Project to install a Tandem Accelerator at USTHB (Algeria)

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1- Problematic

- The SNIRM laboratory have reached a sufficient size (about 40 searchers) to support a national project.
- Experimental 'know-how' around the accelerators of LSNIRM members and other national laboratories needs to be renewed.
- To provide community with a research/training tool at national/regional level.
- In view of the increase in the number of master and PhD students, experimental themes will be welcome. This would increase the attractiveness for 'radiation physics' an develop competencies in this field.
- To promote a technological know-how around techniques related to the accelerator operations (vacuum technique, mechanics, electronics, signal processing, cryogenics ...).
- USTHB presents an important variety of science and technology laboratories potential candidates for accelerator users.

2- What is the aim?

•Creation of a nodal point in order to federate the main activities of the laboratory.
•Exchanges between physicists improvement around a national center.
•To propose and invigorate international partnerships under better conditions.
•To establish a synergy between the different teams potentially using ion beam characterization techniques (biology, materials, geophysics ...).

3- Why an ion accelerator?

•The potential themes are very varied and can be found in academic research as well as in research development (example: characterization of thin layers).
•Longevity of such an installation.
•High-performance instrument for training and scientific projects.
•The human potential at national level and from international collaboration ensure a sufficient supervision of the scientific activities.

4- Why a 3MV tandem?

•Possibility to produce a large number of negative ions is currently a reality.
•The delivered ionic currents may be quite large.
•The source is grounded (ease of changing the source).
•The number of tandem machines currently under construction or use in the world is significant.
•The stripping system makes it possible to achieve high states of charge and therefore high energies (second stage of the tandem).

5- What to do?

•Nuclear reactions. Nucleosynthesis. Cross sections, spectroscopic factors and lifetime measurements.
•Ion beam characterization .
- Channeling/ RBS.
- PIXE
- NRA
- ERDA

•Ionic implantation. Nano structuration.
•Materials under irradiation (stopping power, irradiation defects, sputtering ...).
•Neutron physics.
- Cross sections.
- NAA

6- What are the challenges?

•Funding.
•Reliability of the facility.
•Availability of a technological environment in this field.
•Strategy to minimize duration of implementation (to start experiments as soon as possible).

7- Main required equipments

•3 MV tandem accelerator .
•2 sources of ions,
  •Light ions (H, D and He) .
  •Sputtering source for intermediate and heavy ions.
•Analyzing switching magnet .
•Two equipped beam lines .
  •Analysis chamber with goniometer .
  •Chamber for irradiation and ion implantation (X,Y scan).