CURRICULUM VITAE ET STUDIORUM

Name:	**Rino Castaldi**
Born:	26/04/1944 at Empoli (Florence) Italy
Nationality:	Italian
Address:	Lungarno Antonio Pacinotti, n. 36 - 56126 Pisa - Italy
Telephone:	+390502214234; Cell. +393356238890
e-mail:	rino.castaldi@pi.infn.it
home_page	http://www.pi.infn.it/~castaldi/

Education:

1963 - **"**Diploma" of Maturità Classica
at the Liceo Classico of Empoli, Florence - Italy.

1968 - "Laurea" in Physics with honors (110/110 cum laude)
at the University of Pisa, Pisa - Italy.

1972 - **"**Diploma di Perfezionamento" in Physics with honors (70/70 cum laude)
at the Scuola Normale Superiore of Pisa, Pisa - Italy.

Positions:

1968 - 1970 - Fellowship of "Perfezionamento in Fisica" at the Scuola Normale Superiore of Pisa, Pisa - Italy.

1970 - 1971 - Military service.

1972 - 1972 - Post-doctoral position with a NATO fellowship at CERN, Geneva-CH

1972 - 1973 - Visiting assistant professor at the State University of New York at Stony Brook, New York - USA.

1973 - 1975 - CERN fellow at CERN, Geneva - CH.

1975 - 1988 - Tenure position as "Ricercatore" of Physics at the "Sezione di Pisa" of the INFN, Pisa - Italy.

1988 - 1989 - Tenure position as "Primo Ricercatore" of Physics at the "Sezione di Pisa" of the INFN, Pisa - Italy.

1989 - 1990 - Tenure position as "Dirigente di Ricerca" of Physics at the "Sezione di Pisa" of the INFN, Pisa - Italy.

1990 - 1996 - Full Professor of Physics at the University of Genoa, Genoa - Italy.

1994 - 1996 - Visiting scientist (Scientific Associate) at CERN, Geneva - CH

1996 - 2010 - Tenure position as "Dirigente di Ricerca" of Physics at the "Sezione di Pisa" of the INFN, Pisa - Italy.

2010 - present - CMS Emeritus

Managerial experience:

1979 - 1984 - Coordinator of the Experimental Particle Physics Group ("Gruppo I") of the "Sezione di Pisa" of the INFN.

1984 - 1993 - Leader of the Pisa group in the SLD experiment at the Linear Collider SLC at SLAC.

1989 - 1991 - Director of the "Sezione di Pisa" of the INFN.

1992 - 2006 - Leader of the Pisa group in the CMS experiment at LHC

1993 - 1994 - Member of the CMS Management Board as responsible for the Italian Institutions in the Collaboration.

1994 - 2000 - Project Manager of the tracking system of the CMS experiment.

2000 - 2006 - Advisory Member in the Management Board of the CMS Collaboration.

2002 - 2008 - Director of the "Sezione di Pisa" of the INFN.

Teaching experience:

1973 - 1973 - Class of physics for first year undergraduate students at State University of New York at Stony Brook.

1983 - 1984 - "Tecniche sperimentali delle alte energie", course of the "Scuola di Perfezionamento in Fisica" at Pisa University.

1986 - 1988 - "Introduzione all'acquisizione di dati" as a part of "Laboratorio III" of the course in Physics at Pisa University.

1988 - 1990 - "Fisica ai Colliders" as a part of "Fisica delle Particelle elementari" of the course in Physics at Pisa University.

1990 - 1996 - Full Professor of Physics at the Genoa University: main course "Elettronica" at "Corso di Laurea in Scienze dell'Informazione"

2002 - 2007 - "Apparati Sperimentali", course of the "Laurea Specialistica" in Physics at Pisa University.

Research experience:

1967 – 1970 - *Photoproduction of vector mesons on nuclei at DESY. Bonn-Pisa Collaboration*.

I started my research activity in this experiment as undergraduate student. I wrote a detailed Monte Carlo program of the experiment and I contributed to the data taking and data analysis. The results of this analysis have been the subject of my first two publications and of my thesis for the "Laurea" in Physics at the Pisa University and of my thesis for the "Diploma di Perfezionamento" in Physics at the Scuola Normale Superiore of Pisa.

1970 – 1975 - *Measurement of the total proton-proton cross section at the CERN ISR (experiment R801). Pisa-Stony Brook Collaboration.*

I contributed to the design, construction and data taking of the experiment. During my stay at the State University of New York at Stony Brook as visiting assistant professor, I performed the analysis of total proton-proton inelastic rates measured at the ISR obtaining an unexpected result of a rising behavior with energy of the proton-proton total cross section. This important result was later confirmed with the simultaneous measurement of the total inelastic and forward elastic rates carried on in collaboration with the CERN-Rome group. Other very interesting results were obtained by the experiment on the general features of proton-proton interactions at the ISR energies.

1975 – 1979 - *Measurement of muon pair production and associated hadrons at the CERN ISR (experiment R209). CERN-Harvard-Frascati-MIT-Napoli-Pisa Collaboration.*

I have been responsible for the design and construction of the vertex detector of the experiment. This detector was a modular system based on rather unconventional drift chambers with three-dimensional space-point reconstruction without left-right ambiguities.

The experiment confirmed the presence of the J/ψ and ϒ resonances in the dimuon mass spectrum at the ISR.

1979 – 1984 - *Measurement of the total, elastic and diffractive cross section at the CERN proton-antiproton Collider (experiment UA4). Amsterdam-CERN-Genova-Napoli-Pisa Collaboration.*
The method of the simultaneous measurement of the total inelastic and forward elastic rates, already used to measure the total cross section at the ISR, was repeated at the CERN proton-antiproton Collider by the UA4 Collaboration. I was responsible for the design and the construction of the first and last telescope of the inelastic detector. Each telescope consisted in a wire chamber system assembled with high accuracy drift modules of identical design as those developed for the R209 vertex detector. The proton-antiproton elastic and total cross section was found to continue to increase with energy. The real part of the forward elastic scattering amplitude and very interesting features of the large-*t* elastic scattering and of the single diffractive cross section were also measured.
The relevance of all the previous measurements in elementary particle physics has been the subject of my review article published in collaboration with G. Sanguinetti in the volume 35 of the Annual Review of Nuclear and Particle Science.

1984 – 1993 - *SLD experiment at the Linear Collider SLC at SLAC*.
I joined as leader of a Pisa group of young physicists the SLD Collaboration at SLAC. Our responsibility has been the development of the front-end and of the Fastbus read-out electronics of the Warm Iron Calorimeter (WIC) of the experiment. The difficulties of a Linear Collider of new concept as SLC to deliver high luminosities to the experiment have been partially compensated by the use of the available polarized beams. Many precision electroweak measurements at the Z resonance have been performed by the experiment.

1992 - present - *CMS experiment at the CERN LHC*.
At the beginning of 1992 I joined the CMS experiment as leader of a Pisa group and as coordinator of a large Italian collaboration from eight INFN Sections. At the end of 1994 we proposed a rather

complex and very challenging tracking system based on silicon detectors and on large area micro-strip gas chambers, capable to cope with the high radiation level and high particles fluxes foreseen at the LHC [18,21]. In April 1998 the Technical Design Report of the Tracker Project was submitted to the LHC Committee. Approval for construction by the Committee was made contingent on a large scale test to prove beyond doubt the robustness of the detector modules in the very aggressive LHC environment.

Although very positive results were obtained for both silicon and micro-strip gas chambers modules, the evolution of silicon sensors from a custom technology using large area 6" wafers to an industrial production line of high quality and high volume capacity, pushed towards a decision in favor of a tracking system entirely based on silicon detectors. Consequently, at the beginning of the year 2000, as Project Manager of the tracking system I presented to LHCC for approval the final version of the CMS tracker. With more than 200 m^2 of silicon micro-strips surrounding three layers of pixel detectors in a cylindrical barrel-like layout, with end-caps completing the tracking in the forward and backward regions, the CMS tracker is the largest silicon system ever built. I followed closely the construction of the detector as responsible of the Italian consortium and as Director of the Pisa Section, where the inner barrel and inner disks were designed and fully assembled. Robust tracking and detailed vertex reconstruction were expected to play an essential role for an experiment designed to cleanly detect the diverse signatures from new possible physics at LHC. For an experiment like CMS, which aimed to find the Higgs boson and possibly detect all possible signals of new physics, it was absolutely necessary to build a powerful tracking system capable to identify the primary vertex and all possible secondary vertices of each event reconstructing all charged tracks and measuring all momentum with great precision. In 2008, the tracker was finally installed in the LHC together with all the other CMS sub-detectors ready to take data. Following the unfortunate incident of 19 September 2008 that made the accelerator unavailable for a full year, cosmic rays data were taken; with more than 600 million

events we were able to calibrate and align the tracker with an absolute accuracy of a few tens of μm. When the LHC, at the end of 2009, become operational the apparatus was ready to take data and all track and vertex reconstruction programs were working and fully tested. Already with the data collected in 2010-2011 at the center of mass energy of 7 TeV for an integrated luminosity of ~ 5 fb^{-1} it was possible to verify with high precision the physics of the Standard Model and put strict limits on the existence at these energies of an hypothetical new physics beyond the Standard Model. In 2012 LHC was upgraded to operate at the center of mass energy of 8 TeV. Finally July 4, 2012 with data collected with ~ 5 fb^{-1} at 7 TeV and with other ~ 5 fb^{-1} at 8 TeV the statistics was enough to announce the discovery of a new particle with a mass of ~125 GeV with properties very similar to the ones foreseen for the Higgs boson. The data taking continued throughout 2012 at 8 TeV up to an integrated luminosity of 20 fb^{-1}. The full analysis of all the data collected in the different decay channels has confirmed, albeit with a still limited statistics, that this new particle have all the features foreseen for the Higgs boson. Moreover searches were performed with these data for signs of new physics beyond the Standard Model. New strict limits have been set on quark substructure and on masses of supersymmetric particles. New potential Z-like and W-like bosons and even signs of improbable black holes or extra dimensions were searched. I want to emphasize that one of the main strength of the CMS apparatus in this extensive searches is its tracking detector of which I have been Project Manager since the beginning of the experiment and for almost ten years to follow. It is thanks to this particularly powerful device that the reconstruction technique called "Particle Flow" can be used in CMS. With this technique the tracking detector is used not only for the reconstruction and precision measurement of the momentum of all the charged tracks, but also for the reconstruction and the energy measurement of jets and for the evaluation of the missing energy in the event. This technique indeed provides a substantial improvement to the calorimeter measurements. Finally I would like to point out that the ZZ decay channel with the subsequent decays into $\mu^+ \mu^-$ or e^+e^- is the decay mode in which the Higgs boson mass and the relative angular

distributions of its decay products can be more accurately done. The great precision that has been achieved in the study of this decay mode is mainly due to the precision with which the tracker is measuring the electron and muon momentum. Even one of the last and most difficult precision measurement done by CMS, namely the search for the rare B_s decay in $\mu^+\mu^-$, which recently confirmed the Standard Model prediction, it has been possible thanks to the precision with which the charged particles, and particularly the muons, are reconstructed by the CMS tracker. Now LHC is not running and will resume operation only at the beginning of 2015 with high intensity proton beams at center of mass energy upgraded up to 14 TeV. There is great expectation in our community that at these higher energies new and unexpected physics discoveries could be done by CMS using his powerful tracking detector.

Publications:

The full list of publications can be found with "INSPIRES" at

http://inspirehep.net/search?ln=en&ln=en&p=find+a+rino+castaldi+and+ps+published&of=hb&action_search=Search&sf=year&so=d&rm=&rg=25&sc=0

The list of preprints, conference contributions and documents can be found with "INSPIRES" at

http://inspirehep.net/search?ln=en&ln=en&p=find+a+rino+castaldi+and+not+ps+published&of=hb&action_search=Search&sf=year&so=d&rm=&rg=25&sc=0