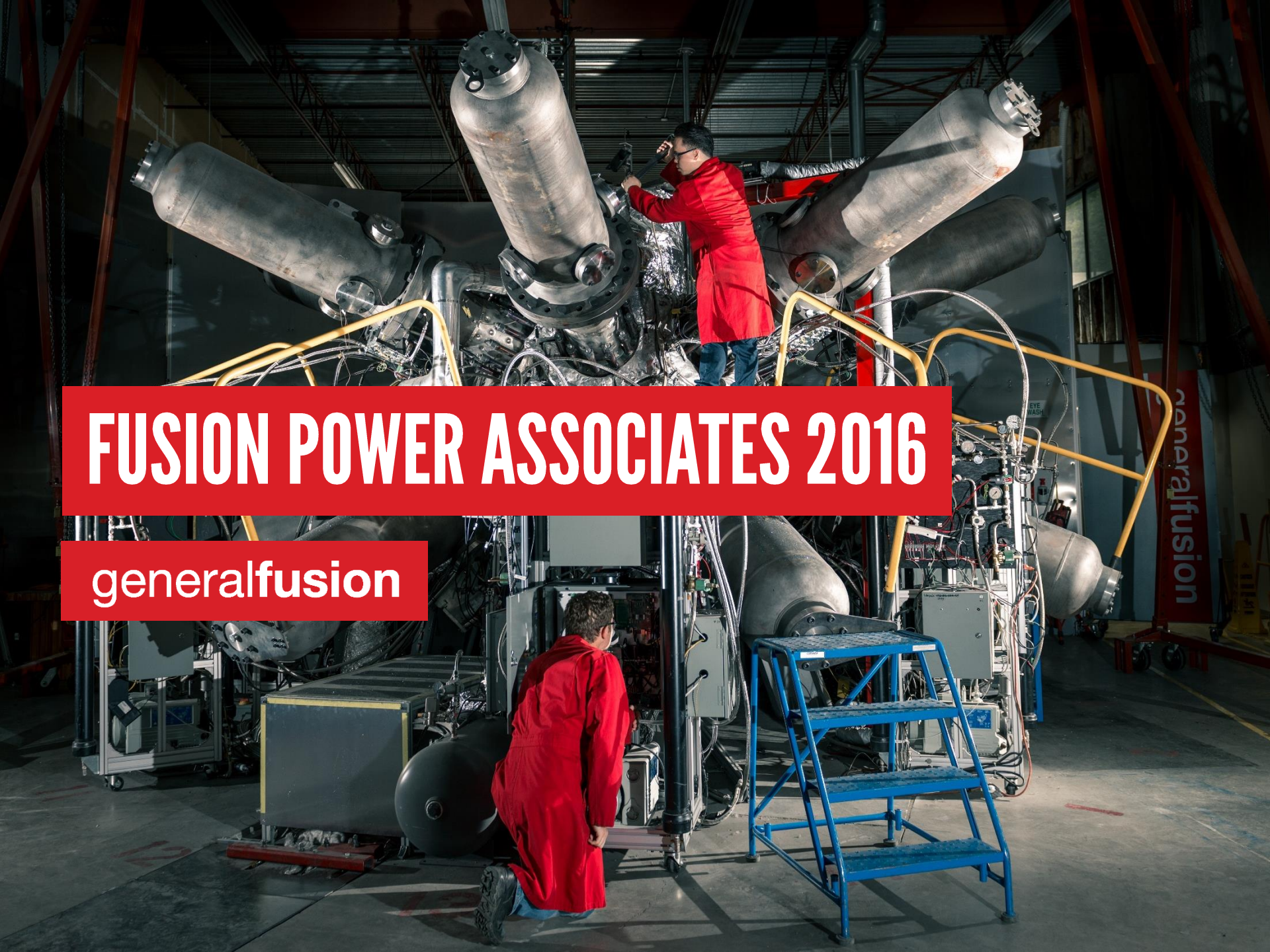
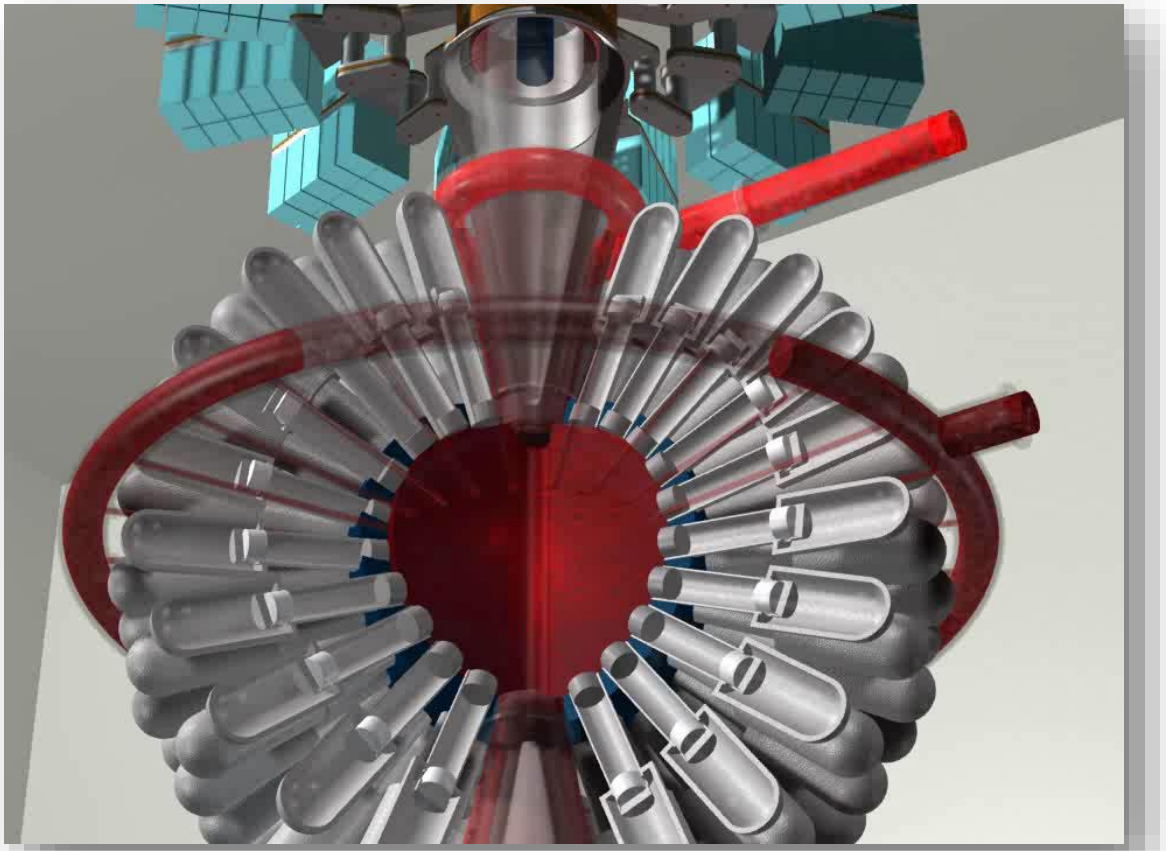

FUSION POWER ASSOCIATES 2016
generalfusion


generalfusion

MTF Power Plant Concept

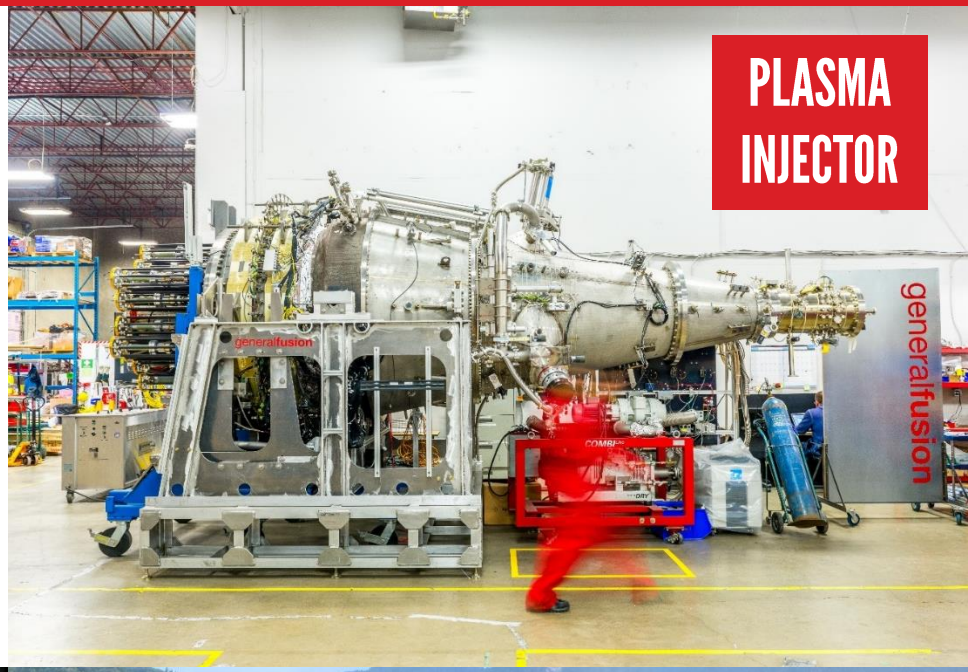


MTF Power Plant Concept

Key Features

- Low cost compressed gas driver
- Thick liquid metal blanket
  - Shields structure
  - Extracts heat
  - Breeds tritium
- Pulsed with plasma-only target

Development Program

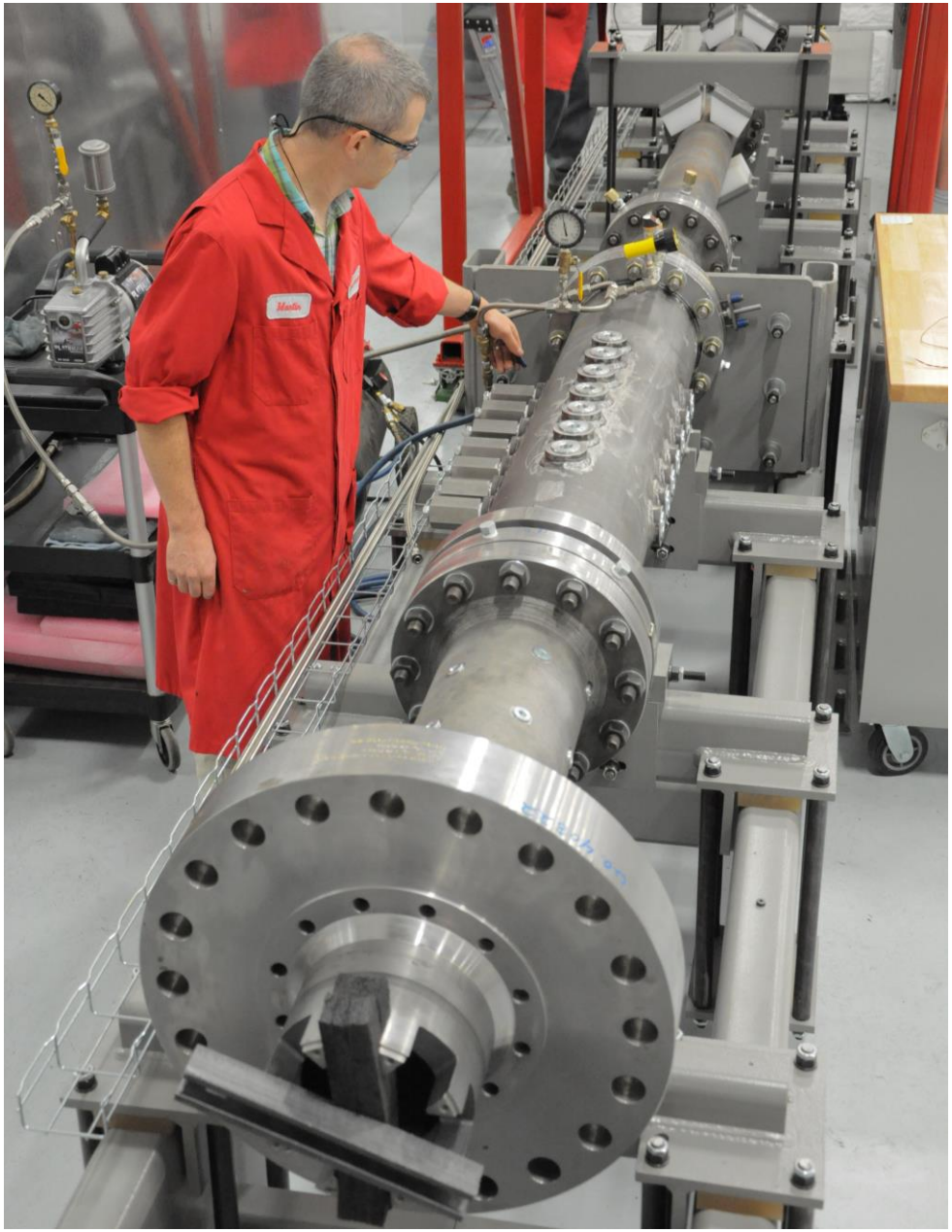


Compression System

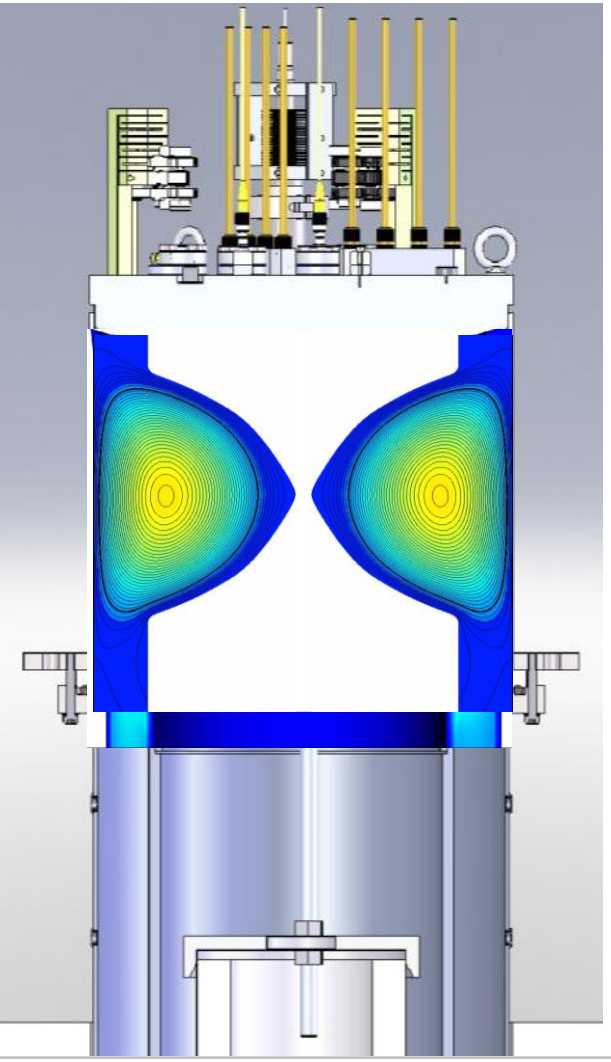
New piston design completed and undergoing testing

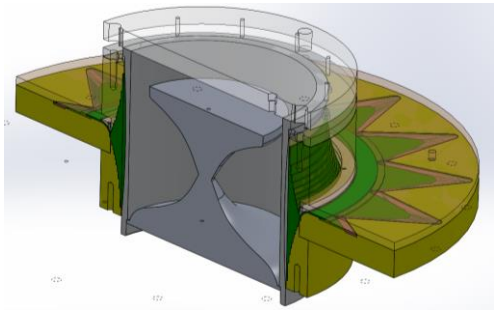
- Much higher drive pressure
- New “launch” system
- Frictionless servo control and independent position measurement

Technology scalable to large piston arrays



Plasma Injector: Recap to end of 2015

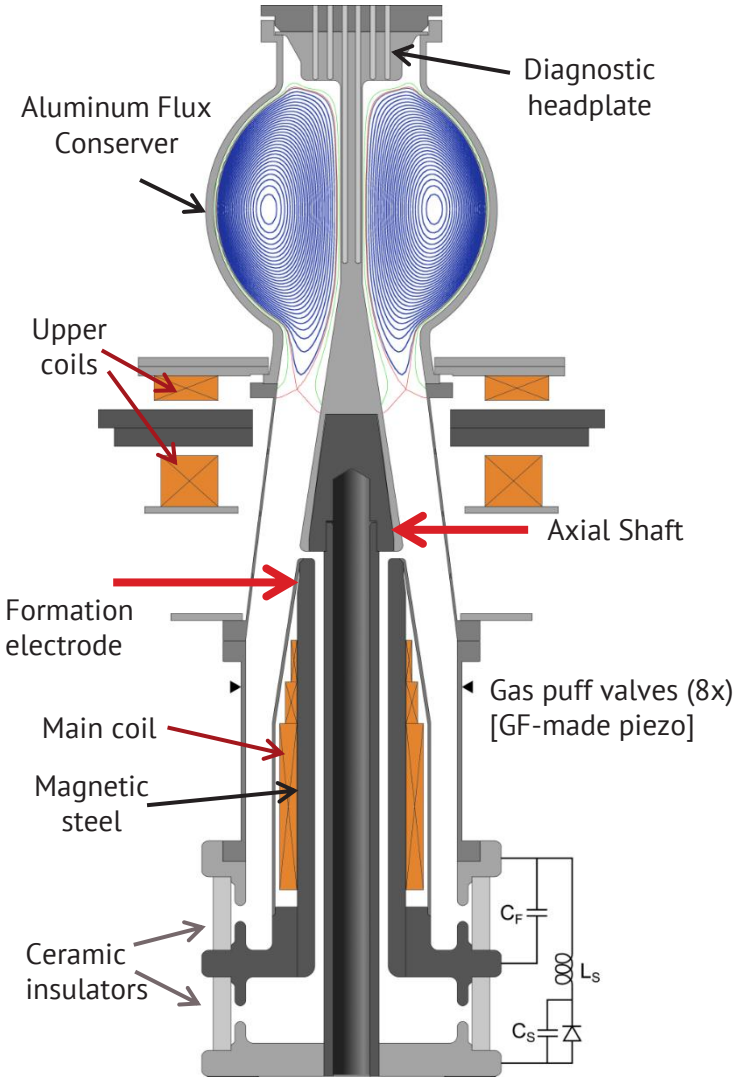




Bad curvature in compression one of the suspects for MHD instabilities in compression

Move to new design with better curvature, self-similar compression geometry

SPECTOR (SPhErical Compact TORoid)



SPECTOR forms spheromak and spherical tokamak plasmas by coaxial helicity injection into a flux conserver

Major, minor radius R= 12 cm, a = 8 cm

Vessel radius = 19 cm (interior)

Current in axial shaft ⩽ 500 kA [crowbarred] creates pre-existing toroidal field before formation plasma

Density range = 5×10^{19} to 5×10^{20} m^{-3}

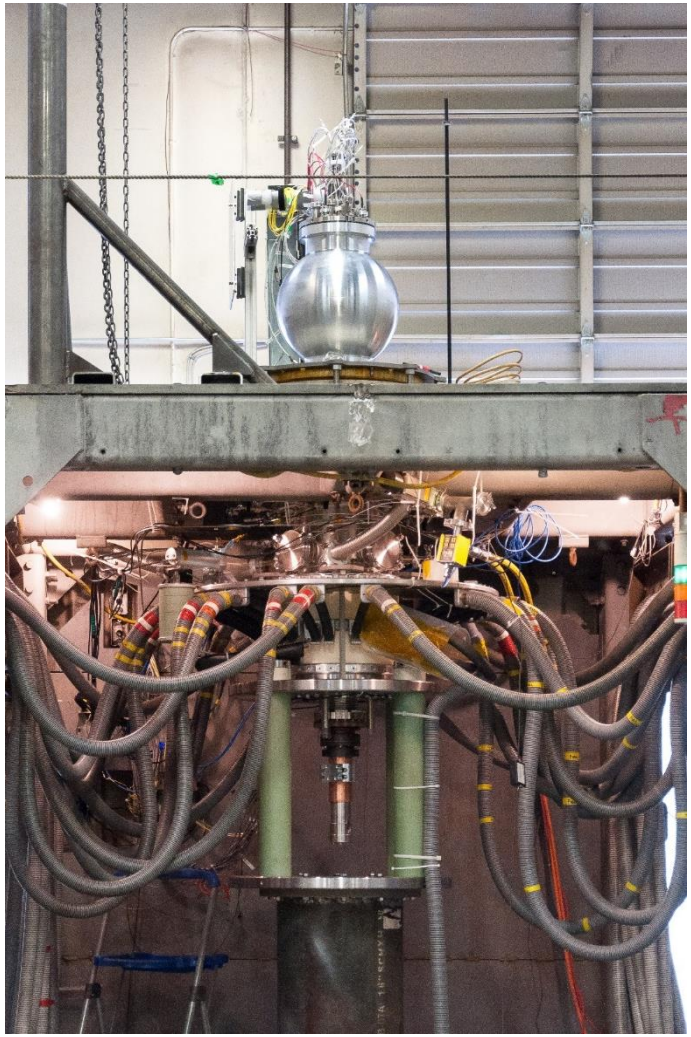
Poloidal Flux in CT = 30 mWb

Toroidal Flux in CT = 35 mWb

Toroidal plasma current = 250 kA

Total magnetic energy in CT = 120 kJ

SPECTOR: Lab and Field Variants



SPECTOR Diagnostics

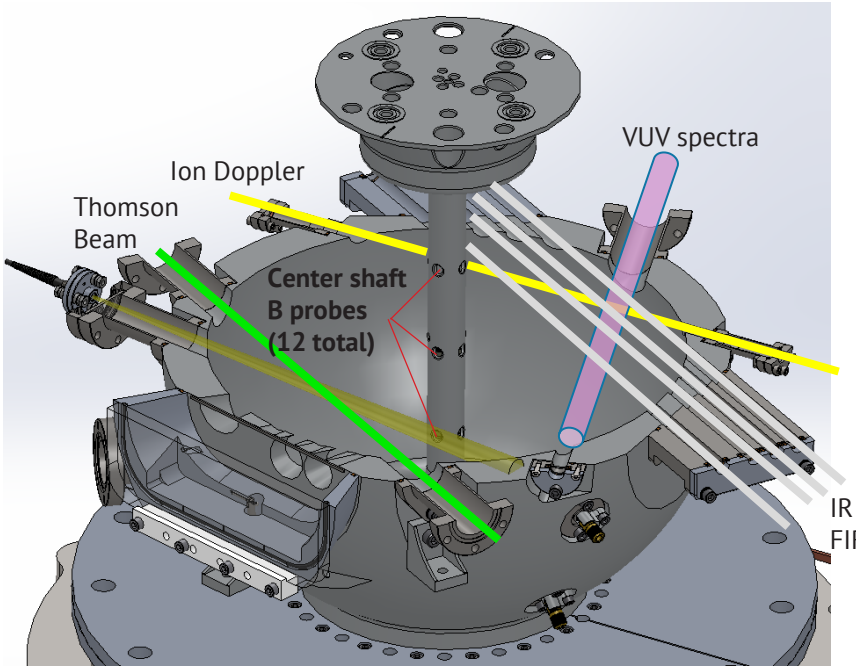
Not Shown:

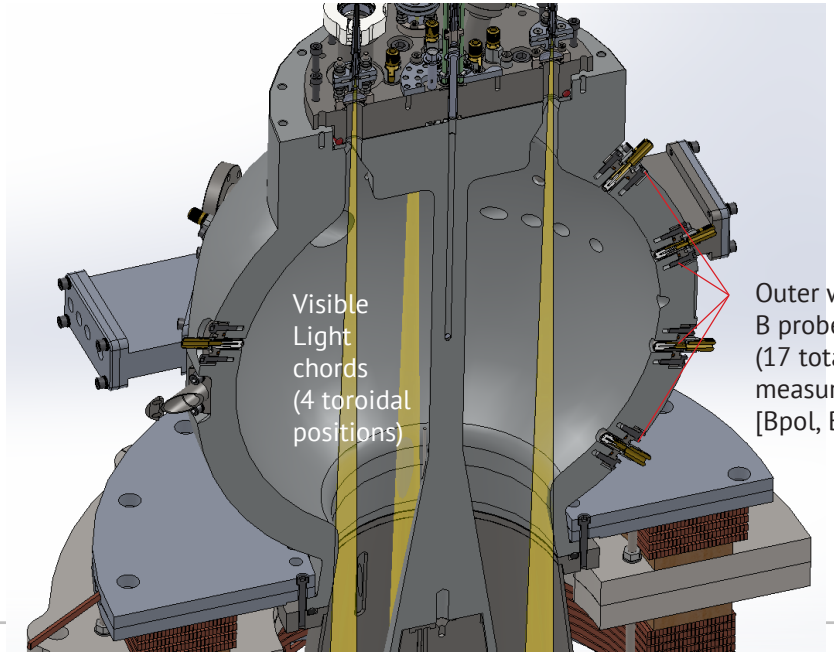
Visible survey spectrometers (x3)

Liquid Scintillator (Gamma + Neutron detector, PSD)

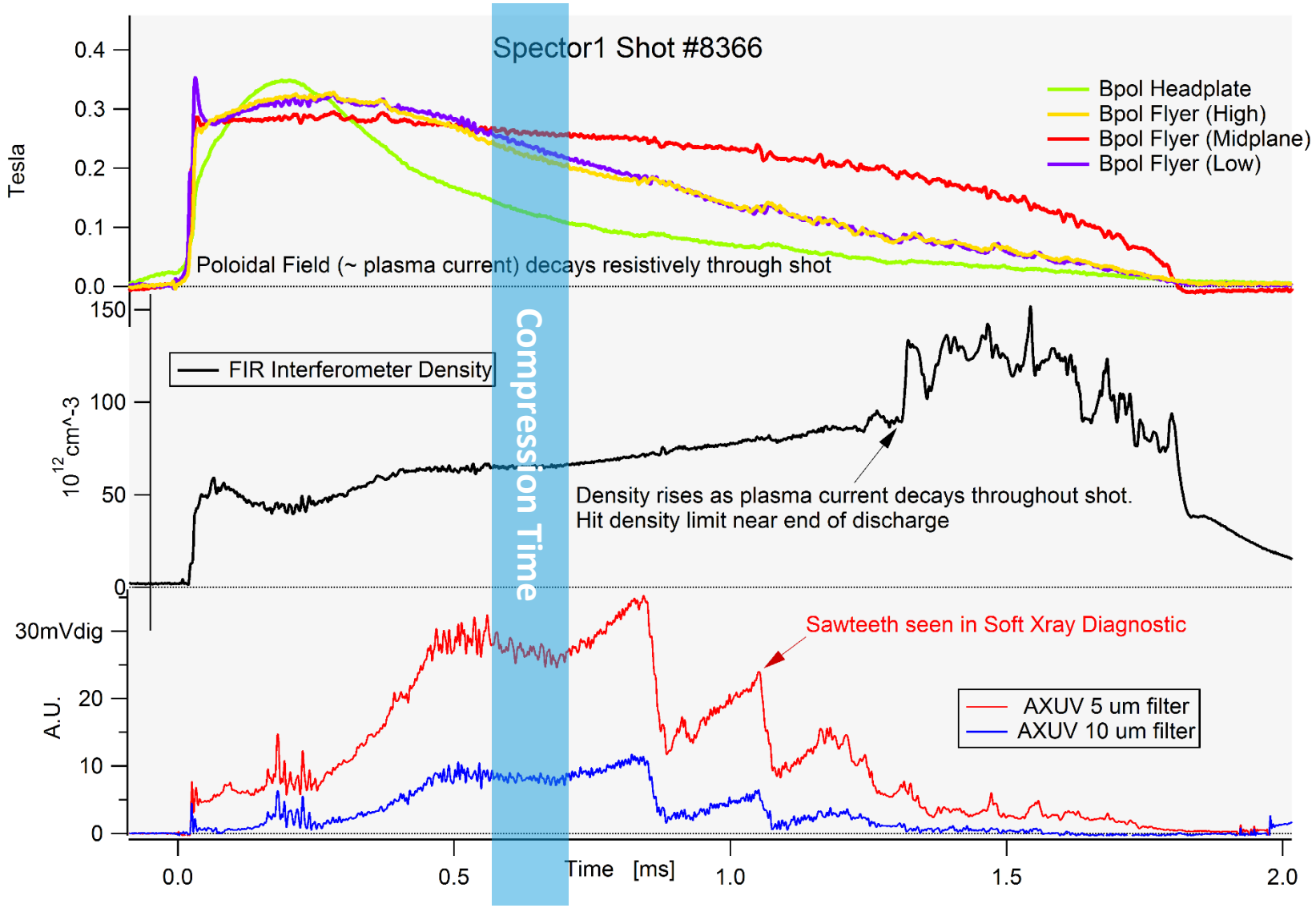
X-ray pinhole camera, with Phantom high speed video

Filtered X-ray photodiodes

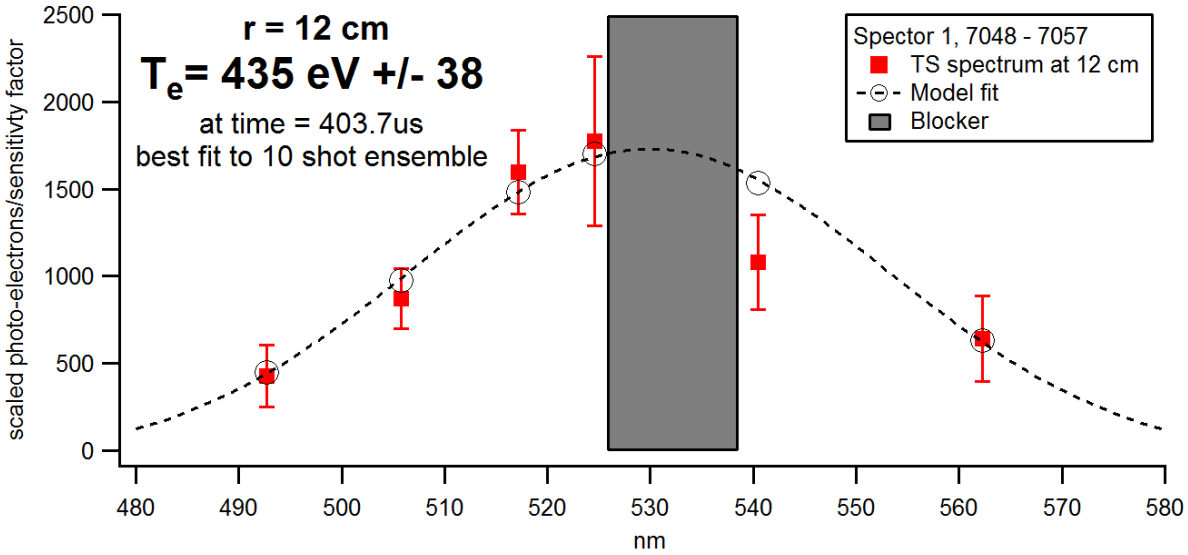


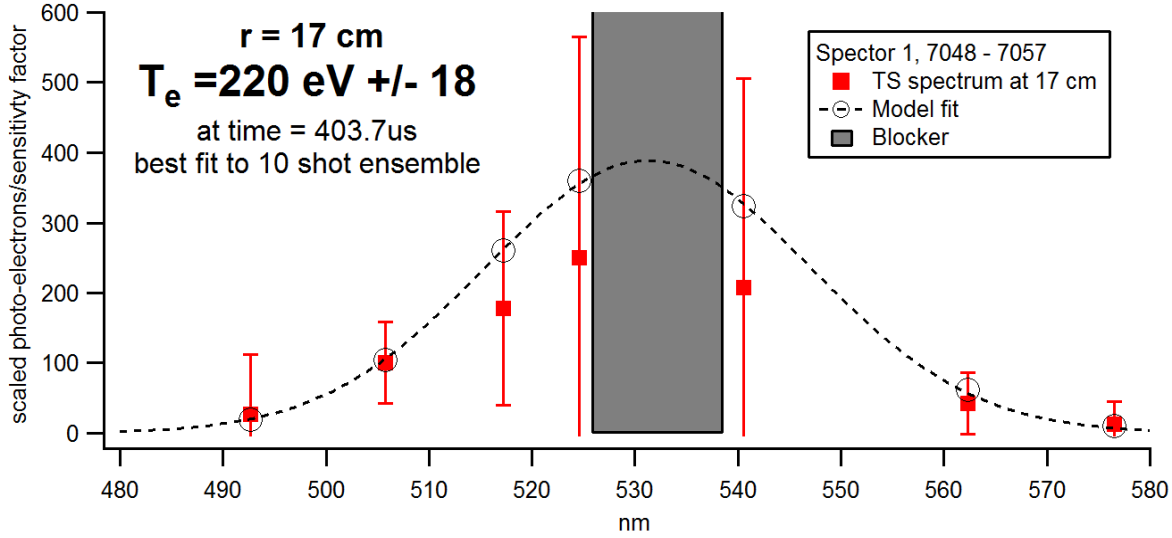


Plasma Lifetimes ~2 ms

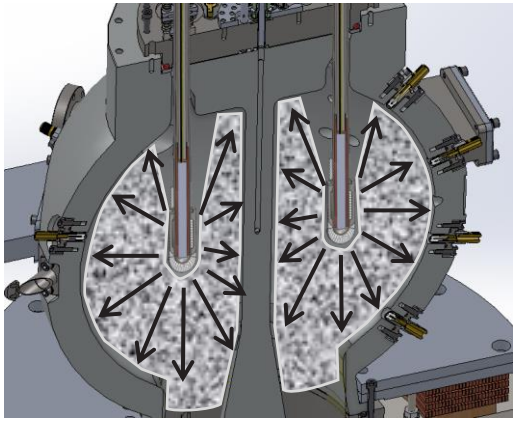


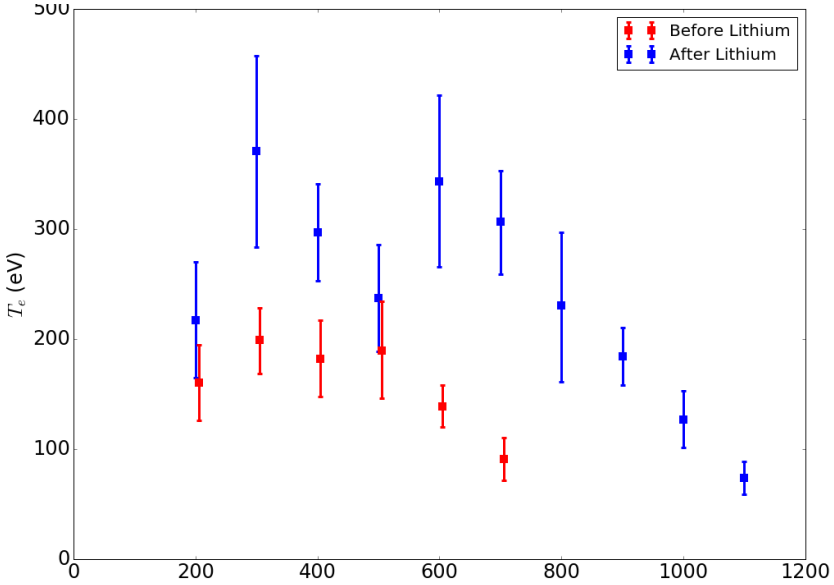
Plasma Temperatures >400 eV

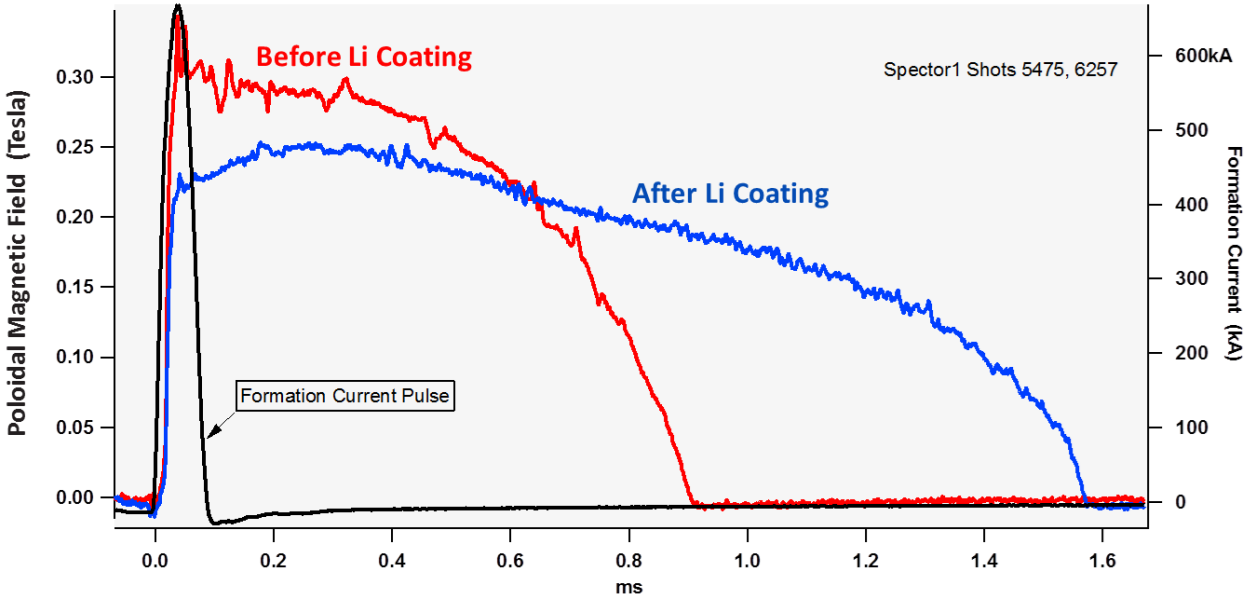




Lithium Gettering

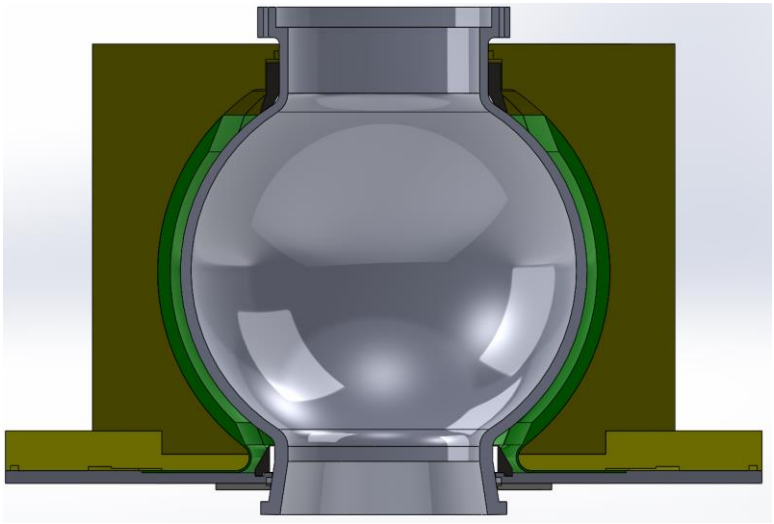




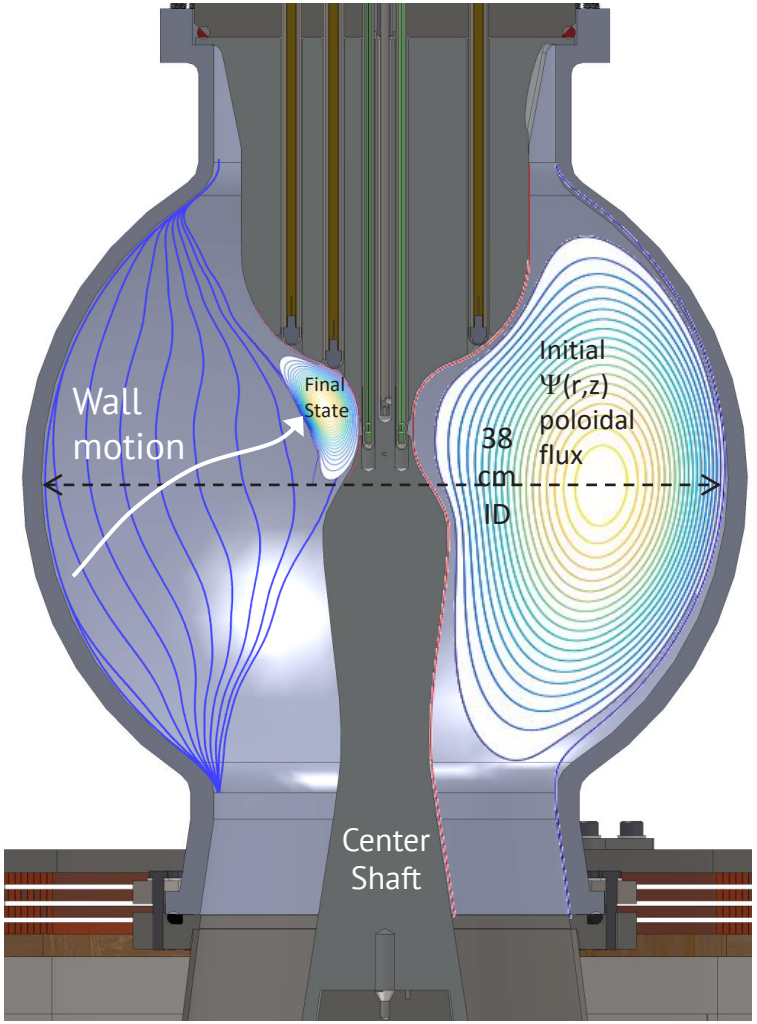


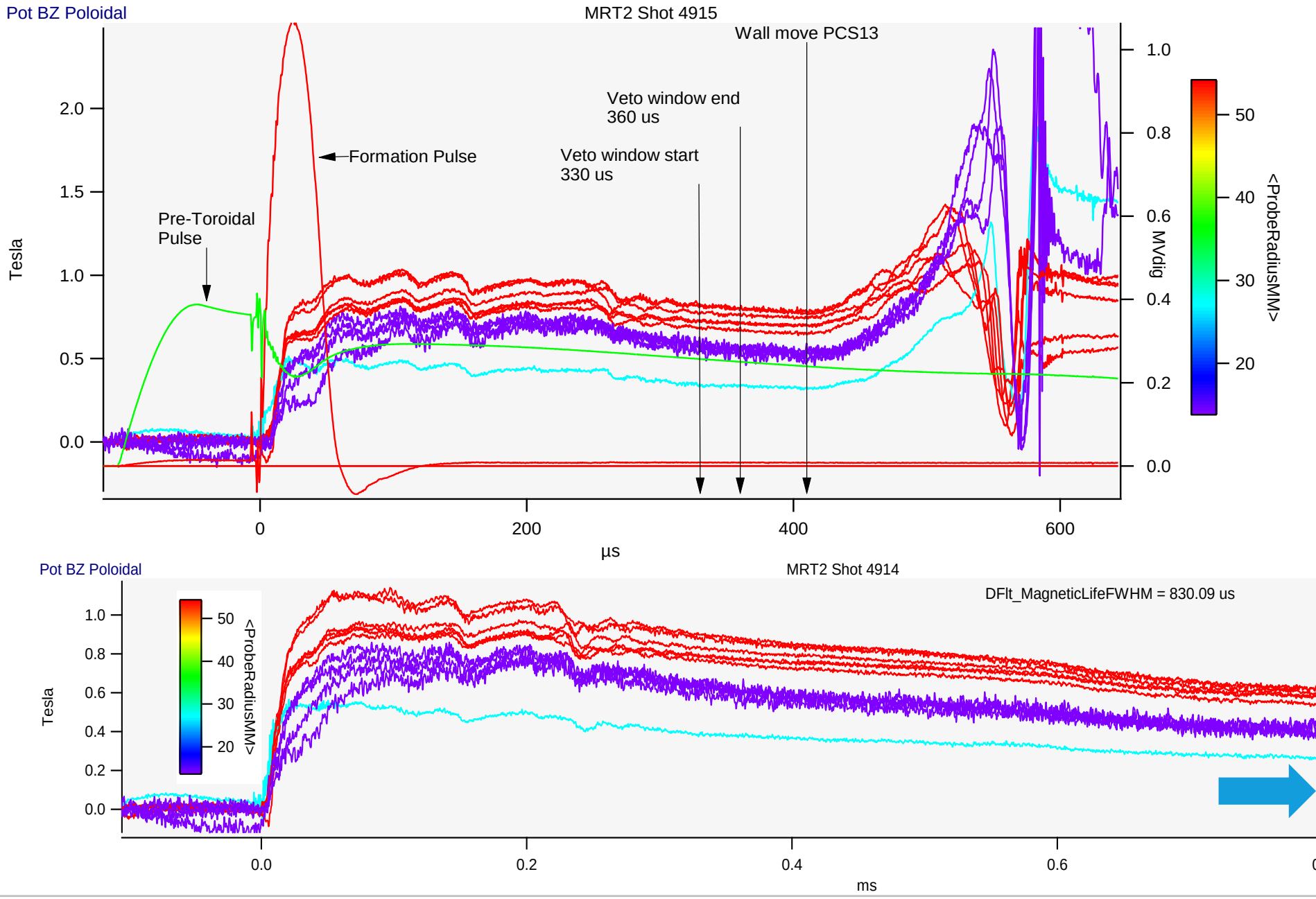
Plasma Compression System

Compression Geometry

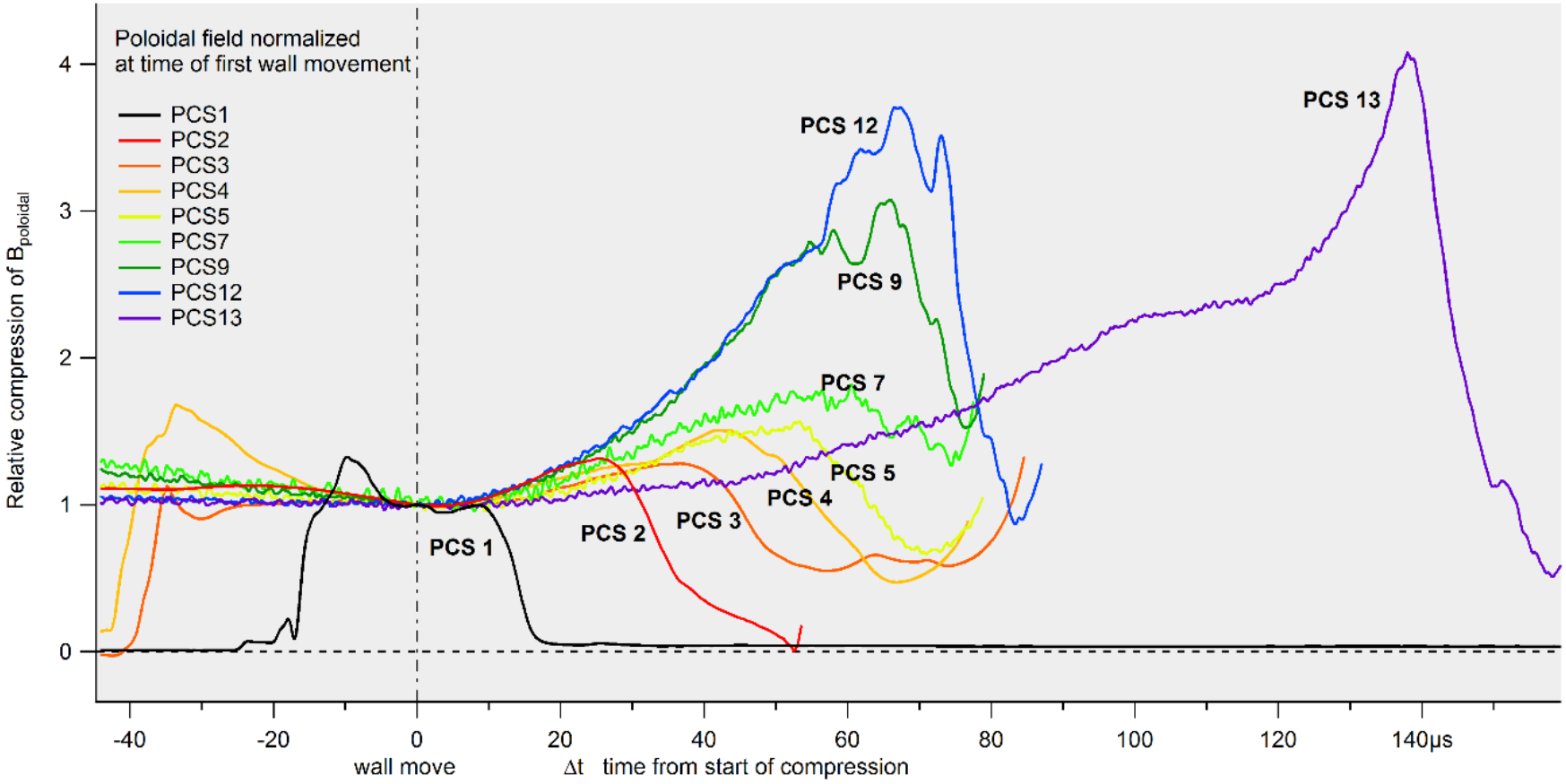


- Design achieves ~4:1 radial compression
- Good shape until very final stages




Pot BZ Poloidal
MRT2 Shot 4915
Wall move PCS13
Veto window end
360 us
Veto window start
330 us
Formation Pulse
Pre-Toroidal
Pulse
Tesla
MVdig
<ProbeRadiusMM>
μs
Pot BZ Poloidal
MRT2 Shot 4914
DFlt_MagneticLifeFWHM = 830.09 us
Tesla
<ProbeRadiusMM>
ms

Plasma Compression Results



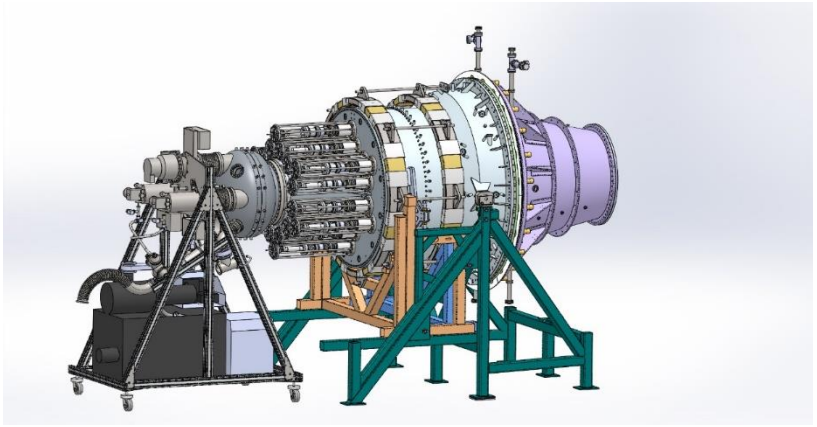
Next Steps

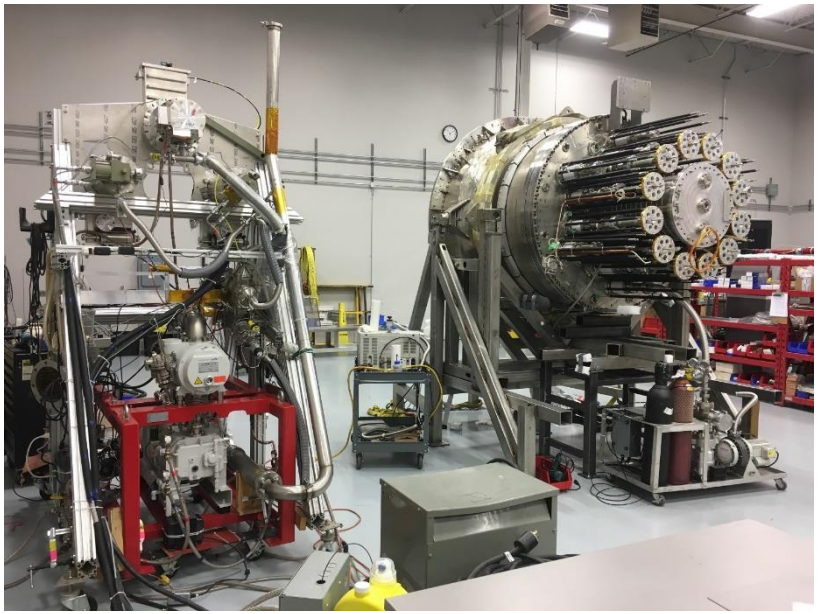
Three plasma compression tests expected in 1H2017

New large injector design being assembled, first plasma this month

Frictionless servo on new piston undergoing testing

Combine it all: detailed design of integrated system in 2017





Aurora

Initiative to migrate all our plasma data to a cloud-based system

Platform for collaboration with outside researchers

Will include some analysis and visualization tools

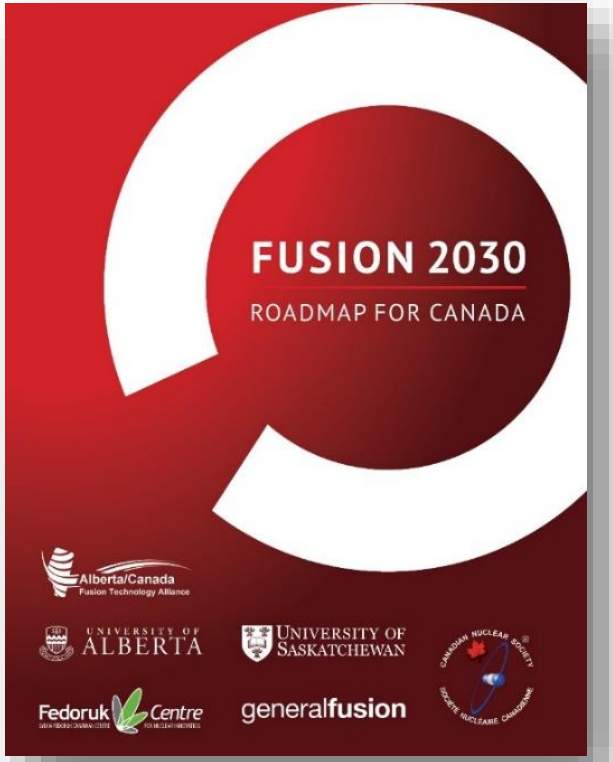
Will support application of machine learning and “big data” statistical analysis

Microsoft

Fusion 2030

A joint initiative by the Canadian fusion research community

Proposes a staged program, starting with a renewal of research capacity in fusion science and support for domestic and international collaborations



[Fusion 2030: Roadmap for Canada]

CLEAN ENERGY. EVERYWHERE. FOREVER.

Michael Delage

Chief Technology Officer
michael.delage@generalfusion.com
604-439-3003

Twitter
@generalfusion

Instagram
@generalfusion

LinkedIn
general-fusion

generalfusion

106-3680 Bonneville Pl
Burnaby, BC
Canada
www.generalfusion.com