

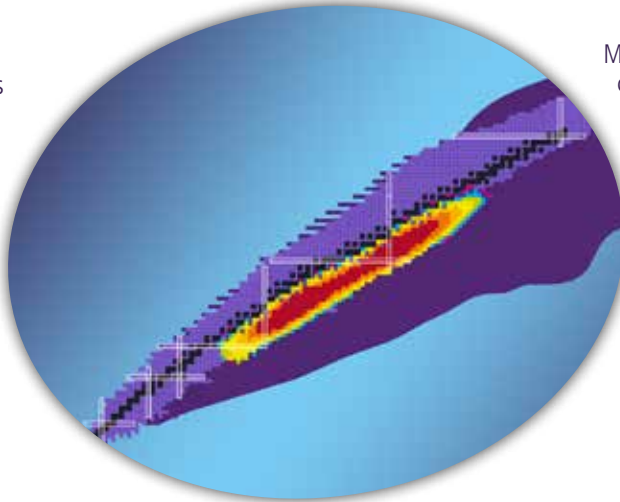
EXOTIC NUCLEAR BEAMS FROM PHOTOFISSION : A WORLD FIRST



VOYAGE INTO TERRA INCOGNITA

How do protons and neutrons interact?

Exotic nuclei having a large excess of neutrons challenge our conventional views on the internal structure of the heart of the atom: the nucleus.



How are the heavy elements formed in the universe?

Masses and lifetimes of nuclei formed in cosmic cauldrons help understanding the abundances of the chemical elements found on Earth.

How to enhance the safety of the nuclear industry?

A part of the energy released in a nuclear reactor is emitted in the form of gamma rays. Understanding their heating effects could be a key in designing even safer power plants for tomorrow.

A FACTORY FOR EXOTIC NUCLEI

Production method

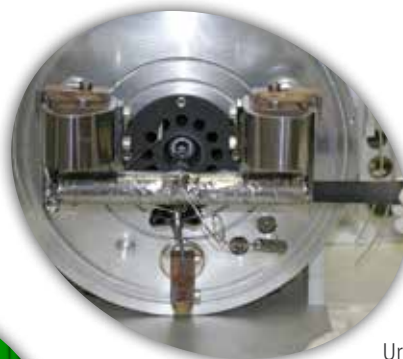
The fission of uranium is induced by photons generated using an intense electron beam.



e-LINAC

Production target

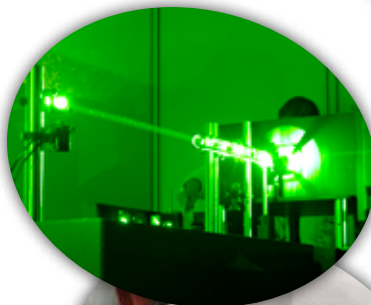
The photofission takes place in a thick target of uranium carbide (UC_x), and the very neutron-rich products, diffuse out due to heating to more than 2000°C.



Uranium target

Beam preparation and purification

The exotic nuclear beam is purified by various ISOL techniques (Isotope Separation On-Line): laser resonance ionization (RIALTO), mass separation (PARRNe)...



Top: RIALTO
Bottom: PARRNe



The physicist's « eyes »

The beams thus produced are delivered to the experimental areas where very sensitive detectors are needed to study the radiations emitted by the exotic nuclei.



BEDO

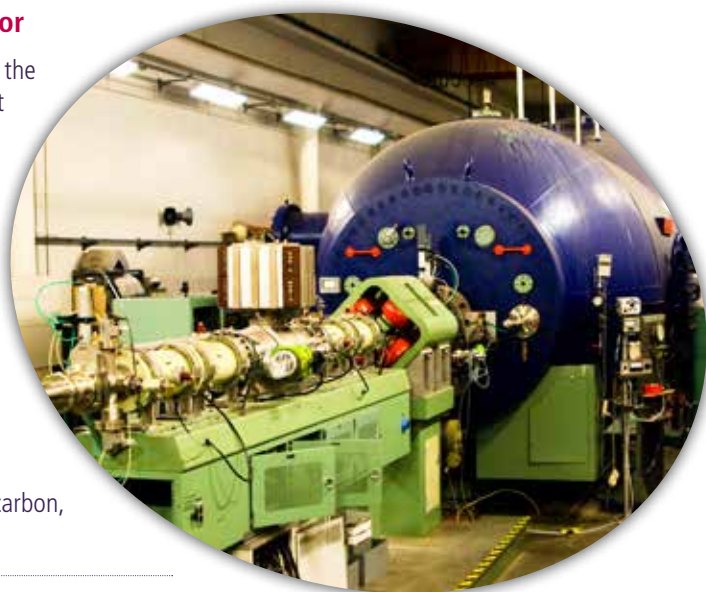
ACCELERATED BEAMS FOR SCIENCE AND TECHNOLOGY

Stable nuclear beams from the TANDEM accelerator

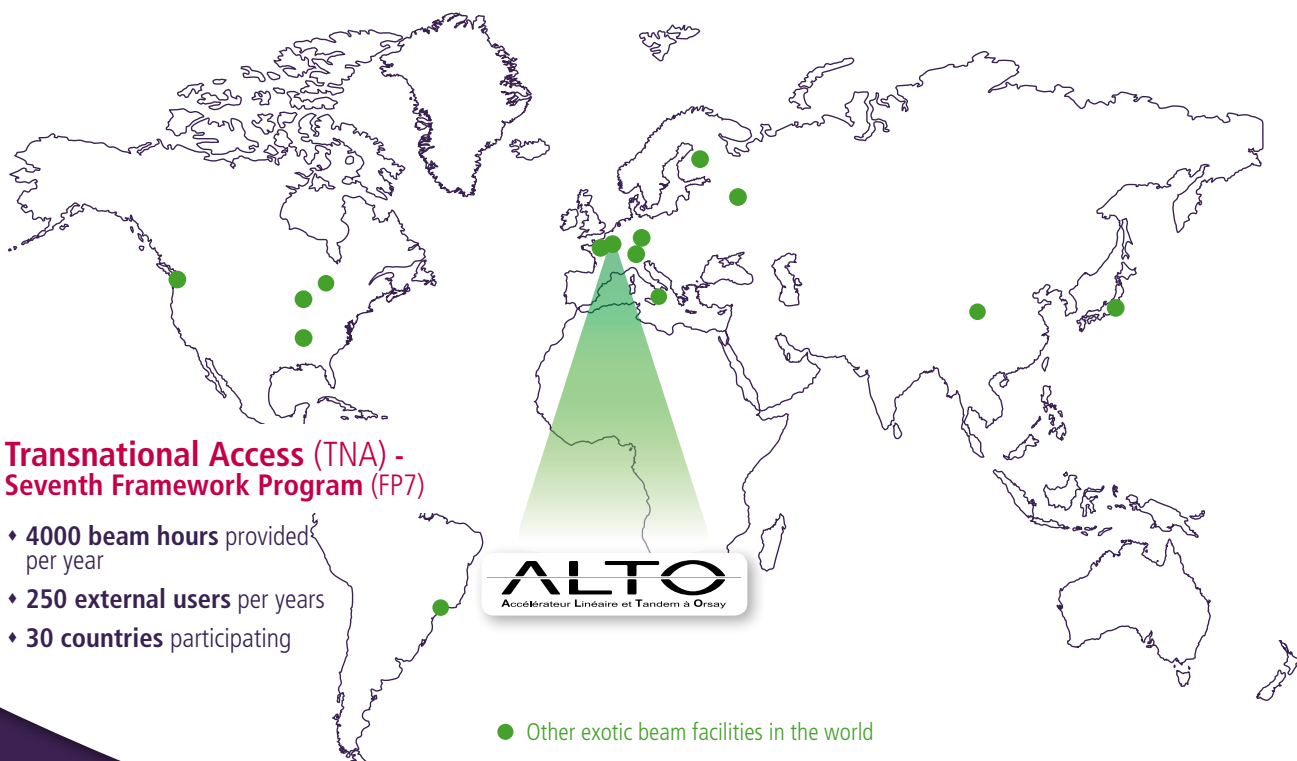
Reactions and decays induced by stable beams provide clues to the intrinsic nature of nuclei and to the behavior of their constituent protons and neutrons. Proton and deuteron beams are used to test and optimize electronic components for use in space missions.

Nanoparticle beams from the TANDEM accelerator

These aggregate projectiles are unique for bombarding nanometer-scale surfaces with hundreds of atoms at once. The concentrated energy deposited can induce profound changes, allowing, for example, the creation of nano-scale diamonds in carbon, and the ejection of intact molecules from biological tissues.



ALTO: ACCÉLÉRATEUR LINÉAIRE ET TANDEM À ORSAY



Transnational Access (TNA) - Seventh Framework Program (FP7)

- ◆ 4000 beam hours provided per year
- ◆ 250 external users per years
- ◆ 30 countries participating

ALTO
Accélérateur Linéaire et Tandem à Orsay

● Other exotic beam facilities in the world

For more details see:

<http://ipnweb.in2p3.fr/tandem-alto>

