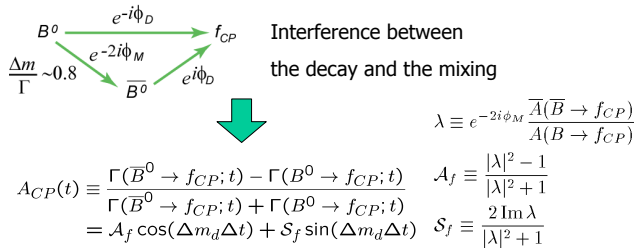


# Measurement of CP-Violation Parameter $\sin 2\phi_1$ with 152 Million $B\bar{B}$ pairs

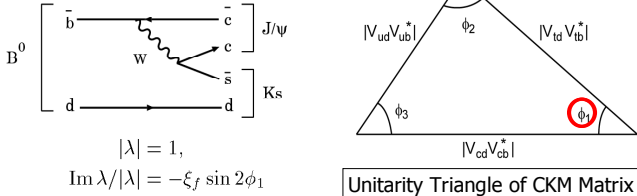


Koji Hara (Osaka University) for the Belle collaboration

## CP violation in $B^0 \bar{B}^0$ system



## $b \rightarrow c\bar{c}s$ decays in the SM



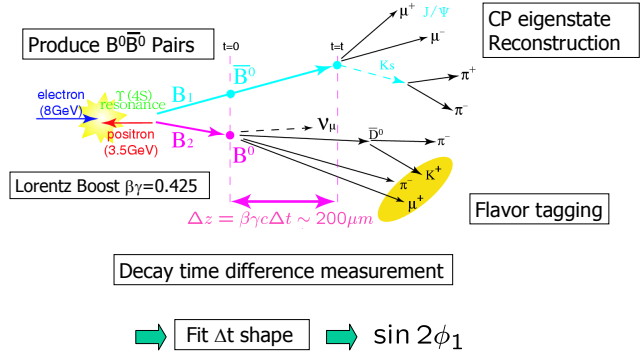
$$A_{CP} = -\xi_f \sin 2\phi_1 \sin(\Delta m_d \Delta t)$$

( $\xi_f$ : CP eigenvalue of the final state)

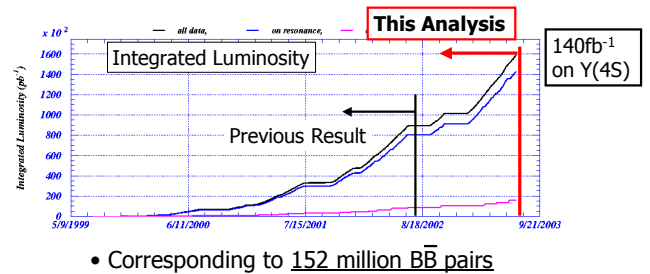
## Previous Result of $\sin 2\phi_1$

- 78fb<sup>-1</sup> (85 million  $B\bar{B}$ ) Data
- $\sin 2\phi_1 = 0.719 \pm 0.074 \pm 0.035$
- $|\lambda| = 0.950 \pm 0.049 \pm 0.026$
- Agree with the SM well

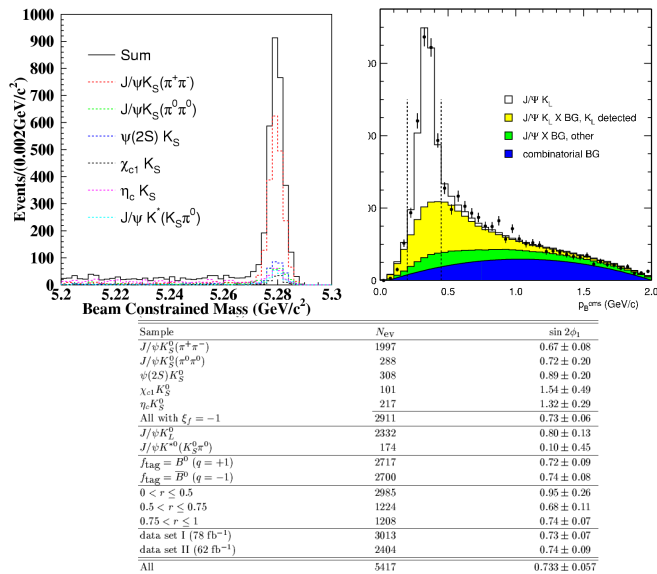
## Principle of the measurement



## Data Sample



## CP Eigenstate Sample

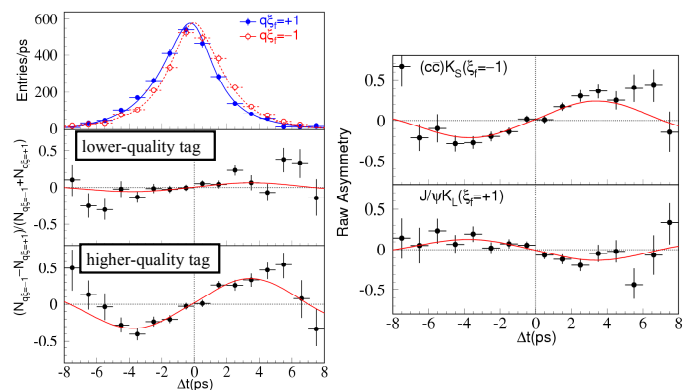


## Null Asymmetry Test

Fit to non-CP eigenstate modes  $B^0 \rightarrow D^{*\mp} \ell^+ \nu, J/\psi K^{*0}(K^+ \pi^-)$

$\rightarrow 0.012 \pm 0.013(\text{stat})$

## Fit Results



Result of unbinned maximum likelihood fit:

$$\sin 2\phi_1 = 0.733 \pm 0.057(\text{stat}) \pm 0.028(\text{syst})$$

Fit with  $|\lambda|$  and  $a_{CP} \equiv -\xi_f \operatorname{Im} \lambda / |\lambda|$ :

$$|\lambda| = 1.007 \pm 0.041(\text{stat})$$

$$a_{CP} = 0.733 \pm 0.057(\text{stat})$$