

## Problem

- Destruction of combustion chamber<sup>1</sup>



## Why?

- Resonance (vibration)
- Bottle = Chamber
- Blowing air = Flame

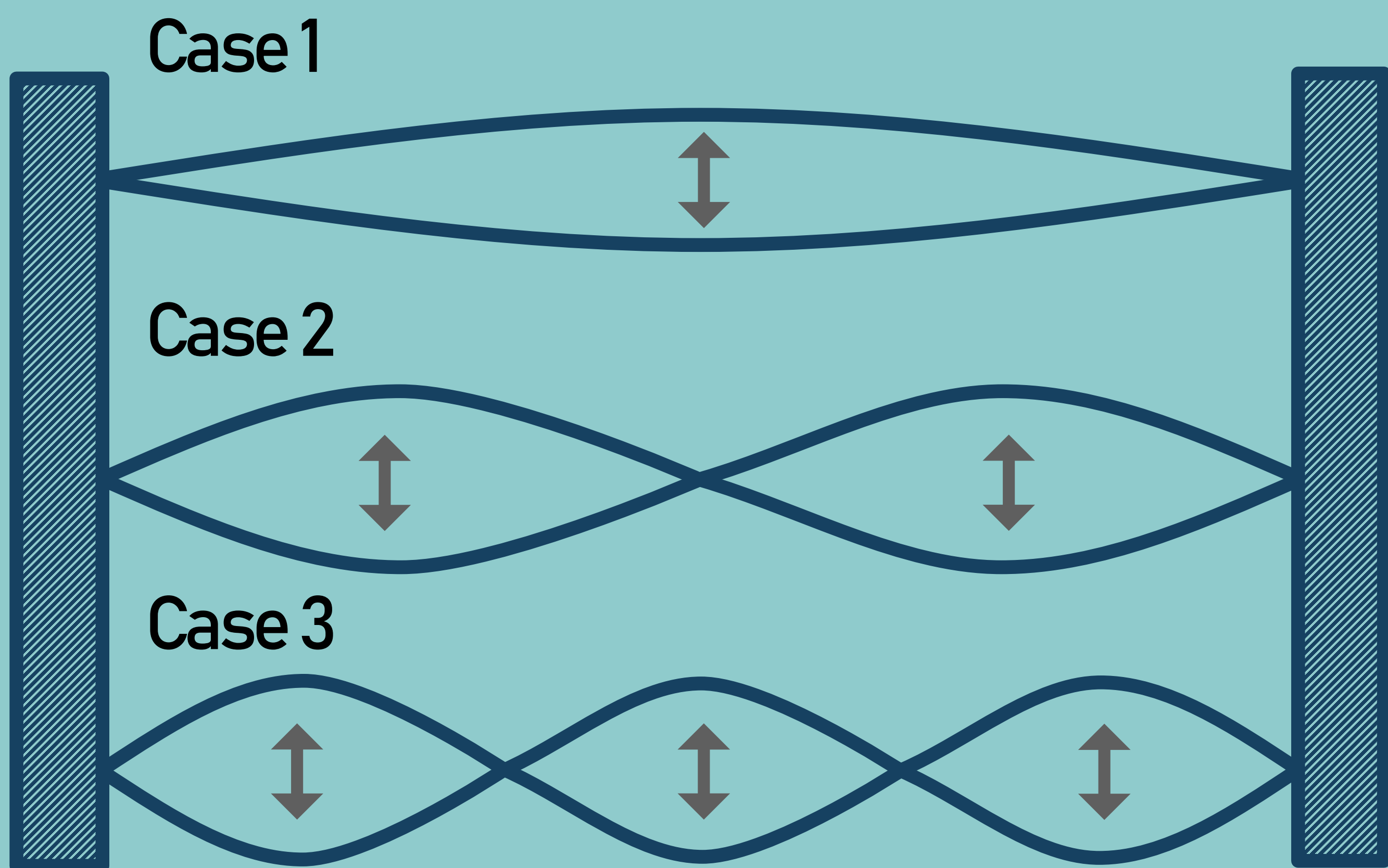


## How?

- Use damping device
- Device to dampen the vibration
- Where should we install the device?

## Quiz

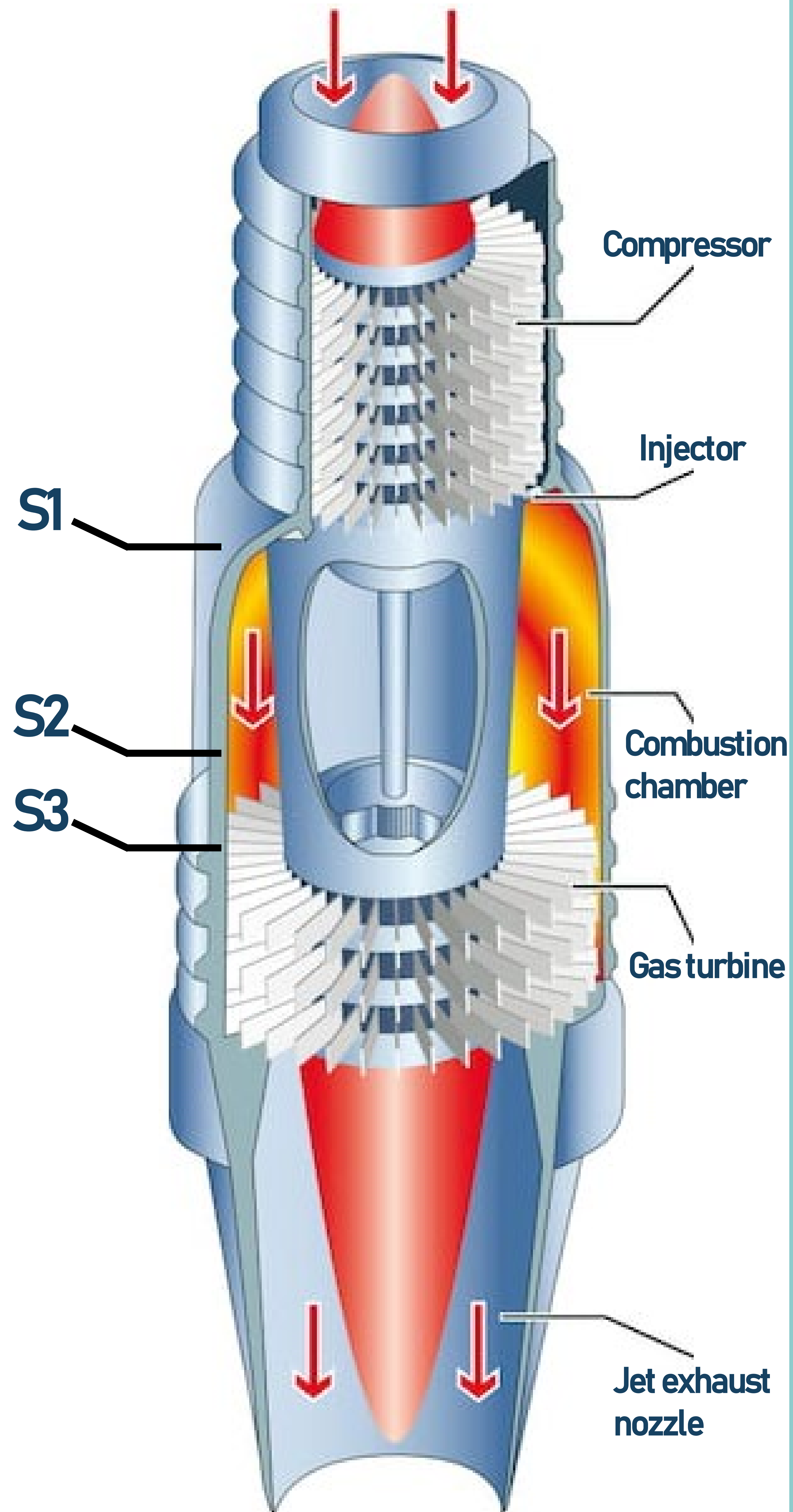
- Where would you locate your finger to suppress the vibration?



- Finger (damping device) location depends on the vibrating pattern.
- Important to identify the pattern

## IDENTIFICATION OF HIGH-FREQUENCY TRANSVERSE ACOUSTIC MODES IN MULTI-NOZZLE CAN COMBUSTORS

J. Kim, W. Gillman, D. Wu, B. Emerson, V. Acharya, R. Mckinney, M. Isono, T. Saitoh, T. Lieuwen

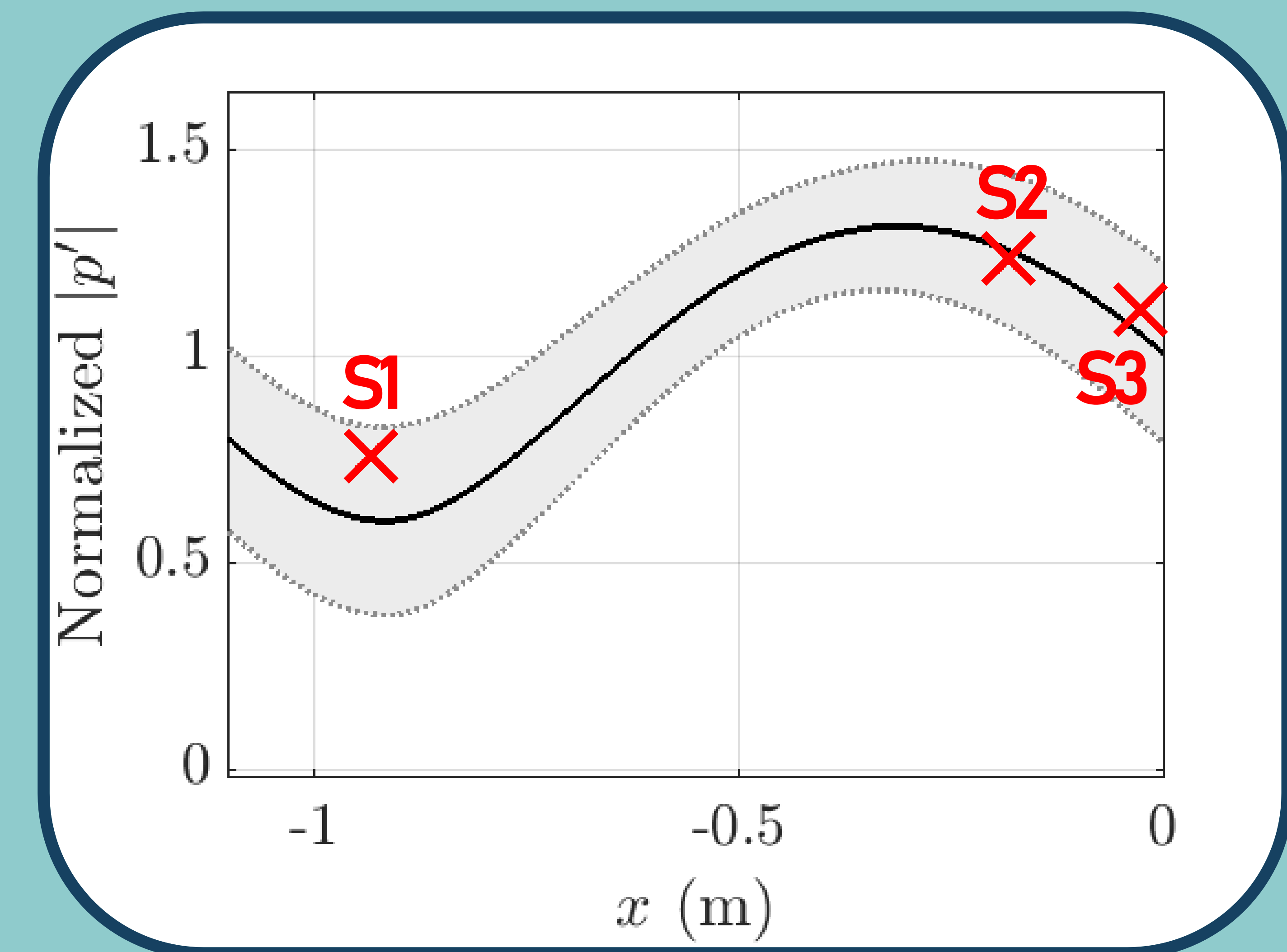


## Methodology<sup>2</sup>

- Install multiple sensors along the chamber
- Experimental data + Model equation → Estimate vibrating pattern

## Results

- Reconstruct vibrating pattern using three sensors.



## Takeaway

This methodology can reconstruct the vibrating pattern, and, thus, provides the information of optimal location for the damping device, which is used to suppress the combustion instability.

## Reference

1. Lieuwen, T. C., & Yang, V. (Eds.). (2005). Combustion instabilities in gas turbine engines: operational experience, fundamental mechanisms, and modeling. American Institute of Aeronautics and Astronautics.
2. Kim, J., Lieuwen, T., Emerson, B., Acharya, V., Wu, D., Mckinney, R., ... & Isono, M. High-Frequency Acoustic Mode Identification of Unstable Combustors. In ASME Turbo Expo 2019: Turbomachinery Technical Conference and Exposition.

