Plans for EM Regeneration Analysis

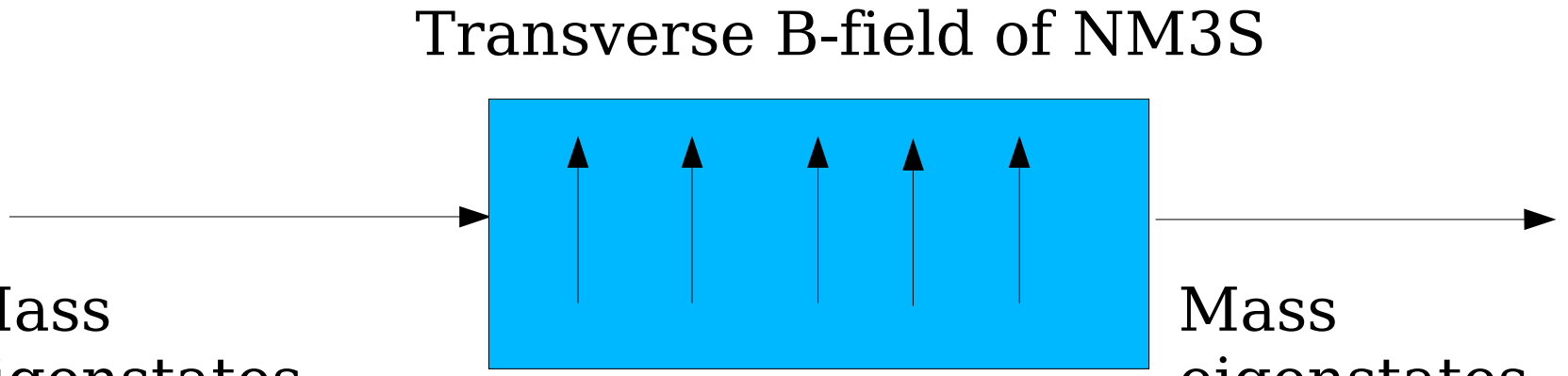
Near the end of KTEV 99, we performed a few special runs in which the last sweeping magnet before the decay volume (NM3S) was alternately turned OFF and ON.

In the ON setting, NM3S was turned to its maximum value.

The MA and REG were out of the beam.

Kendra Rand, Albert, and Hogan
March 12th, 2005.

The idea is to see if an EM field restores CP symmetry



So we try to see what would happen if the target K^0 ($\overline{K^0}$) briefly time-evolved differently within NM3S.

We assume $\Gamma_L = \Gamma_2$ and $\Gamma_S = \Gamma_1$

In practice, we try to see if the rate for $K \rightarrow 2\pi^0$ within and behind NM3S is different between ON and OFF settings of NM3S.

The $2\pi^0$ acceptance should be very similar between ON and OFF.

$K \rightarrow \pi^+\pi^-$ is harder to understand because the acceptance is different. In the ON configuration, charged decays inside NM3S are all swept out.

It is doubtful if we can use $K \rightarrow 3\pi^0$ since we'd be looking for a very small effect on top of a very large $K \rightarrow 3\pi^0$ rate.

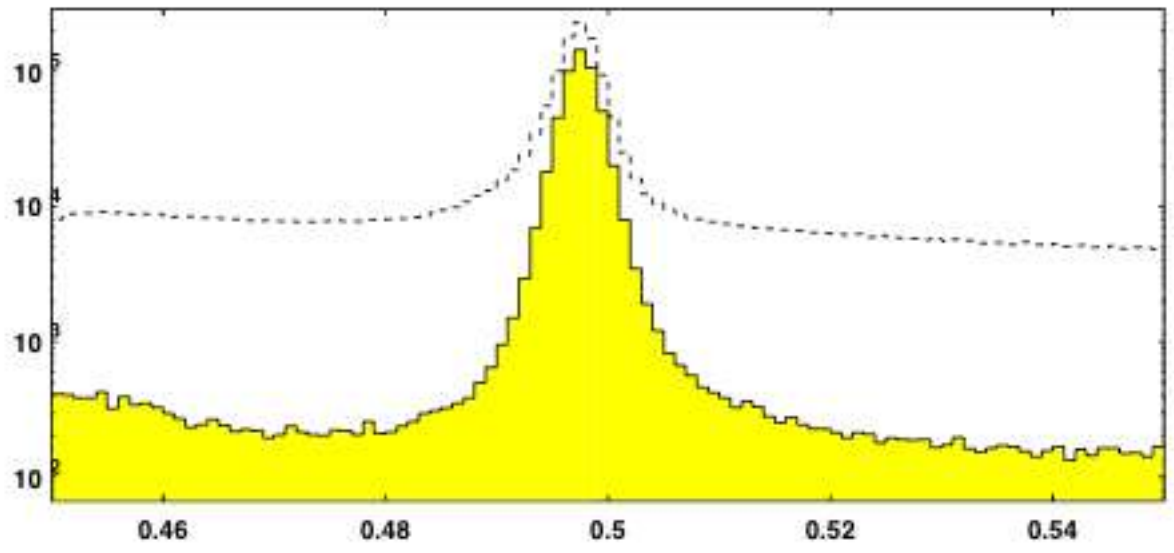
Status and Plans

We're revisiting the analysis started by Theo and Ryan, after a long hiatus.

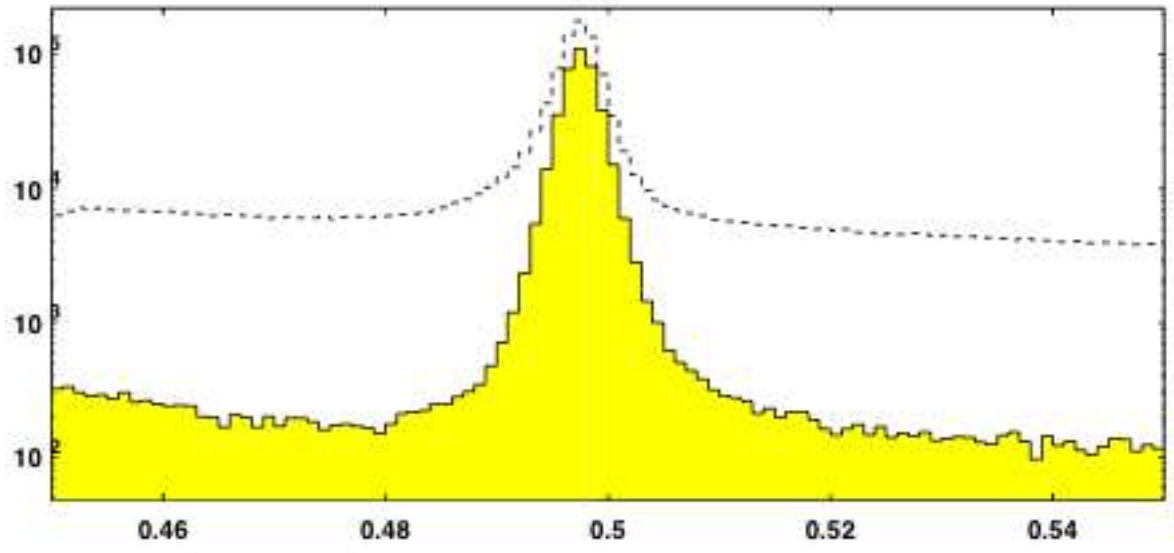
Kendra has reproduced the data plots generated by Theo and Ryan.

However, the $K \rightarrow 2\pi^0$ mass peak shows more $K \rightarrow 3\pi^0$ background than we're used to seeing for epsilon prime.

We need to regenerate the ntuples (from the 8 tapes) to have more variables to control the $K \rightarrow 3\pi^0$ background.



m-pipi ON



m-pipi OFF

There is some $EM_{Crititical}$, and we need to quote a limit on it.

The EM field seen by the kaon depends on its boost.

Depending on the boost, some kaons will time-evolve as normal. Others will time-evolve with CP symmetry restored briefly.

This is complicated enough, that we need to simulate an $EM_{Crititical}$ in the MC.

In the end, we rule out $EM_{Crititical} < XXX$ at 90% CL if the χ^2 of the match between Data and MC, generated with $EM_{Crititical} = XXX$, is less than 10% probable.