BULK MAGNETISATION (5 participants)

- Jc(B) usually a macroscopic approximation using average properties based on some local measurements of small sample(s) → then apply Kim or Kim-like model
- For improved modelling:
  - More fundamental data is needed over a large range of B and T. In general, many modellers use some simple approximations for Jc(B,T)
  - At lower temperatures, microscopic properties (cracks, dislocations, etc.) have a large influence on the magnetisation process, but not much data exists
  - Jc as a function of position is very important, but there don't exist any non-destructive testing methods to evaluate this
- A demand to better understand the physics of bulk superconductor magnetisation, including flux pinning and movement
  - Studies on MgB2 bulks, being more homogeneous, can assist understand this issues overall.
- Less difficulties than tape-/coil-based modelling
  - Meshing & number of elements better due to the simpler geometry and better aspect ratio
  - But now 3D models are being developed, which are more computationally intensive.
- A need for 3D arrays of multiple bulks to model practical devices.
- In 3D models, worry about applying the power law in three axes.
  - There may be issues with flux cutting (Archie) and flux line dynamics may be very complicated, including microscopic nature and anisotropy
  - Current models tend to use simple reduced Jc or ignore current along other axes than the plane of the "main" supercurrent providing the trapped field
- **SOFTWARE/MODELS USED:**
  H formulation, Campbell's equation, A-V formulation
  COMSOL, Open source/self code, FlexPDE
- "Slow magnetisation" models (analogous with DC models)
  "Fast magnetisation" models (like AC)
  - These different models require different considerations – some are time-dependent, some are thermal
  - Developments in tape/coil modelling – which has had many developments in recent times – can assist greatly in optimising bulk superconductor models