A resonator moved by and within a wavefield:
Radiation force and wave particle duality in the double solution framework
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We consider a 'particle' made-up of a mass-spring system which is free to move along a vibrating string.

For small wave amplitudes, we show that the particle movement is governed by a set of dynamical (and non linear) equation coupling the incident wave field to the particle dynamics.

As we show, for some conditions on the waveform, the particle becomes 'transparent' and does not alter the incoming field.

In that special case, the particle undergoes a uniform translation along the string with a constant velocity.

Additionally, a supersonic guiding wave obeying a Klein-Gordon equation emerges and is locked in phase with a modulating and much slower wave co-moving with the particle, as described in the de Broglie double-solution theory.