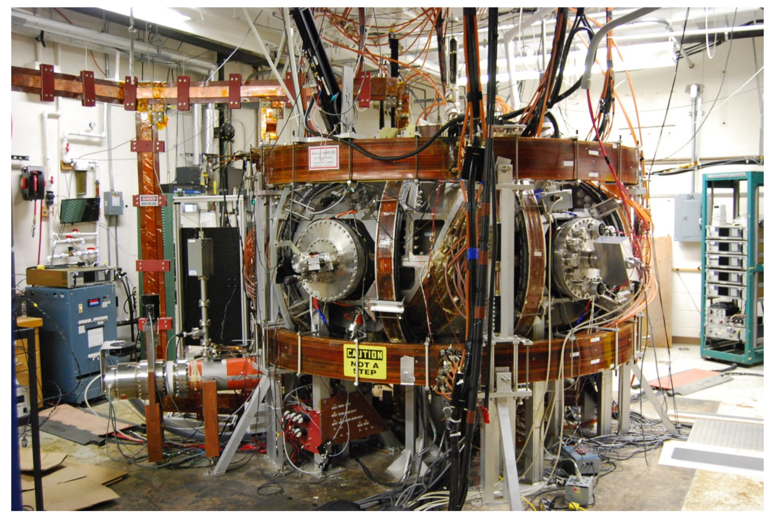
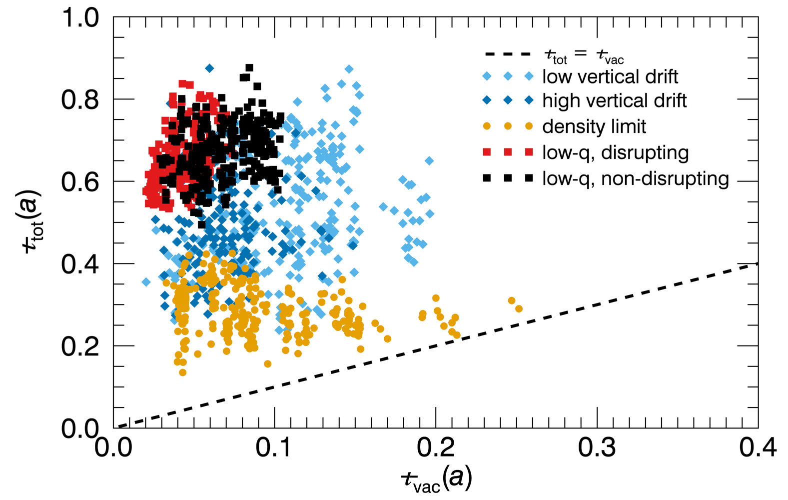
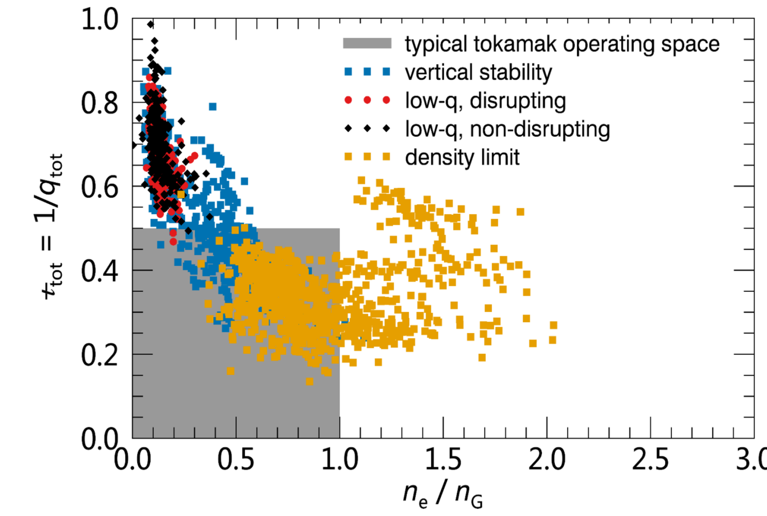
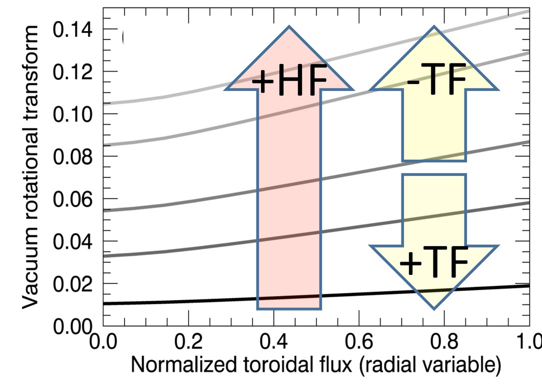
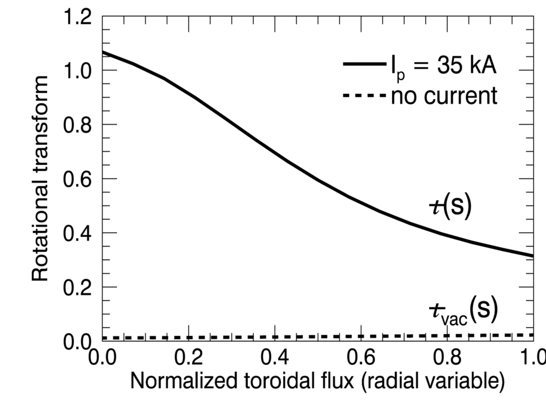
CTH has a flexible coil set that allows for exploration of multiple magnetic field configurations









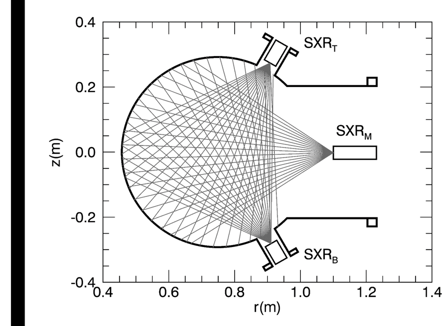


Typical CTH parameters

5 field periods		discharge duration ~0.1s	
R_o	= 0.75 m	n_e	$\le 5 \times 10^{19}$ m^{-3}
a_{vessel}	= 0.29 m	T_e	≤ 200 eV
a_{plasma}	≤ 0.2m		
B_o	≤ 0.7 T		
P_{input}	≤ 15 kW ECRH ~ 200kW OH	I_p	≤ 80 kA
	~ 150 kW 2nd Harmonic x-mode (under construction)		
Vacuum transform 0.02 – 0.35		$\langle\beta\rangle$	≤ 0.2%

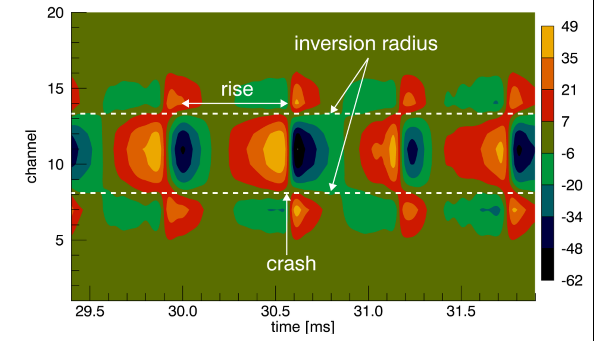
CTH has control of stellarator transform. Transform with plasma current is tokamak-like

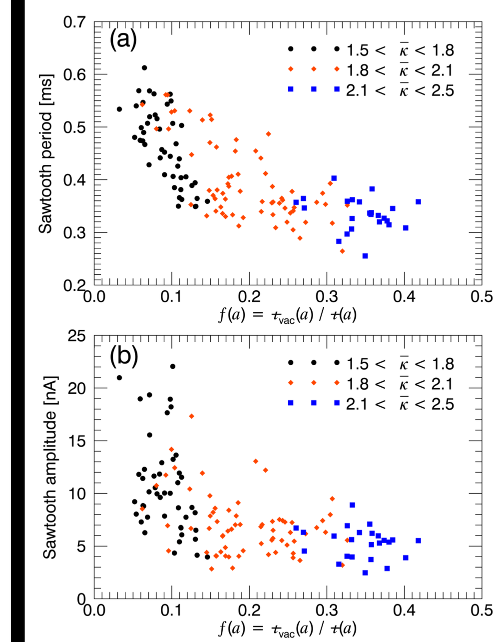
Control of Sawtooth dynamics with 3D fields



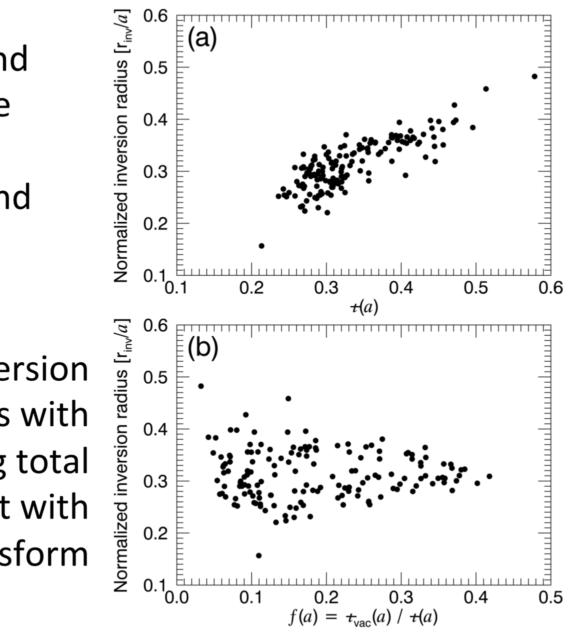
Central SXR camera used in this study

Biorthogonal/SVD analysis used to help identify the inversion radius





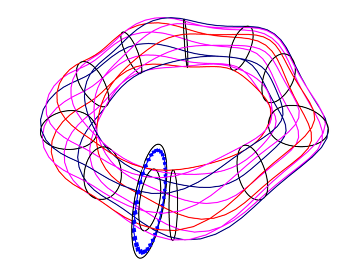
Sawtooth period (a) and amplitude (b) decrease with increasing fractional transform and elongation



Sawtooth inversion radius increases with (a) increasing total transform, but not with (b) fractional transform

Mode structure modeled with current filaments

MHD perturbed currents can be approximated as being parallel to magnetic field lines on mode resonant rational surface

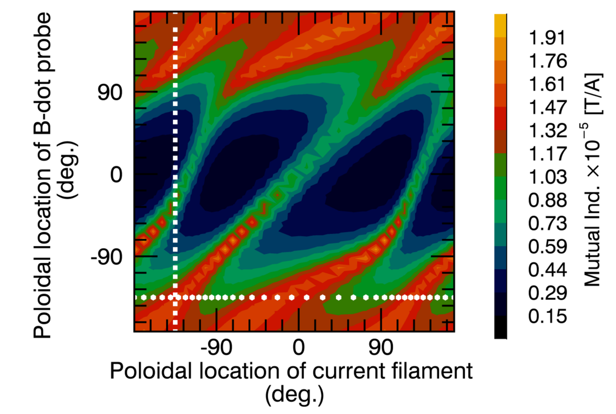


Current filaments follow B-field lines

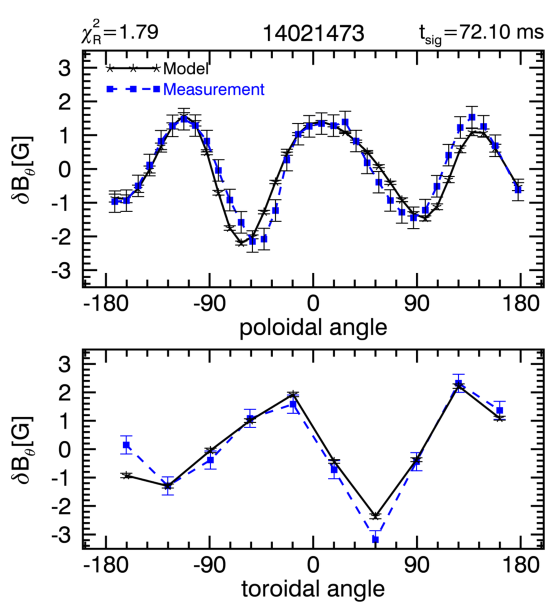
$$S_i^M = \sum_{i=0}^{N_f} M_{ij} I_j$$

$$I_j = I_0 \sin(m\theta_j + \delta)$$

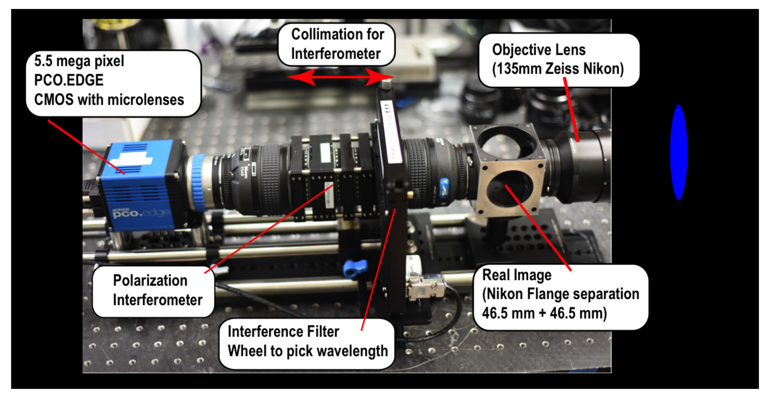
Results from χ^2 fit of I_0 and δ



Mutual inductance measures the response of the B-dot probes to the currents



Coherence Imaging System

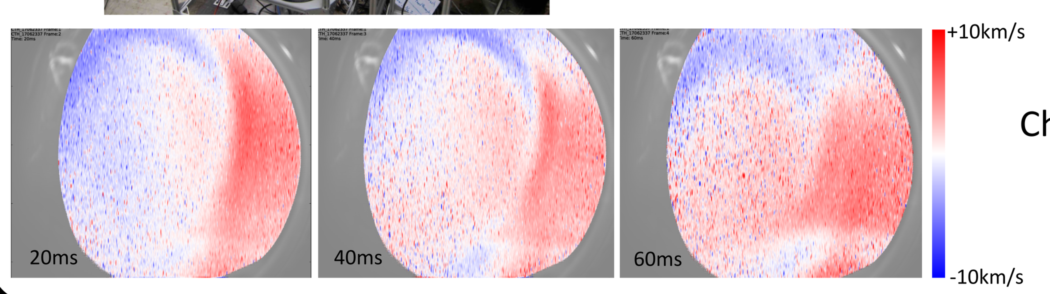


Measures the spectral coherence of an emission line using an imaging interferometer of fixed delay (See N. Allen - BP11.00049)

Measurements of ion parameters in both the edge and the core of CTH plasmas beneficial for island divertor and MHD mode-locking experiments

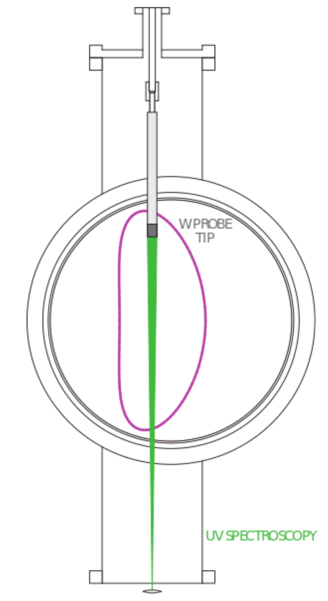
Instrument is housed in a marine cooler to reduce temperature fluctuations of the interferometer crystal

Peltier cooler with feedback controls the ambient temperature (~23 °C) inside the marine cooler



Changes in toroidal flow over time

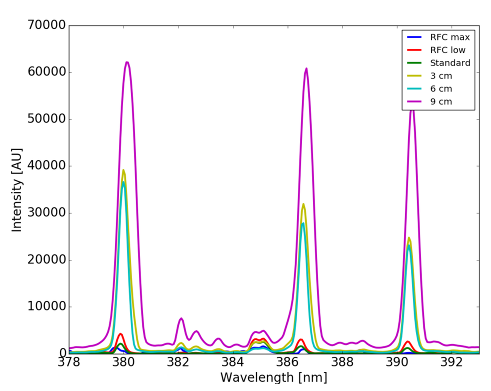
Spectroscopic Studies Support DIII-D and Others



High-Z materials exposed to plasma on CTH to improve spectroscopic erosion measurements through the S/XB method (See C. Johnson - UP11.00037) (See D. Ennis - UP11.00033)

New Mo, W atomic calculations completed at Auburn allowing more accurate erosion measurements (See S. Loch - UP11.00034)

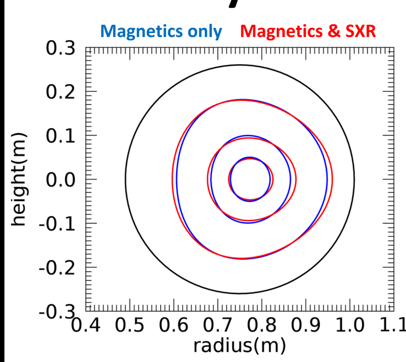
W, Mo, SiC, and stainless steel probes inserted into CTH with collection optics opposing probe

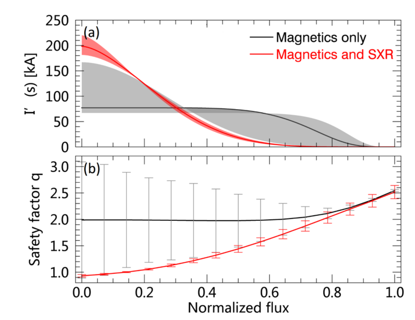


Probe depth scan allows for lines to be distinguished from base CTH impurities

Collisional radiative code developed to model spectra and compare with experiment

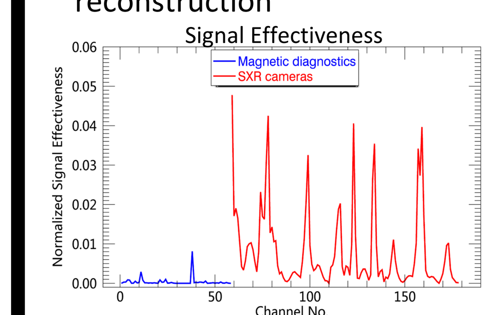
Using SXR measurements in V3FIT reconstructions yields more accurate current profiles



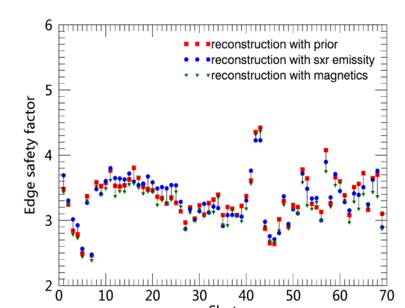


Plasma current is more concentrated in the center (top) dropping the central q value (bottom) when SXR signals are included in the V3FIT reconstruction

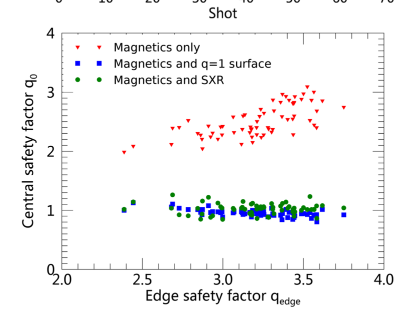
Flux surfaces at φ=π/10 show more elongation when SXR signals are included in the reconstruction



Internal SXR measurements have more influence on central current distribution than external magnetic signals

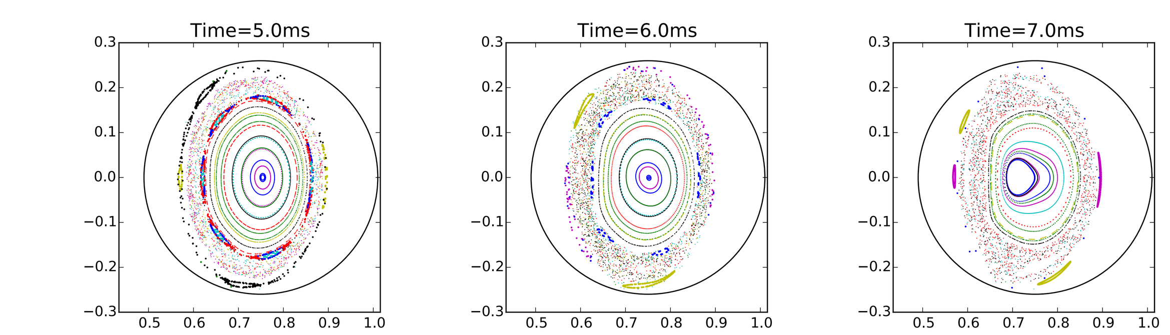


Edge Safety factor is similar for all three reconstruction methods.

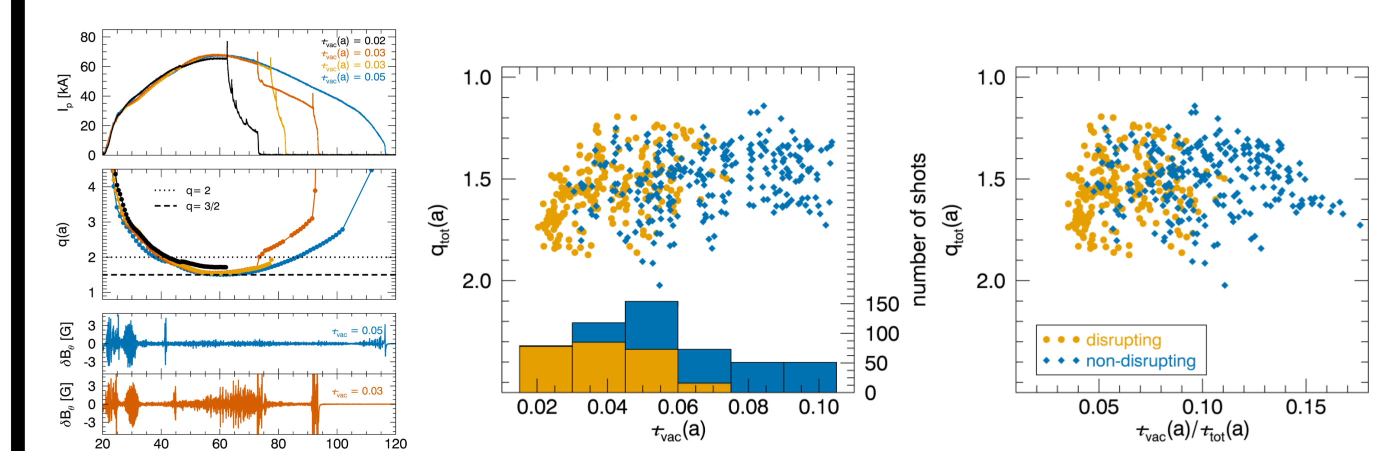


Central Safety factor is better determined with the use of SXR inversion information and SXR signals than with magnetics alone.

NIMROD low-q disruption simulations

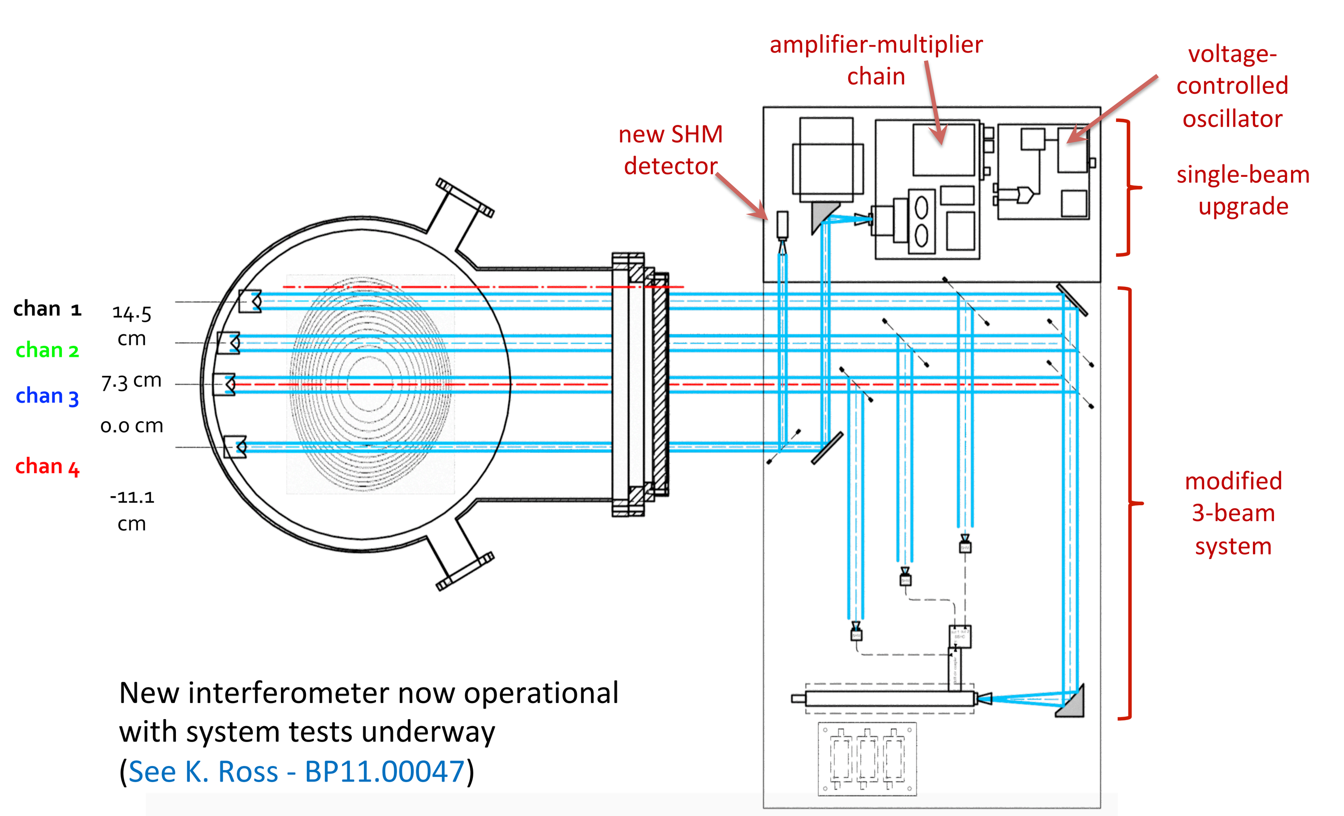


Simulations suggest that low-q disruptions are triggered by an interaction between symmetry preserving islands and symmetry breaking instabilities.



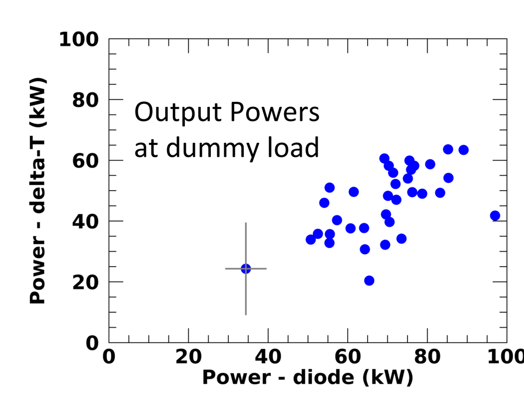
Interferometer being upgraded to four channels

Additional channels will give better resolution of the density profile and allow expanded physics studies

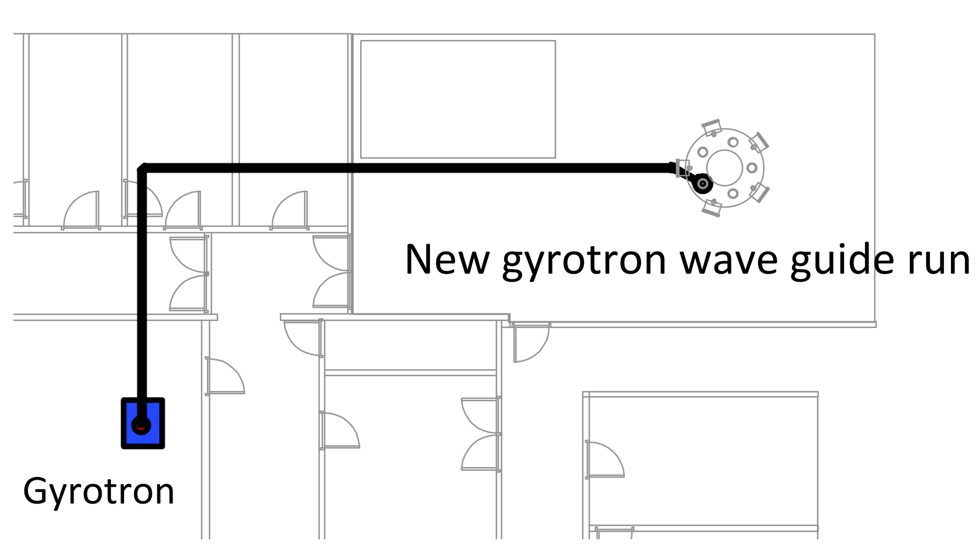


New interferometer now operational with system tests underway (See K. Ross - BP11.00047)

VGA-8050M pulsed gyrotron oscillator 200kW - 28GHz 75ms

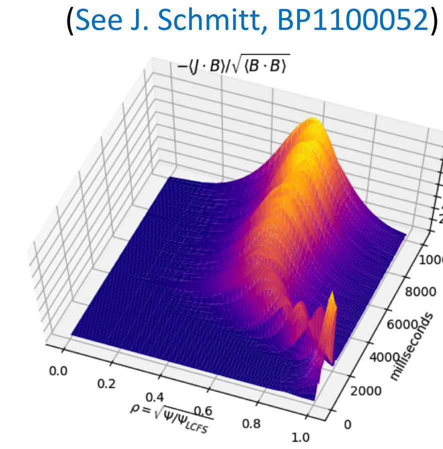


(See G. Hartwell - BP11.00048)

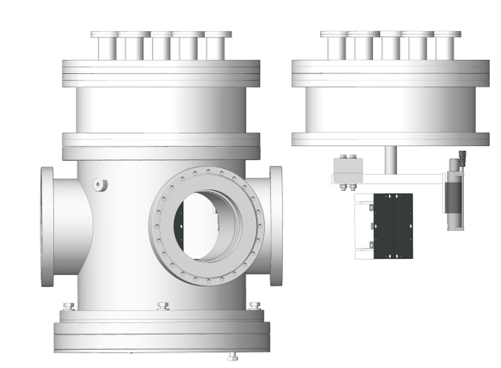


Auburn University research spans a broad range of activities on W7-X

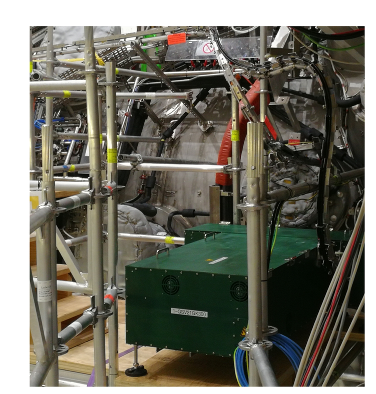
(See J. Schmitt, BP1100052)



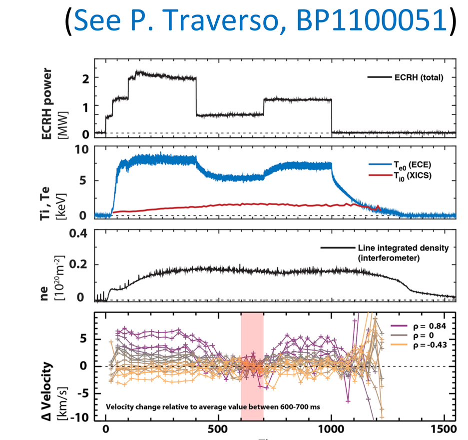
(See J. Kring, BP1100050)



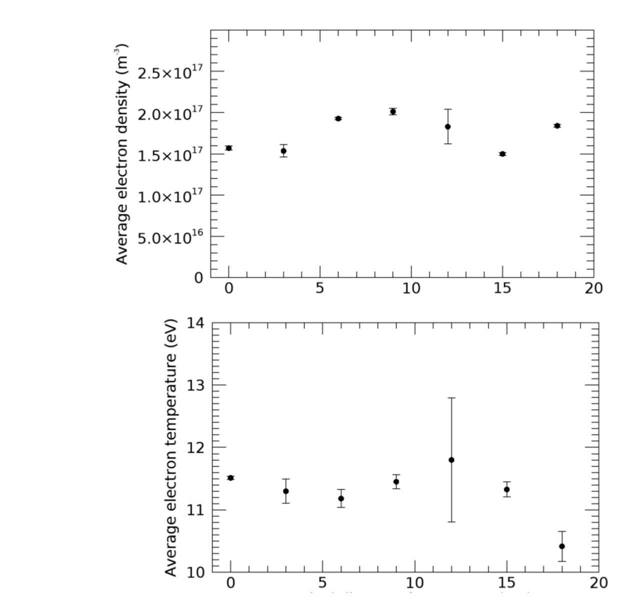
(See V. Perseo, BP1100064)

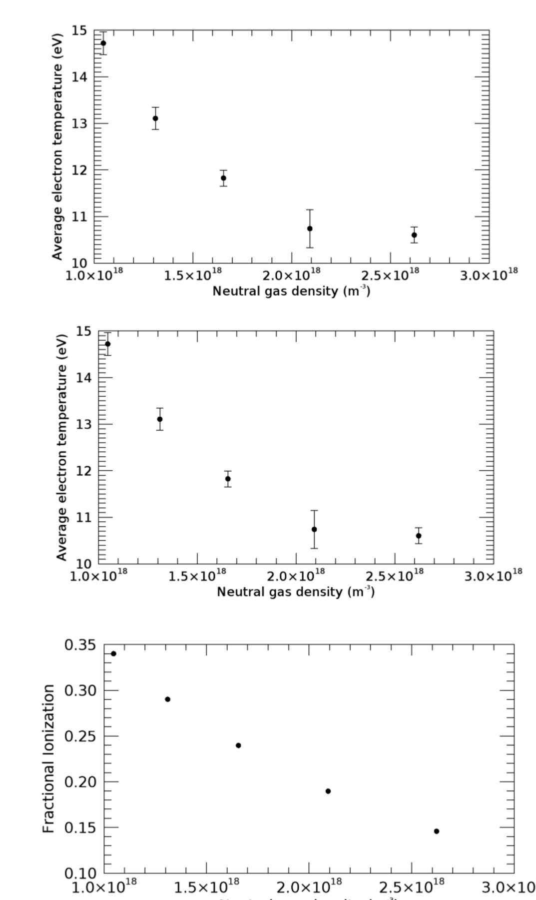


(See P. Traverso, BP1100051)



Creating low temperature plasma with varying fractional ionization on magnetic surfaces





(See E. Williamson, BP1100053)