

Fundamental Physics Roadmap Advisory Team

FPR-AT

2nd Summary Report on FPR-AT Activities

On 23 October 2009, the FPR-AT convened in ESTEC for its second meeting. The following agenda points have been adopted for the meeting:

- Gravitational waves detection: LISA and LISA Pathfinder (O. Jennrich, ESA project scientist for LISA)
- Screening of white papers: Definition of science priorities, review of enabling technology...
- Organization issues: roadmap preparation, workshop organization...
- AOB

The presentations on LISA and LISA Pathfinder have provided the grounds for a discussion of the scientific and technological aspects connected to the LISA program. LISA and LISA Pathfinder are developing key technology important not only for the detection of gravitational waves, but in general for future missions in the fundamental physics domain. Lessons learnt from the LISA program have been discussed, with special attention to the technology development. In particular, the transfer on know-how and technology between scientific institutes and space industries has been identified as a key step for minimizing costs and development time. Further discussions on these topics will be held in the next meeting with the project managers of LISA and LISA Pathfinder.

The discussion of fundamental physics experiments in the areas of dark energy, dark matter and modified gravity, originally foreseen for this meeting, will be rescheduled to the next meeting when a dedicated presentation on EUCLID will be given by the ESA project scientist.

FPR-AT has then focused its activities on the roadmap document.

A very visible science program lies at the interface between the two fundamental theories of physics in the XXth century: general relativity and the quantum theory.

One may group the searches associated with this program under two intimately connected areas of research:

Tests of fundamental laws: tests of fundamental principles, in particular the equivalence principle (weak equivalence principle, local Lorentz invariance and local position invariance including constancy of constants), test of the law of gravity at all length scales, as well as in its weak or strong regime, structure and dimensionality of space-time, tests of the foundation of quantum mechanics, etc.

Search for fundamental constituents: scalar fields for dark energy, wimps for dark matter, fundamental strings, etc.

At the same time, fundamental physics is a field at the crossroads of many scientific interests e.g. astrophysics, solar system science. These interdisciplinary aspects will be discussed in the next meeting.

A new community is bringing new and diverse technologies to space. These technologies, even if relatively young, have already acquired space experience: the LISA program is almost 2 decades old; T2L2 is under operation and ACES and MICROSCOPE are well advanced; and in astroparticle physics, besides PAMELA and FERMI, AMS is ready to be launched.

The roadmap document will start from the rich space program connected to fundamental physics and associated experiments to draw a recommendation on science and technology priorities in the field.

The workshop organization has been briefly discussed. The workshop will be based on a few dedicated talks introducing the field followed by the presentation of the roadmap document by FPR-AT members. The audience will be then split into discussion groups that will provide recommendations on the document. The workshop program will be finalized at the next meeting which will take place on 26-27 November 2009.

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