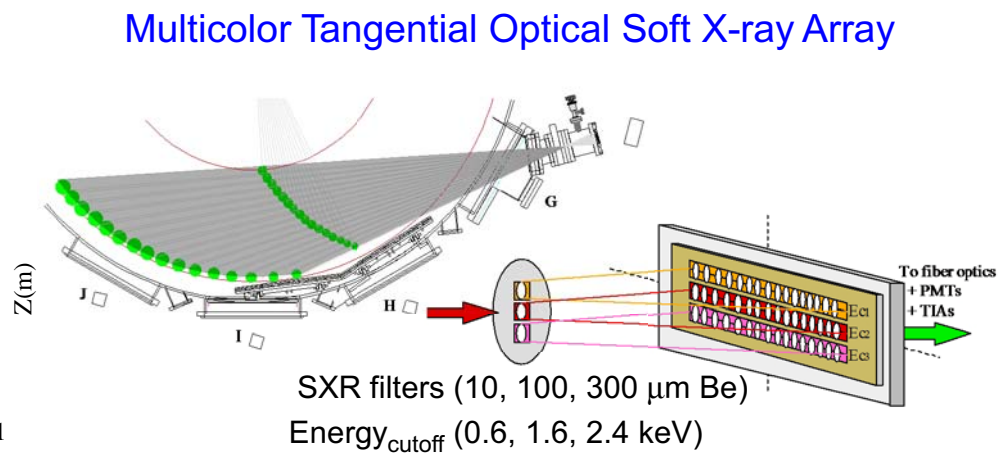
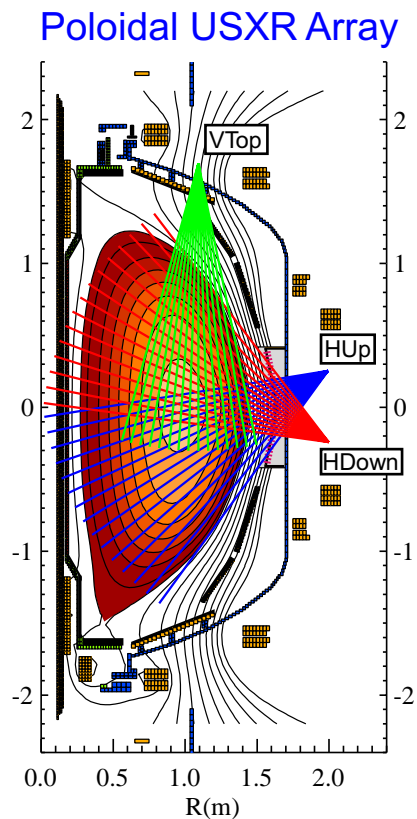


JHU Diagnostic Plans

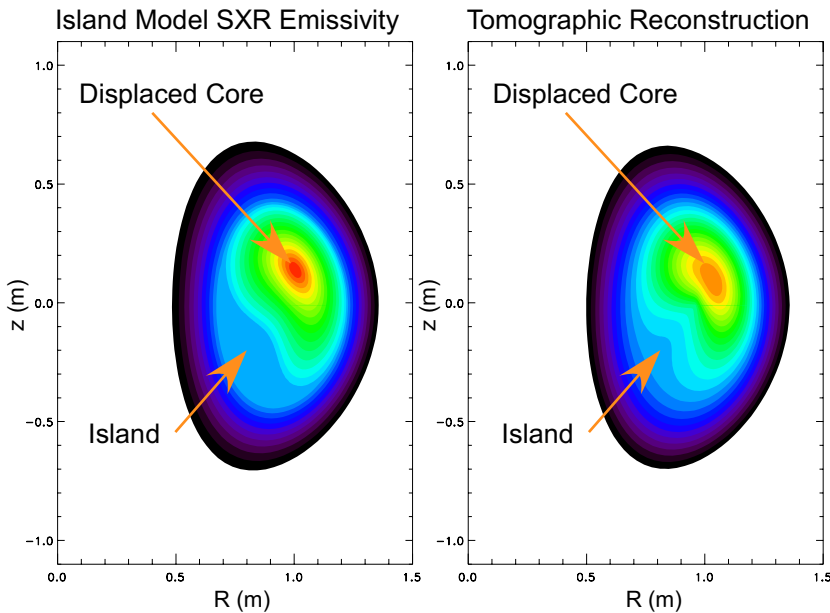
in support of the

NSTX MHD 5 yr. Program

K. Tritz, D. Stutman, L. Delgado-Aparicio, A. Tolea, M. Finkenthal



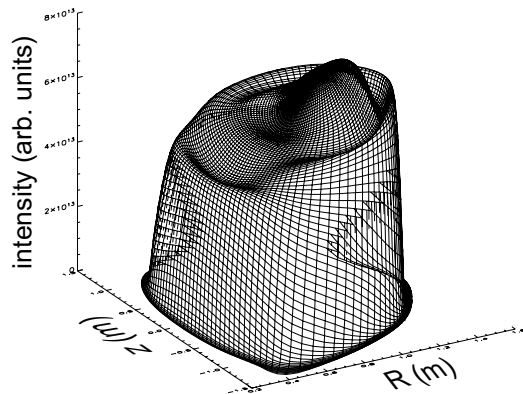
Current SXR Poloidal System Serves Many Functions



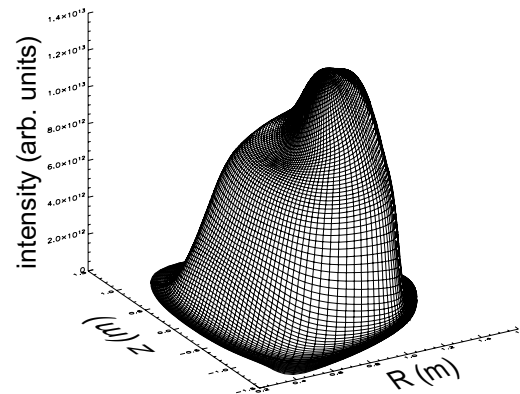
- Tomographic reconstruction of MHD identifies and localizes mode activity
- Current array views limit spline-based tomography to $m \sim 1$
- “Physics-based” island model reconstruction allows higher m reconstruction
- Toroidally spaced arrays can measure RWM structure

Selection of Filters Important to Discriminate Edge and Core

Be $5\mu\text{m}$



Be $100\mu\text{m}$



Study of core modes - thick

Edge modes/RWM - thin

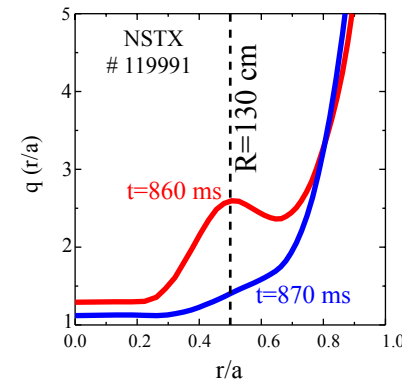
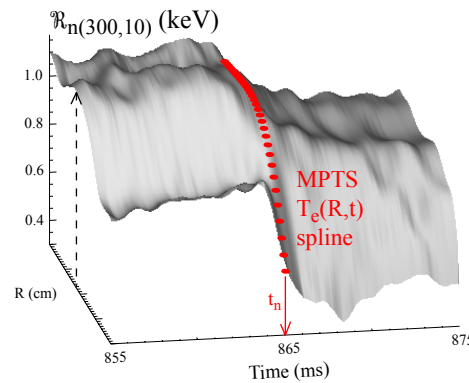
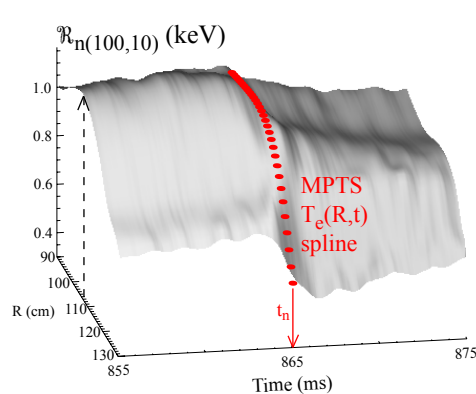
Tomography - identical filters

ELM studies - mixture

XP's often have conflicting filter positioning needs!

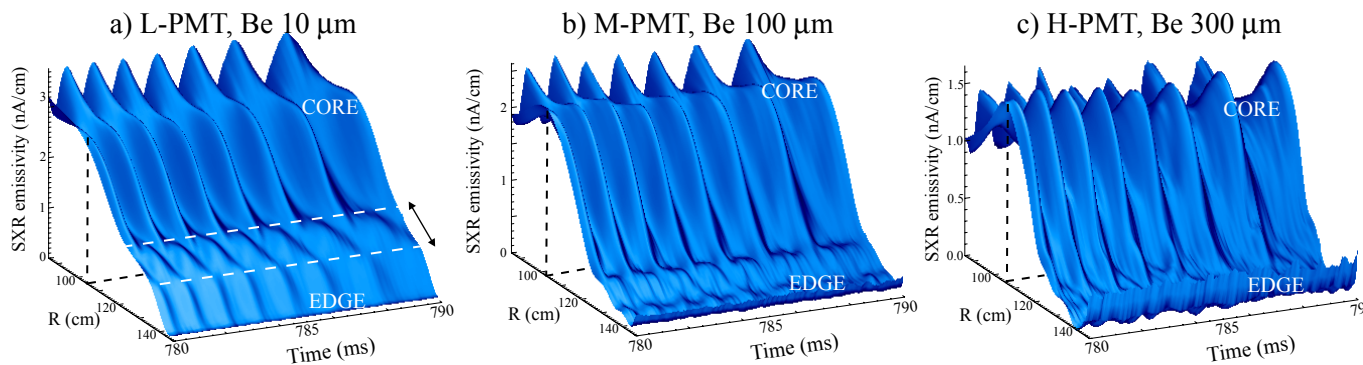
TOSXR Demonstrates Advantage of Simultaneous "Multi-color" Measurements

- Principally a fast $T_e(R)$ measurement (~ 0.1 ms)
 - - study T_e redistribution from reconnections, fast mode activity, disruptions



T_e crash coincides with reconnection, q -profile flattening

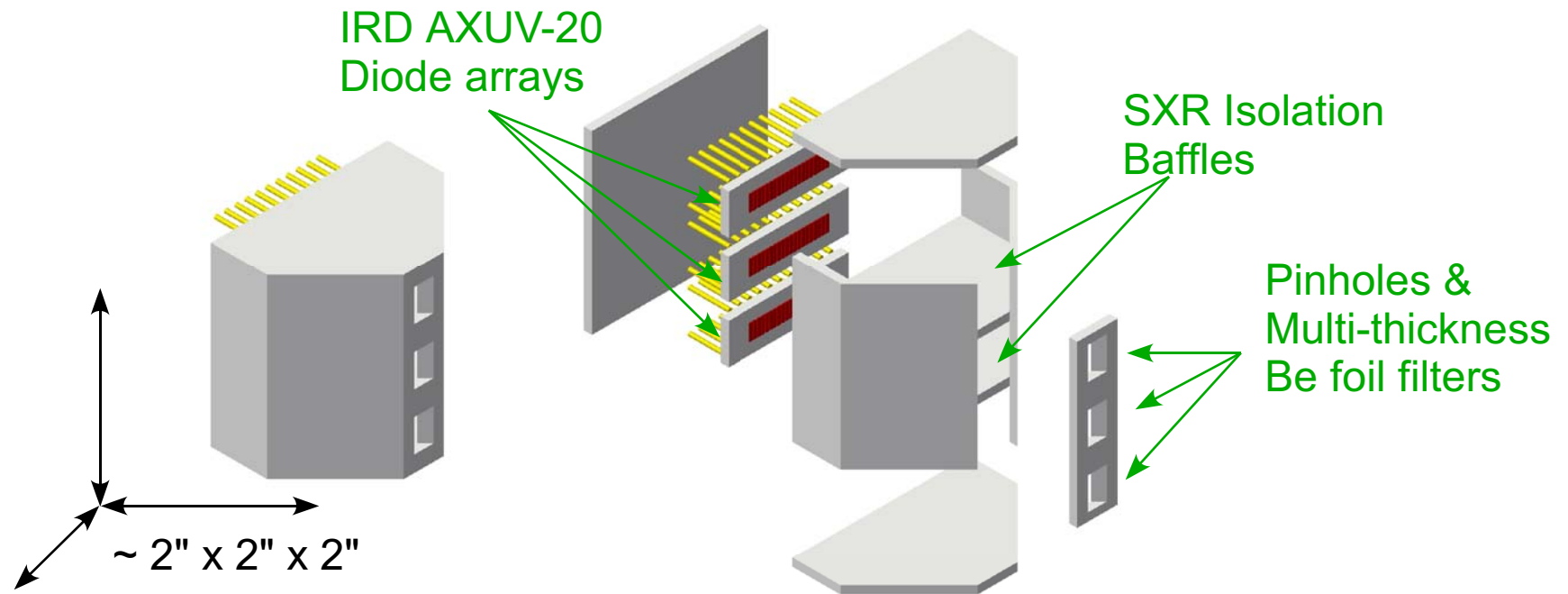
- Can also be used to distinguish temperature and density/impurity effects of island



"Multi-color" signals show differences in peaking at low and high energies.

- Tangential imaging good for profile mapping
 - - normalize T_e and n_e to Thomson midplane measurements
 - - poloidal views provide better mode resolution from expanded flux surfaces

High Spatial Resolution Multi-color Edge Array will Serve as Prototype for NCSX Arrays and NSTX Upgrade Arrays



- Cartridge-based detector allows placement and viewing flexibility
 - in-vessel compatibility for reduced port loading
 - enhanced poloidal coverage for improved tomography
 - toroidally displaced array(s) for **RWM studies**/toroidal mode identification
 - multi-color edge and pedestal array used for **ELM feedback** control
- Replace aging poloidal arrays with compact detectors
- Potential for lithium coating **requires** flexibility of placement and views
 - avoid “line-of-sight” to lithium divertor modules
 - incorporate shields to protect filters from lithium deposition

Expanded Set of SXR Diagnostics can Contribute to MHD Five Year Program Needs

