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### 基于非频散信号构建的Lamb波高分辨率损伤成像方法

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### Lamb Wave High-resolution Damage Imaging Method Based on Non-dispersive Signal Construction

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摘要

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#### 摘要

Lamb波损伤成像是结构健康监测的研究热点之一,然而在实际应用中,成像分辨率很容易受到Lamb波频散特性的影响。本文研究了非频散信号构建(ND-SC)的频散补偿方法并用于提高Lamb波成像分辨率。根据频域中建立的Lamb波传感模型,分析了ND-SC原理,并分别按照宽带激励和窄带激励两种情况对ND-SC的实现方式进行了讨论。随后结合经典的延迟叠加算法提出了高分辨率损伤成像方法。针对铝板的实验结果证明了本文提出的ND-SC方法和高分辨率损伤成像方法的有效性。

关键词: Lamb波 频散补偿 损伤成像 分辨率 信号构建

#### Abstract:

Lamb wave damage imaging is one of the focal research issues in structural health monitoring. However, in practical applications, the imaging resolution is easily affected by the dispersion characteristics of Lamb waves. An dispersion compensation method of non-dispersive signal construction (ND-SC) is studied in this paper to improve Lamb wave imaging resolution. Based on the Lamb wave sensing model established in frequency domain, the theory of ND-SC is analyzed. In addition, the realization of ND-SC is discussed under broadband excitation and narrowband excitation, respectively. Subsequently, associated with the classic delay-and-sum algorithm, a high-resolution damage imaging method is developed. The efficiency of the ND-SC and high-resolution damage imaging methods proposed in this paper is proved by experimental results in an aluminum plate.

Keywords: Lamb wave dispersion compensation damage imaging resolution signal construction

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