H.F.R.I.
Hellenic Foundation for Research & Innovation

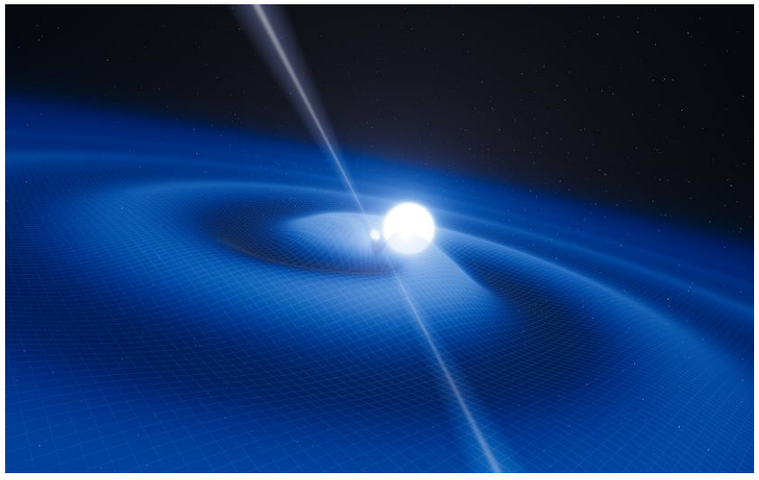
ΙΔΡΥΜΑ ΣΤΑΥΡΟΣ ΝΙΑΡΧΟΣ
STAVROS NIARCHOS FOUNDATION

Description of the funded project

2nd Call “Science & Society”

“Always strive for excellence – Theodoros Papazoglou”

Title of the research project: European Pulsar Composition Survey



Principal Investigator: John Antoniadis

Reader-friendly title:
Searching for the densest objects in the Universe

Scientific Area: Astrophysics

Institution and Country: Max Planck Institute for Radioastronomy, Germany

Host Institution: Institute of Astrophysics - FORTH

Collaborating Institution: MPIfR

Budget: 198,440 EUR

Duration: 2 years

Research Project Synopsis

Neutron stars comprise the densest form of matter in the observable Universe. Their mass distribution contains crucial information about the late evolution of massive stars, the supernova explosion mechanism and the equation-of-state of cold, nuclear matter beyond the nuclear saturation density. Despite their importance, precise NS mass measurements remain challenging to obtain and thus, extremely rare. The European Pulsar Interior Composition Survey (EPICS) is a project that will combine a novel experimental approach with state-of-the-art theoretical modelling to achieve an order-of-magnitude increase in the number of precise neutron star mass measurements. These data will lead to unprecedented insights into the mechanisms driving the formation and evolution of neutron stars, as well as the properties of super-dense matter.

Expected results & Project Impact

The main goal of EPICS is to conduct the most sensitive survey for radio pulsars (a type of rapidly-rotating neutron stars) to date. This survey will search the known positions of fast-moving white dwarfs. Because of the way they are selected, these systems will provide precise neutron star mass measurements, that will allow the localization of the dividing line between neutron stars and black holes.

The importance of this funding

HFRI/SNF funding will allow my team to prepare for the main phase of EPICS by:
- conducting a pilot survey with the five EPICS telescopes, targeting high-priority sources. This survey will demonstrate end-to-end processing, develop important infrastructure for the broader community, and already lead to the discovery of approx. 10 pulsars
-optimizing the EPICS target-selection process using state-of-the-art theoretical modelling. At the same time, my team will be able to significantly expand the capabilities of our code allowing us to simulate simultaneously, for the first time, both the evolution and kinematic properties of large stellar populations.

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