

Study of $B_s \rightarrow D_s^{(*)} D_s^{(*)}$ and $B_s \rightarrow \phi \phi$ Decays at CDF II

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Under certain theoretical assumptions, the branching fraction of $B_s \rightarrow D_s^{(*)} D_s^{(*)}$ is directly sensitive to the relative decay width difference $\Delta\Gamma_{CP}/\Gamma$ in the B_s system, which is predicted to be sizable in the standard model. Using approx. 4 fb⁻¹ of data collected by the CDF II detector at the Tevatron ppbar collider, we are currently performing an exclusive selection of $B_s \rightarrow D_s^{(*)} D_s^{(*)}$ signal candidates in several hadronic modes. In contrast to former branching fraction measurements of this decay, we will be able to disentangle $B_s \rightarrow D_s^{(*)} D_s^{(*)}$ and measure the branching fractions of $B_s \rightarrow D_s^{(*)} D_s^{(*)}$, $B_s \rightarrow D_s^{(*)} D_s^{(*)}$, and $B_s \rightarrow D_s^{(*)} D_s^{(*)}$ separately.

Yet another interesting mode is the decay of the B_s into a ϕ pair: this is a vector-vector decay dominated by $b \rightarrow sss$ penguin transition which is a sensitive probe for possible new physics effects. The only existing sample of this mode was reconstructed by the CDF experiment from 0.2 fb⁻¹ of data, and consisted of only 8 signal events. Here we present new results based on a clean sample of about 300 $B_s \rightarrow \phi \phi$ decays reconstructed by the CDF II detector in a dataset with an integrated luminosity of about 3 fb⁻¹.

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