EXOTIC

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The facility EXOTIC [1] is dedicated to the in-flight production of low-energy light Radioactive Ion Beams (RIBs) through inverse kinematics reactions induced by high intensity heavy-ion beams delivered by the XTU-Tandem accelerator impinging on light gas targets.

The beam-line consists of a cryogenic gas target and of a sequence of eight ion-optical elements: a first quadrupole triplet, a 30°-dipole magnet, a velocity filter and a second quadrupole triplet. Four slit systems are located at suitable positions along the beam-line to better define the primary beam spot size and to further purify the RIB under production from unwanted contaminant species.

The facility was historically installed along a beam line that could have permitted the connection to the magnetic spectrometer PRISMA and the center of the AGATA, in the PRISMA-AGATA configuration, is located 2.68 m downstream the original final focal plane of EXOTIC.

Ion-optical calculations proved that moving the final focus downstream required magnetic fields for the second quadrupole triplet lower than in the original (EXOTIC stand-alone) configuration, guaranteeing that all RIBs already delivered to the EXOTIC focal plane will also reach the AGATA focal plane, without exceeding the capabilities of the existing power supplies and magnets, but obviously with lower transmissions.

The calculations suggested that we expect a ∼50%-reduction in transmission. Therefore, based on the secondary beam intensities achieved in the past with EXOTIC, the expected RIB intensities on target and the maximum energies for the EXOTIC-AGATA configuration are listed in Table 1.

RIB	Intensity (pps)	E_{max} (MeV)
$^{8}Li^{3+}$	5×10^4	21.7
$^{7}Be^{4+}$	5×10^5	44.2
$^{8}B^{5+}$	4×10^2	45.5
$^{10}C^{6+}$	2×10^3	51.8
$^{11}C^{6+}$	10^5	54.2
$^{15}O^{8+}$	2×10^4	70.6
$^{17}F^{9+}$	4×10^4	79.6
$^{18}Ne^{10+}$	2×10^3	78.1

Table 1: Intensities on target and maximum energies expected for the RIBs delivered by EXOTIC and possibly available for experiments with AGATA.

A newly installed tracking system based on two large-area (104 mm diameter) $x - y$ sensitive MicroChannelPlate (MCP) detectors is under final commissioning and will be available for the experiments. The MCPs were acquired from the German company RoentDek and arranged in a Chevron configuration. Off-beam tests with α particles indicated a time resolution of 500 ps, a spacial resolution of 2 mm and an efficiency of about 80%.

References

[1] F. Farinon et al., Nucl. Instr. and Meth. B 266, 4097 (2008).