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HEAVY ION PHYSICS

The status of the ALTO project

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Abstract. The installation of electron Linac at Orsay in the framework of ALTO project is dedicated to fundamental research on exotic nuclei and to other interdisciplinary research subjects, particularly in industrial applications. In fundamental research, the main goal of ALTO is to supply interesting neutron-rich nuclear beams produced from the photo-fission process.

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1. Description of the project

The production of neutron-rich nuclei through fission is currently of prime research interest for the future radioactive beam facilities. In a recent experiment, we have demonstrated the technical feasibility and interest of fission-fragment production induced by gamma [**?**]. This has stimulated us to build a new experimental area at Orsay equipped with an electron linac close to the Tandem which is already used for generating fission induced by fast neutrons. The main components of the electron accelerator were recovered from decommissioned LEP injector (CERN) and NEPAL station (LAL: Laboratoire de l'Accélérateur Linéaire). Irradiating a uranium carbide target ($^{238}UC_x$) at high temperature by a 10 μA electron beam at 50 MeV allows to deliver a large variety of neutron-rich isotope beams and to dispose a test bench for R&D of accelerators and target-ion sources set for SPIRAL-2 [**?**] and EURISOL [**?**]. Furthermore, ALTO will open experimental applications in other fields such as biology, biochemistry, industry etc.
The accelerator is composed with a 3 MeV injector (90 kV thermionic gun and a bunching system working at 3 GHz) and an accelerating section which provides an energy gain of 47 MeV (see fig. 1). The beam line consists of two 65^o dipole magnets (R = 0.4 m) and six magnetic quadrupoles. It is equipped with beam diagnostics for the measurement of current, beam position, energy and energy spread. Security and Control system uses an industrial device for the supervision. The RF power is

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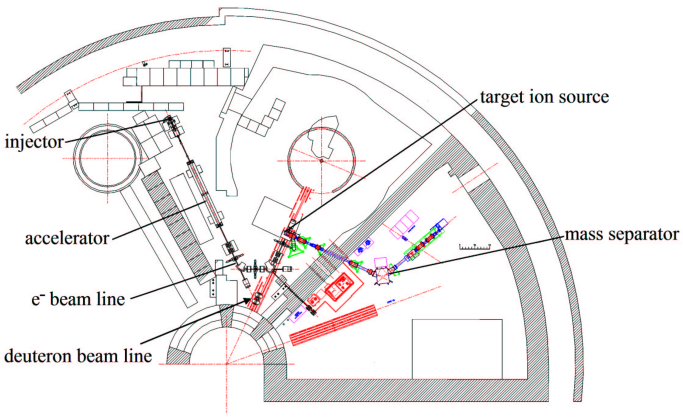

Fig. 1. ALTO layout

delivered by one 3 GHz Thalès klystron (TH2100) and a modulator. The Target-Ion Source (TIS) unit is made of a thick target connected to a FEBIAD-type ion source [**?**] developed at CERN and also used at PARRNe. The target is composed of 150 disks of $^{238}UC_x$ of 14 mm diameter and 1 mm thickness. The target is heated to 2200 ^{o}C (3 kW electric power) using a Tantalum oven. The target shielding has been studied with FLUKA code. The expected productions at ALTO using 50 MeV incident electron beam with 10 μA averaged current correspond to 10^{11}-4 10^{11} fissions/s. This represents a factor 100 in comparison with PARRNe [**?**]. For example, the $^{132}Sn^+$ intensity will reach 3 10^7-10^8 ions/s after separation. ALTO with its integrated equipment will give opportunities to test on-line and off-line the target-ion source prototypes developed [**?**] for SPIRAL-2 and EURISOL.

2. Conclusion

Presently the project is in the middle of its construction phase. The accelerator is completely assembled. The construction of the RF and control systems is in progress. The commissioning of the linac will start by the end of 2005. The production of radioactive beams is planned in 2006. The first series of measurements will contain systematic production measurements and a characterization work (measurement of decay half-life, gamma identification ...).

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