Laser spectroscopy as a tool for nuclear theories

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I. SCIENTIFIC ISSUE

Laser spectroscopy techniques have long been established as a powerful tool for nuclear structure studies. They provide nuclear-model independent properties that are essential for our understanding of the atomic nuclei such as changes in the root-mean-squared charge radii, magnetic and quadrupole moments, and nuclear spins. Owing to recent technical developments carried out at different radioactive beam facilities worldwide, a wealth of data on ground- and isomeric-state properties has become available in regions of the chart of nuclides experimentally unreachable until now [Cam16]. Such results, either concerning observables not accessible by other experimental methods or complementary to the ones obtained via standard techniques, provide important constraints and challenge state-of-the-art theoretical models. In this workshop, the current experimental progress alongside with the modern developments in nuclear theory will be reported, giving the opportunity to explore the interchange of the two with the goal of a deeper understanding of the structure of atomic nuclei.

[Cam16] P. Campbell, I.D. Moore, M.R. Pearson, Prog. Part. Nucl. Phys. 86 (2016) 127.

II. GOALS

The main goals of the workshop are:

1. To review recent experimental progress in nuclear laser spectroscopy and discuss perspectives of forthcoming campaigns
2. To discuss relevant theoretical developments and perspectives
3. To analyse the impact of precision data on the construction of theoretical models
4. To explore novel ground-state properties that could be inferred from next-generation laser spectroscopy measurements

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III. PROGRAM

Structure

The meeting takes place over five days. The first morning is devoted to introductory lectures on basics of laser spectroscopy and theoretical tools relevant to related observables. In the following days five or six experimental/theoretical talks per day will be presented, interspaced with ample time for discussion.

Tentative list of speakers and topics

Introductory lectures

- Piet van Duppen (KU Leuven)
  Introduction to laser spectroscopy
- Thomas Duguet (CEA Saclay)
  Theoretical description of nuclear observables accessible via laser spectroscopy

Talks

- Carlo Barbieri (Surrey)
  Radii and spectroscopy of medium-mass nuclei from Green's Function theory
- Michael Bender (Lyon)
  Recent progress in EDF calculations for heavy nuclei
- Mark Bissell (Manchester)
  The hyperfine anomaly and the distribution of neutrons
- B. Alex Brown (MSU)
  Mirror nuclei, nucleon skins and the equation of state of nuclear matter
- Jacek Dobaczewski (York)
  Nuclear Magnetic Moments in EDF approaches
- Rafael Ferrer (KU Leuven)
  In-gas-jet laser spectroscopy
- Kieran Flanagan (Manchester)
  Collinear laser spectroscopy techniques
- Jason D. Holt (TRIUMF)
  Laser spectroscopy as a stringent test for nuclear interactions
- Mustapha Laatiaoui (Mainz)
  Towards ion mobility measurements of actinides
- Valérie Lapoux (CEA Saclay)
  Elastic proton scattering and matter radii
- Nathalie Lecesne (GANIL)
  Laser spectroscopy at S ^{3}
- Kei Minamisono (MSU/NSCL)
  Recent laser spectroscopy results at NSCL
- Iain Moore (Jyväskylä)
  Laser spectroscopy studies at Jyväskylä
- Peter Müller (Argonne)
  Laser spectroscopy of few-nucleon systems

- Gerda Neyens (CERN/KU Leuven)
  Nuclear moments for nuclear structure studies
- Wilfried Nörtershäuser (Darmstadt)
  Laser spectroscopy of highly charged ions
- Takaharu Otsuka (Tokyo)
  Precision nuclear structure via the Monte-Carlo shell model
- Sophie Péru (CEA Bruyères-le-Châtel)
  Role of precision measurements in designing energy density functionals
- Xavier Roca Maza (Milano)
  How does nuclear structure constrain the equation of state of nuclear matter?
- Dag Hanstorp (University of Gothenburg)
  High-precision spectroscopy of Negative ions
- Bijaya Sahoo (PRL Navrangpura)
  Recent progress and challenges in atomic coupled cluster theory
- David Verney (IPN Orsay)
  Perspectives for laser spectroscopy and electron scattering at Orsay
- Deyan Yordanov (IPN Orsay)
  Laser Induced Nuclear Orientation