Progress Report 29/06/98

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I looked into how The spin density matrix elements can be extracted from data, as I explained, you have the formula of the form:

$$\frac{\mathrm{d}\sigma(e^+e^- \to W^+W^-)}{\mathrm{d}\cos\theta}\mathrm{Im}\rho_{+0}^{W^-(\theta)} = \frac{1}{\mathrm{Br}(W^- \to \ell^-\bar{\nu})}\int \frac{\mathrm{d}\sigma(e^+e^- \to W^+\ell^-\bar{\nu})}{\mathrm{d}\cos\theta\mathrm{d}\cos\theta^*\mathrm{d}\phi^*}\Lambda_{\tau\tau'}(^*\phi^*\mathrm{d}\cos\theta^*\mathrm{d}\phi^*) \tag{1}$$

Where $\rho_{\tau\tau'}$ is the matrix element and Λ is the spin projection operator. Experimentally, this just corresponds to the following, "much less complicated" equation.

$$\rho_{\tau\tau'} = \frac{1}{N}\sum_{i=1}^{N}\Lambda_{\tau\tau'}(\cos\theta_i^*, \phi_i^*) \tag{2}$$

Where N is the number of events.

Also, I have chatted with Silke Petzold, who is the main (and only?) person doing spin density analysis. She explained a few things to me, alot of which can be found on her work page: **http://wwwcn1.cern.ch/ petzold/Welcome.html**

I expressed my keenness in investigating CP-violation using a similar spin density matrix analysis method to hers and she gave me a few suggestions of area I could look into, which is what I have been doing. These suggestions included:

-Check the CP-stuff with a MC, even if it is only generator level MC, which should be ok, because the method to handle experimental effects is included in the reweighting mehtod, and it doesn't matter if for CP-conserving or -violating couplings.

-How the sensitivity behaves if one really only uses the imaginary parts of the spin density matrix elements for CP-violating effects, the theoreticians claim that it is more or less the same as a full anlaysis,

-Extend the spin density method with help of the reweighting method to a full 4fermion-analysis