Proposals for Measurement of Channel Time Variance

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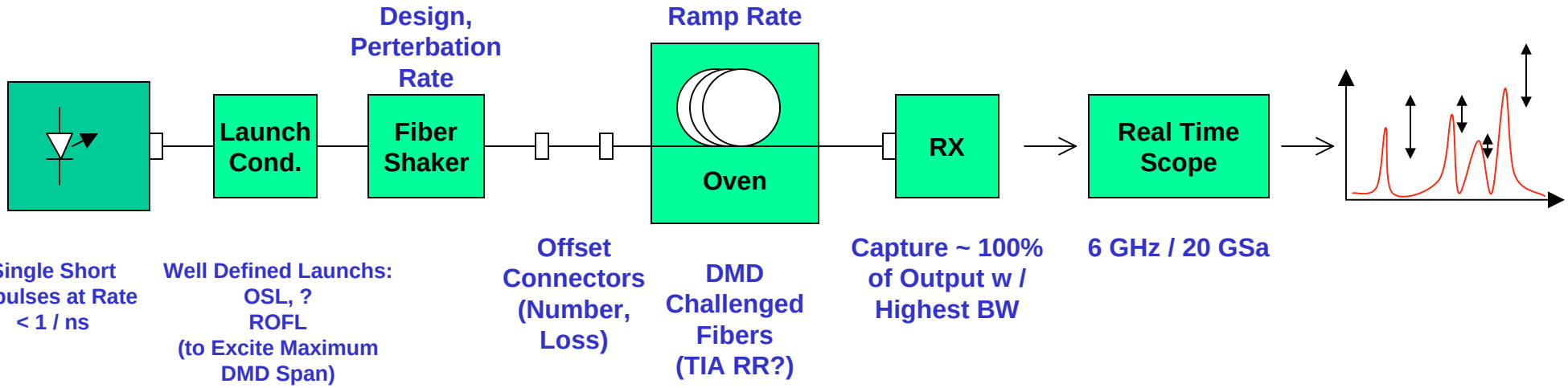
Purpose and Limitations of Measurement

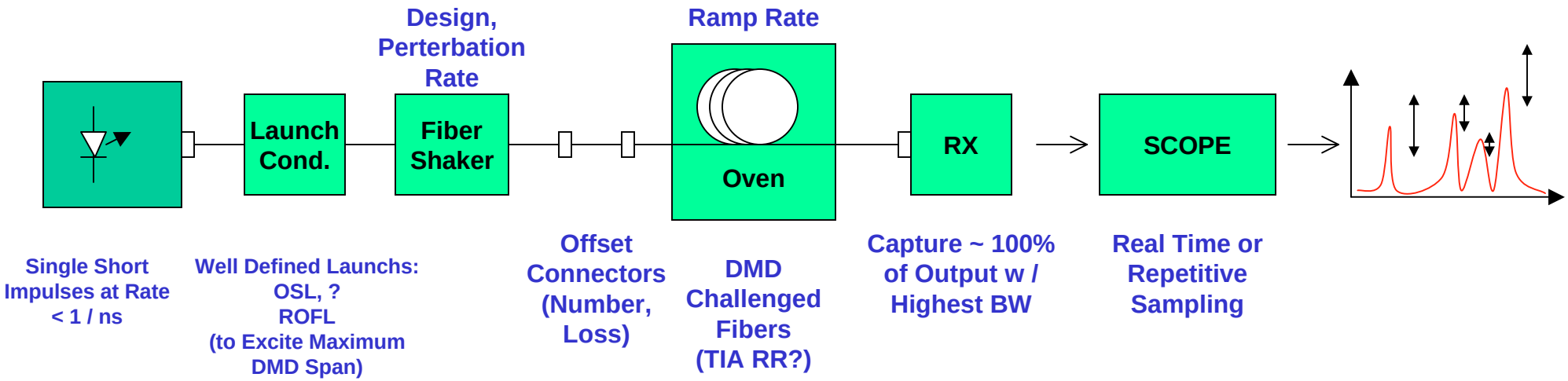
- Establish Approx. Worst Case Time Variance of Channel Impulse Response
  - Combination of Launch Conditions, Time Varying Mode Coupling and Fiber Characteristics
- Results To Be Used To:
  - Model Performance of Adaptation Algorithms
  - Test Performance of IC Solutions
  - **Establish Time Varying Component of RX Compliance Test**
- Measurement Not to Focus on High Frequency Effects
  - Modal Noise Related Issues
    - Combinations of Mode Selective Loss and Fiber Agitation / Thermal Variations
  - Should be Focus of SNR Type Measurements
  - Not A Factor in Adaptation

Measurement Setup – “Real Time”



- Agreed Fiber Shaker Design, Number, Loss of Offset Connectors
- Conduct Experiment with Perturbations at Agreed Worst Case Rates (Shaker Motor Speed, Temperature Ramp Rate).
- Capture Stream of Impulse Patterns Over Fiber Shaker and/or Temperature Cycle
- Process Data to Establish Rate of Change of Power in Mode Groups
  - Average Pulse to Pulse as Needed to Tradeoff Noise and Measurement Bandwidth (Maximum Rate of Impulse Response Detectable)
  - Reduce Data to $\left| \frac{1}{P_{total}} \frac{\partial P_{mode}}{\partial t} \right|_{\max}$

Measurement Setup – "Slow"



- Conduct Measurement with Highly Scaled Down Perturbation Rates
  - Very Slow or Incremental Fiber Shaker Movement
  - Vary Slow Temperature Ramp or Incremental Small temperature Changes
- Allows Collection and Reduction (Deconvolution) of PRBS Patterns
- Allows Use of Repetitive Sampling Scope or Real Time Scope with Extensive Averaging
- Capture Data Over Same Total Range of Perturbations (Increases Measurement Time Considerably)
- Process Data to Establish Rate of Change of Power in Mode Groups vs Rate of Change of Perturbation
  - Scale Data to Agreed Perturbation Rates to Establish $\left| \frac{1}{P_{total}} \frac{\partial P_{mode}}{\partial t} \right|_{\max}$

Consensus Needed

- Launches to Consider
  - Suggest OSL and ROFL to Generate Typical and Max DMD Span
- Fiber Shaker Design and Maximum Perturbation Rate
  - Proposed for FOTP-142 ?
- Number and Loss of Offset Connectors
- Maximum Fiber Temperature Ramp Rate
  - Can we dispense with temperature ramp if initial experiments indicate it is much slower than fiber shaker effects? Number and Nature of Fiber Cases to Consider
  - Suggest Small Number (2 – 4) of TIA RR Fibers
- Agree on Simple Description of Mode Power Rate of Change
  - Maximum Fractional Rate of Change / Time
  - Simple Tradeoff of Max Fractional Rate of Change / Time vs DMD Magnitude
    - (based on qualitative nature of results)