

# SDHCAL activities dashboard

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IP2I (previously IPN) Lyon

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# 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

- 2m<sup>2</sup> 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<sup>st</sup> 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

# 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.

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>

# Published papers

## Recent

- 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>)

# 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.**

# Coming meetings

## Recent workshops

- 2021 CEPC international workshop, November 8-12, online  
<https://indico.ihep.ac.cn/event/14938/>

## Coming workshops

- FCC Physics, Experiments & Detectors workshop in Liverpool, February 7-11, 2022, <https://indico.cern.ch/event/1066234/>, **Abstract up to December 8**
- 3rd CEPC Workshop EU Edition, May 4-7, Marseille, **postponed to spring 2022** <https://indico.in2p3.fr/event/20053/>
- LCWS 2022 in spring

# Coming conferences

## Past

- PANIC 2020 → PANIC 2021 September 5-10 **2021**, Lisbon, Portugal, <https://indico.lip.pt/event/592/> **One SDHCAL talk, proceeding submitted**
- Pico-second timing detectors, September **9-11**, 2021 Zurich, Switzerland, <https://indico.cern.ch/event/861104/>.

## Abstract closed

- Also one **talk accepted** to IEEE conference.
- 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/>

## Coming conferences (more)

### Abstract closed (more)

- Vienna Conference on Instrumentation 2022, February 21-25, 2022, Vienna  
<https://vci2022.hephy.at/>

### Open to abstract

- PISA meeting on Advanced Detector 2021, May 23-29 2021, Elba, Italy,  
<https://www.pi.infn.it/pm/> abstract : 12/1/2021 to 02/20/2022
- CALOR2020 → CALOR2021 → CALOR2022, May 16-20 2022, Sussex, UK,  
<https://indico.cern.ch/event/847884/> (abstract 12/6/21 to 03/11/22)

### postponed conferences

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

# Coming conferences (more)

## Announced date

- ICHEP 2022, July 6-13, 2022, Bologna, Italy,  
<https://www.ichep2022.it/>. Abstract submission to open next january
- PIC 2022, September 2022, Tbilisi, Georgia.
- Lepton Photon 2023, July 17-21 2023, Melbourne, Australia.
- 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



# 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

- indico category <https://agenda.linearcollider.org/category/243/>

## ILD Analysys/software next meeting November 10th

- <https://agenda.linearcollider.org/event/9475/>
- News and software news
- Higgs to 4 scalars analysis.
- next meeting November 24th

# FCC meetings

## FCC-ee physics performance meeting November 15th

- <https://indico.cern.ch/event/1095951/>
- News, some bug fixes for DELPHES.
- $ee \rightarrow WW$  kinematic fits.
- DELPHES news.
- tracking in IDEA.

## FCC physics meetings November 29th

- <https://indico.cern.ch/event/1092025/>

Equivalent CEPC meetings are private

# IDT WG3 Physics meeting

Open meeting on November 11th

- <https://agenda.linearcollider.org/event/9351/>

Open meeting on December 16th

- <https://agenda.linearcollider.org/event/9352/>

# 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/elog/dbd-prod/467>
  - inclusive higgs decay of qqH process :  
<https://ild.ngt.ndu.ac.jp/elog/dbd-prod/468>

# Snowmass 2021

- 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

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

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

- December 9
- Christmas and new year break
- Reconvene January 13

# 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)

- 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.
- 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/>.