

**EMC MEASUREMENT/TECHNICAL REPORT
FOR PART 15.247 APPLICATION**

MANUFACTURER : Intermec Corp.
PRODUCT: MODEL RM182
PCMCIA Radio

FCC ID: HN2RM182-24

April 5, 2000

This report concerns : (check one) Original grant <input checked="" type="checkbox"/> Class II change _____
*Class B verification _____ Class A verification _____ **Class I change _____
Equipment type: 2.4 GHz Spread Spectrum Transceiver
Limits used: (check one)
CISPR 22 <input type="checkbox"/> for digital emissions portion Part 15 <input type="checkbox"/> for RF portion
Measurement procedure used is ANSI C63.4-1992 unless another is specified.
Other test procedure: _____
This report is based on the measurements on Model <u>RM182</u> .
EUT Serial number: <u>742205-952J0078</u> .
Report reviewed and approved by
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*Do not bind or staple this report. A horizontal rubber band plus paper clip at top of document is preferred.
Not to be filed with Equipment Authorization Branch of FCC unless requested.

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1 GENERAL INFORMATION

1.1 Summary of Test Results

Model RM182 was tested to the requirements of Part 15 of the FCC Rules for 2.4 GHz band transceivers to verify its continued compliance with Intermec's antenna set and in a different host. The transceiver module is manufactured by Proxim Inc. As can be seen in section 4 of this report, the product passed all tests with comfortable margins beyond test instrument tolerances.

1.2 Product Description

Model RM182 is a 2.4 GHz FHSS transceiver in PCMCIA (PC-Card) form. It is manufactured by Proxim Inc. of Mountain View, CA. It has already been certified by the FCC under FCC ID: IMK-ILC1PC. Intermec Technologies integrates this module into our data automation products such as handheld and vehicle mount barcode terminals, access points, PenKey terminals etc. (A complete list of host devices is given in the attached exhibits). Since some of these products use different antennas than the ones listed by Proxim and as a result of Intermec's contractual obligations, this report has been prepared to apply for a new grant to Intermec Technologies for the same transceiver. The product is in a standard PCMCIA (PC-Card) enclosure with an MMCX antenna connector. Detailed pictures of the product and the circuit boards are included in the application. Power levels, frequency ranges and channel characteristics are **not** user adjustable.

1.3 Antenna System and Part 15.203 Compliance

For Part 15.203 compliance see separate declarations file included in the application. A complete list of antennas to be used with this product and their drawings are also included in a separate file included in the schematics part of the application.

1.4 Class A Justification (Parts 15.107/109)

For Class A justification of Parts 15.107 and 15.109 compliance see separate declarations file included in the application.

1.5 RF Exposure Compliance

For compliance with the RF Exposure rules as described in OET Bulletin 65 see separate declarations file included in the application.

1.6 Related Submittal(s)/Grant(s)

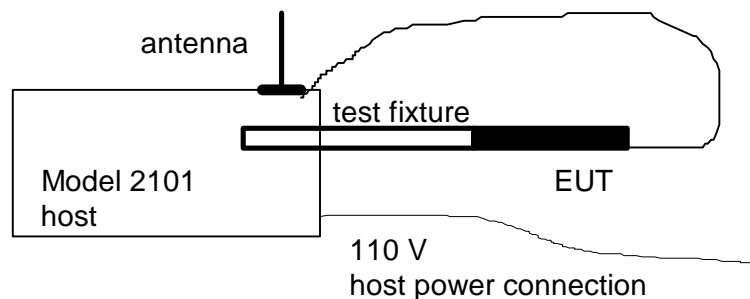
The transceiver was previously certified by Proxim Inc. under the FCC identifier IMK-ILC1PC.

2 Test Conditions

2.1 Tested System Details

Since it is being tested as a module, the transceiver was tested on a special test fixture (a PCMCIA card extender) totally outside the host device. The host device used during the test was one of the typical hosts, Model 2101 Access Point. Other host devices to be used by Intermec Technologies are listed in the attached exhibits. Worst case antennas of each type were used during radiated emission tests. Conducted emissions tests were performed by direct connection through a custom made adapter cable. Conducted tests were repeated under worst case power supply conditions ($\pm 10\%$). Although the results are not presented in this report, all hosts have been tested for emissions, and all have been found compliant.

2.2 Diagram of Tested System



2.3 Test Methodology

Digital emissions tests were performed according to the procedures in ANSI C63.4-1992. For radio performance tests procedures given in Part 15 (paragraphs 109, 247, 205, 209) and described in "Test Procedure Hints", published by Authorization and Evaluation Division.

2.4 Test Facility

The open area test site and conducted measurement facility used to collect the radiated data is in Intermec Corp. facilities at 6001 36th Ave. W Everett, WA 98203. This site has been fully described in a report dated 25 Feb. 94 submitted to your office, and accepted in a letter dated May 24, 1994 (31040/SIT). Latest continued compliance report for the OATS site was submitted to FCC in July 1999.

2.5 Test Summary

Specification Paragraph	Description	Test Data Section	Status
15.207	Powerline Conducted RFI	4.6	N/A
15.109	Radiated Emissions	4.5	passed
15.247(a)(1)	Channel Utilization	4.1	passed
15.247(a)(1)	Channel Bandwidth	4.3	passed
15.247(b)	Maximum Peak Output Power	4.2	passed
15.247(c)	Conducted Out of Band Emissions	4.4	passed
15.205	Restricted Band Emissions	4.4, 4.5	passed
15.209	Radiated Spurious Emissions	4.5.2	passed

2.6 Environmental Conditions

All tests were performed at Intermec test facilities under following conditions:

Temperature: ambient (10 °C to 25 °C)

Humidity: 50% to 80%

Altitude: 550 ft

3 TEST EQUIPMENT

3.1 Test Equipment

Type	Manufacturer/ Model No.	Serial No.	Last Cal.	Cal. Interval
Spectrum Analyzer/ EMI Receiver	Rohde & Schwartz ESMI 100Hz - 26.5 GHz	DE11220	01/14/00	1 year
Bilog Antenna	Chase CBL6111B	2075	3/27/00	1 year
Horn Antenna	EMCO 3115	3720	06/17/99	2 years
LISN	EMCO 3825/2R	3825/2	11/16/99	1 year
Spectrum Analyzer	8591A	2932A00296	12/8/99	1 year
Preamplifier	HP8447F	2944A03597	3/3/00	1 year

3.2 Accessories

All accessories used at Intermec OATS and EMC Lab such as cables, attenuators, filters etc. are measured in predetermined intervals and their loss factors are recorded for adjustment of measured values.

4 TEST DATA AND RESULTS

4.1 Transmit Range and Channel Utilization Measurement

4.1.1 Procedure

The EUT was put into a hopping mode to cover all channels. The analyzer was setup to cover the frequencies between 2.390 GHz and 2.490 GHz with a resolution and video bandwidth of 300 kHz. The EUT was operated with the analyzer in max hold mode for 10 minutes and the result plotted. No external attenuator was used. Cable losses were automatically compensated by the analyzer.

To investigate band edge spectral components the analyzer was set to 2.397 - 2.407 GHz and 2.475 - 2.485 GHz consecutively and max hold measurement performed while the radio was transmitting randomly utilizing all channels.

To verify channel dwell time the EUT was put into a random transmission mode with a typical worst case package. The analyzer was set up to three channels (low, medium high) with 0 span and 1 MHz RBW. The sweep time was set to 1 sec. The number of hits in that channel (one hit = one transmission in that channel) were recorded in max. hold mode over 30 seconds. The number of hits over 30 seconds times the transmission time (32 ms) shows the usage of that channel and must be under 0.4 sec.

4.1.2 Results

As can be seen on the plot, the EUT's operation band (2.402-2.480 GHz) was within the allowed band of 2.400 - 2.483 GHz. All frequencies were evenly used and the range was not exceeded.

No abnormal spectral components were detected at the lower and upper band edges.

As can be seen on the following plots, the selected channels were used 2 times over 30 seconds. Therefore the dwell time is $2 * 32 \text{ ms}$ (standard transmit time for 1.6 Mb operation) = 64 ms, which is under the 400 ms limit.

4.2 Peak Power Measurement

4.2.1 Procedure

The EUT was put into a continuous transmit mode. The analyzer was set to a 20 MHz span around the selected channel with 3 MHz resolution bandwidth and 3 MHz video bandwidth. No external attenuator was used. Cable losses were automatically compensated by the analyzer. The analyzer was put into max hold mode and the peak value measured. Peak power of low, medium and high channels was measured.

4.2.2 Results

The highest measured peak value was 19.77 dBm at 2.402 GHz.

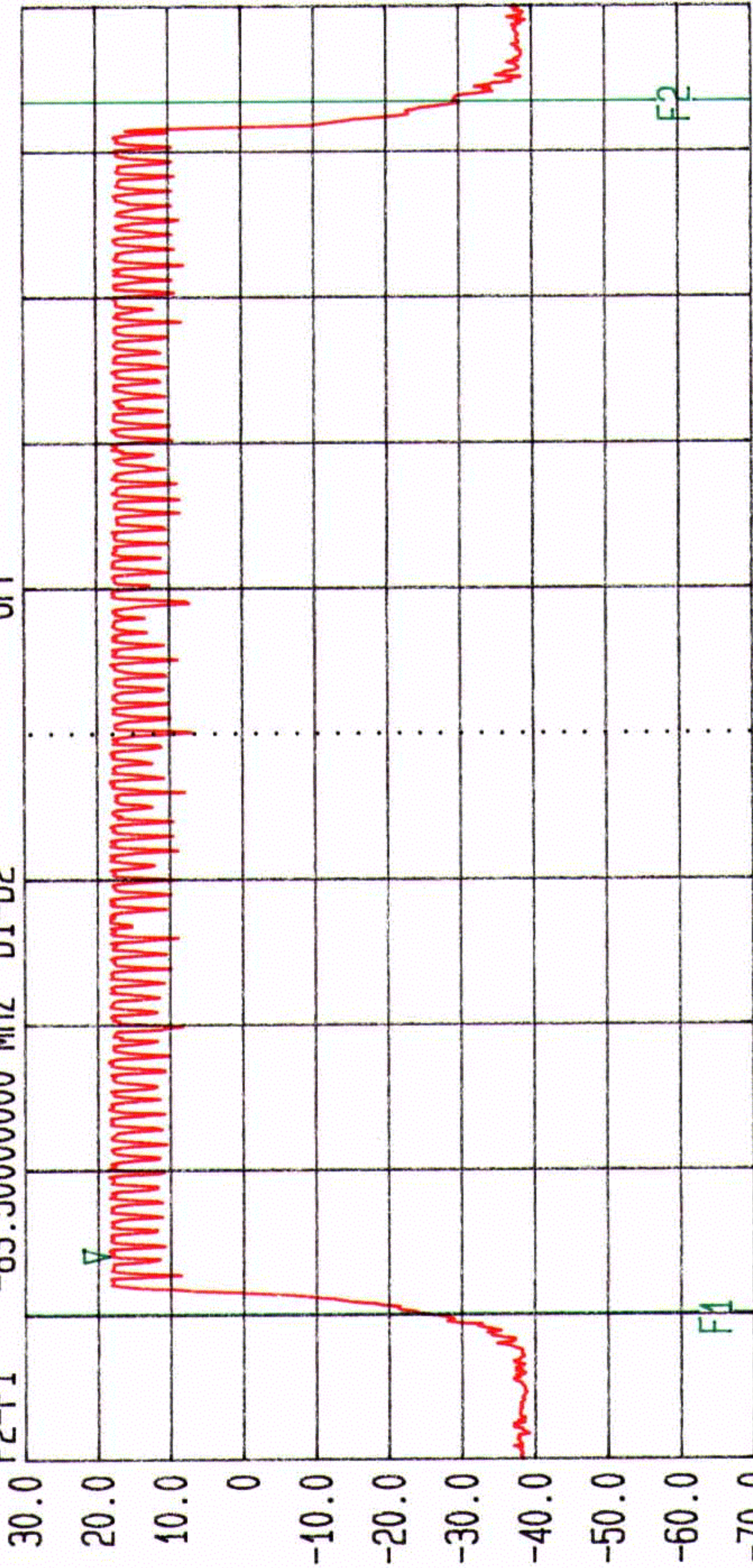


Date 23.Mar.'00 Time 13:35:26
Ref.Lvl 30.00 dBm
Marker 18.43 dBm
2.4041 GHz

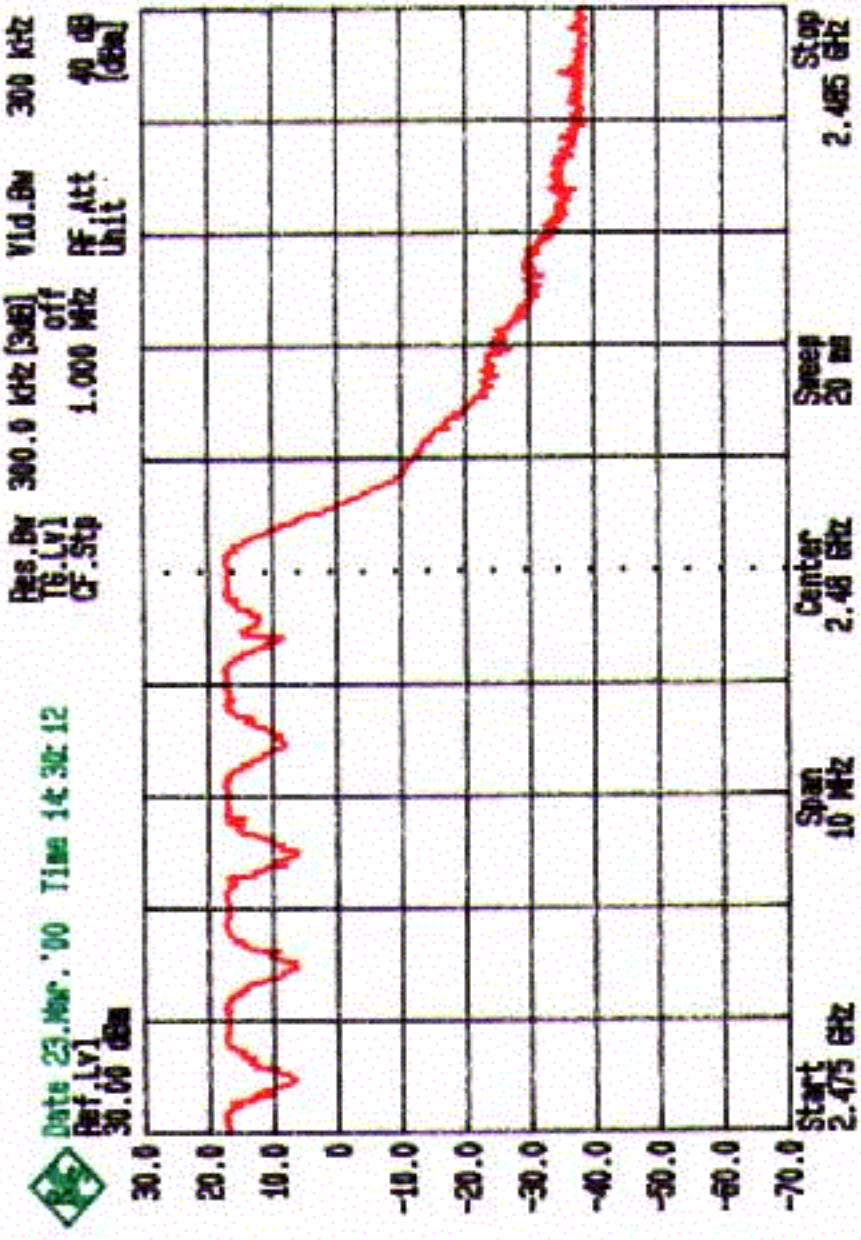
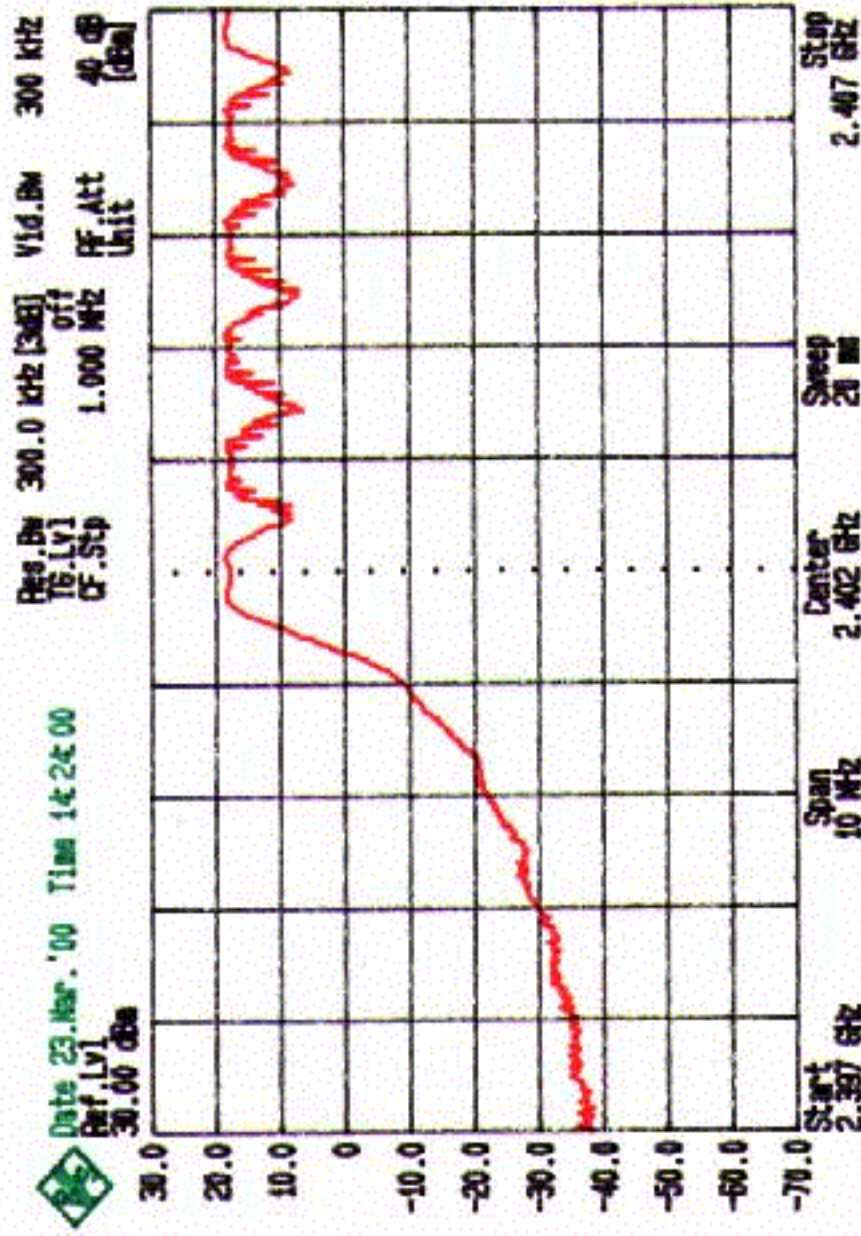
Res.Bw 300.0 kHz [3dB]
TG.Lvl off
CF.Stp 10.000 MHz
Vid.Bw 300 kHz
RF.Att Unit
40 dB [dBm]

F1 2.4000000000 GHz D1
F2 2.4835000000 GHz D2
F2-F1 -83.50000000 MHz D1-D2

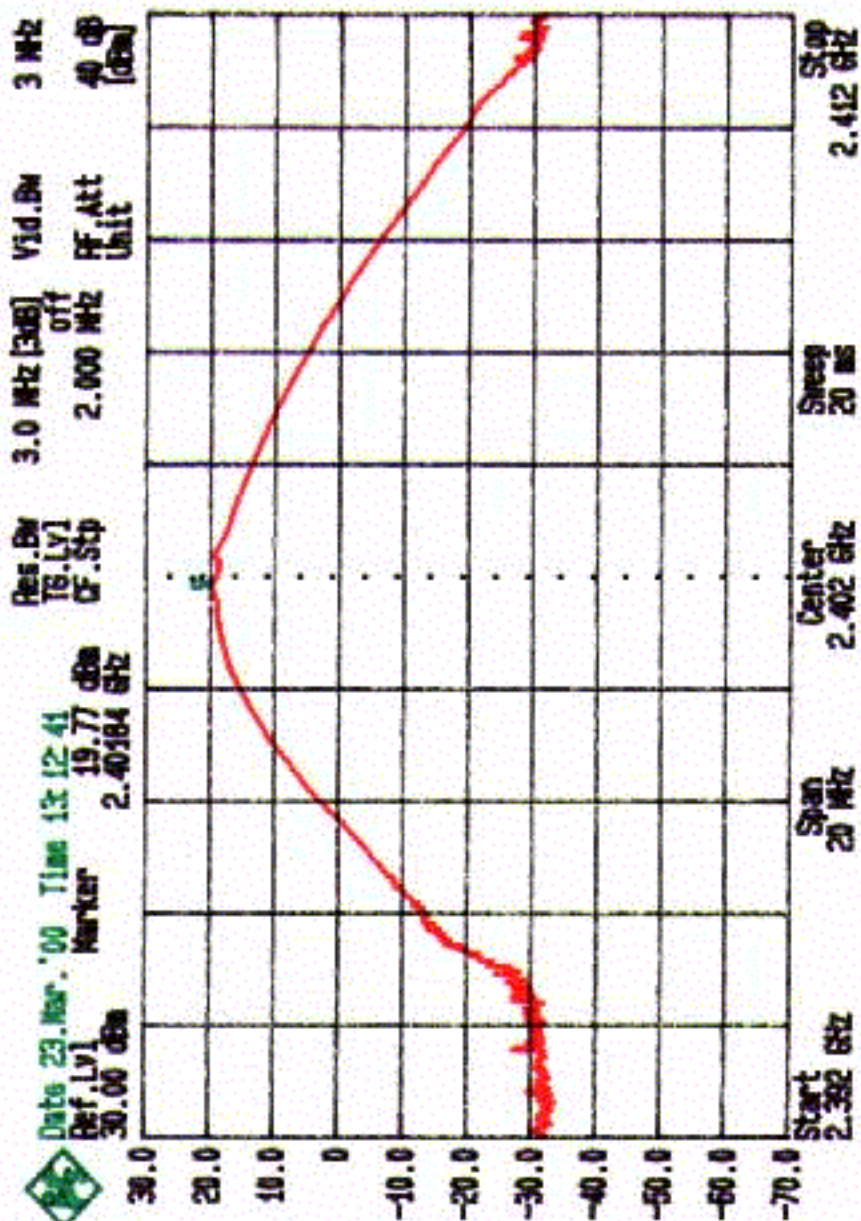
OFF
OFF
OFF



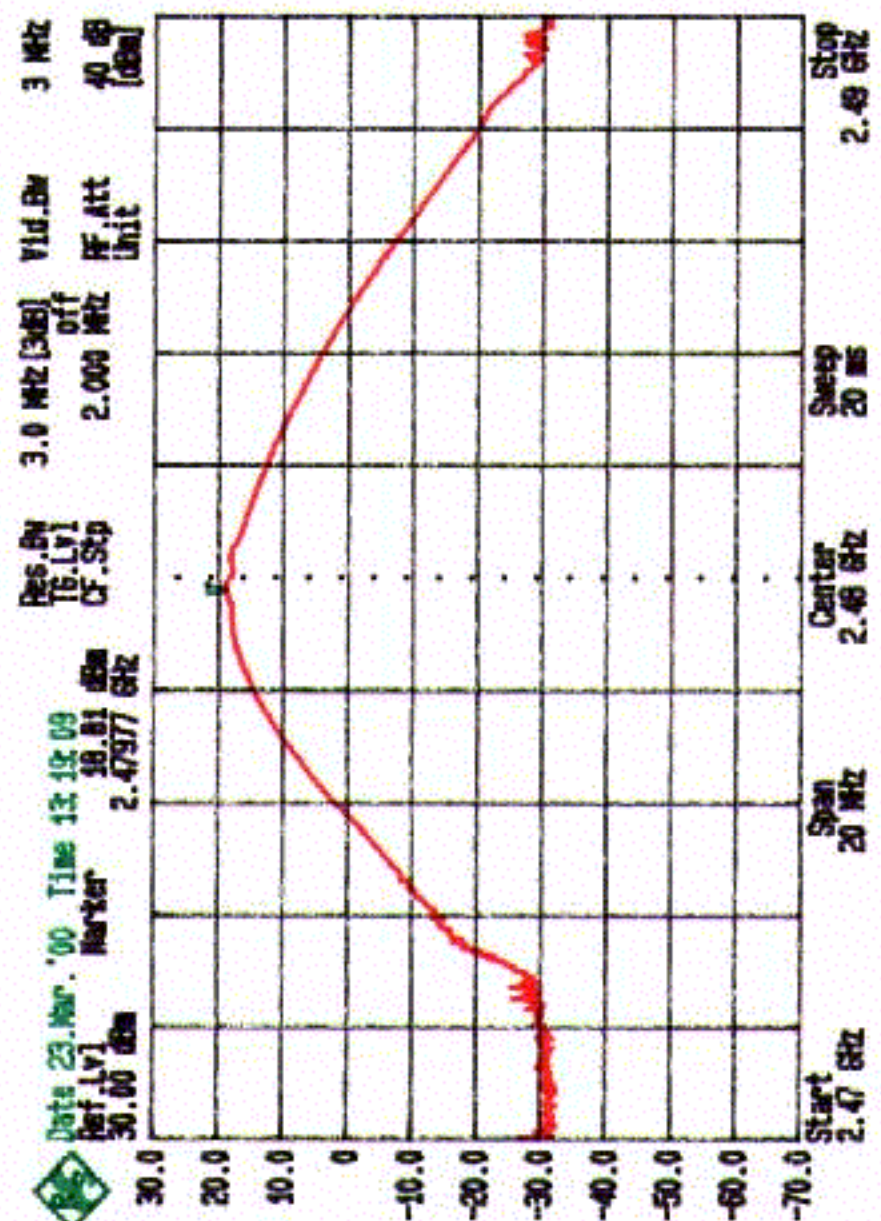
Start 2.39 GHz
Span 100 MHz
Center 2.44 GHz
Sweep 20 ms
Stop 2.49 GHz



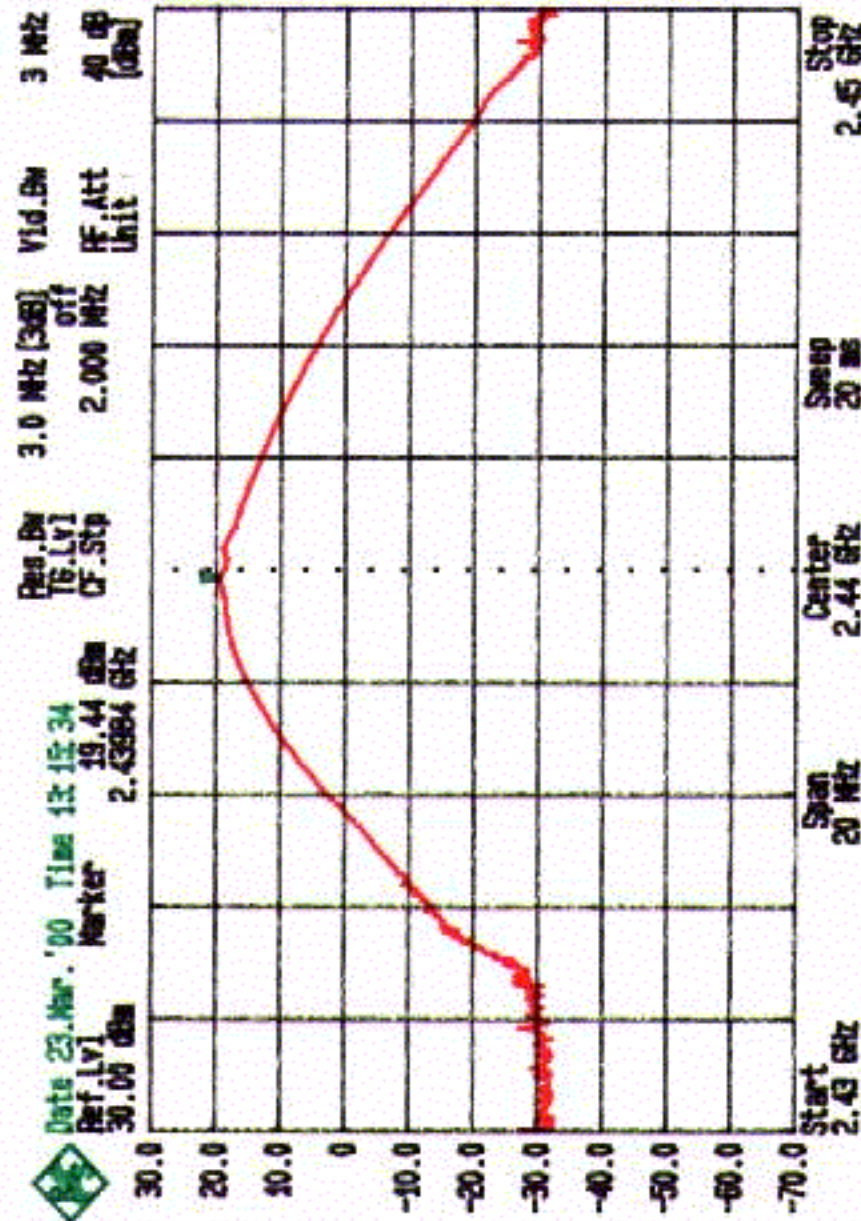
Banded spurious emissions plot



(1)



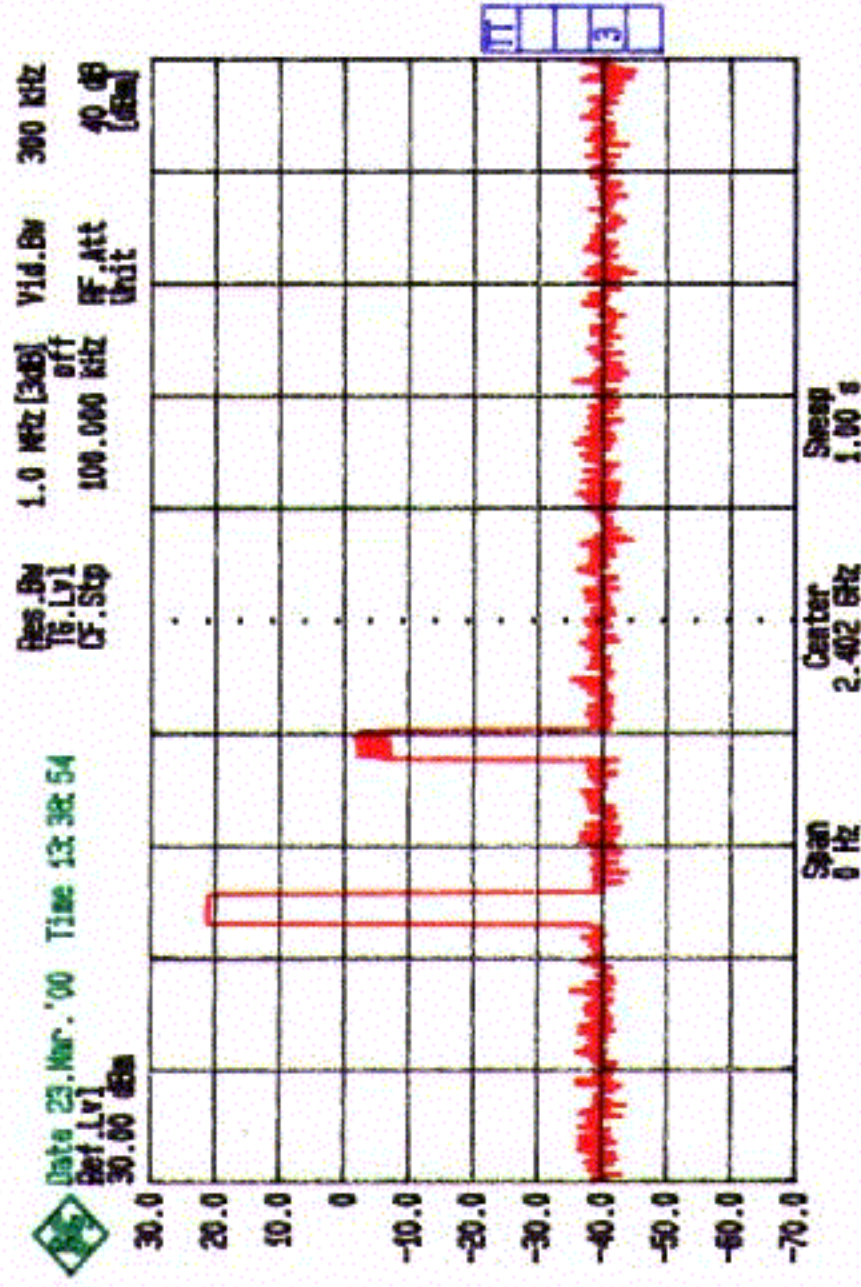
(3)



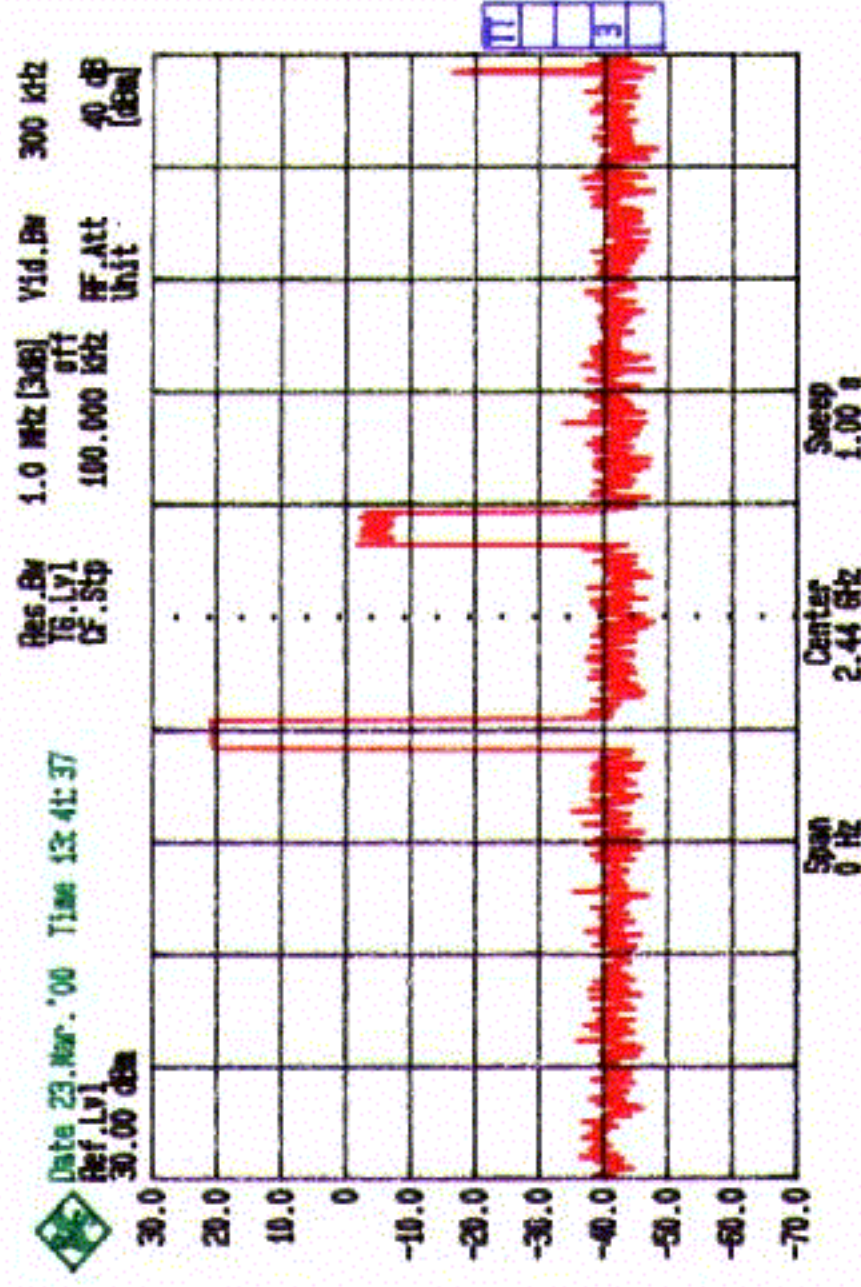
(2)

Maximum Peak Power Measurement

- 1) Low Channel
- 2) Mid Channel
- 3) High Channel



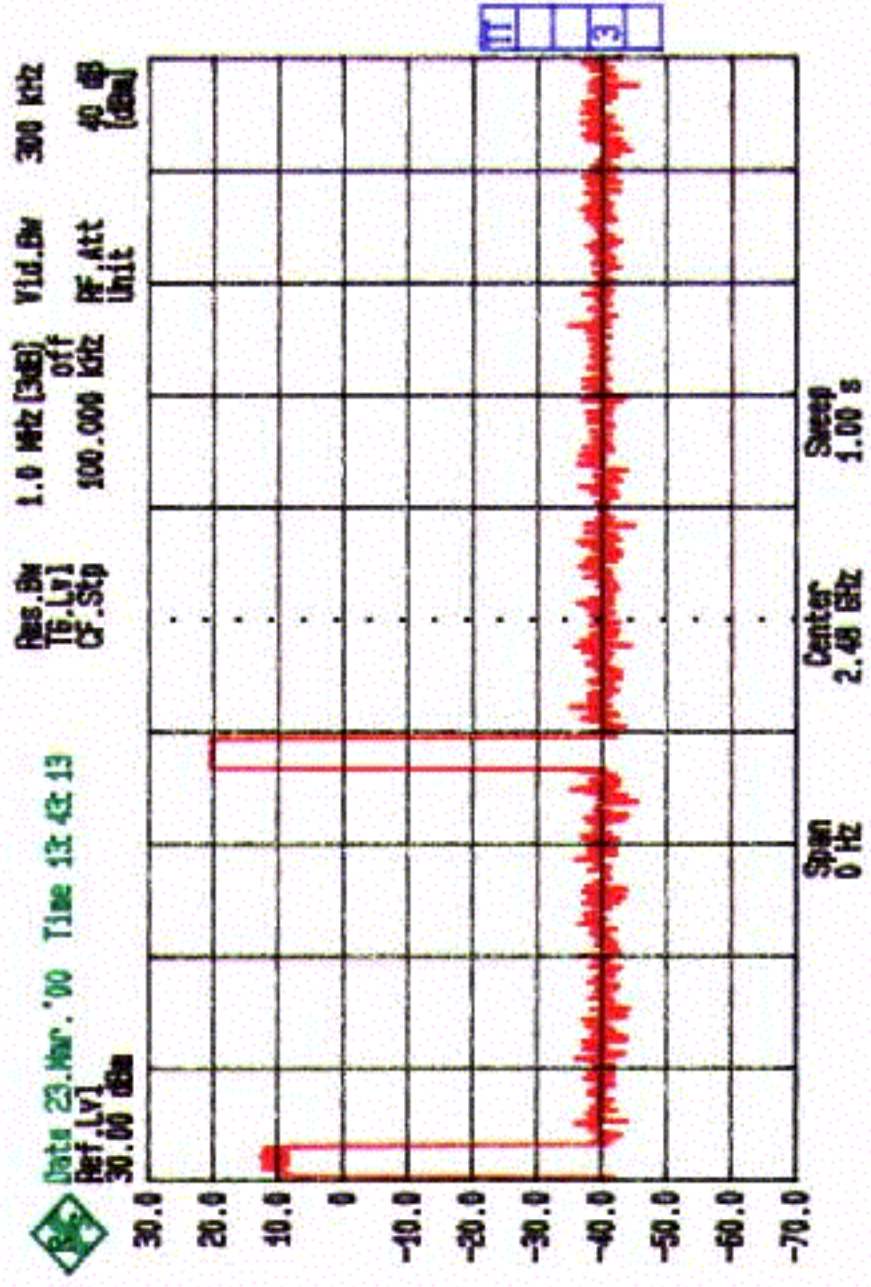
(1)



(2)

Dwell Time Measurement

- 1) Low Channel
- 2) Mid Channel
- 3) High Channel



(3)

*This report file has been split in two to accommodate the large file size.
For Pages 12 through 23, please see the file with description Part 2 of 2.*