

# Multimode Damping Enhancement for Cable Vibration Control: Theoretical and Technological Developments with Applications

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## Abstract

Cables in cable-stayed bridges become super long, exceeding 600 m in the case of the Changtai Bridge which is under construction. Owing to their low inherent damping, cable are subjected various types of vibrations. A combination of aerodynamic treatments and supplemental mechanical dampers is required to suppressing such vibrations. However, providing sufficient damping to all the modes subjected to vibrations is still a challenge issue. This study presents full-scale measurement and field tests results of cable inherent damping and damper efficiency. Theoretical developments on multimode damping analysis of a cable with distributed dampers at different locations and cable networks formed by using cross-ties interconnecting neighboring cables are discussed. Practical measures, including by adding inerter, negative stiffness devices, and by installing both internal and external dampers for enhancing multimode damping are investigated.

**Keywords:** cable vibration control; multimode damping; negative stiffness device; vortex-induced high-mode vibration.

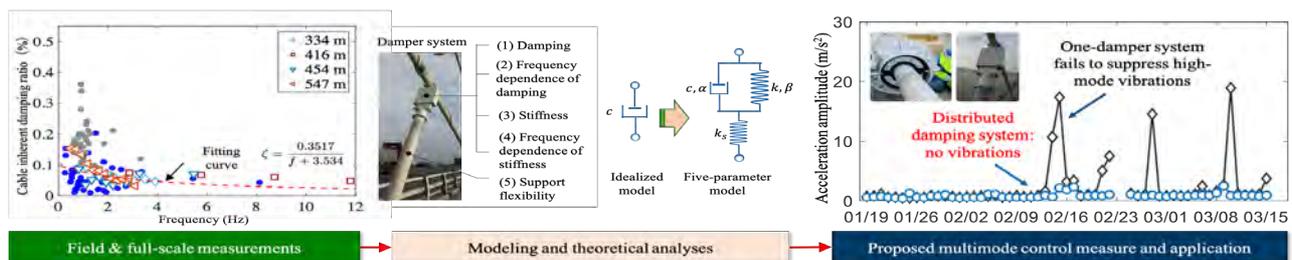


Figure 1. Graphical abstract