

September 6, 2000

Federal Communications Commission  
Authorization and Evaluation Division  
7435 Oakland Mills Road Columbia, MD 21046

Attention: Applications Examiner

Applicant: Allgon Telecom, Ltd.  
7317 Jack Newell Blvd. North Fort Worth, Texas 76118

Equipment: PCS Channel Selective Repeater (PCS Repeater), Model: AR3530  
FCC ID: L6GAR3530

Specification: 47 CFR 24 Licensed Certification

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Dear Examiner:

The following application for Grant of Equipment Authorization is presented on behalf of Allgon Telecom Ltd.. for the Licensed Certification of their Model: AR3530, PCS Repeater.

Enclosed, please find a complete data and documentation package demonstrating that this device complies with the technical requirements of 47 CFR, Part 24, for a PCS Repeater.

If you have any questions, please contact the undersigned, who is authorized to act as Agent.

Sincerely,



Chris Harvey  
Director, EMC Laboratory

**MET Laboratories, Inc.** *Safety Certification - EMI - Telecom Environmental Simulation*

914 WEST PATAPSCO AVENUE ! BALTIMORE, MARYLAND 21230-3432 ! PHONE (410) 354-3300 ! FAX (410) 354-3313

# ENGINEERING TEST REPORT

in support of the  
Application for Grant of Equipment Authorization

**EQUIPMENT:** PCS Repeater, Model AR3530

**FCC ID::** L6GAR3530

**Specification:** 47 CFR 24

**On Behalf of the Applicant:** Allgon Telecom Ltd.  
7317 Jack Newell Blvd. North  
FortWorth, TX 76118

**Manufacturer:** Allgon Telecom Ltd.  
7317 Jack Newell Blvd. North  
FortWorth, TX 76118

**Manufacturer's Representative** Mr. Tim Purvis

**Test Date(s):** June 30 thru July 7, 2000

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## ENGINEERING STATEMENT

**I ATTEST:** the measurements shown in this report were made in accordance with the procedures indicated, and that the emissions from this equipment were found to be within the limits applicable. I assume full responsibility for the accuracy and completeness of these measurements. On the basis of the measurements made, the equipment tested is capable of operation in accordance with the requirements of Part 24 of the FCC Rules under normal use and maintenance.



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Liming Xu  
Project Engineer, MET Laboratories

## 1.0 INTRODUCTION

The following data is presented on behalf of the Applicant, Allgon Telecom Ltd. as verification of the compliance of the Allgon PCS Repeater, Model AR3530 to the requirements of 47CFR 24.

## 2.0 TEST SITE

All testing was conducted at MET Laboratories, Inc., 914 West Patapsco Avenue, Baltimore, Maryland 21230-3493. Radiated emissions measurements were performed on a three-meter open area test site (OATS). A complete site description is on file with the FCC Laboratory Division as 31040/SIT/MET.

## 3.0 TEST EQUIPMENT USED

Manufacturer	Equipment	Calibration Due	Cal. Interval
Hewlett Packard	8563A Spectrum Analyzer	5/26/00	annual
EMCO	Biconical Antenna 3104	09/28/00	annual
EMCO	EMCO Log Periodic Antenna	04/04/00	annual
EMCO	Double Ridge Guided Horn	2/27/01	annual
Hewlett Packard	8594EM Analyzer	11/20/00	annual
Rhode & Swartz (X3)	SMIQ 03 Digital Signal Gen.	7/30/00	N/A
Solar	LISN	7/27/00	annual

## 4.0 EQUIPMENT UNDER TEST CONFIGURATION

The Cellular Repeater was configured with AC power supply modules and a digital signal generator was used to simulate various PCS (i.e. CDMA type) RF input signals to the EUT. The EUT with host external computer was configured for maximum signal gain and bandwidth. The EUT was operated in a manner representative of the typical usage of the equipment. During all testing, (with the exception of intermodulation tests), the EUT was configured for Single Channel operation which results in maximum possible output gain.

## 5.0 TEST TYPE(S)

- 5.1 Radiated Emissions: 47CFR2.1053, 24.238(a)
- 5.2 Occupied Bandwidth: 47CFR2.1049, Input vs. Output
- 5.3 RF Power Output: 47CFR 2.1046, 24.132(b),(c)
- 5.4 Spurious Emission at Antenna Terminals:(uplink & downlink) 47CFR 2.1051, 24.238(a)
- 5.7 AC Line Conducted Emissions: 47CFR 15.107

**6.0 TEST RESULTS****6.1 TEST TYPE:** Radiated Emissions**6.1.1 TECHNICAL SPECIFICATION:** 2.1053; 24.238(a)**6.1.2 TEST DATE(S):** 3 July 2000**6.1.3 MEASUREMENT PROCEDURES:**

As required by 47 CFR 2.1053, *field strength of spurious radiation measurements* were made in accordance with the general procedures of ANSI C63.4-1992 "Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9kHz to 40 GHz". Preliminary radiated emission measurements were performed inside a shielded chamber with all digital signal generators on and terminated. The frequency list from the preliminary measurements was used as a guide for making final measurements on a 10 meter open area test site. The unit was scanned over the frequency range of 9 kHz to 20 GHz.

The Radiated Spurious Emissions *Limit* is obtained by the following:

Based on an output power (as measured at the output of the RF Amplifier) of 8 watts:

$$P_o = 8 \text{ W}$$

As per 2.993 (a), it is assumed this power is to be fed to a half-wave tuned dipole. Using a conversion formula for distance, the field strength at one meter can be derived:

$$E(V/m)_{1m} = \frac{\sqrt{49.2 \times 8}}{1}$$

$$E(V/m)_{1m} = 19.84 \text{ V/m or } 146 \text{ dB}\mu\text{V}$$

As per 24.238(a), the spurious emissions must be attenuated by  $43 + 10\log(P)$  which is:

$$43 + 10\text{Log}(8) = 52.03 \text{ dB}$$

Therefore, the limit for spurious emissions is:

$$146 \text{ dB}\mu\text{V} - 52.03 \text{ dB} = 93.97 \text{ dB}\mu\text{V} @ 1m$$

At 3 meters measurement distance, the limit is;

$$E(V/m)_{3m} = \frac{\sqrt{49.2 \times 8}}{3}$$

$$E(V/m)_{3m} = 6.61 \text{ V/m or } 136.4 \text{ dB}\mu\text{V}$$

According to 24.238(a), all signals must be attenuated by 46.08 dB. Therefore, the limit for spurious emissions for a test distance of 3 meters is:

$$136.4 - 52.03 = 84.37 \text{ dB}\mu\text{V} @ 3m$$

**6.1.4 RESULTS:**

Frequency (MHz)	Azimuth (Degrees)	Polarity	Height (Meters)	Raw Amplitude (dBuV)	A.C.F. (dB)	Cable loss (dB)	Corrected Amplitude (dBuV/m)	Limit (dBuV/m)
75.2	0	H	2.8	16.7	6.9	1.6	25.19	84.37
75.200	0	V	1.3	20.2	7.1	1.6	28.92	84.37
120.500	0	H	1.8	14.1	14.2	2.1	30.37	84.37
120.500	0	V	1.4	14.6	14.4	2.1	31.04	84.37
220.700	0	H	2.2	31.18	16.3	2.9	50.37	84.37
220.700	0	V	1	25.26	16.1	2.9	44.25	84.37
173.000	0	H	2	24.7	15.7	2.5	42.84	84.37
173.000	0	V	1	21.1	16.5	2.5	40.06	84.37
326.000	0	H	1.1	16.44	14.9	3.5	34.82	84.37
326.000	0	V	1.1	14.71	14.5	3.5	32.69	84.37
486.800	0	H	1.4	17.8	18.1	4.3	40.17	84.37
486.800	0	V	1.5	16.59	17.6	4.3	38.53	84.37

No Radiated Emissions was observed between 486.8 MhZ and 20GhZ.

The device complies with 47 CFR 2.1053; 24.238(a).



**6.2 TEST TYPE:** Occupied Bandwidth

**6.2.1 TECHNICAL SPECIFICATION:** 47 CFR 2.1046

**6.2.2 TEST DATE(S):** 6 July 2000

**6.2.3 MEASUREMENT PROCEDURES:**

As required by 47 CFR 2.1049, *occupied bandwidth measurements* were made on the PCS Repeater pre- and post- repeater. A digital signal generator was configured to transmit an PCS modulated carrier signal. Using an IF bandwidth of 30kHz, we determined the occupied bandwidth of the emission at the Input vs Output.

**6.2.4 RESULTS:**

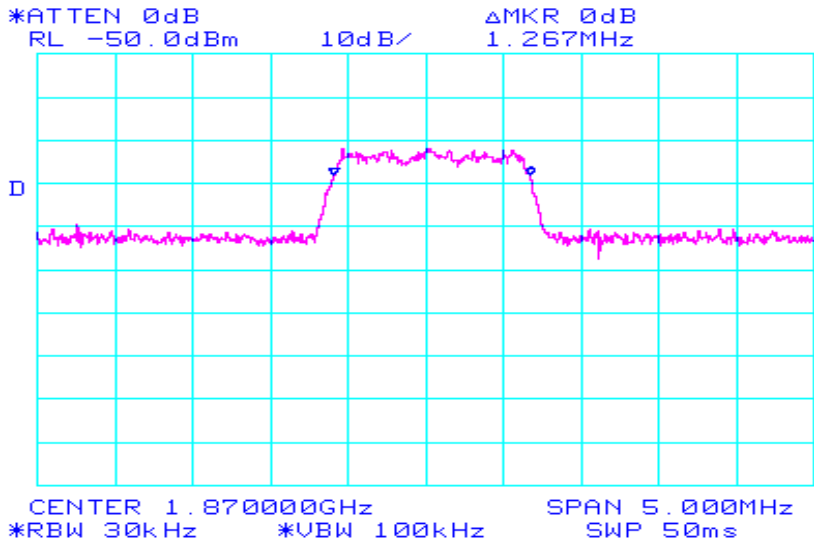
Equipment complies with Section 2.1049. Plots of the occupied bandwidth, as measured at the Repeater RF input port and at the antenna RF output port (post amplification) follow:







**CDMA ( IS-95 ) Occupied B/W at Input side    Uplink**  
**emi1350**





**6.3 TEST TYPE: RF POWER OUTPUT**

**6.3.1 TECHNICAL SPECIFICATION:** 47 CFR 2.1046 and 24.132(b)(c)

**6.3.2 TEST DATE(S):** 7 July 2000

**6.3.3 MEASUREMENT PROCEDURES:**

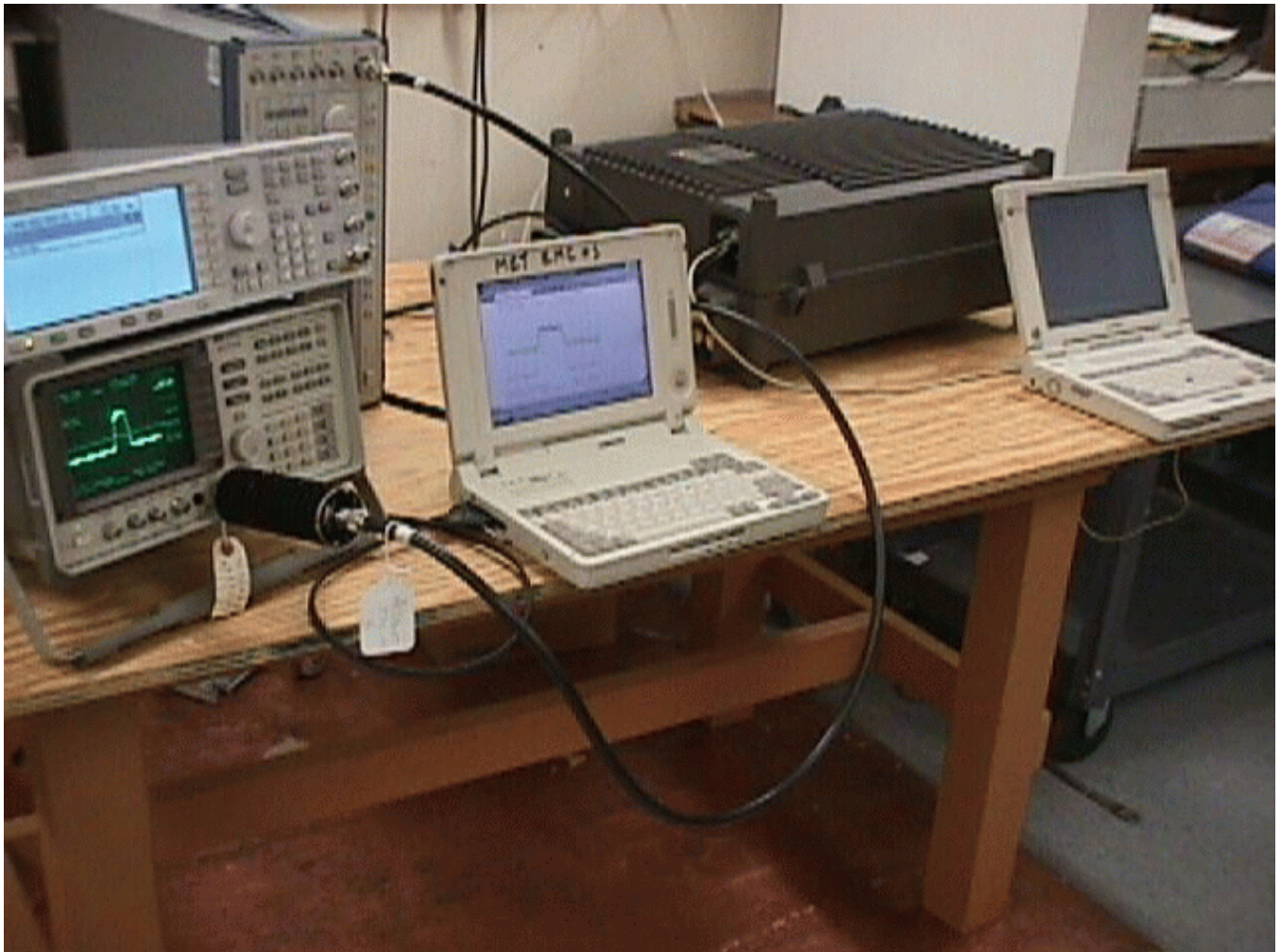
As required by 47 CFR 2.1046, *RF power output measurements* were made at the RF output terminals using an attenuator and spectrum analyzer. This test was performed with carrier modulated by a PCS CDMA, modulated signal.

Plots of the RF output Power level of the Digitally modulated carrier, as measured at the RF output of the signal generator and at the RF output terminals of the EUT appear on the following pages:

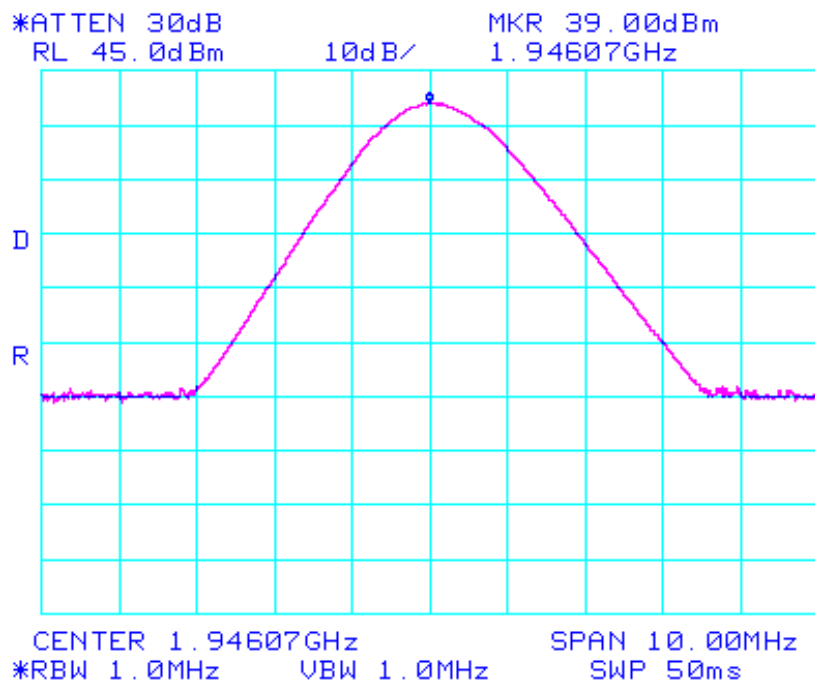
**6.3.4 RESULTS:**

Equipment complies with 47CFR 2.1046 and 24.132(b)(c). The PCS repeater power does not exceed 100 W (50 dBm) at the carrier frequency.

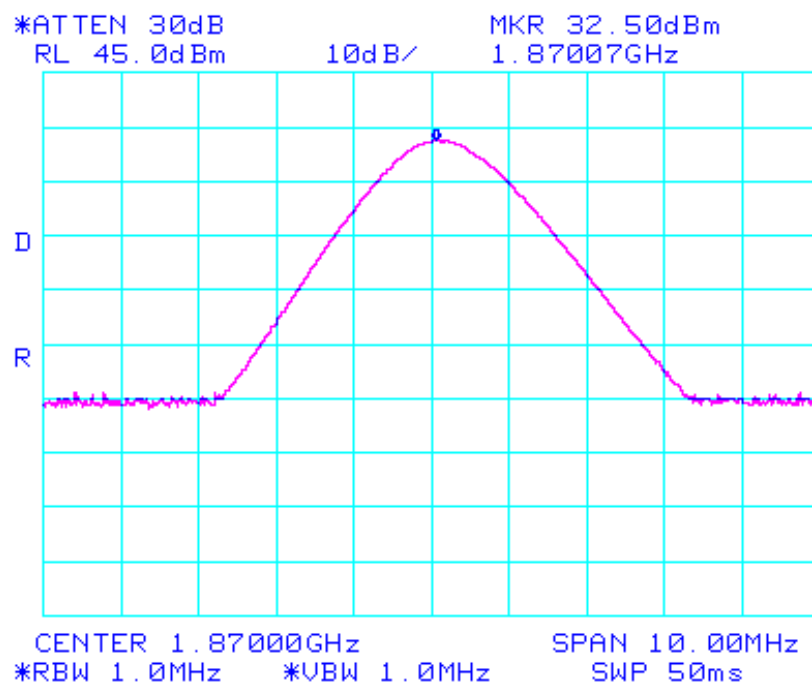
Photograph of Antenna Conducted Spurious Emissions and RF Power Output Test Configuration



RF Power output Downlink emi1350



RF Power output Uplink emi1350



**6.4 TEST TYPE:** Spurious Emissions at Antenna Terminals**6.4.1 TECHNICAL SPECIFICATION:** 2.1051; 24.238(a)**6.4.2 TEST DATE(S):** 7 July 2000**6.4.3 MEASUREMENT PROCEDURES:**

As required by 47 CFR 2.1051, *spurious emissions at antenna terminal measurements* were made at the RF output terminals using a 50  $\Omega$  attenuator and spectrum analyzer set for a 30 kHz bandwidth. This test was performed with Digitally modulated carrier signals. The Digital signal generator was adjusted for continuous transmit on frequencies in both the uplink and down-link frequency bands. The frequency spectrum was investigated from 9.0 KHz to 20.0 GHz. For measuring emissions above 2 GHz, a high-pass filter was used to eliminate the fundamental transmit frequency to prevent possible saturation effects on the front end of the spectrum analyzer.

**6.4.4 RESULTS:**

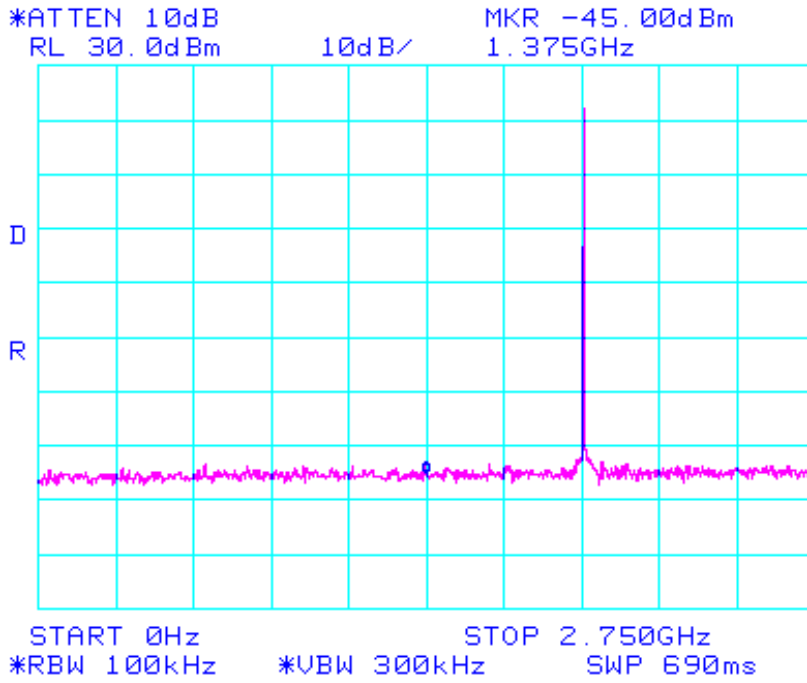
Spur limit =  $P_o - (43 + 10\log P) = 143 \text{ dB}\mu\text{V} - (49 \text{ dB}) = 94 \text{ dB}\mu\text{V} = -13.1 \text{ dBm}$

Equipment complies with Section 2.1051 and 24.238(a)

**PLOTS OF SPURIOUS EMISSIONS AT ANTENNA TERMINALS** : on following pages



Spur Emissions at Antenna terminal emi1350 Downlink

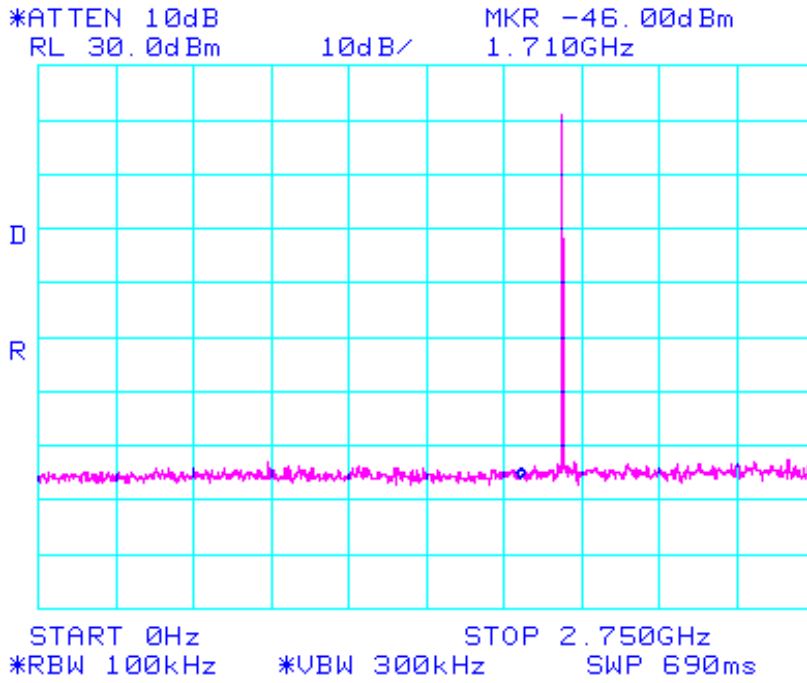








Spur emissions Uplink emi1350











**6.9 TEST TYPE:** Line Conducted Emissions

**6.9.1 TECHNICAL SPECIFICATION:** 15.107(b)

**6.9.2 TEST DATE(S):** 3 July 2000

**6.9.3 MEASUREMENT PROCEDURES:**

The measurements were performed over the frequency range of 0.45 MHz to 30 MHz using a 50  $\Omega$ /50  $\mu$ H LISN as the input transducer to an EMI/Field Intensity Meter. The measurements were made with the detector set for "peak" amplitude within an IF bandwidth of 10 kHz or for "quasi-peak" within a bandwidth of 9 kHz. The tests were conducted in a RF-shielded enclosure.

**6.9.4 RESULTS:**

Equipment complies with Section 15.107(b)

The following plots and data illustrate compliance with the applicable specification

**Neutral**

<b>Frequency (Mhz)</b>	<b>Qp Amplitude (dBuv)</b>	<b>Limit (dBuv)</b>
<b>0.451</b>	<b>28.1</b>	<b>60</b>
<b>0.515</b>	<b>53.7</b>	<b>60</b>
<b>0.642</b>	<b>38.9</b>	<b>60</b>
<b>8.282</b>	<b>42.0</b>	<b>69.5</b>
<b>23.957</b>	<b>32.8</b>	<b>69.5</b>
<b>24.2</b>	<b>32.2</b>	<b>69.5</b>

**Phase**

<b>Frequency (Mhz)</b>	<b>Qp Amplitude (dBuv)</b>	<b>Limit (dBuv)</b>
<b>0.457</b>	<b>29.2</b>	<b>60</b>
<b>0.511</b>	<b>54.4</b>	<b>60</b>
<b>0.638</b>	<b>40.5</b>	<b>60</b>
<b>8.654</b>	<b>41.6</b>	<b>69.5</b>
<b>23.521</b>	<b>32.4</b>	<b>69.5</b>
<b>24.16</b>	<b>31.5</b>	<b>69.5</b>

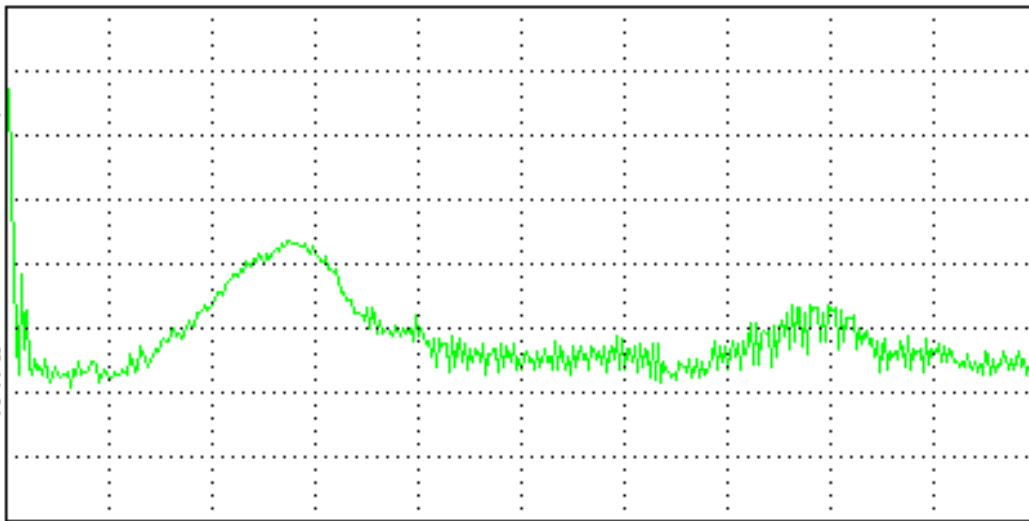
### emi1350 Phase

16:01:04 JUL 03, 2000

REF 80.0 dB $\mu$ V #AT 10 dB

PEAK  
LOG  
10  
dB/  
OFFST  
10.0  
dB

VA SB  
SC FC  
CORR



START 450 kHz #RES BW 9.0 kHz VBW 30 kHz STOP 30.00 MHz SWP 1.09 sec

**AUTO**

MARKER  
NORMAL

MARKER  
 $\Delta$

MARKER  
AMPTD

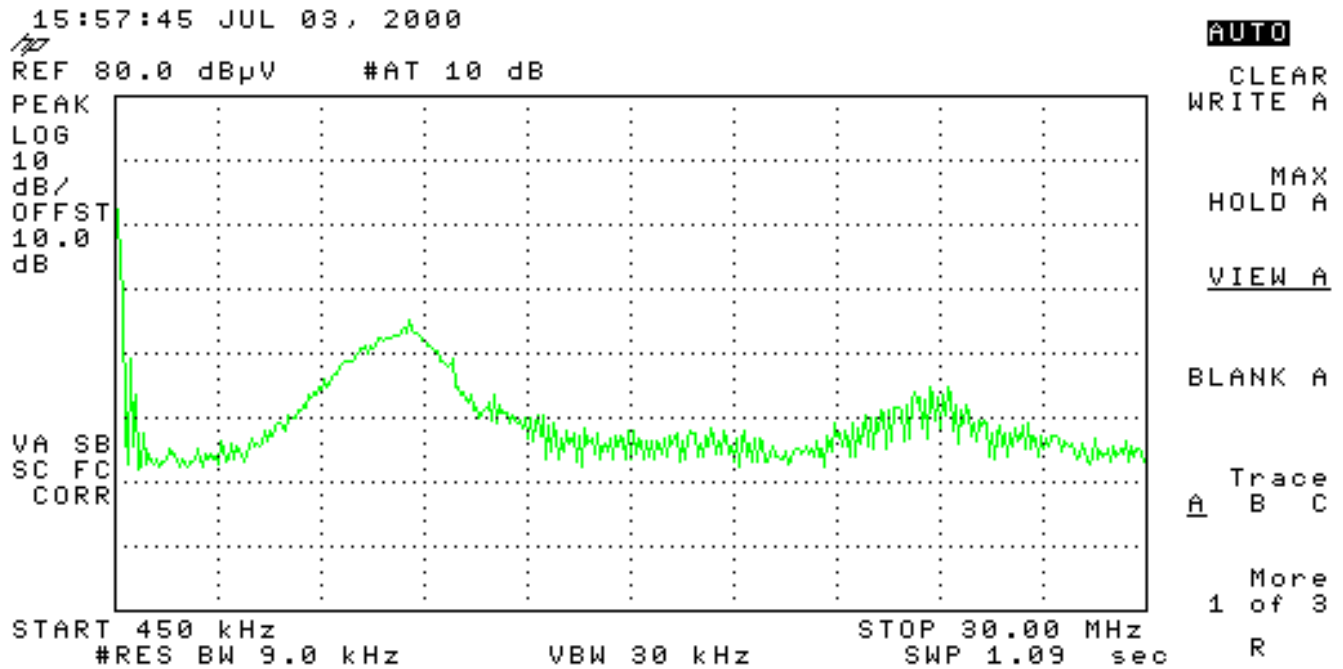
SELECT  
1 2 3 4

MARKER 1  
ON OFF

More  
1 of 2

RL

emi1350 Neutral





**TEST SETUP OF LINE CONDUCTED EMISSIONS**

