Contribution ID: **24** Type: **Invited Lecture**

Trojan Horse Method: a powerful tool to study nuclear reactions at astrophysical energies

Thursday, 16 June 2016 09:00 (1h 30m)

The low energy behavior of reactions of astrophysical interest is one of the most important input to calculate the
reaction rates of astrophysical importance and therefore to evaluate their impact on astrophysical environments. Astrophysical energy range are so low that only in few cases direct measurements in those energy ranges were possible. This is even truer for reactions induced by radioactive ion beams.
Besides, direct measurements in the last decades have highlighted a new problem
related to the lowering of the Coulomb barrier between the interacting nuclei due to the
presence of the ''electron screening" in the laboratory measurements. It was systematically
observed that the presence of the electronic cloud around the interacting ions in
measurements of nuclear reactions cross sections at astrophysical energies gives rise to an enhancement of the astrophysical S(E)-factor as lower and lower energies are explored [1].
Moreover, at present such an effect is not well understood as the value of the potential for
screening extracted from these measurements is higher than the upper limit of theoretical
predictions (adiabatic limit).
On the other hand, the electron screening potential in laboratory measurement is different
from that occurring in stellar plasmas thus the quantity of interest in astrophysics
is the so-called "bare nucleus cross section". This quantity can only be extrapolated in direct measurements.
These are the reasons that led to a considerable growth on interest in indirect measurement
techniques and in particular the Trojan Horse Method (THM). An overview of direct and indirect methods will be given. Attention will be focused to the THM, to its prescriptions and assumptions as well as the application to some problems of big astrophysical relevance. Besides a step-by-step introduction to the experimental features of the method will be given as well as comparison to other direct and indirect methods.

Results concerning the bare nucleus cross sections measurements will be shown in those cases.

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Session Classification: Pizzone