

March 29, 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: Towertop Power Amplifier, Model: 9228.01  
FCC ID: L6G922801

Specification: 47 CFR Part 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: 9228.01, Towertop Power Amplifier.

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 Towertop Power Amplifier.

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:** Towertop Power Amplifier, Model 9228.01

**FCC ID::** L6G922801

**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):** Feb. 2 through 14, 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 Towntop Power Amplifier, Model 9228.01 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	5/25/00	annual
EMCO	Biconical Antenna 3104	3/9/00	annual
EMCO	EMCO Log Periodic Antenna	2/16/01	annual
EMCO	Double Ridge Guided Horn	2/8/01	annual
Hewlett Packard	8594EM Analyzer	11/18/00	annual
Rhode & Swartz (X3)	SMIQ 03 Digital Signal Gen.	N/A (Verified using HP8563A)	N/A
Solar	LISN	7/26/00	annual

## 4.0 EQUIPMENT UNDER TEST CONFIGURATION

The Towntop Power Amplifier was configured with AC power supply modules and a digital signal generator was used to simulate various PCS (i.e. GMSK Modulation 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.

## 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, **24.232(b),(c)**
- 5.4 Spurious Emission at Antenna Terminals: (downlink) 47CFR 2.1051, **24.238(a)**
- 5.6 Spurious Emission at Antenna Terminals +/- 1MHz: 47CFR 2.1051, **24.238(b)**
- 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): 11 Feb. 2000

#### 6.1.3 MEASUREMENT PROCEDURES:

As required by §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 Amplifier) of 14 watts:

$$P_o = 14 \text{ W}$$

As per 2.1046 (a), it is assumed this power is to be fed to a radio frequency load. Using a conversion formula for distance, the field strength at one meter can be derived:

$$E(V/m)_{1m} = \frac{\sqrt{49.2 \times 14}}{1}$$
$$E(V/m)_{1m} = 26.25 \text{ V/m or } 148.5 \text{ dB}\mu\text{V}$$

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

$$43 + 10\text{Log}(14) = 54.46 \text{ dB}$$

Therefore, the limit for spurious emissions is:

$$148.5 \text{ dB}\mu\text{V} - 54.46 \text{ dB} = 94.04 \text{ dB}\mu\text{V} @ 1m$$

At 3 meters measurement distance, the limit is;

$$E(V/m)_{3m} = \frac{\sqrt{49.2 \times 14}}{3}$$
$$E(V/m)_{3m} = 8.75 \text{ V/m or } 138.8 \text{ dB}\mu\text{V}$$

According to 24.238(a), all signals must be attenuated by 54.46 dB. Therefore, the limit for spurious emissions for a test distance of 3 meters is:

$$138.8 - 54.46 = 84.38 \text{ dB}\mu\text{V} @ 3m$$

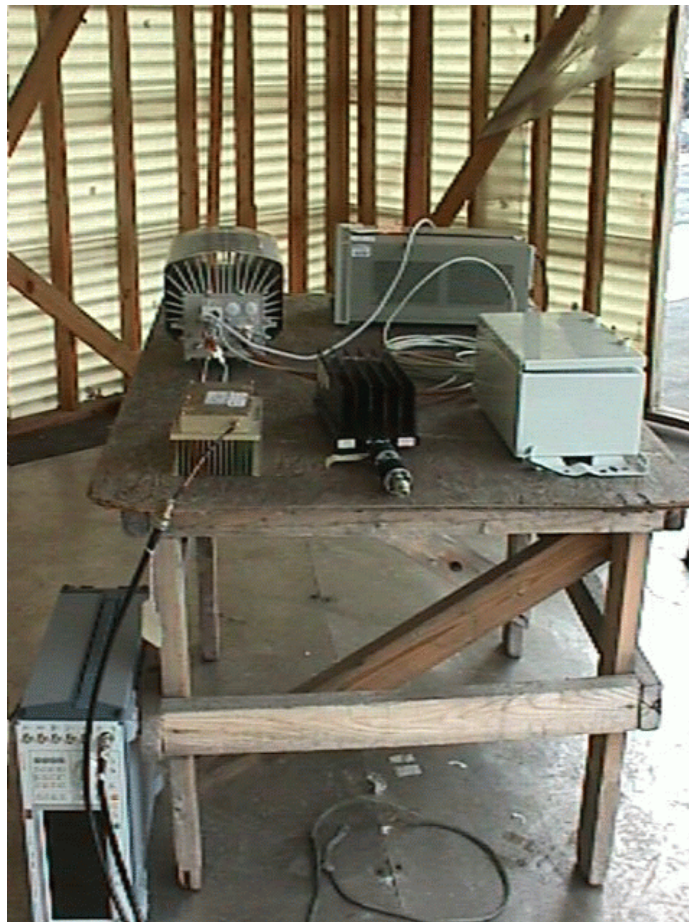
### 6.1.4 RESULTS:

Carrier Emission: 14 Watts

FREQUENCY (MHZ)	EUT AZIMUTH (Degrees)	ANTENNA		EUT RADIATION (dB $\mu$ V)	ANTENNA FACTOR (dB/m)	TEST DISTANCE (m)	CABLE LOSS (dB)	FIELD STRENGTH (dBuV/m)	LIMITS @ 3m (dBuV/m)
		POL (H/V)	HGT (m)						
39.830	180	H	1.5	30.8	12.3	3	1.1	44.2	84.39
39.830	135	V	2	25.6	10.7	3	1.1	37.4	84.39
74.600	180	H	1.5	16.7	8.2	3	1.6	26.5	84.39
74.600	90	V	2	16.4	8.5	3	1.6	26.5	84.39
168.700	225	H	2.5	15.8	15.2	3	2.4	33.4	84.39
168.700	180	V	1.5	14.3	16.3	3	2.4	33.0	84.39
208.020	180	H	1.5	17.8	17.8	3	2.7	38.3	84.39
208.020	135	V	2.5	18.09	18.0	3	2.7	38.8	84.39
256.800	90	H	2	16.07	17.7	3	3.1	36.9	84.39
256.800	225	V	1.5	15.16	17.9	3	3.1	36.2	84.39
321.000	270	H	2	15.12	15.9	3	3.5	34.5	84.39
321.000	225	V	1	14.56	15.3	3	3.5	33.4	84.39

Equipment meets the specifications of 2.1053; 24.238(a)

Photograph of Radiated Emissions Test Configuration



**6.2 TEST TYPE:** Occupied Bandwidth

**6.2.1 TECHNICAL SPECIFICATION:** 47CFR2.1049

**6.2.2 TEST DATE(S):** 7 Feb. 2000

**6.2.3 MEASUREMENT PROCEDURES:**

As required by 47 CFR 2.1049, *occupied bandwidth measurements* were made on the TTPA. A digital signal generator was configured to transmit a PCS GMSK modulated carrier signal. Using an IF bandwidth of 300Hz, we determined the occupied bandwidth of the emission at the lowest and highest selectable channel range.

**6.2.4 RESULTS:**

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







**6.3 TEST TYPE:** RF Power Output

**6.3.1 TECHNICAL SPECIFICATION:** 47CFR2.1046 and 24.132(b)(c)

**6.3.2 TEST DATE(S):** 07 Feb. 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 the carrier modulated by an PCS GSMK modulation signal.

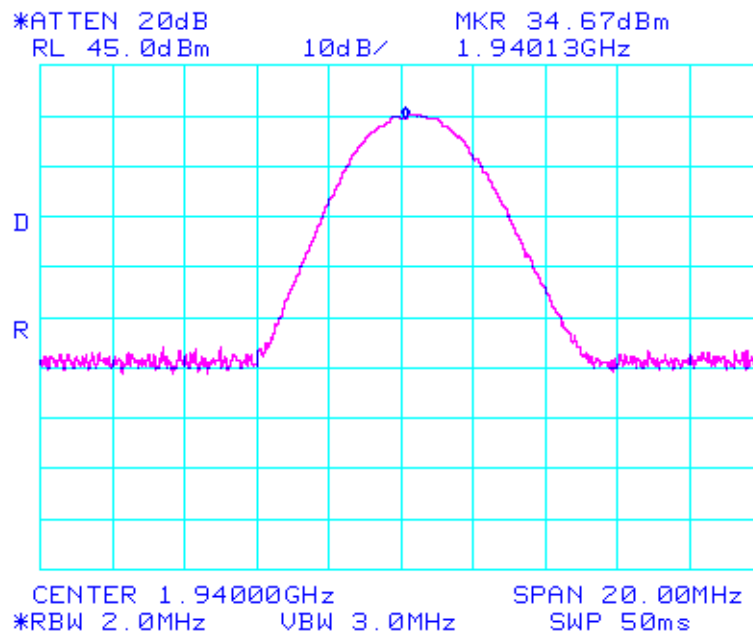
Plots of the RF output Power level of the Digitally modulated carrier, as measured at the RF output of the signal generator and at the RF output terminals of the EUT appear on the following pages:

**6.3.4 RESULTS:**

Equipment complies with 47CFR 2.1046 and 24.132(b)(c). The PCS booster 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 input at input port of The TTPA  
emi1313**



**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):** 07 Feb 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 dB 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.

**6.5.4 RESULTS:**

Equipment complies with Section 2.1051 and 24.238(a)

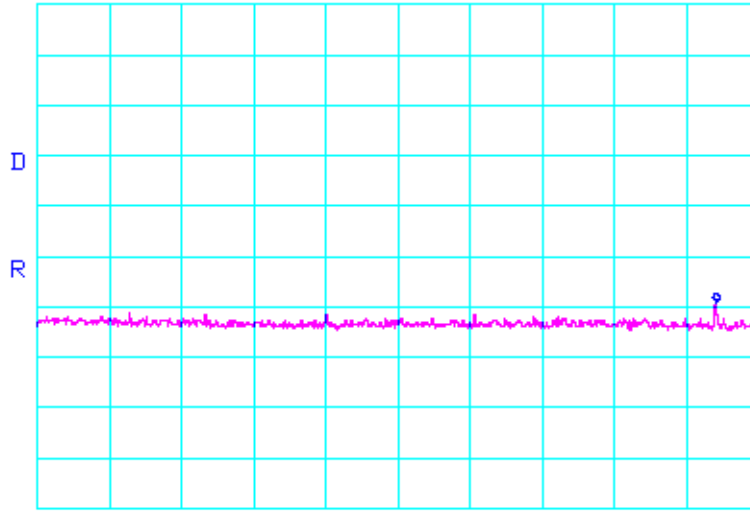
**SUMMARY OF SPURIOUS EMISSIONS AT ANTENNA TERMINALS -  
DownLink (Base)**

Frequency Range	Emission Frequency	Emission Level (dBm)	Limit (dBm)
0 - 1 GHz	975 MHz	-22.67	-13.1
2 - 6 GHz	5.82 GHz	-22.83	-13.1
6-10 GHz	9.05 GHz	-25.5	-13.1
10-15 GHz	14.55 GHz	-20.0	-13.1
15 - 20.0 GHz	19.36 GHz	-19.0	-13.1

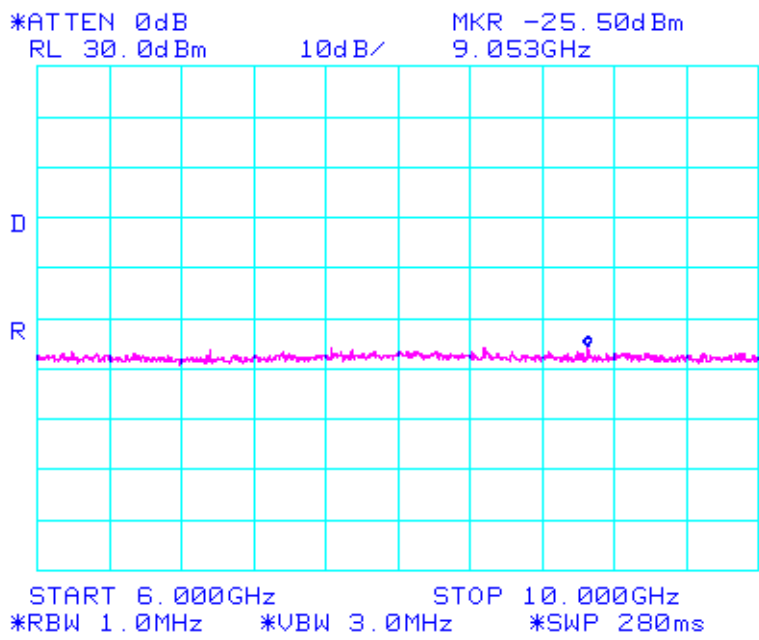
Plots on the following pages illustrate compliance to the required rule parts.

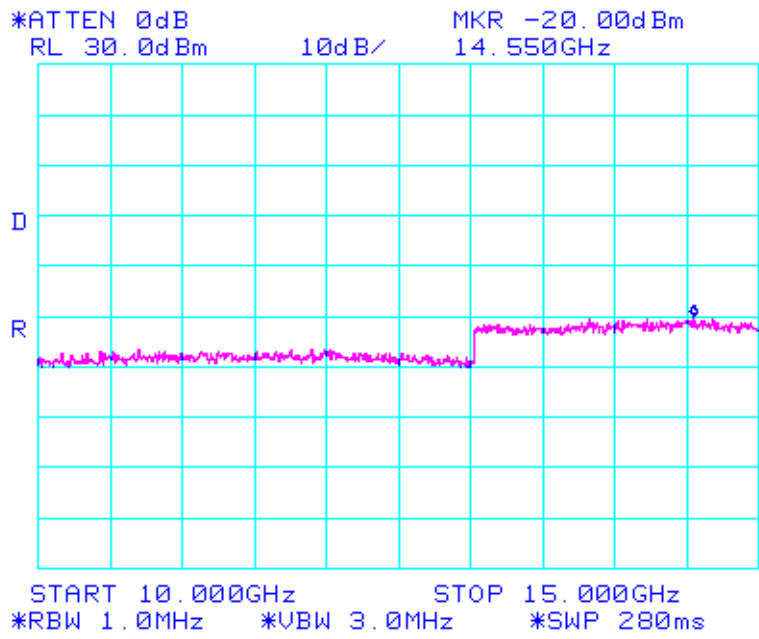


\*ATTEN 0dB  
RL 30.0dBm 10dB/ MKR -29.17dBm  
5.810GHz



START 2.750GHz STOP 6.000GHz  
\*RBW 1.0MHz \*VBW 3.0MHz \*SWP 280ms









**6.6 TEST TYPE:** Spurious Emissions at Antenna Terminals @ Frequency Block Edge +/- 1MHz

**6.6.1 TECHNICAL SPECIFICATION:** 47CFR24.238(b)

**6.6.2 TEST DATE(S):** 08 Feb. 2000

**6.6.3 MEASUREMENT PROCEDURES:** (Downlink) - PCS

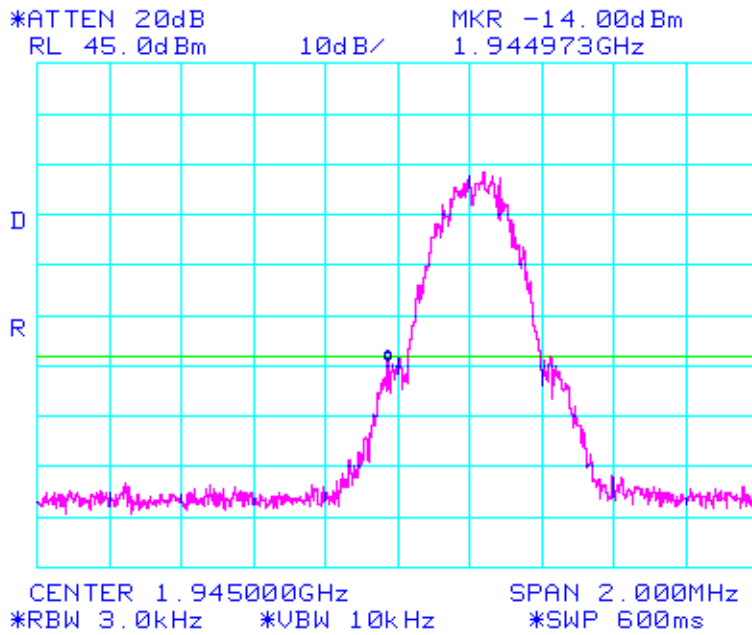
Modulation products outside of this band are attenuated at least  $43 + 10 \text{ Log (P)}$  below the level of the modulated carrier. A Plot of the spurious emissions at +/- 1 MHz around the transmit frequency, as measured at the antenna port, appear on the following pages.

**SPURIOUS EMISSION FREQUENCY BLOCKS**

Frequency Block (MHz)	Low Frequency (MHz)	Hi Frequency (CH #)
A (1930-1945)	(1930.2)	(1944.8)
D (1945-1950)	(1945.2)	(1949.8)

Plots of the spurious emissions as measured at the extremes of each frequency block appear in the following plots:





Conducted spur emissions as measured at +/- 1 MHz of Frequency Block edge  
 Low side of Block  
 emi1313





**6.7 TEST TYPE:** Intermodulation Spurious Emissions Antenna Terminals

**6.7.1 TECHNICAL SPECIFICATION:** N/A

**6.7.2 TEST DATE(S):** Not Applicable

**6.7.3 EXPLANATION OF APPLICABILITY:** The Allgon Tower Top Power Amplifier (L6G922801) is intended for use in single carrier mode only. Due to the configuration of the technology in which the TTPA will be used, only one carrier will be possible per TTPA. The unit will be used with a single GMSK modulated carrier. See the attached attestation from Allgon for manufacturer's statement, submitted as the operational Description Document titled carrier.pdf.

**6.9 TEST TYPE:** Line Conducted Emissions

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

**6.9.2 TEST DATE(S):** 09 Feb 2000

**6.9.3 MEASUREMENT PROCEDURES:**

The measurements were performed over the frequency range of 0.45 MHz to 30 MHz using a 50 /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)

**SUMMARY OF SPURIOUS EMISSIONS AT AC Mains Terminals - Neutral**

Frequency (MHZ)	Emission Quasi-Peak Level (dBuV)	Limit (dBuV)
0.481	52.0	60.0
0.960	49.0	60.0
24.05	31.0	69.0
21.77	30.0	69.0
21.60	24.0	69.0
16.14	30.0	69.0

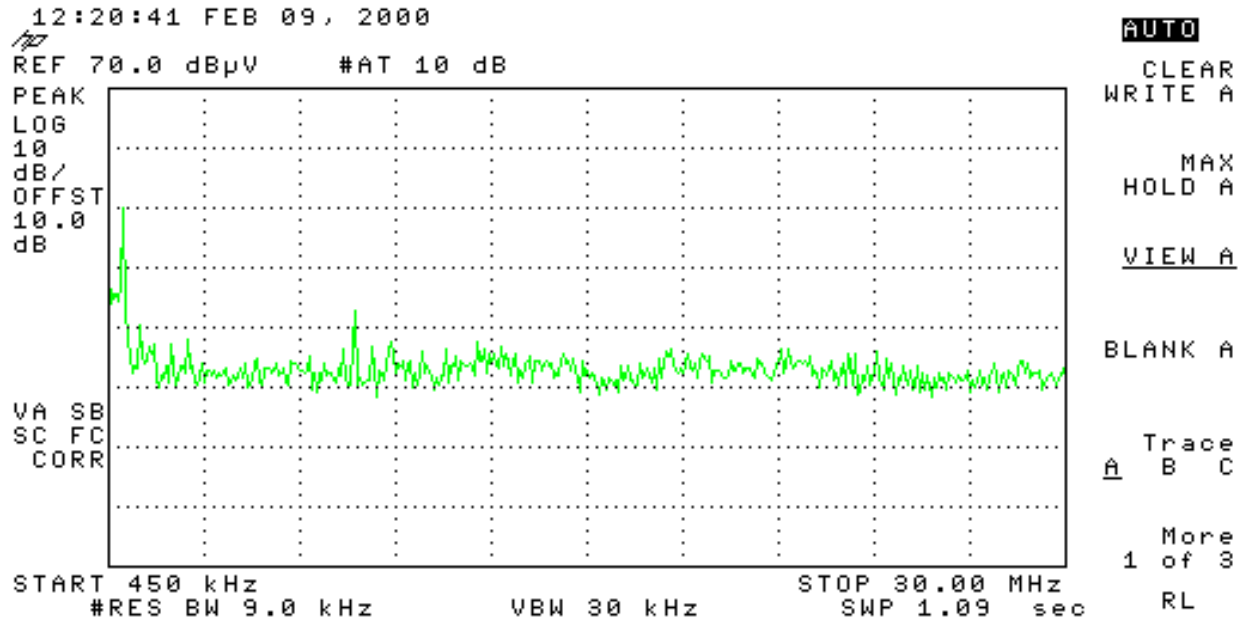
**SUMMARY OF SPURIOUS EMISSIONS AT AC Mains Terminals - Phase**

Frequency (MHZ)	Emission Quasi-Peak Level (dBuV)	Limit (dBuV)
0.480	53.40	60.0
8.02	35.2	60.0
8.58	27.80	60.0
0.960	51.20	69.0
2.879	29.60	69.0
21.65	25.20	69.0

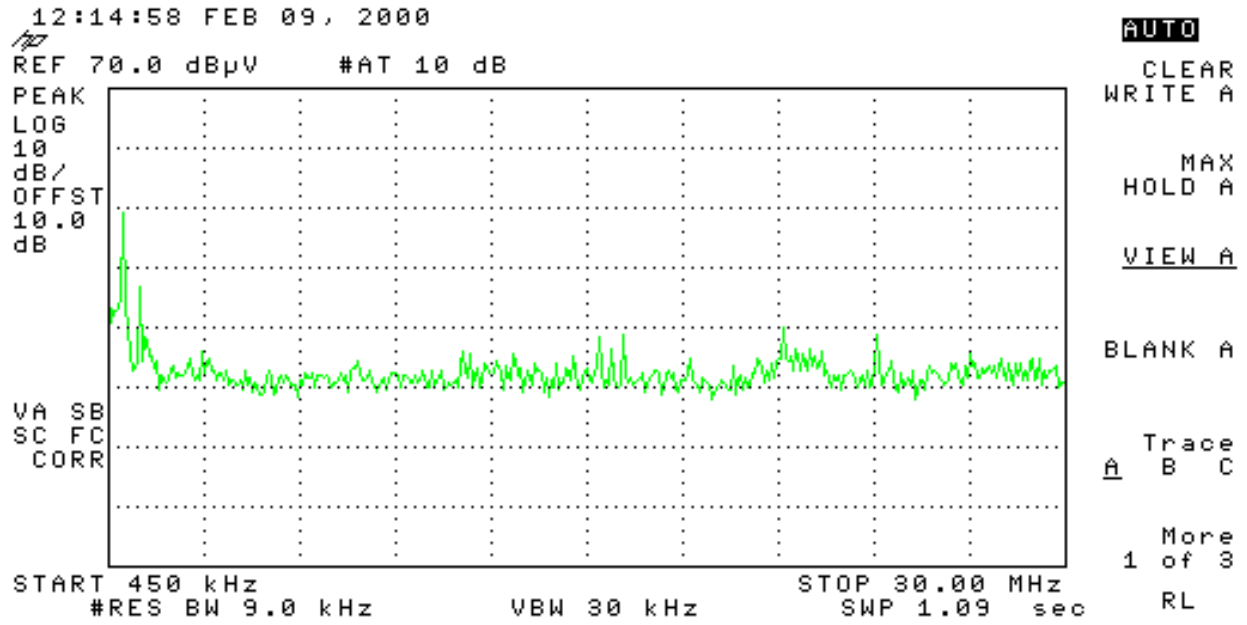
The following plots illustrate compliance with the applicable specification.



# Line Conducted RE at Phase emi1313



# Line Conducted RE at Neutral emi1313



## TEST SETUP OF LINE CONDUCTED EMISSIONS

