

Nuclear Physics Mid Term Plan in Italy

Concluding remarks

Frascati, December 2°, 2022.

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Nuclear Physics Mid Term Plan in Italy

INFN Nuclear Physics
Mid-term Strategy Plan
2022-2027

Session LNF
1-2 December 2022

LNF
Laboratori Nazionali di Frascati

Organizing Committee

- G. Benzoni
- D. Bettoni
- F. Bossi
- G. Carlo
- M. Colonna
- A. Di Leva
- E. Fioretto
- A. Formicola
- L. Fortunato
- S. Gammino
- F. Gramegna
- M. Junker
- M. La Cognata
- I. Lombardo
- R. Nania
- S. Pisano
- E. Previtalli
- S. Romano
- P. Rusotto
- F. Soramel
- J. J. Valiente-Dobón

The workshop is organized in specific working groups that will report their activities in the final event. These working groups will address the

LNS session (4-5 April 2022):

<https://agenda.infn.it/event/28717/>

- About 160 researchers have joined the working groups, about 30% from abroad
- About 270 researchers attended the meeting, ~90 in presence



Laboratori Nazionali del Sud

Working group (Chair)	Topic	Speaker
Nuclear Dynamics (S. Pirrone)	<ul style="list-style-type: none">▶ Heavy Ion Collision – EOS▶ Clustering▶ Fission Dynamics	E. De Filippo A. Di Pietro E. Vardaci
Nuclear Structure (C. Agodi)	<ul style="list-style-type: none">▶ Nuclear Matrix Elements towards $0\nu\beta\beta$: theoretical model developments▶ Selective Study of nuclear structure response with high intensity beams and advanced spectrometry▶ Collective modes in nuclei with stable and unstable beams	A. Gargano F. Cappuzzello G. Cardella
Nuclear Astrophysics (R. Pizzone)	<ul style="list-style-type: none">▶ Nuclear and atomic input for the quiescent stellar evolution▶ The «explosive» universe : BBN and explosive nucleosynthesis▶ s and r process	A. Pidotella G. G. Rapisarda M. L. Sergi
Applications (S. Tudisco)	<ul style="list-style-type: none">▶ Medical Applications▶ Laser-Matter Interaction▶ Plasma traps	G. Petringa G. A. P. Cirrone D. Mascali

LNL session (11-12 April 2022):

<https://agenda.infn.it/event/28738/>

- About 120 researchers have joined the working groups, about 40% from abroad
- About 280 researchers attended the meeting, 82 in presence



Working group (Chair)	Topic	Speaker
Nuclear Astrophysics (R. Depalo)	<ul style="list-style-type: none"> ▶ Nucleosynthesis up to the iron peak ▶ Nucleosynthesis of trans-iron elements ▶ Nuclear astrophysics theory 	A. Cacioli T. Kurtukian Nieto S. Cristallo
Nuclear Structure (D. Mengoni)	<ul style="list-style-type: none"> ▶ Shell evolution ▶ Light to medium-mass exotic nuclei ▶ $N \sim Z$ nuclei and isospin symmetry ▶ Deformation and collective states 	A. Gottardo S. Bottoni S. M. Lenzi F. C. Crespi
Nuclear Reactions and Dynamics (T. Marchi)	<ul style="list-style-type: none"> ▶ Physics overview: alpha clustering, dynamics and structure, thermodynamics, equation of state, collective motions ▶ Mechanisms/Tools: fusion-evaporation and pre-equilibrium emission ▶ Mechanisms/Tools: transfer, particle spectroscopy ▶ Mechanisms/Tools: fission and sub-barrier fusion 	F. Gulminelli & D. Dell'Aquila K. Mazurek & M. Cicerchia L. Gasques & F. Galtarossa M. Caamaño-Fresco & I. Zanon
Applications (G. Pupillo)	<ul style="list-style-type: none"> ▶ Nuclear cross sections measurements and modelling for direct radionuclide production and neutron beam lines at SPES ▶ ISOL and laser applications at the SPES facility ▶ Development, characterization and modifications of materials for applied nuclear physics 	L. Mou M. Ballan M. Campostrini



Laboratori Nazionali di Legnaro

LNGS session (11 October 2022):

<https://agenda.infn.it/event/31580/>

- **About 75 researchers attended the meeting, 44 in presence**



Working group (chair)	Topic	Speaker
Fundamental symmetries (C. Curceanu)	<ul style="list-style-type: none">▶ Pauli Exclusion Principle violation experimental studies▶ Quantum gravity, CPT and Lorentz symmetries and the Pauli Exclusion Principle violation▶ Quantum Collapse models and their experimental tests	K. Piscicchia A. Marciano F. Napolitano
Direct measurement for nuclear astrophysics (G. Imbriani)	<ul style="list-style-type: none">▶ Nuclear process of interest in stellar nucleosynthesis▶ Deep underground direct measurements▶ Measurements with recoil separators and other astrophysical relevant studies at CIRCE	O. Straniero F. Cavanna R. Buompane
Applied nuclear physics (L. Gialanella)	<ul style="list-style-type: none">▶ Mass spectrometry▶ Diagnostics and modification of materials with ion beams	F. Marzaioli A. D'Onofrio

LNF session (1-2 December 2022):

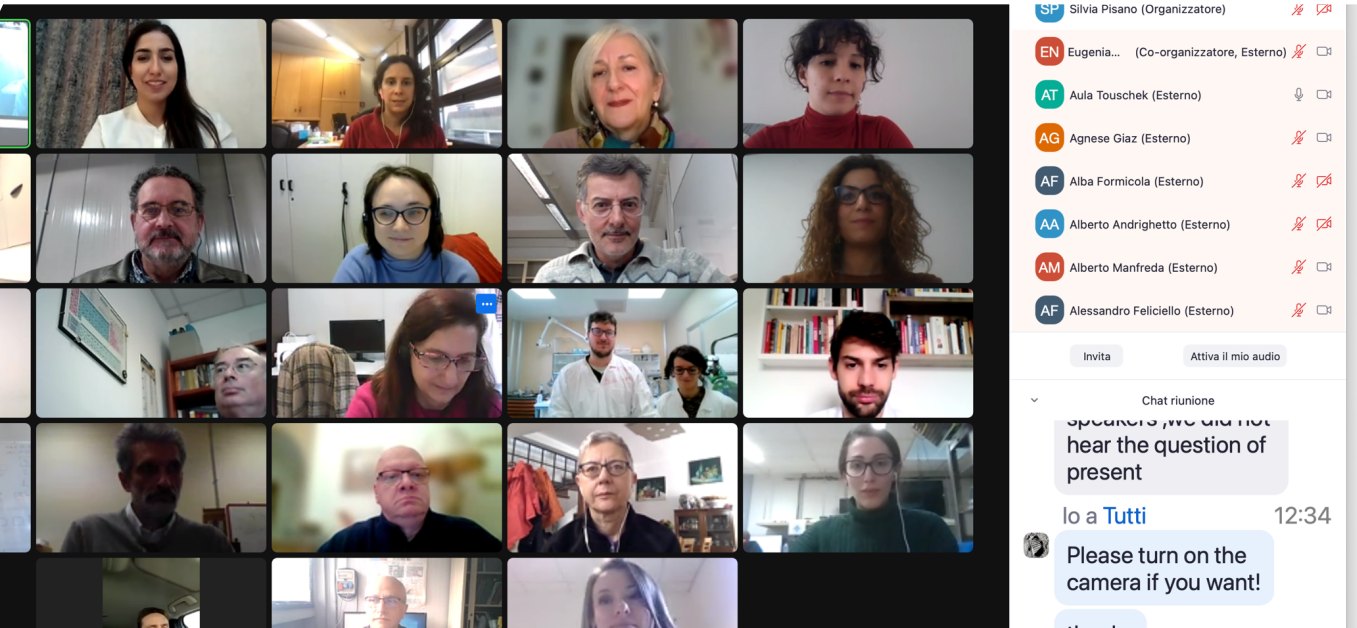
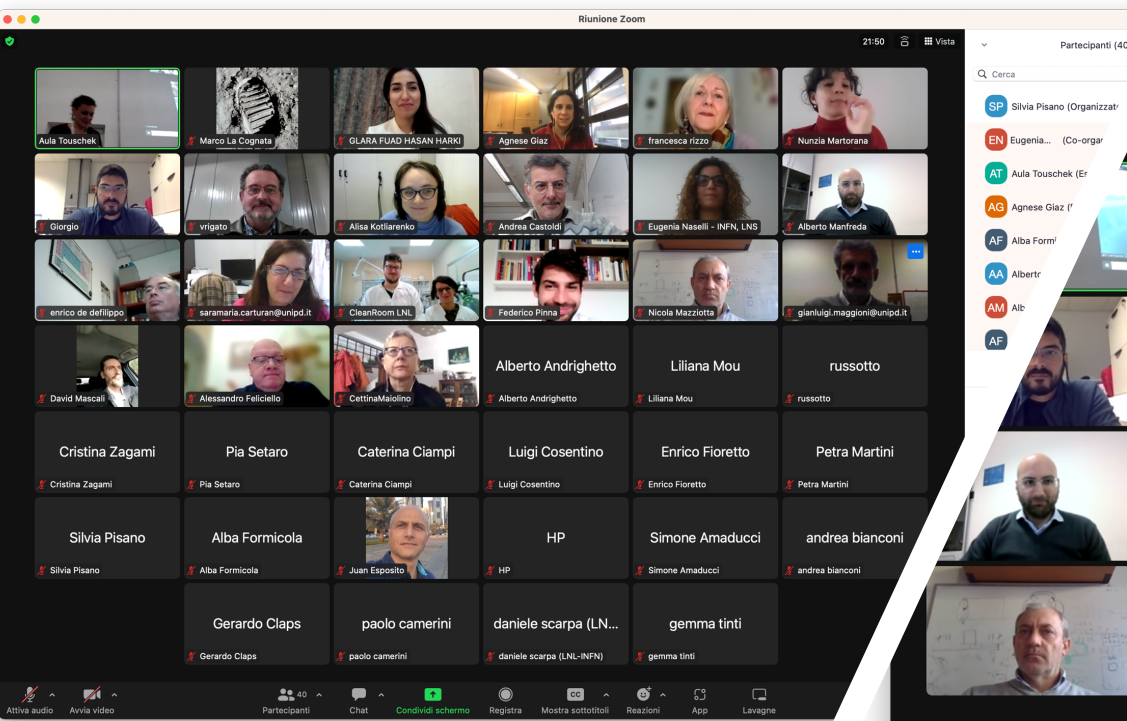
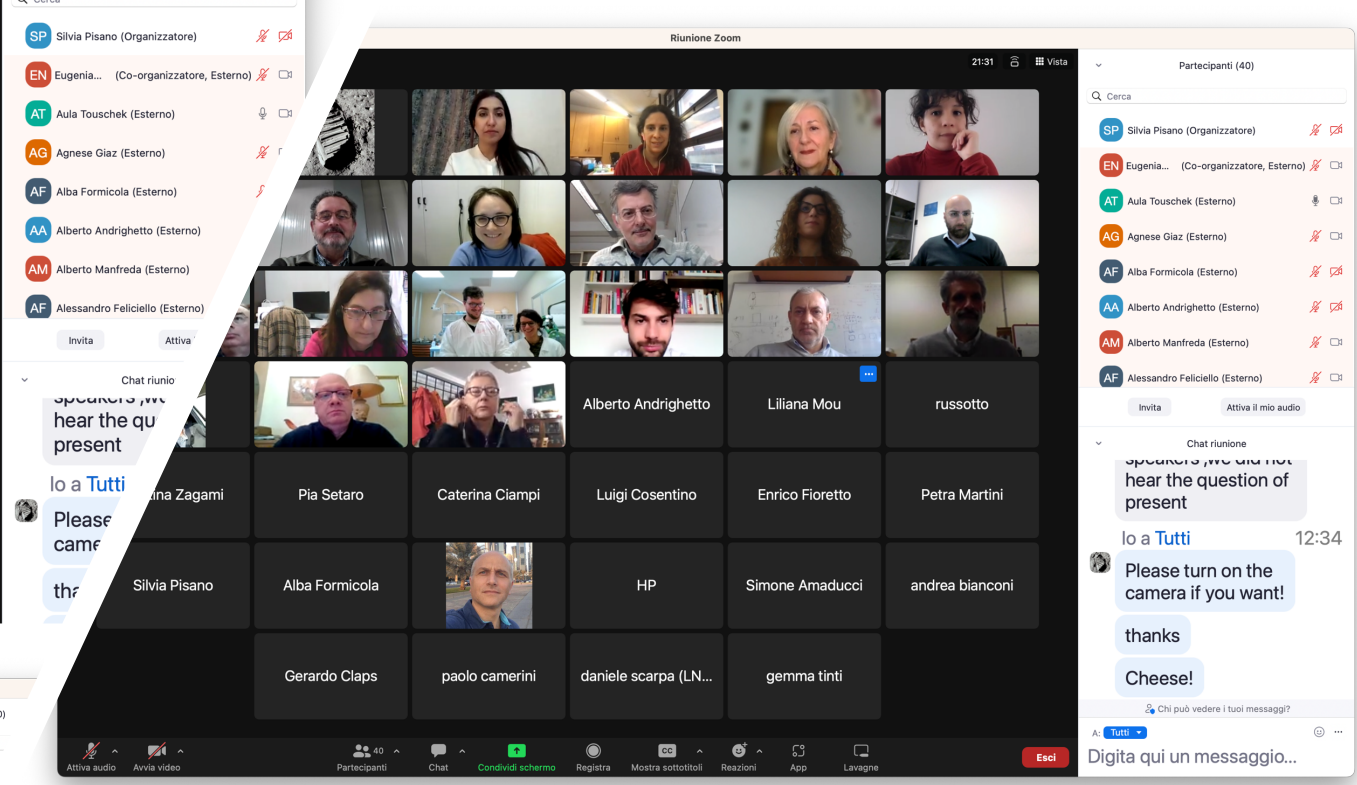
<https://agenda.infn.it/event/32709/>

- 223 researchers attended the meeting, 80 in presence



Working group (Chair)	Topic
Future possibilities for nuclear physics at DAFNE	<ul style="list-style-type: none">▶ Nuclear physics at DAFNE▶ Femtoscopy at SIDDHARTA and ALICE
Charged particle detectors (G. Pasquali, F. Galtarossa, L. Servoli)	<ul style="list-style-type: none">▶ Pulse shape discrimination, silicon carbide detectors, active targets▶ Segmented silicon detectors, heavy ion detection and spectrometers▶ Diamond detectors, emulsions and other techniques
Neutron detectors (C. Massimi, A. Gottardo)	<ul style="list-style-type: none">▶ Organic scintillators for neutron detection▶ Detectors for neutron beams and applications▶ Innovative neutron detectors
Detectors for medical applications (R. Catalano, P. Cardarelli, M. Lunardon)	<ul style="list-style-type: none">▶ Treatment monitoring and optimisation▶ Dosimetry, quality assurance and radiotherapy▶ X-ray and gamma imaging
Targets development for nuclear physics (M. Cavallaro, S. Corradetti)	<ul style="list-style-type: none">▶ Innovative targets for nuclear physics experiments▶ Innovative targets for new production facilities
Detectors for gamma/X-radiation (A. Scordo, W. Raniero)	<ul style="list-style-type: none">▶ X-ray detectors▶ Gamma detectors
New facilities at LNF, LNL and LNS (A. Di Pietro, A. Gottardo)	<ul style="list-style-type: none">▶ New facilities at Laboratori Nazionali di Legnaro▶ New facilities at Laboratori Nazionali del Sud▶ New facilities for laser-based activities at LNF and LNS





Future possibilities for nuclear physics at LNF

- 1) Nuclear physics at DAFNE
- 2) Possibilities for nuclear physics with EuPRAXIA

Charged particle detectors

- 1) Pulse Shape Discrimination, Silicon Carbide detectors, Active Targets
- 2) Segmented silicon detectors, heavy ion detection and spectrometers
- 3) Diamond detectors, emulsions and other techniques

Neutron detectors

- 1) Organic scintillators for neutron detection - *Andreas Best (NA)*
- 2) Detectors for neutron beams and applications - *Simone Amaducci*
- 3) Innovative neutron detectors - *Marco Toppi (RM1)*

Detectors for gamma/X radiation

- 1) Gamma ray detectors - *Francesco Sgarbossa (PD)*
- 2) X-ray detectors

Detectors for medical applications

Targets for nuclear physics measurements

- 1) Innovative targets for nuclear physics experiments - *Federico Pinna (Politecnico di Torino e INFN-TO)*
- 2) Innovative targets for new production facilities - *Sara Cisternino (LNL)*

New facilities at LNL and LNS

- 1) New facilities at Laboratori Nazionali di Legnaro - *Giovanna Benzoni (MI), Alain Goasduff*
- 2) New facilities at Laboratori Nazionali del Sud - *Diana Carbone, Dario Lattuada*

Gabriele Pasquali (FI)

Franco Galtarossa (PD/LNL)

Leonello Servoli (PG)

Cristian Massimi (BO)

Andrea Gottardo (LNL)

Sandra Moretto (PD)

Alessandro Scordo (LNF)

Walter Raniero (LNL)

Roberto Catalano (LNS)

Paolo Cardarelli (FE)

Marcello Lunardon (PD)

Manuela Cavallaro (LNS)

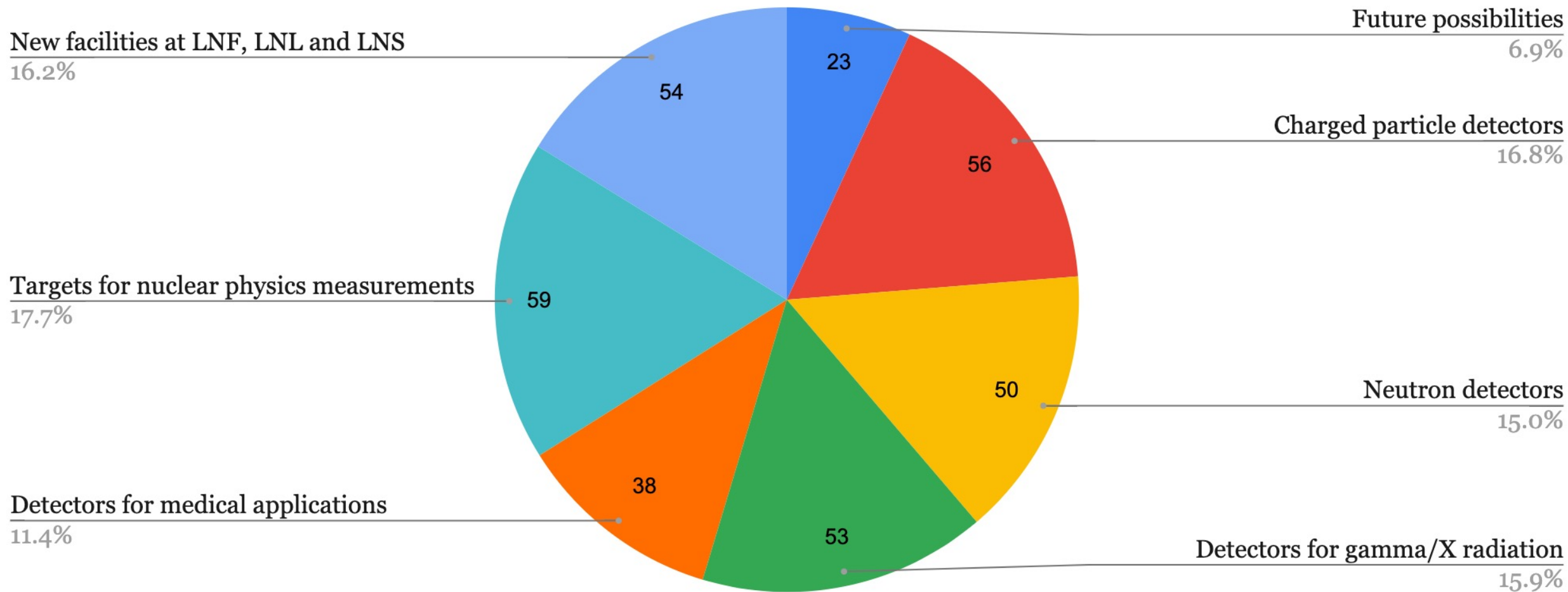
Stefano Corradetti (LNL)

Alessia Di Pietro (LNS)

Simone Bottoni (LNL)

Andrea Gottardo (LNL)

Number of participants



Thanks to (for the present edition)

- WG conveners (both 1 and 2)
- People contributing to the WG activities through meetings, materials and (new) ideas
- Fabio, LNF director, *for hosting the event*
- Paola and the Research Division *for the encouragement*
- Eugenia (LNS) and Julgen (LNL) *for taking care of the scientific secretariat*
- Alessandra, **for everything**

Thanks to (for the Mid-Term Plan for Nuclear Physics series)

- The Organizing Committee

Organizing Committee of the workshop:

Giovanna Benzoni

Maria Colonna

Lorenzo Fortunato

Marco La Cognata

Ezio Previtali

Jose Javier Valiente Dobon

Diego Bettoni

Antonino di Leva

Santo Gammino

Ivano Lombardo

Stefano Romano

Fabio Bossi

Enrico Fioretto

Fabiana Gramegna

Rosario Nania

Paolo Russotto

Gustavino Carlo

Alba Formicola

Matthias Junker

Silvia Pisano

Francesca Soramel

Thanks to (for the Mid-Term Plan for Nuclear Physics series)

- The Organizing Committee
- **Rosario Nania, for the original idea and the enthusiasm**