Search for Ω_c^0 at CLEO

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CLEO Collaboration

Preliminary

OUTLINE

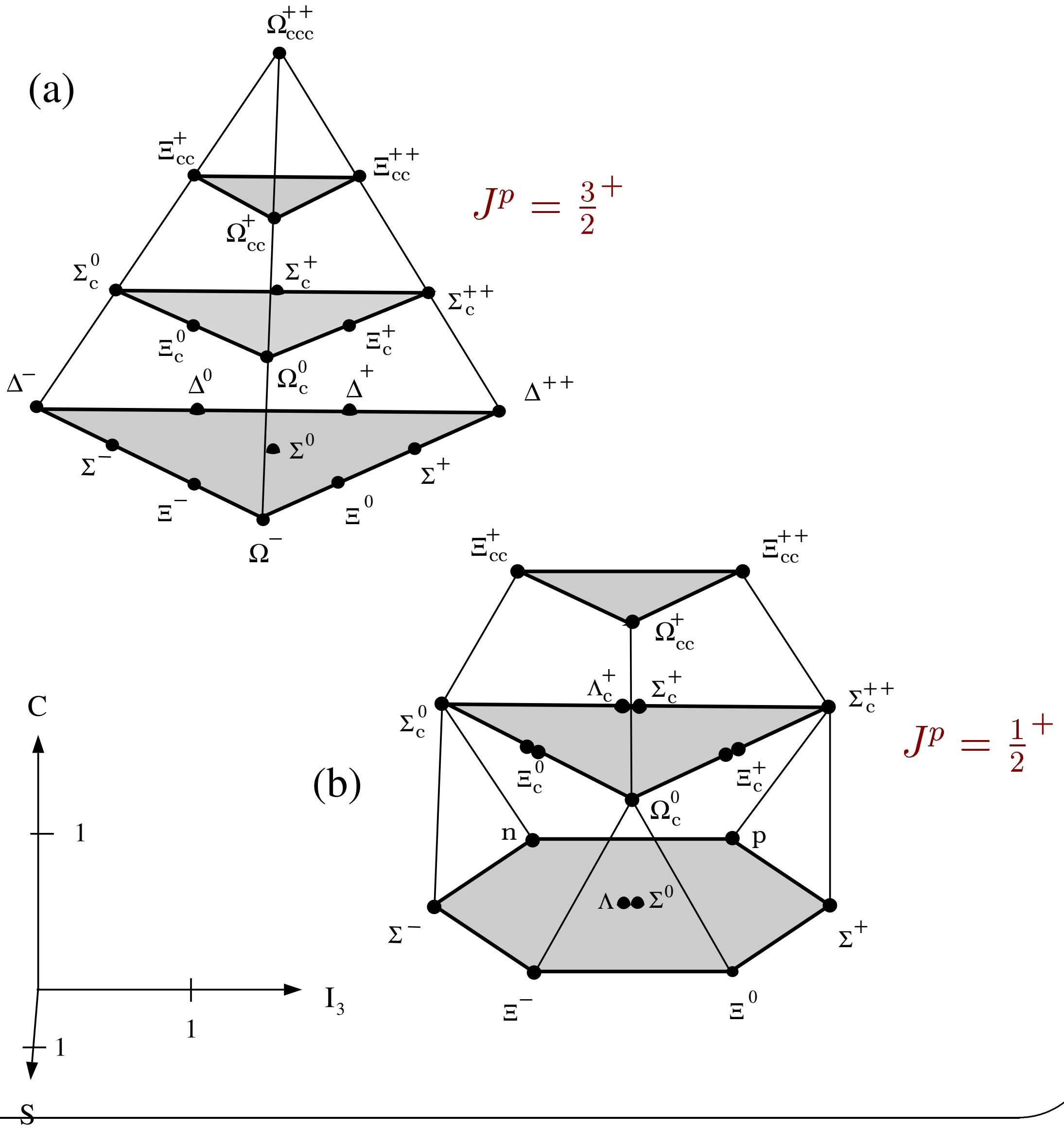
- **Motivation**
- **Brief History**
- **CLEO detector**
- **Data Sample & Event Selection**
- **Results**
- **Conclusions**

MOTIVATION

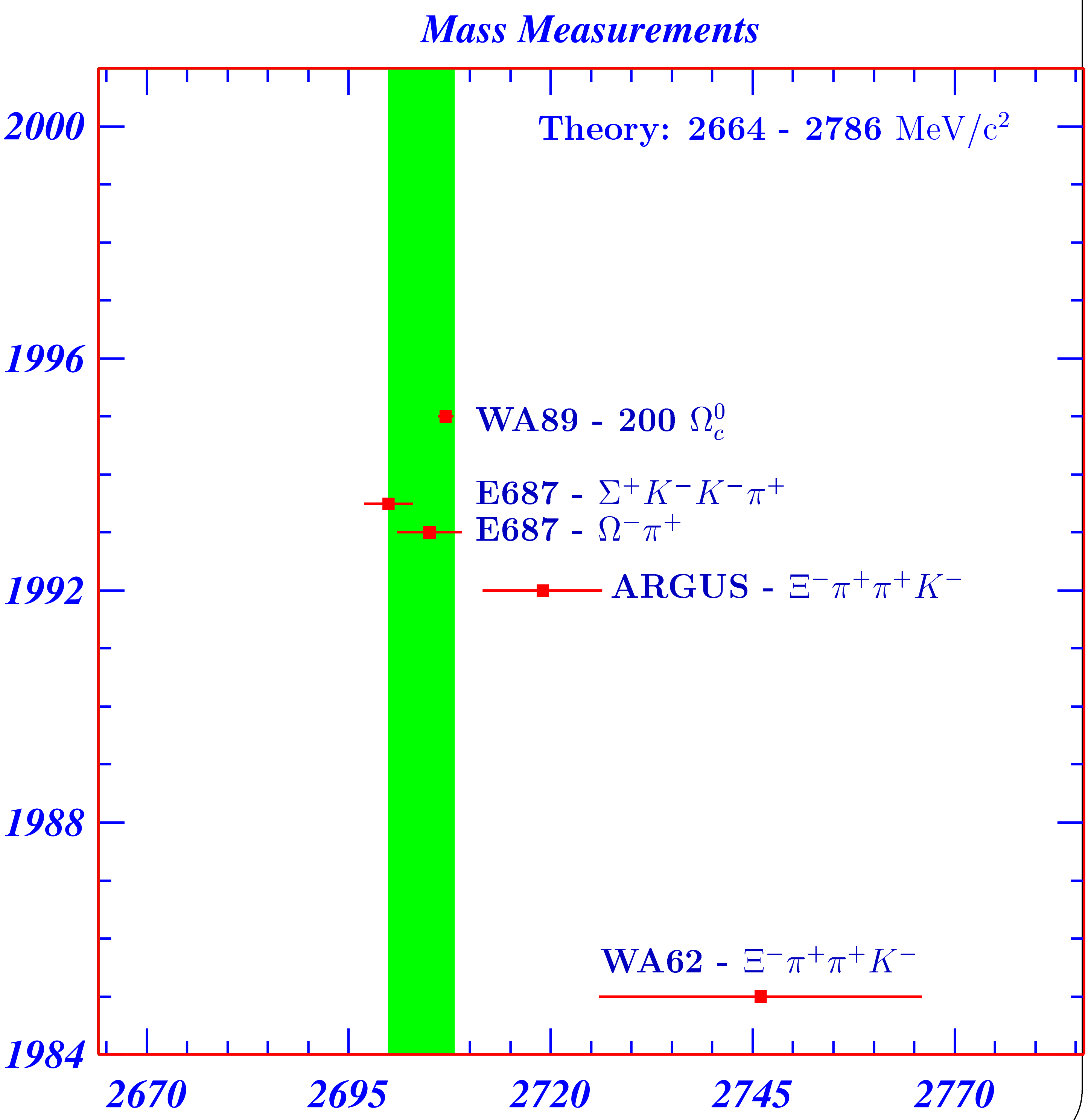
$\Omega_c^0(c\{ss\})$ is $J^p = \frac{1}{2}^+$ baryon - $\{ss\}$ symmetric light diquark Ψ

If the diquark is antisymmetric under SU(3): Λ_c^+, Ξ_c^0 and Ξ_c^+

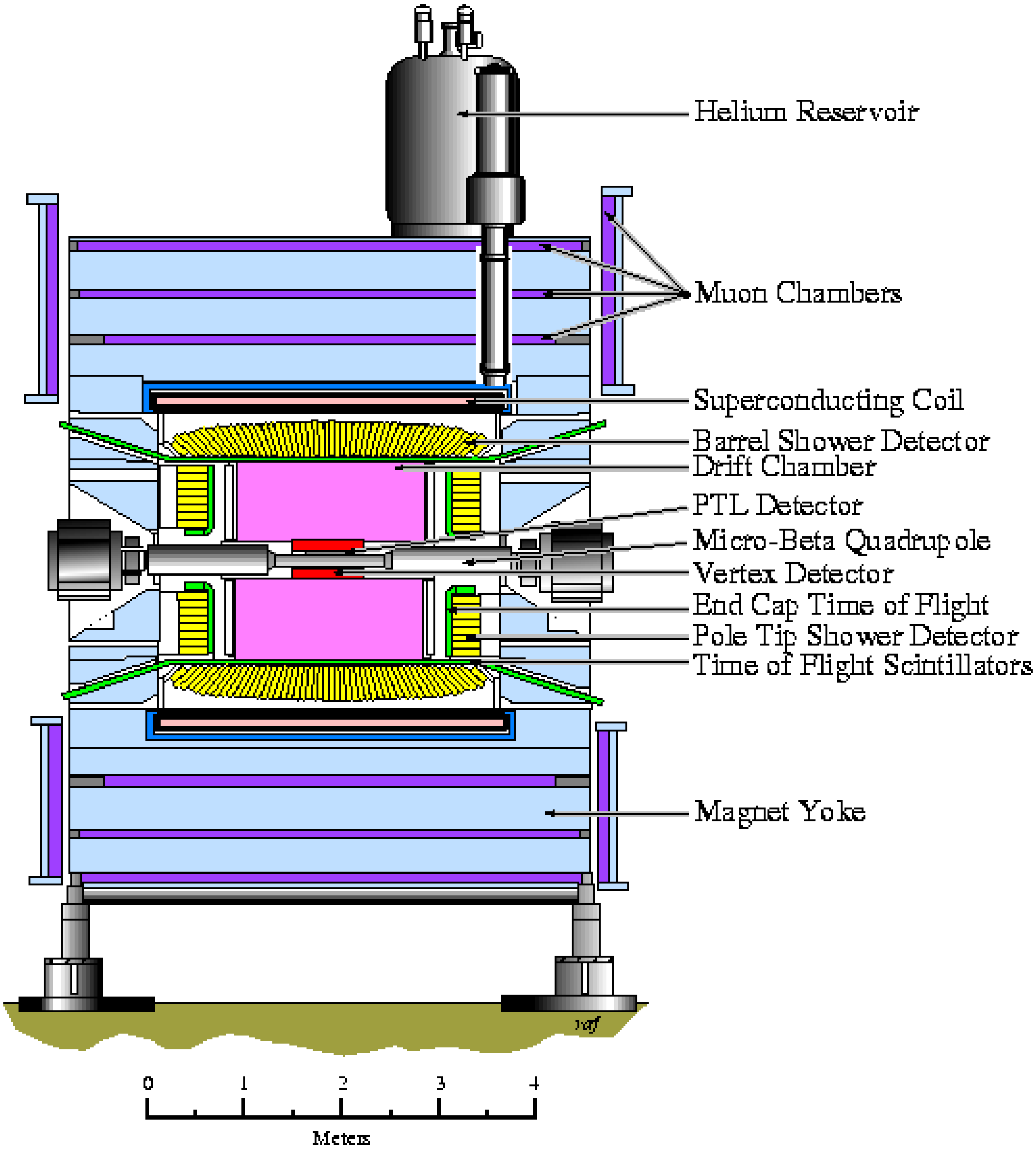
If the diquark is symmetric under SU(3): Σ_c^{++}, Σ_c^+, Σ_c^0, $\Xi_c^{0\prime}$, $\Xi_c^{+\prime}$ and Ω_c^0,



BRIEF HISTORY



CLEO DETECTOR



Decay Channels

Decay channels used for the present analysis are,

where $\Omega_c^0 \rightarrow \Omega^-\pi^+$
$\rightarrow \Omega^-\pi^+\pi^0$
$\rightarrow \Omega^-\pi^+\pi^+\pi^-$
$\rightarrow \Xi^0 K^-\pi^+$
$\rightarrow \Xi^- K^-\pi^+\pi^+$
$\rightarrow \Sigma^+ K^- K^-\pi^+$

Last mode was selected to search for mode found by **E-687**

where	$\Xi^- \rightarrow \Lambda\pi^-$	(99.9 %)
	$\Xi^0 \rightarrow \Lambda\pi^0$	(99.5 %)
	$\Omega^- \rightarrow \Lambda K^-$	(67.8 %)
	$\Sigma^+ \rightarrow$ p π^0	(51.6 %)
and	$\Lambda \rightarrow p\pi^-$	(63.9 %)

Data Set & Event Selection

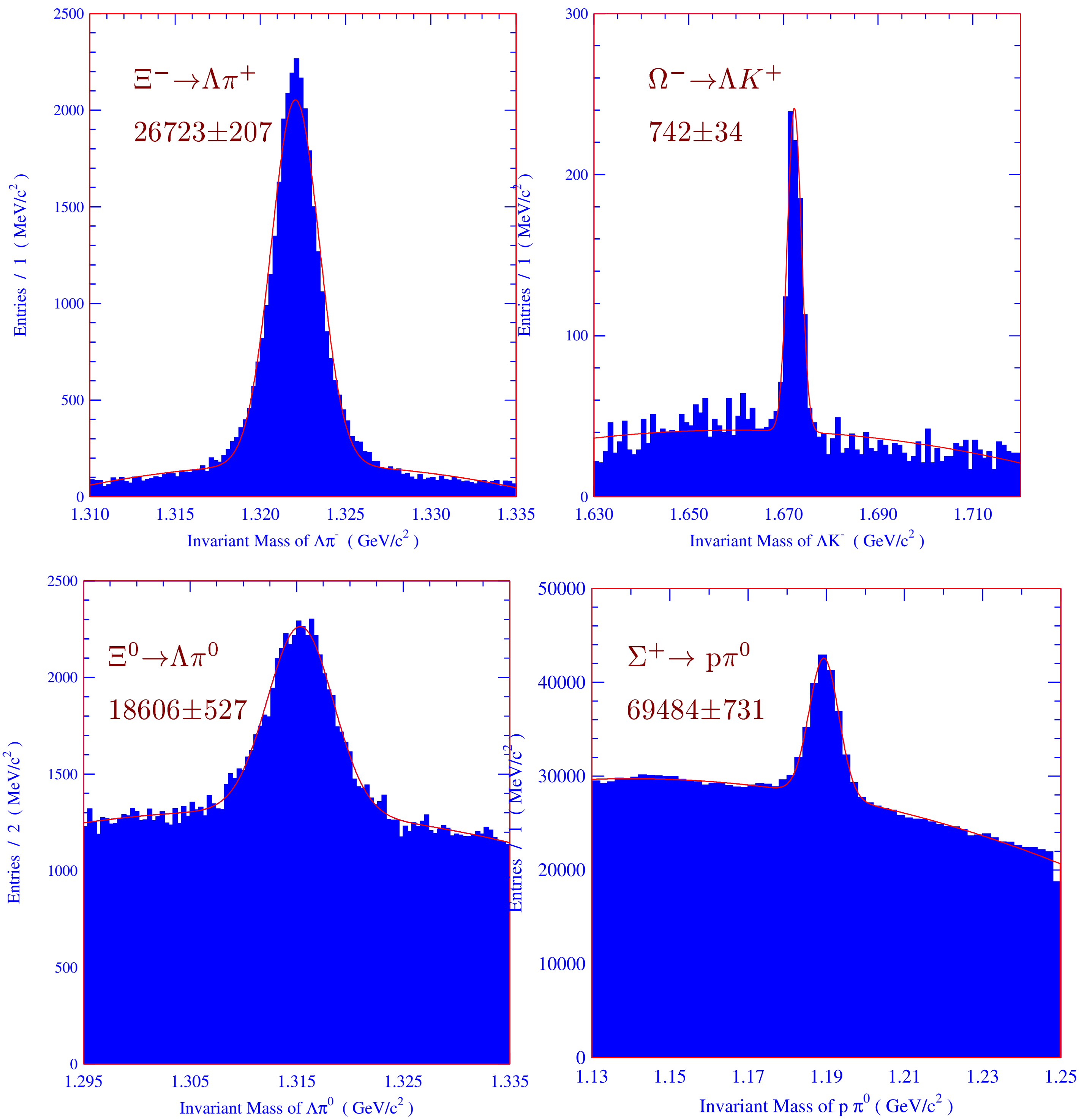
Data Set

- **Total integrated luminosity** $\sim 13.8\ \mathrm{fb}^{-}1$
- **On and just below** $\Upsilon(4S)$ **resonance around 10.5**GeV.

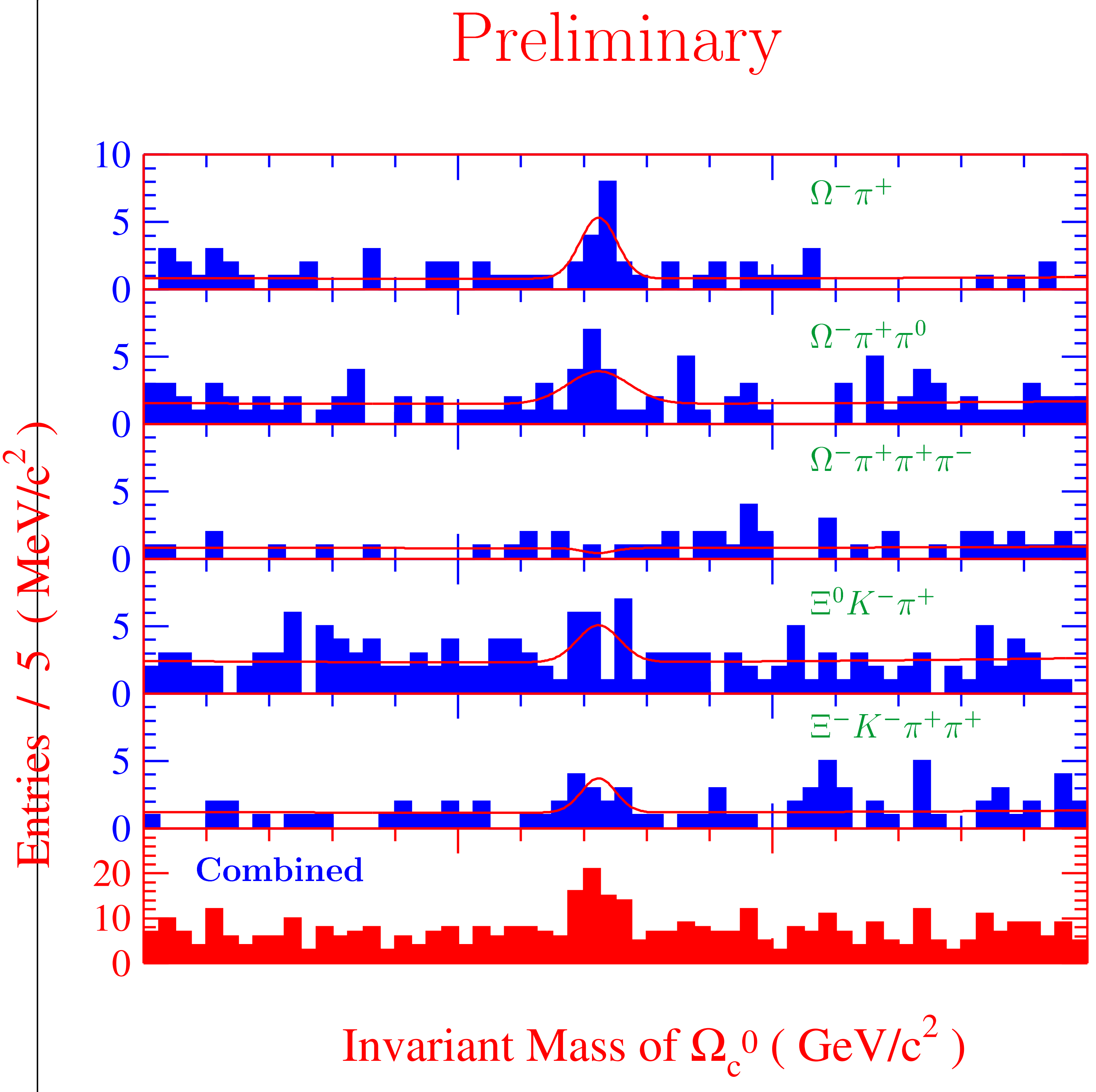
Charmed Baryons

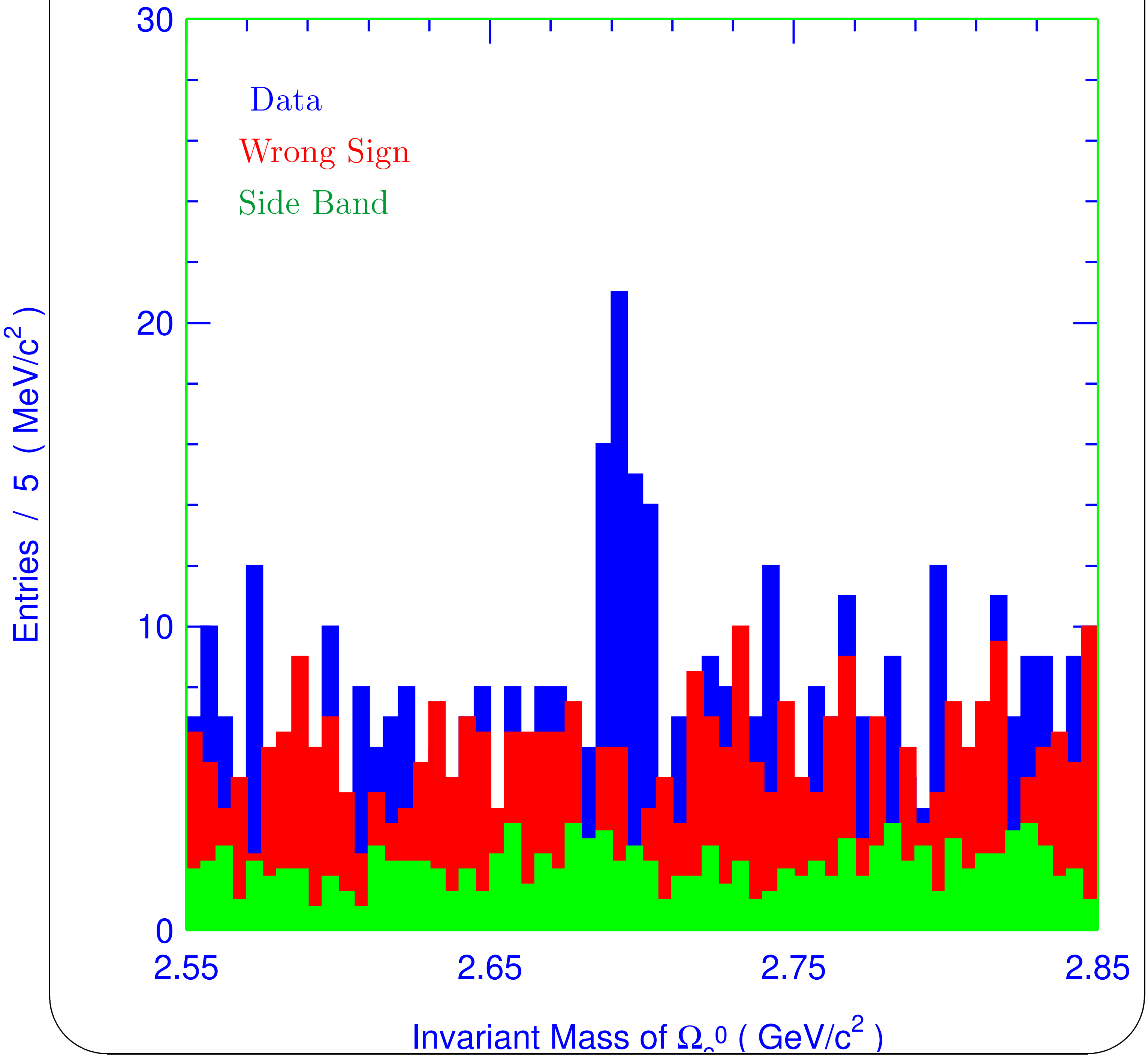
- **Secondary decays of** B **mesons.**
- e^+e^- **annihilations into** $c\overline{c}$ **jets.**
- **We define the scaled momentum** $x_p = \frac{P}{P_{max}}$
  $x_p = \frac{P}{\sqrt{{E_{beam}}^2 - M^2_{\Omega_c^0}}}$
- **Requiring** $x_p >$ **0.5**
  Eliminates combinatorial bkg - dominates at low x_p**.**
  Also charm baryons from B**s.**

Inclusive Hyperon Samples



Ω_c^0 - Reconstruction





Data
Wrong Sign
Side Band
30
20
10
0
2.55
2.65
2.75
2.85
Entries / 5 (MeV/c^2)
Invariant Mass of Ω_c^0 (GeV/c^2)

Summary

The Fit results

	Mass(MeV/c^2)	Fitted Yield
$\Omega^-\pi^+$		13.3±4.1
$\Omega^-\pi^+\pi^0$		11.8±4.9
$\Omega^-\pi^+\pi^+\pi^-$		-0.9±1.4
$\Xi^0\pi^+K^-$		9.2±4.9
$\Xi^-\pi^+\pi^+K^-$		7.0±3.7
$\Sigma^+K^-K^-\pi^+$	-	
Combined 5 modes	2694.7±1.6	40.4± 9.0

Relative Branching Fractions

	Relative BR	$\sigma.Br$ **fb**
$\Omega^-\pi^+$	1.0	$11.3\pm3.9\pm1.1$
$\Omega^-\pi^+\pi^0$	4.25±2.2	$47.7\pm18.1\pm5.7$
$\Omega^-\pi^+\pi^+\pi^-$	< 0.6	< 5.1 @ 90 % CL
$\Xi^0\pi^+K^-$	3.9±2.4	$43.8\pm22.2\pm6.1$
$\Xi^-\pi^+\pi^+K^-$	1.6±1.0	$18.0\pm9.8\pm2.5$
$\Sigma^+K^-K^-\pi^+$	< 4.8	< 53.8@ 90 % CL

SUMMARY

- **Unbinned Maximum Likelihood fit:**
  The fit gives 2694.6±2.6 MeV/c^2 **for** Ω_c^0.

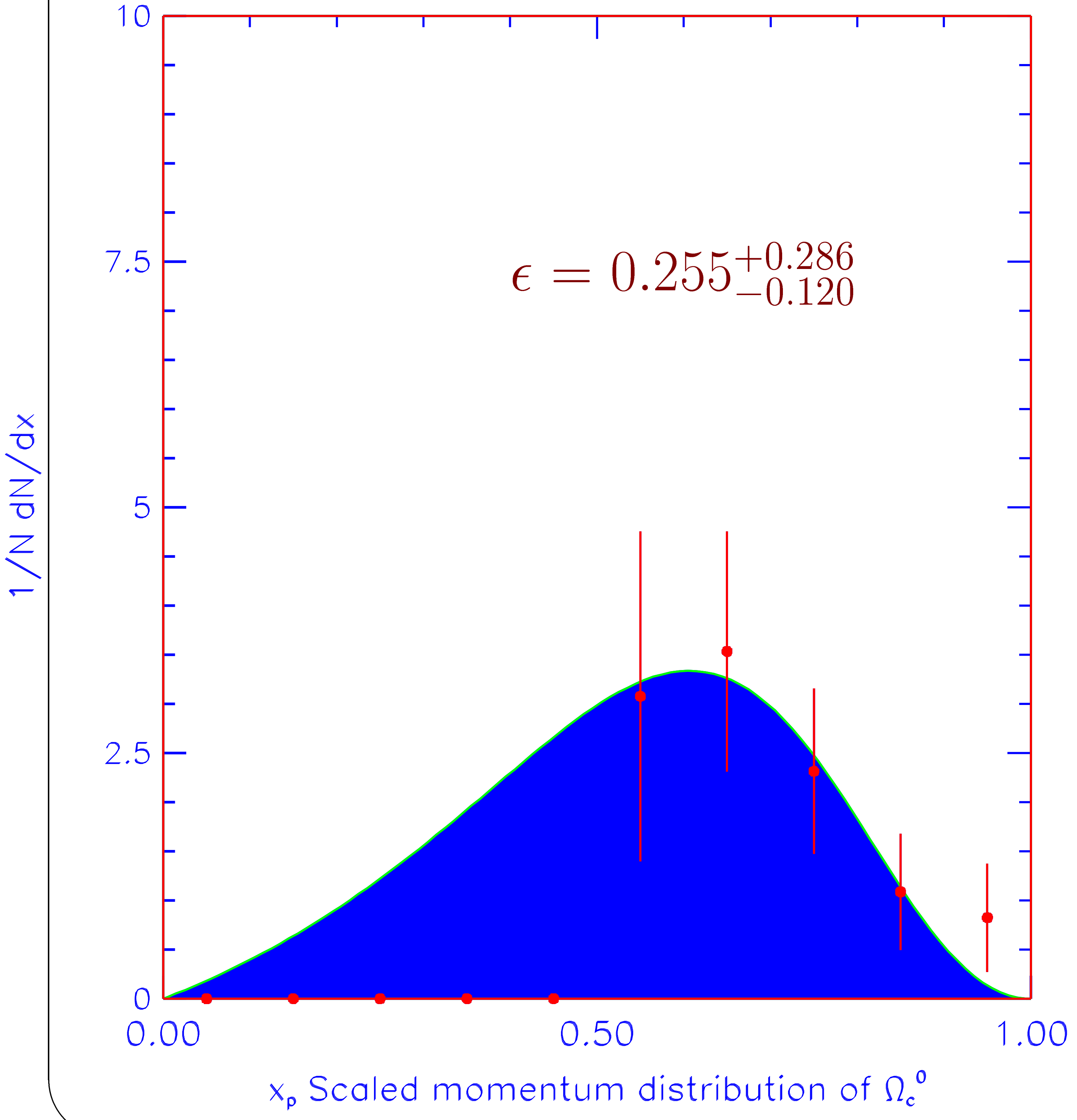
- **We assign the PRELIMINARY systematic error to mass: 3.0** MeV/c^2.
  Ω_c^0 **mass 2694.6±2.6±3.0** MeV/c^2.

- **Side band and Wrong charge study did not show any peaking in the signal region.**

- **Systematic uncertainties are under study.**

- **Momentum spectrum of** Ω_c^0 **is consistent with other charm baryons -** Λ_c^+ **and** Ξ_c.
  Peterson function is parameterized by ϵ.

Momentum Spectrum



CONCLUSIONS

Mass Measurements