

## Vibration Characteristics of a Vertical Round Tube According to Heat Transfer Regimes

Yong Ho Lee, Dae Hun Kim, Won-Pil Baek\* and Soon Heung Chang

Department of Nuclear Engineering,  
Korea Advanced Institute of Science and Technology,  
373-1 Kusong-dong, Yusong-gu,  
Taejon, South Korea, 305-701

\*Korea Atomic Energy Research Institute ,  
150 Duckjin-dong, Yusong-gu,  
Taejon, South Korea, 305-353

### Abstract

This paper presents the results of an experimental work on the effects of boiling heat transfer regimes on the vibration. The experiment has been performed using an electrically heated vertical round tube through which water flows at atmospheric pressure. Vibration characteristics of the heated tube are changed significantly by heat transfer regimes and flow patterns. For single-phase liquid convection, the rod vibrations are negligible. However, On the beginning of subcooled nucleate boiling at tube exit, vibration level becomes very large. As bubble departure is occurred at the nucleation site of heated surface, the vibration decrease to saturated boiling region where thermal equilibrium quality becomes 0.0 at tube exit. In saturated boiling region, vibration amplitude increases with exit quality up to certain maximum value then decreases. At liquid film dryout condition, vibration could be regarded as negligible, however, these results cannot be extended to DNB-type CHF mechanism. Frequency analysis results of vibration signals suggested that excitation sources be different with heat transfer regimes. This study would contribute to improve the understanding of the relationship between boiling heat transfer and FIV.