The linear simulation of the plasma response of the RMP in BOUT++ framework

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The two-field model is used to simulate the plasma response of RMP.

\[
\frac{\partial \tilde{\omega}}{\partial t} = B_0 \nabla_{\parallel} J_{\parallel} + \mu_i \nabla_{\parallel}^2 \tilde{\omega}
\]

\[
\frac{\partial \tilde{\psi}}{\partial t} = -\frac{1}{B_0} \nabla_{\parallel} \tilde{\phi} + \frac{\eta}{\mu_0} \nabla_{\perp}^2 \tilde{\psi}
\]

- The vacuum RMP field which calculated in MAPS code is applied as the outer boundary condition of $\psi$. 

Graphs showing the simulation results for calb-box and RMP, bout-At, and R with new hypertoad.
The data analysis based on BOUT++ output

\[ \vec{B} \cdot \nabla \psi_p = \frac{d\psi_p}{d\rho} \frac{\vec{B} \cdot \nabla \rho}{\rho} = 2\psi_{bm}\rho_p \vec{B} \cdot \nabla \rho_p = 2\psi_{bm}\rho_p B^\rho \]

\[ \Rightarrow B^\rho = \frac{\vec{B} \cdot \nabla \psi_p}{2\psi_{bm}\rho_p} \]

\[ \vec{B} \cdot \nabla \zeta = B^\zeta = \vec{B} \cdot \nabla \phi = \frac{B_t}{R} = \frac{g}{R^2} \]

\[ \frac{B^\rho}{B^\zeta} = \frac{\vec{B} \cdot \nabla \psi_p R}{2\psi_{bm}\rho_p B_t} \]

\[ B_n = \frac{\vec{B} \cdot \nabla \psi_p}{|\nabla \psi_p|} = \frac{\vec{B} \cdot \nabla \psi_p}{RB_p} \]
The spectrum comparison between MAPS and BOUT++
The spectrum comparison between MAPS and BOUT++ cont.

\[ \rho_p = 0.6984 \]

\[ \rho_p = 0.8930 \]
The linear plasma response to RMP

ASIPP
The resonance components of $B_r$ are suppressed at the rational surface.
Thank you!