Level Structure of ^{30}S of Astrophysical Importance in rp Reaction ^{29}P(p,γ)^{30}S

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The structure of proton-unbound ^{30}S states is a key to understand the αp and the rp processes, as it plays a crucial role in the calculation of the ^{29}P(p,γ) and ^{26}Si(α,p) reaction rates. The spin-parity assignments of ^{30}S strongly determine the thermonuclear ^{29}P(p,γ)^{30}S reaction rate at temperatures characteristic of explosive hydrogen burning in classical novae and type I x-ray bursts. Specifically, the rate had been previously predicted to be dominated by two low-lying, unobserved, levels in the Ex = 4.7-4.8 MeV region, with spin and parity assignments of 3^+ and 2^+. Recent experiments were performed to study the structure of ^{30}S. The ^{30}S J$^\pi$ values were inferred from also a comparison to the known decay schemes of the corresponding mirror states in ^{30}Si.

We present, in our contribution, results for levels in ^{30}S that are used for the ^{29}P(p,γ) rp reaction rate calculations. The levels are calculated using the (0+1)$\hbar\omega$ PSDPF interaction, which is charge-independent Hamiltonian. The γ -decay lifetimes of ^{29}P and ^{30}S are also calculated. Based on experimental information on the ^{30}S energy spectrum as well as for the mirror nucleus ^{30}Si, the levels of excited states that are used to determine the ^{29}P(p,γ)^{30}S reaction rates are proposed.