Calibration Constants
for
Run 6 Reprocessing

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• The reprocessing of run 6 is about to start

• We need to make sure the following constants are correct:
  – Default Calibrator
  – Cluster Calibrator
  – Bhabha constants
  – Source constants
  – Alignment constants

The problematic part are the Bhabha and Source constants since there was a lot of change in the light yields during startup.
Available sets of constants

The list of source calibrations is short because of the problems with the Neutron Generator.

The Bhabha constants depend on the source constants.

- **Source constants:**
  - January 17 (about a week before the run started)
  - January 31
  - March 21 (same as January 31 but different elex constants)
  - April-4

- **Bhabha constants**
  - January 28 - February 8
  - March 28 - April 3
  - soon: post-April 4

Which sets should we use? Let’s look at the data...
Bhabha $E/E_{exp}$

**Run 5:**

**Run 6:**
Profile plot for run 6:

- Before Bhabha calibration $E/E_{exp}$ is too low
- After Bhabha calibration $E/E_{exp}$ is too high
- $E/E_{exp}$ is starting to rise around run 70800 (March 2).
- Jörg’s muon plots confirm that now Bhabha constants are too high
Bhabha $E/E_{exp}$

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Evolution of Crismatec light yields

The plot shows the ratio Crismatec/non-Crismatec $E/E_{Exp}$ in Bhabhas.

- Second point is after source calibration.
- Jump is caused by new Bhabha constants.
- Old Bhabha constants are from run 5 (before Crismatec LY loss).
- New Bhabha constants overcorrect because of January src constants.
\( \pi^0 \) Resolution

\( \pi^0 \) resolution for bumps:

- Resolution improves after January 31st source calibration.
- Subsequent deterioration of the resolution is probably mostly due to beam backgrounds.
\[ \pi^0 \text{ Resolution} \]

\[ \pi^0 \text{ resolution for bumps around April 4:} \]

\begin{figure}
\centering
\includegraphics[width=\textwidth]{chart.png}
\caption{Sigma of EmcBump(E>30MeV) Pi0 Mass Fit vs. Run}
\end{figure}

- No improvement seen after loading the source constants on April 4.
\(\pi^0\) Proposal

- Don’t use January 17 source calibration (\(\pi^0\) plots show improvement after new calibration).
- Use Bhabha constants from January until run 70800 (March 2) when \(E/E_{Exp}\) starts to rise.
- Use Source constants from April starting at run 70800 for consistency.
Summary

- We have to load constants for alignment, cluster calibration, and crystal calibrations before reprocessing of run 6 can start.

- Because of the broken neutron generator we only have very few sets of source calibration.

- With the proposed choice of Bhabha and source constants calibration should be ok to 0.1 - 0.2 % on average.

- The Crismatec crystals show large changes in light yield.