Dark matter complementarity ideas from session #77

Quantum Sensors for Wave and Particle Detection

CPM 77 Organizers IF1, IF2, CF1, CF2, NF
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Brief summary of Session 77

From Enectali Figueroa-Feliciano

Dark Matter and Neutrino Particle Detection

Wave Dark Matter

This slide is a work in progress... intended to promote discussion as to how to organize. Please let me know what I’m missing!
Brief summary of Session 77
Wavelike Dark Matter Detection

From Derek Jackson Kimball
A wavelike companion to Tali’s Slide, also intended to promote discussion about organization
Brief summary of Session 77

There is a nice portfolio of projects at different stages.

- Sensor and Readout R&D to improve the performance especially the noise characteristics (sometime pushing the standard quantum limit) of the detector systems themselves.
- Scaling R&D, how do deploy quantum sensors in mid-scale experiments (here you find multiplexing and the needs of neutrino experiments for CEvNS and 0nuBB).
Complementarity questions for 77.

- Quantum Information not just for sensing, we should also think about complementarity of readout, infrastructure and using QI to study the physics of the sensors themselves.

- **Gravitational wave detectors** and experiments using **atomic techniques** provide new windows and complementary technology challenges to the current suite of experiments.
Practical work needed for these ideas in #77

- A theme is emerging that we need a high level summary of the techniques and the physics they can probe. Some of this was done for the BRN for New Initiatives.
- We need to decide on the best way to group techniques. We tend to default to the candidate mass.
- We need a theory effort to guide preferred parameter space and perhaps help with design consideration that would allow us to probe different physics (for instance the number and size of a multi-detector system).
- We need to summarize the common infrastructure needs of this work (cryogenic systems, shielding, magnets etc.)
- Others we haven’t considered?