Abstract Submitted
for the DFD14 Meeting of
The American Physical Society

Kelvin ship waves: the effect of nonlinearity on the apparent wake angle[1] SCOTT MCCUE, RAVINDRA PETHIYAGODA, TIMOTHY MORONEY, Queensland University of Technology — We learn as undergraduates that the half-angle which encloses a Kelvin ship wave pattern is simply $\arcsin(1/3) \approx 19.47°$, provided the fluid is deep and the disturbance is small. But observations and calculations for sufficiently fast-moving ships suggest that the *apparent* wake angle decreases with ship speed. One explanation of this phenomenon is that the wave pattern that is observed in practice is defined by the location of the highest peaks; for wakes created by sufficiently fast-moving objects, these highest peaks no longer lie on the outermost divergent waves, resulting in a smaller apparent angle. We explore these ideas by analysing the linearised problems of flow past a submerged point source (semi-infinite Rankine body) or past a submerged source doublet (sphere). Then we consider the nonlinear versions of these problems. One result is that nonlinearity has the effect of increasing the apparent wake angle so that some highly nonlinear solutions have apparent wake angles that are greater than Kelvin's angle.

[1]We acknowledge support of the Australian Research Council via the Discovery Project DP140100933

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Date submitted: 23 Jul 2014 Electronic form version 1.4