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The concept of coupling impedance in the plasma wake field excitation as a new tool for describing the self-consistent interaction between the driving beam with the surrounding plasma

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Within the framework of the Vlasov-Maxwell system of equations, we describe the self-consistent interaction of a relativistic charged-particle beam with the surroundings while propagating through a plasma-based acceleration device. This is done in terms of the concept of coupling impedance (both longitudinal and transverse) in full analogy with the conventional accelerators. It is shown that also here the coupling impedance is a very useful tool for the Nyquist-type stability analysis. Examples of specific physical situations are finally illustrated.

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