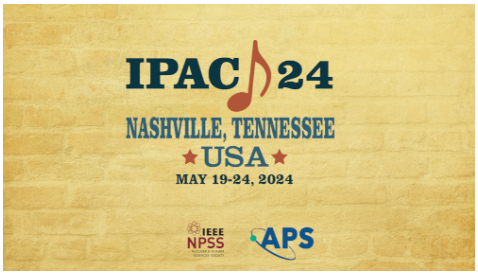

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Updating the RF system model in beam-cavity interactions under heavy beam loading effects

Thursday, 23 May 2024 16:00 (2 hours)

This study presents a refined model of radio frequency (RF) systems by the transfer function perspective of the Pedersen model on the basis of microwave RLC circuit model. While the former concentrates on the signal variation or error analysis, focusing on the cavity-beam interaction. the latter emphasizes the signal's properties within the system, allowing for seamless integration with components like controllers. Recognizing the limitations of the Schilcher model under certain conditions, such as the uncontrolled synchronous oscillation caused by the change in cavity voltage under heavy beam loading, a problem that has been overlooked. Therefore, it combines Pedersen model frequency-domain analysis results with the time-domain analysis conclusions of the new model, providing recommendations for system parameter and controller settings. The resulting model not only offers a more accurate representation of real RF systems but also facilitates digitalization, thus contributing to the innovation of Low-Level RF (LLRF) control systems.

Footnotes

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Region represented

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