Baryonspektroskopie – 2-Körper-Endzustände

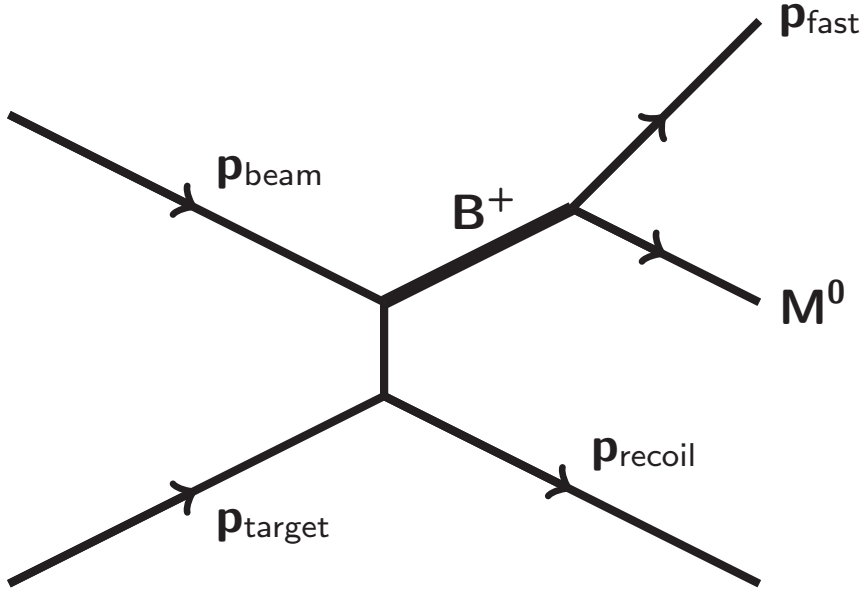
Tobias Weisrock

15. April 2013

JOHANNES GUTENBERG
UNIVERSITÄT MAINZ

Vorüberlegungen

- 2-Körper-Zustände sind technisch einfacher zu behandeln
- kein Isospin Austausch in der Produktion $\Rightarrow$ nur $\mathbf{I = \frac{1}{2}}$ Baryonen
- viele verschiedene Mesonen im Endzustand zugänglich
  - $\pi^0 \rightarrow \gamma\gamma$
  - $\eta \rightarrow \gamma\gamma$
  - $\eta \rightarrow \pi^+\pi^-\pi^0$
  - $\omega \rightarrow \pi^+\pi^-\pi^0$
  - $\eta' \rightarrow \pi^+\pi^-\eta$
  - ...



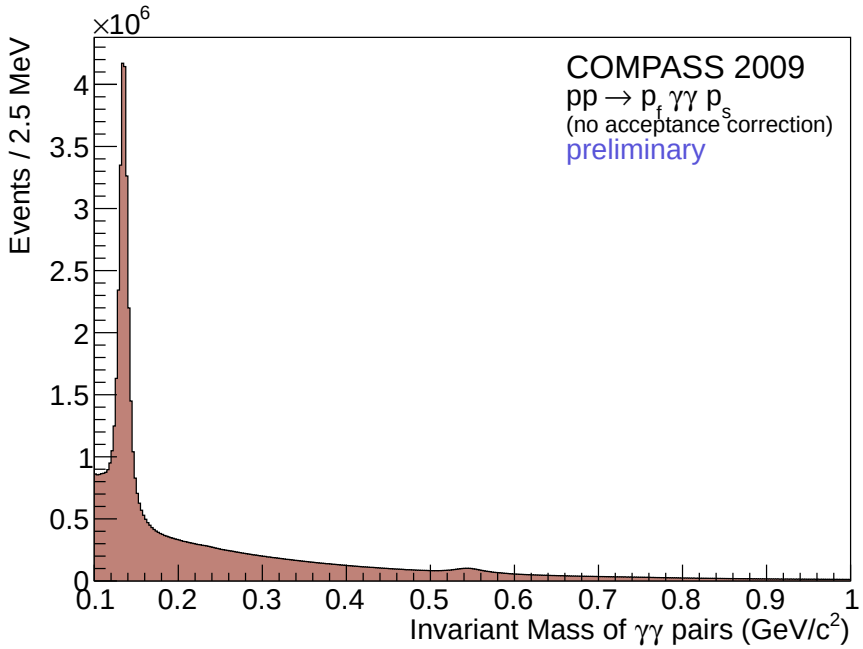
Erinnerung: Vorselektion

1. DT0-Trigger
2. 1 primärer Vertex im Target
3. einlaufendes Proton in mind. 1 CEDAR und kein Pion in beiden CEDARs
4. rekonstruiertes Rückstoßproton

Schnitt	Events	% abs	% rel
ohne	11'321'059'587		
DT0-Trigger	10'825'412'397	95.62	95.62
1 Primärvertex	8'993'834'917	79.44	83.08
im Target	7'925'572'030	70.01	88.12
einlaufendes Proton	5'674'142'337	50.12	71.59
Rückstoßproton	3'967'769'836	35.05	69.93

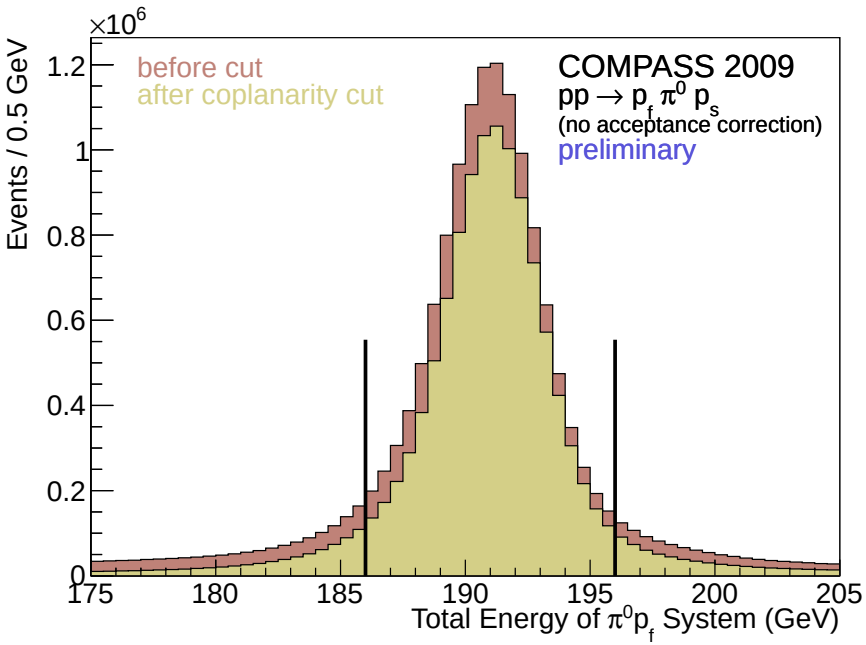
$pp \rightarrow p_{rec}(\gamma\gamma)p_f$ – Schnitte 1

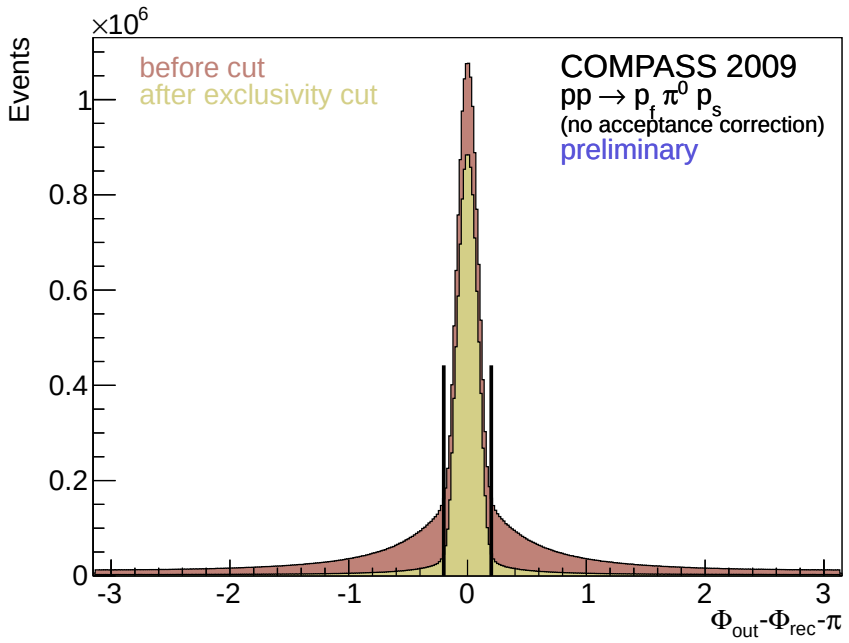
1. 1 auslaufendes geladenes Teilchen
2. Ladung $+1$
3. genau 2 Photonen ($\geq$2??)
   - Energie größer (1,2) GeV in ECAL (1,2)
   - LED/Laser Korrekturen
   - Korrekturen aus OZI Analyse



$pp \to p_{rec}(\gamma\gamma)p_f$ – Schnitte 2

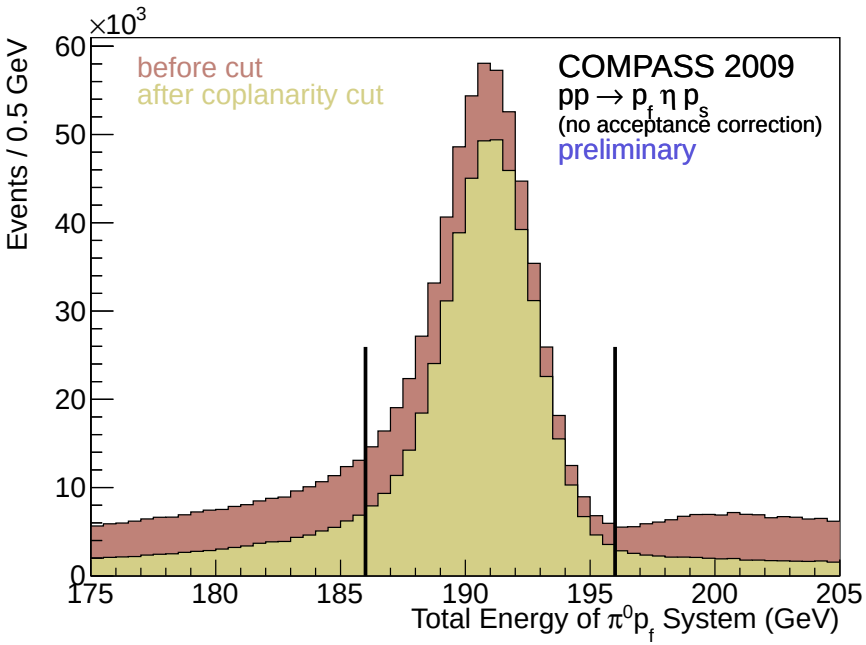
1. Photonen bilden ein π^0 oder η
2. Exclusivity
3. Coplanarity

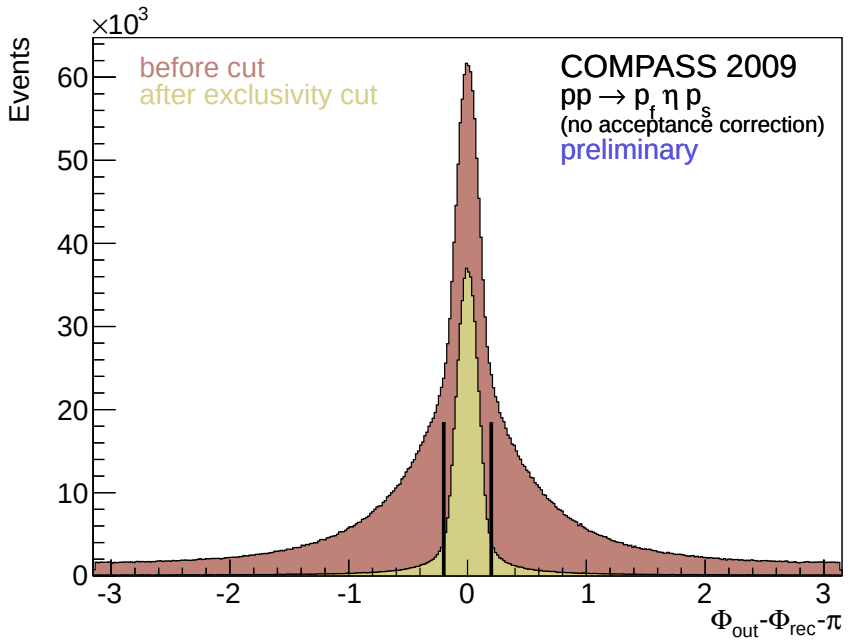




$pp \to p_{rec}(\gamma\gamma)p_f$ – Schnitte 2

1. Photonen bilden ein π^0 oder η
2. Exclusivity
3. Coplanarity

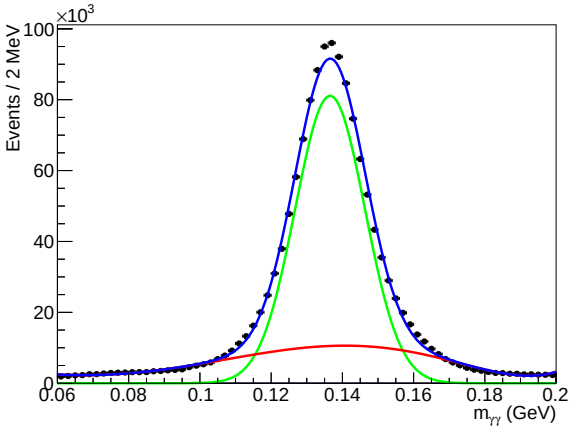




π^0/η Selektion

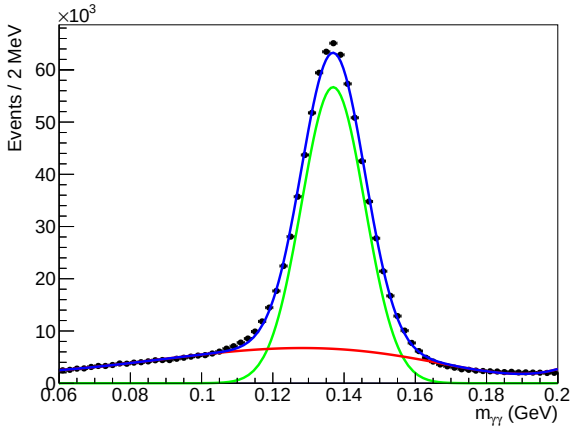
- Invariante $\gamma\gamma$ Masse innerhalb von 2σ um die PDG Masse
- Skalieren der Photonenergie auf PDG Masse

π^0 in ECAL (1,1)



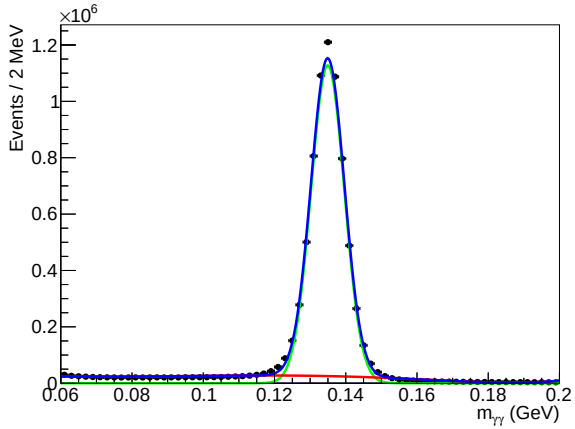
$\sigma = 9.79\,\mathrm{MeV}$

π^0 in ECAL (1,2)/(2,1)



$\sigma = 8.87\,\mathrm{MeV}$

π^0 in ECAL (2,2)



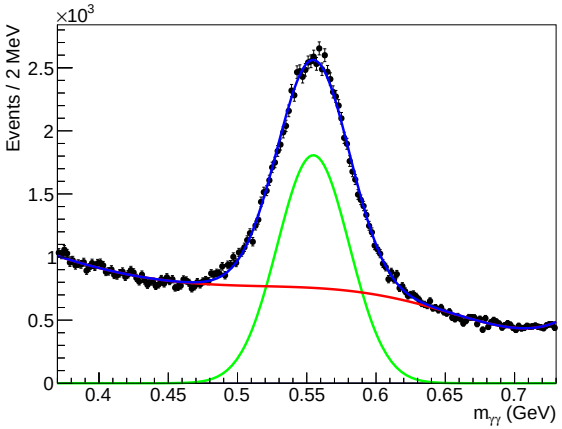
$\sigma = 4.68\,\mathrm{MeV}$

$$\mathbf{f(m) = n_{sig} \cdot exp - \frac{(m - m_0)^2}{2\sigma^2} + n_{bkg} \cdot Pol(m)}$$

π^0/η Selektion

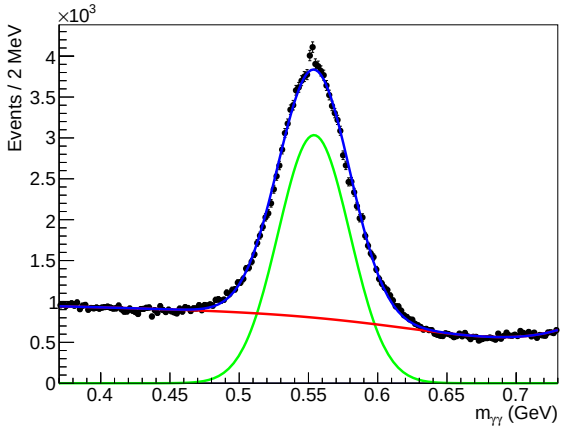
- Invariante $\gamma\gamma$ Masse innerhalb von 2σ um die PDG Masse
- Skalieren der Photonenergie auf PDG Masse

eta in ECAL (1,1)



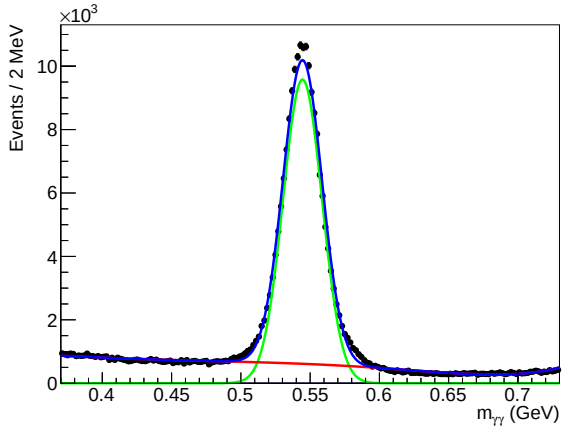
$\sigma = 26.0\,\mathrm{MeV}$

eta in ECAL (1,2)/(2,1)



$\sigma = 25.8\,\mathrm{MeV}$

eta in ECAL (2,2)

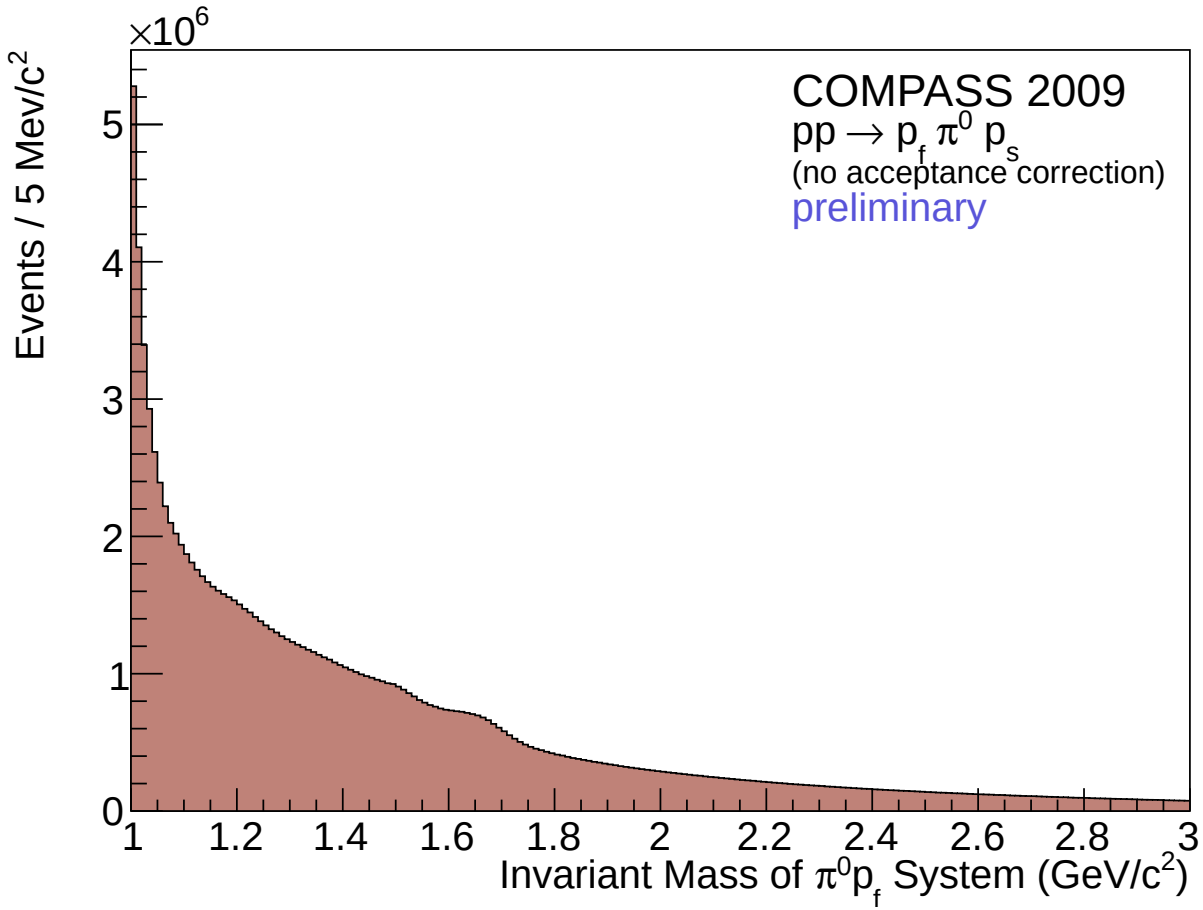


$\sigma = 14.1\,\mathrm{MeV}$

$$\mathbf{f(m) = n_{sig} \cdot exp - \frac{(m - m_0)^2}{2\sigma^2} + n_{bkg} \cdot Pol(m)}$$

$pp \rightarrow p_{rec}\pi^0 p_f$

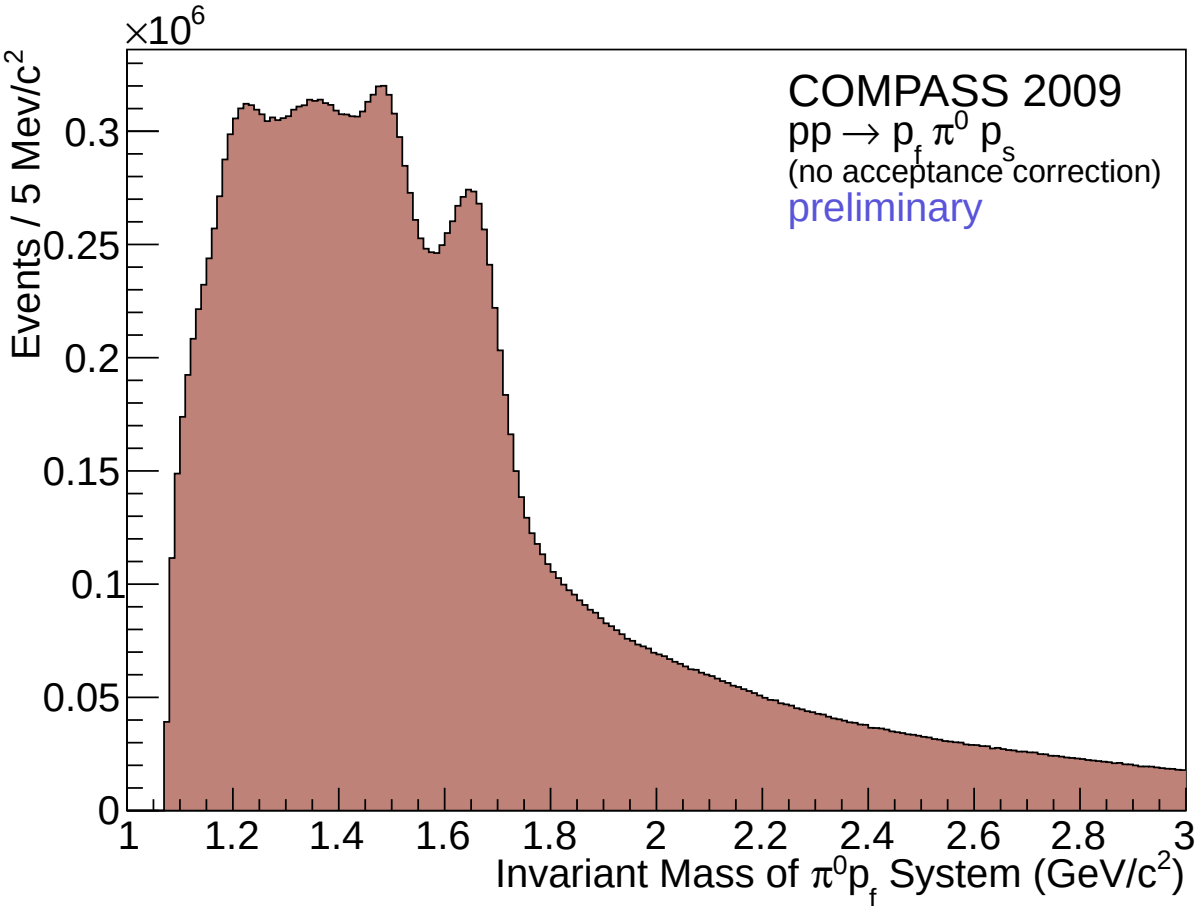
1 geladenes Teilchen + 2 Photonen



n Events

$pp \rightarrow p_{rec}\pi^0 p_f$

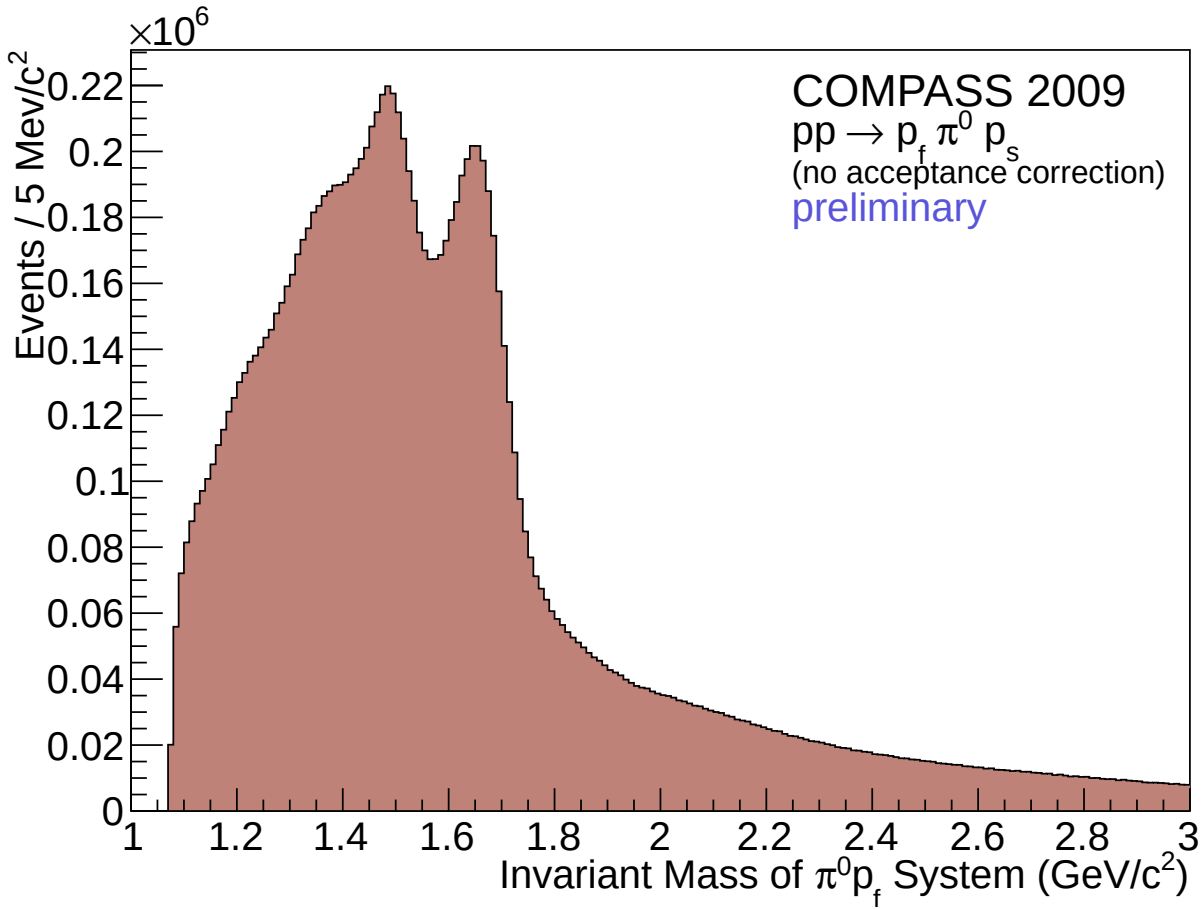
π^0 identifiziert



n Events

$pp \rightarrow p_{rec}\pi^0 p_f$

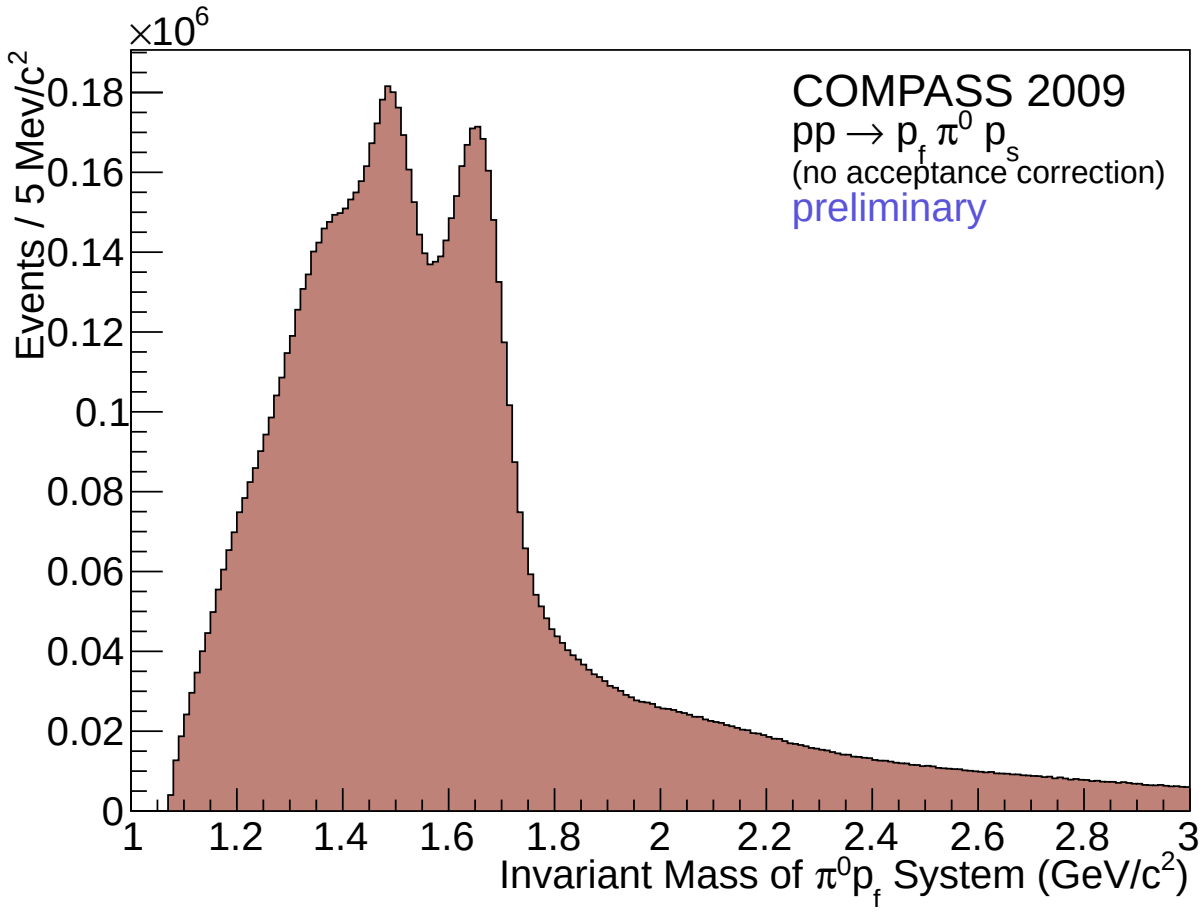
Coplanarity



n Events

$pp \rightarrow p_{rec}\pi^0 p_f$

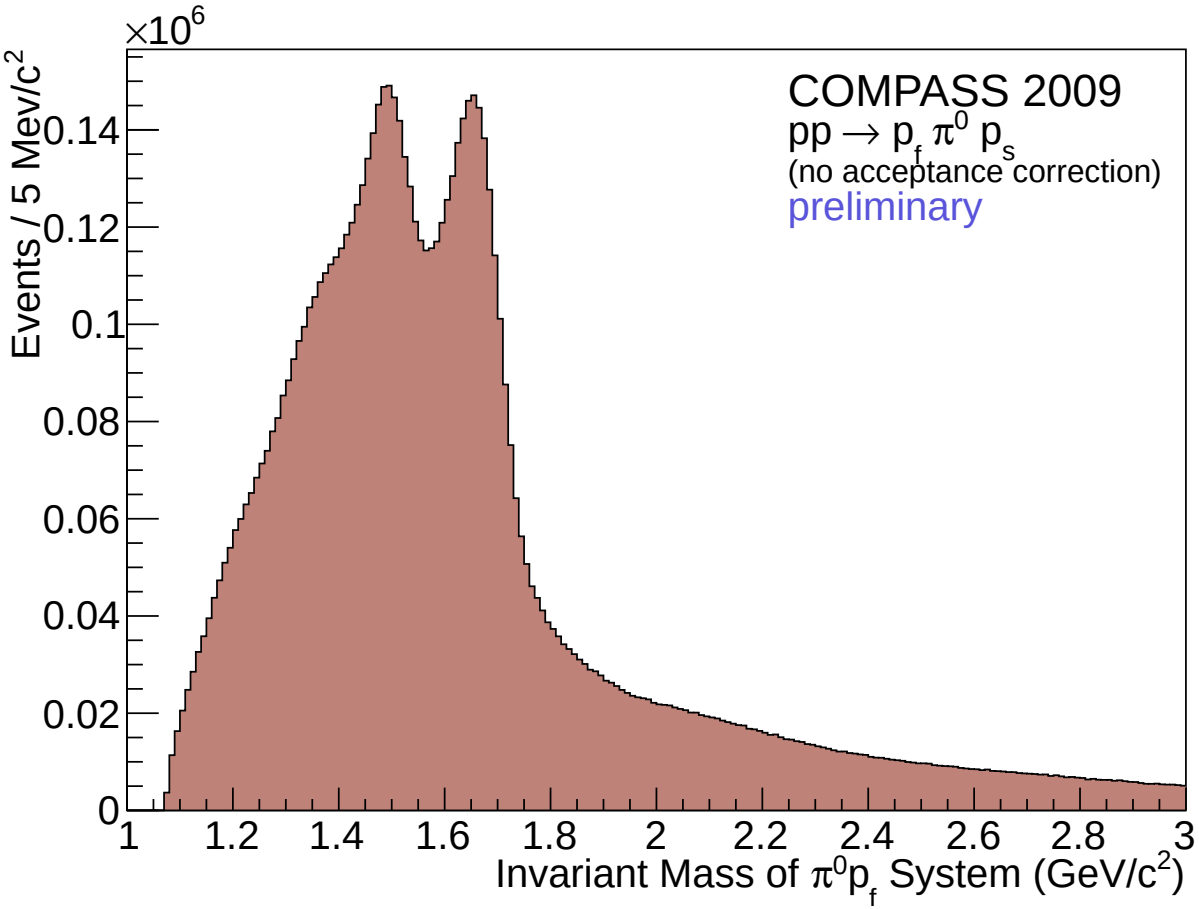
Exclusivity



n Events

$pp \rightarrow p_{rec}\pi^0 p_f$

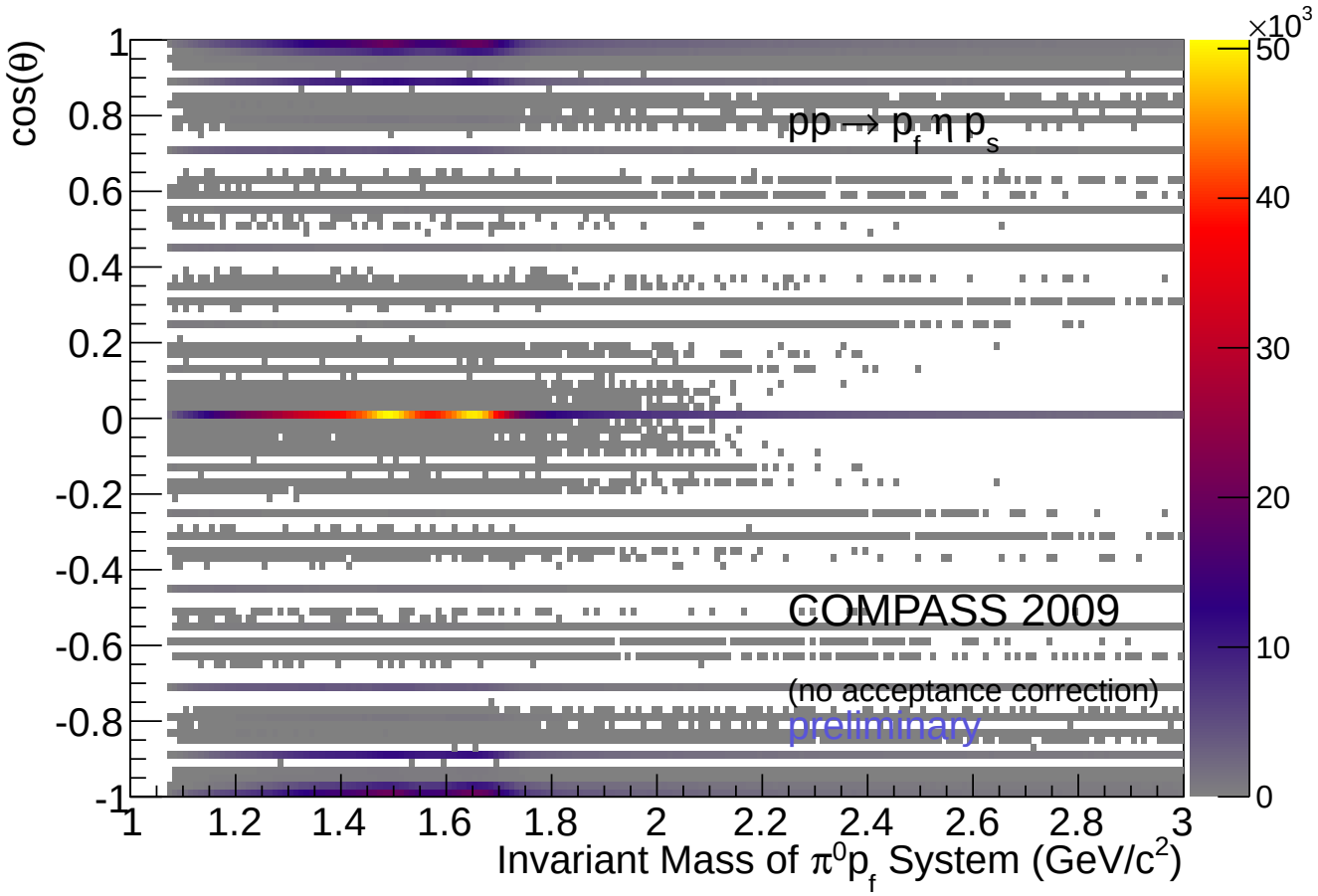
$$0.1 < t' < 1.0$$



n Events

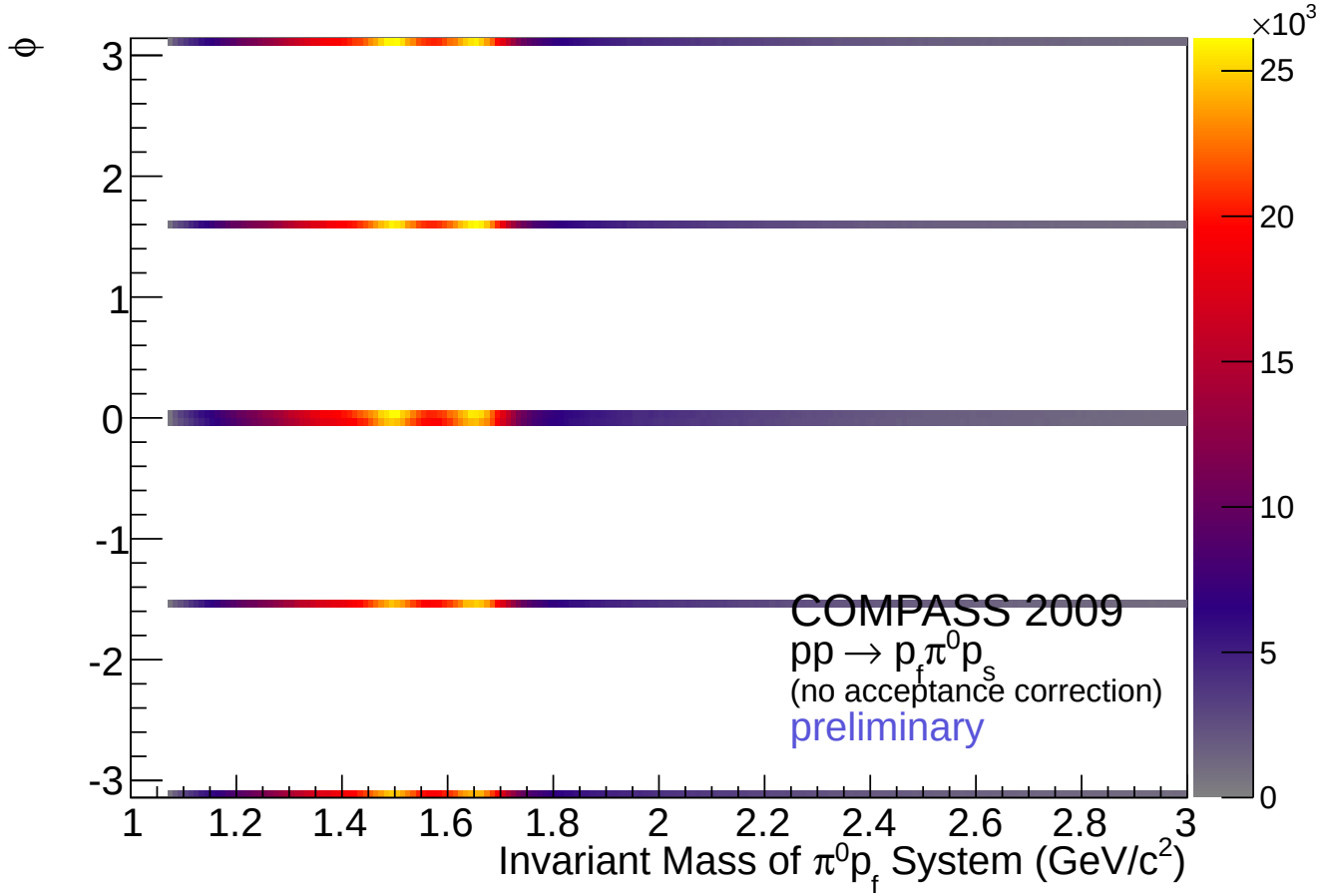
$pp \rightarrow p_{rec}\pi^0 p_f$

Azimuthwinkel $\cos(\theta)$ gegen invariante Masse



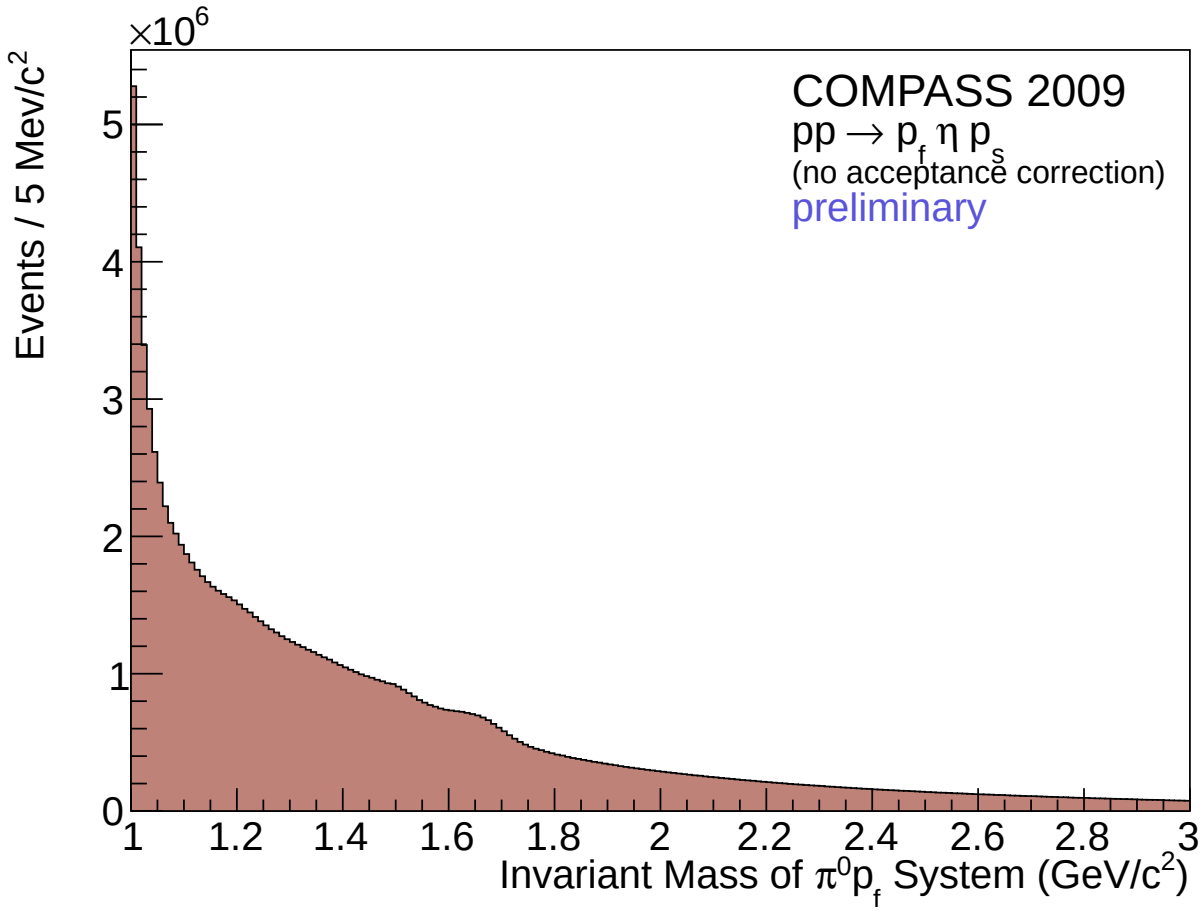
$pp \rightarrow p_{rec}\pi^0 p_f$

Polarwinkel ϕ gegen invariante Masse



$pp \rightarrow p_{rec} \eta p_f$

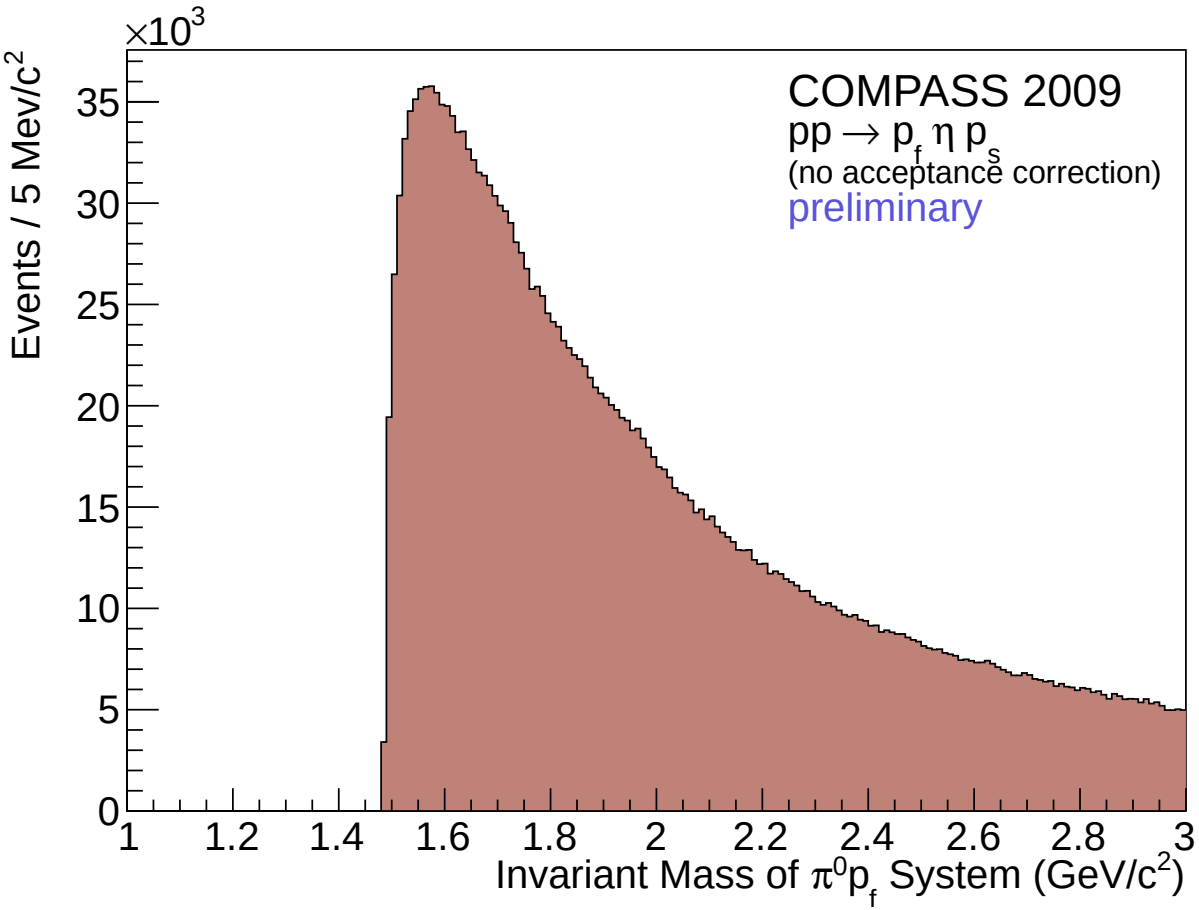
1 geladenes Teilchen + 2 Photonen



n Events

$pp \rightarrow p_{rec} \eta p_f$

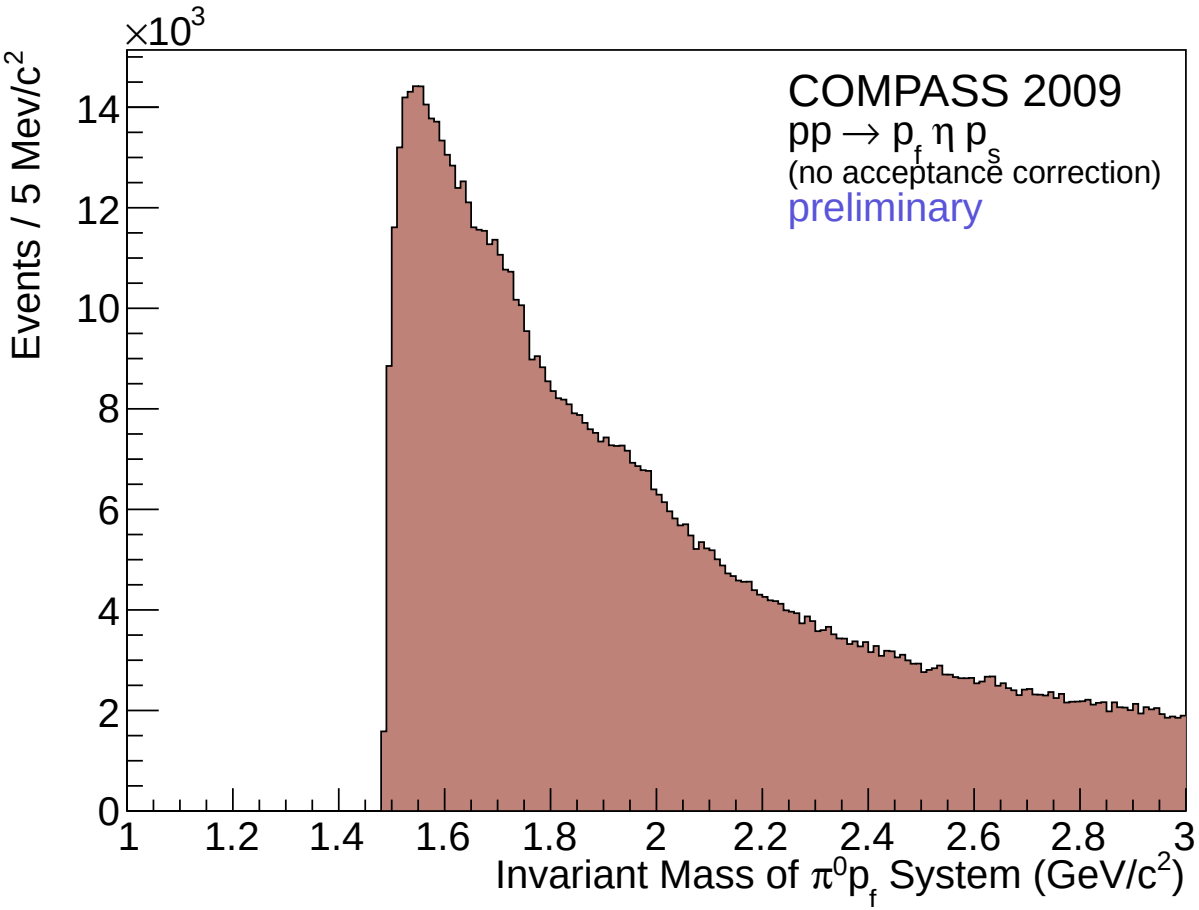
η identifiziert



n Events

$pp \rightarrow p_{rec} \eta p_f$

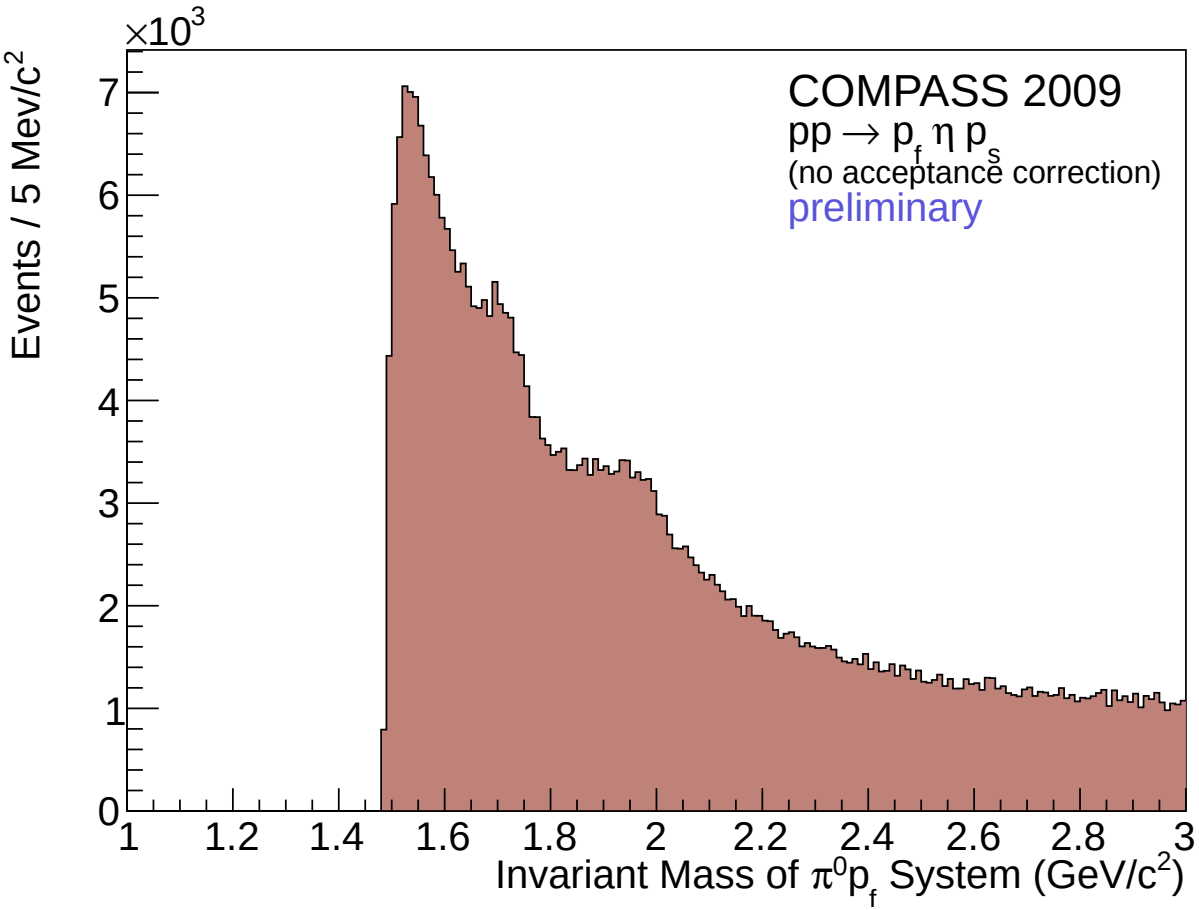
Coplanarity



n Events

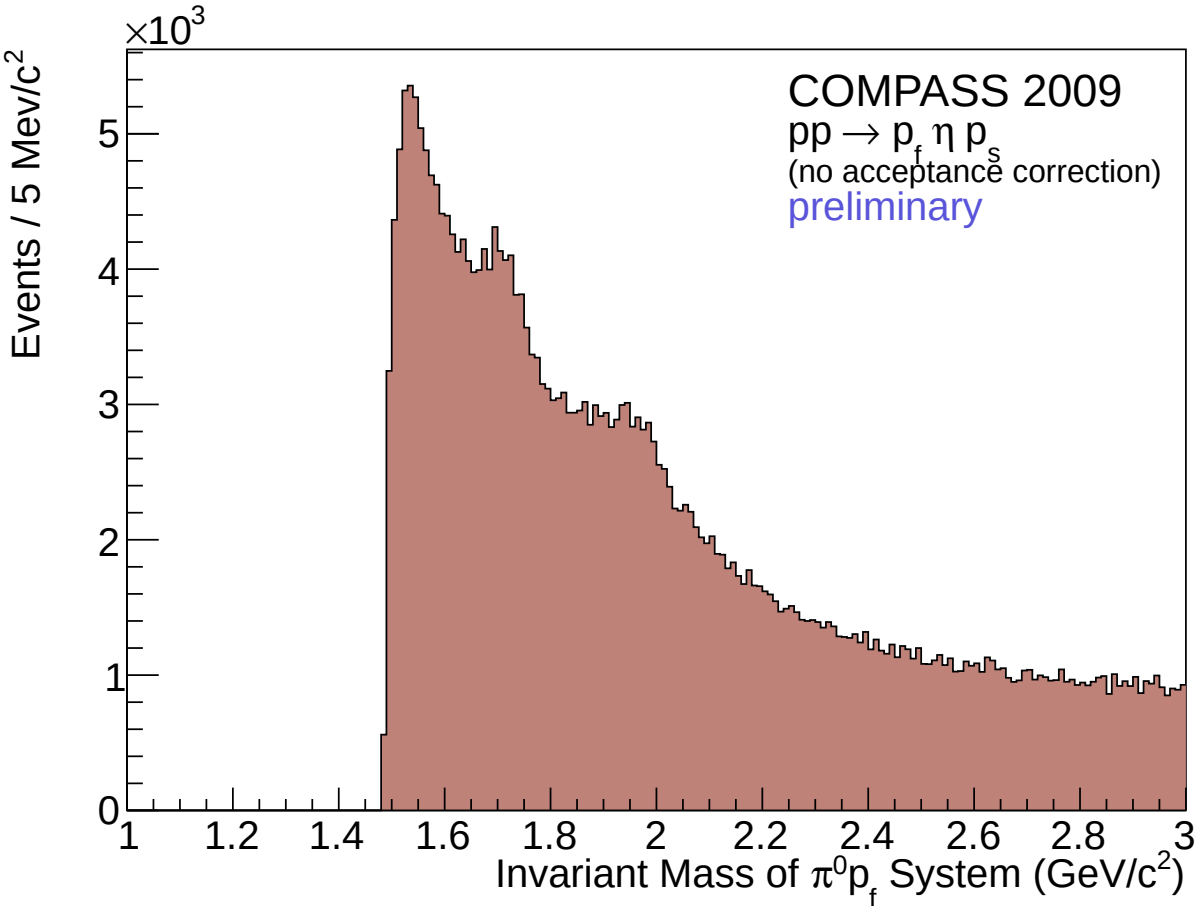
$pp \rightarrow p_{rec} \eta p_f$

Exclusivity



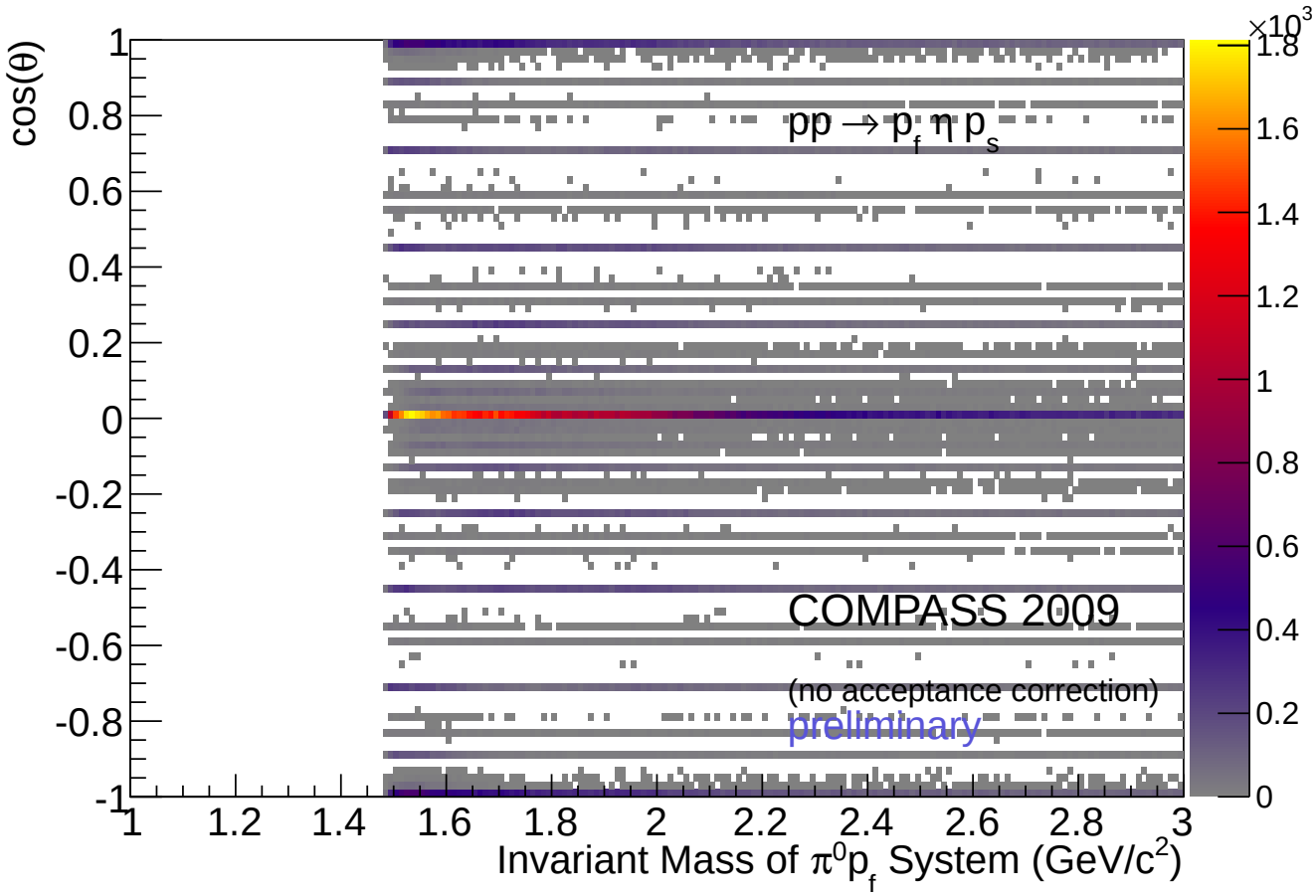
$pp \rightarrow p_{rec} \eta p_f$

$$0.1 < t' < 1.0$$



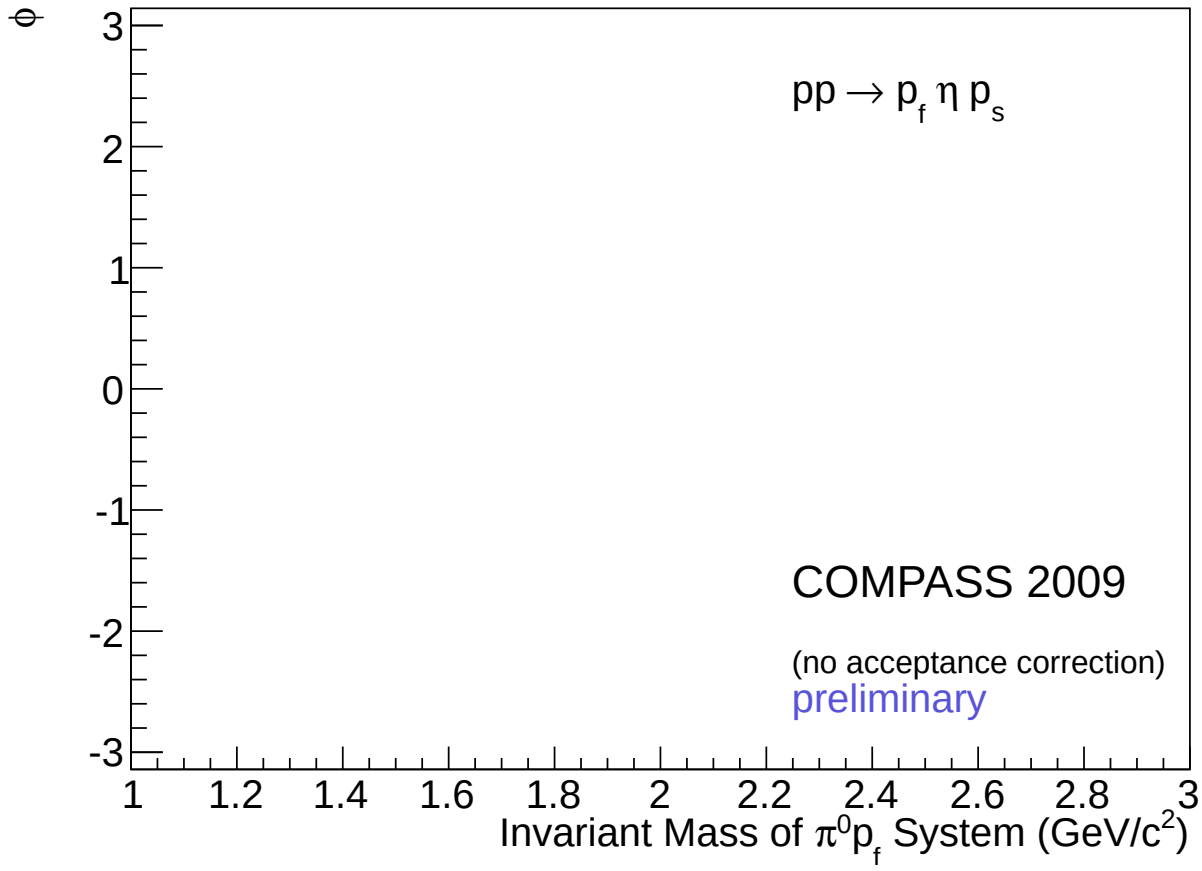
$pp \rightarrow p_{rec} \eta p_f$

Azimuthwinkel $\cos(\theta)$ gegen invariante Masse



$pp \rightarrow p_{rec} \eta p_f$

Polarwinkel ϕ gegen invariante Masse



BACKUP