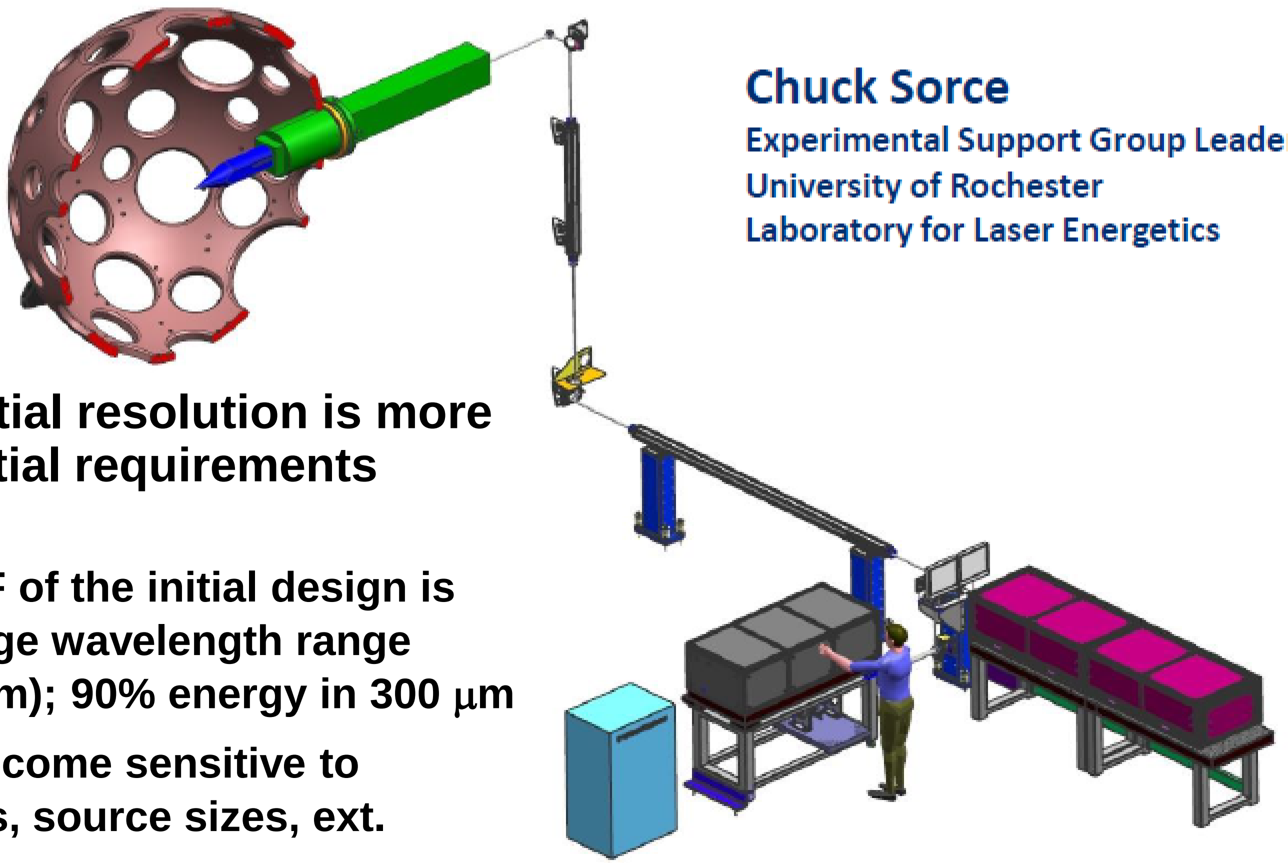
Optical Diagnostics Session

- **OMEGA EP Streaked Optical Pyrometer (SOP)**
  - **C. Sorce**
- **Backscatter spectra in MagLIF on Z**
  - **D. Bliss**
- **NIF optical Thomson scattering**
  - **S. Ross, G. Swadling, P. Swadling, J. Zweiback**

A new Streaked Optical Pyrometer has been activated on OMEGA EP



Chuck Sorce
Experimental Support Group Leader
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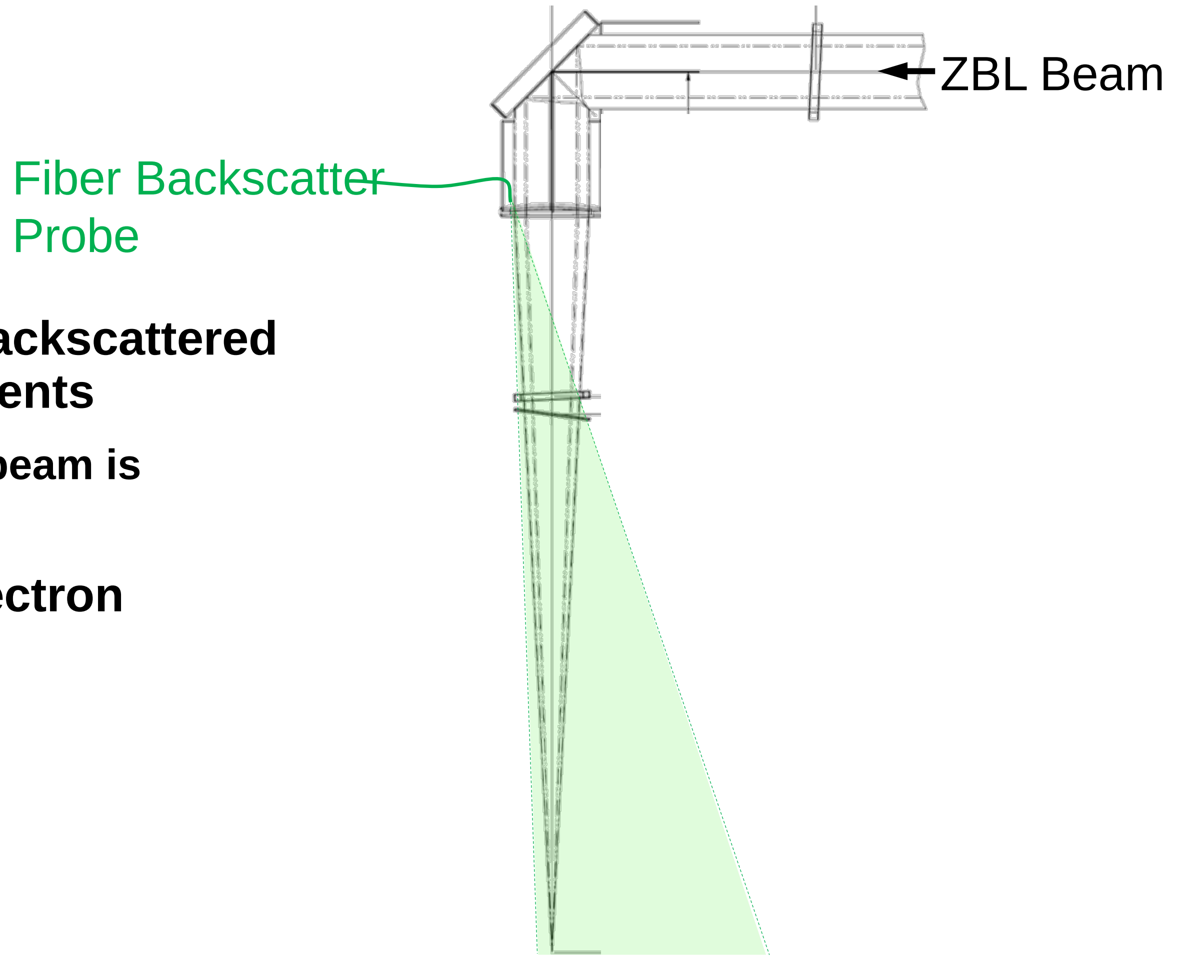
Laboratory for Laser Energetics

- **The impact of spatial resolution is more important than initial requirements specified**
  - **The large MTF of the initial design is caused by large wavelength range (590nm--800nm); 90% energy in 300 μm**
  - **Calibration become sensitive to detector areas, source sizes, ext.**
- **With minimal cost, system will be made to be achromatic**
  - **90% energy in 50 μm**
  - **Goal is a 5% absolute flux measurement**

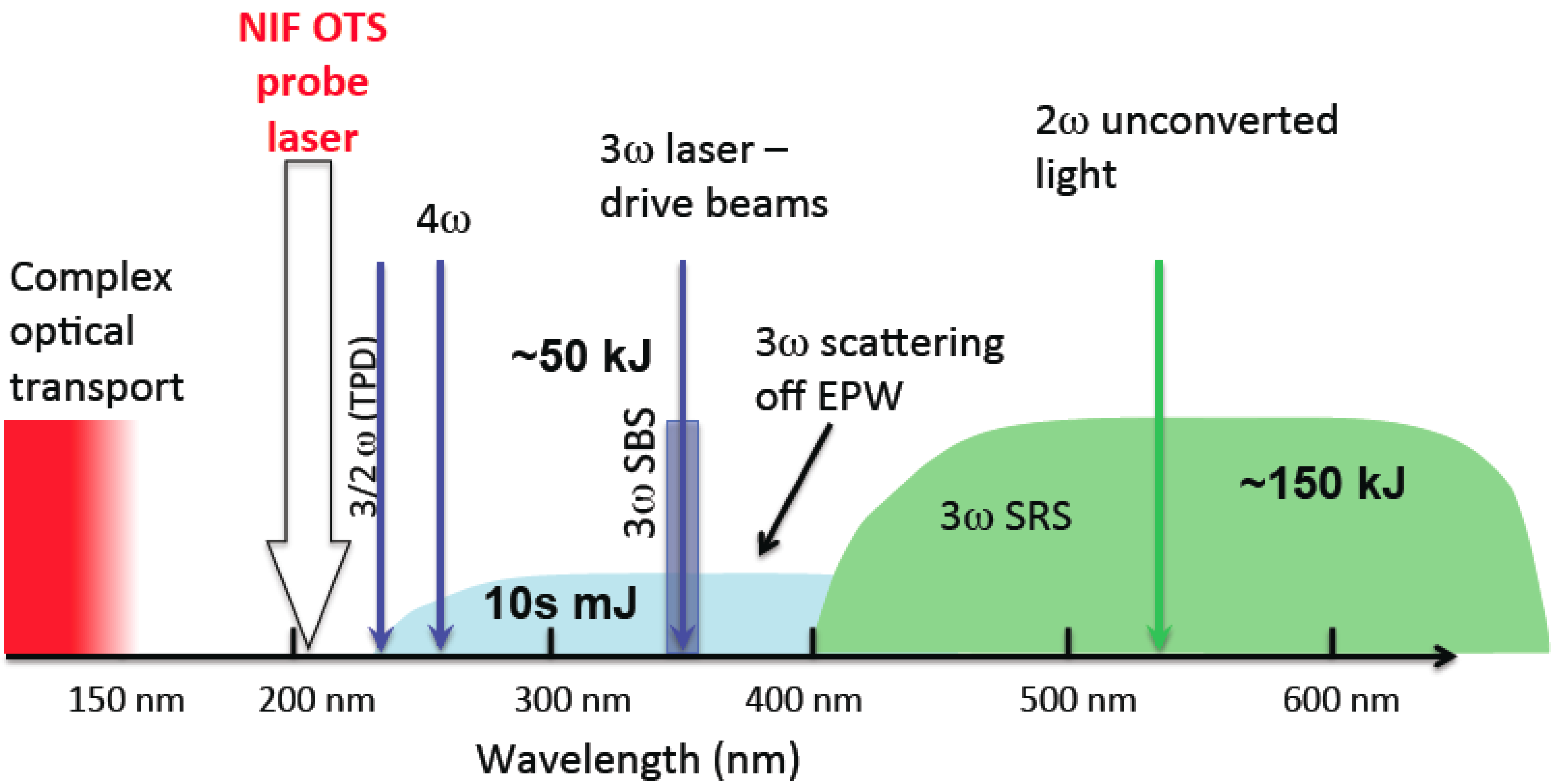
An optical fiber has been added to Z-beamlet to provide spectral measurements of the backscattered light



- **Initial data shows broad backscattered light from MagLIF experiments**
  - **Suggests the incident beam is filamenting**
- **Spectral shift suggests electron temperatures of 1.1 keV**

SNL is looking for collaborations to interrupt backscatter data

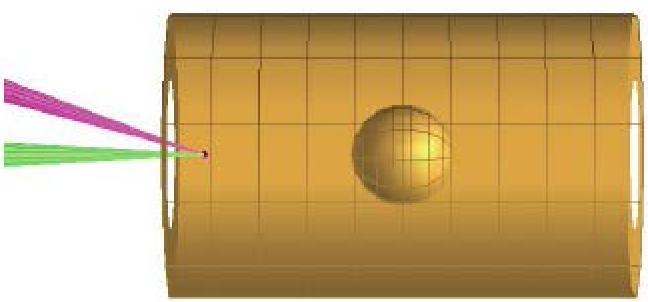
Deep UV Thomson scattering is a transformational approach to measuring plasma conditions



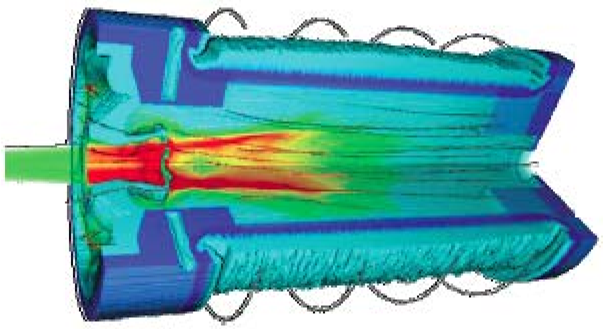
Expected TS signal is a few μJ

Measurements of the plasma conditions will provide transformational science

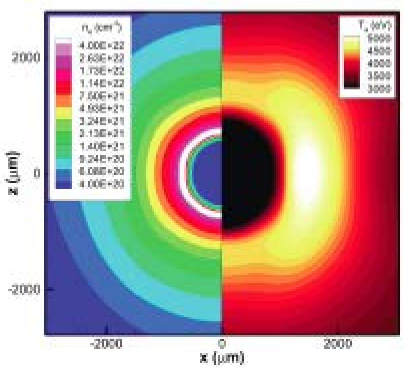
Indirect Drive ICF



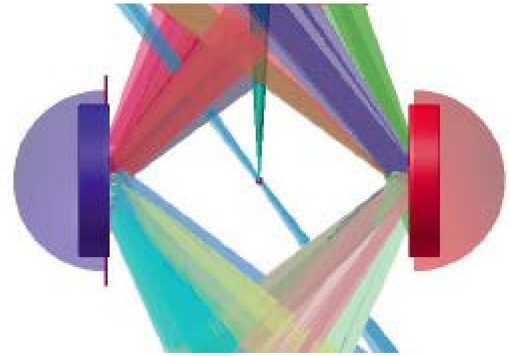
MagLIF



Direct Drive ICF



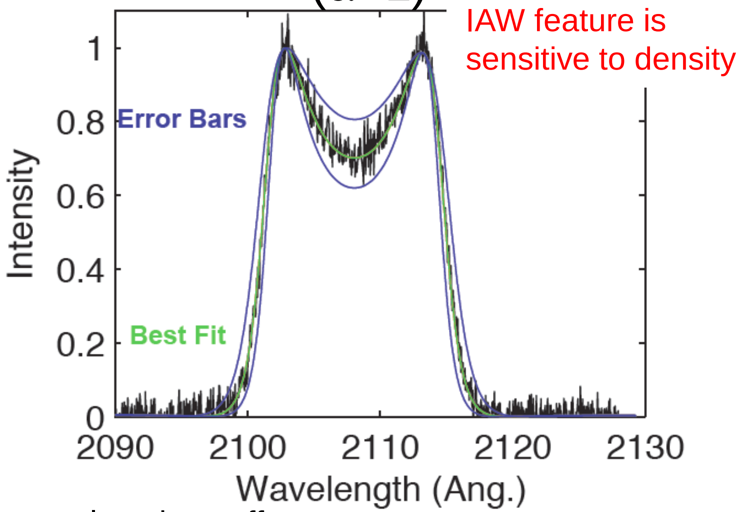
Discovery Science



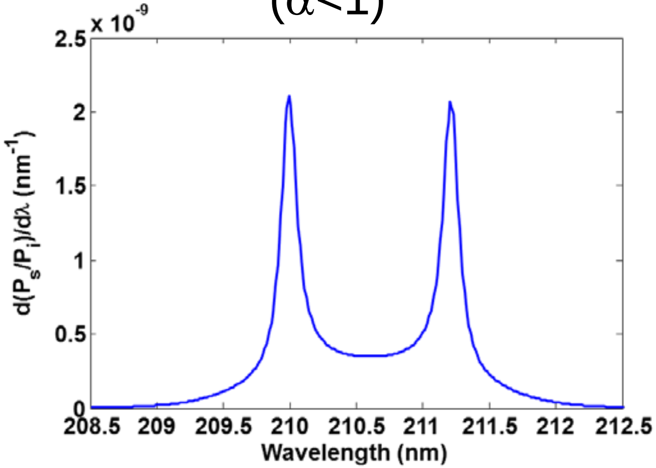
Accurate measurements of the electron temperature and density in each of these areas will refine our understanding of underdense hydrodynamics and help provide a foundation for predictive LPI

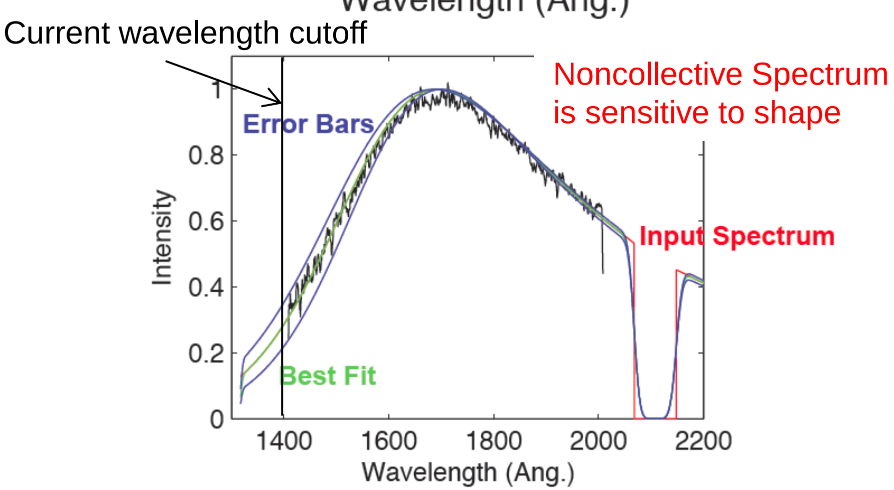
Deep UV Thomson scattering, the high plasma conditions predicted on the NIF, and the large scattering angle challenge our interpretation of the scatter signal

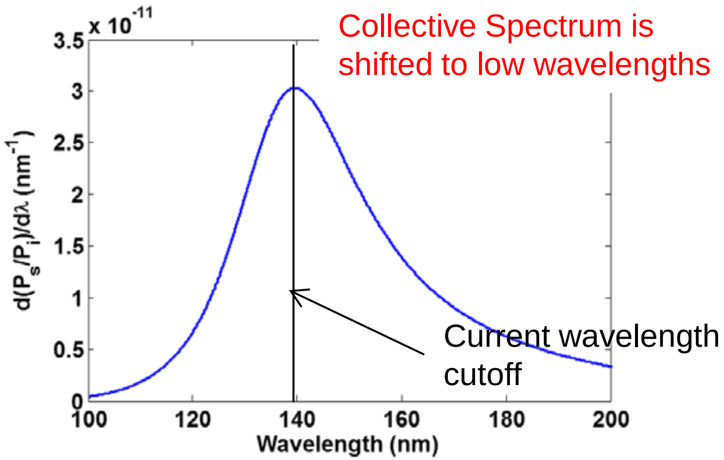
Predicted Hohlraum Scattering Spectra (α<1)



Predicted Polar-Direct Drive Scattering Spectra (α<1)



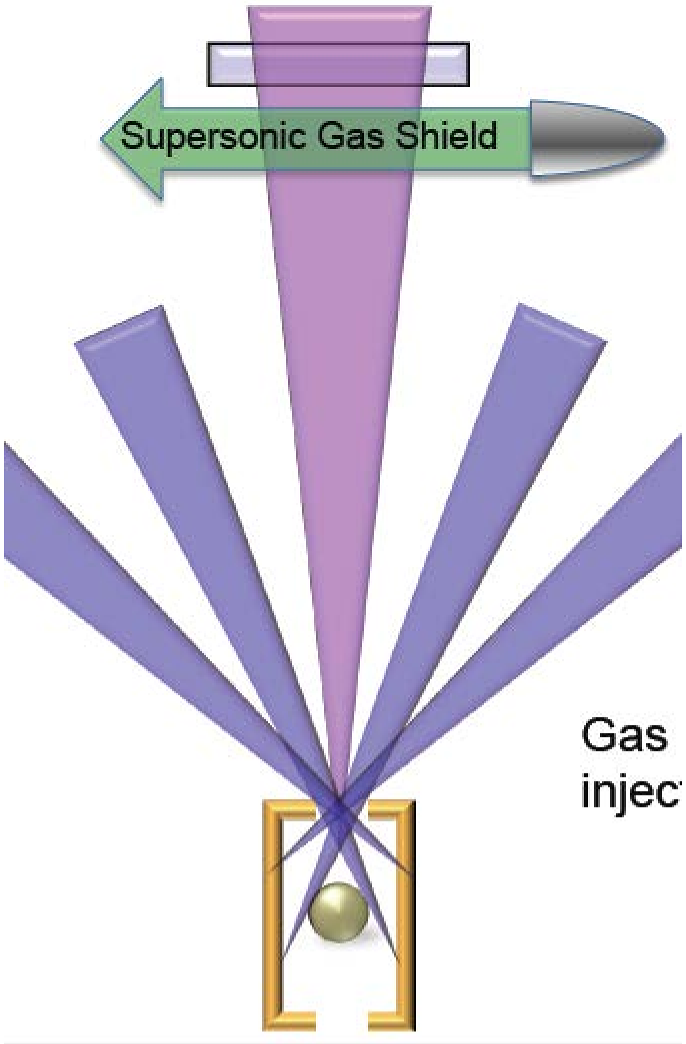




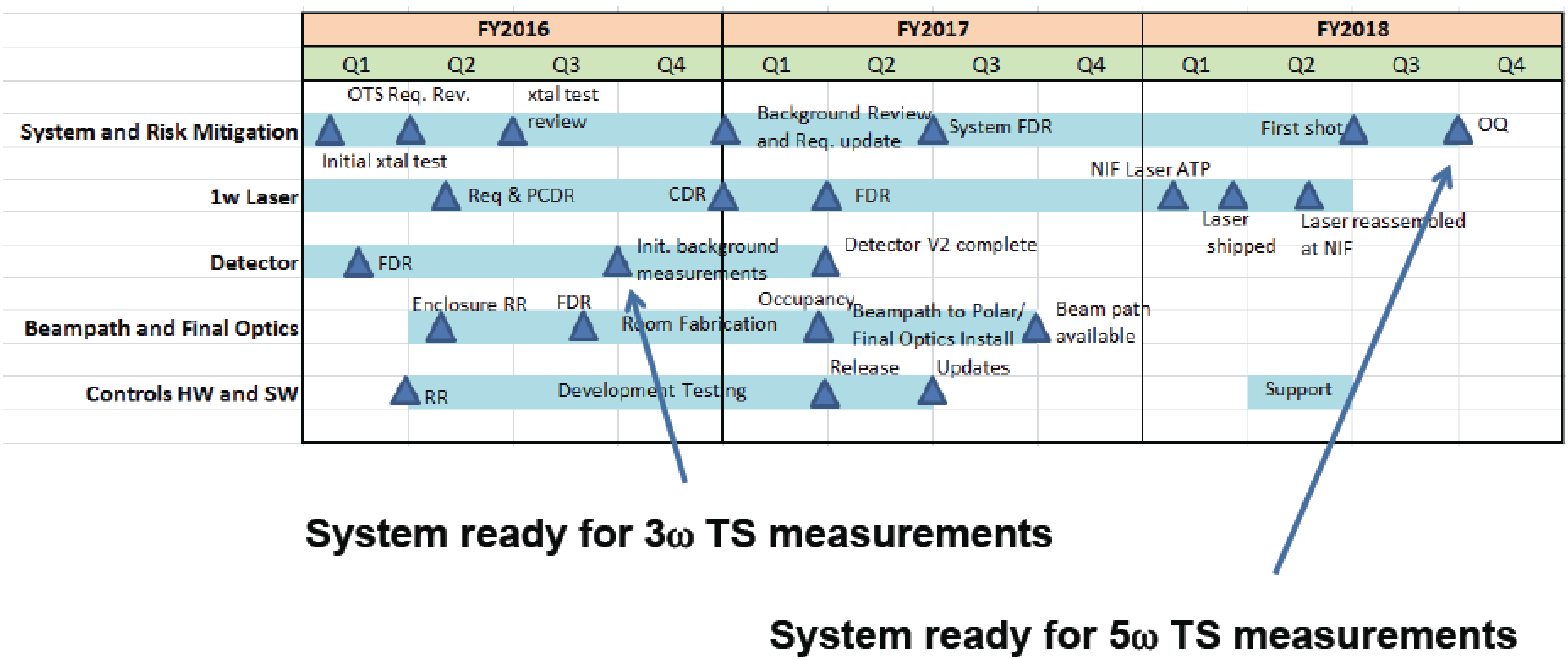
The low wavelength requirements may need to be revised to <120 nm

A number of technical challenges must be solved for a successful implementation of the OTS diagnostic

- **5ω Laser Development**
  - **High energy 5ω laser has not previously been demonstrated**
    - **LLE is currently building a test bed to demonstrate conversion efficiency**
    - **LLE is building a 5ω laser system for OMEGA to help understand the Thomson scattering physics in the deep UV**
- **X-ray blanking of the blast shield**
  - **Initial calculations suggest that the x-ray fluence is 100 times above the blanking limit (mitigation scheme may be required)**
    - **Not directly viewing the Au wall**
    - **Absorbing the x-rays prior to reaching the blast window**



A schedule to field a 5ω Thomson scattering system on the NIF by the end of FY18 is being followed.



LLE is considering building the OTS laser based on the DCS laser architecture