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P4.1031 Interaction of energetic particles from neutral beam injection with Alfvén Eigenmodes in JT-60SA

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The JT-60SA device offers unique conditions before ITER for the study of the interaction of energetic particles with plasma waves. With similar dimensions to JET e.g. major radius but with a slightly more elongated plasma volume, JT-60SA is a high power device where an additional heating power (including 10MW of 500keV Neutral Beam Injection) up to 41MW and the potential for high non-inductive plasma current operation pave the path for numerous physics challenges on MHD stability. The work presented here addresses the MHD stability of shear Alfvén Eigenmodes (AE) in a variant of one of the working scenarios of JT60-SA, namely the high power full inductive single null at high density (Scenario 3). The plasma scenario has a plasma current of 5.48MA, toroidal magnetic field of 2.05T, 9.89/10.9x1019m-3 ion/electron densities on axis, ~5.94keV of ion/electron temperatures on axis and very low shear q~1 safety factor in the core. A comprehensive assessment of all shear AE with frequencies up to 2.7 normalised to on axis Alfvén frequency and with toroidal mode number up to n=25 was performed. The plasma scenario stems from CRONOS [1] simulations and the energetic particle distributions were calculated with the ASCOT code [2]. The drive/damping contributions from the NBI energetic ions were calculated with the CASTOR-K code [3-5]. The simulations were performed using either the full set of NBI sources foreseen for this scenario and only the lower energy (85keV) sources (no counter current positive beams are used). It is found that co-passing orbits from the highly energetic (500keV) N-NBI beams alone can effectively drive modes located dominantly at the plasma core region. With only the low energy units or away from the deep plasma core, the beam contribution is found to be stabilizing.
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