

Graduate School in Physics and Astrophysics

ANNUAL REPORT

Name: Marco Musich
E-mail: musich@to.infn.it
Ciclo: XXIII
Year completed (1,2 or 3): 2
Supervisor: E. Miglore

GRADUATE SCHOOL COURSES

(only completed courses, with examination passed in the year)

Code: 06
Title: **Collider Phenomenology**
Teacher: S. Moretti
Hours: 20

Code: 13
Title: **Particle Physics**
Teacher: R. Demina
Hours: 20

SUMMER SCHOOLS, INTERNATIONAL SCHOOLS

Title: **The 2009 European High Energy Physics School (ESHEP09)**
Place: Bautzen (Germany)
Webpage: <http://physicschool.web.cern.ch/PhysicSchool/2009/Bautzen.html>
Days: 14 (14 - 27 June 2009)
Talk or poster (Y/N): Yes (Poster: **The CMS Tracker Alignment**)

CONFERENCES, WORKSHOP

Title: **IX Meeting CMS Italia**
Place: Torino (Italy)
Webpage: <http://cms-italia-2008.to.infn.it/index.html>
Days: 2 (27-28 November 2008)
Talk or poster (Y/N): No

Title: **International CMS Workshop on cosmic ray data analysis**
Place: Torino (Italy)
Webpage: <http://cms-torino-2009.to.infn.it/index.html>
Days: 3 (11-13 March 2009)
Talk or poster (Y/N): No

Title: **Seminar in Torino - "Accelerator Driven Systems for Nuclear Waste Transmutation: Recent Advances"**
Place: Turin, Italy
Webpage: <http://www.to.infn.it/groups/group4/seminars.html>
Days: 1 (March 2009)
Talk or poster (Y/N): N

Title: **CMS Week 16-20/03**

Place: CERN - Meyrin (CH)

Webpage: <http://indico.cern.ch/conferenceDisplay.py?confId=52437>

Days: 5 (16-20 March 2009)

Talk or poster (Y/N): Yes (Talk: **Recent progress on Tracker Alignment and plans**)

Title: **XXIX International Symposium on Physics in Collision (PIC09)**

Place: Kobe (Japan)

Webpage: <http://www.research.kobe-u.ac.jp/fsci-epp/pic2009/>

Days: 4 (30 August- 2 September 2009)

Talk or poster (Y/N): Yes (Talk : **First Alignment of the CMS Tracker**
+ Poster: **First Alignment of the CMS Tracker and its Implications for first collision data**)

Title: **Statistical methods in LHC data analysis**

Place: CERN - Meyrin (CH)

Webpage: <http://indico.cern.ch/conferenceDisplay.py?confId=73545>

Days: 2 (18-19 November 2009)

Talk or poster (Y/N): No

Title: **Higgs miniWorkshop - HEPTools Training Seminar**

Place: Torino (Italy)

Webpage: <http://formazione.to.infn.it/2009/higgs/>

Days: 2 (23 - 24 November 2009)

Talk or poster (Y/N): No

VISITS AND STAGES

Institution:CERN

Place:Meyrin (CH)

Starting date: 02/02/2009

Days:21 (through the year)

RESEARCH ACTIVITY

I am carrying out my research activity in high energy physics at the Compact Muon Solenoid (CMS) experiment at the Large Hadron Collider (LHC) in Geneva. In particular this year the main effort of my work was devoted to the full-scale alignment of the CMS inner silicon Tracker using cosmic ray tracks collected during the CMS global runs in 2008-2009. The Tracker was operated together with all other subdetectors for the first time and the possibility to measure the momentum of the cosmic muon tracks using the solenoidal CMS magnetic field, offered new opportunities to reach the desired alignment precision level.

I validated alignment results by using several data-driven methods and tested them against predictions with a detailed detector simulation.

These studies have been included in a paper about the alignment of the CMS Tracker with cosmic ray particles, which has been recently submitted to the Journal of Instrumentation (JINST).

In parallel, I'm entering one of the CMS analysis groups which will analyse the first CMS collision data, (expected for late 2009 - beginning of 2010), to measure the total $pp \rightarrow J/\psi + X \rightarrow \mu\mu + X$ production cross-section at the LHC, a process which is important both for detector calibration and to investigate quarkonia production mechanisms at a hadronic collider. In particular I will focus on the separation of prompt di-muons from di-muons coming from heavy

particles decay chains.

This task needs to determine accurately displaced secondary vertices, a procedure very sensitive to the alignment of inner Tracker and which needs a good knowledge of the detector geometry to achieve the desired resolution.

PUBLICATIONS IN THE YEAR

Title: **Search strategy for the Higgs boson in the ZZ(*) channel with the CMS experiment**

Author: S. Baffioni [...] M. Musich, et al.

Date: 2008

Journal: CMS Analysis Note 2008/050

Title: **Projected exclusion limits on the SM Higgs boson cross sections obtained by combining the H to WW* and ZZ* decay channels**

Author: S. Baffioni [...] M. Musich, et al.

Date: 2009

Journal: CMS Analysis Note 2009/020

Title: **Alignment of the CMS Silicon Tracker during Commissioning with Cosmic Rays**

Author: The CMS Collaboration

Date: 2009

Journal: arXiv:0910.2505 (Submitted to JINST)

Title: **First Alignment of the CMS Tracker and Implications for the First Collision Data**

Author: M. Musich

Date: 2009

Journal: CMS Conference Report 2009-317

(to be published in "Proceedings of the XXIX Physics in Collision International Symposium")

BE AWARE: research activity and Pubs are not evaluated as didactic credits, but are requested to trace the PhD students' career