WG1/WG2 Joint experimental detector talks summary

(Walter/Choubey/Schwetz/McFarland/Nieves/Hayato)

- Status of MIND Simulation and Analysis  A. Laing
- TASD  M. Ellis
- R&D Towards huge liquid Argon Detectors  T. Maruyama
- Event Reconstruction in LAr TPCs  O. Palamara
- Proton Identification in future WC detectors  C. Walter
- Liquid Scintillator detectors for high energy neutrinos  S. Smith
- Peanut at FNAL  A. Russo
- Neutrino beam flux systematics  L. Loiacono

Chris Walter
Duke University
NuFact09 IIT
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New Detectors, New Techniques

- This session focused on work and simulations for **new detectors** that would be used in neutrino factories and beta beams.
- This included continuing work on MIND and TASD including the first simulation and reconstruction work package for MIND.
- New progress in detector R&D for Lar
- There are some brand new ideas presented in this meeting along with new techniques for addressing problems.
- I will point out some **highlights**.
LAST YEAR: Start of reconstruction code.

THIS YEAR: First analysis chain running with preliminary results.
TASD Detector

**From Ellis**

**LAST YEAR:** Start of eye scanning for curvature. 
**Homework:** Check in systematic way.

**THIS YEAR:** New simulations + systematic scanning by a team of people for efficiency, curvature etc.

**Electron Simulation**

Eye scanning of Electron curvature “80%” correct ID

**New Homeworks:** Make automatic algorithms. Is this charge ID good enough for platinum?

**Below here charge identified!**
Big Progress in LAR R&D!

Both the US and EU/Japan are working towards solving the R&D issues needed for ~100kton detectors.
LAR Reconstruction

Icarus T600 test from 90s was the first real large scale test of Automatic reconstruction.

Now groups are working on reconstruction in new detectors.

Example of sensitivity to nuclear effects.
SK proton ID algorithm from SK for future projects

This technique gives good energy resolution, high CCQE purity and neutrino tagging.

Let $V$ be the 4-vector

$$V = P_p + P_l - P_n,$$

where $P_p$, $P_l$, and $P_n$ are the 4-momenta of the proton, lepton, and target neutron.

Lorentz invariant quantity $V^2$ must be $m^2_{\nu} \approx 0 \text{ eV}^2/c^4$.

From Walter

Hadronic Interactions

Good for Wideband beams and high Energy beta beams.
New work to try to reconstruct tracks in a scintillator detector using first hit times could open new possibilities (EX: CERN -> LENA)

From Smith
Peanut

Hybrid detector: Emulsion-lead targets and scintillating fibre tracker (SFT detector)

From Russo

A few $\nu_e$ candidates found in PEANUT bricks

Fully reconstructed event
Measurements of the event rate in the muon monitors were used to tune the beam MC to make flux measurements.
My Conclusions

- There is a lot of activity on future detector design.
- A few of the “homeworks” from last year have been addressed.
- Many of the outstanding questions can’t be addressed yet because the reconstruction and simulation work is not yet at a mature level.