Name of submitting author	Dr. Derun Li
Institution	Lawrence Berkeley National Laboratory
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Abstract Title	Challenges of normal conducting RF cavities for a muon collider
Author/Affiliation listing	Lawrence Berkeley National Laboratory
Abstract	Address challenges and report status and progress of normal conducting RF cavity R&D of muon ionization cooling channels, a key technology needed for future muon collider.
Summary	
Ionization cooling, essential for achieving the emittances required for a muon collider, works by passing the muon beam through a material, causing energy loss, and then restoring that energy in RF cavities with frequencies in the 200-800 MHz range. The performance of a cooling channel improves with increasing RF gradients. Furthermore, the highest-performance channel designs have multi-Tesla magnetic fields at the RF cavities; however experimental results have indicated that achieving high RF gradients in the presence of magnetic fields is challenging. This talk will present experimental and theoretical results related to RF cavities for a muon collider. It will discuss the effects of varying the magnetic field configuration at the cavities, modifying the material used for the cavity walls, the use of gas in the cavity (including how the interaction of the beam with the gas affect cavity performance), and other ideas that have been explored. .References: http://map.fnal.gov/	

Name of submitting author	Dr. Jean-Luc Vay
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Abstract Title	Efficient Particle-In-Cell algorithms for modeling of advanced accelerators
Author/Affiliation listing	J.-L. Vay, C. Benedetti, C.G.R. Geddes, E. Esarey, C.B. Schroeder, W.P. Leemans – Lawrence Berkeley National Laboratory D.P. Grote, R.H. Cohen, A. Friedman – Lawrence Livermore National Laboratory E. Cormier-Michel, D.L. Bruhwiler, B. Cowan – Tech-X Corporation
Abstract	We report on recent advances in the modeling of advanced accelerators using Particle-In-Cell methods, including: Lorentz boosted frame, tunable electromagnetic solver, laser injection from a moving plane, stride-based digital filtering, improved envelope solvers, Lorentz invariant and large-timestep “drift-Lorentz” particle pushers, mesh refinement.

Summary

Numerical simulations have been critical in the recent rapid developments of advanced accelerator concepts. Among the various available numerical techniques, the Particle-In-Cell (PIC) approach is the method of choice for self-consistent simulations from first principles. The fundamentals of the PIC method were established decades ago but improvements or variations are continuously being published. We report on several recent advances in PIC related algorithms that are of interest for application to advanced accelerators. For the modeling of laser plasma accelerators, the Lorentz boosted frame technique provides orders of magnitude speedups over calculations in the laboratory frame of reference. Limitations that were preventing the realization of the full potential of the method have been removed, in part by the utilization of novel algorithms: electromagnetic solver with tunable numerical dispersion, laser injection from a moving plane and st ride-based digital filtering. Simulations of deeply depleted beam-loaded stages have been reported for stages up to 1 TeV with a speedup over a million times over standard laboratory frame PIC simulations. An envelope description of the laser is sometimes used but has been limited in the past to stages with low depletion. Improved envelope solvers are presented that now enable the modeling of moderately depleted stages. We also describe Lorentz invariant and large-timestep “drift-Lorentz” particle pushers, that have been developed respectively for the modeling of ultra-relativistic and arbitrarily magnetized species. Methods integrating mesh refinement with PIC will also be reported. Work supported by US-DOE Contracts DE-AC02-05CH11231, DE-AC52-07NA27344 and DE-SC0000840, and the US-DOE SciDAC program ComPASS. Used resources of NERSC, supported by US-DOE Contract DE-AC02-05CH11231.

Name of submitting author	Valery Dolgashev
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Abstract Title	PLENARY: Progress on high-gradient structures
Author/Affiliation listing	Valery A. Dolgashev, SLAC National Accelerator Laboratory
Abstract	We present review of recent results of the R&D efforts directed toward increasing operating gradients of normal conducting accelerating structures. This work includes study of the basic physics of rf breakdown phenomena, high power tests of full scale accelerating structures, and development of alternative approaches to high gradient accelerators.

Summary

We present review of recent results of the R&D efforts directed toward increasing operating gradients of normal conducting accelerating structures. This work includes study of the basic physics of rf breakdown phenomena, high power tests of full scale accelerating structures, and development of alternative approaches to high gradient accelerators. The basic study includes both experiments to understand effects of rf magnetic fields on statistical properties of rf breakdowns and in-situ microscopic diagnostics in both rf and DC experiments. In addition to these experiments, we discuss advances in theoretical models describing properties of the rf breakdown. The tests of full-scale accelerating structures show how complex geometries affect the rf breakdowns properties. In experiments these full-scale structures employ major features to suppress multi-bunch wakes for future linear colliders. We will also discuss the potential of alternative approaches to increase accelerating gradient such as dielectric-rf–powered, dielectric-wakefield accelerators, photonic-band gap structures, multi-frequency cavities. We also show possible applications of high-gradient research such as the recently proposed high gradient electron linac therapy machine, x-band rf guns and compact proton accelerators.