



Contribution ID: 24 Contribution code: P2.3

Type: Poster

## Linear equations for stellarator local MHD equilibria around irrational and rational flux surfaces

Wednesday 4 October 2023 17:48 (4 minutes)

Building on previous work [1, 2, 3], we develop a new set of linear equations to determine the magnetic geometry coefficients needed for local gyrokinetic simulations on a flux surface of interest. The inputs required for the model are the shape of the flux surface, the radial derivative of that shape and four constants. One possible choice for these four constants is the pressure gradient, the gradient of the toroidal flux, and the rotational transform and its radial derivative at the flux surface of interest. When we apply our equations to rational flux surfaces, we find that, for flux surfaces to exist, two conditions must be satisfied. One of the conditions is the well-known Hamada condition [4], but the other has not been discussed in the literature to our knowledge.

### References

- [1] C.C. Hegna, Phys. Plasmas 7, 3921 (2000).
- [2] A.H. Boozer, Phys. Plasmas 9, 3726 (2002).
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**Session Classification:** Poster session: 02