

# Measurements of the elastic scattering of exotic projectiles ${}^6\text{He}$ , ${}^8\text{Li}$ , ${}^7\text{Be}$ and ${}^8\text{B}$ on ${}^{27}\text{Al}$ at energies around the Coulomb barrier.

R. Lichtenthaler<sup>1</sup>, A. Lepine-Szily<sup>1</sup>, E.A. Benjamim<sup>1</sup>, V. Guimaraes<sup>1</sup>, M.S. Hussein<sup>1</sup>, M. Assuncao<sup>1</sup>, L.C.Chamon<sup>1</sup>, O. Camargo Jr.<sup>1</sup>, R. Denke<sup>1</sup>, J. Alcantara Nunez<sup>1</sup>, P.N. de Faria<sup>1</sup>, P.R.S. Gomes<sup>2</sup>, I. Padron<sup>3</sup>, E. Aguilera<sup>4,5</sup>, E. Martinez-Quiroz<sup>5</sup>, H. Garca-Martenez<sup>4</sup>, D. Lizcano<sup>4</sup>, H. Amro<sup>6</sup>, L. O. Lamm<sup>6</sup>, F. D. Bechetti<sup>7</sup>, H. Jiang<sup>7</sup>, K. C. C. Pires<sup>1</sup>, A. Barioni<sup>1</sup>, J. Kolata<sup>6</sup>, A. Arazi<sup>8</sup>

<sup>1</sup> Institute of Physics of the University of Sao Paulo, 05508-900, Sao Paulo, Brazil

<sup>2</sup> Instituto de Fısica-Universidade Federal Fluminense, Niteroi, Brazil

<sup>3</sup> CEADEN, P.O. Box 6122, Havana, Cuba

<sup>4</sup> Departamento del acelerador, Instituto Nacional de Investigaciones Nucleares, A.P. 18-1027, C.P. 11801, Mexico, D.F., Mexico

<sup>5</sup> Universidad Autonoma del Estado de Mexico, Av. Instituto Literario N 100, Toluca 50000, Mexico

<sup>6</sup> Physics Department, University of Notre Dame, Notre Dame, Indiana 46556-567

<sup>7</sup> Physics Department, University of Michigan, Ann Arbor, Michigan 48109-1120

<sup>8</sup> Tandem - Argentina

*rubens@if.usp.br*

The elastic scattering of the radioactive nuclei  ${}^6\text{He}$ ,  ${}^8\text{Li}$ ,  ${}^7\text{Be}$  and  ${}^8\text{B}$  on  ${}^{27}\text{Al}$  target was measured at energies close to the Coulomb barrier using the *RIBRAS (Radioactive Ion Beams Brazil)*[1] facility and the system *Twinsol*[2] of the University of Notre Dame.

The elastic scattering angular distributions for the halo nucleus  ${}^6\text{He}$  at four energies were analysed using the Sao Paulo Potential (SPP)[3]. A considerable improvement in the fits of the angular distributions was obtained by adjusting the difuseness of the matter distribution  $a_m$  for the  ${}^6\text{He}$  projectile. Values of  $a_m$  a little larger than the “normal” values were obtained indicating an effect due to the halo structure of the  ${}^6\text{He}$ .

The total reaction cross-sections were extracted from this optical model analysis. The reduced total reaction cross-sections for  ${}^6\text{He}$  were compared to the reduced total reaction cross-sections for other stable projectiles such as  ${}^6\text{Li}$ ,  ${}^7\text{Li}$ ,  ${}^9\text{Be}$  and  ${}^{16}\text{O}$  on  ${}^{27}\text{Al}$  and it was found that the cross sections for  ${}^6\text{He}$  projectile are higher than for the other stable projectiles. The nuclear break-up cross-section was calculated for the  ${}^6\text{He}+{}^{27}\text{Al}$  system and it seems to account for the observed difference in the reaction cross section.

The elastic angular distributions for the exotic projectiles  ${}^8\text{Li}$ ,  ${}^7\text{Be}$  and  ${}^8\text{B}$  on  ${}^{27}\text{Al}$  are presently under analysis and will be compared to the  ${}^6\text{He}$  results.

1. R. Lichtenthaler, A. Lepine-Szily, V. Guimaraes, et al  
*Europ. Jou. of Phys.* **v25**, (2005)733
2. F.D. Bechetti, J. Kolata, et al  
*Nucl. Instrum. and Methods in Phys. Res.* **A505** (2003)377
3. Chamon, L.C., Pereira D., et al  
*Phys. Rev.* **C66**, 014610, (2002)