

"Constraints on the appearance of a maximum in astrophysical S -factor"

For fusion reactions of astrophysical interest, the existence of a maximum of S-factor is revealed within the extended quantum diffusion approach. We compared the calculated capture cross-sections with the available experimental data. In all cases we obtained a good description of the experiments.

In our approach the S-factor maximum is a result of disappearing of the short range nucleus-nucleus interaction forces at the large external turning point distances.

We propose an analytical expression, predicting very reliably, the dependence of the S-factor maximum on the ion mass and charge numbers, which may be used not only in stellar burning studies but also as a guidance for future experiments. Another interesting behavior of the obtained S-factor is its strong dependence on $E_c.m.$ at the collision energies below the maximum which will reduce considerably the stellar burning rates and its temperature dependence.

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