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## Measurement of time-dependent CP violation in $B^0 \rightarrow J/\psi K_S^0$ decays using early Belle II data

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The Belle II experiment at the SuperKEKB energy-asymmetric  $e^+e^-$  collider is a substantial upgrade of the B factory facility at the Japanese KEK laboratory. The design luminosity of the machine is  $8 \times 10^{35} \text{ cm}^{-2}\text{s}^{-1}$  and the Belle II experiment aims to record  $50 \text{ ab}^{-1}$  of data, a factor of 50 more than its predecessor. From February to July 2018, the machine has completed a commissioning run, achieved a peak luminosity of  $5.5 \times 10^{33} \text{ cm}^{-2}\text{s}^{-1}$ , and Belle II has recorded a data sample of about  $0.5 \text{ fb}^{-1}$ . Main operation of SuperKEKB has started in March 2019. In this presentation we report a measurement of the time-dependent CP violation parameter for  $B^0(\bar{B}^0) \rightarrow J/\psi K_S^0$  using this early data set. One neutral  $B$  meson is reconstructed in the  $J/\psi K_S^0$   $CP$ -eigenstate decay channel and the flavor of the accompanying  $B$  meson is identified to be either  $B^0$  or  $\bar{B}^0$  from its decay products. We present a new concept for the time-dependent  $CP$  violation fit together with initial results for the parameters of  $B^0$  mixing-induced phenomena and the lifetime of  $B^0$ .

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