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Calculation of beam sizes in coupled electron storage rings

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The description of coupling phenomena in electron storage rings is extended beyond the very common formula based on the coupled Hamiltonian [1] into the region where the small coupling is in competition with damping and diffusion from synchrotron radiation. In the derivation, the moment mapping approach is used in combination with the simplified simulation of radiation effects introduced by Hirata and Ruggiero [2]. The results of this theoretical approach are compared to the predictions of well-established theories dealing with coupling in electron storage rings: The envelope mapping approach from Ohmi, et al. [3], and Chao's SLIM approach [4].

[1] G. Guignard, "Betatron coupling and related impact of radiation", Phys. Rev. E 51, 6104, June 1995, or his contributions to CERN Accelerator Schools

[2] K. Hirata, F. Ruggiero in "Treatment of Radiation for Multiparticle Tracking in Electron Storage Rings", Part. Acc. Vol. 28, pp. 137-142 (1990)

[3] K. Ohmi, et al., in "From the Beam-Envelope Matrix to Synchrotron-Radiation Integrals", Phys. Rev. E, Vol. 49, p. 751

[4] A. Chao, in "Evaluation of Beam Distribution Parameters in an Electron Storage Ring", J. Appl. Phys. 50, 595 (1979) or SLAC-PUB-2143, June 1978

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Footnotes

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Yes

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