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The beta-decay rate of 59Fe in shell burning environment

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The stellar beta-decay rate of 59Fe at typical carbon shell burning temperature is determined by taking the experimental Gamow-Teller transition strengths of the 59Fe excited states. The new rate is up to a factor of 2.5 lower than theoretical rate of Fuller-Fowler-Newman (FFN) and up to a factor of 5 higher than decay rate of Langanke and Martinez-Pinedo (LMP) in temperature region of 0.5≤T[GK]≤2. The impact of the newly determined rate on the synthesis of cosmic gamma emitter 60Fe in the C-shell burning and explosive C/Ne burning is estimated by using one-zone model calculation. Our results show that 59Fe stellar beta−decay plays an important role in the 60Fe nucleosynthesis. Future experiment will be discussed to improve the uncertainty.

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