

EMI TEST REPORT

Test Report No. : 21CE0031-YW-2

Applicant: Hitachi Maxell, Ltd.

Type of Equipment: Personal Reader Writer

Model No.: ME-P1000-U

Test standard: FCC Part 15 Subpart C

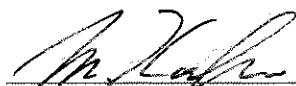
FCC ID: NEEE01

Test Result: Complies

1. This test report shall not be reproduced in full or partial, without the written approval of A-Pex International Co., Ltd.
2. The results in this report apply only to the sample tested.

Date of test: December 5 and 6, 2000 **Issued date:** January 9, 2001

Tested by:



Makoto Kosaka
EMC section

Approved by:



Kazuhiro Kitahara
Section Manager of EMC section

Form Version No. 2

A-pex International Co., Ltd.
YOKOWA LAB.

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MF060b(12.15.00)

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SECTION 1: Applicant information

Company name : Hitachi Maxell, Ltd.

Trade name : maxell

Address : 2-12-24 Shibuya, Shibuya-ku, Tokyo 150-8321 Japan

Telephone Number : +81-3-5467-9343

Facsimile Number : +81-3-5467-3516

Contact Person : Naoyuki Kikuchi

SECTION 2: Equipment under test (E.U.T.)

2.1 Identification of E.U.T.

Type of Equipment : Personal Reader Writer (RFID SYSTEM)

Model No. : ME-P1000-U

Serial No. : -

Rating : DC +5V (supplied from USB I/F Line which is connected to the EUT)

Country of Manufacture : Japan

Receipt Date of Sample : December 5, 2000

2.2 Product Description

Model: ME-P1000-U, referred to as the EUT in this report, is a Personal Reader Writer which will be interfaced by USB to connect to PC. The EUT reads and writes the information stored in a particular IC card and Token.

Size: Approximately 6cm (D) × 6cm (W) × 10cm (H)

Weight: Approximately 135g

Operating Frequency : 6 MHz

Carrier Frequency : 13.56 MHz

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SECTION 3: Test specification, methods & procedures**3.1 Test Specification**

Test Specification : FCC Part 15 Subpart C
Title : FCC 47CFR Part15 Radio Frequency Device
Subpart C Intentional Radiators
§ 15.225 Operation within the Band 13.553 - 13.567 MHz

3.2 Methods & Procedures

No.	Item	Test Procedure	Specification	Remarks
1	Electric Field Strength of Fundamental Emission	FCC/ANSI C63.4:1992	§ 15.225(a)	-
2	Electric Field Strength of Spurious Emission	FCC/ANSI C63.4:1992	§ 15.225(b)	-
3	Frequency Tolerance	FCC/ANSI C63.4:1992	§ 15.225(c)	-

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SECTION 4: Operation of E.U.T. during testing

4.1 Operating Modes

The EUT exercise program used during radiated testing was designed to exercise the various system components in a manner similar to typical use.

The sequence is used: Running mode

Operation : Continuous Reading and Writing between EUT and a token

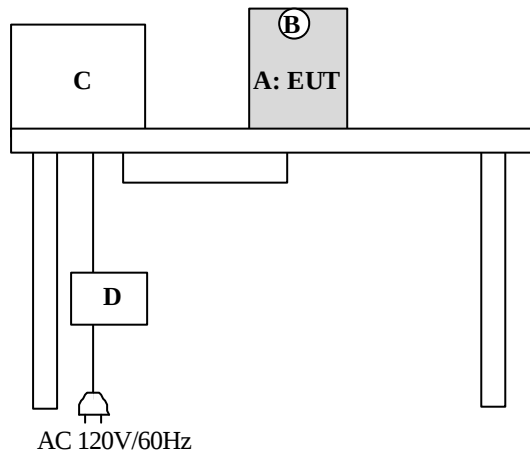
Justification: The system was configured in typical fashion (as a customer would normally use it) for testing.

4.1 EUT Exercise Software

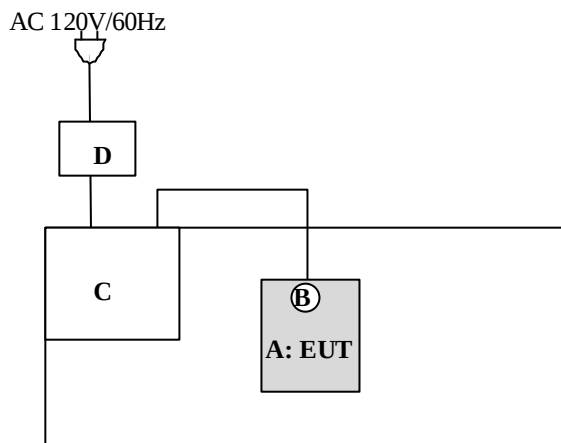
1. Turn on the PC, and start Windows.
2. Start micro computer, Tag Write.exe, which is on the desktop.
3. Choose REQx-RFOFF.cmf and push the start button
4. Push the operating button, and then Token and EUT run continuously.

4.2 Configuration and peripherals

Front View



Top View



*Cabling was taken into consideration and test data was taken under worst case conditions.

Description of EUT and Support equipment

No.	Item	Model number	Serial number	Manufacturer	FCC ID
A	Personal Reader Writer	ME-P1000-U	-	maxell	EUT
B	token	ME-Y1001-A-T	-	maxell	-
C	Note PC	ARMADA V300	AV3 C1466T4 X4DC6458	Compaq Computer Corporation	-
D	AC Adaptor	ADP-50SB	Z1T9952062968	COMPAQ	-

List of cables used

No.	Name	Length (m)	Shield	Backshell Material
	USB I/F Cable	0.8	Y	P.V.C.
	DC Power Cable	1.8	N	P.V.C.
	AC Power Cable	1.9	N	P.V.C.

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SECTION 5: Summary of test results**5.1 Test results**

No.	Item	Test Procedure	Specification	Remarks	Result
1	Electric Field Strength of Fundamental Emission	FCC/ANSI C63.4:1992	FCC Part15 Subpart C § 15.225(a)	3m	Complies
2	Electric Field Strength of Spurious Emission	FCC/ANSI C63.4:1992	FCC Part15 Subpart C § 15.225(b)	3m	Complies
3	Frequency Tolerance	FCC/ANSI C63.4:1992	FCC Part15 Subpart C § 15.225(c)	-	Complies

A-PEX INTERNATIONAL hereby confirms that E.U.T., in the configuration tested, complies with the specifications FCC Part15 Subpart C.

5.1.1 Electric Field Strength Measurement of Fundamental Frequency

The following table lists frequency at which emissions were measured using a Quasi-Peak detector and at a test distance of 3m

Frequency (MHz)	Ant. Receiver Reading (dB μ V)	Correction Factor (dB)	Field Strength (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)
13.56	41.5	-1.3	40.2	120.0	79.8

Note: The limit was calculated using the square of an inverse linear distance extrapolation factor (40dB/decade) i.e $40\log_{10}(d1/d2)$.

30m Fundamental Emission Limit (10,000 μ V/m) = $20\log_{10}(10,000)$ = 80dB μ V/m

3m Fundamental Emission Limit = 80dB μ V/m + $40\log_{10}(30/3)$ = 120dB μ V/m

Field strength calculation

The field strength is calculated by adding the Antenna Factor, Cable Factor and Antenna Pad, and subtracting the Amplifier Gain from the measured reading. The sample calculation is as follows :

$$FS = RA + AF + CF + AT - AG$$

where FS = Field Strength

RA = Receiver Amplitude

AF = Antenna Factor

CF = Cable Factor

AT = Antenna Pad

AG = Amplifier Gain

Assume a receiver reading of 41.5 dB μ V is obtained. The antenna Factor of 20.2 dB, Cable Factor of 0.7 dB and Antenna Pad of 6.0 dB is added. The Amplifier Gain of 28.2 dB is subtracted, giving a field strength of 40.2 dB μ V/m.

$$FS = 41.5 + 20.2 + 0.7 + 6.0 - 28.2 = 40.2 \text{ dB } \mu \text{ V/m}$$

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5.1.2 Electric Field Strength of Spurious Emission

The initial step in collecting radiated data was a spectrum analyzer peak scan of the measurement range (9kHz-1000MHz).

The final data was reported in the worst-case emissions.

The following table lists frequency at which emissions were measured using a Quasi-Peak detector and at a test distance of 3m

The minimum margin to the limit is as follows :

Frequency (MHz)	Ant. Pol.	Receiver Reading (dB μ V)	Correction Factor (dB)	Field Strength (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)
40.68	V	41.1	-6.7	34.4	40.0	5.6

Field strength calculation

The field strength is calculated by adding the Antenna Factor, Cable Factor and Antenna Pad, and subtracting the Amplifier Gain from the measured reading. The sample calculation is as follows :

$$FS = RA + AF + CF + AT - AG$$

where FS = Field Strength
 RA = Receiver Amplitude
 AF = Antenna Factor
 CF = Cable Factor
 AT = Antenna Pad
 AG = Amplifier Gain

Assume a receiver reading of 41.1 dB μ V is obtained. The antenna Factor of 14.5 dB, Cable Factor of 1.2 dB and Antenna Pad of 5.9 dB is added. The Amplifier Gain of 28.3 dB is subtracted, giving a field strength of 34.4 dB μ V/m.

$$FS = 41.1 + 14.5 + 1.2 + 5.9 - 28.3 = 34.4 \text{ dB } \mu \text{ V/m}$$

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5.1.3 Frequency Tolerance

Measurements were performed to determine the frequency stability of the fundamental emission from the EUT when subjected to a variation in ambient temperature and a variation of supply voltage.

5.1.3.1 Variation of Ambient Temperature

The ambient temperature was varied from -20 to $+50$. During the test, the fundamental frequency of the EUT shall be maintained within $\pm 0.01\%$ of the operating frequency.

Frequency Error Limit: 13.56MHz : $\pm 0.01\%$ (1.356kHz)

Lower frq Limit =13.55864MHz / Upper frq Limit = 13.56136MHz

Temperature()	0 minuts	2 minuts	5 minuts	10 minuts	Result
-20	+1050Hz	+720Hz	+500Hz	+480Hz	Complied
+50	+210Hz	+180Hz	- 90Hz	- 120Hz	Complied

5.1.3.2 Variation of Supply Voltage

According to its specification, voltage supplied from host PC to this equipment is stable and hence this equipment does not fall into FCC Part 15 Subpart C clause 15.225(c)

5.2 Uncertainty

Radiated Emission Test

The measurement uncertainty (with a 95% confidence level) for this test was $\pm 3.3\text{dB}$.

- ☐ The data listed in this test report may exceed the test limit because it does not have enough margin (more than 3.3dB).
- ☒ The data listed in this test report has enough margin, more than 3.3dB.

5.3 Test equipment used

See SECTION 6: TEST EQUIPMENT USED

5.4 Test Location

A-PEX International Co.,Ltd. Yokowa No.3 test site
108 Yokowa-cho, Ise-shi, Mie-ken 516-1106 Japan
Telephone number : +81-596-39-1485
Facsimile number : +81-596-39-0232

This site has been fully described in a report submitted to FCC office, and listed on September 12, 2000
(Registration number: 90412).

*NVLAP Lab. code : 200109-0

5.5 Test Configuration Photographs

See Appendix 1.

5.6 Data of EMI Test

See Appendix 2.

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SECTION 6: Test instruments**EMI test instrument**

Instrument	Mfr.	Model No.	Control No.	Calibration Until // Interval
Pre Amplifier	Hewlett Packard	8447D	AF-01	November 5, 2001 / 1 year
Attenuator	Anritsu	MP721B	AT-06	June 8, 2001 / 1 year
Biconical Antenna	Schwarzbeck	BBA9106	BA-03	April 28, 2001 / 1 year
Temperature and Humidity Chamber	Tabai Espec Corp.	PL-4KP	CH-01	October 1, 2001 / 1 year
Logperiodic Antenna	Schwarzbeck	UHALP9108-A	LA-06	April 29, 2001 / 1 year
Loop Antenna	Rohde & Schwarz	HFH2-Z2	LP-01	November 3, 2002 / 3 year
Test Receiver	Rohde & Schwarz	ESHS10	TR-05	August 17, 2001 / 1 year
Test Receiver	Rohde & Schwarz	ESVS10	TR-06	August 9, 2001 / 1 year
Universal Counter	Agilent	53131A	UC-01	October 1, 2001/ 1 year

*All measurement equipment is traceable to national standard.

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SECTION 7 Radiated emission

7.1 Operating environment

The test was carried out in an open site.

Temperature : See data

Humidity : See data

7.2 Test configuration

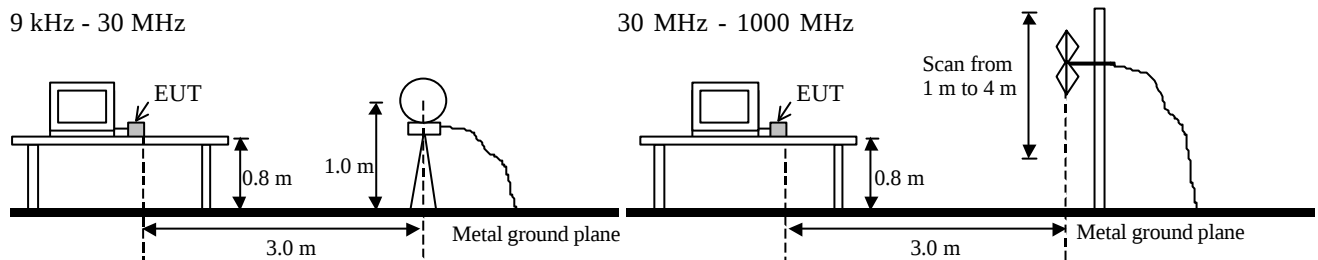
EUT was placed on a table of nominal size, 1m by 1.0m, raised 80cm above the conducting ground plane.

The rear of EUT, including peripherals was aligned and flush with rear of tabletop.

Test was made with the antenna positioned in both the horizontal and vertical planes of polarization.

The measurement antenna was varied in height above the conducting ground plane to obtain the maximum signal strength.

Figure 1 Drawing of the test set-up



7.3 Test conditions

Frequency range : 9kHz-30MHz (Loop antenna) / 30MHz-300MHz (biconical antenna)
/ 300MHz-1000MHz (Log-periodic antenna)

Test distance : 3m

EUT position : Table top

7.4 Test procedure

The Radiated Electric Field Strength intensity has been measured on an open test site with a ground plane at a distance of 3m from the EUT to the antenna.

Pre check measurements were performed in a shielded room or used search coil for ambient noise at high-level, especially from 272MHz to 288MHz.

Measurements were performed with a quasi-peak detector.

The measuring antenna height was varied between 1m to 4m and EUT was rotated a full revolution in order to obtain the maximum value of the electric field intensity.

The measurements were performed for both vertical and horizontal antenna polarization.

The EUT was put into operation at Running mode.

7.5 Results

Summary of the test results: Pass

Date: 2000-12-05 and 06

Tested by: M. Kosaka

A-pex International Co., Ltd.

YOKOWA LAB.

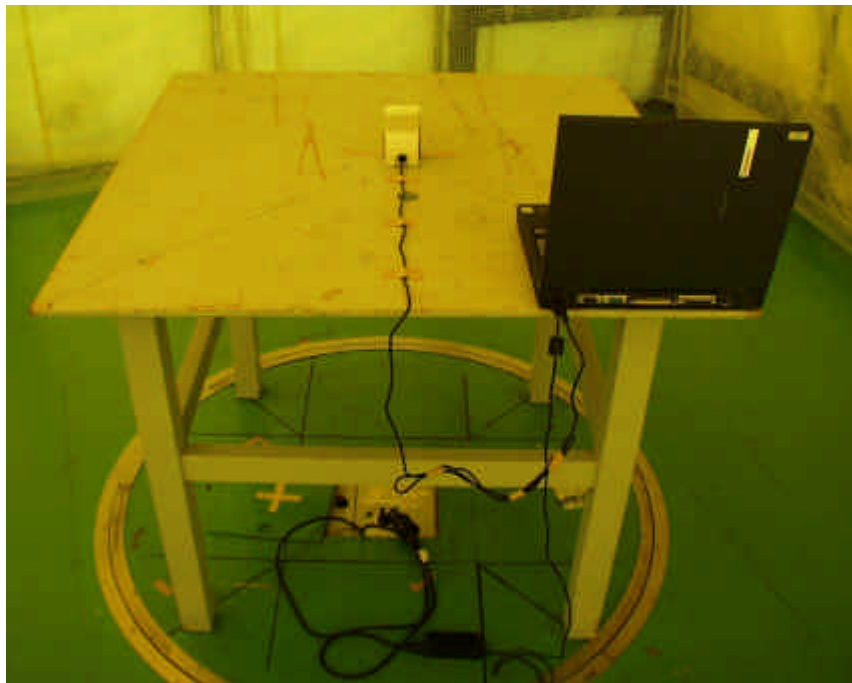
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APPENDIX 1: Photographs of test setup

Radiated emission



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APPENDIX 2: Data of EMI test

This section contains the following data

Radiated emission : A2- 1 and A2-5

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DATA OF RADIATION TEST

A-PEX INTERNATIONAL CO., LTD.
YOKOWA No.3 OPEN TEST SITE
Report No. : 21CE0031-YW-2

Applicant : Hitachi Maxell, Ltd.
Kind of Equipment : Personal Reader Writer
Model No. : ME-P1000-U
Serial No. :
Power : DC 5V
Mode : Running
Remarks :
Date : 12/6/2000
Test Distance : 3 m
Temperature : 22 °C
Humidity : 35 %
Regulation : FCC Part15C § 15.225(a)


Engineer : Makoto Kosaka

No.	FREQ. [MHz]	ANT TYPE	READING		ANT FACTOR [dB/m]	AMP GAIN [dB]	CABLE LOSS [dB]	ATTEN. [dB]	RESULT		LIMITS [dB μ V/m]	MARGIN	
			HOR [dB μ V]	VER [dB μ V]					HOR [dB μ V/m]	VER [dB μ V/m]		HOR [dB]	VER [dB]
1.	13.56	BB	41.5	36.3	20.2	28.2	0.7	6.0	40.2	35.0	120.0	79.8	85.0

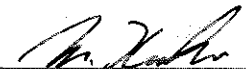
CALCULATION: READING + ANT. FACTOR + CABLE LOSS - AMP. GAIN + ATTEN.

Except for the above table: adequate margin data below the limit
Carrier Limit=(30m:80dB μ V/m) + 40log(30/3)

DATA OF RADIATION TEST

A-PEX INTERNATIONAL CO., LTD.
YOKOWA No.3 OPEN TEST SITE
Report No. : 21CE0031-YW-2

Applicant : Hitachi Maxell, Ltd.
Kind of Equipment : Personal Reader Writer
Model No. : ME-P1000-U
Serial No. :
Power : DC 5V
Mode : Running
Remarks :
Date : 12/6/2000
Test Distance : 3 m
Temperature : 22 °C
Humidity : 35 %
Regulation : FCC Part15C § 15.209(a)

Engineer : 
Makoto Kosaka

No.	FREQ. [MHz]	ANT TYPE	READING		ANT FACTOR [dB/m]	AMP GAIN [dB]	CABLE LOSS [dB]	ATTEN. [dB]	RESULT		LIMITS [dB μ V/m]	MARGIN	
			HOR [dB μ V]	VER [dB μ V]					HOR [dB μ V/m]	VER [dB μ V/m]		HOR [dB]	VER [dB]
1.	27.12	BB	33.1	33.1	21.2	28.3	0.9	6.0	32.9	32.9	69.5	36.6	36.6

CALCULATION: READING + ANT. FACTOR + CABLE LOSS - AMP. GAIN + ATTEN.

Except for the above table: adequate margin data below the limit
Spurious Limit=(30m:29.5dB μ V/m) + 40log(30/3)

DATA OF RADIATION TEST

A-PEX INTERNATIONAL CO., LTD.
YOKOWA No.3 OPEN TEST SITE
Report No. : 21CE0031-YW-2

Applicant : Hitachi Maxell, Ltd.
Kind of Equipment : Personal Reader Writer
Model No. : ME-P1000-U
Serial No. :
Power : DC 5V
Mode : Running
Remarks :
Date : 12/5/2000
Test Distance : 3 m
Temperature : 26 °C
Humidity : 30 %
Regulation : FCC Part15C § 15.209(a)


Engineer : Makoto Kosaka

No.	FREQ. [MHz]	ANT TYPE	READING		ANT FACTOR [dB/m]	AMP GAIN [dB]	CABLE LOSS [dB]	ATTEN. [dB]	RESULT		LIMITS [dB μV/m]	MARGIN	
			HOR [dB μV]	VER [dB μV]					HOR [dB μV/m]	VER [dB μV/m]		HOR [dB]	VER [dB]
1.	40.68	BB	34.4	41.1	14.5	28.3	1.2	5.9	27.7	34.4	40.0	12.3	5.6
2.	48.00	BB	32.8	38.0	11.7	28.1	1.3	5.9	23.6	28.8	40.0	16.4	11.2
3.	54.24	BB	30.7	37.7	9.8	28.2	1.3	6.0	19.6	26.6	40.0	20.4	13.4
4.	96.00	BB	39.2	41.6	9.4	27.9	1.8	5.9	28.4	30.8	43.5	15.1	12.7
5.	108.49	BB	31.6	36.4	11.6	28.1	2.0	5.9	23.0	27.8	43.5	20.5	15.7
6.	122.05	BB	31.6	40.0	13.5	28.2	2.1	6.0	25.0	33.4	43.5	18.5	10.1
7.	135.61	BB	34.2	42.4	14.4	28.0	2.3	5.9	28.8	37.0	43.5	14.7	6.5
8.	149.17	BB	25.4	32.5	14.8	27.8	2.4	5.9	20.7	27.8	43.5	22.8	15.7
9.	176.30	BB	29.9	33.5	15.8	27.8	2.6	6.0	26.5	30.1	43.5	17.0	13.4
10.	189.86	BB	36.3	36.7	16.2	28.0	2.7	6.0	33.2	33.6	43.5	10.3	9.9
11.	203.43	BB	29.9	28.8	16.5	28.0	2.8	5.9	27.1	26.0	43.5	16.4	17.5
12.	354.05	BB	29.7	32.3	15.1	28.0	4.0	6.0	26.8	29.4	46.0	19.2	16.6
13.	456.02	BB	32.1	38.4	16.5	27.9	4.5	6.0	31.2	37.5	46.0	14.8	8.5
14.	474.62	BB	25.0	27.9	16.8	27.6	4.7	5.9	24.8	27.7	46.0	21.2	18.3

CALCULATION: READING + ANT. FACTOR + CABLE LOSS - AMP. GAIN + ATTEN.

Except for the above table: adequate margin data below the limit
ANT. TYPE: 30-300MHz Biconical, 300-1000MHz Logperiodic

FCCID:NEEE01

REF -37.0 dBm ATTEN 10 dB

MKR -16.8 kHz
 -19.95 dB

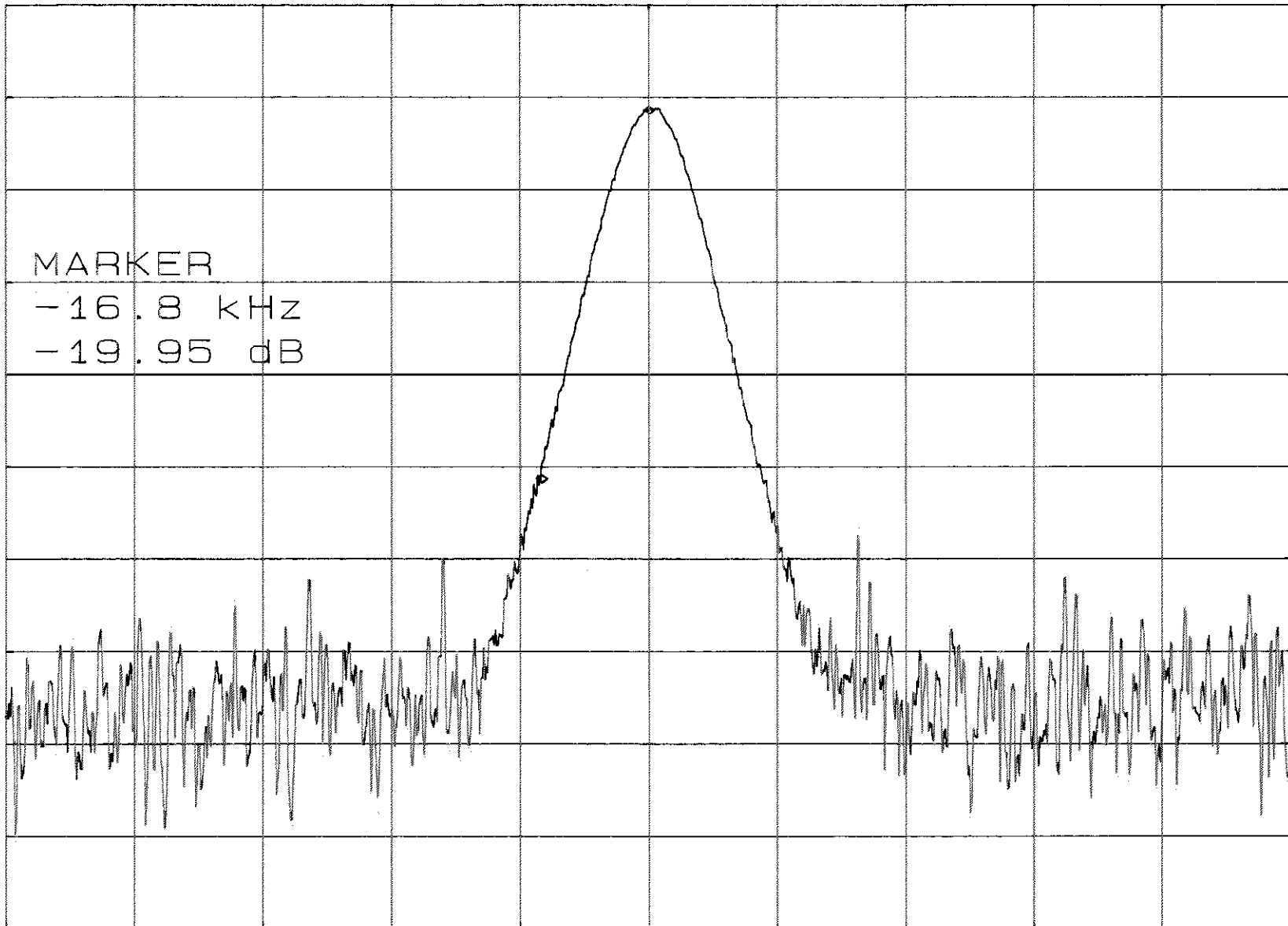
5 dB/

DL
-57.0
dBm

MARKER

-16.8 kHz

-19.95 dB



CENTER 13.5600 MHz
RES BW 10 kHz

VBW 10 kHz

SPAN 200.0 kHz
SWP 30 msec

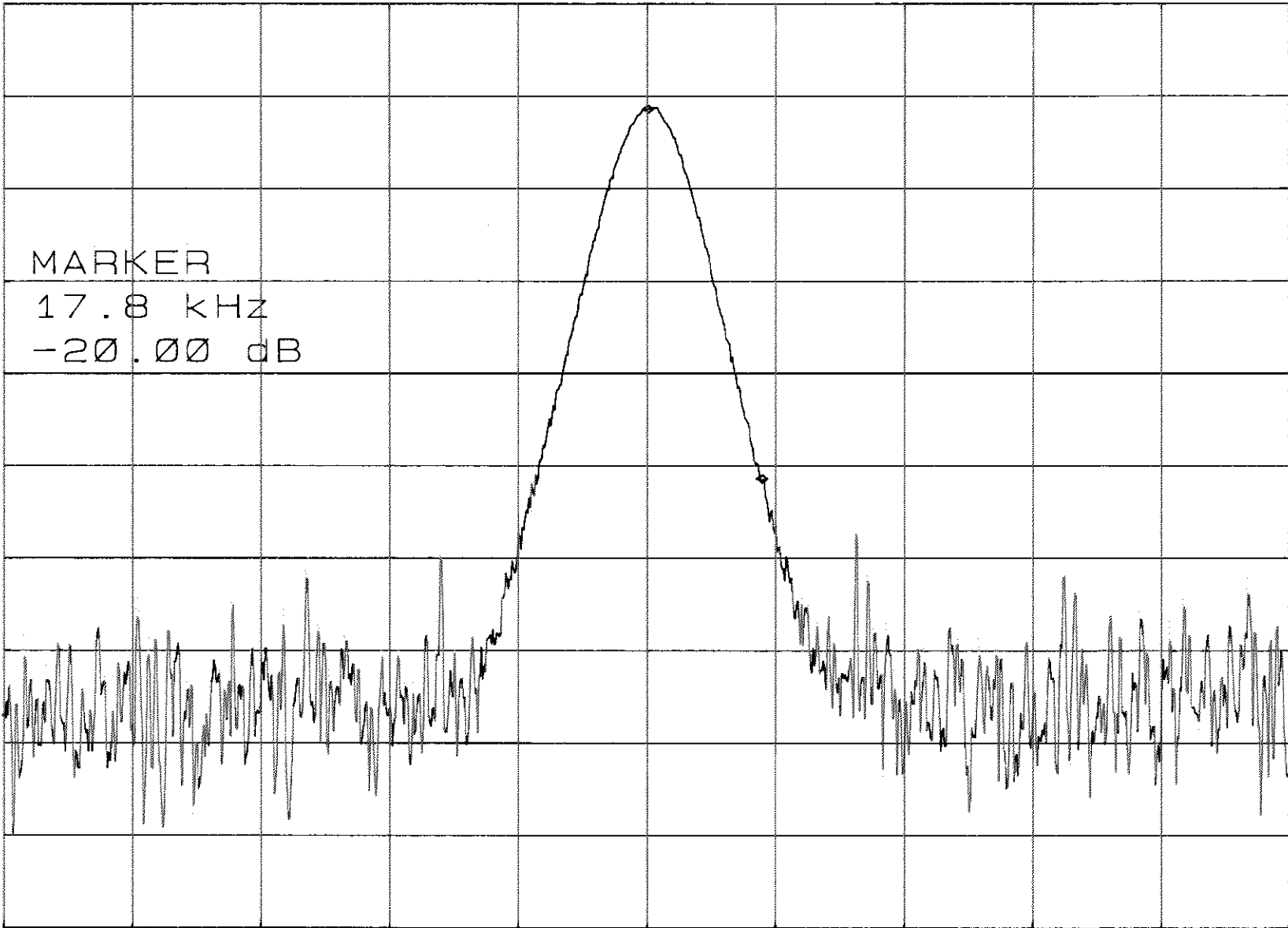
A2-4

MKR 17.8 kHz
-20.00 dB

REF -37.0 dBm ATTEN 10 dB

5 dB/

DL
-57.0
dBm



MARKER
17.8 kHz
-20.00 dB