

# QUANTIFI PHOTONICS™

BREAKING THROUGH THE TEST BOTTLENECK:

*SCALING INTEGRATED PHOTONICS WITH AN EFFECTIVE TEST STRATEGY*

Kees Propstra

# OUTLINE

Introduction

Ecosystem Challenges

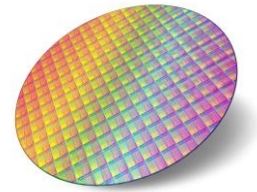
Testing Considerations

Examples

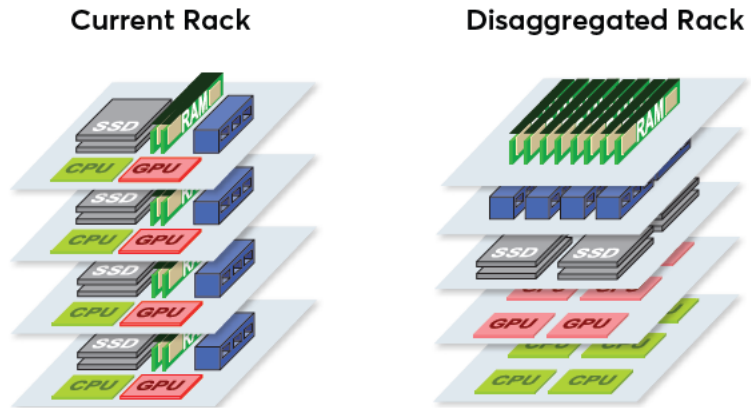
PXI Value Proposition

Conclusions

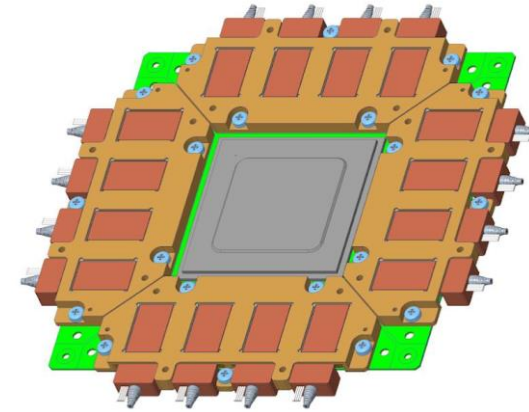




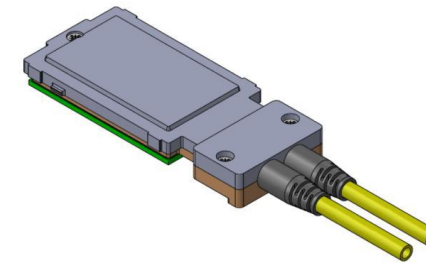
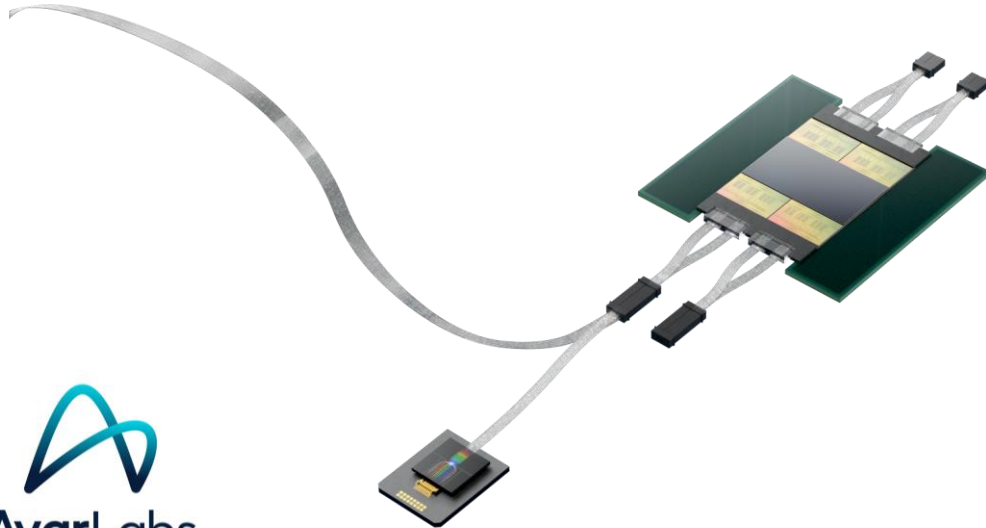
## In-Package Optical I/O



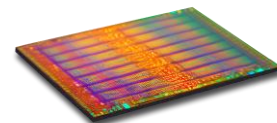
## Co-Packaged Optics



Example attachment system (51.2T)

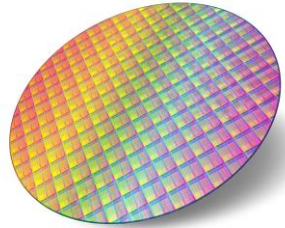


3.2T transceiver modules: Optical

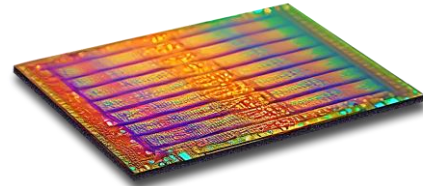




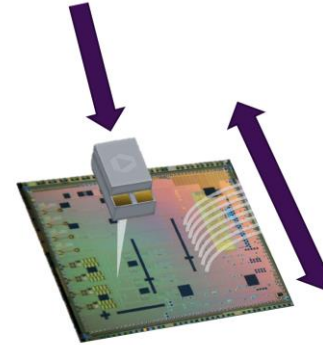
# PHOTONICS IC ECOSYSTEM - II



Wafer Sort



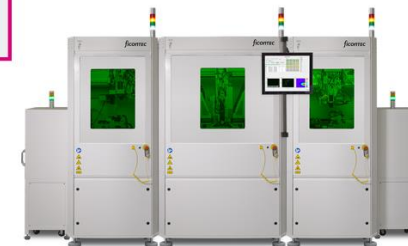
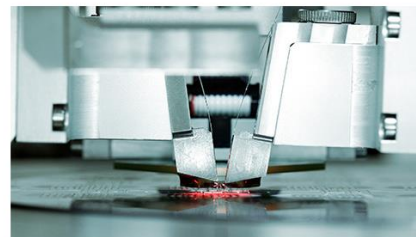
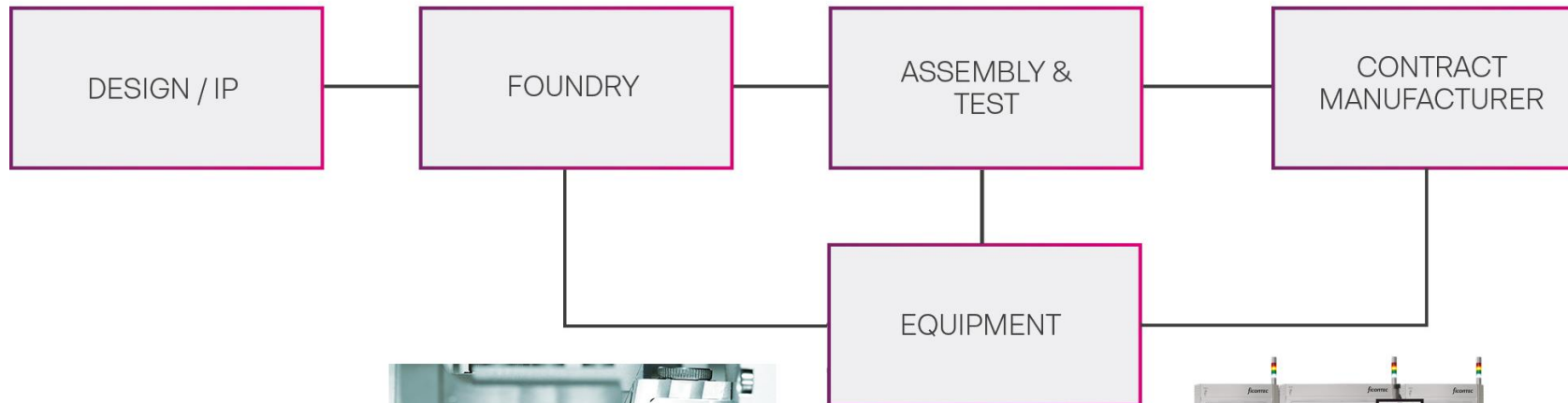
Die/PIC



Assembly



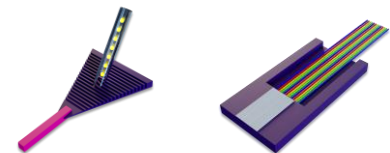
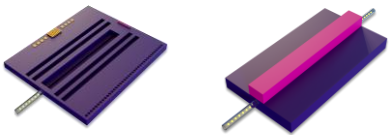
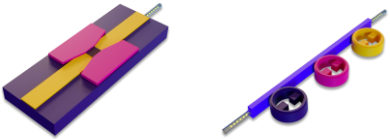
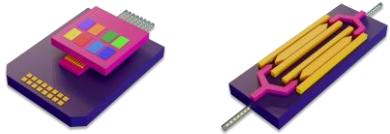
Packaged Test



# TESTING FUNNEL

## R & D

DEVICES

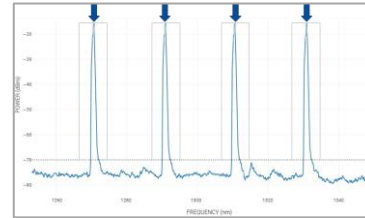


## DVT

MEASUREMENTS

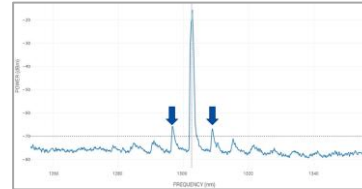
### Passive

- Insertion loss
- Return loss
- Wavelength dependence
- Polarization dependence



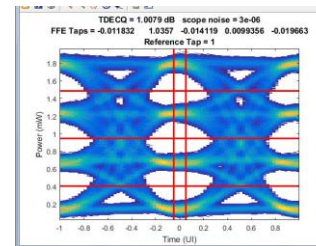
### Active

- Fiber array alignment
- Power levels
- Line width
- Modulation depth
- LIV-curve
- RIN measurement
- Optical spectrum/SMSR/OSNR
- Photocurrent/linearity/responsivity



### High-speed

- Eye diagram
- BER
- Receiver sensitivity
- S-parameters



## HVM

SCALABLE TEST PLATFORM



OPTICAL SWITCH  
MATRIX



OPTICAL POWER  
METER



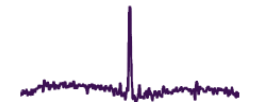
FIXED/TUNABLE  
LASER



PXI



POLARIZATION  
CONTROLLER

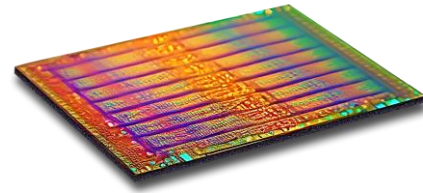


OPTICAL SPECTRUM  
ANALYZER

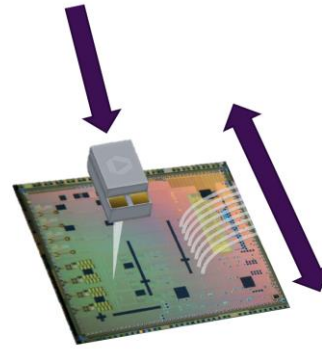


VARIABLE OPTICAL  
ATTENUATOR

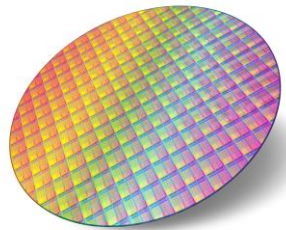
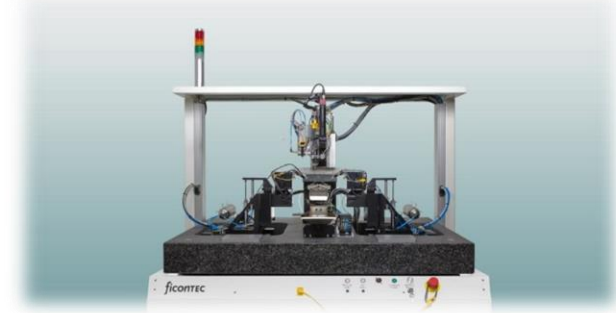
# WHERE TO TEST WHAT?



Die/PIC



Assembly

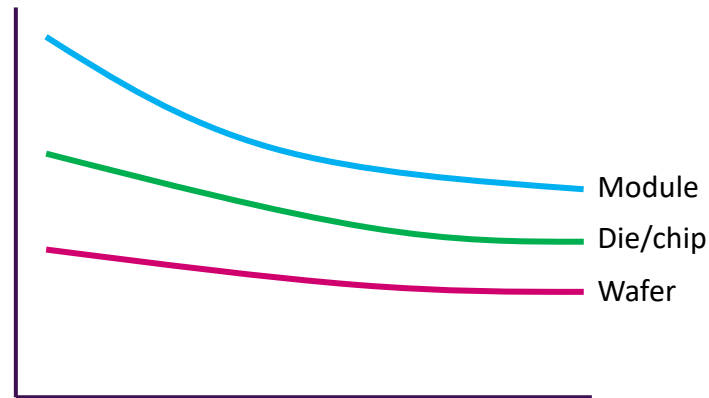


Wafer Sort

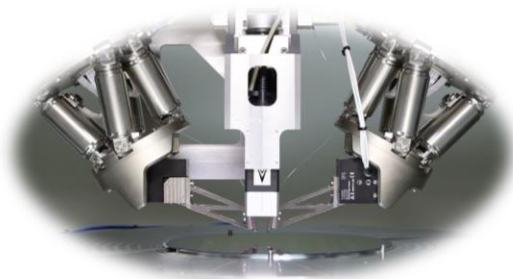


Packaged Test

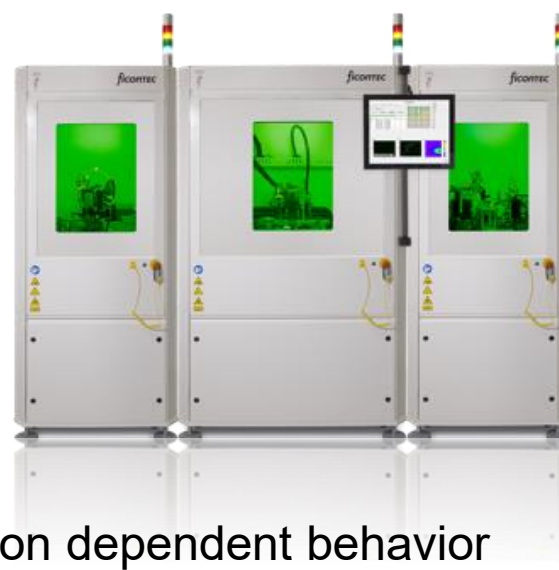
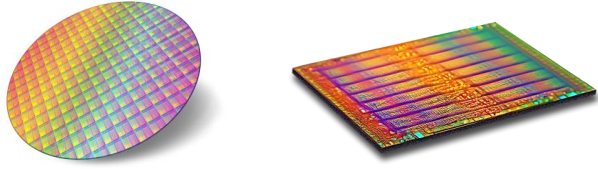
↑  
Cost/unit



Yield →



# TESTING JOURNEY



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## Wafer

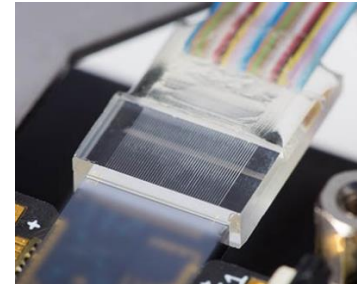
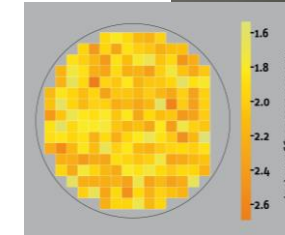
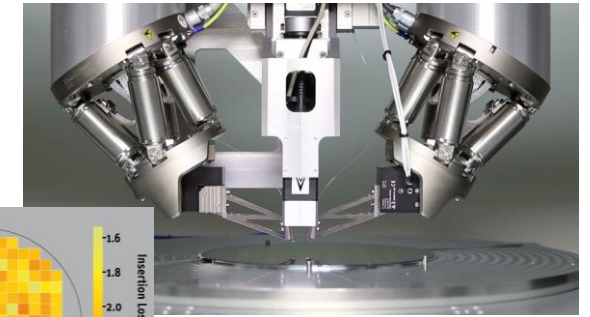
- Parametric testing: wavelength and polarization dependent behavior
- Test individual devices prior to moving to next stage

## Die/chip

- Multi-chip optical/electrical subassembly
- Fiber array alignment (active/passive)
- Validate all channels of DUT are within spec

## Module

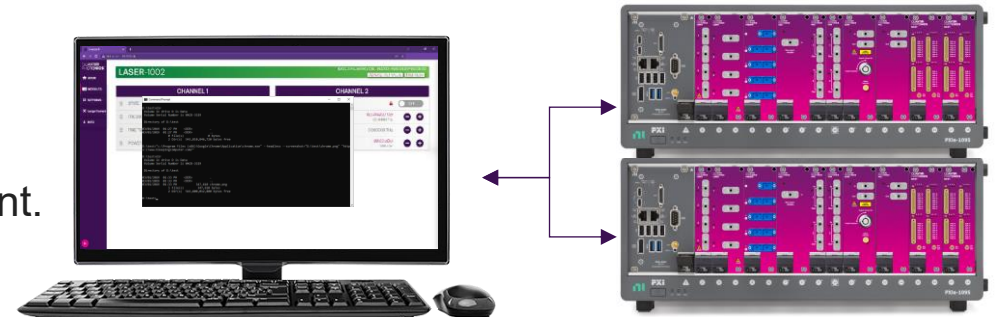
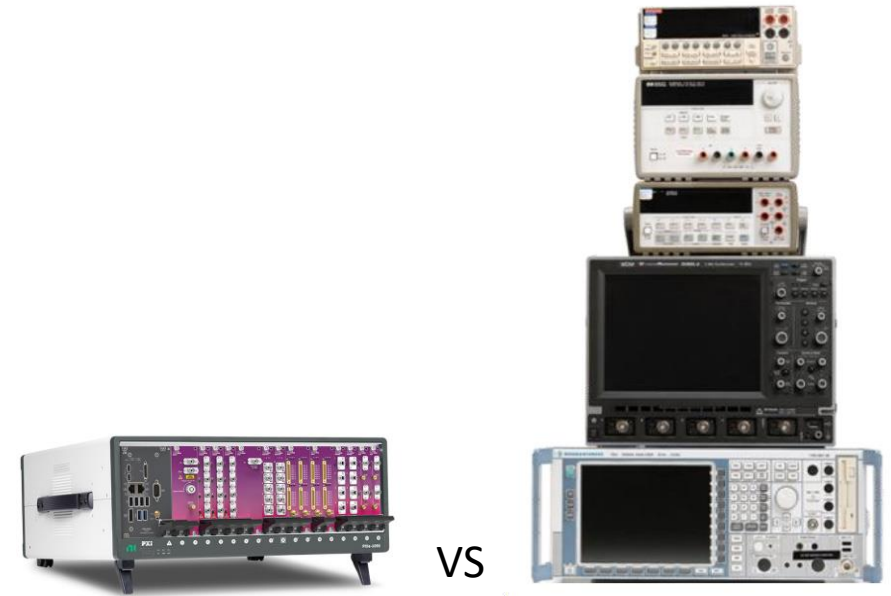
- At-speed testing of transmitter and receiver
- Final tweaking of device parameters
- Spec compliance





# PXI VALUE PROPOSITION

- **High Mechanical Density**
  - Up to 17 modules in a 4U rack-mount chassis.
- **Multi-Vendor Industry Standard**
  - Mature multi-vendor ecosystem.
  - Diverse support and investment ensures longevity.
- **Robust Ecosystem of Test Equipment**
  - Broad selection of power, control, and measurement tools.
  - New and growing portfolio of photonics test equipment.
- **Integrated Triggering and Synchronization**
  - Ensure correlation between stimulus and measured data.
- **Easy Automation**
  - One network endpoint controlling several pieces of test equipment.
- **Remote Control**
  - High-speed remote procedure calls via GRPC and SCPI.



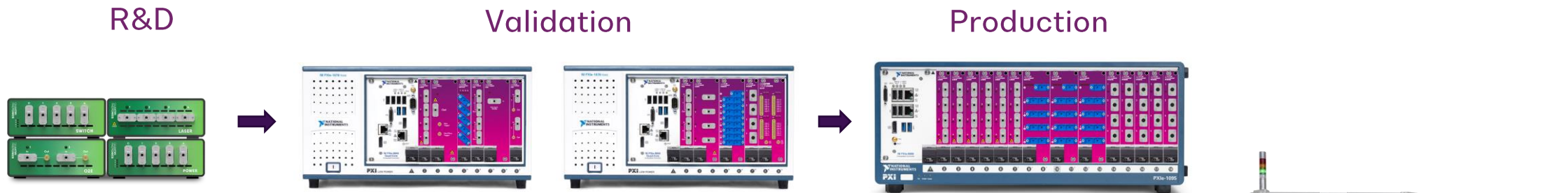


# RECIPE FOR SUCCESS – R&D TO VOLUME PRODUCTION

1 – Access to the **full complement** of photonics test functions



2 – **Flexible** platform to transition from R&D to validation/characterization, pilot and finally mass production



3 – **Integration** into wafer probing, assembly and alignment equipment

4 – **Scalable** to high-channel-count parallel testing

5 – **High-density** to pack a lot of test instruments in a small space

6 – **Optimized** test flow (time is money)



\* Image courtesy of ficonTEC