Prot. n.640 del 24/07/2013
Pubblicato il 24/07/2013.
Scadenza 05/09/2013

IAPP Project FTK

2-Year Post-Doc Position at Pisa University

Fast Tracker for Hadron Collider Experiments

Fast Tracker for Hadron Collider Experiments (FTK) is a Marie Curie PEOPLE Industry-Academy Partnership and Pathways (IAPP) Research Project funded within the EU seventh framework (http://ec.europa.eu/research/participants/portal/page/call_FP7?callIdentifier=FP7-PEOPLE-2012-IAPP&specificProgram=PEOPLE).

FTK (http://www.pi.infn.it/~kordas/FTK_iapp) aims to develop an extremely fast but compact processor, with supercomputer performances, for pattern recognition, data reduction, and information extraction in high quality data processing. The proposed hardware prototype features flexibility for potential applications in a wide range of fields, from triggering in high energy physics to simulating human brain functions in experimental psychology or to automating diagnosis by imaging in medical physics.

The first goal consists in demonstrating the system can perform online track reconstruction of full events at the highest rates and luminosities of the Large Hadron Collider (LHC – http://home.web.cern.ch/about/accelerators/large-hadron-collider) and SLHC (http://info-slhc-pp.web.cern.ch/info-slhc-pp) at CERN (http://home.web.cern.ch), beyond the limits of any existent or planned device and despite the overwhelming confusion due to the very high track multiplicity and the exceedingly large event pile-up.

With this goal in mind, we participate to the construction and the test of a high precision real-time tracker built for the ATLAS experiment (http://atlas.ch/): the Fast Tracker processor. FTK can improve the capability of the ATLAS detector to select interesting events reach of heavy leptons or quarks within the huge LHC background. It uses FPGA and ASIC chips to implement real-time complex track-reconstruction algorithms. The particle trajectories are reconstructed in 3D in a few tens of microseconds, and the quality of the fit parameters is close to that achievable by offline analysis. FTK will increase the ATLAS discovery capability.

The IAPP 324318 "FTK" Project provides a unique opportunity for experienced researchers (e.g., post-docs) to tackle strongly relevant technological problems related to the development of a powerful dedicated processor where parallelism is exploited to the maximum level.

The project consortium is composed by:

(1) Laboratoire de Physique Nucléaire et des Hautes Energies, CNRS, Paris, France;

![University of Pisa logo]	*Dipartimento di Fisica*	L.go B. Pontecorvo,3 56127 Pisa	cod.fisc. 80003670504
UNIVERSITÀ DI PISA	*"E. Fermi"*	tel. (+39) 050 2214000, fax (+39) 050 2214634	p.Iva 0028680501
		Mail: amministrazione@df.unipi.it	

(2)   CERN, European Organization for Nuclear Research, Geneva, Switzerland;

(3)   Aristotle University of Thessaloniki, Thessaloniki, Greece;

(4)   Prisma Electronics SA, Alexandroupolis, Greece;

(5)   CAEN SpA, Costruzioni Apparecchiature Elettroniche Nucleari S.p.A, Viareggio, Italy;

(6)   University of Pisa, Pisa, Italy.

This consortium will offer a multinational and multicultural top-level environment to the researcher.

The scientific and technological work of the project is organized into 6 packages.

The first one, "Prototype Production", includes board design, FPGA firmware development, PCB construction and assembly, and standalone test for a first validation.

The second work package, "Infrastructures and Integration", takes care of the crates, the power supplies, and the space for integrated lab tests.

The third one, "Commissioning", closes the research path described above. After the tests in the laboratory, the new hardware will be moved to the experiment at CERN and will spy real data during normal data taking. Commissioning implies the insertion in the experiment, the development of monitoring and control software compatible with its rules, long tests to validate the system, data taking, and data understanding.

The forth work package is "Architecture Simulation". It consists in producing software that has an important impact on hardware choices. A complex package, FTKsim, has to simulate the hardware on both Monte Carlo and real data. It is used to optimize the hardware design, to specify, build, and test the internal data paths needed for the LHC high luminosity, to determine the optimal size of the system, to produce the physics case. The simulation is an essential part of all tests since it allows prediction of the hardware output, starting from the inputs, in order to validate the hardware functionality.

The fifth work package, "Image Processing", is devoted to applications of our technology outside the high energy physics field. We will use our processor to process still images and movies in real time.

The sixth work package is "Silicon Detector R&D". It does not have a direct impact on the other electronics tasks. However, it provides a solid link with the evolution of the ongoing R&D for the silicon sensors and the front-end readout electronics in view of the high-luminosity upgrade of the LHC.

Details on administrative and funding issues as well as on signed agreements or Italian and European regulation frames can be found at http://www.pi.infn.it/~orso/ftk/IAPP_2012.

Detailed job Description – Position Details

The researcher in the proposed post-doc position will contribute to the work package 4, "Architecture Simulation", at developing the FTK simulation. This software has to become an ATLAS standard, and it must be fast enough to be used in the trigger simulation of all kinds of events whose selection is going to benefit of the FTK tracks. It will be an essential

tool for the data sample analysis, and for the tests and monitoring of the system, since it is able to predict the hardware output. Simulation of the hardware functions will be necessary in all development phases to provide a powerful tool for validation. The simulation predicts the hardware output as a function of its input. In tests, this prediction is compared to the actual output, proceeding to debugging both, the software and the hardware, until they perfectly match. Multiple deliverables of this task are foreseen for the various different integration periods

The appointed researcher will share responsibility for the design, execution, and analysis phases of the hardware systems planned within the FTK Project.

As explained above, the main goals of the fellow will be:

(1) The development of solid tools to test the hardware integrated at CAEN and commissioned at CERN;

(2) The development of the FTK physics case, as well as of corresponding new trigger strategies for the experiment.

During the 24-month duration of the grant, the appointed researcher will:

(1) Participate to the integration of the FTK simulation into the official ATLAS software, aiming at the optimization of the FTK physics case and processor architecture;

(2) Participate to the integration of the FTK emulation into the ATLAS trigger simulation, for the best definition of FTK-based triggers;

(3) Participate to the integration tests performed at CAEN and other FTK laboratories in Europe, by providing tools and test vectors for validation and monitoring.

The researcher will fully exploit the experimental facilities installed at Dipartimento di Fisica "Enrico Fermi" - Università di Pisa, at INFN - Sezione di Pisa, and at CAEN where an FTK laboratory is already in operation. She/he will exploit the computing facilities there and will be able to profit of all other FTK laboratories distributed in Europe.

The research will be carried out under the guidance of Prof. Mauro Dell'Orso of the "Enrico Fermi" Department of Physics.

The position will be funded through a 24-month "Assegno di Ricerca", issued by Università di Pisa according to the rules of Italian law and Pisa University regulations. The grant is planned to start on November 1st 2013.

Salary will be calculated according to EU category standards. A mobility allowance is included, depending on the family situation of the researcher at the time of the recruitment. The total gross annual amounts, including all compulsory social security contributions as well as direct taxes (such as income tax) are: 62.361,00 EUROS/year for the base salary, 12.792,00 EUROS/year for the mobility allowance to a researcher with family charges, and 8.954,40 EUROS/year for the mobility allowance to a researcher without family charges.

The grant will be paid by the administration in monthly deferred payments.

Eligibility Criteria

The candidate should fulfill the eligibility criteria for *Experienced Researchers (ER 4 to 10 years)*, typically equivalent to a post-doc level, according to the EU requirements.

According to the Marie Curie funding scheme, *Experienced Researchers (ER 4-10)* must, at the time of recruitment, **either** be in possession of a doctoral degree, irrespective of the time taken to acquire it, **or** have at least four years of full-time equivalent research experience. This is measured from the date when they obtained the degree which formally allowed them to embark on a doctorate in the country in which the degree was obtained or in the host country (irrespective of whether or not a doctorate was envisaged).

In our case the ER should not have more than 10 years experience (< 10 years experience).

Mobility Requirements:

To ensure the European character of an IAPP project, researchers to be newly recruited are required to undertake trans-national mobility when taking up their appointment. At the time of recruitment by the host organization, researchers must not have resided or carried out their main activity (work, studies, etc) in the country of their host organization for more than 12 months in the 3 years immediately prior to their recruitment. Short stays such as holidays and/or compulsory national service are not taken into account. Researchers of any nationality can be recruited within IAPP projects as long as the transnational mobility rule is respected.

She/he should have experimental skills in software (C++), GRID computing, and hardware data processing for triggering in High Energy Physics. He/she must be expert of complex device simulation.

Selection Procedure

Candidates will be selected taking into account their scientific curriculum vitae, with special emphasis to expertise in the specific fields covered by the Project, to be evaluated through the training career, scientific publications in peer-reviewed journals, internships, participation in scientific conferences and international schools, etc. Adequate knowledge of the English language is mandatory.

Pre-selection of the candidates, based on the evaluation of their scientific CV, will be done by the Steering Committee of the FTK Project.

After shortlisting, the top candidates will be contacted for an interview by a Selection Committee. The interview may take place via videoconference or similar. The Selection Committee consists of three members appointed by the Scientific Board of the FTK Project among the members of the Steering Committee or of the Scientific Board itself.

The final selection will be done by the Scientific Board on the basis of both the CV and the report of the Selection Committee on the interview.

		L.go B. Pontecorvo,3 56127 Pisa	
	Dipartimento di Fisica	tel. (+39) 050 2214000, fax (+39) 050 2214634	cod.fisc. 80003670504
UNIVERSITÀ DI PISA	*"E. Fermi"*	Mail: amministrazione@df.unipi.it	p.Iva 0028680501

The winner will receive a 24-month grant ("Assegno di Ricerca") with Università di Pisa.

The selection of candidates will be accomplished according to the transparent recruitment strategies recommended by the "European Chart for Researchers" and "Code of Conduct for the Recruitment of Researchers". Special care will be taken to the implementation of equal opportunity policies including gender equalities.

How to Apply

Candidates must send their application, according to the scheme of Appendix A, by email to ftk@df.unipi.it, using as the subject: "Assegno di Ricerca FTK".

The deadline for the application is September 5th 2013.

The application must contain, as attachments:

(1) the detailed scientific curriculum vitae of the candidate specifying her/his expertise in the fields covered by the project, the fulfillment of the eligibility criteria, the past experience, and the scientific production;

(2) a scanned copy of a valid identity document (e.g. passport).

Candidates may also optionally include one or more letters of reference.

For further information on the position, please contact prof. Mauro Dell'Orso (mauro.dellorso@df.unipi.it)

Il Direttore del Dipartimento di Fisica "E. Fermi"

Firmato

Prof. Francesco Fidecaro

	Dipartimento di Fisica	L.go B. Pontecorvo,3 56127 Pisa	
UNIVERSITÀ DI PISA	*"E. Fermi"*	tel. (+39) 050 2214000, fax (+39) 050 2214634	cod.fisc. 80003670504
		Mail: amministrazione@df.unipi.it	p.Iva 0028680501

APPENDIX A

To: Dipartimento di Fisica "Enrico Fermi"

Università di Pisa – Pisa,Italy

Re: call for 2-year post-doc position within the MC-PEOPLE-IAPP Project 324318 "FTK"

APPLICATION (please fill and send it to ftk@df.unipi.it)

Name:

Surname (Family name):

Place and Date of Birth:

Sex:

Citizenship:

Identity Document (e.g. Passport, Identity Card):

Identity Document Number:

Please, attach to the email:

1. Detailed scientific curriculum vitae, prepared according to the call;
2. A scanned copy of a valid identity document (e.g., passport);
3. (Optionally): one or more letters of reference.