$B_0 \to \eta' K_0$ for B2TiP report

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What's new wrt last B2GM

- Move to MC6 dataset
- Efficiency of the signal w/ and w/o machine background understood;
  - Signal detector acceptance: $\sim 50\%$
  - tracking efficiency drop from BGx0 to BGx1 ($\sim 8 - 10\%$) $\otimes$ number of $\pi^{\pm}$ (4 or 6)
- BDT for signal cross feed included in the ML fit;
  - separate well true from cross signal, as well signal from background
- Accept multiple candidates per event;
  - particularly useful for $\eta_{3\pi}$, where cands multiplicity is high;
  - the SxF BDT allows for separation of signal and SxF on a statistical basis on the ML fit;
- best sensitivity obtained using at most two candidates for channel $\eta_{3\pi}$
  - as compared to just one (best) candidate and all possible ones;
  - not so relevant for $\eta_{\gamma\gamma}$ final state: low multiplicity.

What is missing

- K_S^{00} as well as K_L final states, but educated extrapolation included
- Estimate of $K_S^0 \to \pi^0\pi^0$ channel;
  - Not enough time to develop full analysis: use ratio $K_S^{00}/K_S^{\pm}$ as published by Belle and rescale the $K_S^{\pm}$ channels studied in Belle2
- Likewise for K_L^0 channel;
  - Already included *(just)* in time for B2TIP@MIAPP
- ML fit tuning;
  - Still some remaining issues:
  - migration between continuum and peaking background
  - still failing to properly fit Δt distribution for peaking (possibly related);
  - Bias seen for C in toys ($C = -0.1$), S is fine
- $\eta' \to \rho\gamma$ not touched at all;
  - would like to do an extrapolation as for K_S^{00}
  - starting from $\eta' \to \eta\pi\pi$ channel and using Belle results

Additional stuff

Additional or backup slides

Bibliography I