Radioactive beams at LNL

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The new facility EXOTIC [1] at LNL dedicated to the production of light exotic nuclei at near-barrier energies by inverse kinematics nuclear reactions is now operational. The EXOTIC beamline consists of a production gas target 5 cm long filled with H_2 or CH_4, a large acceptance triplet of quadrupole lenses that collects the ejectiles exiting the production target and focuses them at the entrance of a bending magnet (p/q filter), a Wien filter (v/q filter) which allows a high purification of the secondary beam and a second triplet of quadrupole lenses. The EXOTIC line is associated with the large solid angle EXODET experimental apparatus [2] for the detection of the reaction products and will be connected also with the large acceptance magnetic spectrometer PRISMA. The characteristics of this facility and the possible beams which can be produced will be presented.

The first beam produced is the ^{17}F through the reaction p(^{17}O,^{17}F)n. With a 300 nA ^{17}O primary beam impinging on the gas target filled by H_2 at a pressure of 800 mbar and a temperature of 300 K (0.323 mg/cm^2), a ^{17}F secondary beam was obtained with very low contaminants background. The beam intensity, measured via elastic scattering on a ^{197}Au target, resulted to have a record value of $9*10^6$ pps; this corresponds to about 100% acceptance/transmission of the EXOTIC beamline. Fig. 1 shows the excellent quality of the ^{17} F beam thank to the Wien filter purification.

We studied the elastic scattering and the inclusive and exclusive breakup cross sections (^{16}O and p) of the ^{17}F radioactive beam on a ^{208}Pb target at energy $E_{lab} = 86 \pm 2$ MeV. The results of this experiment, aiming at the study of the reaction mechanisms of the loosely bound ^{17}F nucleus at subbarier energies, will be presented and discussed.

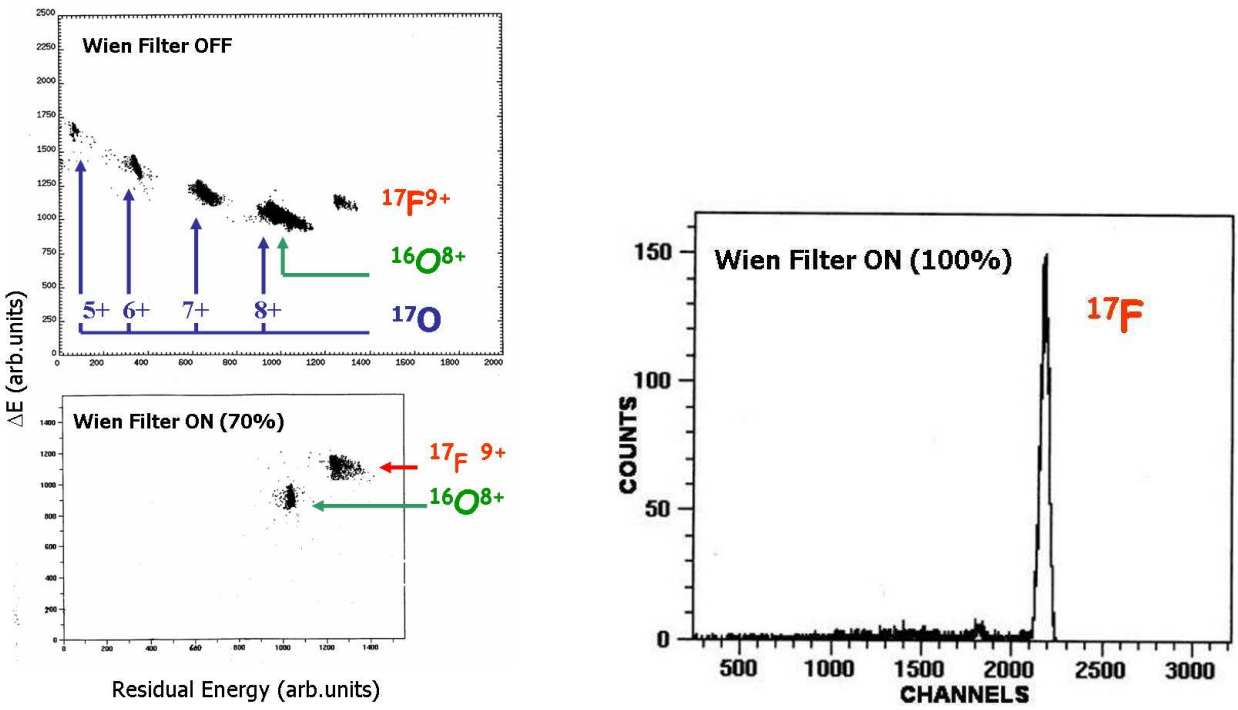

Figure 1: Ions transmitted through the separator by using a gas target filled by CH_4 when the Wien filter is switched off (on).

[1] V.Z. Maidikov et al., Nucl. Phys. **A476**, 389c (2004)

[2] M. Romoli et al., Phys. Rev. **C69**, 064614 (2004)