

# Service de Physique Nucléaire



## Séminaire

le vendredi 17 juin 2011 à 11h

CEA Saclay, Orme des Merisiers, Bât. 703, Salle 135

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### Nuclear astrophysics measurements at nTOF at CERN

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Neutron capture reactions are dominantly responsible for the formation of heavy elements in our universe. Two different processes can explain most of the abundance patterns observed; the slow neutron capture process (s process) and the rapid neutron capture process (r process). The s process takes place during the He burning stages of stellar evolution and is characterized by small reaction rates. Consequently, elements are synthesized close to the valley of stability, since an unstable nucleus decays faster than it captures another neutron. The nuclear physics inputs for this process are therefore Maxwellian averaged neutron capture cross sections (cross section averaged over the stellar neutron spectrum) and beta-decay half-lives. Contrary, the r process is attributed to explosive scenarios with high neutron densities. Neutrons are rapidly captured and the reaction path proceeds towards the neutron drip line. Exact stellar sites are not known and r abundances are commonly calculated by subtracting the s abundance from the solar abundance. Therefore, an accurate knowledge of neutron capture cross sections from Fe up to Bi is of great importance for understanding these two mechanisms. Since several years the nTOF collaboration is following a vast program on measuring neutron capture cross section of astrophysical interest, e.g. the isotopes of Fe and Ni, which represent the seed nuclei for the s process. The neutron time of flight facility nTOF is a spallation source, combining a highly intense neutron beam with a long flight path, which guarantees high-energy resolution. Capture cross sections are determined by detecting the prompt gamma emission following a capture event. I will present recent astrophysics experiments at nTOF, describe the experimental technique and astrophysical motivations. In addition, I will also compare nTOF with complementary activation techniques.

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*Le café sera servi 10 minutes avant*

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