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Generation of cylindrically convergent shockwaves in water on
the MACH facility1 SIMON BLAND, Institute of Shock Physics, Imperial Col-
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Physics, Imperial College London — We report on the first experiments utilizing
MACH facility at Imperial College London to explode copper wire arrays in water,
generating extremely symmetric, cylindrical convergent shockwaves. The experi-
ments were carried out with 10mm diameter arrays consisting of 60 x 130m wires,
and currents ¿500kA were achieved despite the high inductance load. Laser backlit
framing images and streak photography of the implosion showed a highly uniform,
stable shockwave that travelled towards the axis at velocities up to 7.5kms-1. For
the first time, imaging of the shock front has been carried at radii ¿0.5mm, and
there is strong evidence that even at radii ¿0.1mm the shock front remains stable,
resulting in a convergence ratio of 50:1. 2D hydrodynamic simulations that match
the experimentally obtained implosion trajectory suggest pressures of ¿1Mbar are
produced within 10m of the axis, with water densities 3gcm-3 and temperatures of
many 1000s of Kelvin. The results represent a significant step in the application
of the technique to drive different material samples, and calculations of scaling the
technique to larger pulsed power facilities are presented.

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