Proposal for Compliance Interconnect Method of Determining SAS Driver Compliance

Summary: It is proposed to extend Figure 30, *"Dr, Dt, Cr or Ct Compliance Point Connector"*, to incorporate the Compliance Interconnect concept described in XAUI (ref: IEEE P802.3ae Draft 5.0, Clause 47, sec. 47.4.1). This approach enables the use of driver equalization/emphasis and minimizes measurement issues associated with near-end electrical measurements.

Figure 30 and associated text in the SAS rev 00b spec is shown below:

5.7.11 Driver characteristics

For all inter-enclosure TxRx connections, the output shall be A.C. coupled to the cable through a transmission network.

For intra-enclosure TxRx connections the expander shall be A.C. coupled to the media. Other drivers may be A.C. or D.C. coupled.

The driver shall have the output voltages and timing listed in Table 14 and Table 16 measured at the designated interoperability points. The default point is Ct for inter-cabinet TxRx connections and Dt for intra-cabinet TxRx connections. The measurements shall be made across a load equivalent to that shown in Figure 30.

The relevant eye diagrams are given in 5.7.4. The normalized amplitudes, Y1 and Y2, allow signal undershoots. The driver shall meet both the normalized and absolute values.

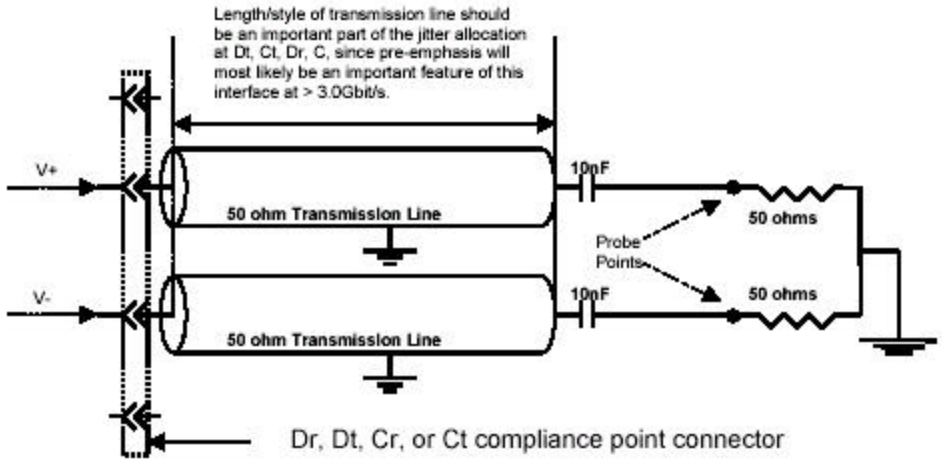

Figure 30. Test loads

This proposal would add specific definition to the above transmission lines. The driver being characterized would then have to meet the far-end specs through this *Compliance Interconnect*. (As stated in 47.3.3.5 of the IEEE 802.3ae draft specification, "The driver

shall satisfy either the near-end eye template and jitter requirements, or the far-end eye template and jitter requirements.")

This Compliance Interconnect is described in a following section of the 802.3ae draft:

47.4.1 Compliance interconnect definition

The compliance interconnect is a 100 Ω differential system specified with respect to transmission magnitude response and intersymbol interference (ISI) loss. The compliance interconnect limits have been chosen to allow a realistic differential interconnect of about 50 cm length on FR4 epoxy PCB. See 47.3.5 for a more detailed description of the target XAUI interconnect. The transmission magnitude response, $|s_{21}|$, of the compliance interconnect in dB satisfies Equation (47-2).

$$|s_{21}| \le |s_{21}|_{limit} = -20\log(e) \times [a_1\sqrt{f} + a_2 f + a_3 f^2] \qquad (47\text{-}2)$$

where f is frequency in Hz, a_1=6.5x10^{-6}, a_2=2.0x10^{-10} and a_3=3.3x10^{-20}. This limit applies from DC to 3.125 GHz. The magnitude response above 3.125 GHz does not exceed -11.4 dB. The ISI loss, defined as the difference in magnitude response between two frequencies, is greater than 4.0 dB between 312.5 MHz and 1.5625 GHz. The magnitude response and ISI loss limits are illustrated in Figure 47–6.

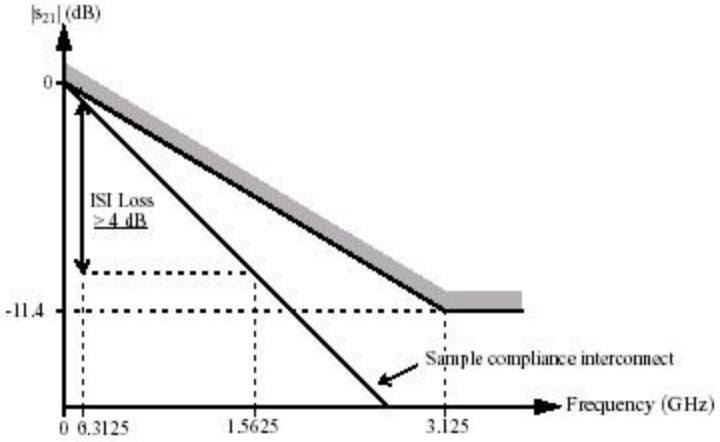

Figure 47–6—Compliance interconnect magnitude response and ISI loss.

This specification was developed to represent a reasonably worst case 20 inch PCB trace. Since the XAUI application and speed (3.125 Gb/s) is so close to the 3 Gb/s SAS application, I would recommend adopting this spec as is.