Optimization of the Collection Optics System for KSTAR Divertor Thomson Scattering Diagnostic

G.H. Park[1,2], H.J. Kim[2], J.H. Lee[1,2,*]

[1]*KFE School, University of Science and Technology (UST), Daejeon, 34113, Korea*
[2]*KSTAR Reserch Center, Korea institute of Fusion Energy (KFE), Daejeon, 34113, Korea*

Thomson scattering (TS) diagnosis is one of plasma diagnostic methods that measures a density and temperature of electrons by using laser and optical system that collects a light emitted through the interaction of free electrons and laser beams in plasma. In Korea Superconducting Tokamak Advanced Research (KSTAR), a tangential TS diagnosis has been installed and measured the electron temperature and density profile every KSTAR campaign [1][2][3].

Recently, KSTAR is in the process of replacing a divertor with tungsten (W) tile to increase a performance of KSTAR plasma. So we are planning to install a divertor TS diagnosis on the divertor X point area to measure the electron temperature and density profile [4].

In this study, we would like to describe the collection lens design for the divertor TS diagnosis of the KSTAR tokamak. Since the divertor material is replaced with tungsten, it is important to minimize the optical noise such as stray light entering into the divertor collection optic system.

In this research, an optimum collection optic design for the KSTAR divertor Thomson scattering diagnostic was derived under various conditions which based on the Cooke triplet lens system [5]. And the optimized divertor collection optic design is introduced and discussed with simulation analysis result.

This work was supported by Ministry of Science and ICT under KFE R&D Program of "KSTAR Experimental Collaboration and Fusion Plasma Research (KFE-EN2301)".

[1] J.H. Lee, *et al.,* Review of scientific instruments. **81** (2010) 10D528.
[2] S. Oh, *et al.,* Review of scientific instruments. **81** (2010) 10D504.
[3] J.H. Lee and H.J. Kim, Journal of Instrumentation. **14** (2019) C11015.
[4] S. Kajita, *et al.,* Fusion engineering and design. **89** (2014) 69-76.
[5] https://en.wikipedia.org/wiki/Cooke_triplet

Presenting author: ghpark@kfe.re.kr