Comparison of Dust Particle Trajectories in Magnum-PSI with Simulations in DTOKS

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Conventially, plasma particles incident on a surface are recycled as they are neutralised, ionised and redeposited. Future magnetic confinement devices such as ITER, and in particular commercial facilities like DEMO, will require near loss-less redeposition on all plasma facing surfaces to avoid prohibitively expensive maintenance. The release of micro-scale solid and liquid particles known as dust from surfaces limits the effectiveness of recycling[1, 2] and causes severe energy losses[3]. With safety limits on dust production in place for ITER, dust survivability and transport are issues of critical importance for tokamak operation[4]. Comparison of dust particle motion in experiments with theoretical models is vital to developing physical models.

Simulations performed by the dust tracking code DTOKS[5, 6] using plasma data generated by BOUT++[7] are compared to dust injection experiments performed at the Magnum-PSI facility in the Netherlands, see Figure 1. Arificial spherical tungsten spheres with diameters of $5\mu m$ and $9\mu m$ were released into the hydrogen plasma and recorded by a fast imaging Phantom and IR camera system from two different planes, allowing their paths to be reconstructed. The behaviour of dust grains in a non-turbulent linear magnetic field is reviewed and the accuracy and applicability of the physical models tested.

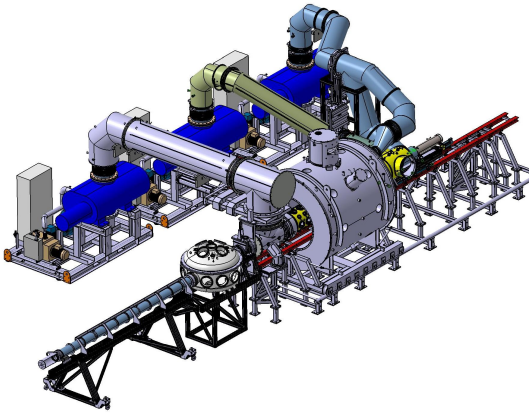

Figure 1: *Magnum PSI Design*

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