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Substance of neoclassical transport under resonant magnetic perturbations in tokamaks[1] JONG-KYU PARK, Princeton Plasma Physics Laboratory (PPPL), SANGKYEUN KIM, SNU, NIKOLAS LOGAN, PPPL, STANISLAS PAMELA, CCFE, MARINA BECOULET, CEA, SEONGMOO YANG, PPPL, YONG-SU NA, SNU — A resonant magnetic perturbation (RMP) offers a promising pathway to control MHD instabilities in tokamaks. A difficulty in addressing underlying RMP transport is due to the potential mixture of integrable and non-integrable field lines across which the neoclassical framework becomes incompatible. It is shown, in various alternative approaches, that it is critical to take both radial and in-surface displacements of the field lines into account to precisely quantify the non-ambipolar (NA) transport contributions. An example is the coupling between a non-linear JOREK MHD response and GPEC transport simulations, which has been recently successful in improving the prediction of RMP-driven torque as well as particle pumping in KSTAR to some degree. The neoclassical part of particle or heat transport is predicted to be small in this study as typically expected but should not be generally ignored in RMP applications. The NA particle transport can reach to an anomalous level locally in the region where particle and collisional rates are both low. The rapid diffusion of the hot and collisionless particles can also elevate the NA heat transport to an alarming level, pointing to the importance of the predictive RMP optimization in high-performance tokamak scenarios.

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