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RF for large heavily loaded rings: limiting factors and promising new developments

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Super B-factory designs under consideration expect to reach luminosities in the 10^{35} - 10^{36} range. The dramatic luminosity increase relative to the existing B-factories is achieved, in part, by significantly raising the beam currents stored in the electron and positron rings. In such machines beam loading effects drive the RF system design. The main effects are the synchronous phase transients due to the uneven ring filling patterns and the longitudinal coupled-bunch instabilities driven by the fundamental impedance of the RF cavities. A systematic approach to predicting such effects and for optimizing the RF system design will be presented. Existing as well as promising new techniques for reducing the effects of heavy beam loading will be described and illustrated with examples from the existing storage rings including PEP-II and KEKB.

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