Master's Dissertation at the Div. of Structural Mechanics

VIBRATION ANALYSIS OF UNDERGROUND TUNNEL AT HIGH-TECH FACILITY

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Introduction
MAX-lab is a national laboratory operated jointly by the Swedish Research Council and Lund University. Nowadays, the Max project consist on three facilities (three storage rings): Max I, Max II, Max III and one electron pre-accelerator called Max Injector.
A new storage ring is needed to improve material science, such as nanotechnology. MAX-IV will be 100 times more efficient than already existing synchrotron radiation facilities, e.g. it is planned to be the next generation Swedish synchrotron radiation facility.

MAX IV will basically consist of a main source that will be a 3-GeV ring with state-of-the-art low emittance for the production of soft and hard x-rays as well as an expansion into the free electron laser field. The second source will be the *Linac* injector that will provide short pulses to a short pulse facility. The *Linac* will be built as an underground tunnel next to the main ring.

Purpose
In this Master Thesis, the vibration levels at the *Linac* will be analysed. Since this construction will be used for high precision measurements, it will be asked to have very strict technical conditions where only very low vibration levels will be allowed.
It is obvious that the surrounding elements existing in the area will have a large influence on the *Linac´s* behavior. Next to it there is the *E22 freeway* that will of course propagate waves of different frequencies depending on the traffic density towards the underground tunnel. Likewise, a bridge for bus traffic is planned to be built over the tunnel that also may disrupt the performance of the *Linac* measurements.
The main aim of this Master Thesis is to analyze the influence of the surrounding vibration sources on the Max-IV Lab´s underground tunnel by means of the finite element method. To achieve this purpose it will be necessary to model with different assumptions loads, materials, etc. in order to prove the fulfillment of the needed requirements. If technical conditions are not fulfilled for the proposed structure, solutions to achieve them could be pointed out as well.

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