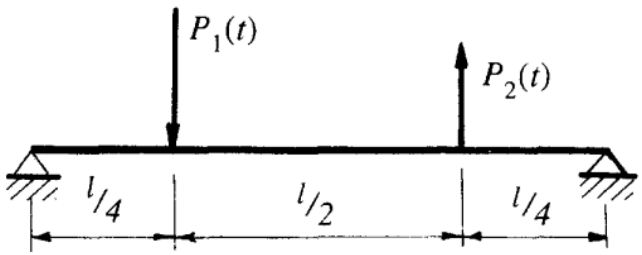
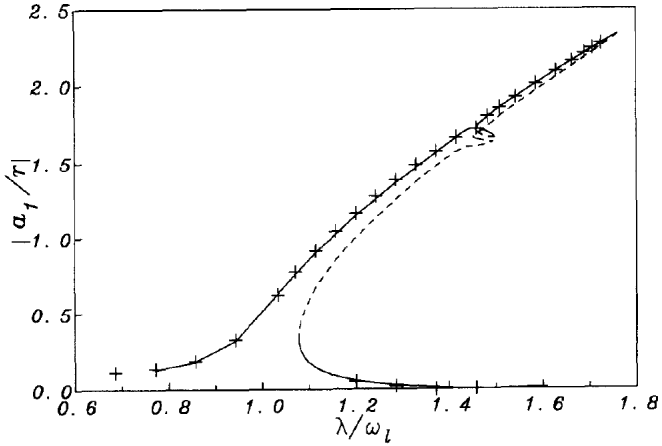
A test example on a homogeneous beam





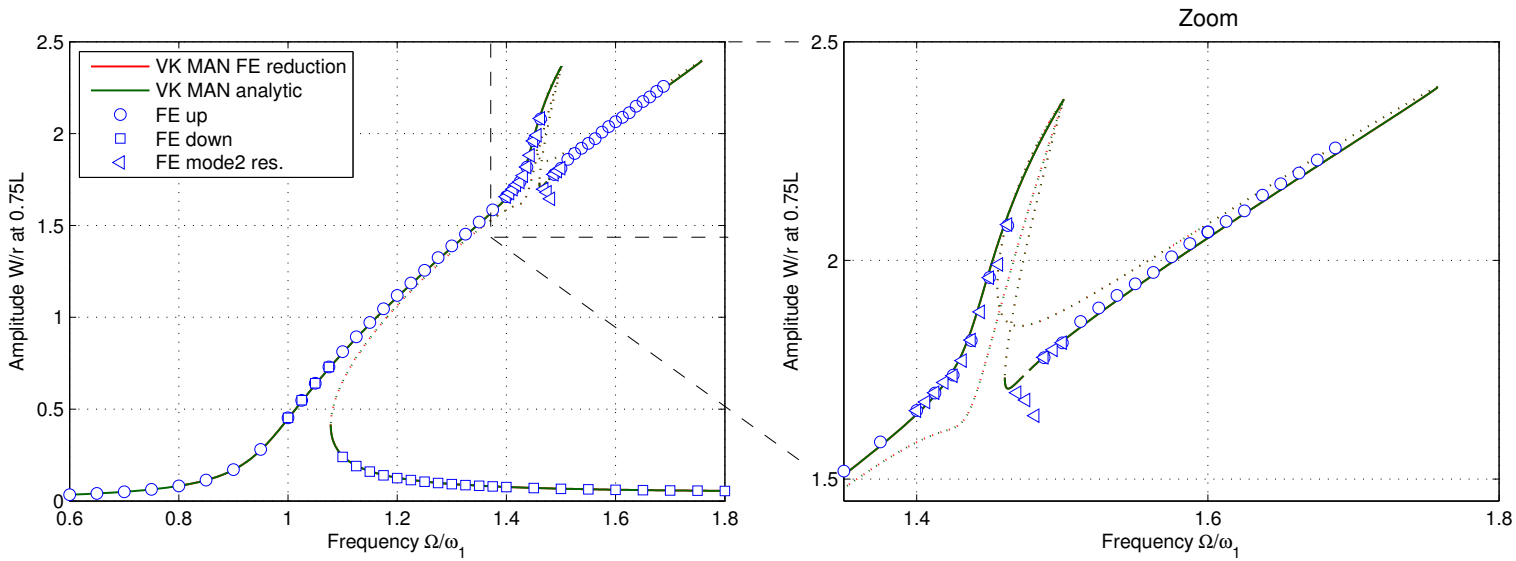
▷ Details

- A literature example [Lewandowski, 1996]
- Simply-supported beam
- Mass proportional damping ($\xi_k = \alpha/\omega_k$)
- Two opposed harmonic point forces:

$$P_1(t) = 13.63\frac{EIr}{L^3}\cos\Omega t, \quad P_2(t) = -9.62\frac{EIr}{L^3}\cos\Omega t,$$

N.L. frequency response around mode 1

Model validation



▷ **Perfect match between 3 models:**

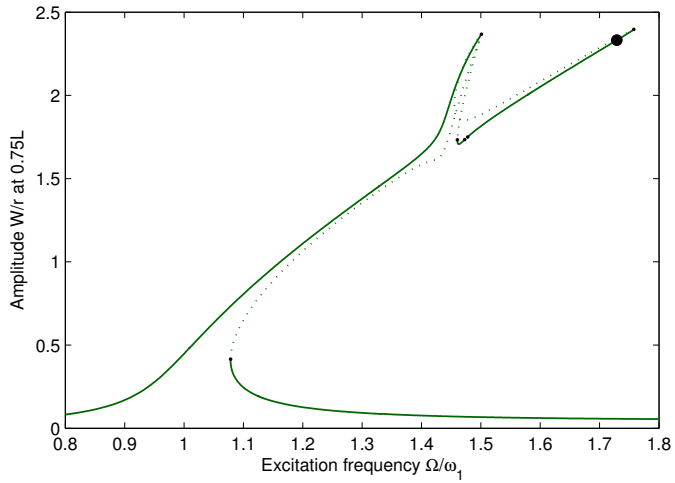
- analytical model + continuation
- full large rotation FE model + time integration
- present FE reduced order model (3 transverse mode, 8 axial modes)

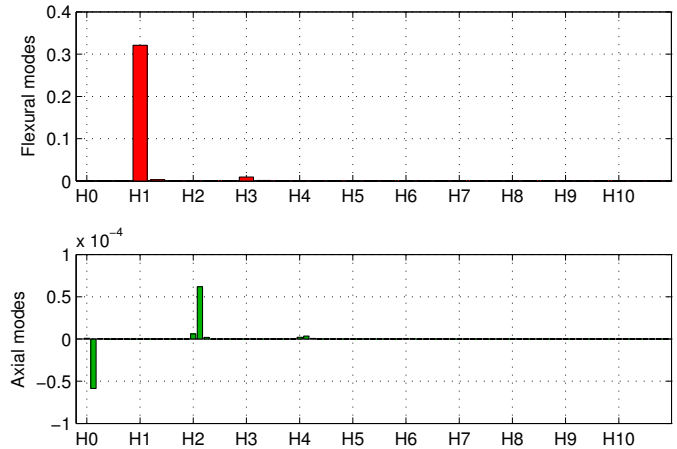
▷ **Special 1/3 superharmonic resonance of mode 2:**

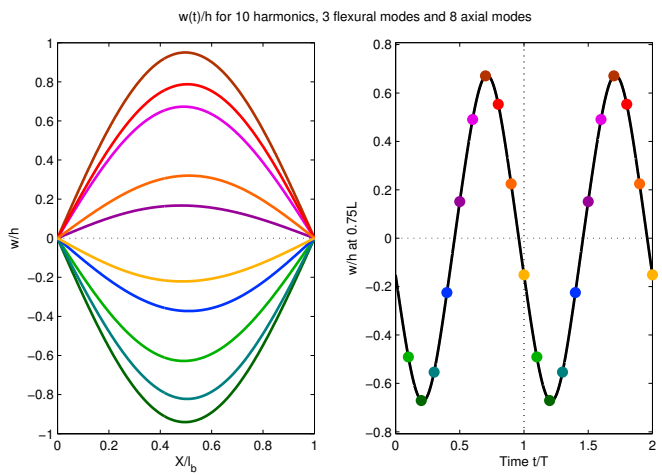
$$\omega_2 = 4\omega_1, \quad \Omega \simeq \frac{\omega_2}{3} = 1.33\omega_1$$

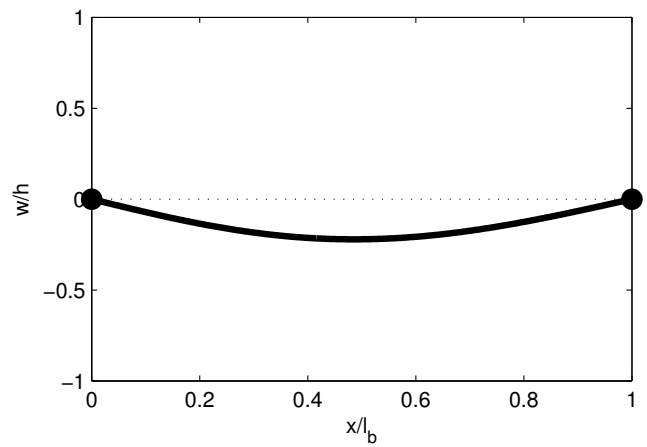
N.L. frequency response around mode 1

Oscillations at resonance









N.L. frequency response around mode 1

N.L. coupling with mode 2 ($\Omega \simeq \omega_2/3 = 1.33\omega_1$)