Cockcroft Institute Colloquium

Investigation of optimised electromagnetic fields in SRF cavities for the ILC

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Abstract

The International Linear Collider (ILC) project aims at colliding electrons and positrons at an initial centre of mass energy of 500 GeV with high luminosity, and thus will allow scientists to probe new energy regimes. A superconducting radio frequency (SRF) cavity will be used to accelerate bunches of particle beams to the design energy before delivering them to the collision point. The major financial cost of the ILC lies in the area of the main linacs. These linacs are based on the TESLA design. An option being considered to reduce the overall footprint and project cost is to enhance the cavity gradient. This research concerns itself with my new cavity design with a view to reaching higher gradients. This design is focussed on minimising the surface electromagnetic fields and maximising the bandwidth of the accelerating mode. This new shape, which is referred to as the New Low Surface Field (NLSF) design, bears a similarity to the current Ichiro and Reentrant designs. A design of a complete nine-cell cavity, including power couplers and higher order mode damping couplers is presented. An equivalent circuit model theory is applied to represent the radio frequency (rf) mode properties of the cavity for both the fundamental accelerating mode and higher order modes.