Performance of Ad Hoc Cat5e Models with the Preliminary Cat5e Alien Model

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Overview

- Purpose:

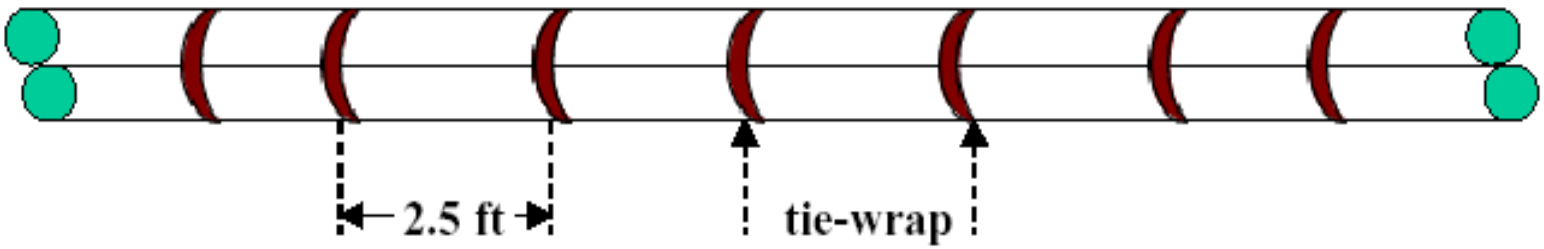
  Determine 10GBASE-T Capacity with Cat5e Models and Cabling Ad Hoc Preliminary Cat5e Alien Model.

- Review of Preliminary Cat5e Alien Model
- Capacity Calculations
- Summary

Preliminary Cat5e Alien Next Model

- Worst Case Model Based on Measurements of Coupling Gain Between Two 4-Pair Cat5e Cables:
  - 100 meter cable length
  - Tie-wraps every 2.5 feet
  - PS Alien NEXT response from 4-disturbers into worst case pair + 10log(6)

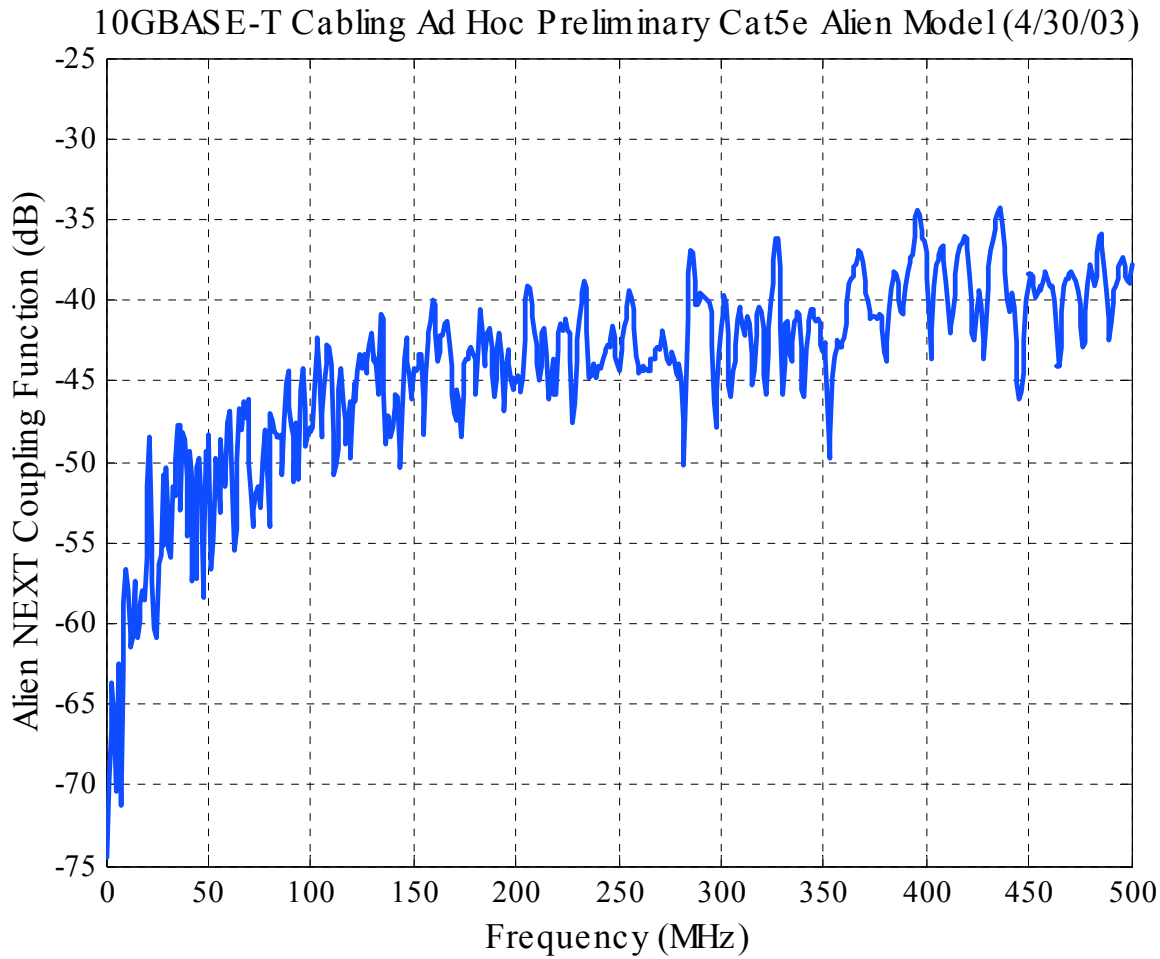
Preliminary Cat5e Alien Next Model



Cable Configuration for Cat5e Alien Measurements

(Source: DiMinico, C., "Alien Crosstalk Cabling Model Development," Report to 10GBASE-T Cabling Ad Hoc, April 2003)

Preliminary Cat5e Alien NEXT Model



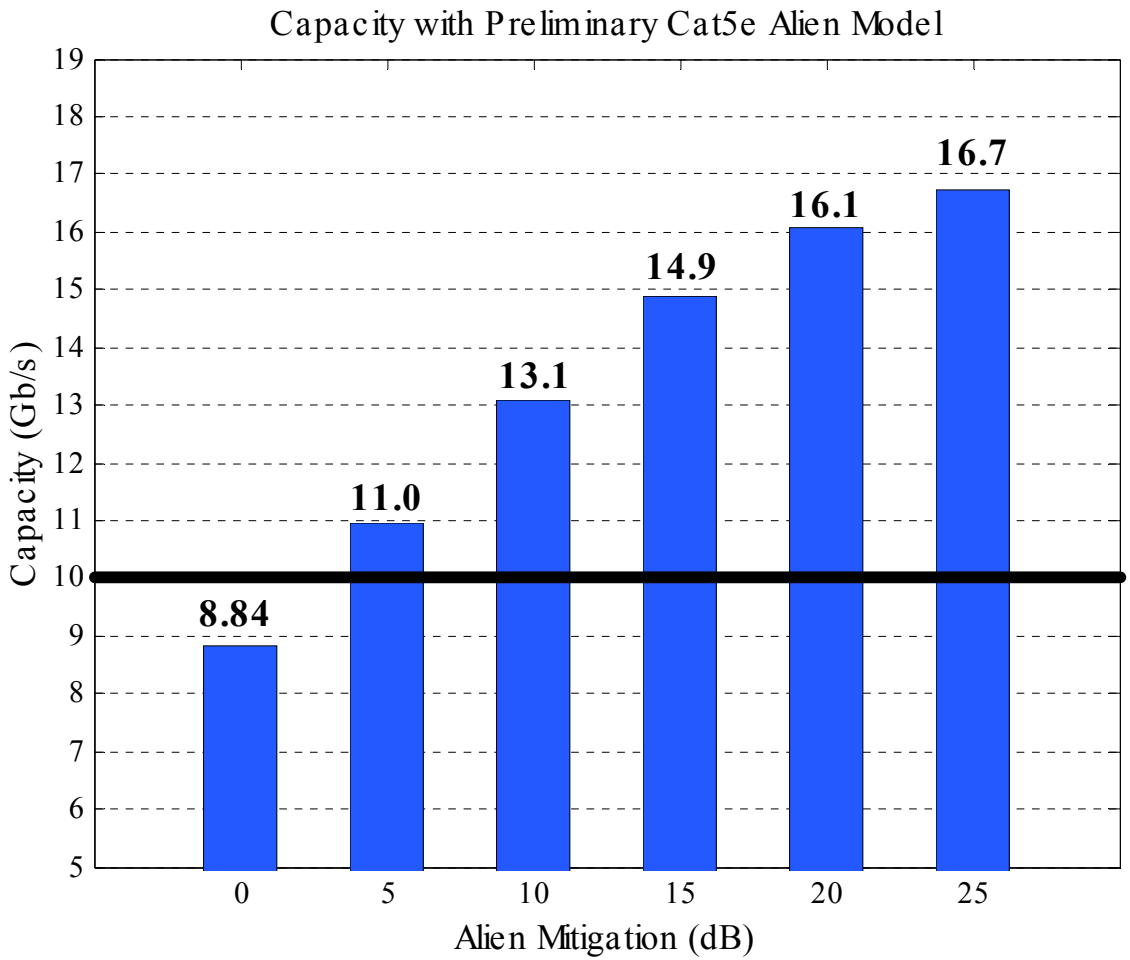
Capacity Calculations

- 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 (C. DiMinico, April 30, 2003).
- Background Noise
  - Upper bound noise level of -150 dBm/Hz appears consistent with actual data center noise.[1,2]
- 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)[3]
  - Improved Installation Practices (0 dB to 10 dB)[4]
  - Enhanced Cable Design/Specification (0 dB to 25 dB)[5]

Capacity vs Alien Mitigation



Summary

- Capacity Greater than 10 Gb/s can be Achieved with
  - Ad Hoc Cat5e Models and Preliminary Cat5e Alien Model
  - Reasonable Levels of Impairment Cancellation

References

[1]Pagnanelli, C., “Data Center Background Noise Measurements,” IEEE802.3 10GBASE-T Contribution, May 2003.

[2]Cobb, T., “Background Noise,” IEEE802.3 10GBASE-T Contribution, May 2003.

[3]Solarflare Communications, “10GBASE-T Tutorial,” IEEE802.3 Contribution, Nov. 2002.

[4]Cohen, L., “Alien Crosstalk Measurements,” IEEE802.3 10GBASE-T Contribution, Jan. 2003.

[5]Cobb, T., “Experimental Cat6 Cable Developed with Improved Alien NEXT,” IEEE802.3 Contribution, March 2003.