BES Analysis Memo

Search for $\psi' \to \Omega^-\overline{\Omega}^+$

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-ABSTRACT-

We report on a search for exclusive $\Omega^-\overline{1}\Omega^+$ final states among 3.4 million $\psi(2S)$ events observed in the BES detector. We find no events and determine a 90% confidence upper limit of $Br(\psi' \to \Omega^-\overline{\Omega}^+) < 1.0 \times 10^{-4}$.

1 Data selection

The dominant Ω^- decay chain is

$$\begin{array}{llll} \Omega^- & \to & \Lambda K^- & Br = 0.678 \\ & \Lambda & \to p\pi^- & Br = 0.641, \end{array} \tag{1}$$

with a total branching fraction of 43% [1]. We look for $\psi' \to \Xi^{*0}\overline{\Xi^{*0}}$ events in events with the topology $\psi' \to p\overline{p}\pi^+\pi^-K^+K^-$, i.e. six charged tracks where the $p\pi^-$ and a $\overline{p}\pi^+$ are consistent with being from the decay of a Λ ($\overline{\Lambda}$). The proton's momenta range from 0.14 to 0.76 GeV; the pion's momenta range from 0 to 0.24 GeV, and the kaon's momenta range from 0.02 to 0.481 GeV.

We select events with six charged tracks in the polar angle region $\mid \cos\theta \mid \leq 0.8$ and with zero net charge. We reject events where *both* the highest momentum positive and negative tracks are identified as being both muons or both electrons. The is subjected to a 7-constraint kinematic fits to the $\psi' \to \Lambda\overline{\Lambda}K^+K^-$ hypothesis, with the ΛK^- invariant mass is constrained to equal that of the $\overline{\Lambda}K^+$. The fit is applied for each of the 36 particle assignment possibilities. Only the assignment with the best χ^2 is considered. A loose requirement of $\chi^2 < 50$ is applied. The exact same analysis was applied to a sample of 2000 Monte Carlo simulated events.

Figure 1a shows the ΛK^- mass distribution for the selected events. Figure 1b shows the same distribution for the selected Monte Carlo events. In the Monte Carlo event sample, the Ω^- shows up as a peak of 71 events near 1.672 GeV; all of the events are within 0.01 GeV of the nominal Ω^- mass of 1.672 GeV, which was used in the generator. There are no events in the data sample closer than 0.02 GeV to the nominal Ω^- mass.

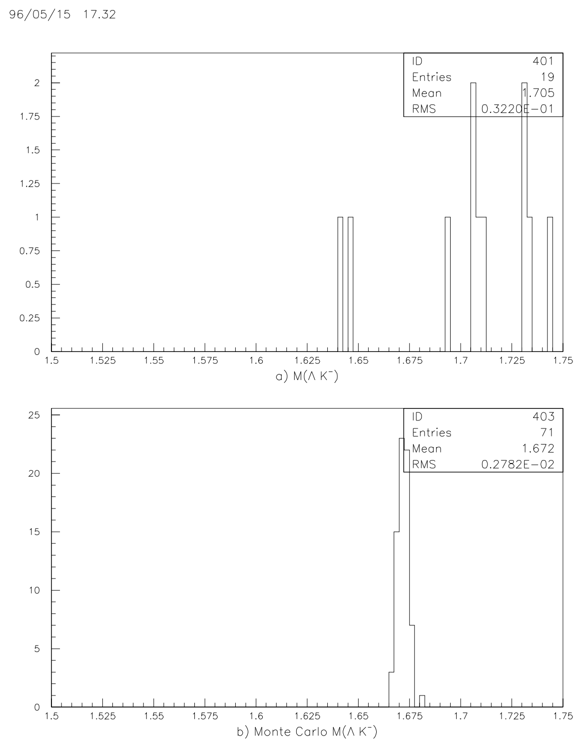

Figure 1: **a)** The ΛK^- invariant mass for the selected events from the data sample. **a)** The same distribution for the Monte Carlo event sample.

The effects of the various selection cuts on the data and the simulated event sample are summarized in Table **??**.

2 Results

We determine the 90% confidence level upper limit for the $\psi' \to \Omega^-\overline{\Omega}^+$ branching ratio from the relation

$$Br(\psi' \to \Omega^-\overline{\Omega}^+) < \frac{N_{evts}^{limit}}{N_{\psi'}\eta\ Br(\Omega^- \to \Lambda K^-)^2 Br(\Lambda \to p\pi^-)^2}, \tag{2}$$

where $N_{evts}^{limit} = 2.3$, $N_{\psi'} = (3.44 \pm 0.31) \times 10^6$ is the number of $\psi's$ in the events sample [2], $\eta = 0.035$ is the detection efficiency and the branching ratios $Br(\Omega^- \to$

Table 1: A tabulation of the $\Omega^-\overline{\Omega}^+$ selection cuts.

Numbers of events surviving each requirement

	94 data	95 data	Simulated events
Generated			2000
8 chrgd trks			505
$\sum q = 0$	334618	619912	437
less than 2 μ's	334152	618162	437
less than 2 μ's	333854	617600	437
$\lvert\cos\theta\rvert \leq 0.8$	178092	326922	264
2 good Λ's	28759	53379	205
$\chi^2_{8c} \leq 50$	8	11	71

$\Lambda K^-) = 0.678 \pm 0.007$ and $Br(\Lambda \to p\pi^-) = 0.641 \pm 0.005$ are taken from the PDG tables [1]. The result is

$$Br(\psi' \to \Omega^-\overline{\Omega}^+) < 1.0 \times 10^{-4}. \tag{3}$$

This mode is energetically inaccessible for J/ψ decays.

References

[1] L. Montanet *et al.* (Particle Data Group), Phys. Rev. **D50**, 1173 (1994).

[2] J.Z. Bai *et al.* (BES Collaboration), *Branching Fractions for ψ' Decays to Octet-Baryon Pairs*, paper submitted to the 1995 International Symposium on Lepton and Photon Interactions at High Energies, Beijing, China.