Curriculum vitae of Lorenzo Gianni Santi:

Researcher at the Udine University (disciplinary group 85, Experimental Physics) since 1986. Associated professor (sector FIS/01, Experimental Physics) at the Trieste University since 2001 and then at the Udine University since 2005.

RESPONSABILITIES
1995-1996 Member of the Integrated Senate of the Udine University
1997-2000 Member of the Administration Council of the Udine University
1999-2003 Responsible of the Gruppo Collegato of Udine, Section of Trieste, of the National Institute for Nuclear Physics (INFN)
2006-2009 Coordinator of the Technologic Class and member of the Directive Council of the SSISS (Specialisation School for Secondary School Teachers) at the Udine University
2006-2012 Director of the Interdepartmental Centre for Didactic research at the Udine University
2012-2015: Coordinator for the Physic Area in the teacher formation training (TFA and PAS) at the Department of Chemistry Physics and Environment of the Udine University

RESEARCH ACTIVITIES
The scientific activity followed two main streams. Since 1986, with prevalent involvement till 2005 and continuing in present, in the field of Experimental physics of the elementary particles, touching also some topics in nuclear and atomic physics.
After a first phase of research in nuclear physics (anelastic scattering mechanisms in pbar^4He) and on forward pp elastic scattering, I studied the physics of the nucleon-antinucleon interaction, at low and high energy. In the framework of the study of the NNbar interaction at low energy, I collaborated to the experiment OBELIX (light meson spectroscopy and search of hybrid and exotic states), studying also topics in nuclear and atomic physics, related to the antinucleon/light nuclei interactions. At the same time I studied the production channels e-e+ --> hadrons at energies up to the J/psi (experiment Fenice, measurement of the e.m. form factor for the antineutron). During the '90 years I participated to studies in particle physics at high energy (experiment CDF, study of the top quark and its production in the ppbar interactions). In that period of time I participated to the design and setup of the silicon detector for the experiment Atlas.
Since 2016 I am participating to the experiment Muon g-2 at Fermilab (measure of the anomalous magnetic dipole moment of muons).

Since 1993, and prevalently since 2005, scientific activity was devoted mainly in the Physics Education Research, mostly regarding on topics related to curricular development and teacher formation. In this framework, I performed researches in Physics education, in national and international projects, focusing on the topics of the curricular development and teacher training.

--- Topics of Nuclear and Particle Physics
1) Anelastic scattering Mechanism pi ^4He(1984-1986) (experiment TOFRADUP, Dubna)
2) Asymmetry in forward elastic scattering pp (1984-1986) (Many experiments at LAMPF, Los Alamos, NM, USA)
3) Collaboration OBELIX(1985-1999)(Experiment at the Low Energy Antiproton Ring at CERN, Geneve, CH) Study of the NNbar interaction at low energy (light meson spectroscopy and search of hybrid and exotic states). Involving topics of nuclear and atomic physics, related to the interaction light nucleon / antinucleon.
3.1) Meson Spectroscopy and search for hybrid and exotic states in NNBar annihilation.
3.2) Annihilation processes of antinucleons over nucleons and light nuclei at low and intermediate energies.
3.3) Nuclear topics: antinucleon interactions on light nuclei and mechanism's dynamics.
3.4) Atomic topics: decay times of protonium, pbar stopping power in helium at low energies and pbar - helium metastable
4) Exotic dibarion resonances(1985-1989) (experiments at LAMPF, Los Alamos, NM, USA) Search for 4 or 6 quarks aggregates, in p(polar) ^4He -> d, X reactions, in AY analysis of the channel.
5) Collaboration FENICE(1985-1996) (Experiment at ADONE, LNF, Frascati, I) study of the channels e-e+ --> hadrons, energies up to J/psi.
5.1) Electromagnetic form factors of nucleons in the time-like region.
5.2) Total cross section of the channel e^+e^-> Hadrons at NNBar production threshold.
5.3) Branching ratio B(J/Psi -> NNbar)
6) Collaboration CDF(1994-) (Experiment at TEVATRON in Chicago, Ill, US. Data taking ended in

2011, at present concluding data analysis).
6.1) R&D activities: mainly aimed to the realization of the PLUG upgrade of apparatus for RUN II. Second level Trigger studies based on data from vertex detector SVX and the Intermediate tracker IFT (not implemented). Realization and management of monitoring systems of the power and amplification system of the tile calorimeters in RUN II. Tuning of the scintillators in the Muon detector.
6.2) Classification of parton origin of the jets.
6.3) Analysis of the channel of diboson production in events with 4 jets.
7) Collaboration ATLAS(1995-2007)
Development, prototyping and test of the silicon pixel vertex detector. Realization of systems for evaluation of device quality, in terms of physical and electrical characterization of the silicon wafers. Collaboration to the development of the data acquiring and analysis programs of the experiment, both for the R&D phase and the final version for the experiment.
8) R&D activities: (1992-) (mainly at test beam MPTB at FNAL, Chicago, US)
8.1) Radiation damage on scintillators
8.2) Artificial neural networks and their application in HEP
8.3) Characterization of silicon photomultipliers, SiPM
8.4) (2010-18)Study of cherenkov radiation of p, muon and pi beams in lead glasses, in order to obtain an improvement in the energy resolution in new generation calorimeters.
9) (2016-) Muon g-2 collaboration: Realization and management of the laser calibration system for the calorimeter of the experiment. Data taking and analysis of the data acquired.

--- Physic Education Topics
Physic Education and teacher formation, developed in the following topics:
A) innovative didactic paths for laboratory activities, even on challenging topics like Hall effect, electrical, thermal and optical properties of solids, Quantum Physic, Superconductivity, Gamma Ray detection.
B) Development and experimentation of multimedia curricular units on mechanics, thermodynamics, electrical properties of solids, optics and quantum physics for the secondary school and university.
C) informal education: research based on a collection of 250 experiments to perform (GEI): low cost experiment prototypes and related activities, didactic and exploration cards for teachers and students, supporting multimedia software.
D) Interactive network environments aimed to the distant learning and teacher training: implementation and use, aimed experimentations.
E) Learning processes and building of the formal thinking in the basic scientific education: project and experimentation of tools methods and didactic paths.

European projects
1. Project SUPERCOMET II, 2004-2007, n. N/04/B/PP/165.008, Leonardo da Vinci UE project.
2. Project MOSEM (Minds-On experimental equipment kits in Superconductivity and ElectroMagnetism for the continuing vocational training of upper secondary school physics teachers), 2007-20010, Leonardo da Vinci project N. LLP-LdV-TOI-2007-NO/165.009.
3. Project MOSEM2 (MOdelling and data acquisition for continuing vocational training of upper secondary school physics teachers in pupil-active learning of Superconductivity and ElectroMagnetism based on Minds-On Simple ExperiMents). NO/08/LLP-LdV/TOI/131.013,program Lifelong Learning - Leonardo da Vinci
The family of the SUPERCOMET european projects on teaching superconductivity in secondary school, was aimed to realize multimedial paths, tuning of laboratory activities and formative paths, teacher formation.
4. European project SECURE (2011-12), SECURE SIS-CT-2010-266640 Science Education Curriculum Research, FP7 program. Curricular research on the scientific teaching, and teacher formation.

Research and fallout projects at national level
1. National project MURST 1994-95 "La didattica della Fisica per una nuova Scuola Secondaria"
2. MURST 1996-99, "Formazione in Servizio di Insegnanti di Scuola Secondaria" (FISISS)
Research line: ESP B, on the use of new technologies in Physics laboratory and on the integrated use of multimediality and laboratory, ESP C, on the introduction of modern physics topics in the upper secondary school.

3. National research project C.N.R. 1997-99, "Tecnologie dell'informazione nella didattica della fisica e nella formazione dei docenti" (TIDIFI);
4. C.N.R. IMOFI_99 (in project TIDIFI), Designing and experimenting a network remote course.
5. National pilot project LabTec aa.ss. 1998-99/99-00 and LabTec2 aa.ss. 2000-2001/2001/2002 (M. P. I.-Direzione generale), on new technologies in the teaching of the experimental sciences.
6. PRIN 1999 "Spiegare e Capire In Fisica" (SECIF). New models for a new cultural formation in Physics, integrated to the use of new technologies: designing, validation and implementation of conceptual and experimental paths, toward an integrated innovation of curricula and teacher formation.
7. Pilot projet BRI- Borse di Ricerca per Insegnanti (2000), funded by MPI, Coordinamento della Formazione degli Insegnanti, in the framework of the activities aimed to the development of the teacher professionality.
8. National project FFC (Fisica per la Formazione Culturale, Sottoprogetto FORM - Formazione Insegnanti), 2001-2002 funded by MIUR
9. PRIN 2004: F21 – PERCORSI DI FORMAZIONE IN FISICA PER IL 21° SECOLO. A new approach to the development of competencies in Physics by means of the Schools, teacher formation and Cultural diffusion.
10. InterUniversity National project IDIFO- Orientamento e formazione degli insegnanti – fisica (2006-2008), within MIUR project (DM prot. n. 262 5 agosto 2004) and following editions (till 2022, for a total of 10 editions)
The IDIFO projects, promoted within the Piano Lauree Scientifiche, involved the collaboration of 17 Italian Universities, aimed to differentiated action in didactic innovation, laboratories for the scientific learning and teacher formation.

The scientific activity is documented by more than 200 referred papers at international level.