

# Tau polarisation, $A_{FB}$ , $A_{LR}$ , decay modes in $e^+e^- \rightarrow \tau^+ \tau^-$

## Short description.

**Physics Motivation:** measure the coupling between Z and left handed tau, and the coupling between Z and right handed tau. This is going to be very useful to constrain some of the contact interactions, or to test models such as gauge-Higgs unification.

**Search Channel:**  $e^+e^- \tau^+ \tau^-$ , tau 1-prong / 3-prong,  $E_{cm} = 500$  GeV.

**Detector Benchmark:** highly boosted tau reconstruction; in 3-prong channel, interesting to test the limit of track separation; in 1-prong channel, interesting to test PFA performance.

## Main observables.

**final observables:**  $g_L$ ,  $g_R$ , (for  $Z\tau\tau$  couplings); cross section for  $e^+e^- \tau_{L,R}^+ \tau_{L,R}^-$ .

**intermediate observables:** efficiency of tau reconstruction, efficiency of tau decay mode identification, tau polarization

## ILD note

ILD-PHYS-PUB-2019-004 can be found on the [ILD notes](#) page (and at [arXiv:1912.08403](https://arxiv.org/abs/1912.08403) [hep-ex]).

## Related figures used in the IDR



decmodeEffTimesPur.pdf



compareplot\_s...ngammapfo.pdf



drawpexresults0.pdf

## People.

[Daniel Jeans](#) and [Keita Yumino](#), reviewed by [Mikael Berggren](#)

## References.

Daniel Jeans, "h $\rightarrow$ tau tau" [LCWS16, ILD0418]

S. Kawada et al., "A study of the measurement precision of the Higgs boson decaying into tau pairs at the ILC", <https://arxiv.org/abs/1509.01885>