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Observing Axion Emission from Supernova with Collider Detectors

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We consider a possibility to observe the axion emission from a nearby supernova (SN) in the future, which can be known in advance by the pre-SN alert system, by collider detectors like the LHC detectors (i.e., the ATLAS and the CMS) and the ILC detectors (i.e., the ILD and SiD). The axion from the SN can be converted to the photon by the strong magnetic field in the detector and the photon can be detected by electromagnetic calorimeter. We estimate the numbers of signal and background events due to a nearby SN and show that the number of signal may be sizable. The axion emission from a nearby SN may be observed if, at the time of the SN, the beam is stopped and the detector operation is switched to the one for the SN axion search.

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