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## Supernova bounds on axion-like particles coupled with nucleons and electrons

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We investigate the potential of core-collapse supernovae (SNe) to constrain axion-like particles (ALPs) coupled to nucleons and electrons. ALPs coupled to nucleons can be efficiently produced in the SN core via nucleon-nucleon bremsstrahlung and, for a wide range of parameters, leave the SN unhindered producing a large ALP flux. For ALP masses exceeding 1 MeV, these ALPs would decay into electron-positron pairs, generating a positron flux. In the case of Galactic SNe, the annihilation of the created positrons with the galactic electron background would contribute to the 511 keV annihilation line. Using the SPI (SPECTrometer on INTEGRAL) observation of this line, allows us to exclude a wide range of the axion-electron coupling,  $10^{-19} < g_{ae} < 10^{-11}$ , for  $g_{ap} \sim 10^{-9}$ . In the case of ALP decays in the extra-galactic medium, the electron-positron annihilations would yield a contribution to the cosmic X-ray background. This allows us to set constraints down to the level  $g_{ae} \sim 10^{-20}$ .

### Speaker

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