

Quantum Science & Technology A Program Manager's Perspective

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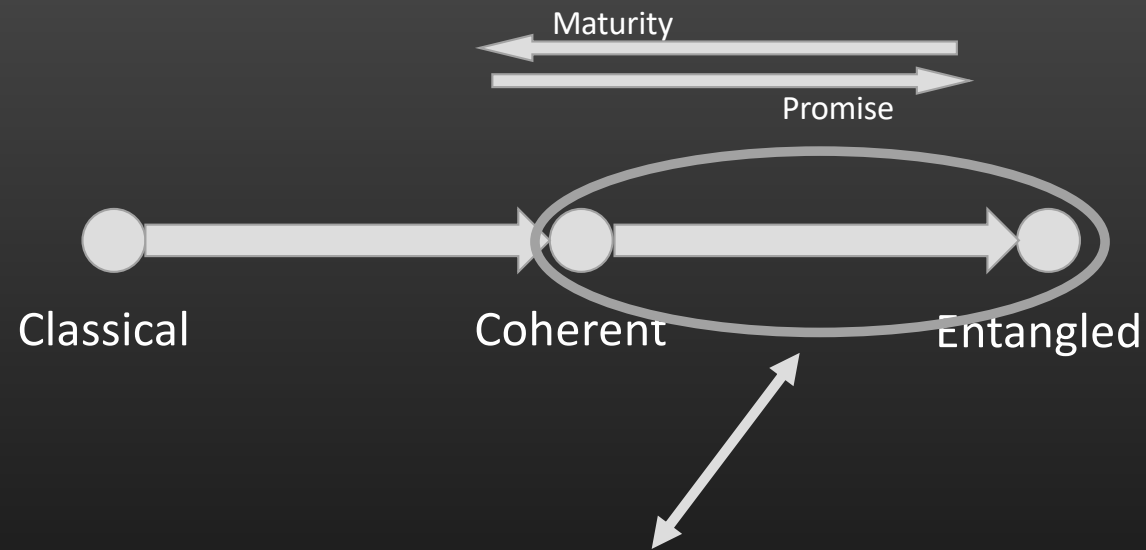


Background

- Much of the promise and impact of quantum science & technology (QST) is about the collection, generation, processing, and communication of information
- Take a holistic view of QST that merges quantum physics and information science to connect to applications
- QST is not a general replacement for classical technology
- Each is likely to make the other better and together lead to beyond classical capabilities in select applications
- The worldwide heightened interest in QST stems from the advances made during 20+ years of basic research

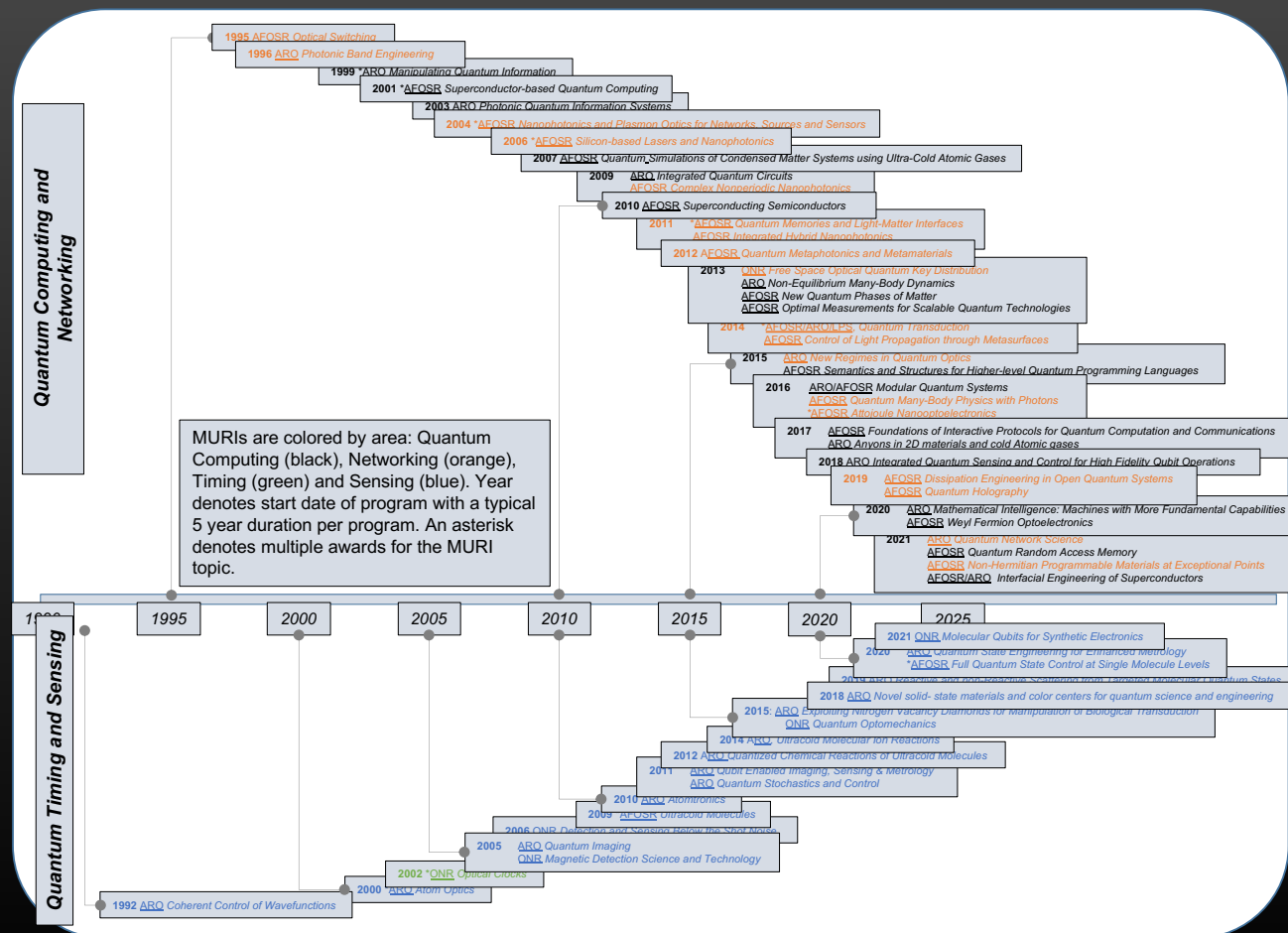


The Promise

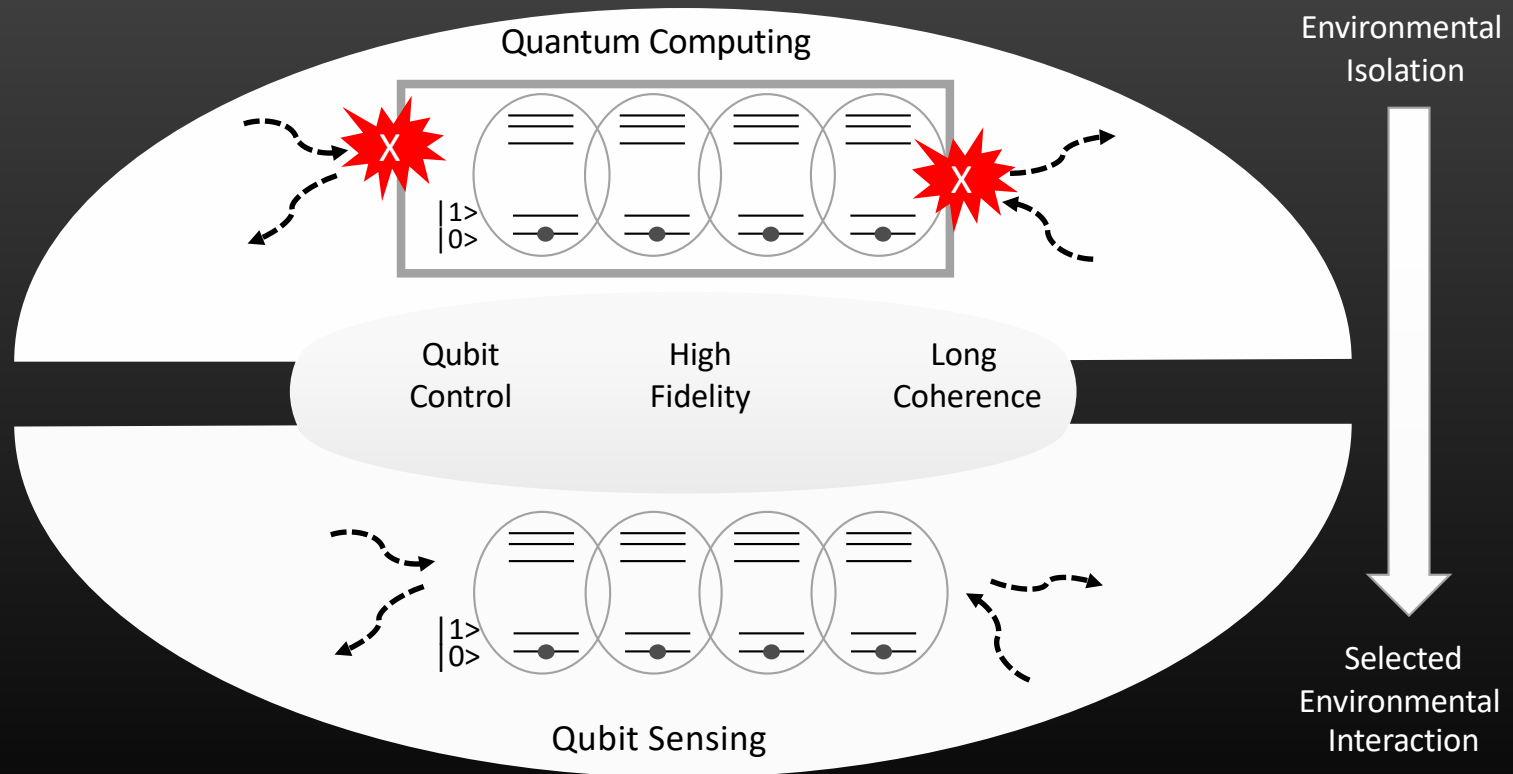


- Beyond classical capabilities from Quantum Science & Technology
- Entanglement is intrinsic to beyond classical capabilities

QIS MURI Programs History & Highlights



Quantum computing & sensing



QST for the workshop

- Quantum Sensors and Precision Measurement
 - Position, Navigation, Timing
 - Gravimeters, magnetometers, ...
- Entanglement Distribution (Quantum Networks)
 - Sensor arrays
 - Interferometers
- Quantum enabled classical technology
 - Single photon sources and detectors
 - Quantum-limited amplifiers



NASA

- Unique platforms, environments, and operations to advance quantum sensors and precision measurement
 - Weak signals and long observation times (rovers, planetary probes)
 - Position, navigation, timing
- Distributed entanglement for interferometry
 - Very long baselines
 - Low losses
 - Tests of and discoveries in foundational science
- Quantum enabled classical technology
 - Deep space communications



NASA Strategy

- Leverage the advantage that NASA missions are one-off and developed over many years in a quest to expand horizons
 - Opportunities to insert unique technology solutions
- Partnerships are critical to advance QST for NASA
 - Within the agency
 - Inter-agency
 - Academia, industry
 - International
- Persistence
 - Long term systematic retirement of challenges with the view that there are beyond classical advantages to be gained
- In-house expertise, infrastructure, and capabilities



Summary

- Much progress has been made in demonstrating basic elements in QST from nearly two-decades of research (Feasibility)
- Much research still to be done and understanding gained to overcome remaining challenges (integration and systems)
- NASA missions and timelines offer many opportunities to realize and take advantage of the beyond classical capabilities of QST
- Partnerships and persistence of efforts are critical
- Overlap with DoD interests in the science & technology is large
- QST is very high risk and likely very high rewards



Thank you!

