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## Neutrino oscillations in a magnetic field and CP violation: The three-flavor case

We develop an approach to neutrino oscillations in a magnetic field and extend it to the case of three neutrino generations. The theoretical framework suitable for computation of the Dirac neutrino spin, flavour and spin-flavour oscillations probabilities in a magnetic field is given. The closed analytic expressions for the probabilities of oscillations are obtained accounting for the normal and inverted hierarchies and the possible effect of CP violation. In particular, it is shown that the probabilities of conversions without neutrino flavor change ( $\nu_{Le} \rightarrow \nu_{Le}$  and  $\nu_{Le} \rightarrow \nu_{Re}$ ) do not exhibit the dependence on the CP phase, while other neutrino conversions are affected by the CP phase. In general, the neutrino oscillation probabilities exhibit quite a complicated interplay of oscillations on the magnetic  $\mu B$  and vacuum frequencies. The obtained are of interest to neutrino oscillations in extreme astrophysical environments such as magnetars and supernovas, as well as neutrino propagation in interstellar magnetic fields.

### Mini-abstract

Three-flavor neutrino oscillations in a magnetic field are derived and exhibit complicated effects.

### Experiment/Collaboration

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