



High amplitude resonances in impact oscillator

E. Pelinovsky (1), A.V. Dyskin (2), T. Marais (2), E. Pasternak (2)

(1) Institute of Applied Physics, Nizhny Novgorod, Russia (enpeli@mail.ru), (2) University of Western Australia, Perth, Australia (adyskin@cyllene.uwa.edu.au)

An oscillator with bi-linear characteristics (impact oscillator) is a simplified model of compliant offshore structures in ocean and coastal engineering, materials with different moduli in tension and compression as well as partially bonded contacts in rock mechanics and materials engineering. The paper reports the results of analytical and numerical study of the resonance phenomenon in the bilinear oscillator. It is shown that the shape of oscillations is very stable for all types of deterministic and stochastic driving force if the ratio of partial frequencies is large. The oscillator is characterised by the presence of multi-harmonic and sub-harmonic resonances which produce considerable amplification of the amplitude of the driving force. The resonances are also accompanied by a phase shift and, in the case of sub-harmonic resonances, by a reduction in frequency.