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Stau searches at future e+e- colliders

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The direct pair-production of the tau-lepton superpartner, stau, is one of the most interesting channels to search for SUSY. First of all the stau is with high probability the lightest of the scalar leptons. Secondly the signature of stau pair production signal events is one of the most difficult ones, yielding the ‘worst’ and thus most general scenario for the searches.
Future e+e- Higgs factories offer excellent facilities for SUSY searches. With respect to previous e+e- colliders, they increase the luminosity and centre-of-mass energy and improve the technologies, while, with respect to hadron colliders, they offer a cleaner environment, a known initial state and a triggerless operation of the detectors.
In this contribution, the prospects for discovering stau-pair production at the future e+e- colliders and the resulting detector requirements will be discussed.
For detector-level simulations, the study takes the ILD detector concept and ILC parameters at 500 GeV as example. It includes all SM backgrounds, as well as beam induced backgrounds, as overlay-on-physics and - for the first time - overlay-only events, and considers the worst-case scenario for the stau-mixing. It shows that with the chosen accelerator and detector conditions, SUSY *will* be discovered if the NLSP mass is up to just a few GeV below the kinematic limit of the collider.
Based on these results, expectations for other center-of-mass energies, luminosities, beam polarisations, beam background and detector conditions will derived.

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