Probing New Physics with Transverse Polarization via CP violation

B. ANANTHANARAYAN[1,2] AND SAURABH D. RINDANI[3]

[1] *Thomas Jefferson National Accelerator Facility, Newport News, VA 23606, USA*

[2] *Centre for Theoretical Studies, Indian Institute of Science, Bangalore 560 012, India*[*]

[3] *Theory Group, Physical Research Laboratory, Navrangpura, Ahmedabad 380 009, India*

This is a précis of a recent preprint [1]. Transverse polarization (TP) enables novel CP violation search in the inclusive process $e^+e^- \to A + X$. When the spin of A is unobserved and m_e is neglected, only (pseudo-)scalar or tensor currents associated with a new-physics scale Λ can lead to CP-odd observables at leading order in the couplings from interference with γ and Z in the presence of TP. In order to test CP violation, one needs more than the momenta of particles to be measured in $e^+e^- \to f\bar{f}$. The presence of TP provides such a vector, without observing final state polarization. This leads to gain in statistics. CP violation due to beyond the standard model interactions may be parametrized in terms of contact interactions in a model independent manner. When m_e is neglected, with only TP interactions that transform as V and A cannot interfere at leading order in the new interactions with the standard model interactions to yield CP odd correlations, which can be inferred from general results of Dass and Ross. We have evaluate the contributions to the differential cross-section due to (pseudo)-scalar and tensor contact interactions at leading order in the interaction strengths for the process $e^+e^- \to t\bar{t}$. This is used to construct an effective up-down asymmetry and a polar angle integrated version of the same. By assuming that the coefficients of the effective interaction that is suppressed by the second power of the new-physics scale Λ, to be of order unity, we show that at $\sqrt{s} = 500$ GeV and with an integrated luminosity $\int dt\mathcal{L} = 500\,\mathrm{fb}^{-1}$, we find that at the 90% confidence level, the scale Λ can be bounded at about 10 TeV, with perfect TP.

References

[1] B. Ananthanarayan and S. D. Rindani, arXiv:hep-ph/0309260.

[*] Permanent address