

# Update on BPO-MHD activities and issues



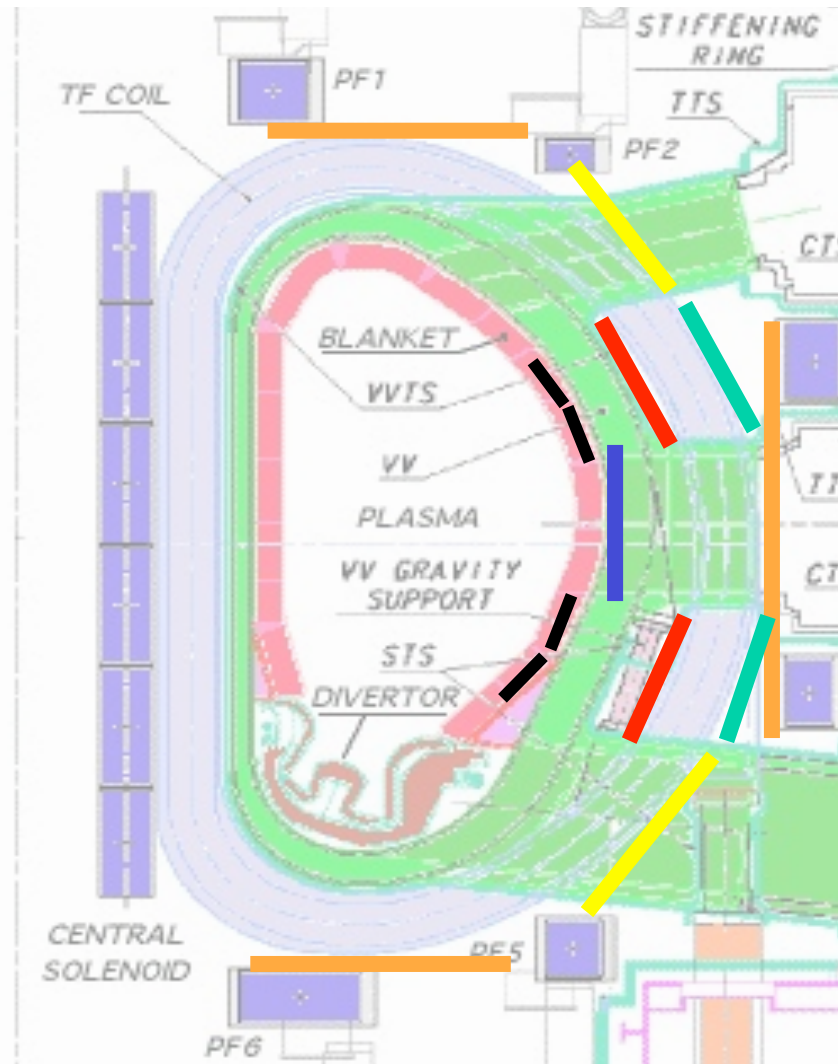
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- Integrated analysis of ELM, RWM, and Error Field coil upgrade options for ITER
  - Also for ITPA – RWM and ELM ITER issue cards
- Discussion of longer term physics issues for BPO-MHD to consider – all ideas welcome

# ITER non-axisymmetric coils for ELM/RWM/EF analysis



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Presently focusing on coil sets #1 and #2

1. Error field correction coils

2. ELM coils on vessel, inside TF

3. ELM coils in blanket modules

4. Mid-plane port-plug RWM coils

5. ELM coils on TF, near mid-plane

6. ELM coils on upper/lower ports

Extension of work performed by  
M. Becoulet (CEA), et al. for ITER

# Task 1 - assess combination of coil sets #1 and #2



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- Assess ELM mitigation capabilities of coil set #2
  - Assess ergodization, 4/3 island width, coil current for coil #2
  - Does addition of coil set #5 to #2 improve performance?
    - Analysis by Becoulet used these coils together – is this desirable/necessary?
  - Does addition of coil set #1 to #2 improve performance?
    - Can operation of EF coil set #1 with  $n=3$  reduce 4/3 island from coil set #2
    - How does EF coil set #1 modify ergodization from coil set #2?
- Assess RWM control capabilities of coil set #2
  - How does performance compare to using coil #1 for RWM?
    - Can we justify removing large AC power requirement for coil set #1
  - How much is performance degraded relative to port plug coils #4
- Assess error field control capabilities of coil set #2
  - How does error field spectrum of coil #2 compare to coil #1?
    - Does coil set #2 offer similar EF correction spectrum/functionality as coil #1?

# Possible longer-term physics topics



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- How/why does ELM coil “ergodization” modify transport – in particular lowering the density and not temperature
  - Also contribute understanding of flow damping from ELM coil fields
- How does MHD in “hybrid” scenario modify current profile?
  - Saturated  $3/2$ ,  $4/3$  NTMs (DIII-D), core  $1/1$  quasi-interchange (NSTX)
  - Dynamo action?
  - KAW current drive?
  - NBI fast-ion redistribution?
- Does massive gas jet injection disruption mitigation (heavily reliant on MHD and island overlap) extrapolate to ITER
  - Improved modeling and experiments needed?