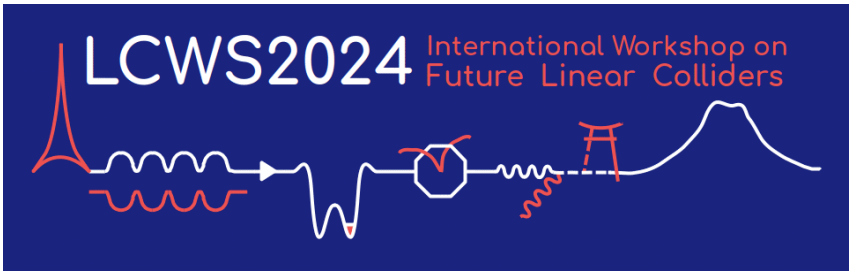

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A Wakefield Resilient, High Shunt Impedance Accelerating Structure for the Cold Copper Collider

Wednesday, 10 July 2024 11:20 (20 minutes)

The initial proposed design of the Cold Copper Collider (C3) is based on a distributed coupling accelerating (DCA) rf structure where the phase advance between the accelerating standing wave cavities is π. In these cavities the aperture radius is 2.624 mm and the corresponding shunt impedance is 300 MΩ/m with 77K copper walls. We propose a novel DCA rf structure with 3π/4 phase advance between the individually fed cavities aperture radius of 3.55mm for the same shunt impedance and the peak field constraints. Because of this 35% larger aperture, this rf structure is much more resilient to both short-range and long-range wakefield effects. The researchers at SLAC have already proposed and designed a 3π/4 DCA with four feeding waveguide manifolds. The implementation of four waveguide manifolds is, however, mechanically challenging. Here, we present a novel 3π/4 DCA for C3 which is based on only two waveguide manifolds. This rf structure comprises of 56 cavities where cavities are fed in pairs through a standard π phase advance rf manifold. This is achieved by pairing the cavities as, first and third, second and forth, and so on. With such pairing, the phase advance between the two cavities in a pair is π/2 and the phase advance between successive pairs is π. The copper cavities are designed to give a coupling coefficient of 1.82 at 77K temperature, as required for critical coupling to accelerate 190 mA with 70 MV/m gradient.

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