

**System Identification** → **Mechanical Systems**

**Time domain (Time history)** → **Frequency domain (FRF)**

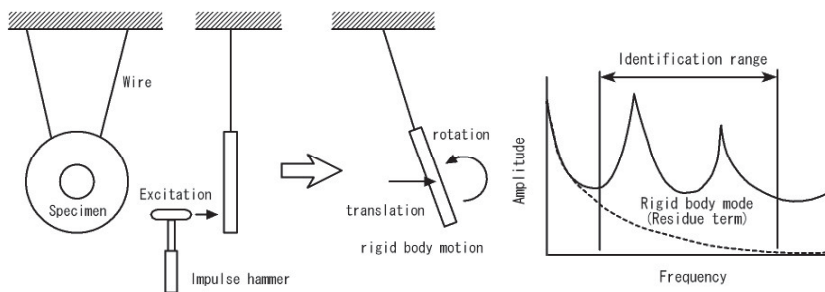


Fig.1 Vibration test.

Fig.2 Rigid body mode in FRF.

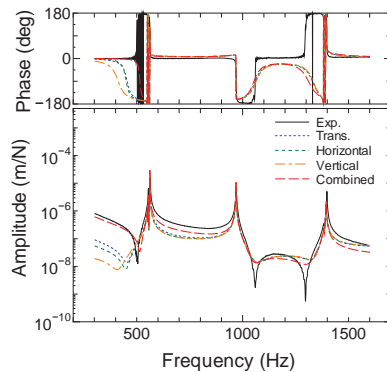
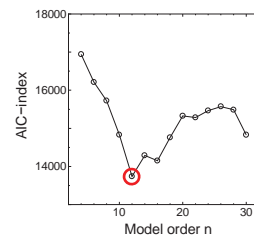


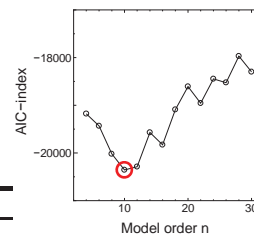
Fig.3 FRF for residual terms.

Table 1 Natural frequencies

Mode order	Natural frequency (Hz)				
	1	2	3	4	5
Calculation	564.1	565.3	971.2	1411	1411
$n=10$	553.7	560.9	967.6	1384	
$n=12$	553.7	560.9	967.6	1383	1396



(a) Logarithmic errors



(b) Linear errors

Fig.4 AIC-indexes.

**Content:**

It is very important to grasp the dynamic characteristics of machinery. Modal analysis is widely used for machine design. Various methods to identify the modal parameters of structures by the vibration test have been proposed. Recently the frequency domain subspace identification method is developed. Generally, it is easier to overview the dynamic properties of structures in frequency domain than time domain. We proposed a frequency domain subspace identification algorithm that takes account of the residual terms from rigid body modes. Additionally, Akaike Information Criterion (AIC) is used to determine the model order by using logarithmic error function. The proposed procedure is applied to identify modal parameters of an aluminum circular plate. The effectiveness of the proposed procedure is verified. The logarithmic error function is suitable for the frequency domain subspace identification method. We extend the proposed procedure to unknown input force estimation.

**Keywords:** Modal analysis, Subspace Identification, Model order, Input force estimation

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