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论文

激光脉冲宽度对远距离尾流气泡后向检测的影响

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摘要:

为了分析激光脉冲宽度对远距离尾流气泡后向检测的影响,基于Fournier Forand体积散射函数,通过Monte Carlo方法建立了水中激光脉冲后向散射信号时域特征的分析模型.利用该模型研究了初始激光脉冲宽度不同时,水中远距离舰船尾流气泡的激光脉冲后向散射信号变化情况.结果表明:随着初始激光脉冲宽度的增加,后向散射信号中水体散射信号与尾流气泡回波信号的轮廓变得模糊.当脉冲宽度增大到一定程度时,无法从后向散射信号中辨别出回波信号.并且,随着尾流区气泡散射强度的减小以及气泡区与检测器之间距离的减短,这种变化趋势变得更加明显.基于仿真结果,提出一种基于逆卷积运算的尾流气泡回波信号提取方法.

关键词: 舰船尾流检测 后向散射 Monte Carlo方法 激光脉冲

Influence of Laser Pulse Width on Backward Detection of Long-distance Wake Bubbles

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Abstract:

In order to analyze influence of laser pulse width on backward detection of long-distance wake bubbles,firstly,a simulated model is built to analyze the time-domain characteristics of the laser pulse's backscattering signal underwater with Monte Carlo method based on Fournier Forand volume scattering function.Using this model,the variation of laser pulse's backscattering signal by long-distance ship wake bubbles underwater with the width of initial laser pulse is studied.The result shows that,with the increase of the width of laser pulse,the outline of scattering signal by water and echo signal by wake bubbles in backscattering signal become vague.When the width increases to a certain size,the echo signal cannot be distinguished from backscattering signal.In addition,with the decrease of the scattering intensity of bubbles or the distance between bubbles and detector,the variation becomes more evident.Finally,according to analysis results,a method is presented to extract the echo signal by wake bubbles based on inverse convolution.

Keywords: Ship wake detection Backscatter Monte Carlo method Laser pulse

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