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Plasma current ramp-up by lower hybrid wave using innovative antennas on TST-2 YUICHI TAKASE, AKIRA EJIRI, Univ of Tokyo, CHARLES MOELLER, General Atomics, BENEDIKT ROIDL, TAKAHIRO SHINYA, NAOTO TSUJII, SATORU YAJIMA, HIBIKI YAMAZAKI, AKICHIKA KITAYAMA, NAOKI MATSUMOTO, AKITO SATO, MASATERU SONEHARA, WATARU TAKAHASHI, YOSHIYUKI TAJIRI, YUKI TAKEI, HIRO TOGASHI, KAZUYA TOIDA, YUSUKE YOSHIDA, Univ of Tokyo — Non-inductive plasma current ($I_{\rm p}$) ramp-up by RF power in the lower hybrid frequency range is being studied on the TST-2 spherical tokamak (R = 0.36 m, a = 0.23 m, $B_{\rm t}$ = 0.3 T, $I_{\rm p}$ = 0.1 MA). Up to 400 kW of RF power is available at a frequency of 200 MHz. An innovative antenna called the capacitively-coupled combline (CCC) antenna was developed to excite a sharp, highly directional traveling wave with the electric field polarized in the toroidal direction. It is an array of resonant circuit elements made of capacitance and inductance, coupled to neighboring elements by mutual capacitance. Two CCC antennas are installed in TST-2, a 13-element outboard-launch antenna and a 6-element top-launch antenna. The latter was installed in March 2016 to improve accessibility to the core and to achieve single-pass damping. The suspected wave power loss in the scrape-off layer plasma should also be avoided. $I_{\rm p}$ ramp-up to 25 kA has been achieved so far. An upgrade of the $B_{\rm t}$ power supply is planned to take advantage of the observed improvement of $I_{\rm p}$ ramp-up with $B_{\rm t}$. Higher $B_{\rm t}$ for longer pulses should improve the $I_{\rm p}$ ramp-up efficiency by improving wave accessibility and by reducing prompt orbit losses of energetic electrons.

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