

# Particle Flow Discussion

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- Minutes of Lunchtime Discussion

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- At the LDC concept meeting on Wednesday it was suggested that
- groups get together to get organized on particular global detector
- concept issues.
- One suggested focus was particle flow and
- S. Magill, F. Sefkow, M. Thomson, H. Videau and G. Wilson
- were volunteered to organize the work around this issue.
- On Friday we had a lunchtime discussion which was advertised
- by last minute E-mail to the LDC at Snowmass mailing list. Since
- some participants are only here for the first week we believed that it
- was important to meet and get started.
- Apologies to interested participants who were probably not
- aware of the meeting.

- Present: N. Graf, M. Thomson, S. Magill, M. Ronan, G. Eigen,
- F. Sefkow, P. Gay, G. Wilson, C. Hensel.
- Mark presented a list of prioritized items about the overall
- detector concept which impact the particle flow performance and
- require studies.
- We agreed to have a list of items which are perceived to be
- of primary importance in the detector design in terms of
- particle flow performance.
- There was strong interest in trying to get together in a manner which
- cuts across the SiD/LDC/GLD separate meetings.
- How we can easily go about studying these items is reserved for
- future meetings where we would develop a work plan.
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- Ideally we would be able to run several different PFAs over
- different detector variations.
- Some of these items may be addressed to some extent at Snowmass, others
- are presumably studies that require more comprehensive work.
- We will try and schedule a follow up meeting maybe on Monday.
- Feedback about these lists and potential other areas of study
- would be very much appreciated.
- It would be great if you could also express your interest in
- pursuing some of these issues.

- Priority Items

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- 1. B-field : is  $BR^2$  the correct performance measure ?
- 2. ECAL radius
- 3. z ECAL endcap
- 4. Calorimeter total number of interaction lengths inside coil
- (ECAL + HCAL) : do we need 4, 5, 6..  $\lambda_I$  ?
- 5. Longitudinal Segmentation. How much does the longitudinal segmentation improve the ability to identify the particles in the jets in pattern recognition terms, rather than just being an issue about sampling frequency for calorimetric energy resolution.
- 6. Transverse Segmentation.
- 7. Compactness / Gap-size.
- 8. HCAL Absorber choice: Stainless Steel, W, U, Pb etc.
- 9. Circular vs Octagonal TPC and circular vs polygonal ECAL: how important are the gaps between TPC and ECAL
- 10. HCAL outside coil

- Additional items perceived to be possibly of secondary importance
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- (ie. if you are really interested in these items and you believe they
- are of primary importance, then you are very welcome to
- work on demonstrating that these things are of primary importance)
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- 1. For events with missing energy, the forward part of the
- detector may be very important for correct reconstruction.
- This should be addressed by looking at jet energy resolution vs
- polar angle. Detailed studies though depend quite a bit on the
- actual accelerator design, and may not be that easy to pursue in
- a general manner.
- 2. Detection thresholds for tracks, clusters.
- 3. Momentum resolution. What would happen if we back off substantially in
- momentum resolution specs since these were not designed around particle
- flow but from the recoil mass to the di-lepton in Zh events?
- Method: degrade single-point resolution within the same
- B,  $R^2$  geometry.
- 4. How important is lepton id to the detection of semi-leptonic heavy
- flavor decays (b, c) with neutrinos for jet energy resolution issues?
- 5. Particle ID. How much do we care about correct mass assignment
- to charged particles, particularly protons in terms of PFA?
- 6. Are backgrounds from gamma-gamma and the machine important to the PFA and
- are there detector design methods to mitigate these effects?
- 7. How important is 2-photon separation to particle flow, particularly after
- applying  $\pi^0$  mass constrained fits?
- 8. Is a tail-catcher important for spotting late interacting K0L and neutrons?
- 9. Could the DREAM approach work in the forward endcaps where the
- tracking performance is starting to degrade?