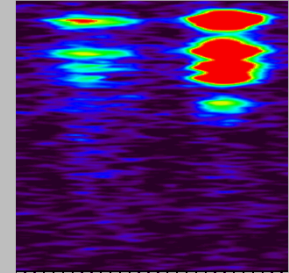
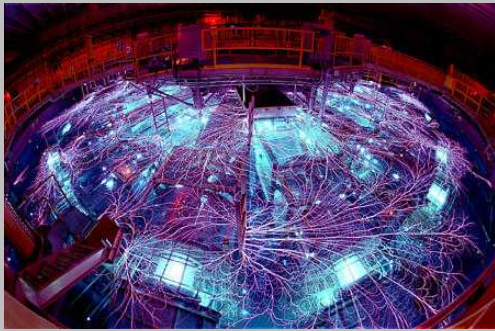


*Exceptional service in the national interest*



## First Results from Shocked Foam XRTS on Z

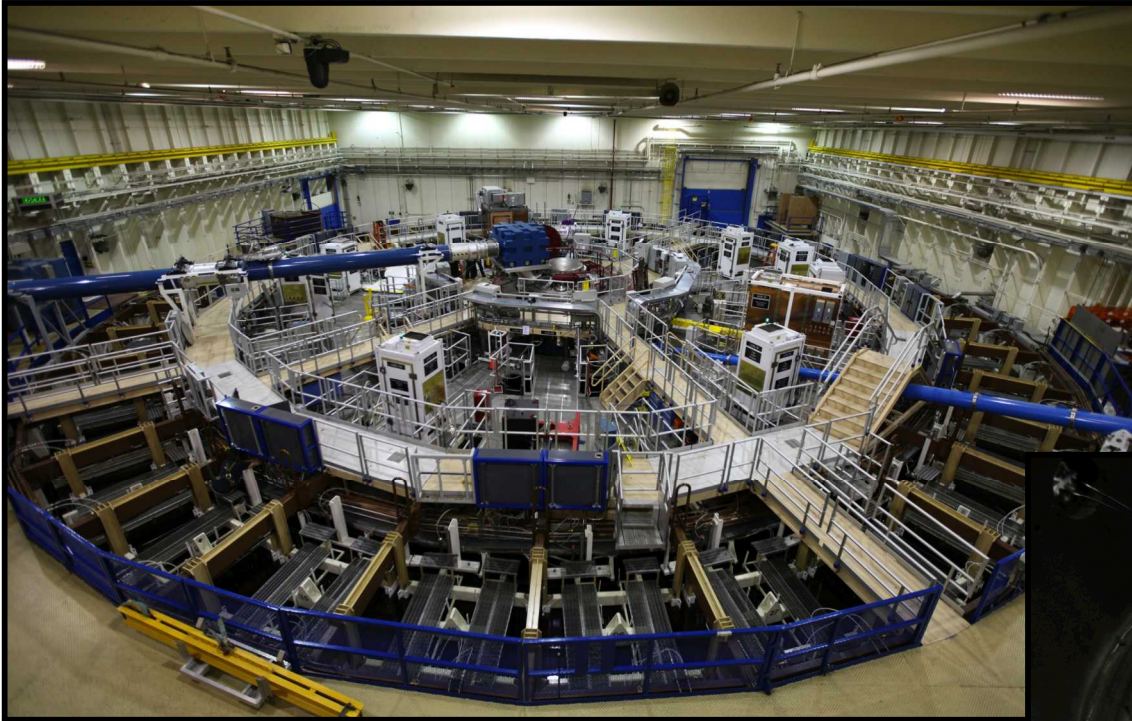
E.C. Harding, T. Ao, J.E. Bailey, L. Shulenburger, C.T. Seagle, D.B. Sinars, G.A. Rochau, S.B. Hansen, G. Loisel, M.P. Desjarlais, L.P. Mix, M. Geissel, I.C. Smith, R.W. Lemke

Sandia National Laboratories, Albuquerque, NM

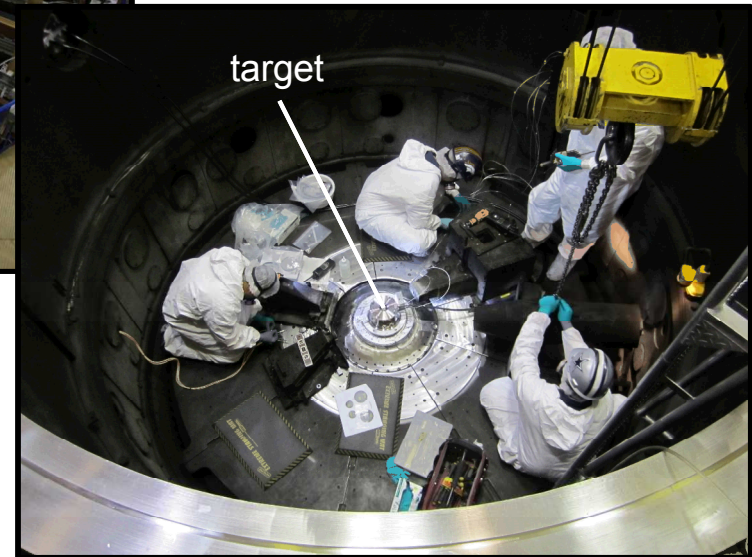
G. Gregori  
University of Oxford, Oxford, UK

The Z machine is an impressive MJ class, pulse-power driver that frequently challenges diagnostic survivability.

## Z Machine Panorama



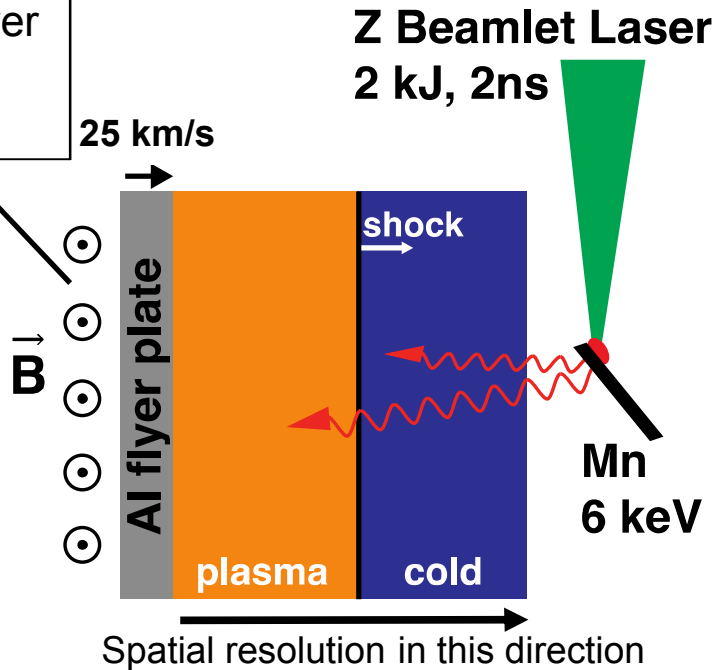
## Machine Center



22 MJ peak stored energy  
~1 MJ to target  
26 MA peak current  
100–300 ns pulse lengths

We are working to develop a space-resolved XRTS technique for shock and ramp loaded targets on Z.

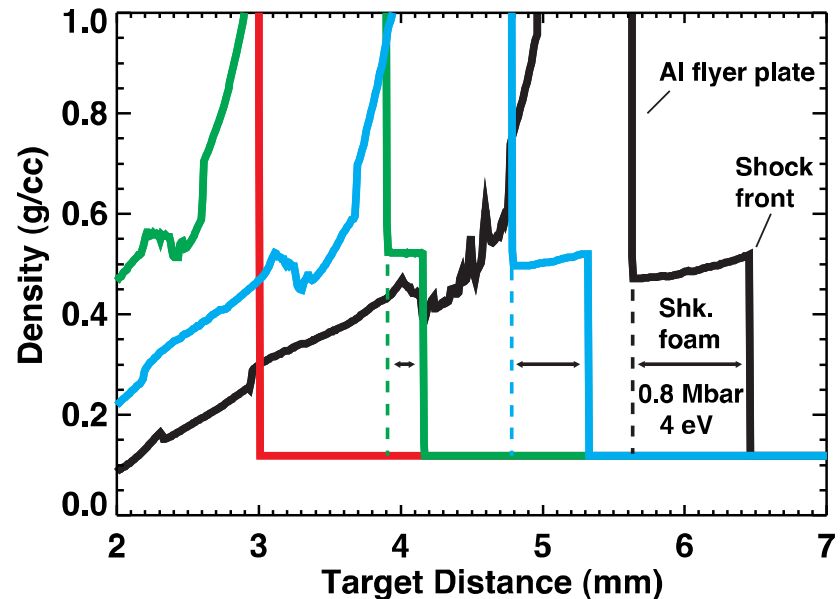
Magnetically launched flyer plates drive sample



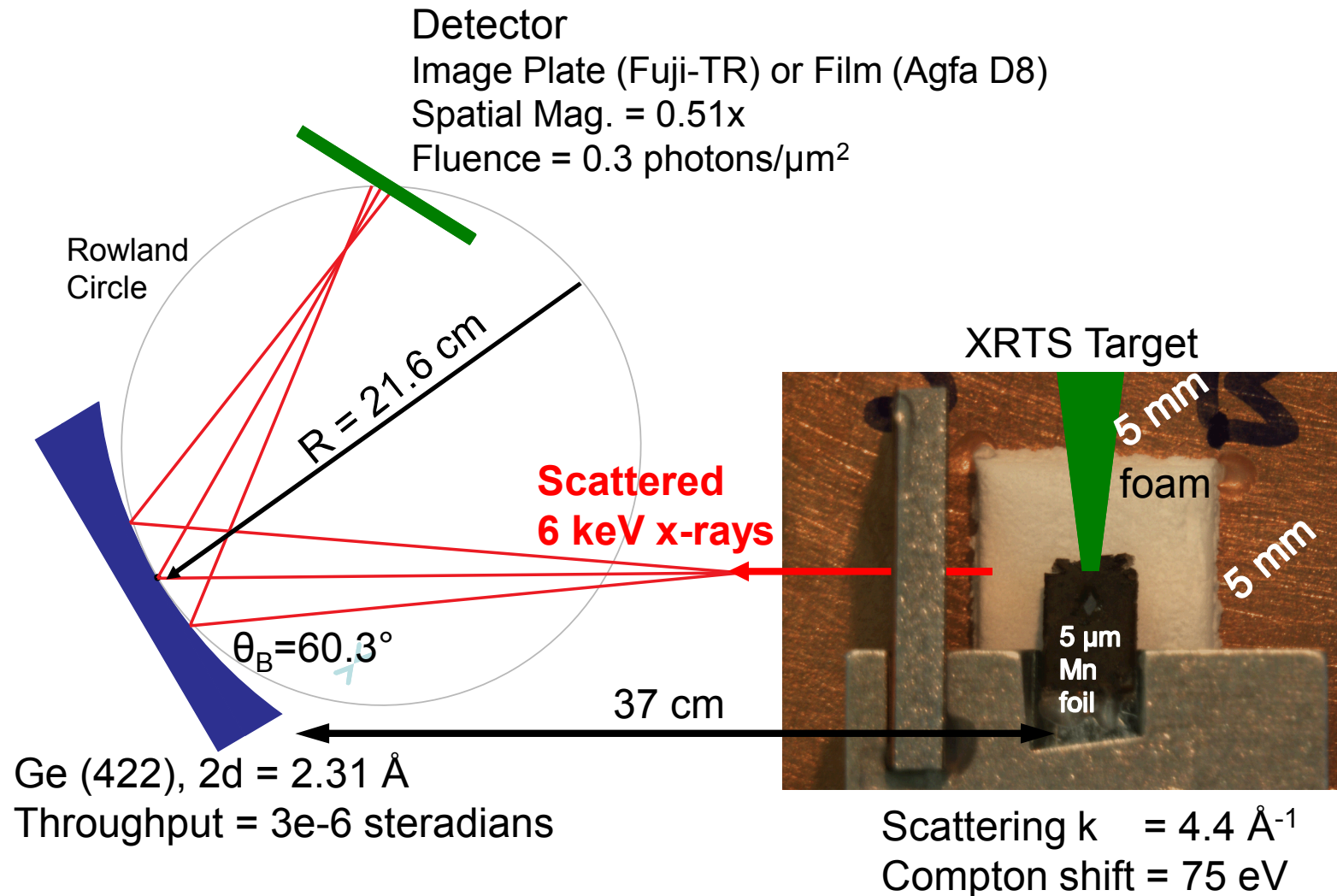
A spherically bent crystal spectrometer provides a spatially resolved spectrum

Large, uniform samples of WDM are generated with the flyer plate drive.

Density Profiles ( $\Delta t = 40$  ns)



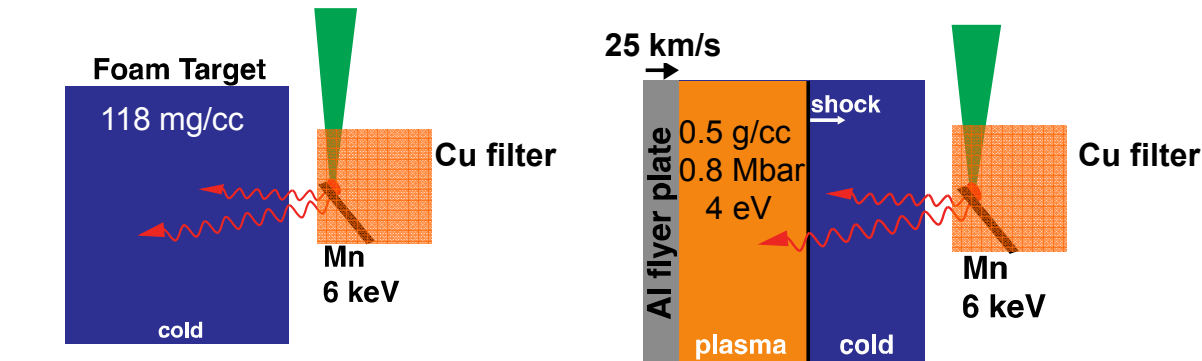
# A new spectrometer and target were developed to enable space-resolved XRTS measurements on Z.<sup>1</sup>



<sup>1</sup>T. Ao *et. al.* JQSRT 2014

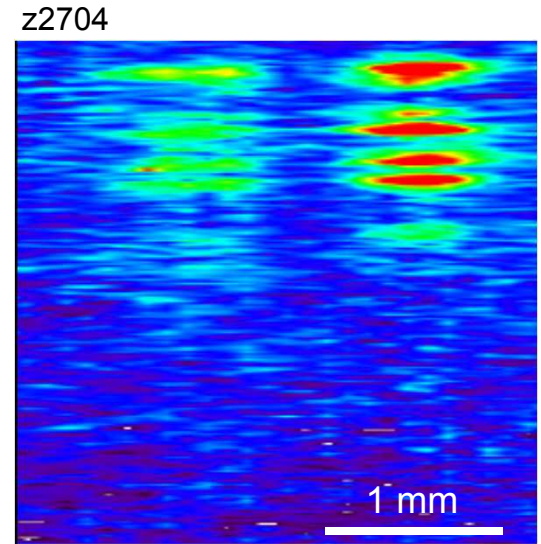
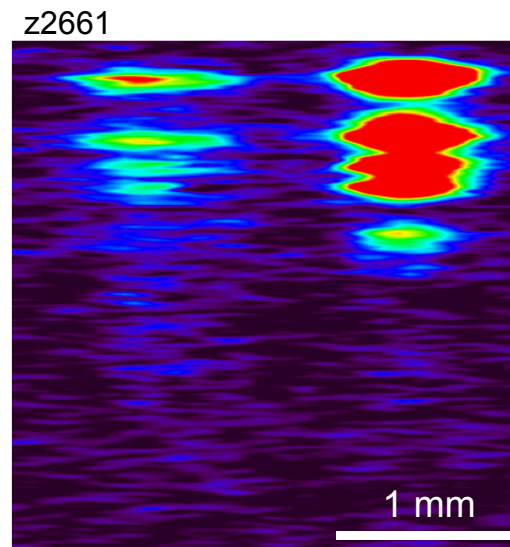
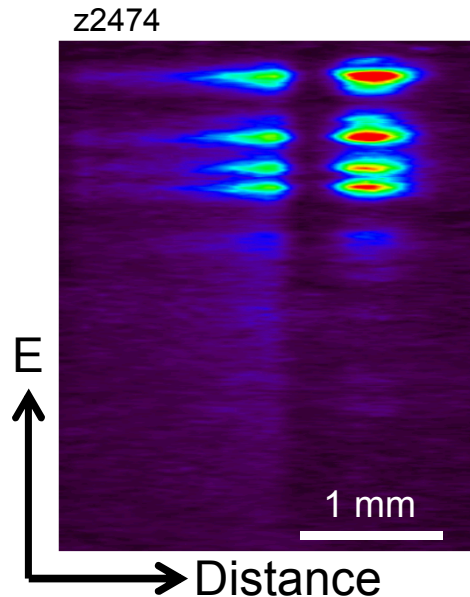


# Two shots successfully in recorded scattering signal from unshocked and shocked foam.



## Repeat Shot

Using film (Agfa D8) results in improved spatial resolution.



SPECT3D is used to generate a simulated image of the scattering signal.\*

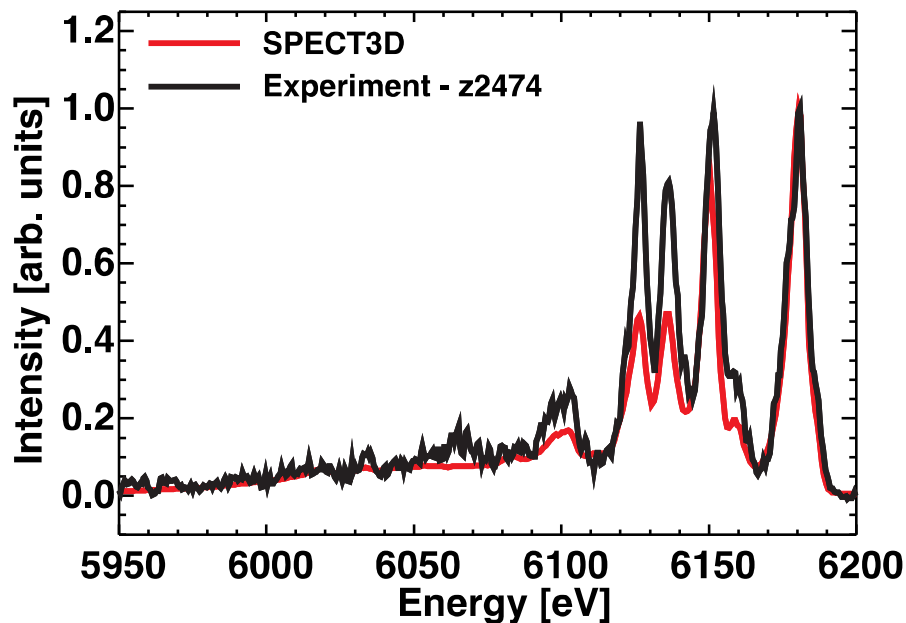
SPECT3D cartoon

Sample images from  
SPECT3D

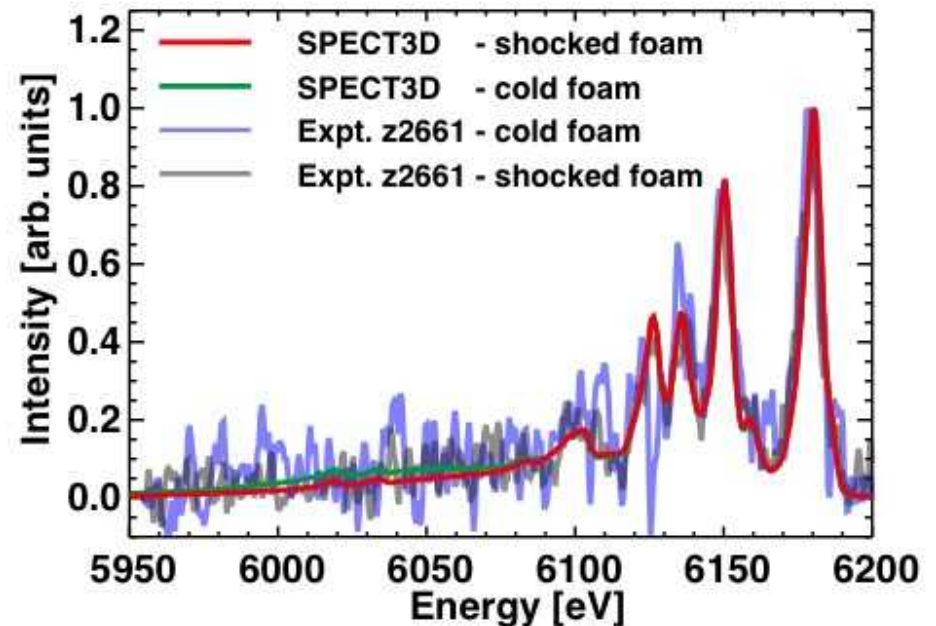
\*Golovkin *et. al.*, HEDP 2013

# SPECT3D reproduces the relative signal difference between the elastic and inelastic scattering.

Comparison of Cold Foam Spectra  
Shot z2474

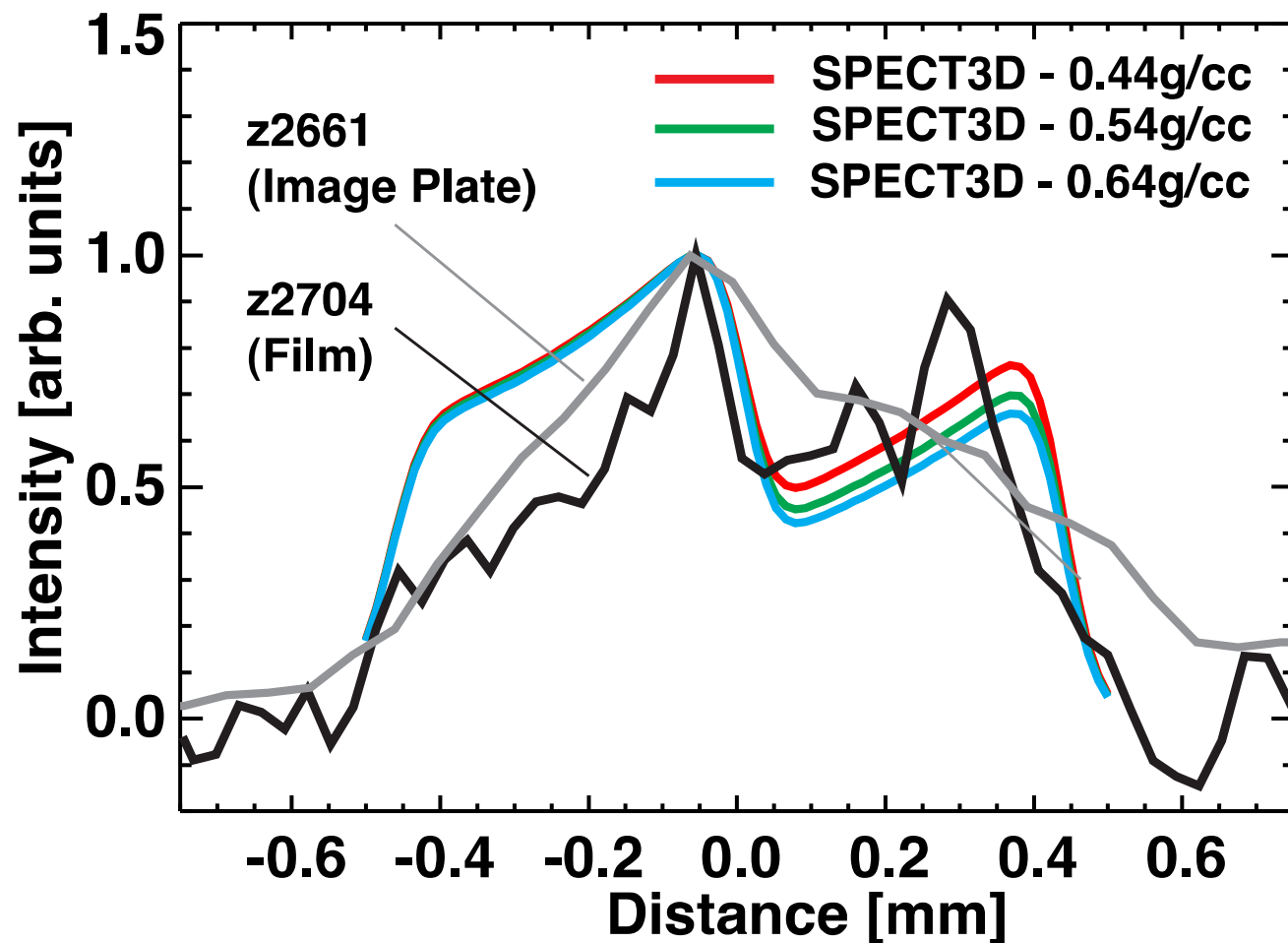


Shocked and unshocked foam spectra



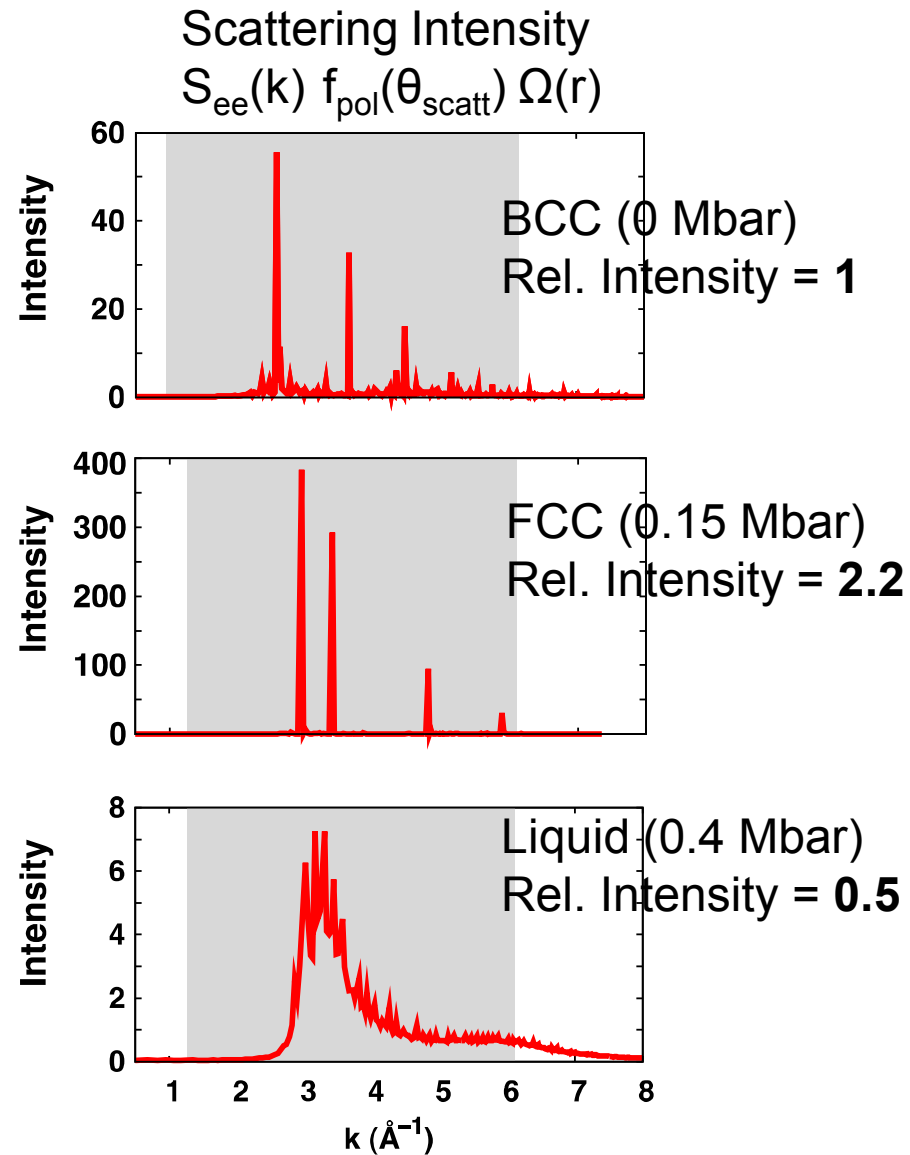
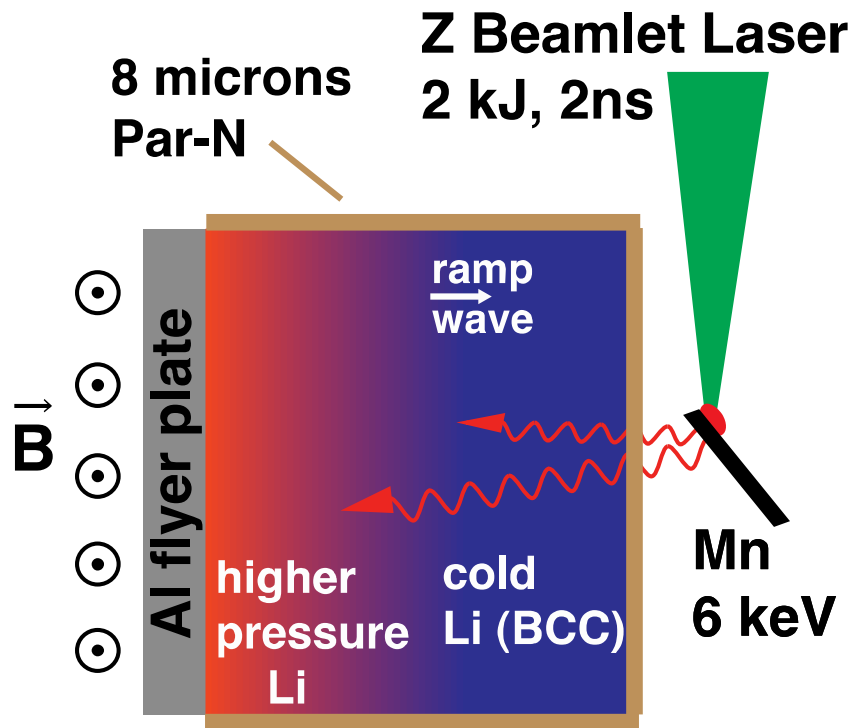
The experimental scattering spectra are consistent with the prediction that shock and unshocked foam should produce the same spectrum.

The intensity jump of the elastic signal is related to the density jump across the shock front.

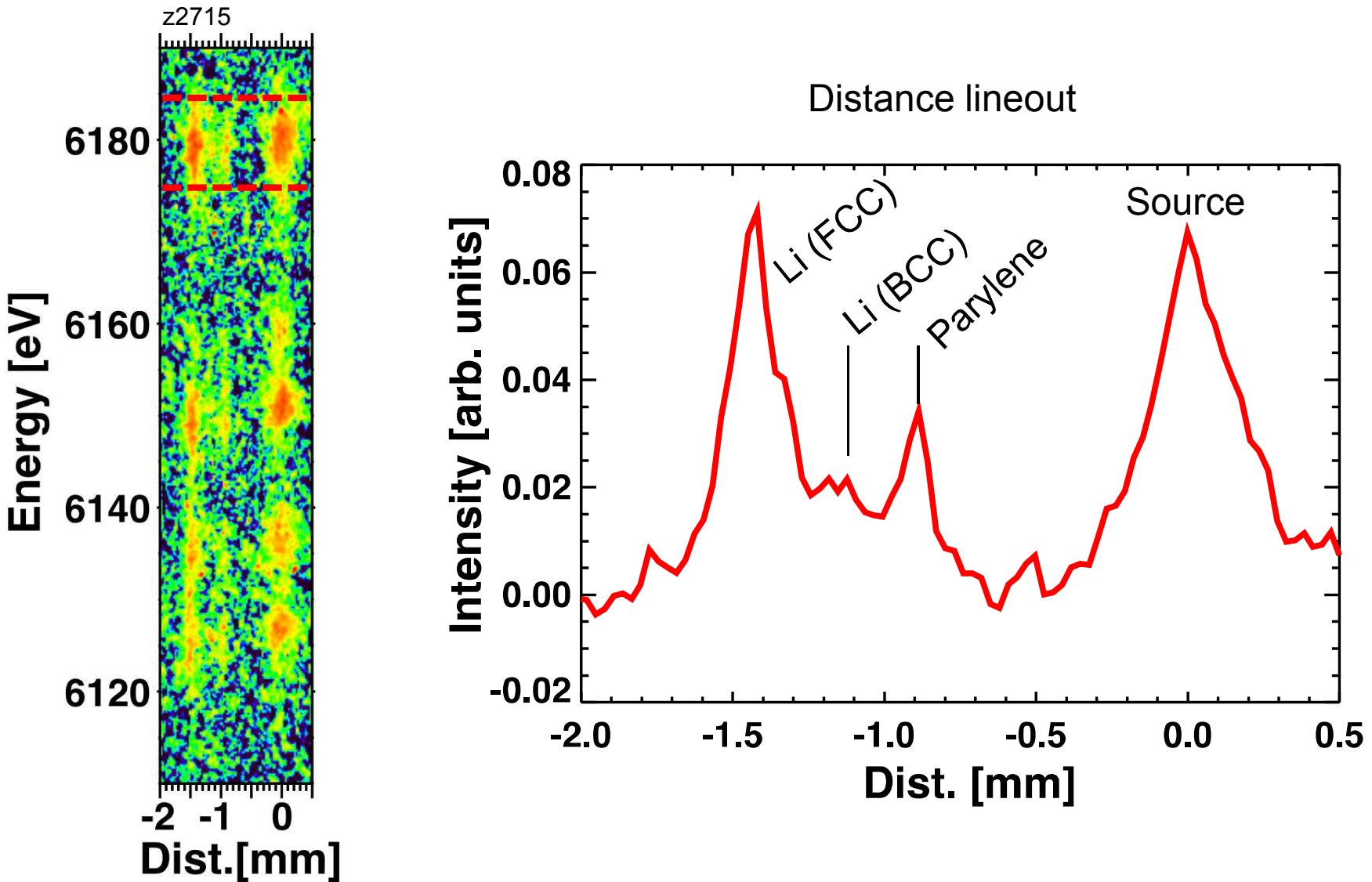




The XRTS technique has now been extended to ramped compressed Li targets on Z.



The observed intensity variations in the elastic signal suggest a phase change has occurred in the Li.



# Summary: