

SDHCAL activities dashboard

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IP2I (previously IPN) Lyon

November 18th, 2022

Past activities

TB analysis

- Low Energy hadrons (Bing+SJTU+Lyon) Published.
- Uses of BDT (Bing+SJTU+Lyon) Published.
- 2018 TB SiWECAL+SDHCAL (Hector+CIEMAT : (done))

Ongoing activities

Test beam analysis

2022 Test Beam

We have new data

- Uniformity studies
- Particle ID (pion/Kaon-proton)
- Performance versus current

09/2018 Test Beam

- Tricot electronics (GG, Imad (?) on hold (?))

2015 Test Beam

- Analysis with rotated device (Hector **Note under CALICE review**)

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 (CIEMAT)
- Tricot simulation (on hold)
- Timing in simulation (developments by Guillaume Garillot → Analysis by Imad+**Tunisian group**)
- Prototype simulation upgrade (Multithreading, CEPC version, ...) (François)

Ongoing activities

TB data reconstruction

- Streamout (François, Gérald) **almost finished**
- Trivent **To be discussed**

PFA

- ArborPFA → APRIL (Bo, → GG).
- AMSTER : potential APRIL reclustering method (GG, on hold)
- Rand Index (GG, on hold)
- PFA with timing (IP2I, work in collaboration with LLR+IHEP)

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) **still active ?**
- $e^+e^- \rightarrow \nu\bar{\nu}H$, ILD and/or FCC (IP2I)

ECFA Detector R & D

Selection of some groups :

- Community 1 (Gaseous), themes 1.1 time and spatial resolution and 1.3 eco-friendly gases.
- Community 6 (Calorimetry), all themes
- Community 7 (Electronics)

First Calorimetry community meeting January 12, 2023

<https://indico.cern.ch/event/1212696/>

AIDAInnova status

- AIDAInnova has started on April Fools' Day(April 1st 2021).
- Kick-off organised April 12-16, 2021
<https://indico.cern.ch/event/1003419>
- First year meeting <https://indico.cern.ch/event/1104064/>

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 Mary Cruz representative

AIDAinnova task 12.5

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.

Monthly meetings <https://indico.cern.ch/category/13510/>

A 3 days "Hackaton" June 21-23 : <https://indico.cern.ch/event/1148507/>

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>

Published papers I

- SJTU+Lyon work : JINST 14 (2019) no.10, P10034
<http://inspirehep.net/record/1762795>.
- CHEF 2019 proceedings :
 - JINST 15 (2020) 05, C05016. <https://arxiv.org/abs/2002.09678>
 - 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>
 - Preprint at <https://arxiv.org/abs/2004.02972>
 - 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>)
- Energy reconstruction from 3 GeV to 80 GeV using BDT

Published papers II

- JINST 17 (2022) 07, P07017
<https://inspirehep.net/literature/2035601>
- <https://arxiv.org/abs/2202.09684>

Publications

Papers, short term

- **NEW** Description and stability of a RPC-based calorimeter in electromagnetic and hadronic shower environments
 - Djamel's note
 - Submitted to JINST
 - <https://inspirehep.net/literature/2111432>
 - preprint at <https://arxiv.org/abs/2207.06291>

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).

Coming meetings

Recent meetings

- Seattle Snowmass Summer Study 2022, July 17-26, <http://seattlesnowmass2021.net/>
- ECFA workshop on future ee colliders, October 5-7, DESY, <https://indico.desy.de/event/33640/> **One poster for SDHCAL**
- CALICE collaboration meeting , October 12-14, 2022 Orsay-Palaiseau, <https://agenda.linearcollider.org/event/9076/>

Coming meetings

- Joint FCC-France-Italy Workshop, November 21-23, 2022, IP2I, Lyon
- CALICE collaboration meeting at Göttingen, March 29-31, 2023

Coming conferences

Past

- One **talk given** to IEEE conference (Imad) end of 2021 (?).
- ICHEP 2022, July 6-13, 2022, Bologna, Italy,
<https://www.ichep2022.it/>. **3 CALICE talks**
- PIC 2022, 5-9 September 2022, Tbilisi, Georgia.
<https://indico.cern.ch/event/1158815/>
- TWEPP2022 (Topical Workshop on Electronics for Particle Physics), Bergen, Norway, September 19-23, <https://twepp2022.w.uib.no/>
- RPC 2022, CERN, 26-30 September 2022
<https://indico.cern.ch/event/1123140/>

Abstract closed

- ACAT 2022, Bari, Italy, 24-28 October 2022
<https://indico.cern.ch/event/1106990/>

Coming conferences (more)

Abstract closed (more)

- 7th Clombian conference oh HEP
<https://indico.cern.ch/event/1158692/>
- A conference with physicists, philosophers, sociologists, ... to discuss large scale experiment, Karlsruhe, December 8-10
<https://indico.uni-wuppertal.de/event/152/>

Open to abstract

- HEP in the LHC Era 2023, January 9-13, 2023, Valparaiso, Chile
<https://indico.cern.ch/event/1158681/> abstract open until December 14th.

Coming conferences (more)

Announced date

- Lepton Photon 2023, July 17-21 2023, Melbourne, Australia,
<https://indico.cern.ch/event/1114856/>
- EPS-HEP 2023, August 21-25 2023, Hamburg, Germany.
<https://www.eps-hep2023.eu/>

ILC Analysis tutorials

- ILC analysis with Delphes and miniDST, June 23, 2021, 3:30pm, online, <https://agenda.linearcollider.org/event/9264/>
- Introduction to iLCSoft, 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
- MarlinKinFit, May 18, 2022, 3:00 pm, online, <https://agenda.linearcollider.org/event/9687/>

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 strategy discussion I

- Part I (CEPC and FCC-ee), March 1st
<https://agenda.linearcollider.org/event/9623/>
- Part II, March 22, <https://agenda.linearcollider.org/event/9624/>
- Part III, April 5, <https://agenda.linearcollider.org/event/9625/> :
Exclusion of Russian institutes from DESY and ILD, FCAL status
- Part IV, April 19 <https://agenda.linearcollider.org/event/9626/> :
status of gaseous trackers.
- Part V, May 3, <https://agenda.linearcollider.org/event/9695/> :
ECAL status
- Part VI, May 17, <https://agenda.linearcollider.org/event/9708/>
status of SI trackers.
- Part VII, June 7, <https://agenda.linearcollider.org/event/9709/>
HCAL status
- Part VIII, June 28th,
<https://agenda.linearcollider.org/event/9749/> software status

ILD strategy discussion II

- ILD strategy document proposal, September 7th, <https://agenda.linearcollider.org/event/9802/>
- Presented at ECFA workshop in DESY.

ILD regular meetings

ILD group meeting November 8th

- <https://agenda.linearcollider.org/event/9849/>
- Discussion on cooperation ILD-FCC-ee and ILD- C^3 managements.
- review of C^3 meeting : strong community support
- Study of CEPC and FCC-ee background impact on ILD TPC performance.

ILD Analysys/software meeting November 9th

- <https://agenda.linearcollider.org/event/9862/>
- software news, measurement of $H \rightarrow Z\gamma$ decay.

next ILD Analysys/software meeting November 23rd

- <https://agenda.linearcollider.org/event/9876/>

FCC meetings

FCC-ee physics performance meeting

- Category <https://indico.cern.ch/category/12894/>
- click above to see recent meetings

FCC physics meetings

- Category <https://indico.cern.ch/category/5307/>

FCC Higgs performance meeting

- Last meeting, October 31 <https://indico.cern.ch/event/1207285/>
- Next meeting, December 5 <https://indico.cern.ch/event/1221257/>

CEPC meetings

CEPC days September 21st

- <https://indico.ihep.ac.cn/event/17741/>

CEPC workshop

The 2022 International Workshop on the High Energy Circular Electron Positron Collider <https://indico.ihep.ac.cn/event/17020/> October 24-28

next CEPC days November 25th

- <https://indico.ihep.ac.cn/event/18254/>

IDT WG3 Physics meeting

Open meeting

- See <https://agenda.linearcollider.org/category/266/> to access meeting list
- Next meeting november 17th,
<https://agenda.linearcollider.org/event/9683/>
- Then next December 15

MC mass production files

situation

- Overlay bug corrected MC production. Samples have been produced :
 - single muons and K_L^0 : <https://ild.ngt.ndu.ac.jp/eelog/dbd-prod/467>
 - inclusive higgs decay of qqH process :
<https://ild.ngt.ndu.ac.jp/eelog/dbd-prod/468>

Local production VIDEAU geometry

- Simulated uds sample from 30 GeV to 600 GeV on ilcDirac
`/ilc/user/g/ggrenier/prod/v02-02-03/uds/sim/ILD_I2_v02/`
- Simulated single klongs from 5 GeV to 100 GeV on ilcDirac
`/ilc/user/g/ggrenier/prod/v02-02-03/single/klong/sim/`

Snowmass 2021 restarted

Snowmass process has restarted

Full process

- Snowmass day, September 24, 2021
<https://indico.fnal.gov/event/50538/>
- Next event : summer meeting 2022, July 17-26, 2022
<https://indico.fnal.gov/event/22303/>

Energy frontier workshop

- Restart, September 2021 <https://indico.fnal.gov/event/49756/>
- Next event : March 28, April 1, 2022
<https://indico.fnal.gov/event/52465/>

Snowmass 2021 (previous items)

- American particle physics strategy update
- Currently discussed in all future collider projects.
- ILD preparation : LOI, simplified ilcsoft, delphesLC 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.

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 → DIRAC → 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

- ECFA DRD starting
- Snowmass process converging

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

Next meetings

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

Meeting on Fridays

- **Friday** December 2nd
- **Friday** December 16th
- Christmas break

Backup

COVID cancelled meetings

- 3rd CEPC Workshop EU Edition, May 4-7, 2020 Marseille,
<https://indico.in2p3.fr/event/20053/>
- HEPChile2021, January 4-8 2021, Valparaiso, Chile,
<https://indico.cern.ch/event/698387/> (**POSTPONED** to 2022)

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)

- FCC France, May 14-15, By video,
<https://indico.in2p3.fr/event/20792/>
- 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/> **Lots of potentially interesting talks**
- CPAD Instrumentation Frontier Workshop 2021, March 18-22 (overlap LCWS) <https://www.stonybrook.edu/cfns/cpad2021/index.html> (abstract up to 02/28/2021)
- LCWS Europe, March 15-19, 2021, online <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>
- Workshop on gas transport, April 22, online, <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/> One talk on tricot electronics <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.
- Pico-second timing detectors, September 9-11, 2021 Zurich, Switzerland,
<https://indico.cern.ch/event/861104/>.
- 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**
- ILCX2021 : "ILC workshop on potential experiments", October 26-29, 2021, Tsukuba, Online, <https://agenda.linearcollider.org/event/9211/>.

Past meetings (V)

- ACAT 2020 (Advanced Computing and Analysis Techniques in Physics Research) → ACAT 2021 November 29-December 3, 2021, Daejeon, South Korea, <https://indico.cern.ch/event/855454/>
- Lepton Photon 2021, January 10-14, 2022, Manchester, UK, <https://www.leptonphoton2021.org/>
- PANIC 2020 → PANIC 2021 September 5-10 2021, Lisbon, Portugal, <https://indico.lip.pt/event/592/> One SDHCAL talk, proceeding published <https://inspirehep.net/literature/2035972>
- 2021 CEPC international workshop, November 8-12, online <https://indico.ihep.ac.cn/event/14938/>
- FCC Physics, Experiments & Detectors workshop in Liverpool, February 7-11, 2022, <https://indico.cern.ch/event/1066234/>
- Vienna Conference on Instrumentation 2022, February 21-25, 2022, Vienna <https://vci2022.hephy.at/>
- CALICE collaboration meeting , April 20-22, Valencia, <https://agenda.linearcollider.org/event/9571/>
- CALOR2020 → CALOR2021 → CALOR2022, May 16-20 2022, Sussex, UK, <https://indico.cern.ch/event/847884/> 2 talks
 - "Status of Timing-SDHCAL Development",