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S-waves and the measurement of beta_s in Bs decays

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The CP Violating asymmetry in Bs mixing (beta_s) is one of the most promising measurements where physics beyond the Standard Model could be revealed. Currently, such measurements are only a 5% likely to be consistent with SM expectations [1]. While this is not yet a significant deviation it does imply that such measurements should be subject to great scrutiny. The mode Bs -> J/psi phi has been used, and the mode Bs -> phi phi proposed for future measurements. These modes both have two vector particles in the final state and thus angular analyses must be used to disentangle the contributions from CP+ and CP- configurations. All publications of beta_s results thus far have not considered the possibility of a substantial S-waves masquerading as low mass K+K- pairs. These could well be the result of a final state formed from an s-quark-anti-s-quark pair in a 0+ spin-parity state, such as the fo(980) meson. I will show estimates of the S-wave contribution to the J/psi phi final state based on Ds decays into K+K-pi+/pi+pi-pi+ [2], and K+K-e+nu/pi+pi-e+nu final states [3]. This S-wave contribution needs to be taken into account in determining beta s by including an S-wave amplitude in the fit. This may change the central value of current results and will also increase the statistical uncertainty [2,4]. I will also show estimates of the relative Bs decay rate into J/psiØfo(980), where fo->pi+pi-. Comparisons will be made with theoretical models [5,6]. The J/psi@fo(980) mode has been suggested as a CP eigenstate that could yield an independent value of beta s. I will show an estimate of the sensitivity relative to J/psi phi [7]. Specific strategies are proposed for the Bs -> phi phi mode where two S-waves are possible. [1] CDF and D0 Combined Working Group, "Combination of DØ and CDF Results o Delta Gamma_s and the CP-Violating Phase beta_s"CDF/PHYS/BOTTOM/CDFR/9787, DØ Note 5928-CONF (2009).

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Author: Prof. STONE, Sheldon (Syracuse University)

Co-author: Dr ZHANG, Liming (Syracuse University)

Presenter: Prof. STONE, Sheldon (Syracuse University)

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