The beam diagnostics systems of the EXCYT facility at LNS

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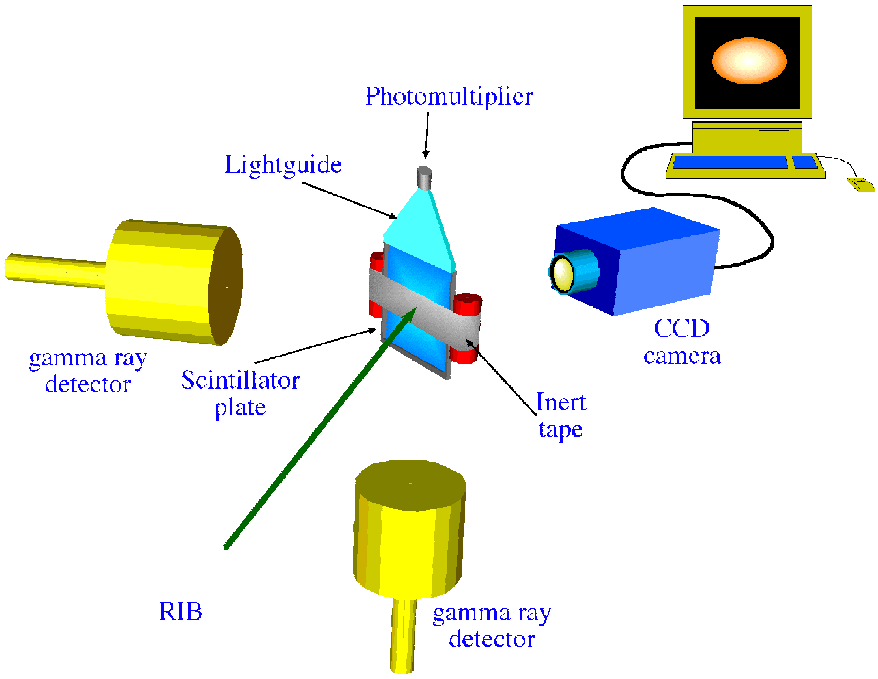
EXCYT (EXotics with CYclotron and Tandem) is the ISOL facility under development at INFN - LNS Catania (Italy) [1], for the production of radioactive beams with energies ranging from 0.2 up to 8MeV/A, emittance less than 1π mm·mrad and energy spread less than 10^{-4}. The primary beam (E ≤ 80MeV/A, A<48) is accelerated by the superconducting cyclotron (CS) and transported onto a graphite thick target, from which the radioactive ions of interest are extracted and then selected by a high resolution magnetic isobar separator (ΔE/E = 1/20000), which rejects the isobaric contaminants. After the separator the beam has a kinetic energy of 300keV and can be accelerated by the 15MV Tandem. The beam intensity is expected to be in the range from 10^3 pps up to 10^9 pps, depending on the intensity of the primary beam (< 1pμA), on the production cross section in the target and on the overall extraction efficiency from the source.

In order to have a suitable check of the beam properties (profile, intensity, ion composition, etc.) for the beam tuning requirements, the facility needs an efficient beam diagnostics. Taking into account the peculiarities of the beams, we have developed a series of diagnostics devices based on particle detectors, like scintillators, semiconductors and gas chambers [2]. The device for the beam imaging is based on a CsI(Tl) scintillator plate and exploits the radioactive decay (mainly β and γ) of the ions, in order to produce a light spot which represents the transversal profile of the beam. In the same device a couple of germanium detectors should recognize the nuclides present in the beam, by acquiring their energy gamma spectrum. Concerning the beam pipe after the tandem accelerator, devices based on a high resolution silicon telescope that can revolve around a target, will be installed. They are able to identify the beam nuclear species by means of scatter plots.



Sketch of the device for beam imaging and identification.

[1] G. Ciavola et al., Nuclear Physics A616 (1997) 69c-76c.
[2] P. Finocchiaro, CAARI 98, 15th Internat. Conf. on the Appl. of Accel. In Research and Industry, Univ. of North Texas Denton, November 4-7, 1998.