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Thermal emission measurement and research of cesium telluride photocathodes

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The thermal emission of photoelectric cathodes significantly influences the emittance of electron beams. Employing cesium telluride as the cathode material, the hard X-ray free-electron laser device utilizes thermal evaporation deposition for fabrication. The typical thermal emission value for cesium telluride cathode materials is ~ 0.7 mm-mrad/mm. Poor processes and formulations lead to decreased cathode quality and increased thermal emission. Therefore, a measurement device is required to assess the thermal emission of cathodes produced under different processes, optimizing fabrication methods and maintaining emission within specified ranges. Traditional emittance measurement methods rely on large accelerator installations, incurring high construction costs, complexity, and environmental demands. We have chosen a pore-anode-based thermal emission measurement scheme that operates within laboratory settings. This approach is independent of large accelerator installations, compact in structure, compatible with cathode fabrication setups, allowing for offline rapid measurement of cathode thermal emission.

Footnotes

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Primary author: FENG, Zhiwen (Shanghai Institute of Applied Physics)

Presenter: FENG, Zhiwen (Shanghai Institute of Applied Physics)

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