Funding methodologies in European Astroparticle Physics research

Second Edition - 2009
Updated report

Proposal/Contract no.: 235489

Project coordinator name: Thomas Berghöfer
Project coordinator organisation name: PT-DESY (Projektträger DESY)

Work Package 2 - Deliverable D2.4

22 April 2011

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Language copyediting by Rachel Reynolds is acknowledged.

Contents

Executive summary

Astroparticle Physics emerged almost three decades ago from deep roots in elementary particle physics, nuclear physics, astrophysics and astronomy.

This field, still often labelled "interdisciplinary" might be now considered "inter-expertise" and multi-cultural, having evolved and expanded into an autonomous research field, in its own right. It brings together communities from neighbouring fields in order to disentangle mysteries such as:

- The yet unknown nature of the content of 96% of the Universe: dark matter, dark energy, or even more exotic entities / phenomena…
- Messengers issued following violent phenomena in the cosmos: gravitational waves, ultra-high energy cosmic rays and neutrinos…
- Extremely rare (if existing) phenomena in the Universe: neutrinoless double β-decay (neutrino mass), proton-decay (Grand Unified Theories)…

New generations of detectors in conceptual, design and/or R&D phases are aiming at unprecedented discoveries in all the above mentioned fields. The complexity and the cost of these projects require international collaborations, within which European laboratories are, typically, major and determinant partners.

These new dimensions for the astroparticle community require tighter co-ordination among the European funding agencies. ASPERA and ApPEC are deeply involved in this effort and also have connections to organisations such as the European Commission, ESFRI, OECD, CERN etc.

Fostering schemes to select and fund the most promising projects led ASPERA to produce a document in 2008 on the research funding mechanisms in eleven EU countries, their manpower involvement and funding allocations.

The present report, Deliverable D2.4 of the ASPERA-2 European project, aims on the one hand to update and complement the previous report with the 2009 data, including 2006 / 2009 comparisons, and on the other hand to extend the census to five additional countries.

The outcome of this survey document is the high vitality of the field and increasing level of support, putting the total budget for 2009 for the 16 countries at the level of 220 M€ and the total personnel at about 2950 FTE; of which roughly 1200 researchers, 400 engineers, 600 post-docs and 750 graduate students.

Astroparticle physics community can be confident on the (r)evolution of the field, promising breakthroughs on several fundamental questions.

In order to optimise the use of funds, enhance and develop research programmes, ASPERA has been concentrating on several issues, namely,

a) Contribute to structuring of the ApP projects, via funding agencies.

b) Help to develop ApP research in countries where the relevant funding agencies are willing to support such evolution,

c) Underline, especially through the ApPEC/ASPERA Roadmap, that under investigation future projects deserve, from scientific and technical point of views, to be considered as high priority within funding agencies and the ESFRI Roadmap,

d) Support ApP projects in participating to the Calls launched by the European Commission, as well as by the ASPERA funding agency members.

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Introduction

Within ASPERA-1, one of the issues investigated was the Funding methodologies in European Astroparticle Physics (ApP) research, the results of which was published as a report and based on data in 2006. The main goals were to give a factual picture of the funding processes in different countries and provide statistics on manpower and budget in various fields of Astroparticle Physics within the ASPERA consortium countries.

The outcome was expected to be an input to efforts deployed by ASPERA and ApPEC in tending towards a common strategic plan and sharing of good practices in project management.

With the advent of ASPERA-2, on the one hand the number of partner countries increased, and on the other hand the field continued to undergo significant evolution both on conceptual aspects and on innovative sophisticated instrumentations.

In line with the above goals, the present census document is an extended and updated version of the previous report, based on the 2009 data. Whenever possible, comparisons between 2006 and 2009 data are also performed.

Among the fundamental questions in physics, ApP concentrates mainly on the following ones:

- What is the Universe made of?
- Do protons have a finite life-time?
- What are the properties of neutrinos? What is their role in cosmic evolution?
- What do neutrinos tell us about the interior of the Sun and Earth, and about Supernova explosions?
- What is the origin of cosmic rays? What is the view of the sky at extreme energies?
- What is the nature of gravity? Can we detect gravitational waves? What will they tell us about violent cosmic processes?

In line with the ApP Roadmap, released by ASPERA-1 in 2008, we classify ApP topics in nine experimental subfields, and treat all relevant theoretical investigations as a single subfield:

- High energy gamma rays (HEγR)
- Neutrino mass (νMass)
- High energy cosmic rays (HECR)
- High energy cosmic neutrinos (HECν)
- Dark matter (DM)
- Dark energy (DE)
- Gravitational waves (GW)
- Low energy neutrinos & proton decay (LEν&PD)
- Cosmology
- Theory

Accordingly, within the present census, the first step was to identify the involvement of each country[1] in these subfields (Table 1).

Country	ν Mass	LEν&PD	HEγR	HECR	HECν	DM	DE	GW	Cosmology	Theory
BE					✓					✓
CH	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CZ	✓	✓	✓	✓		✓				✓
DE	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
ES	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
FR	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
GR			✓		✓	✓			✓	✓
HR			✓	✓		✓			✓	✓
HU	✓	✓	✓	✓	✓			✓	✓	✓
IT	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
NL				✓	✓			✓	✓	✓
PL	✓	✓	✓	✓	✓	✓		✓		✓
PT		✓	✓	✓		✓				✓
RO				✓	✓				✓	✓
SE			✓	✓	✓	✓	✓			✓
SI				✓						✓
UK	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Table 1 - Overview of the participation of each ASPERA country to ApP subfields.

[1] *Country abbreviations (official code in English) in the whole document are listed in alphabetical order (except in Tables 6-9) as given in the ISO 3166-1 and the corresponding ISO 3166-1-alpha-2 code elements. These alpha-2 codes are used in the Internet as the country code top-level domain. (http://www.iso.org/iso/english_country_names_and_code_elements).*

The present report is organised as follows.

Section 1 is devoted to the presentation of methodology and tools used for data collection, via questionnaires filled in by each partner and the presentation given during National Days. National funding systems are reported in Section 2. Strategic plans and funding sources are described in Section 3, followed by research facilities / infrastructures and collaborations (Section 4). Finally, quantitative data on manpower and budget are reported in Section 5, where comparisons with 2006 data are performed, whenever feasible. The document is complemented with five Appendices.

1. Data collection approach

A detailed survey questionnaire was sent to all funding agencies participating in the ASPERA-2 project asking them to provide data for 2009, i.e.

- Budget per project and break down per funding source.
- Personnel per project and break down per employment category.
- Structure and functioning of research funding. Answers to the questionnaire were enriched by the presentations given during National Days.

The corresponding questionnaire template is provided in Appendix A.

The questionnaire aimed at updating the data given by the ASPERA-1 member countries, which contributed to the report on the Census 2006 (partners 1 to 11 in Table 2), and extended the input to the new members during ASPERA-1 and ASPERA-2. For each country, the relevant funding agency (ies) provided data used in this report.

Based on received answers, the first step was:

- Use a homogeneous approach in the presentation of funding agencies. Because of rather rapidly changing structures in some of the countries, the texts give the most up to date situation within each country, namely in 2011 and not always in 2009.

The next step was an *internal consistency* check between 2006 and 2009 data for *each country*. Several anomalies were spotted and required a lot of effort and several iterations with funding agencies to be resolved. The approach proved to be efficient in correcting some 2006 data and corroborating some 2009 data with respect to the earlier information.

		No.	Country	Date	Location	Organiser
ASPERA-1	Census 2006	1	France	16-17 January 2007	Paris	CNRS/CEA
		2	The Netherlands	13 April 2007	Amsterdam	FOM-Nikhef
		3	Germany	22 June 2007	Hamburg	PT-DESY
		4	United Kingdom	24 July 2007	London	STFC
		5	Italy	16-17 October 2007	Assergi (Gran Sasso)	INFN
		6	Spain	6 November 2007	Madrid	FECYT/MEC
		7	Switzerland	3 December 2007	Geneva	SNF
		8	Belgium	15 February 2008	Brussels	FNRS/FWO
		9	Czech Republic	4 April 2008	Prague	MEYS
		10	Portugal	5 May 2008	Lisbon	LIP/FCT
		11	Sweden	3 June 2008	Stockholm	VR
	Census 2009	12	Romania	16-17 October 2008	Bucharest	ANCS
		13	Greece	31 October 2008	Athens	NCSR-Demokritos
		14	Poland	22 April 2009	Warsaw	NCBIR
ASPERA-2	Census 2009	15	Croatia	27 May 2010	Opatija	CSF
		16	Hungary	15 October 2010	Budapest	NKTH

Table 2 - National Days organised by ASPERA, in chronological order.

2. Overview of national research funding systems in Europe

This section describes the national research funding systems for ASPERA-2 countries, detailing the following for each country:

- Main funding agencies and main source of funding for ApP research.
- Grant process: from proposal to funding.
- Availability of large infrastructures.
- Available resources in 2009: Total budget and personnel (undergraduate students are not included).

The texts have benefited from presentations given during National Days (ND), which are 1-2 day working sessions hosted by ASPERA member countries. Presentations started with a short introduction on the purpose of ASPERA in general and the National Days in particular. Typically, representatives of ministries, funding agencies, institutes, projects and researchers were present.

Further information on National Days, listed in Table 2, is available on the ASPERA website; for NDs organised after October 2008 see Appendix B.

The National Days continued to be a great success. The presentations illustrated in a thorough manner the complexity of the various funding systems. Four general observations put forward in the 2006 Census were confirmed by subsequent National Days:

- The meetings served as a unique occasion for all ApP stakeholders to come together and thus strengthen the position of the field in that country.
- Funding systems are dynamic and often subject to change.
- European collaboration received unanimous support.
- The rules for EU projects and those for national projects need to be harmonised.

2.1. BE - Belgium

The main funding agencies for research in Belgium are:

- The Federal Ministry of Economy
- The Belgian Federal Scientific Policy Office (BELSPO)
- The regional funding agencies:
  - ✓ FWO (Flemish-speaking community)
  - ✓ FNRS (French-speaking community)
- The local government organisations that fund the universities.

ApP research in Belgium is largely financed by the two regional funding agencies FWO and FNRS.

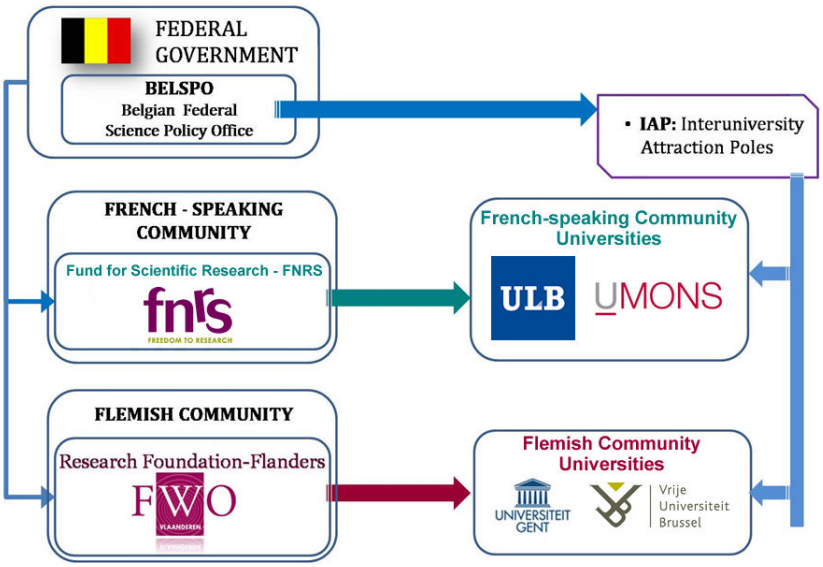

Figure 1 - Schematic overview of the Belgium funding system

ApP research in Belgium is performed at four universities:

- Universiteit Gent
- Université Libre de Bruxelles,
- Université de Mons
- Vrije Universiteit Brussel

ApP research budget: 850 k€

- Personnel: 520 k€
- Investment (equipment): 100 k€
- Running costs: 230 k€

ApP research personnel: 24 FTE

Projects are reviewed by scientific committees whose members are elected for 3 years (FWO) or 5 years (FNRS). About half of the members are experts from the universities of the relevant region, while the other members belong to the universities of the other region or to foreign universities. A board comprising the Rectors of the universities of the relevant region selects the project on the basis of the recommendation of the scientific committees.

2.2. CH - Switzerland

In Switzerland, basic research is performed mainly in 12 universities, i.e. 10 cantonal universities and 2 Federal Institutes of Technology. The cantons are responsible for the cantonal universities, with the support of the Confederation that contributes financially to the operating costs of these universities. The financing of the Swiss Federal Institutes of Technology (ETH) is under the responsibility of the Confederation.

The main agency providing funds for ApP and Science in general in Switzerland is the SNF (Swiss National Science Foundation). It funds basic research on a project basis, fellowships for young researchers and various specific programmes. ApP has to compete with other fields within the division of SNF dedicated to Mathematics, Natural and Engineering Sciences.

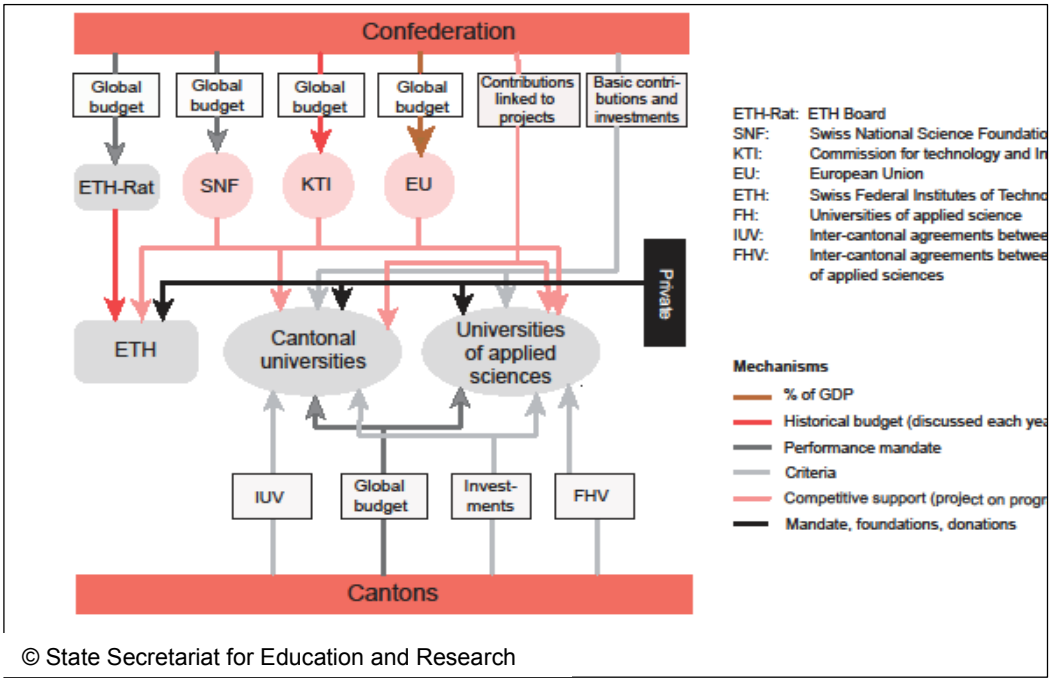

Figure 2 - Schematic overview of the funding system in Switzerland.

ApP research in Switzerland is performed in 6 universities:

- 4 Cantonal universities (Geneva, Zurich, Bern and Basle)
- 2 Federal Institutes of Technology (Zurich and Lausanne).

Switzerland is active in all subtopics of ApP.

Switzerland has an operational research infrastructure at Jungfraujoch (3450 m above sea level) for cosmic ray research (http://www.hfsjg.ch/).

ApP research budget: 5.93 M€

- Personnel: 4.70 M€
- Investment + Running costs: 1.23 M€

ApP research personnel: 72 FTE, 28% women.

The SNF accepts applications for project funding for basic research directly from researchers. Any researcher working in Switzerland is entitled to participate. Researchers are free to choose their research topics. SNF funding grants cover direct research costs (staff salaries, materials, travel costs, etc.). Applications are evaluated by the SNF Research Council based on peer review by external experts. The central criteria for evaluation are the scientific quality, originality and project methodology as well as the qualifications and track record of the applicants. Grants are awarded on a competitive basis.

2.3. CZ – Czech Republic

In the Czech Republic the two main funding agencies in the order of importance are:

- Ministry of Education, Youth and Sports (MEYS) and
- Grant Agency of the Czech Republic (GACR).

The funds from MEYS cover all running costs and most investment money (independent of the depreciation of given equipment). In the case of MEYS the salaries are funded by the institution performing the funded project.

GACR funds in principle also include salaries corresponding to the proportion of FTE allocated to the project. Currently no ApP project is funded from GACR; however, the GACR calls are opened periodically every year.

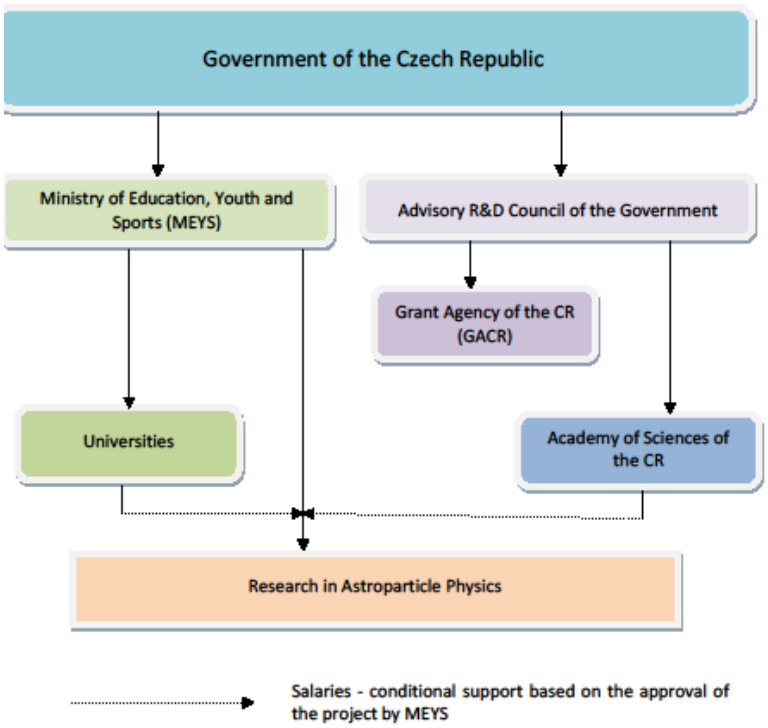

Figure 3 – Schematic overview of the Czech funding system

Practically all the research in ApP is performed at:

- Research institutes of the Academy of Sciences of the Czech Republic (ASCR)
  - ✓ Institute of Physics
  - ✓ Nuclear Physics Institute
- Universities:
  - ✓ Palacky University at Olomouc
  - ✓ Charles University in Prague
  - ✓ Czech Technical University in Prague

Czech ApP research is actively involved in the following subfields: high energy cosmic rays, gamma telescope, dark matter, both single and double beta decay.

There are no underground laboratories and large scale ApP facilities in the Czech Republic. Czech physicists have access to large infrastructures via collaborations and their membership in various experiments only.

The total resources allocated for ApP in the Czech Republic have been stable for several years.

ApP research budget: 510 k€

- Personnel: Not communicated (NC)
- Investment: NC
- Running costs: NC

ApP research personnel: 29 FTE

The funding system is based on grant schemes with their rules given by the particular grant agency involved. Projects can be submitted in principle by anybody; in reality they are submitted by senior researchers. Support can also be gained directly by junior researchers in various junior or start up grant schemes – these typically represent additional (small) increases of the total budget of larger projects. Grant proposals are peer reviewed and evaluated by grant agencies in accordance with their rules. The typical duration of projects is 5 years with an annual review of the results obtained in each year. In the case of large projects funded by MEYS the reviews are in the form of public colloquia. The annual reports are reviewed by researchers appointed by the funding agency from different research institutions to those funded.

2.4. DE – Germany

The German funding landscape is governed by the federal system and the different responsibilities of the Federal Government and the 16 Länder. Supporting science is one of the duties of the Länder and therefore all the public universities are institutionally funded by the Länder. A convention between the Federal Government and the Länder defines cases where the Federal Government (mainly through the Federal Ministry of Education and Research BMBF) is allowed to provide funding for science. For instance, the BMBF is responsible for the German contributions to international large infrastructures.

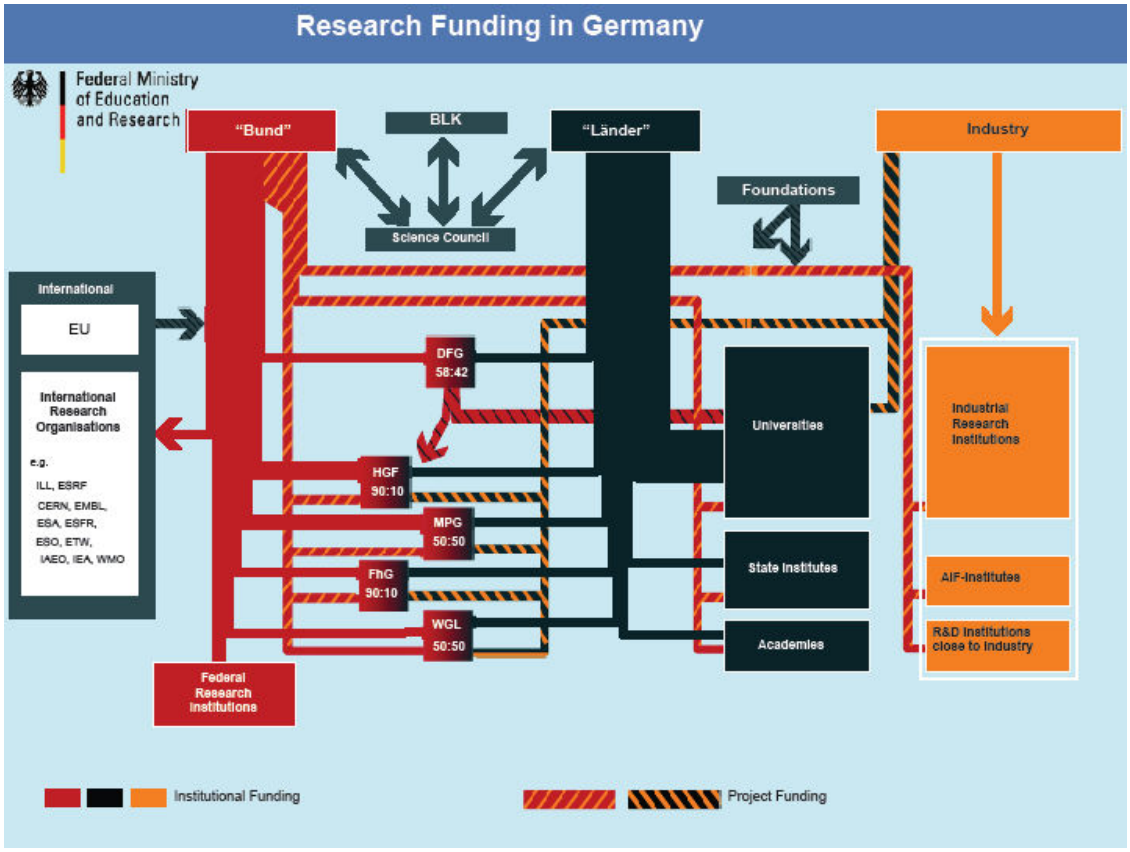

Figure 4 – Schematic overview of the German funding system for basic research including Astroparticle Physics

The major source of funding for basic research is the German Research Foundation (**DFG**). It is a central self-governed research funding organisation, serving all branches of science and providing support to individuals or coordinated research programmes at universities and other publicly financed research institutions.

Non-university institutions active in the field of Astroparticle Physics are operated by the Helmholtz Association of German Research Centres (**HGF**) and the Max Planck Society (**MPG**). Both organisations are partly funded by the Federal Government and the Länder. The HGF comprises 17 national centres for natural scientific, technological and biomedical research and is centred on big infrastructures. The MPG is a research organisation maintaining about 80 institutes, supporting cutting-edge basic research outside of higher education institutions in the areas of biomedical research, chemical, physical and technical research and the humanities.

Space-borne experiments are funded by the German Aerospace Centre (DLR). The BMBF maintains a funding programme, mainly for researchers at German universities, to support the extension and use of large infrastructures, the so-called Verbundforschung.

Currently Germany supports several international research infrastructures for ApP: Auger, CAST, CTA, Double-Chooz, GEO600, H.E.S.S., KASCADE-Grande, KATRIN, LOPES, MAGIC, VERITAS, ANTARES, IceCube, KM3NeT, BAIKAL NT200, BOREXINO, CRESST, EDELWEISS, GERDA and XENON100.

There are many institutions and university groups working in ApP in Germany: 3 HGF institutes, 7 MPG institutes and 28 universities.

Large ApP research infrastructures in Germany are KASKADE-Grande at FZ Karlsruhe, KATRIN at FZ Karlsruhe, and GEO600 near Hannover.

ApP research budget: 49.56 M€

- Personnel: 26.90 M€
- Investment: 21.38 M€
- Running costs: 1.28 M€

ApP research personnel: 584 FTE, 13% women

ApP in Germany is funded institutionally as well as on a project basis. Depending on their eligibility, researchers, research groups and research institutes can apply for funding at the agencies described above. Each funding agency has its own evaluation procedures and strategy for decision making. A common national roadmap on large infrastructures is currently under discussion. Where major decisions need to be taken, the German Council of Science and Humanities (Wissenschaftsrat) acts as an advisory body to the Federal Government and the state (Länder) governments.

2.5. ES – Spain

The majority of Spain's funds for research and infrastructures are mainly public and are provided either by the state or the regional governments (*Comunidades Autónomas*). The public sector is responsible for the scientific and technological policies in accordance with the Science Law of 1986, known as *Ley de la Ciencia* 13/1986. The Government Commission for Science and Technology Policy (CDGPCYT) is responsible for co-ordinating all the interministerial activities carried out in accordance with the National R&D&I Plan. At the moment a new law, Law on Science, Technology and Innovation, known as *Ley de la Ciencia, la Tecnología y la Innovación* is pending parliamentary approval. It will replace the current Science Law of 1986 if it is adopted.

As shown in Figure 5, the Spanish Research, Development and Innovation (R&D&I) system is governed by several ministries and by the regional authorities of the 17 autonomous regions.

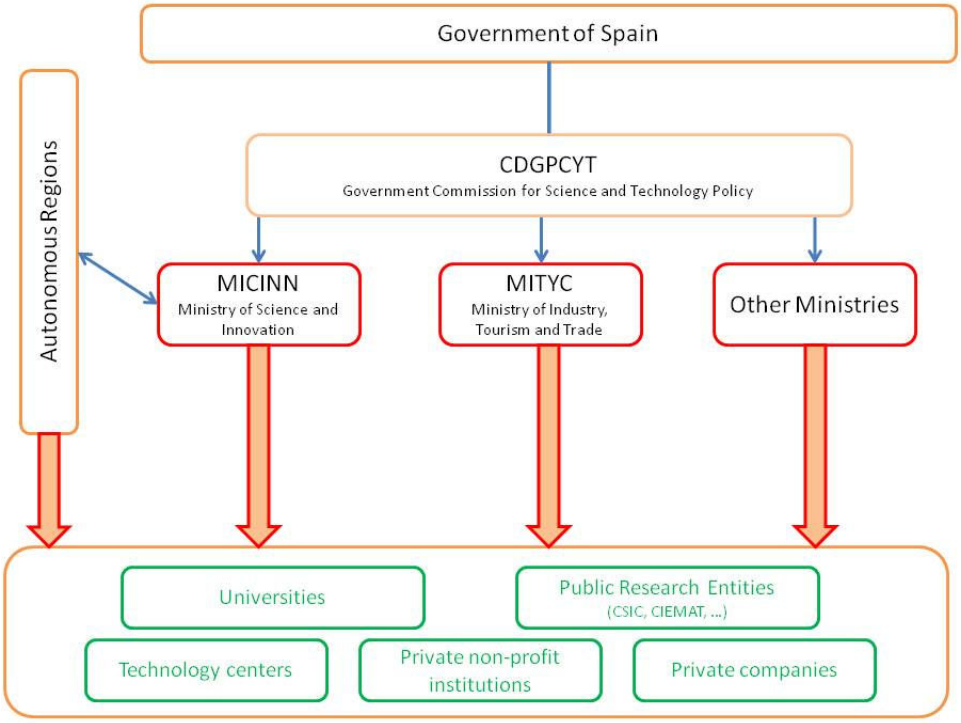

Figure 5 – Overview of the Spanish R&D&I system.

The Ministry of Science and Innovation (MICINN) is in charge of the promotion and general co-ordination of scientific research and technological innovation. Most of the annual budget for R&D&I of the central government is managed by MICINN. **The Government Commission for Science and Technology Policy (CDGPCYT)** is the institution officially in charge of defining R&D&I policy and the elaboration of the National R&D&I Plan, as well as coordinating its management and implementation across different ministries and evaluating its results.

Ten universities are involved in ApP projects. The two research institutes CSIC (Consejo Superior de Investigaciones □ientíficas) and CIEMAT (Centro de Investigaciones Energéticas Medioambientales y Tecnológicas) also take part in some projects. Spain participates in several collaborations covering most of the subtopics commonly described as ApP and plays an important role in some of them.

There are two main infrastructures related to ApP in Spain:

- Laboratorio Subterráneo de Canfranc (LSC), the second largest underground laboratory in Europe.
- Observatorio del Roque de los Muchachos (ORM) which is basically an astronomy observatory.

Thanks to the existing infrastructure it was possible to build the high energy gamma-ray telescope MAGIC there.

ApP research budget: 16,7 M€

- Personnel: 12,2 M€
- Investment + Running costs: 4,5 M€

ApP research personnel: 338 FTE, 21 % women

Up to 2007, ApP was funded through the National Programme for Particle Physics. Then, all basic research programmes merged to form the Basic Research National Programme where projects from every field in basic research compete for funding. Applications are presented by the principal investigator (PI) of the group (from universities, public research institutes, etc.) and the evaluation proceeds in a two-step process where each project is evaluated by ad hoc expert committees.

2.6. FR – France

The French public research system falls under the authority of the Ministry of Higher Education and Research (MESR)[2]. There are three main groups funded by the ministries:

- The research institutions funding both researchers, laboratory infrastructures, multiannual projects and very large infrastructures (e.g. CNRS, CEA and CNES, see below)
- The grant agencies issuing open calls leading to funding on a project by project basis (e.g. ANR, see below)
- The Networks or Pôles of Excellence (e.g.; the GIS P2I, see below)

Some agencies (CNES, CEA…) are funded by other ministries: industry, defence etc.

Within CNRS, Astroparticle Physics research is funded through its two institutes IN2P3 (Institut National de Physique Nucléaire et Physique des Particules) and INSU (Institut National des Sciences de l'Univers). Since 1999, there has been a CNRS interdisciplinary programme funding ApP research, as well as the so-called "Very Large Infrastructure" budget line funding VIRGO and H.E.S.S. There are also laboratories within institutes of mathematics and physics performing Astroparticle Physics research.

On the CEA side, research teams working on Astroparticle Physics belong to IRFU (Institut pour la Recherche des lois Fondamentales de l'Univers), a department of the matter science division (DSM).

The research activities in Astroparticle Physics are mainly performed by laboratories that are 'joint-ventures' between Universities and CNRS, and sometimes CEA.

The ANR issues annual calls on proposals, funding projects on a three-year basis. The calls where Astroparticle physicists can apply are the calls belonging to the so called "White" (or "blue sky") category.

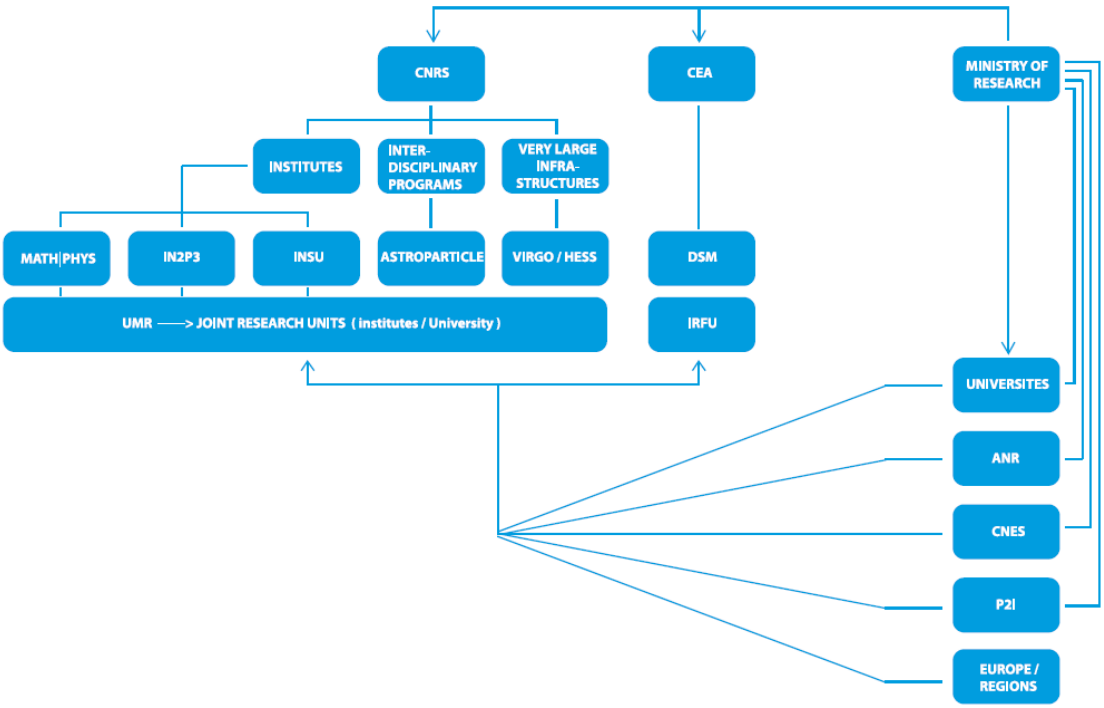

Figure 6 – Schematic overview of the French funding system for ApP research.

[2] The Ministry of National Education, Higher Education and Research have been split in two separate ministries in March 2009 (Decree N° 2009-293 of 16 March 2009).

Researchers in France are involved in all subfields of Astroparticle Physics carried out at:

- 3 Research institutions (IN2P3, INSU, IRFU)
- 15 IN2P3 Laboratories and 15 INSU Laboratories
- 10 Mathematics and Physics laboratories
- 1 Saclay Irfu laboratory

There are 3 large infrastructures for ApP research in France:

- Laboratoire Souterrain de Modane (LSM)
- Centre de Calcul (CC), in Villeurbanne
- Laboratoire des Matériaux Avancés (LMA), Villeurbanne

The French resources include the ApP research budget for CNRS (IN2P3, INSU) and CEA (Irfu) together.

ApP research budget: 59,40 M€

- Personnel: 41,38 M€
- Investment: 14,54 M€
- Running costs: 3,47 M€

ApP research personnel: 712 FTE, 18% women

Each funding agency has its own system of funding, evaluation procedure and decision making process.

CNRS
Scientific projects are proposed by researchers and are examined by the relevant scientific councils (CS-IN2P3, CSA-INSU) that give advice to the head of the relevant institute. For large projects, launching reviews and technical reviews are organised. In the case of IN2P3, there is also a steering committee formed from members of the Institute directorate, directors of the laboratories concerned and experts. Its mission is to evaluate the project on an annual basis. The final decision on funding is taken by the head of the Institute, upon the recommendation of the deputy director.

CEA
Scientific projects are proposed by researchers and are examined by relevant scientific committees that give advice to the head of the appropriate division. Then, the proposal is examined by the “resources council” and the final decision is taken by the head of Irfu. The scientific committee is composed of world experts, some of them from CEA.

ANR
Applicants are academic laboratories and private companies in partnership with academic laboratories. A scientific project is submitted following a call for proposals, either in the thematic section or non-thematic section. The selection of the projects within a given call for proposals is carried out on the quality of the scientific aspects of the proposal plus the economic relevance for the companies. This is a four step process.

Regional or local public funds
The project proposal is written by researchers and submitted to the funding agencies such as CNRS and/or CEA, who ask for a technical study and report. Once finalised, representatives of the funding agencies start negotiations with the policy makers of the regions. If all parties agree, a financial contribution and a schedule are decided upon.

2.7. GR – Greece

Research policy making and funding in Greece are mainly implemented at the operational level by the General Secretariat for Research and Technology (GSRT) of the Ministry of Education, Lifelong Learning and Religious Affairs. The GSRT has an explicit research and technology policy and its share in the government financing of R&D is about one third of the overall budget.

In Greece, the most important source of funding for research is the government. There are three types of funding:

- **Institutional funding** for both Higher Education Institutions and public Research Centres. This type of funding mainly covers salaries for permanent staff and other running costs.
- **Targeted or thematic funding** is provided by the GSRT for R&D programmes focusing on a predefined set of technological areas.
- **Non-targeted project-based funding** is mainly directed to basic research projects or, to a lesser extent, to investments in infrastructures.

Both targeted and non-targeted research funding comes from the Community Support Framework and the National Strategic Reference Framework which is co-funded by the Structural Funds.

European funds cover approximately one fifth of GERD in Greece and they are either in the form of Structural funds that flow through the channel of project funding (whether targeted or not), or they come from European Framework Programmes for Research and Development, for which Greek research teams compete at the EU level.

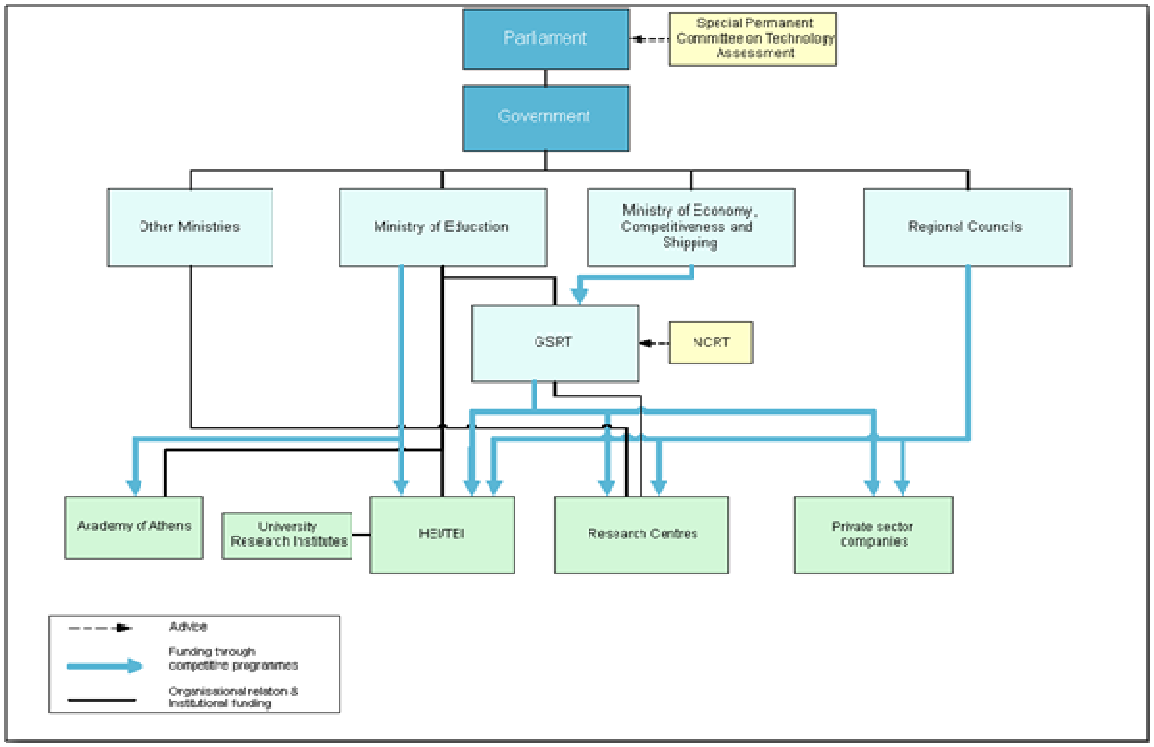

Figure 7 – Schematic overview of the funding system in Greece.

ApP research in Greece is performed at five (5) universities:

- University of Athens (UoA)
- National Technical University of Athens (NTUA)
- Aristotle University of Thessaloniki (AUTh)
- University of Patras (UoP)
- Hellenic Open University (HOU)

and 3 research centres:

- National Centre for Scientific Research “Demokritos” (NCSR-D-Institute of Nuclear Physics)
- National Observatory of Athens-NESTOR Institute for Astroparticle Physics (NOA-NESTOR)
- Hellenic Centre for Marine Research (HCMR)

Researchers in Greece are involved in the following subfields of Astroparticle Physics:

- High Energy Cosmic Neutrinos (HECν) – NESTOR, KM3NeT
- Dark Matter (DM) – CAST
- High Energy Gamma Rays (HeγR) – CTA
- Theory

Strategic plans describing the future of ApP Research in Greece can be found in the report “Investing in Research and Innovation NSRF-OPCE II” written by the National Committee for the Specialisation of Actions of NSRF in issue of Research, Technological Development and Innovation (February 2009).

There is one large infrastructure related to ApP in Greece, the Neutrino Extended Submarine Telescope with Oceanographic Research (NESTOR). NESTOR is the Europe’s first collaborative effort for a deep-sea high energy neutrino telescope. It is a tower of 12 hexagonal floors of 32 m diameter with highly sensitive photomultipliers of large surface area at the corner points. NESTOR will detect the Cherenkov radiation produced by muons in a large volume of transparent matter, water.

ApP is mainly funded by both institutional and targeted project-based funding, the latter in response to calls for grants.

ApP research budget: 2.65 M€

- Personnel: 1 M€
- Investment: 1 M€
- Running costs: 0,65 M€

ApP research personnel: 61 FTE, 15% women

The GSRT accepts applications for targeted or non-targeted project-based funding directly from researchers, irrespective of their nationality, from the private or the public sector (mainly Higher Education Institutions and Research Centres) who fulfil a certain set of criteria. Applications are received as a response to calls produced by the GSRT. The evaluation of the projects is carried out by experts from both the public and the private sectors. The applications are judged based on their originality, methodology, the qualifications of the researchers, and the quality of the project. The grants provided by the GSRT cover costs such as personnel salaries, materials, equipment, etc. The duration of the grants varies from 1 year to 4 years. At the end of each project, a report is produced which can be used for follow-up projects.

2.8. HR – Croatia

The main funding agencies in Croatia regarding science in general but also ApP in particular are: Ministry of Science, Education and Sports (MoSES); Croatian Science Foundation (CSF)[3], and Unity through Knowledge Fund (UKF). Some additional funding sources include the Croatian Academy of Sciences and Arts, universities and other foundations.

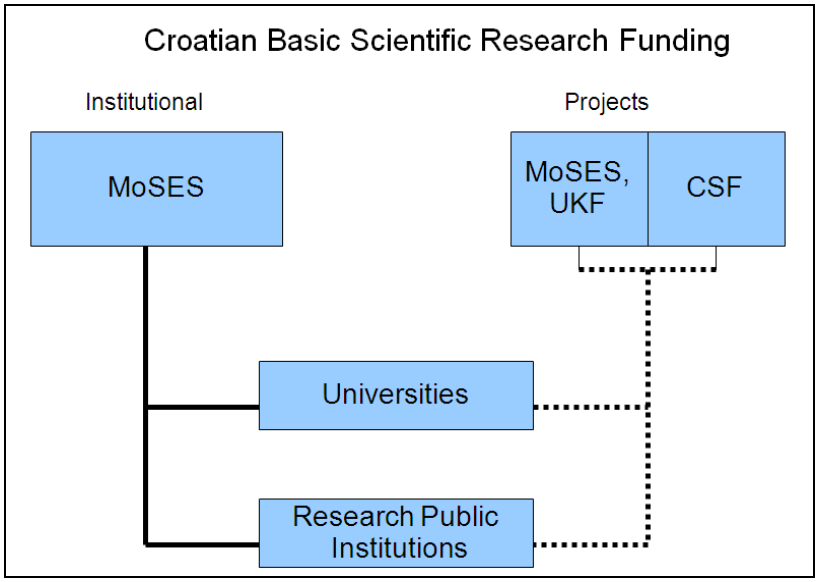

Figure 8 – Schematic overview of the funding system in Croatia.

The tertiary education and government sectors employ the vast majority of researchers in Croatia, almost 85%, while the business sector employs a modest 15% of researchers.

The Croatian Science Foundation (CSF) financially supports scientific and technological projects, higher education initiatives and international cooperation of the scientific and higher education community. Moreover, supported by the MoSES, UKF has a mission to unite scientific and professional potential in Croatia and in the Croatian Diaspora.

Astroparticle Physics was not a well identified domain of research until 2008. ApP research in Croatia (experimental research in particular) is developing in parallel with the development of the Croatian involvement in the ASPERA initiative.

Until 2008, only a group of three researchers from the R. Boskovic Institute was involved in an ApP experiment, the project CAST. Since then, Croatian research groups have joined the MAGIC, CTA and AUGER collaborations.

At the end of 2009, 16 researchers (including PhD students) were involved in large ApP international collaborations. In addition, about 10-12 people are involved in theoretical ApP research. ApP research in Croatia is mostly performed at the R. Boskovic Institute, but also at Zagreb, Split and Rijeka Universities.

ApP research budget: 0.48 M€

- Personnel: 0.34 M€
- Investment + Running costs: 0.14 M€

ApP research personnel: 18 FTE, 20% women.

[3] In 2009, Croatian Science Foundation's legal name was National Foundation for Science, Higher Education and Technological Development of the Republic of Croatia (NZZ). Name change occured in December 2010.

2.9. HU – Hungary

The key players of the Hungarian science, technology and innovation policy system are the Parliament, the Research and Science Policy Council (KTT), the Hungarian Academy of Sciences (MTA), Ministries, the Research and Technology Innovation Council (KuTIT) and the National Office for Research and Technology (NKTH).[4]

Governance of the Hungarian R&D&I system from May 2010:

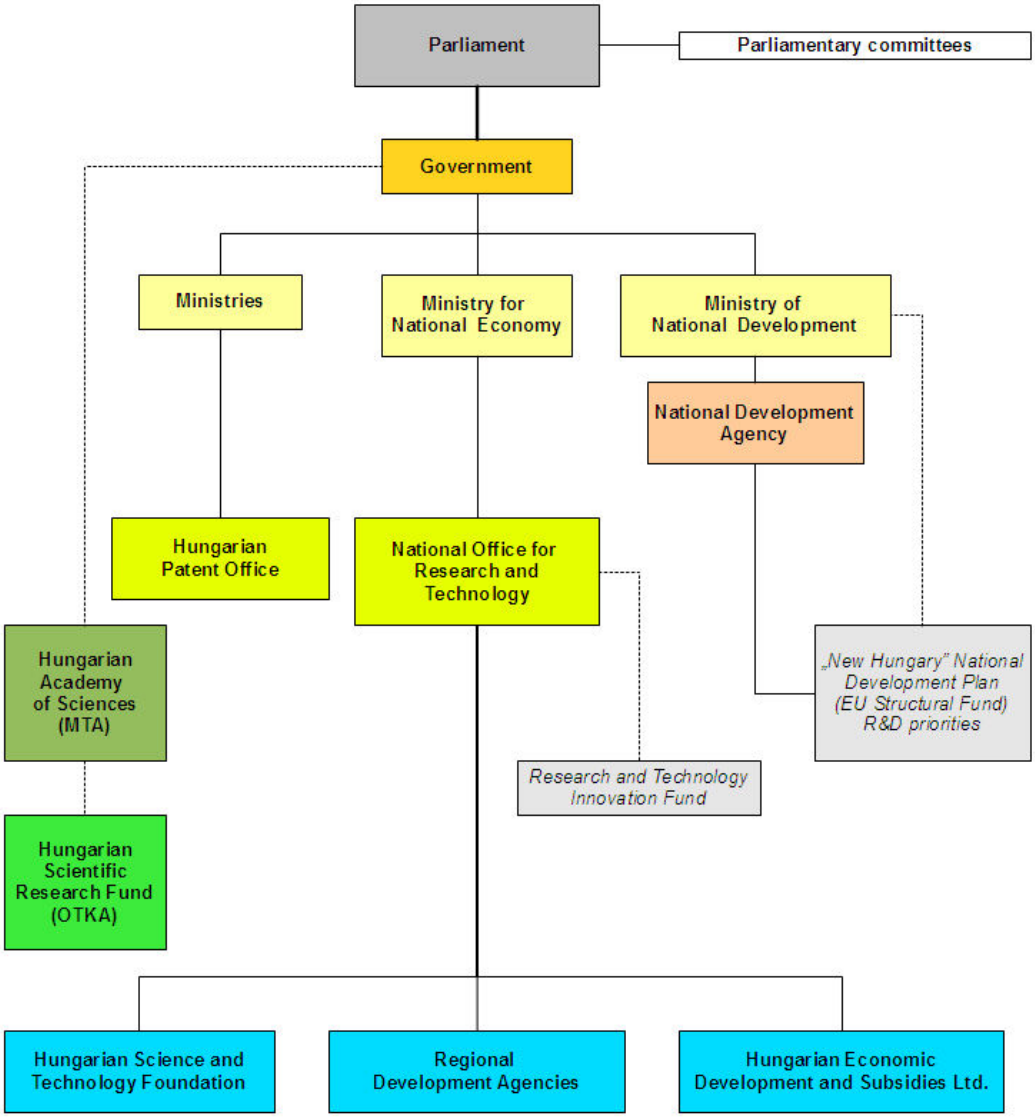

Figure 9 – Schematic overview of the Astroparticle Physics (ApP) research funding in Hungary.

[4] In December 2010 the KTT ceased to exist.
From January 2011 the Research and Technology Innovation Fund (KTIA) is managed by the National Development Agency (NFÜ) and the National Office for Research and Technology (NKTH) is called National Innovation Office (NIH). In January 2011 the KuTIT ceased to exist.

In Hungary three organisations, the Hungarian Scientific Research Fund (OTKA), the National Office for Research and Technology (NKTH) and the Hungarian Academy of Sciences (MTA) provide the largest contribution to ApP research.

The National Office for Research and Technology (NKTH) was founded in 2004. NKTH is a public body, supervised by the Minister for National Economy. NKTH plays a key role in elaborating and implementing Hungary's science, technology and innovation policies. It provides subsidies for the creation, dissemination and exploitation of new scientific results and technologies, and fosters participation in international networks of science, technology and innovation. The aim and task of NKTH is to support R&D&I activities primarily through its system of calls for proposals. The system provides public funding, financed by the Research and Technology Innovation Fund (KTIA), for R&D&I projects.

The Hungarian Scientific Research Fund (OTKA) has been a funding agency of basic science and scholarship since 1986 and it has been operating as an independent non-profit organisation since 1991. Its legal status and rules of operation were established in an act in 1993 and reinforced in 1997 by the Hungarian Parliament in order to provide independent support for scientific research activities and infrastructure, to promote scientific achievements of international standards, and to provide young researchers with assistance.

The Hungarian Academy of Sciences (MTA) was founded in the middle of the 19th century and since 1870 it has evolved to become the centre of scientific activity in Hungary. It is an autonomous public body. The MTA has a double role to play; it has responsibilities in contributing to science policy making as well as in its implementation by running the largest network of research institutes in Hungary. It has approximately 40 research institutes and dozens of research units attached to universities with approximately 13 000 members.

ApP research in Hungary is performed in 2 research institutions and 3 universities:

- KFKI Research Institute for Particle and Nuclear Physics of the Hungarian Academy of Sciences (KFKI RMKI)
- Institute of Nuclear Research of the Hungarian Academy of Sciences (ATOMKI, Debrecen)
- Eötvös Loránd University (ELTE)
- University of Szeged (SZTE)
- Budapest University of Technology and Economics (BME)

ApP research budget: 0.336 k€ including 0,034 k€ of overheads

- Personnel: 0,082 k€
- Investment 0,05k€
- Running costs: 0,17 k€

ApP research personnel: 21 FTE

In Hungary ApP research is institutionally supported by the Hungarian Academy of Sciences on its institutional decisions. The funding agencies provide funding for ApP research field on project basis. Each funding agency has its own system of calls for proposals, evaluation procedures and decision making processes. In Hungary there are no specific calls dedicated to ApP research, these projects can submit project proposals when suitable R&D&I calls are launched by funding agencies.

2.10. IT – Italy

The following text is related to the organisation of the public research in Italy in the year 2009 with a focus on Astroparticle Physics. On December 2009 the Italian Government issued a decree aimed at the reorganisation of the Research Public Institutions superintended by the Ministry for Instruction, Universities and Research. The decree is a final act of a legislative process initiated in 2007. Possible variations developed in the years following 2009 and due to the reorganisation process are not reported in the text.

Funds for research and universities in Italy come from the Ministry for Instruction, Universities and Research (MIUR). The main Research Public Institutions (RPI's) benefiting from MIUR funds are:

- ASI: the Italian Space Agency
- CNR: the National Research Council
- INAF: the National Institute for Astrophysics
- INFN: the National Institute for Nuclear Physics

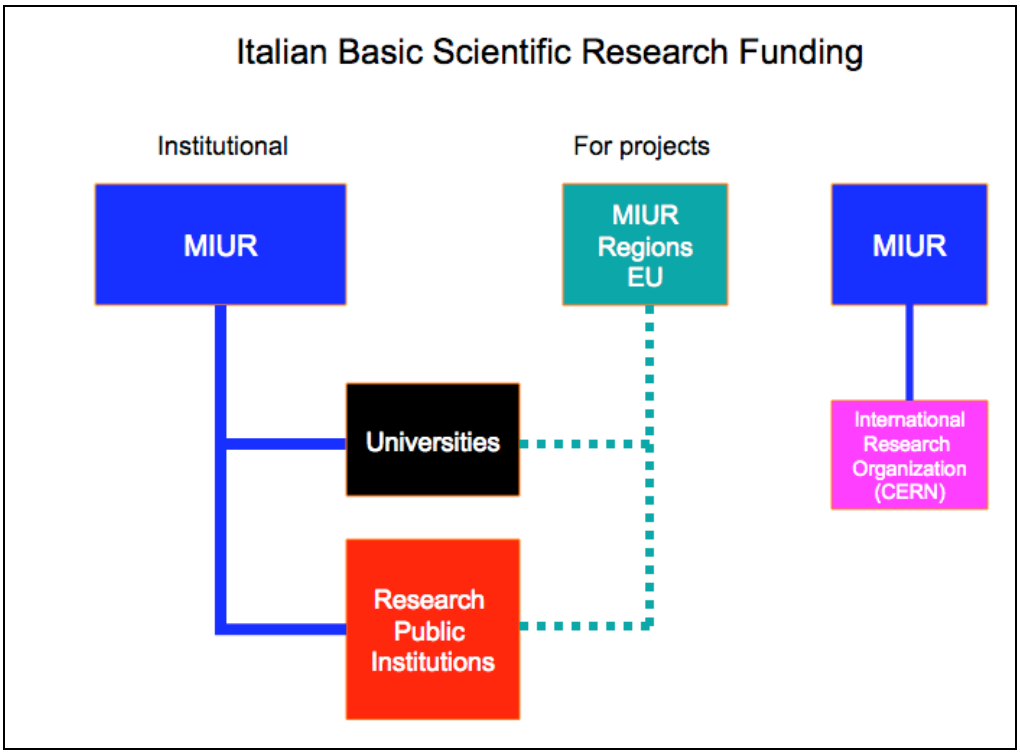

Figure 10 – Schematic overview of the Italian funding system for basic scientific research.

In Italy, Astroparticle Physics is a well-defined domain of the experimental and theoretical research in physics. Namely, searches for dark matter, proton decay, gravitational waves, antimatter in space and studies of neutrino properties (including oscillations), high energy cosmic rays as well as high energy gamma and neutrino astronomy make part of the mission of INFN in a specific scientific line named "Astroparticle Physics". Other Italian RPI's – like ASI and INAF – play a role in some ApP fields, at the frontier with Astrophysics and Cosmology.

Most of the University staff, involved in researches in the ApP fields, are associated to INFN as a result of bilateral conventions between INFN and the universities.

The INFN organisation includes 20 Sections that are located in the university physics departments and where the INFN/university collaboration is exploited, 4 national laboratories and 1 computing centre.

There are three large ApP research facilities in Italy:

- The INFN Laboratori Nazionali del Gran Sasso (LNGS) is presently the largest underground laboratory in the world. Most of the experiments hosted by Gran Sasso Laboratory are performed by international collaborations.
- The European Gravitational Observatory (EGO) is the infrastructure hosting the Virgo experiment. A consortium formed by CNRS and INFN manages the observatory.
- The Neutrino Mediterranean Observatory (NEMO) is one of the undersea experiments contributing to the KM3NET project. It is part of the LNS (Southern National Laboratory) in Catania, which is one of the four INFN National Laboratories.

ApP research INFN budget: 57.7 M€

- Personnel: 24.8 M€, including ~1.5 M€ funded by ASI to INFN and INAF for temporary positions in space-based APP experiments
- Investment: 13.7 M€ for the realisation of experimental apparatuses, consumables and travel expenses.
- Running costs: 19.1 M€

The above budget includes contributions from MIUR and EU.

ApP research personnel: 650 FTE, 19,5% women

The INFN scientific mission is related to five scientific lines: Particle Physics, Astroparticle Physics, Nuclear Physics, Theoretical Physics and Technological Research. For each line a Scientific National Committee (CSN) advises the INFN governing bodies (Council of Directors, Executive Board) on experiment approval and funding. CSN2 is devoted to ApP. INFN researchers (staff and associates) may apply for experiment funding. CSNs appoint an expert committee for each experiment with the aim of first examining the proposal and then assessing progress during the experiment's lifetime. The advice of these committees is taken into account by the CSNs when they formulate proposals to the Governing Bodies.

The activities of the RPI's are performed according to their own 3-year strategic plans, which are updated every year.

2.11. NL – The Netherlands

In the Netherlands science and research are funded in two, largely independent, ways: through the universities and through the national organisation for scientific research (NOW). Both the universities and NOW are almost entirely funded by the Ministry for Education, Culture and Science (OC&W). Larger scale research projects and most PhD positions are funded by NOW, while most academic staff are on the pay-roll of the universities. NOW has divisions and institutes. The physics division is called FOM, which is an independent foundation.

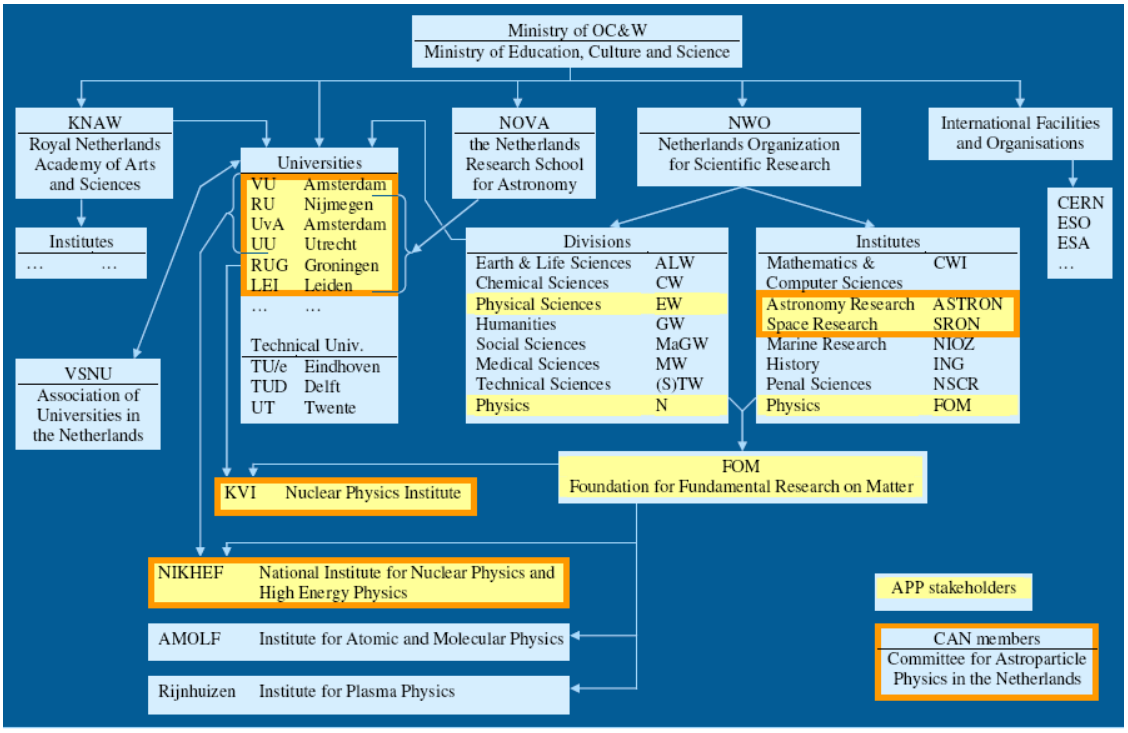

Figure 11 – Schematic overview of the Dutch funding system for ApP research.

The main players in ApP research in the Netherlands are:

- Nikhef, the FOM institute for subatomic physics
- 6 university groups
- KVI, which is a university institute, partly funded by FOM
- 2 NWO institutes (ASTRON, SRON)

LOFAR is a large research infrastructure that is mainly used for radio astronomy, but as well for ApP research in the Netherlands.

ApP research budget: 5,35 M€

- Personnel: 4,31 M€
- Investment: 0,91 M€
- Running costs: 0,125 M€

ApP research personnel: 43 FTE, 15% women

For fellowships, Postdoc or junior researchers can apply directly, but will receive the grant through one of the research institutions. For projects, a senior researcher has to apply, while the money (if approved) will be granted to the research group. For larger programmes the research leader/professor will request the funds for a set of research groups. For large investments, the institute director has to apply for the funding. The institute or infrastructure will receive the money.

All calls rely on evaluation by external reviewers. In most cases the review committee proposes a priority list to a board, which decides on funding.

For large programmes, first a letter of intent (pre-proposal) is submitted. The selected group is invited to write a full proposal, which is reviewed by the executive board, based on recommendations from external reviewers and a presentation of the proposal. The general board finally decides which programmes are funded.

For very large infrastructure investments the general board carries out the review, based on recommendations from external reviewers and a presentation of the proposal and a site visit. Some very large funding requests like LOFAR go directly to one or more ministries. There is usually no call for these large investment funds, but one can submit a request at any time. Large programmes and very large infrastructure investments compete with all other science fields for funding.

2.12. PL – Poland

Poland is undergoing a significant transformation of its research sector.

Until 2007, the Ministry of Science and Higher Education (MSHE) was the sole source of public funding for civil research.
Since 2007, two public funding agencies have been established for:

- ✓ Applied Science (2007): National Centre for Research and Development (Narodowe Centrum Badań i Rozwoju - NCBiR)
- ✓ Basic and Fundamental Science (October 2010): National Centre of Science (Narodowe Centrum Nauki - NCN)

Currently, the Polish research funding is mainly provided by:

- **Public funding:** MSHE, NCBiR and NCN.

Two other sources are also funding the research sector:

- **Private funding:** Industry and foundations (e.g. Foundation for Polish Science)
- **EU Funding:** Structural Funds (via MSHE, The Foundation for Polish Science…) and Framework Programmes

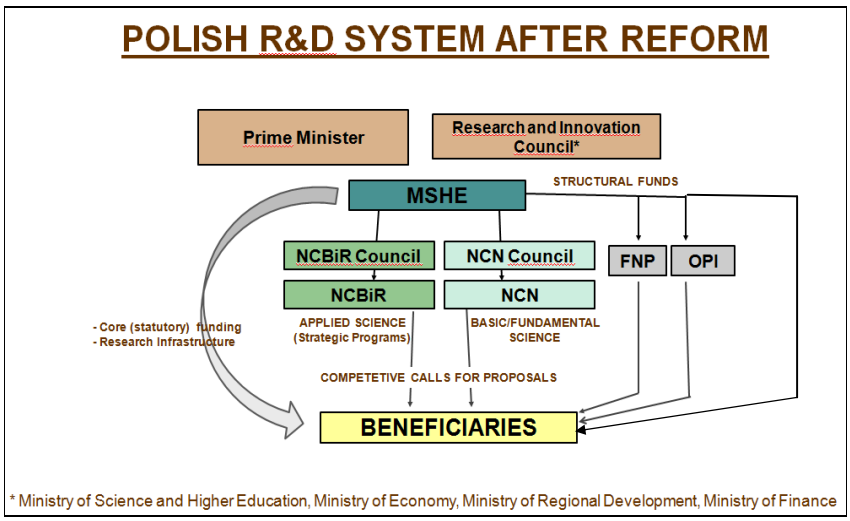

Figure 12 - Polish R&D system after reform.

In Poland, research activities are conducted by public institutions belonging to one of three types of body:

- ✓ Universities
- ✓ Polish Academy of Science
- ✓ R& D Institutes

Main ApP players in Poland:

- ✓ Warsaw University (UW)
- ✓ The Andrzej Sołtan Institute for Nuclear Studies (IPJ), Warsaw/Łódź
- ✓ Center for Theoretical Physics, Polish Academy of Science (CFT PAN), Warsaw
- ✓ The Jagiellonian University in Cracow (UJ)
- ✓ Institute of Nuclear Physics PAN (IFJ PAN), Cracow
- ✓ University of Wroclaw (UWroc)
- ✓ University of Lodz (UŁ)
- ✓ University of Silesia (UŚ), Katowice

Poland is active in Astroparticle Physics in the following fields:

- ✓ Experiment: neutrino physics, dark matter searches, high energy astrophysics and cosmic rays.
- ✓ Theory: neutrino physics, dark matter, models of inflation, baryogenesis, theoretical astrophysics, theories of perturbation in homogenous universe.

2.13. PT - Portugal

Fundação para a Ciência e Tecnologia (FCT) – Foundation for Science and Technology – is Portugal's main funding agency for research. It is responsible for a large number of bilateral and multilateral international cooperation agreements in science and technology. FCT is a public autonomous institute under the aegis of the Ministry of Science, Technology and Higher Education (MCTES).

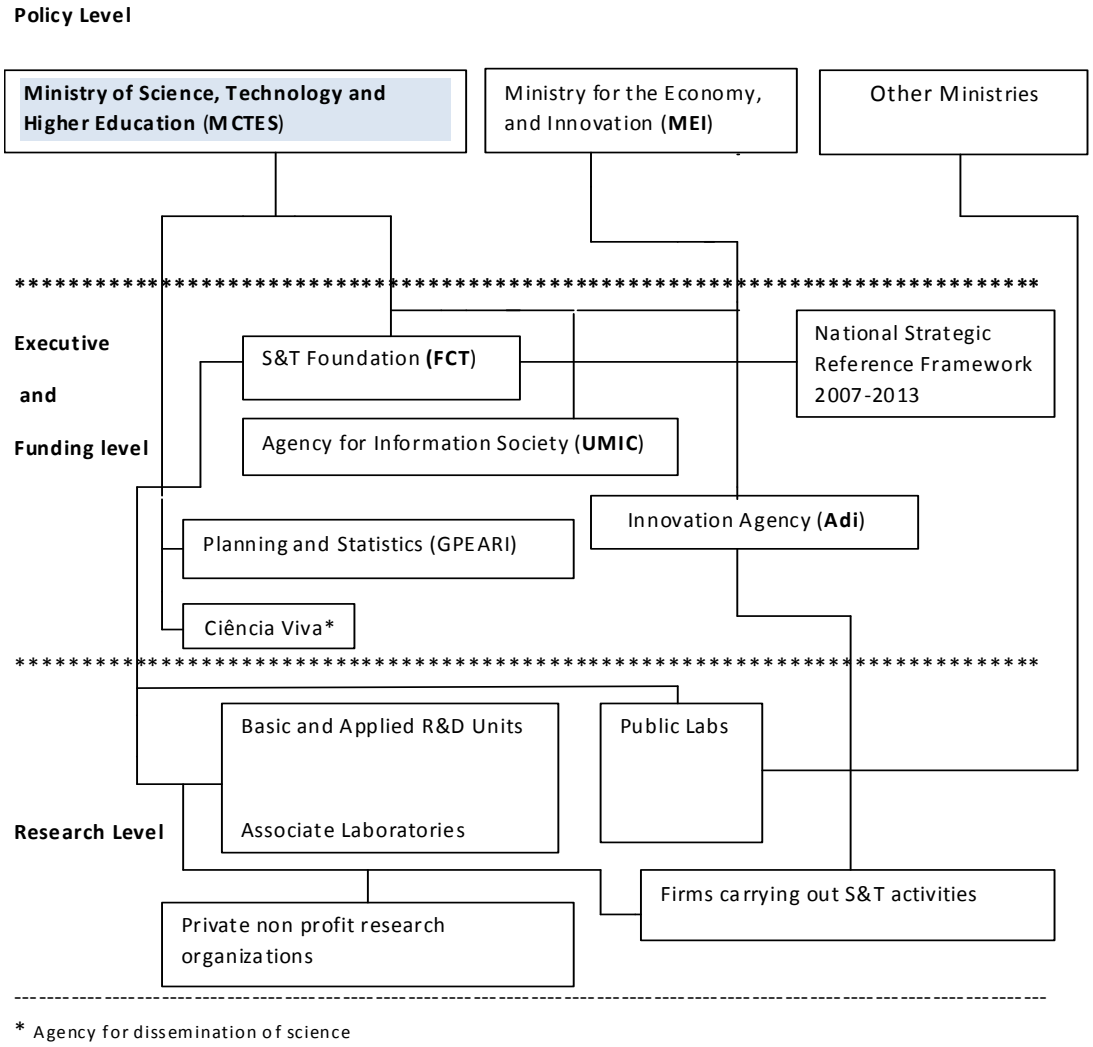

Figure 13 - Portuguese Science and Technology System.

FCT is structured around the following types of schemes: promotion of training and career development (fellowships & scholarships), support of centres of excellence and research centres and infrastructures, promotion and development of scientific activity (research projects) and for diffusion of scientific culture. FCT also provides the institutional framework for the Research Councils. FCT has significant experience in coordinated actions at national level (joint calls) with other ministries and at the European level.

Other relevant institutions supporting MCTES in making operational its objectives are Direcção Geral do Ensino Superior (DGES) on the field of Higher Education and Agência para a Sociedade do Conhecimento (UMIC) on the field of the Information Society.

Several State Laboratories in sectorial areas are still associated to MCTES and some of them to other ministries as well.

The main players in ApP research in Portugal are:

- Laboratório de Instrumentação e Física Experimental (LIP): LIP-Lisbon and LIP-Coimbra,
- Centro Multidisciplinar de Astrofísica (CENTRA-Lisbon), IST

ApP research budget: 1,22 M€

- Personnel: 0,91 M€
- Investment: 0,31 M€

ApP research personnel: 38 FTE, 29% women

Projects in Astroparticle Physics have to make use of the general calls issued by FCT. These projects apply when calls for high-energy physics are issued.

2.14. RO – Romania

The National Authority for Scientific Research (ANCS) of the Ministry of Education, Research and Innovation (MEC[5]) is the main agency providing funds (81%) for Science Research, followed by the Romanian Academy and other ministries.

ANCS has designated the National University Research Council (CNCSIS[5]) and the National Centre for Programme Management (CNMP[6]) to manage the National Plan Programmes. Each of them has a scientific advisory board and a review panel.

ANCS is providing funds on a project-oriented competitive basis, in line with t*he National Plan for Research, Development and Innovation for the period 2007-2013.*

This National Plan is based on several programmes, its structure being similar to FP7:
1. Human Resources;
2. Capacities;
3. Ideas;
4. Partnerships in priority fields;
5. Innovation;
6. Institutional Performance

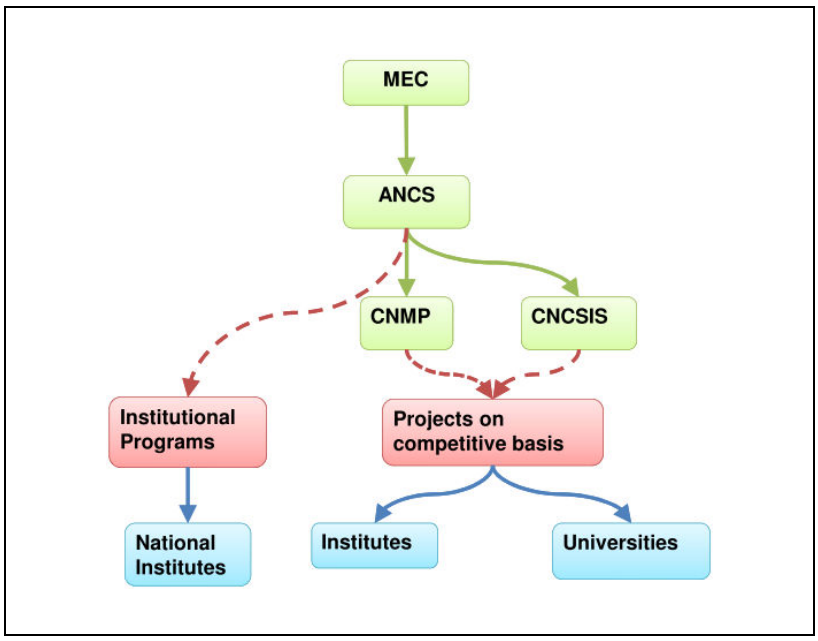

Figure 14 - Schematic overview of the Romanian funding system for ApP.

ApP research is performed in the following institutions:

- IFIN-'Horia Hulubei' National Institute for Physics and Nuclear Engineering (IFIN-HH), Bucharest-Magurele
- Institute of Space Sciences (ISS of Bucharest-Magurele
- University of Bucharest (UB)
- University Politehnica of Bucharest (UPB)

[5] In 2011 Ministry of Education, Research, Youth and Sport
[6] Executive Unit for Financing the Higher Education, Research, Development and Innovation

Romania is actively involved in the following ApP sub-fields: high energy cosmic ray physics, high energy cosmic neutrinos, high energy gamma rays, double β decay, cosmology, gravitational waves.

There is a small underground laboratory in the Slanic Prahova Salt Mine.
A mini-array, WILLI-EAS, for measuring muon charge ratio in EAS, is built in IFIN-HH Bucharest in collaboration with KIT Karlsruhe.

ApP research budget: 0,56 M€

- Personnel: 0,42 M€
- Investment: 0,14 M€
-

ApP research personnel: 7 FTE, 31% women

Possible sources of funding for ApP are:

- Institutional funding
- Competitive calls for projects (submitted by professors or senior researchers).
- EU funds

Funds can be awarded for personnel, travel, and investment or running costs.

2.15. SE-Sweden

The coordination of research policy is the responsibility of the Ministry of Education and Research. The major research funding bodies are governmental agencies (sectorial research agencies and research councils), private foundations (e.g. Knut and Alice Wallenberg Foundation) and fundraising organisations. State research funds are allocated both by direct appropriations to higher education institutions and by means of appropriations to research councils and sectorial research agencies.

Figure 15 - Schematic overview of the Sweden funding system

The main funding bodies for ApP are:

- The Swedish Research Council (Vetenskapsrådet, VR)
- Knut and Alice Wallenberg Foundation (KAW)
- The Swedish National Space Board (SNSB)

The main players in ApP research in Sweden are found at Uppsala University (UU), Stockholm University (SU) and Royal Institute of Technology (KTH). There is also some activity in ApP research at Linneus University and Luleå Technical University.

ApP research budget: ~3 M€

- Personnel: Not communicated (NC)
- Investment: NC
- Running costs: NC

ApP research personnel: 37 FTE (plus 30 graduate students), 25% women

Once a year, the Swedish Research Council (VR) accepts applications for funding. The projects for basic research need to be submitted directly by the principal investigator who has to be employed full or part-time by a Swedish Higher Education Institution. The project grants also cover the indirect costs. Applications are evaluated, based on peer review, by panels and external experts appointed by the Research Council. The central criteria for evaluation are the scientific quality and the feasibility of the proposed project and the qualification of the applicant. Grants are awarded on a competitive basis

Applications can also be made for research equipment (> 200k€), project planning and operation grants. The latter form of grant is intended to enable Swedish researchers to get more access to national and international research infrastructures through contributions to operation, support and user support. The duration of grants varies usually from three to five years.

VR exceptionally invited in 2008 applications for 10-year “Linnaeus grants” in all fields of science. One of these was granted to Astroparticle physics at Stockholm University, which led to the formation of the Oskar Klein Centre for Cosmoparticle Physics. The grant is 0.85 M€ per year, and has enabled a strong environment, with for instance hiring of around 10 postdoctoral researchers in the field.

2.16. UK - United Kingdom

From April 2007 the main funding agency for basic research in UK is the STFC (Science and Technology Facilities Council) which was created following the merger of PPARC (Particle Physics and Astronomy Research Council) and CCLRC (Council for the Central Laboratory of the Research Councils). STFC is one of seven Research Councils of the DIUS (Department of Innovation, Universities and Skills). It provides research grants to universities, infrastructure support, project grants, education and training support and also subscriptions to international agencies like ESA, ESO and CERN. In 2007 it published a 2-year strategic plan covering all branches of science.

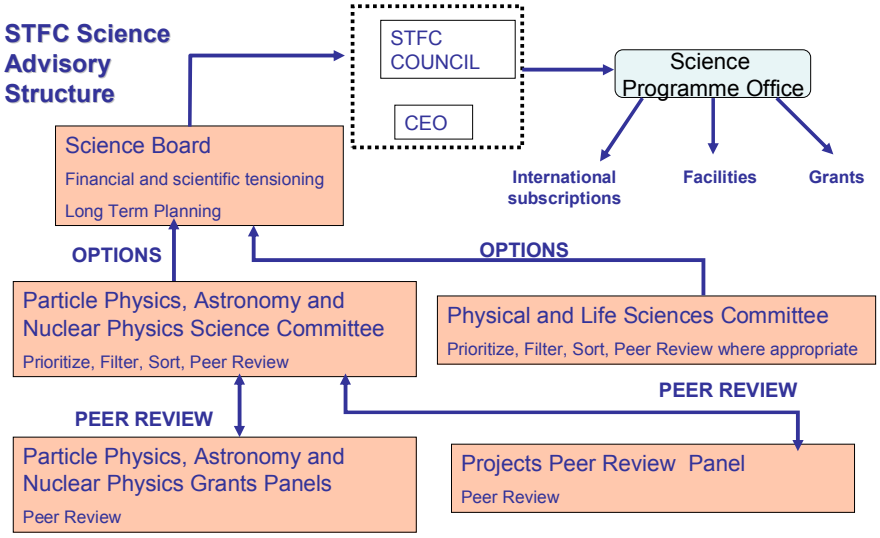

Figure 16 - Schematic overview of the UK funding system for ApP research for 2009.

Research in ApP in UK is performed in 22 Universities and the STFC Laboratory at RAL. UK researchers are involved in several ApP subtopics giving the UK a significant presence in the field. In particular, they have presence in Dark Matter searches, High Energy Cosmic and Gamma Rays, Gravitational Waves and neutrino mass experiments.

UK has one important infrastructure related to ApP, the Boulby Underground Laboratory (BUL) located in the Boulby mine facility. It is part of the ILIAS network which makes it part of a network of European underground labs. It holds various experiments devoted to Dark matter searches like Zeplin and Drift.

ApP research budget (salaries incl.): 11.52 M€

- Personnel: Not communicated (NC)
- Investment: NC
- Running costs: NC

ApP research personnel: 245 FTE

Formal applicants for research grant funding in UK are the PIs of research groups who have to be resident in the UK and employed as an academic member of staff in a UK research organisation. Astroparticle Physics does not have a specific panel to review proposals so this field has to compete for funding in the same way as other areas in Particle Physics and Astronomy. Separate Astronomy Grants Panels (AGP) and Particle Physics Grants Panels (PPGP) exist, which review major rolling grants on a 3 yearly basis to UK institutes. These grants are intended to support the staff and infrastructure of the research programme on a long term basis at the institute, rather than being project specific. Where appropriate, rolling grants are awarded in Astroparticle Physics. The current Astroparticle Physics rolling grant is reviewed by a specially convened panel for each review.
Project specific grants in Astroparticle Physics are reviewed by the Project Peer Review Panel (PPRP), which reviews project proposals across particle physics, astronomy and nuclear physics. It has a core panel of members, but also seconds additional experts relating to the specific area of science being reviewed.

The recommendations of AGP, PPGP and PPRP are considered by the Particle Physics, Astronomy and Nuclear Physics Committee (PPAN) where funding decisions are made.

Once funds are awarded, grant-holders report on how the work has progressed and the money spent. For running experiments and exploitation grants, the report is submitted at the end of the grant and reviewed by experts, for construction projects progress reports are also required and an oversight committee may be set up to monitor progress.

3. Sources of funding and strategic plans

An overview of the research funding system as it was implemented in 2009 in each country was included in the questionnaire. In a few cases, significant changes have occurred since 2009. The reported schemes for those countries are the latest ones (2010 or 2011).
In this section, sources of funding, information on strategic plans, as well as grant processes are reported.

3.1. Source of funding for ApP research: main funding agencies

Table 3 gives the chain of funding from the highest governmental level (ministries and federal authorities) to the body which provides the relevant budget to research units and/or researchers.

Country	Main funding agencies
BE	*Federal* : Federal Ministry of Economy, Belgian Federal Scientific Policy Office *Regional* : Flemish-speaking Community (Government, FWO, IWT), French-speaking Community (Government, FNRS, FRIA) Local : Local government organisation (Universities)
CH	SNF (projects) State Secretariat for Education and Research (large infrastructures and programmes) Universities
CZ	Ministry of Education, Youth and Sports (MEYS) Grant Agency of the Czech Republic (GACR)
DE	Federal States (Länder) Federal Ministry (BMBF) DFG, HGF, MPG
ES	Ministry (MICINN)
FR	Ministry (CNRS(IN2P3, INSU), CEA(Irfu), CNES, Universities, ANR)
GR	Ministry of ECS (GSRT (Academy of Athens) Private sector companies
HR	Ministry, Croatian Science Foundation (CSF)
HU	National Office for Research and Technology (NKTH) Hungarian Scientific Research Fund (OTKA) Hungarian Academy of Sciences (MTA) – institutional support for ApP research
IT	Ministry (INFN, ASI, INAF, Universities)
NL	Ministry (NWO (FOM (Nikhef), ASTRON, SRON), Universities)
PL	Ministry (NCBiR)
PT	Ministry (FCT)
RO	National Authority for Scientific Research (ANCS)
SE	Ministry (VR, SNSB) KAW (private foundation)
UK	Ministry (STFC)

Table 3 - Main funding agencies in ASPERA countries, ranked hierarchically, with colours referring to the levels N, starting with the highest one: N_1, N_2 and N_3.

3.2. Strategic plans

In Table 4 information relevant to the latest strategic plans are listed. In the 2nd column the organisations responsible for the plans are listed, with the titles of the plans given in the 3rd column. The 4th column summarises the fields covered by the strategic plan, the 5th and 6th columns give the period covered and the renewal periodicity, respectively. Finally, links to the electronic versions, whenever available, are reported in the last two columns.

Country	Entity	Headline	Field(s) covered	Period covered	Renewal periodicity (years)	Language	Electronic version Direct link to document
BE	FWO	FWO Beleidsplan 2008-2012	All science fields	2008-2012	5	NL	http://www.fwo.be/CMSDownload.aspx?ID=90e25f7d-f6a8-4705-8539-441c9c451507&L=nl
	FRS-FNRS	PHARE Refinancement Plan stratégique du FRS-FNRS *Période 2010 à 2014*	All science fields (R&D)	2010-2014	5	FR	http://www2.frs-fnrs.be/Uploaddocs/docs/ORIENTER/FRS-FNRS_PHARE.pdf
CH	CHIPP	CHIPP 2004 roadmap Status and outlook of research and education *Particle physics in Switzerland*	Particle physics	2004-2019	2011 (update)	EN	http://www.chipp.ch/documents/roadmap.pdf
	SSAA	Roadmap for Astronomy in Switzerland	Astrophysics	2007-2016	10	EN	http://obswww.unige.ch/SSAA/uploads/pdf/policy/Roadmap.pdf
CZ	NC	NC	NC	NC	NC	NC	NC
DE	KAT	Astroteilchenphysik in Deutschland: *Zustandsbeschreibungen und Empfehlungen*	ApP science vision	2010	NC	DE	(DE) http://web.mac.com/jbluemer/KAT/KAT-Material+Links_files/D-Road-1-7.pdf
ES	MICINN	National R&D&I Plan	All science fields (R&D&I)	2008-2011	4	EN	http://www.micinn.es/stfls/MICINN/Investigacion/FICHEROS/Politicas_I+D+i_PlanNacional/PLAN_NACIONAL_2008-2011_ingles.pdf
						ES	http://www.micinn.es/stfls/MICINN/Investigacion/FICHEROS/PLAN_NACIONAL_CONSEJO_DE_MINISTROS.pdf
		Estrategia Nacional de Ciencia y Tecnología	All science fields	2008-2010	3	ES	http://www.micinn.es/stfls/MICINN/investigacion/FICHEROS/Encyt.pdf

Table 4 - Strategic plans, fields covered and time scale (to be continued…).

Country	Entity	Headline	Field(s) covered	Period covered	Renewal periodicity (years)	Language	Electronic version - Direct link to document
FR	CNRS/IN2P3 CEA/Irfu	From Quarks to Cosmos Scientific prospects of the next 10 years for nuclear and high energy physics of the IN2P3-CNRS and the DAPNIA-DSM-CEA	Particle, nuclear and astroparticle physics	2005-2015	4	EN	http://www.in2p3.fr/actions/publications/media/prospectiveuk_2005.pdf
						FR	http://www.in2p3.fr/actions/publications/media/prospectivefr_2005.pdf
	CNRS/INSU	Prospective en Astronomie-astrophysique *Rapport de prospective mi-parcours 2006*	Particle, nuclear and astroparticle physics	2004-2008	4	FR	http://www.insu.cnrs.fr/f753pdf,integralite-rapport-prospective-mi-parcours-sans-annexes.pdf
GR	GSRT	Report of the National Committee to specify the actions of the NSRF for ResearchTechnological Development and Innovation (February 2009)	Astroparticle physics	2007-2013	8	GR	http://www.google.gr/url?sa=t&source=web&cd=1&ved=0CBcQFjAA&url=http%3A%2F%2Fwww.gsrt.gr%2Fdefault.asp%3FFILE%3Ditems%2F6564%2F149&ei=5-V9TZL-DpCUOqCs1agH&usg=AFQjCNFG90qnBqFPW3Xj2GEqhnAsWNuuKA&sig2=_NyLXfWppZlDaYpZLtOi1A
HR	MoSES	Science and Technology Policy of the Republic of Croatia 2006 -2010	All science fields	2006-2010	4	EN	http://public.mzos.hr/fgs.axd?id=14189
						HR	http://public.mzos.hr/fgs.axd?id=14188
	CSF	Strategic plan 2004 – 2008	All science fields	2004-2008	4	HR	http://www2.nzz.hr/doc/dokumenti/Strateski_plan_NZZ.pdf
HU	Government	The Government's mid-term (2007-2013) science, technology and innovation policy (STI) strategy	All science fields	2007-2013	7	EN	http://www.nih.gov.hu/english/strategic-documents/the-government-mid-term-090619
						IT	http://www.nih.gov.hu/hivatal/tti-strategia/kormany-tudomany-080519
IT	ASI	PTA 2007-2009 (Piano Triennale delle Attivita)	Spatial and Aerospatial, technological & scientific research	2007-2009	1	IT	http://www.asi.it/files/20080909024652PTA_2007-2009_0.pdf
		Strategic Vision 2010 - 2020	Spatial and Aerospatial, technological & scientific research	2010-2020	10	EN	http://www.asi.it/files/ASI_DVS_2010_2020_ENG_0.pdf
	INAF	Piano Triennale 2010-2012	Astronomy Radioastronomy Astrophysics Cosmic physics	2010-2012	1	IT	http://www.inaf.it/struttura-organizzativa/presidenza/piano-triennale/
		Long Term Plan Plans and perspectives for Italian Astrophysics	Astrophysics	2007-2017	10	EN	http://www.inaf.it/struttura-organizzativa/cs/plt/inaf-long-term-plan
	INFN	Piano Triennale 2010-2012	Particle, Astroparticle, Nuclear, Theoretical physics & Technology research	2010-2012	1	IT	http://www.presid.infn.it/documenti.html

Table 4 - continued...

Country	Entity	Headline	Field(s) covered	Period covered	Renewal periodicity (years)	Language	Electronic version - Direct link to document
NL	CAN	Strategic Plan for Astroparticle Physics in the Netherlands	ApP only	2005	3	EN	http://www.astroparticlephysics.nl/papers/APP-4.0.pdf
	FOM/NWO	Topfysica midden in de wereld *Strategisch Plan FOM/N 2010-2015*	Physics (incl. ApP)	2010-2015	5	NL	http://www.fom.nl/live/attachment.db?120889
PL	NCBiR & NCN	"Krajowy Program Badań Naukowych i Prac Rozwojowych"	All science fields	Published In 2007	Priority research area – 5-10 years; strategic programmes3-5 years	PL	http://www.bip.nauka.gov.pl/_gAllery/54/32/5432/Krajowy_Program_Badan_Naukowych_i_Prac_Rozwojowych.pdf
PT	FCT	National Strategic Reference Framework	All science fields	2007-2013	6	EN	NSRF http://www.qren.pt/download.php?id=510
						PT	QREN http://www.qren.pt/download.php?id=421
RO	IFIN-HH	IFIN-HH Strategy	All science fields (R&D)	2009-2012	5	EN	http://www.nipne.ro/about/mission/docs/IFINHH_Strategy_2009_EN.pdf
						RO	http://www.nipne.ro/about/mission/docs/Strategia_IFIN_2009_Ro.pdf
SE	VR	Research Council´s Guide to Infrastructure Vetenskapsrådets forskningsstrategie	All science fields (Incl. Astronomy & subatomic physic research)	2009-2011	2	EN	http://www.vr.se/download/18.76ac7139118ccc2078b800011963/Rapport+5.2008.pdf
						SE	http://www.vr.se/download/18.2f62b054117692ac43f8000446/Rapport+11.2007.pdf
		Council's Research Strategy	All science fields	2009-2012	4	EN	http://www.vr.se/inenglish/aboutus/activities/analysisevaluationandfollowup/thecouncilsresearchstrategy20092012.4.76ac7139118ccc2078b80003530.html
						SE	http://www.vr.se/download/18.76ac7139118ccc2078b80004579/Forskningsstrategi_20092012_VR.pdf
UK	STFC	PPA Roadmap	All science fields (physics)	2009-2010	2	EN	http://www.stfc.ac.uk/roadmap/

Table 4 - continued

3.3. Grant Process: application/evaluation procedures

In Table 5 the project funding procedure per country is summarised. Entities eligible to apply are given in the 3rd column. The subsequent columns present consecutive steps: evaluation, ranking and decision taking bodies. The last column shows the finalisation process.

Country	Agency / Programme	Applicants	Evaluators	Ranking	Decision	Process
BE	FNRS-FWO	Researcher	Internal and external experts	Scientific committee	Board (following SC recommendations)	One step
	Belspo/Univ	Research units (directors)	External experts	External experts	Universities	
	Flemish region	Research units (directors)			Minister	
CH	SNF	Researcher	SNF research council with help of external experts			Reply
CZ	MEYS	Researcher	Experts panel	Review panel	Review panel	
	GACR			Scientific advisory board	Scientific advisory board	
DE	HGF	HGF institute (researcher/groups)	Expert board	External experts	Senate	
	MPG	MPI institute (researcher/groups)		Expert board	General assembly	Depends
	DFG	All researcher/research groups			Joint committee	Depends
	BMBF	Mainly university groups			BMBF	One step
ES	MICINN	Public and non-profit private R&D+I centres, technological centres and other scientific organisations to which the PI belongs	Experts, coordinators of the ANEP, and managers of the DGI.	Committee	Committee	Two step
		Special call that requires the PI to be under 40 years				

Table 5 - Overview of formal applicant and receiving entity for funding requests and overview of evaluation processes (to be continued…).

Country	Agency / Programme	Applicants	Evaluators	Ranking	Decision	Process
FR	CNRS	Researchers/Professors	Scientific council		Head of institute	One step
	CEA	Researchers	Scientific committee	Resources council	Head of IRFU	Two step
	ANR	Public and private research laboratories	Evaluation committee		Director of ANR	One step
GR	GSRT	Researchers from private / public sectors	Experts from public / private sectors			
HR	MoSES CSF	Researchers	Evaluation committee		Governing bodies	One step
HU	NKTH	Mainly researchers, universities and research institutions	Independent, external experts.	Evaluation Committee or/and Board (depending on the call	President of NKTH.	One step
	OTKA	University or research institution	Independent external reviewers, review panels and boards	Review panels and boards	OTKA Committee	One step
	MTA	The Hungarian Academy of Sciences supports ApP research through financing its research institutes on its institutional decisions.				
IT	INFN	Research groups, staff and university associates	ApP scientific committee	ApP scientific committee	Governing bodies	Letter of intent + full proposal + review
	MIUR/PRIN	Academic staff NB: Projects over all disciplines can be co-funded up to 70% for 2 years.	Expert committee of undisclosed composition	Committee	Committee	One step

Table 5 - Continued…

Country	Agency / Programme	Applicants	Evaluators	Ranking	Decision	Process
NL	Fellowships	Host institution (Post Doc or junior researcher)	External review	Review committee	FOM board	One step + presentation
	Projects	Research group (senior researcher)				One step + reply
	Programme	Research groups (research leader/professor)		Executive board		Letter of intent + full proposal + presentation + reply
	Large investment	Institute (director)		Review committee	NWO board	As programme + site visit
PL	NCBiR	Research and industry	Evaluation panel	Depending on the call	Funding agency – Director	Depending on the call
PT	FCT	Institute (researcher)	External experts		Funding agency	One step
RO	ANCS/IDEI, Parteneriate, Nucleu	Institutes, Universities	Internal evaluators	Internal experts	Funding agency	One step
SE	VR	Host university/institute (PI) NB: For VR, PIs must hold a PhD and be employed by a Swedish Higher Education Institution	Peer review: evaluation panels and external experts		Scientific Councils, natural and engineering/sciences Committees	One step
UK	Rolling grants	Institute (PI) NB: PIs must be resident in the UK and employed as academic member of staff of a UK research organisation	External experts	Grant panels	Executive	Full proposal + presentation+ reply
	Projects			Projects Peer Review Panel		Letter of intent + full proposal + presentation+ reply
	Fellowships			Selection panel		Full proposal + shortlisting+ presentation

Table 5 – Continued.

From the overview given above, it is clear that there is a large diversity in funding mechanisms in Europe. However, all the procedures are essentially peer review based. As a result, so far large international ApP projects such as H.E.S.S., Antares or Virgo did not suffer from the mentioned differences.

4. Large ApP research facilities

In this section an overview of worldwide large ApP research facilities is given, in which European teams participate.

The large ApP research facilities are divided in four groups:

- Underground laboratories (Section 4.1)
- Facilities and observatories, other than underground labs (Section 4.2)
- Satellites (Section 4.3)
- Existing collaborations (Section 4.4)

There will be an update of the information given in this section in the "long write-up of the Roadmap Paper Phase-II".

For the last three items above (sections 4.2 to 4.4), more information is provided in Appendix C.

4.1. Underground laboratories

Table 6 presents the on-going experiments as for year 2009 in each of the four largest European Underground laboratories as well as financial information such as initial investment and comparative annual cost for 2006 and 2009. The figures given below have been extracted from an extensive report (Deliverable 2.5) about the corresponding labs based on questionnaire and interviews with laboratories' directors.

There are two other underground laboratories in ASPERA countries: Polkowice-Sieroszowice (SUNLAB, Poland) and Ultra-Low Radiation Background Laboratory (SLANIC, Romania). More detailed information is available in the Deliverable 2.5 report.

Lab	**Laboratori Nazionali del Gran Sasso (LNGS)**	**Laboratoire Souterrain de Modane (LSM)**	**Laboratorio Subterráneo de Canfranc (LSC)**	**Boulby Underground Laboratory (BUL)**
Country	**IT**	**FR**	**ES**	**UK**
Experiments (2009)	BOREXINO, COBRA, CRESST, CUORE, ERMES, DAMA/LIBRA, DAMA/R&D, GERDA, GIGS, ICARUS, LUCIFER, LUNA, LVD, OPERA, PULEX2, STELLA, TELLUS, UnderSeiS, VIP, WARP, XENON	EDELWEISS-II, NEMO-3, SHIN, TGV Gamma spectroscopy Logical test failure in microelectronics	ANAIS, ArDM, BiPo, GEODYN, NEXT, ROSEBUD, SUPER-KAMIOKANDE	DRIFT II, SKY-0, ZEPLIN III
Initial investment cost (M€)		1,5	3,5	4,6
Annual cost for 2006 (M€)	12,0	1,3	1,6	0,420
Annual cost for 2009 (M€)	9,3*	2,6**	1,3	0,320

Table 6 - European deep underground laboratories active in ApP, in ASPERA countries.

* Salaries not included.

** Including 1,3 M€ construction costs.

4.2. Facilities and ground-based observatories

Facility/ Observatory	Participating Countries		Type of facility	Place	Initial asset (M€)	Annual cost (M€)
	ASPERA	OTHERS				
UNDERWATER SITES						
IceCube	DE, BE, SE, UK, NL, CH	US, JP, NZ	Deep-ice neutrino telescope	AQ	180	5,0
ANTARES	FR, IT, DE, ES, NL, RO	RU	Underwater neutrino telescope	FR	20	0,5
NESTOR	GR, CH, DE	RU, US	Underwater neutrino telescope	GR	8	0,7
NEMO	IT		Underwater neutrino telescope	IT	13	0,7
OBSERVATORIES (COSMIC RAYS)						
Jungfraujoch	CH		Cosmic rays research	CH		
Pierre Auger Observatory	FR, DE, IT, NL, PL, PT, SI, ES, UK, CZ, RO, HR	AR, AU, BO, BR, US, VN	EAS array	AR		
ANTENNAS & TELESCOPES						
Cosmic Ray Telescope / Cosmic Ray Antenna						
KASKADE Grande*	DE, IT, PL, RO, NL	BR, MX, NO	CR array	DE		
LOFAR	NL, DE, SE, UK, IT, FR, PL		CR antennas	NL	52	
LOPES	DE, NL, IT, PL, RO		CR array	DE		
Gamma Telescope						
ARGO-YBJ	IT	CN	RPC array for gamma astronomy and cosmic rays	CN	12	0,8
H.E.S.S.	DE, FR, UK, PL, CZ, SE, IE,	AT, AR, ZA, NA	Cherenkov Imaging Air Telescope	NA		
MAGIC	DE, ES, IT, CH, PL, HR	FI, US, UA, AM, BG	Cherenkov Imaging Air Telescope	ES		
VERITAS	UK, DE, IE	CA, US, AR	Gamma rays telescope	US		
Gravitational Antenna						
EGO/VIRGO	IT, FR, NL, HU		GW interferometer	IT	85	10
GEO600	DE, ES, UK, HU		GW interferometer	DE	10	
LIGO	DE, UK, HU	AU, US	GW interferometer	US		
Neutrino						
KATRIN	DE, UK, CZ, HU	RU, US	Beta spectrometer	DE	33.5	

Table 7 - Facilities, with participation of ASPERA countries.

* KASCADE-Grande experiment was closed in March 2009, but parts of the device continued operation and serve as an open user facility providing air-shower triggers and reconstruction parameters. This facility is used in particular by Radio Detection Experiments, like LOPES and CROME, but also by others. In addition, the KASCADE-Grande collaboration still exists in order to analyse the data sampled in 15 years of operation. *(Information received from Andreas Haungs (KIT))*.

4.3. Satellites

In Table 8 satellite missions, of importance for ApP research, are listed. Corresponding participating countries, type of facility and launch date are reported.

Satellite	Participant Countries			Type of satellite	Launch
	ASPERA	Other European	Non Europe		
INTEGRAL	DE, FR, IT, CH, NL, DK, ES	ESA	NASA, RU	Gamma ray	2002
PAMELA	IT, DE, SE	RU	US, INDIA	Cosmic ray	2006
AMS	CH, DE, ES, FR, IT, NL, PT, RO	DK, FI, RU	CN, KR, MX, TW, US	Cosmic ray	Planned in 2011
AGILE	IT			Gamma ray	2007
FERMI (former GLAST)	FR, IT, ES, DE, SE, HU		JP, US	Gamma ray	2008
PLANCK	CH, DE, DK, ES, FR, IT, NL, SE UK	ESA, FI, IE, NO,	CA, US	(Dark) matter distribution/cosmology	2009
LISA PF	FR, DE, IT, UK, ES, CH, NL	ESA	US	GW interferometer	Planned in 2011
LISA	FR, DE, IT, UK, ES, CH, NL	ESA	US	GW interferometer	Planned in 2018

Table 8 - Satellites with participation of ASPERA countries.

4.4. Existing collaborations

Table 9 lists the name of the existing collaborations in 2009, the type of experiment or infrastructure, the status in 2011, and the last two columns with the collaborating countries inside and outside EU.

Collaboration	Research area	Status 2011	EU countries	Non EU countries
AGILE	Gamma Telescope	Running	IT	
AMS	Cosmic Rays LE	To be launched on April 29, 2011	CH, DE, ES, FR, IT, NL, PT, RO, DK, FI	RU, US, CN, KR, MX, TW
ANAIS	Dark Matter	Construction	ES	
ANITA	Neutrinos detector	Running	UK	US
ANTARES	Neutrino Telescope	Running	FR, DE, ES, IT, NL, RO	RU
ARA	Neutrino Telescope	Construction	BE	US
ArDM	Dark Matter	Ready for installation	CH, ES, PL, UK	
ARGO-YBJ	Gamma Astronomy & Cosmic Rays	Running	IT	CN
Pierre Auger Observatory	Cosmic Rays HE	Running	FR, DE, IT, NL, PL, PT, SI, ES, UK, CZ, RO, HR	AR, AU, BO, BR, US, VN
AURIGA	Gravitational Waves	Running	IT	
Baikal NT200	Neutrino Telescope	Running	DE	RU
BAO, BigBOSS	Dark Matter	Running	FR, ES, UK	CN, KR
BOREXINO				
BOREXINO	Low Energy Neutrinos	Running	IT, FR, DE, PL, HU	RU, UA, US
CTF	Low Energy Neutrinos	Running	IT, FR, DE, PL, HU	RU, US
CAST	Dark Matter	Running	FR, DE, GR, ES, CH, HR	RU, TR, CA, US
CLOVER	Cosmology	Cancelled	UK	
COBRA	Double Beta	Running	DE, CZ, ES, IT, SK	US
CODALEMA	Cosmic Rays HE	R&D	FR	
CREAM	Cosmic Rays LE	Running	FR	US, KR, MX
CRESST-II	Dark Matter	Running/upgrade	DE, UK, IT	
CTA	Gamma Telescope	Preparatory phase	DE, ES, IT, CH, PL, FR, UK, HR, SE, CZ, GR, NL, AT, BG, FI, IE	US, UA, AM, JP, IN…

Table 9 - Existing collaborations in ApP research, with participation of ASPERA countries (*to be continued*).

Collaboration	Research area	Status 2011	EU countries	Non EU countries
CUORE				
CUORICINO	Double Beta	Terminated	IT, NL, ES	US
CUORE	Double Beta	Construction	IT, NL, ES	US
DAMA-LIBRA	Dark Matter	Running	IT	CN
DARWIN	Dark Matter	R&D	CH, DE, FR, IT, NL, PT	US
DES	Dark Energy	Digital camera under construction	DE, UK, ES	US, BR
Double-CHOOZ	Reactor	Running/ Construction	FR, DE, ES	RU, US, BR, JP
DRIFT				
DRIFT II	Dark Matter	Running	UK	US
DRIFT 1T	Dark Matter	R&D	UK	US
DUAL	Gravitational Waves	R&D	IT	
E.T.	Gravitational Waves	R&D	IT, DE, FR, UK, NL, PL	
EDELWEISS-II	Dark Matter	Running	FR, DE, UK	RU
EUCLID	Dark Energy	Definition phase	FR, DE, IT, ES, CH, UK, *ESA, ESO*	US
EURECA	Dark Matter	R&D	FR, DE, ES, UK, CERN	RU, UA
EUSO				
EUSO	Cosmic Rays HE	Cancelled	FR, DE, IT, PT, ES, CH	JP, BR, US
JEM-EUSO	Cosmic Rays HE	R&D	DE, ES, FR, IT, PL, BG, SK	RU, JP, MX, US, KR
EXO-200	Double Beta	Commissioning	CH, DE	RU, US, CA
FERMI (former GLAST)	Gamma Telescope	Running	FR, IT, DE, ES, SE, HU	US, JP
GAW	Gamma Telescope	R&D	IT, PT, ES	
GENIUS-TF	Dark Matter	Cancelled	DE	RU
GEO 600	Gravitational Waves	Running/Upgrade	DE, ES, UK, HU	
GERDA				
GERDA (ex GENIUS-TF)	Dark Matter	Running	DE	RU
GERDA I/II	Double Beta	Construction	CH, DE, IT, PL	RU
GLACIER	Low Energy Neutrinos	R&D	CH, FR, IT, PL, ES, UK	RU, JP

Table 9 – *Continued…*

Collaboration	Research area	Status 2011	EU countries	Non EU countries
H.E.S.S	Gamma Telescope	Running/Upgrade	DE, FR, UK, PL, CZ, SE, IE, AT	AR, ZA, NA
ICARUS	Low Energy Neutrinos	Running	IT, PL, DE	RU, US
IceCube	Neutrino Telescope	Running	BE, DE, NL, SE, CH, UK	JP, NZ, US
INTEGRAL	Gamma Telescope	Running	DE, FR, IT, CH, NL, ES, DK, *ESA*	RU, US, *NASA*
KASCADE-Grande	Cosmic Rays HE	Terminated (March 09*)	DE, IT, NL, PL, RO	NO, BR, MX
KATRIN	Single Beta	Construction	DE, UK, CZ, HU	RU, US
KM3NeT	Neutrino Telescope	Preparatory phase	FR, DE, GR, IT, NL, ES, UK, RO, CY, IE	
LAGUNA	Neutrinos Detector	R&D	ES, FR, IT, DE, GR, PL, RO, CH, UK	RU, JP
LENA	Low Energy Neutrinos	R&D	DE, FI	RU
LIGO				
LIGO	Gravitational Waves	Running/Upgrade	DE, UK, ES, HU	US, AU
AdvancedLIGO	Gravitational Waves	R&D	UK, DE, HU	US, AU
LISA				
LISA-PF	Gravitational Waves	Construction	FR, DE, IT, UK, ES, CH, NL, *ESA*	US
LISA	Gravitational Waves	R&D	FR, DE, IT, NL, ES, CH, UK, PL, *ESA*	US
LOFAR	Cosmic Rays HE	Construction	NL, DE, SE, UK, IT, FR, PL	
LOPES	Cosmic Rays HE	R&D	DE, NL, PL, IT, RO	
LSST	Dark Energy	R&D/Construction	FR	US, CN
LUCIFER	Double Beta	Construction	FR, IT	
LUX	Dark Matter	Construction	UK, PT	US
LVD	Low Energy Neutrinos	Running	IT	RU, US, BR, JP
MAGIC	Gamma Telescope	Running	DE, ES, IT, CH, HR, PL, FI	UA, US, AR
MANITOP	Neutrino Theory	Running	DE	
MANU2	Single Beta	Terminated	IT	
MARE	Single Beta	R&D	IT, DE	US
MEMPHYS	Low Energy Neutrinos	R&D	FR, IT, CH, ES	
MIBETA	Single Beta	Terminated	IT	US

Table 9 – *Continued…*

Collaboration	Research area	Status 2011	EU countries	Non EU countries
MIMAC	Dark Matter	R&D/Construction	FR	
MiniGRAIL	Gravitational Waves	Terminated	NL, IT	
NEMO	Neutrino Telescope	Running	IT	
NESTOR	Neutrino Telescope	Construction	GR, DE, CH	RU, US
NEXT	Double Beta	R&D	ES	
NuMoon	Cosmic Rays HE	Running	NL, UK	AU
PAMELA	Cosmic Rays LE	Running	IT, DE, SE	RU
PAU	Dark Energy	Construction	ES	
PEBS	Cosmic Rays HE	Construction	CH, DE, IT	RU, CN, US
PICASSO	Dark Matter	Running	CZ	CA, US
PLANCK	Cosmology	Running	FR, CH, ES, NL, UK, IT, PT, DK, FI, DE, IE, *ESA, CNES*	NO, US, CA
POLAR	Cosmic Rays HE	R&D	CH, FR, PL	
PVLAS	Dark Matter	Running	IT	
ROG	Gravitational Waves	Running	IT, CERN, PL	
ROSEBUD	Dark Matter	Running	FR, ES	
SIMPLE	Dark Matter	Running	PT, FR	US
SNLS	Dark Energy	Running	FR	CA, US
SNIF	Dark Energy	Running	FR, DE	US
SNO				
SNO	Low Energy Neutrinos	Terminated (Nov. 2006)	UK, DE, PT	US, CA
SNO+	Low Energy Neutrinos	Construction	UK	US, CA
Super-Kamiokande	Neutrinos detector	Running	PL, ES	JP, US, KR, CN
SuperNEMO				
NEMO3	Double Beta	Terminated (Jan 2011)	FR, CZ, UK	RU, UA, US, JP, MA, KR
SuperNEMO	Double Beta	Construction	FR, CZ, UK, ES, FI	RU, UA, US, JP, MA, KR
Bi-Po	Double Beta	Running	FR, CZ, UK, ES, FI	RU, UA, US, JP, MA, KR

Table 9 – *Continued…*

Collaboration	Research area	Status 2011	EU countries	Non EU countries
SWIFT	Gamma Telescope	Running	UK, IT	US
TGV	Double Beta	Running/Upgrade	CZ, FR, SK	RU
TRACER	Cosmic Rays LE	Running	DE	US, JP
T-REX	Detector R&D	R&D	ES	
TUNKA-133	Cosmic Rays HE	Running	DE, IT	RU, US
VERITAS	Gamma Telescope	Running/Upgrade	UK, DE, IE	CA, US, AR
VIRGO/EGO	Gravitational Waves	Running/Upgrade	IT, FR, NL, CH, PL, HU	
WARP-140	Dark Matter	Commissioning	IT, PL	US
XENON				
XENON-100	Dark Matter	Running	FR, DE, IT, NL, PT, CH	US, CN, IL
XENON 1T	Dark Matter	Conception	DE	US
ZEPLIN III	Dark Matter	Running	UK, PT	RU

Table 9 – *Continued.*

5. ApP research resources

The quantitative information about 2009 consists of a summary of the total amount of funding available for ApP research and the total amount of scientific personnel in FTE (Full Time Equivalent) persons working in ApP research.

5.1. ApP Budget in 2009

Table 10 gives an overview of the total ApP research budget (M€) in each country split into personnel, investment, running and overhead costs, whenever the information was available.

Country	2009					2006	Variation (%)	Inflation[a] (%)
	Personnel	Investment	Running	Overhead	Total	Total		
BE	0,52[b]	0,10	0,23	included	0,85	0,73	+16	
CH	4,70	1,23		6-7 %	5,93	3,10	+77[c]	4,3
CZ	0,51				0,51	0,43	+14[c]	
DE	26,90	21,38	1,28		49,56	44	+13	6,7
FR	41,38	14,45	3,47	60% not included	59,40	51,46	+15	5,8
IT	24,80	13,71	19,10	Included	57,7	58,60	-2	7,5
NL	4,31	0,91	0,125	50% included	5,35	6,09	-12	5,5
PT	0,91	0,31		included	1,22	1,08	+24	
SE	3.0			included	3,0	2,0	+70[c]	
Subtotal					**184**	**167**		
ES	12,2	4,5		NC	*16,7*	*10*[d]	+67	10,4
UK	11,52			NC	11,52	*9*[d]	+69[c]	8,9
GR	1,0	1,0	0,65	NC	2,65	-		
HR	0,34	0,14		included	0,48	-		
HU	0,082	0,050	0,170	0,034M€	0,336	-		
PL	0,448			NC	0,448	-		
RO	0.42	0.14		50% not included	0,56	-		
SI	0,081	0,039	0,052	Not included	0,172	-		
Total					**216**			

Table 10 - Available ApP budget (in M€) in 2009 in ASPERA countries, compared to those in 2006

NC: Not Communicated

[a] *Inflation rates summed over 2007 – 2009 period* http://www.indexmundi.com/france/inflation_rate_(consumer_prices).html

[b] *This includes salaries for PhD students and post-docs, not from permanent staff hired by universities.*

[c] *Variation calculated by taking into account exchange rates on 31.12.06 and 31.12.09; see Appendix D.*

[d] *Estimates*

In Fig. 17, the Total budgets in 2006 and 2009 per country are shown in decreasing order.

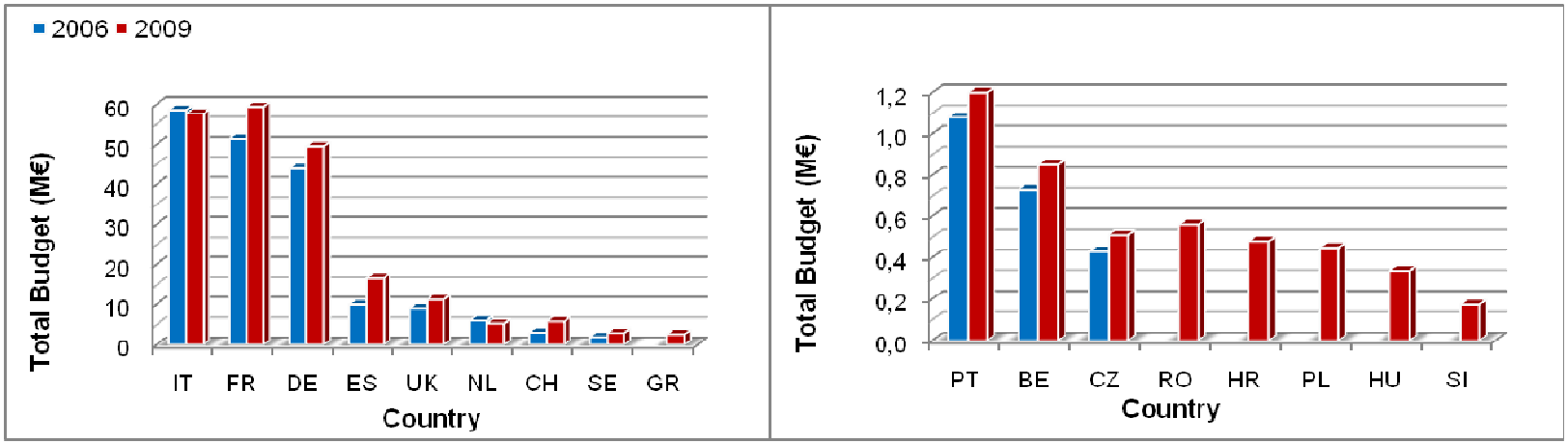

Figure 17 – Total ApP budget per country in 2006 and 2009.

Table 10 deserves a few comments:

a) Numbers given in columns 2 to 5 are taken from Section 2. In a few cases, splitting of the budget among the three categories (personnel, investment, running costs) was not made available by the relevant funding agencies, and the same for overhead issues.
For nine out of the eleven, countries included in the 2006 Census it was possible to compare 2006 and 2009 data within identical categories.
For the two remaining countries, no 2006 versus 2009 comparisons were performed. Actually, following the process of cross-checking 2006 versus 2009 data, it became clear that:

   i) Spain: data for personnel (FTE and budget) in 2006 could not be granted as reliable enough.

   ii) UK: the personnel data in 2006 had been underestimated. Moreover, the reported numbers for 2009 include very likely contributions from neighbouring fields (astronomy, astrophysics, elementary particle physics, and nuclear physics). Though those overlaps are expected to be rather small, they could not be quantified.

b) For the additional six countries which joined ASPERA after the 2006 Census report there were obviously no 2006 data available.

c) Variations observed in column 8 are heterogeneous and do not allow a straightforward insight to the evolution of ApP budget between 2006 and 2009. Moreover, those numbers do not take account of inflation.

   In order to get a better understanding of those issues, five countries are sampled out: CH, DE, FR, IT, and NL, for two reasons: i) total contributions in 2009 from those countries (178M€) represents more than 82% of the total budget (216M€), ii) all five countries have provided consistent numbers for 2006 and 2009.
   For those countries, the total budget goes from 163M€ in 2006 to 178M€ in 2009, showing an increase of +9,0%. To clarify the significance of this, one needs to take into account the impact of inflation on the budgets over that period, namely, 2007-2009.
   The inflation rate per year and per relevant country is given in Table 11. In consequence, by taking into account the inflation rate over 3 years per country, the total variation goes down from +9% to about +2%.

Year	CH	DE	FR	IT	NL
2007	1,2	1,7	1,5	2,3	1,4
2008	0,7	2,3	1,5	1,8	1,6
2009	2,4	2,7	2,8	3,4	2,5
Sum	**4,3**	**6,7**	**5,8**	**7,5**	**5,5**

Table 11 – Inflation rates (%) http://www.indexmundi.com/france/inflation_rate_(consumer_prices).html

   The effective variation is hence ≈+2%, which is very likely smaller than the uncertainties on the used budget data. However, as can be found in Section 5.2, the manpower in the same countries has increased by about +10% between 2006 and 2009, very likely mainly due to the increasing number of PhD students and post-docs. From this study, we could infer that the ApP budget has been (slightly) increasing between 2006 and 2009. This trend is amplified due, on the one hand, to countries with rather small but increasing budgets (e.g. BE, CZ, PT, SE) and on the other hand, to newcomers in the field.

To summarise, the following considerations can be put forward:

i) The almost stable total ApP budget for five of the major countries underlines the crucial role of structuring efforts, which allow funding agencies to allocate financial support and manpower to new projects, though not enough for constructing ambitious future detectors.

ii) Fostering and/or expanding ApP activities in other countries are highly important issues for the realisation of future projects.

Since 2006, ASPERA has been concentrating on those issues, namely,

e) Contribute to structuring of ApP projects, via funding agencies.

f) Help to develop ApP research in countries where the relevant funding agencies are willing to support such evolution,

g) Underline, especially through the ApPEC/ASPERA Roadmap, that under investigation future projects deserve, from scientific and technical point of views, to be considered high priority within funding agencies and the ESFRI Roadmap,

h) Support ApP projects in participating to the Calls launched by the European Commission, as well as by the ASPERA funding agency members.

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5.2. ApP researchers and subfields

For each country the total number of FTEs active in ApP research in 2006 and 2009 are listed in Table 12. Undergraduate students are not included in the statistics.

Country	2006		2009		Variation (%)	
	FTE	Women (%)	FTE	Women (%)	FTE	Women
BE	17	16	24	17	+41	+50
CH	52	26	72	28	+38	+49
CZ	20	10	29	6	+45	-13
DE	490	17	584	13	+19	-9
FR	608	18	712	18	+17	17
IT	679	20	650	20	-4	-4
NL	55	18	43	15	-22	-35
PT	40	33	38	29	-5	-17
SE	34	15	37	25	+9	+81
Subtotal I	**1 995**	**19**	**2 189**	**18**	**+10**	**+3**
ES	168*	20	338	21		
UK	158*	24	245*	14		
GR			61	15		
HR			18	20		
HU			21	0		
PL			58	20		
RO			7	31		
SI			5	0		
Subtotal II			**752**	**18**		
Total (I + II)			**2 942**	**18**		

Table 12 – Manpower per ASPERA country, percentage of women and variations.

* Estimate; see comments in Section 5.1

Table 12 shows that within the first 9 countries (Subtotal I) the manpower in ApP has increased by about 10% from 2006 to 2009, with +3% for women.

Within the 17 countries in Table 12, the personnel in FTE add up to about 2950 FTE, with roughly the following breakdown: 1200 professors and researchers, 400 engineers, 600 post-docs and 750 graduate students.

The Total for 2009 (Table 12), taking into account uncertainties explained in Section 5.1, allows putting the total manpower in the 17 countries to 2900±150 FTE, working in about 200 universities, research institutes and national laboratories (Table 13).

Country	2009			2006
	Universities	Research Institutes + National laboratories	Total	Total
BE	4	0	4	4
CH	4	2	6	7
CZ	4	1	5	5
DE	28	10	38	38
ES	10	3	13	13
FR	25	3	28	28
GR	5	3	8	8
HR	3	1	4	
HU	3	2	5	
IT	28	7	35	35
NL	6	2	8	8
PL	5	5	10	
PT	5	5	10	5
RO	2	2	4	
SE	5	0	5	3
UK	22	1	23	19
TOTAL	**159**	**47**	**206**	**173**

Table 13 – Number of academic institutions where ApP research is performed in the ASPERA countries.

The breakdown of manpower per subfield and per country is summarised in Tables 14 and 15.

In accordance with the 2006 Census, subfield abbreviations used in this report are given as listed below

- **DM-DE** ⇨ Dark Matter (DM) + Dark Energy (DE)
- **CR** ⇨ High Energy Cosmic Rays (HECR) + Low Energy Cosmic Rays (LECR)
- **GR** ⇨ High energy gamma rays (HEγR) ; (Cherenkov Telescopes, satellites)
- **NU-HE** ⇨ High energy cosmic neutrinos (HECν)
- **NU-LE** ⇨ Low energy neutrinos & proton decay (LEν&PD) + Neutrino mass (νMass)
- **GW** ⇨ Gravitational waves (GW)
- **Theory** ⇨ Theoretical Astroparticle Physics
- **Cosmology**
- **Others** ⇨ ApP Neighbour fields (astrophysics, etc.)

In 2006 report, there was no “Cosmology” subfield, and the corresponding items had been distributed in other subfields, or simply put in “Others”. Given the rapid development of that domain, for 2009 an additional subfield is introduced. However, data reported here are mainly for Planck and in some countries that project is funded by other sources than those collected in this report, e.g. Germany (DLR and MPG), Italy (ASI, CNR, INAF).

Subfield	Year	BE	CH	CZ	DE	FR	IT	NL	PT	Total per subfield
DM-DE	*2006*		18,9		34,8	129,0	26,2		10,8	**220**
	2009		21,6	0,8	39,0	164,5	31,2		8,0	**265**
	V (%)		+14		+12	+28	+19		-26	**+21**
CR	*2006*		10,8	14,0	75,7	83,9	167,5	17,6	22,4	**392**
	2009		11,2	15,5	78,0	57,0	171,3	13,1	17,0	**363**
	V (%)		+4	+11	+3	-32	+2	-26	-24	**-7**
GR	*2006*			2,0	66,0	108,1	107,9			**284**
	2009		13,8	1,5	88,0	121,1	89,5			**314**
	V (%)			-25	33	12	-17			**+10**
Nu_HE	*2006*	17,0			90,0	52,2	60,9	16,1		**236**
	2009	24,0	3,3		74,3	97,0	57,6	20,2		**276**
	V (%)	+41			-17	+86	-5	+25		**+17**
Nu_LE	*2006*				76,2	22,1	115,6		6,8	**221**
	2009		12,8	10,9	106,0	17,2	122,1		13,0	**282**
	V (%)				+39	-22	+6		+91	**+28**
GW	*2006*				49,0	41,9	125,9	7,5		**224**
	2009		1,5		98,0	47,4	103,2	9,0		**259**
	V (%)				+100	+13	-18	+21		**+16**
Cosmology	*2006*		7,0			110,4				**117**
	2009		5,5			142,8				**148**
	V (%)		-21			+29				**+26**
Theory	*2006*		5,0		98,0	41,0	75,0	14,0		**233**
	2009		2,5		101,0	42,7	75,0	0,8		**222**
	V (%)		-50		+3	+4	0	-95		**-5**
Others	*2006*		10,2	4,0		19,8				**34**
	2009		0,0	0,0		22,3				**22**
	V (%)					+13				**-34**
Total	*2006*	17	52	20	490	608	679	55	40	**1 961**
	2009	24	72	29	584	712	650	43	38	**2 152**
	V (%)	+41	+39	+44	+19	+17	-4	-22	-5	**+10**

Table 14 – Manpower (FTE) per subfield and per country, for 2006 and 2009 and variation (V).

In Table 14, the variations per subfield and per country need to be considered keeping in mind that in a large number of cases they result from rather small absolute numbers.

Subfield	ES	UK	GR	HR	HU	PL	RO	SE	Total 8 countries	Total 16 countries
DM - DE	89,9	24,3	18,0	4,0		7,1	2,5		**146**	**411**
CR	57,0					17,3	11,0	7,0	**92**	**455**
GR	48,3	17,2	3,0	14,0	0,2	17,0	16,5		**116**	**430**
Nu_HE	28,2	8,2	40,0				5,5		**82**	**358**
Nu_LE	52,4	26,4			7,5	5,1			**91**	**373**
GW	12,5	45,4			11,0	10,5			**79**	**339**
Cosmology	7,5	25,4				0,6			**34**	**182**
Theory	42,8	62,3			2,6		1,5		**109**	**331**
Others		35,6							**36**	**58**
Total FTE ApP per country in 2009	**338**	**245**	**61**	**18**	**21**	**58**	**37**	**7**	**785**	**2 937**

Table 15 - Manpower per (FTE) per subfield and per country, for 2009.

Table 15 gives the 2009 budget breakdown for the additional 8 countries. Notice that Slovenia has reported 5 FTE for 2009, without breakdown per subfield.
The total manpower per subfield for all 16 countries is reported in Table 15, last column, showing comparable numbers among various subfields, except Cosmology. This latter exception is due to the fact that in several universities and research centres Cosmology topics are partly classified in Astronomy / Astrophysics.

Graphical presentations of the last columns in Tables 14 and 15 are depicted in Figures 18 and 19.

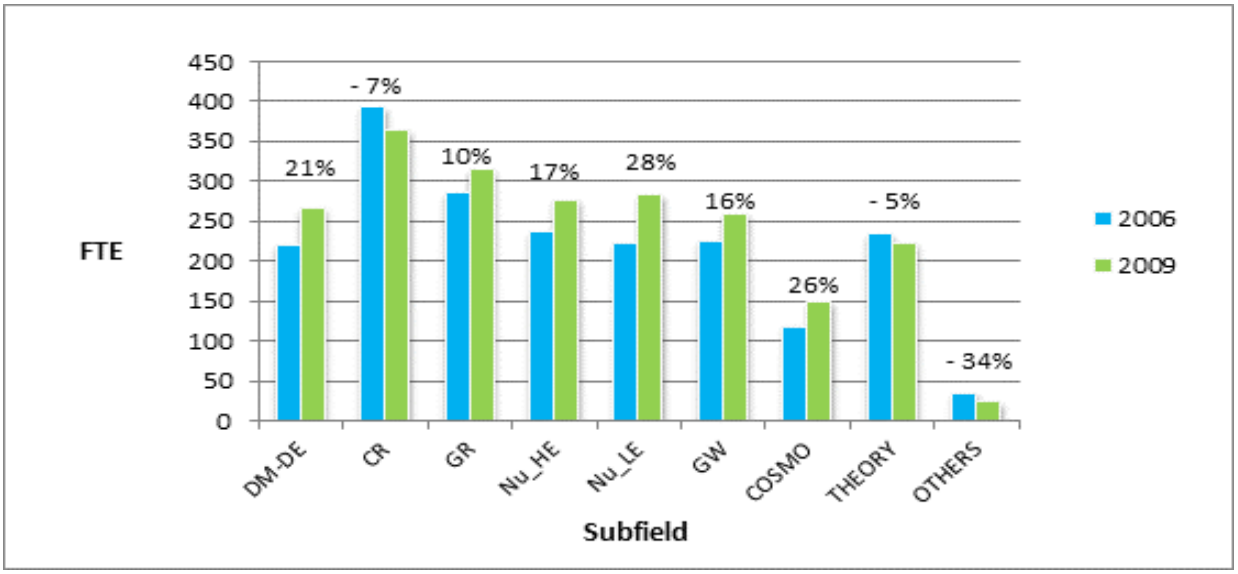

Figure 18 – Total personnel (FTE) per subfield in 2006 and 2009 for 8 countries (see Table 14).

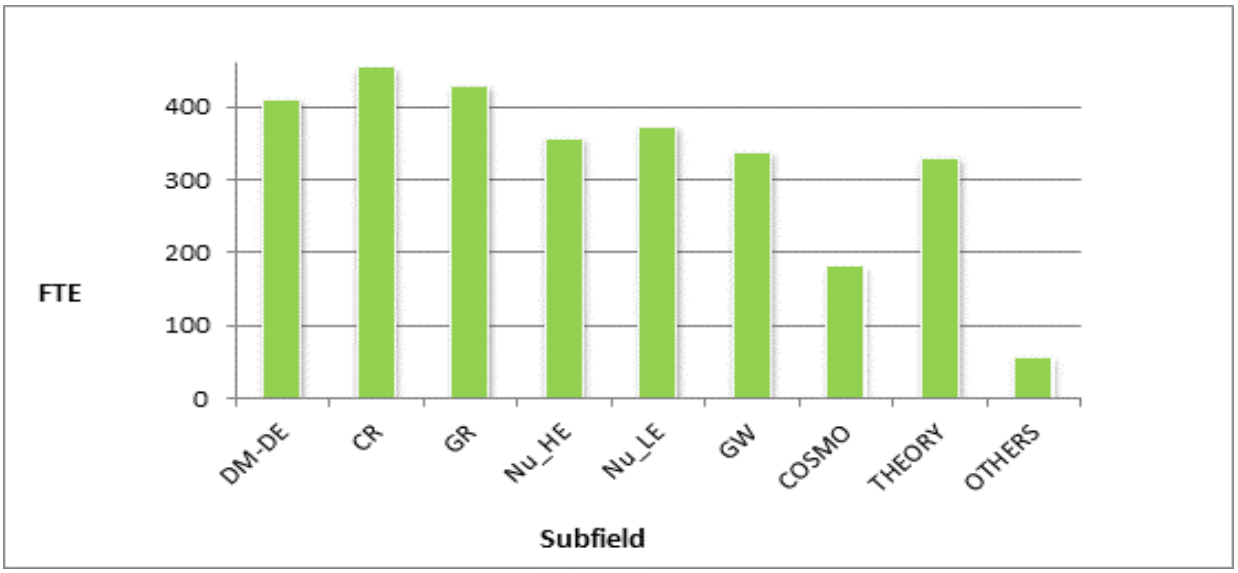

Figure 19 – Total personnel (FTE) per subfield in 2009 for 16 countries (see Tables 14 and 15).

5.3. Average salary range

The average salary range, from the lowest start position in the indicated function to the highest rank (Table 16), is an important number to compare between countries when in the process of requesting support from any funding agency. We are fully aware that each country has its own way of referring to salary cost. Therefore we provide in Table 17 the gross salary that a person finds on his/her contract and/or on his/her tax papers. The column overhead shows the percentage that the employer uses to calculate the actual costs of such a person for the employer.

PhD	**Person working on his PhD research**
Postdoc	**Person with a doctorate title, with a temporary job. This includes junior fellowships.**
Researcher	**Person with permanent research position, or tenure track position, not being a professor.**
Professor	**Any person with the title professor (junior, assistant, associate, full), also professors with higher functions, as director or dean**
Technician	**Technical support staff**
Engineer	**Person with a degree in engineering, who has other duties than a researcher.**

Table 16 – Description of various research levels.

Country		PhD	Postdoc	Researcher	Professor	Technician	Engineer	Overhead (%)
BE		25 – 40	40 – 65	45 – 67	70 – 100	40 – 55	35 – 65	60
CH		22 – 39	44 – 71	NA	77– 136	44 – 71	65 – 93	20
CZ*		4 – 9	7 – 12	10 – 18	11 – 15	8 – 12	14	37
DE		16– 38	38 – 65	40 – 75	70 – 100	30 – 55	35-75	20
ES				50 – 70	55 – 75	35 – 45		NC
FR	CNRS*	17	30	30 – 70	30 – 70	20– 30	30 – 55	NC
	CEA	36	50 – 55	65 – 105	65 – 105	40 – 65	50 – 100	60
GR		8	14	20 – 35	50	15	25	NC
HR		9-10	11	14-22	19-22	7-10	9-10	40
HU		5-10	10-15	12-20	12-36	8-10	12-25	27
IT		17	25	35 – 95	40 – 95	25 - 30	35 – 95	29
NL		25 – 35	40 – 60	45 – 80	65 – 115	25 – 50	30 – 80	50
PL		NC	NC	NC	NC	NC	NC	NC
PT		12 -- 21	18 - 27	45 – 50	50 – 70	20 – 25	25	NC
RO		7	13	22	22	7	13	50
SE		30	35	35 – 40	65	35	NC	56
UK*		20	40-50	35 – 65	100 –120	35 – 55	49**	46

Table 17 – Gross salary range in k€ per year in 2009. Additional employer costs, e.g. heating, etc., are not included.

* 2006 data, no updates for 2009 received.
** 2009 data

5.4. ApP funding and national effort in research

In this section the intensity of the effort per country devoted to ApP research is briefly presented.

Table 18 gives manpower versus population in each country.
The highest ratios correspond to France and Italy. It is worthwhile noticing that for only two other countries, Germany and Switzerland, are the ratios above the average (6,3).

	Personnel ApP		**Population**		**Personnel ApP / Population**	
	2006	2009	2006	2009	2006	2009
	FTE	FTE	Million	Million	per Million	per Million
BE	17	24	10,6	10,8	1,6	2,2
CH	52	72	7,5	7,8	6,9	9,2
CZ	20	29	10,3	10,5	1,9	2,8
DE	490	584	82,3	81,8	6,0	7,1
ES	168*	338	44,5	46,0	3,8	7,3
FR	608	712	63,6	64,7	9,6	11,0
GR		61	11,2	11,3		5,4
HR		18	4,4	4,4		4,1
HU		21	10,1	10,0		2,1
IT	679	650	59,1	60,3	11,5	10,8
NL	55	43	16,4	16,6	3,4	2,6
PL		58	38,1	38,2		1,5
PT	40	38	10,6	10,6	3,8	3,6
RO		7	21,6	21,5		0,3
SE	34	37	9,1	9,3	3,7	4,0
SI		5	2,0	2,0		2,4
UK	158*	245*	60,8	62,0	2,6	4,0
Total	**2321**	**2942**	**462,2**	**468,0**		**6,3**

Table 18 – ApP personnel (FTE), population and ratio per country.

* Estimates, see comments in Section 5.1.

Graphic presentation is depicted in Fig. 20.

Source: Eurostat
http://epp.eurostat.ec.europa.eu/tgm/table.do?tab=table&language=fr&pcode=tps00001&tableSelection=1&footnotes=yes&labeling=labels&plugin=1

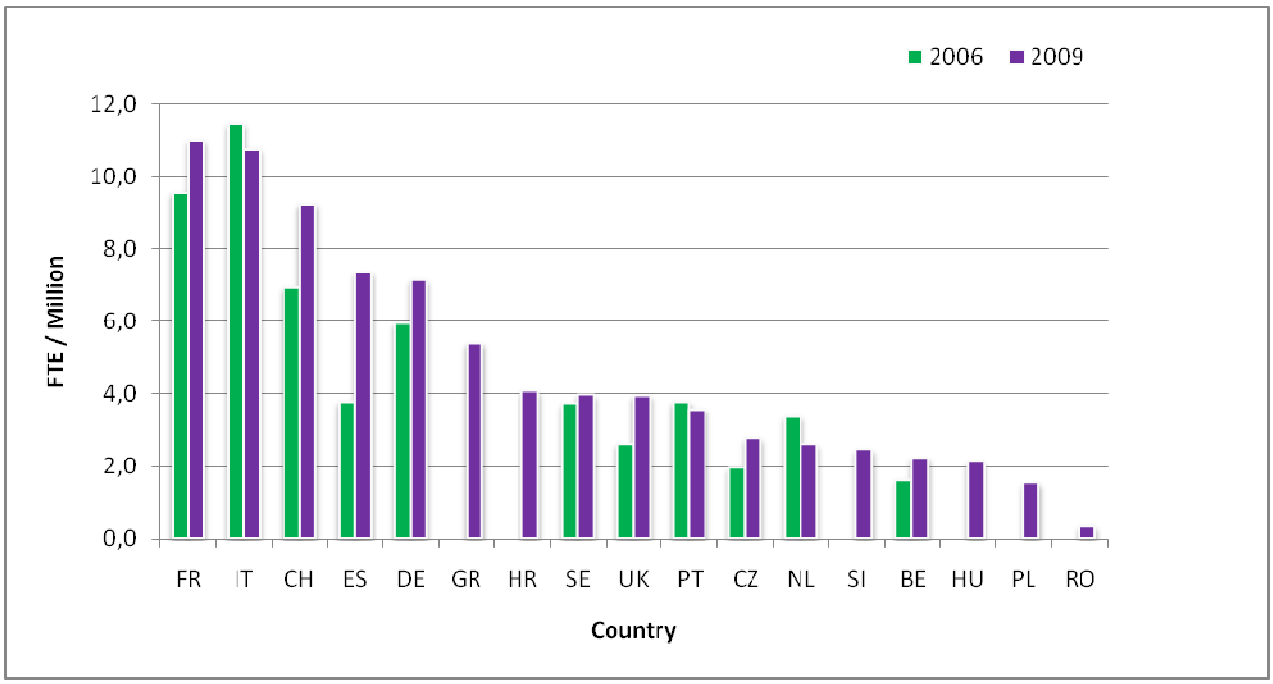

Figure 20 – Ratio of total ApP personnel (FTE) over total population per country in 2006 and 2009.

Ratios of total ApP budget over Government Budget appropriations or outlays on R&D (GBOARD) and Gross Domestic Product (GDP) are given in Table 19 and shown in Figures 21 and 22.

Notice that the GBOARD data for 2009 has not yet been released. Accordingly, the last column in Table 19 is taken from 2008 data (both for GBOARD and GDP) to illustrate the part of budget dedicated to R&D in each of the countries.

	ApP budget			**GDP**			**ApP Budget / GDP**		**GBOARD / GDP**
	2006	2009	Variation 2006/2009	2006	2009	Variation 2006/2009	2006	2009	2008
	M€	M€	(%)	G€	G€	(%)	‰	‰	%
BE	0,73	0,85	16,4	318,20	337,80	6,16	0,002	0,003	0,59
CH	3,10	5,93	77,0	311,90	354,70	13,72	0,010	0,017	0,72
CZ	0,43	0,51	14,0	113,70	134,50	18,29	0,004	0,004	0,56
DE	44,00	49,56	12,6	2 325,10	2 407,20	3,52	0,019	0,021	0,79
ES	10,00	16,70		984,30	1 051,20	6,80	0,010	0,016	1,07
FR	51,46	59,40	15,4	1 806,40	1 943,40	7,58	0,028	0,031	0,75
GR		2,65		210,50	237,50	12,83		0,011	0,30
HR		0,48		39,10	45,38	16,05		0,011	0,07
HU		0,34		89,90	93,10	3,56		0,004	0,43
IT	58,60	57,71	-1,5	1 485,40	1 520,90	2,39	0,039	0,038	0,63
NL	6,09	5,35	-12,2	540,20	570,20	5,55	0,011	0,009	0,71
PL		0,45		272,10	310,10	13,97		0,001	0,30
PT	1,08	1,22	13,0	155,40	163,90	5,47	0,007	0,007	1,02
RO		0,56		97,80	115,90	18,51		0,005	0,41
SE	2,00	3,00	70,0	313,40	287,90	-8,14	0,006	0,010	0,81
SI		0,17		31,10	34,90	12,22		0,005	0,55
UK	9,00	11,52		1 944,80	1 566,70	-19,44	0,005	0,007	0,64
Total	**186,40**	**216,40**		**11 039,30**	**11 175,28**	**1,23**	**0,017**	**0,019**	**0,61**

Table 19 – ApP budget, GPD and ratios per country.

Sources:

GDP: Eurostat and DG ECFIN – *EU economic data pocketbook Quarterly 4-2009*
http://epp.eurostat.ec.europa.eu/cache/ITY_OFFPUB/KS-CZ-09-004/EN/KS-CZ-09-004-EN.PDF

GBAORD/GDP: Eurostat, Eurostat Pocketbook – *Science, technology and innovation in Europe, 2010 edition*
http://epp.eurostat.ec.europa.eu/cache/ITY_OFFPUB/KS-32-10-225/EN/KS-32-10-225-EN.PDF

Croatia data: Croatia Bureau of Statistics
Research & Development 2008, Statistical Report 1417 http://www.dzs.hr/Hrv_Eng/publication/2010/SI-1417.pdf
2010 Croatia in Figures http://www.dzs.hr/Hrv_Eng/CroInFig/hrvatska_u_brojkama.pdf

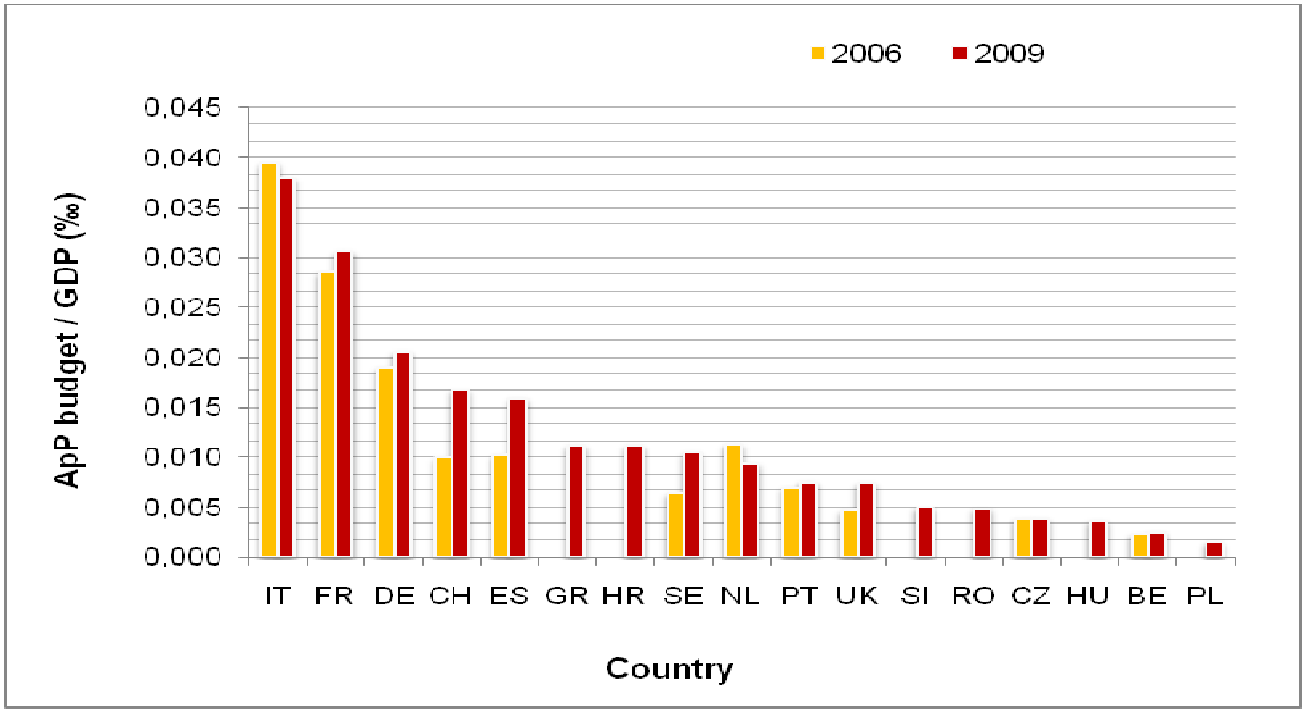

Figure 21 – Ratio of total ApP budget over GDP per country in 2006 and 2009.

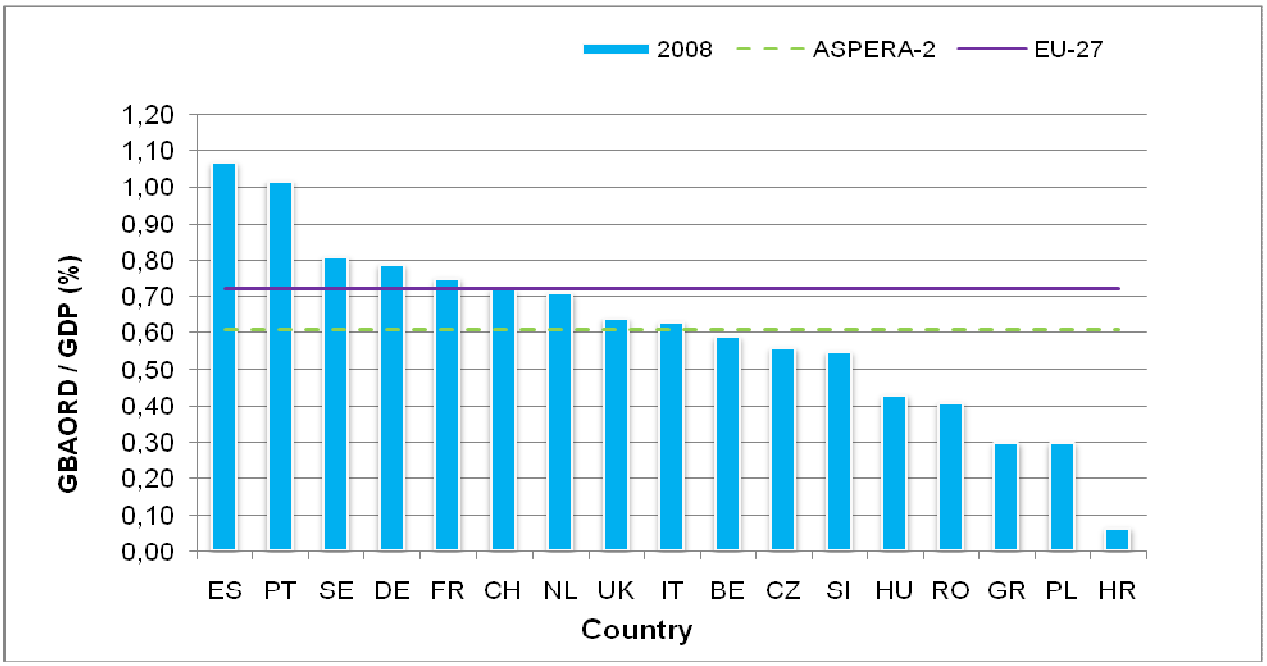

Figure 22 – Ratio of GBOARD over GDP per country in 2008.

6. Appendices

6.1. Appendix A – Census of ApP resources in Europe: Survey

Questionnaire 1: Financial resources

ASPERA funding agencies were asked to give the funding sources of their respective Astroparticle Physics budget for 2009.

For each project, listed in thematic order, funding agencies needed to:

- Fill in the total budget in K€ for 2009 (column 3) and use the entire row to identify each of its sources;
- Specify the name of the agencies, ministries, ministerial calls, FP programmes as well as other funds, in the top row;
- Extend the table by as many rows as needed;
- Identify the names of the projects or research groups and do the same work as for listed projects.

Questionnaire 2: Manpower

ASPERA funding agencies were requested to quantify the manpower involved in Astroparticle Physics for 2009, i.e. to give the total personnel contribution per employment category.

For each project, listed in thematic order, funding agencies needed to:

- Fill in the total personnel involvement in Full Time Equivalent (FTE) for 2009 (column 3);
- Indicate the fraction of women in column 4;
- Use the entire row to quantify the contribution of each category of personnel, i.e. Full professors, Senior researcher (associates),Postdocs (or fellows), Engineers, PhD students and Undergraduates;
- Extend the table by as many rows as needed;
- Identify the names of the projects or research groups and provide the same information as for listed projects.

Questionnaire 3: Funding description

ASPERA funding agencies were requested to describe their national research funding system, i.e. the structure and functions of funding agencies in ASPERA-2 countries with respect to the following:

- Main funding agencies and main source of funding for ApP research.
- Main places where ApP research is performed
- Availability of large infrastructures.
- Available resources in 2009: Total budget and personnel (undergraduate students are not included)
- Grant process: from proposal to funding.

List of projects in the questionnaires 1 and 2

Cosmic Rays (CR)

Cosmic Rays HE

- ARGO-YBJ
- Auger
- CODALEMA
- EUSO
- KASCADE-Grande
- LOFAR
- LOPES
- NuMoon
- TUNKA

Cosmic Rays LE

- AMS
- CREAM
- PAMELA
- TRACER

Cosmology (Cosmo)

- PLANCK

Dark Matter/Dark Energy (DM-DE)

- ANAIS
- ArDM
- BAO
- CAST
- Cosmo mm (DE)
- CRESST
- DAMA/LIBRA
- DRIFT
- EDELWEISS
- EURECA
- GENIUS-TF
- HDMS
- LUX
- PICASSO
- PVLAS
- ROSEBUD
- SIMPLE
- WARP
- XENON
- ZEPLIN I-III

Gamma Rays (GR)

- AGILE
- CTA
- GAW
- FERMI (formerly GLAST)
- H.E.S.S.
- Integral
- MAGIC
- VERITAS

Gravitational Waves (GW)

- advLIGO
- AURIGA
- DUAL
- E.T.
- GEO 600
- LIGO
- LISA
- LISA PF
- MiniGRAIL
- ROG
- VIRGO/EGO

Neutrinos High Energy (NU-HE)

- ANTARES
- IceCube
- KM3NeT
- NEMO
- NESTOR
- Baikal NT200
- Double CHOOZ

Neutrinos Low Energy (NU-LE)

Double Beta

- COBRA
- CUORE
- CUORICINO
- EXO
- GERDA
- NEMO-3
- SuperNEMO
- TGV

Low Energy Neutrinos

- BOREXINO
- CTF
- GLACIER
- ICARUS
- LENA
- LVD
- MEMPHYS
- SNO
- SNO+

Single Beta

- KATRIN
- MANU2
- MARE
- MIBETA

Theory

6.2. Appendix B - National Days

As mentioned in Section 1, the 2006 report included summaries of National Days in 11 countries.

In this section the programmes of the National Days for 5 additional countries are presented, with links to the presentations on the ASPERA website.

Croatian National Day, 28 May 2010, Opatija

On May 27, 2010 the **Croatian Science Foundation (CSF)** invited the **ASPERA** partners to the 15th National Day of the network. The event was held in the beautiful city of Opatija situated on the Adriatic coast where CSF just recently moved into its new domicile, a newly renovated old Wilhelminian style villa.

About 40 participants, high level representatives of the **Croatian science and funding system** as well as members of the ASPERA network, met for a presentation of the Croatian science system and its activities in Astroparticle Physics.

Responsibity for funding science in Croatia lies with the Ministarstvo znanosti, obrazovanja i športa (**MZOŠ**), the **Ministry of science, education, and sports of the Republic of Croatia**. Generally speaking, scientific research in Croatia is monitored and conducted in six fields of science: natural sciences, technical, biomedical, biotechnical and social sciences, and humanities. Established in 2001, NZZ is in the process to become the main funding agency in Croatia to provide funding for competitive R&D projects, support of junior researchers, and equipment.

An interesting approach on the regional level was presented by **Zaklada Sveučilišta u Rijeci**, a foundation of the **University of Rijeka**, which is providing financial support for the science community of the University of Rijeka on a smaller scale based on a budget that is raised by public sponsorship.

Astroparticle Physics activities in Croatia is mainly concentrated on groups at the **Ruđer Bošković Institute** in Zagreb and the **University of Split**. The groups are involved in international collaborations such as Auger, MAGIC, and CAST as well as in Astroparticle Physics theory and have developed tight links to scientists in essentially all neighbouring countries. It is worthwhile to mention that Croatia applied for membership of CERN and Croatian scientists are involved already in the CMS experiment. Altogether, the Croatian astroparticle physicists form a small but enthusiastic community with internationally oriented scientific activities.

Welcome to CSF *xxxxxx*	
ASPERA-2: Consortium, project and purpose of a National Day *T. Berghöfer (ASPERA-2 Coordinator)*	Slides
ASPERA achievements *S. Katsanevas (ASPERA-2 Deputy-coordinator)*	Slides
Croatian Science Foundation (CSF) – Funding instruments and opportunities *L. Barać Lauc (Croatian Science Foundation)*	Slides
The Foundation of the University of Rijeka – Funding instruments and opportunities *S. Baric (Foundation of the University of Rijeka)*	Slides
Importance of Astroparticle Physics and collaboration with Croatian groups (MAGIC) *A. De Angelis (University of Udine)*	Slides
Importance of Astroparticle Physics and collaboration with Croatian groups (AUGER) *S. Stanić (University of Nova Gorica)*	Slides
Ruder Bosković Institute (RBI) – Astroparticle Physics at RBI *D. Ramljak (Ruđer Bošković Institute)*	Slides
Astroparticle Physics at DEP, RBI and Croatian collaboration in AUGER and plans with LOFAR *T. Antičić (Ruđer Bošković Institute)*	Slides
Astroparticle Physics at UNIST and Croatian collaboration in MAGIC and CTA *N. Godinović (University of Split)*	Slides
Croatian collaboration in CAST *B. Lakić (Ruđer Bošković Institute)*	Slides
Croatian collaboration in CMS-CERN *I. Puljak (University of Split)*	Slides
Astroparticle Physics Theory in Croatia *D. Kekez (Ruđer Bošković Institute), D. Klabučar (University of Zagreb)*	Slides
Discussion *T. Surić (Croatian Science Foundation)*	Slides

Greek National Day, 31 October 2008, Athens

On 31th October Athens hosted Aspera's 13th National Day, where the Greek Astroparticle Physics (ApP) activities were presented to an audience of about 20 people and the characteristics of the Greek funding system were discussed.

The event was opened by Ion Siotis from the National Centre for Science and Technology "Demokritos" (NCST-D). This centre is formed by 8 independent institutes of which the Institute of Nuclear Physics (INP) is the one most related to ApP. Another research centre is the National Observatory of Athens. Two of its five institutes are of importance for ApP: the Institute of Astronomy and Astrophysics (IAA) and the Nestor Institute of Astroparticle Physics. Both research centres are under the supervision of the General Secretariat of Research and Technology (GSRT) of the Ministry of Development. Besides these institutes, research is also performed in several universities.

Apart from salaries and maintenance for the institutes and universities, in Greece there is no institutional budget or rolling grants for research programmes which makes the long term support of scientific projects a very difficult and energy-intensive endeavour. Nevertheless, thanks to European funds and international collaborations, Greece is developing a strong programme in two ApP topics: neutrino astronomy and axion searches. This situation may soon change thanks to a new law already approved which will allow for grant programmes similar to the ones existing in other European countries.

The Nestor collaboration, presented by Petros Rapidis (NCST-D Director), is part of the KM3NeT project and has been working on the deployment of a neutrino telescope in the Greek coast in Pylos for more than a decade. Their experience is essential for KM3NeT and the Greek government is deeply interested in hosting it. It announced funds up to 50 Million Euros in the case that KM3NET was hosted in the Nestor site.
Konstantine Zioutas, CAST spokesman, presented this axion experiment, which gives the most restrictive limits at present and in which Greece has a leading role.

Manolis Plionis, representing IAA gave the view of the astronomy and astrophysics community in Greece, while Minos Axenides described the theoretical activities which involve almost 10 universities/institutes and covers different aspects of cosmology, gravity, dark energy or dark matter.

Theodoros Geralis, from the INP, presented the outreach activities in Particle and Astroparticle Physics, which include seminars, presentations, visits, web resources, or the HELYCON cosmic network. These initiatives have deserved the European Outreach prize.

The talks were held in the old Doridis telescope Observatory of NOA in the Nymphs hill. The day after, a visit to the Nestor facilities in Pylos was kindly organised giving a detailed view of the activities developed there.

Welcome, Introductory remarks *I. Siotis (NCSR-Demokritos)*	
Neutrino Astronomy in Greece, Past and Future *P. Rapidis (NCSR-Demokritos)*	Slides
Axion Searching - CAST, the Greek perspective *K. Zioutas. (University of Patras)*	Slides
Theoretical Particle (Astro) Physics in Greece *M. Axenides (NCSR-Demokritos)*	Slides
The Hellenic Astronomy & Astrophysics Sector *M. Plionis (Institute of Astronomy and Astrophysics-NOA)*	Slides
Outreach - Presenting Particle (and Astroparticle) Physics to the Greek Public *T. Geralis (INP/NCSR-Demokritos)*	Slides

Hungarian National Day, 15 October 2010, Budapest

The 16th ASPERA National Day was organised by the National Office for Research and Technology (NKTH) on 15 October 2010. Invited by NKTH, representatives of the ASPERA network, the Hungarian science funding system and Astroparticle Physics research convened in Budapest, Hungary. The main purpose of the ASPERA Hungarian National Day was to present the Astroparticle Physics activities and the science funding system in Hungary to the other ASPERA partners.

There were approximately 50 participants in the National Day who received a full overview of the structure of Hungarian R&D; they were informed about the R&D funding opportunities and the main trends and achievements of Hungarian Astroparticle Physics researchers.

In Hungary three organisations, the Hungarian Scientific Research Fund (OTKA), the National Office for Research and Technology (NKTH) and the Hungarian Academy of Sciences (MTA) provide the largest contribution to Astroparticle Physics research. Representatives of these organisations gave presentations about their funding opportunities and future plans.

Hungarian researchers are very active in some fields of Astroparticle Physics and are looking forward to playing a more significant role in the European research area. Astroparticle Physics activities in Hungary include research carried out at three major universities (at Eötvös Loránd University in Budapest, at the University of Szeged and at the University of Debrecen), and research activities at two major research institutes run by the Hungarian Academy of Sciences (at the Research Institute for Particle and Nuclear Physics in Budapest and at the Institute of Nuclear Research in Debrecen). There were eight presentations by researchers from all these places on the National Day. Focus was on activities at CERN (which Hungary joined more than a decade ago) and participation at both the LIGO and VIRGO gravitational wave observatories, a recent addition to activities in Hungary. During the discussions on the ASPERA Hungarian National Day it was mentioned that Hungary could be a suitable building site for one of the proposed magnificent seven research labs.

Welcome to NKTH *V. Németh (National Office for Research and Technology- NKTH Director)*	
ASPERA roadmap, evolutions, international context *T. Berghöfer (ASPERA-2 Coordinator)*	Slides
ASPERA roadmap, evolutions, international context *S. Katsanevas (ASPERA-2 Deputy-coordinator)*	Slides
Funding system of the National Office for Research and Technology (NKTH) *V. Németh (NKTH)*	Slides
The Role of the Hungarian Scientific Research Fund (OTKA) in Supporting Hungarian Research *L. P. Kollár (Hungarian Scientific Research Fund-OTKA)*	Slides
Research institutions and their financing at the Hungarian Academy of Sciences (MTA) *L. Szarka (Hungarian Academy of Science-MTA)*	Slides
Astroparticle Physics research in Hungary *Z. Frei (Eötvös Loránd University-ELTE)*	Slides
Astroparticle Physics and High Energy Physics at KFKI RMKI *P. Lévai (Research Institute for Particle and Nuclear Physics-RMKI)*	Slides
The ATOMKI nuclear astrophysics programme *G. Gyürky (Institute of Nuclear Research of the Hungarian Academy of Sciences-ATOMKI)*	Slides
Nuclear Reactions and their Astrophysical Relevance *E. Somorjai (ATOMKI)*	Slides
Future plans in gravitation research: The Hungarian participation in the Einstein Telescope *I. Rácz (RMKI)*	Slides
Gravitation: theory and recent experiments in Hungary (the VIRGO participation) *M. Vasúth (RMKI)*	Slides
LIGO participation in Hungary: The Budapest-Szeged-Debrecen Collaboration *P. Raffai (ELTE)*	Slides
High Energy Astrophysics and Space Physics in Hungary *Z. Bagoly (ELTE)*	Slides

Polish National Days, 21 April 2009, Warsaw

On April 22nd Aspera celebrated its 14th National Day in the city of Warsaw, where the Polish funding system for Science, and Astroparticle Physics (ApP) activities in the country were presented to an audience of about 30 people.

Science in Poland is mainly funded through the Ministry of Science and Higher Education (MNiSW), which provides the institutional budget for the different participants in research and opens competitive calls for research projects. The main participants include institutes of the Academy of Science (PAN), Higher Education Institutions (Universities) and R&D centres, which implies the existence of hundreds of groups, both public and private. The follow-up and evaluation of strategic programmes is performed by the National Centre for Research and Development (NCBiR) which is the Polish contractor in Aspera.

The Polish funding system is in the process of some changes in order to accommodate the Lisbon strategy. One of these changes will be the creation of a specific agency for basic research (NCN). Another independent funding body is the Polish Science Foundation (FNP), which is a private foundation. A wide variety of programmes are implemented like grants for graduate students, PhDs, foreign researchers or teams, prestigious awards, or support for technology transfer.

Poland is very active in most of the subtopics of Astroparticle Physics, well in alignment with the Aspera roadmap. Almost 100 Polish physicists from different institutions (Copernicus Astronomical Center of PAN in Warsaw, Institute of Nuclear Physics IFJ-PAN in Krakow, the Andrzed Soltan Institute IPJ in Lodz, …) and Universities (Warsaw, Krakow, Katovice, Lodz, Torun, Wroclaw, …) are involved in theory and in experiments devoted to: neutrino physics (Icarus, Borexino, Gerda), Gamma Ray physics (Magic, Hess, CTA and the interesting Polish project 'Pi of the sky'), Cosmic Ray physics (Kaskade-Grande, Lopes, Jem-Euso) and Dark Matter searches (Warp, Osqar). It is worth mentioning also the outreach 'Roland Maze' project (Polish representative in Eurocosmics). Besides, Poland hosts the SUNLAB, an underground site which is a firm candidate for the LAGUNA project.

Welcome to NCBIR *NCBiR Director/Deputy*	
Purpose of ASPERA & National Day *S. Katsanevas (ASPERA-1 Coordinator), T. Berghöfer (ASPERA-1 Deputy-coordinator)*	
The Polish research and funding landscape *MNiSW/NCBiR representative*	Slides
MNiSW funding *MNiSW representative*	Slides
NCBiR funding and NCN – new funding agency for fundamental science *NCBiR representative*	Slides
FNP funding *FNP representative*	Slides
Panel Discussion *Theme: The Polish Funding System*	
Astroparticle Physics in Poland *S. Pokorski (University of Warsaw, Polish representative in ApPEC)*	Slides
Organization of Polish ATP Community 2006-8 *M. Krawczyk (University of Warsaw)*	Slides
Theoretical network "Particles-Astrophysics-Cosmology" *Z. Lalak/ K. Meissner (University of Warsaw)*	Slides

High Energy Physics *A. F. Żarnecki (University of Warsaw)*	Slides
Polish Neutrino network *J. Sobczyk (University of Wroclaw)*	Slides
Cosmic Rays *J. Zabierowski (IPJ, Łódź)*	Slides
High Energy Astrophysics *M. Ostrowski (Jagiellonian U., Cracow, Polish leader in FP7 CTA PP project)*	Slides
Search for dark matter *A. Zalewska (INP PAN, Cracow, Polish leader in FP7 LAGUNA PP project)*	Slides
Concluding remarks and discussion *S. Katsanevas (ASPERA-1 Coordinator), T. Berghöfer (ASPERA-1 Deputy-coordinator)*	

Romanian National Days, 16-17 October 2008, Bucharest

During 16th-17th October 2008 ASPERA celebrated its 12th National Day in the city of Bucharest, where the Romanian scientific funding system and Astroparticle Physics projects were presented to an audience of about 40 people.

In Romania science is mainly (80%) funded through the ANCS (National Authority for Scientific Research) which also acts as a monitoring, political and strategic body and under the **Ministry of Education, Research and Youth** (MECT).

Funding is structured mainly in **PN-II** (National Plan for Research, Development and Innovation for 2007-2013) which is the one most related to ApP. It includes 6 different programmes, similar to the FP7 ones. Research groups from institutes or universities can apply and compete for funding. In addition, there is also an institutional funding, covering about 30% of the entity's research budget.

Research is mainly performed at the institutes (of which the IFIN-HH is the largest Romanian R&D institute, in terms of personnel and assets, with around 700 people and 20 M€ in 2008 and ISS, with around 100 people and 3,3 M€ in 2008), and some university groups (**Bucarest University** and **Politechnique University of Bucarest**). Romania is very active in the field of cosmic rays (KASKADE-Grande, Lopes, radiodetection) and neutrino telescopes (Antares, KM3Net). It has also entered a network of underground labs with a very promising site (the Slanic lab). There are also theory groups and a project to construct a gamma ray Cherenkov telescope.

The event was opened by Alexandru Aldea, Vice-President of ANCS, followed by a presentation of what is ASPERA from Stavros Katsanevas. Talks were divided into two sessions.

The first one, dedicated to the funding system, hosted talks from the ANCS managers, the **IFIN-HH** Scientific Director and Directors from the Space Agency and the Institute of Space Science.

The second centred on physics presented the **ROASTROPART** consortium and the projects it covers with presentations from representatives of the IFIN-HH, ISS and the two universities in Bucarest (**UB** and **UPB**).

The event was complemented with a visit to the Slanic salt mine where the **IFIN-HH** has an underground facility for low background and cosmic ray studies. The site is considered in the **LAGUNA project** as a candidate for a multipurpose megaton detector.

Introduction *A. Aldea (Vice-President, National Authority for Scientific Research (ANCS))*	
Presentation of ASPERA *S. Katsanevas (ASPERA-1 Coordinator)*	
The Romanian national research, development and innovation system *R. Predescu*	Slides
The National Plan for Research, Development and Innovation - Capacities Programme *M. Alionte*	Slides
Romanian Space Program - Space Science Overview *M-I. Piso*	
Horia Hulubei Institite of Physics and Nuclear Engineering - present and future *I. Ursu*	Slides
Astoparticle physics at the Institue of Space Science *D. Hasegan*	
Cosmic radiation studies in IFIN-HH *I. Brancus (IFIN-HH)*	Slides
Romanian Underground Laboratory - present and future *R. Margineanu*	Slides
Probing Astroparticle Physics with space measurements: complementarity between ESA Cosmic Vision and ASPERA Roadmap *L. Popa*	Slides
Astroparticle experiments in ISS *V. Popa*	Slides
Towards Gamma Ray Astronomy in ISS *A. Radu*	Slides
Astroparticle Physics in the university of Bucharest *O. Sima*	Slides
The study of cosmic particles and radiations - a constant research interest in the Telecommunications Department of UPB *O. Fratu*	

6.3. Appendix C – Existing experiment: acronym, full name and website

Experiment Acronym	Experiment Name	Official website
Advanced LIGO	Advanced Laser Interferometer Gravitational-waves Observatory	http://www.ligo.caltech.edu/advLIGO/
AGILE	Astro-rivelatore Gamma a Immagini Leggero	http://agile.rm.iasf.cnr.it/
AMS-02	Alpha Magnetic Spectrometer Experiment	http://www.ams02.org/
ANAIS	Annual Modulation with NAI'S	http://www.unizar.es/lfnae/ipaginas/ip0400.html#manais
ANITA	Antatric Impulsive Transient Antenna	http://www.phys.hawaii.edu/~anita/web/index.htm
ANTARES	Astronomy with a Neutrino Telescope and Abyss environmental RESearch	http://antares.in2p3.fr/
ARA	Askaryan Radio Array	http://ara.physics.wisc.edu/
ArDM	Argon Dark Matter - Search for Dark Matter in the Universe with liquid Argon	http://neutrino.ethz.ch/ArDM
ARGO-YBJ	Astrophysical Radiation with Ground-based Observatory at YangBaJing	http://argo.na.infn.it/
Auger	Pierre Auger Observatory	http://www.auger.org/
AURIGA	Ultracryogenic Resonant Antenna for the Gravitational Astronomical Investigation	http://www.auriga.lnl.infn.it/
Baikal NT200	Lake Baikal Neutrino Telescope with 200 PMTs	http://baikalweb.jinr.ru/
BAO, BigBOSS	Baryon Acoustic Oscillations, BigBOSS: The Ground-Based Stage IV BAO Experiment	http://bigboss.lbl.gov/
BiPo	^{212}Bi^{212}Po detector, The BiPo Low-Background Detector Project	http://www-lsm.in2p3.fr/activites/phys_fondam/BiPo.htm
BOREXINO	BORon EXperiment	http://borex.lngs.infn.it/
CAST	CERN Axion Solar Telescope	http://www.cern.ch/CAST
CLOVER	C$_l$Obser VER	http://www-astro.physics.ox.ac.uk/research/expcosmology/groupclover.html

Table 20 - Existing ApP experiments: acronym, full name, and website (*to be continued*)

Experiment Acronym	Experiment Name	Official website
COBRA	Cadmium-Zinc-Telluride O-neutrino Double-Beta Research Apparatus	http://www.cobra-experiment.org/
CODALEMA	COsmic ray Detection Array with Logarithimic Electro Magnetic Antennas	http://codalema.in2p3.fr/
CREAM	Cosmic Ray Energetics And Mass	http://cosmicray.umd.edu/cream/cream.html
CRESST	Cryogenic Rare Event Search using Superconducting Thermometers	http://www.cresst.de/
CTA	The Cherenkov Telescope Array (CTA)	http://www.cta-observatory.org/
CTF	Counting Test Facility	http://www.infn.it/indexen.php
CUORE	Cryogenic Underground Observatory for Rare Events	http://crio.mib.infn.it/wig/Cuorepage/CUORE.php
DAMA/LIBRA	DArk MAtter/Large sodium Iodide Bulk for RAre processes	http://people.roma2.infn.it/~dama/web/home.html
DARWIN	DARk matter WImp search in Noble liquids	http://darwin.physik.uzh.ch/
DES	The Dark Energy Survey	https://www.darkenergysurvey.org
Double Chooz	Double Chooz	http://doublechooz.in2p3.fr/
DRIFT	Directional Recoil Identification From Tracks	http://www.hep.shef.ac.uk/research/dm/drift.php
DUAL-R&D	The DUAL detector of gravitational waves	http://www.dual.lnl.infn.it/
E.T	Einstein Telescope	http://www.et-gw.eu/
EDELWEISS-II	Expérience pour DEtecter Les WIMPs En Site Souterrain	http://edelweiss.in2p3.fr/
EUCLID	The new mission concept was called Euclid, honouring the Greek mathematician Euclid of Alexandria (~300 BC) who is considered as 'the father of geometry'.	http://sci.esa.int/science-e/www/object/index.cfm?fobjectid=42266
EURECA	European Underground Rare Event Calorimeter Array	http://www.eureca.ox.ac.uk/
EXO	Enriched Xenon Observatory	http://www-project.slac.stanford.edu/exo
FERMI	The FERMI Large Area Telescope	http://fermi.gsfc.nasa.gov/

Table 20 - *Continued…*

Experiment Acronym	Experiment Name	Official website
GAW	Gamma Air Watch	http://www.ifc.inaf.it/cgi-bin/INAF/pub.cgi?href=activities/gaw/index.html
GEO600	GEO 600	http://geo600.aei.mpg.de/
GERDA	GERmanium Detector Array	http://www.mpi-hd.mpg.de/gerda/
GLACIER	Giant Liquid Argon Charge Imaging ExpeRiment	http://neutrino.ethz.ch/GLACIER/
HESS	High Energy Stereoscopic System	http://www.mpi-hd.mpg.de/HESS
ICARUS	Imaging Cosmic And Rare Underground Signal	http://www1.na.infn.it/wsubnucl/cosm/icarus/eng/web/collaboration.htm
IceCube	IceCube	http://www.icecube.wisc.edu/
INTEGRAL	INTErnational Gamma-Ray Astrophysics Laboratory	www.isdc.unige.ch/integral/
JEM-EUSO	Japanese Experiment Module-Extreme Universe Space Observatory	http://euso.riken.go.jp/
KASCADE-Grande	KArlsruhe Shower Core and Array DEtector-Grande	http://www-ik.fzk.de/KASCADE-Grande
KATRIN	KArlsruhe TRItium Neutrino experiment	http://www-ik.fzk.de/katrin/
KM3NeT	one cubic kilometer Neutrino Telescope	http://www.km3net.org/
LAGUNA	Large Apparatus studying Grand Unification and Neutrino Astrophysics	http://www.hep.shef.ac.uk/research/laguna.php
LENA	Low Energy Neutrino Astronomy	http://archiv.e15.physik.tu-muenchen.de/research/lena.html
LIGO	Laser Interferometer Gravitational-waves Observatory	http://www.ligo.caltech.edu/advLIGO/
LISA	Laser Interferometer Space Antenna	http://www.rssd.esa.int/index.php?project=LISA&page=index
LISA-PF	Laser Interferometer Space Antenna-PathFinder	http://www.rssd.esa.int/index.php?project=LISAPATHFINDER&page=index
LOFAR	LOw Frequency ARray	http://www.lofar.org/
LOPES	small LOFAR PrototypE Station	http://www.astro.ru.nl/lopes/

Table 20 - *Continued…*

Experiment Acronym	Experiment Name	Official website
LSST	Large Synoptic Survey Telescope	http://www.lsst.org/
LUCIFER	Low-background Underground Cryogenics Installation For Elusive Rates	http://cordis.europa.eu/fetch?CALLER=FP7_PROJ_EN&ACTION=D&DOC=31&CAT=PROJ&QUERY=012af6094762:8700:2210d328&RCN=94007
LUX	Large Underground Xenon	http://lux.brown.edu/collaboration.html
LVD	Large Volume Detector	http://www.bo.infn.it/lvd/
MAGIC	Major Atmospheric Gamma-ray Imaging Cerenkov telescope	http://wwwmagic.mppmu.mpg.de/
MANITOP	Massive Neutrinos: Investigating their Theoretical Origin and Phenomenology	http://www.mpi-hd.mpg.de/manitop/
MARE1-2	Microcalorimeter Arrays for a Rhenium Experiment	http://mare.dfm.uninsubria.it/
MEMPHYS	MEgatonne Mass PHYSics	http://www-lsm.in2p3.fr/projets/grand_labo/grand_labo1.htm
MIMAC	MIcro-tpc MAtrix of Chambers	http://lpsc.in2p3.fr/mimac/index.html
MiniGRAIL	Mini Gravitational Radiation Antenna In Leiden	http://www.minigrail.nl/
NEMO	NEutrino Mediterranean Observatory	http://nemoweb.lns.infn.it/
NEMO-3	Neutrino Ettore Majorana Observatory 3	http://nemo.in2p3.fr/
NESTOR	Neutrino Extended Submarine Telescope with Oceanographic Research project	http://www.nestor.org.gr/
NEXT	Neutrino Experiment with a Xenon TPC	http://next.ific.uv.es/next/
NuMoon	ν off the Moon	http://www.rug.nl/kvi/research/astroparticlephysics/numoon/
PAMELA	Pay-load for Antimatter Matter Exploration and Light-nuclei Astrophysics	http://wizard.roma2.infn.it/pamela
PAU	The Physics of the Accelerating Universe	http://www.pausurvey.org/home-PAU.html
PEBS	Positron Electron Balloon Spectrometer	http://www1b.physik.rwth-aachen.de/~pebs/?PEBS_-_Positron_Electron_Balloon_Spectrometer
PICASSO	Project In CAnada to Search for Supersymmetric Objects Projet d'Identification de CAndidats Supersymétriques SOmbres	http://www.picassoexperiment.ca
PLANCK	PLANCK satellite	http://www.rssd.esa.int/index.php?project=Planck

Table 20 - *Continued…*

Experiment Acronym	Experiment Name	Official website
POLAR	Space-borne Gamma-ray burst POLARimeter	
PVLAS	Polarizzazione del Vuoto con LASer	http://www.ts.infn.it/experiments/pvlas
ROG	Ricerca Onde Gravitazionali	http://www.lnf.infn.it/esperimenti/rog
ROSEBUD	Rare Objects SEarch with Bolometers UndergrounD	http://www.unizar.es/lfnae/paginas/p0400.html#mrosebud
SIMPLE	Superheated Instrument for Massive ParticLe Experiments	http://lsbb.oca.eu/spip.php?article5
SNIF	SuperNova Integral Field spectrograph	http://snfactory.in2p3.fr/ ; http://snfactory.lbl.gov/
SNLS	The SuperNova Legacy Survey	http://cfht.hawaii.edu/SNLS/
SNO+	Sudbury Neutrino Observatory +	http://snoplus.phy.queensu.ca/Home.html
Super-Kamiokande	Super-Kamioka Nucleon Decay Experiments	http://www-sk.icrr.u-tokyo.ac.jp/sk/index-e.html
SuperNEMO	Super Neutrino Ettore Majorana Observatory	http://nemo.in2p3.fr/supernemo
SWIFT	Swift Gamma-Ray Burst Mission	http://www.nasa.gov/mission_pages/swift/main/index.html
TGV	Télescope Germanium Vertical	http://www-lsm.in2p3.fr/activites/phys_fondam/TGV.htm
TRACER	Transition Radiation Array for Cosmic Energetic Radiation	http://tracer.uchicago.edu/
T-REX	Novel developments in Time projection chambers (TPCs) for Rare event searches in Underground astroparticle EXperiments	http://lfna.unizar.es/lfna/index.php?lang=en
TUNKA	TUNKA EAS Cherenkov light array	http://dbserv.sinp.msu.ru/tunka
VERITAS	Very Energetic Radiation Imaging Telescope Array System	http://veritas.sao.arizona.edu/
VIRGO/EGO	VIRGO Gravitational Observatory/European Gravitational Observatory	http://www.virgo.infn.it/
WARP	Wimp ARgon Programme	http://warp.lngs.infn.it/
XENON	XENON Dark Matter Search Experiment	http://xenon.astro.columbia.edu/index.html
ZEPLIN III	ZonEd Proportional scintillation in LIquid Noble gases	http://www.hep.ph.ic.ac.uk/ZEPLIN-III-Project/

Table 20 - *Continued…*

6.4. Appendix D – Exchange rates

Country	Exchange rate* 31 December	
	2006	2009
CH	1,6069	1,48373
CZ	27,485	26,45510
HR		7,27059
HU		270,45473
PL		4,10155
RO		4,24635
SE	9,0404	10,26208
UK	0,6715	0,88645

Table 21 – Currencies exchange rates versus Euro.

* http://fr.exchange-rates.org/

6.5. Appendix E - List of acronyms

Table 22 contains the acronyms, in alphabetical order, used throughout the document.

Acronym	Explanation	Country
ADI	Innovation Agency	Portugal
AGP	Astronomy Grants Panels	United Kingdom
AM	Armenia	
ANCS	National Authority for Scientific Research	Romania
ANR	Agence Nationale de la Recherche	France
ApP	Astroparticle Physics	
ApPEC	Astroparticle Physics European Coordination	
AR	Argentina	
ASCR	Academy of Sciences of the Czech Republic	Czech Republic
ASI	Italian Space Agency	Italy
ASPERA	AStroparticle Physics ERA-NET	
ASTRON	Institute for Radio Astronomy	Netherlands (The)
ATOMKI	Institute of Nuclear Research	Hungary
AU	Australia	
BE	Belgium	
BELSPO	Belgian Federal Scientific Policy Office	Belgium
BMBF	Federal Ministry of Education and Research	Germany
BR	Brazil	
BU	Bulgaria	
BUL	Boulby Underground Laboratory	United Kingdom
CA	Canada	
CAN	Committee for Astroparticle Physics	Netherlands (The)
CC	Centre de Calcul, Villeurbanne	France
CCLRC	Council for the Central Laboratory of the Research Councils	United Kingdom
CDGPCYT	Government Commission for Science and Technology Policy	Spain
CEA	Commissariat à l'énergie atomique et aux énergies alternatives	France
CENTRA	Centro Multidisciplinar de Astrofísica	Portugal
CERN	European Organization for Nuclear Research	
CH	Switzerland	
CHF	Swiss Franc	
CHIPP	Swiss Institute of Particle Physics	Switzerland
CIEMAT	Centro de Investigaciones Energeticas Medioambientales y Technologicas	Spain
CN	China	
CNCSIS	National University Research Council	Romania
CNES	Centre National d'Études Spatiales	France
CNMP	National Centre for Programme management	Romania
CNR	National Research Council	Italy
CNRS	Centre National de la Recherche Scientifique	France
CR	Cosmic Rays	
CSF	Croatian Science Foundation	Croatia
CSIC	Consejo Superior de Investigaciones Cientificas	Spain
CSN	Scientific National Committee	Italy
CY	Cyprus	
CZ	Czech Republic	
CZK	Czech Krown	

DE	Germany	
DE	Dark Energy	
DESY	Deutsches Elektronensynchrotron	Germany
DFG	German Research Foundation	Germany
DGES	Direcção Geral do Ensino Superior	Portugal
DIUS	Department of Innovation, Universities and Skills	United Kingdom
DK	Denmark	
DLR	German Aerospace Centre	Germany
DM	Dark Matter	
DM-DE	Dark Matter-Dark Energy	
DSM	Direction des Sciences de la Matière	France
EGO	European Gravitational Observatory	Italy
ES	Spain	
ESA	European Space Agency	
ESO	European Southern Observatory	
ETH	Swiss Federal Institutes of Technology	
EU	European Union	
FCT	Fundação para a Ciência e Tecnologia	Portugal
FECYT	Spanish Science and Technology Foundation	Spain
FI	Finland	
FNRS	Fonds de la Recherche Scientifique, Agency of the French-speaking Community	Belgium
FOM	Foundation for fundamental research on Matter	Netherlands (The)
FR	France	
FRIA	Fonds pour la formation à la Recherche dans l'Industrie et l'Agriculture	Belgium
FTE	Full Time Equivalent	
FWO	Fonds Wetenschappelijk Onderzoek – Vlaanderen (FWO) – Research Foundation - Flanders (independent agency of the Flemish Government)	Belgium
GACR	Grant Agency of the Czech Republic	Czech Republic
GBAORD	Government budget appropriations or outlays on R&D	
GDP	Gross Domestic Product	
GERD	Gross Expenditures on Research and Development	
GR	Gamma Rays	
GR	Greece	
GSRT	General Secretariat for Research and Technology	Greece
GW	Gravitational Waves	
HCMR	Hellenic Centre for Marine Research	Greece
HECR	High Energy Cosmic Rays	
HECν	High Energy Cosmic Neutrinos	
HeγR	High Energy Gamma Rays	
HESS	High Energy Stereoscopic System	
HGF	Helmholtz Association of German Research Centres	Germany
HR	Croatia	
HU	Hungary	
IFIN-HH	IFIN-Horia Hulubei National Institute for Physics and Nuclear Engineering	Romania
IN2P3	Institut National de Physique Nucléaire et Physique des Particules	France
INAF	National Institute for Astrophysics	Italy
INFN	National Institute for Nuclear Physics	Italy
INSU	Institut National des Sciences de l'Univers	France

Irfu	Institut pour la recherche des lois fondamentales de l'univers	France
ISS	Institute of Space Sciences	Romania
IST	Instituto Superior Técnico	Portugal
IT	Italy	
IWT	Agentschap voor Innovatie door Wetenschap en Technologie Agency for Innovation by Science and Technology	Belgium
JP	Japan	
KAT	Komitee fuer Astroteilchenphysik	Germany
KAW	Knut and Alice Wallenberg Foundation	Sweden
KFKI-RMKI	KFKI Research Institute for Particle and Nuclear Physics	Hungary
KTIA	Research and Technology Innovation Fund	Hungary
KTT	Research and Science Policy Council	Hungary
KuTIT	Research and Technology Innovation Council	Hungary
KVI	Kernfysisch Versneller Instituut	Netherlands (The)
LEν&PD	Low Energy Neutrinos & Proton Decay	
LIP	Laboratório de Instrumentação e Física Experimental	Portugal
LMA	Laboratoire des Matériaux Avancés, Villeurbanne	France
LNGS	INFN-Laboratori Nazionali del Gran Sasso	Italy
LNS	Southern National Laboratory, Catania	Italy
LSC	Laboratorio Subteráneo de Canfranc	Spain
LSM	Laboratoire Souterrain de Modane	France
MCTES	Ministry of Science, Technology and Higher Education	Portugal
ME	Mexico	
MEC	Ministry of Education and Science	Spain
MEC	Ministry of Education Research and Innovation	Romania
MECS	Ministry	Greece
MEI	Ministry for Economy and Innovation	Portugal
MESR	Ministère de l'Enseignement Supérieur et de la Recherche	France
MEYS	Ministry of Education, Youth and Sports	Czech Republic
MICINN	Ministry of Science and Innovation	Spain
MITYC	Ministry of Industry, Tourism and Trade	Spain
MIUR	Ministry for Instruction, Universities and Research	Italy
MoSES	Ministry of Science Education and Sports	Croatia
MPG	Max Planck Society	Germany
MSHE	Ministry of Science and Higher Education	Poland
MTA	Hungarian Academy of Science	Hungary
MX	Mexico	
NA	Namibia	
NCBiR	Narodowe Centrum Badań I Rozwoju	Poland
NCN	Narodowe Centrum Nauki	Poland
NCSR-Demokritos	National Centre for Scientific Research Demokritos, Institute of Nuclear Physics	Greece
ND	National Day	
NEMO	NEutrino Mediterranean Observatory	Italy
NFU	National Development Agency	Hungary
NIH	National Innovation Office	Hungary
Nikhef	FOM Institute for subatomic physics	Netherlands (The)
NKTH	National Office for Research and Technology	Hungary
NL	Netherlands (The)	
νMass	Neutrino mass	

NOA-NESTOR	National Observatory of Athens-NESTOR Institute for Asptroparticle Physics	Greece
NOVA	The Netherlands Research School for Astronomy	Netherlands (The)
NSRF	National Strategic Reference Framework	
NU_HE	High Energy Neutrinos	
NU_LE	Low Energy Neutrinos	
NWO	National organisation for scientific research	Netherlands (The)
NZ	New Zealand	
OC&W	Ministry of Education, Culture and Science	Netherlands (The)
OKTA	Hungarian Scientific Research Fund	Hungary
ORM	Observatorio del Roque de los Muchachos	Spain
PI	Principal Investigator	
PL	Poland	
PRIN	Research Projects of National Interest	Italy
PT	Portugal	
PT-DESY	Projektträger DESY	Germany
R&D	Research and Development	
R&D&I	Research, Development and Innovation	
RAL	Rutherford Appleton Laboratory	United Kingdom
RO	Romania	
RPI	Research Public Institution	
RU	Russia	
SE	Sweden	
SI	Slovenia	
SNF	Swiss National Science Foundation	Switzerland
SNSB	Swedish National Space Board	Sweden
SRON	Netherlands Institute for Space Research	Netherlands (The)
SSAA	Swiss Society for Astrophysics and Astronomy	Switzerland
SSER	State Secretariat for Education and Research	Switzerland
STFC	Science and Technology Facilities Council	United Kingdom
UA	Ukraine	
UK	United Kingdom	
UKF	Unity through knowledge Fund	Croatia
UMIC	Agência para a Sociedade do Conhecimento	Portugal
UMR	Unité Mixte de Recherche (Joint Research Unit)	France
US	United States of America	
VR	Vetenskapsrådet Research Council	Sweden
ZA	South Africa	

Table 22 – List of acronyms used throughout the document in alphabetical order.