

# Spectral properties of VMEC equilibria

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The aim of this work is to clarify some aspects related to the mutual spectral properties of MHD equilibria with different symmetries defined by action-angle coordinates. We refer mostly to the spontaneous helical states [1] that commonly occur in high current RFX-mod plasmas and which are now routinely reconstructed by means of the equilibrium code VMEC [2], modified to suit the RFP configuration [3]. The existence of such equilibria is the basis on which several stability and transport studies can be established. Tearing instabilities are one of the most dangerous sources of particle and energy transport, so an important question to be addressed is the occurrence of resonant tearing instabilities in helical plasmas and particularly what they look like when seen by the (toroidally symmetric) set of edge magnetic probes.

In order to clarify the mutual spectral properties of axisymmetric and helical MHD equilibria we deal with the problem of how magnetic spectra (Fourier analysed in helical coordinates) transform under a change of coordinates, from helical action-angle coordinates to toroidal ones, and viceversa. It is worth noting that in these coordinate transformations the radial coordinate is changing too. Furthermore, since the method can be applied to any VMEC equilibrium, similar considerations can be made for the other toroidal configurations, for example for the study of the effect of resonant or non-resonant magnetic perturbations in tokamak plasmas.

## References

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- [3] D. Terranova *et al.*, *Plasma Phys. Control. Fusion* **52**, 124023 (2010)

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