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## Field emission of nanotip cathode in RF gun

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Nowadays, DC gun field emission currents have become common applications as electron sources for electron microscopy, while we focus on the research of field emission of sharp tips in microwave fields, which promises low emittance currents for high energy electron imaging. The tungsten rods are fabricated into tips by electrochemical etching with the radius of curvature of apex within one hundred nanometers, and the field emission experiments are expected to be performed in RF gun. Simulation results show that if the gradient of RF gun is set to 30 MV/m, the corresponding emission current is expected to reach nano scale, and the field enhancement factor can be up to 100 according to the Fowler-Nordheim formula. The instantaneous current density per cycle is approximately as a Gaussian distribution of which the rms width below  $20^\circ$  in general. The magnitude of the field enhancement can be controlled by fine-tuning the protruding length from the cathode plug to protect the tip itself. We anticipate that the combination of nanotip cathode and RF gun is expected to yield stable, low-emittance and high-energy electron beams as high-quality electron sources in electron microscopy.

### Footnotes

### Funding Agency

### Paper preparation format

### Region represented

Asia

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