

Preliminary Study: Modeled 40G Reach on Category Cabling Paul Vanderlaan, Nexans Inc.

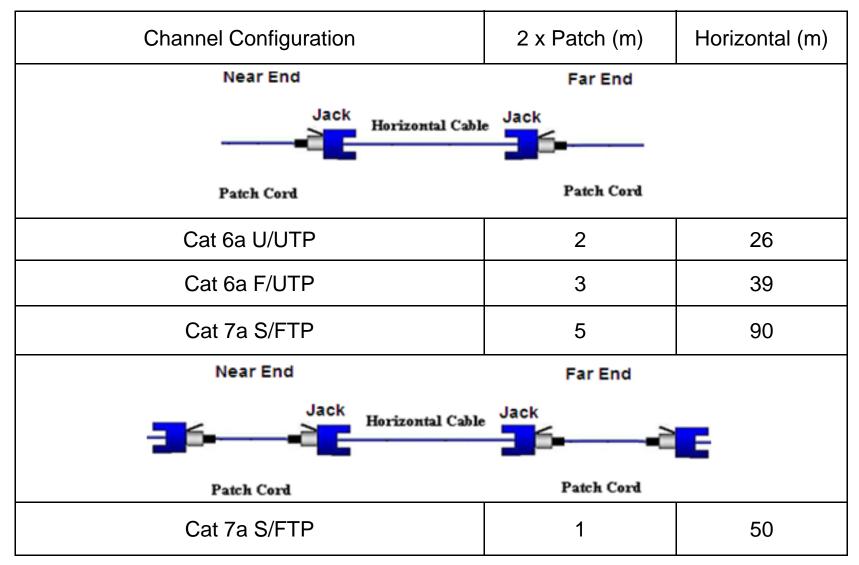
Introduction



- Support the efforts for multiple implementations of next generation twisted pair (NGTP) technology
- Study reach capabilities of:
 - Standards based Channels:
 - Cat 6a U/UTP, F/UTP
 - Cat 7a F/FTP
 - Built Channels (2 Connector, Approximating predicted reaches)
 - Cat 6a U/UTP, F/UTP
 - Cat 7a F/FTP

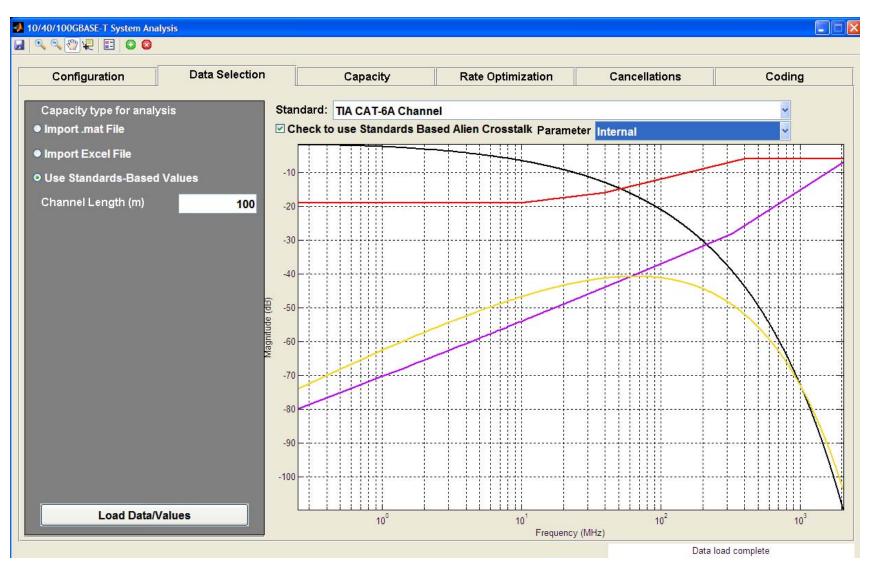
Initial results indicate feasibility, with separate designs providing distinct reaches. However, extrapolated specifications not necessarily accurate to predict reach.





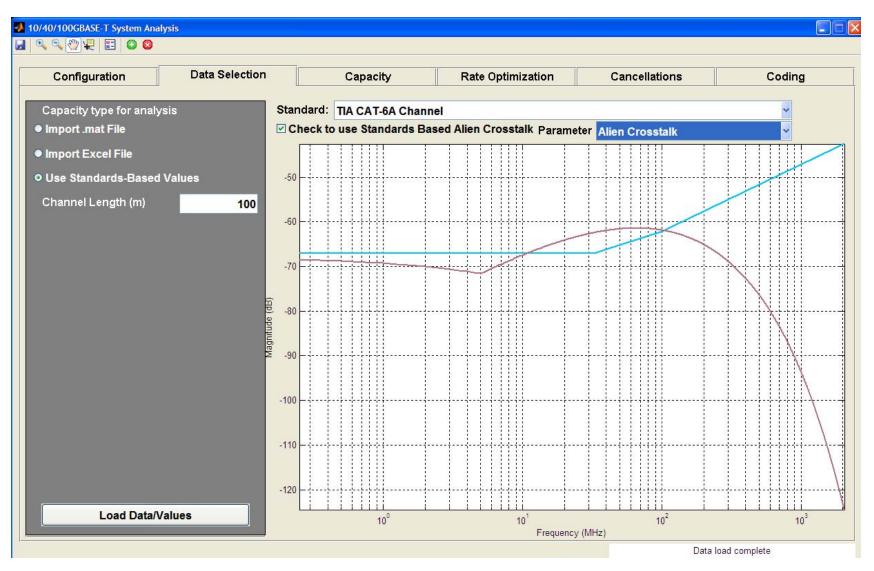
TIA Category 6a 100m Channel Model Internal Impairments





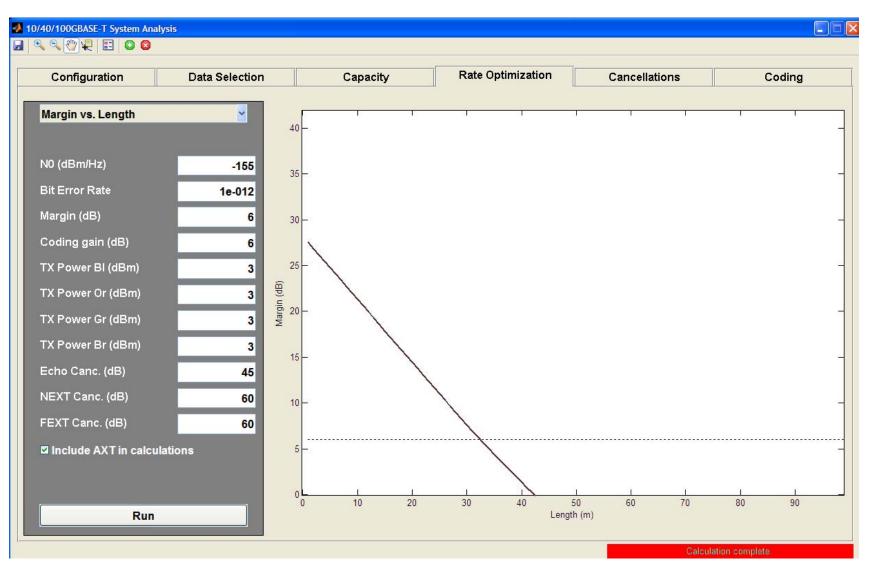
TIA Category 6a 100m Channel Model External Impairments





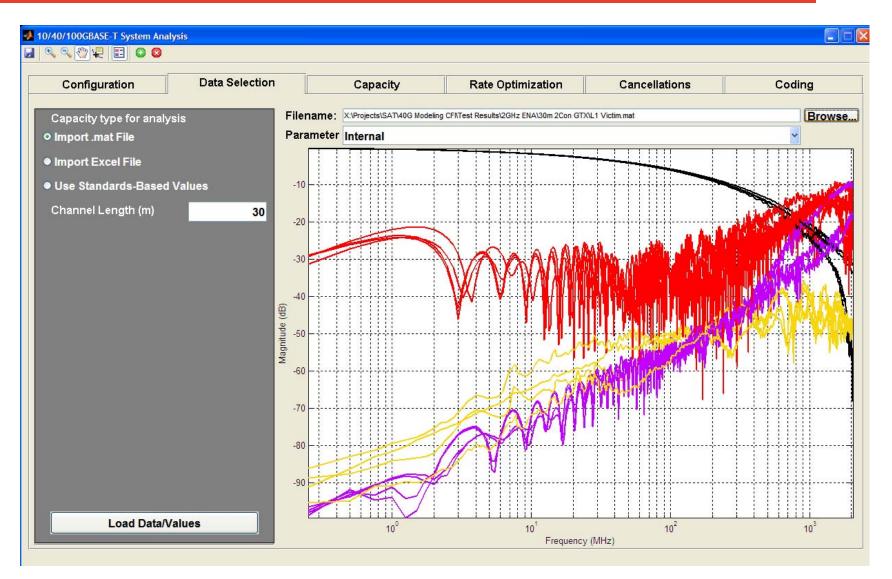
TIA Category 6a U/UTP Channel Predicted Reach

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Category 6a Two Connector 30m Channel

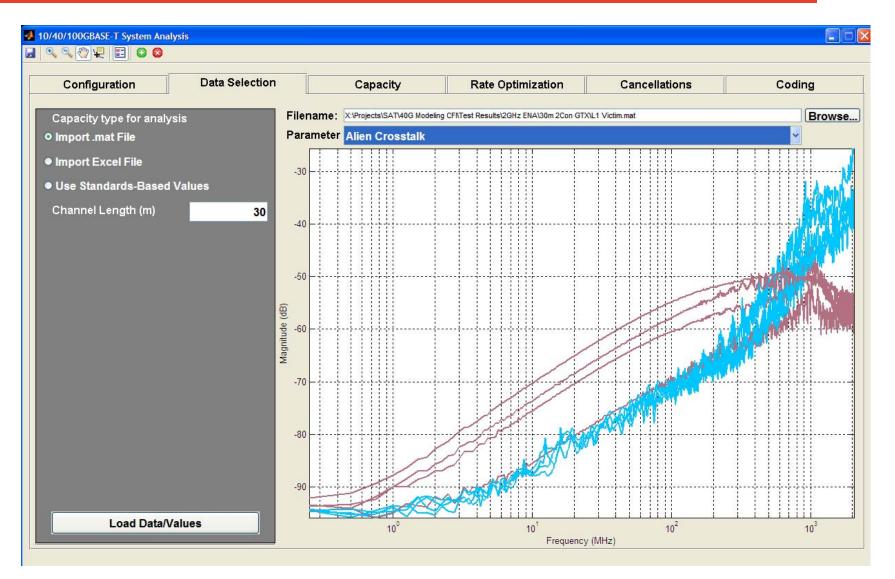
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Category 6a Two Connector 30m Channel

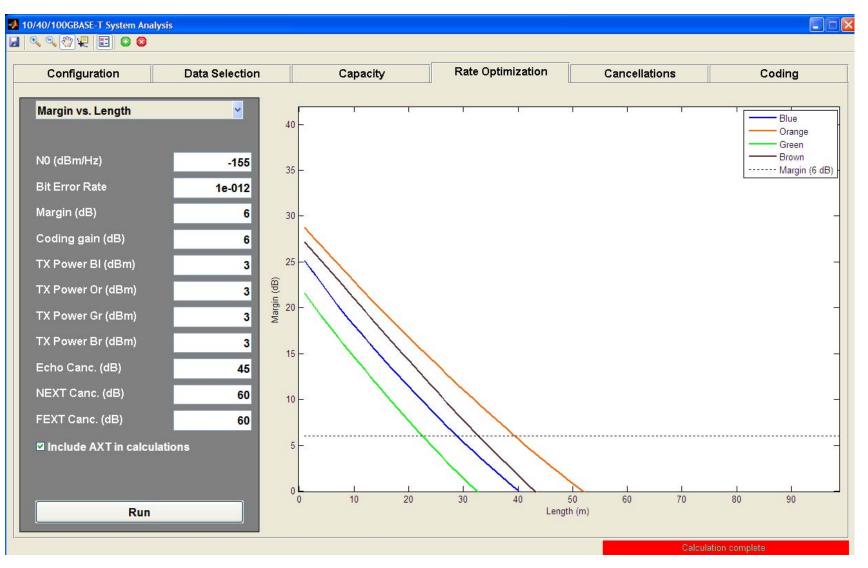
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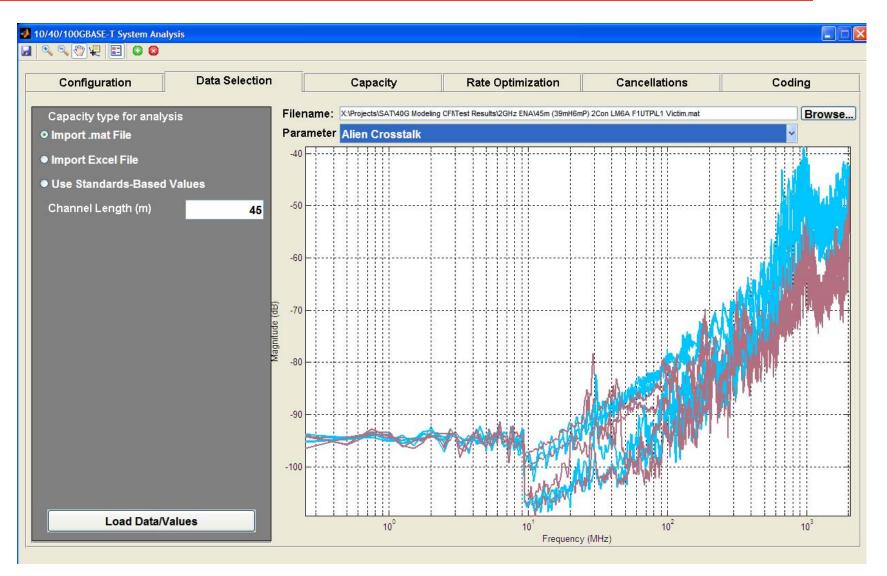
Category 6a U/UTP Two Connector 30m Channel

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Category 6a F/UTP Two Connector 45m Channel

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Category 6a F/UTP Two Connector 45m Channel

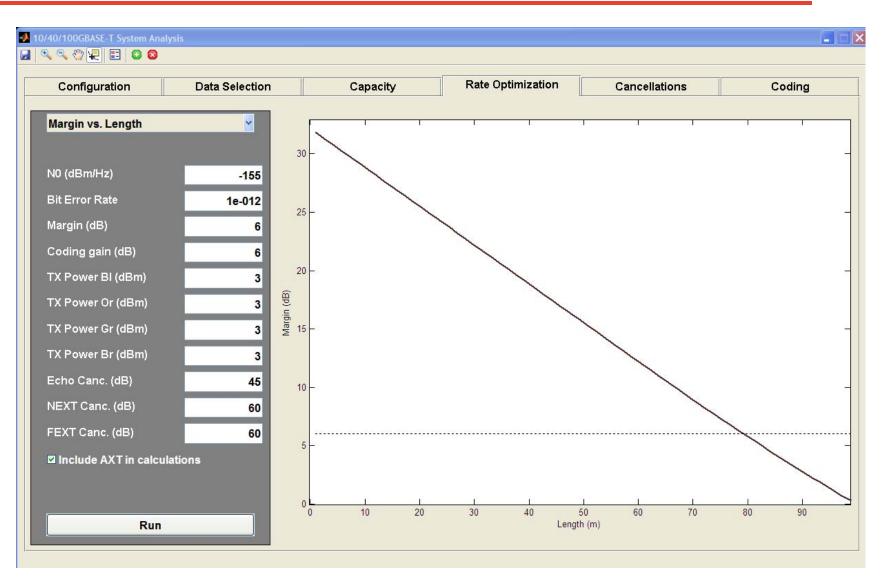
10/40/100GBASE-T System Analysis 🛃 🔍 🔍 🖤 🖳 🚺 🔕 Configuration Rate Optimization Data Selection Capacity Cancellations Coding Margin vs. Length × Blue 45 Orange Green Brown N0 (dBm/Hz) -155 40 ----- Margin (6 dB) Bit Error Rate 1e-012 35 Margin (dB) Coding gain (dB) 30 TX Power BI (dBm) Margin (dB) TX Power Or (dBm) TX Power Gr (dBm) 20 TX Power Br (dBm) 3 Echo Canc. (dB) 45 15 NEXT Canc. (dB) 60 10 FEXT Canc. (dB) 60 Include AXT in calculations 5 0 0 10 20 30 40 50 60 70 80 90 Run Length (m)

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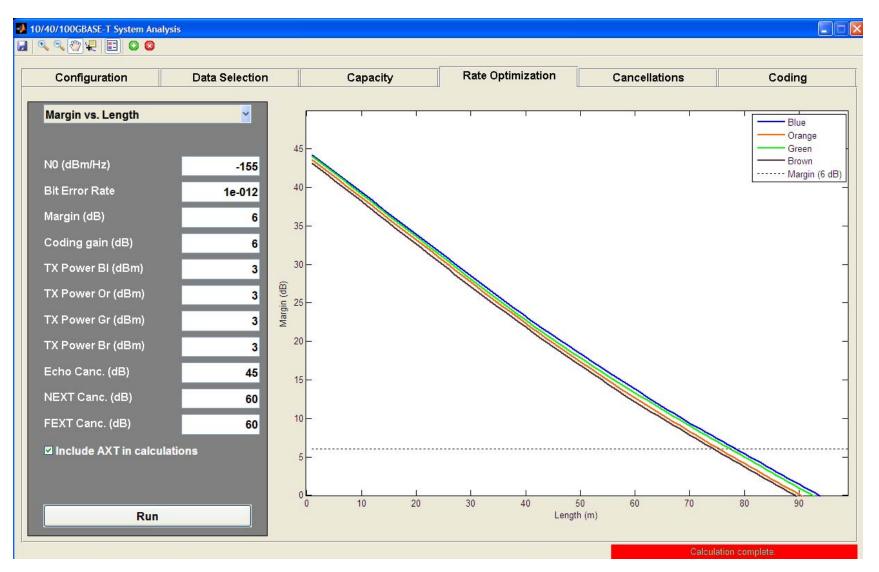
ISO Class FA Category 7a F/FTP Four Connector 100m Channel

Mexans

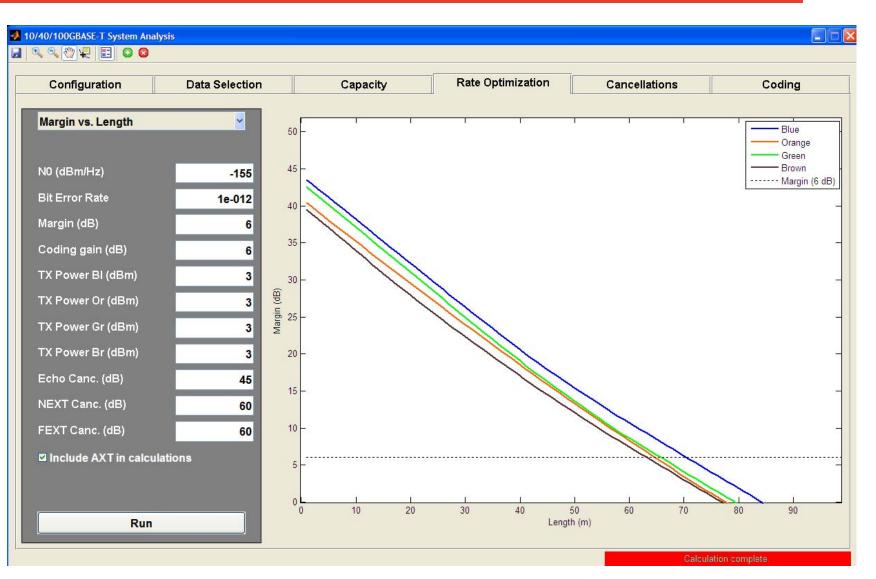


Category 7a Two Connector 100m Channel





Category 7a F/FTP Four Connector 52m Channel



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| 40G Capacity Reach (m) 6 dB Margin | As Specified (Extrapolated) | Observed |
|---------------------------------------|--------------------------------|----------|
| Cat 6a U/UTP | 32.5 | 23.0 |
| Cat 6a F/UTP | 32.5* | 40 |
| Cat 7a F/FTP (2 Connector) | 79 | 74 |
| Cat 7a F/FTP (4 Connector) | 79 | 63 |

* Alien Next Spec the same as U/UTP cabling

- Cat 6a split pair exhibits significant deviation above 500MHz
 - Insertion loss, Alien Crosstalk
- Cat 6a F/UTP increased reach due to improved Alien NEXT and IL
- Simple extrapolation of existing specifications may not represent performance of installed base



- Twisted Pair cabling exists which can support reach targets with additional bandwidth characterization
 - Cat6A U/UTP appears feasable for TOR distances
 - Cat6A F/UTP appears feasable for ~30-40m
 - Cat7A S/FTP appears feasable for ~60-70m

• Future Work:

 Further study on impairments such as RL, IL, AXT and Common Mode Noise needed