



Charge for the NYS Photonics Board of Officers

The New York State Photonics Board of Officers will oversee and implement the investment of State funds committed to support the efforts of the American Institute for Manufacturing Integrated Photonics (AIM Photonics).

State funds will be administered in accordance with the terms identified in AIM Photonics application, which was submitted by a consortium of organizations and selected by the Department of Defense to be the Integrated Photonics Institute for Manufacturing Innovation (IP-IMI), and should be focused on the economic development of the photonics industry, particularly in Rochester as identified by Governor Cuomo.



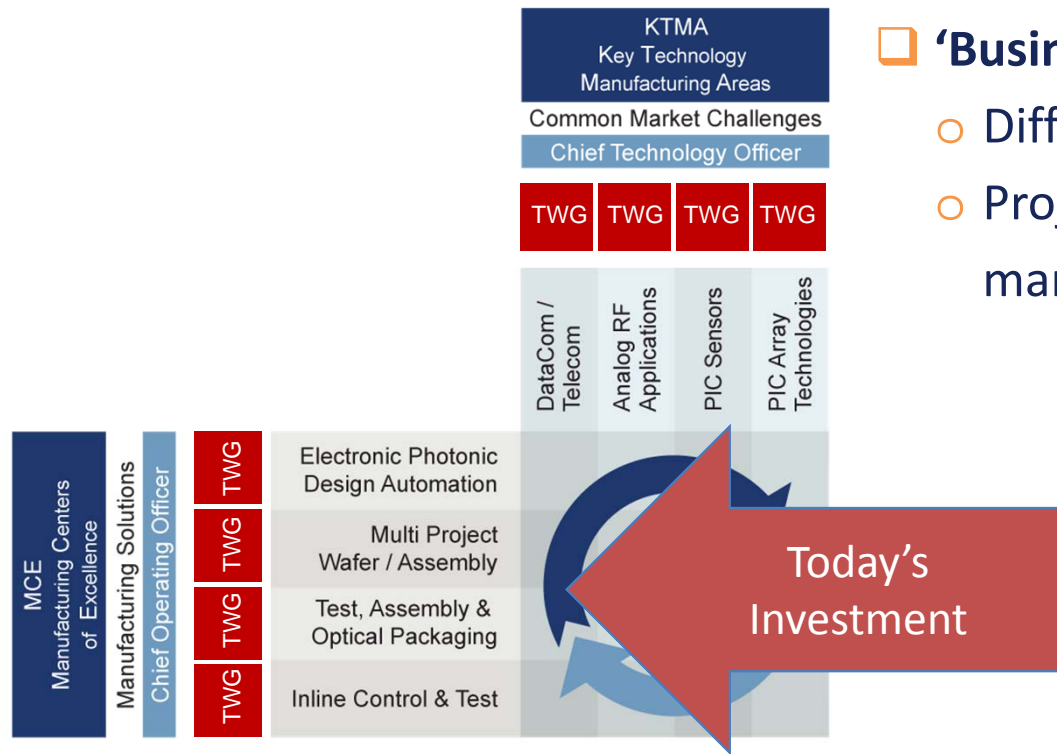


Budget Summary

- New York State committed \$250M to the American Institute for Manufacturing integrated Photonics (“AIM Photonics”) program centered in Rochester, New York.
- The total 5-year AIM budget is \$612,877,000 with the federal government committing \$110 million and the state and other parties including private sector companies providing the balance of \$502,877,000.
- The draft budget proposes expenses that cover a period that will end on or about April 1, 2017.
 - It proposes the first tranche of state expenditure of \$106 million.
 - Overall, the capital budget is front end loaded to allow for the purchase and installation of equipment and tools that will be used for many years.
 - The budget calls for \$11 million to be spent on operating and maintenance costs and \$95 million to be spent on capital.

30 current members, >100 interested parties from 27 states





□ 'Business Units'

- Different market application segments
- Projects as drivers to advance manufacturing capabilities

□ 'Manufacturing & Design Platforms'

- Maturation of integrated photonic ecosystem
- Baseline capabilities
- Maximize synergy across manufacturing capabilities and 'businesses'

□ Plus: Education and Workforce Development



AIM Mission and Hub Capability

AIM Photonics is to build a nation-wide ecosystem in integrated photonics manufacturing technology aiding U.S. industry to compete effectively.

We are expanding upon existing assets to build an entire supply chain capable of attractive large enterprises as well as supporting SMEs, academia and federal government.

Capability	Result	Participating Core Members*
Electronic-photonic design automation		MIT, UR , UCSB, UC Berkeley
State-of-the-art wafer fabrication and stacking		Albany
High-speed Test, Package and Assembly		Rochester TAP , RIT, Columbia, U Arizona
In-line Control for manufacturability		Rochester TAP , Albany
Education and workforce development		MIT, UR , RIT, UCSB MCC , QCC

* Academic only

Rochester capabilities to be established

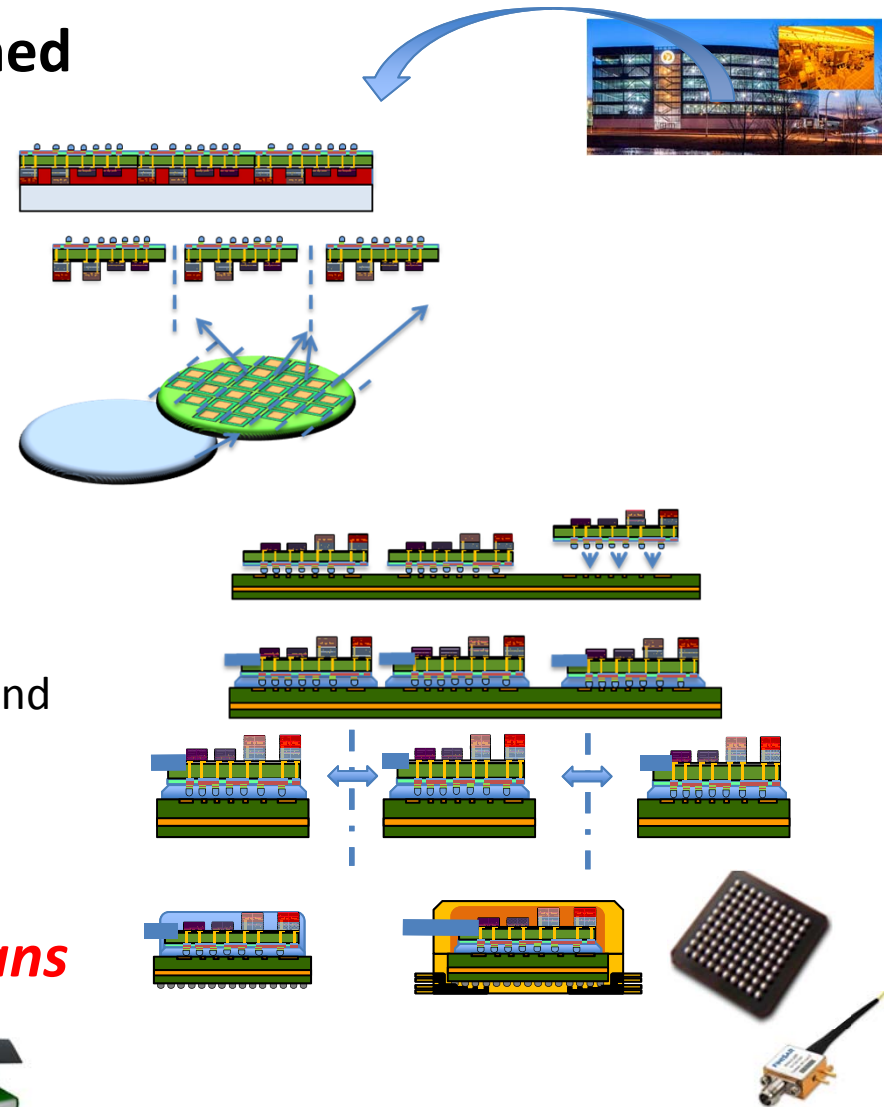
1. *Wafer-scale* photonics packaging
 - First-level interposer metallization
 - De-bond and dicing of wafers

70-80% of the cost of a Si-photonic system is in the package

2. *Chip-scale* test, assembly and packaging
 - Laminate and fiber attach
 - Manufacturing technology development and hardware support

The industry is lacking trained engineers as well as skilled technicians

3. Education and workforce development



MUV Lithography Exposure
Coat/Dev Track
Overlay Metrology
CD Metrology and 3D Inspection
Thick Organics Stripper
Physical Vapor Deposition metallization
Electrochemical Deposition with Analysis for Sol
Wet Etch
Plasma Enhanced Chemical Vapor Deposition for Insulators
Annealing Oven
Reflow Oven
Bake Oven
Adhesive/Underfill Dispense
Silicon Thickness Measurement
Laser Scribe
Wire Bonder
Wafer Saw
Package Saw
Molded Underfill
Post-mold Cleaner
Ball Attach Tool
Flux Cleaner
Pick & Place
Shear & Pull Tester
Wire Bonder
Flip Chip Bonder

Imaging

Films

Bond and Package

Photonic Chip Packaging

Photonic Assembly and Control	
Analog Signal Generator	
Arbitrary Waveform Generator	
Booster Amplifier	
Chassis for Arbitrary Waveform Generator	
Device Parameter Analyzer	
High-Definition Oscilloscope	
High-Performance BERT	
In-line amplifier	
Lightwave Component Analyzer	
Lightwave Multimeter	
Lightwave Probe LWP	
Microscope for Epi-Fluorescence XY Platform	
Motorized Micromanipulator Assembly	
Motorized Physiology Stage	
Optical Attenuator	
Optical modulators 10 gbps	
Optical modulators 20 gbps	
Optical modulators 40 gbps	
Optical Preamplifier	
Optical Spectrum Analyzer	
Oscilloscope	
Photodetector 50 Ghz	
Photodetector 70 Ghz	
RFIC & Wedge Probes	
Scientific camera	
Signal Analyzer	
Tunable Laser Low SE	
Tunable Laser Source	
Tunable Laser with power meter 4 Chnl WDM	
Vacuum Tips	
3-axis motorized translational stages 12mm	
3-axis motorized translational stages 25mm	
3-axis motorized translational stages 50mm	
Active Fiber Attach	
Fiber Cleavers - Laser	
Passive Fiber Attach	
Aqueous Board Cleaner	
Atmospheric Plasma	
Cure Oven	
Desiccant Dry Cabinets	
Drying oven	
ESD Stations	
Freezers	
Refrigerator	
Sub-zero freezer	
Hand soldering stations	
Ionograph	
SMT Line	
Characterization and Alignment	
Confocal Scanning Acoustic Microscope	
Digital Microscope	
High accuracy Comparator	
Inspection Microscope	
Interferometer	
IR Microscope	
Optical Backscatter Reflectometer	
Reflectance Spectrometer	
Spectroscopic Ellipsometer	
Stereo Microscope	
X-ray Fluorescence System	

Chip Scale Test

Fiber attach

Metrology

Automated wafer prober for electro-optical test
Automated wafer tester for electro-optical test
Chip Inspection System
Datacom and Telecom Receivers
Extender Modules 140GHz-12
Extender Modules 140GHz-8
High-Definition Oscilloscope
LN Modulator
Microwave Network Analyzer
Multi-Port Data Generator/Data Analyzer
Optical Amplifier
Optical Modulation Analyzer
Optical Modulation Analyzer MCS
Optical Modulation Analyzer QAM
Optical Transmitter
ParBERT
Photodetector 100Ghz
PLC Connections
Power and Energy Meter Console
Precise Motion Systems
Probe Station
Synchronization Hub AWG
Synchronization Hub RFX
UV-VIS Spectrometer
Waveform Generator (AWG)
Floor Management Software
Ultrasonic Bath
UV Exposure System
Wafer Dicing Tape Frame Applicator
Wafer Ink System
Dispensing, Assembling, Marking and Packaging
Scanning Electron Microscope
X-ray Scanning Tomography System
Automated Die and Bond Testing
Digital Image Correlation
Digital Scanning Calorimetry
Optical Vector Analyzer
Stereo Microscope
Stress Screening System

Performance Test

Analysis

High Speed Test

1st Phase Facility Concept

SPACE	AREA (sqft)
Laboratory	5,500
Cleanroom: Class 1,000 * incl. class 100/10 minienvironment	10,500

Multi-user, easy access environment

* *Vibration specs need to be met*
Chemical storage, use and disposal





AIM TAP Facility Requirements

General Site

Offices	50	AIM Personnel, Trainees and Customers / Members
Parking	80	AIM Personnel, Visitors, Meeting Attendees
Meeting Rooms	6-8	Visitors, Training Rooms, desired: Auditorium
Access	Must	Facility secure at the bldg perimeter
	Must	Ease of access for unplanned visits
	Must	Ease of access for group training or group meetings
	Must	Parking (see above) proximate to the bldg
	Want	Ease of access to food
Appearance	Want	Appearance that projects technical and professional confidence

Process Chemicals / Utilities

Conceptual Toolset Specialty Services					
Acid Exhaust	6,672	cubic feet per minute	Industrial City Water	26	gallons per minute
Acid Waste	85	gallons per minute	Low Purity Nitrogen	147	average cubic feet per minute
Base Exhaust	1,516	cubic feet per minute	Make-Up Air Unit	22,767	cubic feet per minute
Cabinet Exhaust	1,689	cubic feet per minute	Process Chilled Water	436	gallons per minute
Compressed Dry Air	545	average cubic feet per minute	Process Vacuum	54	average cubic feet per minute
*CDU/HPM Exhaust	528	cubic feet per minute	Solvent Exhaust	1,848	cubic feet per minute
Fluoride Waste	7	gallons per minute	Ultra-Pure Argon	18	average cubic feet per minute
Heat Exhaust	11,438	cubic feet per minute	Ultra-Pure Hydrogen	6	average cubic feet per minute
High / Low Purity Oxygen	12	average cubic feet per minute	Ultra-Pure Water	11	gallons per minute
High Purity Nitrogen	303	average cubic feet per minute			

**Chemical Distribution Unit / Hazardous Production Materials*



- Corporate end users
 - Explore prototype development using the state of the art tool set
- Equipment suppliers
 - Establish equipment evaluation programs
 - Encouraged to establish a production base and/or application lab
- Foundries
 - Establish joint development programs with AIM
- Packaging service providers
 - Evaluate equipment for suitability for manufacturing
 - Investigate standards that facilitate industry growth
- Component providers
 - Industry users to evaluate their component in integrated photonic assembly
- Start-ups
 - Access a very capital intensive infrastructure via low entry barrier vehicles
- Universities and Colleges
 - Access for faculty projects and student training coordination



AIM NY-State FY 2016/17 Funding Request

2016 Request Item	[\$M]
Capital	
Rochester Photonics Assembly Equipment and Install:	\$ 7
Rochester High Speed Optical Test Equipment and Install:	\$ 13
Facility Upgrades for above:	\$ 11
Wafer Scale Metallization and Optical Fiber Package:	\$ 32
Cleanroom Facility Upgrades for above:	\$ 17
High Speed Optical Packaging Technology License:	\$ 10
Wafer Test and Wafer-scale Laser Attach Equipment:	\$ 5
TOTAL CAPITAL	\$ 95
Operations and Maintenance	
Education and Workforce Development (UR, RIT, MCC):	\$ 1
R&D Project State Match (RIT, UR):	\$ 2
AIM Operating Wafer, Test, Package and Assembly Budget:	\$ 7
2015 AIM Start-up Fund:	\$ 1
TOTAL O&M	\$ 11

Ratio Rochester : Albany funds = 96:10