V. Paolone
Pittsburgh DONUT Meeting
October 26-27, 2001

Discussion of Backgrounds to 3 Prong Tau Decays

Jason has sent a set of files for tau and charm with the following Information:

```
*************************************************************
c
c Format of files
c
********TAU.dat*********************************************
c  WGT   delta  log10       momentum
c          phi   theta
c         angle  angle
c
c  17.7   2.847  -1.116       15.7
c  20.1   2.610  -1.585       36.3
********c_e_data.raw*************************************
c  WGT     a_dif   log10  charm charm   neutrino
c                  theta    id    mom.   mom.
c
c   6.60    1.857  -1.155   412  13.0    20.3 1
c  51.60    1.043  -1.583   412  16.9    37.8 1
```

Each file contains ~400,000 events.

I've used the tau/charm production angle and momentum as an input to a decay subroutine:

Decay modes and lifetime generator.

Three Prong Tau Decays used:

$\tau \rightarrow \pi^-\pi^-\pi^+\nu_\tau$ (9.13%)
$\tau \rightarrow \pi^-\pi^-\pi^+\pi^0\nu_\tau$ (4.3%)

What are the Backgrounds:

1) Charm decay – Hadronic Decays Only(~32%): A 3 prong leptonic decay is charm....

These involve 3 to 5 body decays:

$D^+ \rightarrow K^-\pi^+\pi^+$ (9.0%)
$K^-\pi^+\pi^+\pi^0$ (6.5%)
$K^0\pi^+\pi^+\pi^-$ (7.0%)
$K^-\pi+\pi+\pi^0\pi^0$ (2.2%)
$K^0\pi^+\pi^+\pi^-\pi^0$ (5.4%)
$K^0K^-\pi^+\pi^+$ (1.0%)
$K^+K^-\pi^+\pi^0$ (1.5%)

All decays are generated using GENBOD and isotropic.

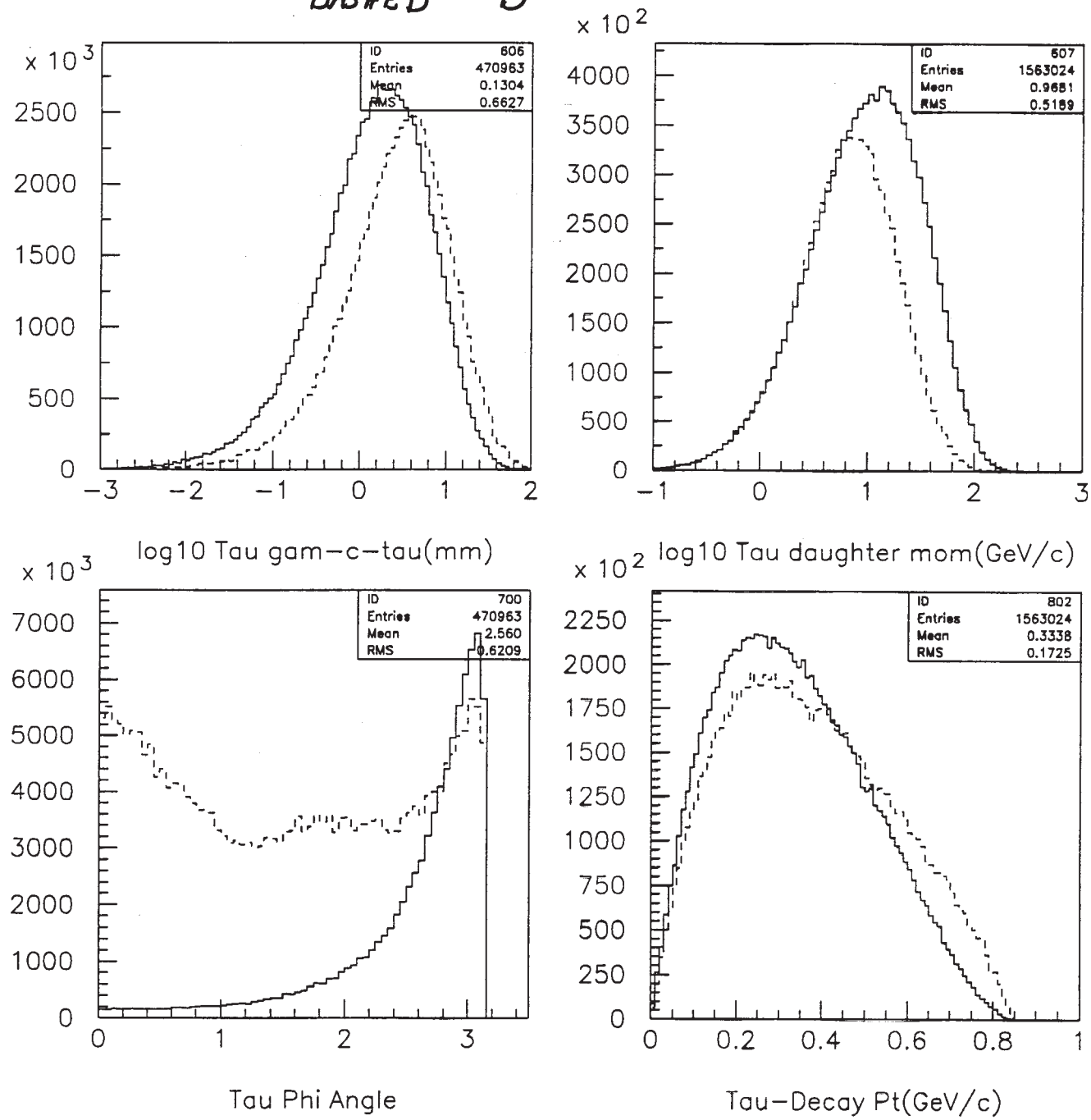
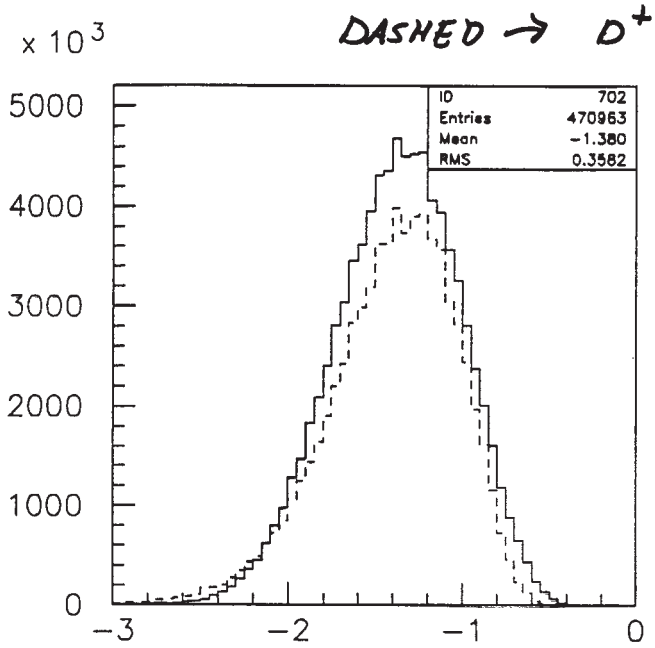
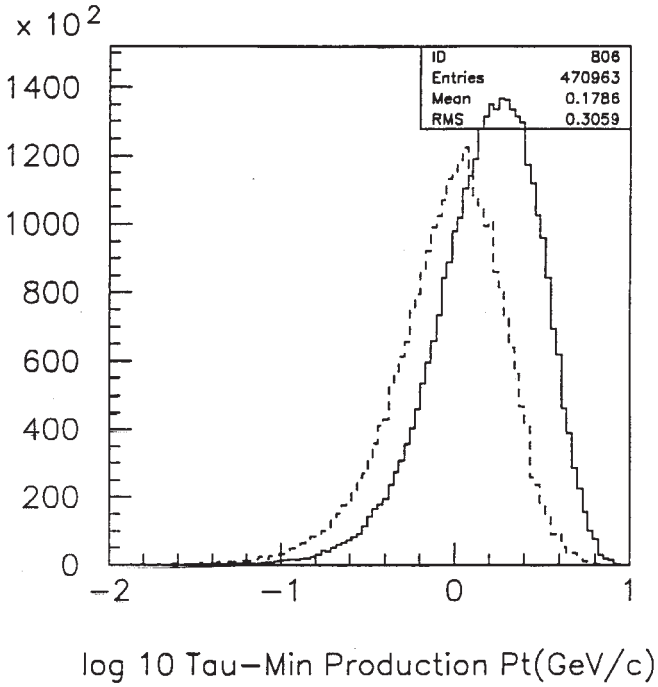
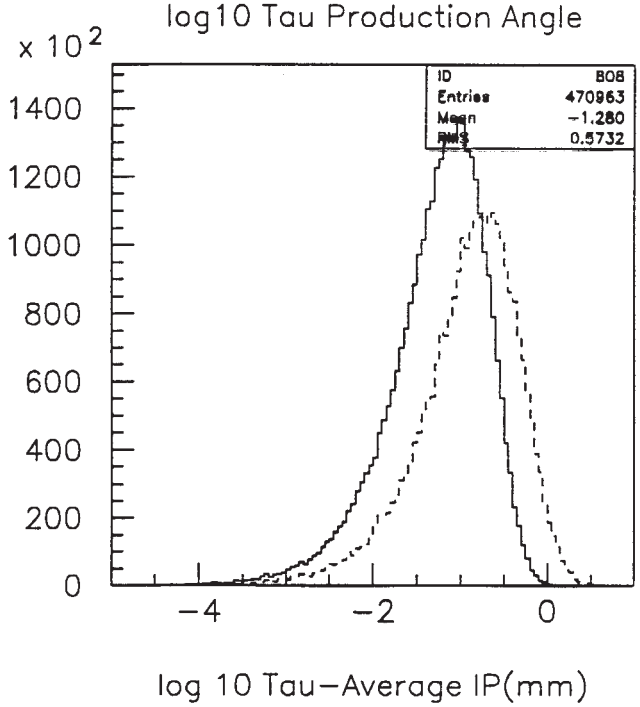
There are of course D_s and Λ_c – I have not implemented these yet...

2) Hadronic interactions that produce 3 charged tracks, in three materials: Iron, Plastic and Emulsion

–> A production angle and momentum spectra of hadronic tracks produced in NC I think is all you need.

You "create" a track form above distributions "place" the track in a target module and let GEANT take over. Jason must have a similar mechanism for kinks that can be easily modified for 3 prong's....

SOLID → TAU
DASHED → D^+



SOLID → TAU
DASHED → D^+