

# Acoustic Modeling of a "Minute Repeater"

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## Abstract

The project was ordered by a Swiss watchmaker. The aim was to modelize and optimize the acoustic of a minute repeater on one of the high range item made by the watchmaker. Therefore we based our work on a simplified geometry made by Creo.

The mesh model includes the gongs, the bottom plate, a dozen of fixed pieces, the case and the glasses.

The acoustic field is computed thanks to the finite element method. The comparaisn of the results with the tests shows an 90% correlation of the eigenmodes. A resting of the experiments and the computations was necessary in order to validate the model. We optimized the geometry to get a proper and louder sound.

A dedicated application - created with COMSOL Server™ and synchronized with Creo - permits watchmakers to set and tune autonomously the length of the timbres. This represents a significant time saving and a gain for the homogeneity of the production. We compared the quality of the sound produced by watchcases made of different materials such as gold or titanium.

The aim being to optimize the volume of the case made with additive manufacturing. The COMSOL modules used are: COMSOL Multiphysics®, Acoustic, Optimisation, COMSOL Server™, LiveLink™ for Creo®.