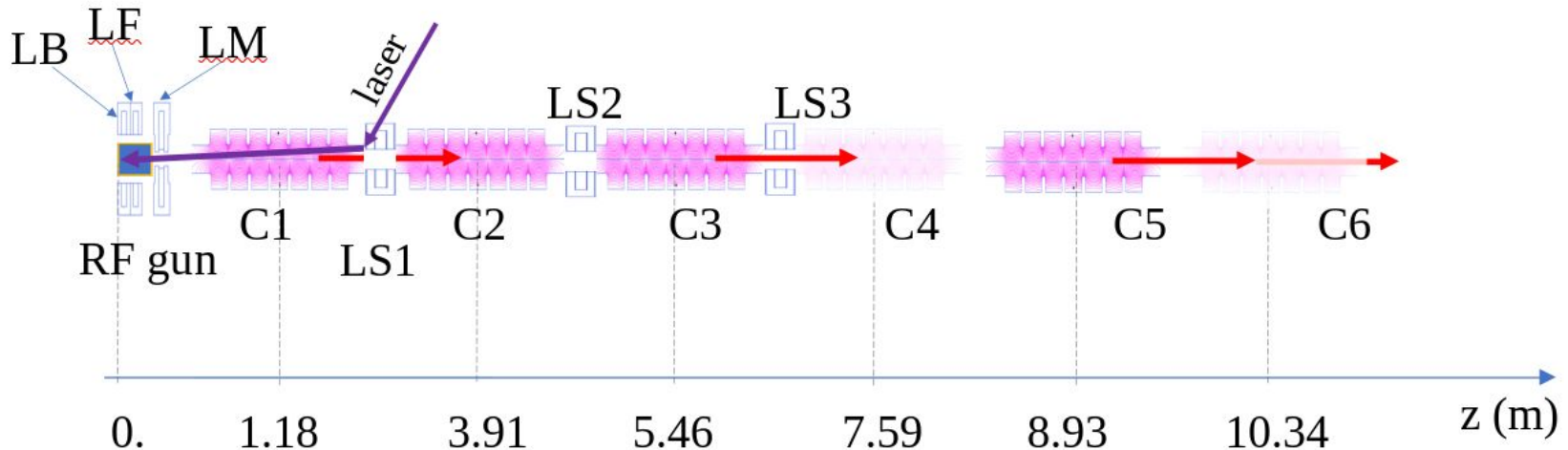


CBB Meeting: low-MTE photocathodes

Emily Frame and Philippe Piot

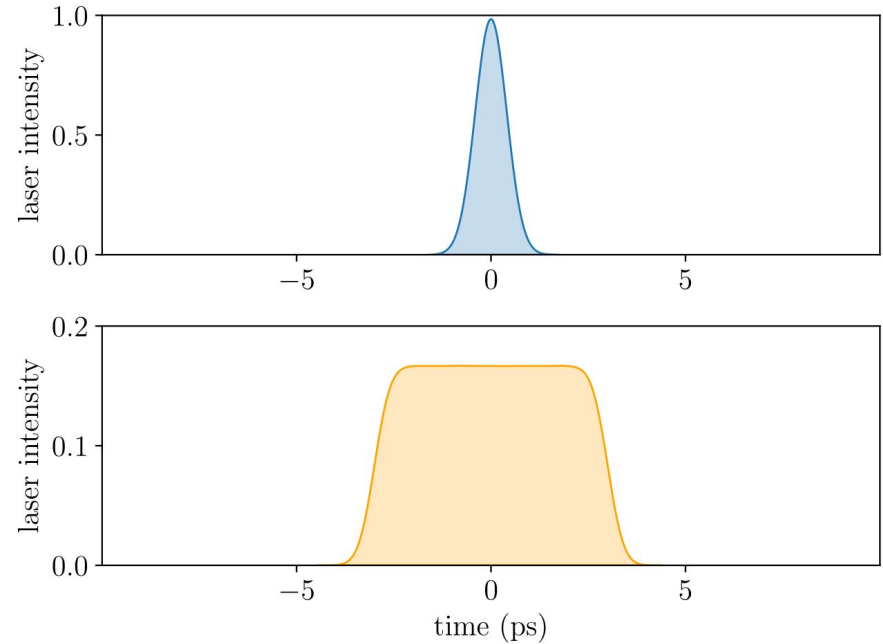
Argonne Wakefield Accelerator

- AWA is upgrading the photoinjector on the drive-beam accelerator
 - Generates ~70 MeV electron bunches
 - RF photoinjector, $1 + \frac{1}{2}$ cells, with 1.3 GHz resonant cavity and Cs₂Te photocathode
 - Field on cathode is 60 MV/m
 - Can reach bunch charge of 100 nC



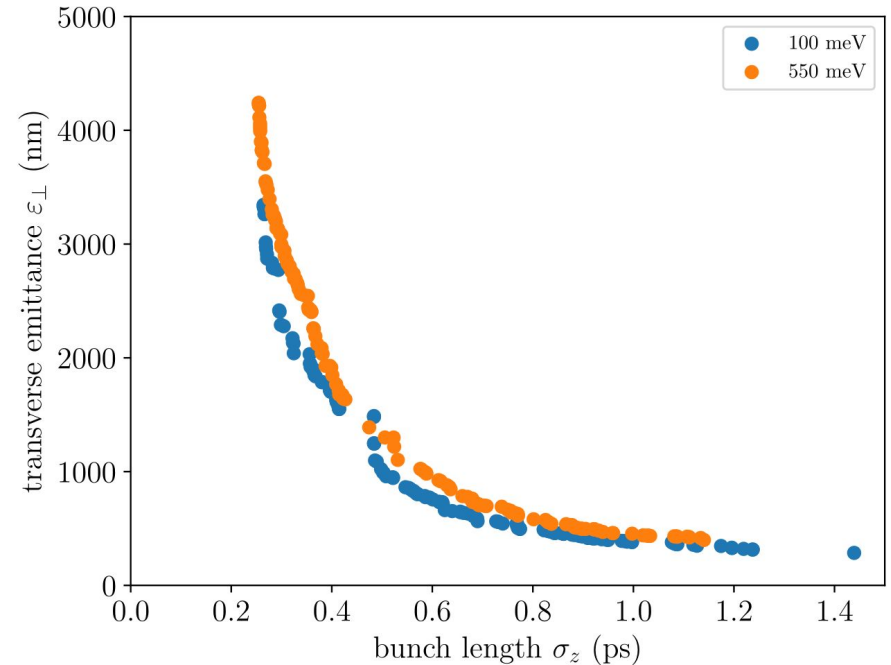
Low-charge optimization

- Part of the upgrade was redesigning a solenoid, allowing us to perform an optimization study
- Optimized for low- and high-bunch charge, short and long laser pulse
- Generated Pareto fronts for energy spread and emittance, and for bunch length and emittance



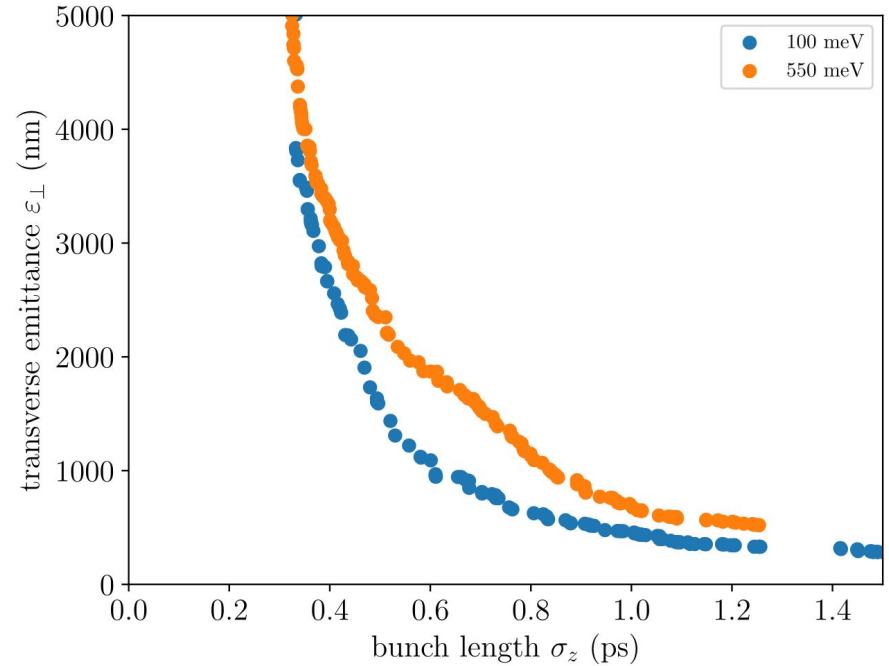
Short laser pulse at 100 pC

- At 100 meV excess KE, we reach emittance of 286 nm
- At 550 meV excess KE, we reach emittance of 399 nm



Long laser pulse at 100 pC

- At 100 meV excess KE, we reach emittance of 282 nm
- At 550 meV excess KE, we reach emittance of 319 nm



Further improvement

- We want to redo this optimization, allowing bunch length to increase to see a corresponding decrease in emittance