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Numerical Investigation of Quench Event in the Innermost Pair of the KSTAR Central Solenoids

In 2011, the KSTAR tokamak underwent a real quench, and it is recorded as the unique event of ramp-down by quench detection in the magnet operations. Whereas many efforts had been made to survey the thermohydraulic data, such a quench-generating scenario has been identified for the first time when a minimalistic (0-D thermal) model assessed the risk of given current profile. On the other hand, any accurate modeling on the practical condition of thermohydraulic states was not established because of limited performance of the latest simulation tools for fusion magnets. Recently, mitigating the trouble of numerical instability, the thermohydraulic simulator is significantly improved owing to our effort to compensate the drawback of the coupled simulator. Thus, a thermohydraulic modeling of the quench event is successfully carried out with acceptable numerical performance. In this presentation, the numerical model is described as the post-event investigation of quench generating scenario. Based on such a simulation work, we discuss actual states of the magnet under the flow driven by the quench, whose detail cannot be known only looking into the experimental data. As a result, some tangible interpretations are presented about the conductor performance.

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