Name of submitting author	Jonathan Wurtele
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Abstract Title	**Principles of Particle Acceleration**
Author/Affiliation listing	Department of Physics, UC Berkeley and Center for Beam Physics, LBNL
Abstract	Two complementary perspectives on particle acceleration are discussed. One considers the Lorentz force and energy gain, while the second looks at fields, spontaneous emission and energy conservation. These are equivalent and both are shown to be useful in understanding and categorizing acceleration methods. Useful theorems on acceleration are presented.

Summary

I will focus on simple acceleration concepts rather than complicated equations, technology, or the status of the AAC field. I will attempt to provide an overarching framework under which the various accelerator schemes proposed and studied at this 15th Advanced Accelerator Concepts Workshop can be understood. For linear acceleration (where the energy gain is proportional to the external electric field providing the acceleration) two complementary viewpoints are discussed. The first is a particle perspective. Charged particles are accelerated by the Lorentz force and hopefully exit an accelerating region with greater energy than they entered. The properties of near and far fields constrain the accelerator system and some useful theorems [1,2] will be discussed. The second viewpoint [1-3] is field-centric. From a field perspective, there can be no acceleration without spontaneous emission, since it is the interference of the spontaneous emission with the accelerating wave in the far field region (away from the interaction region with the accelerated particles) that ensures conservation of particle and field energy. Thus, each acceleration mechanism has a corresponding radiation generation mechanism (e.g., the Inverse FEL and the FEL). These dual perspectives will be illustrated by examples from the concepts that are to be discussed this week. Nonlinear effects (with respect to the fields), such as ponderomotive acceleration from an intense laser pulse, will be examined and contrasted with linear acceleration schemes. Practical advice on how to find useful free references [4] will be discussed.

References:

1. R. Palmer, An Introduction to Acceleration Mechanisms, in Lecture Notes in Physics 296 (1988). DOI: 10.1007/BFb0031487 and Acceleration Theorems, Proc. 6th AAC Workshop (1995); dx.doi.org/10.1063/1.48253.

2. M. Zolotorev, S. Chattopadhyay and K. McDonald, A Maxwellian Perspective on Particle Acceleration, Online note puhep1.princeton.edu/~mcdonald/examples/vacuumaccel.pdf

3. M. Xie, A Theorem on Particle Acceleration, Proc. 2003 Accelerator Conference, accelconf.web.cern.ch/AccelConf/p03/PAPERS/TPPG017.PDF

4. Free online resources on accelerator physics include texts and course notes. Among them are the USPAS Particle Accelerator School class notes (uspas.fnal.gov), the CERN Accelerator School Series (cas.web.cern.ch/cas/) and textbooks such as Alex Chao's Physics of Collective Beam Instabilities in High Energy Accelerators (www.slac.stanford.edu/~achao/wileybook.html) and Stan Humphries: Principles of Charged Particle Acceleration, www.fieldp.com/freeware/pcpaccel.pdf)

Name of submitting author	Dr. Thomas Antonsen Jr.
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Abstract Title	**Tutorial: Computation for Advanced Accelerators**
Author/Affiliation listing	**Institute for Research in Electronics and Applied Physics** **University of Maryland**
Abstract	This tutorial will attempt to cover aspects of computation that are relevant to advanced accelerators.
Summary	
Computation has become a key element of accelerator research and development. This tutorial will attempt to cover, at an elementary level, aspects of computation that are relevant to advanced accelerators. The first half will introduce important basic concepts such as grid based and nongrid-based algorithms, and discuss issues of numerical accuracy and numerical stability. The second half will focus on computational issues that are of particular importance to plasma based accelerator concepts.	

Name of submitting author	Prof. James Rosenzweig
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Abstract Title	**Principles of Accelerating Structures**
Author/Affiliation listing	James Rosenzweig, UCLA Dept. of Physics and Astronomy
Abstract	This presentation will pedagogically discuss the concepts needed to understand current linear accelerator structures, and the different aspects that are introduced when one passes to advanced concepts such as laser and wake-driven structures, as well as plasmas.

Summary

We introduce the principles guiding the physical design considerations for accelerating structures. We first discuss the historically dominant metal-based electromagnetic accelerator cavities, both normal- and super-conducting and introduce critical concepts and terminology underpinning such elements. We then discuss the revolutionary changes in structures needed to enable very high gradient (GV/m-class), high frequency (up to optical-IR) operation. These structures will be excited by lasers or wakefields, will likely employ dielectric materials, and may be designed using photonic concepts. We then discuss the plasma accelerator from the vantage point of its similarities and differences with respect to a standard accelerator.