






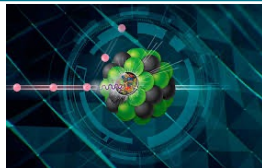



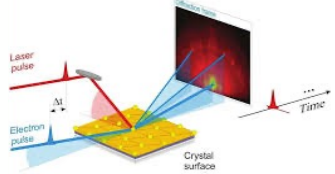


BEAM PRODUCTION Roadmap 2022

The understanding, materials, and technology necessary to produce the brightest possible electron beams across the wide span of beam currents, pulse durations, and operating environments demanded by forefront scientific research and emerging technological applications.

Objectives	FY 22	FY 23	FY 24	FY 25	FY 26	Legacy
Photocathodes for high peak-intensity beam generation with <5 meV MTE	Deliverables					
	<div>Cathode with MTE <35 meV & QE > 10⁻³ at low fluence </div> <div>Photocathode with MTE < 35 meV and QE > 10⁻³ at laser fluences in excess of 50 μJ/cm² </div> <div>First principles predictions of MTE and QE of relevant photocathode materials </div> <div>Photocathode with 10 meV MTE and QE > 10⁻⁴ at laser fluences in excess of 50 μJ/cm² (stretch goal) </div>					Free Electron Lasers like LCLS-II at SLAC that lase at markedly higher photon energies.
Long-lived cathodes in extreme electric fields and at high average current	<div>Photocathode that operates for >1 week with MTE < 35 meV at 50 mJ/cm² laser fluence and high field </div> <div>Photocathode that operates for >1 week with MTE <100 meV and QE>1% at high average current (>50 mA) </div>					 <p>Extremely high currents for future particle colliders and x-ray sources.</p>
Cathodes that approach fundamental brightness limits with nanostructure photoemitters	<div>A photoemission electron source with sub-100 nm spot size </div> <div>An electron source with normalized transverse emittance approaching the fundamental limit of 0.2pm for single electron per bunch beams </div> <div>Nano-structured arrays that deliver pm-emittances for higher charge per bunch (stretch goal) </div>					 <p>Unprecedented resolutions in ultrafast electron diffraction and microscopy to reveal new transient phenomena in materials.</p>