

Analysis of magnetic data

- Mode analysis now based on statistics of von Mises distributions to reflect the periodic nature of phases
- Datamining project: the first analysis of this type and scale (tens of thousands of plasma shots) now covers the 5 largest stellarators (LHD, Heliotron J, TJII, H-1, W7-AS)
- New method of discovering unusual behaviour - ‘probability density in high dimensional space’ finds outliers in millions of data points

Internal structure of modes in H-1 via density and visible light tomography

- Wealth of data from imaging diagnostics allows essentially unconstrained reconstruction of radial profiles from the numerous ($> 10,000$) line-of-sight projections
- Successful match of radial density fluctuation profile with finite beta eigenmodes from 3D MHD codes.
- However the above does not reproduce the frequency dependence on rotational transform which has the characteristics of global Alfvén eigenmodes.

Future challenges

- real time classification based on historical data to enable action before confinement degradation occurs.
- Convergence of compressible MHD codes in the presence of the large number of sound modes required by the strongly 3D nature of advanced confinement geometries.