Title of the project	**COMPUTATIONAL METHODS IN SCIENTIFIC INVESTIGATION OF SPACE**
Acronym	**COMISIS**
Subprogramme	***S1 Research***

(Calibri 11)

Executive summary

Fundamental researches in Theoretical Physics, Gravitation, Cosmology and Astrophysics provide a series of new computational methods (numerical, symbolic and graphical simulations) which can be applied in wide areas of space technologies, mainly designing new experiments and measurements in space. On the other hand, recent Astrophysical achievements (discovery of cosmic acceleration, Gamma-ray bursts, galactic black-holes nuclei, gravitational lensing, etc.) impose validation of different theories and models through future experiments and space missions. Thus, this project proposes a joint research program having the following main directions:

- Providing an entire computer library devoted to numerical, symbolic computation and algebraic programming methods in space science areas as numerical relativity, nonlinear flow equations and other applications.
- Analytical and numerical models for remote solar and space plasma diagnostics.
- Semi-analytical methods in studying the stability of constrained space flight dynamics.

General and specific objectives of the project:

Within the general ESA and STAR objectives, the COMISIS Project has the following general aims:

- Producing high-level scientific results and output increasing the international recognition and relevance of the Romanian science.
- Improving the capacity of the partner institutions to built research and educational projects in space science and technology.
- Development of software technologies as support of experiments and measurements in space missions.

The **main goal** of the project is to solve the following problems:

- Identifying possible effects of different cosmological models on the astrophysical measurements in space missions (satellites and planetary movement in the solar system, supernovae, etc.)
- Complementing and validating the proposed methods of solar and space plasma diagnostics by novel observations and corresponding data assimilation procedures.
- Refinement of reconnection models based on stochastic behaviour of magnetic fields and applications to astrophysical events, like the intraday variability observed in the spectra of accretion disks of Active Galactic Nuclei.
- Extension of the Draper Semianalytical Satellite Theory (DSST) in studing the stability of spacecraft orbits.
- Development of specific application of the stability theory in the study of turbulent atmospheric phenomena.

The research aproach will start from TRL 1 and will end to TRL 4.

The major results of the project will consist in technical reports, collection of libraries with computer software (including user guides) as well as scientific papers published in main flow journals and/or communicated in international conferences. On the educational side, COMISIS will provide, through informal sessions and workshops, good opportunities for multidisciplinary training of high-level specialists. The social and educational impact of the project will be assured by a series of public conferences and events organized within COMISIS.