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Coherent Beam-Beam Simulations*

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The study of coherent beam-beam phenomena in electron-positron storage rings requires the use of simulations in which both beams are allowed to affect each other. To date these have assumed Gaussian beam distributions for the field calculations. This, however, turns out to inhibit the occurrence of coherent resonances. We have developed a new technique for calculating the fields due to general beam distributions. In simulations that employ this technique we find a new class of coherent phenomena. Higher order coherent resonances, that have a period-n, anti-correlated variation of the beam sizes, limit performance at the tunes investigated. The widths of these resonances depend inversely on the damping decrement of the ring.

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