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Near-Relativistic Electron Beam Production From an Array of Pyroelectric Crystals[1] RODNEY YODER, AHMED IBRAHIM, KRISTINE UNG, Goucher College — Laser-powered acceleration structures having dimensions comparable to optical wavelengths ($\sim$1 μmm) are in development, with potential to produce GeV/m acceleration gradients in a microchip-like device. Such structures require injection of a sub-micron-scale electron bunch at near-relativistic energies; field emission from a nanotip is one mechanism to produce such beams. In previous work, we have demonstrated that the quasi-DC fields produced by pyroelectric crystals during slow heating and cooling are sufficient for electron emission and acceleration from a carbon nanotube layer. Here, we report on the production of higher-energy electrons from an array of lithium niobate crystals, using a nanotipped needle within a narrow vacuum channel through the center of the crystals. This proof-of-principle experiment takes advantage of the highly uniform accelerating fields within the channel; experimental energy spectra will be presented and compared with theoretical expectations. The mechanism has potential as a standalone radiation source.

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