NIST-on-A-Chip Technologies

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Commercialization of NIST-on-a-Chip enables democratization of Quantum SI
Classical SI Dissemination Chain

Primary Standard

SECONDARY CALIBRATION LAB

Secondary Standard Gauge

USERS

Calibrated Gauge
Quantum SI Dissemination Chain

NOAC Pressure Standard and Sensor

WHEN QUANTUM-BASED METROLOGY REPLACES CLASSICAL METROLOGY

1. You interrogate nature so you get the right answer
2. Uncertainties still exist
3. SI traceability is intrinsic

NO NEED TO CALIBRATE
**GOAL:** Ubiquitous Metrology is NIST-quality standards and sensors available directly where customers/users need them
The Commercialization Path Forward

Fit for Purpose:

- Direct SI-traceable measurement capability built into instruments
- Devices become flexible, manufactural, and usable
An Example of Commercialization

Chip Scale Atomic Clock

(10^{-11} uncertainty)

As Commercialized

Telecom Networks

>$2 \text{ trillion/year globally}$
NIST-on-a-Chip: Platform Vision

Holistic NIST-on-a-Chip Platform

• Additive measurement capabilities over time
• Replacement of classical sensors and standards
• Combination of sensors is a multiplier and enables completely new and exciting opportunities.
NOAC for Humidity: Broad Markets

Deployable & Accurate:
- “Humidity” from thermodynamic temperature
- Inherently quantum phenomenon
- Consistent with emergent Quantum-SI

Robust & Low Cost:
- Integrated photonics – leverages advances in telecom
- Based on SOI platform
- Amenable to mass manufacturing
NOAC Platform Strategy

“Just four” NOAC devices

Temperature  Humidity  Pressure  Vacuum

What happens if you integrate all four onto one chip?
“Just four” NOAC devices

- Fuel Cells
- Infrastructure monitoring
- Genetics Engineering
- Public Safety
- Inertial guidance
- Autonomous Vehicles
- Energy Harvesting
- Medical implants
- Aerospace
- Semi-conductors
- Medical diagnostics
- Advanced Manufacturing
- Automobile manufacturing
- Agriculture
- Regulatory agencies
- Homeland Security
- Space Exploration
- Particle Physics
- Food Safety

TECHNOLOGY APPLICATIONS
QUESTIONS?