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## Prospect for measurement of the CP-violating phase $\phi_s$ in the $B_s \rightarrow J/\psi\phi$ channel at a future Z factory

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The CP-violating phase  $\phi_s$ , the  $B_s$  decay width ( $\Gamma_s$ ), and the  $B_s$  decay width difference ( $\Delta\Gamma_s$ ) are sensitive probes to new physics and can constrain the heavy quark expansion theory. The potential for the measurement at future Z factories is studied in this manuscript. It is found that operating at Tera-Z mode, the expected precision can reach:  $\sigma(\phi_s) = 4.6 \text{ mrad}, \sigma(\Delta\Gamma_s) = 2.4 \text{ ns}^{-1}$  and  $\sigma(\Gamma_s) = 0.72 \text{ ns}^{-1}$ . The precision of  $\phi_s$ is 40\% larger than the expected precision with the LHCb experiment at HL-LHC. If operating at 10-Tera-Z mode, the precision of  $\phi_s$  can be measured at 45\% of the precision obtained from the LHCb experiment at HL-LHC. However, the measurement of  $\Gamma_s$  and  $\Delta\Gamma_s$  cannot benefit from the excellent time resolution and tagging power of the future Z-factories. Only operating at 10-Tera-Z mode can the  $\Gamma_s$  and  $\Delta\Gamma_s$  reach an 18\% larger precision than the precision expected to be obtained from LHCb at HL-LHC. The control of penguin contamination at the future Z-factories is also discussed.

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