

FCC Part 15 Subpart E Test Report
for
Western Multiplex Corporation

U-NII Radio
Model: 28020

FCC ID: HZB-U5358-155

Job # 3012069


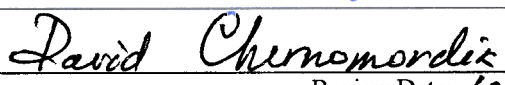
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Review Date: 10/30/01

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TABLE OF CONTENTS

1.0	SUMMARY OF TESTS.....	2
2.0	GENERAL DESCRIPTION	3
2.1	PRODUCT DESCRIPTION	3
2.2	RELATED SUBMITTAL(S) GRANTS	4
2.3	TEST METHODOLOGY.....	4
2.4	TEST FACILITY	4
3.0	SYSTEM TEST CONFIGURATION.....	5
3.1	SUPPORT EQUIPMENT AND DESCRIPTION	5
3.2	BLOCK DIAGRAM OF TEST SETUP	5
3.3	JUSTIFICATION.....	6
3.4	SOFTWARE EXERCISE PROGRAM.....	6
3.5	MODE OF OPERATION DURING TEST.....	6
3.6	MODIFICATIONS REQUIRED FOR COMPLIANCE	6
3.7	ADDITIONS, DEVIATIONS AND EXCLUSIONS FROM STANDARDS	6
4.0	MEASUREMENT RESULTS	7
4.1	CONDUCTED OUTPUT POWER AT ANTENNA TERMINAL	7
4.2	26 DB BANDWIDTH	8
4.3	POWER DENSITY	11
4.4	THE RATIO OF THE PEAK EXCURSION OF THE MODULATION ENVELOPE TO THE PEAK POWER.....	14
4.5	OUT-OF-BAND CONDUCTED EMISSIONS.....	19
4.6	TRANSMITTER RADIATED EMISSIONS	41
4.7	RADIATED EMISSIONS FROM DIGITAL SECTION AND RECEIVER.....	51
4.8	AC LINE CONDUCTED EMISSION	54
4.9	TRANSMITTER DUTY CYCLE CALCULATION / MEASUREMENTS	56
5.0	LIST OF TEST EQUIPMENT	57
APPENDIX	58

Western Multiplex, Model: 28020
FCC ID: HZB-U5358-155

Date of Test: October 20-29, 2001

1.0 Summary of Tests**Western Multiplex, MODEL: 28020
FCC ID: HZB-U5358-155**

Test	Reference	Results
Output power	15.407(a)	Complies, see sec. 4.1 of this report
26 dB Bandwidth	15.407(a)	For calculation only, see sec. 4.2 of this report
Power Density	15.407(a)(5)	Complies, see sec. 4.3 of this report
The ratio of the peak excursion of the modulation envelope to the peak transmit power	15.407(a)(6)	Complies, see sec. 4.4 of this report
Out-of-band Antenna Conducted Emission	15.407(b)	Complies, see sec. 4.5 of this report
Spurious Radiated Emission from transmitter	15.407(b)	Complies, see sec. 4.6 of this report
Radiated Emission in Restricted Bands	15.109, 15.205	Complies, see sec. 4.6 of this report
Radiated Emission from digital part and receiver	15.109, 15.209	Complies, see sec. 4.7 of this report
AC Conducted Emission	15.207	Complies, see sec. 4.9 of this report
Requirement	15.407(c)	Complies, see Appendix
Requirement	15.407(d)	Complies, see Appendix
Radiation Exposure Requirement	1.1310	Complies, see file "RF Exposure Statement"
Antenna Requirement	15.203	Not applicable, The EUT requires professional installation

Note: According to the test results, the maximum allowed antenna gain is:

26.4 dBi at 5300 MHz;

35.9 dBi at 5775 MHz.

When a higher gain antenna is used, the output power will have to be reduced.

Western Multiplex, Model: 28020
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2.0 General Description

2.1 Product Description

The EUT Model No.: 28020 is an intentional transmitter used for wireless point-to-point communications operating in the frequency ranges: 5.25 - 5.35 GHz and 5.725 - 5.825 GHz.

A pre-production version of the EUT was received on October 20, 2000 in good operating condition.

Overview of the U-NII Radio, Model 28020

Applicant	Western Multiplex Corporation
Trade Name & Model No.	Lynx OC-3 SONET/SDH Wireless Bridge
FCC Identifier	HZB-U5358-155
Use of Product	Point-to-point fixed wireless interconnect
Manufacturer & Model of Spread Spectrum Module	Western Multiplex, Model 28020
Type of Transmission	FDD
Rated RF Output (dBm)	$\leq 3.6 \text{ dBm} * (5.250\text{-}5.350 \text{ GHz})$ $\leq 17.1 \text{ dBm} * (5.725\text{-}5.825 \text{ GHz})$
Frequency Range (MHz)	2 Channels in 5.25-5.35 GHz, 5.725-5.825 GHz frequency ranges
Number of Channel(s)	2
Antenna(s) & Gain, dBi	2' Parabolic Antenna, 28.5 dBi 8' Parabolic Antenna, 39.7 dBi 1' Flat Panel Antenna, 23.5 dBi 2' Flat Panel Antenna, 28.0 dBi
Antenna Requirement	<input type="checkbox"/> The EUT uses a permanently connected antenna. <input type="checkbox"/> The antenna is affixed to the EUT using a unique connector which allows for replacement of a broken antenna, but DOES NOT use a standard antenna jack or electrical connector. <input checked="" type="checkbox"/> The EUT requires professional installation (supporting documentation is attached).
Manufacturer name & address	Western Multiplex Corporation 1196 Borregas Avenue Sunnyvale, California 94089

* The output power depends on the gain of the antenna used.

Western Multiplex, Model: 28020
FCC ID: HZB-U5358-155

Date of Test: October 20-29, 2001

2.2 Related Submittal(s) Grants

None.

2.3 Test Methodology

Both AC mains line-conducted and radiated emissions measurements were performed according to the procedures in ANSI C63.4 (1992). Radiated tests were performed at an antenna to EUT distance of 3 meters, unless stated otherwise in the "**Data Sheet**" of this Application. All other measurements were made in accordance with the procedures in part 2 of CFR 47.

2.4 Test Facility

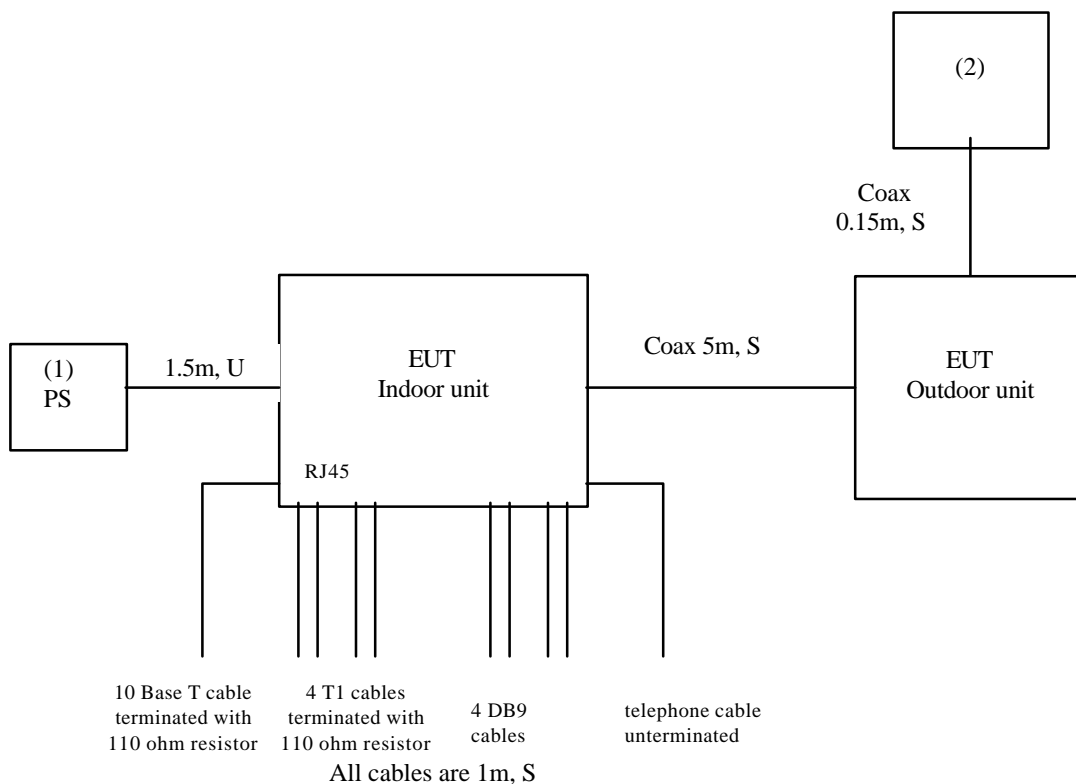
The open area test site and conducted measurement facility used to collect the radiated data is site 2. This test facility and site measurement data have been fully placed on file with the FCC and NVLAP accredited.

3.0 System Test Configuration

3.1 Support Equipment and description

Item #	Description	Model No.	Serial No.
1	HP DC Power Supply	6296A	2234A-04250
2	Gabriel Electronics 1' Directional Flat Panel Antenna	DFPD1-52	N/A
2	Gabriel Electronics 2' Directional Flat Panel Antenna	DFPD2-52	N/A
2	Gabriel Electronics 2' Parabolic Antenna	SSP2-52B	N/A
2	Gabriel Electronics 8' Parabolic Antenna	SSD8-52	N/A

3.2 Block Diagram of Test Setup



S: Shielded
U: Unshielded

3.3 Justification

For emission testing, the Equipment under Test (EUT) was configured for testing in a typical fashion (as a customer would normally use it). During testing, all cables were manipulated to produce worst case emissions.

For radiated emission measurements, the EUT is attached to a cardboard box (if necessary) and placed on the wooden turntable. If the EUT attaches to peripherals, they are connected and operational (as typical as possible). The EUT is wired to transmit full power.

The signal is maximized through rotation and placement in the three orthogonal axes. The antenna height and polarization are varied during the search for maximum signal level. The antenna height is varied from 1 to 4 meters.

Radiated emissions are taken at three meters unless the signal level is too low for measurement at that distance. If necessary, a pre-amplifier is used and/or the test is conducted at a closer distance. All readings are extrapolated back to the equivalent three meter reading using inverse scaling with distance.

3.4 Software Exercise Program

The EUT exercise program used during radiated and conducted testing was designed to exercise the various system components in a manner similar to a typical use. For emissions testing, the units were setup to transmit continuously to simplify the measurement methodology. Care was taken to ensure proper power supply voltages during testing.

3.5 Mode of operation during test

The EUT is of FDD 100% duty-cycle transmission. The EUT internally generates pseudo-random data so that data input into the modulator is always in the same way.

3.6 Modifications required for Compliance

The following modifications were installed during compliance testing in order to bring the product into compliance (Please note that this list does not include changes made specifically by Western Multiplex prior to compliance testing):

No modifications were made to the EUT by Intertek Testing Services.

3.7 Additions, deviations and exclusions from standards

No additions, deviations or exclusion have been made from standard.

4.0 Measurement Results**4.1 Conducted Output Power at Antenna Terminal**
FCC Rule 15.407(a)**Requirement:**

For fixed point-to-point U-NII devices operating in 5.725-5.825 GHz band, the peak transmit power shall not exceed the lesser of 1 Watt (30 dBm) or $17 \text{ dBm} + 10\text{Log}(B)$, where B is the 26dB emission bandwidth in MHz (for antenna gain up to 23 dBi). For devices operating in 5.25-5.35 GHz band, the peak transmit power shall not exceed the lesser of 250 mW (24 dBm) or $11 \text{ dBm} + 10\text{Log}(B)$, where B is the 26 dB emission bandwidth in MHz (for antenna gain up to 6 dBi).

Procedure:

The antenna port of the EUT was connected to the input of a power meter. Power was read directly from the meter and cable loss correction was added to the reading to obtain power at the EUT antenna terminal.

Result:

Frequency, MHz	Output Power, mW	Output Power, dBm	EIRP Limit, dBm	Maximum allowed antenna gain, dBi
Low Channel: 5300	2.3	3.6	30.0	26.4 *
High Channel: 5775	51.0	17.1	53.0	35.9 *

Note: When a higher gain antenna is used, the Output Power will have to be reduced

Western Multiplex, Model: 28020
FCC ID: HZB-U5358-155**Date of Test: October 20-29, 2001**4.2 26 dB Bandwidth
FCC Rule 15.407(a) (for calculation only)

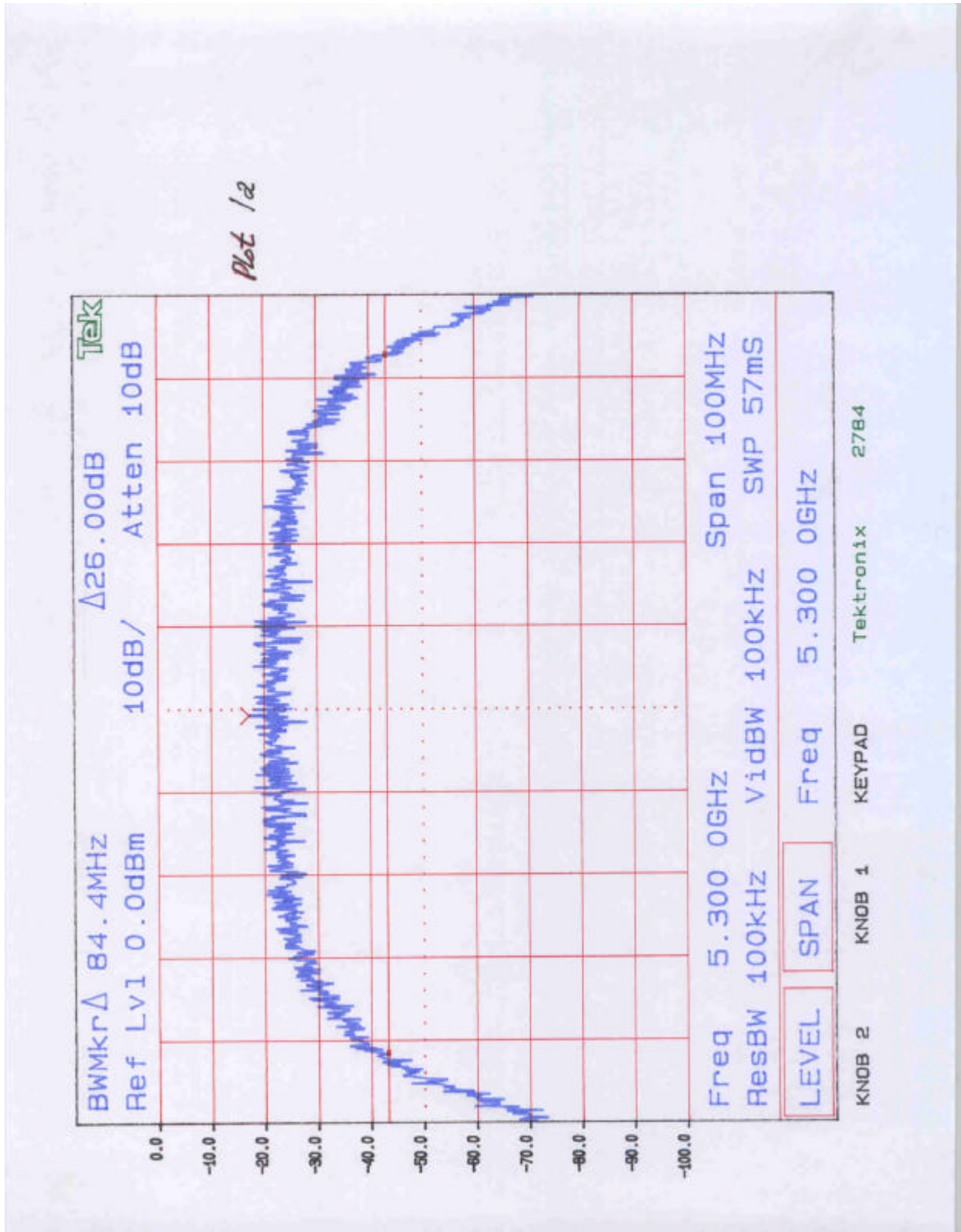
The antenna port of the EUT was connected to the input of a spectrum analyzer. Analyzer Res BW was set to 100 kHz. For each RF output channel investigated, the spectrum analyzer center frequency was set to the channel carrier. A PEAK output reading was taken, a DISPLAY line was drawn 26 dB lower than PEAK level. The 26-dB bandwidth was determined from where the channel output spectrum intersected the display line.

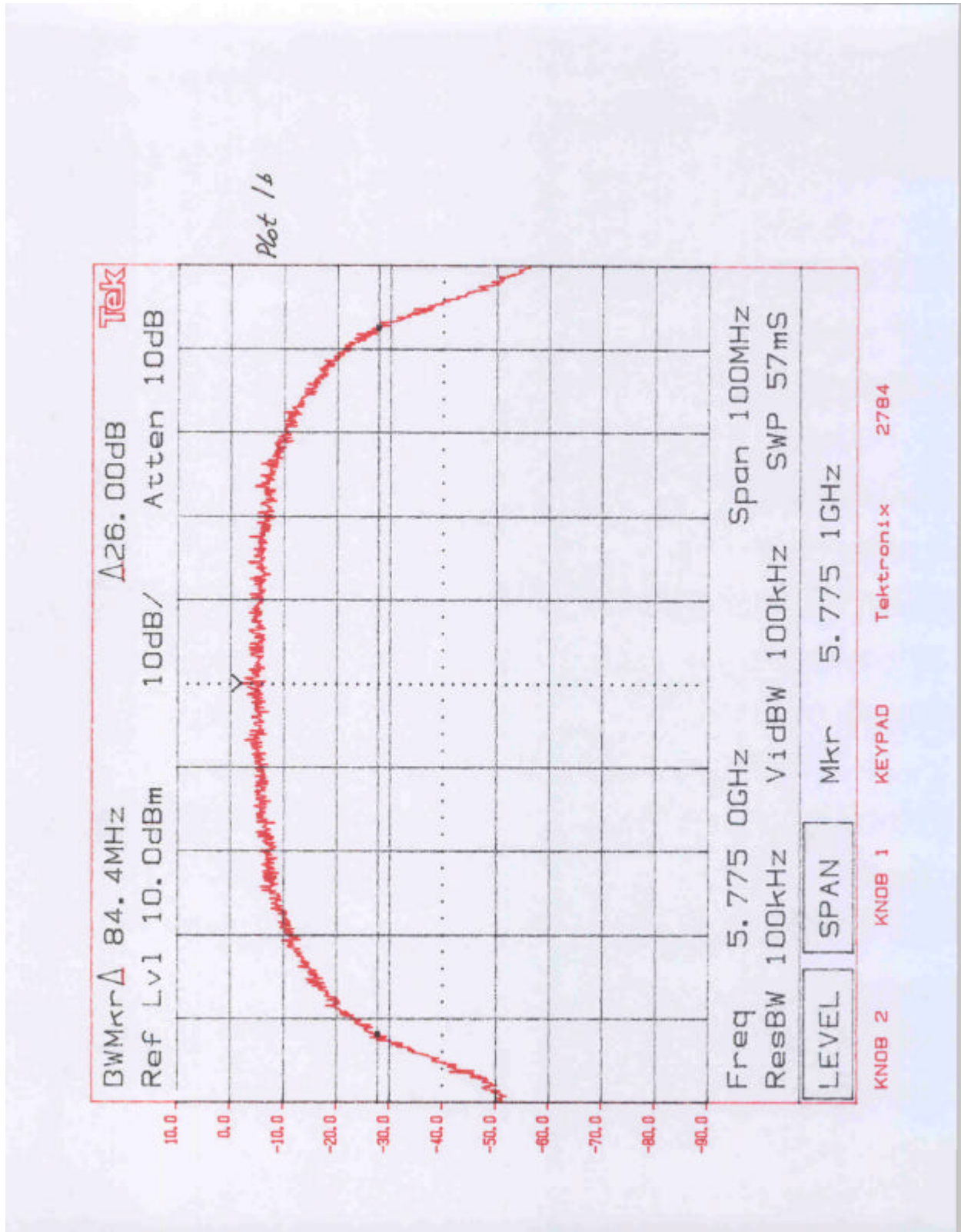
Frequency, MHz	26 dB Bandwidth, MHz
5300	84.4
5775	84.4

Refer to the following plots for 26-dB bandwidth:

Plot 1a: Low Channel 26 dB Bandwidth

Plot 1b: High Channel 26 dB Bandwidth





Western Multiplex, Model: 28020
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FCC Rule 15.407(a)(3)**Requirement:**

For fixed point-to-point U-NII devices operating in 5.725-5.825 GHz band the peak power spectral density shall not exceed 17 dBm in any 1 MHz band (for antenna gain up to 23 dBi).

For devices operating in 5.25-5.35 GHz band peak power spectral density shall not exceed 11 dBm in any 1 MHz band (for antenna gain up to 6 dBi).

Procedure:

Antenna output of the EUT was coupled directly to spectrum analyzer; if an external attenuator and/or cable was used, these losses are compensated for with the analyzer OFFSET function.

The spectrum analyzer Resolution Bandwidth was set to 1 MHz and Video Bandwidth was set to 7 MHz. The START and STOP frequencies were set to the band edges of the maximum output passband. The spectrum analyzer was set to average mode by sampling, 100 sweeps were used. Maximum power spectral density reading was recorded.

Result:

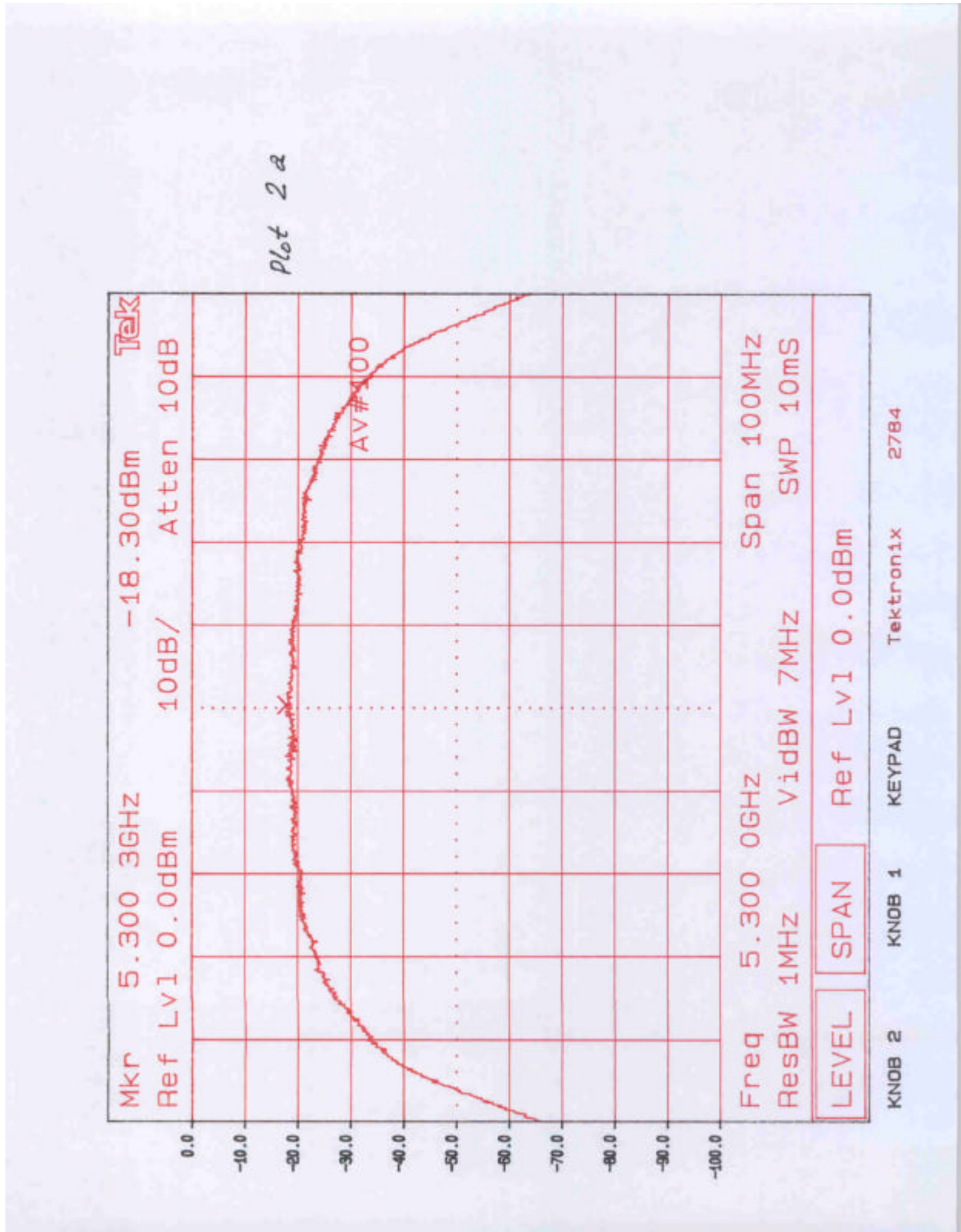
Frequency MHz	Power Density dBm	EIRP Limit dBm	Maximum Allowed Antenna Gain dBi
5300	-18.3	17.0	35.3 *
5775	-4.5	40.0	44.5 *

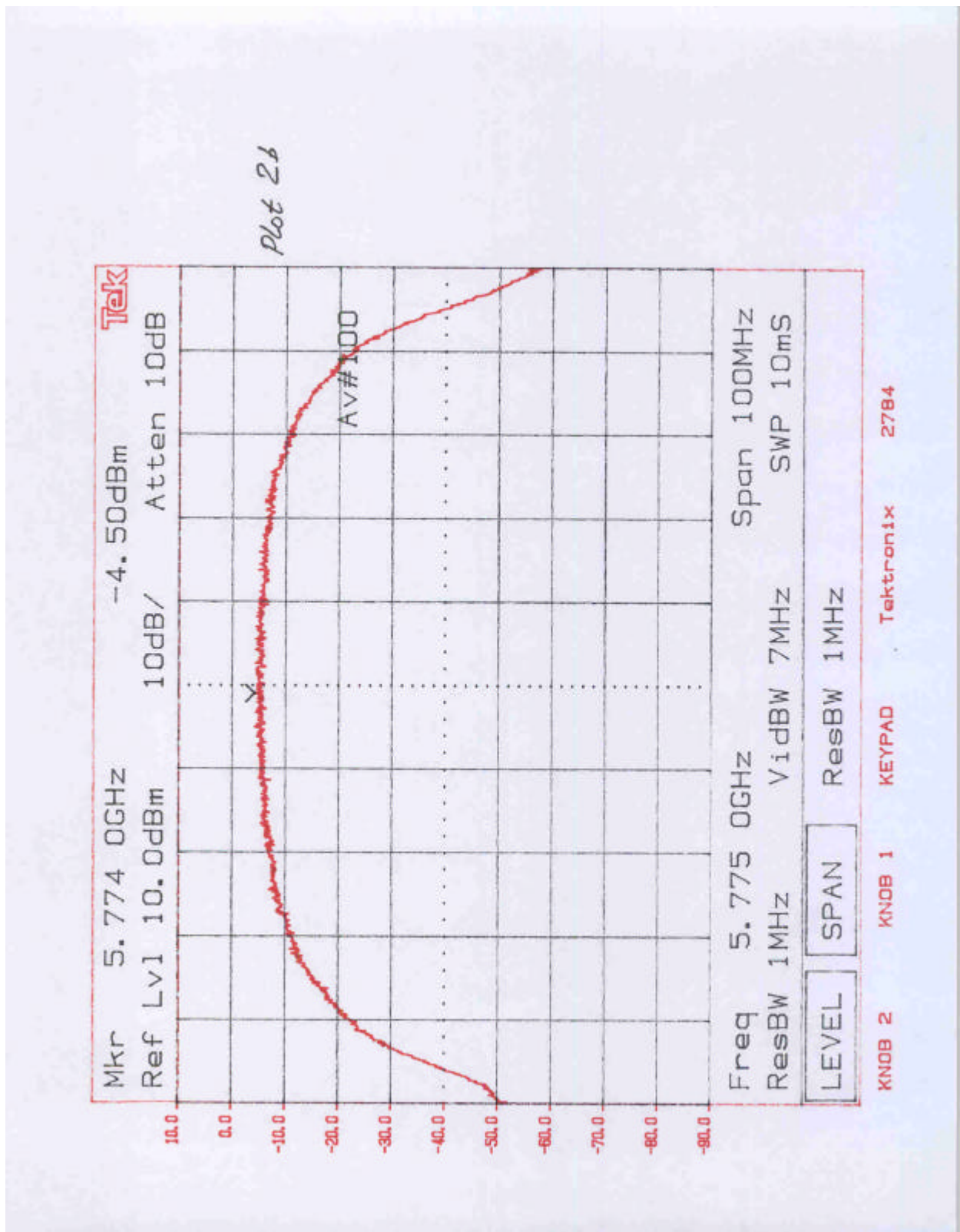
Refer to the following plots for power density data:

Plot 2a: Low Channel Power Density

Plot 2b: High Channel Power Density

* When a higher gain antenna is used, the Output Power should be reduced and, as a result, the Power Density is in compliance with EIRP Power Density Limit.





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- 4.4 The ratio of the peak excursion of the modulation envelope to the peak power
FCC Rule 15.407(a)(6)

Requirement:

The ratio of the peak excursion of the modulation envelope to the peak transmit power shall not exceed 13 dB.

Procedure:

Spectrum Analyzer was connected to the output of the EUT. The Resolution Bandwidth was set to 1 MHz. Two plots were made in each band: with the Video Bandwidth set to 7 MHz and with the Video Bandwidth set to 30 kHz. The difference between spectrum analyzer readings indicates the ratio of the peak excursion of the modulation envelope to the peak transmit power.

Test Result:

See attached plots 3.a1, 3.a2 and 3.b1, 3.b2. for the ratio of the peak excursion of the modulation envelope to the peak power. The maximum Ratio is 7.8 dB.

