After 50 years of research on pulsars, there is no consensus on the pulsar radio emission mechanism. The three most widely favored mechanisms, coherent curvature emission (CCE), relativistic plasma emission (RPE) and anomalous Doppler emission (ADE), all suggested in the 1970s, involve plasma instabilities driven by relativistic beams (CCE and RPE) or by an extreme anisotropy (ADE). In a recent paper (Melrose, Rafat & Mastrano 2020a) we argue that these three mechanisms encounter overwhelming difficulties, associated with both the formation of relativistic beams and with the dispersive properties of subluminal in the relativistic, one-dimensional plasma. None of the three is acceptable as the generic pulsar radio emission mechanisms. We (Melrose, Rafat & Mastrano 2020b) proposed an alternative mechanism that does not appeal to plasma instabilities involving relativistic beams and involves superluminal waves in the L-O~mode, which are generated as oscillations as the plasma attempts to screen the parallel component of the rotation induced electric field. These waves can escape directly if the are generated in overdense fibers in the pulsar magnetosphere. We estimate the frequency of the oscillations, which is identified as the frequency of the observed radio emission. The mechanism implies a specific relation between the frequency and the height of the emission.

6. List of related published papers (option)

6.1 Rafat, M. Z., Melrose, D. B. & Mastrano, A. (2019a), J. Plasma Phys. **85**, 905850305

6.2 Rafat, M. Z., Melrose, D. B. & Mastrano, A. (2019b), J. Plasma Phys. **85**, 905850311

6.3 Rafat, M. Z., Melrose, D. B. & Mastrano, A. (2019c), J. Plasma Phys. **85,** 905850603

6.4 Melrose, D. B., Rafat, M. Z. & Mastrano, A. (2020a) "Pulsar radio emission mechanisms: a critique" submitted to MNRAS

6.5 Melrose, D. B., Rafat, M. Z. & Mastrano, A. (2020b) "A rotation-driven pulsar radio emission mechanism" submitted to MNRAS