

Modulo 1:

Riferimento a linee guida	AUTOVALUTAZIONE DIPARTIMENTI SCHEMA DIPARTIMENTO
1.a	Nome Dipartimento:
	<i>Dipartimento di Fisica “Galileo Galilei”</i>
1.a	Area Scientifico disciplinare:
	AREA 02 Scienze Fisiche e Settori Disciplinari FIS/01, FIS/02, FIS/03, FIS/04, FIS/05, FIS/06, FIS/07, FIS/08
1.b	Collaborazioni istituzionalizzati con altri istituti di ricerca, a livello locale, regionale, nazionale e internazionale
	<p>The Department is fully integrated in national and international networks; in particular it collaborates with INFN (National Institute for Nuclear Physics), CNR (National Research Council), ENEA (National Institute for Alternative Energies), INAF (National Institute for Astrophysics), ASI (Italian Space Agency) and, prior to its incorporation into CNR in 2003, with INFN (National Institute for the Physics of Matter). Moreover a large part of researches are performed in international laboratories as detailed in Sect.7a.</p>
2	Missione del Dipartimento
	<p>Mission of the Galileo Galilei Physics Department is the development of experimental and theoretical knowledge in the field of Fundamental and Applied Physics at the current frontiers of this science. This task requires the involvement of the Department researchers in all national and international initiatives related to the frontier of Physics. To reach this goal, the Department activity is essentially integrated in the national and international contexts with operative roles of recognized excellence and leadership. It is useful to remind the presence of researchers in many international laboratories such as CERN at Geneva, SLAC at Stanford and DESY at Hamburg, for the pursuit of common research programs; constant is, furthermore, the interaction with INFN (National Institute for Nuclear Physics), at Padova Section that is hosted in the building of the Department, according to specific agreements between the parts, and at the National Laboratories of Legnaro and Gran Sasso.</p> <p>The achievement of significant results in current research in Physics often requires the use of technologies, methods and infrastructures which, for their high cost and complexity, can hardly be afforded by groups of researchers, singularly. For this reason, the Department inclusive structure for the entire Physics area allows an efficient optimization of the use of resources and the creation of synergies which make possible the achievement of the goals.</p> <p>A further strength in the optimization of resources is given by the presence, already mentioned, of INFN local section in the Department location, and of a CNISM (Consorzio Nazionale Interuniversitario per le Scienze Fisiche della Materia) unit. The operational units of such Bodies are completely integrated in the Department structure and functional to its services, giving a substantial contribute to their effectiveness and allowing the achievement of results not otherwise achievable by the sole University resources.</p> <p>The main areas of research present in the Department are:</p> <ol style="list-style-type: none"> 1) Nuclear and Subnuclear Physics 2) Astrophysics and Cosmology 3) Physics of Condensed Matter and Nanotechnologies

	<p>The Department also promotes all interdisciplinary and multidisciplinary applications of methodologies and techniques (theoretical and experimental) developed through the research within the above topic areas as well as through the related specifically oriented ones. These last include the Environmental Physics, Medical Physics, Biological Physics and Electronics.</p> <p>Among the Department most important goals there is the coordination of the didactic activities of the Physics subjects in various Courses of Study, either for the MM.FF.NN. Science Faculty or for other Faculties. In particular, the Department cooperates with the Courses of Study and Faculties to the optimization of the use of teaching resources. Moreover, the Department responsibility is also in the management of the infrastructures for didactic laboratories suited for Basic and Advanced Physics teaching.</p> <p>A fundamental aspect of the Department mission is its commitment to keep a constant link between the educational and the research activities so to enrich its formative offer continuously as far as Doctorate, Research and Master Courses are concerned, thanks also to the contribute given by researchers belonging to other Institutions. Moreover, it favours the development of specific skills and know-how responding to the productive world demands. In this general context, the Department favors the students' international mobility (since 1989), participates since its beginning in the European Thematic Network named EUPEN-European Physics Education Network and it is open to co-operate in several international Physics Education events, conferences and pilot projects.</p>
3	Elenco dei programmi di ricerca con i nomi dei responsabili e gli obiettivi specifici di ogni singolo programma
	<p>In the sequel eighteen research programs are listed according to the main areas mentioned in the Department Mission. In addition activities which are pursued by individuals or small group of researchers in the Department, for which the main effort is spent by other Structures, will be listed afterwards and presented in Sect.8. Such activities are not less important than the other ones, but, since they are mostly based on resources located outside the Department, their future development will mostly require investments by other Structures and therefore the evaluation of these activities cannot be performed by the Department of Physics alone.</p> <p>PROGRAM 1 <i>Title: Astroparticle Physics</i> <i>Leader: Massimo Cerdonio, Luigi Peruzzo</i> <i>(for all the details see Scheda N. 1)</i></p> <p>PROGRAM 2 <i>Title: Heavy-ion Collision Dynamics</i> <i>Leader: Maurizio Morando</i> <i>(for all the details see Scheda N. 2)</i></p> <p>PROGRAM 3 <i>Title: Neutrino Physics</i> <i>Leader: Furio Bobisut</i> <i>(for all the details see Scheda N. 3)</i></p> <p>PROGRAM 4 <i>Title: Nuclear Structure and Reaction Mechanism around the Coulomb Barrier</i> <i>Leader: Santo Lunardi</i> <i>(for all the details see Scheda N. 4)</i></p> <p>PROGRAM 5 <i>Title: Particle Physics: the Frontier of Energy</i></p>

*Leader: Giovanni Zumerle
(for all the details see Scheda N. 5)*

PROGRAM 6

Title: Precision Measurements and Search for Rare Events

*Leader: Franco Simonetto
(for all the details see Scheda N. 6)*

PROGRAM 7

Title: Field and String Theory of the Fundamental Interactions

*Leader: Mario Tonin
(for all the details see Scheda N. 7)*

PROGRAM 8

Title: Phenomenology of Elementary Particles

*Leader: Antonio Masiero
(for all the details see Scheda N. 8)*

PROGRAM 9

Title: Theoretical Nuclear Physics

*Leader: Silvia M. Lenzi
(for all the details see Scheda N. 9)*

PROGRAM 10

Title: High-energy Astrophysics, Cosmology and Planetary Sciences

*Leader: Sabino Matarrese
(for all the details see Scheda N.10)*

PROGRAM 11

Title: Materials and Processes for Micro- and Opto-electronic Semiconductor Devices

*Leader: Alberto Carnera
(for all the details see Scheda N. 11)*

PROGRAM 12

Title: Nanostructured and Ferroelectric Materials: Application in Photonics, Magnetism and Sensors Technology

*Leader: Paolo Mazzoldi
(for all the details see Scheda N. 12)*

PROGRAM 13

Title: Surface and Interface Physics

*Leader: Giampaolo Mistura
(for all the details see Scheda N. 13)*

PROGRAM 14

Title: Theory of Condensed Matter

*Leader: Flavio Toigo
(for all the details see Scheda N. 14)*

PROGRAM 15

Title: Biological Physics

*Leader: Amos Maritan
(for all the details see Scheda N. 15)*

PROGRAM 16

Title: Nuclear Analytical Techniques and Applications

Leader: Paolo Rossi

	<p><i>(for all the details see Scheda N. 16)</i></p> <p>PROGRAM 17 <i>Title: Electronics and Detectors</i> <i>Leader: Dario Bisello</i> <i>(for all the details see Scheda N. 17)</i></p> <p>PROGRAM 18 <i>Title: Medical Physics</i> <i>Leader: Giuliano Moschini</i> <i>(for all the details see Scheda N. 18)</i></p> <p>OTHER RESEARCH ACTIVITIES (see Sect.8)</p> <p><i>Title: Nanomaterials for Solid State Hydrogen Storage</i> <i>Leader: Sergio Lo Russo</i></p> <p><i>Title: Plasma Physics</i> <i>Leader: Piero Martin</i></p> <p><i>Title: GRID Computing</i> <i>Leader: Ugo Gasparini</i></p> <p><i>Title: Project Mantegna</i> <i>Leader: Domenico Toniolo</i></p> <p><i>Title: VIRLAB - High Tech Instrumentation for Personal Mobility & New Welfare</i> <i>Leader: Enzo Schiavuta</i></p> <p><i>Title: Promotion of Scientific Culture</i> <i>Leader: Alessandro Pascolini</i></p> <p><i>Title: Promotion of International Dimension in Physics Education</i> <i>Leader: Luigi Filippo Donà dalle Rose</i></p> <p><i>Title: Museum of the History of Physics</i> <i>Leader: Cesare Voci</i></p> <p><i>Title: Didactics of Physics and Formation of Physics Teachers</i> <i>Leader: Antonio Saggion</i></p>
4.a	Risorse personale [media quinquennale 2001-2005]
	<p><i>[professori ordinari, associati, ricercatori e dottorandi, borsisti post dottorato, assegnisti, personale tecnico-amministrativo]</i></p> <p>40 PO 44 PA 25 RU 38 PhD Students 6 Post-doc fellows 26 Assegni di Ricerca 54 Technician and Administrative staff</p>

PERSONALE DOCENTE E RICERCATORE

Ancilotto Francesco	PA	RU fino al 30.11.01
Bassetto Antonio	PO	
Bastieri Denis	RU	dal 10.01.05
Berti Marina	PO	PA fino al 27.12.04
Bettini Alessandro	PO	
Bisello Dario	PO	
Bobisut Furio	PO	
Borghesani Armando F.	PA	
Brandolini Franco	PA	
Brugnera Riccardo	RU	
Bruschi Lorenzo	PO	
Busetto Giovanni	PO	PA fino al 06.01.04
Calimani Eugenio	PO	
Calvelli Giulio	PA	fino al 30.09.04
Campogalliani Paolo	PA	
Carlin Roberto	PA	
Carnera Alberto	PO	
Cattapan Giorgio	PA	
Cazzola Paolo	PA	fino al 31.10.03
Centro Sandro	PO	
Cerdonio Massimo	PO	
Ciampolillo Sergio	PO	fino al 31.12.04
Ciccariello Salvino	PA	
Costa Giovanni	PO	fino al 31.12.04
De Felice Fernando	PO	
De Marchi Giovanna	RU	fino al 30.09.03
De Salvador Davide	RU	dal 01.01.05
Degrassi Giuseppe	RU	fino a 30.09.01
Demin Alberto	RU	fino al 28.02.03
Donà dalle Rose L. Filippo	PA	
Drigo Antonio	PO	
Feruglio Ferruccio	PO	PA fino al 31.10.02
Galeazzi Giuseppe	PA	fino al 31.10.05
Gasparini Fabrizio	PO	
Gasparini Ugo	PO	PA fino al 28.02.02
Gasparotto Andrea	PA	RU fino al 31.10.02
Gibin Daniele	RU	
Laveder Marco	RU	
Lechner Kurt	PA	RU fino al 06.01.04
Lenzi Silvia	PA	RU fino al 06.01.04
Limentani Silvia	PO	
Lo Russo Sergio	PO	
Loreti Maurizio	PA	
Lunardi Santo	PO	PA fino al 30.11.02
Lunardon Marcello	RU	dal 07.01.04
Maglione Enrico	PA	
Mammano Fabio	PA	dal 20.12.02
Manfredi Vincenzo	PA	
Marchetti Pieralberto	PA	
Marcolungo Paolo	PA	
Margoni Matteo	RU	dal 01.05.01
Mariotti Mosè	RU	
Maritan Amos	PO	dal 01.11.03
Martin Piero	PA	RU fino al 31.10.02

Marzari Francesco	RU	
Masiero Antonio	PO	dal 01.10.01
Matarrese Sabino	PO	
Matone Marco	RU	
Mattei Giovanni	RU	dal 01.05.01
Mattioli Franca	PA	
Mazzi Giulio	PA	
Mazzoldi Paolo	PO	
Meneguzzo Anna Teresa	RU	
Minelli Tullio	PA	fino al 30.09.03
Mistura Giampaolo	PA	RU fino al 31.12.04
Mittner Paolo	PO	fino al 31.10.03
Montagnoli Giovanna	RU	
Morando Maurizio	PO	
Moschini Giuliano	PO	
Nigro Massimo	PO	
Nobili Luciano	PA	
Nobili Renato	AS	fino al 30.09.05
Onofrio Roberto *	RU	
Orlandini Enzo	PA	dal 28.12.04
Paccanoni Francesco	PA	
Pantano Ornella	RU	
Pascoli Donatella	PA	
Pascolini Alessandro	PA	
Pasti Paolo	PA	
Patergnani Giuliano	PA	fino al 31.10.02
Pavan Piero	PA	
Pellegrini Fausto	PO	fino al 31.10.01
Peruzzo Luigi	PO	
Pisent Gualtiero	PO	fino al 31.10.05
Pusterla Modesto	PO	
Ricci Renato	PO	fino al 31.10.02
Ronchese Paolo	RU	
Rossi Paolo	PA	
Saggion Antonio	PA	
Santini Mario	PO	fino al 30.09.02
Sartori Gianfranco	PO	
Sartori Giorgio	PA	
Sartori Paolo	RU	
Sartori Silvia	PA	
Scarlassara Francesco	RU	
Schiavuta Enzo	PA	
Sconza Andrea	PA	fino al 31.08.02
Segato Gianfranco	RU	
Seno Flavio	PA	RU fino al 19.12.02
Signorini Cosimo	PO	
Silvestrelli Pier Luigi	RU	
Simonetto Franco	PA	RU fino al 30.09.02
Stella Attilio	PO	
Stroili Roberto	RU	
Taffara Luigi	PO	fino al 31.10.01
Toigo Flavio	PO	
Tonin Mario	PO	
Toniolo Domenico	PA	fino al 30.09.05
Tornielli Giorgio	PA	
Turolla Roberto	PA	RU fino al 31.10.02
Vanzani Vittorio	PO	

Vascon Mario	PA	
Vendramin I.	PA	fino al 15.12.04
Ventura Luigi	PO	fino al 30.09.04
Viesti Giuseppe	PA	
Vingiani G. Battista	PO	fino al 31.10.05
Vitturi Andrea	PO	PA fino al 31.03.01
Voci Cesare	PO	
Zanella Giovanni	PA	
Zannoni Giorgio	PA	fino al 30.09.05
Zannoni Roberto	PA	
Zotto Pierluigi	PA	dal 01.11.02
Zumerle Gianni	PO	
Zwirner Fabio	PO	dal 01.11.05

PhD STUDENTS

DOTTORATO DI RICERCA IN FISICA

XV CICLO

Bartolo Nicola
Cesca Tiziana
Maddaloni Pasquale
Marin Andrea
Mattoni Alessandro
Moretto Sandra
Preti Giovanni
Rotondo Marcello
Torrielli Alessandro
Turcato Monica
Viel Matteo

XVI CICLO

Biggio Carla
Dainese Andrea
Fortunato Lorenzo
Frassinetti Lorenzo
Lissandron Giorgio
Longhin Andrea
Parenti Andrea
Pesente Silvia
Polin Marco
Tricarico Pasquale

XVII CICLO

Bianchin Valentina
Bignotto Michele
Bonfiglio Daniele
Carlin Alessandro
Della Vedova Francesca
Faccia Antonio
Mazzocco Marco
Nespolo Massimo
Rando Riccardo
Zilio Silvio

XVIII CICLO

Alciati Maria
Barbui Marina
Barlini Sandro
Cortiana Giorgio
Cravotta Andrea
Da Ronco Saverio
Giubilato Piero
Liguori Michele
Scarabello Luca
Verna Adriano

IXX CICLO

Alfier Alberto
Azzaele Sandro
Bello Valentina
Calibbi Lorenzo
De Mattia Marco
Marcone Boris
Mogentale Irene
Mosconi Francesco
Scalzotto Villi Mario
Tibolla Omar
Varanini Filippo
Zanetti Marco
Zanzi Andrea
Zonta Francesco

XX CICLO

Agostini Matteo
Bellan Paolo
Bertacca Daniele
Bonomo Federica
Brigo Laura
Carrara Enrico
Doro Michele
Gaz Alessandro
Gobbin Marco
Liguori Nicola
Marra Valerio
Mattiazzo Serena
Posocco Piero Antonio
Recchia Francesco
Riccobene Giuseppe
Volpato Roberto

ALTRI DOTTORATI

CISAS

Barbieri M.
Granata V.
Turrini D.

SCIENZA DEI MATERIALI

Bazzan M.
Bersani M.
Bisognin G.
Capetti G.

Dal Toe' S.
Di Marino M.
Enrichi F.
Fois G.
Mattevi C.
Pellegrini G.
Schiavuta P.
Trave E.
BIOELETTROMAGNETISMO
Nofrate V.

POST-DOC FELLOWS (during 2001-2005)

Baldovin F.
Bertolin A.
Candelori A.
Bigongiari C.
Chiminello F.
Colecchia F.
De Noce C.
De Pol G.
De Zolt Sappadina S.
Dorigo T.
Galeazzi F.
Ghirlanda L.
Intavaia A.
Kabakcioglu A.
Komenkov V.
Lytovchenko A.
Moretto S.
Nurmagambetov A.
Paoletti M.
Passera M.
Perazzi E.
Popov SB.
Portales H.
Prete G.
Rosati F.
Saber A.
Sada C.
Scodellaro L.
Tornielli A.
Vecchiato A.

ASSEGNISTI DI RICERCA

Andrighetto A.	(01.03.00 - 29.02.04)
Argiolas N.	(01.06.03 - 31.05.07)
Baiesi M.	(01.11.01 - 30.06.02)
Bastieri D.	(01.02.99 - 23.12.02)
Bhattacharyay A.	(01.10.04 - 31.12.05)
Bignotto M.	(01.04.05 - 31.03.07)
Bigongiari C.	(01.03.02 - 28.02.06)
Bisognin G.	(01.03.05 - 30.11.06)
Cesca T.	(01.04.03 - 31.03.07)

Chiminello F.	(01.05.03 - 30.11.04)
Ciubotaru C.	(01.06.05 - 31.05.07)
Conti L.	(01.03.00 - 31.07.04)
Dainese A.	(01.04.04 - 20.12.05)
Dazzi F.	(01.11.04 - 30.11.05)
De Julian F. C.	(01.03.99 - 28.02.03)
De Nardo L.	(01.03.00 - 29.02.04)
De Pol G.	(01.06.03 - 31.05.07)
De Salvador D.	(01.04.01 - 15.12.02)
Dorigo A.	(01.05.03 - 01.05.04)
Dorigo T.	(01.05.03 - 20.12.05)
Flamini A.	(01.01.04 - 15.09.04)
Fortunato L.	(01.04.05 - 21.11.05)
Gemelli G.	(01.06.00 - 01.09.01)
Glodariu T.	(01.06.02 - 08.09.06)
Gonella F.	(01.04.01 - 23.12.04)
Lacaprara S.	(01.04.02 - 20.12.05)
Longhin A.	(01.05.04 - 30.04.07)
Lucchesi D.	(01.04.01 - 31.03.05)
Lunardon M.	(01.01.99 - 31.12.02)
Marginean R.M.	(01.05.04 - 30.04.08)
Margoni M.	(01.02.99 - 30.04.01)
Monari P.	(01.07.00 - 06.04.01)
Moretto S.	(01.05.05 - 30.04.07)
Ortolano S.	(01.05.05 - 30.04.07)
Parenti A.	(01.09.03 - 31.08.07)
Passera M.	(01.06.01 - 31.05.03)
Passera M.	(01.04.04 - 22.12.05)
Rizzi V.	(01.03.02 - 01.02.04)
Rosati F.	(01.03.03 - 31.07.07)
Rossi A.	(01.06.00 - 31.05.04)
Rotondo M.	(01.03.02 - 20.12.05)
Schiavuta P.	(01.02.03 - 31.10.04)
Shadchin S.	(01.06.05 - 31.05.07)
Trovato A.	(01.05.04 - 30.04.06)
Turcato M.	(01.03.03 - 28.02.07)
Turrisi R.	(01.06.01 - 31.05.05)
Valencia H. F.	(01.06.05 - 31.10.06)
Valente G.	(01.06.01 - 31.05.05)
Vanini S.	(01.06.00 - 31.10.04)
Vempati S.	(01.01.04 - 31.12.04)
Venturelli R.	(01.04.00 - 01.09.03)
Vian F.	(01.02.99 - 31.01.03)
Vomiero A.	(01.03.03 - 28.02.05)
Zampieri L.	(01.04.99 - 01.07.01)

TECHNICIAN AND ADMINISTRATIVE STAFF

Andreella Irene
 Artosin Giuseppina
 Barbierato Alessandra
 Benazzato Leopolda
 Bertante Germana
 Berto Enrico (dal 15.12.2002)
 Berton Laura (dal 01.09.2005)

Bettella Giancarlo
Biasiolo Gianfranco
Birolo Sandra
Bolzan Enrico (fino al 10.03.2003)
Borsato Enrico
Caldogno Marco
Calore Davide
Calore Giorgio
Calore Giulio
Carpanese Lina
Ceccato Daniele
Cesaro Sandro
Clementi Osmano
Dalla Fina Aldo
Da Riva Monja (dal 3/11/03)
Delfitto Giorgio
Del Grosso Enesio
Dragoni Barbara
Filippi Daniele
Furlanetto Annamaria (fino al 31.01.2004)
Galet Giampaolo
Legname Giovanna (dal 15/3/2004)
Lorenzin Maria Rosa
Mazzucco Cristina
Menguzzato Matteo
Menegazzo Enrico
Menon Giorgio
Modenato Mariarosa
Negrello Mauro
Pantano Devis
Parisotto Paolo
Parolin Moreno (fino al 30/06/2005)
Pironi Monica
Pulzato Nicola
Rando Paolo
Salvato Giorgio
Sambo Andrea
Schiavon Adriana
Schiavon Vittorio
Scian Carlo (dal 10/11/03)
Storti Renzo
Tavazzi Fernando
Temporin Roberto
Venier Claudio
Viola Giampietro
Voltan Giuseppe
Zatti Franco
Zenere Paola

5.a	Risorse finanziarie [media quinquennale 2001-2005]																																																																																				
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6.a	<p>The Department is mainly located in two buildings (via Marzolo 8 and via Loredan 10) with a total area of about 12,700 sq. m. The major research facilities are located in via Marzolo, whereas student laboratories and administrative offices are in via Loredan.</p> <p>The research facilities in via Marzolo are operated jointly with the INFN Padova Section. Major items are the Mechanical Workshop, the Electronics Laboratory, the Clean Room and a large room for a computer cluster; such facilities have been also used on request by other Departments. The main part of experimental activities related to INFN programs is performed at the Laboratori Nazionali di Legnaro, besides the activities in foreign Laboratories (CERN, STANFORD, DESY,).</p> <p>The experimental activity of the Material Science group makes use of a number of research laboratories equipped with important instrumentation such as SIMS (Secondary Ion Mass Spectrometry) and, HRXRD (High Resolution X-ray Diffraction). Other laboratories are devoted to the Optical Characterization of Materials, to Crystal Growth and Thermal Treatments, to the Atomic Force Microscope, and to the experimental Surface Physics, mainly to the study of the friction at low temperatures and to the interaction between liquids and micro- and nano-patterned solid surfaces. The Material Science Group also manages the Ion Implantation laboratory located at Laboratori Nazionali di Legnaro.</p> <p>The Department hosts a large, dedicated Library, with about 14,000 books and 102 journals, which cover all branches of Physics and some of related sciences. The total budget for the library in the year 2005 amounted to 288,000 €.</p>																																																																																				
6.b	<p>In the near future an area of about 1,000 sq.m. will be acquired by the Department in a building located in via Belzoni. This will permit, besides a small expansion mainly for offices, a better rearrangement of the existing structures towards a more rational utilization of the available space.</p> <p>Part of the experimental activity of the Material Physics group is expected to move to a new</p>																																																																																				

	<p>laboratory facility, which the University is setting up in via Trasea and which will be available by the end of 2007. This new facility will be shared by Material Science research groups coming both from the Department of Physics and from the Department of Information Engineering. Such a joined initiative will constitute a significant improvement of the research capabilities of the Department in the near future.</p> <p>Moreover the Department will play an essential role in the development of the initiatives that Veneto Nanotech is expected to locate at Padova University.</p>
7	Rapporti con altri istituti di ricerca a livello locale, nazionale e internazionale, a livello di Dipartimento
7.a	<p><i>[specificare concretamente quanto indicato sotto collaborazioni istituzionalizzate indicate al punto 1]</i></p> <p>The partnership between the University of Padova and INFN is governed by an official agreement since 1968. Within this agreement the INFN Section of Padova is hosted in the Physics Department and major research facilities are jointly operated. Similarly, a research agreement exists between the Padova University and the INFN Laboratori Nazionali di Legnaro. Moreover the research activities in Astrophysics are performed within the agreement between the University of Padova and INAF.</p> <p>The partnership between the University of Padova and INFN was governed by an official agreement from 1995 to 2003. That agreement is now with CNR. Research in condensed matter is now coordinated nationally by CNISM.</p> <p>The Department participates also in the Consorzio.RFX, a joint venture between CNR, ENEA, University of Padova, INFN and Acciaierie Venete s.p.a. RFX is working in the field of controlled thermonuclear fusion for energy production, within an EURATOM contract.</p>
7.b	<p><i>[collaborazioni personali non istituzionalizzate ma rilevanti per la ricerca del Dipartimento: partecipazioni di ricercatori esterni a programmi di ricerca del Dipartimento e partecipazioni di ricercatori del Dipartimento a programmi di ricerca di altri istituti in Italia o all'estero]</i></p> <p>See specific research programs.</p>
8	Prestazioni, ricerche a pagamento, consulenze conto terzi e altre attività di ricerca.
	<p>Nanomaterials for solid state hydrogen storage.</p> <p>In the framework of CNISM, an interarea research project on innovative hydrogen storage materials is pursued in our Department (DF) by S. Lo Russo in a well established interarea collaboration with the Material Section of the Department of Mechanical Engineering (DIM). This new research line started up in the year 2002 in the framework of the ex-INFN Unit (now CNISM) of Padova. This research field is oriented to solve one of the main open problems for a future utilization of hydrogen as energy vector both for vehicular and stationary applications. Such activity started up at the Padova Physics Department under the responsibility of Prof. Sergio Lo Russo, involving also Physicists of the near Dept. of Mechanical Engineering (Materials Section) belonging to the same INFN Unit. The "Hydrogen Group" is then a homogeneous interdepartmental group operating at the Department of Physics (DF) and at the Materials Section of the Department of Mechanical Engineering (DIM) of Padova University. The Group has investigated in the last years the hydrogen storage processes in solids from the points of view of both fundamental and oriented physics, joining the previous consolidated competences in solid state physics, material science, metallurgy, in cooperation also with researchers of other national and international laboratories with complementary competences. The topic of this research is a novelty for Padova University and is surely actual and of</p>

scientific interest, also considering the possible technological implications in local, national and international context. Local and national industries, as well as a Japanese car big company, have already shown interest for the recent activity of the group, for its future projects and for the young researchers trained.

The studied materials are produced in our laboratory in the form of nanopowders: their high surface to volume ratio can improve the ability of the material to absorb hydrogen. Much research activity has been carried out by the Group recently on Mg-based materials with suitable additives. It has been shown that the preparation method (e.g. ball milling) and the different additives used (e.g. graphite, Nb₂O₅, Ni, Fe) have a remarkable effect in improving the hydrogen absorption and desorption kinetics, but do not influence the thermodynamics of the process, which has good characteristics of reversibility. It means that Mg-based hydrides need to be heated at about 300°C to release hydrogen. However, due to the rather high gravimetric hydrogen capacity of these materials (about 6 wt%), a functional hydrogen reservoir, in which the energy of part of stored hydrogen is used for its release, is under development for niche applications.

The future work will be addressed to the study of complex hydrides (alanates, imides, etc.) presenting a high gravimetric hydrogen capacity, but at the moment unresolved problems of reversibility and contamination in not highly protected atmosphere.

This research line has been funded within the PRIN-COFIN 2001 (121.367 euros (DF)) and PRIN-COFIN 2004 (95.500 euros (DIM)). A laboratory, located in the Materials Section of the new Dept. of Mechanical Engineering, has been equipped with advanced instrumentation. The Padova Group is linked with many other qualified international research Groups, also from industry, with which proposals of European Projects will be presented to the EC. Prof. Lo Russo is member of the Scientific Council of H2IT, a national association of research institutions, industries, public administrations interested to the development of the hydrogen energy vector, operating at both national and european level.

A sizeable number (13) of presentation to national and international conferences and papers on international journals (20) resulted as products of this research line. The workshop “Materiali per il Vettore Energetico Idrogeno” has been successfully organized at Padova by S. Lo Russo e G. Principi (10-11 October 2005) to join the national competence in the field.

Plasma Physics

A plasma physics activity is established at the Physics Department and makes its experimental work in the Consorzio RFX laboratory in Padova. Connections are tight because members of the Department are in the Consortium committees and P. Martin, a member of our department, is leader of a line of research at RFX. The RFX laboratory hosts the RFX-mod experiment, whose aim is to study magnetically confined plasmas in the reversed field pinch RFP configuration. The Department of Physics is directly and formally involved in the Consorzio RFX structure, through the “Centro Interdipartimentale per Ricerche sulla fusione”. A professor of the physics department seats in the board of directors of Consorzio RFX. The Consorzio RFX is one of the largest physics laboratory in the Padova area; it is strongly integrated in the European and international research framework, and it represents a strong attraction pole for the education and training of young researchers.

In the time span 2001-2005, 1 faculty member (Piero Martin,), 7 PhD and several undergraduate students participated to the Plasma Physics activity. The main research area has been that of magnetically confined plasmas and thermonuclear fusion for energy purposes. The role of the plasma physics activity has been relevant also in its education and training aspects. The main research topics of the plasma physics group have been:

- Magnetohydrodynamics (MHD) problems, magnetic self-organization and magnetic field selfamplification (dynamo) processes in magnetically confined plasmas.
- Experimental study of helical states in the RFP, and of chaos-order transitions in the RFP

complex plasma system

- MHD in tokamak plasmas, in particular through experiments performed in the Asdex Upgrade device at the Max-Planck Institut fuer Plasmaphysik in Garching bei Muenchen
- The design and realization of complex diagnostics for fusion and industrial plasmas
- Transport and energy confinement in RFP plasmas
- Fluctuations and turbulence in RFP plasmas
- Experiments on feed-back control of magnetic instabilities in fusion plasmas.

In the period covered by this document this activity has produced 39 papers in international physics journals and many contributions to international conferences; 11 invited talks at international conferences have been given. In July 2004 P. Martin has been appointed as leader of the task force “MHD instabilities and their active control” at the Max-Planck Institut fuer Plasmaphysik (IPP) in Garching bei Muenchen, where is therefore responsible for a broad physics program. At IPP is active the Tokamak Experiment ASDEX upgrade, one of the largest in the world. From 2003 he is also member of the “International Liason Committee” of the “Center for Magnetic Self-Organization (CMSO, www.cmso.info). The CMSO is a frontier physics centre founded by the US National Science Foundation.

It has to be noted that funds of the Plasma Physics activity are essentially provided by the Consorzio RFX.

GRID computing

In the framework of the INFN GRID project and of the European project EGEE (Enabling Grids and EScience in Europe) the Department, in close collaboration with the Section of INFN, started a research activity for the development and the usage of GRID middleware and software technologies, particularly for the simulation, reconstruction and analysis of the large amount of data recorded in High Energy Physics experiments at accelerator machines of last generation. For the most recent, currently running experiments (CDF, Babar) or the ones in an advanced assembling status (CMS, Alice), this is a particularly complex challenge since it implies the access to hundred or even thousands of TeraBytes of data. Their processing requires huge computational resources (both in terms of CPU and mass storage), necessarily distributed on Wide Area Networks at the various Laboratories and/or Universities hosting the research groups of International Collaborations. These resources must be efficiently usable from the researchers in a completely transparent way (i.e. without knowing the architectural details of the many different Computing Centres involved), by submitting their simulation, reconstruction and analysis application programs on the GRID in the same way as they used their home Computing Centre from their desktop.

The Computing Centre of the Department hosts important CPU resources organized in computing farms, mainly funded by INFN, either dedicated to specific HEP experiment (as Babar) or shared for the usage through the GRID by more experiments (CDF at FNAL, CMS and ALICE at CERN). The goal of the research activity developed within the GRID project was to make these resources available to the outside world as a single GRID Computing Element (with corresponding connected “Storage Element”) to which the user applications are automatically addressed by a “broker program”, which decides the destination of the jobs on the basis of the information registered in the databases of the Grid Information System, optimizing the usage of the resources. This information includes the data and experiment software availability at the different Computing Elements, the load of the computational resources in a given Grid Node and the status of the network.

In this framework, the MURST funded in the three years 2001-2003 the HEP research line of the Centre of Excellence of the Padua University on “Science and Application of Advanced Computational Paradigms”, developed in collaboration with the Department of Information Engineering.

This activity produced already a number of papers on international journals and presentations to international Conferences and Workshops. Moreover, a specific workshop (the II Workshop del Centro di Eccellenza su Scienza ad applicazioni di Paradigmi Computazionali Avanzati, May

2003) was organized in collaboration with DEI.

Mantegna Project

On request of the Soprintendenza per il Patrimonio Storico Artistico e Demoetnoantropologico del Veneto a project of consultancy of the Department of Physics “G.Galilei” initiated in 1994 to aid in the long-standing problem of a recomposition of the frescos of the Ovetari Chapel, wrecked during a bombing in March 1944. During the following years, that activity bore an original mathematical method (the method of circular harmonics) for the virtual recomposition of fragments on existing photographs taken several tens of years before the wreckage.

The encouraging outcome of a first test on a thousand of the about eighty thousand existing fragments brought to the birth in 2001 of Project Mantegna, disciplined by an agreement stipulated by University of Padova, Soprintendenza, Curia Vescovile, and the Foundation of the Cassa di Risparmio di Padova e Rovigo, who financed the whole project.

During the works, performed in collaboration with the Department of Art History, many students of technical, scientific and humanistic disciplines have been engaged. They operated under guidance from two computer scientists and two art historians. The responsibility and financial administration of the whole project has been entirely provided by the Physics Department.

On the basis of the results of the project of finessing and rearrangement, which is close to completion, an actual restoration of a first part of the frescos has started a few months ago by a group of restorers, guided by Prof. Gianluigi Colalucci, and helped by the permanent personnel of the Mantegna Laboratory.

VIRLAB - High Tech instrumentation for Personal Mobility & New Welfare

The activity of this group is concentrated to HIGH TECH ICT & advanced sensors for applications to the areas of personal mobility and New Welfare along three main lines of scientific & Technological research.

Line 1: The Edelweiss project. The object of this project was the complete revamping of the integrated Access Control System (Dolomiti SkiPass) of the about 500 Alpine ski stations of the Dolomiti Superski consortium. The main results were presented at the 9th International congress for the transportation by rope, September 2005, Innsbruck, Austria. The main tasks of the project were in the following fields

- T1. Biometry and Face recognition, in collaboration with the Cagliari University.
- T2. RFID in the 13.56 Mhz frequency band.
- T3. Embedded Linux subsystems and Pervasive computing.
- T4. Wireless

integrated communication for HICH distributed control systems at the local and mesoscale geographic dimensions. This development was organized in collaboration with the companies Cap Research srl, Cap spa and Oracle Europe and the results were communicated at the Oracle European Conference during 2005.

Line 2. Fleet management and control systems in the area of application to the Local Public Transportation (LPT). The technologies we developed during the Edelweiss project were transferred, from the early 2003, to Public LPT systems, in two Italian regions: Veneto, in collaboration with ATVO & ACTV public companies, and Liguria, in collaboration with the Regione Liguria Public Administration. This line of research is now in advanced state of development and three prototype – level control systems were installed in Veneto and Liguria, with application to a) RFID new ticketing, b) personal security, c) fleet management. Our group was recently committed by the ATVO public company as the official consultant for a Feasibility Study on the subject of “Secure technologies for Interoperability of the multifunctional and multicontractor ticketing systems” which was officially requested by the Regione Veneto administration.

Line 3. ICT and new sensoristic for distributed Health Care control systems. This line was

activated in the 3rd quarter of 2005 on the basis of a general agreement with the Regione Liguria and its local Research Institutions for HIGH TECH developments in the areas of Bioscience, Biotechnologies, Health Care and Informatics. At the present moment we are evaluating, at a very ground level, two main application projects:

- T5. Simple and portable Axial Tonometry for the monitoring of atherosclerosis in critical patients.
- T6. Wearable analytical microlabs for distributed internetworked Health Care systems.

Promotion of scientific culture

An important activity concerns the description and the diffusion of the most important results obtained in the Department activity in various specialized publications, media and meeting organization. It is pursued in a fully professional way by A. Pascolini, with promotion and production of activities for raising public awareness of science, in particular of modern physics and of its applications, including its history. Particular importance is given to collaboration with educators to introduce particle and nuclear physics into Italian high schools, and for the continuing training of school teachers, on one side, and, on the other, with science journalists for a correct presentation of science.

The main lines of activities have been:

- the Magazine of the INFN “INFN-Notizie, dai quark alle galassie”;
- scientific exhibitions in Italy;
- scientific exhibitions abroad;
- promotion of physics in high schools;
- production of educational and promotional materials.

Promotion of International Dimension in Physics Education

This activity has recently acquired more and more momentum because of the so-called Bologna Process, which triggered the reforms of university studies all over Europe.

Since 1989 the Departmental degree-courses have a consolidated tradition in running Erasmus exchange flows with some of the best European Physics Departments (such as Paris XI – Orsay, Imperial College in London, Universidad Autonoma de Madrid, Universidade de Coimbra, Freiburg Universität, ...). On the basis of this experience, the Department “lent” LF Donà dalle Rose to the Rectorate, as the Rector Delegate for the European Student Mobility. He covered this position since November 1990, promoting several important steps for the internationalization of the University of Padova. Among his main achievements we recall here: promotion of students and teacher mobility, promotion of the ECTS credits among the Padova academics much earlier than the Bologna Reform of studies (DM 509), the promotion of the European Masters Degree in Human Rights and Democratisation and in recent years the planning and co-ordination of the procedure for conferring the corresponding Joint Degree Diploma (by 4 universities from 3 countries, a case of good practice in Europe), the admission of the University as a full member institution in the *Coimbra Group of the European Historical Universities* in 1998 and in the European network of prestigious engineering Faculties/Departments named *T.I.M.E. – Top Industrial Managers for Europe* in 2002, the promotion of the university participation in the Erasmus Mundus Master Courses, the promotion of the University Service named *SAOS-Servizio Accoglienza Ospiti Stranieri* i.e. an interface service between the foreign guests of the University and the local Police authorities, the co-ordination of a University strategic plan of action in Romania, etc.. In such a position LF Donà dalle Rose wrote several reports, short contributions and papers.

LF Donà dalle Rose also developed several reflections and papers about the Physics teaching in Italy and in Europe. He is among the founders in 1995 of *EUPEN-European Physics Education Network*, co-ordinated by Prof. H. Ferdinande, University of Gent, and presently named STEPS by EUPEN and counting more than 160 partners (Departments and Physical Societies). He is an

active member of the corresponding Steering Committee, contributing to the development of operational ideas, questionnaires and published reports (mainly in the EUPEN series). Since 2001 he is in the Managing Committee of the European Pilot Project *Tuning Educational Structures in Europe* (*Tuning Europe*, for short) and is the chair (in close cooperation with H. Ferdinande) of the Physics Tuning Subject Area Group (Tuning SAG), which includes representatives from 16 countries.

In such a position he has prepared several SAG reports and papers, giving a substantial contribution to the two official books, which so far describe the Tuning methodology. He has written some dissemination papers concerning the same methodology. As a Tuning Counsellor he has visited three Socrates Thematic Networks. Recently he was invited as an advisor to the Physics network of the pilot project *Tuning America Latina*. At present the works of the Physics Tuning SAG (phase 3 of Tuning EU) are mainly concerned with the doctoral training in Physics in Europe. In the recent past the issue of the internationalization of doctoral studies implied the participation of LF Donà dalle Rose as invited speaker to national and international events. Another branch of activity of LF Donà dalle Rose stems from his appointment as a member of the Italian Group of the Bologna Promoters established by the Italian Ministry of Education. He has been active in some Bologna events and at national level is mainly taking care of the issues related to mobility and joint degrees. He has been among the promoters of the Seminars of CRUI (Italian Conference of Rectors) aimed at re-visiting the new Bologna degree-courses under the new Italian Ministry Decree DM 270.

Museum of the History of Physics

The Museum of the History of Physics houses a remarkable collection of historical scientific instruments from the sixteenth to the twentieth century. The core of the Museum was set up in 1740, when Giovanni Poleni inaugurated his *Teatro di Filosofia Sperimentale*, the first physics cabinet in an Italian university. After Poleni's death, in 1761, the following professors of physics continued increasing the collection with new high quality scientific instruments intended both for didactics and for research. The Museum thus represents an important material evidence of the lively scientific activity carried out at the University of Padua throughout the centuries. The collection is remarkable both for its completeness and for the quality of the objects, many of which are unique or very rare.

The Museum is open to the public, and specialists from all around the world as well as a large number of school-classes from all parts of Italy come every year to visit the collection. The Museum thus greatly contributes to the diffusion of scientific culture and it plays a significant role as a research and documentation centre on the history of Italian physics.

Didactics of Physics and Formation of Physics Teachers

In the field of the formation of Physics Teachers and of the research in the didactics of Physics, the main activities are twofold: a Course on Methodology and Didactics of Physics, and the activities included in the "Progetto Lauree Scientifiche" (PLS).

The former is devoted to High School Teachers and includes laboratory work and lectures in different fields of Physics both for the strictly scientific aspect, the historical and epistemological side and the learning evaluation.

The latter is a project, financed by the Italian Ministry for Education, University and Research (MIUR). It is a two years project, started in Spring 2005 and it is directed to the High School Teachers and Students; it includes the promotion of Physics and the formation of Teachers and gives strong impulse to an activity started in late 2003. The aim of the group working at this project is to create a stable structure for the link of Physics Teachers of the Region and our Physics Department.

As far as the promotion of Physics is concerned the activities are mainly devoted to stages for Students in the most relevant Research Laboratories, conferences and lectures with visits to the

	<p>Museum of Physics history of our University.</p> <p>As far as the Physics Teachers formation is concerned, besides the Course mentioned above, we have started a research for the teaching of Relativity and the construction of "Learning Environments" (LE) based on Problem Based Learning (Jonassen, 2003) in some High Schools of our Region; at the moment this project has started in one High School but it will be extended to other Institutes within the next year. This latter research is in collaboration with Prof. S. Tagliagambe of the Sassari University and is strongly supported by the Regional Authorities of the MIUR.</p> <p>Both within the Course and the research on LE, we devote some effort to the study and application of a relatively new method of teaching Physics developed the Group of the University of Karlsruhe. For this goal we are in strict collaboration with the Group of Research in Didactics of Science of the High Pedagogical School of Locarno (CH).</p> <p>This activity is coordinated by Prof. A. Saggion with the collaboration of other Colleagues of the Department of Physics, of the Faculties of Philosophy and Engineering and High School Teachers.</p>
9	<p>Altre attività rilevanti per la ricerca, a livello di Dipartimento</p>
	<p>During September 2005 an international celebration was organized by the Department in the 100th anniversary of the birth of Bruno Rossi, an outstanding scientist, father of Cosmic Ray Physics and founder in 1936 of the "Istituto di Fisica", the actual seat of the Department. Other meetings and workshops on specific topics have been organized by members of the Department, who also often participated in international contexts as invited speakers (see the specific Programs).</p> <p>It is worth mentioning that the Physics Department has been directly engaged in the organization of several International Conferences and Workshops held in the Veneto Region:</p> <ol style="list-style-type: none"> 1) the series of NO-VE International Workshop on NEUTRINO OSCILLATIONS IN VENICE 2) the series of the International Workshops on "Neutrino Telescopes" in Venice 3) The international Conference on Nuclear Structure with Large Gamma – Arrays: Status & Perspectives Legnaro - Padova, September 2002 4) The International Symposium on Proton-Emitting Nuclei (Legnaro-Padova) February 2003 5) IV Congresso Nazionale Oggetti Compatti (CNOG IV), Padova November 2005 6) The international Conference "Radiation and its Effects on Components and Systems" (RADECS 2002) Padova 2002 7) The school "Detectors and Electronics for High Energy Physics, Astrophysics and Space Applications" Legnaro-Padova April 2005
10	<p>Coinvolgimento del Dipartimento in dottorati e numero di dottorandi, borsisti post dottorato e assegnisti ospitati dal Dipartimento</p>
	<p>Among the doctoral schools in which the Department is involved, the department members spend most of their efforts in the "Scuola di Dottorato in Fisica". The activity of this school is a direct and exhaustive follow up of the research carried on in the Department. This can be argued by examining the reports on the various projects, most of which count doctoral students among the participants. A considerable fraction of the financial resources of the various teams is devoted to equipment used by the doctoral students and to their participation to scientific collaborations, and to international schools and conferences.</p> <p>The students are all inserted in research teams, where they operate under the supervision of a member of the Department (tutore).</p> <p>In some cases the responsibility of supervision is shared with one or more colleagues (cotutori) also belonging to the Department, or, in exceptional cases, to other Institutions.</p> <p>The Department offers every year courses attended by doctoral students. The courses cover</p>

	<p>advanced research topics of interest for the doctoral curriculum and last for 30 hours each. They are taught mostly by members of the Department selected each year and address exclusively doctoral students.</p> <p>The Department is fully involved in the activity of the “Scuola di Dottorato in Scienza ed Ingegneria dei Materiali” which is a joint initiative between the Department of Physics, the Department of Chemistry and the Department of Mechanical Engineering. The main aim of this PhD School is to promote a high-level, research-oriented education curriculum sharing the peculiarities of the three disciplines and focused to the field of the functional micro/nano structured materials.</p> <p>(for the number of PhD students, etc. see 4.a)</p>																																				
11.a	<p>Prodotti della ricerca</p> <p>[per ogni anno del quinquennio la quantità totale dei prodotti del Dipartimento secondo la tipologia CINECA e indicare anche eventuali prodotti che non rientrano in questa tipologia.]</p> <table border="1"> <thead> <tr> <th></th> <th>2001</th> <th>2002</th> <th>2003</th> <th>2004</th> <th>2005</th> </tr> </thead> <tbody> <tr> <td><i>papers published on refereed journals</i></td> <td>314</td> <td>298</td> <td>354</td> <td>393</td> <td>369</td> </tr> <tr> <td><i>conference proceedings</i></td> <td>95</td> <td>96</td> <td>113</td> <td>105</td> <td>112</td> </tr> <tr> <td><i>books</i></td> <td></td> <td>4</td> <td>1</td> <td>1</td> <td></td> </tr> <tr> <td><i>patents</i></td> <td></td> <td></td> <td>1</td> <td></td> <td>1</td> </tr> <tr> <td><i>other</i></td> <td>12</td> <td>9</td> <td>7</td> <td>10</td> <td>7</td> </tr> </tbody> </table>		2001	2002	2003	2004	2005	<i>papers published on refereed journals</i>	314	298	354	393	369	<i>conference proceedings</i>	95	96	113	105	112	<i>books</i>		4	1	1		<i>patents</i>			1		1	<i>other</i>	12	9	7	10	7
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12	<p>SWOT Analysis (da allegare)</p> <p>[Analizzare per ogni singolo programma le forze (Strengths) e le carenze (Weaknesses) della ricerca del Dipartimento e le circostanze positive (Opportunities) e negative (Threats), che potranno risultare rilevanti per il futuro della ricerca]</p> <p><u>Programs 1-6</u></p> <p>The experimental research programs in the field of Particle, Astro-particle and Nuclear Physics (as described in the Program Forms 1-6) mainly performed within INFN funded projects show a number of common features that allow a unique SWOT analysis. Peculiarities of single research programs are also outlined in the following.</p> <p>The major common feature of all the above programs is that they are performed in International Laboratories, when accelerators are needed, or within established international collaborations. This means that the Internationalization is one of the distinctive strength of such research activity. In the latter cases, the Quality, Originality, Relevance and Innovation of the research programs are validated by a number of Program Committees or established collaboration bodies. Such “international” assessment is completed by the evaluation performed at a national level by the Scientific Committees of INFN that provide a valuable ex-ante and ex-post analysis for each research program that is funded by the Institute. This means that also the Scientific Productivity is evaluated year by year by the above bodies. As a result, clearly documented for each Program in the attached forms, scientific productivity in term of number of paper published in refereed journals or presentation at International Conferences represents a strength of such research programs.</p> <p>It is worth mentioning that the publication production rate is sufficiently good even for the Research Lines that are in the phase of construction of new experimental set-ups, as the CMS and ALICE activities, experiments planned at the new LHC accelerator at CERN. In this case the published papers are mainly technical reports that are documenting the progress in the hardware/software developments.</p> <p>All research projects described in Forms 1-6 have been funded in the past by INFN and such</p>																																				

research lines are also included in the next Three-year Plan of the Institute. This means that they are likely to be funded for the next years. Moreover, some Research Programs, as the one in the field of Astroparticle Physics, have been also funded in part by the Italian Ministry of Research and Education (MIUR) by the so called PRIN (Research programs of National Interest) framework, providing additional resources for specific tasks.

The socio-economical impact of this activities is in part related to the long term benefits coming from basic sciences. Moreover, development of specific technologies have a direct impact on societal needs. As an example, the pixel detectors used in relativistic heavy-ion studies are today proposed in several medical applications and the neutron techniques developed in low energy studies are applied in interdisciplinary fields. Moreover, the large computing facility and the development of GRID technologies that are distinctive features of the complex experiments found several application also in interdisciplinary fields.

It has also to be mentioned that the impact on the educational aspect of the Physics Department is relevant, being a sizeable number of students graduated with a thesis work on topics close to the INFN experimental activity. On the contrary, in the last year there has been a slight decrease of the student interest on the above activity, especially respect to the future experiments at LHC that require a large production effort. The decrease of the number of students attracted by this type of Physics, together with the important contraction of the number of students in Physics has to be taken as a serious concern for future actions.

As far as the Opportunities and Threats for the future, it is important to stress that fundamental research activities in Particle, Astro-particle and Nuclear Physics are foreseen to be funded in future by INFN and therefore are strongly related to the budget of this Research Institute for the next years. Although it is unlikely a future increase of this budget, it seems that all activities performed in Padova are on the main research interest of INFN and consequently will be funded also for the next years. However, it has to be noted that INFN has problems with the man-power, being the personnel turnover not granted for future and the use of temporary staff limited by law. In this respect being all activities performed jointly together with INFN personnel or inside INFN National Laboratories, this might represent a future threat.

On the other side, even if that fundamental research activities in Particle, Astro-particle and Nuclear Physics is not one of the FP6 priorities and will not be for FP7, the possibility of European funding of network for Integrating the European Research Area has been used in the past and might represent an important way of getting additional resources.

PECULIAR PROGRAM FACTS

As far as the Frontier of Energy Program in Particle Physics, this program is based on two experiments that will assure a continuity of activities in the field of hadron collider physics. While one experiment (CDF) is taking data and obtaining physics results at the same time the CMS experiment is designed and built with new advanced technologies and improved performances, in order to be ready to replace the first one when its scientific potential will be exhausted.

For the future of the Precision Measurements and Weak Decays Program, it should be noted that the DELPHI program is now over. Some of the people involved in BABAR and ZEUS experiments already devote a share of their time to new projects involving neutrino Physics (OPERA, Nova), other will be soon involved in CMS. For this reason their future contributions will be focused on completing the on-going activities and it will steadily decrease with time.

For the Nuclear Dynamics Projects, future activities of the research group in the next year are mainly related to the ALICE Collaboration at LHC. This activity will be certainly funded by INFN and a future up-grade of the SPD detector is now under discussion. The man-power of this group, based on 5 University and 4 INFN staff researchers, is supposed to be stable during the next five years. At the time of writing, 4 group members that have key position in the ALICE activities, are with temporary positions (3 INFN and 1 University). Possible future up-grade of the Silicon Pixel Detector, to be performed in parallel with the ALICE running, will require the present total man power, thus the possibility of maintaining the total man-power in the group.

Also the Nuclear Structure Program shows a future plan based on INFN funds with a sizeable research activity by using the accelerator facilities located at the Laboratori Nazionali di Legnaro where some of the experimental set-ups are in operation. The development of the new gamma-ray system AGATA, performed within an international collaboration will be one of the major goal of this group.

Program 7: Field and String Theory of the Fundamental Interactions

<i>Indicator</i>	S	W
Quality, Originality, Relevance and Innovation of the Research Program	X	
Internationalization	X	
Scientific Productivity	X	
Socio-economic Impact		x
Capacity of attract Resources	X	

Opportunities (O) and Threats (T) relevant for the future of the research program

	O	T
Future Research Planning	X	
Future funding possibilities	X	
Future access to research facilities	X	
Future man-power situation:		
4a. Program Participants with temporary position	2	
4b. Program Participants retiring in the next 5 years	1p. 2 f.r.	

Program 8: Phenomenology of Elementary Particles

<i>Indicator</i>	S	W
Quality, Originality, Relevance and Innovation of the Research Program	X	
Internationalization	X	
Scientific Productivity	X	
Socio-economic Impact		X
Capacity of attract Resources	X	

Opportunities (O) and Threats (T) relevant for the future of the research program

	O	T
Future Research Planning	X	
Future funding possibilities	X	
Future access to research facilities	X	
Future man-power situation:		
Temporary/Staff 9/7		
Program participants retiring in the next 5 years/staff 1/7		

Remarks:

O: Our group has behaved quite dynamically in these last years attracting a relevant and well-qualified set of students (both PhD and laurea students) and Postdocs (both Italian and foreign postdocs; in particular, we emphasize the presence of postdocs who joined our group using their own fellowships). They were manifestly attracted by the ample and significant results achieved by our group in its research activity and in its specific attention to the tutorial needs of young researchers. In our effort to obtain support from external sources for our postdoctoral activities, we succeeded to get access to a number of EU fellowships within EU Network programmes and also to a 3-year postdoctoral fellowship from the Helmholtz foundation for a joint research project with the DESY Theory Group. All these results were made possible thanks to a keen interest of our group in international research activities.

T: All the above positive results make the outlook for our future positive, but for a major threat

which is particularly serious given all the energy and interest we put in the growth of our human resources, in particular the young ones. We refer to the largely insufficient possibility we have to keep at least the best young physicists we educate in our group, or, more precisely, to offer them some position after they spend a vast period (at least 4-5 years) of postdoc activity abroad. We have not been assigned any position of researcher for quite a few years now and, actually, if we were to consider only university researchers, we should say that we have no researcher at all in our research line at present. Taking into account that Prof. Paccanoni is going to retire this Autumn, the previous statement can be enlarged even including the absence of any Associate Professor in our entire research line. Needless to say, this situation can lead to a failure of our intense efforts to guarantee a high-level future to our group, unless some significant measures are taken to modify the present trend.

Program 9: Theoretical Nuclear Physics

<i>Indicator</i>	S	W
Quality, Originality, Relevance and Innovation of the Research Program	X	
Internationalization	X	
Scientific Productivity	X	
Socio-economic Impact		X
Capacity of attract Resources	X	

Opportunities (O) and Threats (T) relevant for the future of the research program

	O	T
Future Research Planning	X	
Future funding possibilities	X	
Future access to research facilities	X	
Future man-power situation		X
Program participants with temporary positions		X
Program participants retiring in the next years		X
Future increase of the man-power		X

Program 10: High-Energy Astrophysics, Cosmology and Planetary Sciences

<i>Indicator</i>	S	W
Quality, Originality, Relevance and Innovation of the Research Program	X	
Internationalization	X	
Scientific Productivity	X	
Socio-economic Impact		X ¹
Capacity of attract Resources	X	
Impact on the Educational role of the Department	X	

¹This being a program in fundamental research, its social-economical impact is limited. However the team active involvement in several space programs (XMM-Newton, Planck, Rosetta and others) provides a direct link with aerospace industries.

Opportunities (O) and Threats (T) relevant for the future of the research program

	O	T
Future Research Planning	X	
Future funding possibilities	X	

Future access to research facilities	X	
Future man-power situation		X ²

²In the next 2-3 years one full professor and one associate professor retire. Taking into account that in the same period only one researcher position will be opened for the group, it is crucial that the Department provides further human resources for the program. In the years 2001-5 the shortage of staff members as been partly recovered through research contracts. Contract researchers provided about 10% of the program scientific production.

Programs 11-14 : Physics of Condensed Matter and Nanotechnologies

Indicator	S	W
Quality, Originality, Relevance and Innovation of the Research Program	X	
Internationalization	X	
Scientific Productivity	X	
Impact on the Educational role of the Department	X	
Socio-economic Impact		X
Capacity of attract Resources	X	

Opportunities (O) and Threats (T) relevant for the future of the research program

	O	T
Research program within PNR o del FP6/7 priorities (1)	X	
Future Research Planning (2)	X	
Future funding possibilities (3)		X
Future access to research facilities (4)	X	

- 1) The research activity described in the 4 programs is closely related to various aspects of material science and nano-bio sciences which are considered among the priorities of both PNR and UE Research programs.
- 2) All research programs deal with problems in areas of well established and increasing international activity having both fundamental research goals and application targets.
- 3) Due to points 1) and 2) above and to ongoing and planned collaborations between theorists and experimentalists, it is quite reasonable that grants from MIUR and/or from UE will be available. It is nonetheless true that the end of INFM (Istituto Nazionale per la fisica della Materia), makes it difficult to plan activities on long term basis and to fully exploit all the possible synergies with the laboratories of both CNR and former INFM.
- 4) The access to the experimental large scale research facilities needed by the various programs, mainly synchrotron light lines at Grenoble-ESRF and Trieste-Elettra were formerly managed by INFM with a precise evaluation procedure. Its role has now been moved to CNISM and CNR. Also for the theoretical activities an easy and cheap access to supercomputers should be possible through CNISM (Consorzio Interuniversitario per la scienza della Materia), which has replaced INFM in an agreement with the supercomputer center CINECA to grant computer time for big projects in Condensed Matter Physics.
- 5) A new promising opportunity for the development of the activities in the field of nanoscience is the new regional initiative called "Veneto Nanotech" which is expected to give rise in the near future to a new nanofabrication laboratory in Padova. Although the time schedule is not yet completely defined, the political decision has been already taken and a new framework for both fundamental research and industrial fallout will be available to the researchers in this field.

Program 15: Biological Physics

<i>Indicator</i>	S	W
Quality, Originality, Relevance and Innovation of the Research Program	X	
Internationalization	X	
Scientific Productivity	X	
Impact on the Educational role of the Department		X
Capacity of attract Resources	X	

Opportunities (O) and Threats (T) relevant for the future of the research program

	O	T
Research program within PNR or FP6/7	X	
Future Research Planning		X
Future funding possibilities	X	
Future access to research facilities	X	

We have put W on “Impact on the Educational role of the Department” because till now the department has not fully developed teaching programs to exploit our skills. Nevertheless the number of students (both undergraduate and graduate) which are doing thesis with our group is quite high.

We have put T on “Future Research Planning” because the scientific plans of the physics department have not yet foreseen a suitable development in our research direction (at least for the next three years).

Program 16-17-18: Nuclear Analytical Techniques and Applications, Electronics and Detectors, Medical Physics

<i>Indicator</i>	S	W
Quality, Originality, Relevance and Innovation of the Research Program	X	
Internationalization	X	
Scientific Productivity	X	
Impact on the Educational role of the Department		X
Socio-economic Impact	X	
Capacity of attract Resources	X	

Opportunities (O) and Threats (T) relevant for the future of the research program

	O	T
Research program within PNR or FP6/7 (1)	X	
Future Research Planning (2)	X	
Future funding possibilities (3)		X
Future man-power situation (4)		X

(1) Both PNR and EU directives strongly support programs in the fields of Medical, Environmental and Civil Security Physics. Electronics and sensors engineering, above all in spatial applications, is considered strategic and accordingly fostered.

(2) The programs 16-17-18 propose several projects of social and economical import. These

	<p>projects are inserted in international programs of large perspective and pursue widely consented goals.</p> <p>(3) Future funding might substantially depend on the strategic choices of the INFN and the funds that will be employed in applied (not basic) research. Future availability of accelerated beams in Italy may for example become an issue.</p> <p>(4) Staff has not increased at all during last five years, but a RU in Medical Physics recently posted. A hiring policy of the Department is required to invert this trend; otherwise these programs would not effectively develop. In particular, laboratories and facilities do require steady personnel.</p>
13	Posizionamento qualitativo del Dipartimento nel contesto nazionale e internazionale della disciplina.
	As already anticipated, the Department is fully integrated in an international context where it often plays a leading role. In the recent CIVR analysis the Department was ranked at the top position with respect to other Italian departments of comparable size.
14	Indicazioni per una strategia per il futuro
	<p>In recent years the strategy of the Department has been strongly influenced by the significant reduction of the available budget for new positions. This reduction was determined both by the policy of the University regarding the Faculty of Sciences and by the inner policy of the Faculty which further decreased the number of available new positions given to the Physics area. Under such penalizing constraints the strategy of the Department has been focused to maintain as much as possible the quality of the existing research activities, with the only exception in the recent years of the opening of a new research line in Biological Physics.</p> <p>The first ranking of the Department between the Italian University physics departments of comparable size in the recent CIVR evaluation is a proof of the success of this “defensive” strategy. Since no significant modification of the global university policy can be realistically foreseen in the near future the short term strategy of the Department is rather straightforward, first of all aiming at supporting the existing research lines.</p> <p>To be specific we mention the well established groups working, both experimentally and theoretically in nuclear and subnuclear Physics, astrophysics, cosmology, condensed matter physics and biological physics, whose projects are or were validated by INFN, INFN, INAF and the activities have been reported above. Most of the groups are involved in international collaborations and perform competitive research at the actual frontier of physics.</p> <p>It is obvious that to those groups the Department has to grant the necessary resources, both in terms of personnel and funding, to continue successfully their activity fulfilling their national and international commitments. To this purpose, it is necessary that funds from MIUR are given in a transparent and steady way.</p> <p>The activities of the theoretical groups in all the main research fields of the Department are very important not only for their own outstanding scientific production, but also because they provide a fertile cultural humus in which experimental activities can fully flourish.</p> <p>Particular attention will be paid to get the best out of two opportunities which are peculiar of the Physics Department of Padova: the presence of the INFN Laboratori Nazionali in the nearby Legnaro and the Distretto Veneto delle Nanotecnologie. The former is a well established large scale infrastructure easily accessible to all the researchers of the Department, through a specific agreement between INFN and the University of Padova. It offers research facilities not only for nuclear physics but also for condensed matter physics and for interdisciplinary projects.</p> <p>The latter is a much more recent institution supported by the national and local government aiming at sustaining the local industries through the transfer of the basic knowledge in nanotechnology developed, among the others, by our experimental and theoretical groups in</p>

condensed matter physics.

The strategy for the mid term future is more difficult to foresee, because it heavily depends on external circumstances. It is conceivable that the strong groups will successfully continue their activity, possibly cleverly tuning their targets and, consequently, suitably recycling the people involved in them. More delicate is the fate of a wealth of researches, some of them quite interesting on their own, but with a sub-critical size in the Department. Since probably the Department will not be able to support all of them in a way they can reach an adequate size, it is likely that a choice will turn out to be eventually unavoidable.