

UT Austin Portugal | 2019 Strategic Research Projects

SPACE-EARTH INTERACTIONS

uPGRADE

Miniaturized Prototype for Gravity field Assessment using Distributed Earth-orbiting assets

The rate at which ice loss in polar caps is occurring is a key parameter that indicates how quickly sea levels will change over the next few decades as a result of global warming. uPGRADE aims at estimating how the water moves in the Earth's surface, at a regional scale, by searching for minute changes in our planet's gravitational field as measured from an orbiting CubeSat (at around 300-500km altitude).

Keywords: Earth observation, earth-orbiting, nanosatellites, IoT



Start Date: 1-JUL-2020

Duration: 36 months

Operation Code: 45927

Main challenge/problem the project seeks to address

uPGRADE is an Earth Observation Cubesat for observing Earth's gravitational field variations and measuring the neutral thermosphere – along the line of past missions such as CHAMP (DLR), GRACE (DLR/ NASA) and GOCE (ESA). The project aims at the development, integration and preparation for the operation of a prototype demonstrator of a general purpose CubeSat platform for commercial and scientific purposes, such as Earth observation, communications, land monitoring, support of distributed and/or fractionated constellations of nano-satellites and execution of missions in the cislunar and interplanetary space. The use of CubeSat technology for geophysical applications such as satellite gravimetry and thermospheric studies intends to demonstrate the capabilities of the satellite platform under demanding requirements for structural and thermal stability, power management, high volume data communication and accuracy of satellite orientation and position determination.

Proposed solution

Researchers propose to develop a nano-satellite prototype for studying gravitational fields. The main objective of this satellite will be the monitoring of large water reservoirs. The project will also develop a platform for future nano-satellite capabilities, including Earth observation, communications and exploration missions.

Innovative Potential

The innovative nature lies on the high-accuracy miniaturized accelerometer (based on MEMS technology), which will open up the potential in the future for adopting a distributed approach (up to 20 spacecraft) to measuring changes in the Earth's Gravity field, as an alternative to using a single measurement system (GRACE/GRACE-FO were/are two satellites). This new satellite concept is designed to have no more than 1/1000 of the volume of its predecessors with about 1/100 of the cost.

Target beneficiaries

The commercial uses of a generic nanosatellite platform such as the one developed by uPGRADE extend from Earth Observation applications to Communications. Space exploration is another expected application, especially taking into account the ESA activities in which Spin.Works is often involved.

Consortium

PORTUGAL

Spin.Works, S.A. (Lead Beneficiary)

International Iberian Nanotechnology Laboratory (INL)

Instituto de Soldadura e Qualidade

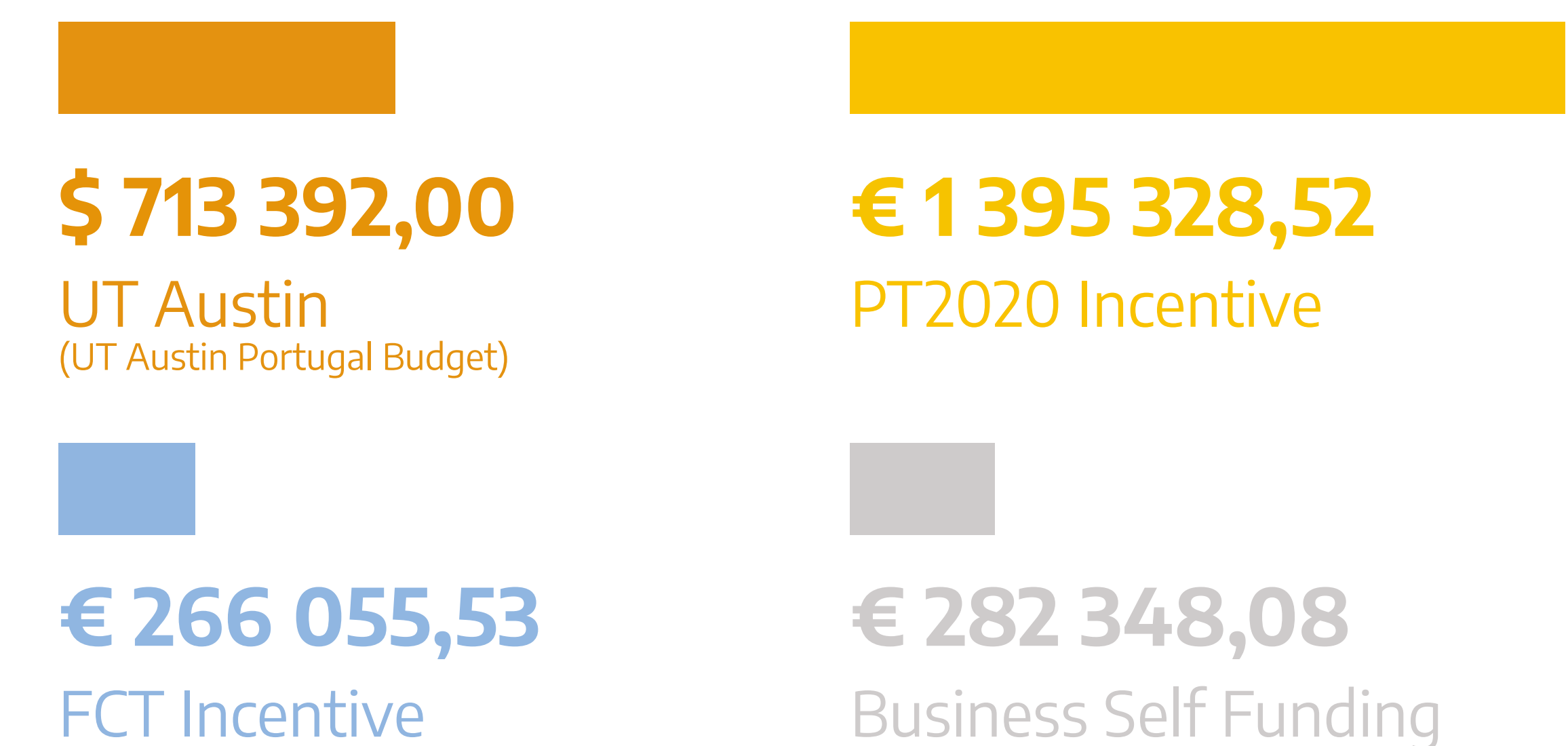
University of Minho

USA - UT AUSTIN'S PRINCIPAL INVESTIGATORS

Byron Tapley (Cockrell School of Engineering and Center for Space Research)

Brandon Jones (Cockrell School of Engineering and Texas Spacecraft Laboratory)

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