

Research on multi-dimensional feature recognition for PCBs typical defects using laser ultrasonic imaging

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In this paper, a new laser ultrasonic nondestructive testing technique scheme is proposed for the typical defect detection of PCBs. Firstly, based on the laser ultrasonic excitation theory, a three-dimensional mathematical model of ultrasonic excitation by pulsed laser on the dielectric surface of PCBs board is established, and sparse principal component analysis (sparse PCA), independent component analysis (ICA) and partial least squares regression (PLSR) are briefly described and utilized to extract the characteristic of laser-induced ultrasonic signal. Furthermore, laser ultrasonic imaging detection system was established based on the principle of laser ultrasonic theory, the detection experiment of simulated debonding flat bottom hole defects is carried out, and the transmission approach is used for C-scan experiment. The influence of the eigenvalues extracted by different algorithms on the imaging effect is analyzed from the perspective of quantification of signal-to-noise ratio, and the obtained detection results are compared with the infrared thermal wave imaging detection technology. The experimental results show that laser ultrasonic testing has the characteristics of high resolution and the advantages of imaging in small diameter. Therefore, it is of great significance to study a set of feasible laser ultrasonic technique for PCBs defect detection.

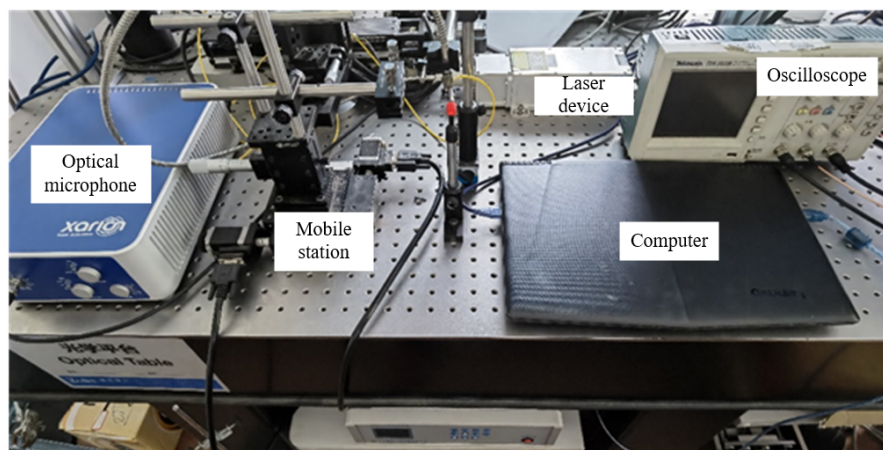


Fig. 1. General schematic diagram of laser ultrasonic imaging detection system