

The ~~instrumentation~~ detector frontier

F. Retière

Cryogenic detector technology (Matt Pyle)

- Excellent talk albeit shortened
 - Working towards the detection of meV scale energy deposit
 - Super exciting technologies – quantum sensing
- *Other talks in order of increasing temperature*
 - *LAr (86K) by Pietro Giampa*
 - *SENSEI Tien-Tien Yu*
 - *nEXO*
- Aim is the detection of dark matter interactions
 - From sub-eV to keV (WIMP world) energy deposited
- Canada assets
 - CUTE at SNOLAB
 - W.Rau's group at TRIUMF
 - Quantum Institutes?
 - Cryogenic expertise?

Solid state tracking detector (T. Koffas, Carleton U.)

- Goal: thrive/survive at High luminosity LHC and future collider
 - Very high radiation environment
 - Radiation hardness
 - Very large number of interaction
 - Fast (sub-ns timing per hit)
 - Also fast readout
- CERN RD50 collaboration driving effort
 - Canada now a member
- Technologies consider
 - Monolithic Active Pixel Sensor (MAPs)
 - Similar to CMOS camera, though much faster
 - Low Gain Avalanche Diode (LGADs)
 - Possible edge in Canada: strong overlap with Single Photon Avalanche diode
 - GaN as a better alternative to Si
 - Edge in Canada: strong expertise at NRC Ottawa

Pacific Ocean Neutrino Observatory (J-P Yanes, Alberta)

- P-ONE taking advantage of Ocean Network infrastructure
 - Huge asset enabling rapid deployment and stable operation
 - Water quality is promising
 - Off the coast of Vancouver Island
- Physics is primarily neutrino astronomy
- Large area photo-detection technology
 - How to make it cheap enough that it does not dominate the cost of the experiment?
 - Canada's assets
 - Strong synergy with Hyper-K/IWCD technology (though not really cheap)
 - Hybrid photo-detector concept
 - Cheaper and faster?

Canada and detector technologies

- We know how to build detectors
 - Able to deliver complex solution
 - Though mostly relying on established technology
 - On-time/budget delivery remain uneven
 - Should we talk about management?
- High risk / high payoff R&D is exciting and should be rewarding
 - We should do some!
- What detector technology R&D?
 - Cryogenic detector technology?
 - mK to K, to liquid Argon and liquid Xenon?
 - Solid state tracker?
 - MAPs, LGADs, GaN?
 - Photon detection?
 - Large area, silicon (nEXO/ARGO) or/and vacuum (P-ONE, Hyper-K)
 - Fiber development?
- Or even instrumentation tech
 - Trap + laser + light sensing