

Abstract Submitted
for the DFD16 Meeting of
The American Physical Society

Vortex structures in the near field of a transversely forced jet
OYVIND HANSSSEN-BAUER, DHIREN MISTRY, NICHOLAS WORTH, JAMES
DAWSON, NTNU — We investigate the effect of transverse acoustic forcing on the
formation of vortex structures in the near field of an axisymmetric jet using stereo-
scopic particle image velocimetry. The jet is placed at different locations between
the pressure anti-node and node within a standing wave, and velocity and vorticity
fields were measured in the $x - r$ plane. At the pressure anti-node, the jet response
exhibited an axisymmetric mode, $m = 0$, as harmonic fluctuations in pressure and
the streamwise velocity components result in the periodic formation of vortex rings
at the forcing frequency. As the jet was moved away from the anti-node, the shear
layer roll-up and resulting vortex structures become increasingly asymmetric and
three-dimensional due to time-varying spatial pressure gradients across the jet exit.
The location where the transverse and streamwise velocity fluctuations were of equal
magnitude coincided with sudden change in the jet response, characterised by shear
layer roll-up and resulting vortex structures either side of the jet being in anti-phase.
At the pressure node, harmonic transverse oscillations of the jet were observed form-
ing vortices of equal circulation on either side of the jet in anti-phase. Meandering
of the potential core was also observed.

Oyvind Hanssen-Bauer
NTNU

Date submitted: 30 Jul 2016

Electronic form version 1.4