Noble ~~Liquids~~ Elements (w/ liquids, solids, and gas) Townhall

Jonathan Asaadi (UTA)
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Noble Element BRN

denotes they are here at CPAD

- **Roxanne Guenette & Jocelyn Monroe (Conveners)**
  - **Jonathan Asaadi**
  - **Hugh Lippincott**
  - **Andrea Pocar**
  - Jen Raaf

We want to give some time to the BRN members who are at CPAD to give their thoughts about the process and the PRD's

Noble Elements Key Challenge

- The enhancement and enabling of large scale noble element detectors which fully exploit their discovery potential

Three PRD's for this key challenge

1. Develop large area, high granularity, high efficiency signal collection technologies.
2. Develop noble detector calibration techniques
3. Develop strategies to address known and hidden challenges associated with scalability of future noble element experiments

PRD #1: Develop large area, high granularity, high efficiency signal collection technologies.

- **Charge - direct collection, amplification, pixels**
- **VUV - wavelength shifting, direct detection, optics**
- **IR, quasiparticles, bubbles**
- **Detection of Ions**

PRD #2: Develop noble detector calibration techniques

- Low energy nuclear recoils (DM, coherent scattering)
- Uniform calibrations over (very) large volumes (detectors like G3, future DUNE modules)
- Improve resolution, particle ID, over a wide energy range

PRD #3: Develop strategies to address known and hidden challenges associated with scalability of future noble element experiments

- Need for radiologically pure materials and removal of radioactive impurities
- Higher drift voltages and chemical purity than are achieved in the current generation of experiments.
- Clean assembly facilities for detector integration
- Procurement and clean storage of large quantities of noble elements perform
- Isotopic separation for enriched sources
- R&D to approach all areas of computing from data acquisition to data analysis for large scale liquid noble detectors.

Questions for discussion

- Do the draft BRN points comprehensively cover the research priorities of the noble element community?
- How do we reframe our PRDs in light of the discussion this morning?
  - One challenge is that noble liquids cover many physics topics that have different requirements

Questions for discussion

- Are there ground breaking measurements which are currently impossible, but could be enabled by a breakthrough in noble element technology?
  - Cosmics Neutrino Background (CνB)
  - Directional low energy nuclear recoil (Directional DM)
  - ...