



**UNIVERSITÀ DI PISA**  
**Staff management**

**Director: Dr. Ascenzo Farenti**

**Call for the selection of no. 3 short-term Research Associate positions:**

The University of Pisa announces the public selection for the assignment of n. 3 research activities grants (hereinafter referred as Research Grants):

**“High energy theoretical physics within the research program of the NEO-NAT ERC grant - Understanding mass scales in nature” (as summarized in the attachment A)**

at the **Department of Physics**

**Scientific Sector: FIS/02 - Theoretical physics, mathematical models and methods**

**Contract duration: 12 months**

**Gross annual salary: € 32.567,70**

**Admission requirements:**

**Master degree and a professional scientific CV relevant for the research activities.** All qualifications shall be awarded by the application’s deadline.

**Applications:**

Applications are to be submitted online only, using the following link: <https://pica.cineca.it/unipi/>

or shall be invalid. It is necessary to have an email address to login and complete the application.

Applicants should fill in all the required data and upload all documents in PDF format.

The system allows saving a draft of the application within the application deadline. The system will register the online application date and send a receipt with an automatic e-mail reply. After the deadline, the system will not allow login nor application submission.

In order to be valid, application shall include all the required data, applicant’s signature and a valid identification document.

Each application will be assigned a tracking number to be cited in all subsequent communications, together with the selection code provided by the application form.

Applicants undertake to communicate in writing any variations of what declared in the application form.

The communication shall be edited in PDF format, signed and forwarded to the University of Pisa Rector via the Italian certified e-mail system address ( P.E.C. Posta Elettronica Certificata): [protocollo@pec.unipi.it](mailto:protocollo@pec.unipi.it) or via e-mail at: [concorsi\\_assegni@unipi.it](mailto:concorsi_assegni@unipi.it).

Applicant’s valid identification document shall be annexed.

For further information on application submission, please refer to [concorsi\\_assegni@unipi.it](mailto:concorsi_assegni@unipi.it).

For any IT malfunctioning please refer to [unipi@cineca.it](mailto:unipi@cineca.it).

Applications shall be completed with the following annexes:

1. A self-attested Curriculum of the personal didactics, teaching and scientific activities, dated and signed;
2. The qualifications applicant considers eligible for this selection;
3. The Publications applicant considers eligible for this selection;
4. A list of Publications and qualifications, dated and signed;
5. A copy of the fiscal code (if applicable) and identification card/passport, dated and signed;

All publications should not exceed 30 megabyte and are to be submitted in PDF format only, using the specific section of the application form.

If the file produced exceeds that size, it is possible to forward it by PEC (the Italian certified e-mail system address) to [protocollo@pec.unipi.it](mailto:protocollo@pec.unipi.it) with reference to the application.

#### **Selection procedure:**

For each selection procedure, the Director of the Department concerned will appoint a Committee, consisting of three members.

The selection is assessed by qualifications and an interview.

The total rating allowed is 100/100. Academic qualifications and publications will be assigned up to 60 points. The interview will be assigned up to 40 points, with a minimum passing rate of 32/40. The ranking list will be compiled considering both ratings.

**The interview**, relating to the research program, will be held on **2<sup>nd</sup> May 2019** at **10.00 am** at the Department of Physics - Room no. 177 - Largo Bruno Pontecorvo, 3 - Pisa.

Candidates living abroad, and therefore unable to attend the interview at the University of Pisa, will be allowed to be interviewed via web or conference call, prior to applicant's identification by approved international universities or research centers and upon Selection Committee approval. The Selection committee is appointed to establish the duly examination of the candidates and shall acquire each candidate's copy of an identity card or passport.

In the event of a single candidate for each research grant of this selection, the Committee can assess all the academic qualifications and publications and can approve the candidates without the interview.

In this case, the Committee is appointed to communicate its decision to the Staff Management that will inform the candidates during the two days before the interview's date on the website <https://www.unipi.it/ateneo/bandi/assegni/2019/index.htm>. A similar notice will be published in case the Committee is unable to conform to the date set for the interview.

Nonetheless, we invite candidates to check the University website (<https://www.unipi.it/ateneo/bandi/assegni/2019/index.htm>) during the two days before the interview's date.

Please note that the English version is given as a matter of courtesy, for the only purpose of information. It cannot be legally used in the event of a dispute or a claim arising from the interpretation of this translation and concerning the contents, a possible uncertainty, contradiction or discrepancy. Should this occur, the Italian version of the call should prevail as the only valid. For full Italian text see: <https://www.unipi.it/ateneo/bandi/assegni/index.htm>.

## Attachment A

This research proposal is focused on the following main objectives:

1. *Extrapolating the Standard Model at ultra-high energies.*
2. *Dynamical generation of the weak scale.* The first objective is identifying the possible ways in which, under the assumption of ignoring power divergences, the electro-weak scale can be dynamically generated by perturbative or strong new dynamics around the weak scale itself. Once that the possible models have been identified, one needs to find their phenomenological signatures.
3. *Dark Matter.* The observed cosmological abundance of Dark Matter (DM) can be explained by theories where Dark Matter is a new particle with weak-scale mass. Models where the weak scale is dynamically generated provided novel ways to obtain DM at the weak scale. The objective is identifying the possible models and their experimental signatures.
4. *Landau poles.* If the Standard Model is extrapolated above the Planck scale, its couplings (in primis hypercharge) become non-perturbative at super-Planckian scales. One needs to understand if such “Landau poles” induce a large contribution to the Higgs mass and are therefore incompatible with the modified naturalness principle. In such a case, one needs to devise extensions of the Standard Models around the weak scale that can be extrapolated up to infinite energy, and to identify their experimental signatures.
5. *Gravity.* The possibility that the Planck scale is dynamically generated from a dimension-less theory has been realised within the context of a local quantum field theory (“agravity”) that, however, contains negative norm states in the gravitational sector. One objective is understanding if such states indicate a fatal flaw of the theory or they have some sensible quantum interpretation. If the answer is positive, one wants to identify signals of such unusual state. Otherwise, one needs to find alternative implementations of dimensionless gravity.
6. *Cosmology.* Inflation is a generic phenomenon within agravity, with the slow-roll parameters given by the beta-functions of the theory. One objective is understanding the predictions, taking into account all the fields of the theory. Another objective is understanding the electroweak phase transition within the models of point 2., with possible observable consequences: generation of gravitational waves and baryogenesis.
7. *Connection with experiments.* Needless to say, the project will involve keeping an actively open eye on experiments of possible interest. A significant fraction of the future research activity within a time-scale of years usually comes out from unexpected experimental (and sometimes theoretical) developments.

In conclusion, the research project is focused on such new ideas about the issue of mass scales in nature, balanced with incremental research about traditional ideas, aiming at fruitful interactions with experimental colleagues.