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MHD instabilities limiting beta value in LHD and the interaction with error field SATORU SAKAKIBARA, YUKI TAKEMURA, KIYOMASA WATANABE, SATOSHI OHDACHI, YOSHIRO NARUSHIMA, KATSUJI ICHIGUCHI, KATSUMI IDA, KENJI TANAKA, TOKIHIKO TOKUZAWA, ICHIHIRO YAMADA, HIROSHI YAMADA, YASUHIKO TAKEIRI, National Institute for Fusion Science, LHD EXPERIMENT TEAM — Characteristics of MHD instabilities limiting beta value have been investigated in unstable regime of ideal interchange mode in LHD to optimize magnetic configuration of heliotron-type fusion reactor. We accessed ideal-unstable regimes by enhancing magnetic hill and reducing magnetic shear. The magnetic hill was enhanced by shifting magnetic axis position, Rax, to the inward, whereas the magnetic shear was reduced by increasing plasma current and plasma aspect ratio. In the enhanced magnetic hill configuration, m/n = 2/1 mode with a finite frequency appeared when Rax <3.55 m, and strong growth of the mode was observed after stop of the mode rotation. Then central beta value was dropped by 30%. In the reduced magnetic shear configuration, m/n = 1/1 mode was destabilized when the plasma current exceeded a threshold, the mode significantly grew after the stop of the rotation as well as the case of m/n = 2/1 mode, which degraded the central beta by about 60%. The onset of the mode was qualitatively consistent with ideal stability boundary, the occurrence of the collapse was independent of an existence of an error field (EF). In the configuration with the error field, the spatial structure of the mode after the stop of the rotation was almost the same as that of the EF, while it changed at random in the reduced EF case.

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