



Commissariat à l'énergie atomique  
et aux énergies alternatives

Direction des sciences de la matière

Irfu Institut de recherche sur les lois  
fondamentales de l'Univers

Service de Physique Nucléaire



**SOUTENANCE DE THÈSE**  
Le lundi 7 septembre 2015 à 14h  
CEA-Saclay, Orme des Merisiers, b774, Amphithéâtre Claude Bloch

**Clémentine SANTAMARIA**  
CEA-Saclay DSM, IRFU, SPhN

## **Quest for new nuclear magic numbers with MINOS**

Atomic nuclei are few-body systems mainly governed by the strong force and quantum mechanical laws. Magic numbers of nucleons are well established for stable nuclei: 2, 8, 20, 28, 50, 82, 126, but are known not to be universal over the nuclear chart. The nuclear structure of exotic nuclei can provide strong constraints on the nuclear interaction.

New shell closures or strong shell reordering may occur in several regions of the nuclear chart at the limit to be reached with current setups and beam intensities.

MINOS (*MagIc Numbers Off Stability*), is a new apparatus dedicated to in-beam nuclear structure and gamma spectroscopy experiments in these low-intensity exotic regions, for measurements of knock-out reactions on proton target, done in inverse kinematics at intermediate energies above 150 MeV/nucleon.

The device is composed of a thick liquid hydrogen target to increase the luminosity coupled to a Time Projection Chamber (TPC) for vertex tracking, important for an optimized Doppler correction in the gamma-ray detector array surrounding the target.

During the PhD defense, the MINOS system will be detailed from its development to its first tests and physics campaign at the RIBF facility of RIKEN in Japan.

The interpretation of the new results on the spectroscopy of the neutron-rich nuclei  $^{66}\text{Cr}$  and  $^{70,72}\text{Fe}$  will be discussed.

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