

# **Final Report**

## **ILIAS**

**Integrated Large Infrastructures for Astroparticle Science**

**Integrating Activity**

implemented as

**Integrated Infrastructure Initiative**

Contract number: RII3-CT-2004-506222

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Project website: *ilias-cea.fr*

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## A. ACTIVITY REPORT

Astroparticle science is an emerging field of physics linking investigation of the microscopic world, ie particle physics, and investigation of the largest scales of the universe, ie astronomy and astrophysics.

The best illustration of this new field has been the investigation of the solar neutrino puzzle. In the 1950's, from a single pioneering experiment, there was indication that not enough neutrinos were coming from the Sun if one believed the model of Hydrogen burning in the sun. Thanks to dedicated new and more sensitive installations, it has been concluded that indeed this observation was confirmed and that correct understanding of this observations could be accounted for by new properties of the neutrino and not by the functioning of the sun.

Another typical example is the understanding of the dark matter of our Universe. This long standing question, which has its origins in the 1930's, is now recognised best accounted for by new particles bathing the Universe since the Big Bang. Detecting these particles is now one of the major challenge of the field.

In both cases and many others illustrated in the following report, the issues can only be solved with the help of dedicated infrastructures, the deep underground laboratories. Only such sites, deep underground, are well enough protected against cosmic rays from the Universe to provide an environment free of parasites and background for the very sensitive experiments dedicated to observe the very rare processes at work in this field.

There are four major running Deep Underground Laboratories in Europe and 2 major Gravitational Waves installations. The goal of the present integrating activity was to initiate and strengthen coordination between these infrastructures for a better service to users, promote integration of communities involved, in particular for larger scale projects, develop techniques that will allow next generation investigations and facilitate, promote and organise access to Deep Underground labs to enlarged community.



This gives the context and scope of ILIAS (Integrated Large Infrastructures for Astroparticle Science), which main achievements are described in the following.

The ILIAS web site (<http://ilias-cea.fr>) has known two major phases. A first site, built shortly at the beginning of the project has shown not to be fully adequate to the communities that were visiting it. It has then been upgraded to a version with publication data base, regular update of news, and workable links to outreach pages.

### **N2: Deep Underground Science Laboratories (DUSL)**

The **network N2** (DUSL) was set up as a core component of ILIAS, to act as a focus for the first formal cooperation and communication between the four deep laboratories of Europe, the Boulby facility (UK), LNGS Gran Sasso (Italy), LSC Canfranc (Spain) and LSM Frejus (France). To provide a clear pivot for this new cross-laboratory interaction, N2 was assigned three workpackages, with clear annual deliverables totalling over 50 items, with remit to work together on: performance improvements, possible extensions of the deep underground laboratories and scientific coordination (WP1); safety problems and accident prevention in the underground sites (WP2); and public communication (WP3). Driven by