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# Scattering System for ETG physics on NSTX

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*at*

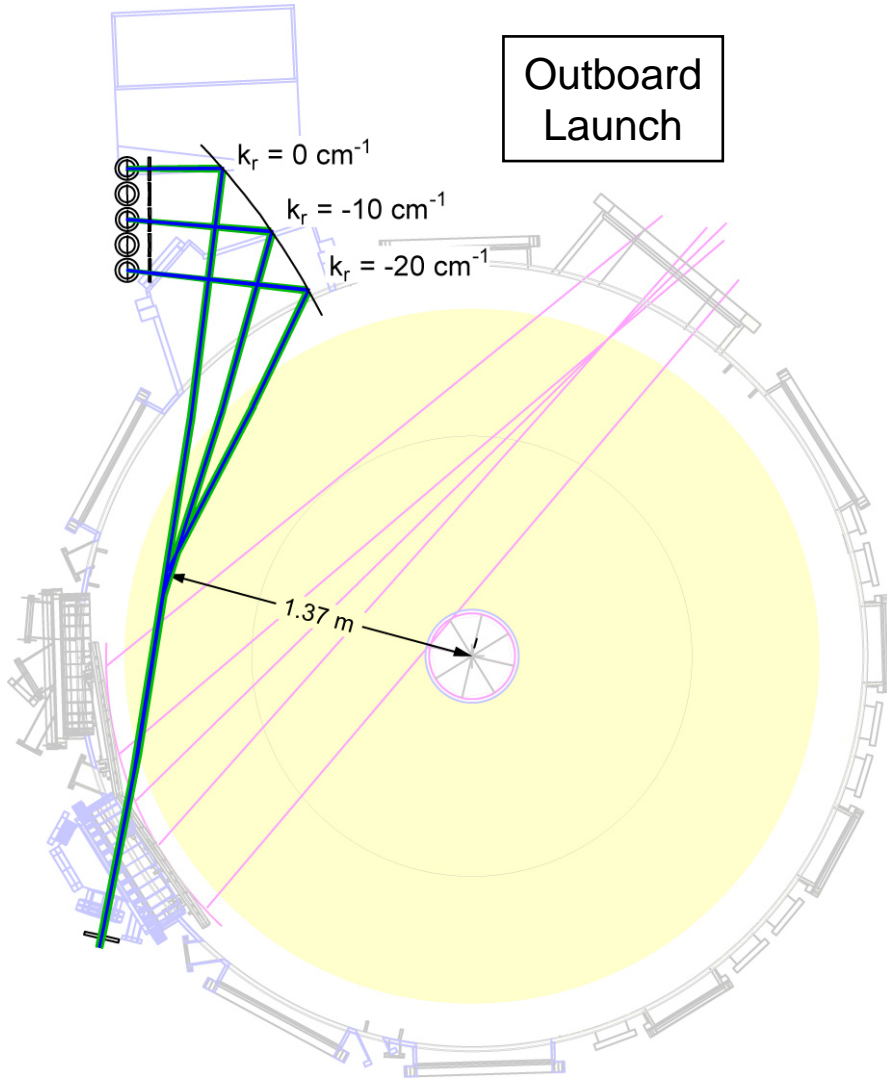
*Workshop on Long Time Simulations of Kinetic Plasmas*

*April 21, 2006*

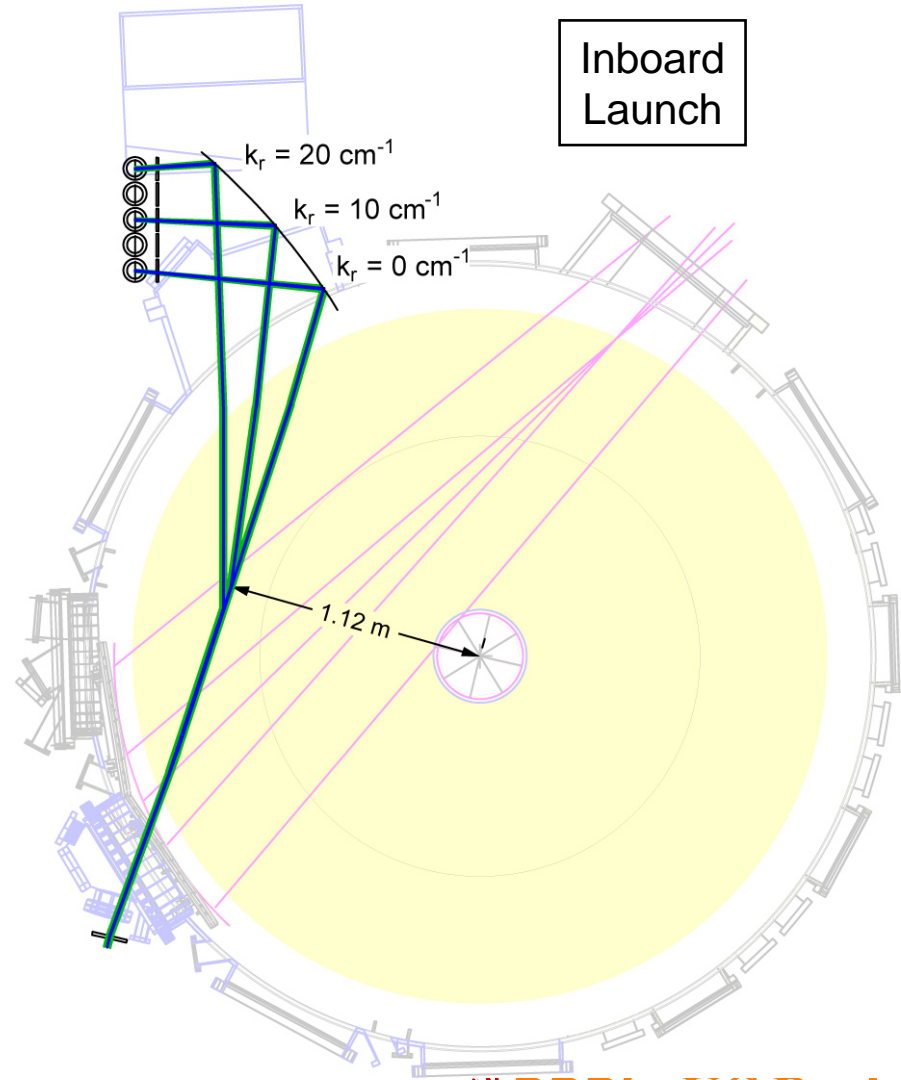
*Hyatt Regency, Dallas, TX*

# Two spatial positions

Outboard  
Launch

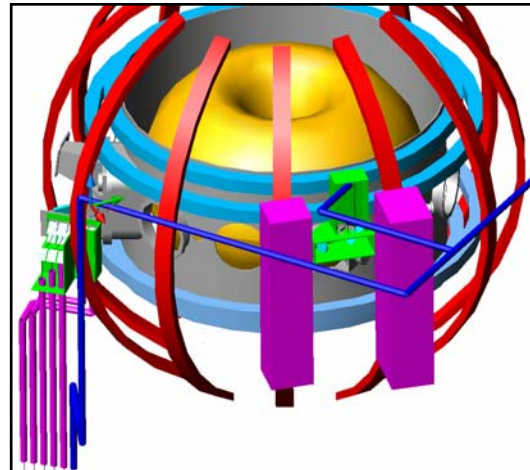
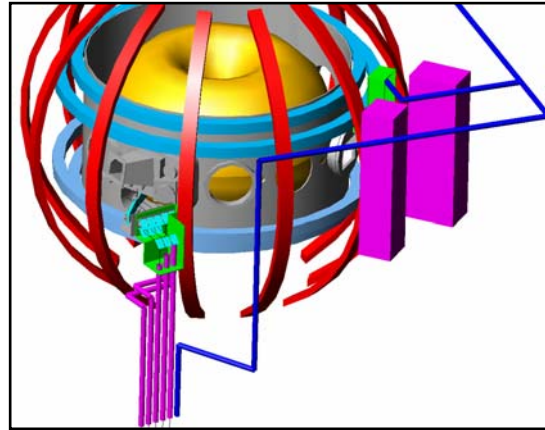
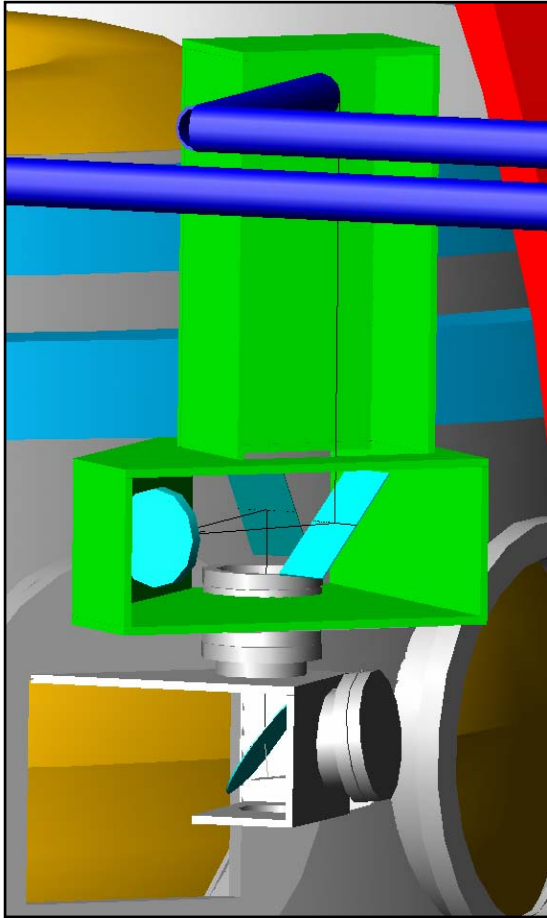


Inboard  
Launch

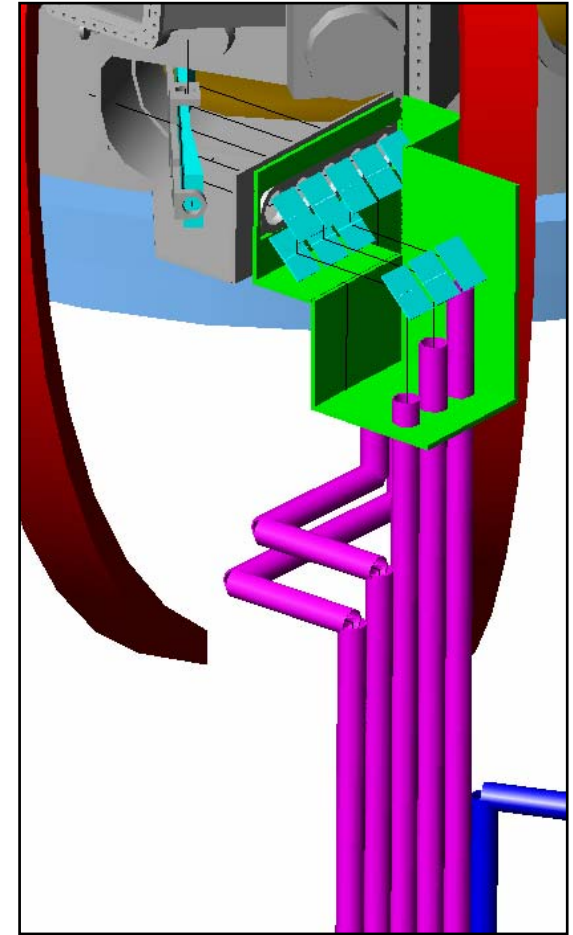


# Critical components and control

Bay H Launch

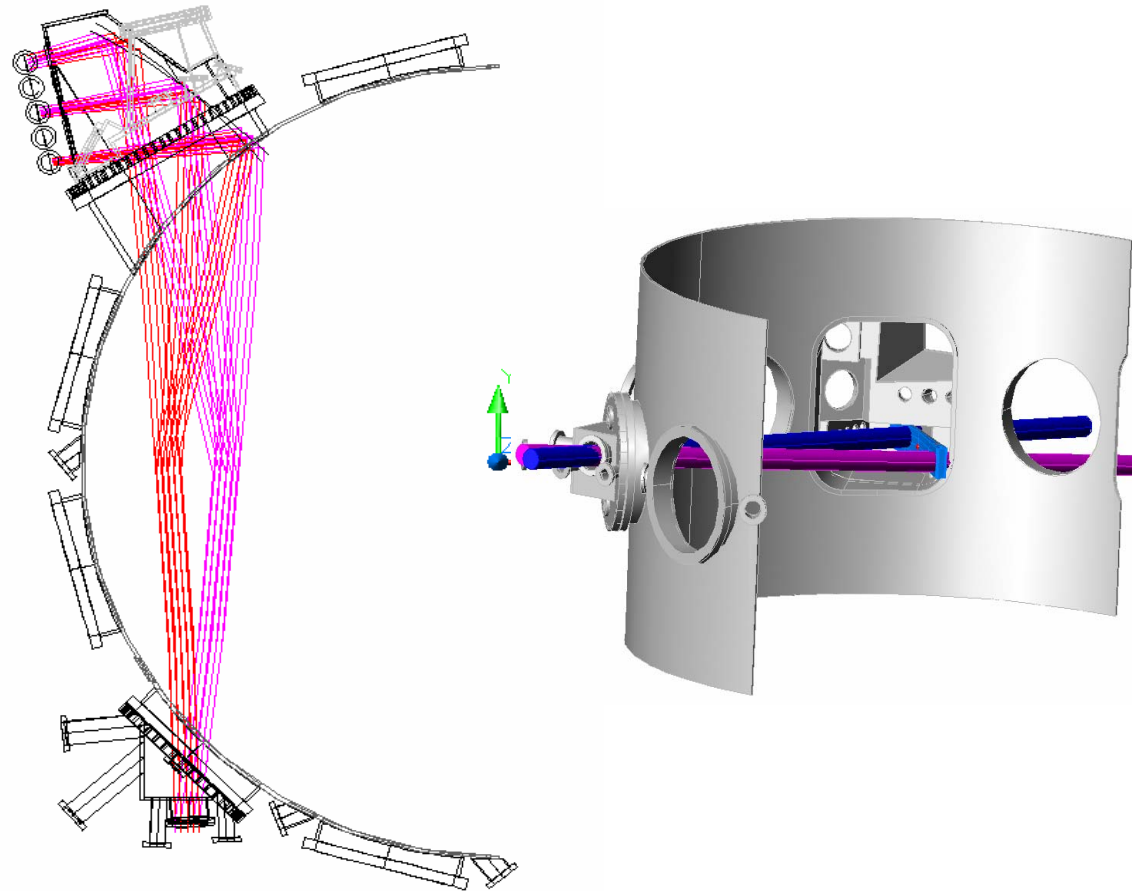


Bay K Receive



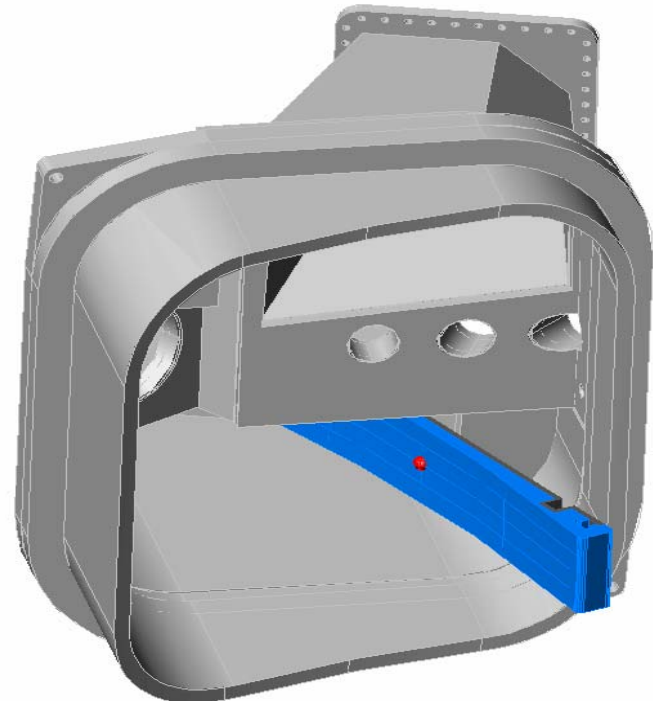
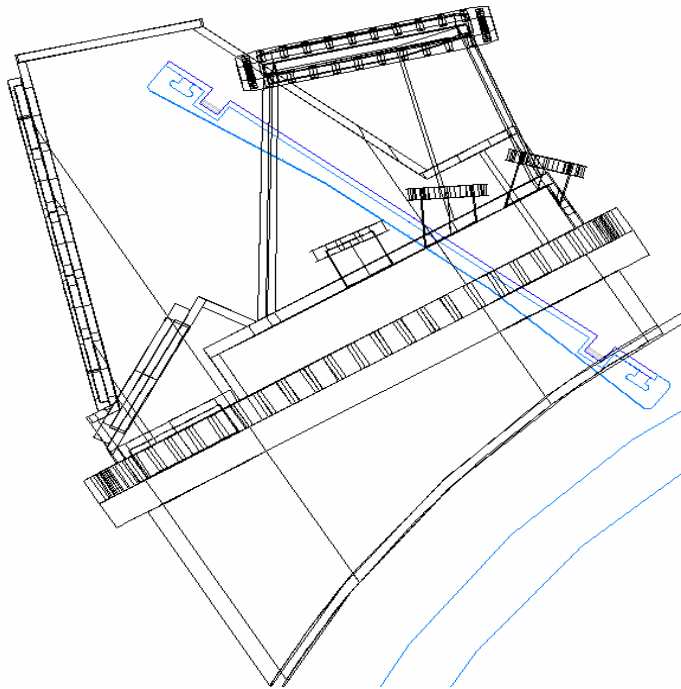
# Probe Beam and detection area

- Input beam is entered from Bay-H and looking down with 5.3 degrees
- Detection Mirror and windows are at Bay K.
  - 5 channels (5 discrete wavenumbers)
- Spatial coverage
  - $r/a = 0.1 \sim 0.9$
  - Mainly confined to two positions (inboard and outboard now)



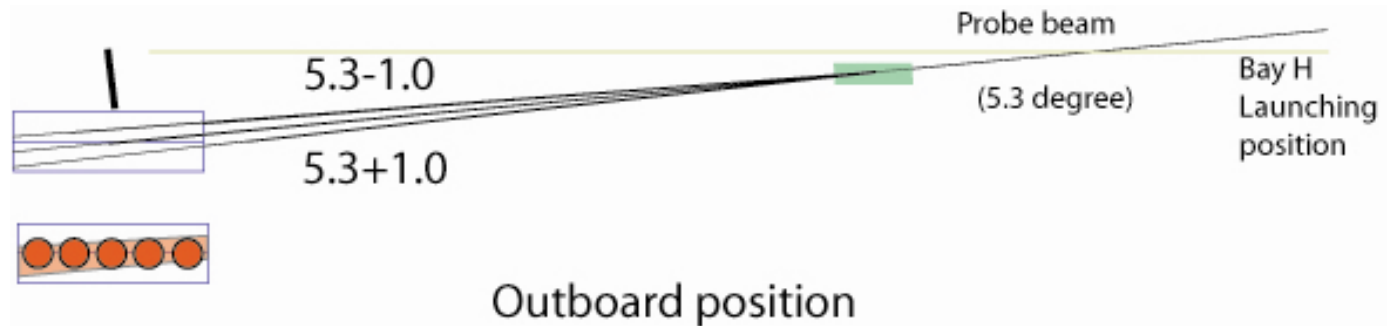
# Bay K detection mirror design

3 m focal length

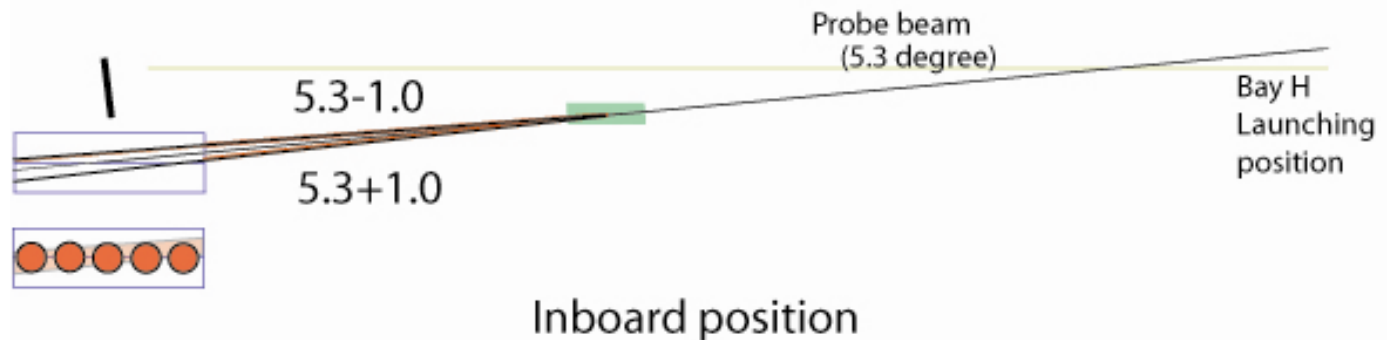


# Scattering geometry

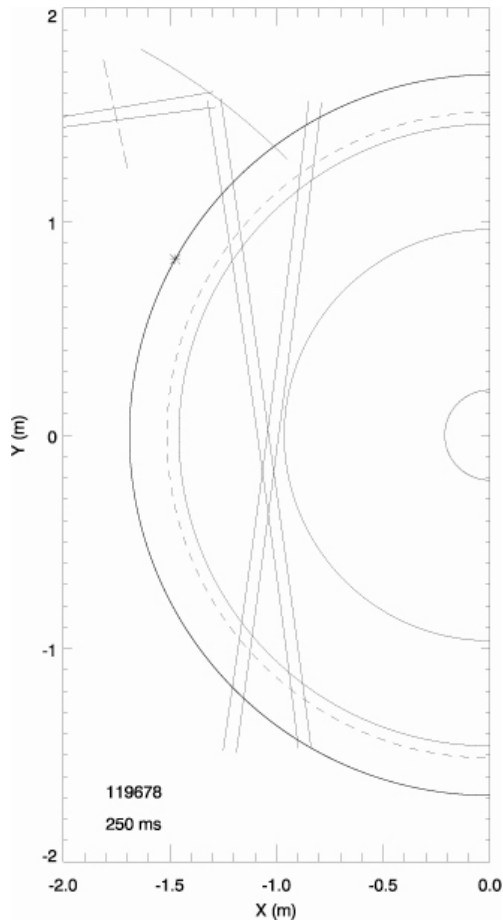
- Scattered signals impinging with  $5.3 \pm 1.0$  degree to the mirror will get into the detection system
- Shaded box is scattered signals for each cases and the circle is the windows



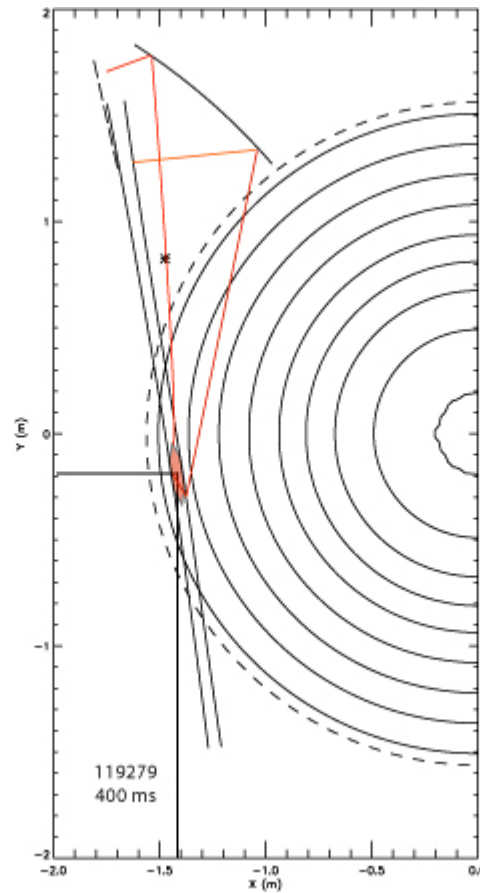
## Collection mirror & Windows



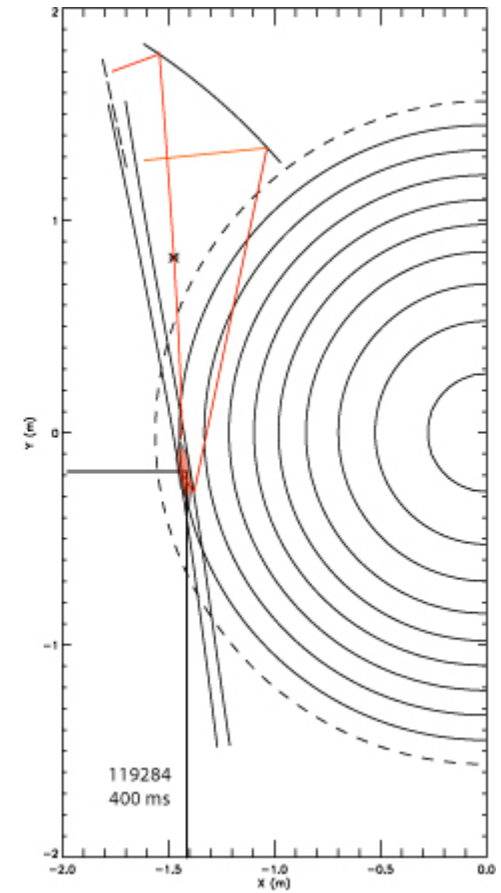
# Two Cases of Preliminary Scattering Geo.



Inboard Launch

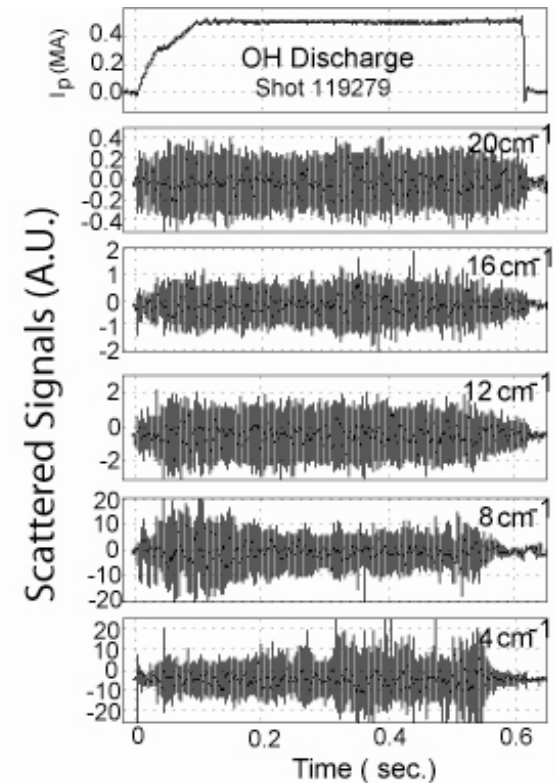
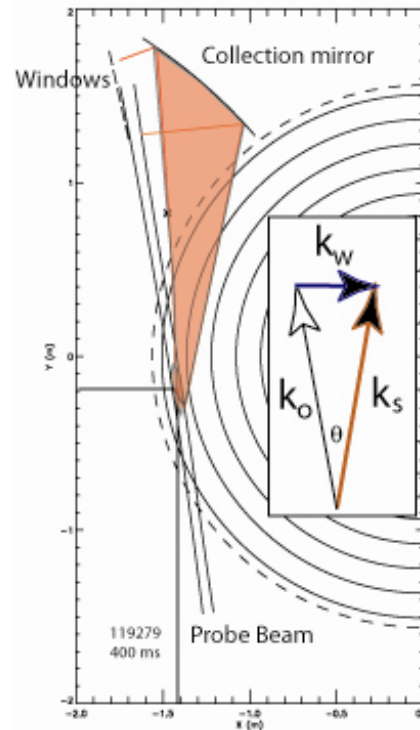


Outboard Launch



# Preliminary scattering data from OH plasma

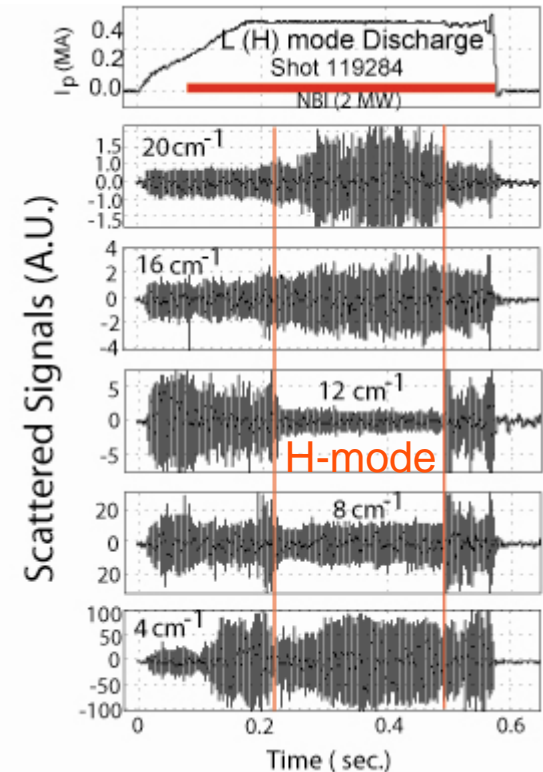
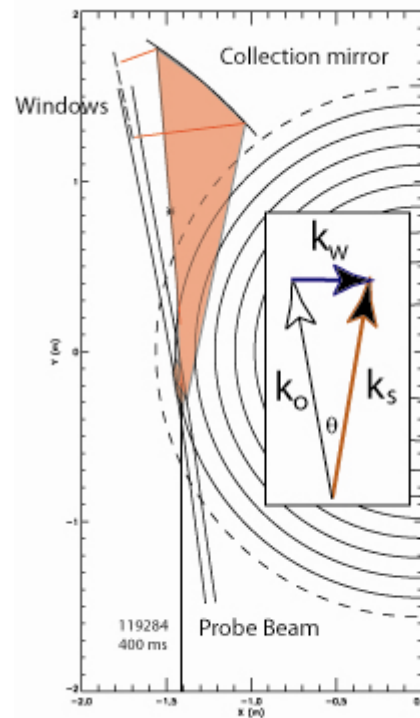
- Plasma parameters
  - $n_e(0) \sim 2.5 \times 10^{13} \text{cm}^{-3}$
  - $T_e(0) \sim 200 \text{eV}$
- Spatial coverage
  - $r/a \sim 0.7$
  - Wavenumber  $\sim 4 \text{cm}^{-1} - 20 \text{cm}^{-1}$
- Monotonically decreasing power spectra as a function of wavenumbers
  - Resembles ITG characteristic





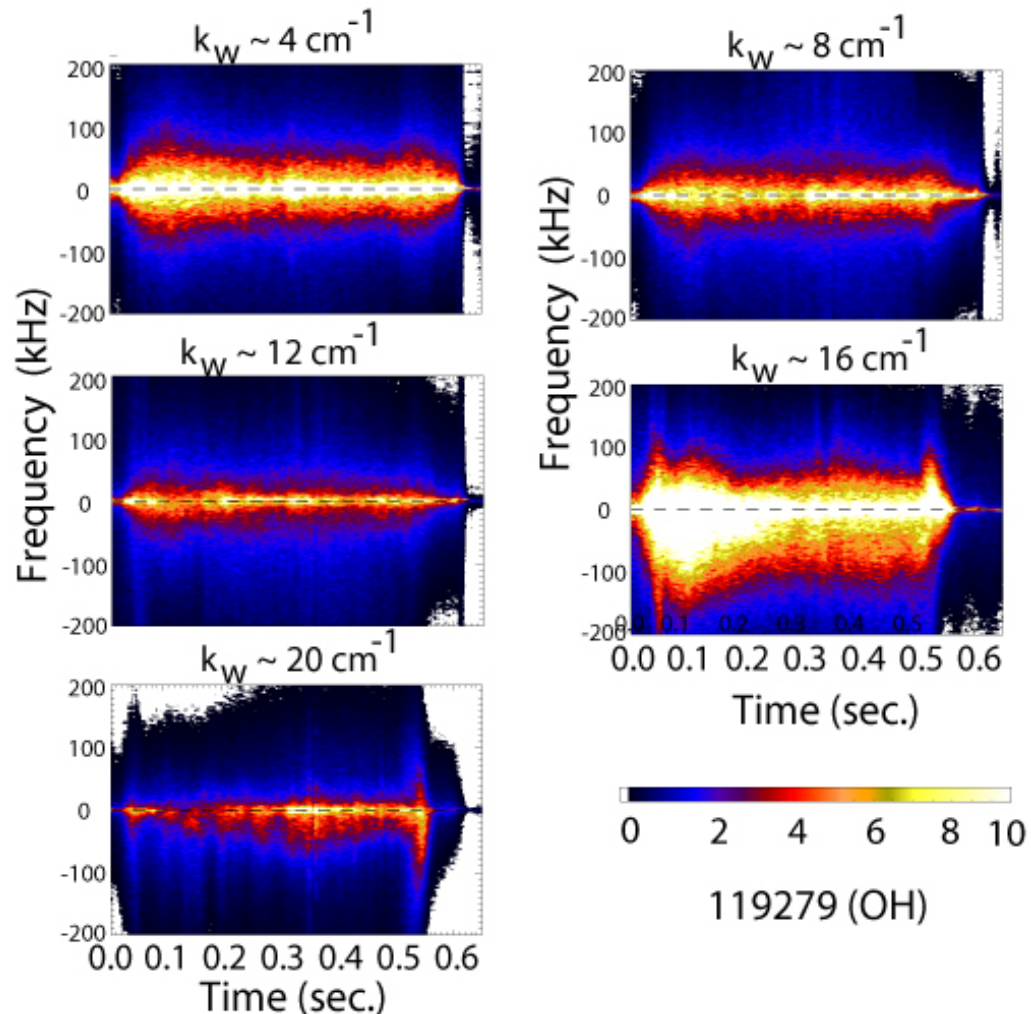
# Preliminary scattering data from L/H mode plasma

- Plasma parameters
  - $n_e(0) \sim 6 \times 10^{13} \text{ cm}^{-3}$
  - $T_e(0) \sim 1000 \text{ eV}$
- Spatial coverage
  - $r/a \sim 0.85$
  - Wavenumber  $\sim 4 \text{ cm}^{-1} - 20 \text{ cm}^{-1}$
- Monotonically decreasing power spectra during L-mode phase
- Reduction in amplitude at the medium wavenumbers during H-mode phase



# Spectral analysis of the scattering data from OH plasma

- Plasma parameters
  - $n_e(0) \sim 2.5 \times 10^{13} \text{cm}^{-3}$
  - $T_e(0) \sim 200 \text{eV}$
- Spatial coverage
  - $r/a \sim 0.7$
  - Wavenumber  $\sim 4 \text{cm}^{-1} - 20 \text{cm}^{-1}$
- Symmetric frequency spectra at low  $k$
- Asymmetric frequency spectra at high  $k$ 
  - Outward wavenumbers are dominant at high  $k$ .



# Spectral analysis of the scattering data from L/H mode plasma

- Plasma parameters
  - $n_e(0) \sim 6 \times 10^{13} \text{ cm}^{-3}$
  - $T_e(0) \sim 1000 \text{ eV}$
- Spatial coverage
  - $r/a \sim 0.85$
  - Wavenumber  $\sim 4 \text{ cm}^{-1} - 20 \text{ cm}^{-1}$
- Symmetric frequency spectra during L-mode phase
- Reduction in frequency at the medium wavenumbers during H-mode phase

