



Transport Information Days



Brokerage event
18-19 July 2012



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- public academic institution



FEUP FACULDADE DE ENGENHARIA
UNIVERSIDADE DO PORTO

Competences

Numerical modelling
Experimental analysis
Assessment of vibrations and noise induced by railway traffic



Team

- 15 PhD Researchers
- 25 Assistant Researchers and PhD Students

Research Areas

- railway dynamics (bridges, tracks, transitions)
- assessment of vibrations induced by traffic;
- vehicle-track dynamic interaction;
- railway maintenance management;
- track stability;

Civil Engineering Group

- rolling contact fatigue
- rolling bearings
- materials for rolling stock
- design, manufacturing and testing of composite materials

Mechanical Engineering Group



Centre of Rail Knowledge – FEUP (CEC)



FP7 Project: MAXBE - Interoperable monitoring, diagnosis and maintenance strategies for axle bearings

Coordinator: Cecília Vale

Project ***to be started in 2012; 3 years***

- WP 1 - Consortium coordination and management
- WP 2 - Technology assessment and specification
- WP 3 - Onboard systems
- WP 4 - Wayside systems
- WP 5 - Integration of systems
- WP 6 - Testing and validation of systems
- WP 7 – Development of asset management technologies
- WP 8 – Demonstration
- WP 9 – Dissemination

Partners involved: FEUP, IST, UCC, IVE, COMSA, ASTS, SKF, MERMEC, EVOLEO, NEM, REFER, D2S, DL, IMOSS, KRESTOS, EMEF, UoB

FP7 Project: **FADLESS- Fatigue damage control and assessment for railways bridges (2009-2012)**

Description: 1) Development of novel procedure for the evaluation of the integrity of bridges which may be affected by fatigue; 2) Assessment of the actual fatigue load and resistance of principal elements and critical details for representative bridge typologies; 3) Evaluation of the actual fatigue loading spectra for real and expected traffic flows and of the local dynamic vibration and distortional effects; 4) Evaluation of the actual fatigue resistance of the main elements subjected to distortion induced effects.

Institutions involved:

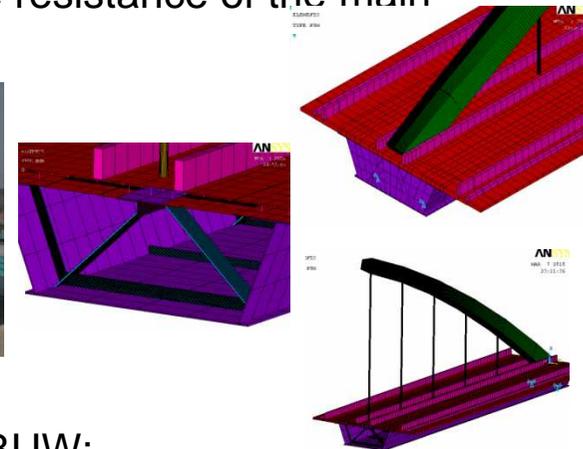
Rete Ferroviaria Italiana S.p.A. – RFI ;

Austrian State Railways – ÖBB

RIVA ACCIAIO – SPA; VCE Holding GmbH;

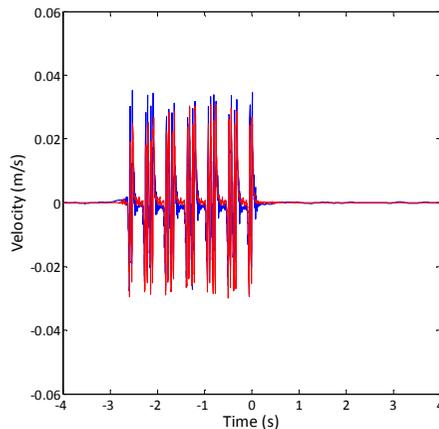
Consorzio Pisa Ricerche – CPR Bauhaus University of Weimar – BUW;

Faculdade de Engenharia da Universidade do Porto (FEUP); Katholieke Universiteit Leuven – KUL



FCT Project: Ground Vibrations and Noise Induced by High-Speed Trains: Prediction and Mitigation (2011-2013)

Description: 1) Development of efficient and comprehensive numerical models for the assessment of vibrations and noise induced by railway traffic; 2) Experimental validation of the numerical models; 3) Assessment of the efficiency of mitigation measures; 4) Probabilistic analysis of vibrations and low frequency noise induced by traffic.



Institutions involved:

[University of Porto – www.fe.up.pt](http://www.fe.up.pt)

[University of Coimbra – www.fct.uc.pt](http://www.fct.uc.pt)

[REFER – www.refer.pt](http://www.refer.pt)

Contact:

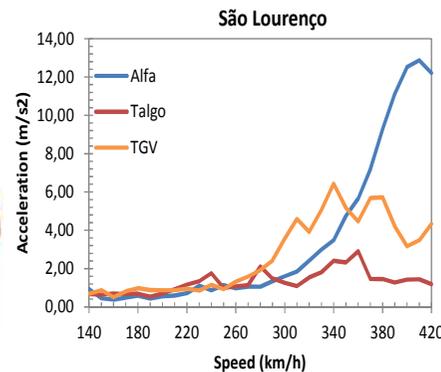
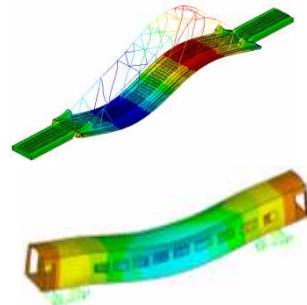
[Raimundo Delgado: rdelgado@fe.up.pt](mailto:rdelgado@fe.up.pt)

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Papers: Soil Dynamics and Earthquake Engineering: [10.1016/j.soildyn.2009.11.002](https://doi.org/10.1016/j.soildyn.2009.11.002)
Soil Dynamics and Earthquake Engineering: [10.1016/j.soildyn.2011.09.002](https://doi.org/10.1016/j.soildyn.2011.09.002)
Journal of Rail and Rapid Transit: [10.1177/09544409711433686](https://doi.org/10.1177/09544409711433686)
Soil Dynamics and Earthquake Engineering: [10.1016/j.soildyn.2012.06.014](https://doi.org/10.1016/j.soildyn.2012.06.014)

FCT Project: Advanced methodologies for the assessment of the dynamic behaviour of high speed railway bridges (2009-2011)

Description: 1) Improvement of computational tools for dynamic analysis of the bridge-train interaction; 2) new methodologies for the structural behaviour assessment; 3) Numerical modelling of the train-bridge system; 4) Experimental assessment and calibration; 5) Probabilistic assessment of the dynamic behaviour of high speed railway bridges.



Institutions involved:

[University of Porto – www.fe.up.pt](http://www.fe.up.pt)

[REFER – www.refer.pt](http://www.refer.pt)

[RAVE – www.rave.pt](http://www.rave.pt)

Contact:

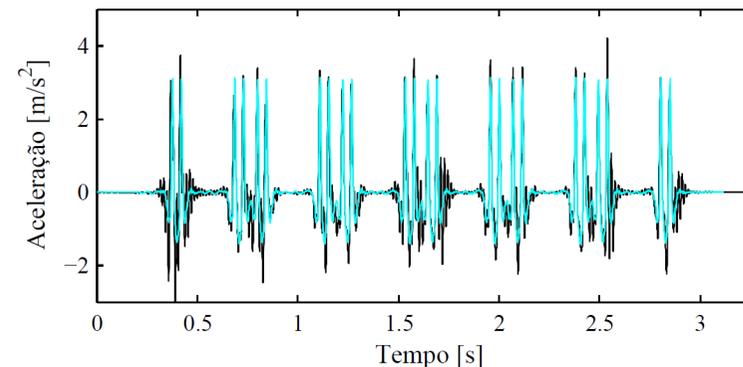
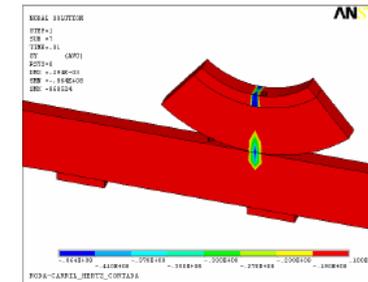
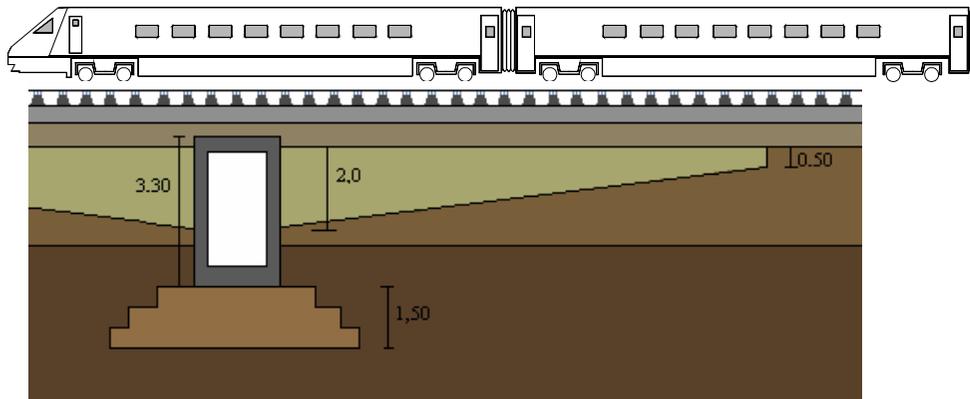
[Rui Calçada: ruiabc@fe.up.pt](mailto:ruiabc@fe.up.pt)

Papers: Engineering Structures: [10.1016/j.engstruct.2011.10.010](https://doi.org/10.1016/j.engstruct.2011.10.010)
Engineering Structures: [10.1016/j.engstruct.2012.03.013](https://doi.org/10.1016/j.engstruct.2012.03.013)
Engineering Structures: [10.1016/j.engstruct.2012.02.024](https://doi.org/10.1016/j.engstruct.2012.02.024)
International Journal of Railway Technology: [10.4203/ijrt.1.1.4](https://doi.org/10.4203/ijrt.1.1.4)

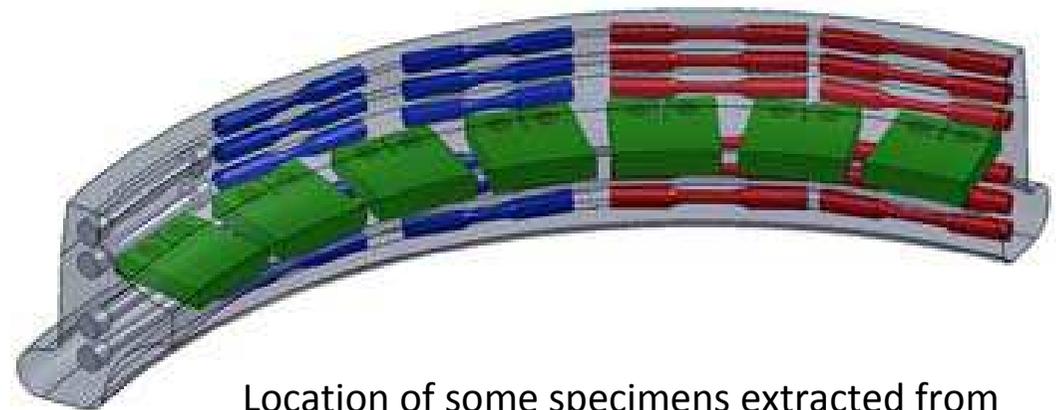
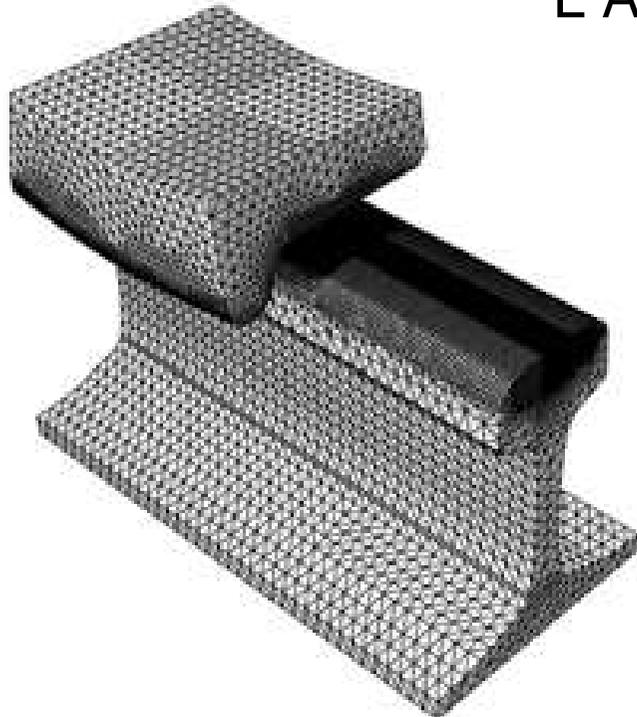
Assessment of the train-track dynamic behaviour at transition zones

Description: 1) Numerical models of the train-track system; 2) Calibration and experimental validation of the numerical models; 3) Assessment of the short and long-term behaviour; 4) Track condition monitoring.

Contact: [Rui Calçada](mailto:ruiabc@fe.up.pt)
ruiabc@fe.up.pt



- Project: FCT Railways- rolling contact fatigue (2010-13)
- Description: Study of wheel/rail contact fatigue, taking into consideration residual stress effects
- Persons involved: D Peixoto (PhD student); P M S T de Castro
L A A Ferreira; P M G P Moreira



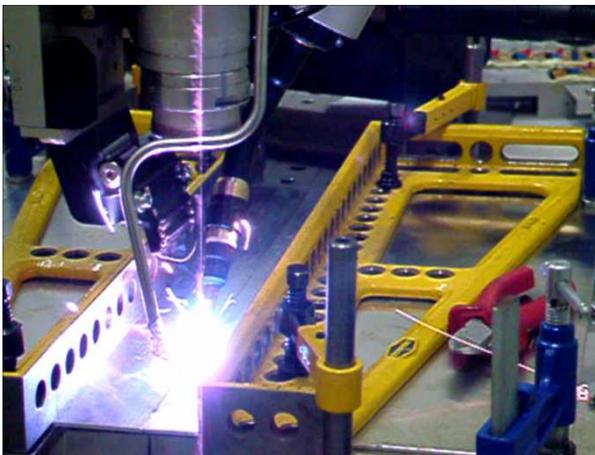
Location of some specimens extracted from
ALSTOM AVE wheel

Project: QREN LighTrain (with ALSTOM), started in 2011

Description: Development of new solutions for improved durability of aluminum platforms for railways passenger cars; joint project with ALSTOM, INEGI, IST and ISQ

Persons involved: P M G P Moreira, P M S T de Castro, L A A Ferreira and 2 scholarships awarded

Contact: Pedro Moreira (pmoreira@inegi.up.pt)



Laser beam welding

Friction stir welding

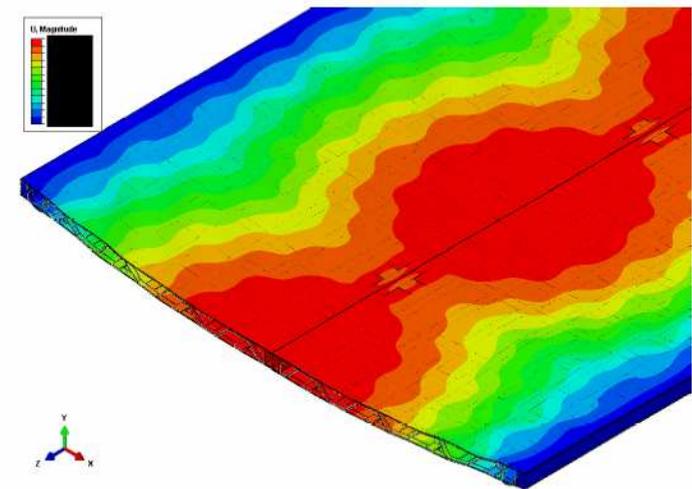


Figure 9: Deflection of bent plate model (half plate).

Design, Manufacturing and Testing of Composite Materials



Develop and optimization of design procedures for components and structures;

Develop and optimization of manufacturing processes;

Adhesive and bolt joining of composite materials and hybrid metals/composite materials

Structural health monitoring, including development of non-destructive techniques for damage detection;

Definition of procedures for damage repairing, and application to typical structures and components;

Process Simulation (RTM, Filament Winding, Pultrusion, Autoclave)

Machining of composite materials

Topics of interest

SST.2013.1-1. Railway infrastructure optimization and monitoring for further noise reduction;

SST.2013.2-2. New concepts for railway infrastructure and operation: adaptable, automated, resilient and high capacity.

Thank you for your attention!



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