

**FCC ID: 9900RT**

**Test Report**

**Alcatel 9900 LMDS Terminal Station**

This is a summary of the test measurements performed on the Alcatel 9900 LMDS Terminal Station transmitter as required for type certification operating under FCC Part 101.

Also included are measurements required for conformance with FCC Part 15 as a Class B unintentional radiator.

## Part 2.1046 - RF Power Output

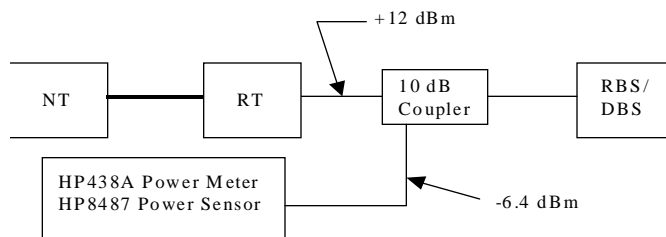
The Alcatel 9900 Terminal Station is composed of two separate assemblies, an indoor Network Termination (NT) and an outdoor Radio Termination (RT). The RT operates at fixed gain that is programmable to compensate for the distance from the base station and for losses generated in the cable between the RT and the NT. The NT uses a combination of the receive signal level and commands from the base station to adjust the IF levels sent to the RT. This forms an Automatic Transmit Power Control (ATPC) loop that adjusts the RT transmit power to maintain a constant receive level at the base station. The ATPC has a dynamic range of 40 dB. The RT normally operates at a nominal level of -8 dBm when at the maximum distance from the base station and no fading conditions are present.

DC power for the RT is supplied from the NT through the connecting cable. Internal regulator circuits in the RT generate the required bias currents and voltages for the transmitter devices. No operator adjustments are required other than to program the RT with the IF cable length and nominal path distance losses.

The RT uses an integral 3° parabolic antenna. The transmitter power was measured with the antenna removed and a WR-28 to coaxial transition installed in its place. Since the transmitter is shut off if the NT is not connected to the base station, a 10 dB directional coupler (calibrated loss = 11.0 dB) is also installed. The transmitter power was then measured using an HP438A Power Meter with an HP8487A Power sensor.

|                 |  |
|-----------------|--|
| RT part number: | 3CC10886AB   |
| Type design:    | solid state  |
| RT DC Power:    | +30 VDC nominal<br>12 W nominal DC power   |
| Gain:           | -5 to 35 dB  |
| Output Power:   | +12 dBm (measured output when adjusted for maximum normal power)<br>+16.5 dBm (measured output when driven abnormally to full compression) |
| Antenna Gain:   | 34.5 dB  |
| EIRP maximum:   | 45 W   |

### Test Setup:



## Part 2.1047 - Modulation Characteristics

The minimum attenuation limits for the modulated spectrum are defined in 101.111 (a)(2)(ii) by the following equation for frequencies removed from the center frequency by 50 to 250 percent of the authorized bandwidth:

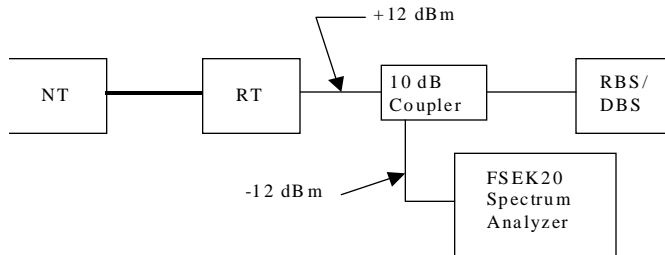
$$A = 11 + 0.4(P-50) + 10\log(B).$$

Maximum required attenuation is 56 dB. Measurements are to be made referenced to a 1 MHz resolution bandwidth.

The authorized bandwidth for the Base Station is the lower LMDS block from 27500 to 28350 MHz. This is an 850 MHz channel centered at 27295 MHz and translates into an attenuation mask defined by the following points:

| <u>Frequency (MHz)</u> | <u>Percent</u> | <u>Attenuation (dB)</u> |
|------------------------|----------------|-------------------------|
| 26862                  | -250           | 56                      |
| 27160                  | -90            | 56                      |
| 27500                  | -50            | 40                      |
| 28350                  | 50             | 40                      |
| 28690                  | 90             | 56                      |
| 28988                  | 250            | 56                      |

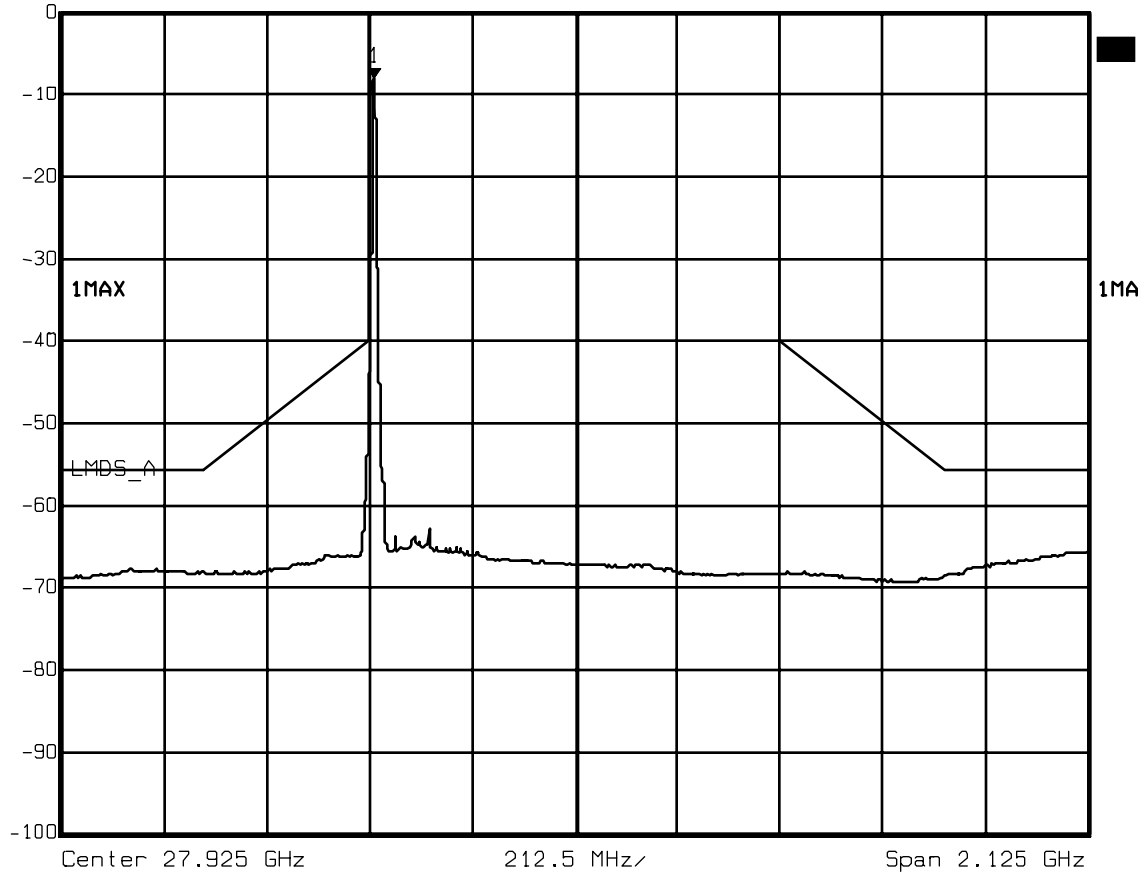
Test Setup:



The RT transmitter was set to its maximum nominal output and measured using the HP power meter to be +12 dBm. The transmit spectrum was then measured with a Rhode&Schwarz FSEK20 spectrum analyzer using the power into the spectrum analyzer (including measurement cable losses) as the reference level. The RT operates on center frequencies between 27509.5 and 27845.5 MHz. The measurement results for each end of the operating range are shown in **Error! Reference source not found.** and **Error! Reference source not found.** Expanded measurements at the 27500 MHz band edge are shown in **Error! Reference source not found.** The RT does not operate near the 28350 MHz band edge. Expanded measurements when the RT is driven abnormally into compression are shown in Exhibit 4.



Marker 1 [T1] RBW 1 MHz RF Att 0 dB  
Ref Lvl -11.7 dBm -19.89 dBm VBW 1 kHz Mixer -20 dBm  
27.50950000 GHz SWT 5.4 s Unit dB

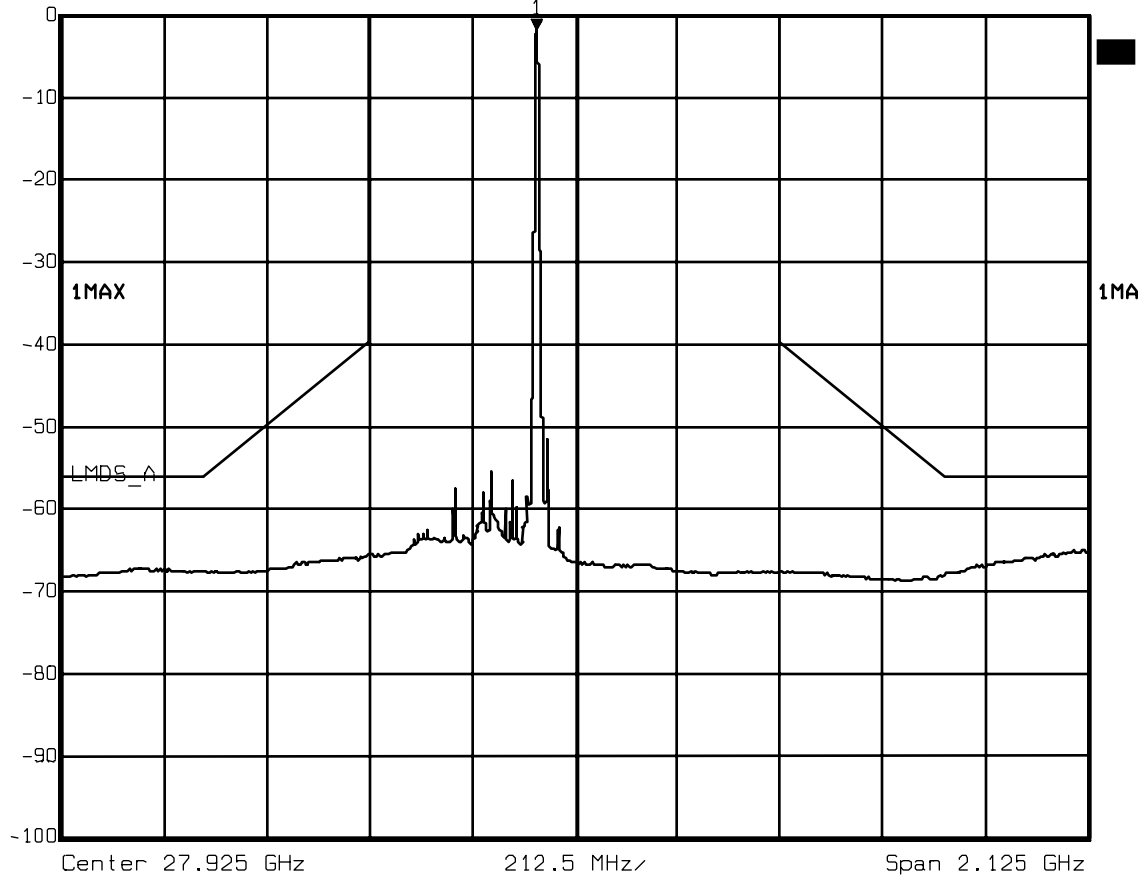


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Exhibit 1 - Modulation Characteristics at 27509.5 MHz



Marker 1 [T1] RBW 1 MHz RF Att 0 dB  
Ref Lvl -14.24 dBm VBW 1 kHz Mixer -20 dBm  
-12.3 dBm 27.84450000 GHz SWT 5.4 s Unit dB

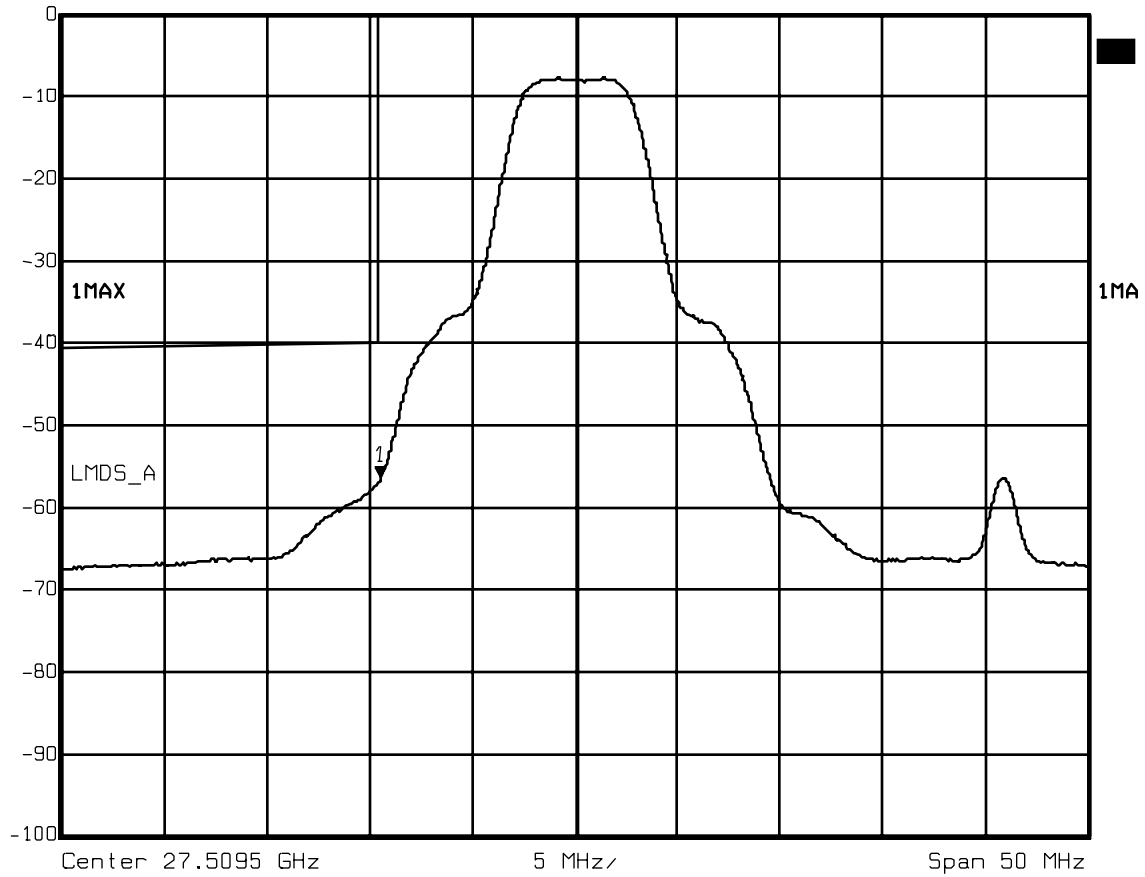


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Exhibit 2 - Modulation Characteristics at 27845.5 MHz



Marker 1 [T1] RBW 1 MHz RF Att 0 dB  
Ref Lvl -66.32 dBm VBW 1 kHz Mixer -20 dBm  
-10 dBm 27.5000000 GHz SWT 125 ms Unit dB

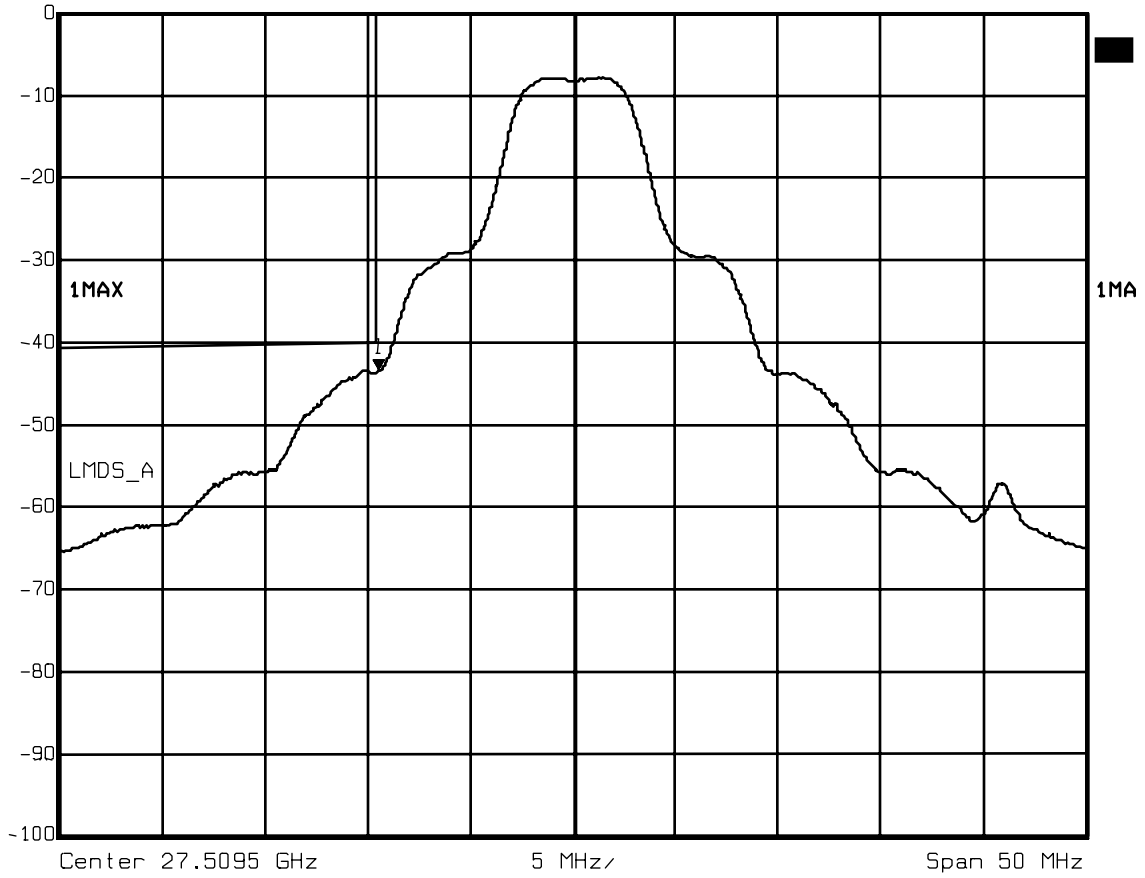


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Exhibit 3 - Expanded Modulation Characteristics at 27509.5 MHz



Marker 1 [T1] RBW 1 MHz RF Att 0 dB  
Ref Lvl -55.20 dBm VBW 1 kHz Mixer -20 dBm  
-11.7 dBm 27.50000000 GHz SWT 125 ms Unit dB



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Exhibit 4 - Compression Modulation Characteristics at 27509.5 MHz

## Part 2.1049 - Occupied Bandwidth

The FSEK20 Spectrum Analyzer has the capability to calculate occupied bandwidth from a measured spectrum. The analyzer was set up to measure 99% bandwidth, resulting in the measurement of 5.96 MHz as shown in Exhibit 5.

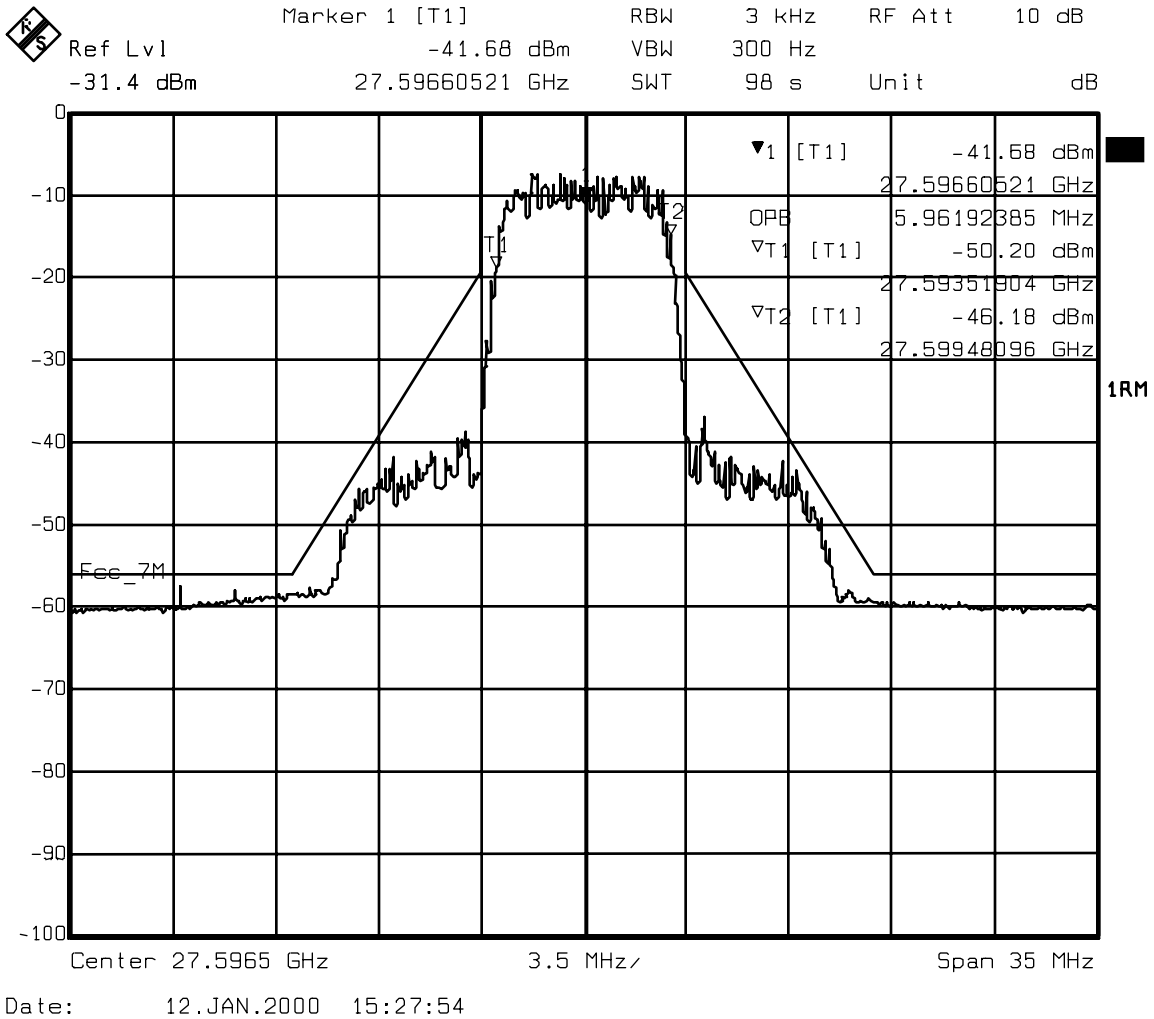


Exhibit 5 - Occupied Bandwidth



## Part 2.1051 - Emissions at the Antenna Port

Emissions removed from the center frequency by more than 250 percent of the authorized bandwidth are required by Part 101.111(a)(2)(iii) to be attenuated from the transmitter output power by  $43 + 10\log(\text{Power in watts})$  decibels. For a +12 dBm transmit power, this results in an attenuation of 25 dB. Measurements are to be made using a 4 kHz resolution bandwidth. Since this is not a standard spectrum analyzer bandwidth, a resolution bandwidth of 3 kHz was used with the -6.4 dBm reference level offset by -1 dB.

Measurement results are shown in Exhibits 3 and 4.

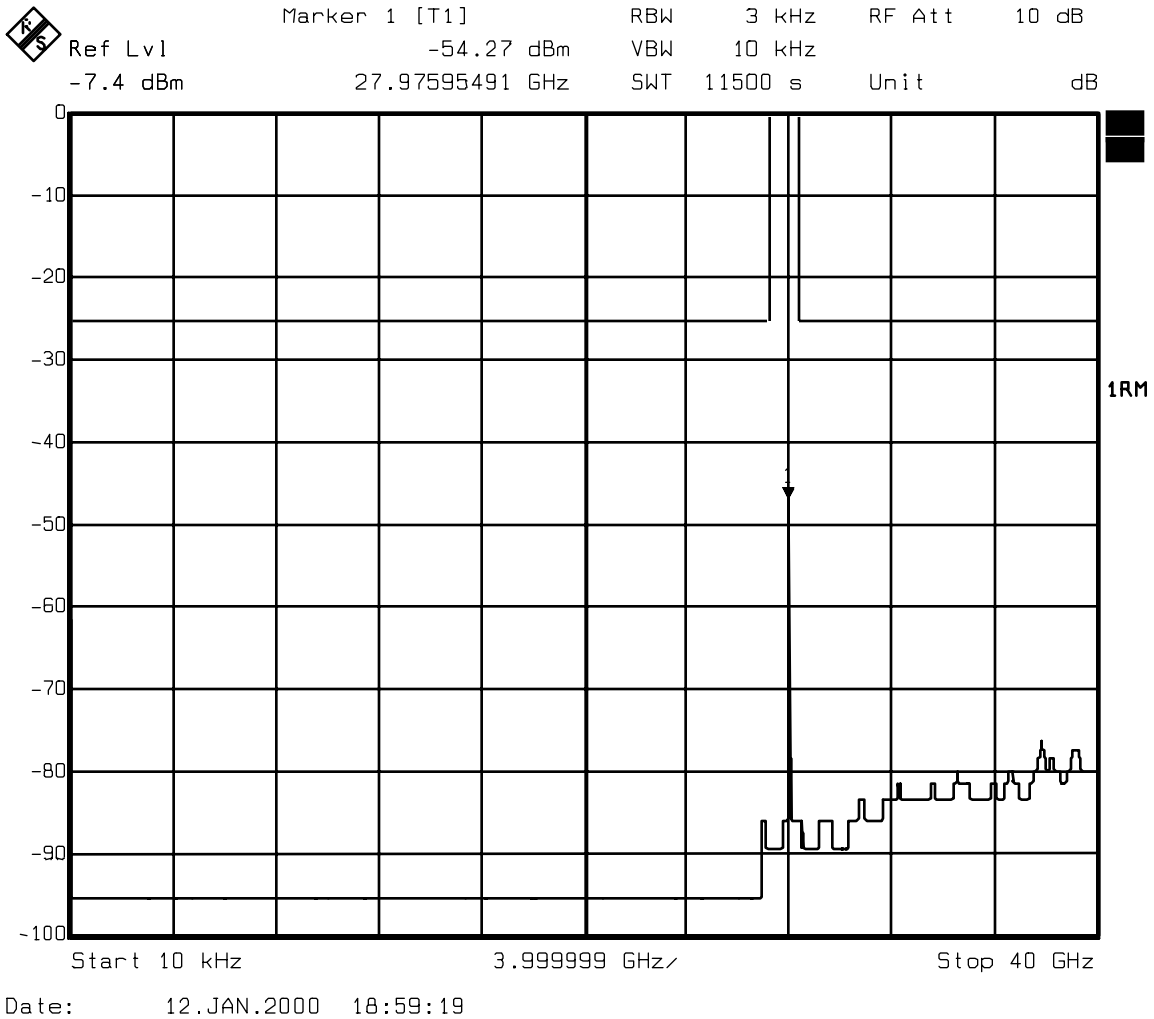


Exhibit 6 - Emissions at the Antenna Port

## Part 2.1053/15.109 - Field Strength of Spurious Radiation

Measurements for spurious radiation were taken as part of the CISPR testing performed by CETECOM ICT Services. These results are shown in Exhibit 7, Exhibit 8, and Exhibit 9.

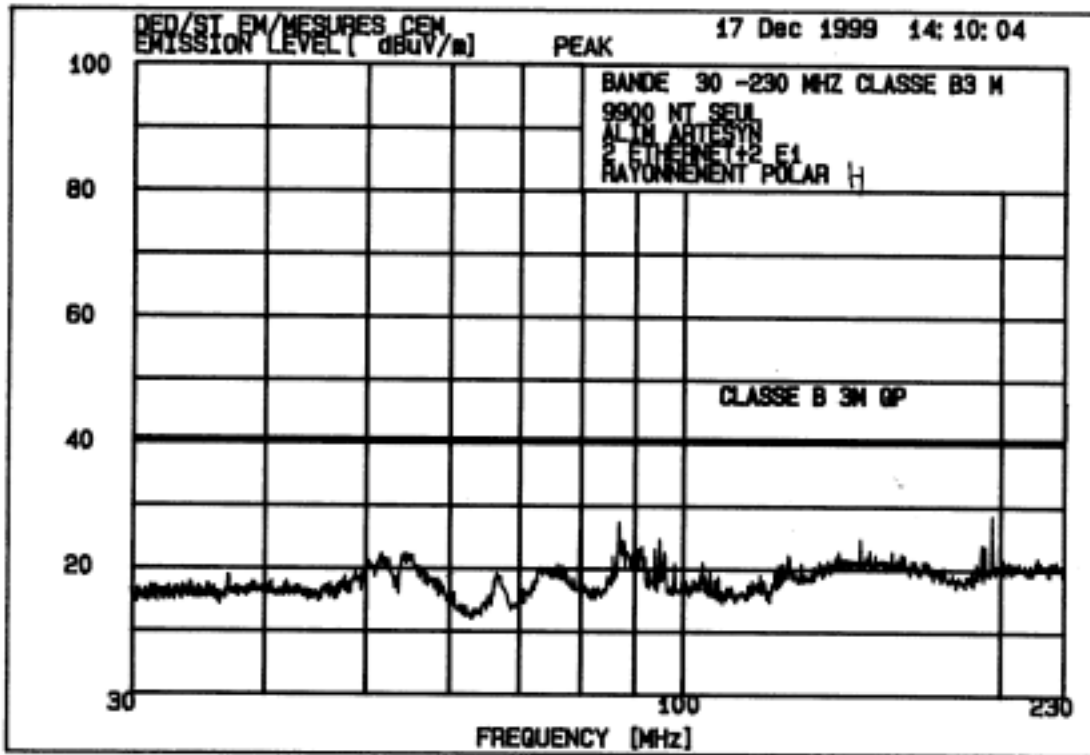


Exhibit 7 - Spurious Radiation (horizontal)

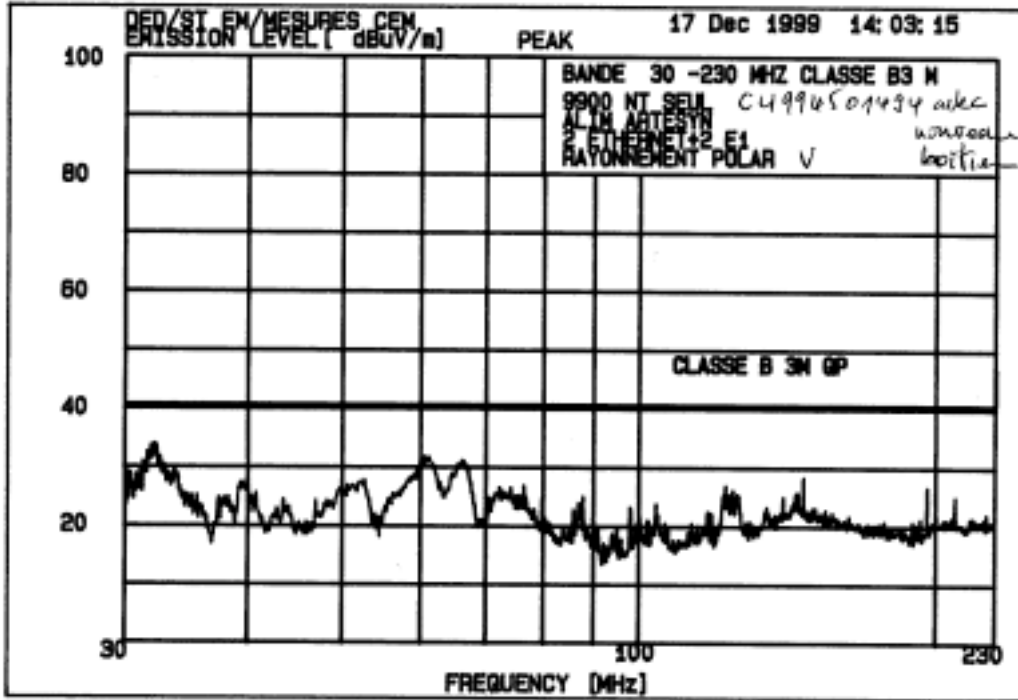


Exhibit 8 - Spurious Radiation (vertical)

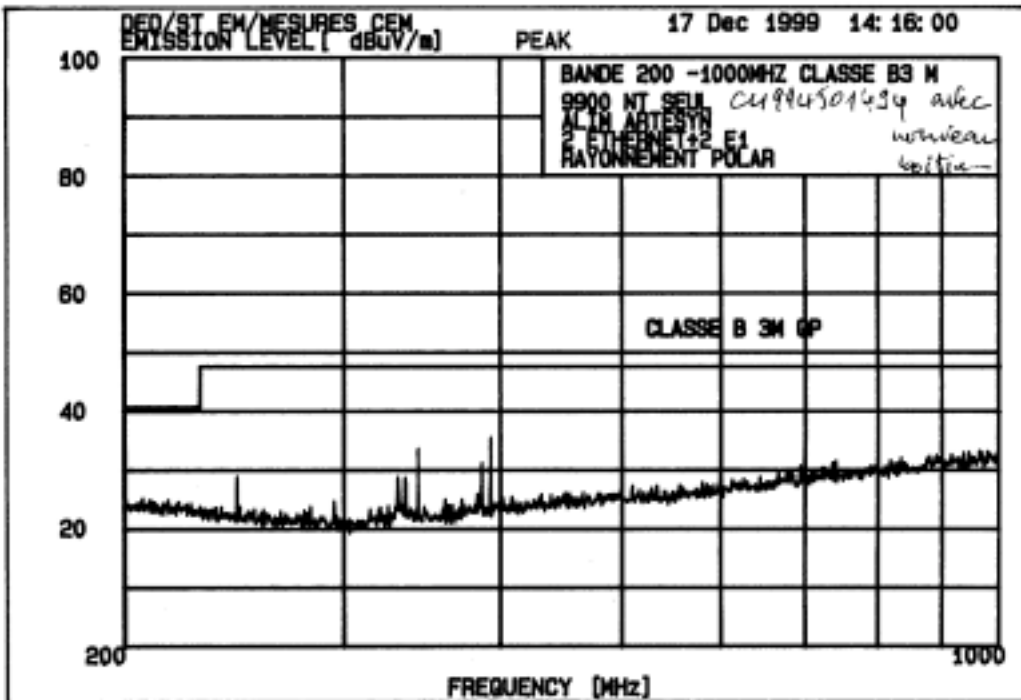


Exhibit 9 - Spurious Radiation (circular)

## **Part 2.1055 - Frequency Stability**

The RT uses a common fixed local oscillator for both the receive and transmit RF/IF conversions. Error in the local oscillator frequency or in the frequency of the base station signal cause an error in the receive IF frequency at the NT. The NT measures the error in the receive IF frequency and offsets the frequency of the transmit IF signal by the same amount. This cancels the error in the RT local oscillator when the transmit IF signal is mixed back to RF. Any remaining error in the transmit RF frequency is due to error in the signal transmitted from the base station. The base station also uses a common LO for both the transmit and receive. Residual frequency error in the receive IF at the base station is detected and a correction message is sent to the terminal station. This correction message is used by the NT to fine adjust the transmit IF frequency. Thus the stability of the terminal station transmitter is the same as the base station transmitter (+/- 0.0008 percent). Turning off the modulation at the terminal station breaks this feedback loop and therefore the transmit frequency cannot be directly measured. The frequency compensation that is generated in the transmit IF signal also makes measurements of the RT local oscillator stability meaningless with regard to the transmit RF frequency.

To measure the frequency stability of RT/NT combination, the Rhode&Schwarz FSEK20 spectrum analyzer (equipped with a high stability time base that provides a measurement accuracy specified to be better than 0.1 ppm) was used to monitor the transmit spectrum over temperature. The center frequency of the analyzer was adjusted to keep the spectrum centered. This adjustment could be made with an accuracy of approximately +/- 10 kHz (+/-0.35 ppm at 28 GHz). The results of the measurements are shown in Exhibit 10.

The terminal station transmitter is turned off whenever the terminal station receiver is not locked to the base station signal. This prevents the terminal station from transmitting at the wrong frequency.

All frequency determining circuits are powered by internal voltage regulators. Changes in the primary power supplied to the NT and RT have no effect on frequency of operation.

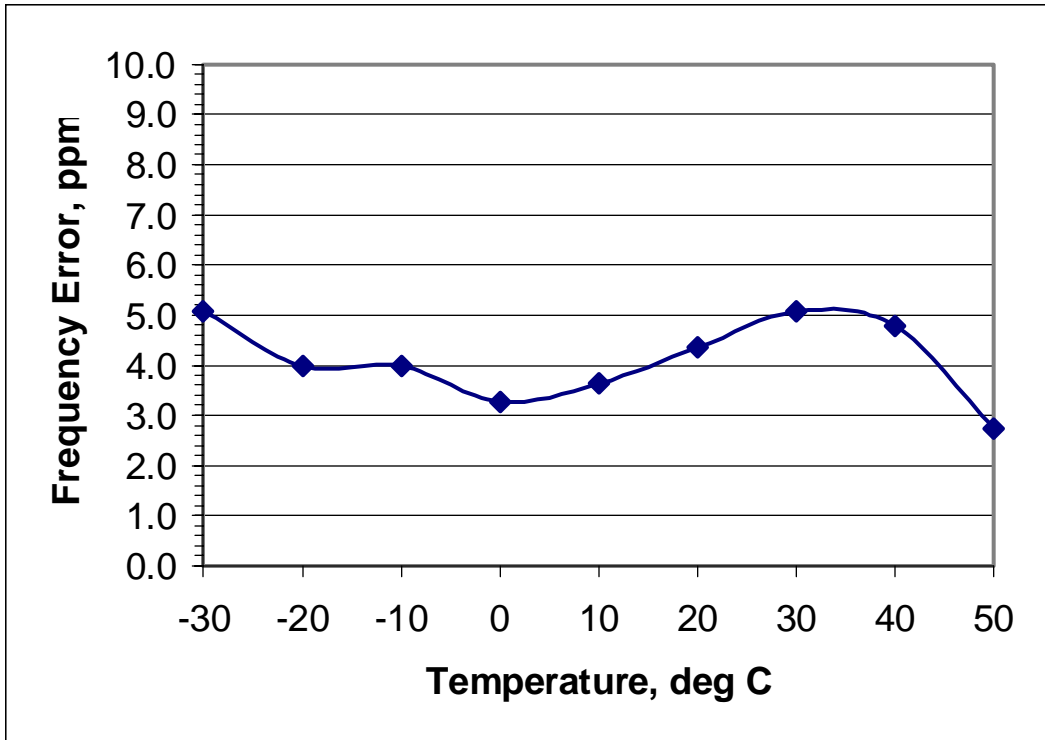


Exhibit 10 - RF Frequency Stability

## **Part 15.107 - AC Power Conducted Emissions**

The 9900 NT uses an 85-264V AC power supply manufactured by Artesyn or Martek.

Measurements for conducted emissions were taken as part of the CISPR testing performed by CETECOM ICT Services. These results are shown in Exhibit 11 through and Exhibit 18.

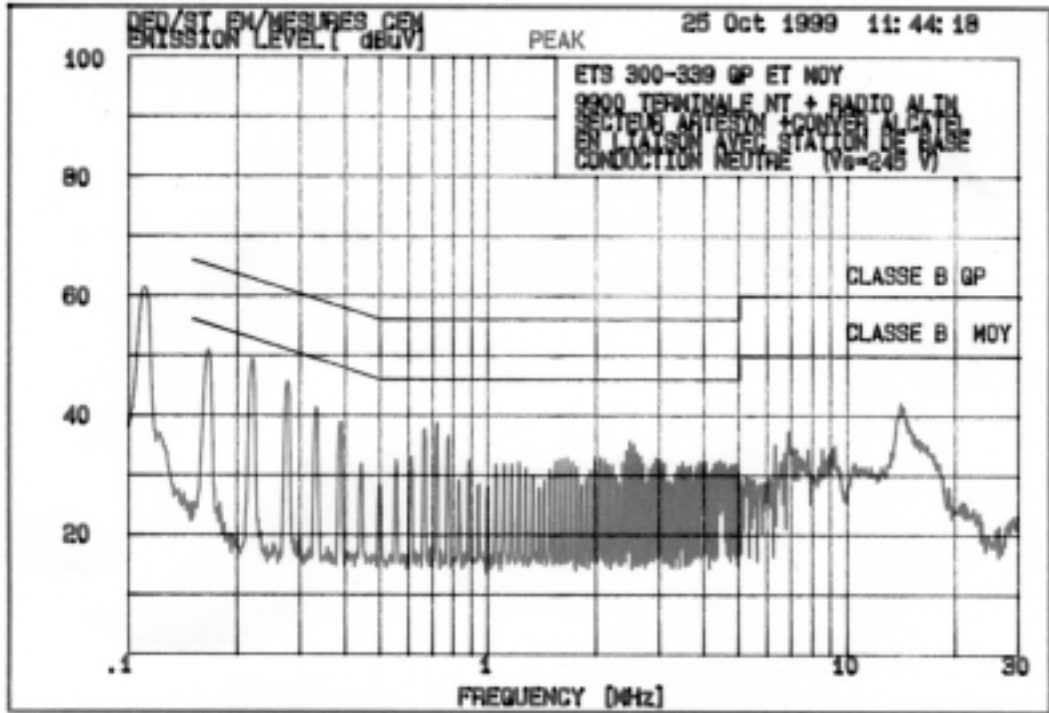


Exhibit 11 - Artesyn supply, neutral conductor @ 245V

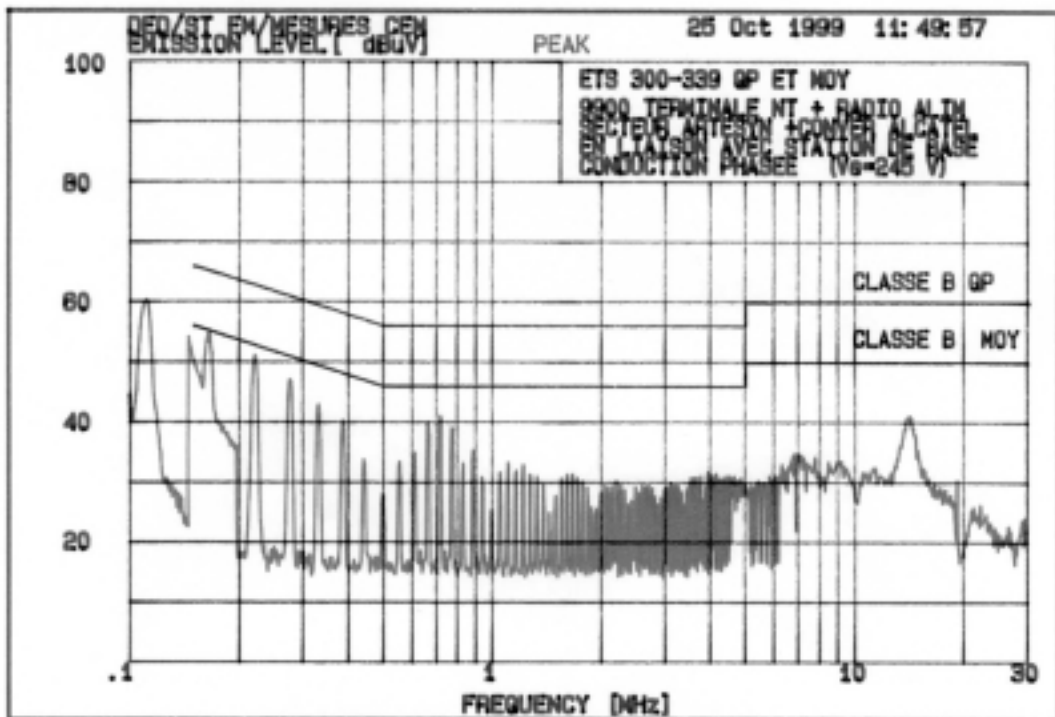


Exhibit 12 - Artesyn supply, power conductor @ 245V

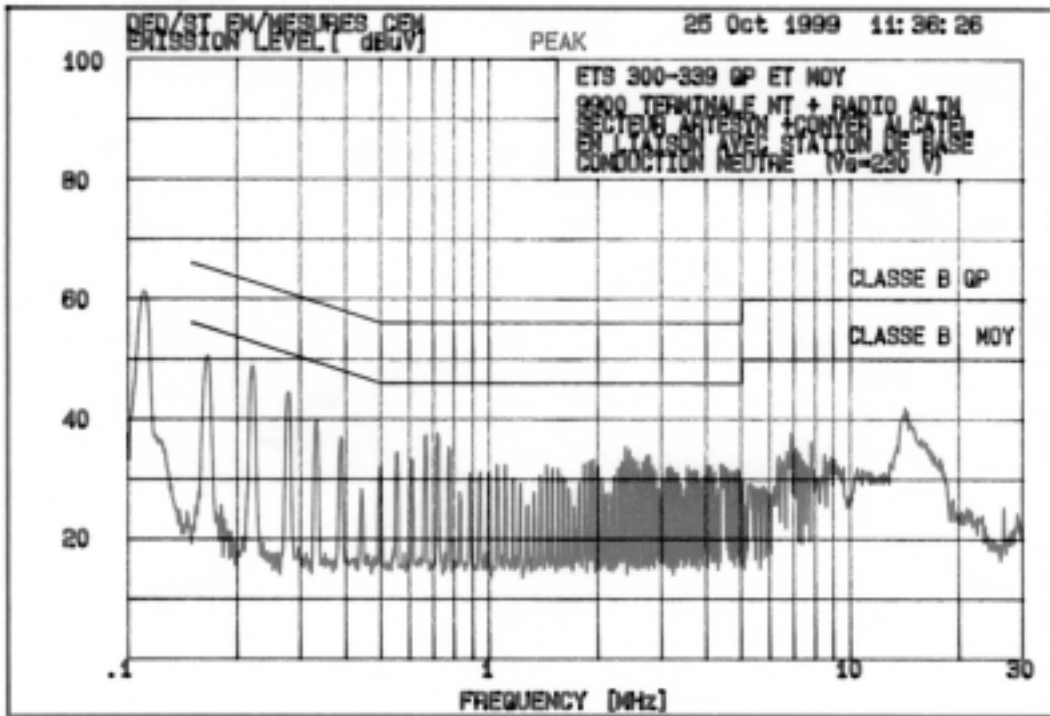


Exhibit 13 - Artesyn supply, neutral conductor @ 230V

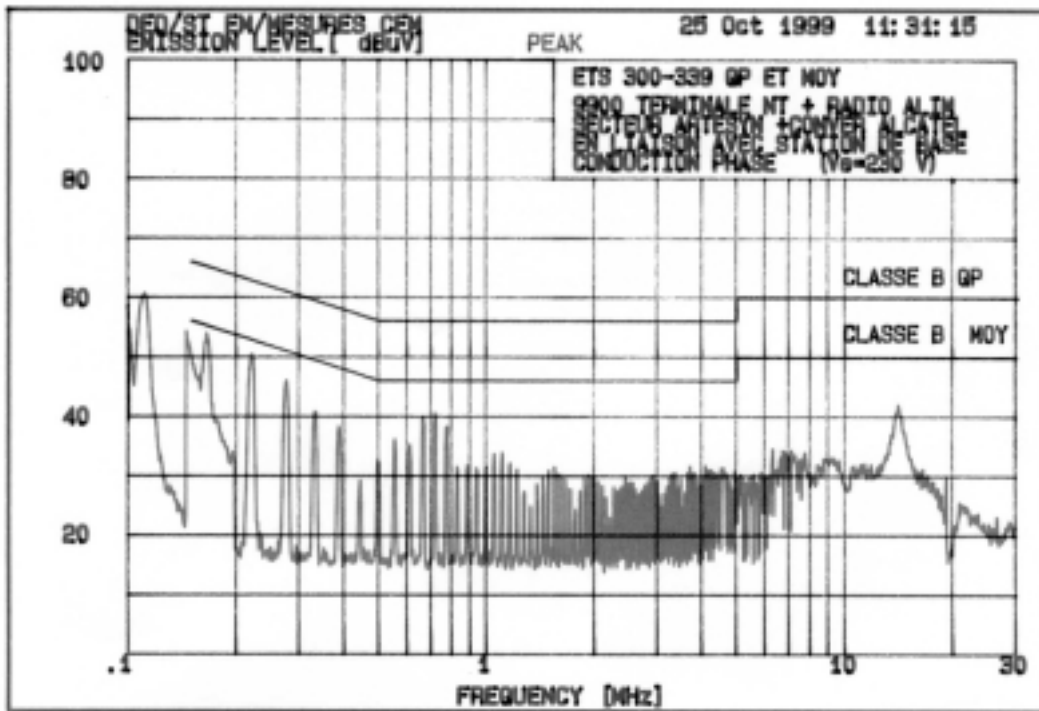


Exhibit 14 - Artesyn supply, power conductor @ 230V



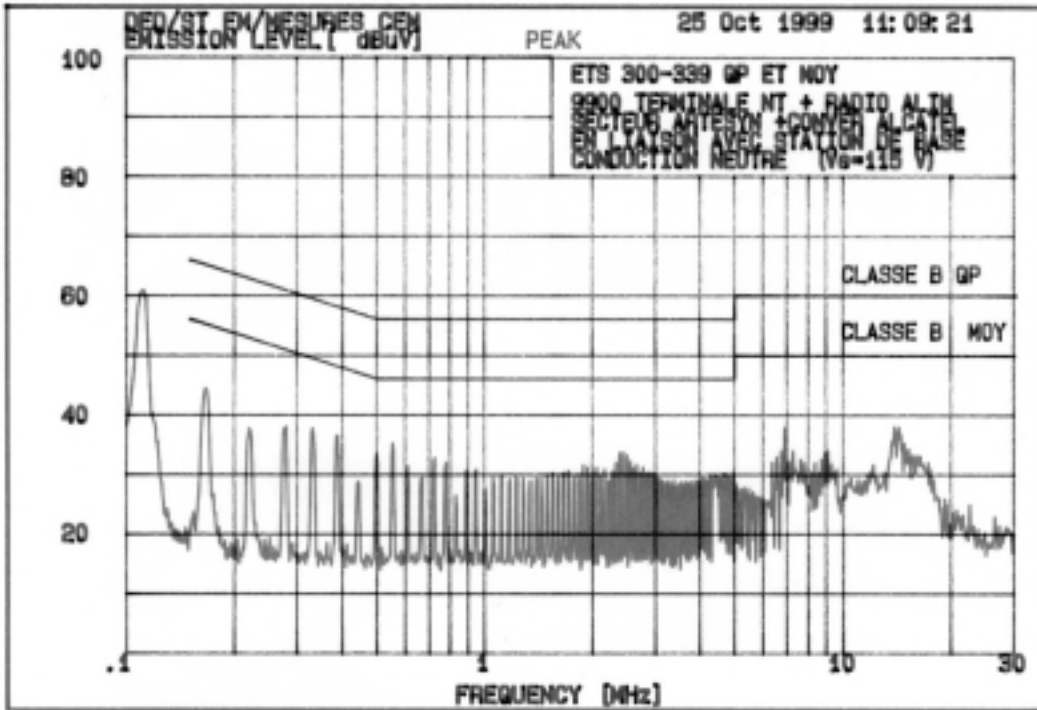


Exhibit 15 - Artesyn supply, neutral conductor @ 115V

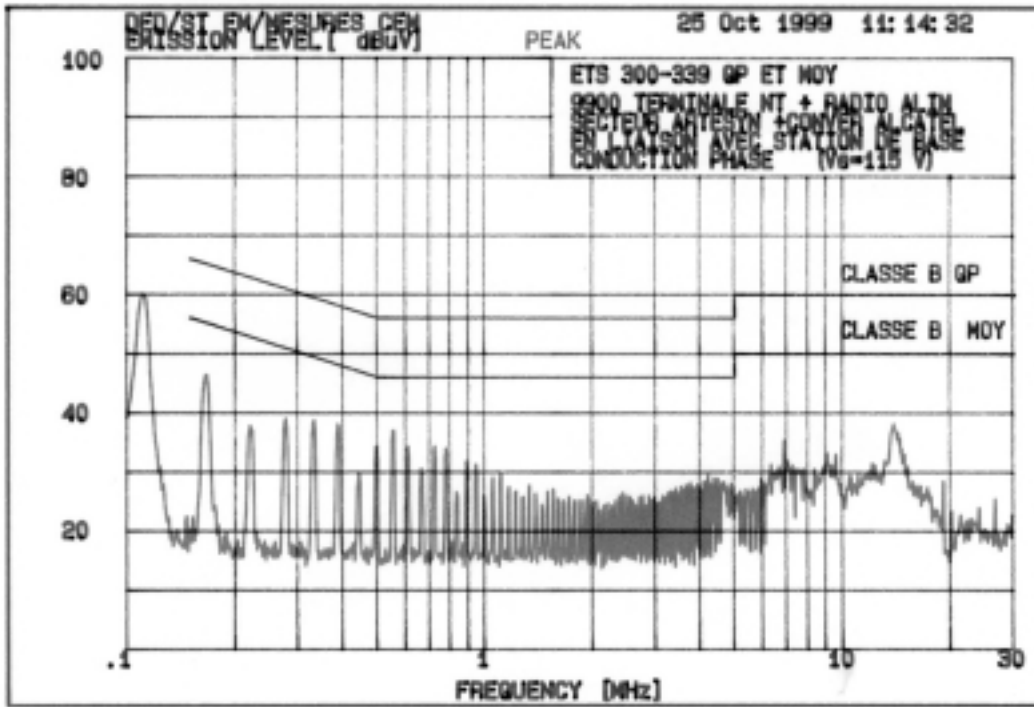


Exhibit 16 - Artesyn supply, power conductor @ 115V

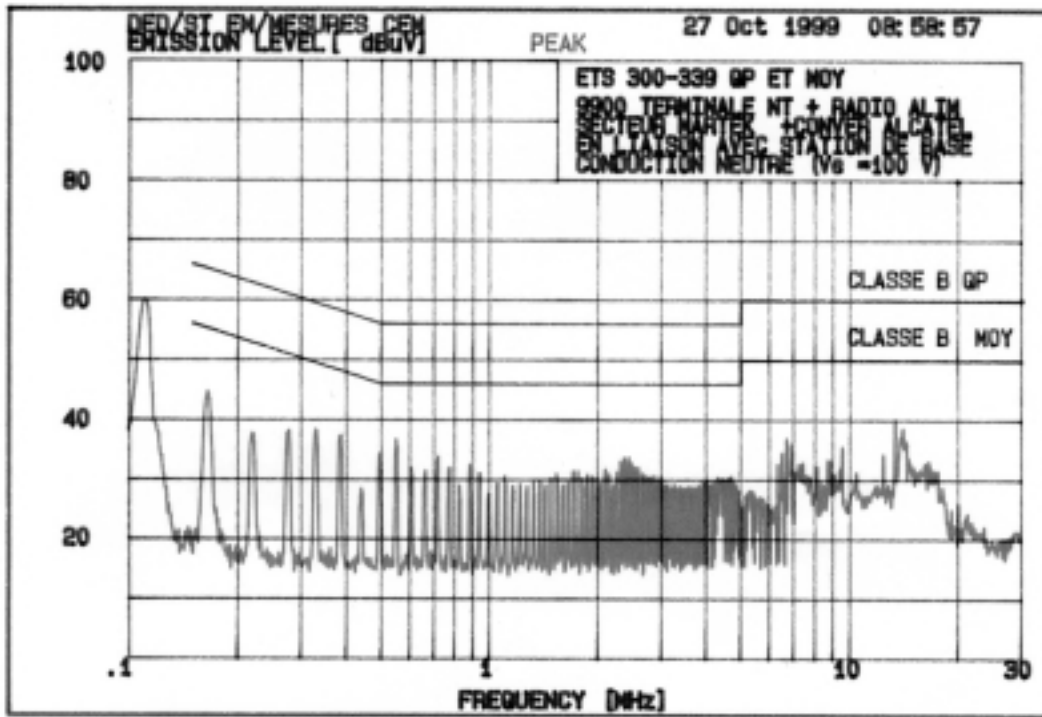


Exhibit 17 - Martek supply, neutral conductor @ 100V

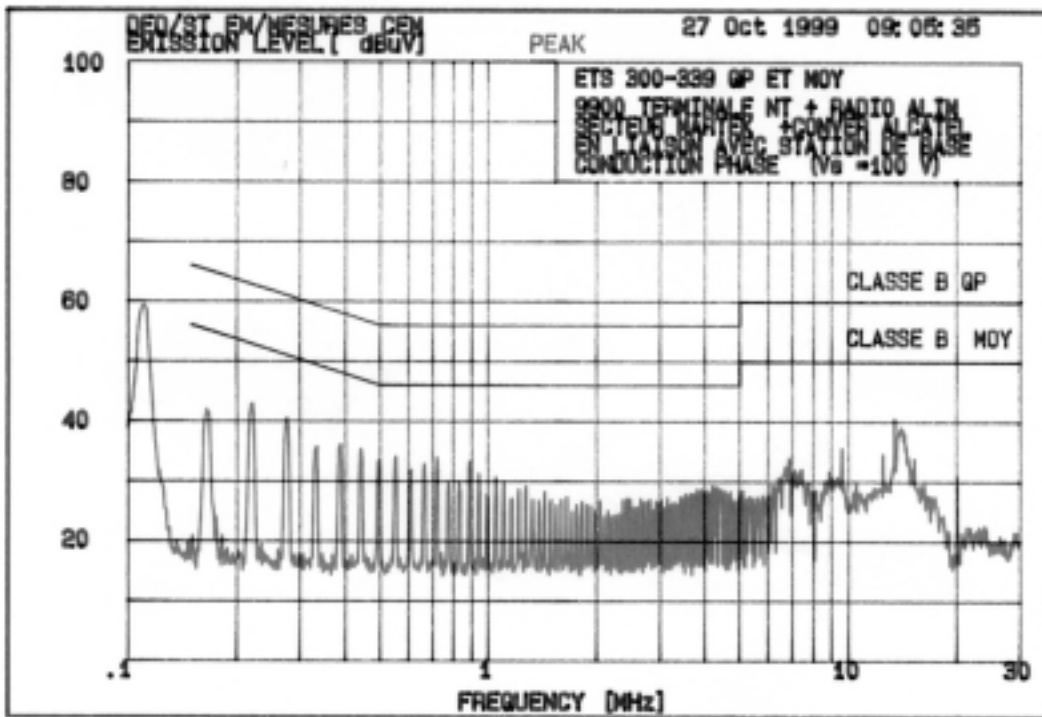


Exhibit 18 - Martek supply, power conductor @ 100V