Objective Comparisons between an Ancient and a Modern Clarinet

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ABSTRACT

Impedance measurements and digital simulation of the functioning are used to compare two clarinets whose conception and design are separated by two centuries: a copy of an ancient model by Heinrich Grenser and a modern clarinet (Prestige, from Buffet Crampon). Both instruments were manufactured approximately 30 years ago. The full first register is studied for both instruments. Input impedance measurements have been made in the same conditions and differences between the features of the peaks are studied: amplitudes, quality factors, frequencies, harmonicity and cut off frequency due to the network of open toneholes. These impedances are then used, thanks to the modal estimation of their resonances in a real-time, compatible model of sound production based on a classical physical model of the functioning, including reed dynamics, reed flow and shock between the reed and the table. Mouthpiece pressure and radiated sound are computed with respect to two varying control parameters sampled on a grid: the blowing pressure and a parameter related to the effort exerted by the lip on the reed. From these sounds several bidimensional maps have been computed, describing either the functioning (regime, intonation) or the timbre (attack transient duration, spectral centroid, power). Finally, we try to make a link between the differences observed note by note on the maps and those observed in the input impedances.