

## **LHCD Scenarios for Spherical Tokamak Plasmas\***

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Noninductive plasma current start-up and sustainment are crucial issues for spherical tokamak reactors and other applications such as component test facility. It is widely recognized that the lower hybrid wave (the slow wave), which is most efficient in driving current, is not accessible to the core of a fully developed spherical tokamak plasma with very high dielectric constant. However, it may be useful in the initial plasma current ramp-up phase while the density is still low, where it is not practical to use other methods of noninductive current drive. Such a possibility is investigated theoretically for planned experiments on the TST-2 spherical tokamak ( $R = 0.37$  m,  $a = 0.24$  m,  $B_t = 0.3$  T) at the University of Tokyo. The transmitters previously used for FWCD experiments on JFT-2M (200 MHz) are being prepared for this experiment. The combline antenna used for JFT-2M has been modified for use in TST-2. This antenna will be used to excite a unidirectional fast wave traveling in the toroidal direction with a toroidal mode number of 12 (corresponding to an initial parallel index of refraction of about 5). The fast wave can mode convert to the lower hybrid wave and drive current under some conditions. Examination of the dispersion relation indicates that there may be a suitable regime at relatively high field (0.3 T) and low density ( $< 1 \times 10^{19} \text{ m}^{-3}$ ).

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