First I produce the 4-momenta of the p, $K^0$ $\pi^+$ and $\pi^-$ from the reaction

$K^+ + n \rightarrow p + K^0$
$K^0 \rightarrow \pi^+ + \pi^-$

Next I smear out the pion 3-momenta until the $(\pi^+,\pi^-)$ invariant mass is spread by 5 MeV ($\sigma$). The $K^0$ 4-momentum is then formed from the smeared pion momenta, that is:

$$\widetilde{P}_{K^0} = \widetilde{P}_{\pi^+} + \widetilde{P}_{\pi^-}$$

$$\widetilde{P}_{\pi} = \left[E_{\pi}, \vec{P}_{\pi}\right]$$

$$E_{\pi} = \sqrt{\left|P_{\pi}\right|^2 + M_{\pi}^2}$$

$$\vec{P}_{\pi} = (P_{\pi} + g(\sigma)) \cdot \hat{p}_{\pi}(\theta + g(\sigma), \phi + g(\sigma))$$

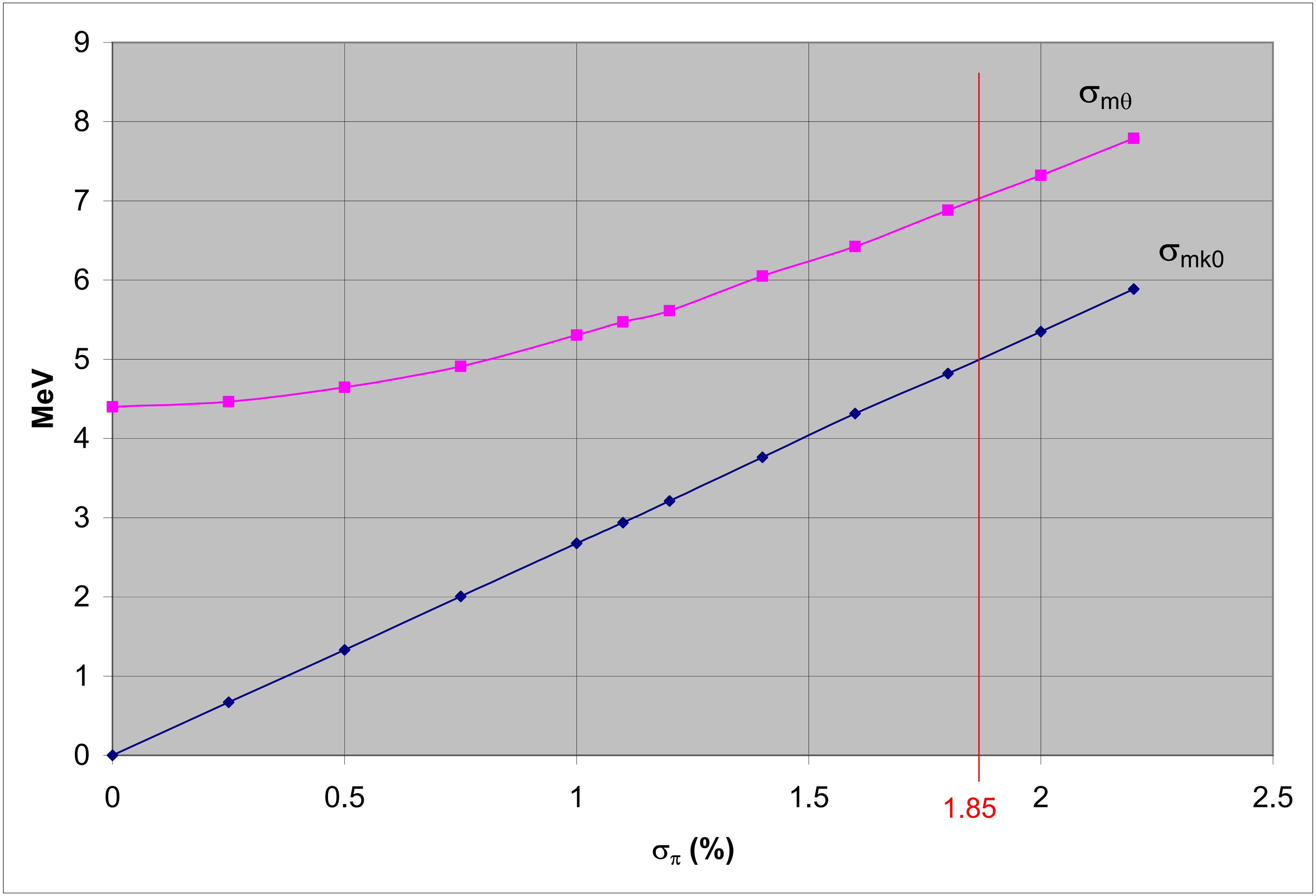
the function $g(\sigma)$ is a gauss distribution with a spread given in percent of the variable being smeared. So if the number is 0.01, then the amplitude and the individual angles of the pion momentum get spread out by 1% ($\sigma$), each, and independent of eachother. A bit primitive, but it is a first step, and I don't see how it can skew the result in any direction by much.

The proton momentum is used to form its kinetic energy (T) which is smeared by 5%. The 4-momentum is then "reassembled" using $\theta=\phi=0$ for the proton direction.

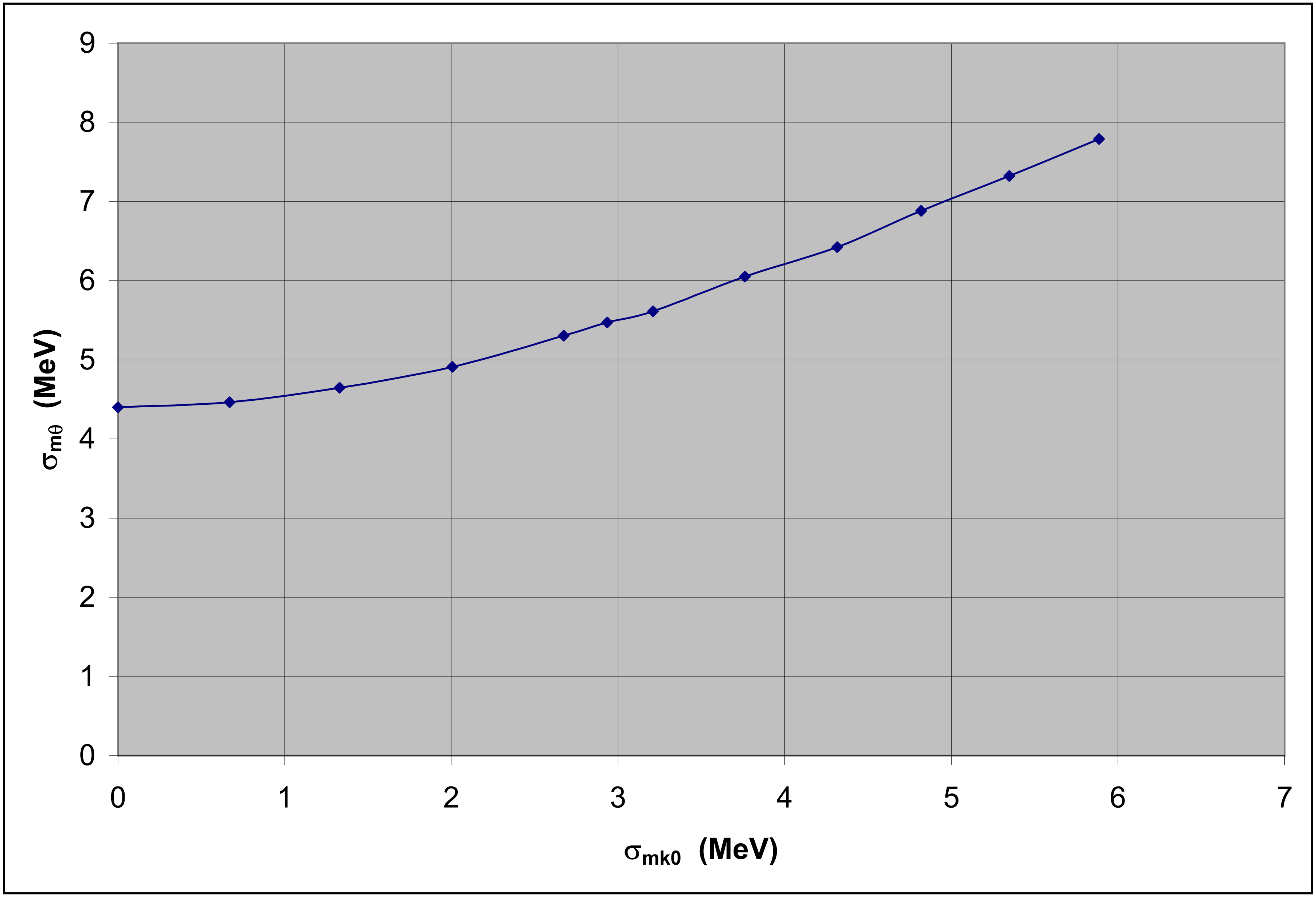
Next, the (p, $K^0$) invariant mass is formed with the smeared out momenta.

When I restrict the proton angle to 10° (the zero angle assumption is only used in constructing the invariant mass), and the pion angles to between 57° and 123° each, I get an error of 7 MeV ($\sigma$) on this invariant mass.

The figures I attached shows the error on the (p,$K^0$) invariant mass as a function of the $(\pi^+,\pi^-)$ invariant mass error, and both plotted against the error on the pion momentum.



MeV
0
1
2
3
4
5
6
7
8
9
0
0.5
1
1.5
1.85
2
2.5
σπ (%)
σmθ
σmk0



9
8
7
6
5
4
3
2
1
0
0
1
2
3
4
5
6
7
σmθ (MeV)
σmk0 (MeV)