

# Progress Towards a Field Emission Electron Gun for the ELENA Electron Cooler

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Field emission-based cathodes have been shown to be an attractive alternative to thermionic sources for the generation of electron beams. Their low transverse energy spread, and low power consumption make them an ideal replacement for the thermionic cathode currently used on the electron cooler of the Extra Low ENergy Antiproton (ELENA) ring.

We have investigated the use of carbon nanotubes (CNT) as the field emitting source, studying the emission characteristics and lifetime of various patterned structures. Fowler-Norheim analysis of our samples has given us a better understanding of the limiting factors of such sources, especially the influence of the conditioning process on the emitted current.

A double-gridded electron gun has also been tested with CNT samples of various sizes up to 4x4 cm<sup>2</sup>. The measured current density for the larger samples was somewhat lower than expected and showed a larger beam divergence than what was predicted by the simulations. This discrepancy is currently under investigation as well as improvements to the gun design to obtain stable and reproducible beams.

## Footnotes

## Funding Agency

## I have read and accept the Privacy Policy Statement

Yes

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