A brief look at $B_s^0 \to \psi(2S)\phi$ and $B_s^0 \to J/\psi\phi$

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Goal of thesis

- Measure the two decays
  - $B_s^0 \to \psi(2S)\phi$
  - $B_s^0 \to J/\psi\phi$
- And their corresponding ratio

$$\frac{B_s^0 \to \psi(2S)\phi}{B_s^0 \to J/\psi\phi}$$

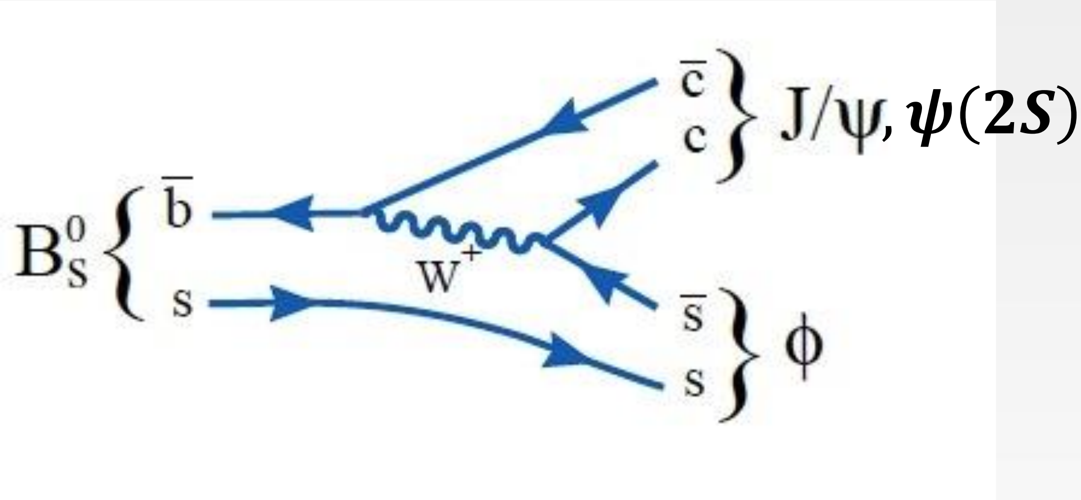
For our analysis

- To guarantee identical topologies we let
- $B_s^0 \to \psi(2S)\phi$
  - $\phi \to K^+K^-$
  - $\psi(2S) \to \mu^+\mu^-$
- $B_s^0 \to J/\psi\phi$
  - $\phi \to K^+K^-$
  - $J/\psi \to \mu^+\mu^-$

Monte Carlo Samples

- Signal
- Background
  - 3 inclusive J/ψ decays
    - $pp \rightarrow J/\psi X$, where X is any possible particle
    - $b\bar{b} \rightarrow J/\psi X$
    - $b\bar{b} \rightarrow \mu^{+}\mu^{-}X$
  - Peaking background
    - $B_s^0 \rightarrow \psi(2S) f_0(980)$, $f_0(980) \rightarrow \pi^{+}\pi^{-}$ (most dominant)
    - $B_s^0 \rightarrow J/\psi f_0(980)$, $f_0(980) \rightarrow \pi^{+}\pi^{-}$ (most dominant)

Feynman diagram



Why?

- Sheds light on of t'he major mysteries
- B_s^0 & $\overline{B_s^0}$ are not exact mirror images
- Difference related to CP violating phase

$$B_s^0 \rightarrow \psi(2S)\phi$$
$$B_s^0 \rightarrow J/\psi\phi$$

Thank you!

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