5)Nucleosynthesis os elements in ONe white dwarf novae. Peripheral elastic scattering ^{17,18}O on light targets.

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We have a long-term program to understand and describe nucleus-nucleus collisions in terms of one body interaction potential, the optical model potential (OMP). A good understanding of all phenomena occurring in the elastic nucleus-nucleus scattering, which are used typically to extract OMP, and the interpretation of the origin of different aspects, including the well known potential ambiguities, are of crucial importance for finding and justifying the procedures used for predicting nucleus-nucleus OMP in the era of radioactive nuclear beams (RNB), including ours based on double folding \cite{trache00}. The reliability of these potentials is crucial for the correct description of a number of reactions involving RNBs, from elastic to transfer and breakup, at energies ranging from a few to a few hundred
MeV/nucleon. Of particular interest for us is to support the absolute values of the calculated cross sections for reactions used in indirect methods for nuclear astrophysics, see [1] and [2] for the most recent results. In this framework, we treat here the case of heavy ion orbiting, one of the phenomena found over the years to occur in special cases of elastic scattering, well understood semi-classically, but not well documented by specific examples. We review the semiclassical theory for heavy ion orbiting insisting on the connection with Regge poles and barrier-top resonances. Although the physical content of the phenomenon is well understood semiclassically, a clear signature is hard to be found because the relation between the observation angle and the deflection angle is not one to one. We discuss two specific examples of heavy ion orbiting. A first example, $\alpha+^{16}$O at 54.1 MeV reaction dominated by strong optical potentials shows all characteristics of a strongly refractive scattering: Fraunhofer cross over at very forward angles, deep Airy oscillation, rainbow bump, significant increase of the cross section at large angles. We demonstrate semiclassically that this in fact is a typical orbiting reaction. In a second example, $\alpha+^{28}$Si at 18.0 MeV, we describe a special kind of heavy ion orbiting-butterfly scattering, with diffractive oscillations in the entire physical angular range, determined by Regge pole dominance.

[1] T. Al-Abdullah, F. Carstoiu, X. Chen, H. L. Clarke, C. A. Gagliardi, Y.-W. Lui, A. Mukhamedzhanov, G. Tabacaru, Y. Takimoto, L. Trache, R.E.Tribble, Y. Zhai Phys. Rev. **C 89**, 025809 (2014).
[2] T. Al-Abdullah, F. Carstoiu, C. A. Gagliardi, G. Tabacaru, L. Trache and R. E. Tribble. Phys. Rev. **C 89**, 064602 (2014).