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Drift waves in helically symmetric stellarators[1] TARIQ RAFIQ, CHRIS HEGNA, University of Wisconsin — The local linear stability of electron drift waves and ion temperature gradient modes (ITG) is investigated in a quasi-helically symmetric (QHS) stellarator and a conventional asymmetric (Mirror) stellarator. While the eigenfunctions have a similar shape in both magnetic geometries, they are slightly more localized along the field line in the QHS case. The most unstable electron drift modes are strongly localized at the symmetry points (where stellarator symmetry is present) and in the regions where normal curvature is bad and magnitude of the local magnetic shear and magnetic field is minimum. Modes are found more affected by the normal curvature than by the geodesic curvature. The threshold of stability of the ITG modes in terms of η_i is found to be 2/3 in this fluid model consistent with the smallest threshold for toroidal geometry with adiabatic electrons. Optimization to favorable drift wave stability has small field line curvature, short connection lengths, the proper combination of geodesic curvature and local magnetic shear, large values of local magnetic shear and the compression of flux surfaces in the bad curvature region. In most of these studies, a simplified adiabatic electrons response is used. Progress on a more rigorous treatment of the electrons will be reported that accounts for toroidally and helically trapped particles and landau resonances in stellarator geometry.

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Tariq Rafiq
University of Wisconsin

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