

# Report from AIDA Annual meeting – WP2

Frank Gaede, DESY

KILC 2012

Daegu, Korea, Apr 23–27, 2012

# The AIDA project

AIDA – Advanced European Infrastructures for Detectors at Accelerators

AIDA – Advanced European Infr...

<http://aida.web.cern.ch/aida/index.html>



## AIDA

Advanced European Infrastructures  
for Detectors at Accelerators

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### Advancing European detector development

The AIDA project addresses infrastructures required for detector development for future particle physics experiments. In line with the European strategy for particle physics, AIDA targets user communities preparing experiments at a number of key potential future accelerators: SLHC (luminosity-upgraded LHC), future Linear Colliders (ILC and CLIC), future accelerator-driven neutrino facilities or future B-physics facilities (e.g. Super-B).



CALICE 1m<sup>3</sup> semi digital hadronic calorimeter, now in beam tests at CE

The infrastructures covered by the AIDA project are key facilities required for an efficient development of the future experiments, such as: test beam infrastructures (at CERN and DESY), specialised equipment irradiation facilities (in several European countries), common software tools, common microelectronics tool engineering coordination offices. The project, coordinated by CERN, involves more than 100 institutes and laboratories from 23 countries as beneficiaries or associate partners.

[more >>](#)

### European funding to access test facilities

European researchers from outside the AIDA project can benefit from dedicated Transnational Access funding to access AIDA test beams and irradiation facilities.

[more >>](#)

AIDA is co-funded by the European Commission within Framework Programme 7 Capacities, Grant Agreement 262025. Design based on Ezekiel | Webmaster Kate Kahle | Search | Sitemap | Acknowledgement Text | Contact us

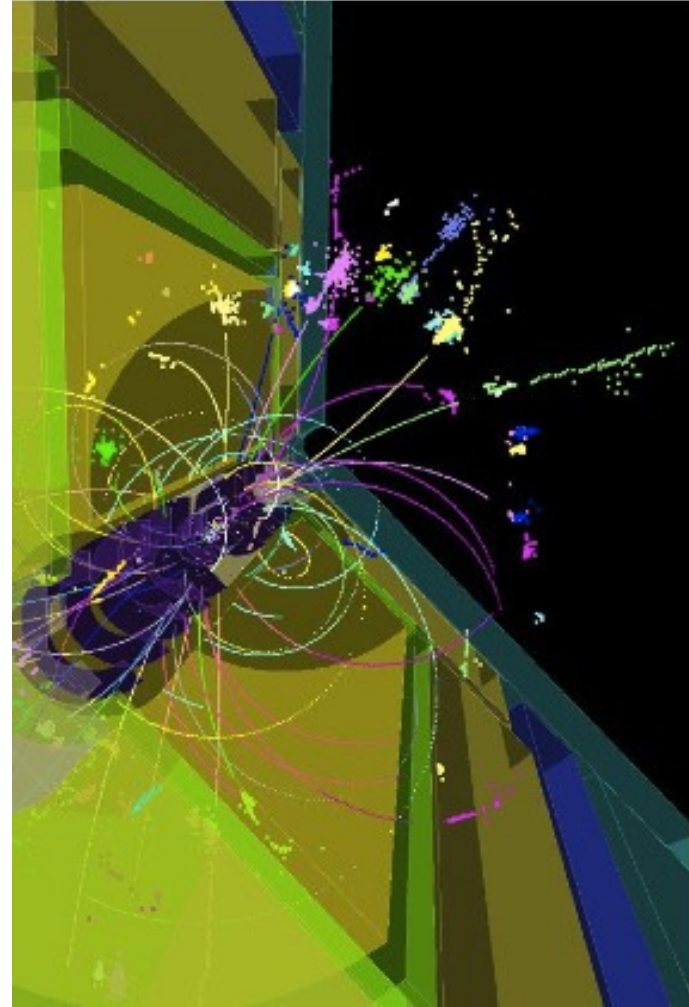


- EU project
- duration of four years
- started Feb 2011
- sLHC, Linear Collider, neutrino,...
- WP2: common software

Summary talk given at  
First Annual Meeting – DESY

# Outline

- Introduction
  - organization of WP2
  - deliverables and milestones
- Status of tasks
  - geometry
  - tracking
  - particle flow
  - pile-up
  - alignment
- Summary



# goal of WP2 – Common Software

- develop core software tools that are useful for the HEP community at large
- in particular for sLHC and Linear Collider (ILC/CLIC)
- strategy: develop tools in the context of the corresponding groups and frameworks, while having general application (re-use !) as a design criterion from the start

## Task 2.2: Geometry toolkit for HEP

- Allow the description of complex geometrical shapes, materials and sensitive detectors
- Provide interfaces to full simulation programs (Geant4), fast simulations, visualization tools and reconstruction algorithms
- Allow for the misalignment of detector components
- Provide an interface to calibration constants and conditions data

## Task 2.3: Reconstruction toolkit for HEP

- Tracking toolkit based on best practice tracking and pattern recognition algorithms
- Provide alignment tools
- Allow for pile up of hadronic events
- Calorimeter reconstruction toolkit for highly granular calorimeters based on Particle Flow algorithms

# work package organization

TASK	PERSON
<b>Coordination</b>	Frank Gaede, DESY Pere Mato, CERN
<b>Geometry</b>	Gabriele Cosmo, CERN
<b>Reconstruction</b>	
<b>Tracking</b>	Steven Aplin, DESY
<b>Particle Flow</b>	Mark Thomson, UCam
<b>Alignment</b>	Chris Parkes, UMan
<b>Tracking and Vertexing in Pile-Up</b>	Lucia Silvestris, INFN

Participant	Person-Months
CERN	60
OeAW	24
CNRS/LLR	61
DESY	71
NTUA	4.5
MTA-KFKI	17
INFN	38
UCAM	47
UNIGLA/UMAN	43

total: 397  
~1/3 funded by EU

# Deliverables for WP2

Deliverable Number <sup>61</sup>	Deliverable Title	Partners (lead beneficiary) <sup>62</sup>			Dissemination level <sup>63</sup>	Delivery date <sup>64</sup>	
D2.1	Project web infrastructure to document software packages	CERN	5.00	O	PU	3	done
D2.2	Central code repositories and other infrastructure required for the software development	DESY	5.00	O	PP	4	done
D2.3	Software design for geometry toolkit including the interfaces for the reconstruction toolkits	CERN, DESY, LLR, UniGla, STFC			PU	12	ongoing
D2.4	Software design for tracking toolkit	DESY, CERN, OeAW, KFKI				12	ongoing
D2.5	Software design for PFA tools	Ucam, LLR, CERN,			PU	12	done
D2.6	Design for handling the pile-up in sLHC	INFN, NTU, KFKI			PU	17	next
D2.7	Software toolkit for detector geometry, materials and detection technologies	CERN, DESY, LLR, UniGla, STFC			PU	38	
D2.8	Software toolkit with tracking algorithms	DESY, CERN, OeAW, KFKI				38	
D2.9	Particle Flow software tools	Ucam, LLR, CERN,			PU	38	
D2.10	Alignment tools software tools	UniGla	30.00	O	PU	38	
D2.11	Trigger simulation software tool	STFC	20.00	O	PU	38	
		Total	350.00				

# WP2 – Milestones

Milestone number <sup>59</sup>	Milestone name	Partners (lead beneficiary)		Comments
MS10	Running first prototype of the particle flow algorithm.	Ucam,LLR,CERN	10	Application to LC detector (Task 2.3)
MS11	Running prototype of tracking toolkit including some algorithms	DESY	18	Application to ILD-TPC simulation (Task 2.2)
MS12	Running prototype of the geometry toolkit	CERN, DESY, LLR	26	Application to ILD detector simulation (Task 2.2)
MS13	Running prototype of the tracking code for the pile-up	INFN, NTU, KFKI	26	Application to sLHC simulation (Task 2.3)
MS14	Integration of tracking toolkit into LC software framework	DESY, CERN, OeAW	44	Validation of physics performance (Task 2.3)
MS15	Application of PFA tools to sLHC detectors	Ucam, LLR	44	Demonstration of concept (Task 2.3)
MS16	Application of alignment tools to sLHC	UniGla	44	Validation of performance (Task 2.3)
MS17	Integration of pile-up tracking code in sLHC software frameworks	INFN, NTU, KFKI		Validation of tracking efficiency (Task 2.3)

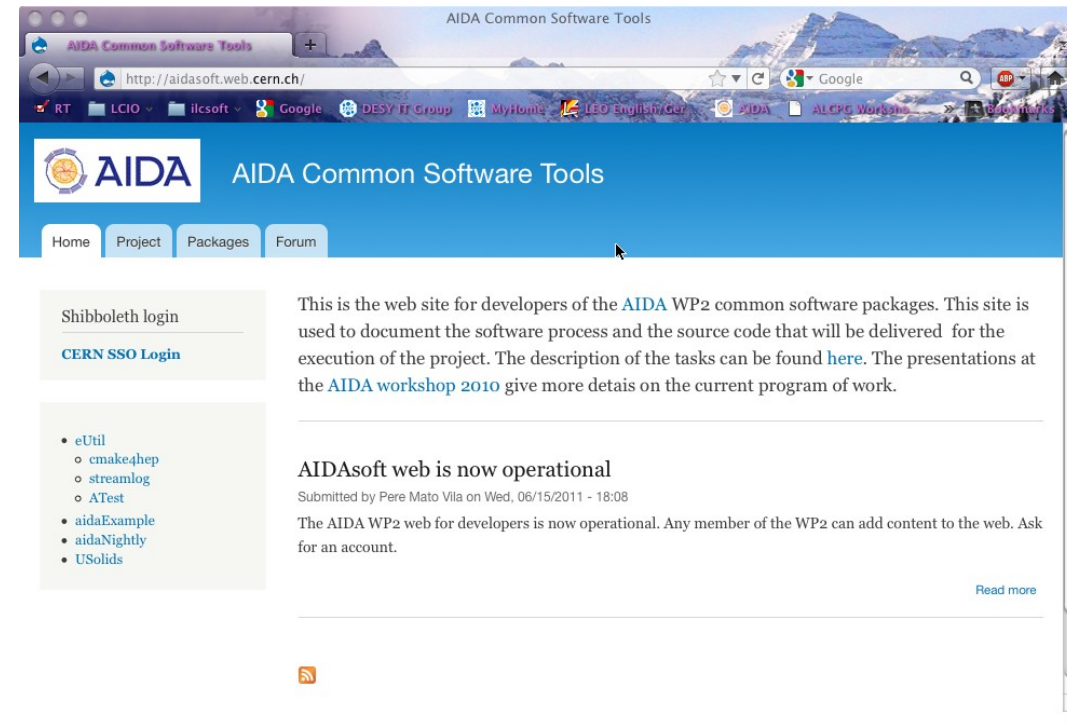
done

next



# Deliverable 2.1 – WP2 Web site

- created web site for documentation of WP2 sub tasks and software projects
- based on Drupal system
  - <http://aidasoft.web.cern.ch>
- provides:
  - general documentation for software projects
  - link to code repositories
  - discussion forum



deliverable report:

<http://cdsweb.cern.ch/record/1379521>



# Deliverable 2.2 – WP2 Code repository

- created svn code repository for AIDA WP2
  - <https://svnsrv.desy.de/viewvc/aidasoft/>
- utilities for building HEP software packages with CMake
- logging library
- simple scripts for including software tests in project
- CDash server for dashboard with nightly test results
  - <http://aidasoft.desy.de/CDash>

deliverable report:

<http://cdsweb.cern.ch/record/1383272>

The screenshot displays two web interfaces. The top interface is the WebSVN repository for 'General.aidasoft - Rev 64'. It shows a list of subversion repositories with columns for Path, Last modification, View Log, Download, and RSS. The bottom interface is the CDash dashboard for 'AIDAEXAMPLE Dashboard'. It shows a table of builds with columns for Site, Build Name, Update, Configure, Build, Test, and Build Time. The dashboard also includes a 'No Nightly Builds' section and a 'No Continuous Builds' section.

**WebSVN: General.aidasoft - Rev 64**

Subversion Repositories: General.aidasoft

Revision Information

Last modification: Rev 64 - engels - 2011-06-16 17:19:44 - Rev 63

Log message: added initial documentation

Last modification - Compare with Previous - View Log - RSS

Path	Last modification	View Log	Download	RSS
aidaExample/	44 23h 47m engels	Log	RSS	
aidaNightly/	50 23h 33m engels	Log	RSS	
ATest/	61 2h 33m engels	Log	RSS	
cmake4hep/	64 28m engels	Log	RSS	
eUtil/	48 23h 42m aplin	Log	RSS	
streamlog/	62 2h 01m gaede	Log	RSS	
USolids/	5 6d 00h gaede	Log	RSS	

**AIDA** Advanced European Infrastructures for Detectors at Accelerators

**AIDASOFT Projects**

**Available Dashboards**

Project	Description	Submissions	First build	Last activity
aidaExample	aidaExample is an example package that demonstrates how new software packages can easily be created using the CMake built tools, the ATest test infrastructure and the streamlog logging library.	0	NA	NA
aidaNightly	aidaNightly is a meta packages that builds all (registered) software packages of AIDA and runs the implemented tests for these packages.	0	NA	NA
eUtil	eUtil is a utility meta package that provides some core infrastructure for developing software packages.	0	NA	NA

**AIDAEXAMPLE Dashboard**

Friday, June 17 2011 17:42:52 CEST

No file changed as of Friday, June 17 2011 01:00:00 CEST

**No Nightly Builds**

**No Continuous Builds**

**Experimental**

Site	Build Name	Update		Configure		Build			Test				Build Time	
		Files	Min	Error	Warn	Min	Error	Warn	Min	NotRun	Fail	Pass		Min
grid-lic-pa0	Linux-c++			0	0	0	0	0	0	0	1	1	0	2011-06-17T17:20:24 CEST
grid-lic-pa0	Linux-c++			0	0	0	0	0	0	0	0	2	0	2011-06-17T17:19:45 CEST
grid-lic-pa0	Linux-c++			0	0	0	0	0	0	0	0	2	0	2011-06-17T17:17:47 CEST
grid-lic-pa0	Linux-c++			0	0	0	0	0	0	0	0	2	0	2011-06-17T17:08:19 CEST
Totals	4 Builds	0	0	0	0	0	0	0	0	0	1	7	0	

**No Coverage**

**No Dynamic Analysis**

Kitware

CDash 1.8.2 © 2010 Kitware Inc. [report problems]

# Agenda of WP2 session

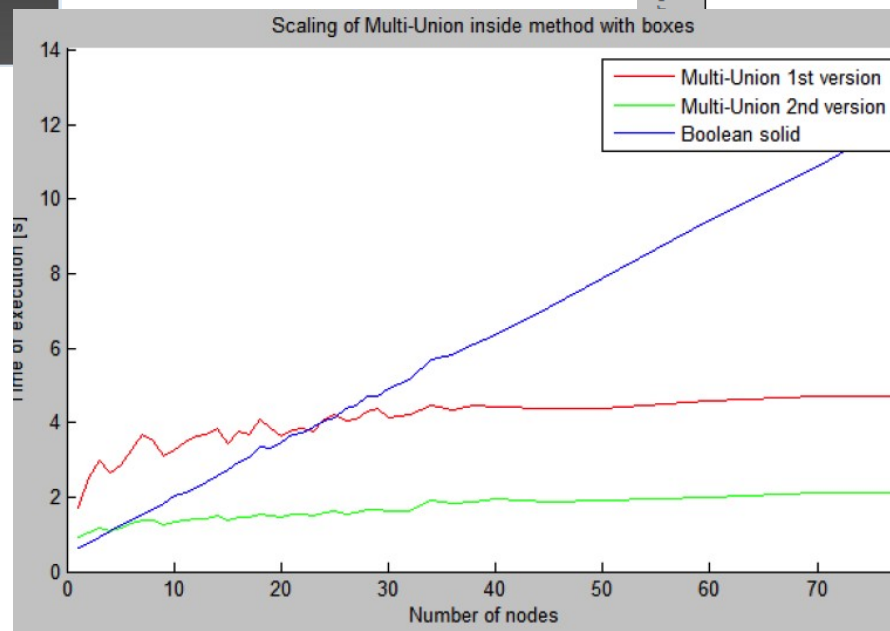
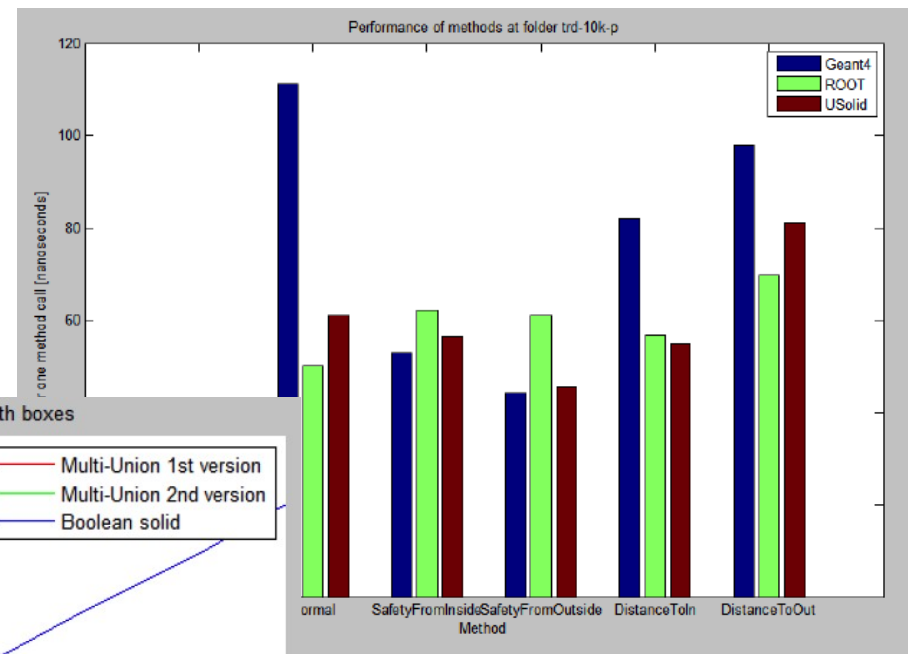
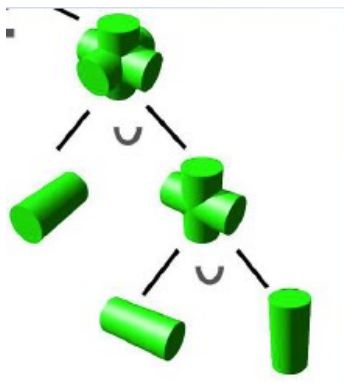
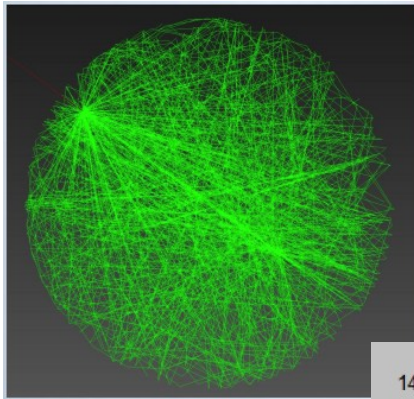
11:00	<b>Introduction</b> <i>Sem 3, DESY</i>	MATO VILA, Pere et al.  11:00 - 11:20
	<b>Status of Geometry - USolids</b> <i>Sem 3, DESY</i>	GAYER, Marek  11:20 - 11:40
	<b>Status of Geometry: DD4Hep</b> <i>Sem 3, DESY</i>	MATO VILA, Pere  11:40 - 12:00
12:00	<b>Status of Tracking Task</b> <i>Sem 3, DESY</i>	APLIN, Steven  12:00 - 12:20
14:00	<b>Status of Alignment Task</b> <i>Sem 4, DESY</i>	PARKES, Chris  14:00 - 14:20
	<b>Timing of hadronic showers in geant4</b> <i>Sem 4, DESY</i>	RAMILLI, Marco  14:20 - 14:40

- very interesting talks and fruitful discussions
- unfortunately not all beneficiaries could be present

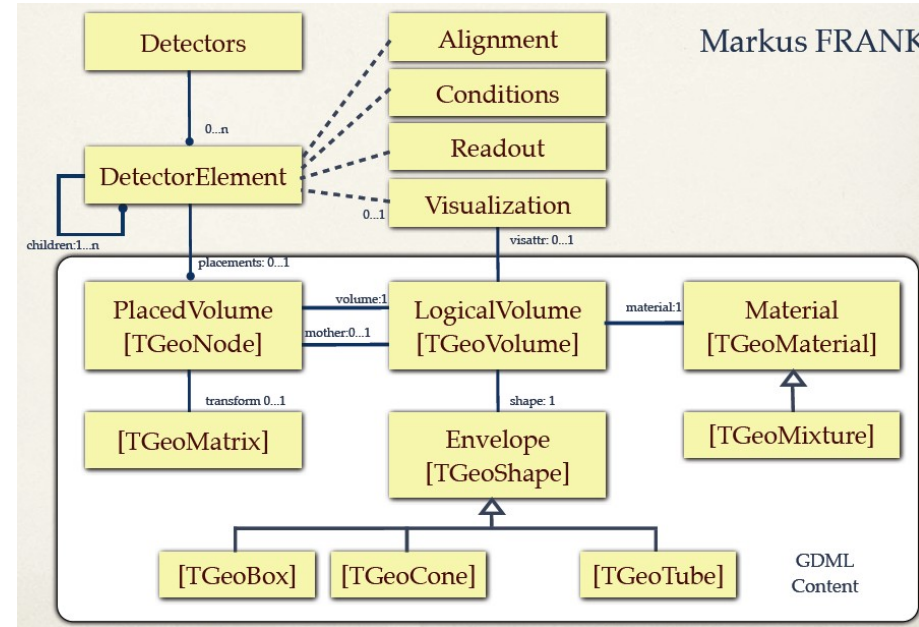
# Geometry - USolids

[Marek Gayer]

- implementation of geometrical 3D primitives for **Geant4** and **ROOT** including new 'union of many' shape
- phase 1 completed: design, first prototype and software tests
- phase 2: box, orb, trd, union of many completed, performance tests (comparison geant4, ROOT, USolid )



- Frank Gaede, KILC12, Daegu, Korea, Sep 23-27, 2012



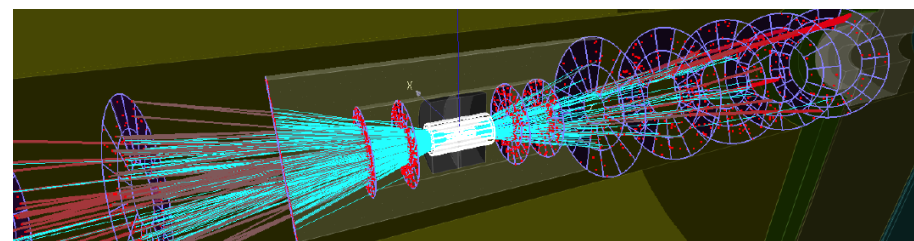
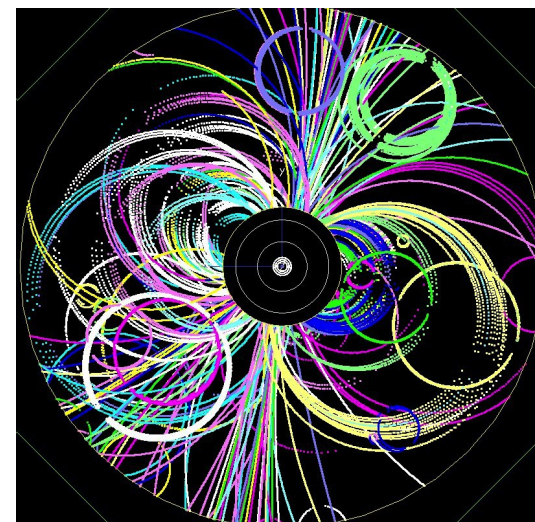
- 12



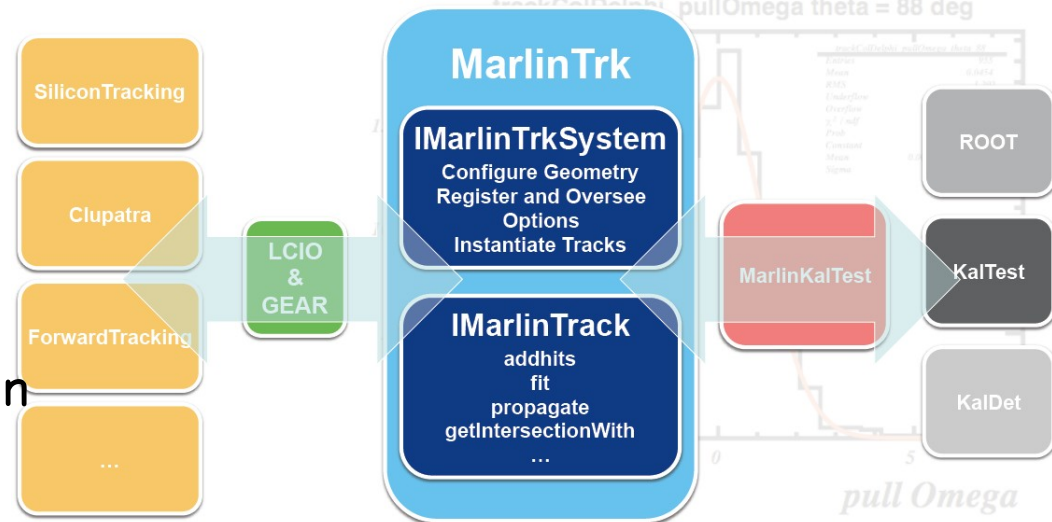
# Tracking

[Steven Aplin]

- in 2011 complete re-write of of iLCSoft tracking software
- topological TPC patrec
- forward patrec w/ cellular automaton
- definition of MarlinTrk interface
  - decouple tracking finding and fitting
- currently finalizing tracking package for massive DBD MC production
- serves as prototype for tracking toolkit in AIDA



- deliverable D2.4 'software design for tracking toolkit' is slightly delayed by 2-3 months
  - reason is tight manpower situation and preparation for the ILC-DBD
- institutes: DESY, OEAW
- upcoming MS11: prototype for iLC tracking (M18)



# Particle Flow

- *Calorimeter reconstruction toolkit for highly granular calorimeters based on Particle Flow algorithms*
- good progress has been made with the Particle Flow tools work package with all institutes making significant contributions
- design for a powerful new particle flow reconstruction framework designed with generic applications in mind
- re-implemented existing LC PFA in new PandoraPFA framework
- successful application to 3TeV events at CLIC in context of CDR
- development of reconstruction algorithms for digital and semi-digital highly granular calorimeters

- milestone M10: "Application of PFA to Linear Collider" reached
- deliverable D2.5 'design of Particle Flow software tools' submitted on time



# Tracking and Vertexing w. Pile Up

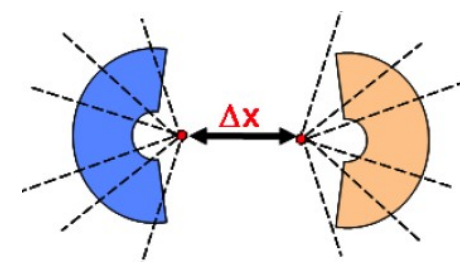
- *provide tracking and vertexing tools for high multiplicity hadronic events with pile up*
- subtask has made considerable progress in the context of LHC experiments:
  - code development of new phase I geometry for CMS Pixel system integrated in CMSSW framework
  - study to improve the CPU performance of the CMS tracking finding
  - development of a Legendre transform based track finding for ATLAS
  - development of a detector independent vertexing package for high pile up at colliders
  - development of rapid tracking detector simulation for triggers
- no milestones or deliverables in subtask so far
- upcoming D2.6 : design for handling the pile-up in sLHC (M17)
- institutes: INFN, KFKI, MTUA, STFC



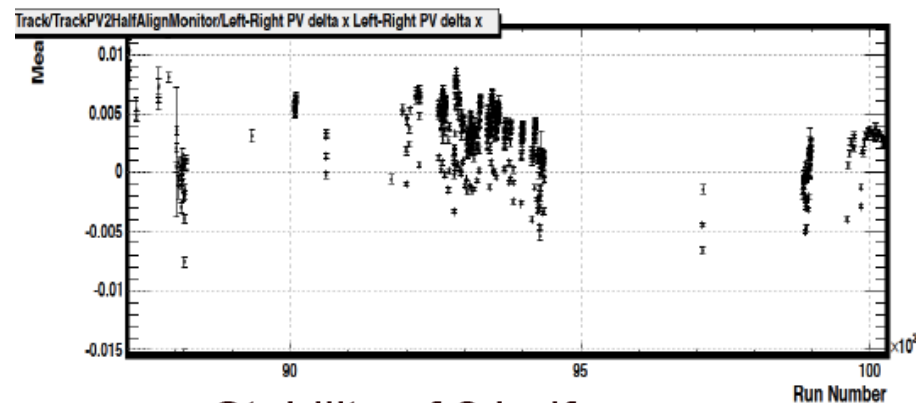
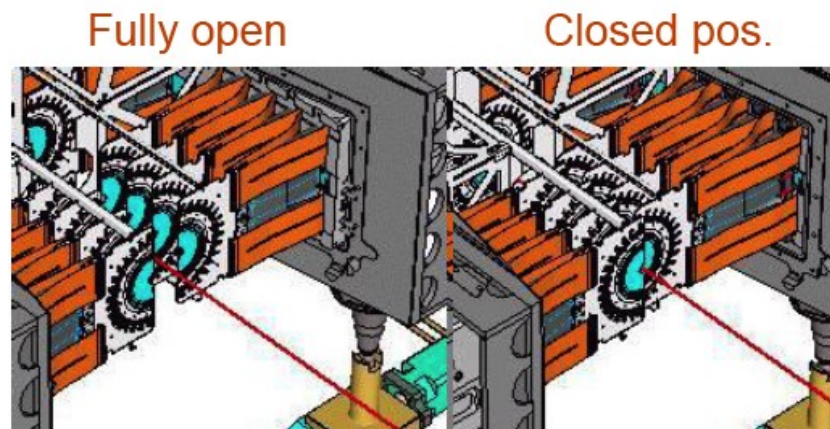
# Alignment

[Chris Parkes]

- *development of generic alignment tools*
- work has focused on the development of alignment for the LHCb silicon vertex locator ( VELO )
- study of **weak modes in alignment** for LHCb performed.
- **alignment monitoring** package for LHCb developed
- plan to apply alignment techniques and DD4Hep to WP9 medipix telescope
- → nice synergy between AIDA WPs



2011 data



- institute: University of Manchester (transferred from Glasgow)

- Stability of 2 half alignment by PV method:
  - within  $\pm 5 \mu\text{m}$  for Tx

# Summary

- in WP2 we develop core software tools that are useful for the HEP community at large
- develop tools in context of existing experiments/frameworks but eventually have experiment independent tools
- work organized in sub tasks
  - geometry
  - tracking
  - particle flow
  - pile-up
  - alignment
- in first year we have made good progress towards our goals and objectives:
  - one milestone achieved on time
  - three deliverables on time
  - currently working on two deliverables that are slightly delayed