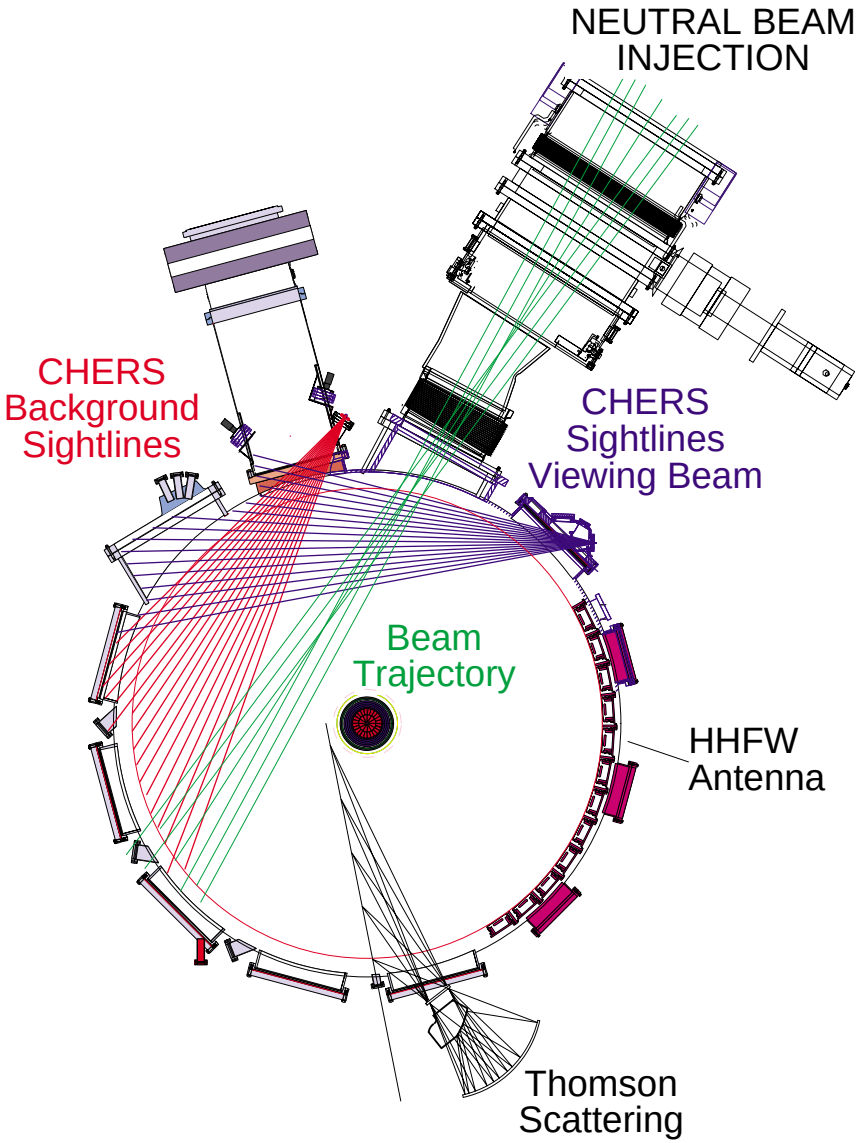
NSTX CHERS Diagnostic



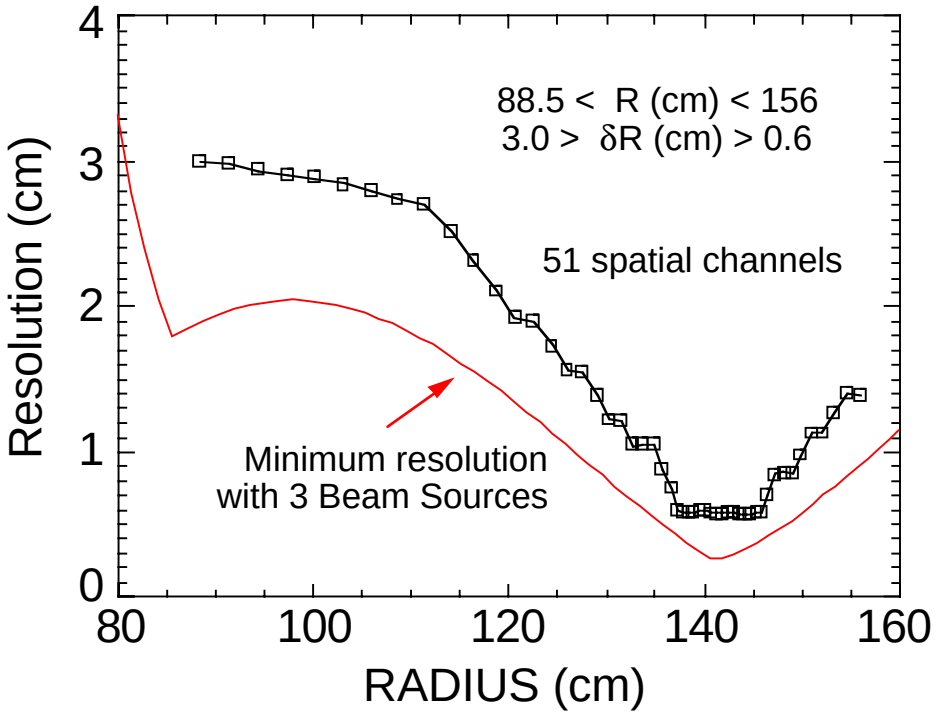
New NSTX CHERS:

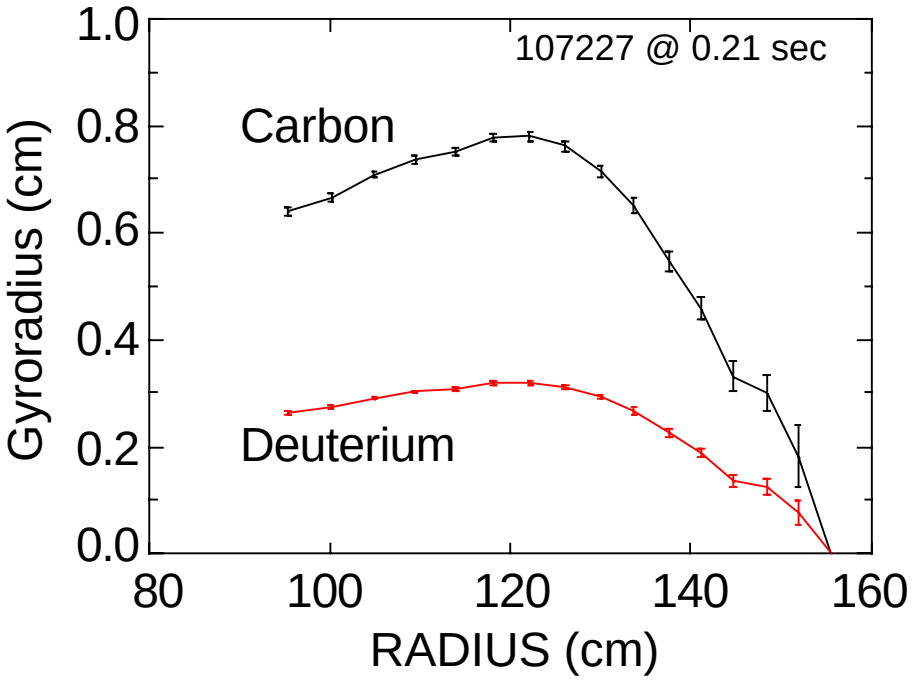
- 51 spatial channels, Bay B, viewing Neutral Beam
- 39 background channels, Bay L
- MSE/CHERS collection optics
- 10 ms integration time
- T_i (R), V_ϕ (R), N_{carbon} (R)
- T_i (instrumental) ~ 100 eV
- NBI required
- C VI emission, 5290 Å

Bell, Biewer, Johnson, NSTX 5-year Forum

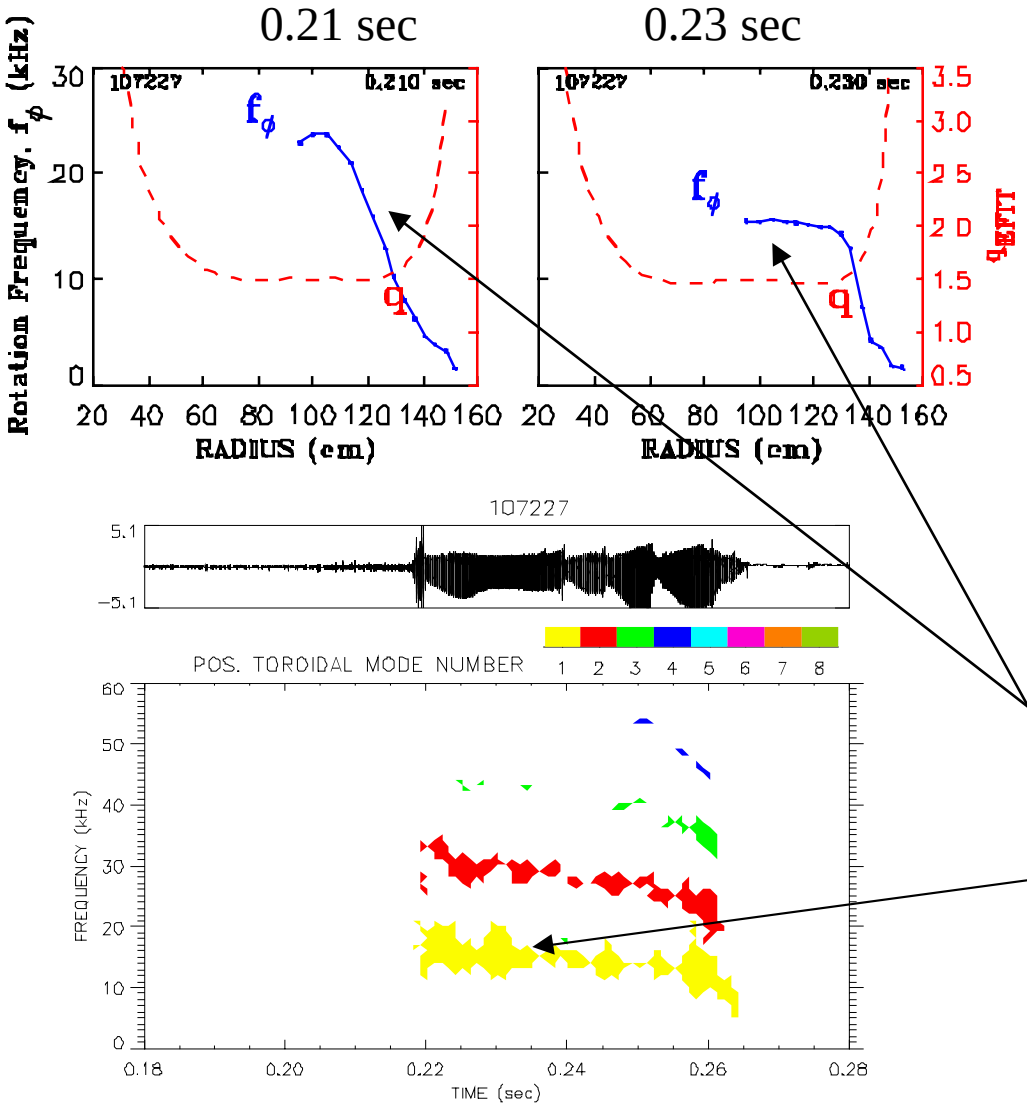
NSTX CHERS Resolution

- Optical design allows good edge imaging
- Planned spatial resolution is 1.5 - 5 × carbon gyroradius
- Spare fibers at image plane can accommodate another spectrometer with equal resolution





NSTX CHERS Rotation Profiles and MHD



- Profound changes in V_ϕ profile are often correlated with MHD activity
- Regions with constant ω_ϕ may correspond to magnetic islands

- Flattening of V_ϕ profile coincides with n=1 mode

NSTX CHERS Future

Issues:

- High quality cross calibration needed between background array and main array.
- Analysis techniques to handle large background emission still maturing
- Analysis time long (now 15-30 minutes depending on shot length)
- Expansion will increase analysis time $\times$ 6.
- Need array of processors for between shot analysis

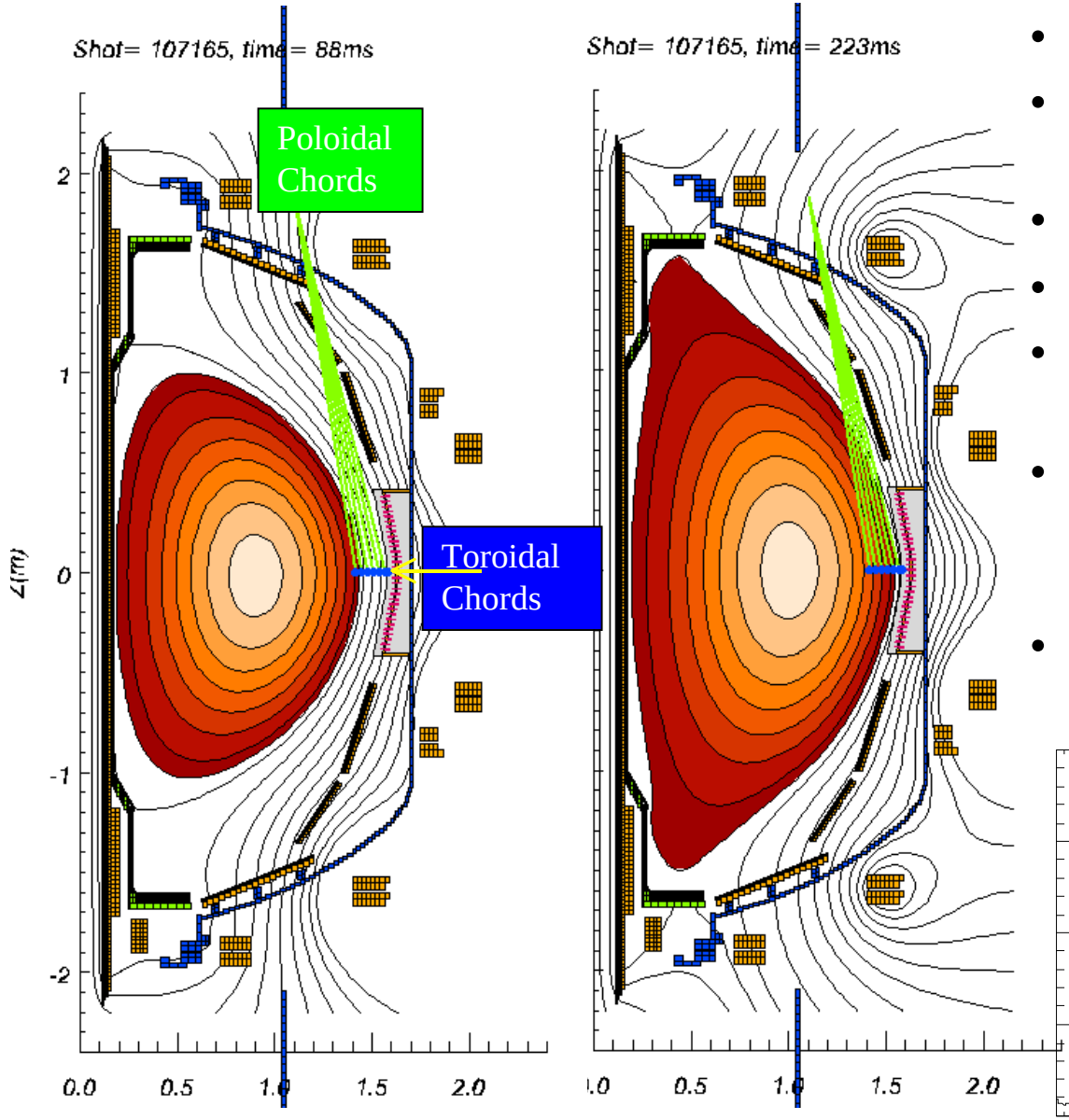
Status:

- New NSTX CHERS will be installed in Fall 2002.
- Edge Rotation diagnostic installed Fall 2002.

Upgrades:

- Other transitions (Li III 4499 Å, B V 4944 Å, Ne X 5249 Å) could be monitored with additional spectrometer/detectors.
- Better time resolution with faster 2D CCD detectors possible

Edge Rotation Diagnostic



- 10 ms time resolution.
- 6 toroidal and 7 poloidal rotation chords covering 140 to 155 cm.
- Local $E_r = v \times B - \nabla p/eZn$
- Does not require neutral beam.
- Sensitive to C III (near separatrix) and C IV (inside, but weaker).
- Cold plasma broadens C III emission shell, resulting in possible ∇E_r measurement.
- Edge rotation measurement complements main-CHERS.