COMPONENT LEVEL POWER SUM COMPLIANCE AND RJ21X CONNECTIVITY SOLUTIONS

OPTICAL CABLE CORPORATION

Near End Crosstalk (NEXT) has been the hot topic since cabling systems reached 100MHz. It is the unintentional communication between pairs of a cabling system resulting from the wire pairs being placed close to each other. The testing process consists of measurement of each pair's NEXT in relation to each of the other three pairs in the component, Permanent Link, or Channel. This may also be referred to as Pair-to-Pair NEXT.

When Gigabit Ethernet (1000BaseT as specified by IEEE 802.3ab) was developed utilizing all four pairs simultaneously and bi-directionally over existing 100MHz cabling systems, Power Sum NEXT (PSNEXT) became an important parameter. The testing process for PSNEXT consists of measuring all pair-to-pair Crosstalk combinations and then summing all of the values for each pair. This specification was developed to directly address the effect of transmissions on multiple adjacent pairs on the pair being tested and is relevant to all connecting hardware and associated communications cables.

Connecting Hardware:
The RJ21X (a.k.a. Telco, Amphenol, 25pr) connector is gaining wide acceptance in the industry as an alternative to the termination of six or twelve ports using Insulation Displacement Connectors (IDCs). As these systems are specified, it is critical to the user that PSNEXT specifications are met for all 24 pairs being used in the connector, therefore providing assurance of Crosstalk performance between ports within the ganged module.

This is especially critical within RJ21X/RJ45 modular patch panels. Not all manufacturers of 25 pair modular patch panels and components test and qualify all pair combinations relative to the 25 pair connector. Thus they are providing a product that is no better (and probably much worse) than a typical four pair product. All pair combinations in the Printed Circuit Board (PCB) mounted RJ21X connector must be tested and power summed to assure compliance. In the illustration below, the critical nature of PSNEXT within the RJ21X connector becomes immediately apparent. Lack of compliance with this specification in the case of the RJ21X connectors can have the same result as Alien Crosstalk (ANEXT) in a four-pair system.

Communications Cables:
25 pair cable is typically constructed of four pair groupings. However, all pair to pair Crosstalk couplings within the cable are measured and the power sum Crosstalk must pass the same TIA requirements as established for four pair cabling. Since all 25 pairs are "summed" together, the pair to pair and PowerSum Crosstalk requirements provide an electrically better "standards based" cabling solution.

When 4 pair cabling is installed, there is no assurance of port-to-port isolation between connectors and cables. In fact, since the cables are usually from the same manufacturer, the individual cables will have identical twist rates, virtually guaranteeing poor cable-to-cable Crosstalk performance (ANEXT and AFEXT). In the 25 pair system, all port-to-port Crosstalk couplings are known and controlled by the manufacturer, assuring performance. There is also much less likelihood of like-twist pairs in close proximity in a bundled configuration of 25 pair cables.

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25 Pair RJ21X vs. 4 Pair RJ45:

In today's higher density installations, such as Data Centers, ANEXT is one of the leading contributors to BER failures. PSNEXT compliance within the RJ21X connector in a RJ21X cabling system represents the only specification for UTP cabling that provides a degree of "port-to-port" Crosstalk isolation. In four pair systems, there are no formal requirements for ANEXT or PSANEXT. Typically, the port-to-port Crosstalk couplings are not measured due to the many variables of cable placement and bundling and the difficulty in making field measurements. This is where 25 pair cabling systems actually provide greater performance margins when compared to four pair systems.

Conclusions:

- By definition of standards requirements, the RJ21X connectivity solution offers a channel solution fully capable of transmitting Gigabit Ethernet on all ports simultaneously
- PowerSum NEXT specifications for RJ21X connecting hardware and high-pair-count cables offer a degree of Alien Crosstalk reduction that far exceeds that of four-pair UTP cables in similar network designs.
- For high-density applications such as Data Centers the 25 pair cabling solution is not only neater and easier to install and manage, but it yields better performance as well.

Data references: TIA 568B, IEEE 802.3

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