Recent results on the direct measurement of the $^{12}C + ^{12}C$ fusion cross-section at deep sub-barrier energies with STELLA*

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The measurement of the $^{12}C + ^{12}C$ fusion reaction at astrophysical energies is mandatory to well understand stellar evolution. First, fusion hindrance [1] has been observed in most of medium-heavy fusion systems, but it is still unclear if it affects also ligh-medium fusion reactions. In the case of the $^{12}C + ^{12}C$ mild hints of hindrance have been observed and still need a clear confirmation. Second, the presence of resonances in the fusion cross-section on the $^{12}C + ^{12}C$ fusion reaction that can be a strong indication of molecular states in the ^{24}Mg, can also have an impact on our understanding of stellar evolution. Precise measurements at deep sub-barrier energies are highly challenging, as the cross-section is at a sub-nanobarn range and the dominating background level. To overcome this challenge, the STELLA (STELla LAboratory) experiment combined to UK-FATIMA (FAst TIMing Array) allows for a coincident measurement of gammas and charged particles products of the fusion reaction to efficiently suppress the background and achieve precise measurements at deep sub-barriers energies in the astrophysical region of interest. The first experimental campaign in 2016/2017 [2] revealed hints of hindrance and a potential resonance at low energy. This contribution will present data from the 2019 experimental campaign. Details on the analysis will be given, and new results will be presented.

[1] C.L. Jiang *et al.*, Phys. Rev. Lett **93** (2004) p. 012701.
[2] G. Fruet *et al.*, Phys. Rev. Lett **vol. 124** (2020) p. 192701.

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