KEYSIGHT

Photonic Designer Enhancing Accuracy with Digital Twin Technology

[Your Name | Title]
[Date]

Agenda

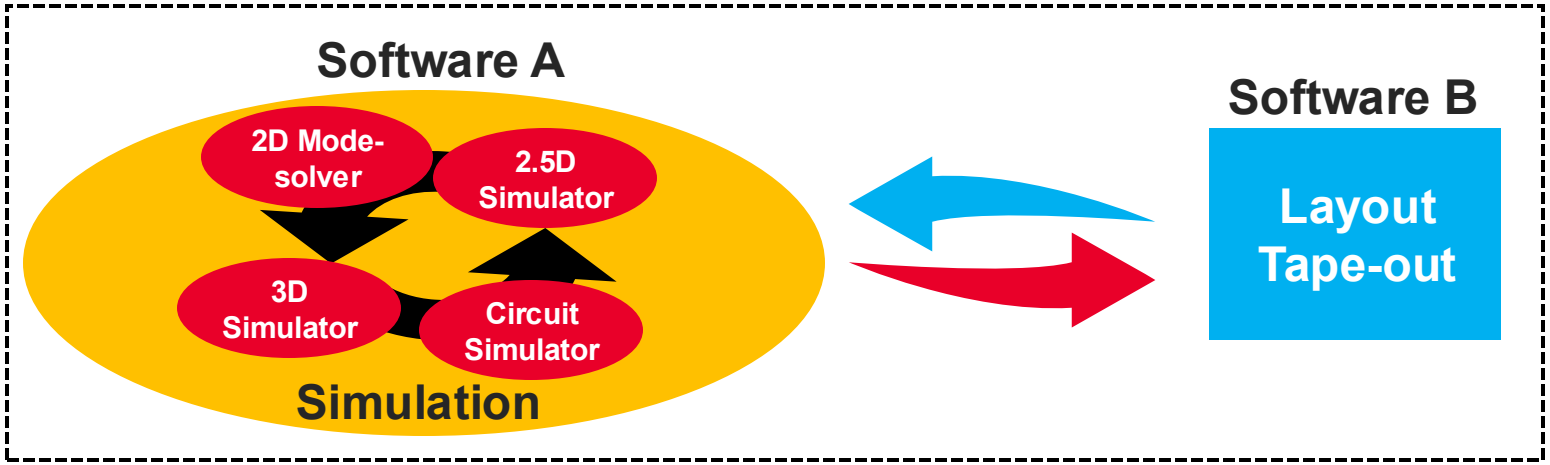
Photonic Designer

- **Challenges in Photonic Design**
- **Introduction to Photonic Designer**
  - How do we address the challenges
  - Demonstrations
  - Achieving model accuracy using digital twin

Photonic Design Flow Challenges

Issues cited by industry leading photonics design teams

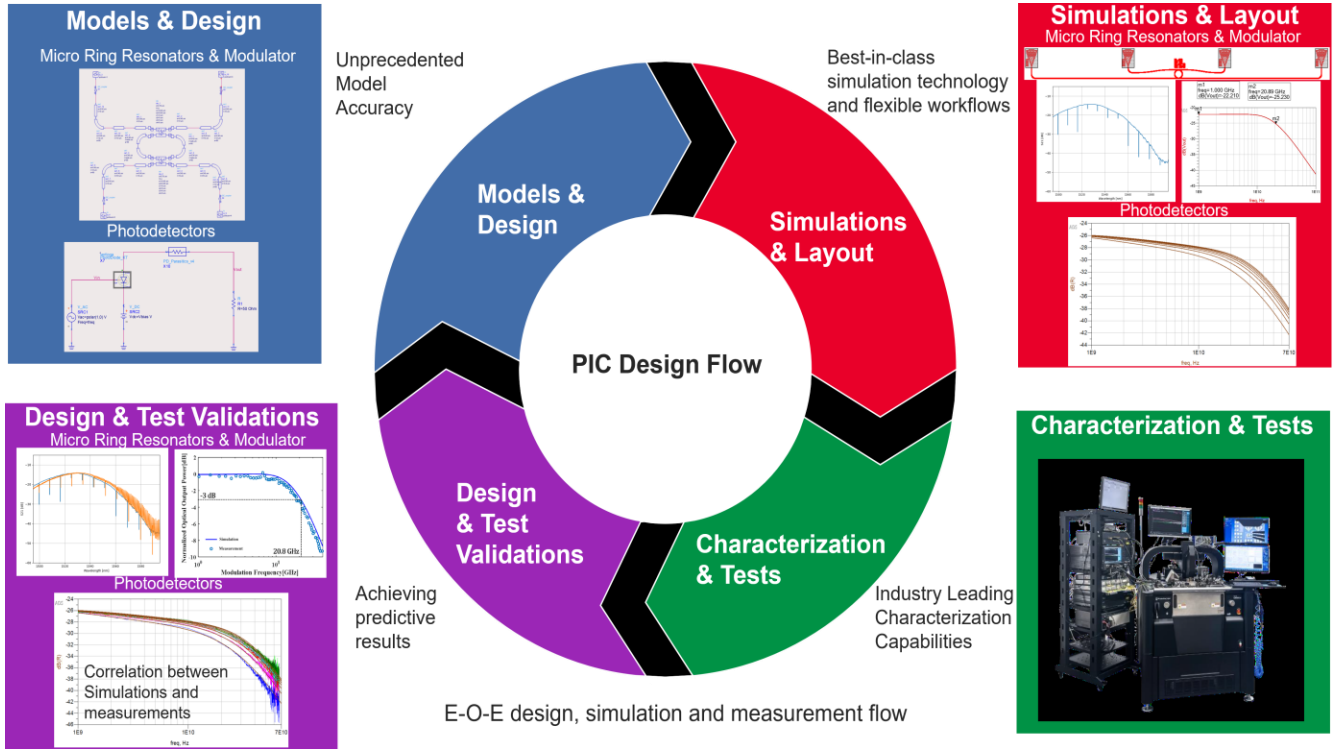
- **Predictive Simulation**
  - Lack of accuracy
  - Capturing the underlying physics
  - Fast simulation
  - Achieving yield
- **Photonic Design Workflow**
  - Fragmented solutions
  - Manual efforts – lack of automation
- **Design & Test Eco-system**
  - Not an easy way to correlate design and test results
  - Using measurements to update models



Key Features

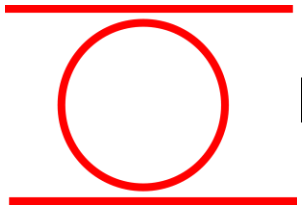
Electronic Photonics Design Automation (EPDA)

- Best-in-Class Models
  - Unprecedented accuracy
- Leverage platform
  - Integrated PIC workflow in ADS (schematic, layout, simulation)
  - Integrated circuit and system (Dataflow + ADS circuit simulation)
  - Integrated EPDA (E-O-E) workflow
  - Foundry program experience
- Design and test engineering lifecycle
  - Modeling, characterization, model extraction from measurements expertise
  - Standards compliance (400GBASE-LR8, CEI-VSR-PAM4, etc.)
  - Keysight Requirements Verification Suite
- High frequency application expertise

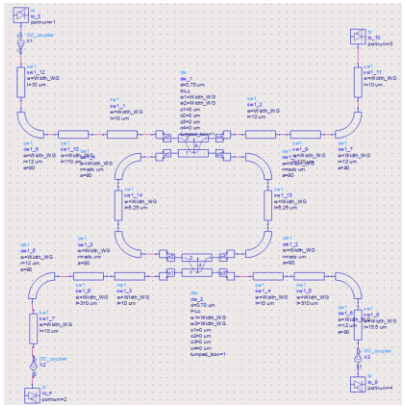


Photonics Design Cycle

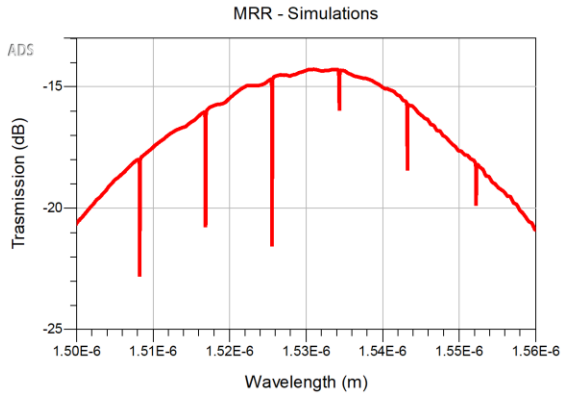
Idea



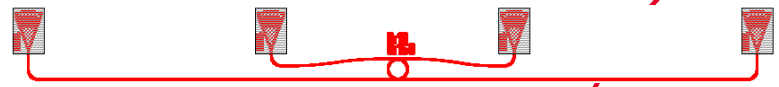
Schematic



Simulation



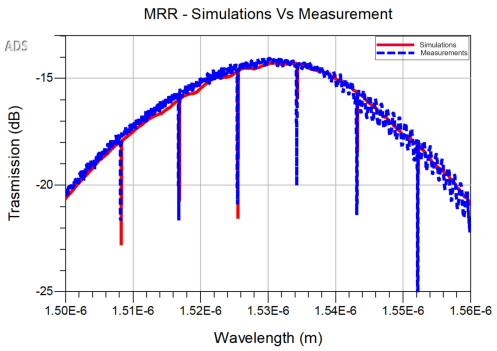
Layout Generation



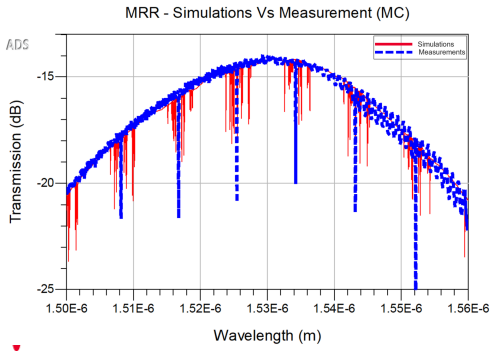
Foundry

Chip/wafer level characterizations

Sim. Vs Measurement



Yield Analysis

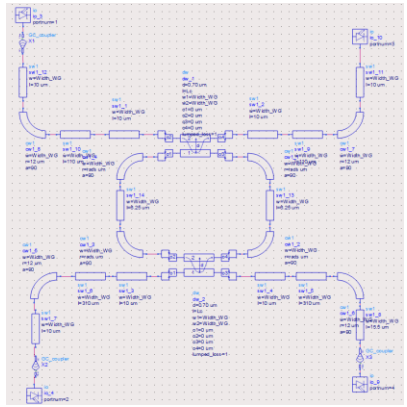


Model refinement based on analysis

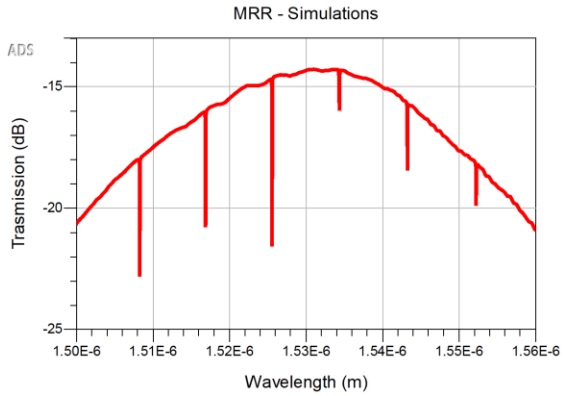
Photonics Design Cycle

Idea

Schematic



Simulation



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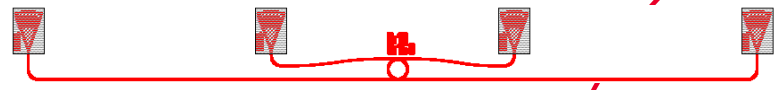
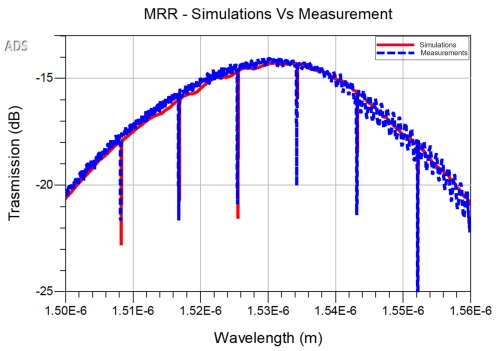


Foundry

All design steps in a single platform - Advanced Design System (ADS)

Chip/wafer level characterizations

Sim. Vs Measurement



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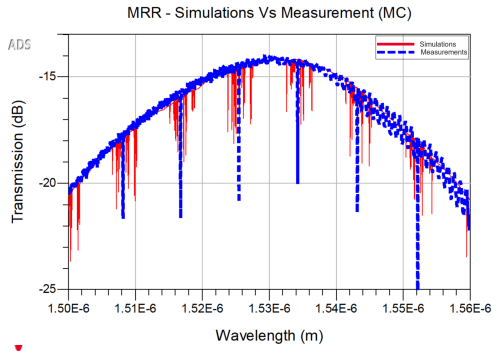

Model refinement based on analysis

Use Cases

- Component Design
  - Photonics components design
    - Accurate models
- Circuit Design
  - Circuits using components
  - Photonics subsystems
- System Design
  - System using the circuits

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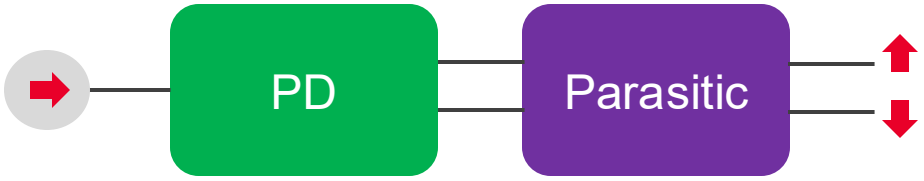
Components Design

Photo Detector (PD)



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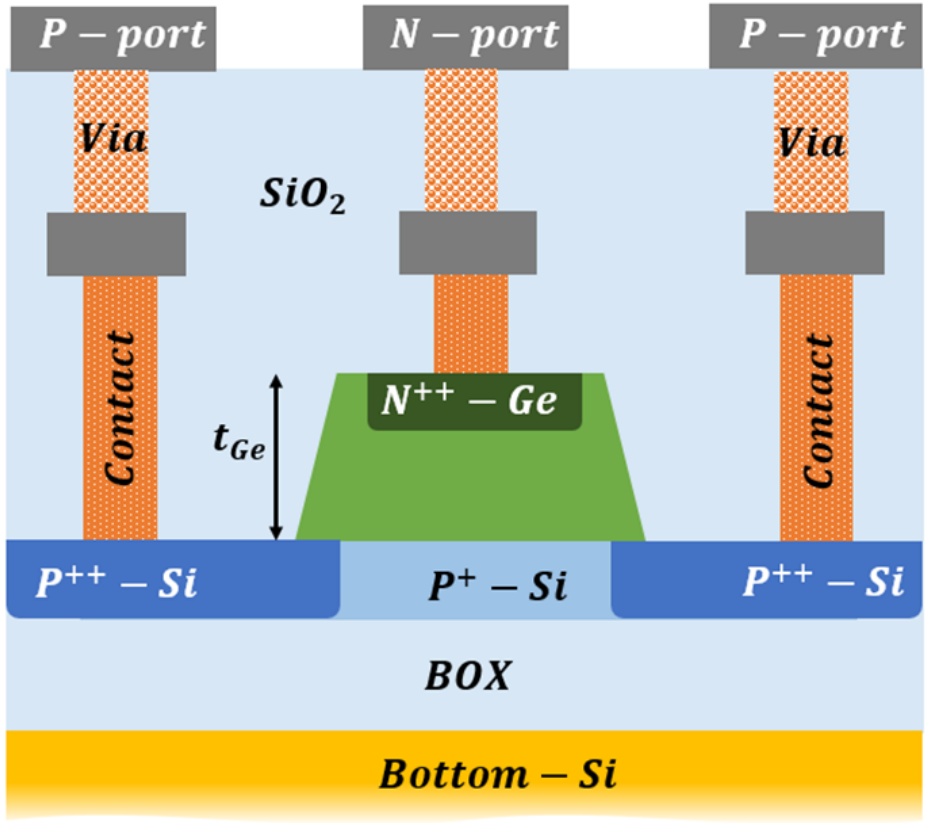
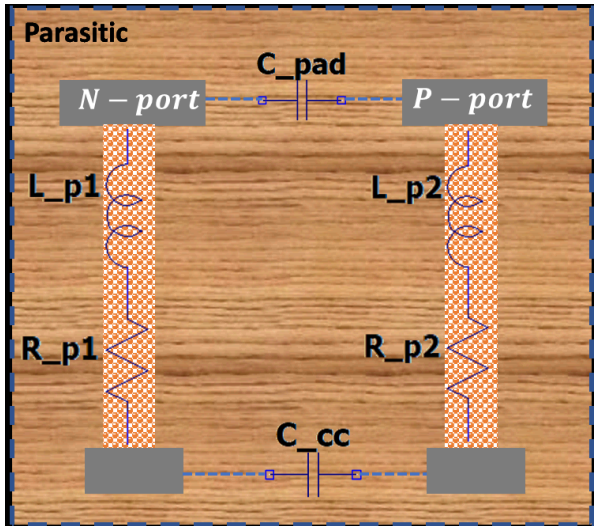


Parasitic



Components Design

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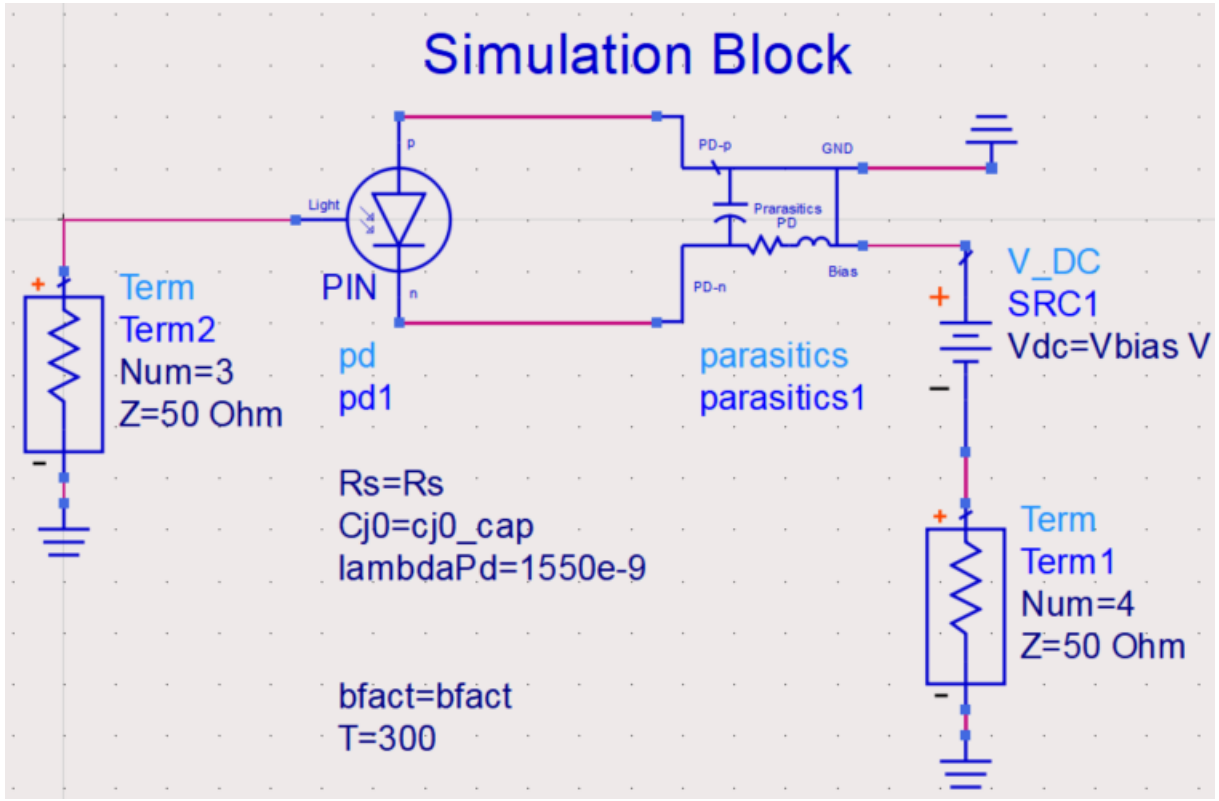
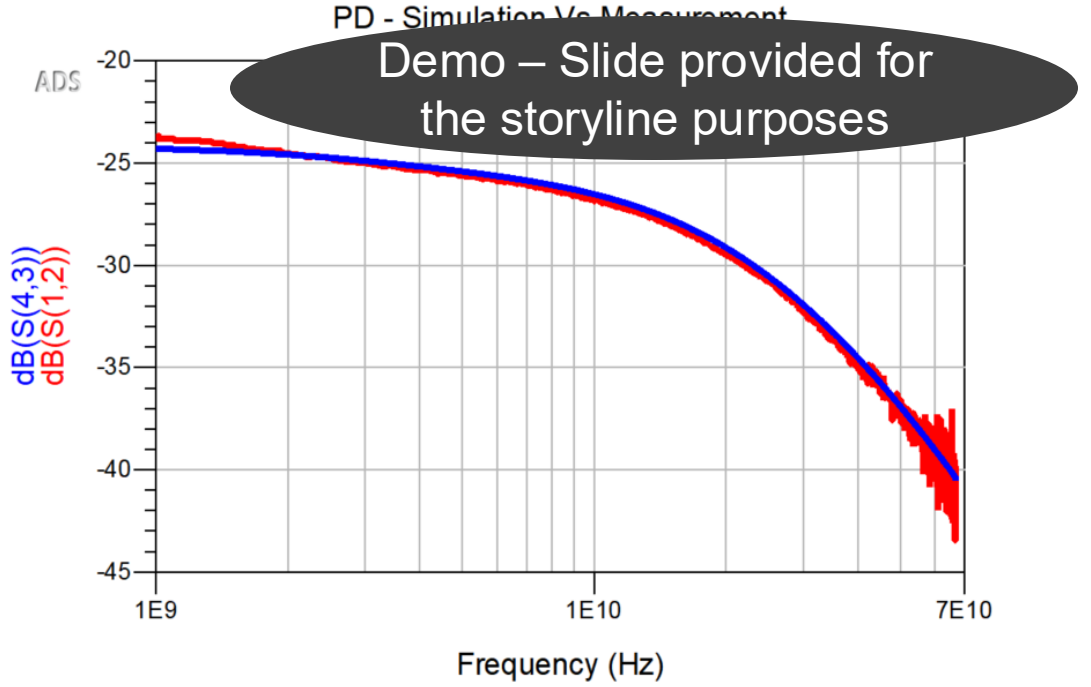
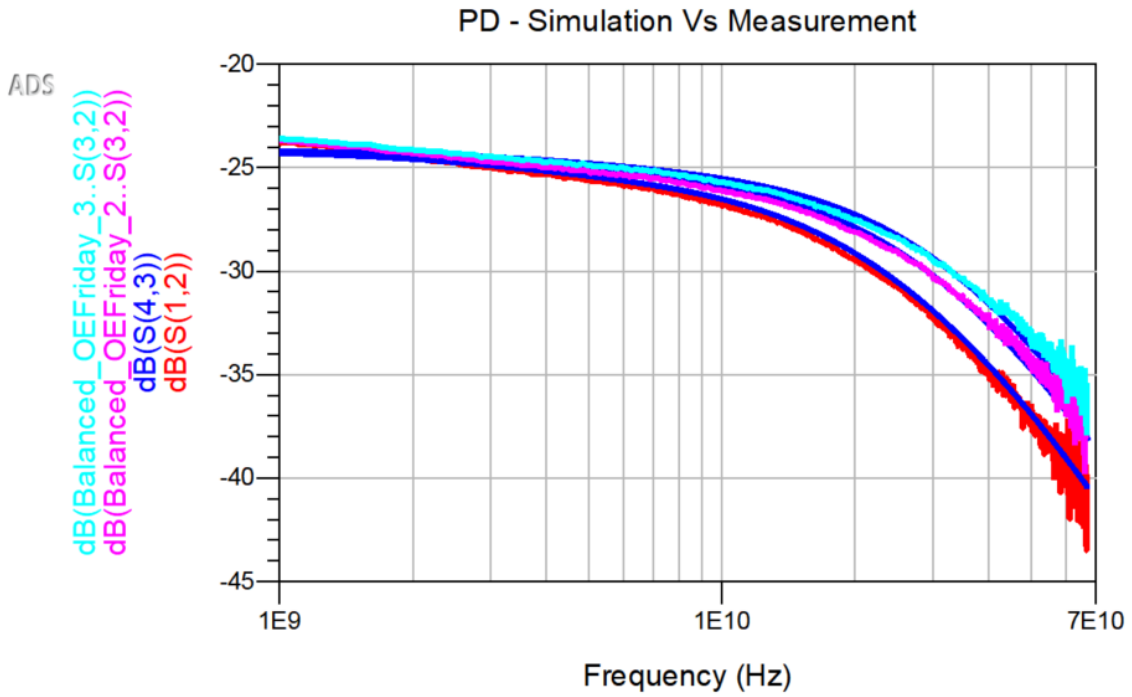


Demo – Slide provided for the storyline purposes





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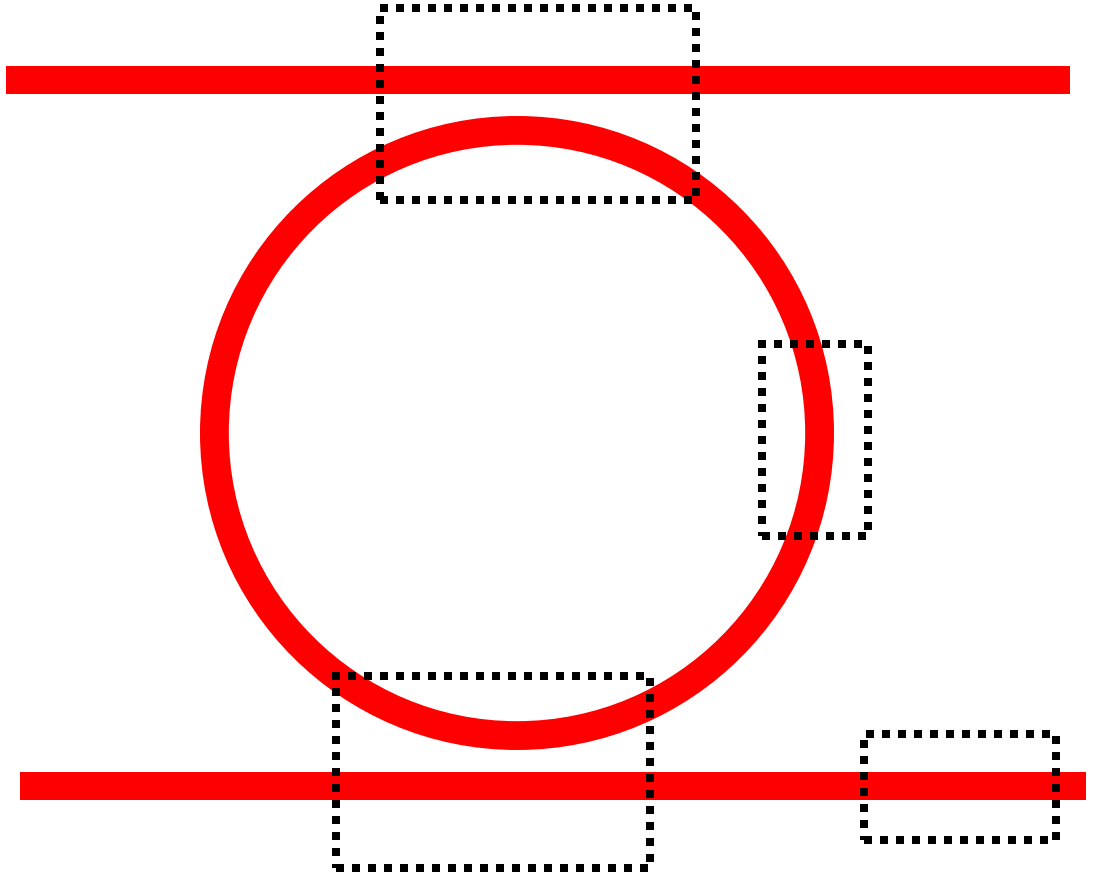
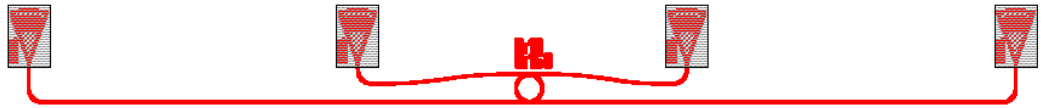
Circuit Design

Micro Ring Resonator (MRR)





- Directional Coupler
- Bend waveguide
- Straight waveguide

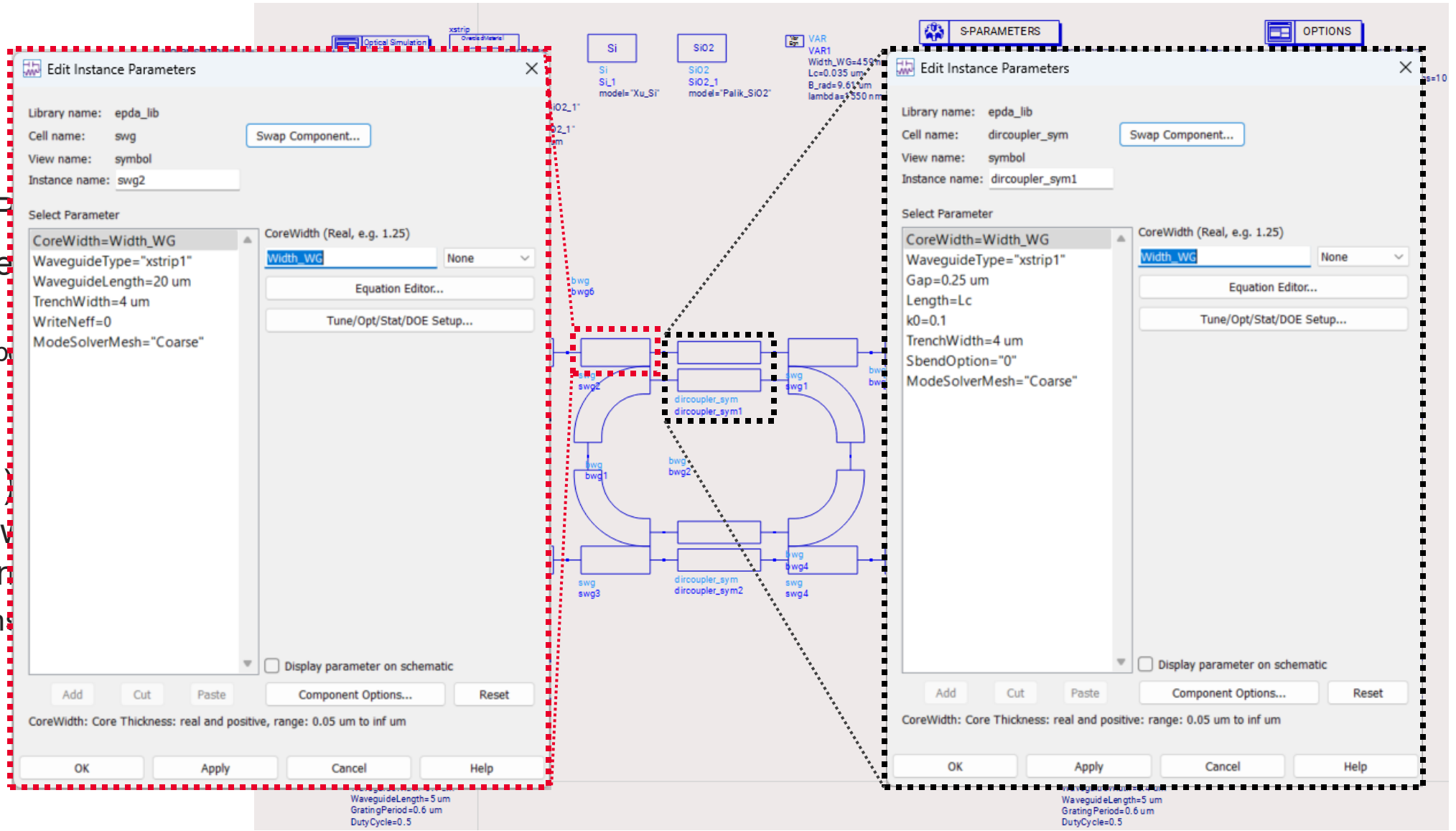
- Simulate the circuit
- Modesolver

Demo – Slide provided for the storyline purposes

Circuit Design/Simulation

MRR Schematic

- Simulations
  - MRR on Golden P
  - Wavelength range
    - 1500-1560 nm
      - 1500 wavelength p
- Monte-Carlo (MC)
  - 1% variations on w (WG) width (443 n
    - To mimic variations
      - WG thickness
      - WG width



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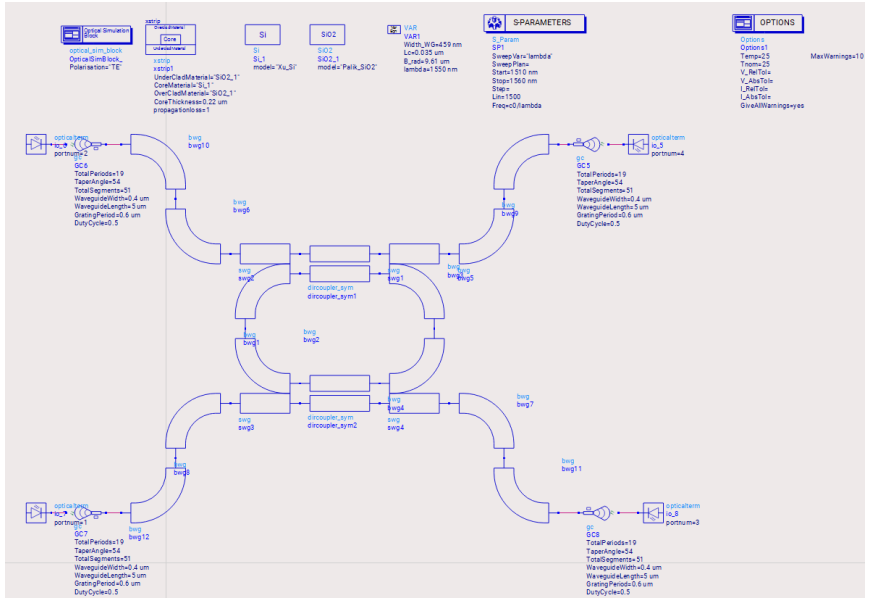
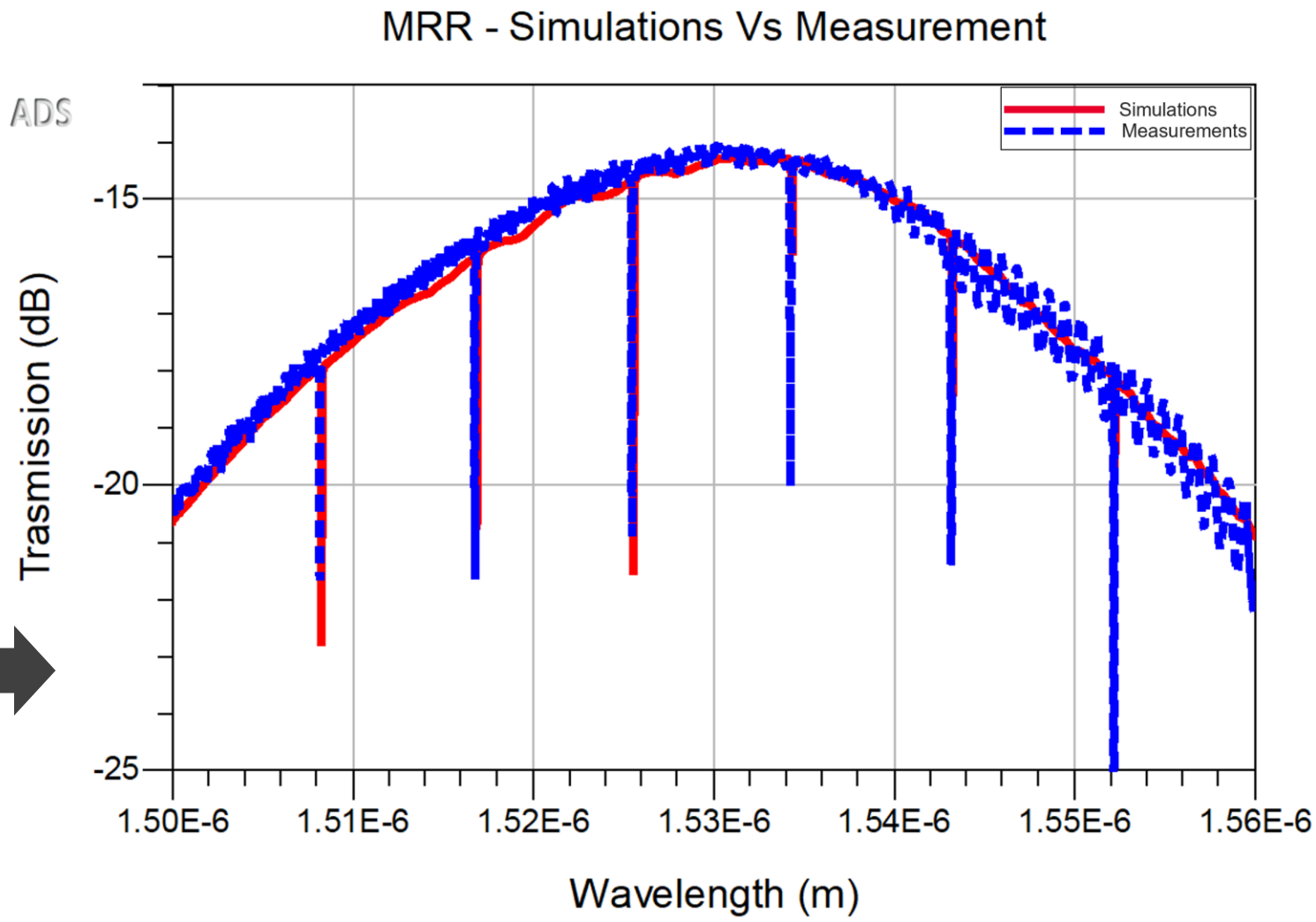
Demo – Slide provided for the storyline purposes

Circuit Design/Simulation

Results

- Measurements
  - Golden PIC MRR structure
  - λ : 1500 – 1560 nm
- Good match b/w Sim. & Measurement



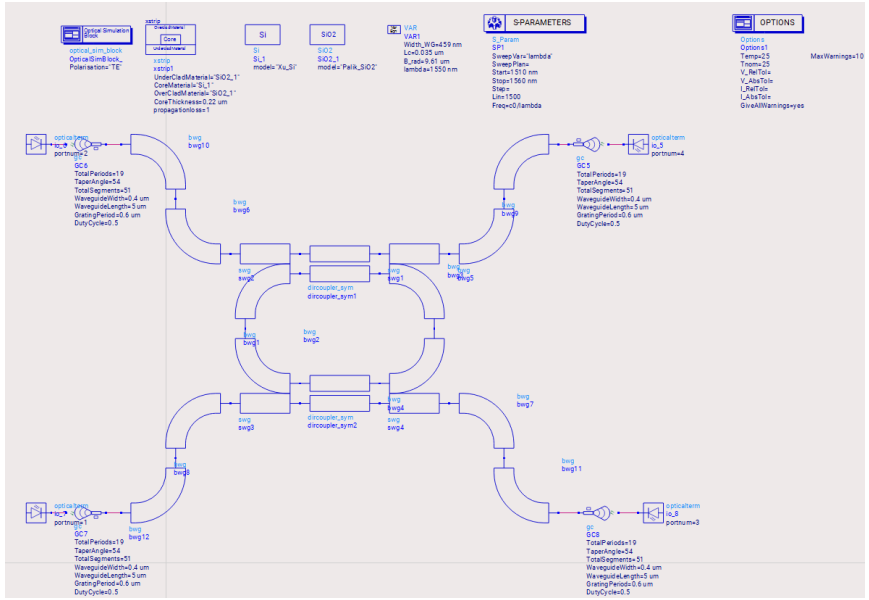


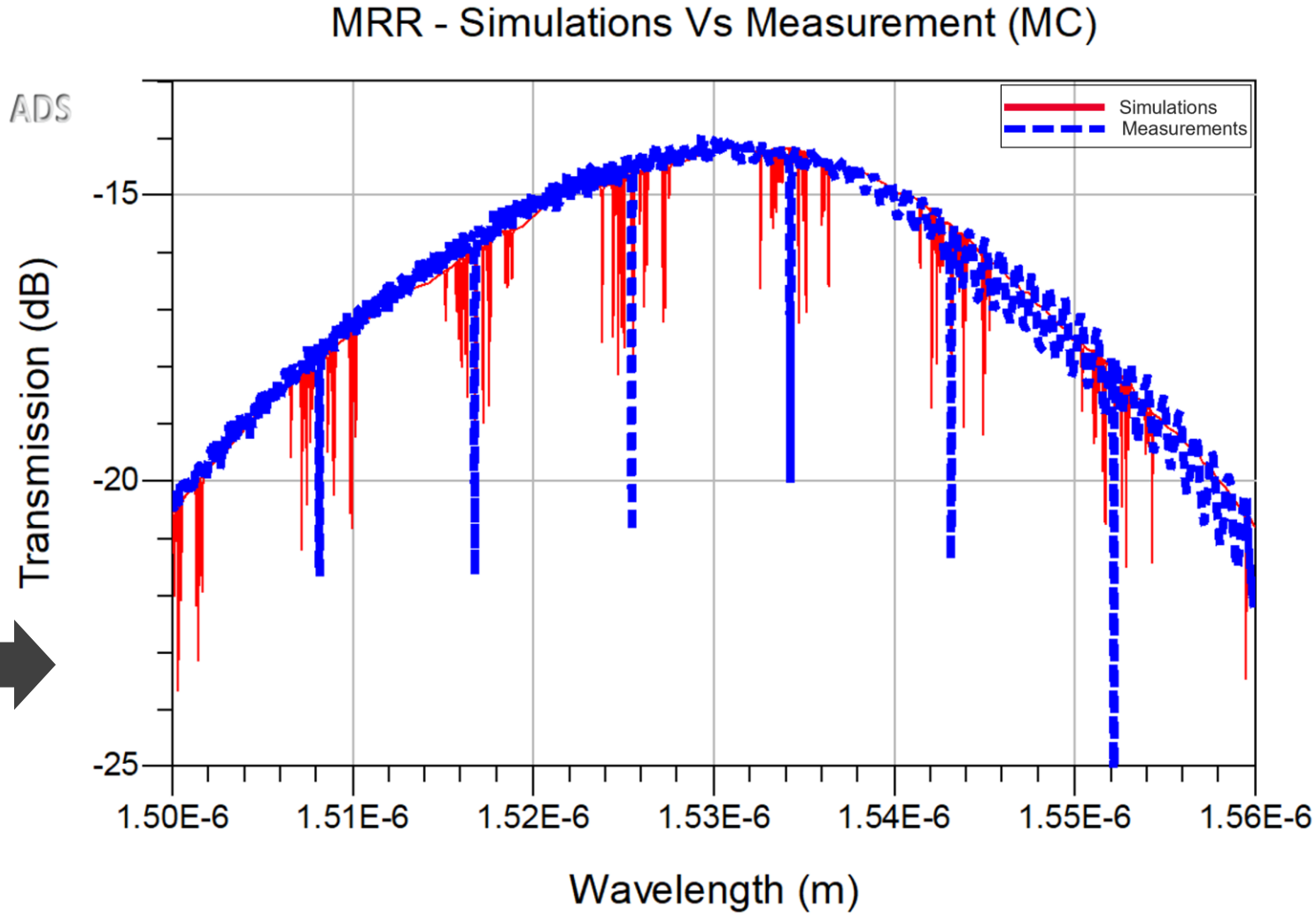
Demo – Slide provided for the storyline purposes

Circuit Design/Simulation

Results including Monte Carlo

- Measurements
  - Golden PIC MRR structures
  - λ : 1500 – 1560 nm
- Monte Carlo -> WG width variations





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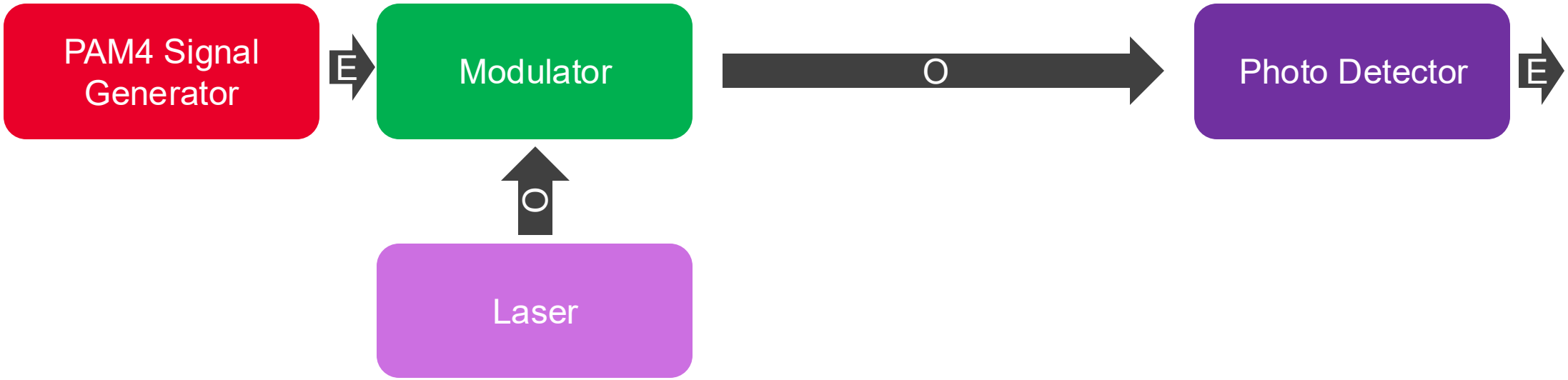
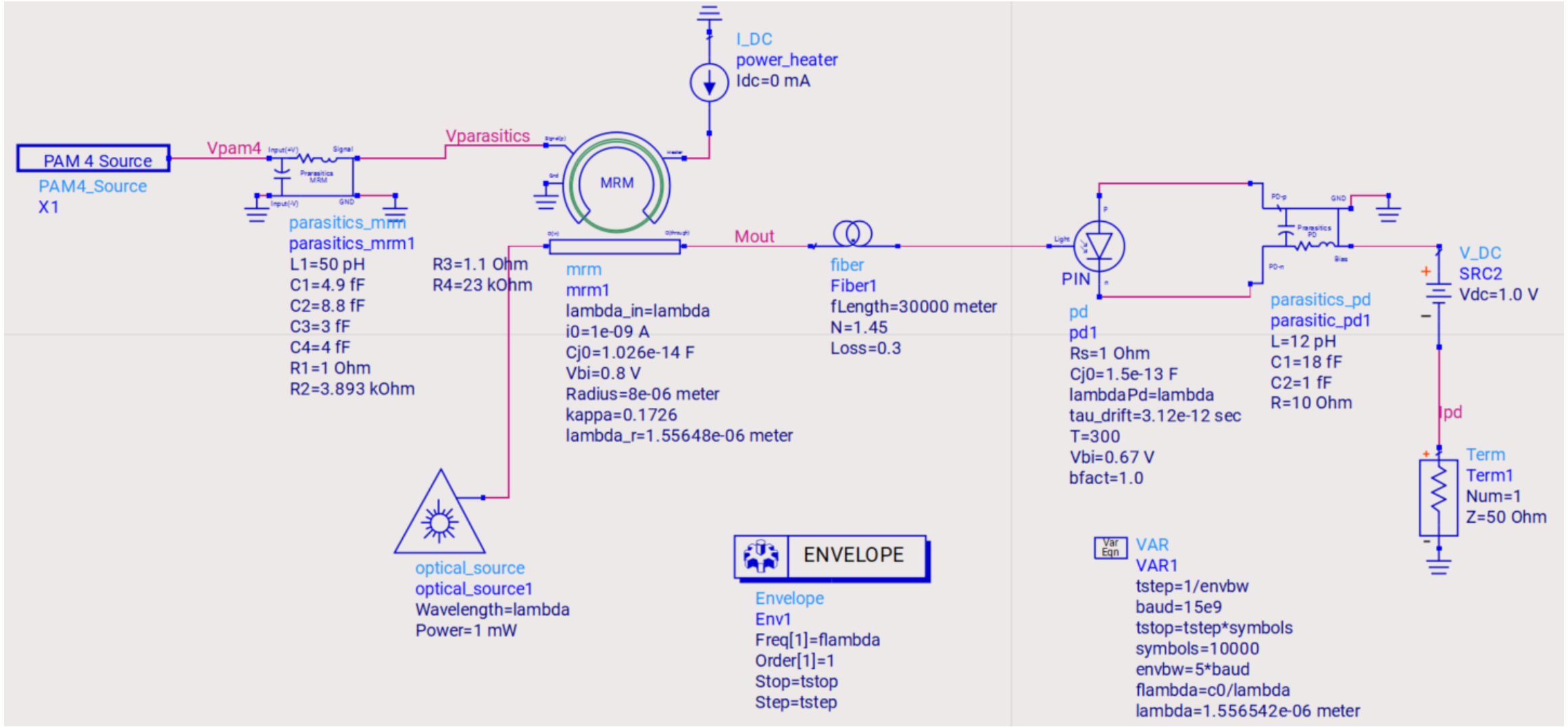
EOE simulation

PAM4



EOE simulation

PAM4



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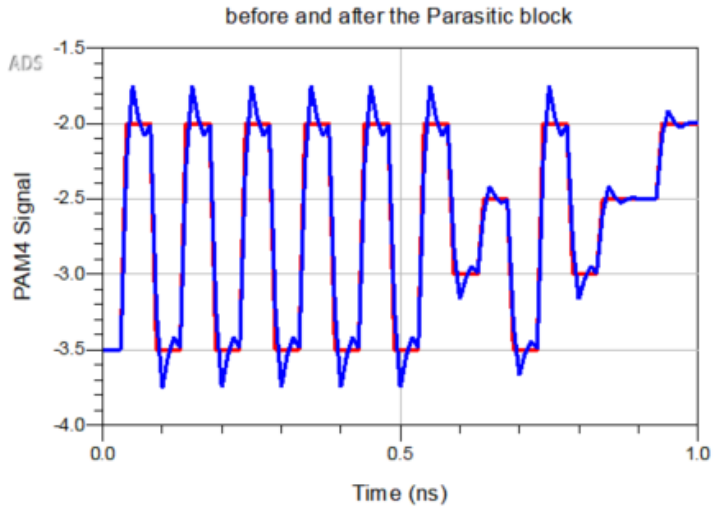
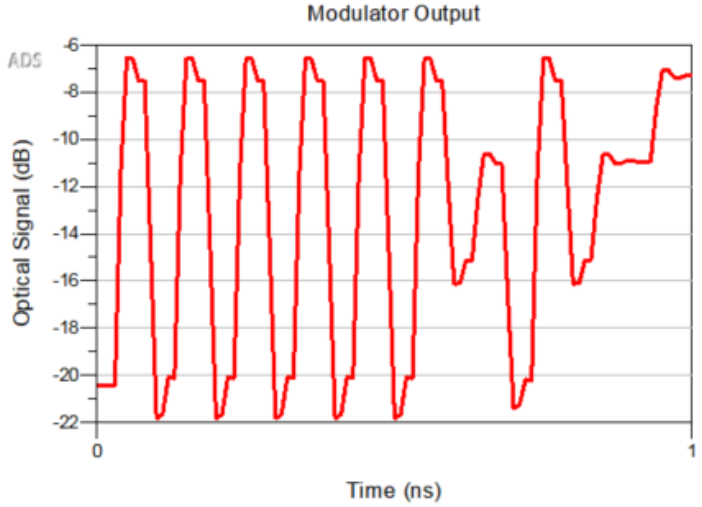
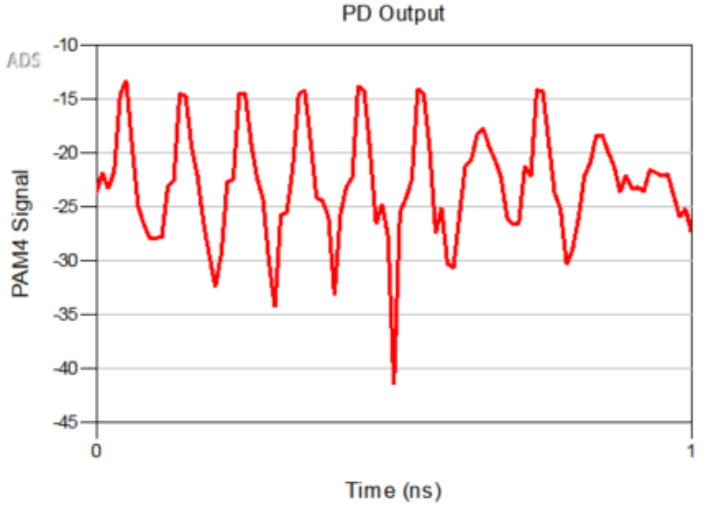
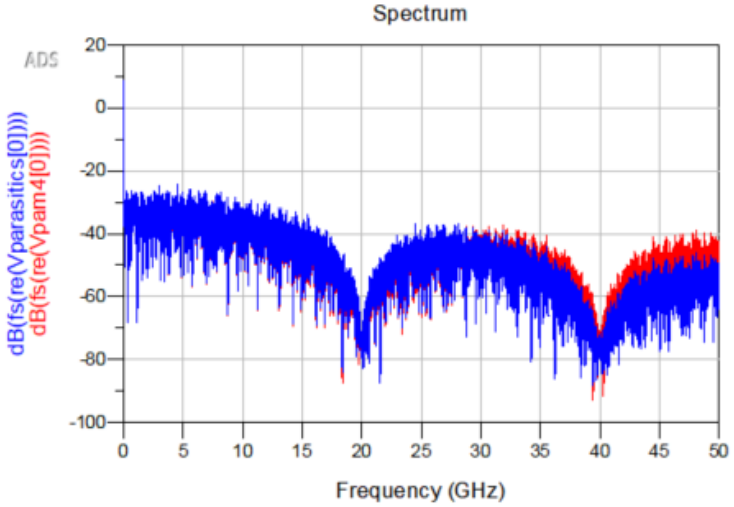
EOE simulation

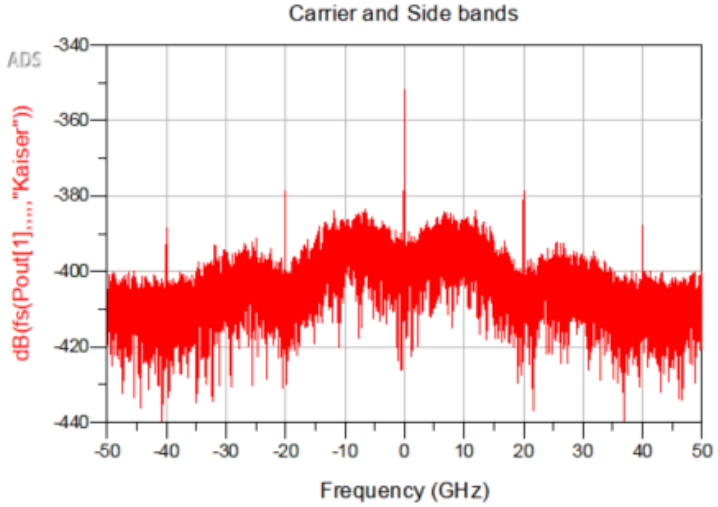
PAM4

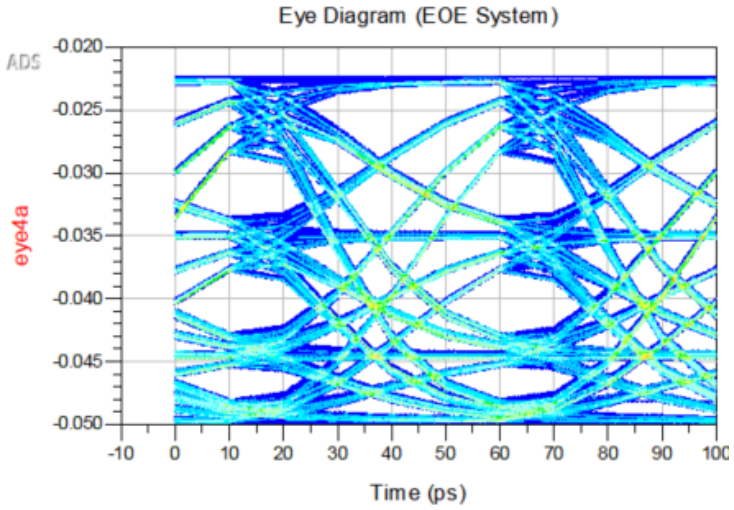




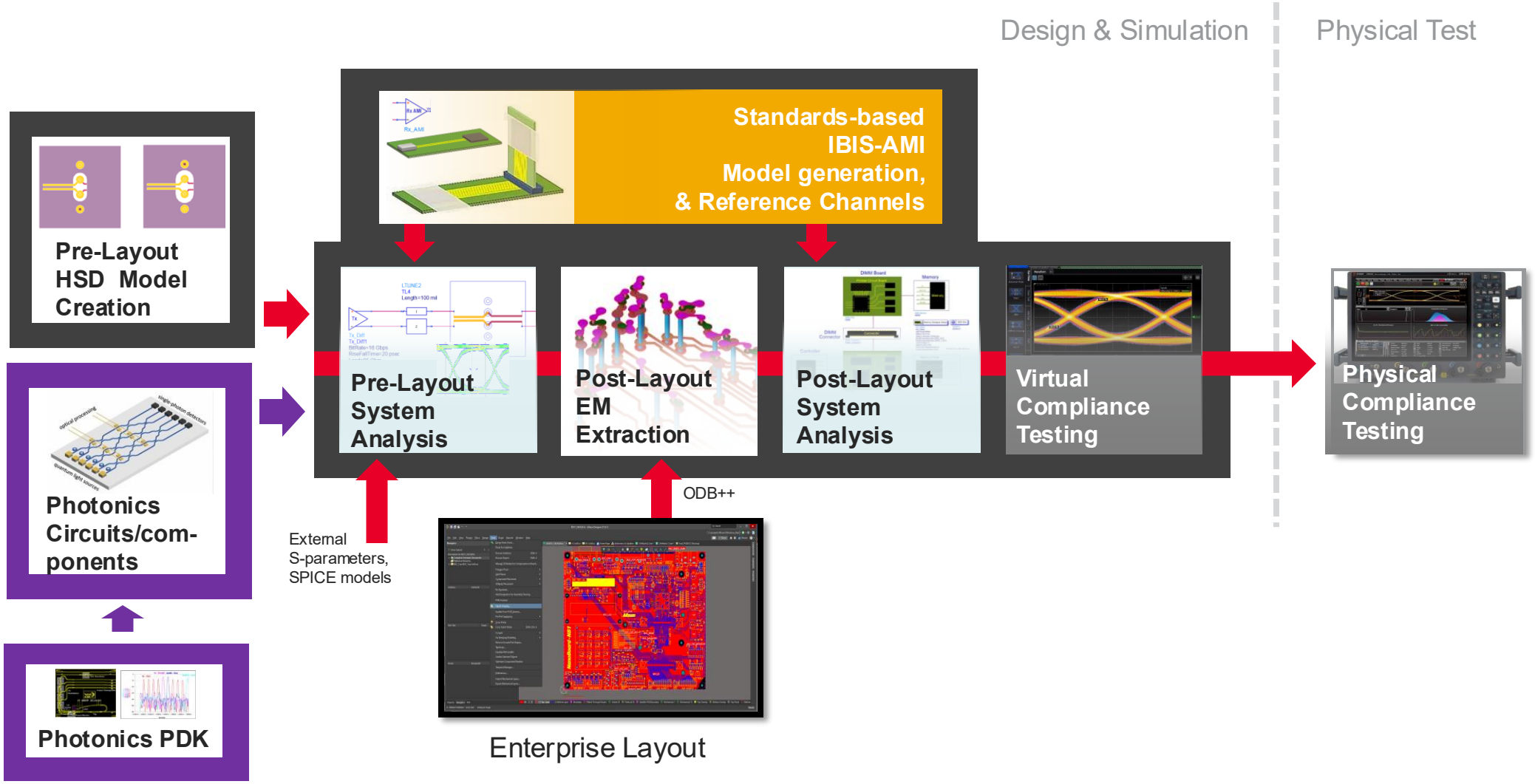








High Speed Digital + Photonics Workflow

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Summary

Photonic Designer