Università degli Studi di Ferrara

RIPARTIZIONE RICERCA
Ufficio Ricerca Internazionale

AL MAGNIFICO RETTORE

SEDE

Iniziative di Internazionalizzazione di Ateneo – Anno 2012
Scheda per la presentazione del progetto

Il sottoscritto Prof. Vincenzo Guidi chiede l'assegnazione di un contributo di € 12800 per l'avviamento del progetto sotto descritto, a valere sui fondi di Ateneo 2012 per la promozione di iniziative di internazionalizzazione.

DESCRIZIONE PROGETTO

TITOLO:
DUAL-TITLE PHD FERRARA-KHARKOV IN PHYSICS

1) Partner stranieri e internazionali:

Akhiezer Institute for theoretical physics of National Science Center of Ukraine, Kharkov Institute of Physics and Technology.

During the Soviet period, Lev Landau (Nobel prize in Physics, 1962) headed the department of theoretical physics at the Kharkov Institute. He was the principal founder of the prestigious school of theoretical physics in Kharkov, sometimes referred to as the "Landau school", known throughout the world. Nowadays, the AITP is the most important theoretical school of physics in Ukraine and one of the most important centers worldwide.

2) Obiettivi del progetto e risultati attesi:

The aim of this project is to establish a *Dual-Title PhD in Physics* between the Department of Physics and Earth Sciences of the University of Ferrara (UF) and the Akhiezer Institute for Theoretical Physics (AITP) of Kharkov Institute of Physics and Technology.
The project consists of two stages, i.e., the *start-up* and the *Dual-Title PhD in Physics establishment.*

2a. *Start-up* (for which funding is requested)

ADB/cf

This phase will be dedicated to planning of future educational offers of the *Dual-Title PhD Ferrara-Kharkov in Physics*. With this aim, it will be necessary to study the current educational offers of both institutes and to prepare an educational proposal for the future Dual-Title PhD. For this reason, Prof. Guidi, coordinator of the Physics PhD school of UF and head of the Sensors and Semiconductor Laboratory (SSL) of UF, and Prof. Shul'ga, head of the AITP, will meet each other to prepare a joint agreement between the two institutes.

Firstly, in order to facilitate the establishment of a *Dual-Title PhD Ferrara-Kharkov in Physics*, a collaboration based on a common field of scientific research and concerning the *interactions between particle beams and crystals* will be started between SSL and AITP.

In fact, SSL is one of the most active laboratories worldwide in the design, fabrication and characterization of silicon and germanium crystals employed in experiments devoted to the study of interactions between high-energy particle beams and crystalline media. Members of SSL have been involved in international collaborations, such as UA9 at CERN (Geneva, Switzerland) and T980 at Fermilab (Chigaco, USA). The experimental results achieved at CERN, with the crystals manufactured at the SSL, convinced the CERN scientific committee to install one of those crystals in the Large Hadron Collider in order to attempt the collimation of the circulating beam. Moreover, on the strength of achieved results, scientists from MAMI (University of Mainz, Germany) and SLAC (Stanford University, USA) laboratories have shown interest for a new generation of crystals manufactured at the SSL and have proposed a joint collaboration for 2013.

On the other hand, one of the most relevant research activities of AITP is the development of theories and models concerning the coherent interactions between charged particle beams and crystals. Prof. Shul'ga and his team have been involved in important discoveries in such research field. Moreover, Prof. Shul'ga is author of more than 200 articles on international journals and co-author of one of the most important books concerning interactions between particles and matter, i.e., *High Energy Electrodynamics in Matter* by A.I. Akhiezer, N.F. Shul'ga (CRC Press). Nowadays, PhD students and young researchers are following his footsteps and are developing innovative theories to explain the most recently discovered coherent effects in crystals and predict new effects.

Joining the theoretical experience of the AITP group and the experimental knowledge of the SSL group will be very useful for future PhD students in order to obtain a higher valued dual-title PhD. During the first year of the project (*start-up* phase), short-period exchanges of current members (PhD students and researchers) of both SSL-UF and AITP are foreseen to start and consolidate the scientific and educational partnership. In particular, the PhD students exchange will be very useful to prepare the optimal conditions aimed at establishing the Dual-Title PhD in the second part of this project.

2b. Dual-Title PhD in Physics phase

During this second stage, the Ferrara-Kharkov Dual-Title PhD in Physics will be established. Dual-Title PhD students will spend half of their PhD period at the UF and the other half at the AITP.

The possibility to apply for the Dual-Title PhD in Physics at UF will be certainly offered through the SSL group. The proposed subject will be the study of coherent interactions between high-energy charged

via Savonarola, 9	Partita Iva 00434690384	Telefono: (+39) 0532 293204
44100 Ferrara	Codice Fiscale 80007370382	Fax: (+39) 0532 293459
		E-mail: fnc@unife.it

particles beams and crystals, with particular attention to theoretical and experimental investigations of effects predicted by AITP members, but still not experimentally observed. In particular, it has been predicted the possibility to use crystals as innovative sources of high energy monochromatic X-rays or as electrons/positrons sources and it is foreseen the realization of experiments to proof unexplored aspects of the quantum electrodynamics.

Thanks to the wide research activities carried out at either UF or AITP, PhD exchange program could cover other research fields. In fact, in addition to the Department of high-energy electrodynamics in matter headed by Prof. Shul'ga, other departments which belong to AITP are the following:

- Department of statistical physics and quantum field theory
- Department of condensed matter and nuclear matter theory
- Department of quantum-electrodynamic phenomena and hadron electrodynamics
- Department of diffusional and electronic phenomena in solids
- Department of group-theory properties of elementary particles, nuclear theory and nonlinear mechanics

Approval of this project would enable the creation of a stable and fruitful collaboration between UF and AITP, thus allowing PhD students of both institutes to improve their scientific formation, knowledge and career.

In summary, the project can be divided in two stages.
The first stage aims to

- establish an agreement on Dual-Title PhD in Physics between the UF and AITP.
- start a PhD students exchange program between the UF and the AITP.

The Second stage aims to

- establish a Dual-Title PhD in Physics program between the UF and AITP.
- strengthen of research collaboration between the UF and the AITP.

Il proponente dichiara che (barrare la casella che interessa):

X il progetto non ha mai ricevuto contributi sul bando di Ateneo per la promozione di iniziative di internazionalizzazione .

~~☐ il progetto è già stato finanziato sul bando di Ateneo per la promozione di iniziative di internazionalizzazione – Anno _____; si allega relazione sulle attività già svolte, con motivazione del mancato avviamento del progetto e della richiesta di contributo per completare la fase di avviamento.~~

3) Il progetto potrà avere ricadute positive sui seguenti indici di internazionalizzazione della didattica e della ricerca richiamati dal Piano Strategico Triennale di UniFe (barrare le caselle che interessano):

ADB/cf

X ***Sostegno alla mobilità didattica in uscita per le seguenti ragioni:***

The first phase of the project foresees the activation of an exchange program between PhD students of both UF and AITP. In particular, during their stays in Kharkov, the PhD students of Ferrara would improve their theoretical knowledge on coherent interactions between high-energy particle beams and crystals with the support of AITP members.

X ***Aumento degli studenti stranieri iscritti per le seguenti ragioni:***

To establish an high-educational link between UF and AITP would help to promote the UF at Kharkov, the second largest city in Ukraine. In particular, this project would help the promotion of the research activities and the eduational offers of the DPES of UF, with a particular attention to the Master's Degree in Physics of the UF in English language.

X ***Creazione di percorsi didattici internazionali per le seguenti ragioni:***

The aim of the project is to establish a Dual-Title PhD in physics between the Akhiezer Institute for theoretical physics, one of the most important Institutes for Theoretical Physics worldwide and the University of Ferrara. This will result in new possibilities for PhD students of both institutes to improve their scientific formation and open new career possibilities.

X ***Creazione reti di eccellenza per le seguenti ragioni***

This project would be the basis for a strong collaboration between UF and AITP. In particular, both institutes are active in the research field of *interaction between particle beams and crystalline media.* In more detail, AITP has one of the most important theoretical group concerning this research field, while the SSL of UF is one of the most important laboratories in the world for fabrication and characterization of crystals for experiments in the context of *interaction between particle beams and crystalline media.* Therefore, the synergy between SSL of UF and AITP would be the basis for the creation of a network of excellence in the research field of *interaction between particle beams and crystalline media.*

X ***Accesso ai canali europei e internazionali di finanziamento della ricerca per le seguenti ragioni:***

The establishment of a Dual-Title PhD Ferrara-Kharkov in Physics would strengthen the scientific collaboration between the UF and the AITF and can be the basis for an exchange of knowledge and, consequently, for the development of new research projects. In particular, the collaboration with AITP could be an important value for application to national and international funding sources, such as INFN and european projects, which will be needed in order to assist the preparation of the experiments. Another potential source of resources could be a preferential pathway for application to special grants to undertake projects with scientific groups of the former countries of the Soviet Union.

ADB/cf

4) Costo del progetto per la sola fase di avviamento:

Costi di mobilità personale italiano

Ruolo	n.	Durata complessiva * (in giorni)	Previsione di spesa €
Professore ordinario	1	7	900
Professore associato			
Personale tecnico			
Ricercatore	1	14	1400
Altro (PhD)	2	40	4000
TOTALE	4	71	6300

Costi di mobilità personale straniero

Ruolo	n.	Durata complessiva * (in giorni)	Previsione di spesa €
Professore ordinario	1	7	1200
Professore associato	1	10	1300
Personale tecnico			
Ricercatore			
Altro (PhD)	2	30	4000
TOTALE	4	47	6500

* (sommare tutte le mobilità)

ADB/cf

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Ferrara 15/12/2012,

Il Responsabile Scientifico
Prof. Vincenzo Guidi

V. Guidi

Allegati:

X dichiarazione di interesse da parte di ciascuno dei partner elencati al precedente punto 1;

~~☐ (*solo per i progetti già finanziati su una precedente edizione del presente bando*) relazione indicante le attività già realizzate e le ragioni in base alle quali si richiede un ulteriore contributo per l'avviamento del progetto.~~

ADB/cf

via Savonarola, 9	Partita Iva 00434690384	Telefono: (+39) 0532 293204
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		E-mail: fnc@unife.it