Design of a Multipoint Thomson Scattering Diagnostic for the TCABR Tokamak

L. A. Berni
Laboratório Associado de Plasma, INPE, São José dos Campos, SP, Brazil

M. P. Alonso, C. Varandas
Association Euratom-IST, Centro de Fusão Nuclear, Lisboa, Portugal

J. H. Severo, J. I. Elizondo, R. M. O. Galvão
Instituto de Física, Universidade de São Paulo, SP, Brazil

M. Machida
Universidade Estadual de Campinas, Campinas, SP, Brazil

F. O. Borges
Universidade Federal Fluminense, Rio de Janeiro, Brazil

The realization of a Thomson Scattering Diagnostic in a small tokamak to obtain the radial profile of the electron temperature and plasma density is one of the most complex and expensive of the optical diagnostics. Nevertheless, it is one of the most valuable tools to understand tokamak plasma physics because, in ideal conditions, it allows the measure of absolute plasma parameters. In this work, we describe the design details, the ray-tracing simulations and the numerical results of the multipoint Thomson scattering diagnostic system, which is based on a particular use of small optical diameter fibers arrangement. This arrangement has the particular feature that the optical signals from the electrons are delivered progressively to only one detector. We will show this multiplexing technique, based upon an ensemble of optical fibers, which fits to the detector étendue and has a particular monotonic grow of the optical fiber length. The detector is the traditional Thomson polychromator made with 3 pairs of interference filter and Si avalanche photodiodes. The laser source is a Nd:glass laser with up to 30 J and 20 ns pulse duration, which is delivered to the tokamak vacuum plasma by dielectric mirrors and then the Thomson scattered light is collected at 90^o by a specially designed light collecting lens.