

Vertex Examine Shift Instructions

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Introduction

The vertex examine can be used to monitor tracking performance, the beam position at DØ, and the beam quality. In its present implementation, it runs the Level 3 tracking algorithms, a simple dca-phi fit to find the beam position, and offline vertex reconstruction algorithms. Moreover, it analyzes Luminosity data to find the z position of the interaction. Finally, it checks the validity of combinations of Luminosity trigger and/or terms.

How To Run

To start vertex examine:

1. Log in to d0o127 as user d0run (`d0ssh -l d0run d0o127`)
2. Type `setup d0online`
3. Type `start_daq vertex_examine`
4. Type `init` and then `start`
5. Start histoscope in a separate window, on d0o127 as user d0run: `setup d0online` and then `histo`
6. In histoscope: File menu connect to process select VertexExamine
7. Select HISTO-VERTEX_EXA and press `open`
8. Select histograms and press `multiple view`
9. To see the histogram statistics, click the right-mouse-button on the histogram and select `Show Statistics`

To stop vertex examine:

1. In histoscope, File Close File/Connections
2. In the window where you started vertex examine, type `quit`

To reset the histogram content:

- In the window where you started vertex examine, type `report vtx` and then `resume`

Note that:

- Vertex examine will stop automatically when a new (physics) run starts, it has to be restarted manually
- Vertex examine will automatically reset the histograms every 3000 events

List of Histograms

The following histograms are available in vertex examine:

- Good L0 z position:
Beam position from time info in luminosity detector. The spikes are ok, they are caused by a hardware feature.
- Good fastz, (Anti)proton bit fired:
Beam quality bits. The majority of the events should have good fastz.
- Bad gap south (north) bit:
Gap trigger quality plots. All events should be in the zero bin. If not, the south (north) LM bit is faulty. This results in high gap trigger rates. It is known that the Gap North is not working properly (yet).
- Reconstructed vertices x,y,z:
Position of all primary vertices (in cm) reconstructed from L3 tracks with offline vertex algorithms. Don't expect the distributions to be centred at zero, the beam position can change from store to store.
- Number of vertices:
Number of reconstructed vertices per event.
- Number of tracks attached to vertex:
Number of L3 tracks attached to each reconstructed vertex.
- Beam x,y offset at z=0:
Position of the beam in x,y at z=0 (in cm).
- Beam slope x-z, y-z:
Tilt of the beam in xz and yz planes (dimensionless, or cm/cm).
- Number of tracks (L3Track):
Number of reconstructed tracks per event.
- Track rsigned, z at DCA, phi, tan(lambda), q over pt, DCA vs phi (L3Track):
Track parameter distributions.

Number of xy,z hits (L3Track):

Number of axial / stereo hits on the reconstructed tracks. Tracks with no stereo hits will show up at $\tan(\lambda) = 0$.

Track phi CFT only (L3Track):

Track phi for tracks with exactly 8 axial hits, only CFT hits. If parts of the SMT readout are missing, and the CFT is readout completely, a bump will show up in this distribution, in the region where the SMT readout is missing.

Track phi not-stereo (L3Track):

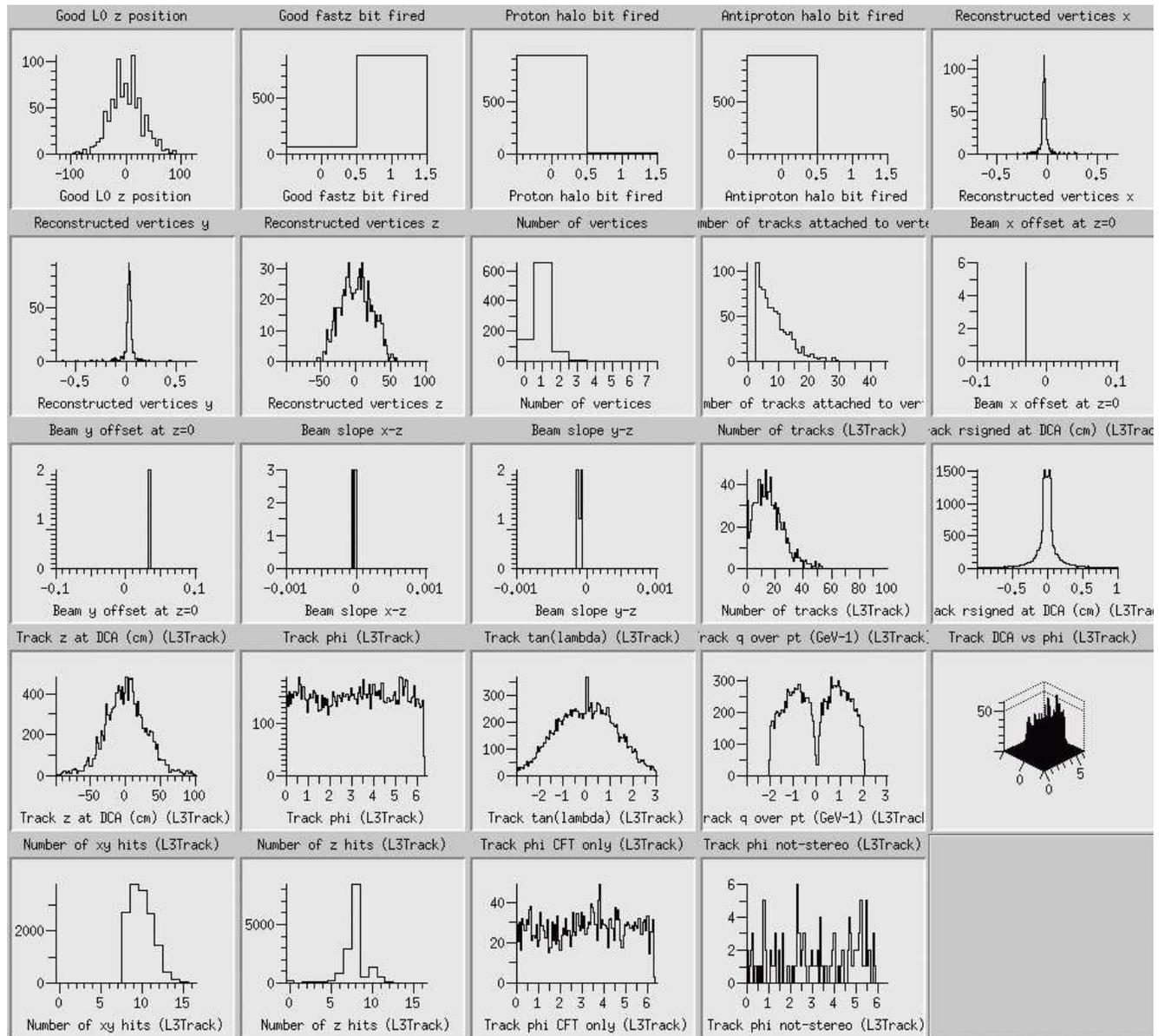
Track phi for tracks with no stereo hits attached. A bump in this distribution points to the region where stereo hits are missing, e.g., a set of stereo fibres in the CFT.

Hit phi in (+-z) global layer 1,...,16:

Track hit phi for hits attached to reconstructed tracks. Layers 1,...,8 are the SMT layers (from inside out), split up in positive and negative z. Layers 9,...,16 are the CFT layers (from inside out). Dips in the track phi distribution can be correlated to missing hits in a certain layer.

Examples

An example of a set of 'good' histograms:





Problems

If the vertex examine doesn't process any data, check with the DAQ shifter whether events are flowing out of Level 3. If that seems to be the case, hit the return key a few times in the window where vertex examine is running, until you see the message `No such command`. Then type `resume`.

If the window in which the examine is running was resized (with the mouse), then the examine will stop processing events. The only way out is to hit `ctrl-c` and start over.

Beam Position

The beam position is found using the correlation between the track dca and the track phi. For one fit, a sample of at least 15000 tracks is used. The fit is independent of the vertex reconstruction. It is assumed that the primary vertices lie on a straight line parameterized by

$$x = X_0 + A_x z$$
$$y = Y_0 + A_y z$$

The fit parameters X_0, Y_0 give the beam offset at $z=0$, parameters A_x, A_y quantify the beam slope in the xz, yz plane.

L3 Tracking

The Level 3 tracking algorithms run in the vertex examine use the CFT axial fibres as a starting point and includes SMT hits. Either 8 axial CFT hits, or 7 axial CFT with at least 3 SMT hits are required. If an axial track is found, stereo hits are searched for. At most 2 misses (with respect to the number of axial hits) in CFT stereo or at most 3 misses in global stereo are allowed. There is a cut on $p_t > 0.5$ GeV.

For the vertexing and fitting of the beam position, only those tracks are used which have at least 10 axial hits in total, and at least one stereo hit. The track histograms show all tracks, before these cuts are applied. This selection means that for a run which does not include the SMT, the track distributions will be filled, but no vertices will be found.

For the Experts

In the default implementation, no selection on trigger bits is made. Vertex examine will process data from the `all` stream (global physics runs). To process data from any stream (e.g., from a zero bias run), type `start_daq vertex_examine anything`. You can also select data from a specific L1 trigger. To get zero bias triggers only, type `start_daq vertex_examine ALiveBX`. For minimum bias triggers, type `start_daq vertex_examine Afastz`. (Trigger names as defined in `global_CMT-8.41`)

The automatic resetting of histograms after 3000 events can be disabled or changed. Edit the RCP file `VertexExamine.rcp` in directory `/online/examines/p16.03.01/vertex_examine/vertex_examine/rcp`

To disable automatic resets completely, set `int AutoReset_Nevent = 0` and restart vertex examine. Similarly, the number of events for automatic resets can be changed.

In Case of Trouble

First contact: Michiel Sanders

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The Level 3 tracking is maintained by the Imperial College group, contact person m.petteni@ic.ac.uk

Michiel Sanders 06-jul-2004