LOSS OF CONTACT OF A ROUGH SLIDER ON A ROUGH SURFACE UPON INCREASED DRY SLIDING SPEED

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ABSTRACT

We address experimentally the fundamental question of the vibrations induced in the direction normal to the interface when two dry rough solids slide on one another.

We consider a stainless steel slider in dry contact with a stainless steel surface, under its own weight. We investigate the vibration behavior of the slider during steady sliding at increasing velocities, using onboard accelerometers. We also monitor at high frequencies the contact voltage between the two surfaces, enabling detection of contact losses as a transient vanishing of the electric current through the interface. Macroscopic measurements of the sound pressure emitted by the interface and of the friction force are also performed simultaneously.

All types of measurements indicate a transition between a low velocity regime in which the two solids remain in contact at all times, and a high velocity regime where the slider moves through random bounces on top of the antagonist surface (Fig.1).

We will discuss (i) the scenario leading to such a transition, (ii) the statistical characteristics of the bouncing regime and (iii) a simple modelling framework. The latter is based on the classical Bouncing Ball model, used here with a correlated random excitation [1] obtained through a geometrical filtering of the contacting topographies [2].

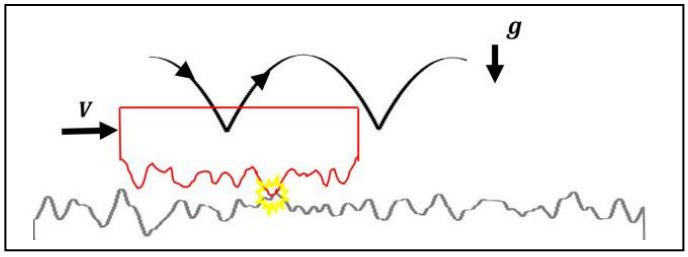

Fig.1 Sketch of the bouncing regime of rough slider (red) moving at constant velocity V on a rough surface (grey), under its own weight. Yellow: impact between two antagonist asperities.

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