

The INSULAB group led by Michela Prest is involved in detector development in particle physics, space physics, medical physics. The group consists of senior physicists, PhD and first and second level degree students with different skills in software and hardware items, collaborating with scientific national and international institutes: the National Institute for Nuclear Physics (INFN, Sections of Trieste, Milano Bicocca, Padova, Pavia, Ferrara, Roma1), CERN, S. Anna Hospital in Como, PSI.

The group is expert in the the development of detectors systems based on scintillators, scintillating fibers, silicon detectors and their related frontend and readout electronics to be used for tracking, calorimetry, imaging. See for instance:

D. Lietti, PhD thesis - <https://cds.cern.ch/record/2626151/files/CERN-THESIS-2015-453.pdf>

A. Berra, PhD thesis - <http://cds.cern.ch/record/1458946/files/CERN-THESIS-2012-081.pdf>

A. Selmi, Master thesis - <http://cds.cern.ch/record/2814582/files/CERN-THESIS-2022-076.pdf>

P. Monti-Guarnieri, Master thesis - <http://cds.cern.ch/record/2850897/files/CERN-THESIS-2023-011.pdf>

F. Ronchetti, Master thesis

- https://drive.google.com/file/d/1Go_PsLp6MSDpquNTOFTTrYBnLfnZqaVGB/view?usp=drive_link

The group is involved in several collaborations/projects:

- **ENUBET (Enhanced NeUtrino BEams from kaon Tagging - project ID 681647, ERC-CoG-2015):** to measure quantities such as the CP violating phase, next generation neutrino experiments will need very precise measurements of oscillation probabilities and will be limited by systematics uncertainties, in particular due to cross sections. A precise determination of the absolute neutrino cross sections, especially for ν_e , is thus considered mandatory. The uncertainty derives from the lack of knowledge on the initial neutrino flux that cannot be measured directly. This limit can be overcome measuring directly the ν_e interaction rate at the detector while monitoring the positrons produced in the decay tunnel and originating from the $K^+ \rightarrow e^+ \pi^0 \nu_e$ (Ke3) decay. If the decay tunnel is short (~ 50 m for 8GeV secondaries) Ke3 represents the only source of ν_e : the corresponding ν_e flux can thus be inferred from the positron rate in the decay tunnel with a precision of 1%. The goal of the project is the development of a cost-effective technology based on fast shashlik calorimeters with longitudinal sampling readout by Silicon PhotoMultipliers and able to measure the rate of positrons identifying them against the background of charged pions and converted photons.

Website: <http://enubet.pd.infn.it/>

- **STORM (INFN CSNV project):** the project belongs to the field of crystal physics in which the INSULAB group has been involved since 2008. This last development concerns the study of the influence of the crystalline structure on electromagnetic processes in matter, in particular the increase of the coherent bremsstrahlung and the decrease of the interaction length of electrons and positrons in new types of crystals in order to develop compact detectors. The INSULAB group is responsible of the tracking and calorimetric systems, of the data taking and online analysis on the CERN extracted beamlines. See Selmi and Monti-Guarnieri master theses links above.

- **PHYSICS EDUCATION:** since 2010, the INSULAB group is developing innovative approaches in teaching science for schools of all grades, working directly in the schools with teachers and students. For a description of part of our activities see:

S. Rabaioli, https://drive.google.com/open?id=1MiqpFBfgK8N_7wOg7si5n_ya6vJGOimU

A. Ferrarini, <https://drive.google.com/open?id=1ZkImKiVM0m73EuzbKTxyTY8t4-1yeRKS>

A. Pugliese, https://drive.google.com/file/d/1Jp9yrTqgrFLqJgNx1PBbJckGlv_7yAxi/view?usp=drive_link

- **MUON PHYSICS:** since 2014, students from the INSULAB group have the possibility to participate to the FAMU and CHNET projects, based on the use of low energy muons produced at the ISIS facility at RAL for fundamental physics and culturale heritage. See for instance:
D. Guffanti, [https://drive.google.com/file/d/1KXYVyHVDj7nM7GVzKj4icztx4IS7fNLn/view?usp=drive link](https://drive.google.com/file/d/1KXYVyHVDj7nM7GVzKj4icztx4IS7fNLn/view?usp=drive_link)

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For the complete list of publications: <https://irinsubria.uninsubria.it/simple-search?query=prest#.V-kEoNERjyw>