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New mechanisms of rotation of 3D plasma clusters L. WOERNER, MPE, Garching / GREMI, Orleans, V. NOSENKO, S.K. ZHDANOV, A.V. IVLEV, C. RAETH, H.M. THOMAS, MPE, Garching, M. KROLL, J. SCHABLINSKI, D. BLOCK, A. PIEL, IEAP, Kiel, G.E. MORFILL, MPE, Garching — Dust grains introduced into a plasma can charge up and arrange in ordered systems. A plasma crystal can be made to rotate by applying a rotating electric field. We report on the behavior of 3D dust clouds suspended by thermophoretic levitation in a four-electrode box placed in rf discharge. The speed of cluster rotation depends on the frequency of the applied sinusoidal voltage. Clusters always rotate in the direction of the electric field, which is consistent with the ion-drag force mechanism. Additional tests indicate that the delayed-charging mechanism might play a role. The angular speed of the particle rotation in the cluster increases with increasing height. Possible causes of this include the height dependence of the ion drag force and plasma screening. To study the full 3D dynamics of a cluster additional experiments using the laser holography imaging method were performed at the University of Kiel. In these experiments, 3D plasma crystals also rotated in response to rotating electric fields.

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