Important Definition

Alien Crosstalk

Unwanted signal coupling from one component, channel, or permanent link to another is defined as alien crosstalk. Since alien crosstalk is an indicator of differential (or balanced) signal coupling, alien crosstalk cannot be adversely impacted by common mode noise (e.g. noise from motors or florescent lights) that is present in the environment. Alien crosstalk is only specified by the Standards as a power sum parameter for components and cabling to approximate the energy present when all pairs are energized. Power sum alien crosstalk measured at the near-end is called power sum alien near-end crosstalk loss (PSANEXT loss) and power sum alien crosstalk measured at the far-end is called power sum alien attenuation to crosstalk ratio, far-end (PSAACRF). High power sum alien crosstalk levels can compromise the operation of the 10 G BASE-T application.

Attenuation to Crosstalk Ratio, Far-End (ACRF) (previously know as ELFEXT)

Pair-to-pair far-end crosstalk (FEXT) loss quantifies undesired signal coupling between adjacent pairs at the far-end (the opposite end of the transmit-end) of cabling or a component. ACRF is calculated by subtracting the measured insertion loss from the measured far-end crosstalk loss and yields a normalized value that can be used to compare cable and cabling performance independent of length. Poor ACRF levels can result in increased bit error rates and/or undeliverable signal packets. Note that NEXT loss margin alone is not sufficient to ensure proper ACRF performance.

Attenuation to Crosstalk Ratio (ACR)

A critical consideration in determining the capability of a cabling system is the difference between insertion loss and near-end crosstalk (NEXT) loss. This difference is known as the attenuation to crosstalk ratio (ACR). Positive ACR calculations mean that transmitted signal strength is stronger than that of near-end crosstalk. ACR can be used to define a signal bandwidth (i.e. 200 MHz for category 6) where signal to noise ratios are sufficient to support certain applications. It is interesting to note that digital signal processing (DSP) technology can perform crosstalk cancellation allowing some applications to expand useable bandwidth up to and beyond the point at which calculated ACR equals zero. Even so, the maximum frequency for which positive ACR is assured provides a benchmark to assess the useable bandwidth of twisted-pair cabling systems.

Balance

Twisted-pair transmission relies on signal symmetry or "balance" between the two conductors in a pair. Maintaining proper balance ensures that cabling systems and components do not emit unwanted electromagnetic radiation and are not susceptible to electrical noise. Component balance requirements are specified for category 6 / class E cabling. Component and cabling balance requirements are specified for category 6A / class EA and higher grades of cabling. Balance may be characterized by longitudinal conversion loss (LCL), longitudinal conversion transfer loss (LCTL), transverse conversion loss (TCL), or equal level transverse converse transfer loss(ELTCTL).

Source: *De-Mystifying Cabling Specifications From 5e to 7A* by Valerie Maguire

Important Definition

Equal Level Far-End Crosstalk (ELFEXT)

See definition for Attenuation to Crosstalk Ratio, Far-End.

Insertion Loss (Attenuation)

Insertion loss is a measure of the decrease in signal strength along the length of a transmission line. Ensuring minimal signal attenuation is critical because digital signal processing (DSP) technology can not compensate for excessive signal loss.

Near-End Crosstalk (NEXT) Loss

Pair-to-pair near-end crosstalk (NEXT) loss quantifies undesired signal coupling between adjacent pairs at the near-end (the same end as the transmit-end) of cabling or a component. Excessive NEXT loss can be detrimental to applications that do not employ crosstalk cancellation digital signal processing (DSP) technology.

Power Sum

All pair-to-pair crosstalk parameters can be expressed as a power summation, which approximates the level of undesired internal signal coupling present when all pairs are energized. Power sum NEXT loss, ACRF, ANEXT loss, and AACRF characterization confirms that the cabling is significantly robust to minimize crosstalk from multiple disturbers. This type of characterization is necessary to ensure cabling compatibility with applications that utilize all four pairs for transmitting and receiving signals simultaneously such as 1000 BASE-T and applications that are sensitive to alien crosstalk such as 10 G BASE-T.

Propagation Delay & Delay Skew

Propagation delay is the amount of time that passes between when a signal is transmitted and when it is received at the opposite end of a cabling channel. The effect is akin to the delay in time between when lightning strikes and thunder is heard - except that electrical signals travel much faster than sound. Delay skew is the difference between the arrival times of the pair with the least delay and the pair with the most delay. Transmission errors that are associated with excessive delay and delay skew include increased jitter and bit error rates.

Return Loss

Return loss is a measure of the signal reflections occurring along a transmission line and is related to impedance mismatches that are present throughout a cabling channel. Because emerging applications such as 1000 BASE-T and 10 G BASE-T rely on full duplex transmission encoding schemes (transmit and receive signals are superimposed over the same conductor pair), they are sensitive to errors that may result from marginal return loss performance.

Source: *De-Mystifying Cabling Specifications From 5e to 7A* by Valerie Maguire