Investigation of the Λ(1405)-Resonance with HADES

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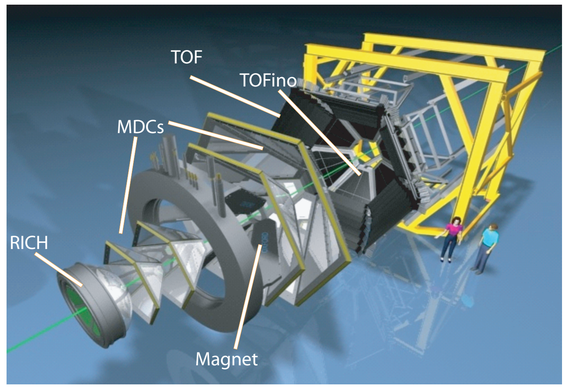
1 Introduction

The Λ(1405)
Mass = 1406 MeV/c^2
Width = 50 MeV/c^2
Quark content = uds
Is the Λ(1405) a K^-p bound state ?
Information can be provided by the resonace line shape .

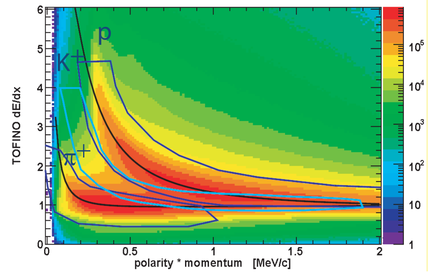
2 The Spectrometer

The **H**igh **A**cceptance **DiE**lectron spectrometer (**HADES**) @ GSI
$\Delta p/p$ = 2-4 %
Reaction = p+p at E_{beam} = 3.5 GeV
Statistics = $1.2 \cdot 10^9$ Events
Geom. acceptance for the investigated reaction ~ 0.12 %



3 Hadron Identification

The dE/dx over p shows a clear signal of p and π^+.
The K^+ signal is hidden between these two particles.
The PID is now made by graphical cuts. To improve the purity of the K^+ an additional cut on the K^+ mass is necessary.
- dE/dx in MDC
- dE/dx in TOF
- dE/dx in TOFino



4 The Reaction

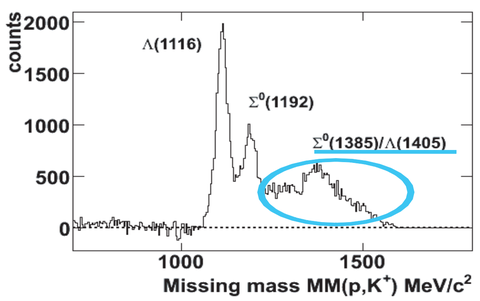
Measure these 4 charged particles in one event

$$p + p \xrightarrow{3.5GeV} \Lambda(1405) + K^+ + p$$
$$\Lambda(1405) \rightarrow \Sigma^0 + \pi^0$$
$$\Sigma^0 \rightarrow \Lambda + \gamma$$
$$\Lambda \rightarrow p + \pi^-$$

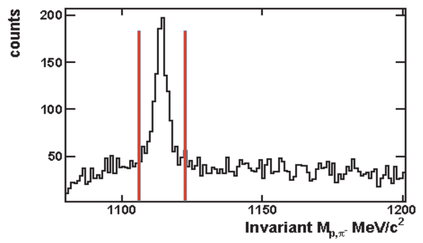
5 The Analysis

- Select events with p_1,K^+,p_2,π^-
- InvMass (p_2,π^-) ~ Λ
- ΔMass of all 4 particles > π^0 γ
- Cut on K^+ mass
- Draw the ΔMass (p,K^+)

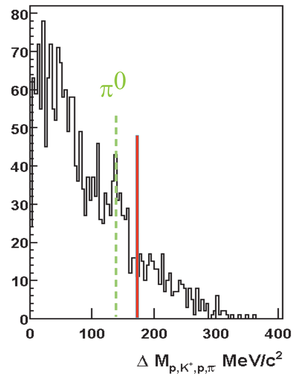
The ΔMass (p,K^+) spectra shows a peak of the Λ(1405) and the Σ(1385). In order to get a pure signal one has to apply several cuts to supress the background.



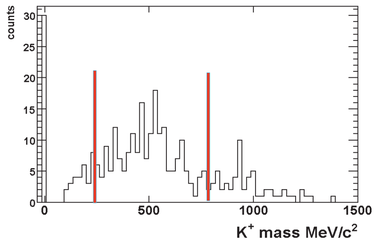
I) Select events with a Λ(1116) by a cut on the InvMass(p,π^-)



II) Cut on the ΔMass of all particles to separate the Λ(1405) from the Σ(1385) ΔMass > π^0 γ (190 MeV)



III) Cut on the mass of particles that were identified as K^+ to improve the PID purity



IV) Under these conditions draw ΔMass(p,K^+)