# Forbidden $^{20}$Ne $\rightarrow$ $^{20}$F electron capture in intermediate-mass stars

Dag F. Strömberg,[1,2] Gabriel Martínez-Pinedo,[1,2] Samuel Jones,[3,4] Oliver S. Kirsebom,[5] and Frédéric Nowacki[6]

[1] *Institut für Kernphysik, TU Darmstadt, Germany*

[2] *GSI Helmholtzzentrum für Schwerionenforschung, Germany*

[3] *Heidelberger Institut für Theoretische Studien, Germany*

[4] *X Computational Physics Division, LANL, USA*

[5] *Department of Physics and Astronomy, Aarhus University, Denmark*

[6] *Université de Strasbourg, CNRS, IPHC UMR 7178, France*

The range 7 to 11 solar masses bridge the gap between massive stars (which explode as core-collapse supernovae) and light stars (which end as CO white dwarfs). These intermediate-mass stars form degenerate ONe cores following carbon burning. In some cases the cores grow dense enough to trigger electron capture on various nuclei. Most notably, the double electron capture $^{20}$Ne $\rightarrow$ $^{20}$F $\rightarrow$ $^{20}$O releases enough heat to trigger runaway oxygen burning.

We show that the electron capture on $^{20}$Ne is triggered by the second-forbidden non-unique transition between the ground states of $^{20}$Ne and $^{20}$F. This transition has recently been measured and found to have a significant strength. Stellar models that take this measurement into account ignite oxygen off-centre and at lower densities compared with those without the forbidden transition. This increases the likelihood of a thermonuclear explosion with an ONeFe remnant as opposed to a collapse to a neutron star.

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