Worst Case Impulse Responses for Various EDC Architectures

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Outline

- Channel Model
- Impulse Responses Considered
- Equalizer Architectures
- Simulation Results
- Conclusions

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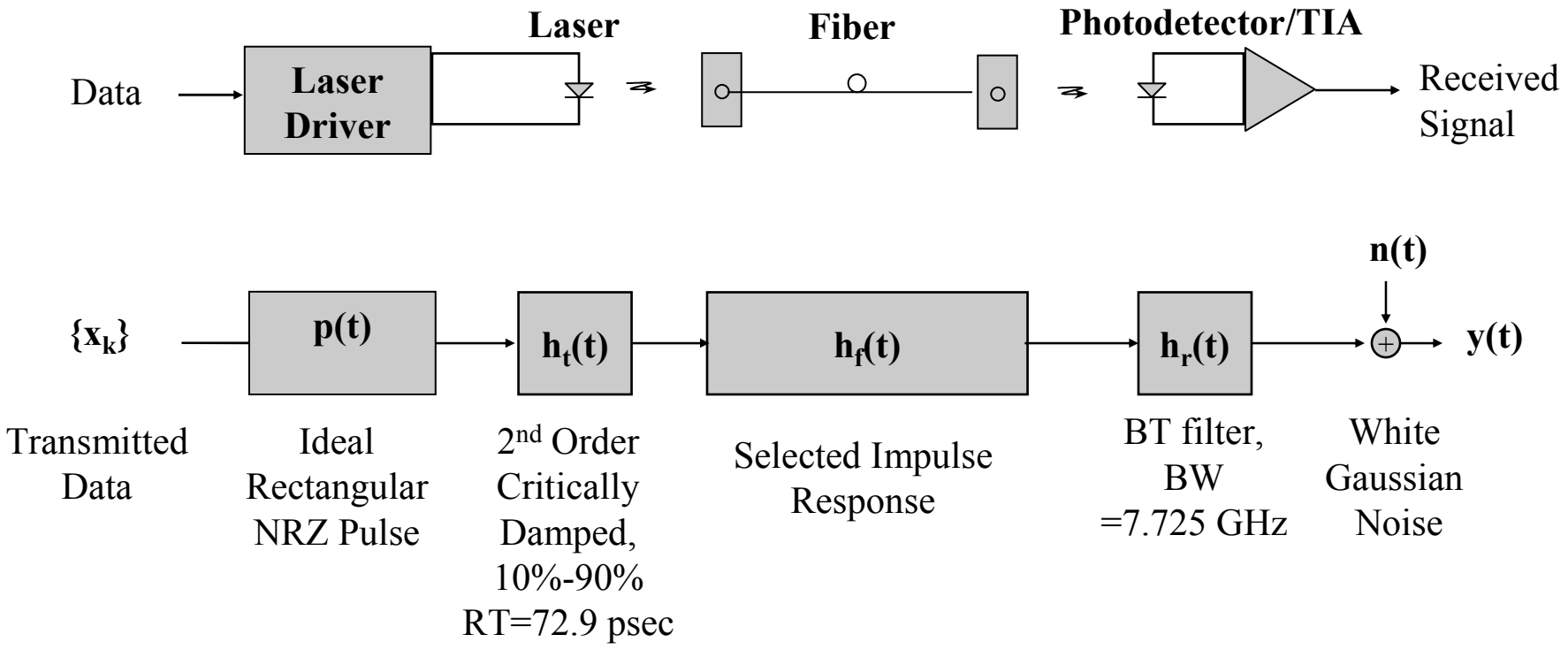
Channel Model



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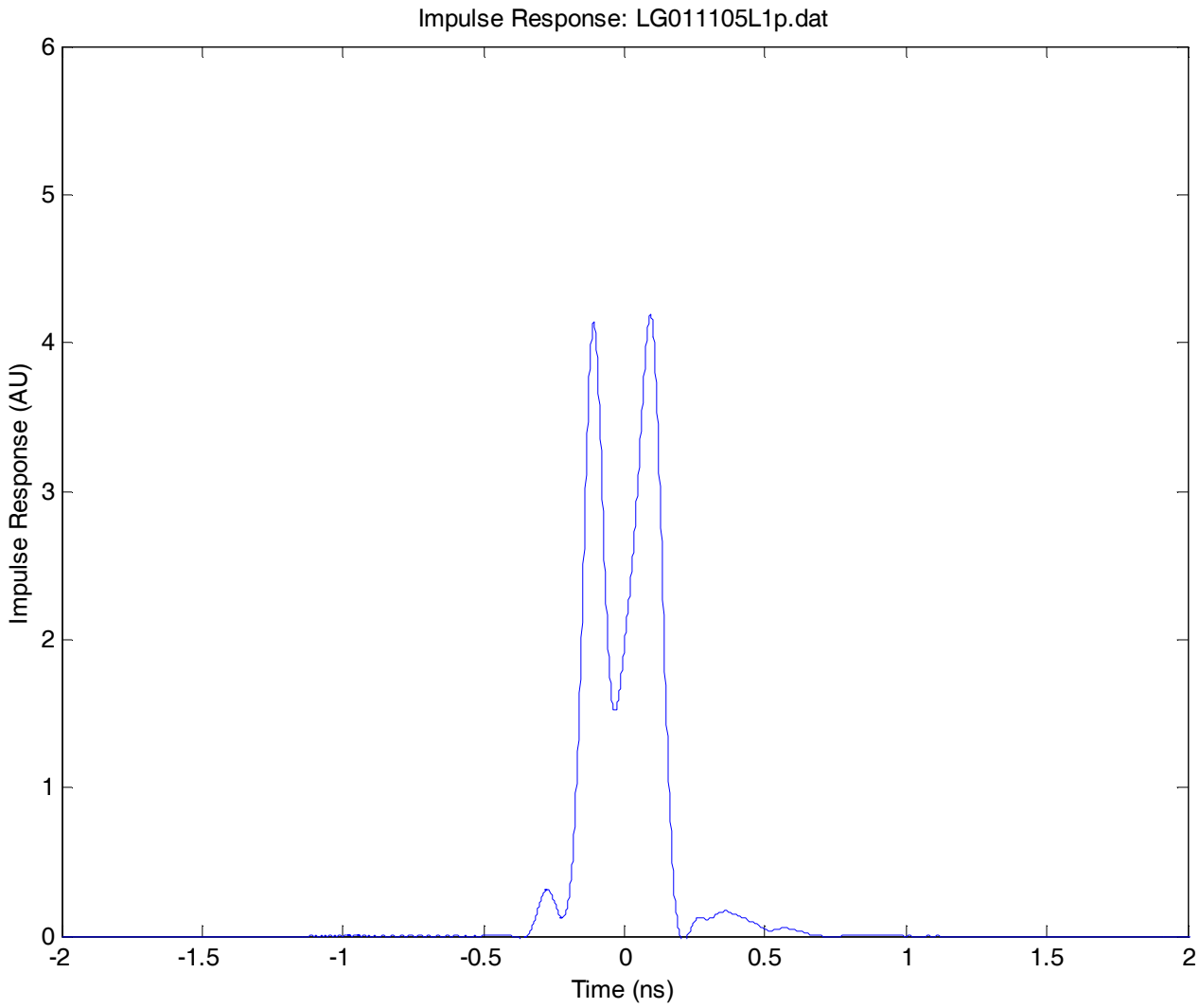
Impulse Responses Considered

Fiber Impulse Responses

- Five impulse responses simulated
  - Three impulse responses from the 802.3z National Lab set of measurements
    - http://www.ieee802.org/3/z/mbi/index.html
    - "Split Pulse", "Stair-Step", "Smooth Pulse"
  - Ideal Gaussian Pulse
  - Ideal Split Pulse
    - Two delta functions with separation set to give correct modal BW
- All impulse responses normalized to give -3dB Optical BW (-6dB Electrical BW) of 1.67 GHz at 300m
  - Corresponds to 500 MHz-km modal BW at 300m

"Split-Pulse" Impulse Response



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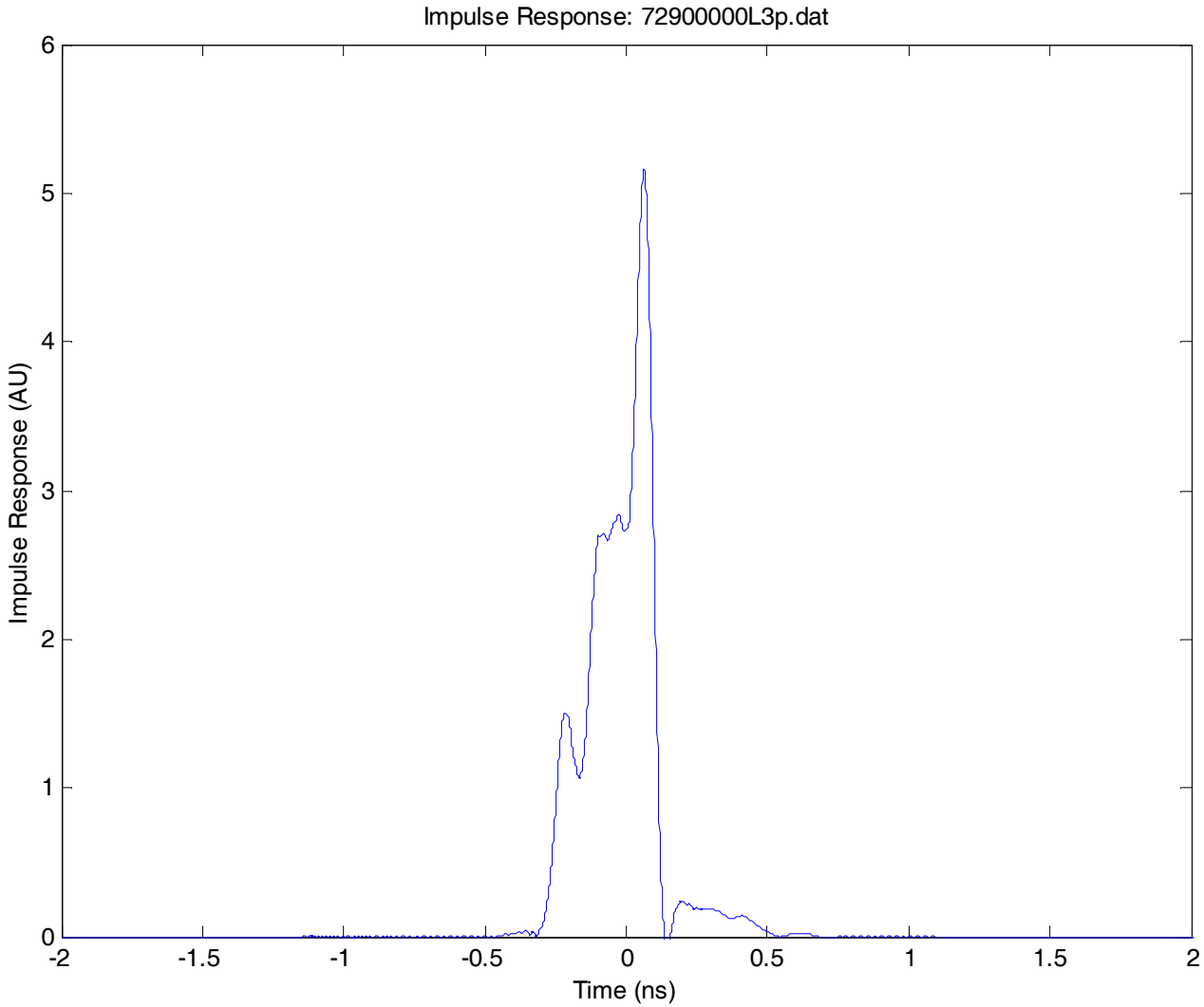
"Stair-Step" Impulse Response



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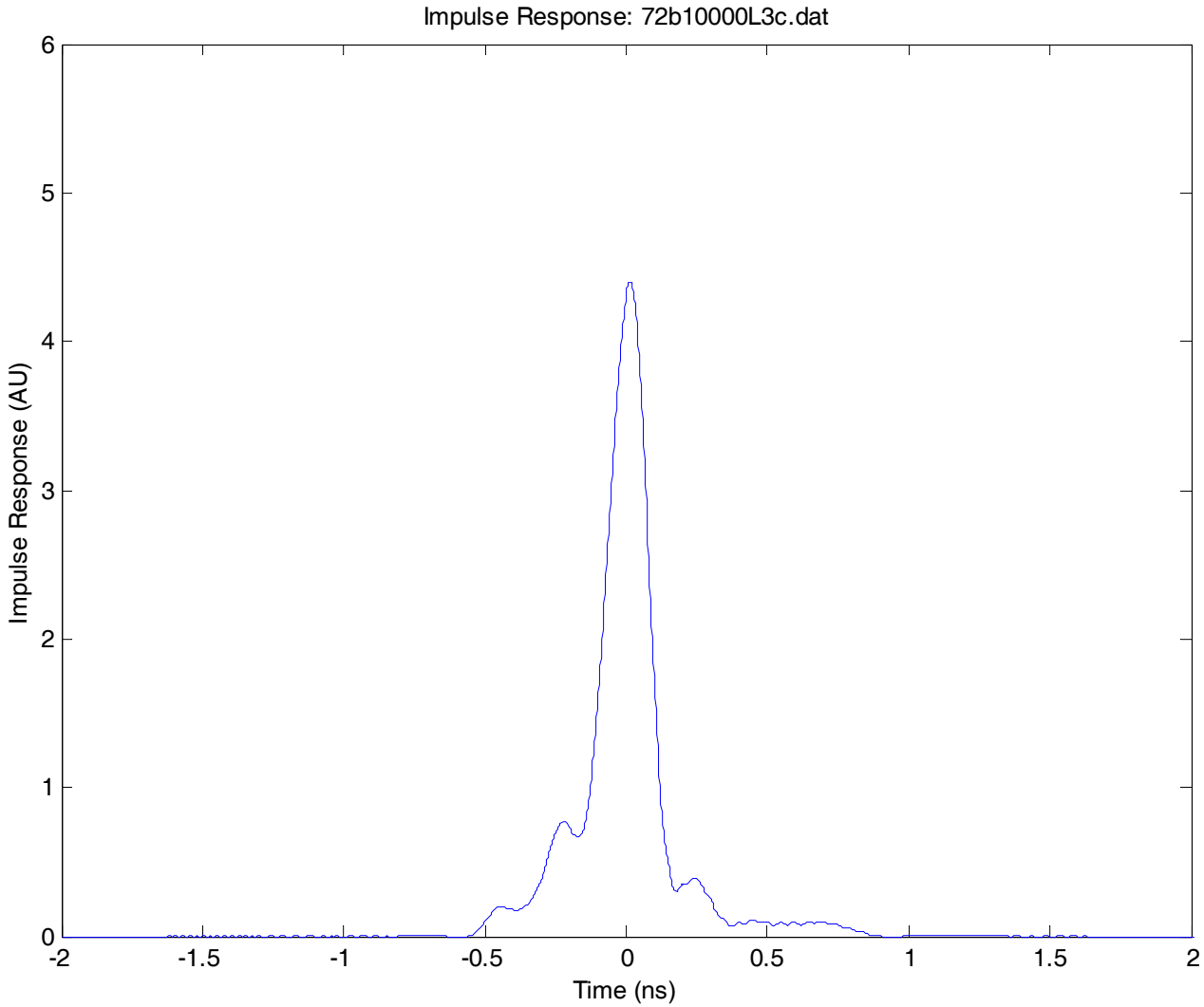
"Smooth Pulse" Impulse Response



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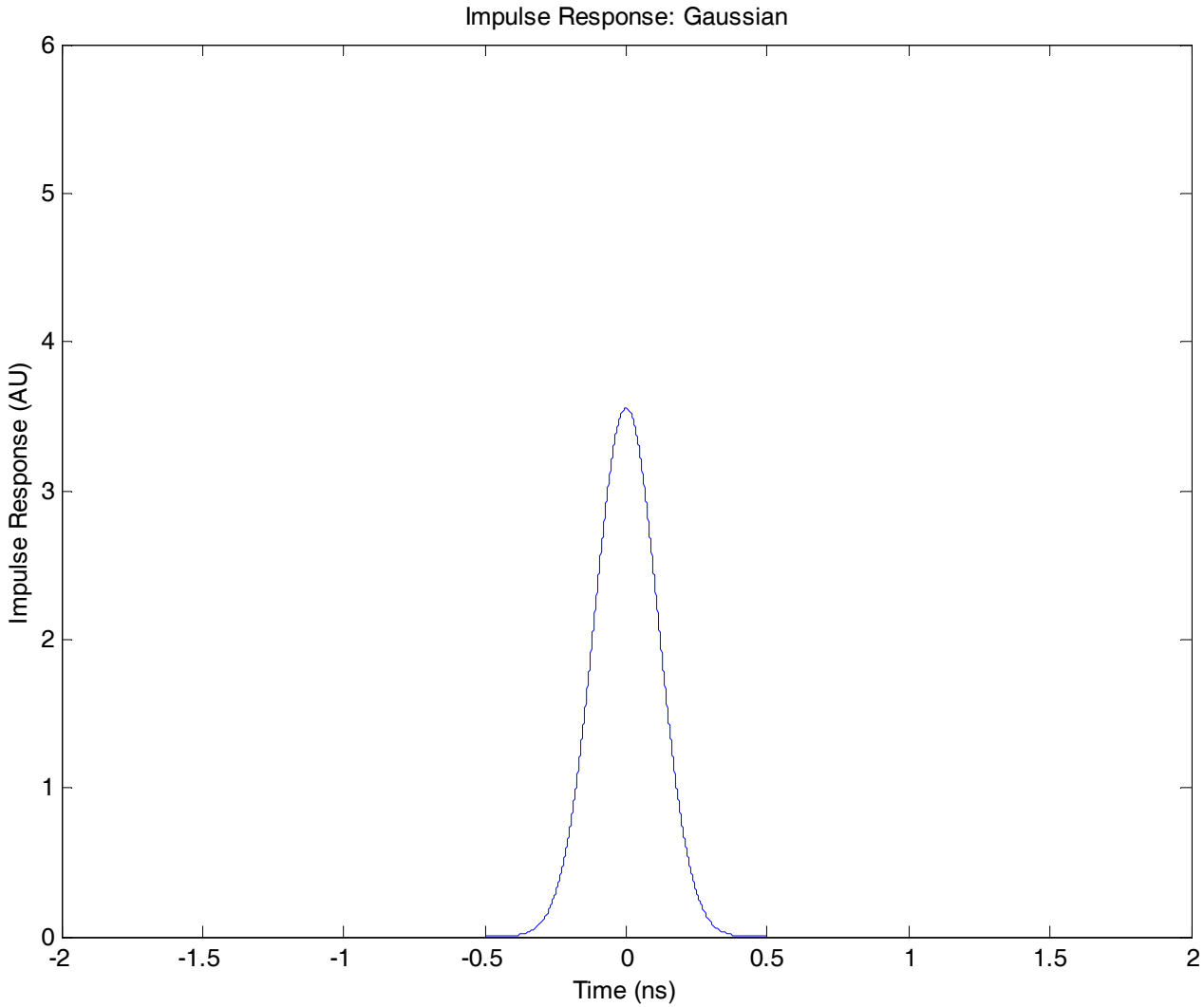
Gaussian Impulse Response



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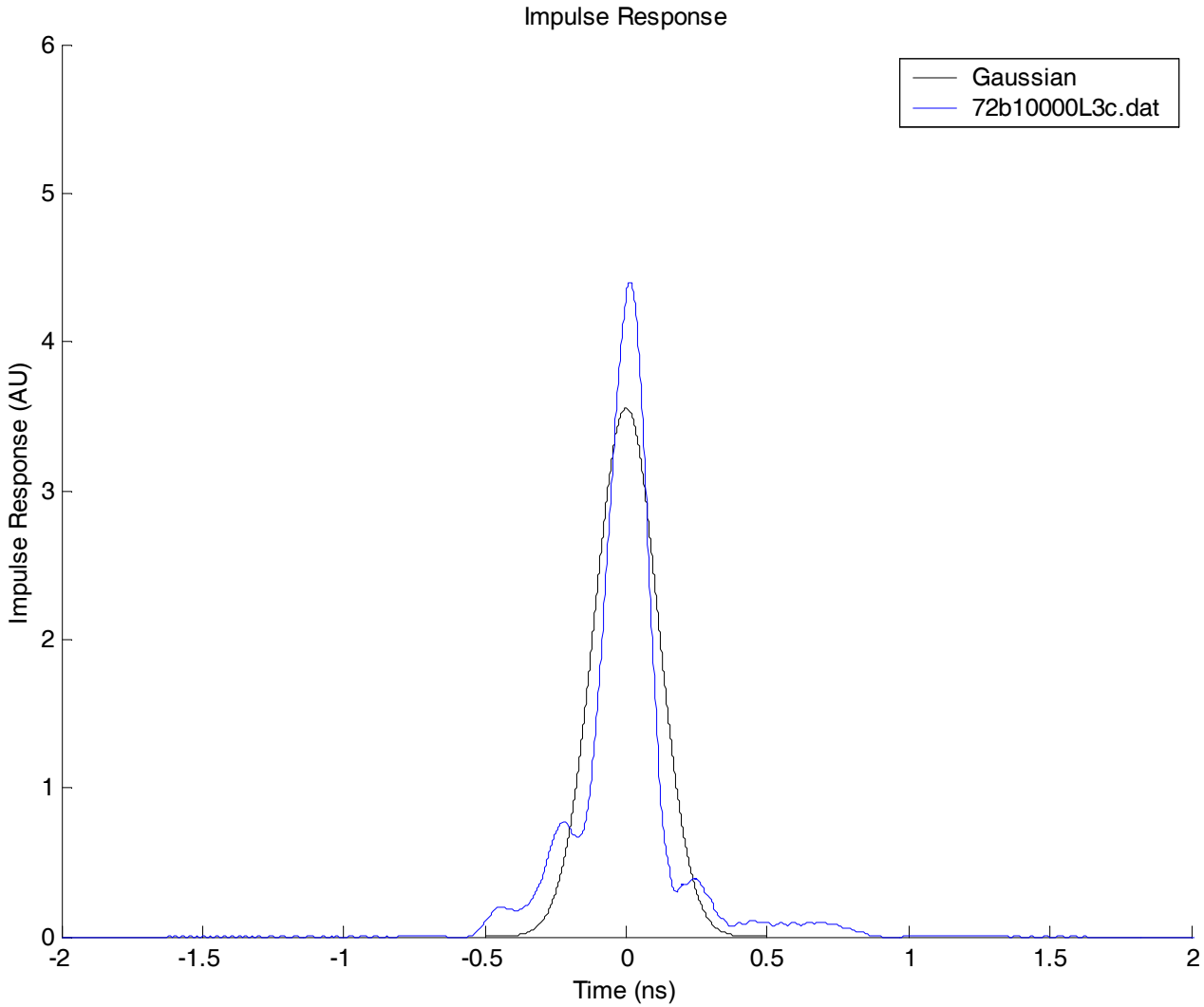
Comparison of Gaussian and "Smooth Pulse"



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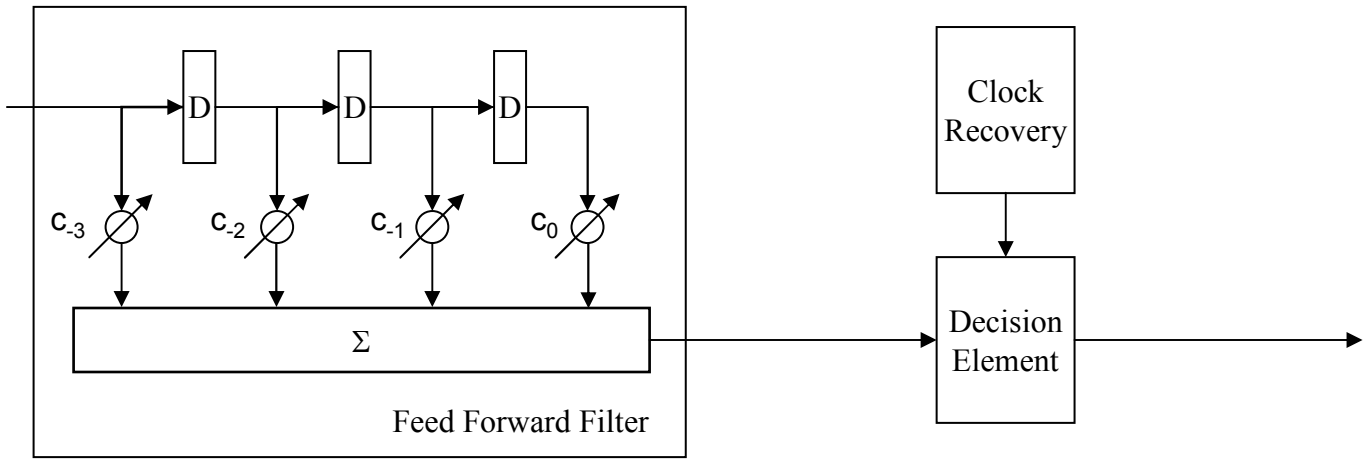
Equalizer Architectures

Linear Equalizer



- 4-Tap equalizer shown
- Ideal infinite-length equalizer simulated

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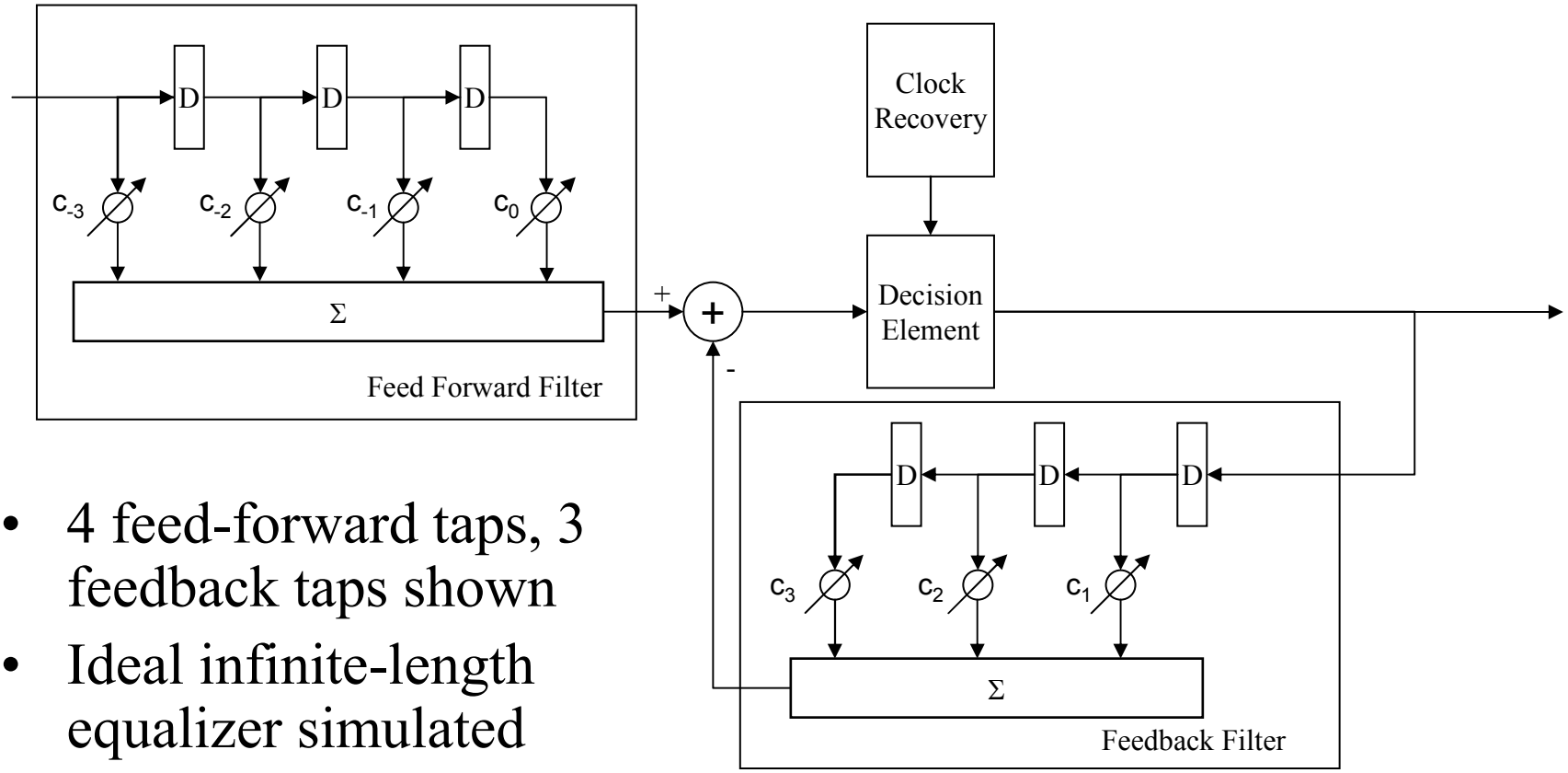
Decision Feedback Equalizer



- 4 feed-forward taps, 3 feedback taps shown
- Ideal infinite-length equalizer simulated

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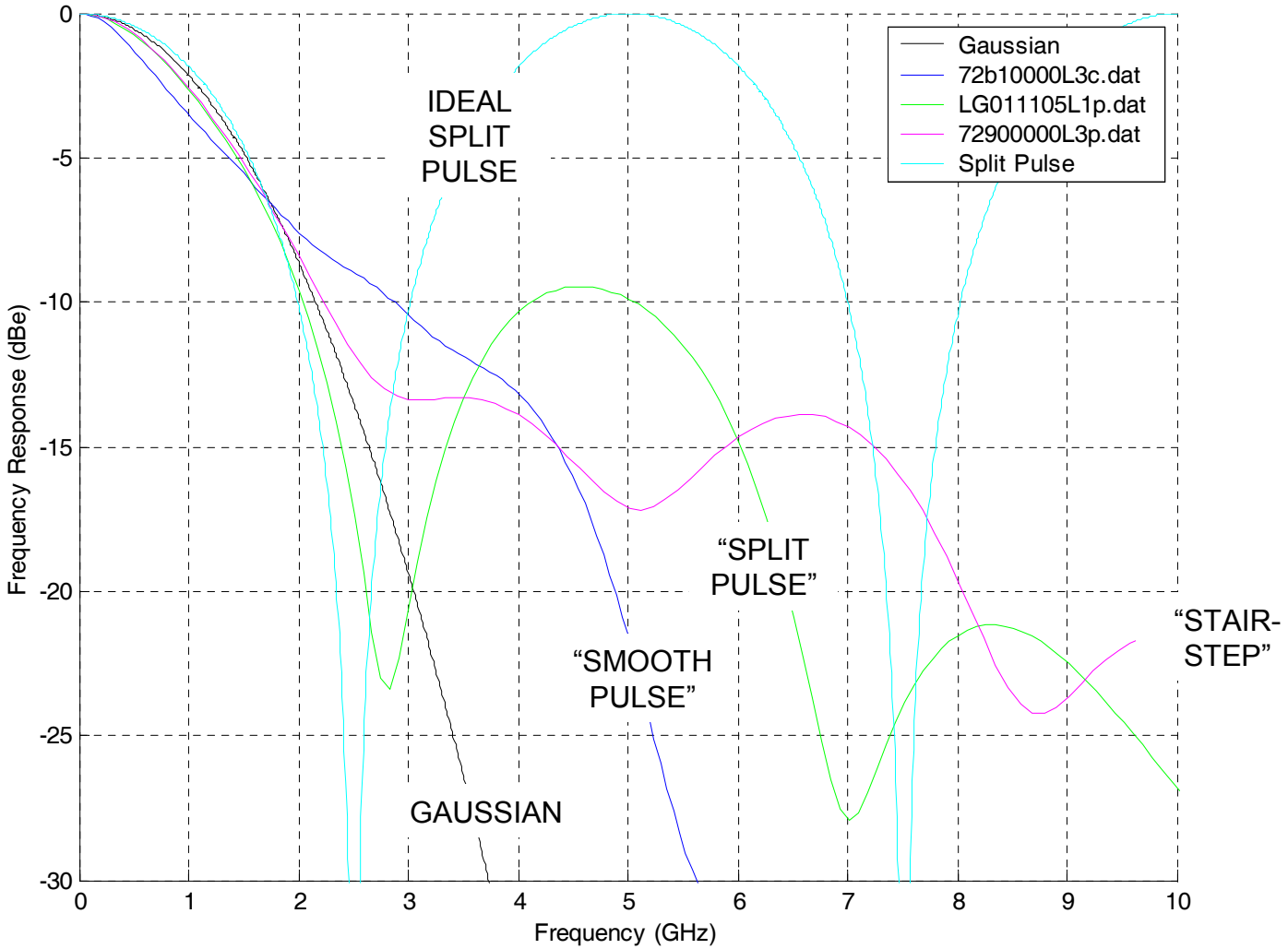
Simulation Results

Frequency Responses @ 300m



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Optical Power Penalties

- Next two slides give optical power penalties with respect to -12.6 dBm LR nominal sensitivity
- MMSE criterion used to compute performance
- Performance for infinite length ideal equalizers

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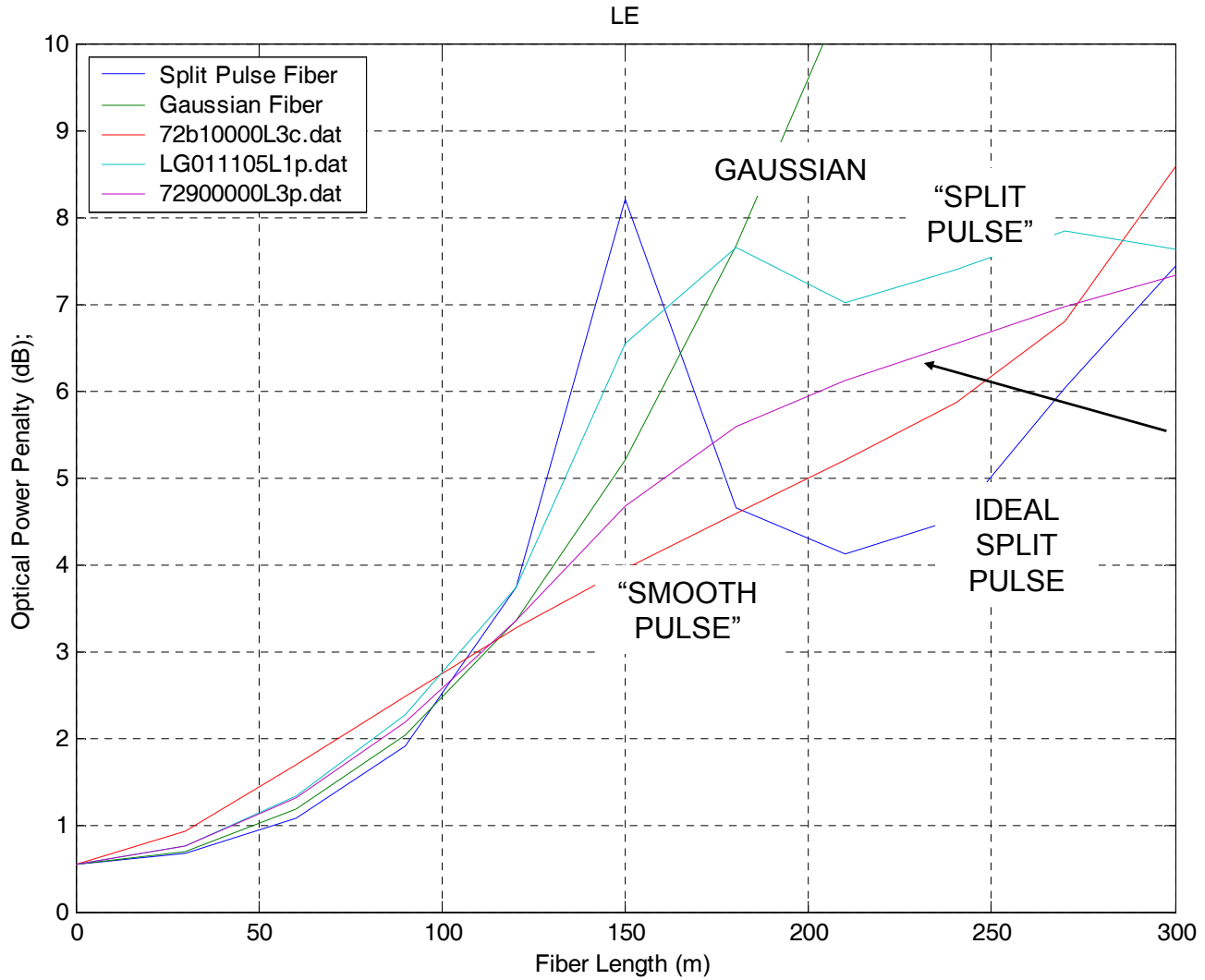
Optical Power Penalty vs Distance, Linear Eq



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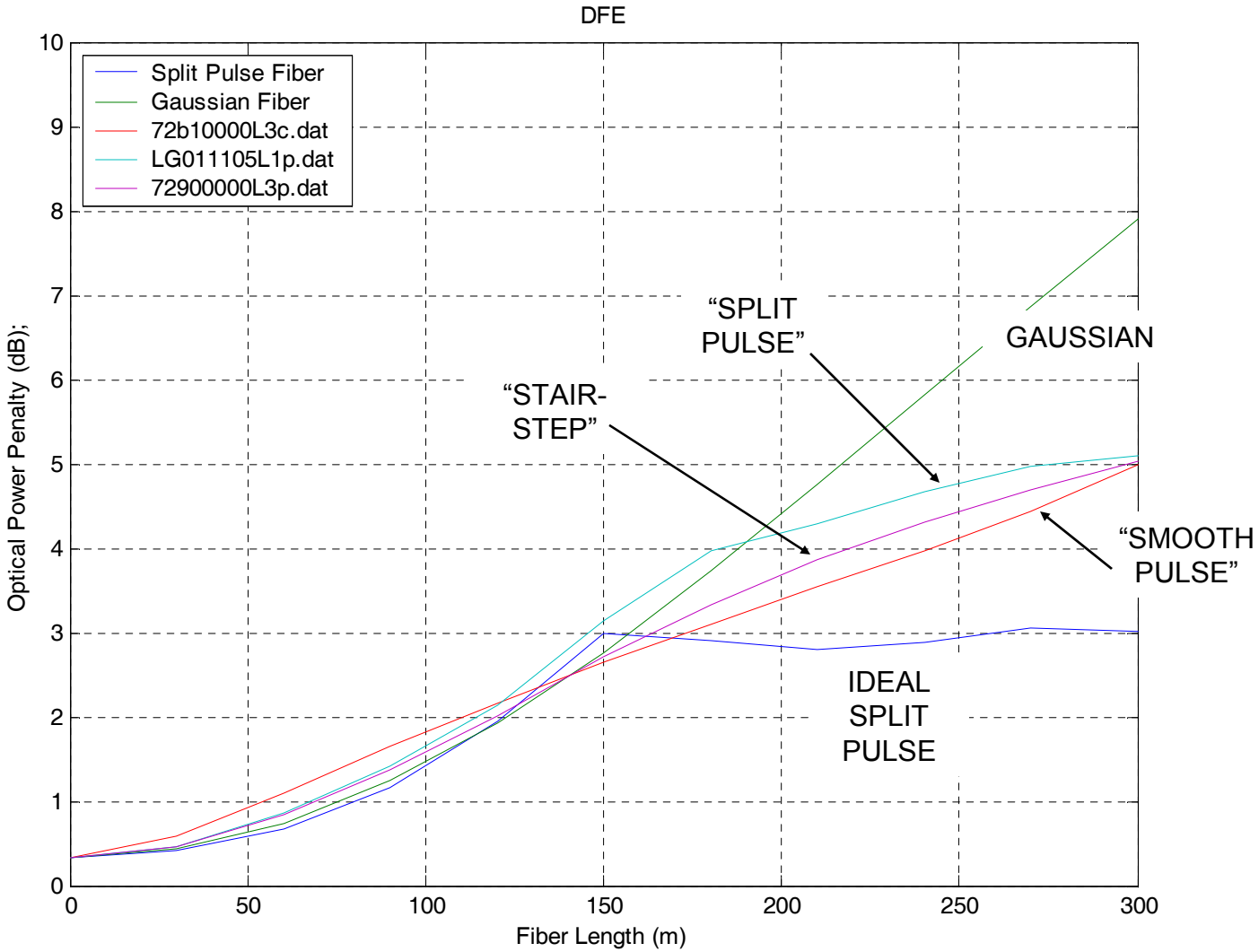
Optical Power Penalty vs Distance, DFE



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Conclusions

Conclusions

- Worst-case shape of impulse response, for a given modal-bandwidth, depends on distance
- Performance does not necessarily degrade monotonically with distance
  - Consider ideal split pulse and linear equalizer
  - Performs worst when delay is integer number of bit periods
- For distances exceeding ~185m of 500 Mhz-km fiber, Gaussian performed worse than all other impulse responses considered
  - True for linear equalizer and DFE
  - Attributed to sharp rolloff of Gaussian at high frequencies
- Gaussian is candidate model for worst case impulse response for 500 MHz-km fiber at distances of interest (220m-300m)
  - May be conservative