

# PANEL: “OPPORTUNITIES FOR QUANTUM SENSING FOR HIGH ENERGY PHYSICS”.

- A discussion on where quantum information science can help particle physics, broadly interpreted to include cosmology, following the letter from the Office of Science (Stephen Binkley) which states:
- “Novel approaches to fundamental science and to applications such as sensing, communications, simulation, and computing are enabled by understanding and manipulation of the uniquely quantum phenomena of **superposition**, **entanglement**, and **squeezing**.”
- The expected FOA from OHEP will be guided by this
- The emphasis of the discussion: is the workshop meeting the goal of bringing these techniques to high energy physics- (which will be the main theme of the workshop whitepaper)?

# “OPPORTUNITIES FOR QUANTUM SENSING FOR HIGH ENERGY PHYSICS”.

- Some suggested questions to initiate the discussion were given to the panel these include:
- What opportunities in Quantum Sensing for Particle Physics have you identified that the field should invest or invest more strongly in?
- Have any gaps been identified for opportunities for HEP.
- Much of QIS depends on the availability of the proper materials with the appropriate quantum properties. What are currently the technical limitations and what role can the national labs play and what collaborative efforts with universities do you recommend?
- After opening remarks from each panelist there will be questions and contributions from the audience

# WORKSHOP REPORT

- One of the deliverables of the workshop is a summary report outlining suitable research directions using Quantum Sensing technologies and methodologies that could have transformative effort on Particle Physics
- Proposals for speculative ideas (blue sky), as well as expected incremental advances.
- Proposed Report Structure:
  - **Executive Summary** *Ian Shipsey, Marcel Demarteau*
  - **Introduction** *Karl van Bibber, Ian Shipsey, Marcel Demarteau*
  - **Quantum Sensing Technologies and potential for HEP**  
*Malcolm Boshier, Matt Dietrich, Maurice Garcia-Sciveres, Hannes Hubmayr, Kent Irwin, Akito Kusaka, Raphael Pooser,*
  - **Role of National Labs** *Mike Norman*
  - **Opportunities for HEP** *Joe Lykken, Chris Tully, Sergio Rescia, Salman Habib*