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# Physical design of microwave electron gun optimized for carbon nanotube cathodes

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Since the maximum electric field strength that a carbon nanotube field-emission cathode can withstand is less than 13 MV/m, the optimization scheme of shortening the length of the first cavity based on the traditional 1/2+1 cavity-type microwave electron gun fails to solve the problems of electron phase slippage and back-bombardment. Therefore, in accordance with the emission characteristics of the carbon nanotube field-emission cathode, beam dynamics optimization was conducted on different cavity structures to select a more suitable cavity structure. Subsequently, the radio frequency (RF) design of the electron gun was completed through fine parameter adjustment of the cavity structure. Finally, the engineering design of the electron gun was accomplished after considering multiple aspects such as the gun's assembly, cathode structure, microwave feed-in structure, and electron beam output structure.

## Footnotes

## Funding Agency

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