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Mass-Radius relation for magnetized white dwarfs from SDSS

A large number of magnetized white dwarfs (WDs), with surface field strength generally less than 10^9 G, identified from wide-field surveys have helped us to understand their physical and chemical properties and the effect of magnetic field strength (B) on them. Though these weaker fields are not expected to modify their properties significantly, it is an excellent step for probing the impact of higher fields on the stellar structure. Observationally, it is very difficult to detect highly magnetized WDs directly, but the presence of over-luminous Type Ia supernovae has indirectly given evidence for their existence, since their progenitors are proposed to be super-Chandrasekhar (M$>1.4M_{\odot}$) mass WDs . In recent work, we derived the mass-radius (M—R) relation for a sample of magnetized WDs, identified from SDSS data release 7 with B ranges between 1 and 773 MG. Our results show excellent agreement with the theoretical M—R relation derived by assuming a lower surface B and a constant temperature from the center to the core-envelop interface. Hence, we propose that our model can be further extrapolated to higher surface fields, which may indicate the existence of super-Chandrasekhar mass WDs at higher fields.

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