

Particle identification with TOF

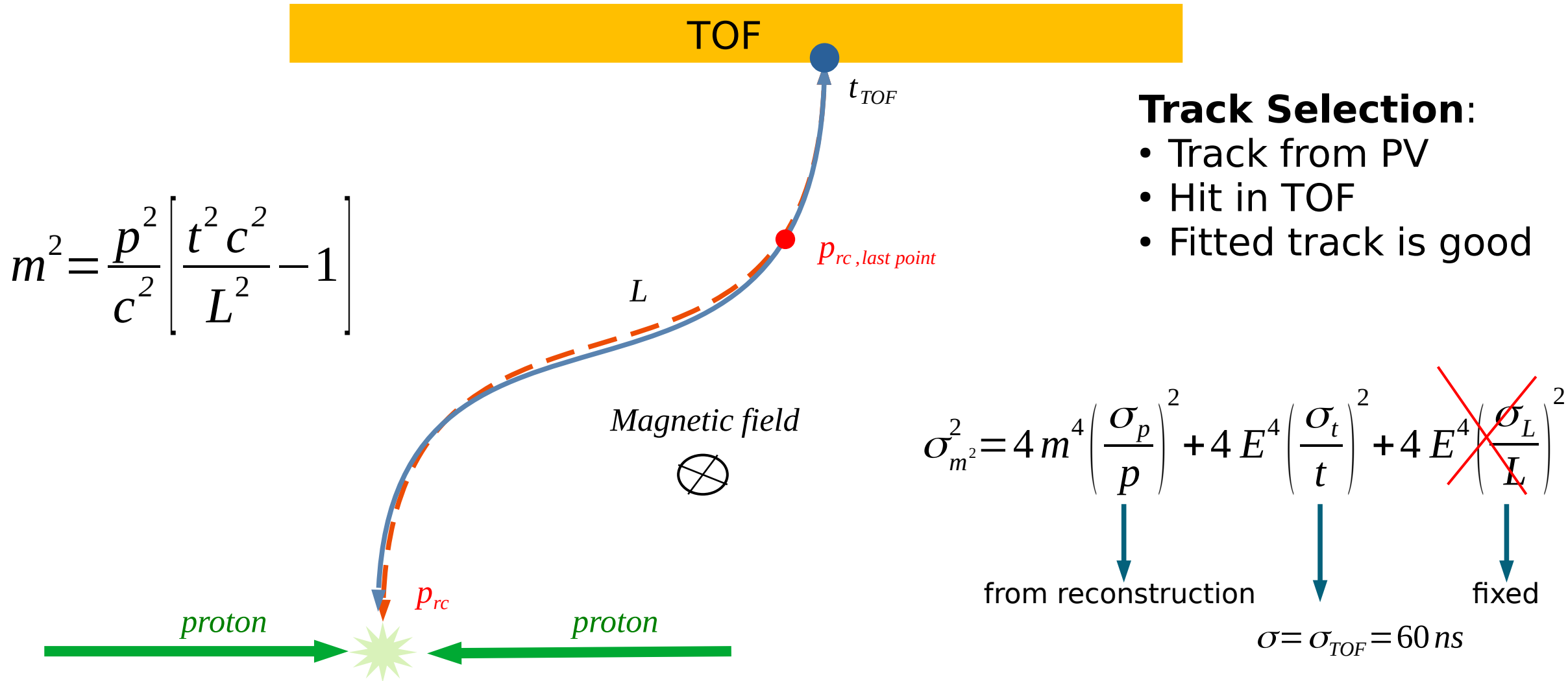
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JINR, Dubna

SPD S&C meeting
07.12.2021

The purpose of the report

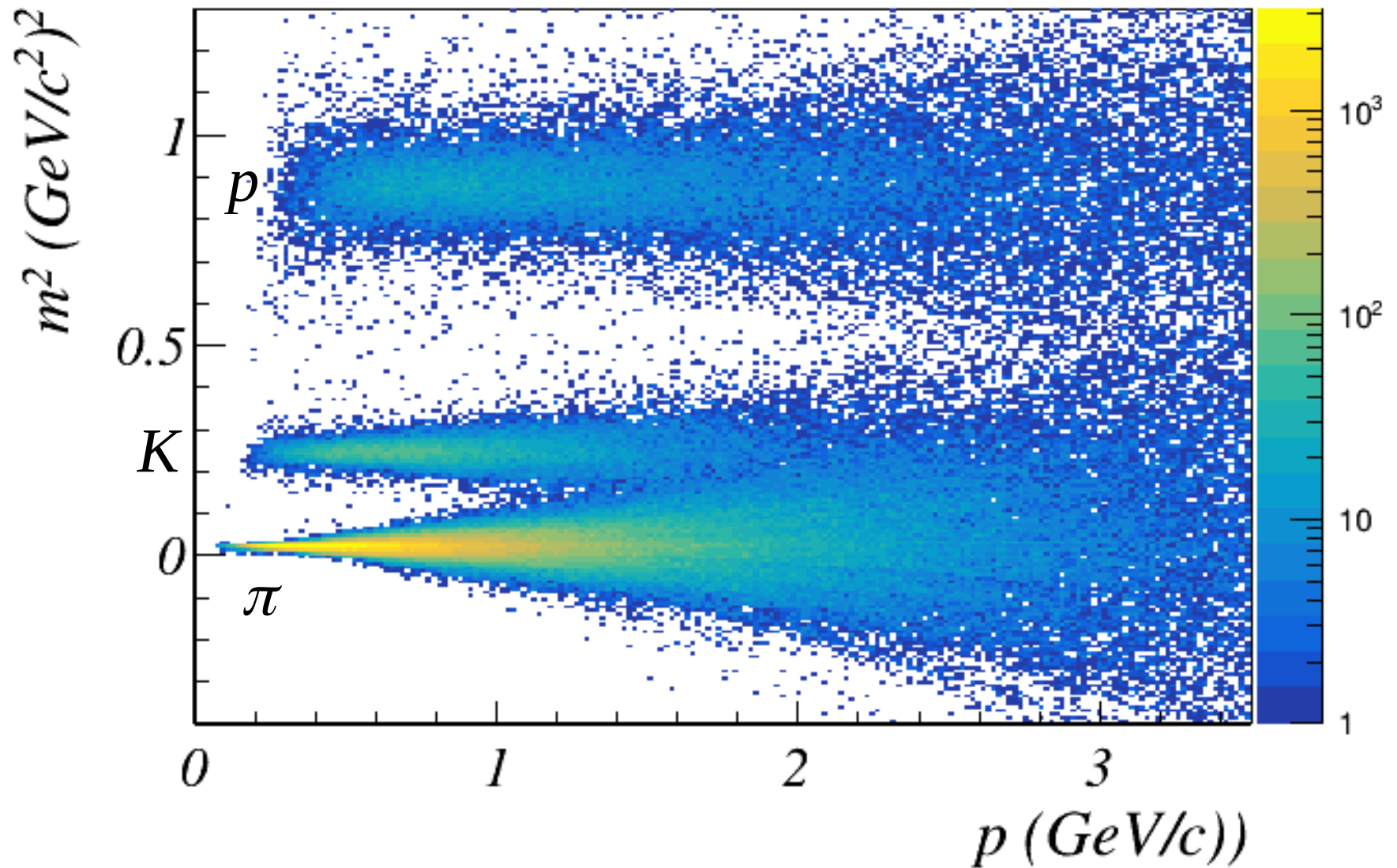
- Calculate probability for particle identification from TOF

PID analysis with TOF in SpdRoot



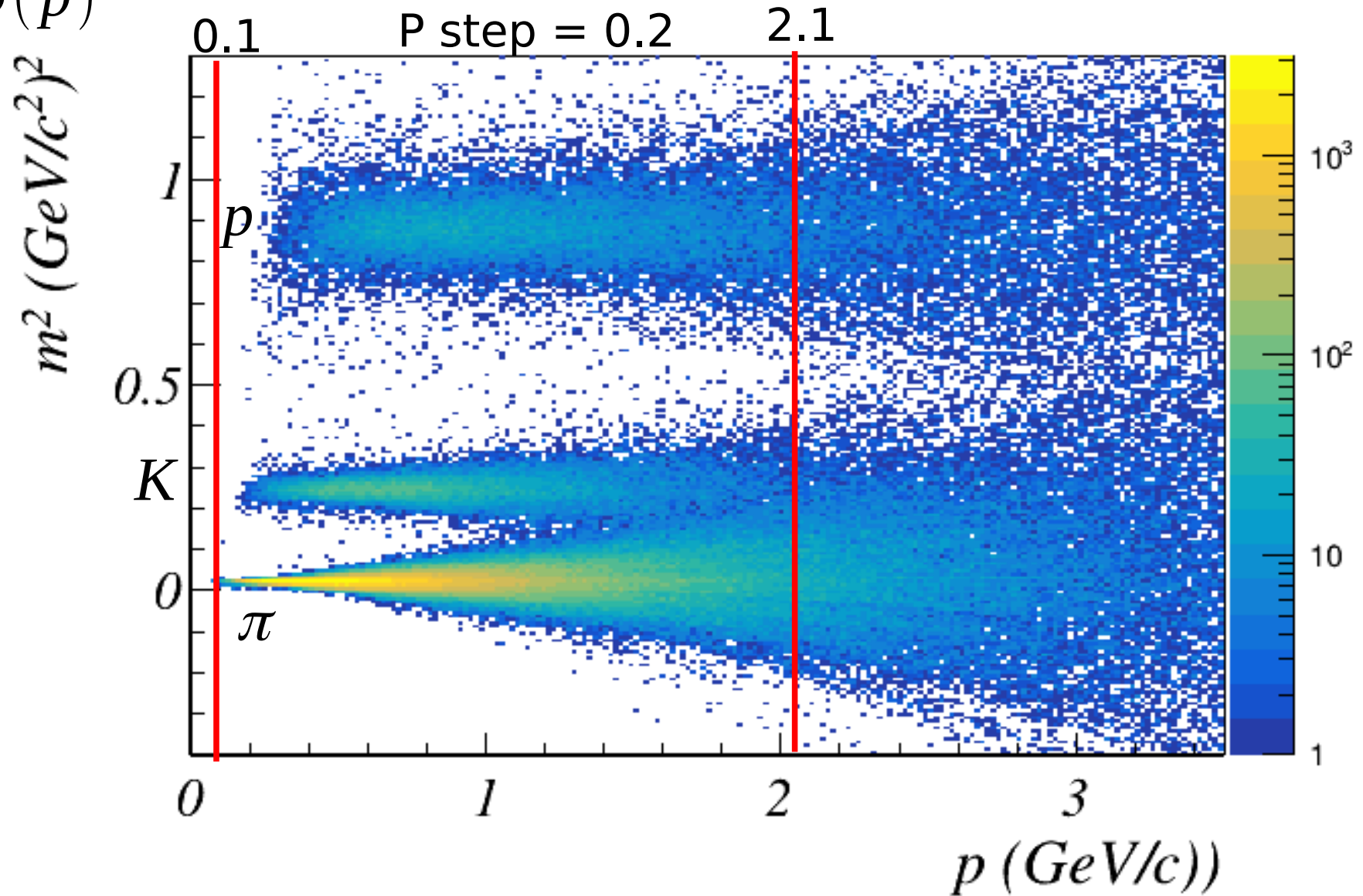
PID analysis with TOF in SpdRoot

Mass-squared information from the Time-of-Flight system versus total momentum



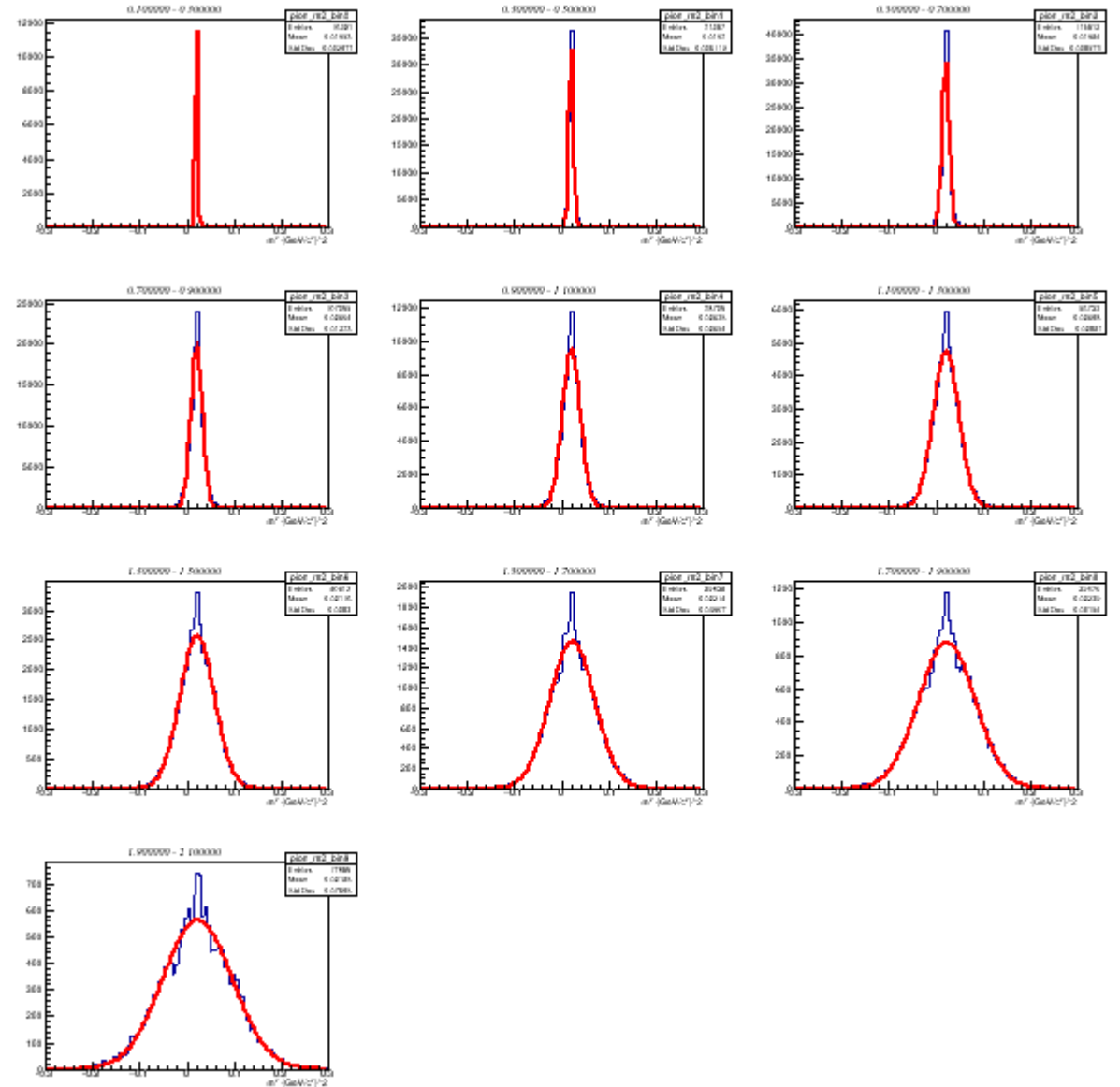
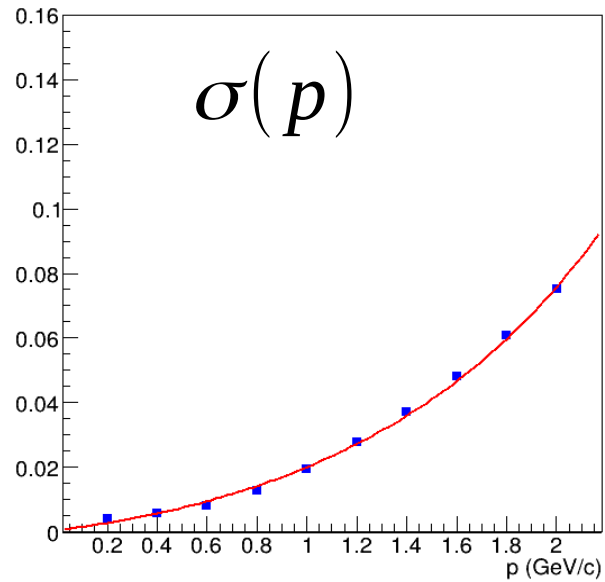
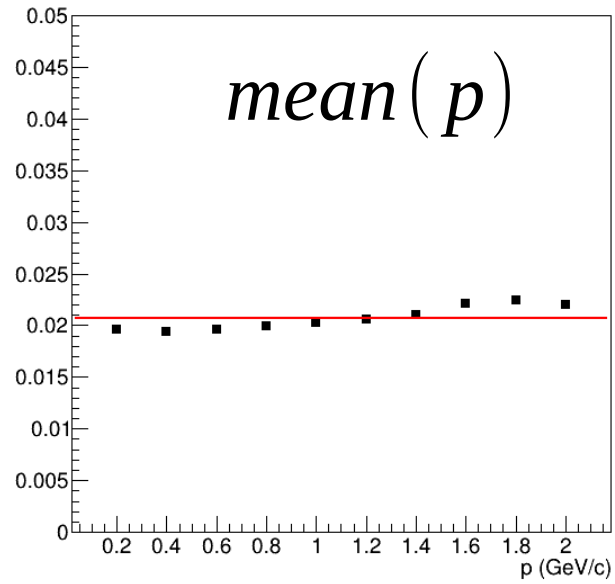
PID analysis with TOF in SpdRoot

$$P(m^2) = \frac{1}{\sqrt{2\pi}\sigma(p)} e^{-\frac{(m_{TOF}^2 - m_{fit}^2)^2}{2\cdot\sigma(p)^2}}$$



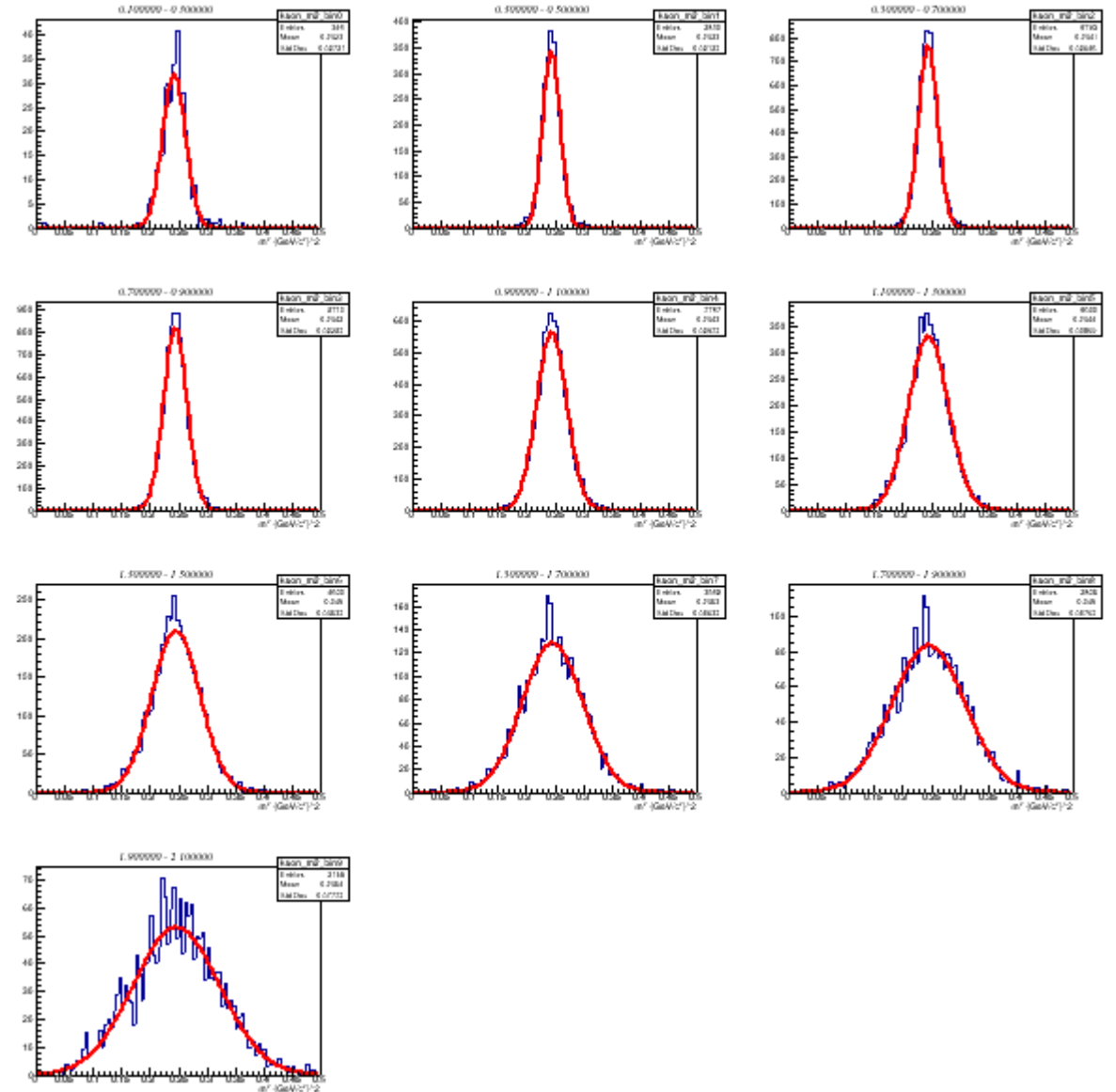
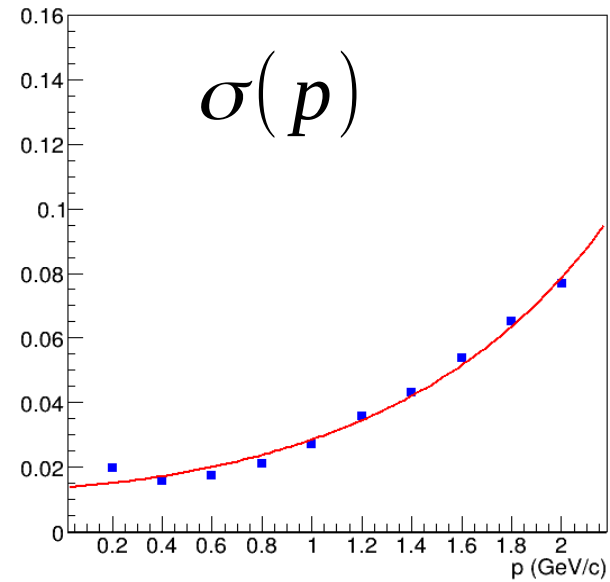
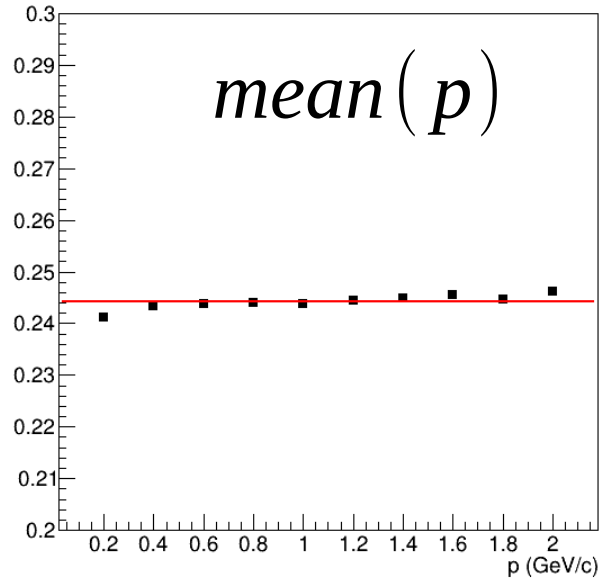
Pion

$$P[0.1-2.1], p_{step} = 0.2$$



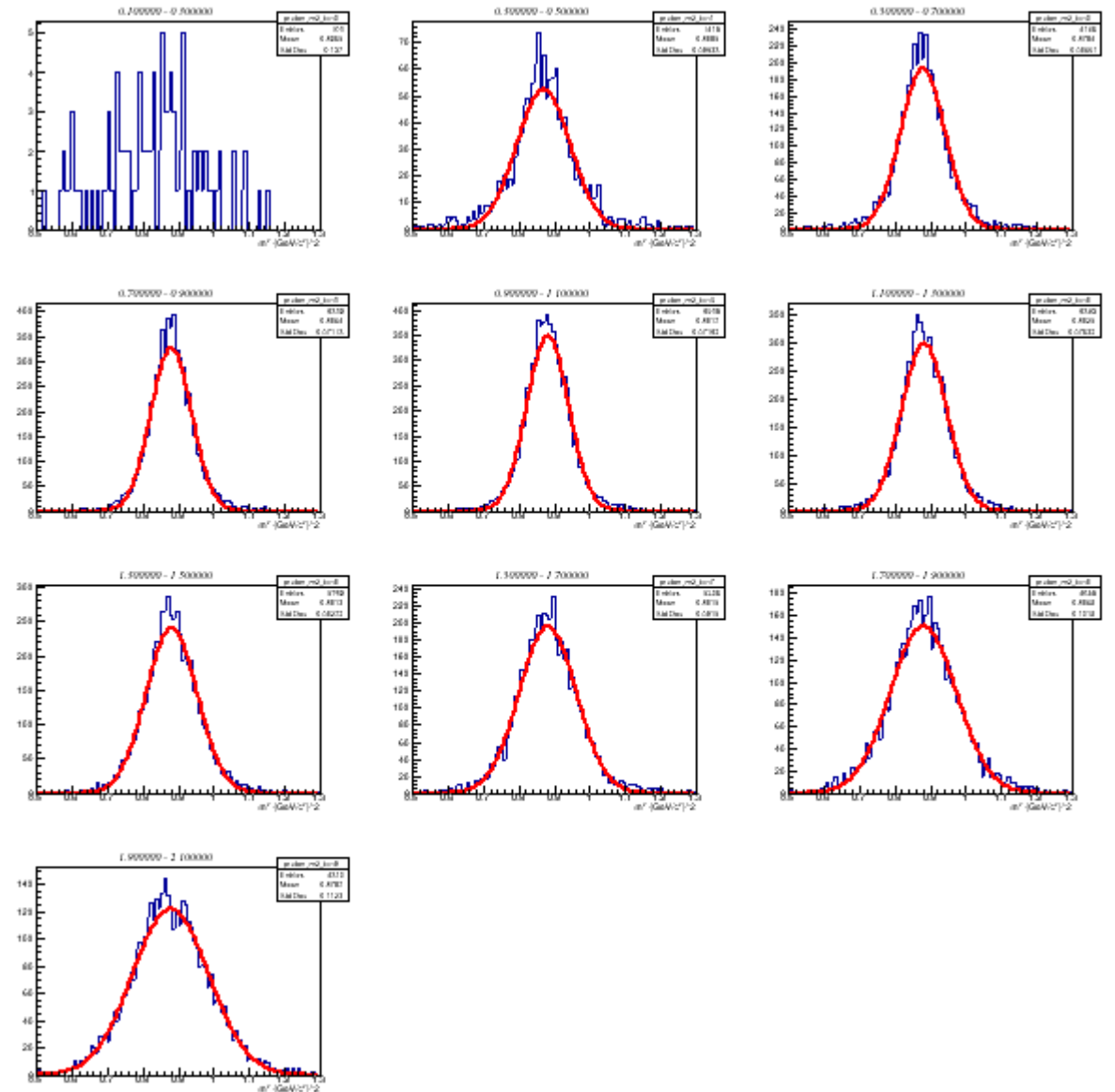
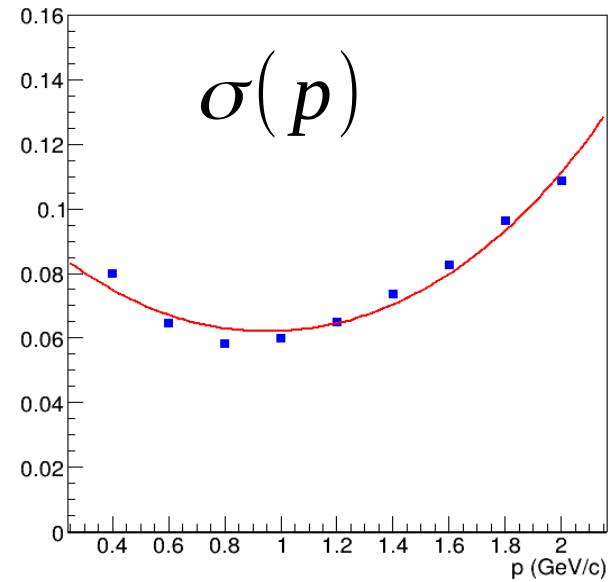
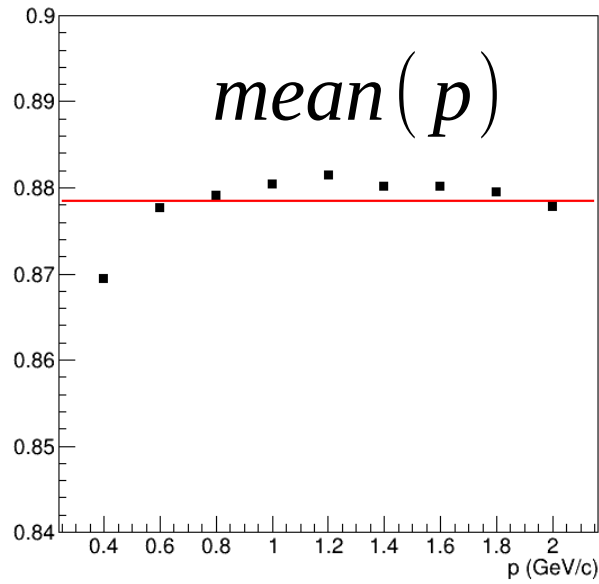
Kaon

$P[0.1-2.1], p_{step}=0.2$

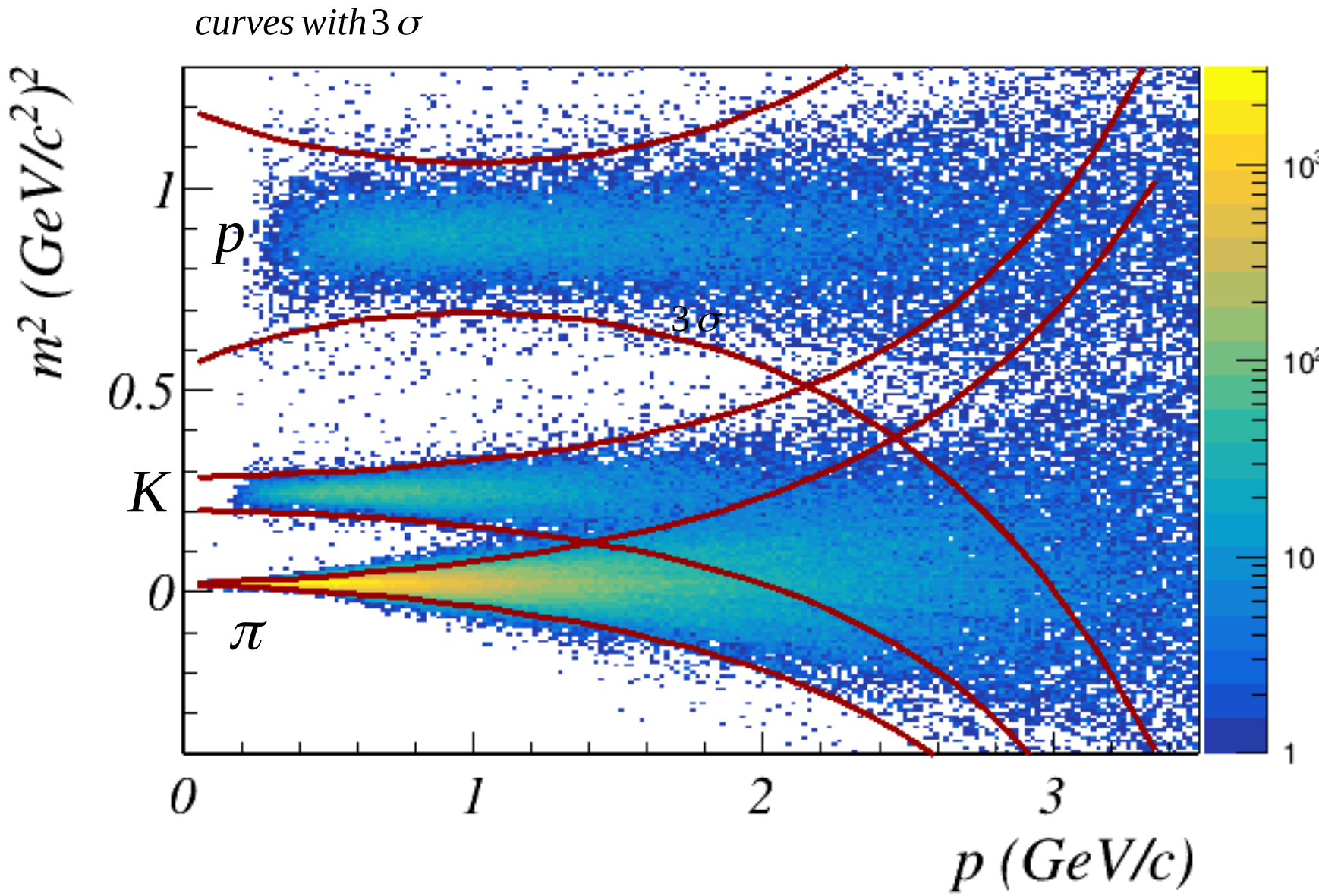


Proton

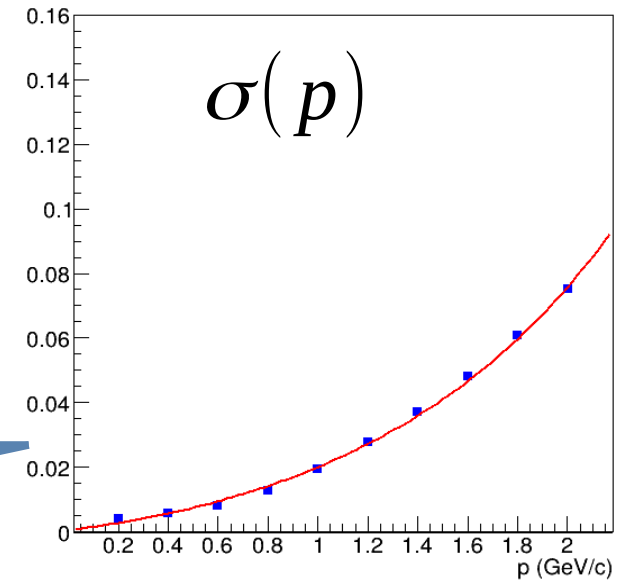
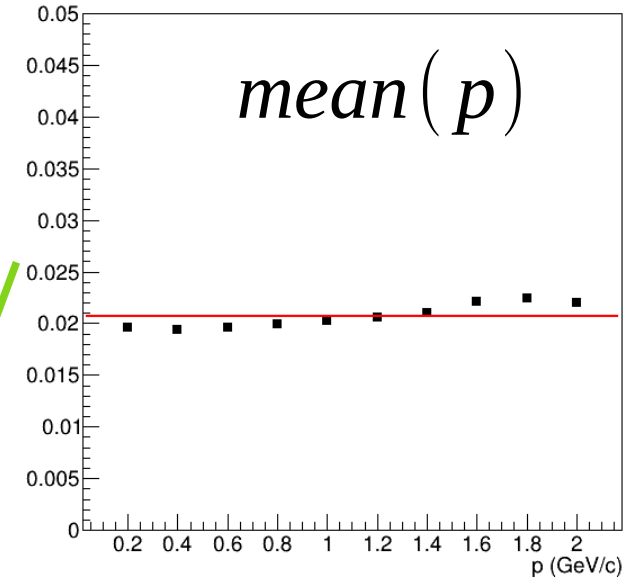
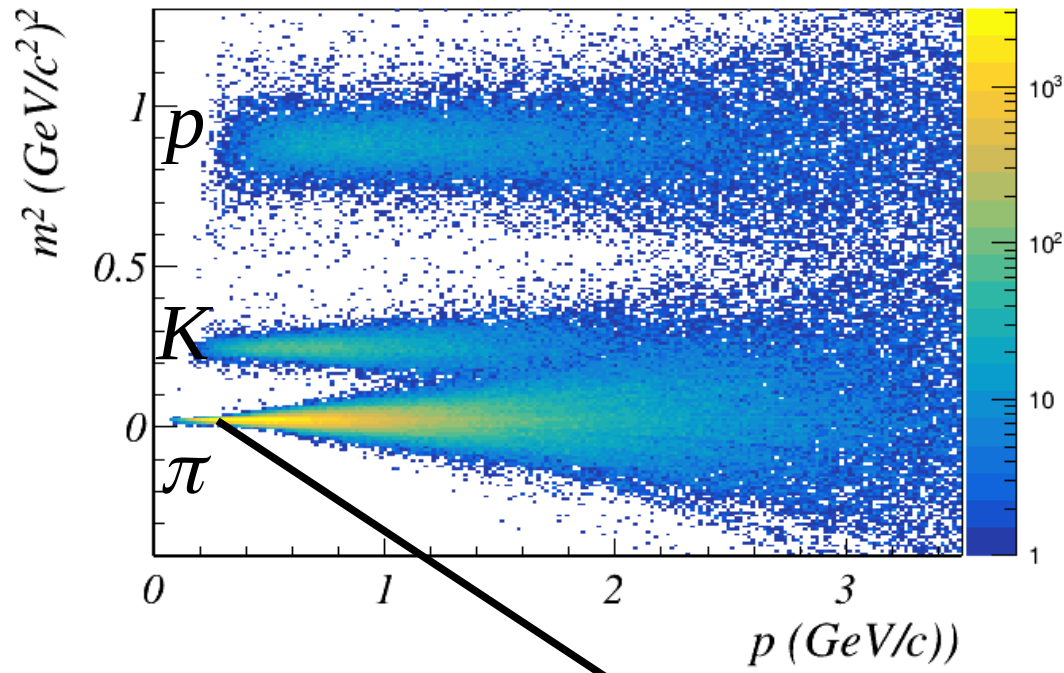
$P[0.1-2.1], p_{step}=0.2$



M^2 vs p

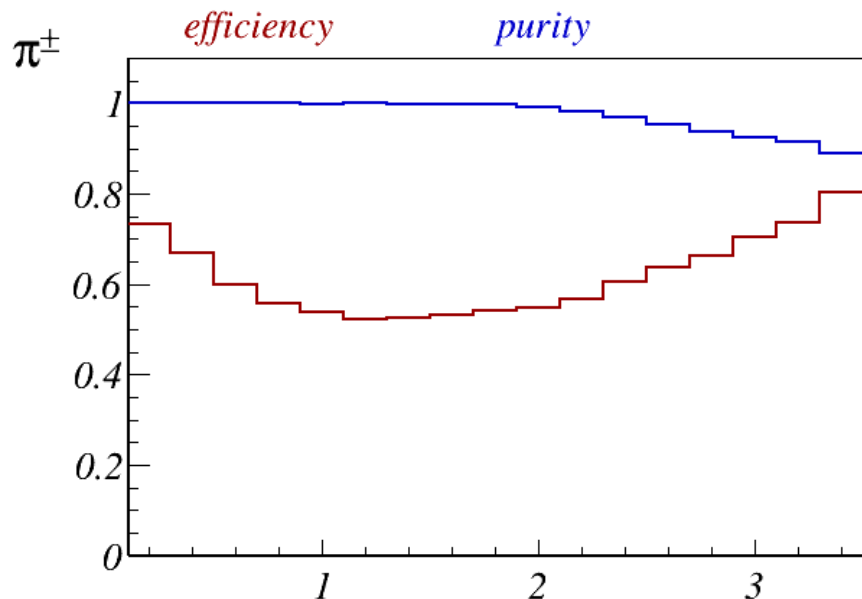


Calculation probability



$$P(m^2) = \frac{1}{\sqrt{2\pi}\sigma(p)} e^{-\frac{(m_{TOF}^2 - m_{fit}^2)^2}{2 \cdot \sigma(p)^2}}$$

Efficiency and Purity

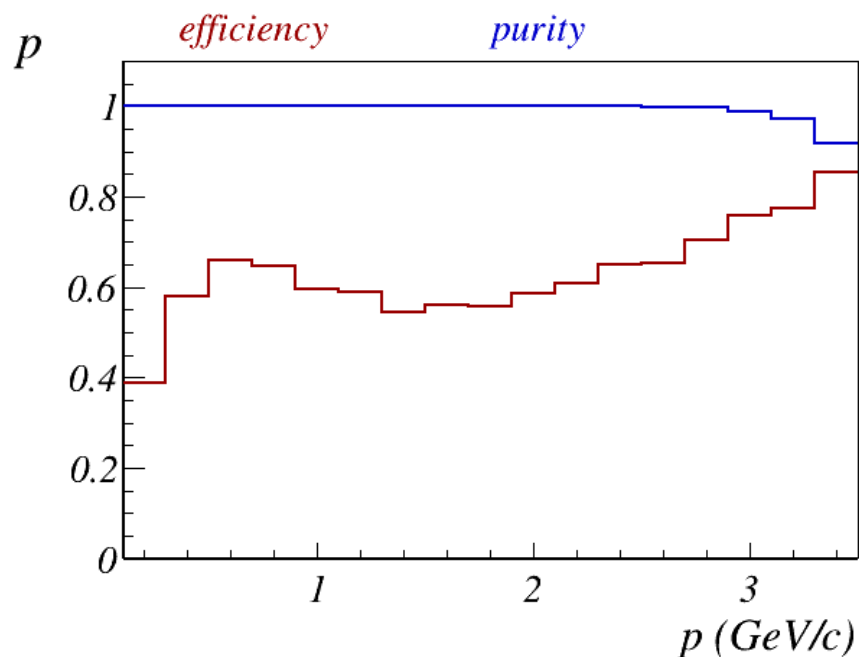
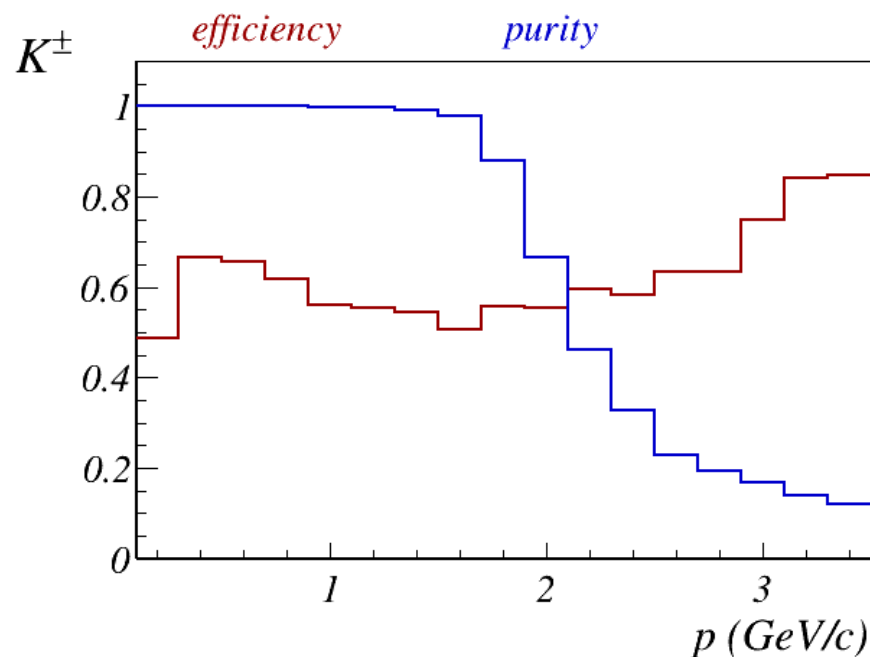


$$\text{Efficiency} = \frac{N_{MC}^i \cap N_{sel}^i}{N_{MC}^i}$$

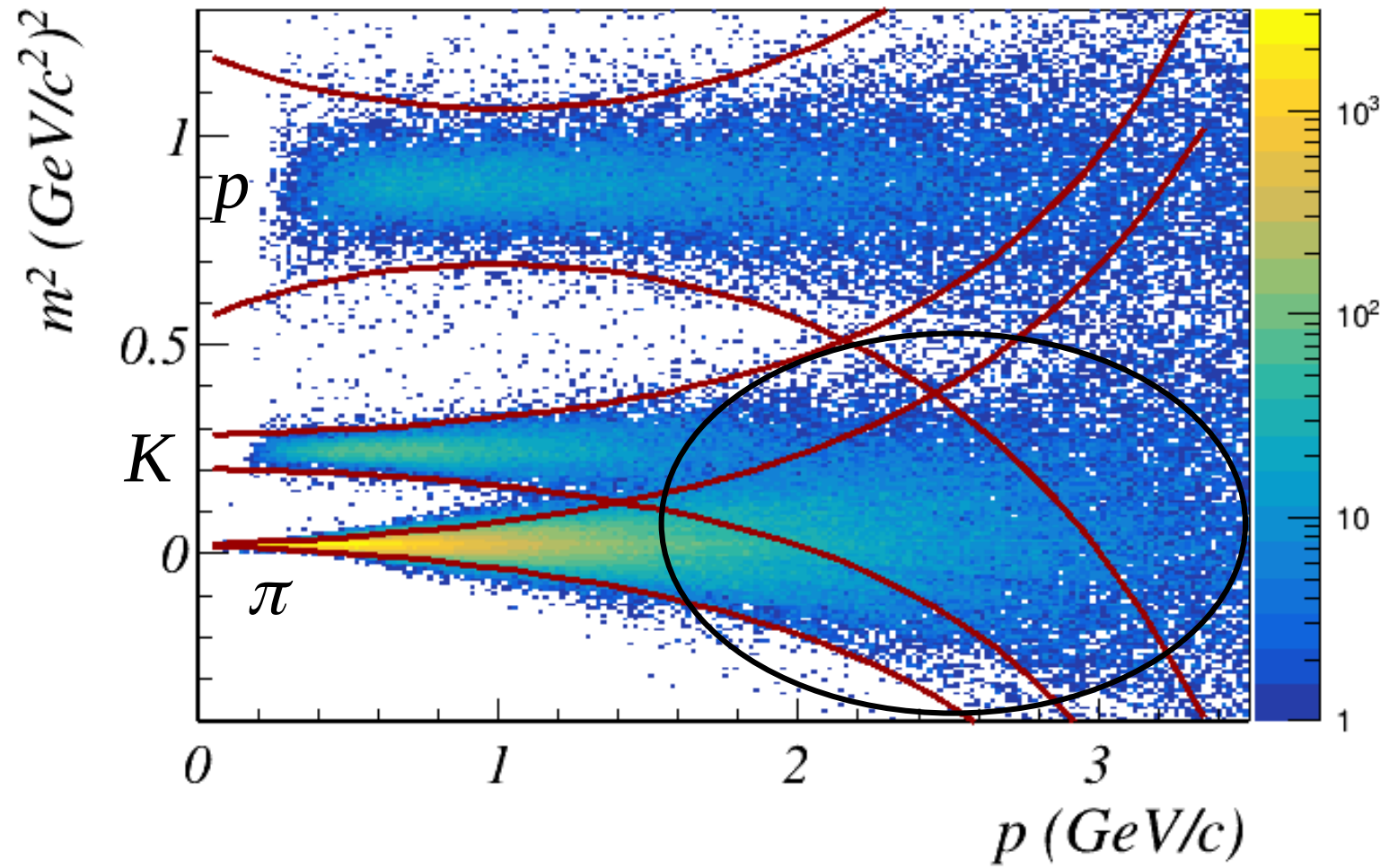
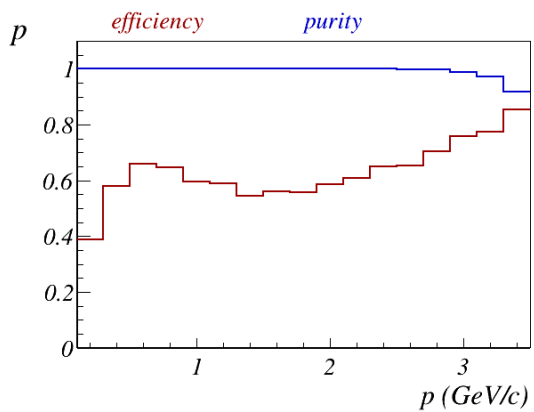
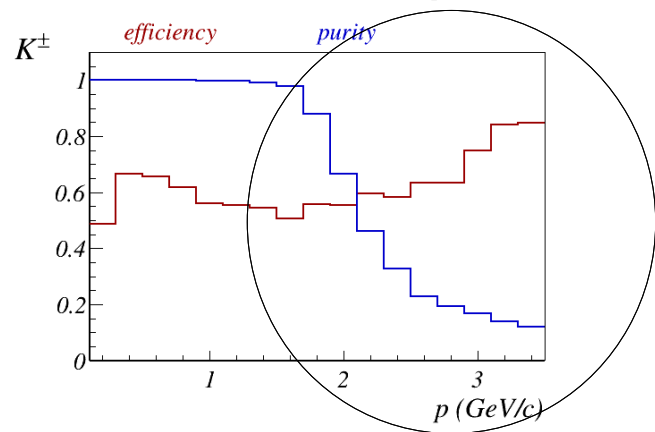
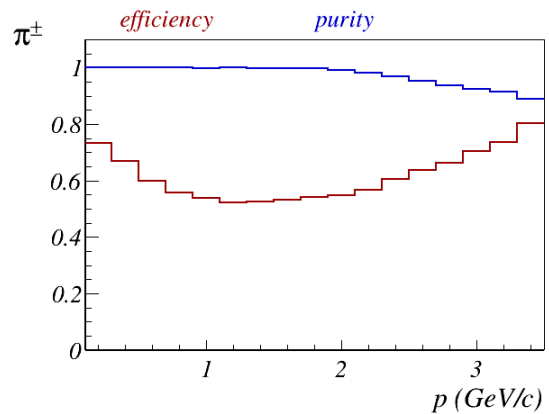
$$\text{Purity} = \frac{N_{MC}^i \cap N_{sel}^i}{N_{sel}^i}$$

$i = \pi, K, p$

N_{MC} – select track with MC PID
 N_{sel} – select track with prob > 0.6



Efficiency and Purity



Conclusion

- Increase number of events, improve fits
- To add code for calculation probability to SpdRoot