EMISSION TEST REPORT

Test Report No. : **21LE0100-YW-1**

Applicant:	**Hitachi Software Engineering Co.,Ltd.**
Type of Equipment:	**Electronic Pen**
Model No.:	**K-W019-004**
FCC ID:	**PJV-RX01**
Test standard:	**FCC Part 15 Subpart C §15.227**
Test Result:	**Complies**

The results in this report apply only to the sample tested.

Date of test: July 31 , 2001

Tested by:

Masafumi Inui

Approved by: Issued date: September 3, 2001

Kazutoyo Nakanishi

Site Operation Manager of EMC section

Testing Laboratory

A-pex International Co., Ltd.

108 Yokowa-cho, Ise-shi Mie-ken 516-1106 JAPAN

Telephone: +81 596 39 1485

Facsimile: +81 596 39 0232

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Testing Laboratory
A-pex International Co., Ltd. Telephone: +81 596 39 1485
108 Yokowa-cho, Ise-shi Mie-ken 516-1106 JAPAN Facsimile: +81 596 39 0232

1 GENERAL INFORMATION

APPLICANT	: Hitachi Software Engineering Co.,Ltd.
TRADE NAME	: Hitachi Software Engineering Co.,Ltd.
ADDRESS	: 6-81 Onoe-cho, Naka-ku,Yokohama-shi, Kanagawa 231-0015 Japan Tel: +81-45-681-2146 Fax: +81-45-681-3062
REGULATION(S)	: FCC Part 15 Subpart C §15.227
MODEL NUMBER	: K-W019-004
FCC ID	: PJV-RX01
SERIAL NUMBER	: E0011 (1CH 27.195MHz) E0012 (2CH 26.995MHz) E0015 (3CH 27.045MHz)
KIND OF EQUIPMENT	: Electronic Pen
TESTED DATE	: July 31 , 2001
RECEIPT DATE OF SAMPLE	: July 25, 2001
REPORT FILE NUMBER	: 21LE0100-YW-1
TEST SITE	: A-PEX Yokowa No.2 Open Test Site

1.1 Product Description

Model: K-W019-004 (referred to as the EUT in this report) is a Electronic Pen.

The specification is as following:
Carrier Frequency : 1CH 27.195MHz.
2CH 26.995MHz
3CH 27.045MHz
4CH 27.145MHz
Operation Voltage : DC2.4V (Ni-MH)
Modulation : Frequency Modulation
Information on antenna : Build in antenna

1.2 Test Specification

Test Specification : FCC Part 15 Subpart C

Title : FCC 47CFR Part15 Radio Frequency Device

Subpart C Intentional Radiators

§15.227 Operation within the Band 26.96 – 27.28MHz

1.3 Methods & Procedures

No.	Item	Test Procedure	Specification	Remarks
1	Electric Field Strength of Fundamental Emission	FCC/ANSI C63.4:1992	§15.227(a)	-
2	Electric Field Strength of Spurious Emission	FCC/ANSI C63.4:1992	§15.227(b)	-

1.4 Test Location

A-PEX International Co.,Ltd. Yokowa No.2 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 October 26, 2000(Registration number: 90411/No.2).

2 SYSTEM TEST CONFIGURATION

2.1 Operation Modes

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

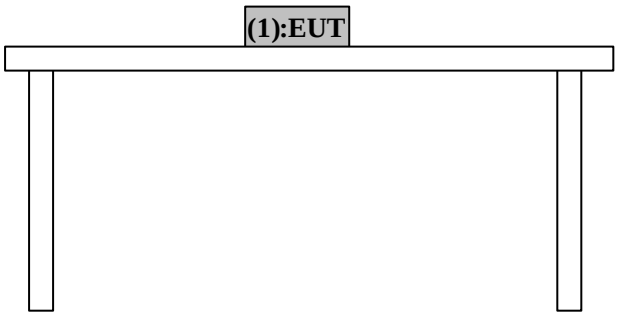
The sequence is used:

Operation Mode : Transmitting

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

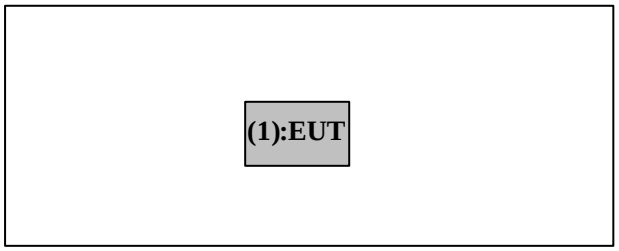
Figure2.1 Configuration of Tested System

Front View



* Test data was taken under worse case conditions.

Top View



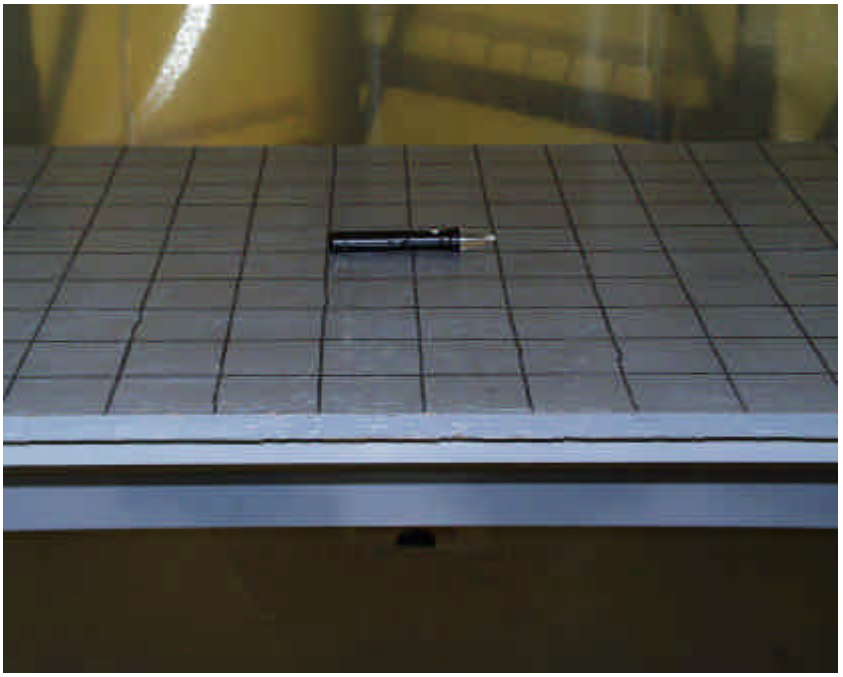
*Test data was taken under worse case conditions.

Description of EUT and Support equipment

No.	Item	Model number	Serial number	Manufacturer	Remark
1	Pen type Transmitter	K-W019-004	E0011 (1CH) E0012 (2CH) E0015 (3CH)	Hitachi Software Engineering Co.,Ltd.	EUT

3 RADIATED MEASUREMENT PHOTOS

Figure 3.1 Radiated Measurement Photos



3.1 Measurement Uncertainty

Radiated Emission Test

■ Measurement distance of 3m:
The measurement uncertainty (with a 95% confidence level) for this test using Biconical antenna is ±4.4dB.
The measurement uncertainty (with a 95% confidence level) for this test using Logperiodic antenna is ±4.8dB.
■ Measurement distance of 10m:
The measurement uncertainty (with a 95% confidence level) for this test using Loop antenna is ±2.5dB.

■The data listed in this test report may exceed the test limit because it does not have enough margin.
□The data listed in this test report has enough margin, more than site margin.

4 Summary of test results

4.1 Test results

No.	Item	Test Procedure	Specification	Remarks	Result
1	Electric Field Strength of Fundamental and Spurious Emission(below 30MHz)	FCC/ANSI C63.4:1992	FCC Part15 Subpart C §15.227(a) and (b)	10m	Complies
2	Electric Field Strength of Spurious Emission (above 30MHz)	FCC/ANSI C63.4:1992	FCC Part15 Subpart C §15.227(b)	3m	Complies

A-PEX INTERNATIONAL hereby confirms that E.U.T. , in the configuration tested, complies with the specificationsFCC Part15 Subpart C §15.227.

4.2 Electric Field Strength Measurement of Fundamental Frequency

The follwing table lists frequency at which emissions were measured using a average detector and at a test distance of 10m

Frequency (MHz)	Ant. Pol.	Receiver Reading (dBμV)	Correction Factor (dB)	Field Strength (dBμV/m)	Limit (dBμV/m)	Margin (dB)
27.1974 (1CH)	V	69.9	-7.4	62.5	100.9	38.4

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

3m Fundamental Emission Limit (10,000 μV/m) = $20\log_{10}(10{,}000)$ = 80dBμV/m
10m Fundamental Emission Limit = 80dBμV/m + $40\log_{10}(10/3)$ = 100.9dBμV/m

Field strength calculation

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

FS = RA + AF + CF - AG

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

Assume a receiver reading of 69.9 dBμV is obtained. The antenna Factor of 21.2 dB and Cable Factor of 1.2 dB is added. The Amplifier Gain of 29.8 dB is subtracted, giving a field strength of 62.5 dBμV/m.
FS = 69.9 + 21.2 + 1.2 – 29.8 = 62.5 dBμV/m

4.3 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 follwing table lists frequency at which emissions were measured using a Quasi-Peak detector and at a test distance of 3m(above 30MHz) and 10m(below 30MHz).
The minimum margin to the limit is as follows :

Frequency (MHz)	Ant. Pol.	Receiver Reading (dBμV)	Correction Factor (dB)	Field Strength (dBμV/m)	Limit (dBμV/m)	Margin (dB)
244.78 (1CH)	H	47.1	-3.4	43.7	46.0	2.3

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 47.1 dBμV is obtained. The antenna Factor of 16.9 dB, Cable Factor of 3.6 dB and Antenna Pad of 5.8 dB is added. The Amplifier Gain of 29.7 dB is subtracted, giving a field strength of 43.7 dBμV/m.

FS = 47.1 + 16.9 + 3.6 + 5.8 – 29.7 = 43.7 dBμV/m

5 Radiated emission

5.1 Operating environment

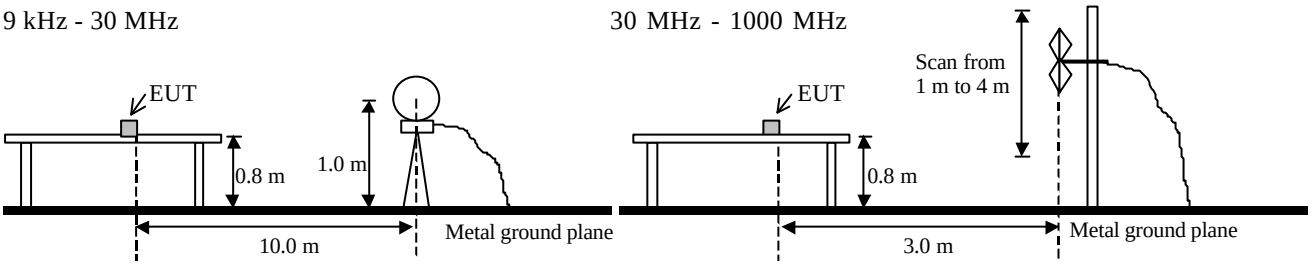
The test was carried out in an open site.

Temperature : See data
Humidity : See data

5.2 Test configuration

EUT was placed on a table of nominal size, 1.0m by 1.5m, raised 80cm above the conducting ground plane.
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. (above 30MHz)

Figure 1 Drawing of the test set-up



5.3 Test conditions

Frequency range : 9kHz-30MHz (Loop antenna) / 30MHz-300MHz (biconical antenna) / 300MHz-1000MHz (Log-periodic antenna)
Test distance : 10m(9kHz-30MHz) and 3m(30MHz-1000MHz)
EUT position : Table top

5.4 Test procedure

The Radiated Electric Field Strength intensity has been measured on an open test site with a ground plane at a distance of 10m and 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 80MHz to 90MHz and 270MHz to 290MHz. and 500MHz to 700MHz.
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. (above 30MHz)
The measurements were performed for both vertical and horizontal antenna polarization.
The EUT was put into operation at Transmitting mode.
The radiated emission measurements were made with the following detector function of the receiver.

Detector Type :QP and AV(Fundamental only)
IF Bandwidth : 120kHz(above 30MHz) / 10kHz(below 30MHz)

5.5 Results

Summary of the test results: Pass

Date: 2001-07-31 Tested by: M. Inui

6 TEST EQUIPMENT USED

Instrument	Mfr.	Model No.	Control No.	Calibration Until / / Interval
Pre Amplifier	Anritsu	MH648A	AF-03	March 30, 2002 / 1 year
Attenuator	Anritsu	MP721B	AT-04	March 30, 2002 / 1 year
Loop Antenna	Rohde & Schwarz	HFH2-Z2	LP-01	November 3,2002 / 3 year
Biconical Antenna	Schwarzbeck	BBA9106	BA-05	April 30, 2002 / 1 year
Logperiodic Antenna	Schwarzbeck	UKLP9140-A	LA-08	April 30, 2002 / 1 year
Spectrum Analyzer	Hewlett Packard	8567A	SA-03	March 30, 2002 / 1 year
Test Receiver	Rohde & Schwarz	ESHS30	TR-03	April 23, 2002 / 1 year
Test Receiver	Rohde & Schwarz	ESVS10	TR-04	April 23, 2002 / 1 year

*All measurement equipment is traceable to national standard.

APPENDIX

A : Test Data

Radiated emissions A1 – A7

Testing Laboratory
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DATA OF FUNDAMENTAL EMISSIONS

A-PEX INTERNATIONAL CO., LTD.
YOKOWA NO.2 OPEN SITE

COMPANY : Hitachi Soft ware Engineering Co.,Ltd.
EQUIPMENT : Electronic Pen
MODEL : K-W019-004
POWER : DC2.4V
DESCRIPTION : Transmitting
DATE : 07/31/2001
Temp./Humi. : 30℃/40%

REPORT NO : 21LE0100-YW-1
REGULATION : Fcc Part15 SubpartC 227
TEST DISTANCE : 10m

ENGINEER : Masafumi Inui

1CH

No.	FREQ	READING		ANT	ANP	CABLE	RESULT		Limit	MARGIN	
		HOR	VER	Factor	GAIN	LOSS	HOR	VER		HOR	VER
	[MHz]	[dB μ V]	[dB μ V]	[dB]	[dB]	[dB]	[dB μ V]	[dB μ V]	[dB μ V]	[dB]	[dB]
1	27.1974	65.7	69.9	21.2	29.8	1.2	58.3	62.5	100.9	42.6	38.4

2CH

No.	FREQ	READING		ANT	ANP	CABLE	RESULT		Limit	MARGIN	
		HOR	VER	Factor	GAIN	LOSS	HOR	VER		HOR	VER
	[MHz]	[dB μ V]	[dB μ V]	[dB]	[dB]	[dB]	[dB μ V]	[dB μ V]	[dB μ V]	[dB]	[dB]
1	26.9920	63.5	63.5	21.2	29.8	1.2	56.1	56.1	100.9	44.8	44.8

3CH

No.	FREQ	READING		ANT	ANP	CABLE	RESULT		Limit	MARGIN	
		HOR	VER	Factor	GAIN	LOSS	HOR	VER		HOR	VER
	[MHz]	[dB μ V]	[dB μ V]	[dB]	[dB]	[dB]	[dB μ V]	[dB μ V]	[dB μ V]	[dB]	[dB]
1	27.0418	65.7	66.7	21.2	29.8	1.2	58.3	59.3	100.9	42.6	41.6

SAMPLE CALCLATION :
RESULT=Reading + ANT Factor - CABLE LOSS.

*Limit : 15.227Limit + 40log(10/3)

DATA OF RADIATION TEST

A-PEX INTERNATIONAL CO., LTD.
YOKOWA No.2 OPEN TEST SITE
Report No.: 21LE0100-YW-1

Applicant : Hitachi Software Engineering Co.,Ltd.
Kind of Equipment : Electronic Pen
Model No. : K-W019-004
Serial No. :
Power : DC2.4V
Mode : Transmitting
Remarks : CH No.1
Date : 7/31/2001
Test Distance : 3 m
Temperature : 30 ℃
Humidity : 40 %
Regulation : Fcc 15C §15.209(a)

Engineer : Masafumi Inui

No.	FREQ. [Mhz]	ANT TYPE	READING HOR [dBμV]	READING VER [dBμV]	ANT FACTOR [dB/m]	AMP GAIN [dB]	CABLE LOSS [dB]	ATTEN. [dB]	RESULT HOR [dBμV/m]	RESULT VER [dBμV/m]	LIMITS [dBμV/m]	MARGIN HOR [dB]	MARGIN VER [dB]
1.	54.39	BB	28.2	32.8	9.6	29.8	1.6	5.8	15.4	20.0	40.0	24.6	20.0
2.	81.59	BB	31.4	27.7	6.6	29.8	2.0	5.9	16.1	12.4	40.0	23.9	27.6
3.	108.78	BB	27.1	29.6	11.5	29.7	2.3	5.9	17.1	19.6	43.5	26.4	23.9
4.	136.02	BB	31.7	29.9	14.0	29.7	2.6	5.8	24.4	22.6	43.5	19.1	20.9
5.	163.16	BB	22.7	23.7	15.0	29.7	2.8	5.9	16.7	17.7	43.5	26.8	25.8
6.	190.37	BB	27.3	23.6	16.1	29.6	3.1	5.9	22.8	19.1	43.5	20.7	24.4
7.	217.57	BB	38.7	31.6	16.6	29.7	3.3	5.8	34.7	27.6	46.0	11.3	18.4
8.	244.78	BB	47.1	36.6	16.9	29.7	3.6	5.8	43.7	33.2	46.0	2.3	12.8
9.	271.97	BB	43.6	31.9	17.9	29.7	3.8	5.8	41.4	29.7	46.0	4.6	16.3

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

All other spurious emissions are more than 20dB below the limits.
ANT.Type: 30-300MHz Biconical, 300-1000MHz Logperiodic

DATA OF RADIATION TEST

A-PEX INTERNATIONAL CO., LTD.
YOKOWA No.2 OPEN TEST SITE
Report No.: 21LE0100-YW-1

Applicant	: Hitachi Software Engineering Co.,Ltd.
Kind of Equipment	: Electronic Pen
Model No.	: K-W019-004
Serial No.	:
Power	: DC2.4V
Mode	: Transmitting
Remarks	: CH No.2
Date	: 7/31/2001
Test Distance	: 3 m
Temperature	: 30 ℃
Humidity	: 40 %
Regulation	: Fcc 15C §15.209(a)

Engineer : Masafumi Inui

No.	FREQ. [MHz]	ANT TYPE	READING HOR [dBμV]	READING VER [dBμV]	ANT FACTOR [dB/m]	AMP GAIN [dB]	CABLE LOSS [dB]	ATTEN. [dB]	RESULT HOR [dBμV/m]	RESULT VER [dBμV/m]	LIMITS [dBμV/m]	MARGIN HOR [dB]	MARGIN VER [dB]
1.	53.99	BB	28.5	32.7	9.8	29.8	1.6	5.9	16.0	20.2	40.0	24.0	19.8
2.	81.00	BB	27.4	28.2	6.5	29.8	2.0	5.9	12.0	12.8	40.0	28.0	27.2
3.	107.97	BB	33.2	33.4	11.4	29.7	2.3	5.9	23.1	23.3	43.5	20.4	20.2
4.	134.97	BB	25.4	25.0	13.9	29.7	2.6	5.8	18.0	17.6	43.5	25.5	25.9
5.	162.05	BB	23.3	24.9	15.0	29.7	2.8	5.9	17.3	18.9	43.5	26.2	24.6
6.	188.96	BB	25.9	23.4	16.1	29.6	3.1	5.9	21.4	18.9	43.5	22.1	24.6
7.	215.95	BB	36.0	29.5	16.6	29.7	3.3	5.8	32.0	25.5	43.5	11.5	18.0
8.	242.93	BB	39.6	30.4	16.8	29.7	3.6	5.8	36.1	26.9	46.0	9.9	19.1
9.	269.94	BB	35.5	26.5	17.8	29.7	3.8	5.8	33.2	24.2	46.0	12.8	21.8

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

All other spurious emissions are more than 20dB below the limits.
ANT.Type: 30-300MHz Biconical, 300-1000MHz Logperiodic

DATA OF RADIATION TEST

A-PEX INTERNATIONAL CO., LTD.
YOKOWA No.2 OPEN TEST SITE
Report No.: 21LE0100-YW-1

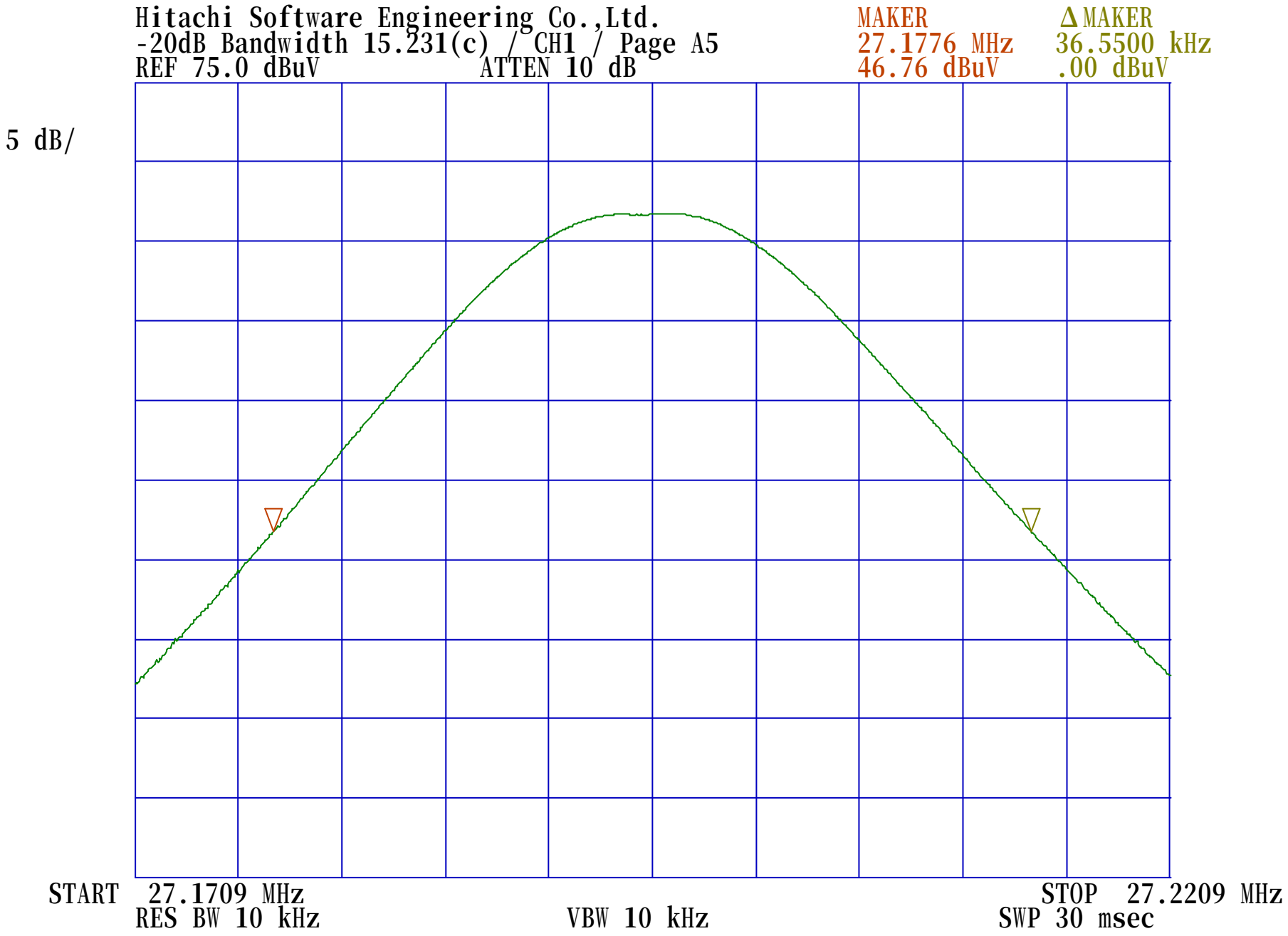
Applicant : Hitachi Software Engineering Co.,Ltd.
Kind of Equipment : Electronic Pen
Model No. : K-W019-004
Serial No. :
Power : DC2.4V
Mode : Transmitting
Remarks : CH No.3
Date : 7/31/2001
Test Distance : 3 m
Temperature : 30 ℃
Humidity : 40 %
Regulation : Fcc 15C §15.209(a)

Engineer : Masafumi Inui

No.	FREQ. [MHz]	ANT TYPE	READING HOR [dBμV]	READING VER [dBμV]	ANT FACTOR [dB/m]	AMP GAIN [dB]	CABLE LOSS [dB]	ATTEN. [dB]	RESULT HOR [dBμV/m]	RESULT VER [dBμV/m]	LIMITS [dBμV/m]	MARGIN HOR [dB]	MARGIN VER [dB]
1.	54.10	BB	30.4	34.4	9.7	29.8	1.6	5.8	17.7	21.7	40.0	22.3	18.3
2.	81.13	BB	34.5	31.2	6.5	29.8	2.0	5.9	19.1	15.8	40.0	20.9	24.2
3.	108.16	BB	27.8	29.4	11.4	29.7	2.3	5.9	17.7	19.3	43.5	25.8	24.2
4.	135.20	BB	25.7	24.8	13.9	29.7	2.6	5.8	18.3	17.4	43.5	25.2	26.1
5.	162.26	BB	24.0	23.6	15.0	29.7	2.8	5.9	18.0	17.6	43.5	25.5	25.9
6.	189.27	BB	24.7	23.5	16.1	29.6	3.1	5.9	20.2	19.0	43.5	23.3	24.5
7.	216.35	BB	39.6	32.4	16.6	29.7	3.3	5.8	35.6	28.4	46.0	10.4	17.6
8.	243.38	BB	44.9	34.5	16.8	29.7	3.6	5.8	41.4	31.0	46.0	4.6	15.0
9.	270.43	BB	40.5	29.9	17.8	29.7	3.8	5.8	38.2	27.6	46.0	7.8	18.4

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

All other spurious emissions are more than 20dB below the limits.
ANT.Type: 30-300MHz Biconical, 300-1000MHz Logperiodic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-20dB Bandwidth 15.231(c) / CH1 / Page A5
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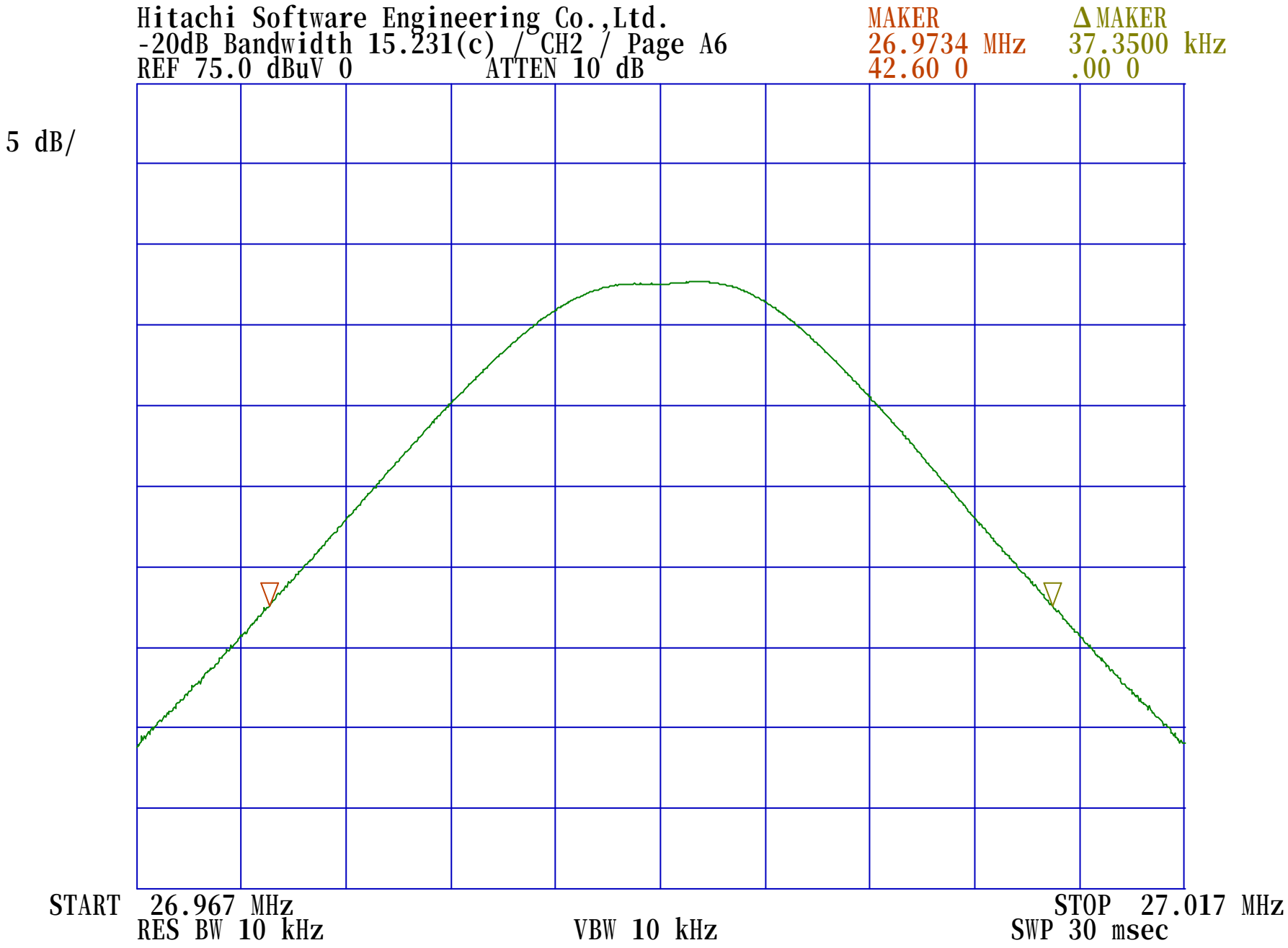
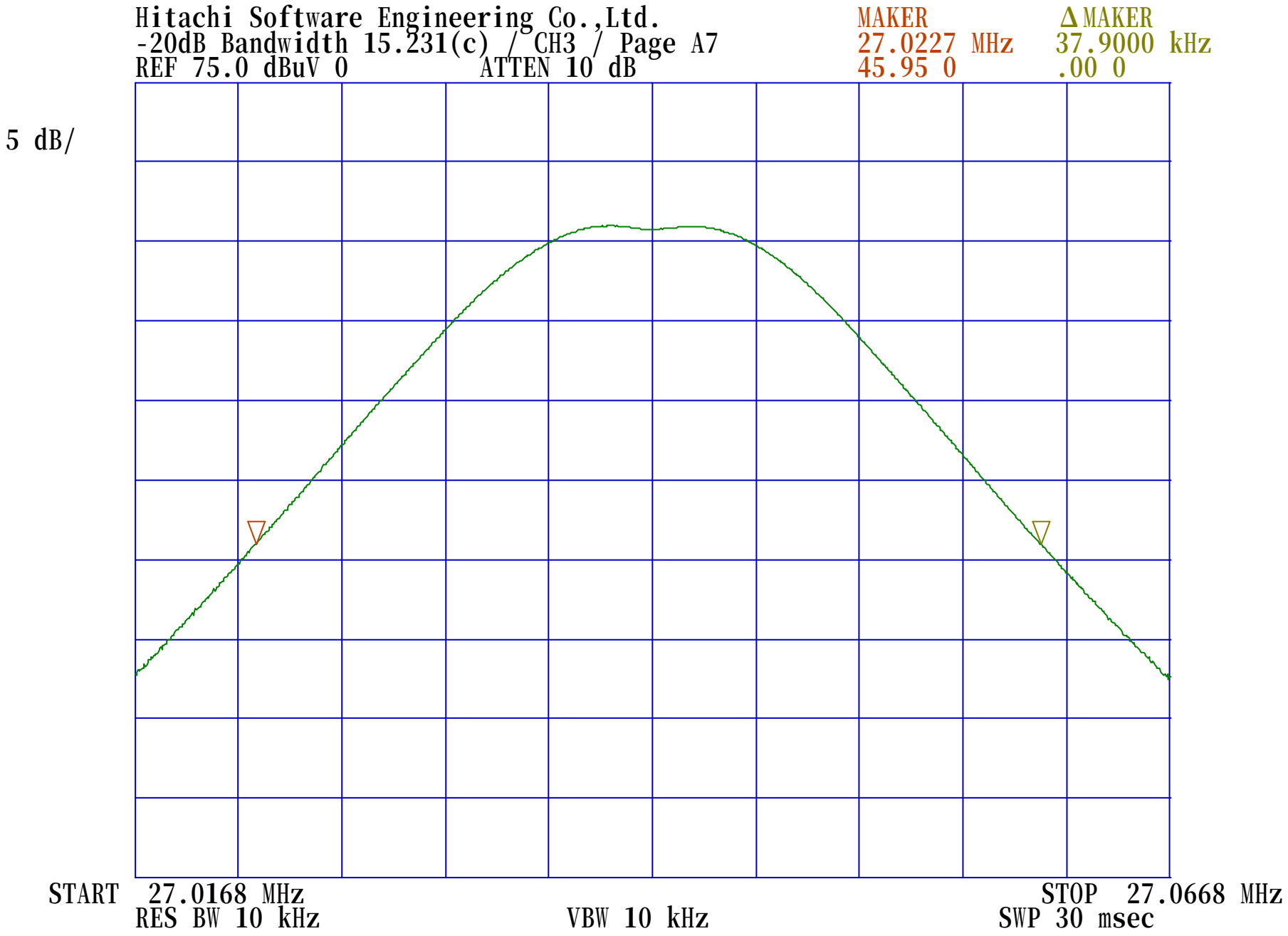
ATTEN 10 dB
MAKER
27.1776 MHz
46.76 dBuV
ΔMAKER
36.5500 kHz
.00 dBuV
5 dB/
START 27.1709 MHz
STOP 27.2209 MHz
RES BW 10 kHz
VBW 10 kHz
SWP 30 msec


Hitachi Software Engineering Co.,Ltd.
-20dB Bandwidth 15.231(c) / CH2 / Page A6
REF 75.0 dBuV 0
ATTEN 10 dB
MAKER
26.9734 MHz
42.60 0
ΔMAKER
37.3500 kHz
.00 0
5 dB/
START 26.967 MHz
RES BW 10 kHz
VBW 10 kHz
STOP 27.017 MHz
SWP 30 msec


Hitachi Software Engineering Co.,Ltd.
-20dB Bandwidth 15.231(c) / CH3 / Page A7
REF 75.0 dBuV 0
ATTEN 10 dB
MAKER
27.0227 MHz
45.95 0
ΔMAKER
37.9000 kHz
.00 0
5 dB/
START 27.0168 MHz
RES BW 10 kHz
VBW 10 kHz
STOP 27.0668 MHz
SWP 30 msec