

CLICdp Calorimeter R&D

Input provided by Frank Simon, May 04, 2014

- The R&D for the main calorimeter systems (Barrel, Endcap) is carried out within the CALICE collaboration – with a large number of participating institutes. Many projects are in common with R&D for ILC. Efforts in the context of forward calorimetry are reported in a separate document. Additional information is provided in documents from the LCD group at CERN, and from other CALICE members.

Major R&D topics

Analog hadronic calorimetry with tungsten absorbers

- A series of test beams with a tungsten absorber structure and the CALICE AHCAL physics prototype active layers in 2010 and 2011 – Analysis results on performance, GEANT4 shower models for tungsten
- Main institutes: CERN, DESY, MPI for Physics, U Hamburg
- Publications
 - Description of beam test [LCD-Note-2012-002](#)
 - Particle composition of beam [LCD-Note-2013-006](#)
 - Publication of low-energy results [JINST 9 P01004 \(2014\)](#)
 - Preliminary higher-energy results [CAN-044](#)
- Future plans: Data taking with second-generation electronics – Extend time structure measurements (see below)

Digital hadronic calorimetry with tungsten absorbers

- A series of test beams with a tungsten absorber structure and the CALICE DHCAL physics prototype active layers in 2012– Analysis results on performance, GEANT4 shower models for tungsten
- Test of micromegas detectors as alternative active elements
- Main institutes: ANL, CERN, LAPP Annecy
- Publications:
 - First results [CAN-039](#)
- [Presentation by Christian Greife at LCWS2013](#)
- Future plans: Data analysis ongoing

The time structure of hadronic showers in tungsten absorbers

- Several test experiments with two detectors specialized for high time resolution (T3B, FastRPC), run parasitically with the W-AHCAL and W-DHCAL to measure average time profiles of showers in tungsten with scintillator and RPC active elements, comparison to GEANT4 shower models
- Main institutes: MPI for Physics
- Publications:
 - Technical aspects of T3B [JINST 8 P12001 \(2013\)](#)
 - First low-energy T3B results [CAN-033](#)
 - Time structure in Tungsten and Steel [arXiv:1404.6454](#)
 - Time structure with RPCs and Scintillators [CAN-043](#)

- Future Plans: Data taking completed, analysis still ongoing, extension of study to larger volumes with new AHCAL electronics (see above)

Highly granular scintillator-based calorimeter readout for CLIC

- Study of small plastic scintillator tiles with SiPM readout
 - Investigate potential of using scintillators for a cost-effective ECAL
 - Provide higher-granularity options for HCAL if needed
 - Starting point for R&D on CLIC-specific calorimeter electronics
- Main institutes: CERN, U Bergen
- Publications: New activity, no publications yet

Engineering Challenges

- Many of the engineering aspects for calorimeters are common between ILC and CLIC – Collaboration on common questions
- CLIC-specific aspects: Engineering aspects for tungsten-based absorber structures
 - Has been studied in the context of the CLIC CDR, no additional activities at present
 - Publications
 - <https://indico.cern.ch/event/204269/session/19/contribution/182/material/slides/0.pdf>