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Circular polarization in radio pulsar PSR B1451-68: a close look at coherent mode transitions

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The radio signal of pulsar PSR B1451-68 contains two polarization modes of comparable strength, which are observed as two flux patches that rotate meridionally on the Poincare sphere. Whenever they pass through the Stokes V poles, a transition between the orthogonal polarization modes (OPMs) is observed on a polarisation angle diagram. The circular polarization can be interpreted as a result of a coherent OPM transition (COMT), ie. a coherent superposition of orthogonal modes with their relative strength undergoing inversion.

COMTs may be ubiquitous and difficult to detect in radio pulsar data, because, unlike the usual OPM jumps, COMTs can leave no trace in polarized fractions, and their polarization angle follows an equation similar to the rotating vector model.

The meridional circularization in PSR B1451-68 requires that the oscillation phase in radiation that is forming consecutive pulse components must increase in steps of 90 degrees per component. A physical mechanism for such case will be presented.

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