

一種基於布拉格光纖光柵的新型震動感測器

A New-type Vibration Sensor Based on a Fiber Bragg Grating

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一、摘要

The demand for wind power has risen with the growth of the renewable energy sector. Studies on Structural Health Monitoring of wind turbines show that effective identification models can detect structural defects, enhancing safety and reducing maintenance costs. These models rely on highly sensitive sensors to analyze turbine vibrations, typically between 5 to 100 Hz. Traditional sensors have electromagnetic interference and corrosion issues, while the proposed FBG vibration sensor detects grating wavelength shifts to monitor turbine performance effectively.

二、研究目的與方法

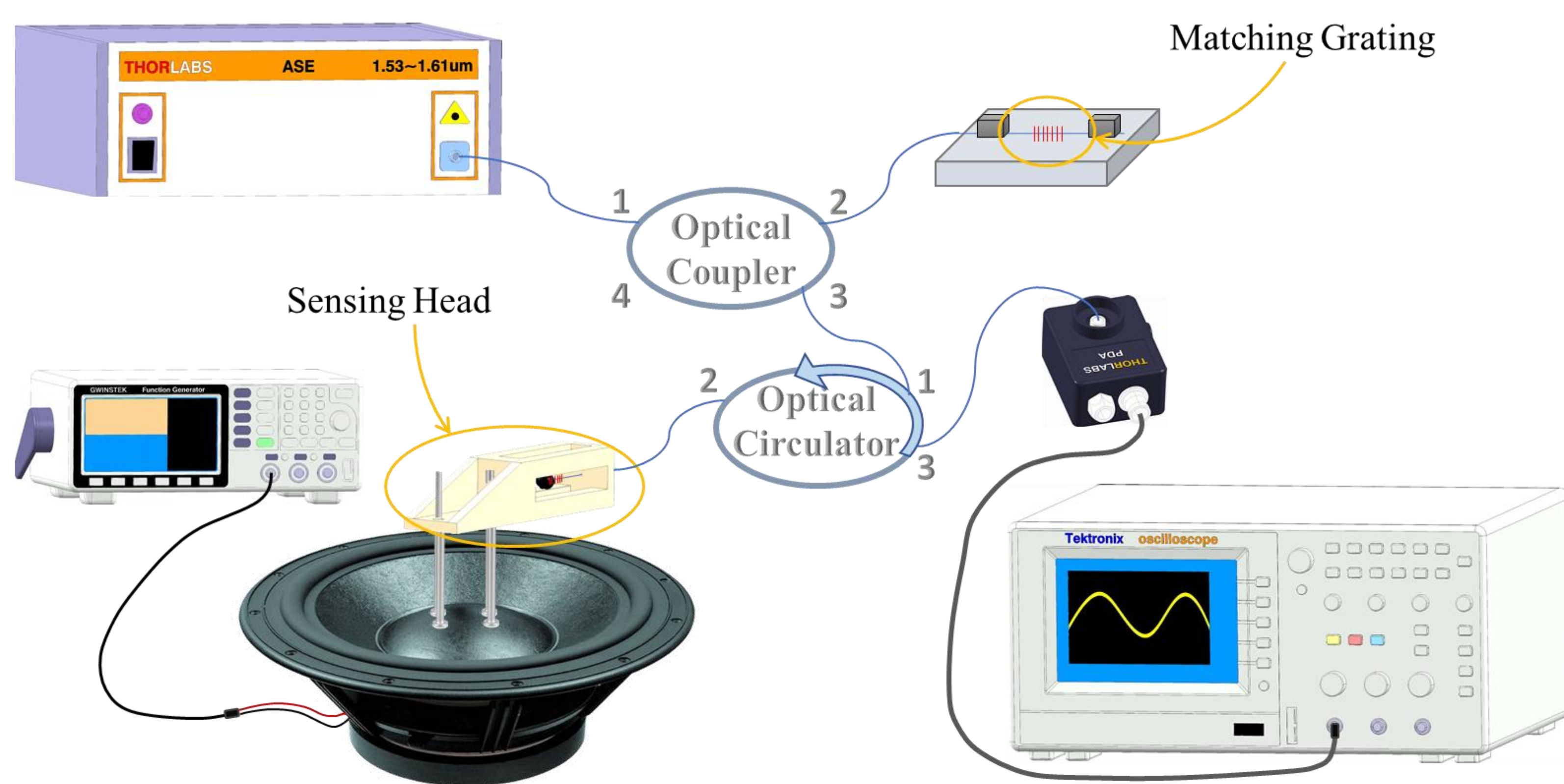


Fig.1 shows an experimental setup for measuring vibration signals.

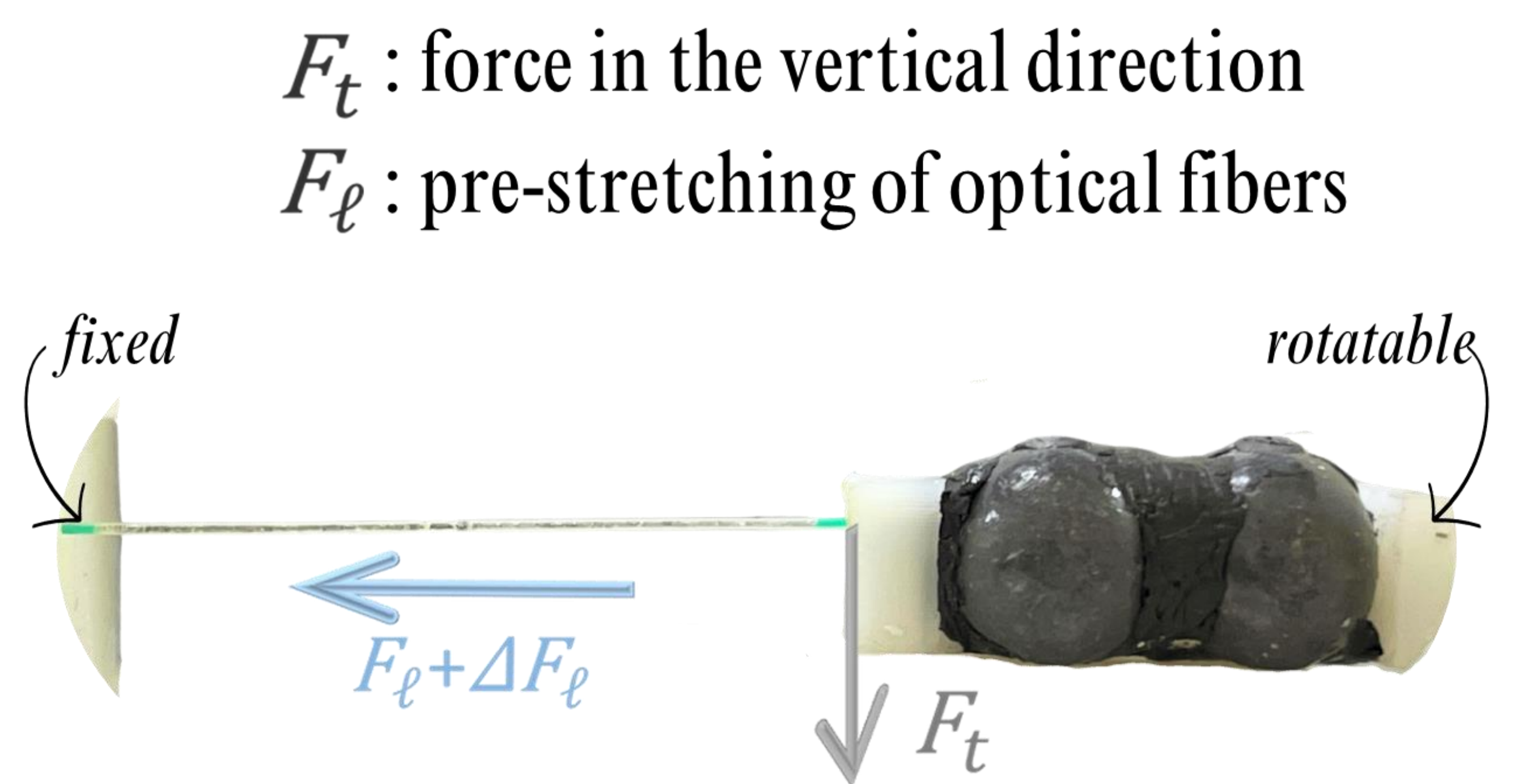


Fig.2 shows the design structure's actual configuration.

三、結果

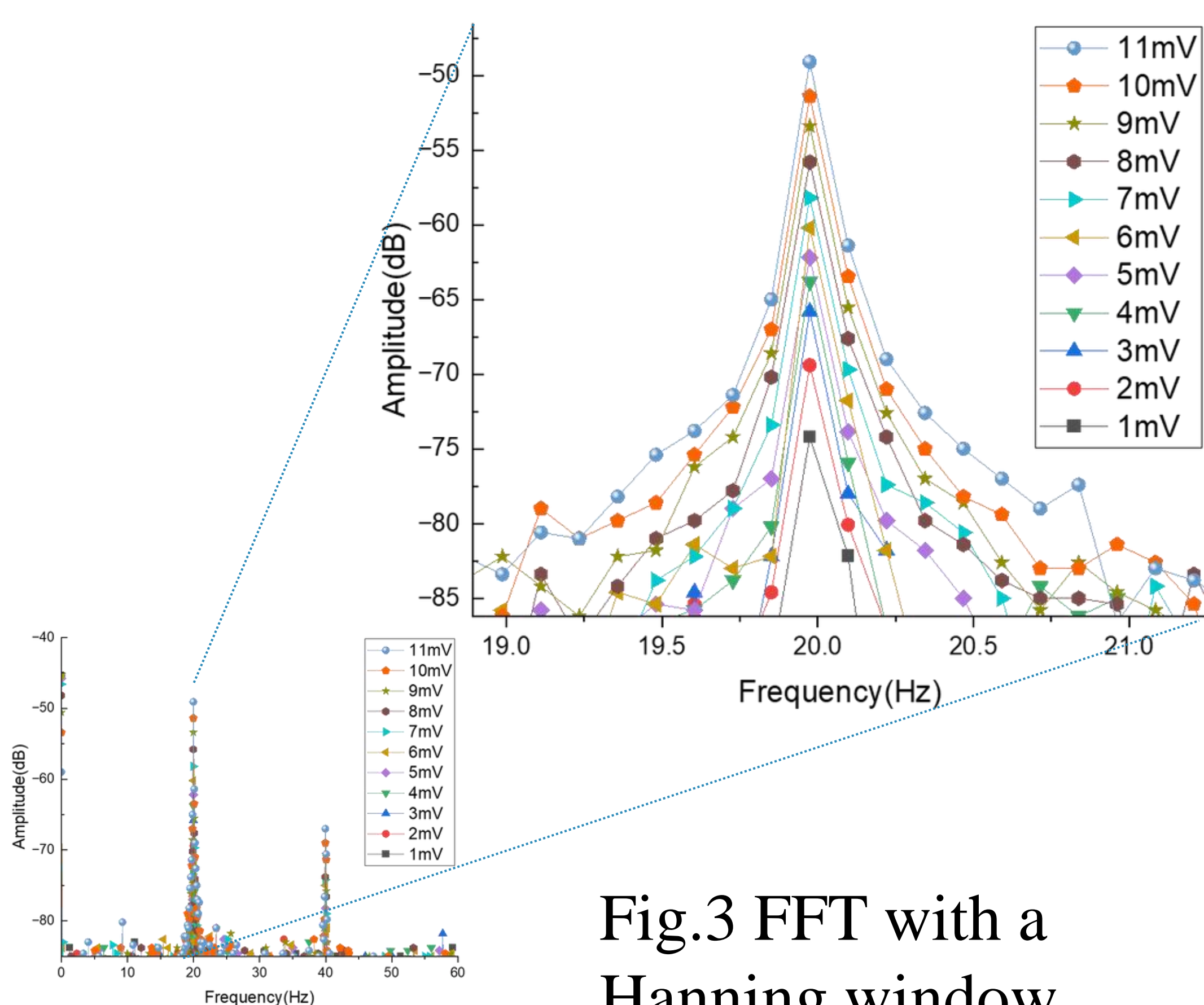


Fig.3 FFT with a Hanning window.

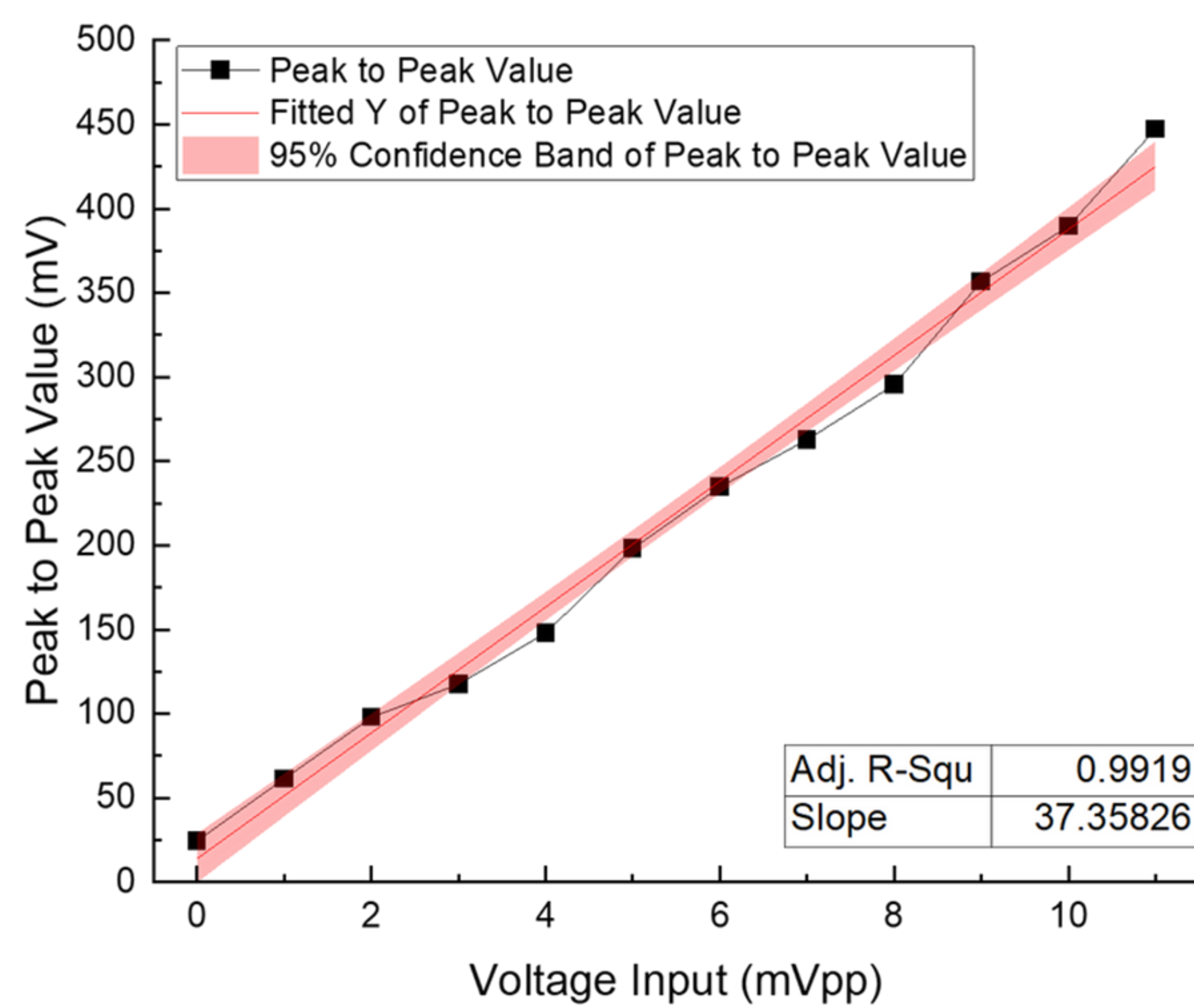


Fig.4 sensing voltage versus the vibration driving-voltage with a slope of 37.358

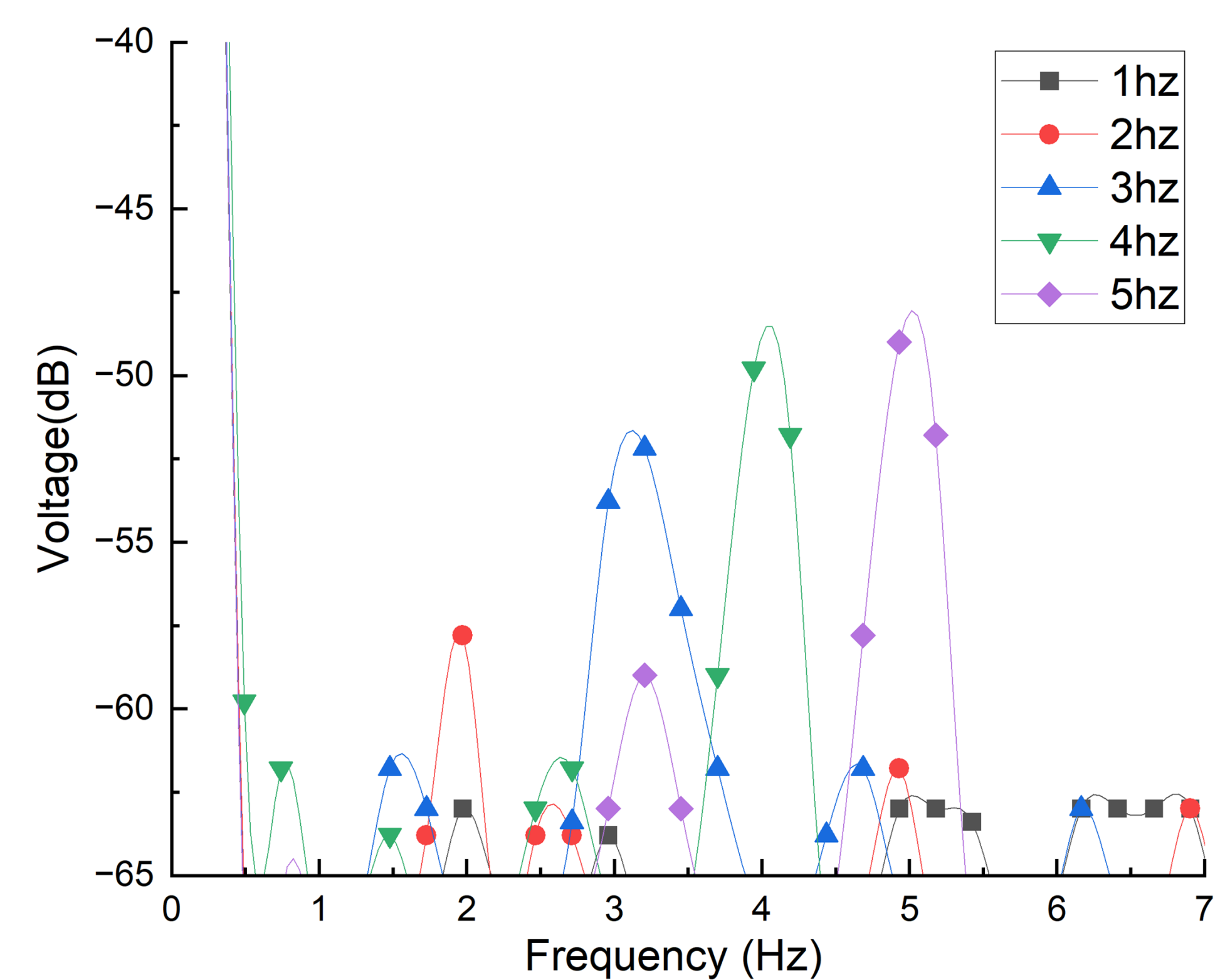


Fig.5 frequency response under low-frequency vibrations

四、結論

This study proposes a fiber grating vibration sensor with high frequency resolution and linearity. The new design features a longer structure, heavier block, enhancing low-frequency response. Tungsten steel wire limits the swinging direction of mass block, reducing interference from other vibrations. This FBG vibration sensor can be used to sense low-frequency vibrations with high precision and sensitivity.

五、成本評估

專題名稱	一種基於布拉格光纖光柵的新型震動感測器	
	時間	成本
製作前預估	45天	3000
實際完成後	60天	2500

