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Understanding the origin of Bunny-Hop light curves of periodic methanol masers

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Class II 6.7 GHz methanol maser emission, first discovered by Menten (1991), is exclusively associated with high-mass star-forming regions. Long-term observational studies have shown that masers are variable on many timescales; this finding was unsurprising as masers are incredibly sensitive to the changes in their local physical environment. A more surprising finding was that of the periodic methanol masers originally reported by Goedhart et al. (2003) and Goedhart et al. (2004). There are now close to thirty periodic maser sources known to us. In this research, the methanol maser source G358.460 - 0.391 was observed using the 26-metre HartRAO telescope to characterise its periodic nature; the maser is periodic, and the periodic nature of the light curve follows a behaviour which can best be described as an absolute cosine behaviour; such sources have been termed \textit{bunny-hop} sources. The source was also observed to have a velocity drift, and based on observations completed in this project as well as recent literature, it is believed that the maser region has a face-on orientation, i.e, the accretion disc associated with the high-mass stellar object is orientated face on with bipolar outflows in the direction of the observer. It is believed that the distinct periodic nature of the maser is due to some well-behaved periodic behaviour within the maser environment, and the face-on orientation may be correlated to the distinct bunny-hop behaviour observed.

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MSc

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