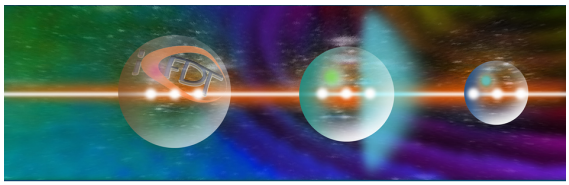

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# Evaluation of the viewing factors of tokamak bolometric diagnostics using ray tracing for the improvement of tomographic reconstructions

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Nuclear fusion offers the potential for an almost limitless and clean energy source. Achieving controlled fusion necessitates the confinement of hot plasmas within devices called tokamaks, which use magnetic fields for this purpose. Accurate measurement of total radiation and impurities in these plasmas is crucial for optimizing performance and ensuring safety.
Bolometers, which provide line-integrated measurements, are key diagnostics for measuring radiation. Tomography is essential in these measurements as it converts line integrals into spatially resolved emissivity, a process complicated by its inherently ill-posed nature. Traditional tomographic methods often approximate lines of sight as exact lines; however, these lines broaden due to the geometry of the collection system and the finite dimensions of the detectors, significantly affecting the accuracy of reconstructions. Enhancing the quality of these reconstructions requires a precise understanding of the viewing geometry.
This work presents a comprehensive methodology for calculating and validating viewing factors using ray-tracing simulations. This approach evaluates viewing factors and étendue by considering the detailed geometry of the machine and detectors.
This method can handle complex aperture and collimator geometries and its applicability and effectiveness are demonstrated for the diagnostics of various European tokamaks.

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