

## §16. Tangentially Viewing Fast Camera Measurements in Core Density Collapse in LHD

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A fast visible CMOS camera (Photoron APX-RS) and a bundle fiber (Schott IG-567) were introduced from CIEMAT in the experimental campaign before the last year. The fast visible camera system was upgraded by additionally introducing an image intensifier (Hamamatsu C9547), two filter wheels (Optec IFW) and relay lens optical systems in the beginning of the last experimental campaign. We can choose an interference filter from eight ones ( $H_{\alpha}$ , CII, CIII, Brems., LiI, LiII, ND, etc.) by rotating stepping motors from the LHD control room.

In the last experimental campaign (13th cycle), the fast camera system was mainly installed in a tangential port (6-T) for observing overall LHD plasma behavior, and we successfully acquired interesting image data, for example:

1. Filtered images of the outward and inward bright filament propagation on divertor legs in high beta plasma discharges (low gamma configurations),
2. Filtered observation of plasmas during radiation collapse,
3. Rotating radiation belt in the plasma periphery during

self sustained detachment (Serpens mode),

4. Dust release after Core Density Collapse (CDC) and strong dust-plasma interactions, etc.

In this report, we focus on the process of the dust release and the dust-plasma interactions just after the CDC event.

Figure 1 shows the sequential images of a LHD plasma tangential view during a CDC event in high plasma density operation (30000fps). No interference filters and no image intensifier were used in this observation. Before the CDC, dim emission was observed in the plasma central region by bremsstrahlung due to the formation of high dense core plasma (a). A bright spot on a divertor plate installed in the upper edge of the tangential port was observed at the CDC event (b). Strong plasma-wall interactions were observed in the plasma periphery just after the CDC (c). After about 0.1s of this event, some dust appeared from an upper side of the observation area (d), and many dust particles dropped into the central region to enhance the emission in the plasma in the inboard side of the torus (e). Finally, the emission area expanded to the plasma central region and radiation collapse occurred (f).

The fast camera observation at the CDC strongly suggests that reduction of dust release, understanding of the behavior of dusts, and investigation of dust-plasma interactions during plasma discharges are critical issues for sustaining LHD plasmas stably.<sup>1)</sup>

1) Ashikawa, N. et al.: J. Plasma Fusion Res. **84** No.12 (2008) 924

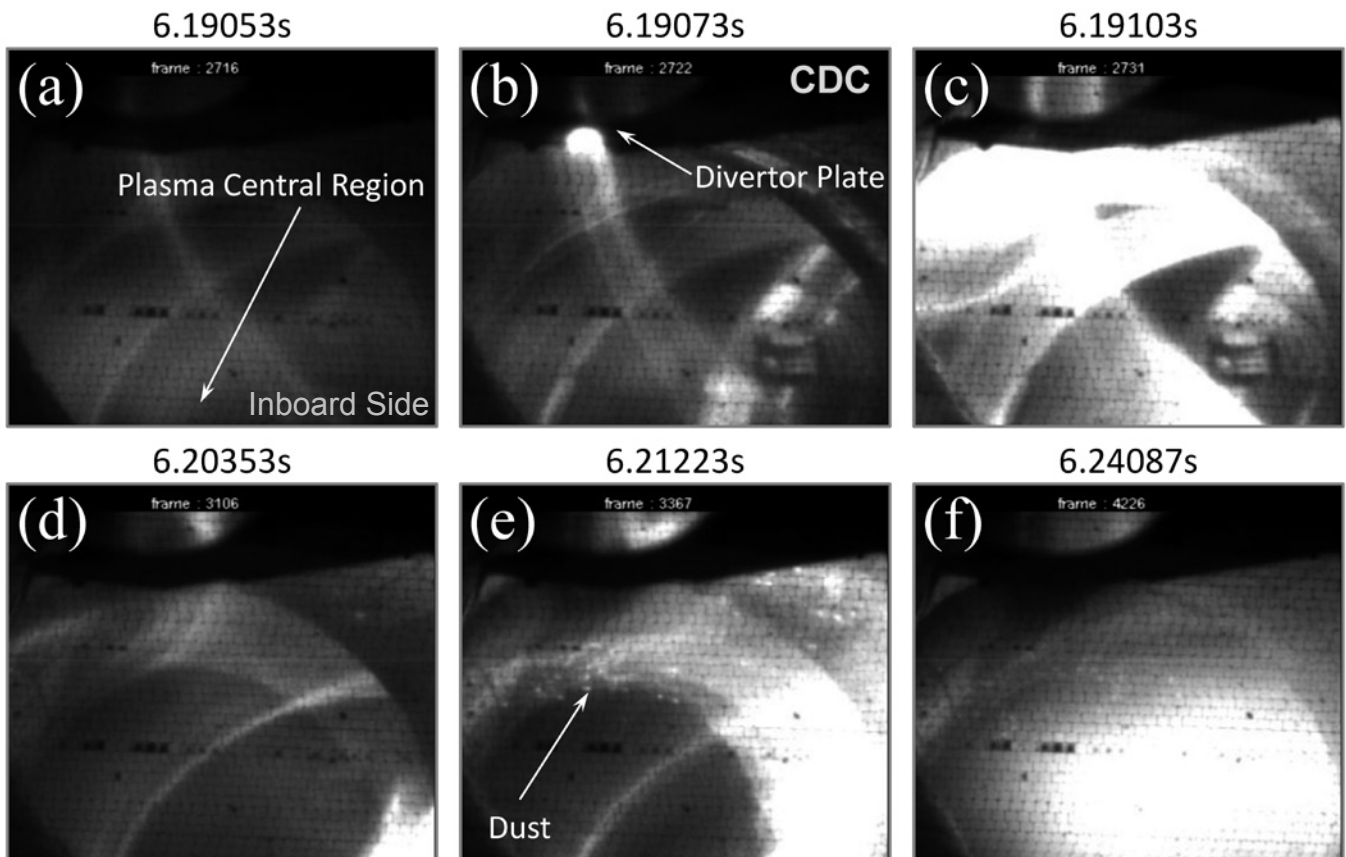


Fig. 1 Sequential images of a LHD plasma tangential view during a CDC event in which many dust particles dropped into the plasma central region, strong dust-plasma interactions causing radiation collapse were observed in the periphery.