Extended charged particles in a quadrupole linear electrodynamic trap

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The aim of the work was to study the retention of extended dielectric particles in a linear quadrupole electrodynamic trap. Metal rods with a diameter of 4 mm were used as linear electrodes. The distance between the axes of the electrodes was 20 mm. Spherical locking electrodes with a diameter of 10 mm were installed at the ends of the trap, the distance between the spheres was 160 mm. The frequency of the alternating voltage was 50 Hz. The voltage was regulated from 1 to 14 kV. The registration of particles illuminated by a laser with a wavelength of 532 nm was carried out by a digital monochrome video camera. The experiment used extended particles from 1 to 2.5 cm long, made of cotton thread with a diameter of 80 micrometers. The particles were charged by induction method. As a result of the research, stable structures of charged extended particles were obtained at a voltage of 5 kV on the electrodes of the trap, oriented along the axis of the linear trap and at an angle of 90 degrees to the axis. The orientation of the particles depended on the length of the particles. Particles with sizes commensurate with the interelectrode distance were oriented along the axis of the trap, and shorter ones across it.