UPGRADED ALIGNMENT CONTROL FOR THE DIII–D THOMSON LASER SYSTEM*

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The DIII–D Thomson scattering system measures electron density and temperature with eight pulsed ND:YAG lasers along three 35 m paths through the center, edge, and divertor region of the plasma vessel. The density measurements from the different regions are combined to produce density profiles throughout the plasma at regular time intervals during the discharge. It is critical to monitor and control the alignment of all the lasers to produce correct density profiles. A careful and time-consuming alignment procedure has been required to produce good Thomson density measurements. A recent series of upgrades to the alignment system reduced the effort required to perform an initial alignment before plasma operations and allows for monitoring and controlling the alignment remotely by using CCD cameras. The goals of the upgrade were mainly to allow for monitoring and control of the alignment from the Thomson control room during operations and from multiple key locations along the optical path between the control room and the DIII–D vessel. As a result of the upgrade the daily initial alignment in the DIII–D pit is performed much faster and with less effort. The alignment can now be maintained continuously and plans are in place to finish this upgrade by including a computerized beam analysis system providing automatic feedback to eliminate the constant human intervention. Now the Thomson operators monitor and correct the beam positions from the Thomson control console. The newly established methods of YAG alignment procedures using the CCD cameras instead of burn paper offer a faster and more reliable way to achieve co-linearity with the guiding HeNe. The YAG lasers can now be aimed with repeatable accuracy and any drifts can be corrected during the small warm-up period before each shot.

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