Performance of GeantinoMap Material Service in MOORE, Rel. 7.0.0

Observations

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MOORE Phone Conference, March 11, 2004

Before Christmas, Luca showed results of first thorough tests of the geantino-map based material service in MOORE, using Rel. 7.0.0. He found unacceptably large $1/p_{\mathrm{T}}$ pulls.

With help by Luca, who has kindly provided me with his kumacs, and after some detailed studies by myself, I think I may have found the reason for those pulls.

The geantino-map based service calls the DetDescr service first to obtain the material for the chambers, and adds then the material from Toroids and Feet. The DetDescr service puts a scatterer at the place of the last measurement hit of each chamber. The geantino-map service places scatterers at last measurement hit of one chamber and the first measurement hit of the next chamber, if there is toroid/feet material in between, assigning half the material and energy loss to the first scatterer, half to the second.

I think there is a MOORE/iPatRec internal problem with this multiple placement of scatterers. The problem appears only in the above scenario, i.e., , "DetDescr+GeantinoMap" material together. I modified the geantino-map service in a way that it only takes into account the Toroid/Feet material, through commenting out the call of DetDescr material; the pulls get much smaller (although they are still too large – but there is the chamber material missing.

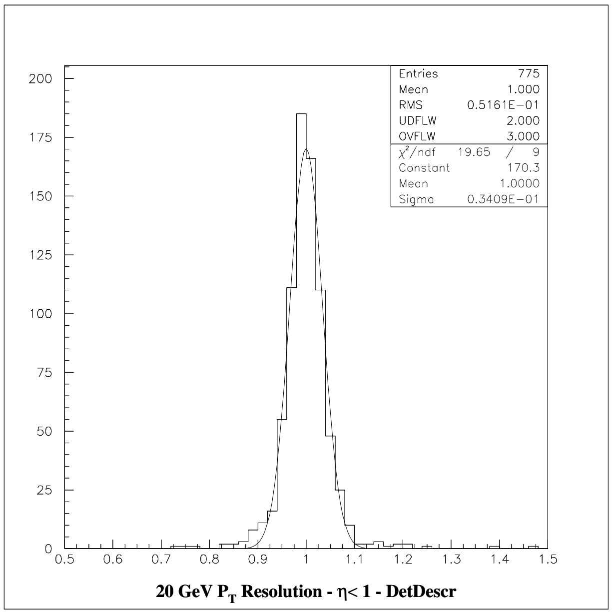
I used the following set-up:

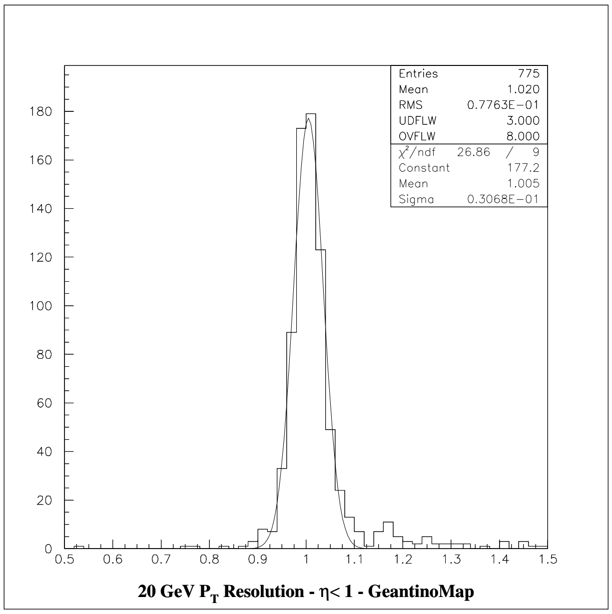
- MOORE as in Rel. 7.0.0
- Luca's kumacs
- Alessandro di Mattia's single-muon files
  `dc1.003100.simul.0001.trigger.mu_minus_20.zebra` ($p_{\mathrm{T}} = 20$ GeV)
  `dc1.003101.simul.0002.trigger.mu_minus_100.zebra` ($p_{\mathrm{T}} = 100$ GeV)

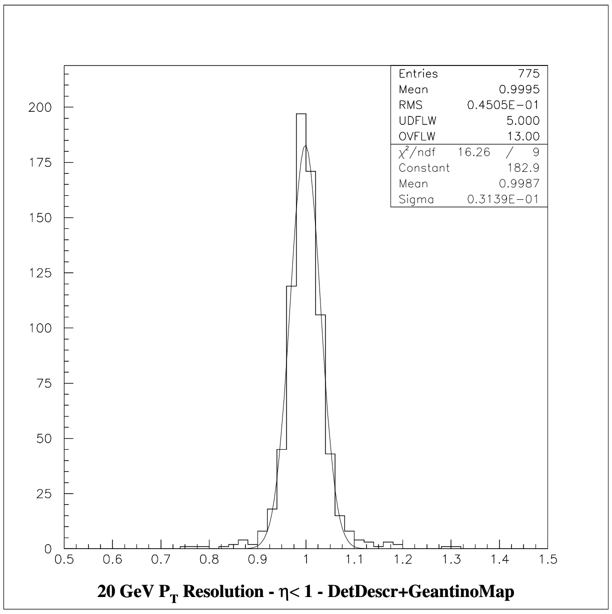
The following plots show the $1/p_{\mathrm{T}}$ resolutions, error estimates (cov55), and pulls for $p_{\mathrm{T}} = 20$ GeV and $p_{\mathrm{T}} = 100$ GeV in the barrel, and for the scenarios "DetDescr material only", "GeantinoMap material only", "DetDescr + GeantinoMap material".

The most striking feature is that the mean error (cov55) *decreases* when more material is added.

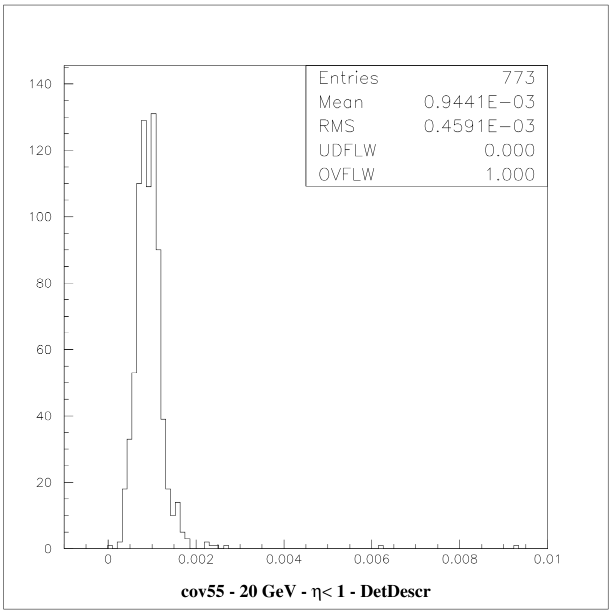
$1/p_{\mathrm{T}}$ Resolution, $p_{\mathrm{T}} = 20$ GeV, $|\eta| < 1$

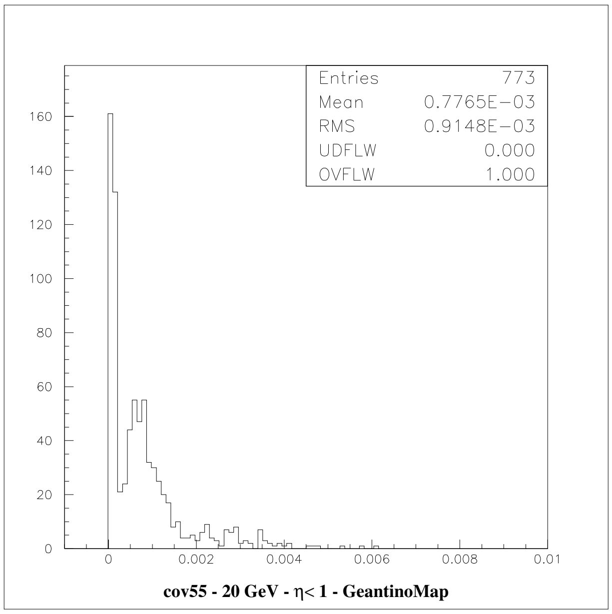


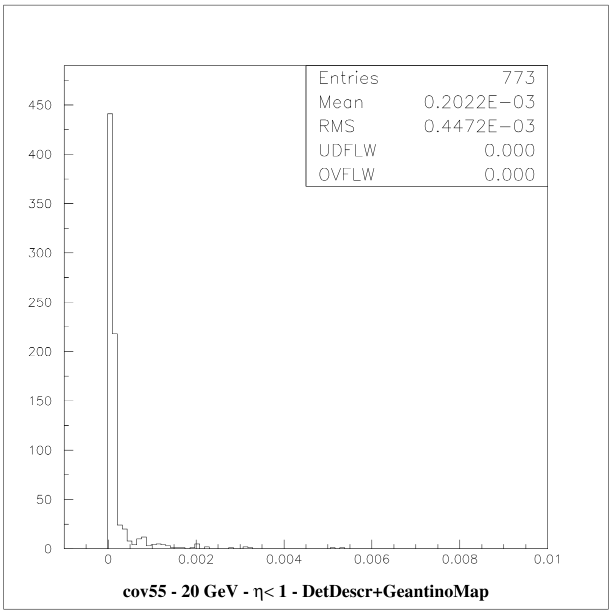




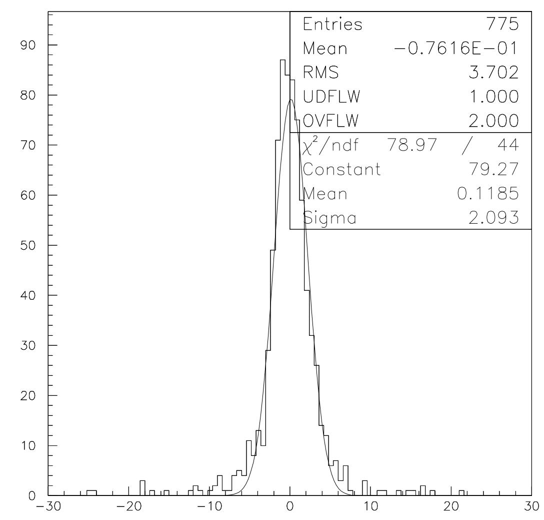
$1/p_{\mathrm{T}}$ Cov55, $p_{\mathrm{T}} = 20$ GeV, $|\eta| < 1$



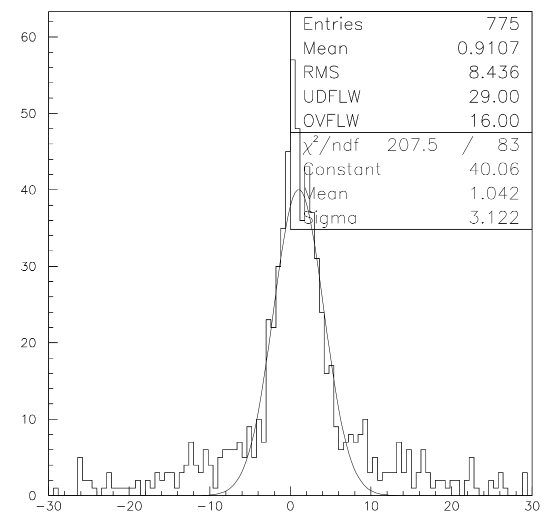




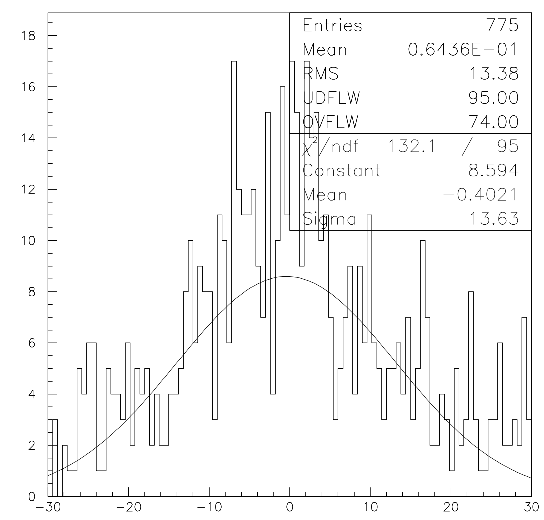
$1/p_{\mathrm{T}}$ Pull, $p_{\mathrm{T}} = 20$ GeV, $|\eta| < 1$



20 GeV P_T Pull - η< 1 - DetDescr

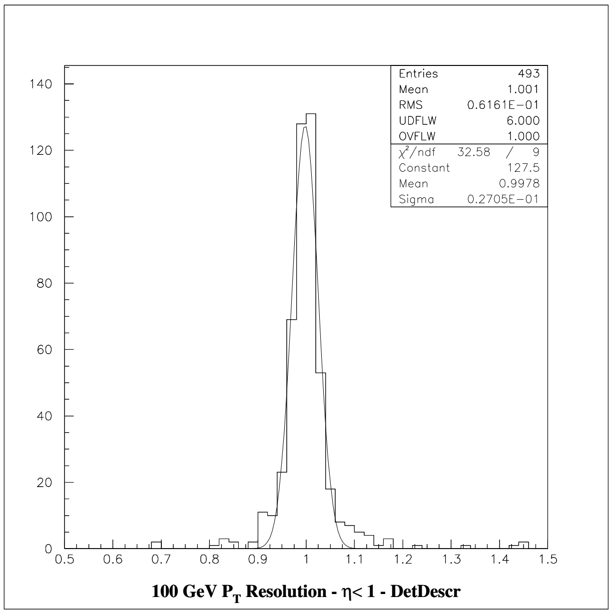


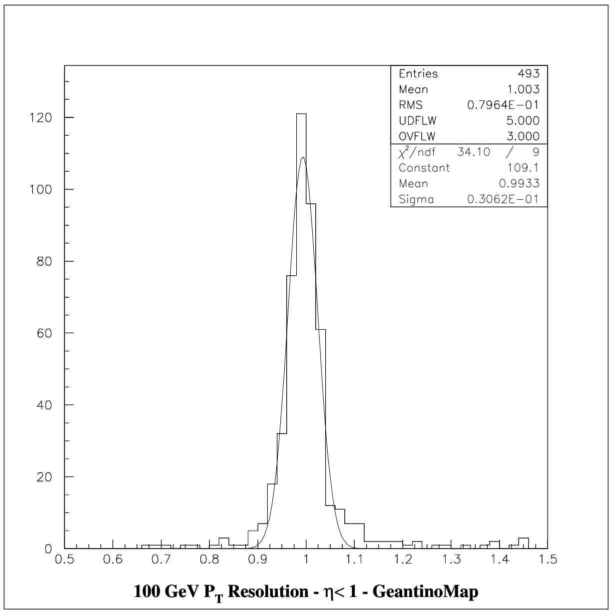
20 GeV P_T Pull - η< 1 - GeantinoMap

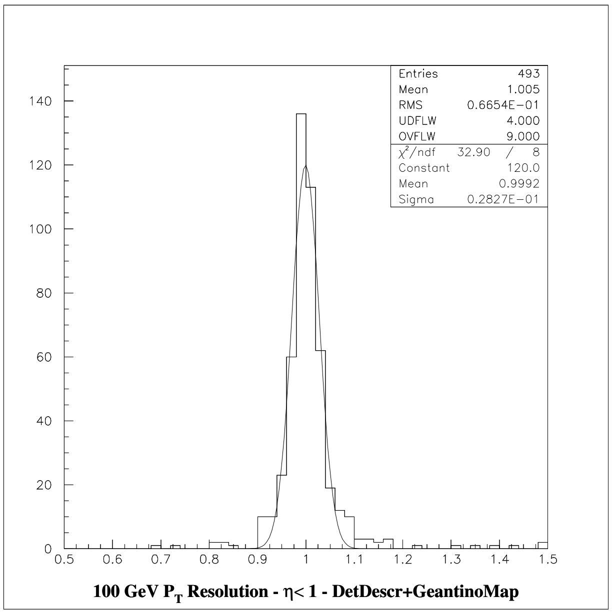


20 GeV P_T Pull - η< 1 - DetDescr+GeantinoMap

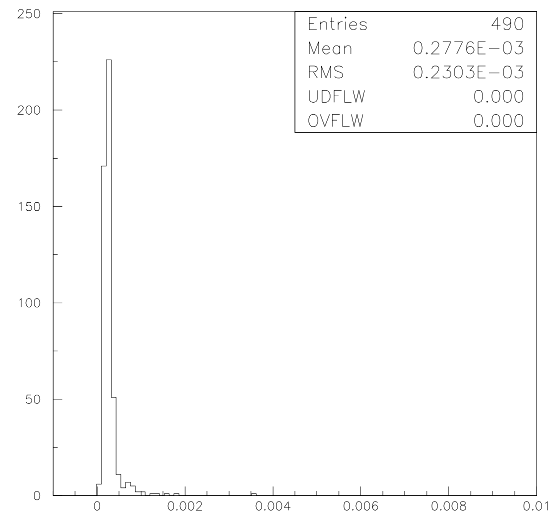
$1/p_\mathrm{T}$ Resolution, $p_\mathrm{T} = 100$ GeV, $|\eta| < 1$



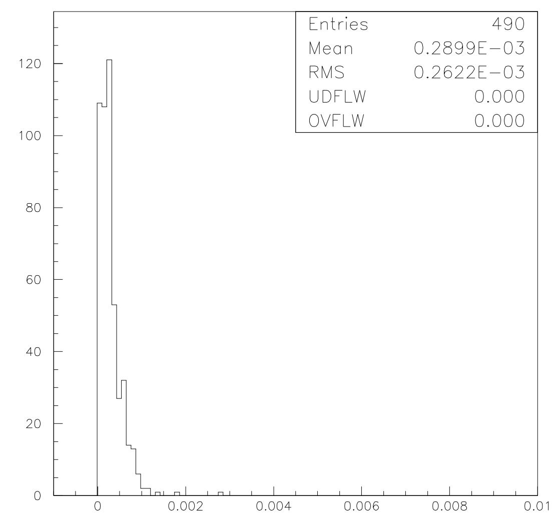




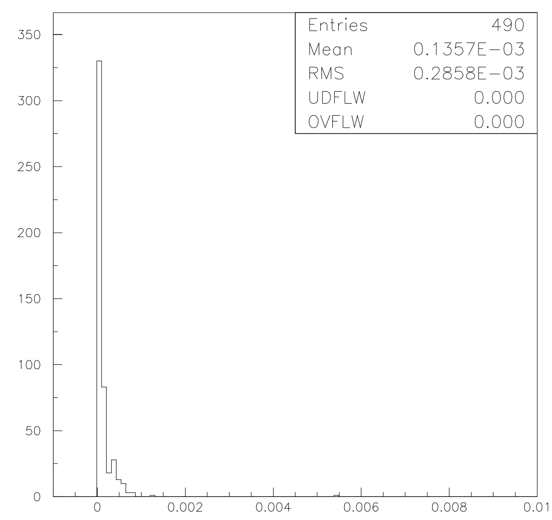
$1/p_\mathrm{T}$ Cov55, $p_\mathrm{T} = 100$ GeV, $|\eta| < 1$



cov55 - 100 GeV - η< 1 - DetDescr



cov55 - 100 GeV - η< 1 - GeantinoMap



cov55 - 100 GeV - η< 1 - DetDescr+GeantinoMap

$1/p_T$ Pull, $p_T = 100$ GeV, $|\eta| < 1$