

Séminaire commun LVA - École Doctorale MEGA

Tyre-Road Interaction

Wolfgang KROPP

Full Professor/Deputy Head of Department, Civil and Environmental Engineering,
Applied Acoustics, Chalmers University of Technology, Sweden

Invited professor at LVA (February-April 2015)

wolfgang.kropp@chalmers.se - [personal webpage](#)

Jeudi 5 Mars 2015 à 13h00

Salle M1B – Batiment Saint Exupéry (premier étage) - INSA de Lyon

25 Avenue Jean Capelle, 69621 VILLEURBANNE

When driving a car we are not always aware of the tremendous importance of the contact between the tyres and the road surface. However the interaction between tyre and road determines many of the main features of tyre performance such as braking, handling, wear, rolling resistance but also interior and exterior noise. The multitude of performance criteria makes the overall improvement of tyres often difficult. For instance improvement for noise might be in conflict to performance with respect to wear. At the same time tyre/road noise is the main source of road traffic noise over a wide range of driving speeds.

For understanding the interaction between tyre and road it is essential to be able to model the tyre/road interaction including the necessary degree of complexity. An introduction will be given to the analysis of tyre vibrations based on a so-called Wave Guide Finite Element model. Different waves as shown in Figure 1 (left) play different role in the transient rolling contact between tyre and road, but are also responsible for instance for sound radiation or rolling resistance.

The main reason for tyre vibrations are the excitation due to the road roughness. The vibrations will lead for instance to sound radiation or to losses in the tyre structure which represent the rolling resistance. The main key for a successful simulation of the tyre-road interaction is to capture the important details of the transient rolling contact between the tyre tread and the rough road surface. An introduction is given to the modelling of the contact.

Finally focus will be put on the mechanisms behind noise radiation and rolling resistance. The understanding of the mechanisms might open for technical solutions with improved tyre performance. Although the results from modelling are promising (see for instance Figure 1 (right) which shows typical results for the modelling of sound radiation) it has shown that today it is not the modelling itself, which limits prediction accuracy but uncertainties in the input data (e.g. material data for the tyre).

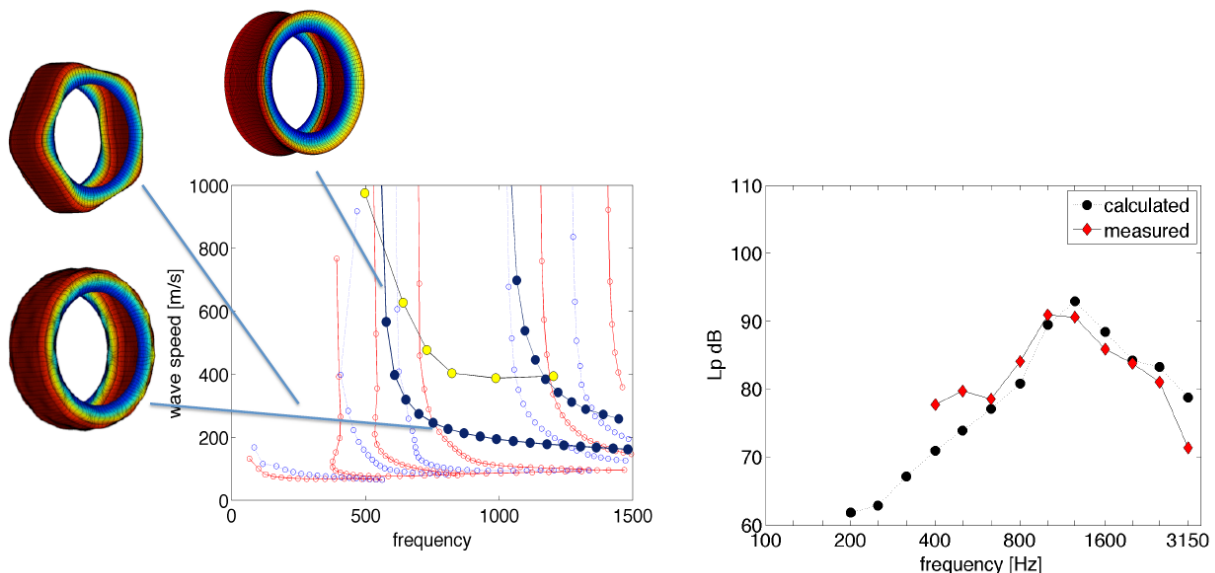


Figure 1: Dispersion diagram for waves on the tyre and some examples of the representative vibration patterns (left). Calculated and predicted sound radiation from a slick tyre on an ISO surface (right).