TP3 "3-impulse" test proposal

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21 Sept 2004

Investigation

- Evaluate PIE-L & PIE-D for a range of spacings and amplitudes

- Compare with PIE-L & PIE-D for installed base (as modelled by Cambridge fibers, version 1.0)

- Check sensitivity of PIE values to variations in spacing and amplitude (ie. check 3-impulse test can be implemented with reasonable tolerances)

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Simulation Model

- Filters representing tx & rx consistent with Petre Popescu's TP3 ISI generator work, ie...

- Tx filter = Gaussian; rise time$_{20\%-80\%}$ = 30 ps

- Rx filter = 4th order Bessel LPF; f$_{-3dB}$ = 7.5 GHz

- These filters used to compute the PIE metrics both for the 3-impulse test and the Cambridge 99% values
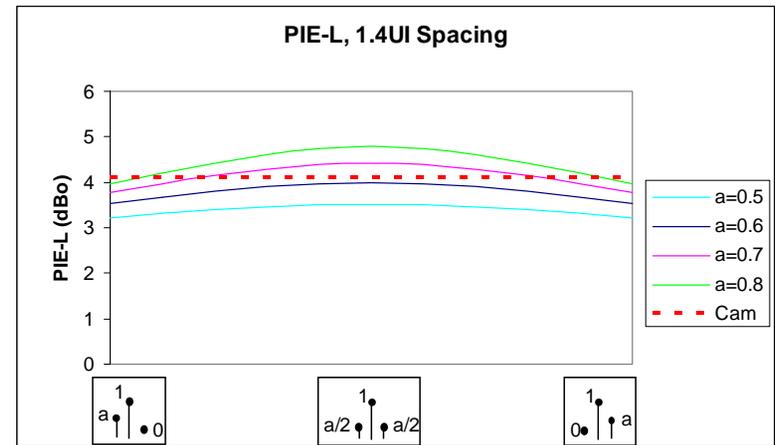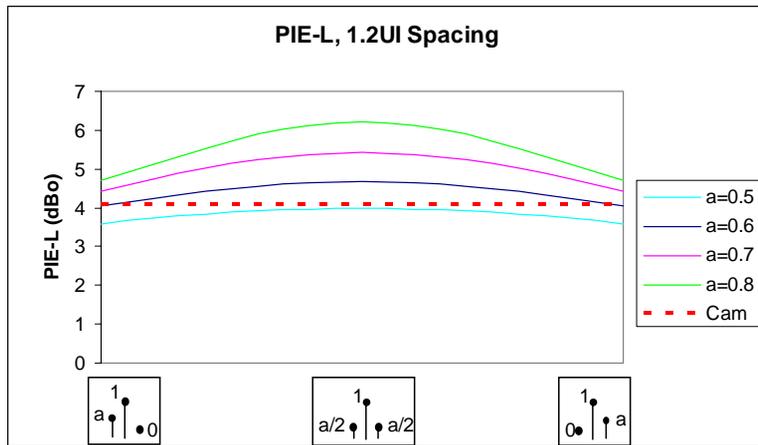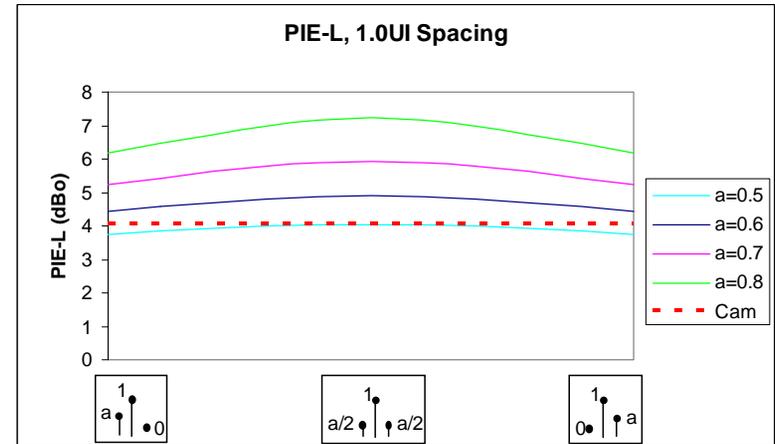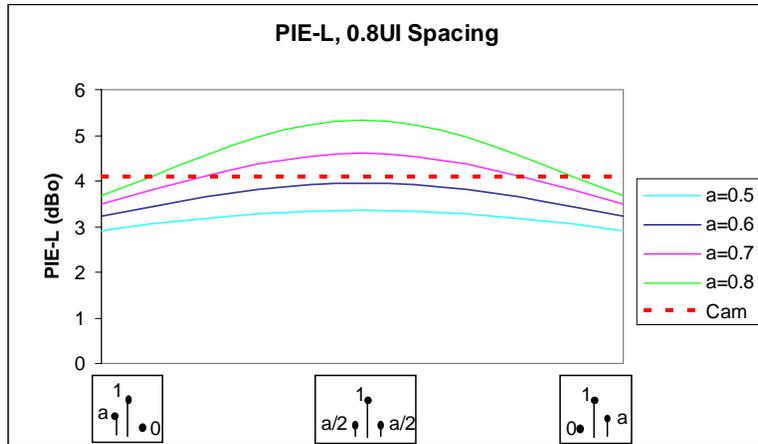
Notes on Results

- X axis of graphs shows shift from precursive to postcursive ISI

- Curves are labelled according to the amount of energy in the interferers (relative to a cursor of 1.0)

- Measured with the same tx & rx filters, the "99%" PIE values for the installed base (as modelled by Cambridge fibers) are:
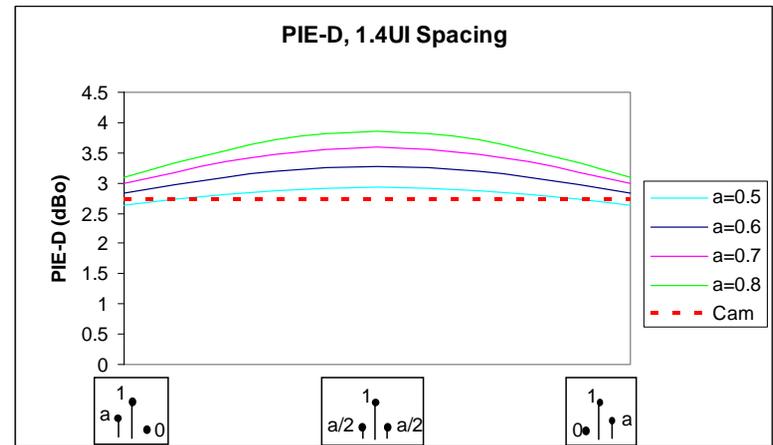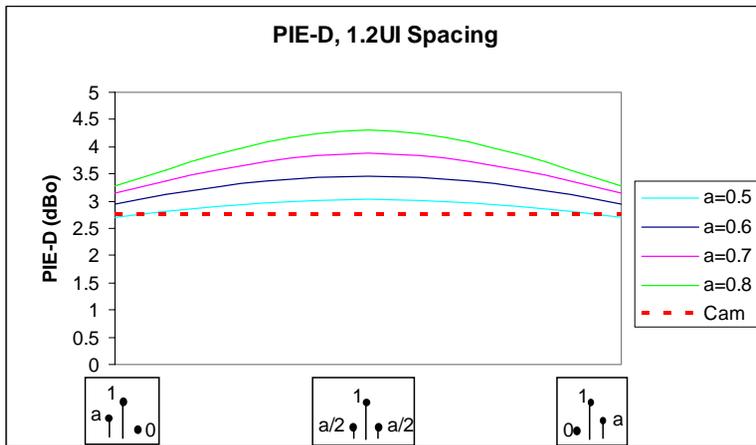
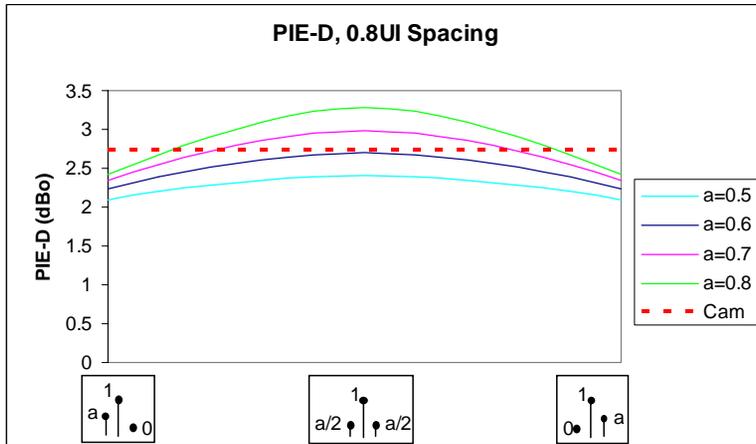|	PIE-L	PIE-D
220m	4.1 dBo	2.7 dBo
300m	6.3 dBo	4.1 dBo

The red lines on the graphs show the 220m values

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PIE-L

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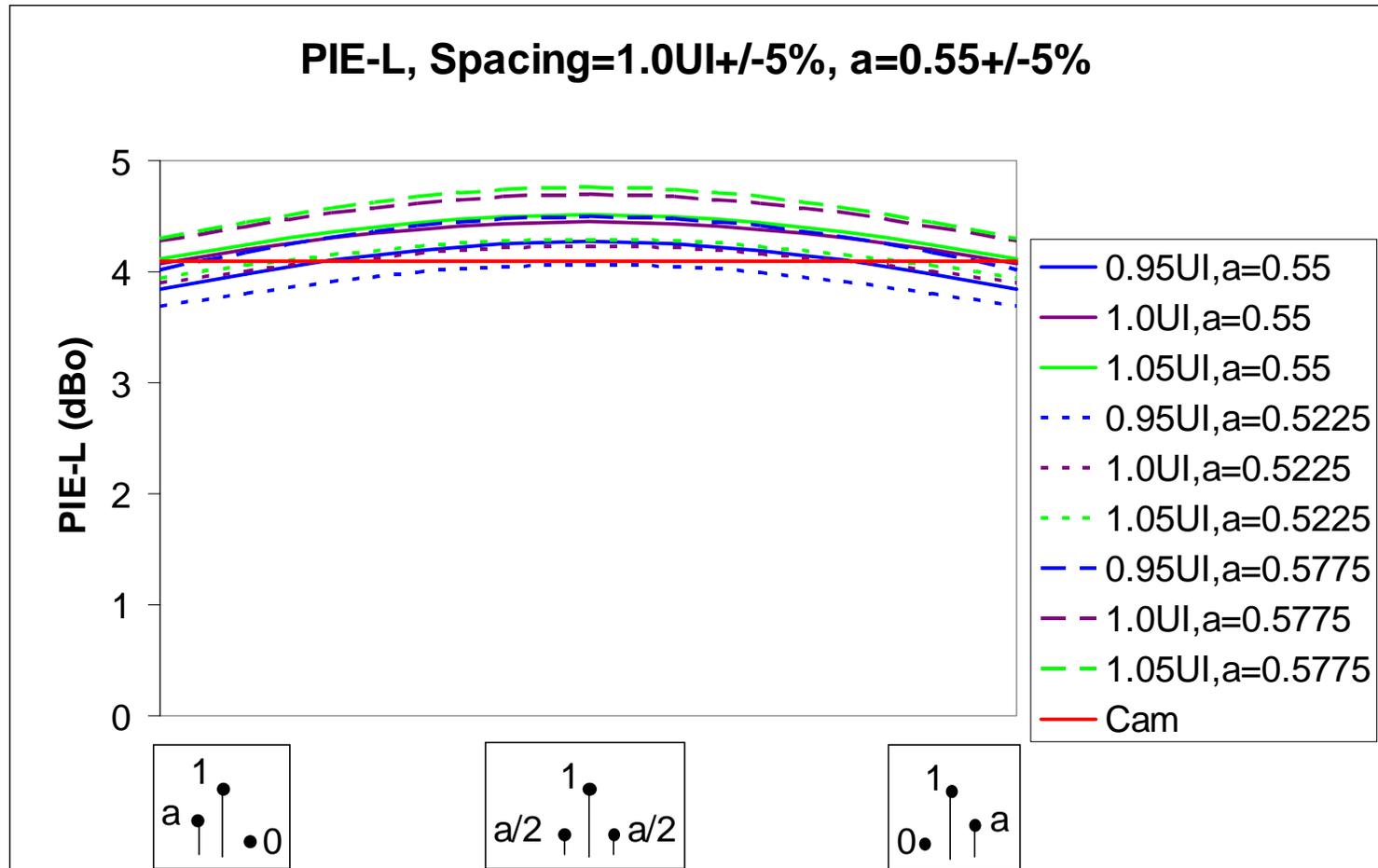Phyworks

PIE-D
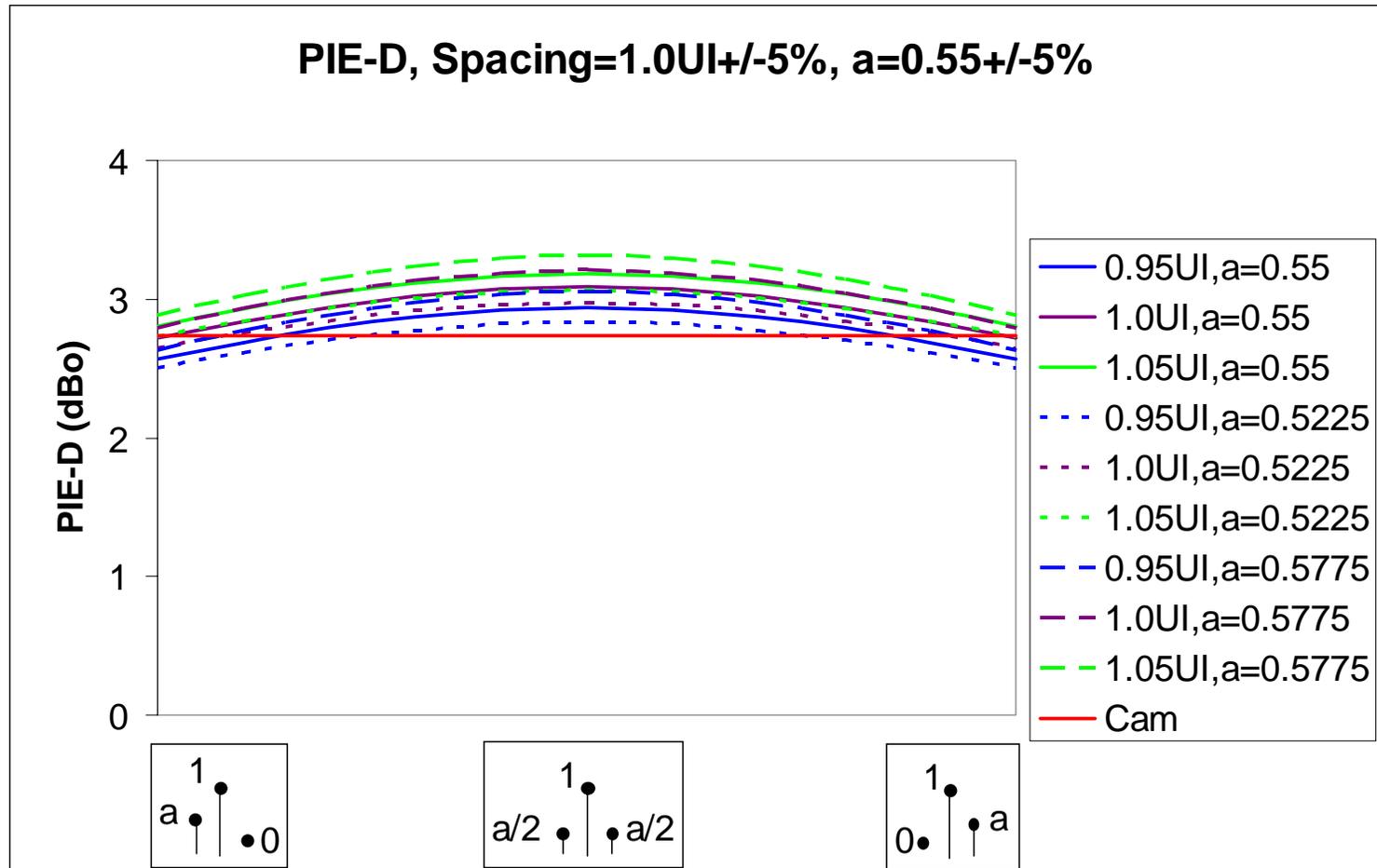
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Phyworks
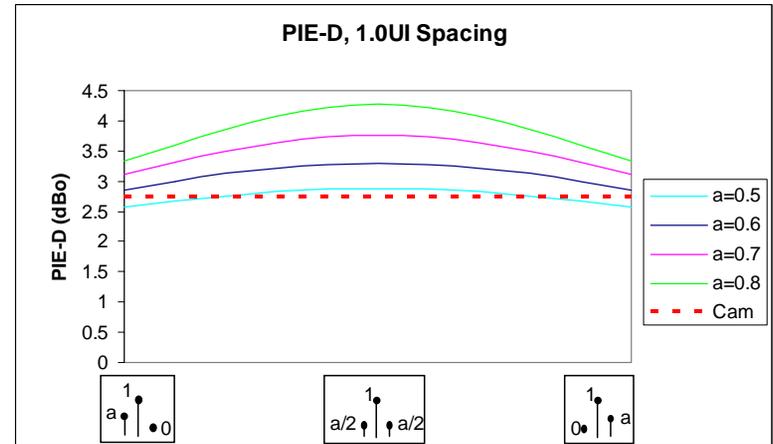
Observations

- At around 1.0 UI spacing, it is possible to choose a value of "a" which results in both PIE-L and PIE-D being close to the installed base 99% values

- Promising candidate for TP3 dynamic test is spacing = 1.0UI, a = 0.55

- Let's examine sensitivity to implementation accuracy...

Sensitivity to Implementation Accuracy, PIE-L

PIE-L, Spacing=1.0UI+/-5%, a=0.55+/-5%

Legend:
- 0.95UI,a=0.55
- 1.0UI,a=0.55
- 1.05UI,a=0.55
- 0.95UI,a=0.5225
- 1.0UI,a=0.5225
- 1.05UI,a=0.5225
- 0.95UI,a=0.5775
- 1.0UI,a=0.5775
- 1.05UI,a=0.5775
- Cam

Sensitivity to Implementation Accuracy, PIE-D

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Conclusions

- A single 3-impulse TP3 dynamic test can provide stress consistent with the fiber model, measured by both PIE-L and PIE-D metrics

- We recommend the following values, which result in a rigorous test:
  - **impulse spacings = 1.0 UI ± 5%**
  - **"a" = 0.55 ± 5%**

  (we also looked at ± 10%, but found range of metrics too large. Can ±5% be implemented?)

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Proposed dynamic penalty test

- Dynamic penalty is the difference between the two sensitivity measurements:
  - With static ISI (precursor = postcursor = 0.275)
  - With modulated ISI

- As a starting point for further discussion, we also suggest modulation of the ISI between fully precursive and fully postcursive, with:
  - Modulation waveform: sinusoidal
  - Modulation frequency: 1KHz