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MSSM precision physics at the Z resonance

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LEP1 and SLC measurements provide accurate data for the process $e^+e^- \to f\bar{f}$ at a centre of mass energy$\tilde{}s \sim M_Z^2$. This data is used to define various on resonance pseudo observables, such as effective fermionic mixing angles, pole asymmetries, partial and total $Z\tilde{}$boson decay widths, peak cross sections, and ratios of partial widths. Despite the fact that the experimental errors of these quantities are already below the per mill level, the GigaZ option of a future linear collider will further reduce these error. To match current and future experimental accuracy, equally precise theoretical predictions are indispensable. As the theory predictions depend on model dependent quantum corrections, the comparison of the theory predictions with the experimental data provides a crucial test of models of new physics.

In this talk we present the currently most precise and most general MSSM predictions for the observables at the $Z\tilde{}$resonance. These contain all relevant contributions from Standard Model and MSSM, as well as the full dependence on the complex parameters at one-loop order. Our calculations are performed within an unconstrained MSSM, allowing for detailed studies within any constrained model of phenomenological interest. Comparing our results with the current data we impose constraints on the MSSM parameter space and analyse possible indications for the scale of supersymmetry. We furthermore comment on the prospects and potential improvements at the future LHC and ILC colliders.

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