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# Divertor Turbulence Control via Leg Geometry: Experimental Tests on TCV tokamak

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Understanding the mechanisms that govern heat and particle transport in the divertor region is critical for the design and operation of future fusion reactors. Turbulent cross-field transport plays a key role in determining the heat flux distribution at divertor targets, affecting both the peak heat load and the overall power exhaust scenario. A key metric for characterizing heat flux spreading is the S parameter in the Eich's fit. While previous studies have investigated S under various conditions [1, 2, 3, 4], its behavior remains poorly constrained. A new generation of 3D plasma turbulence codes has been developed to tackle edge/SOL turbulence in diverted geometry (e.g. [5,6]), even revealing unexpected results under reactor-relevant conditions [7], highlighting the challenges of extrapolating current tokamak experiments to reactor scenarios in the edge and SOL regions. In this contribution we present an exprimental test for such codes, based on the theoretical ideas proposed in [8]. The key idea is that the relative orientation of the magnetic curvature vector κ and the pressure gradient ∇p determines the turbulence transport into the private flux region of the two divertor legs, depending on their geometry. This alignment can either destabilize or stabilize drift-interchange and drift-wave turbulence. Controlling the turbulence drive and its impact on transport through diverted plasma geometry represents a promising approach in the design of alternative divertor configurations. Leveraging the shaping flexibility of the TCV tokamak, a scan of the outer divertor leg orientation has been performed while maintaining matched upstream plasma parameters and target flux expansion. Initial results from Langmuir probes and infrared analysis do not show any significant difference in the divertor spreading parameter S, while fast camera analysis is still ongoing. However, according to [8], the inner divertor leg is expected to be more affected, as the κ and ∇p drifts are parallel when the leg is vertically oriented. A database analysis is currently underway, based on discharges in negative triangularity, to further investigate this effect. Finally, taking advantage of the new upper divertor shaping capabilities at ASDEX Upgrade, similar but less extensive scans are planned for the ASDEX Upgrade tokamak as well.

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## Speaker's title

Mr

## Speaker's Affiliation

Department of Physics, University of Milano-Bicocca, Italy

## Member State or IGO

Italy

**Author:** CAVEDON, Marco (Department of Physics, University of Milano-Bicocca, Italy)

**Co-authors:** BONISOLLI, Martino (École Polytechnique Fédérale de Lausanne, Swiss Plasma Center, Lausanne, Switzerland); BRIDA, Dominik (Max-Planck-Institute for Plasma Physics); FAITSCH, Michael; FÉVRIER, Olivier (Ecole Polytechnique Fédérale de Lausanne (EPFL), Swiss Plasma Center (SPC), CH-1015 Lausanne, Switzerland); REIMERDES, Holger (Ecole Polytechnique Fédérale de Lausanne (EPFL), Centre de Recherches en Physique des Plasmas); SCOTTI, Luca (Department of Physics, University of Milano-Bicocca, Italy); ZURITA, Martim (École Polytechnique Fédérale de Lausanne, Swiss Plasma Center, Lausanne, Switzerland); ASDEX UPGRADE TEAM (aSee author list of H. Zohm et al, 2024 Nucl. Fusion 64 112001); TCV TEAM (See author list of B.P. Duval et al 2024 Nucl. Fusion 64 112023); EUROFUSION TOKAMAK EXPLOITATION TEAM (See author list of E. Joffrin et al 2024 Nucl. Fusion 64 112019)

**Presenter:** CAVEDON, Marco (Department of Physics, University of Milano-Bicocca, Italy)

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