Plans for the HCAL Optimisation

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CALICE Calorimeter for ILC

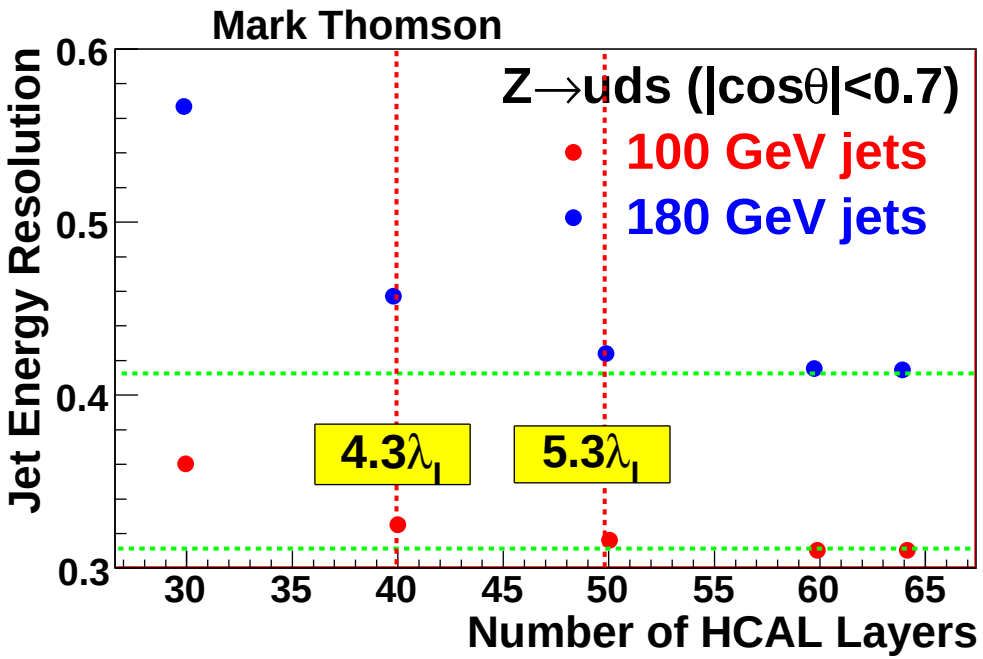
Overview

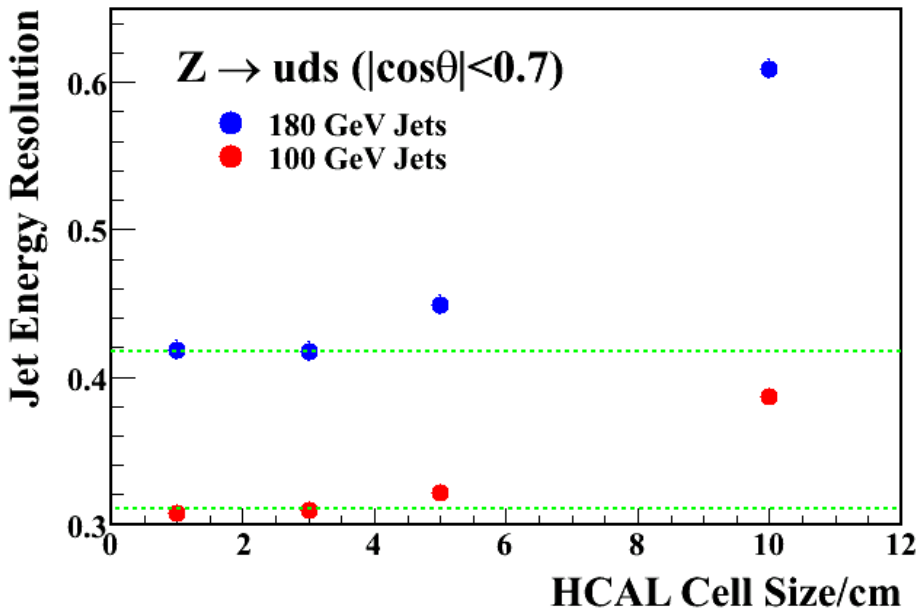
1. Scintillator HCAL
2. Digital HCAL

DESY

Optimisation of the Scintillator HCAL

- Already optimised, based on PFA performance (although it may not be the final answer):
  - HCAL depth: $\sim 5\ \lambda_I$
  - cell size: 3 cm
  - absorber material: Fe
  - scintillator thickness: 5 mm
  - absorber thickness: 20 mm
  - layer support structure: 5 mm Al





Optimisation of the Scintillator HCAL (continued)

Still to be done:

1. Simulate a full bunch train, including background
   - study occupancy in the detector (do we need trigger?)
   - determine buffer length of the electronics (not worried about the radiation damage) $\Rightarrow$ could change the whole electronic concept
2. Comparison of different detector techniques with the same design
   - in the moment, we have 2 structures: a la Videau, with gas detectors, and a la Tesla design, with scintillator, with different levels of realism
   - direct comparison difficult
3. Absorber material: iron vs tungsten
   - maybe PFA algorithm needs retuning for the latter case
4. Engineering design of endcaps
   - no dedicated design yet
   - optimisation
5. Gap at the interaction point
   - benefit from shifting it from 0?

Optimisation of the Digital HCAL

Adapt Pandora to the DHCAL

- Main goal: adapt Pandora to the DHCAL with the circular mechanical structure (á la Henry Videau)
- Tools (event display, digitisation, calibration) and Monte Carlo samples are under preparation
- Event viewer: DRUID (based on ROOT) to look at shower details and analyse performance of reconstruction software (see Manqi's talk in the software pre-meeting)

Central MC Production

- Single particle events (partially finished)
- Benchmark ILC events (especially event with double/multiple jets, largely boosted jets and jets overlay)
- Serve as base for later analyses:
  - global detector properties (leakage, calibration, hit rate, etc)
  - optimisation of DHCAL thresholds

Optimisation of the Digital HCAL (continued)

New Mokka Plugins

- for saving particles inside calorimeter region (study showers in detail)
- for suspending tracks that enter the DHCAL $\Rightarrow$ allows comparison of different HCAL options

Digitisation Study

- Mokka output contains simulated hits with deposited energy in the gas (i.e. ”analog” output) $\Rightarrow$ the ”digital” part comes with Marlin processors
  - Study the dependence of energy deposition in each cell on the induced charge on each pad with cosmic ray data $\Rightarrow$ basis for threshold optimisation study
  - Marlin digitisation processor developed, can be used for other type of gaseous detectors, with experim. input