

Compact field emission electron gun driven by terahertz wave

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Accelerator-based light sources require high brightness electron bunches to improve performance in exploring structure of matter. Higher acceleration gradient is the key to generate high brightness electron bunches and is more feasible with higher frequency and shorter pulse length electromagnetic wave according to previous empirical formulas. A tapered rectangle waveguide structure driven by terahertz wave is designed as a compact electron gun. A nanotip is fabricated by focused ion beam (FIB) in the center to enhance the field and to emit electrons. The average emission charge per pulse is measured by Pico ammeter, and the peak value reaches 10fC. The max electron energy beyond 4keV is measured from the signal of channel electron multiplier behind a -4kV metal grids, revealing that maximum acceleration gradient is beyond 100MeV/m. These results indicate promising performance of compact terahertz electron gun in high brightness electron injection. Further research will be done in the future.

Footnotes

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