U.S. DEPARTMENT OF ENERGY | Office of Science

NSTX-U

ECH/EBW modeling

Nicola Bertelli,

J. Hosea, R. J. Perkins, G. Taylor & NSTX-U Team

PPPL

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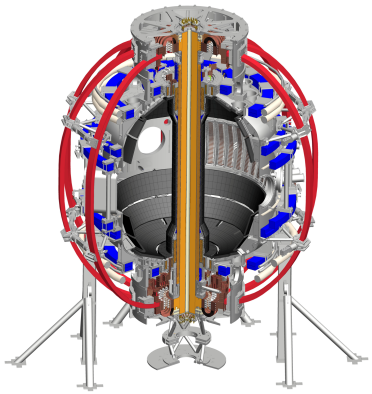
PPPL



EC/EBW numerical tools available in PPPL

EC codes:

- `GENRAY` (from A. Smirnov & R. Harvey - CompX)
  - ray-tracing code so based on WKB approximation (geometrical optics)
  - takes into account refraction effects
  - implemented in `TRANSP`
  - several options for the EC dispersion relations: w/ or w/o relativistic effects, etc.
  - momentum conservation in the current drive evaluation
  - . . .
- `TORBEAM` (from E. Poli - IPP-Garching)
  - beam-tracing method or called paraxial WKB
  - takes into account refraction and diffraction effects
  - recently implemented in `TRANSP`
  - few options for the EC dispersion relations: w/ or w/o relativistic effects, etc.
  - momentum conservation in the current drive evaluation
  - . . .

EC/EBW numerical tools (cont'd)

EBW code:

- GENRAY
  - ray-tracing code so based on WKB approximation (geometrical optics)
  - takes into account refraction effects
  - implemented in TRANSP
  - hot plasma dispersion relation
  - Change in the dispersion function along the ray
    - For example, this can occur for hot plasma when the trajectory goes through the gyro-resonance area, where the dispersion relation has points of bifurcation or conversion from X to EBW mode
  - couple to the Fokker-Planck code CQL3D
- Interest to apply numerical tools beyond the ray tracing technique
  - Full waves codes (?): at least a couple of codes in Europe
  - For instance, in QUEST & LATE, what are the people using for ECH/EBW modeling?
  - Opportunity to collaborate with Japanese colleagues on EBW modeling & experiments (?)