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Measurement of dust particle density by a laser extinction method C.R. SEON, H.Y. PARK, W. CHOE, Department of Physics, Korea Advanced Institute of Science and Technology, 373-1 Guseong-dong, Yuseong-gu, Daejeon 305-701, Korea, S. PARK, Y.H. SHIN, K.H. CHUNG, Korea Research Institute of Standards and Science, P.O. Box 102, Yuseong-gu, Daejeon 305-600, Korea — Measurement of dust particle density was performed using the laser extinction method, in which particle density was obtained by the relation between the particle density and the difference between two He-Ne laser beam intensities with and without passing through a dusty plasma. The multi-pass laser beam is provided by two spherical mirrors of which radius of curvature is 8 m with small holes, and the design value of the number of reflections is 32. Before applying the method to the dusty plasma, the measurement limit of the extinction ratio of the setup and the accuracy of the calculated scattering cross-section were experimentally investigated using a solution of particles and distilled water. The measurement limit was about 2% with the single-pass system. In the single-pass experiment, the 120 nm diameter dust particle density in a Ar-diluted SiH₄ CCP (20 mtorr, 30 W RF power, 200 s after plasma on) was about 10⁸ cm⁻³. The lowest measurable particle diameter of the single-pass setup was about 90 nm. However, in the multi-pass setup with 20 passes, ~5x10⁶ cm⁻³ of 120 nm diameter particles is expected to be measured, and the lowest measurable size is expected to be about 30-40 nm in diameter.

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