

# Theory for Experiment: Serving the EURO-LABS Community

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*On behalf, Ubirajara Van Kolck (ECT\*)*

Karlsruhe, 30th June 2026



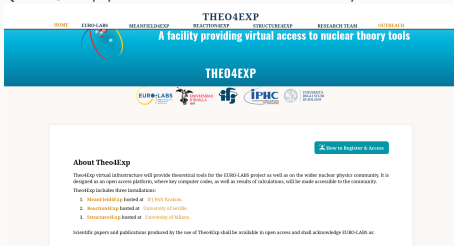
ECT\*  
EUROPEAN CENTRE  
FOR THEORETICAL STUDIES  
IN NUCLEAR PHYSICS AND RELATED AREAS

# WP 2.4: Theoretical support

- Transnational Access (TA) at ECT\*, Trento (Italy)



- Virtual Access (VA) at Theo4Exp  
(<https://institucional.us.es/theo4exp/>)



The screenshot shows the Theo4Exp website. At the top, there are navigation links: HOME, EURO-LABS, REANFIELDDEEP, REACTORCITY, REACTORHELP, RESEARCH TEAM, and GETTHEAPP. Below this is a blue banner with the text "A facility providing virtual access to nuclear theory tools". Underneath the banner, the name "THEO4EXP" is displayed, followed by logos for EURO-LABS, REACTORCITY, REACTORHELP, and IPHC. A "Show to Register & Access" button is visible. The main content area is titled "About Theo4Exp" and contains the following text:

Theo4Exp virtual infrastructure will provide theoretical tools for the EURO-LABS project as well as on the wider nuclear physics community. It is designed as an open access platform, where key computer codes, as well as results of calculations, will be made available to the community. Theo4Exp includes three installations:

1. [Neand4Exp](#) based at [EJ PAS Kofers](#).
2. [ReanfieldDeep](#) based at [University of Jyväskylä](#).
3. [ReactorCity](#) based at [University of Milano](#).

Scientific papers and publications produced by the use of Theo4Exp shall be available in open access and shall acknowledge EURO-LABS as:

The work has made use of the Material Access Facility, Theo4Exp based at the Príncipe Felipe, Technical Medical Physics Research and Innovation center.



- ❑ established in 1993 by community initiative
- ❑ institutional member of NuPECC/ESF
- ✓ at the frontline of nuclear theory research
- ✓ interface with experiment and with related areas
- ✓ training of ECRs
- 4 perm researchers + 1 emeritus + 4 pdocs + 2 PhD studs + 4 admin staff + Director
- ~ 26 weeks/year of workshops + Doctoral Training Program

Unique venue in European  
nuclear ecosystem



## 2022 PROGRAMME OF ACTIVITIES

### JANUARY

31.1-04.2  
**Alpha<sub>S</sub> (2022): Workshop on Precision Measurements of the Strong Coupling Constant**  
D. ENTERRIA (CERN), S. KLUTH (MPP), G. ZANDERIGHI (MPP)

### APRIL

11-15.4  
**Nuclear Physics from Atomic Spectroscopy**  
L. PLATTER (University of Tennessee), R. GARCIA RUIZ (Massachusetts Institute of Technology), C. JI (Central China Normal University), S. PASTORE (Washington University)

### MAY

02-20.5  
**ECT\* DOCTORAL TRAINING PROGRAM: Hadron Physics with Functional Methods**  
R. ALKOFER (University of Graz), G. EICHMANN (LIP Lisboa), M. HUBER (Giessen University)

23-27.5  
**Gauge Topology, Flux Tubes and Holographic Models: The Intricate Dynamics of QCD in Vacuum and Extreme Environments\***  
E. SHURYAK (Stony Brook University), M. DE JIA (University of Pisa), J. GREIFENSTE (San Francisco State University), E. KIRITSIS (University of Crete), I. ZAHED (Stony Brook University)

30.5-03.6  
**Theoretical and Experimental Challenges in Flavour Hadrons, Heavy Quarkonia and Multi-quark Physics\***  
M. BARABANOV (JINR, Dubna), B. EL-BENNICH (Universidade Cruzeiro do Sul), E. SANTOPINTO (INFN Genova), E. EPELBAUM (Ruhr-Universität Bochum), A. BASHIR (Universidad Michoacana de San Nicolás de Hidalgo)

### JUNE

06-10.6  
**Connections Between Cold Atoms and Nuclear Matter: From Low to High Energies**  
C. SA DE MELO (Georgia Institute of Technology), A. GEZERLIS (University of Guelph)

13-17.6  
**Jet Quenching in the Quark-Gluon Plasma\***  
J. MULLIGAN (UC Berkeley), W. J. LEE (MIT), K. TYWONIUK (University of Bergen), L. CUNQUEIRO (Ecole Polytechnique), S. CAO (Shandong University)

20-24.6  
**Neutron Stars as Multi-Messenger Laboratories for Dense Matter\***  
I. TEWS (LANL, Los Alamos), B. GIACOMAZZO (University of Milano), S. GUILLOT (CNRS Toulouse), J. MARGUERON (IPN Lyon), S. NISSANKE (University of Amsterdam)

27.6-1.7  
**Saturation and Diffraction at the LHC and the EIC**  
C. ROYON (Kansas University), A. SABIO VERA (Universidad Autónoma de Madrid), S. SCHLICHTING (University of Bielefeld), A. DESHPANDE (Stony Brook University), G. SOYEZ (IphT, Saclay), M. HENTSCHINSKI (Universidad de Las Américas Puebla)

### JULY

04-08.7  
**Nuclear Physics at the Edge of Stability\***  
G. HUPIN (JLab), O. SORLIN (GANIL), A. GADE (MSU), L. PLATTER (UTK)

11-15.7  
**Advances on Giant Nuclear Monopole Excitations and Applications to Multi-messenger Astrophysics\***  
Y. BLUMENFELD (JCLab), G. COLÒ (University of Milano and INFN), U. GARG (University of Notre Dame), E. KHAN (JCLab), M. VANDEBROUCK (DPHn, CEA Saclay)

18-22.7  
**Radiative Corrections from Medium to High Energy Experiments\***  
E. CLINE (Stony Brook University), A. AFANASEV (George Washington University), S. BARKANOVA (Memorial University of Newfoundland), J. BERNAUER (Stony Brook University), R. GILLMAN (Rutgers University), H. SPIESBERGER (Johannes Gutenberg University of Mainz)

25-29.7  
**Nuclear and Atomic Transitions as Laboratories for High Precision Tests of Quantum Gravity Inspired Models**  
A. MARCIANO (Fudan University), S. ALEXANDER (Brown University, Providence), E. BARBERIO (Melbourne University), C. CURCEANU (INF-INFN), K. PISCICCHIA (Centro Fermi, Roma), N. YUNES (University of Illinois at Urbana-Champaign)

### AUGUST

01-05.8  
**Neutron Electric Dipole Moment: from Theory to Experiment\***  
A. ATHENODOROU (Pisa University), D. GIATAGANAS (National and Kapodistrian University of Athens), B. LUCINI (Swansea University), E. RINALDI (Arithmetic Inc., Tokyo), K. CRANMER (New York University), G. ALEXANDROU (University of Cyprus)

29.8-02.9  
**LFC22: Strong Interactions from QCD to New Strong Dynamics at LHC and Future Colliders\***  
G. CORCELLA (INF-INFN), S. DE CURTIS (INF-Florence), S. MORETTI (University of Southampton), G. PANCHERI (INF-INFN), R. TENCHINI (INFN Pisa), M. VOS (IFIC Valencia)

### SEPTEMBER

05-09.9  
**From Hadrons to Therapy: Fundamental Physics Driving New Medical Advances**  
P. DE VERA GOMIS (Universidad de Murcia), M. DURANTE (GSI), C. HOEHR (TRIUMF), K. PAROBI (Ludwig-Maximilians-Universität München), Y. CONTE (INF-INFN), J. KOHANOFF (Universidad Politécnica de Madrid), M. SCHWARZ (APSS, Trento), R. GARCIA-MOLINA (Universidad de Murcia)

12-16.9  
**Revealing Emergent Mass through Studies of Hadron Spectra and Structure\***  
D. BINOSI (ECT\*), H. W. LIN (Michigan State University), T. HORN (Catholic University of America), C. ROBERTS (Nanjing University)

26-30.9  
**Opportunities with JLAB Energy and Luminosity Upgrade**  
H. AVAGYAN (Jefferson Lab), J. ARRINGTON (LBL), A. BACCHETTA (Pavia University), O. HEN (MIT), X. JI (UMD), K. JOO (UConn), X. ZHENG (UVA)

### OCTOBER

03-14.1  
**Reduced Density-Matrix Functional Theory: Improving its foundation and extending its scope**  
O. L. BENAVIDES-RIVEROS (Max Planck Institute for Complex Systems), E. K. U. GROSS (Hebrew University) and C. SCHILLING (LMU, Munich)

17-21.1  
**EXOTIC: EXOTIC Atoms Meet Nuclear Collisions for a New Frontier Precision Era in Low-Energy Strangeness Nuclear Physics\***  
O. VAZQUEZ DOCE (INF-INFN), C. CLURCEANU (INF-INFN), A. RAMOS (Universitat de Barcelona), J. ZMESKAL (SMI-Vienna), J. MARES (Czech Academy of Sciences)

24-28.1  
**Giant and Soft Modes of Excitation in Nuclear Structure and Astrophysics\***  
E. LITVINOVA (Western Michigan University), R. BROGLIA (Niels Bohr Institute), H. LENSKE (Justus-Liebig-Universität, Giessen)

### NOVEMBER

07-11.1  
**Tomography of Light Nuclei at an EIC\***  
A. FREESE (University of Washington), W. COSYV (Chent University & Florida International University), I. CLOET (ANL), P. SHANAHAN (MIT)

### DECEMBER

12-16.1  
**Key Reactions in Nuclear Astrophysics\***  
A. TUMINO (University of Enna "Kore" & INFN LNS, Catania), J. JOSE (Technical University of Catalonia), C. BERTULIANI (Texas A&M University-Commerce), R. DIEHL (MPI Munich), L. TRACHE (IFIN-HH Bucurest-Magurele, Romania)

\*STRONG2020 supported workshop

All workshops will run in hybrid mode, provided that the pandemic situation permits this.

The ECT\* is part of the Bruno Kessler Foundation. The Centre is funded by the Autonomous Province of Trento, funding agencies of EU Member and Associated States, INFN-TIFPA, and has the support of the Department of Physics of the University of Trento. The Director of the ECT\* is Prof. Gert Aarts (Trento and Swansea University)

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# EURO-LABS Projects – users

## 1. Strangeness nuclear physics – 8



## 2024 PROGRAMME OF ACTIVITIES

<b>FEBRUARY</b> 5-9.2	<b>alpha_S(2024): Workshop on Precision Measurements of the Strong Coupling Constant</b> D. D'ENTERRIA (CERN), S. KLUTH (MPP), G. ZANDERIGHI (MPP)	17-21.6	<b>Towards a Consistent Approach for Nuclear Structure and Reaction: Microscopic Optical Potentials</b> C. BARBIERI (University of Milan), C. ELSTER (Ohio University), C. HEBBORN (FRIB), A. OBERTELLI (TU Darmstadt)
12-16.2	<b>New Jet Quenching Tools to Explore Equilibrium and Non-Equilibrium Dynamics in Heavy-Ion Collisions</b> A. SADOVYEV (IIP), C. ANDRES (LP), J. BARATA (BNL), C. SALGADO (IGFAE)	<b>JULY</b> 1-5.7	<b>New Opportunities and Challenges in Nuclear Physics with High Power Lasers</b> C.J. YANG (ELI-NP), K. SPOHR (ELI-NP), P. TOMOSSINI (ELI-NP), Y. FUKADA (Kansai Photon Science Institute), V. HORNY (ELI-NP), L. GIZZI (INO), D. DOMENICO (ELI-NP)
26.2-1.2	<b>Inaugural Workshop on Nuclear Astrochemistry</b> N. MASON (University of Kent), D. BEMMERER (HZDR), E. MASHA (HZDR), D. MIFUSO (Atomki)	8-12.7	<b>Synergies between LHC and EIC for Quarkonium Physics</b> F. CELIBERTO (Universidad de Alcalá), C. VAN HULSE (Universidad de Alcalá), J.P. LANSBERG (CNRS), D. KIKOLA (Warsaw University of Technology), D. BOER (University of Groningen), E. GONZALES-FERRERO (IGFAE), C. FLORE (University of Turin)
<b>MARCH</b> 04-08.2	<b>EDMs: Complementary Experiments and Theory Connections</b> S. DEGENKOLB (Heidelberg University), P. SCHMIDT-WELLENBURG (Paul Scherrer Institute), B. PIGNO (LPSIC), J. DE VRIES (University of Amsterdam), R. BERGER (Philipps-Universität Marburg)	15.7-2.8	<b>DTP/TALENT: Training in Advanced Low Energy Nuclear Theory: Nuclear Theory for Astrophysics</b> A. ARCONES (TU Darmstadt & GSI), B. GIACOMAZZO (University of Milano-Bicocca), J. PIEKARWICZ (Florida State University)
<b>APRIL</b> 15-19.4	<b>Bridging Scales: At the Crossroads among Renormalisation Group, Multi-Scale Modelling, and Deep Learning</b> R. MENICCHETTI (University of Trento), F. PEDERIVA (University of Trento), R. POTESTIO (University of Trento), A. ROGGERO (University of Trento)	<b>AUGUST</b> 5-9.8	<b>Towards Improved Hadron Tomography with Hard Exclusive Reactions</b> M. BOER (Virginia Tech), A. CAMSONNE (Jlab), J. WAGONER (NCBJ)
22-26.4	<b>The Physics of Strongly Interacting Matter: Neutron Stars, Cold Atomic Gases and Related Systems</b> A. SCHWENK (TU Darmstadt), F. FERLAINO (University of Innsbruck), C. PETHICK (Niels Bohr Institute), A. WATTS (University of Amsterdam)	19-23.8	<b>The Nuclear Interaction: Post-Modern Developments</b> R. TIMMERMANS (University of Groningen), J. McGOVERN (University of Manchester), M. PIARULLI (Washington University), U. VAN KOLCK (Jülich Oryx)
<b>MAY</b> 7-10.5	<b>Quantum Science Generation 2024</b> D. DE BERNARDIS (INO-CNR), V. PANIZZA (University of Trento), L. VESPUCCI (University of Trento), A. BALDAZZI (University of Trento), V. AMITRANO (University of Trento), C. BENAVIDES-RIVEROS (INO-CNR), A. BERTI (INO-CNR), A. NARDIN (University of Trento)	<b>SEPTEMBER</b> 9-13.9	<b>New Developments in Studies of the QCD Phase Diagram</b> H. DING (Central China Normal University), F. KARSCH (University of Bielefeld), M.P. LOMBARDO (INFN Florence), P. PETRECKZY (BNL)
13-17.5	<b>SPICE: Strange Hadrons as a Precision Tool for Strongly Interacting Systems</b> J. POCHODZALLA (University of Mainz), C. CURCEANU (INFN-LNF), B. DOENIGUS (University of Frankfurt), L. FARBBIETTI (TU Munich), S. NAKAMURA (University of Tokyo), F. SAKUMA (RIKEN), I. VIDANA (INFN Catania)	16-20.9	<b>Spin and Quantum Features of QCD Plasma</b> F. BECATTINI (University and INFN Florence), X. HUANG (Fudan University), D. RISCHKE (Goethe University Frankfurt), Y. YIN (CAS)
20-24.5	<b>Beyond-Eikonal Methods in High-Energy Scattering</b> J. JALILIAN-MARIAN (Baruch College), A. CZAJKA (NCBJ), V. KOVCHEGOV (Ohio State University)	30.9-4.10	<b>KAMPAL - Kaonic, Antiprotonic, Muonic, Pionic and "onia" exotic Atoms: Interchanging Knowledge</b> A. SCORIO (INFN Frascati), P. INDELICATO (Laboratoire Kastler Brossel), J. OBERTOVA (Czech Technical University, Prague), C. CURCEANU (INFN-LNF), A. KNECHT (PSI), M. SKURZOK (Jagiellonian University of Krakow), T. HASHIMOTO (JAEA)
27-31.5	<b>Machine Learning and the Renormalization Group</b> J. URBAN (MIT), D. HACKETT (Fermilab), A. HASENFRATZ (University of Colorado Boulder), J. PAWLOWSKI (Heidelberg University), B. LUCINI (Swansea University)	<b>OCTOBER</b> 14-25.10	<b>Measuring Neutrino Interactions for Next-Generation Oscillation Experiments</b> S. DOLAN (CERN), C. WILKINSON (LBNL), C. WRET (University of Oxford), L. PICKERING (Rutherford Appleton Laboratory)
<b>JUNE</b> 3-7.6	<b>A Modern Odyssey: Quantum Gravity meets Quantum Collapse at Atomic and Nuclear Physics Energy Scales in the Cosmic Silence</b> C. CURCEANU (INFN-LNF), A. BASSI (University and INFN Trieste), L. BAUDIS (University of Zurich), A. MARCIANO (Fudan University China), K. PISCICCHIA (CREA & Centro Ricerche Enrico Fermi), L. DIOSI (Wigner, University of Budapest)	<b>NOVEMBER</b> 4-8.11	<b>Universal Themes in Bose-Einstein Condensation</b> J. CARUSOTTO (INO-CNR BEC Center), T. GIAMARCHI (University of Geneva), G. FERRARI (University of Trento), D. SNOKE (University of Pittsburgh), P. LITTLEWOOD (University of Chicago), F. M. MARCETTI (UAM), N. PROUKAKIS (University of Newcastle)
10-14.6	<b>Diffraction and Gluon Saturation at the LHC and the EIC</b> C. ROYON (University of Kansas), M. HENTSCHINSKI (Universidad de las Americas Puebla), A. SABIO VERA (Universidad Autónoma de Madrid), S. SCHLICHTING (University of Bielefeld), A. DESHPANDE (Stony Brook University)	<b>DECEMBER</b> 02-06.12	<b>Penetrating Probes of Hot High-mu<sub>B</sub> matter: Theory Meets Experiment</b> E. SCOMPARNI (INFN Turin), T. GALATYUK (TU Darmstadt), M.P. LOMBARDO (INFN Florence), R. RAPP (Texas A&M University), G. USAI (University Cagliari)

The ECT\* is part of the Fondazione Bruno Kessler. The Centre is funded by the Autonomous Province of Trento, funding agencies of EU Member and Associated states, and by INFN-TIRPA and has the support of the Department of Physics of the University of Trento. The Interim Director of ECT\* is Prof. Gert Aarts (ECT\* and Swansea University).

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## 2025 PROGRAM OF ACTIVITIES

<b>FEBRUARY</b> 17-21	<b>Key Reactions in Nuclear Astrophysics</b> A. TUMINO (Università degli Studi di Enna "Kore" & INFN-LNS), C. BERTULANI (Texas A&M University-Commerce), R. DIEHL (Max Planck Institut für Extraterrestrische Physik), J. JORDI (Technical University of Catalonia), L. TRACHE (IFIN-HH)	<b>21-25</b>	<b>Penetrating Probes of Hot High-<math>\mu</math>B Matter: Theory Meets Experiment</b> E. SCOMPARNI (INFN Torino), T. GALATYUK (TU Darmstadt), M. LOMBARDO (INFN Firenze), R. RAPP (Texas A&M University), G. USAI (Università di Cagliari)
<b>MARCH</b> 3-7	<b>Scale Setting: Precision Lattice QCD for Particle and Nuclear Physics</b> A. BAZAVOV (Michigan State University), S. COLLINS (University of Regensburg), R. SOMMER (DESY & Humboldt-Universität zu Berlin)	<b>JUL/AUG</b> 28-01	<b>New Perspectives in the Charge Radii Determination for Light Nuclei</b> F. HAGELSTEIN (JGU Mainz & PSI Villigen), L. GASTALDO (Kirchhoff-Institute for Physics), N. PAUL (Laboratoire Kastler Brossel), R. POHL (JGU Mainz)
<b>24-28</b>	<b>Holographic Perspectives on Chiral Transport and Spin Dynamics</b> M. KAMINSKI (University of Alabama), K. LANDSTEINER (IFT Madrid), D. KHARZEEV (Stony Brook University/BNL), U. GURSOY (Utrecht University)	<b>25-29</b>	<b>Bridging Analytical and Numerical Methods for Quantum Field Theory</b> A. GHERMAN (University of Minnesota), A. ATHEMODOROU (The Cyprus Institute), T. JACOBSON (University of California, Los Angeles), M. CASELLE (University of Torino)
<b>MAR/APR</b> 31-04	<b>Mechanical Properties of Hadrons: Structure, Dynamics, Visualization</b> P. SCHWEITZER (University of Connecticut), S. DIEHL (University Gießen), K. IIO (University of Connecticut), C. LORCE (École Polytechnique), B. PASQUINI (Università di Pavia), C. WEISS (JLab)	<b>SEPTEMBER</b> 01-05	<b>Hamiltonian Lattice Gauge Theories: Status, Novel Developments and Applications</b> C. URBACH (University of Bonn), K. JANSEN (DESY Zeuthen / OQTA), R. LEWIS (York University), G. MAGNINICO (University of Bari), S. ROMITI (University of Bern), E. RICO ORTEGA (kerbasque)
<b>APRIL</b> 14-18	<b>Lepton Flavour Change in Nuclei</b> K. BENNACEUR (IP2I, IN2P3), S. DAVIDSON (LUPM, IN2P3)	<b>08-12</b>	<b>Analytic Structure of QCD and Yang-Lee Edge Singularity</b> V. SKOKOV (North Carolina State University), G. BAŞAR (University of North Carolina Chapel Hill), C. SCHMIDT (Universität Bielefeld)
<b>MAY</b> 05-09	<b>Quantum Science Generation 2025</b> A. BALDAZZI (University of Trento), C. BENAVIDES-RIVEROS (INO-CNR Pitaevskii BEC Center), C. CAPECCI (UniTn, Pitaevskii BEC Center), D. DE BERNARDIS (INO-CNR Pitaevskii BEC Center), C. JOHANSEN (INO-CNR Pitaevskii BEC Center), F. MANTEGAZZINI (FBK) et al.	<b>22-26</b>	<b>Attractors and Thermalization in Nuclear Collisions and Cold Quantum Gases</b> M. HELLER (Ghent University), J. BERGES (Heidelberg University), J. BREWER (University of Oxford), T. LAPPI (University of Jyväskylä), M. SPALINSKI (National Centre for Nuclear Research)
<b>12-16</b>	<b>Nonequilibrium Phenomena in Superfluid Systems: Atomic Nuclei, Liquid Helium, Ultracold Gases, and Neutron Stars</b> P. MAGIERSKI (Warsaw University of Technology), B. HASKELL (Nicolaus Copernicus Astronomical Center), G. ROATI (University of Florence, LENS), G. WLAZLOWSKI (Warsaw University of Technology)	<b>OCTOBER</b> 06-09	<b>Superconducting Devices for Quantum Optics and Quantum Simulations</b> P. MANTEGAZZINI (FBK), I. GARUSOTTO (CNR-INO), N. ROCH (CNRS-Institut Neel), M. ESPOSITO (CNR-SPIN), N. CRESCINI (FBK), F. AHRENS (FBK)
<b>19-23</b>	<b>The Complex Structure of Strong Interactions in Euclidean and Minkowski Space</b> J. SKULLERUD (National University of Ireland), M. GOMEZ-ROCHA (Universidad de Granada), T. FREDERICO (Instituto Tecnológico de Aeronáutica), O. OLIVEIRA (Universidade de Coimbra), M. PELEAZ (Universidad de la República Uruguay), P. SILVA (Universidade de Coimbra), F. SIRINGO (Università di Catania)	<b>13-24</b>	<b>Pan-American Few-Body Physics Boot Camp: Fostering Collaboration</b> G. HUPIN (JCLab), T. FREDERICO (Instituto Tecnológico de Aeronáutica), S. KÖNIG (North Carolina State University), A. LEPINE-SZILY (University of São Paulo)
<b>JUNE</b> 09-13	<b>Universality in Strongly-Interacting Systems: from QCD to Atoms</b> J. KIRSCHER (SRM University AP), D. BLUME (The University of Oklahoma), R. BRICENO (UC Berkeley), L. CONTESSI (Université Paris-Saclay, JCLab, CNRS), M.P. VALDERRAMA (Beihang University)	<b>NOVEMBER</b> 03-07	<b>Neutron-Capture Reactions for Astrophysical Processes</b> A. SPYROU (Michigan State University), S. GORIELY (IAA-ULB), A. LARSEN (University of Oslo), S. LIDDICK (Michigan State University), D. MÜCHER (University of Cologne), M. WIEDEKING (Lawrence Berkeley National Lab)
<b>JUNE/JULY</b> 16-04	<b>Doctoral Training Program/TALENT School: Quantum Computing for Nuclear Physics</b> A. BAZAVOV (Michigan State University), Z. DAVOUDI (University of Maryland), M. HORTH-JENSEN (University of Oslo and Michigan State University), R. LAROSE (Michigan State University), D. LEE (Michigan State University), A. ROGGERO (University of Trento)	<b>17-21</b>	<b>ISNET-11: Information and Statistics in Nuclear Experiment and Theory</b> A. EKSTRÖM (Chalmers University of Technology), D. PHILLIPS (Ohio University), A. LOVELL (Los Alamos National Laboratory)
<b>07-09</b>	<b>Theory Service for the Low Energy Nuclear Physics Community: a Hands-on Workshop</b> G. COLO (University of Milano and INFN), J. DUDEK (UdS and IPHC/IN2P3/CNRS, Strasbourg), M. RODRIGUEZ-GALLARDO (University of Sevilla)	<b>DECEMBER</b> 01-05	<b>Multi-Canonical Methods and Lattice Field Theory</b> G. KANWAR (University of Edinburgh), C. BONANNO (IFT UAM/CSIC), D. HACKETT (Fermilab), B. LUCINI (Swansea University), A. NADA (University of Turin), J. URBAN (MIT)
<b>14-18</b>	<b>Next Generation Ab Initio Nuclear Theory</b> C. BARBIERI (Università di Milano), E. EPELBAUM (Ruhr Universität Bochum), R. FURNSTAHL (Ohio State University), S. PASTORE (Washington University in St. Louis)		

The ECT\* is part of the Fondazione Bruno Kessler. The Centre is funded by the Autonomous Province of Trento, funding agencies of EU Member and Associated states, and by INFN-TIFPA and has the support of the Department of Physics of the University of Trento. The Director of ECT\* is Prof. Udirajara van Kolck.  
For information: [staff@ectstar.eu](mailto:staff@ectstar.eu) | [www.ectstar.eu](http://www.ectstar.eu)

## EURO-LABS Projects – users

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# 2026 PROGRAM OF ACTIVITIES



<b>FEBRUARY</b> 02-05	<b>The Search for Neutrinoless Double-<math>\beta</math> Decay: Experimental and Theoretical Challenges</b> L. Coraggio, S. Pastore, M. Pavan, S. Schönert	<b>JULY</b> 13-31	<b>Doctoral Training Program - Nuclear Theory for New Physics</b> V. Cirigliano, H. Hergert, E. Mereghetti, S. Pastore, M. Piarulli, A. Walker-Loud
<b>MARCH</b> 02-06	<b>Glueballs and Charmonium: Lattice QCD, Experiment and Phenomenology</b> F. Knechtli, T. Korzec, M. Peardon	<b>AUGUST</b> 03-07	<b>From Nuclear Structure to New Physics</b> M. Gorshteyn, A. Glick-Magid, B. Ohayon, C.-Y. Seng
09-13	<b>Bridging TMD Frameworks: Intersections, Tensions, and Applications</b> G.A. Chirilli, A. Lelek, A. Vladimirov, P. Zurita	10-14	<b>Nuclear Physics under the Low-Energy, High-Intensity Frontier</b> C.-J. Yang, C. Bertulani, D. Maslarova, K. Spohr, P. Tomassini
23-27	<b>The X17 Particle, Status and New Ideas</b> E. Filandri, L. Doria, C. Gustavino, M. Viviani	<b>SEPTEMBER</b> 07-11	<b>Bridging Machine Learning and Statistical Field Theory Through Generative and Diffusion Processes</b> L. Wang, G. Aarts, A. Athendodorou, M. Cheng
<b>MAR/APR</b> 30-03	<b>Non-Perturbative Renormalization in Fundamental and Effective Theories</b> J. Gegelia, V. Cirigliano, E. Epelbaum, M. Schiffer, P. Shanahan	14-18	<b>The Physics and Chemistry of the Heaviest Elements</b> A. Diaz-Torres, C. Düllmann, S. Heinz, M. Kowal, G. Scamps
<b>APRIL</b> 20-24	<b>The Sign Problem of Fermions: Computational Challenges and Emerging Approaches</b> T. Morresi, M. Casula, G. Garberoglio, S. Taioli, H. Xiong	21-25	<b>The Interplay of Magnetic Fields, Nuclear Physics, and Nucleosynthesis in Neutron-Star Mergers and Supernovae</b> P. Mösta, A. Arcones, S. Curtis, E. O'Connor
<b>MAY</b> 04-08	<b>Quantum Science Generation 2026</b> M.M. Wauters, A. Baldazzi, C. Caeppi, D. Pascual Solis, A. Windey	<b>SEP/OCT</b> 28-02	<b>Relativistic Fermions in Flatland: from Moiré Materials to Gauge Field Theories</b> S. Hands, H. Gies, J. Gracey, I. Herbut, E. Huffman, L. Janssen
11-15	<b>Digital Twins for Nuclear and Particle Physics</b> A. Pilloni, M. Battaglieri, Y. Li	<b>OCTOBER</b> 05-09	<b>Many-Body Quantum Magic</b> C. Robin, T. Haug, M. Savage, E. Tirrito, X. Turkeshi
18-22	<b>Nuclear Theory for Astrophysics: Bridging Bound-State and Continuum Physics</b> P. Arthuis, F. Bonaiti, M. Heinz, G. Hupin, S. Pastore	12-16	<b>New Frontiers in Exotic Atoms: High-Precision Tests of QCD and QED and Probes of Beyond Standard Model Physics</b> C. Curceanu, M. Hori, P. Indelicato, A. Scordo, A.W. Thomas
<b>JUNE</b> 15-19	<b>Hadron Imaging with GPDs: High-Precision Global Analysis and Lattice QCD</b> M. Constantinou, V. Braun, I. Cloët, R. Dupré, D. Richards	19-23	<b>Theoretical Motivations and Empirical Evidence for Diquark Correlations in Hadrons</b> Z.-Q. Yao, T. Mineeva, C. Roberts, B. Wojtsekhowski
<b>JUNE/JULY</b> 22-03	<b>Doctoral Training Program - Emerging Superconducting Technologies for Quantum Sensing and Computing</b> A. Giachero, E. Enrico, F. Mantegazzini, N. Roch, G.S. Paraoanu	<b>NOVEMBER</b> 09-13	<b>Quark-Gluon Dynamics in the Nuclear Medium</b> M. Sargsian, C. Keppel, F. Olness, M. Rinaldi, H. Szumila-Vance
<b>JULY</b> 06-10	<b>Responses of Strongly Interacting Systems from Femto to Astrophysical Scales</b> G. King, W. Jiang, A. Roggero, J. Sobczyk		

## EURO-LABS Projects – users

1. Neutrinoless double-beta decay – 6
2. X17 particle – 6
3. Fermion sign problem – 10
4. Quantum science generation – 14
5. Digital twins – 5
6. Nuclear theory for astrophysics – 4
7. DTP: Quantum sensing – 5 (TBC)
8. Responses of strongly interacting systems – TBA
9. DTP: Nuclear theory for new physics – 11 (TBC)
10. Nuclear structure and new physics – TBA

# Summarizing for ECT\*

- 31 projects (2 non-EU), 248 users and 137 AU!
- Diverse topics, but emphasis on relation to on-going/forthcoming nuclear experiment eg, deuteron tensor spin observables, high-power lasers, neutrinoless double-beta decay.
- *Strong* interactions with other communities, esp. atomic, particle, astro eg, astrophysical reactions, electric dipole moments, lepton-flavor violation.
- Some *theoretical* topics eg, ab initio methods, sign problem, machine learning.
- *Extensive* participation of ECRs eg, Doctoral Training Programs.

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Enabled exchanges not otherwise possible

# Theo4Exp Virtual Access Infrastructure

<https://institucional.us.es/theo4exp/>

Theo4Exp is providing VA to theoretical tools for the EURO-LABS community, as well as for the wider experimental nuclear physics community, since 1st February 2024 with 3 installations:

- **MeanField4Exp** (Krakow/Strasbourg): providing VA to mean-field theory service in the domain of nuclear structure physics. Deputies: Jerzy Dudek & Piotr Bednarczyk
- **Reaction4Exp** (Sevilla): providing VA to codes used for nuclear reaction calculations. Coordinator: Manuela Rodríguez-Gallardo
- **Structure4Exp** (Milano): providing VA to codes for basic spectroscopic properties of spherical nuclei through-out the mass table. Deputy: Gianluca Colò

# Developed within EUROLABS project

## Contracted personnel

- **MeanField4Exp** (IFJ PAN, Krakow): 2-year contract  
**Dr. Abdelghafar Gaamouchi** (ex-PhD student).
- **Reaction4Exp** (U. Sevilla): 2-year contract  
**Carla Muñoz** (Master Nucl. Phys.).
- **Structure4Exp** (U. Milano): 1-year contract  
**Dr. Imane Moumene** (ex-PhD student).

## International Review Panel

- **Members:** Piotr Bednarczyk (IFJ-PAN), Krystoff Rusek (U. Warsaw), Ian Thompson (LLNL/U. Surrey), Antonio Moro (U. Sevilla), Enrico Viggezzi (U. Milano), Angela Gargano (Catania).
- **Online meetings:** 9/22, 10/23, 10/24 (and one before the end of project)

# Easy and secure access

- Users registration made through the application developed by WP5.2 (Antoine Lemasson and Michel Jouvin):  
<https://iam-eurolabs.ijclab.in2p3.fr>
- Users can register via institutional credentials (eduGAIN network) or using ORCID account.



Welcome to **EURO-LABS SSO**

Sign in with

ORCID



eduGAIN



Local credentials

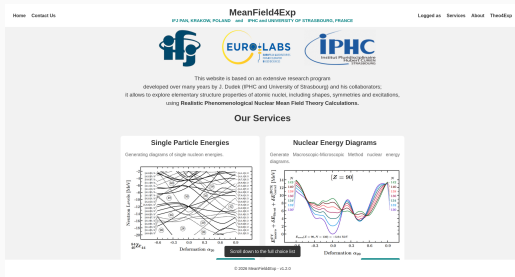
# Objectives met

- All kind of calculations promised are available in the platform (and some extra).
- With respect to number of users and Access Units (AU):

VA Installation	Estimated Users	Supported Users	Estimated AU	Provided AU
MeanField4Exp	40	154	360	1321
Reaction4Exp	80	207	400	2071
Structure4Exp	20	144	160	2564

<https://meanfield4exp.ifj.edu.pl>

- Single Particle Energies
- Macroscopic-Microscopic Energy
- Nuclear Energy Diagrams
- 3D Nuclear Surface
- 3D Cranking



- Shape Evolution with Spin
- Giant Dipole Resonances

**People involved:** A. Gaamouchi, I. Dedes, J. Dudek (Strasbourg), A. Maj, P. Bednarczyk, Michal Ciamala, K. Mazurek, Piotr Kedzierski and Zbigniew Natkaniec

<https://reaction4exp.us.es>

- Elastic scattering
- Inelastic scattering
- Coulomb breakup
- Transfer reactions
- Folding potentials
- Coming CDCC

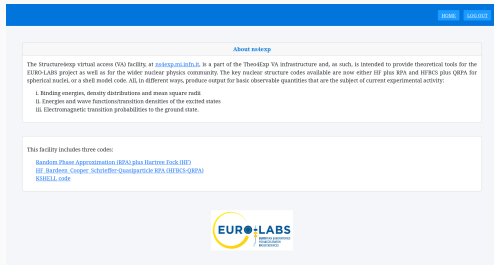
The screenshot displays the Reaction4Exp website interface. At the top, it says "Welcome to Reaction4Exp!" with the subtitle "Virtual access Infrastructure - University of Seville". Logos for TheofExp, EURO-LABS, and UNIVERSIDAD DE SEVILLA are visible. The main heading is "Start your calculation" with the instruction "Select the type of nuclear reaction and explore results". Three panels are shown:

- Coulomb breakup**: *Semi-classical calculations - EPM*
  - Angular distribution of cross section
  - Energy distribution of cross section
  - Probability distribution
- Elastic scattering**: *Classical and Optical Model FRESKO*
  - Generate potential SYSP and SPF2
  - Angular distribution and reaction cross section
  - Elastic S matrix
- Rotational model for inelastic scattering**: *CC method and DWBA - FRESKO*
  - Generate potential SYSP
  - Inelastic and elastic angular distribution
  - Reaction cross section

**People involved:** C. Muñoz-Chimbo, M. Rodríguez-Gallardo, A.M. Moro, M. Gómez-Ramos, J.A. Lay, J. Gómez-Camacho, J. Casal, P. Punta, F. Barranco and I.J. Thompson (LLNL, USA), Servicio de Informática y Comunicaciones (SIC) at the University of Sevilla.

<https://ns4exp.mi.infn.it/>

- Hartree-Fock and Hartree-Fock-BCS for the ground-state of spherical nuclei (Skyrme interactions)
- Self-consistent RPA and QRPA for vibrational excited states
- Shell model calculations using the KSHELL code



The screenshot shows the 'About ns4exp' page of the Structure4Exp virtual access (VA) facility. The page has a blue header with 'HOME' and 'ABOUT' buttons. The main content area is white with a light blue border. The text describes the facility as part of the TheroExp VA infrastructure and lists the key nuclear structure codes available: HF, HF+RPA, and HFBCS+QRPA. It also lists the types of observables calculated: binding energies, density distributions, excitation energies, and electromagnetic transition probabilities. At the bottom, it lists the three codes included: Random Phase Approximation (RPA) plus Hartree-Fock (HF), HF, Skyrme, Cooper, Schifferle-Quasiparticle RPA, HFBCS+QRPA, and KSHELL code. The EURO-LABS logo is visible at the bottom right of the page.


**About ns4exp**

The Structure4exp virtual access (VA) facility, at [ns4exp.mi.infn.it](https://ns4exp.mi.infn.it/), is a part of the TheroExp VA infrastructure and, as such, is intended to provide theoretical tools for the EURO-LABS project as well as for the wider nuclear physics community. The key nuclear structure codes available are now either HF plus RPA and HFBCS plus QRPA for spherical nuclei, or a shell model code. All, in different ways, produce output for basic observable quantities that are the subject of current experimental activity:

- I. Binding energies, density distributions and mean square radii
- II. Energies and wave functions/transition densities of the excited states
- III. Electromagnetic transition probabilities to the ground state.

This facility includes three codes:

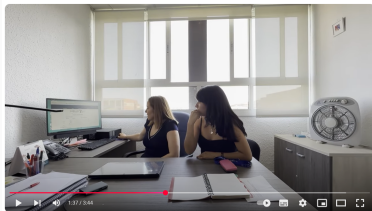
- [Random Phase Approximation \(RPA\) plus Hartree-Fock \(HF\)](#)
- [HF, Skyrme, Cooper, Schifferle-Quasiparticle RPA, HFBCS+QRPA](#)
- [KSHELL code](#)



**People involved:** I. Moumène, G. Colò, E. Vigezzi, F. Leveraro, M. Bensi  
G. Di Gregorio (Univ. Campania) and A. Gargano (INFN, Napoli)

# Outreach

- Theo4exp: a theory service for euro-labs community  
Rodríguez-Gallardo, M. et al. Acta Physica Polonica B, Proc. Suppl. 18 (2025) A10
- Service for the EURO-LABS Community: The THEO4EXP Virtual Access Facility, Rodríguez-Gallardo, M.; Colò, G.; Dudek, J., Nuclear Physics News 35 (2025) 33-36
- Two articles for EURO-LABS newsletters.
- Article published in The Conversation (Spain) about Theo4Exp.  
<https://doi.org/10.64628/AAO.qyu5rauwg>
- Youtube video: (“A new platform brings nuclear physics calculations closer to non-expert users”) – released by University of Seville.



Una nueva plataforma acerca los cálculos de Física Nuclear a usuarios no expertos

UIS Universidad de Sevilla

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- The inclusion of new programs will depend again on having a person dedicated to that.
- **It is also a good tool for the training of young researchers.**



## Topics:

- ✓ Theo4Exp functioning
- ✓ physics background (*"with more details than usually provided in conferences"*)
- ✓ hands-on practice
- ✓ feedback on platform

## Main outcomes:

- community engagement
- training of young researchers
- ongoing discussion on perspectives

## Organizers:

- G. Colò
- J. Dudek
- M. Rodríguez-Gallardo


41 participants  
 mostly early career  
 experimentalists!

WORKSHOP

THEORY SERVICE FOR THE LOW  
ENERGY NUCLEAR PHYSICS  
COMMUNITY: A HANDS-ON  
WORKSHOP

7-9 July, 2025

ECT\* Villa Tambosi, Villazzano



**Organizers:** Gianluca Colò  
Jerzy Dudek  
Manuela Rodríguez-Gallardo

**Main topics:** \*Computer codes for low-energy nuclear physics community  
\*Theo4Exp Virtual Access facility  
\*Nuclear structure for experiment  
\*Nuclear Mean field for experiment, Nuclear Reactions for experiment

ECT\* Director: Prof. Ulfarsson van Kolck

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# Thanks to EUROLABS: TA+VA

