GEANT RECONSTRUCTION, M.Blecher 3/10/03

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As charged particles pass through the PR wire chambers (wc) and scintillators (sc) and through the shashlyk (SH) scintillators, their positions and energy deposits are obtained. The variables are determined in kopio_step.F via calls to the appropriate routines and are available for reconstruction via kopio_prerad_out.inc and kopio_shashlyk_out.inc.

Shower reconstruction is controlled by the routine kopio_shower.F

First, CALorimeter clumps are found from SH hits above threshold in routine kopio_shashlyk_clump_get.F To find the clumps the SH energies are arranged in descending order. Once in a clump the SH hit cannot be used again. Thus a new clump is always started by the highest energy SH still available. The first clump is started by the highest energy SH. After this first point has been placed in clump 1 all the other SH hits are examined. If an unused hit is close enough to a clump point, (see the test in the routine) it is included in the clump. If no unused point is close enough to a clump point, then the highest energy available SH starts a new clump.

Next the PR wc and sc information is decoded to look for tracks. The decoding goes from US to DS in z. The most US wc with hits starts the first track. The first hit starts the first track centroid. The other hits in wcs at this z are tested to see if they are close enough to the centroid, if so they are combined with the previous centroid to produce an updated track centroid. If they are too far away they start another track.

The track centroids predict the slat in the sc just DS of the wc, or in case of the first, last wc in a module in the nearest sc on its US, DS side (the latter being in a different module). The energy deposited in this slat is

added to the track energy. If a slat participates in more than one track the common energy is noted. Too much common energy permits one to cut the event.

Moving downstream in z to the next wc layer, the hits are examined and either placed on tracks because they are close enough to the previous centroid or start new tracks. In either case a centroid at this z value is obtained and the energies of the tracks are updated.

When a track has four centroids, its direction cosines can be obtained. Then the march DS in z continues to either add more centroids to a track or start new tracks. If more than five tracks are started I discard the event.

I go through this looping two more times. In the second and third loopings the previously determined direction cosines are used to exclude points from track centroids, but not from track energies. This gives a better final set of direction cosines. Individual showers are complicated and can really spread out as they proceed through the PR.

After all wc planes have been examined, I toss tracks with less than four points and keep the event if one or two tracks in the PR remain. I keep events where there is a track in the PR and there is also a clump in the CAL to which that PR track doesn't point. This means one of the gammas didn't convert in the PR.

Using the track direction cosines I see if the PR track could have come from the decay region. You can force that it pass through the US face of the PR or also allow it to come through the beam pipe. The track will also point to the CAL. If there is a CAL clump close enough to where the track is pointing, that energy gets added to the track. I have determined from various test rays that the real energy entering the CAL is about three times the clump energy. In the case of the PR this normalization depends on the scintillator thickness. My present geometry uses 0.6 cm thick PR sc. However, the TRIUMF people are changing to thicker scintillator so that the normalization must be redone.

There are a few other cuts that can be applied before passing the track energies and directions to the non-linear fitting routine. These include too much common slat energy, too much energy in PR and CAL that is not in the two good tracks/clump, etc.

This is the philosophy. For the details one will have to wade through kopio_shower.F. It could use a good cleanup and probably a revision, if anyone is interested.