The Surface Muon Source

Trigger rates
Energy and angular distributions
Rotations

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Why Surface Muons?

• Useful for testing the alignment of the LAT
  – Simulation will allow determination of how long we need to gather data for good statistics

• LAT will be set on its side for testing
  – Must be able to simulate a fixed, rotated LAT
The Source

• Added by Toby Burnett and Sean Robinson
• Latest incarnation in FluxSvc v6r3p2
  – “surface_muons” and “vertical_surface_muons” defined in source_library.xml
• surface_muons simulates the muon flux on the ground.
  vertical_surface_muons restricts the flux to the vertical for use as a diagnostic tool (cos(θ)=0.99 to 1.0; user may change in xml)
• Now possible to rotate GLAST about the x and/or z-axis with Gleam jobOptions commands. Examples:
  – Specify pointing mode 4:       FluxAlg.pointing_mode = 4;
  – Specify rotation angle about x-axis in degrees: FluxAlg.rocking_angle = 90;
  – Specify rotation angle about z-axis in degrees: FluxAlg.rocking_angle_z = 90;
Example of a $90^\circ$ rotation – same event (27)

$90^\circ$ about x-axis
Trigger Rates – surface_muons

<table>
<thead>
<tr>
<th>No rotation</th>
<th>Rate in Hz</th>
</tr>
</thead>
<tbody>
<tr>
<td>L1T</td>
<td>298</td>
</tr>
<tr>
<td>TKR</td>
<td>296</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>90 degree rotation</td>
<td>Rate in Hz</td>
</tr>
<tr>
<td>L1T</td>
<td>182</td>
</tr>
<tr>
<td>TKR</td>
<td>175</td>
</tr>
</tbody>
</table>

L1T/TKR rate goes down by 40% with a 90° rotation, but CAL triggers increase due to more events like the one below.
Energy Distribution

From rootplot

surface_muons w/90 deg rotation about x
Angular Distributions – surface_muons, no rotation

Zenith

Azimuth

MC_xdir

MC_ydir
Angular Distributions – surface_muons w/ rotation about x
Next Steps

Will study the source more thoroughly. What is shown in these slides is preliminary.

Will work on defining the cross-tower sample in order to refine the rates.