Microwave Imaging Reflectometry for KSTAR

W. Lee, G. S. Yun, Y. Nam, I. Hong, M. W. Kim, J. C. Kim, H. K. Park[a],
C. W. Domier, N. C. Luhmann, Jr.[b],
T. Munsat[c]

[a]*Pohang University of Science and Technology, Pohang, Korea*
[b]*University of California, Davis, California, USA*
[c]*University of Colorado, Boulder, Colorado, USA*

woochanglee@postech.ac.kr

Microwave reflectometry has been widely used for probing electron density fluctuations in tokamak plasmas. Despite its straightforward operating principle similar to radar, recent studies indicated that the reflected wave from the cutoff layer forms a complex interference pattern at the detector plane in the presence of strong turbulences and/or short wavelength fluctuations. These effects make the interpretation of reflectometry signal dubious. Recently, it has been shown that this difficulty can be overcome by microwave imaging reflectometry (MIR), which has been briefly tested on the TEXTOR through extensive laboratory tests [1]. This paper introduces the MIR system being developed for the KSTAR together with the solution of the problems experienced in the TEXTOR. Conceptually, the KSTAR MIR system is an extension of the first MIR system tested in the TEXTOR, which measured density fluctuations along the poloidal contour of a single cutoff layer. The KSTAR MIR will be able to yield poloidal contours of density fluctuation at different radial positions using multiple beam sources of different frequencies. Recovery of density fluctuation information is strongly affected by matching of the probe beam phase front with the cutoff layer curvature. The optics design features to ensure proper curvature matching are discussed for both X-mode and O-mode cases.
*Work supported by NRF of Korea under contract no. 20090082507.

[1] H. Park, et al., Rev. Sci. Instrum. **74**, 4239 (2003)