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Self-induced temporal instability from a neutrino antenna

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It has been recently shown that the flavor composition of a self-interacting neutrino gas can spontaneously acquire a time-dependent pulsating component during its flavor evolution. In this context, we perform a more detailed study of this effect in a model where neutrinos are assumed to be emitted in a two-dimensional plane from an infinite line that acts as a neutrino antenna. We consider several examples with varying matter and neutrino densities and find that temporal instabilities with various frequencies are excited in a cascade. We compare the numerical calculations of the flavor evolution with the predictions of linearized stability analysis of the equations of motion. We show that large flavor conversions can take place if some of the temporal modes are unstable for long enough, and that this can happen even if the matter and neutrino densities are changing, as long as they vary slowly.

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