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2D BPM Simulation Codes: BEM and FEM fusion

In the world of 2D electromagnetic and electrostatic modeling the two prevalent approaches are the finite-element and boundary-element methods (FEM and BEM). BpmLab (FEM) developed in ALBA in 2017, and BEM (i.e. BEM) developed in Diamond in 2004, both made for Matlab, have been extensively used across synchrotron labs and accelerator machines for the last 10 years. These codes precisely meet the needs of the Accelerator community, offering rapid and precise simulations of BPM sensitivity function and other related effects. Other alternatives are not as straightforward and accessible (like the expensive codes CST, HFSS) or much older and limited (as Poisson, GdFidl, etc.). This work summarizes the capabilities and potential of these 2D codes: arbitrary geometry layout, wall current and sensitivity function calculation, 2D response maps and various non-linearity correction methods, showing the benefits of a possible fusion between both FEM and BEM

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