

FCC CFR47 PART 15 SUBPART C CERTIFICATION

TEST REPORT

FOR

802.11a/b/g COMBO MINI PCI MODULE

MODEL NUMBER: PA3297U-1MPC

BRAND NAME: TOSHIBA

FCC ID: CJ6UPA3297WL

REPORT NUMBER: 03U1876-1

ISSUE DATE: MAY 21, 2003

Prepared for TOSHIBA CORPORATION DIGITAL MEDIA NETWORK COMPANY 2-9 SUEHIRO-CHO, OME TOKYO, 198-8710 JAPAN

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

TABLE OF CONTENTS

| 1. | TE | EST RESULT CERTIFICATION | |
|----|--|---|---|
| 2. | EU | JT DESCRIPTION 4 | 1 |
| 3. | TE | EST METHODOLOGY | |
| 4. | FA | CILITIES AND ACCREDITATION | |
| | 4.1. | FACILITIES AND EQUIPMENT | |
| | 4.2. | TABLE OF ACCREDITATIONS AND LISTINGS | |
| 5. | CA | ALIBRATION AND UNCERTAINTY7 | |
| | 5.1. | MEASURING INSTRUMENT CALIBRATION | , |
| | 5.2. | MEASUREMENT UNCERTAINTY | , |
| | 5.3. | TEST AND MEASUREMENT EQUIPMENT 8 | , |
| 6. | SE | TUP OF EQUIPMENT UNDER TEST9 | |
| 7. | AF | PPLICABLE LIMITS AND TEST RESULTS 11 | |
| | 7.1. | | |
| | | 6 dB BANDWIDTH | |
| | 7.2. | | |
| | 7.2. 7.3. | 6 dB BANDWIDTH11 | |
| | | 6 dB BANDWIDTH | |
| | 7.3. | 6 dB BANDWIDTH | |
| | 7.3. 7.4. | 6 dB BANDWIDTH.11OUTPUT POWER.25MAXIMUM PERMISSIBLE EXPOSURE.28PEAK POWER SPECTRAL DENSITY.30 | |
| | 7.3. 7.4. 7.5. | 6 dB BANDWIDTH.11OUTPUT POWER.25MAXIMUM PERMISSIBLE EXPOSURE.28PEAK POWER SPECTRAL DENSITY.30CONDUCTED SPURIOUS EMISSIONS.44 | |
| | 7.3. 7.4. 7.5. 7.6. | 6 dB BANDWIDTH.11OUTPUT POWER.25MAXIMUM PERMISSIBLE EXPOSURE.28PEAK POWER SPECTRAL DENSITY.30CONDUCTED SPURIOUS EMISSIONS.44RADIATED EMISSIONS.72 | |

Page 2 of 117

1. TEST RESULT CERTIFICATION

COMPANY NAME: TOSHIBA CORPORATION DIGITAL MEDIA NETWORK COMPANY 2-9 SUEHIRO-CHO, OME TOKYO, 198-8710 JAPAN EUT DESCRIPTION: 802.11a/b/g COMBO MINI PCI MODULE MODEL: PA3297U-1MPC DATE TESTED: APRIL 30 – MAY 09, 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 2.4 and 5.8 GHz bands are applicable to this report; another band of operation (5.2 GHz) is documented in a separate report

Approved & Released For CCS By:

Tested By:

MH

MIKE HECKROTTE CHIEF ENGINEER COMPLIANCE CERTIFICATION SERVICES

Wankon guyon

THANH NGUYEN EMC ENGINEER COMPLIANCE CERTIFICATION SERVICES

Page 3 of 117

2. EUT DESCRIPTION

The EUT is an 802.11a/b/g transceiver module. The EUT has a output power of 22.63 dBm (183mW) and highest antenna gain of 4.8 dBi in the 2400 - 2483.5 MHz band.

The EUT has an output power of 21.2 dBm (132 mW) and highest antenna gain of 4.8 dBi in the 5725 - 5850 MHz band.

Optionally the WLAN may be collocated with a Bluetooth transceiver, FCC ID: CJ6UPA3232BT.

Antennas filed under this report: Hitachi Cable, Dual Band Film antenna, model: HTL008, antenna gain 4.8dBi; Hitachi Cable, Wide band film antenna, model: HTL008, antenna gain 4.1 dBi; Tyco Electronics AMP, Dual band film antenna, TIAN01, antenna gain 1.0dBi.

Page 4 of 117

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."

Page 5 of 117

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 |

Page 6 of 117

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%.

Page 7 of 117

5.3. TEST AND MEASUREMENT EQUIPMENT

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

| | TEST EQUIPME | ENT LIST | | |
|-------------------------------|--------------|------------------|------------|------------|
| Name of Equipment | Manufacturer | Model No. | Serial No. | Due Date |
| SA RF Section, 1.5 GHz | HP | 85680A | 2314A02604 | 7/16/04 |
| Quasi-Peak Adaptor | HP | 85650A | 2521A01038 | 7/16/04 |
| SA Display Section 3 | HP | 85662A | 2314A04793 | 7/16/04 |
| LISN, 10 kHz ~ 30 MHz | FCC | 50/250-25-2 | 114 | 9/6/2003 |
| Line Filter | Lindgren | LMF-3489 | 497 | CNR |
| LISN, 10 kHz ~ 30 MHz | Solar | 8012-50-R-24-BNC | 837990 | 9/6/2003 |
| EMI Test Receiver | R & S | ESHS 20 | 827129/006 | 4/17/2004 |
| Preamplifier, 1 ~ 26.5 GHz | HP | 8449B | 3008A00369 | 6/30/2003 |
| Antenna, Horn 1 ~ 18 GHz | EMCO | 3115 | 2238 | 2/4/2004 |
| PSA Spectrum Analyzer | Agilent | E4446A | 424446A | 1/13/2004 |
| EMI Receiver, 9 kHz ~ 2.9 GHz | HP | 8542E | 3942A00286 | 11/20/2003 |
| RF Filter Section | HP | 85420E | 3705A00256 | 11/20/2003 |
| BILOG ANTENNA | A.R.A | LPB-2520/A | 1185 | 6/24/2003 |
| Antenna, Horn 1 ~ 18 GHz | A.R.A | MWH-1826 | 1049 | 11/7/2003 |
| Power Meter | HP | E4416A | GB4129116 | C.N.R |

Page 8 of 117

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 | PP2002-00002 | 321029675 | CJ6PA3171WL | | | | | |
| AC Adapter | Toshiba | PA3241U-1ACA | 0211A00164506 | N/A | | | | | |

I/O CABLES

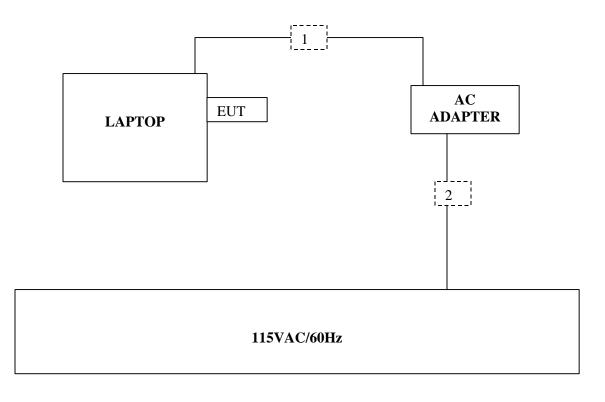
| Cable No. | Port | # of Identical Ports | Connector Type | Cable Type | Cable Length | Remarks |
|--------------|------|----------------------------|-------------------|---------------|-----------------|---------|
| 1 | DC | 1 | DC PWR | Unshielded | 1.86 m | N/A |
| 2 | AC | 1 | AC PWR | Unshielded | 1.86 m | N/A |

TEST SETUP

The EUT is installed on extender card of laptop

Page 9 of 117

SETUP DIAGRAM FOR TRANSMITTER TESTS



Page 10 of 117

7. APPLICABLE LIMITS AND TEST RESULTS

7.1. 6 dB BANDWIDTH

<u>LIMIT</u>

§15.247 (a) (2) For direct sequence systems, the minimum 6 dB bandwidth shall be at least 500 kHz.

TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer. The RBW is set to 100 kHz and the VBW is set to 100 kHz. The sweep time is coupled.

2.4 GHz BAND RESULTS

No non-compliance noted:

802.11b Mode

| Channel | Frequency | 6 dB Bandwidth | Minimum Limit | | |
|---------|-----------|----------------|---------------|--|--|
| | (MHz) | (kHz) | (kHz) | | |
| Low | 2412 | 12500 | 500 | | |
| Middle | 2437 | 12550 | 500 | | |
| High | 2462 | 12750 | 500 | | |

802.11g Mode

| Channel | Frequency 6 dB Bandwidth | | Minimum Limit |
|---------|--------------------------|-------|---------------|
| | (MHz) | (kHz) | (kHz) |
| Low | 2412 | 16600 | 500 |
| Middle | 2437 | 16700 | 500 |
| High | 2462 | 16850 | 500 |

802.11g Turbo Mode

| Channel Frequence | | 6 dB Bandwidth | Minimum Limit | | |
|-------------------|-------|----------------|---------------|--|--|
| | (MHz) | (kHz) | (kHz) | | |
| Middle | 2437 | 33050 | 500 | | |

Page 11 of 117

5.8 GHz BAND RESULTS

802.11a Normal Mode

| Channel | Frequency | 6 dB Bandwidth | Minimum Limit | | |
|---------|-----------|----------------|---------------|--|--|
| | (MHz) | (kHz) | (kHz) | | |
| Low | 5745 | 16500 | 500 | | |
| Middle | 5785 | 16580 | 500 | | |
| High | 5825 | 16580 | 500 | | |

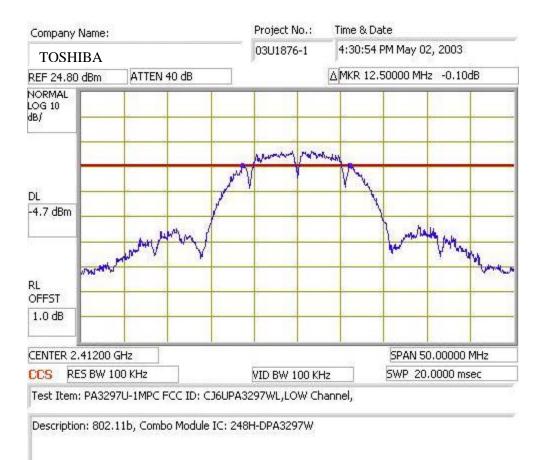
802.11a Turbo Mode

| Channel | Frequency | 6 dB Bandwidth | Minimum Limit | | |
|---------|-----------|----------------|---------------|--|--|
| | (MHz) | (kHz) | (kHz) | | |
| Low | 5760 | 32670 | 500 | | |
| High | 5800 | 32750 | 500 | | |

No non-compliance noted:

Page 12 of 117

6 DB BANDWIDTH (2.4 GHZ BAND b MODE)

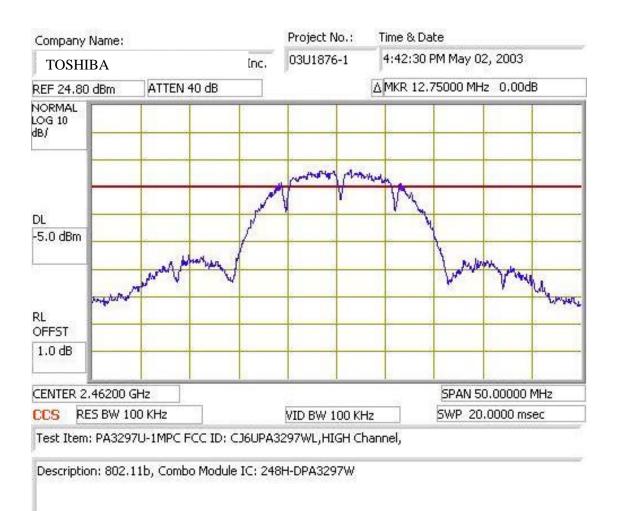


Page 13 of 117

| Company | ompany Name: | | | | Project N | o.: | Time & Date | | | |
|-------------------------|------------------------|----------|-----|----------------|-----------|-------|--------------------------|--------|-----------|------------|
| TOSH | IBA | | | | 03U1876-1 | | 4:39:09 PM May 02, 2003 | | | |
| | REF 24.80 dBm ATTEN 40 | | | | 40 1 | | AMKR 12.55000 MHz 0.00dB | | | |
| NORMAL LOG 10 dB/ | | | | | | | | | | |
| | | | | | whenty | phone | 4 | | | |
| DL | | - / | | AM | 7 | | N | | | |
| -5.0 dBm | | - sh pri | mal | | | | | In | M1 | |
| RL OFFST | Antany | Merry | ~~/ | | | | | (m | Vm | HAN HANNEN |
| 1.0 dB | | | | | | | | | | |
| CENTER 2 | .43700 GF | Hz | | | 1 1 | | F. | SPAN 5 | 0.00000 1 | ИHz |
| CCS RES BW 100 KHz | | 1 | | VID BW 100 KHz | | | SWP 20,0000 msec | | | |

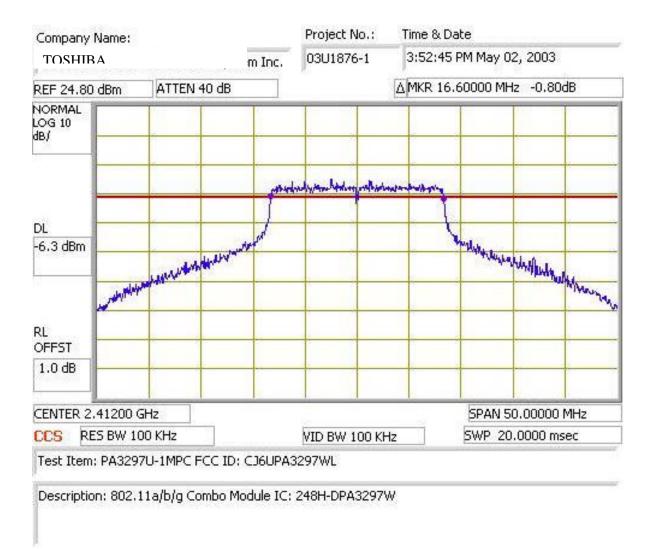
Description: 802.11b, Combo Module IC: 248H-DPA3297W

Page 14 of 117



Page 15 of 117

6 DB BANDWIDTH (2.4 GHZ BAND g NORMAL MODE)



Page 16 of 117

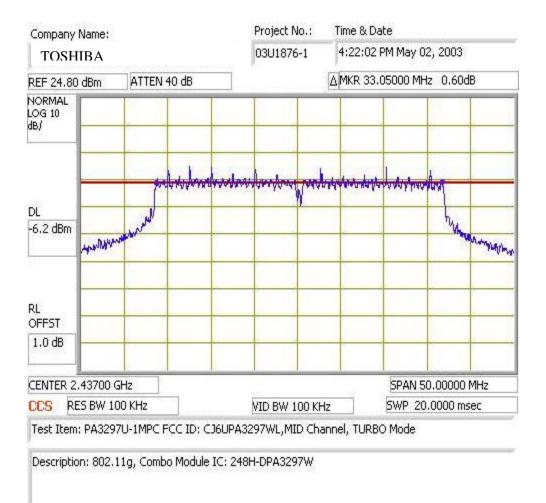
| Company Name: TOSHIBA | | | Project No.: | Time & Da | ne & Date | | | | |
|--------------------------|---------------|------------|----------------|-----------|---------------------------------|----------------|----------------|----------------------|-------------|
| | | | | 03U1876-1 | 3:59:11 PM May 02, 2003 | | | | |
| REF 24.80 | dBm | ATTEN | 40 dB | | | ∆MKR 16. | 70000 MH | lz 0.60d | в |
| NORMAL LOG 10 dB/ | | | | | | | | | |
| | | | | - An | hateraria | anthormoreling | | | |
| DL -5.5 dBm | | | will when when | J | | | Manyayin day | | |
| | and the month | phone half | | | | | Namado Mandall | When we are a second | and a state |
| RL OFFST | | | | | | | | | |
| 1.0 dB | | | | | | | | | |
| CENTER 2.43700 GHz | | - | | | SPAN 50.00000 MHz | | | | |
| CCS RES | 5 BW 10 | D KHz | | | VID BW 100 KHz SWP 20.0000 msec | | | ec | |
| Test Item: | PA3297 | U-1MPC F | CC ID: C | J6UPA: | 3297WL, MID Cł | nannel | | | |
| Description | n: 802.1 | 1a/b/g Co | imbo Mod | lule IC: | 248H-DPA3297 | w | | | - |

Page 17 of 117

| Company Name: | | | Project No.: Time & Date | | | | | | | |
|------------------------|-------------|-----------|--------------------------|----------------|---------------------|------------|-----------------------|----------|----------|-------------|
| TOS | TOSHIBA | | | 03U1876-1 5:03 | | | 03:29 PM May 02, 2003 | | | |
| REF 26 | .80 dBm | ATTEN · | 10 dB | | | Δ | MKR 16.8 | 85000 MH | łz -0.10 | dB |
| NORMA LOG 10 dB/ | | - | | | | | | | - | |
| | | | | , bu | d vilan managenting | portandant | whyrredy | | | |
| DL -3.7 dB | m | a doctari | white white | | | | ł | model | hui | |
| | im | unal hand | | | | | | | MANNAN N | and the way |
| RL OFFST 1.0 dB | | | | | | | | | | |
| CENTER | | Hz | _ | - | | | | SPAN 5 | 0.00000 | MHz |
| CCS | RES BW 100 |) KHz | | | VID BW 10 | 00 KHz | | SWP 20 | .0000 ms | ec |
| Test It | em: PA32971 | U-1MPC F | | | 3297WL,HIG | iH Char | nnel, | | | |

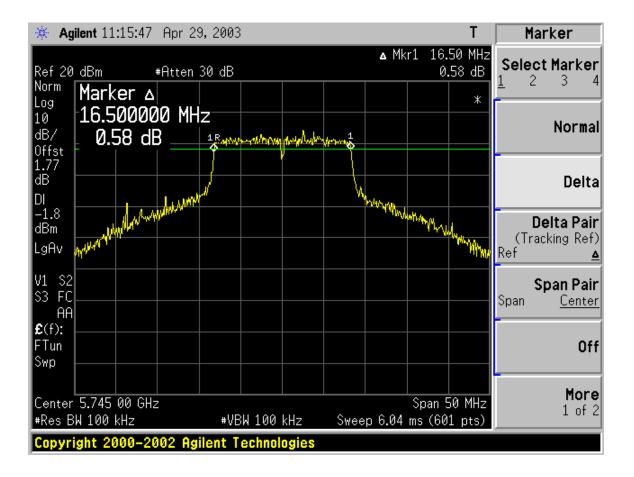
Page 18 of 117

6 DB BANDWIDTH (2.4 GHZ BAND g TURBO MODE)



Page 19 of 117

6 DB BANDWIDTH (5.8 GHZ BAND, NORMAL MODE)



Page 20 of 117

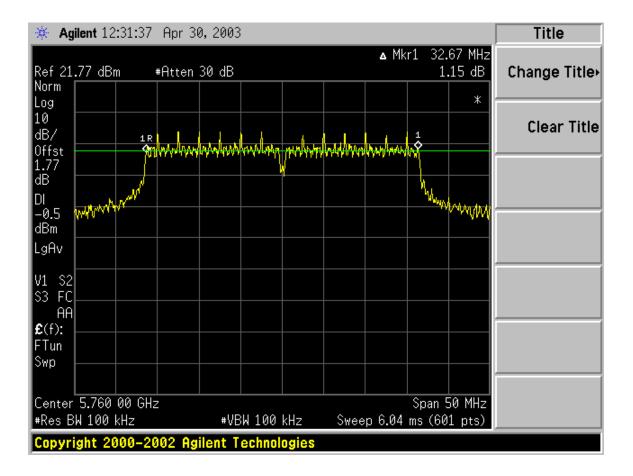
| 🔆 Agilent 11:27:06 | Apr 29, 2003 | | | Т | Title |
|--------------------------------------|-----------------|--|---|--------------------------|--------------|
| Ref 20 dBm | #Atten 30 dB | | | 6.58 MHz 1.02 dB | Change Title |
| Norm Log | | | | * | |
| 10 dB/ | 18 | | | | Clear Title |
| Offst | | When have been a start and a start and a start and a start and a start a start a start a start a start a start a | | | |
| dB | h.nM | | m | | |
| DI -2.9 dBm | AMM AND A | | Vound Ango and Ango ang ango ang | | |
| uch LgAv vvⁿ₩ ₩ | | | | and the formation of the | |
| V1 S2 | | | | | |
| S3 FC | | | | | |
| £ (f): | | | | | |
| Swp | | | | | |
| Center 5.785 00 GH | | | Snan | 50 MHz | |
| #Res BW 100 kHz | #VBW 1 | .00 kHz Swe | ep 6.04 ms (6 | | |
| File Operation Sta | tus, A:\SCREN25 | 5.GIF file save | d | | |

Page 21 of 117



Page 22 of 117

6 DB BANDWIDTH (5.8 GHZ BAND, TURBO MODE)



Page 23 of 117

| ₩ Agilent 12:33:40 Apr 30, 2003 | Title |
|---|--------------|
| ▲ Mkr1 32.75 MHz Ref 21.77 dBm #Atten 30 dB 0.44 dB Norm | Change Title |
| Log * 10 dB/ 1R 1 Offer ON subbly shalls on such than what shalls what have | Clear Title |
| 1.77 dB | |
| DI -1.2 dBm LgAv | |
| V1 S2 S3 FC | |
| AA £(f): FTun | |
| Swp Center 5.800 00 GHz Span 50 MHz | |
| #Res BW 100 kHz #VBW 100 kHz Sweep 6.04 ms (601 pts) File Operation Status, A:\SCREN275.GIF file saved | |

Page 24 of 117

7.2. OUTPUT POWER

PEAK POWER LIMIT

§15.247 (b) The maximum peak output power of the intentional radiator shall not exceed the following:

15.247 (b) (3) For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz , and 5725-5850 MHz bands: 1 watt.

\$15.247 (b) (4) Except as shown in paragraphs (b)(3) (i), (ii) and (iii) of this section, if transmitting antennas of directional gain greater than 6 dBi are used the peak output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1) or (b)(2) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

The maximum antenna gain is 4.8 dBi, therefore the limit is 30 dBm.

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.

Page 25 of 117

2.4 GHz BAND RESULTS

The cable assembly insertion loss of 11.02 dB (including 10 dB pad and 1.02 dB cable) was entered as an offset in the power meter to allow for direct reading of power.

No non-compliance noted:

802.11b Mode

| Channel | Frequency Average Power | | Peak Power | Limit | Margin |
|---------|-------------------------|-------|------------|-------|--------|
| | (MHz) | (dBm) | (dBm) | (dBm) | (dB) |
| Low | 2412 | 14.9 | 18.21 | 30 | -11.79 |
| Middle | 2437 | 15.34 | 18.32 | 30 | -11.68 |
| High | 2462 | 15.68 | 18.68 | 30 | -11.32 |

802.11g Mode

| Channel | Frequency | Average Power | Peak Power | Limit | Margin |
|---------|-----------|---------------|------------|-------|--------|
| | (MHz) | (dBm) | (dBm) | (dBm) | (dB) |
| Low | 2412 | 15.74 | 22.43 | 30 | -7.57 |
| Middle | 2437 | 15.83 | 22.51 | 30 | -7.49 |
| High | 2462 | 15.04 | 21.03 | 30 | -8.97 |

802.11g Turbo Mode

| Channel | Frequency | Average Power | Peak Power | Limit | Margin |
|---------|-----------|---------------|------------|-------|--------|
| | (MHz) | (dBm) | (dBm) | (dBm) | (dB) |
| Middle | 2437 | 15.95 | 22.63 | 30 | -7.37 |

Page 26 of 117

5.8 GHz BAND RESULTS

The cable assembly insertion loss of 11.02 dB (including 10 dB pad and 1.02 dB cable) was entered as an offset in the power meter to allow for direct reading of power.

No non-compliance noted:

| Channel | Frequency | Average Power | Peak Power | Limit | Margin |
|---------|-----------|---------------|------------|-------|--------|
| | (MHz) | (dBm) | (dBm) | (dBm) | (dB) |
| Low | 5745 | 16.65 | 21.02 | 30 | -8.98 |
| Middle | 5785 | 16.72 | 21.2 | 30 | -8.80 |
| High | 5825 | 16.86 | 21.17 | 30 | -8.83 |

802.11a Turbo Mode

| Channel | Frequency | Average Power | Peak Power | Limit | Margin |
|---------|-----------|---------------|------------|-------|--------|
| | (MHz) | (dBm) | (dBm) | (dBm) | (dB) |
| Low | 5760 | 16.71 | 20.24 | 30 | -9.76 |
| High | 5800 | 17 | 20.74 | 30 | -9.26 |

Page 27 of 117

7.3. MAXIMUM PERMISSIBLE EXPOSURE

<u>LIMITS</u>

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

and

 $E = \sqrt{(30 * P * G)} / d$ $S = E^{2} / 3770$

where

$$\begin{split} E &= Field \; Strength \; in \; Volts \; / \; meter \\ P &= Power \; in \; Watts \\ G &= Numeric \; antenna \; gain \\ d &= distance \; in \; meters \\ S &= Power \; Density \; in \; milliwatts \; / \; square \; centimeter \end{split}$$

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

where

d = distance in cm P = Power in mW G = Numeric antenna gain S = Power Density in mW / cm^2

Page 28 of 117

Substituting the logarithmic form of power and gain using: P (mW) = 10 ^ (P (dBm) / 10) and G (numeric) = 10 ^ (G (dBi) / 10) yields $d = 0.282 * 10 ^ ((P + G) / 20) / \sqrt{S}$ 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

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

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.

2.4 GHz BAND RESULTS

| Mode | Power Density Limit | Output Power | Antenna Gain | MPE Distance |
|---------------|---------------------|--------------|--------------|--------------|
| | (mW/cm^2) | (dBm) | (dBi) | (cm) |
| 802.11b | 1.0 | 18.68 | 4.80 | 4.21 |
| 802.11g Base | 1.0 | 22.51 | 4.80 | 6.54 |
| 802.11g Turbo | 1.0 | 22.63 | 4.80 | 6.63 |

No non-compliance noted:

5.8 GHz BAND RESULTS

No non-compliance noted:

| Mode | Power Density Limit | Output Power | Antenna Gain | MPE Distance |
|---------------|---------------------|--------------|--------------|--------------|
| | (mW/cm^2) | (dBm) | (dBi) | (cm) |
| 802.11a Base | 1.0 | 21.20 | 4.80 | 5.63 |
| 802.11a Turbo | 1.0 | 20.74 | 4.80 | 5.34 |

Page 29 of 117

7.4. PEAK POWER SPECTRAL DENSITY

<u>LIMIT</u>

§15.247 (d) For direct sequence systems, the peak power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer, the maximum level in a 3 kHz bandwidth is measured with the spectrum analyzer using RBW = 3 kHz and VBW >= 3 kHz, sweep time = span / 3 kHz, and video averaging is turned off. The PPSD is the highest level found across the emission in any 3 kHz band.

2.4 GHz BAND RESULTS

No non-compliance noted:

2.4 GHz Band, 802.11b Mode

| Channel | Frequency | PPSD | Limit | Margin |
|---------|-----------|-------|-------|--------|
| | (MHz) | (dBm) | (dBm) | (dB) |
| Low | 2412 | -7.00 | 8 | -15.00 |
| Middle | 2437 | -7.60 | 8 | -15.60 |
| High | 2462 | -9.10 | 8 | -17.10 |

2.4 GHz Band, 802.11g Mode

| Channel | Frequency | PPSD | Limit | Margin |
|---------|-----------|-------|-------|--------|
| | (MHz) | (dBm) | (dBm) | (dB) |
| Low | 2412 | -8.70 | 8 | -16.70 |
| Middle | 2437 | -9.00 | 8 | -17.00 |
| High | 2462 | -9.40 | 8 | -17.40 |

802.11g Turbo Mode

| Channel | Frequency | PPSD | Limit | Margin |
|---------|-----------|-------|-------|--------|
| | (MHz) | (dBm) | (dBm) | (dB) |
| Middle | 2437 | -9.30 | 8 | -17.30 |

Page 30 of 117

5.8 GHz BAND RESULTS

No non-compliance noted:

802.11a Normal Mode

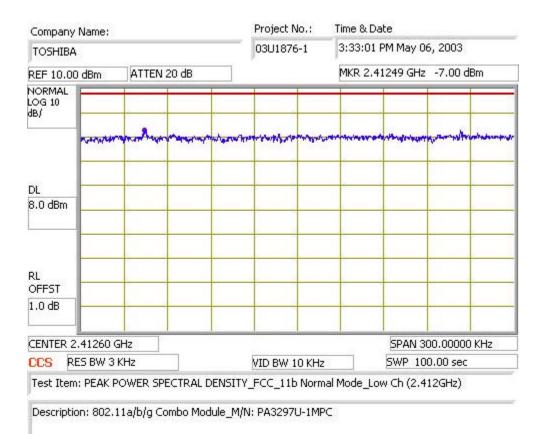
| Channel | Frequency | PPSD | Limit | Margin |
|---------|-----------|--------|-------|--------|
| | (MHz) | (dBm) | (dBm) | (dB) |
| Low | 5745 | -8.20 | 8 | -16.20 |
| Middle | 5785 | -8.60 | 8 | -16.60 |
| High | 5825 | -10.30 | 8 | -18.30 |

802.11a Turbo Mode

| Channel | Frequency | PPSD | Limit | Margin |
|---------|-----------|--------|-------|--------|
| | (MHz) | (dBm) | (dBm) | (dB) |
| Low | 5760 | -14.30 | 8 | -22.30 |
| High | 5800 | -11.10 | 8 | -19.10 |

Page 31 of 117

PPSD (2.4 GHZ BAND b MODE)



Page 32 of 117

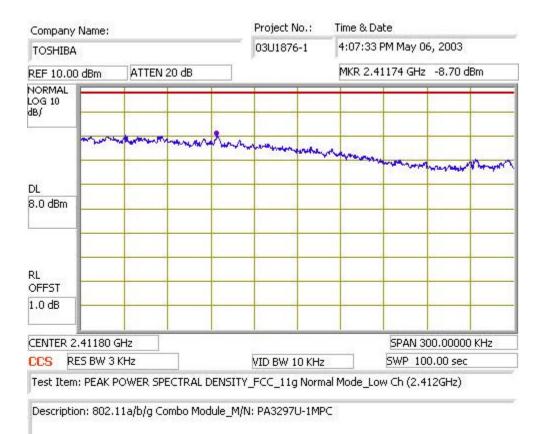
| Company Name: | | | | | Project No.: Time & Date | | | | | |
|-------------------------|---------|---------|----------------------|------------|--------------------------|--------|-------------------------|--------------|-----------|-------|
| TOSHIBA | TOSHIBA | | | | 03U1876-1 | | 3:49:16 PM May 06, 2003 | | | |
| REF 10.0 | 0 dBm | ATTEN | 20 dB | | | | MKR 2.4 | 3549 GHz | -7.60 c | Bm |
| NORMAL LOG 10 dB/ | | | | | | | | | | |
| 6. | * white | nanywan | New York Strategical | L Marana M | wound | harrin | manut | n a star and | ****** | - |
| DL 8.0 dBm | | | | | | | | | | |
| RL | | | | | | | | | | |
| OFFST 1.0 dB | | | | | | | | | | |
| CENTER 2.43550 GHz | | | | | 5PAN 300.00000 KHz | | | | |) KHz |
| CCS R | ES BW 3 | KHz | | | VID BW 1 | 0 KHz | | SWP 10 | 10.00 sec | |

Page 33 of 117

| Company Name: | | | | | Project No.: Time & Date | | | | | | |
|-------------------------|-----------|---------|-------|-------------------|--------------------------|----------|------------|-------------------------|----------|-----|--|
| TOSHIBA | 4 | | | | 03U1876-1 3:54 | | | 3:54:08 PM May 06, 2003 | | | |
| REF 10.0 | 0 dBm | ATTEN | 20 dB | | | | MKR 2.46 | 5499 GHz | -9.10 d | Bm | |
| NORMAL LOG 10 dB/ | | | | | , | | | | - | | |
| | Marcarda | nundrev | - | nt for the second | nerdekter ran | ny worth | narrighted | ndrahhar have | withmost | mym | |
| DL 8.0 dBm | | | | 6 | i i | | | | - | | |
| | | | | | | | | | | | |
| RL OFFST | | | | | | | | | | | |
| 1.0 dB | | | | | | | | | | | |
| CENTER 2.46510 GHz | | | | | 5PAN 300.00000 KHz | | | | | | |
| CCS R | ES BW 3 K | Hz | | | VID BW 1 | LO KHz | | SWP 10 | 0.00 sec | | |

Page 34 of 117

PPSD (2.4 GHZ BAND g NORMAL MODE)



Page 35 of 117

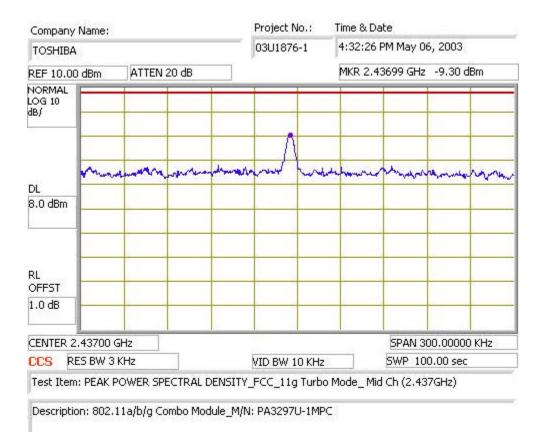
| Company Name: | | | | | Project No.: Time & Date | | | | | | |
|-------------------------|-----------|----------------|-------|--------------------|--------------------------|-----------------|----------|-------------------------|----------|-------|--|
| TOSHIBA | TOSHIBA | | | | 03U1876-1 4:1 | | | 4:12:20 PM May 06, 2003 | | | |
| REF 10.0 | 0 dBm | ATTEN | 20 dB | | | | MKR 2.43 | 3262 GHz | -9.00 d | Bm | |
| NORMAL LOG 10 dB/ | | | | | - | | | | | | |
| 0, | www. | the way | mound | Henry | where why in | -gg-hat/hg-land | white | Num | may | minim | |
| DL | | ; ; | | | | | 6 5 | | | | |
| 8.0 dBm | | | | | - | | | | | | |
| RL OFFST | | | | - | | | | | | | |
| 1.0 dB | | | | | | | | | | | |
| CENTER 2.43268 GHz | | | | SPAN 300.00000 KHz | | | | |) KHz | | |
| CCS R | ES BW 3 K | Hz | | | VID BW 1 | 0 KHz | | SWP 10 | 0.00 sec | | |

Page 36 of 117

| Company Name: | | | | Project | Project No.: Time & Date | | | | | | |
|-------------------------|-----------|-------|--------|--------------------|--------------------------|-----------------------------|-------------------------|-----------|-------|--|--|
| TOSHIB | 4 | | | 03U187 | 03U1876-1 | | 4:20:35 PM May 06, 2003 | | | | |
| REF 10.0 | 0 dBm | ATTEN | 20 dB |] | | MKR 2.4 | 6233 GHz | -9.40 d | Bm | | |
| NORMAL LOG 10 dB/ | | | | - | | | | - | | | |
| | whent | netto | monund | m | mennew | مراجع در را م می | helin | Men Mayor | umanu | | |
| DL | - | | | | - | | | - | - | | |
| 8.0 dBm | | | | | | | | | | | |
| RL OFFST | | | | | | | | | | | |
| 1.0 dB | | | | | | | | | | | |
| CENTER 2.46225 GHz | | | | SPAN 300.00000 KHz | | | | | | | |
| CCS F | ES BW 3 K | Hz | | VID BW | 10 KHz | | SWP 10 | 0.00 sec | | | |

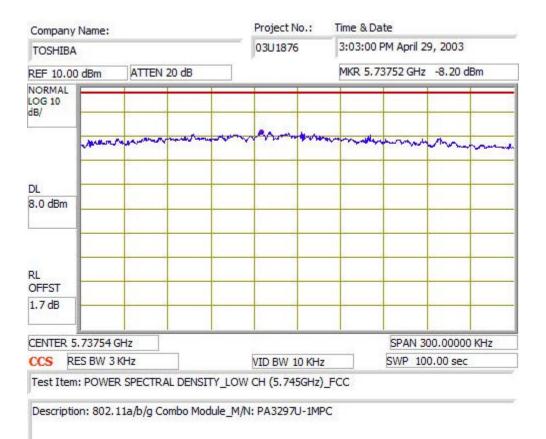
Page 37 of 117

PPSD (2.4 GHZ BAND g TURBO MODE)



Page 38 of 117

PPSD (5.8 GHZ BAND, NORMAL MODE)



Page 39 of 117

| 20 dB | | :42:14 PM April 29 KR 5.78351 GHz | 1000 COM - 100 | | |
|--|--------------------|--|----------------------------------|--|--|
| 20 dB | M | KR 5.78351 GHz | -8.60 dBm | | |
| | | | | | |
| | | | | | |
| and the state of t | mound | man | man | | |
| | | | 6 - 1 - 9 | | |
| | | | | | |
| | | | | | |
| | | | | | |
| <u> </u> | SPAN 300.00000 KHz | | | | |
| VIC | BW 10 KHz | SWP 100 | SWP 100.00 sec | | |
| | | VID BW 10 KHz RAL DENSITY_MID CH 5.785GHz_FCC | SPAN 30 VID BW 10 KHz SWP 100 | | |

Page 40 of 117