List of Romanian activities approved by ESA Committees and Programme Boards

A. Science Programme Committee

1. PLANCK – Low Frequency Instrument (LFI) data exploitation

Contractor: Institute for Space Sciences, Bucharest The objectives of this project are part of the scientific programme of the Planck Low Frequency Instrument (LFI) and they will be achieved through the following actions:

- Software development and implementation at Level S and Level 4 of the Planck-LFI Data Processing Centre (DPC).
- In-flight data analysis: statistical and consistence checks.
- Scientific interpretation of the Planck-LFI measurements.
- Study of the complementarities between Planck scientific results and other cosmological and astrophysical information.

This project will be carried out in close cooperation with the PI of the Planck – LFI instrument (INAF/IASF Bologna, Dr. N. Mandolesi).

2. CLUSTER II and VENUS EXPRESS – Kinetic investigation of the Earth and Venus plasma layers (KEV2)

Contractor: Institute for Space Sciences, Bucharest

This project is aiming at contributing to the development of Romanian knowledge in the field of planetary magnetospheres and ionospheres and their interaction with the solar wind. It will be focusing on the study of fundamental dynamics of space plasmas at the interface between different plasma regimes and will benefit from the Romanian expertise gained in the field of kinetic modeling and advanced methods of experimental data analysis acquired within the Cluster project. Furthermore this project will enable a comparative study of boundary layers formed in two different plasma environments: the Earth's magnetosphere confined by the strong geomagnetic field and the ionosphere of Venus depleted of its own magnetic field. Both plasma systems interact with the solar wind whose density and velocity significantly vary with radial distance from the sun.

The Institute for Space Sciences in Bucharest will be responsible for this project in cooperation with the Belgian Institute for Space Aeronomy (IASB) in Brussels and with Max-Planck Institute for Extraterrestrial Physics (MPE) in Garching.

3. CLUSTER II – Energy conversion and transfer in the solar wind magnetosphere / ionosphere system (ECSTRA)

Contractor: Institute for Space Sciences, Bucharest

This project will investigate the sequence of conversion and transfer steps that lead the energy from its source in the solar wind to the sink in the ionosphere. Particular attention will be given to the relationship between processes in the magnetospheric boundary layers (like the plasma sheet boundary layer or the layers close to the magnetopause) and energy dissipation in the auroral ionosphere. The local processes leading to energy conversion will be examined by

using tools specifically designed to take full advantage of the multipoint measurements capabilities of the Cluster mission. In order to explore the large scale energy transfer within the magnetosphere, additional data from low altitude satellites like Fast Auroral Snapshot Explorer (FAST), as well as ground observatories will be used. Key solar wind and geophysical parameters publicly available (e.g. solar wind Advanced Composition Explorer (ACE) data, Kp, Dst and AE indices) will allow the examination of the global context.

ECSTRA will be implemented by the Space Plasma and Magnetometry Group (SPMG) of the Institute for Space Sciences in Bucharest, in close cooperation with Max-Planck Institute for Extraterrestrial Physics (MPE) in Garching (Dr. G. Paschmann) and the Centre d'Etudes Spatiales des Rayonnements in Toulouse (Prof. H. Rème).

4. PLANCK, CLUSTER II and VENUS EXPRESS – Romanian GRID middelware repository for Space Science Applications (RoSpaceGRID)

Contractor: Institutes for Space Sciences, Bucharest

The RoSpaceGRID framework is an implementation of GRID which consists of clusters, labs with distributed computing resources all around the world, where computer activities can be submitted for scheduled execution. The RoSpaceGRID is deployed in Institute for Space Science (ISS) for PLANCK, CLUSTER II and VENUS EXPRESS space missions.

This project will be established for the benefit and in cooperation with the scientific community of the three missions mentioned above.

5. COROT – Romanian participation in the COROT mission

Contractor: Astronomical Institute of the Romanian Academy of Sciences, Bucharest

This project is aiming at:

- Up-grade of the OSCROM (computational model of a star) pulsational model to take into account active convection and differential rotation.
- Theoretical calculations for a grid of stellar pulsations using OSCROM model.
- Based on these grids, theoretical calculations of stellar inverse data (INVERTROM asteroseismological data) for the observed pulsating stars in the COROT programme
- Parameters determination for eclipsing binaries observed in the COROT programme.
- For the astrometric positioning of the spacecraft, determination and amelioration of the local system of reference in the observing zones.

The Astronomical Institute of Romanian Academy will be in charge of this project in close cooperation with CNES COROT team.

6. SOHO / ULYSSES – Romanian contribution to the Sun-Heliosphere Studies

Contractor: Astronomical Institute of the Romanian Academy of Sciences, Bucharest

The objectives of this project are twofold:

1. Study of configurations observed in the solar atmosphere susceptible to give CME's and other instabilities. The relationship between filament eruption and CME is a theme which complements nicely the ESA space studies on the sun. The Coronal Mass Ejections (CME's) are important features of the solar activity with a direct impact to the Space Weather and Earth. The sources of CME's are in some of the solar active phenomena (flares, prominences, streamers). The majority of CME's are linked to prominences/filaments "disparitions brusques". This study is aiming at gaining an understanding of the source regions from which the CME's occur. A statistical analysis about their respective location, their number, the mass of prominences according the EIT dimming volumes. This investigation will use SOHO-EIT observations of EUV dimmings and EIT waves and SOHO-LASCO white light observations of CME's. This task will be performed in collaboration with the Observatoire de Paris-Meudon (Dr. Brigitte Schmieder).
2. Heliospheric studies using Ulysses data . Interplanetary magnetic field in 3D. Connections with CMEs. This project covers the follow up of a CME from an active region to interplanetary space.

7. GAIA – Improving relative positions of reference stars around ICRF radio-sources

Contractor: Astronomical Institute of the Romanian Academy of Sciences, Bucharest

This contribution consists in the improvement of the relative positions of reference stars around ICRF radio-sources. The main tasks can be describes as follows:

- Determination and amelioration of the local system of reference in the observing zones.
- Obtaining a dynamic reference system for NEO's, referred to the ICRF sources.

The work is based on agreements with Bulgarian National Observatory and CNRS (France). In the near future, the Instituo Astronomico e Geofisico da Universidade de Sao Paulo (IAG/ISP) will team up.

8. HERSCHEL / ASTRO-F – Modeling photoconductor detectors developed for ESA Space Science Missions in the far-infrared regime

Contractor: Institute for Space Sciences, Bucharest

The overall objectives of this project are the following:

- Characterization of photoconductor detectors developed for ESA Space Science Mission in the far-infrared regime.
- Development of a general model to quantify the transient response behavior and the response to cosmic rays hits of these detectors.

- Development of algorithms which employ this model to correct science data for these artifacts.

The work will require the execution of the different work packages for each of the missions ASTRO-F and HERSCHEL. The project proposed will belong to ESA Research and Scientific Support Department, Astrophysics Mission, ASTRO-F and HERSHEL. All work is to be done at the Astronomical Institute of the Romanian Academy (AIRA), where the Principal Investigator (PI) is a research associate. The PI also requests the services of an independent development manager located at the Max-Planck Institut für Kernphysik in Heildelberg.

B. Human Spaceflight, Microgravity and Exploration Programme Board

Experiment in the SURE project): Growth and survival of coloured fungi in space – CFS)

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Part A (Part B on hold)

Contractor: Institute for Space Sciences, Bucharest

These two Romanian experiments have been selected by the SURE Selection Boards for implementation in the SURE project (Part B being on hold). Latest status report on the SURE project is provided to HME-SBD at its meeting on 30-31 October 2006. The access to the ISS will be funded by EC (in the frame of SURE), the experiment development will funded by Romania (in the frame of PECS).

This project aims to assess the effects of both microgravity and gamma radiation conditions on the survival of a number of different fungal species. It will provide insights into the effects of space travel on the survival of these spores and help determine the potential model to be used during transportation from Earth to space and potentially to planetary systems. The project has two main components, one involving the culturing of fungal species on agar surfaces inside the ISS (Part A of the project) and a second component involving the exposition of fungal spores to the space environment including vacuum, cosmic radiation and solar ultraviolet, with connection to planetary protection (Part B of the project).

The project is based on experiments both on the Earth and in space inside of microcapsules made by experts from Romanian Institute of Space Sciences (RISS) in Bucharest. Microbiology activities and imaging of spores after exposure to the space environment will also be done by experts from the Romanian Institute of Biology (IBML) and the Hellenic Research Foundation in Athens (NHRF).

The fungal species chosen for the experiments belong to six genera selected as organic material decomposers, possible contaminants of materials meant for interplanetary travel, aggressive biodeteriogens of artworks and wooden buildings. Those, containing melanin are protected against UV rays.

Black fungal spores survivals in space have high important applications for panspermia and planetary protection forward contamination. Results can be taken into consideration for calculation of the survival and possible proliferation of potential contaminants transferred from Earth on spacecraft.

The project will provide insight on whether, how and for how long terrestrial fungi are able to survive, grow and replicate in extreme conditions (solar UV radiation, vacuum, cosmic radiation, extreme temperatures). Colonial growth of fungi, sporulationa, spreading and adhesion of spores will be studied measuring the rate of growth and intensity by optical microscopy. Survival value of fungal spores' exposure in space and their germination will be studied using various techniques like optical microscopy, Atomic Force Microscope (AFM) and cultivation. Phenotypic and metabolic expressions of mutagenesis will be put in evidence.
Some samples will be exposed to microgravity and gamma radiations in a microbiology laboratory on Earth. As far as the experiments in space are concerned, those within Part A of the project will be performed on board the Station with photography of agar plate cultures in flight. Since Part B involves an external exposure using the EXPOSE-R facility, it is dependent on the availability of a second batch of ESA experiments on EXPOSE-R on which SURE experiments could be added. Consequently, Part B of the project is put on hold – as well as the SURE budget pre-allocated to it – until a decision on the possibility to flight experiments within EXPOSE-R is taken in principle in the course of 2008.