Radio Emission Mechanism in Pulsar Magnetosphere

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Abstract

Pulsars emit beamed electromagnetic radiation in the form of periodic pulses, as it sweeps across the observer. We know from observations that the radio emission of pulsars is coherent and highly polarized. The typical brightness temperature of pulsars range from 10^{25} to 10^{32} K. The mechanism of radio wave emission of pulsars is still an outstanding problem in pulsar astronomy. However, it is generally believed that the coherent curvature radiation mechanism can explain the high brightness temperature and polarization of pulsars in radio band. Physicists have suggested several mechanisms like Plasma antenna mechanism, Maser amplification and Relativistic plasma instabilities. We believe that coherent curvature radiation mechanism can incorporate both relativistic plasma instabilities and antenna mechanism, and worth enough to explain the high brightness temperature of pulsars. Coherent curvature radiation model is being developed by taking into account of detailed viewing geometry and dipolar magnetic field. The relativistic pair plasma (e-, e+) tied to the dipolar magnetic field lines, changes direction in every moment which results in the acceleration and hence emitting radiation. Several non-linear process is taking place in pulsar magnetosphere like wave wave coupling and instability process like two stream . Ion and electron motion in plasma is generating standing longitudinal waves. Now wave wave coupling among the plasma waves will leads to the generation of non-linear wave mode , and finally this non-linear wave partially converted to transverse wave to stabilize the amplitude of plain waves. We are trying to develop a theoretical model based on the above plasma process, which is believed to explain the enhanced intensity as well as high brightness temperature.