Plasma rotation effects on the resistive wall modes in the negative triangularity tokamaks

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There is renewed interest in the negative triangularity (NT) tokamaks. Earlier NT experiments in TCV and DIII-D have shown exciting results [1,2]. Although NT configuration may be more unstable for low n modes, the transport level related to higher n modes in the NT configuration is observed to be constantly lower as compared with the positive triangularity (PT) case. This is confirmed by the MHD stability analyses with the AEGIS and DCON codes for DIIID-like equilibria [3]. It is found in Ref. [3] that the NT configuration is indeed more MHD-unstable for low n modes and, nevertheless, the situation is reversed for intermediate n modes. The NT configuration becomes more stable for intermediate n modes (n = 3-10). In this work, we extend the studies to include the rotation effects to see how the resistive wall modes in the NT configuration are affected as compared with the PT configuration. This is particularly motivated by noting that the wall interface with the plasma is quite different between the NT and PT configurations. It affects the plasma rotation effects on the low n modes. We first consider the DIII-D-NT-experiment equilibrium reconstructed by the EFIT code. The equilibrium g-file is refined by the adaptive toroidal equilibrium code ATEQ developed recently at IFS. Subsequently, based on the equilibrium g-file, the extended equilibria are constructed with the VMEC code (verified with ATEQ) by varying the beta values while keeping the pressure and poloidal current flux profiles basically unchanged. The bootstrap current contribution to the equilibria is taken into account with the Sauter formula. The MHD stability is then computed using the AEGIS code with the rotation effects taken into account. The stability parameter diagram will be presented. The rotation effects will be discussed with the emphasis on the comparison between the positive and negative triangularity configurations.

[1] Camenen Y. et al 2007 Impact of plasma triangularity and collisionality on electron heat transport in TCV L-mode plasmas, Nucl. Fusion **47** 510-16.

[2] Austin M. E. et al. 2019 Achievement of Reactor-Relevant Performance in Negative Triangularity Shape in the DIII-D Tokamak, Phys. Rev. Lett. 122 115001.

[3] Linjin Zheng, M.T. Kotschenreuther and F.L. Waelbroeck 2021 Intermediate n mode stability in the negative triangularity tokamaks, Nucl. Fusion **61** 116014.