

SEMI MSIG Positioning, Navigation, and Timing (PNT) RFP 2024 (PNT22 YEAR 3) Proposal Webinar



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September 6, 2024

R&D FUNDING FOR POSITIONING, NAVIGATION & TIMING MEMS & SENSOR SOLUTIONS

Webinar Agenda

- SEMI MSIG Introduction [10 minutes]
- RFP 2024 (PNT22 YEAR 3) Presentation [25 minutes]
- General Q&A [10-25 minutes]

Yes, we will share the webinar slide deck with all registered attendees!



SEMI MEMS & SENSORS INDUSTRY GROUP (MSIG) Overview

TIM BROSNIHAN, PhD | Executive Director

PAUL CAREY, PhD | Director

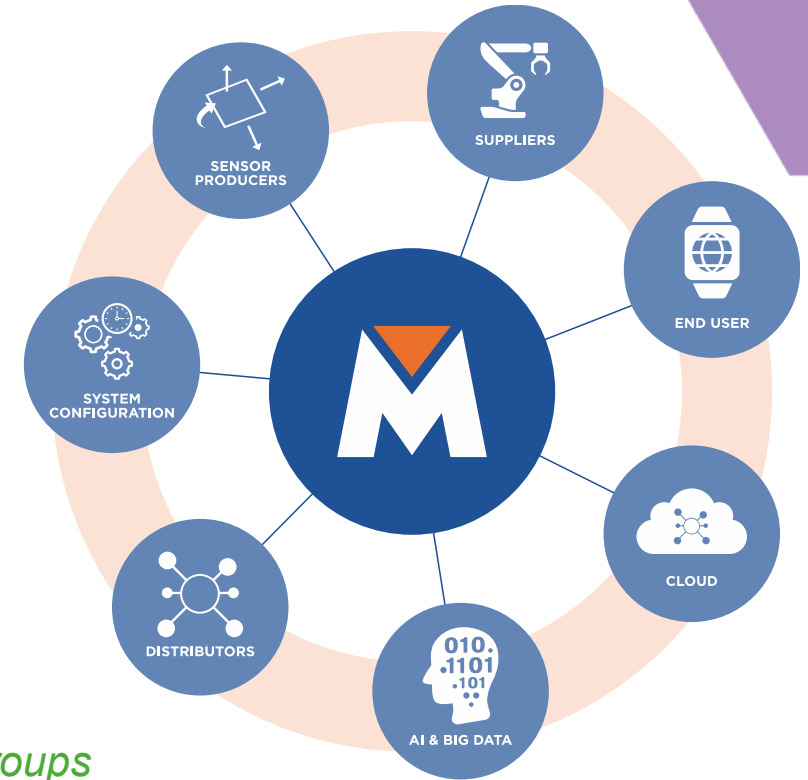
SARAH SHEN | Program Coordinator

SEMI

- **THE** premier global semiconductor trade organization
- 3000+ member companies
- Your gateway to the semiconductor ecosystem

MEMS & Sensors Industry Group—MSIG

- 200+ member companies worldwide
- **Value Proposition**
 - Education + **Networking**—*Conference + events*
 - Promotional Opportunities—*SEMI blogs, webinars, social media*
 - Collaborative Problem-Solving—*Industry task forces and workgroups*
 - R&D Funds—*\$25M 5-year (2022–2027) in positioning, navigation, and timing sensors*
 - New Opportunities + Markets—*e.g. Biz Dev in Smart Cities*
- **Get better business results faster!**




















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MSIG Events

2024 MSIG Program Calendar

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	
MSIG GC	MSIG GC Meeting			MSIG GC Meeting			MSIG GC Meeting				MSIG GC Meeting		
Federal R&D Program	PNT GC/TAC	PNT GC/TAC	PNT GC/TAC					TC Executive GC Meeting		PNT GC/TAC			
	PNT22 Quarterly Project Reviews												
	PNT23 Full Proposals Ranked, New Projects Awarded, Annual Program Plan to ARL			PNT23 Contracting			PNT23 Quarterly Project Reviews						
				PNT24 Gap Analysis			PNT24 Activities: RFP Announcement, White Paper & Full Ranking, Award Notification, Annual Program Plan to ARL						
Community Engagement & Promotion		MSIG Webinar	MSIG Webinar	MSIG Webinar		MSIG Webinar	MSIG Webinar		MSIG Webinar	MSIG Webinar		MSIG Webinar	
			Quarterly Newsletter			Quarterly Newsletter			Quarterly Newsletter			Quarterly Newsletter	
	Monthly Workgroup Meetings: Device, Manufacturing, Reliability, Smart City + MSIG Promotion, Outreach, Blogs and Happy Hours												
Events	 AUSTIN, TEXAS 21-25 JANUARY THE 5TH IEEE INTERNATIONAL CONFERENCE ON MICRO-ELECTRO-MECHANICAL SYSTEMS Jan 21 – 25 Austin, TX			 April 4/14-4/16 Shenzhen	 May 1-2 UCLA	 June 2-6 Hilton Head, SC				 Sept. 4 - 6 Taipei, Taiwan	 Oct. 7-9 Bromont, Quebec, Canada	 November 12 - 15 Munich, Germany	
	 Jan 31 – Feb 2 Seoul, Korea		 FPDCHINA Mar 20 – 22 Shanghai, China	 April 4/14-4/16 Hamburg, Germany	 May 28 - 30 Penang, Malaysia	 June 24-26 Santa Clara	 July 9-11 San Francisco, CA		 Sept. 11 - 13 Greater Noida, Delhi, India	 Oct 23-25 Suzhou, China	 Nov 14-15 Munich, Germany	 Dec 11 - 13 Tokyo, Japan	



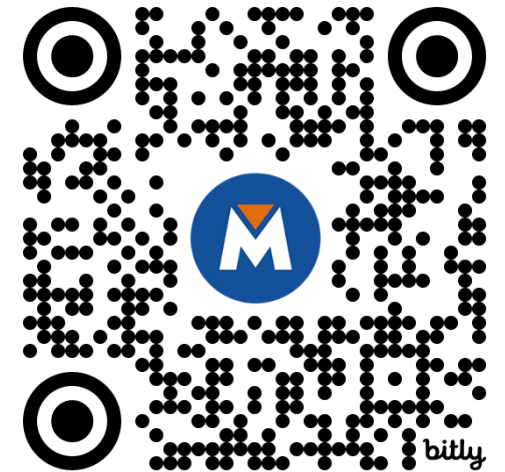
Promotional Opportunities

MSIG MEMBER COMPANY PROMOTION

GOALS

- Promote sensor products, services + applications
- Educate our community on the latest MEMS + sensors technology

- Events
 - Speaking Opportunities
 - Networking
- Webinars
- Blogs
- Articles
- Social Media Posts



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MORE**

Webinar Goals:

- Educate the sensor community (member + non-members)
- Reach a large audience (>200)

2024 MSIG Webinars (since March)

1. Enabling PiezoMEMS Applications for today and tomorrow

- Date: March 27, 2024 (8-9am PDT)
- Presenter: Arjen Janssens (Lam Research)
- Registered: **370**



2. Advanced SiC Processing to Enable Future Technology in the AI, MEMS, Sensors, Automotive, and Semiconductor Industries

- Date: June 27, 2024 (8-9am PST)
- Presenters: Catherine Bullock & Dan Trojan (Axus Technologies)
- Registered: **409**



3. SEMI MSIG Positioning, Navigation, and Timing (PNT) RFP 2023 Proposal Webinar

- Date: September 6, 2024 (8-9am PDT)
- Presenters: Paul Carey & Tim Brosnihan (MSIG)



4. Accelerating Piezoelectric MEMS Product Development

- Date: September 18, 2024 (8-9am PDT)
- Presenters: Andrew Fung (AMFitzgerald) & Mario Kiuchi (MEMS Infinity, Sumitomo)



**Piezo Webinar
Registration**

Problem Solving

MSIG COLLABORATIVE PROBLEM-SOLVING

MEMS MANUFACTURING TASK FORCE

MISSION: Develop, document, and present best-known methods for taking MEMS prototypes to volume manufacturing

CURRENT FOCUS: MEMS Manufacturing Readiness Document



MMTF CHAIR
Michelle Bourke
Senior Director
LAM RESEARCH

MEMS DEVICE TASK FORCE

MISSION: Develop technical specifications, industry standards, and best practices for MEMS and Sensor devices and platforms

CURRENT FOCUS: Gas & Environmental Sensors

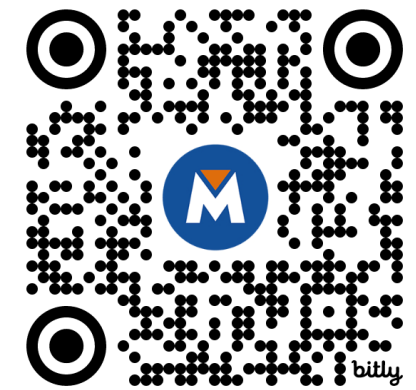


MDTF CHAIR
Radislav Potyrailo
Principal Scientist
GE GLOBAL RESEARCH



Help Spread the Word!

- Joining and participating in Industry Groups is important:
 - Build your network
 - Fix problems together
 - Good exposure for you and your company
 - Leads to new personal, professional and business opportunities
 - Amplifies your voice (within industry and to Government)



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Participate! Participate! Participate!



Back to Today's PNT RFP Webinar

R&D FUNDING FOR POSITIONING, NAVIGATION & TIMING MEMS & SENSOR SOLUTIONS

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- RFP 2024 (PNT22 YEAR 3) Presentation [25 minutes]
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SEMI MSIG PNT RFP 2024

SEMI MSIG PNT R&D Program: (Partner is ARL)

PNT R&D Thrust Areas:

Thrust Area 1: Novel Materials, Fabrication, Testing, and Packaging Techniques for Low-SWaP Inertial and PNT Sensors

Thrust Area 2: Advanced Active and Passive Integrated Photonics for Low-SWaP Atomic Clocks, Quantum Systems, and PNT Sensors

Thrust Area 3: Advancements Towards Low-SWaP, GPS-Free PNT Technologies

PNT Program Overview:

Phase I (2020-2022): 10 Projects

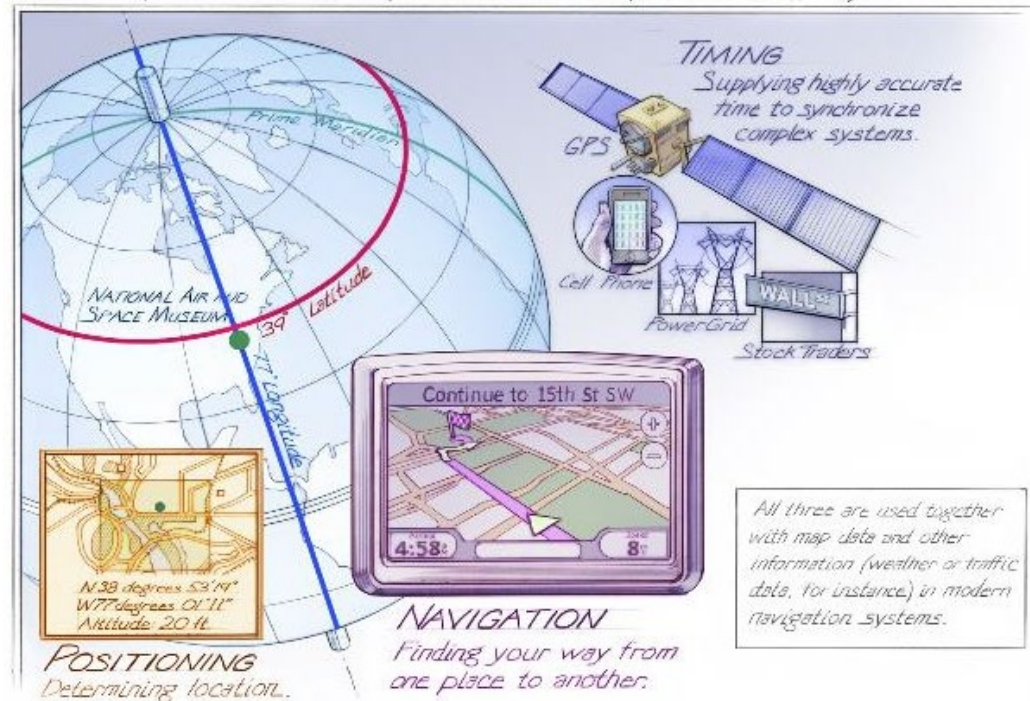
- \$6.1M (\$15.2M with Cost Share) **[DONE]**

Phase II (2022-2027) **[ON GOING]**

- 5 Years @\$5M/year (total \$25M, \$50M+ w/cost share)
- 2024 Activities:
 - YEAR 1: **9 projects – finishing up**
 - YEAR 2: **10 projects - starting**
 - September: 2 projects started, 8 pending
 - YEAR 3 (**This RFP**):
 - 4/30/24: Gap Analysis Workshop at UCLA
 - 8/19/24 & 9/4/24: PNT RFP 2024 announced
 - Projects to begin in Q2'25

PNT: Positioning, Navigation, and Timing - dual use technology good for both private and public sectors

PNT (POSITIONING, NAVIGATION, AND TIMING)



SEMI-MSIG PNT22 YEAR 1 Projects: Budgets and Timelines

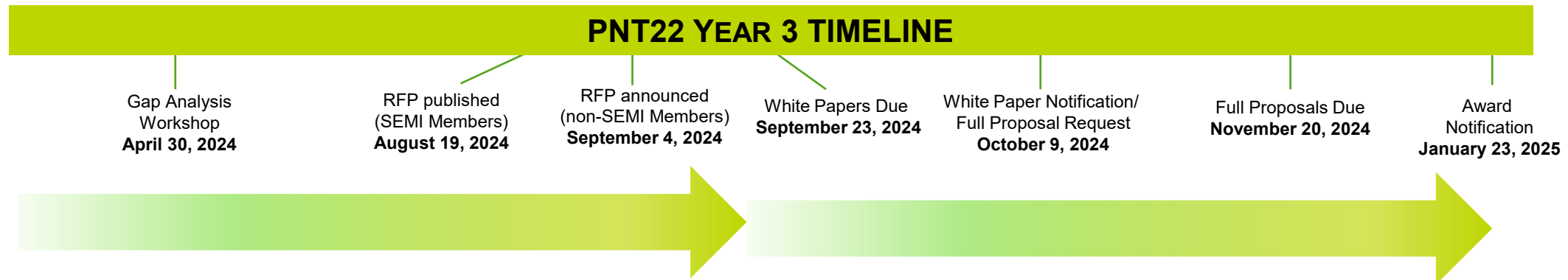
Item	Lead Institution	SEMI/ARL Share (\$)	2022	2023				2024				2025
			Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1
1	PARC	\$ 649,076			Photonic Integrated UV Lasers for Next Generation PNT Systems							
2	Honeywell (IMU Calibration)	\$ 330,254			In-Field IMU Calibration: Differentiable Filters for Navigation Systems							
3	Honeywell (3D Package)	\$ 329,539			Universal 3D Package for MEMS Gyroscopes and Accelerometers							
4	Nexus Photonics	\$ 560,041			GOALE: General Opto-Atomic Laser Engine							
5	ColdQuanta	\$ 375,000			Photonically Integrated Vacuum Optical Technologies (PIVOT)							
6	Georgia Tech	\$ 650,176		Piezo-Capacitive Nano-Gap 4H SiCOI MEMS Platform for Ultra-High-Performance Inertial Sensors and Timing Resonators								
7	GE Research	\$ 550,000			Low-Cost Navigation-grade MEMS Fabrication Platform to Enable PNT Innovations							
8	Teledyne Scientific	\$ 495,275			NAVIGATION GRADE INTEGRATED INERTIAL SENSOR MODULE							
9	Purdue	\$ 347,780			An Optomechanical Z-Axis Accelerometer							

SEMI MSIG PNT22 YEAR 2 Projects						
Item	Title	Thrust Area Topic	Organization	SEMI Funds	Project Duration (months)	Multiphase Project (#)
1	Novel Integration of Thin Film Stiction Reduction for Low-SWaP-c and High G Inertial Sensors	1	Forge Nano	\$ 250,000	8	No
2	Photonicallly Integrated Vacuum Optical Technologies (PIVOT)	2	Infleqtion	\$ 608,029	12	Yes (2)
3	High-Performance Ovenized BAW Gyroscope in 4H-SiC	1	Georgia Tech	\$ 636,404	12	No
4	Machine Learning Enhanced Dynamic Self-Calibration for Navigation Grade MEMS IMU	3	Northrop Grumman	\$ 474,460	9	No
5	ULTRA-HIGH TEMPERATURE STABILITY CSAC UTILIZING DUAL-VAPOR CELL TECHNOLOGY	2	Teledyne CSAC	\$ 209,000	10	Yes (2)
6	Compact UV/VIS Chip Lasers for Next Generation Atomic Clocks	2	SRI	\$ 674,971	12	No
7	Supercharged MEMS ML: Unlocking Limited-Data Training with Synthetic Data Augmentation and Family Foundation Models	3	Honeywell	\$ 180,000	6	No
8	Low-Cost Navigation-grade MEMS Fabrication Platform PDK Development	1	GE Research PDK	\$ 249,999	15	No
9	PRECISION FREQUENCY TRIMMING OF MEMS INERTIAL SENSORS	3	Teledyne Trimming	\$ 249,326	12	No
10	Miniaturized High-Stability IMU with ML-Based Adaptive Navigation Filter	1	Analog Devices	\$ 670,000	12	Yes (3)



multiphase proposals =

- **Objective:** advance the **US PNT supply chain** for both manufacturing and future development opportunities
- **Project Teams:** collaboration among organizations is **encouraged** (companies, start-ups, universities, research institutes)
- **Deliverables:** Concept demonstrations (demos) as part of the deliverables are highly encouraged
- **Awards:**
 - Range: \$200K – \$750K
 - Cost Share: additional matching cost share (in-kind, monetary) from award recipient(s)



- **Yes - More Thrust Area 1 Testing & non-PFAS anti stiction proposals sought:**
 - Brought up at last 2 Gap Analysis Workshops
 - MSIG encourages proposals from MEMS/IMU testing companies & anti stiction experts
- **Multi-phase Projects:**
 - Multi-phase project proposals can be submitted
 - Current project phase durations have ranged from 9-18 months.
 - Can submit more than two phases, but only first phase is considered funded
 - The same cost share (at least 50%) rules apply to multi-phase project proposals.
 - Subsequent phases are considered as unfunded options, and unfunded options are not guaranteed:
 - Budget Range: each phase should be in the same \$200-\$750K range as one phase projects.
 - Unfunded Option Approval Process (decided by PNT GC & ARL):
 - Best Case: no need to write another full proposal
 - Worst Case: need to write another full proposal
 - Unfunded Award Amount: If the unfunded option years are subsequently awarded, the funded amount may differ from the original request (depends on the available funds for that funding round).
 - Bottom line: it's "yours to lose" if a multiphase award is accepted – but dollar amount & SOW may change

What Happens Next?

- **9/23/24:** white paper proposals collected at msig-rfp@semi.org (5PM PDT)
- **9/23/24-10/7/24:** white paper proposals ranked by:
 - SEMI MSIG PNT Technical Advisory Council (TAC)
 - SEMI MSIG PNT Governing Council (GC)
 - DARPA & ARL subject matter experts (SME's)
- **10/9/24:** white paper project teams notified whether or not to submit full proposals
- **11/20/24:** full written proposals due
- **11/20-12/14/24:** full proposal ranking by:
 - SEMI MSIG PNT Technical Advisory Council (TAC)
 - SEMI MSIG PNT Governing Council (GC)
 - DARPA & ARL subject matter experts (SME's)
- **1/23/25:** award notification

Current PNT GC & TAC

2024 SEMI MSIG PNT Consortium Members			
Item	Contact	Company	Category
1	Sam Zhang	Analog Devices	PNT GC
2	Craig Aykroyd	NXP	PNT GC
3	Stephane Martel	Teledyne	PNT GC
4	Bob Filkins	GE Research	PNT GC
5	Gary O'Brien	Northrop Grumman	PNT GC
6	George Hsu	PNI Sensor	PNT TAC
7	Mary Ann Maher	SoftMEMS	PNT TAC
8	David Lin	GE Research	PNT TAC

SEMI MSIG PNT GC and TAC Member Activities

- **PNT Technical Advisory Council (TAC): SEMI members - no additional fee to join**
 - Attend quarterly meetings
 - Invited to all currently funded PNT quarterly project reviews
 - Reading and ranking PNT RFP white papers and full proposals
 - Make funding recommendations
 - Example current members: GE Research, SoftMEMS, PNI Sensor
- **PNT Governing Council (GC): SEMI members - \$5k additional yearly fee to join**
 - Attend quarterly meetings
 - Invited to all currently PNT quarterly project reviews
 - Attend the high-level yearly SEMI/DoD strategy meeting
 - Last 4: Washington DC (Nov-2021), Seattle WA (Aug-2022), Detroit (Aug-2023), San Diego (Aug-2024)
 - Reading and Ranking PNT RFP White Papers and Full Proposals
 - Make funding recommendations
 - Review TAC & SME funding and project recommendations
 - **Final PNT Proposal arbiters** - make final decision on which projects receive funding
 - Example current members: NXP, ADI, GE, Teledyne, Northrop Grumman



Note: Currently Open to adding new PNT TAC & GC member companies

In recent decades, both the U.S. military and civilians have relied on global positioning system (GPS) satellites to provide accurate PNT data. However, GPS is not always available and is vulnerable to jamming and spoofing. ARL DEV/COM has been investigating and developing technologies that enable low size, weight, power, and cost (SWaP-C) PNT solutions for operation in GPS-contested or –denied environments. The PNT22 YEAR 3 R&D work will build on the existing MSIG PNT Program and again focus on the following 3 thrust areas:

- **Thrust Area 1:** Novel Materials, Fabrication, Packaging, and Testing Techniques for Low-SWaP Inertial and PNT Sensors
- **Thrust Area 2:** Advanced Active and Passive Integrated Photonics for Low-SWaP Atomic Clocks, Quantum Systems, and PNT Sensors
- **Thrust Area 3:** Advancements Towards Low-SWaP-C, GPS-Free PNT Technologies

Thrust Area 1:

Novel Materials, Fabrication, Packaging, and Testing Techniques for Low-SWaP Inertial and PNT Sensors

Novel Materials, Fabrication, Packaging, and Testing Techniques for Low-SWaP Inertial and PNT Sensors

The purpose of this solicitation is to fund a recipient, a single team, or multiple recipients and teams to conduct an R&D effort to develop and demonstrate novel microfabrication process modules to enable low-SWaP-C inertial and PNT sensors.

Examples:

- Lower cost, lower power, and more universal testing kit (e.g. lower SWaP-C or chip-scale locking amplifiers or other test equipment)
- Broadly accessible state-of-the-art testing facility and service
- Techniques and process equipment for *in-situ* surface oxide removal and deposition of anti-stiction (non-PFAS) and anti-dielectric-charging coatings for MEMS PNT devices
- High-aspect-ratio etching (“Bosch”-like) processes for silicon carbide (SiC) and fused quartz inertial sensors
- High-Q, low-loss piezoelectric materials (e.g. AlN, PZT) compatible with silicon inertial sensor production processes; high-Q, low-loss piezoelectric composites and electrode materials;
- Atomic layer deposition/etching to enhance PNT sensor performance
- Wafer-level vacuum packaging for rapid PNT sensor prototyping and enhanced performance
- Heterogeneous integration of photonic components (i.e. multi-chip photonic modules)
- Through-package photonic interconnects.

SWaP-C = Size, Weight, and Power AND Cost (reducing the overall dimensions, weight, and cost of a device while increasing its efficiency)

Novel Materials, Fabrication, Packaging, and Testing Techniques for Low-SWaP Inertial and PNT Sensors

Last 2 Gap Analysis Workshops - Summary of Discussion/Recommendations

Gap Analysis Summary: Thrust Area 1				
Item	Inertial MEMS Testing	Packaging Challenges	New Materials	Modeling/Simulation
1	Performance Metrics	miniaturized stress isolation solution	Piezoelectric (ALD): PZT, AlScN, limited in thickness, integrate with other materials	AI to help identify long term gyro bias drift
2	Platform dependent (size, application)	3D packaging	Fused Silica, 3D (high Q), Conductor (metal layer), electrode integration, wafer level glass blowing, repeatability, new equipment, process for glass blowing	AI to help identify root cause of packaging stress
3	No standard test protocol/facility	Packaging Materials: low stress, die attach, stable	Non-metallic electrode	
4	post-Fab trimming	Measurement Stress: compensation and correction	physical trimming	
5	Performance under harsh conditions	vibration	anti-stiction coating for high temperature: low g accelerometer, anti-charging	
6	test cost reduction, test method	better He barrier for vacuum packaged devices	anti-stiction (non-PFAS) for MEMS devices	
7	accelerated life test	Improved SiC packaging to eliminate bias shift		
8	machine learning (ML) coupled with AI			

Thrust Area 2:

Advanced Active and Passive Integrated Photonics for Low-SWaP Atomic Clocks, Quantum Systems, and PNT Sensors

Advanced Active and Passive Integrated Photonics for Low-SWaP Atomic Clocks, Quantum Systems, and PNT Sensors

The purpose of this solicitation is to fund a recipient, a single team, or multiple recipients and teams to conduct an R&D effort to develop and demonstrate advanced lasers and integrated photonic systems compatible with low-SWaP-C atomic clocks and PNT sensors.

Theory and modeling, material growth and characterization, laser fabrication, system design, and manufacturability should be considered for the following areas of interest:

- Two lasers with different wavelengths on the same PIC chip, which are suitable for atomic spectroscopy / clock measurements
- Improved manufacturability of passive PICs that can support two dissimilar wavelengths
- High quality photonic wire bonding capability
- Heterogenous integration of dissimilar active material/devices on the same PIC
- Low-SWaP, narrow-linewidth lasers for microwave and optical atomic clocks
- Active/passive photonic integrated circuits (PICs) and PIC elements (including phase modulators, switches, detectors, isolators, etc) for cold atom clocks and inertial sensors
- Photonic and RF low-loss and low-noise interfaces, low-loss, on/off-chip, or PIC-to-PIC coupling techniques

Advanced Active and Passive Integrated Photonics for Low-SWaP Atomic Clocks, Quantum Systems, and PNT Sensors

Last 2 Gap Analysis Workshops - Summary of Discussion/Recommendations

Gap Analysis Summary: Thrust Area 2					
Item	Active Photonics	Passive Photonics	Fundamental Late-Stage Non-Differentiating Areas	What's Lacking	Early Stage-Stage Challenges
1	Feedback insensitive lasers	Interfacing I/O to PICs	Fabrication to testing	ability to design epitaxial layers	Monolithic integration
2	High-speed tuning of PIC-based lasers	Optical Isolators	Manufacturability testing	process GaN device (all III-V)	thin film lithium niobate, III-nitrides, BTO, SiC, AlD coatings
3	Multiple wavelength lasers on a single PIC	Large area out-couplers	General integration of packaging techniques	Shorter wavelength material to replace SiN (deposition and etch)	custom vapor cells and physics package design and testing
4	Integrated or integratable optical amps	PIC integrated micro-optics	Environmental qualification and life-testing of PIC based laser systems	High power optics for visible and UV	
5	Manufacturable chip-scale frequency combs	General approaches to stray light mitigation	Photonic wire bonding	narrow 780nm lasers, non-magnetic isolators, 1550nm WDM	
6	Detectors		Access to commercial instrumentation, testing, and fabrication of package components		
7	High finesse optical cavities				
8	High efficiency frequency converter				
9	Modulators (reliable lithium niobate fab)				

Thrust Area 3:

Advancements Towards Low-SWaP, GPS-Free
PNT Technologies

Advancements Towards Low-SWaP, GPS-Free PNT Technologies

The purpose of this solicitation is to fund a recipient, a single team, or multiple recipients and teams to conduct an R&D effort to develop and demonstrate low-SWaP GPS-Free PNT sensors.

Possible topics include, but are not limited to:

- Establishing PDKs and MPW runs for MEMS foundry operation
- Sensor fusion systems for resilient GPS-free PNT
- Gravity sensors: technology that measures gravity at a level that would allow navigating with a gravity map
- Applying machine learning to navigation sensor/system calibration
- Ultra-low-SWaP oscillators targeting < 50 mW
- Novel inertial sensor designs
- Photonic integrated circuits (PICs)
- Enabling technology for low-SWaP, integrated PNT systems
- 5G/6G components and systems

Advancements Towards Low-SWaP, GPS-Free PNT Technologies

Last 2 Gap Analysis Workshops - Summary of Discussion/Recommendations

Gap Analysis Summary: Thrust Area 3		
Item	Opportunities	Description and Comments
1	New materials	in addition to SiC
2	New fab techniques	better etching, etching of new materials, deposition methods for better uniformity
3	Packaging technologies for MEMS and systems to support SWaP-C	Large area out-couplers, on-edge
4	Components and system level funding for optical technologies	Integrated or integratable optical amps
5	Timing: high performance resonators and oscillators	Manufacturable chip-scale frequency combs
6	Software: AI/ML equivalent filters	Detectors
7	Sampling methodologies	High finess optical cavities
8	Vision systems for navigators	methods for establishing ground truth with landmarks, how to get pre-mapped data, lower power vision systems, combo/fusion systems (radar & camera, IMU & vision)
9	GPS alternatives	Other satellite systems, ultra-wideband, RF, beacon references
10	Multifunctional use-material	CMOS, MEMS, ferroelectrics, ALD materials, PZT, AlN, AlScN
11	Funding foundry MPW runs	
12	Testing: development	cheaper testing hardware, benchmarking study to document MEMS test methods
13	Protype assembly and testing houses	
14	Lower power	allow more sampling on the edge

Proposal Do's and Don'ts

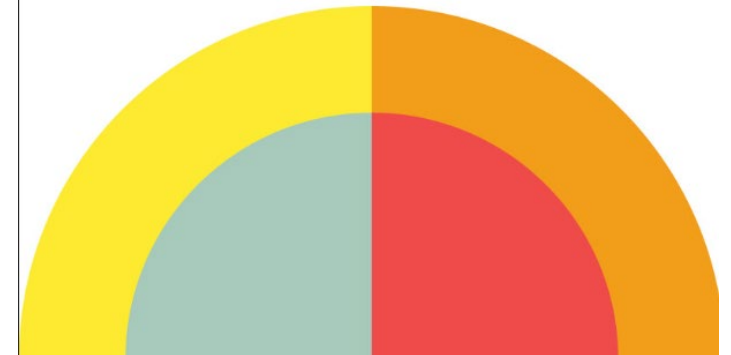
Do's:

- ✓ Project results should benefit the PNT ecosystem, not just one company
- ✓ Collaborative projects preferred (many companies is better than one)
- ✓ Address thrust area topics and pain points identified in the gap analysis workshop
- ✓ Technology must be dual use (military AND commercial)
 - This is SEMI funding after all!
- ✓ Cost sharing must be 50% or greater
 - SEMI PNT program average 57%

Don'ts:

- ✗ Propose work that is not dual use
- ✗ Propose entirely foreign-based projects
- ✗ Propose projects with no for-profit organization included

Dos and Don'ts Checklist



Diversity Statement

- At SEMI, we support efforts to build diverse and inclusive project teams and workforces
- We believe diversity and inclusion efforts foster greater innovation in the microelectronics industry
- Diverse project teams, including women and other under-represented groups, bring a more diverse problem-solving set of lived experiences

Therefore:

- Proposers are asked to **operationalize** DEI by creating diverse and inclusive teams which recognize, appreciate, and use of the talents and skills of employees from all backgrounds.
- The projects selection committee will consider team composition, with regard to diversity, when evaluating proposals.

- SEMI recognizes industry awareness is another key item to advancing the PNT ecosystem.
- This consortium-based funding **requires** participants to conduct industry awareness activities such as a short promotional video targeting high school students.



White Paper Requirements

- Length: Not to exceed 5 pages, total
- Contents:
 - Title, Team (email of PI), Cost, and Cost Share (Executive statement)
 - Proposed Idea
 - Define the problem being addressed and how the proposed idea would solve the challenge
 - Discuss the current state of the art (SOA) and the advancement the proposed idea has over SOA and its relevance to advancing or demonstrating PNT technology
 - Identify how it will move the needle on the US PNT electronics ecosystem.
 - Outline path to commercialization, application spaces for the innovation
 - High level budget (what you're spending your money on, cost share details)
 - Timeline
 - Background/experience of the R&D team
- Submit papers electronically (msig-rfp@semi.org) by 5:00 PM PDT Monday, September 23, 2024



[Download the RFP](#)

Award Requirements

- Company/team must have **significant US presence** in the form R&D activities or manufacturing
- Primary company leading the proposal must be a US-owned company (Can be waived if the development is critical to US manufacturing capability for select cases)
- **Company/team must be committed to volume manufacturing and provision to the US PNT industry on a right-of-first acceptance basis.** (Applied research conducted by universities does not need to meet this requirement but a pathway to commercialization and or licensing must be envisioned and described)
- **The company/team**, including universities, **must provide a matching share** of the development cost in cash and in-kind contributions (e.g., labor and materials), 50% or more is required
- At least one for-profit institution needs to be on the project team
- **Companies** which are selected for an award, including all partners and/or subcontractors, **must subsequently join SEMI** at the appropriate membership level.
- Companies and organizations which are selected for an award **must agree to terms and conditions** set forth in the SEMI-MSIG Development Agreement before receiving any portion of the award.
- Operationalize DEI in your project and participate in Industry Awareness with a promotional video

MSIG website:



<https://www.msg.org>

SEMI membership information:



<https://www.semi.org/en/connect/semi-membership-levels>

Email for RFP questions:



msg-rfp@semi.org

Scan the QR Codes above with your cellphone to immediately send an email or open a URL



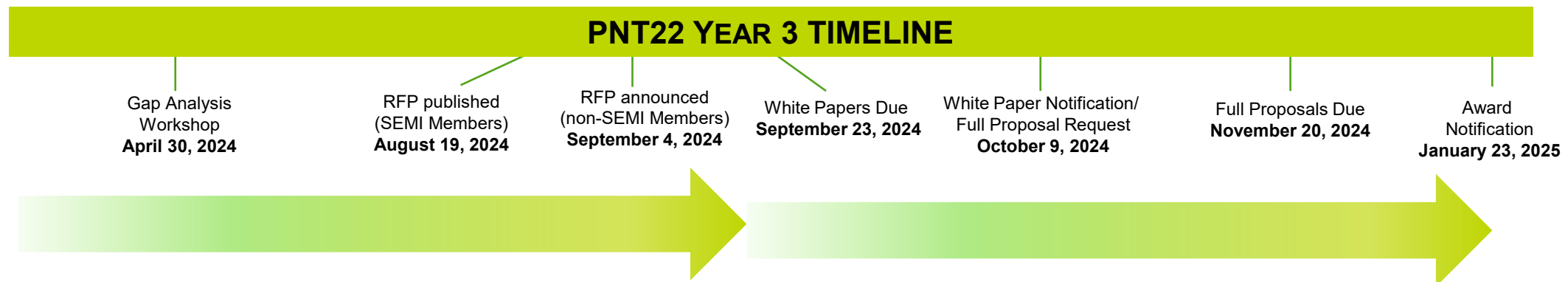
Questions?

R&D FUNDING FOR POSITIONING, NAVIGATION & TIMING MEMS & SENSOR SOLUTIONS

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- **Awards:**
 - Range: \$200K – \$750K
 - Cost Share: additional matching cost share (in-kind, monetary) from award recipient(s)





**For more information:
Contact SEMI MSIG**

Interested in MSIG PNT Funding?
Email msig-rfp@semi.org or Scan QR Code



Backup



THANK YOU