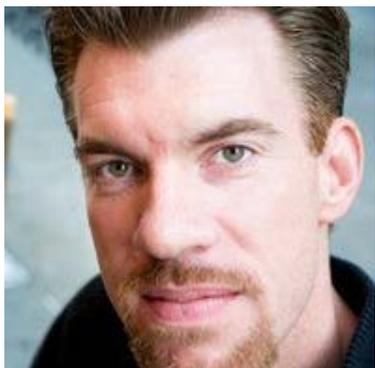

Quantum SI

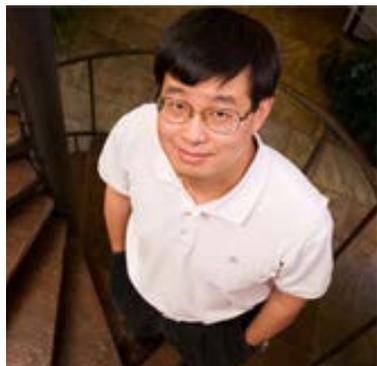
Strategic Vision Team Update

David Gundlach
NIST Program Coordination Office

The Quantum SI team



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Jun Ye (PML)



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John Kitching (PML)



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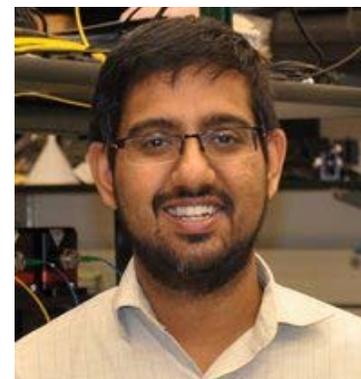
John Henry Scott (MML)



Paul Hale (CTL)



Scott Glancy (ITL)



Kartik Srinivasan (CNST)

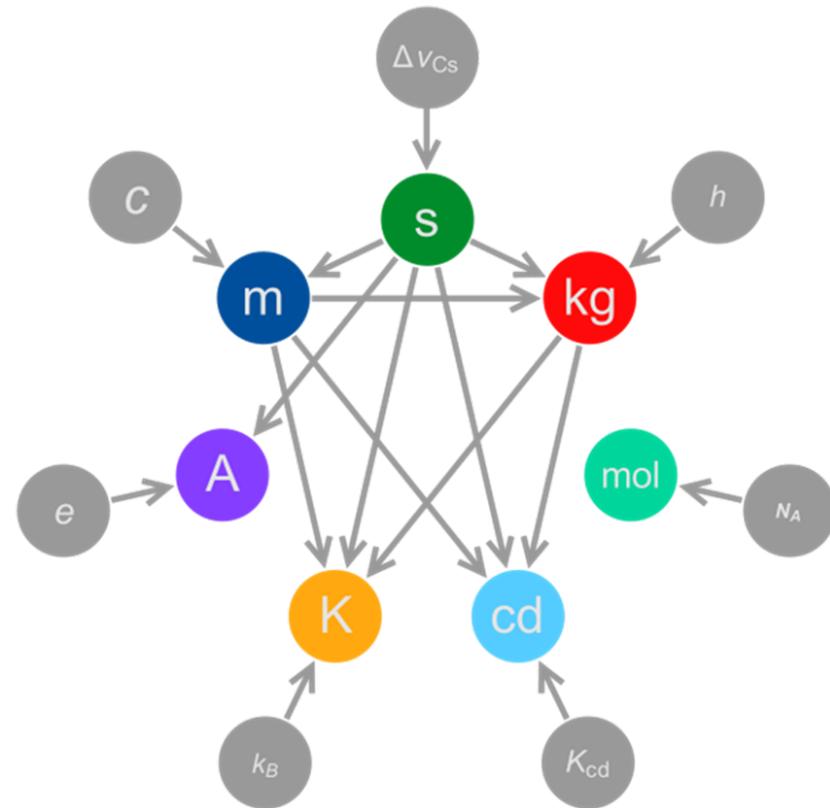


Li Piin Sung (EL)

Why now? Why NIST?

In May 2019, the SI will be recast from being based on units with reference to artifacts to being based on fundamental constants and laws of nature: the new Quantum SI.

- NIST's work in metrology has made it a leader in quantum science
- NIST is working to apply these capabilities to transform how metrology is disseminated
- These quantum measurement technologies will advance other fields of quantum science like computing and communications

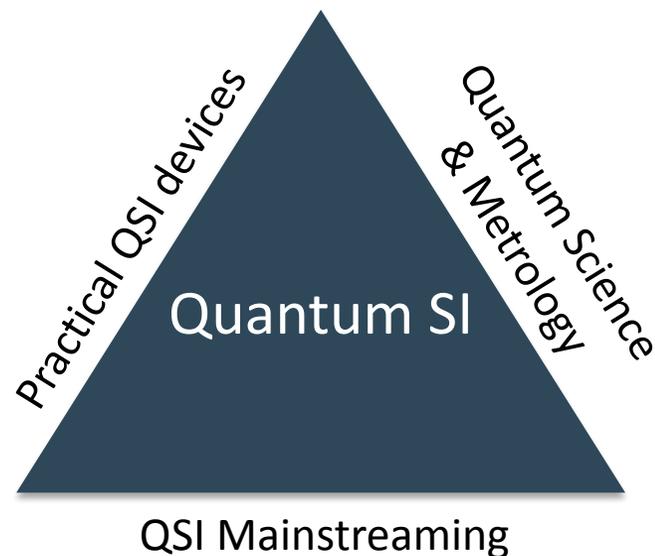


Vision and Strategies

NIST will revolutionize commerce through quantum measurement by leading the transition to the Quantum SI paradigm. This will yield transformational benefits in industrial efficiencies, safety, healthcare, and security.

Strategies for Quantum SI:

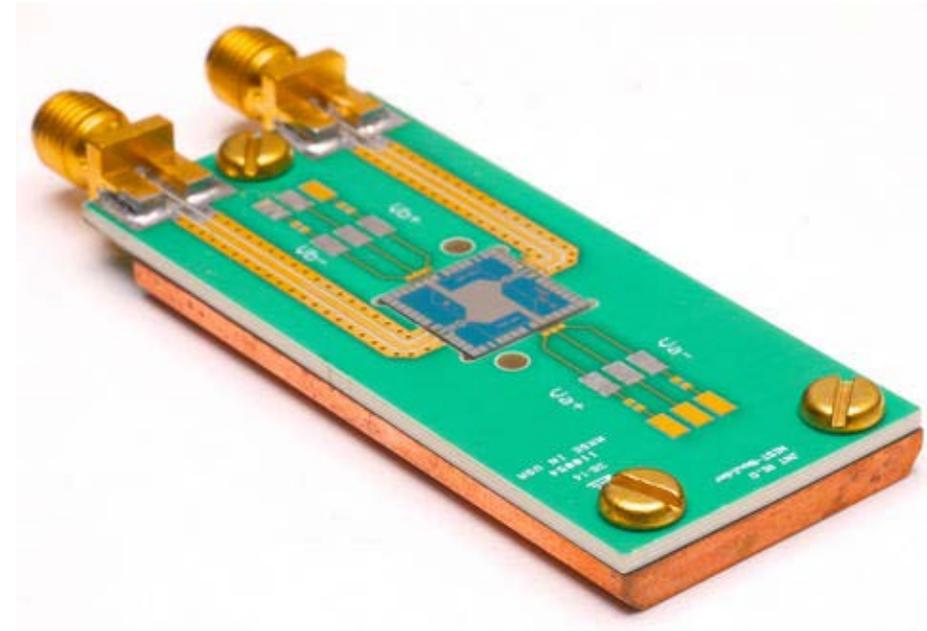
- Realize practical quantum SI devices and enabling technologies
- Improve foundational quantum science and metrology
- Create new pathways for technology transfer and Quantum SI adoption



Practical Quantum SI Devices & Enabling Technologies

NIST should:

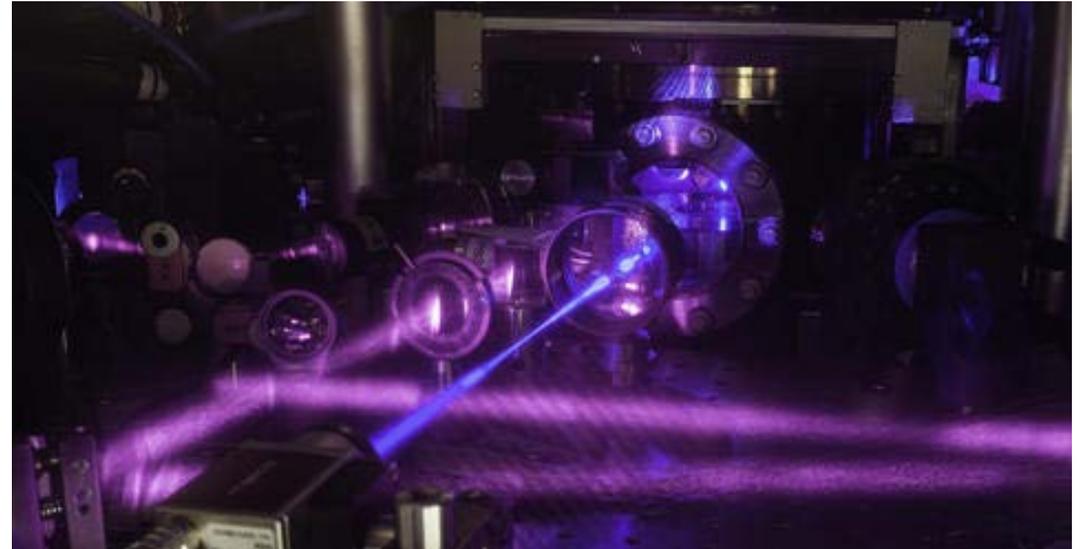
- Develop expertise in building quantum sensors from new materials with quantum properties
- Develop expertise in interfacing classical and quantum devices, and assessing the integrated system performance
- Realize quantum SI devices for derived units



Foundational Quantum Science & Technology

NIST should:

- Improve foundational measurement science for quantum systems and the knowledge underpinning new quantum technologies
- Develop the understanding and control methodology for harnessing the benefits of quantum many-body and entangled systems
- Engage external stakeholders to define measurands and metrics of quantum sensors and related quantum technologies



Mainstreaming the Quantum SI

NIST should:

- Develop the spectrum of dissemination methodologies to accelerate acceptance of the Quantum SI and quantum technologies
- Develop methods and partnerships for technology transfer of Quantum SI devices
- Deliver a new infratechnology of Quantum SI devices that are multi-function platforms of dual standards and sensors



What does success look like in five years?

NIST has:

- transferred increasing amounts of NIST on a Chip (mixed modality) technology for commercialization and adoption.
- established foundations for the design, fabrication, and characterization of practical quantum SI sensors and enabling technologies.
- increased its footprint and expertise in fundamental quantum science and metrology and begun harnessing emergent properties of many-body and entangled systems to push past the “quantum limit” in measurement accuracy.
- successfully implemented dissemination methodologies designed to accelerate worldwide acceptance of the Quantum SI and the adoption of NIST created Quantum SI technologies.

Questions for Discussion

What should NIST consider with regard to:

- new methods for effective technology transfer of emerging quantum technologies?
- mechanisms and tools that lower barriers and enhance engagement with industry?
- the changes that come in a new era with intrinsic traceability readily available to industry?