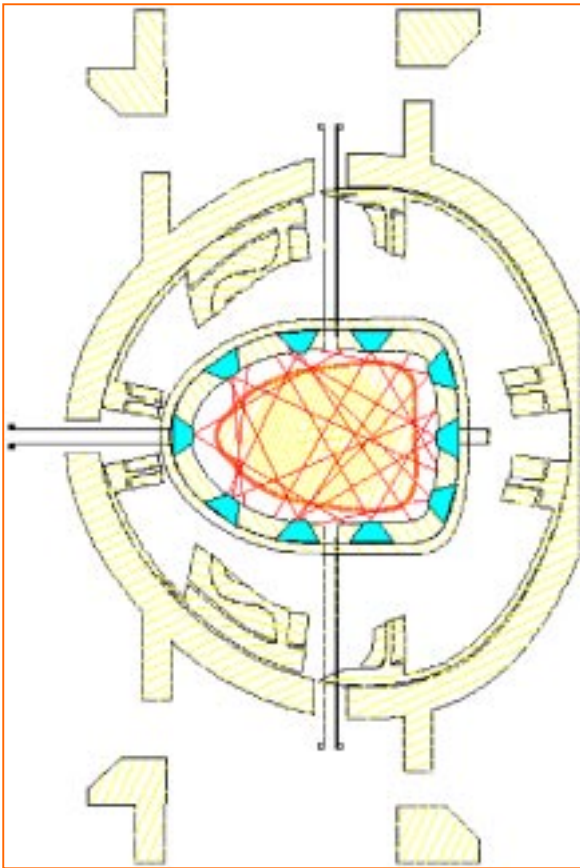# Optimization of NCSX Ports for Diagnostic Views
- Several Examples -

David Johnson

July 24, 2002

Compact Arrays for X-ray Tomography

- For adequate coverage, need to install compact arrays between the first wall and the vessel, as shown at left.
- Currently, there is not a design that is compact enough to fit within the 50 mm space behind PFCs.
- It may be possible to integrate compact arrays into one of the "wedge" flanges.
- Cooling of detectors will be needed during bakeout.

Thomson Scattering

- Optically, the simplest geometry is shown at right.
    - High resolution
    - High throughput
    - Straightforward design
- Research issues
    - Laser not always thru axis
    - 2-D capability ??
        - Definitely between plasma shots
        - Perhaps within a laser shot

Thomson Collection Optics

Laser
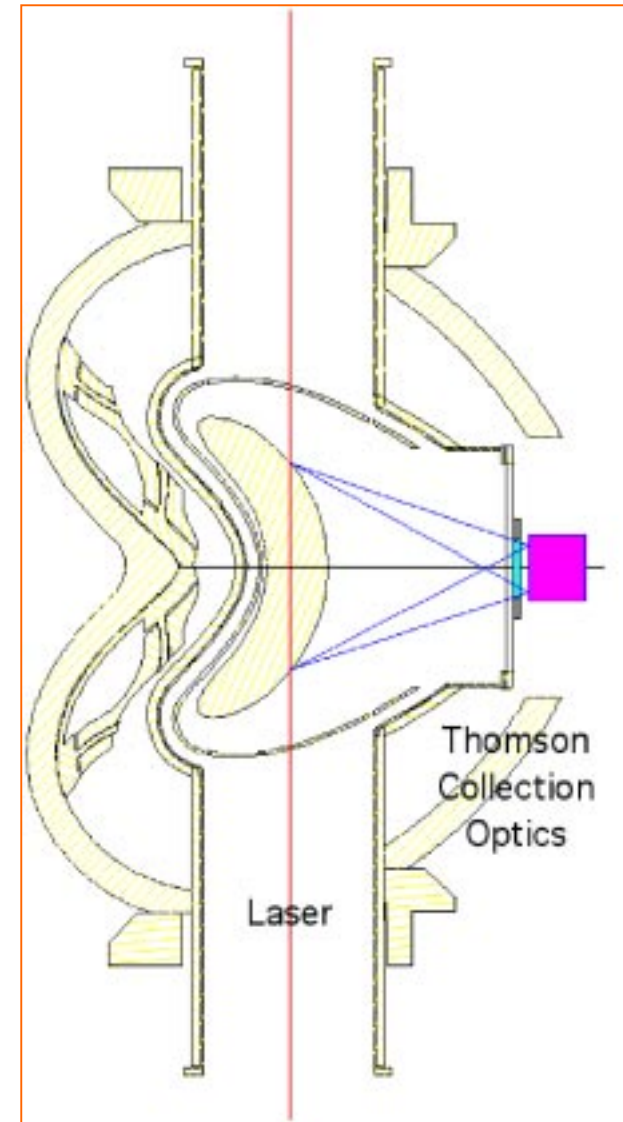
# Existing Design would need Modification to Accommodate TS Optics

- Proposed Thomson viewing would requires large outer vessel flange different from existing beam/pumping ports shown at right

- New flange could also incorporate pumping and DNB (shown in later slide).
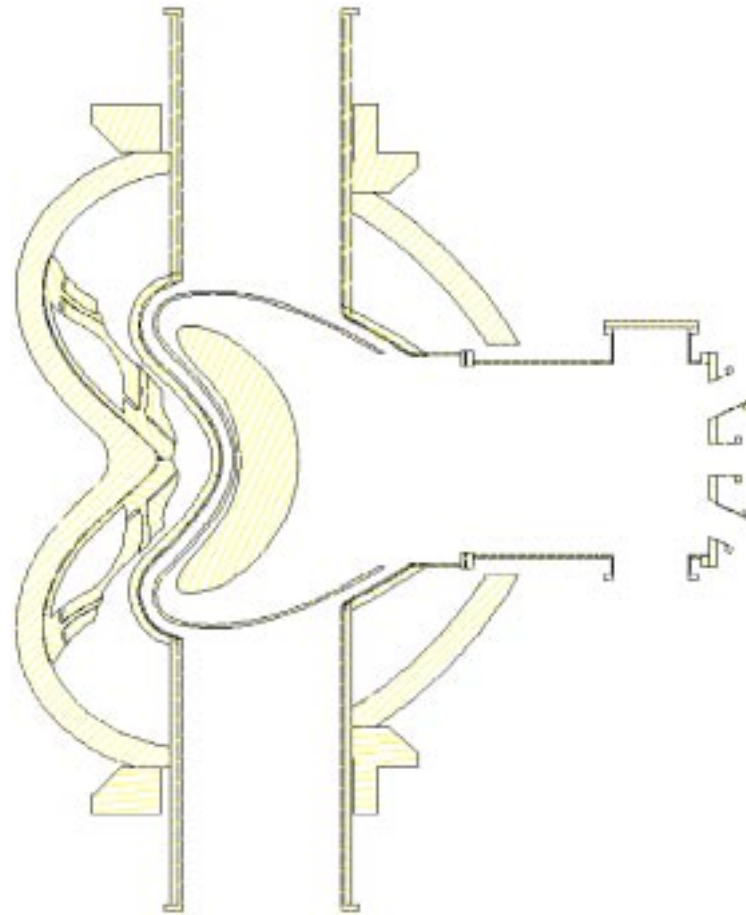
FIR Interferometer/Polarimeter
$j(R)$, $n_e(R)$, and B fluctuations

- This system would use a vertical sheet FIR laser beam similar to systems used on TEXT and MST.

- Would make use of large vertical ports in this location. (beam port OK)

- Estimate 1.0-1.5 cm radial channel spacing may be possible. (Brower UCLA)
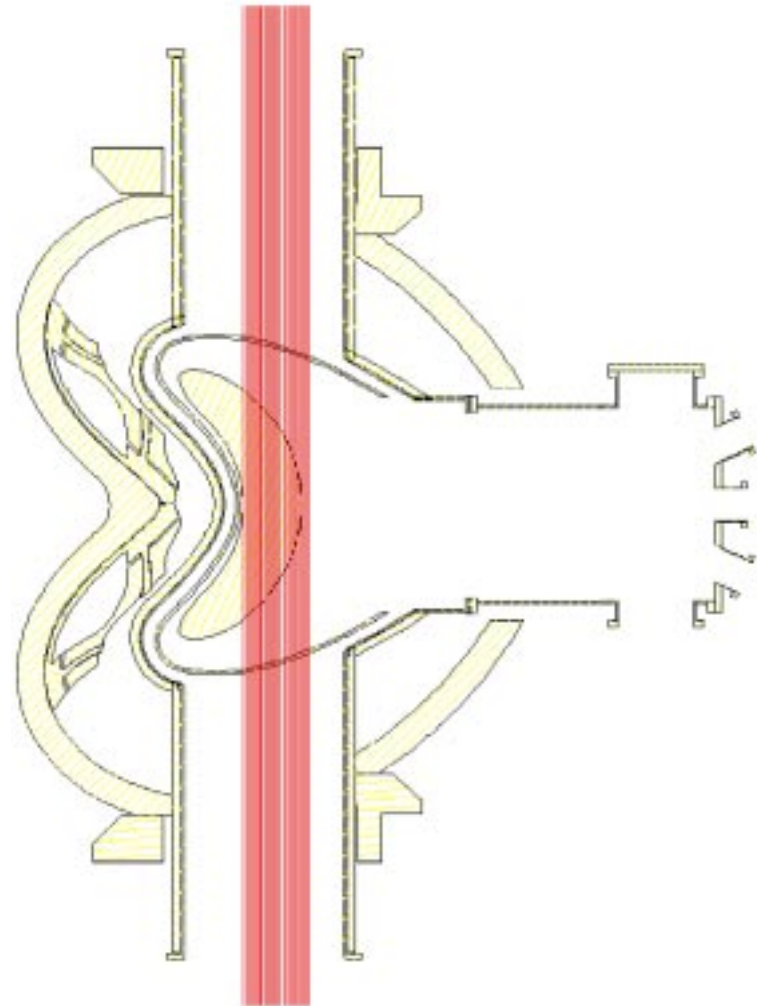
Active Spectroscopy

- The simplest optical designs with the highest optical throughput would require ports that deviate from radial planes and do not point at magnetic axis.

- They would also require vacuum interfaces near outer shell surface, and custom interfaces with cryostat.

- In order to preserve stellarator symmetry, optimizing must be done in groups of 6.
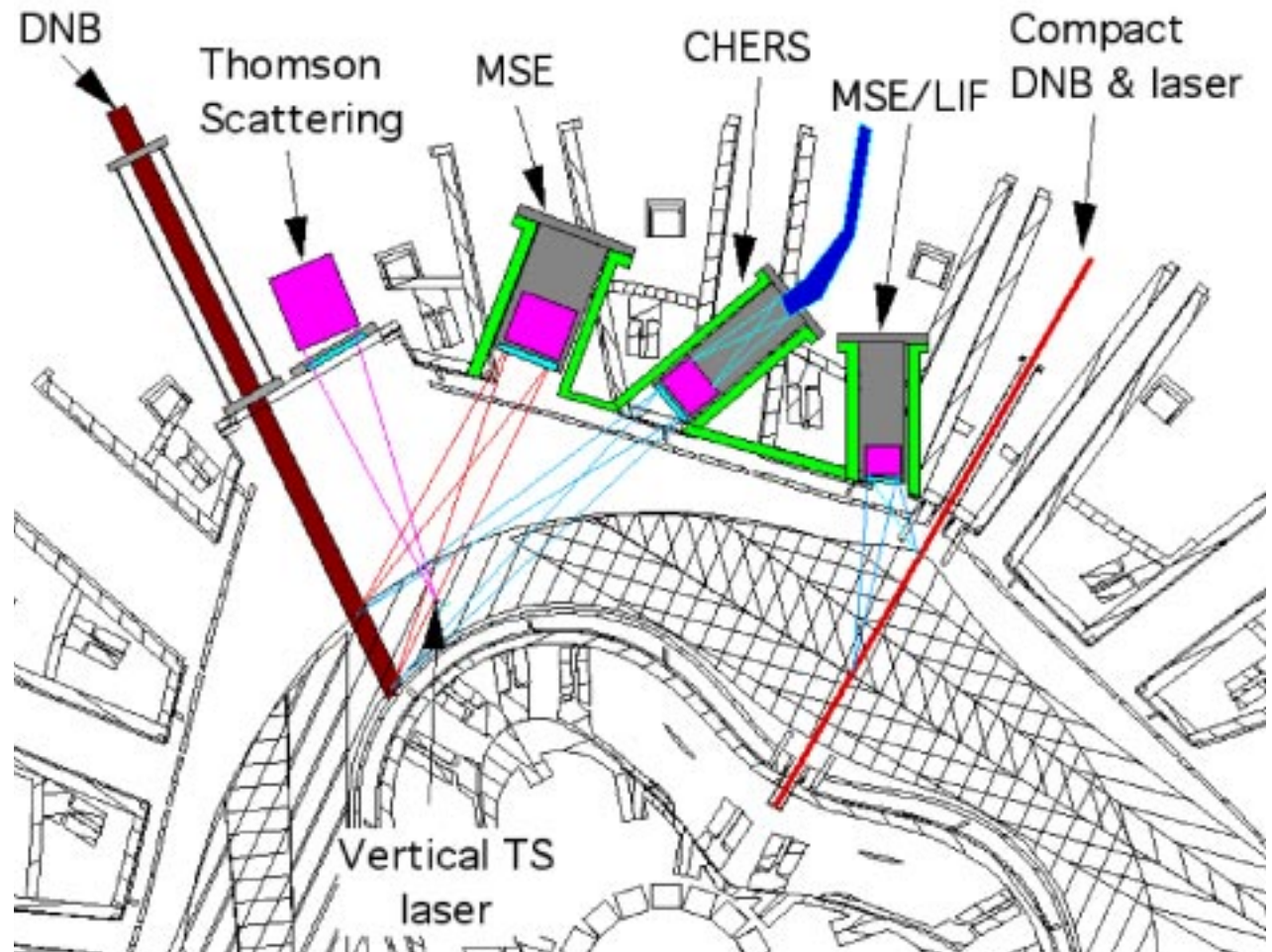
This limits how 'optimized' any one view can be, since 5 other ports will be affected.