SDHCAL activities dashboard

Gérald Grenier

IP2I (previously IPN) Lyon

November 4th, 2021
Ongoing activities

Test beam analysis

all TB

- Uniformity (Guillaume)
- Low Energy hadrons (Bing+SJTU) Paper in preparation
- Uses of BDT (Bing+SJTU) Published.

09/2018 only

- SiWECAL+SDHCAL (Hector+CIEMAT : (done ?))
- Tricot electronics (GG, Imad (?) on hold (??))

2015 only

- Analysis with rotated device (Hector Note in preparation)
Ongoing activities

Hardware

- 2m² GRPC+HR3 ASU+ new DIF (Lyon+ CIEMAT )
- Timing electronics (CMS muon for strip and SJTU for SDHCAL pads): board design.
- Cooling for CEPC (SJTU)
- SJTU lab (SJTU)

Simulation

- ILD SDHCAL simulation/reconstruction performance monitoring (Camilo, CIEMAT)+Guillaume
- Tricot simulation (on hold) participation from SJTU ?
- Timing in simulation (developments by Guillaume Garillot → Analysis by Imad)
- Prototype simulation upgrade (Multithreading, CEPC version, …) (François)
Ongoing activities

grid
- Learning how to run jobs on ILCdirac grid (Gérald)

PFA
- ArborPFA → APRIL (Bo, → GG, on hold).
- AMSTER: potential APRIL reclustering method
- Rand Index (GG, on hold)
- PFA with timing (IP2I)

Digitisation
- Incorporate GRPC response modelling to digitiser, (Clermont+Lyon).
- Evolution: tricot electronics, independence from Marlin (discussion started)
Ongoing activities

ILD/CEPC Analysis

- \(e^+e^- \rightarrow Z \rightarrow \text{jets}\) then \(e^+e^- \rightarrow ZH \rightarrow \text{jets}\) (CIEMAT)
- \(e^+e^- \rightarrow \gamma\gamma VV\) (Bing did it for CEPC, Imad+ Guillaume for ILC)
- Include FCC-ee also?
AIDAinnova status

- AIDAinnova has started on April Fools’ Day (April 1\textsuperscript{st} 2021).
- Kick-off organised April 12-16, 2021
  https://indico.cern.ch/event/1003419

Work Packages

- PFA (ARTIC) : 50 k€ (was EOI #145), in WP 12 Software, task 12.5, deliverable 12.4 (quite generic : provide working PFA)
- SDHCAL + electronics : 50 k€ (was EOI #57 and EOI #58), in WP 7 Gaseous detectors for frontier science, task 7.2 and deliverable 7.1 (50 k€, Mary Cruz representative)

SDHCAL removed from high granularity calorimeter WP
AIDAinnova task 7.2

**task 7.2 : Multigap RPCs (MRPC) for fast timing and Eco-friendly gas mixtures for RPCs**

- Developing and testing material (thin plates of low resistivity glass)
- Construction, characterization and test beam of small-size prototypes
- Construction of $1 \times 1 \text{ m}^2$ prototypes with the new structure read-out plane for SDHCAL
- Test beam study of the shower time development in an SDHCAL, equipped with the prototype detectors
- Identification and characterization of new gas mixture candidates Validation of the gas mixtures after large integrated charges at GIF++

**Deliverable 7.1: Characterization of the small size prototypes of MRPCs for fast timing and high rates in 24 months**
task 12.5 : Particle Flow Reconstruction

- Advanced PFA algorithms for DUNE detectors using new readout technologies.
- PFA algorithm with particle ID for dual-readout calorimeters.
- Optimised APRIL PFA algorithm for hadronic jets (collaboration with Vincent Boudry, LLR).

Deliverable 12.4 New PFA prototypes (responsible Warwick university)

Improved and documented particle flow algorithms, including machine learning based algorithms, available in the PandoraPFA toolkit, suitable for new readout technology detectors.

Meeting on June 24th https://indico.cern.ch/event/1050262/
AIDAinnova kickoff

- **WP3**: task 3.3 Sub-ns timing precision for EUDET, task 3.4 Common DAQ+monitoring (CERN mailing lists AIDAinnova-WP3@cern.ch)
- **WP7**: task 7.2 5D SDHCAL, also eco Gas for RPC. (AIDAinnova-WP7@cern.ch, AIDAinnova-WP7-general@cern.ch)
- **WP8**: calorimeters (AIDAinnova-WP8-General@cern.ch)
- **WP11**: electronics (includes some OMEGA chips)
- **WP12**: software: task 12.3 ML techniques for shower simulation, task 12.5 PFA. (AIDAinnova-WP12@cern.ch)
- **WP 13**: call for extra innovative projects, deadline mid july: [https://indico.cern.ch/event/1003419/contributions/4273255/attachments/2226853/3772291/AIDAINNOVA-210415-krizan.pdf](https://indico.cern.ch/event/1003419/contributions/4273255/attachments/2226853/3772291/AIDAINNOVA-210415-krizan.pdf)
Published papers

Recent

- SJTU+Lyon work: JINST 14 (2019) no.10, P10034
  http://inspirehep.net/record/1762795.
- CHEF 2019 proceedings:
  - JINST 15 (2020) 05, C05022.
    https://inspirehep.net/literature/1826123 7 pages document available only on journal website.
  - There were 3 SDHCAL talks at CHEF 2019
- BDT paper
  - Published, D. Boumediene et al 2020 JINST 15 P10009.
    https://inspirehep.net/literature/1790235
  - The mismatch between the paper and the CHEF 2019 proceeding is fixed in inspireHEP, in HAL and in CERN CDS
    (http://cds.cern.ch/record/2715408 and http://cds.cern.ch/record/2743482)
Publications

Papers, short term

- Bing Current analysis of test beam data on low energy hadrons (direct CALICE paper, no note), CALICE Paper032 EB=Fouz, Cvach, Simon (same as BDT paper).

Notes in preparation

- Bo : APRIL PFA (on hold, Bo got a position in a chinese university)
- Hector : analysis with rotated devices.
- GRPC uniformity from test beam data (on hold).
- More on GRPC response modeling by Clermont Note under CALICE EB review.
Recent workshops

  - Talk by AHCAL and DHCAL.
  - Timing in calorimetry (still mostly PID oriented)
  - but tracking hadron shower with Graph ATtention network
    https://agenda.linearcollider.org/event/9211/contributions/49382/attachments/37503/58754/ILCX_kuhara_20211028.pdf
  - Nice summary talks, ILC moving TESLA like with non particle physics applications.
Coming meetings

Coming workshops

- 3rd CEPC Workshop EU Edition, May 4-7, Marseille, postponed to spring 2022 https://indico.in2p3.fr/event/20053/
- FCC Physics, Experiments & Detectors workshop in Liverpool, February 7-11, 2022
- LCWS 2022 in spring
Coming conferences

Past


Abstract closed

- Also one talk accepted to IEEE conference.
Coming conferences (more)

Abstract closed (more)

- Vienna Conference on Instrumentation 2022, February 21-25, 2022, Vienna
  Abstract before October 17th [https://vci2022.hephy.at/](https://vci2022.hephy.at/)

Open to abstract

postponed conferences

- HEPChile2021, January 4-8 2021, Valparaiso, Chile,
  [https://indico.cern.ch/event/698387/](https://indico.cern.ch/event/698387/) (POSTPONED to 2022)

- CALOR2020 → CALOR2021 → CALOR2022, May 16-20 2022, Sussex, UK,
  [https://indico.cern.ch/event/847884/](https://indico.cern.ch/event/847884/) (abstract 12/6/21 to 03/11/22)

- PISA meeting on Advanced Detector 2021, May 23-29 2021, Elba, Italy,
  [https://agenda.infn.it/event/22092/](https://agenda.infn.it/event/22092/) POSTPONED to May 2022
Coming conferences (more)

Announced date

- PIC 2022, September 2022, Tbilisi, Georgia.
- Lepton Photon 2023, July 17-21 2023, Melbourne, Australia.
ILC Analysis tutorials

- ILC analysis with Delphes and miniDST, June 23, 2021, 3:30pm, online, https://agenda.linearcollider.org/event/9264/
- Introduction to iLCSof, July 21, 2021, 3:30pm, online, https://agenda.linearcollider.org/event/9272/
- Jet flavor identification with LCFIPlus, August 18, 2021, 3:30pm, online, https://agenda.linearcollider.org/event/9318/
- SGV - fast simulation October 13, 2021, 3:30pm, online, https://agenda.linearcollider.org/event/9394/

Simulation à Grande Vitesse works on ubuntu 20 only
Request from CALICE

News from autumn 2019 CALICE Meeting

- Message from Roman. Clean/update the CALICE twiki page.
  https://twiki.cern.ch/twiki/bin/view/CALICE/SdHCal
ILD regular meetings

**ILD group meeting (October 19th)**
- [https://agenda.linearcollider.org/event/9461/](https://agenda.linearcollider.org/event/9461/)
- News and rehearsal for ILCX2021

**ILD Analysys/software meeting October 20th**
- [https://agenda.linearcollider.org/event/9467/](https://agenda.linearcollider.org/event/9467/)
- MC production idle : do we need some samples ?
- Jet charge measurements at CEPC (Manqi Ruan)
- Analysis measuring $H_{\gamma\gamma}$ and $H_{\gamma Z}$ couplings.

**ILD Analysys/software next meeting November 10th**
- [https://agenda.linearcollider.org/event/9475/](https://agenda.linearcollider.org/event/9475/)
FCC meetings

FCC-ee physics performance meeting october 18th
- https://indico.cern.ch/event/1085888/
- Setting up physics working group with convener for the end of the year.
- strange quark tagging.
- KKMC : a MC for lepton pair production.

FCC physics meetings october 25th
- https://indico.cern.ch/event/1086252/
- News, composite Higgs, flavour physics and strange quark tagging
- Next on November 29th https://indico.cern.ch/event/1092025/

What about equivalent CEPC meetings ?
Open meeting on November 11th


https://agenda.linearcollider.org/event/9351/
MC mass production files

**situation**

- Overlay bug corrected MC production. Samples have been produced:
  - single muons and $K^0_L$: https://ild.ngt.ndu.ac.jp/elog/dbd-prod/467
  - inclusive higgs decay of qqH process:
    https://ild.ngt.ndu.ac.jp/elog/dbd-prod/468
American particle physics strategy update
Currently discussed in all future collider projects.
ILD preparation: LOI, simplified ilcsoft, delphesILC card
http://ilcsnowmass.org/
Energy Frontier workshop was held July 20-22
https://indico.fnal.gov/event/43963/overview
Process planning meeting Oct 5-8,
https://indico.fnal.gov/event/44870/overview
Snowmass 2021 and CALICE

Input for the Instrumentation Frontier
https://snowmass21.org/instrumentation/start

- Dominant themes for calorimetry: High granularity, Dual Readout, PFA, timing
- CALICE has submitted not 6 but 10 proposals
  https://agenda.linearcollider.org/event/8647/
    - Timing-SDHCAL (Imad)
    - Generic R&D on timing layer in calorimeters (Frank Simon)
    - Scintillator Strip ECAL
    - SiW ECAL
    - Common compact readout for CALICE calorimeters (for ILD option 1) (Katja, Roman, Taikan)
    - AHCAL (Katja, Felix)
    - High granularity crystal ECAL.
    - DHCAL (José).
    - ALICE FoCal improved.
    - New sensors for SiW ECAL.

Gérald Grenier (IP2I (previously IPN) Lyon)
News from our data

Our data on DIRAC will need to be moved: IP2I end of grid support

- Our test beams data have been transferred from grid catalogue LFC to DIRAC catalogue and to CERN eos.
- CERN files on EOS have been copied in 2018 from NAS or recently from the path LFC $\rightarrow$ DIRAC $\rightarrow$ CERN eos.
- Checksum on files: CERN eos files that were on LFC are identical to those in DIRAC and LFC except for 6 files.
- These 6 files were copied in 2018, they are identical between LFC and DIRAC (likely they were badly transferred to LFC)
- These 6 files are from SPS_AugSep2012 (DHCAL_715572_I0_0.slcio, DHCAL_715572_I1_0.slcio, DHCAL_715572_I2_0.slcio, DHCAL_715572_I3_0.slcio, DHCAL_715573_I0_0.slcio, DHCAL_715651_I0_0.slcio)
- The test beam data in LFC have been deleted.
Outlook

Flash info

- A task force to redefine the LCIO RawCalorimeterHit has been set up.
- Discussion on timing in calorimeters started with ECAL groups and chinese groups.

Don’t hesitate to add any important activity, paper, or conference, I may have miss.

Next meetings

Europe (winter) 9-11 / China 16-18 / Korea 17-19

- Europe winter time
- November 18
- December 9 (?)
Backup
Past meetings

- LCWS2019, October 28 - November 1 2019, Sendai, https://agenda.linearcollider.org/event/8217/: one talk by Bo on APRIL PFA
- CEPC workshop, November 18-20, IHEP, Beijing, https://indico.ihep.ac.cn/event/9960/, a SDHCAL talk by Bing.
- CHEF2019, November 25-29, Kyushu, https://indico.cern.ch/event/818783/ 3 talks (Bing, GG, Djamel)
  - PID with Boosted Decision Tree (Bing)
  - Digitizer (Djamel)
  - APRIL PFA (GG)
- RPC2020, February 10-14, Roma, https://agenda.infn.it/event/19942/ No abstract submitted
- Spring 2020 CALICE meeting, March 4-6, McGill https://agenda.linearcollider.org/event/8343/overview Very little SDHCAL presence (2 persons)
  One talk by Mary-Cruz
Past meetings (II)

- CALICE analysis meeting, May 20
  https://agenda.linearcollider.org/event/8526/ (one talk by Hector)
- CALICE analysis meeting, July 30, 2020
  https://agenda.linearcollider.org/event/8585/ (one talk by Bing)
- CALICE Collaboration meeting, Sept 28-30, 2020
  https://agenda.linearcollider.org/event/8608/
- AWLC 2020 (Americas Workshop on Linear Colliders), October 19-22, online
  https://conf.slac.stanford.edu/awlc2020/
- FCC workshop, November 10-13, 2020, online
  https://indico.cern.ch/event/932973/
- CALICE analysis meeting, December 10, online
  https://agenda.linearcollider.org/event/9005/
Past meetings (III)

- IML Machine Learning Workshop, June 2-5 2020, CERN, POSTPONED to October 19-22 [https://indico.cern.ch/event/852553/](https://indico.cern.ch/event/852553/) Lots of potentially interesting talks
- LCWS Europe, March 15-19, 2021, online [https://indico.cern.ch/event/995633/](https://indico.cern.ch/event/995633/) 2 talks accepted, April 16 at 11:20 pm and 18 at 11:20 am.
- CALICE meeting, March 24-26, 2021 online [https://agenda.linearcollider.org/event/9076/overview](https://agenda.linearcollider.org/event/9076/overview)
- Workshop on gas transport, April 22, online, [https://indico.cern.ch/event/1022051/overview](https://indico.cern.ch/event/1022051/overview) Numerous talks on high GWP gas replacement
- TIPP 2020 → TIPP 2021, online, May 24-28, 2021 [https://indico.cern.ch/event/981823/](https://indico.cern.ch/event/981823/) One talk on tricot electronics [https://indico.cern.ch/event/981823/contributions/4295341/](https://indico.cern.ch/event/981823/contributions/4295341/)
Past meetings (IV)

- ILD meeting, June 3-4 2021, online,  
  https://agenda.linearcollider.org/event/9199/
- ECFA Higgs at ee collider meeting, June 18, 2021  
  https://indico.cern.ch/event/1033941/
- EPS-HEP 2021, online, July 26-30,  
  https://indico.desy.de/event/28202/. One CALICE talk
- CALICE Analysis meeting, June 30, 2021 online,  
  https://agenda.linearcollider.org/event/9265/
- FCC week 2021, June 28-July 2, 2021 online.  
- PIC 2020, September 14-17 2021, Aachen, Germany,  
  https://pic2020.physik.rwth-aachen.de/
- Higgs 2021, October 18-22, 2021, Stony Brook, NY, USA,  
  https://indico.cern.ch/event/1030068/overview. fully online