ϕ and ω Mesons from Dielectron Decays at STAR

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Resonances In Medium

• Resonance particles are short lived particles (strong interaction).
  - decay inside medium
  - sensitive to medium effects (mass shift, width broadening possible link to chiral symmetry restoration)

### Hadronic Decay
- Interact with hadronic medium
- Sensitive to lifetime of hadronic medium

### Leptonic Decay
- Less interaction with hadronic medium
- Small branching ratio ~10^{-4}

<table>
<thead>
<tr>
<th>Resonance</th>
<th>Lifetime [fm/c]</th>
<th>decays (BR)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ϕ (1020)</td>
<td>46.3</td>
<td>K^{+}K^{-}, e^{+}e^{-} (10^{-4})</td>
</tr>
<tr>
<td>ω (782)</td>
<td>23.2</td>
<td>π^{+}π^{-}π^{0}, e^{+}e^{-} (10^{-5})</td>
</tr>
</tbody>
</table>
\[ \phi(1020) \rightarrow e^+e^- \] Signal

After Background Subtraction

Normalized Mixed Event Background

Electron identification

\[ \Delta \beta^{-1} / \beta^{-1} \text{(TOF)} \]

STAR Preliminary

Au+Au (0-80\%) \[ \sqrt{s_{NN}} = 200 \text{GeV} \]
Mass and width are in agreement with the simulation.

→ No mass shift or width broadening
Comparison to Hadronic Decay


d^2N/2\pi dp_T dy \left( \text{GeV/c} \right)^2

\sqrt{s_{NN}} = 200\text{GeV}

STAR Au+Au (0-80%)
- Run4 $\phi \rightarrow K^+K^-$ (stat. err)
- Run10 $\phi \rightarrow e^+e^-$
- Errors are stat. + sys.

Line shows a fit to the Run4 result

No significant difference between hadronic and leptonic decay channel within the errors.

This study $\phi \rightarrow e^+e^-$ (0-80%)

$<p_T> = 0.87 \pm 0.05 \pm 0.07 \ [\text{GeV/c}]$

dN/dy = 2.87 \pm 0.17 \pm 0.23

Run4 $\phi \rightarrow K^+K^-$ (0-80%)

$<p_T> = 0.96 \pm 0.01 \ [\text{GeV/c}]$

dN/dy = 2.68 \pm 0.15

(Stat. err only)

\( \omega(782) \rightarrow e^+e^- \)

Production in p+p and Au+Au

- p+p and Au+Au results are consistent with the predictions based on a Tsallis-Blast-Wave fit.
- p+p results are consistent with PHENIX results.

Measurement of \( \omega \) mass and width are under study.

Summary

• The $\phi \to e^+e^-$ result is **consistent** with $\phi \to K^+K^-$ result.

• **No mass shift or width broadening** beyond the known detector effects are observed for $\phi$ mesons.

• The $\omega$ meson production in dielectron channel in $p+p$ and $Au+Au$ is measured and agrees with previous measurements.

• At BES physics program high statistics data is needed.