

ISSNAF - INFN INTERNSHIP PROGRAM
Study of $B^0 \rightarrow J/\Psi K^*$ Decays
Angular Analysis

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During the Summer Internship Program supported by the ISSNAF in collaboration with the INFN, I spent two months at the Fermi National Accelerator Laboratory in Illinois (United States). I was followed by my supervisor Diego Tonelli and I had the opportunity to work with him at the CDF Experiment, an experimental collaboration committed to studying high energy particle collisions at the proton-antiproton collider.

Here I worked on the analysis of the $B^0 \rightarrow J/\Psi K^*$ decay in order to measure its angular polarization amplitudes.

The study of these amplitudes is interesting because they are theoretically determined by the Standard Model, that means their measurement is sensitive to New Physics. Moreover the B^0 -decay has same topology and dynamics of the $B_s \rightarrow J/\Psi \Phi$, important for CP-violation, so its study can be used for a cross-check.

In my analysis I used a test data sample of 100000 events selected by the Dimuon Trigger. I analyzed statistically the distribution of the angular variables of the decay and I separated signal events from the background through the study of the mass distribution. In order to extract the polarization amplitudes I performed a 4-Dimensional Maximum Likelihood Fit in mass and angular space, that I conceived, developed, implemented and tested. The fit reproduces fairly well all the four distributions (the three angular variables and the mass), even if there are some mismatches, probably due to the acceptance of the detector, not yet included. However the Maximum Likelihood estimates are not too far from published results and the obtained resolutions are better than the previous ones, that is extremely promising in view of a full measurement with an improved fit.