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# P4.1005 Application of Laplacian Eigen Functions for the tomographic reconstruction of tokamak

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See the full abstract here
http://ocs.ciemat.es/EPS2019ABS/pdf/P4.1005.pdf

The estimation of 2D plasma emission profile via tomographic reconstruction inherits the ill-posed inversion characteristic and is constrained by the limited number of plasma observations sights/directions. Such complex estimation is carried out by special mathematical treatments like the series expansion method. These methods hold some drawbacks especially while dealing with signals harboring significant noise. In the case of the Fourier-Bessel function (FBF)[1,2], the emission profile is decomposed in orthogonal basis patterns and exhibits robust 2D emission profile with the noisy signals, while ignoring high-frequency components. However, FBF works well for the circular cross-section but it has problems in applying to noncircular cross-section or 3D shaped case. A new approach based on Laplacian Eigen Functions (LEF) [3,4], very often employed in image data processing, is discussed here for the tomographic reconstruction of the fusion plasma. Under LEF procedure the Eigen-functions of the Laplacian are computed over the 2D or 3D emission areas and the line integrated data is then expanded into these Eigen-functions. As a first step, the formulation of the tangential viewing tomographic reconstruction on the 2D emission profile is conducted and it is used to find the magnetic axis and the X-point from the visible camera image of the tokamak.

[1] Wang L and Granetz R S 1991 Rev. Sci. Instrum. 62 8423 [2] Wang L and Granetz R S 1991 Rev. Sci. Instrum. 62 11156 [3] Saito N 2005 IEEE/SP 13th Workshop on Statistical Signal Processing, 2005 (IEEE) pp 42530 [4] Saito N 2008 Appl. Comput. Harmon. Anal. 25 6897 [5] van Wieringen W N 2018 arXiv:1509.09169

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