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Time-dependent Energy Deposition Characteristics on Different Anode Position of a Weak-pinched Diode

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The energy deposition plays an important role in the study of the thermal mechanical effect of intense electron beam. A new method to obtain the time-dependent electron beam energy deposition at different anode target position was presented. First, the electron beam energy should be discretized according to diode working time（every 5ns）, so that the electron beam in each time period is considered to one single energy value.Then the energy deposition profile at this position can be calculated accurately by Monte Carlo method only the incidence angle here is available.A method of incidence angle measurement based on small Faraday cup array, called Modified Multi-Layer Stacking (MMLS), was given in this work.The time-dependent energy deposition characteristics in r and z direction of a weak-pinched diode working at 600kV and 7Ω were analyzed by means of MMLS.The results show that the energy deposition characteristics are related to the incidence angle in the case of the energy of the electron beam has been confirmed in each time period.The experimental results are in good agreement with the simulation results,the deviations are less than 10%. The energy deposition at different position of the target is different due to the time-dependent incident energy and incidence angle.Under the influence of the beam pinching, the incidence angle changes greatly with time at the position where more than 25mm away from the center of the target surface. When the incidence angle is less than 40°, the peak depth of the high current electron beam energy deposition is about 0.2mm.When the incidence angle exceeds 40°, the energy deposition peak depth is reduced to about 0.1mm. At the positions near the center of the target, the influence of the beam pinching is weakened. The energy deposition characteristics of these locations are closer to the case of the deposition with small incidence angles(<40°).

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