# Extrapolation of the DCH Efficiency at high Luminosity M.Margoni, M.Posocco, M.Zancan

## Strategy:

- Extrapolate the Background amount versus the Luminosity in terms of the average number of DCH digis/event versus the Beam Currents using the BKG runs (Done, already presented).

- Use the previous result to fix the number of Background files to be mixed in the production of a dedicated MC sample for the study of the DCH Efficiency and the amount of reconstructed tracks not linked to the simulation (Preliminary results today for $L=2*10**34$ ).

- Study of the Momentum Resolution in the different configurations (To be done).

• **MC Sample:** 6000 B+B− events were produced with different BKG amount (release 10.3.1a + analysis−13b)

• The average Ndigi/event increases of about 170 for each BKG file added.

• From our extrapolation, at L=2*10**34 we expect ~ 840 digis/event due to BKG, corrisponding to 5 BKG files.



| ID | 10 |
|---|---|
| Entries | 1000 |
| Mean | 484.0 |
| RMS | 179.0 |

Ndigi/Event no BKG files

| ID | 20 |
|---|---|
| Entries | 1000 |
| Mean | 645.6 |
| RMS | 178.1 |

Ndigi/Event 1 BKG files

| ID | 30 |
|---|---|
| Entries | 500 |
| Mean | 822.2 |
| RMS | 175.3 |

Ndigi/Event 2 BKG files

| ID | 40 |
|---|---|
| Entries | 908 |
| Mean | 960.8 |
| RMS | 174.1 |

Ndigi/Event 3 BKG files

| ID | 50 |
|---|---|
| Entries | 500 |
| Mean | 1132. |
| RMS | 172.2 |

Ndigi/Event 4 BKG files
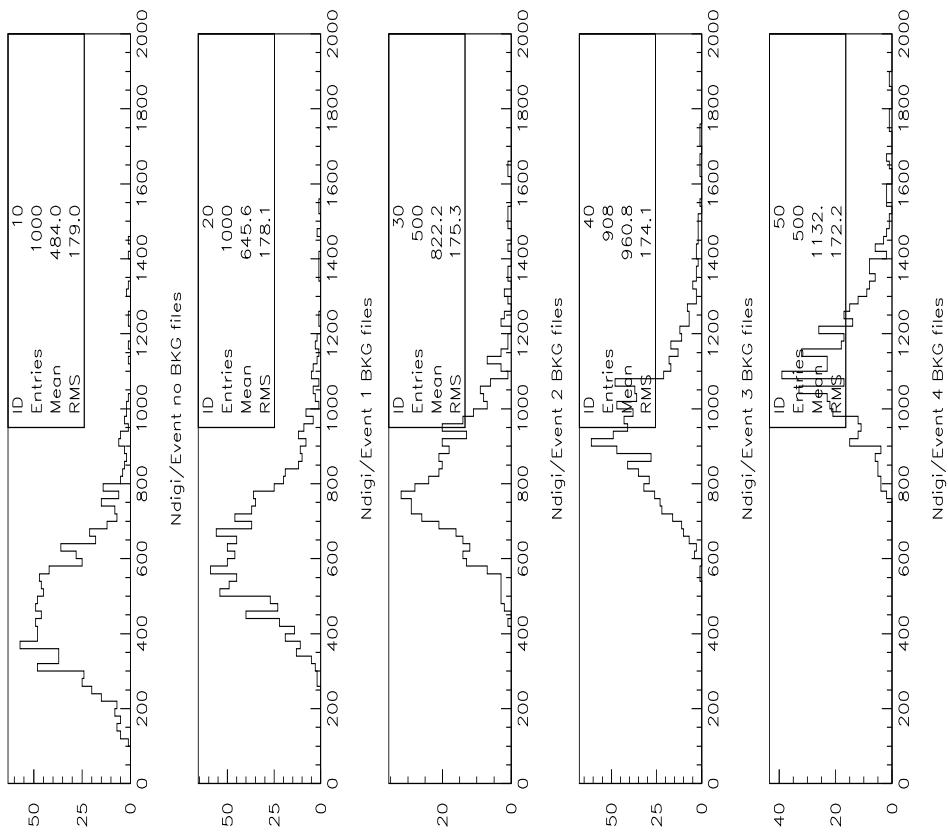
# Efficiency Study:

In order to be retained for the efficiency calculation, the charged tracks had to survived the following cuts:

- Pt > 180 MeV
- $\theta$ = .41–2.41 rad

- Starting point of the tracks in the transverse plane Rs < 0.5 cm
- Starting point of the tracks in the z direction Zs < 1.cm

- The Efficiency was determined for each charged particle species (e, m, p, K, P) for the two different luminosity scenarious and the Ratio of the two determinations was calculated.

- The exercise was repeated for the usual track selection categories: ChargeTracks, GoodTracksVeryLoose, GoodTracksLoose, GoodTracksTight

Average efficiency(%) for the various selections and particle species in the two luminosity scenarious. BKG effect increasing with the track quality.

| | e | μ | π | K | P | All |
|---|---|---|---|---|---|---|
| **Charg. Trks** | | | | | | |
| ε(curr.) | 99.7+−.1 | 100 | 99.2+−.1 | 98.3+−.3 | 98.8+−.4 | 99.1+−.1 |
| ε(high L) | 99.0+−.2 | 98.4+−.5 | 99.1+−.1 | 98.3+−.3 | 98.4+−.5 | 99.0+−.1 |
| Ratio | 99.3+−.3 | 98.4+−.8 | 99.9+−.1 | 100.0+−.1 | 99.6+−.4 | 99.9+−.1 |
| **Very Loose** | | | | | | |
| ε(curr.) | 98.9+−.2 | 100 | 98.5+−.1 | 97.4+−.4 | 97.5+−.6 | 98.4+−.1 |
| ε(high L) | 97.9+−.3 | 98.3+−.6 | 98.0+−.2 | 97.4+−.4 | 96.8+−.7 | 97.9+−.1 |
| Ratio | 99.0+−.3 | 98.3+−.9 | 99.5+−.1 | 100.0+−.1 | 99.3+−.6 | 99.5+−.1 |
| **Loose** | | | | | | |
| ε(curr.) | 95.9+−.5 | 99.4+−.3 | 96.5+−.5 | 94.6+−.5 | 91.4+−1.1 | 96.0+−.2 |
| ε(high L) | 94.0+−.5 | 97.3+−.7 | 93.8+−.3 | 92.1+−.6 | 89.3+−1.2 | 93.5+−.2 |
| Ratio | 98.0+−.4 | 97.9+−.9 | 97.2+−.2 | 97.4+−.4 | 97.7+−1.1 | 97.4+−.2 |
| **Tight** | | | | | | |
| ε(curr.) | 94.3+−.5 | 99.2+−.4 | 95.4+−.2 | 93.8+−.5 | 90.1+−1.1 | 94.9+−.2 |
| ε(high L) | 91.9+−.6 | 96.5+−.8 | 92.2+−.3 | 90.5+−.7 | 88.0+−1.2 | 91.9+−.2 |
| Ratio | 97.5+−.4 | 97.3+−.9 | 96.6+−.5 | 96.5+−.5 | 97.7+−1.1 | 96.8+−.2 |

Efficiency vs P:
white bullets: Current Luminosity, black ones: L=2*10**34
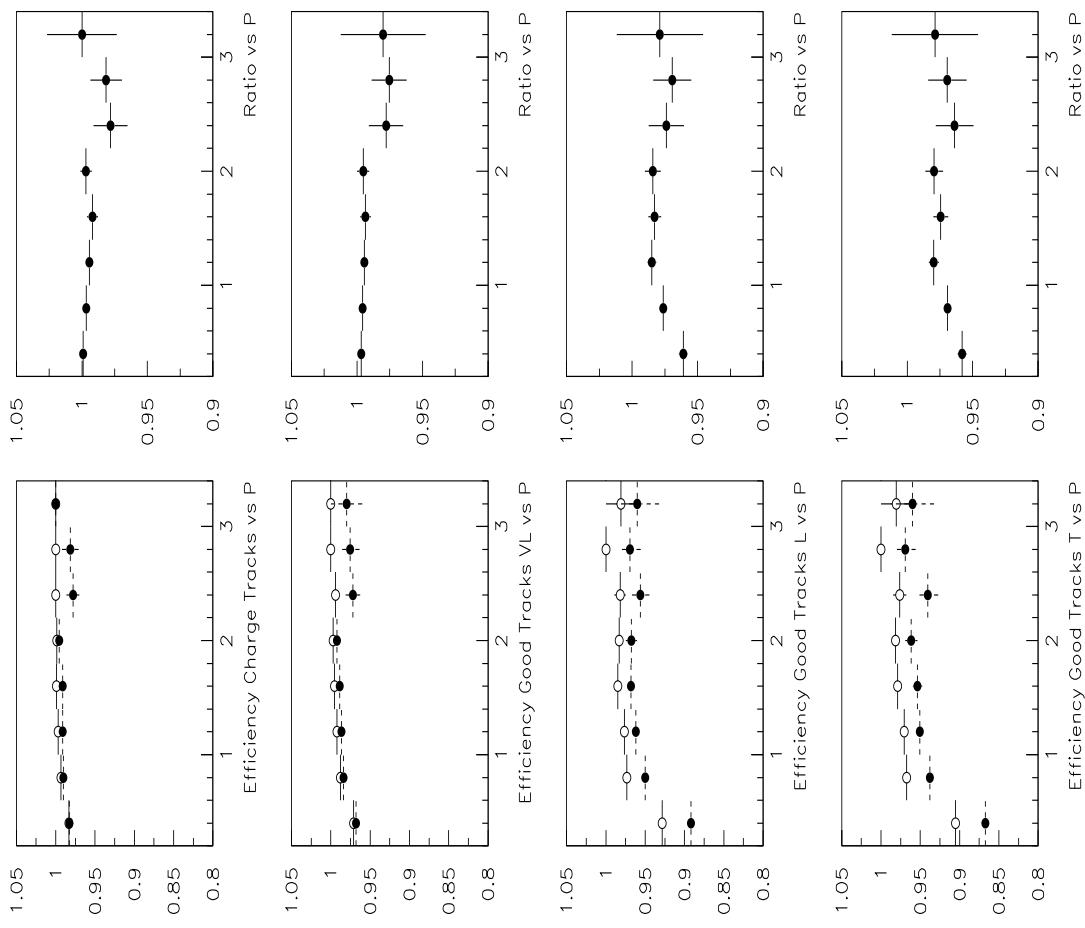
# Efficiency vs Pt:

# Efficiency vs θ



Ratio vs Theta

Ratio vs Theta

Ratio vs Theta

Ratio vs Theta

Efficiency Charge Tracks vs Theta

Efficiency Good Tracks VL vs Theta

Efficiency Good Tracks L vs Theta

Efficiency Good Tracks T vs Theta

# Efficiency vs φ:



Efficiency Charge Tracks vs Phi

Ratio vs Phi

Efficiency Good Tracks VL vs Phi

Ratio vs Phi

Efficiency Good Tracks L vs Phi

Ratio vs Phi

Efficiency Good Tracks T vs Phi

Ratio vs Phi
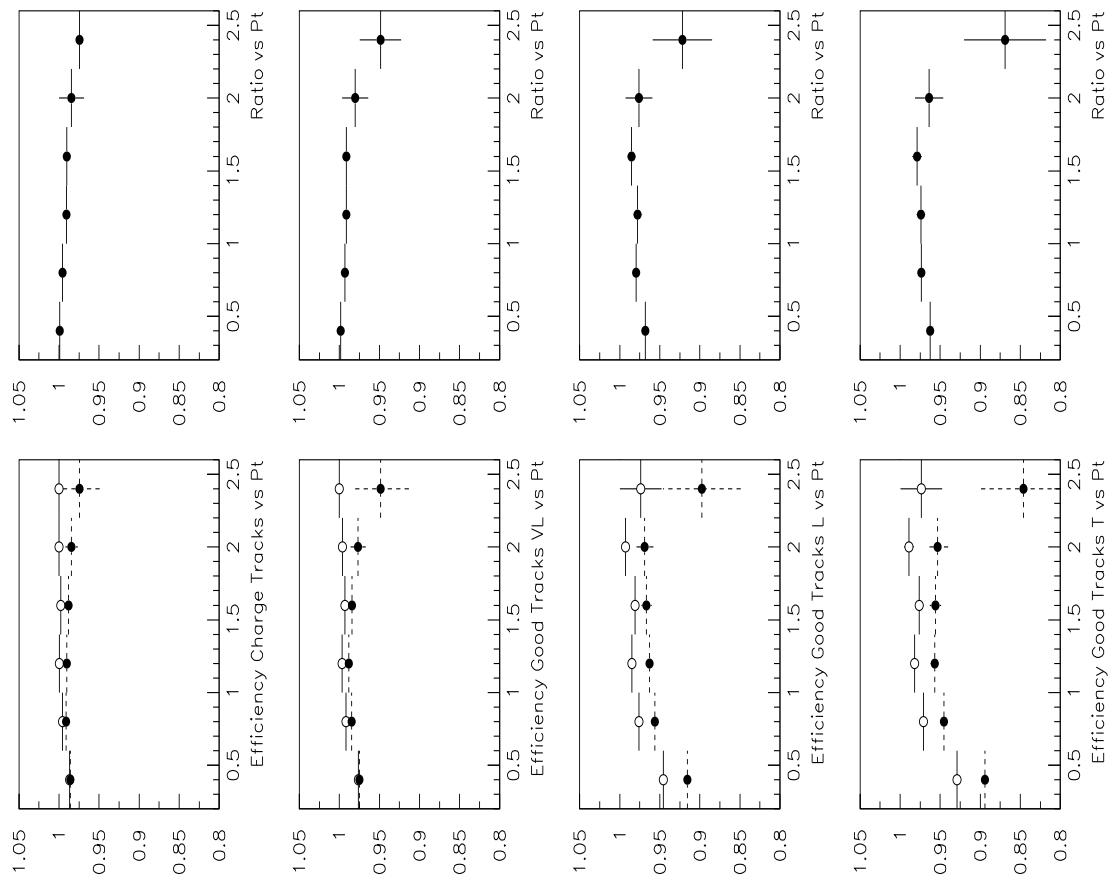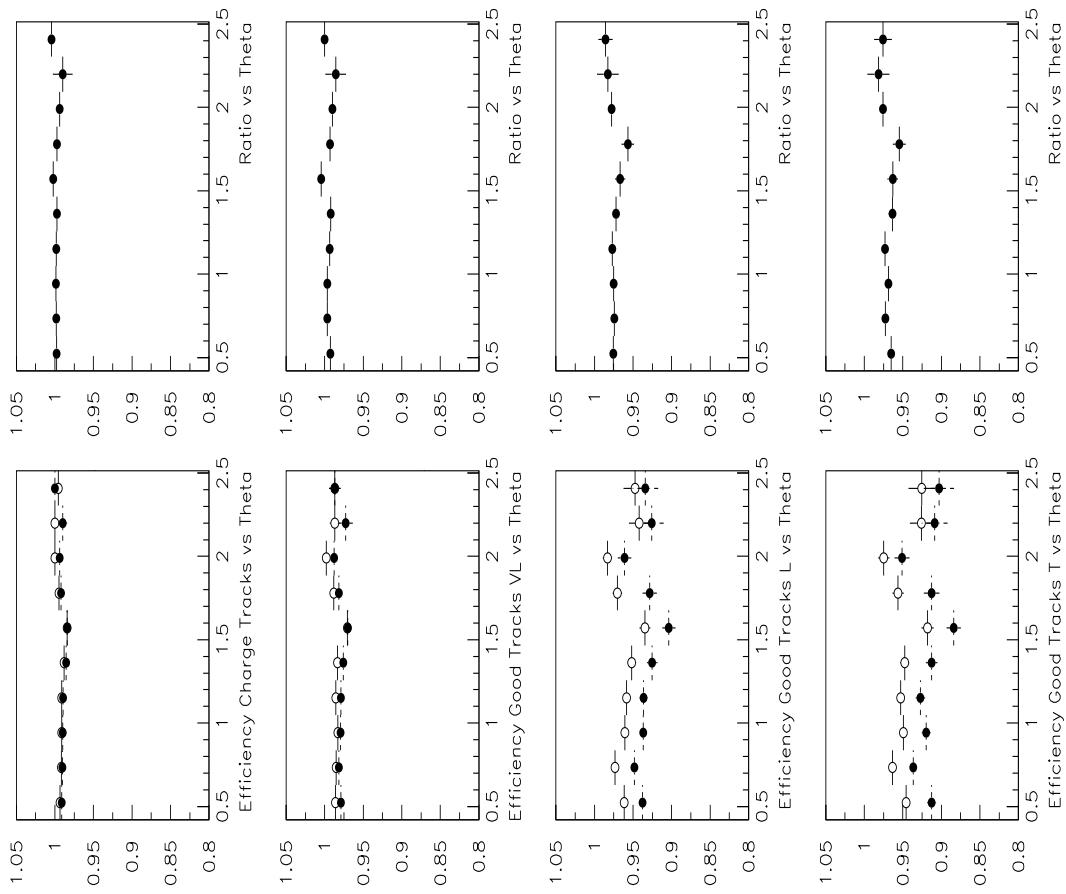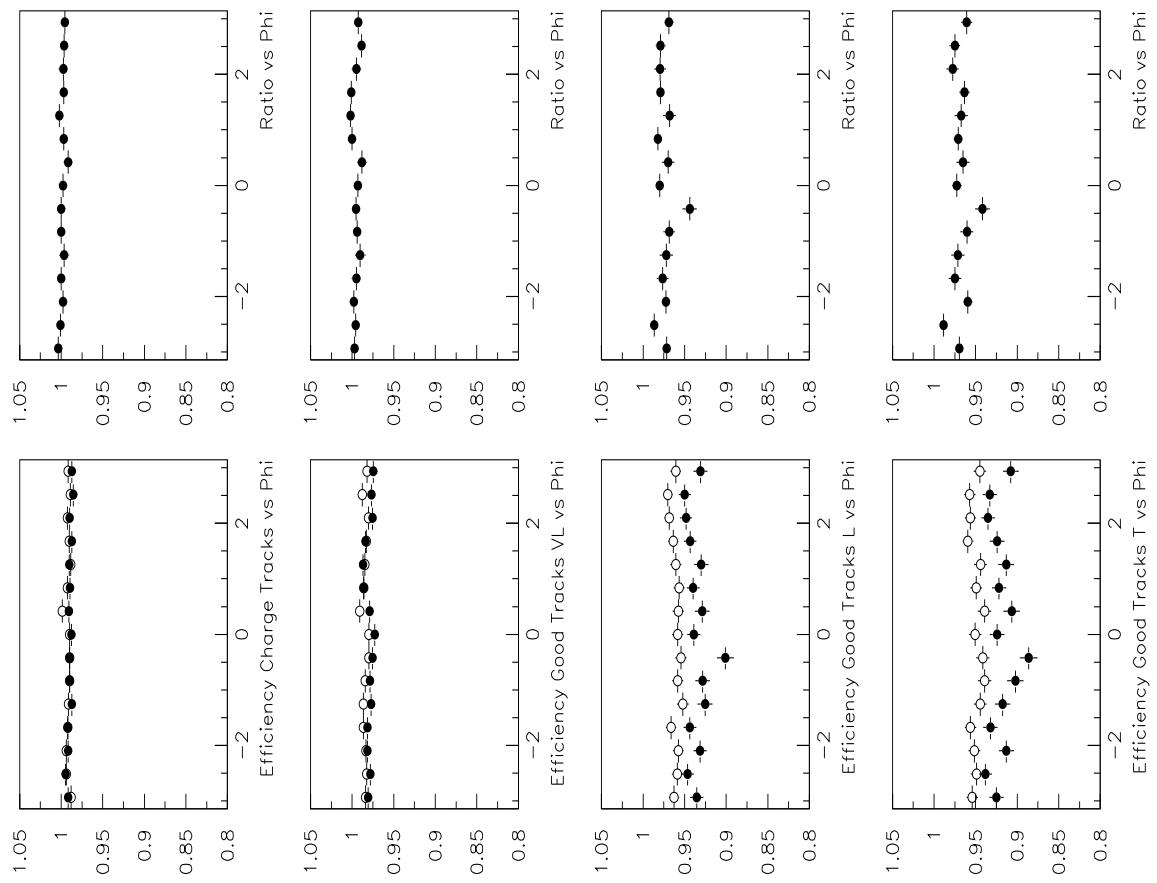
# Reconstructed tracks not linked to simulation:

Increase of a factor 10 at high L, but strongly suppressed by quality requirement (solid line: ChargedTracks, dashed: GoodTracks VeryLoose, bullet: GoodTracksLoose).
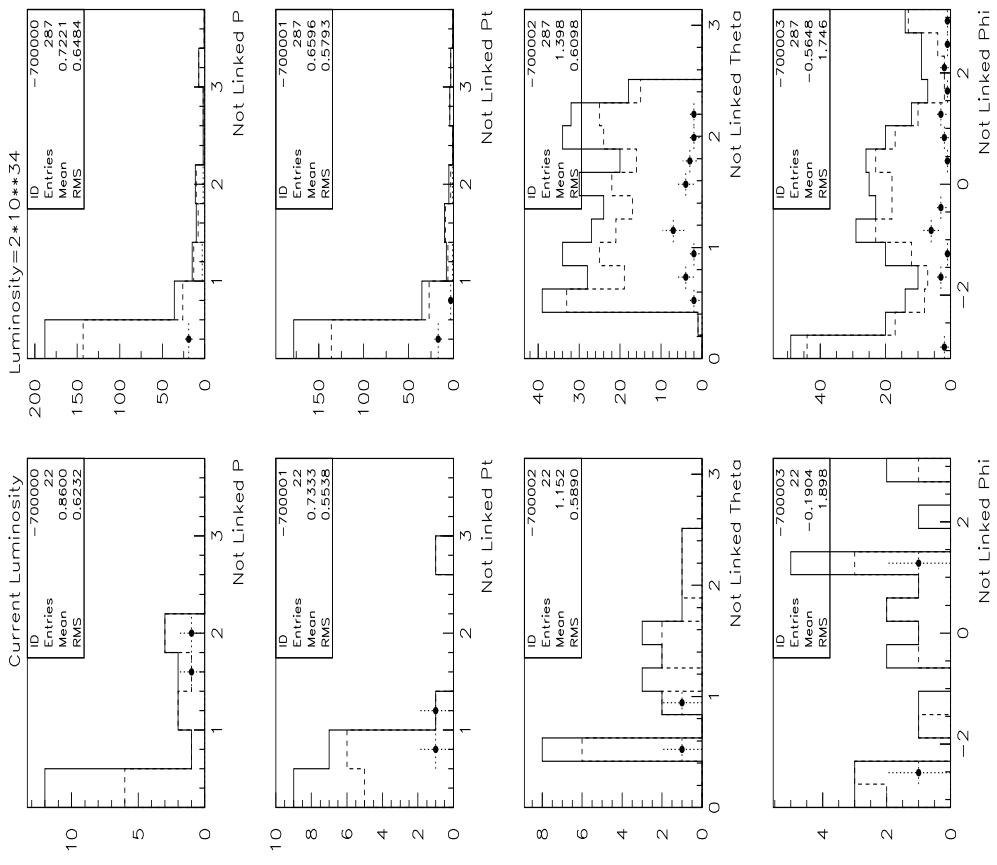
# Next Steps:

- Check the absolute value of the Efficiency for the current luminosity with the official tables values.

- Resolution Study