FCC CFR47 PART 15 SUBPART E
CERTIFICATION
TEST REPORT

FOR

802.11a/b/g CARDBUS

MODEL NUMBER: AR5BCB-00032

BRAND NAME: ATHEROS

FCC ID: PPD-AR5BCB-00032

REPORT NUMBER: 03U2005-1

ISSUE DATE: JUNE 17, 2003

Prepared for
ATHEROS COMMUNICATIONS
529 ALMANOR AVE.
SUNNYVALE
CA 94085, USA

Prepared by
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1. TEST RESULT CERTIFICATION

COMPANY NAME: ATHEROS COMMUNICATIONS
529 ALMANOR AVE.
SUNNYVALE, CA 94085

EUT DESCRIPTION: 802.11A/B/G CARDBUS

MODEL: AR5BCB-00032

DATE TESTED: MAY 21 – JUNE 16, 2003

APPLICABLE STANDARDS	
STANDARD	**TEST RESULTS**
FCC PART 15 SUBPART C	NO NON-COMPLIANCE NOTED

Compliance Certification Services, Inc. tested the above equipment in accordance with the requirements set forth in the above standards. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

Note: This document reports conditions under which testing was conducted and results of tests performed. This document may not be altered or revised in any way unless done so by Compliance Certification Services and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by Compliance Certification Services will constitute fraud and shall nullify the document.

Note: The 5.2 GHz band is applicable to this report; other bands of operation (2.4 and 5.8 GHz) are documented in a separate report.

Approved & Released For CCS By:

MIKE HECKROTTE
CHIEF ENGINEER
COMPLIANCE CERTIFICATION SERVICES

Tested By:

YAN ZHENG
EMC ENGINEER
COMPLIANCE CERTIFICATION SERVICES

2. EUT DESCRIPTION

The EUT is an 802.11a/b/g transceiver module.

The EUT has a peak output power of 17.74 dBm (59 mW) and an antenna gain of 0 dBi in the 5150 - 5350 MHz band.

3. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.4/1992, FCC CFR 47 Part 2 and FCC CFR 47 Part 15.

4. FACILITIES AND ACCREDITATION

4.1. FACILITIES AND EQUIPMENT

The open area test sites and conducted measurement facilities used to collect the radiated data are located at 561F Monterey Road, Morgan Hill, California, USA. The sites are constructed in conformance with the requirements of ANSI C63.7, ANSI C63.4 and CISPR Publication 22.

All receiving equipment conforms to CISPR Publication 16-1, "Radio Interference Measuring Apparatus and Measurement Methods."

4.2. TABLE OF ACCREDITATIONS AND LISTINGS

Country	Agency	Scope of Accreditation	Logo
USA	FCC	3/10 meter Open Area Test Sites to perform FCC Part 15/18 measurements	1300
Japan	VCCI	CISPR 22 Two OATS and one conducted Site	R-1014, R-619, C-640
Norway	NEMKO	EN50081-1, EN50081-2, EN50082-1, EN50082-2, IEC61000-6-1, IEC61000-6-2, EN50083-2, EN50091-2, EN50130-4, EN55011, EN55013, EN55014-1, EN55104, EN55015, EN61547, EN55022, EN55024, EN61000-3-2, EN61000-3-3, EN60945, EN61326-1	ELA 117
Norway	NEMKO	EN60601-1-2 and IEC 60601-1-2, the Collateral Standards for Electro-Medical Products. MDD, 93/42/EEC, AIMD 90/385/EEC	ELA-171
Taiwan	BSMI	CNS 13438	SL2-IN-E-1012
Canada	Industry Canada	RSS210 Low Power Transmitter and Receiver	IC2324 A,B,C, and F

5. CALIBRATION AND UNCERTAINTY

5.1. MEASURING INSTRUMENT CALIBRATION

The measurement instruments utilized to perform the tests documented in this report have been calibrated in accordance with the manufacturer's recommendations, and are traceable to national standards.

5.2. MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus:

Radiated Emission, 30 to 200 MHz	+/- 3.3 dB
Radiated Emission, 200 to 1000 MHz	+4.5 / -2.9 dB
Radiated Emission, 1000 to 2000 MHz	+4.5 / -2.9 dB
Power Line Conducted Emission	+/- 2.9 dB

Uncertainty figures are valid to a confidence level of 95%.

5.3. TEST AND MEASUREMENT EQUIPMENT

The following test and measurement equipment was utilized for the tests documented in this report:

TEST AND MEASUREMENT EQUIPMENT LIST				
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due Date
Quasi-Peak Adapter	HP	85650A	2521A01038	7/16/04
SA Display Section	HP	85662A	2314A04793	7/16/04
SA RF Section	HP	85680A	2314A02604	7/16/04
Preamplifier, 1300 MHz	HP	8447D	2944A06589	8/22/03
Antenna, Biconical	Eaton	94455-1	1214	3/6/04
Antenna, Log Periodic	EMCO	3146	9107-3163	3/06/04
Preamplifier	Miteq	NSP10023988	646456	4/26/04
Horn Antenna (1 - 18GHz)	EMCO	3115	6739	2/4/04
Spectrum Analyzer	HP	8564E	3943A01643	7/22/03
High Pass Filter (7.6 GHz)	FSY Microwave	FM-7600-9SS	002	N.C.R.
Spectrum Analyzer	Agilent	E4446A	US42070220	03/01/04
Power Meter	Agilent	E4416A	GB41291150	08/09/03
Power Sensor	Agilent	E9327A	US40440755	08/09/03
EMI Test Receiver	R & S	ESHS 20	827129/006	7/17/04
LISN, 10 kHz ~ 30 MHz	FCC	50/250-25-2	114	9/6/2003

6. SETUP OF EQUIPMENT UNDER TEST

SETUP INFORMATION FOR TRANSMITTER TESTS

SUPPORT EQUIPMENT

PERIPHERAL SUPPORT EQUIPMENT LIST				
Device Type	Manufacturer	Model	Serial Number	FCC ID
Laptop	Toshiba	TC8517ZCA000	J291200E8019	Doc
Power Adapter	Toshiba	PA3083U-1ACA	0536906G	Doc

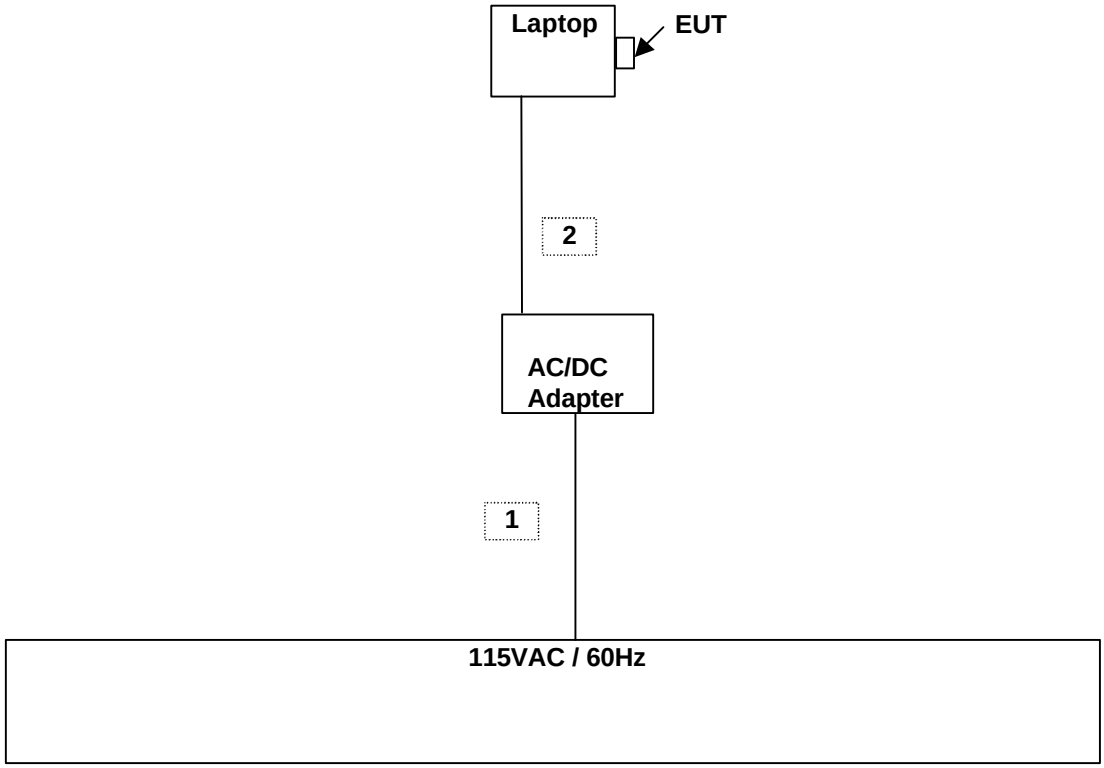
I/O CABLES

Cable No.	Port	# of Identical Ports	Connector Type	Cable Type	Cable Length	Remarks
1	AC	2	US115V	Un-Shielded	2m	NA

TEST SETUP

The EUT was installed in the host computer and operated via a test program.

SETUP DIAGRAM FOR TESTS



7. APPLICABLE LIMITS AND TEST RESULTS

7.1. EMISSION BANDWIDTH

LIMIT

§15.403 (c) Emission bandwidth. For purposes of this subpart the emission bandwidth shall be determined by measuring the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, that are 226 dB EMISSION down relative to the maximum level of the modulated carrier. Determination of the emissions bandwidth is based on the use of measurement instrumentation employing a peak detector function with an instrument resolutions bandwidth approximately equal to 1.0 percent of the emission bandwidth of the device under measurement.

TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer. The RBW is set to 1% to 3% of the 26 dB EMISSION bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled.

RESULTS

No non-compliance noted:

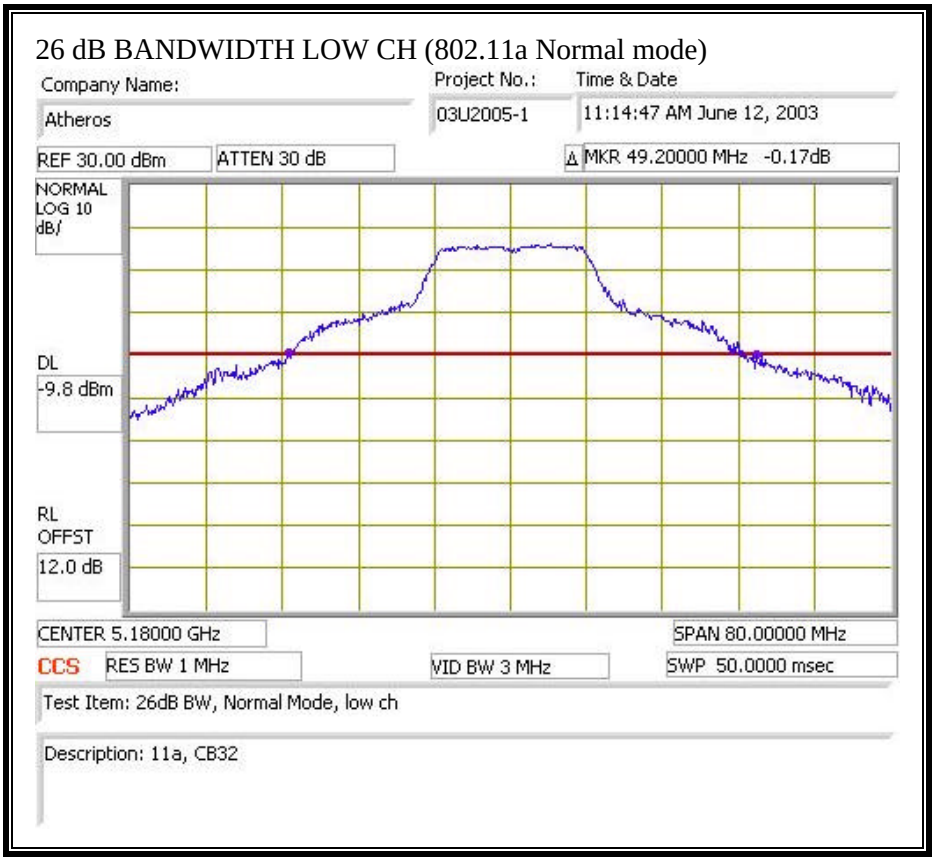
Normal Mode

Channel	Frequency (MHz)	B (MHz)	10 Log B (dB)
Low	5180	49.20	16.92
Middle	5260	49.00	16.90
High	5320	47.00	16.72

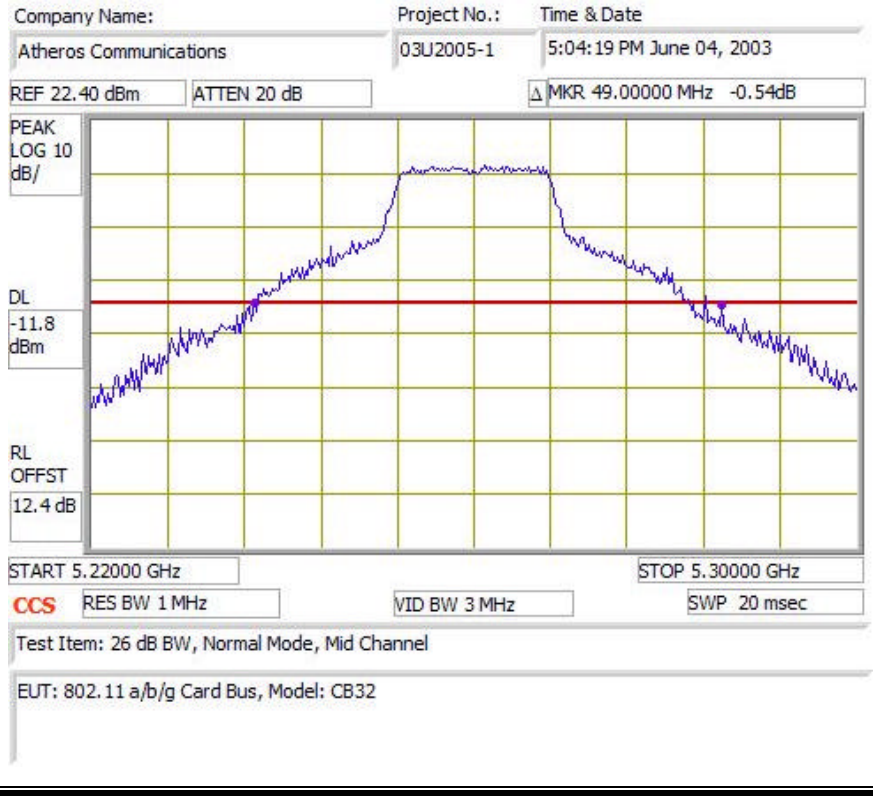
Turbo Mode

Channel	Frequency (MHz)	B (MHz)	10 Log B (dB)
Low	5200	96.80	19.86
Middle	5250	95.60	19.80
High	5290	98.40	19.93

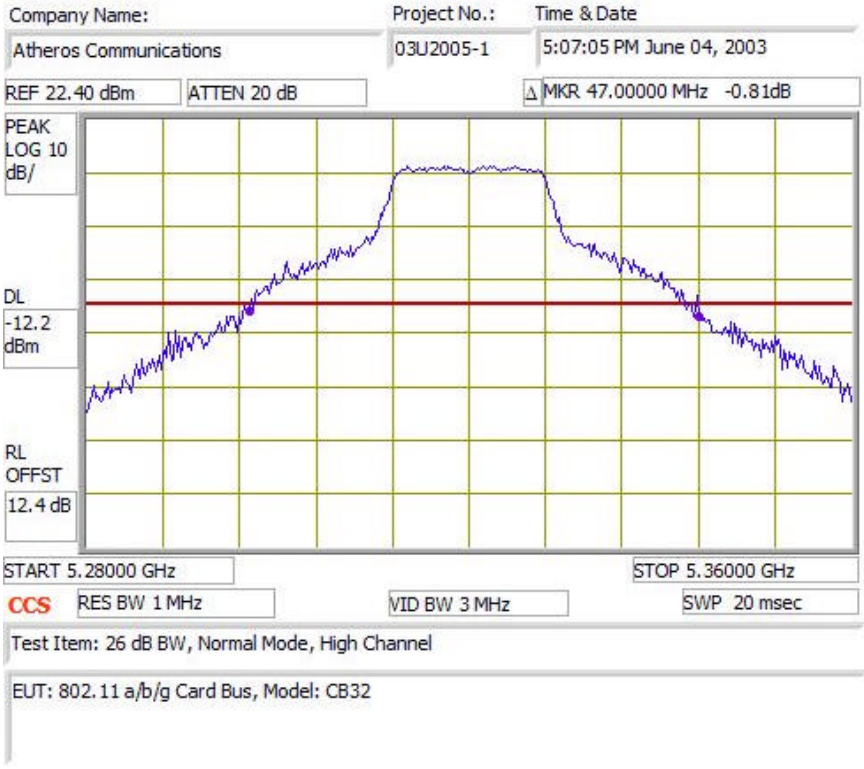
26 dB EMISSION BANDWIDTH (802.11a NORMAL MODE)



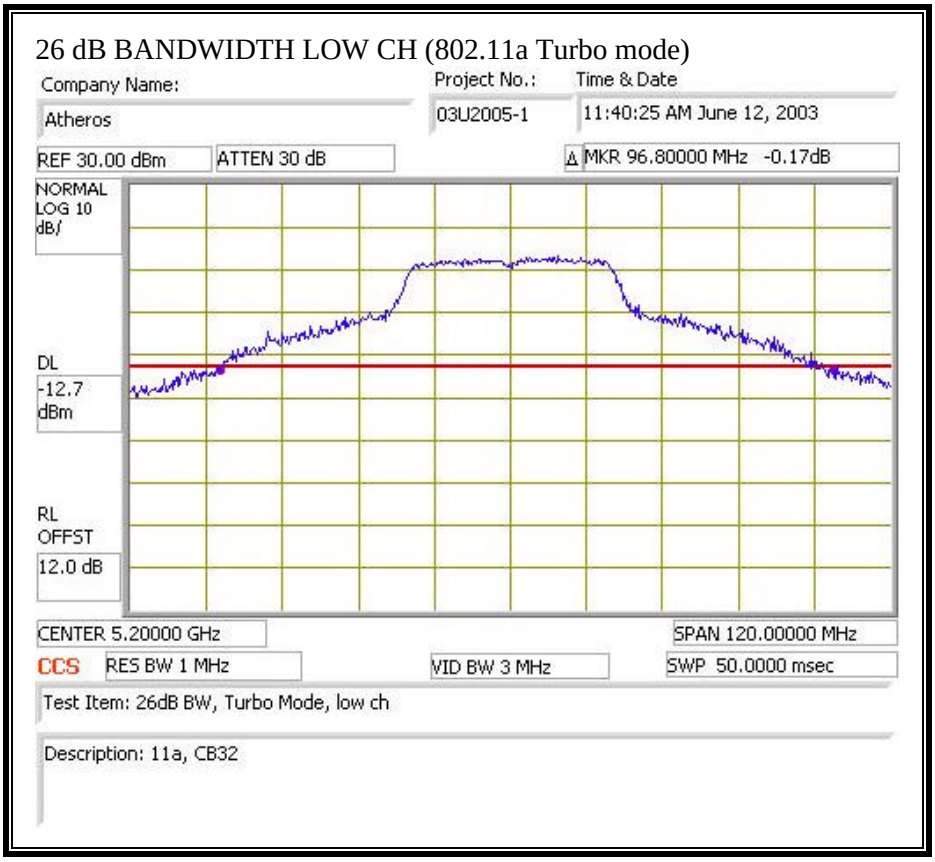
26 dB BANDWIDTH MID CH (802.11a Normal mode)



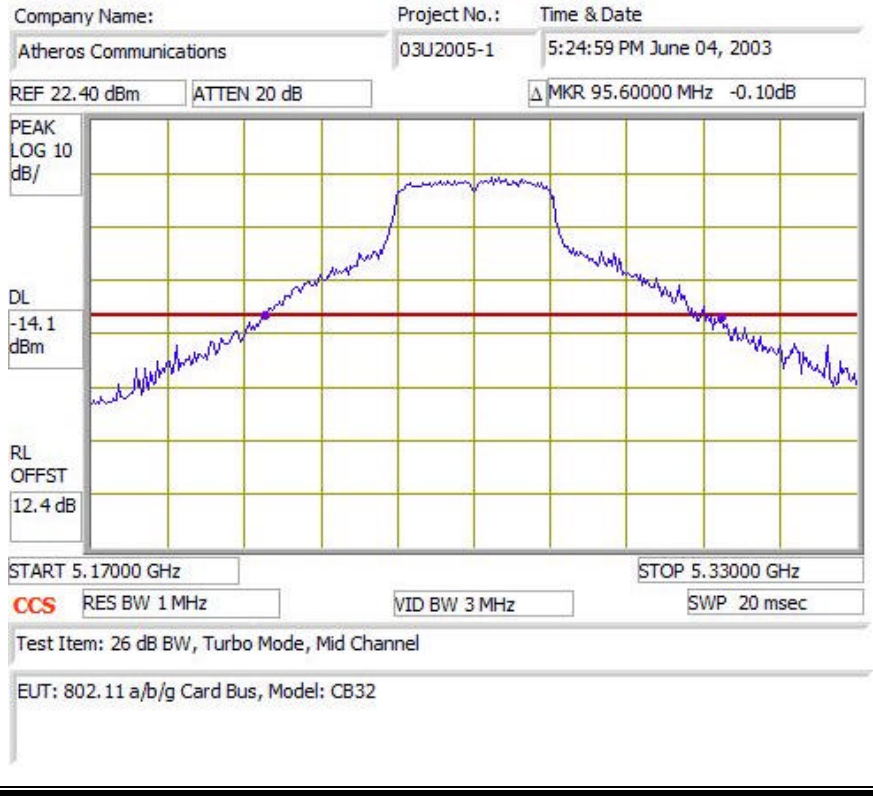
26 dB BANDWIDTH HIGH CH (802.11a Normal mode)



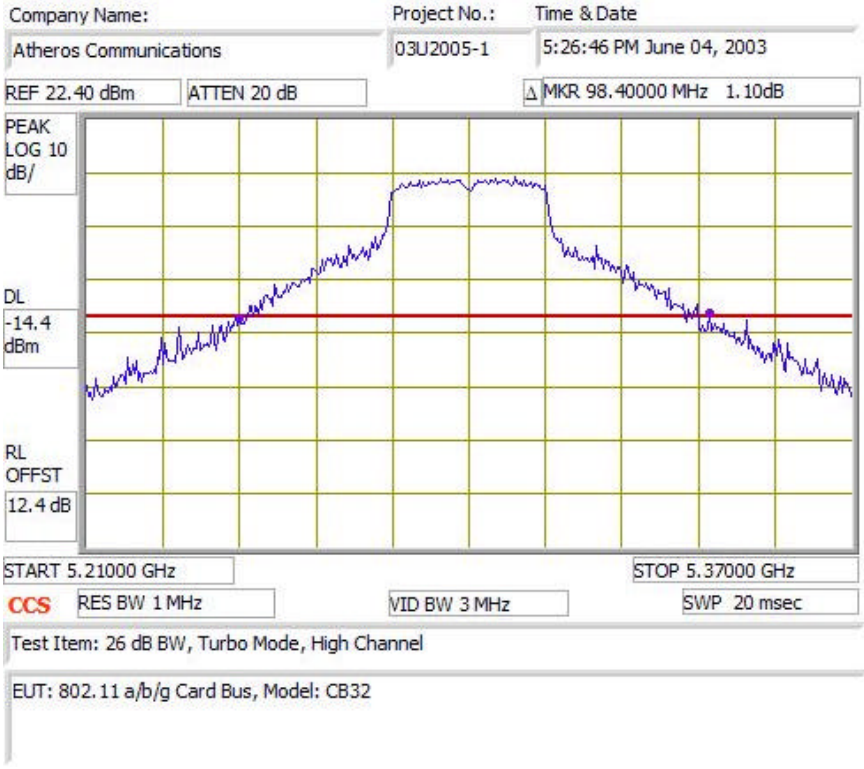
26 dB EMISSION BANDWIDTH (802.11a TURBO MODE)



26 dB BANDWIDTH MID CH (802.11a Turbo mode)



26 dB BANDWIDTH HIGH CH (802.11a Turbo mode)



7.2. PEAK POWER

LIMIT

§15.407 (a) (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 (17 dBm) or 4 dBm + 10 log B, where B is the 26-dB emission bandwidth in MHz. In addition, the peak power spectral density shall not exceed 4 dBm in any 1-MHz band. 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.

§15.407 (a) (1) 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 (24 dBm) or 11 dBm + 10 log B, where B is the 26-dB emission bandwidth in MHz. In addition, the peak power spectral density shall not exceed 11 dBm in any 1-MHz band. 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.

TEST PROCEDURE

The test is performed in accordance with FCC Public Notice: APPENDIX A Guidelines for Assessing Unlicensed National Information Infrastructure (U-NII) Devices – Part 15, Subpart E, August 2002.

The transmitter output operates continuously therefore Method # 1 is used.

LIMITS AND RESULTS

No non-compliance noted:

Limit in 5150 to 5250 MHz Band

Mode	Frequency (MHz)	Fixed Limit (dBm)	B (MHz)	4 + 10 Log B Limit (dBm)	Excess Antenna Gain (dB)	Limit (dBm)
Normal	5180	17	49.20	20.92	0.00	17.00
Turbo	5200	17	96.80	23.86	0.00	17.00
Turbo	5250	17	95.60	23.80	0.00	17.00

Limit in 5250 to 5350 MHz Band

Mode	Frequency (MHz)	Fixed Limit (dBm)	B (MHz)	11 + 10 Log B Limit (dBm)	Excess Antenna Gain (dB)	Limit (dBm)
Normal	5260	24	49.00	27.90	0.00	24.00
Normal	5320	24	47.00	27.72	0.00	24.00
Turbo	5290	24	98.40	30.93	0.00	24.00

Normal Mode Results

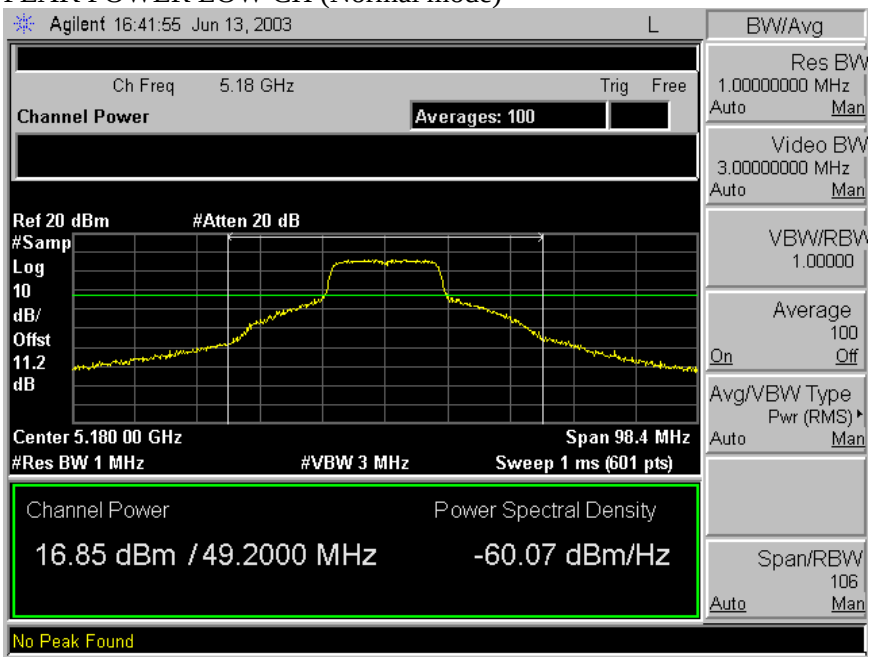
Channel	Frequency (MHz)	Power (dBm)	Limit (dBm)	Margin (dB)
Low	5180	16.85	17.00	-0.15
Middle	5260	17.74	24.00	-6.26
High	5320	17.14	24.00	-6.86

Turbo Mode Results

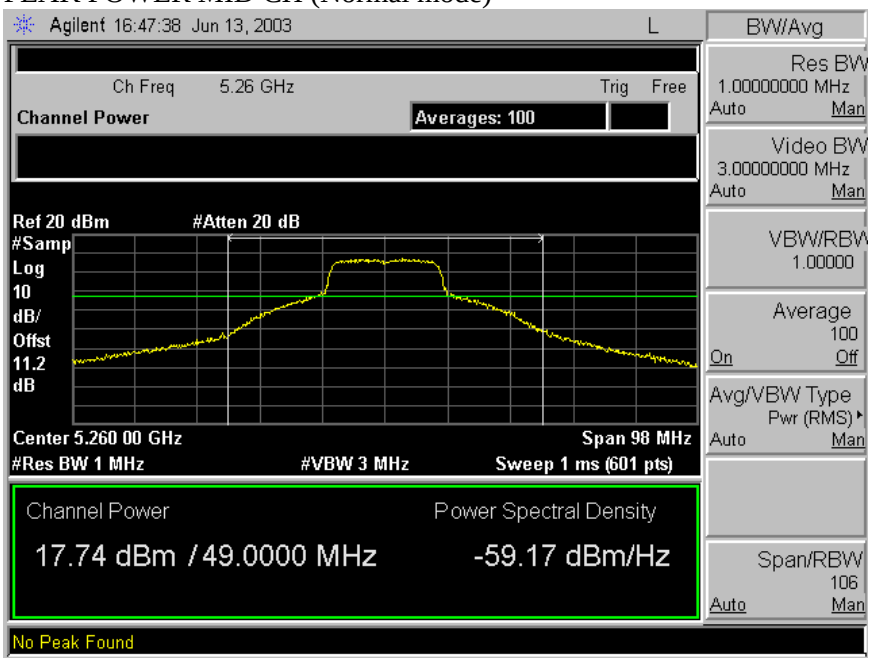
Channel	Frequency (MHz)	Power (dBm)	Limit (dBm)	Margin (dB)
Low	5200	16.66	17.00	-0.34
Middle	5250	16.89	17.00	-0.11
High	5290	17.50	24.00	-6.50

PEAK POWER (NORMAL MODE)

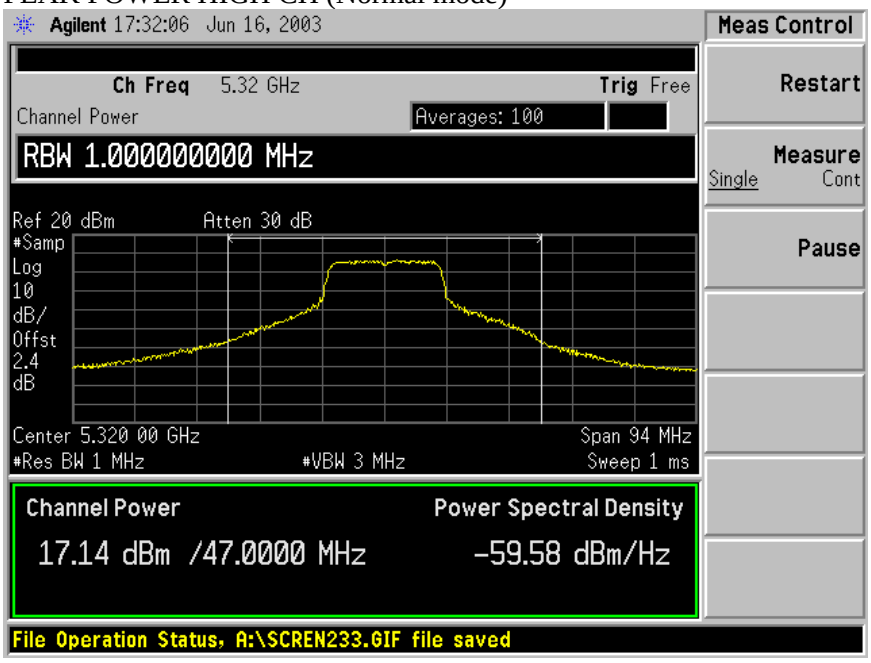
PEAK POWER LOW CH (Normal mode)



PEAK POWER MID CH (Normal mode)

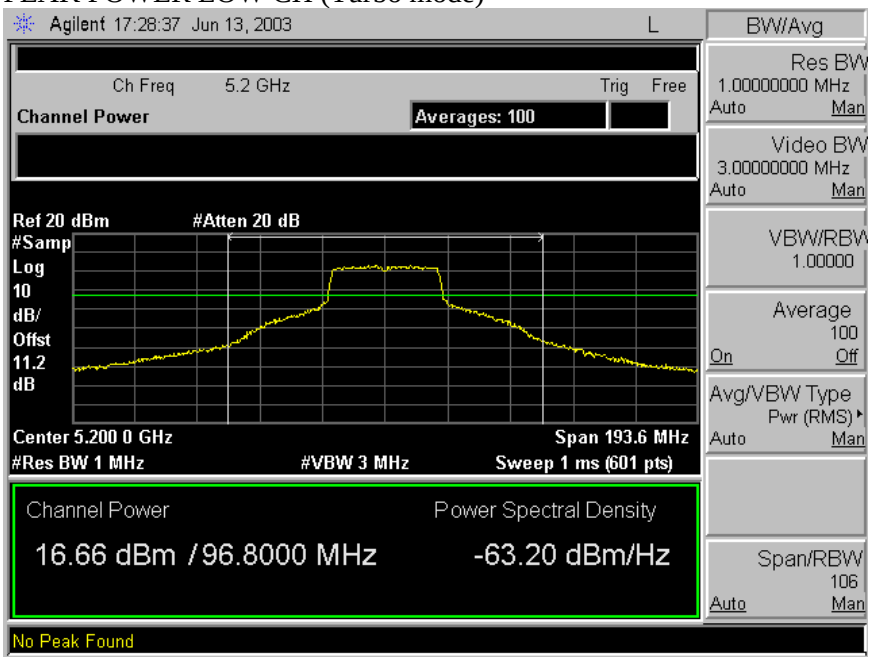


PEAK POWER HIGH CH (Normal mode)

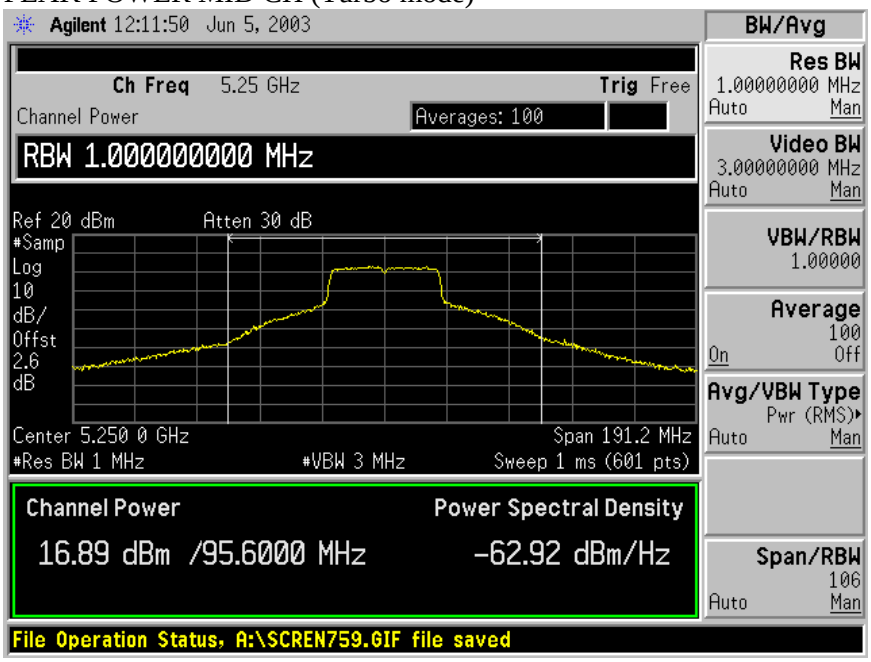


PEAK POWER (TURBO MODE)

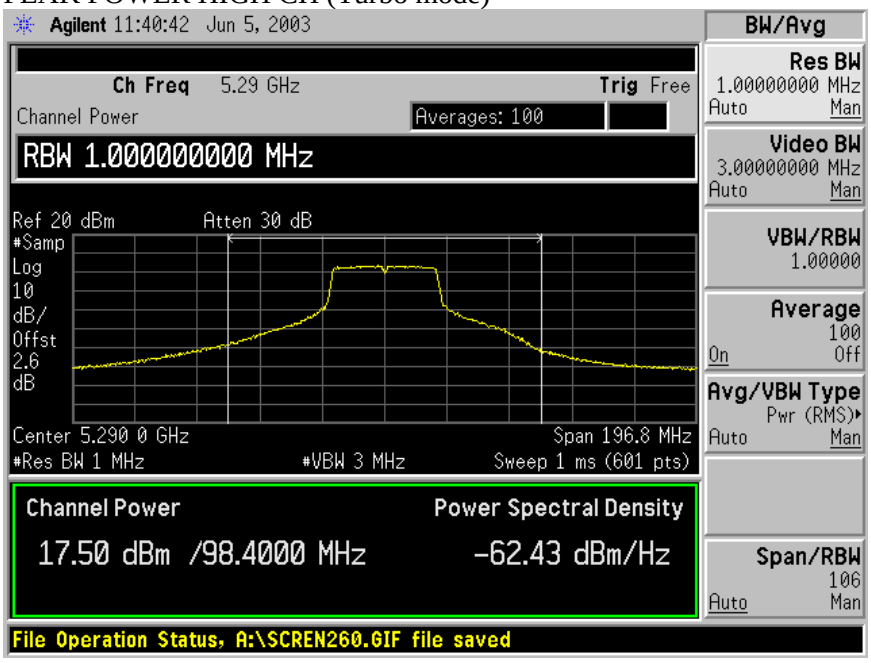
PEAK POWER LOW CH (Turbo mode)



PEAK POWER MID CH (Turbo mode)



PEAK POWER HIGH CH (Turbo mode)



7.3. AVERAGE POWER

AVERAGE POWER LIMIT

None; for reporting purposes only.

TEST PROCEDURE

The transmitter output is connected to a power meter. The power meter is set to simultaneously read peak power and average power.

RESULTS

No non-compliance noted:

The cable assembly insertion loss of 11.2 dB (including 10 dB pad and 1.2 dB cable) was entered as an offset in the power meter to allow for direct reading of power.

Normal Mode

Channel	Frequency (MHz)	Average Power (dBm)
Low	5180	17.60
Middle	5260	18.10
High	5320	17.80

Turbo Mode

Channel	Frequency (MHz)	Average Power (dBm)
Low	5200	17.50
Middle	5250	17.60
High	5290	18.20

7.4. PEAK POWER SPECTRAL DENSITY

LIMIT

§15.407 (a) (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 (17 dBm) or 4 dBm + 10 log B, where B is the 26-dB emission bandwidth in MHz. In addition, the peak power spectral density shall not exceed 4 dBm in any 1-MHz band. 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.

§15.407 (a) (1) 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 (24 dBm) or 11 dBm + 10 log B, where B is the 26-dB emission bandwidth in MHz. In addition, the peak power spectral density shall not exceed 11 dBm in any 1-MHz band. 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.

The maximum antenna gain = 0 dBi, therefore there is no reduction due to antenna gain.

TEST PROCEDURE

The test is performed in accordance with FCC Public Notice: APPENDIX A Guidelines for Assessing Unlicensed National Information Infrastructure (U-NII) Devices – Part 15, Subpart E, August 2002. PPSD method #2 was used.

RESULTS

No non-compliance noted:

Normal Mode

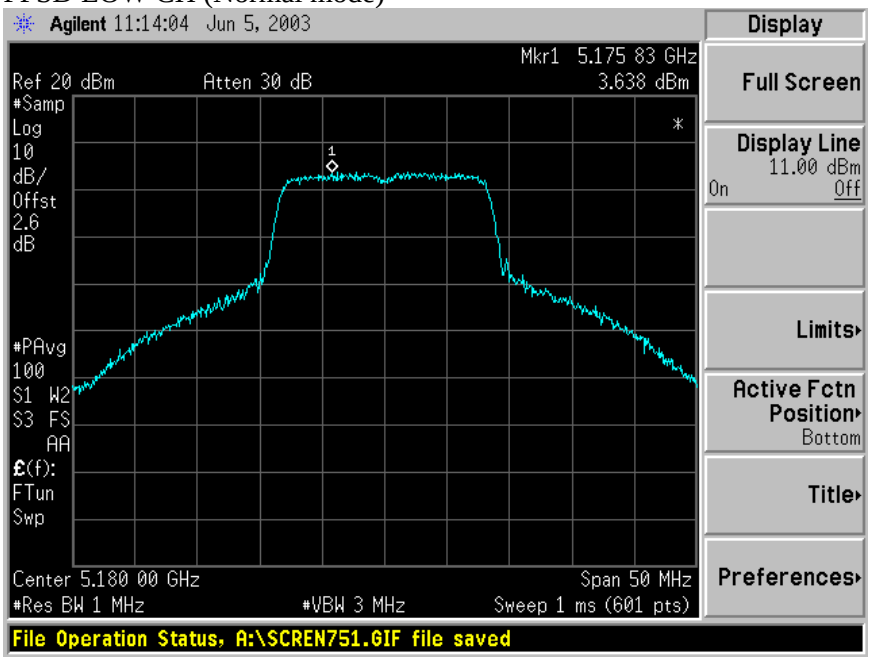
Channel	Frequency (MHz)	PPSD (dBm)	Limit (dBm)	Margin (dB)
Low	5180	3.64	4.00	-0.36
Middle	5260	5.96	11.00	-5.04
High	5320	4.55	11.00	-6.45

Turbo Mode

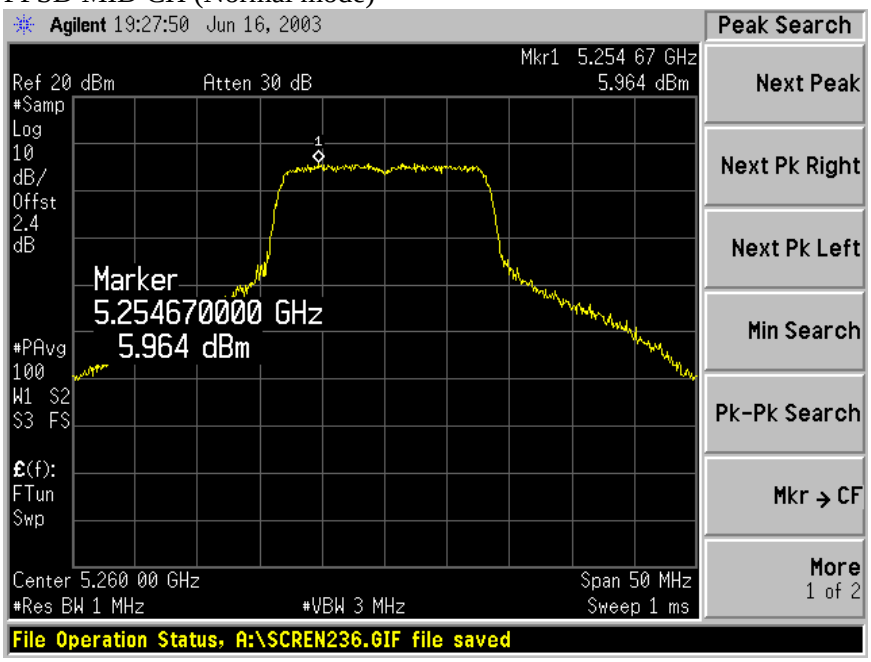
Channel	Frequency (MHz)	PPSD (dBm)	Limit (dBm)	Margin (dB)
Low	5200	3.00	4.00	-1.00
Middle	5250	3.60	4.00	-0.40
High	5290	3.06	11.00	-7.94

PEAK POWER SPECTRAL DENSITY (NORMAL MODE)

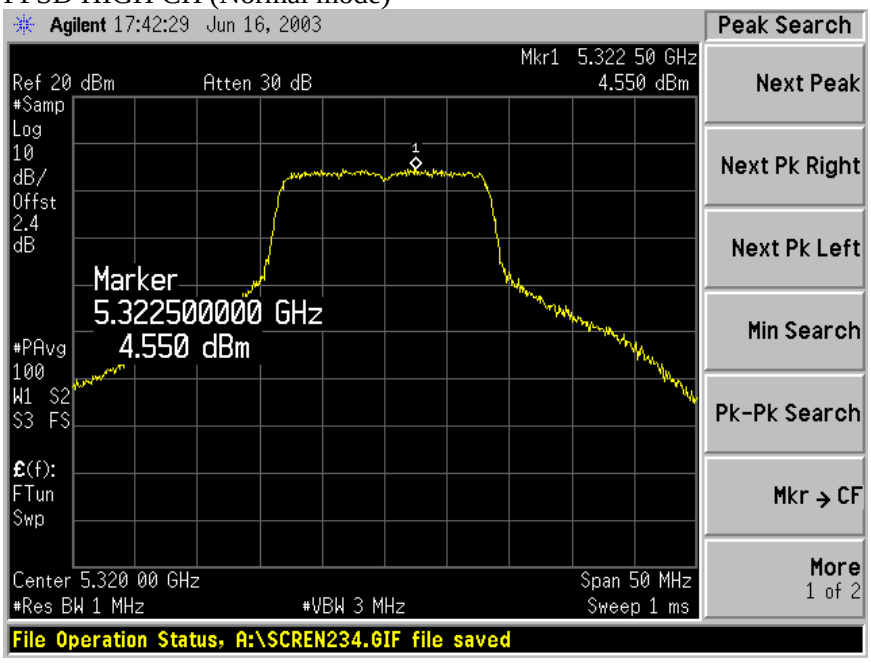
PPSD LOW CH (Normal mode)



PPSD MID CH (Normal mode)

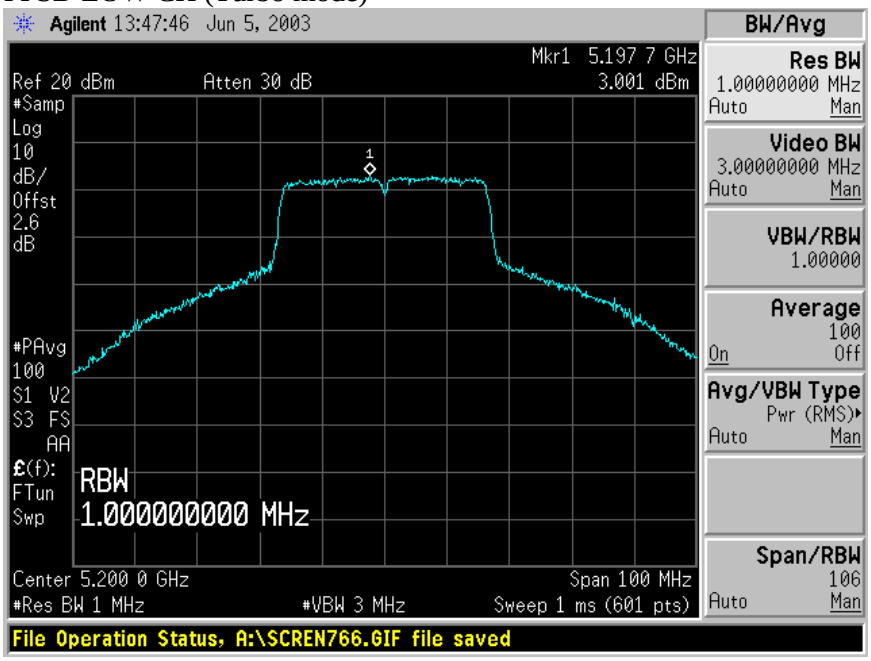


PPSD HIGH CH (Normal mode)

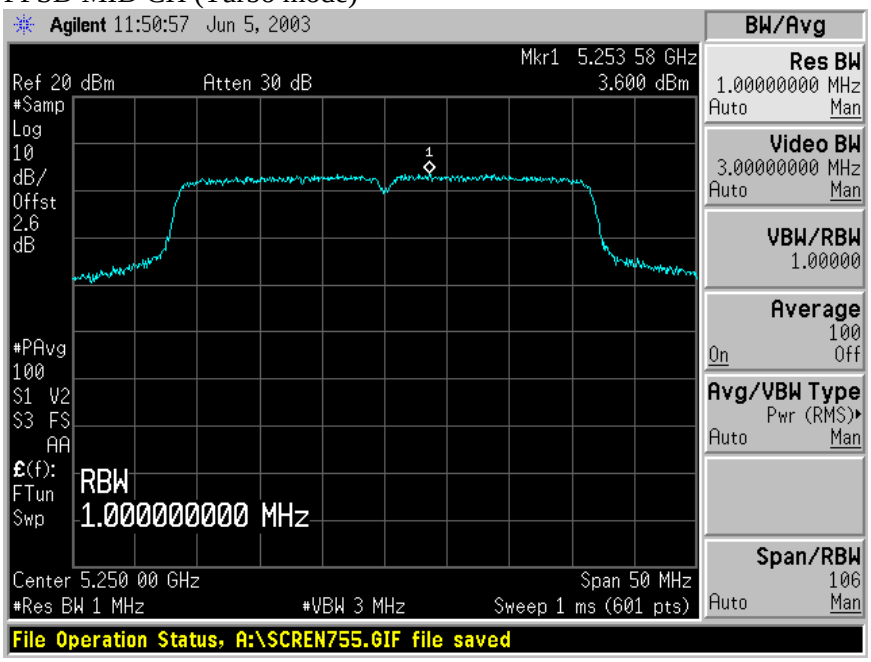


PEAK POWER SPECTRAL DENSITY (TURBO MODE)

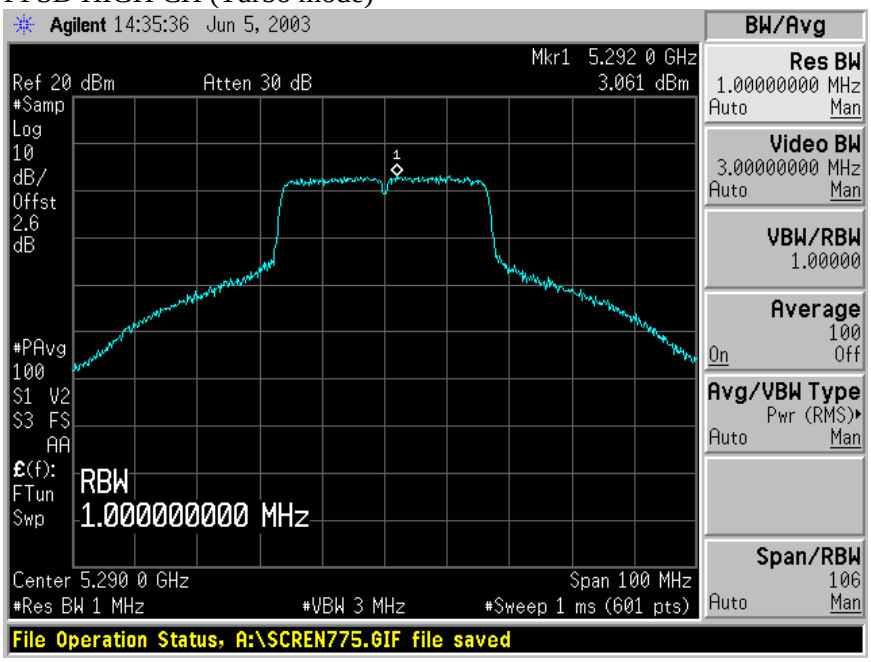
PPSD LOW CH (Turbo mode)



PPSD MID CH (Turbo mode)



PPSD HIGH CH (Turbo mode)



7.5. PEAK EXCURSION

LIMIT

§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.

TEST PROCEDURE

The test is performed in accordance with FCC Public Notice: APPENDIX A Guidelines for Assessing Unlicensed National Information Infrastructure (U-NII) Devices – Part 15, Subpart E, August 2002.

Since Method # 1 was used for peak power measurements, Method # 1 settings are used for the second PPSD trace.

RESULTS

No non-compliance noted:

Normal Mode

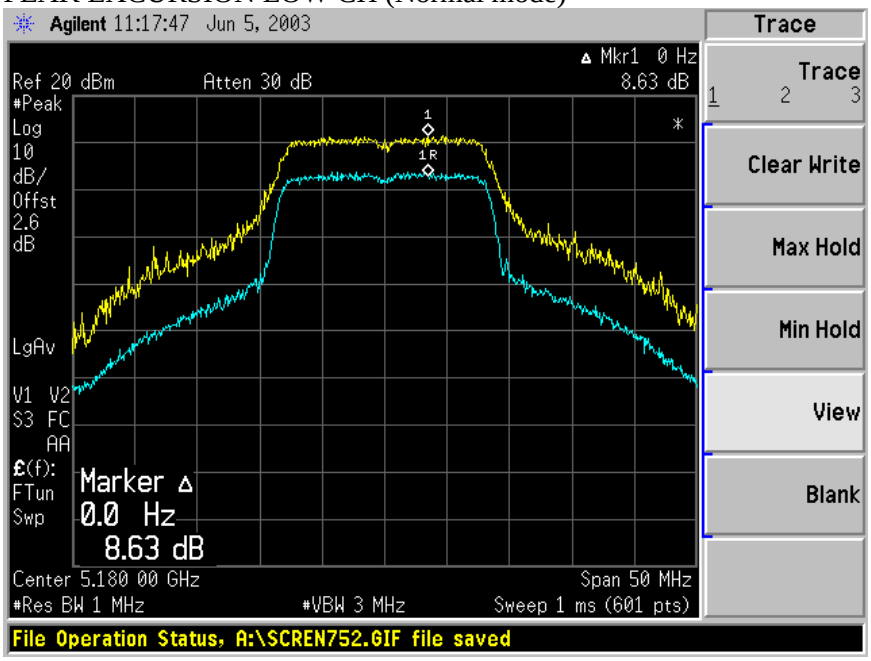
Channel	Frequency (MHz)	Peak Excursion (dB)	Limit (dB)	Margin (dB)
Low	5180	8.63	13	-4.37
Middle	5260	9.52	13	-3.48
High	5320	8.62	13	-4.38

Turbo Mode

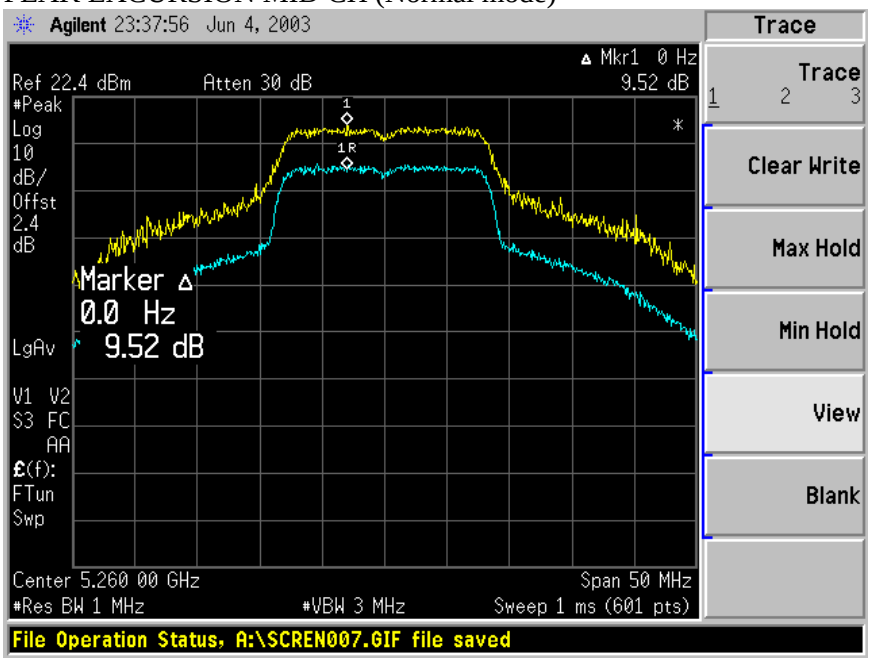
Channel	Frequency (MHz)	Peak Excursion (dB)	Limit (dB)	Margin (dB)
Low	5200	9.26	13	-3.74
Middle	5250	8.89	13	-4.11
High	5290	8.40	13	-4.60

PEAK EXCURSION (NORMAL MODE)

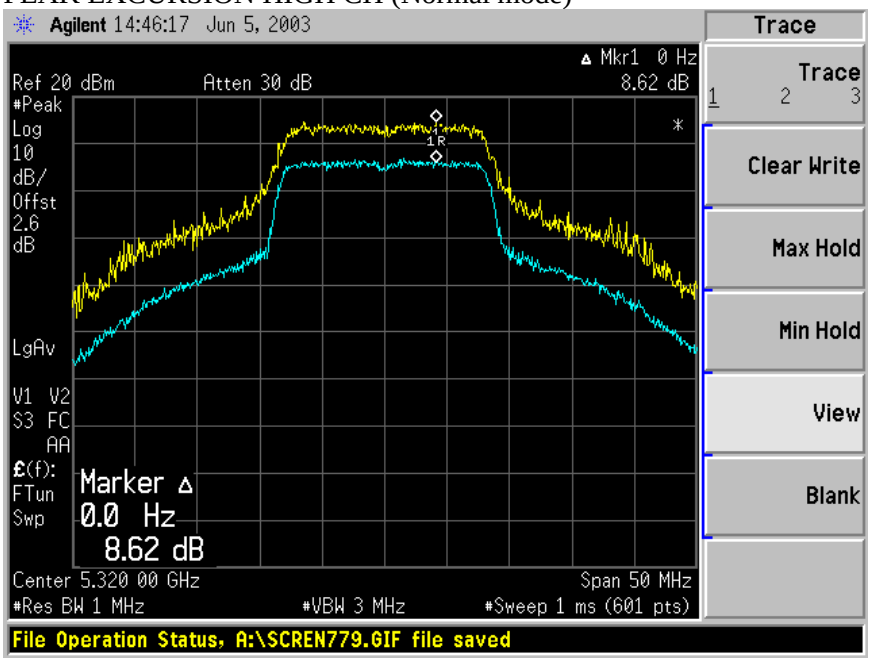
PEAK EXCURSION LOW CH (Normal mode)



PEAK EXCURSION MID CH (Normal mode)

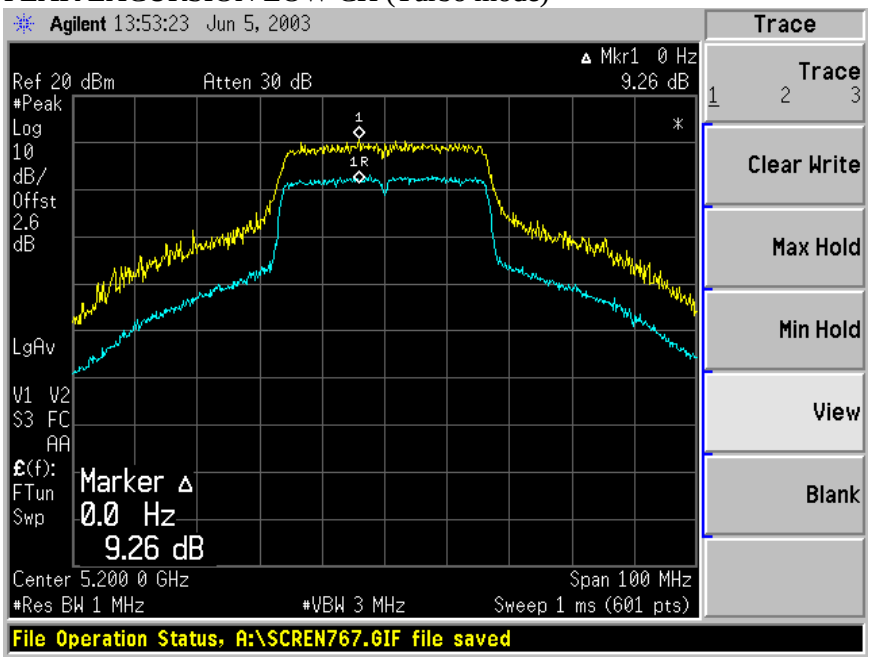


PEAK EXCURSION HIGH CH (Normal mode)



PEAK EXCURSION (TURBO MODE)

PEAK EXCURSION LOW CH (Turbo mode)



PEAK EXCURSION MID CH (Turbo mode)