

## Embedded Acoustic Signal Processing System Using OpenMP Architecture

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**Abstract :** In this paper, altera de1-SoC FPGA board technology is utilized as a distinguished tool for nondestructive characterization of an aluminum circular cylindrical shell of radius ratio  $b/a$  ( $a$ : outer radius;  $b$ : inner radius). The acoustic backscattered signal processing system has been developed using OpenMP architecture. The design is built in three blocks; it is implemented per functional block, in a heterogeneous Intel-Altera system running under Linux. The useful data to determine the performances of SoC FPGA is computed by the analytical method. The exploitation of SoC FPGA has lead to obtain the backscattering form function and resonance spectra.  $A_0$  and  $S_0$  modes of propagation in the tube are shown. The findings are then compared to those achieved from the Matlab simulation of analytical method. A good agreement has, therefore, been noted. Moreover, the detailed SoC FPGA-based system has shown that acoustic spectra are performed at up to 5 times faster than the Matlab implementation using almost the same data. This FPGA-based system implementation of processing algorithms is realized with a coefficient of correlation  $R$  and absolute error respectively about 0.962 and  $5 \cdot 10^{-5}$ .

**Keywords :** OpenMP, signal processing system, acoustic backscattering, nondestructive characterization, thin tubes

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