

May 25, 2000

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

Attention: Applications Examiner

Applicant: Airspan Communications Ltd.  
Cambridge House, Oxford Road, Uxbridge Middlesex UB8 1UN UK

Equipment: PCS Base Transmitter Station (BTS), Model: AS4000  
FCC ID: O2J-AS4000CT-PCS

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 Airspan Communications Ltd. for the Licensed Certification of their Model: AS4000 PCS Base Transmitter Station (BTS).

Enclosed, please find a complete data and documentation package demonstrating that this device complies with the technical requirements of 47 CFR 24, for a Base Transmitter Station (BTS).

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

Sincerely,

Chris Harvey  
EMC Director  
MET Laboratories, Inc.

# ENGINEERING TEST REPORT

in support of the  
Application for Grant of Equipment Authorization

**EQUIPMENT:** PCS Base Transmitter Station (BTS),  
Model: AS4000

**FCC ID:** O2J-AS4000CT-PCS

**Specification:** 47 CFR 24

**On Behalf of the Applicant:** Airspan Communications Ltd.  
Cambridge House  
Oxford Road  
Uxbridge  
Middlesex  
UB8 1UN UK

**Manufacturer:** Same as above

**Manufacturer's Representative** Mr. Mel Nance

**Test Date(s):** Mar 1 thru 19, 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

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## 1.0 INTRODUCTION

The following data is presented on behalf of the Applicant, Airspan Communications Ltd.

## 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	5/29/00	annual
EMCO	Biconical Antenna 3104	1/27/01	annual
EMCO	EMCO Log Periodic Antenna	3/20/01	annual
EMCO	Double Ridge Guided Horn	3/20/01	annual
Hewlett Packard	8591E Analyzer	8/12/00	annual
Solar	LISN	6/30/00	annual

## 4.0 EQUIPMENT UNDER TEST CONFIGURATION

The Base Transmitter Station (BTS) was configured with DC power supply modules and an external PC to program the EUT to output a PCS (i.e.CDMA Modulation type) cellular RF signal. 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, system components were manipulated within the confines of typical usage to maximize each emission.

## 5.0 TEST TYPE(S)

- 5.1 Radiated Emissions: 47CFR2.1053, , **24.238(a)**
- 5.2 Occupied Bandwidth: 47CFR2.1049, **300kHz**
- 5.3 RF Power Output: 47CFR 2.1046, **24.232(a), (c)**
- 5.4 Spurious Emission at Antenna Terminals:(uplink & downlink) 47CFR 2.1051, **24.238(a)**
- 5.5 Spurious Emission at Antenna Terminals at Frequency Block edges +/- 1 MHz, 47CFR 2.1051, **24.238(b)**
- 5.6 Frequency Stability over temperature variations: 47CFR **2.1055(a)(1)**
- 5.7 Frequency Stability over variations in supply voltage: 47CFR **2.1055(d)(1)**
- 5.8 DC 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):** 15 Mar 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 the lowest system oscillator value to 9 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 2.8 watts:

$$P_o = 2.8 \text{ W}$$

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:

$$E(V/m)_{1m} = \frac{\sqrt{49.2 \times 2.8}}{1}$$

$$E(V/m)_{1m} = 11.74 \text{ V/m or } 141.3 \text{ dB}\mu\text{V}$$

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

$$43 + 10\text{Log}(2.8) = 47.47 \text{ dB}$$

Therefore, the limit for spurious emissions is:

$$141.3 \text{ dB}\mu\text{V} - 47.47 \text{ dB} = 93.83 \text{ dB}\mu\text{V} @ 1m$$

At 3 meters measurement distance, the limit is;

$$E(V/m)_{3m} = \frac{\sqrt{49.2 \times 2.8}}{3}$$

$$E(V/m)_{3m} = 3.91 \text{ V/m or } 131.8 \text{ dB}\mu\text{V}$$

According to 24.238(a), all signals must be attenuated by 47.77 dB. Therefore, the limit for spurious emissions for a test distance of 3 meters is:

$$131.8 - 47.47 = 84.38 \text{ dB}\mu\text{V} @ 3m$$

**6.1.4 RESULTS:**

Carrier Emission: 9.73 Watts

FREQUENCY (MHZ)	EUT AZIMUTH (Degrees)	ANTENNA		EUT RADIATION (dBµV)	ANTENNA FACTOR (dB/m)	TEST DISTANCE (m)	CABLE LOSS (dB)	AMP GAIN MINUS FILTER LOSS (dBµV)	FIELD STRENGTH (dBuV/m)	LIMITS @ 3m (dBuV/m)
		POL (H/V)	HGT (m)							
54.3	180	H	2	20.5	11.128	3	1.31	n/a	32.9	84.38
54.3	180	V	1	28.8	10.784	3	1.31	n/a	40.9	84.38
57.370	90	H	2	22.6	10.9578	3	1.37	n/a	34.9	84.38
57.370	90	V	1	36.6	10.6052	3	1.37	n/a	48.6	84.38
139.4	180	H	2	11.7	12.624	3	2.208	n/a	26.5	84.38
139.4	180	V	1	12.2	12.276	3	2.208	n/a	26.7	84.38
253.5	180	H	2	14.5	17.02	3	3.09	n/a	34.6	84.38
253.5	180	V	1	12.4	17.7	3	3.09	n/a	33.2	84.38
299.7	180	H	2	11.5	21.688	3	3.315	n/a	36.5	84.38
299.7	180	H	1	11.6	19.518	3	3.315	n/a	34.4	84.38
368.6	0	H	2	16.2	15.772	3	3.719	n/a	35.7	84.38
368.6	0	V	1	22.5	15.772	3	3.719	n/a	42	84.38
914	0	H	2	12.17	24.12	3	6.442	n/a	42.7	84.38
914	0	V	1	12.3	23.66	3	6.442	n/a	42.4	84.38
3894	0	H	1	57	32.4	3	2	n/a	56.4	84.38
3894	0	V	1	53	32.2	3	2	n/a	52.2	84.38

Equipment meets the specifications of 2.993; 24.238(a)

Photograph  
Test



of Radiated Emissions  
Configuration

**6.2 TEST TYPE:** Occupied Bandwidth

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

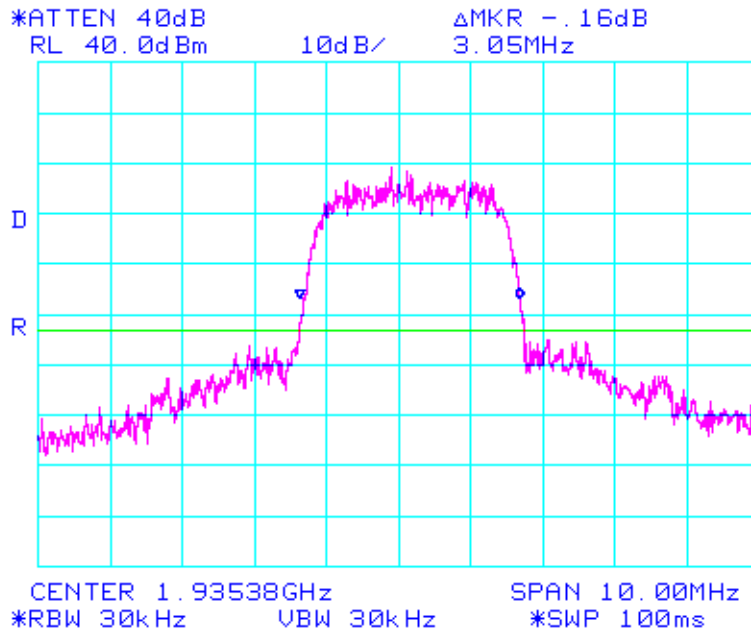
**6.2.2 TEST DATE(S):** 10 Mar 1999

**6.2.3 MEASUREMENT PROCEDURES:**

As required by §2.1049 of CFR 47, *occupied bandwidth measurements* were made on the Base Transmitter Station (BTS). The EUT was configured to transmit an PCS CDMA modulated carrier signal. Using a bandwidth of 30KHz, we determined the occupied bandwidth of the emission at the center of the selectable channel range.

**6.2.4 RESULTS:**

Equipment complies with Section 2.1049. Plots of the occupied bandwidth, as measured at the RF output port follows:



Occupied B/W emi1298





**6.3 TEST TYPE:** RF Power Output

**6.3.1 TECHNICAL SPECIFICATION:** 47CFR2.1046 and 24.232(a), (c)

**6.3.2 TEST DATE(S):** 10 Mar 2000

**6.3.3 MEASUREMENT PROCEDURES:**

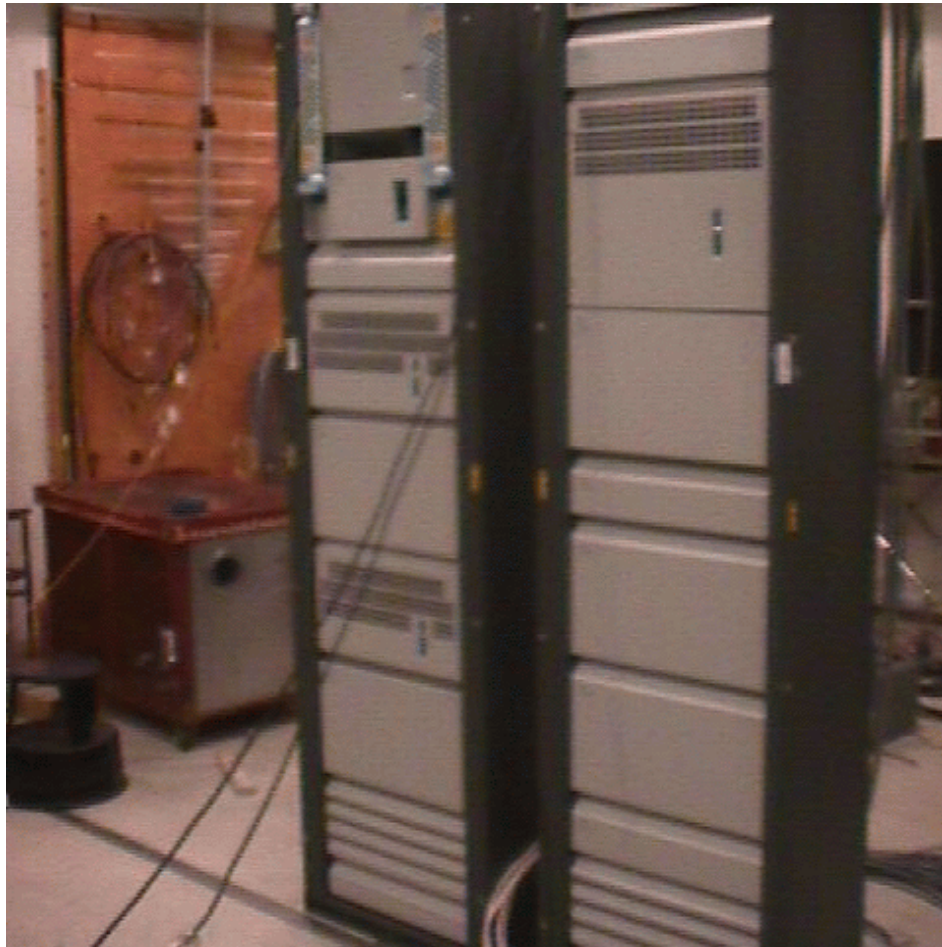
As required by §2.1046 of CFR 47, *RF power output measurements* were made at the RF output terminals using an attenuator and spectrum analyzer. This test was performed with carrier modulated by an PCS CDMA modulation signal.

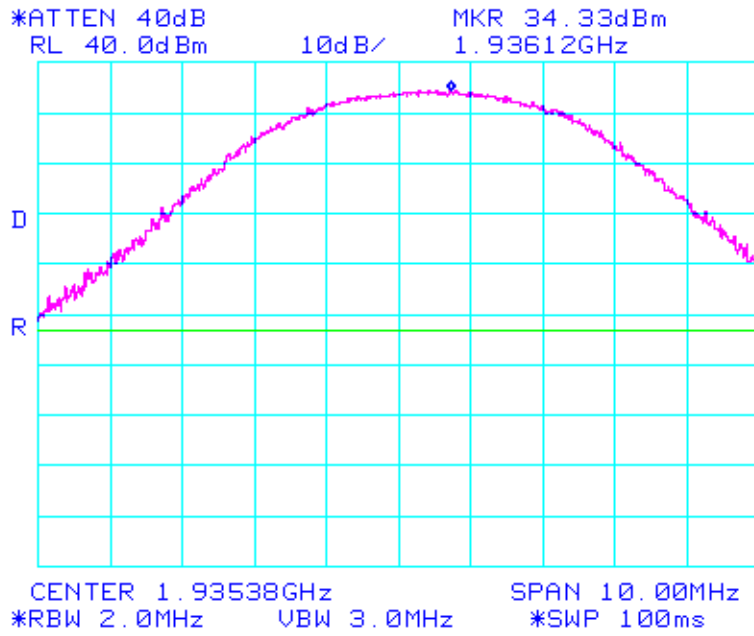
Plots of the RF output Power level of the Digitally modulated carrier, as measured at the RF output are included on the following page .

**6.3.4 RESULTS:**

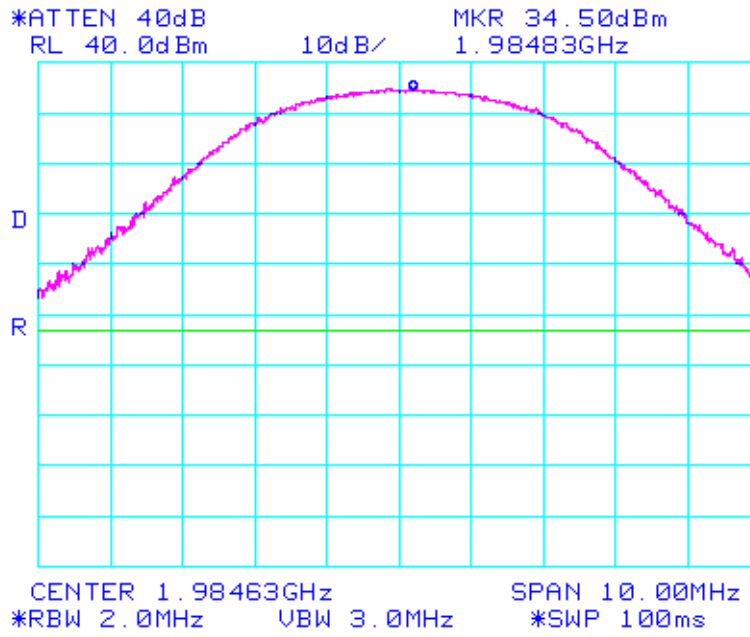
Equipment complies with 47CFR 2.1046 and 24.232(a). The Base Transmitter Station (BTS) does not exceed 100 W ( or 50 dBm) at the carrier frequency.

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





RF power output at antenna terminal block A  
emi1298



RF power output at antenna terminal block C  
emi1298

**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):** 10 Mar 1999**6.4.3 MEASUREMENT PROCEDURES:**

As required by §2.1051 of CFR 47, *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.

**6.4.4 RESULTS:**

Equipment complies with Section 2.1051 and 24.238(a)

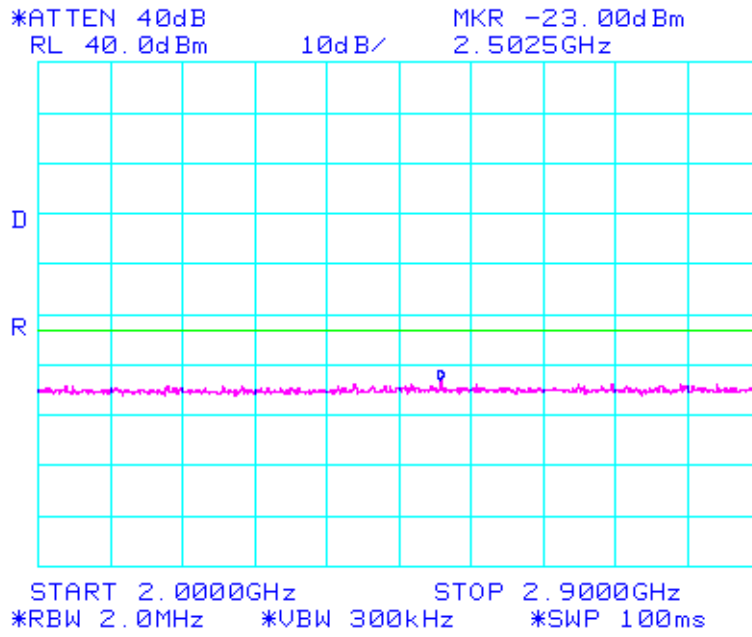
**SUMMARY OF SPURIOUS EMISSIONS AT ANTENNA TERMINALS - DownLink**

Frequency Range	Emission Frequency	Emission Level (dBm)	Limit (dBm)
9k - 1 GHz	none	none	-13.1
1 - 2 GHz	none	none	-13.1
2 - 6 GHz	none	none	-13.1
6 - 11 GHz	none	none	-13.1
11-15 GHz	none	none	-13.1
15 - 20 GHz	none	none	-13.1

The following plots are included to illustrate compliance with the requirements of 47 CFR Part 24.238(a):

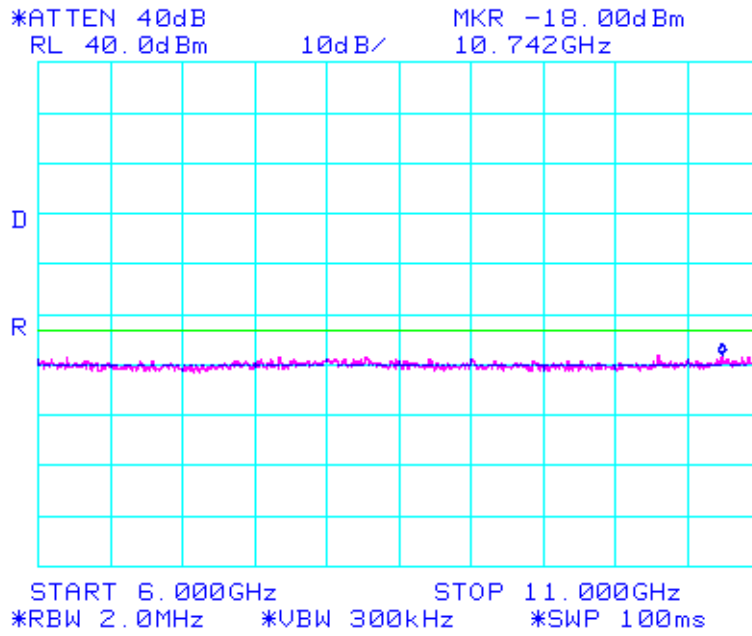


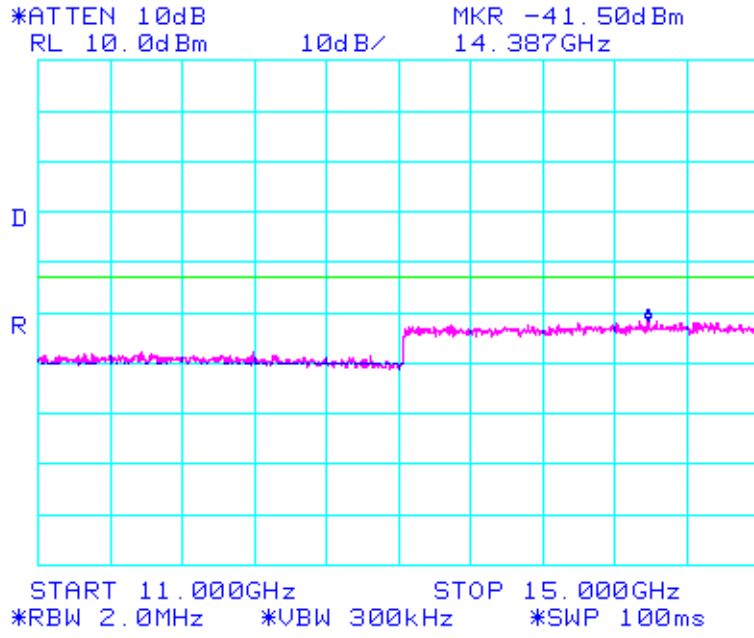


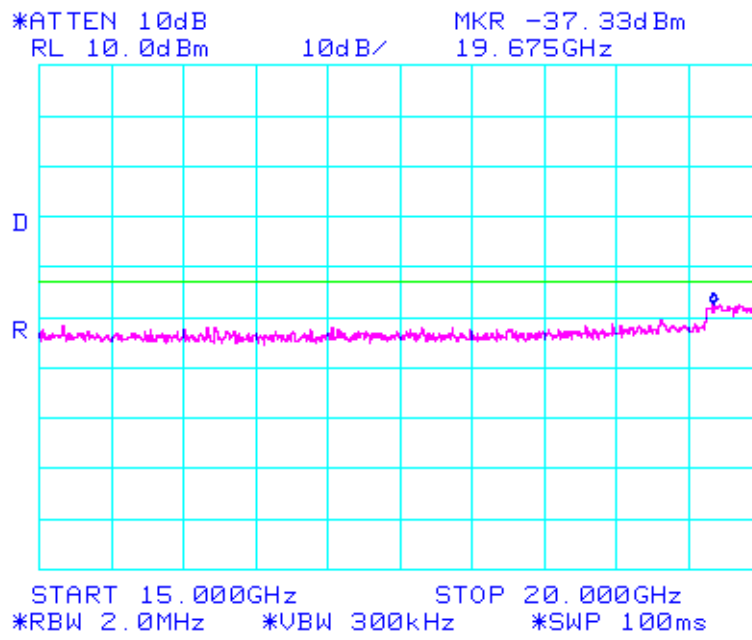












**6.5 TEST TYPE:** Spurious Emissions at Antenna Terminals at Block Edges +/- 1 MHz

**6.5.1 TECHNICAL SPECIFICATION:** 2.1051; 24.238(b)

**6.5.2 TEST DATE(S):** 10 Mar 1999

**6.5.3 MEASUREMENT PROCEDURES:**

As recommended in FCC Part 24, 1% of the 26dB bandwidth was chosen to measure the peak of any emission inside the 1.0 MHz frequency band adjacent to each frequency block edge. All other frequencies were measured using a 30 KHz RBW. The unit was exercised using signal types required by §2.1051.

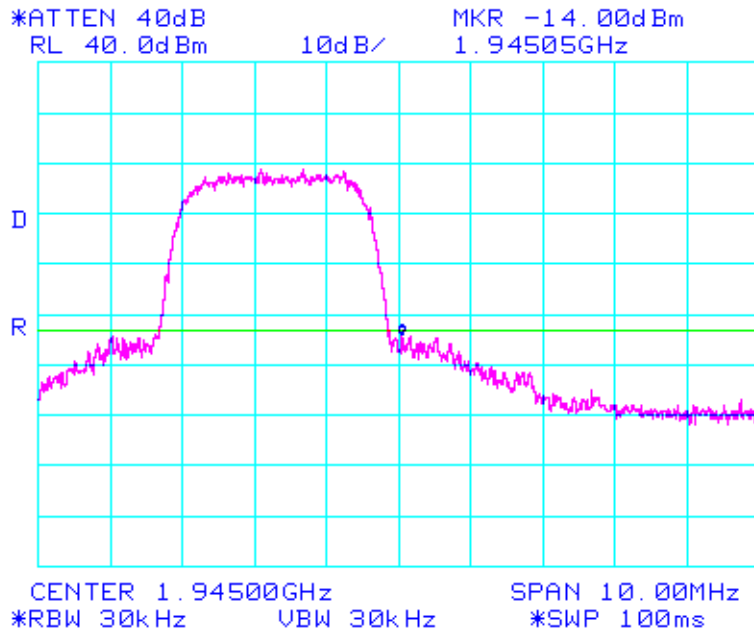
**6.5.4 Results:**

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, appears on the following page.

SPURIOUS EMISSION FREQUENCY BLOCKS

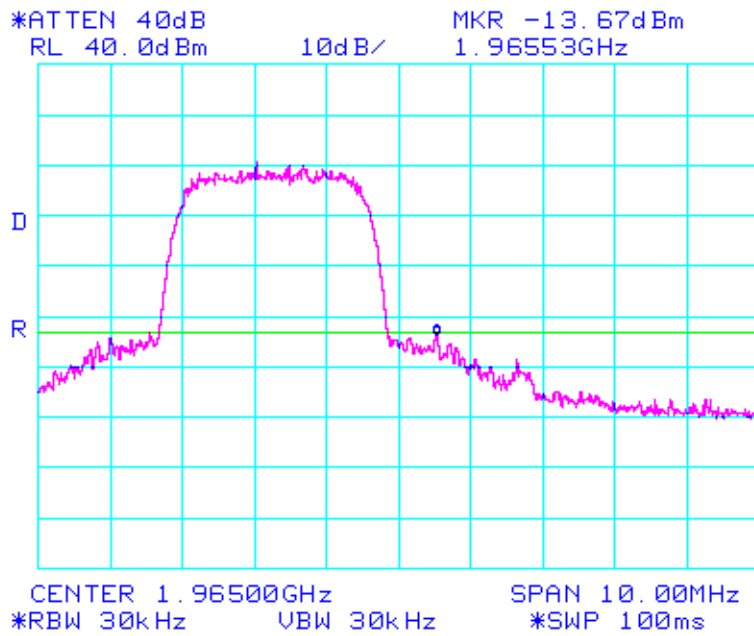
Frequency Block (MHz)	Low Frequency (CH #)	Hi Frequency (CH #)
A (1930 - 1945)	513 (1930.2)	584 (1944.8)
B (1950 - 1965)	613 (1950.2)	684 (1964.8)
C (1975 - 1990)	738 (1975.2)	809 (1989.8)
D (1945 - 1950)	588 (1945.2)	609 (1949.8)
E (1965 - 1970)	688 (1965.2)	709 (1969.8)
F (1970 - 1975)	713 (1970.2)	734 (1974.8)

Plots of the spurious emissions as measured at the extremes of each frequency block appear on the following pages.

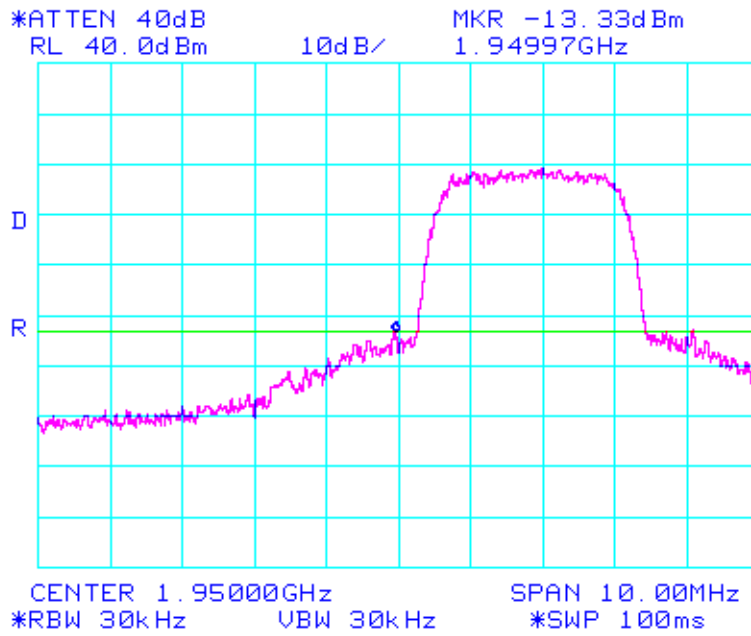


Conducted spur emissions at frequency blockedge +/-1 MHz at high side of A  
emi1298





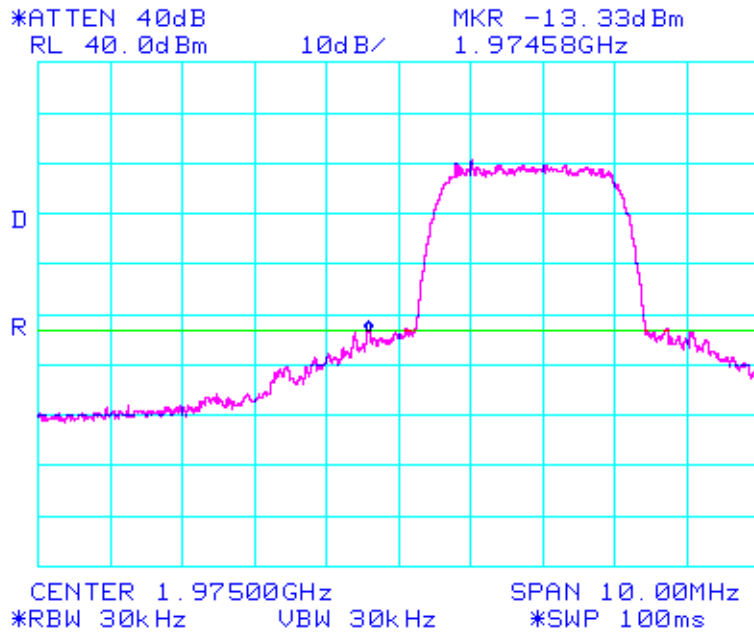
Conducted spur emissions at frequency blockedge +/- 1MHz High side of B  
emi1298



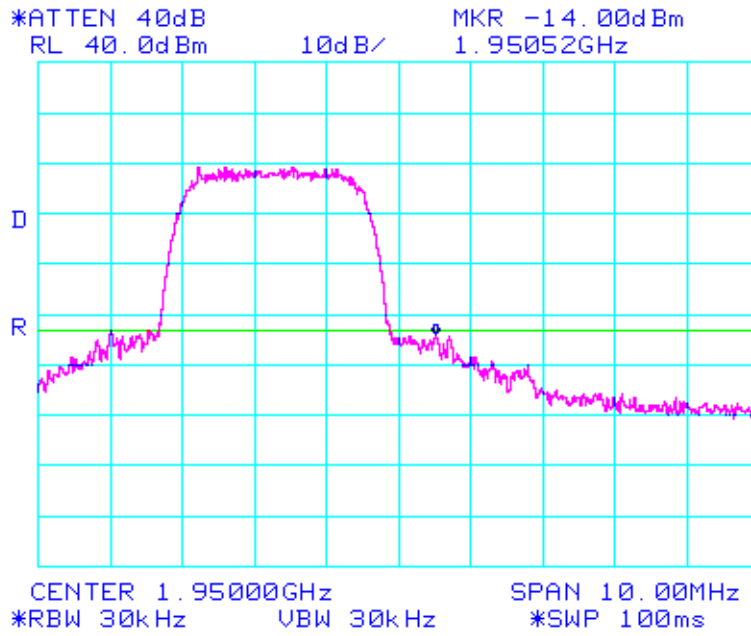
Conducted spur emissions at frequency blockedge +/- 1MHz at Low side B  
emi1298



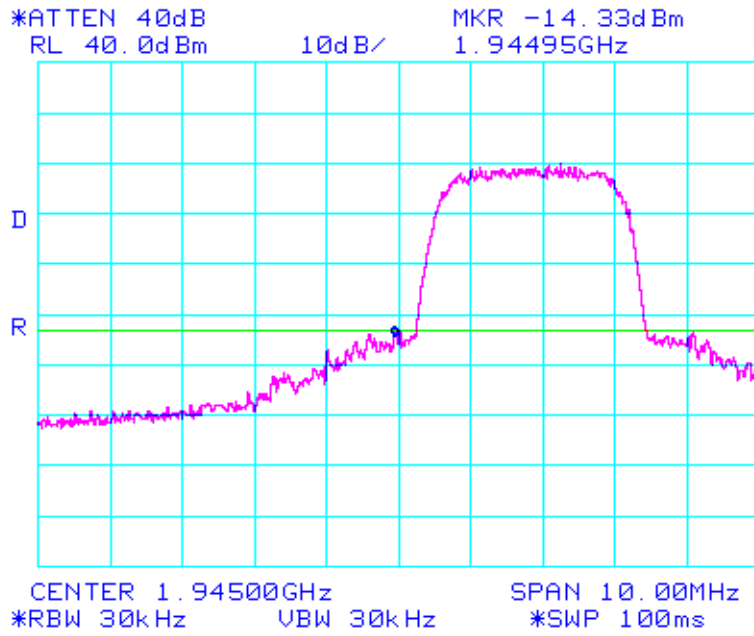




Conducted spur emissions at frequency blockedge +/- 1MHz Low side of block C  
emi1298

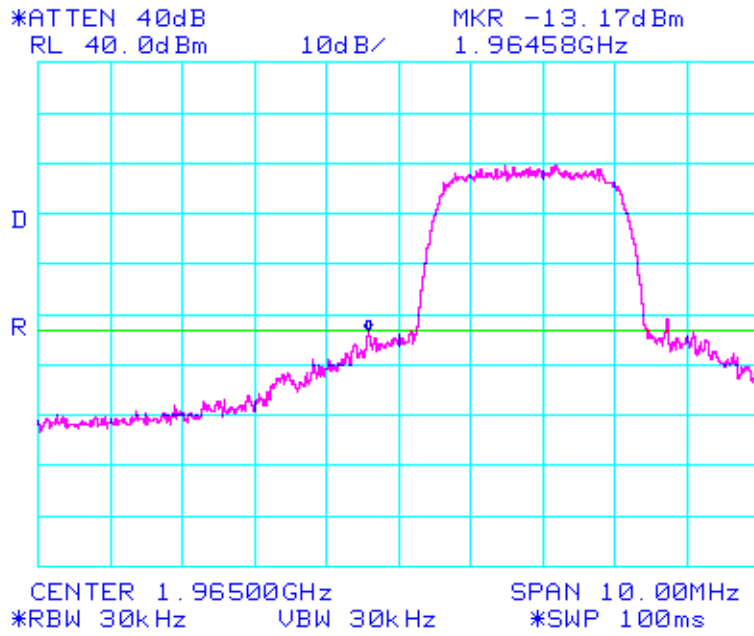


Conducted spur emissions at frequency blockedge +/- 1MHz at High side of D  
emi1298



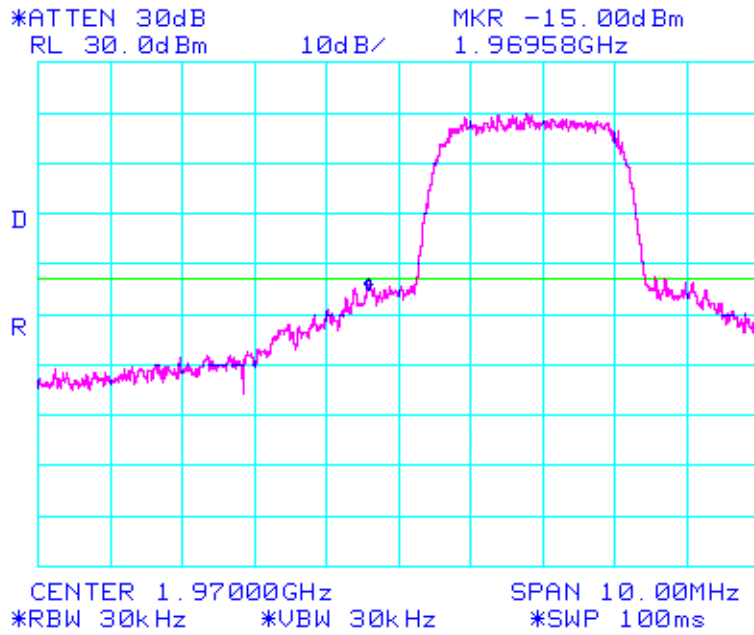
Conducted spur emissions at frequency blockedge +/- 1MHz at Low side of D  
emi1298





Conducted spur emissions at frequency blockedge +/- 1 MHz Low side of E  
emi1298





conductrd spur emissions at frequency blockedge +/- 1 MHz Low side of block F  
emi1298



**6.6 TEST TYPE:** Frequency Stability over Temperature Variations**6.6.1 TECHNICAL SPECIFICATION:** 2.1055(a)(1)**6.6.2 TEST DATE(S):** 12 Mar 2000**6.6.3 MEASUREMENT PROCEDURES:**

As required by §2.1055(a)(1) of CFR 47, *frequency tolerance measurements* were made over the temperature range of -30 C to +50 C. The frequency measurements were made using direct input to a spectrum analyzer. Climatic control was accomplished using an environmental simulation chamber. The temperature was first lowered to -30 C and then raised hourly in 10 increments. The unit remained in the chamber during temperature transitions and during the measurement process.

**6.5.4 Results:**

In accordance with 47 CFR 24.235, the Frequency tolerance of the carrier signal must be such that the resulting shift due to changes in supply voltage or ambient temperature must not drive it outside of the block edges. The frequency deviations of the EUT that were noted during testing were less than what would be required to drive the carrier frequency outside of the block edges. Carrier Frequency = 1.9374980 GHz

**CARRIER FREQUENCY DEVIATIONS DUE TO TEMPERATURE INSTABILITY**

Temperature ( C )	Carrier Frequency (GHz)	Recorded Frequency Deviation (kHz)
-30	1.9374962	-1.800
-20	1.9374955	-2.500
-10	1.9374959	-2.100
0	1.9374966	-1.400
+10	1.9374980	0.000
+20	1.9374986	+0.600
+30	1.9374986	+0.600
+40	1.9374983	+0.300
+50	1.9374983	+0.300

**The unit meets the requirements of 2.1055 (a)(1)**

**6.7 TEST TYPE:** Frequency Stability over Voltage Variations

**6.7.1 TECHNICAL SPECIFICATION:** 2.1055(d)(1)

**6.7.2 TEST DATE(S):** 12 Mar 2000

**6.7.3 MEASUREMENT PROCEDURES:**

As required by §2.1055(d)(1) of CFR 47, *frequency tolerance measurements* were made over changes in the supply voltage to the EUT from 85% to 115% of the nominal supply voltage using a variac to vary the DC supply. The frequency measurements were made using direct input to a spectrum analyzer.

**6.7.4 Results:**

In accordance with 47 CFR 24.235, the Frequency tolerance of the carrier signal must be such that the resulting shift due to changes in supply voltage or ambient temperature must not drive it outside of the block edges. The frequency deviations of the EUT that were noted during testing were less than what would be required to drive the carrier frequency outside of the block edges.

Voltage (Volts)	Carrier Frequency Recorded (GHz)	Recorded Frequency Deviation (kHz)
55.2 (115% of Nominal)	1.9374980	0
48.0 (100% of Nominal)	1.9374980	0
40.8 (85% of Nominal)	1.9374980	0

The unit meets the requirements of 2.1055 (d)(1)

Photograph of Antenna Conducted Spurious Emissions Test Configuration





**6.8 TEST TYPE:** Line Conducted Emissions

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

**6.8.2 TEST DATE(S):** 13 Mar 2000

**6.8.3 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", "quasi-peak", and "average" amplitude within an IF bandwidth of 9 kHz. The tests were conducted in a RF-shielded enclosure.

**6.8.4 RESULTS:**

Equipment complies with Section 15.107(b)

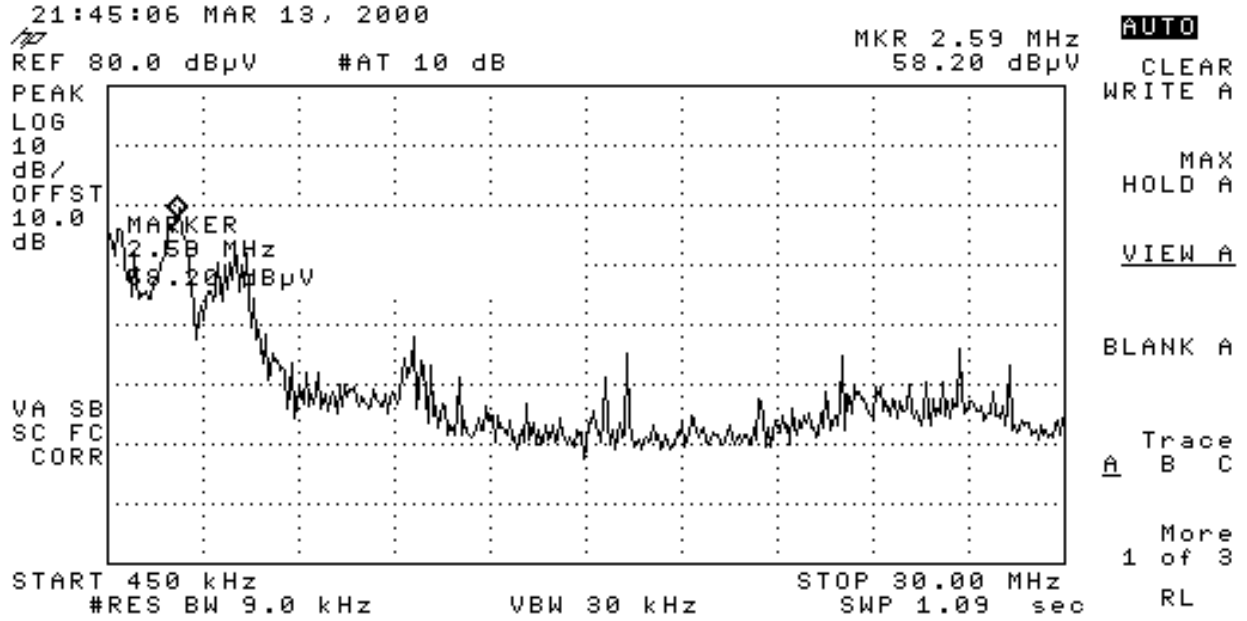
**SUMMARY OF SPURIOUS EMISSIONS AT DC Mains Terminals - Phase**

Frequency (MHz)	Quasi-Peak Measurement	Quasi-Peak Limit
4.463	45.7	69.5
4.464	45.7	69.5
15.774	33.8	69.5
24.196	31.1	69.5
27.390	31.5	69.5
27.393	32.7	69.5

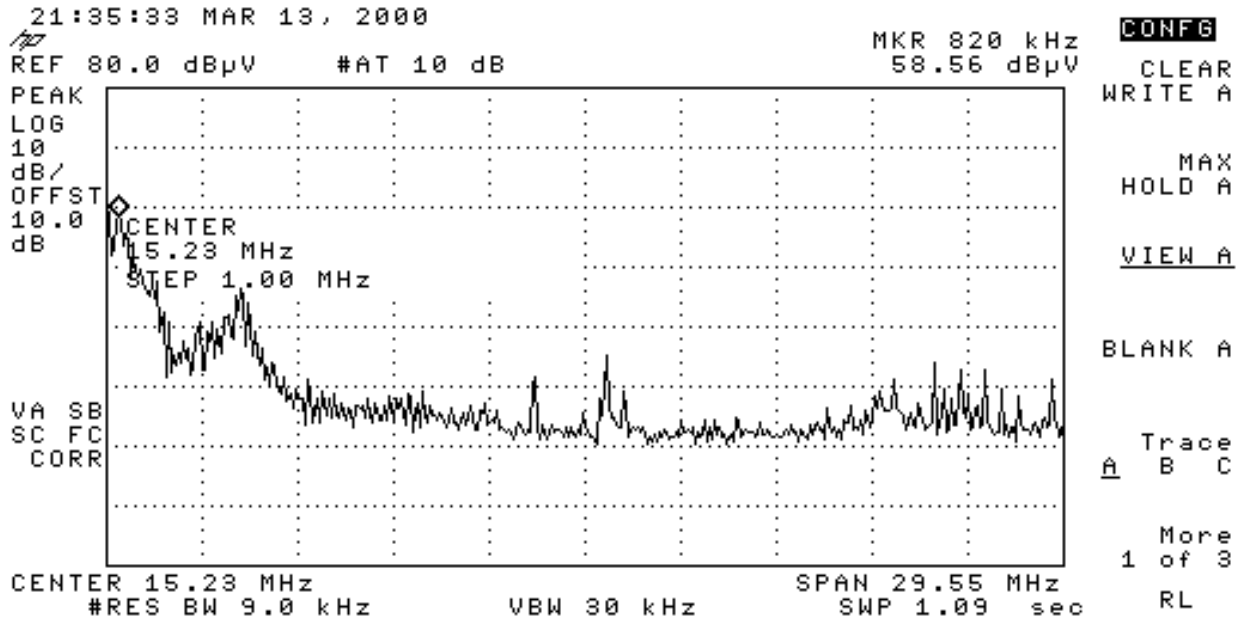
**SUMMARY OF SPURIOUS EMISSIONS AT DC Mains Terminals - Neutral**

Frequency (MHz)	Quasi-Peak Measurement	Quasi-Peak Limit
2.281	56.9	69.5
4.050	56.6	69.5
4.467	57.1	69.5
9.859	42.0	69.5
9.860	42.3	69.5
16.384	39.7	69.5

The following plots illustrate compliance with the applicable specification.



Negative CT  
emi1298



Positive CT  
emi1298

**TEST SETUP OF LINE CONDUCTED EMISSIONS**

