

Reference	Title	Duty Station
IE-2018-NAV-PFS	Innovative technology for future high performance positioning applications	ESTEC

Overview of the unit's mission:

ESA has the role of design authority and procurement agent for Galileo, a Global Navigation Satellite System (GNSS) able to deliver Position, Navigation and Timing (PNT) in an autonomous way based on similar principles as GPS or GLONASS. Galileo is currently under final stages of deployment and already is already providing Initial Services with outstanding performances.

In parallel, ESA is also engaged in defining the Galileo 2nd Generation (G2G), which targets at improvement in coverage, accuracy, time to fix and vulnerability of services through addition of new system concepts and innovative technologies. Nevertheless, in this fast evolving PNT environment, the G2G needs to consider the full PNT landscape in order to be able to establish the correct evolution direct and requirements.

Even GNSS systems are the *de facto* positioning means for many applications due to its global and open features and its performance; there are augmentation systems providing corrections improving the service performances, and other alternative positioning methods based on terrestrial or satellite technologies. Also the use of complementary sensors may support positioning and navigation. In the future, stringent applications will require the use of hybrid approaches using a combination or fusion of different technologies to reach seamless positioning in different environments. Such approaches are already being considered for a number of positioning use cases under definition in 5G wireless networks or for autonomous vehicles navigation.

The post is to work in the GNSS Evolution Programme and Strategy Division, within the Directorate of Galileo and Navigation Related Activities. The Division is responsible for identifying novel space and ground technologies and assessing its relevance for consideration in evolutions of European GNSS systems, such as G2G, and eventually to implementing related technology R&D pre-developments and research studies. It is also responsible for identifying and assessing disruptive technologies that could be considered for alternative future space-based PNT systems, including hybridisation with sensors, terrestrial and alternative technologies.

Overview of the field of activity proposed:

Depending on the profile and interests of the candidate, the work will be carried out in one of the following domains:

Satellite On-Board Innovative Technologies Domain:

- New on-board clock technologies (vapour cells, trapped ions, cold atoms, optical clocks)
- Advanced timing subsystem approaches (clock ensemble combinations, remote clock steering)
- New Laser Retro-Reflector (LRR) technologies, including detection and timing capabilities.
- Accelerometers on-board.
- Space weather instruments on-board (radiation, plasma, magnetic field)
- Orbit Determination and Time Synchronisation

Technology Hybridisation for Demanding Future Applications Domain

- Technologies for positioning and timing in future wireless networks (5G) – IoT, autonomous vehicles, drones -, including the role of GNSS and the seamless integration with sensors and alternative technologies.
- Positioning, Navigation and Timing Technologies for Autonomous Vehicles including absolute and vehicle-to-vehicle navigation, and integration with other sensors.

Alternative Satellite-Based PNT (Positioning, Navigation, and Timing):

- Novel concepts and technologies for satellites at different orbits (e.g. Highly Elliptical Orbit, Inclined Geosynchronous Orbit, Low Earth Orbit).
- High Altitude Pseudo-Satellites (HAPS) for PNT
- Quantum technologies for PNT (clocks, sensors, secure communications, key distribution)
- Solar system PNT using pulsars.
- Relativistic Positioning Systems.
- Neutrino communications for PNT.

Required education:

Applicants for this post have just completed, or will be in their final year of a University course at Masters Level in engineering or related technical or scientific discipline. Relevant experience in one or several domains identified in this vacancy is considered an asset. A general understanding of GNSS systems and/or some of the identified technologies is considered important.

Candidates are expected to have a proactive attitude to solving problems and “hands-on” experience in using analysis and engineering tools, including simulation environments such as Matlab and programming languages such as Python and C. Applicants should have good interpersonal and communication skills and should be able to work in a multi-cultural environment, both independently and as part of a team.