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Drawbacks of Fixed THP Coefficients

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Fixed THP approach

- Fixed THP coefficients will be optimum only for a given configuration (channel, AFE, digital receiver)
- For what configuration do we want to optimize?
- What is the price when for those THP coefficients we use a different configuration?
- This presentation gives an example of performance loss due to the non-optimality of a precoder.

An Example

- First, we optimize the THP coefficients of a 12 Tap FIR for the channel described in vareljian_1_1104.pdf (slide 4). We then derive the FFE as per slide 3 in the same presentation.
- Second, for the same channel we implement zero excess bandwidth as per in powell_1_0904.pdf (slide 16) and derive the optimal THP coefficients.
- The performance loss of 2 vs 1 is shown below.
- So if we decide to choose the THP coefficients that allow phase insensitive sampling we get loss even if we do not need phase insensitive sampling in our implementation.

FFE Length	Loss in SNR
32	0.8739 dB
64	0.7055 dB
128	0.4830 dB

Things that may change

- Real systems may prove different from the models used to derive THP (for example noise coloring or narrowband noise).
- Channel Response (different amounts of Alien Crosstalk, SRL, impedance mismatches, transformer, board layout, etc).
- Alternative Receiver Architectures
  - Oversampling.
  - Analog Equalization.
  - ADC implementation.
  - FFE length.

Conclusion

- We think that the standard should include a flexible mechanism by which the receiver can program the THP coefficients.
- For example, the receiver can send sets of coefficients to the transmitter until one is found that meets the performance requirements. These coefficients can either be stored in a LUT in the receiver or calculated dynamically.
- This is not incompatible with having a LUT in the transmitter, however if the above mechanism is implemented there appears to be no need for this.