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Determination of the ^{6}He nuclear radius from the total reaction cross section

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Nuclear reactions induced by neutron-rich radioactive beams have opened new possibilities for studying nuclei far from stability line [1]. The increase of the reaction cross-sections for neutron rich nuclei compared to the stable nuclei can be attributed to their larger nuclear radii. In order to observe this effect a systematic investigation of total reaction cross sections from elastic scattering measurements using the ^{9}Be target and tightly bound, weakly bound and exotic projectiles have been performed [2]. In particular, the ^{6}He+^{9}Be exotic system shows large values of the reaction cross section compared to reactions induced by stable weakly bound projectiles [1,2]. For this light system, the Coulomb interaction is smaller than nuclear interaction. Thus, the Coulomb breakup of the projectile is expected to have less influence. Another study was carried out to verify the dependence of the observed enhancement as a function of the target mass. The analysis was extended to the ^{6}He scattering on light, medium and heavy mass targets. The results showed a weak, but considerable, enhancement in the total reaction cross section for ^{6}He+^{9}Be system in comparison to ^{6}He scattered on heavy targets [2]. From the total reaction cross sections values, the ^{6}He nuclear interaction radius are extracted using a new method employing a simple geometric relation [3]. A comparison with the radius of the ^{6}He obtained at higher energies is presented.

1. E. Benjamin et al. Phys. Lett. B 647 (2007), 30.
2. K.C.C. Pires et al. Phys.Rev. C90 (2014) no.2, 027605.
3. A.S. Freitas et al Braz. J. Phys. 46, (2016) 120-128.

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