Proposed experiments, analysis, and measurements

National Implosion Stagnation Physics WG
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Experiments I – series of shots

Proposal	Benefits	Risks	Effort
Experimentally tune out early-time drive asymmetry in HGF HF (using 3-axis keyholes and 2D ConAs)	Only systematic method to reduce observed shape swings and corresponding RKE in HGF HF	# of shots required is uncertain Effect could be small if other degradation mechanisms dominate	medium
Improve drive symmetry by moving in hohlraum design space (LGF, larger CCR) – in progress with 672 LGF HF	Addresses both early-time and late-time LPI-related issues Reduces LPI and backscatter losses	Au wall motion presents new problems	high
Move to a very conservative design space to achieve symmetrically-drive implosion (v. short pulse with high α, v. large CCR) – semi in progress with 2sh CH and BF HDC	Most conservative basecamp implosion Good for code validation (hohlraum physics, and 1D capsule physics)	Time-consuming May not be necessary May not significantly help in dealing with physics issues back in 'ignition-relevant' regime	high

Experiments II – eliminating engineering features

Proposal	Benefits	Risks	Effort
Develop alternate to tent mounted capsule – in progress	Removes a known perturbation source, predicted to have large performance impact	None	high
Develop alternate to standard fill-tube – in progress	Removes a known perturbation source, though performance impact is not well understood	May not be necessary	medium -to-high

Experiments III – individual shots

Proposal	Benefits	Risks	Effort
Repeat N140819 with better capsule	Tests if melt feature in capsule shell contributed to degradation	None	low

Measurements I – hot spot

Measurement	Technique	Effort
Hot spot Te (time-avg)	X-ray continuum slope using high-energy differentially filtered imaging (Ross Pair II)	low
Hot spot Te (time-avg)	X-ray continuum slope using multiple monochromatic measurements (SPBT II)	medium -to-high
Hot spot Te (time-avg)	X-ray continuum slope using a crystal spectrometer	medium -to-high
High spatial and temporal resolution imaging of hot spot (~6μm, ~10 ps) Optically thin imaging of hot spot Hot spot Te (time/space resolved)	Penumbral imaging on DIXI	low
Hot spot Te (time-resolved)	Differentially filtered SPIDER	low-to-medium

Measurements II – hot spot

Measurement	Technique	Effort
Improved neutron temporal burn profile	GCD3	medium
Time-resolved neutron production rate, apparent Tion, and DSR	MRS(t)	high

Measurements III – shell

Measurement	Technique	Effort
Shell ρR asymmetry closer to stagnation	>15 keV x-ray radiography using new crystal backlit imager (CBI)	medium
Cold fuel and ablator shape at stagnation	ARC Compton radiography	v. high
Cold fuel shape at stagnation	50 in-situ FNADs	medium
3D hot spot and cold fuel shape	Dual-axis NIS	high

Analysis I

Issue	Analysis	Effort
Tion anomaly (thermal temerature vs. residual flow)	Perform suite of 2D and 3D simulations with varying levels of applied perturbations – analyse effects of residual flow and scattering on DT and DD Tions	medium
3D model of stagnation consistent with observables	Develop fast approximate time-dependent 3D implosion model and apply statistical methods to relate input parameters to observables	medium
Correspondence between x-ray and nuclear burn histories	Detailed analysis of x-ray and nuclear burn histories (measurements and simulations)	low
Hot spot mix induced by fill-tube	Determine magnitude of hot spot mix induced by fill-tube from x-ray spectral and imaging data	medium


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