INVESTIGATION OF PRESSURE WAVES GENERATED BY A HIGH-SPEED TRAIN ENTERING A GALLERY

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The present research work was intended to investigate of the flow field generated by a high-speed train entering and running through a gallery. The flow field is mainly characterized by strong pressure waves propagating, reflecting and interacting inside the gallery. Recently, great effort in the research world has been directed to the study of the velocity field and pressure pattern induced by a high-speed train approaching and moving through a gallery. The desire to design new methods to weaken the pressure variations has grown together with the improvements in the high-speed train technology. Such pressure variations originate a variety of problems related to passengers discomfort and safety, train body damage and aerodynamic noise. The objective of the project was twofold. Firstly, the task was to understand better the mechanisms that dictate the pressure pattern inside the gallery. Experiments were conducted on the tunnel surface and on the train body to achieve this purpose. Numerical simulations were also very useful to gain insight on the pressure field. Secondly, the influence of geometrical modifications of the tunnel geometry and of the train body shape was investigated. The most relevant parameters that alleviate the pressure intensity were identified and analyzed.

The train nose shape and airshafts on the tunnel surface were seen to play a key role on the pressure pattern inside the gallery. Future work should then focus on the design of an aerodynamically shaped train head and on a ventilated entry portal to suppress the intensity of the first compression wave entering the tunnel. The shape of the train section did not influence the pressure pattern, as long as the blockage ratio (ratio between the train section and the tunnel section) was maintained constant.

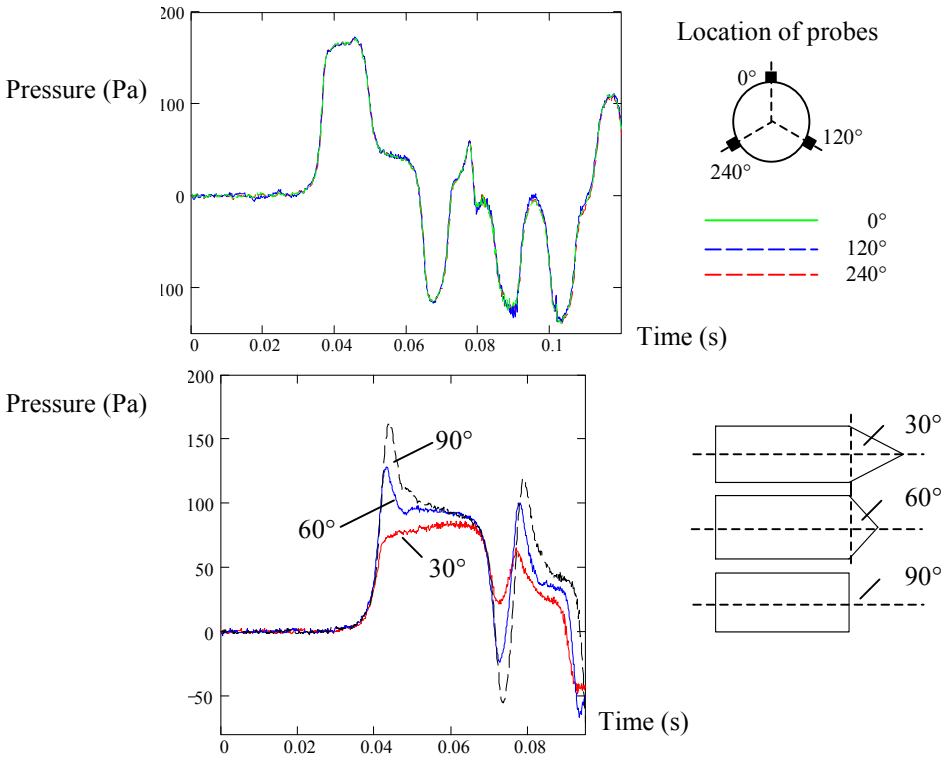

Figure 1: Axial-symmetry check of pressure pattern originated by squared section train running through the gallery and influence of train nose shape on pressure pattern for circular section train