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Gravitational waves from fast-spinning white dwarfs

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Two mechanisms of gravitational waves (GWs) emission in fast-spinning white dwarfs (WDs) are investigated: accretion of matter and magnetic deformation. In both cases, the GW emission is generated by an asymmetry around the rotation axis of the star. However, in the first case, the asymmetry is due to the amount of accreted matter on the magnetic poles, while in the second case it is due to the intense magnetic field. We have estimated the GW amplitude and luminosity for three binary systems that have a fast-spinning magnetized WD, namely, AE Aquarii, AR Scorpii and RX J0648.0-4418. We find that, for the first mechanism, the systems AE Aquarii and RX J0648.0-4418 can be observed by the space detectors BBO and DECIGO if they have an amount of accreted mass of $\delta m \geq 10^{-5} M_{\odot}$. For the second mechanism, the three systems studied require that the WD have a magnetic field above $\sim 10^9$ G to emit GWs that can be detected by BBO. We also verified that, in both mechanisms, the gravitational luminosity has an irrelevant contribution to the spindown luminosity of these three systems. Therefore, other mechanisms of energy emission are needed to explain the spindown of these objects.

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