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ELECTROMAGNETIC EMISSIONS COMPLIANCE REPORT INTENTIONAL RADIATOR CERTIFICATION TO FCC PART 15 SUBPART E REQUIREMENT

OF

802.11a/b/g WIRELESS LAN CARDBUS ADAPTER

MODEL No.: CB-500AG

FCC ID: NKRCB500AG

REPORT NO: 030019-RF-ID

ISSUE DATE: Mar. 10, 2003

Prepared for

Wistron NeWeb Corporation
No. 10-1,Li-hsin Road 1,Hsinchu300, Taiwan, R.O.C.

Prepared by

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ACCREDITED

VERIFICATION OF COMPLIANCE

Applicant:	**Wistron NeWeb Corporation** No. 10-1,Li-hsin Road 1,Hsinchu 3000,Taiwan,R.O.C.
Product Description:	IEEE 802.11 a/b/g WLAN Cardbus Adapter
Model No.:	CB-500AG
Serial Number:	N/A
File Number:	030019-RF-ID
Date of test:	February 18, 2003 ~March 07, 2003

We hereby certify that:

The above equipment was tested by C&C Laboratory Co., Ltd. The test data, data evaluation, test procedures, and equipment configurations shown in this report were made in accordance with the procedures given in ANSI C63.4 (2000) and the energy emitted by the sample EUT tested as described in this report is in compliance with the requirements set forth in CFR 47, Part 15, Subpart E. The equipment in the configuration described in this report, shows the measured emission levels emanating from the equipment do not exceed the specified limit.

The test results of this report relate only to the tested sample identified in this report.

Approved By

Vincent Su

Vincent Su / Vice Manager
C&C Laboratory Co., Ltd..

Table of Contents

1. GENERAL INFORMATION

1.1 Product Description

The Wistron NeWeb Corporation Model: CB-500AG (referred to as the EUT in this report) is a IEEE802.11a/b/g WLAN PCMCIA Card.

A major technical descriptions of EUT is described as following:

A). Operation Frequency:

5.15 GHz – 5.35 GHz

	Base Mode			Turbo Mode	
1	5180		1	5210	
2	5200		2	5250	
3	5220		3	5290	
4	5240				
5	5260				
6	5280				
7	5300				
8	5320				

B). Transmit Power: 16dBm
C). Modulation type: OFDM
D). Transition Speed: up to 54Mbps(108Mbps:Turbo mode)
E). Antenna Designation: PIFA Antenna,1.5dBi; Non-User Replaceable (Fixed), two provided. one for Tx, another for Rx.
F). Power Supply: DC3.3V from PCMCIA port of Notebook system for EUT

1.2 Related Submittal(s) / Grant (s)

This submittal(s) (test report) is intended for FCC ID: NKRCB500AG filing to comply with Section 15.407 of the FCC Part 15, Subpart E Rules.

1.3 Test Methodology

Both conducted and radiated testing was performed according to the procedures in ANSI C63.4 (2000) and FCC CFR 47 2.1046, 2.1047, 2.1049, 2.1051, 2.1053, 2.1055, 2.1057, and 2.407.

1.4 Test Facility

The open area test site and conducted measurement facility used to collect the radiated data is located on the address of C&C Laboratory, Co., Ltd. No. 81-1, 210 Lane, Pa-de 2nd Road, Lu-Chu Hsiang, Taoyuan, Taiwan, R.O.C.. The Open Area Test Sites and the Line Conducted labs are constructed and calibrated to meet the FCC requirements in documents ANSI C63.4: 2000 and CISPR 22/EN 55022 requirements.

1.5 Measurement Uncertainty

All the measurement equipments and accessories have been carefully selected to meet the maximum measurement uncertainty specified below:

Radiated Emission, valid up to 1GHz	+/- 2.16 dB
Radiated Emission, valid up to 26GHz	+/- 3.5 dB
Power Line Conducted Emission, valid up to 30MHz	+/- 2.8 dB
RF Frequency	+/- 2 X 10^-6
RF Peak Power (Conducted)	+/- 0.221 dB
Power Density (Conducted)	+/- 2.0022 dB
Frequency Stability V.S. Voltage	+/- 0.3538 %
Frequency Stability V.S. temperature	+/- 1.8974 %

P.S. Uncertainty figures are valid to confidence level of 95% calculated according to the methods described in the ETR 028[7]

1.6 Special Accessories

Not available for this EUT intended for grant.

1.7 Equipment Modifications

Not available for this EUT intended for grant.

2. SYSTEM TEST CONFIGURATION

2.1 EUT Configuration

The EUT configuration for testing is installed on RF field strength measurement to meet the Commissions requirement and operating in a manner that intends to maximize its emission characteristics in a continuous normal application.

2.2 EUT Exercise

The EUT (Transmitter) was operated in the engineering mode to fix the Tx frequency that was for the purpose of the measurements.

2.3 Test Procedure

2.3.1 Conducted Emissions

The EUT is a placed on as turn table which is 0.8 m above ground plane. According to the requirements in Section 13.1.4.1 of ANSI C63.4-2000.Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30MHz using CISPR Quasi-Peak detector mode.

2.3.2 Radiated Emissions

The EUT is a placed on as turn table which is 0.8 m above ground plane. The turn table shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3m away from the receiving antenna which varied from 1m to 4m to find out the highest emission. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. In order to find out the max. emission, the relative positions of this hand-held transmitter(EUT) was rotated through three orthogonal axes according to the requirements in Section 13.1.4.1 of ANSI C63.4-2000.

2.4 Configuration of Tested System

Fig. 2-1 Configuration of Tested System

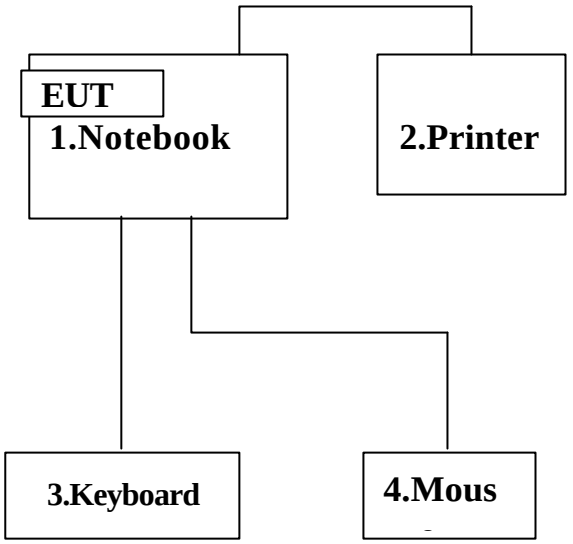


Table 2-1 Equipment Used in Tested System

Item	Equipment	Mfr/Brand	Model/ Type No.	FCC ID	Series No.	Data Cable	Power Cord
1	Notebook	IBM	2656	DoC	AK-VFOHT	N/A	*1.2m unshielded AC power cable* *1.8m unshielded DC power cable*
1	Notebook	TOSHIBA	1110	DoC	X2370069	N/A	*1.8m unshielded AC power cable* *1.8m unshielded DC power cable*
1	Notebook	BENQ	DH8000	DoC	N/A	N/A	*1.8m unshielded AC power cable* *1.8m unshielded DC power cable*
2	Printer	EPSON	P1114A	N/A	CAQY004717	*Shielded,1.8m*	*UnShielded,1.8m*
3	Keyboard	IBM	SK-8805	N/A	00037822	*Shielded,1.8m*	N/A
4	Mouse	LOGITECH	M-BB48	N/A	LZE01450987	*Shielded,1.8m*	N/A

3. SUMMARY OF TEST RESULTS

FCC Rules	Description Of Test	Result
§ 15.207	AC Power Line Conducted Emission	Compliant
§ 15.403(c)	Emission Bandwidth	Compliant
§ 15.407(a)	Power Measurement	Compliant
§ 15.407(a)	Peak Power Spectral Density Measurement	Compliant
§ 15.407(a)	Peak Excursion Measurement	Compliant
§ 15.407(b)	Undesirable Emission – Conducted Measurement	Compliant
§ 15.407(b)	Undesirable Emission – Radiated Measurement	Compliant
§ 15.407(c)	Transmission in case of Absence of Information	Compliant
§ 15.407(g)	Frequency Stability	Compliant
§ 15.4079d)	Antenna Requirement	Compliant
§ 1.1310 and § 2.1093	RF exposures	Compliant

4. DESCRIPTION OF TEST MODES

The EUT has been tested under engineering test mode. Software used to control the EUT for staying in continuous transmitting and receiving mode is programmed.

Base mode of frequency band 5.15GHz – 5.35GHz: Channel 1(5180MHz)、4(5240MHz)、5(5260MHz) and 8(5320MHz) with 54Mbps highest data rate are chosen for full testing.
Turbo mode of frequency band 5.15GHz – 5.35GHz: Channel 1(5210MHz)、2(5250MHz) and 3(5290MHz) with 108Mbps highest data rate are chosen for full testing.

AC Power port conducted emission and Radiated Spurious Emission are measured with three difference type of Notebook PC.

5. AC POWER LINE CONDUCTED EMISSION TEST

5.1 Standard Applicable

Any U-NII devices using an AC power line are required to comply also with the conducted limits set forth in §15.207.According to § 15.207 frequency within 150KHz to 30MHz shall not exceed

Frequency range (MHz)	Limits (dBuV)	
	Quasi-peak	Average
0.15 to 0.50	66 to 56	56 to 46
0.50 to 5	56	46
5 to 30	60	50
Note 1.The lower limit shall apply at the transition frequencies 2.The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz.		

5.2 EUT Setup

1. The conducted emission tests were performed in the test site, using the setup in accordance with the ANSI C63.4-2000.
2. The EUT was plug-in the host Notebook via PCMCIA port. The host Notebook system was placed on the center of the back edge on the test table. The peripherals like printer, K/B, and mouse were placed on the side of the host Notebook system. The rear of the EUT and peripherals were placed flushed with the rear of the tabletop.
3. The keyboard was placed directly in the front of the Notebook, flushed with the front tabletop. The mouse was placed next to the Keyboard, flushed with the back of keyboard.
4. The spacing between the peripherals was 10 centimeters.
5. External I/O cables were draped along the edge of the test table and bundle when necessary.
6. The host Notebook system was connected with 110Vac/60Hz power source.

5.3 Measurement Procedure

1. The EUT was placed on a table which is 0.8m above ground plane.
2. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
3. Repeat above procedures until all frequency measured were complete.

5.4 Measurement Equipment Used:

Conducted Emission Test Site # 3					
EQUIPMENT TYPE	**MFR**	**MODEL NUMBER**	**SERIAL NUMBER**	**LAST CAL.**	**CAL DUE.**
EMI Test Receiver	R&S	ESHS30	828144/003	08/08/2002	08/07/2003
LISN	R&S	ESH2-Z5	843285/010	10/17/2002	10/16/2003
LISN	EMCO	3825/2	9003-1628	07/26/2002	07/25/2003
Spectrum Analyzer	ADVANTEST	R3261A	91720031	N/A	N/A
2X2 WIRE ISN	R&S	ENY22	100020	06/20/2002	06/19/2003
FOUR WIRE ISN	R&S	ENY41	100006	06/20/2002	06/19/2003

5.5 Measurement Result

The initial step in collecting conducted data is a spectrum analyzer peak scan of the measurement range. Significant peaks are then marked as shown on the following data page, and these signals are then quasi-peaked.

Operation Mode:	TX + RX Mode	Test Date :	Mar. 06 2003
Temperature :	23 ℃	Test By:	James
Humidity :	58%	Test host:	IBM

FREQ. (MHz)	Correct. Factor (dB)	Q.P. Read Value (dBuV)	AV. Read Value (dBuV)	Emission Level(Q.P.) (dBuV)	Emission Level(AV.) (dBuV)	Q.P. Limit (dBuV)	AV. Limit (dBuV	Result	NOTE
0.152	0.3	52.0	36.8	52.3	37.1	65.89	55.89	PASS	L1
0.648	0.4	32.5	28.1	32.9	28.5	56.00	46.00	PASS	L1
0.998	0.4	34.0	31.8	34.4	32.2	56.00	46.00	PASS	L1
6.902	0.5	36.6	32.1	37.1	32.6	60.00	50.00	PASS	L1
11.957	0.5	27.4	21.2	27.9	21.7	60.00	50.00	PASS	L1
19.750	0.5	21.8	15.7	22.3	16.2	60.00	50.00	PASS	L1
0.150	0.3	50.8	30.0	51.1	30.3	66.00	56.00	PASS	L2
0.715	0.4	32.5	24.8	32.9	25.2	56.00	46.00	PASS	L2
1.934	0.4	33.0	30.4	33.4	30.8	56.00	46.00	PASS	L2
16.200	0.5	27.6	22.0	28.1	22.5	60.00	50.00	PASS	L2
18.752	0.5	31.7	26.2	32.2	26.7	60.00	50.00	PASS	L2
22.631	0.5	30.2	25.2	30.7	25.7	60.00	50.00	PASS	L2

Remark：

(1) Measuring frequencies from 0.15 MHz to 30MHz。

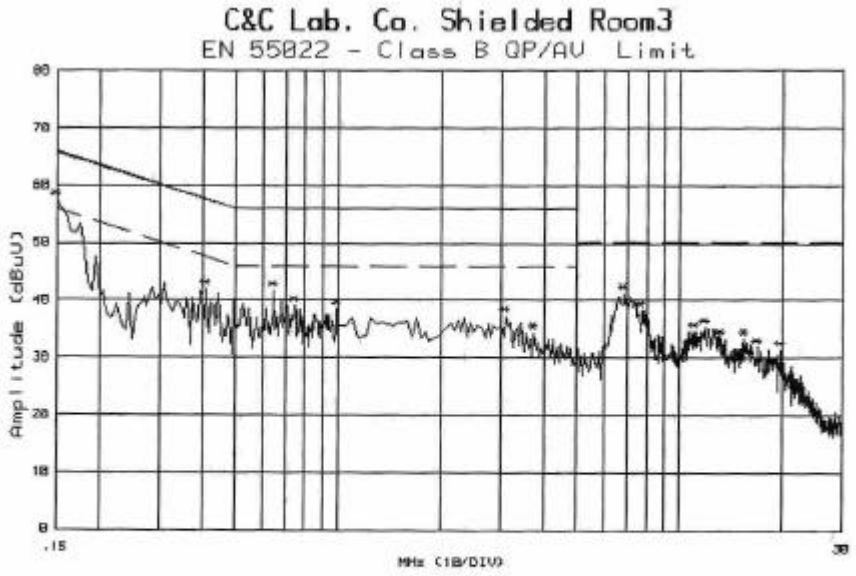
(2) The emissions measured in frequency range from 0.15 MHz to 30MHz were made with an instrument using Quasi-Peak detector and Average detector.

(3) "---" denotes the emission level was or more than 2dB below the Average limit, so no re-check anymore.

(4) The IF bandwidth of SPA between 0.15MHz to 30MHz was 10KHz;
The IF bandwidth of Test Receiver between 0.15MHz to 30MHz was 9KHz;

(5) L1 = Line One (Hot side) / L2 = Line Two (Neutral side)

Conducted Emission Test Data L1

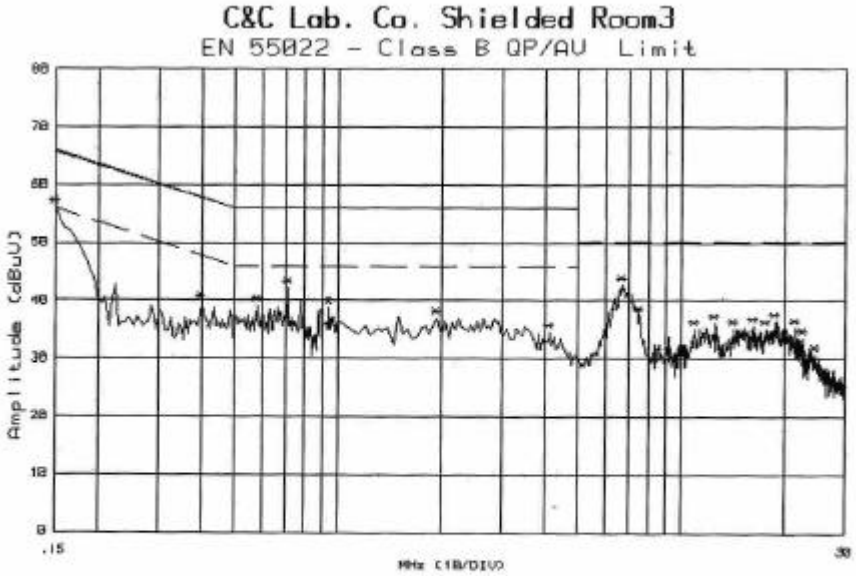


Customer:WINSTRON
Model :WLAN(IBM)
Mode :
Reading :Peak(R&S Receiver)
Remark :

File#: 1501
Humd.:58 (%)
Port :L1

Date : 6 Mar 2003 06:24:53
Temp. :23 (C)
Tested by:JAMES_LEE

Conducted Emission Test Data L2



Customer:WINSTRON
Model :WLAN(IBM)
Mode :
Reading :Peak(R&S Receiver)
Remark :

File#: 1502
Humd.:58 (%)
Port :L2

Date : 6 Mar 2003 06:32:39
Temp. :23 (C)
Tested by:JAMES_LEE

Operation Mode:	TX + RX Mode	Test Date :	Mar. 06 2003
Temperature :	23 ℃	Test By:	James
Humidity :	58%	Test host:	TOSHIBA

FREQ. (MHz)	Correct. Factor (dB)	Q.P. Read Value (dBuV)	AV. Read Value (dBuV)	Emission Level(Q.P.) (dBuV)	Emission Level(AV.) (dBuV)	Q.P. Limit (dBuV)	AV. Limit (dBuV	Result	NOTE
0.159	0.3	46.2	32.6	46.5	32.9	65.52	55.52	PASS	L1
0.431	0.4	30.0	28.2	30.4	28.6	57.23	47.23	PASS	L1
0.808	0.4	26.3	20.9	26.7	21.3	56.00	46.00	PASS	L1
7.607	0.5	21.6	15.3	22.1	15.8	60.00	50.00	PASS	L1
12.449	0.5	27.8	22.7	28.3	23.2	60.00	50.00	PASS	L1
17.150	0.5	21.9	16.4	22.4	16.9	60.00	50.00	PASS	L1
0.153	0.3	47.8	36.1	48.1	36.4	65.84	55.84	PASS	L2
0.539	0.4	30.2	26.3	30.6	26.7	56.00	46.00	PASS	L2
0.857	0.4	27.3	23.5	27.7	23.9	56.00	46.00	PASS	L2
6.746	0.4	23.2	17.5	23.6	17.9	60.00	50.00	PASS	L2
12.400	0.5	28.0	22.9	28.5	23.4	60.00	50.00	PASS	L2
15.949	0.5	24.0	17.9	24.5	18.4	60.00	50.00	PASS	L2

Remark：

(1) Measuring frequencies from 0.15 MHz to 30MHz。

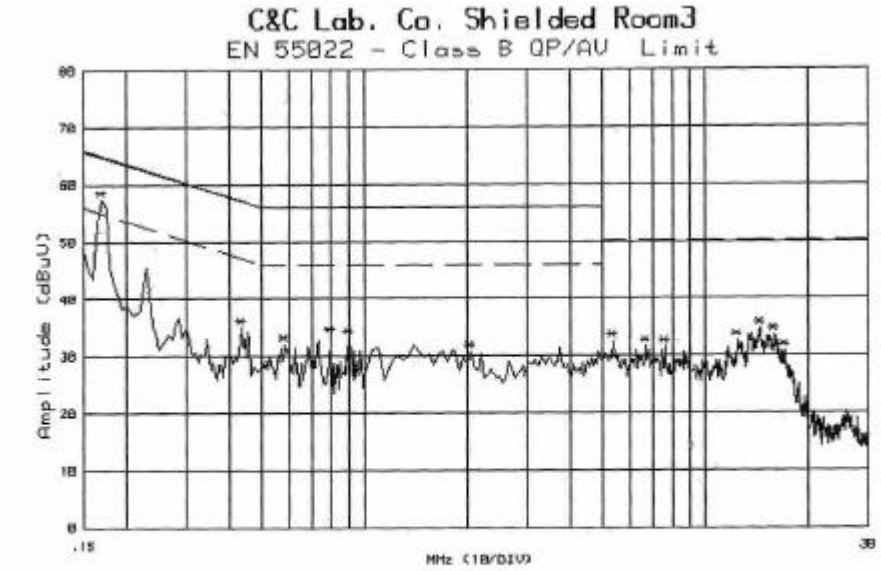
(2) The emissions measured in frequency range from 0.15 MHz to 30MHz were made with an instrument using Quasi-Peak detector and Average detector.

(3) "---" denotes the emission level was or more than 2dB below the Average limit, so no re-check anymore.

(4) The IF bandwidth of SPA between 0.15MHz to 30MHz was 10KHz;
The IF bandwidth of Test Receiver between 0.15MHz to 30MHz was 9KHz;

(5) L1 = Line One (Hot side) / L2 = Line Two (Neutral side)

Conducted Emission Test Data L1

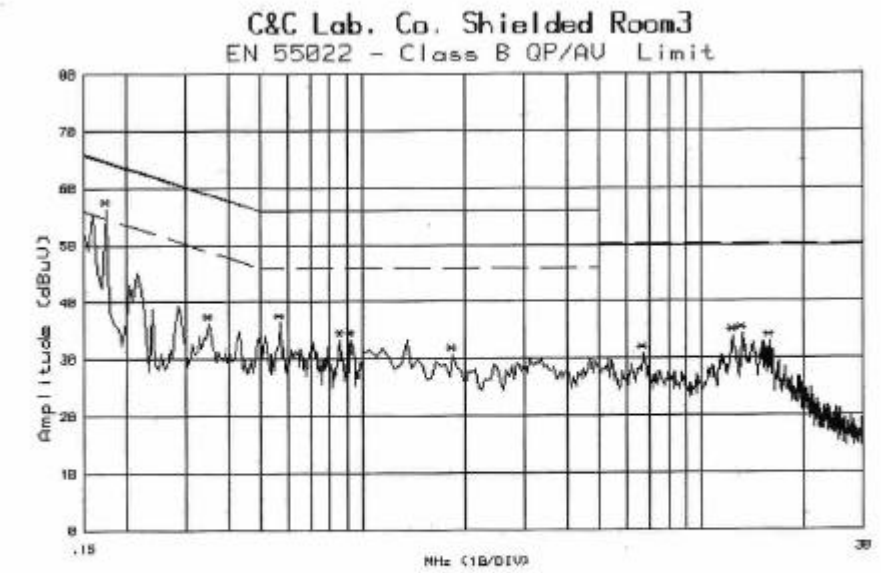


Customer:WINSTRON
Model :WLAN(TOSHIBA)
Mode :
Reading :Peak(R&S Receiver)
Remark :

File#: 1499
Humd.:58 (%)
Port :L1

Date : 6 Mar 2003 06:02:48
Temp. :23 (C)
Tested by:JAMES_LEE

Conducted Emission Test Data L2



Customer:WINSTRON
Model :WLAN(TOSHIBA)
Mode :
Reading :Peak(R&S Receiver)
Remark :

File#: 1500
Humd.:58 (%)
Port :L2

Date : 6 Mar 2003 06:10:53
Temp. :23 (C)
Tested by:JAMES_LEE

Operation Mode:	TX + RX Mode	Test Date :	Mar. 06 2003
Temperature :	23 ℃	Test By:	James
Humidity :	58%	Test host:	BENQ

FREQ. (MHz)	Correct. Factor (dB)	Q.P. Read Value (dBuV)	AV. Read Value (dBuV)	Emission Level(Q.P.) (dBuV)	Emission Level(AV.) (dBuV)	Q.P. Limit (dBuV)	AV. Limit (dBuV	Result	NOTE
0.198	0.4	42.3	35.1	42.7	35.5	63.69	53.69	PASS	L1
0.529	0.4	38.0	34.1	38.4	34.5	56.00	46.00	PASS	L1
0.928	0.4	38.8	35.1	39.2	35.5	56.00	46.00	PASS	L1
3.646	0.4	31.5	27.7	31.9	28.1	56.00	46.00	PASS	L1
7.094	0.5	28.8	23.0	29.3	23.5	60.00	50.00	PASS	L1
17.037	0.5	27.5	20.0	28.0	20.5	60.00	50.00	PASS	L1
0.199	0.4	38.9	33.2	39.3	33.6	63.65	53.65	PASS	L2
0.463	0.4	38.1	32.6	38.5	33.0	56.64	46.64	PASS	L2
0.795	0.4	37.8	34.2	38.2	34.6	56.00	46.00	PASS	L2
2.451	0.4	31.4	25.0	31.8	25.4	56.00	46.00	PASS	L2
17.093	0.5	28.4	20.9	28.9	21.4	56.00	50.00	PASS	L2

Remark：

(1) Measuring frequencies from 0.15 MHz to 30MHz。

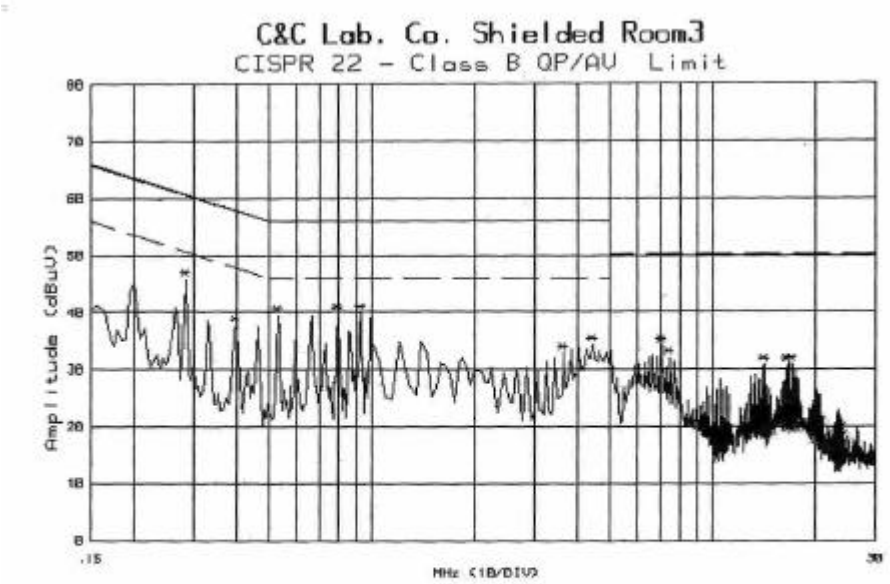
(2) The emissions measured in frequency range from 0.15 MHz to 30MHz were made with an instrument using Quasi-Peak detector and Average detector.

(3) "---" denotes the emission level was or more than 2dB below the Average limit, so no re-check anymore.

(4) The IF bandwidth of SPA between 0.15MHz to 30MHz was 10KHz;
The IF bandwidth of Test Receiver between 0.15MHz to 30MHz was 9KHz;

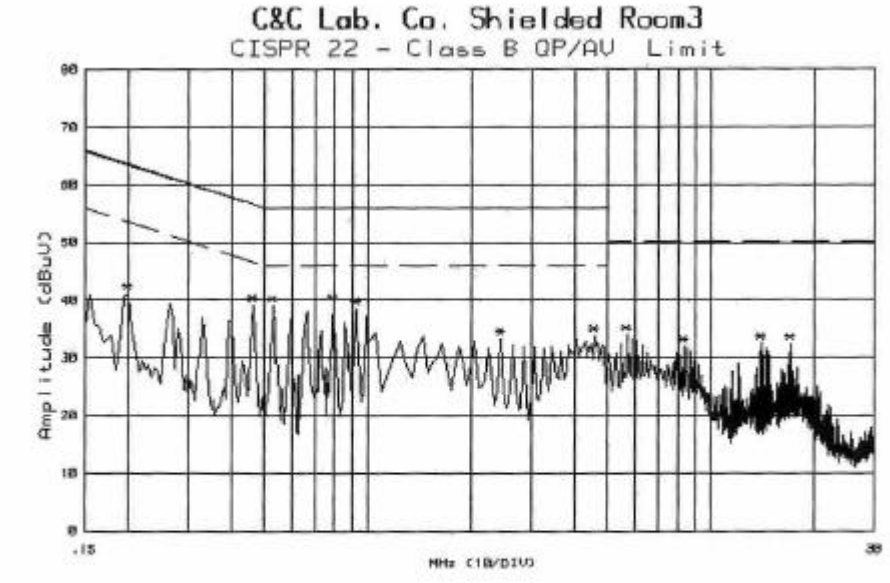
(5) L1 = Line One (Hot side) / L2 = Line Two (Neutral side)

Conducted Emission Test Data L1



Customer:WINSTRON File#: 1497 Date : 6 Mar 2003 05:40:43
Model :WLAN(BENQ) Humd.:58 (%) Temp. :23 (C)
Mode : Port :L1 Tested by:JAMES_LEE
Reading :Peak(R&S Receiver)
Remark :

Conducted Emission Test Data L2



Customer:WINSTRON File#: 1498 Date : 6 Mar 2003 05:48:32
Model :WLAN(BENQ) Humd.:58 (%) Temp. :23 (C)
Mode : Port :L2 Tested by:JAMES_LEE
Reading :Peak(R&S Receiver)
Remark :

6. 26 dB EMISSION Bandwidth Measurement

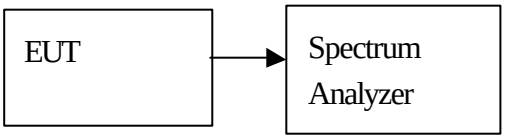
6.1 Standard Applicable

According to § 15.403(C). No Limit required.

6.2 Measurement Equipment Used:

EQUIPMENT TYPE	MFR	Model No.	Serial No.	LAST CAL.	Cal. Due.
Spectrum Analyzer	Advantest	R3182	110600647	11/16/2002	11/15/2003
Spectrum Analyzer	R&S	FSP30	1093.4495.30	07/23/2002	07/22/2003

6.3 Test Set-up:



The EUT was connected to a spectrum analyzer through a 50Ω RF cable.

6.4 Measurement Procedure

1. Place the EUT on the table and set it in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
3. Set the spectrum analyzer as RBW=1%EBW, VBW = RBW, Span=50MHz/100MHz(Turbo Mode), Sweep=auto.
4. Mark the peak frequency and –26dBc (upper and lower) frequency.
5. Repeat above procedures until all frequency measured were complete.

6.5 Measurement Result

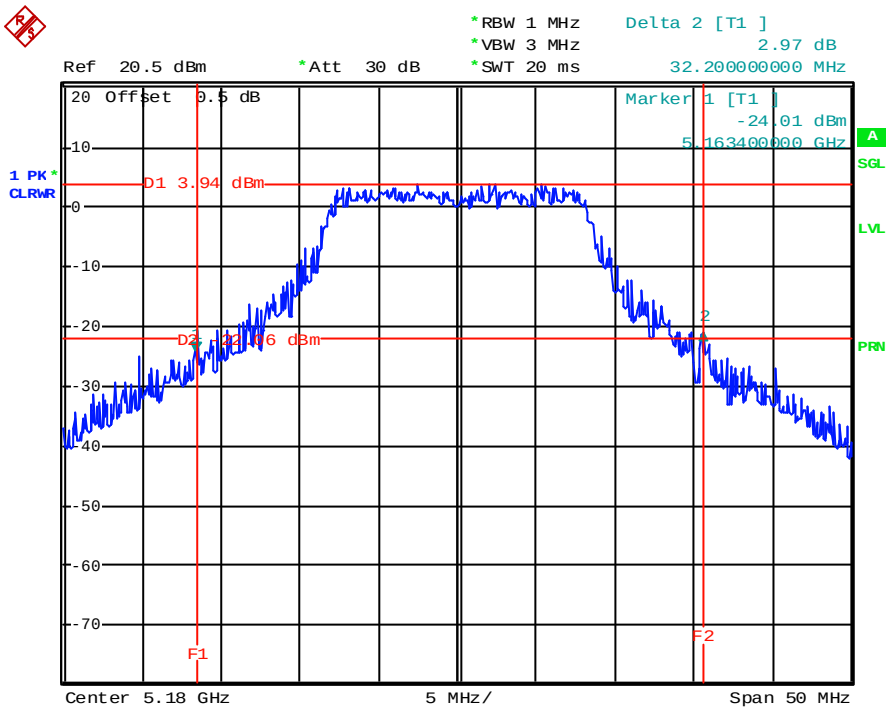
Base Mode of 5.15GHz - 5.35GHz

Channel	Frequency (MHz)	Bandwidth(B) (MHz)	10 Log B (dB)
Low	5180	32.2	15.08
Middle	5240	32.0	15.05
Middle	5260	33.5	15.25
High	5320	33.1	15.20

Turbo Mode of 5.15GHz – 5.35GHz

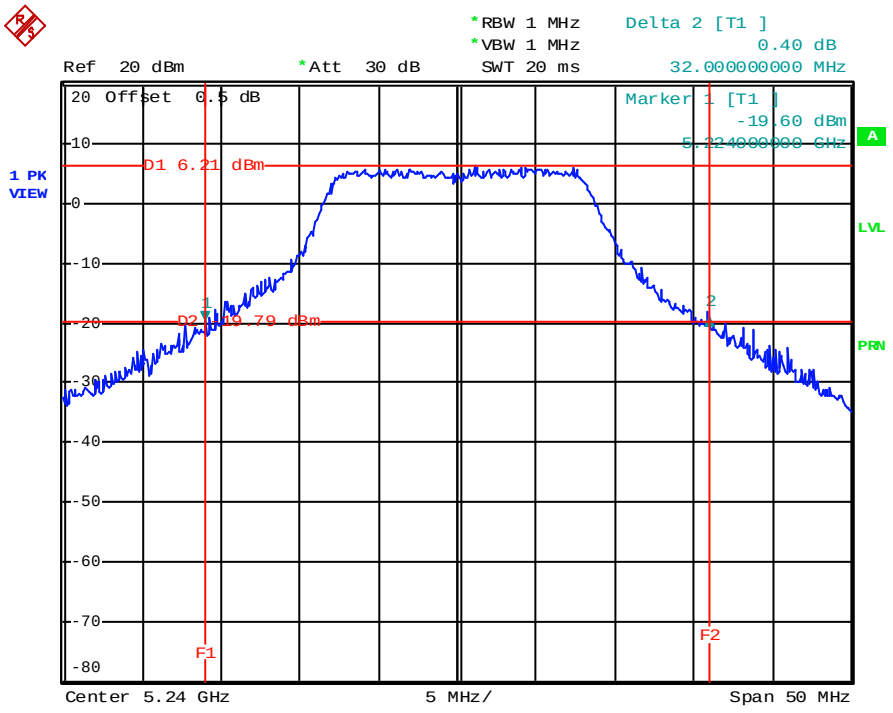
Channel	Frequency (MHz)	Bandwidth (MHz)	10 Log B (dB)
Low	5210	58.0	17.63
Middle	5250	57.4	17.59
High	5290	67.4	18.29

Base Mode of 5.15GHz - 5.35 GHz, CH-Low



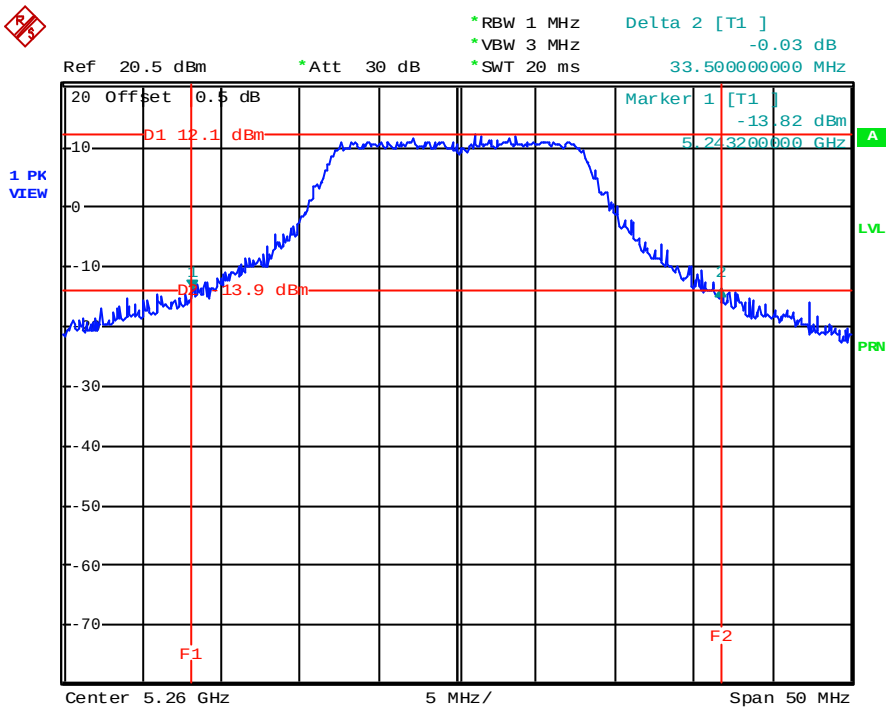
Date: 22.FEB.2003 04:17:59

Base Mode of 5.15GHz - 5.35 GHz, CH-Middle



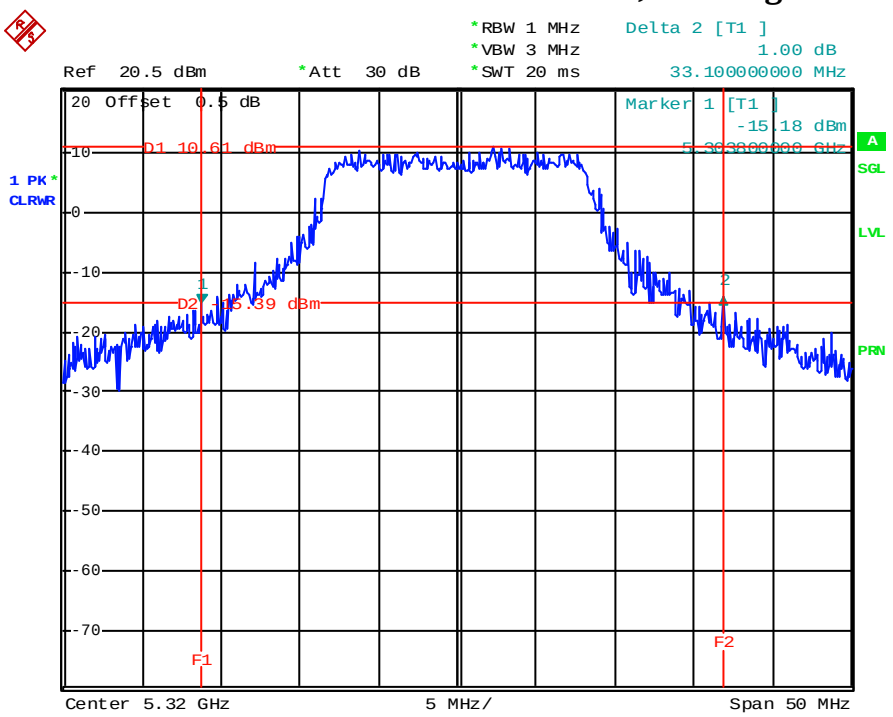
Date: 6.MAR.2003 14:44:10

Base Mode of 5.15GHz - 5.35 GHz, CH-Middle



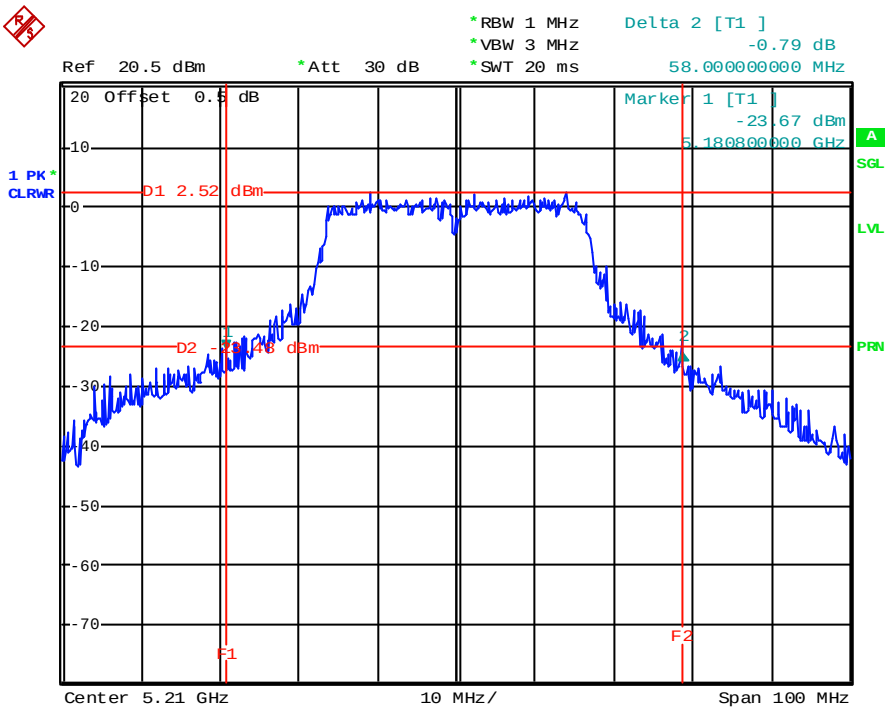
Date: 22.FEB.2003 04:13:04

Base Mode of 5.15GHz - 5.35 GHz, CH-High



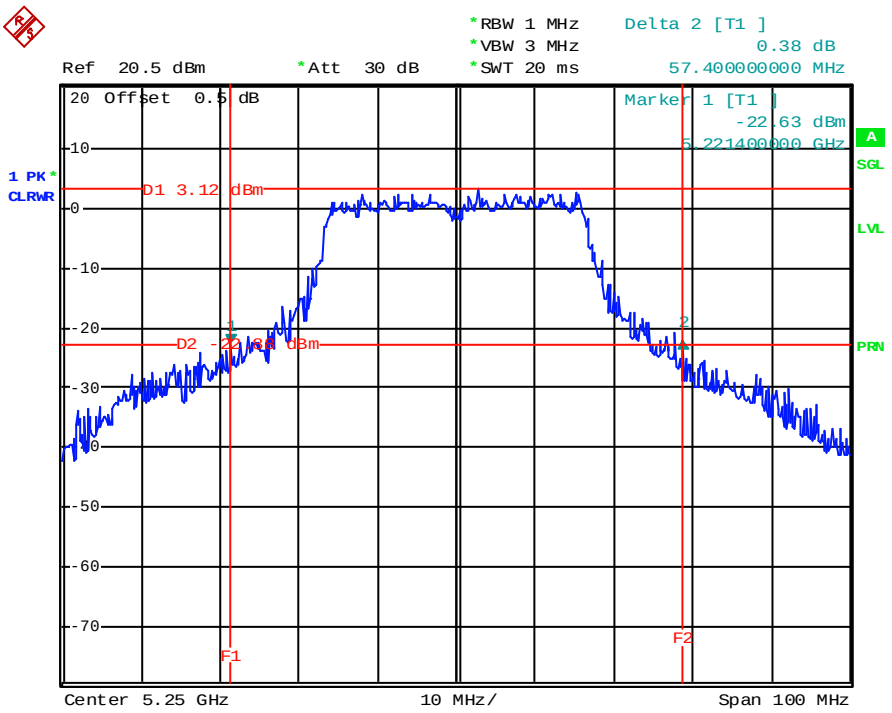
Date: 22.FEB.2003 04:25:59

Turbo Mode of 5.15GHz - 5.35 GHz, CH-Low



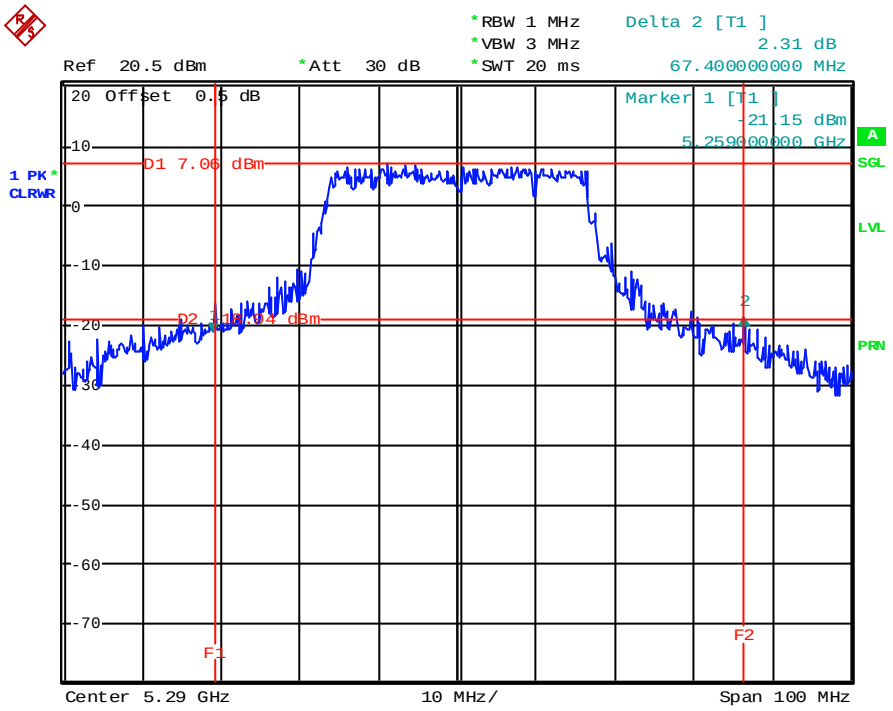
Date: 22.FEB.2003 04:20:43

Turbo Mode of 5.15GHz - 5.35 GHz, CH-Middle



Date: 22.FEB.2003 04:21:59

Turbo Mode of 5.15GHz - 5.35 GHz, CH-High



Date: 22.FEB.2003 04:24:22

7. PEAK OUTPUT POWER MEASUREMENT

7.1 Standard Applicable

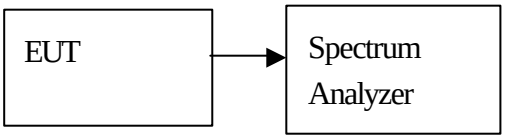
(1) For the band 5.15-5.25 GHz, the peak transmit power over the frequency band of operation shall not exceed the lesser of 50 mW (17dBm) or 4 dBm + 10log B.

(2) For the band 5.25-5.35 GHz, the peak transmit power over the frequency band of operation shall not exceed the lesser of 250 mW (24dBm) or 11 dBm + 10log B.

(3) For the band 5.725-5.825 GHz, the peak transmit power over the frequency band of operation shall not exceed the lesser of 1W (30dBm) or 17 dBm + 10log B.

Where B is the -26dBc emission bandwidth in MHz. If transmitting antennas of directional gain greater than 6 dBi are used, both the peak transmit power and the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

7.2 Test Set-up:



The EUT was connected to a spectrum analyzer through a 50Ω RF cable.

7.3 Measurement Procedure

1. Place the EUT on the table and set it in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the power meter or spectrum. (Channel Power Function, RBW=1MHz,VBW=3MHz, CP Bandwidth =26dB Emission Bandwidth)
3. Record the max. reading.
4. Repeat above procedures until all frequency measured were complete.

7.4 Measurement Equipment Used:

EQUIPMENT TYPE	MFR	Model No.	Serial No.	LAST CAL.	Cal. Due.
Spectrum Analyzer	Advantest	R3182	110600647	11/16/2002	11/15/2003
Spectrum Analyzer	R&S	FSP30	1093.4495.30	07/23/2002	07/22/2003

7.5 Specification Limit:

Base Mode

Channel	Frequency (MHz)	10 Log B (dB)	4 + 10 Log B or 11 + 10 Log B (dBm)	Power Limit (dBm)
Low	5180	15.08	19.08	17
Middle	5240	15.05	19.05	17
Middle	5260	15.25	26.25	24
High	5320	15.20	26.20	24

Turbo Mode

Channel	Frequency (MHz)	10 Log B (dB)	4 + 10 Log B or 11 + 10 Log B (dBm)	Power Limit (dBm)
Low	5210	17.63	21.63	17
Middle	5250	17.59	21.59	17
High	5290	18.29	29.29	24

Maximum antenna gain = 1.5 dBi, therefore there is no reduction due to antenna gain.

7.6 Test Results:

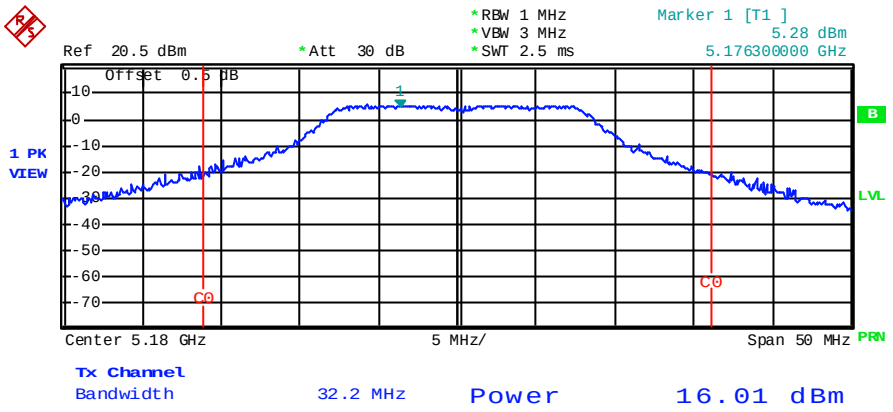
Base Mode of 5.15GHz – 5.35GHz

Channel	Frequency (MHz)	Peak Output Power (dBm)	Limit (dBm)	Margin (dB)
Low	5180	16.01	17	-0.89
Middle	5240	16.55	17	-0.45
Middle	5260	20.84	24	-2.48
High	5320	21.85	24	-1.25

Turbo Mode of 5.15GHz – 5.35GHz

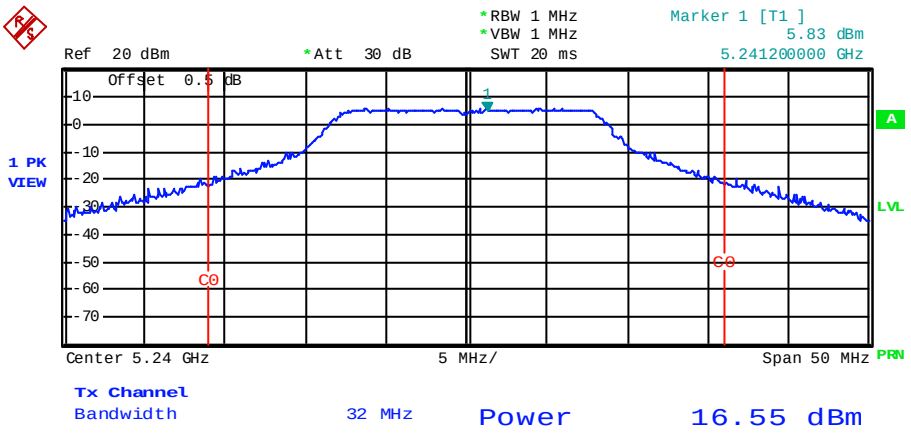
Channel	Frequency (MHz)	Peak Output Power (dBm)	Limit (dBm)	Margin (dB)
Low	5210	16.36	17	-0.22
Middle	5250	16.74	17	-0.26
High	5290	20.82	24	-2.37

Base Mode of 5.15GHz - 5.35 GHz, CH-Low



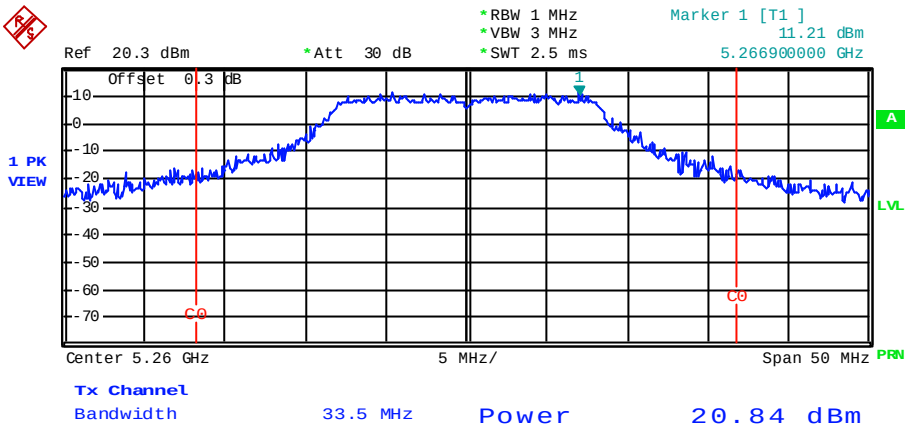
Date: 3.MAR.2003 07:28:09

Base Mode of 5.15GHz - 5.35 GHz, CH-Middle



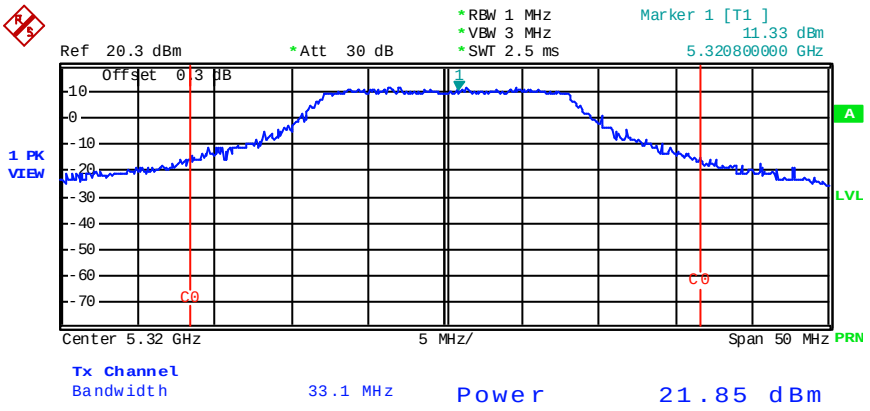
Date: 6.MAR.2003 14:46:48

Base Mode of 5.15GHz - 5.35 GHz, CH-Middle



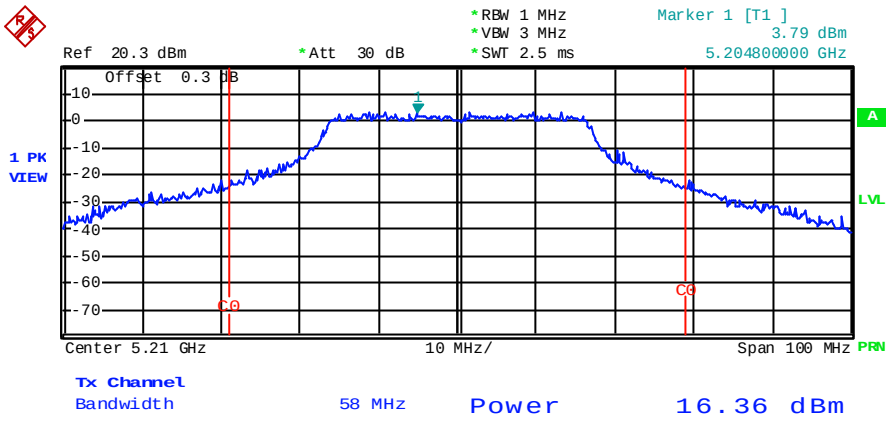
Date: 14.MAR.2003 04:42:02

Base Mode of 5.15GHz - 5.35 GHz, CH-High



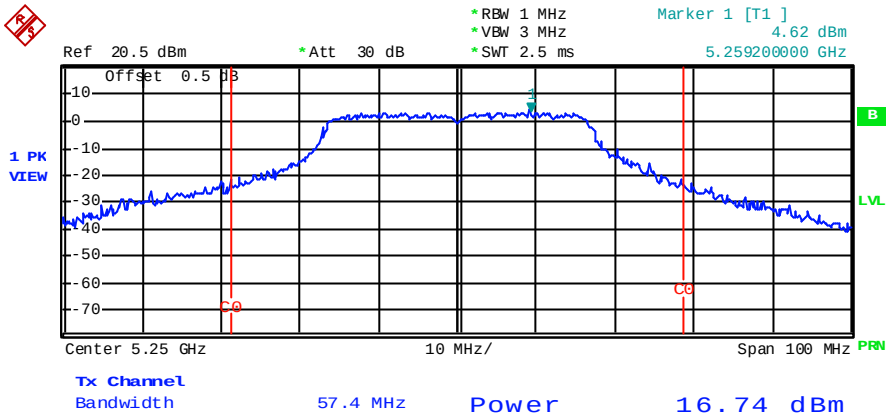
Date: 14.MAR.2003 04:43:31

Turbo Mode of 5.15GHz - 5.35 GHz, CH-Low



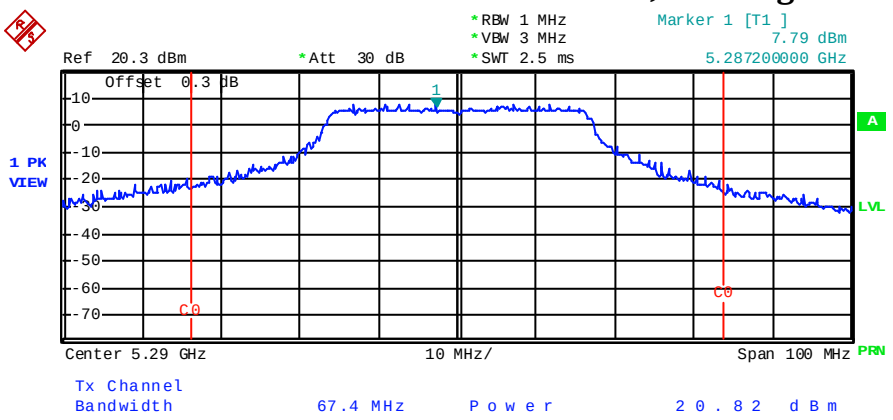
Date: 14.MAR.2003 04:50:04

Turbo Mode of 5.15GHz - 5.35 GHz, CH-Middle



Date: 3.MAR.2003 07:44:56

Turbo Mode of 5.15GHz - 5.35 GHz, CH-High



Date: 14.MAR.2003 04:36:54

8. PEAK POWER SPECTRAL DENSITY MEASUREMENT

8.1 Standard Applicable

(1) For the band 5.15-5.25 GHz, the peak power spectral density shall not exceed 4 dBm in any 1-MHz band.

(2) For the band 5.25-5.35 GHz, the peak power spectral density shall not exceed 11 dBm in any 1-MHz band.

(3) For the band 5.725-5.825 GHz, the peak power spectral density shall not exceed 17 dBm in any 1-MHz band.

Where B is the -26dBc emission bandwidth in MHz. If transmitting antennas of directional gain greater than 6 dBi are used, both the peak transmit power and the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

8.2 Measurement Procedure

1. Place the EUT on the table and set it in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to Spectrum.
3. Set RBW=1MHz,VBW=3MHz, Span=30MHz (Base Mode)/ 50MHz (Turbo Mode), Sweep time = Auto.
4. Record the max. reading.
5. Repeat above procedures until all frequency measured were complete.

8.3 Measurement Equipment Used:

EQUIPMENT TYPE	MFR	Model No.	Serial No.	LAST CAL.	Cal. Due.
Spectrum Analyzer	Advantest	R3182	110600647	11/16/2002	11/15/2003
Spectrum Analyzer	R&S	FSP30	1093.4495.30	07/23/2002	07/22/2003

8.4 Test Results:

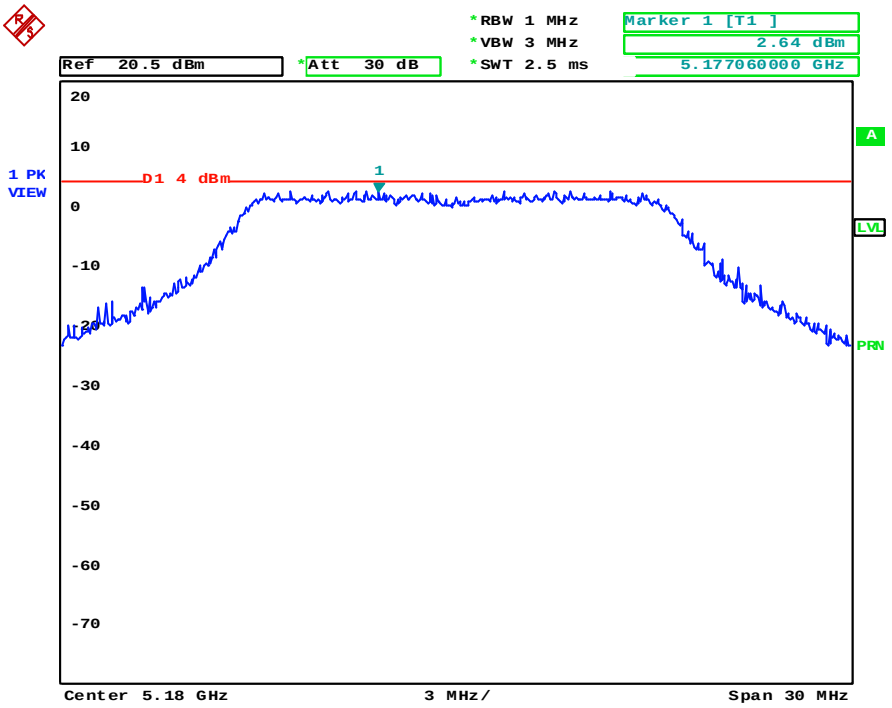
Base Mode of 5.15GHz - 5.35 GHz

Channel	Frequency (MHz)	PPSD (dBm)	Limit (dBm)	Margin (dB)
Low	5180	2.64	4	-1.36
Middle	5240	3.08	4	-0.92
Middle	5260	10.35	11	-0.65
High	5320	10.28	11	-0.72

Turbo Mode of 5.15GHz - 5.35 GHz

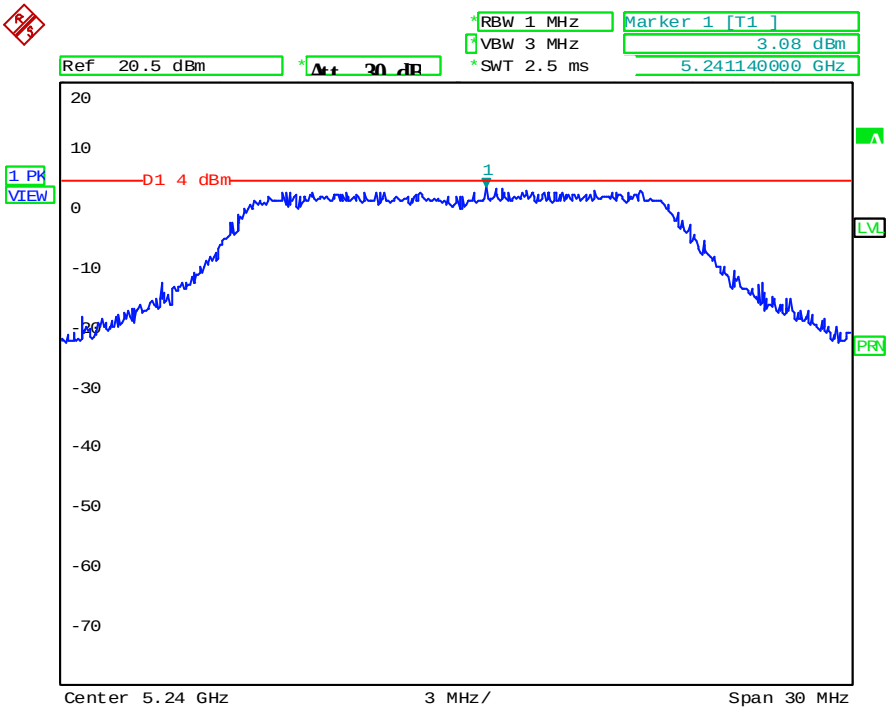
Channel	Frequency (MHz)	PPSD (dBm)	Limit (dBm)	Margin (dB)
Low	5210	2.74	4	-1.26
Middle	5250	2.96	4	-1.04
High	5290	9.04	11	-1.96

Base Mode of 5.15GHz - 5.35 GHz, CH-Low



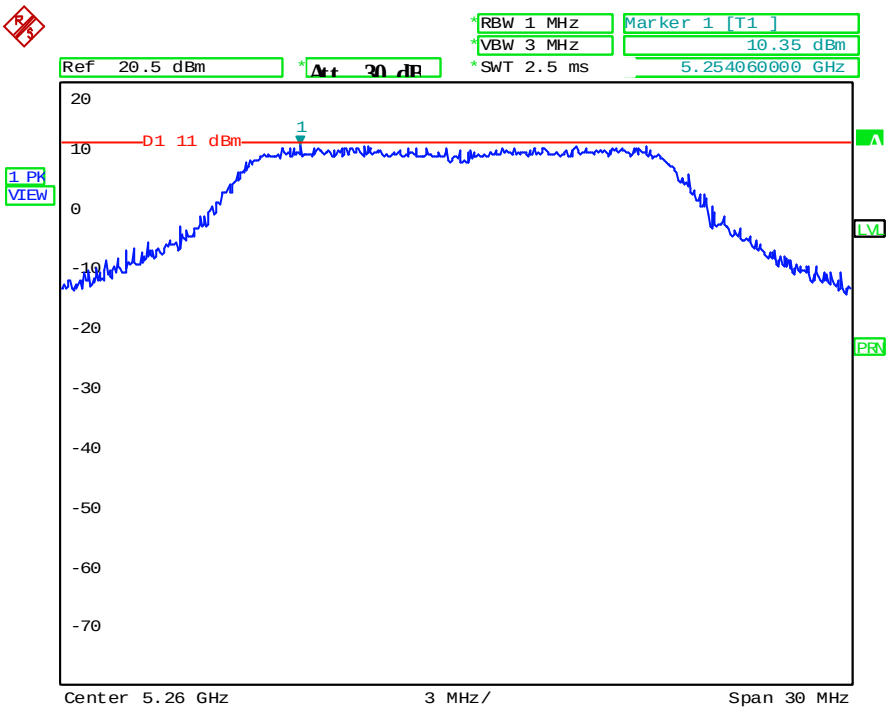
Date: 5.MAR.2003 13:52:35

Base Mode of 5.15GHz - 5.35 GHz, CH-Middle



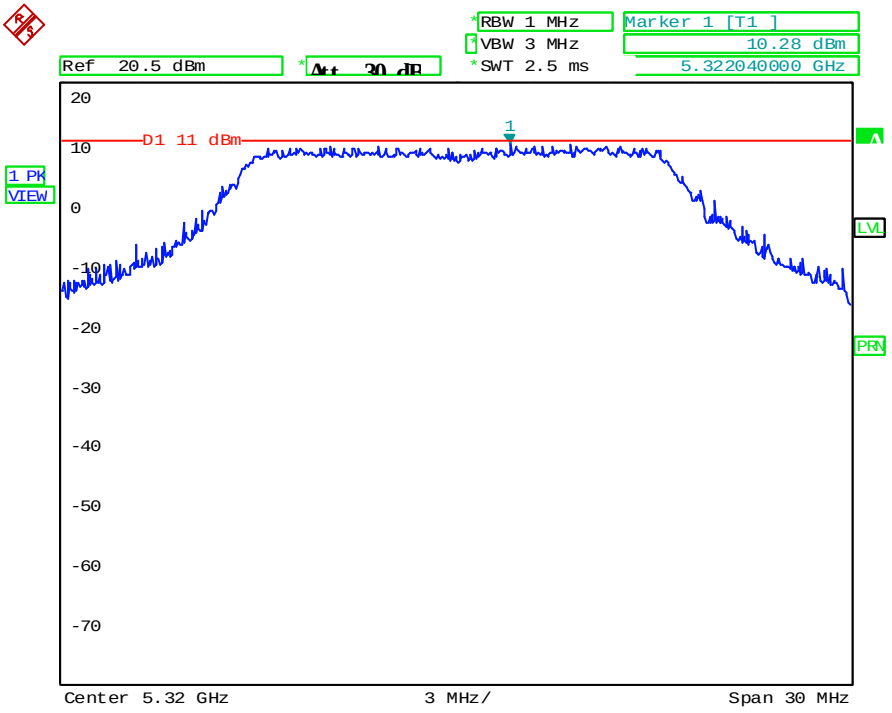
Date: 5.MAR.2003 13:49:41

Base Mode of 5.15GHz - 5.35 GHz, CH-Middle



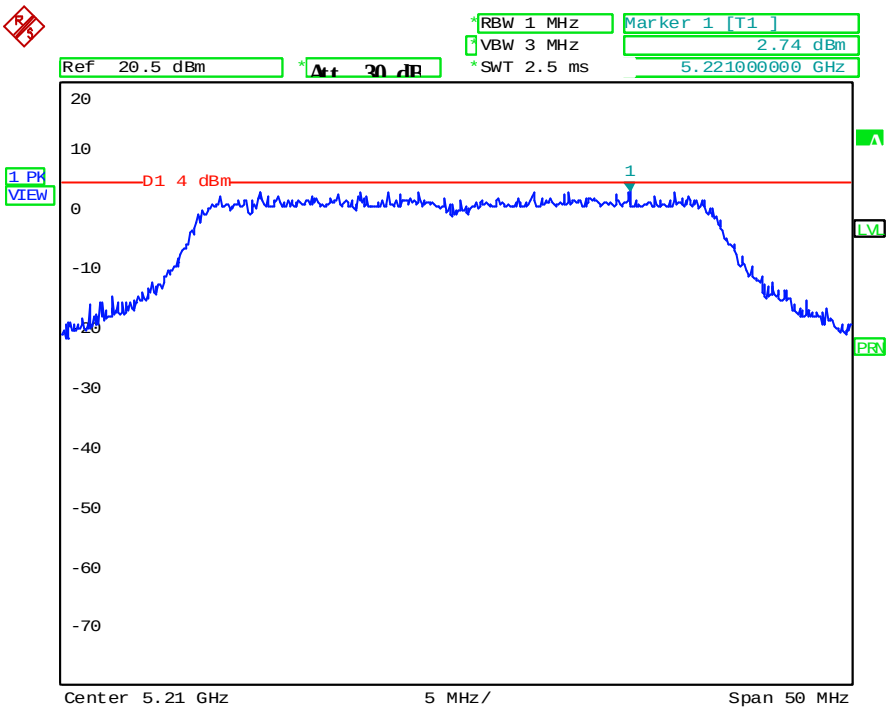
Date: 5.MAR.2003 13:44:58

Base Mode of 5.15GHz - 5.35 GHz, CH-High



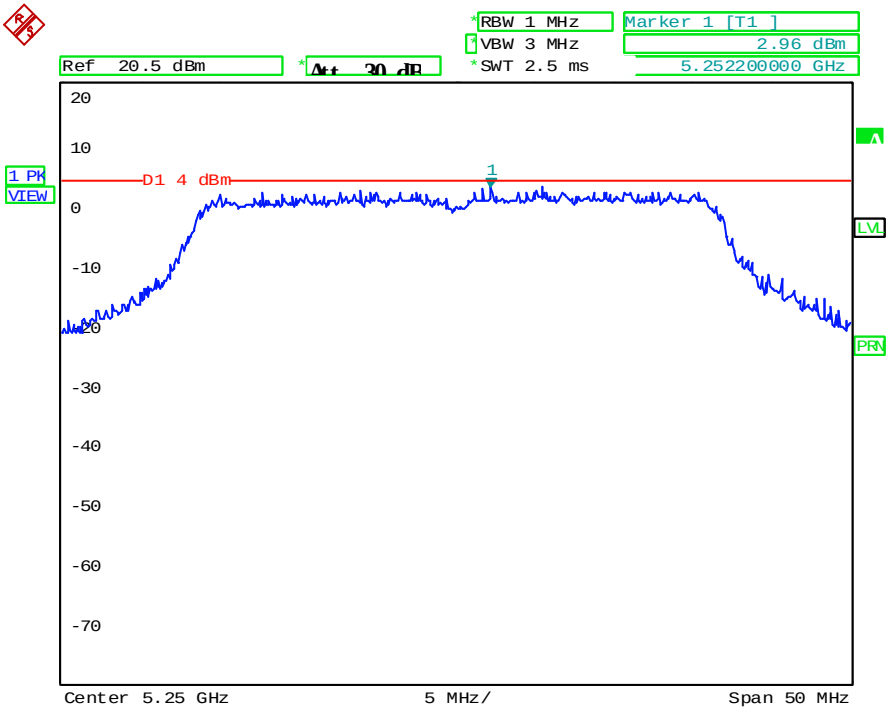
Date: 5.MAR.2003 13:46:05

Turbo Mode of 5.15GHz - 5.35 GHz, CH-Low



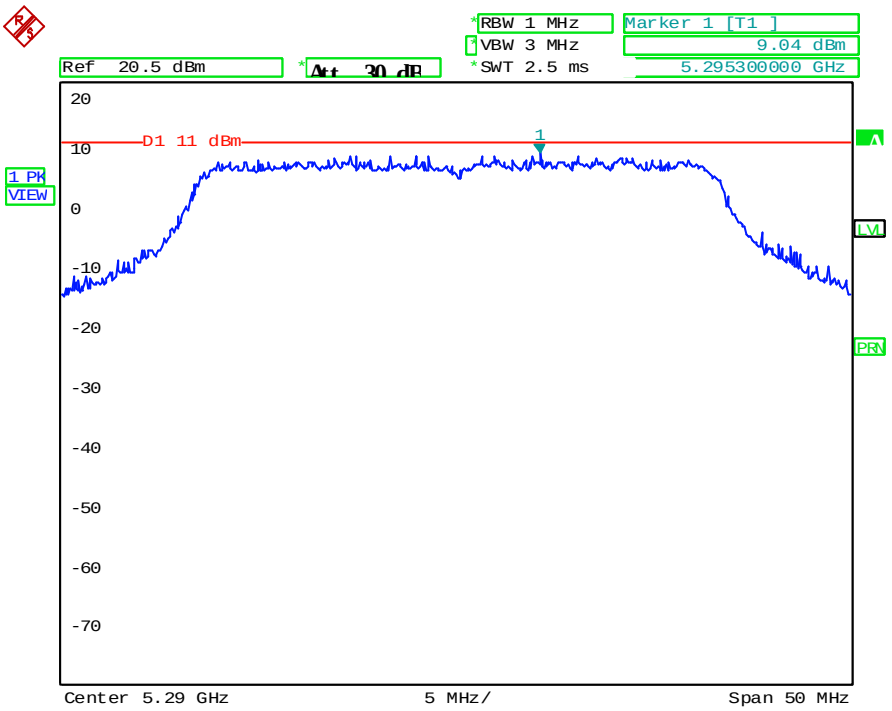
Date: 5.MAR.2003 13:54:01

Turbo Mode of 5.15GHz - 5.35 GHz, CH-Middle



Date: 5.MAR.2003 13:48:40

Turbo Mode of 5.15GHz - 5.35 GHz, CH-High



Date: 5.MAR.2003 13:47:09

9. PEAK EXCURSION MEASUREMENT

9.1 Standard Applicable

15.407(a)(6) The ratio of the peak excursion of the modulation envelope (measured using a peak hold function) to the peak transmit power (measured as specified above) shall not exceed 13 dB across any 1 MHz bandwidth or the emission bandwidth whichever is less.

9.2 Measurement Procedure

1. Place the EUT on the table and set it in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to spectrum.
3. Trace A, Set RBW=1MHz, VBW = 3MHz, Span = 25MHz(Base Mode)/50MHz(Turbo Mode), Max. hold.
4. Trace B, Set RBW=1MHz, VBW = 30KHz, Span =25MHz(Base Mode)/50MHz(Turbo Mode), Max. hold..
5. Delta Mark trace A Maximum frequency and trace B same frequency.
6. Repeat above procedures until all frequency measured were complete.

9.3 Measurement Equipment Used:

EQUIPMENT TYPE	MFR	Model No.	Serial No.	LAST CAL.	Cal. Due.
Spectrum Analyzer	Advantest	R3182	110600647	11/16/2002	11/15/2003
Spectrum Analyzer	R&S	FSP30	1093.4495.30	07/23/2002	07/22/2003

9.4 Test Results:

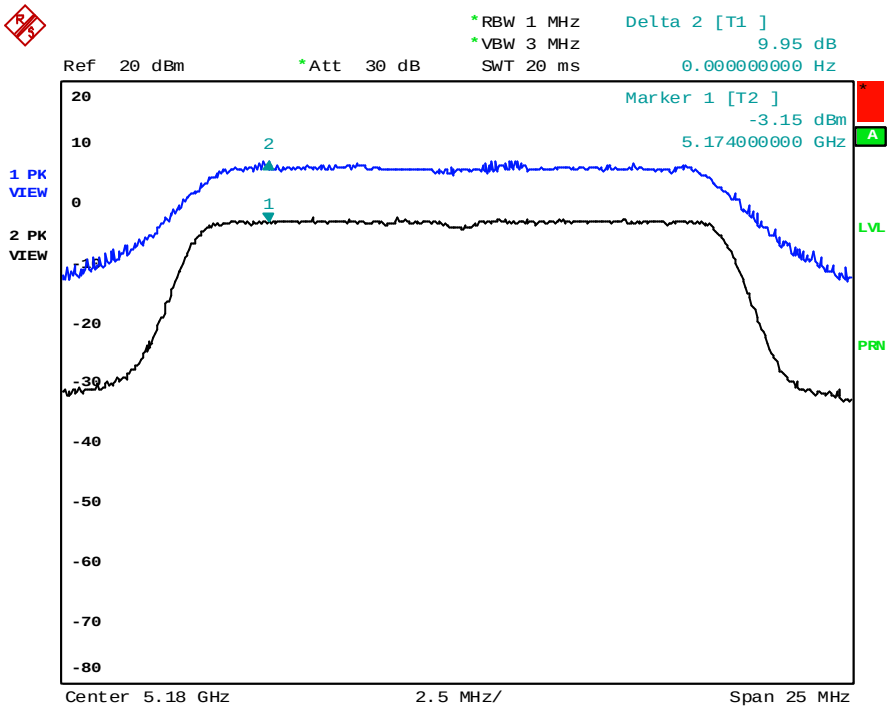
Base Mode of 5.15GHz - 5.35 GHz

Channel	Frequency (MHz)	Peak Excursion (dB)	Limit (dB)	Margin (dB)
Low	5180	9.95	13	-3.05
Middle	5240	9.40	13	-3.6
Middle	5260	9.76	13	-3.24
High	5320	9.79	13	-3.21

Turbo Mode of 5.15GHz - 5.35 GHz

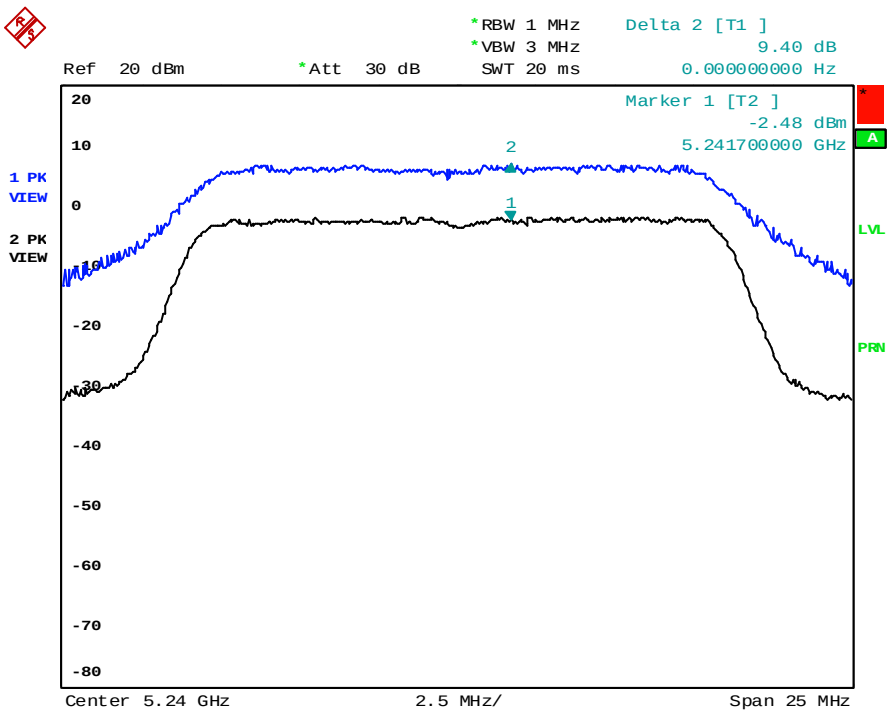
Channel	Frequency (MHz)	Peak Excursion (dB)	Limit (dB)	Margin (dB)
Low	5210	9.44	13	-3.56
Middle	5250	9.71	13	-3.29
High	5290	9.09	13	-3.91

Base Mode of 5.15GHz - 5.35 GHz, CH-Low



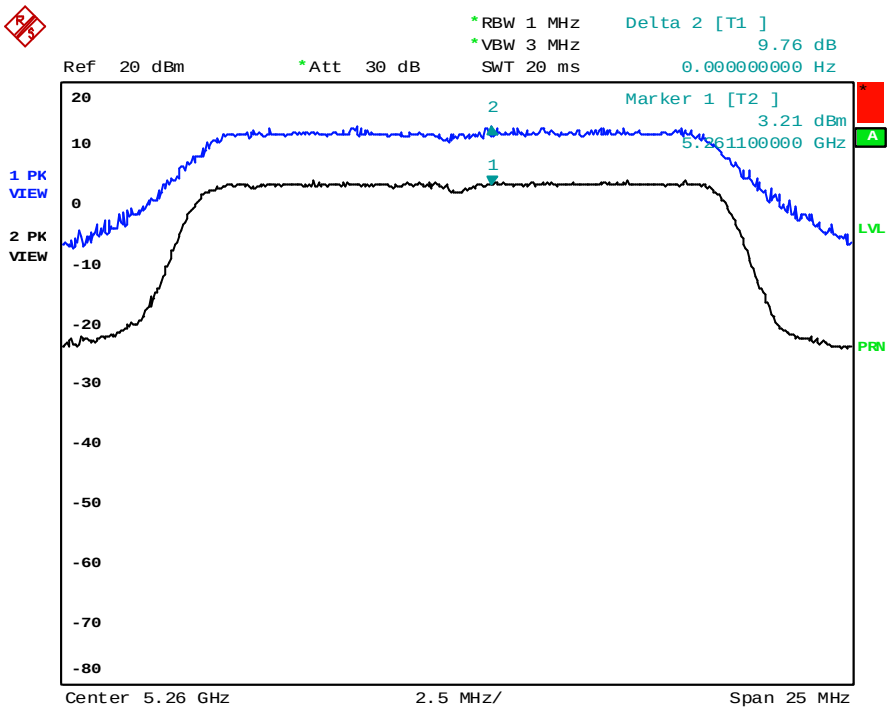
Date: 7.MAR.2003 02:44:20

Base Mode of 5.15GHz - 5.35 GHz, CH-Middle



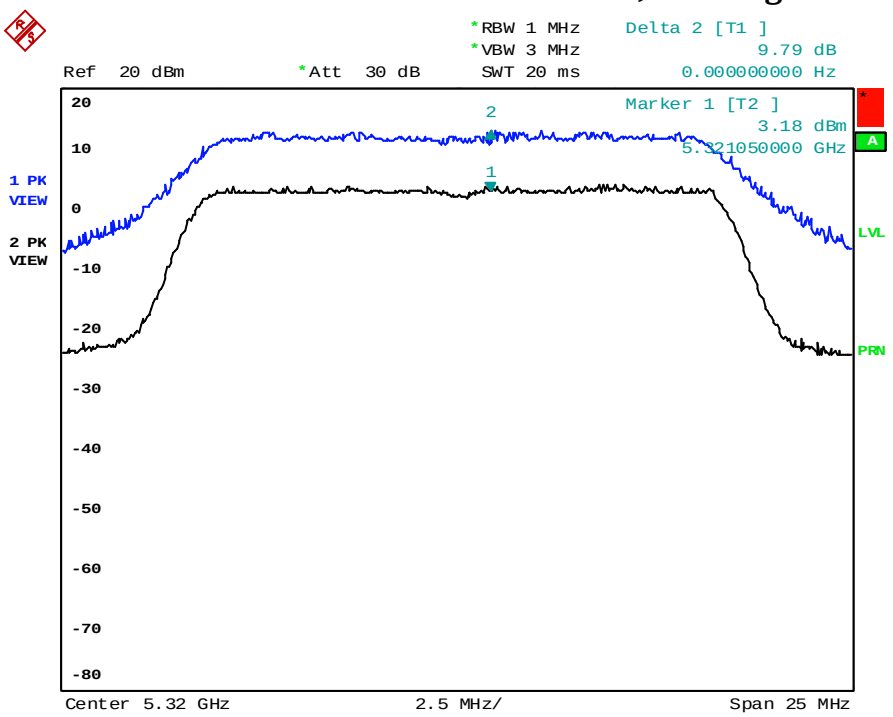
Date: 7.MAR.2003 02:42:19

Base Mode of 5.15GHz - 5.35 GHz, CH-Middle



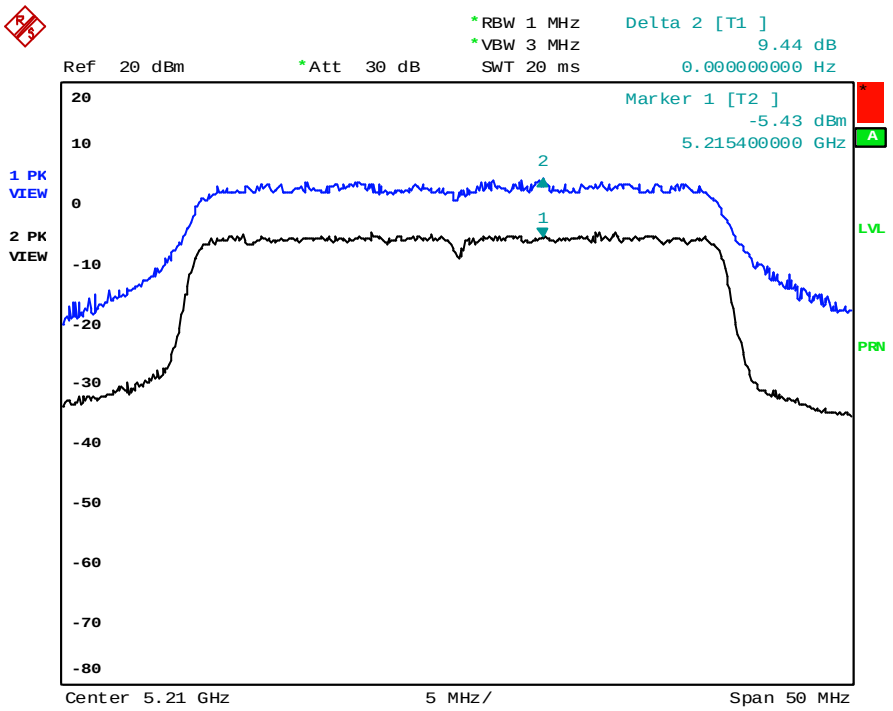
Date: 7.MAR.2003 02:47:25

Base Mode of 5.15GHz - 5.35 GHz, CH-High



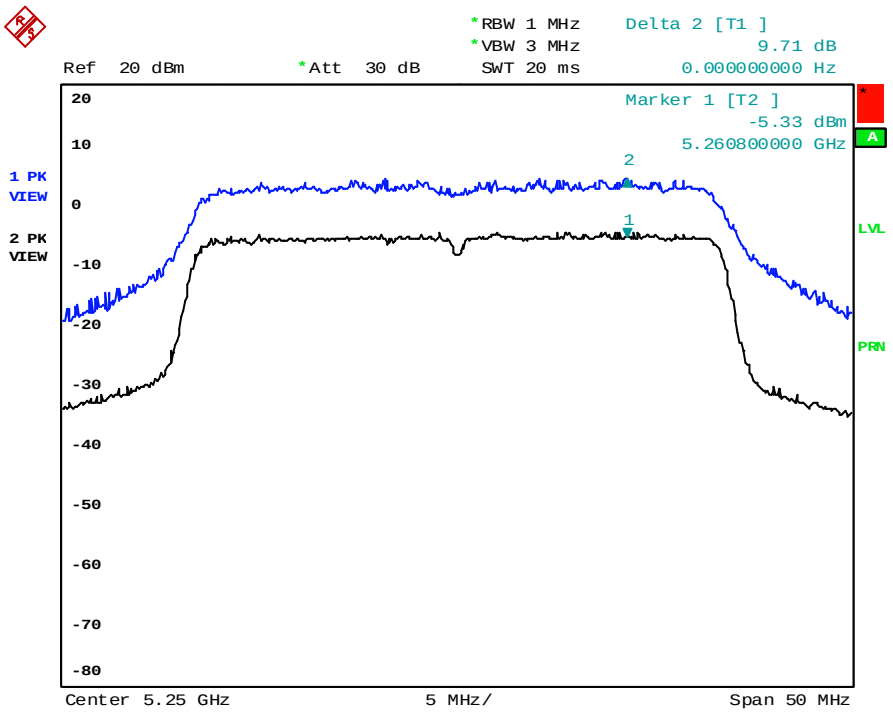
Date: 7.MAR.2003 02:48:56

Turbo Mode of 5.15GHz - 5.35 GHz, CH-Low



Date: 7.MAR.2003 02:54:06

Turbo Mode of 5.15GHz - 5.35 GHz, CH-Middle



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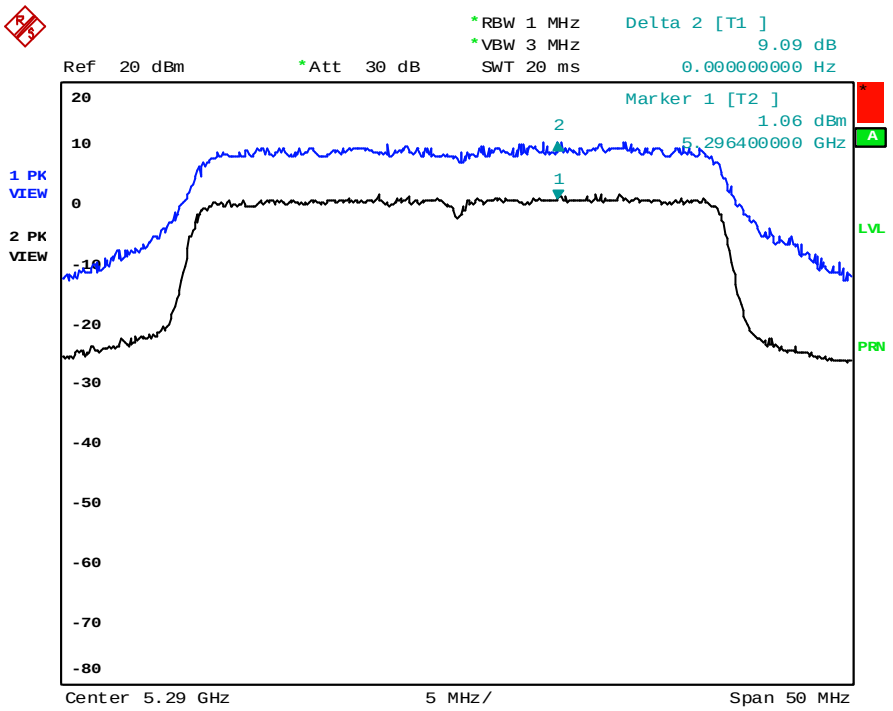
Turbo Mode of 5.15GHz - 5.35 GHz, CH-High



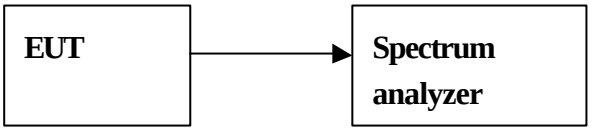
Date: 7.MAR.2003 02:50:53

10. BAND EDGES MEASUREMENT

Conducted RF measurements of the transmitter output were made to confirm that the EUT antenna port conducted emissions meet the specified limit and to identify any spurious signals that require further investigation and measurements on the radiated emissions site.

10.1 Test Setup

1. Conducted test



The EUT was connected to the spectrum analyzer through a 50Ω RF cable.

2.Radiation test

The EUT is placed on the wooden table. The antenna to EUT distance is 3 meters. The EUT is configured in accordance with ANSI C63.4/2000.

10.2 Measurement Procedure

1.Conducted test:

The transmitter output is connected to the spectrum analyzer. The RBW is set to 1MHz and the VBW is set to 1MHz for peak measurements. The RBW is set to 1MHz and the VBW is set to 10Hz for average measurements. The sweep time is coupled.

2.Radiation test

For measurements above 1 GHz, the resolution bandwidth is set to 1 MHz, then the video bandwidth is set to 1 MHz for peak measurements and 10 Hz for average measurements.

10.3 Measurement Equipment Used:

Open Area Test Site # 3					
EQUIPMENT TYPE	**MFR**	**MODEL NUMBER**	**SERIAL NUMBER**	**LAST CAL.**	**CAL DUE.**
Spectrum Analyzer	ADVANTEST	R3261A	N/A	03/18/2003	03/17/2004
Spectrum Analyzer	Advantest	R3182	110600647	11/16/2002	11/15/2003
Spectrum Analyzer	ROHDE & SCHWARZ	FSP30	100112	06/29/2002	06/28/2003
EMI Test Receiver	R&S	ESVS20	838804/004	01/04/2003	01/03/2004
Pre-Amplifier	HP	8447D	2944A09173	03/03/2003	03/02/2004
Bi-log Antenna	SCHWAZBECK	VULB9163	145	07/06/2002	07/05/2003
Turn Table	EMCO	2081-1.21	9709-1885	N.C.R	N.C.R
Antenna Tower	EMCO	2075-2	9707-2060	N.C.R	N.C.R
Controller	EMCO	2090	9709-1256	N.C.R	N.C.R
RF Switch	ANRITSU	MP59B	M53867	N.C.R	N.C.R
Site NSA	C&C	N/A	N/A	11/17/2002	11/16/2003
Horn antenna	Schwarzbeck	BBHA 9120	D210	2/23/2003	2/22/2004
Horn antenna	EMCO	3116	2487	11/11/2002	11/10/2003
Pre-Amplifier	HP	8449B	3008B00965	10/01/2002	10/02/2003

9.4 Measurement Result

Base Mode

1.Conducted test

Frequency (MHz)	Reading (dBm)		Ant. Gain (dBi)	Emission (dBm)		Limit Line (dBm)		Margin (dBm)	
	PK	AV		PK	AV	PK	AV	PK	AV
5150.00	-34.97	-51.42	1.5	-33.47	-49.92	-21	-41	-12.47	-8.92
5119.92	-40.72	-51.37	1.5	-39.22	-49.87	-21	-41	-18.22	-8.87
5351.44	-24.15	-44.09	1.5	-22.65	-42.59	-21	-41	-1.65	-1.59
5375.92	-37.96	-48.72	1.5	-36.46	-47.22	-21	-41	-15.46	-6.22

2.Radiation test:

Operation Mode:	TX Mode	Test Date :	Mar. 07 2003
Temperature :	23 ℃	Test By:	James
Humidity :	58 %	Pol:	Ver./Hor
Test Host:	IBM		

Frequency (MHz)	Cable loss (dB)	Ant. Fact. (dB/m)	Pre-amp. (dB)	Ant. Pol. (H/V)	Reading (dBuV)		Emission (dBuV/m)		Limit Line (dBuV/m)		Margin (dBuV/m)	
					PK	AV	PK	AV	PK	AV	PK	AV
5148.20	1.34	37.16	31.86	V	53.3	42.9	49.3	38.9	74.0	54.0	-24.7	-15.1
5148.00	1.34	37.16	31.86	H	51.0	40.9	47.0	36.9	74.0	54.0	-27.0	-17.1
5352.00	1.45	37.18	31.94	V	64.5	50.0	60.7	46.2	74.0	54.0	-13.3	-7.8
5352.20	1.45	37.18	31.94	H	60.3	47.1	56.5	43.3	74.0	54.0	-17.5	-10.7

Operation Mode:	TX Mode	Test Date :	Mar. 07 2003
Temperature :	23 ℃	Test By:	James
Humidity :	58 %	Pol:	Ver./Hor
Test Host:	TOSHIBA		

Frequency (MHz)	Cable loss (dB)	Ant. Fact. (dB/m)	Pre-amp. (dB)	Ant. Pol. (H/V)	Reading (dBuV)		Emission (dBuV/m)		Limit Line (dBuV/m)		Margin (dBuV/m)	
					PK	AV	PK	AV	PK	AV	PK	AV
5148.00	1.34	37.16	31.86	V	54.9	42.6	50.9	38.6	74.0	54.0	-23.1	-15.4
5152.60	1.34	37.16	31.86	V	55.1	43.2	51.2	39.3	74.0	54.0	-22.8	-14.7
5148.00	1.34	37.16	31.86	H	51.9	38.9	47.9	34.9	74.0	54.0	-26.1	-19.1
5351.40	1.45	37.18	31.94	V	66.4	49.6	62.6	45.8	74.0	54.0	-11.4	-8.2

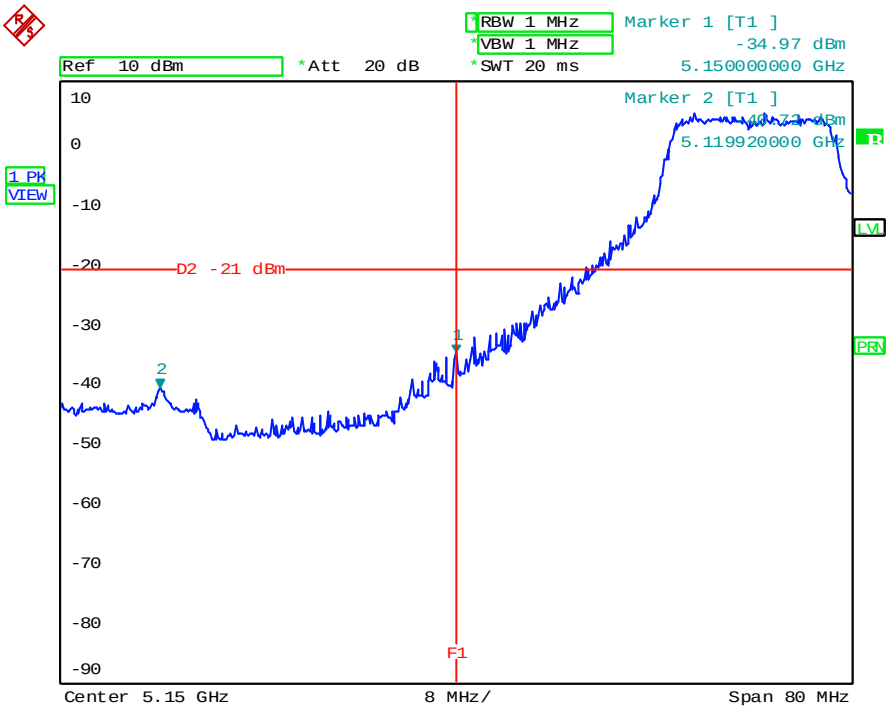
5352.80	1.45	37.18	31.94	H	60.1	43.9	56.3	40.1	74.0	54.0	-17.7	-13.9

Operation Mode:	TX Mode	Test Date :	Mar. 07 2003
Temperature :	23 ℃	Test By:	James
Humidity :	58 %	Pol:	Ver./Hor
Test Host:	BENQ		

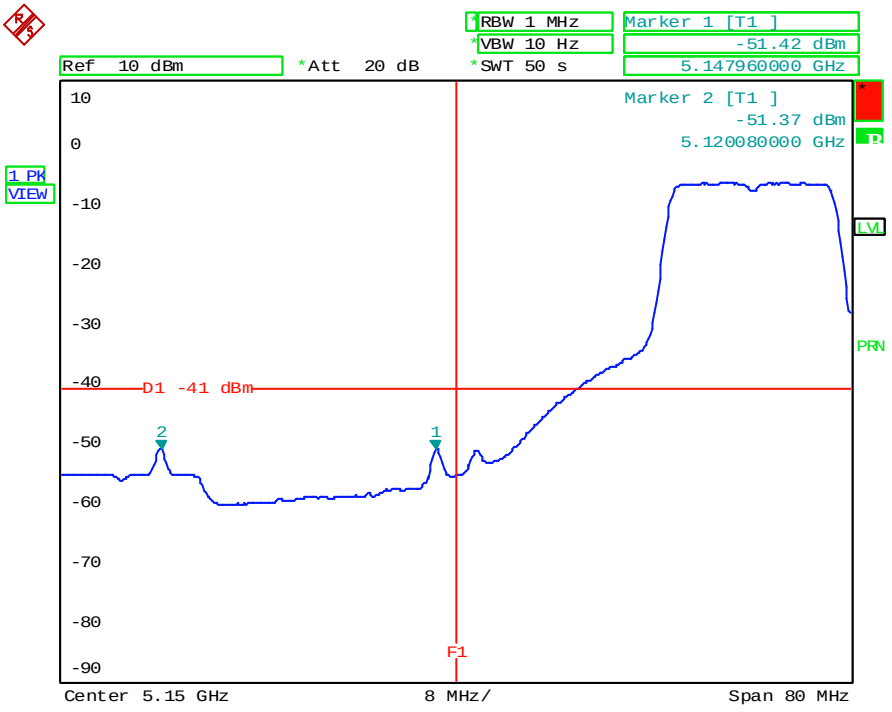
Frequency (MHz)	Cable loss (dB)	Ant. Fact. (dB/m)	Pre-amp. (dB)	Ant. Pol. (H/V)	Reading (dBuV)		Emission (dBuV/m)		Limit Line (dBuV/m)		Margin (dBuV/m)	
					PK	AV	PK	AV	PK	AV	PK	AV
5148.20	1.34	37.16	31.86	V	54.5	42.2	50.5	38.2	74.0	54.0	-23.5	-15.8
5152.10	1.34	37.16	31.86	V	55.0	43.0	51.0	39.0	74.0	54.0	-23.0	-15.0
5148.10	1.34	37.16	31.86	H	51.3	38.3	47.3	34.3	74.0	54.0	-26.7	-19.7
5351.10	1.45	37.18	31.94	V	66.1	49.3	62.3	45.5	74.0	54.0	-11.7	-8.5
5352.70	1.45	37.18	31.94	H	60.0	43.8	56.2	40.0	74.0	54.0	-17.8	-14.0

Conducted Band Edge Measurement Result

Base Mode CH Lowest (Peak Mode)



Base Mode CH Lowest (Average Mode)



Turbo Mode

1.Conducted test

Frequency (MHz)	Reading (dBm)		Ant. Gain (dBi)	Emission (dBm)		Limit Line (dBm)		Margin (dBm)	
	PK	AV		PK	AV	PK	AV	PK	AV
5149.36	-36.45	-55.49	1.5	-34.95	-53.99	-21	-41	-6.05	-12.99
5119.92	-44.53	-51.48	1.5	-43.03	-49.98	-21	-41	-2.03	-8.98
5350.96	-26.21	-46.02	1.5	-24.71	-44.52	-21	-41	-3.71	-3.52
5376.24	N/A	-51.86	1.5	N/A	-50.36	-21	-41	N/A	-9.36
5385.84	-40.73	-52.42	1.5	-39.23	-50.92	-21	-41	-18.23	-9.92

2.Radiation test:

Operation Mode: TX Mode Test Date : Mar.0 7 2003

Temperature : 23 ℃ Test By: James

Humidity : 58 % Pol: Ver./Hor

Test Host: IBM

Frequency (MHz)	Cable loss (dB)	Ant. Fact. (dB/m)	Pre-amp. (dB)	Ant. Pol. (H/V)	Reading (dBuV)		Emission (dBuV/m)		Limit Line (dBuV/m)		Margin (dBuV/m)	
					PK	AV	PK	AV	PK	AV	PK	AV
5150.00	1.34	37.16	31.86	V	51.8	38.3	47.9	34.3	74.0	54.0	-26.1	-19.7
5150.00	1.34	37.16	31.86	H	51.5	38.2	47.6	34.3	74.0	54.0	-26.4	-19.7
5350.00	1.45	37.18	31.94	V	59.8	46.6	56.0	42.8	74.0	54.0	-18.0	-11.2
5350.00	1.45	37.18	31.94	H	58.6	44.7	54.8	40.9	74.0	54.0	-19.2	-13.1

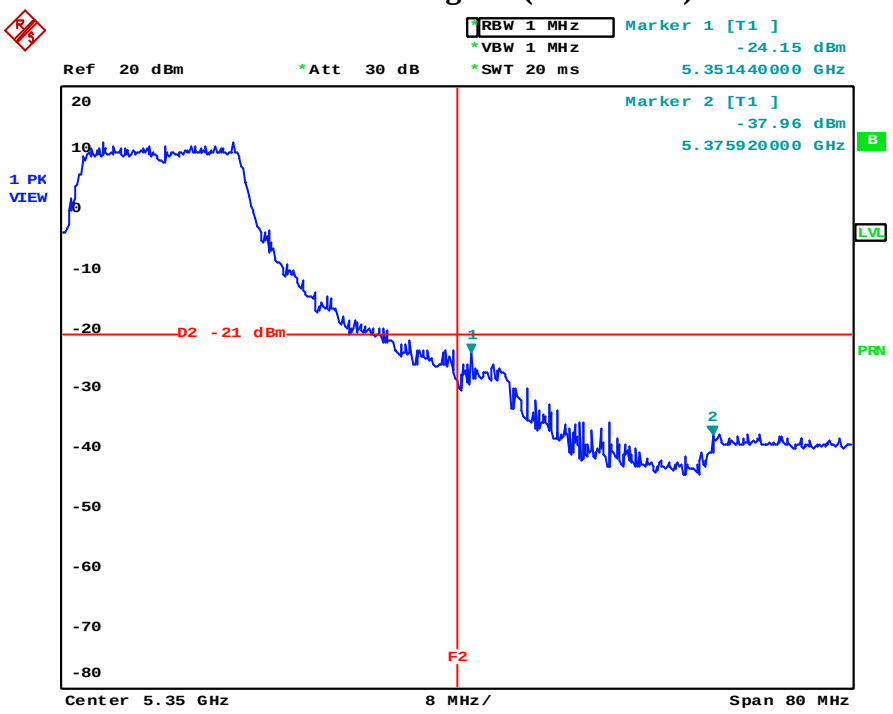
Operation Mode:	TX Mode	Test Date :	Mar. 07 2003
Temperature :	23 ℃	Test By:	James
Humidity :	58 %	Pol:	Ver./Hor
Test Host:	TOSHIBA		

Frequency (MHz)	Cable loss (dB)	Ant. Fact. (dB/m)	Pre-amp. (dB)	Ant. Pol. (H/V)	Reading (dBuV)		Emission (dBuV/m)		Limit Line (dBuV/m)		Margin (dBuV/m)	
					PK	AV	PK	AV	PK	AV	PK	AV
5150.00	1.34	37.16	31.86	V	55.2	41.1	51.3	37.1	74.0	54.0	-22.7	-16.9
5150.00	1.34	37.16	31.86	H	49.3	37.0	45.3	33.1	74.0	54.0	-28.7	-20.9
5350.00	1.45	37.18	31.94	V	63.5	46.9	59.7	43.1	74.0	54.0	-14.3	-10.9
5350.00	1.45	37.18	31.94	H	55.7	40.4	51.9	36.6	74.0	54.0	-22.1	-17.4

Operation Mode:	TX Mode	Test Date :	Mar. 07 2003
Temperature :	23 ℃	Test By:	James
Humidity :	58 %	Pol:	Ver./Hor
Test Host:	BENQ		

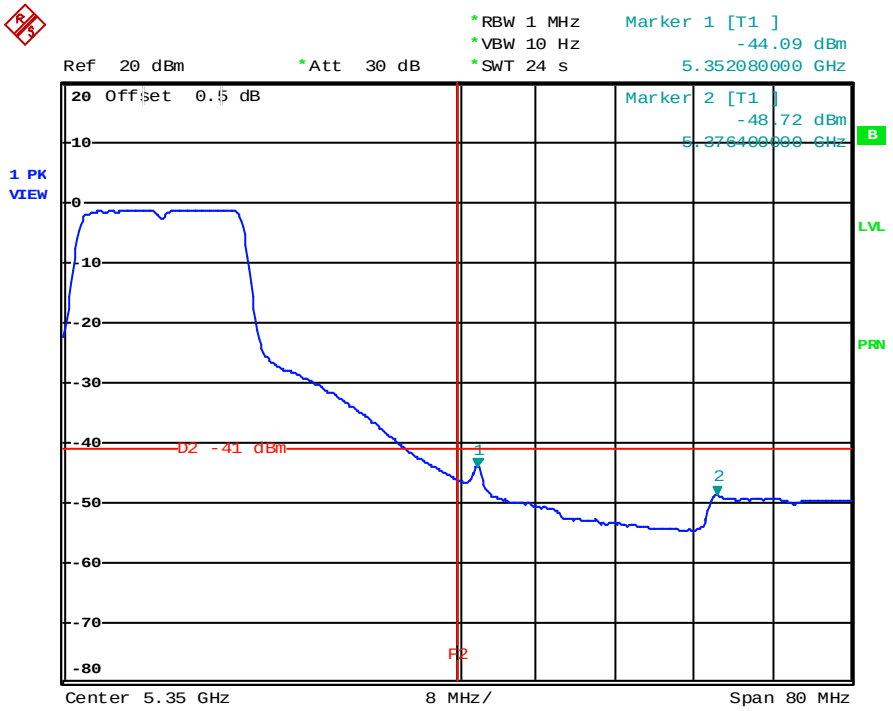
Frequency (MHz)	Cable loss (dB)	Ant. Fact. (dB/m)	Pre-amp. (dB)	Ant. Pol. (H/V)	Reading (dBuV)		Emission (dBuV/m)		Limit Line (dBuV/m)		Margin (dBuV/m)	
					PK	AV	PK	AV	PK	AV	PK	AV
5150.10	1.34	37.16	31.86	V	55.0	41.0	51.0	37.0	74.0	54.0	-23.0	-17.0
5150.10	1.34	37.16	31.86	H	49.1	36.8	45.1	32.8	74.0	54.0	-28.9	-21.2
5350.10	1.45	37.18	31.94	V	63.2	46.6	59.4	42.8	74.0	54.0	-14.6	-11.2
5350.10	1.45	37.18	31.94	H	55.7	40.4	51.9	36.6	74.0	54.0	-22.1	-17.4

Base Mode CH Highest (Peak Mode)



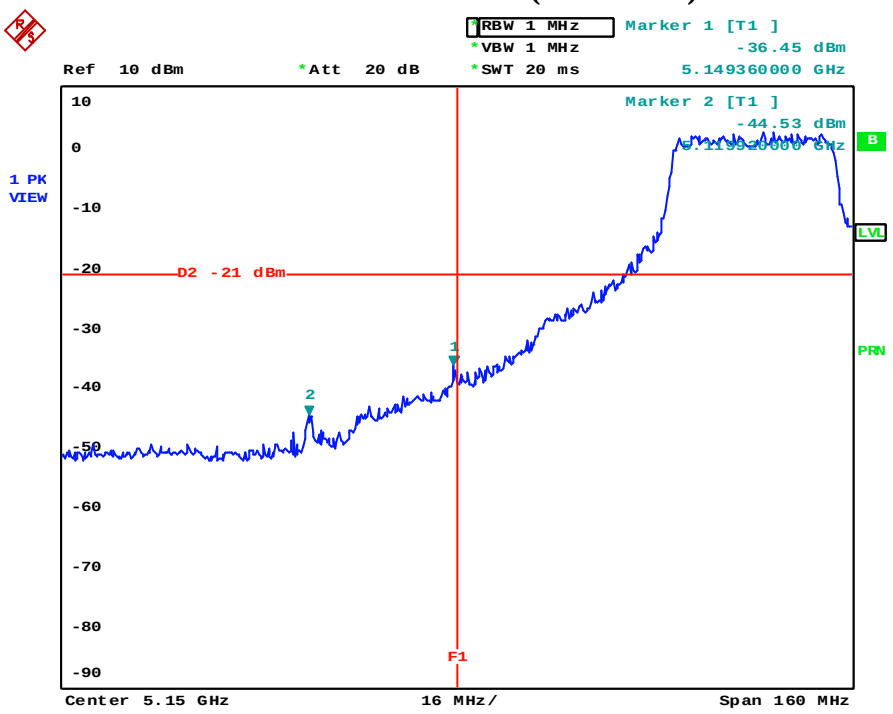
Date: 22.FEB.2003 13:37:18

Base Mode CH Highest (Average Mode)



Date: 22.FEB.2003 13:38:34

Turbo Mode CH Lowest (Peak Mode)



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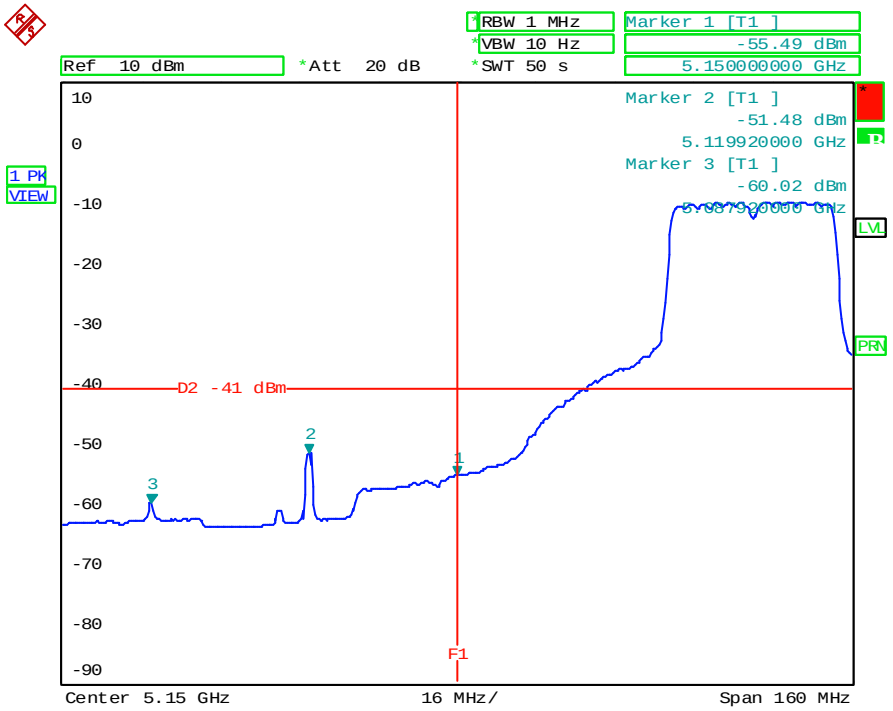
Turbo Mode CH Lowest (Average Mode)



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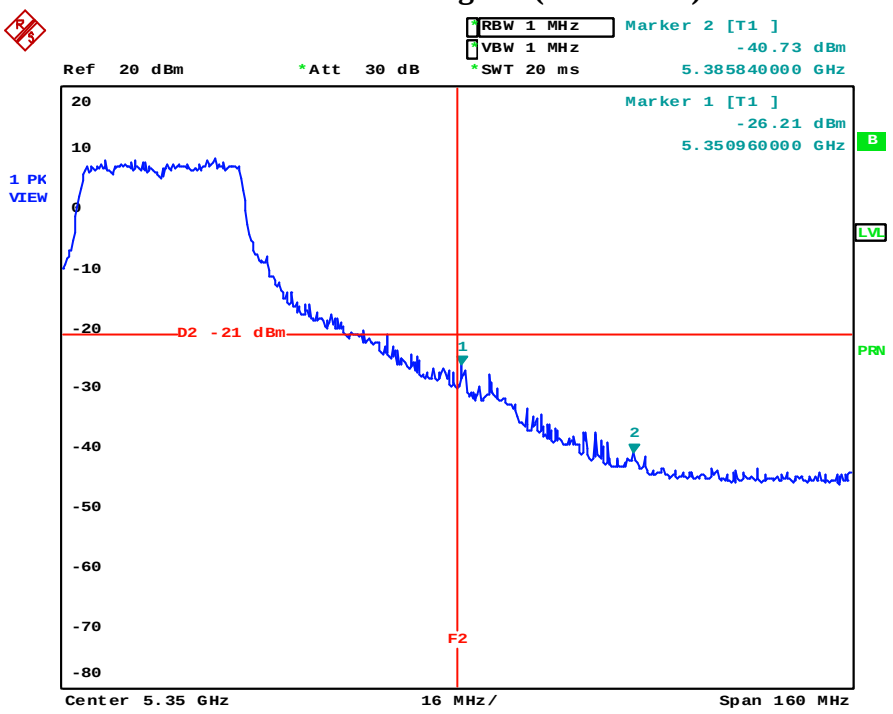
Turbo Mode CH Highest (Peak Mode)



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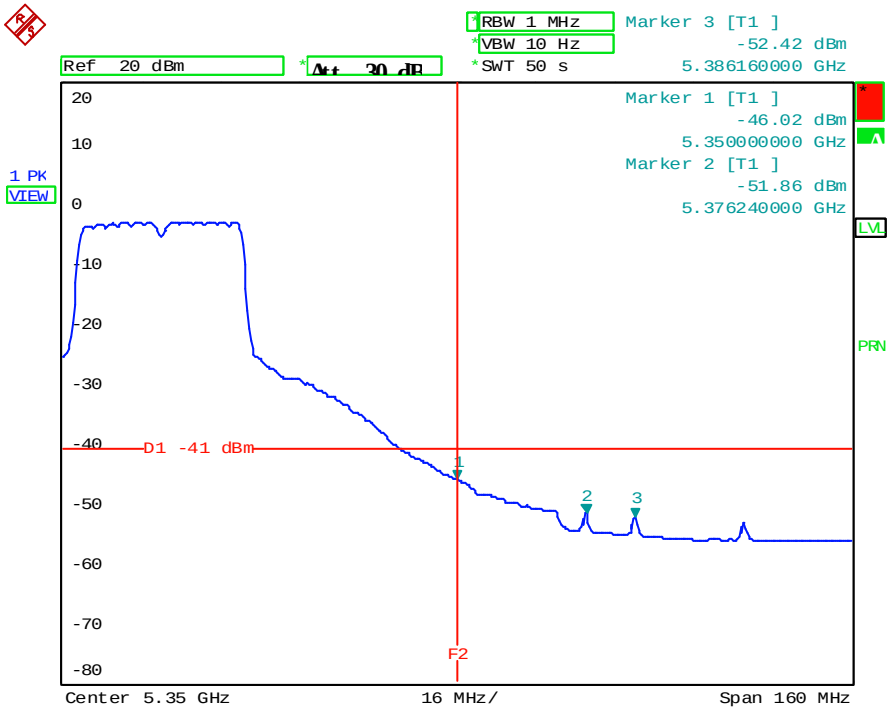
Turbo Mode CH Highest (Average Mode)



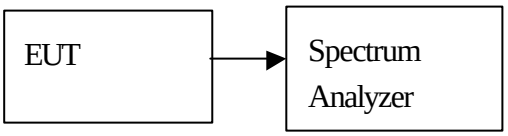
Date: 5.MAR.2003 12:58:07

10. UNDESIRABLE EMISSION - CONDUCTED MEASUREMENT

Conducted RF measurements of the transmitter output were made at the band edges and the adjacent restricted bands.

Also, conducted RF measurements of the transmitter output over the 30 MHz to 40 GHz band were made in order to identify any spurious signals that require further investigation or measurements on the radiated emissions site.

10.2 Test setup



The EUT was connected to a power meter through a 50Ω RF cable.

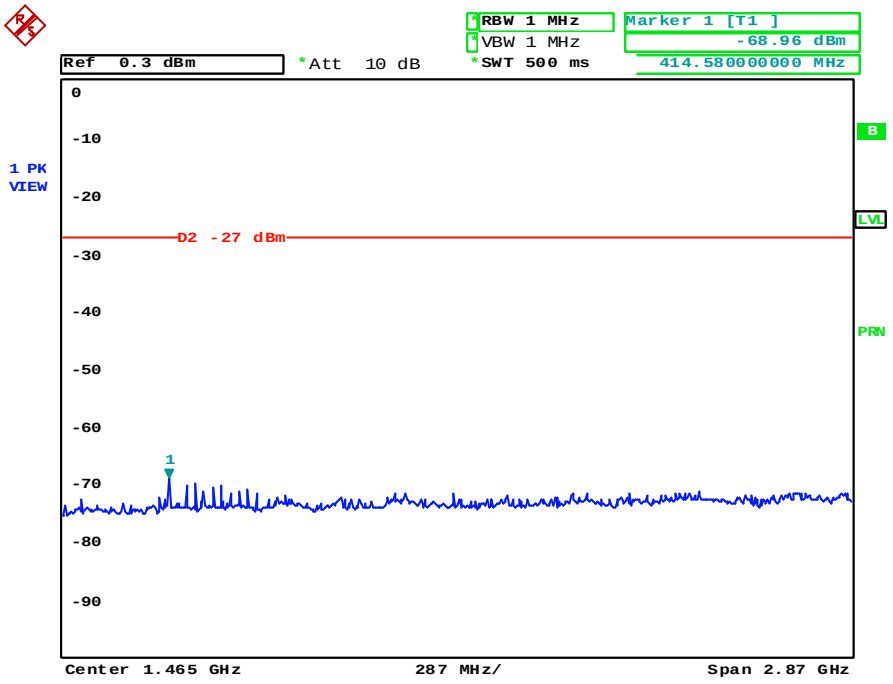
10.1 Measurement Procedure

1. Place the EUT on the table and set it in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to spectrum.
3. Set Spectrum RBW=1MHz, VBW = 1MHz for peak measurement.
4. Set Spectrum over the 30MHz to 40GHz range with the transmitter set to the lowest, middle, and highest channels.

10.2 Measurement Equipment Used:

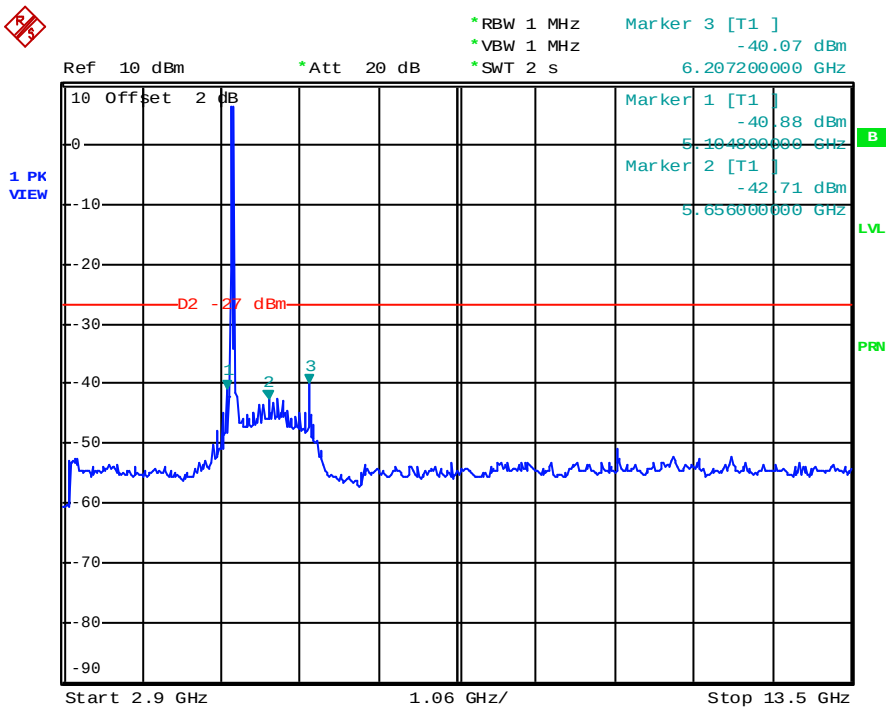
EQUIPMENT TYPE	MFR	Model No.	Serial No.	LAST CAL.	Cal. Due.
Spectrum Analyzer	Advantest	R3182	110600647	11/16/2002	11/15/2003
Spectrum Analyzer	R&S	FSP30	1093.4495.30	07/23/2002	07/22/2003

Base Mode CH Low 30MHz – 2.9GHz



Date: 22.FEB.2003 14:57:14

Base Mode CH Low 2.9GHz –13.5GHz



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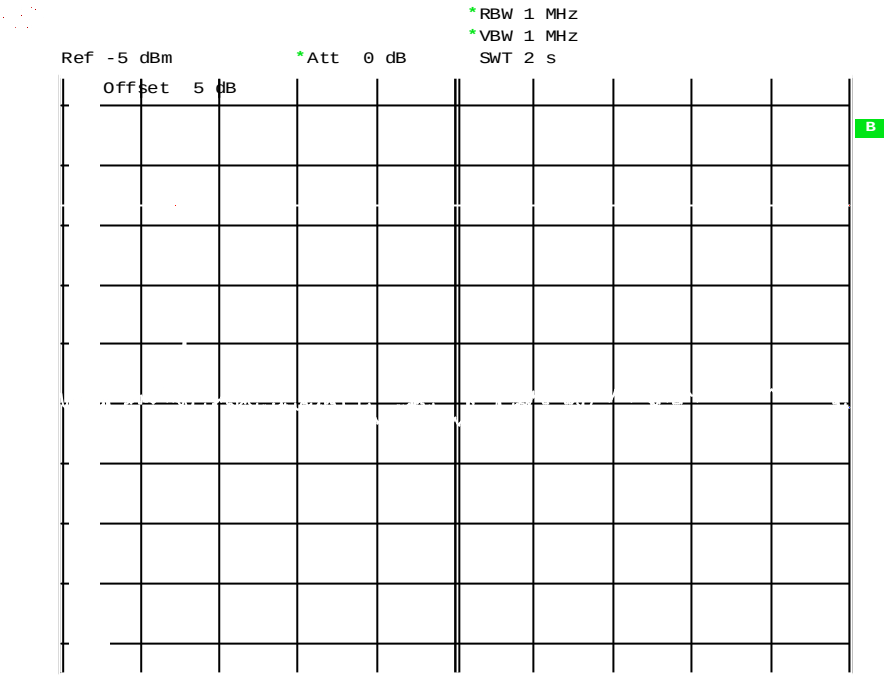
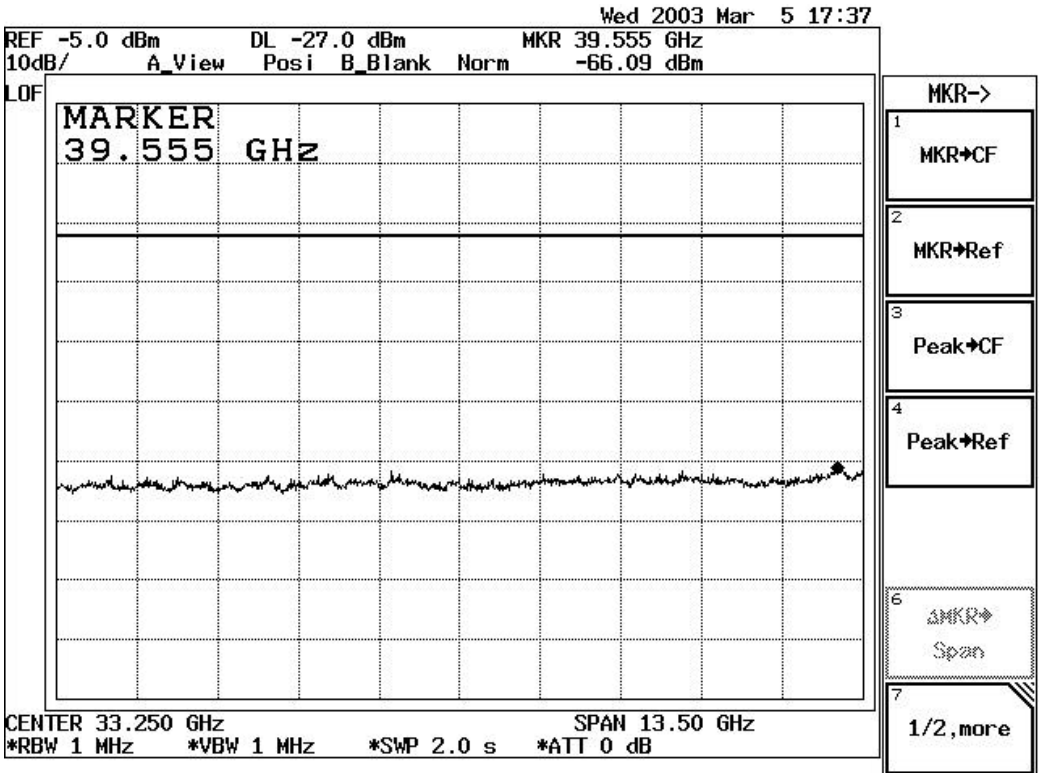
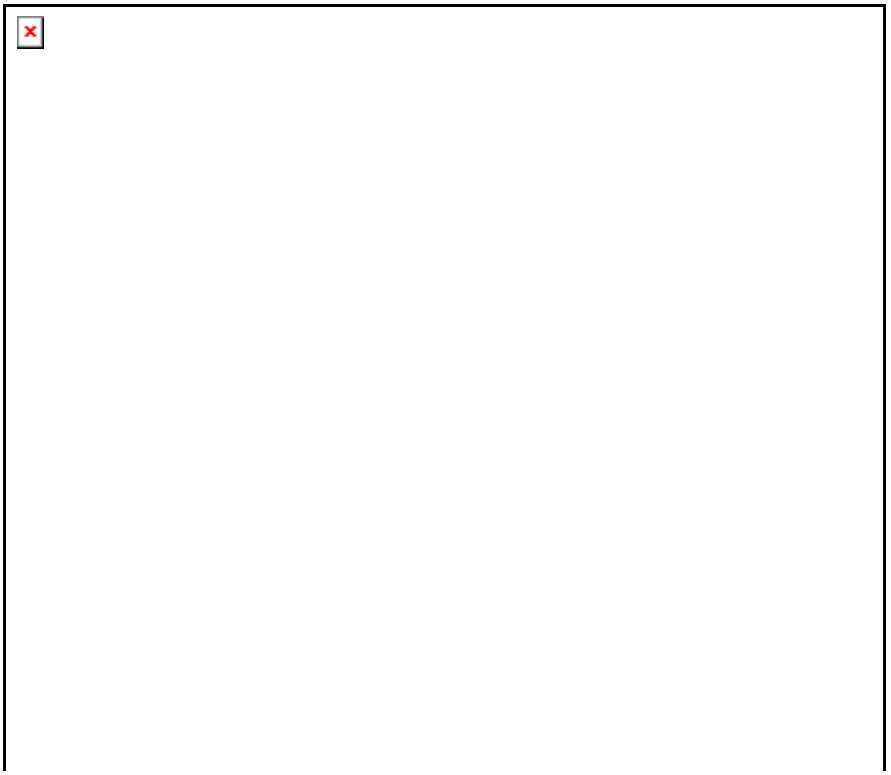
Base Mode CH Low 13.5GHz –26.5GHz



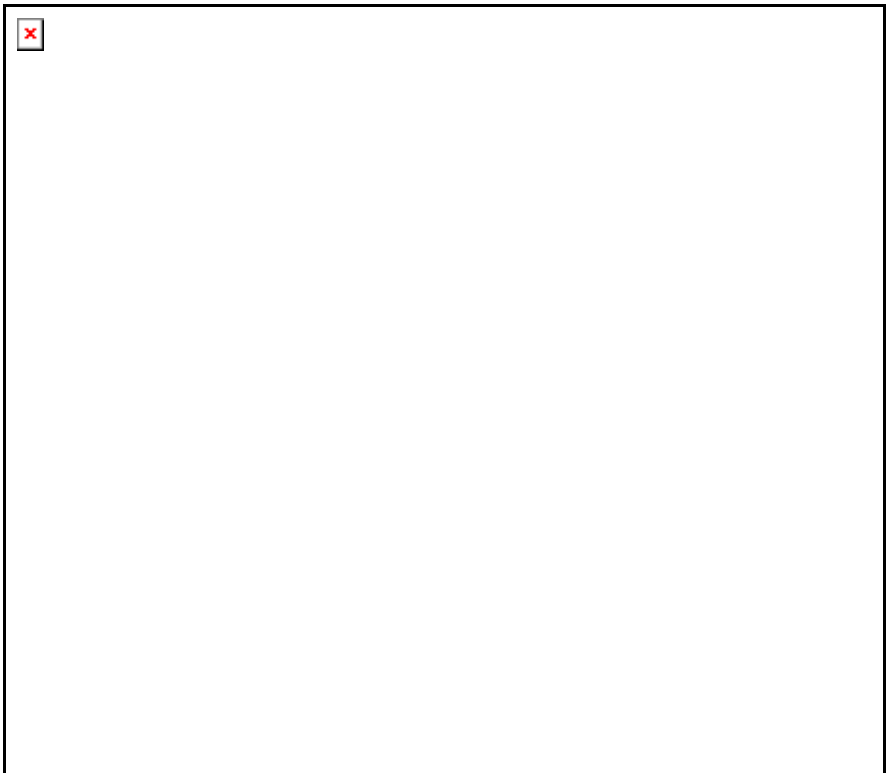
Base Mode CH Low 26.5GHz –40GHz



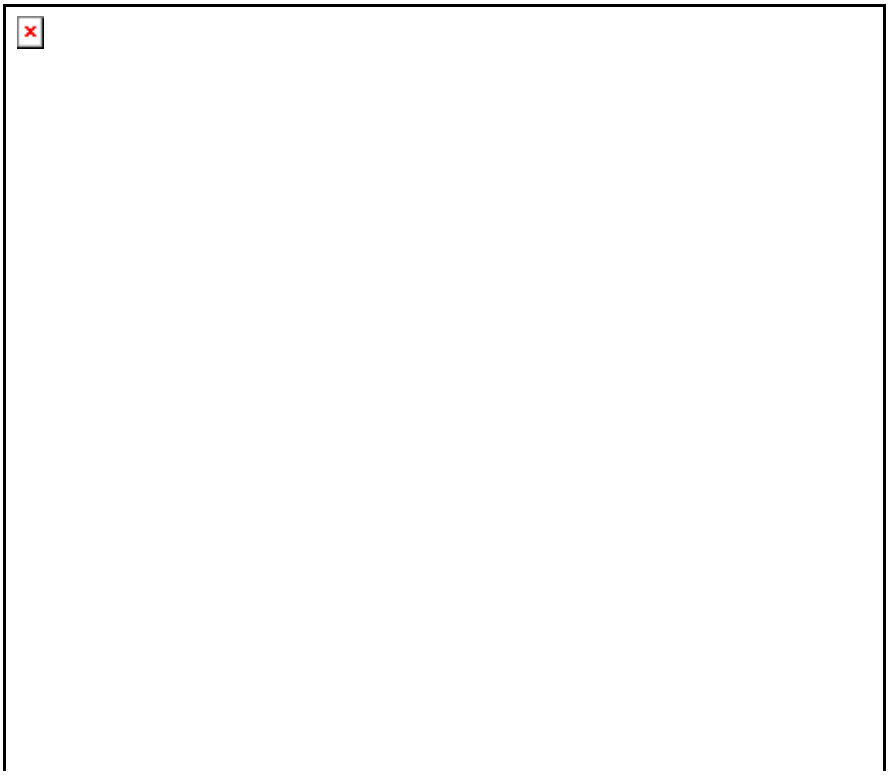
Base Mode CH Middle 30MHz – 2.9GHz



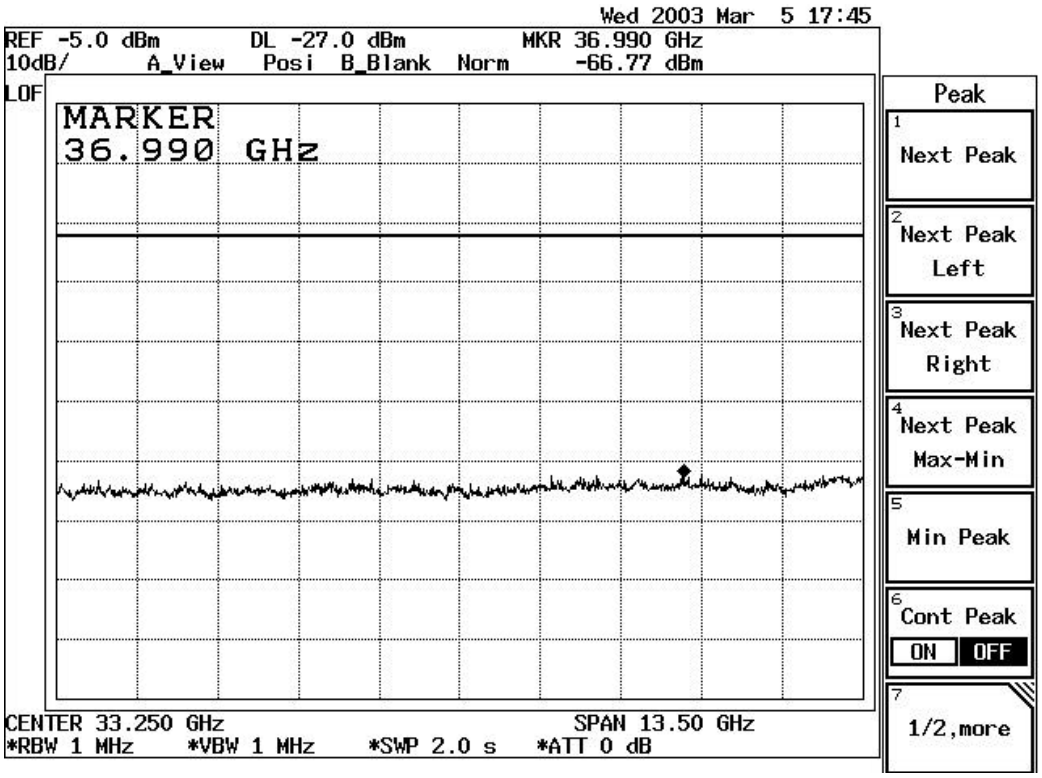
Base Mode CH Middle 2.9GHz –13.5GHz



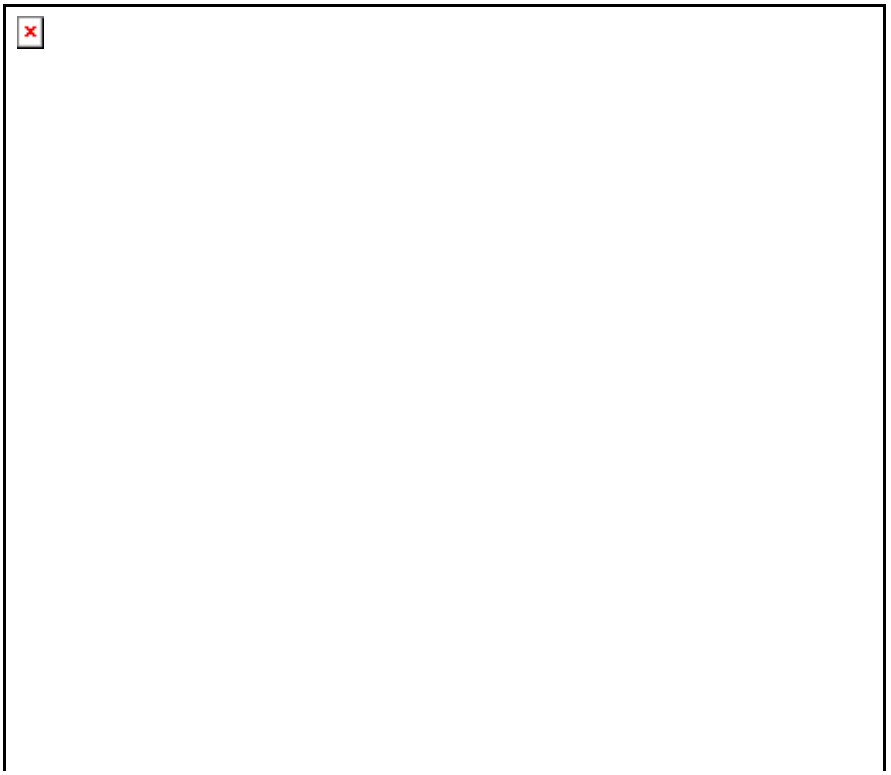
Base Mode CH Middle 13.5GHz –26.5GHz



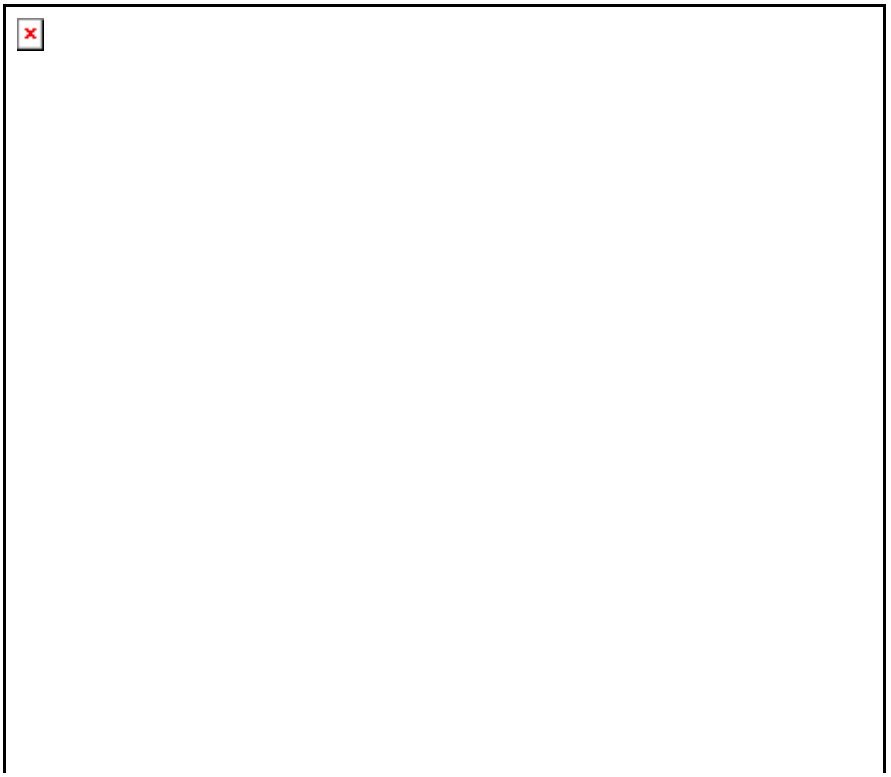
Base Mode CH Middle 26.5GHz –40GHz



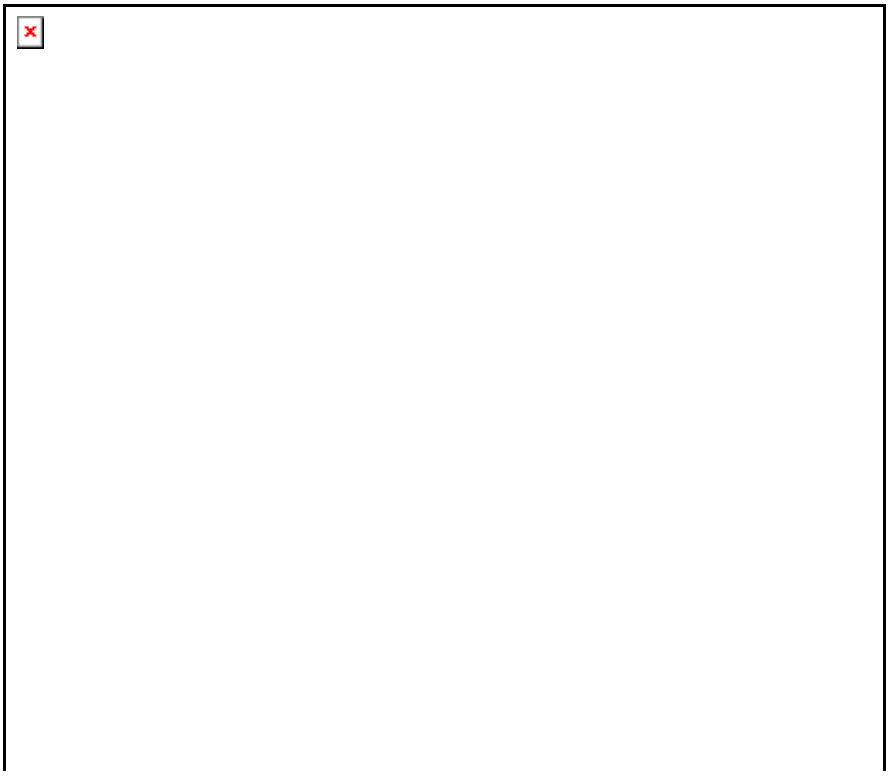
Base Mode CH Middle 30MHz – 2.9GHz



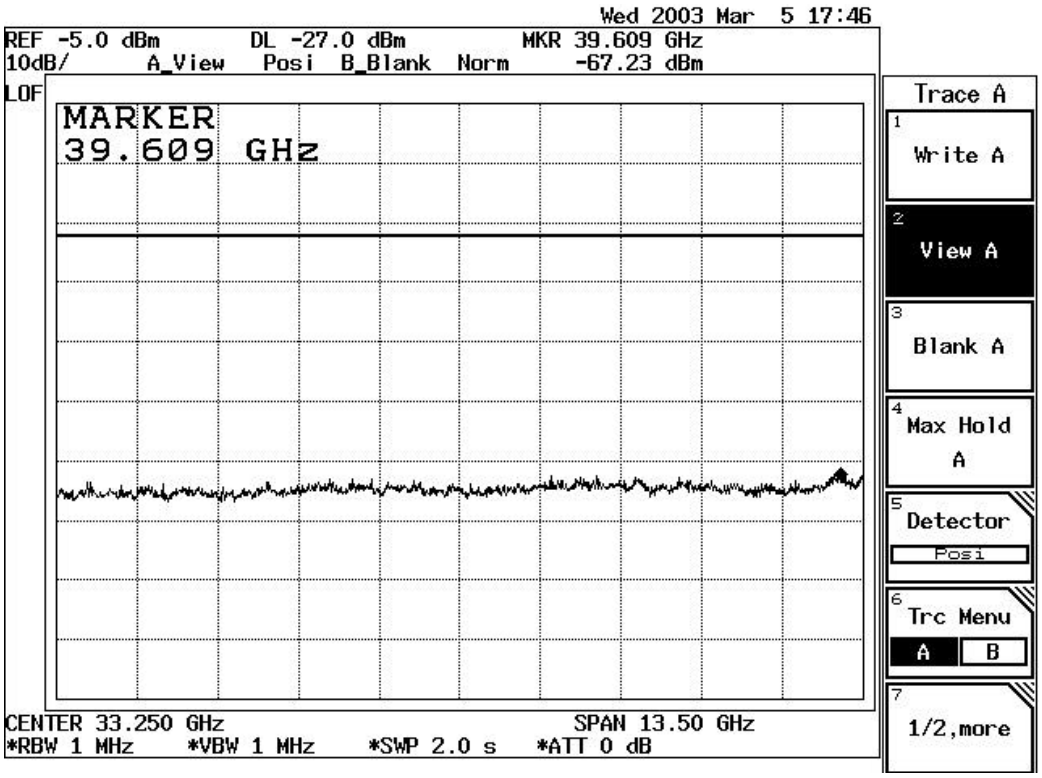
Base Mode CH Middle 2.9GHz –13.5GHz



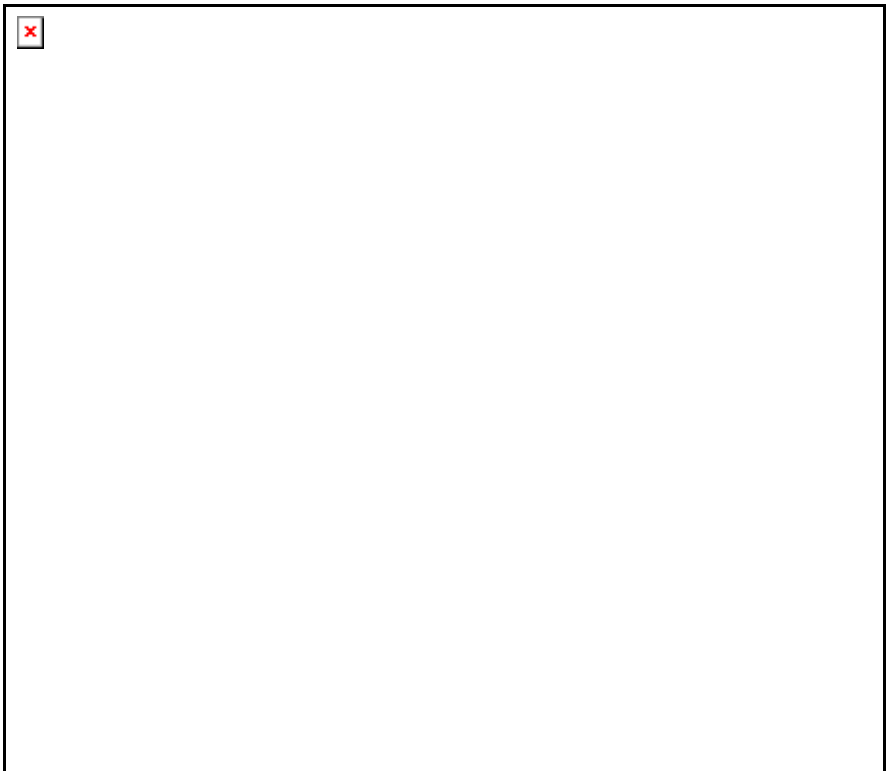
Base Mode CH Middle 13.5GHz –26.5GHz



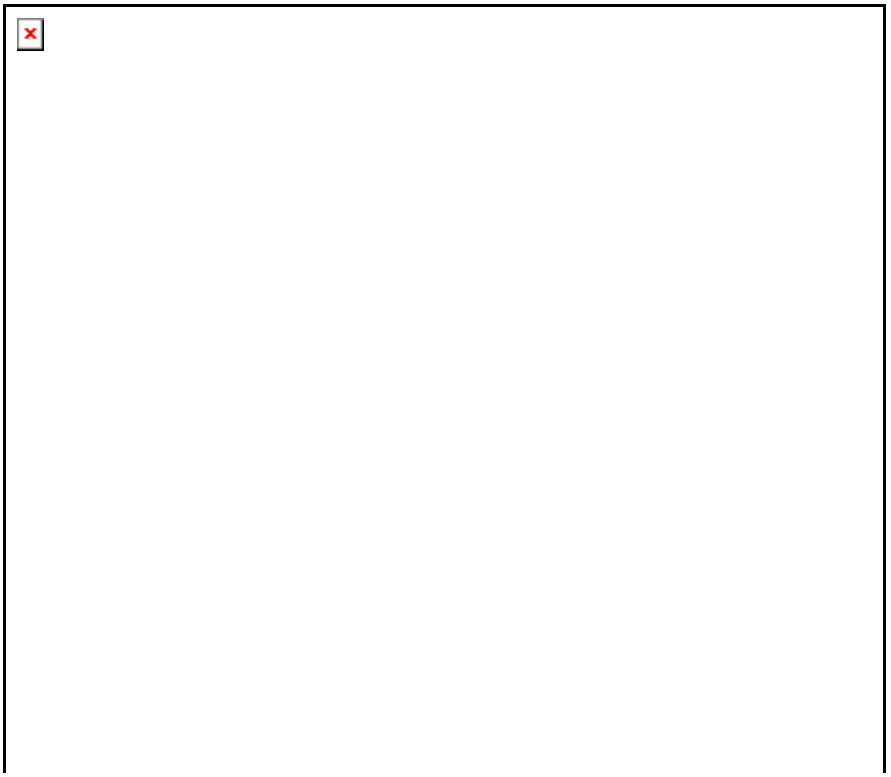
Base Mode CH Middle 26.5GHz –40GHz



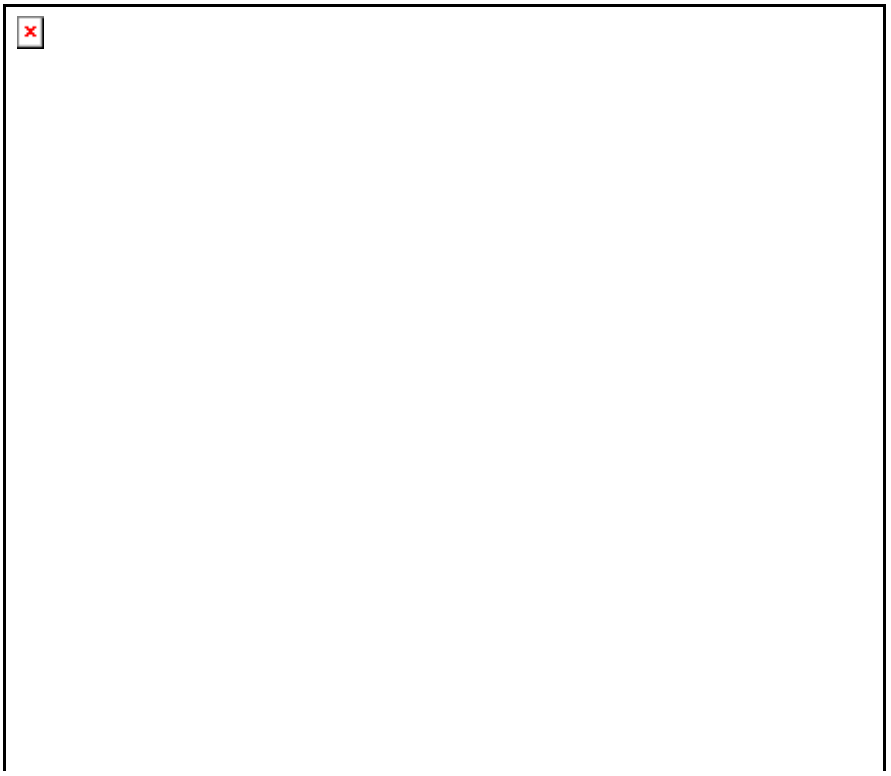
Base Mode CH High 30MHz – 2.9GHz



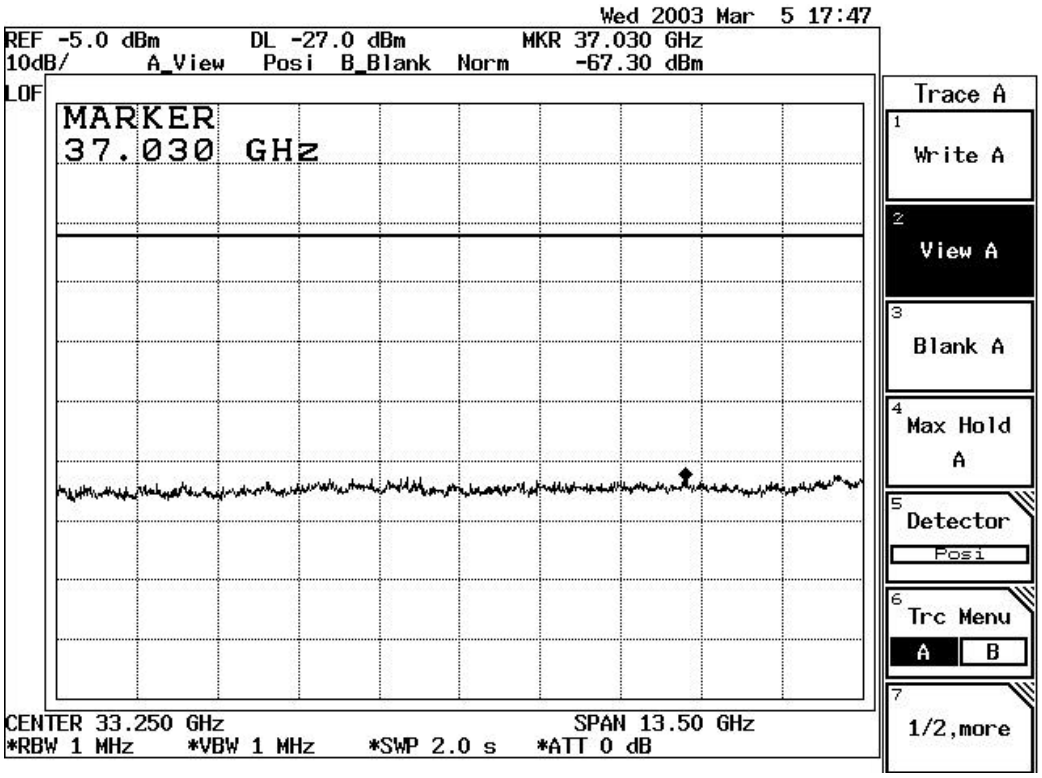
Base Mode CH High 2.9GHz – 13.5GHz



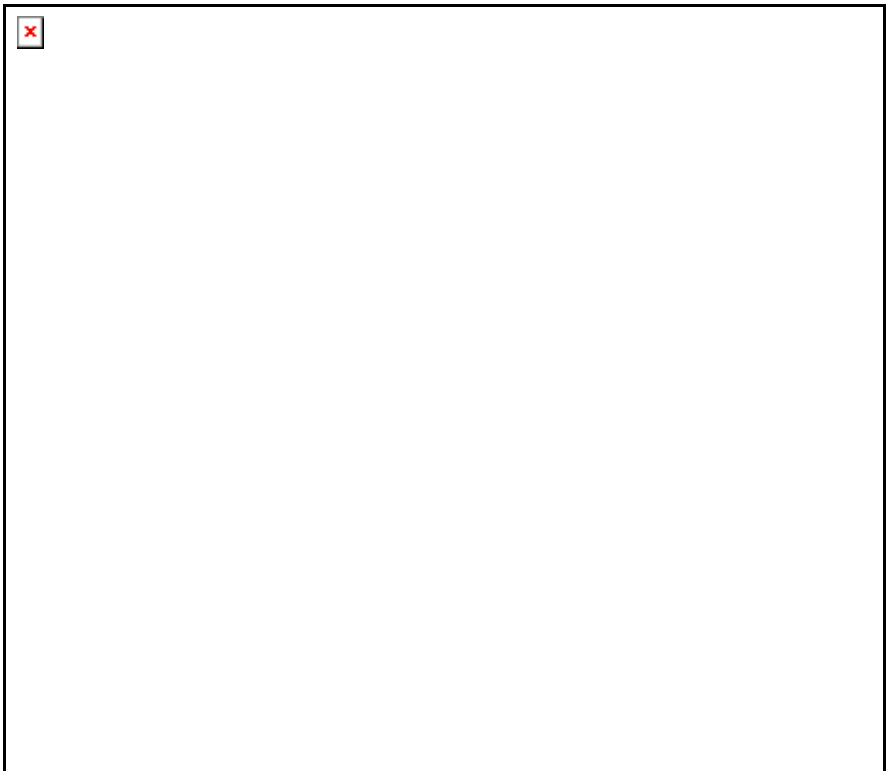
Base Mode CH High 13.5GHz – 26.5GHz



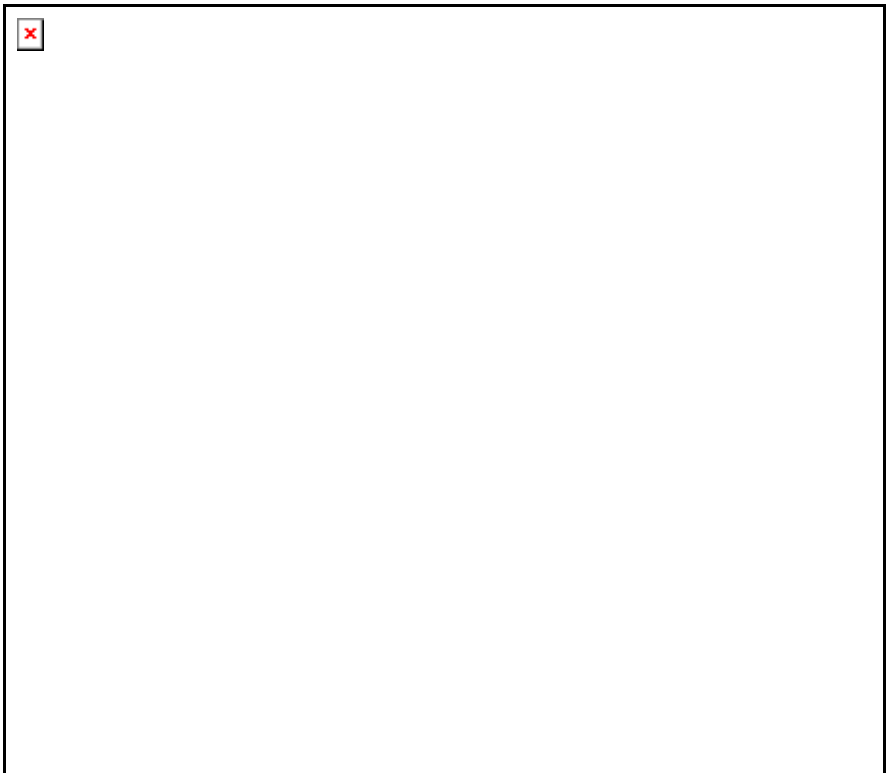
Base Mode CH High 26.5GHz – 40GHz



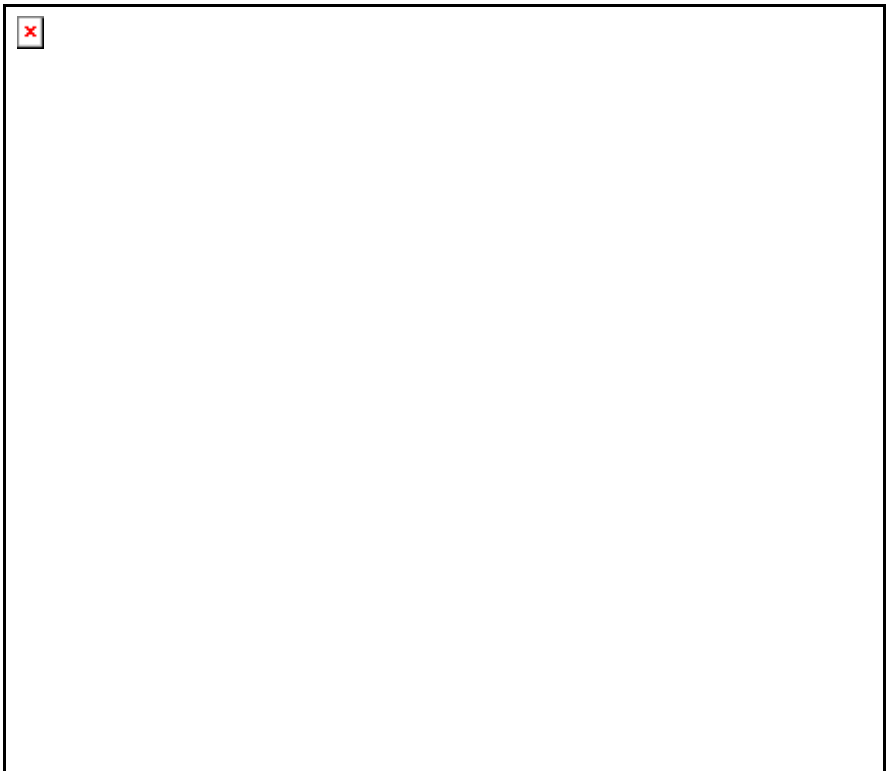
Turbo Mode CH Low 30MHz – 2.9GHz



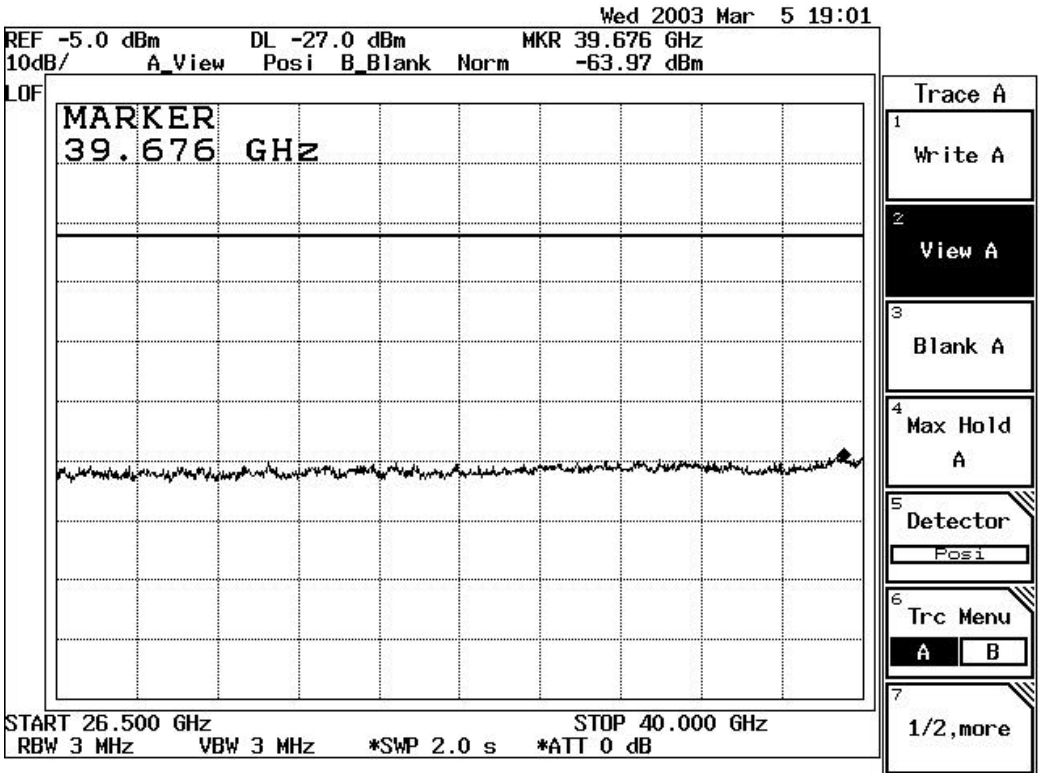
Turbo Mode CH Low 2.9GHz – 13.5GHz



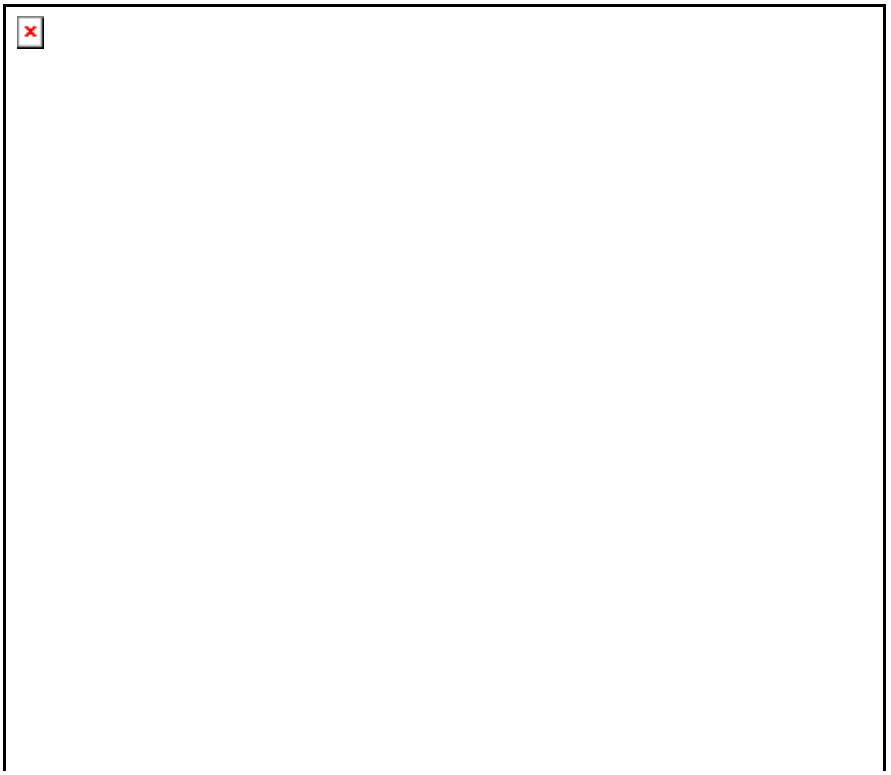
Turbo Mode CH Low 13.5GHz – 26.5GHz



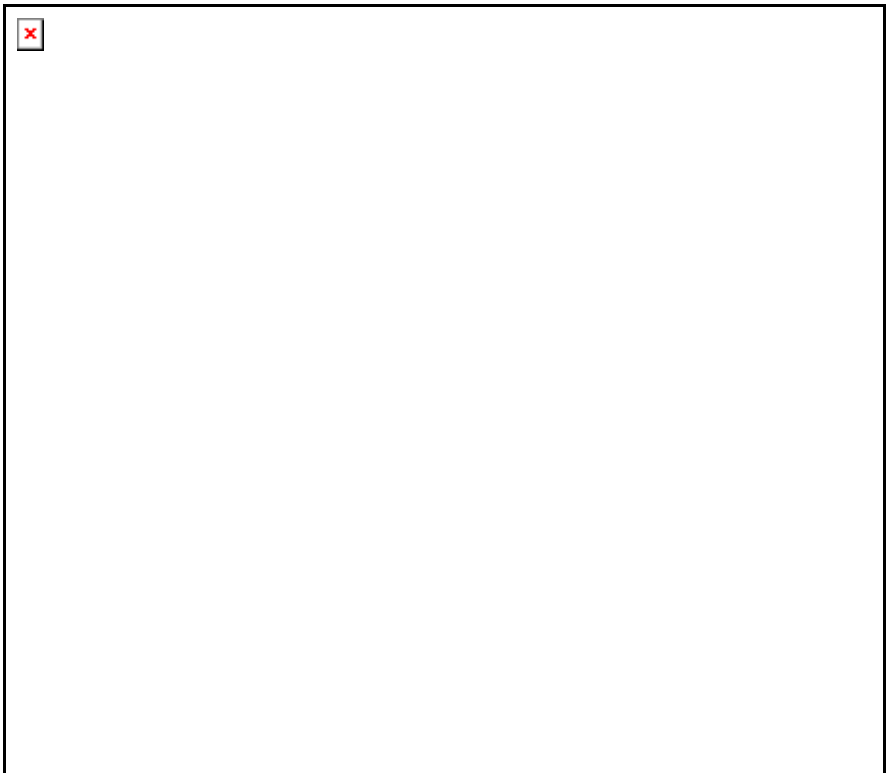
Turbo Mode CH Low 26.5GHz – 40GHz



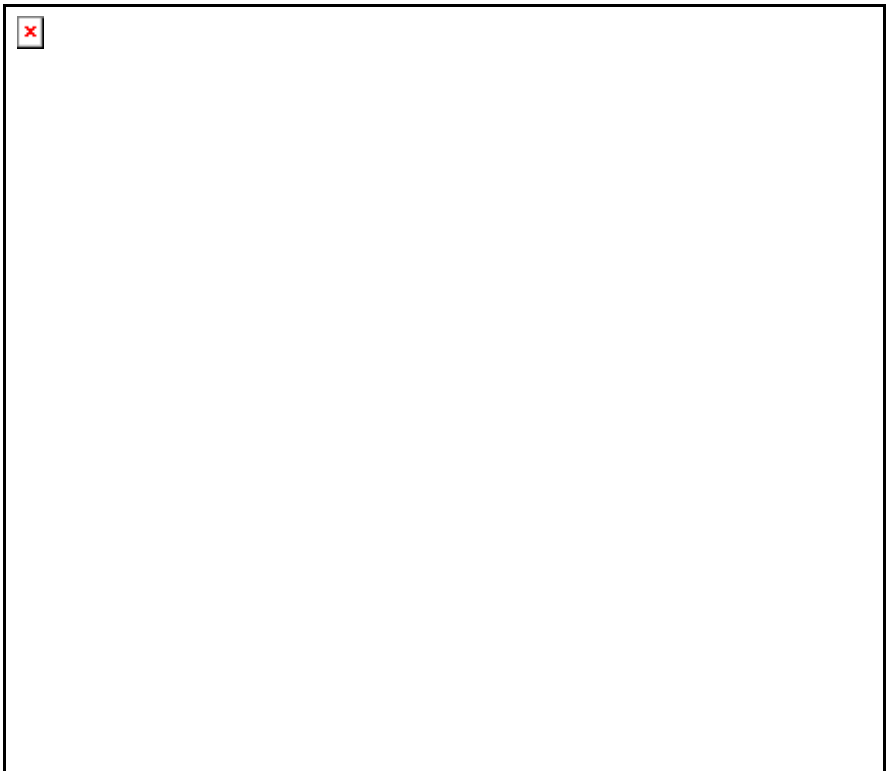
Turbo Mode CH Middle 30MHz – 2.9GHz



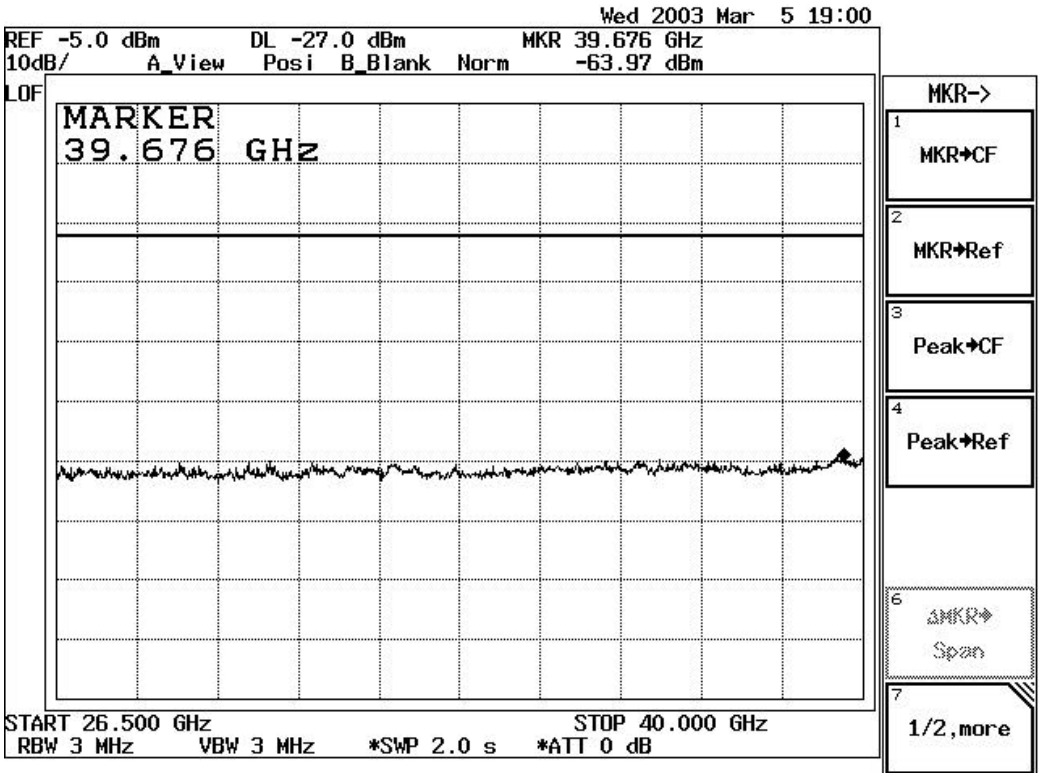
Turbo Mode CH Middle 2.9GHz – 13.5GHz



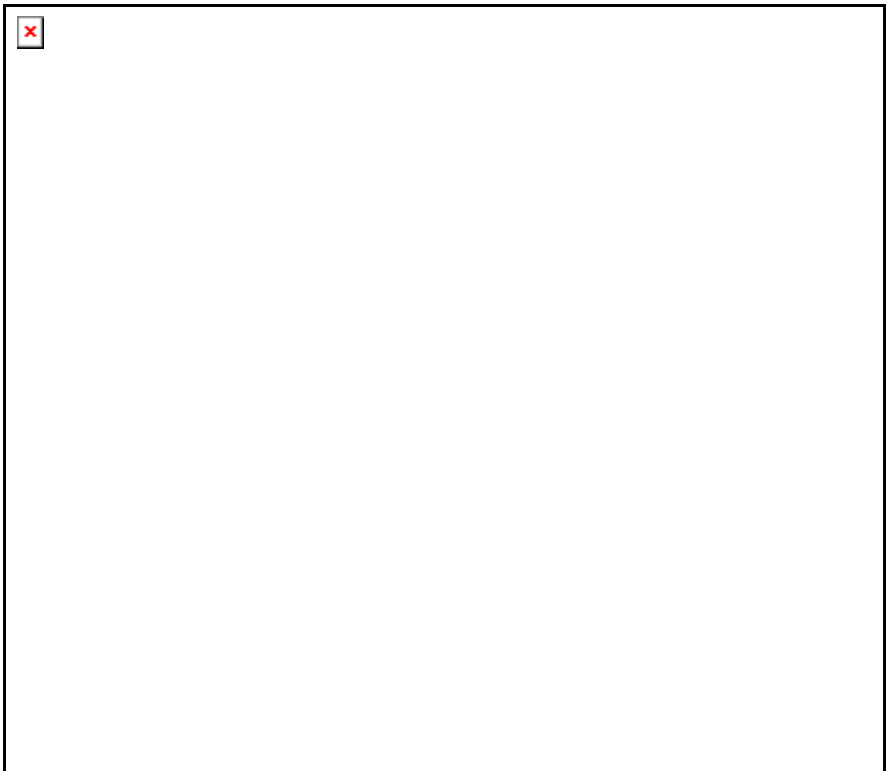
Turbo Mode CH Middle 13.5GHz – 26.5GHz



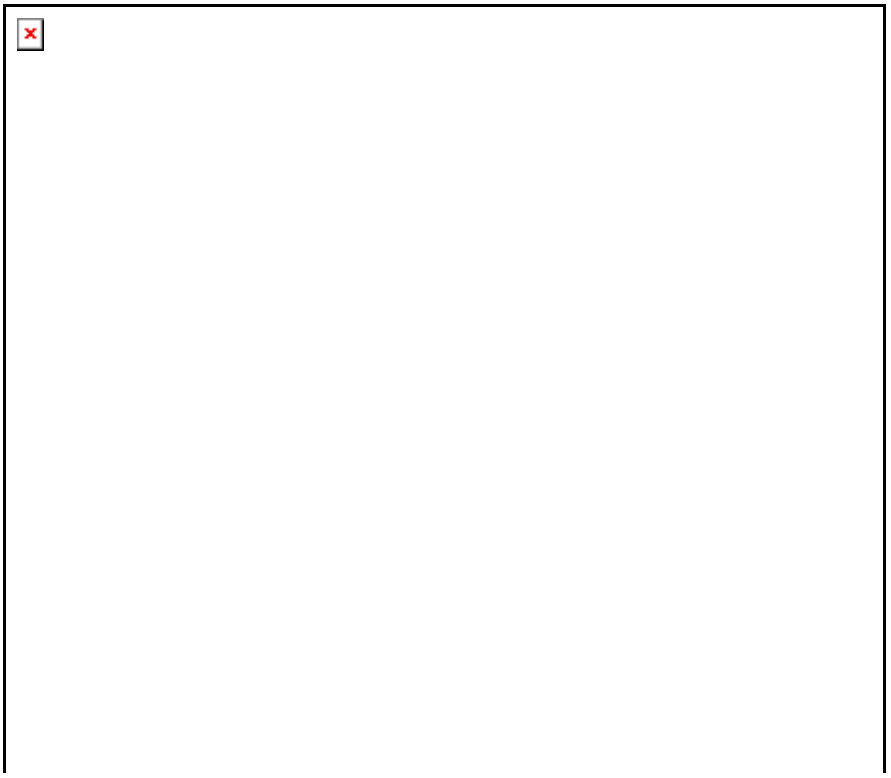
Turbo Mode CH Middle 26.5GHz – 40GHz



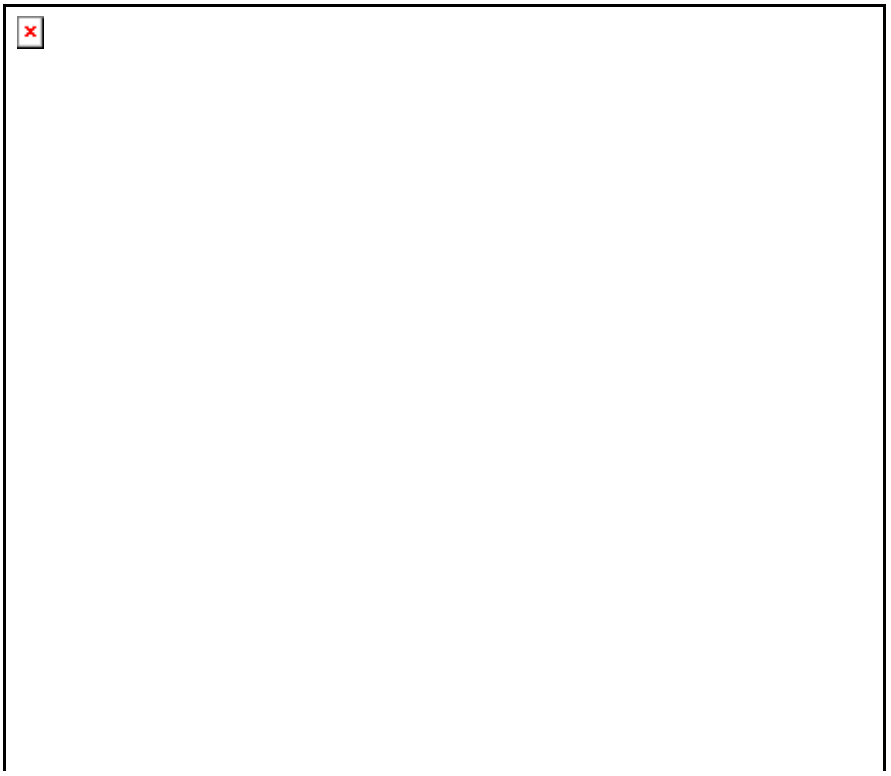
Turbo Mode CH High 30MHz – 2.9GHz



Turbo Mode CH High 2.9GHz – 13.5GHz



Turbo Mode CH High 13.5GHz – 26.5GHz



Turbo Mode CH High 26.5GHz – 40GHz