Development and prototyping of the ENUBET positron tagger

The ENUBET groups at **INFN**-Padova [1] and Bologna [2] (Istituto Nazionale di Fisica Nucleare), have an immediate opening to appoint a postdoctoral research associate to work on the **ENUBET** project (**E**nhanced **NeU**trino **BE**ams from kaon **T**agging, ERC-Consolidator Grant, G.A. 681647, 2016-2021[3]). The appointment will be for three years, starting in December 2016.

- **Contract type and duration**: 3 years full-time, fixed term. Senior post-doc. INFN researcher (Art. 36, III level).
- **Salary**: 45.000 € gross/year + pension and social security benefits
- **Job location**: the activity will be shared between Padova and Bologna.
- **Tasks**: the activity will be performed within the ENUBET Working Packages 2-3-4 (tagger prototype electronics and readout).

  ENUBET aims at demonstrating the feasibility of a 1% systematic error on the ν_e cross section by monitoring positrons emitted at large angles by K_{e3} decays in an instrumented decay tunnel.

  The final setup, which will be the result of a phased prototyping program, will have a length of about 3 m and should be able to demonstrate the feasibility of positron tagging under realistic conditions with the desired background and systematics suppression capabilities. The current baseline consists in using a modular structure of shashlik calorimeters (iron+organic plastic scintillators) with a very compact light readout system based on wavelength shifting fibers individually coupled to Silicon Photo-Multipliers. The calorimeter allows positron tagging and discrimination against charged pions. A dedicated system (photon

[1] INFN Padova, http://www.pd.infn.it/indexEN.html
[2] INFN Bologna, http://www.bo.infn.it
[3] http://cordis.europa.eu/project/rcn/200776_it.html

veto) is envisaged to reject neutral pions and provide accurate timing information.

We plan to develop custom digitizers capable of sampling signals with a 2 ns granularity over the proton extraction windows which is expected to extend from about 10 ms up to 1 s depending on the constraints imposed by the hadron focusing beam-line.

The role of the candidate is central in this program and her/his activities will focus on:

- developing and testing hardware solutions for the the ENUBET positron tagger.
- defining the light readout system and testing the performance of the front-end electronics and DAQ.
- validating the photon veto performance (e^+/π^0 separation) and the timing accuracy of the tagger. The ultimate goal is to investigate the possibility of performing time-coincidences between the ENUBET positron tagger and a neutrino detector.
- working in a distributed group of collaborators, acting in close contact with colleagues involved in the simulation and the development of the beam extraction and hadron focusing.

- **Requirements**:
  - PhD in Physics and 3 years research experience (at postgraduate level) in experimental neutrino physics with accelerator-based beams.
  - A broad knowledge on detector techniques and experimental methodologies for R&D on innovative detectors.
  - Familiarity with systems based on Silicon Photo-Multipliers, organic scintillators and shashlik calorimeters.
  - Experience in organizing and successfully performing measurement campaigns at test beams (i.e. at CERN or at electron machines).
  - Ingenuity and pro-activity towards potentially interesting new hardware schemes.
  - Self-responsible, timely work in accordance with mutually defined objectives, while also integrating into a team.
  - Communicative and collaborative personality.

- **Application**: please provide a motivation letter next to a CV in English, your list of publications and references in one single pdf-file by sending it to the ENUBET Principal Investigator, A. Longhin (**andrea.longhin@pd.infn.it**).
- **Selection process**: candidates are expected to attend an interview either in person at the Padova Physics Department or using a remote connection. The selection of the candidates will be based on the evaluation of the documents sent with the application and on the interview. The interview will focus on the candidate's own research, curriculum and publications.
- **Useful bibliography**
  - *A novel technique for the measurement of the electron neutrino cross section*, A. Longhin, L. Ludovici, F. Terranova E.P.J. C, April 2015, 75:155, arXiv://1412.5987.
  - *A compact light readout system for longitudinally segmented shashlik calorimeters*, A. Berra et al. Nucl. Instrum. Meth. **A**830 (2016), 345-354.
- This position is advertised on:
  - the ENUBET web page (http://enubet.pd.infn.it/pos.html)
  - Euraxess jobs (http://ec.europa.eu/euraxess/index.cfm/jobs/index)