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Circulant Matrix Model For Flat Beams: First Steps.

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The circulant matrix model was successfully used to study mode coupling instabilities in the presence of electromagnetic wakefields, space-charge, beam-beam interactions and active feedbacks. The following work shows the implementation of beam-beam interactions with flat beams in the code BimBim in order to address issues encountered in electron positron collider such the FCC-ee or SuperKEKB. The computation of the linearised coherent beam-beam force is optimised using a semi analytical approach. The tune shifts obtained with the new model are benchmarked against theoretical predictions. First results related to collective instabilities driven by synchrotron resonance, so called $\langle x, z \rangle$ instabilities, are compared to those obtained with existing models. The promising results show the potential of this model for the estimation of performance limitations linked to beam instabilities in high energy electron-positron colliders.

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