Laboratório de Instrumentação e Física Experimental de Partículas

Prof. Eric van Herwijnen
Chairman of the
Country Representative Board
of the SHiP Collaboration

nossa ref vossa ref. data

Coimbra, 06/06/2016

Subject: **Expression of interest for the participation of LIP in the SHiP Collaboration**

Dear Prof. Eric van Herwijnen

LIP is the reference institution for experimental particle physics and associated technologies in Portugal, devoted to research and development in experimental particle physics, new instruments and methods and advanced computing. We are present in Lisbon, Coimbra and Braga, in close collaboration with the local universities.

The participation in experiments at CERN (presently ATLAS, COMPASS and CMS) is central in the activities of LIP, which today are developed also in collaboration with the European Space Agency and international scientific infrastructures such as the Sudbury Neutrino Observatory, the Pierre Auger Observatory, SURF(LUX) and the GSI research centre in Darmstadt. LIP further participates in numerous international infrastructures of distributed scientific computing.

The LIP RPC group finds its roots in previous work on Parallel Plate Avalanche Chambers done in collaboration with the old Charpak group at CERN.

In 1998/9 we participated in the R&D effort for the time-of-flight (TOF) detector of the ALICE experiment, within which we co-invented the timing Resistive Plate Chamber (tRPC) technology. These devices revolutionized the TOF detection technique, opening way for very large area TOF detectors, which were, are or will be present in many HEP experiments (ALICE, CBM, FOPI, HADES, HARP, STAR).

Besides the original work in ALICE, along with numerous international collaborators, we contributed to the field a number of developments that expanded the RPC applications range, continuing at present the work along some of these lines:

- very large area/channel tRPCs;
- shielded tRPCs for robust multi-hit capability in dense arrays;
- the use of ceramic materials and warm glass for expanding the RPC count-rate capability;
- application of RPCs to animal and human Positron Emission Tomography;
- simultaneous high-resolution measurement of positions and times (TOFtracker);
- very low maintenance, environmentally robust, RPCs for deployment in remote locations;
- large fast-neutron TOF detectors.

At GSI our group designed and built the HADES TOF Wall detectors and it is now the sole responsible for the operation of the system, which has shown so far flawless performance.

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We feel that several lines of our work could profitably converge for application in the SHiP timing detector. Namely our experience in tRPC detectors of several kinds, combined with the robust, economical and environmentally friendly (low gas flow) RPCs developed originally in collaboration with the LIP AUGER group for deployment in standalone remote stations. We believe that the application of this RPC technology will revolutionize costwise the construction of large, low-rate, low-multiplicity, TOF detectors, opening way for ever larger TOF detectors.

Therefore, having in mind the latter application, along with a participation in the physics program to be defined in the future, we would like to apply for the LIP membership in SHiP, conditional, however, to the success of the funding requests that will follow in due time.

Yours truly

PAULO J. R. FONTE

Paulo J. R. Fonte
(for the LIP RPC group)

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