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**Road to global quasisymmetry: avoiding the problem of overtermination in near-axis expansions**<sup>1</sup> EDUARDO RODRIGUEZ, Princeton University, AMITAVA BHATTACHARJEE, Princeton University/PPPL — Quasisymmetric (QS) fields have long been a topic of study for stellarators, given that they present an elegant way to realize good particle confinement. It is however generally believed that the construction of globally QS magnetostatic equilibria is probably possible only in the case of true axisymmetry. Such an intuition has been largely built on the original and ensuing work on near axis expansion of magnetic fields<sup>2</sup>, which show that the expansion becomes overdetermined at larger distance from the axis.

In this paper, we follow a different path in constructing quasisymmetric solutions by near-axis expansion than pursued in Ref. 1. Following recent work<sup>3,4</sup>, we decouple QS from the particular form of force balance to form a generalised form to the standard near axis expansion for quasisymmetric fields. Specializing in anisotropic plasma equilibrium, we show that, formally, the overdetermined nature of the near-axis expansion may be avoided. This opens the door to the possibility of building QS fields in a global sense.

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<sup>2</sup>D. Garren & A. Boozer, Phys. Fluids B, **3**(10) (1991)

<sup>3</sup>J. Burby, N. Kallinikos & R. MacKay, arXiv:1912.06468 (2019)

<sup>4</sup>E. Rodríguez, P. Helander & A. Bhattacharjee, Phys. Plasmas, **27**, 062501 (2020)

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