Short note on $\bar{p}/p$ correction for absorption

Paweł Staszel, NBI

1 MRS at 90 deg

In order to determine the correction on $\bar{p}/p$ ratio the identical samples of protons and anti-protons have been thrown towards the spectrometer and using the GBRAHMS the accepted proton $(N(p))$ and anti-proton $(N(\bar{p}))$ yields have been found. Fig. 1 shows calculated $N(\bar{p})/N(p)$ versus p_t in two different ways.
Top panel **(i)**: the particles have been thrown along the center axes of the MRS ($\Theta = 90.0deg, \phi = 0.0deg$) from the nominal intersection point.
Bottom panel **(ii)** : the particles have been thrown into the range of polar angle: $80deg < \Theta = 99.deg$, and of azimuthal angle $-2.5deg < \phi = 2.5.deg$ from the vertexes uniformly distributed between -15cm and +15cm around the nominal vertex. (for more details see sec. Comments).

This two different methods of calculation (**(i)** and **(ii)**) are illustrated in Figs 2 and 3. The total momentum ($p \simeq p_t$) distribution of considered particles was the same as for the particle emitted from single thermal source (at y=0) at T=565MeV.

2 MRS at 40 deg

Fig. 4 presents $N(\bar{p})/N(p)$ versus p_t calculated according to the prescription given by **(ii)** for MRS at 40 deg. The correction is about 6%. The temperature of the source was chosen to get the 0.48 GeV effective inverse m_t slope (However, this kind of analysis doesn't depend (significantly) on the particle spectrum assumed).

3 FFS at 4 deg

Fig. 4 shows $N(\bar{p})/N(p)$ versus p_t calculated according to the prescription given by **(ii)** for FFS at 4 deg. The correction is about 8%. In the case FFS I've applied the same cuts on the total momentum as imposed in the data analysis eg. $2.0GeV < p < 5.0GeV$. The previously mentioned value 9% refers to the different cuts imposed on the total momentum: $2.0GeV < p < 4.0GeV$.

The temperature of the source was chosen to get the 0.35 GeV effective inverse m_t slope.

4 Comments

The angular ranges used for all FFS and MRS settings were determined according to the following procedure:
Θ range: I set $phi = 0deg$ (or $180deg$ for FFS). Then for the most extreme **negative** vertex I throw particles at the certain Θ angle. The minimum angle for which all the thrown particles hit the magnet coil is set as the lower limit of the Θ range. To find the upper limit I do the same for the most extreme **positive** vertex.
ϕ range: Θ is set to point to the center of spectrometer and $V_z = 0$. I define the upper limit for the ϕ range as the minimum angle for which all the thrown particles hit the magnet coil. To find the lower limit I do the same.

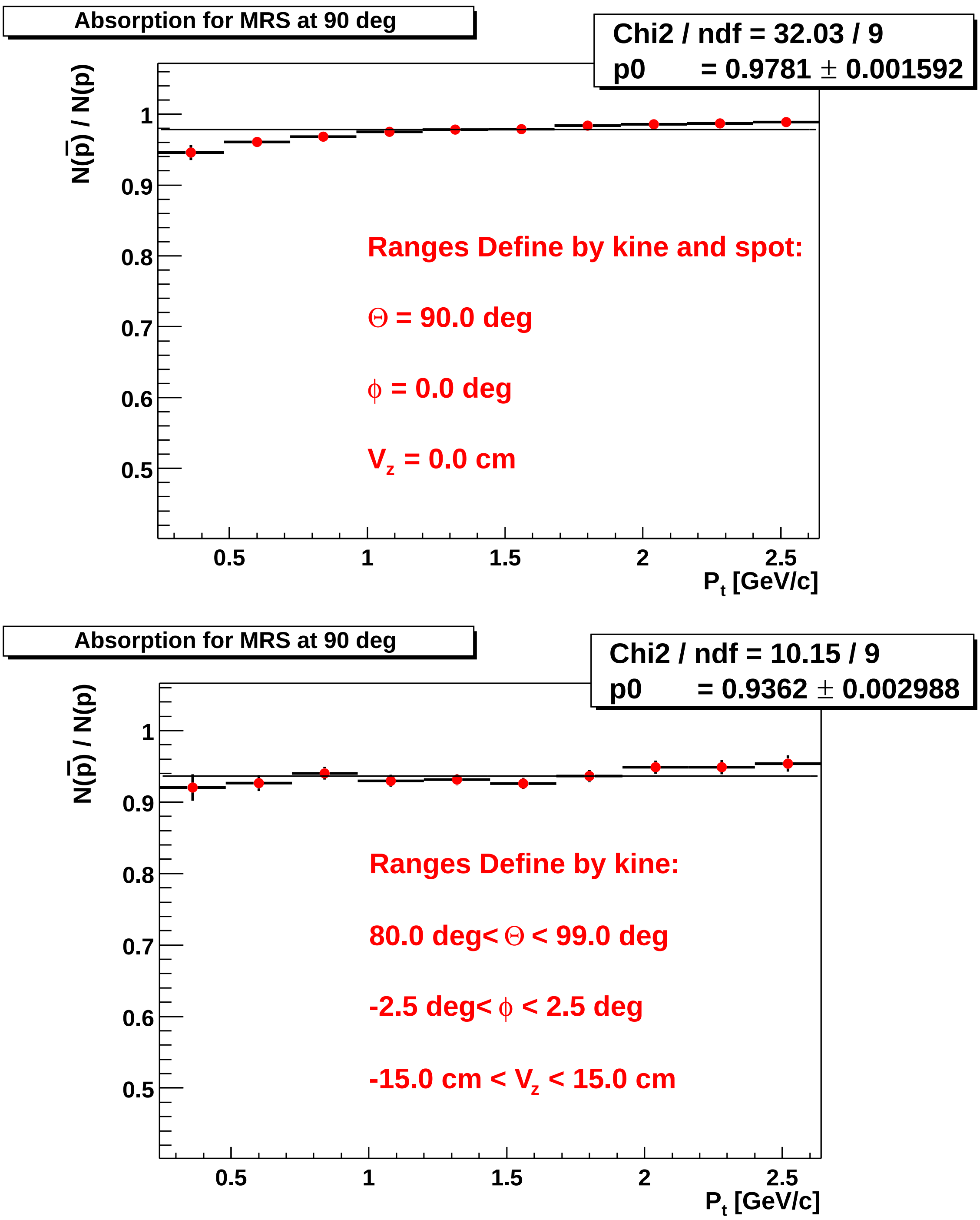

Figure 1: Top panel: calculation according to method illustrated in Fig. 2. Bottom panel: calculation according to method illustrated in Fig. 3.

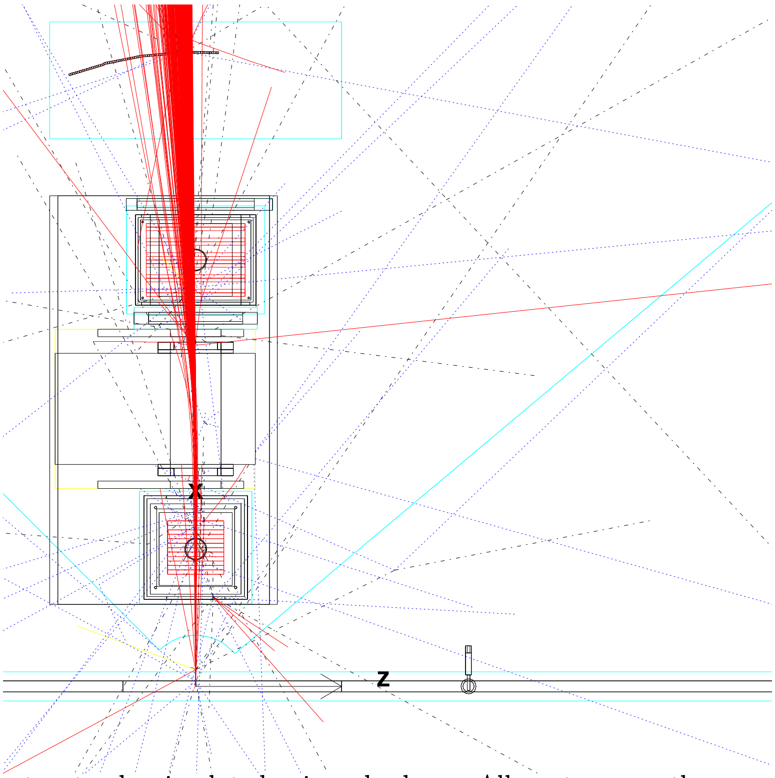

Figure 2: 1k proton tracks simulated using gbrahms. All protons are thrown at $\Theta = 90deg$ and $\phi = 0.0deg$.

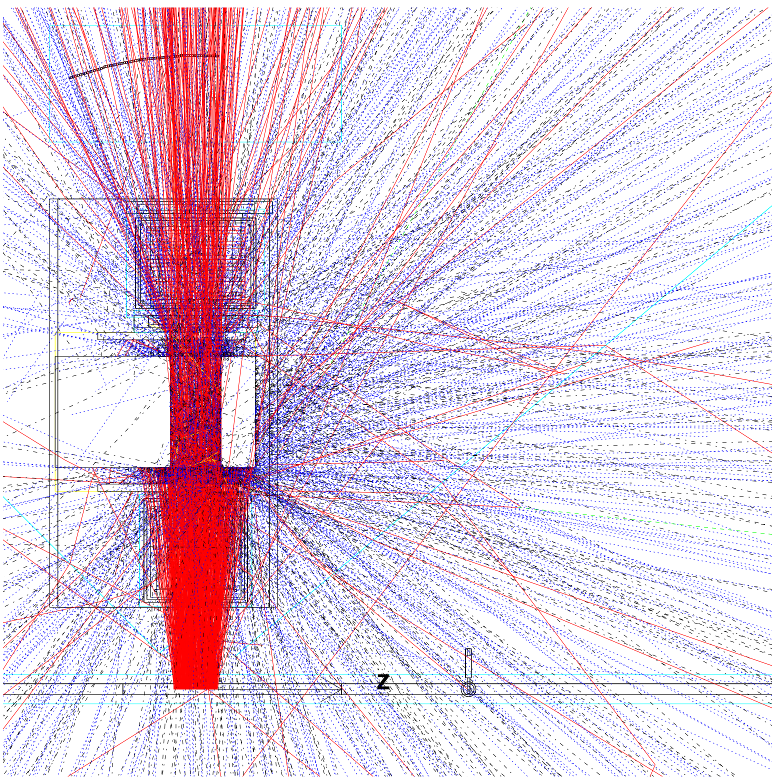

Figure 3: 1k proton tracks simulated using gbrahms. See text for more details.

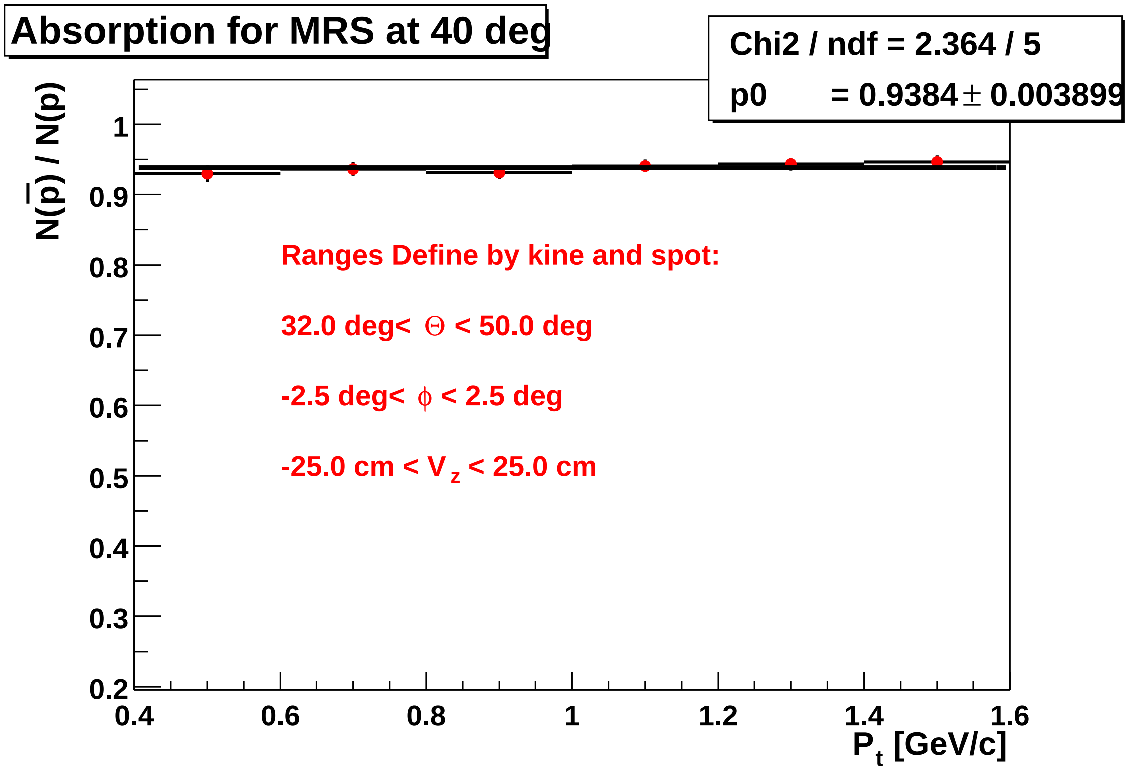

Figure 4: MRS at 40 deg.

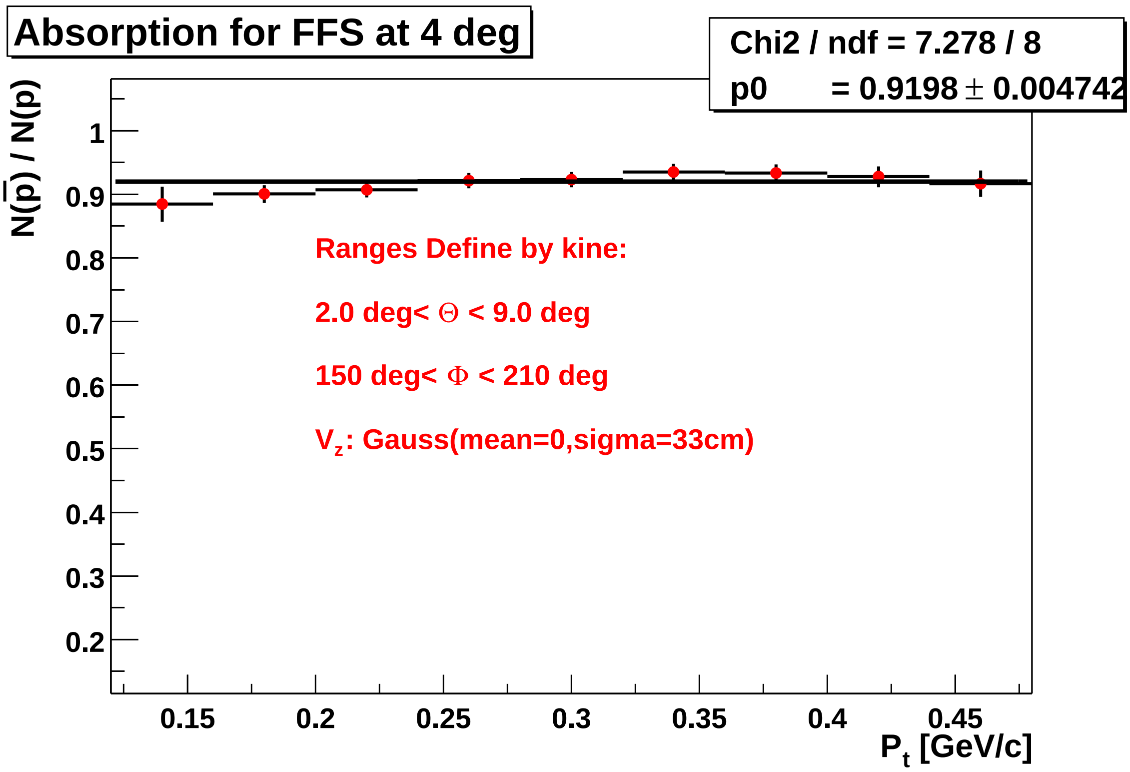

Figure 5: FFS at 4 deg.