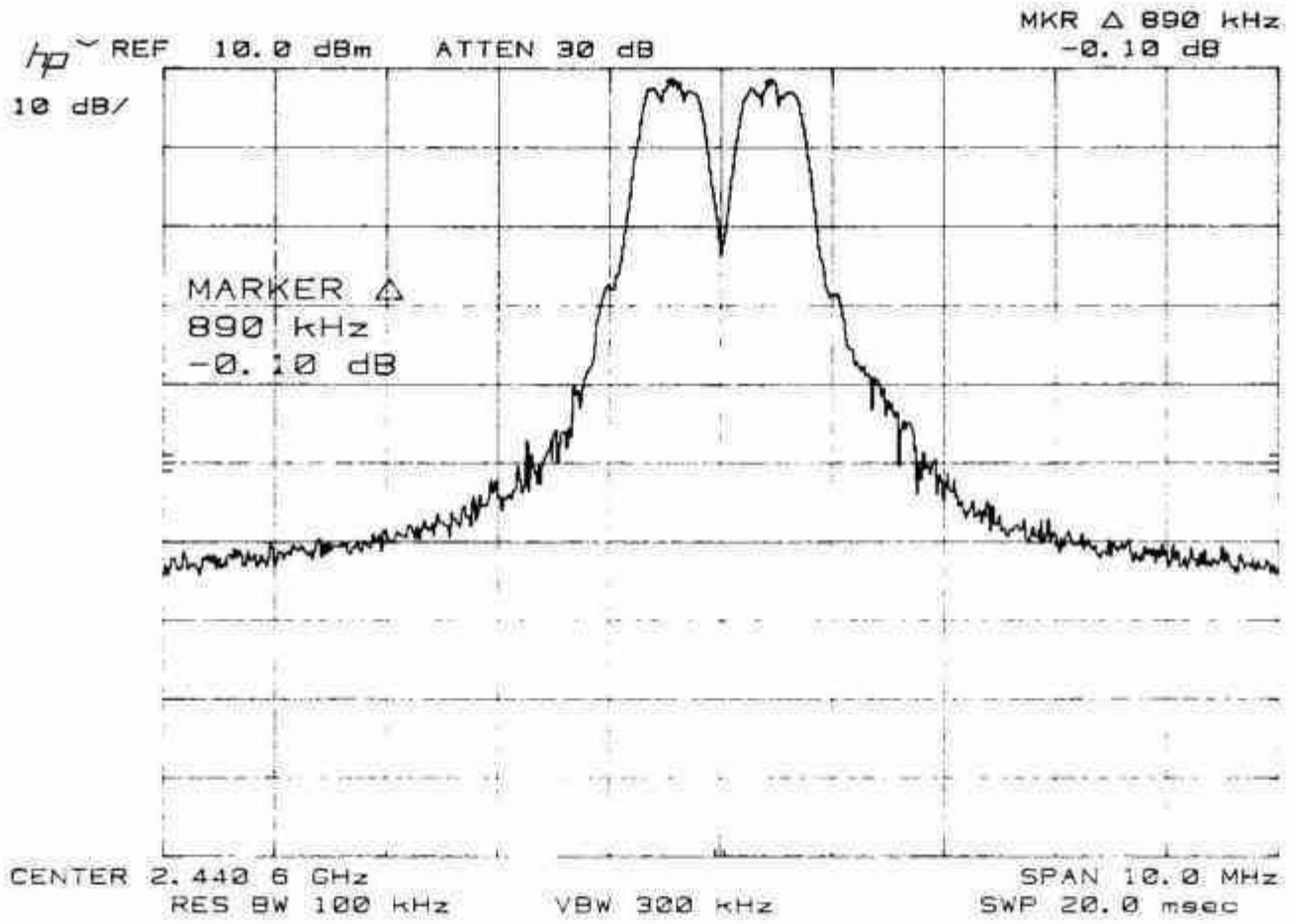
Test Date: December 4, 2001
Temp.: 23 °C ; Humi.: 48 %

Measurement Results:

| | | |
|---|---|---|
| Transmitting Frequency No.1 | : | 2440.158968 MHz (45 ch) |
| Transmitting Frequency No.2 | : | 2441.050839 MHz (46 ch) |
| Channel Separation | : | 890 kHz |
| Attached Graph Page | : | page 41 |

Tester : Yasuhisa Sakai

**Carrier Frequency Separation Measurement**
**Transmitting Frequency No.1 : 2440.158968 MHz (45 ch)**
**Transmitting Frequency No.2 : 2441.050839 MHz (46 ch)**



# Sec.247(a)(1)(ii) CHANNEL SEPARATION/DWELL TIME

Compliance with other provision of Sec.15.247 is stated in Kyushu Matsushita Electric Co., Ltd., as stated below:

Hopping channel carrier frequencies are separated by 891.871 kHz.

Each bearer is independent and hops at a rate of 100 hops/sec.

The hopping sequence is either table-generated or RNG-generated:

1. A table-generated hop sequence is 75 hops long, each channel is used exactly once in the sequence. Therefore, in a 30 second period each frequency channel is used 40 times in that sequence.

2. An RNG-generated hop sequence is 3000 hops long, each channel is used exactly 40 times in the entire sequence. Therefore, in a 30 second period each frequency channel is used exactly 40 times in that sequence.

The hopping sequence contains 75 logical channels these are mapped-onto 75 physical channels using a mapping table.

The highest channel occupancy is when an FP has 4 traffic bearers (i.e. 8 slots utilized), each using the same hopping sequence. As shown previously, for a given sequence, in a 30 second period each frequency channel is exactly 40 times. A slot is 1.01 msec. long, therefore the average time of occupancy on any frequency channel in a 30 second period is:

T = 1.01 msec. × 40 × 8 = 323.20 msec.

As a comparison, the lowest channel occupancy is when only a single dummy bearer is being transmitted. The transmission is 1.01 msec. long, therefore the average time of occupancy on any frequency channel in a 30 second period is:

T = 1.01 msec. × 40 × 1 = 40.4 msec.

## Sec.15.247(g)

In the case of the dummy bearer (which the FP transmits all the time it is powered up and operating), the hopping sequence cycles through the 75 hops in the selected hopping pattern and then repeats.

In the case of a traffic bearer presented with continuous data (which is the normal case, as this is a voice system), the hopping sequence cycles through the 3000 hops in the sequence and then repeats.

In the case of a traffic bearer transmitting short bursts (for example, which may happen if a PP has several failed attempts[1] to establish a traffic bearer), then the successive traffic bearers will start on different patterns (because the PSTN is incremented each frame).

Note, that this system is a voice system and short burst transmissions are not typical.

1 The protocol actually limits the number of re-tries to 11 before giving up on the connection.

## Sec.15.247(h)

There is no coordination between transmitters for the purpose of the avoiding the simultaneous occupancy of hopping frequencies by multiple transmitters.
Communication only ever takes place between an FP and a PP, never between two FPs (It is actually impossible for an FP to receive an FP packet, because their respective 'sync-fields' are different).
An FP and a PP that have an active traffic bearer between them will share a common hopping sequence and hop sequence adaption information (i.e. 'swapped channels'). However, neither the FP nor the PP transmits this information to a 3rd party, for any purpose whatsoever.

This is even true when in a state of bearer hand-over, where the PP is simultaneously 'locked-onto' two FPs. The PP will know both FP's hopping sequences, but it does not share this information with either FP.
In actual fact, channel collisions between FPs and PPs can and will take place. These may result in reduced voice quality, but this has to be tolerated.

In the case of 'sequence collision' (where two transmitters, with overlapping radio cells, are using the same slot, pattern and phase within the pattern), this is detected by multiple consecutive corrupted packets. Each connection that is experiencing sequence collision will independently attempt to remedy the situation (either by pattern changing or by bearer hand-over, as discussed previously).