

# CHARMEC Publications since 1995 – as of February 2011

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88 pages

The Swedish National Competence Centre CHARMEC (CHAlmers Railway MEChanics) started at Chalmers University of Technology in 1995. The two-letter code at the below headings relates to CHARMEC's six programme areas, see page 11 in the Triennial Report 2006–2009 on [www.chalmers.se/charmec](http://www.chalmers.se/charmec):

Interaction of train and track (Samverkan Tåg/Spår, **TS**)

Vibrations and noise (Vibrationer och Buller, **VB**)

Materials and maintenance (Material och Underhåll, **MU**)

Systems for monitoring and operation (System för övervakning och Drift, **SD**)

Parallel EU projects (Parallella EU-projekt, **EU**)

Parallel special projects (Parallella specialprojekt, **SP**)

Some selected additional publications 1988–2003 are listed at the end of this document under the two-letter code **SS**.

## TS1. Calculation models of track structures

1. Tore Dahlberg: Vertical dynamic train/track interaction - verifying a theoretical model by full-scale experiments, *Proceedings 3rd Herbertov Workshop on Interaction of Railway Vehicles with the Track and Its Substructure*, Herbertov (Czech Republic) September 1994. Published in *Vehicle System Dynamics*, vol 24, supplement, 1995, pp 45-57
2. Mikael Fermér and Jens Nielsen: Vertical interaction between train and track with soft and stiff railpads - full-scale experiments and theory, *IMechE Journal of Rail and Rapid Transit*, vol 209, no F1, 1995, pp 39-47
3. Andrew Peplow, Johan Oscarsson and Tore Dahlberg: Review of research on ballast as track substructure, *Chalmers Solid Mechanics*, Research Report F189, Gothenburg 1996, 39 pp

4. Thomas Broberg, Patrik Johansson, Per Anders Jönsson, Stefan Larsson and Ulf Lång: Railway track vibrations - a benchmark test and a sleeper vibration study, Student Report, *Chalmers Solid Mechanics*, Gothenburg 1995, 46 pp
5. Ulf Mårtensson: Railway crossing vibrations, Student Report T138, *Chalmers Solid Mechanics*, Gothenburg 1996, 27 pp
6. Johan Ivarsson and Anders Johansson: Finite element model of a railway turnout, Student Report T144, *Chalmers Solid Mechanics*, Gothenburg 1996, 70 pp
7. Clas Andersson: Railway turnout vibrations, MSc Thesis 1997:1, *Chalmers Solid Mechanics*, Gothenburg 1997, 53 pp
8. Tore Dahlberg and Clas Andersson: Vibration due to a wheelset passing a railway turnout crossing, *Proceedings WCRR'97 (World Congress on Railway Research)*, Florence (Italy) November 1997, vol E (Environment), pp 413-419
9. Annika Igeland and Johan Oscarsson: Modelling of railway track for computer simulation of dynamic train/track interaction, *Proceedings XVth International Modal Analysis Conference (IMACXV)*, Tokyo (Japan) September 1997, pp 464-470
10. Johan Oscarsson, Jens Nielsen and Annika Igeland: Dynamic train/track interaction - theory and full-scale experiments, *Proceedings WCRR'97 (World Congress on Railway Research)*, Florence (Italy) November 1997, vol B (Infrastructure and Track), pp 123-129
11. Johan Oscarsson and Tore Dahlberg: Dynamic train/track/ballast interaction - computer models and full-scale experiments, *Proceedings 15th IAVSD Symposium - Dynamics of Vehicles on Roads and Tracks*, Budapest (Hungary) August 1997, pp 73-84. Also in *Vehicle System Dynamics*, vol 29, supplement 1, 1998, pp 73-84
12. Clas Andersson and Tore Dahlberg: Wheel/rail impacts at a railway turnout crossing, *IMEchE Journal of Rail and Rapid Transit*, vol 212, no F2, 1998, pp 123-134
13. Johan Oscarsson: Dynamic train/track/ballast interaction - linear and state-dependent track models, Licentiate Thesis, *Chalmers Solid Mechanics*, Gothenburg March 1999, 66 pp

14. Clas Andersson and Johan Oscarsson: Dynamic train/track interaction including state-dependent track properties and flexible vehicle components, *Proceedings 16th IAVSD Symposium - Dynamics of Vehicles on Roads and Tracks*, Pretoria (RSA) August-September 1999, pp 11-14. Full-length paper in *Vehicle System Dynamics*, vol 33, supplement, 2000, pp 47-58 (also listed as TS4:6)
15. Mikael Hallqvist: Track/vehicle simulation with explicit FE-code, MSc Thesis 2000:5, *Chalmers Solid Mechanics*, Gothenburg 2000, 58 pp
16. Johan Oscarsson: Dynamic train-track interaction – linear and non-linear track models with property scatter, Doctoral Dissertation, *Chalmers Solid Mechanics*, Gothenburg 2001, 130 pp (summary and five appended papers)
17. Johan Oscarsson: Dynamic train-track interaction – variability attributable to scatter in the track properties, *Vehicle System Dynamics*, vol 37, no 1, 2002, pp 59-79
18. Johan Oscarsson: Simulation of train-track interaction with stochastic track properties, *Vehicle System Dynamics*, vol 37, no 6, 2002, pp 449-469
19. Johan Oscarsson: Dynamic train-track-ballast interaction with unevenly distributed track properties, *Vehicle System Dynamics*, vol 37, supplement, 2002, pp 385-396
20. Jens Nielsen and Johan Oscarsson: Simulation of dynamic train-track interaction with state-dependent track properties, *Journal of Sound and Vibration*, vol 275, nos 3-5, 2004, pp 515-532

## **TS2. Railhead corrugation formation**

1. Jens Nielsen and Annika Igeland: Vertical dynamic interaction between train and track - influence of wheel and track imperfections, *Journal of Sound and Vibration*, vol 187, no 5, 1995, pp 825-839
2. Annika Igeland: Time domain solution of the dynamic interaction between railroad structures and moving loads, *Third International Congress on Industrial and Applied Mathematics, ICIAM/GAMM95*, Hamburg (Germany) July 1995. Published in *ZAMM (Zeitschrift für Angewandte Mathematik und Mechanik)*, vol 76, supplement 4, 1996, pp 137-140
3. Annika Igeland: Dynamic train/track interaction - parametric study and comparisons with full-scale experiments, *Engineering Foundation Conference Vehicle-Infrastructure Interaction IV*, San Diego CA (USA) June 1996, 14 pp

4. Annika Igeland and Heike Ilias: Railhead wear calculations based on high frequency wheelset/track interaction - a comparison between different models, *Proceedings 2nd MiniConference on Contact Mechanics and Wear of Rail/Wheel Systems*, Budapest (Hungary) July 1996, pp 304-314
5. Annika Igeland: Railhead corrugation growth explained by dynamic interaction between track and bogie wheelsets, *IMEchE Journal of Rail and Rapid Transit*, vol 210, no F1, 1996, pp 11-20
6. Annika Igeland: Railhead wear calculations based on high frequency vehicle/track interaction, *Chalmers Solid Mechanics*, Research Report F196, Gothenburg 1996, 9 pp
7. Annika Igeland and Heike Ilias: Railhead corrugation growth predictions based on non-linear high frequency vehicle/track interaction, *Wear*, vol 213, 1997, pp 90-97
8. Annika Igeland: Dynamic train/track interaction - simulation of railhead corrugation growth under a moving bogie using mathematical models combined with full-scale measurements, Doctoral Dissertation, *Chalmers Solid Mechanics*, Gothenburg 1997, 84 pp (summary and five appended papers)

### **TS3. Sleeper and rail pad dynamics**

1. Åsa Fenander: Modal synthesis when modeling damping by use of fractional derivatives, *AIAA Journal*, vol 34, no 5, 1996, pp 1051-1058
2. Tore Dahlberg, Jan Köhler and Åsa Fenander: Ett järnvägsspårs dynamiska egenskaper - Gåsakullamätningarna 1995 (The dynamic properties of a railway track – the Goose Hill measurements 1995; in Swedish), *Seminarium Samverkan Fordon - Bana*, VTI, Linköping (Sweden) April 1996, 11 pp
3. Åsa Fenander: Fractional derivatives in damping descriptions, *Proceedings ESA International Workshop on Advanced Mathematical Methods in the Dynamics of Flexible Bodies*, Noordwijk (NL) June 1996, pp 159-166
4. Mikael Enelund, Åsa Fenander and Peter Olsson: Fractional integral formulation of constitutive equations of viscoelasticity, *AIAA Journal*, vol 35, no 8, 1997, pp 1356-1362
5. Åsa Fenander: Frequency-dependent stiffness and damping of railpads, *IMEchE Journal of Rail and Rapid Transit*, vol 211, no F1, 1997, pp 51-62

6. Åsa Fenander: A fractional derivative railpad model included in a railway track model, *Journal of Sound and Vibration*, vol 212, no 5, 1998, pp 889-903
7. Åsa Fenander: Modelling stiffness and damping by use of fractional calculus with application to railpads, Doctoral Dissertation, *Chalmers Solid Mechanics*, Gothenburg 1997, 82 pp (summary and four appended papers)

#### **TS4. Lateral track dynamics**

1. Jeanette Lavery: 2-D rail-wheel contact in train-track interaction, MSc Thesis 1999:16, *Chalmers Solid Mechanics*, Gothenburg 1999, 49 pp
2. Clas Andersson, Johan Oscarsson and Jens Nielsen: Dynamic train/track interaction including state-dependent track properties and flexible vehicle components, *Proceedings 16th IAVSD Symposium - Dynamics of Vehicles on Roads and Tracks*, Pretoria (RSA) August-September 1999, pp 11-14
3. Clas Andersson and Johan Oscarsson: Dynamic train/track interaction including state-dependent track properties and flexible vehicle components, *Vehicle System Dynamics*, vol 33, supplement, 1999, pp 47-58
4. Clas Andersson and Tore Dahlberg: Load impacts at a railway turnout crossing, *Proceedings 16th IAVSD Symposium - Dynamics of Vehicles on Roads and Tracks*, Pretoria August-September 1999, pp 32-34. Full length paper in *Vehicle System Dynamics*, vol 33, supplement, 2000, pp 131-142
5. Mikael Hallqvist: Track/vehicle simulation with explicit FE-code, MSc Thesis 2000:5, *Chalmers Solid Mechanics*, Gothenburg 2000, 58 pp
6. Clas Andersson and Johan Oscarsson: Dynamic train/track interaction including state-dependent track properties and flexible vehicle components, *Proceedings 16th IAVSD Symposium - Dynamics of Vehicles on Roads and Tracks*, Pretoria (RSA) August-September 1999, pp 11-14. Full-length paper in *Vehicle System Dynamics*, vol 33, supplement, 2000, pp 47-58 (also listed as TS1:14)
7. Clas Andersson: Modelling and simulation of general train/track interaction, Licentiate Thesis, *Chalmers Solid Mechanics*, Gothenburg 2000, 45 pp (summary and two appended papers)
8. Clas Andersson and Thomas Abrahamsson: Simulation of interaction between a train in general motion and a track, *Vehicle System Dynamics*, vol 38, no 6, 2002, pp 433-455

9. Clas Andersson and Thomas Abrahamsson: A partitioned time integration approach for coupled systems in dynamics, *Chalmers Applied Mechanics*, Gothenburg 2002, 24 pp (contained in Clas Andersson's doctoral dissertation)
10. Clas Andersson: Vertical and lateral track dynamics – measurements, model and calibration, Research Report 2003:2, *Chalmers Applied Mechanics*, Gothenburg 2003, 38 pp
11. Clas Andersson and Anders Johansson: Prediction of rail corrugation generated by three-dimensional wheel/rail interaction, *Wear*, vol 257, nos 3-4, 2004, pp 423-434
12. Clas Andersson: Modelling and simulation of train-track interaction including wear prediction, Doctoral Dissertation, *Chalmers Applied Mechanics*, Gothenburg 2003, 163 pp (summary and five appended papers)

## **TS5. Out-of-round wheels - causes and consequences**

1. Anders Johansson and Jens Nielsen: Out-of-round railway wheels - a literature survey, *Chalmers Solid Mechanics*, Research Report F 210, Gothenburg 1998, 46 pp
2. Jens Nielsen and Anders Johansson: Out-of-round railway wheels - a literature survey, *IMechE Journal of Rail and Rapid Transit*, vol 214, no F2, 2000, pp 79-91
3. Anders Johansson and Jens Nielsen: Railway wheel out-of-roundness – influence on wheel-rail contact forces and track response, *Proceedings 13th International Wheelset Congress (IWC13)*, Rome (Italy) September 2001, 9 pp. This work was awarded the prize for best paper in the category “Wheel-Rail Contact”
4. Anders Johansson and Jens Nielsen: Out-of-round railway wheels – wheel-rail contact forces and track response derived from field tests and numerical simulations, *IMechE Journal of Rail and Rapid Transit*, vol 217, no F2, 2003, pp 135-146
5. Anders Johansson: Mathematical models for simulation of wheel-rail rolling contact and for prediction of wheel wear – survey of models for calculation of creep forces, spin moments and wear depths, Research Report 2003:3, *Chalmers Applied Mechanics*, Gothenburg 2003, 42 pp

6. Anders Johansson and Clas Andersson: Out-of-round railway wheels – a study of wheel polygonalization through simulation of three-dimensional wheel-rail interaction and wear, Research Report 2003:5, *Chalmers Applied Mechanics*, Gothenburg 2003, 38 pp
7. Jens Nielsen, Roger Lundén, Anders Johansson and Tore Vernersson: Train-track interaction and mechanisms of irregular wear on wheel and rail surfaces, *Vehicle System Dynamics*, vol 40, nos 1-3, 2003, pp 3-54. Also presented as an invited Keynote Lecture at *18th IAVSD Symposium, Dynamics of Vehicles on Roads and Tracks*, Atsugi, Kanagawa (Japan) August 2003
8. Anders Johansson and Clas Andersson: Out-of-round railway wheels – a study of formation of long periodic defects by combining analysis of wear and dynamic train-track interaction, *Proceedings 18th IAVSD Symposium, Dynamics of Vehicles on Roads and Tracks (IAVSD18)*, Atsugi, Kanagawa (Japan) August 2003, pp 291-293
9. Anders Johansson: Out-of-round railway wheels – literature survey, field tests and numerical simulations, Licentiate Thesis, *Chalmers Applied Mechanics*, Gothenburg 2003, 87 pp (summary and three appended papers)
10. Anders Johansson: Out-of-round railway wheels – literature survey of wheel removal criteria and damage to track from impact loads, Research Report 2003:7, *Chalmers Applied Mechanics*, Gothenburg 2003, 28 pp
11. Anders Johansson: Out-of-round railway wheels – measurements of out-of-roundness, transverse profile and surface hardness, Research Report 2004:1, *Chalmers Applied Mechanics*, Gothenburg 2004, 40 pp
12. Anders Johansson: Out-of-round railway wheels – assessment of wheel tread irregularities in train traffic, *Proceedings 8th International Workshop on Railway Noise (IWRN8)*, Buxton, Derbyshire (UK) September 2004, vol 1, pp 297-308
13. Anders Johansson: Integrerade beräkningsmodeller för användning inom Banverksprojektet “Hjulskador” (Integrated numerical models for use within the Banverket project “Wheel Damage”; in Swedish), Research Report 2004:11, *Chalmers Applied Mechanics*, Gothenburg 2004, 19 pp
14. Anders Johansson and Clas Andersson: Out-of-round railway wheels – a study of wheel polygonalization through simulation of three-dimensional wheel-rail interaction and wear, *Vehicle System Dynamics*, vol 43, no 8, 2005, pp 539-559 (revised article from conference *IAVSD18*)

15. Anders Johansson and Jens Nielsen: Out-of-round railway wheels – influence of powered wheelsets with tread braking on rail corrugation growth, *Poster at 19th IAVSD Symposium, Dynamics of Vehicles on Roads and Tracks (IAVSD19)*, Milan (Italy), August– September 2005
16. Anders Johansson and Jens Nielsen: Rail corrugation growth – influence of powered wheelsets with wheel tread irregularities, *Wear*, vol 262, nos 11-12, 2007, pp 1296-1307 (full-length article from conference *IAVSD19*)
17. Anders Johansson: Out-of-round railway wheels – assessment of wheel tread irregularities in train traffic, *Journal of Sound and Vibration*, vol 293, nos 3-5, 2006, pp 795-806 (revised article from conference *IWRN8*)
18. Anders Johansson: Out-of-round railway wheels – causes and consequences: an investigation including field tests, out-of-roundness measurements and numerical simulations, Doctoral Dissertation, *Chalmers Applied Mechanics*, Gothenburg 2005, 191 pp (introduction, summary and six appended papers)

## **TS6. Identification of dynamic forces in trains**

1. Christophe Deventer: Structural load identification with experimental evaluation, MSc Thesis 2001:8, *Chalmers Applied Mechanics*, Gothenburg 2001, 81 pp
2. Lars Nordström and Patrik Nordberg: A critical comparison of time domain load identification methods, *Proceedings 6th International Conference on Motion and Vibration Control (MOVIC2002)*, Saitama (Japan), August 2002, vol 2, pp 1151-1156
3. Lars Nordström and Patrik Nordberg: A time delay method to solve non-collocated input estimation problems, *Mechanical Systems and Signal Processing*, vol 18, no 6, 2004, pp 1469-1483
4. Lars Nordström: Load identification using time domain methods, Licentiate Thesis, *Chalmers Applied Mechanics*, Gothenburg 2003, 57 pp (summary and two appended papers)
5. Johanna Lilja: Identification of a finite element railway wheelset model, MSc Thesis 2003:6, *Chalmers Applied Mechanics*, Gothenburg 2003, 58 pp
6. Lars Nordström: A dynamic programming algorithm for input estimation on linear time-variant systems, *Computer Methods in Applied Mechanics and Engineering*, vol 195, no 44-47, 2006, pp 6407-6427



7. Lars Nordström: Comments on 'A dynamic programming algorithm for input estimation on linear time-variant systems', *Chalmers Applied Mechanics*, Gothenburg 2005, 5 pp
8. Lars Nordström, Håkan Johansson and Fredrik Larsson: A strategy for input estimation with sensitivity analysis, *International Journal for Numerical Methods in Engineering*, vol 69, no 11, 2007, pp 2219-2246. Also presented at *8th US National Congress on Computational Mechanics (USNCCM8)*, Austin TX (USA) July 2005
9. Lars Nordström: Input estimation in structural dynamics, Doctoral Dissertation, *Chalmers Applied Mechanics*, Gothenburg November 2005, 141 pp (introduction, summary and five appended papers)

## TS7. Dynamics of track switches

1. Jan Henrik Sällström (editor), Tore Dahlberg, Magnus Ekh and Jens Nielsen: State-of-the-art study on railway turnouts – dynamics and damage / Förstudie om spårväxlar – dynamik och slitage (both English and Swedish version), Research Report 2002:7, *Chalmers Applied Mechanics*, Gothenburg 2002, 50 pp
2. Jan Henrik Sällström: Railway switches in Sweden – research towards enhanced reliability and maintenance, *Proceedings International Railway Conference on Switches and Crossings*, Delft (NL) March 2002, 18 pp
3. Elias Kassa: Simulation of dynamic interaction between train and turnout, Licentiate Thesis, *Chalmers Applied Mechanics*, Gothenburg 2004, 56 pp
4. Elias Kassa, Clas Andersson and Jens Nielsen: Simulation of dynamic interaction between train and railway turnout, *Vehicle System Dynamics*, vol 44, no 3, 2006, pp 247-258
5. Elias Kassa and Göran Johansson: Simulation of train-turnout interaction and plastic deformation of rail profiles, *Vehicle System Dynamics*, vol 44, supplement, 2006, pp 349–359. Also presented at *19th IAVSD Symposium*, Milan (Italy) August – September 2005
6. Martina Wiest, Elias Kassa, Werner Daves, Jens Nielsen and Heinz Ossberger: Assessment of methods for calculating contact pressure in wheel-rail/switch contact, *Proceedings 7th International Conference on Contact Mechanics and Wear of Rail/Wheel Systems (CM2006)*, Brisbane (Australia) September 2006, vol 2, pp 501-508

7. Martina Wiest, Elias Kassa, Werner Daves, Jens Nielsen and Heinz Ossberger: Assessment of methods for calculating contact pressure in wheel/rail/switch contact, *Wear*, vol 265, nos 9-10, 2008, pp 1439-1445 (revised article from conference *CM2006*)
8. Elias Kassa and Jens Nielsen: Stochastic analysis of dynamic interaction between train and railway turnout, *Vehicle System Dynamics*, vol 46, no 5, 2008, pp 429-449
9. Elias Kassa and Jens Nielsen: Dynamic interaction between train and railway turnout – full-scale field test and validation of simulation models, *Vehicle System Dynamics*, vol 46, supplement 1, 2008, pp 521-534. Also presented at *20th IAVSD Symposium*, Berkeley CA (USA) August 2007 (also listed as EU10:4)
10. Elias Kassa and Jens Nielsen: Dynamic train-turnout interaction in an extended frequency range using a detailed model of track dynamics, *Journal of Sound and Vibration*, vol 320, nos 4-5, 2009, pp 893-914
11. Elias Kassa: Dynamic train-turnout interaction – mathematical modelling, numerical simulation and field testing, Doctoral Dissertation, *Chalmers Applied Mechanics*, Gothenburg 2007, 123 pp (introduction, summary and six appended papers)

## TS8. Integrated track dynamics

1. Jens Nielsen, Anders Ekberg, Elena Kabo and Roger Lundén: Integrated analysis of dynamic train/track interaction and rolling contact fatigue, *Proceedings 14th International Wheelset Congress (IWC14)*, Orlando FL (USA) October 2004, 15 pp (also listed as MU9:14)
2. Jens Nielsen, Jonas Ringsberg and Luis Baeza: Influence of railway wheel flat impact on crack growth in rails, *Proceedings 8th International Heavy Haul Conference (IHHC8)*, Rio de Janeiro (Brazil) June 2005, pp 789-797
3. Jens Nielsen: Utvärdering av hjulskadedetektorer (Assessment of wheel impact load detectors; in Swedish), *Chalmers Applied Mechanics*, Gothenburg 2005, 11 pp
4. Jens Nielsen, Anders Ekberg and Roger Lundén: Influence of short-pitch wheel/rail corrugation on rolling contact fatigue of railway wheels, *IMEchE Journal of Rail and Rapid Transit*, vol 219, no F3, 2005, pp 177-187 (also listed

as MU9:18 and SP11:4). This paper received the *IMechE Railway Division W A Agnew / C N Goodall Award 2005*

5. Elena Kabo, Jens Nielsen and Anders Ekberg: Prediction of dynamic train-track interaction and subsequent material deterioration, *Proceedings 19th IAVSD Symposium Dynamics of Vehicles on Roads and Tracks (IAVSD19)*, Milan (Italy), August– September 2005, 3 pp (also listed as MU9:19)
6. Anders Karlström, Jens Nielsen and Anders Boström: Train/track-soil numerical-analytical interaction model in the time domain, *Chalmers Applied Mechanics*, Research Report 2006:8, Gothenburg 2006 (also listed as VB8:6)
7. Jens Nielsen: High-frequency vertical wheel-rail contact forces – validation of a prediction model by field testing, *Proceedings 7th International Conference on Contact Mechanics and Wear of Rail/Wheel Systems (CM2006)*, Brisbane (Australia) September 2006, vol 1, pp 41-48 (also listed as SP11:2)
8. Luis Baeza, Alejandro Roda and Jens Nielsen: Railway vehicle/track interaction analysis using a modal substructuring approach, *Journal of Sound and Vibration*, vol 293, nos 1-2, 2006, pp 112-124
9. Elena Kabo, Jens Nielsen and Anders Ekberg: Prediction of dynamic train/track interaction and subsequent material deterioration in the presence of insulated rail joints, *Vehicle System Dynamics*, vol 44, supplement 1, 2006, pp 718-729 (also listed as MU9:20 and SP8:3)
10. Jens Nielsen: High-frequency vertical wheel/rail contact forces – validation of a prediction model by field testing, *Wear*, vol 265, nos 9-10, 2008, pp 1465-1471 (revised article from conference *CM2006*. Also listed as SP11:9)
11. Anders Ekberg, Elena Kabo, Jens Nielsen and Roger Lundén: Subsurface initiated rolling contact fatigue of railway wheels as generated by rail corrugation, *International Journal of Solids and Structures*, vol 44, no 24, 2007, pp 7975-7987, (also listed as MU10:9, MU22:1 and SP11:5)
12. Elias Kassa and Jens Nielsen: Stochastic analysis of dynamic interaction between train and railway turnout, *15th Nordic Seminar on Railway Technology*, Hook (Sweden) May 2008, 1+20 pp (Summary and PowerPoint presentation)
13. Jens Nielsen: Out-of-round wheels, in *Wheel-rail interface handbook* (editors Roger Lewis and Ulf Olofsson), Woodhead Publishing, Cambridge (UK) 2009, pp 245-279

14. Jens Nielsen, Oskar Lundberg and Nicolas Renard: Reduction of railway rolling noise by use of rail dampers – results from a field test in Tjörnarp, Research Report 2009:06, *Chalmers Applied Mechanics*, Gothenburg 2009, 63 pp

## **TS9. Track dynamics and sleepers**

1. Jonas Zachrisson: Reliability optimization with application to sleeper design, MSc Thesis 2004:6, *Chalmers Applied Mechanics*, Gothenburg December 2004, 41 pp. This work was awarded Swedtrain's (Swedish Association of Railway Industries) Prize 2005 for Best Master's Thesis in Railway Technology
2. Johanna Lilja, Thomas Abrahamsson and Jens Nielsen: Experimental investigation of stochastic boundary conditions – planning a railway sleeper test, *Proceedings 24th International Modal Analysis Conference (IMAC XXIV)*, St Louis MO (USA) January-February 2006, 7 pp
3. Benoît Duveiller: Statistical evaluation of structural dynamics problems with application to sleeper design, MSc Thesis 2006:47, *Chalmers Applied Mechanics*, Gothenburg 2006, 79 pp
4. Johanna Lilja: Preliminaries for probabilistic railway sleeper design, Licentiate Thesis, *Chalmers Applied Mechanics*, Gothenburg 2006, 70 pp (summary and two appended papers)
5. Thomas Abrahamsson, Johanna Lilja and Jens Nielsen: Towards probabilistic design of railway sleepers, *15th Nordic Seminar on Railway Technology*, Hook (Sweden) May 2008, 1+14 pp (Summary and PowerPoint presentation)
6. Johanna Lilja, Thomas Abrahamsson and Jens Nielsen: On the adequacy of metamodelling techniques in probabilistic design of railway sleepers, *Proceedings 4th ASRANet International Colloquium*, Athens (Greece) June 2008, 10 pp
7. Johanna Lilja, Sadegh Rahrovani, Thomas Abrahamsson and Jens Nielsen: On the accuracy of reliability analysis methods applied in railway sleeper design (in preparation)
8. Sadegh Rahrovani: Test data evaluation from field measurements of sleeper-ballast interface, *Chalmers Applied Mechanics*, Research Report 2010:05, Gothenburg 2010, 53 pp

## TS10. Track response when using Under Sleeper Pads (USP)

1. Rikard Bolmsvik: Influence of USP on the track response – a literature survey, *Abetong Teknik AB*, Växjö (Sweden) 2005, 15 pp
2. Anders Johansson: Under Sleeper Pads – influence on dynamic train/track interaction, Research Report 2006:02, *Chalmers Applied Mechanics*, Gothenburg 2006, 35 pp
3. Anders Johansson, Jens Nielsen, Rikard Bolmsvik, Anders Karlström and Roger Lundén: Under Sleeper Pads – influence on dynamic train-track interaction, *Proceedings 7th International Conference on Contact Mechanics and Wear of Rail/Wheel Systems (CM2006)*, Brisbane (Australia) September 2006, vol 2, pp 583-592 (also listed as VB8:7)
4. Andreas Lundqvist, Rikard Larsson and Tore Dahlberg: Influence of railway track stiffness variations on wheel/rail contact force, *Proceedings Workshop Track for High-Speed Railways*, Faculty of Engineering of the University of Porto (Portugal) October 2006, pp 67-78
5. Johan Jonsson, Philippe Schneider, Rikard Bolmsvik, Tony Johansson and Jens Nielsen: Experimental study of the influence of USP on track response using LSQ on field measurement data, *15th Nordic Seminar on Railway Technology*, Hook (Sweden) May 2008, 1+18 pp (Summary and PowerPoint presentation)
6. Anders Johansson, Jens Nielsen, Rikard Bolmsvik, Anders Karlström and Roger Lundén: Under sleeper pads – influence on dynamic train–track interaction, *Wear*, vol 265, nos 9-10, 2008, pp 1479-1487 (revised article from conference *CM2006*)
7. Philippe Schneider, Rikard Bolmsvik and Jens Nielsen: In-situ performance of a ballasted track with under sleeper pads, Research Report 2009:07, *Chalmers Applied Mechanics*, Gothenburg 2010, 22 pp
8. Philippe Schneider, Rikard Bolmsvik and Jens Nielsen: In-situ performance of a ballasted railway track with under sleeper pads, *IMechE Journal of Rail and Rapid Transit*, vol , no F, 2011, pp -

## TS11. Rail corrugation growth on curves

1. Peter Torstensson: Rail corrugation growth on curves, *15th Nordic Seminar on Railway Technology*, Hook (Sweden) May 2008, 1+34 pp (Summary and PowerPoint presentation)
2. Peter Torstensson and Jens Nielsen: Monitoring of rail corrugation growth due to irregular wear on a railway metro curve, *Wear*, vol 267, nos 1-4, 2009, pp 556-561. Also presented at *17th International Conference on Wear of Materials (WOM2009)* in Las Vegas NV (USA) April 2009
3. Peter Torstensson and Jens Nielsen: Simulation of dynamic train-track interaction on small radius curves subjected to rail corrugation, *Poster at 21st IAVSD Symposium Dynamics of Vehicles on Roads and Tracks (IAVSD 21)*, Stockholm (Sweden) August 2009
4. Jim Brouzoulis, Peter Torstensson, Richard Stock and Magnus Ekh: Prediction of wear and plastic flow in rails – test rig results, model calibration and numerical prediction, *Proceedings 8th International Conference on Contact Mechanics and Wear of Rail/Wheel Systems (CM2009)*, Florence (Italy) September 2009, vol 2, pp 701-710 (also listed as MU20:4)
5. Peter Torstensson: Rail corrugation growth on curves, Licentiate Thesis, *Chalmers Applied Mechanics*, Gothenburg 2009, 74 pp (introduction, summary and three appended papers)
6. Peter Torstensson and Jens Nielsen: Simulation of dynamic vehicle-track interaction on small radius curves, *Vehicle System Dynamics*, vol ?, no ?, 201?, pp ?-?
7. Peter Torstensson, Jens Nielsen and Luis Baeza: High-frequency vertical wheel-rail contact forces at high vehicle speeds – the influence of wheel rotation, *Proceedings 10th International Workshop on Railway Noise (IWRN10)*, Nagahama (Japan) October 2010, pp 43-50

## TS12. Identification of wheel/rail contact forces

1. Hamed Ronasi: Identification of wheel-rail contact forces, *15th Nordic Seminar on Railway Technology*, Hook (Sweden) May 2008, 1+20 pp (Summary and PowerPoint presentation)
2. Hamed Ronasi, Håkan Johansson and Fredrik Larsson: A numerical framework for load identification with application to wheel-rail contact forces, *Proceedings*

*ECCOMAS International Symposium on Inverse Problems in Mechanics of Structures and Materials (IPM2009)*, Rzeszów Łańcut (Poland) April 2009, pp 69-70 (ECCOMAS stands for European Community on Computational Methods in Applied Sciences)

3. Hamed Ronasi, Håkan Johansson and Fredrik Larsson: A numerical framework for load identification and regularization with application to rolling disc problem, *Computers & Structures*, vol 89, nos 1-2 , 2011, pp 38 - 47
4. Hamed Ronasi, Håkan Johansson and Fredrik Larsson: Load identification for a rolling disc - finite element discretization and virtual calibration (submitted for international publication)
5. Hamed Ronasi: Towards the identification of wheel-rail contact forces, Licentiate Thesis, *Chalmers Applied Mechanics*, Gothenburg September 2010, 53 pp (introduction and two appendid papers)

### **TS13. Optimization of track switches**

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## **SP2. Noise from Swedish railways**

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## **SP3. Track force measurements on X2**

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## SS. Some selected additional publications 1988 – 2003

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