New low-energy direct measurement of the $^{18}F(p,\alpha)^{15}O$ reaction*

N. de Séreville[1], C. Angulo[1], A. Coc[2], N.L. Achouri[3], E. Casarejos[1], T. Davinson[4], P. Figuera[5], S. Fox[6], F. Hammache[7], J. Kiener[2], A. Laird[6], A. Lefebvre[2], P. Leleux[1], P. Mumby-Croft[6], N. Orr[3], D. Robertson[4], K. Vaughan[6], V. Tatischeff[2]

[1]CRC and FYNU, Université catholique de Louvain, B-1348 Louvain-la-Neuve, Belgium
[2]CSNSM Orsay, IN2P3-CNRS, Bâtiment 104, F-91405 Orsay Cedex, France
[3]LPC, ISMRA and Université de Caen, IN2P3-CNRS, 14050 Caen Cedex, France.
[4]School of Physics, University of Edinburgh, Edinburgh EH9 3JZ, UK
[5]Laboratori Nazionali del Sud, INFN, I-95123 Catania, Italy
[6]Department of Physics, University of York, Heslington, York YO10 5DD, UK
[7]IPN Orsay, F-91406 Orsay Cedex, France

The ^{18}F, produced during nova explosions, is the main responsible for the 511 keV γ-ray emitted during the outburst that could be detected with satellite missions or future γ-ray telescopes [1]. In spite of many experimental efforts [2], the amount of ^{18}F synthesised still suffers from large uncertainties concerning, mainly, the $^{18}F(p,\alpha)^{15}O$ reaction.

We report here on a new direct measurement of the $^{18}F(p,\alpha)^{15}O$ cross section recently carried out at the RIB facility at Louvain-la-Neuve. Cross section data down to a centre-of-mass energy of 400 keV have been obtained using an isobarically pure ^{18}F beam (averaged intensity of the order of 10^6 pps) and a thin polyethylene target. The reaction products were detected using the multi-strip detector array LEDA [3].

The cross section data are analysed in the framework of the R-matrix model [4]. Our main aim is to determine the interference sign between three $3/2^+$ resonances above threshold that can significantly affect the extrapolation of the $^{18}F(p,\alpha)^{15}O$ cross section to the energies relevant for novae, and thus, the modeling of the nova explosions.

* This work is supported by the Belgian IAP program P5/07 on inter-university attraction poles of the Belgian-State Federal Services for Scientific, Technical and Cultural Affairs and by the European Commission within the Sixth Framework Programme through I3-EURONS (contract no. RII3-CT-2004-506065).

[1] A. Coc et al., Astron. Astrophys. 357 (2000) 561.
[2] N. de Séréville et al., Phys. Rev. C 67 (2003) 052801, and references therein.
[3] C.E. Moss and A.B. Comiter, Nucl. Phys. A178 (1971) 241.
[4] A.M. Lane and R.G. Thomas, Rev. Mod. Phys. 30 (1958) 257.