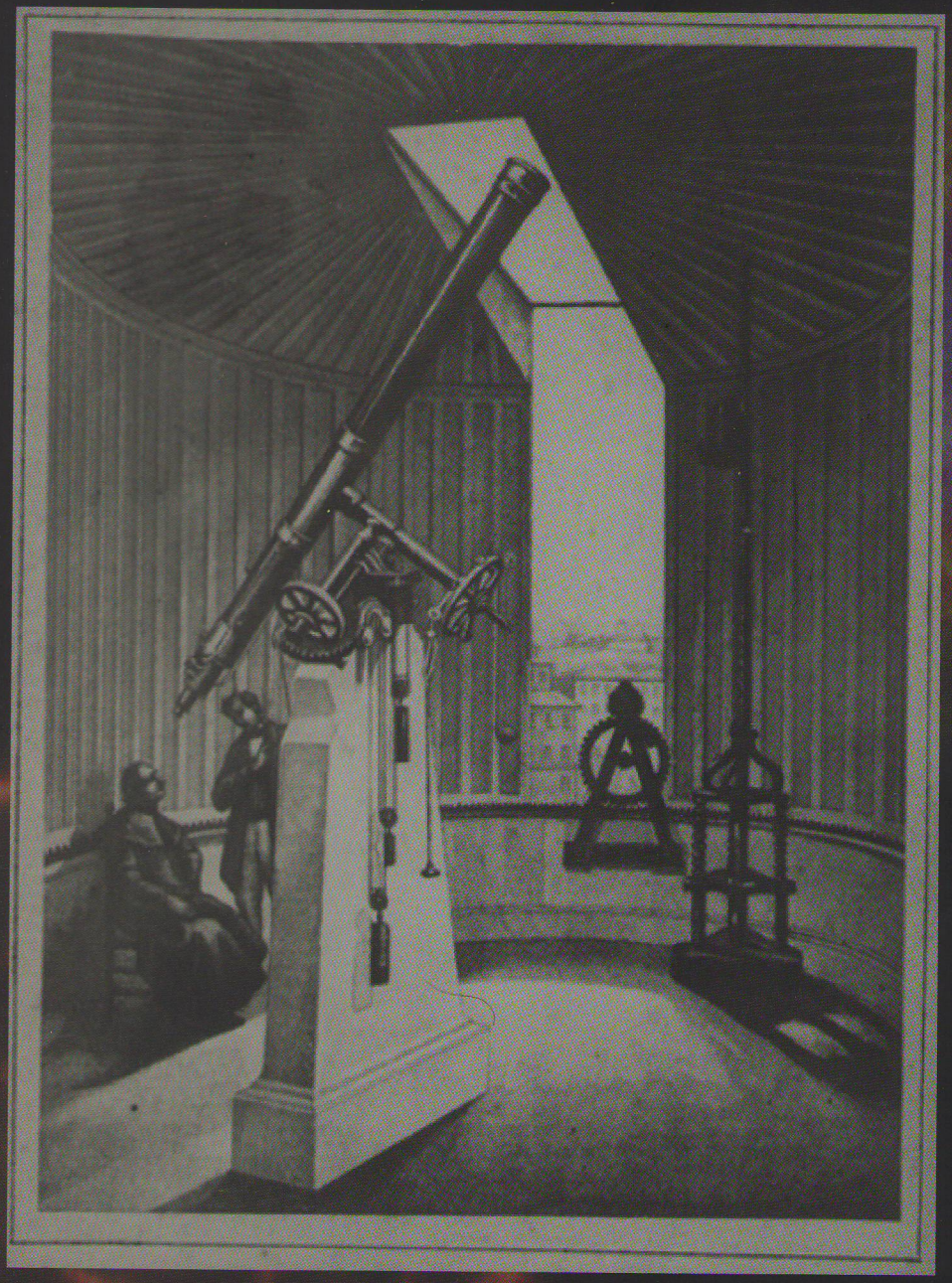
Abstract booklet

The AGB-Supernovae Mass Transition

Observatory of Rome – March 27th – 31st, 2017



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Alpha cluster transfer in elastic scattering of ^{13}C ions on ^{9}Be nuclei

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The scattering of 1p-shell nuclei, having the cluster structure, one can see the anomaly increasing of cross sections for large angles. Most often, this increasing of cross sections is connected with transfer mechanism of clusters or nucleons. This behavior has been observed by Jarczyk et al. [1] in elastic scattering of ^{9}Be on ^{13}C at c. m. energies of 11.5 and 14.9 and Bodek et. al. [2] for the system $^{13}C+^{9}Be$ at c. m. energies around 11.6 MeV. Alpha cluster contribution to $^{9}Be+^{13}C$ on higher energy (50.46 MeV) was investigative by Barbadoro et. al. [3]. In another paper [4], the significant rise of the scattering cross section of α - particles on Be nuclei can be reproduced with using a set of optical potential with deep real part that not taking into account the possible contribution of elastic transfer of α-cluster.

Angular distribution for elastic scattering of carbon ions ^{13}C on ^{9}Be nuclei were measured at E_{Lab}=22.75 MeV at DC-60 accelerator at Institute of Nuclear Physics (Astana, Kazakhstan) (see figure). The rise of the cross sections at backward angles was observed which is typical for alpha-cluster structured nuclei [5]. Analysis showed that, optical model does not provide cross sections enhancement in backward direction. This increase of cross section could be interpreted to be due to the contribution of α-cluster transfer. Data analysis was performed in framework of the coupled channel method and obtained optimal parameters of potentials. The work performed under the grant number 2272 / GF4 MES RK.

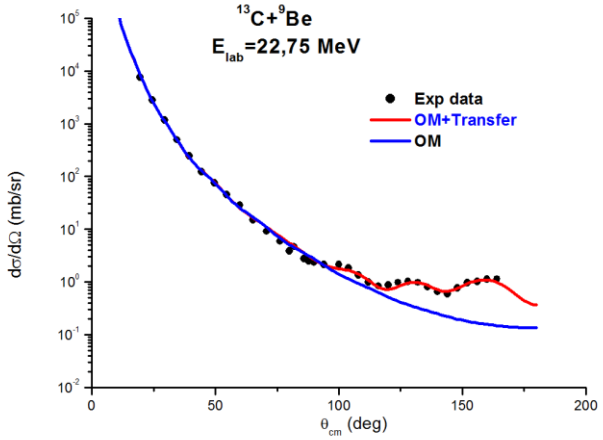

Figure: Angular distribution of the elastic scattering of ^{13}C on ^{9}Be at the E_{lab}=22.75 MeV. Circles are experimental data; the blue line is the optical model prediction, and the red line represents the coupled reaction channels calculation by code FRESCO with taking into account the exchange mechanism of the α-cluster transfer.

Reference:

1. L. Jarczyk et. al. Nucl. Phys. A 316 (1976) 1824.
2. K. Bodek et.al. J. Phys. G: Nucl. Phys. 6 (1980) 1017.
3. A. Barbadoro et. al. Phys. Rev. C 41 (1990) 24.
4. R. J. Peterson Nucl. Phys. A 377 (1982) 41.
5. N. Burtebayev et. al. Nucl. Phys. A 859(2011) 29.