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# Feasibility Study to Search for Additional Scalars at Future $e^+e^-$ Colliders

*Wednesday, 5 July 2023 16:00 (20 minutes)*

We presents a full simulation study of the production of a scalar ($M_S$) using $e^+e^- \to ZS$ at the future $e^+e^-$ colliders. We consider the events in which a Scalar recoils against a $Z$ boson decaying into a pair of muons or electrons at $\sqrt{s} = 250$ˇGeV. We evaluate the statistical precisions of the Scalar mass $m_S$ measurement at the future $e^+e^-$ colliders in the $Z \to \mu^+ \mu^-$ channel and provide the extension to additional $Z \to e^+ e^-$ channel. For the whole mass range, $M_S = 90-200$ˇGeV, the observed limit on the cross section is weaker than expected. Furthermore, at $\approx 95$ˇGeV the limit is weakest and a new scalar subsequently decays leptonically with a cross section $\approx 0.5$ pb indistinguishable over the Standard Model hypothesis. We use Deep Neural Network (DNN) as a machine learning technique to provide discrimination at $\approx 95$ˇGeV.

## Apply to be considered for a student ; award (Yes / No)?

Yes

## Level for award;(Hons, MSc, PhD, N/A)?

MSc

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