# Advanced energetic ion and impurity ion physics in 2D and 3D magnetically confined plasmas

VENUS-LEVIS [D. Pfefferlé, *et al*, Compt. Phys. Communs. **185** 3127 (2014)] guiding centre and full orbit code has been employed for various 3D applications in tokamaks and stellarators:

- Alpha particle transport due to toroidal field ripple in European DEMO design
- Higher order guiding centre equations applied to novel 5 1/2 D ICRH modelling
- Tungsten impurity transport in tokamak hybrid scenarios: the effect of 1/1 long living modes and flows
- Heating and fast ion generation schemes for the W7-X advanced stellarator using SCENIC 3D ICRH code:
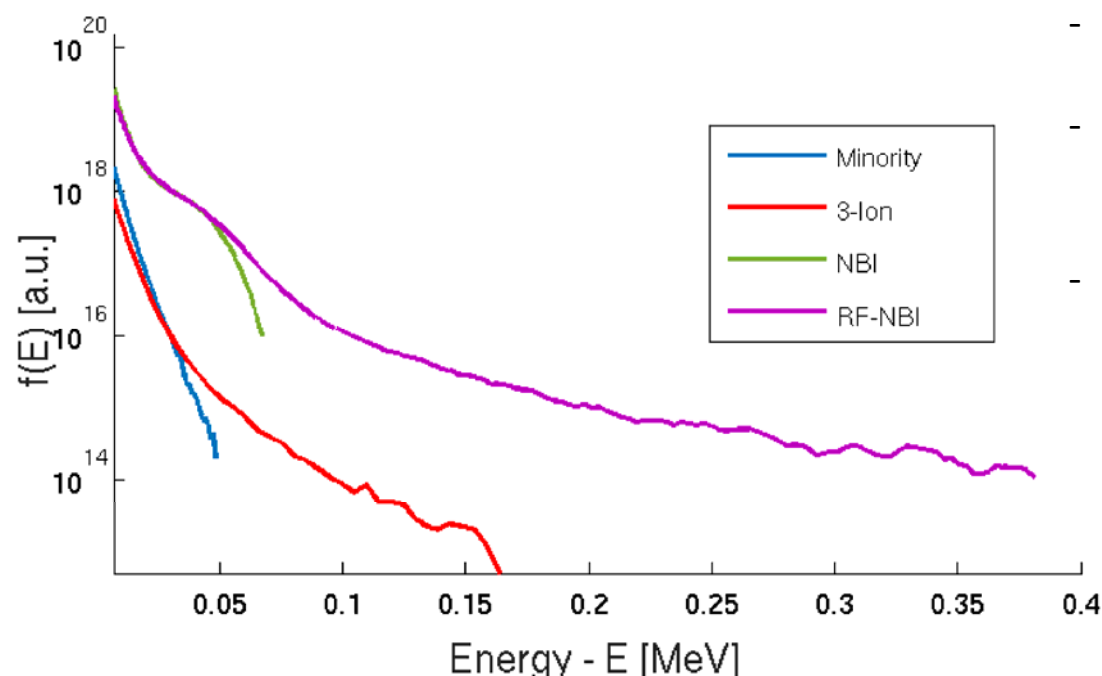
- The stellarator line towards a fusion reactor must demonstrate fast ion confinement
- The synergetic NBI-RF scheme overcomes high collisionality problems associated with RF in W7-X.
- RF-NBI generates a relatively isotropic distribution of highly energetic ions. Better confined than deeply trapped distributions usually associated with minority heating or 3-ion species heating