Research Group VISIBLE

Axis 1

Interaction between vehicle and infrastructure

Contents

- Topics addressed in Axis 1
- French entities involved
- Activities

Topics addressed in Axis 1

Vehicle / Infrastructure interaction

- Source scale interactions
  - Contact (wheel/rail – tyre/road)
  - Vehicle / Track / Ground
  - External aerodynamics
- Infrastructure scale interactions
  - Traffic / Infrastructure management
- Impact on surrounding environment
  - Ground-borne noise and vibrations

Topics

- Vibro-acoustics and noise reduction
- Contact (non linear phenomena in the contact zone)
- Rolling noise / Squeal noise
- Vibration sources
- Vibrations induced in the ground
- Optimization of low noise road surfaces
- Dynamic modelling of traffic

Applications

- Models of physical sources
- Prediction tools for noise and vibration levels
- Noise and vibration impacts on surrounding buildings
- Dynamic modelling of traffic noise
- Optimization for noise and vibration mitigation
- Monitoring of the infrastructure

Methodologies

- Contact: Time domain modelling approaches
- Comparison of different modeling approaches (analytical, semi-analytical, numeric)
- Identification of physical parameters
- Influence of Roughness / Texture
- Measurement methods
- Comparison between predicted and measured attenuation

French entities involved


G. Dutilleux
A. Le Bot
E. Gourdon
ENTPE
CETE de l'Est
CENTRALE LYON
P.O. Mattei
LMA
C. Fillol
G. Coquel
RATP
A. Chaigne
ENSTA ParisTech
A. Gaudin
PSA PEUGEOT CITROEN
Axis 1
P. Jean
C. Guigou-Carter
M. Villot
CSTB
le futur en construction
Navier
D. Duhamel
H. Yin
F. Poisson
E. Bongini
SNCF
IFSTTAR
O. Chiello
J. Lelong
P. Klein
J. Cesbron

Activities

Projects, PhD theses, Publications

Current projects

- RIVAS (2011-2014) - 7th FP

"**Railway Induced Vibration Abatement Solutions**"

  - Partners : SNCF, RATP, CSTB + 20 european partners (railway companies, manufactuers, universities...) incl. DB

- CITEDYNE (2011-2014) - ADEME

« Cities and transport : Dynamic emission evaluation »

  - Partners : IFSTTAR (Bron&Nantes), CSTB, ENTPE, UCP, Coparly, Le Grand Lyon

Submitted projects

- ODSurf – ADEME - Deufrako

“Modelling and building the optimal dense low noise road surface”

  - French Partners : IFSTTAR(Nantes&Bron), ENPC, COLAS S.A., EUROVIA
  - German partners: BASt, Müller-BBM, Bauhaus U. Weimar, …

PhD Theses

- Tyre / Road
  - Rabie Meftah (2008-2011) : "**A multi-scale approach for the dynamics of structures. Application to tyre vibration and noise**", ENPC, IFSTTAR/Nantes
  - Guillaume Dubois (2009-2012) : "**Road texture influence on the dynamic tyre/road contact and rolling noise generation**", ENPC, IFSTTAR/Nantes
  - Quoc Huong BUI (2010-2013) : "**Numerical study on the influence of the road texture on rolling resistance**", ENPC, IFSTTAR/Nantes
  - Trong Dai VU (2010-2013) : "**Tyre/road : modelling rotational effects and equivalent frequential road profile identification for rolling noise issue**", ENPC, PSA

PhD Theses

- Gaëlle Benoît: "**Structural evolution characterization of porous road owing to an absorption in situ measurement**", ENTPE/LASH, CETE Est, IFSTTAR/Nantes, LRPC Blois, CETE Lyon

Wheel / Rail

- Virginie Delavaud (2007-2010) : "**Time domain modelling of wheel/rail contact**", SNCF, ENSTA
- Pierre-Emile Chartrain: "**Acoustic reading of the rail**", SNCF, LMA

Publications

Tyre / Road

- Kozhevnikov I.F., Duhamel D., Yin H.P., Feng Z.-Q., **"A new algorithm for solving the multi-indentation problem of rigid bodies of arbitrary shapes on a viscoelastic half-space",** International Journal of Mechanical Sciences, Volume 52, Issue 3, March 2010, Pages 399-409.
- Duhamel D., **"A recursive finite element method for computing tyre vibrations",** Impact 2010, Djerba, Tunisie, 22 - 24 Mars 2010.
- Meftah R., Duhamel D., Cesbron J., Anfosso F., Yin H. and Argoul P., **"Efficient computation of tire road contact using an ARMA model of the Green function"**, VCB 2010, Ecully, France, 15-17 June 2010.
- Cesbron J., Yin H. P., **"Contact analysis of road aggregate with friction using a direct numerical method"**, Cesbron J., Yin H. P., Wear, 268, 5-6 (2010) pp 686-692
- Klein P., **"Influence du revêtement routier sur le bruit de roulement: le modèle HyRoNE",** Congrès Français d'Acoustique, Lyon, 12-16 Avril 2011

Publications

Wheel / Rail

- V. Delavaud, F. Poisson, C. Gérault, « **Experimental caracterisation of rolling and impact noise »**, Acoustique & Techniques

Environmental vibrations

- C. Fillol, "**Railway noise abatement at the RATP : lines of progress targeted."** Revue générale des Chemins de Fer.
- M. Villot, P. Ropars, P. Jean, E. Bongini, F. Poisson, **"Modeling the influence of Building types on the building response to railway vibration",** Internoise 2010, Lisbon (Portugal), Proceedings
- G. Coquel, C. Fillol, « **Evaluation and modelisation of vibration propagation in some residential buildings. Case of replacement of points and crossing. »** Acoustique & Technique
- C. Guigou, M. Villot, P. Ropars, C. Petit, E. Bongini, F. Poisson, **"Influence of track-work on building response to railway vibration",** Internoise 2010, Lisbon (Portugal), Proceedings

Merci - Thank you

Presentations ...

- “Modelling tools for coupled ground/structure propagation”

  Philippe Jean, CSTB

- “A dynamic multi-asperity contact model for tyre/road noise”

  Guillaume Dubois, IFSTTAR/Nantes, ENPC

- “Time domain modelling of wheel/rail contact”

  Virginie Delavaud, ENSTA&SNCF