EMISSION TEST REPORT

Test Report No. : 21AE0058-YW-1

Applicant: DENSO CORPORATION

Type of Equipment: Bar-code Handy Terminal

Model No.: BHT-7500S

Test standard: FCC Part 15 Subpart C
IC RSS-210 (Issue No. 3)
*IC RSS-210 (Issue No. 3) is based upon FCC Part 15.

Test Result: Complies

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

Date of test: August 23 and 25, 2000

Tested by: Naoki Sakamoto

Approved by: Kazutoyo. Nakanishi
Section Manager of EMC section

Issued date: September 12, 2000

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

APPLICANT	: DENSO CORPORATION
ADDRESS	: 1-1, Showa-cho, Kariya-city Aichi, 448-8661 Japan Tel: +81-566-25-5922 Fax: +81-566-25-4548
REGULATION(S)	: FCC Part 15 Subpart C.247 : IC RSS-210(Issue No.3)
MODEL NUMBER	: BHT-7500S
SERIAL NUMBER	: 000050
KIND OF EQUIPMENT	: Bar-code Handy Terminal
TESTED DATE	: August 23 and 25, 2000
RECEIPT DATE OF SAMPLE	: August 23, 2000
REPORT FILE NUMBER	: 21AE0058-YW-1
TEST SITE	: A-PEX Yokowa NO.3 Open Test Site

1.1 Tested Methodology

The measurement was performed according to the procedures in FCC/ANSI C63.4(1992).

1.2 Test Facility

The open area site measurement facility used to collect the radiated data is located on 108, Yokowa-cho, Ise-shi, Mie-ken, 516-1106 Japan.
This site has been fully described in a report dated August 1, 1997 submitted to FCC office, and listed dated September 16, 1997 (31040/SIT 1300F2) and accepted Feb. 19, 1998 (IC2973-3) by Industry Canada.

2 PRODUCT DESCRIPTION

DENSO CORPORATION, Model BHT-7500S (referred to as the EUT in this report) is a Bar-code Handy Terminal.

The specification is as following :

Operation Frequency	:	18.432MHz
Operation Voltage	:	DC 3.6V, 1200mAh (Battery)
Carrier Frequency	:	Low power frequency hopping spread spectrum(FHSS) 2402 through 2480MHz (79channels / each 1MHz wide) *Antenna gain : 0 44dBD (Integral Antenna)

3 SUPPORT EQUIPMT

Model	FCC ID	Description
(1) Proxim M/N: 7520 S/N: 752005-02600011	IMK-AP II 1121	Access Point
(2) Proxim M/N: 481210003CO S/N: 0002	-	AC Adapter for Access Point
(3) Denso Corporation M/N: CU-7001 C/N: 0000351	DOC	Communication Unit
(4) Denso Corporation M/N: 496460-0130 S/N: 49646013101	-	AC Adaptor for Communication Unit
(5) IBM M/N: 2626-5AJ S/N: AA-D13ZY 98/11	DOC	Personal Computer
(6) IBM M/N: - S/N: J14HC561292	-	AC Adapter for Personal Computer
(7) Hewlett Packard M/N: 895Cxi S/N: SG8AR231X4	DOC	Printer
(8) Hewlett Packard M/N: C4557-60004 S/N: -	-	AC Adaptor for Printer
(9) EPSON M/N: C202A S/N:010309	BKM552C202A	Modem
(10) EPSON M/N: H00CAA S/N: 022754	-	AC Adaptor for Modem
(11) Microsoft M/N: 90741 S/N:01158817	C3KKMP3	Mouse

4 SYSTEM TEST CONFIGURATION

4.1 Justification

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

Operation mode : Running
*BHT-7500S(EUT) transmits the data of bar-code to 7520(Access Point).

4.2 Test Procedure

4.2.1 Tabletop Equipment Conducted Emissions

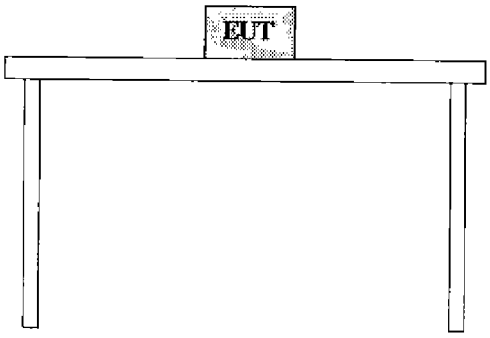
EUT was placed on a platform of nominal size, 1m by 1.5m, raised 80cm above the conducting ground plane.
The rear of tabletop was located 40cm to the vertical conducting plane.
The rear of EUT, including peripherals aligned and flush with rear of tabletop.
All other surfaces of tabletop was at least 80cm from any other grounded conducting surface.
I/O cables and AC cables that were connected to the peripherals were bundled in center.
They were folded back and forth forming a bundle 30cm to 40cm long and were hanged at a 40cm height to the gournd plane.
Each EUT current-carrying power lead, except the ground (safety) lead, were individually connected through a LISN to the input power source.
All unused 50 Ω connectors of the LISN were resitively terminated in 50 Ω when not connected to the measuring equipment.

4.2.2 Tabletop Equipment Radiated Emissions

EUT was placed on a platform of nominal size, 1m by 1.5m, raised 80cm above the conducting ground plane.
The rear of EUT, including peripherals was aligned and flush with rear of tabletop.
I/O cables that were connected to the peripherals were bundled in center.
They were folded back and forth forming a bundle 30cm to 40cm long and were hanged 40cm height to the 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.
The measurement distance was 3m.

Figure 4.1 Configuration of Tested System (Maximum peak output power)

Front View



Top View

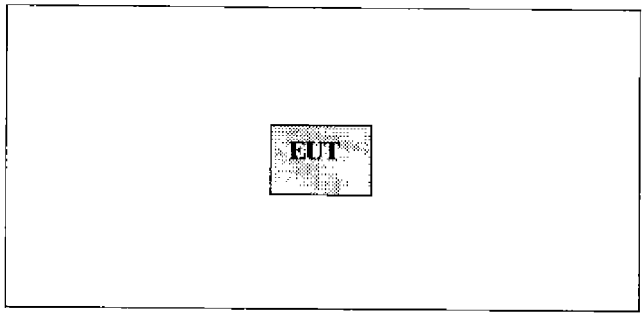
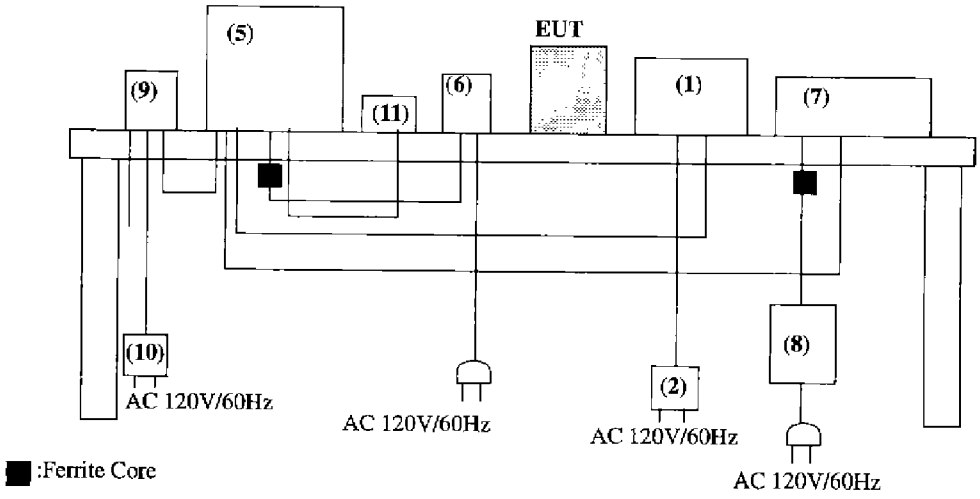


Figure 4.2 Configuration of Tested System (Radiated emission)

Front View



Top View

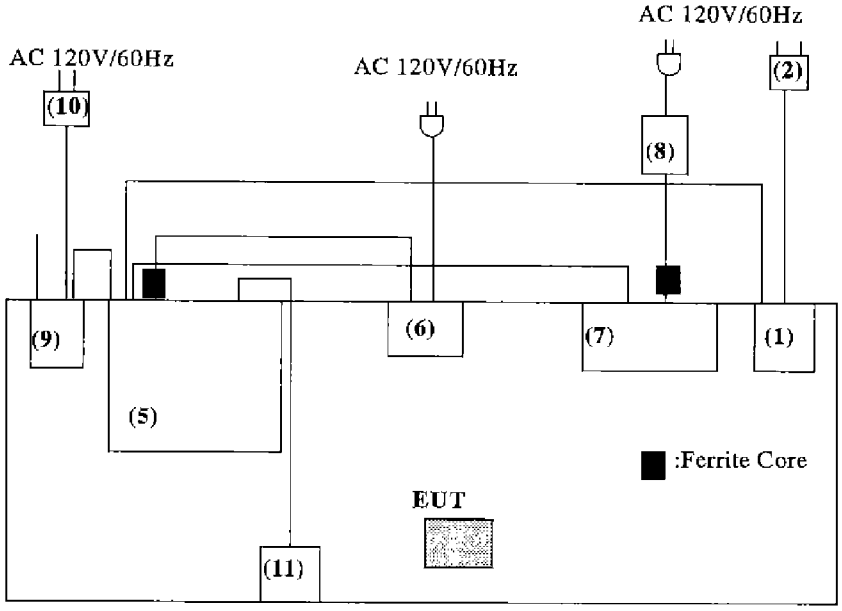


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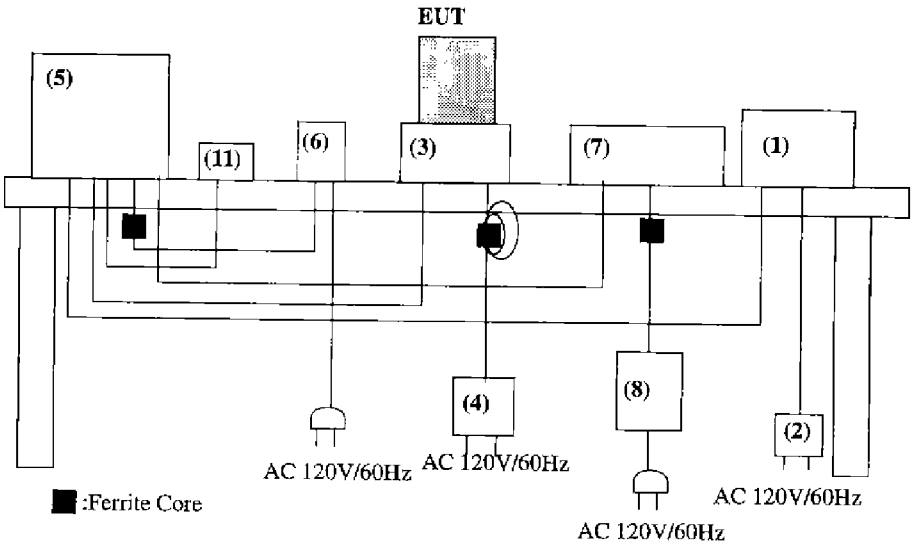
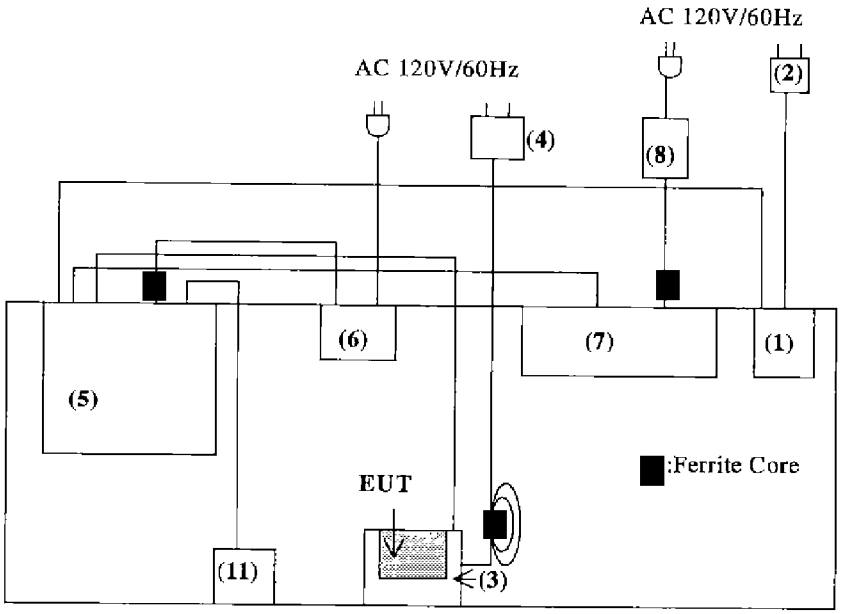
Figure 4.3 Configuration of Tested System (Conducted emission)

Front View



Top View



5 Measurement Uncertainty

Conducted Emission Test

The measurement uncertainty (with a 95% confidence level) for this test was ±2 0dB.

Radiated Emission Test

The measurement uncertainty (with a 95% confidence level) for this test was ±3.3dB.

6 SUMMARY OF TEST

Low power frequency hopping spread spectrum (FHSS) radio system operating in the 2400-2483.5MHz bands.

6.1 15.247(a)(1) FREQUENCY HOPPING SYSTEMS

BHT-7500S uses 79 channels, each 1MHz wide. The system hops over one of 15 pseudorandom sequneces. On average,each channel is used equally.

6.1.1 15.247(a)(1)(ii) CHANNEL UTILIZATION

The total number of channels is 79 . Appendix A1

20dB band width
①2402MHz(Low) : Appendix A2,3(999kHz)
②2441MHz(Mid) : Appendix A4,5(960kHz)
③2480MHz(High) : Appendix A6,7(950kHz)

Dwell time shows worst case transmission time in a given slot : 18msec. Elapsed time < 100% duty
Maximum allowed 400msec. : Appendix A8

Summary of the test result : Pass

6.1.2 15.247(b) MAXIMUM PEAK OUT PUT POWER

Maximum peak output power limit 1W(30dBm)
①2402MHz(Low) : Appendix A9,10,11 (VER : 15.6dBm)
②2441MHz(Mid) : Appendix A9,12,13 (VER : 17.1dBm)
③2480MHz(High) : Appendix A9,14,15 (VER : 15.9dBm)

Summary of the test result : Pass

6.1.3 15.247(C) OUT OF BAND EMISSIONS and RESTRICTED BAND RADIATION

In any 100kHz bandwidth outside the frequency band in which the spread apectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator confimed 20dB below that in the 100kHz bandwidth within the band that contains the highest level of the desired power,based on a radiated measurment. The result was also satisfied the general limits specified in Sec.15.209(a).

①30MHz to 1000MHz (QP DETECT) : Appendix A16
②1GHz to 26GHz (PK and AV DETECT) : Appendix A17,18

Summary of the test result : Pass

6.1.4 15.207 CONDUCTED EMISSIONS

Conducted emissinons 450kHz to 30MHz (QP DETECT) : Appendix A19,20

Summary of the test result : Pass

7 TEST EQUIPMENT USED

NAME	MANUFACTURER	MODEL	Control No.	Calibrated Until
Pre Amplifier	Hewlett Packard	8447D	AF-01	November 16, 2000
Pre Amplifier	Hewlett Packard	8449B	AF-04	November 16, 2000
Biconical Antenna	Schwarzbeck	BBA9106	BA-03	April 29, 2001
Logperiodic Antenna	Schwarzbeck	UHALP9108-A	LA-06	April 29, 2001
Horn Antenna	AH System, Inc	SAS-200/571	HA-01	February 4 , 2001
Horn Antenna	AH System, Inc	SAS-200/571	HA-02	February 4 , 2001
Horn Antenna	EMCO	3160-09	APANT14	February 4 , 2001
Spectrum Analyzer	Hewlett packard	8560A	SA-02	November 21, 2000
Spectrum Analyzer	Hewlett packard	8567A	SA-04	December 13, 2000
Spectrum Analyzer	Advantest	R3271	SA-05	September 27, 2000
Test Receiver	Rohde & Schwarz	ESVS-30	TR-02	July 13, 2001
Test Receiver	Rohde & Schwarz	ESHS-20	TR-01	March 30, 2001
LISN	Rohde & Schwarz	ESH3-Z5	LS-02	November 15, 2000
LISN	Schwarzbeck	NSLK8127	LS-03	November 15, 2000
Signal Generator	Wiltron	68247B	APSSG03	August 09, 2001

indicates EMI Test Equipment used.

All measurement equipment is traceable to national standard

APPENDIX

Test Data

Measurement Photos

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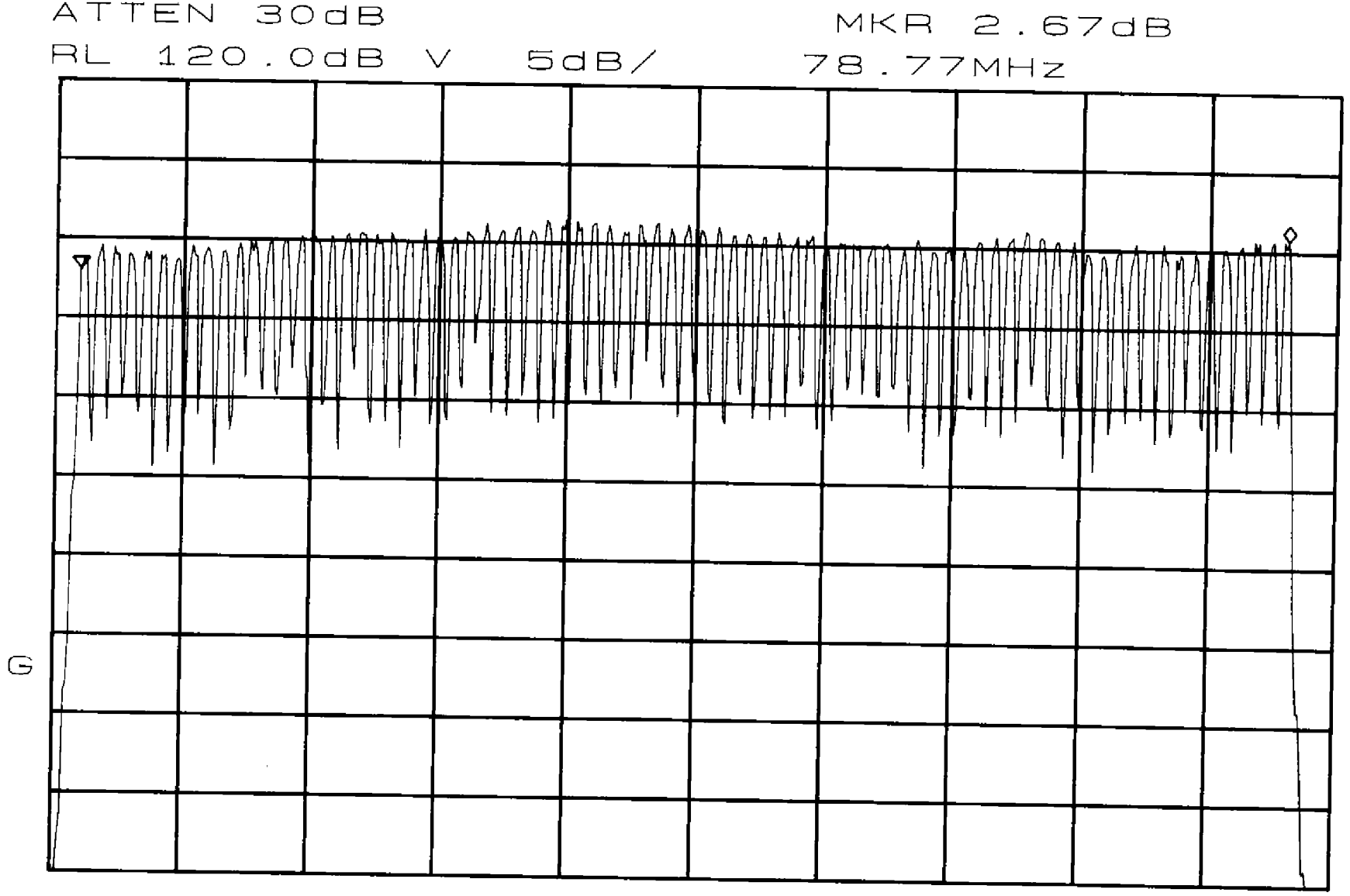
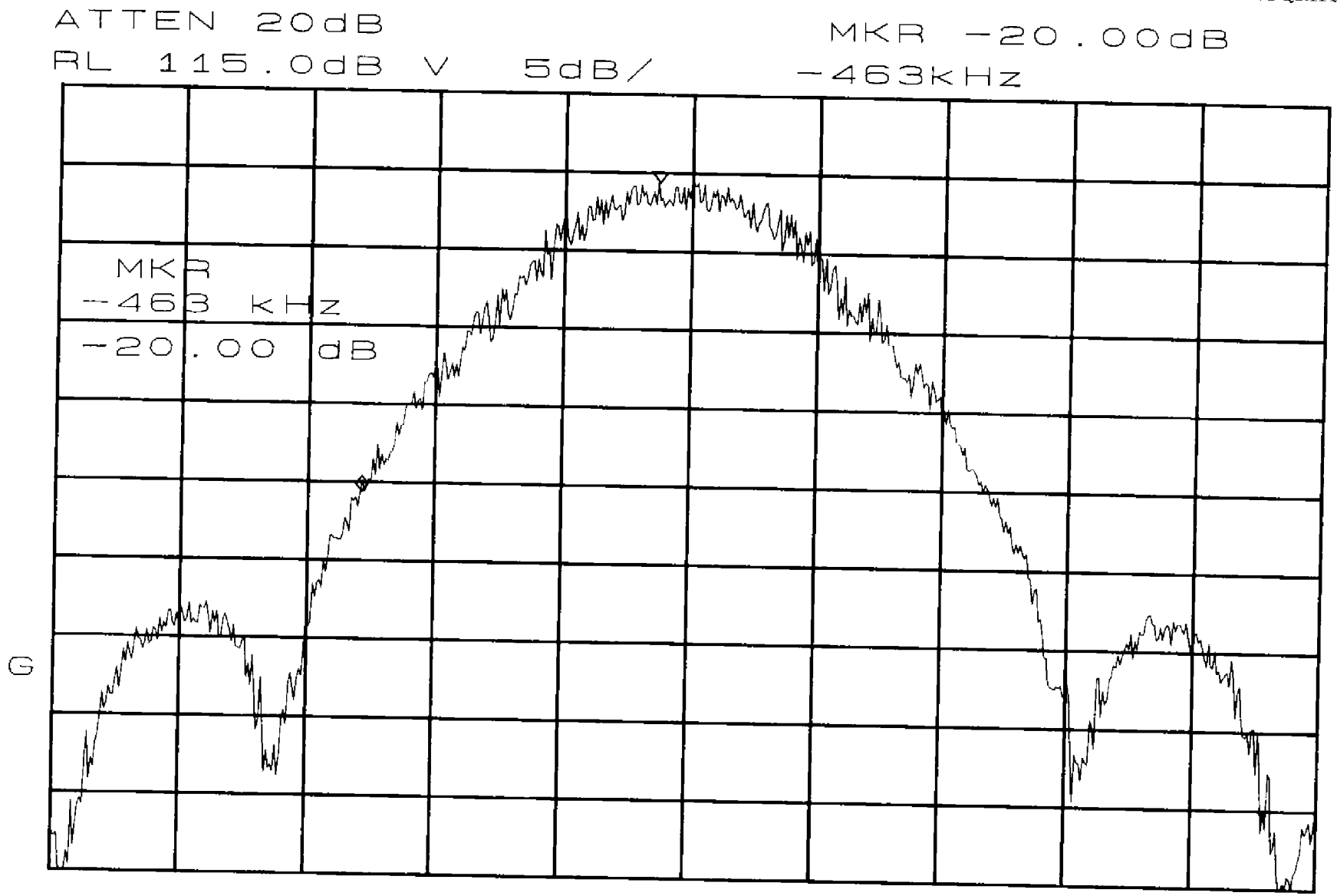


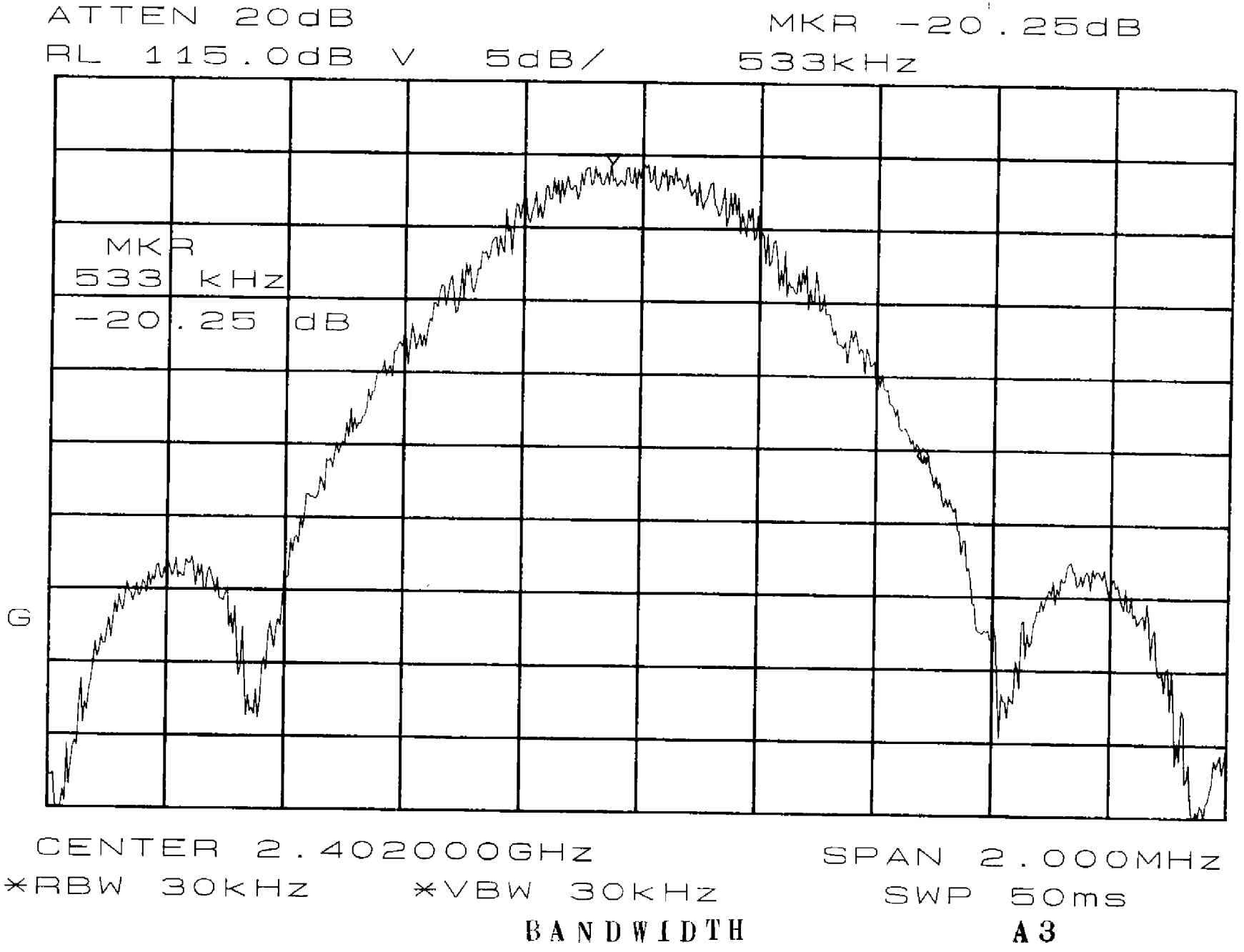
CHANNEL UTILIZATION

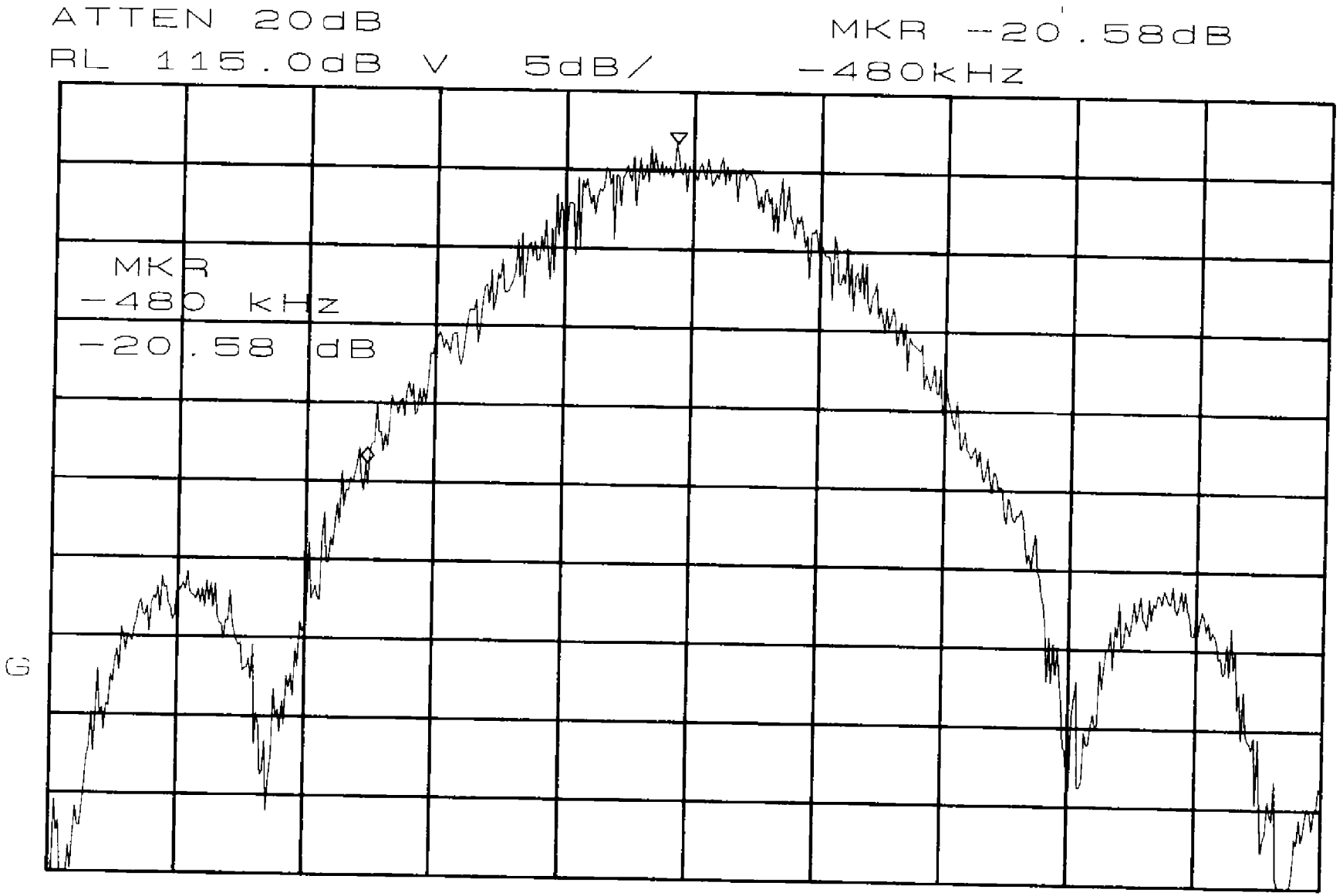
A1



BANDWIDTH

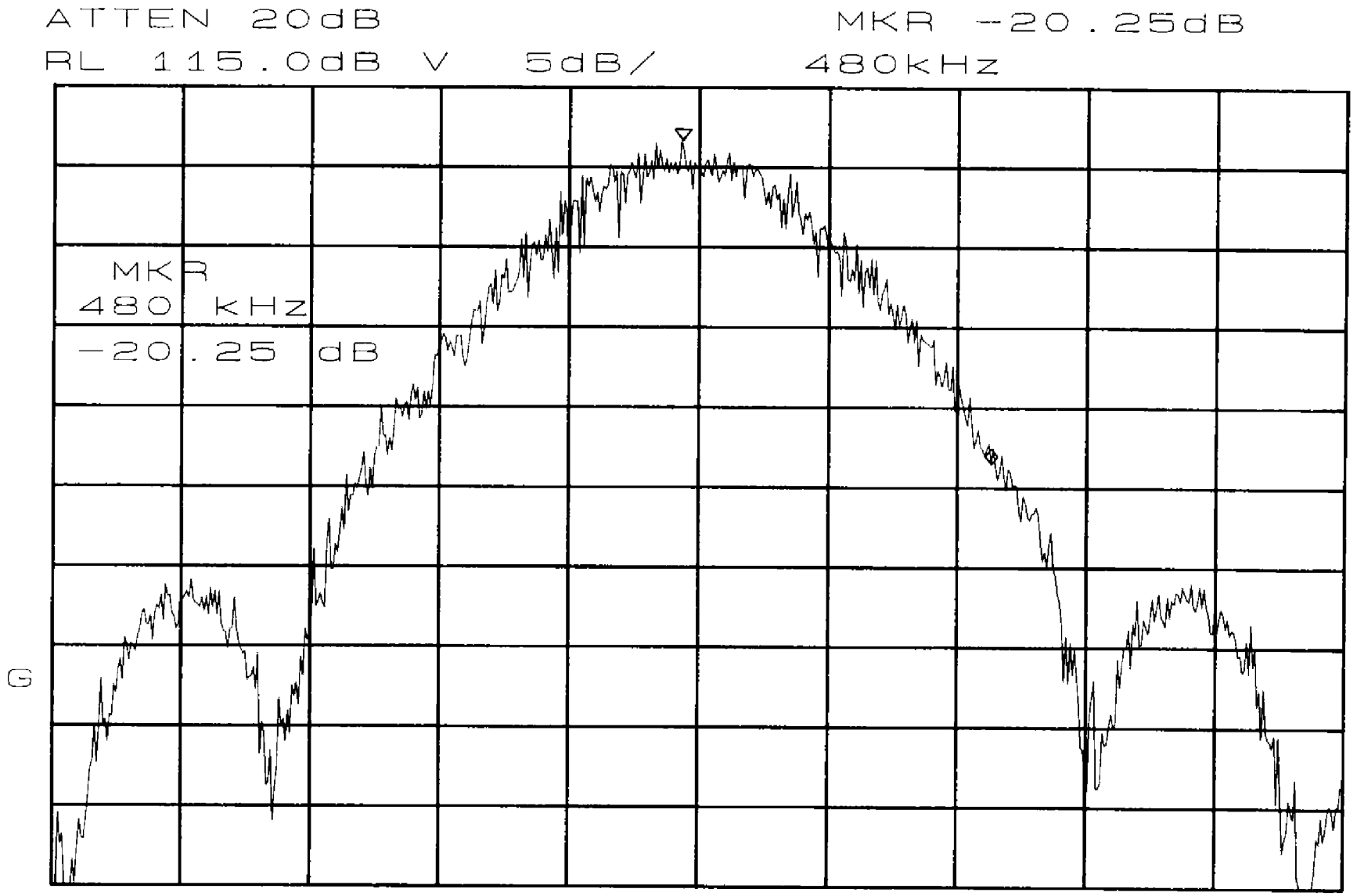
A2


ATTEN 20dB
MKR -20.25dB
RL 115.0dB V 5dB/
533kHz
MKR
533 kHz
-20.25 dB
G
CENTER 2.402000GHz
SPAN 2.000MHz
*RBW 30kHz
*VBW 30kHz
SWP 50ms
BANDWIDTH
A3



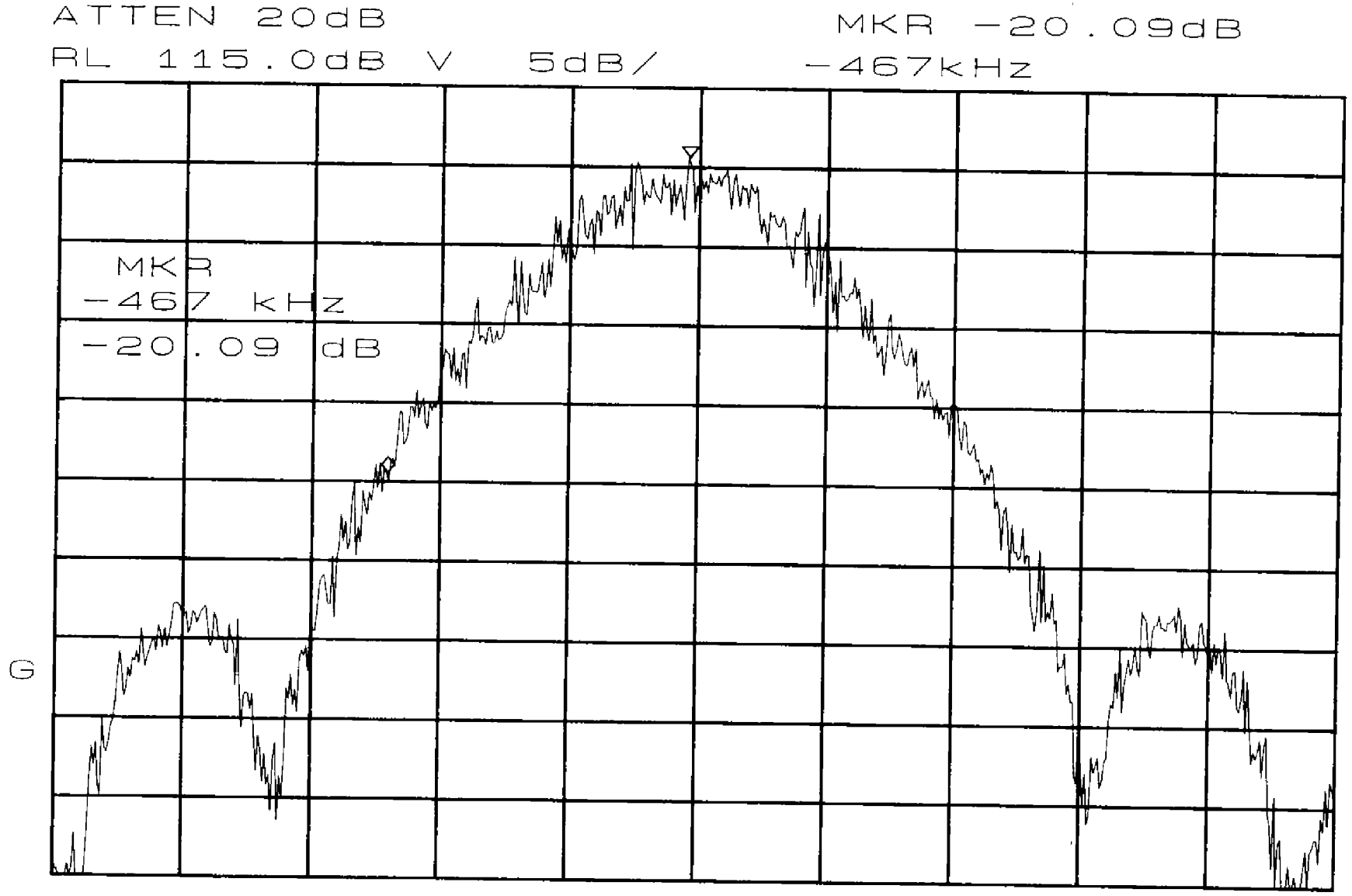
BANDWIDTH

A4



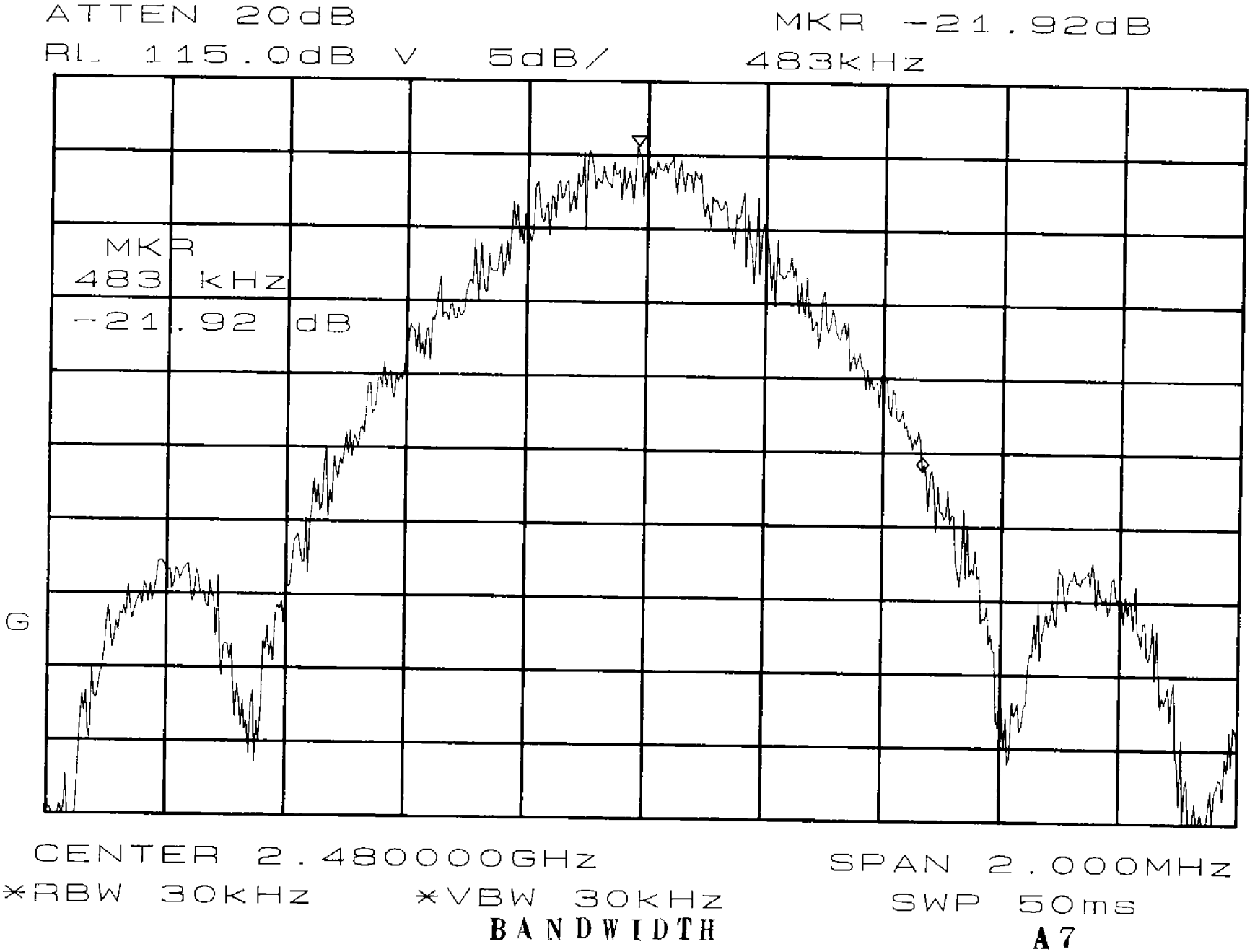
BANDWIDTH

A5

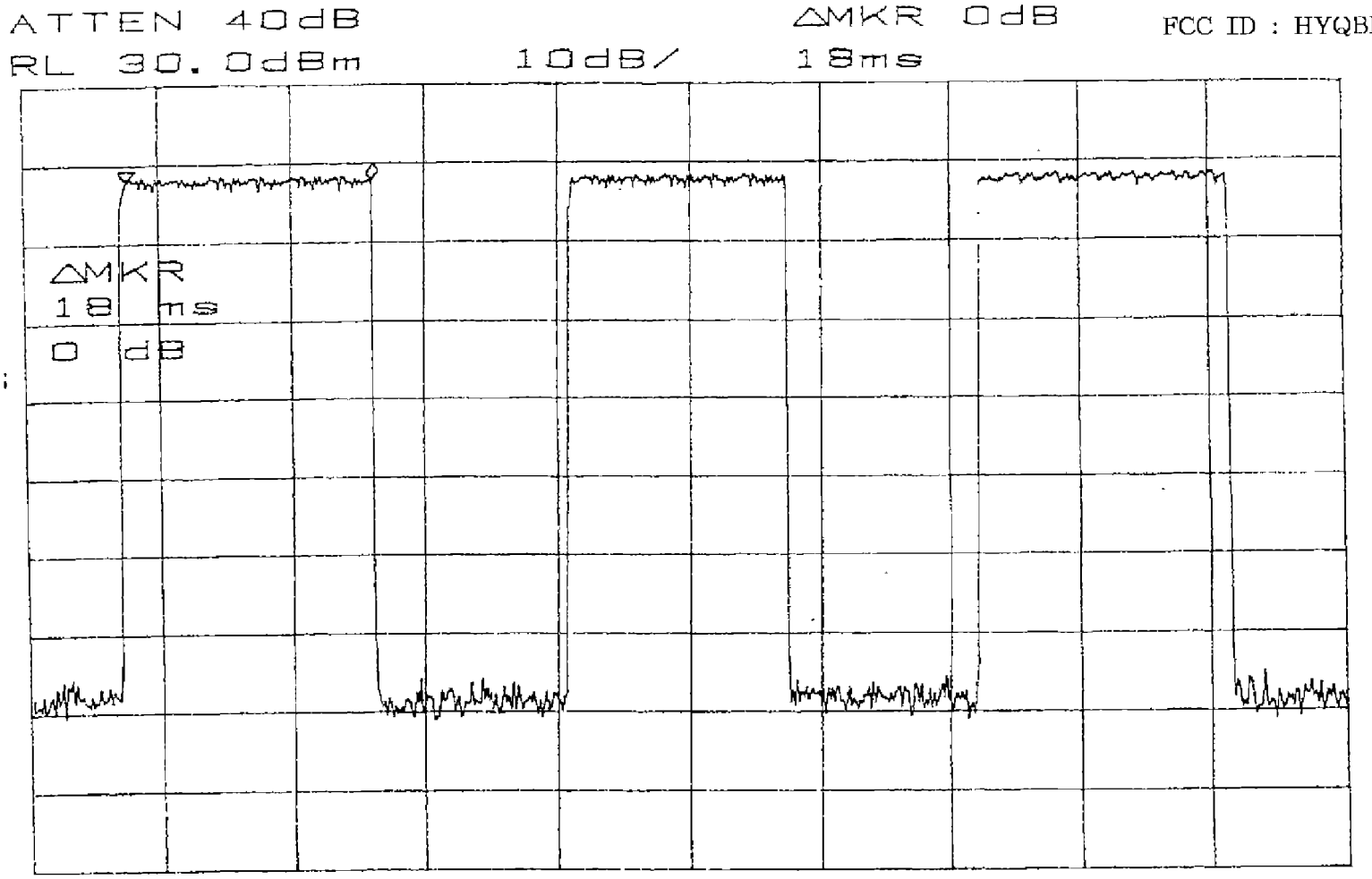


BANDWIDTH

A6


ATTEN 20dB
MKR -21.92dB
RL 115.0dB V 5dB/
483kHz
MKR
483 kHz
-21.92 dB
G
CENTER 2.480000GHz
SPAN 2.000MHz
*RBW 30kHz
*VBW 30kHz
SWP 50ms

BANDWIDTH


ATTEN 40dB
RL 30.0dBm
10dB/
ΔMKR 0dB
18ms
ΔMKR
18 ms
0 dB
CENTER 2.402000000GHz
SPAN 0Hz
←RBW 100kHz
VBW 100kHz
*SWP 100ms

DWELL TIME

MAXIMUM PEAK OUT PUT POWER

A-PEX INTERNATIONAL CO., LTD.
YOKOWA NO.3 OPEN SITE

COMPANY : DENSO CORPORATION
TRADE NAME : DENSO
EQUIPMENT : BAR-CODE HANDY TERMINAL
MODEL : BHT-7500S
POWER : DC3.6V
Mode : Ch1(2402MHz)/Ch40(2441MHz)/Ch79(2480MHz)
Remarks : PK Detect
DATE : 2000/ 8/25

REPORT NO : 21AE0058-YW-1
REGULATION : FCC15.247(b)
TEST DISTANCE : 3m
ATTENUATOR : NONE
FCC ID : HYQBHT-7500S

ENGINEER : Naoki.Sakamoto

Ch No.	FREQ [GHz]	S/A READING(PK) HOR [dBμV]	S/A READING(PK) VER [dBμV]	S/G Output HOR [dBm]	S/G Output VER [dBm]	ANT Gain [dB]	Cable Loss [dB]	RESULT HOR [dBm]	RESULT VER [dBm]	LIMIT [dBm]	MARGIN HOR [dB]	MARGIN VER [dB]
1	2.402	111.3	112.5	9.7	10.7	8.9	4.0	14.6	15.6	30.0	15.4	14.4
40	2.441	113.7	114.0	11.8	12.1	9.0	4.0	16.8	17.1	30.0	13.2	12.9
79	2.4796	112.0	112.8	10.2	10.9	9.1	4.1	15.2	15.9	30.0	14.8	14.1

SAMPLE CALCLATION :
RESULT= S/G Output + ANT Gain - Cable Loss

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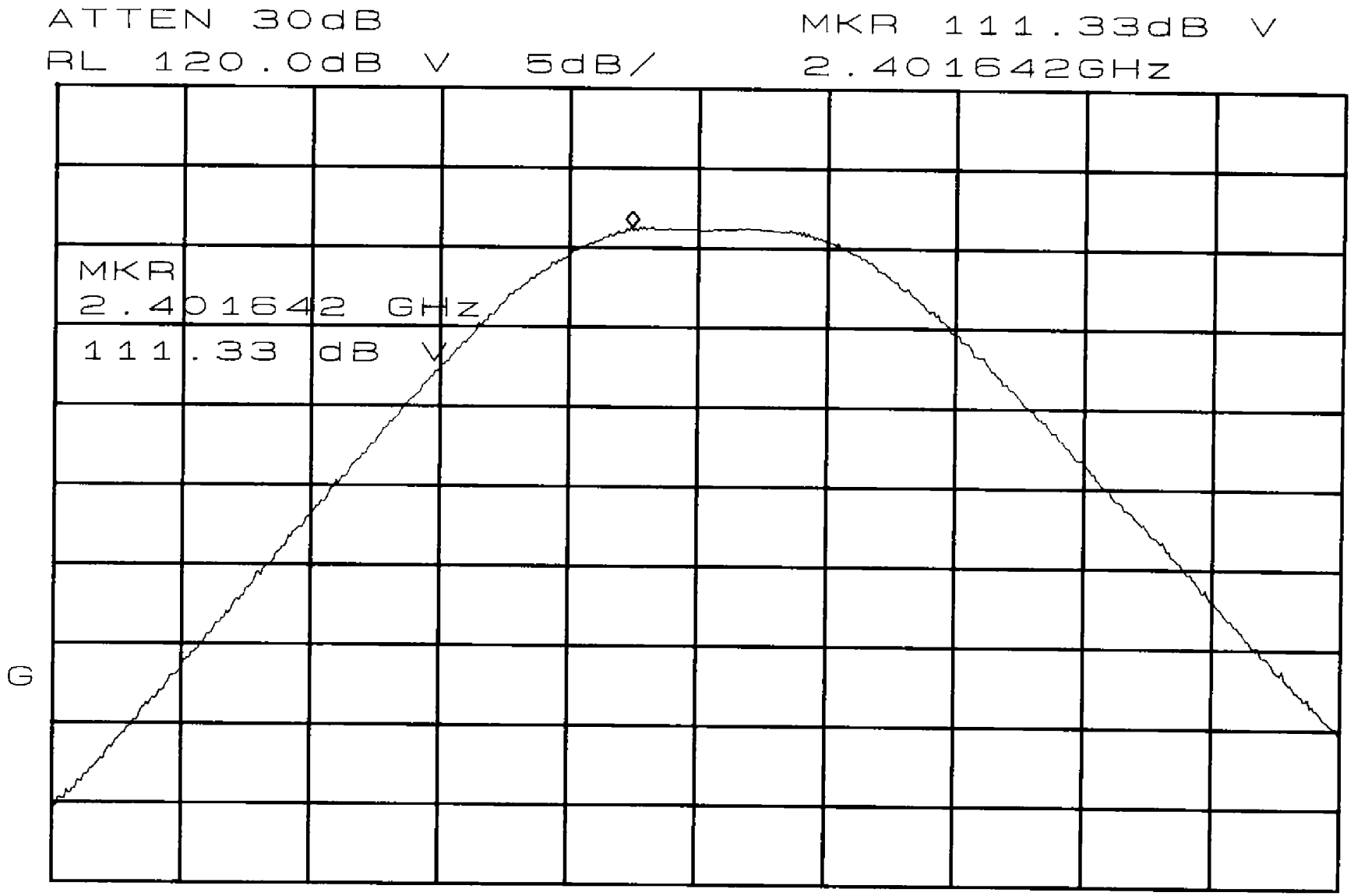
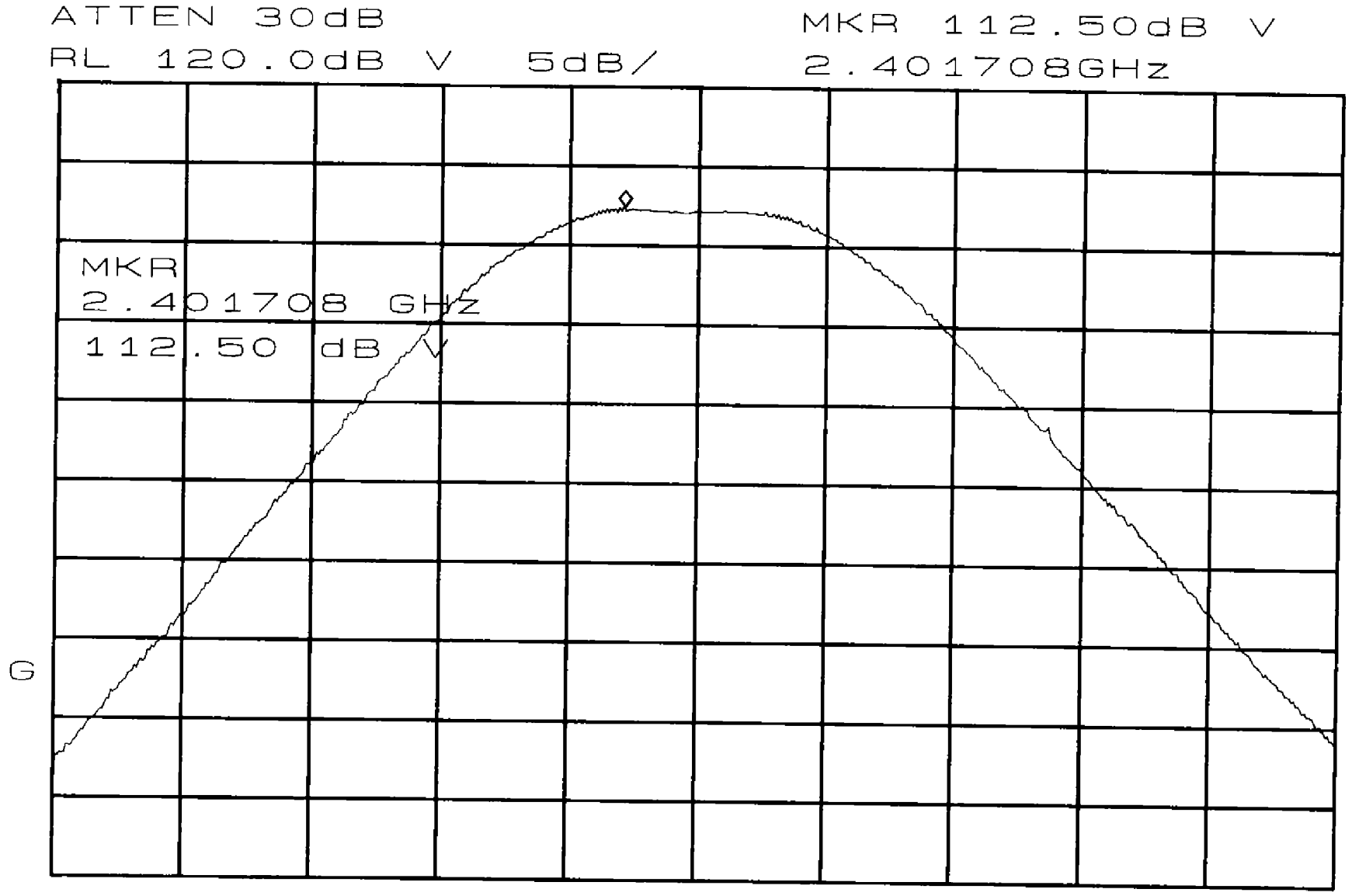
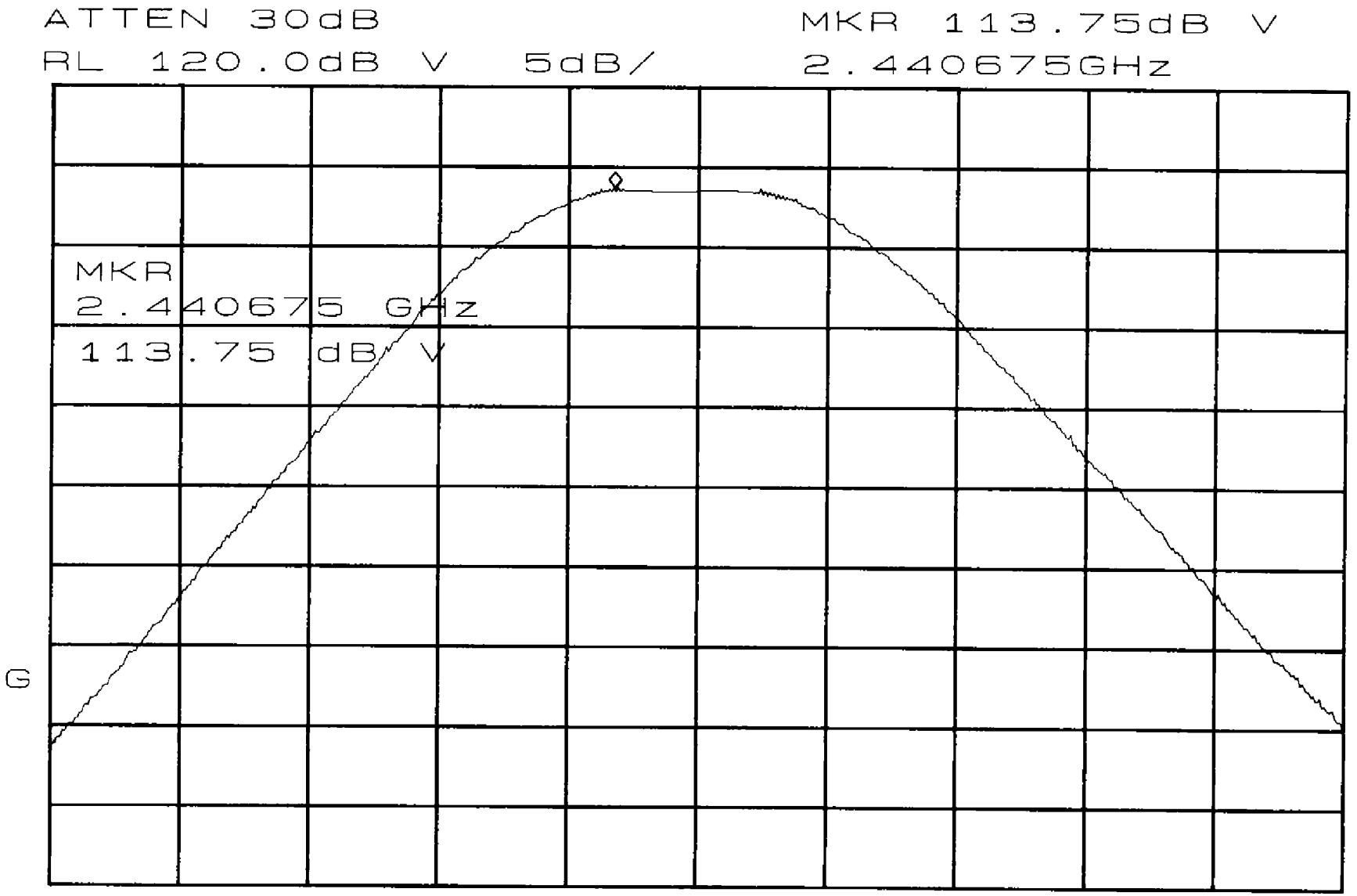


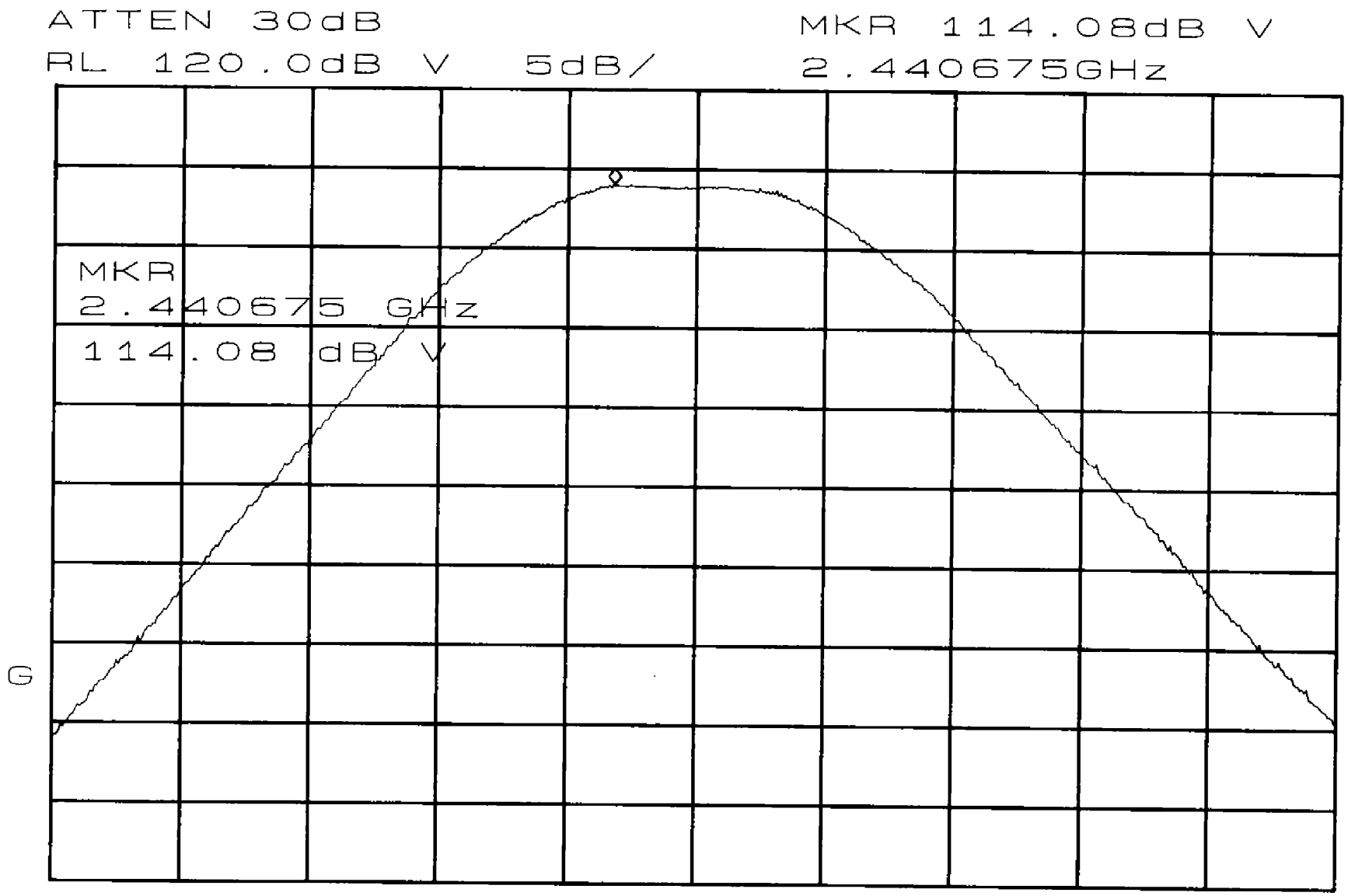
OUTPUT POWER(HOR)



OUTPUT POWER(VER)

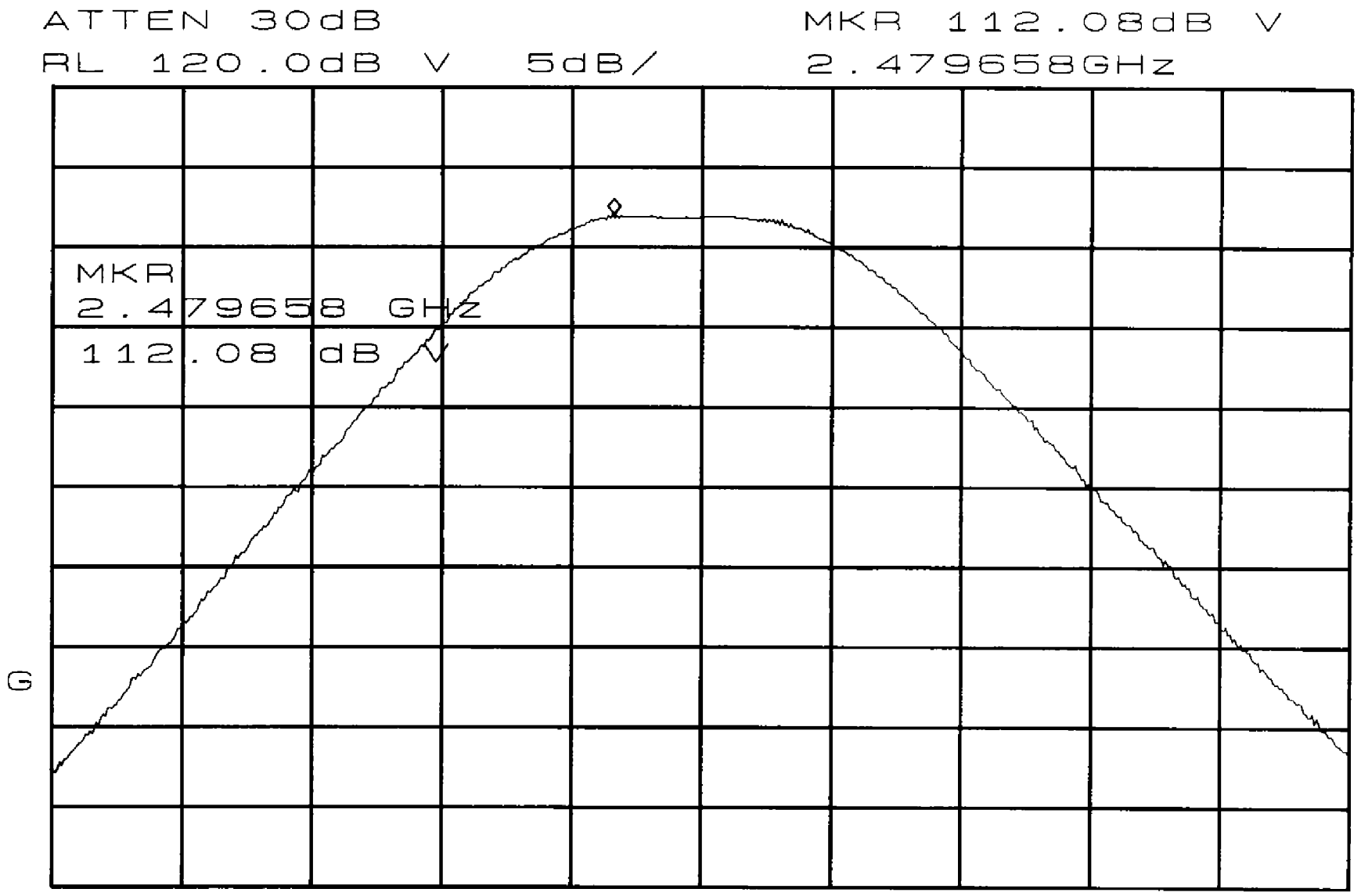


OUTPUT POWER(HOR)

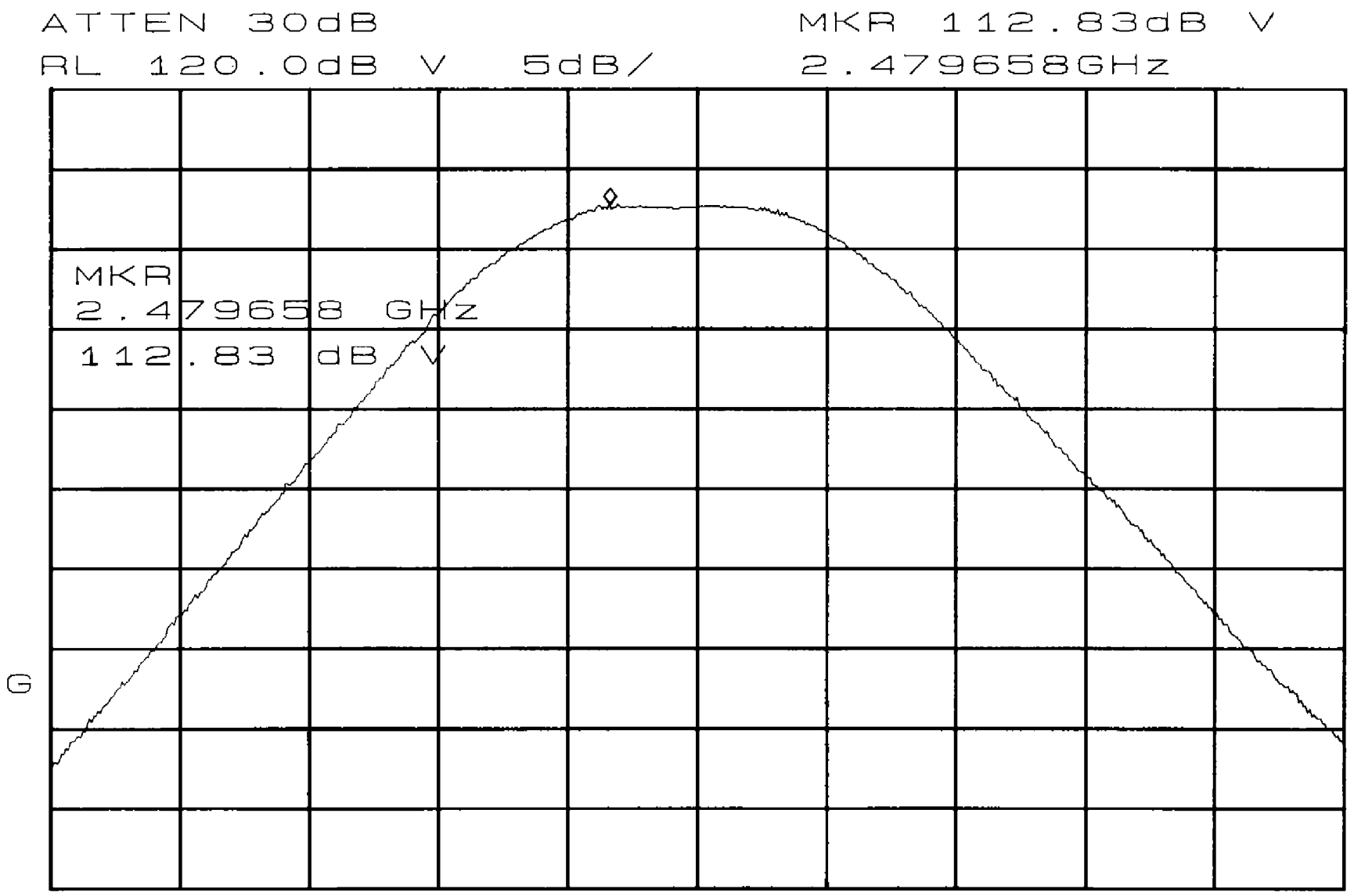


OUTPUT POWER(VER)

A 13



OUTPUT POWER(HOR)



OUTPUT POWER(VER)

DATA OF RADIATION TEST

A-PEX INTERNATIONAL CO., LTD.
YOKOWA No.3 OPEN TEST SITE
Report No. : 21AE0058YW-1
FCC ID : HYQBHT-7500S

Applicant : DENSO CORPORATION
Kind of Equipment : BAR-CODE HANDY TERMINAL
Model No. : BHT-7500S
Serial No. :
Power : DC3.6V
Mode : RUNNING
Remarks :
Date : 8/23/2000
Test Distance : 3 m
Temperature : 28 ℃
Humidity : 55 %
Regulation : FCC Part15B CLASS B

Engineer : Naoki Sakamoto

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.	36.88	BB	25.1	25.4	16.0	28.3	1.8	5.9	20.5	20.8	40.0	19.5	19.2
2.	55.30	BB	27.7	28.7	9.5	28.2	2.1	6.0	17.1	18.1	40.0	22.9	21.9
3.	73.73	BB	32.0	31.4	6.6	27.7	2.6	5.9	19.4	18.8	40.0	20.6	21.2
4.	92.15	BB	27.2	29.8	8.6	27.7	2.9	5.9	16.9	19.5	43.5	26.6	24.0
5.	147.49	BB	27.0	26.3	14.8	27.6	3.7	5.9	23.8	23.1	43.5	19.7	20.4
6.	184.36	BB	28.0	27.9	16.1	27.7	4.3	6.0	26.7	26.6	43.5	16.8	16.9
7.	202.79	BB	27.0	26.6	16.5	27.8	4.4	5.9	26.0	25.6	43.5	17.5	17.9
8.	350.27	BB	35.2	30.6	15.0	27.5	6.1	6.0	34.8	30.2	46.0	11.2	15.8
9.	645.22	BB	33.0	30.8	19.2	26.9	8.8	6.1	40.2	38.0	46.0	5.8	8.0
10.	682.09	BB	32.6	29.7	20.1	27.0	9.0	6.1	40.8	37.9	46.0	5.2	8.1
11.	755.84	BB	33.4	28.1	20.5	26.8	9.6	5.8	42.5	37.2	46.0	3.5	8.8
12.	774.27	BB	32.5	26.8	20.5	26.6	9.7	5.8	41.9	36.2	46.0	4.1	9.8
13.	792.27	BB	32.1	27.0	20.5	26.5	9.8	5.7	41.6	36.5	46.0	4.4	9.5
14.	811.14	BB	31.4	25.2	20.7	26.5	9.9	5.7	41.2	35.0	46.0	4.8	11.0
15.	829.55	BB	30.4	25.0	21.0	26.7	10.1	5.7	40.5	35.1	46.0	5.5	10.9

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

Except for the above table: adequate margin data below the limits.

Sheet1

DATA OF RADIATION TEST

A-PEX INTERNATIONAL CO., LTD.
YOKOWA NO.3 OPEN SITE

COMPANY : DENSO CORPORATION
TRADE NAME : DENSO
EQUIPMENT : BAR-CODE HANDY TERMINAL
MODEL : BHT-7500S
POWER : DC3.6V
Mode : Ch1(2402MHz)/Ch40(2441MHz)/Ch79(2480MHz)
Remarks : PK Detect
DATE : 2000/ 8/25

REPORT NO : 21AE0058-YW-1
REGULATION : FCC15.209(Upper 1GHz)
TEST DISTANCE : 3m
ATTENUATOR : NONE

ENGINEER : Naoki.Sakamoto

Ch No.	FREQ	S/A READING(PK)		ANT	CABLE	AMP	RESULT		LIMIT	MARGIN	
		HOR	VER	Factor	LOSS	Gain	HOR	VER	(PK)	HOR	VER
	[GHz]	[dBμV]	[dBμV]	[dB]	[dB]	[dB]	[dBμV]	[dBμV]	[dBμV]	[dB]	[dB]
1	4.804	56.4	57.0	33.4	6.8	33.8	62.8	63.4	74.0	11.2	10.6
1	7.206	54.1	56.3	36.4	8.8	34.7	64.6	66.8	74.0	9.4	7.2
40	4.882	57.0	57.7	33.8	6.8	33.8	63.8	64.5	74.0	10.2	9.5
40	7.323	55.9	56.2	36.3	8.8	34.6	66.4	66.7	74.0	7.6	7.3
79	4.960	57.1	57.5	34.1	6.9	33.8	64.3	64.7	74.0	9.7	9.3
79	7.440	56.4	57.0	36.2	8.9	34.6	66.9	67.5	74.0	7.1	6.5

SAMPLE CALCLATION :
RESULT= S/A READING + ANT Factor + Cable Loss - AMP Gain
*Except for the above table : adequate margin data below the limits.

DATA OF RADIATION TEST

A-PEX INTERNATIONAL CO., LTD.
YOKOWA NO.3 OPEN SITE

COMPANY : DENSO CORPORATION
TRADE NAME : DENSO
EQUIPMENT : BAR-CODE HANDY TERMINAL
MODEL : BHT-7500S
POWER : DC3.6V
Mode : Ch1(2402MHz)/Ch40(2441MHz)/Ch79(2480MHz)
Remarks : AV Detect
DATE : 2000/ 8/25

REPORT NO : 21AE0058-YW-1
REGULATION : FCC15.209(Upper 1GHz)
TEST DISTANCE : 3m
ATTENUATOR : NONE

ENGINEER : Naoki.Sakamoto

Ch No.	FREQ	S/A READING(AV)		ANT	CABLE	AMP	RESULT		LIMIT	MARGIN	
		HOR	VER	Factor	LOSS	Gain	HOR	VER	(AV)	HOR	VER
	[GHz]	[dBμV]	[dBμV]	[dB]	[dB]	[dB]	[dBμV]	[dBμV]	[dBμV]	[dB]	[dB]
1	4.804	43.2	44.0	33.4	6.8	33.8	49.6	50.4	54.0	4.4	3.6
1	7.206	40.0	39.7	36.4	8.8	34.7	50.5	50.2	54.0	3.5	3.8
40	4.882	43.6	43.8	33.8	6.8	33.8	50.4	50.6	54.0	3.6	3.4
40	7.323	39.1	39.4	36.3	8.8	34.6	49.6	49.9	54.0	4.4	4.1
79	4.960	43.8	44.1	34.1	6.9	33.8	51	51.3	54.0	3.0	2.7
79	7.440	39.8	39.5	36.2	8.9	34.6	50.3	50	54.0	3.7	4.0

SAMPLE CALCLATION :
RESULT= S/A READING + ANT Factor + Cable Loss - AMP Gain
*Except for the above table : adequate margin data below the limits.

DATA OF CONDUCTION TEST

A-PEX INTERNATIONAL CO., LTD.
YOKOWA No.3 OPEN TEST SITE
Report No. : 21AE0058YW-1

Applicant	:	DENSO CORPORATION
Kind of Equipment	:	BAR-CODE HANDY TERMINAL
Model No.	:	BHT-7500S
Serial No.	:	
Power	:	DC3.6V(AC Adaptor : AC120V/60Hz)
Mode	:	RUNNING(CHARGING)
Remarks	:	FCC ID : HYQBHT-7500S
Date	:	8/23/2000
Phase	:	Single Phase
Temperature	:	28 ℃
Humidity	:	49 %
Regulation	:	FCC Part15B CLASS B

Engineer : Naoki Sakamoto

No.	FREQ. [MHz]	READING(N) QP [dBuV]	READING(N) AV [dBuV]	READING(L1) QP [dBuV]	READING(L1) AV [dBuV]	LISN FACTOR [dBuV]	CABLE LOSS [dBuV]	ATTEN. [dBuV]	RESULT QP [dBuV]	RESULT AV [dBuV]	LIMITS QP [dBuV]	LIMITS AV [dBuV]	MARGIN QP [dBuV]	MARGIN AV [dBuV]
1.	0.4967	36.5	-	37.7	-	0.1	0.1	0.0	37.9	-	48.0	0.0	10.1	-
2.	0.9947	35.1	-	36.7	-	0.2	0.1	0.0	37.0	-	48.0	0.0	11.0	-
3.	1.0663	34.2	-	35.8	-	0.2	0.2	0.0	36.2	-	48.0	0.0	11.8	-
4.	1.0672	34.3	-	35.7	-	0.2	0.2	0.0	36.1	-	48.0	0.0	11.9	-
5.	2.2745	33.5	-	34.9	-	0.2	0.2	0.0	35.3	-	48.0	0.0	12.7	-
6.	6.3288	30.0	-	32.1	-	0.3	0.3	0.0	32.7	-	48.0	0.0	15.3	-
7.	11.8757	31.3	-	32.5	-	0.5	0.4	0.0	33.4	-	48.0	0.0	14.6	-
8.	19.3424	22.8	-	23.0	-	0.6	0.4	0.0	24.0	-	48.0	0.0	24.0	-

CALCULATION: READING + LISN FACTOR + CABLE LOSS + ATTEN.

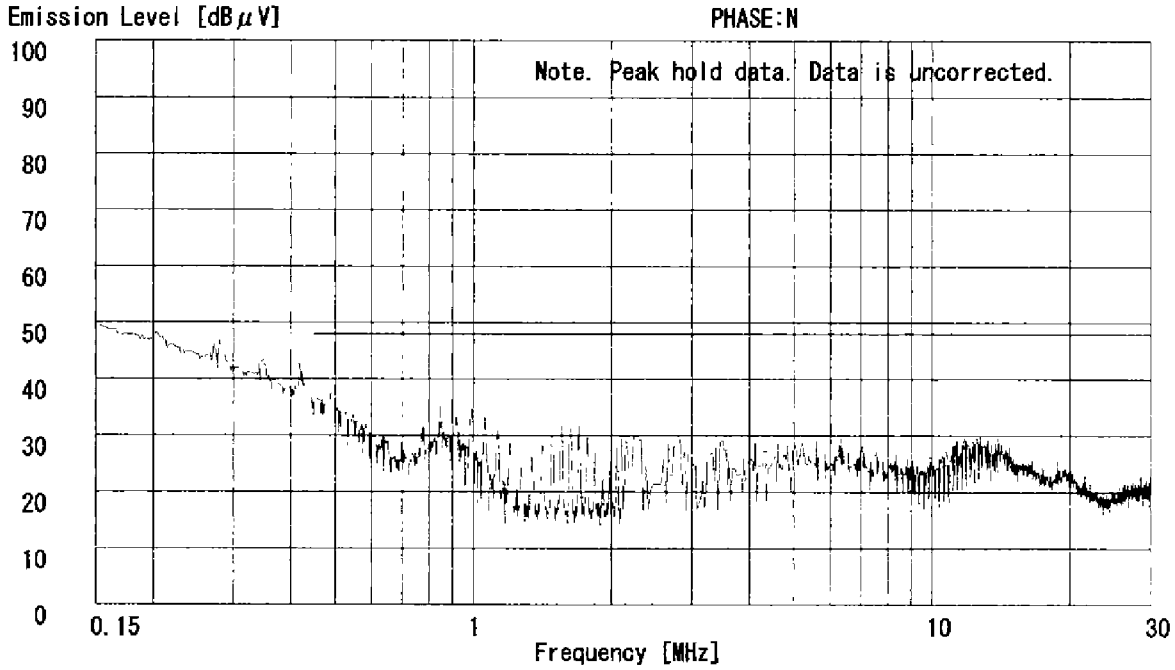
Except for the above table: adequate margin data below the limits.

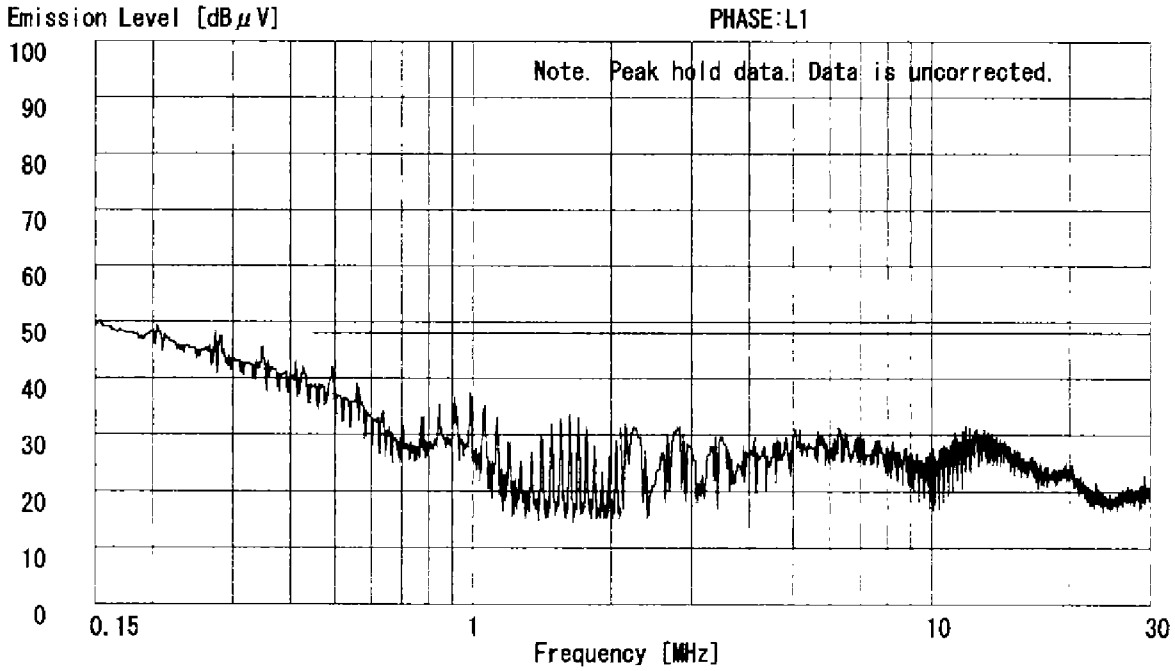
DATA OF CONDUCTION TEST CHART

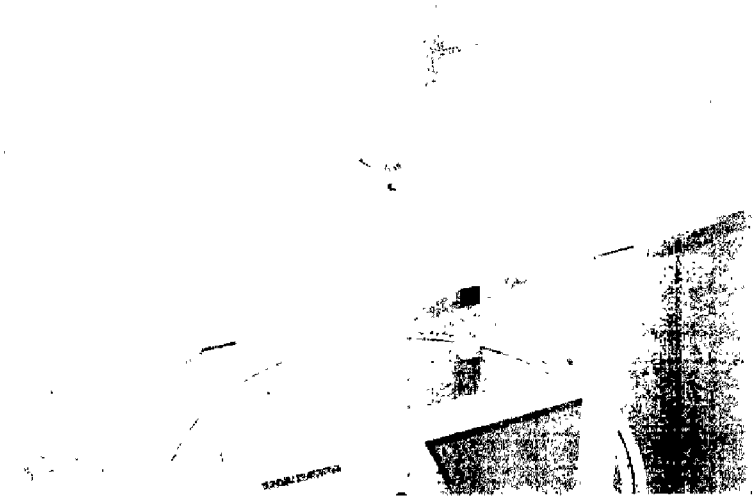
A-PEX INTERNATIONAL CO., LTD
YOKOWA No.3 OPEN TEST SITE
Report No.: 21AE0058YW-1

Applicant	:	DENSO CORPORATION
Kind of Equipment	:	BAR-CODE HANDY TERMINAL
Model No.	:	BHT-7500S
Serial No.	:	
Power	:	DC3.6V(AC Adaptor : AC120V/60Hz)
Mode	:	RUNNING(CHARGING)
Remarks	:	FCC ID : HYQBHT-7500S
Date	:	8/23/2000
Phase	:	Single Phase
Temperature	:	28 ℃
Humidity	:	49 %
Regulation 1	:	FCC Part15B CLASS B
Regulation 2	:	None

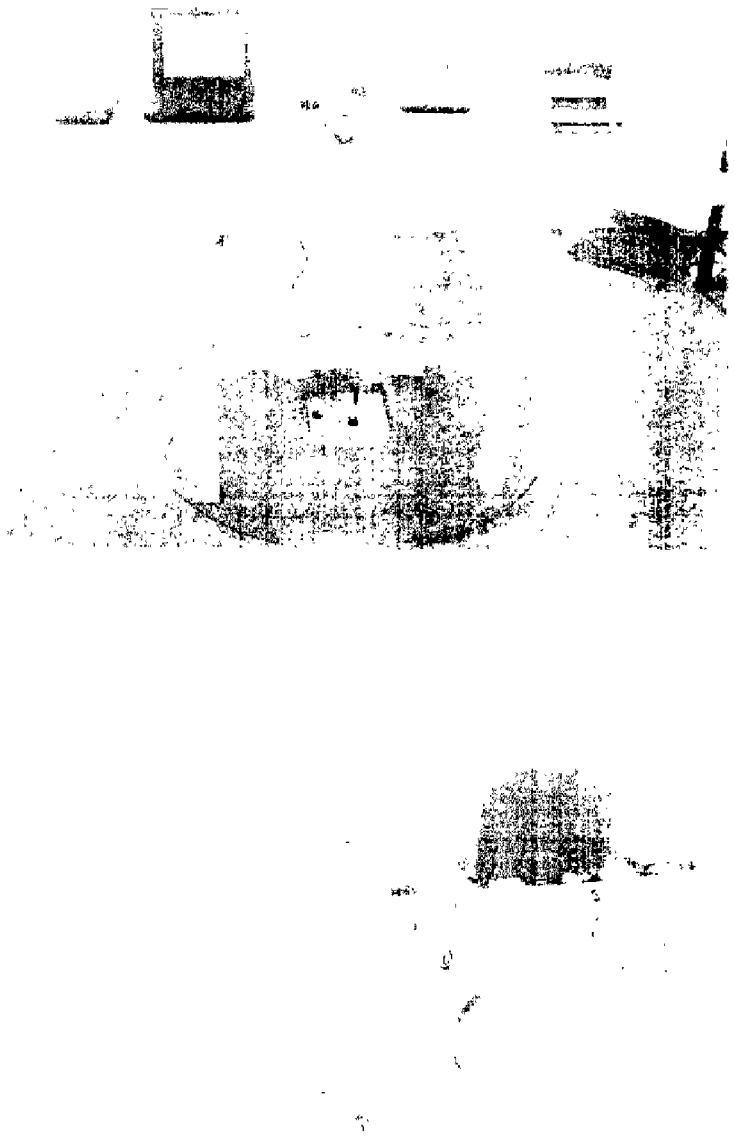
Engineer : Naoki Sakamoto







15.247(b):Maximum peak output power A21



15.209(a):Radiated emissions A22

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15.207(a):Conducted emissions A23

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