

FCC CFR47 PART 15 SUBPART E CERTIFICATION TEST REPORT

FOR

802.11a/b/g ACCESS POINT

MODEL NUMBER: AR5BAP-00032

BRAND NAME: ATHEROS

FCC ID: PPD-AR5BAP-00032

REPORT NUMBER: 03U2012-2

ISSUE DATE: JULY 1, 2003

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

Prepared by

COMPLIANCE CERTIFICATION SERVICES 561F MONTEREY ROAD, MORGAN HILL, CA 95037, USA TEL: (408) 463-0885 FAX: (408) 463-0888

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1. TEST RESULT CERTIFICATION

	APPLICABLE STANDARDS	
DATE TESTED:	JUNE 1 – JUNE 30, 2003	
MODEL:	AR5BAP-00032	
EUT DESCRIPTION:	802.11A/B/G ACCESS POINT	
COMPANY NAME:	ATHEROS COMMUNICATIONS 529 ALMANOR AVE. SUNNYVALE, CA 94085	
COMDANV NAME.	A THEDOS COMMUNICATIONS	

APPLICABLE STANDARDS					
STANDARD	TEST RESULTS				
FCC PART 15 SUBPART E	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:

Tested By:

MA

MIKE HECKROTTE CHIEF ENGINEER COMPLIANCE CERTIFICATION SERVICES

VIEN TRAN EMC ENGINEER COMPLIANCE CERTIFICATION SERVICES

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2. EUT DESCRIPTION

The model AR5BAP-00032 Access Point contains two radios capable of simultaneous 802.11b/g (2.4 GHz) and 802.11a (5 GHz) operation.

The AR5BAP-00032 has an output power of 20.97 dBm (125 mW) and an antenna gain of 4.0 dBi in the 5150 - 5350 MHz band.

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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."

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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	FC 1300
Japan	VCCI	CISPR 22 Two OATS and one conducted Site	VCCI 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	N _{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	N _{ELA-171}
Taiwan	BSMI	CNS 13438	(本) SL2-IN-E-1012
Canada	Industry Canada	RSS210 Low Power Transmitter and Receiver	Canada IC2324 A,B,C, and F

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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%.

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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		
Horn Antenna (1 - 18GHz)	EMCO	3115	6739	2/4/04		
Antenna, Biconical	Eaton	94455-1	1214	3/6/04		
Antenna, Log Periodic 200- 1000MHz	EMCO	3146	9107-3163	3/06/04		
Preamplifier	Miteq	NSP10023988	646456	4/26/04		
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		
Spectrum Analyzer	Rohde &Schwarz	FSP	100112	06/28/03		
Power Sensor	Agilent	E9327A	US40440755	08/09/03		

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6. SETUP OF EQUIPMENT UNDER TEST

SETUP INFORMATION FOR TRANSMITTER TESTS

SUPPORT EQUIPMENT

PERIPHERAL SUPPORT EQUIPMENT LIST							
Device Type	Device Type Manufacturer Model Serial Number FCC ID						
Laptop	Toshiba	NA	J291200E8019	Doc			
Power Adapter Toshiba PA3083U-1ACA 0536906G Doc							
5V DC power adapter	Switching Adapter	RHC-060200-1	0319	DOC			

I/O CABLES

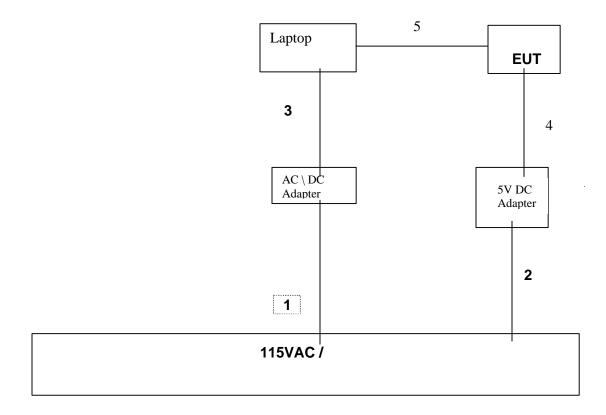
Cable	Port	# of	Connector	Cable	Cable	Remarks
No.		Identical	Type	Type	Length	
		Ports				
1	AC	2	US115V	Un-Shielded	2m	NA
2	AC	2	US115V	Un-Shielded	2m	NA
3	DC	2	DC	Un-Shielded	2m	Integral with adapter
4	DC	2	DC	Un-Shielded	2m	Integral with adapter
5	RJ45	1	RJ45	Un-Shielded	2m	NA

TEST SETUP

The EUT was controlled by the laptop via Ethernet cable.

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SETUP DIAGRAM FOR TRANSMITTER TESTS



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SETUP INFORMATION FOR DIGITAL DEVICE TESTS

SUPPORT EQUIPMENT

PERIPHERAL SUPPORT EQUIPMENT LIST							
Device Type	Manufacturer	Model	Serial Number	FCC ID			
Laptop	Toshiba	NA	J291200E8019	Doc			
Power Adapter	Toshiba	PA3083U-1ACA	0536906G	Doc			
MOUSE	HP	M-S34	LZB75062022	DZL211029			
PRINTER	HP	2225C	2541S41679	BS46XU2225C			
5V DC power adapter	Switching Adapter	RHC-060200-1	0319	DOC			

I/O CABLES

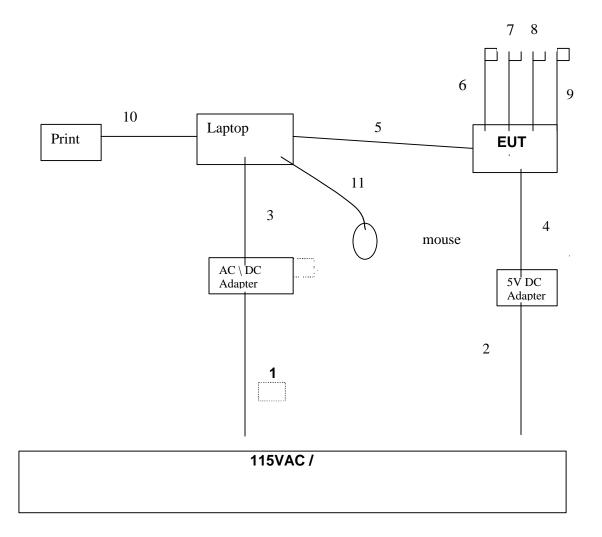
Cable	Port	# of	Connector	Cable	Cable	Remarks
No.		Identical	Туре	Туре	Length	
		Ports				
1	AC	2	US115V	Un-Shielded	2m	NA
2	AC	2	US115V	Un-Shielded	2m	NA
3	DC	2	DC	Un-Shielded	2m	Integral with adapter
4	DC	2	DC	Un-Shielded	2m	Integral with adapter
5	RJ45	1	RJ45	Un-Shielded	2m	NA
6	RJ45	1	RJ45	Un-Shielded	2m	NA
7	RJ45	1	RJ45	Un-Shielded	2m	NA
8	RJ45	1	RJ45	Un-Shielded	2m	NA
9	RJ45	1	RJ45	Un-Shielded	2m	NA
10	Parallel	1	DB25	Un-Shielded	2m	NA
11	Mouse	1	Mini	Shielded	1m	Integral with mouse

TEST SETUP

The EUT was controlled by the laptop via Ethernet cable.

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SETUP DIAGRAM FOR DIGITAL DEVICE TESTS



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7. APPLICABLE RULES AND TEST RESULTS

7.1. EMISSION BANDWIDTH

LIMIT

§15.403 (c) <u>Emission bandwidth</u>. 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

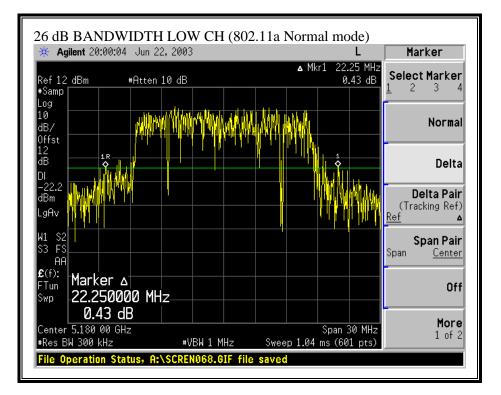
Channel	Frequency	В	10 Log B
	(MHz)	(MHz)	(dB)
Low	5180	22.25	13.47
Middle	5260	22.35	13.49
High	5320	22.35	13.49

Turbo Mode

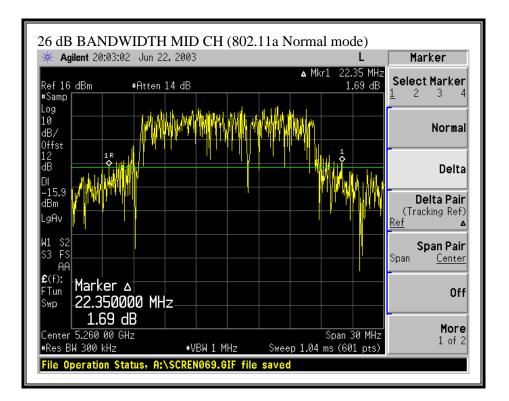
Channel	Frequency	В	10 Log B
	(MHz)	(MHz)	(dB)
Low	5200	45.33	16.56
Middle	5250	46.00	16.63
High	5290	44.53	16.49

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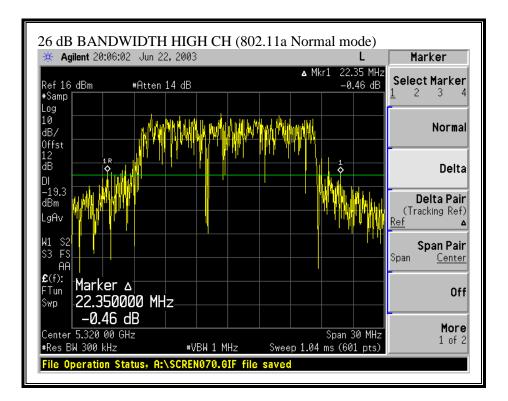
26 dB EMISSION BANDWIDTH (802.11a NORMAL MODE)



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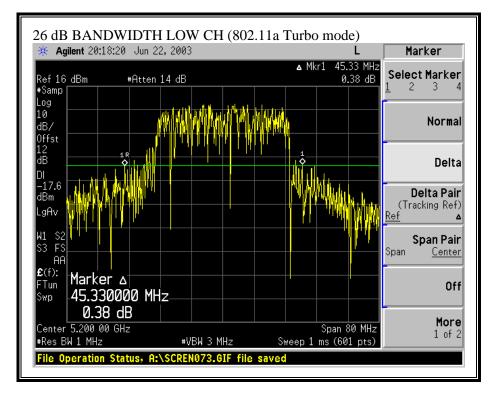


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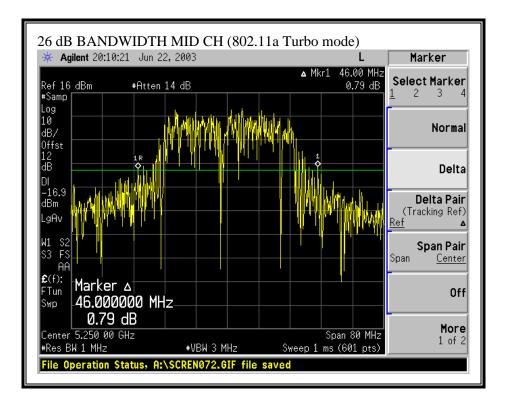


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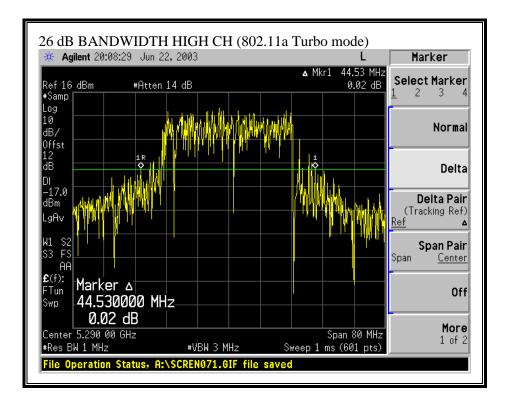
26 dB EMISSION BANDWIDTH (802.11a TURBO MODE)



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7.2. PEAK POWER

<u>LIMIT</u>

§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.

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LIMITS AND RESULTS

No non-compliance noted:

Limit in 5150 to 5250 MHz Band

Mode	Frequency	Fixed	В	4 + 10 Log B	Excess Antenna	Limit
		Limit		Limit	Gain	
	(MHz)	(dBm)	(MHz)	(dBm)	(dB)	(dBm)
Normal	5180	17	22.25	17.47	0.00	17.00
Turbo	5200	17	45.33	20.56	0.00	17.00
Turbo	5250	17	46	20.63	0.00	17.00

Limit in 5250 to 5350 MHz Band

Mode	Frequency	Fixed	В	11 + 10 Log B	Excess Antenna	Limit
		Limit		Limit	Gain	
	(MHz)	(dBm)	(MHz)	(dBm)	(dB)	(dBm)
Normal	5260	24	22.35	24.49	0.00	24.00
Normal	5320	24	22.35	24.49	0.00	24.00
Turbo	5290	24	44.53	27.49	0.00	24.00

Normal Mode Results

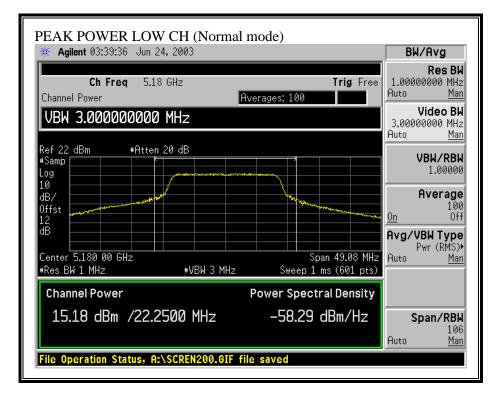
Channel	Frequency	Power	Limit	Margin
	(MHz)	(dBm)	(dBm)	(dB)
Low	5180	15.18	17.00	-1.82
Middle	5260	20.65	24.00	-3.35
High	5320	17.10	24.00	-6.90

Turbo Mode Results

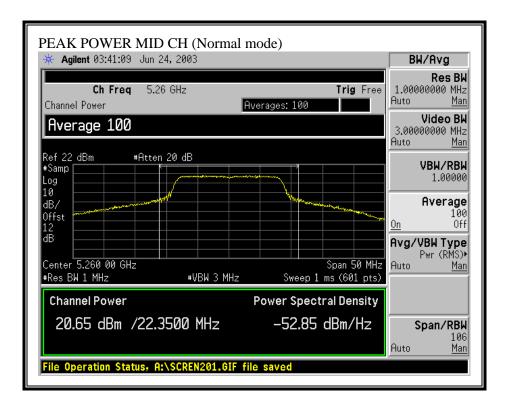
Channel	Frequency	Power	Limit	Margin
	(MHz)	(dBm)	(dBm)	(dB)
Low	5200	16.64	17.00	-0.36
Middle	5250	16.33	17.00	-0.67
High	5290	20.97	24.00	-3.03

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PEAK POWER (NORMAL MODE)



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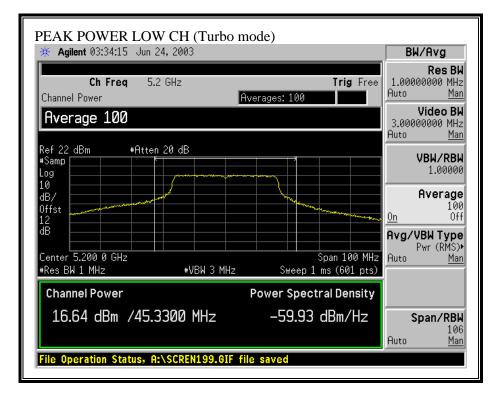


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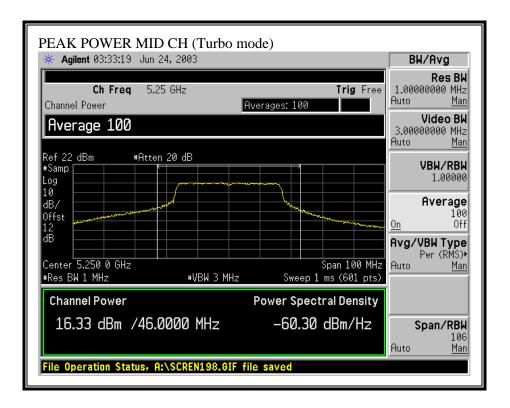
🔆 Agilent 04:00:00 Jun 24, 2003		BW/Avg
Ch Freq 5.32 GHz Channel Power	Trig Free Averages: 100	Res BW 1.00000000 MHz Auto <u>Man</u>
Average 100		Video BW 3.00000000 MHz Auto <u>Man</u>
Ref 22 dBm #Atten 20 dB #Samp Log 10		VBW/RBW 1.00000
dB/ Offst 12 dB		Average 100 <u>On</u> Off
Center 5.320 00 GHz #Res BW 1 MHz #VBW 3 MHz	Span 50 MHz Sweep 1 ms (601 pts)	Avg/VBWType Pwr(RMS)► Auto <u>Man</u>
Channel Power	Power Spectral Density	
17.10 dBm /22.3500 MHz	-56.39 dBm/Hz	Span/RBW 106 Auto <u>Man</u>

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PEAK POWER (TURBO MODE)



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🔆 Agilent 03:31:39 Jun	24, 2003		BW/Avg
Ch Freq 5.3 Channel Power		Trig Fre erages: 100	Res BW 1.00000000 MHz Auto <u>Man</u>
RBW 1.00000000			Video BW 3.00000000 MHz Auto <u>Man</u>
Ref 22 dBm #Atte #Samp Log	n 20 dB		VBW/RBW 1.00000
dB/		Construction and the second second	Average
dB			<u>On</u> Off Avg/VBW Type
Center 5.290 0 GHz #Res BW 1 MHz	#VBW 3 MHz	Span 100 MH Sweep 1 ms (601 pts	
Channel Power		Power Spectral Density	
20.97 dBm /44.	5300 MHz	-55.52 dBm/Hz	Span/RBW 106 Auto Man

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7.3. MAXIMUM PERMISSIBLE EXPOSURE

LIMITS

15.247 (b) (5) Systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy levels in excess of the Commission's guidelines. See 1.1307(b)(1) of this chapter.

CALCULATIONS

Given

 $E = \sqrt{(30 * P * G)} / d$

and

 $S = E^{2}/3770$

where

E = Field Strength in Volts / meter

P = Power in Watts

G = Numeric antenna gain

d = distance in meters

S = Power Density in milliwatts / square centimeter

Combining equations and rearranging the terms to express the distance as a function of the remaining variables yields:

 $d = \sqrt{((30 * P * G) / (3770 * S))}$

Changing to units of mW and cm, using:

P (mW) = P (W) / 1000 andd (cm) = 100 * d (m)yields $d = 100 * \sqrt{ ((30 * (P / 1000) * G) / (3770 * S))}$ $d = 0.282 * \sqrt{ (P * G / S)}$ where

where

d = distance in cm P = Power in mW G = Numeric antenna gain

 $S = Power Density in mW / cm^2$

Substituting the logarithmic form of power and gain using:

Substit	uting the logarithmic form of power and gain using.	
	$P(mW) = 10 \wedge (P(dBm) / 10)$ and	
	G (numeric) = $10 \land (G (dBi) / 10)$	
yields		
	$d = 0.282 * 10 \wedge ((P + G) / 20) / \sqrt{S}$	Equation (1)
where		
	d = MPE distance in cm	
	P = Power in dBm	
	G = Antenna Gain in dBi	
	$S = Power Density Limit in mW / cm^2$	

Equation (1) and the measured peak power is used to calculate the MPE distance.

LIMITS

 $S = 1.0 \text{ mW} / \text{cm}^2 \text{ from } 1.1310 \text{ Table } 1$

RESULTS

No non-compliance noted:

Mode	Power Density Limit	Output Power	Antenna Gain	MPE Distance
	(mW/cm^2)	(dBm)	(dBi)	(cm)
Normal	1.0	20.65	4.00	4.82
Turbo	1.0	20.97	4.00	5.00

NOTE: For mobile or fixed location transmitters, the minimum separation distance is 20 cm, even if calculations indicate that the MPE distance would be less.

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7.4. AVERAGE POWER

AVERAGE POWER LIMIT

None; for reporting purposes only.

TEST PROCEDURE

The transmitter output is connected to a power meter.

RESULTS

No non-compliance noted:

The cable assembly insertion loss of 11.8 dB (including 10 dB pad and 1.8 dB cable) was entered as an offset in the power meter to allow for direct reading of power.

Normal Mode

Channel	Frequency	Average Power
	(MHz)	(dBm)
Low	5180	15.22
Middle	5260	20.66
High	5320	17.45

Turbo Mode

Channel	Frequency	Average Power
	(MHz)	(dBm)
Low	5200	17.00
Middle	5250	16.74
High	5290	21.20

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7.5. PEAK POWER SPECTRAL DENSITY

<u>LIMIT</u>

§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 = 4.0 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.

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RESULTS

No non-compliance noted:

Normal Mode

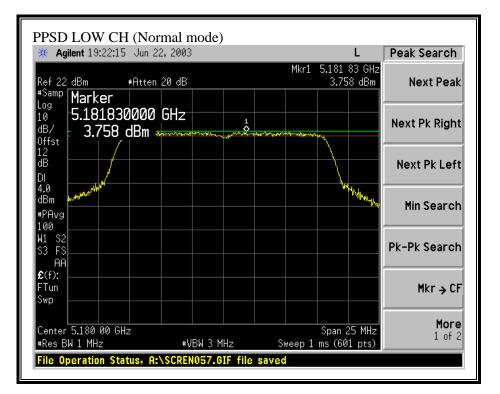
Channel	Frequency	PPSD	Limit	Margin
	(MHz)	(dBm)	(dBm)	(dB)
Low	5180	3.76	4.00	-0.24
Middle	5260	9.65	11.00	-1.35
High	5320	6.94	11.00	-4.06

Turbo Mode

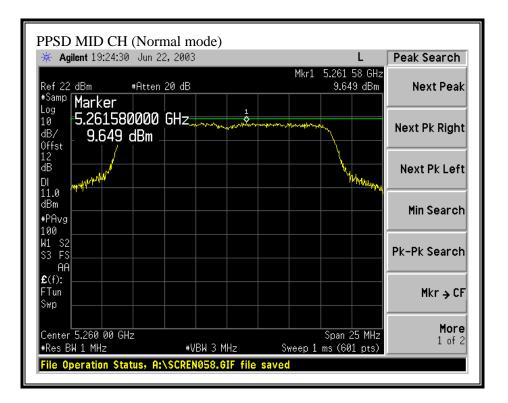
Channel	Frequency	PPSD	Limit	Margin
	(MHz)	(dBm)	(dBm)	(dB)
Low	5200	3.01	4.00	-0.99
Middle	5250	2.65	4.00	-1.36
High	5290	7.30	11.00	-3.70

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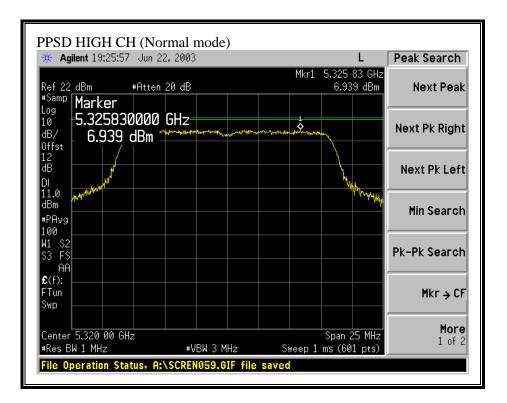
PEAK POWER SPECTRAL DENSITY (NORMAL MODE)



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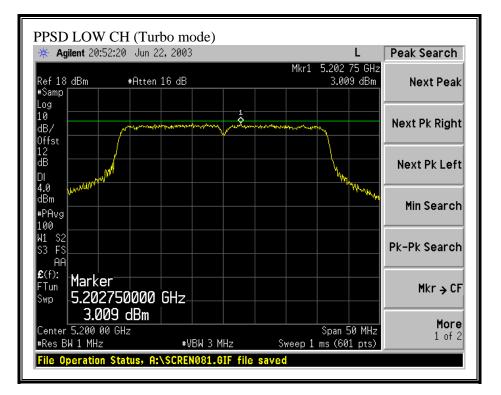


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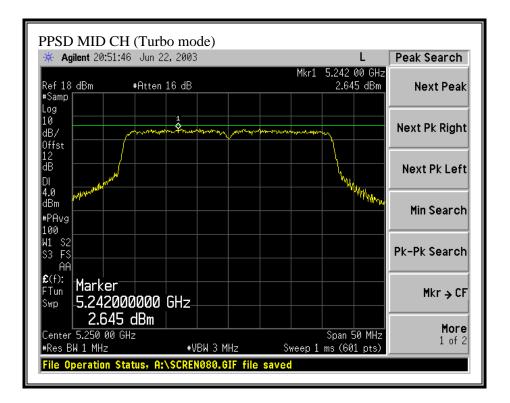


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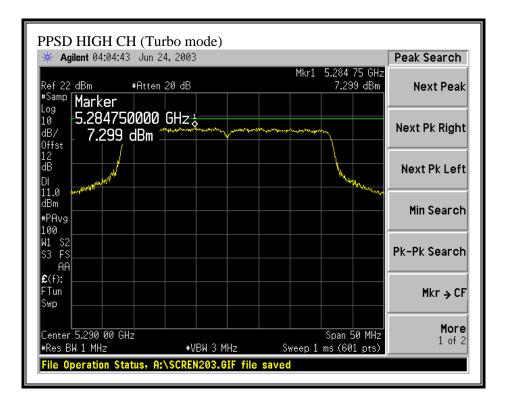
PEAK POWER SPECTRAL DENSITY (TURBO MODE)



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7.6. PEAK EXCURSION

<u>LIMIT</u>

§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

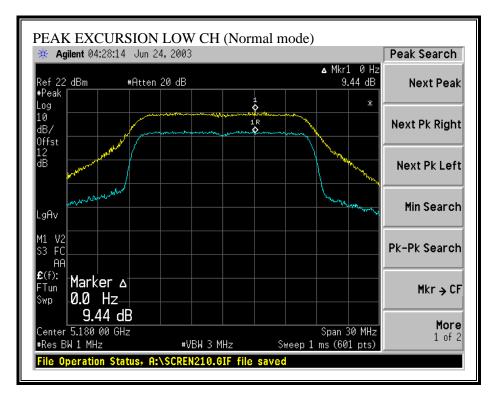
Channel	Frequency	Peak Excursion	Limit	Margin
	(MHz)	(dB)	(dB)	(dB)
Low	5180	9.44	13	-3.56
Middle	5260	8.60	13	-4.40
High	5320	8.52	13	-4.48

Turbo Mode

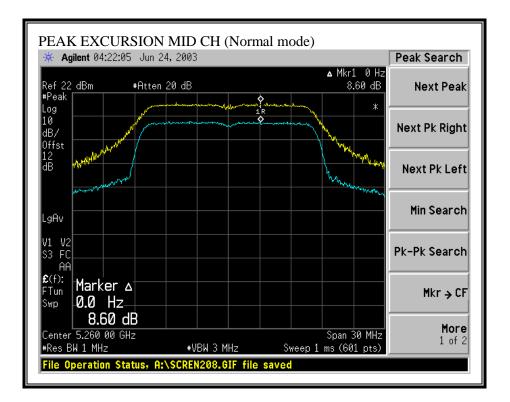
Channel	Frequency	Peak Excursion	Limit	Margin
	(MHz)	(dB)	(dB)	(dB)
Low	5200	8.65	13	-4.35
Middle	5250	7.84	13	-5.16
High	5290	7.99	13	-5.01

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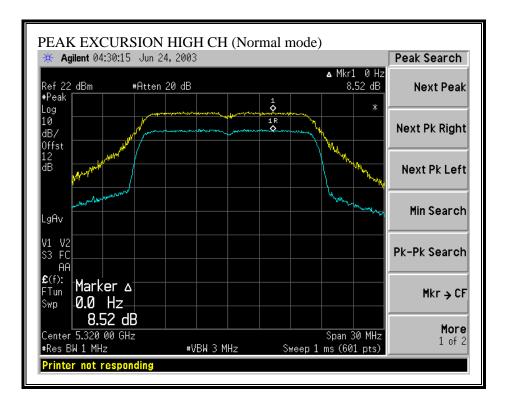
PEAK EXCURSION (NORMAL MODE)



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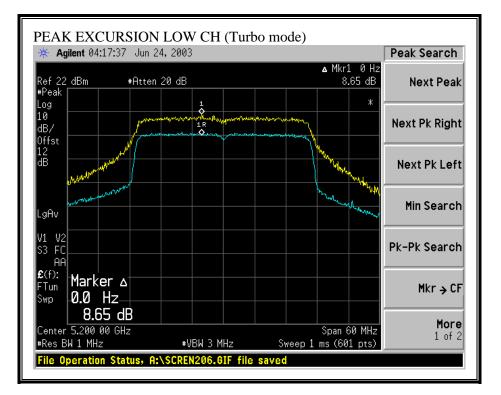


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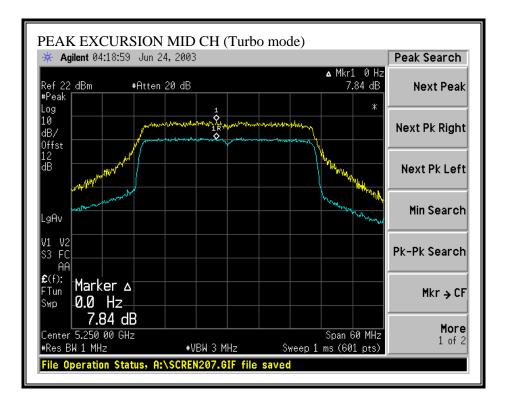


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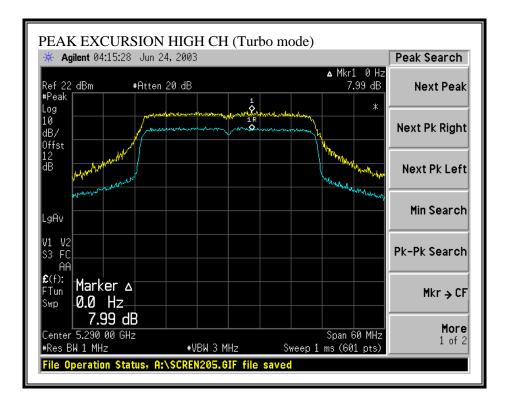
PEAK EXCURSION (TURBO MODE)



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7.7. CONDUCTED SPURIOUS EMISSIONS

<u>LIMITS</u>

15.407 (b) (1 & 2) For transmitters operating in the 5.15-5.35 GHz band: all emissions outside of the 5.15-5.35 GHz band shall not exceed an EIRP of -27dBm / MHz.

TEST PROCEDURE

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

The transmitter output is connected to the spectrum analyzer. The resolution bandwidth is set to 1 MHz. The video bandwidth is set to 1 MHz. Peak detection measurements are compared to the average EIRP limit, adjusted for the maximum antenna gain. If necessary, additional average detection measurements are made.

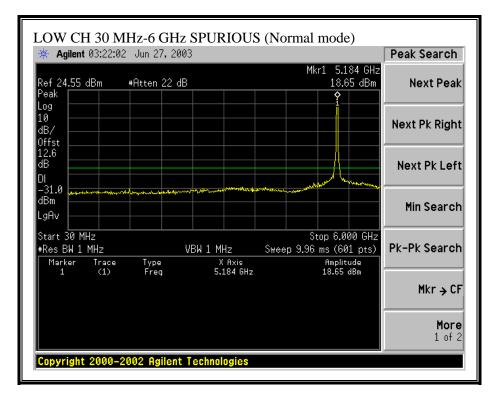
Measurements are made over the 30 MHz to 40 GHz range with the transmitter set to the lowest, middle, and highest channels.

RESULTS

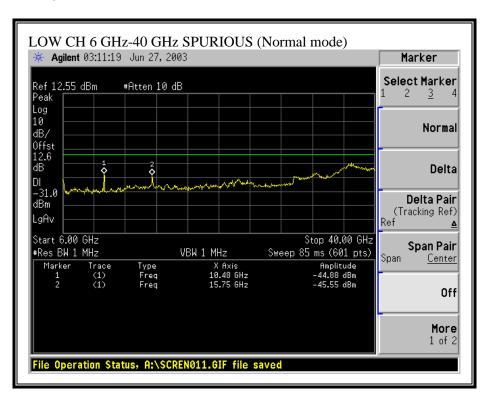
No non-compliance noted:

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SPURIOUS EMISSIONS, LOW CHANNEL (NORMAL MODE)

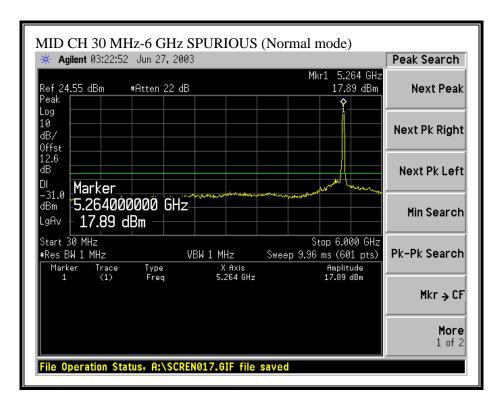


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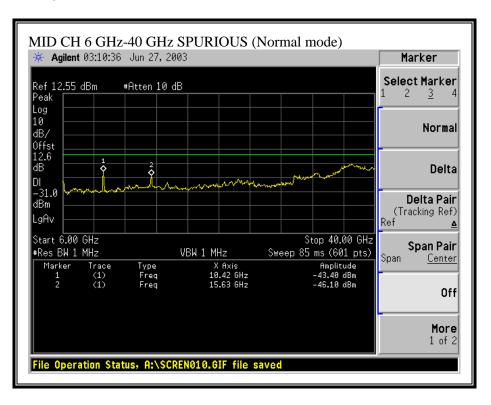


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SPURIOUS EMISSIONS, MID CHANNEL (NORMAL MODE)

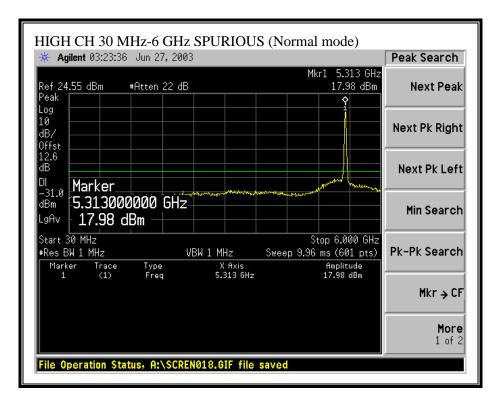


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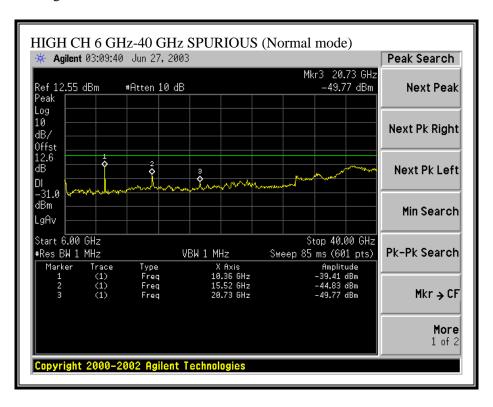


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SPURIOUS EMISSIONS, HIGH CHANNEL (NORMAL MODE)

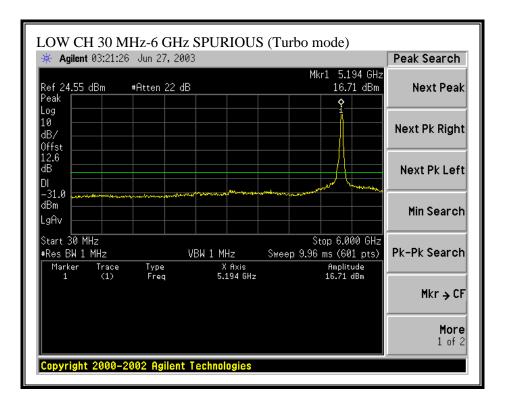


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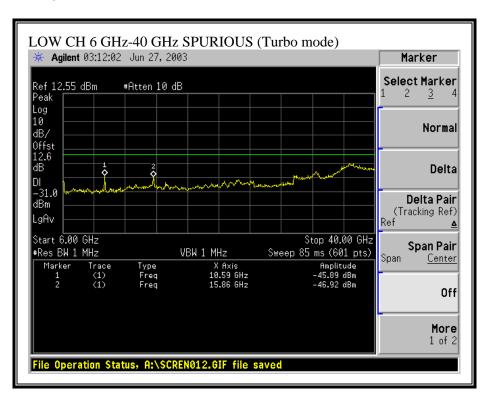


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SPURIOUS EMISSIONS, LOW CHANNEL (TURBO MODE)

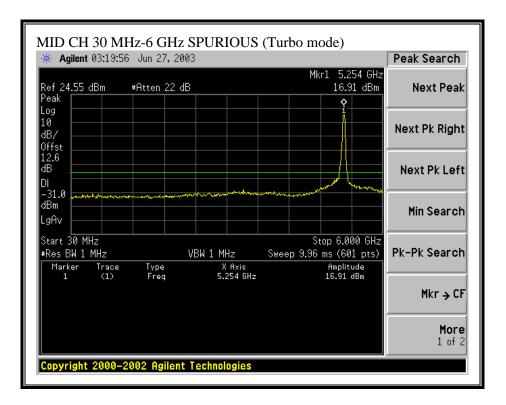


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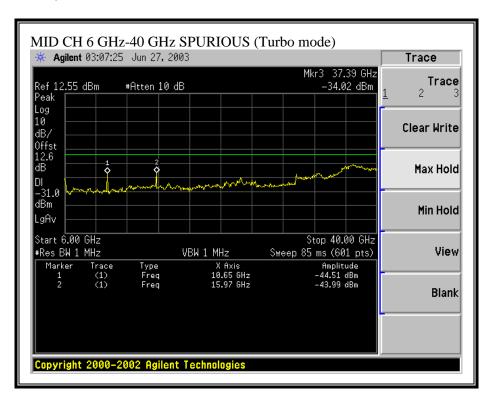


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SPURIOUS EMISSIONS, MID CHANNEL (TURBO MODE)

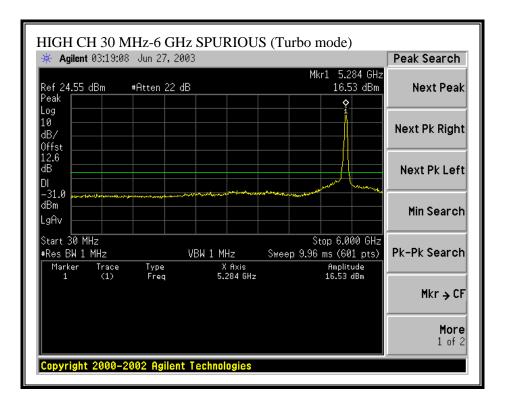


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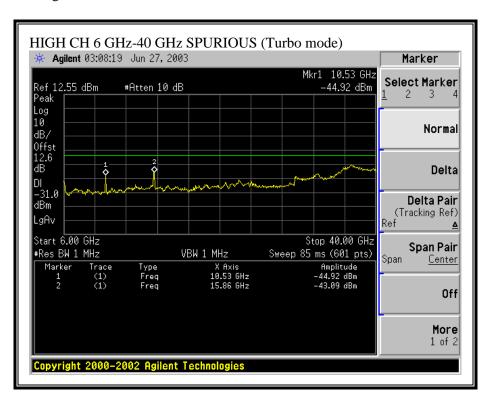


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SPURIOUS EMISSIONS, HIGH CHANNEL (TURBO MODE)



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7.8. RADIATED EMISSIONS

LIMITS

\$15.205 (a) Except as shown in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.090 - 0.110	16.42 - 16.423	399.9 - 410	4.5 - 5.15
¹ 0.495 - 0.505	16.69475 - 16.69525	608 - 614	5.35 - 5.46
2.1735 - 2.1905	16.80425 - 16.80475	960 - 1240	7.25 - 7.75
4.125 - 4.128	25.5 - 25.67	1300 - 1427	8.025 - 8.5
4.17725 - 4.17775	37.5 - 38.25	1435 - 1626.5	9.0 - 9.2
4.20725 - 4.20775	73 - 74.6	1645.5 - 1646.5	9.3 - 9.5
6.215 - 6.218	74.8 - 75.2	1660 - 1710	10.6 - 12.7
6.26775 - 6.26825	108 - 121.94	1718.8 - 1722.2	13.25 - 13.4
6.31175 - 6.31225	123 - 138	2200 - 2300	14.47 - 14.5
8.291 - 8.294	149.9 - 150.05	2310 - 2390	15.35 - 16.2
8.362 - 8.366	156.52475 - 156.52525	2483.5 - 2500	17.7 - 21.4
8.37625 - 8.38675	156.7 - 156.9	2655 - 2900	22.01 - 23.12
8.41425 - 8.41475	162.0125 - 167.17	3260 - 3267	23.6 - 24.0
12.29 - 12.293	167.72 - 173.2	3332 - 3339	31.2 - 31.8
12.51975 - 12.52025	240 - 285	3345.8 - 3358	36.43 - 36.5
12.57675 - 12.57725	322 - 335.4	3600 - 4400	(²)
13.36 - 13.41			

¹ Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz.

² Above 38.6

§15.205 (b) Except as provided in paragraphs (d) and (e), the field strength of emissions appearing within these frequency bands shall not exceed the limits shown in Section 15.209. At frequencies equal to or less than 1000 MHz, compliance with the limits in Section 15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1000 MHz, compliance with the emission limits in Section 15.209 shall be demonstrated based on the average value of the measured emissions. The provisions in Section 15.35 apply to these measurements.

\$15.209 (a) Except as provided elsewhere in this Subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
30 - 88	100 **	3
88 - 216	150 **	3
216 - 960	200 **	3
Above 960	500	3

** Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this Part, e.g., Sections 15.231 and 15.241.

§15.209 (b) In the emission table above, the tighter limit applies at the band edges.

TEST PROCEDURE

The EUT is placed on a non-conducting table 80 cm above the ground plane. The antenna to EUT distance is 3 meters. The EUT is configured in accordance with ANSI C63.4. The EUT is set to transmit in a continuous mode.

For measurements below 1 GHz the resolution bandwidth is set to 100 kHz for peak detection measurements or 120 kHz for quasi-peak detection measurements. Peak detection is used unless otherwise noted as quasi-peak.

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.

The spectrum from 30 MHz to 40 GHz is investigated with the transmitter set to the lowest, middle, and highest channels.

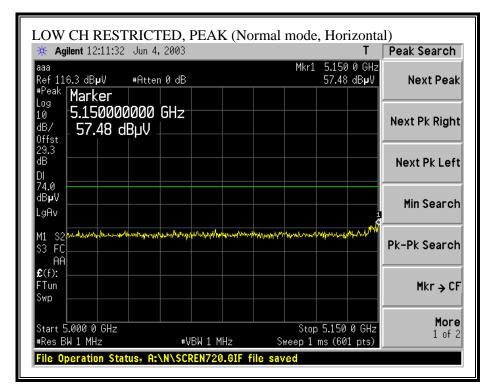
The frequency range of interest is monitored at a fixed antenna height and EUT azimuth. The EUT is rotated through 360 degrees to maximize emissions received. The antenna is scanned from 1 to 4 meters above the ground plane to further maximize the emission. Measurements are made with the antenna polarized in both the vertical and the horizontal positions.

RESULTS

No non-compliance noted:

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RESTRICTED BANDEDGE (NORMAL MODE, LOW CHANNEL, HORIZONTAL)

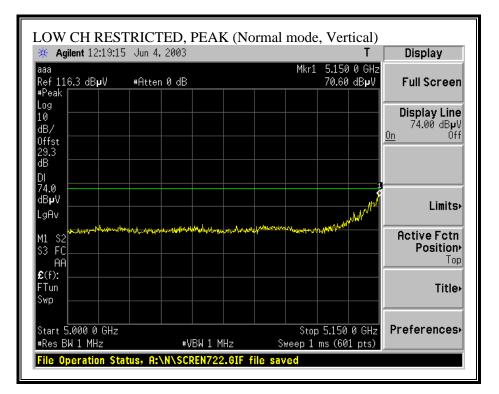


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🔆 Agi	ilent 12:10:52	Jun 4	, 2003					т	Peak Search
aaa Ref 11	6.3 dB µ V	#Atte	n 0 dB				Mkr1	0 GHz dB µ V	Next Peak
10	Marker 5.150000 45.07 d		GHz						Next Pk Right
29.3 dB DI									Next Pk Left
54.0 dB µ V LgAv									Min Search
M1 S2 S3 FC AA									Pk-Pk Search
€(f): FTun Swp									Mkr → Cf
	.000 0 GHz W 1 MHz		#\	BW 10	Hz	Swe		0 GHz 1 pts)	More 1 of 2

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RESTRICTED BANDEDGE (NORMAL MODE, LOW CHANNEL, VERTICAL)

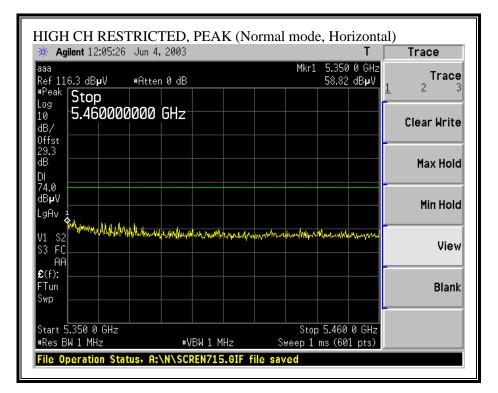


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🔆 Agilent 15:18:09 Jun	4,2003		Peak Search
Ref 116.3 dB µ V #Atto #Peak	en 0 dB	Mkr1 5.150 0 GHz 53.73 dB µ V	
Log 10 dB/ Offst			Next Pk Right
29.3 dB DI 54.0			Next Pk Left
dBµV			Min Search
V1 S2 S3 FC AA			Pk-Pk Search
£(f): FTun Swp 5.150000000 53.73 dBµV	GHz		Mkr → CF
Start 5.000 0 GHz #Res BW 1 MHz	#VBW 10 Hz	Stop 5.150 0 GHz Sweep 11.7 s (601 pts)	More 1 of 2

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RESTRICTED BANDEDGE (NORMAL MODE, HIGH CHANNEL, HORIZONTAL)

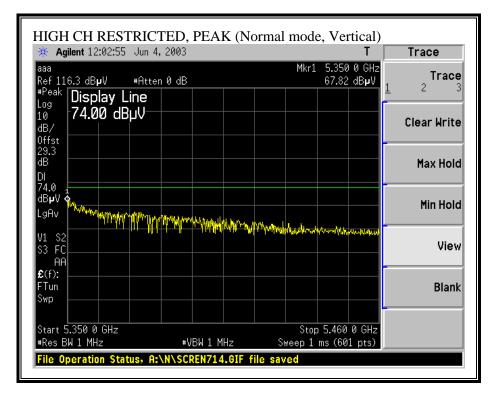


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🔆 Agilent 12:06:27 Jur	1 4,2003			Т	Display
aaa Ref 116.3 dB u V #At				5.350 0 GHz 47.89 dB µ V	Full Screer
^{*Peak} Display Line 10 54.00 dBµV					Display Line 54.00 dBp
dB/ 0ffst 29.3 dB					<u>On</u> Of
DI 54.0 dB µ V					
LgAv					Limits
M1 S2 S3 FC AA					Active Fctn Position Top
€(f): FTun Swp					Title
Start 5.350 0 GHz ^ #Res BW 1 MHz	#VBW 1	0 Hz S	Stop ! weep 8.577	5.460 0 GHz s (601 pts)	Preferences

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RESTRICTED BANDEDGE (NORMAL MODE, HIGH CHANNEL, VERTICAL)



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🔆 Agilent 12:01:54	Jun 4,	2003					Т	Peak Search
aaa Ref 116.3 dB µ V #Peak	#Atter	0 dB				Mkr1	0 GHz dB µ V	Next Peak
*Peak Marker Log 10 5.350000 dB/ 0ffst 53.46 dE		GHz						Next Pk Right
29.3 dB DI 54.0								Next Pk Left
dBµV LgAv								Min Search
W1 S2 S3 FC AA								Pk-Pk Search
£(f): FTun Swp								Mkr → CF
Start 5.350 0 GHz #Res BW 1 MHz			BW 10	 Hz	Swee	Stop p 8.577	0 GHz 1 pts)	More 1 of 2

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HARMONICS AND SPURIOUS EMISSIONS (NORMAL MODE, LOW CHANNEL)

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HARMONICS AND SPURIOUS EMISSIONS (NORMAL MODE, MID CHANNEL)

ng	r: \	Yan Zheng	Services, Mo	rgan H	ill Op	en Field	Site								
ject # 1pan		03U2012 Atheros													
T Des	crip.: 8	802.11a, M													
T M/I		AP30-401													
st Tar ode Op		Transmitt													
	ipment:	Taisinit													
			D 10	1.000	. 1	s	spectrum A	nalvzer					(
	Horn 1-18 N: 6739 @		Pre-amplife T87 Miteq 9		tz		566B Analy			T117; ARA	Horn > 18 18-26GHz; 8				
- Hi Fred	uency Cable					י י		DealeN	L		A	r			
□ (2			□ (4 ~ 6 ft)	✔ (12 ft)]		1 MHz	Measureme Resolution B Video Bandw	Bandwidth		leasuremen dution Bandw Bandwidth			
f GHz	Dist feet	Read Pk dBuV	Read Avg. dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	HPF	Peak	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes
	5.26 GHz, 1 9.8		36.2	38.8	ив 7.7	-45.6	0.0	1.0	50.4	38.0	74.0	54.0	-23.6	-16.0	Н
780	9.8	49.3	36.3	38.8	7.7	-45.6	0.0	1.0	51.1	38.1	74.0	54.0	-23.0	-10.0	V N
	Read A	Distance to Analyzer R Antenna Fa Cable Loss	actor			Avg Peak	Average	Field S ed Peak	t to 3 mete trength @ Field Stre	3 m		Avg Mar	Margin vs	rield Streng l Strength L . Average I . Peak Limi	Limit
	Read A	Analyzer R Antenna Fa	eading actor			Avg Peak	Average Calculate	Field S ed Peak	trength @ Field Stre	3 m		Avg Mar	Margin vs	l Strength L . Average I	Limit
	Read A	Analyzer R Antenna Fa	eading actor			Avg Peak	Average Calculate	Field S ed Peak	trength @ Field Stre	3 m		Avg Mar	Margin vs	l Strength L . Average I	Limit
	Read A	Analyzer R Antenna Fa	eading actor			Avg Peak	Average Calculate	Field S ed Peak	trength @ Field Stre	3 m		Avg Mar	Margin vs	l Strength L . Average I	Limit
	Read A	Analyzer R Antenna Fa	eading actor			Avg Peak	Average Calculate	Field S ed Peak	trength @ Field Stre	3 m		Avg Mar	Margin vs	l Strength L . Average I	Limit
	Read A	Analyzer R Antenna Fa	eading actor			Avg Peak	Average Calculate	Field S ed Peak	trength @ Field Stre	3 m		Avg Mar	Margin vs	l Strength L . Average I	Limit
	Read A	Analyzer R Antenna Fa	eading actor			Avg Peak	Average Calculate	Field S ed Peak	trength @ Field Stre	3 m		Avg Mar	Margin vs	l Strength L . Average I	Limit
	Read A	Analyzer R Antenna Fa	eading actor			Avg Peak	Average Calculate	Field S ed Peak	trength @ Field Stre	3 m		Avg Mar	Margin vs	l Strength L . Average I	Limit
	Read A	Analyzer R Antenna Fa	eading actor			Avg Peak	Average Calculate	Field S ed Peak	trength @ Field Stre	3 m		Avg Mar	Margin vs	l Strength L . Average I	Limit
	Read A	Analyzer R Antenna Fa	eading actor			Avg Peak	Average Calculate	Field S ed Peak	trength @ Field Stre	3 m		Avg Mar	Margin vs	l Strength L . Average I	Limit
	Read A	Analyzer R Antenna Fa	eading actor			Avg Peak	Average Calculate	Field S ed Peak	trength @ Field Stre	3 m		Avg Mar	Margin vs	l Strength L . Average I	Limit
	Read A	Analyzer R Antenna Fa	eading actor			Avg Peak	Average Calculate	Field S ed Peak	trength @ Field Stre	3 m		Avg Mar	Margin vs	l Strength L . Average I	Limit
	Read A	Analyzer R Antenna Fa	eading actor			Avg Peak	Average Calculate	Field S ed Peak	trength @ Field Stre	3 m		Avg Mar	Margin vs	l Strength L . Average I	Limit
	Read A	Analyzer R Antenna Fa	eading actor			Avg Peak	Average Calculate	Field S ed Peak	trength @ Field Stre	3 m		Avg Mar	Margin vs	l Strength L . Average I	Limit
	Read A	Analyzer R Antenna Fa	eading actor			Avg Peak	Average Calculate	Field S ed Peak	trength @ Field Stre	3 m		Avg Mar	Margin vs	l Strength L . Average I	Limit
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	Read A	Analyzer R Antenna Fa	eading actor			Avg Peak	Average Calculate	Field S ed Peak	trength @ Field Stre	3 m		Avg Mar	Margin vs	l Strength L . Average I	Limit

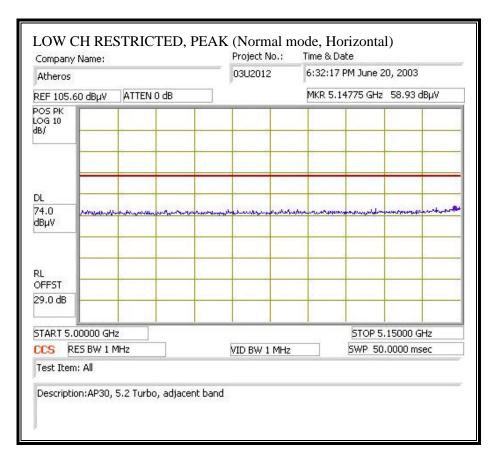
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HARMONICS AND SPURIOUS EMISSIONS (NORMAL MODE, HIGH CHANNEL)

yject #: 03U2012 mpany: Atheros TDescrip: 802.11a.H TM/N: AP30-401 st Target: wde Oper: Transmit st Equipment: EMCO Horn 1-18GHz T72; S/N: 6739 @1m v Pre-amplifer 1-26GHz T87 Miteq 924342 v Pre-amplifer 1-26GHz T17; ARA 18-26GHz; S/N:1013 v T17; ARA 18-26GHz; S/N:1013 v T17; ARA 18-26GHz; S/N:1013 v T1 MHz Resolution Bandwidth 10Hz Video Bandwidth 1	$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	mplia			Measureme Services, Mo		ill Op	en Field	Site										
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RESTRICTED BANDEDGE (TURBO MODE, LOW CHANNEL, HORIZONTAL)

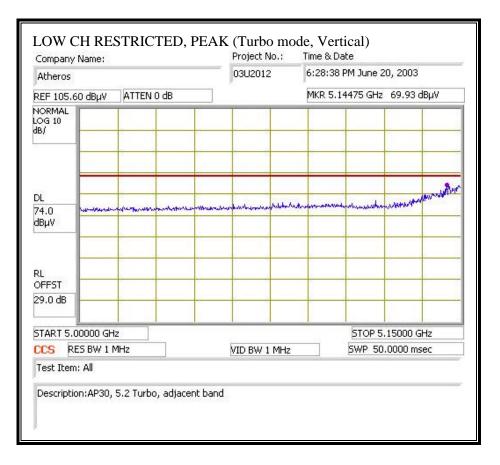


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Test Item: All								

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RESTRICTED BANDEDGE (TURBO MODE, LOW CHANNEL, VERTICAL)

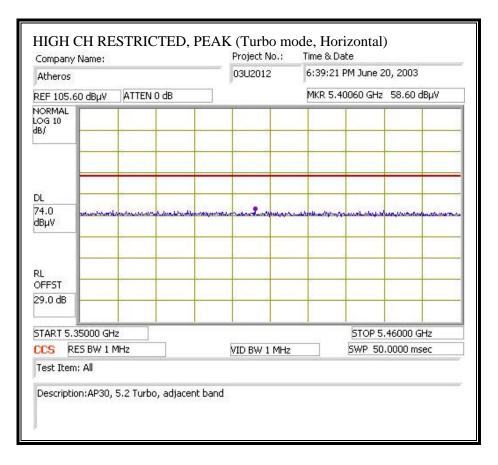


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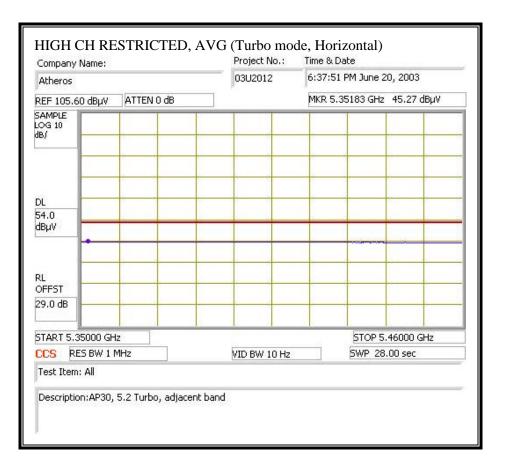
Atheros			03U201:	2	6:27:04	PM June :	20, 2003		
REF 105.60 dBµ		I O dB	7		MKR 5.14975 GHz 52.60 dBµV				
SAMPLE LOG 10 dB/						-			
	-				0 0				
	6	-	-		-	-	e -		
54.0 dBµV	-	-	-		-			_	
								_	
						-		_	
29.0 dB			-			-		_	
START 5.00000	GHz	<u> </u>		1		STOP 5	.15000 Gł	Ηz	
CCS RES BW	1 MHz		VID BW :	l OHz		SWP 38.00 sec			
Test Item: All									

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RESTRICTED BANDEDGE (TURBO MODE, HIGH CHANNEL, HORIZONTAL)

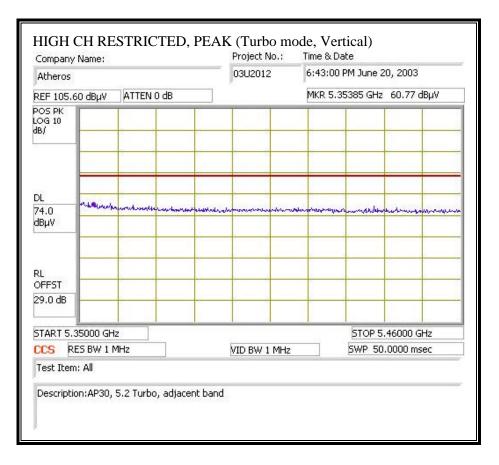


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RESTRICTED BANDEDGE (TURBO MODE, HIGH CHANNEL, VERTICAL)



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Atheros			03U2012	6:44:3	6 PM June :	20, 2003		
, REF 105.60 dBµ	V ATTEN C) dB	í [©]	MKR 5.	35000 GHz	2 47.93 dBµ\		
SAMPLE OG 10 IB/								
	- <mark>5 5</mark>							
DL								
					-			
	_							
29.0 dB								
START 5.35000	GHz				STOP 5	5.46000 GHz		
CCS RES BW	1 MHz		VID BW 10 H	łz	SWP 28	SWP 28.00 sec		
Test Item: All								

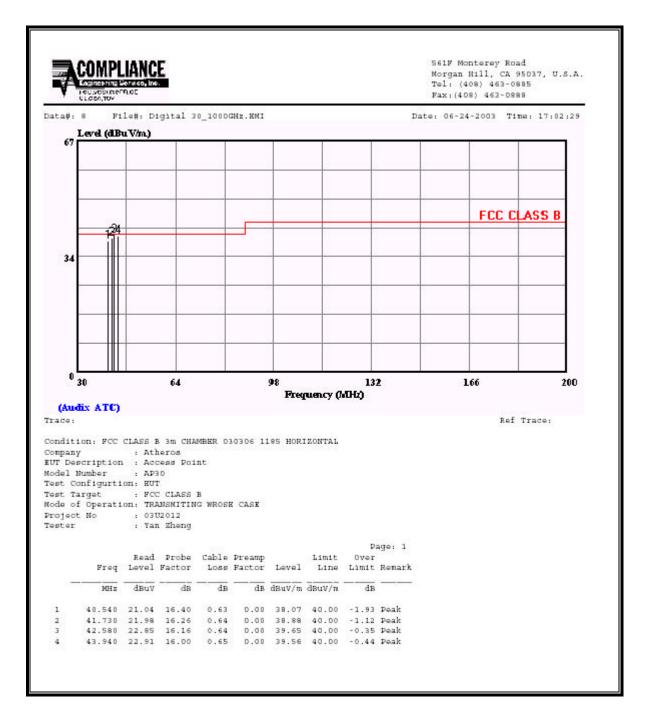
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HARMONICS AND SPURIOUS EMISSIONS (TURBO MODE)

р.:	03U2012 Atheros 802.11a, L, I AP30-401	М, Н												
M/N: `arget: Oper: Cquipmer	Transmitt													
MCO Horn 2; S/N: 673		Pre-amplife T87 Miteq 9		lz =	_	pectrum A 566B Analy		•	T117; ARA	Horn > 18 18-26GHz; S		•		
Hi Frequency (□ (4 ~ 6 ft)	▼ (12 ft)		I		1 MHz	Measureme Resolution B Video Bandw	andwidth	Average M 1 MHz Reso 10Hz Video	lution Bandw	<u>its:</u> ⁄idth		
f Dis Hz fee		dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	HPF	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes
narmonics o		cted above the s	ystem no	oise floo	r									
narmonics o	r spurious dete	cted above the s	system no	oise floo	r									
	Hz, 11a, high tu r spurious dete	rbo cted above the s	ystem no	oise floo	r									
f Dist Read AF CL	Distance to	Reading actor	,		D Corr Avg Peak	Average	Correc Field S ed Peak	et to 3 mete Strength @ c Field Stre	3 m		Pk Lim Avg Mar	Peak Field Margin vs	Field Streng d Strength L s. Average I s. Peak Limi	.imit .imit

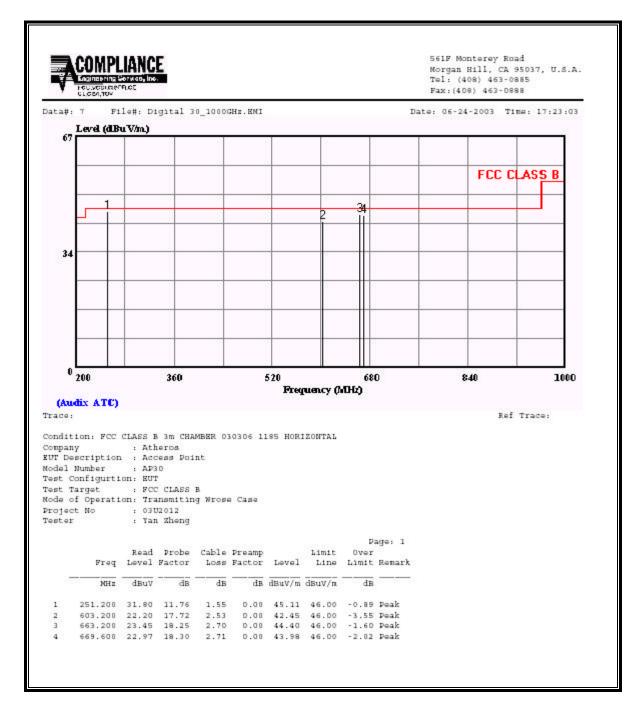
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DIGITAL DEVICE EMISSIONS 30 TO 200 MHz (WORST-CASE HORIZONTAL)



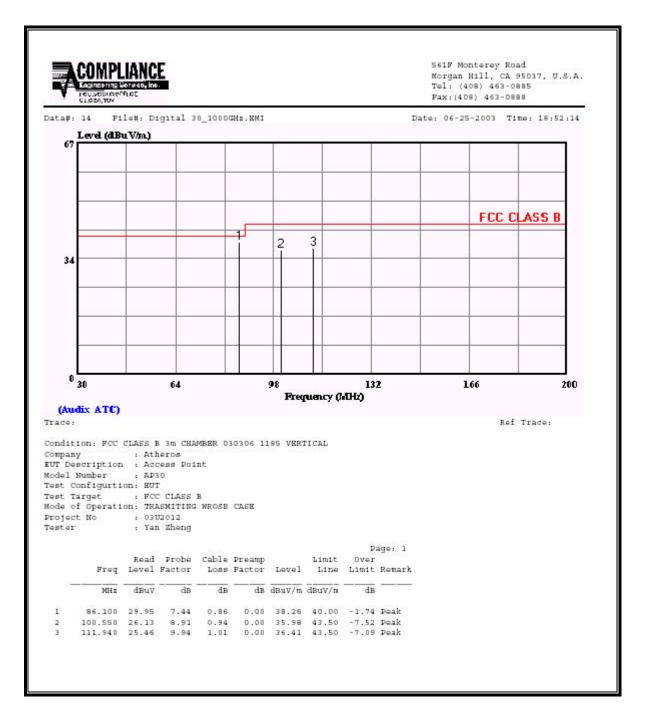
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DIGITAL DEVICE EMISSIONS 200 TO 1000 MHz (WORST-CASE HORIZONTAL)



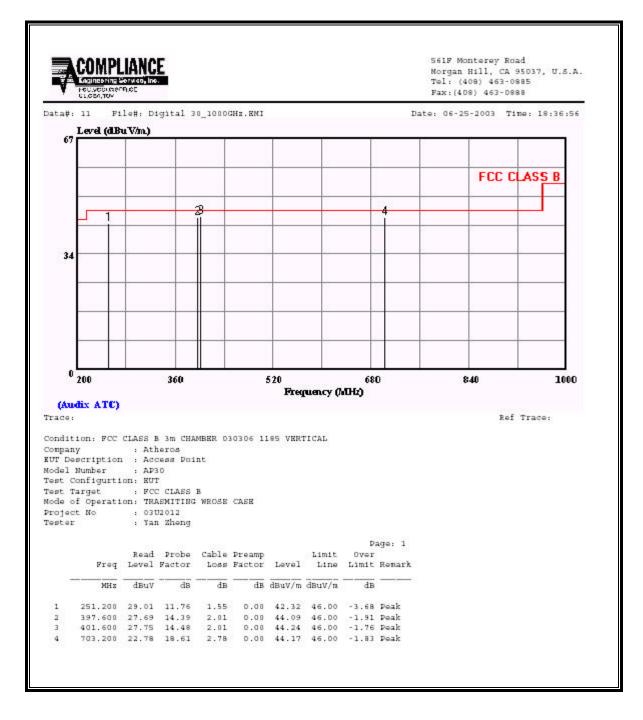
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DIGITAL DEVICE EMISSIONS 30 TO 200 MHz (WORST-CASE VERTICAL)



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DIGITAL DEVICE EMISSIONS 200 TO 1000 MHz (WORST-CASE VERTICAL)



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7.9. CO-LOCATED RADIATED EMISSIONS

TEST PROCEDURE

The EUT is placed on a non-conducting table 80 cm above the ground plane. The antenna to EUT distance is 3 meters. The EUT is configured in accordance with ANSI C63.4. The EUT is set to transmit in a continuous mode.

For measurements below 1 GHz the resolution bandwidth is set to 100 kHz for peak detection measurements or 120 kHz for quasi-peak detection measurements. Peak detection is used unless otherwise noted as quasi-peak.

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.

The EUT can transmit simultaneously in the 802.11a mode and the 802.11b/g mode.

The dominant transmitter (802.11a) is set to the worst case channel. The spurious emissions performance of the dominant transmitter is investigated as the settings of the non-dominant transmitter (802.11b/g) are varied. Worst case results are reported.

Note: Although the dominant transmitter is worst-case in the 5.8 GHz band and the non-dominant transmitter is in the 2.4 GHz band, these co-located emission results are also being reported in this UNII report (5.2 GHz band) since this is a composite application.

The frequency range of interest is monitored at a fixed antenna height and EUT azimuth. The EUT is rotated through 360 degrees to maximize emissions received. The antenna is scanned from 1 to 4 meters above the ground plane to further maximize the emission. Measurements are made with the antenna polarized in both the vertical and the horizontal positions.

RESULTS

No non-compliance noted:

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WORST-CASE CO-LOCATED HARMONICS AND SPURIOUS EMISSIONS

est Eng roject #	ance Cer gr: #:(Tification Standards Van Zheng 03U2012	Measureme Services, Mo		ill Op	en Field	Site								
Compan EUT Des		Atheros 802.11a, 5.74	I5GHz												
UT M/	N: /	AP30													
est Tar lode Oj		Simultaneous	Transmission	on Domir	hand and	l Non-Don	ninant Tran	smitters							
st Ea t	ipment:														
			D 110				Spectrum A	naluzor							
	Horn 1-18		Pre-amplife		-tz	_	566B Anal			T117. ARA	Horn > 18 18-26GHz; \$				
173; S	N: 6717 @	⊉1m –	T86 Miteq 9	24341	•	in o	Sood Anar	, 201		1117, АКА	10-200112,1	J.1015	_		
- Hi Free	quency Cable	es —				1		Peak !	Measureme	nts:	Average N	leasuremen	ts:		
□ (2	ft) 🔽	(2 ~ 3 ft)	□ (4 ~ 6 ft)	▼ (12 ft)					Resolution E Video Bandw			olution Bandy			
						,									
f			Read Avg.	AF	CL	Amp	D Corr	HPF	Peak	Avg	Pk Lim			Avg Mar	Notes
<u>GHz</u> ominan	feet t Transmit	dBuV tter Harmor	dBuV ic (Co-location	dB/m	dB	dB	dB		dBuV/m	dBuV/m	dBuV/m	dBuV/m	dB	dB	
.490 .490	9.8 9.8	54.9 49.5	42.3 38.2	39.1 39.1	7.5 7.5	-44.6 -44.6	0.0 0.0	1.0 1.0	57.9 52.5	45.3 41.2	74.0 74.0	54.0 54.0	-16.1 -21.5	-8.7 -12.8	V H
	Read A	Distance to Analyzer F Antenna Fa Cable Loss	Reading actor			Avg Peak	Average Calculate	Field S ed Peal	ct to 3 mete Strength @ k Field Stre r	3 m		Avg Mar	Margin vs	l Strength L . Average L . Peak Limi	Limit
	Dist I Read A AF	Analyzer F	Reading actor			Avg	Average	Field S ed Peal	Strength @ k Field Stre	3 m		Avg Mar	Margin vs	. Average L	Limit
	Dist I Read A AF	Analyzer F Antenna Fa	Reading actor			Avg Peak	Average Calculate	Field S ed Peal	Strength @ k Field Stre	3 m		Avg Mar	Margin vs	. Average L	Limit
	Dist I Read A AF	Analyzer F Antenna Fa	Reading actor			Avg Peak	Average Calculate	Field S ed Peal	Strength @ k Field Stre	3 m		Avg Mar	Margin vs	. Average L	Limit
	Dist I Read A AF	Analyzer F Antenna Fa	Reading actor			Avg Peak	Average Calculate	Field S ed Peal	Strength @ k Field Stre	3 m		Avg Mar	Margin vs	. Average L	Limit
	Dist I Read A AF	Analyzer F Antenna Fa	Reading actor			Avg Peak	Average Calculate	Field S ed Peal	Strength @ k Field Stre	3 m		Avg Mar	Margin vs	. Average L	Limit
	Dist I Read A AF	Analyzer F Antenna Fa	Reading actor			Avg Peak	Average Calculate	Field S ed Peal	Strength @ k Field Stre	3 m		Avg Mar	Margin vs	. Average L	Limit
	Dist I Read A AF	Analyzer F Antenna Fa	Reading actor			Avg Peak	Average Calculate	Field S ed Peal	Strength @ k Field Stre	3 m		Avg Mar	Margin vs	. Average L	Limit
	Dist I Read A AF	Analyzer F Antenna Fa	Reading actor			Avg Peak	Average Calculate	Field S ed Peal	Strength @ k Field Stre	3 m		Avg Mar	Margin vs	. Average L	Limit
	Dist I Read A AF	Analyzer F Antenna Fa	Reading actor			Avg Peak	Average Calculate	Field S ed Peal	Strength @ k Field Stre	3 m		Avg Mar	Margin vs	. Average L	Limit
	Dist I Read A AF	Analyzer F Antenna Fa	Reading actor			Avg Peak	Average Calculate	Field S ed Peal	Strength @ k Field Stre	3 m		Avg Mar	Margin vs	. Average L	Limit
	Dist I Read A AF	Analyzer F Antenna Fa	Reading actor			Avg Peak	Average Calculate	Field S ed Peal	Strength @ k Field Stre	3 m		Avg Mar	Margin vs	. Average L	Limit
	Dist I Read A AF	Analyzer F Antenna Fa	Reading actor			Avg Peak	Average Calculate	Field S ed Peal	Strength @ k Field Stre	3 m		Avg Mar	Margin vs	. Average L	Limit
	Dist I Read A AF	Analyzer F Antenna Fa	Reading actor			Avg Peak	Average Calculate	Field S ed Peal	Strength @ k Field Stre	3 m		Avg Mar	Margin vs	. Average L	Limit
	Dist I Read A AF	Analyzer F Antenna Fa	Reading actor			Avg Peak	Average Calculate	Field S ed Peal	Strength @ k Field Stre	3 m		Avg Mar	Margin vs	. Average L	Limit
	Dist I Read A AF	Analyzer F Antenna Fa	Reading actor			Avg Peak	Average Calculate	Field S ed Peal	Strength @ k Field Stre	3 m		Avg Mar	Margin vs	. Average L	Limit
	Dist I Read A AF	Analyzer F Antenna Fa	Reading actor			Avg Peak	Average Calculate	Field S ed Peal	Strength @ k Field Stre	3 m		Avg Mar	Margin vs	. Average L	Limit
	Dist I Read A AF	Analyzer F Antenna Fa	Reading actor			Avg Peak	Average Calculate	Field S ed Peal	Strength @ k Field Stre	3 m		Avg Mar	Margin vs	. Average L	Limit

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7.10. CO-LOCATED MAXIMUM PERMISSIBLE EXPOSURE

LIMITS

15.247 (b) (5) Systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy levels in excess of the Commission's guidelines. See 1.1307(b)(1) of this chapter.

CALCULATIONS

Given

 $E = \sqrt{(30 * P * G)} / d$

and

 $S = E^{2}/3770$

where

E = Field Strength in Volts / meter

P = Power in Watts

G = Numeric antenna gain

d = distance in meters

S = Power Density in milliwatts / square centimeter

Combining equations and rearranging the terms to express the distance as a function of the remaining variables yields:

 $d = \sqrt{((30 * P * G) / (3770 * S))}$

Changing to units of mW and cm, using:

P (mW) = P (W) / 1000 andd (cm) = 100 * d (m)yields $d = 100 * \sqrt{((30 * (P / 1000) * G) / (3770 * S))}$ $d = 0.282 * \sqrt{(P * G / S)}$ where

where

d = distance in cm P = Power in mW G = Numeric antenna gain

 $S = Power Density in mW / cm^2$

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This equation is kept in the linear form to enable the proper summation of the power densities for each of the two radios:

Equation (1)

where

d = distance in cm P1 = Power of Radio 1 in mW G1 = Numeric antenna gain of Radio 1 P2 = Power of Radio 2 in mW G2 = Numeric antenna gain of Radio 2 S = Power Density in mW / cm^2

 $d = 0.282 * \sqrt{\{[(P1 * G1) + (P2 * G2)] / S\}}$

Equation (1) and the measured peak power of each radio is used to calculate the MPE distance.

<u>LIMITS</u>

 $S = 1.0 \text{ mW} / \text{cm}^2 \text{ from } 1.1310 \text{ Table } 1$

CO-LOCATED RADIO RESULTS

No non-compliance noted:

The dominant transmitter is the 802.11a mode: P1 = 0.716 WG1 = 2.51

The non-dominant transmitter is the 802.11g mode: P2 = 0.637 WG2 = 1.41

Substituting actual values into Equation (1) yields:

D = 14.6 cm

NOTE: For mobile or fixed location transmitters, the minimum separation distance is 20 cm, even if calculations indicate that the MPE distance would be less.

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7.11. POWERLINE CONDUCTED EMISSIONS

<u>LIMIT</u>

\$15.207 (a) Except as shown in paragraphs (b) and (c) of this section, for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table, as measured using a 50 μ H/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal.

The lower limit applies at the boundary between the frequency ranges.

Frequency of Emission (MHz)	Conducted Limit (dBuV)				
	Quasi-peak	Average			
0.15-0.5	66 to 56	56 to 46			
0.5-5	56	46			
5-30	60	50			

Decreases with the logarithm of the frequency.

TEST PROCEDURE

The EUT is placed on a non-conducting table 40 cm from the vertical ground plane and 80 cm above the horizontal ground plane. The EUT is configured in accordance with ANSI C63.4.

The resolution bandwidth is set to 9 kHz for both peak detection and quasi-peak detection measurements. Peak detection is used unless otherwise noted as quasi-peak.

Line conducted data is recorded for both NEUTRAL and HOT lines.

RESULTS

No non-compliance noted:

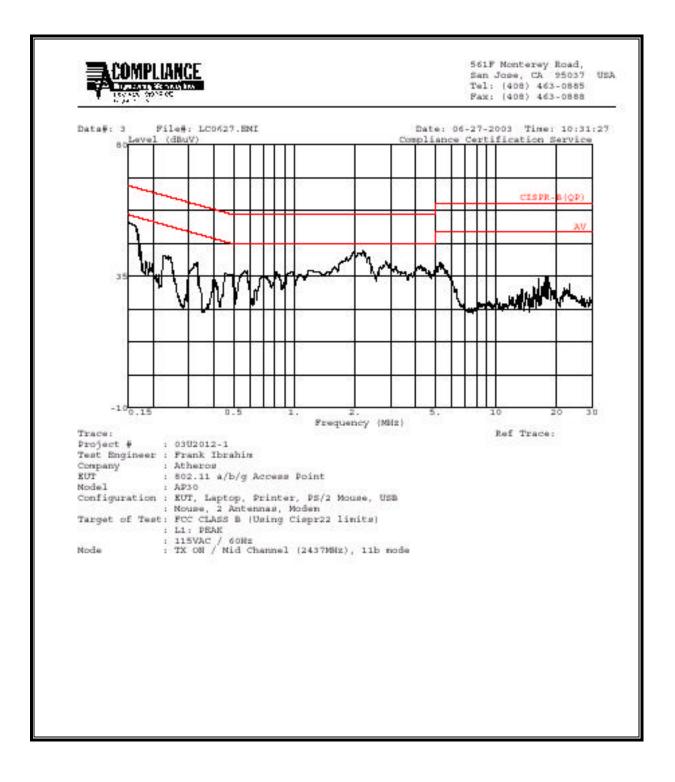
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<u>6 WORST EMISSIONS</u>

	CONDUCTED EMISSIONS DATA (115VAC 60Hz)											
Freq.		Reading		Closs	Limit	EN_B	Margin		Remark			
(MHz)	PK (dBuV)	QP (dBuV)	AV (dBuV)	(dB)	QP	AV	QP (dB)	AV (dB)	L1 / L2			
0.15	53.44			0.00	65.97	55.97	-12.53	-2.53	L1			
0.24	41.80			0.00	63.51	53.51	-21.71	-11.71	L1			
2.20	43.62			0.00	56.00	46.00	-12.38	-2.38	L1			
1.93	48.92		36.74	0.00	56.00	46.00	-7.08	-9.26	L2			
2.08	48.92		36.30	0.00	56.00	46.00	-7.08	-9.70	L2			
2.18	48.82		35.51	0.00	56.00	46.00	-7.18	-10.49	L2			
6 Worst I	Data											

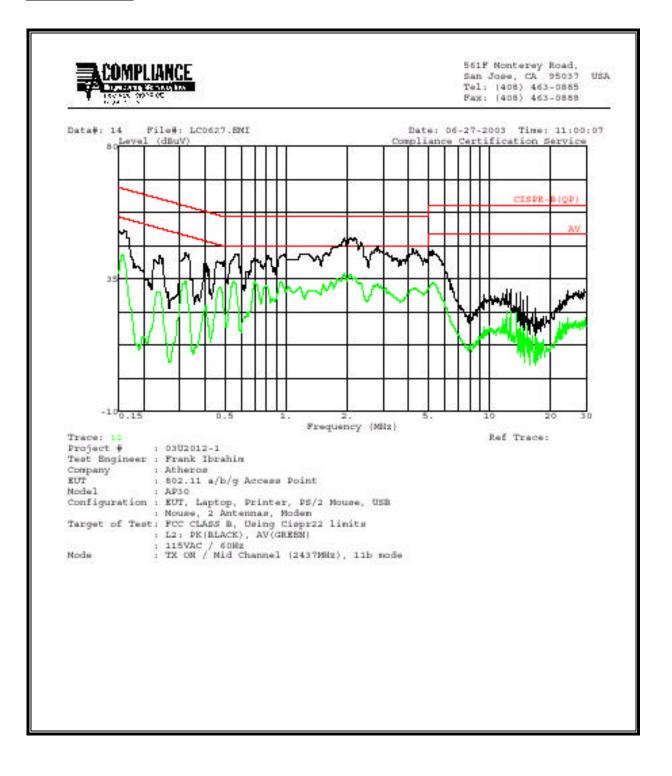
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LINE 1 RESULTS



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LINE 2 RESULTS



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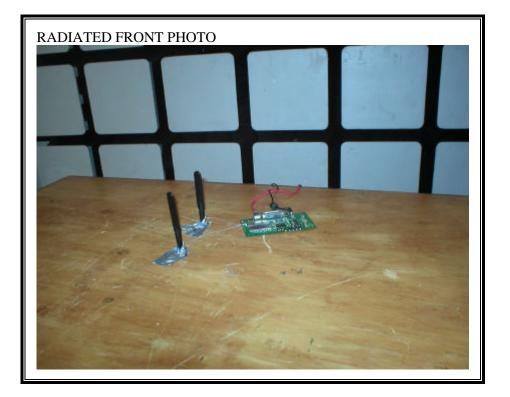
8. SETUP PHOTOS

ANTENNA PORT CONDUCTED RF MEASUREMENT SETUP



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RADIATED RF MEASUREMENT SETUP



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DIGITAL DEVICE RADIATED EMISSIONS SETUP

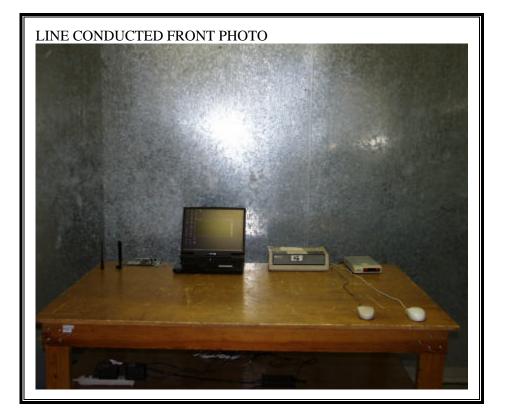


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POWERLINE CONDUCTED EMISSIONS MEASUREMENT SETUP



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END OF REPORT

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