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WD40: a highly elliptically polarised radio white dwarf

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I will present WD40, a white dwarf first identified as a radio source using circular polarisation searches with ASKAP. WD40 has been observed over 40 times with ASKAP and is highly variable, with flux densities ranging from 1 mJy to 65 mJy. It has been detected 40 times in 15 minute, 888.5 MHz and 943 MHz ASKAP observations but has not been detected in ASKAP observations at higher frequencies or in VLASS at 3 GHz. Follow-up using ATCA revealed highly elliptically polarised, up to 100% linearly and circulatory polarised, bursts. These bursts have a period of ~ 1.6 hours and are half an hour long or longer, resulting in a duty cycle of $>30\%$. Bursts were detected persistently in two, 9 hour ATCA observations. But only one burst was detected in a subsequent ATCA observation. As well as the time variability, the radio emission from WD40 sharply cuts off at ~ 1300 MHz, with no emission detected at higher frequencies. The radio emission is coincident with a Gaia source. We confirmed that the source is a white dwarf using optical spectroscopy. The source is 177 pc away and is detected as a variable source in the infrared, optical, and X-ray. The multi-wavelength properties indicate that it may be a new “period-bouncer” white-dwarf-brown dwarf binary, of which there are only 19 known and none have been detected in the radio. I will present this enigmatic source and what we think may be causing its interesting properties.

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