Beam emission from magnetars as a mechanism for Fast Radio Bursts

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Abstract

Fast Radio Bursts (FRBs) are transient and fast (millisecond) episodes of very strong and coherent radio emission. The origin of FRBs is still unknown but its seems to be related to compact objects. This is independently supported by the recent association of the repeating FRB 200428 with the magnetar SGR 1935+2154 [1]. We present a scenario where coherent radio emission is produced in the magnetosphere of a neutron star, where the baryon-loaded expanding fireball interacts with the electron-positron wind. Two-stream instabilities driven by the velocity shear between these two plasma creates density cavities filled by electrostatic fields. Microwave coherent radiation is emitted from the modulated relativistic electrons interacting with the caviton fields, and this radiation can be observed only for certain beam to plasma density ratios [2, 3]. By performing Particle In Cell simulations we constrain the size of the cavities and the electrostatic field. Finally we compute the outgoing emission and conclude that this model can explain the detected radio fluxes.

References

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