HIB 2015, LNS CATANIA

BOOK OF ABSTRACTS

Monday, 14th December 2015

Tuesday, 15th December 2015

AGODI, Clementina
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MAGNEX: studying exotic nuclei and isospin with RIB's and stable beams

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ASSIÉ, Marlène
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Study of neutron-proton pairing in N=Z unstable nuclei through transfer reactions

Neutron-proton pairing is the only pairing that can occur in the T=0 and the T=1 isospin channels. T=1 particle-like pairing (n-n or p-p) has been extensively studied unlike T=0 neutron-proton pairing. The over-binding of N=Z nuclei could be one of its manifestation. Neutron-proton pairing can be studied by spectroscopy as shown in ref.[1].We have studied it through transfer reactions in order to get more insight into the relative intensities of the two aforementioned channels. Indeed, the cross-section for a n-p pair transfer is expected to be enhanced if there is an important n-p pairing. Neutron-proton pairing is predicted to be more important in N=Z nuclei with high J orbitals so that the best nuclei would belong to the g9/2 shell [2]. However, considering the beam intensities in this region, we have focussed on fp shell nuclei (56Ni and 52Fe). The measurement was performed at GANIL with radioactive beams produced by fragmentation of a 75A MeV 58Ni beam on a 185 mg.cm-2 Be target purified by the LISE spectrometer. An efficient set-up based on the coupling of the MUST2 and TIARA Silicon arrays for charged particle detection with the EXOGAM gamma-ray detector was used. Using 52Fe (N=Z=26) which is a partially occupied 0f7/2 shell nucleus and 56Ni (N=Z=28) which has a fully occupied 0f7/2 shell will allow us to compare n-p pairing according to shell occupancy. First results on the nature of the n-p pairing will be discussed based on the relative intensities of the 0+ and 1+ states populated in 54Co and 50Mn in the 56Ni(p,3He) and 52Fe(p,3He) reaction measurement respectively.

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ECOS: The european initiative for nuclear physics with stable ion beams

BONANNO, Danilo
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Front-end and Read-out Electronics for the upgrade of the NUMEN FPD

The experimental demands of the NUMEN experiment require an upgrade of the cyclotron and a consequent, important, upgrade of the MAGNEX detector.
A fundamental task for the success of the experiment is the upgrade of the front-end and read-out electronics for the Focal Plane Detector.
The top-of-the-line technological choices and the preliminary design of the Front-end and read-out electronics architecture are presented.

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CAPPUZZELLO, Francesco

University of Catania and INFN-LNS
Catania, Italy

The status of the NUMEN project

The physics case of neutrino-less double beta decay and its tremendous implications on particle physics, cosmology and fundamental physics will be briefly introduced. In particular the crucial aspect of the nuclear matrix elements entering in the expression of the half-life of this process will be emphasized. The novel idea of using heavy-ion induced reactions as tools for the determination of these matrix elements will be then presented. Data from MAGNEX facility at the INFN-LNS laboratory give first evidences of the possibility to get quantitative results about nuclear matrix elements from experiments. Results will be shown at the Workshop regarding the 40Ca(18O,18Ne)40Ar at 270 MeV incident energy. The strengths and the limits of the proposed methodology will be considered. To this purpose a summary of the discussion driven at the NUMEN Workshop, which will be held at INFN-LNS on 1-2 December 2015, will be added. Finally the NUMEN project of INFN and the proposed strategy to this research will be sketched in the view of the impact on the future research in basic experimental and theoretical nuclear physics at the INFN-LNS laboratory.

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CARDELLA, Giuseppe
INFN-Sezione di Catania
Catania, Italy

Present possibility and status of In Flight exotic beam at LNS

The status of the in flight exotic beam at LNS will be presented, problems results and perspectives will be outlined

COSENTINO, Luigi and PAGANO, Emanuele
LNS–INFN,
Catania, Italy
Diagnostics of FRIBs beam transport line

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DIAZ-TORRES, Alexis
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Traento, Italy

Evolution of transfer-like reactions from Coulomb to Fermi energy

The physics of nuclear reactions is critical for understanding galactic chemical evolution. Reaction dynamics and nuclear structure are strongly coupled, the coupling determining the reaction outcomes such as mass and charge distributions of the reaction products. The dynamics of the single-particle motion around the avoided crossings of molecular single-particle levels changes as the bombarding energy in a heavy-ion collision increases from the Coulomb-barrier energy towards the Fermi energy. A gradual transition from an adiabatic to a diabatic regime of the single-particle motion takes place and, consequently, the shell structure of the single-particle orbits well-above the Fermi level of the colliding nuclei may play a key role in determining the integrated and differential cross sections of the reaction products. I will discuss this physics in connection with the experimental activities carried out and planned at LNS-Catania.

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NICOLAS, Le Neindre
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Fazia: a new versatile detector device for isospin physics

Fazia has demonstrated his capability in improving the isotopic resolution, as well as keeping the full charge identification with quite low energy thresholds, of charged particles produced in heavy ion collisions at intermediate energies. This compact modular device, composed by blocks of 16 telescopes (Si-Si-CsI) allows correlation studies too, thanks to his small granularity (20×20 mm square detectors). In the near future up to 12 blocks will be available for a scientific program that we will develop in the following: - Isospsin transport in heavy ion collisions at Fermi energies (LNS Catania) - Isotopic cross section measurements in the 40 , 48Ca+40Ca systems at E/A = 35 MeV (LNS Catania) - Exploring in-medium structure with particle-particle correlations in heavy-ion collisions (LNS Catania) - Isospin transport versus neutron preequilibrium in medium-light systems (LNS Catania) - N/Z dependence in dissipative collisions: from evaporation toward vaporization (Ganil) - Characterization of neutron signal in Si-CsI telescope and measurement of the absolute neutron detection efficiency (Ganil- NFS) - The role of the Isospin in the formation and decay of excited nuclei (Ganil-Spiral2) - Transport Properties of Isospin Asymmetric Nuclear Matter (Ganil-Spiral2) - Neutron and proton transfer in dissipative collisions (SPES-Alpi) - Prompt collective oscillations with exotic beams (SPES-Alpi)

NOCIFORO, Chiara
GSI
Darmstadt, Germany

PID for in-fligth radioactive ion separator

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PIANTELLI, Silvia
INFN - Sezione di Firenze
Firenze, Italy

Progress in FAZIA detection system

The present status and perspectives of the FAZIA project are presented, with a particular focus on the main achievements in terms of identification thresholds and isotopic resolution. Some preliminary results obtained during the first physics experiment are shown.

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PLANETA, Roman
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Search for hyperheavy toroidal nuclear systems formed in heavy ion collisions

We study the feasibility of an experimental observation of toroidal systems in heavy ion collisions using the CHIMERA multidetector system. Data from the experiment on the 197Au + 197Au reaction at 23 AMeV were analyzed with an aim to find signatures of exotic nuclear configurations such as toroid-shaped objects. The experimental data were compared with predictions of the ETNA code dedicated to look for such configurations and with the QMD model. A novel criterion of selecting events possibly resulting from the formation of exotic freeze-out configurations, "the efficiency factor", was tested. Comparison between experimental data and model predictions may indicate for the formation of at/toroidal nuclear systems.

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POLLACCO, Emanuel
IRFU/Service de Physique Nucléaire,
Gif-Sur_Yvette, Franced

On Instrumenting a Nuclear Physics Program

For some years nuclear physics instrumentation has been strongly shaped by the availability of radio-active beams in a number of laboratories. The trend is to deploy high luminosities and wide phase space cover. The cover is associated with a highly segmented devices. I will attempt to give an abridged review of the challenges once similar instruments are utilized with stable beams.

RIFUGGIATO, Danilo
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Beam intensity upgrade of the LNS Superconducting Cyclotron

The LNS Superconducting Cyclotron has been working for more than 20 years delivering ion beams from protons to lead in an energy range from 10 to 80 MeV/amu. For light ion beams, intensity is limited by the electrostatic extraction process, due to the low extraction efficiency. A different extraction mode, i.e. extraction by stripping, has been envisaged to increase the maximum intensity of light ion beams by a factor 10-100, so as to reach a beam power as high as few kwatt. These intense beams are of particular interest for many nuclear physics research lines. Beam dynamics features of extraction by stripping have been studied and will be here presented. From these studies it comes out that the new extraction path is not compatible with the geometry of the present cryostat, therefore a new superconducting magnet has to be installed. A Technical Design of the project is presently being accomplished. The main results will be here presented.

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The study of new FRIBs facility line

In the perspective of superconducting cyclotron upgrade that will increase the beam ion power, a radioactive protection problem about the existing setup of FRIBs facility arises at INFN-LNS of Catania. For this reason it is necessary to move the FRIBs equipment to another laboratory area. The study of the new beam transport line able to select the required radioactive ion, the operating principle of the system optic, the constraint posed by the space available in the new location, and the mass resolving power and performances of the system will be presented and discussed.