Contribution ID: **102** Type: **Contributed Oral**

Short Pulse High Gradient Accelerating Structures

Tuesday, 8 November 2022 16:00 (30 minutes)

RF breakdown and pulse heating are the greatest obstacles to increasing the accelerating gradient. Numerous experiments have shown that the RF breakdown and pulse heating thresholds depend on the exposure time of the structure to the RF fields. The idea described here is to accelerate particles by short (nanosecond or subnanosecond) duration wakefields in a structure assembled of individually fed cells. Because there are no high-power efficient sources of such radiation, we focus on wakefield structures where witness bunches are accelerated by radiation generated by drive bunches. One of successful wakefield experiments has been carried out at Argonne Wakefield Accelerator facility. About 400 MV/m gradient was obtained at X-band photoinjector powered by 9 ns RF pulses. To substantially enhance the efficiency of short pulse structures we propose using of a periodic pulsed regime. In this regime the repetition rate of the excited RF pulses is equal to the repetition rate of the drive bunches and equal to the repetition rate of the witness bunches. In the optimal stationary conditions, the pulsed accelerating field is inversely proportional to losses of the structure. On the other hand, it was shown experimentally that at 45 K accelerating structures can sustain 25% higher gradient and have almost twice higher shunt impedance in comparison with structures at room temperature. The synergetic effect of short pulse technology and cryogenic technology would allow reaching world record gradients as well as high efficiency due to a higher wall conductance.

Acknowledgments

Primary author: KUZIKOV, Sergey (Euclid Techlabs, LLC)

Presenter: KUZIKOV, Sergey (Euclid Techlabs, LLC)

Session Classification: WG3: Laser and High-Gradient Structure-Based Acceleration

Track Classification: Working Group Parallel Sessions: WG3 Oral: Laser and High-Gradient Structure-Based Acceleration