In an experimental arrangement used for astrophysics research, a thin metallic foil, rather than discrete wires in a stretched between a radial cathode and anode.

The foil melts and expands to move OD like a gas opens up near cathode and plasma bubble accelerated, while plasma stagnates on axis.

Reconnection at the cathode leads to further bubbles.

Filling the area above the foil with gas results in a radiative shock wave being launched from across the surface of the foil. This shock precedes the formation of the bubble above the cathode.

With Ar gas at ~5bar, the radiative shock travels at ~30km/s.

The mechanism through which the shock is launched is still unclear.

Experiments with small current pulses (to just melt the foil) demonstrate shock is not caused by release wave of the Al as it passes through phase transitions.

2D MHD simulations suggest the argon immediately above the foil is ionised and a small fraction of the current. Fluxes through this, forming a magnetic piston that snaploads up material in the radiative shock. Later in time plasma that has ablated from the foil reaches the shock front compressing the magnetic field in the argon.

Experimental results will probe the magnetic field through the shock and the material upstream and downstream of it (optical spectroscopy).

Whatever physical pressures responsible, the large scale shock wave allows extremely well diagnosed shock experiments to take place.

Now exploring experiments with shock waves that should interact with the targets, and experiments in convergent geometries.

The MACH facility – a new generator for isentropic compression experiments

Experiments pioneered at on the 20MA 2 accelerator at Sandia National Laboratories have demonstrated the use of magnetic pressures for ramp loading. This allows direct isentropic compression for EOS studies below Hugoniot to ~500bar. Also allows high velocity flyer plate launching for shock EOS studies ~300bar.

For the ISP, a new 2MA, 300ns rise time pulsed power facility is being commissioned to drive strip load. The generator is based on LTD technology with 20 capacitors which units to allow precise shaping of the current pulse and hence magnetic pressure.

The LTD will be compact (~4m diameter) and will not require insulating or SFE – minimising maintenance. It will be easily stackable to increase voltage to drive higher inductance, imploing plasma loads.

The new 12 month experiments will examine pressure profile across jet using line VISAR and multiple point Hot-Wire, redesign the experiment to improve repeatability and look at using just the ablated plasma as a kinetic drive.