Specific acoustic impedance of the ultrasonic field by the square flat transducers

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Abstract: Sound pressure, Particle velocity and specific acoustic impedance are being investigated, using the case where square flat transducers are tilted from parallel condition. Particle velocity is computed by numerical quadruple integration with Huygens' principle, and compared with that of plane wave.

INTRODUCTION

In the analysis of the ultrasonic field by the finite transducers, only sound pressure has long been paid attention. But, particle velocity and specific acoustic impedance are also important to investigate the nature of it.1)

SPECIFIC ACOUSTIC IMPEDANCE

Sound pressure is proportional to the velocity potential of the ultrasonic field. Particle velocity is proportional to the space derivative of the velocity potential. Specific acoustic impedance is quotient of sound pressure by particle velocity.

EFFECT OF TILT BY THE SQUARE FLAT TRANSDUCERS

The ultrasonic transmission system of square flat transducers is computed by numerical quadruple integration. And effect of tilt to the ultrasonic responses by the square flat transducers is investigated. The results are illustrated as in Fig. 1, Fig. 2 and Fig. 3. Figure 1 shows both the amplitude and the phase delay of the mean sound pressure, where the half side length (a) to the ultrasonic wavelength (λ) is 2.5, and the distance (z) between transducers is 2a. Figure 2 shows those of the mean particle velocity, where a/λ = 2.5 and z = 2a. Figure 3 shows those of the mean specific acoustic impedance, where a/λ = 2.5 and z = 2a.

CONCLUSION

Particle velocity and specific acoustic impedance are investigated for the case where square flat transducers are tilted from parallel condition. The feature of the phase delay leap of the specific acoustic impedance on the central axis of the circular flat transducer does not appear in the square case.

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REFERENCES

FIGURE 1. Mean sound pressure (a/λ = 2.5, z = 2a).

FIGURE 2. Mean particle velocity (a/λ = 2.5, z = 2a).

FIGURE 3. Mean specific acoustic impedance (a/λ = 2.5, z = 2a).