

Abstract Submitted
for the DPP06 Meeting of
The American Physical Society

VALEN Enhancements: Transfer Functions and Progress in Including Multiple Plasma Modes* J. BIALEK, A.H. BOOZER, G.A. NAVRATIL, Columbia University, L.P. KU, Princeton Plasma Physics Laboratory — The capabilities of the VALEN RWM active control modeling code have been enhanced. VALEN now has the capability to compute transfer functions based on a single unstable plasma mode. This allows the standard techniques of frequency response analysis and design, such as Nyquist analysis and feedback compensation design to be applied to VALEN RWM problems. VALEN Nyquist analyses for ITER benchmark problems without plasma effects are in excellent agreement with MARS code results. With plasma included in the model good agreement between MARS and VALEN was obtained up to mid-way between the no-wall and ideal wall pressure limit. At higher values of plasma pressure near the ideal limit the two codes differ with VALEN observing more complexity in Nyquist plots resulting in saturation in maximum stable pressure with proportional gain feedback. We also report on progress in including the effects of multiple plasma modes in the VALEN model. The new version of VALEN will include the effects of additional stable plasma modes in the calculation. The method assumes a linear plasma response to an applied external magnetic perturbation and uses the DCON ideal-MHD stability code to obtain the total normal magnetic field distribution on the plasma surface and the eigen-energies of the modes. Results are presented for HBT-EP and ITER. *Supported by U.S. DOE Grant DE-FG02-86ER53222.

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Date submitted: 23 Jul 2006

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