Quality of Crystal Spectra

using data of Jan and Feb 2007
what makes a spectrum bad?

dips and peaks

deviation from av. ring cutoff

zero dips

ten^5
ten^4
ten^3
ten^2
ten^1

theta_51_phi_62

Entries 97720
Mean 0.1085
RMS 0.3226
dip and peak finder

- Assumes, spectrum is smooth
- Calculates integrals $a, b, c$ over 3 bins to reduce statistical fluctuation
- Detects slope deviating from local average $\Delta = 0$
- Only triggers at 3 sigma significance, that is if $\Delta - 3\sigma(\Delta) > 0$

\[
\frac{a}{b} = \frac{b}{c} \rightarrow \Delta = \left| \frac{a}{b} - \frac{b}{c} \right| = 0 \quad \Delta > 0
\]

- Only triggers if dip deeper than $\Delta = 1.8$
zero dips and cutoff deviation

- these quantities are computed straightforwardly.
- zero dips are defined as a number of adjacent empty bins, so just count them.
- the average ring cutoff is just the arithmetic average of the cutoffs of each crystal in a ring.
some difficulties

- the initial deep fall of the spectrum fakes a dip
  - start searching for dips and peaks at bin 15 from the left

- the fluctuations in the high energy tail fake both dips and zero dips and it spoils the ring average
  - only search for dips up to the last bin which has more than 10 entries
  - only search for zero dip up to the last bin which has more than 5 entries
  - use the last bin which has more than 2 entries for calculating the average ring cutoff
some difficulties

theta_1_phi_22

Entries 118005
Mean 0.08668
RMS 0.3229

dips
zero dips
used for ring cutoff
compose a figure of merit, the „quality“:

\[ q = \sum \frac{p_i}{a_i} \]

tuned by hand

parameters \( p_i \)

dips: number of dips, depth of deepest, length of longest

zero dips: number, length

av. ring cutoff: deviation

define 4 intervals of quality, the „badnesses“:

1 (slightly bad) ... 4 (disaster)

\[
\begin{align*}
2.5 & \leq q < 4.0 \\
4.0 & \leq q < 7.5 \\
7.5 & \leq q < 40.0 \\
40.0 & < q
\end{align*}
\]
August 2006

Hitmap
root file: adbspectra-jul06+aug06
bad crystals: 137
dead crystals: 20
bad cutoff threshold (sigma): 4
full spectra

Legend:
- badness 1
- badness 2
- badness 3
- badness 4
- badness 0.1,2 & cutoff deviation
- badness 3.4 & cutoff deviation
- dead channels
August 2006 zoomed
February 2007 zoomed

Hitmap
root file: aditspectra_jan07
bad crystals: 199
dead crystals: 4
bad cutoff threshold (sigma): 4
zoomed spectra (below 100MeV)
Feb 07 – badness 1
Feb 07 – badness 2
Feb 07 – badness 3
Feb 07 – badness 4
Feb 07 – bad 1 – zoomed
Feb 07 – bad 2 – zoomed
Feb 07 – bad 3 – zoomed
Feb 07 – bad 4 – zoomed