NOISE/COM

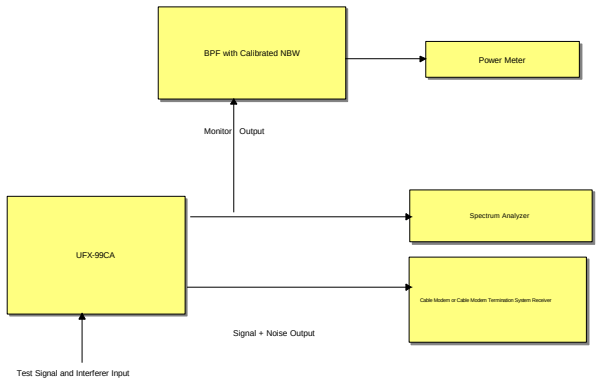
Product Application Note

Application Note # 122 ACCURATE E_S/N_O SETTING FOR DOCSIS/CATV BER MEASUREMENTS

The Data-Over-Cable Service Radio Frequency Interface Specifications call out BER performance vs. E_s/N_o as required tests for both the Upstream CMTS (Cable Modem Termination System) and Downstream CM (Cable Modem) receivers.

Accurate setting of E_s/N_o for BER testing can be accomplished using the UFX99CA with the setup in **Figure 1** below.

FIGURE 1



E_s/N_o (dB) is set with the adjacent channel or other interfering signals off. According to the following procedure:

1. Measure C_p, carrier power, at the monitor port with noise off.
2. Adjust carrier power to desired level using signal attenuators in the UFX99CA.
3. Measure N_p, noise power at the monitor port with carrier off.
4. Using the equation below, solve for E_s/N_o.
5. Adjust the noise attenuators until the desired ratio is achieved. An optional filter with calibrated Noise bandwidth can be ordered from Noise Com to achieve E_s/N_o accuracy for a specific frequency range.
6. After the correct ratio is achieved, the carrier and adjacent signals can be turned on to perform the BER test.

$E_s/N_o = C_p - N_p + 10\log(NBW / SR)$

Where:

E_s = Energy per Symbol.

N_o = Noise Power Spectral Density. Calculated from noise power measurement and calibrated NBW.

C_p = Measured power of the carrier or signal (dBm or dBmV).

N_p = Measured power of the noise (dBm or dBmV).

NBW = Noise Band-width of the noise source, or calibrated filter NBW (Hz). Used to determine N_o.

SR = Symbol Rate(symbols/second).

E_s/N_o (dB) is set with the adjacent channel or other interfering signals off.

Similarly, for Carrier to Noise ratio.

$C/N = C_p - N_p + 10\log(NBW/SBW)$

Where SBW = DUT System bandwidth.

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