Long Gauge VibroFibre

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Long Gauge VibroFibre

DFB Laser with dithering

3dB coupler

Sensing fiber under test

Photodetector and PicoScope

VibroFiber

Long Gauge Vibrofibre is a distributed sensor
VibroFibre structure
How it works
It is from interference if multiple optical reflection, integrated with cable noise.
Best with Fourier transform Analysis
Dithering reduces the coherent length of the laser and reduces long Gauge VibroFibre performance

- It turns the full length of connecting fiber into a distributed vibration sensor
- Best used with Fourier transform signal analysis
- The sensing fiber is not as sensitive as the Vibrofibre itself
- The sensing fiber can be 1 kilometer long
Two sections of sensing fiber are placed on different shakers to evaluate cross talk.
Frequency response of the interrogation system using dithering

![Graph showing frequency response](image-url)
Frequency response and crosstalk characterization System without dithering

-30
-35
-40
-45
-50
-55
-60
-65
-70
-75
-80

0  2000  4000  6000  8000

- Single vibration
- 5000 Hz applied as additional frequency
Frequency response comparison of systems with and without dithering

![Frequency response comparison graph](image)
Effect of reducing the power of the DFB laser

Diagram:
- DFB Laser with dithering
- 3dB coupler
- 3dB coupler
- Sensing fiber under test
- VibroFiber
- Photodetector and PicoScope
Effect of reducing the power of the DFB laser-- better signal to noise
Long gauge terminated with high finesse cavity performance actually reduced.

![Graph showing Measured SNR (dB) vs Frequency (Hz)]
Summary

- Long Gauge vibration sensor is caused by interference between multiple reflections
- Dithering, reduce long Gauge performance (line width widening)
- Lowering the power of the DFB laser by about 6 dB increase SNR performance
- Termination with High finesse cavity actually hurts sensor performance
- Good for FFT analysis
- Cannot locate origin of vibration
It is the cheapest distributed Vibration sensor ---- many potential applications

- Measuring vibration of the wind turbine blades to detect misalignment
- Increase the number of sensing points of large industrial motors
- Measure in slot vibration of gas fired turbine generators, works at 300 degrees C using polyimide coated fiber
- Perimeter or pipeline security detecting intrusion
Thank you for your attention

Please contact Peter Kung for more discussion

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