Assessment of the real contact area of a multi-contact interface from electrical measurements

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Abstract - The electrical supply of moving trains is provided by a sliding contact between the train's pantographs and the catenary. This electromechanical interface is composed of the strips of the pantograph – made mainly of carbon – and the catenary contact wire. The objective is to define the real contact area with a simple electrical measurement. In many practical or fundamental situations involving contacting solids, the relevant notion of the real contact area is a very delicate one and especially its experimental assessment.

Based on Drude's classical transport model and within the linear elasticity approximation, a phenomenological model of a metal/metal contact is built up, offering an interpretation framework of experimental data. The model accounts for the influence of the mechanical state of the contacting zone upon its electrical properties, such as its impedance. Interpreting available data within this framework leads to the assessment of the number of spots. The total contact force works on the spots and on the average contact length. In this model, the interface is treated as a new medium with its own conductivity.

Key words: multi-contact / real contact area / interface / spots / electrical measurement