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Simulation study on power loss in the coupling cavity damper of the accelerating π/2 mode for the SuperKEKB ARES cavity

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In the SuperKEKB electron-positron collider, the coupled-bunch instability caused by the accelerating mode of RF cavities becomes severe in high beam current. To suppress it, the ARES cavities have been used. The accelerating cavity is coupled with an energy storage cavity via a coupling cavity between them. While the beam is accelerated by the π/2 mode, the parasitic 0 and π modes are damped by a coaxial damper at the coupling cavity without damping the π/2 mode. However, as the beam current becomes higher, some of the accelerating field of the π/2 mode is absorbed by the damper. This is because the π/2-mode field is deformed when two frequency tuners in the accelerating and storage cavities are moved for the optimum tuning condition. This effect increases power load of the damper, which can be an issue at higher beam current. Our high-power test showed that the power loss was higher than a prediction of the equivalent circuit model. Thus, using the CST MW Studio, we simulated the power loss and studied the relation between the power loss and the detuning frequency. We compare the simulation and high-power test results and discuss the possibility of new frequency tuning schemes.

Footnotes

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Region represented

Asia

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