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# JET Asymmetrical Disruptions

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Asymmetrical disruptions may occur during ITER operations. It is possible that they may be accompanied by large sideways forces and by toroidal rotation. This is of particular concern because resonance with the natural frequencies of the vacuum vessel and in-vessel components could lead to the high dynamic amplification of the forces.
Roughly half of all JET disruptions have toroidally asymmetric halo currents i.e. they have asymmetric currents that flow partly inside the plasma and partly inside the surrounding wall. The presented analysis covers 1634 JET disruptions from 2005 up to 2014, with both C-wall and ITER like wall. The unique magnetic diagnostics at JET, namely a full set of poloidal coils and saddle loops recorded from four toroidally orthogonal locations and two poloidal in-vessel loops recorded from two toroidally opposite locations, allow for a comprehensive analysis of asymmetrical disruptions with a large scale database.
The observed 3D structures (asymmetries) usually rotate toroidally. Various types of rotation were identified on JET: nearly uniform multi-turn rotations, trapped (or locked) toroidal rotations, reversal rotations and others. The observed rotation of the Ip asymmetry is in the range from -5 turns to +10 turns, where rotation is most commonly seen in the electron drift direction.
A 3D JET vessel model is being developed to calculate the asymmetrical vessel poloidal current by using the measured poloidal voltages. The phase correlation between the toroidal and poloidal vessel current asymmetries will allow the deduction of the relationship between toroidal and poloidal components of the asymmetrical vessel currents during disruptions on JET.
The JET study on the 3D effects during the Ip current quench provides unique experimental data that can help to improve the understanding of disruptions and to develop robust models, which could be used to predict the loads at future machines like ITER.
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