Hitachi Cable America Inc.

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Inspire the Next

Supra 10G-XE Category 6A Cable

Continuous Barrier Cable Designs Deliver Optimal Performance

A New Generation

Now that Category 6A has gained traction and has become the new standard for telecommunication infrastructure, the second generation of category 6A cables is taking over from their larger diameter counterparts. While the most obvious change is the reduction in the cable diameter, that diameter reduction requires an alternative approach to limiting the impact of external noise. The first generation of cables accomplished noise immunity with larger diameters that increased the distance between the cable cores. This second generation of cables utilizes various forms of shielding without requiring the bonding effort associated with F/UTP and other shielded cables.

Category 6A cables are designed to support IEEE 802.3an 10GBase-T transmission. 10GBase-T operates at higher frequencies (standardized to 500 MHz) than lower performing systems and is more susceptible to external electronic noise in the form of Alien Crosstalk (AXT), which is unwanted noise on a cable pair coupled from a pair in an adjacent cable, and noise generated by motors, fluorescent lighting and other electrical devices.

When it comes to overall performance of the category 6A cabling infrastructure, there are 3 designs that can be described as Good, Better and Best. UTP cables fulfill the "Good" role. It is a proven technology that has been the standard for over 20 years. Alternative barrier cable designs, which tend to have a smaller OD than standard UTP cables, offer a "Better" solution since they take up less space than standard UTP cables and do not need bonding & grounding like fully shielded cables do. However, some of these designs do have limitations in regards to ensuring signal integrity. Fulfilling the "Best" role, fully shielded systems provide the best immunity to outside electronic noise. Though once found to be more difficult and costly to install than UTP solutions, shielded systems have become more commonplace.

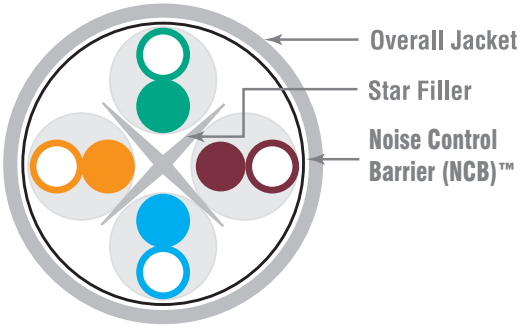
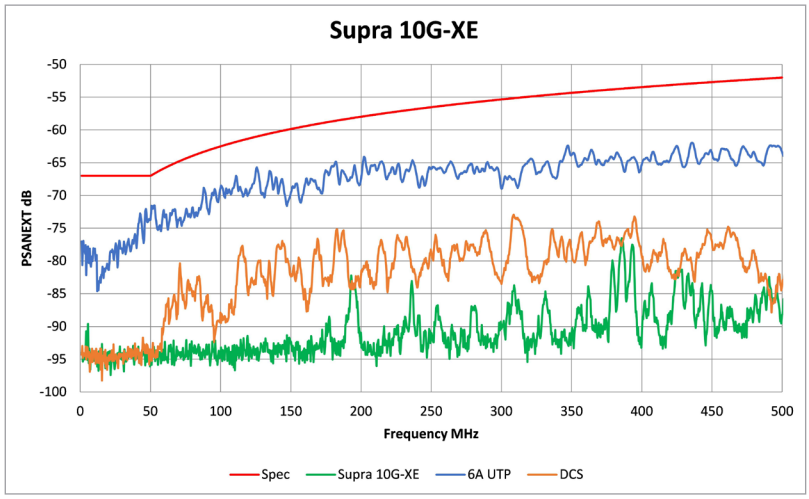


Figure 1: Supra 10G-XE Cross section

While alternative cable designs utilizing discontinuous shields have been introduced to reduce cable diameter while maintaining AXT performance, these cables may still be susceptible to noise from other external sources. A new alternative is Hitachi Cable America's Category 6A Supra10G-XE cable. Incorporating Hitachi's new Noise Control Barrier (NCB) (see Figure 1), the Supra 10G-XE provides excellent noise immunity without the increased labor cost associated with fully shielded systems. Graph1 shows the Supra10G-XE PSANEXT performance compared to a standard UTP cable and a comparable discontinuous shield cable. PSANEXT (power-sum alien near end crosstalk) is a form of AXT identified in the Category 6A standard ANSI/TIA 568-C.2. It is the sum of all unwanted crosstalk from adjacent cables.

However, improved margin for alien crosstalk is not by itself indicative of immunity to other types of outside noise. In order to simulate an active network setting within a noisy environment, cables under test were placed in to an EMC chamber and then subjected to RF interference (See Image1). The test was performed according to IEC 61000-4-3 Electromagnetic compatibility (EMC) -Part 4-3: Testing and measurement techniques – Radiated, radio-frequency, electromagnetic field immunity test. A signal strength of 3V/m was used to simulate a noisy commercial or light industrial environment. The frequency of applied noise was increased in 10MHz steps from 80 to 680MHz. During the test, the cable was supporting a 10Gb/s Ethernet data stream, and the number of steps at which the data interruption occurred was recorded.



Graph 1: PSANEXT Performance (greater distance from Spec line preferred)

Image 1: Cable under test in EMC chamber

Data interruption occurred in two manners, either as data packet loss or a link loss. A packet loss is a less severe short-term interference in the data stream that leads to reduced data rates. Due to how Ethernet works, packets of data that don't arrive complete are resent. This occurrence does ultimately slow the transmission down and true 10 gigabit-per-second throughput is not achieved. A link loss, however, is a more severe interruption that requires the link to be re-established. Both instances can negatively impact network performance, especially if the interference is prolonged or occurs regularly.

Chart 1 shows packet loss events during testing. As anticipated, the fully shielded Category 6A solution performed the best while the Supra 10G-XE which utilizes a continuous barrier came in a close second. This was followed by the discontinuous shield cable and the UTP design. There are many discontinuous cable designs available on the market. Internal testing revealed that some designs perform better than others. For purposes of this analysis, the highest performing discontinuous cable tested is shown.

When looking at link loss events (See Chart 2), the difference between the cable constructions becomes even more notable. The fully shielded cable link and the Supra 10G-XE link were the only links to not undergo complete transmission loss. Interestingly, HCA's verified Category 6A UTP cable performed better than the discontinuous cable design.

Figure 2 below illustrates how external noise can penetrate the discontinuous cable designs through the gaps in their shield segments. A continuous barrier design like that of the Supra 10G-XE, shown in Figure 3, blocks virtually all the external noise from reaching the cable core. The continuous barrier design minimizes the impact of both Alien Crosstalk and exterior noise and assures the 10GBaseT signal transmission.

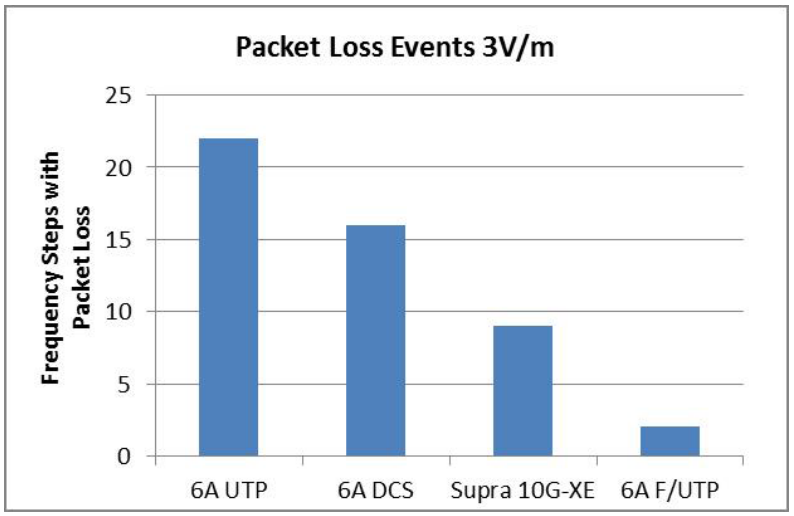


Chart 1: Packet loss events during EMC testing

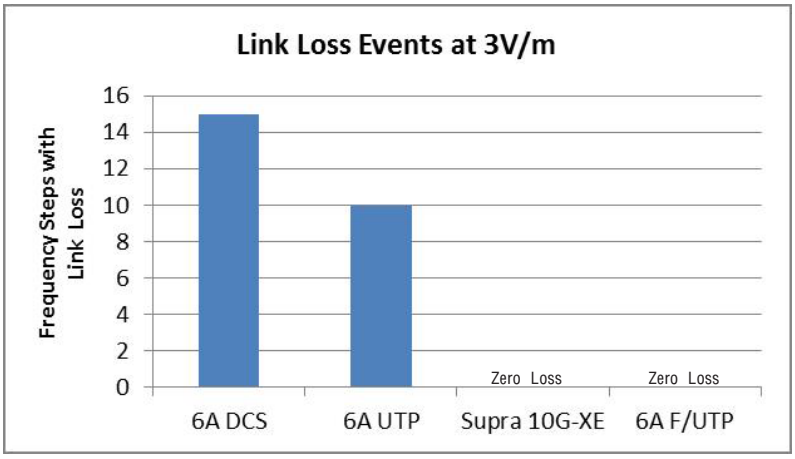


Chart 2: Link loss events during EMC testing

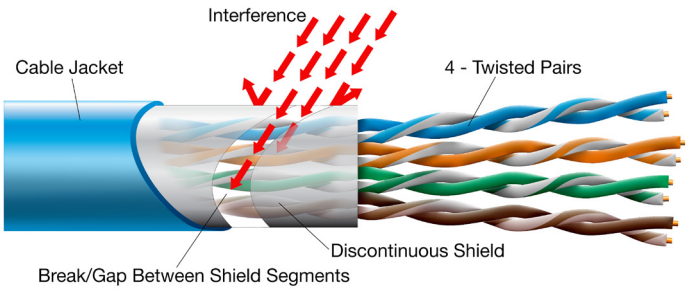


Figure 2: Segmented shield cable design

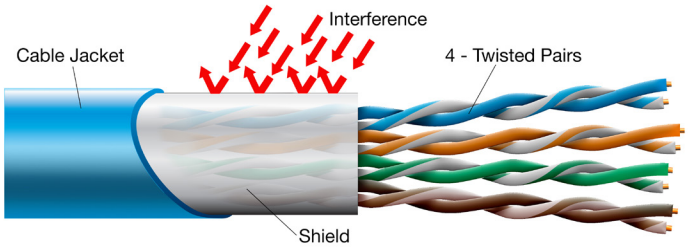


Figure 3: Barrier cable design

In conclusion, there are new cables on the market that can significantly reduce the amount of external noise that can be coupled onto the physical cable infrastructure. External noises can impede the transmission of network signals and prove detrimental to network efficiency. The first generation of Category 6A UTP cables provided a good solution. Though typically possessing a larger outside diameter, these cables can deliver 10 gigabit Ethernet. The newer generation of Category 6A UTP cables offer a smaller outside diameter and can help increase cable density in conduit and similar pathway spaces. Of the newer designs, the continuous barrier design cables provide greater immunity to external noises that can disrupt 10 gigabit Ethernet transmissions. These designs, such as Hitachi's Supra 10G-XE represent a better option when compared to the first generation UTP cables. However, the edge in performance ultimately goes to fully shielded Category 6A cables. Solutions utilizing bonded and grounded shielded cables and connectivity provide optimal signal throughput by delivering maximum noise immunity.

Hitachi Cable America Inc.

Located in Manchester, New Hampshire, Hitachi Cable America's (HCA) 300,000 square-foot facility produces over 4,500 unique cable constructions. HCA has been manufacturing cables at this facility since 1986 and operates 24/7 to supply demand. In addition to producing network related cables, HCA builds cables for the medical industry, the cellular phone industry, industrial applications, supercomputing and more.

Products from Hitachi Cable America Include:

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Industrial Ethernet Cables
Coaxial & Mini-coaxial Cables
Distributed Antenna System Cables
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