Kelvin-Like Wake Pattern in a Two-Dimensional Lee-Huang-Yang Supersonic Flow

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A supersonic flow past an obstacle can generate a rich variety of wave excitations. This paper investigates, both analytically and numerically, two types of excitations generated by the flow of a Lee-Huang-Yang quantum fluid past an obstacle: linear radiation and oblique dark solitons. We show that wave crests of linear radiation can be accurately described by the proper modification of the Kelvin original theory, while the oblique dark soliton solution is obtained analytically by transformation of the 1D soliton solution to the obstacle's reference frame. A comparison between analytical predictions and numerical simulations demonstrates good agreement, validating our the- oretical approach.

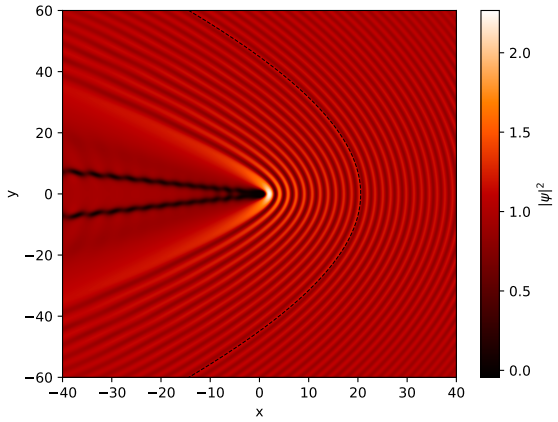

Figure 1: Wave crest position calculated analytically and the numerical simulations. The analytical solution is represented by the dashed line and the results correspond to $M = 2$. The simulation was conducted in a quasi-2D system for an impenetrable obstacle with a small radius $R = 1$ and evolution time $t = 20$