$B_d^0 \to J/\Psi K_s^0$

Initial luminosity at LHC : $L \leq 10^{33} cm^{-2} s^{-1}$

- $5 * 10^{12}\ b\bar{b}$/year $(10^4 pb^{-1})$
- $5 * 10^7\ B_d^0 \to J/\Psi K_s^0 \to \mu^+\mu^-\pi^+\pi^-$ events/year

CP violation asymmetry:

$$A(t) = \frac{N(B_d^0 \to \Psi K_s^0) - N(\overline{B}_d^0 \to \Psi K_s^0)}{N(B_d^0 \to \Psi K_s^0) + N(\overline{B}_d^0 \to \Psi K_s^0)} = sin2\beta * sin(x_d t/\tau)$$

Time integrated asymmetry:

$$A = D_{int} * sin2\beta \quad D_{int} = \frac{x_d}{1 + x_d^2} = 0.48 \quad (x_d = 0.73)$$

Experimental dilution factors:

$$\begin{aligned} A &= D_{int} * D_{tag} * D_{s/b} * sin2\beta \\ & D_{tag} = 1 - 2w \quad w = \text{fraction of wrong tags} \\ & D_{s/b} = \frac{N_s}{N_s + N_b} \end{aligned}$$

$$\Rightarrow \delta(sin2\beta) = \frac{1}{D_{int} D_{tag} D_{s/b} \sqrt{N_s + N_b}}$$

Tagging methods considered:

- associated B semileptonic decay (μ or e)
- same side tag: $B^{**+} \to B_d^{0*}\pi^+$