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Use of Gaussian Beam Tracing in the Design of Millimeter-Wave Diagnostics on ITER[1] HEESEOK JOO, University of Virginia, MANFRED BITTER, BEN TOBIAS, Princeton Plasma Physics Laboratory, HYEON PARK, Ulsan National Institute of Science and Technology, ALI ZOLFAGHARI, Princeton Plasma Physics Laboratory — When the wavelength of the radiation being studied is comparable to the size optical components, the diffraction effect cannot be ignored. Gaussian beam tracing (GBT) can be used by treating the propagation of the light as a beam with certain size rather than a ray used in geometrical optics when analyzing the optics of millimeter-wave diagnostics. Gaussian optics is an effective way to represent diffraction effect because of its ability to show the beam size and the intensity that could be altered from diffraction. GBT has been used in two millimeter-wave diagnostics suited to ITER geometry. The first is in a design of a Gaussian telescope for correction of transmission line misalignment in the ITER LFS reflectometer due to motion of the vessel during heating to operating temperature from room temperature. The second is a new concept of using spherical mirrors for electron cyclotron emission imaging (ECEI) and assessing its promise of a more realistic method of ECEI in ITER than previous idea of using a cylindrical mirror that requires large access ports that can be exposed to intense neutron radiation. The spherical mirror promises a smaller aperture on the first wall of ITER. The simulation of GBT of the two applications are analyzed and discussed.

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HeeSeok Joo
University of Virginia

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