
Alien Crosstalk Measurements and Performance Under Different Installation Practices

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Overview

- Purpose:
 - Determine the Impact on 10GBASE-T Capacity of Different Installation Practices using Cat5e Models and Preliminary Cat5e Alien Model.
- Review of Installation Options and Associated Alien Mitigation
- Capacity Calculations
- Summary

Installation Practices (Patch Cords)

- Patch Cord Configuration Options:
 - 10GBASE-T Switch Port Interconnect made with Isolated Patch Cords
 - Isolation achieved through screening or separation
 - 10GBASE-T Switch Port Interconnect made with Tightly-Bundled Patch Cords
- Significantly Less Alien Crosstalk from Isolated Patch Cords
 - Alien Mitigation up to 2.6 dB per 2 meters of Cat5e
 - Source: Cohen L., “Alien Crosstalk Measurement,” IEEE802.3 10GBASE-T Contribution, Jan. 2003.

Installation Practices (Horizontal Cable)

- Horizontal Cable Configuration Options:
 - 10GBASE-T Cables Arranged in Tightly Bundled Groups
 - Tie-wraps located at short intervals
 - 10GBASE-T Cables Arranged in Loosely Bundled Groups
- Loose Bundling Introduces Significantly Less Alien NEXT
 - Alien Mitigation up to 6.4 dB on Cat5e
 - Source: Cohen L., “Alien Crosstalk Measurement,” IEEE802.3 10GBASE-T Contribution, Jan. 2003.

Installation Practices (Patch Panel)

- Patch Panel Configuration Options:
 - 10GBASE-T Traffic Located on Adjacent Patch Panel Ports
 - 10GBASE-T Traffic Located on Separated Patch Panel Ports
- Significantly Less Alien Crosstalk from Separated Patch Panel Ports
 - Alien Mitigation up to 6.6 dB on Cat5e
 - Source: Cohen L., “Alien Crosstalk Measurement,” IEEE802.3 10GBASE-T Contribution, Jan. 2003.

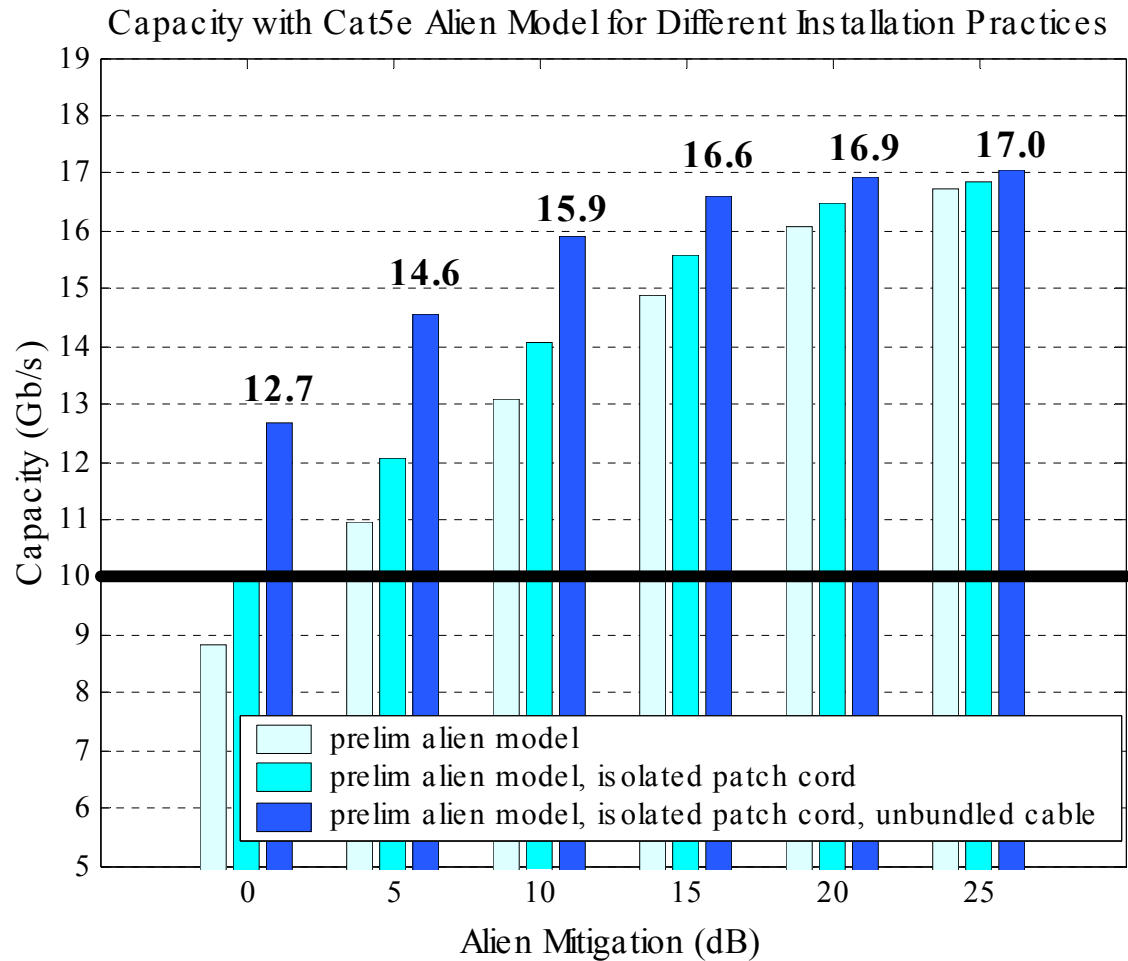
Capacity Calculations

- 10GBASE-T Cabling Ad Hoc Channel Models:
 - Established models for Category 5e Insertion Loss, Return Loss, self NEXT and self FEXT (April 17, 2003).
 - Preliminary model for Category 5e Alien NEXT with scaling for Different Installation Practices.¹
- Background Noise
 - Upper bound noise level of -150 dBm/Hz appears consistent with actual data center noise.^{2,3}
- Launch power of 10 dBm.

Capacity Calculations

- Self-Impairment Cancellation:
 - 55 dB Return Loss Cancellation (15 dB Hybrid, 40 dB PHY)
 - 40 dB NEXT Cancellation
 - 25 dB FEXT Cancellation
- No Established Level for Alien NEXT Mitigation. Mitigation of 0 dB to 25 dB Realized through Combination of One or More Alternatives:
 - PHY (0 dB to 10 dB)⁴
 - Improved Installation Practices (0 dB to 10 dB)¹
 - Enhanced Cable Design/Specification (0 dB to 25 dB)⁵

Capacity for Different Configuration Options



Summary

- Improved Installation Practices Provide a Viable Means of Alien NEXT Mitigation
 - Isolated Patch Cords
 - Separated Patch Panel Ports
 - Unbundled Cable
- Capacity Greater than 10 Gb/s can be Achieved Using Improved Installation Practices and Reasonable Levels of Impairment Cancellation

References

- ¹Cohen, L., “Alien Crosstalk Measurements,” IEEE802.3 Contribution, Jan. 2003.
- ²Pagnanelli, C., “Data Center Background Noise Measurements,” IEEE802.3 10GBASE-T Contribution, May 2003.
- ³Cobb, T., “Background Noise,” IEEE802.3 10GBASE-T Contribution, May 2003.
- ⁴Solarflare Communications, “10GBASE-T Tutorial,” IEEE802.3 Contribution, Nov. 2002.
- ⁵Cobb, T., “Experimental Cat6 Cable Developed with Improved Alien NEXT,” IEEE802.3 Contribution, March 2003.