

EMI TEST REPORT

Test Report No. : 22JE0004-YK-1

Applicant: Sony Corporation
Type of Equipment: Bluetooth Module
Model No.: PEGA-MSB1
FCC ID: AK8PEGAMSB1
Test standard: FCC Part15 Subpart C, Section 15.247
Except FCC 15.247(e) Processing Gain
Test Result: Complied

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

Date of test: June 26 and 27, 2002

Tested by: T. Imamura
Toyokazu Imamura
EMC section

Approved by: O. Watatani
Osamu Watatani
Site Assistant Manager of Yamakita Lab.

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1 GENERAL INFORMATION

Company Name : Sony Corporation
Brand Name : Sony
Address : 6-7-35 kitashinagawa, Shinagawa-ku, Tokyo, 141-0001Japan
Telephone Number : +81-3-6409-3669
Facsimile Number : +81-3-6409-3409
Contact Person : Yuji Kumai
Type of Equipment : Bluetooth Module
Model No. : PEGA-MSB1
Rating : DC3.3V (PDA: AC120V/ 60Hz)
Country of Manufacture : Japan
Receipt Date of Sample : June 25, 2002
Condition of EUT : Production prototype
Regulation(s) : FCC Part15 Subpart C ,Section 15.247
Except FCC 15.247(e) Processing Gaine
Test Site : A-PEX Yamakita No.1 Open Test Sites

1.1 Tested Methodology

The measurement was performed according to the procedures in ANSI C63.4(2000).

1.2 Test Facility

This site has been fully described in a report dated November 24, 1999 submitted to FCC office, and accepted in a letter dated December 8, 2000 (No.1 Open Test Site: 95486).

NVLAP Lab. code : 200441-0

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2 PRODUCT DESCRIPTION

Sony Corporation, Model: PEGA-MSB1 (referred to as the EUT in this report) is a Bluetooth Module.
The clock frequency used in EUT is 13MHz.

Frequency characteristics:	2402MHz through 2480MHz
No. of channels/ channel spacing:	79 channels/ 1MHz channel spacing
Modulation:	FSK (Low power Frequency Hopping Spread Spectrum (FHSS))
Antenna type:	Monopole (Integral)
Antenna Gain:	2.15dBi
Operating Voltage:	DC3.3V

*FccPart15.31(e)

The host device PEGA-MSB1 provide the Bluetooth Module with stable power supply(DC:3.3V), and the Bluetooth Module complies power supply regulation.

*FccPart15.203 Antenna requirement

Bluetooth Module and its antenna comply with this requirement since this antenna is built in Bluetooth Module when they are put up for sale and they are used with a particular antenna connector.

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3 SYSTEM TEST CONFIGURATION

3.1 Justification

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

Test mode :

1. Transmitting mode(DH5) : Radiated and Antenna Port Conducted tests.
Performed the test about channels 2408MHz(Low) and 2480MHz(high) channels of all Carrier frequencies.
2. Hopping mode : Antenna Port Conducted tests.
3. Inquiry mode. : Antenna Port Conducted tests.
4. Page mode: Antenna Port Conducted tests.
5. Receiving mode: Radiated and Antenna Port Conducted tests.

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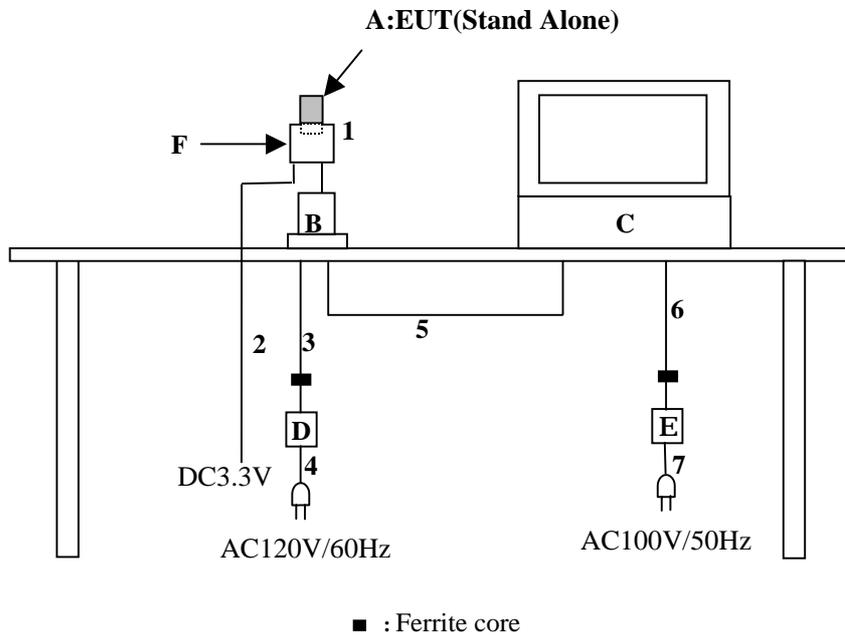
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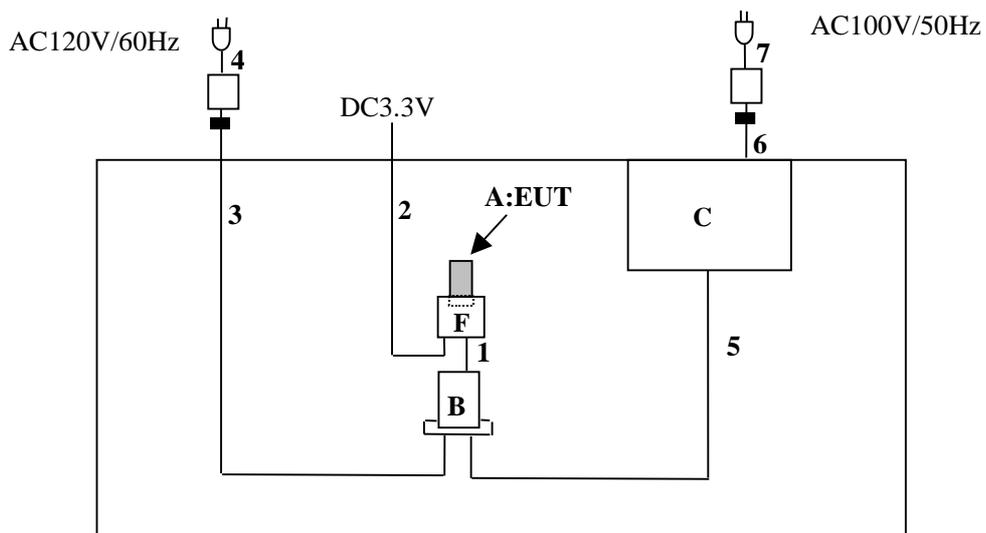
3.2 Configuration of Tested System

Front View (Radiated emission)



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

Top View (Radiated emissions)



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

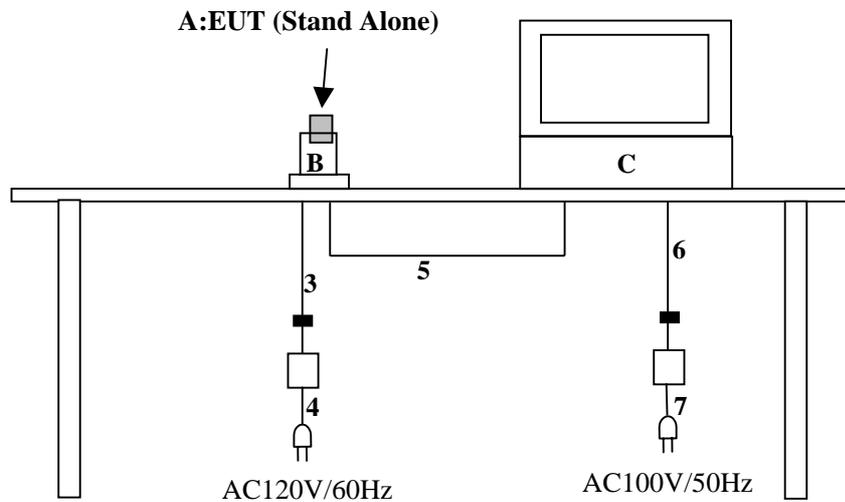
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Front View (Conducted emission)



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

Description of EUT and support equipment

No.	Item	Model number	Serial number	Manufacturer	FCC ID
A	Bluetooth Module	PEGA-MSB1	MSBT020625	Sony Corporation	AK8PEGAMSB1
B	PDA(CLIE)	PEG-T615C	28934830-3165648	Sony Corporation	DoC
C	PC(VAIO)	PCG-Z505JX	28302500-1106489	Sony Corporation	DoC
D	AC Adaptor	PEGA-AC10	A100152	Sony Corporation	-
E	AC Adaptor	PCGA-ACX1	9906A0030099	Sony Corporation	-
F	Relay Bard	-	-	Sony Corporation	-

Meshed column are represented EUT

List of cables used

No.	Name	Length (m)	Shield	Backshell material
1	Flat Cable	0.1	Unshielded	Polyvinyl chloride
2	DC Cable	2.1	Unshielded	Polyvinyl chloride
3	DC Cable	1.8	Unshielded	Polyvinyl chloride
4	AC Main Cable	0.75	Unshielded	Polyvinyl chloride
5	USB Cable	2.0	Shielded	Polyvinyl chloride
6	AC Cable	2.0	Unshielded	Polyvinyl chloride
7	AC Main Cable	0.8	Unshielded	Polyvinyl chloride

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4 MEASUREMENT UNCERTAINTY

Conducted emission test

The measurement uncertainty (with a 95% confidence level) for this test was ± 1.3 dB.

The data listed in this test report has enough margin, more than site margin.

Radiated emission test

The measurement uncertainty (with 95% confidence level) for this test using Biconical antenna is ± 4.8 dB.

The measurement uncertainty (with 95% confidence level) for this test using Logperiodic antenna is ± 5.2 dB.

The measurement uncertainty (with 95% confidence level) for this test using Horn antenna is ± 6.6 dB.

The data listed in this test report has enough margin, more than site margin.

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5 SUMMARY OF TESTS

5.1 §15.207 Conducted Emissions (Limits by CISPR Pub.22 Class B)

Test Procedure

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 flushed with rear of tabletop.

All other surfaces of tabletop were 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 ground plane.

Each EUT current-carrying power lead, except the ground (safety) lead, was individually connected through a LISN to the input power source. All unused 50 ohm connectors of the LISN were resistively terminated in 50 ohm when not connected to the measuring equipment.

The AC Mains Terminal Continuous disturbance Voltage has been measured with the EUT on a shielded room.

The EUT was connected to a Line Impedance Stabilization Network (LISN).

An overview sweep with peak detection has been performed.

The measurements have been performed with a CISPR quasi-peak detector(IF BW 9kHz) .

(Measurement range : 150kHz to 30MHz)

Test data : APPENDIX Page17 to 20

Photographs of test setup: Page 13

Test result : Pass

Test instruments : KCC-14/15/16/18/KPL-01,KLS-01(EUT),KLS-02(AE),KSA-01,KTR-02

5.2 §15.247 (a)(1)Frequency Hopping Systems

Bluetooth Module uses 79channels, each 1MHz wide.

On Average, each channel is used equally.

Test data : APPENDIX Page21

Test result : Pass

Test instruments : KTR-01,KCC-D5

5.3 §15.247 (a)(1)(ii)Channel Utilization

The total number of channel is 79.

Test data : APPENDIX Page22 to 24

Test result : Pass

Test instruments : KTR-01,KCC-D5

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20dB Band Width

1. 2402MHz(Low) : 0.7695MHz < 1MHz
2. 2480MHz(High): 0.8417MHz < 1MHz

Test data : APPENDIX Page25
Test result : Pass
Test instruments : KTR-01,KCC-D5

Dwell Time

Spectrum analyzer was set as center frequency 2402MHz,dwell time 30sec.(Hopping mode)
Spectrum analyzer was set as center frequency 2402MHz,dwell time 1sec.(Inquiry and page mode)

1.Hopping mode

As a result of observation with Bluetooth module was on hopping condition, 88 Average times hopping were appeared per 1channel.

Maximum transmit ON time per appeared hopping is 2.94ms (DH5)
 $88 * 2.94ms = 258.72ms < 400ms$

2.Inquiry mode

As a result of observation with Bluetooth module was on hopping condition, 50 Average times Inquiry were appeared per 1channel.

Maximum transmit ON time per appeared hopping is 160 μ s (Inquiry mode)
 $50 * 30 * 160\mu s = 240.0ms < 400ms$

3.Page mode

As a result of observation with Bluetooth module was on hopping condition, 49.8 Average times Page were appeared per 1channel.

Maximum transmit ON time per appeared hopping is 160 μ s (Page mode)
 $49.8 * 30 * 161\mu s = 240.5ms < 400ms$

Test data : APPENDIX Page26 to 31
Test result : Pass
Test instruments : KTR-01,KCC-D5, KST-01

5.4 § 15.247(b) Maximum Peak Out Put Power(Antenna Port Conducted)

Test Procedure

The Maximum Peak Output power was measured with a power meter connected to the antenna port.

* Antenna Gain dose not exceed 6dBi.

Test data : APPENDIX Page32
Test result : Pass
Test instruments : KPM-05, KPSS-01

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5.5 § 15.247(c) Out of Band Emissions(Radiated)

Test Procedure

EUT was placed on a platform of nominal size, 1m by 1.5m, raised 80cm above the conducting ground plane. 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 Radiated Electric Field Strength intensity has been measured on an open test site with a ground plane and at a distance of 3m.

The measuring antenna height was varied between 1 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.

EUT emission levels were compared when the EUT antenna position was vertical polarization and horizontal polarization.

The equipment was also previously checked at each position of three axis X,Y and Z to find that X axis was worst in these position under the vertical antenna polarization and that Z axis was worst in these position under the horizontal antenna position. The position in which the maximum noise occurred was chosen to put into measurement.

See the photographs in the 15 to 16 page

It was opened under transmitting mode.

Radiated Spurious emissions

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

Measurement range : 30MHz to 1000MHz CISPR QP Detector, IF BW 120kHz
: 1GHz to 26GHz PK and AV Detector

Test data : APPENDIX Page33 to 38 (30 –1000MHz)
: APPENDIX Page39 to 40 (1 – 26GHz)
: APPENDIX Page41 to 44 (Band Edges:2390MHz/2483.5MHz, Restricted band Charts)

Photographs of test setup : Page14

Test result : Pass

Test instruments : KAF-01,KAT6-1,KBA-01,KCC-10/11/12/13/18,KCC-D3,KHA-01,
KOTS-S1,KSA-01,KTR-01,KTR-02

5.6 § 15.247(c) Out of Band Emissions(Antenna Port Conducted)

Test Procedure

The Out of Band Emissions(Conducted) was measured with a spectrum analyzer connected to the antenna port.

Test data : APPENDIX Page45 to 50

Test result : Pass

Test instruments : KTR-01,KCC-D5

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APPENDIX 1: Photographs of test setup

- 1. Page 13 : Conducted emission
- 2. Page 14 : Radiated emission
- 3. Page 15 - 16: Pre check of worse-case position

APPENDIX 2: Test Data

- 1. Page 17 - 20: Conducted emission
- 2. Page 21 : Channel Separation (Antenna Port Conducted)
- 3. Page 22 - 24: Channel Utilization (Antenna Port Conducted)
- 4. Page 25 : 20dB Bandwidth (Antenna Port Conducted)
- 5. Page 26 - 31: Dwell Time (Antenna Port Conducted)
- 6. Page 32 : Maximum Peak Power (Antenna Port Conducted)
- 7. Page 33 - 44: Out Band Emissions (Radiated)
- 8. Page 45 - 50: Out Band Emissions (Antenna Port Conducted)

APPENDIX 3: Test instruments

- Page 51 : Test instruments

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Conducted emission



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Radiated emission



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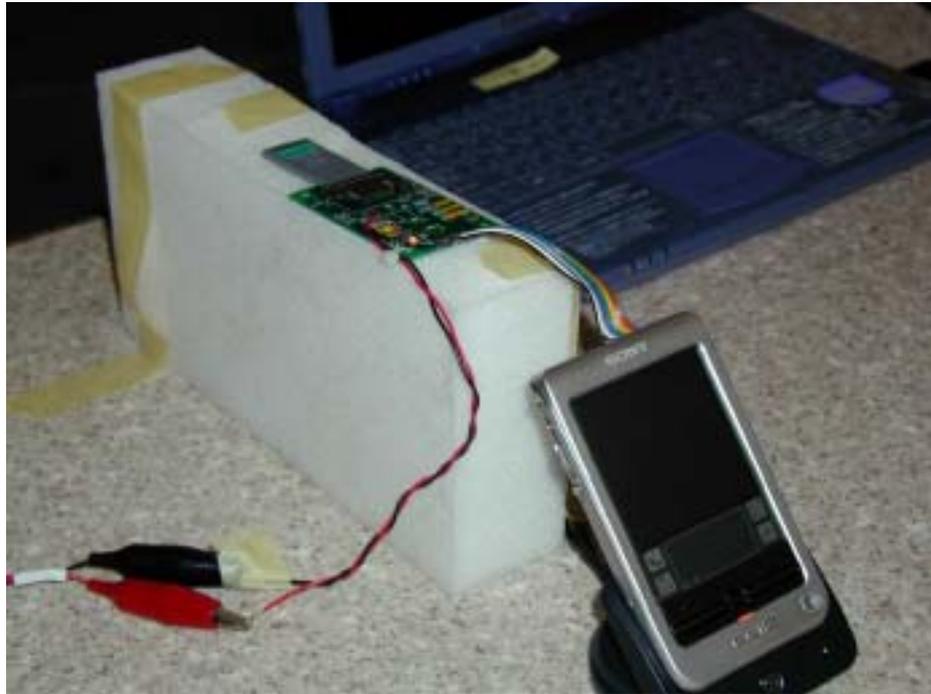
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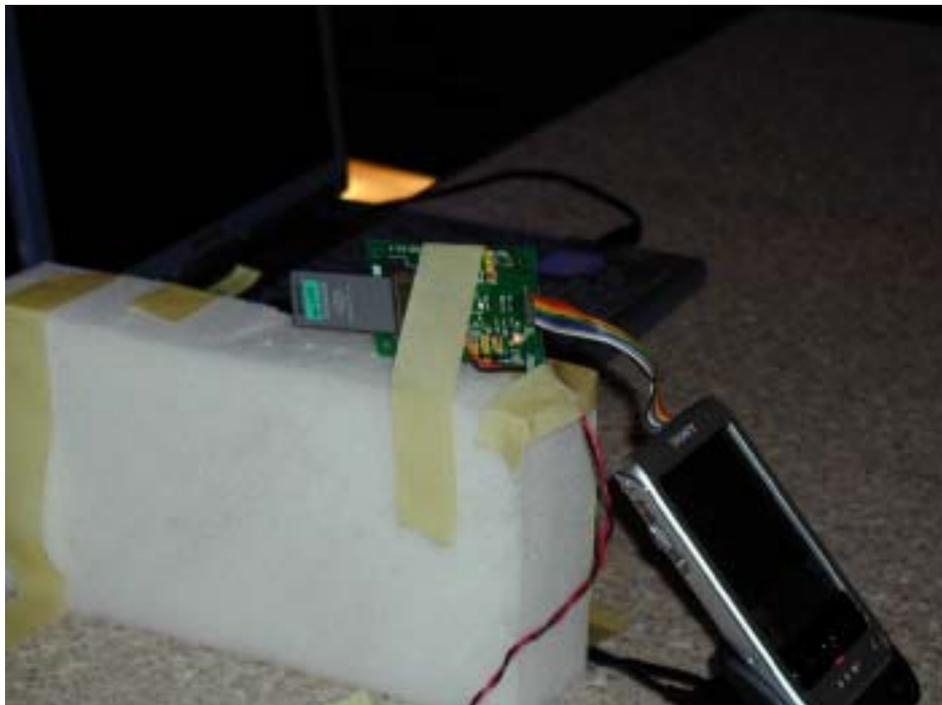
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Pre check of worse-case position

X axis



Y axis



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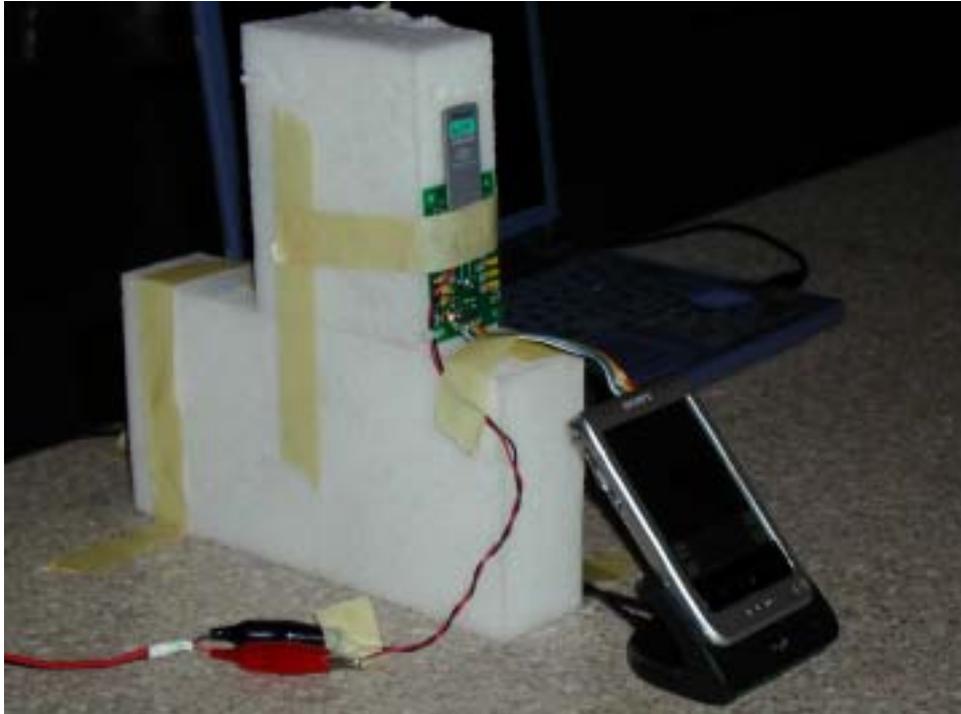
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Radiated emission

Z axis



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DATA OF CONDUCTION TEST

A-PEX INTERNATIONAL CO., LTD.
Yamakita No.1 Shielded Room
Report No. : 22JE0004-YK-1

Applicant : Sony Corporation
Kind of Equipment : Bluetooth Module
Model No. : PEGA-MSB1
Serial No. : MSBT020625
Power : DC3.3V
Mode : Transmitting
Remarks : FCC ID AK8PEGAMSB1
Date : 6/26/2002
Phase : Single Phase
Temperature : 19 °C
Humidity : 70 %
Regulation : CISPR Pub. 22 CLASS B


Engineer : Toyokazu Imamura

No.	FREQ. [MHz]	READING (N)		READING (L1)		LISN FACTOR [dB]	CABLE LOSS [dB]	ATTEN. [dB]	RESULT		LIMITS		MARGIN	
		QP [dBuV]	AV	QP [dBuV]	AV				QP [dBuV]	AV	QP [dBuV]	AV	QP [dB]	AV
1.	0.1639	46.7	33.8	46.4	30.9	1.4	0.1	0.0	48.2	35.3	65.3	55.3	17.1	20.0
2.	0.2892	37.0	29.4	36.4	29.3	0.8	0.1	0.0	37.9	30.3	60.5	50.5	22.6	20.2
3.	0.3340	34.8	28.3	33.6	23.7	0.7	0.1	0.0	35.6	29.1	59.4	49.4	23.8	20.3
4.	0.6242	29.2	25.3	28.0	25.5	0.4	0.2	0.0	29.8	26.1	56.0	46.0	26.2	19.9
5.	1.9443	29.0	22.3	27.9	20.7	0.3	0.3	0.0	29.6	22.9	56.0	46.0	26.4	23.1
6.	5.1827	28.5	19.0	29.3	19.7	0.3	0.6	0.0	30.2	20.6	60.0	50.0	29.8	29.4

CALCULATION: READING[dB μV] + LISN FACTOR[dB] + CABLE LOSS[dB] + ATTEN[dB].

■ LISN: KLS-01 (NSLK8126) ■ COAXIAL CABLE: KCC-14/15/16/18
■ PULSE LIMITTER: KPL-01 ■ EMI RECEIVER: KTR-02 (ESCS30)

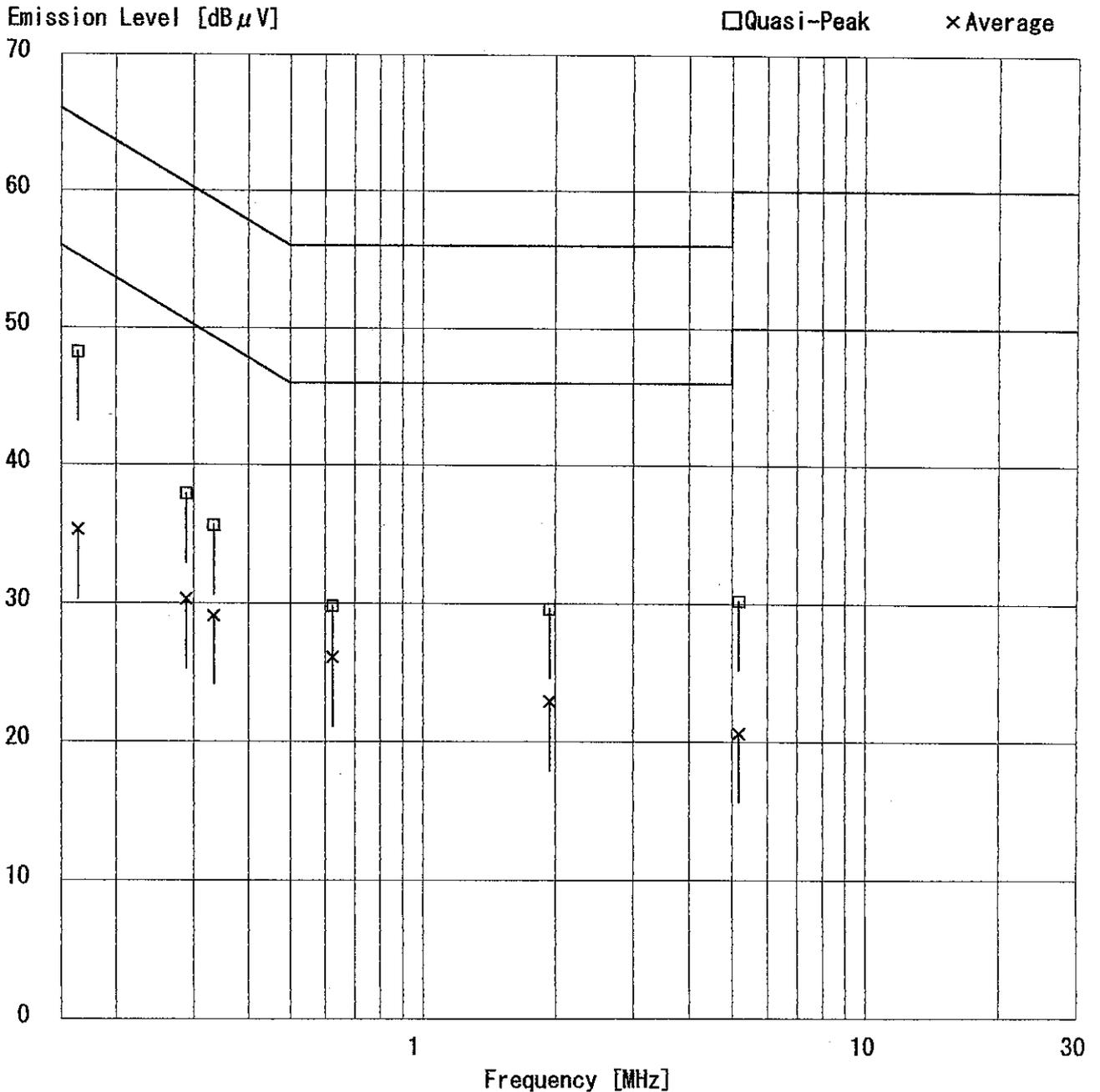
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 Model No. : PEGA-MSB1
 Serial No. : MSBT020625
 Power : DC3.3V
 Mode : Transmitting
 Remarks : FCC ID AK8PEGAMSB1
 Date : 6/26/2002
 Phase : Single Phase
 Temperature : 19 °C
 Humidity : 70 %
 Regulation : CISPR Pub.22 CLASS B

T. Imamura

 Engineer : Toyokazu Imamura



DATA OF CONDUCTION TEST CHART

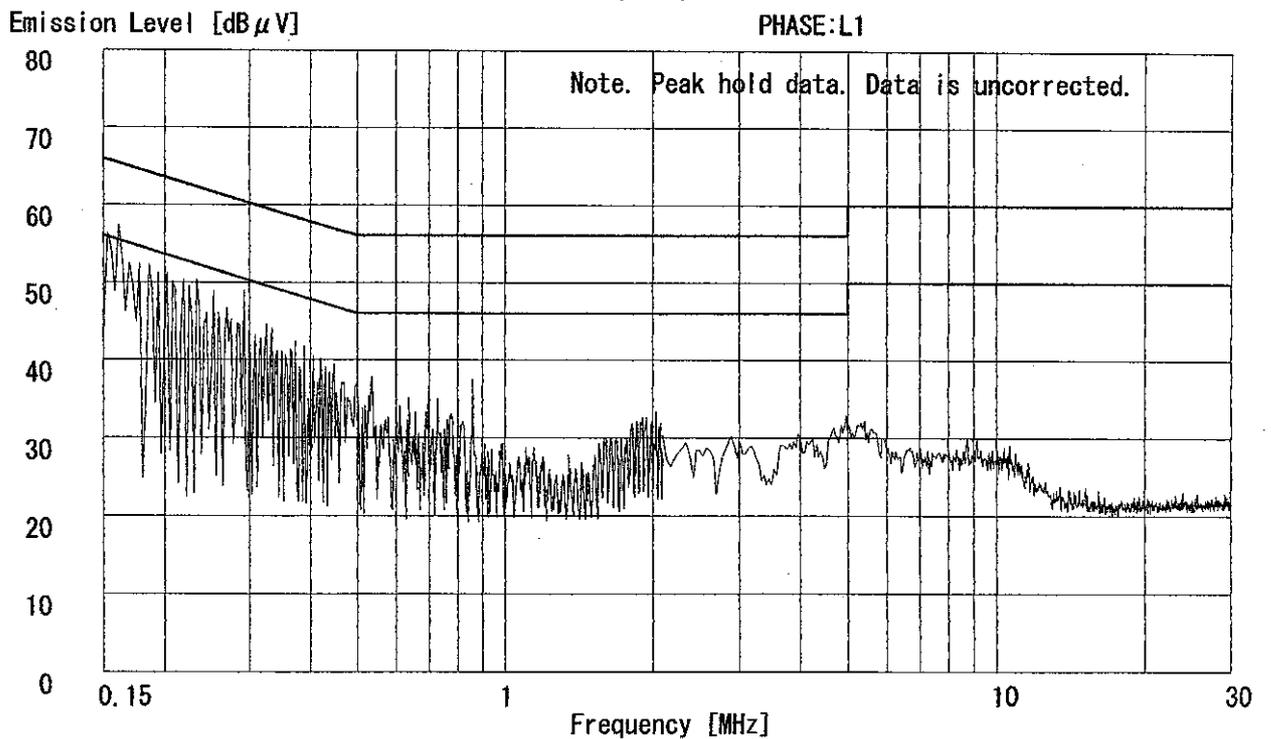
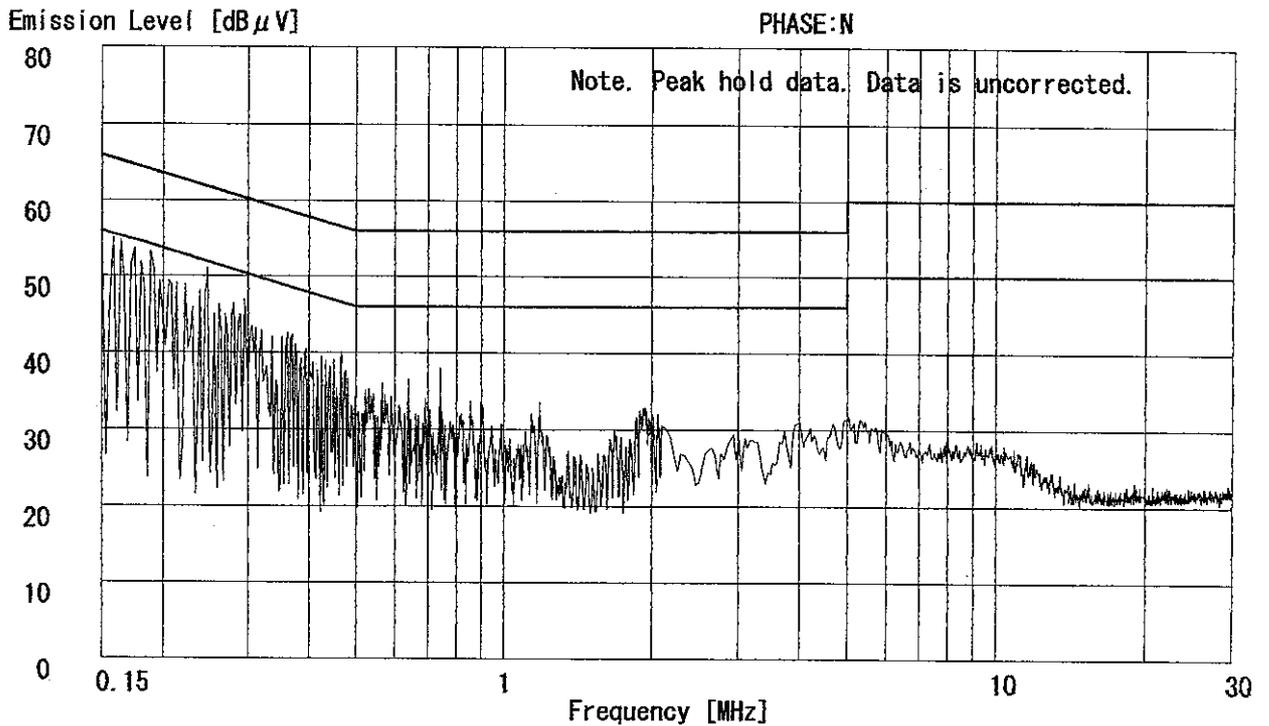
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Kind of Equipment : Bluetooth Module
Model No. : PEGA-MSB1
Serial No. : MSBT020625
Power : DC3.3V
Mode : Transmitting
Remarks : FCC ID AK8PEGMSB1
Date : 6/26/2002
Phase : Single Phase
Temperature : 19 °C
Humidity : 70 %
Regulation 1 : CISPR Pub.22 CLASS B
Regulation 2 : None


Engineer : Toyokazu Imamura



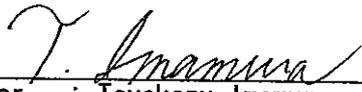
DATA OF CONDUCTION TEST CHART

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Yamakita No.1 Shielded Room

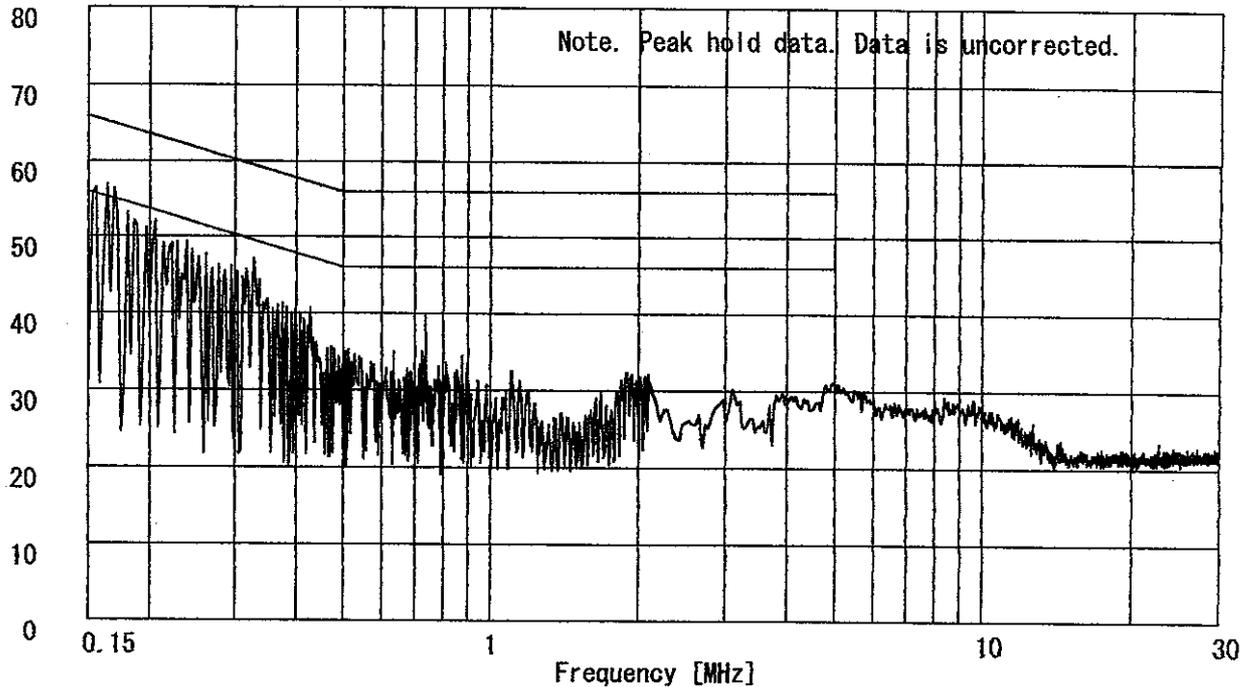
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Applicant : Sony Corporation
Kind of Equipment : Bluetooth Module
Model No. : PEGA-MSB1
Serial No. : MSBT020625
Power : DC3.3V
Mode : Receiving
Remarks : FCC ID AK8PEGAMSB1
Date : 6/26/2002
Phase : Single Phase
Temperature : 19 °C
Humidity : 70 %
Regulation 1 : CISPR Pub.22 CLASS B
Regulation 2 : None


Engineer : Toyokazu Imamura

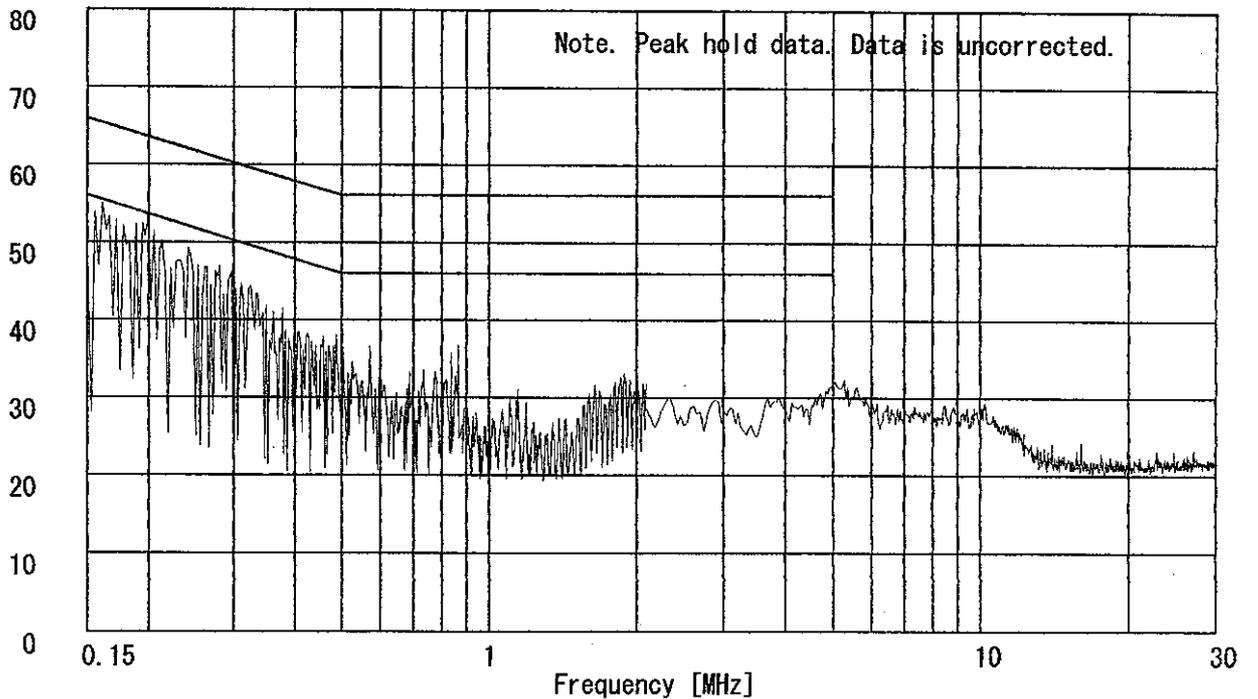
Emission Level [dB μ V]

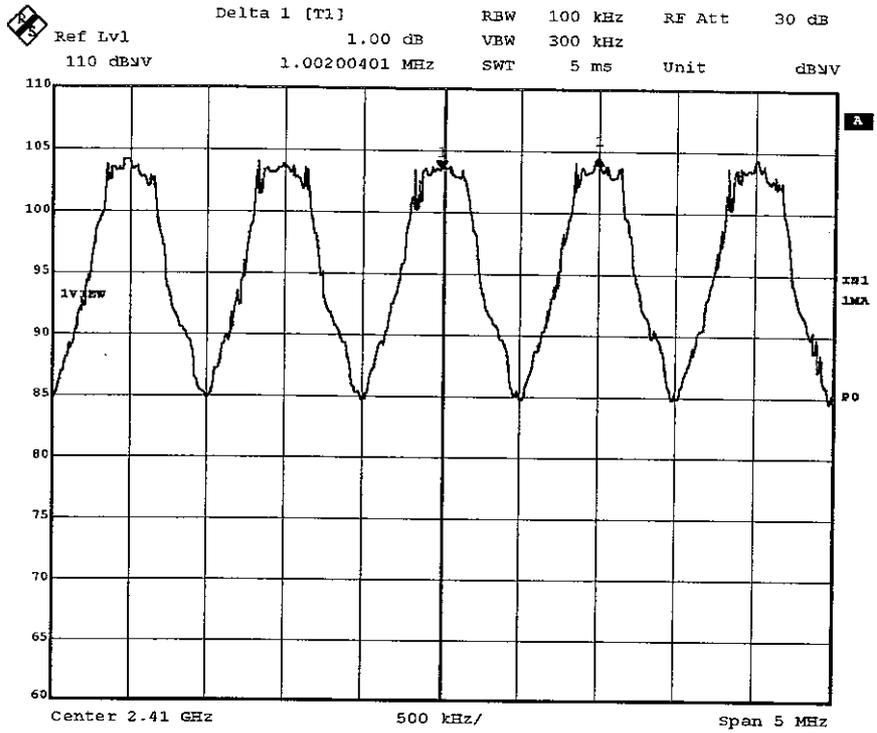
PHASE:N



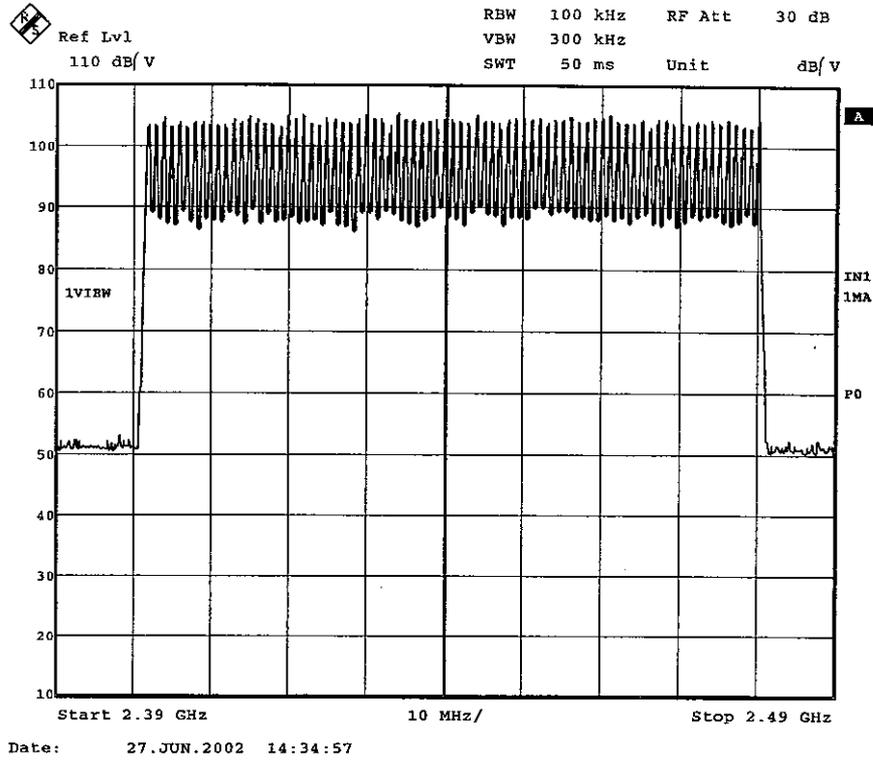
Emission Level [dB μ V]

PHASE:L1

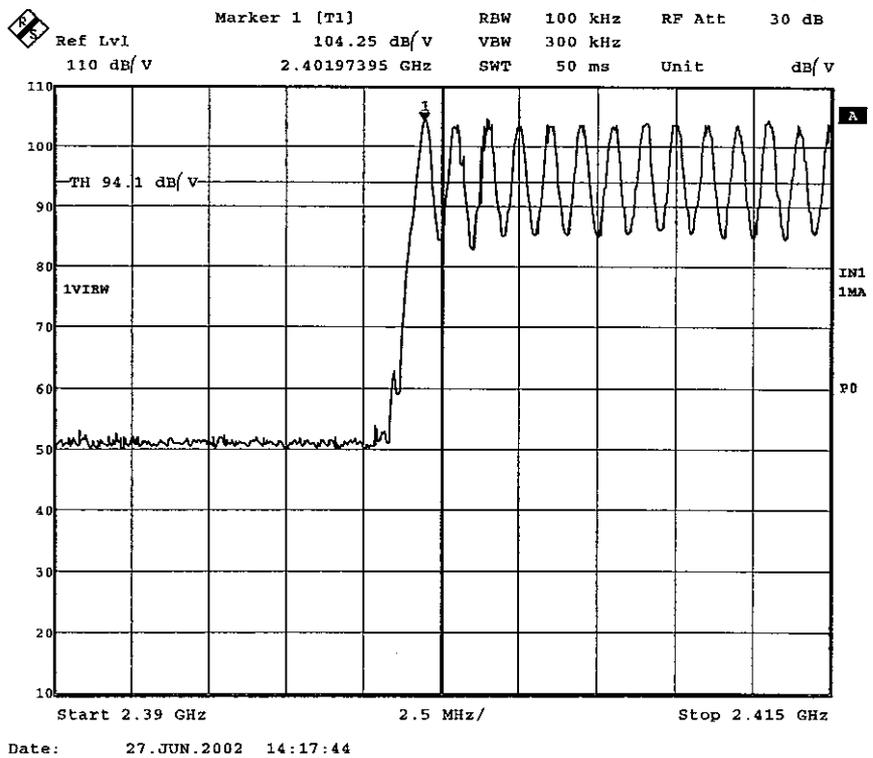




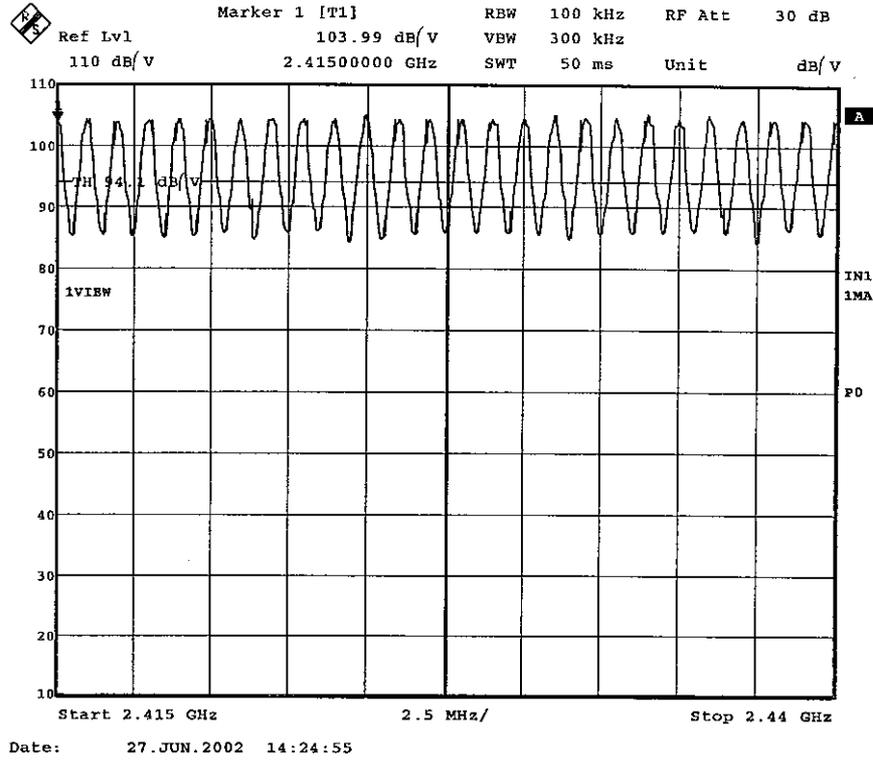
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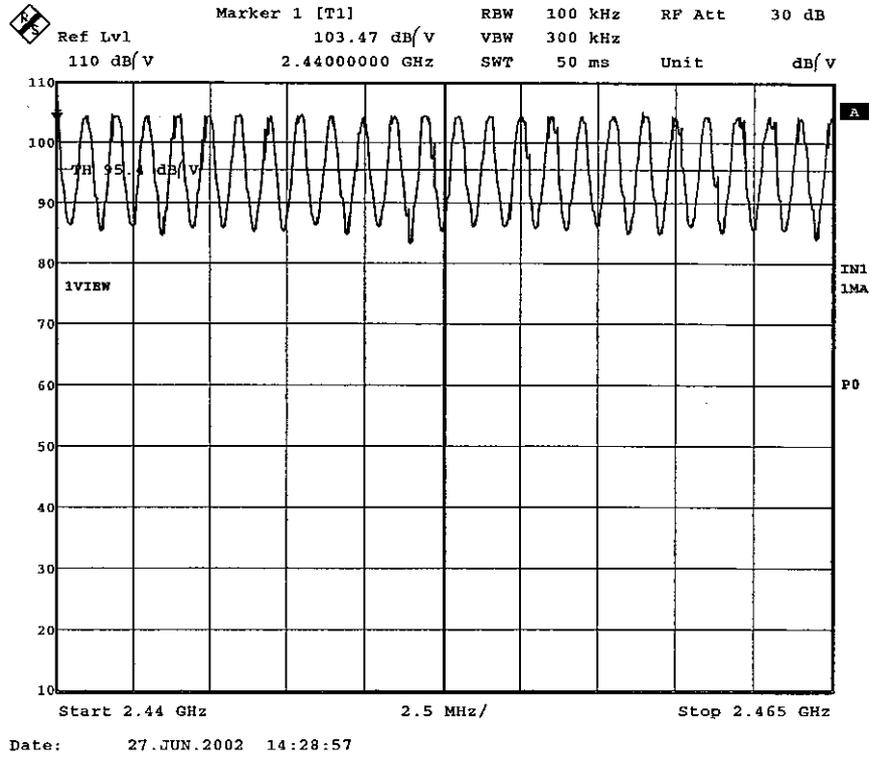
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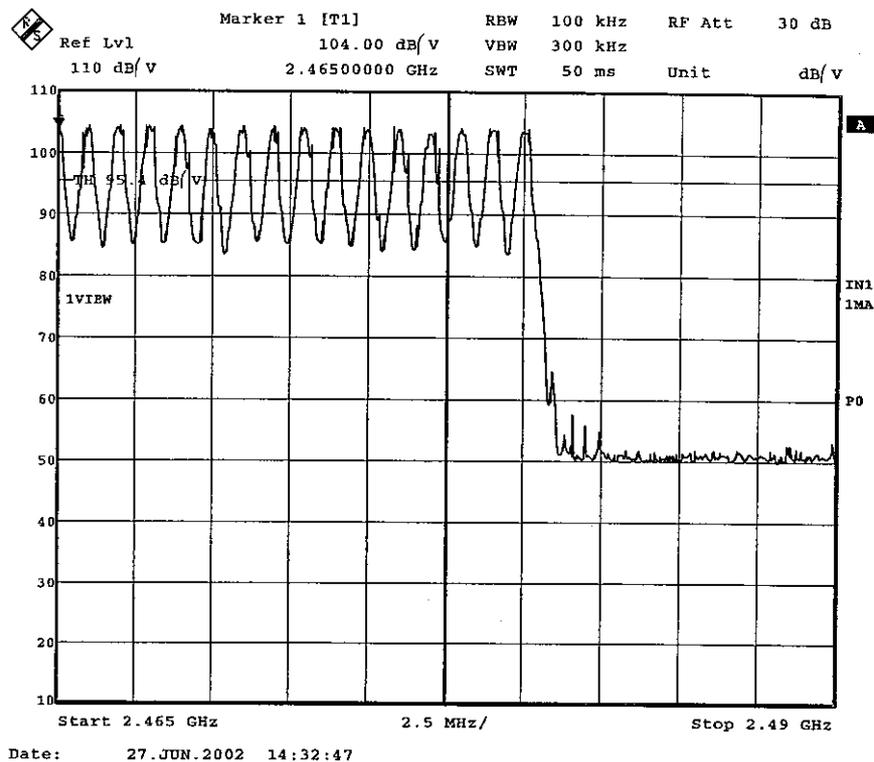
3.



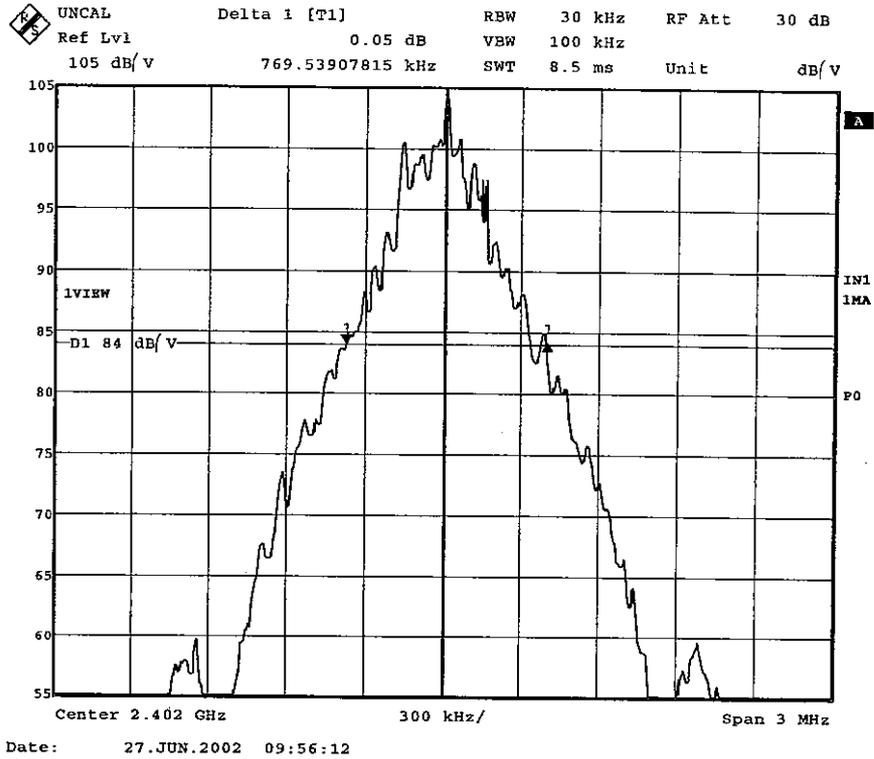
4.



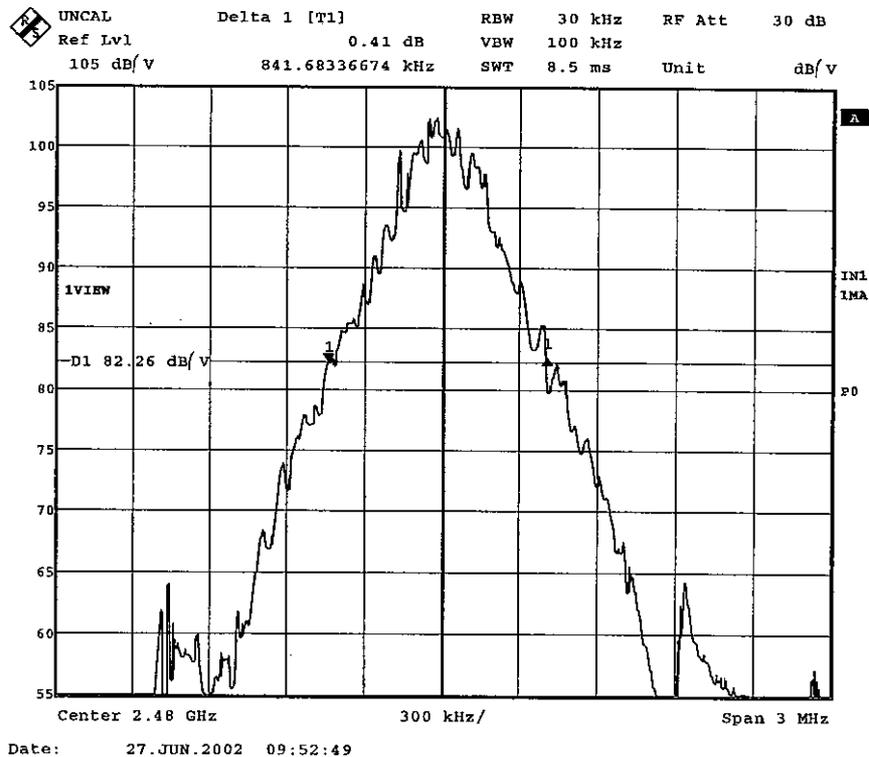
5.



1. ch Low: 2402MHz

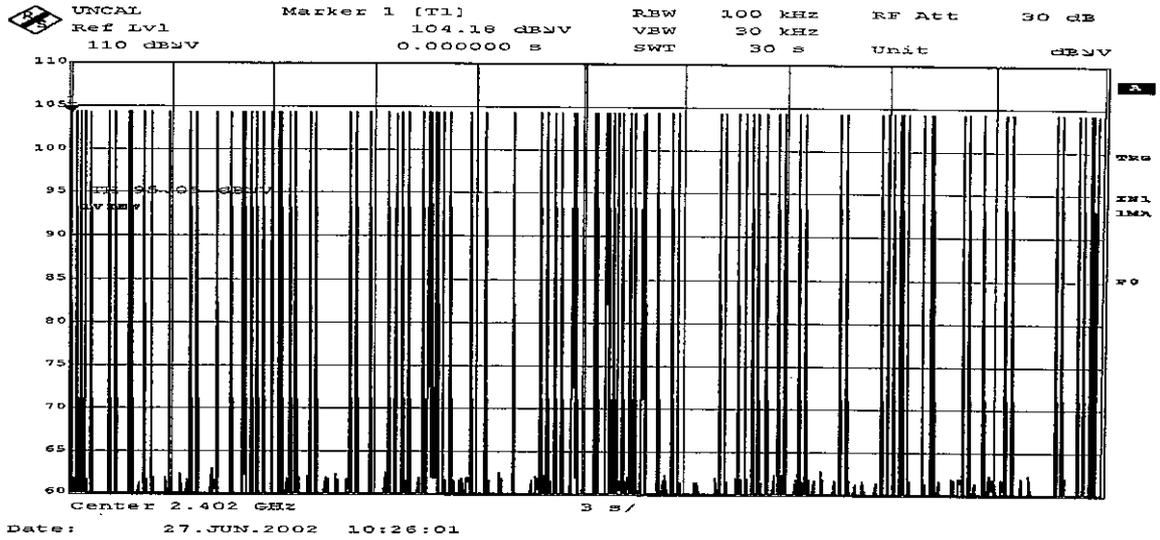


2. ch High: 2480MHz

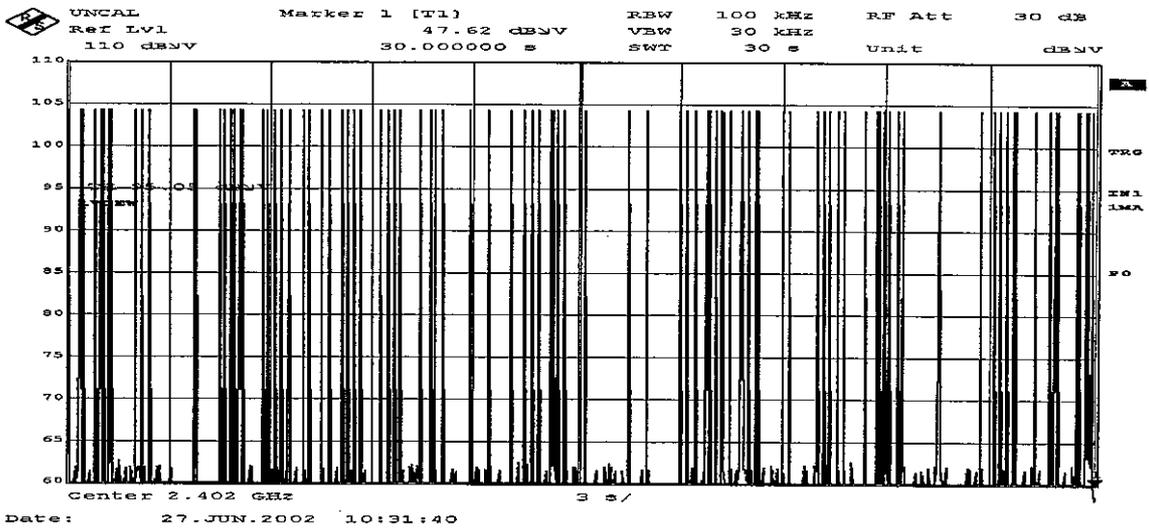


Dwell Time(Hopping)

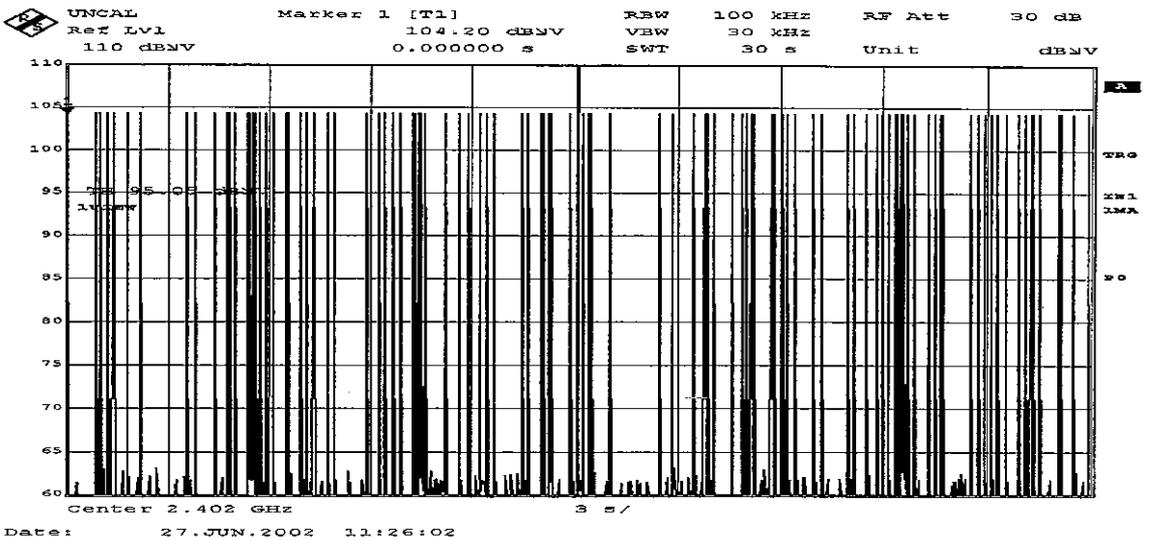
Count 1



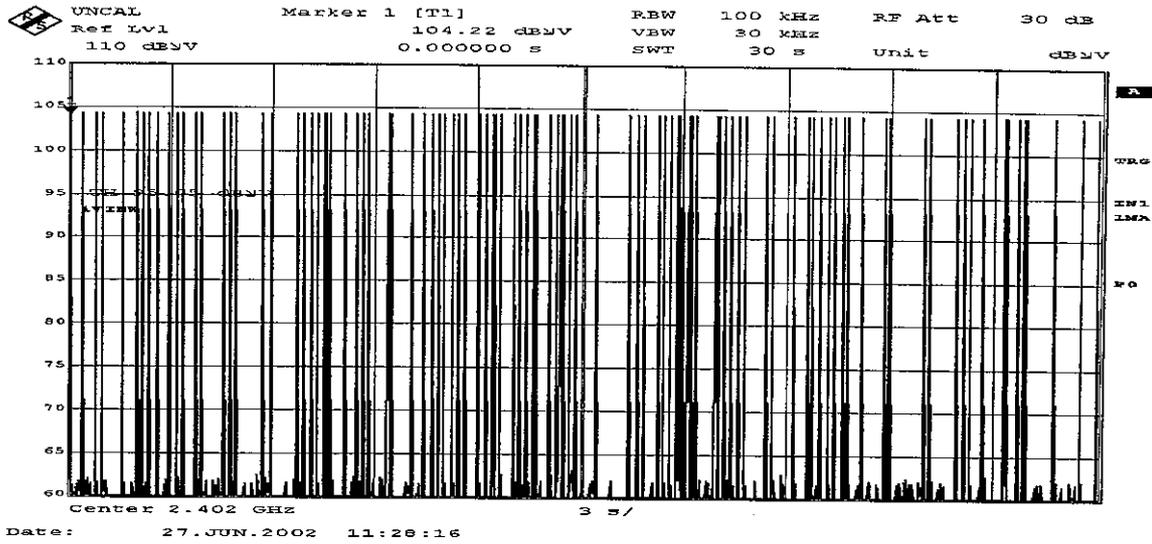
Count 2



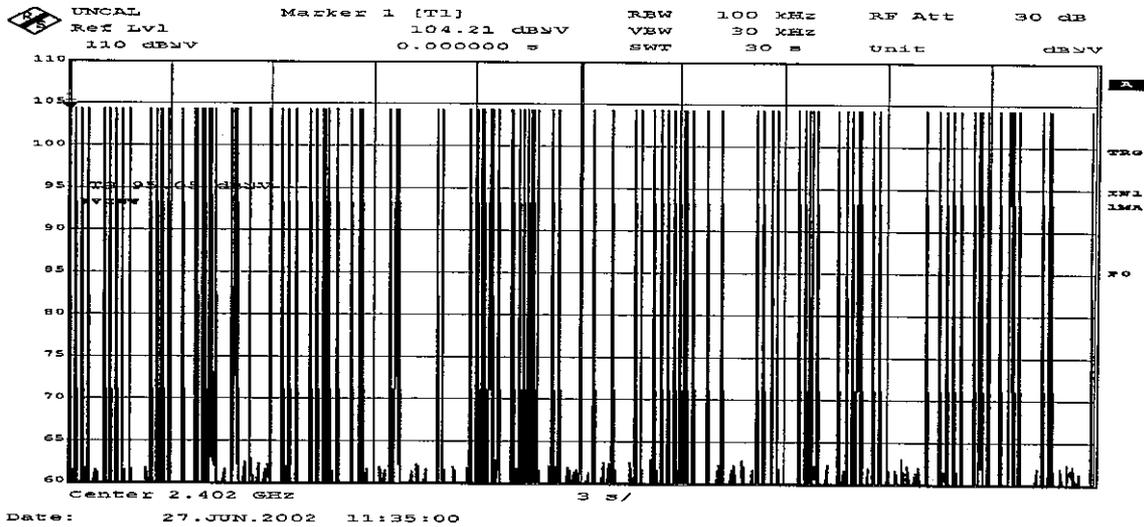
Count 3



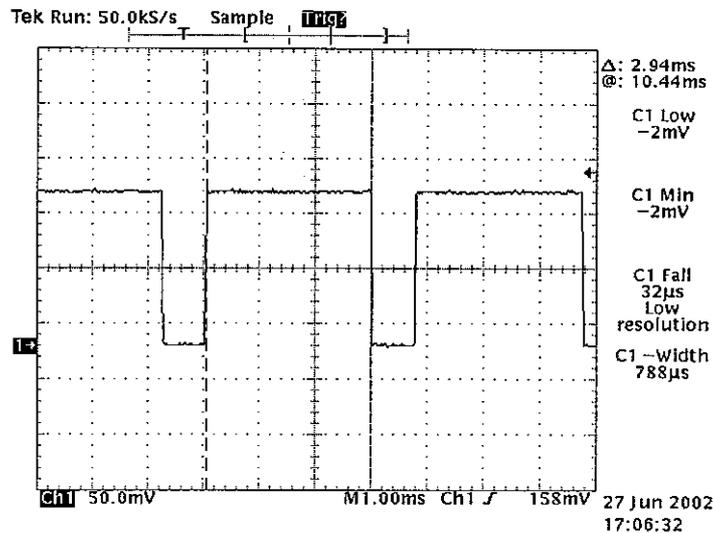
Count 4



Count 5



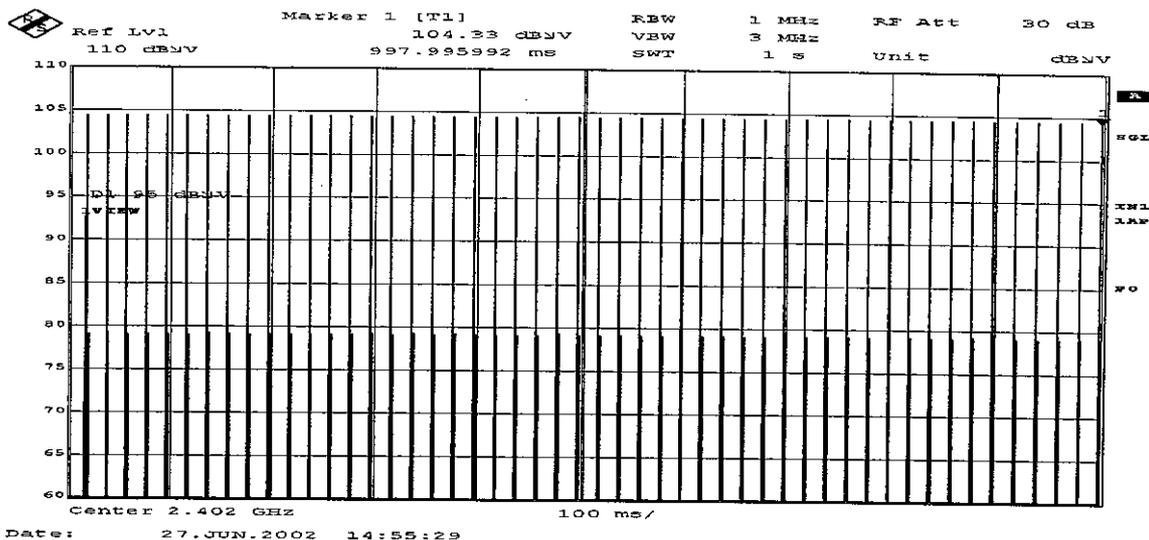
Duty cycle(Hopping)



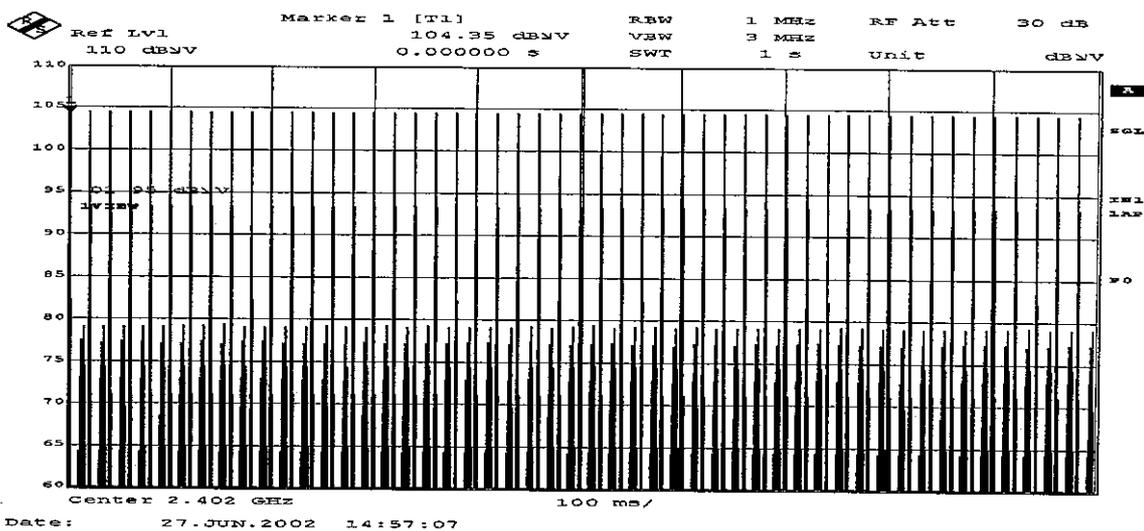
$$\begin{aligned} \text{Dwell time} &= (\text{Count 1} + \text{Count 2} + \text{Count 3} + \text{Count 4} + \text{Count 5}) / 5 * T_{on} \\ &= (88 + 82 + 87 + 87 + 92 + 91) / 5 * 2.94 \text{ [ms]} \\ &= 258.72 \text{ [ms]} \end{aligned}$$

Dwell Time(Inquiry)

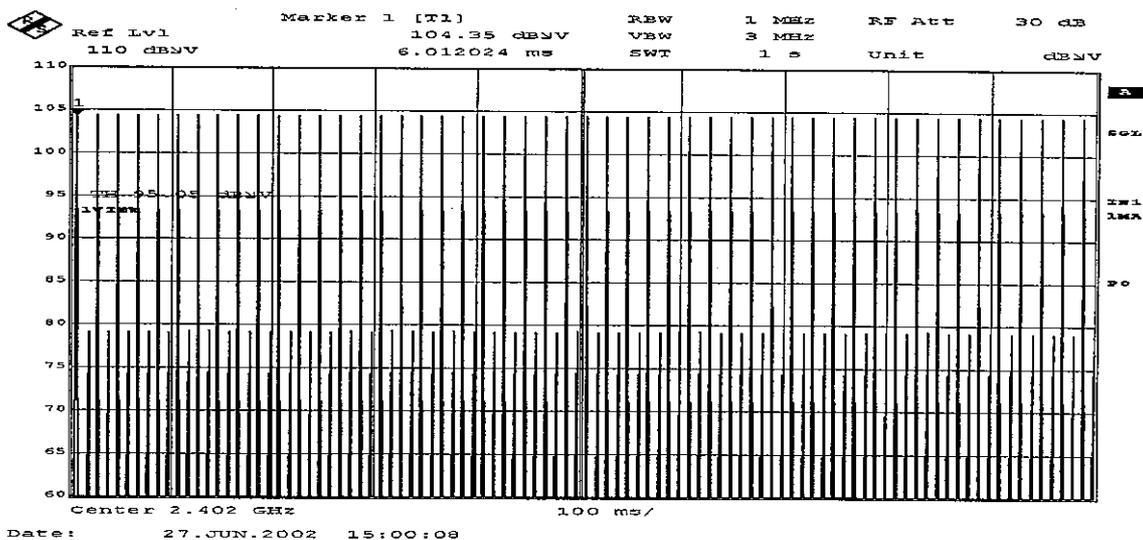
Count 1



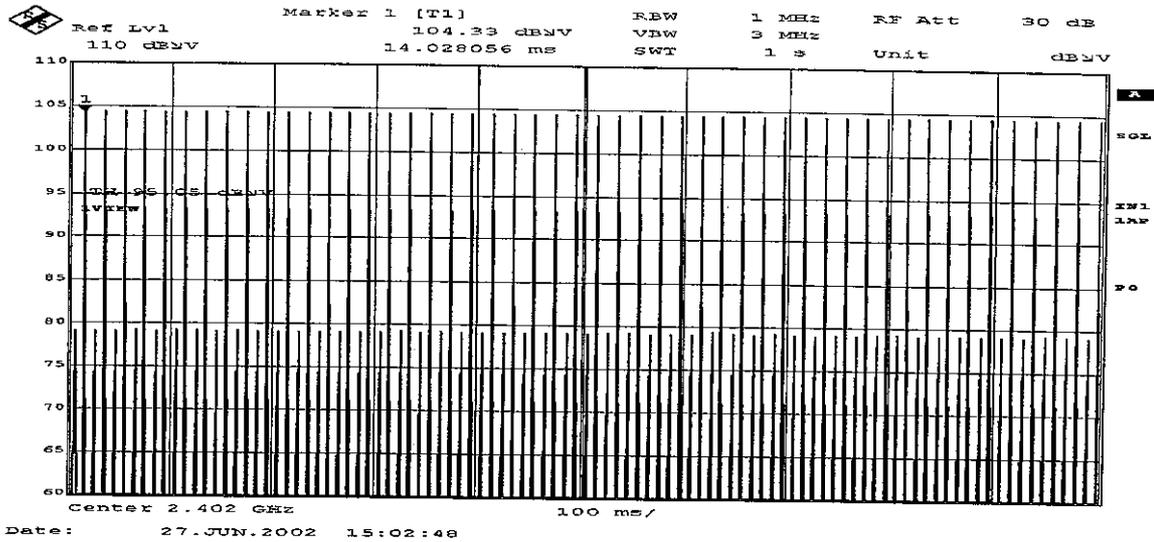
Count 2



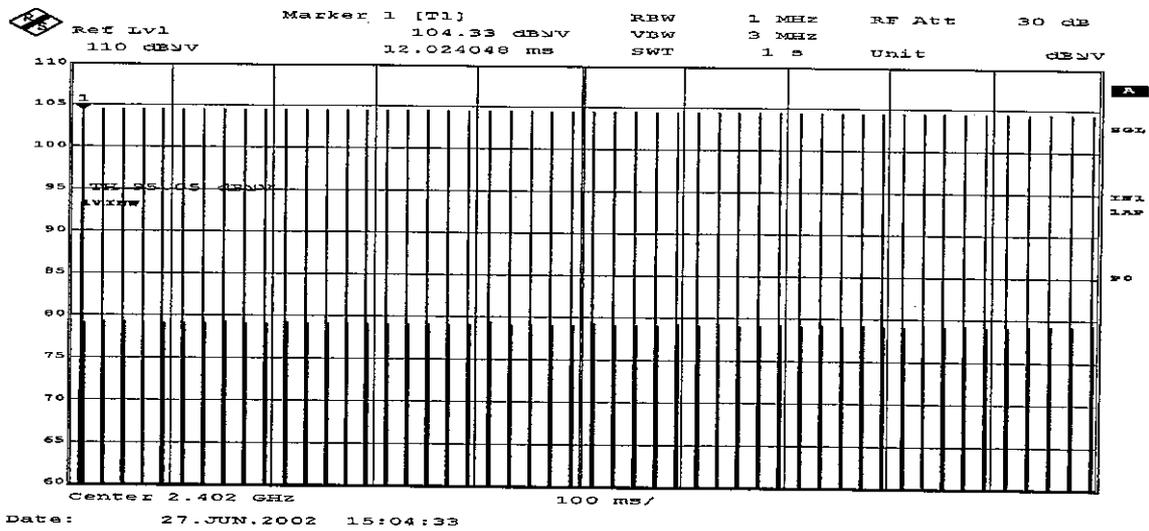
Count 3



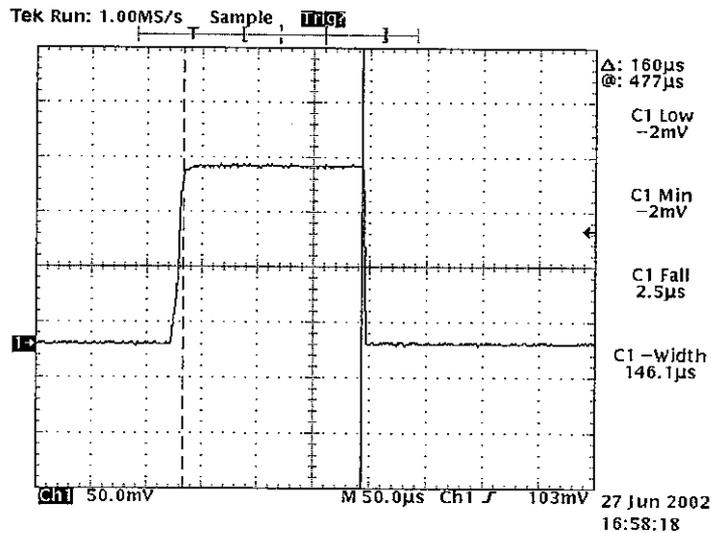
Count 4



Count 5

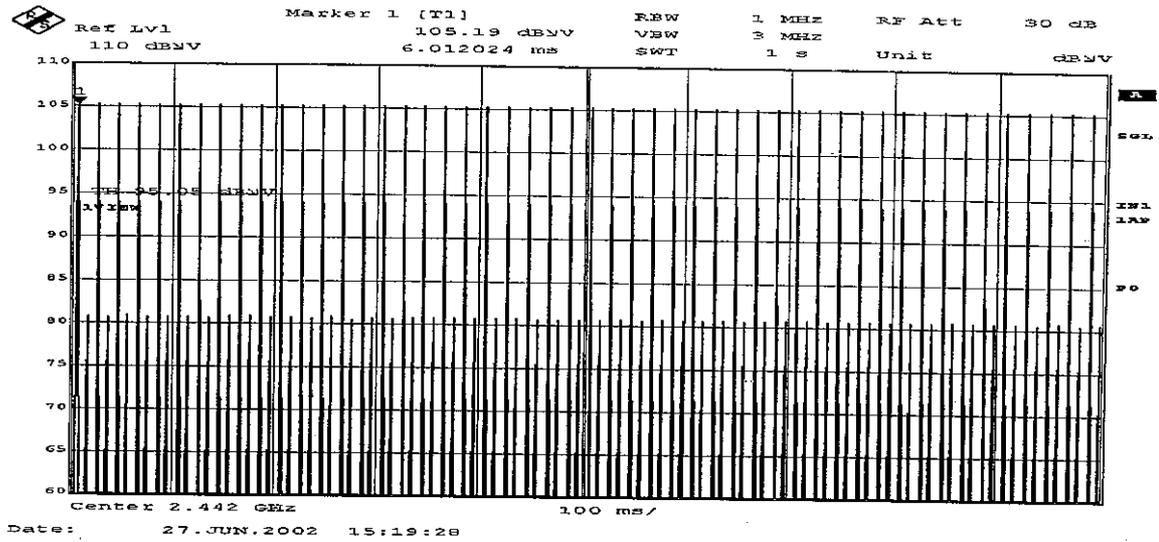


Duty cycle(Inquiry)

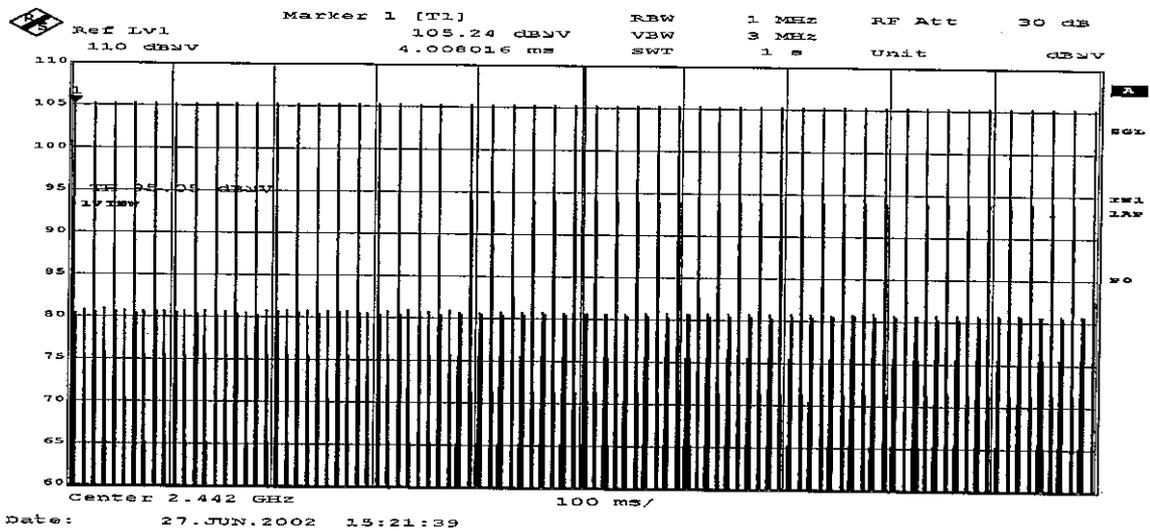


$$\begin{aligned} \text{Dwell time} &= (\text{Count 1} + \text{Count 2} + \text{Count 3} + \text{Count 4} + \text{Count 5}) / 5 * T_{on} \\ &= (50 + 50 + 50 + 50 + 50) / 5 * 3 * 160 [\mu s] \\ &= 24.0 [\text{ms}] \end{aligned}$$

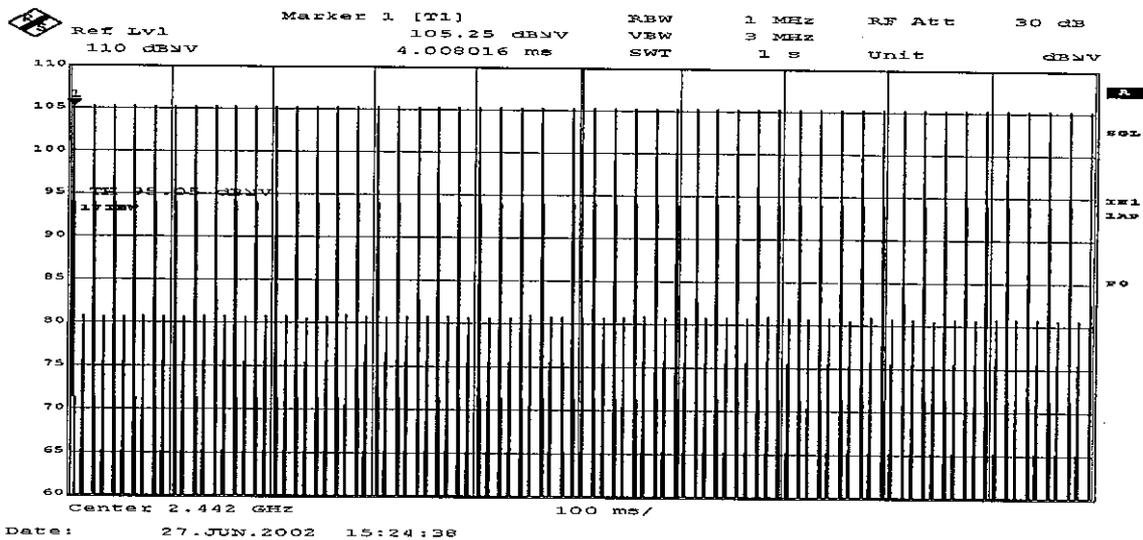
Dwell Time(Page)
Count 1



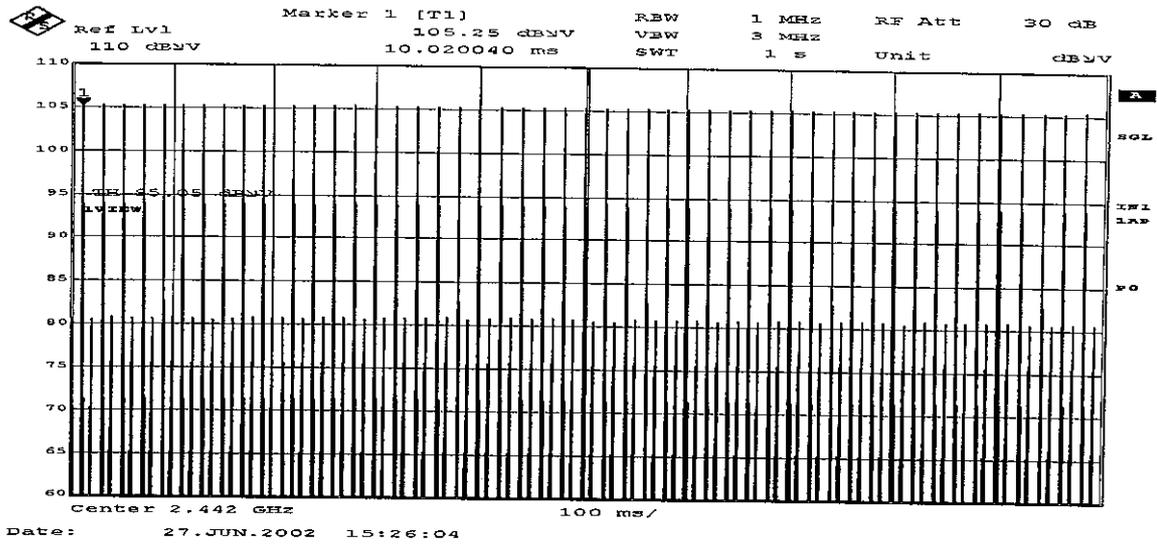
Count 2



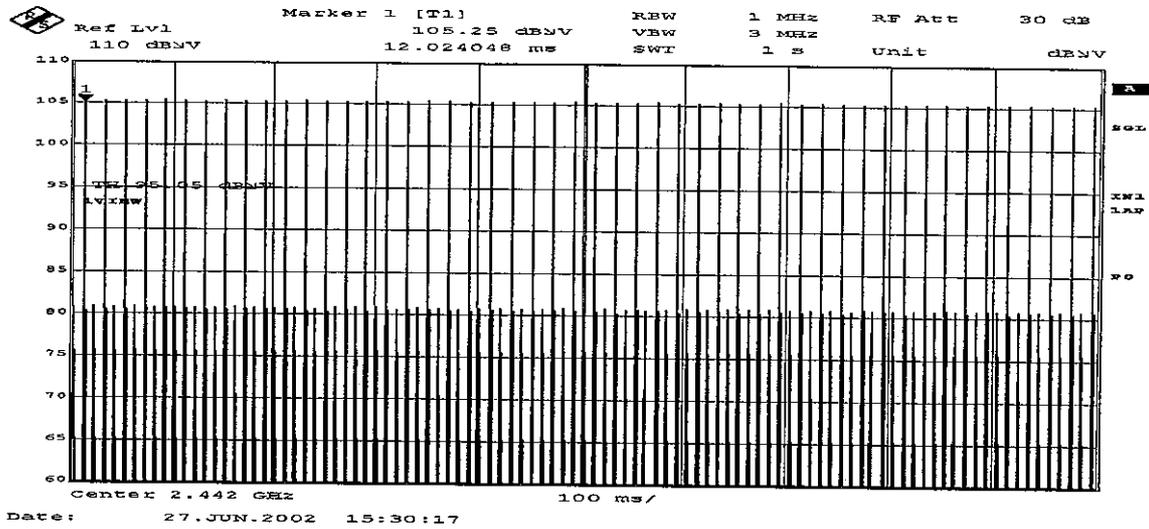
Count 3



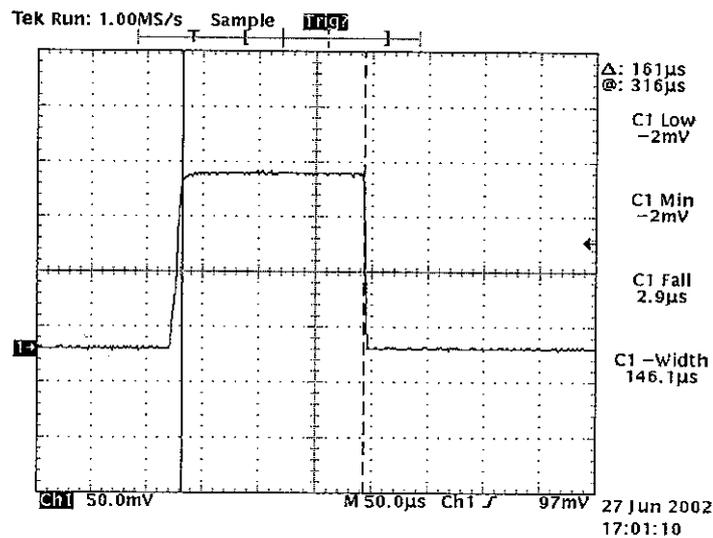
Count 4



Count 5



Duty cycle(Page)



$$\begin{aligned} \text{Dwell time} &= (\text{Count 1} + \text{Count 1 2} + \text{Count 3} + \text{Count 4} + \text{Count 5}) / 5 * \text{Ton} \\ &= (50 + 50 + 50 + 50 + 49 + 50) / 5 * 3 * 161 [\mu\text{s}] \\ &= 24.053 [\text{ms}] \end{aligned}$$

Peak Out Put Power (Conducted)

A-PEX INTERNATIONAL CO., LTD.
YAMAKITA NO. 1 OPEN SITE

COMPANY : SONY Corporation.
EQUIPMENT : Bluetooth Module
MODEL : PEGA-MSB1
FCC ID : AK8PEGAMSB1
POWER : DC3.3V
Mode : Transmitting

REPORT NO : 22JE0004-YK-1
REGULATION : Fcc Part15SubpartC 247 (b) (1)
DATE : 2002/ 6/27
Temp./Humi. : 24°C/60%


ENGINEER : Toyokazu Imamura

CH	FREQ [GHz]	PM Reading [dBm]	Limit (1W) [dBm]	MARGIN [dB]
Low	2.40200	-1.1	30.0	31.1
High	2.48000	-0.4	30.0	30.4

DATA OF RADIATION TEST

A-PEX INTERNATIONAL CO., LTD.
Yamakita No.1 Open Test Site
Report No. : 22JE0004-YK-1

Applicant : Sony Corporation
Kind of Equipment : Bluetooth Module
Model No. : PEGA-MSB1
Serial No. : MSBT020625
Power : DC3.3V
Mode : Transmitting(Low ch)
Remarks : FCC ID:AK8PEGAMSB1
Date : 6/26/2002
Test Distance : 3 m
Temperature : 19 °C
Humidity : 70 %
Regulation : FCC Part15C § 15.209


Engineer : Toyokazu Imamura

No.	FREQ. [MHz]	ANT TYPE	READING		ANT FACTOR [dB/m]	AMP GAIN [dB]	CABLE LOSS [dB]	ATTEN. [dB]	RESULT		LIMITS		MARGIN	
			HOR [dB μV]	VER [dB μV]					HOR [dB μV/m]	VER [dB μV/m]	HOR [dB]	VER [dB]		
1.	99.48	BB	39.9	43.2	9.9	28.4	2.5	6.1	30.0	33.3	43.5	13.5	10.2	
2.	132.64	BB	30.0	31.2	13.9	28.5	2.9	6.1	24.4	25.6	43.5	19.1	17.9	
3.	215.29	BB	31.7	29.6	16.8	28.1	3.9	6.1	30.4	28.3	43.5	13.1	15.2	
4.	298.37	BB	32.2	28.9	20.2	27.8	5.4	6.1	36.1	32.8	46.0	9.9	13.2	
5.	312.00	BB	35.6	30.6	15.4	27.9	5.4	6.1	34.6	29.6	46.0	11.4	16.4	
6.	336.02	BB	36.4	29.4	15.9	28.1	5.4	6.1	35.7	28.7	46.0	10.3	17.3	
7.	364.81	BB	40.2	37.0	16.5	28.3	5.4	6.1	39.9	36.7	46.0	6.1	9.3	

CALCULATION: $READING[dB \mu V] + ANT. FACTOR[dB/m] + CABLE LOSS[dB] - AMP. GAIN[dB] + ATTEN[dB]$.

■ ANTENNA: KBA-01 (BBA9106) 30-299.99MHz/KLA-01 (USLP9143) 300-1000MHz
■ CABLE: KCC-10/11/12/13/18 ■ PREAMP: KAF-01 (8447D) ■ EMI RECEIVER: KTR-02 (ESCS30)

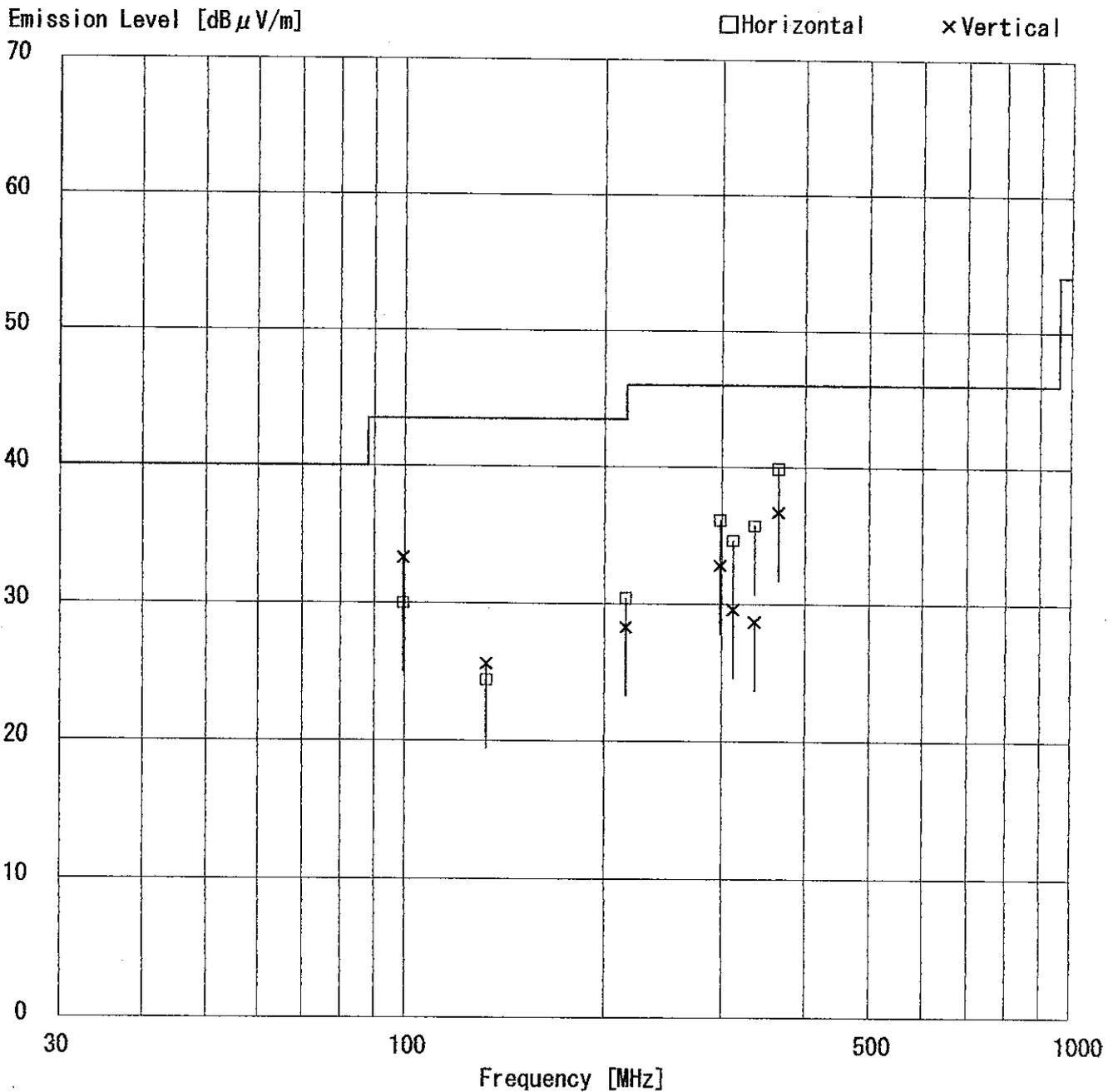
DATA OF RADIATION TEST

A-PEX INTERNATIONAL CO., LTD.
Yamakita No.1 Open Test Site
Report No. : 22JE0004-YK-1

Applicant : Sony Corporation
 Kind of Equipment : Bluetooth Module
 Model No. : PEGA-MSB1
 Serial No. : MSBT020625
 Power : DC3.3V
 Mode : Transmitting (Low ch)
 Remarks : FCC ID: AK8PEGAMSB1
 Date : 6/26/2002
 Test Distance : 3 m
 Temperature : 19 °C
 Humidity : 70 %
 Regulation : FCC Part15C § 15.209

T. Imamura

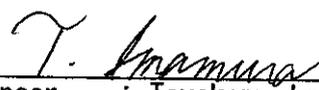
 Engineer : Toyokazu Imamura



DATA OF RADIATION TEST

A-PEX INTERNATIONAL CO., LTD.
Yamakita No.1 Open Test Site
Report No. : 22JE0004-YK-1

Applicant : Sony Corporation
Kind of Equipment : Bluetooth Module
Model No. : PEGA-MSB1
Serial No. : MSBT020625
Power : DC3.3V
Mode : Transmitting(High ch)
Remarks : FCC ID:AK8PEGAMSB1
Date : 6/26/2002
Test Distance : 3 m
Temperature : 19 °C
Humidity : 70 %
Regulation : FCC Part15C § 15.209


Engineer : Toyokazu Imamura

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.	99.48	BB	39.4	42.5	9.9	28.4	2.5	6.1	29.5	32.6	43.5	14.0	10.9
2.	132.64	BB	30.8	31.2	13.9	28.5	2.9	6.1	25.2	25.6	43.5	18.3	17.9
3.	215.29	BB	32.3	30.1	16.8	28.1	3.9	6.1	31.0	28.8	43.5	12.5	14.7
4.	298.37	BB	31.8	28.3	20.2	27.8	5.4	6.1	35.7	32.2	46.0	10.3	13.8
5.	312.00	BB	35.5	32.2	15.4	27.9	5.4	6.1	34.5	31.2	46.0	11.5	14.8
6.	336.02	BB	35.2	30.2	15.9	28.1	5.4	6.1	34.5	29.5	46.0	11.5	16.5
7.	364.81	BB	38.4	31.7	16.5	28.3	5.4	6.1	38.1	31.4	46.0	7.9	14.6

CALCULATION: $READING[dB \mu V] + ANT.FACTOR[dB/m] + CABLE LOSS[dB] - AMP.GAIN[dB] + ATTEN[dB]$.

■ ANTENNA: KBA-01 (BBA9106) 30-299.99MHz/KLA-01 (USLP9143) 300-1000MHz
■ CABLE: KCC-10/11/12/13/18 ■ PREAMP: KAF-01 (8447D) ■ EMI RECEIVER: KTR-02 (ESCS30)

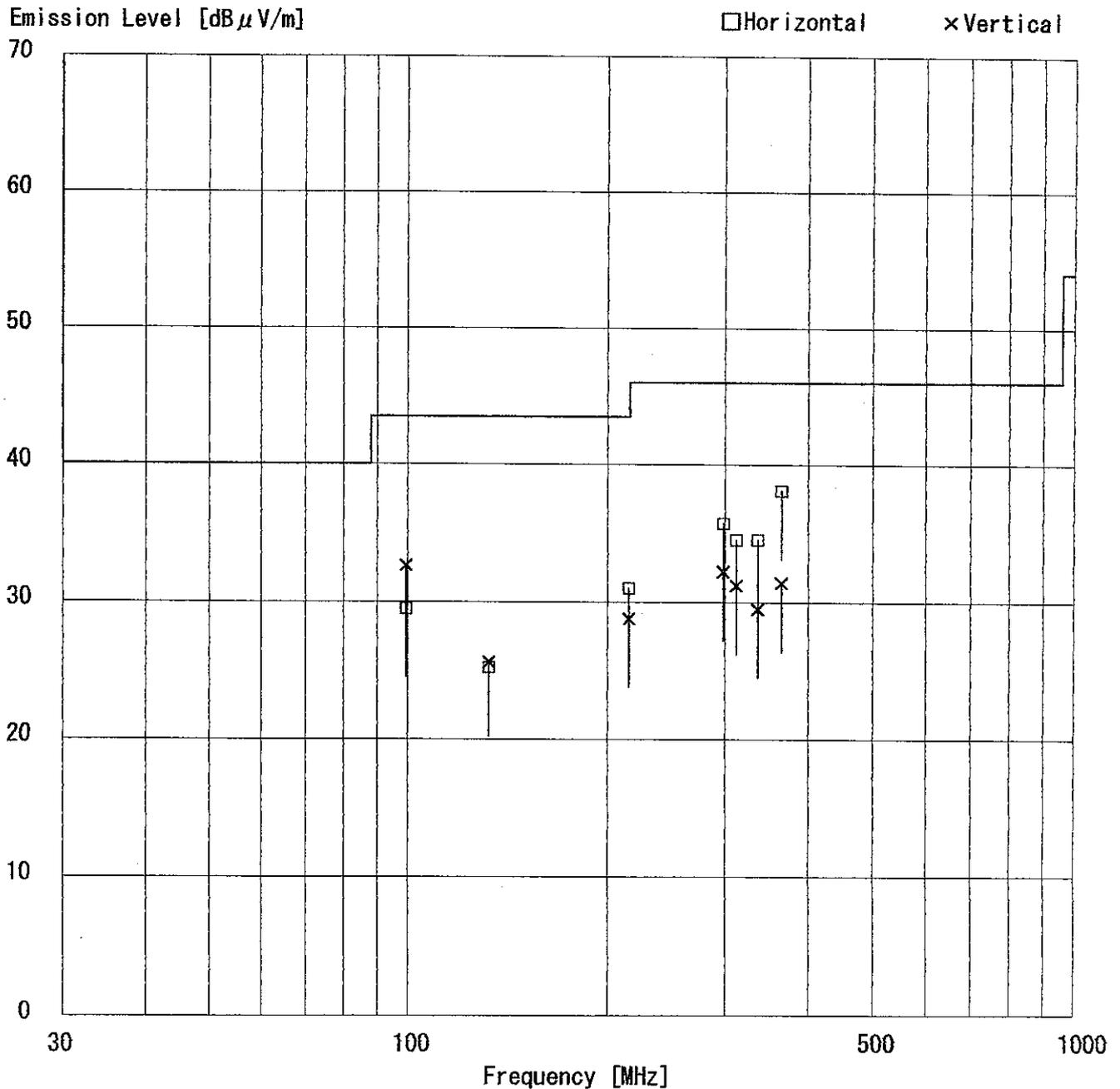
DATA OF RADIATION TEST

A-PEX INTERNATIONAL CO., LTD.
 Yamakita No.1 Open Test Site
 Report No. : 22JE0004-YK-1

Applicant : Sony Corporation
 Kind of Equipment : Bluetooth Module
 Model No. : PEGA-MSB1
 Serial No. : MSBT020625
 Power : DC3.3V
 Mode : Transmitting(High ch)
 Remarks : FCC ID:AK8PEGAMSB1
 Date : 6/26/2002
 Test Distance : 3 m
 Temperature : 19 °C
 Humidity : 70 %
 Regulation : FCC Part15C § 15.209

T. Imamura

 Engineer : Toyokazu Imamura



DATA OF RADIATION TEST

A-PEX INTERNATIONAL CO., LTD.
Yamakita No.1 Open Test Site
Report No. : 22JE0004-YK-1

Applicant : Sony Corporation
Kind of Equipment : Bluetooth Module
Model No. : PEGA-MSB1
Serial No. : MSBT020625
Power : DC3.3V
Mode : Receiving
Remarks : FCC ID:AK8PEGAMSB1
Date : 6/26/2002
Test Distance : 3 m
Temperature : 19 °C
Humidity : 70 %
Regulation : FCC Part15C §15.209


Engineer : Toyokazu Imamura

No.	FREQ. [MHz]	ANT TYPE	READING		ANT FACTOR [dB/m]	AMP GAIN [dB]	CABLE LOSS [dB]	ATTEN. [dB]	RESULT		LIMITS		MARGIN	
			HOR [dB μV]	VER [dB μV]					HOR [dB μV/m]	VER [dB μV/m]	HOR [dB]	VER [dB]		
1.	99.48	BB	39.2	41.8	9.9	28.4	2.5	6.1	29.3	31.9	43.5	14.2	11.6	
2.	132.64	BB	31.0	30.7	13.9	28.5	2.9	6.1	25.4	25.1	43.5	18.1	18.4	
3.	215.29	BB	33.2	29.6	16.8	28.1	3.9	6.1	31.9	28.3	43.5	11.6	15.2	
4.	298.37	BB	32.8	28.3	20.2	27.8	5.4	6.1	36.7	32.2	46.0	9.3	13.8	
5.	312.00	BB	35.4	31.9	15.4	27.9	5.4	6.1	34.4	30.9	46.0	11.6	15.1	
6.	336.02	BB	34.9	31.3	15.9	28.1	5.4	6.1	34.2	30.6	46.0	11.8	15.4	
7.	364.81	BB	37.5	35.2	16.5	28.3	5.4	6.1	37.2	34.9	46.0	8.8	11.1	

CALCULATION: $READING[dB \mu V] + ANT. FACTOR[dB/m] + CABLE LOSS[dB] - AMP. GAIN[dB] + ATTEN[dB]$.

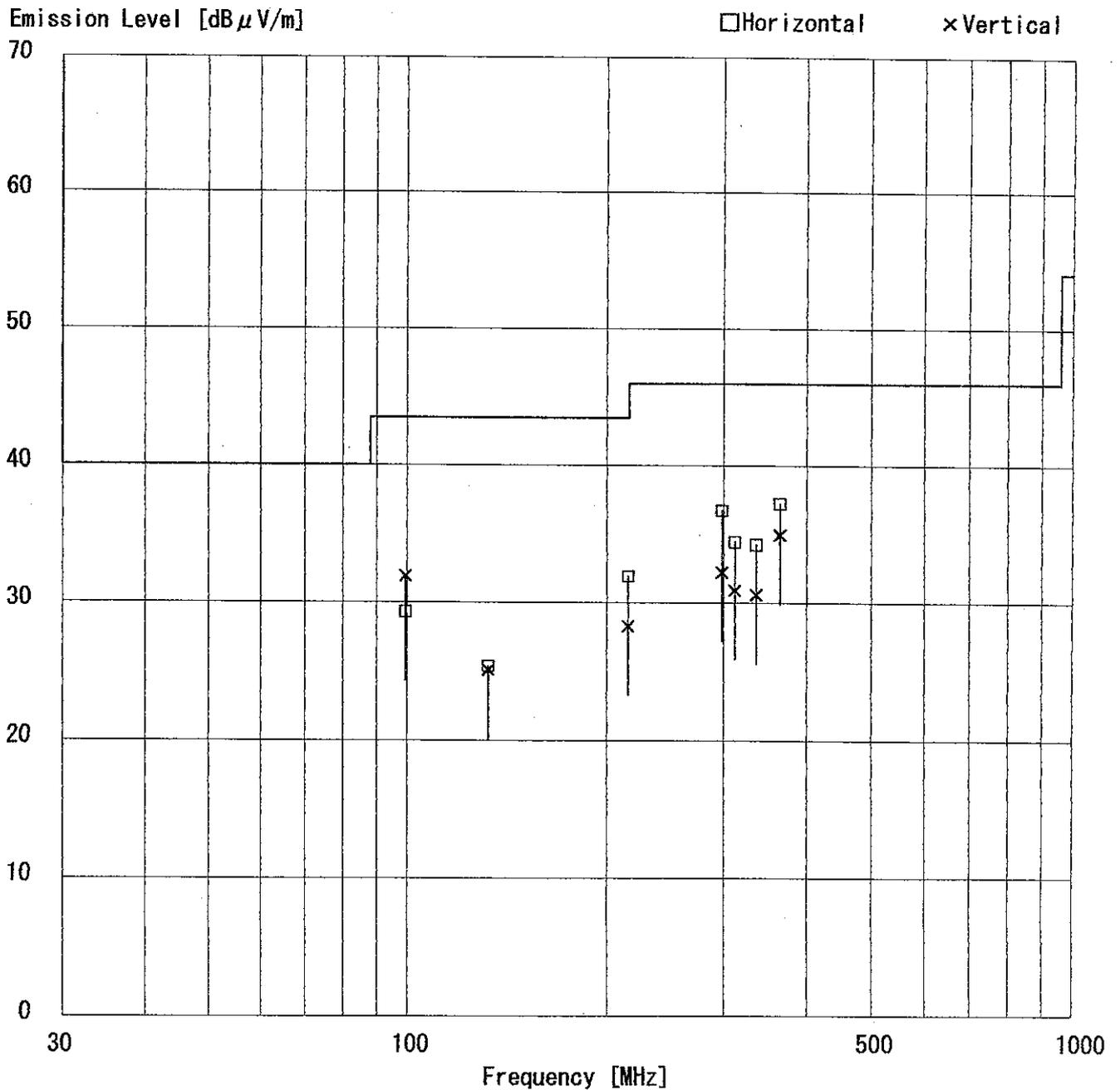
■ ANTENNA: KBA-01 (BBA9106) 30-299.99MHz/KLA-01 (USLP9143) 300-1000MHz
■ CABLE: KCC-10/11/12/13/18 ■ PREAMP: KAF-01 (8447D) ■ EMI RECEIVER: KTR-02 (ESCS30)

DATA OF RADIATION TEST

A-PEX INTERNATIONAL CO., LTD.
Yamakita No.1 Open Test Site
Report No. : 22JE0004-YK-1

Applicant : Sony Corporation
 Kind of Equipment : Bluetooth Module
 Model No. : PEGA-MSB1
 Serial No. : MSBT020625
 Power : DC3.3V
 Mode : Receiving
 Remarks : FCC ID:AK8PEGAMSB1
 Date : 6/26/2002
 Test Distance : 3 m
 Temperature : 19 °C
 Humidity : 70 %
 Regulation : FCC Part15C § 15.209

Engineer : Toyokazu Imamura



DATA OF SUPURIOUS EMISSIONS(1GHz to 26GHz)

A-PEX INTERNATIONAL CO., LTD.
YAMAKITA NO.1 OPEN SITE

COMPANY : SONY Corporation
EQUIPMENT : Bluetooth Module
MODEL : PEGA-MSB1
S/N : MSBT020625
FCC ID : AK8PEGAMSB1
POWER : DC3.3V
Mode : Transmitting (Low Ch)

REPORT NO : 22JE0004-YK-1
REGULATION : Fcc Part15SubpartC 247(b)(1)
TEST DISTANCE : 1m(10-26GHz)/3m(1-10GHz)
DATE : 2002/6/26
Temperature : 19degrees centigrade
Humidity : 70%


ENGINEER : Toyokazu Imamura

PK DETECT(S/A : RBW 1MHz and VBW 1MHz)

No.	FREQ [GHz]	S/A READING		ANT Factor [dB]	AMP GAIN [dB]	CABLE LOSS [dB]	H-Pass Filter [dB]	ATTEN [dB]	RESULT		Limit PK [dBuV/m]	MARGIN	
		HOR [dBuV]	VER [dBuV]						HOR [dB]	VER [dB]			
Test distance 3meters RESULT=Reading + ANT Factor - Amp Gain + CABLE LOSS + (High Pass or ATTEN).													
1	2.39000	44.4	44.9	29.7	36.7	2.4	0.0	10.0	49.8	50.3	74.0	24.2	23.7
2	4.79802	44.4	45.6	32.9	37.1	3.5	0.9	0.0	44.6	45.8	74.0	29.4	28.2
3	4.80400	44.7	45.2	32.9	37.1	3.5	0.9	0.0	44.9	45.4	74.0	29.1	28.6
4	7.20600	45.2	45.0	37.9	37.0	4.2	0.6	0.0	50.9	50.7	74.0	23.1	23.3
5	9.60800	45.3	44.9	39.6	37.0	5.2	0.9	0.0	54.0	53.6	74.0	20.0	20.4
6	12.01000	44.8	44.9	42.3	36.1	5.6	0.5	0.0	57.1	57.2	74.0	17.0	16.8
7	14.41200	44.8	44.6	40.8	35.1	6.3	0.9	0.0	57.7	57.5	74.0	16.4	16.5
8	16.81400	45.0	45.0	40.5	34.9	6.5	1.2	0.0	58.3	58.3	74.0	15.7	15.7
9	19.21600	45.6	44.6	41.3	34.8	7.2	0.0	0.0	59.3	58.3	74.0	14.7	15.7
10	21.61800	45.2	45.2	41.3	34.9	7.5	0.0	0.0	59.1	59.1	74.0	14.9	14.9
11	24.02000	45.3	45.3	40.5	34.6	8.1	0.0	0.0	59.3	59.3	74.0	14.7	14.7

AV DETECT(S/A : RBW 1MHz and VBW 10Hz)

No.	FREQ [GHz]	S/A READING		ANT Factor [dB]	AMP GAIN [dB]	CABLE LOSS [dB]	H-Pass Filter [dB]	ATTEN [dB]	RESULT		Limit AV [dBuV/m]	MARGIN	
		HOR [dBuV]	VER [dBuV]						HOR [dB]	VER [dB]			
Test distance 3meters RESULT=Reading + ANT Factor - Amp Gain + CABLE LOSS + (High Pass or ATTEN).													
1	2.39000	31.8	31.8	29.7	36.7	2.4	0.0	10.0	37.2	37.2	54.0	16.8	16.8
2	4.80400	30.8	31.4	32.9	37.1	3.5	0.9	0.0	31.0	31.6	54.0	23.0	22.4
3	4.79802	31.2	32.8	32.9	37.1	3.5	0.9	0.0	31.4	33.0	54.0	22.6	21.0
4	7.20600	32.8	32.8	37.9	37.0	4.2	0.6	0.0	38.5	38.5	54.0	15.5	15.6
5	9.60800	32.6	32.6	39.6	37.0	5.2	0.9	0.0	41.3	41.3	54.0	12.7	12.7
6	12.01000	32.5	32.6	42.3	36.1	5.6	0.5	0.0	44.8	44.9	54.0	9.2	9.1
7	14.41200	32.0	32.0	40.8	35.1	6.3	0.9	0.0	44.9	44.9	54.0	9.1	9.1
8	16.81400	32.2	32.2	40.5	34.9	6.5	1.2	0.0	45.5	45.5	54.0	8.5	8.5
9	19.21600	32.3	32.2	41.3	34.8	7.2	0.0	0.0	46.0	45.9	54.0	8.1	8.1
10	21.61800	32.7	32.7	41.3	34.9	7.5	0.0	0.0	46.6	46.6	54.0	7.4	7.5
11	24.02000	32.9	32.8	40.5	34.6	8.1	0.0	0.0	46.9	46.8	54.0	7.1	7.2

*Except for the above table : All other spurious emissions were less than 20dB for the limit.

DATA OF SUPURIOUS EMISSIONS(1GHz to 26GHz)

A-PEX INTERNATIONAL CO., LTD.
YAMAKITA NO.1 OPEN SITE

COMPANY : SONY Corporation
EQUIPMENT : Bluetooth Module
MODEL : PEGA-MSB1
S/N : MSBT020625
FCC ID : AK8PEGAMSB1
POWER : DC3.3V
Mode : Transmitting (High Ch)

REPORT NO : 22JB0004-YK-1
REGULATION : Fcc Part15SubpartC 247(b)(1)
TEST DISTANCE : 1m(10-26GHz)/3m(1-10GHz)
DATE : 2002/6/26
Temperature : 19degrees centigrade
Humidity : 70%


ENGINEER : Toyokazu Imamura

PK DETECT(S/A : RBW 1MHz and VBW 1MHz)

No.	FREQ [GHz]	S/A READING		ANT Factor [dB]	AMP GAIN [dB]	CABLE LOSS [dB]	H-Pass Filter [dB]	ATTEN [dB]	RESULT		Limit PK [dBuV/m]	MARGIN	
		HOR [dBuV]	VER [dBuV]						HOR [dBuV/m]	VER [dBuV/m]		HOR [dB]	VER [dB]
Test distance 3meters RESULT=Reading + ANT Factor - Amp Gain + CABLE LOSS + (High Pass or ATTEN).													
1	2.48350	43.4	46.2	30.1	36.7	2.4	0.0	10.0	49.2	52.0	74.0	24.8	22.0
2	4.95400	43.6	43.5	33.1	36.8	3.5	1.0	0.0	44.4	44.3	74.0	29.6	29.7
3	4.96000	45.4	45.2	33.1	36.8	3.5	1.0	0.0	46.2	46.0	74.0	27.8	28.0
4	7.44000	44.6	44.6	38.1	36.9	4.3	0.5	0.0	50.6	50.6	74.0	23.4	23.4
5	9.92000	44.4	44.8	39.8	39.8	5.4	1.1	0.0	50.9	51.3	74.0	23.1	22.8
6	12.40000	44.1	44.5	41.4	35.6	5.7	0.6	0.0	56.2	56.6	74.0	17.8	17.4
7	14.88000	45.0	44.8	41.3	35.5	6.5	0.9	0.0	58.2	58.0	74.0	15.8	16.1
8	17.36000	44.8	44.4	40.8	34.9	6.7	0.9	0.0	58.3	57.9	74.0	15.8	16.1
9	19.84000	44.8	44.9	40.9	35.3	7.5	0.0	0.0	57.9	58.0	74.0	16.2	16.0
10	22.32000	45.7	45.3	41.4	35.3	7.2	0.0	0.0	59.0	58.6	74.0	15.0	15.4
11	24.80000	45.0	45.2	40.8	34.2	8.3	0.0	0.0	59.9	60.1	74.0	14.1	13.9

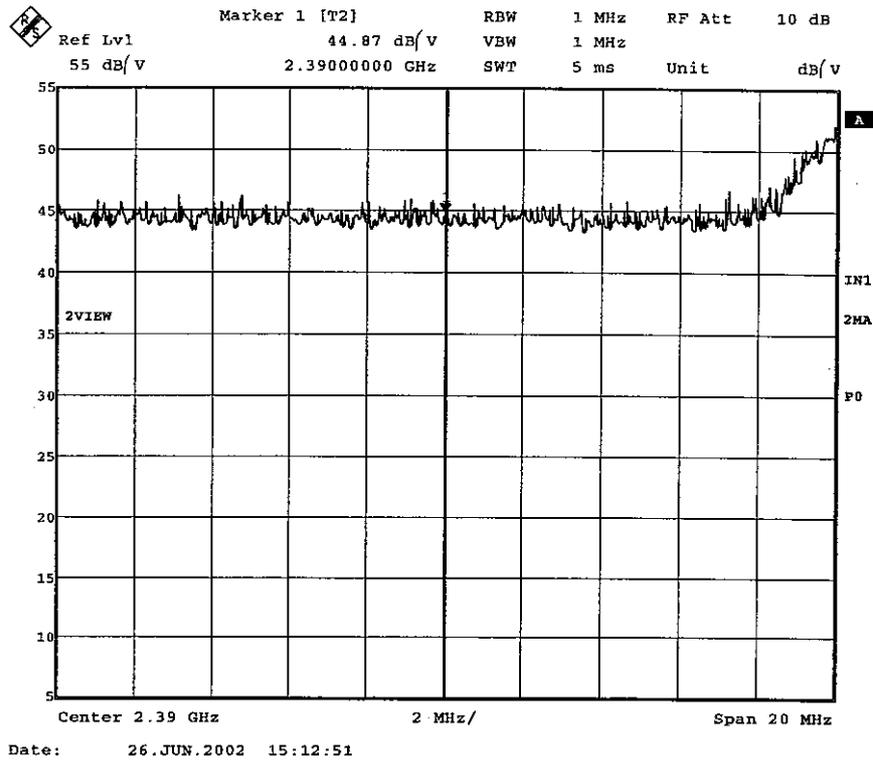
AV DETECT(S/A : RBW 1MHz and VBW 10Hz)

No.	FREQ [GHz]	S/A READING		ANT Factor [dB]	AMP GAIN [dB]	CABLE LOSS [dB]	H-Pass Filter [dB]	ATTEN [dB]	RESULT		Limit AV [dBuV/m]	MARGIN	
		HOR [dBuV]	VER [dBuV]						HOR [dBuV/m]	VER [dBuV/m]		HOR [dB]	VER [dB]
Test distance 3meters RESULT=Reading + ANT Factor - Amp Gain + CABLE LOSS + (High Pass or ATTEN).													
1	2.48350	30.9	31.1	30.1	36.7	2.4	0.0	10.0	36.7	36.9	54.0	17.4	17.1
2	4.95400	30.1	29.9	33.1	36.8	3.5	1.0	0.0	30.9	30.7	54.0	23.1	23.3
3	4.96000	36.1	35.7	33.1	36.8	3.5	1.0	0.0	36.9	36.5	54.0	17.1	17.5
4	7.44000	32.1	32.1	38.1	36.9	4.3	0.5	0.0	38.1	38.1	54.0	15.9	15.9
5	9.92000	32.1	32.1	39.8	39.8	5.4	1.1	0.0	38.6	38.6	54.0	15.4	15.4
6	12.40000	31.6	31.5	41.4	35.6	5.7	0.6	0.0	43.7	43.6	54.0	10.3	10.4
7	14.88000	32.3	32.3	41.3	35.5	6.5	0.9	0.0	45.5	45.5	54.0	8.5	8.5
8	17.36000	32.0	31.9	40.8	34.9	6.7	0.9	0.0	45.5	45.4	54.0	8.5	8.6
9	19.84000	31.9	32.3	40.9	35.3	7.5	0.0	0.0	45.0	45.4	54.0	9.1	8.6
10	22.32000	32.9	32.8	41.4	35.3	7.2	0.0	0.0	46.2	46.1	54.0	7.8	7.9
11	24.80000	32.0	32.1	40.8	34.2	8.3	0.0	0.0	46.9	47.0	54.0	7.2	7.0

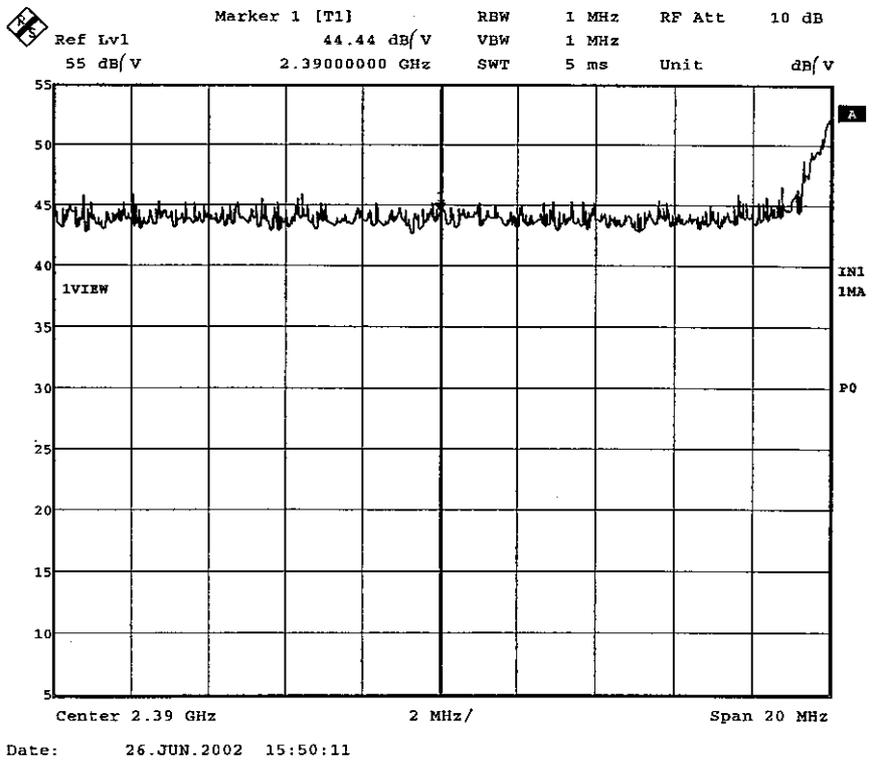
*Except for the above table : All other spurious emissions were less than 20dB for the limit.

2.39GHz (Ch Low)

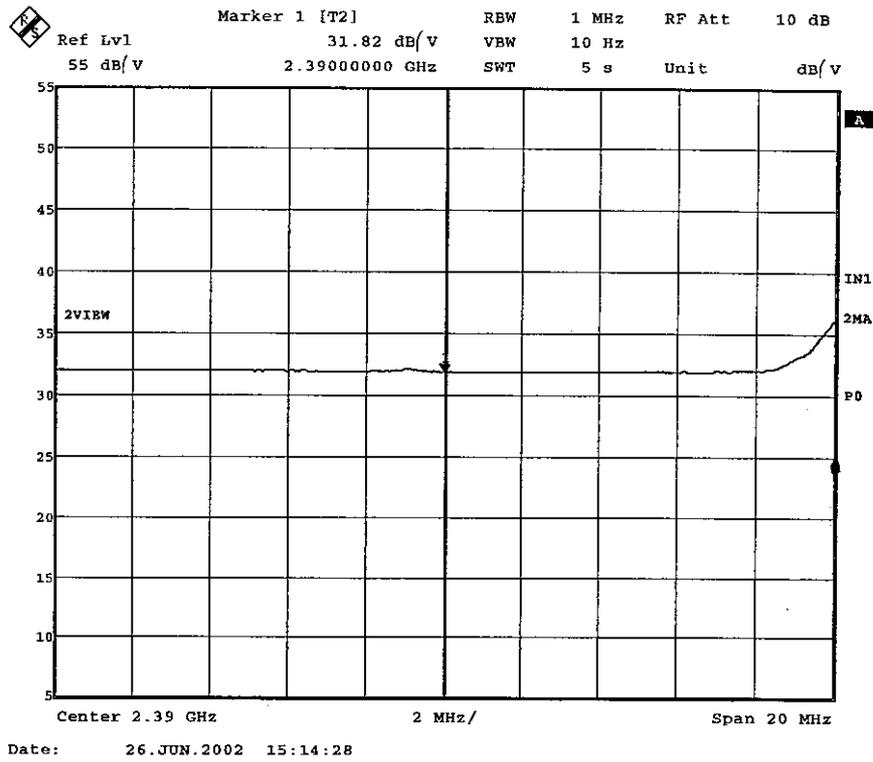
1. Horizontal/PK



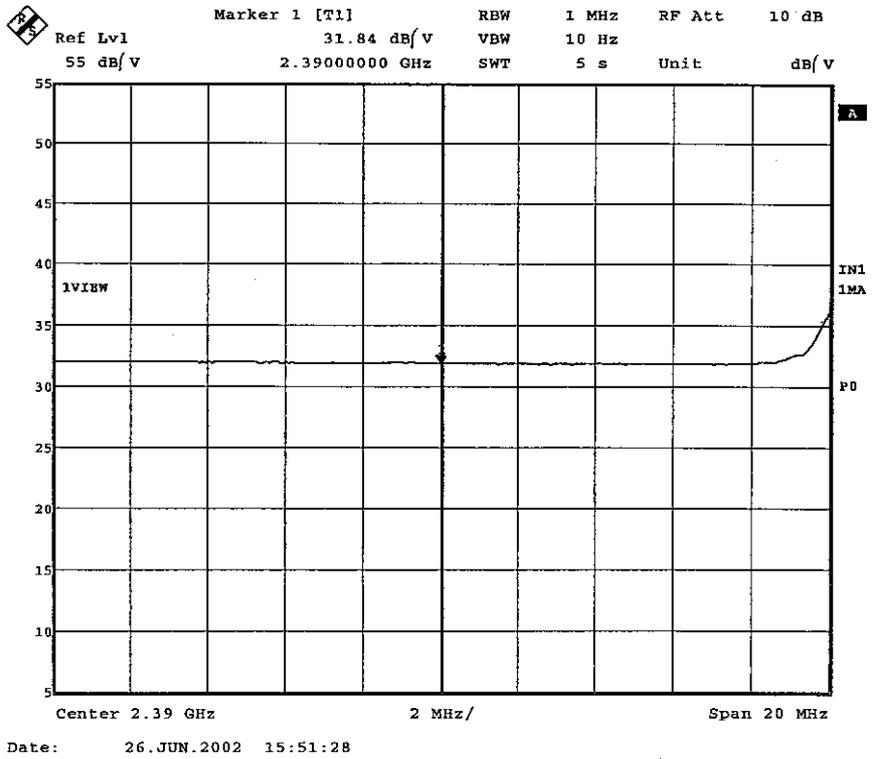
2. Vertical/PK



3. Horizontal/AV

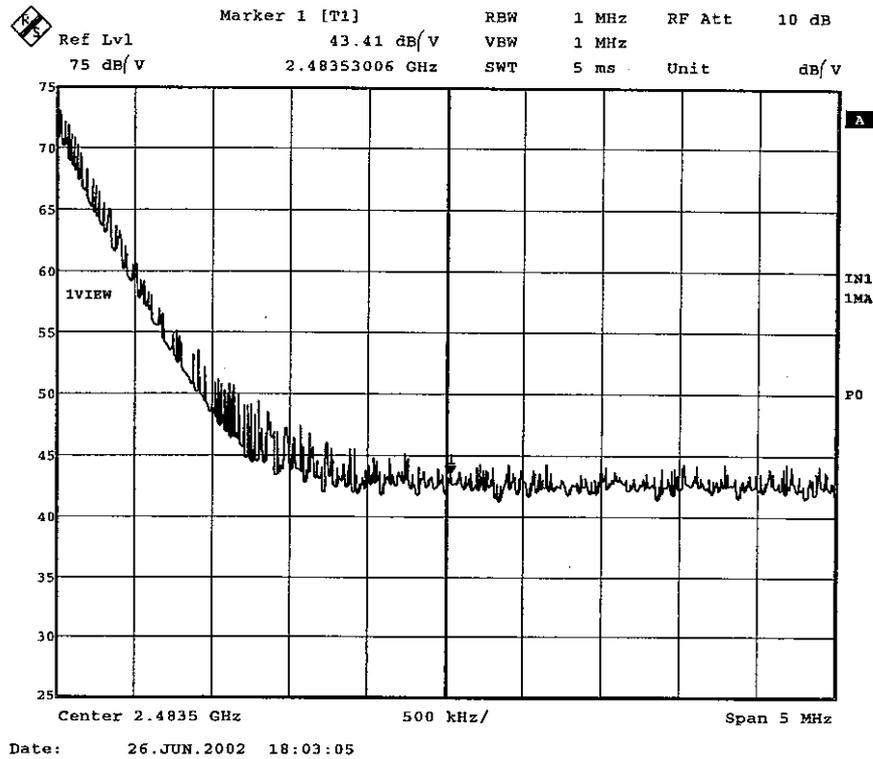


4. Vertical/AV

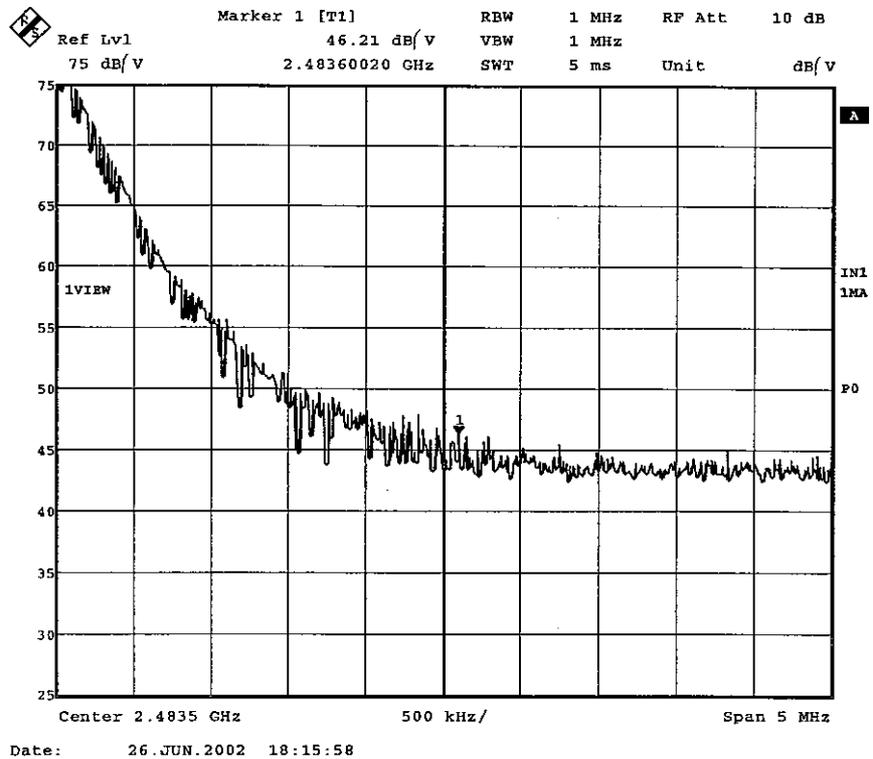


2.4835GHz (Ch High)

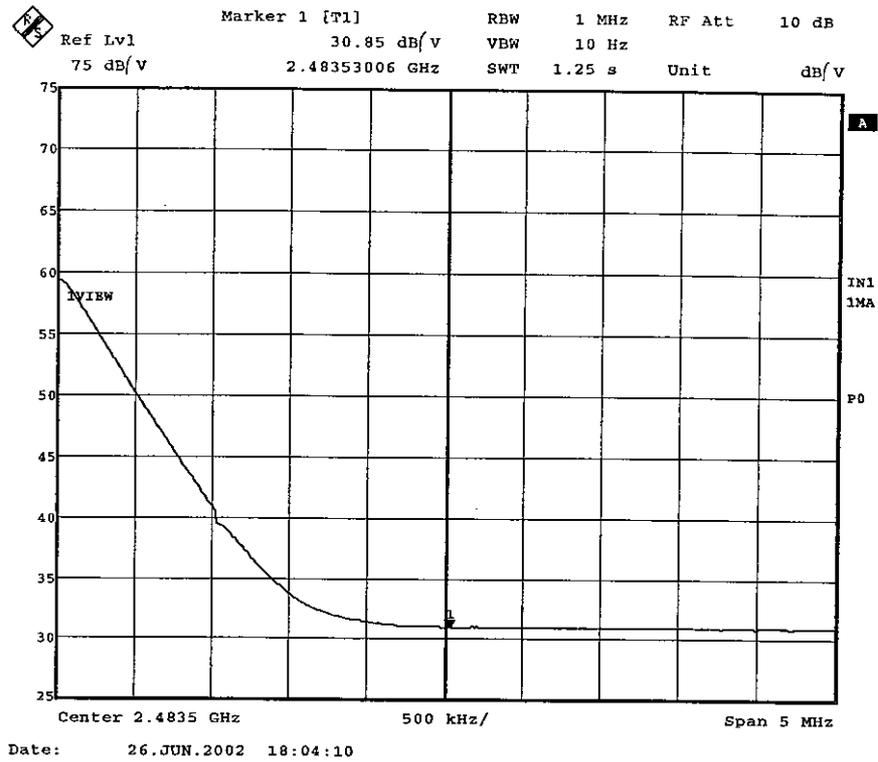
1. Horizontal/PK



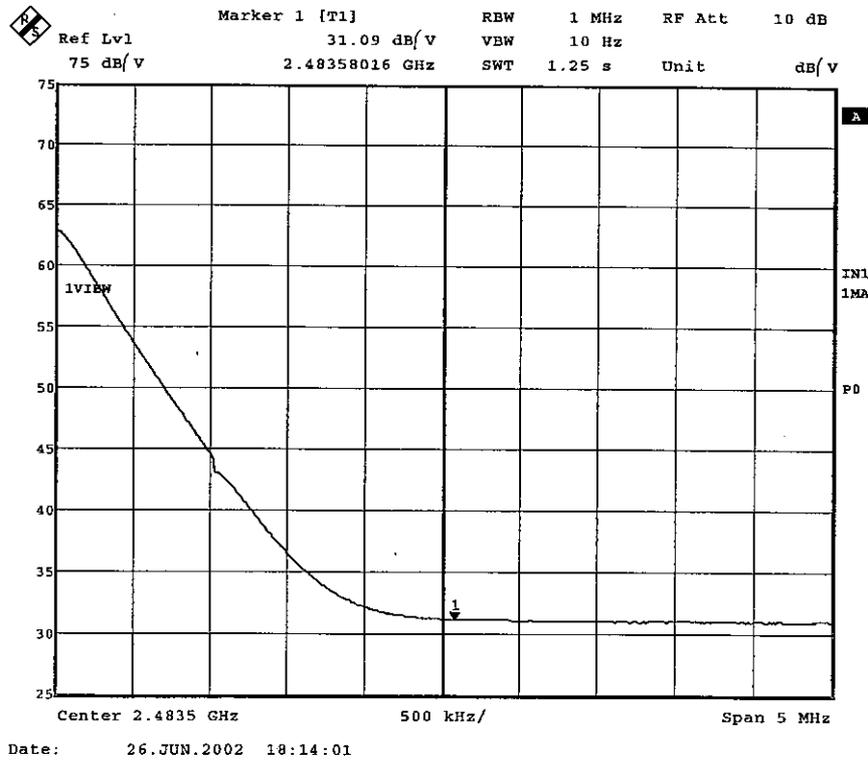
2. Vertical/PK



3. Horizontal/ AV

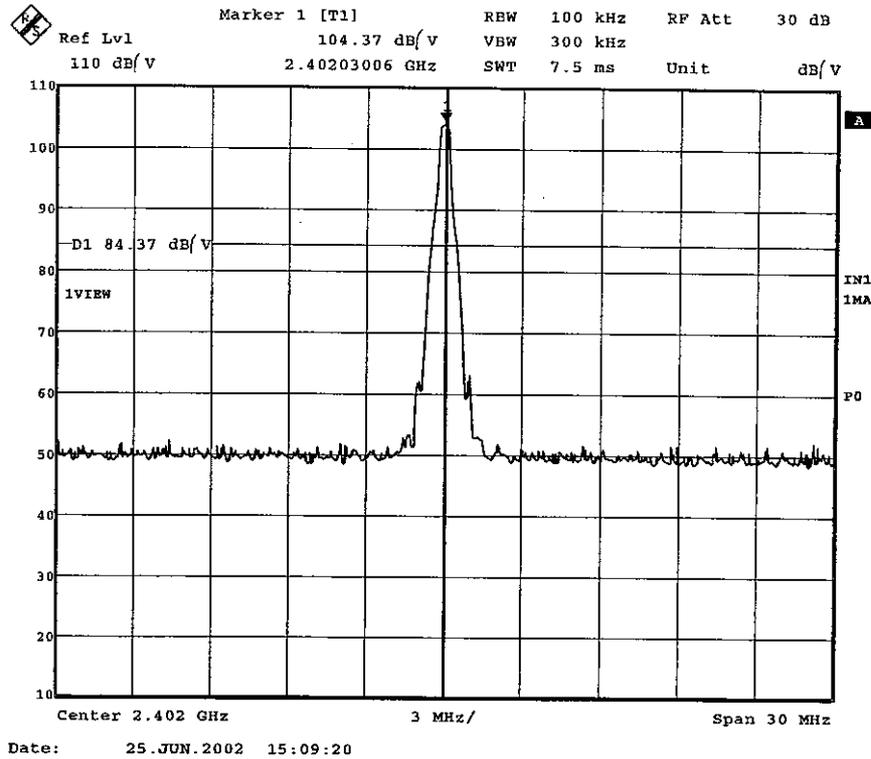


4. Vertical/ AV

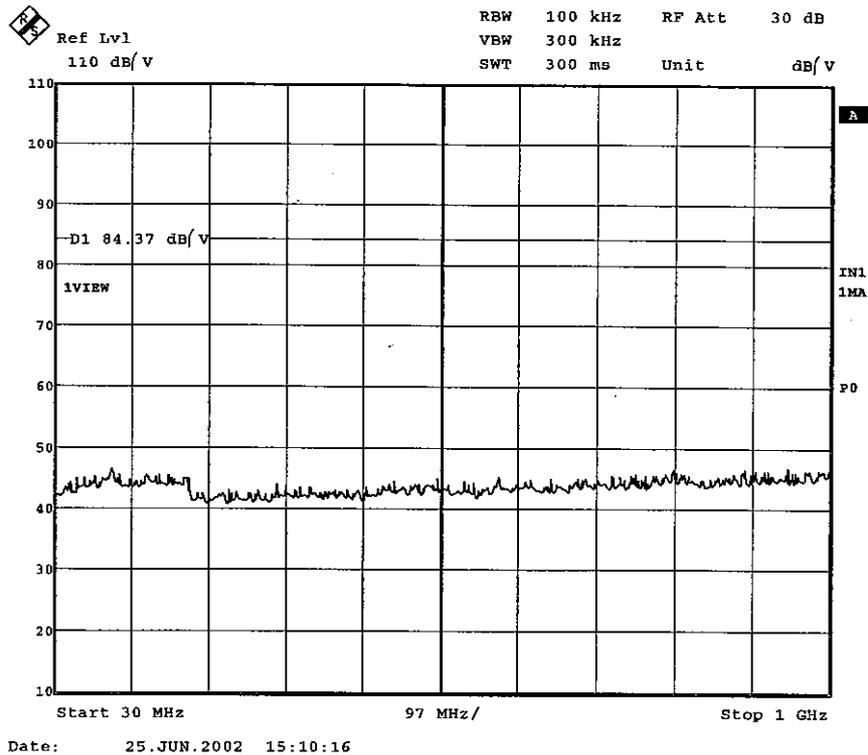


Ch Low: 2402MHz

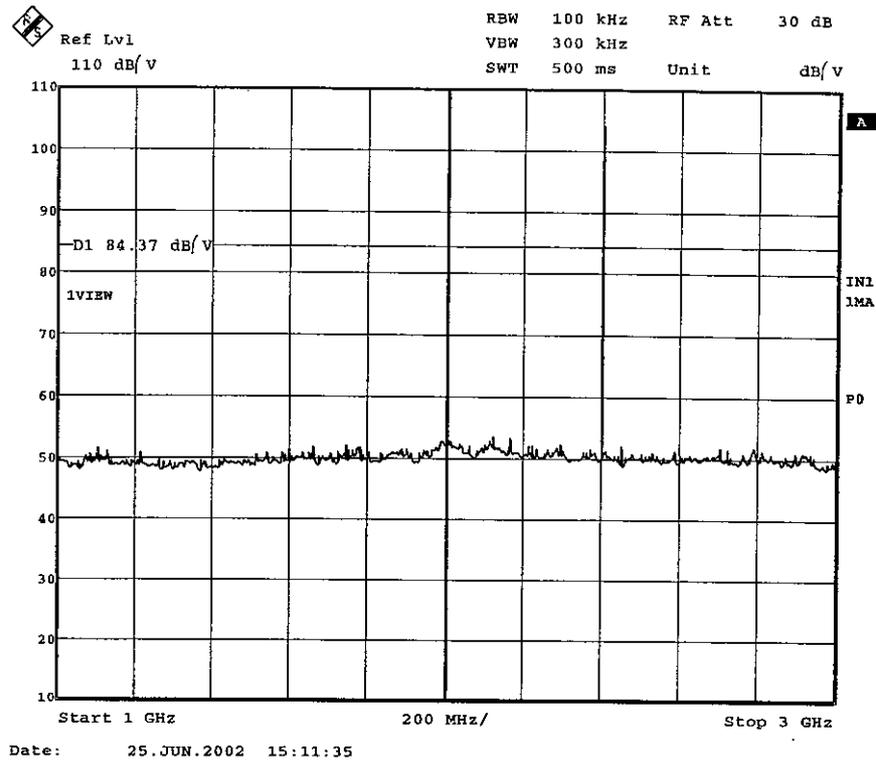
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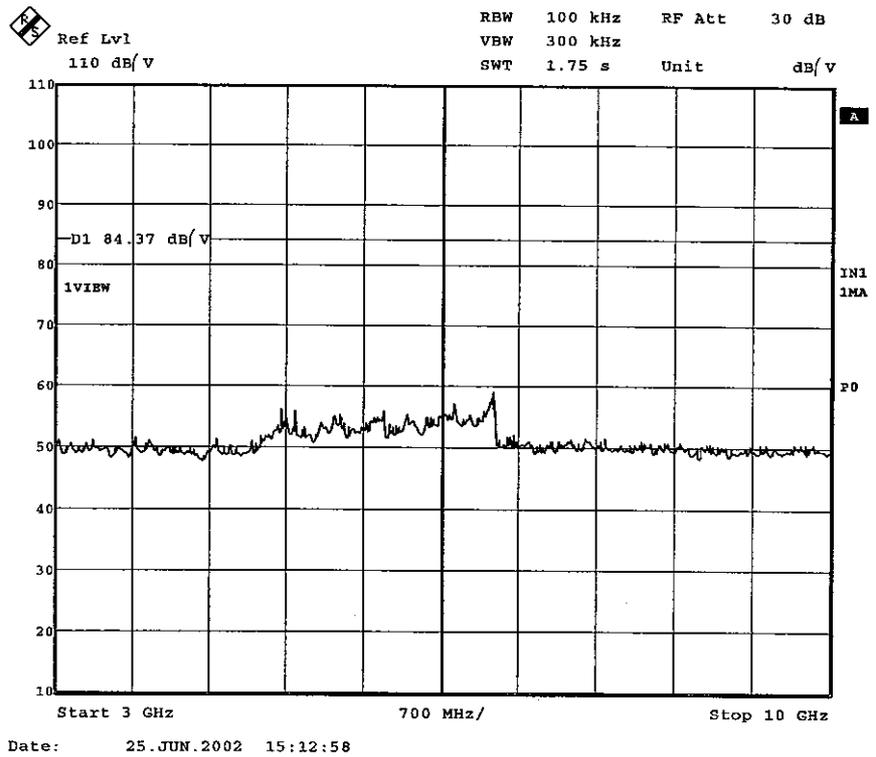
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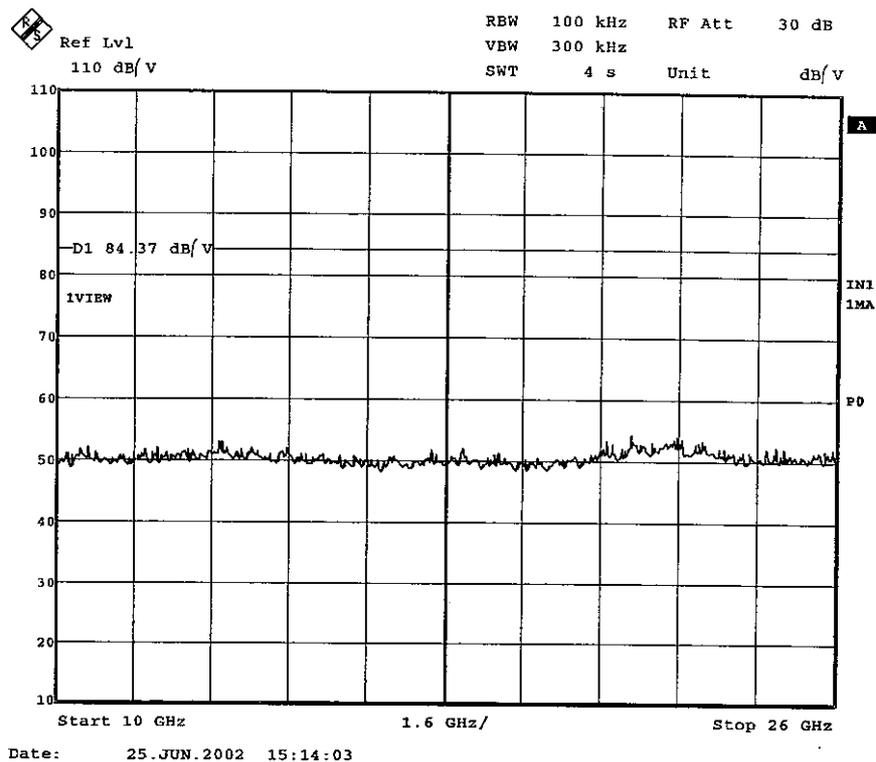
3.



4.

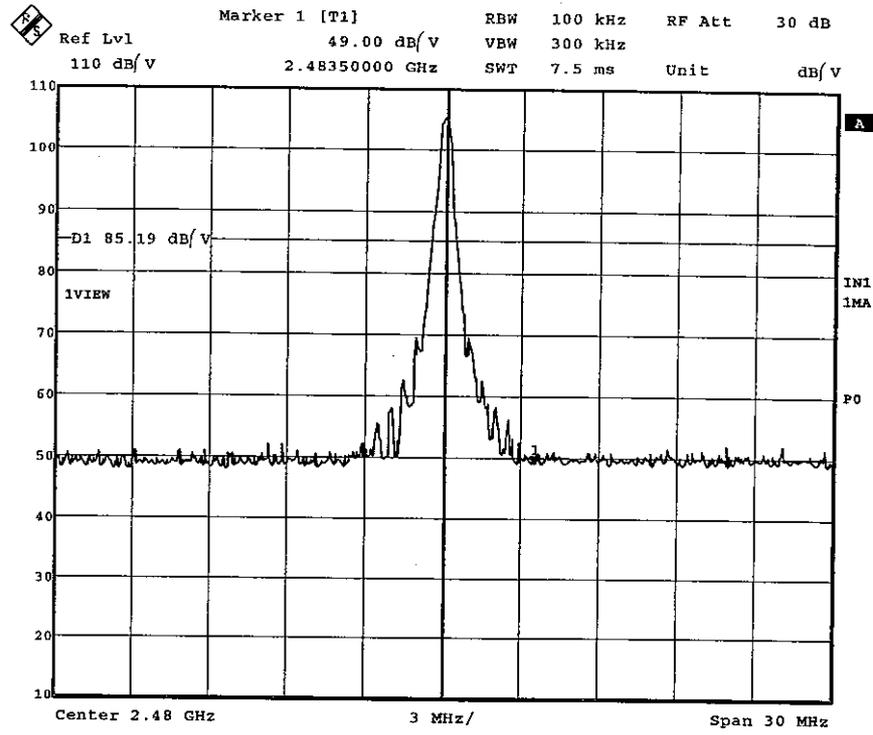


5.



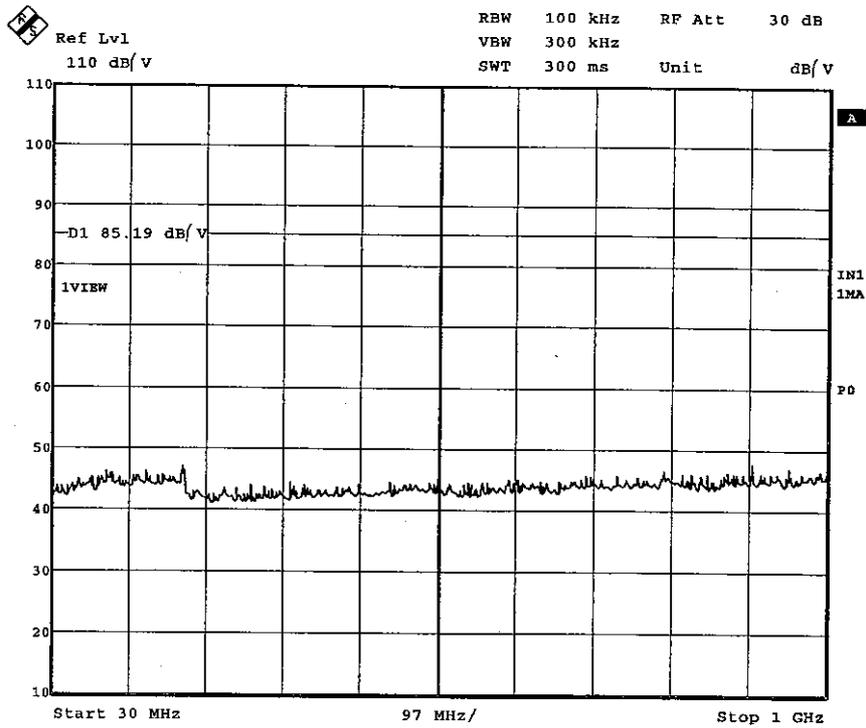
Ch High: 2480MHz

1.



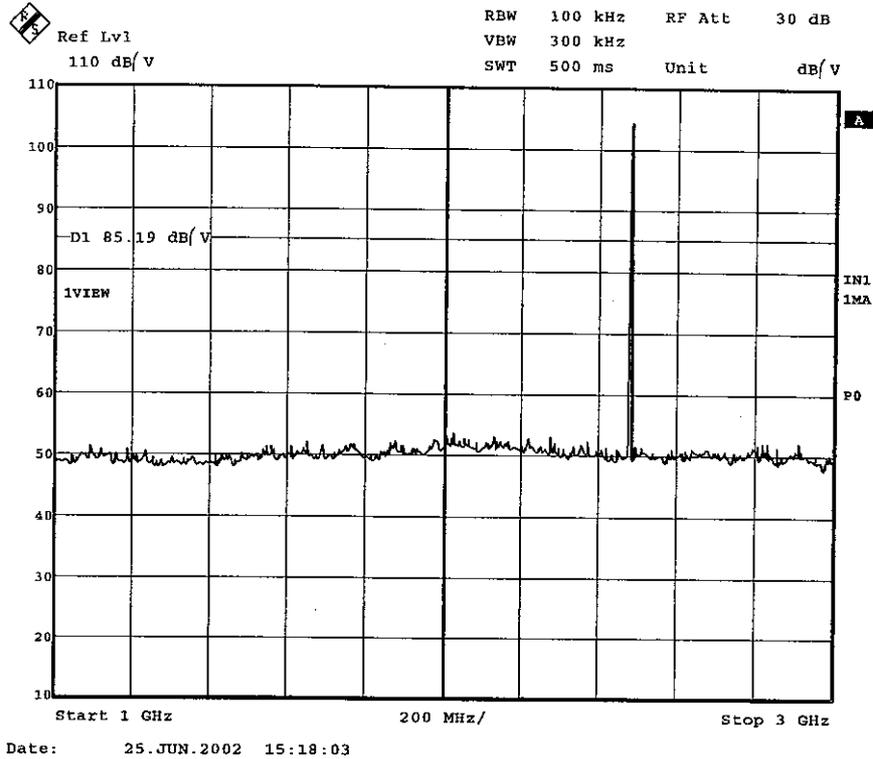
Date: 25.JUN.2002 15:16:10

2.

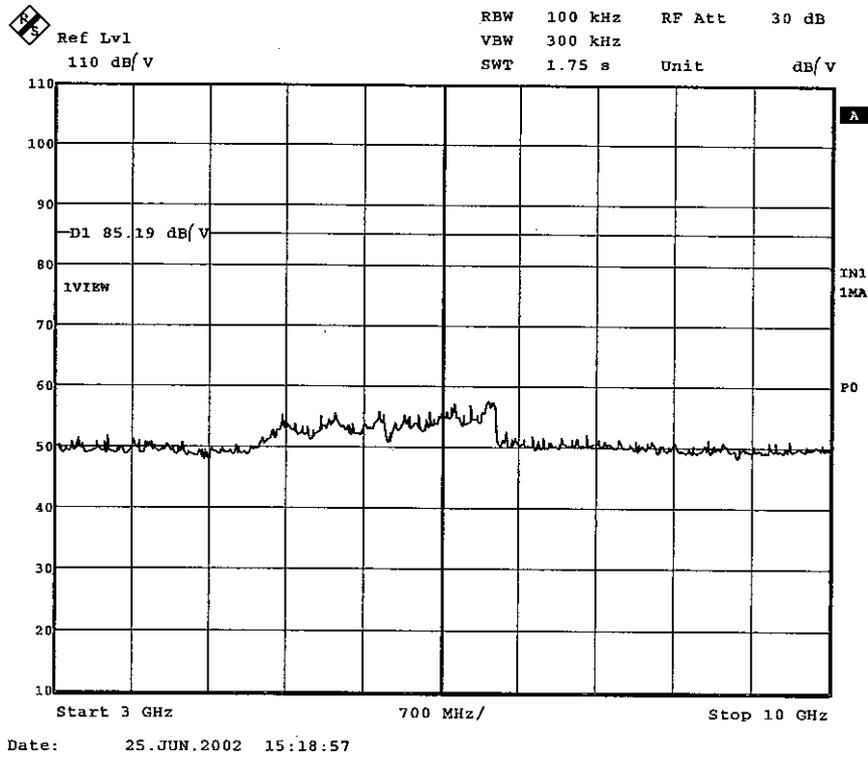


Date: 25.JUN.2002 15:17:25

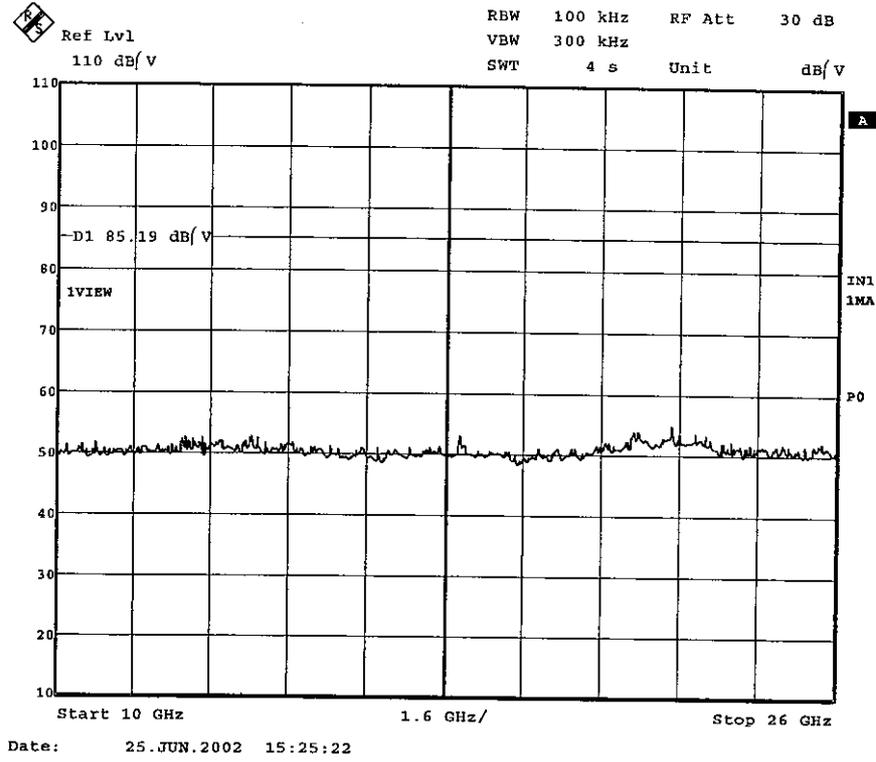
3.



4.



5.



Test Report No : 22JE0004-YK-1

APPENDIX 3 Test Instruments

EMI test equipment

Control No.	Instrument	Manufacturer	Model No	Test Item	Calibration Date * Interval(month)
KAF-01	Pre Amplifier	Hewlett Packard	8447D	RE	2001/08/25 * 12
KAT6-01	Attenuator	INMET	18N-6dB	RE	2002/06/20 * 12
KBA-01	Biconical Antenna	Schwarzbeck	BBA9106	RE	2001/08/31 * 12
KCC-10/11/12/13/18	Coaxial Cable	Fujikura/Suhner	8D-2W/12D-SFA/S04272B/S04272B/S04272B	RE	2001/09/05 * 12
KCC-14/15/16/18/KPL-01	Coaxial Cable/Pulse Limitter	Fujikura/Suhner/PMM	5D-2W/8D-2W/S04272B/S04272B/PL01	CE	2001/09/05 * 12
KCC-D3	Coaxial Cable	Rosenberger	2201	RE	2002/06/28 * 12
KHA-01	Horn Antenna	A.H.Systems	SAS-200/571	RE	2001/07/07 * 12
KLS-01	LISN	Schwarzbeck	NSLK8126	CE(EUT)	2001/09/04 * 12
KLS-02	LISN	Schwarzbeck	NSLK8127	CE(AE)	2001/09/04 * 12
KOTS-01	Open Test Site	JSE	30m	RE	2001/08/27 * 12
KSA-01	Spectrum Analyzer	Advantest	R3365	RE/CE	2002/06/20 * 12
KTR-01	Test Receiver	Rohde & Schwarz	ESI40	AT/RE	2001/08/01 * 12
KTR-02	Test Receiver	Rohde & Schwarz	ESCS30	RE/CE	2001/12/17 * 12
KCC-D5	Coaxial Cable	Storm	421-011(2m)	AT	2002/04/16 * 12
KPM-05	Power meter	Agilent	E4417A	AT	2002/02/15 * 12
KPSS-01	Power sensor	Agilent	E9327A	AT	2002/03/12 * 12
KAT10-S1	Attenuator	Agilent	8449D 010	RE	2002/04/16 * 12
KDT-01	Coaxial Crystal Detector	Agilent	8573C	AT	2002/04/22 * 12
KLA-01	Logperiodic Antenna	Schwarzbeck	USLP9143	RE	2002/03/08 * 12
KHA-03	Horn Antenna	EMCO	3160-09	RE	2002/04/27 * 12
KST-01	Digitizing Oscilloscope	Tektronix	TDS420A	AT	2001/08/20 * 12

All equipment is calibrated with traceable calibrations. Each calibration is traceable to the national or international standards.

Test Item:

- CE: Conducted emission,
- RE: Radiated emission,
- AT: Antenna terminal conducted