Exterior Magnets Concept
Blanket and Vacuum Vessel Chamber Integration and Maintenance

G. Sviatoslavsky,
M. Sawan (UW),
A.R. Raffray (UCSD),

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Outline

• Chamber Layout
• Blanket Maintenance
• Dump Maintenance
• Design Assessment in Terms of Givens and Druthers
Nested polar modules allow VV access without disturbing beam ducts or magnets.

VV Module Housing
Polar Cusp
Armored Dump

VV Module housing Polar Blanket
External manifold (not shown) allows hands-on pipe connection & disconnection
Blanket Maintenance Scheme

Self-contained remote handling system attaches vessel at pole
Blanket Maintenance Scheme
Blanket Maintenance Scheme
Blanket Module with Frame and Coolant Manifold

- Frame is one option
  - Provides module/vessel clearance required for manifold
  - Frame requires cooling
  - Another option: mount attachment points directly onto sub-modules
- Another manifold option is to have concentric inlet/outlet piping
Tee Nut Remote Fasteners

- Captive nut / bolt fasteners
- Utilized in TPX divertor module mounting
- Allows some lateral movement to accommodate thermal expansion
- Fastener tightened outside the chamber due to space constraints at module/chamber interface

Fixed mounting receptacles mounted on module frame

Nut Bar mechanism integrated into chamber and manipulated from outside of chamber
Attachment Point Detail

1. Module is aligned to engage nut bar through “keyed” opening of receptacle
2. Rotation of nut bar is stopped at 90°
3. Additional rotation tightens nut bar against receptacle keyed wall
Cut-Away View of Module/Chamber Interface

- Shield wall
- Blanket Module
- Module frame
- Fixed mounting receptacle
- Chamber Support I-beam
- Nut bar tightened from outside of chamber
- Manifold inlet & outlet connection
Tee Bar Fastener detail

Module frame

Fixed mounting receptacle

Tee bar fastener tightened from outside of chamber

Length of linkage through shield provides “flexibility” to accommodate thermal expansion

Shield

Module
Option 1: External welding possible with proper installation alignment

Option 2: ~11” inlet & outlet pipes allows internal welding

Coolant penetrations through shield
(two shown but concentric option requires only one)
Maintenance of Ring Cusp Dump

Removable “Ring Caps” at equator
Possibly replaceable ring cap modules with integrated dumps plates
• Does not allow “Straight-up” blanket removal

• Field coil radii: 4.1m & 6.9m vs. 3.4m & 6.1m
  (radius measured to center of coil cross-section)

• Blanket offset from shield by only ~35cm
• Blanket access does not require re-welding beam ports
• Blanket Access does not require disconnecting (or moving) beam ports
• Minimizes mass lifted for chamber access
• Minimizes height of components to be lifted
• Minimizes evacuated volume
Additional Advantages

• Blanket access does not require disturbing magnets

• Magnets accessible for hands-on maintenance