Analysis of Sound Post Adjustment using a Hybrid Bowed String Model

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ABSTRACT

The position of the sound post on a violin is considered by makers as an important adjustment parameter, which affects both tonal and playing qualities of the instrument. The aim of this study is to investigate the influence of sound post adjustment on the response of the instrument when played. Mobility measurements at the bridge are made to evaluate the consequences of typical variations in sound post position on the dynamic behavior of the body as seen by the string. Then, modal identification is performed for each configuration using the high resolution method ESPRIT. The modal parameters of the body are used to feed a hybrid physical model of bowed string. In this model, the dynamic behavior of each string is described using a theoretical modal basis, while that of the body is represented by an experimental modal basis. The set of modal equations thus obtained is combined with a friction model to simulate the bowed string dynamics. Time-domain simulations are made to obtain the response of the instrument to the same gesture, for different adjustments of the sound post. A set of indicators is proposed to highlight the effects of these adjustments on both transient and steady-state regimes.