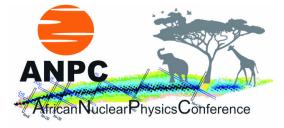
## **African Nuclear Physics Conference**



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## Indirect Experimental Methods and 12C+12C Fusion

C-burning plays a pivotal role in astrophysics, from the nucleosynthesis of massive stars, to explosive scenarios in carbon-rich environments such as superbursts from accreting neutron stars and type Ia Supernovae [1-4]. Carbon burning occurs at temperatures greater than 0.4 GK, corresponding to center-of-mass energies exceeding 1 MeV. The dominant evaporation channels below 2 MeV are a and proton, leading to 20Ne and 23Na, respectively. In spite of the considerable efforts devoted to measure the  $12C(12C,\alpha)20Ne$  and 12C(12C,p)23Na cross sections at astrophysical energies, they have been measured only down to 2.14 MeV, still at the beginning of the astrophysical region [5]. As known, direct measurements at lower energies are extremely difficult. Moreover, in the present case the extrapolation procedure from current data to the ultra-low energies is complicated by the presence of possible resonant structures even in the low-energy part of the excitation function. For these reasons, indirects approaches can represent a unique way for an accurate investigation at the relevant energies. In particular indirect information on the energy trend plus 24Mg levels that may play a role in the 12C+12C low-energy fusion has been obtained through the 12C+13C and 13C+13C fusion [6]. Recently, the Trojan Horse Method [7] has been applied in the measurement of the  $12C(14N,\alpha20Ne)2H$  and 12C(14N,p23Na)2H three-body processes [8]. The measurement was performed at 30 MeV of 14N beam energy in the quasi-free (QF) kinematics

regime, where 2H from the 14N Trojan Horse nucleus is spectator to the 12C+12C two-body processes. The cross section experiences a strong resonant behaviour with resonances associated to 24Mg levels. As a consequence, the reaction rate is strongly enhanced at the relevant temperatures.

Results from indirect experiments will be presented and discussed.

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