

# Study of $p\bar{p} \rightarrow \chi_{c1,2} \rightarrow J/\psi\gamma$

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$$\bar{p}p \rightarrow \chi_{1,2} \rightarrow J/\psi\gamma \rightarrow \ell^+\ell^-\gamma$$

## Cross section

$$\sigma(\chi_{c1} \rightarrow J/\psi\gamma) \sim 1.7 \text{ nbarn}$$

$$\sigma(\chi_{c2} \rightarrow J/\psi\gamma) \sim 2 \text{ nbarn}$$

E835 Collaboration, Nucl. Phys. B 717, 34 (2005)

Background:  $\bar{p}p \rightarrow \pi^+\pi^-\pi^0$ :  $\sigma(\chi_{c2})=0.12 \text{ mb}$

CERN-HERA 70-03 (1970)

- Fast Simulation
- $J/\psi \rightarrow e^+e^-$ ;  $J/\psi \rightarrow \mu^+\mu^-$
- PID for Electrons: 1 Electron Loose; 1 Electron Tight (as in the Physics Book)
- PID for Muons: 1 Muon Loose; 1 Muon Tight (as in the Physics Book)
- PID for Photons: Neutral
- Bremsstrahlung effect for the electrons
- MC Truth Match
- 10.000 events generated
- Decay model:  $\chi_{c1,2} \rightarrow J/\psi\gamma$ : Chic1toJpsiGam
- Decay model:  $J/\psi \rightarrow \ell^+\ell^-$ : VLL

4C fit is performed and best  $\chi_{c1}$  candidate in each event is selected by minimal  $\chi^2$

# Results

Scenario proposed:

a) Nominal Setup:

MvdGem EmcBar Drc Dsc FwdSpec

b) w/o EMC:

MvdGem Drc Dsc FwdSpec

c) w/o FS:

MvdGem EmcBar Drc Dsc

d) w/o Disc DIRC:

MvdGem EmcBar Drc FwdSpec

e) STT only:

EmcBar Drc Dsc FwdSpec

## Reconstruction efficiencies

Scenario	$\chi_{c1}$		$\chi_{c2}$	
	Electron	Muon	Electron	Muon
a	48.1%	63.5%	48.6%	63.7%
b	14.2%	17.9%	13.9%	18.6%
c	40.1%	54.0%	40.8%	56.4%
d	47.8%	61.0%	48.2%	62.9%
e	27.4%	36.4%	28.3%	35.5%

Only with the scenario **b)** is impossible, to fit and measure the angular distributions.

## Background studies

Background:  $\bar{p}p \rightarrow \pi^+\pi^-\pi^0$ :  $\sigma(\chi_{c2})=0.12$  mb

$\chi_{c1}$		$\chi_{c2}$	
Electron	Muon	Electron	Muon
$1.1 \cdot 10^{-6}$	$9.0 \cdot 10^{-6}$	$2.2 \cdot 10^{-6}$	$1.4 \cdot 10^{-5}$