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The need for Nb3Sn coated Cu cavities for future accelerators

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Based on current efforts in the U.S. on the novel concept of parallel-feed RF accelerator structures, and in the U.S. and abroad in producing Nb3Sn films on either Cu or bronze, we rec-ommend that the Particle Physics community foster R&D in Superconducting Nb3Sn coated Cu RF Cavities instead of costly bulk Nb. The paper includes methods to process the coated cavi-ties at temperatures consistent with Cu retaining its shape. A devoted global effort in develop-ing Cu cavity structures coated with Nb3Sn would make the ILC or Higgs factories more afforda-ble and more likely to be built. Not only do parallel-feed RF structures enable both higher ac-celerating gradients and higher efficiencies, but they would be applicable to both Cu and Nb3Sn coated Cu cells. Increased effort on these two techniques would synergize expenditures to-wards progress, which will converge on the choice of technology for the RF of an ILC or any fu-ture accelerator. The current methods of Nb3Sn coatings on Cu or bronze can be geared also towards standard cavity cells. In conclusion, the use of distributed coupling structure topology within improved performance parameters together with Nb3Sn coating technology can lead to a paradigm shift for superconducting linacs, with higher gradient, higher temperature of opera-tion, and reduced overall costs for any future collider.

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