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Distinguishing between 3d magnetic field structures and transport

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NSTX-U Research Forum
Princeton, NJ
2/25/15

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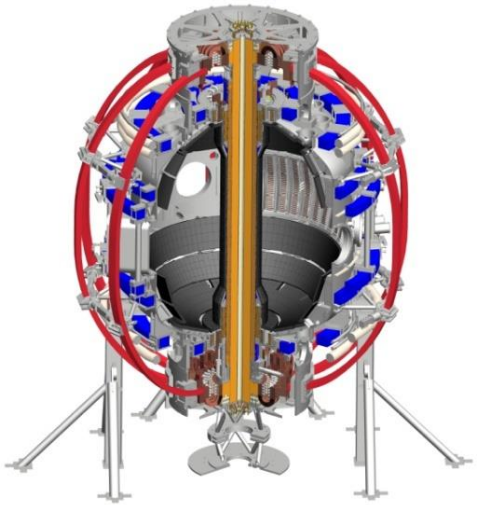


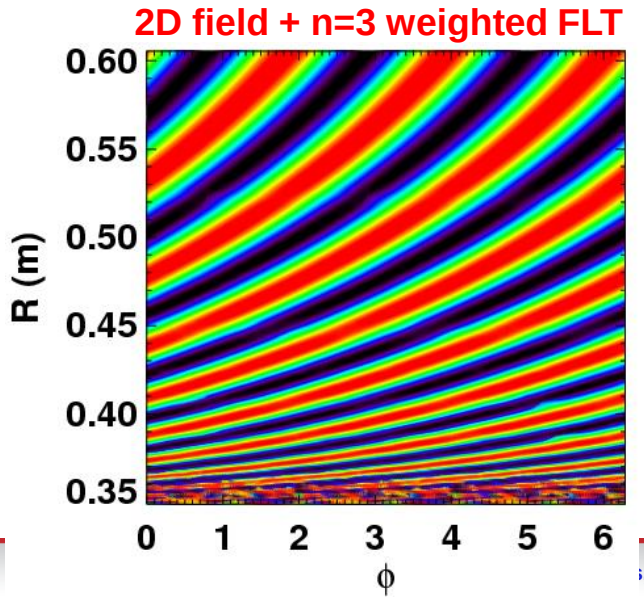
Toroidal modulation of radial heat flux can yield divertor striations even in a 2D B-field

- Even with fully screened RMPs, curvature, shear, etc will have toroidal modulation
  - Drive for local instabilities will be non-axisymmetric (e.g., Bird & Hegna)
  - Expect that radial heat flux will vary toroidally and poloidally
- Effect of n=3 radial heat flux modeled via field line tracing (using EFIT field)
  - Assuming radial transport puts heat into SOL at the OMP with an n=3 dependence
  - Launch field lines from OMP, weight based on toroidal angle (represents heat flux)
  - Follow field lines to wall to get spatial distribution of weights
- Mechanism can produce lobes, even with strongly screening plasma response
  - Contrasts with magnetic lobes (tangles), which shrink with screening

NSTX Example

ψ_0=1..1.5
θ_0 = 0
ϕ_0 = 0..2π
w=1+$\varepsilon_t$cos(nϕ_0)

Field line tracing
$\Rightarrow$ w(ψ,θ,ϕ)



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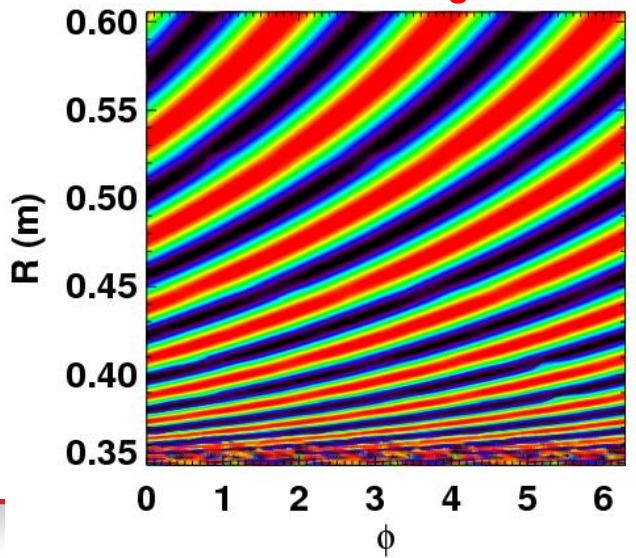
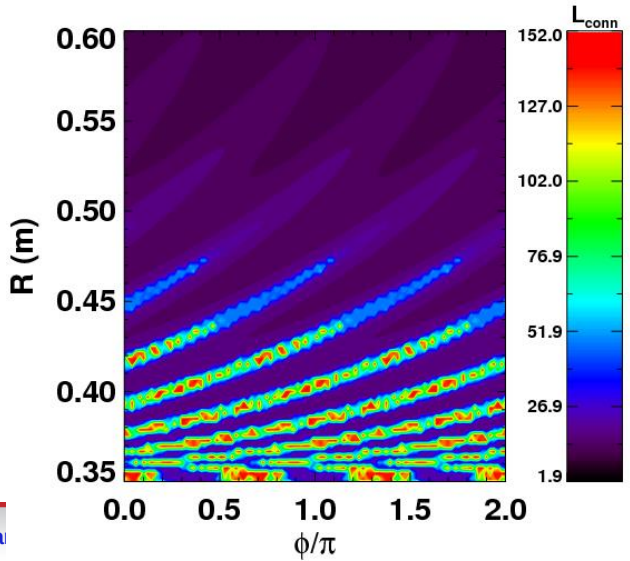
2D field + n=3 weighted FLT



2D field + 3D vacuum field



Testing role of changing magnetic topology vs. n=3 radial heat flux

- If due to cross-field transport, expect 3D patterns to be a modulation of initial 2D transport and so to scale with underlying SOL transport
  - Striations in heat flux profile exist only (roughly) where the heat flux is large in the 2D case
  - Won't get heat flux in formerly un-wetted area (unlike tangles, which can in principle connect hot core plasma to anywhere if they're big enough)

- Proposal: Test via I_p scan at constant q
  - FY10 JRT results indicate SOL width will contract with I_p
  - Can scale RMP to try to maintain constant magnetic lobe size according to field line tracing (although changes in screening complicate this)
  - If its tangles, striations should be ~constant, if its transport, striations should contract with λ_q