

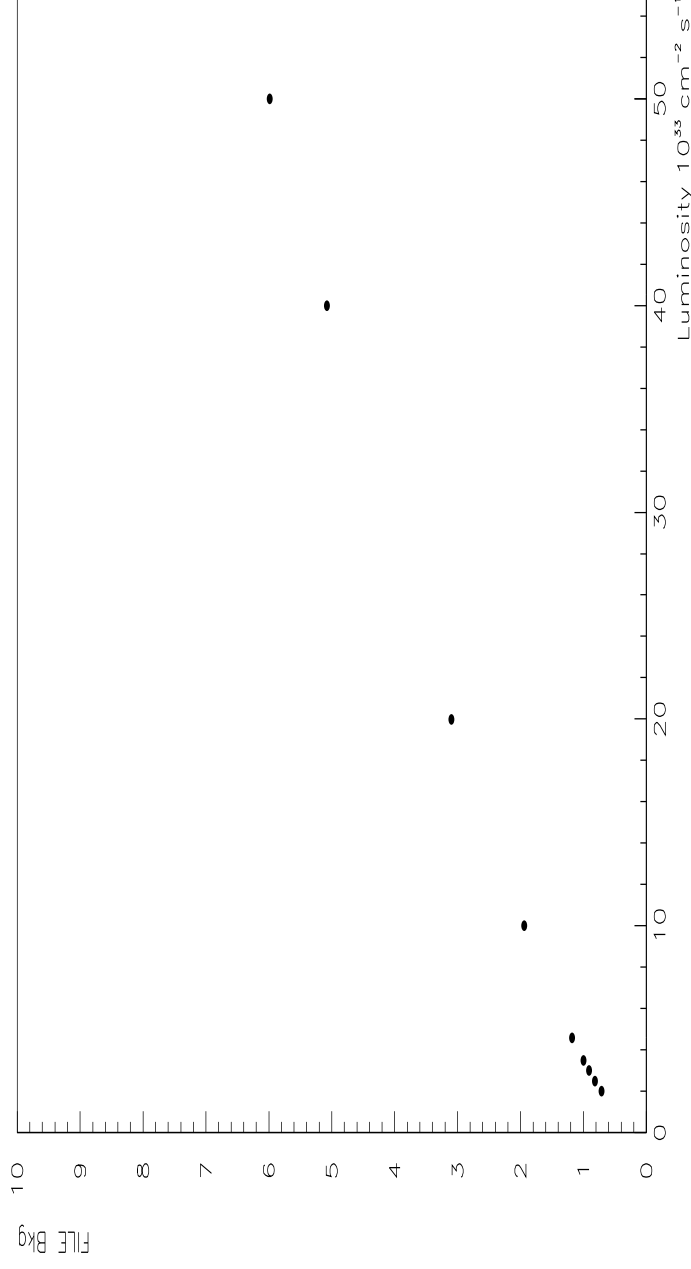
DCH Efficiency and Resolution at high

Luminosity M. Margoni, M. Posocco, M. Zancan

Since last time:

- Improvement of the Background extrapolation versus the Beam Currents
- Increased MC sample
- Resolution study
- Preliminary results for $L=2*10^{34} \text{ cm}^{-2}\text{s}^{-1}$ and $L=4*10^{34} \text{ cm}^{-2}\text{s}^{-1}$

- **MC Sample:** 10000 B+B-events were produced with different BKG amount (release 10.3.1a+analysis-13b)
- The average N_{digi}/event increases of about 170 for each BKG file added.
- Our extrapolation at the Current Luminosity overestimated by ~30% the Bkg amount: a correction was applied and a 30% systematic error on the extrapolation method was taken into account.
- This error reflects in an uncertainty < 2% on the Efficiency expectation (depending on the particle species).



- **The Efficiency and the Resolution** for each particle species (**e**, **μ**, **π**, **K**, **p**) and for each track selection kind (**ChargedTracks**, **GoodTracksVeryLoose**, **GoodTracksLoose**, **GoodTracksTight**) were computed from the charged tracks surviving the following cuts:
- **Pt > 180 MeV**
- **θ = .41–2.41 rad**
- Starting point of the track in the transverse plane **Rs < 0.5 cm**
- Starting point of the track in the z direction **Zs < 1 cm**

The Ratios of the results for the high Luminosity scenarios and the current Luminosity were then computed in bins of several variables (**P**, **Pt**, **θ**, **φ**)

- **Average Ratio (%) vs Selection category:**

	CT	GTVL	GTL	GTT
L=2*10³⁴	99.9+-.2+-.1	99.8+-.2+-.1	99.1+-.2+-.3	98.7+-.2+-.4
L=4*10³⁴	99.8+-.2+-.1	99.6+-.2+-.2	98.2+-.1+-.9	97.9+-.1+-.8

Efficiency vs P

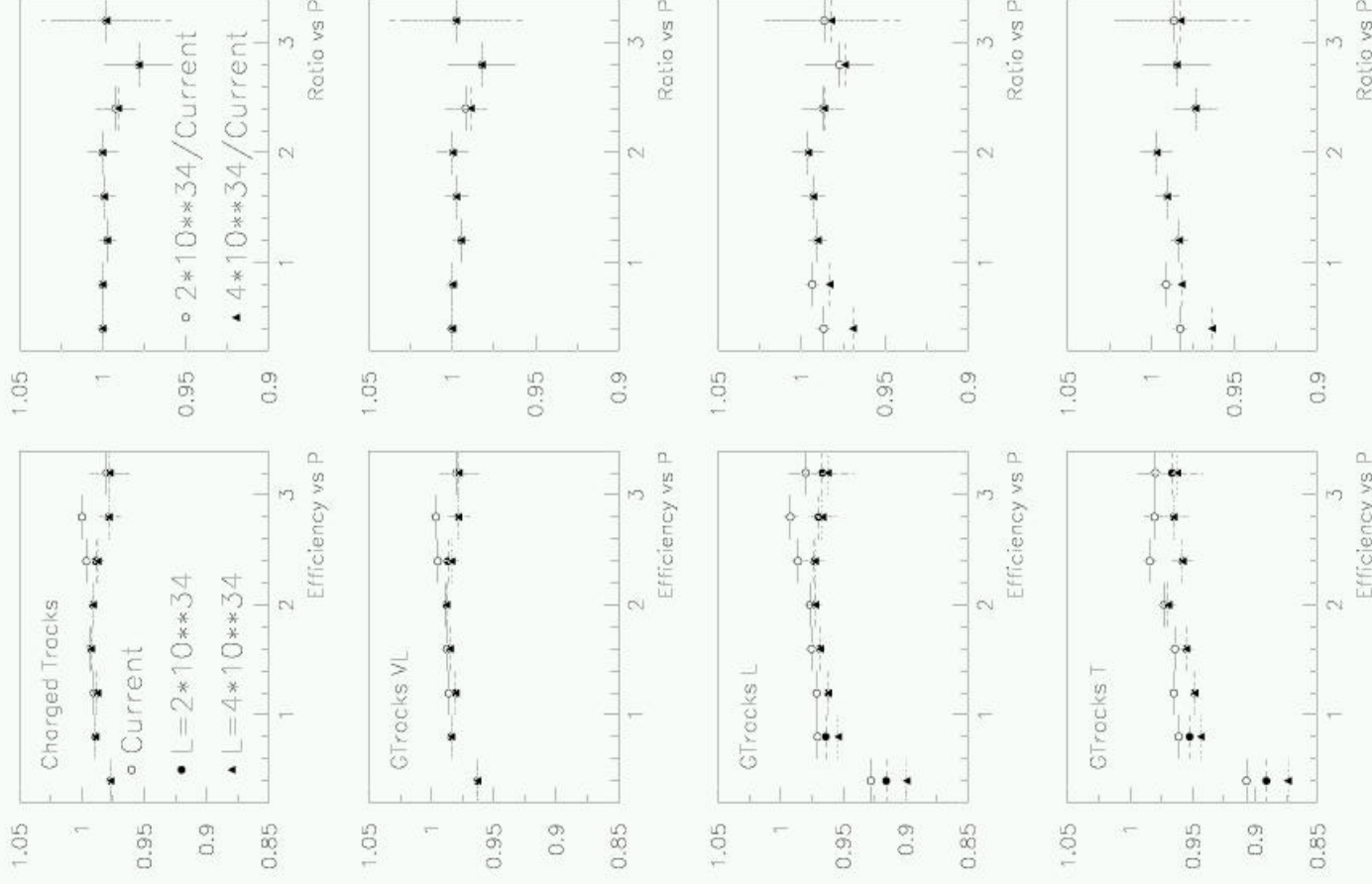
Open Bullets:
Current Lumi.

Black Bullets:
 $L=2*10^{34}$

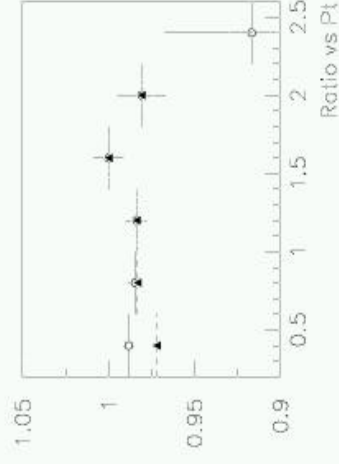
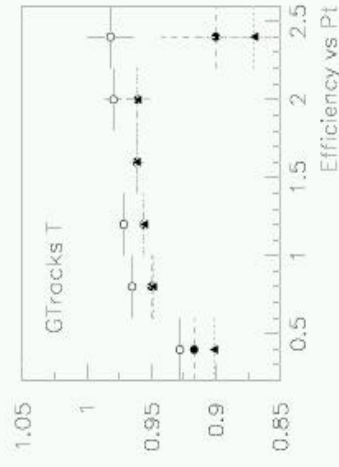
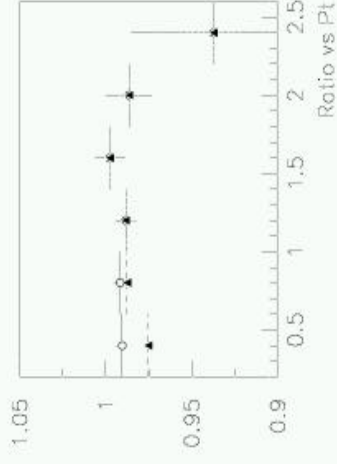
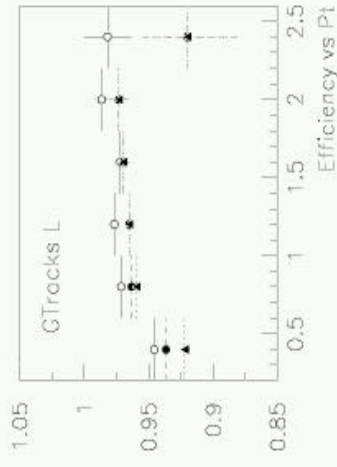
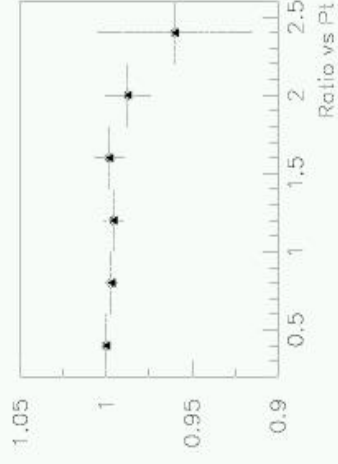
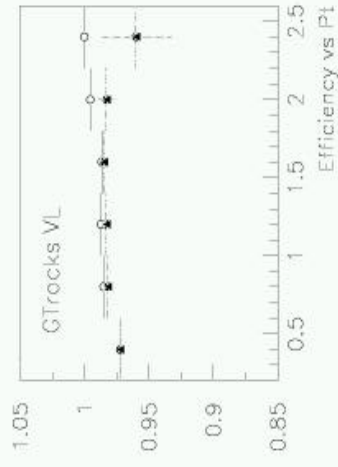
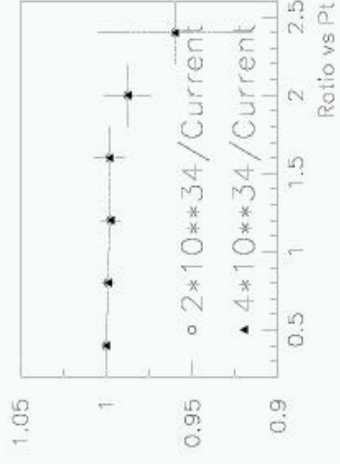
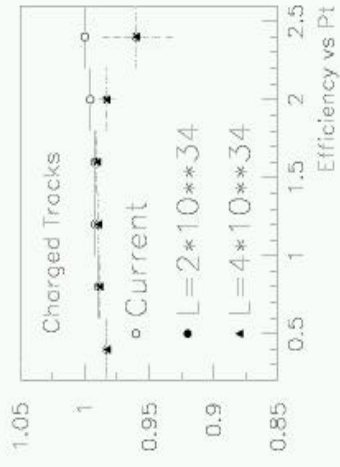
Black Triangles:
 $L=4*10^{34}$

Open Bullets:
 $L=2*10^{34}/\text{Current}$

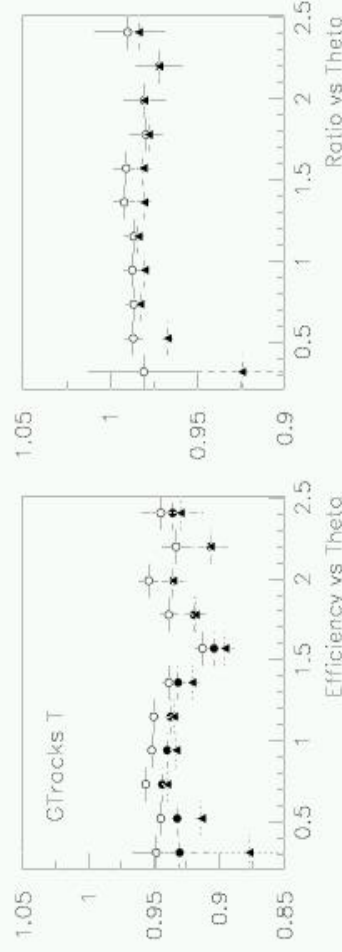
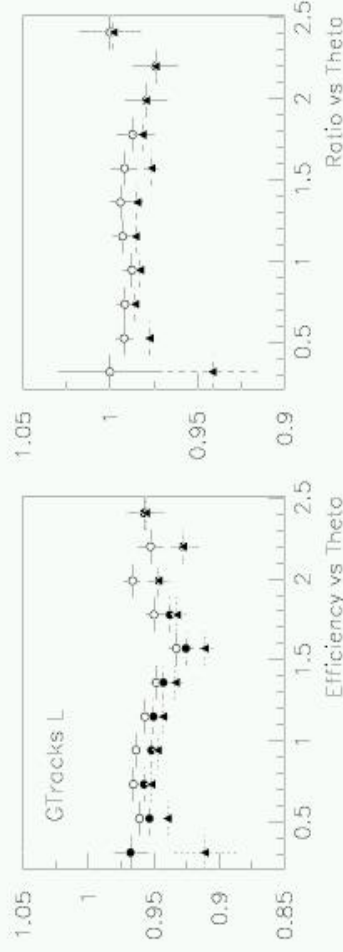
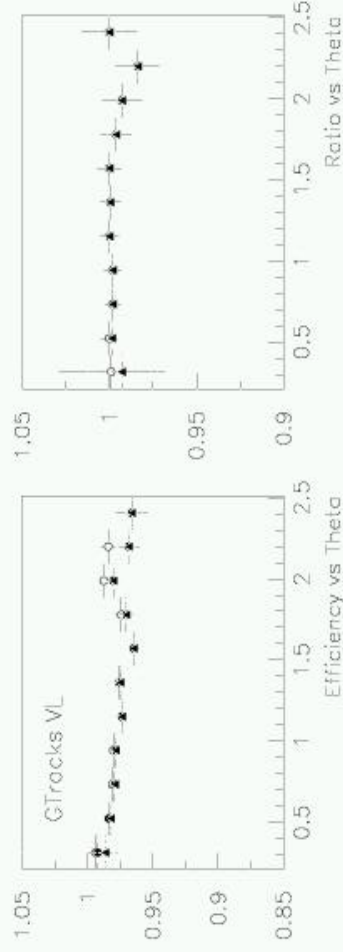
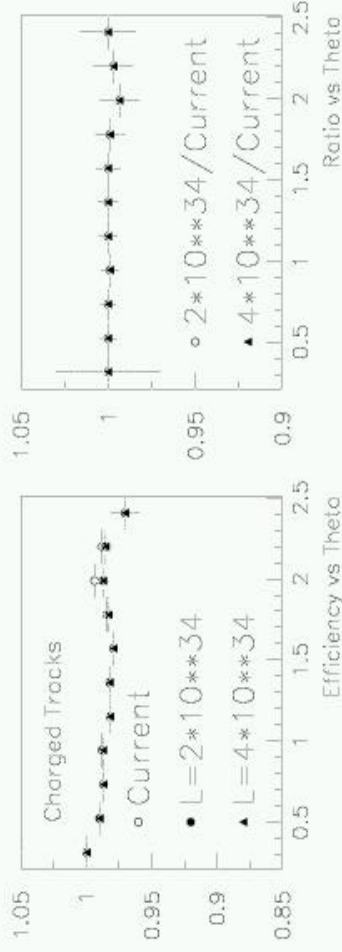
Black Triangles:
 $L=4*10^{34}/\text{Current}$



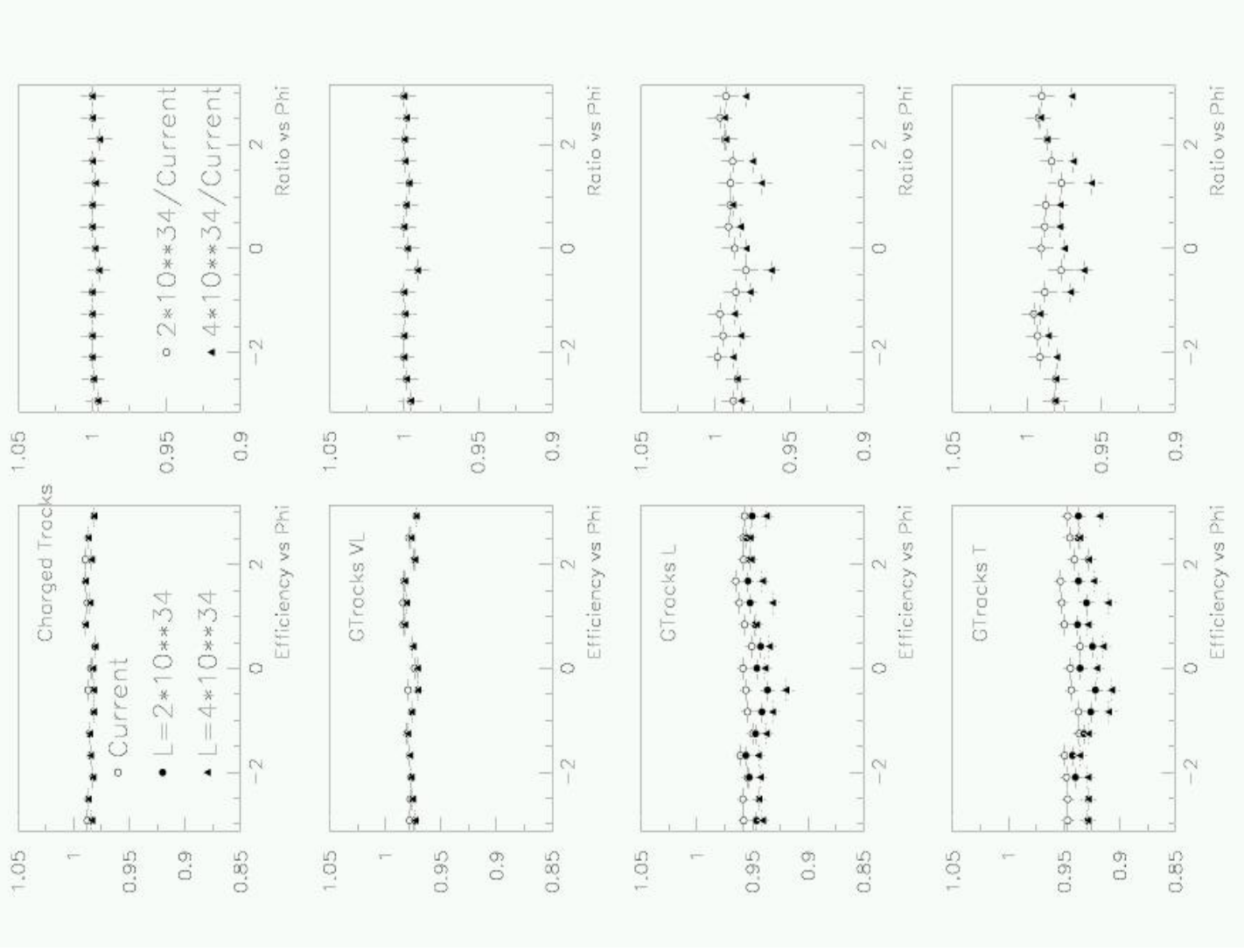
Efficiency vs Pt



Efficiency vs θ



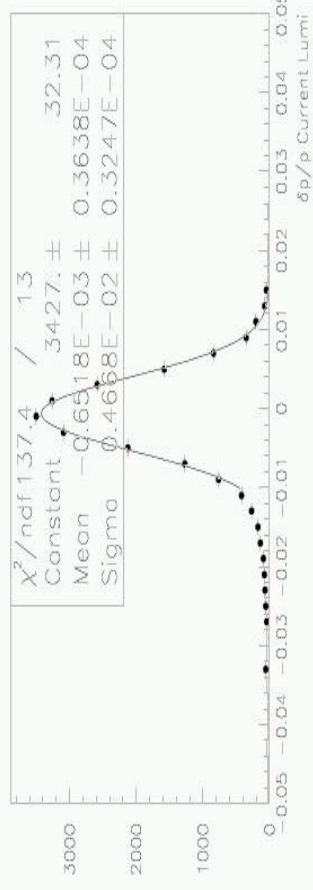
Efficiency vs ϕ



Average Momentum Resolution

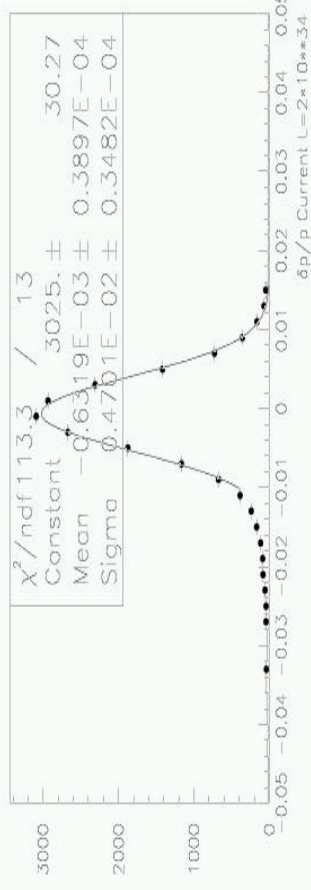
- The average resolution is roughly independent on the selection category;
- The resolution worsening is at the level of $\Delta=3.3*10^{-5}$ and $\Delta=7.2*10^{-5}$ respectively in the two high luminosity

scenarios

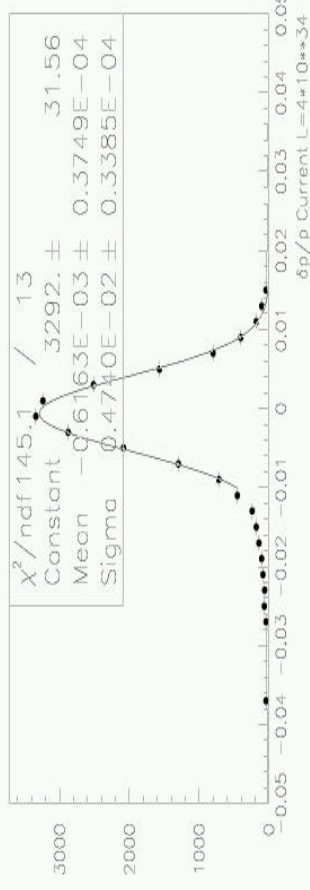


Current Luminosity

$L=2*10^{34}$

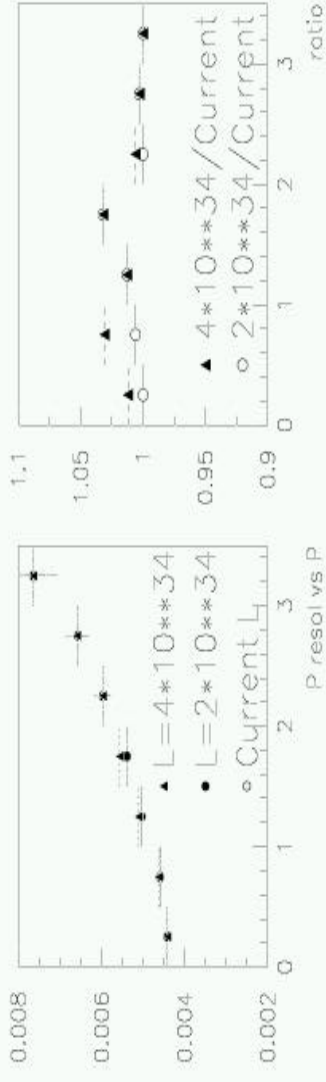


$L=4*10^{34}$

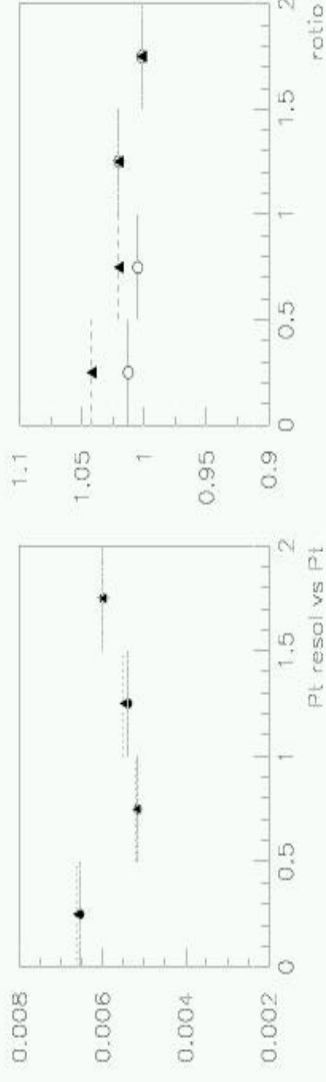


Resolution Study

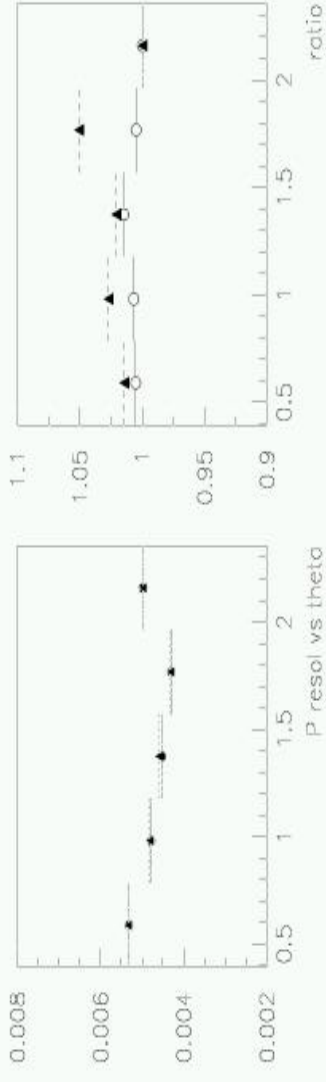
$\delta P/P$ vs P



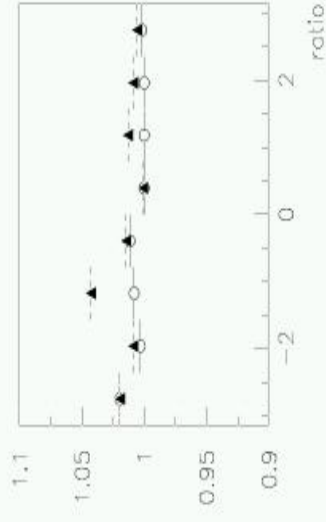
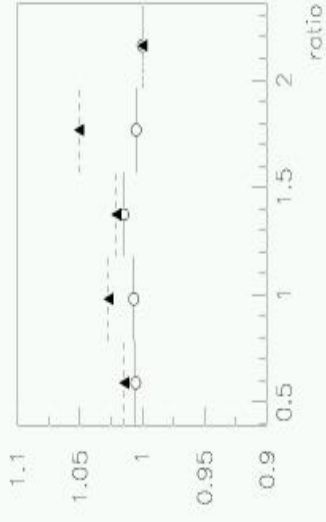
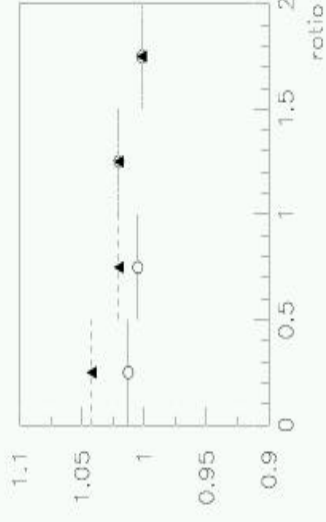
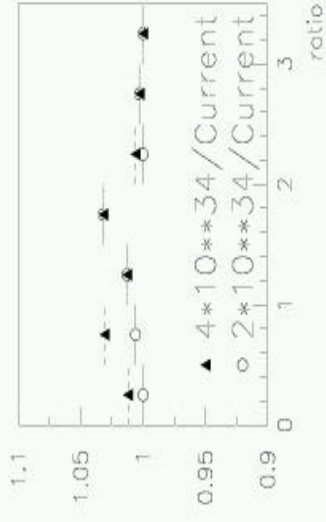
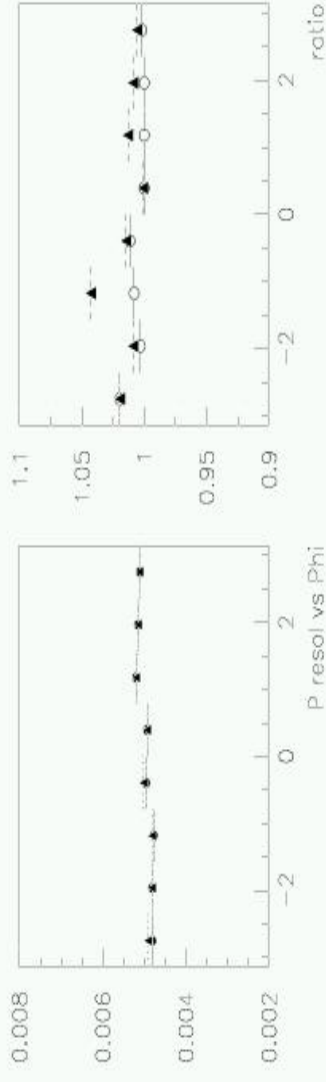
$\delta Pt/Pt$ vs Pt



$\delta P/P$ vs θ



$\delta P/P$ vs ϕ



Tracks with no link to the simulation

- Only 22 tracks/10000 MC events have no link to the simulation at the current luminosity, which become 497 at $L = 4 \cdot 10^{34}$...but they are mostly removed just requiring some DCH hits and with some selection requirement:

Current L $L = 4 \cdot 10^{34}$

No DCH hits:

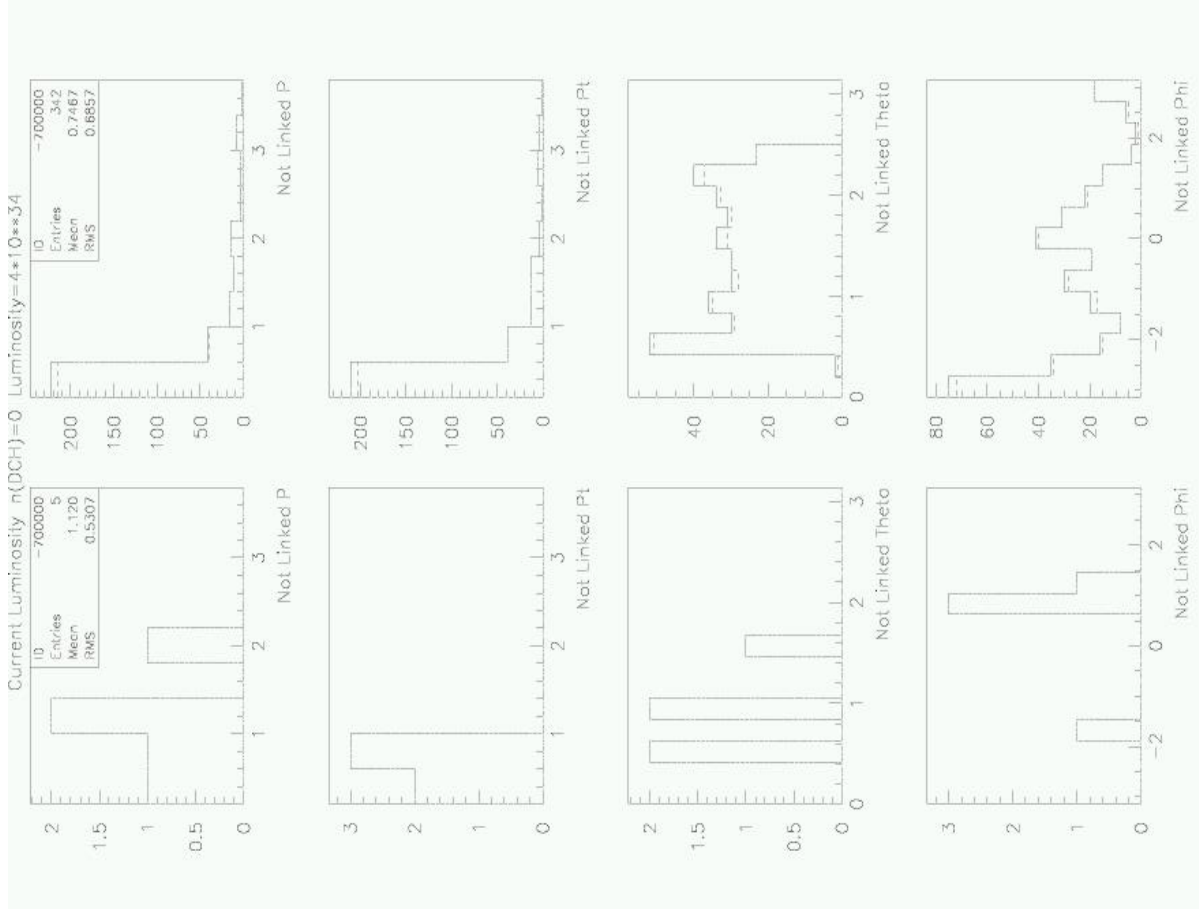
CT	5	342
GTVL	5	328

DCH hits:

CT	17	155
GTVL	3	46
GTL	3	46
GTT	1	33

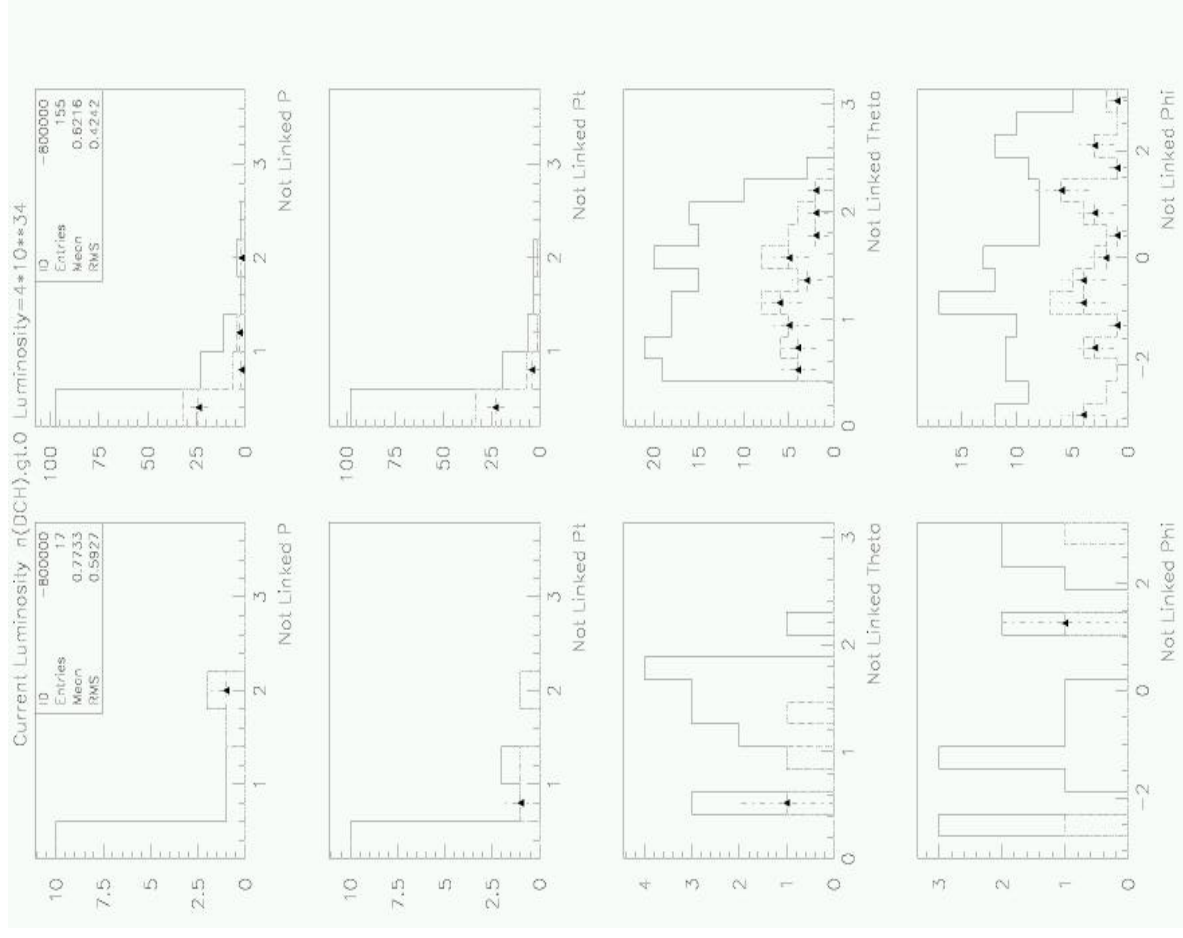
Tracks without DCH hits

Current L $L = 4 * 10^{34}$



Tracks with DCH hits

Current L $L = 4 * 10^{34}$



Preliminary Conclusions:

- In a high Luminosity scenario the Track Efficiency seems to be lowered from 1–2% ($L=2*10^{34}$) to 3–4% ($L=4*10^{34}$) depending on the particle species and the selection category.
- The Momentum Resolution seems to be less affected (worsening $\Delta=3.3*10^{-5}$, $\Delta=7.2*10^{-5}$ in the two scenarios)
- The number of tracks with no link to the simulation increases up to $\sim 1/20$ events at the highest Luminosity ($\sim 1/60$ events requiring some DCH hits).