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Prospects of Ultralow MTE photocathodes in Electron Guns

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Brightness of electron beams is directly proportional to the accelerating electric field at the cathode and inversely proportional to the mean transverse energy (MTE) of electrons emitted from photocathodes. Thus, maximizing the brightness of electron beams requires the use of lowest possible MTE photocathodes in the highest possible electric fields. While the maximum electric field is limited by the electric breakdown and design of the electron gun, the MTE is a property of the cathode material, its surface and the laser used for excitation. MTEs of up to two orders of magnitude lower than those typically used in photoinjectors today have been demonstrated by using atomically ordered surfaces at cryogenic temperatures with photon energy very close to the emission threshold. In this talk, I will discuss the various hurdles in using such low MTE photocathodes in high field electron guns and elaborate on the recent progress towards achieving this.

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