

INTERTEK TESTING SERVICES

MEASUREMENT/TECHNICAL REPORT

Asahi Corporation - MODEL: 39352
FCC ID: AQC39352-T49

May 16, 1998

This report concerns (check one): Original Grant X Class II Change

Equipment Type: Low Power Transmitter (example: computer, printer, modem, etc.)

Deferred grant requested per 47 CFR 0.457(d)(1)(ii)? Yes No X

If yes, defer until:
date

Company Name agrees to notify the Commission by:
date

of the intended date of announcement of the product so that the grant can be issued on that date.

Transition Rules Request per 15.37? Yes No X

If no, assumed Part 15, Subpart C for intentional radiator - the new 47 CFR [10-1-96 Edition] provision.

Report prepared by:

C. K. Lam
Intertek Testing Services
2/F., Garment Center,
576, Castle Peak Road,
HONG KONG
Phone: 852-2746-8211
Fax: 852-2785-5487



Intertek Testing Services
ETL Testing Laboratories

May 16, 1998

*Federal Communications Commission
c/o Mellon Bank
Three Mellon Bank
525 William Penn Way
27th Floor, Room 153-2713
Pittsburgh, PA 15251-5315
Attn: Wholesale Lockbox Shift Supervisor*

To The Federal Communications Commission:

*Enclosed you will find an original Part 15 Application for Certification for Asahi Corporation
(FCC ID: AQC39352-T49).*

Also enclosed you will find a check in the amount of \$895.00 to cover the application fee.

Please contact me if you have any questions regarding the enclosed material.

Sincerely,

*C. K. Lam
Assistant Manager*

Enclosure

FCC ID : AQC39352-T49

Intertek Testing Services Hong Kong Ltd.

2/F., Garment Centre, 576 Castle Peak Road, Kowloon, Hong Kong.
Telephone (852) 2746 8600 Fax (852) 2785 5487





Intertek Testing Services
ETL Testing Laboratories

Asahi Corporation

Application
For
Certification
(FCC ID: AQC39352-T49)

Transmitter

WO# 9803612
CKL/at
May 16, 1998

- The test results reported in this report shall refer only to the sample actually tested and shall not refer or be deemed to refer to bulk from which such a sample may be said to have been obtained.
- This report shall not be reproduced except in full without prior authorization from Intertek Testing Services Hong Kong Limited.

FCC ID : AQC39352-T49

Intertek Testing Services Hong Kong Ltd.

2/F., Garment Centre, 576 Castle Peak Road, Kowloon, Hong Kong.

Telephone (852) 2746 8600 Fax (852) 2785 5487





Asahi Corporation

3-1-8 Sakae-cho Kawaguchi
Saitama 332, Japan

Phone: 048-254-1011
Fax : 048-254-5111 ☐
048-254-9950 ☐
048-254-9951 ☐

"I, an officer of Asahi Corporation do hereby authorize Intertek Testing Services to act on our behalf in front of the Federal Communications Commission with respect to all matters relating to certification of equipment under Part 15 and Part 18 of the FCC Rules until further notice."

I further certify that no party (as defined in § 1.2002(b) of CFR 47, 1992) to this application, including myself, is subject to a denial of federal benefits, that includes FCC benefits, pursuant to Section 5301 of the Anti-Drug Abuse Act of 1988, 21 U.S.C., 853(a).

dated this 7th day of April 1998.

By


Signature

Haruo Someya
Printed

Title

Manager

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EXHIBIT 1

GENERAL DESCRIPTION

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1.0 General Description

1.1 Product Description

The equipment under test (EUT) is a transmitter for a remote controlled toy robot operating at 49.86 MHz which is controlled by a crystal. The EUT is powered by a 9V battery. There is a control button. When the button is depressed, the robot moves forward. When the button is released, the robot rotates.

The brief circuit description is listed in the following:

- Q₁, Q₂ and associated circuit act as a pulse generator.
- Q₃ and associated circuit act as a modulator.
- Q₄ and associated circuit act as an oscillator.
- Q₅ and associated circuit act as a RF output amplifier.

1.2 Related Submittal(s) Grants

This is a single application for certification of a transmitter. The FCC ID of the receiver associated with this transmitter is AQC39352-R49.

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1.3 Test Methodology

Both AC mains line-conducted and radiated emission measurements were performed according to the procedures in ANSI C63.4 (1992). All measurements were performed in Open Area Test Sites. Preliminary scans were performed in the Open Area Test Sites only to determine worst case modes. For each scan, the procedure for maximizing emissions in Appendices D and E were followed. All Radiated tests were performed at an antenna to EUT distance of 3 meters, unless stated otherwise in the "**Justification Section**" of this Application.

1.4 Test Facility

The open area test site and conducted measurement facility used to collect the emission data is located at Garment Centre, 576 Castle Peak Road, Kowloon, Hong Kong. This test facility and site measurement data have been fully placed on file with the FCC.

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EXHIBIT 2

SYSTEM TEST CONFIGURATION

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2.0 System Test Configuration

2.1 Justification

The equipment under test (EUT) was configured for testing in a typical fashion (as a customer would normally use it). The EUT was mounted to a cardboard box, which enabled the engineer to maximize emissions through its placement in the three orthogonal axes. The worst case bit sequence was applied during test.

The EUT was powered from a new 9V battery.

For maximizing emissions, the EUT was rotated through 360°, the antenna height was varied from 1 meter to 4 meters above the ground plane, and the antenna polarization was changed. This step by step procedure for maximizing emissions led to the data reported in Exhibit 3.0.

The unit was operated standalone and placed in the center of the turntable.

For simplicity of testing, the unit was wired to transmit continuously.

2.2 EUT Exercising Software

There was no special software to exercise the device. Once the button is depressed, the unit transmits the typical signal. For simplicity of testing, the unit was wired to transmit continuously.

2.3 Special Accessories

There are no special accessories necessary for compliance of this product.

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2.4 Equipment Modification

Any modifications installed previous to testing by Asahi Corporation will be incorporated in each production model sold/leased in the United States.

No modifications were installed by Intertek Testing Services.

2.5 Support Equipment List and Description

This product was tested in a standalone configuration.

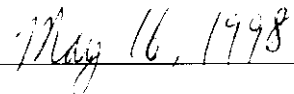
All the items listed under section 2.0 of this report are

Confirmed by:

C. K. Lam
Assistant Manager
Intertek Testing Services
Agent for Asahi Corporation



Signature



Date

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EXHIBIT 3

EMISSION RESULTS

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3.0 Emission Results

Data is included worst case configuration (the configuration which resulted in the highest emission levels). A sample calculation, configuration photographs and data tables of the emissions are included.

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3.1 Field Strength Calculation

The field strength is calculated by adding the reading on the Spectrum Analyzer to the factors associated with preamplifiers (if any), antennas, cables, pulse desensitization and average factors (when specified limit is in average and measurements are made with peak detectors). A sample calculation is included below.

$$FS = RA + AF + CF - AG + PD + AV$$

where FS = Field Strength in dB μ V/m

RA = Receiver Amplitude (including preamplifier) in dB μ V

CF = Cable Attenuation Factor in dB

AF = Antenna Factor in dB

AG = Amplifier Gain in dB

PD = Pulse Desensitization in dB

AV = Average Factor in -dB

In the radiated emission table which follows, the reading shown on the data table may reflect the preamplifier gain. An example of the calculations, where the reading does not reflect the preamplifier gain, follows:

$$FS = RA + AF + CF - AG + PD + AV$$

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3.1 Field Strength Calculation (cont)

Example

Assume a receiver reading of 62.0 dB μ V is obtained. The antenna factor of 7.4 dB and cable factor of 1.6 dB is added. The amplifier gain of 29 dB is subtracted. The pulse desensitization factor of the spectrum analyzer was 0 dB, and the resultant average factor was -10 dB. The net field strength for comparison to the appropriate emission limit is 32 dB μ V/m. This value in dB μ V/m was converted to its corresponding level in μ V/m.

$$RA = 62.0 \text{ dB}\mu\text{V}$$

$$AF = 7.4 \text{ dB}$$

$$CF = 1.6 \text{ dB}$$

$$AG = 29.0 \text{ dB}$$

$$PD = 0 \text{ dB}$$

$$AV = -10 \text{ dB}$$

$$FS = 62 + 7.4 + 1.6 - 29 + 0 + (-10) = 32 \text{ dB}\mu\text{V/m}$$

$$\text{Level in mV/m} = \text{Common Antilogarithm} [(32 \text{ dB}\mu\text{V/m})/20] = 39.8 \mu\text{V/m}$$

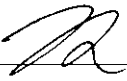
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3.3 Radiated Emission Data

The data on the following page lists the significant emission frequencies, the limit and the margin of compliance. Numbers with a minus sign are below the limit.

Judgement: Passed by 6.3 dB

TEST PERSONNEL:



Signature

Ken C. C. Lam, Compliance Engineer
Typed/Printed Name

May 16, 1998
Date

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Company: Asahi Corporation
Model: 39352

Date of Test: May 11, 1998

Table 1

Radiated Emissions

Polarity	Frequency (MHz)	Reading (dB μ V)	Antenna Factor (dB)	Pre-Amp Gain (dB)	Average Factor (-dB)	Net at 3m (dB μ V/m)	Limit at 3m (dB μ V/m)	Margin (dB)
V	49.860	84.1	11	16	5.4	73.7	80.0	-6.3
H	149.576	28.4	13	16	--	25.4	43.5	-18.1
H	199.436	23.2	16	16	--	23.2	43.5	-20.3
H	249.295	20.3	20	16	--	24.3	46.0	-21.7
H	299.155	16.4	22	16	--	22.4	46.0	-23.6

77.1

Notes: 1. Peak Detector Data unless otherwise stated.

2. All measurements were made at 3 meter. Harmonic emissions not detected at the 3-meter distance were measured at 0.3-meter and an inverse proportional extrapolation was performed to compare the signal level to the 3-meter limit. No other harmonic emissions than those reported were detected at a test distance of 0.3-meter.

3. Negative value in the margin column shows emission below limit.

4. Horn antenna and average detector are used for the emission over 1000MHz.

*Emission within the restricted band meets the requirement of part 15.205. The corresponding limit as per 15.209 is based on Quasi peak detector data for frequencies below 1000 MHz and average detector data for frequencies over 1000 MHz.

Test Engineer: Ken C. C. Lam

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EXHIBIT 4

EQUIPMENT PHOTOGRAPHS

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4.0 Equipment Photographs

Photographs of the tested EUT are attached.

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EXHIBIT 8

MISCELLANEOUS INFORMATION

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8.0 Miscellaneous Information

This miscellaneous information includes details of the measured bandwidth, the test procedure and calculation of factors such as pulse desensitization and averaging factor.

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8.1 Measured Bandwidth

The plot on the following page shows the fundamental emission when modulated in the specified band. The field strength of any emission appearing between the band edges and up to 10 kHz above and below the band edges (49.81 and 49.91 MHz) is at least 39.13 dB below the carrier level. It meets the requirement of Section 15.235(b).

...
...
by H

Figure 8.1 Bandwidth

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8.2 Discussion of Pulse Desensitization

The determination of pulse desensitivity was made in accordance with Hewlett Packard Application Note 150-2, *Spectrum Analysis ... Pulsed RF*.

Pulse desensitivity was not applicable for this device. The effective period (T_{eff}) was approximately 0.562 ms for a digital "1" bit, as shown in the plots of Exhibit 8.3. With a resolution bandwidth (3 dB) of 100 kHz, the pulse desensitivity factor was 0 dB.

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8.3 Calculation of Average Factor

Averaging factor in dB = $20 \log (\text{duty cycle})$

The specification for output field strengths in accordance with the FCC rules specify measurements with an average detector. During testing, a spectrum analyzer incorporating a peak detector was used. Therefore, a reduction factor can be applied to the resultant peak signal level and compared to the limit for measurement instrumentation incorporating an average detector.

The time period over which the duty cycle is measured is 100 milliseconds, or the repetition cycle, whichever is a shorter time frame. The worst case (highest percentage on) duty cycle is used for the calculation. The duty cycle is measured by placing the spectrum analyzer in zero scan (receiver mode) and linear mode at maximum bandwidth (3 MHz at 3 dB down) and viewing the resulting time domain signal output from the analyzer on a Tektronix oscilloscope. The oscilloscope is used because of its superior time base and triggering facilities.

A plot of the worst-case duty cycle as detected in this manner are included in the following pages.

The duty cycle is simply the on-time divided by the period:

The duration of one cycle = 1.05ms
Effective period of the cycle = 0.562ms

$DC = 0.562\text{ms} / 1.05\text{ms} = 0.54$ or 54%

Therefore, the averaging factor is found by $20 \log_{10} 0.54 = -5.4 \text{ dB}$

hp

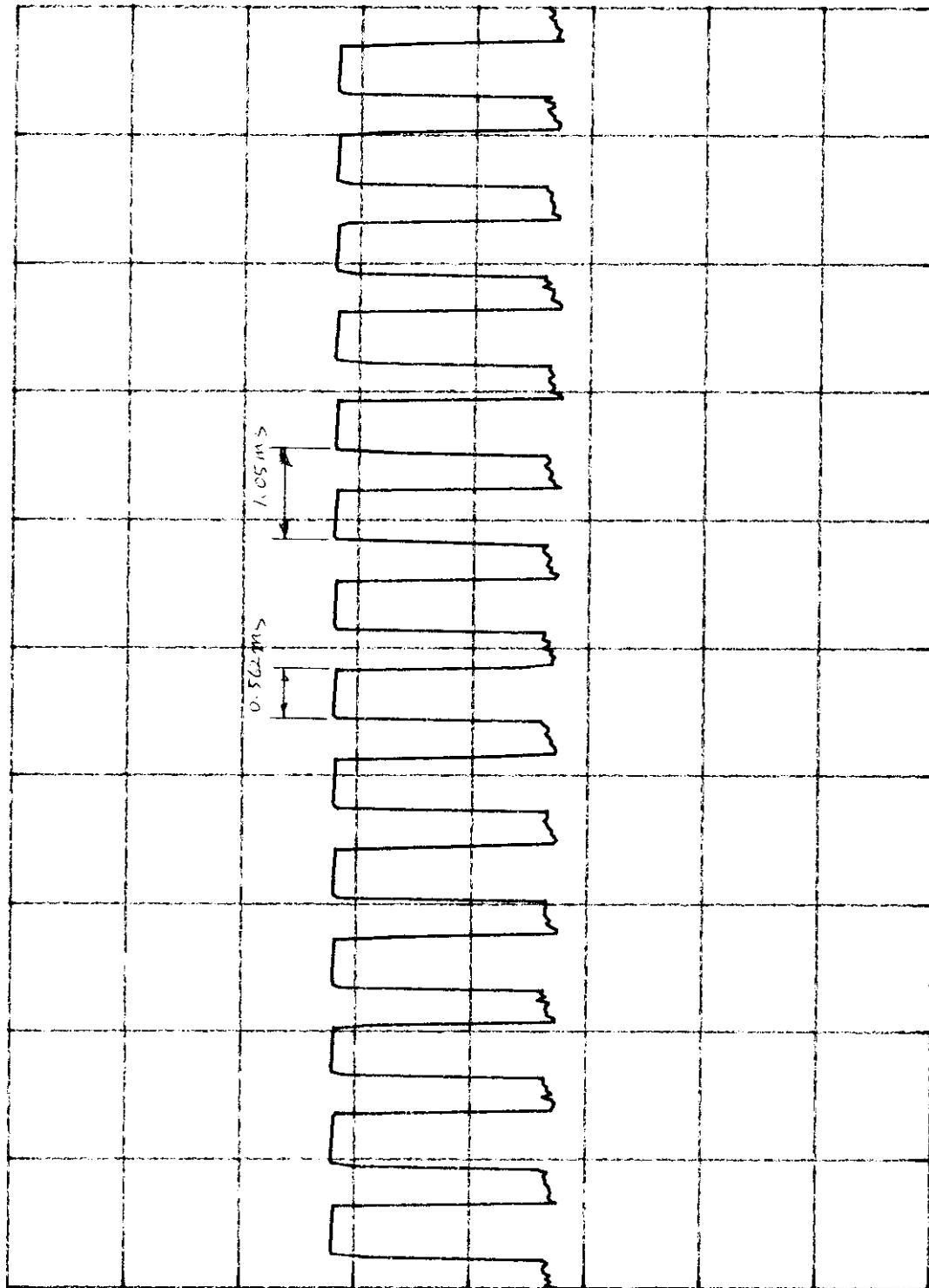
REF 137.0 dBμV AT 40 dB

PEAK

LOG

10

dB/



VA SB
SC FC
CORR

CENTER 49.860 MHz

#RES BW 3.0 MHz

#VBW 3 MHz

SPAN 0 Hz

#SWP 15.0 msec

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8.4 Emissions Test Procedures

The following is a description of the test procedure used by Intertek Testing Services in the measurements of transmitters operating under Part 15, Subpart C rules.

The test set-up and procedures described below are designed to meet the requirements of ANSI C63.4 - 1992.

The transmitting equipment under test (EUT) is attached to a cardboard box and placed on a wooden turntable which is four feet in diameter and approximately one meter in height above the ground plane. During the radiated emissions test, the turntable is rotated and any cables leaving the EUT are manipulated to find the configuration resulting in maximum emissions. The cardboard box is adjusted through all three orthogonal axes to obtain maximum emission levels. The antenna height and polarization are varied during the testing to search for maximum signal levels.

Detector function for radiated emissions is in peak mode. Average readings, when required, are taken by measuring the duty cycle of the equipment under test and subtracting the corresponding amount in dB from the measured peak readings. A detailed description for the calculation of the average factor can be found in Exhibit 8.3.

The frequency range scanned is from the lowest radio frequency signal generated in the device which is greater than 9 kHz to the tenth harmonic of the highest fundamental frequency or 40 GHz, whichever is lower. For line conducted emissions, the range scanned is 450 kHz to 30 MHz.

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8.4 Emissions Test Procedures (cont'd)

The EUT is warmed up for 15 minutes prior to the test.

AC power to the unit is varied from 85% to 115% nominal and variation in the fundamental emission field strength is recorded. If battery powered, a new, fully charged battery is used.

Conducted measurements are made as described in ANSI C63.4 - 1992.

The IF bandwidth used for measurement of radiated signal strength was 100 kHz or greater below 1000 MHz. Where pulsed transmissions of short enough pulse duration warrant, a greater bandwidth is selected according to the recommendations of Hewlett Packard Application Note 150-2. A discussion of whether pulse desensitivity is applicable to this unit is included in this report (See Exhibit 8.2). Above 1000 MHz, a resolution bandwidth of 1 MHz is used.

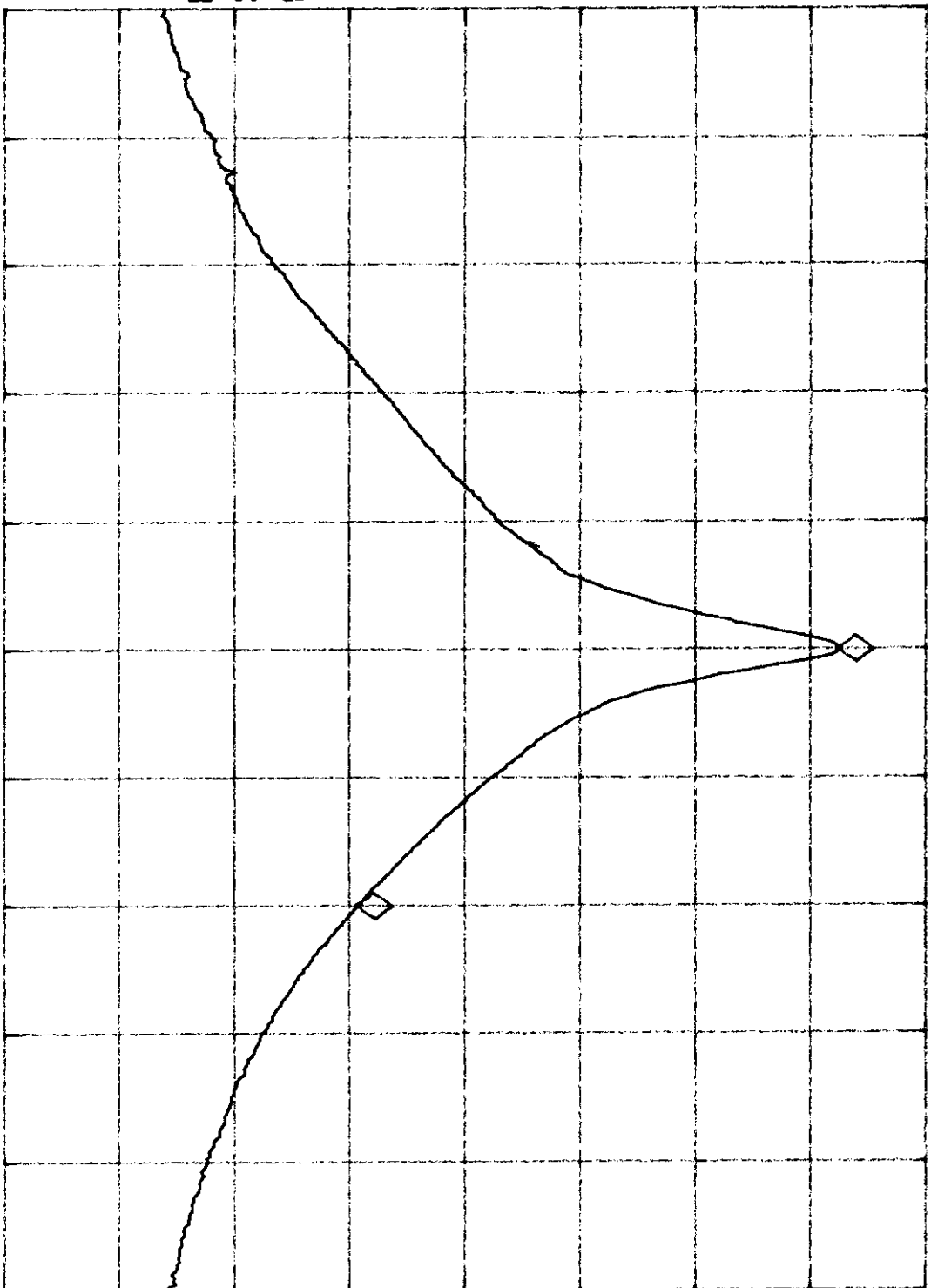
Transmitter measurements are normally conducted at a measurement distance of three meters. However, to assure low enough noise floor in the forbidden bands and above 1 GHz, signals are acquired at a distance of one meter or less. All measurements are extrapolated to three meters using inverse scaling, but those measurements taken at a closer distance are so marked.

~~172~~

REF 117.0 dBμV AT 20 dB MKR 40.0 KHZ
-41.74 dB

PEAK
LOG
10
dB/

VA SB
SC FC
CORR



CENTER 49.8600 MHZ SPAN 200.0 KHZ
#RES BW 3.0 KHZ #VBW 3 MHZ SWP 100 msec

MIN - 40.3 KIN

13. 13 RB

五

SPAN 200.0 KHZ
SWP 100 msec