

A New Local Field Quantity Describing the High-Gradient Limit of Accelerating Structures

Tuesday 2 December 2008 14:40 (20 minutes)

A new local field quantity which gives the high gradient performance limit of accelerating structures in the presence of vacuum rf breakdown is presented. A model of the breakdown trigger based on the pulsed heating of a potential breakdown site by the field emission currents and driven by a new field quantity, a modified Poynting vector, has been derived. The field quantity S_c takes into account both active and reactive power flow on the surface. This new quantity has been evaluated for many X-band and 30 GHz rf tests, both travelling wave and standing wave, and the value of S_c achieved in the experiments agrees well with analytical estimates.

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Session Classification: Plenary Session (Chair R.M.Jones)