DIMA
DEPARTMENT OF MECHANICAL AND AEROSPACE ENGINEERING

Newsletter – November 2018

HIGHLIGHTS

Destination Mercury: Sapienza en route with the BepiColombo Probe

The on-board Mercury Orbiter Radioscience Experiment (MORE) has been developed by a team guided by Sapienza Professor Luciano Iess. The instrument, which will measure the gravity and orbit of the planet nearest the Sun, will provide a new and advanced space navigation system and will search for violations to Einstein's General Relativity Theory. Mission BepiColombo is set to take off for Mercury from the Kourou Space Centre in French Guyana at 3:45 am (Italian time) on the night between October 19 and 20. The probe will be launched with an Ariane 5 rocket, the most powerful available in Europe. This is the first European mission towards the planet that is closest to the Sun and the third such mission after NASA's Mariner 10 Mission (1973) and Messenger Mission (2004). As such, it rightly stands out as a milestone for the European Space Agency (ESA). The BepiColombo Mission has been made possible thanks to the collaboration between ESA and JAXA, the Japanese Space Agency. ESA developed the Mercury Planetary Orbiter (MPO) Module, while the Japanese Space Agency produced the Mercury Magnetospheric Orbiter (MMO). Both modules will be placed in orbit around Mercury in about seven years, after a series of passages near the Earth, Venus and Mercury, too. The sophisticated on-board instruments will allow the mission to study the planet in great detail (internal structure, lithosphere, chemical composition) and the surrounding environment (solar wind and magnetic field). The analysis of the internal structure will provide information on the primordial cloud that gave birth to the solar system and the evolution of the planet over the last 4.6 billion years. Moreover, it will also provide useful information for the study of exoplanets, many of which orbit around the host start at a distance similar to that between Mercury and the Sun. Last, but not least, the measure of the gravity field will allow us to understand the geological evolution of the planet. "The BepiColombo Mission", explains Prof. Iess, "thrusts Europe towards the exploration of Mercury, one of the most fascinating objects in our Solar System".

DIMA
DEPARTMENT OF MECHANICAL AND AEROSPACE ENGINEERING

Newsletter – November 2018

HIGHLIGHTS

Four out of the eleven scientific instruments on board the ESA spacecraft are Italian. These include the Mercury Orbiter Radioscience Experiment (MORE), led by Prof. Luciano Iess from the Sapienza Department of Mechanical and Aerospace Engineering together with an international team of scientists and engineers. Fabrizio De Marchi, Paolo Cappuccio e Andrea Di Ruscio, postdocs or graduate students at Sapienza's Radio Science Lab, are actively involved in the investigation. In Italy, collaborators include the Universities of Pisa and Bologna and the Abruzzo Astronomical Observatory of the National Astrophysics Institute. MORE includes two main elements: the KaT (Ka-band Transponder), funded by the Italian Space Agency (ASI) and developed by Thales Alenia Space Italy, and the two large antennas located in the California desert and in Malargue, Argentina. The exchange of radio signals between the antennas on earth and the KaT will enable measurements of the probe's distance to a precision of a few centimetres and its velocity to a thousandth of a millimetre a second. This, in turn, will allow to accurately determine the gravity and orbit of Mercury. Yet another Italian tool, the Italian Spring Accelerometer (ISA), will measure all forces acting on the probe (other than gravity) to make the gravity and orbit determinations as precise as possible. "The scientific objectives of MORE", points out Luciano Iess, "do not only include the determination of Mercury's internal structure with precise measurements of the planet's gravity, but also the search for possible violations of Einstein's Theory of General Relativity through the reconstruction– just a few centimetres off - of Mercury's orbit". In fact, Mercury is in a zone of the Solar System in which the curvature of time-space produced by the Sun (and predicted by Einstein's Theory) is more marked. This curvature produces anomalies in the planet's orbit that have been measured since the 19thcentury but were only explained in 1915 thanks to the Theory of General Relativity; indeed, the first experimental clue to it. "Thanks to MORE", adds Iess, "we will be able to accurately determine Mercury's orbit, and this will allow us to verify more precisely than ever before if the Theory of General Relativity remains a valid theory for gravitation. And, of course, MORE is also a test of a new and advanced space navigation system". The BepiColombo Mission is dedicated to Italian scientist Giuseppe "Bepi" Colombo, who provided much impetus to the study and exploration of Mercury.

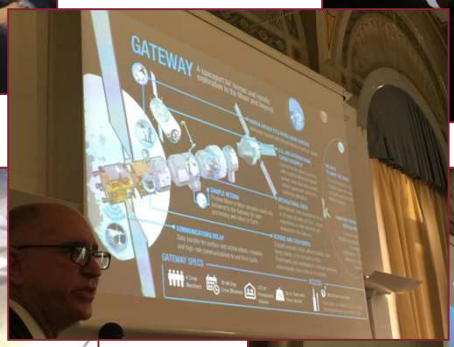
DIMA
DEPARTMENT OF MECHANICAL AND AEROSPACE ENGINEERING

Newsletter – November 2018

NEWS FROM DIMA

International Space Apps Challenge 2018

Sponsored by NASA, organized by the European Space Agency and the Embassy of the United States in collaboration with the University of Rome La Sapienza, this year the International Space Apps Challenge will take place at the Faculty of Engineering of Sapienza from 20 to 21 October. This initiative is aimed at students of engineering and science, but also to simple science and space enthusiasts from around the world and will take place simultaneously in 164 cities around the world. The International Space Apps Challenge aims to create open-source solutions to the problems posed by space exploration and issues related to improving life on earth. During the event, working groups will be formed that will have access to public data to propose their solutions. Here a declaration of DIMA Director, prof. Gaudenzi: ″A very special “space” week end at La Sapienza: yesterday Sam Scimeni, NASA Director of International Space Station, lectures for our students on the human flight to Mars and on the Gateway program to the Moon. Here Sam with Marcello Onofri, myself and the students attending the seminar and Sam lecturing. Today and tomorrow Nasa Space App Challenge, an akaton on Space applications developed simultaneously in Rome, Naples, Milan, Turin, Vicenza. Today the Rector of Sapienza Prof. Gaudio opened the event after an interactive speech of Luca Parmitano an the young participants!”



DIMA
DEPARTMENT OF MECHANICAL AND AEROSPACE ENGINEERING

Newsletter – November 2018

NEWS FROM DIMA

Science Festival in Genoa & Nanosatellites

Sala del Trionfo crowded and public captured by the notes of three exceptional musicians, Danilo Rea, Paolo Damiani, Martux-m, in Genoa «Festival of Science». The show Lights and Waves Rhapsody ended with the enthusiastic reception of the public, a story in music of the greatest discovery in the field of physics of the last 100 years. On stage the physicists Immacolata Donnaruma, Paolo D'Avanzo and Fulvio Ricci narrated the first revelation of gravitational waves emitted by the fusion of neutron stars, which took place in synergy between different instruments, which opened the new era of multi-messenger astronomy.
The initiative has been curated by the Italian Space Agency (ASI), the National Institute of Nuclear Physics (INFN), the National Institute of Astrophysics (INAF).
Not only gravitational waves at Festival of Science: an attentive audience has crowded Sala del Gran Consiglio of Palazzo Ducale for the debate on nanosatellites "a paradigm change for the evolution of space systems that will allow the control of the Earth from Space and big data generated by Space on a multiplicity of functions" has explained prof. Paolo Gaudenzi, Sapienza's DIMA Director. "The paradigm shift in the space sector takes place because the size is reduced, 400 launches are expected in the next two years" added Pini Gurfil, Samson's scientific Coordinator, describing the potential of cubesat, the 10x10x10 cm satellite base for the construction of modular satellites. Here another declaration of prof. Gaudenzi: «At the Festival della Scienza in Genova speaking about Nanosatellites with Pini Gurfil (in the picture) director of the Aerospace Research Institute of Technion (Israel) and Giancarlo Varacalli of the Italian Space Agency. Great interest in the audience about the future of space systems. In the evening, following the tradition of the Festival, a dinner in a family with all the speakers of the different events of the day at the festival and many stakeholders from the town. A very pleasant and interesting networking experience with the objective of a better communication of science and technology with eyes on the future!»

SAPIENZA
UNIVERSITÀ DI ROMA

DIMA
DEPARTMENT OF MECHANICAL AND AEROSPACE ENGINEERING

Newsletter – November 2018

DIMA

NEWS FROM DIMA

Hydrogen transport: agreement between RFI, DIMA and CNIM

Promote the development of hydrogen rail transport, exploring benefits and sustainability. The study is functional for the technical / economic evaluation of the benefits in terms of environmental and social impact deriving from the hydrogen power supply, compared to the other systems and to activate possible synergies with the developments of industry and of energy plants. The agreement was signed today in Rome by Prof. Paolo Gaudenzi Director of the Department of Mechanical and Aerospace Engineering, Aurelio Salvatore Misiti of the Italian National Maintenance Committee and by Maurizio Gentile, Chief Executive Officer and General Manager of the Italian Railway Network.

The agreement signed today will allow to identify and deepen the most suitable solutions for the production and supply of hydrogen, necessary for the fuel cells of the trains. The activities planned will be carried out by DIMA, responsible for energy and fuel systems with low environmental impact, supported by the CNIM, specialized in productivity and competitiveness of companies, in particular in the maintenance sector, with the collaboration and supervision of the Italian Railway Network (RFI).

«According to Sapienza Third Mission strategies - has declared prof. Paolo Gaudenzi - DIMA offers its expertise to the world of companies and institutions to foster the development of technological solutions in response to the needs emerging from society and of sustainable development. An approach that wants to stimulate the participation of the University in the innovation ecosystem based on its own skills to be invested in the national and local area with the ambition to play a role of protagonists in the global scenario. This project, with a high level of innovation, aims at developing hydrogen technologies for use in railway traction systems, and is therefore perfectly in line with the strategic goals of DIMA mission». According to Aurelio Misiti «the Convention between the University, CNIM and RFI, signed today at the headquarters of Ferrovie dello Stato represents a decisive step forward in the relations between the world of research and the industrial one in our country. It is an important signal for the enhancement of scientific and technological research and its transfer to the transport sector».

«RFI has always been committed to research and technological innovation to modernize rail transport in our country, in terms of efficiency and environmental impact», has declared Maurizio Gentile. «We are aware of the strategic importance of an increasingly sustainable mobility and of the opportunities that can derive from this project and this collaboration».

OPPORTUNITIES FOR RESEARCH, NETWORKING AND INTERNATIONALIZATION

- On Tuesday 16th October, at the Cloister room of the Faculty of Civil and Industrial Engineering, a meeting will take place with representatives of the Rolls-Royce industry of the University Campus Team, whose goal is the training and professional possibilities currently available, aimed at graduates and undergraduates. Rolls-Royce, known worldwide for its ability to provide high performance and integrated propulsive power solutions in the marine, terrestrial and air, is currently looking for talented young people for different training programs. In the afternoon, from 13.30 pm to 17.30 pm, interested students can personally hand over their curriculum vitae, upon reservation.

- MAECI: Call for the collection of joint research projects under the Agreement for Scientific and Technological Cooperation between Italy and the People's Republic of China for the period 2019-2021. MAECI intends to finance projects that provide for ministerial co-financing in the face of adequate funding also by the proposing body. It is possible to present proposals in the following thematic areas: 1) Artificial Intelligence (Brain-inspired Artificial Intelligence, Intelligent City); 2) Technologies related to astrophysics; 3) Innovative biomedical devices (medical robots, tissue engineering, new therapeutics, neurodegenerative diseases and personalized medicine); 4) Innovative processes for biomass conversion into energy and other added value products. The announcement follows a two-step evaluation. The deadline for submitting your expression of interest (phase 1) is set for 12 December 2018. More information and the text of the Announcement with all attachments are available on this website: https://www.esteri.it/mae/it/politica_estera/cooperscientificatecnologica/avvisiincaricobandi.html?id=1814