A unifying platform for Chip-Scale Hybrid Integrated Photonics

Suresh Venkatesan
Chairman and Chief Executive Officer

Innovation inspires growth
Agenda

- POET Vision and Mission
- Strategy
- Technology and Business
- Conclusion
- Questions and Answers
Vision: To become the global leader in chip-scale integrated photonics solutions by deploying our Optical Interposer technology, enabling seamless integration of electronics and photonics for a broad range of vertical market applications.

Mission: Establish an industry leadership position in chip-scale integrated photonics with validated disruptive, IP protected, Optical Interposer platform components for Datacenter, 5G and Co-packaged Optics.
Industry Mega Trends

PROFILERATION OF Cloud Computing

GROWTH OF Artificial Intelligence

ADOPTION OF 5G and Edge

100G/200G/400G Optical Engines
Multiplexed Light Bars

Multiplexed Light Bars
Co-packaged Optics

25G I-Temp solutions
Advanced PON

POET Roadmap Solutions
Focus on Competitive Differentiation
- A unifying photonics hybrid integration platform

POET
Optical Interposer

Micro Optic Assembly
Interposer Functionality
Passive Optical Device Integration

Photonics | Optics | Electronics
From Platform to Products

“A product platform is not a product. It is a collection of common elements, especially the underlying core technology, implemented across a range of products.”

Product Platform Strategy:
- defining product generations
- supporting extensions
- creating derivatives
- enhancing capability

Expanding capabilities of the platform to enable next gen solutions

- CMOS Compatible Waveguide Passives
  - Low Loss; Single Mode waveguides
  - O band and C band
- External Cavity Lasers
  - Low cost; High Scalability
- Vertical Mirrors
  - Wafer level test and characterization
  - Compatibility to top entry Optical devices
- InP Known Good Die Passive Assembly
  - Compatible with different types of InP active devices
- Micro Optics assembly and Hermetic Seal
  - Expands applications to Telecom and 5G
- Si Photonics Compatibility
  - Compatible for use with Si Photonics Modulators
Our **2020** Journey  
Technology Development → Product Development

<table>
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<tr>
<th>Proof Points</th>
<th>Technology Development</th>
<th>Product Development</th>
</tr>
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<tbody>
<tr>
<td>Technology Feasibility</td>
<td>Product Functionality</td>
<td></td>
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<tr>
<td>Specifications</td>
<td>Proof of Principle</td>
<td>Product Specifications</td>
</tr>
<tr>
<td>Implementation</td>
<td>Market Entry unspecified</td>
<td>Deterministic Product / Market entry</td>
</tr>
<tr>
<td>Organizations Involved</td>
<td>Research and Development</td>
<td>Product Development and Supply Chain</td>
</tr>
<tr>
<td>Deployment Schedules</td>
<td>Broadly Defined</td>
<td>Specific Timelines</td>
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<tr>
<td>NRE Budgets</td>
<td>Larger for broad proof of principle</td>
<td>Smaller for specific customization but with product revenue</td>
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<td>Duration</td>
<td>Multi-year typically</td>
<td>Twelve to Eighteen months from start</td>
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- **Proof Points**
  - Technology Feasibility
  - Proof of Principle
  - Market Entry unspecified
- **Organizations Involved**
  - Research and Development
- **Deployment Schedules**
  - Broadly Defined
- **NRE Budgets**
  - Larger for broad proof of principle
- **Duration**
  - Multi-year typically

**Notes:**
- Duration: Multi-year typically
- NRE Budgets: Larger for broad proof of principle, smaller for specific customization but with product revenue
- Deployment Schedules: Broadly Defined, Specific Timelines
We continue to build out our IP portfolio around the Optical Interposer

- Self Alignment features for efficient passive alignment of both active die as well as micro optics
- External cavity ‘athermal’ lasers essential for co-packaging optics
- Vertical Mirrors
- Electrical and Optical Interfaces
Increasing explorations of optical neural networks for inferencing in AI applications

- Photonics are fundamentally:
  - Higher Performance
  - More Energy Efficient
  - Lower Cost

*Outside of Data Centers, AI represents a compelling use case for co-packaged optics*
Interposer Architectures for Co-packaged Optics Applications

- Coarse Through Silicon Vias (TSV) for power and low speed IO
- Dense interconnects on interposer for 2.5D high speed routing
- Integrated Light sources and passive optics
Innovation inspires growth

Strategy

Vivek Rajgarhia
President & General Manager
Cloud Data Centers – Exponential Growth

Content providers deploying unprecedented level of global infrastructure

Interconnect Bandwidth is growing across a variety of industries

Data Growth drives cloud computing infrastructure spend
5G Adoption and Proliferation

5G END-TO-END

DATA CREATION
DATA CONSUMPTION

5G accelerates network transformation
What does 5G mean to Photonics

5G is Fiber Hungry and Needs Bandwidth
A Scalable High-Speed Optical Engine Platform

- Single Engine, Single Investment, Multiple Generations
- Wafer scale integrated CWDM/FR4 Mux / DeMux
- Flip-Chip Passively-Aligned DML and EML Lasers
- Top Entry InP or Ge Photodetectors

Integrated RF Matching Circuits
Industry Leading Footprint
Flexible Architectures

PAM4 Electronics

100G, 200G, 400G

56Gb Optics
Product Roll Out Strategy

- Scalable Optical Engine Platform
  - 100G/200G
- 400G Light Engines
- 400G Receive Optical Engines
- Scalable Optical Engine Platform
  - 400G
- 5G Solutions
## Product Roadmap driven by Customer Engagement

<table>
<thead>
<tr>
<th></th>
<th>2020</th>
<th>Q1 2021</th>
<th>Q2 2021</th>
<th>Q3 2021</th>
<th>Q4 2021</th>
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<tbody>
<tr>
<td><strong>100/200G CWDM4</strong></td>
<td>Alpha</td>
<td>Beta</td>
<td>Production</td>
<td></td>
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<tr>
<td><em>Optical Engines</em></td>
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<tr>
<td><strong>400G Light Engine</strong></td>
<td>Alpha</td>
<td>Beta</td>
<td>Production</td>
<td></td>
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<tr>
<td><strong>400G FR4 Receiver</strong></td>
<td>Pre-Alpha</td>
<td>Alpha</td>
<td>Beta</td>
<td></td>
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<tr>
<td><strong>400G FR4/DR</strong></td>
<td>Pre-Alpha</td>
<td>Alpha</td>
<td>Beta</td>
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<tr>
<td><em>Optical Engines</em></td>
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- Optical systems and module customer
- Leading North American Optical systems customer
- Optical module customer

**Ability to rapidly roll-out products on the platform**
Joint Venture – Objectives and Status

- Vertical integration manufacturing for Optical Engines (Cost)
- Investment to scale production (Scale)

- Sanan IC is a wholly owned subsidiary of Sanan Optoelectronics
- World’s largest producer of compound semiconductor wafers
- 20 Million wafers per year, using ~400 MOCVD reactors

- $50M valuation for the JV
- Provides credence and endorsement of POET Optical Interposer Platform

- LOI signed
- Definitive Agreement expected in Q3 2020
Manufacturing Strategy

<table>
<thead>
<tr>
<th>Optical Interposer</th>
<th>Photonic Devices</th>
<th>Electronics</th>
<th>Assembly &amp; Test</th>
</tr>
</thead>
<tbody>
<tr>
<td>POET Owned and Designed</td>
<td>Strategic Sourcing Co-Designed POET Specified</td>
<td>Off-the-shelf</td>
<td>POET JV</td>
</tr>
</tbody>
</table>

JV enables “at scale” manufacturing and a consolidated supply chain
Structure and Organization

CORP. HQ: TORONTO, CANADA
- Finance
- Investor Relations
- Corporate Administration

ALLENTOWN, PA
- Optical Engine Design & Product Development
- Device Design
- Supply Chain & Manufacturing Engineering
- Product Management & Marketing
- Customer Technical Support (NORTH AMERICA, EUROPE)

SHENZHEN, CHINA
- Optical Engine Design & Validation
- Module Reference Design & Applications Engineering
- Customer Technical Support (CHINA)

SINGAPORE
- Optical Interposer Process & Design
- Platform Design
- Supply Chain

JOINT VENTURE
- Assembly & Test

How
Innovation inspires growth

Technology and Business

Suresh Venkatesan
Chairman and Chief Executive Officer

Innovation inspires growth
Product Designs Completed

Multiplexed Light Engines

- 400G Light Sources

Scalable Optical Engine

- 100G/200G Optical Engines
- 400G EML based Optical Engines

 Receivers

- 400G Receivers
Systematic Product Design Validation underway

Lasers and Laser Attach

POET's Multiplexer

POET's CWDM/FR4 DeMux

PDs and PD Attach

Directional Couplers and Power Taps

Novel Spot Size Converter Design

Laser and Laser Attach

POET's Multiplexer

POET's CWDM/FR4 DeMux

PDs and PD Attach

Directional Couplers and Power Taps

Novel Spot Size Converter Design

Tap power [dB] vs Pitch [um]

Fiber Coupling Loss

Spec for 0.5dB/facet
## 2020 Key Accomplishments

<table>
<thead>
<tr>
<th>Quarter</th>
<th>Accomplishments</th>
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</table>
| Quarter 4 2019 | • Completed Tranche 1 of DLS Transaction  
• Hired Vivek Rajgarhia as President and GM                                                                                           |
| Quarter 1 2020 | • Completed Technology Validation of the Interposer principles with strategic partner  
• Delivered prototypes as proof of concept  
• Defined end to end Platform requirements and architecture for Product designs  
• Engaged in Product design wins                                                                                                     |
| Quarter 2 2020 | • Announced LOI for Joint Venture with Sanan IC, as a critical manufacturing outlet for POET’s technology → established commercial viability of the platform  
• Completed DLS Transaction  
• Augmented Optical Interposer IP portfolio                                                                                       |
| Quarter 3 2020 | • Completed four product designs for multiple applications  
• Refined platform requirements for end product applications based on voice of the customer  
• Engaged with Lead Customer for a scalable 400G Optical Engine product  
• Proposed Development and Supply agreement for Interposer based light source for AI applications                                    |
## Looking Forward

<table>
<thead>
<tr>
<th>Quarter 4 2020</th>
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<tbody>
<tr>
<td>Commence JV operations</td>
<td></td>
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<tr>
<td>New flip chip laser architecture for high accuracy passive alignment proven for product implementation</td>
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<tr>
<td>Pre-Alpha Product Prototypes for 100G/200G scalable optical engines and multiplexed Light Source products for 400G DR and FR applications</td>
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<tr>
<td>Incorporate POET Shenzhen and establish Product Reference Design capabilities</td>
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<table>
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<tr>
<th>Quarter 1 2021</th>
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<tr>
<td>2nd Generation High Power CW CWDM multiplexed Light sources for 400G DR and FR applications</td>
<td></td>
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<tr>
<td>Live Product demonstrations at OFC 2021</td>
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<tr>
<td>Strategic partnership for 400G Optical Engines using Si Photonics based modulators</td>
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<th>Quarter 2 2021</th>
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<tr>
<td>Beta 100G/200G Products for customers and customer qualification</td>
<td></td>
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<tr>
<td>Alpha Customer samples of 400G FR4 Receivers</td>
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<tr>
<td>Beta (production ready) 400G DR and FR multiplexed Light Sources</td>
<td></td>
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<tr>
<td>Alpha 400G Optical Engines using EML lasers</td>
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POET Technologies Today

- Team Established
- Technology Developed
- Products Designed
- Customers Committed
- Manufacturing Planned