EMC EMISSION - TEST REPORT

JQA APPLICATION No. : KL80020027

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

Model / Type No. : KX-TG2382

FCC ID : ACJ96NKX-TG2382

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 : April 18, 2002

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

		Page
A) Documentation		
Directory		2
Test Regulation / General Information		3 - 5
Test Conditions		6 - 13
Configuration of EUT / Operation mode of the EUT		14 - 15
EUT Modification / Responsible Party / Deviation from Standard		16
Test results / Measurement Uncertainty		17 - 19
Summary		20
Test System-Arrangement (Drawings)		21
Preliminary Test and Test-setup (Drawings)		22 - 24
Test-setup (Photographs) at worst case		25
B) Test data		
Conducted Emission	450 kHz - 30 MHz	N/A
Electromagnetic Field Radiated Emission	9 kHz - 25 GHz	26 - 30
Maximum Peak Power (EIRP)		31
Transmitter Power (TP)		32
Antenna Gain of the EUT		33
-20dB Bandwidth and Band-edge Emission		34 - 39
Carrier Frequencies Separation		40 - 41
Channel Separation / Dwell Time		42 - 43

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:

The 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-TG2382
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	:	344 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

Time Division Multiple Access(TDMA) Frame structure.
The basic, repeating, frame structure is 10msec long. It is sub-divided into 8 slots, each 1250usec long. The active transmission time is 937.5usec. The first 4 slots from the " up-link ", when the Handsets transmit to the Base Unit. The last 4 slots form the " down-link ", when the Baseset transmits to the Handsets.
This system uses TDD (Time Division Duplex) to carry a two-way voice communication. This is always by using slot-pairs: 0 and 4, 1 and 5, 2 and 6, 3 and 7.
Each slot contains 540 bits of 1.74 usec duration, with 312.5 usec gap times between each slot.

Detailed Receiver portion:

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

Local frequency : 2398.916645 MHz (01ch) - 2478.293161 MHz (90ch)

Intermediate frequency : 2.000 MHz

Other used (generated) frequencies in the EUT:

Reference Clock : 13.824 MHz
PLL1(2nd, Reference Clock) : 129.6 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: 30 °C Humidity: 60 %

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	December, 2001	1 Year
○ - ESV/ESV-Z3	A - 6 / A - 18		
○ - ESV/ESV-Z3	A - 4 / A - 20		
○ - ESV/ESV-Z3	A - 8 / A - 19		
○ - ESVS 10	A - 5		
● - KBA-511A	C - 12	November, 2001	1 Year
○ - KBA-611	C - 21		
● - VHA9103/BBA9106	C - 43	August, 2001	1 Year
● - UHALP9107	C - 42	August, 2001	1 Year
○ - VHA9103/FBAB9177	C - 25		
○ - UHALP9108-A1	C - 28		
● - Cable	H - 5	November, 2001	1 Year

Environmental conditions:

Temperature: 30 °C Humidity: 60 %

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	January, 2002	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, 2002	1 Year
● - 355D	D - 23	March, 2002	1 Year
● - MZ5010C	D - 81	November, 2001	1 Year
● - 8673D	B - 2	April, 2002	1 Year
● - Cable	C - 40 - 11	May, 2001	1 Year
● - Cable	C - 40 - 12	May, 2001	1 Year

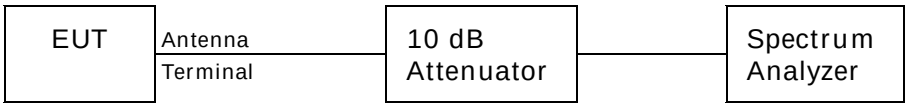
Environmental conditions:

Temperature: 23 °C Humidity: 50 %

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	January, 2002	1 Year
○ - 432B/8478B	B - 24/B-43		
○ - 6-20	D - 27		
○ - 2-10	D - 79		
● - 4T-10	D - 73	May, 2001	1 Year
○ - 4T-10	D - 74		
○ - 8593A	A - 15		

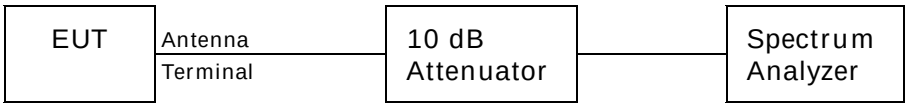
Environmental conditions :

Temperature: 23 °C Humidity: 50 %

-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	January, 2002	1 Year
○ - 2-10	D - 79		
● - 4T-10	D - 73	May, 2001	1 Year
○ - 4T-10	D - 74		

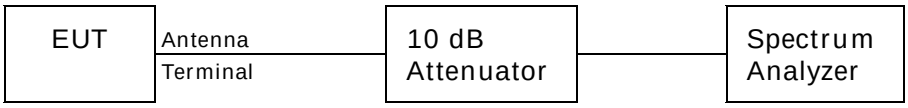
Environmental conditions:

Temperature: 23 °C Humidity: 50 %

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	January, 2002	1 Year
○ - 2-10	D - 79		
● - 4T-10	D - 73	May, 2001	1 Year
○ - 4T-10	D - 74		

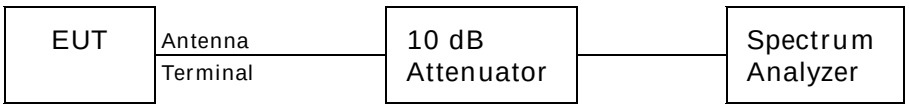
Environmental conditions:

Temperature: 23 °C Humidity: 50 %

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	January, 2002	1 Year
○ - 2-10	D - 79		
● - 4T-10	D - 73	May, 2001	1 Year
○ - 4T-10	D - 74		

Environmental conditions:

Temperature: 23 °C Humidity: 50 %

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-TG2382 (--)	ACJ96NKX-TG2382

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 190kHz 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)	0.344	W	at	2480.293161 MHz
Min. limit margin	4.6	dB	at	2480.293161 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	6.3	dB	at	122.9 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)	+ 4.1	dB(2σ)		- 4.2 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	0.240	W	at	2480.293161	MHz
Min. limit margin	6.2	dB	at	2480.293161	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	2.07	dBi	at	2400.916645	MHz

Remarks:

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

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

The -20dB Bandwidth is	609.0	kHz	at	2400.916645	MHz
		and	at	2440.158968	MHz
The results		Refer to pages		35 - 37	
Min. limit margin	391.0	kHz	at	2400.916645	MHz
		and	at	2440.158968	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.

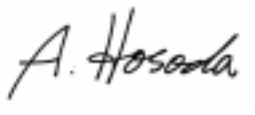
○ - doesn't fulfill the test regulation mentioned on page 3.

Begin of testing : April 28, 2002

End of testing : May 13, 2002

- JAPAN QUALITY ASSURANCE ORGANIZATION -

Approved by :



Akio Hosoda
Manager
EMC Div.
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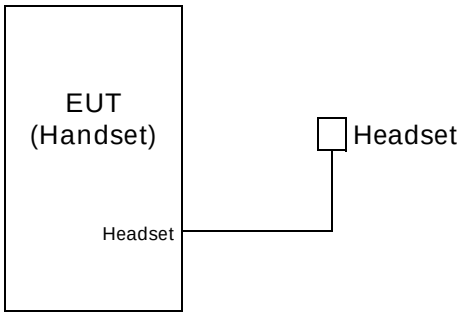
Issued by :

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

Test System-Arrangement (Drawings)

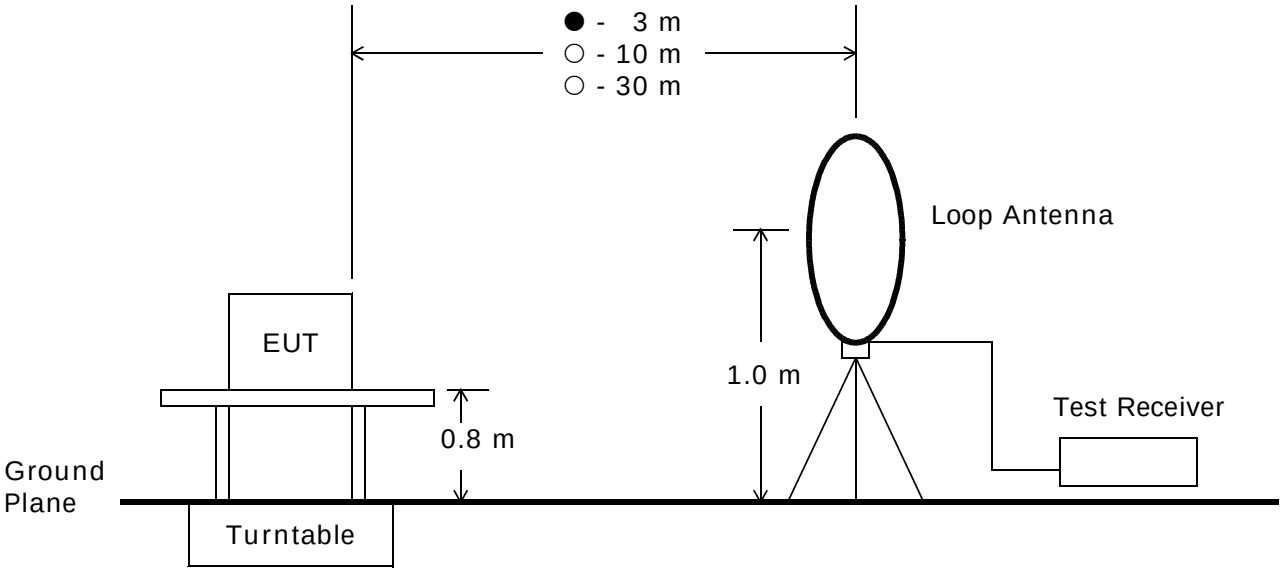


Power Supply : DC3.6V (Ni-Cd Batterry Pack : N4HKGMA0001)

Preliminary Test and Test-setup(Drawings)

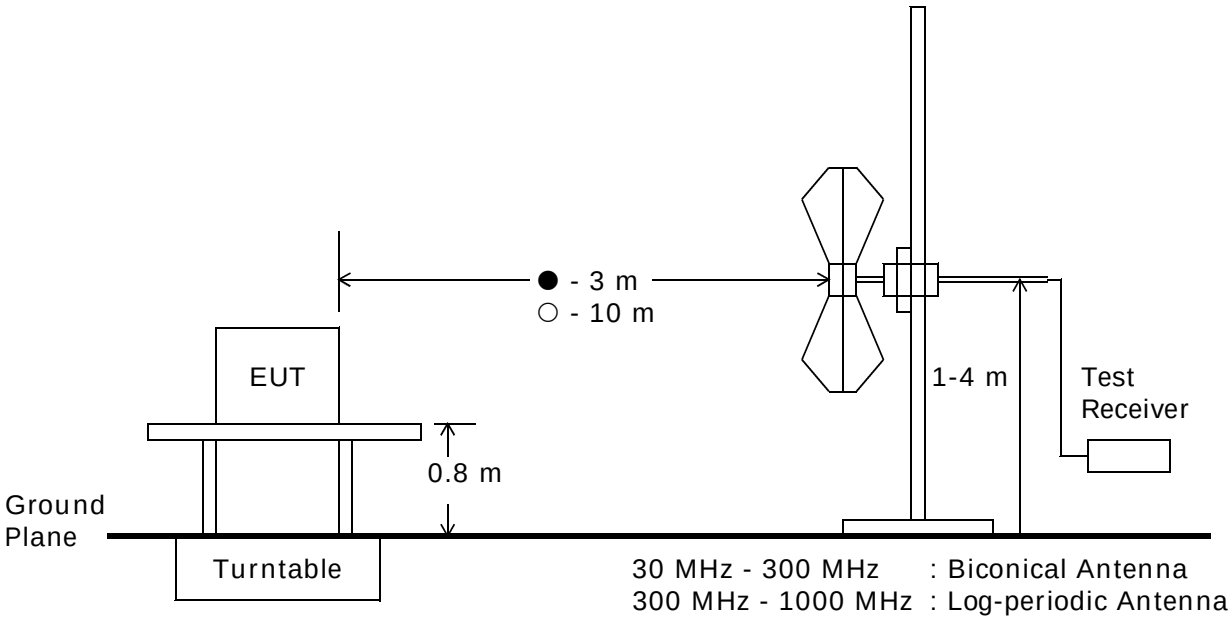
Radiated Emission (Magnetic Field) 9 kHz - 30 MHz:

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.



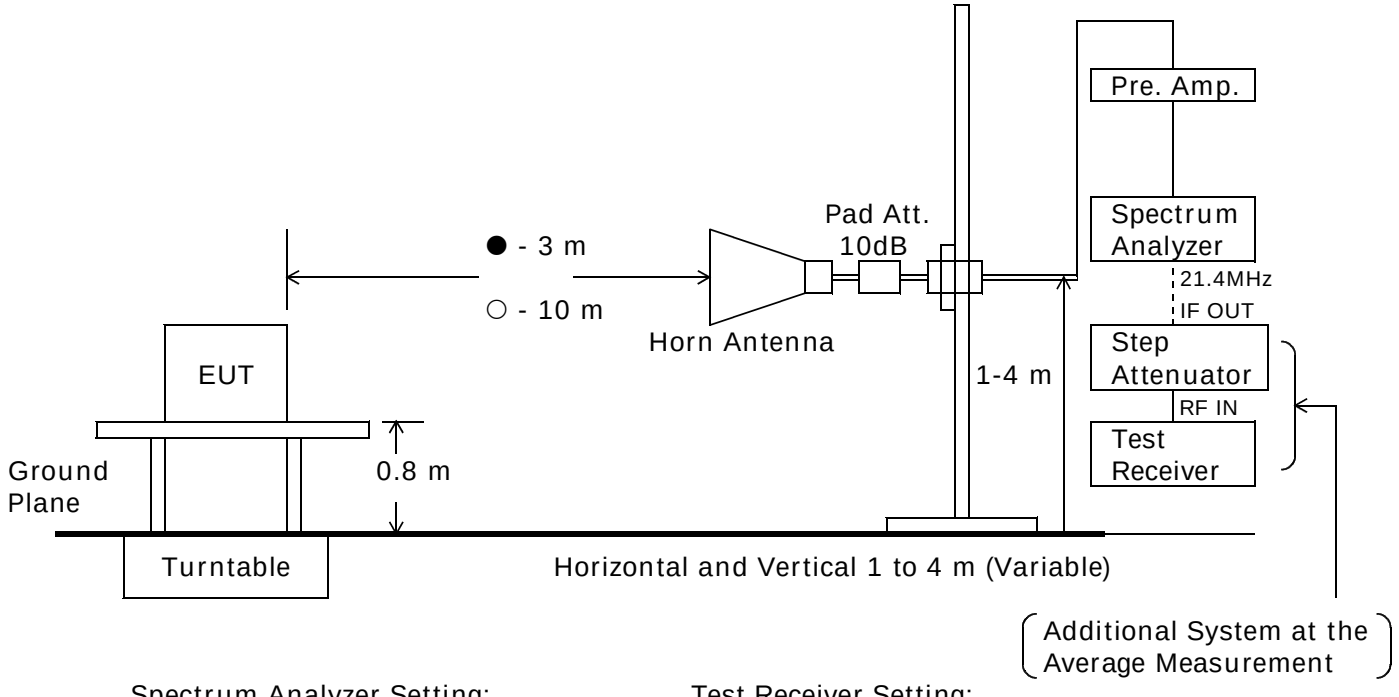
Electromagnetic Field Radiated Emission 30 MHz - 1000 MHz:

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 linearly polarized broadband 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 linearly polarized broadband antenna or 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 9 kHz - 25 GHz

Horizontal polarization

Vertical polarization

Electromagnetic Field Radiated Emission Measurement

Intentional Radiator

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

Test Date: May 8, 2002

Temp.: 30 °C ; Humi.: 60 %

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)
*	61.4	4.6	1.0	21.0	< 23.0	40.0	26.6	< 28.6	> +11.4	C
*	122.9	10.7	1.5	25.0	17.0	43.5	37.2	29.2	+ 6.3	C
	129.6	13.7	1.6	13.0	4.0	43.5	28.3	19.3	+15.2	C
	245.8	17.1	2.2	17.0	6.0	46.0	36.3	25.3	+ 9.7	C
	318.0	16.5	2.5	10.0	6.0	46.0	29.0	25.0	+17.0	C
	345.6	16.8	2.6	12.0	8.0	46.0	31.4	27.4	+14.6	C
	400.9	17.2	2.9	10.0	7.0	46.0	30.1	27.1	+15.9	C
	491.5	18.9	3.2	7.0	9.0	46.0	29.1	31.1	+14.9	C
	553.0	20.2	3.4	5.0	8.0	46.0	28.6	31.6	+14.4	C
	737.3	22.6	4.0	4.0	4.0	46.0	30.6	30.6	+15.4	C

Sample of calculated result at 122.9 MHz, as the Minimum Margin point:

	Antenna Factor	=	10.7 dB(1/m)
+)	Cable Loss	=	1.5 dB
	Meter Reading	=	25.0 dB(µV)
	Result	=	37.2 dB(µV/m)

Minimum Margin : 43.5 - 37.2 = 6.3(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.

4) * : Resonant Tune Dipole Antenna KBA-511A, Others : Linearly polarized broadband antenna

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 : Yuzo Tanaka

Electromagnetic Field Radiated Emission Measurement

Intentional Radiator

Fundamental and Spurious (above 1 GHz)

Test Date: April 28, 2002
Temp.: 23 °C ; Humi.: 50 %

Transmitting Frequency : 2400.916645 MHz (01ch)

	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										
	2400.916645	21.6	10.8	87.0	88.0	---	119.4	120.4	---	B
Spurious at Peak Detector										
*	4801.833290	27.3	-31.2	64.0	62.0	74.0	60.1	58.1	+13.9	D
	7202.749935	29.9	-29.5	58.0	56.0	100.4	58.4	56.4	+42.0	B
	9603.666580	33.4	-27.5	52.0	< 50.0	100.4	57.9	< 55.9	+42.5	B
*	12004.583225	33.6	-26.7	< 50.0	< 50.0	74.0	< 56.9	< 56.9	> +17.1	D
	14405.499870	37.1	-26.3	< 50.0	< 50.0	100.4	< 60.8	< 60.8	> +39.6	B
	16806.416515	37.2	-27.0	< 50.0	< 50.0	100.4	< 60.2	< 60.2	> +40.2	D
*	19207.333160	40.2	-28.0	< 50.0	< 50.0	74.0	< 62.2	< 62.2	> +11.8	B
	21608.249805	40.3	-28.2	< 50.0	< 50.0	100.4	< 62.1	< 62.1	> +38.3	B
	24009.166450	40.4	-28.2	< 50.0	< 50.0	100.4	< 62.2	< 62.2	> +38.2	B
Spurious at Average Detector										
*	4801.833290	27.3	-31.2	44.0	42.5	54.0	40.1	38.6	+13.9	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	87.0	87.6	---	119.3	119.9	---	B
Spurious at Peak Detector										
*	4880.317936	27.3	-31.2	65.0	66.0	74.0	61.1	62.1	+11.9	D
*	7320.476904	29.9	-29.4	54.0	52.0	74.0	54.5	52.5	+19.5	D
	9760.635872	33.5	-27.4	< 50.0	< 50.0	99.9	< 56.1	< 56.1	> +43.8	B
*	12200.794840	33.6	-26.6	< 50.0	< 50.0	74.0	< 57.0	< 57.0	> +17.0	D
	14640.953808	37.1	-26.4	< 50.0	< 50.0	99.9	< 60.7	< 60.7	> +39.2	B
	17081.112776	37.2	-27.1	< 50.0	< 50.0	99.9	< 60.1	< 60.1	> +39.8	B
*	19521.271744	40.3	-27.8	< 50.0	< 50.0	74.0	< 62.5	< 62.5	> +11.5	D
	21961.430712	40.3	-27.9	< 50.0	< 50.0	99.9	< 62.4	< 62.4	> +37.5	B
	24401.589680	40.4	-28.7	< 50.0	< 50.0	99.9	< 61.7	< 61.7	> +38.2	B
Spurious at Average Detector										
*	4880.317936	27.3	-31.2	50.0	41.0	54.0	46.1	37.1	+ 7.9	C
*	7320.476904	29.9	-29.4	39.0	38.0	54.0	39.5	38.5	+14.5	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 : 2480.293161 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										
	2480.293161	21.4	10.8	87.3	88.4	---	119.5	120.6	---	B
Spurious at Peak Detector										
*	4960.586322	27.3	-31.2	59.0	54.0	74.0	55.1	50.1	+18.9	D
*	7440.879483	30.0	-29.4	51.0	< 50.0	74.0	51.6	< 50.6	+22.4	D
	9921.172644	33.5	-27.4	< 50.0	< 50.0	100.6	< 56.1	< 56.1	> +44.5	B
*	12401.465805	37.0	-26.6	< 50.0	< 50.0	74.0	< 60.4	< 60.4	> +13.6	D
	14881.758966	37.1	-26.4	< 50.0	< 50.0	100.6	< 60.7	< 60.7	> +39.9	B
	17362.052127	37.2	-27.1	< 50.0	< 50.0	100.6	< 60.1	< 60.1	> +40.5	B
*	19842.345288	40.3	-27.4	< 50.0	< 50.0	74.0	< 62.9	< 62.9	> +11.1	D
*	22322.638449	40.4	-27.6	< 50.0	< 50.0	100.6	< 62.8	< 62.8	> +37.8	D
	24802.931610	40.4	-28.8	< 50.0	< 50.0	100.6	< 61.6	< 61.6	> +39.0	B
Spurious at Average Detector										
*	4960.586322	27.3	-31.2	< 37.0	< 37.0	54.0	< 33.1	< 33.1	> +20.9	C
*	7440.879483	30.0	-29.4	38.0	< 37.0	54.0	38.6	< 37.6	+15.4	C
*	12401.465805	37.0	-26.6	< 30.0	< 30.0	54.0	< 40.4	< 40.4	> +13.6	C
*	19842.345288	40.3	-27.4	< 30.0	< 30.0	54.0	< 42.9	< 42.9	> +11.1	C
*	22322.638449	40.4	-27.6	< 30.0	< 30.0	54.0	< 42.8	< 42.8	> +11.2	C

Sample of calculated result at 4880.317936 MHz, as the Minimum Margin point:

Antenna Factor	=	27.3 dB(1/m)
Corr. Factor	=	-31.2 dB
+) Meter Reading	=	50.0 dB(μV)
Result	=	46.1 dB(μV/m)

Minimum Margin : 54.0 - 46.1 = 7.9(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 : Shigeru Kinoshita

Maximum Peak Power (EIRP) Measurement

Fundamental Emission

Test Date: April 28, 2002
Temp.: 23 °C ; Humi.: 50 %

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	87.0	88.0	119.4	120.4	A
2440.158968	21.5	10.8	87.0	87.6	119.3	119.9	A
2480.293161	21.4	10.8	87.3	88.4	119.5	120.6	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	0.261	0.329	1.000	+ 4.8
45	2440.158968	0.255	0.293	1.000	+ 5.3
90	2480.293161	0.267	0.344	1.000	+ 4.6

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 2480.293161 MHz : 10log(1.000 / 0.344) = 4.6 (dB)

Tester : Shigeru Kinoshita

Transmitter Power(TP) Measurement

Test Date: April 28, 2002
Temp.: 23 °C ; Humi.: 50 %

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	10.4	12.7	23.1	0.204	1.000	+ 6.9	A
45	2440.158968	10.4	13.2	23.6	0.229	1.000	+ 6.4	A
90	2480.293161	10.4	13.4	23.8	0.240	1.000	+ 6.2	A

Sample of calculated result at 2480.293161 MHz, as the Minimum Margin point:

Correction Factor = 10.4 dB
+) Meter Reading = 13.4 dBm
Result = 23.8 dBm : $10^{(23.8/10)} \times 10^{-3} = 0.240$(W)

Minimum Margin : 30.0 - 23.8 = 6.2(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 : Shigeru Kinoshita

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	0.329	0.204	2.07
45	2440.158968	0.293	0.229	1.07
90	2480.293161	0.344	0.240	1.57

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

	EIRP	=	25.17 dBm = $10\log_{10}(0.329) + 30$
-)	TP	=	23.10 dBm = $10\log_{10}(0.204) + 30$
	Result	=	2.07 dBi

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

-20dB bandwidth and Band-edge Emission Measurement

Fundamental Emission

Test Date: May 13, 2002
Temp.: 23 °C ; Humi.: 50 %

1) -20dB bandwidth measurement

Measurement Results:

CH No.	Frequency (MHz)	-20dB bandwidth (kHz)	Attached graph page
00	2400.916645	609	page 36
46	2440.158968	609	page 37
91	2480.293161	607	page 38

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

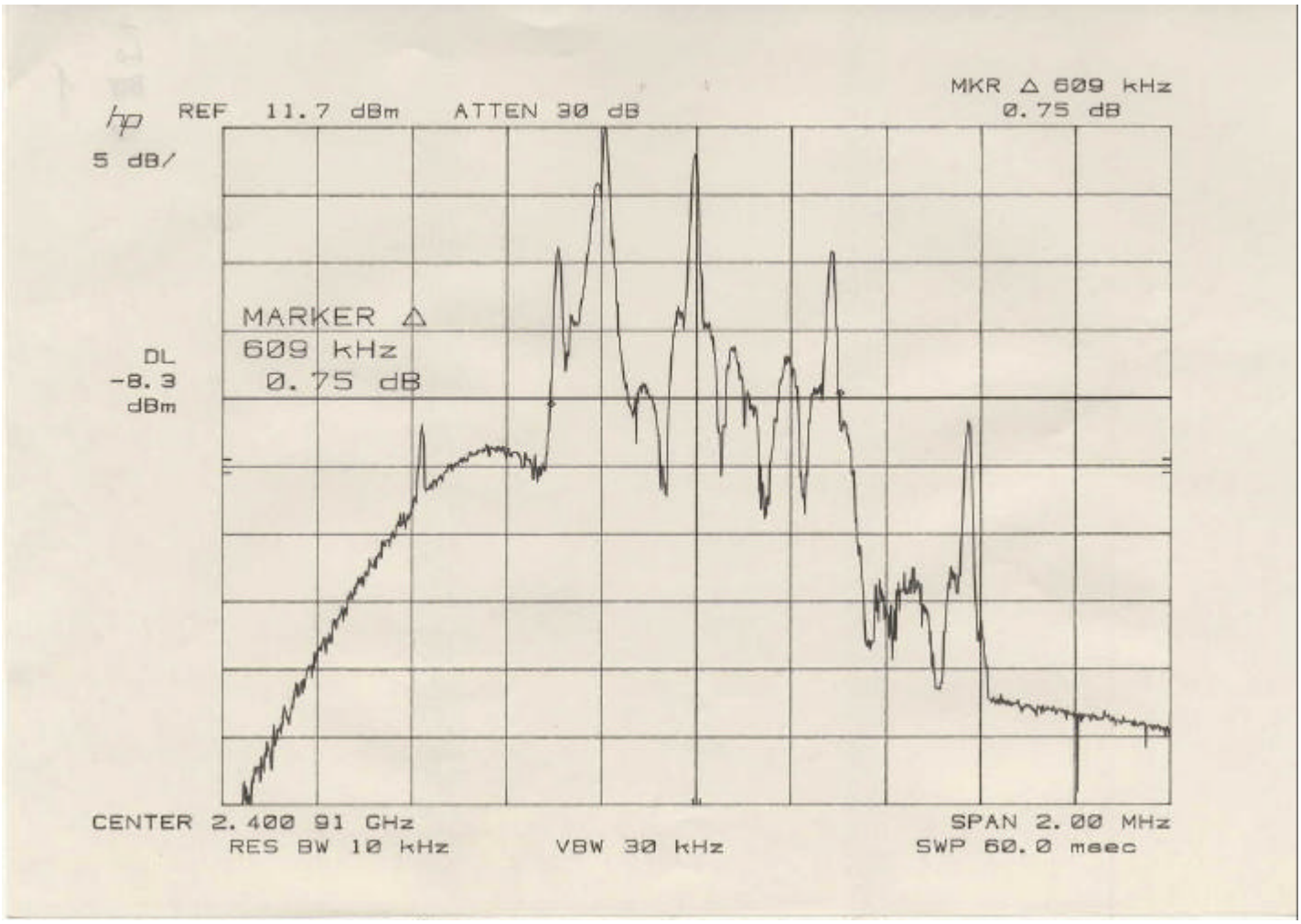
2) Band-edge Emission measurement

Measurement Results:

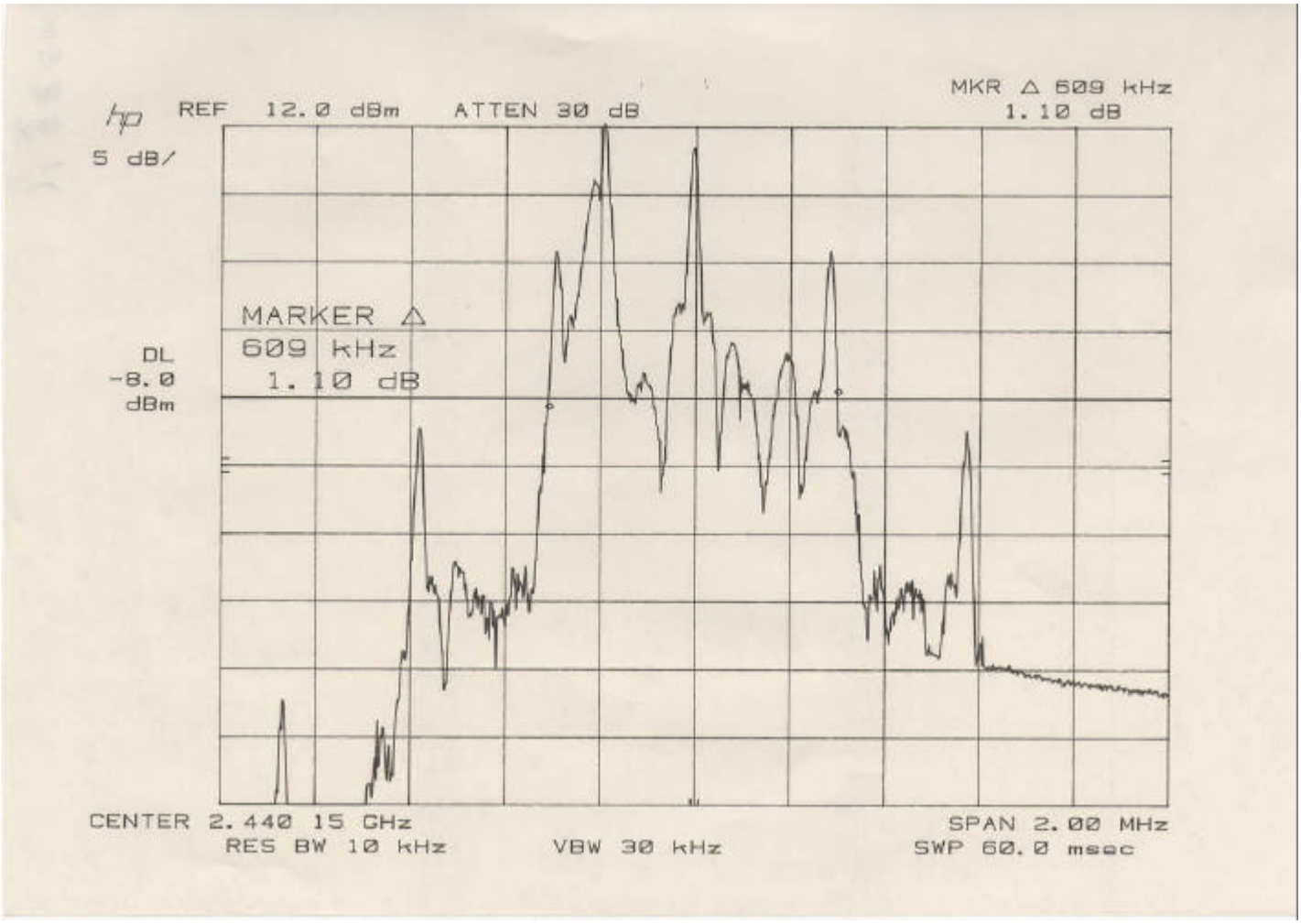
CH No.	Frequency (MHz)	Band-edge Frequency (MHz)	Attached graph page
00	2400.916645	2400.000	page 38
91	2480.293161	2483.500	page 39

Tester : Shigeru Kinoshita

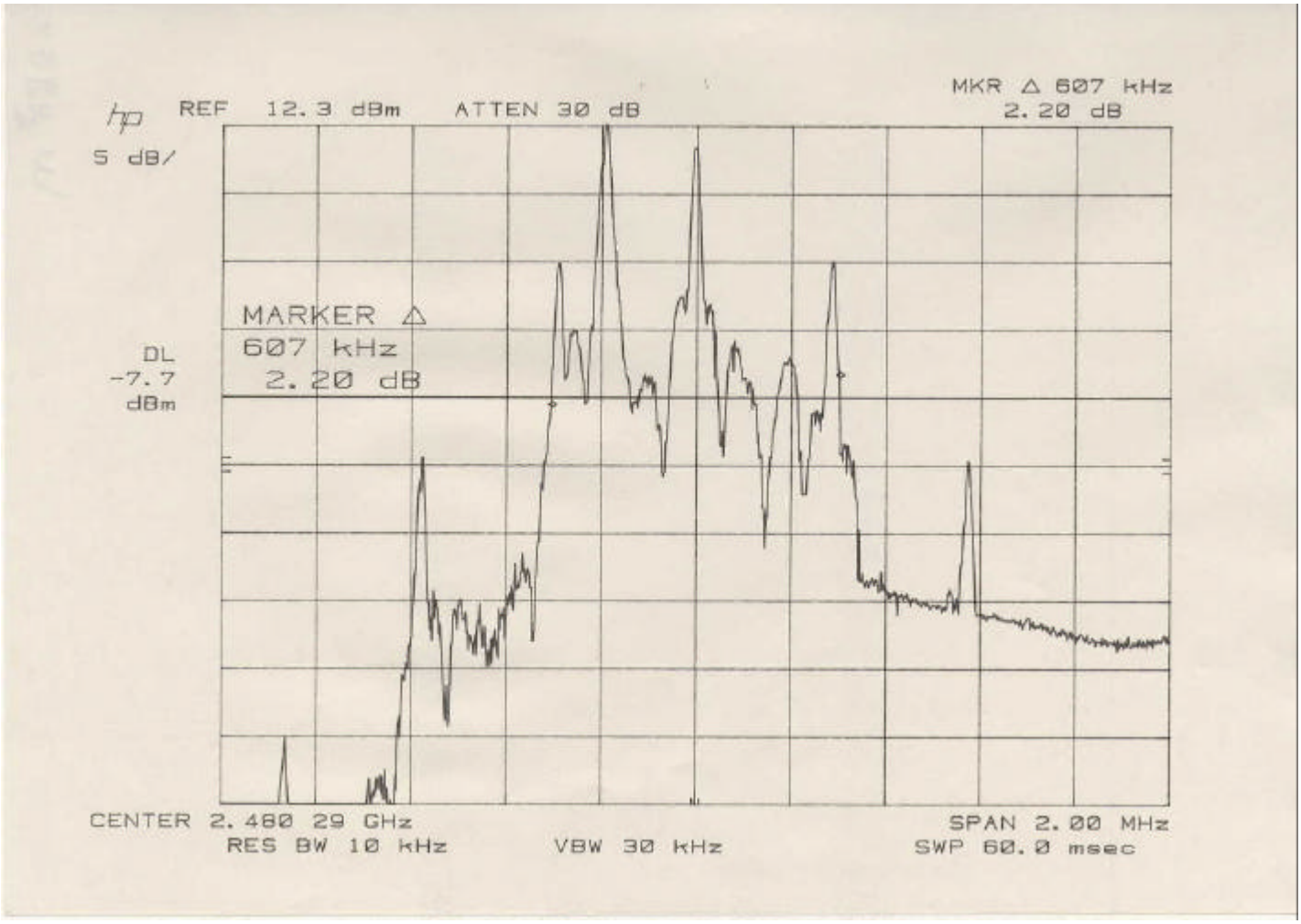
-20dB Bandwidth Measurement
Transmitting Frequency : 2400.916645 MHz (01 ch)



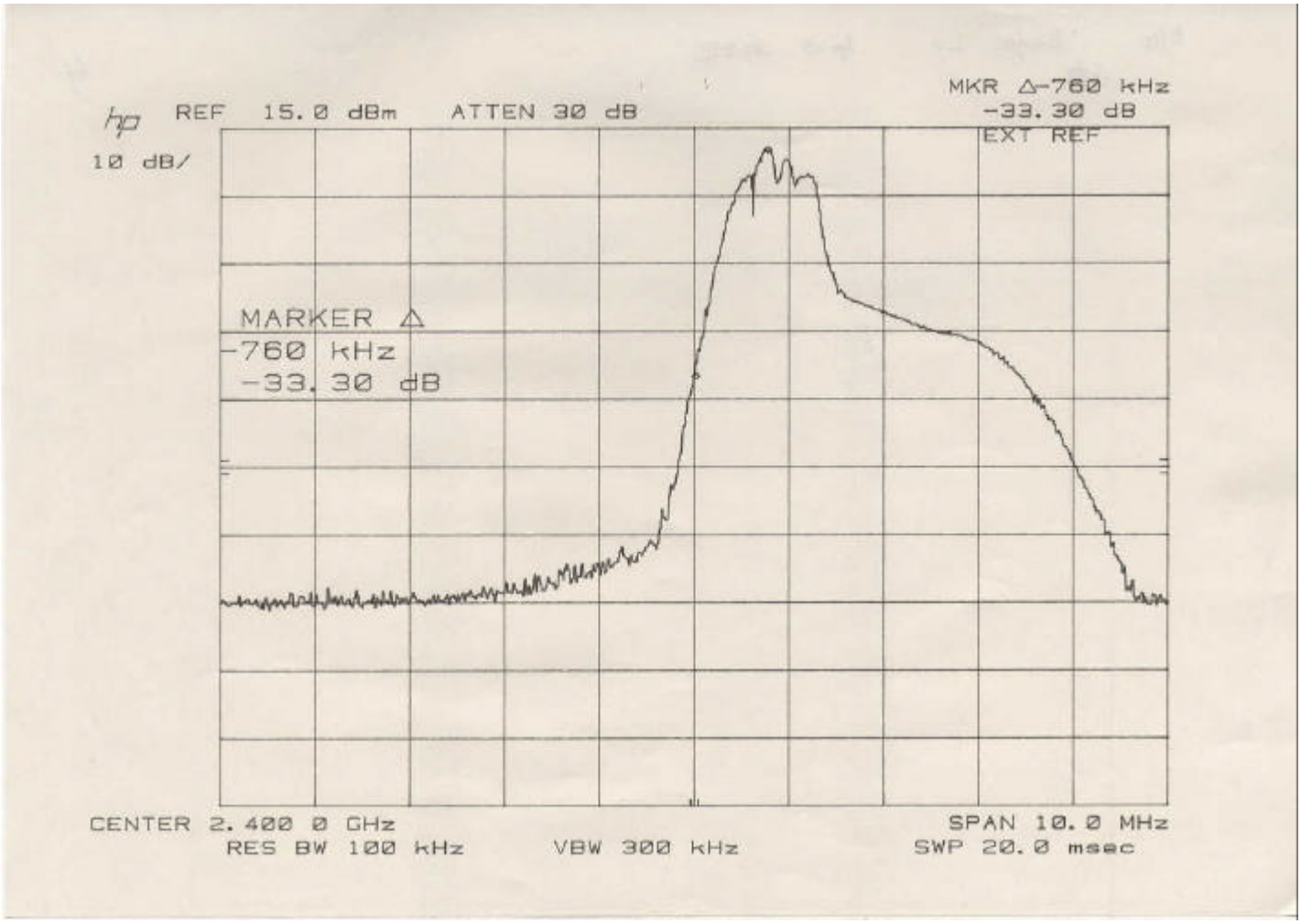
-20dB Bandwidth Measurement
Transmitting Frequency : 2440.158968 MHz (45 ch)



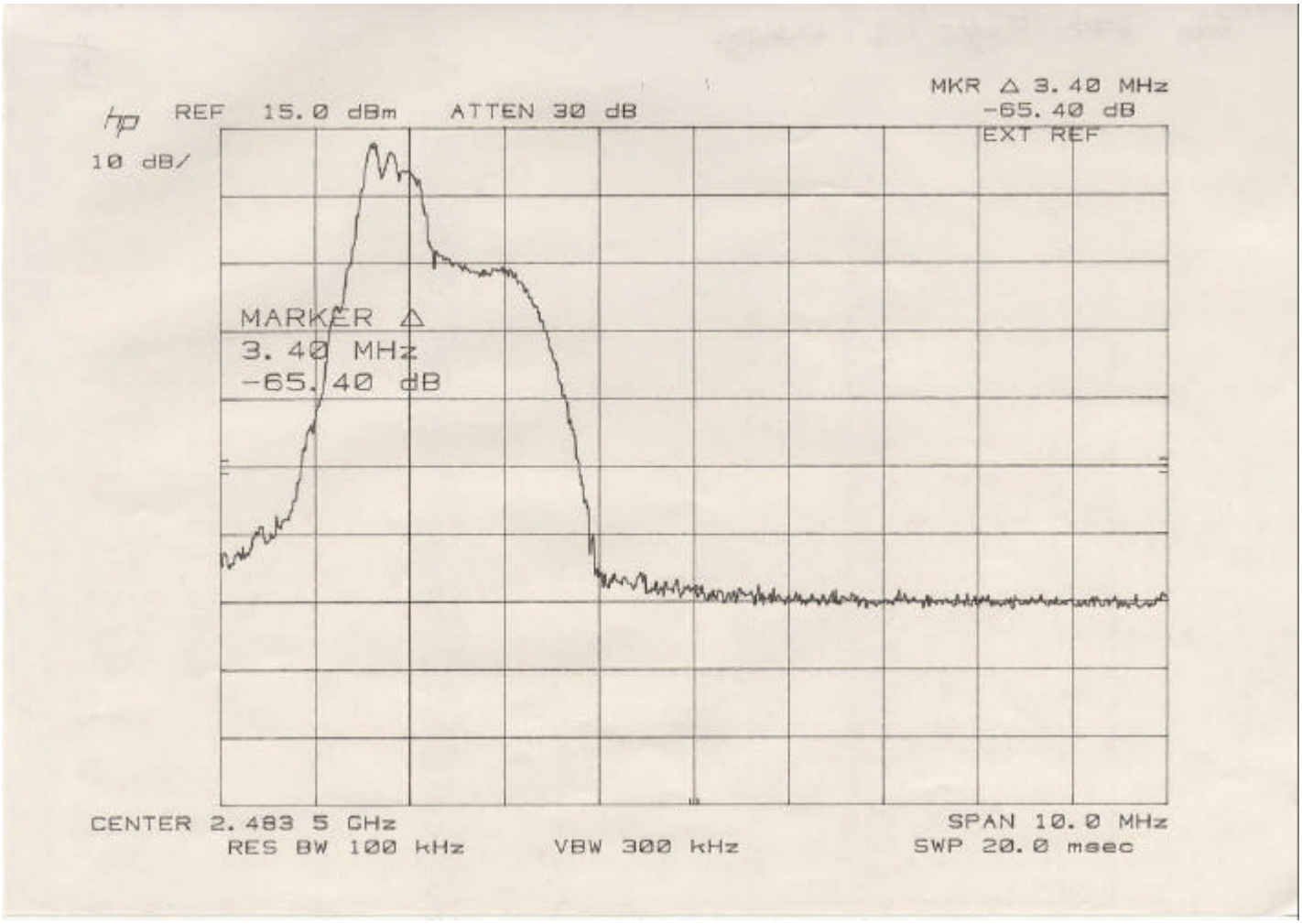
-20dB Bandwidth Measurement
Transmitting Frequency : 2480.293161 MHz (90 ch)



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

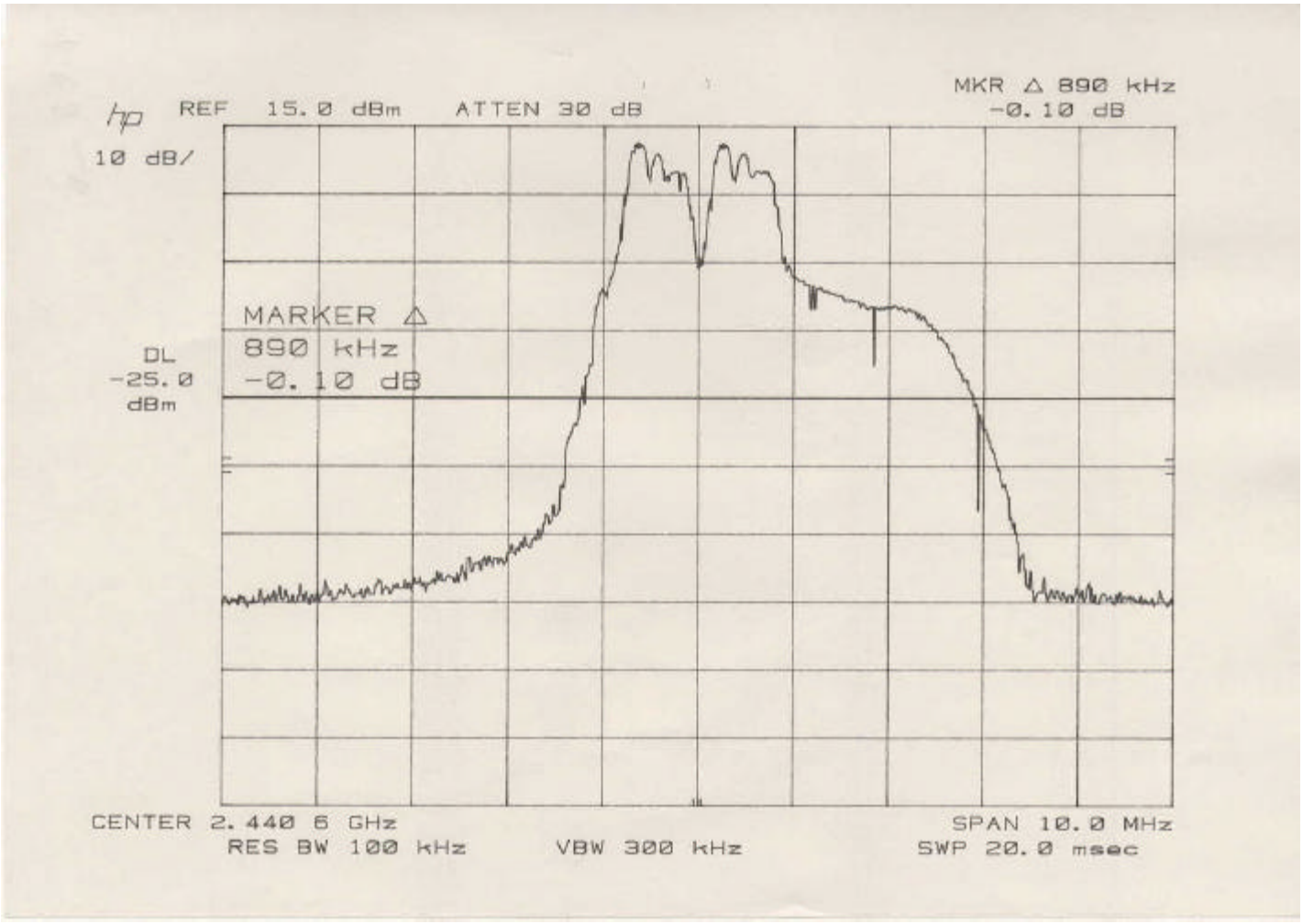
Test Date: May 13, 2002
Temp.: 23 °C ; Humi.: 50 %

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 : Shigeru Kinoshita

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:

$T = 1.01 \text{ msec.} \times 40 \times 8 = 323.20 \text{ msec.}$

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:

$T = 1.01 \text{ msec.} \times 40 \times 1 = 40.4 \text{ msec.}$

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).