cases	doc_1	doc_2	decision	id

doc_1

authors	• A. J. Webster • C. G. Gimblett
title	Magnetohydrodynamic Stability of a Toroidal Plasma's Separatrix
publication_date	2009-01-21 00:00:00
source	SupportedSources.INTERNET_ARCHIVE
journal	American Physical Society (APS)
volume	
doi	10.1103/physrevlett.102.035003
urls	• https://web.archive.org/web/20190223203842/http://pdfs.semanticscholar.org/5632/eb92ae48678c48727bc94923bb1806221c14.pdf
id	id-2136534221489892862
abstract	Large tokamaks capable of fusion power production such as ITER, should avoid large edge localized modes (ELMs), thought to be triggered by an ideal magnetohydrodynamic instability due to current at the plasma's separatrix boundary. Unlike analytical work in a cylindrical approximation, numerical work finds the modes are stable. The plasma's separatrix might stabilize modes, but makes analytical and numerical work difficult. We generalize a cylindrical model to toroidal separatrix geometry, finding one parameter Ã 0 determines stability. The conformal transformation method is generalized to allow nonzero derivatives of a function on a boundary, and calculation of the equilibrium vacuum field allows Ã 0 to be found analytically. As a boundary more closely approximates a separatrix, we find the energy principle indicates instability, but the growth rate asymptotes to zero.
versions	

doc_2

authors	• A. J. Webster • C. G. Gimblett
title	Magnetohydrodynamic Stability at a Separatrix: Part I
publication_date	2009-02-20 14:22:16+00:00
source	SupportedSources.ARXIV
journal	None
volume	
doi	
urls	• http://arxiv.org/pdf/0902.3585v1 • http://arxiv.org/abs/0902.3585v1 • http://arxiv.org/pdf/0902.3585v1
id	id-1530334295714460260
abstract	The rapid deposition of energy by Edge Localised Modes (ELMs) onto plasma facing components, is a potentially serious issue for large Tokamaks such as ITER and DEMO. The trigger for ELMs is believed to be the ideal Magnetohydrodynamic Peeling-Ballooning instability, but recent numerical calculations have suggested that a plasma equilibrium with an X-point - as is found in all ITER-like Tokamaks, is stable to the Peeling mode. This contrasts with analytical calculations (G. Laval, R. Pellat, J. S. Soule, Phys Fluids, {\bf 17}, 835, (1974)), that found the Peeling mode to be unstable in cylindrical plasmas with arbitrary cross-sectional shape. However the analytical calculation only applies to a Tokamak plasma in a cylindrical approximation. Here, we re-examine the assumptions made in cylindrical geometry calculations, and generalise the calculation to an arbitrary Tokamak geometry at marginal stability. The resulting equations solely describe the Peeling mode, and are not complicated by coupling to the ballooning mode, for example. We find that stability is determined by the value of a single parameter Δ' that is the poloidal average of the normalised jump in the radial derivative of the perturbed magnetic field's normal component. We also find that near a separatrix it is possible for the energy principle's δW to be negative (that is usually taken to indicate that the mode is unstable, as in the cylindrical theory), but the growth rate to be arbitrarily small.
versions	

decision	id
NOT DUPLICATES	1298