

INSULAB

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, post-doc, 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. It 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 $K^+ \rightarrow e^+ \pi^0 \nu_e$ (K_{e3}) decay. If the decay tunnel is short ($\sim 50\text{m}$ for 8GeV secondaries) K_{e3} 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/>

- **AXIAL (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 axial and quasi-axial phenomena in crystals for beam steering and electromagnetic radiation generation. The INSULAB group is responsible of the tracking and calorimetric systems, of the data taking and online analysis on the CERN extracted beamlines. The project foresees also the test of a crystal based steering of the 70-250 MeV protons used by the proton therapy facility in Trento.

For crystal physics and tests, see dedicated thesis at:

http://insulab.dfm.uninsubria.it/index.php?option=com_content&task=section&id

=13&Itemid=60

- **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:

http://insulab.dfm.uninsubria.it/images/download_files/rabaioli_thesis_master.pdf

http://insulab.dfm.uninsubria.it/images/download_files/thesis_armandaferrarini_phd.pdf

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