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To: Whom it may concern

From: Eduardo Garza

Subject: Guaranteed additional protection in a CAT 6A F/UTP cable compared to a CAT 6 UTP cable

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**Objective:**

The purpose of this report is to provide technical evidence on the fact that a shielded Category 6A cable will offer increased protection to outside sources of Electro Magnetic Interference (EMI) when compared to a Category 6 UTP cable.

**Background:**

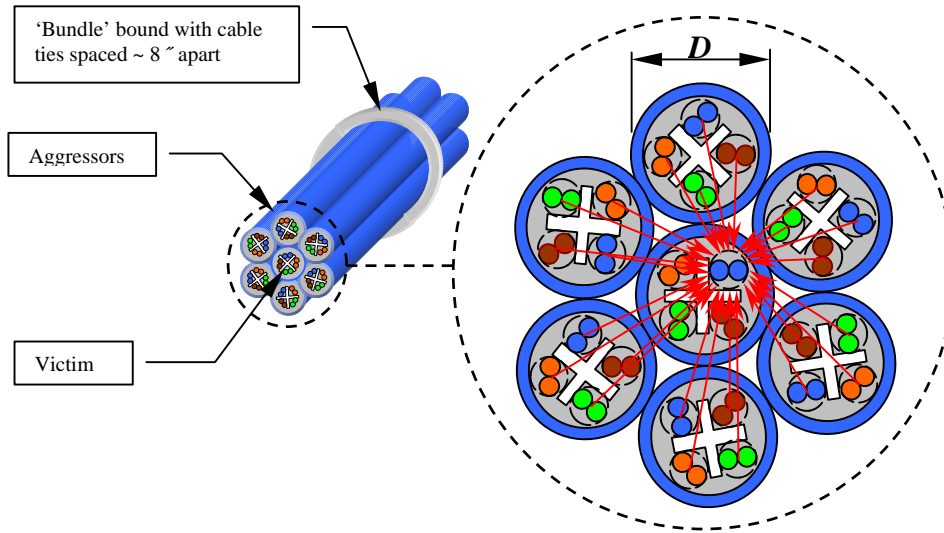
The data rate capacity of a telecommunications cable is given primarily by its usable frequency range (bandwidth) and the Signal to Noise Ratio (SNR), which is the difference between the strength of the signal transmitted and the electromagnetic noise coming from both inside and outside the cable. Due to this fact, noise mitigation is of imperative importance in the design of any telecommunications cable.

The most common method to achieve noise mitigation is through the twisting of the insulated wires into pairs, which reduces the magnetic coupling into the signal to a certain extent. However, when a cable is to be installed in the vicinity of other EMI sources (i.e. other cables, electronic equipment, power lines, etc.) the twisting of the pairs becomes insufficient to guarantee its performance, giving way to network disruptions. In such situations, a cable with an overall shield is greatly preferred.

**Test Setup:**

In order to determine the difference in external noise mitigation between an overall shielded and an unshielded cable, an ANEXT (Alien Near End Crosstalk) test setup based on TIA/EIA 568-B.2-10 was used. For this test, one cable (known as victim) is surrounded by six similar cables (commonly referred to as aggressors). The aggressor cables are then energized, and the signal is measured in each pair of the victim cable (Fig. 1). This test was performed at Underwriters Laboratories in their Melville, NY facilities.

It is important to note that since there is no requirement from the governing agencies for ANEXT testing on a CAT 6 UTP cable, the results comparison shown pertain to a CAT 6A UTP cable. Results with a CAT 6 UTP cable are expected to be far worse.

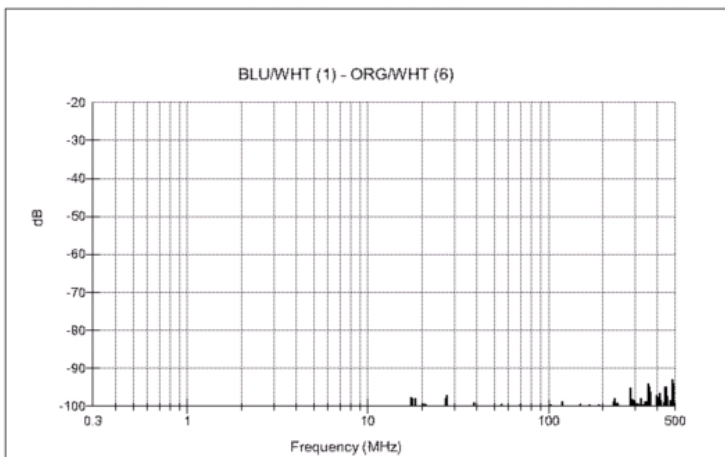


**Fig. 1 ANEXT test setup**

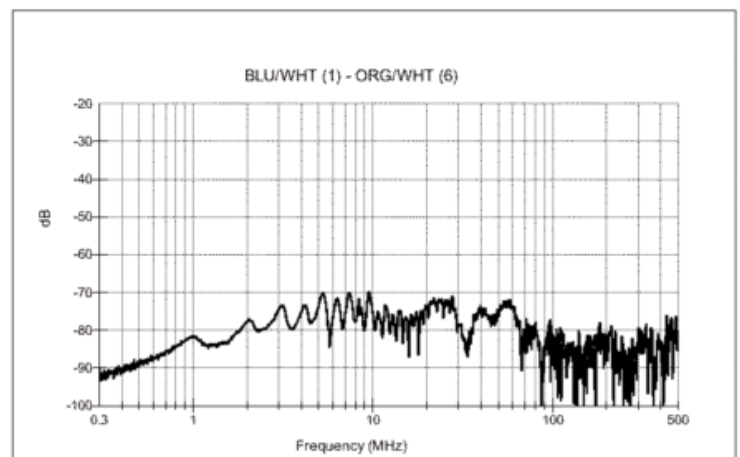
**Test Results:**

The following are the resulting ANEXT graphs for a frequency sweep from 0.3 to 500 MHz. Only worst case pair combinations are shown.

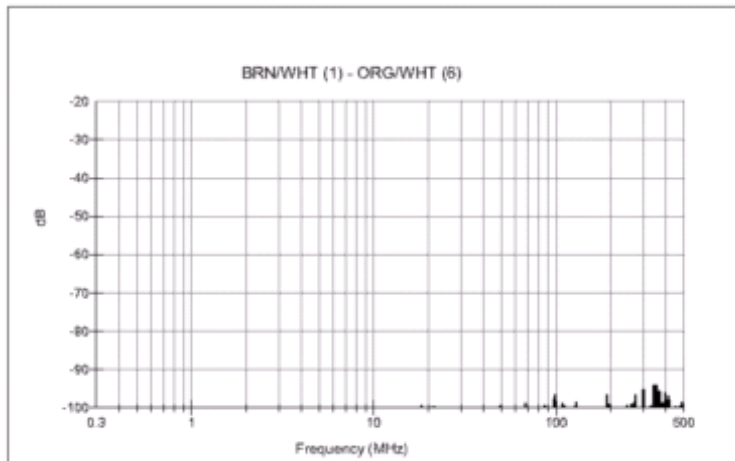
**CAT 6A F/UTP**



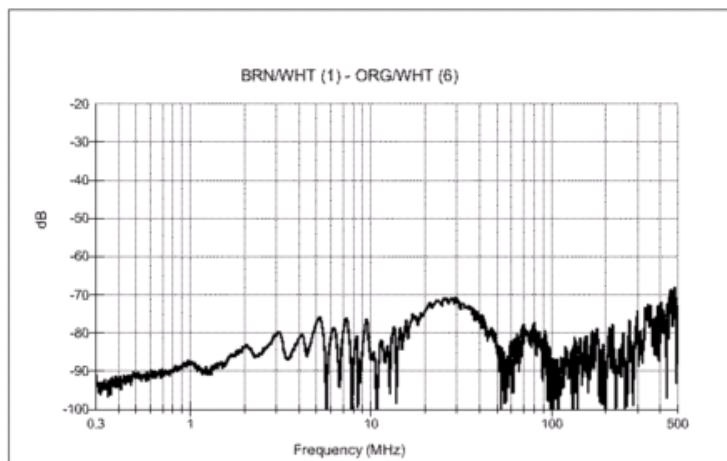
**CAT 6A UTP**



### CAT 6A F/UTP



### CAT 6A UTP



As it can be seen from the graphs, in an F/UTP cable the noise mitigation is almost a 100% (barely any noise to be seen even @ high frequencies). On the other hand, in the UTP cable, the electromagnetic radiation (noise) from the other cables is evident in the complete frequency range. Differences in noise reception can be seen as high as 30 dB from mid to high frequencies with a minimum of 8 dB at low frequencies.

### Conclusion:

- Even if in the original planning a UTP solution is good enough to provide the desired network performance, the future functioning of the system is really an unknown. This based on the fact that additional installations of EMI sources such as supplemental cables, power lines, high power circuits, etc. might cause the network to fail. For this reason, an F/UTP solution will increase significantly the probability of this network to work at the desired data rate level for a longer period of time.

*End of Report*