PRELIMINARY
VALEN MODELING OF PASSIVE AND ACTIVE CONTROL OF RWM IN FIRE

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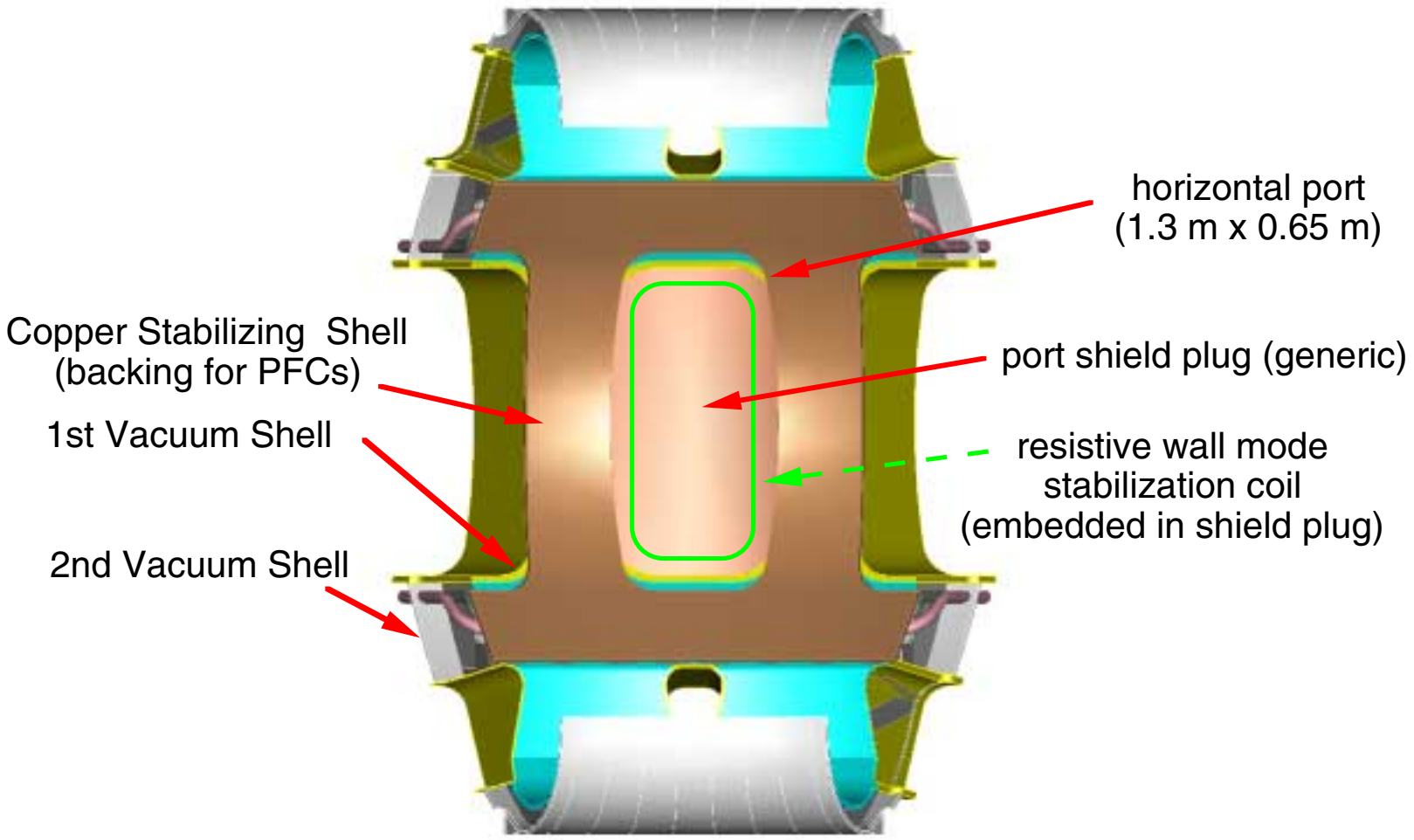
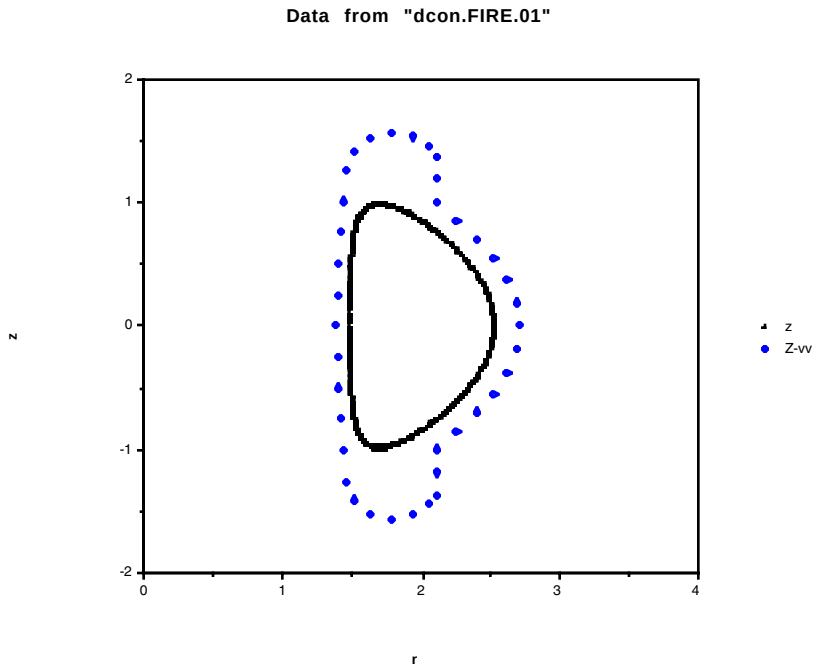
Potential for Resistive Wall Mode Stabilization System

view of hoizontal port front looking from plasma side



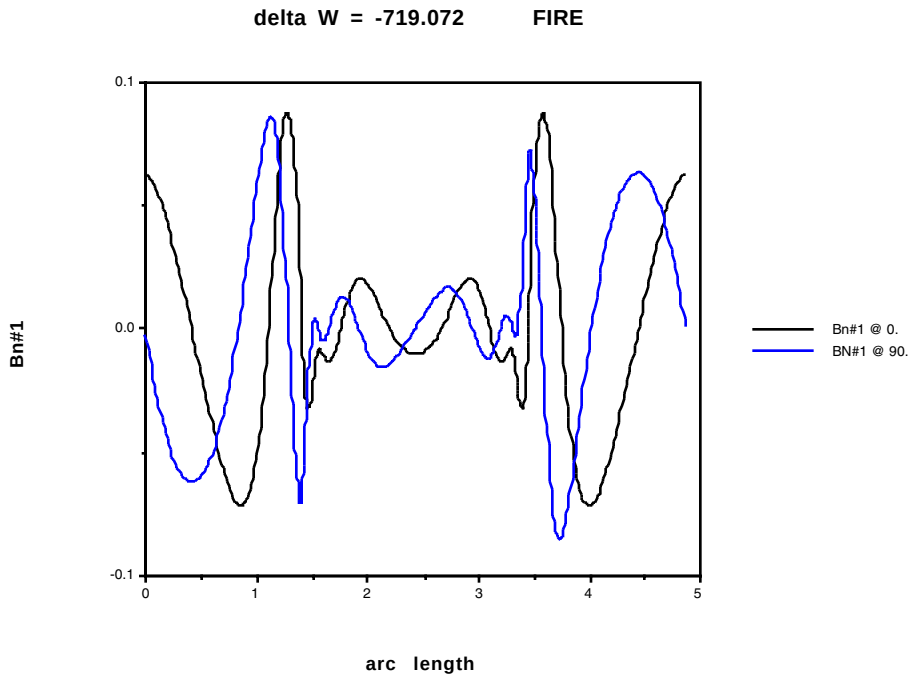
Concept under development by Columbia Univ. J. Bialek, G. Navratil, C.Kessel(PPPL) et al

VALEN Model of FIRE Passive & Active Stabilization



- **Conducting Wall in FIRE modeled with and w/o port plugs as copper clad stainless.**
- **Active Control coils modeled in open ports with 10 cm clearance from stabilizer plate in plane of the stabilizer.**

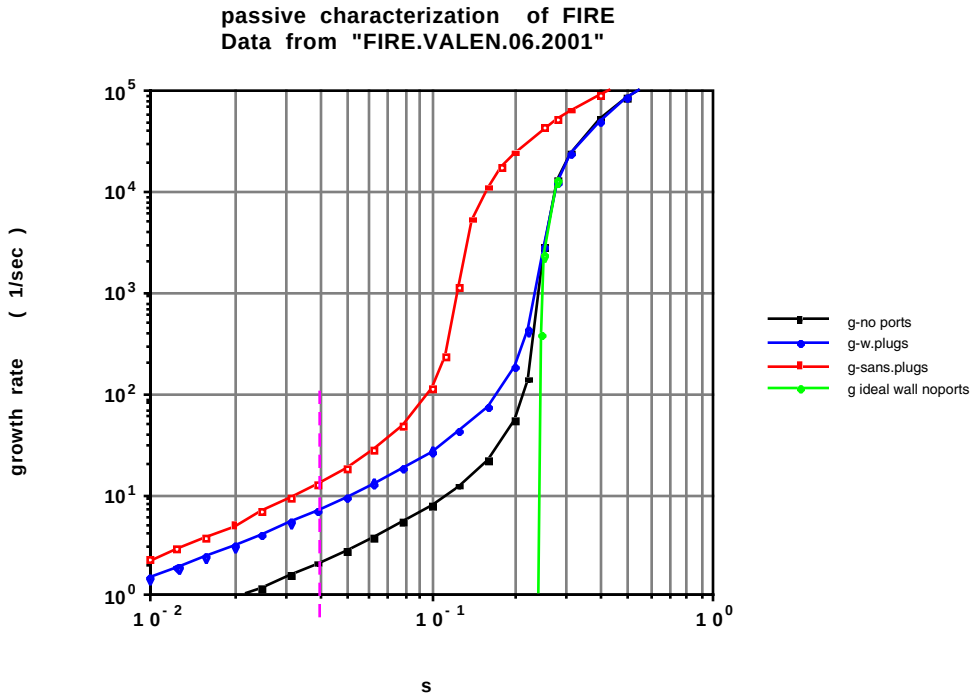
Mode Structure of Unstable RWM from DCON



- **Obtained from DCON using input file from Kessel of Kink Unstable FIRE Equilibrium.**

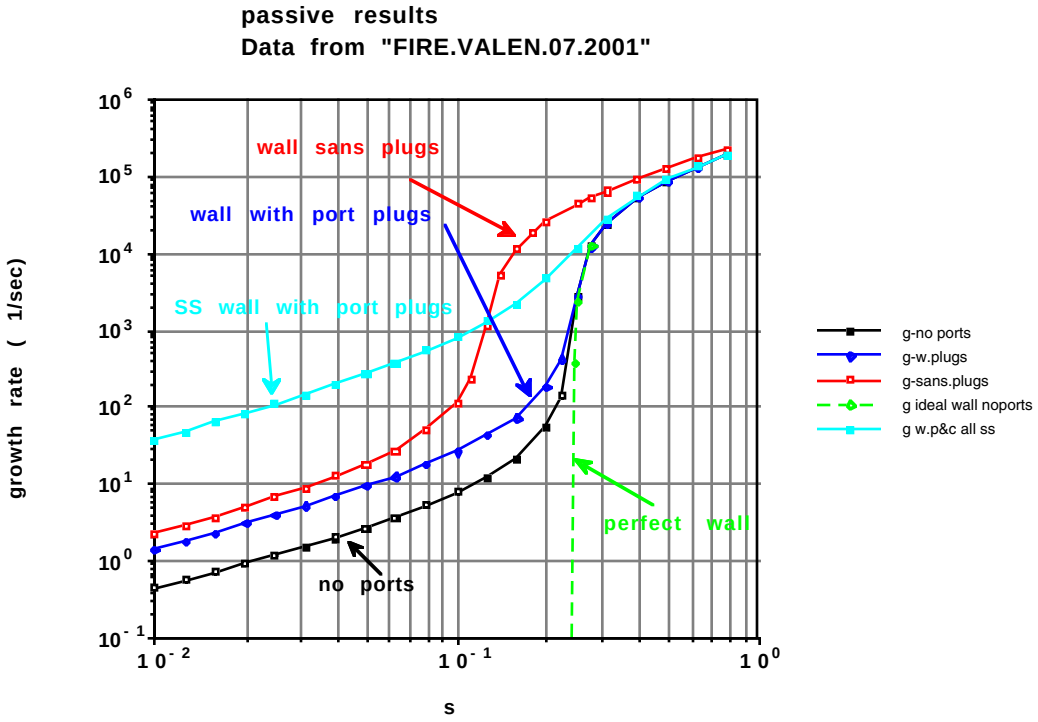
- **Mode structure is computed w/o FIRE conducting wall.**

VALEN Model of FIRE Passive Stabilization



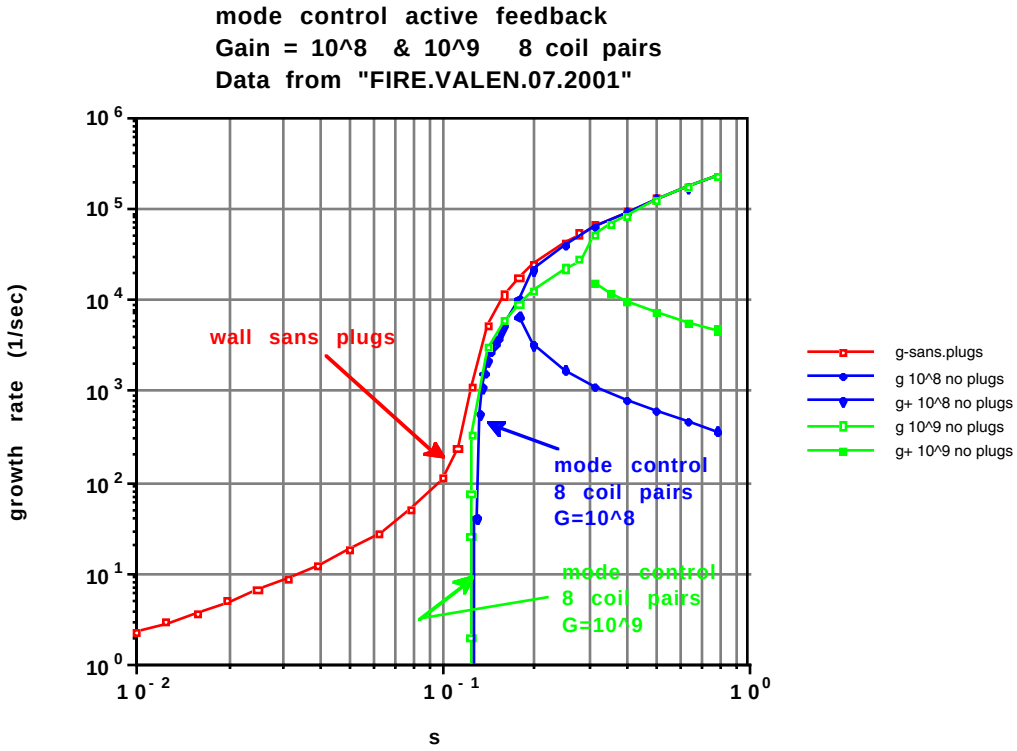
- **Ideal Wall in FIRE is almost factor of 2 more effective than DIII-D vessel Wall.**
- **Port Plugs restores most passive performance, but mode growth is x4 larger.**
- **If all mid-plane ports open, significant loss of stabizer performance ~factor of 2 in beta.**

VALEN Model of FIRE Passive Stabilization: Effect of Copper Cladding is Significant



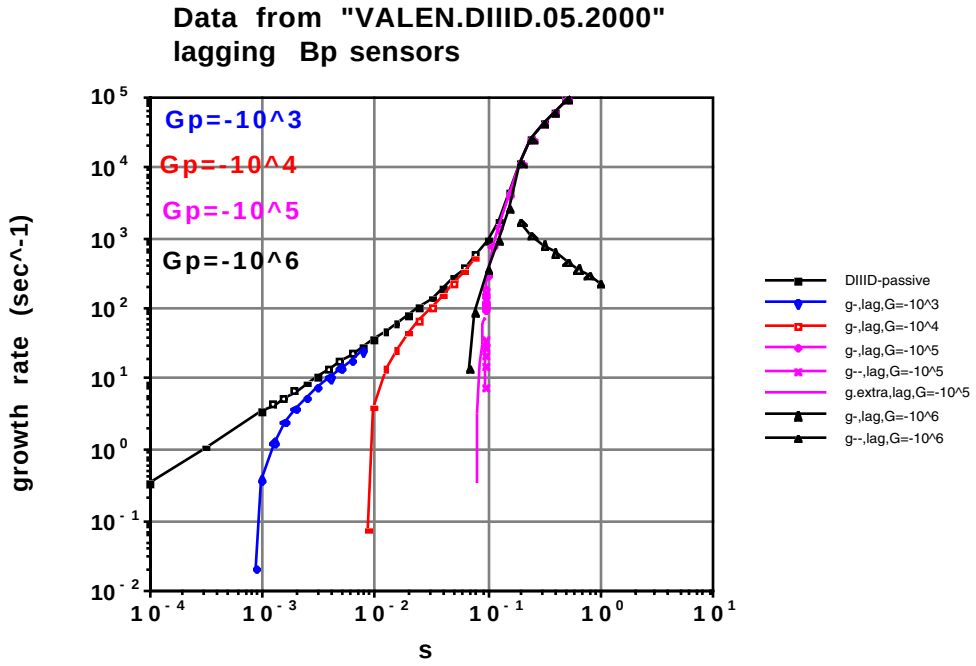
- **Passive Stabilization Modeled with Copper Cladding on Stabilizer removed.**
- **RWM growth rates increased by factor of 50.**

VALEN Model of FIRE Active Mode Control: Using 8 Feedback Coil Pairs

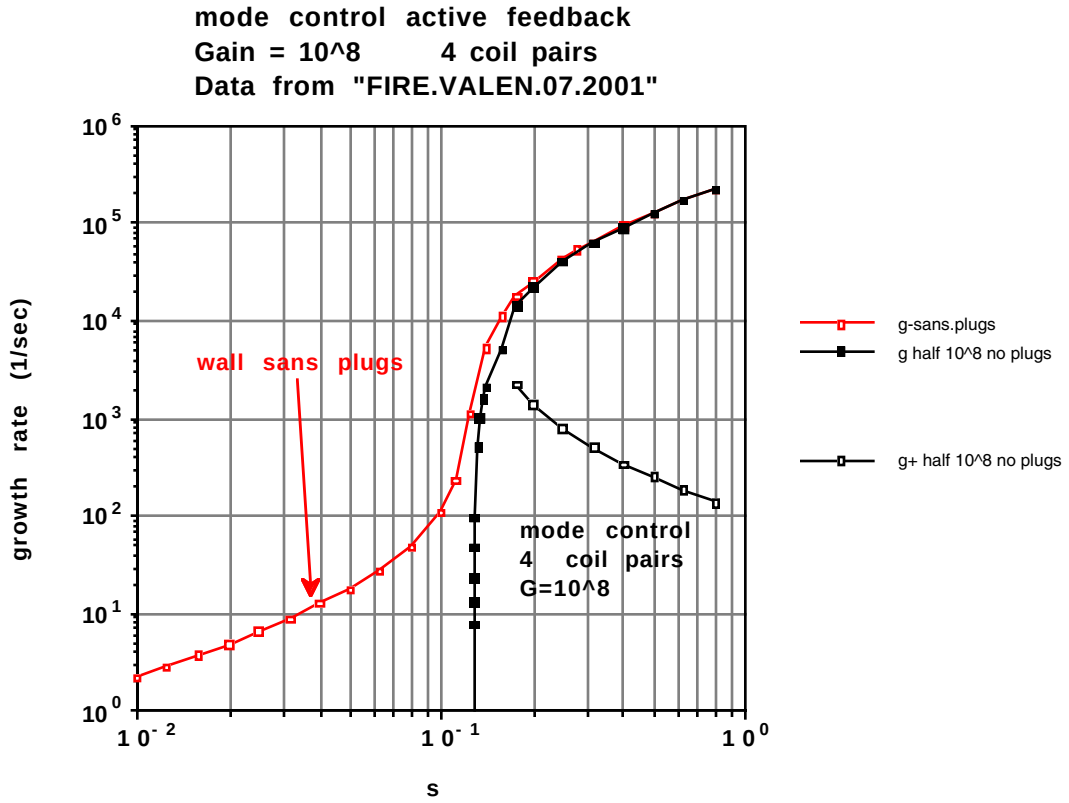


- **Feedback modeled using "Mode Control" Scheme with Poloidal Field Sensors on Mid-Plane weakly coupled to Control Coils.**
- **Control Coils Located in each of 16 ports (8 n=1 coil pairs).**
- **Control Coils in plane of stabilizer with 10 cm space between coil and port boundary.**

VALEN Model of DIII-D Using Bp Sensors



VALEN Model of FIRE Active Mode Control: Using 4 Feedback Coil Pairs



- **Feedback modeled using “Mode Control” Scheme with Poloidal Field Sensors on Mid-Plane weakly coupled to Control Coils.**
- **Control Coils Located in 8 of 16 ports (4 n=1 coil pairs).**
- **Same effectiveness as 8 coil pairs using all 16 ports!**