



JRA2 SITRA Silicon Tracking -2009 Achievements

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Abstract

A brief review of all the achievements of the SiTRA-JRA2 work package is discussed in this report. There is no more deliverables for 2009 and thus the emphasis is put on the spread of the activities related to it, in terms of publications in Journals and written Proceedings, presentation in conferences and use of the work and results achieved including the transnational applications foreseen for the year 2010.

1 Introduction

The work briefly summarized here has been achieved by the 4 SiTRA-JRA2 members, Helsinki Institute of Physics (HIP) in Helsinki (Finland), The LPNHE Laboratory (CNRS-IN2P3) in Paris (France), the Charles University (CUPrague) in Prague (Czech Republic) and the Instituto de Fisica de Cantabria (IFCA) from CSIC-Cantabria University in Santander (Spain). The associated partners to this activity are: IMB-CNM/CSIC in Barcelona (Spain), IEKP from the University of Karlsruhe (Germany), the National Research Nuclear University in Obninsk (Russia), The University of Torino and INFN Torino, the IFIC/CSIC-University of Valencia (Spain) and HEPHY from the Austrian Academy of Science in Vienna (Austria). This work also takes place in the framework of the SiLC R&D Collaboration.

In 2009 after having achieved in 2008 the deliverables as scheduled (see 2008 Annual Report), the SiTRA activities have concentrated on developing furthermore available Silicon tracking test infrastructure for transnational access (TA) users and also for exploiting these infrastructures to beam tests activities and obtained results that have been presented in various conferences and been published in International Journals in the field. This has provided a large visibility of the work achieved thanks to the EUDET project. The overall achievements in 2009 are summarized in EUDET-Memo-2009-10 and EUDET-Memo-2009-15 and detailed also in the presentations given at the Annual EUDET Meeting as well as various reports at the EUDET Steering Committee.

2 More on test beam infrastructures

In 2009, SiTRA members and associated collaborators have developed more test beam infrastructures that include:

- Test infrastructure to host the new alignment system installed at the system test beam at the SPS-CERN H6b beam from 15 to 31 August and run by the HEPHY-Vienna, also combined with the EUDET beam telescope (*EUDET-Memo-2009-18*).
- Upgrade of the multipurpose and standalone test system performed by LPNHE-Paris and including modules equipped with alignment friendly HPK sensors, and microstrips modules. This include a complete new DAQ system (both hardware and software easy to connect to any central DAQ system, hardware DAQ adapted both to the readout with the new SiTR_130 F.E. chips (deliverables 2008) and reference FE system based on VA1' chips. Different types of modules (up to 6) can be included in this set-up. A laser-based alignment system is also included (*EUDET-Memo-2009-20*).
- Preparation of new larger size modules for combined beam tests with calorimetry prototypes foreseen by mid 2010 and in 2011 (*EUDET-memo-2009-10 and 15*).
- Preparation of the dedicated tools to build new modules based on new sensors that will be part of the TA beam tests for 2010 (*EUDET-memo-2009-10 and 15*).
- New version of the FEE chip to equip larger size prototypes (requesting a factor 10 up to 20 more channels than the present modules) and the associated DAQ system have been developed and will be produced in end 2010. These will allow equipping the larger number of channels to read out these larger prototypes (*EUDET-memo-2009-21*).

3 Advances on alignment techniques

A detailed simulation study (by far the most complete up to now) has been achieved by one of the EUDET appointed young researcher; the goal was to determine the key parameters in order to develop high transmittance (70% instead of the "usual" 20%) new Silicon sensors. This year a new crucial step was successfully achieved with the collaboration of IFCA with

IMB-CNM/CSIC in order to produce those new sensors and test their optical performances. The preliminary tests on these new sensors show very promising results (EUDET-Memo-2009-23).

4 Test beams

Two combined test beams were performed in 2009 not TA test beams as they combine two EUDET infrastructures.

- SiLC test beam at SPS CERN with the EUDET telescope and one of the SiTRA test infrastructure, allowed to test new direct connection between strip and associated F.E. Electronics (EUDET-Memo-2009-18).
- Combined test beam between the two EUDET tracking infrastructure: LCTPC and SiTRA allowed to test the concept of the Silicon envelope which is part of the tracking system of the ILD Concept. (EUDET-Memo-2009-17).

At least two TA test beams are in preparation and will be achieved for 2010. Two more requests for 2010 for SiTRA-test beam infrastructure by non EUDET European colleagues have been sent to SiTRA for 2010 and to be performed at CERN and DESY or even FNAL.

5 Spread of information and visibility

Here below is given a list of the main presentations given at international events in 2009 and main publications which reflect the work achieved thanks to the EUDET project.

- 4 Papers submitted to the Proceedings of **LCWS08** on LCTPC (Stefan Haensel-HEPHY), Alberto Ruiz (Alignment), Aurore Savoy-Navarro (FEE mix mode chip), A. Savoy-Navarro (Test beams results with Si prototypes) and corresponding reports submitted for publication in the Proceedings of the conference in 2009.
- **TIPP09 Conference**, Tsukuba (Japan), March 2009:
 - => Than Hung Pham (LPNHE), mix mode FEE chip for Silicon strip detectors readout for the LC (invited talk) and paper submitted to NIM A Journal, accepted.
 - => Poster presented by Thomas Bergauer (HEPHY)
- **TiLC09 Conference**, Tsukuba (Japan), April 2009:
 - 4 presentations by: A. Ruiz on Alignment and on Forward Detector and Physics; A. Savoy-Navarro, on the new mix mode FEE chip and on Integration Challenges in Silicon Tracking in the ILC detector Concepts
- **Lepton-Photon International Conference**, DESY (August 2009):
 - Poster presented by A. Charpy
- **Symposium on Semi Conductors Tracking**, Hiroshima (Japan) August 29-Sept 1st, invited talk: A. Savoy-Navarro and a NiM A Journal article, to be published.
- LC International Workshop for the Americas (Albuquerque), presentations by A. Ruiz and A. Savoy-Navarro.
- **LC Test Beam Workshop** (LAL, France), October 2009
 - Presentation by A. Charpy (LPNHE) on the tests performed within the SiLC Collaboration.
 - Presentation by Marcel Vos (IFIC) and also co-organizer. Proceedings in preparation.
- **Annual EUDET Meeting**, November 2009, Geneva (CH)
 - Plenary presentation of the SiTRA-JRA2 activities in 2009 by I. Vila.
- **Contribution to the Letters of Intent (LOI) of the detector Concepts for the future International Linear Collider**, March 31, 2009, Reports to be published.
 - => Letter of Intent of the ILD concept: Editor of the Silicon tracking section.
 - => Letter of Intent of the SiD Concept (contributors)

6 Synergy and impact on other R&Ds

The work achieved within the JRA2-SiTRA has important impact on R&Ds on Silicon tracking for other important experiments such as the upgrades of the Silicon trackers of the LHC experiments (ATLAS and CMS) as well as a continuous synergy with the different phases of these experiments since their construction phase and now the start of the upgrades.

Moreover the activities within JRA2-SiTRA also well involved within the R&D SiLC are extensively used for the development of the new Silicon tracking system of the SuperBelle detector in construction at KEK; several teams in SiLC and also associated to JRA2-SiTRA activity are main contributors to this detector. Finally the new g-2 experiment proposed at JPARC-KEK expressed a strong interest in the outcomes of these R&D activities for the Silicon tracker that will be an essential part of this new proposed experiment.

7 Conclusion

In 2009 the visibility and spread of the R&D activities performed within JRA2-SiTRA work package has been widely increased by the participation to several important international conferences, the publications of the results in international Journals. Moreover the spread and importance of this activity is still strengthened by the synergy with the upgrades of the LHC experiments and also the direct impact and contribution to the development and construction of new Silicon tracking system such as the one for the SuperBelle experiment at KEK.

More is even expected in 2010 with also transnational applications in test beams to be performed at CERN.