Status of $\tilde{\tau}$ searches at the ILC

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DESY

- Summary last presented results
- Analysis of worst scenario
- Outlook/Conclusions



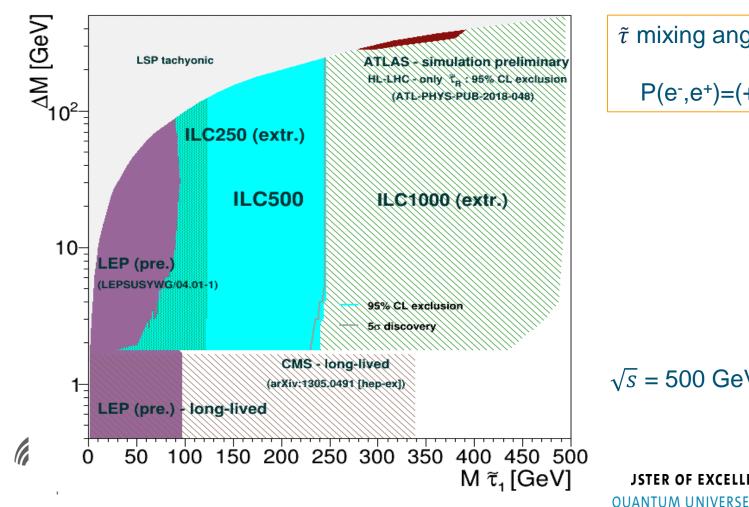
ILD Software and Analysis Meeting, 07-07-21



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Summary last presented results



 $\tilde{\tau}$ mixing angle 53 degrees

P(e⁻,e⁺)=(+80%,-30%)

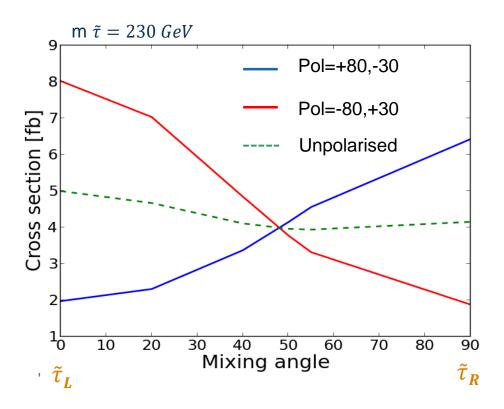
 $\sqrt{s} = 500 \text{ GeV}, 1.6 \text{ ab}^{-1}$

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Search for "worst" mixing angle

53 degrees $\tilde{\tau}$ mixing angle corresponds to the worst case for (unpolarized) LEP conditions



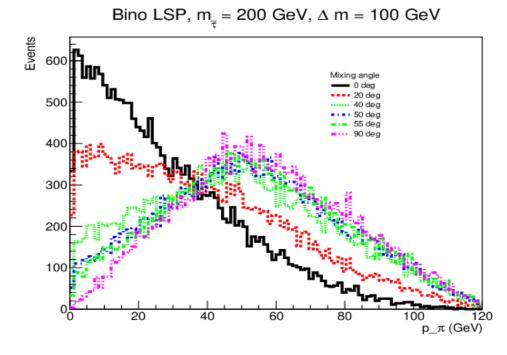
Use ILC conditions weighting contribution of both polarisations (affecting background level)

Take into account effect of mixing in cross-section and signal efficiency

- Signal: Whizard + Tauola
- Background: Whizard 1.95 (standard "DBD" background samples)

Event reconstruction using SGV adapted to the ILD detector concept at ILC

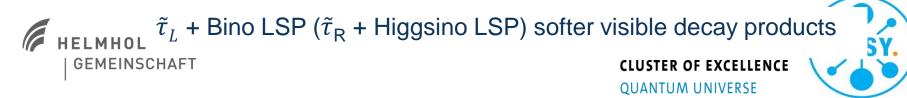
Dependence of signal efficiency on $\tilde{\tau}$ mixing



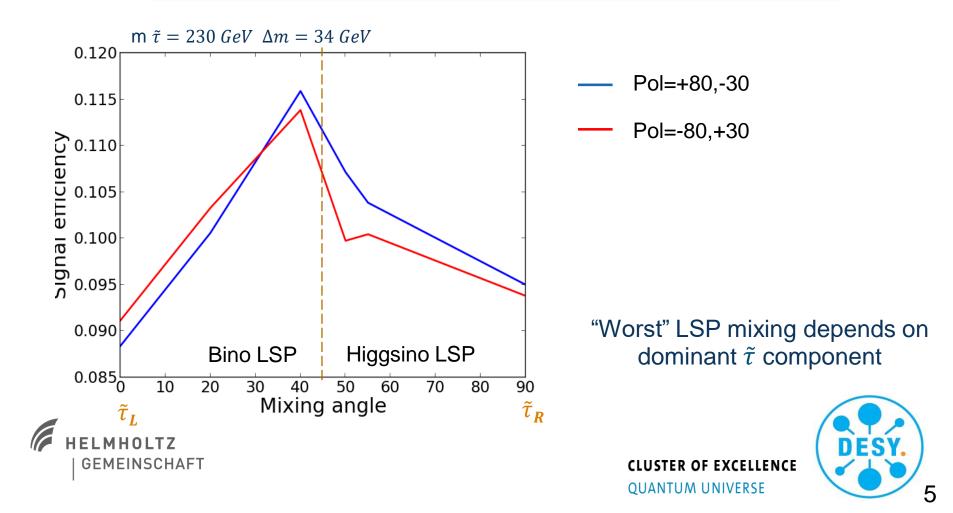
 Signal efficiency depends on spectrum of detectable T decays

- Spectrum of t decay products depends on t polarisation
- T polarisation depends on $\tilde{\tau}$ and LSP mixing angles

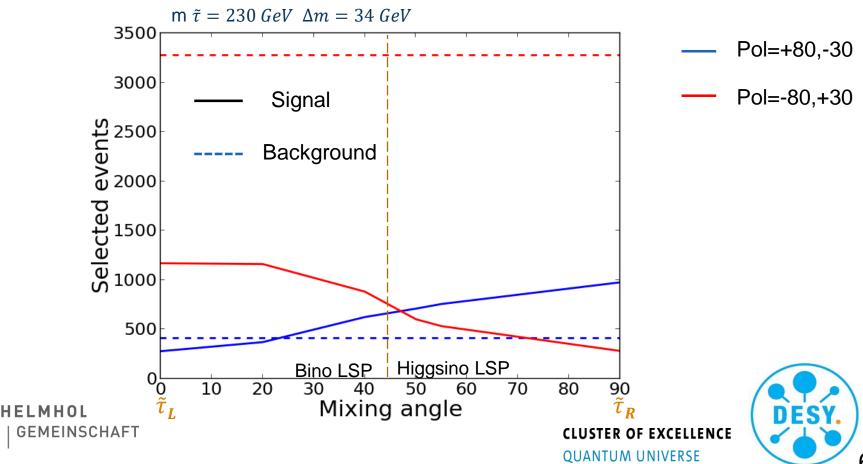
Higgsino changes chirality but Bino does not



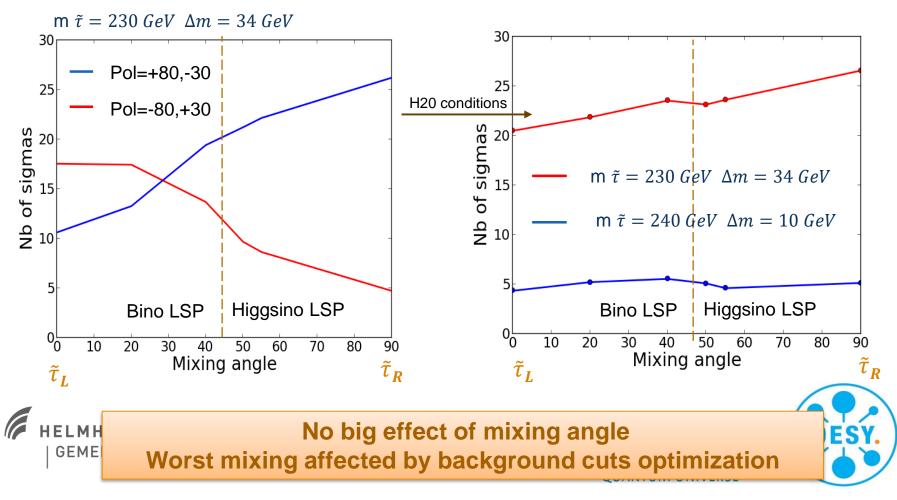
Dependence of signal efficiency on $\widetilde{\tau}$ mixing



Selected background and signal events



Likelihood-ratio statistic used to weight both polarisations



Outlook/Conclusions

- Worst scenario for $\tilde{\tau}$ production at the ILC was reviewed taking into account ILC beam polarisation conditions
- Dependence of spectrum of visible products from τ decays on $\tilde{\tau}$ and LSP mixings (via τ polarisation) was taken into account
- Cuts optimized P(e⁻,e⁺)=(+80%,-30%). Maybe possible improvement using different cuts depending on beam polarisation

No big effect of mixing angle on worst scenario 53 deg worst case for low Δm



