

# **Emission Test Report**

## **Standard: FCC Part 15 Subpart E / IC RSS-210**

**Document Number : FCC 19-0212-0**

**Product: IBM ThinkPad X30 Series**

**included IBM Dual-Band 11a/b Wi-Fi® Wireless Mini PCI Adapter**

**FCC ID: ANO20020304T2L**  
**IC: 349E-PH11107E**

**January 9, 2003**

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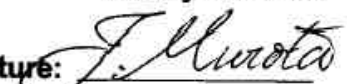
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**MEASUREMENT / TECHNICAL REPORT – Part 15 Subpart E  
(Intentional Radiator)****IBM ThinkPad X30 Series****(Machine type : 2672, 2673)****with****IBM Dual-Band 11a/b Wi-Fi® Wireless Mini PCI Adapter****FCC ID : ANO20020304T2L****January 9, 2003**

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                     |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------|
| This report concerns: (check one)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                     |
| Original Grant                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | <input checked="" type="checkbox"/> |
| Class I change                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | <input type="checkbox"/>            |
| Class II change                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | <input type="checkbox"/>            |
| Equipment type: <u>Wireless LAN device</u>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                     |
| This report shall not be reproduced except in full, without the written permission of this test lab.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                     |
| The measurement results contained in this report relate only to the item which was tested.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                     |
| Measurement procedure used is ANSI C63.4-2000 unless otherwise specified.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                     |
| Other test procedure: _____                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                     |
| The FCC has issued provisional acceptance of this test laboratory for Declaration of Conformity testing per letter dated 1997.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                     |
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## A. General Information

APPLICANT : IBM Japan, Ltd.  
 TEST SITE : IBM Japan, Ltd., Yamato Semi-anechoic chamber #1  
 TEST SITE ADDRESS : 1623 – 14 Shimotsuruma, Yamato-shi, Kanagawa 242-8502 Japan  
 Tel: +81-46-215-4779, Fax: +81-46-273-7420  
 REGULATION : FCC Part 15 Subpart E  
 Industry Canada RSS-210 (Issue No.5)  
 MODEL NUMBER : 2672-CHU (ThinkPad X30 Series)  
 FCC ID : ANO20020304T2L  
 IC Certification Number : 349E-PH11107E  
 SERIAL NUMBER : ZZ-00094  
 PHYSICAL CONDITION : Preproduction  
 KIND OF EQUIPMENT : Personal computer with a IEEE802.11a & b Wireless LAN  
 Mini-PCI Combo Card ([Composite application](#))  
 TESTED DATE : November 18, 25, 26, 27, December 4, 5, 16, 2002  
 and January 8, 2003

### A.1 Test Methodology

Both conducted and radiated testing were performed according to the procedures in ANSI C63.4-2000. Radiated testing was performed at an antenna to EUT distance of 3 meters.

### A.2 Test Facility / NVLAP Accreditation

The semi-anechoic chamber #1 and #2 used to correct the data are located in Yamato Laboratory, IBM Japan.

- This facility has been fully described in a report dated September 1998, submitted to the FCC office, and accepted in a letter, dated Nov. 2, 1998(31040/SIT).
- IBM Yamato EMC Engineering is recognized under the National Voluntary Laboratory Accreditation Program for satisfactory compliance with Criteria established in Title 15, Part 285 Code of Federal Regulations.(NVLAP Lab code: 200198-0)
- This facility is accepted by **Industry Canada** in a letter dated March 19, 2001 as number **IC 349E** for chamber #2, and January 25, 2002 as number **IC 4221** for chamber #1.

### A.3 EUT details

Table-A EUT details

| Model and S/N                                                             | FCC ID<br>IC Certification Number | Description                                                                                                       |
|---------------------------------------------------------------------------|-----------------------------------|-------------------------------------------------------------------------------------------------------------------|
| IBM Dual-Band 11a/b Wi-Fi®<br>Wireless Mini PCI Adapter<br>(s/n PVT-074F) | IC: 349E-PH11107E                 | IEEE802.11a & b Wireless LAN Mini-PCI<br>Combo Card without antenna                                               |
| ThinkPad X30 Series<br>M/T 2672-CHU<br>(s/n ZZ-00094)                     | FCC ID:<br>ANO20020304T2L         | <b>Applying equipment</b><br>IBM Notebook PC with built in antenna<br>CPU: Intel® Pentium® M Processor,<br>1.3GHz |
| P/N 02K6808                                                               | N/A                               | Universal AC adapter 56W, Unshielded<br>power cord                                                                |

## B. Summary of Test Results

Table-B presents the list of the measurement items for U-NII devices under FCC Part 15 Subpart E, and for LELAN devices under Industry Canada RSS-210.

The section numbers of upper portion are showing FCC codes, and the lower ones are for IC RSS-210.

Table-B List of the measurements

| Section(s)                                                                | Test Items                                                                    |                                                                                                                                                  | Condition                                                  | Result                                                                                                                    |      |
|---------------------------------------------------------------------------|-------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------|------|
|                                                                           | Transmit mode (TX):                                                           |                                                                                                                                                  |                                                            |                                                                                                                           |      |
| 15.407(a)(1), (2)<br><br>6.2.2 (q1)(i)(ii)                                | Bandwidth at 26 dB below                                                      | According to RSS-210 6.2.2q(iv)(b), 26 dB WB was taken for 99% BW.                                                                               | Conducted                                                  | Pass                                                                                                                      |      |
|                                                                           | Peak conducted transmit output power or EIRP for IC                           | 5150-5250MHz:<br>FCC: 50mW or (4+10logB)dBm<br>IC : 200mW* or (10+10logB)dBm*<br>*: EIRP                                                         |                                                            | Pass                                                                                                                      |      |
|                                                                           |                                                                               | 5250-5350MHz:<br>FCC: 250mW or (11+10logB)dBm<br>IC : 250mW or (11+10logB)dBm<br>IC : 1W* or (17+10logB)dBm*<br>*: EIRP B: 26dB BW in MHz        |                                                            | Pass                                                                                                                      |      |
|                                                                           | Peak Power Spectral Density                                                   | 5150-5250MHz:<br>FCC: 4 dBm in any 1MHz<br>IC : 10 dBm in any 1MHz (EIRP)<br>5250-5350MHz:<br>FCC: 11 dBm in any 1MHz<br>IC : 11 dBm in any 1MHz |                                                            | Pass                                                                                                                      |      |
|                                                                           | N/A<br>6.2.2 (q1)(iv)(b)                                                      | Peak Spectral Density                                                                                                                            |                                                            | IC: 3 + 10logB dBm/MHz                                                                                                    | Pass |
|                                                                           | 15.407(a)(6)<br>N/A                                                           | Peak Excursion                                                                                                                                   |                                                            | The ratio of the peak excursion of the modulation envelope to the peak transmit shall not exceed 13 dB across any 1 MHz . | Pass |
| 15.207 / 407(b)(5)<br>6.2.2 (q1)(v) / 6.6                                 | AC Wireline Conducted Emissions<br>150kHz- 30MHz                              | Class B:<br>Freq.(MHz) QP(dBμV) Ave.(dBμV)<br>0.15 - 0.5 66 - 56 56 - 46<br>0.5 - 5 56 46<br>5 - 30 60 50                                        | Radiated<br>(30MHz - 1GHz)<br><br>Radiated<br>(1G - 40GHz) | Pass                                                                                                                      |      |
| 15.205 & 209 / 407(b)(1)(2)(5)(6)<br><br>6.2.1 / 6.2.2(q1)(i)(ii)(v)/ 6.3 | General Field Strength Limits (Restricted Bands and Radiated Emission Limits) | Shall not exceed the limits specified in FCC 15.209 or RSS-210 Table3.                                                                           |                                                            | Pass                                                                                                                      |      |

| Receive mode (RX):                       |                                                   |                                                                                                           |           |      |
|------------------------------------------|---------------------------------------------------|-----------------------------------------------------------------------------------------------------------|-----------|------|
| 15.207 / 407(b)(5)<br>6.2.2(q1)(v) / 7.4 | AC Wireline Conducted Emissions<br>150kHz - 30MHz | Class B:<br>Freq.(MHz) QP(dBμV) Ave.(dBμV)<br>0.15 - 0.5 66 - 56 56 - 46<br>0.5 - 5 56 46<br>5 - 30 60 50 | Conducted | Pass |

|                                                                                             |                                                             |                                                   |                         |      |
|---------------------------------------------------------------------------------------------|-------------------------------------------------------------|---------------------------------------------------|-------------------------|------|
| <b>15.205 &amp; 209 / 407(b)(1)(2)(5)(6)</b><br><br><b>6.2.1 / 6.2.2(q1)(i)(ii)(v)/ 7.3</b> | General Field Strength Limits<br>(Radiated Emission Limits) | Shall not exceed the limits specified in RSS-210. | Radiated (30MHz - 1GHz) | Pass |
|                                                                                             |                                                             |                                                   | Radiated (1G - 40GHz)   | Pass |

|                                           | Other general requirements                                           |                                                                                                | Result   |
|-------------------------------------------|----------------------------------------------------------------------|------------------------------------------------------------------------------------------------|----------|
| <b>15.407(a)(1)(2)</b>                    | Antenna gain                                                         | Peak : 2.98 dBi                                                                                | N/A      |
| <b>6.2.2(q1)(iv)(a)</b>                   | Digital modulation                                                   | Applying equipment employs IEEE802.11a (OFDM) or 11b(CCK) digital modulation technology.       | complies |
| <b>15.407(c) 6.2.2(q1)(iv)(d)</b>         | Automatic link disconnection in no transaction state                 | Refer to “Circuitry Description” document.                                                     | complies |
| <b>15.407(d) 6.2.2(q1)(i)</b>             | Integral antenna in the 5150M - 5250MHz band                         | Refer to “Circuitry Description” document.                                                     | complies |
| <b>15.407(e) 6.2.2(q1)(i) (q1)(iv)(g)</b> | Indoor use in the 5150M -5250MHz band, and interference from radars. | Refer to “Manual_Regulatory_Notice”.                                                           | complies |
| <b>15.407(f) 6.2.2(q1)(iv)(g)</b>         | RF Exposure Requirement                                              | Refer to “RF Exposure Evaluation” or “Exposure of Humans to Radio Frequency Fields” documents. | complies |
| <b>15.407(g) 6.2.2(q1)(iv)(e)</b>         | Frequency stability                                                  | Refer to “Circuitry Description” document.                                                     | complies |

## C. Test Instruments

Table-C List of Measuring Instruments

| Description                      | Model          | Serial Number | Calibration Date | Calibration Interval |
|----------------------------------|----------------|---------------|------------------|----------------------|
| Computer                         | IBM 5551-L     | #4            | N/A              | N/A                  |
| Computer                         | IBM 6589-13J   | 97-15613      | N/A              | N/A                  |
| Spectrum Analyzer (100Hz-1.5GHz) | HP 85680B      | 2601A02634    | 08/28/02         | 1 year               |
| Spectrum Analyzer (100Hz-1.5GHz) | HP 85680B      | 3019A05155    | 02/15/02         | 1 year               |
| Spectrum Analyzer (100Hz-1.5GHz) | HP 85680B      | 2841A04252    | 06/17/02         | 1 year               |
| Spectrum Analyzer Display        | HP 85662A      | 2542A12308    | 08/28/02         | 1 year               |
| Spectrum Analyzer Display        | HP 85662A      | 3026A19353    | 02/15/02         | 1 year               |
| Spectrum Analyzer Display        | HP 85662A      | 2816A16831    | 06/17/02         | 1 year               |
| Quasi-Peak Adapter               | HP 85650A      | 2043A00062    | 08/28/02         | 1 year               |
| Quasi-Peak Adapter               | HP 85650A      | 2811A01156    | 06/17/02         | 1 year               |
| Quasi-Peak Adapter               | HP 85650A      | 3033A01449    | 02/15/02         | 1 year               |
| Amplifier (100KHz - 1.3GHz)      |                |               |                  |                      |
| - for 30-200MHz                  | HP 8447D       | 2805A02919    | 04/15/02         | 1 year               |
| - for 200-1000MHz                | HP 8447D       | 2944A03506    | 04/15/02         | 1 year               |
| Amplifier (1 - 26.5GHz)          | HP 8449B       | 3008A00582    | 06/13/02         | 1 year               |
| Amplifier (26.5 - 40GHz)         | Agilent 83051A | 3950M00193    | 12/06/01         | 1 year               |

|                                                       |                |                          |            |            |
|-------------------------------------------------------|----------------|--------------------------|------------|------------|
| Spectrum Analyzer EMI Test Receiver                   | R&S ESI26      | 836119/003               | 07/18/02   | 1 year     |
| Spectrum Analyzer                                     | HP 8563E       | 3416A02248               | 08/14/02   | 1 year     |
| Harmonic Mixer                                        | Agilent 11970A | 011269-001               | 07/19/02   | 1 year     |
| Receiver (9kHz-30MHz)                                 | R&S ESH3       | 891806/012               | 10/07/02   | 1 year     |
| Receiver (20MHz-1.3GHz)                               | R&S ESVP       | 893202/018               | 02/06/02   | 1 year     |
| Biconical Antenna (30-200MHz)                         | EMCO 3108      | 2309                     | 05/06/02   | 1 year     |
| Log-Periodic Antenna (200-1000MHz)                    | EMCO 3146      | 1585                     | 05/06/02   | 1 year     |
| Horn Antenna (1- 18GHz)                               | EMCO 3115      | 9903-5774                | 07/18/02   | 1 year     |
| Horn Antenna (3.95- 5.85GHz)                          | EMCO 3160-5    | 1099                     | 04/17/02   | 1 year     |
| Horn Antenna (5.85- 8.20GHz)                          | EMCO 3160-6    | 9712-1044                | 04/17/02   | 1 year     |
| Horn Antenna (8.2- 12.4GHz)                           | EMCO 3160-7    | 1156                     | 04/17/02   | 1 year     |
| Horn Antenna (12.4- 18GHz)                            | EMCO 3160-8    | 1143                     | 04/17/02   | 1 year     |
| Horn Antenna (18- 26.5GHz)                            | EMCO 3160-9    | 0004-1202                | 04/17/02   | 1 year     |
| Horn Antenna (26.5- 40GHz)                            | EMCO 3160-10   | 1175                     | 04/17/02   | 1 year     |
| LISN                                                  | EMCO 3825/2    | 1426                     | 09/01/02   | 1 year     |
| Power Meter                                           | HP 437B        | 3043U03437               | 11/08/02   | 1 year     |
| Power Sensor                                          | HP 8481A       | US41030582               | 11/08/02   | 1 year     |
| Switch/control unit                                   | HP 3488A       | 2719A17226<br>2719A17228 | N/A<br>N/A | N/A<br>N/A |
| Plotter                                               | HP 7550A       | 2631A33619               | N/A        | N/A        |
| Coaxial cables (1 – 18GHz):                           | Length:        |                          |            |            |
| - Horn Ant <=> RF Amp.                                | 6 m            | - EM206SCO               | 09/05/02   | 1 year     |
| - RF Amp.<=>Spectrum Analyzer(<12GHz)                 | 15m            | - EM215SCO               | 09/05/02   | 1 year     |
| - RF Amp.<=>Spectrum Analyzer(>12GHz)                 | 3 m            | - SF102-20166            | 09/05/02   | 1 year     |
| Coaxial cables (18 – 40GHz):                          |                |                          |            |            |
| - Horn Ant <=> RF Amp.                                | 3m             | - SF102-20167            | 09/05/02   | 1 year     |
| - RF Amp.<=>Spectrum Analyzer                         | 1m             | - SF102-21105            | 09/05/02   | 1 year     |
| N-Coax cables:                                        |                |                          |            |            |
| - Bi-coni Ant <=> 10m Cable                           | 9 m            | - EM103L01               | 04/15/02   | 1 year     |
| - 10m Cable <=> Shield Panel                          | 10 m           | - EM103L02               | 04/15/02   | 1 year     |
| - Shield Panel <=> RF Amp                             | 7 m            | - EM103L03               | 04/15/02   | 1 year     |
| - RF Amp <=> Power Splitter                           | 0.5m           | - EM103L04               | 04/15/02   | 1 year     |
| - Log-peri Ant <=> 10m Cable                          | 9 m            | - EM103H01               | 04/15/02   | 1 year     |
| - 10m Cable <=> Shield Panel                          | 10 m           | - EM103H02               | 04/15/02   | 1 year     |
| - Shield Panel <=> RF Amp                             | 7 m            | - EM103H03               | 04/15/02   | 1 year     |
| - RF Amp <=> Power Splitter                           | 0.5m           | - EM103H04               | 04/15/02   | 1 year     |
| Coax cables:                                          |                |                          |            |            |
| - Lism-L <=> SW/Con.unit (SW100)                      | 4 m            | - EMIC-L                 | 04/15/02   | 1 year     |
| - Lism-N <=> SW/Con.unit (SW101)                      | 4 m            | - EMIC-N                 | 04/15/02   | 1 year     |
| - SW/Con.unit <=> RCVR (Input)                        | 1 m            | - EMIC-R                 | 04/15/02   | 1 year     |
| - SW/Con.unit<=> Spe Ana.(Signal In)                  | 1 m            | - EMIC-S                 | 04/15/02   | 1 year     |
| - Power Splitter <=> SW/Con.unit (SW110)              | 1 m            | - EM103L05               | 04/15/02   | 1 year     |
| - Power Splitter <=> SW/Con.unit (SW300)              | 1 m            | - EM103L06               | 04/15/02   | 1 year     |
| - Power Splitter <=> SW/Con.unit (SW100)              | 1 m            | - EM103H05               | 04/15/02   | 1 year     |
| - Power Splitter <=> SW/Con.unit (SW301)              | 1 m            | - EM103H06               | 04/15/02   | 1 year     |
| - SW/Con.unit <=> Receiver (Input)                    | 2 m            | - EM1RCV                 | 04/15/02   | 1 year     |
| - SW/Con.unit <=> Spe Ana.(Signal In) for 30- 200MHz  | 2 m            | - EM1SPL                 | 04/15/02   | 1 year     |
| - SW/Con.unit <=> Spe Ana.(Signal In) for 200-1000MHz | 2 m            | - EM1SPH                 | 04/15/02   | 1 year     |

## Notes.

- The above equipment calibration is traceable to National standards.
- HP: Hewlett Packard, R&S: Rohde & Schwarz

## D. Operation mode of EUT

1. All tests were performed using the “Atheros Radio Test” program. This tool supports to emit the continuous transmission mode for the testing purpose.
2. Three kinds of frequencies were chosen for the measurement. i.e. 5180MHz (lowest), 5260MHz(middle), and 5320MHz (highest).

Table-D Transmission mode of EUT (The measurement plots are shown in shading.)

| Operation Frequency [GHz] | Rated output power (conducted) [dBm] |        |         |         |         |         |         |         |
|---------------------------|--------------------------------------|--------|---------|---------|---------|---------|---------|---------|
|                           | 6M bps                               | 9M bps | 12M bps | 18M bps | 24M bps | 36M bps | 48M bps | 54M bps |
| 5.180 (Ch. 36)            | +14                                  | +14    | +14     | +14     | +14     | +14     | +14     | +13     |
| 5.200 (Ch. 40)            | +14                                  | +14    | +14     | +14     | +14     | +14     | +14     | +13     |
| 5.220 (Ch. 44)            | +14                                  | +14    | +14     | +14     | +14     | +14     | +14     | +13     |
| 5.240 (Ch. 48)            | +14                                  | +14    | +14     | +14     | +14     | +14     | +14     | +13     |
| 5.260 (Ch. 52)            | +17                                  | +17    | +17     | +17     | +17     | +15     | +14     | +13     |
| 5.280 (Ch. 56)            | +17                                  | +17    | +17     | +17     | +17     | +15     | +14     | +13     |
| 5.300 (Ch. 60)            | +17                                  | +17    | +17     | +17     | +17     | +15     | +14     | +13     |
| 5.320 (Ch. 64)            | +14                                  | +14    | +14     | +14     | +14     | +14     | +14     | +13     |

3. 24Mbps transmission mode was selected for full testing as the worst case sampling.  
See “Chapter 2. Peak Conducted Transmit Output Power” as to the determination of measurement plots.
4. As for the RF receiving test, the middle channel with the worst case(i.e. 5260MHz, 24Mbps mode) was selected representatively.

## E. Justification

The EUT was investigated for both the main(left) and the auxiliary(right) antennas. The worse case data taken in this report represents the measurement results of the left(main) antenna that has comparatively higher gain.

The same tendency with the previous application (ANO20020300D3L) was found on the worse cases, since the applying transmitter module is the same. i.e. The columns marked in shading of the above table are the worst cases of each Tx mode for all measurement items (conducted power, 26dB BW, ..etc.).

|                    |                 |
|--------------------|-----------------|
| Left Antenna gain  | 1.42 dBi (peak) |
| Right Antenna gain | 0.19 dBi (peak) |



## **F. Measurement Uncertainty**

Uncertainties of the both, the Yamato EMI radiated test facilities (EMI chambers, #1 and #2) and the Yamato EMI conducted test facility are derived with the NIS 81 "Treatment of uncertainty in EMC measurements" 1994.

Estimated site uncertainty values are as follows.

EMI chamber #1 : 4.39dB

EMI chamber #2 : 4.40dB

EMI conducted measurement system : 2.4dB

Detail should be referred to "Treatment of Uncertainty, Calculations and Policy" report, document number TCR 10-0015.

## **G. Temperature and Humidity**

The temperature is controlled within range of 17° to 28°.

The relative humidity is controlled within range of 40% to 70%.

## **H. Related Submittal(s)/Grant(s)/Notes**

The host unit with full peripheral devices including the applying modular as an unintentional radiator is classified as a Digital Device under the FCC Part 15 Subpart B or the Industry Canada Class B Emission Compliance (ICES-003), and subject to SDoC.

# 1. Bandwidth at 26 dB below / Bandedge

[5150-5250MHz: FCC 15.407(a)(1), RSS 6.2.2q1(i) / q1(iV)(b)]

[5250-5350MHz: FCC 15.407(a)(2), RSS 6.2.2q1(ii) / q1(iV)(b)]

## 1.1 Test Procedure

The bandwidth at 26 dB down from the peak of the RF emission was measured with a spectrum analyzer connected to the antenna terminal, while EUT was operating in continuous transmission mode at the appropriate center frequencies (5180 / 5260 / 5320MHz).

The spectrum analyzer was set to:

RBW=300kHz<sup>\*1</sup>, VBW=1MHz<sup>\*2</sup>, Span=50MHz, Sweep= 50ms, Mode= Peak detector

\*1: approximately 1% of the emission bandwidth (§15.403(c))

\*2: VBW > RBW (To be adjusted accordingly based on the spectrum stability.)

Table 1-1 : 26 dB Bandwidth Test Instruments

| Description                                 | Model                          | Serial Number |
|---------------------------------------------|--------------------------------|---------------|
| Spectrum Analyzer EMI Test Receiver         | R&S ESI26                      | 836119/003    |
| Coax cables:<br>- Spectrum Analyzer <=> EUT | Length: 110 cm<br>Loss: 2.2 dB |               |

Notes: - R&S: Rohde & Schwarz

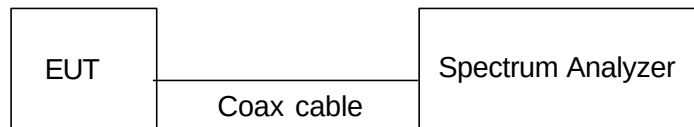


Figure 1: Measurement setup for 26dB bandwidth test

## 1.2 Measurement Results

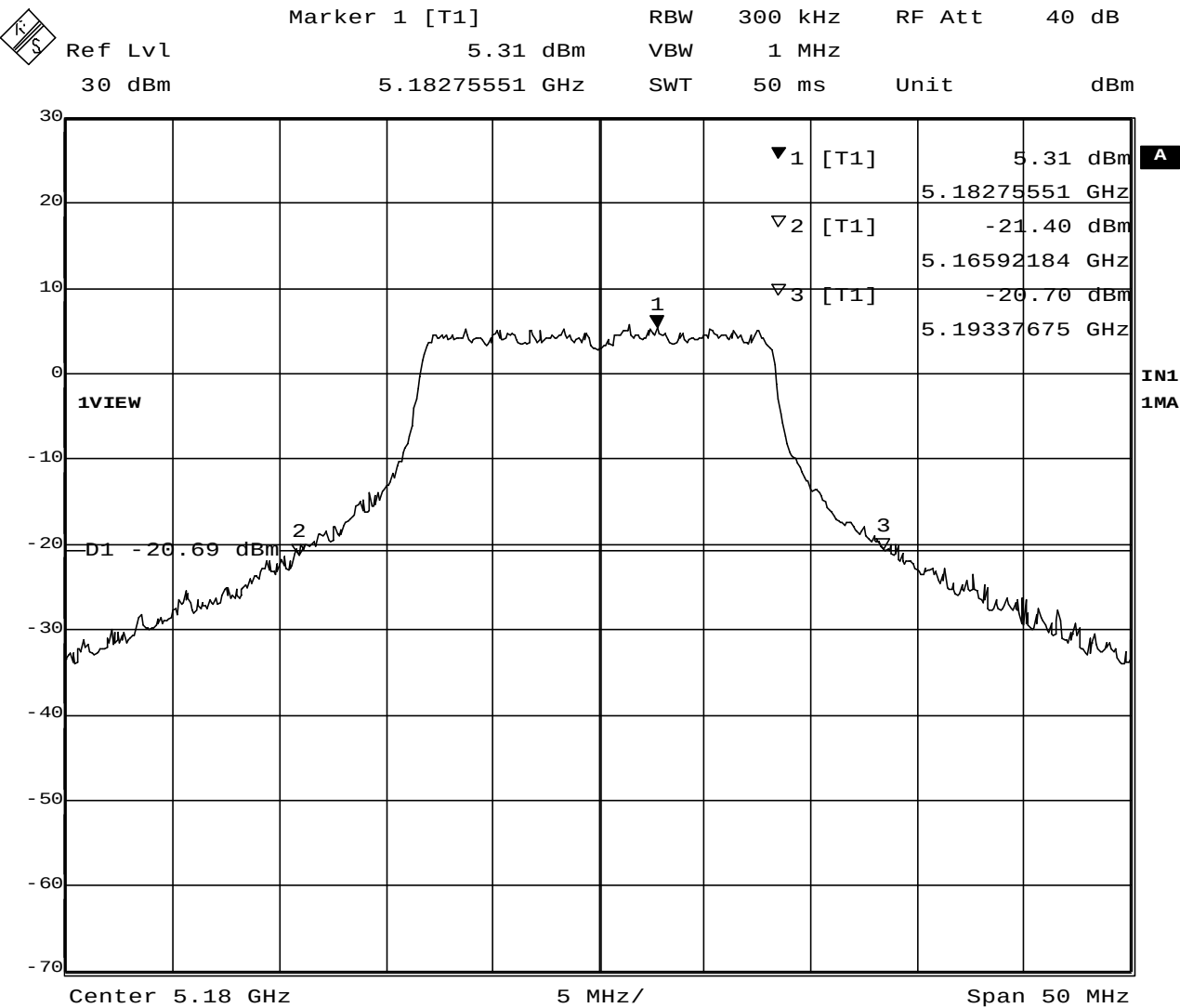
Test Date: December 16, 2002

Table 1-2. EUT: M/T 2672-CHU, s/n ZZ-00094 , TX mode 24Mbps

| Center Frequency<br>(MHz) | Lower frequency<br>(MHz) | Upper frequency<br>(MHz) | Bandwidth<br>at 26 dB below<br>(MHz) | Plot data |
|---------------------------|--------------------------|--------------------------|--------------------------------------|-----------|
| 5180 (ch. 36)             | 5165.92                  | 5193.38                  | 27.46                                | Plot 1-1  |
| 5260 (ch. 52)             | 5241.91                  | 5276.38                  | 34.47                                | Plot 1-2  |
| 5320 (ch. 64)             | 5306.02                  | 5334.18                  | 28.16                                | Plot 1-3  |

: the closest frequencies to the bandedge

1.3 Trace Data

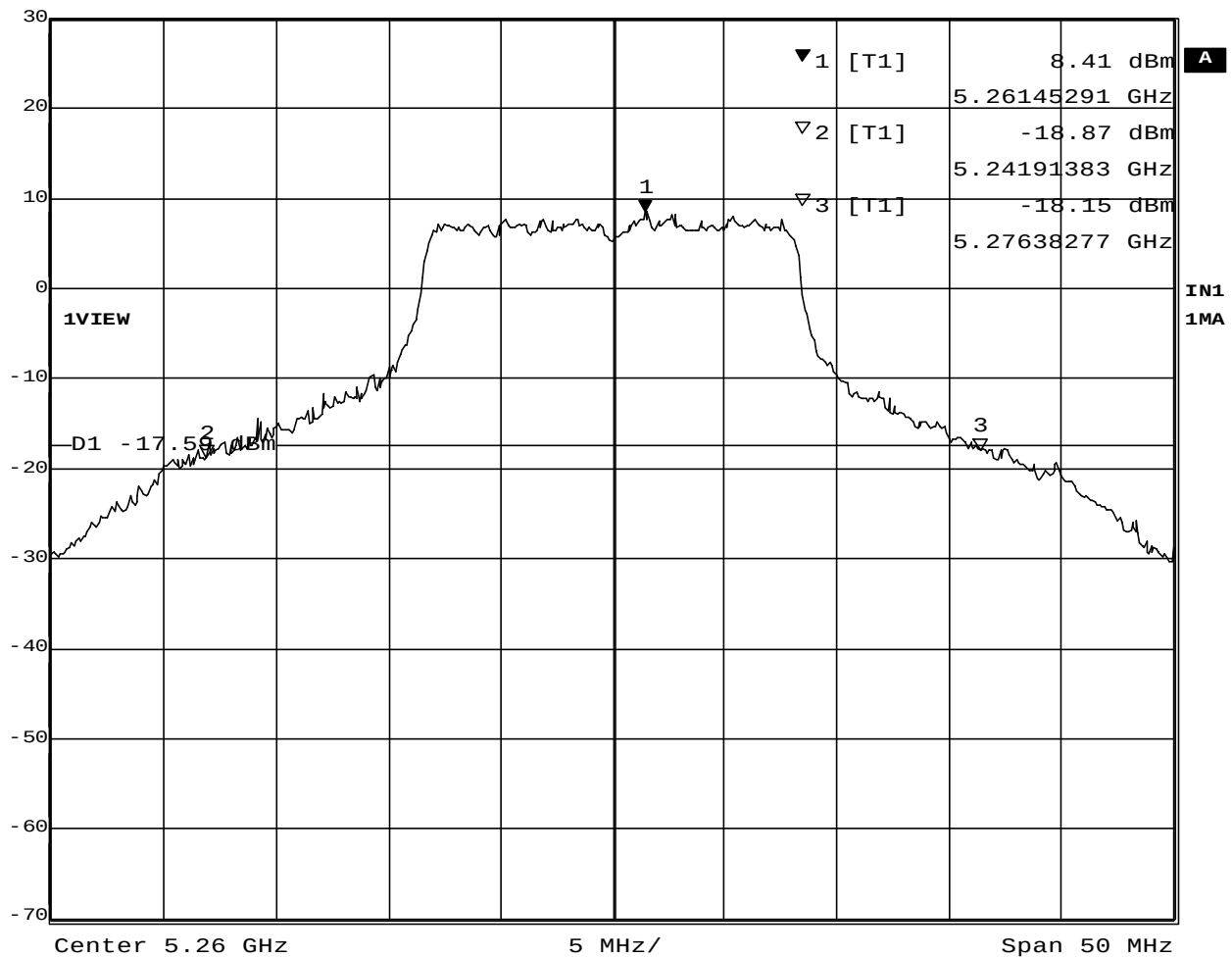


Date: 16.DEC.2002 18:42:55

Plot 1-1. 26dB BW at 5180MHz



Marker 1 [T1] RBW 300 kHz RF Att 40 dB  
Ref Lvl 8.41 dBm VBW 1 MHz  
30 dBm 5.26145291 GHz SWT 50 ms Unit dBm

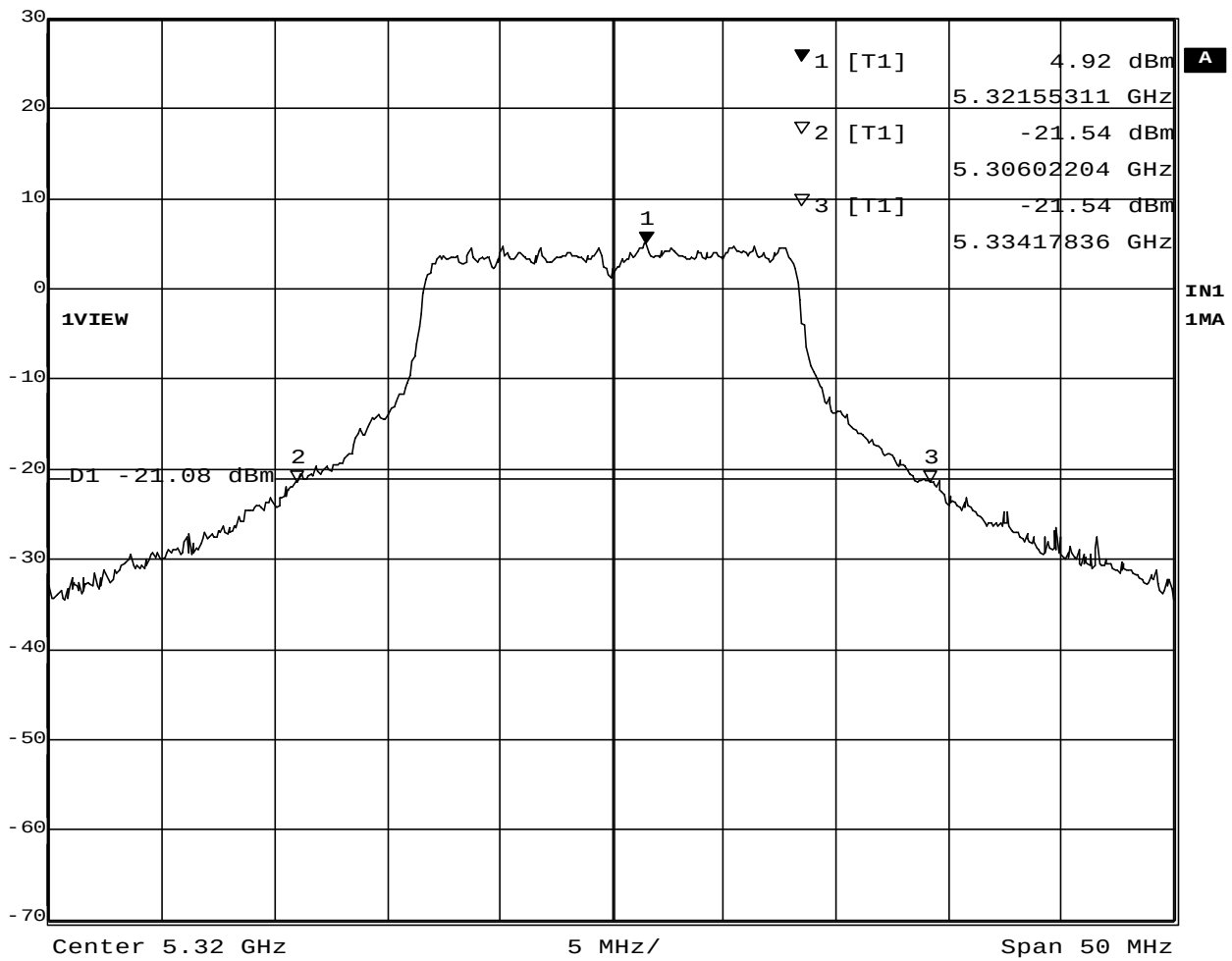


Date: 16.DEC.2002 18:46:48

Plot 1-2. 26dB BW at 5260MHz



|         |                |     |         |        |       |
|---------|----------------|-----|---------|--------|-------|
| Ref Lvl | Marker 1 [T1]  | RBW | 300 kHz | RF Att | 40 dB |
| 30 dBm  | 4.92 dBm       | VBW | 1 MHz   |        |       |
|         | 5.32155311 GHz | SWT | 50 ms   | Unit   | dBm   |



Date: 16.DEC.2002 19:55:27

Plot 1-3. 26dB BW at 5320MHz

## 2. Peak Conducted Transmit Output Power

[5150-5250MHz: FCC 15.407(a)(1), RSS 6.2.2q1(i) / q1(iV)(b)]

[5250-5350MHz: FCC 15.407(a)(2), RSS 6.2.2q1(ii) / q1(iV)(b)]

### 2.1 Test Procedure

The test was performed with two kinds of measurement methods as follows.

- 1) using Power meter
- 2) using Spectrum Analyzer according the Method #3 of the FCC Public Notice, DA 02-2138, August/30/2002

#### 2.1.1 Power Meter measurement method

To find the worse case in the implemented transmission modes in each measuring frequency (low, middle, high), the following test was performed with a power meter.

- A transmitter antenna terminal of EUT was connected to the input of a RF power sensor.
- Measurement was performed while EUT was operating in continuous transmission mode at the appropriate center frequencies. The spectrum of the continuous transmission test mode is shown in the Plot 2-0.

Table 2-1 : Test Instruments of power meter method

| Description                            | Model                        | Serial Number |
|----------------------------------------|------------------------------|---------------|
| Power Meter                            | HP 437B                      | 3043U03437    |
| Power Sensor                           | HP 8481A                     | US41030582    |
| Coax cables:<br>- Power Sensor <=> EUT | Length: 20 cm<br>Loss: 1.2dB |               |

Notes: - HP: Hewlett Packard

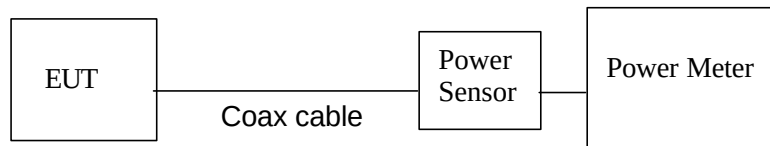


Figure 2-1: Measurement setup of power meter method

#### 2.1.2 Spectrum Analyzer measurement method

The spectrum analyzer was connected to the antenna terminal, while EUT was operating in continuous transmission mode (shown in the Plot 2-0) at the appropriate center frequencies.

The spectrum analyzer was set to :

VBW= 30kHz ( $\geq 1/T$ , where T is transmission pulse duration. See Plot 2-0.), RBW=1MHz,  
Span=30-40MHz encompassing the entire 26dB emission bandwidth of the transmission signal,  
Mode= sample detector, Trigger= free run

The band power measurement function was used to measure the peak power of each transmission mode selected by the step 2.1.1. The analyzer computed the peak power by integrating the spectrum across the 26 dB emission bandwidth given by the previous chapter.

Table 2-2 : Test Instruments of spectrum analyzer method

| Description                                 | Model                          | Serial Number |
|---------------------------------------------|--------------------------------|---------------|
| Spectrum Analyzer EMI Test Receiver         | R&S ESI26                      | 836119/003    |
| Coax cables:<br>- Spectrum Analyzer <=> EUT | Length: 110 cm<br>Loss: 2.2 dB |               |

Notes: - R&S: Rohde & Schwarz

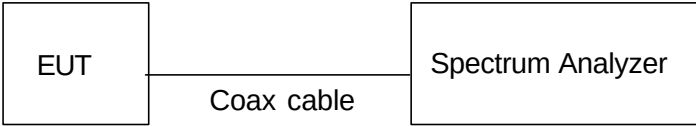
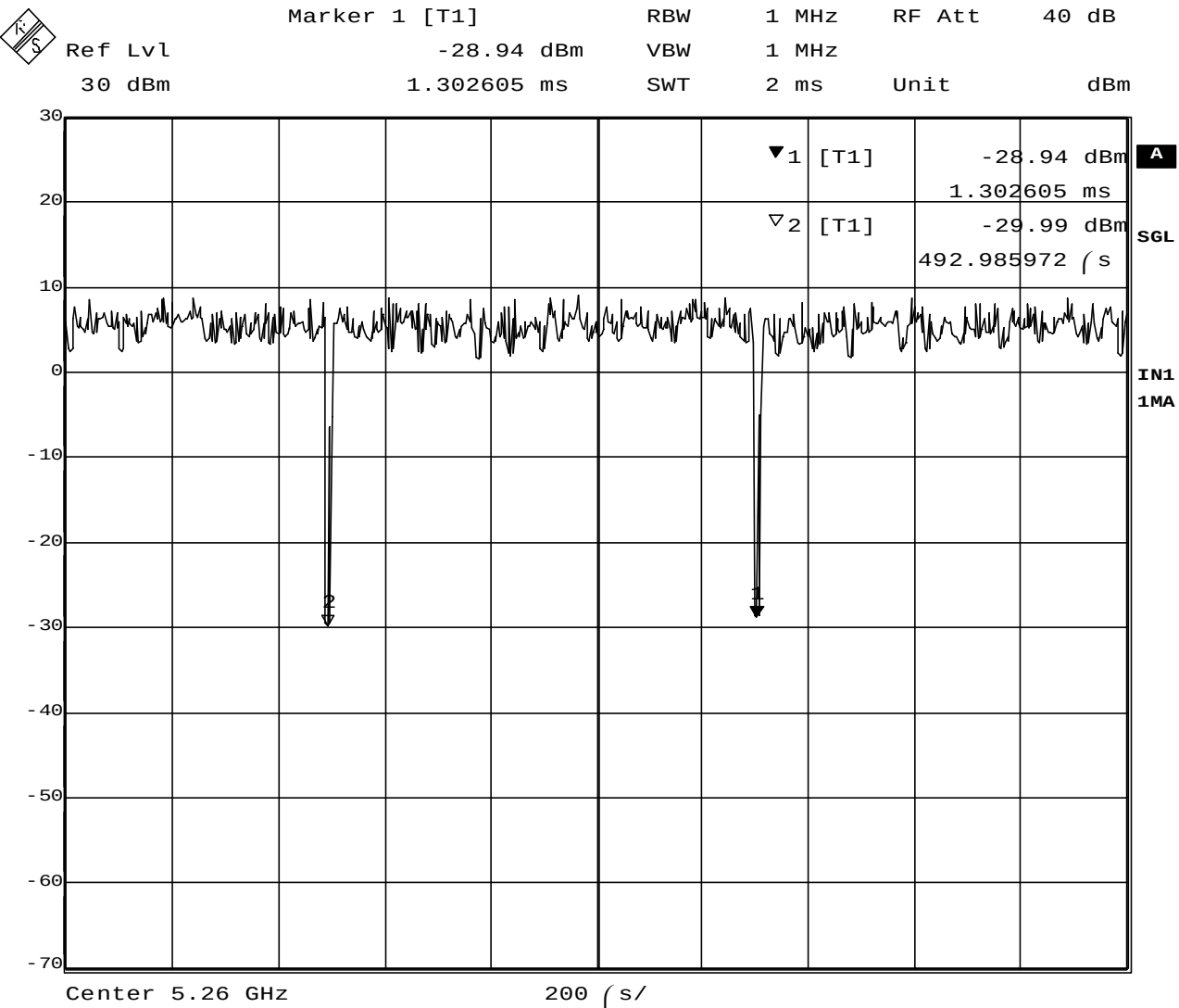


Figure 2-2 : Measurement setup of spectrum analyzer method



Date: 16.DEC.2002 18:33:32

Plot 2-0 Transmission Pulse Duration

## 2.2 Measurement Results

Test Date: November 18 and December 16, 2002

Table 2-2-1. Power meter measurement results (EUT: M/T 2672-CHU, s/n ZZ-00094)

| Operation<br>Frequency<br>[GHz] | Rated output power (conducted) [dBm] |           |            |            |            |            |            |            |
|---------------------------------|--------------------------------------|-----------|------------|------------|------------|------------|------------|------------|
|                                 | 6M<br>bps                            | 9M<br>bps | 12M<br>bps | 18M<br>bps | 24M<br>bps | 36M<br>bps | 48M<br>bps | 54M<br>bps |
| 5.180                           | 13.4                                 | 13.4      |            |            |            | 13.3       | 13.3       | 12.0       |
| specification                   | 14                                   |           |            |            |            |            |            | 13         |
| 5.260                           | 16.3                                 | 16.3      |            |            |            | 14.3       | 13.4       | 12.6       |
| specification                   | 17                                   |           |            |            |            | 15         | 14         | 13         |
| 5.320                           | 13.2                                 | 13.2      |            |            |            | 13.2       | 13.2       | 12.0       |
| specification                   | 14                                   |           |            |            |            |            |            | 13         |

[ Calculation table ]

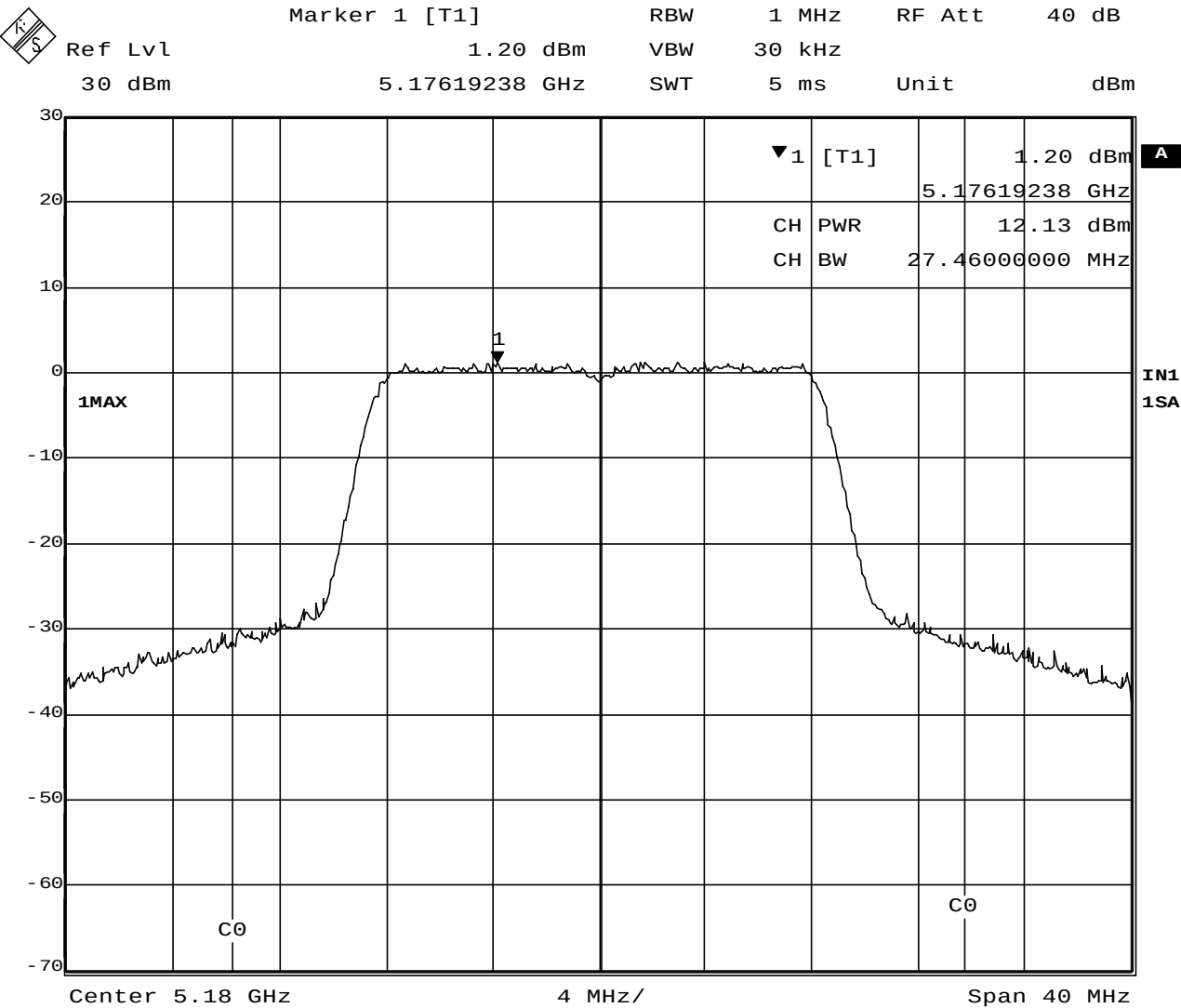
| Measured<br>Frequency<br>(MHz) | Power<br>Meter<br>Reading<br>(dBm) | Cable<br>Loss<br>(dB) | Results<br>(dBm) | Limit        |             | Peak<br>antenna gain<br>of EUT<br>(dBi) | EIRP<br>(dBm) | IC limit<br>(dBm) |
|--------------------------------|------------------------------------|-----------------------|------------------|--------------|-------------|-----------------------------------------|---------------|-------------------|
|                                |                                    |                       |                  | FCC<br>(dBm) | IC<br>(dBm) |                                         |               |                   |
| 5180                           | 13.4                               | 1.2                   | <b>14.6</b>      | 17           | N/A         | 1.42                                    | <b>16.0</b>   | 23                |
| 5260                           | 16.3                               | 1.2                   | <b>17.5</b>      | 24           | 24          |                                         | <b>18.9</b>   | 30                |
| 5320                           | 13.2                               | 1.2                   | <b>14.4</b>      | 24           | 24          |                                         | <b>15.8</b>   | 30                |

Table 2-2-2. Spectrum analyzer measurement results (EUT: M/T 2672-CHU, s/n ZZ-00094)

| Measured<br>Frequency<br>(MHz) | Analyzer<br>reading<br>(dBm) | Trace<br>number | Cable<br>Loss<br>(dB) | Results<br>(dBm) | Limit        |             | Peak<br>antenna gain<br>of EUT<br>(dBi) | EIRP<br>(dBm) | IC limit<br>(dBm) |
|--------------------------------|------------------------------|-----------------|-----------------------|------------------|--------------|-------------|-----------------------------------------|---------------|-------------------|
|                                |                              |                 |                       |                  | FCC<br>(dBm) | IC<br>(dBm) |                                         |               |                   |
| 5180                           | 12.13                        | Plot 2-1        | 2.2                   | <b>14.3</b>      | 17           | N/A         | 1.42                                    | <b>15.7</b>   | 23                |
| 5260                           | 15.04                        | Plot 2-2        | 2.2                   | <b>17.2</b>      | 24           | 24          |                                         | <b>18.6</b>   | 30                |
| 5320                           | 12.16                        | Plot 2-3        | 2.2                   | <b>14.4</b>      | 24           | 24          |                                         | <b>15.8</b>   | 30                |



2.3 Trace Data

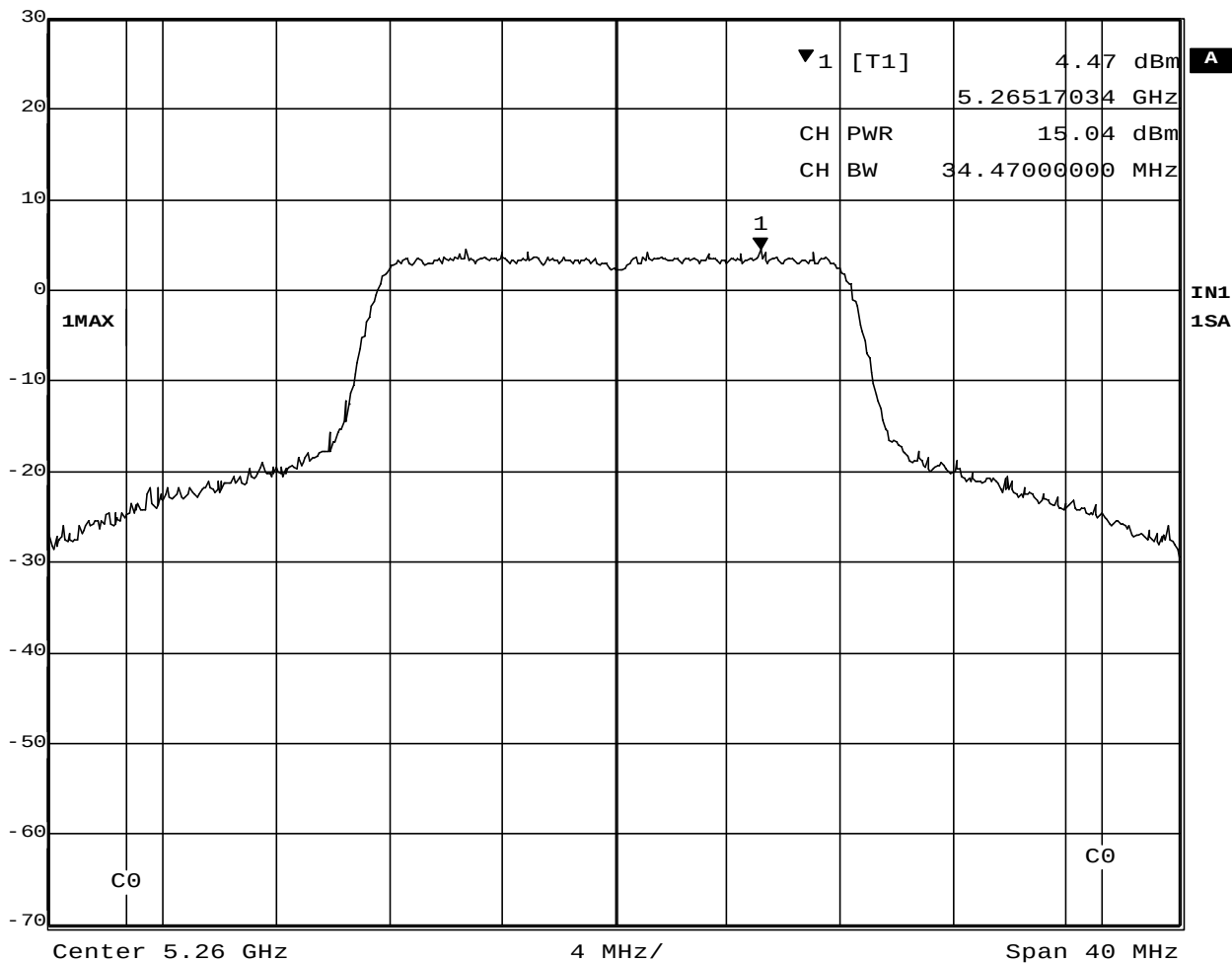


Date: 16.DEC.2002 18:53:02

Plot 2-1 Conducted Peak Power at 5180MHz



|         |                |     |        |        |       |
|---------|----------------|-----|--------|--------|-------|
| Ref Lvl | Marker 1 [T1]  | RBW | 1 MHz  | RF Att | 40 dB |
| 30 dBm  | 4.47 dBm       | VBW | 30 kHz |        |       |
|         | 5.26517034 GHz | SWT | 5 ms   | Unit   | dBm   |

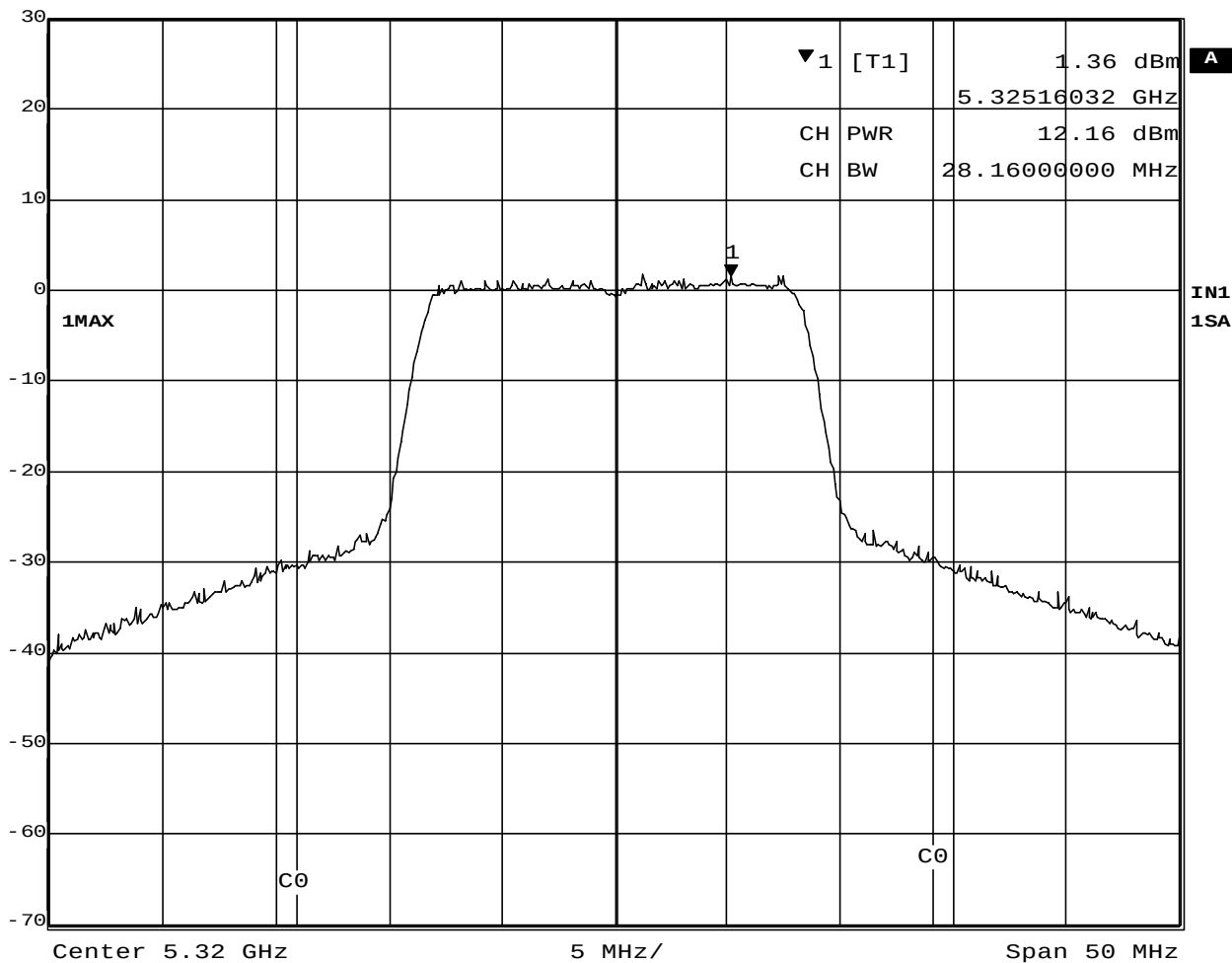


Date: 16.DEC.2002 18:56:31

Plot 2-2 Conducted Peak Power at 5260MHz



|         |                |     |        |        |       |
|---------|----------------|-----|--------|--------|-------|
| Ref Lvl | Marker 1 [T1]  | RBW | 1 MHz  | RF Att | 40 dB |
| 30 dBm  | 1.36 dBm       | VBW | 30 kHz |        |       |
|         | 5.32516032 GHz | SWT | 5 ms   | Unit   | dBm   |



Date: 16.DEC.2002 19:58:29

Plot 2-3 Conducted Peak Power at 5320MHz

### 3. Peak Power Spectral Density

[5150-5250MHz: FCC 15.407(a)(1), RSS 6.2.2q1(i), (iv)(b) ]  
 [5250-5350MHz: FCC 15.407(a)(2), RSS 6.2.2q1(ii), (iv)(b) ]

#### 3.1 Test Procedure

The spectrum analyzer was connected to the antenna terminal, while EUT was operating in continuous transmission mode at the appropriate center frequencies.

The spectrum analyzer was set to :

RBW= 1MHz, VBW=3MHz, Span=20MHz, Mode= sample detector,  
 The analyzer averaged 100 traces in averaging mode, then the marker was set to the highest position in the spectrum.

Also the Canadian PPSP was examined with the following spectrum analyzer setting.

RBW= 1MHz, VBW=1MHz, Span=20MHz, Mode= sample detector, averaging off

The test instruments and setup configuration are the same as the Table 2-2 and Figure 2-2.

#### 3.2 Measurement Results

Test Date: December 16, 2002

Table 3-1. Measurement results of PPSP (EUT: M/T 2672-CHU, s/n ZZ-00094)

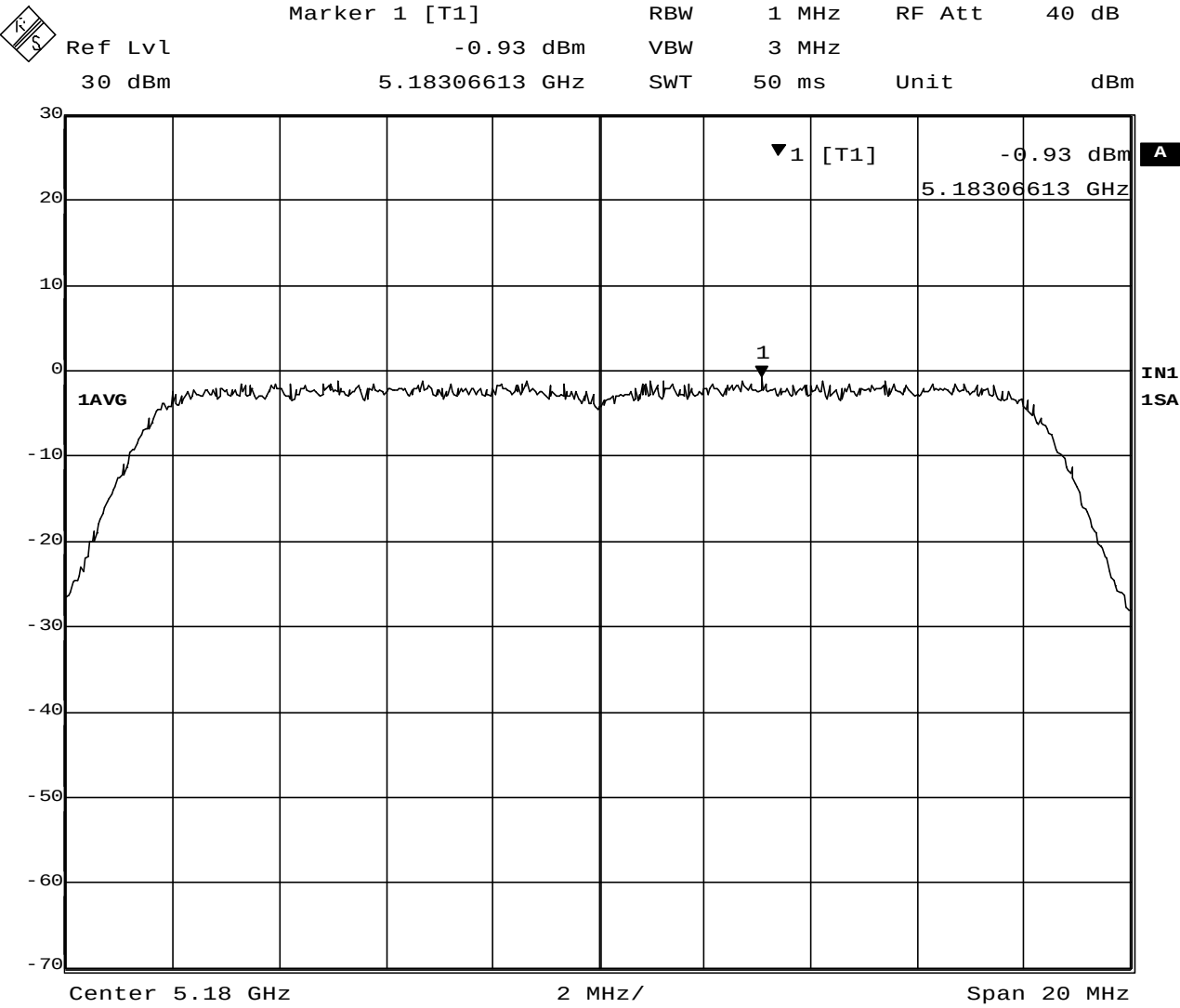
| Measured Frequency (MHz) | Analyzer reading (dBm) | Trace number | Cable Loss (dB) | Results (dBm) | FCC Limit (dBm) | IC Limit q1(ii) (dBm) | Peak Antenna Gain (dBm) | IC EIRP (dBm) | IC Limit q1(i) (dBm) |
|--------------------------|------------------------|--------------|-----------------|---------------|-----------------|-----------------------|-------------------------|---------------|----------------------|
| 5180                     | -0.93                  | Plot 3-1     | 2.2             | 1.3           | 4.0             | N/A                   | 1.42                    | 2.7           | 10                   |
| 5260                     | 1.97                   | Plot 3-2     | 2.2             | 4.2           | 11.0            | 11.0                  |                         |               | N/A                  |
| 5320                     | -1.50                  | Plot 3-3     | 2.2             | 0.7           | 11.0            | 11.0                  |                         |               | N/A                  |

Table 3-2. Measurement results of Canadian PPSP (EUT: M/T 2672-CHU, s/n ZZ-00094)

| Measured Frequency (MHz) | Analyzer reading (dBm) | Trace number | Cable Loss (dB) | Results (dBm) | IC Limit q1(iv)(b) $3 + 10\log B^*$ (dBm) |
|--------------------------|------------------------|--------------|-----------------|---------------|-------------------------------------------|
| 5180                     | 8.74                   | Plot 3-4     | 2.2             | 10.9          | 17.39                                     |
| 5260                     | 11.12                  | Plot 3-5     | 2.2             | 13.3          | 18.37                                     |
| 5320                     | 8.66                   | Plot 3-6     | 2.2             | 10.9          | 17.50                                     |

\* B = 26dB Bandwidth

3.3 Trace Data

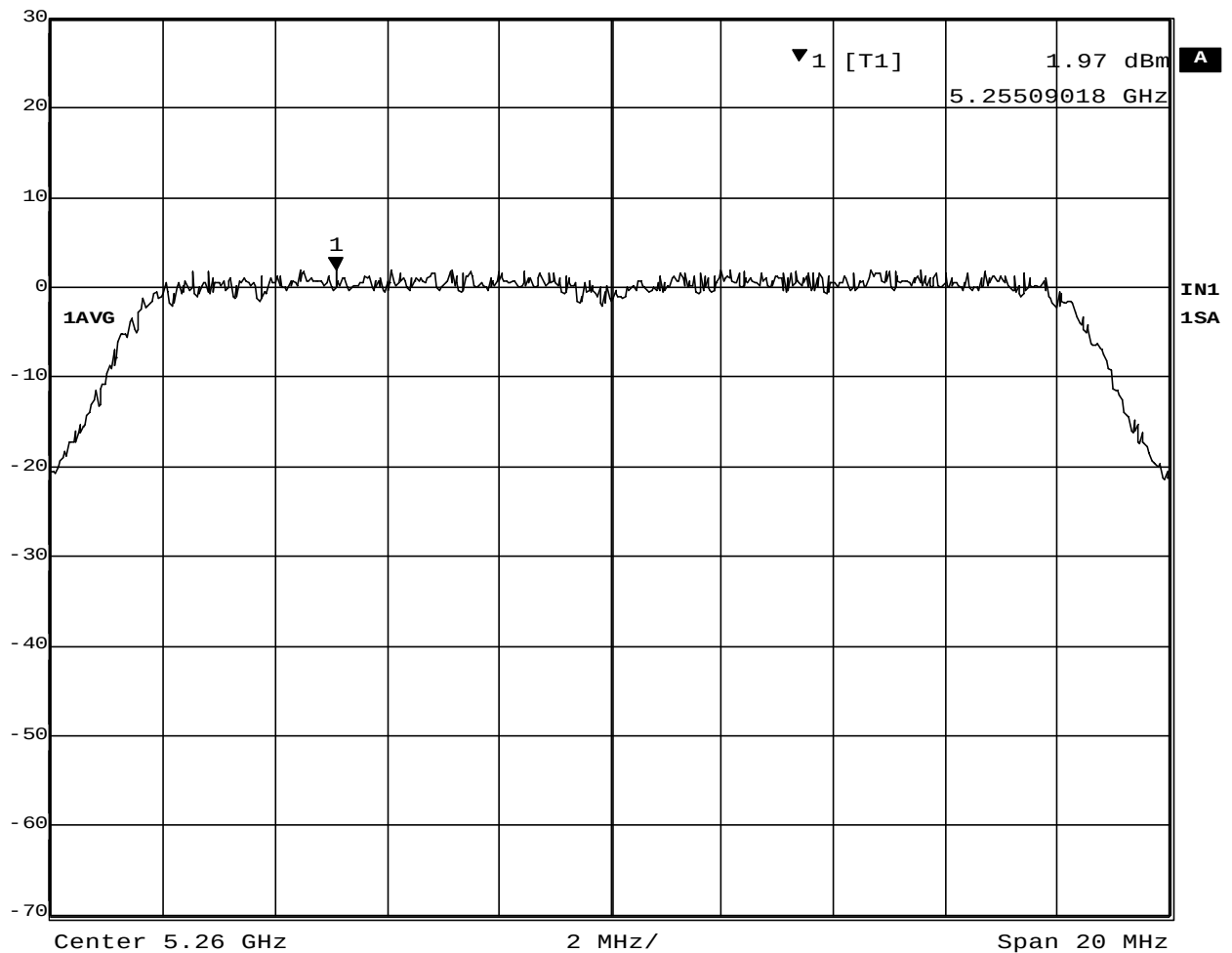


Date: 16.DEC.2002 19:03:45

Plot 3-1 Peak Power Spectral Density at 5180MHz



|         |                |     |       |        |       |
|---------|----------------|-----|-------|--------|-------|
| Ref Lvl | Marker 1 [T1]  | RBW | 1 MHz | RF Att | 40 dB |
| 30 dBm  | 1.97 dBm       | VBW | 3 MHz |        |       |
|         | 5.25509018 GHz | SWT | 50 ms | Unit   | dBm   |

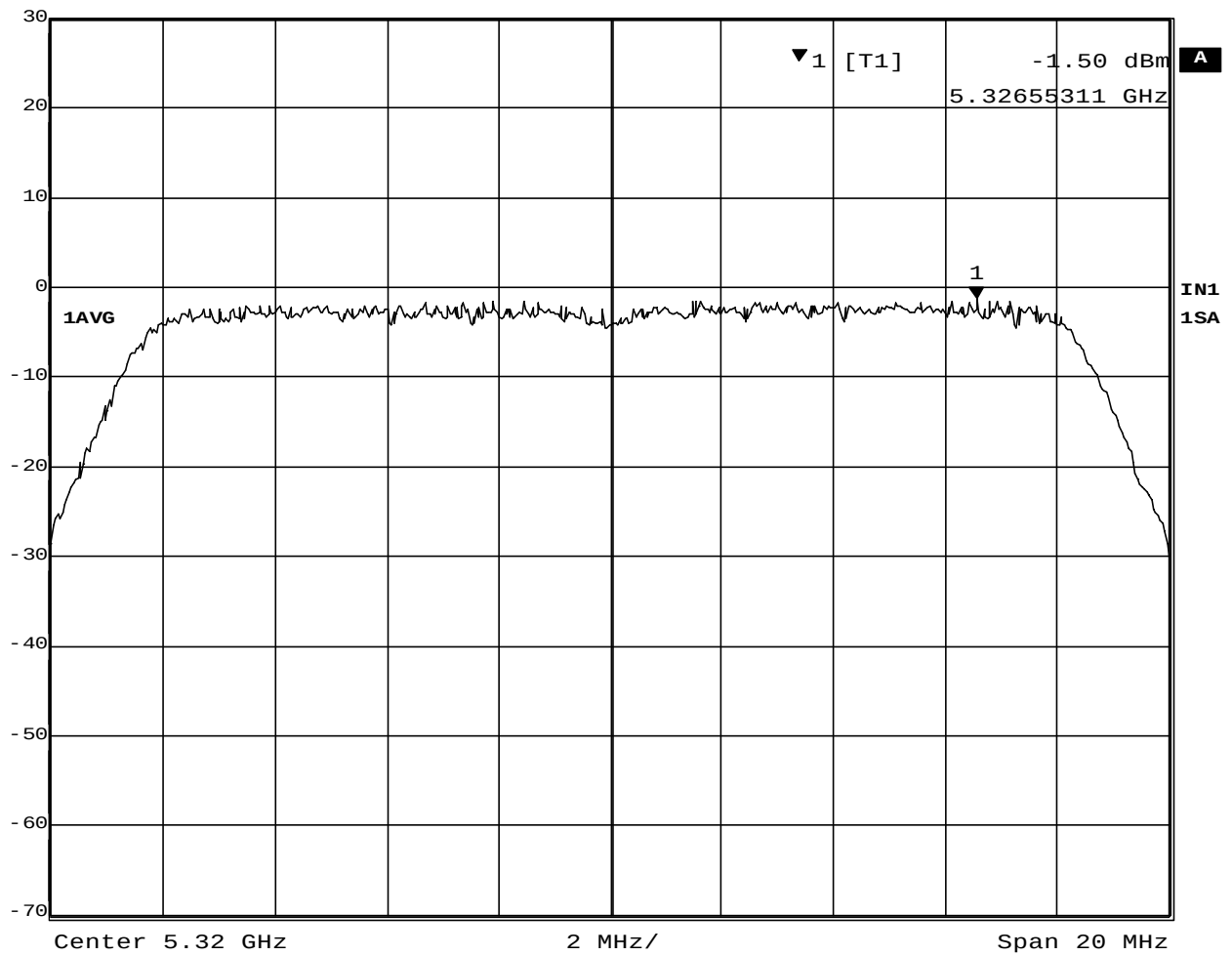


Date: 16.DEC.2002 19:05:26

Plot 3-2 Peak Power Spectral Density at 5260MHz



|         |                |     |       |        |       |
|---------|----------------|-----|-------|--------|-------|
| Ref Lvl | Marker 1 [T1]  | RBW | 1 MHz | RF Att | 40 dB |
| 30 dBm  | -1.50 dBm      | VBW | 3 MHz |        |       |
|         | 5.32655311 GHz | SWT | 50 ms | Unit   | dBm   |

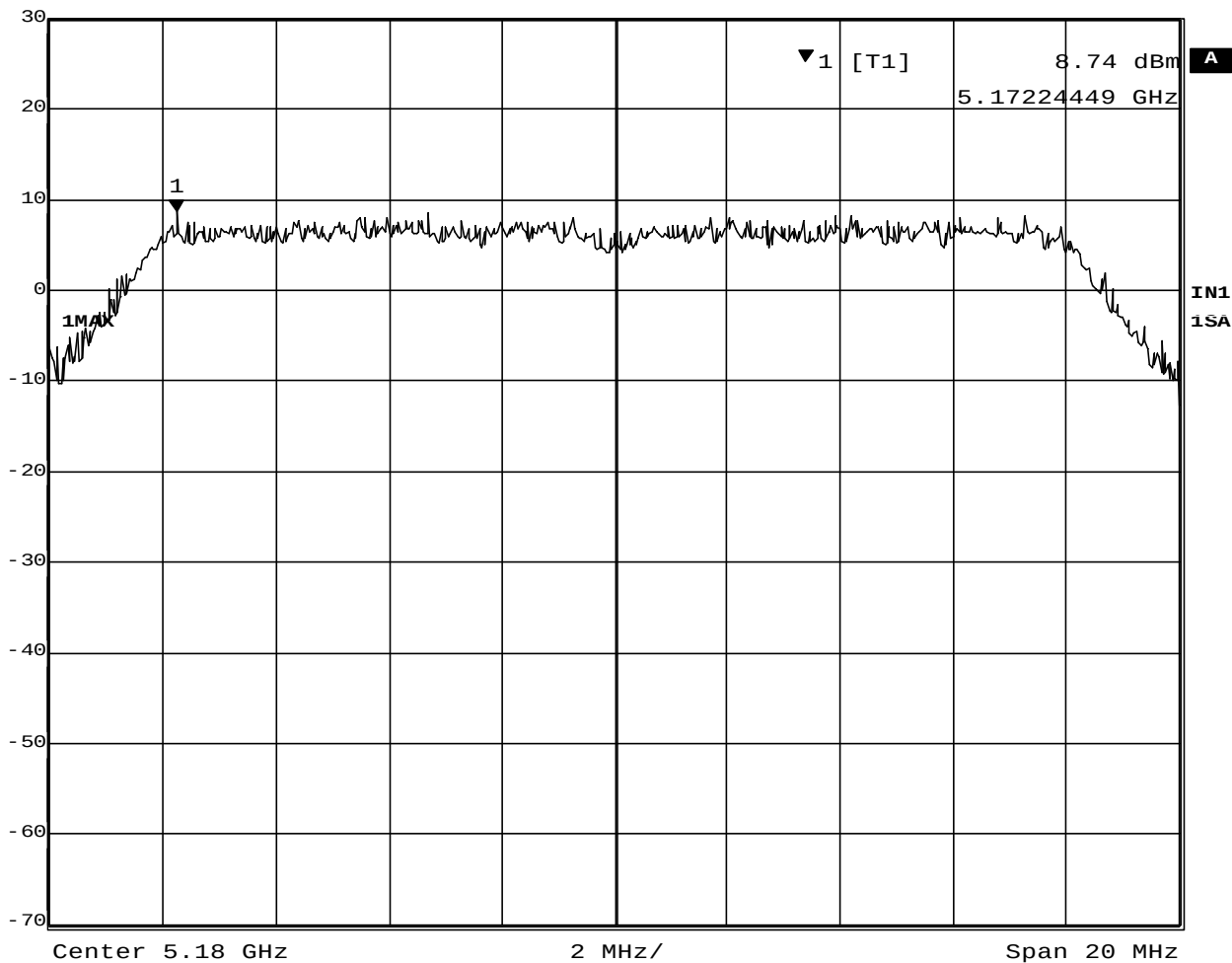


Date: 16.DEC.2002 19:06:37

Plot 3-3 Peak Power Spectral Density at 5320MHz



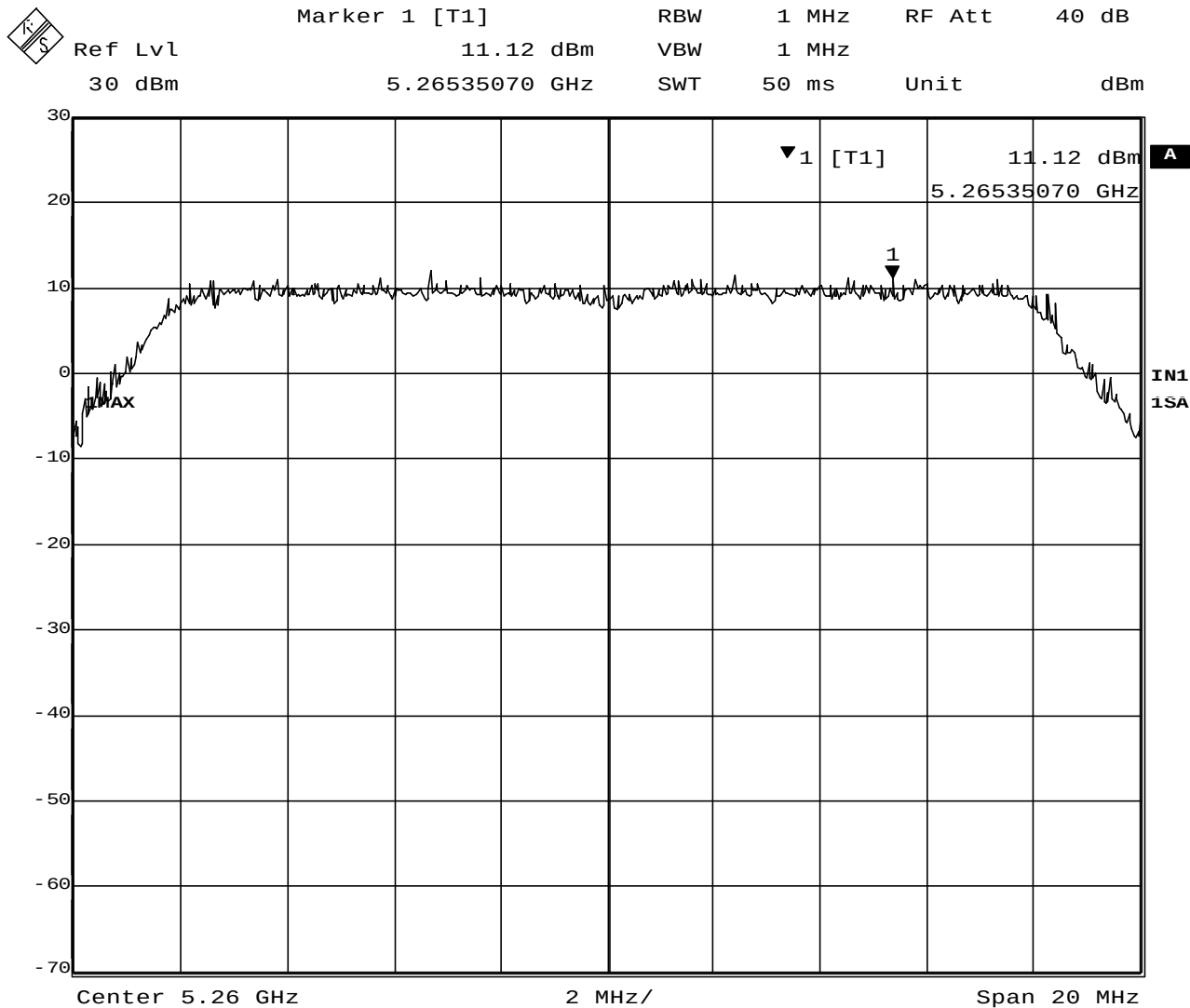
|         |                |     |       |        |       |
|---------|----------------|-----|-------|--------|-------|
| Ref Lvl | Marker 1 [T1]  | RBW | 1 MHz | RF Att | 40 dB |
| 30 dBm  | 8.74 dBm       | VBW | 1 MHz |        |       |
|         | 5.17224449 GHz | SWT | 50 ms | Unit   | dBm   |



Date: 16.DEC.2002 19:09:16

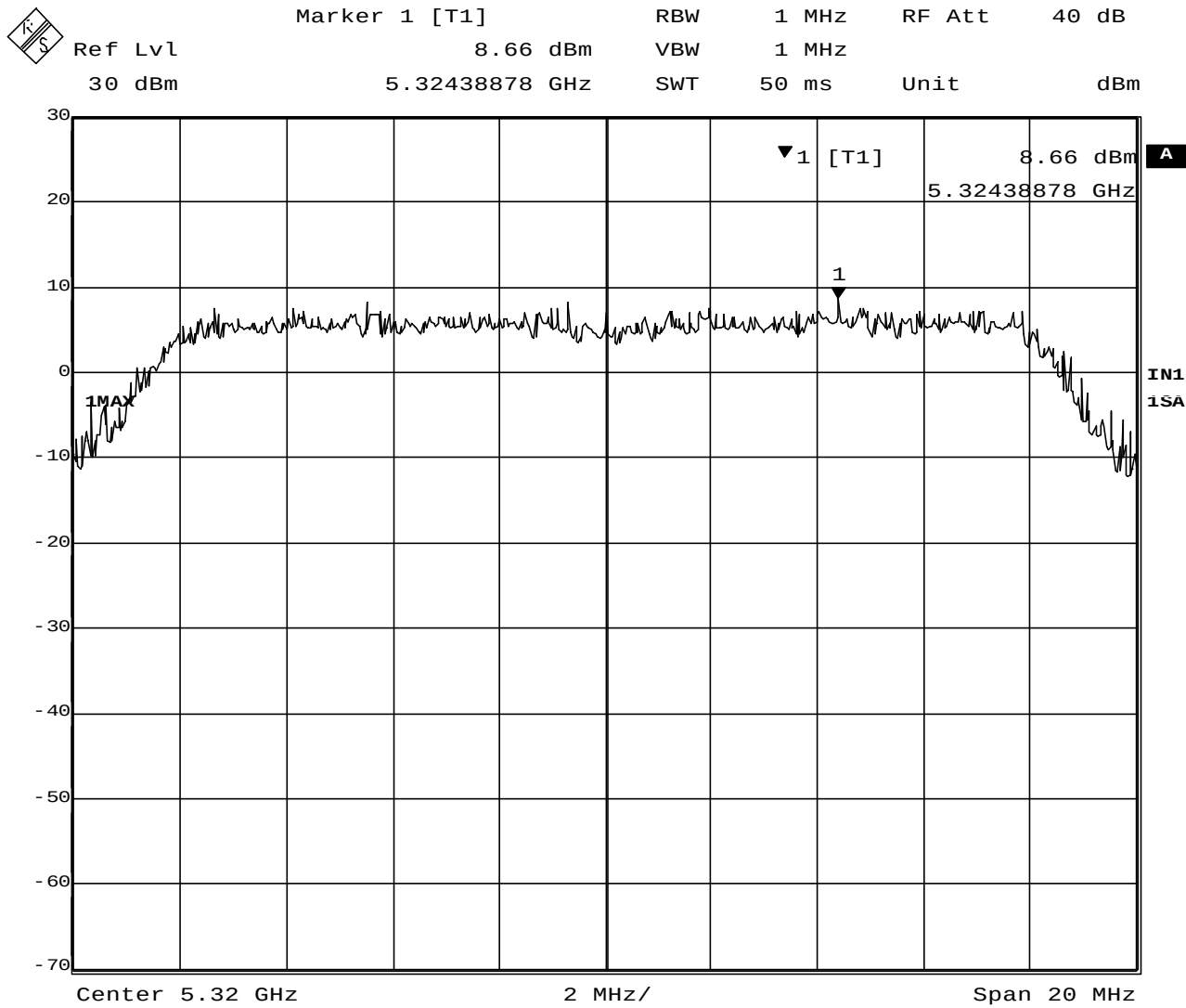
Plot 3-4 Peak Power Spectral Density at 5180MHz (IC RSS-210)





Date: 16.DEC.2002 19:10:34

Plot 3-5 Peak Power Spectral Density at 5260MHz (IC RSS-210)



Date: 16.DEC.2002 19:12:10

Plot 3-6 Peak Power Spectral Density at 5320MHz (IC RSS-210)

## 4. Peak Excursion Ratio

[ FCC 15.407(a)(6) ]

### 4.1 Test Procedure

The spectrum analyzer was connected to the antenna terminal, while EUT was operating in continuous transmission mode at the appropriate center frequencies.

- 1<sup>st</sup> trace :  
The spectrum analyzer was set to :  
RBW= 1MHz, VBW=3MHz, Mode= peak detector and max hold  
then to view.
- 2<sup>nd</sup> trace :  
The measurement result of the peak conducted power in Chapter 2.1.2 tend to present the similar values to the results of power meter, therefore the same setting of spectrum analyzer as the one for the Chapter 2.1.2 was used for the 2<sup>nd</sup> trace.  
i.e. VBW= 30kHz, RBW=1MHz, Span=30-40MHz, Trigger= free run,  
Mode= sample detector

The largest difference of amplitude delta between the two trances is the peak excursion.

The test instruments and setup configuration are the same as the Table 2-2 and Figure 2-2.

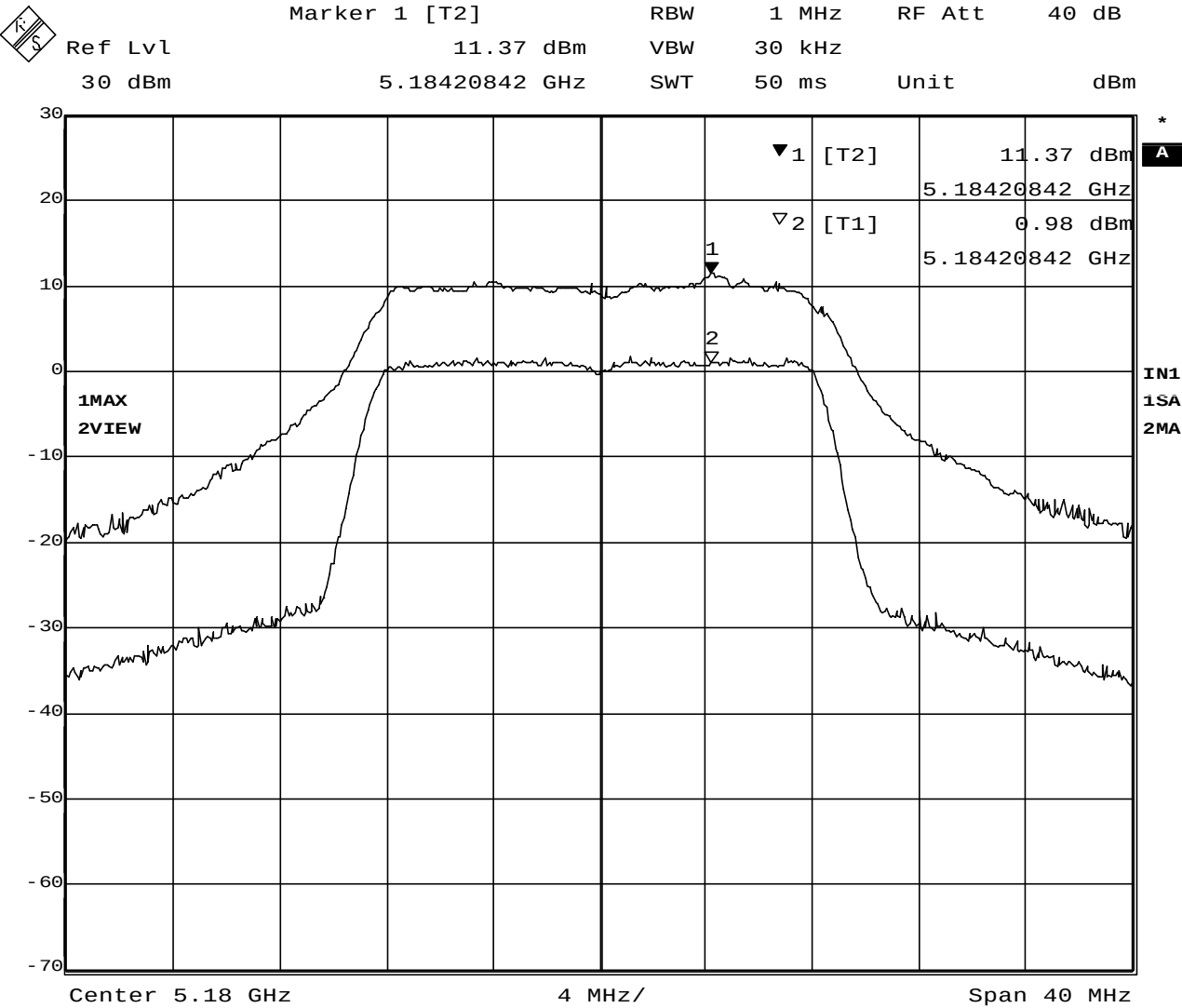
### 4.2 Measurement Results

Test Date: December 16, 2002

Table 4-2. Measurement results of Peak Excursion Ratio (EUT: M/T 2672-CHU, s/n ZZ-00094)

| Measured Frequency (MHz) | Analyzer Reading delta (dB) | FCC Limit (dB) | Margin (dB) | Trace number |
|--------------------------|-----------------------------|----------------|-------------|--------------|
| 5180                     | 10.39                       | 13             | 2.61        | Plot 4-1     |
| 5260                     | 9.65                        |                | 3.35        | Plot 4-2     |
| 5320                     | 10.51                       |                | 2.49        | Plot 4-3     |

4.3 Trace Data

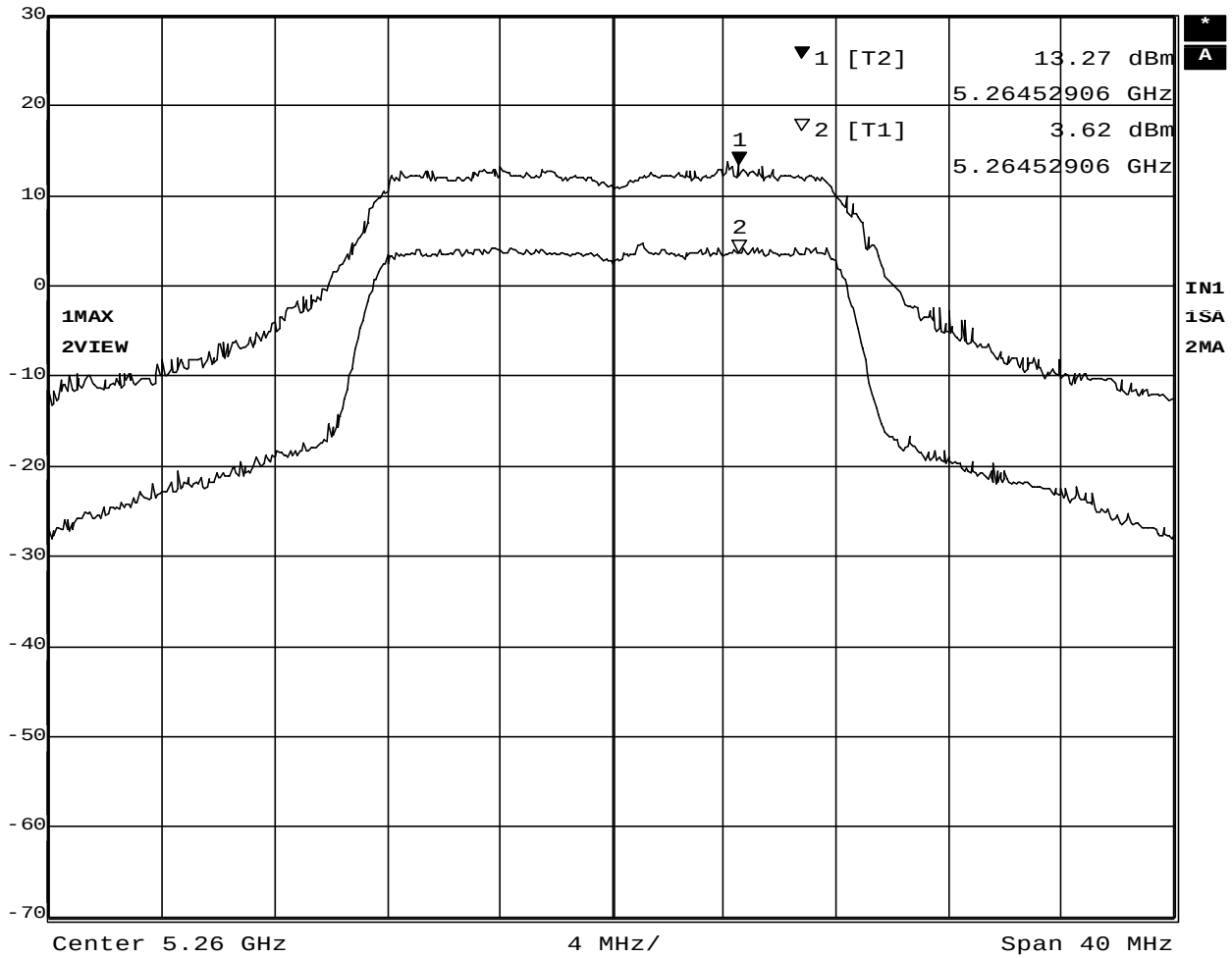


Date: 16.DEC.2002 19:26:18

Plot 4-1 Peak Excursion Ratio at 5180MHz



|         |                |     |        |        |       |
|---------|----------------|-----|--------|--------|-------|
| Ref Lvl | Marker 1 [T2]  | RBW | 1 MHz  | RF Att | 40 dB |
| 30 dBm  | 13.27 dBm      | VBW | 30 kHz |        |       |
|         | 5.26452906 GHz | SWT | 50 ms  | Unit   | dBm   |

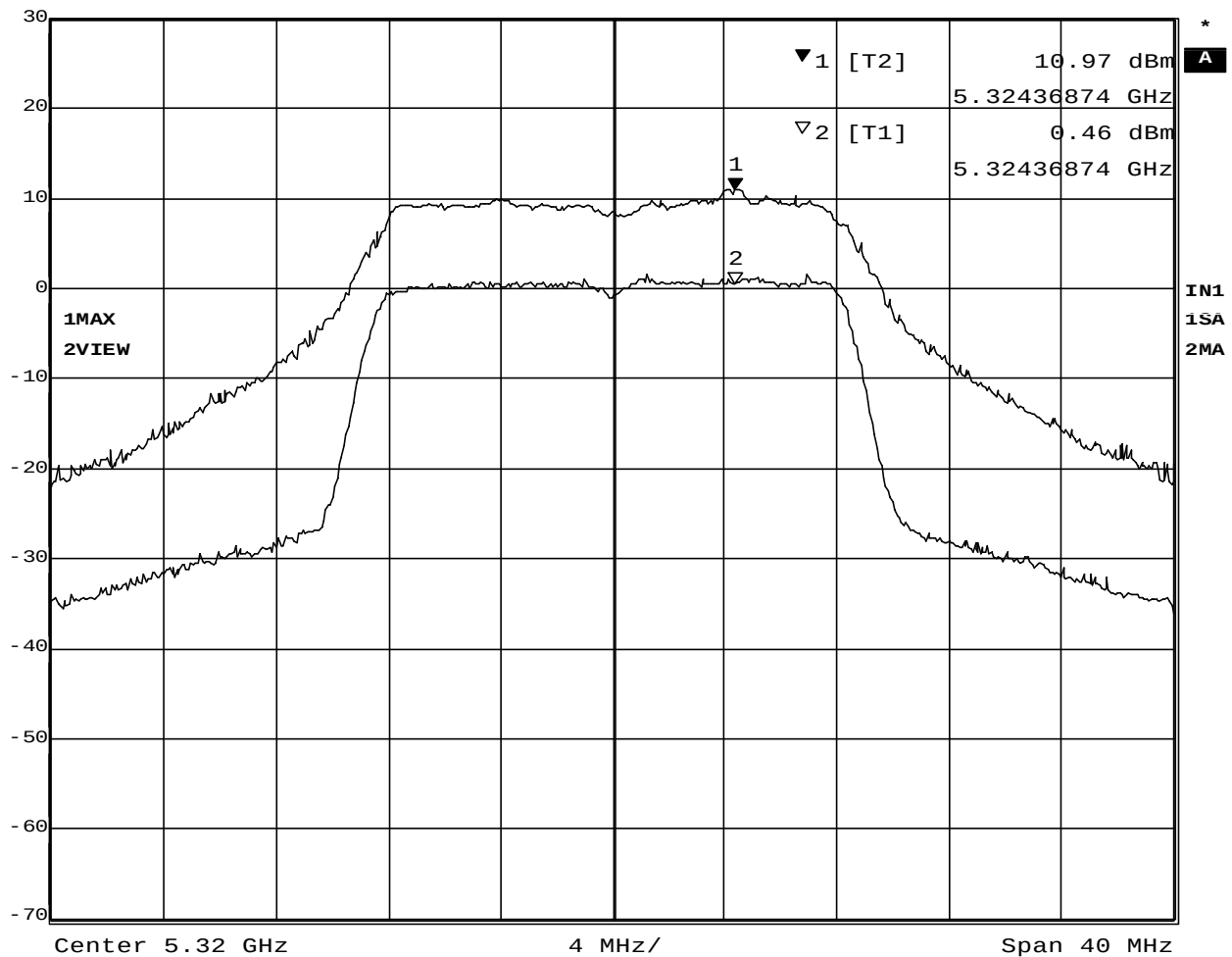


Date: 16.DEC.2002 19:29:41

Plot 4-2 Peak Excursion Ratio at 5260MHz



Marker 1 [T2] RBW 1 MHz RF Att 40 dB  
Ref Lvl 10.97 dBm VBW 30 kHz  
30 dBm 5.32436874 GHz SWT 50 ms Unit dBm



Date: 16.DEC.2002 19:32:50

Plot 4-3 Peak Excursion Ratio at 5320MHz

## 5. AC WIRELINE CONDUCTED EMISSIONS (150KHz – 30MHz)

[ FCC 15.207/ 15.407(b)(5), RSS-210 6.2.2(q1)(v) / 6.6 / 7.4 ]

### 5.1 Test Procedure

The conducted emissions are measured in the IBM shielded room with a spectrum analyzer in peak hold. Emissions closest to the limit are measured in the quasi-peak mode (QP) with the tuned receiver using a bandwidth of 9KHz. The emissions are maximized further by cable manipulation. The highest emissions relative to the limit are listed.

### 5.2 Test Instruments and Measurement Setup

Table 5-1. Conducted Emission Test Instrumentation

| Description                                                                                                                                                      | Model                               | Serial Number                                |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------|----------------------------------------------|
| Computer                                                                                                                                                         | IBM 6589-13J                        | 97-15613                                     |
| Spectrum Analyzer (100Hz-1.5GHz)                                                                                                                                 | HP 85680B                           | 2601A02634                                   |
| Spectrum Analyzer Display                                                                                                                                        | HP 85662A                           | 2542A12308                                   |
| Quasi-Peak Adapter                                                                                                                                               | HP 85650A                           | 2043A00062                                   |
| Receiver (9kHz-30MHz)                                                                                                                                            | R&S ESH3                            | 891806/012                                   |
| LISN                                                                                                                                                             | EMCO 3825/2                         | 1426                                         |
| Switch/control unit                                                                                                                                              | HP 3488A                            | 2719A17228                                   |
| Plotter                                                                                                                                                          | HP 7550A                            | 2631A33619                                   |
| Coax cables:<br>- Lisen-L <=> SW/Con.unit (SW100)<br>- Lisen-N <=> SW/Con.unit (SW101)<br>- SW/Con.unit <=> RCVR (Input)<br>- SW/Con.unit<=> Spe Ana.(Signal In) | Length:<br>4 m<br>4 m<br>1 m<br>1 m | - EMIC-L<br>- EMIC-N<br>- EMIC-R<br>- EMIC-S |

Notes: - HP: Hewlett Packard, R&S: Rohde & Schwarz

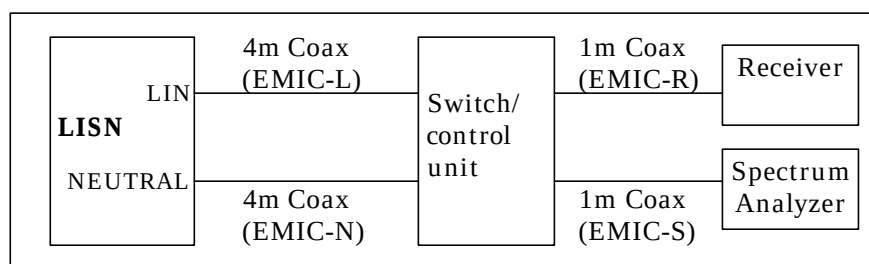


Figure 5. Cables for Conducted Emission Test

## 5.3 Measurement Results

The EUT was found to comply to the limits of FCC Part 15 Subpart E and RSS-210 with a margin of 18.3dB. The 6 highest emissions relative to the limits are reported.

Test Date: January 8, 2003

Table 5-2-1. EUT: M/T 2672-CHU, s/n ZZ-00094, Ch.36(5180MHz) **TX** mode 24Mbps

| Frequency (MHz) | Phase | QP Voltage (dBμV) | CISPR22 QP Limit (dBμV) | AV Voltage (dBμV) | CISPR22 AV Limit (dBμV) |
|-----------------|-------|-------------------|-------------------------|-------------------|-------------------------|
| 0.2025          | LINE  | 38.8              | 63.5                    | 33.6              | 53.5                    |
| 0.2743          | LINE  | 34.1              | 61.0                    | 29.4              | 51.0                    |
| 0.3430          | LINE  | 29.1              | 59.1                    | 25.2              | 49.1                    |
| 0.4095          | LINE  | 23.3              | 57.7                    | 19.3              | 47.7                    |
| 0.4792          | LINE  | 26.0              | 56.4                    | 22.4              | 46.4                    |
| 0.6151          | LINE  | 22.6              | 56.0                    | 18.7              | 46.0                    |

Table 5-2-2. EUT: M/T 2672-CHU, s/n ZZ-00094 , Ch.52(5260MHz) **TX** mode 24Mbps

| Frequency (MHz) | Phase   | QP Voltage (dBμV) | CISPR22 QP Limit (dBμV) | AV Voltage (dBμV) | CISPR22 AV Limit (dBμV) |
|-----------------|---------|-------------------|-------------------------|-------------------|-------------------------|
| 0.2041          | LINE    | 40.1              | 63.4                    | 35.0              | 53.4                    |
| 0.2728          | LINE    | 34.0              | 61.0                    | 29.1              | 51.0                    |
| 0.3411          | LINE    | 29.3              | 59.2                    | 25.2              | 49.2                    |
| 0.4080          | NEUTRAL | 20.6              | 57.7                    | 17.6              | 47.7                    |
| 0.4772          | LINE    | 24.8              | 56.4                    | 21.0              | 46.4                    |
| 0.6174          | LINE    | 23.0              | 56.0                    | 19.1              | 46.0                    |

Table 5-2-3. EUT: M/T 2672-CHU, s/n ZZ-00094, Ch.64(5320MHz) **TX** mode 24Mbps

| Frequency (MHz) | Phase | QP Voltage (dBμV) | CISPR22 QP Limit (dBμV) | AV Voltage (dBμV) | CISPR22 AV Limit (dBμV) |
|-----------------|-------|-------------------|-------------------------|-------------------|-------------------------|
| 0.2041          | LINE  | 40.0              | 63.4                    | 35.1              | 53.4                    |
| 0.2763          | LINE  | 33.5              | 60.9                    | 28.7              | 50.9                    |
| 0.3410          | LINE  | 29.3              | 59.2                    | 25.2              | 49.2                    |
| 0.4102          | LINE  | 23.8              | 57.6                    | 19.9              | 47.6                    |
| 0.4788          | LINE  | 26.0              | 56.4                    | 22.2              | 46.4                    |
| 0.6176          | LINE  | 23.0              | 56.0                    | 19.1              | 46.0                    |

Table 5-2-4. EUT: M/T 2672-CHU, s/n ZZ-00094, Ch. 52(5260MHz) **RX** mode

| Frequency (MHz) | Phase | QP Voltage (dBμV) | CISPR22 QP Limit (dBμV) | AV Voltage (dBμV) | CISPR22 AV Limit (dBμV) |
|-----------------|-------|-------------------|-------------------------|-------------------|-------------------------|
| 0.2024          | LINE  | 39.0              | 63.5                    | 34.1              | 53.5                    |
| 0.2711          | LINE  | 32.5              | 61.1                    | 27.4              | 51.1                    |
| 0.3397          | LINE  | 28.0              | 59.2                    | 24.1              | 49.2                    |
| 0.4106          | LINE  | 24.2              | 57.6                    | 20.0              | 47.6                    |
| 0.4771          | LINE  | 24.9              | 56.4                    | 21.3              | 46.4                    |
| 0.6135          | LINE  | 21.3              | 56.0                    | 17.1              | 46.0                    |



## 6. RESTRICTED BANDS RADIATIONS (30MHz – 1GHz)

[ FCC 15.205&209 / 15.407(b)(1),(2),(5),(6) ]  
 [ RSS-210 6.2.1 / 6.2.2(q1)(i),(ii),(v) / 6.3 / 7.3 ]

### 6.1 Test Procedure

Preliminary radiated emissions are measured in the semi-anechoic chamber at a 3 meter distance on every azimuth in both horizontal and vertical polarity. The antennas are also scanned in height. The emissions are recorded with a spectrum analyzer in peak hold mode. The identified emissions are further maximized by a cable manipulation. Emissions closest to the limits are measured in the quasi-peak mode with the tuned receiver using a bandwidth of 120kHz. The highest emissions relative to the limit are listed.

### 6.2 Test Instruments and Measurement Setup

Table 6-1 Radiated Emission Test Instrumentation

| Description                                          | Model      | Serial Number |
|------------------------------------------------------|------------|---------------|
| Computer                                             | IBM 5551-L | #4            |
| Spectrum Analyzer (100Hz-1.5GHz) for 30-200MHz       | HP 85680B  | 3019A05155    |
| Spectrum Analyzer Display for 30-200MHz              | HP 85662A  | 3026A19353    |
| Quasi-Peak Adapter for 30-200MHz                     | HP 85650A  | 3033A01449    |
| Spectrum Analyzer (100Hz-1.5GHz) for 200-1000MHz     | HP 85680B  | 2841A04252    |
| Spectrum Analyzer Display for 200-1000MHz            | HP 85662A  | 2816A16831    |
| Quasi-Peak Adapter for 200-1000MHz                   | HP 85650A  | 2811A01156    |
| Amplifier (100KHz-1.3GHz)                            |            |               |
| - for 30-200MHz                                      | HP 8447D   | 2805A02919    |
| - for 200-1000MHz                                    | HP 8447D   | 2944A03506    |
| Biconical Antenna (30-200MHz)                        | EMCO 3108  | 2309          |
| Log-Periodic Antenna (200-1000MHz)                   | EMCO 3146  | 1585          |
| Receiver (20MHz-1.3GHz)                              | R&S ESVP   | 893202/018    |
| Switch/control unit                                  | HP 3488A   | 2719A17226    |
| N-Coax cables:                                       | Length:    |               |
| - Bi-coni Ant <=> 10m Cable                          | 9 m        | - EM103L01    |
| - 10m Cable <=> Shield Panel                         | 10 m       | - EM103L02    |
| - Shield Panel <=> RF Amp                            | 7 m        | - EM103L03    |
| - RF Amp <=> Power Splitter                          | 0.5m       | - EM103L04    |
| - Log-peri Ant <=> 10m Cable                         | 9 m        | - EM103H01    |
| - 10m Cable <=> Shield Panel                         | 10 m       | - EM103H02    |
| - Shield Panel <=> RF Amp                            | 7 m        | - EM103H03    |
| - RF Amp <=> Power Splitter                          | 0.5m       | - EM103H04    |
| Coax cables:                                         |            |               |
| - Power Splitter <=> SW/Con.unit (SW110)             | 1 m        | - EM103L05    |
| - Power Splitter <=> SW/Con.unit (SW300)             | 1 m        | - EM103L06    |
| - Power Splitter <=> SW/Con.unit (SW100)             | 1 m        | - EM103H05    |
| - Power Splitter <=> SW/Con.unit (SW301)             | 1 m        | - EM103H06    |
| - SW/Con.unit <=> Receiver (Input)                   | 2 m        | - EM1RCV      |
| - SW/Con.unit <=> Spe Ana.(Signal In) for 30- 200MHz | 2 m        | - EM1SPL      |

|                                                       |     |          |
|-------------------------------------------------------|-----|----------|
| - SW/Con.unit <=> Spe Ana.(Signal In) for 200-1000MHz | 2 m | - EM1SPH |
|-------------------------------------------------------|-----|----------|

Notes:

- HP: Hewlett Packard, R&amp;S: Rohde &amp; Schwarz

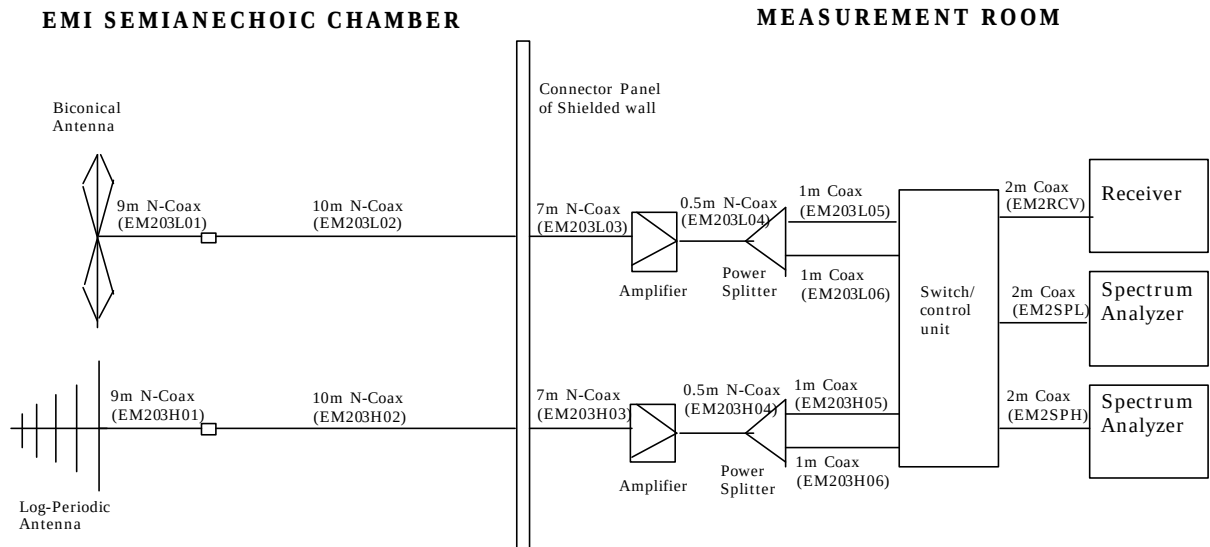


Figure 6 Cables for Radiated Emission Test

## 6.3 Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Loss, and subtracting Amplifier Gain from the measured reading. In this test facility, the Antenna Factor, Cable Loss, and Amplifier Gains are loaded into the Rohde & Schwarz Receiver and the corrected field strength can be read directly on the receiver. All factors are included in the reported data.

$$FS = R + AF + CORR$$

where:

|      |   |                                   |
|------|---|-----------------------------------|
| FS   | = | Field Strength                    |
| R    | = | Measured Receiver Input Amplitude |
| AF   | = | Antenna Factor                    |
| CORR | = | Correction Factor = CL - AG       |
| CL   | = | Cable Loss                        |
| AG   | = | Amplifier Gain                    |

For example:

Given a Receiver input reading of 51.5dB $\mu$ V; Antenna Factor of 8.5dB/m; Cable Loss of 1.3dB; and an Amplifier Gain of 26dB. The Field Strength of the measured emission is:

$$FS = 51.5 + 8.5 + 1.3 - 26.0 = 35.3\text{dB}\mu\text{V/m}$$

Conversion between dB $\mu$ V/m (or dB $\mu$ V) and  $\mu$ V/m (or  $\mu$ V) are done as:

$$\text{Level(dB}\mu\text{V/m)} = 20 \times \text{Log( Level}(\mu\text{V/m) )}$$

$$40\text{dB}\mu\text{V/m} = 100\mu\text{V/m}$$

$$48\text{dB}\mu\text{V/m} = 250\mu\text{V/m}$$

## 6.4 Measurement Results

The EUT was found to comply to the limits of FCC Part 15 Subpart E and RSS-210 with a margin of 1.5 dB at 30MHz - 1000MHz band.

The 6 highest emissions relative to the limits are reported.

Test Date: November 25, 2002

Table 6-2-1. EUT: M/T 2672-CHU, s/n ZZ-00094, Ch.36(5180MHz) **TX** mode 24Mbps

| Frequency (MHz) | Polarity (H/V) | Measured (dB $\mu$ V) | Antenna Factor (dB/m) | Corr. Factor (dB) | Field Strength (dB $\mu$ V/m) | Limit (dB $\mu$ V/m) | Field Strength ( $\mu$ V/m) | Limit ( $\mu$ V/m) |
|-----------------|----------------|-----------------------|-----------------------|-------------------|-------------------------------|----------------------|-----------------------------|--------------------|
| 37.714          | H              | 33.7                  | 12.4                  | -18.7             | 27.4                          | 40.0                 | 23.4                        | 100                |
| 59.160          | V              | 37.3                  | 9.5                   | -18.1             | 28.7                          | 40.0                 | 27.2                        | 100                |
| 199.972         | H              | 37.3                  | 13.8                  | -15.7             | 35.4                          | 43.5                 | 58.9                        | 150                |
| 454.779         | V              | 41.0                  | 16.5                  | -13.8             | 43.7                          | 46.0                 | 153.1                       | 200                |
| 632.017         | H              | 26.2                  | 19.2                  | -11.9             | 33.5                          | 46.0                 | 47.3                        | 200                |
| 863.996         | V              | 24.6                  | 22.2                  | -10.3             | 36.5                          | 46.0                 | 66.8                        | 200                |

Table 6-2-2. EUT: M/T 2672-CHU, s/n ZZ-00094, Ch.52(5260MHz) **TX** mode 24Mbps

| Frequency (MHz) | Polarity (H/V) | Measured (dB $\mu$ V) | Antenna Factor (dB/m) | Corr. Factor (dB) | Field Strength (dB $\mu$ V/m) | Limit (dB $\mu$ V/m) | Field Strength ( $\mu$ V/m) | Limit ( $\mu$ V/m) |
|-----------------|----------------|-----------------------|-----------------------|-------------------|-------------------------------|----------------------|-----------------------------|--------------------|
| 38.917          | V              | 33.9                  | 12.2                  | -18.6             | 27.5                          | 40.0                 | 23.7                        | 100                |
| 58.463          | V              | 37.4                  | 9.5                   | -18.2             | 28.7                          | 40.0                 | 27.2                        | 100                |
| 199.972         | H              | 38.2                  | 13.8                  | -15.7             | 36.3                          | 43.5                 | 65.3                        | 150                |
| 454.779         | V              | 40.9                  | 16.5                  | -13.8             | 43.6                          | 46.0                 | 151.4                       | 200                |
| 733.234         | V              | 24.3                  | 20.6                  | -10.9             | 34.0                          | 46.0                 | 50.1                        | 200                |
| 899.878         | V              | 25.8                  | 22.5                  | -9.3              | 39.0                          | 46.0                 | 89.1                        | 200                |

Table 6-2-3. EUT: M/T 2672-CHU, s/n ZZ-00094, Ch.64(5320MHz) **TX** mode 24Mbps

| Frequency (MHz) | Polarity (H/V) | Measured (dB $\mu$ V) | Antenna Factor (dB/m) | Corr. Factor (dB) | Field Strength (dB $\mu$ V/m) | Limit (dB $\mu$ V/m) | Field Strength ( $\mu$ V/m) | Limit ( $\mu$ V/m) |
|-----------------|----------------|-----------------------|-----------------------|-------------------|-------------------------------|----------------------|-----------------------------|--------------------|
| 38.320          | V              | 35.1                  | 12.3                  | -18.7             | 28.7                          | 40.0                 | 27.2                        | 100                |
| 58.270          | V              | 37.4                  | 9.5                   | -18.2             | 28.7                          | 40.0                 | 27.2                        | 100                |
| 199.971         | H              | 38.0                  | 13.8                  | -15.7             | 36.1                          | 43.5                 | 63.8                        | 150                |
| 454.779         | V              | 41.0                  | 16.5                  | -13.8             | 43.7                          | 46.0                 | 153.1                       | 200                |
| 899.872         | V              | 25.6                  | 22.5                  | -9.3              | 38.8                          | 46.0                 | 87.1                        | 200                |
| 930.357         | H              | 20.3                  | 22.6                  | -9.0              | 33.9                          | 46.0                 | 49.5                        | 200                |

Table 6-2-4. EUT: M/T 2672-CHU, s/n ZZ-00094, Ch.52(5260MHz) **RX** mode

| Frequency (MHz) | Polarity (H/V) | Measured (dB $\mu$ V) | Antenna Factor (dB/m) | Corr. Factor (dB) | Field Strength (dB $\mu$ V/m) | Limit (dB $\mu$ V/m) | Field Strength ( $\mu$ V/m) | Limit ( $\mu$ V/m) |
|-----------------|----------------|-----------------------|-----------------------|-------------------|-------------------------------|----------------------|-----------------------------|--------------------|
| 38.619          | V              | 33.8                  | 12.2                  | -18.5             | 27.5                          | 40.0                 | 23.7                        | 100                |
| 57.636          | V              | 36.7                  | 9.7                   | -18.2             | 28.2                          | 40.0                 | 25.7                        | 100                |
| 62.952          | V              | 37.6                  | 9.1                   | -18.0             | 28.7                          | 40.0                 | 27.2                        | 100                |
| 199.971         | H              | 36.5                  | 13.8                  | -15.7             | 34.6                          | 43.5                 | 53.7                        | 150                |
| 454.779         | V              | 41.8                  | 16.5                  | -13.8             | 44.5                          | 46.0                 | 167.9                       | 200                |
| 899.875         | V              | 25.3                  | 22.5                  | -9.3              | 38.5                          | 46.0                 | 84.1                        | 200                |

## 7. RESTRICTED BANDS RADIATIONS (1GHz – 40GHz)

[ FCC 15.205&209 / 15.407(b)(1),(2),(5),(6) ]  
 [ RSS-210 6.2.1 / 6.2.2(q1)(i),(ii),(v) / 6.3 / 7.3 ]

### 7.1 Test Procedure

Radiated emissions were measured in the frequency range with 1 GHz to 40GHz in transmitting mode and 1 GHz to 25GHz in receiving mode. All tests were performed in the semi-anechoic chamber at a 3-meter distance (except for the frequency range with 18 GHz to 40 GHz where test distance was reduced to 1 meter) on both horizontal and vertical polarities. The antenna was also scanned in height. The emissions are recorded with a spectrum analyzer in peak hold mode. The identified emissions are further maximized as a function of cable manipulation, azimuth, and antenna height. The emissions closest to the limits are measured in the peak mode with the tuned spectrum analyzer using resolution bandwidth of 1MHz / video bandwidth of 1MHz, and the average setting mode with the tuned spectrum analyzer using resolution bandwidth of 1MHz / video bandwidth of 100Hz or 10Hz. The highest emissions relative to the limit are listed.

### 7.2 Test Instruments and Measurement Setup

Table 7 Radiated Emission Test Instrumentation (1GHz – 40GHz)

| Description                                                                                                                                                                                                                     | Model                                    | Serial Number                                                               |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------|-----------------------------------------------------------------------------|
| Spectrum Analyzer EMI Test Receiver                                                                                                                                                                                             | R&S ESI26                                | 836119/003                                                                  |
| Spectrum Analyzer                                                                                                                                                                                                               | HP 8563E                                 | 3416A02248                                                                  |
| Harmonic Mixer (26.5 – 40GHz)                                                                                                                                                                                                   | Agilent 11970A                           | 011269-001                                                                  |
| Amplifier (1 - 26.5GHz)                                                                                                                                                                                                         | HP 8449B                                 | 3008A00582                                                                  |
| Amplifier (26.5 – 40GHz)                                                                                                                                                                                                        | Agilent 83051A                           | 3950M00193                                                                  |
| Horn Antenna (1 - 18GHz)                                                                                                                                                                                                        | EMCO 3115                                | 9903-5774                                                                   |
| Horn Antenna (3.95 – 5.85GHz)                                                                                                                                                                                                   | EMCO 3160-5                              | 1099                                                                        |
| Horn Antenna (5.85 – 8.2GHz)                                                                                                                                                                                                    | EMCO 3160-6                              | 9712-1044                                                                   |
| Horn Antenna (8.2 – 12.4GHz)                                                                                                                                                                                                    | EMCO 3160-7                              | 1158                                                                        |
| Horn Antenna (12.4 – 18GHz)                                                                                                                                                                                                     | EMCO 3160-8                              | 1143                                                                        |
| Horn Antenna (18 - 26.5GHz)                                                                                                                                                                                                     | EMCO 3160-9                              | 0004-1202                                                                   |
| Horn Antenna (26.5 - 40GHz)                                                                                                                                                                                                     | EMCO 3160-10                             | 1175                                                                        |
| Coaxial cables:<br>- Horn Ant <=> RF Amp. (1-18GHz)<br>- RF Amp.<=>Spectrum Analyzer (1-12.4GHz)<br>- RF Amp.<=>Spectrum Analyzer (12.4-18GHz)<br>- Horn Ant <=> RF Amp. (18-40GHz)<br>- RF Amp.<=>Spectrum Analyzer (18-40GHz) | Length:<br>6 m<br>15 m<br>3m<br>3m<br>1m | - EM206SCO<br>- EM215SCO<br>- SF102-20166<br>- SF102-20167<br>- SF102-21105 |

Notes: - HP: Hewlett Packard, R&S: Rohde & Schwarz

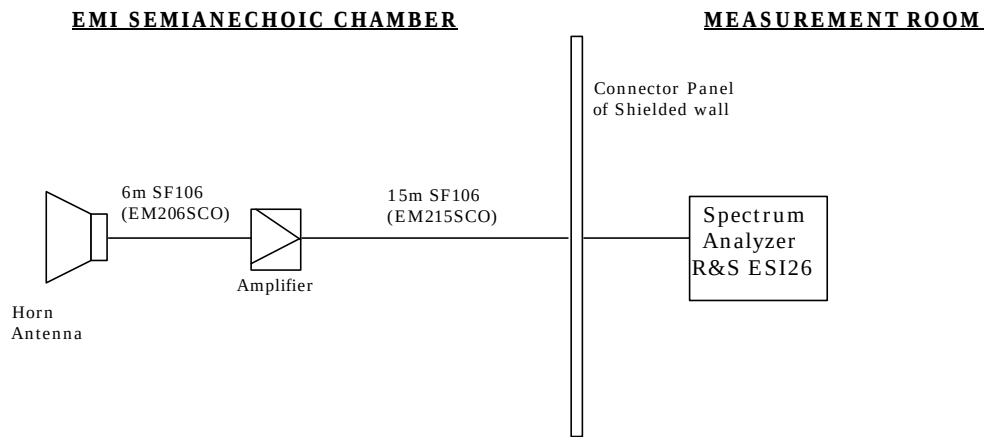


Figure 7-1.    Cables for Radiated Emission Test (1 – 12.4 GHz)

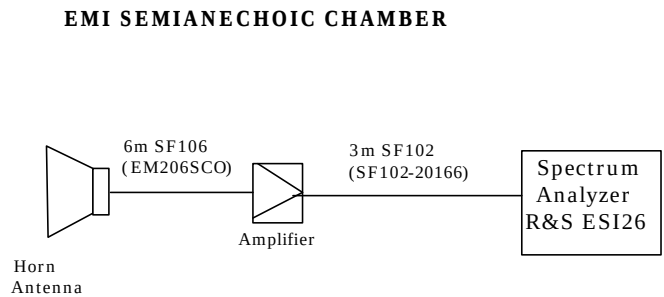


Figure 7-2.    Cables for Radiated Emission Test (12.4 - 18GHz)

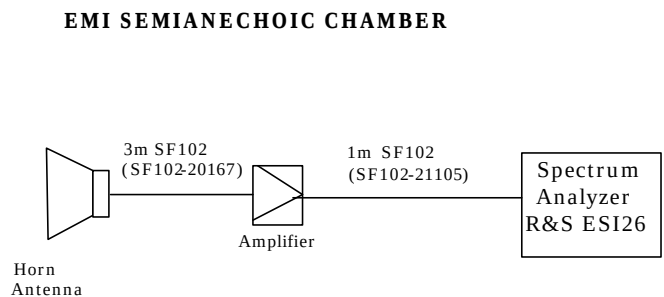


Figure 7-3.    Cables for Radiated Emission Test (18 - 26.5GHz)

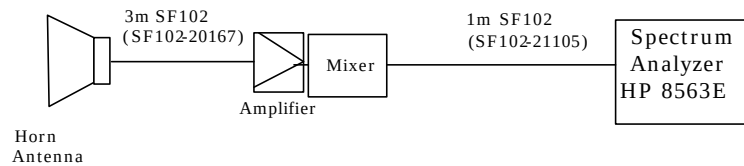
**EMI SEMIANECHOIC CHAMBER**

Figure 7-4. Cables for Radiated Emission Test (26.5 - 40GHz)

## 7.3 Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Loss, and subtracting Amplifier Gain from the measured reading. All factors are included in the reported data.

$$FS = R + AF + CORR - FO$$

where:

FS = Field Strength

R = Measured Spectrum analyzer Input Amplitude

AF = Antenna Factor

CORR = Correction Factor = CL-AG

CL = Cable Loss

AG = Amplifier Gain

FO = Distance Falloff Factor

For example:

Given a Spectrum Analyzer input reading of 51.5 dB $\mu$ V; Antenna Factor of 8.5 dB/m; Cable Loss of 1.3 dB; Falloff Factor of 0 dB; and an Amplifier Gain of 26 dB. The Field Strength of the measured emission is:

$$FS = 51.5 + 8.5 + 1.3 - 26 - 0.0 = 35.6 \text{ dB}\mu\text{V/m}$$

Conversions between dB $\mu$ V/m (or dB $\mu$ V) and  $\mu$ V/m (or  $\mu$ V) are done as :

$$\text{Level(dB}\mu\text{V/m)} = 20 \times \text{Log (Level}(\mu\text{V/m))}$$

$$40 \text{ dB}\mu\text{V/m} = 100 \mu\text{V/m}$$

$$48 \text{ dB}\mu\text{V/m} = 250 \mu\text{V/m}$$

## 7.4 Limits

Table 7-1. Limits for emissions

|                                             |                                       |                        |
|---------------------------------------------|---------------------------------------|------------------------|
| Limit for emissions in restricted bands     | 54 dB $\mu$ V/m (average)             | 74 dB $\mu$ V/m (peak) |
| Limit for emissions in non_restricted bands | 68.2 dB $\mu$ V/m (EIRP< -27 dBm/MHz) |                        |

## 7.5 Measurement Results

The EUT was found to comply to the limits of FCC Part 15 Subpart E and RSS-210 with a margin of 3.5 dB. The measurement was done for the frequency range of 1 GHz to 40 GHz in TX mode and 1 GHz to 25GHz in RX mode.

Test Date: November 26, 27, December 4 and 5, 2002

Table 7-2-1. EUT: M/T 2672-CHU, s/n ZZ-00094, Ch.36(5180MHz) **TX** mode 24Mbps

| Frequency<br>(GHz) | Polarity<br>(H/V) | Measured<br>(dB $\mu$ V)<br>(peak) | Measured<br>(dB $\mu$ V)<br>(average) | Antenna<br>Factor<br>(dB/m) | Corr.<br>Factor<br>(dB) | Falloff<br>Factor<br>(dB) | Field<br>Strength<br>(dB $\mu$ V/m)<br>(peak) | FCC Limit<br>(dB $\mu$ V/m)<br>(peak) | Field<br>Strength<br>(dB $\mu$ V/m)<br>(average) | FCC Limit<br>(dB $\mu$ V/m)<br>(average) |
|--------------------|-------------------|------------------------------------|---------------------------------------|-----------------------------|-------------------------|---------------------------|-----------------------------------------------|---------------------------------------|--------------------------------------------------|------------------------------------------|
| OB                 |                   |                                    |                                       |                             |                         |                           |                                               |                                       |                                                  |                                          |
| 5.185<br>bandedge  | V                 | 100.6                              | 88.1                                  | 33.7                        | -27.3                   | 0.0                       | 107.0                                         | N/A                                   | 94.5                                             | N/A                                      |
| 5.150              | V                 | 61.6                               | 41.8                                  | 33.6                        | -26.5                   | 0.0                       | 68.7                                          | 74.0                                  | 48.9                                             | 54.0                                     |
| 1.066              | V                 | 52.7                               | -                                     | 24.6                        | -32.7                   | 0.0                       | 44.6                                          | 74.0                                  | -                                                | 54.0                                     |
| 1.130              | V                 | 53.1                               | -                                     | 24.6                        | -32.4                   | 0.0                       | 45.3                                          | 74.0                                  | -                                                | 54.0                                     |
| 1.152              | V                 | 51.6                               | -                                     | 24.6                        | -32.4                   | 0.0                       | 43.8                                          | 74.0                                  | -                                                | 54.0                                     |
| 1.198              | V                 | 54.5                               | -                                     | 25.2                        | -32.3                   | 0.0                       | 47.4                                          | 74.0                                  | -                                                | 54.0                                     |
| 6.048              | V                 | 42.6                               | -                                     | 29.8                        | -26.5                   | 0.0                       | 45.9                                          | 68.2                                  | -                                                | NRB                                      |
| 6.112              | V                 | 38.4                               | -                                     | 29.8                        | -26.2                   | 0.0                       | 42.0                                          | 68.2                                  | -                                                | NRB                                      |
| 6.176              | V                 | 37.6                               | -                                     | 29.9                        | -25.7                   | 0.0                       | 41.8                                          | 68.2                                  | -                                                | NRB                                      |
| 6.216              | H                 | 46.1                               | -                                     | 29.9                        | -26.2                   | 0.0                       | 49.8                                          | 68.2                                  | -                                                | NRB                                      |
| 10.359             | V                 | 36.7                               | -                                     | 33.5                        | -23.0                   | 0.0                       | 47.2                                          | 68.2                                  | -                                                | NRB                                      |

Note: OB means “operation band” (5150-5250MHz).

NRB means “non restricted band”: The limit of FCC Part 15.407(b)(1),(2) and RSS-210 6.2.2(q1)(I),(ii) apply.

Table 7-2-2. EUT: M/T 2672-CHU, s/n ZZ-00094, Ch.52(5260MHz) **TX** mode 24Mbps

| Frequency<br>(GHz) | Polarity<br>(H/V) | Measured<br>(dB $\mu$ V)<br>(peak) | Measured<br>(dB $\mu$ V)<br>(average) | Antenna<br>Factor<br>(dB/m) | Corr.<br>Factor<br>(dB) | Falloff<br>Factor<br>(dB) | Field<br>Strength<br>(dB $\mu$ V/m)<br>(peak) | FCC Limit<br>(dB $\mu$ V/m)<br>(peak) | Field<br>Strength<br>(dB $\mu$ V/m)<br>(average) | FCC Limit<br>(dB $\mu$ V/m)<br>(average) |
|--------------------|-------------------|------------------------------------|---------------------------------------|-----------------------------|-------------------------|---------------------------|-----------------------------------------------|---------------------------------------|--------------------------------------------------|------------------------------------------|
| OB                 |                   |                                    |                                       |                             |                         |                           |                                               |                                       |                                                  |                                          |
| 5.256<br>bandedge  | V                 | 105.2                              | 94.0                                  | 33.6                        | -27.2                   | 0.0                       | 111.6                                         | N/A                                   | 100.4                                            | N/A                                      |
| 5.350              | V                 | 51.2                               | 38.0                                  | 33.9                        | -27.2                   | 0.0                       | 57.9                                          | 74.0                                  | 44.7                                             | 54.0                                     |
| 1.066              | V                 | 52.5                               | -                                     | 24.6                        | -32.7                   | 0.0                       | 44.4                                          | 74.0                                  | -                                                | 54.0                                     |
| 1.130              | V                 | 53.0                               | -                                     | 24.6                        | -32.4                   | 0.0                       | 45.2                                          | 74.0                                  | -                                                | 54.0                                     |
| 1.152              | V                 | 50.2                               | -                                     | 24.6                        | -32.4                   | 0.0                       | 42.4                                          | 74.0                                  | -                                                | 54.0                                     |
| 1.198              | V                 | 58.3                               | -                                     | 25.2                        | -32.3                   | 0.0                       | 51.2                                          | 74.0                                  | -                                                | 54.0                                     |
| 6.048              | V                 | 41.8                               | -                                     | 29.8                        | -26.5                   | 0.0                       | 45.1                                          | 68.2                                  | -                                                | NRB                                      |
| 6.112              | H                 | 38.6                               | -                                     | 29.8                        | -26.2                   | 0.0                       | 42.2                                          | 68.2                                  | -                                                | NRB                                      |
| 6.313              | V                 | 46.3                               | -                                     | 30.0                        | -26.4                   | 0.0                       | 49.9                                          | 68.2                                  | -                                                | NRB                                      |
| 6.549              | V                 | 39.7                               | -                                     | 29.9                        | -26.6                   | 0.0                       | 43.0                                          | 68.2                                  | -                                                | NRB                                      |
| 10.521             | H                 | 45.4                               | -                                     | 33.5                        | -22.4                   | 0.0                       | 56.5                                          | 68.2                                  | -                                                | NRB                                      |

Note: OB means “operation band” (5250-5350MHz).

NRB means “non restricted band”: The limit of FCC Part 15.407(b)(1),(2) and RSS-210 6.2.2(q1)(I),(ii) apply.



Table 7-2-3. EUT: M/T 2672-CHU, s/n ZZ-00094, Ch.64(5320MHz) **TX** mode 24Mbps

| Frequency<br>(GHz) | Polarity<br>(H/V) | Measured<br>(dB $\mu$ V)<br>( <i>peak</i> ) | Measured<br>(dB $\mu$ V)<br>( <i>average</i> ) | Antenna<br>Factor<br>(dB/m) | Corr.<br>Factor<br>(dB) | Falloff<br>Factor<br>(dB) | Field<br>Strength<br>(dB $\mu$ V/m)<br>( <i>peak</i> ) | FCC Limit<br>(dB $\mu$ V/m)<br>( <i>peak</i> ) | Field<br>Strength<br>(dB $\mu$ V/m)<br>( <i>average</i> ) | FCC Limit<br>(dB $\mu$ V/m)<br>( <i>average</i> ) |
|--------------------|-------------------|---------------------------------------------|------------------------------------------------|-----------------------------|-------------------------|---------------------------|--------------------------------------------------------|------------------------------------------------|-----------------------------------------------------------|---------------------------------------------------|
| OB                 |                   |                                             |                                                |                             |                         |                           |                                                        |                                                |                                                           |                                                   |
| 5.324<br>bandedge  | V                 | 102.5                                       | 90.6                                           | 33.7                        | -27.3                   | 0.0                       | 108.9                                                  | N/A                                            | 97.0                                                      | N/A                                               |
| 5.350              | V                 | 60.9                                        | 43.8                                           | 33.9                        | -27.2                   | 0.0                       | 67.6                                                   | 74.0                                           | 50.5                                                      | 54.0                                              |
| 1.066              | V                 | 54.1                                        | -                                              | 24.6                        | -32.7                   | 0.0                       | 46.0                                                   | 74.0                                           | -                                                         | 54.0                                              |
| 1.130              | V                 | 52.2                                        | -                                              | 24.6                        | -32.4                   | 0.0                       | 44.4                                                   | 74.0                                           | -                                                         | 54.0                                              |
| 1.152              | V                 | 49.9                                        | -                                              | 24.6                        | -32.4                   | 0.0                       | 42.1                                                   | 74.0                                           | -                                                         | 54.0                                              |
| 1.198              | V                 | 54.7                                        | -                                              | 25.2                        | -32.3                   | 0.0                       | 47.6                                                   | 74.0                                           | -                                                         | 54.0                                              |
| 6.048              | V                 | 41.0                                        | -                                              | 29.8                        | -26.5                   | 0.0                       | 44.3                                                   | 68.2                                           | -                                                         | NRB                                               |
| 6.112              | V                 | 37.9                                        | -                                              | 29.8                        | -26.2                   | 0.0                       | 41.5                                                   | 68.2                                           | -                                                         | NRB                                               |
| 6.176              | V                 | 37.2                                        | -                                              | 29.9                        | -25.7                   | 0.0                       | 41.4                                                   | 68.2                                           | -                                                         | NRB                                               |
| 6.385              | V                 | 41.2                                        | -                                              | 29.9                        | -26.6                   | 0.0                       | 44.5                                                   | 68.2                                           | -                                                         | NRB                                               |
| 10.643             | H                 | 39.0                                        | -                                              | 33.5                        | -22.3                   | 0.0                       | 50.2                                                   | 74.0                                           | -                                                         | 54.0                                              |

\*Note: OB means “operation band” (5250-5350MHz).

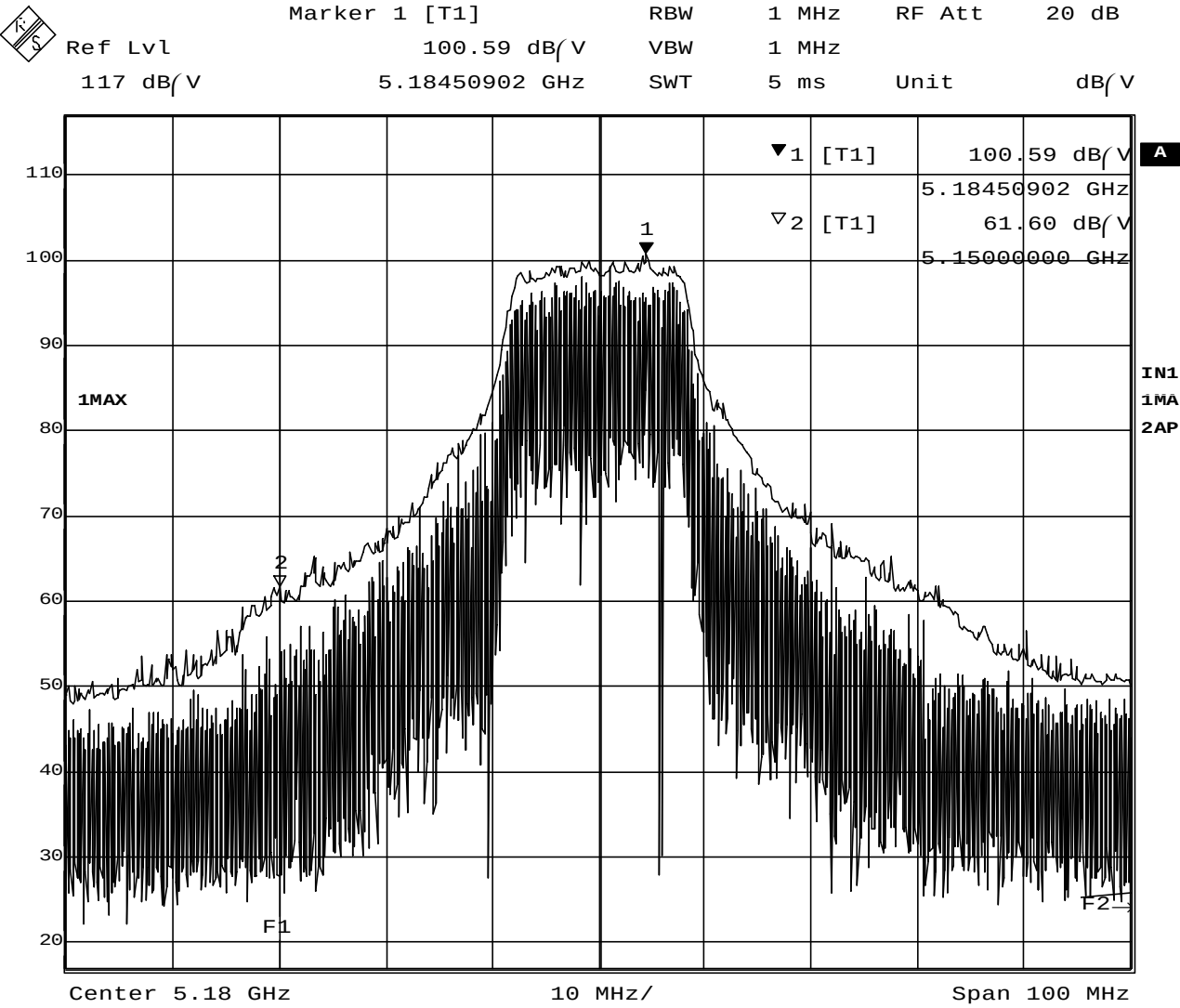
NRB means “non restricted band”: The limit of FCC Part 15.407(b)(1),(2) and RSS-210 6.2.2(q1)(I),(ii) apply.

Table 7-2-4 EUT: M/T 2672-CHU, s/n ZZ-00094, Ch.52(5260MHz) **RX** mode

| Frequency<br>(GHz) | Polarity<br>(H/V) | Measured<br>(dB $\mu$ V)<br>( <i>peak</i> ) | Measured<br>(dB $\mu$ V)<br>( <i>average</i> ) | Antenna<br>Factor<br>(dB/m) | Corr.<br>Factor<br>(dB) | Falloff<br>Factor<br>(dB) | Field<br>Strength<br>(dB $\mu$ V/m)<br>( <i>peak</i> ) | FCC Limit<br>(dB $\mu$ V/m)<br>( <i>peak</i> ) | Field<br>Strength<br>(dB $\mu$ V/m)<br>( <i>average</i> ) | FCC Limit<br>(dB $\mu$ V/m)<br>( <i>average</i> ) |
|--------------------|-------------------|---------------------------------------------|------------------------------------------------|-----------------------------|-------------------------|---------------------------|--------------------------------------------------------|------------------------------------------------|-----------------------------------------------------------|---------------------------------------------------|
| 1.066              | V                 | 56.6                                        | -                                              | 24.6                        | -32.7                   | 0.0                       | 48.5                                                   | 74.0                                           | -                                                         | 54.0                                              |
| 1.130              | V                 | 52.3                                        | -                                              | 24.6                        | -32.4                   | 0.0                       | 44.5                                                   | 74.0                                           | -                                                         | 54.0                                              |
| 1.152              | V                 | 50.2                                        | -                                              | 24.6                        | -32.4                   | 0.0                       | 42.4                                                   | 74.0                                           | -                                                         | 54.0                                              |
| 1.198              | V                 | 56.3                                        | -                                              | 25.2                        | -32.3                   | 0.0                       | 49.2                                                   | 74.0                                           | -                                                         | 54.0                                              |

Note: NRB means “non restricted band”: The limit of FCC Part 15.407(b)(1),(2) and RSS-210 6.2.2(q1)(I),(ii) apply.

7.6 Trace Data

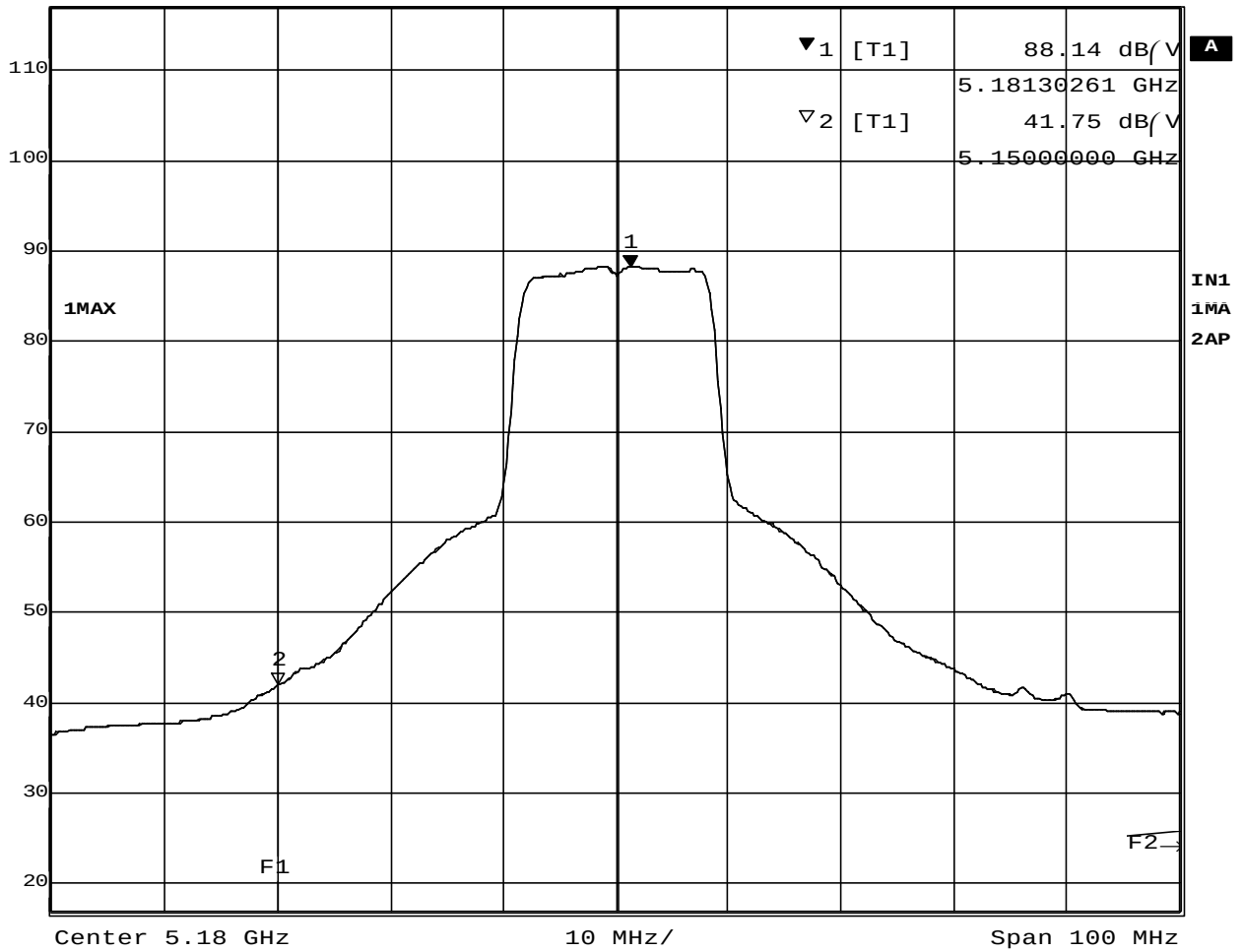


Date: 26.NOV.2002 18:00:18

Plot 7-1-1 5180MHz TX mode (Peak)



|          |                |     |       |        |       |
|----------|----------------|-----|-------|--------|-------|
| Ref Lvl  | Marker 1 [T1]  | RBW | 1 MHz | RF Att | 20 dB |
| 117 dB/V | 88.14 dB/V     | VBW | 10 Hz |        |       |
|          | 5.18130261 GHz | SWT | 25 s  | Unit   | dB/V  |

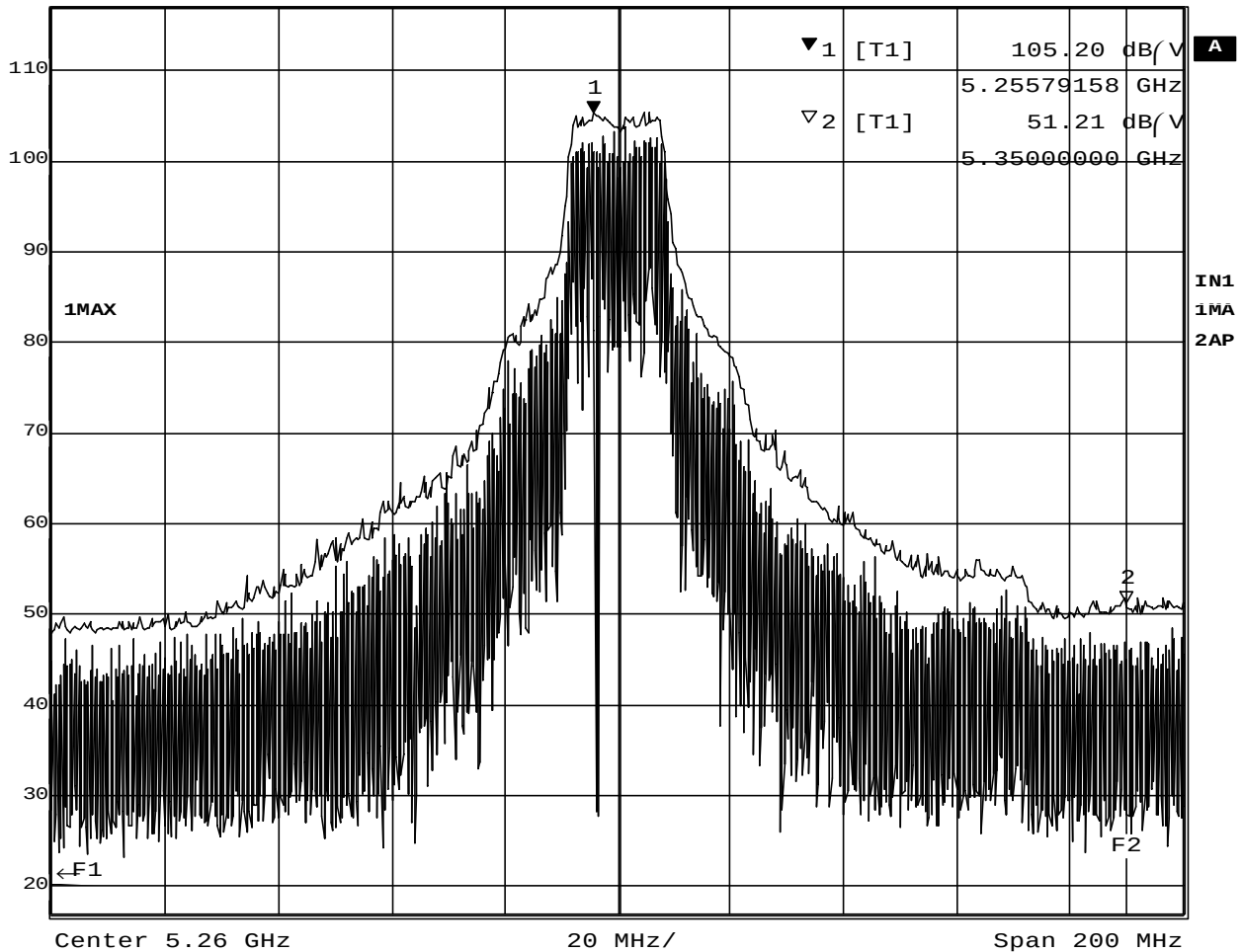


Date: 26.NOV.2002 18:01:47

Plot 7-1-2 5180MHz TX mode (Average)



|          |                |     |       |        |       |
|----------|----------------|-----|-------|--------|-------|
| Ref Lvl  | Marker 1 [T1]  | RBW | 1 MHz | RF Att | 20 dB |
| 117 dB/V | 105.20 dB/V    | VBW | 1 MHz |        |       |
|          | 5.25579158 GHz | SWT | 5 ms  | Unit   | dB/V  |

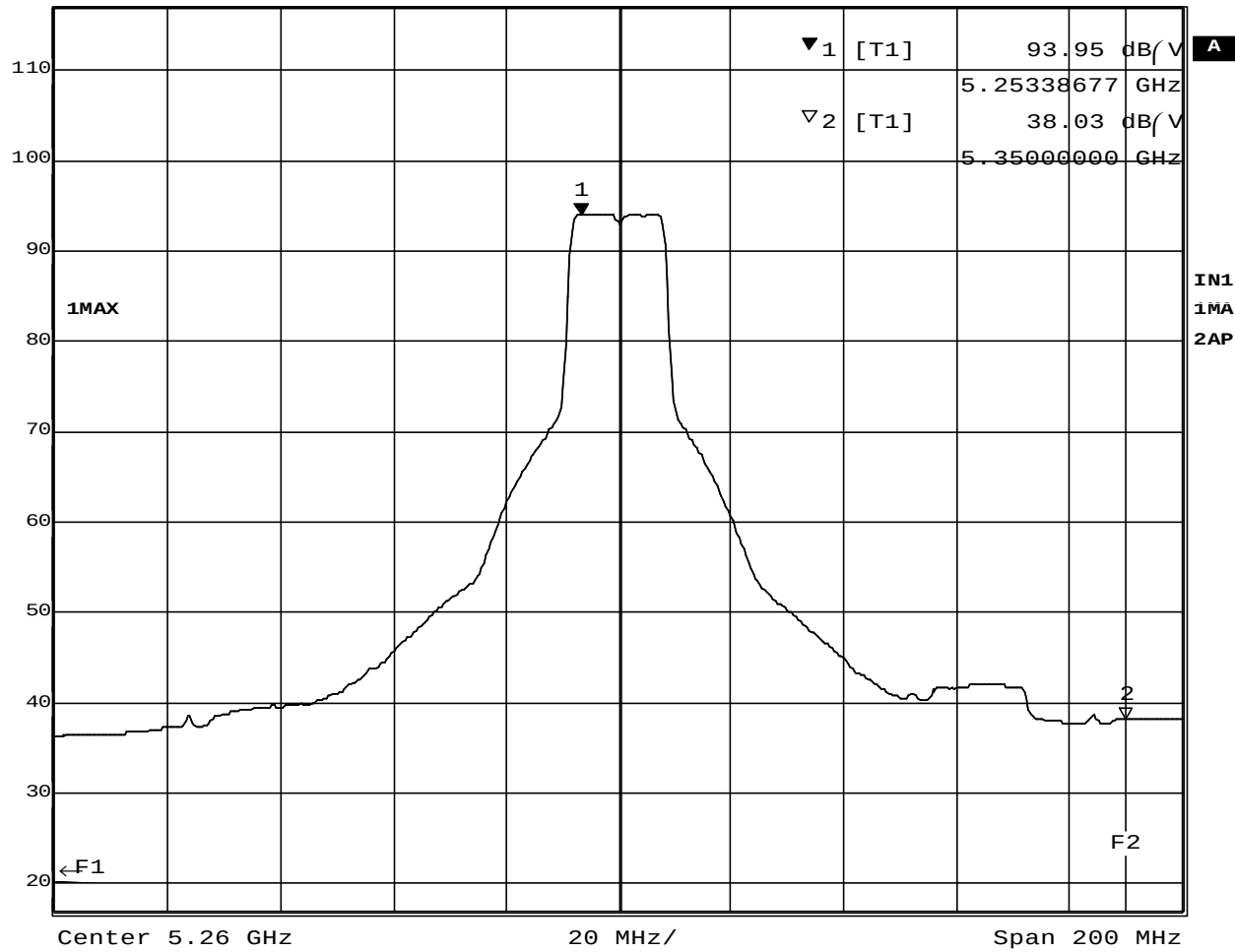


Date: 26.NOV.2002 17:43:40

Plot 7-2-1 5260MHz TX mode (Peak)



|          |                |     |       |        |       |
|----------|----------------|-----|-------|--------|-------|
| Ref Lvl  | Marker 1 [T1]  | RBW | 1 MHz | RF Att | 20 dB |
| 117 dB/V | 93.95 dB/V     | VBW | 10 Hz |        |       |
|          | 5.25338677 GHz | SWT | 50 s  | Unit   | dB/V  |

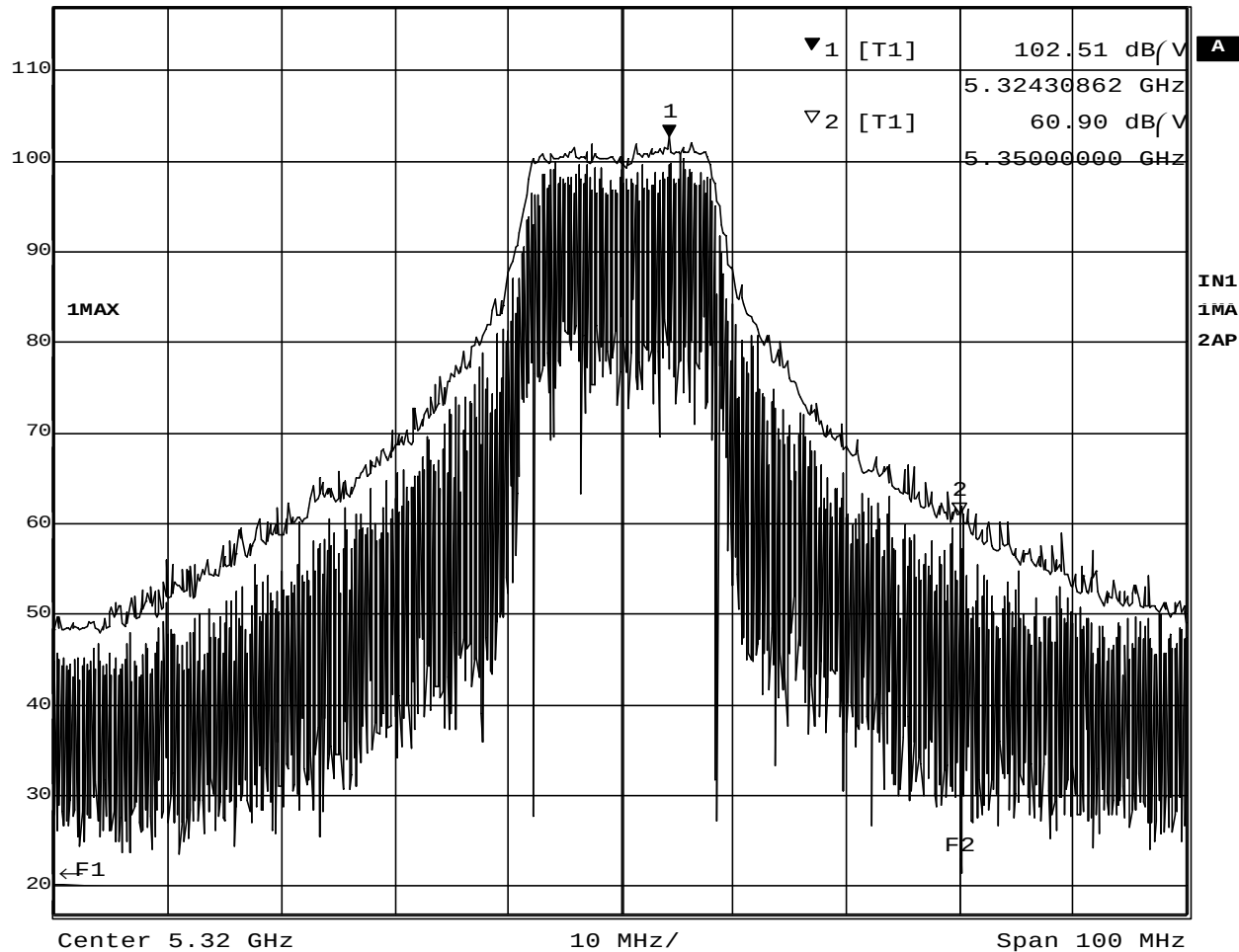


Date: 26.NOV.2002 17:45:10

Plot 7-2-2 5260MHz TX mode (Average)



|          |                |     |       |        |       |
|----------|----------------|-----|-------|--------|-------|
| Ref Lvl  | Marker 1 [T1]  | RBW | 1 MHz | RF Att | 20 dB |
| 117 dB/V | 102.51 dB/V    | VBW | 1 MHz |        |       |
|          | 5.32430862 GHz | SWT | 5 ms  | Unit   | dB/V  |

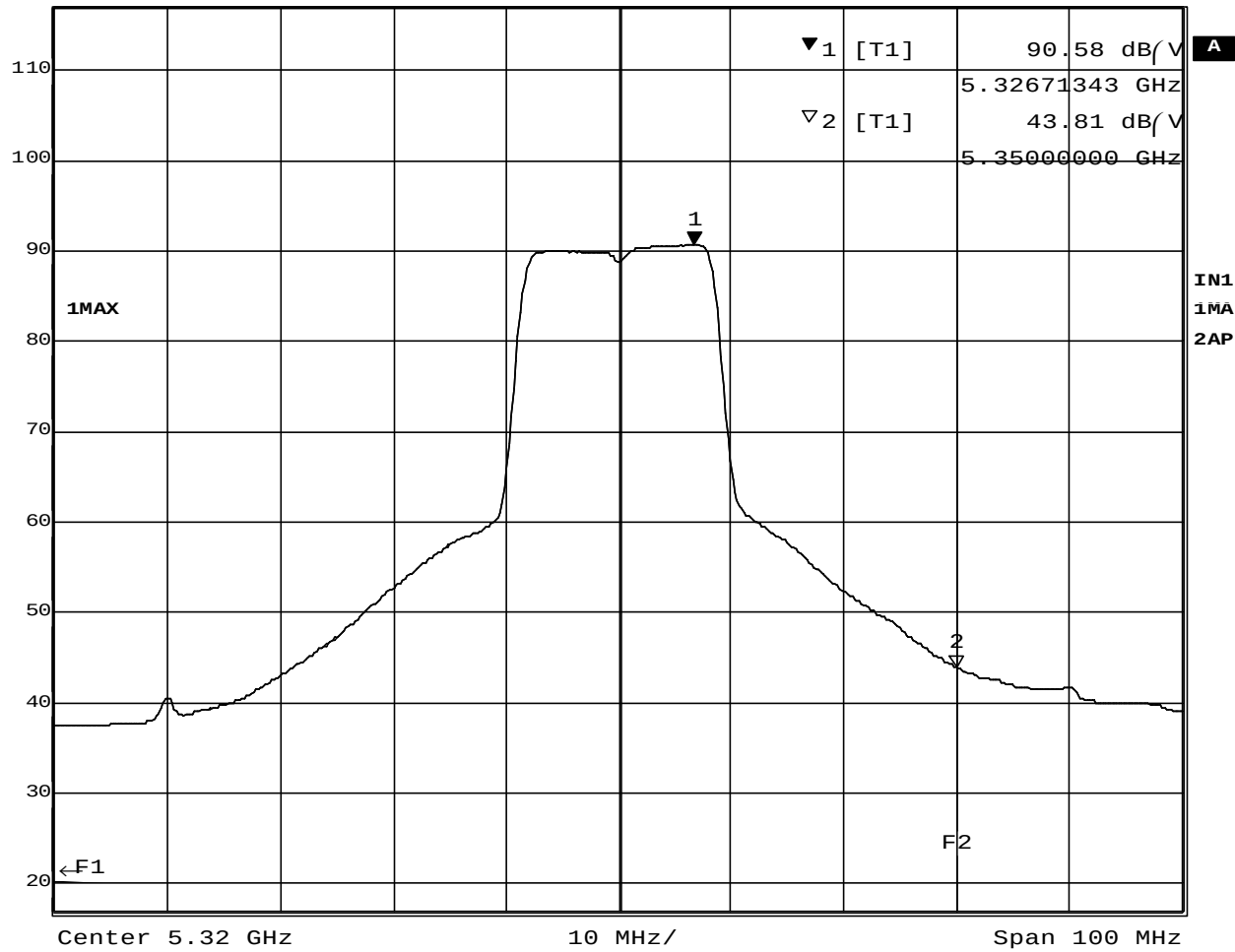


Date: 26.NOV.2002 17:52:05

Plot 7-3-1 5320MHz TX mode (Peak)



|          |                |     |       |        |       |
|----------|----------------|-----|-------|--------|-------|
| Ref Lvl  | Marker 1 [T1]  | RBW | 1 MHz | RF Att | 20 dB |
| 117 dB/V | 90.58 dB/V     | VBW | 10 Hz |        |       |
|          | 5.32671343 GHz | SWT | 25 s  | Unit   | dB/V  |



Date: 26.NOV.2002 17:51:34

Plot 7-3-2 5320MHz TX mode (Average)