

Fonds pour la Formation à la Recherche dans l'Industrie et dans l'Agriculture

Appel/Call FRIA 2025

Jury report

APPLICATION REFERENCE

FRIA (1st grants) [FRIA-B1]

Jury : PE9 - jury 1

Application ID : 40038239

Host institution : Université de Liège

Participants :

- **MIFTAH Mohamed Amine [Applicant]**
- **JEHIN Emmanuel (ULiège) [Promoter]**

Title in French :

Modélisation optique et radar de la forme des astéroïdes géocroiseurs

Title in English :

Optical and Radar Shape Modelling of Near-Earth Asteroids

JURY REPORT

Quality of the research project: Feasibility, originality, host laboratory, work plan, and activities report (applicable only for applicants to a 1st Grant 2nd Year)

Indicate a comment below.

The candidate proposes to carry out a multi wavelength study using radar, optical, and polarimetric data to better constrain the physical and dynamical properties of Near-Earth Asteroids (NEAs). Understanding NEAs is particularly important in the context of planetary defense, including impact risk modeling. The proposed research aims to double the number of NEAs for which geometric, physical, and spin parameters are known, increasing the constraints for polarimetric modelling and understanding the YORP effect.

The project includes a significant observational component, involving the planning and acquisition of dense photometric lightcurves for a selected sample of NEAs. Lightcurve inversion techniques will be used to derive shape models and rotational properties, which will be complemented with radar measurements available in the Arecibo archive. The success of the project is dependent on the acquisition of these dense lightcurves, which will be obtained during the PhD.

The PhD will be hosted at the ULiege STAR CometA lab, which benefits from 50% observing time on both TRAPPIST telescopes, ensuring access to high-quality photometric data. The CometA team collaborates closely with the University of Florida, providing access to the Arecibo radar data. The hosting lab is particularly well suited to conduct this research, thanks to its unique observational resources, the presence of Prof. Jehin, and an active group of 5 PhD+PostDoc researchers working on small Solar System bodies.

The work plan is well-balanced over the four years. The first year will be dedicated primarily to tool/pipeline development, while the following years will focus on data acquisition and analysis and publication of the results. At least three scientific publications are anticipated, with one currently in preparation.

Competencies of the applicant with respect to his/her speciality (CV)

Indicate a comment below.

The candidate has gained relevant experience in the field during his Master's thesis, which focused on similar topics. He is familiar with the ULiege team and has spent six months as a doctoral fellow at Cometa group, contributing to the current project.

His academic record may appear modest by F.R.S.-FRIA standards, with grades ranging from 11 to 14/20 throughout his coursework, though he achieved a 16/20 on his Master's thesis. Nonetheless, he ranked first among 20 students in his cohort at Cadi Ayyad University in Morocco. The grading system in Morocco aligns more closely with that of French universities, where a score of 16/20 is regarded as excellent.

Presentation and answers given to questions about the project

Indicate a comment below.

The candidate gave a clear presentation, demonstrating a good understanding of the project's objectives and main outcomes. Having already worked on the project for six months during his doctoral fellowship and carried out similar

research during his Master's thesis, he showed familiarity with the topic and its broader context. He communicated his ideas in a coherent manner and responded to the jury's questions quite clearly. The candidate conveyed genuine enthusiasm and clear ownership for his research, reflecting solid engagement with the subject.

Scientific knowledge in general

Indicate a comment below.

The candidate appears to have good scientific knowledge.

Final comment and grading

Final comment

The research program proposed by the candidate is well structured and scientifically relevant. It benefits from privileged access to the TRAPPIST telescopes, guaranteeing reliable data acquisition. While the research project will target 20 NEAs observable during the proposed PhD calendar, it will output a standardized data processing pipeline that can continue to be used for future datasets acquired beyond the PhD timeframe further expanding the statistics of NEAs.

Final grading

A : Excellent

Decision of the Board of Trustees

Although well evaluated, the project cannot be funded due to the strong competition in the field. / Bien qu'évalué positivement, le projet ne peut être financé étant donné la forte compétition dans le domaine.