NuPNET

ERA-NET for Nuclear Physics Infrastructures
202914

Call: FP7-Infrastructures-2007-1
Funding Scheme: CSA (Co-ordination and Support Action)

D2.1 Census of Existing Funding Programmes

Due date of deliverable: m16 (June 30, 2009)
Actual submission date: m17

Start date of project: March 1, 2008 Duration: 36 months

Organisation name of lead contractor for this deliverable:
PROJEKTTRÄGER DES BUNDESMINISTERIUMS FÜR BILDUNG UND FORSCHUNG FÜR HADRONEN- UND KERNPHYSIK, GSI ("PT-GSI")

Revision [draft 1]

Project co-funded by the European Commission within the Seventh Framework Programme (2007-2013)		
Dissemination Level		
PU	Public	
PP	Restricted to other programme participants (including the Commission Services)	X
RE	Restricted to a group specified by the consortium (including the Commission Services)	
CO	Confidential, only for members of the consortium (including the Commission Services)	

Project No.:	202914
Project Acronym:	**NuPNET**
Project Title:	ERA-NET for Nuclear Physics Infrastructures

Deliverable Number:	**D2.1**
Title:	**Census of Existing Funding Programmes**
Workpackage:	WP2
Task:	2.2
Task Title:	Census of present EU nuclear physics agents and resources
Task Leader:	PT-GSI

Due date:	30/06/2009
Actual submission date:	24/07/2009

Organisation name(s) of lead contractor for this deliverable:
PT-GSI – Projektträger des Bundesministeriums für Bildung und Forschung für Hadronen- und Kernphysik, GSI

Prepared by the authors of D2.1:	PT-GSI: I. Reinhard (WP2 Leader), E. Stork
Contributions received from:	All 18 NuPNET member institutions (cf. Appendix1) and NuPECC

Viewed by:	NuPNET Co-ordinator: S. Galès
Approved by:	NuPNET Consortium
Date of Approval:	July 23, 2009 – via email

Nature:	Report
Revision:	v1

Deliverable D2.1 Census of Existing Funding Programmes

CONTENTS

CONTENTS

LIST of TABLES

1. EXECUTIVE SUMMARY
-Census of Existing Funding Programmes-

NuPNET has performed a survey of the structure of the funding systems in their member countries, i.e. of the actors in nuclear physics research, of national strategic planning, resources for nuclear physics and international collaborations. This document is the first report of WP2, Task 2, of NuPNET. It is Deliverable D2.1, “Census of Existing Funding Programmes”. The main findings of the report are as follows:

- Nuclear physics has developed into an international and largely collaborative field. International cooperation in nuclear physics is characterised by many types of international collaborations:
  - Membership in international laboratories and organisations.
  - Many large and multilateral international project collaborations.
  - Free and open access to research facilities, in part supported through the EU transnational access (TNA) programmes.
  - Collaboration through EU projects (including EU TNA programmes).
  - Many bi- (or few-) lateral agreements / contracts / MoUs.
  - More individual scientific exchanges.

- Many international collaborations centre on major national and European nuclear physics research facilities, such as CERN, GANIL, GSI, INFN or JYFL (in alphabetical order). Recently, special effort has been put into designing two new large-scale international facilities in Europe, FAIR and SPIRAL2. Both have been recommended for construction by ESFRI and are in the process of being realised. In addition to novel accelerators, they include large experiment facilities such as CBM, NUSTAR and PANDA (at FAIR), S3, NFS and EXOGAM2 (at SPIRAL2) and AGATA, which is intended to be used at FAIR, GANIL and INFN-LNL as a “travelling γ-ray detector”.

- National strategy plans exist in almost all countries: In countries with stronger physics communities plans exist often together with neutrino physics and particle and astro-particle physics ("sub-atomic physics"); in other countries plans exist for all sciences. In a few cases specific plans for nuclear physics have been prepared by national scientific communities.

- The tendency of preparing national roadmaps is actually quite recent and must be considered in the context of various approaches to international planning and priority setting on European and global scale (European programmes, ESFRI, NuPECC, IUPAP, OECD-NP-WG).

- The nuclear physics community size in the NuPNET countries is found to consist of approximately 4,000 physicists and 1,700 technicians + engineers and thus forms more than 90% of the total European nuclear physics community, which is about ~4,300 scientists and 1,750 technicians + engineers according to the NuPECC 2006 survey.

- The nuclear physics budget in 2007 in the NuPNET countries is approximately 540 Mio. €

- It is important to keep in mind the national differences in the definition of nuclear physics and its boundaries (particularly regarding neutrino physics and other interfaces with particle and astro-particle physics).

This survey of nuclear physics in Europe will provide the basis for developing the plans in subsequent NuPNET workpackages how best to promote the field in Europe in the future.

2. INTRODUCTION

Nuclear physics (NP) research has a long tradition. European collaboration in nuclear physics was strengthened in 1988 by the foundation of **NuPECC (Nuclear Physics European Collaboration Committee),** an Expert Committee of the ESF (European Science Foundation). NuPECC has since played a crucial role in providing an independent view on the direction of nuclear physics in Europe, in the form of periodic Forward Looks (Long-Range Plans). Over a number of years, NuPECC has gained the respect of the European nuclear physics community, and its authority is now recognised by the EU Commission, the national Funding Agencies and, most recently, by ESFRI (European Strategic Forum for Research Infrastructures).
In addition to the science vision given by NuPECC, the EU framework programmes (from 4th to the 7th) and instruments (Round table, Networks, IAs / I3s, Design Studies, preparatory Phase funding) have been adopted with considerable success by the nuclear physics community and therefore have played a decisive role in establishing joint European projects .
Today within Europe the challenge is to form an even **stronger** and more **cohesive** research activity which is truly European in scope. The current funding procedures where groups are funded by separate national funding agencies that reflect national priorities have to be given an additional strategic direction to help align some of the national decisions to common pan-European goals.

The goal of the **ERA-NET NuPNET** is to do this in a stepwise approach. In the first step, the major goal is to compare research and funding systems in participating funding agencies and to provide a Census of Resources and Agents in Nuclear Physics and Infrastructures that paves the way to common decisions. This goal is being pursued in workpackage 2, in particular in Task 2.2.

To this end, a census has been carried out by collecting and updating information on present European nuclear physics resources, including institutions, personnel, existing programmes, financing, equipment and access to infrastructures. Furthermore, national assets in inter-European and intercontinental multi-lateral actions, bodies and infrastructures, concentrating on information related to nuclear physics research infrastructures have been taken into account. This census will be an essential input for the development of the Funding Plan for joint activities in WP3, Task 3.1.

The information was collected via questionnaires filled in by all participating member institutions (cf. Appendix 1) and through the organisation of Open Days relating to nuclear physics research funding. Three Open Day sessions were organised in partner countries, where the funding agencies of the host country and 3-4 other NuPNET member countries presented their nuclear physics funding structure. In parallel, a questionnaire was sent out to all agencies requesting information about the funding systems in their countries. This information was used together with the information obtained during the Open Days to prepare this report. In addition, the progress of the work has been monitored by the NuPNET Co-ordination Committee. Once the collected information was transposed into tables and summarised in concluding paragraphs, all NuPNET members were asked to check the conclusions to ensure that the report properly reflects the situation in their country.

In Chapter 3 of this document the methods used to collect the data are described in more detail.
In Chapter 4 - 10 the results extracted from the data are summarised by subject in separate tables. This includes an overview of the resources available for nuclear physics research in the various countries in 2007. These chapters also give a description of the similarities and differences found among the partner agencies in NuPNET.

3. METHODS:
Open Days & Questionnaire

Within the overall organisation of NuPNET, the work presented here was discussed and planned at the NuPNET kick-off meeting and the regular meetings of the NuPNET Co-ordination Committee. The philosophy and organisation of the NuPNET Open Days and the questionnaire are described in the next two subsections. Based on the presentations at the Open Days and the answers to the questionnaires, some additional questions were formulated and others were reformulated to clarify the issues at stake. A preliminary version of this report was circulated among the NuPNET funding agencies and presented at the third session of the Open Days with the intention of ensuring that a good and properly verified picture is obtained of the funding situation for nuclear physics research in each country.

3.1 Open Days

Three Open Days were organised. These events took the form of a 1 or 2 day workshop, where presentations were given by the host country and several additional countries on the structure and organisation of funding in nuclear physics in the corresponding country. The attendance was limited to people invited by the consortium. The dates of the workshops were spread over a period of 1 year, as can be seen from Table 3.1.

Open Days Session	Presenting Countries	Date	Place	Organiser
1	BG, GR, HU, RO	08 September 2008	Athens, GR	NCSR "Demokritos", for GSRT
2	BE, CZ, DE, FI, NL	30 / 31 October 2008	Darmstadt , DE	PT-GSI
3	ES, FR, IT, PL, UK	12 / 13 May 2009	Milan, IT	INFN

Table 3.1: *Dates and places of the three Open Days organised by NuPNET, where presentations were given by the host and several additional countries to give detailed information about the structure and organisation of funding of nuclear physics in each country.*

Programme overviews of the Open Days are listed in Appendix 2. Every Open Day started with a short introduction by the NuPNET co-ordinator on the status and issues of NuPNET in general and the Open Days in particular. Typically, representatives of ministries, funding agencies, institutes and scientific representative bodies of the nuclear physics community of the host country were present. At the end of each Open Day an overview of the status of the questionnaire analysis was given and issues at stake discussed. The presentations given at the various Open Days will be provided on the NuPNET website.

The Open Days were a great success. The presentations illustrated in a thorough manner the diversity and complexity of the various national funding systems. Five general observations applied to all Open Days:

- 80-90% of the member countries / institutions were represented at each meeting.
- Thus the meetings were efficiently used also to present and discuss general issues of the project.
- The meetings also served as a unique occasion for all nuclear physics stakeholders to come together and thus further strengthen the potential for European collaboration.
- Funding systems are dynamic and often subject to change.
- European collaboration received unanimous support.

3.2 Questionnaires

A detailed questionnaire was sent to all member institutions of NuPNET. In a first round, a trial version of the questionnaire was distributed only to those four agencies that belong to the Co-ordination Committee. This provided a good response to most questions. In a second run, a revised version was sent to all 18 NuPNET participants. The responses received were different in length and depth. As a result, some of the questions were modified, some added and guidelines were provided for the funding agencies to clarify the requested level of detail. In this report the results of this round, that included high quality answers from all countries, were used.

The main topics of the questionnaire were the following:

- Brief general overview of the complete research system used in your country.
- Who are the actors in nuclear physics research in your country?
- Do strategic plans for nuclear physics research exist in your country?
- Define or describe the nuclear physics domain in your country.
- Describe and quantify nuclear physics funding across the various agencies.
- Personnel.
- International Collaboration.

Each topic was subdivided into several questions to obtain detailed information.

The order of the countries in the next sections is alphabetical according to the 2-letter abbreviation used by the International Organisation for Standardisation (ISO) as international country codes.

Country Code	Country
BE	Belgium
BG	Bulgaria
CZ	Czech Republic
DE	Germany
ES	Spain
FI	Finland
FR	France
GR	Greece
HU	Hungary
IT	Italy
NL	The Netherlands
PL	Poland
RO	Romania
UK	United Kingdom

In some cases, depending on the structure of the funding system it appeared more appropriate to provide the information by agency. This was the case in particular for the two Belgian regions, the Flemish (BE Vla) and the French speaking (BE Fr) part, and for the two major French research institutions acting here as funding agencies for nuclear physics, FR IN2P3 and FR CEA.

4. ACTORS IN NUCLEAR PHYSICS

In most European countries nuclear physics research is traditionally carried out by public bodies (universities, research facilities and other labs) and is funded through ministries and other funding agencies. Table 4.1 gives an overview of the ministries, funding agencies, and advisory committees related to nuclear physics as well as committees formally representing the nuclear physics scientific community in NuPNET. In several countries major research performing organisations (RPO) act also as funding agencies (FA).

A more detailed description of structures, organisation, etc. and the connection of these bodies will be given in the second deliverable of WP2: D2.2. "Compilation of the results of the questionnaire".

Country	Ministries	Funding Agencies (FA)	FA also RPO	Advisory Committees	Scientific Community Representation
BE	Belgian Federal Science Policy Office (BELSPO)	BELSPO		Intl. peer reviewing	
		(Fr): FRS-FNRS (positions, grants)			
		(Fr): FRIA (PhD grants)			
		(Vla): FWO-Vlaanderen		Board of directors -> E5 Committee "Sub-atomic Physics"	
BG	Ministry of Education and Science (MES)	MES		Expert body for physics; scientific councils	
		BAS	x		
		BNRA			
CZ	Ministry of Education, Youth and Sports (MEYS)	MEYS		Intl. peer reviewing for projects	
		GACR			
		ASCR	x		
		SF ASCR			
DE	Bundesministerium für Bildung und Forschung (BMBF); Länder	BMBF, Länder		Wissenschaftsrat (for LSF, all sciences) (gov. appointed committee)	KHuK (committee elected by community)
		PT-GSI		NP Science Committee (for NP projects) (BMBF appointed)	
		DFG		elected panel of experts (Fachgutachter DFG)	
		HGF	x	Intl. peer reviewing	
		MPG	x	Panel of experts (Fachbeirat MPI)	
ES	Ministerio de Ciencia e Innovación (MICINN)	MICINN		NP-experts in particle physics panel	Spanish Nuclear Physics Network
		Ministries of Autonomous Regions			
		CSN			
		CSIC	x		
		CIEMAT	x		
FI	Ministry of Education; Ministry of Employment and Economy	Ministry of Education		Intl. advisory boards for large projects	
		Ministry of Employment and Economy			
		Academy of Finland			
		[TEKES: in general industry related]			
FR	Ministère de l'Enseignement supérieur et de la Recherche; Ministère de l'Industrie, Ministère de la Défense	ANR		Discipline-oriented expert committee	
		IN2P3 / CNRS	x	Intl. Scientific Councils	National elected (CNRS) committee
		CEA	x	Intl. Visitors Committee of IRFU; Intl. Scientific & Technological Committee of NP Division	Directors

Country	Ministries	Funding Agencies (FA)	FA also RPO	Advisory Committees	Scientific Community Representation
GR	Ministry of Development (MD); Ministry of National Education (MNE)	MD: GRST		The National Council for Research and Technology	No
		MNE			
HU	Ministry of Education & Culture	OTKA			
		HAS	x		
		NKTH			
IT	Ministry for Universities and Research (MUR)	INFN	x	CVI: Intl. Science Committee appointed by INFN president and management	CSN3: committee elected by community
NL	Ministry of Education, Culture and Science (OCW)	OCW		Discipline-oriented research councils; discipline-oriented ad hoc committees for (personnel) grants	
		NWO	x		
		FOM	x		
PL	Ministry of Science and Higher Education (MSHE)	MSHE		NP Committee, advisory board of National Atomic Energy Agency	(Polish Nuclear Physics Network)
		NAEA			
		NCBiR			
		New (to be established in 2009): NCN			
RO	Ministry of Education, Research and Innovation	ANCS		Scientific advisory boards at: National University Research Council (CNCSIS), National Centre for Programme Management (CNMP)	
		Romanian Academy			
		Other Ministries			
UK	Department for Business, Innovation, and Skills (DBIS)	STFC (main agency since 2007)	x	Nuclear Physics Grants Panel (NPGP); Project Peer Review Panel (PPRP); PP, Astronomy & NP Science Committee (PPAN); NP Advisory Panel (NPAP)	Heads of Groups Committee; Nuclear Physics Forum http://nuclear1.paisley.ac.uk/npf/
		EPSRC (main agency until 2007)			
		SFC, SUPA		SUPA Advisory Committee (AC)	SUPA Nuclear & Plasma Physics Theme

Table 4.1: *Major actors in nuclear physics funding (ministries, funding agencies (FA) and advisory committees related to nuclear physics) and bodies officially representing the national scientific nuclear physics community. In several countries, research performing organisation (RPO) act as funding agency (FA), too. All abbreviations can be found in Appendix 4.*

Country	Research Facilities	Universities and other organisations
BE	CRC	Universities BE Fr: Brussels, Louvain la Neuve, Liège, Mons, Namur
		Universities BE Vla: Leuven, Gent
BG	INRNE	Universities: Sofia, Plovdiv, Shumen; Nuclear reactor (Reconstruction), Electron accelerator
CZ	NPI ASCR	Universities: Charles Univ. Prague, Czech Technical Univ. Prague, Silesian Univ. Opava
DE	GSI, FZJ-COSY, DESY-HERMES, Garching-MLL, FRM-II, S-DALINAC, Köln-TANDEM, MAMI, ELSA, MPI-K Heidelberg	Universities: Berlin (FU, HU), Bochum, Bonn, Clausthal, Darmstadt, Dresden, Erlangen-Nürnberg, Frankfurt, Giessen, Hamburg, Heidelberg, Köln, Leipzig, Mainz, München (TU, LMU), Münster, Regensburg, Tübingen
ES	CNA, CMAM	Universities: UA-Barcelona, UA-Madrid, Barcelona, UC-Madrid, Cantabria, Granada, Huelva, UI-Baleares, Extremadura, UP-Cataluña, Salamanca, Santiago de Compostela, Sevilla, Valencia
FI	JYFL-Acc. Lab, HYFL-Accelerator Lab	Universities: Jyväskylä, Helsinki, Turku, Helsinki Institute of Physics (HIP)
FR	AIFIRA (CENBG, Gradignan); ARRONAX (CNRS, Nantes, Ecole des Mines); GANIL; IPNL Van de Graaff; ILL; Tandem/ALTO (IPNO), ARAMIS-JANNUS (CSNSM Orsay)	Universities and Labs (JRUs): Ecole des Mines, Ecole polytechnique, ENSICAEN, Bordeaux, Caen, Clermont-Ferrand, Strasbourg, Grenoble, Lyon, Orsay
GR	NCSR Demokritos: INP, INTRP	Universities: NTU Athens, NCU Athens, AU Thessaloniki, Ioannina
HU	ATOMKI, Institute of Isotopes, RMKI	Universities: Debrecen, Pecs, Eötvös Roland (ELTE), TU Budapest
IT	INFN: LNL, LNF, LNS; LNGS; ECT*	Universities with INFN links: Trento, Trieste, Udine, Bari, Bologna, Catania, Ferrara, Genova, Firenze, Napoli (Fed), Padova, Messina, Milano, Pavia, Camerino-Perugia, Pisa, Rome (Sap), Rome (Verg), Torino
NL	KVI	Universities: Free University Amsterdam (VUA, Nikhef), Utrecht, Groningen, Nijmegen
PL	HIL-Warsaw, IFJ PAN (Krakow), Andrzej Soltan Institute of Nuclear Studies (Otwock-Swierk)	Universities: JU Krakow, Warsaw, TU Warsaw, AMM Krakow, Wroclaw, Kielce, Lodz, Silesia, Lublin
RO	IFIN-HH (Bucharest), Institute for Nuclear Research (Pitesti)	Universities: Bucharest (U, PTU), Targoviste
UK		STFC Daresbury Lab; Universities: Birmingham, Brighton, Edinburgh, Glasgow, Liverpool, Manchester, Surrey, Sussex, West of Scotland, York

Table 4.2: *Nuclear physics research facilities, universities and other organisations active in performing nuclear physics research. Please note that only facilities and institutions located in the NuPNET countries are listed here. A more detailed list of the research facilities can be found in Appendix 3.*

Table 4.2 provides an overview of the research facilities, universities and other labs active in nuclear physics in the NuPNET countries. A list of the facilities in column 2 with numbers of users and specific parameters is provided in Appendix 3. The third column lists universities and other organisations active in nuclear physics.

It is interesting to note here that a good third of the 90 research facilities listed in the IUPAP WG.9 report (http://www.jlab.org/~sbrown/Handbook_rev3.pdf) and distributed over 26 countries worldwide, are based in Europe. Out of these nearly all (28) are placed in countries that are members of NuPNET. To complete the picture the inter-governmental organisations CERN, located in Switzerland, and JINR, located in Russia, should be mentioned.

Moreover, more than 100 universities located in the 14 NuPNET member countries and about ten additional national laboratories that were not listed in the IUPAP report are involved in nuclear physics research.

Nuclear physics research requires accelerators from the lowest energies of several MeV/u up to hundreds of GeV/u to address the broad field of nuclear science and its applications (*). This includes both lepton and hadron beam facilities. At low and intermediate energies, nuclear structure and nuclear astrophysics can be studied whereas at the higher energies, the structure and spectroscopy of strongly interacting particles (hadrons) and the quark-gluon plasma state of matter are being investigated. The complexity of the systems studied requires the use of various probes including exotic ones (antiprotons and radioactive particles) and thus several complementary facilities are necessary to acquire the information needed to obtain a full description of the physics involved.

The scale of the listed research facilities ranges from small university-based, through medium sized national laboratories, to a small number of facilities that effectively operate as international research centres. Whilst the major facilities lead the field and need a high level of investment in order to address key scientific questions, medium-sized and small-scale facilities also play a vital role. They provide a cost-effective way of addressing some of the open questions when maximum beam energy or intensity is not required. They also provide the essential training ground where junior scientists acquire research skills.

(*) A description of the field can be found in the NuPECC Long Range Plan published in 2004: http://www.nupecc.org/pub/lrp03/long_range_plan_2004.pdf or in the 2008 report of the OECD nuclear physics working group: http://www.oecd.org/dataoecd/35/41/40638321.pdf

5. NATIONAL & INTERNATIONAL PLANNING AND PRIORITY SETTING

In most countries, strategic plans are available describing the future perspective of nuclear physics research. In table 5.1 the availability of these plans and relevant URLs are listed, together with the last date (year) when a report was produced as well as the typical period of updates and the time span covered. In the second column the organisations or bodies responsible for the national planning are listed. The third column gives a brief description of the fields covered by the strategic plan.

	National Planning & Roadmaps						
Country	Responsible for National Planning	Competition with other fields?	Roadmap or other planning	Roadmap available at	Publ. date (Update)	Time span	Roadmap includes prioritisation?
BE	FRWB (advice to federal gov.)	All sciences	Not avail.	None			n.a.
	VRWB (Vla) -> ad-hoc working group	All sciences	"Big Science" programme (only Vla.)	http://www.vrwb.be/MFiles/070104%20advies%20108%20def.pdf (Belgian)	2006		Yes
BG	Ministry of Education and Science	All sciences	Available after the discussion and adoption by parliament	http://www.minedu.government.bg/opencms/opencms/left_menu/documentsproject/2008/proekt_strategia_nauka-2008-2.pdf (Bulgarian)	2008 (Update acc. to priority & funds)		Yes
CZ	Research and Development Council	All sciences (very general)	National research and development policy of the Czech Republic	http://www.vyzkum.cz/FrontClanek.aspx?idsekce=1020	2000	8yrs	No
DE	BMBF -> Wissenschaftsrat	All sciences	Wissenschaftsrat-Report on LSF	http://www.wissenschaftsrat.de/texte/5385-02.pdf (complete version)	2002 (~10yrs)		
				http://www.wissenschaftsrat.de/presse/pm_2002.htm (press release)	2002		
	KHuK	NP only	KHuK Long Range Plan	http://ikpp30.ikp.kfa-juelich.de/khuk/dokumente/nhpg2002.pdf	2002 (~5yrs?)		Yes
ES	CPAN	PP, APP	National Centre for PP, APP and NP (CPAN)	http://www.i-cpan.es/doc/memoria-2fase_CPAN_2007.pdf	2007	5yrs	Yes
	FECYT	Space science	Estrategia Nacional de Ciencia y Tecnología Ejercicio de Prospectiva a 2020	http://sise.fecyt.es/sise-public-web/cargarArchivo.do?id=89 (Spanish)	2007	~12yrs	No
	MICINN	Space science	National Roadmap for Scientific Infrastructures	http://web.micinn.es/files/2008-folletook.pdf (Spanish)	2008		Yes
FI	Centre of Excellence in NP and Accelerator Based Physics, JYFL	All sciences	Strategic plan for NP	http://www.tsv.fi/tik/laaja_englanti_PDF.pdf	2009 (~10yr)		In a way
	Academy of Finland	Other fields of physics	Academy policy lines	http://www.aka.fi/en-gb/A/Academy-of-Finland/Academy-Policy-Lines/	2006 (1yr)	8yrs	Not easy to extract
	All universities	All sciences	Annual university reports	http://www.jyu.fi/science/laitokset/fysiikka/en/info/ann_reports/ (example for JYFL)	2008 (1yr)		In a way

Country	Responsible for National Planning	Competition with other fields?	Roadmap or other planning	Roadmap available at	Publ. date (Update)	Time span	Roadmap includes prioritisation?
FR	CNRS/IN2P3 & CEA/DSM-IRFU	APP, HEP, nu-P, AP (CEA only)	Nation-wide: French Minister of Higher Education and Research For NP in particular: CNRS/IN2P3 & CEA-DSM-IRFU	Booklet: "From Quarks to Cosmos" http://www.in2p3.fr/actions/publications/media/prospectiveuk_2005.pdf	2005 (5yrs)	10yrs	Yes
GR	National Research & Technology Council / GSRT	All sciences (very general)	Strategic Plan for Research, Technology and Innovation	http://www.gsrt.gr/default.asp?FILE=items/5838/149	(No)	6yrs	Yes, in thematic areas.
HU	National Office for Research and Technology	All sciences (very general)	Science, Technology and Innovation strategy (2007-2013) and Implementation Plan of gov.	http://www.nkth.gov.hu/english/science-technology-and-national-development	2003	6yrs	
IT	INFN	APP, PP	INFN 3-years plan 2008-2010	www.infn.it (under "INFN Headquarters -> documenti", Italian)	2006 (3-4yrs)	3yrs	Yes
NL	FOM	All fields of physics	FOM Strategic Plan	http://www.fom.nl/live/overfom/missie_strategie/strategisch_plan.pag (Dutch)	2004 (5-6yrs)	6yrs	Yes
PL	Ministry of Science and Higher Education	All sciences	Strategy for Research Development in Poland up to the year 2015	http://www.nauka.gov.pl (Polish)		7yrs	
	Nuclear Physics Committee, advisory board of the NAEA		Long Range Plan for Nuclear Physics 2008-2016	http://www.paa.gov.pl/dokumenty/strategia_rozwoju_atomistyki.pdf (Polish)	2006	8yrs	
	Ministry of Science and Higher Education	All sciences	National Programme of Research and Development (draft)	http://www.bip.nauka.gov.pl/bipmein/ (Polish)			
RO	ANCS	All sciences (very general)	2nd National RTDI Plan 2007-2013 (PNII)	http://www.mct.ro/img/files_up/1188313586PN2%20eng.pdf	2007 (2yrs)	6yrs	No
UK	STFC	PP, APP, Astronomy	STFC Programmatic Review	http://www.stfc.ac.uk/STFCConsultation/sources/PPANRep.pdf	2008 (2yrs)	3yrs	Yes
	STFC	Covers whole remit of STFC	STFC Delivery Plan	http://www.stfc.ac.uk/resources/pdf/delplan_07.pdf	2007 (3yrs)	3yrs	
	STFC (in prep.)	PP, APP, Astronomy	STFC-Roadmap	In prep.			

Table 5.1: *National planning relevant to nuclear physics*

Most strategic plans are incorporated in a wider strategy either together with neutrino physics, particle physics and astro-particle physics ("sub-atomic physics"), or for all of physics research if not for all of science. In Germany and Poland separate plans exist for nuclear physics prepared by the respective scientific communities, the German nuclear physics community's representative body KHuK and the Polish Nuclear Physics Committee.

It should be noted that the tendency of preparing national roadmaps is actually quite recent and must be considered in the context of various approaches to international planning and priority setting on the European and indeed global scale. As nuclear physics research infrastructures (accelerators, research reactors as well as detectors) have been increasing in size and cost throughout the discipline's history, international planning and co-ordination have become more and more important, because they help make informed national decisions in an international context and optimise the use of available resources. In many cases, the preparation of national plans has actually been triggered in Europe by the ESFRI process, which is described below.

Indeed, several approaches to international planning already exist on the European and global scale. Organisations such as NuPECC, the CERN Council, ESFRI and special EU- programmes promote collaboration in nuclear physics in Europe whereas IUPAP and the OECD-GSF act on the global scale.

The structures and roles of these organisations differ. They may be classified in two categories:

(1) Inter-governmental activities in international planning and priority setting
at the European and global level:

The oldest inter-governmental organisation dedicated to cooperation in nuclear physics is **CERN**, the European Organisation for Nuclear Research, established in 1954. Nowadays, it has a strong focus on elementary particle physics, but its mandate and experimental programmes still encompass facilities and experiments in nuclear physics, such as the ISOLDE facility, the COMPASS experimental setup at the SPS and the ALICE detector at LHC. In 1956, the Joint Institute of Nuclear Research (**JINR**) was established in Dubna, near Moscow, with member states from the former Soviet Union, Eastern Europe and other overseas communist states. Nowadays, JINR is mostly used by researchers from member states, with some involvement of other European as well as non-European countries on a bilateral level.

Since the late 1980s, special **EU-programmes** were introduced to offer support to research infrastructure related projects (across all fields of science) such as Integrated Infrastructure Initiatives (I3s comprising transnational access, R&D and networking) in the 6th Framework Programme (FP6) and Integrating Activities (IAs, same as I3s) in the 7th Framework Programme (FP7); Design Studies (DS), Construction of New Infrastructures (CNI). Examples in nuclear physics are the EURONS and HadronPhysics I3s, the HadronPhysics2 IA, Design Studies for FAIR and EURISOL, a FAIR CNI project in FP6 and Preparatory Phase funding for FAIR and SPIRAL2 in FP7. Whereas so far all of these projects have been handled in a pure bottom-up approach, the Construction of New Infrastructure projects in FP7 are matched by a top-down approach by linking such projects to the recently developed ESFRI roadmap (first edition 2006, update December 2008). Only projects listed there are eligible for EU support in the CNI-programme.

These *research facility oriented* programmes are complemented by the European Research Council (ERC, launched in 2007) programmes, a new approach to support *bottom-up, investigator-driven* research.

In 2002 the European Strategy Forum for Research Infrastructures (**ESFRI**) was formed, composed of delegates from 27 national research ministries and one representative of the European Commission. In 2006, the ESFRI Roadmap identified 35 priority research infrastructure projects of pan-European dimension for the next decades. These projects span a very broad scientific spectrum, including the social, life, energy, environmental, and materials sciences.

There are two nuclear physics infrastructures on the roadmap: FAIR and SPIRAL2. Whilst decisions on financial contributions from countries to any of the projects on the ESFRI Roadmap will continue to be taken at the national level, this roadmap is helpful for the principal decision of participation.

In addition, the **OECD Working Group on Nuclear Physics** should be mentioned, which was set up by the Megascience Forum (MSF) for the period 1996-1999 and by the Global Science Forum (GSF) for the period 2006-2008. This time-limited effort, bringing together all of the stakeholders at the global level (representatives of major funding agencies, advisory bodies, and the inter-governmental and non-governmental organisations), has been a venue for discussions about future directions and requirements of nuclear physics in a truly international and global context.

(2) Activities in international planning and priority setting
undertaken by non-governmental organisations on the European and global level

The oldest organisations that are dedicated to fostering collaboration are the International Union for Pure and Applied Physics (**IUPAP**) and its Nuclear Physics Commission C12 (one of 19 Commissions spanning all the subfields of physics). IUPAP sponsors and supports conferences but not research programmes and facilities. To complement the work of the Commissions, working groups have been established to deal with cross-disciplinary issues and to promote international co-ordination of programmes and facilities. These groups include the International Committee on Future Accelerators (ICFA) and the Working Group on International Cooperation in Nuclear Physics (WG.9).

WG.9, whose membership includes the chairs of NSAC and NuPECC (described below) and representatives of the major nuclear physics laboratories world-wide, has an IUPAP mandate to provide a landscape of key science issues and future directions in nuclear physics, to organise and provide expert advice for governmental or inter-governmental organisations, and to encourage co-ordination of facility construction worldwide. However, WG9 is not formally connected to any funding agency or governmental body and works strictly in an advisory capacity.

To foster cooperation in nuclear physics in Europe, the Nuclear Physics European Collaboration Committee (**NuPECC**) was formed in 1988. It was originally a board established by the science community and delegates from the major nuclear physics facilities in Europe. It is now a formal Expert Committee of the European Science Foundation (ESF), and its members are appointed by ESF at the recommendation of the participating national funding agencies / research councils. The long range plans developed by NuPECC for Europe, together with the long range plans developed by NSAC (Nuclear Science Advisory Committee) for the U.S., and ANPhA (Asian Nuclear Physics Association) for Asia in the future, establish a reference frame for nuclear physics research worldwide.

The ERA-NET programme of the European Commission is a relatively new initiative of the European Commission, which supports and strengthens the networking of funding agencies in specific fields of science. The present ERA-NET NuPNET not only aims at providing a forum for discussion and information exchange among funding agencies but also at establishing tools for implementing and funding joint activities at the European level in collaboration with NuPECC.

6. NUCLEAR PHYSICS SUBFIELDS & BOUNDARIES

A useful starting point to define the scope of nuclear physics activity in Europe is the list of topics in the recent NuPECC Long Range Plan 2004, copies of which can be downloaded from the NuPECC website http://www.nupecc.org . These Topics are:

1. Quantum Chromodynamics
2. Phases of Nuclear Matter
3. Nuclear Structure
4. Nuclei in the Universe
5. Fundamental Interactions
6. Accelerator R&D
7. Applications of Nuclear Science

This definition has been adopted by NuPNET.

However, whereas Nuclear Structure and Nuclei in the Universe are quite unanimously traditional core fields of nuclear physics some other topics or some subfields of these topics are not always considered nuclear physics. In particular, the following areas are often allocated in other fields of science such as atomic physics, particle physics / high-energy physics, astro-particle physics or astrophysics:

1. Quantum Chromodynamics (QCD)
2. Phases of Nuclear Matter / Quark Gluon Plasma (QGP)
3. Neutrino Physics
4. Fundamental Interactions
5. Applications of nuclear science in other fields of science

Table 6.1 shows which of the NuPECC topics each country is actively participating in – independently of whether this field is actually considered nuclear physics by the respective funding agency.

Table 6.2 provides an overview of whether the abovementioned areas are actually considered nuclear physics or which other field they are attributed to in the respective country/agency. Conversely, there can be special cases where projects not typically considered nuclear physics are counted as nuclear physics by a funding agency.

These national differences in the definition of nuclear physics and its boundaries must be kept in mind when considering any numbers concerning budgets or the size of the community.

As can be seen from table 6.1 all NuPNET countries are involved in applications of nuclear science in other fields, such as energy, environment, medicine / biology, archaeology / art and materials science. Most nuclear physics research facilities have an application programme. These programmes typically correspond to 10-20% of the programme of nuclear physics facilities.

Table 6.3 provides an overview of which nuclear physics applications are supported by the various funding agencies, either for R&D (R) or service (S).

Country	NuPECC Topics						
	1	2	3	4	5	6	7
	QCD	***QGP***	***Nuclear Structure***	***Nuclei in Universe***	***Fundamental Interactions***	***Accelerator R&D***	***Appli-cations***
BE Fr	x		x	x	x		x
BE Vla			x	x	x		x
BG			x			x	x
CZ	x	x	x	x	x	x	x
DE	x	x	x	x	x	x	x
ES	x	x	x	x	x	x	x
FI	x	x	x	x	x	x	x
FR IN2P3	x	x	x	x	x	x	x
FR CEA	x	x	x	x	x	x	x
GR	x	x	x	x		x	x
HU	x	x	x	x	x		x
IT	x	x	x	x	x	x	x
NL	x	x	x	x	x	x	x
PL	x	x	x	x	x	x	x
RO	x	x	x	x	x	x	x
UK	x	x	x	x	x	(x*)	x

Table 6.1: *NuPECC topics each country is actively participating in – independently of whether this field is actually considered nuclear physics by the respective funding agency.*

*In principle STFC supports accelerator R&D nuclear physics, but so far no projects in this area have been funded.

Field:	**Quantum Chromo-dynamics**	**Phases of Nuclear Matter /QGP**	**Neutrino-Physics**	**Funda-mental Inter-actions**	**Others**	**Other special cases**	**What does your country precisely consider under Fundamental Interactions?**
Country	**If a country/agency does not consider a field as Nuclear Physics, the field is listed under:**						
BE Fr		PP	PP, NP	PP			Neutrino, QCD, …
BE Vla			PP				
BG	PP		PP	PP			
CZ			In part APP				
DE - BMBF &PT			APP		R&D on Ion-Beam appl. yes, applications itself separately	BABAR, usually PP, is counted as NP	Experiments concerning antihydrogen, tests of special relativity theory, neutron life time measurements, ...
DE - DFG	*No Distinction between NP, AP, APP, PP*						
DE - HGF					*Ion-Beam appl. considered separately*		
ES		NP, PP	PP				Neutrino physics and double β-decay are not considered as nuclear physics.
FI	PP	PP	Partially considered PP		*Ion-Beam appl. not considered NP*		Definition is same as in the NuPECC long-range plan. On-going research: Theory related to 2β-decay, CKM-unitarity via mass- and β-decay experiments.

Field:	**Quantum Chromo-dynamics**	**Phases of Nuclear Matter /QGP**	**Neutrino-Physics**	**Funda-mental Inter-actions**	**Others**	**Other special cases**	**What does your country precisely consider under Fundamental Interactions?**
Country	**If a country/agency does not consider a field as Nuclear Physics, the field is listed under:**						
FR IN2P3			APP	PP			Antiproton Physics, neutron lifetime, dipole moment and high precision measurements, tests of special relativity theory...
FR CEA			AP, APP, PP				
GR	PP in general	PP in general	Mostly APP	NOT considered NP			The fields as described in the last NuPECC Long range plan
HU	PP		PP	PP			
IT			APP	PP			Experiments with antihydrogen, tests of fundamental symmetries and principles
NL		PP, NP	PP, NP, APP				Low-energy searches for physics beyond the Standard Model: tests of Electric Dipole Moments, β-ν correlations, parity violation
PL	COMPASS considered PP; NP, PP	PP	APP	PP, NP			Neutrinoless β-decay is considered as NP
RO							Neutrino Physics
UK	High energy QCD considered PP/ Low energy QCD considered NP	(ALICE used to be PP, now NP)	APP, PP		Laser plasma physics in general considered AtP		In NP: lattice QCD, chiral perturbation theory, reaction theory, beyond mean field calculations. APP: areas such as gravity and neutrinoless 2β-decay. PP: topics such as baryon number violation, lepton number / flavour violation, CKM matrix, electric dipole moments.

Table 6.2: *Nuclear physics (NP) intersections with neighbouring fields such as particle physics /high energy physics (PP), atomic physics (AtP), astro-particle physics (APP) or astrophysics (AP)*

Country	Nuclear Physics Applications in the fields of:					
	Energy	*Environment*	*Medicine / Biology*	*Archaeology, Art*	*Materials Science**	*Others*
BE Fr	S	S		S		
BE Vla	R/S		R/S		R/S	
BG	R	R/S			R/S	
CZ	R	R/S	R/S	S	S	
DE	R	R/S	R/S	R/S	R/S	
ES	R	R/S	R	S	R/S	
FI			R/S		R/S	
FR IN2P3	R	R/S	R	R	R/S	
FR CEA	R/S	R/S	R		R/S	
GR	R/S	R/S	R/S	R/S	R/S	
HU	R/S	R/S	R/S	R/S	R/S	
IT	R	R	R/S	R/S	R/S	
NL			R/S		R/S	
PL		R/S	R			
RO		R/S	R/S	R/S	R/S	
UK	R		R/S	S		Homeland security

Table 6.3: *R&D (R) and service (S) for applications carried out at nuclear physics facilities and/or supported by nuclear physics funding agencies.*

* This includes also materials science R&D (R) and service (S) relating to space research.

7. NUCLEAR PHYSICS BUDGET IN 2007

The agencies were asked to complete two tables with details on their institutional funding and project funding. "Institutional funding" refers to budgets of the whole institute / facility, or membership contributions (if applicable) to international institutions, but excluding the CERN membership contribution (see below). It is usually provided on a long-term basis and does not basically depend on individual grant applications, even if its volume may well depend on the results of evaluations. Project funding refers to budgets for individual projects, which depend on the success of individual proposals.

Table 7.1 gives an overview of the total national nuclear physics budget in each country and in addition EU funds or funds from other sources. The amounts in the table are in Mio. € and reflect a best estimate of the 2007 budget.

Country	National Funding Sources *(Other sources, apart from EU, if applicable)*	Total Instit. Funding (national sources)	Total Project Funding (national sources)	Total National Funding	Total EU Funding in 2007 from FP6 & FP7	Funding from other Sources	Total Funding per Country
		A	B	C = A + B	D	E	F = C + D + E
BE Fr*	FNRS-FRIA, BELSPO, Min Higher Education, IISN	0.7	2.5	3.2	0.24		7.8
BE Vla*	BELSPO, FWO, universities	0.8	3.6	4.4			
BG**	BAS, MES, BNRA, PHARE; (*Other Src.*: US DOE**)	0.8	6.0	6.8	0.01	US DOE: ~39	6.8 + ~39
CZ	MEYS, CU, GACR, ASCR, SFASCR, MFA	4.0	1.3	5.3	0.07		5.4
DE***	BMBF, Länder, HGF, DFG	~170.0	~30.0	~200.0	6.40	n.a.	~210.0
ES	CSIC, CIEMAT, MICINN, Autonomous Regions, CSN	17.2	3.8	21.0	0.25		21.2
FI	Uni. Jyv., Uni. Hel., AF, HIP, Ministry, (commercial services)	4.0	1.3	5.3	0.41	Commercial services: ~0.5	6.2
FR IN2P3 ****	CNRS/IN2P3	13.9	56.5	70.4	2.54		90.0
FR CEA ****	CEA	15.0	2.1	17.1			
GR	GSRT + Min Education	2.3	0.0	2.3	0.01		2.3
HU	HAS, OTKA, NKTH, universities	2.6	0.5	3.1	0.03		3.1
IT	INFN, universities, ministry	52.5	12.3	64.8	1.81		66.6
NL	FOM-NWO, MECS, Uni. Groningen, Utrecht, Amsterdam,	8.0	1.6	9.7	0.25	GSI, EURATOM, SenterNovem, commercial services: 1.3	11.2
PL	MSHE, NCBiR, NAEA	12.5	2.0	14.5	0.26		14.8
RO	ANCS	6.0	13.5	19.5	0.10		19.6
UK	STFC, SFC, SUPA	0.0	11.7	11.7	0.53		12.2
Sum		310.3	148.7	**459**	**12.9**	40.8	515

Table 7.1: *Nuclear physics funding in 2007. All numbers are in* ***Mio. €****. The numbers for institutional funding do NOT include the CERN membership contribution. The EU-funds given here include the following projects, in FP6: FAIR-CNI, FAIR-DS, EURISOL-DS, EURONS-I3, and HadronPhysics-I3; in FP7: FAIR-PP, SPIRAL2-PP. The total EU contributions at the start of each project were used to calculate the 2007 only budget allocation (cf. tables 10.14, 10.15). It should be noted that the two FP7 projects only started during the course of 2007 and thus contribute only a minor fraction to the EU funds in 2007.*

*BE: Project funding includes all non-university personnel. Estimated costs for personnel at universities are given as institutional funding. The EU funding for the considered projects concerns only CRC (BE Fr)
**BG: For reconstruction of nuclear reactor: 50 Mio. USD (~39 Mio. €)
***DE: Institutional funding includes HGF funds for the preparation of FAIR , but not for FAIR start version
****FR: Funding for IN2P3 and CEA includes the budget for SPIRAL2. The EU funding for the considered projects concerns IN2P3, CEA and GANIL

The numbers for the total national funding sum up to about **459 Mio. €**, NOT including the nuclear physics part of the CERN membership contribution. Even though it should be noted that, depending on the respective funding system, the distinction between institutional funding and project funding is not always clear (also permanent staff in some countries is accounted to project funds), it may be noted that a substantial fraction of national funding is provided through individual projects, in many countries even the bulk part. It should be remarked also that budgets related to nuclear physics research facilities are mostly given as full costs whereas university related budgets often are provided without overheads such as costs for office space, heating, etc.

In addition the European Commission has provided about **13 Mio. €** in 2007 to NuPNET countries for nuclear physics projects. For this estimate the following projects running in 2007 were taken into account

- FP6: Design Studies for FAIR and EURISOL, FAIR CNI, EURONS-I3 and HadronPhysics-I3
- FP7: FAIR-PP and SPIRAL2-PP (HadronPhysics2-IA only started in 2009)

and their 2007-budget allocations summed up.

With the total CERN contribution in 2007 of the NuPNET countries summing up to 889 Mio. CHF (542 Mio. €; about 87% of the total CERN Contribution) and assuming that a fraction of about 12.7% (*) is for nuclear physics, this results in a nuclear physics related CERN contribution of about **69 Mio. €** by the NuPNET countries.
(* For this estimate a sixth of the full cost of LHC (including operation of the LHC and its pre-accelerators and all related infrastructure services) is counted for ALICE; the dedicated cost for the low and medium energy facilities COMPASS, ISOLDE and n-TOF have been taken into account.)

Thus the total nuclear physics budget of the NuPNET countries including the nuclear physics CERN contribution and the EU contribution sums up to approximately **540 Mio. €** as shown in table 7.2. (In addition, in some cases also non-European funding is available, see table 7.1). This is estimated to be the major part (> 90%) of the total European nuclear physics budget.

Nuclear Physics Budget in NuPNET Countries	**in Mio. €**
Total National Budgets (NOT Including CERN contribution)	459
EU Funds (for core NP projects, as listed above)	13
NP part of CERN contribution	69
Total	**540**

Table 7.2: *Overview of the total nuclear physics budget of the NuPNET countries (without non-European funding)*

The accuracy of the figures above is estimated to be on the level of 10%. It should be kept in mind that there are considerable differences between countries with respect to where the boundaries are drawn between nuclear physics and related fields such as particle physics, neutrino physics, astrophysics, and astro-particle physics as well as fields of applications.

8. SCIENTIFIC PERSONNEL IN NUCLEAR PHYSICS

Since a survey on personnel has been performed by NuPECC in 2006 (*), the NuPNET member institutions were asked to check the numbers indicated and to update them if necessary.
Table 8.1 provides an overview of the number of PhD students and physicists in fixed term or tenured posts. The community size in NuPNET countries totals to about 4,000 nuclear physicists not including undergraduate students plus approximately 1,750 technicians and engineers.

Country	PhD Students	Physicists Fixed Term	Physicists Tenured	Total Physicists	Technicians / Engineers	Comparison with NuPECC survey 06	Estimated ratio of female / total researchers
BE	58	37	38	133	21	Updated	15-33%
BG	3	21	28	52	9	Updated	30%
CZ	19	40	16	75	12	Updated	15%
DE	440	330	330	1,100	500	Updated *	10%
ES	61	35	119	215	15	Updated	35%
FI	61	35	24	120	25	Updated	20%
FR IN2P3	92	21	301	414	466	Updated	30%
FR CEA	12	12	50	74	100	Updated	25%
GR	10	10	35	55	15	Updated	33%
HU	14	14	59	87	26	As in NuPECC	13%
IT	70	204	354	628	295	Updated	30%
NL	42	5	31	78	55	As in NuPECC	21% (40% for PhD Students)
PL	150	88	203	441	109	Updated	15-20%
RO	99	28	213	340	85	As in NuPECC	36%
UK	112	53	63	228	31	As in NuPECC	10%
Sum	1,236	939	1,858	**4,032**	**1,759**	**5,791**	
	30.7%	23.3%	46.1%	**Total Physicists**	**Support**	**Total with Support**	

Table: 8.1: *Nuclear physics workforce*

* DE: Numbers still refer to 2006/2007.

It should be noted that despite some changes in individual countries the total size of the nuclear physics community has remained approximately constant in the NuPNET member countries over the past couple of years. In comparison to the NuPECC survey, the community size in the NuPNET countries forms more than 90% of the total nuclear physics community.

The ratio of female scientists to the total number of researchers varies between 10-40%. In general this ratio is larger in the more southern countries like Bulgaria, Spain, Greece, Italy, Romania, where it is 25% or higher. This is the case also for France and Belgium. In the other countries it varies from about 10% to just barely above 20%.

Please note that the nuclear physicists' workforce is split about half and half between research institutions and universities.

(*) http://www.nupecc.org/pub/survey2006.pdf

The results of the survey above should be interpreted with some caution. The accuracy of the figures given is estimated to be on the level of 10%. Funding mechanisms and employment practices differ greatly between different countries. The classification of engineers, technicians, and researchers can vary, too. There are also considerable differences between countries as to where the boundaries are drawn between nuclear physics and related fields such as neutrino physics, particle physics, astrophysics and applications. Finally, there are some differences in the way support staff and facility operations staff are counted.

9. PERSONNEL COST PER SCIENTIST CATEGORY

The personnel costs per scientist category are important figures to compare between countries when in the process of requesting support from any funding agency. The most common scientist categories are as listed in table 9.1.

	Levels at Universities	Levels at non-university organisations
PhD	PhD Student	PhD Student
Post-doc	Post-doc	Post-doc
Assistant	Assistant Professor	Junior Researcher
Associate	Associate Professor	Senior Researcher
Professor	Full Professor *	Director of Research *

Table 9.1: *Description of various academic research levels*

*Not including top level functions like dean or director general or similar

We are fully aware that each country has its own way of referring to personnel costs. Therefore, we provide in table 9.2 the employer's costs per scientist category, which includes the gross salary that a person finds on his/her contract and/or on his/her tax papers <u>plus</u> the additional costs to the employer for social security contributions and work-risk insurance that are not deducted from the employee's pay, but are paid by the employer. The percentage addition to basic pay is shown in the final column. These figures do not include overhead costs such as office space, heating etc.

In table 9.2, a cost range is given from the lowest starting position in the indicated function to the highest rank. The figures are given in k€ per year.

Country	Employer's full annual costs per scientist category (= employee's gross + employer's share for social security)					Employer's share for social security in % of employee's gross
	PhD	Post-doc	Assistant	Associate	Professor	
BE	33	51-80	60-95	71-108	79-122	5-35%
BG	4	not avail.	5-6	7	10	16.0%
CZ	6-9*	17	15-25	25-27	25-33	37.0%
DE	20*-37	50-63	60-75	65-90	75-140	15-40% (typically 25%)
ES	26-33	31-42	52-67	58-76	71-92	30.0%
FI	30-40	42-50	46-52	52-76	81-124	30.0%
FR IN2P3	33	47	55	79	107	Minimum 43.0%
FR CEA	34	50	60	84	100	45.0%
GR	11	22-25	34-42	42-54	48-72	20.0%
HU	10-12	13-14	13-14	18-21	27-29	29.0%
IT	12*	25*	50	71	92	41.0%
NL	32-44	50-61	52-84	82-98	100-144	16-20%
PL	6-8	8-13	11-24	18-28	21-37	20.0%
RO	7-9	9-12	12-15	13-16	15-18	33.0%
UK	14*	45	52	83	118	29.4%

Table 9.2: *Employer's cost range in k€ per year. This table shows the employer's actual full annual costs, which include the gross salary that an employee finds on his/her pay cheque plus the extra amount that the employer pays for social security and work-risk insurance (employer's charges). The percentage of these employer's charges relative to the employee's gross is given in the last column.*

*Grant or fellowship: no extra charges for employer

10. EXISTING INTERNATIONAL COLLABORATIONS

Since the 1960s, when accelerators started to become the key instruments of nuclear physics research, levels of collaboration evolved from small unstructured exchanges of ideas, progress reports, research goals, and independent (possibly co-ordinated) work on common research objectives to joint shorter-term studies and joint proposals, to longer-term joint R&D and research, to institutional collaborations on joint projects, and, most recently, to joint construction and operation of research facilities. Nuclear physics today is characterised by many types of international collaborations:

a) Membership in international laboratories
b) Many multilateral international project collaborations
c) Free and open access to research facilities, in part supported through the EU transnational access (TNA) programmes
d) Collaboration through EU projects (including EU TNA programmes)
e) Many bi- (or few-) lateral agreements / contracts / MoUs
f) Scientific exchanges on the level of collaborations between individuals

The agencies were asked to complete a table where they list major international cooperations in these different categories. The original tables will be provided on the NuPNET website. In this section the information regarding a), b), c) and if applicable e) has been sorted by laboratory.

Table 10.1 provides an overview of membership in the international laboratories CERN (Geneva) and JINR (Dubna). This table includes also information on membership in NuPECC, official participation in ECT* as well as the prospective membership in the international Facility for Antiproton and Ion Research FAIR.

Country	NuPECC Membership	CERN-Member-state	JINR-Member-state	ECT* Participation	FAIR-Partners
BE	Yes	Yes	No	Yes	No
BG	In prep.	Yes	Yes	Yes	Not yet
CZ	Yes	Yes	Yes	Yes	Not yet
DE	Yes	Yes	BC (Min)	Yes	Yes
ES	Yes	Yes	No	Yes	Yes
FI	Yes	Yes	No	Yes	Yes
FR	Yes	Yes	MoU	Yes	Yes
GR	Yes	Yes	No	No	Yes
HU	Yes	Yes	Treaty	Yes	No
IT	Yes	Yes	No	Yes	Yes
NL	Yes	Yes	No	Yes	No*
PL	Yes	Yes	Yes	Yes	Yes
RO	Yes	In prep.	Yes	Yes	Yes
UK	Yes	Yes	No	Yes	Yes

Table 10.1: *Membership in current and prospective membership in near-future international nuclear physics facilities as well as membership in NuPECC and official participation in ECT* (see also text above). The table includes also information on high-level contracts, treaties or MoUs between these laboratories and non-member countries.*
*The term "**FAIR partners**" refers to countries who have signed the FAIR MoU expressing their interest to participate in construction and operation of FAIR. A draft convention for the construction of FAIR has been prepared.*

*NL is not partner in FAIR but RuG-KVI and GSI have signed a bilateral contract in November 2005 regarding KVI participation in FAIR

Tables 10.2 – 10.13 provide collaboration overviews of participation in major nuclear physics projects or collaborations at **selected major facilities** (right part of table) as well as information regarding the more general framework of collaborations with institutions in the partner countries (left part of the table). In addition to CERN (table 10.2) and the near future international facilities FAIR (Facility for Antiproton and Ion Research, table 10.3) and SPIRAL2 (Système de Production d'Ions Radioactifs en Ligne 2, table 10.4) – both of which have recently been recommended for construction by ESFRI – those nuclear physics facilities that provide transnational access in the frame of the two FP6 Integrated Infrastructure Initiatives EURONS and HadronPhysics have been selected, provided they are still running and have an active nuclear physics programme. (The Belgian CRC facility as well as the Swedish TSL facility have in the meantime completely shifted their focus to applications and have therefore not been included here; also DESY- HERMES has been left out, since DESY has stopped operating HERA in summer 2007). These tables were crosschecked, completed and harmonised by representatives of these facilities.

Each of these tables includes -in the left part- information on the general framework of collaboration with the partner countries such as use of the facility through free and open access and bilateral (or few-lateral) agreements (MoUs, contracts or other) defining a general collaboration between laboratories as well as - in the right part - information about multilateral agreements (in this case usually MoUs) concerning collaborations around specific instruments. It should be noted that the multi-lateral collaborations described often include also institutions from non- NuPNET member countries, which are not listed in these tables.

In these tables the following abbreviations are generally used:

BA / BC:	Bilateral (or few-lateral) Agreement / Contract
CA:	Collaboration Agreement
MoU (Min):	Memorandum of Understanding signed on ministerial level
MoU:	Memorandum of Understanding signed by research institutions or universities
pp:	Participation in collaboration, possible or planned partner in multilateral MoU around the respective instrument
x:	Participation in collaboration without formal documents
Open access:	The infrastructure is open for free access (without costs) for users from outside own institute and country to perform experiments at the facility.

It should be noted that the terminology used for the various types of agreements does not per se provide an indication of the importance of the respective agreement. Whereas, contracts are usually only concluded when financial commitments are involved, bilateral (or few-lateral) agreements, common declarations and memoranda of understanding may or may not involve financial commitments. In addition, the topics may vary strongly, from very specific and time limited R&D work, collaboration on specific scientific issues to broader scientific themes and R&D issues or general programmes for the exchange of scientists, from rather loose forms of cooperation to very specific commitments in terms of investment and manpower. The intention here is to provide an overview of those agreements with partner countries that are of more general importance for the respective facility.

Concerning collaborations around instruments it should be noted that they very often form in the very early stages of projects (e.g. in the conceptual design phase or early R&D phase) without any formal commitments, and project partners enter into agreements at a later stage (e.g. in the R&D phase or typically before starting to actually build the instrument). There are also several longstanding collaborations without any formal agreement as well as collaborations where a MoU has been signed only by part of the collaboration. In the right part of these tables the entry "x" indicates participation in collaboration without signature of a MoU; "MoU" indicates that a multilateral MoU has been signed.

Country	CERN, Geneva, CH				
	General Framework of Collaboration	Collaborations around Instruments (Multilateral Agreements)			
	Member-state	ALICE (MoU)	COMPASS (MoU)	ISOLDE (MoU)	n-TOF (MoU)
BE	Yes			MoU	
BG	Yes				
CZ	Yes	MoU (Min)	MoU	MoU	MoU
DE	Yes	MoU (Min)	MoU	MoU	MoU
ES	Yes			MoU (Min)	MoU
FI	Yes	MoU		MoU	
FR	Yes	MoU	MoU	MoU	MoU
GR	Yes	MoU		MoU signature in prep.	MoU
HU	Yes	MoU			
IT	Yes	MoU	MoU	MoU	MoU
NL	Yes	MoU			
PL	Yes	MoU		MoU	
RO	In prep.	MoU		MoU	MoU
UK	Yes	MoU		MoU	

Table 10.2: *Membership in CERN and participation in major nuclear physics collaborations around running instruments.*

Country	FAIR, Darmstadt, DE					
	General Framework of Collaboration		Collaborations around Instruments (Multilateral Agreements if applicable)			
	FAIR-Partners	FP7-PP	CBM (I-MoU in prep)	PANDA (I-MoU in prep)	NUSTAR * (I-MoU signed / MoU in prep)	APPA** (various stages of I-MoU & MoU)
BE	No				I-MoU / pp	
BG	Not yet				pp	
CZ	Not yet		pp			pp
DE	Yes	Yes	pp	pp	I-MoU / pp	pp
ES	Yes	Yes		pp	I-MoU /pp	pp
FI	Yes	Yes			pp	pp
FR	Yes	Yes	pp	pp	pp	pp
GR	Yes				I-MoU / pp	pp
HU	No		pp			pp
IT	Yes	Yes		pp	I-MoU / pp	pp
NL	No***			pp	I-MoU / pp	pp
PL	Yes	Yes	pp	pp	I-MoU / pp	pp
RO	Yes	Yes	pp	pp	I-MoU / pp	pp
UK	Yes	Yes		pp	pp	pp

Table 10.3: *Prospective membership in FAIR and participation in major collaborations.*
*The term "**FAIR partners**" refers to countries which have signed the FAIR MoU expressing their interest to participate in construction and operation of FAIR. A draft convention for the construction of FAIR has been prepared. In total there are 16 FAIR-Partner countries.*
*"**FP7-PP**" refers to the Preparatory Phase project for FAIR in FP7.*
For the collaborations around the individual instruments there are usually two MoUs:
*"**I-MoU**" here stands for an interim MoU for the preparation phase and R&D, "**MoU**" for an MoU for building the respective instrument. The MoUs will be prepared when the respective technical design reports are finished. "**pp**" indicates participation in the respective collaboration and planned partnership in the MoUs.*

*NUSTAR contains a number of instruments: SFRS, R3B, EXL, ELISe, HISPEC/DESPEC, ILIMA, MATS/LASPEC; The interim MoU (I-MoU) has been signed by several partner institutes.
**APPA includes individual collaborations around a number of instruments: BIOPh/BIOMat, FLAIR, SPARC, WDM/HEDGgeHOB. For these, separate MoUs are being prepared. In some cases interim MoUs (I-MoU) have already been signed.
***See footnote Table 10.1

Country	SPIRAL2, Caen, FR										
	General Framework of Collaboration			Collaborations around Instruments (Multilateral Agreements if applicable)							
	FP7-PP	Bilateral Agreements	Remarks	S3 (MoU in prep)	EXOGAM2 (MoU in prep)	NFS (MoU in prep)	DESIR (MoU in prep)	FAZIA (MoU in prep)	GASPARD (MoU in prep)	ACTAR (MoU in prep)	PARIS (MoU in prep)
BE	Yes			pp		pp	pp				
BG	Yes	MoU INRNE					pp				pp
CZ	Yes	MoU in progress				pp					
DE	Yes	Common Declaration Min	Cooperation on FAIR & SPIRAL2	pp		pp	pp		pp	pp	pp
ES	Yes	MoU in progress					pp	pp	pp	pp	
FI				pp	pp		pp				
FR	Yes	MoU-IN2P3		pp	pp	pp	pp	pp	pp	pp	pp
GR											pp
HU	Yes				pp		pp		pp		pp
IT	Yes	MoU INFN		pp	pp		pp	pp	pp		pp
NL	Yes						pp		pp		pp
PL	Yes	MoU COPIN (consortium of Polish institutes)		pp	pp			pp	pp	pp	pp
RO	Yes	MoU IFIN				pp	pp	pp			
UK	Yes	MoU in progress		pp	pp	pp	pp		pp	pp	pp

Table 10.4: *General Framework of Collaboration and Participation in major SPIRAL2 collaborations. "**FP7-PP**" refers to the Preparatory Phase project for SPIRAL2 in FP7. The collaboration in this project focuses on equipment R&D; construction of experiments and detector design and testing. "**pp**" indicates participation in the respective collaboration around the individual instruments and possible partnership in the MoUs currently in preparation.*

Tables 10.5-10.12 are sorted in alphabetical order.

Country	FZJ-COSY, Jülich, DE							
	General Framework of collaboration			Collaborations around Instruments (Multilateral Agreements if applicable)				
	Users through Open Access	Bilateral Agreements	Remarks	ANKE	TOF	WASA	PAX	dEDM
BE	Yes						x	
BG	Yes					x		
CZ								
DE	Yes			x	x	x	x	x
ES								
FI								
FR	Yes		Accelerator Component					
GR								
HU	Yes		Accelerator Component					
IT	Yes			x	x		x	x
NL	Yes							x
PL	Yes	HGF/FZJ Cracow Univ IPN Cracow		x	x	x	x	
RO								
UK	Yes			x				

Table 10.5: *General Framework of Collaboration and participation in major nuclear physics collaborations around running instruments at COSY. "**x**" indicates participation in the respective collaboration around the individual instruments without formal documents. Users at COSY come from 73 institutes of 18 countries, out of which 9 are NuPNET member countries.*

Country	GANIL, Caen, FR						
	General Framework of Collaboration			Collaborations around Instruments (Multilateral Agreements if applicable)			
	Users through Open Access	Bilateral Agreements	Remarks	EXOGAM (MoU)	VAMOS (MoU)	LISE (MoU)	SPEG (MoU)
BE	Yes	MoU FNRS	Collaboration on neutron detection array DEMON				
BG	Yes	MoU		x			
CZ	Yes	MoU ASCR/IN2P3			x	MoU	MoU
DE	Yes	MoU GSI/ IN2P3/CEA	Exchange of scientists	MoU	x		
ES	Yes	MoU MICINN/IN2P3/ CEA		x	x		x
FI	Yes			MoU			
FR	Yes			MoU	x	x	x
GR	Yes						
HU	Yes			MoU			
IT	Yes	MoU INFN/IN2P3/ CEA		MoU	MoU		
NL	Yes					x	
PL	Yes	BA/ MoU GANIL-COPIN (consortium of Polish institutes)		x			
RO	Yes	MoU IFIN/ IN2P3/CEA	Nuclear structure studies (IN2P3), nuclear energy (CEA)	MoU			
UK	Yes	MoU STFC		MoU	MoU	MoU	

Table 10.6: *General Framework of Collaboration and participation in major nuclear physics collaborations around running instruments at GANIL. "**x**" indicates participation in the respective collaboration around the individual instruments without formal documents. In general, users at GANIL come from 100 institutes of 26 countries.*

Country	GSI, Darmstadt, DE											
	General Framework of Collaboration											
	Users through Open Access	Bilateral Agreements	Remarks	HADES (MoU)	RISING (MoU)	PRE-SPEC (MoU)	FOPI	ALADIN-LAND	FRS/ ESR	SHIP	SHIP-TRAP	TASCA
BE	Yes				MoU	x			x			
BG	Yes				x	MoU			x			
CZ	Yes			MoU								
DE	Yes			MoU	MoU	MoU	x	x	x	x	x	x
ES	Yes	CA-CSIC	FAIR R&D	MoU	MoU	MoU		x	x		x	
FI	Yes					MoU			x	x		x
FR	Yes	MoU IN2P3/CEA	Exchange of scientists	MoU	x	MoU	x	x	x			
GR	Yes				x	x			x			
HU	Yes				x	x	x	x				
IT	Yes	MoU INFN (LNL/LNS)	R&D for accelerator & instrumenta-tion; student exchange		MoU	MoU	x	x	x	x	x	
NL	Yes	BC RuG/KVI-GSI	FAIR R&D						x			
PL	Yes	MoUs / var. agreements: Krakow Univ, IFJ-PAN	FAIR R&D	MoU	MoU	MoU	x	x	x			
RO	Yes				x	MoU	x		x			
UK	Yes				MoU	MoU		x	x	x		x

Table 10.7: *General Framework of Collaboration and participation in major nuclear physics collaborations around running instruments at GSI. "**x**" indicates participation in the respective collaboration around the individual instruments without formal documents. In general, users at GSI come from more than 40 countries worldwide.*

Country	INFN LNL / LNS / LNF, IT									
	General Framework of Collaboration			Collaborations around Instruments (Multilateral Agreements if applicable)						
	Users through Open Access	Bilateral Agreements	Remarks	PRISMA-CLARA (MoU)	Garfield /8pilp	CHIMERA /MEDEA	MAGNEX	GASP	FINUDA	SIDD-HARTA
BE										
BG	Yes	BA								
CZ	Yes									
DE		MoU GSI	R&D for acc. & instrumenta-tion; student exchange	x			x	x	x	x
ES	Yes			x				x		
FI										
FR	Yes			x		x	x	x		
GR	Yes							x		
HU	Yes									
IT	Yes	MoU IN2P3/ CEA		MoU	x	x	x	x	x	x
NL										
PL	Yes			x	x	x	x	x		
RO	Yes	MoU		x		x	x	x		x
UK	Yes			MoU				x		

Table 10.8: *General Framework of Collaboration and participation in major nuclear physics collaborations around running instruments at INFN. LNS was not a transnational access facility in FP6 in either EURONS or HadronPhysics; however it is a part of the application of ENSAR as a TNA facility in FP7. "**x**" indicates participation in the respective collaboration around the individual instruments without formal documents. In general, users at INFN come also from several other European as well as non-European countries.*

Country	JYFL, Jyväskylä, FI						
	General Framework of Collaboration			Collaborations around Instruments (Multilateral Agreements if applicable)			
	Users through Open Access	Bilateral Agreements	Remarks	IGISOL *1	GREAT+ SAGE+LISA *2	RITU *3	JUROGAM (EoC)
BE	Yes						
BG	Yes						
CZ							
DE	Yes	BA		x	x	x	EoC
ES	Yes			x			
FI	Yes						
FR	Yes					x	EoC
GR	Yes						
HU	Yes						
IT	Yes						EoC
NL	Yes						
PL	Yes					x	x
RO	Yes						
UK	Yes	BA	Investment in instrumenta-tion	x	x	x	EoC

Table 10.9: *General Framework of Collaboration and participation in major nuclear physics collaborations around running instruments at JYFL. "**x**" indicates participation in the respective collaboration around the individual instruments without formal documents. In general, users at JYFL come from 35 institutes of 20 countries.*

EoC: Agreement via Euroball owners Committee to employ Euroball detectors at JYFL
*1 The collaboration concerns: DE/FURIOS: Joint development of a laser ion source with University Mainz and UK/Lasers: Use of Laser-spectroscopy facility at JYFL
*2 The collaboration concerns: Joint development of instrumentation for Recoil Decay Tagging (RDT) measurements
*3 The collaboration concerns: Cooperation in Spectroscopy of Super Heavy Elements (SHE) at RITU

Country	KVI, Groningen, NL						
	General Framework of Collaboration*			Collaborations around Instruments (Multilateral Agreements if applicable)			
	Users through Open Access*	Bilateral Agreements	Remarks	BBS / ESN (MoU)	BINA / SALAD (BAs)	TRIμP	EDEN (BAs)
BE	Yes			MoU		x	
BG							
CZ					x		
DE	Yes	BC RuG/KVI-GSI	FAIR R&D	MoU	x	x	
ES	Yes					x	
FI	Yes					x	
FR	Yes			MoU		x	BA
GR	Yes			x			
HU	Yes			MoU			
IT	Yes			MoU		x	x
NL	Yes			MoU	BA	x	BA
PL	Yes				BA	x	
RO							
UK	Yes			x			

Table 10.10: *General Framework of Collaboration and participation in major nuclear physics collaborations around running instruments at KVI. "**x**" indicates participation in the respective collaboration around the individual instruments without formal documents. Users at KVI come from 25 institutes of 15 countries, out of which 11 are NuPNET member countries.*

*Open access users in the period 2005-2008

Country	MAMI, Mainz, DE						
	General Framework of collaboration			Collaborations around Instruments (Multilateral Agreements if applicable)			
	Users through Open Access	Bilateral Agreements	Remarks	A1	A2	A4	X1
BE	Yes			x	x	x	
BG							
CZ							
DE	Yes			x	x		
ES	Yes			x			
FI							
FR	Yes			x	x	x	
GR	Yes			x			
HU							
IT	Yes			x	x		
NL	Yes					x	
PL							
RO	Yes						
UK	Yes			x	x		

Table 10.11: *General Framework of Collaboration and participation in major nuclear physics collaborations around running instruments at MAMI. "**x**" indicates participation in the respective collaboration around the individual instruments without formal documents. Users at MAMI come from 32 institutes of 17 countries, out of which only 8 are NuPNET member countries.*

Country	MAX-Lab, Lund, Sweden					
	General Framework of collaboration			Collaborations around Instruments (Multilateral Agreements if applicable)		
	Users through Open Access	Bilateral Agreements	Remarks	MAX I stretcher	Tagging spectrometers MT, ET	NaI cluster, BUNI, CATS, DIANA
BE						
BG						
CZ						
DE	Yes			x	x	
ES						
FI						
FR						
GR						
HU						
IT	Yes			x	x	
NL						
PL						
RO						
UK	Yes			x	x	x

Table 10.12: *General Framework of Collaboration and participation in major nuclear physics collaborations around running instruments at MAX-Lab. "**x**" indicates participation in the respective collaboration around the individual instruments without formal documents. Users at MAX-lab come from about 25 different institutes out of which only 4 institutes are from the NuPNET member countries.*

In addition to the plenitude of collaborations centring around instruments at the listed national and international facilities, one further collaboration should be mentioned in particular which is not linked to one specific facility, but is planned as a travelling instrument to be used at several facilities: AGATA (Advanced GAmma-ray Tracking Array), a next generation gamma detection array, has been developed by groups from many countries in a true European effort.

Table 10.13 provides an overview of the participation in the AGATA collaboration.

Country	AGATA (MoU 1 / MoU 2)
BE	
BG	MoU1+2
CZ	
DE	MoU1+2
ES	
FI	MoU1+2
FR	MoU1/ MoU2 signature in progress
GR	
HU	
IT	MoU1+2
NL	
PL	MoU1+2
RO	MoU1+2
UK	MoU1+2

Table 10.13: *Participation in the AGATA collaboration. The collaboration, consisting of institutions from 10 countries in total,* is *governed by two MoUs, the first one (**MoU1**) covering the R&D phase and the building of the demonstrator (this phase is now being completed), the second one (**MoU2**) which entered into force in 2008 covering the construction of one third of the* 4π*-array.*

Tables 10.14 and 10.15 provide overviews on the participation in the core nuclear physics projects of FP6 and FP7 in the programme area "Capacities / Research Infrastructures", i.e.

- FP6: Design Studies for FAIR and EURISOL, FAIR CNI, EURONS-I3 and HadronPhysics-I3
- FP7: FAIR-PP; SPIRAL2-PP and HadronPhysics2-IA

Other projects (such as CARE and EUROTeV in FP6 or EUCARD in FP7) which focus more on high energy physics or other fields, but have some relevance to nuclear physics, are also not taken into account.

Both tables contain the total budget contributions over the full length of the project as they were allotted at the start of the projects. Later changes in the budget distribution were not taken into account.

	FP6 Projects					Total	Total in 2007
Duration	01.02.05 - 31.01.09	10.10.05 - 31.09.09	01.02.05 - 31.01.09	01.01.05 - 31.12.08	01.01.04 - 31.12.08	in k€	in k€
In years	4	4	4	4	5		
Country	FAIR -DS	FAIR -CNI	EURISOL -DS	EURONS -I3	Hadron Physics -I3		
BE	0	0	63	907	0	970	242
BG	0	0	0	2	0	21	5
CZ	78	0	0	0	225	303	65
DE	5,634	6,084	1,182	3,528	9,178	25,606	5,943
ES	232	0	104	321	284	940	221
FI	0	33	237	1,247	40	1,557	387
FR	3,506	0	3,005	2,331	1,021	9,863	2,415
GR	0	0	0	44	0	44	11
HU	0	0	0	43	117	160	34
IT	0	387	1,429	1,866	4,276	7,957	1,775
NL	0	0	0	849	164	1,013	245
PL	106	170	75	283	235	869	205
RO	0	0	82	46	171	299	66
UK	31	596	239	659	427	1,953	467
Sum NuPNET	**9,587**	**7,270**	**6,413**	**12,145**	**16,138**	**51,553**	**12,081**
Other Countries	818	1,730	2,749	1,911	1,262	8,470	2,054
TOTAL	**10,405**	**9,000**	**9,162**	**14,056**	**17,400**	**60,023**	**14,136**

Table 10.14: *FP6 EU-Funding (in k€) for the core nuclear physics projects in the activity area "Research Infrastructures". The total EU budget contributions at the start of each project were scaled down to 2007 in order to calculate the EU-FP6 budget contribution to nuclear physics in 2007.*

	FP7 Projects			Total	Total in 2007
Duration	01.08.07 - 31.07.10	01.11.07 - 31.10.10	01.01.09 - 31.12.12	in k€	in k€
In years	3	3	4		
Country	FAIR -PP	SPIRAL2 -PP	HadronPhysics2 -IA		
BE	0	9	0	9	0.5
BG	0	13	0	13	0.5
CZ	0	12	57	69	0.5
DE	3,278	126	4,224	7,628	462.5
ES	122	159	147	428	26.0
FI	150	0	63	213	21.0
FR	128	1,909	754	2,792	124.0
GR	0	0	0	0	0.0
HU	0	12	21	33	0.5
IT	144	283	3,535	3,962	35.5
NL	0	40	61	101	2.0
PL	283	197	92	572	50.0
RO	197	115	107	419	33.5
UK	135	812	350	1,297	64.0
Sum NuPNET	**4,436**	**3,687**	**9,413**	**17,536**	**821**
Other Countries	464	213	587	1,264	76
TOTAL	**4,900**	**3,900**	**10,000**	**18,800**	**897**

Table 10.15: *FP7 EU-Funding (in k€) for the core nuclear physics projects in the programme area* "Capacities / Research Infrastructures". *The total EU budget contributions at the start of each project were scaled down to 2007 in order to calculate the EU-FP7 budget contribution to nuclear physics in 2007. It may be noted that the first two FP7 projects only started during the course of 2007 and thus contribute only a minor fraction to the EU funds in 2007.*

Whereas the above tables can be considered to give, for the selected facilities, a rather complete picture of the respective types of collaboration (a)-(d), the number of individual collaborations based on the schemes (e)-(f) is so large that it is not possible (and probably not useful) to attain a complete list. Therefore, the NuPNET member institutions were asked to focus on those collaborations they consider to be of more general importance.

For the selected facilities, such bilateral (or few-lateral) agreements/ contracts / MoUs are already included in the above tables. This selection already shows that a dense network of collaborations governed by bilateral agreements, contracts or MoUs exists. Moreover, several programmes for exchange of individual scientists exist. It is not possible to provide a complete picture of such collaborations here.

In summary, the above tables show clearly that basic nuclear physics research is conducted already in a highly international manner.

A key principle governing this productive history of cooperation was that of free and open access to facilities. According to this principle (which is by no means universal in science but has proven its worth in other domains, notably high energy physics, where it originated) the use of research facilities is allocated based on the importance and quality of the research proposed (and related criteria such as the likelihood of success and the scientific qualifications of the researchers) regardless of nationality or institutional affiliation of the proposers. In addition, the operating costs of the facility are borne by the facility itself, with external users only being expected to pay for their specialised experimental equipment, certain consumables, plus travel and subsistence.

It should be noted that free and open access to infrastructures is offered by basically all nuclear physics research facilities worldwide as is documented by the IUPAP Report 41 "Research Facilities in Nuclear Physics" (*). An updated table by NuPNET is provided in Appendix 3.

In the two FP6 I3 projects EURONS and HadronPhysics transnational access (TNA) to the access facilities of these projects has been supported by EC funds for approximately 830 users (**) per year (not including facilities which focus on specialised computing). It is estimated that this is about a third of the number of users to which free and open access is offered by these facilities.

(**)In this number same users making use of the same facility more than once are counted only once. However, double counting wherein same users use different facilities can not be excluded.

Even though the amount of the EC funds used for TNA in FP6 (approximately 3-3.5 Mio. €) makes up just about 2% of the total costs of running these facilities (and about 1% of the total institutional funding in the NuPNET member countries, cf. table 7.1), this support is very effective in that it gives access to groups from universities and institutes to unique and large infrastructures that could only be constructed and run by or with the help of financially potent funding agencies. Moreover, in the transnational access in these I3 projects a special emphasis on new users to these facilities is made. This helps to increase the collaboration in nuclear physics across Europe and opens possibilities for many users from countries in Europe, who have no large infrastructures. It is considered essential that the same level of EC funding, at least for the TNA programme, should be maintained in FP7.

It may be remarked that the administrative effort for EU funds is generally considered to be much higher compared to that for national funds. On the other hand, the visibility of EU funds is considered to be very high, in particular in the East European countries.

(*) http://www.jlab.org/~sbrown/Handbook_rev3.pdf

Appendices:

1. List of persons responsible for the questionnaire on behalf of their institution
2. Programme Overviews of NuPNET Open Days
3. List of research facilities in nuclear physics
4. List of Acronyms

APPENDIX 1
List of persons responsible for the questionnaire on behalf of their institution

Country	Name	Email	Institution
BE	Paul-Henri Heenen	phheenen@ulb.ac.be	FRS-FNRS
	Mark Huyse	mark.huyse@fys.kuleuven.be	FWO-Vlaanderen
BG	Chavdar Stoyanov	stoyanov@inrne.bas.bg	INRNE
CZ	Andrej Kugler	kugler@ujf.cas.cz	NPI ASCR
DE	Irene Reinhard Erik Stork	i.reinhard@gsi.de e.stork@gsi.de	PT-GSI
	Monica Pantea	monica.pantea@bmbf.bund.de	BMBF
ES	José Benlliure	j.benlliure@usc.es	MICINN
	Manuela Turrión	manuela.turrion@fecyt.es	FECYT
FI	Dan-Olof Riska	riska@mappi.helsinki.fi	HIP
	Rauno Julin	rauno.julin@jyu.fi	JYFL
FR	Sydney Galès Dorothée Peitzmann	gales@in2p3.fr dorothee.peitzmann@cnrs-dir.fr	CNRS/IN2P3
	Nicolas Alamanos Bijan Saghai	nicolas.alamanos@cea.fr bijan.saghai@cea.fr	CEA/DSM/IRFU
GR	Sotirios Harissopulos	sharisop@inp.demokritos.gr	GSRT
HU	Zsolt Fülöp	fulop@atomki.hu	NKTH
IT	Angela Bracco Alberto Russo	angela.bracco@mi.infn.it alberto.russo@mi.infn.it	INFN
NL	Muhsin Harakeh Marjan Koopmans	m.n.harakeh@kvi.nl koopmans@kvi.nl	KVI
PL	Anna Ostapczuk Adam Maj	a.ostapczuk@ncbir.gov.pl adam.maj@ifj.edu.pl	NCBiR
RO	Nicolae Victor Zamfir Ioan Ursu	zamfir@tandem.nipne.ro iursu@ifin.nipne.ro	IFIN-HH
UK	Katharine Schofield Janet Seed	katharine.schofield@stfc.ac.uk janet.seed@stfc.ac.uk	STFC

APPENDIX 2
Programme Overview of the NuPNET Open Days

NuPNET OPEN DAYS 1 on 8 Sept. 2008 in Athens, Greece
(21 participants: 14 NuPNET member institutions representing 11 countries + guests)

Topic	Presented by	Presentation
Welcome to N.C.S.R.	P. Rapidis (NCSR "Demokritos", GR)	
Welcome to Open Days 1	S. Harissopulos (GSRT, GR)	
Introduction to the Open Days 1	S. Galès (CNRS/IN2P3, FR)	slides
Country Presentation Romania	V. Zamfir (IFIN-HH, RO) I. Ursu (IFIN-HH, RO)	slides
Country Presentation Hungary	Zs. Fülöp (NKTH, HU)	slides
Country Presentation Bulgaria	J. Stamenov (INRNE, BG) Ch. Stoyanov (INRNE, BG) L. Kostov (funding agency, BG)	slides
Country Presentation Greece	S. Harissopulos (GSRT, GR) N. Sidiropoulos (GSRT, GR)	slides
Discussion of the WP2 questionnaire	I. Reinhard (PT-GSI, DE)	slides
Discussion / Conclusion / Next steps	S. Galès (CNRS/IN2P3, FR)	

NuPNET OPEN DAYS 2 on 30-31 Oct. 2008 in Darmstadt, Germany
(22 participants: 15 NuPNET member institutions representing 13 countries + NuPECC + guests)

Topic	Presented by	Presentation
Welcome to GSI and to Open Days 2	I. Reinhard (PT-GSI, DE)	
Introduction to the Open Days 2	S. Galès (CNRS/IN2P3, FR)	slides
Country Presentation Czech Republic	A. Kugler (NPI ASCR, CZ)	slides
Country Presentation Finland	R. Julin (HIP, FI)	slides
Welcome to GSI	H. Stöcker (GSI, DE)	
Country Presentation Belgium	P.-H. Heenen (FNRS, BE)	slides
Country Presentation Netherlands	N. Kalantar (RuG, NL)	slides
Country Presentation Germany	P. Schroth (BMBF, DE)	slides
Country Presentation Germany	K. Zach (DFG, DE)	slides
Country Presentation Germany	I. Reinhard (PT-GSI, DE)	slides
Status of WP2 Questionnaire Analysis	I. Reinhard (PT-GSI, DE)	slides
Discussion / Conclusion / Next steps	S. Galès (CNRS/IN2P3, FR)	

NuPNET OPEN DAYS 3 on 12-13 May, 2009 in Milan, Italy
(24 participants: 15 NuPNET member institutions representing 13 countries + NuPECC + guests)

Topic	Presented by	Presentation
Welcome to INFN and to Open Days 3	A. Bracco (INFN, IT)	
Introduction to the Open Days 3	S. Galès (CNRS/IN2P3, FR)	slides
Country Presentation Italy	A. Bracco (INFN, IT)	slides
Country Presentation U.K.	J. Seed (STFC, UK) K. Schofield (STFC, UK)	slides
Country Presentation Poland	A. Ostapczuk (NCBiR, PL) A. Maj (NCBiR, PL)	slides
Preparation of the 1st Activity Report	D. Peitzmann (CNRS/IN2P3, FR)	slides
Country Presentation France	N. Alamanos (CEA/DSM/IRFU, FR) B. Saghai (CEA/DSM/IRFU, FR)	slides
Country Presentation France	S. Galès (CNRS/IN2P3, FR) D. Peitzmann (CNRS/IN2P3, FR)	slides
Country Presentation Spain	M. Turrión (FECYT, ES)	slides
Proposal of Deliverable D2.1 (1st draft)	I. Reinhard (PT-GSI, DE)	slides
Discussion / Conclusion / Next steps	S. Galès (CNRS/IN2P3, FR)	

All presentations of the Open Days will be provided on the NuPNET website.

APPENDIX 3
Research Facilities in Nuclear Physics in the NuPNET Countries
(Update as of 2009)

In this section Nuclear Physics research facilities located in the NuPNET member countries are listed. Table a) gives the names of the Nuclear Physics Laboratories, their location, and the staffing levels of the Nuclear Physics Laboratories as well as the total number of users and how these divide into internal users, national users and international users. Table b) gives the chief performance characteristics of the laboratory's accelerator(s).
This information is based on the IUPAP Report 41 "Research Facilities in Nuclear Physics" which has been published by the IUPAP Working Group WG9 in 2007 (http://www.jlab.org/~sbrown/Handbook_rev3.pdf). The data has been updated in the framework of this questionnaire in 2009.

APPENDIX 3
Research Facilities in Nuclear Physics in the NuPNET Countries
a) Staffing Levels and Number of Users

Country	Institution	Facility Name	Staff							Users			
			Total	Theory (total)	Permanent	Temporary	Post-docs	PhD Students Onsite / Other graduate students	Undergraduates	Total user number	Internal (%)	National (%) *1	International (%)
BE	Université Catholique de Louvain, Louvain-la-Neuve	Centre de Recherche du Cyclotron	19	0	19	0	2	0	1	145	7%	20%	80%
CZ	Nuclear Physics Institute, Řež	Accelerators of NPI; Neutron Physics Laboratory of NPI	52	8	11	27	6	8	7	50	65%	70%	30%
DE	Deutsches Elektronen-Synchrotron (DESY), Hamburg *	HERA	1695	50	1114	581	92	100/100	45	3000	5%	53%	47%
	Forschungsneutronenquelle Heinz Meier Leibnitz, Garching	FRM II	220	0	140	20	40	15	5	814	0%	62%	38%
	Forschungszentrum Juelich (FZJ)	COSY	148	12	125	23	7	16/6	8	391	21%	44%	56%
	Gesellschaft fuer Schwerionenforschung (GSI)	UNILAC, SIS, ESR NP	1003	50	543	460	90	115/80	40	1300	20%	60%	40%
	Technical University of Darmstadt, Darmstadt	S-DALINAC	22	7	17	5	5	23	13	39	84%	25%	75%
	University of & Technical University of Munich, Garching	Maier-Leibnitz Laboratory	58	0	26	32	10	17/5		122	31%	75%	25%
	University of Bonn, Bonn	ELSA									0%	0%	0%
	University of Cologne, Cologne	Tandem Accelerator	35	0	6	29	5	12	0	75	40%	66%	34%
	University of Mainz, Mainz	MAMI Accelerators	216	20	103	113	36	93/10	0	150	50%	80%	20%
	Max-Planck-Institut für Kernphysik, Heidelberg	MPI-K	28	2	19	9	9	22	5	26	85%	27%	73%
		(*) Numbers for DESY: Less than 10% of the users are involved in nuclear physics											
ES	Centro de Microanálisis de Materiales (CMAM), Madrid	CMAM	26	0	6	8	0	7/5	0	58	35%	93%	7%
	Centro Nacional de Aceleradores (CNA), Sevilla	CNA*		0	4	5	5	12	0	61	34%	66%	34%
FI	University of Jyväskylä, Jyväskylä	Accelerator Laboratory	68	9	26	42	9	32	10	270	15%	25%	75%
FR	Centre des Etudes Nucléaires Bordeaux Gradignan (CENBG), Gradignan	AIFIRA	17	0	10	7	3	4/0	0	60	65%	95%	5%
	CNRS, Université de Nantes, École des Mines de Nantes, Nantes	ARRONAX	construction in progress										
	GANIL Laboratory, Caen	GANIL	300	8	250	50	4	9/8	20	600-700	9%	55%	45%
	Institut de Physique Nucléaire de Lyon (IPNL), Lyon	IPNL Van de Graaff	29	0	20	9	0	6/1	0	30	95%	95%	5%
	Institut Laue-Langevin (ILL), Grenoble (*)	ILL	452	5	382	70	18	28	5	1220 **(**)**	7%	26%	74%
	Institut de Physique Nucléaire d'Orsay (IPNO), Orsay	Tandem / ALTO	38	0	28	10	10	5	10	130	22%	64%	36%
	Centre de Spectrométrie Nucléaire et de Spectrométrie de Masse (CSNXM), Orsay	ARAMIS-JANNUS							60		10%	20%	2%

(*) In France, PhDs always have temporary contracts.
(**) More than 90% of the users at ILL are carrying out research on atomic, molecular, material and life sciences

APPENDIX 3
Research Facilities in Nuclear Physics in the NuPNET Countries
a) Staffing Levels and Number of Users

Country	Institution	Facility Name	Staff: Total	Staff: Theory (total)	Staff: Permanent	Staff: Temporary	Staff: Post-docs	Staff: PhD Students Onsite / Other graduate students	Staff: Undergraduates	Users: Total user number	Users: Internal (%)	Users: National (%) *1	Users: International (%)
GR	Institute of Nuclear Physics, National Centre of Scientific Research "DEMOKRITOS", Aghia Paraskevi, Athens	TANDEM Accelerator Laboratory	50	13	20		8	12	0	40	45%*	90%*	10%*
										* percentage of beamtime			
HU	Institute of Nuclear Research of the Hungarian Academy of Sciences, Debrecen	ATOMKI	21	0	15	6	0	0	0	80	63%	87%	13%
IT	European Centre for Theoretical Studies in Nuclear Physics, Trento	ECT*	10	1	5	4	6	0	0	675	3%	16%	84%
	National Institute of Nuclear Physics (INFN), Assergi	Gran Sasso National Lab.	144	0	*1	*1	*0	*0	*0	53*	*8%	*64%	*36%
	National Institute of Nuclear Physics (INFN), Catania	Laboratori Nazionali del Sud	194	10	51	13	17	21	2	270	15%	69%	31%
	National Institute of Nuclear Physics (INFN), Frascati	Laboratori Nazionali di Frascati	379	*0	*27	*12	*8	*5	*0	88*	*25%	*70%	*30%
	National Institute of Nuclear Physics (INFN), Legnaro	Laboratori Nazionali di Legnaro	207	0	62	27	16	8	1	770	5%	69%	31%
								* only NP users					
NL	Kernfysisch Versneller Institut (KVI), Groningen	AGOR	50*	5	22	28	3	24/0	10	108	39%	50%	50%
			* Scientific staff at KVI										
PL	Warsaw University, Warsaw	Heavy Ion Laboratory	53	0	46	7	2	2/13	16	100	10%	80%	20%
	Institute of Nuclear Physics PAN, Krakow	IFJ-PAN	320	20	170	20	30	80	100	30	90%	90%	10%
RO	Horia Hulubei National Inst. for Physics and Nuclear Engineering (IFIN-HH), Bucharest-Magurele	FN Tandem Van de Graaff	54	4	49	5	11	10/3	7	50	90%	97%	3%

***1:** The percentage "National" includes the percentage "Internal"

APPENDIX 3
Research Facilities in Nuclear Physics in the NuPNET Countries
b) Facility Characteristics

Country	Institution / Location	Facility Name	Facility Characteristics
BE	Université Catholique de Louvain, Louvain-la-Neuve	Centre de Recherche du Cyclotron	Cyclotrons (K=30 & K=110) / p (30/70 MeV) / HI(A≤130 25-0.56 MeV/u / RIB (A < 20: 10 - 0.56 MeV/u)
CZ	Nuclear Physics Institute, , Řež	Accelerators of NPI; Neutron Physics Laboratory (NPL) of NPI	Cyclotron (K=40) p He, 3MV Tandetron (p-Au, 100keV-10MeV); Neutron Physics Laboratory (set of difractometers and irradiation places at research reactor LVR15 of NRI)
DE	Deutsches Elektronen-Synchrotron (DESY), Hamburg	HERA	Electron (30GeV)-Proton (920 GeV) Collider, pol. e^-
	Forschungsneutronenquelle Heinz Meier Leibnitz, Garching	FRM II	20 MW Research Reactor
	Forschungszentrum Juelich (FZJ)	COSY	Synchrotron (acc.-cooler) / pl. p,d/0.27 - 3.7 GeV/c
	Gesellschaft fuer Schwerionenforschung (GSI)	UNILAC, SIS, ESR NP	Linac-Synchrotron-Storage Ring / p (4.7 GeV) / HI/RIBs (2 GeV/u)
	Technical University of Darmstadt, Darmstadt	S-DALINAC	Electron-linac -s.c. recirculating 2-130 MeV
	University of & Technical University of Munich, Garching	Maier-Leibnitz Laboratory	14 MV tandem p (28 MeV) HI (9-1.1 MeV/n)
	University of Bonn, Bonn	ELSA	Electron-Synchrotron/Storage-Stretcher Ring/0.5 - 3.5 GeV
	University of Cologne, Cologne	Tandem Accelerator	10 MV tandem p (20 MeV) HI (A≤80, 6-1.5 MeV/u)
	University of Mainz, Mainz	MAMI Accelerators	Electron cw-race track microtron 180-800 MeV
	Max-Planck-Institut für Kernphysik, Heidelberg	MPI-K, MP-Tandem, TSR	Acceleration, Storage, Cooling of Ion Beams, 6-12 MeV/u
ES	Centro de Microanálisis de Materiales (CMAM), UAM, Madrid	CMAM	5MV Tandetron
	Centro Nacional de Aceleradores (CNA), Sevilla	CNA	3MV Tandem Van de Graaff, Tandetron AMS, Cyclotron (p 18MeV)
FI	University of Jyväskylä, Jyväskylä	Accelerator Laboratory	Cyclotron (K=130) / p (130 MeV) / HI (A≤130 30 MeV/u – 5 MeV/u)
FR	Centre des Etudes Nucléaires Bordeaux Gradignan (CENBG), Gradignan	AIFIRA	3.5 MV Singletron p (3.5 MeV) n (7 MeV)
	CNRS, Université de Nantes, Ecole des Mines de Nantes, Nantes	ARRONAX	Cyclotron (K=70) commissioning; radioisotope production and nuclear medicine
	GANIL Laboratory, Caen	GANIL	Cyclotrons (2 injectors, 2 sep. sect. cyclotrons), C to U-ions, HI (95 MeV/u); SPIRAL-ISOL + CIME Post-Acc. Cyclotron; Exotic beams (0.1 to 25 MeV/u)
	Institut de Physique Nucléaire de Lyon, Lyon	IPNL Van de Graaff	4 MV Van de Graaff 2 MeV Au-clusters / p(3.5 MeV) HI (0.25MeV/u)
	Institut Laue-Langevin, Grenoble	ILL	Research Reactor International (D, F, UK…)
	Institut de Physique Nucléaire d'Orsay, Orsay	Tandem / ALTO	15 MV Tandem & 50 MeV, p (25 Mev), HI (8-1 MeV/u), e- linac, ISOL, photofission
	Centre de Spectrométrie Nucléaire et de Spectrométrie de Masse, Orsay	ARAMIS-JANNUS	Multi-ion beam irradiation platform and a 200 kV Transmission Electron Microscope coupled with two ion accelerators.
GR	Institute of Nuclear Physics, National Centre of Scientific Research "DEMOKRITOS", Aghia Paraskevi, Athens	TANDEM Accelerator Laboratory	5.5 MV Tandem Van de Graaff. By end of 2009, additional 250 keV accelerator (the former Orsay "PAPAP") will be installed capable of providing very low-energy p, d, He beams with high currents up to 0.5 mA.

APPENDIX 3
Research Facilities in Nuclear Physics in the NuPNET Countries
b) Facility Characteristics

Country	Institution / Location	Facility Name	Facility Characteristics
HU	Institute of Nuclear Research of the Hungarian Academy of Sciences, Debrecen	ATOMKI	Cyclotron (K=20) / p(20 MeV) / 3He(27 MeV)
IT	European Centre for Theoretical Studies in Nuclear Physics, Trento	ECT*	Theory Institute
	National Institute of Nuclear Physics (INFN), Assergi	Gran Sasso National Lab.	Electrostatic Acc. 50 kV & 400 kV / deep underground facilities
	National Institute of Nuclear Physics (INFN), Catania	Laboratori Nazionali del Sud	Tandem (15 MV) p (28 MeV)/HI (14-1 MeV/u) SC-Cyclotron / p (80 MeV) / HI (80-20 MeV/u)
	National Institute of Nuclear Physics (INFN), Frascati	Laboratori Nazionali di Frascati	Synchrotron-Storage-Collider-Ring (e+e -) / 1020 MeV cm energy
	National Institute of Nuclear Physics (INFN), Legnaro	Laboratori Nazionali di Legnaro	15 MV tandem & s.c. linac p (30 MeV) HI (21-5.5 MeV/u)
NL	Kernfysisch Versneller Institut (KVI), Groningen	AGOR	SC-Cyclotron (K=600) / p (190 MeV) / HI (6≤A≤208 5-95 MeV/u)
PL	Warsaw University, Warsaw	Heavy Ion Laboratory	Cyclotrons HI (K=160 11≤A≤40 5-1 MeV/u) p (K=16.5)
	Institute of Nuclear Physics PAN, Krakow	IFJ-PAN	Cyclotron AIC-144 (protons 30-60MeV, deuterons 15-30 MeV, alphas 30-60 MeV
RO	Horia Hulubei National Inst. for Physics and Nuclear Engineering (IFIN-HH), Bucharest-Magurele	FN Tandem Van de Graaff	(9 MV) /p (18 MeV) /HI (5-0.5 MeV/u)

APPENDIX 4
List of Acronyms

International and Country Specific Abbreviations sorted by Country
(ministries, funding agencies, other bodies, research organisations, other)

	International
NuPNET	Nuclear Physics Network
ERA-NET	European Research Area Network
ANPhA	Asian Nuclear Physics Association
CERN	European Organisation for Nuclear Research, Geneva, Switzerland
ECT*	European Centre for Theoretical Studies in Nuclear Physics and Related Areas, Trento, Italy
ERC	European Research Council
ESF	European Science Foundation
ESFRI	European Strategy Forum on Research Infrastructures
EU	European Union
FAIR	Facility for Antiproton and Ion Research, Darmstadt, Germany
ICFA	International Committee on Future Accelerators
IUPAP	International Union of Pure and Applied Physics
JINR	Joint Institute for Nuclear Research, Dubna, Russia
NSAC	US DOE/NSF Nuclear Science Advisory Committee
NuPECC	Nuclear Physics European Collaboration Committee
OECD	Organisation for Economic Co-operation and Development
OECD-GSF	OECD-Global Science Forum
SPIRAL2	Système de Production d'Ions Radioactifs en Ligne 2, Caen, France
WG.9	IUPAP Working Group on International Cooperation in Nuclear Physics

APPENDIX 4
List of Acronyms

BE	**Belgium**
BE Fr	French community
BE Vla	Vlaanders
BELSPO	Belgian Federal Science Policy Office
CRC	Centre de Recherches du Cyclotron (Cyclotron Research Centre)
FRIA	Fonds pour la Formation à la recherche dans l'industrie et dans l'agriculture (Fund for research and education within industry and agriculture)
FRS-FNRS	Fonds de la Recherche Scientifique - Fonds National de la Recherche Scientifique ((National) Fund for Scientific Research)
FRWB	Federale Raad voor Wetenschapsbeleid (Federal Council for Science Policy)
FWO	Fonds Wetenschappelijk Onderzoek (National Fund for Scientific Research)
IISN	Institut Interuniversitaire des Sciences Nucléaires (Interuniversity Institute of Nuclear sciences)
VRWB	Vlaamse Raad voor Wetenschapsbeleid (Flemish Council for Science Policy)
BG	**Bulgaria**
BAS	Bulgarian Academy of Science
BNRA	Bulgarian Nuclear Regulatory Agency
PHARE	EU Programme of Community aid to the countries of Central and Eastern Europe
INRNE	Institute for Nuclear Research and Nuclear Energy
MES	Ministry of Education and Science
CZ	**Czech Republic**
ASCR	Academy of Science of Czech Republic
CU	Charles University, Prague
GACR	Grantová Agentura Ceské Republiky (Czech Science Foundation)
MEYS	Ministry of Education, Youth and Sports
MFA	Ministry of Foreign Affairs of the Czech Republic
NRI	Nuclear Research Institute
SF ASCR	Science Foundation of Academy of Science of Czech Republic
DE	**Germany**
BMBF	Bundesministerium für Bildung und Forschung (Federal Ministry of Education and Research)
DFG	Deutsche Forschungsgemeinschaft (German Research Foundation)
GSI	Helmholtzzentrum für Schwerionenforschung GmbH (GSI Helmholtz Centre for Heavy Ion Research GmbH)
HGF	Helmholtz-Gemeinschaft Deutscher Forschungszentren (Helmholtz Association of German Research Centres)
KHuK	Komitee für Hadronen- und Kernphysik (Committee for Hadron and Nuclear Physics)
PT-GSI	Projektträger GSI für Hadronen- und Kernphysik des BMBF (Project Management Office for Hadron and Nuclear Physics of BMBF)
WR	Wissenschaftsrat (German Science Council)

APPENDIX 4
List of Acronyms

ES	**Spain**
CIEMAT	Centro de Investigaciones Energéticas, Medioambientales y Energéticas (Centre for Research in Energy, Environment and Technologies)
CPAN	Centro Nacional de Física de Partículas, Astropartículas y Nuclear (National Centre for Particle, Astro-Particle and Nuclear Physics
CSIC	Consejo Superior de Investigaciones Científicas (Spanish National Research Council)
CSN	Consejo de Seguridad Nuclear (Nuclear Safety Council)
FECYT	Fundación Española para la Ciencia y la Tecnología (Spanish Foundation for Science and Technology)
MICINN	Ministerio de Ciencia e Innovación (Ministry of Science and Innovation)
FI	**Finland**
AF	Academy of Finland
HIP	Helsinki Institute of Physics
HYFL	Department of Physical Sciences, University of Helsinki
JYFL	Department of Physics, University of Jyväskylä
Univ. Hel.	University of Helsinki
Univ. Jyv.	University of Jyväskylä
FR	**France**
ANR	Agence Nationale de la Recherche (National Research Agency)
CEA	Commissariat à l'Énergie Atomique (French Atomic Energy Commission)
CNRS	Centre National de la Recherche Scientifique (National Centre for Scientific Research)
DSM	Direction des Sciences de la Matière (CEA's Physical Sciences Division), CEA
GANIL	Grand Accélérateur National d'Ions Lourds (French Large Heavy-Ion Accelerator Facility)
IN2P3	Institut National de Physique Nucléaire et de Physique des Particules (National Institute for Nuclear Physics and Particle Physics), CNRS
IRFU	Institut de Recherches sur les lois Fondamentales de l'Univers (Institute of Research into the Fundamental Laws of the Universe), DSM, CEA
JRU	Joint Research Units
GR	**Greece**
GSRT	General Secretariat for Research and Technology
MD	Ministry of Development
MNE	Ministry of National Education
NCSR-D	National Centre for Scientific Research “Demokritos”
HU	**Hungary**
HAS	Hungarian Academy of Science
NKTH	Nemzeti Kutatási és Technológiai Hivatal (National Office for Research and Technology)
OTKA	Országos Tudományos Kutatási Alapprogramok (Hungarian Scientific Research Fund)

APPENDIX 4
List of Acronyms

IT	**Italy**
INFN	Istituto Nazionale di Fisica Nucleare (National Institute for Nuclear Physics)
MUR	Ministero dell'Università e della Ricerca (Ministry for Universities and Research)
NL	**The Netherlands**
FOM	Stichting voor Fundamenteel Onderzoek der Materie (Foundation for Fundamental Research on Matter)
KVI	Kernfysisch Versneller Instituut (Nuclear Physics Accelerator Institute)
NWO	Nederlandse Organisatie voor Wetenschappelijk Onderzoek (Netherlands Organisation for Scientific Research)
OCW / MECS	Ministerie van Onderwijs, Cultuur en Wetenschap (Ministry of Education, Culture and Science)
Nikhef	Nationaal instituut voor subatomaire fysica (National Institute for Subatomic Physics)
PL	**Poland**
MSHE	Ministry of Science and Higher Education
NAEA	National Atomic Energy Agency
NCBiR	Narodowe Centrum Badań i Rozwoju (National Centre for Research and Development)
NCN	National Centre of Science
RO	**Romania**
ANCS	Autoritatea Nationala pentru Cercetare Stiintifica (National Authority for Scientific Research)
CNCSIS	Consiliul National al Cercetarii Stiintifice din Invatamantul Superior (National University Research Council)
CNMP	Centrul National de Management Programme (National Centre for Programme Management)
IFIN-HH	Institutul de Fizică şi Inginerie Nucleară „Horia Hulubei” (Horia Hulubei National Institute of Physics and Nuclear Engineering)
UK	**United Kingdom**
DBIS	Department of Business, Innovation and Skills
EPSRC	Engineering and Physical Sciences Research Council
NPAP	Nuclear Physics Advisory Panel
NPGP	Nuclear Physics Grants Panel
PPAN	Particle Physics, Astronomy and Nuclear Physics Science Committee
PPRP	Project Peer Review Panel
SFC	Scottish Funding Council
STFC	Science and Technology Facilities Council
SUPA	Scottish Universities Physics Alliance

APPENDIX 4
List of Acronyms

General abbreviations as used in this report

acc.	according
APP	astro-particle physics
appl.	application
AtP	atomic physics
BA	bilateral agreement
BC	bilateral contract
CNI	Construction of New Infrastructures
consid.	considered
def.	definition
DS	Design Study
FA	funding agency
FP	EU Framework Programme
FP6	Sixth EU Framework Programme
FP7	Seventh EU Framework Programme
gov.	government
I3	Integrated Infrastructure Initiative
IA	Integrating Activities
I-MoU	interim MoU
Instit.	institutional
intl.	international
LSF	large scale facilities
Min	ministry / ministerial level
Mio. €	Million Euro
Mio. CHF	Million Swiss Franc
Mio. USD	Million US Dollar
MoU	memorandum of understanding
n.a.	not applicable
nat.	national
NP	nuclear physics
nu-P	neutrino physics
PP	particle physics
pp	possible or planned partner
prep.	preparation
publ.	publication
QCD	Quantum Chromodynamics
QGP	Quark Gluon Plasma
R	R&D for applications
R&D	research and development
RPO	research performing organisation
RTDI	research, technological development and innovation
S	service for applications
TNA	transnational access
Univ.	university
US DOE	Department of Energy, USA
WG	working group
WP	workpackage