Sensitivity to POTS Transients (Ring Trip and Ring Cadence)

There are several practical problems in implementing the transmission of DSL signals and analog POTS baseband signals over the subscriber loop. One significant problem is ringing cadence and the occurrence of “ring trip” events which can cause errors in the upstream or downstream data paths. The problem stems from the high frequency transient noise signals generated by POTS equipment. These transients can result in voltage levels greater than 220V peak and current spikes in excess of 300mA.

The DSL Splitter is a low pass filter (LPF); by definition it should prevent any disruption of DSL service during ring cadence or ring trip. Therefore, it is essential to ensure that splitter performance will not be affected by voltage and current spikes generated during a phone transient event.

Common components in splitters can be very sensitive to ringing. Detailed analysis demonstrates that components could change their values up to 80% under increased voltages or high currents. As a result, the filter characteristics will change drastically. Figure 1 compares the filter characteristics for Vendor X at 0mA and 300mA DC loop currents. Similarly, Figure 2 compares Comtest filter characteristics at the same current levels.

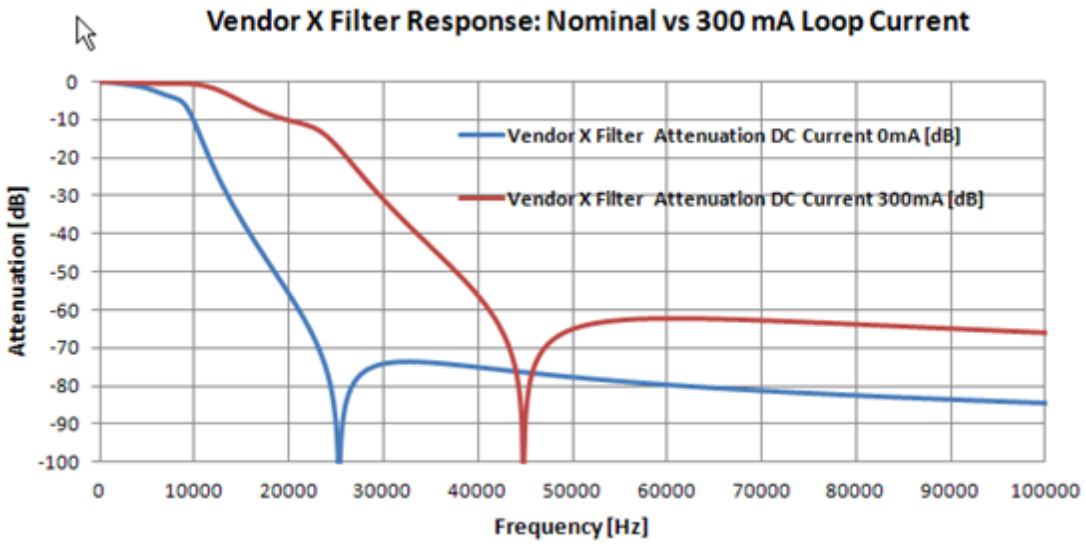

Figure 1: Vendor X Filter Response for Different DC Loop Current

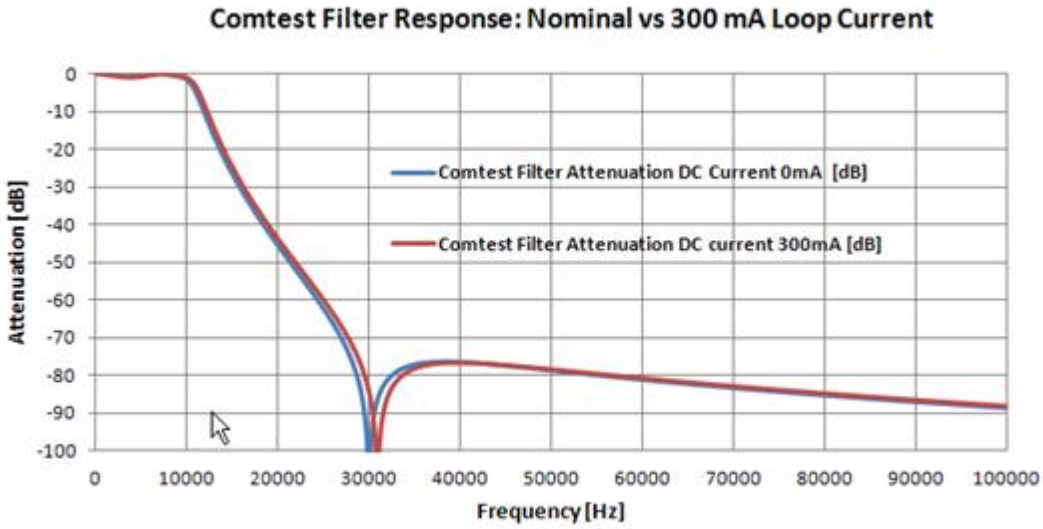

Figure 2: Comtest Filter Response for Different DC Loop Current

The variations in Vendor X splitter characteristics are evident in Figure 1. The LPF roll off is considerably effected; attenuation in the DSL band is decreased and the transition from pass band to stop band is pushed out significantly. It is important to note that the measurements in the above figures were taken at steady DC loop currents. In fact, during a transient event the DC characteristics will fluctuate and transition sharply. These fluctuations will result in more pronounced changes in the filter characteristics.

Figure 2 demonstrates that the Comtest splitter response does not change at higher loop currents.

The Splitter LPF is very specifically designed in order to optimize voice quality and DSL performance. Changes in the splitter response will affect:

DSL service – Additional noise will be introduced into the DSL band resulting in lower attainable data rates, increased errors and poor video quality.

Voice band signaling – During transient events (i.e., ringing) the filter response will change and may interfere with the proper operation of telephone features such as call display.

Many splitters are specified for DC loop currents up to 100 mA; this is clearly not enough. It is important to select a splitter that is designed to handle these transient events. Splitter stability over varying voltages and currents is critical to the quality of DSL and Voice services.