TEST REPORT

Equipment Under Test	:	Bluetooth Flash Disk
Model No.	:	BT112FTT05, BT112FTT07, BT112FTT08
Applicant	:	Formosa Teletek Corporation
Address of Applicant	:	358, Huaya 2nd Rd., Gueishan shiang, Taoyuan, Taiwan, R.O.C.

Standards:

FCC Part 15 subpart C

In the configuration tested, the EUT complied with the standards specified above.

Remarks:

This report details the results of the testing carried out on one sample, the results contained in this test report do not relate to other samples of the same product. The manufacturer should ensure that all products in series production are in conformity with the product sample detailed in this report.

This report may only be reproduced and distributed in full. If the product in this report is used in any configuration other than that detailed in the report, the manufacturer must ensure the new system complies with all relevant standards. Any mention of SGS Taiwan E&E Services or testing done by SGS Taiwan E&E Services in connection with distribution or use of the product described in this report must be approved by SGS Taiwan E&E Services in writing.

Tested by	:	**Alex Hsieh**	**Date**	:	**Jun. 27, 2003**
Approved by	:	**Robert Chang**	**Date**	:	**July 2, 2003**

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1. General Information

1.1 Testing Laboratory

SGS Taiwan Ltd. (FCC Registration number: 573967)
1F, No. 134, Wukung Road, Wuku industrial zone
Taipei county , Taiwan , R.O.C.
Telephone : +886-2-2299-3279
Fax : +886-2-2298-2698
Internet : http://www.sgs.com.tw

1.2 Details of Applicant

Applicant : Formosa Teletek Corporation
Address of Applicant : 358, Huaya 2nd Rd., Gueishan shiang, Taoyuan, Taiwan, R.O.C.
Contact : Jeff Shih
Telephone : +886-3-3280800 ext. 6303

1.3 Description of EUT(s)

1	Product name	Bluetooth Flash Disk
2	Product ID	BT112FTT05, BT112FTT07, BT112FTT08
3	Supply Voltage	DC 5V from USB port
4	Carrier Frequency	2400MHz to 2483.5MHz
5	Modulation Method	GFSK,1Mbps,0.5BT Gaussian
6	Hopping	1600hops/sec, 1MHz channel space
7	Antenna Gain	1 dbi
8	Operation Temperature	-20 to +70 degree
9	Compliant	Bluetooth Specification Ver1.1

1.4 Operation Procedure

Bluetooth is a FHSS system, the output power and operating frequency of EUT are NOT End-user adjustable. The applicant provide a “Btcli.exe” software installed on PC to let EUT enter test mode, then we use Anritsu MT8850 to send Bluetooth HCI command to EUT. Let EUT hopping on and transmit at every channel with highest power. Only “output power” use conducted method, others are using radiated method. After MT8850 send the command to EUT , it can be removed , and the EUT keep hopping.

The lowest operating frequency within Bluetooth specification is 2402Mhz, and highest operating frequency is 2480Mhz. So the frequency above are used as the lowest and highest frequency in the testing, and the middle frequency is set as 2441Mhz.

Since the EUT is a bluetooth usb dongle with flash disk , the manufacturer provide 3 different memory size to test. Different model number means different memory size, BT112FTT05 is 64MB, BT112FTT07 is 128MB, BT112FTT08 is 256 MB . The circuit and PCB layout are all the same. And the memory chips are pin to pin identical. After checking the radiated spurious emission performance , we choose the 128MB dongle as the worst case, which will be used in the other test.

1.5 Testing Method

The testing standard follows CFR 47, Part 15.247 and ANSI C63.4 1992, and measurement method according to Public Notice DA00-705 (March 2000).

The Testing procedure is as following:
a. The EUT was plug in the USB port of PC and placed on the top of a rotating table 0.8 meters above the ground at a 3m chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
b. The EUT was set 3 meters away from the interference-receiving antenna.
c. The antenna is a broadband antenna, and its height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
e. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

NOTE:

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Peak detection (PK) and Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 1 MHz for Peak detection at frequency above 1GHz.
3. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 300 Hz for Average detection (AV) at frequency above 1GHz.
4. During the Output power testing, the manufacturer attach a test fixture which is a short cable that replace the antenna. So we use conducted method to measure the power. Hence the EIRP is the output power plus the antenna gain in dBi. Due to cable loss, the real value will equal to measured value(show on the instrument) add cable loss.

2.Summary of Results

subclause	Parameter to be measures	Verdict	Page
15.207	Conducted Emission	*PASS*	8
15.209	Radiated emission Limits, general requirement	*PASS*	11
15.247(a)(1)	Channel Spacing	*PASS*	18
15.247(a)(1)(ii)	20db bandwidth / No. of channels	*PASS*	20
15.247(a)(1)(ii)	Average Time of Occupacy	*PASS*	25
15.247(b)(1)	Peak Output power	*PASS*	30
15.247(c)	Band-Edge Emission	*PASS*	33
15.247(c)	Spurious Emission under 25Ghz	*PASS*	35

3. Instruments List

Instrument	Model	Serial number	Calibration date
Desktop PC	HP Pavillion 723D	N/A	N/A
Bluetooth Test set (signalling unit)	Anritsu MT8850A	6K00000302	Feb, 12, 2003
Spectrum Analyzer	Agilent E7405A	US40240202	Jun 01, 2002
Spectrum Analyzer	R&S FSP 40	100034	Mar. 27, 2003
Antenna	Schwarzbeck BBHA9170A	184/185	July 01, 2002
Antenna	Schwarzbeck BBHA9120A	309/320	July 01, 2002
Antenna	Schwarzbeck VULB9163	152	July 01, 2002
Transient Limiter	HP 11947A	3107A02062	Jul. 24, 2002
L.I.S.N	Rolf-Heine NNB-2/16Z	99012	Oct. 08, 2002
Signal generator	R&S SMR 40	100210	Feb. 11, 2003

4. Measurements

4.1 Conducted emission SUBCLAUSE 15.207

Product Name:	Bluetooth Flash Disk	Test Date:	July.2.2003
Model No.:	BT112FTT06	Report No:	EM/2003/60120
Test Mode:	Operation Mode	Tester :	Tom Chou
Test Result:	PASS	Temperature	22°C
		Humidity:	59%

Main Terminals:L

FREQ MHz	QP1 dBuV	AVG1 dBuV	Factor	QP2 dBuV	AVG 2	QP Limit	AV Limit	QP Offset	AV Offset
0.17	40.3	32.4	2.96	43.26	35.36	65.04	55.04	-21.78	-19.68
0.32	39.3	23.3	2.84	42.14	26.14	59.76	49.76	-17.62	-23.62
0.69	38.6	19.3	2.86	41.46	22.16	56.00	46.00	-14.54	-23.84
1.32	26.2	20.2	2.90	29.10	23.10	56.00	46.00	-26.90	-22.90
5.16	32.2	23.3	3.20	35.40	26.50	60.00	50.00	-24.60	-23.50
8.86	39.8	29.6	3.28	43.08	32.88	60.00	50.00	-16.92	-17.12

1." -" denotes the emission level was - 10 dB beneth the Average limit,so nothing need to re-check anymore.
2. QP1/ AVG1 value means the QP/AV reading without the factor.
3. QP2/AVG2 value means the QP/AV final reading with the factor.

Product Name:	Bluetooth Flash Disk	Test Date:	July.2.2003
Model No.:	BT112FTT06	Report No:	EM/2003/60120
Test Mode:	Operation Mode	Tester :	Tom Chou
Test Result:	PASS	Temperature	22°C
		Humidity:	59%

Main Terminals:N

FREQ MHz	QP1 dBuV	AVG1 dBuV	Factor	QP2 dBuV	AVG 2	QP Limit	AV Limit	QP Offset	AV Offset
0.16	41.1	34.5	2.98	44.08	37.48	65.5	55.52	-21.4	-18.04
0.36	38.50	27.40	2.92	41.42	30.32	58.81	48.81	-17.39	-18.49
0.95	34.70	21.30	2.81	37.51	24.11	56.00	46.00	-18.49	-21.89
1.34	30.60	25.60	2.90	33.50	28.50	56.00	46.00	-22.50	-17.50
6.59	34.90	22.90	3.23	38.13	26.13	60.00	50.00	-21.87	-23.87
8.32	40.20	23.10	3.27	43.47	26.37	60.00	50.00	-16.53	-23.63

1." -" denotes the emission level was - 10 dB beneth the Average limit,so nothing need to re-check anymore.

2. QP1/ AVG1 value means the QP/AV reading without the factor.

3. QP2/AVG2 value means the QP/AV final reading with the factor.

4.1.1 Limits (EN55022)

Frequency range Mhz	Limits dB(uV)	
	Quasi-peak	Average
0.15 to 0.5	66 to 56	56 to 46
0.5 to 5	56	46
5 to 30	60	50

4.2 Radiated emission Limits, general requirement SUBCLAUSE 15.209

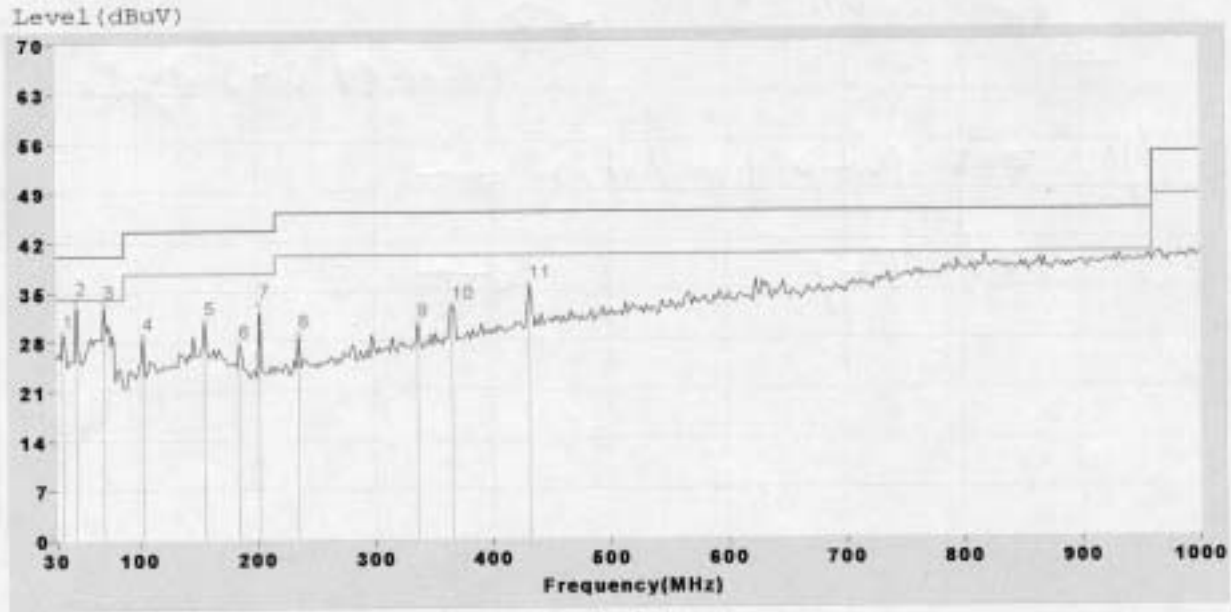
1. Transmit at 2402Mhz, The Spectrum setting : RBW=120Khz , VBW=120Khz, **Vertical**

SGS EMC Lab. Site 2

EMI TESTING REPORT

Customer:Formosa
Model :Flash dongle (2402MHz)
Spec. :
Ser. No.:
Limit :FCC_B

Date:2003-06-30 Time:13:27
Polar. :Vertical- 3M
Report No.:
File :-1
Tester :Alex
Tmp.(C):23.0 Humid.(%):59



MEMO:

	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Factor	Other Factor
	MHz	dB	dB	dB	dB	dB	dB	dB
1	35.82	29.25	-10.75	40.00	17.43	11.38	0.43	0.00
2	47.46	33.83	-6.17	40.00	21.72	11.60	0.51	0.00
3	70.74	33.30	-6.70	40.00	22.91	9.76	0.63	0.00
4	103.72	28.84	-14.66	43.50	18.60	9.49	0.75	0.00
5	156.10	30.84	-12.66	43.50	17.12	12.83	0.88	0.00
6	185.20	27.53	-15.97	43.50	15.84	10.74	0.95	0.00
7	202.66	33.24	-10.26	43.50	22.64	9.60	1.00	0.00
8	235.64	29.02	-16.98	46.00	16.98	10.96	1.08	0.00
9	336.52	30.48	-15.52	46.00	15.12	13.99	1.37	0.00
10	365.62	32.85	-13.15	46.00	16.77	14.61	1.48	0.00
11	431.58	35.78	-10.22	46.00	17.84	16.26	1.68	0.00

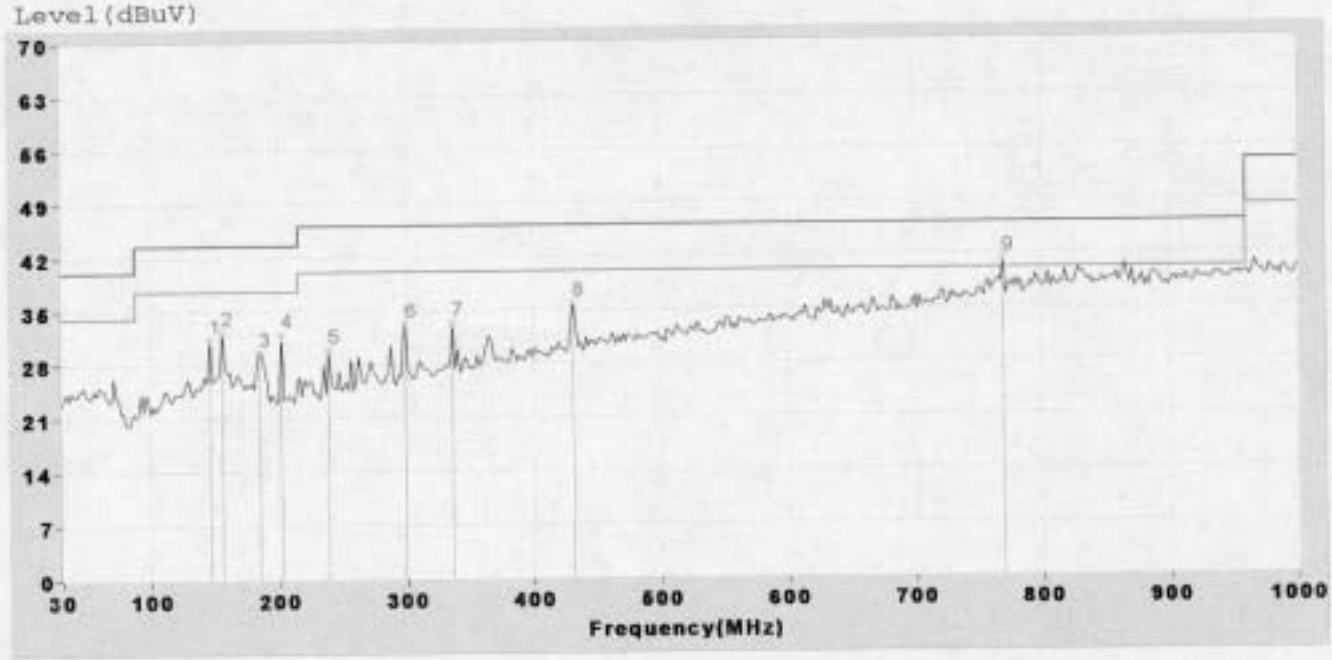
2. Transmit at 2402Mhz, The Spectrum setting : RBW=120Khz , VBW=120Khz, **Horizontal**

SGS EMC Lab. Site 2

EMI TESTING REPORT

Customer:Formosa
Model :Flash dongle (2402MHz)
Spec. :
Ser. No.:
Limit :FCC_B

Date:2003-06-30 Time:13:26
Polar. :Horizontal- 3M
Report No.:
File :-1
Tester :Alex
Tmp.(C):23.0 Humid.(%):59



MEMO:

		Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Factor	Other Factor
		MHz	dB	dB	dB	dB	dB	dB	dB
	1	146.40	31.23	-12.27	43.50	17.73	12.65	0.86	0.00
	2	156.10	32.29	-11.21	43.50	18.58	12.83	0.88	0.00
	3	185.20	29.55	-13.95	43.50	17.86	10.74	0.95	0.00
	4	202.66	31.97	-11.53	43.50	21.37	9.60	1.00	0.00
	5	239.52	29.84	-16.16	46.00	17.58	11.17	1.09	0.00
	6	299.66	33.16	-12.84	46.00	18.90	13.02	1.24	0.00
	7	336.52	33.34	-12.66	46.00	17.98	13.99	1.37	0.00
	8	431.58	35.75	-10.25	46.00	17.82	16.26	1.68	0.00
!	9	769.14	41.13	-4.87	46.00	16.63	22.12	2.37	0.00

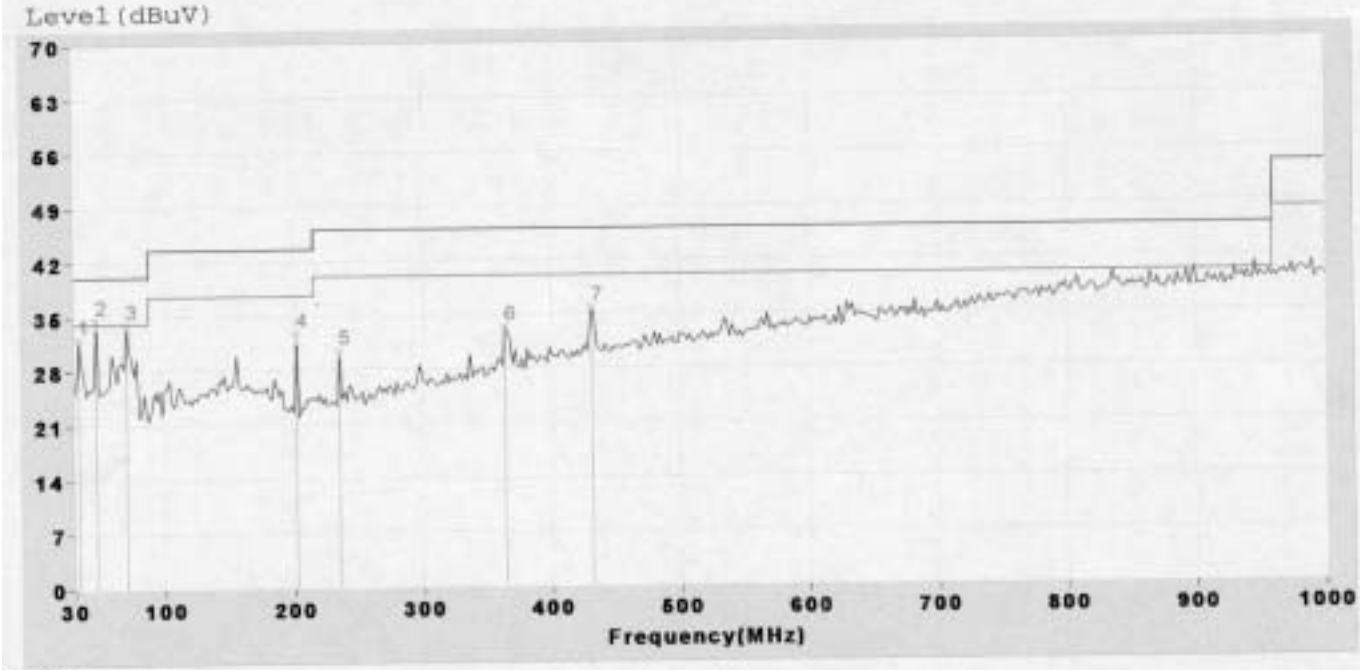
3. Transmit at 2441Mhz, The Spectrum setting : RBW=120Khz , VBW=120Khz, **Vertical**

SGS EMC Lab. Site 2

EMI TESTING REPORT

Customer:Formosa
Model :Flash dongle (2441MHz)
Spec. :
Ser. No.:
Limit :FCC_B

Date:2003-06-30 Time:13:31
Polar. :Vertical- 3M
Report No.:
File :-1
Tester :Alex
Tmp.(C):23.0 Humid.(%):59



MEMO:

		Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Factor	Other Factor
		MHz	dB	dB	dB	dB	dB	dB	dB
	1	33.88	32.06	-7.94	40.00	20.38	11.26	0.41	0.00
!	2	47.46	34.49	-5.51	40.00	22.39	11.60	0.51	0.00
	3	70.74	33.91	-6.09	40.00	23.51	9.76	0.63	0.00
	4	202.66	32.69	-10.81	43.50	22.09	9.60	1.00	0.00
	5	235.64	30.42	-15.58	46.00	18.38	10.96	1.08	0.00
	6	363.68	33.34	-12.66	46.00	17.31	14.55	1.47	0.00
	7	431.58	35.64	-10.36	46.00	17.70	16.26	1.68	0.00

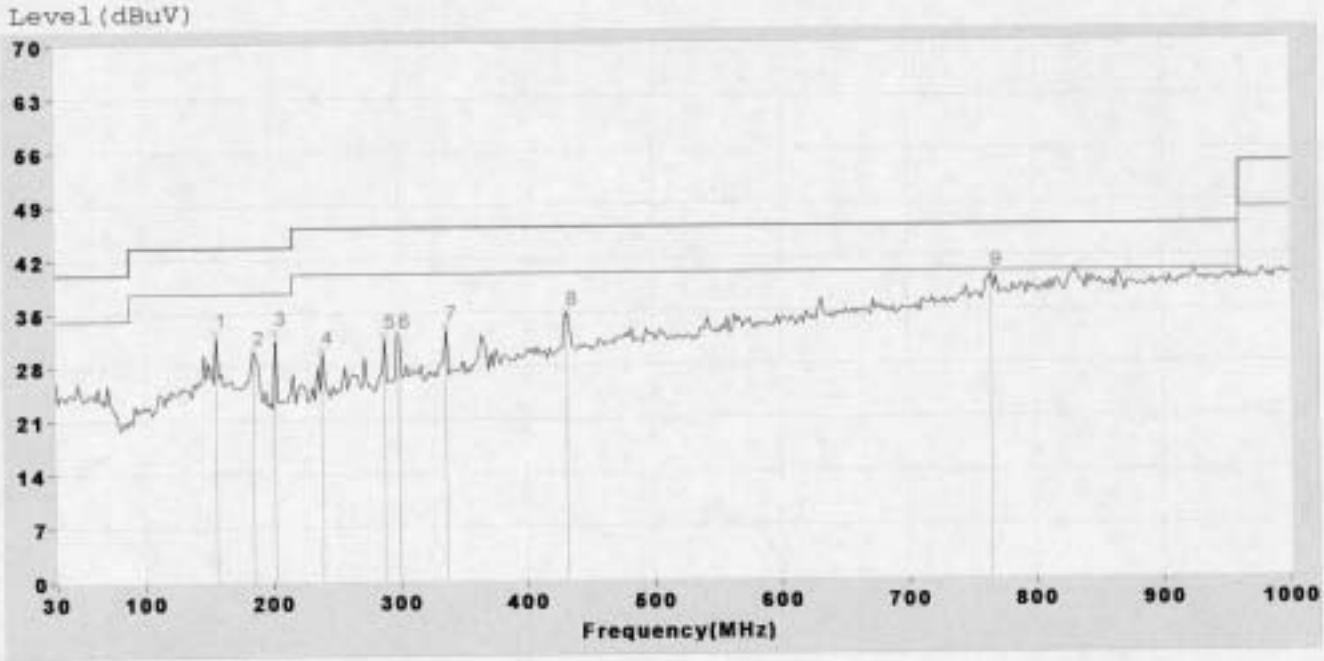
4. Transmit at 2441Mhz, The Spectrum setting : RBW=120Khz , VBW=120Khz,**Horizontal**

SGS EMC Lab. Site 2

EMI TESTING REPORT

Customer:Formosa
Model :Flash dongle (2441MHz)
Spec. :
Ser. No.:
Limit :FCC_B

Date:2003-06-30 Time:13:30
Polar. :Horizontal- 3M
Report No.:
File :-1
Tester :Alex
Tmp.(C):23.0 Humid.(%):59



MEMO:

	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Factor	Other Factor
	MHz	dB	dB	dB	dB	dB	dB	dB
1	156.10	32.38	-11.12	43.50	18.67	12.83	0.88	0.00
2	185.20	29.99	-13.51	43.50	18.30	10.74	0.95	0.00
3	202.66	32.54	-10.96	43.50	21.94	9.60	1.00	0.00
4	239.52	30.09	-15.91	46.00	17.83	11.17	1.09	0.00
5	288.02	31.96	-14.04	46.00	18.01	12.74	1.21	0.00
6	299.66	32.04	-13.96	46.00	17.78	13.02	1.24	0.00
7	336.52	33.11	-12.89	46.00	17.75	13.99	1.37	0.00
8	431.58	34.86	-11.14	46.00	16.92	16.26	1.68	0.00
9	765.26	39.60	-6.40	46.00	15.13	22.11	2.36	0.00

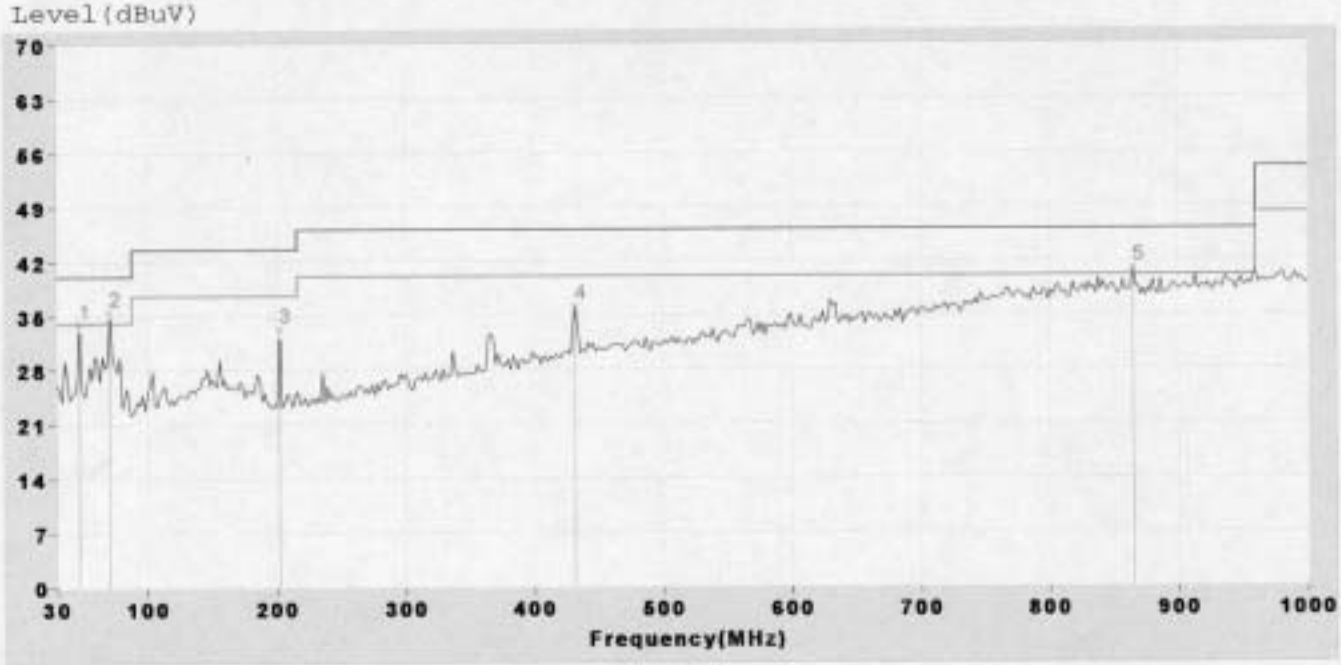
5. Transmit at 2480Mhz, The Spectrum setting : RBW=120Khz , VBW=120Khz, **Vertical**

SGS EMC Lab. Site 2

EMI TESTING REPORT

Customer:Formosa
Model :Flash dongle (2480MHz)
Spec. :
Ser. No.:
Limit :FCC_B

Date:2003-06-30 Time:13:35
Polar. :Vertical- 3M
Report No.:
File :-1
Tester :Alex
Tmp.(C):23.0 Humid.(%):59



MEMO:

		Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Factor	Other Factor
		MHz	dB	dB	dB	dB	dB	dB	dB
	1	47.46	33.85	-6.15	40.00	21.75	11.60	0.51	0.00
!	2	70.74	35.41	-4.59	40.00	25.02	9.76	0.63	0.00
	3	202.66	33.25	-10.25	43.50	22.65	9.60	1.00	0.00
	4	431.58	36.14	-9.86	46.00	18.20	16.26	1.68	0.00
!	5	864.20	40.90	-5.10	46.00	15.53	22.85	2.52	0.00

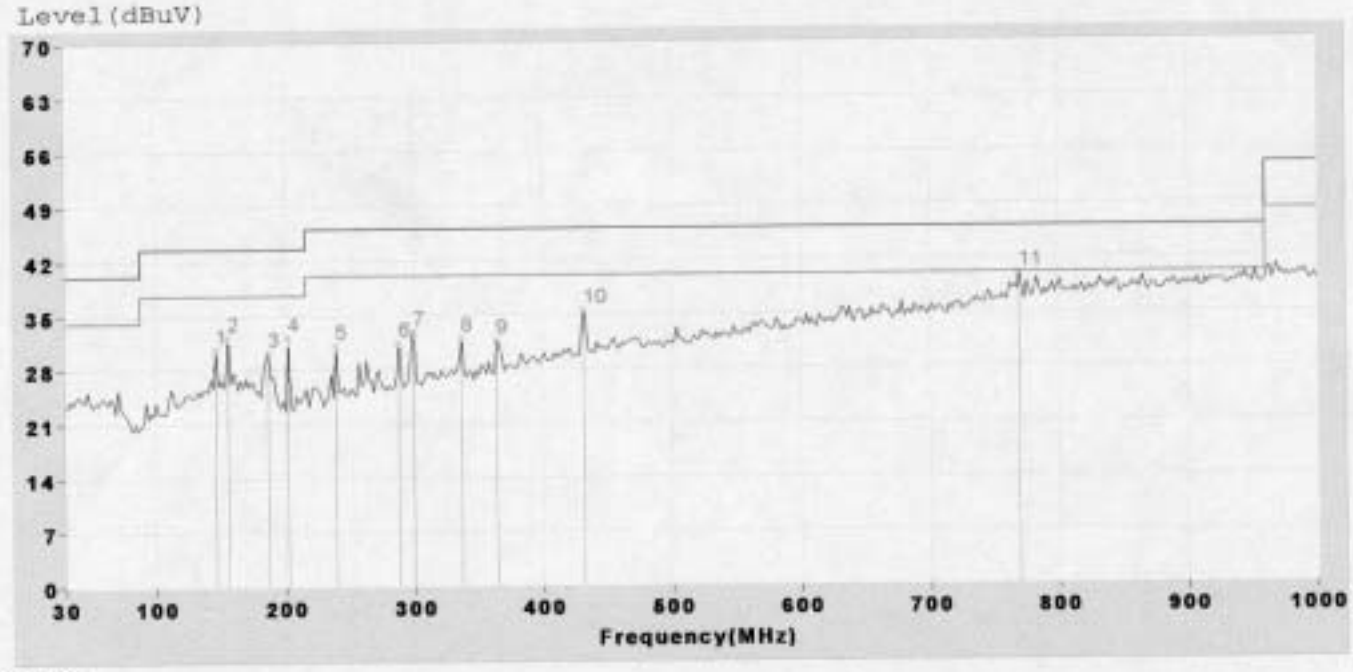
6. Transmit at 2480Mhz, The Spectrum setting : RBW=120Khz , VBW=120Khz,**Horizontal**

SGS EMC Lab. Site 2

EMI TESTING REPORT

Customer:Formosa
Model :Flash dongle (2480MHz)
Spec. :
Ser. No.:
Limit :FCC_B

Date:2003-06-30 Time:13:34
Polar. :Horizontal- 3M
Report No.:
File :-1
Tester :Alex
Tmp.(C):23.0 Humid.(%):59



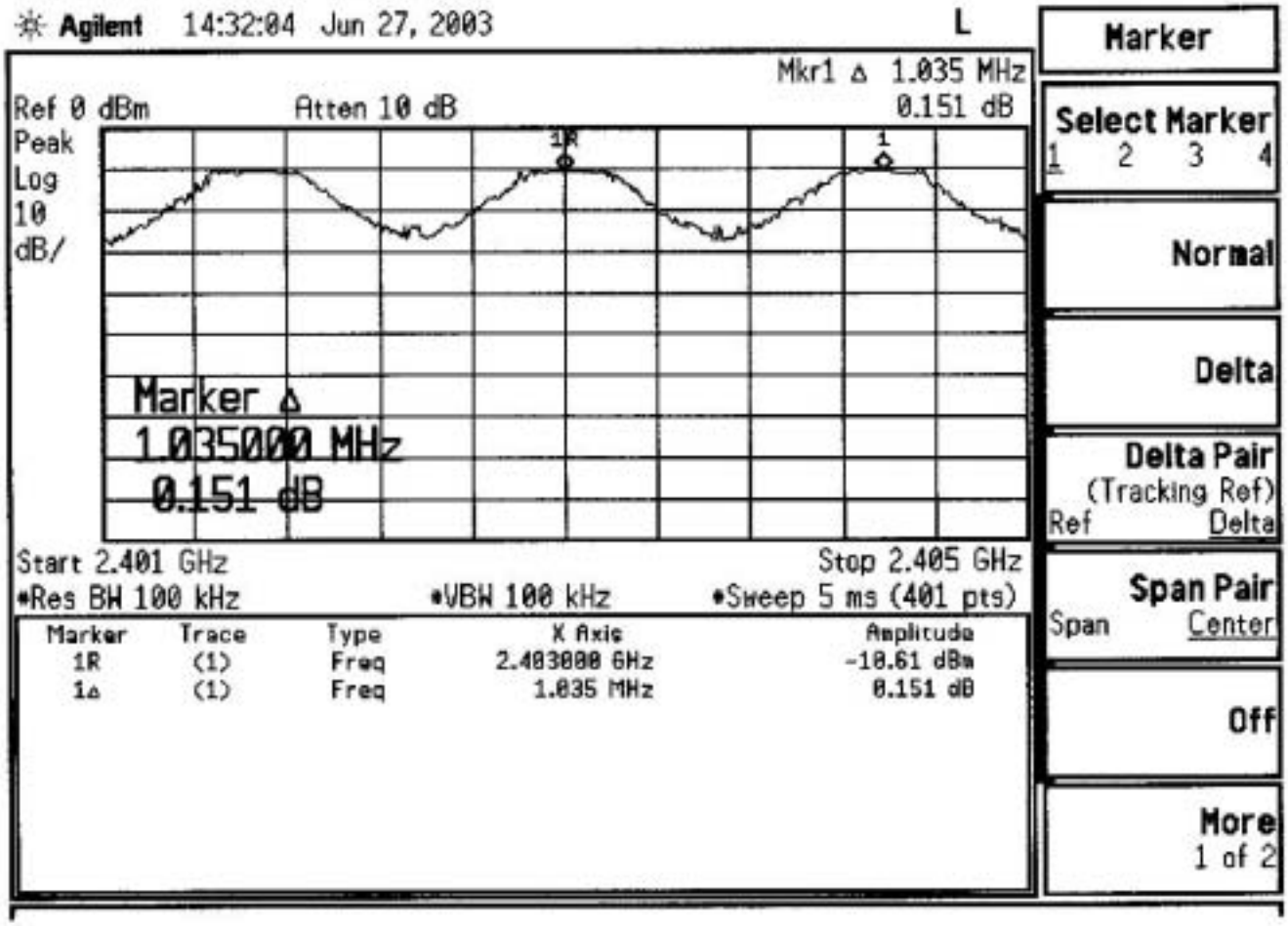
MEMO:

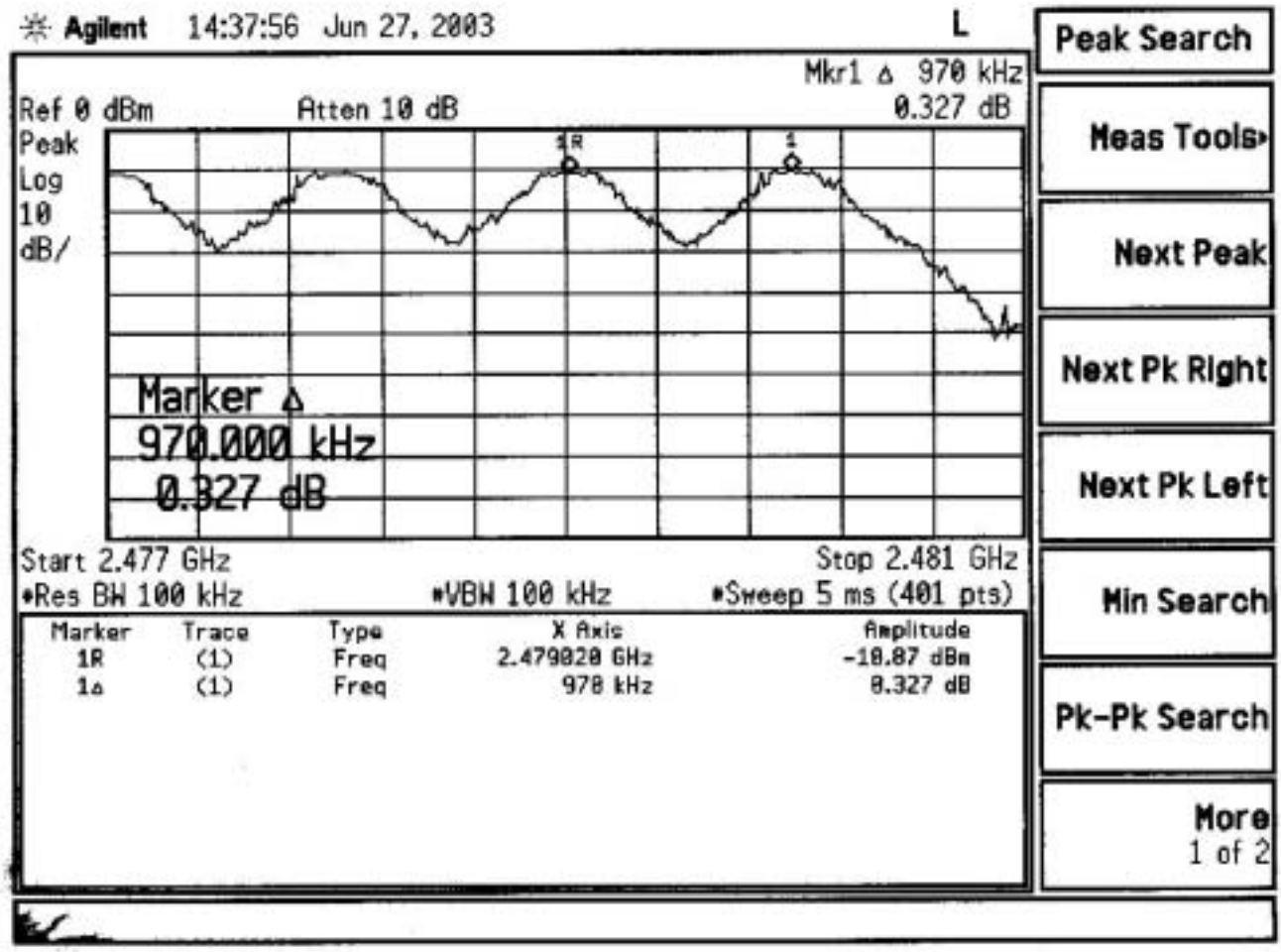
	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Factor	Other Factor
	MHz	dB	dB	dB	dB	dB	dB	dB
1	146.40	30.63	-12.87	43.50	17.12	12.65	0.86	0.00
2	156.10	32.16	-11.34	43.50	18.44	12.83	0.88	0.00
3	187.14	30.17	-13.33	43.50	18.71	10.50	0.96	0.00
4	202.66	32.13	-11.37	43.50	21.53	9.60	1.00	0.00
5	239.52	31.06	-14.94	46.00	18.79	11.17	1.09	0.00
6	288.02	31.37	-14.63	46.00	17.42	12.74	1.21	0.00
7	299.66	32.74	-13.26	46.00	18.48	13.02	1.24	0.00
8	336.52	31.98	-14.02	46.00	16.61	13.99	1.37	0.00
9	363.68	31.68	-14.32	46.00	15.66	14.55	1.47	0.00
10	431.58	35.46	-10.54	46.00	17.53	16.26	1.68	0.00
11	769.14	39.85	-6.15	46.00	15.35	22.12	2.37	0.00

4.2.1 Limits

Frequency (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
0.009 - 0.490	2400/F(kHz)	300
0.490 - 1.705	24000/F(kHz)	30
1.705 - 30.0	30	30
30 - 88	100 **	3
88 - 216	150 **	3
216 - 960	200 **	3
Above 960	500	3

4.3 Channel Spacing SUBCLAUSE15.247(a)(1)

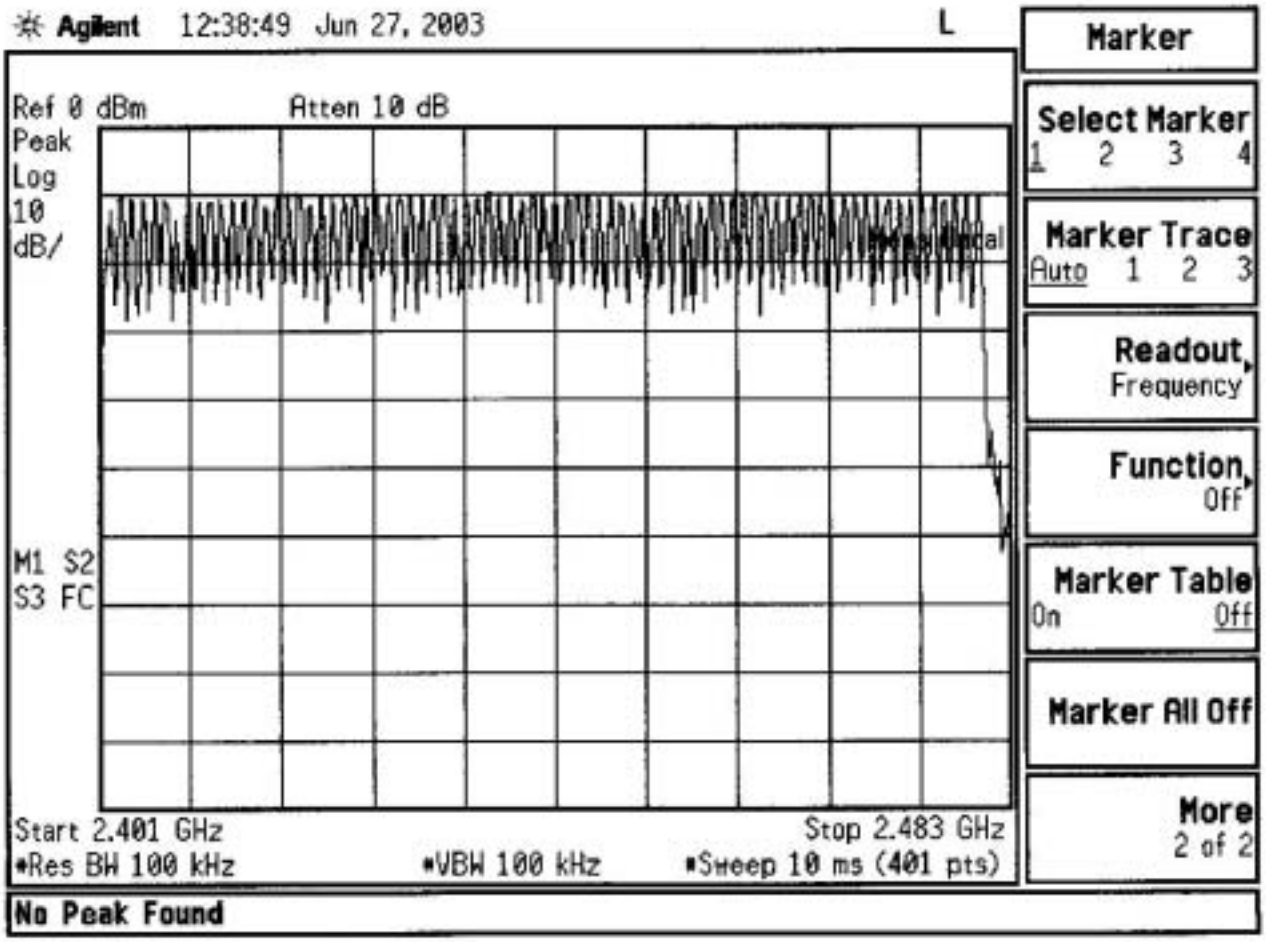




Channel separation	Lowest channel	Highest channel
	1035Khz	970 khz

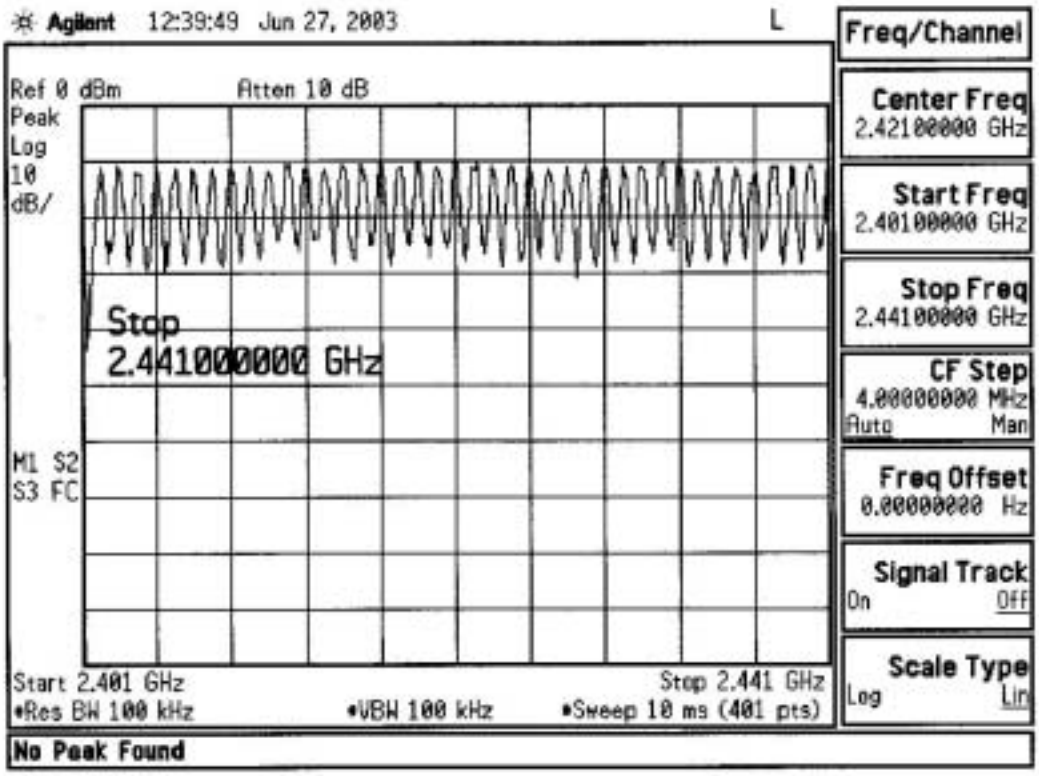
4.4 No. of carrier frequency / 20db Bandwidth

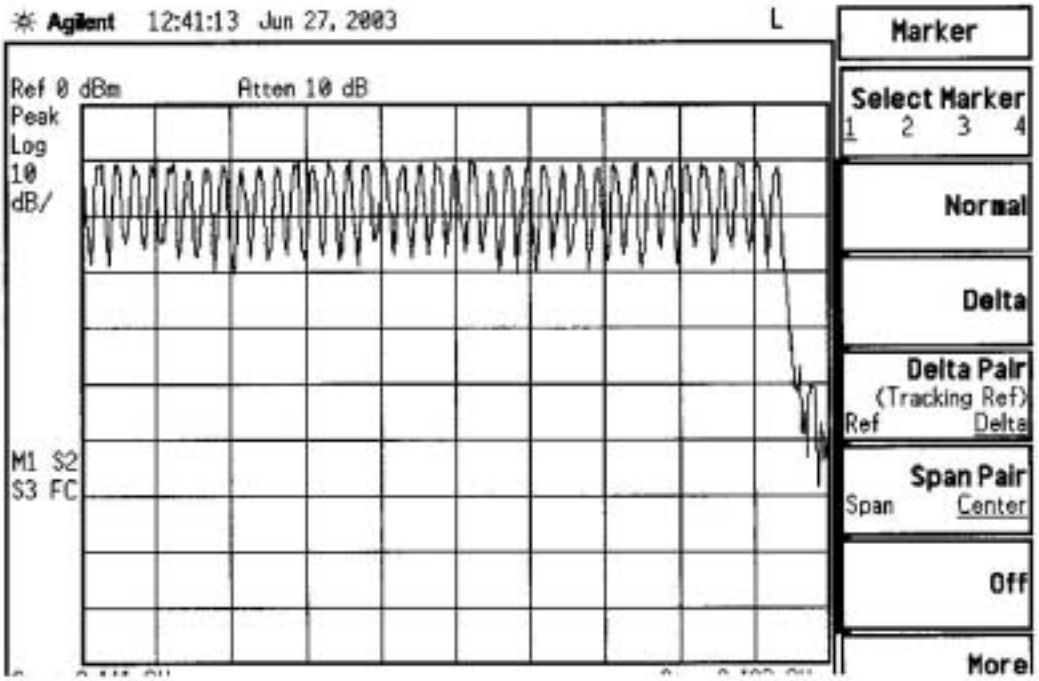
SUBCLAUSE15.247(a)(1)(ii)



Number of channels = 79

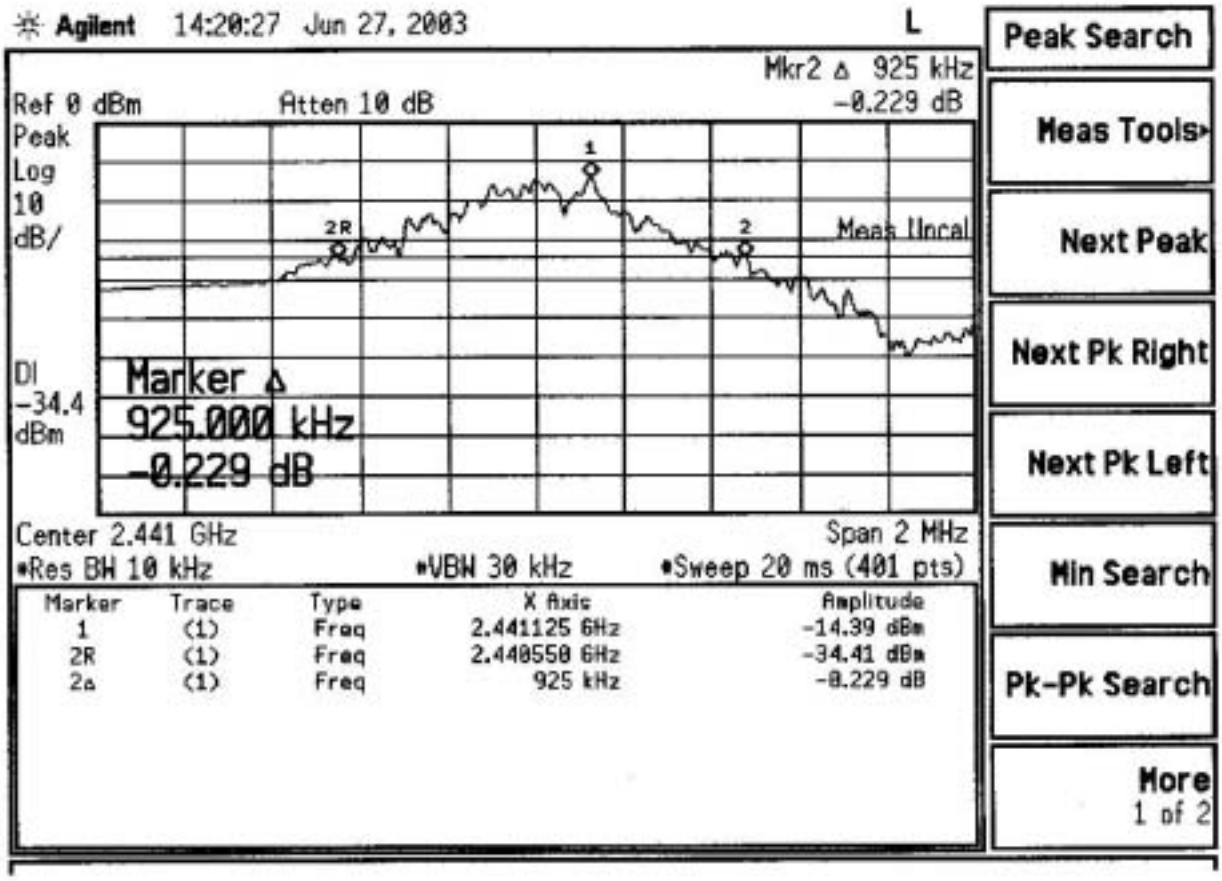
Split the whole frequency band into two.



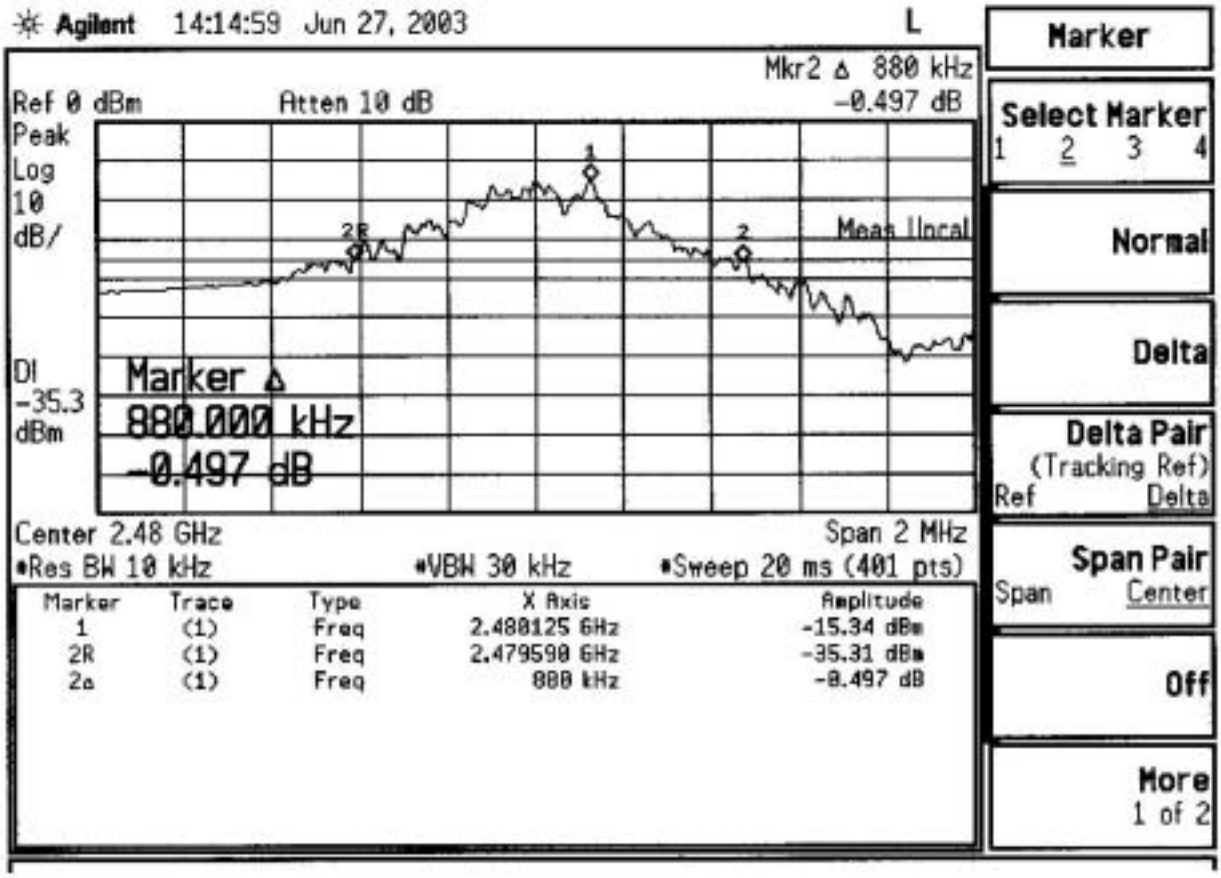


20dB bandwidth at lowest (2402Mhz), middle(2441Mhz), highest channel(2480Mhz)

Channel bandwidth = 885 KHZ



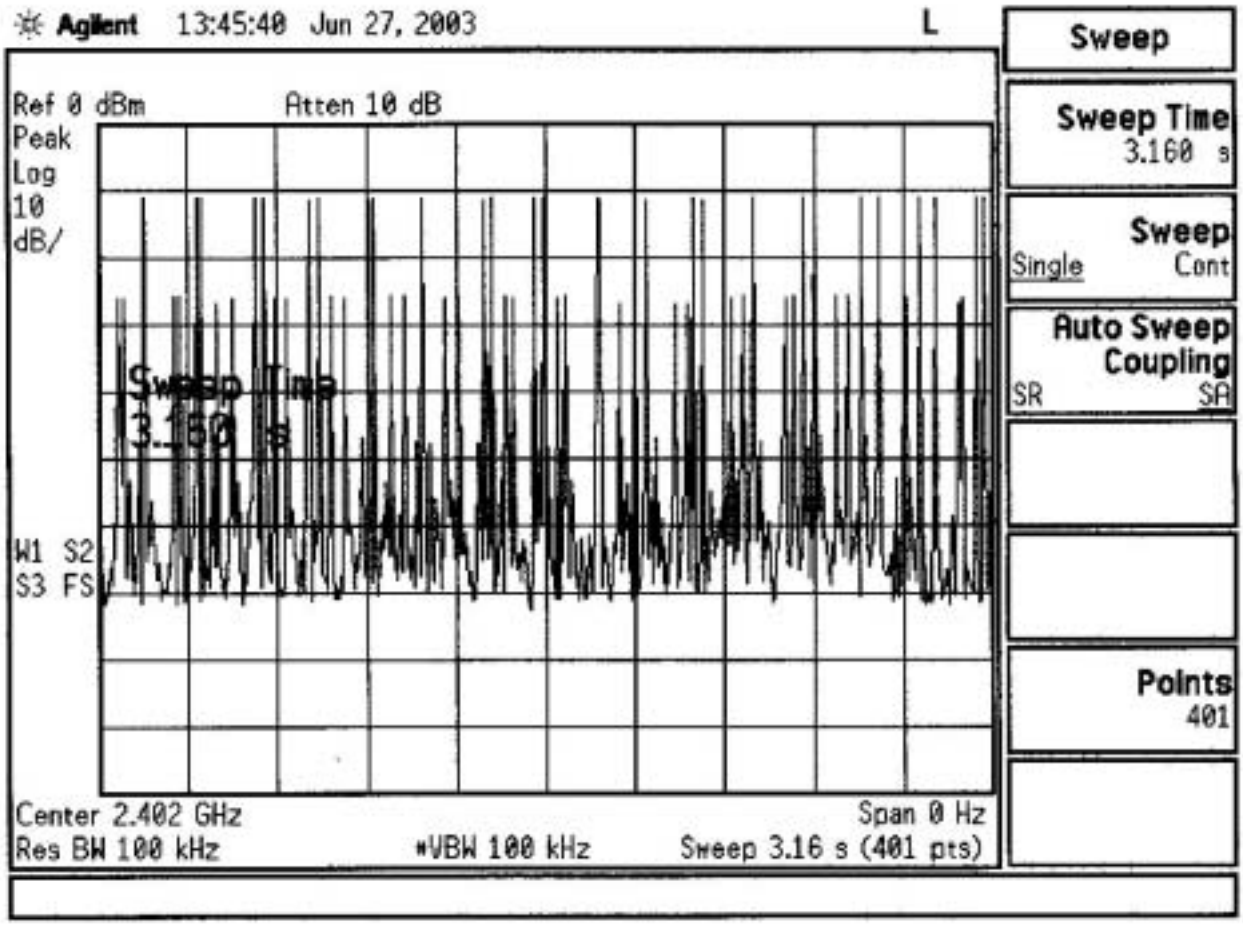
Channel bandwidth =925 KHZ



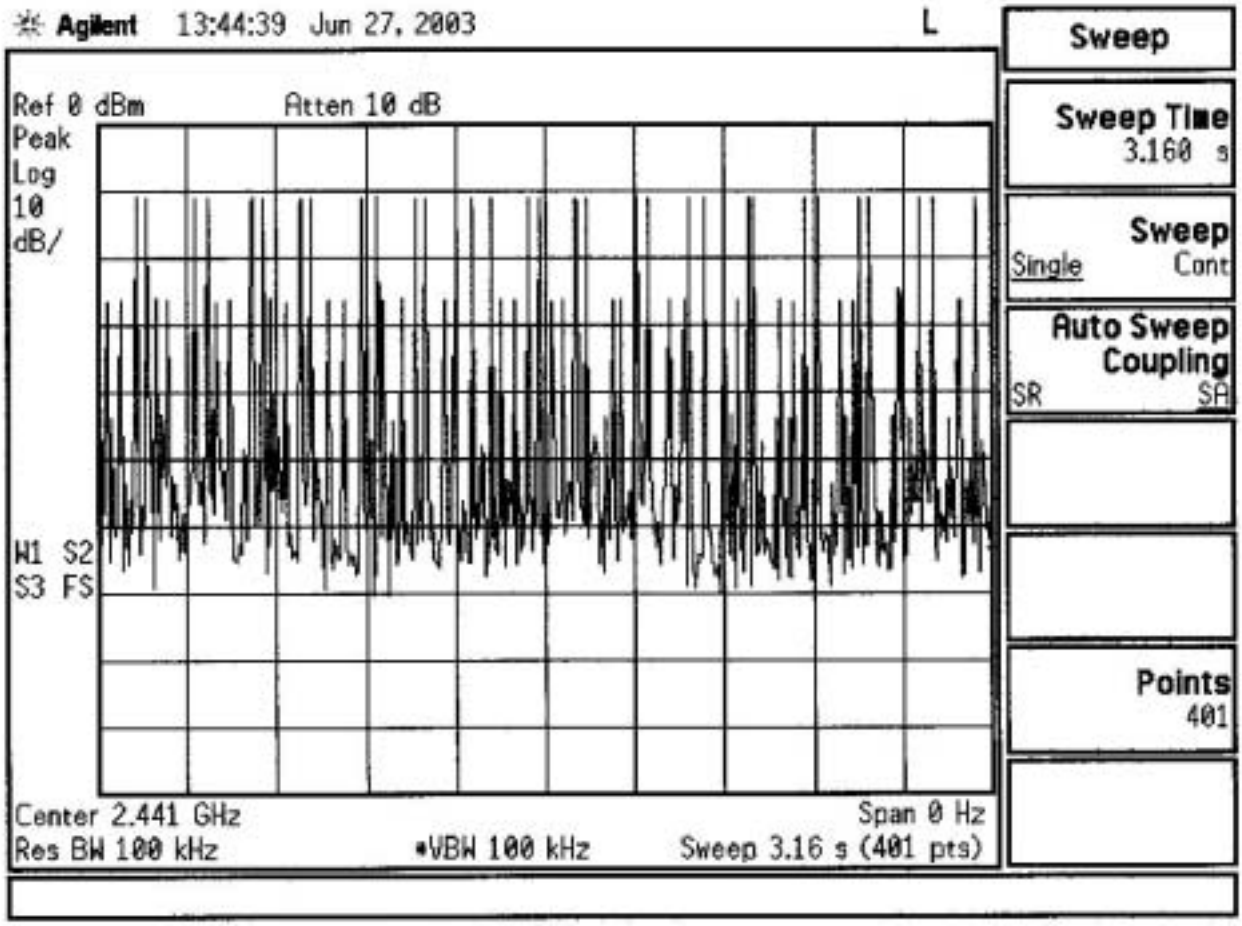
Channel bandwidth =880 KHZ

4.5 Average Time of Occupancy SUBCLAUSE15.247(a)(1)(ii)

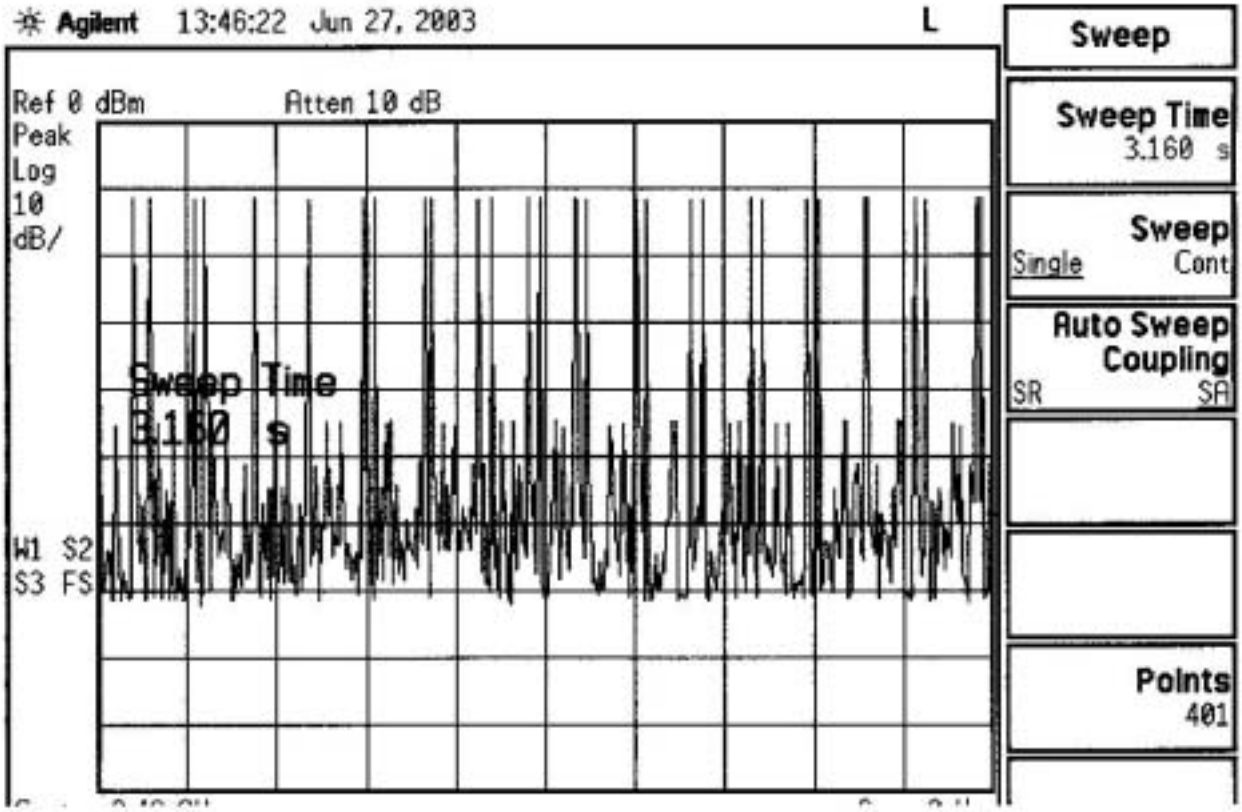
1. Number of staying at Lowest channel (time domain), 2402Mhz



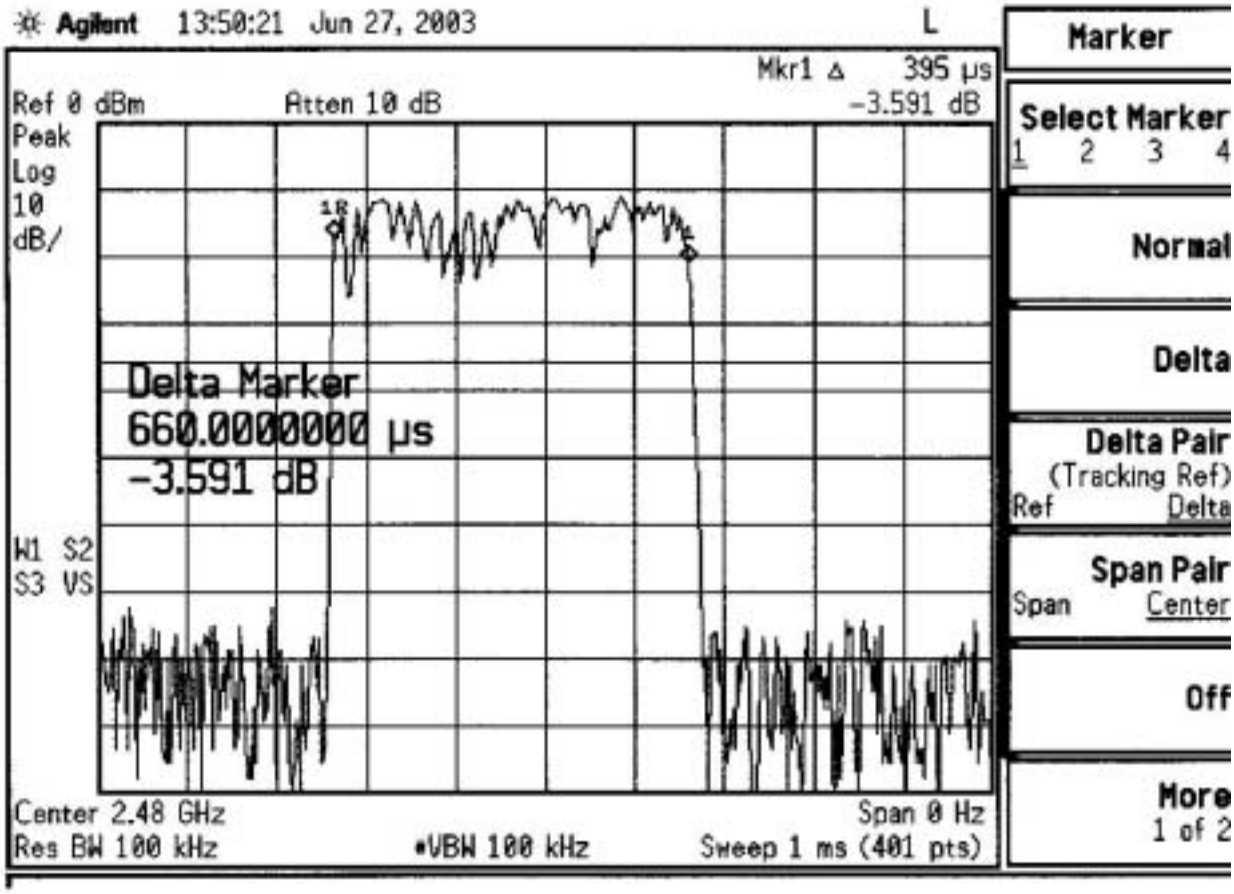
2. Number of staying at middle channel (time domain), 2441Mhz



3. Number of staying at Highest channel (time domain), 2480Mhz



4. Packet length of each pulse



4.5.1 calculation

At these channels, there are 32 bursts in 3.16 sec. Time period of each burst is 660 µSec. So the occupancy time within 30 second is (30/3.16) x 32 x 660 = 200506 µSec = 200.506 mSec = 0.2 Sec.

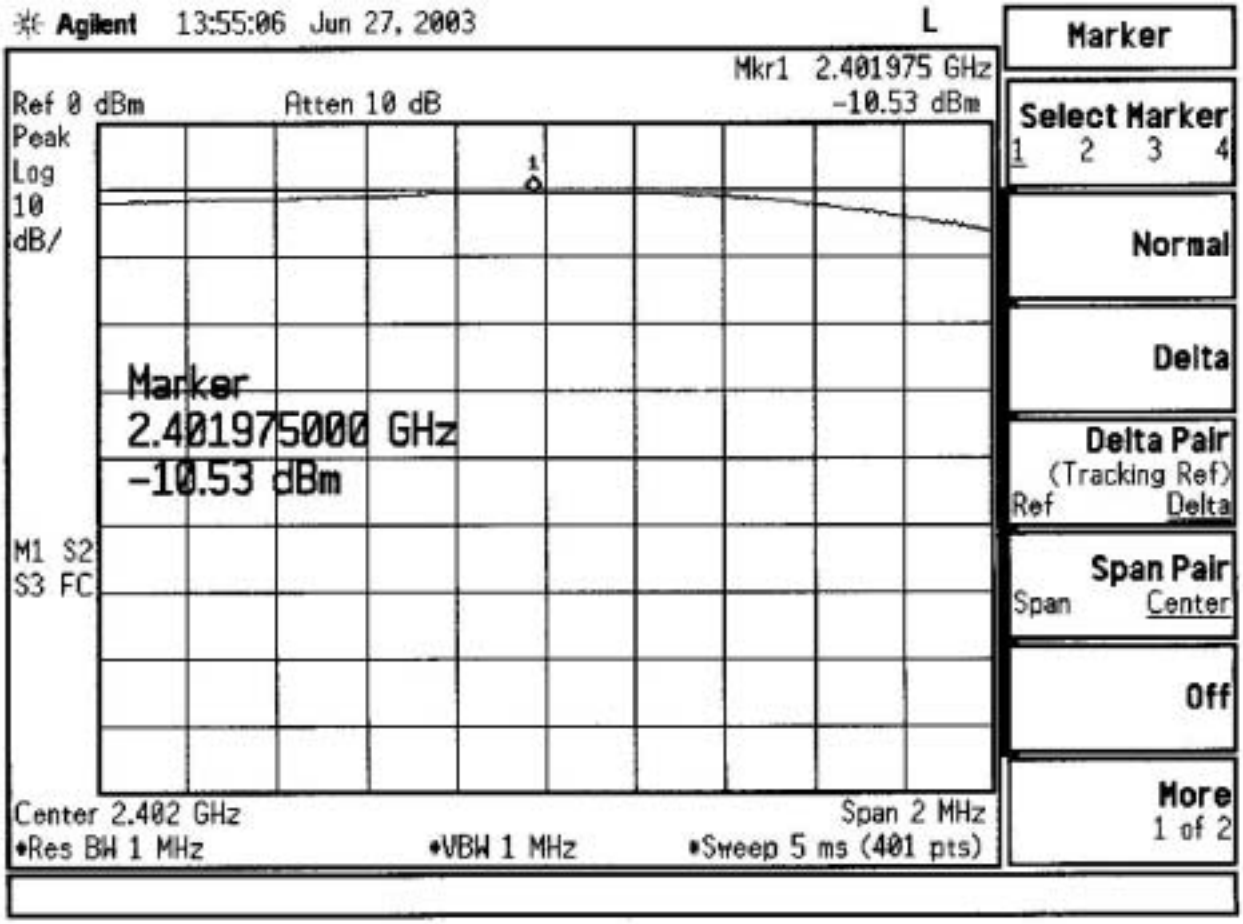
4.5.2 Limits

The average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 30 second period.

The EUT comply with the requirement in Sec 15.247(a)(1) that use at least 75 hopping frequencies. The maximum 20dB bandwidth of the hopping channel is 1 MHz. The average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 30 second period.

4.6 Peak output Power SUBCLAUSE15.247(b)(1)

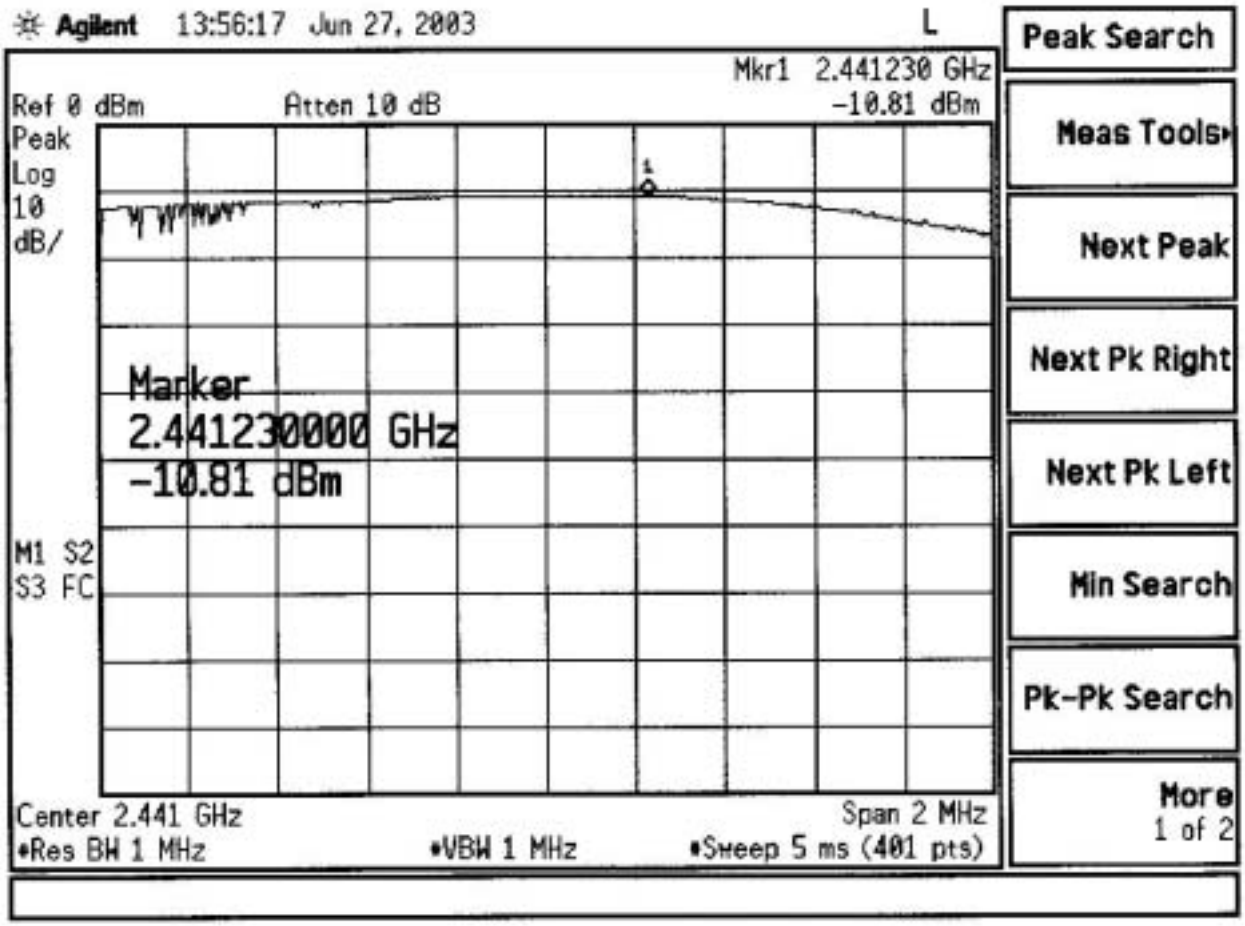
Transmitter transmit at lowest channel (2402Mhz)



The Power (ERP) = Output power + cable loss + antenna gain

= -10.53 dbm + 3.6 db+ 1 dBi = -5.93 dbm

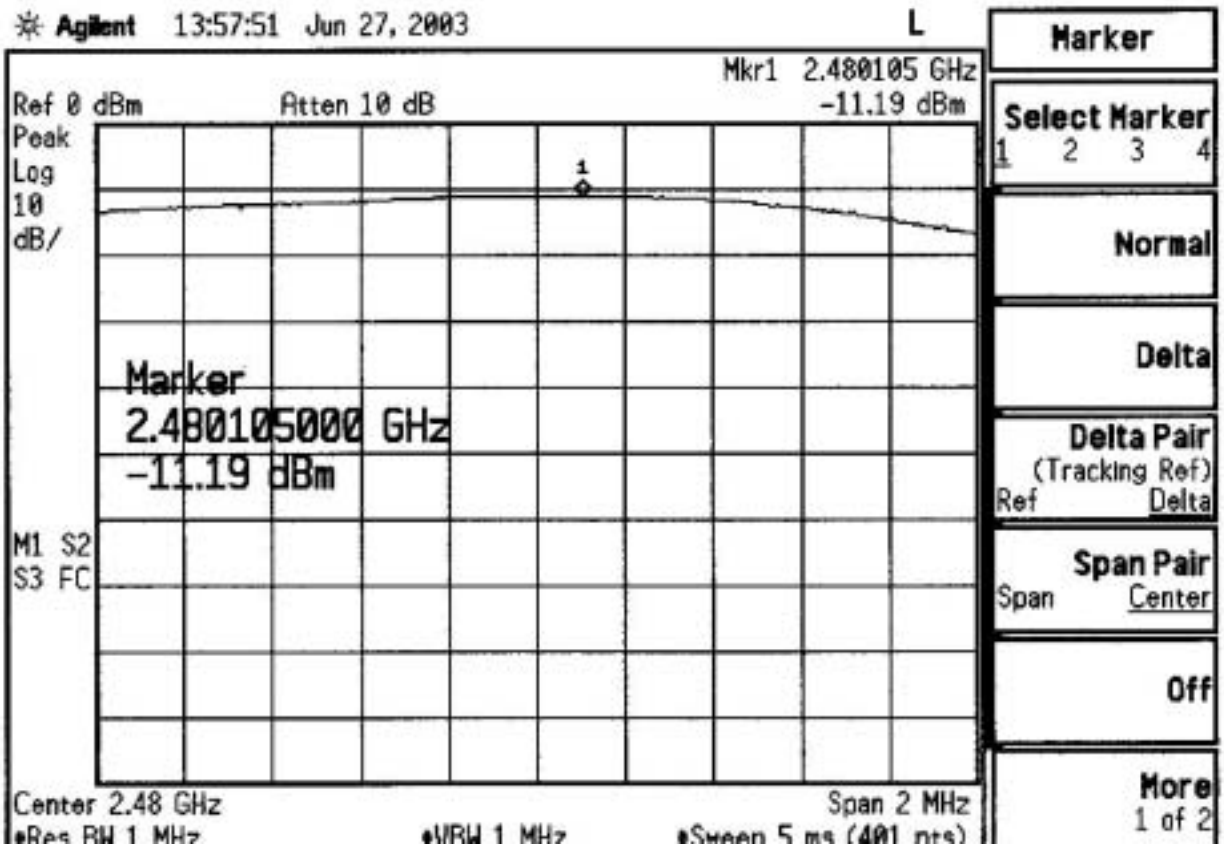
Transmitter transmit at middle channel (2441Mhz)



The Power (ERP) = Output power + cable loss + antenna gain

= -10.81 dbm + 3.6 db+ 1 dBi = -6.21 dbm

Transmitter transmit at highest channel (2480Mhz)



The Power (ERP) = Output power + cable loss + antenna gain

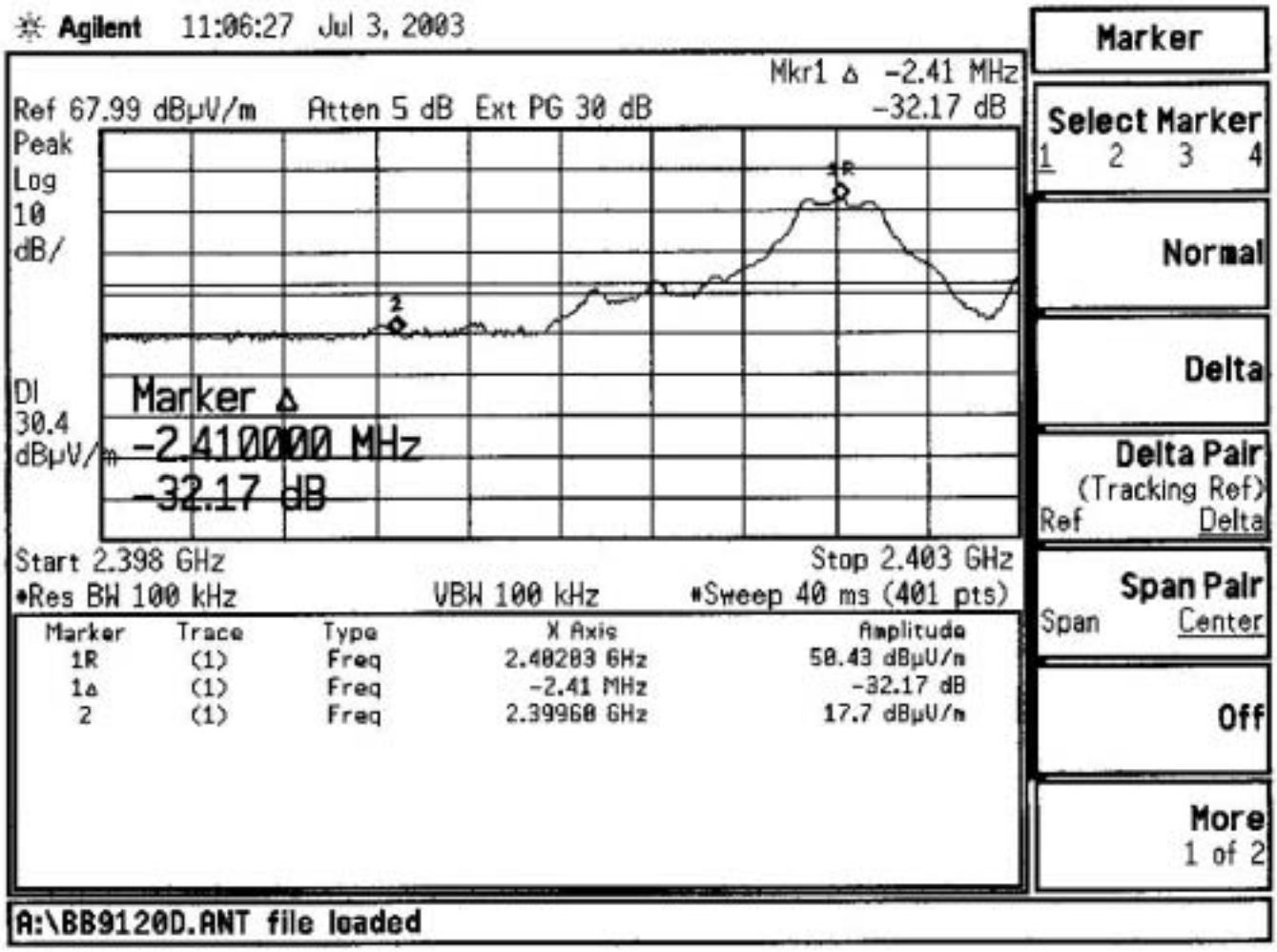
= -11.19 dbm + 3.6 db+ 1 dBi = -6.59 dbm

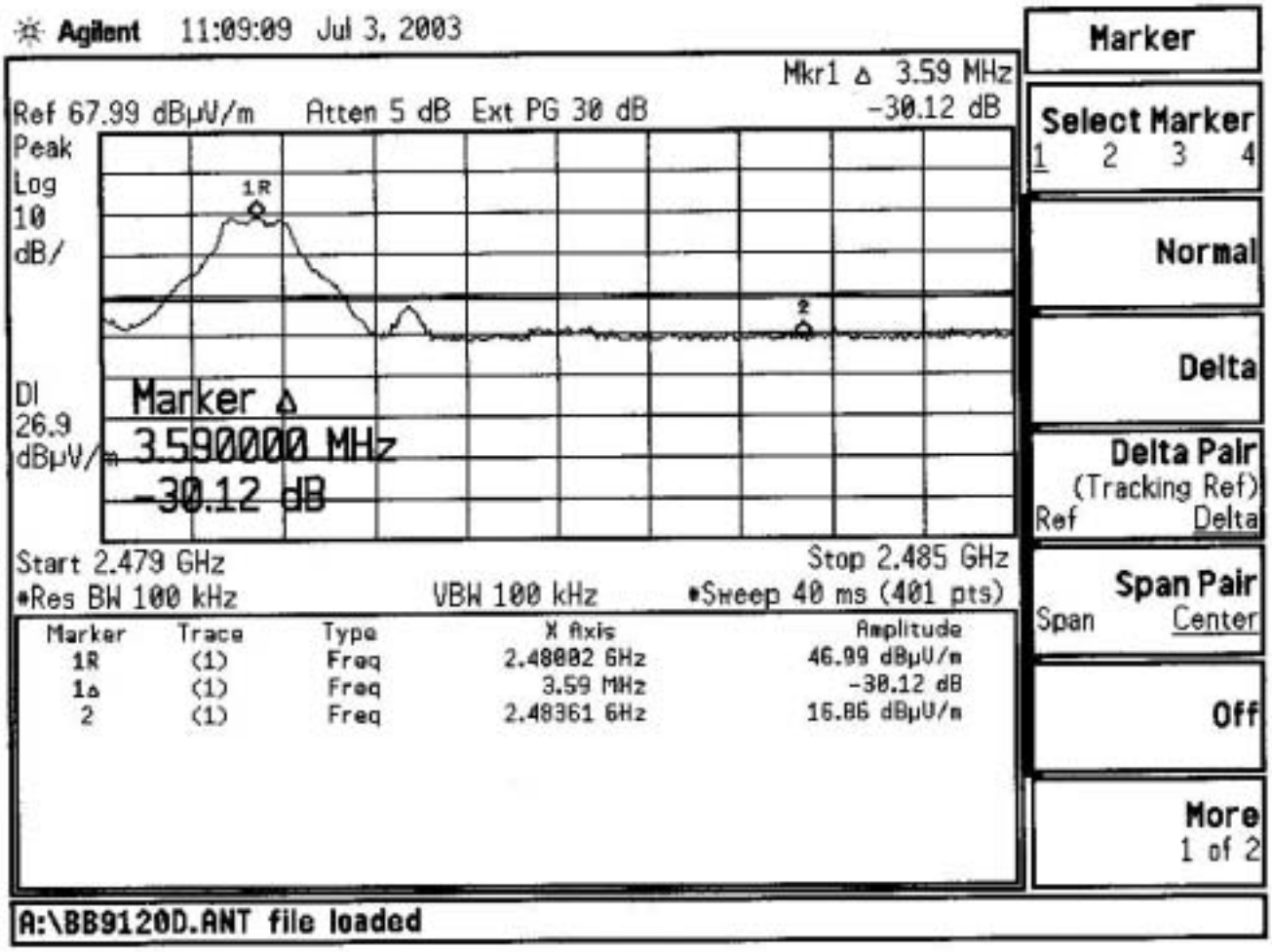
So the max power happens at 2402Mhz , which equals to –5.93 dbm = 0.255 mW

Limits:

For frequency hopping systems operating in the 2400-2483.5 MHz band employing At least 75 hopping channels, all frequency hopping systems in the 5725-5850MHZ Band, and all direct sequence systems: 1 Watt.

4.7 Band Edge emission SUBCLAUSE15.247(c)





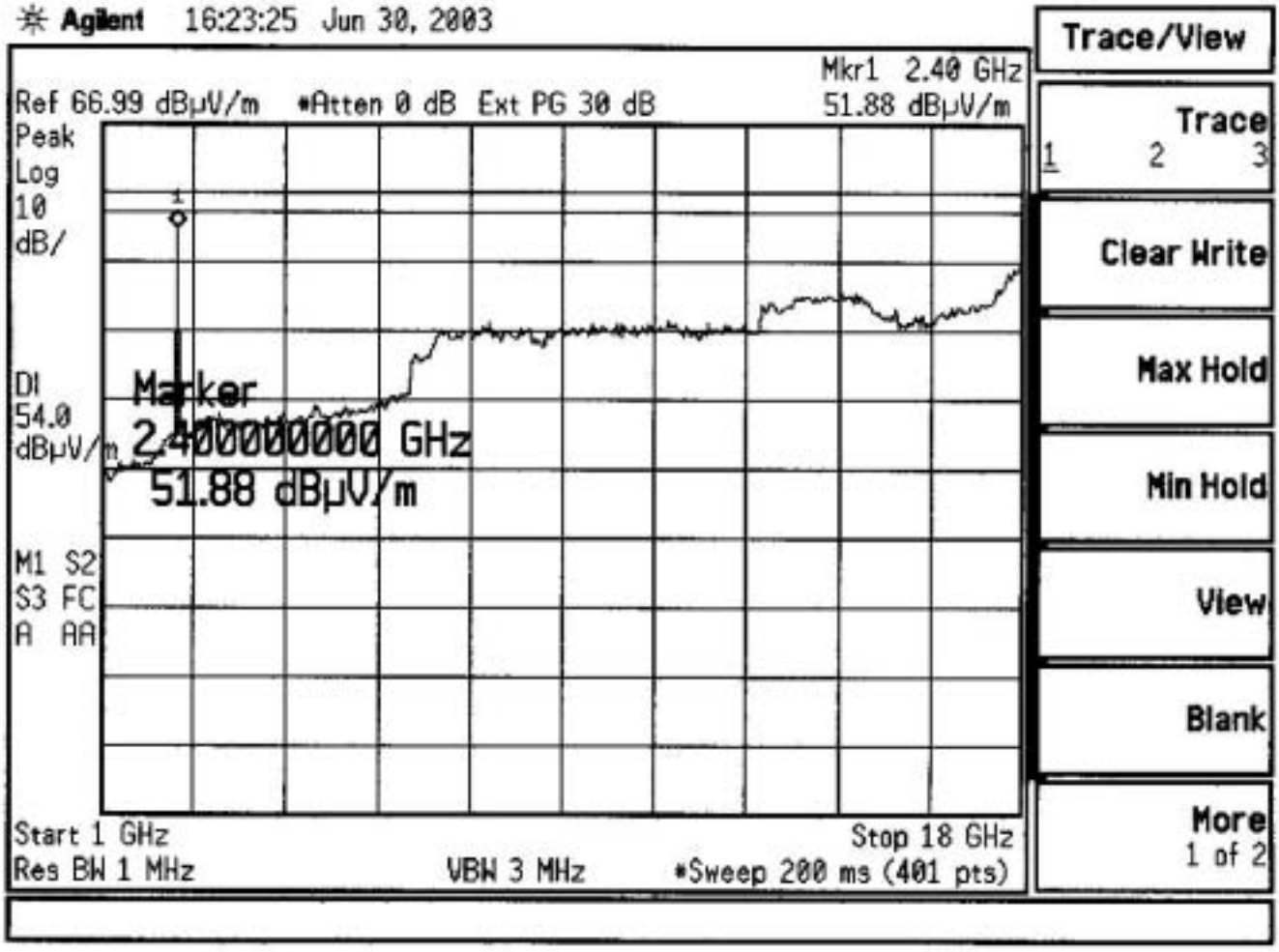
	Lower bandedge	Upper bandedge
Band-edge difference from main channel	**32.17 db**	**30.12 db**

4.7.1 Limits

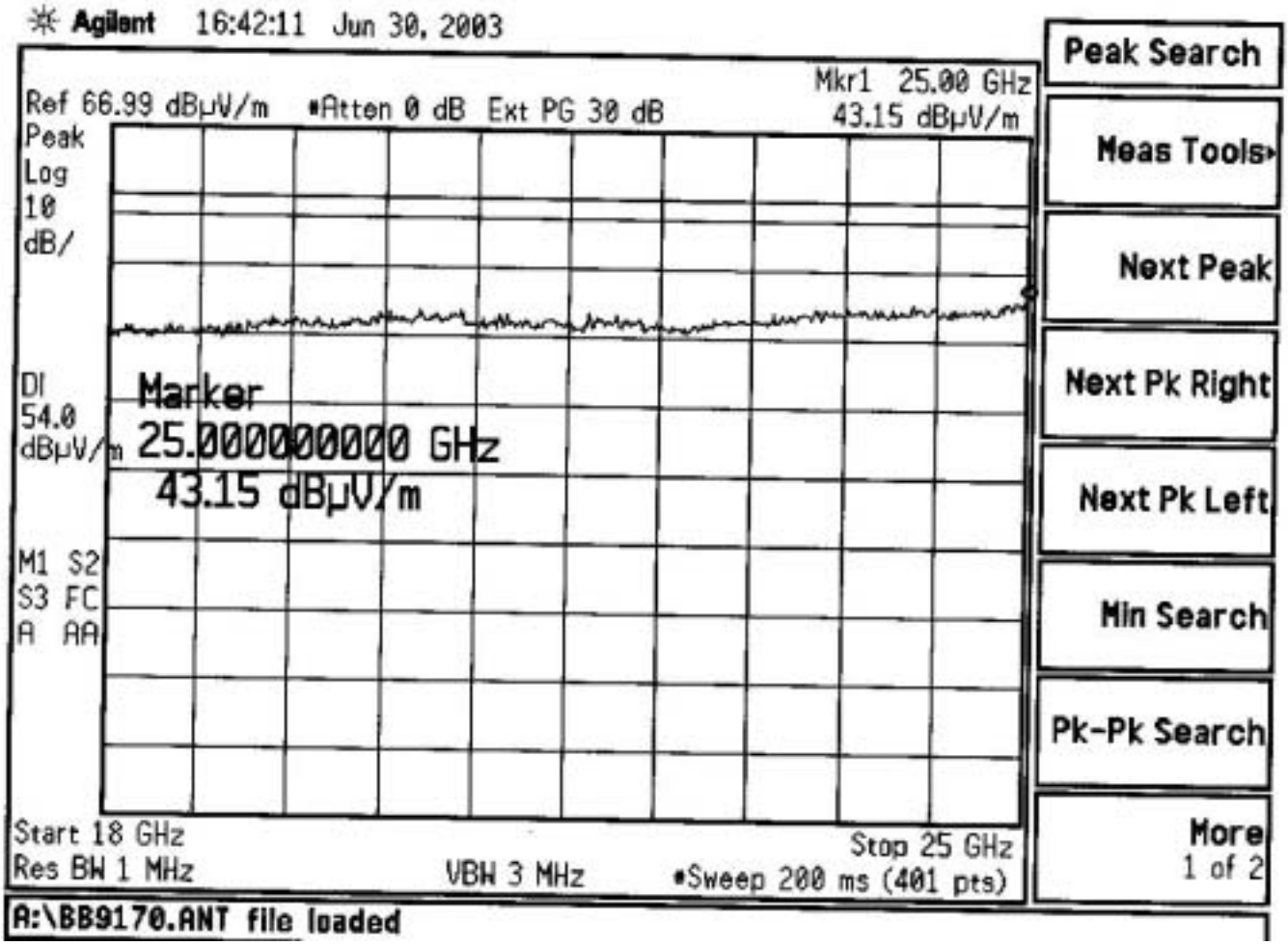
In any 100 kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, and it must comply with the limit in 15.209.

4.8 Spurious Emission under 25Ghz (from 1Ghz) SUBCLAUSE15.247(c)

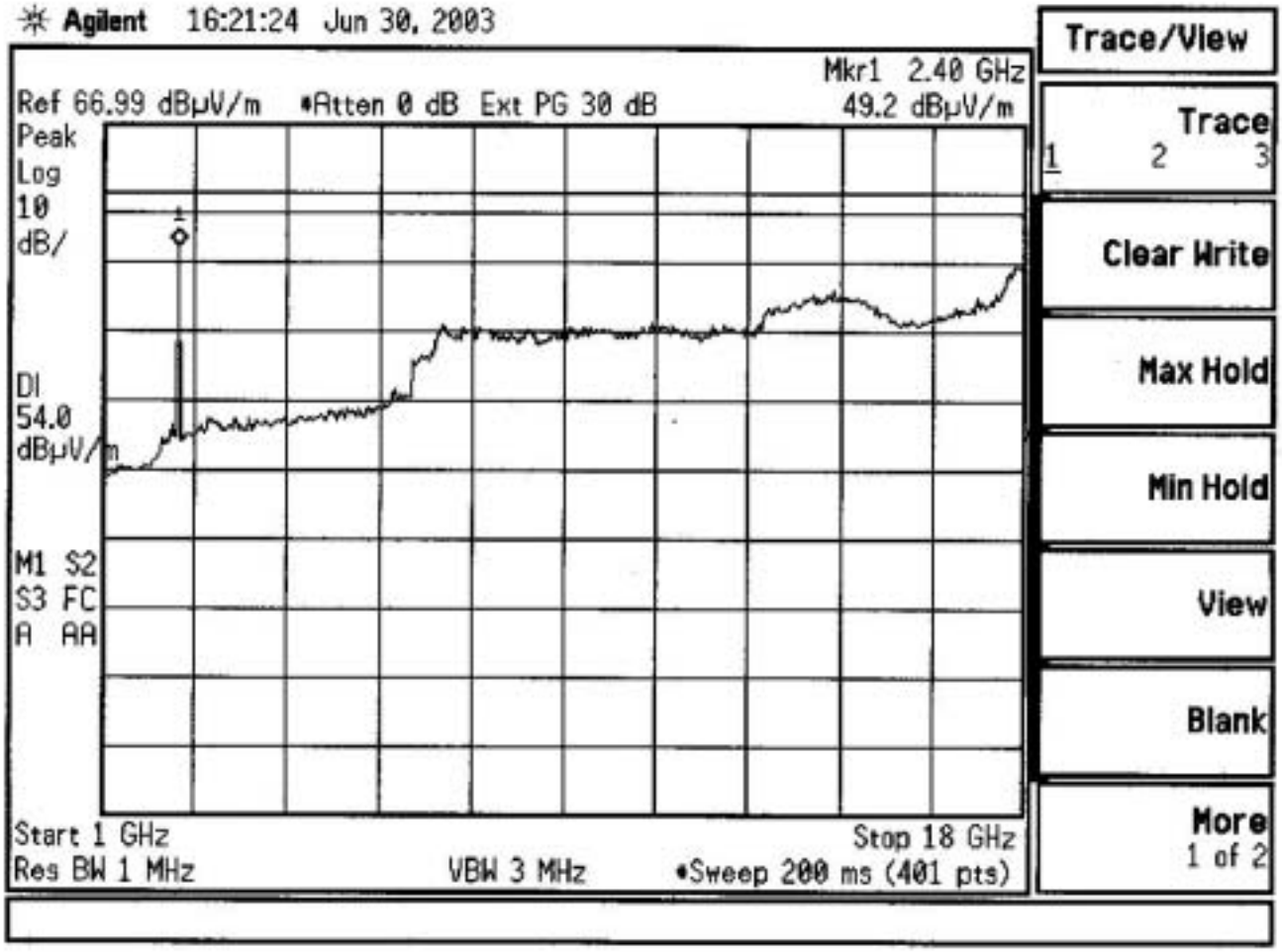
1. Transmit at 2402Mhz
1Ghz – 18Ghz , Vertical



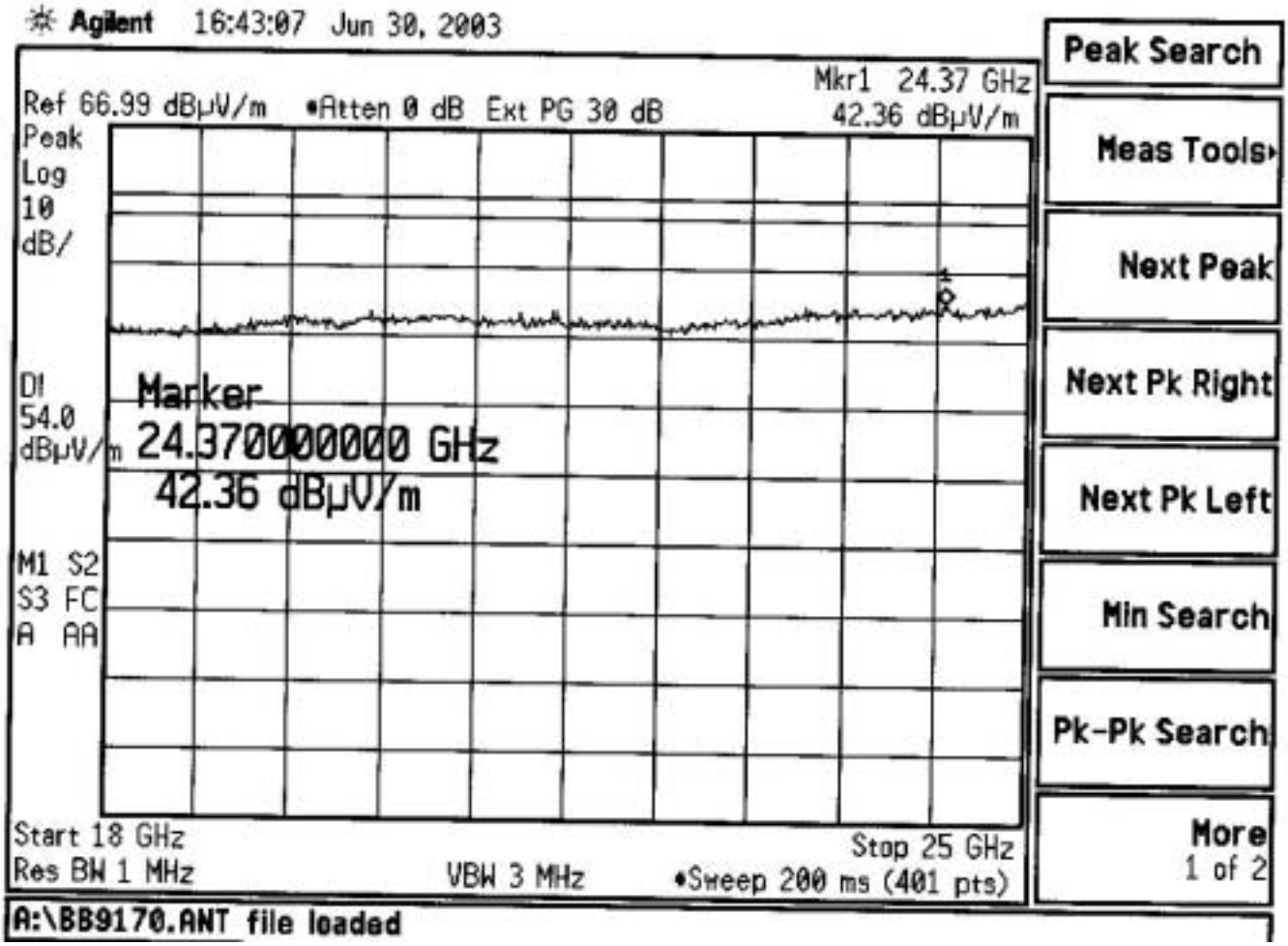
18Ghz – 25Ghz , Vertical



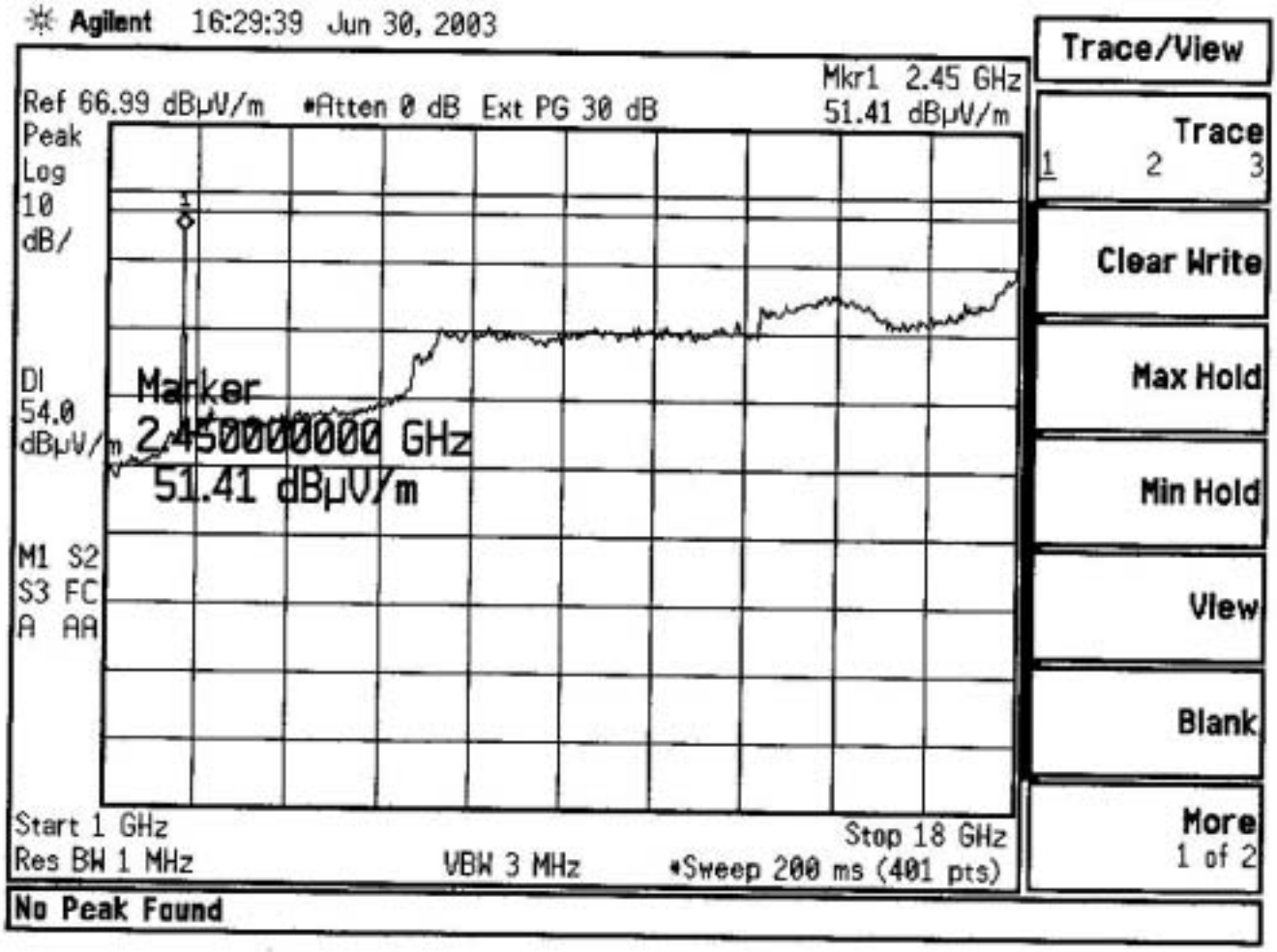
1Ghz – 18Ghz , Horizontal



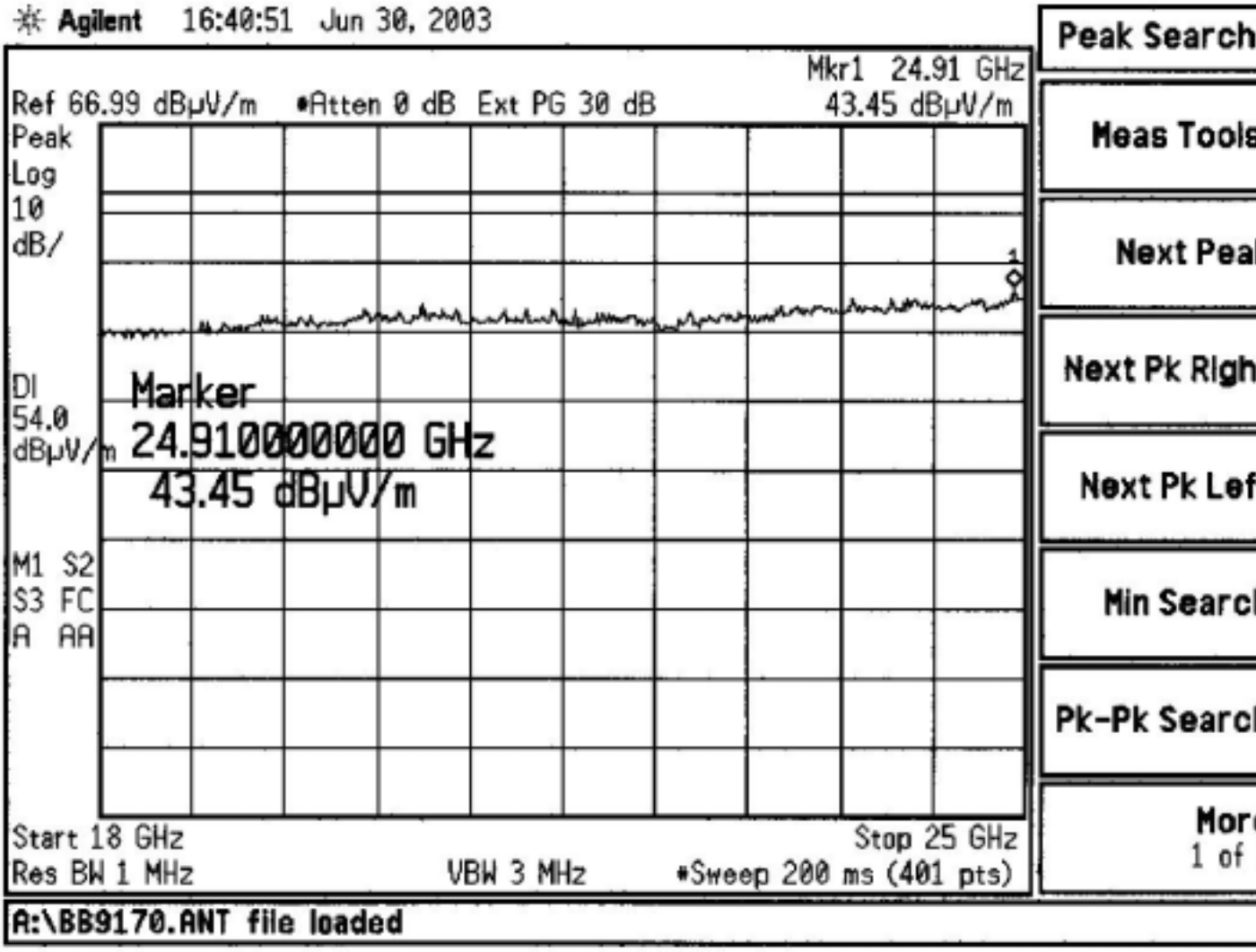
18Ghz – 25Ghz , Horizontal



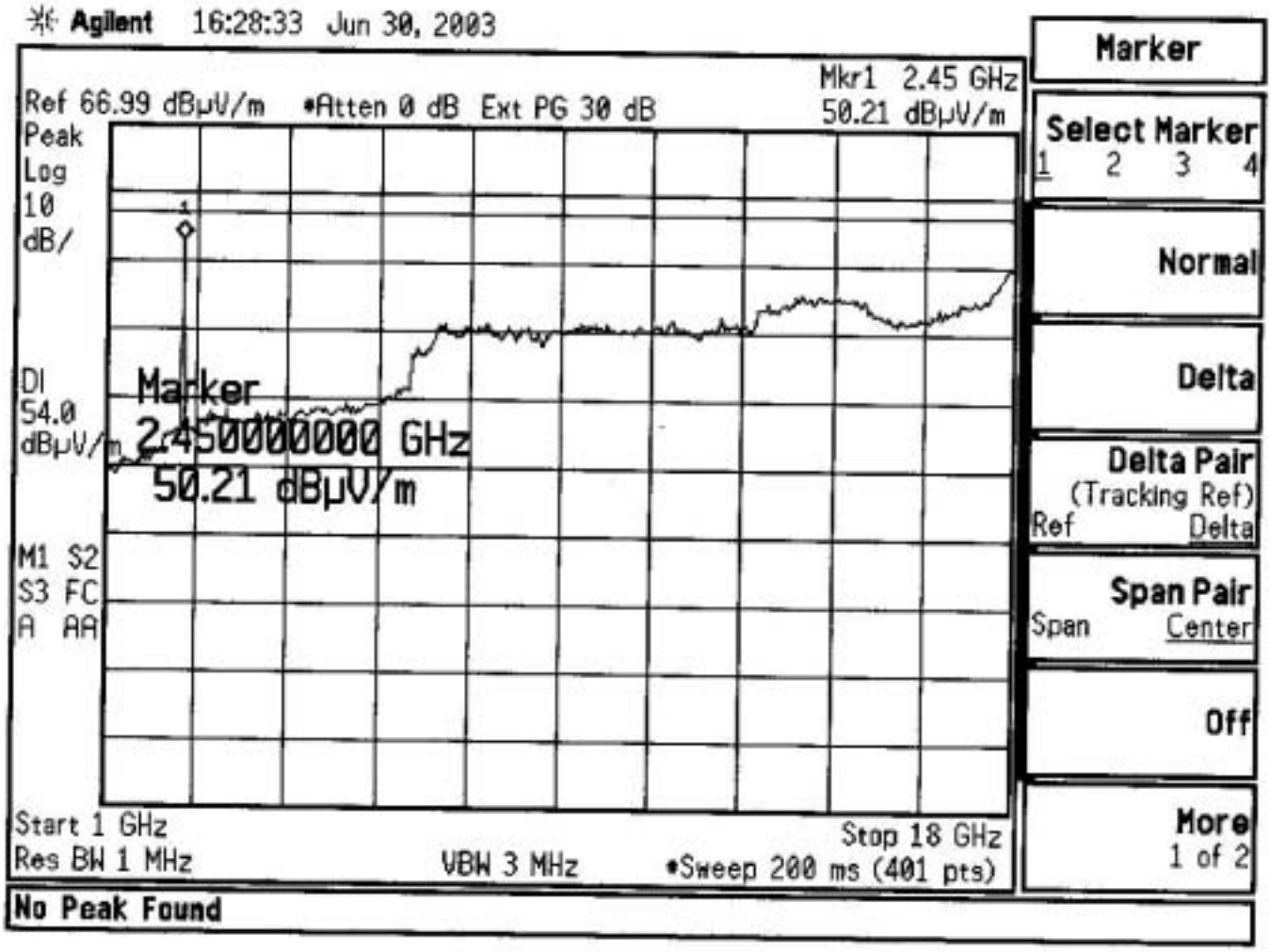
2. Transmit at 2441Mhz
1Ghz – 18Ghz , Vertical



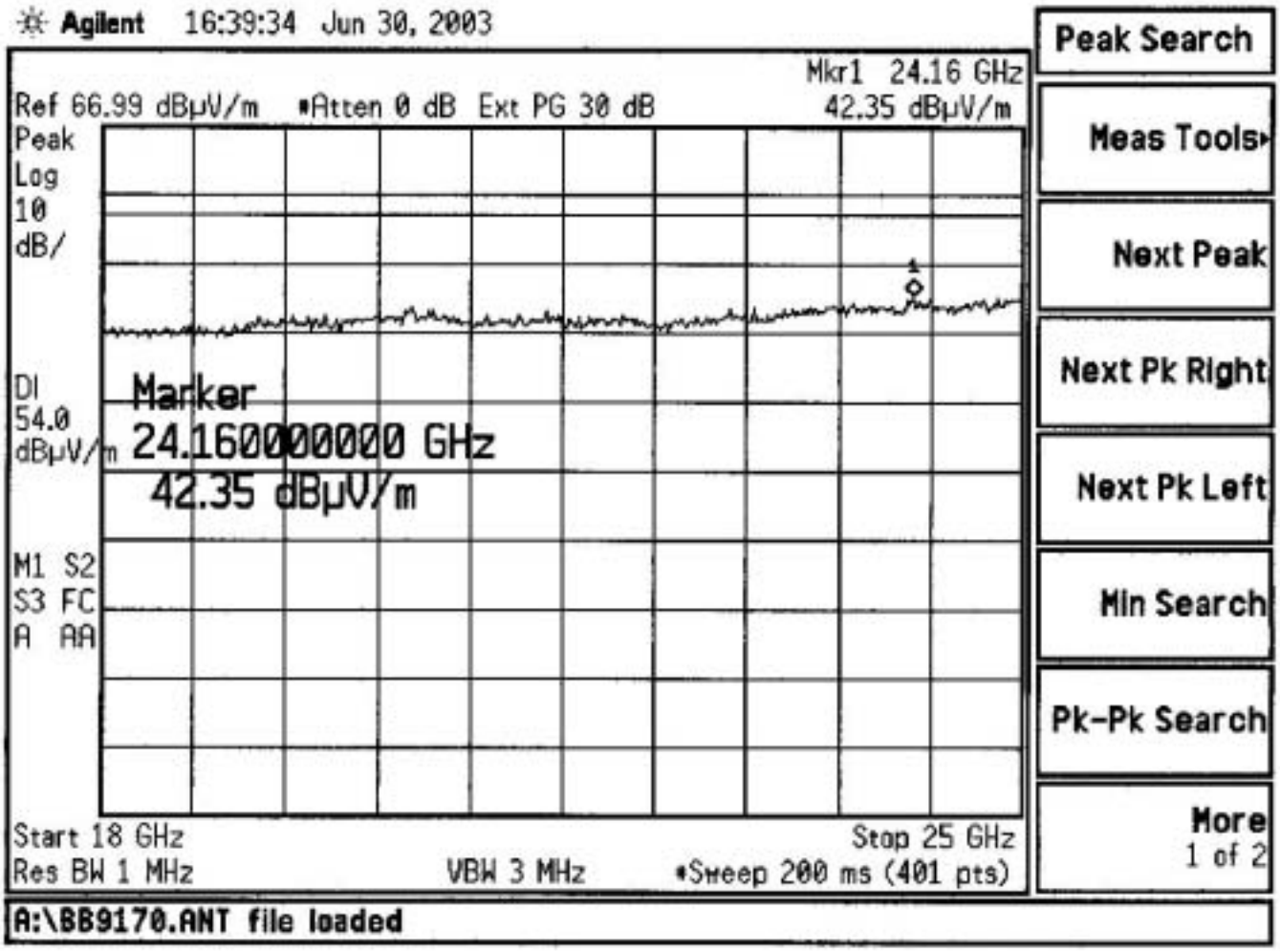
18Ghz – 25Ghz , Vertical



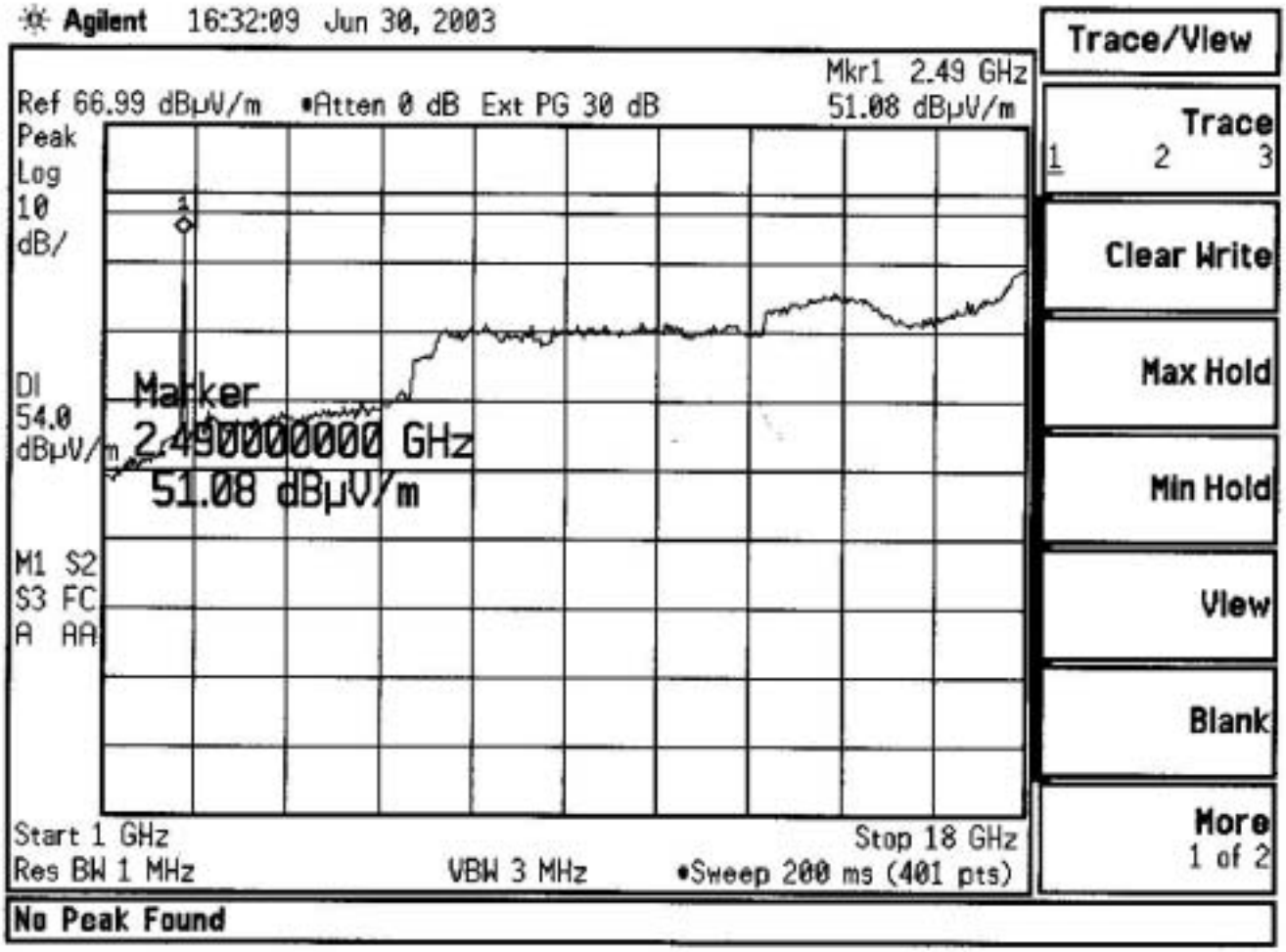
1Ghz – 18Ghz , Horizontal



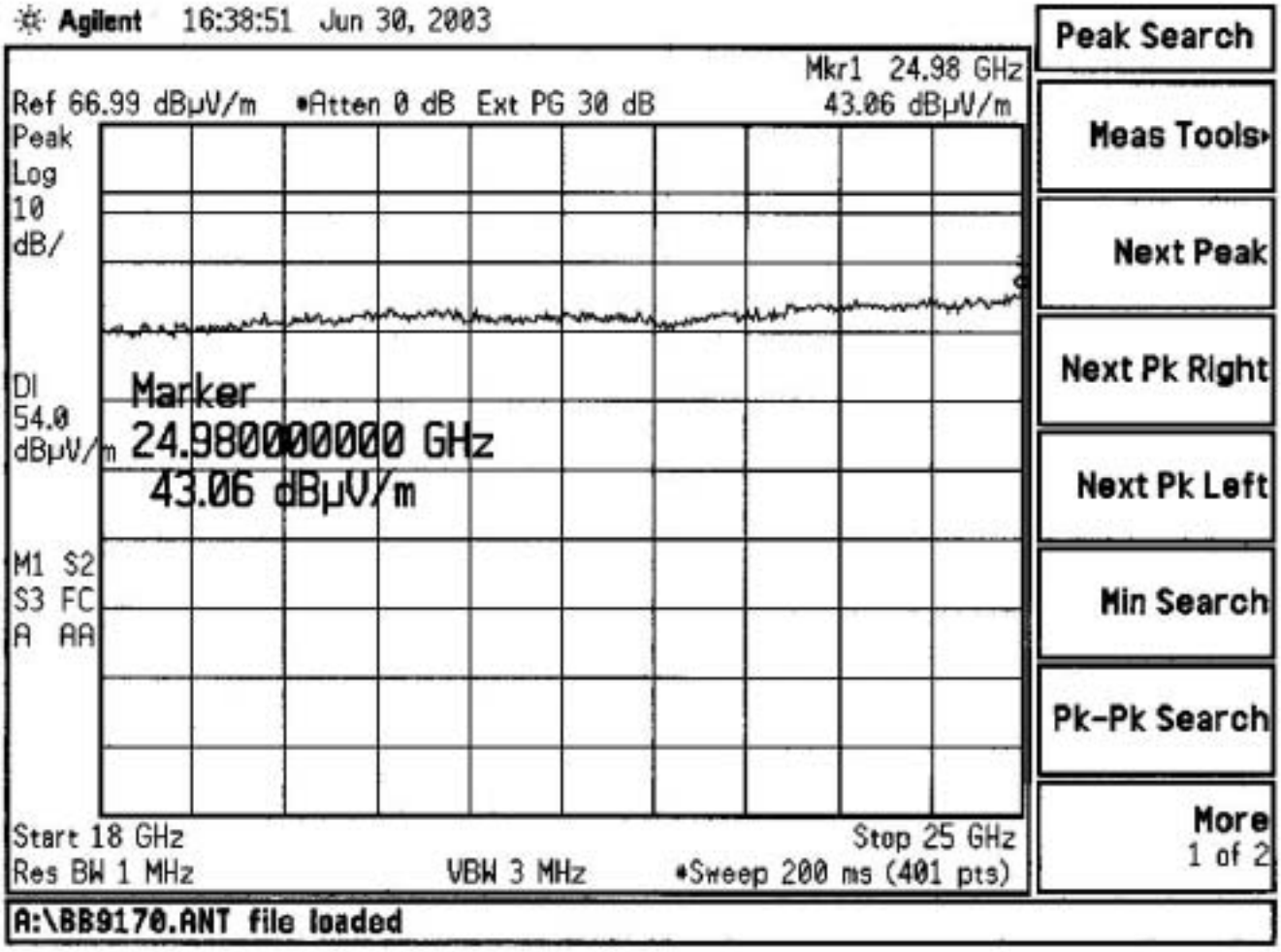
18Ghz – 25Ghz , Horizontal



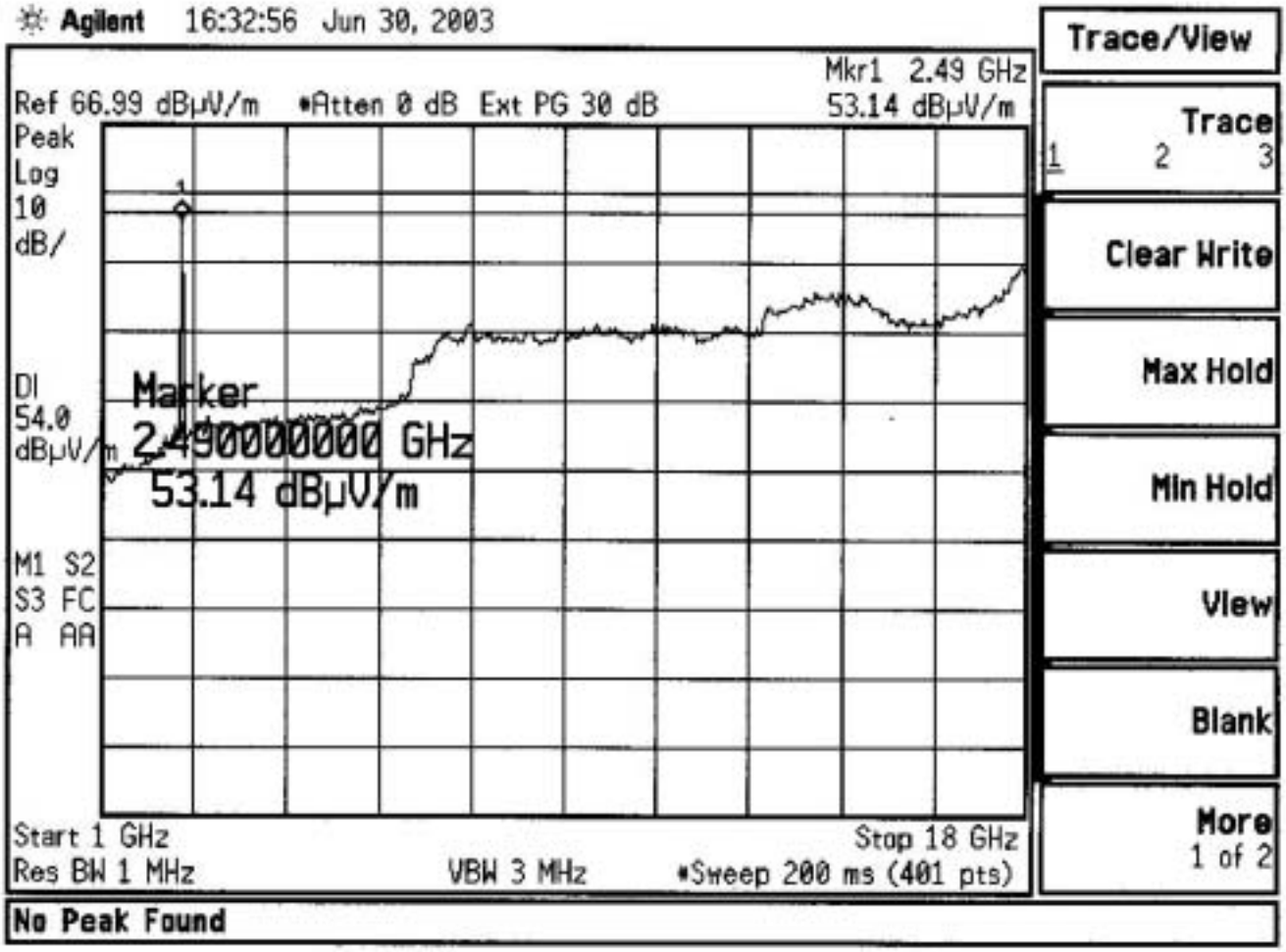
3. Transmit at 2480Mhz
1Ghz – 18Ghz , Vertical



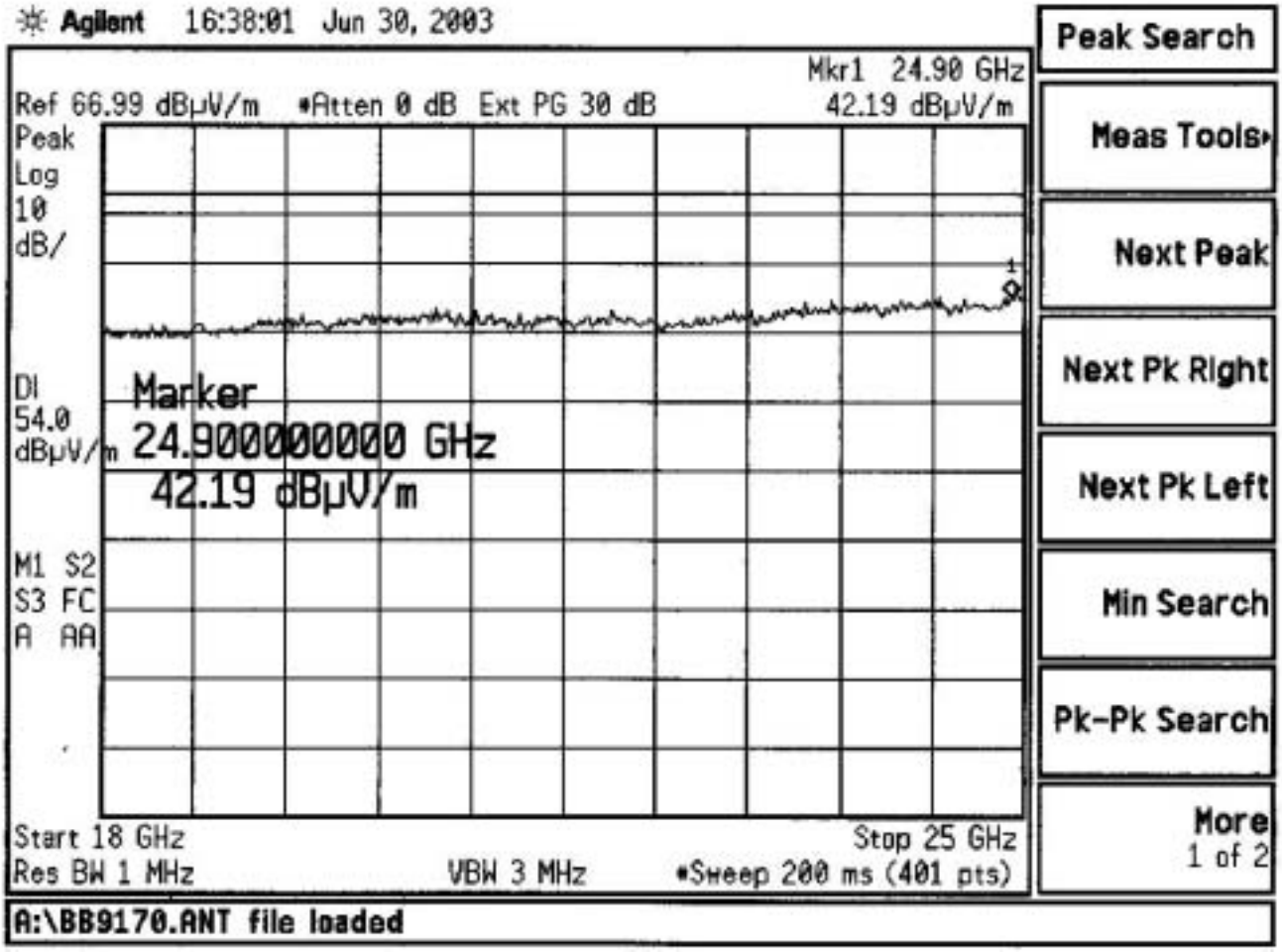
18Ghz – 25Ghz , Vertical



1Ghz – 18Ghz , Horizontal



18Ghz – 25Ghz , Horizontal



APPENDIX: Photographs of Test Setup

<Photos are saved separately>

APPENDIX : Photographs of EUT

Internal Photos

<Photos are saved separately>

External Photos

<Photos are saved separately>