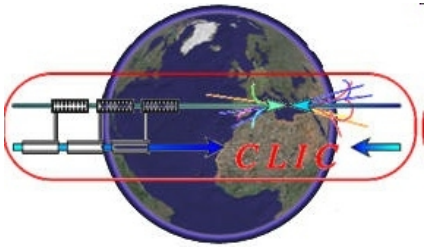
LABORATOIRE DE L'ACCÉLÉRATEUR LINÉAIRE

Summary of LCTW09



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LCWS 2010 Beijing/China March 2010

Disclaimer:

Due to “Non Availability” of R.P. During winter 2009/10 the summary and conclusions of the workshop takes only shape now.

Some issues reported here will need further clarification in the coming weeks.

Idea/Charge of the Workshop

- Dates and Location: 3.11.09 – 5.11.09 at LAL Orsay
- Successor of 1st workshop of this kind at FNAL in Jan. 07
  https://conferences.fnal.gov/idtb07/
  Three year rhythm looks appropriate

- Review achievements/developments since FNAL workshop

- Assure that necessary R&D for DBDs can be conducted

- Sharpen the view of community to identify synergies in R&D programs (particularly) testbeam efforts
  Common tools, common reservation of testbeam areas, common application for beam time

- "Remind" Testbeam operators of our needs

- The workshop will render a document where the testbeam plans are listed and explained

For more info on LCTW09 see:

http://events.lal.in2p3.fr/conferences/LCTW09

Program of Workshop

Focus on Period 2010-2013

- Opening Session including review
- Plans of Subdetectors – Calorimetry
- Plans of Subdetectors – Silicon Tracking
- Plans of Subdetectors Gaseous Tracking
- DAQ
- Software including Communication Tools
- Testbeam Facilities
- Resources and infrastructure for common testbeams

Lively discussions among the 40 participants from all three regions and facility managers

Facilities Summary I

Hadron Beams (These have also e- beams):

FNAL: New beam line Mcenter
Energies 1-120 GeV
ILC Beamline possible
ILC beam structure seems feasible
Shutdown in 2012?

CERN: A lot of beam lines (PS, SPS)
Energies 1-450 GeV
ILC spill structure maybe feasible at PS
Availability of North Area for >2010 depends on LHC schedule
ILC Beamline should be orally discussed begin of 2010 and formally requested latest by middle of 2010

IHEP Protvino: Hadron/electron/muon beams 1-45 GeV
Available 2 times a year

DUBNA: Neutron beam with good rates

Facilities Summary II

Electron Beams

DESY: 1-6 GeV e-
- 4 beamlines
- High availability
- Optimal for prove of principle test

Asian Facilities: Japan/China
- Low energy e- facilities with varying availability

SLAC: **New** nice facility in “Hall of the Quarks” End Station A
- e-/h beam up to 13.6 GeV
- Good momentum resolution
- e- beam available end of 2010
- **hadron** beam end of 2011 (needs target to be installed)
- ILC time structure maybe possible

CALICE Testbeam Planning beyond 2010

Table published in DESY-PRC Report (also arXiv: 1003.1394 phys.ins-det, hep-ex)

Project	2010/1	2010/2	2011/1	2011/2	2012/1	2012/2
Phys. Prot. Si-W ECAL/DCHAL/TCMT	xx	xx	xx	-	-	-
Phys. Prot. W ECAL / W HCAL / TCMT		x	x	xx	xx	-
Tech. Prot. DHCAL	x	x	xx	xx	xx	xx
Tech. Prot. AHCAL	x	x	x	x	xx	xx
Tech. Prot. Si-W ECAL	-	x	x	xx	xx	xx
Phys. Prot. DECAL	x	x	x	x	x	x
Tech. Prot. Sc-W ECAL	-	-	-	-	-	x

- No Activity
x Small Activity
xx Large Scale Testbeam

- Large Scale 2011/1 – 2012/2, SDHCAL/AHCAL+ECAL
  Needs several weeks/months steady occupation of beam line
  Table does not take W-HCAL into account (also large scale TB)

- Main needs: Relatively small rates O(100Hz)
  Large Bore Magnets (up to 5T)
  Telescope?

SiW Ecal - SiD

Summary goals, progress, plans

	Year 1	Year 2	Year 3
Goal from proposal	Complete R&D on component technologies	Assemble test module, start beam test	Beam test, data analysis
Status	•Sensors – OK •Tungsten – OK •KPiX – need 1024 channel chip •KPiX-Si bumps: need to converge on technology •Flex cable – ok •Cable-Si connect: needs R&D	Need the integrated tests first. Flex cable can be made independently; same for DAQ	tbd
Plan	•Have 1024 KPiX and bumping technology by summer for combined testing in lab. •Need to finalize cable-Si tech • Re-evaluate resource needs – so far ok.	If integrated tests look OK, begin planning for beam test. Assume SLAC for now.	tbd

R. Frey, Oregon

Forward Calorimeters and Muon Systems

FCAL Collaboration: Test of small sensor units in 2010 Location unclear
Will be clarified for workshop document

Muon Systems: Two alternatives
RPC and Scintillator strips read out by SiPM

Small units tests in 2010
More demands in 2011
Exploitation of experience from CALICE devices
TCMT and RPC digital HCAL?
To be clarified for final document!!!

R&D Conducted within LC-TPC Collaboration

- **Demonstration Phase: Small prototype tests still going!**

  Provide a basic evaluation of the properties of an MPGD TPC and demonstrate that the requirement (1-b,c) can be met using small prototypes.

- **Consolidation Phase: LP1: 2007-2010 & LP2 2010 –**

  Design, build and operate a "Large Prototype" (of large number of measured points) at the EUDET facility in DESY comparing tecnologies and demonstrating (1-a) in a way.

- **Design Phase:**

  Start working on an engineering design for aspects of the TPC at ILC.

  (LC TPC collaboration: MOU)

At each phase, we perform beam tests probably with different purposes.

Current Viewpoint of LC-TPC Collaboration

- "Stay at DESY as long as possible"

  Setting up a "home" at DESY has taken a large efforts
  Moving is a considerable undertaking
  Limited time, man power and funding
  LC-TPC so far funded by EUDET

- Remain a Contender for a hadron testbeam at CERN or FNAL
  - Small prototype
  - Not before beginning of 2012
  - Depends largely on progress of studies at DESY and funding AIDA

Silicon Tracking – A Plethora of Activities

Group	Technology	Goals	Test Beam
SID Tracking (SLAC)	Multi-metal strips + KPIX Chip	SID Outer Tracker	FNAL
DEPFET Collaboration (MPI Munich)	Depletion mode FET	ILC Vertex	CERN
MIMIOSA (INPE Strasburg)	CMOS MAPS development	ILC Vertex	DESY, CERN
SPYDR (Bristol U.)	CMOS MAPS, deep n-well	Tracking and Vertex	?
3D (FNAL)	3D detector/electronics integration	ILC Vertex	FNAL
APSEL (INFN)	CMOS MAPS triple well, 3D	ILC Vertex	CERN
CAPS (Hawaii)	CMOS MAPS + SOI	ILC Vertex, Belle 2	FNAL
Thinned MAPS (LBL)	CMOS MAPs thinning	ILC Vertex, RHIC	FNAL
SiLC (Paris)	Silicon Strips	ILC (ILD) Tracking	CERN
FPCCD (Japan?)	Fine Pixel CCD	ILC Vertex	KEK?
ISIS (LCFI-UK)	CCD with in-pixel storage	ILC Vertex	?
CPCCD (LCFI-UK)	Column-parallel CCD	ILC Vertex	?
Chronopixel (Yale)	CMOS MAPS	SID Vertex	?

Main needs: High Rates

Citation from WS document:

“Beams should be able to simulate rates seen at the inner radius of the vertex detectors” Exact numbers to be clarified

Beam Telescope

Large range of energies (Multiple Scattering)

Track separation in Magnetic Field

DAQ Issues

- Available DAQ systems CALICE-DAQ, EUDAQ, KAPTAN
  Developed for dedicated project yet largely generic
  However, little effort to synchronise them or combine them into one system
  Room for synergies: Trigger Logic Units
  Common Beam Interface cards

- "Conflict" between isolated systems or common approach
  The first approach is quick but application specific
  The second generates overhead which may pay off in the long run
  Indispensable for combined testbeams

- Several DAQ software systems
  TANGO, DOOCS, XDAQ, EUDAQ ...

- Recommendation: Commonalities should be sought for to ease integration at least at a later stage
  Work on common DAQ systems need corresponding funding (e.g. AIDA) and regular exchange on experience

Software Issues

- Testbeam projects are using ILC software tools for data processing analysis
  Good experience in the past, mutual benefit

- Interface DAQ/offline needs to be (better) defined
  DAQ which writes LCIO or offline conversion

- Common fields for testbeams and core software
  Conditions Data handling
  Event Display

Realisation of these tools depends on funding!!!!

- Grid computing is essential also for testbeam data taking
  CALICE, TPC, EUDET telescope used heavily grid in the past
  Need to assure availibilty of ressources and support in view of LHC start

- Communication tools (virtual control rooms) are now available and performant and can save considerably cost
  Large and good experience e.g. in Calice

Summary Table of Projects

Project	2010/2	Site	2011/1	Site	2011/2	Site	2012/1	Site	2012/2	Site
Calo	xx	**CERN** **FNAL** SLAC	xx	**CERN** **FNAL** **SLAC**	xx	**CERN** **FNAL** **SLAC**	xx	**CERN** **FNAL** SLAC	xx	**CERN** **FNAL** SLAC
Needs		Magnet		Magnet		Magnet		Magnet		Magnet
	Particle Types: e, π, p, Energies: 1-120 GeV, Low Rates $\approx$ 100 Hz									
Gas/TPC	xx	**DESY**	xx	CERN **DESY** FNAL	xx	CERN **DESY** FNAL	xx	CERN **DESY** FNAL	?	CERN **DESY** FNAL
Needs		Magnet		Magnet		Magnet		Magnet		Magnet
	Particle Types and rates: e as available at DESY. Hadron beam test not planned but possible.									
SiTrack	x	Various (see Tab.2)	x	Various	x	Various	x	Various	x	Various
Needs		Magnet/Telescope		M./T.		M./T.		M./T.		M./T.
	Particle Types: e, π, p, Energies: 1-120 GeV, High Rates $\approx$ 10 kHz for short periods									

- Try to combine projects, needs and preferred sites

- Difficult to summarize wealth of activities in short and concise table

- Question to operators: What kind of information would you need?

- Availability of beam lines
  Shutdown of FNAL in 2012 can be harmful to progress in view of DBDs
  The same is true if CERN needs to reduce testbeam duration due to LHC issues

On (ILC) Beam Structure

- Detector Hardware (i.e. Front End Electronics) is adapted to ILC needs
  Keyword: Power Pulsing (in a magnetic field)
  True for all projects

- Still, different components have different requirements

  Vertex detectors need high rates

  (Central) Calorimeters needs low rates
  If ILC beam structure: Duty cycle on top would be “undesirable”
  If no ILC Beam Structure: Spill stretched over a long time (long flat top)

  TPC: Small rates, but no dedicated request for ILC beamstructure so far
  Would however exploit it if available

- Macrostructure more important than microstructure

- The results of all projects would benefit from beams which mimic the ILC beamstructure

Sites are asked to continue to work on establishing beam structure required for “ILC Hardware”
No discussion on CLIC structure so far

Infrastructural Issues

- LC Detector R&D is mainly organised in R&D Collaborations (see above)
  only way to soften short comings by limited funding and manpower

- Common beam lines carry a lot of potential for synergies
  Knowledge of “pecularities” of beam line enhances efficiency of data taking
  Possibility to establish common infrastructure (e.g. for data management)

- Calorimeter effort will need beam lines over a long time (~1 ½ year) starting in 2011
  “Breaks” in data taking could be filled with activities of projects with smaller devices

- TPC will benefit from established infrastructure at DESY
  Quasi-permanent beamline

- Plans to place beam requests of detector R&D projects in a organised manner
  Two options: - Central request for all activities
  - Requests are placed at a common date by the R&D collaborations

- Data base to monitor and keep track of testbeam activities

Summary and Conclusion

- LCTW09 witnessed the wealth of highly challenging R&D actvities
  How can testbeam activities accompagny the R&D needed for DBDs

- Right time to make up our minds on what we want and how to organise ourselves

- Still in the phase of sharpening conclusions
  Beam structure
  Request for Semi-Permanent beam lines
  Organisation among R&D groups

- Workshop document in preparation
  Good progress
  Publication planned for 30/4/2010
  Document will benefit from further input at LCWS10

- Publication to the Detector Community (LC-Note) and Site Managers