

# 고차 진동모드의 특성을 이용한 압전 발전기의 설계

## Design of Piezoelectric Generator for High Vibration Modes

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Fig.1

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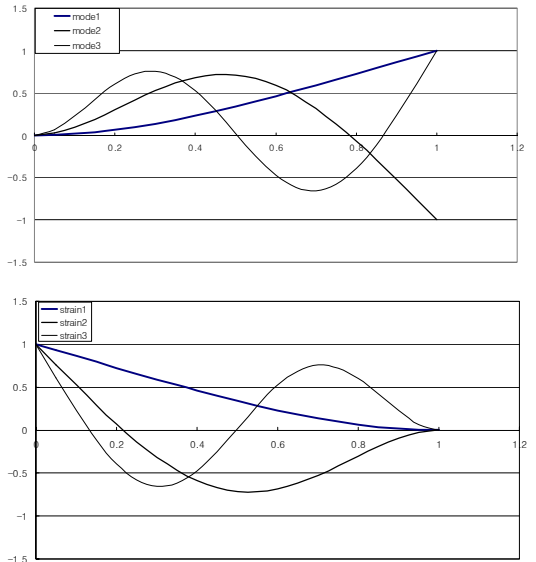


Fig.1 Mode shapes and Strain for Cantilever beam

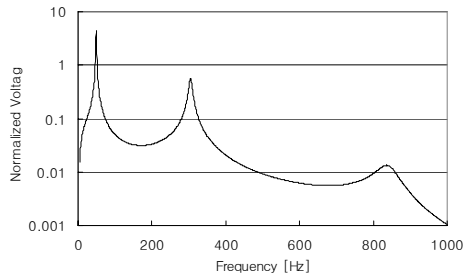


Fig.2 Voltage FRF for base model

2.

2.1

Inman

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가 Y<sub>o</sub> ,

$$\frac{v(t)}{-\omega^2 Y_o e^{j\omega t}} \quad (1)$$

$$= \frac{\sum_{r=1}^{\infty} \frac{-jm\omega\varphi_r \gamma_r^w}{\omega_r^2 - \omega^2 + j2\zeta_r \omega_r \omega}}{\sum_{r=1}^{\infty} \frac{j\omega\varphi_r \chi_r}{\omega_r^2 - \omega^2 + j2\zeta_r \omega_r \omega} + \frac{1 + j\omega\tau_c}{\tau_c}}$$

(1)

100mm, 20mm  
 (1) Fig.2  
 48.7Hz ,  
 5.77  
 48.7Hz , 1  
 가

**2.2**

2, 3 가  
 1  
 (2)  
 2 3 가  
 1  
 2.50, 4.19 .

$$\omega_r = \frac{\lambda_r^2}{L^2} \sqrt{\frac{EI}{m}} \quad (2)$$

1, 가 2.50, 4.19  
 2 3  
 Table  
 1  
 2 1 가 2.5  
 0.52 20%  
 3 4.19 ,  
 0.20 4.7%  
 1 가 2  
 3

**Table 1** Output Voltage

Model	Output Voltage	Length	Efficiency
Model 1	5.77	100	1.0000
Model 2	2.89	250	0.2003
Model 3	1.13	419	0.0467

**2.3**

47.8Hz

Table 2

1

Table 2 가

**Table 2** Comparison of Voltage, Power and Strain

Model	Voltage	Strain	Equiv. Strain
Model 1	5.77	2.63E-4	2.63E-4
Model 2	4.05	1.30E-4	1.85E-4
Model 3	4.15	2.27E-5	3.15E-5

**3.**

1  
 가 2, 3  
 가 2.5 10  
 ,  
 2, 3

(1) Erturk, A. and Inman, D.J., 2008, A Distributed Parameter Electromechanical Model for Cantilevered Piezoelectric Energy Harvesters, ASME Journal of Vibration and Acoustics, Vol.130.