

Cockcroft Institute Seminar

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At Stanford University

Tuesday 13th May 2014, 15:00
Walton Rooms A & B, The Cockcroft Institute

Advanced High Frequency Acceleration

During the last few years, we have successfully gained a qualitative understanding of the basic physics of breakdown phenomena in high vacuum RF structures. We have been able to use this knowledge of geometrical effects and material properties to develop accelerator structures with gradient well above the state of the art. It has now been demonstrated that room temperature linacs can operate at gradients up to 175 MV/m 6x the gradient of the best superconducting structures. However, operation at these high gradients requires extremely high power rf sources, which with current technology, are not very cost-effective. These problems will become even more pronounced with the next generation of high gradient structures. To push the gradient further, the scaling laws we developed would require higher frequency, shorter filling time and equivalently very short pulses. Initial investigation shows the possibility of a 1GV/m structure at W-band that operates for only 3 ns. The next stage of development must address efficient production and utilization of RF power for linacs as well as high gradient structure technologies. This is not a simple task. The technologies used for high power RF sources have a long history and appear to be mature, with only minor improvements likely. We need to create a paradigm shift in the art. To this end, we should cross-fertilize the art from other disciplines, utilize the unique characteristics of the linacs to create specialized sources, and conduct active research on all fronts for energy recovery at every stage, from wall plug to accelerator structure. We will present a vision for this required R&D.