ANALOG DEVICES

AHEAD OF WHAT'S POSSIBLE™

Consensus Model Update

Michael Paul

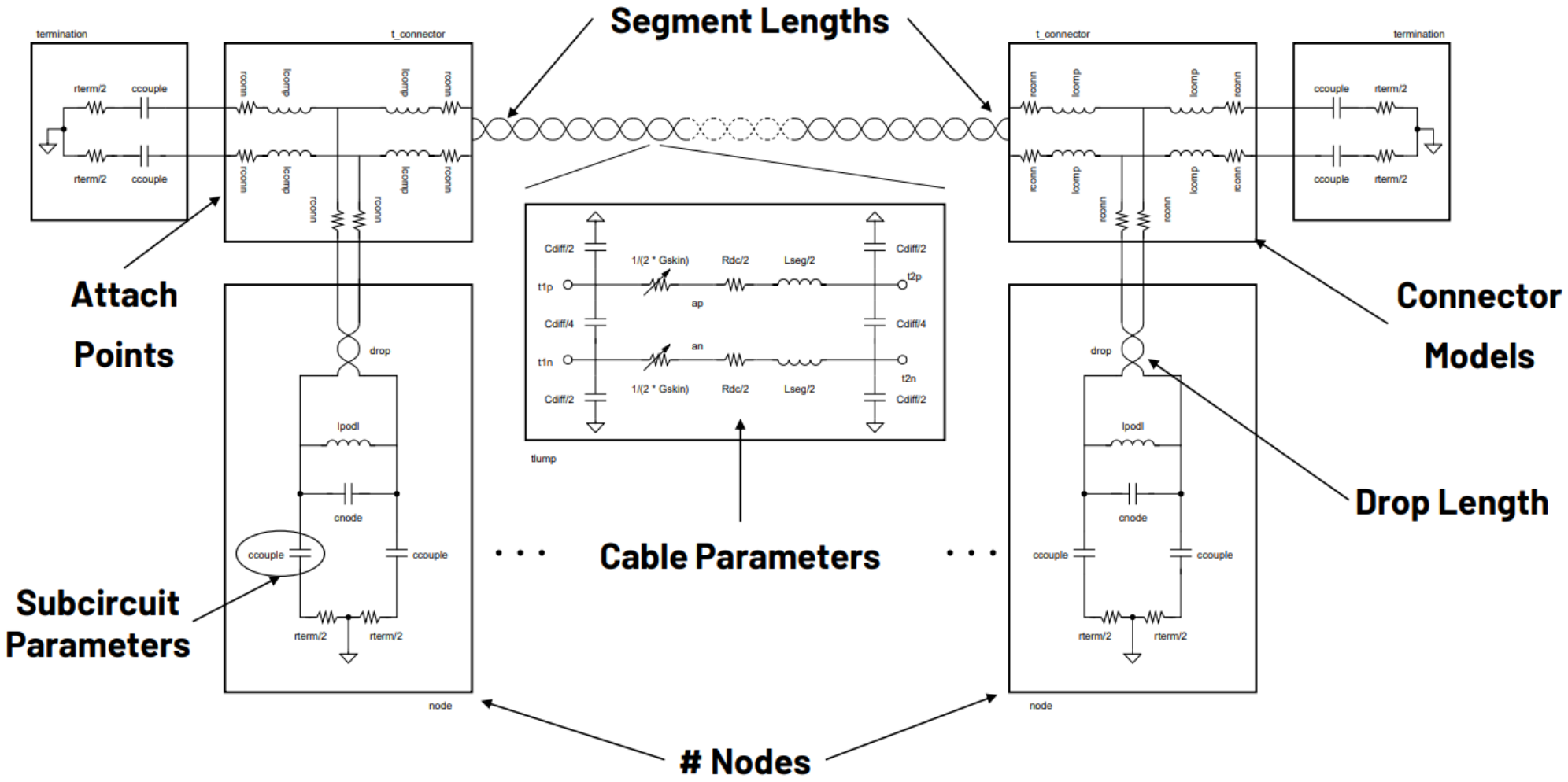
Acknowledgments

- George Zimmerman
- Piergiorgio Beruto
- Paul Wachtel
- Jason Potterf

Outline

- An open source mixing segment model
- Model Mechanics
- New additions
  - Tx filter
  - 2D-Histogram Eye Diagrams
  - Figures of merit
    - Eye area
    - Zero Crossing widths
- Work needed
  - Rx filters
  - Figure of merit correlation

Algorithmic Model Assembly



Running the Model

Configure System (.json)

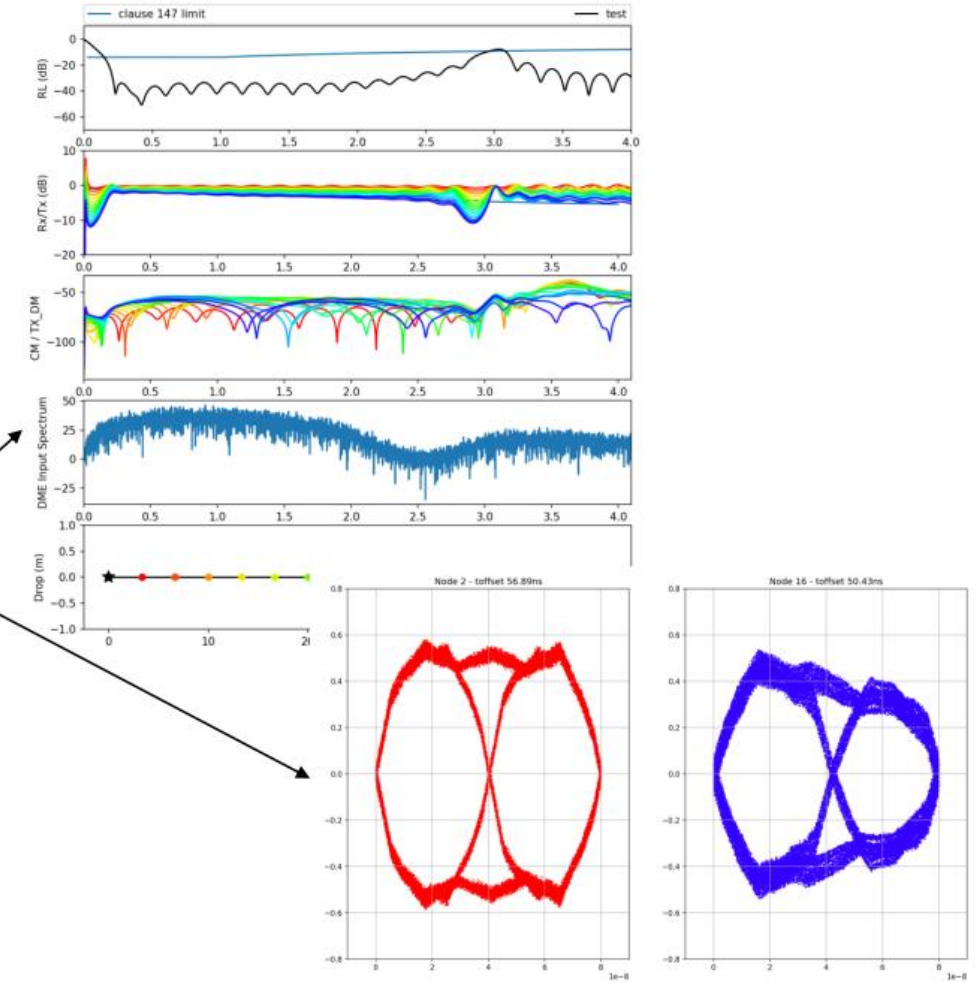
e.g. your_test.json

python cmodel.py –json=your_test.json

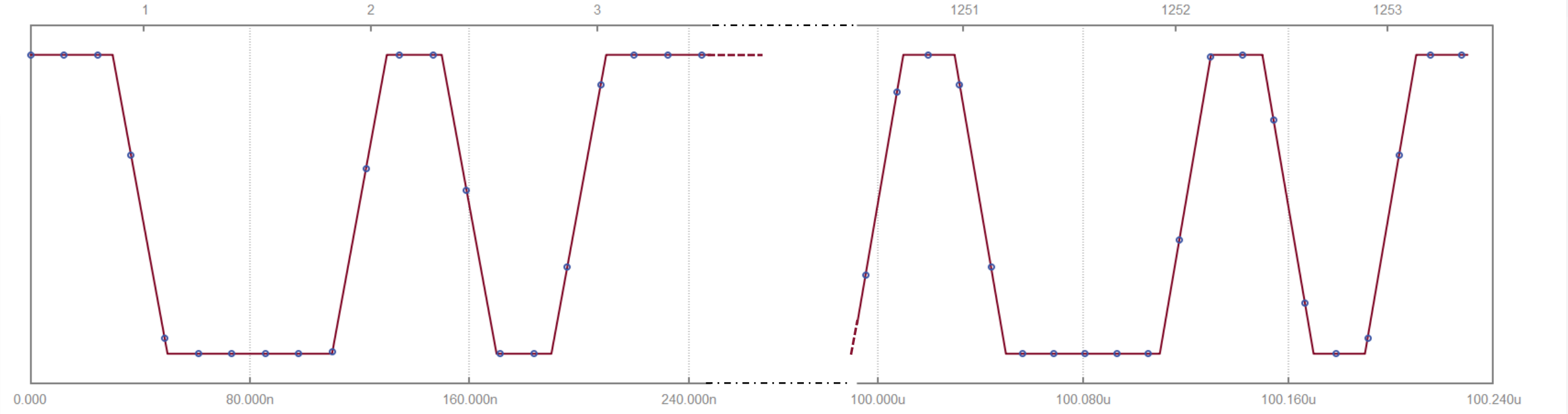
Build netlist

Run LTSpice

Extract + Process Data



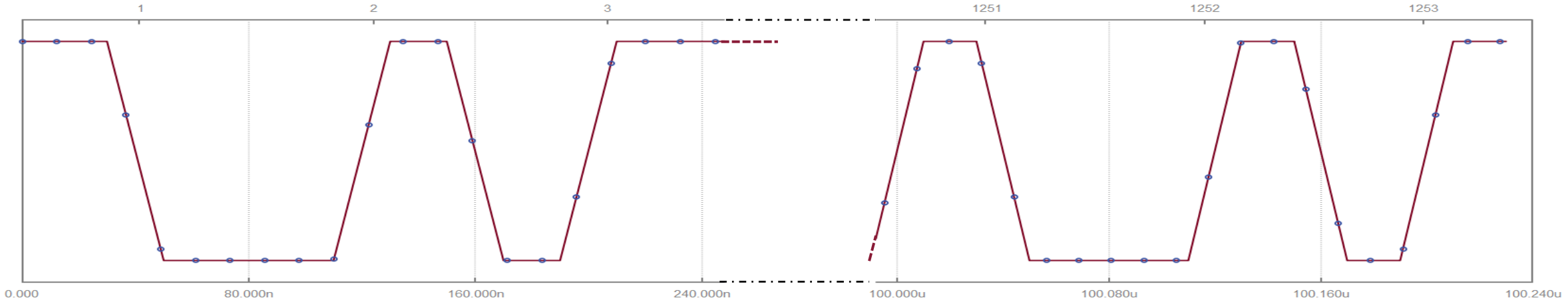
Sample Parameter Setup



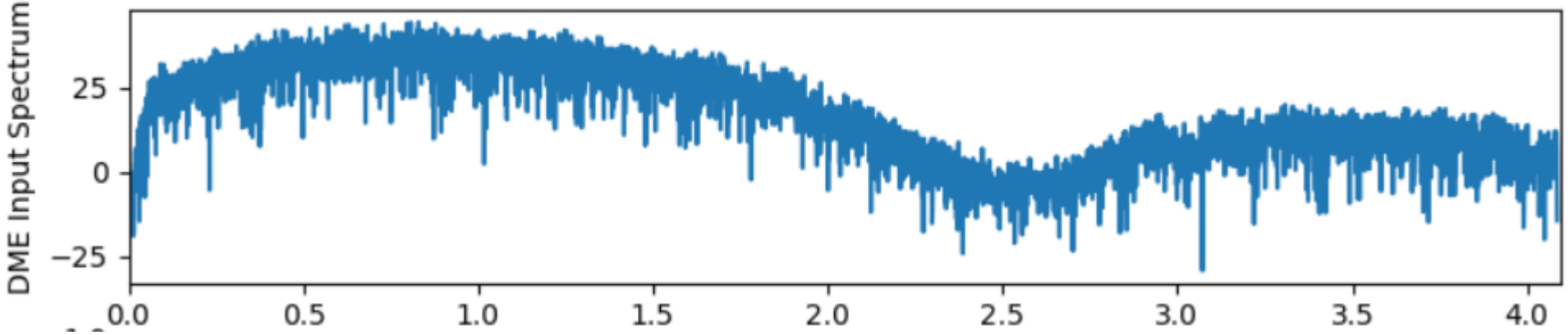
- Coherent Sample a DME Signal
  - 8192 samples
  - 1253 bit periods
  - 8192 / 1253 * 80ns = Fs
    - Fs = 81.723MHz
  - Nyquist Frequency = 40.861MHz

- Align AC analysis with Coherent Samples
  - .ac lin <nsamples> <step_size> <end_freq>
    - `nsamples  = 8192 / 2  = 4096`
    - `step_size = Fs / 8192 = 9.976k`
    - `end_freq  = Fs / 2    = 40.861MHz`

Create Frequency Domain Signal

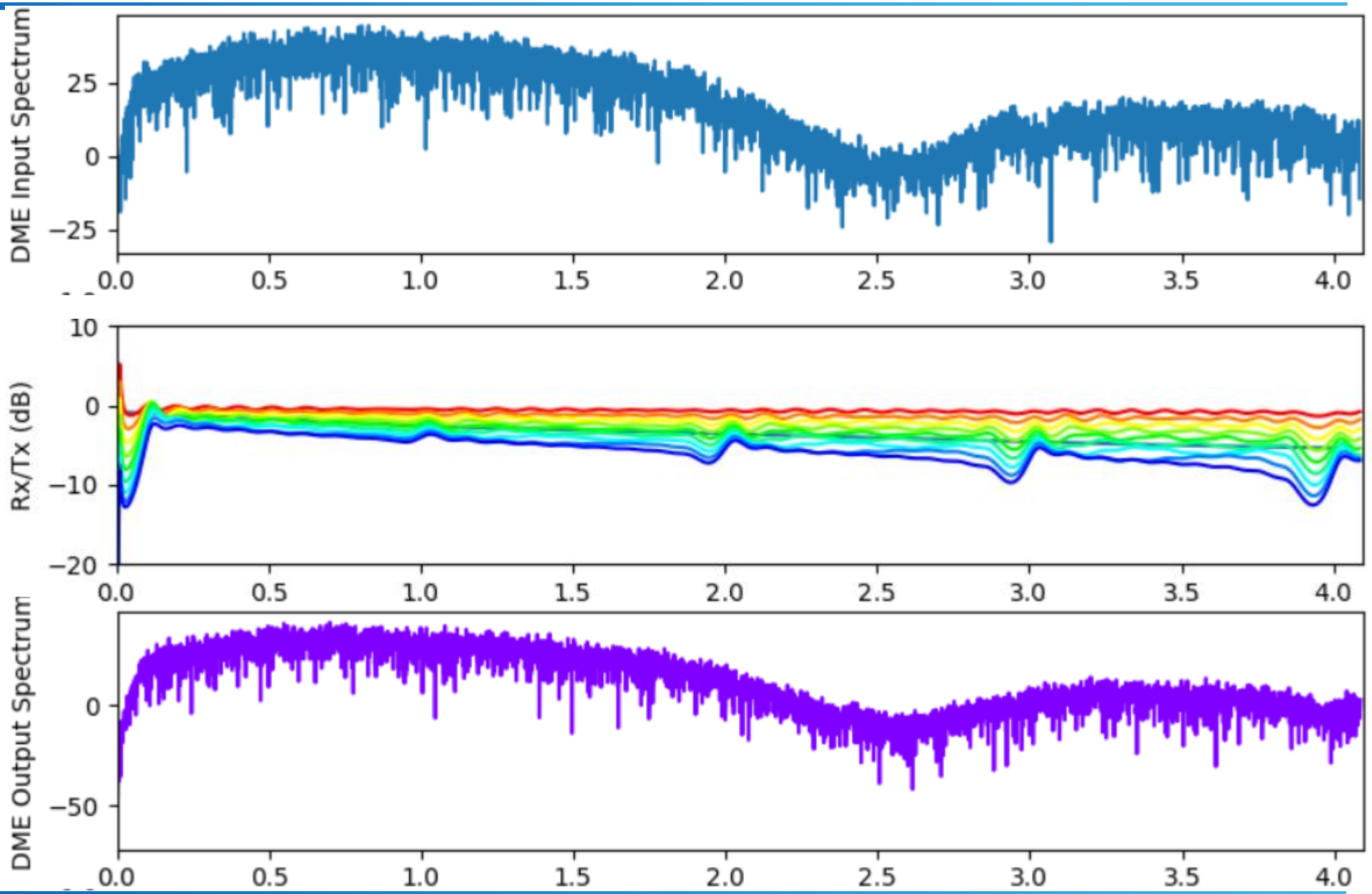


FFT

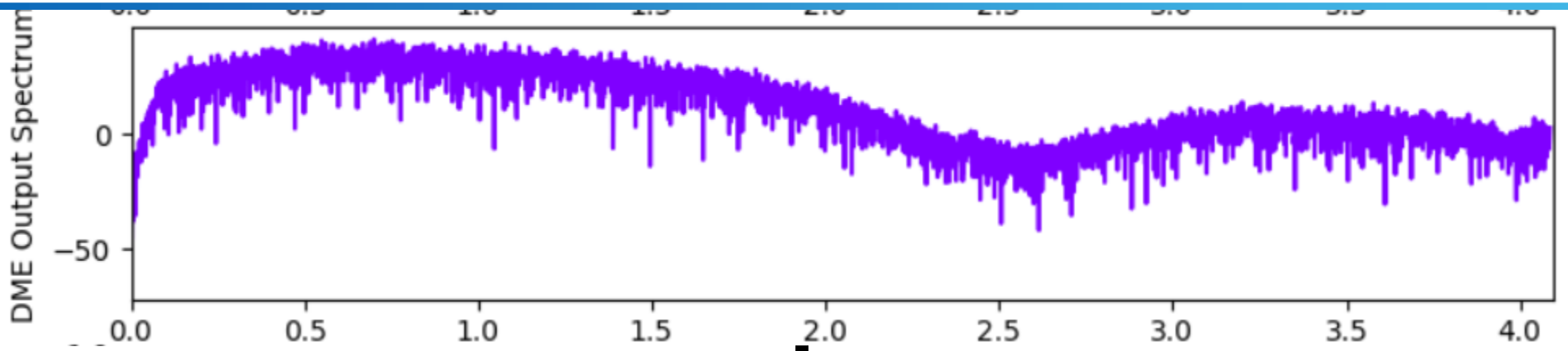


x10MHz

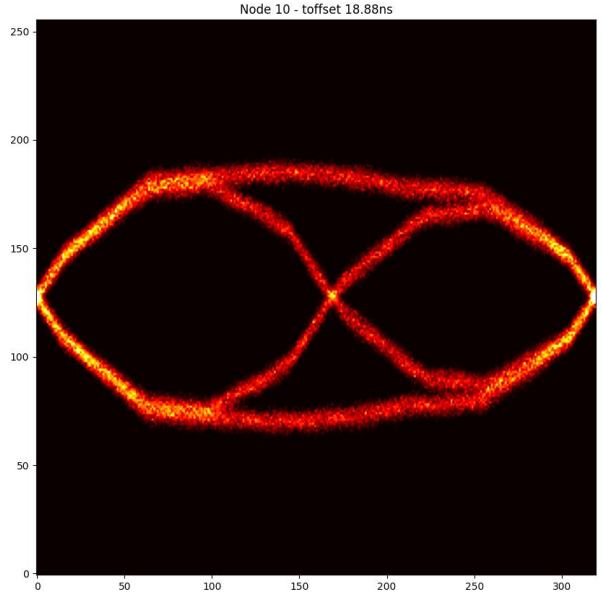
Transform Input Signal by Gain to Different Nodes



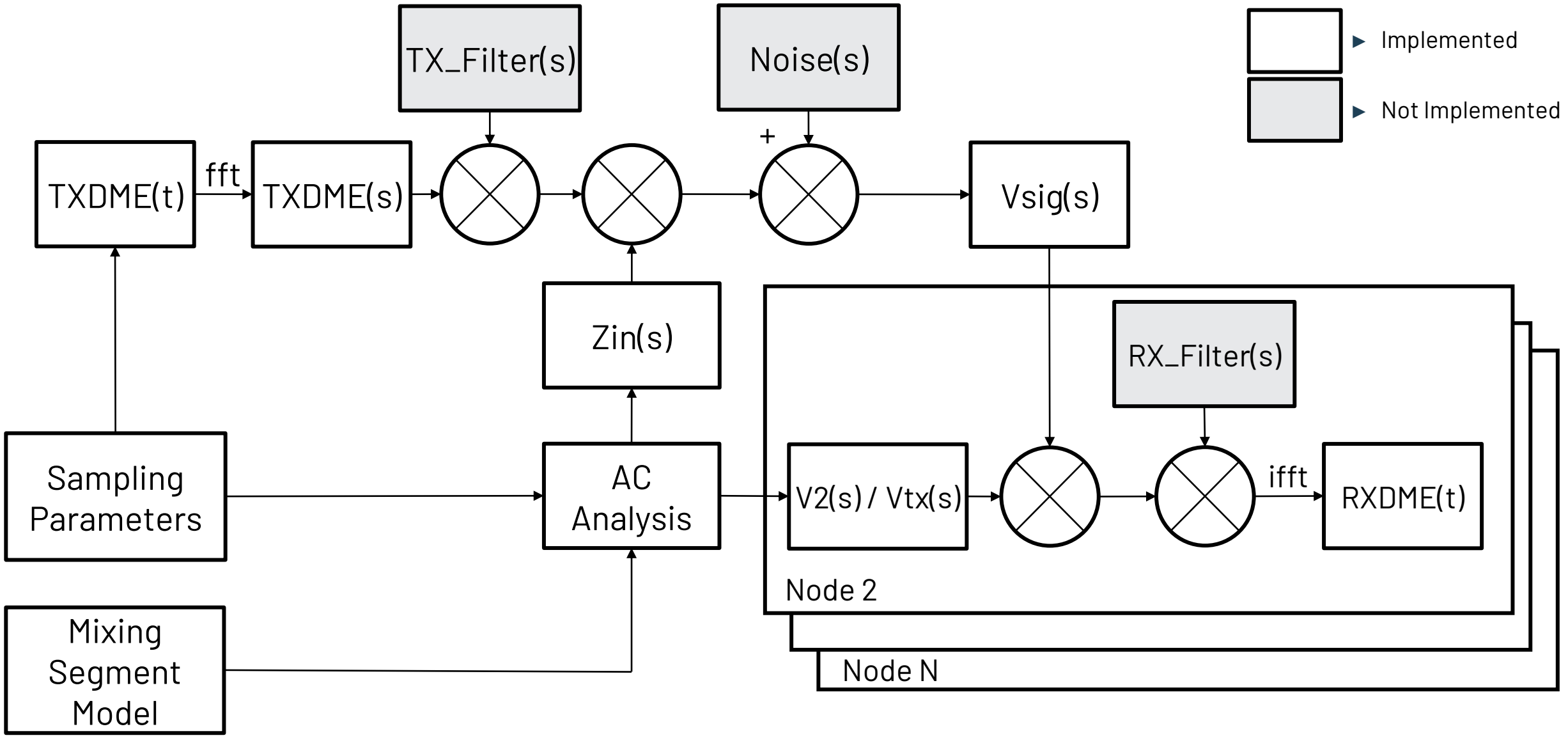
Recover Time Domain Signal at Node X



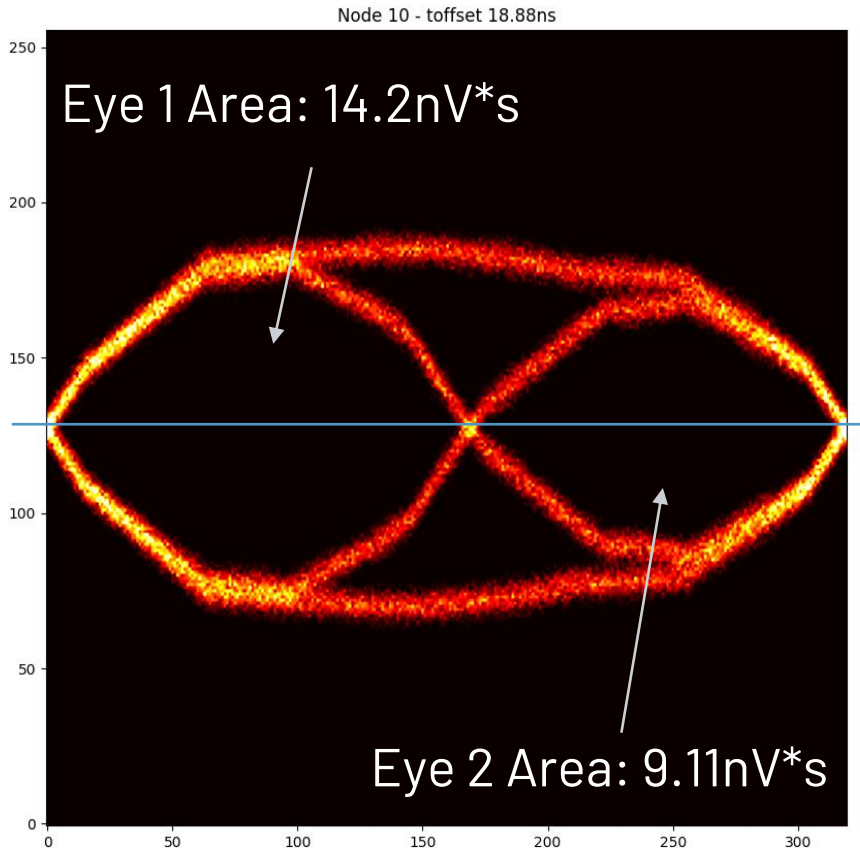
iFFT



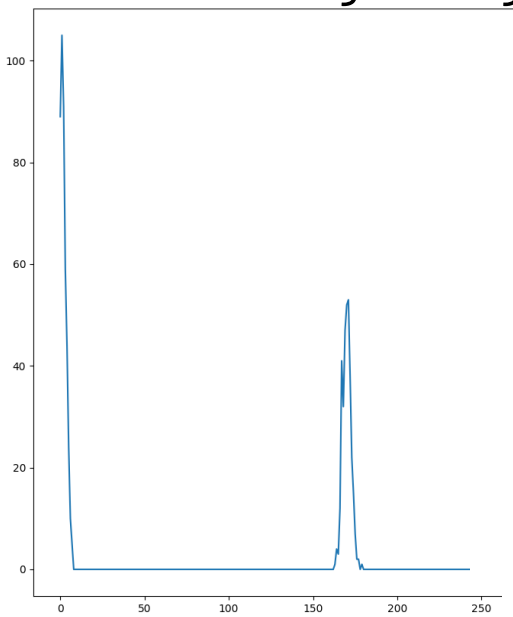
Signal Chain



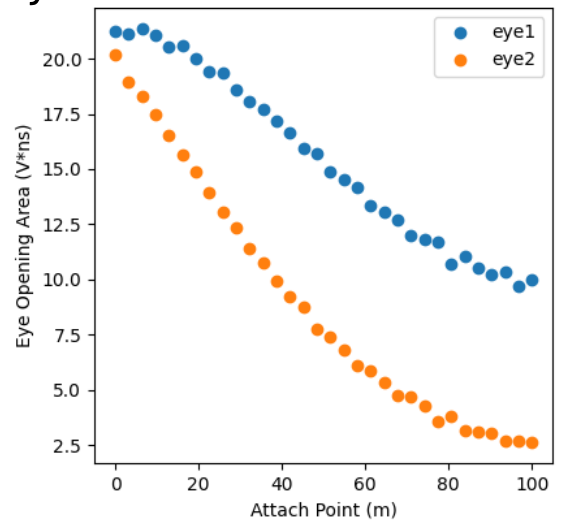
Eye Diagrams are 2D Histograms



Zero Crossing Histogram



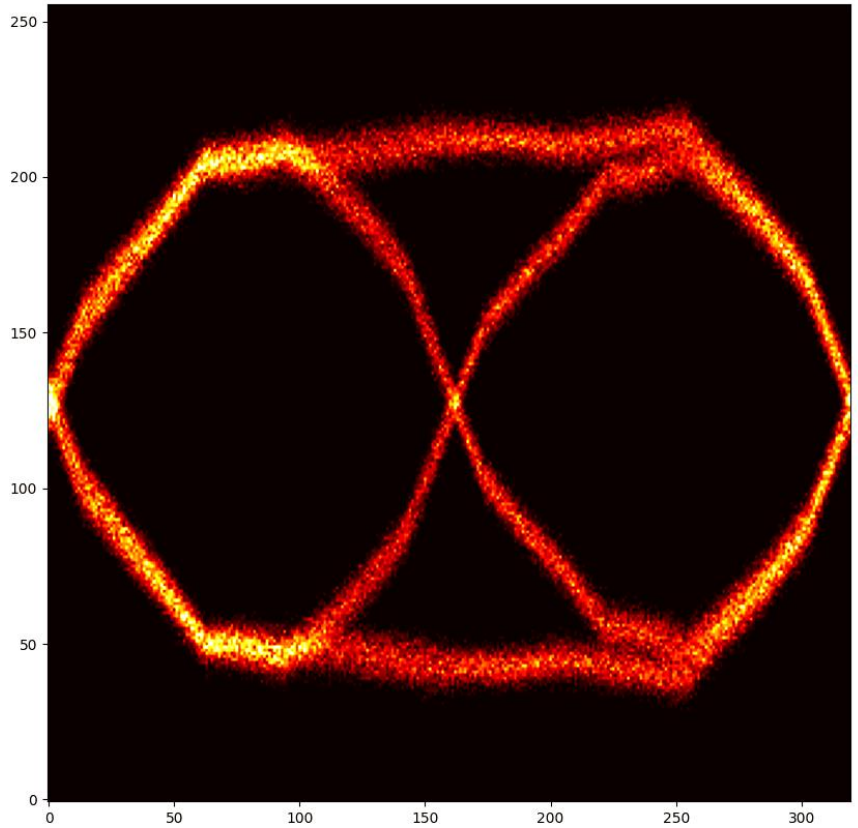
Eye Area vs Attach Point



- Histogram eye output enables easier analysis
- Generate figures of merit

Future Work

- Finish implementing TX filter
  - Needs controllability from .json files
- Implement RX filter
- Add noise sources
  - Gather statistical data from output eyes
  - Eye closure and zero crossing jitter modeled as mean +/-6σ
- Prove BER goals are achievable
- Contributions and suggestions are welcome



Eye Candy

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Thank You

https://github.com/SPE-MD/SPMD-Simulations/tree/main/ADI_model