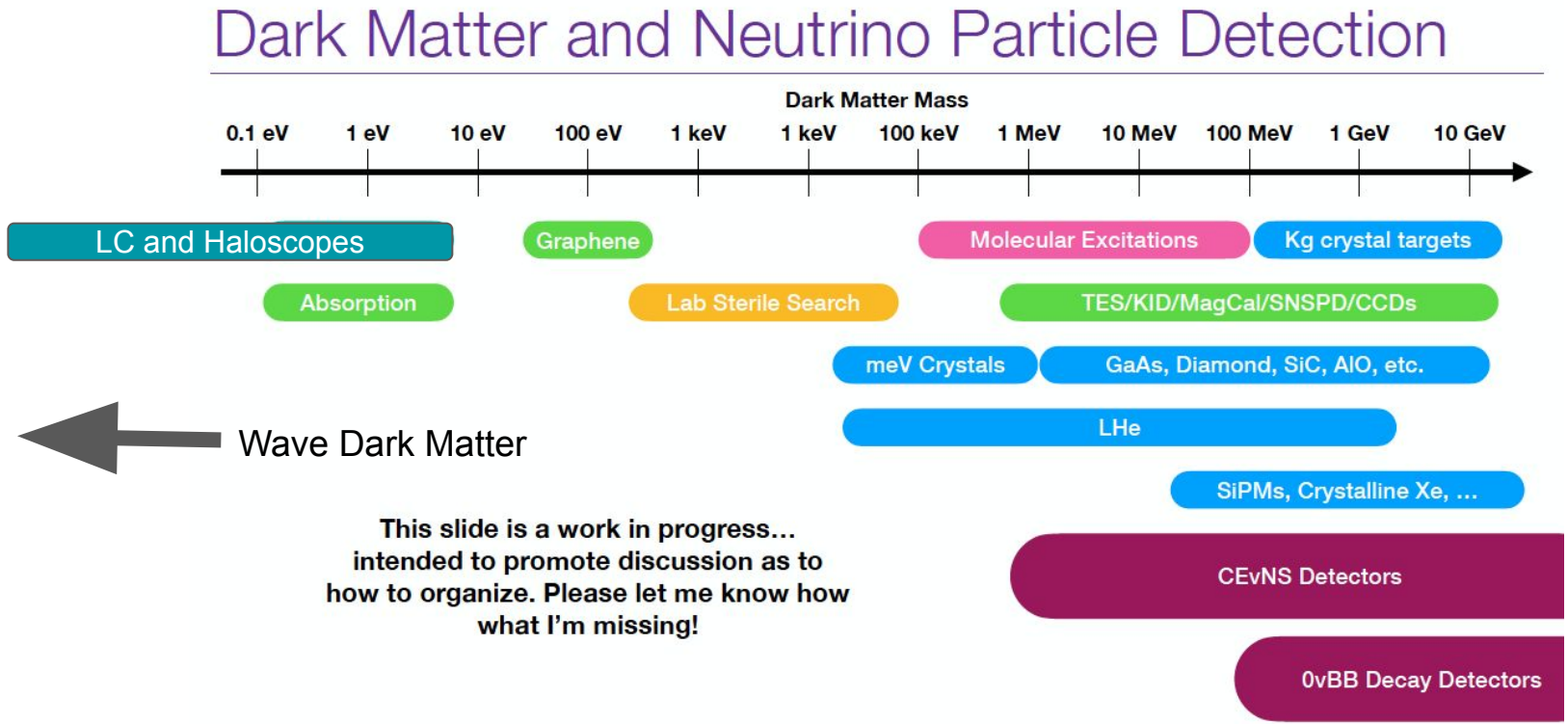
Session #77

Quantum Sensors for Wave and Particle Detection

CPM 77 Organizers IF1, IF2, CF1, CF2, NF
Jodi Cooley, Enectali Figueroa-Feliciano, Maurice Garcia-Sciveres, Roni Harnik, Kent Irwin, Juan Estrada Vigil and Lindley Winslow

Brief summary of Session 77

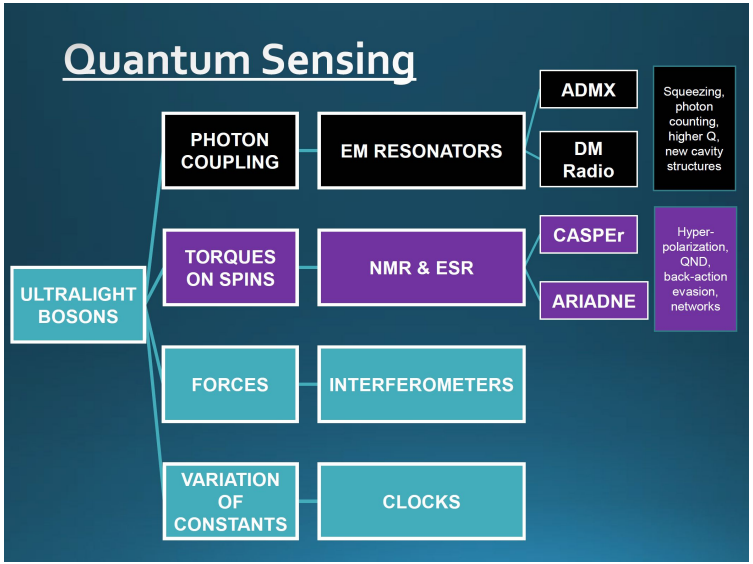
From Enectali Figueroa-Feliciano

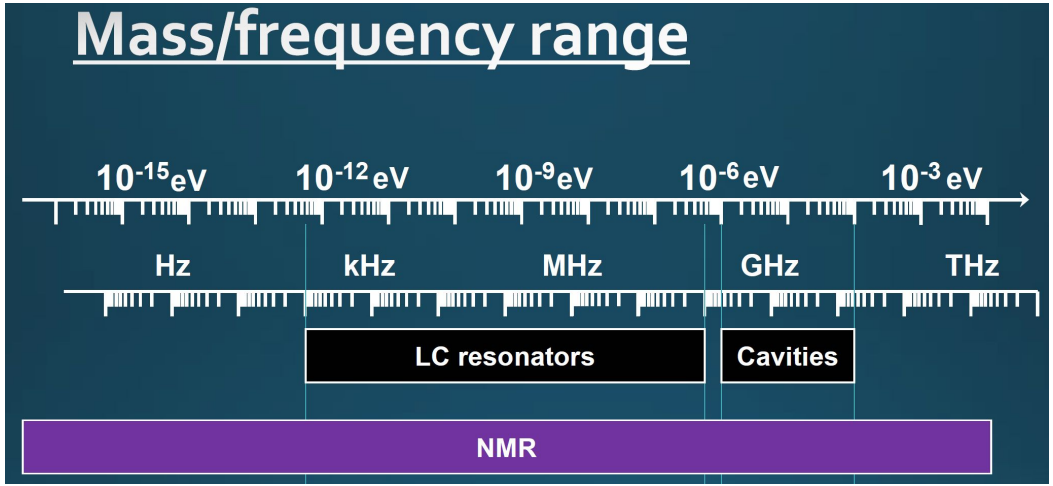


Brief summary of Session 77

Wavelike Dark Matter Detection

From Derek Jackson Kimball
A wavelike companion to Tali's Slide, also intended to promote discussion about organization

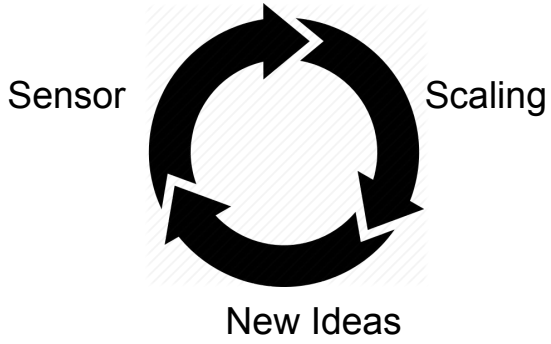




Brief summary of Session 77

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.)
- Significant investment is needed in quantum sensing algorithm development. These algorithms are considerably less advanced than in some other parts of QIS. They often cross-cut across many different quantum sensor technologies
- Others we haven’t considered?