

**Håkan Wirdelius**

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**Current position**

Research leader of ANDT (advanced NDT) and Director of SCeNDT (Scientific centre of NDT) both situated at Department of Materials and Manufacturing technology, Chalmers University of technology, Sweden, 2005-present (50% research).

**Educational background**

- Associate Professor, Non-Destructive Testing, Chalmers University of Technology, Sweden, 2010.
- Ph. D., Mechanics, Chalmers University of Technology, Sweden, 1995 (Thesis: “Ultrasonic NDT in crack detection – Mathematical modelling”, Advisor: Prof. Anders Boström).
- Lic. Eng., Mechanics, Chalmers University of Technology, Sweden, 1991 (Thesis: “Probe model implementation in the null field approach to crack scattering”, Advisor: Prof. Anders Boström).
- M. Sc., Mechanical Engineering, Chalmers University of Technology, Sweden, 1988.

**Previous employments**

- Director, SCeNDT/Department of Mechanical Engineering, Chalmers Lindholmen University College, Sweden, 2001-2004
- Engineering and Scientific Consultant in advanced NDT, Det Norske Veritas (DNV Sweden), Sweden, 1996-2001.
- Assistant Professor, Department of Applied Mechanics, Chalmers University of Technology, Sweden, 1995-1996.
- Doctoral student, Division of Mechanics, Chalmers University of Technology, Sweden, 1988-1995 (nine months parental leave in 1992).

**Grants**

- “Development of the SUNDT software”, 1996-1997, 1000kSEK (Swedish Nuclear Inspectorate).
- “Initiation of the Simulation Center of NDT (SCeNDT)”, 1998-2004, 2500kSEK (Swedish Qualification Center).
- “The establishing of an advanced radiographic laboratory”, 2001-2002, 325kSEK (Chalmers Lindholmen University College).
- “The development of a high resolution X-ray system”, 2004-2007, 3250kSEK (SKI and Swedish nuclear plant owners).
- “Gjutdesign 2005”, 2002-2005, 950kSEK (NI and Volvo CE).
- “Utveckling av en teoretisk modell för att karakterisera en svets ...”, 2002-2004, 2000kSEK (SKi/SQC/Chalmers).
- “System för karakterisering av dendritorientering”, 2005-2007, 2000kSEK (SKi/SQC/Chalmers).
- “Kvalitet, optimering och kostnadseffektiva svetsade strukturer”, 2006-2009, 1600kSEK (Vinnova/Volvo CE)
- “Quantification of the reliability of flaw detection for non-destructive techniques using probability of detection (POD) based on synthetic data”, 2008-2011, 2450kSEK (Energimyndigheten)
- “PICASSO-imProved reliability inspeCtion of Aeronautic structure through Simulation Supported POD”, 2009-2012, 5500kSEK (EU-7)
- “Detection and classification of defects with digital RT applied to laser welded titanium”, 2009-2012, 2500kSEK (NFFP)
- “Upgrade of simSUNDT software”, 2011-2012, 970kSEK (SSM)
- “Characterisation and fatigue life prediction of laser welded titanium with single pores and chain porosity”, 2012-2013, 1700kSEK (NFFP)

**National and international academic appointments**

- Opponent and part of the dissertation committee (1/3) at a public defense of a PhD thesis at the University of Tromsø, Norway. The PhD candidate, Martin H. Skjelvareid, defended his thesis entitled “Synthetic aperture ultrasound imaging with application to interior pipe inspection”, 7 September 2012.
- Member of the dissertation committee (1/3) at a public defense of a PhD thesis at the Royal Institute of Technology, Sweden. The PhD candidate, Dmitry Grishenkov, defended his thesis entitled “Polymer-shelled ultrasound contrast agents: characterization and application”, 26 March 2010.
- Discussion leader at a licentiate dissertation at Chalmers Univ. of Technology, Applied Mechanics, Sweden. The PhD candidate, T. Théodore Zagbaï, presented his licentiate, entitled “Modelling of ultrasonic testing of cracks in claddings”, at a seminar 20 April 2006.

**Advisor experience (Licentiate and PhD)**

- Co-advisor (main supervisor) for Dr. Liu Qingwei at the Department of Applied Mechanics, Chalmers University of Technology, Sweden.  
Examiner (and reference) Prof. Anders Boström at the Department of Applied Mechanics. (PhD 2007-12-14)
- Co-advisor (supervising) for M. Sc. Anders Rosell at the Department of Applied Mechanics, Chalmers University of Technology, Sweden.  
Examiner (and reference) Prof. Anders Boström. (Licentiate 2012-05-02)
- Co-advisor (supervising) for M. Sc. Lars Larsson at the Department of Applied Mechanics, Chalmers University of Technology, Sweden.  
Examiner (and reference) Prof. Anders Boström. (Licentiate 2012-09-01)
- Advisor (main supervisor) for M. Sc. Erik Lindgren at the Department of Materials and Manufacturing technology, Chalmers University of Technology, Sweden.  
Examiner (and reference) Prof. Lars Nyborg. (Licentiate 2012-11-09)

**Advisor experience (current)**

- Advisor (main supervisor) for Licentiate Erik Lindgren
- Co-advisor (main supervisor) for M. Sc. Lars Hammar at the Department of Materials and Manufacturing technology, Chalmers University of Technology, Sweden.  
Examiner (and reference) Prof. Lars Nyborg.
- Co-advisor (supervising) for Licentiate Anders Rosell
- Co-advisor (supervising) for Licentiate Lars Larsson

**Advisor experience (M.Sc.)**

- Advisor and examiner for M. Sc. Martin Karlstedt during his M. Sc. Thesis work.
- Advisor and examiner for M. Sc. Anders Rosell during his M. Sc. Thesis work.

**Papers published in journals (referee)**

1. H. Wirdelius, "Probe model implementation in the null field approach to crack scattering", *J. Nondestr. Eval.* 11, 29-39, 1992.<sup>1</sup>
2. Boström, A. and H. Wirdelius, "Ultrasonic probe modelling and nondestructive crack detection", *J. Acoust. Soc. Am.*, 97, 2836-2848, 1995.<sup>2</sup>
3. H. Wirdelius and L. Hammar, "Modeling of a high resolution digital radiographic system and development of a filtering technique based on wavelet transforms", *NDT & E International*, 37:1, 73-81, 2004.
4. L. Qingwei and H. Wirdelius, "A 2D model of ultrasonic wave propagation in an anisotropic weld", *NDT & E International*, 40:3, 229-238, 2006.
5. L. Qingwei, G. Persson and H. Wirdelius, "A receiver model for ultrasonic ray tracing in an anisotropic weld", accepted in *NDT & E International*.
6. L. Qingwei and H. Wirdelius, "An ultrasonic technique to estimate grain orientation in an anisotropic weld", accepted in *J. Nondestr. Eval.*
7. H. Wirdelius and G. Persson, "Simulation Based Validation of the Detection Capacity of an Ultrasonic Inspection Procedure", *Int. Journal of Fatigue* 41, 23-29, 2012.
8. E. Lindgren and H. Wirdelius, "X-ray modeling of realistic synthetic radiographs of thin titanium welds", *NDT & E Int.* 51, 111-119, 2012.

**To be submitted (referee)**

9. G. Persson and H. Wirdelius, "Experimental validation of curved surfaces impact on ultrasonic non destructive testing", *Comm. SCeNDT-0801*, Göteborg (2008).
10. H. Wirdelius, "An optimization technique for inverse crack detection", Updated version of *Comm. CTH-1994:11*, Göteborg (1994).<sup>3</sup>
11. L. Larsson, A. Bostöm, P. Bøvik, and H. Wirdelius, "Integral equation method for eddy current nondestructive evaluation of a tilted, surface-breaking crack", Göteborg (2012).

**Papers published in conference proceedings (referee)**

12. H. Wirdelius, P. Bøvik and A. Boström, "A model for ultrasonic NDE on defect detection", *Proc. 13th Int. Conf. on NDE in the nuclear and pressure vessel industries*, Kyoto, 1995.
13. A. Boström and H. Wirdelius, "UTDefect: A simulation tool for ultrasonic NDT", *Proc. 14th Int. Conf. on NDE in the nuclear and pressure vessel industries*, Stockholm, 1996.
14. A. Blomquist and H. Wirdelius, "SUNDT-A simulation tool for ultrasonic NDT and its application in the procedure of inspection qualification", *World congress of ultrasonics*, Yokohama, 1997.
15. H. Wirdelius, "Examples of mathematical modeling used as a tool within NDT qualification", *1<sup>st</sup> int. conf. on NDE in relation to structural integrity*, Amstersdam, 1998.

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<sup>1</sup> Paper I in PhD thesis

<sup>2</sup> Paper II in PhD thesis

<sup>3</sup> Paper V in PhD thesis

16. H. Wirdelius, "The application of mathematical modeling of ultrasonic NDT in the qualification process", 7<sup>th</sup> Euro. Conf. on NDT, Copenhagen, 1998.
17. H. Wirdelius, "The simSUNDT software and experimental validation of the grain noise model", Proc. of the World congress of ultrasonics (WCU03), Paris, 2003.
18. L. Qingwei and H. Wirdelius, "Model of ultrasonic ray paths in an anisotropic weld based on ray methods", Proc. 16th World Conf. on NDT, Montreal, 2004.
19. L. Hammar and H. Wirdelius, "HiReX- development of a high resolution digital X-ray system", Proc. 16th World Conf. on NDT, Montreal, 2004.
20. H. Wirdelius and P. Bövik, "Modelling of ultrasonic backscattering due to grain growth in a welded region", Proc. 16th World Conf. on NDT, Montreal, 2004.
21. H. Wirdelius and L. Hammar, "Filtering technique applied to synthetic radiograms and images from a high resolution digital radiographic system", VTT Symposium 237, Helsinki, 2005.
22. G. Persson, J. Niklasson and H. Wirdelius, "Scattering of SH waves by isolated cracks using a hybrid approach", Proc. 5th International Conference on NDE, San Diego, 2006.
23. H. Wirdelius and J. Niklasson and, "Ultrasonic simulation of immersion pulse-echo situation and experimental validations", Proc. 5th International Conference on NDE, San Diego, 2006.
24. L. Hammar and H. Wirdelius, "Radiographic sensitivity improved by optimized high resolution X-ray detector design", Proc. International Symposium on Digital industrial Radiology and Computed Tomography, Lyon, 2007.
25. H. Wirdelius, "Experimental validation of the UTDefect software", Proc. 6th International Conference on NDE, Budapest, 2007.
26. G. Persson and H. Wirdelius, "Recent survey and application of the simSUNDT software", Proc. Review of Progress in Quantitative Nondestructive Evaluation, AIP Conf. Proc. 1211, 2125, 2010.
27. E. Lindgren and H. Wirdelius, "Separation of geometrical- and defect information in digital radiographs using wavelet filter techniques", ISABE 2011.
28. P. Hammersberg, G. Persson and H. Wirdelius, "Emulation of POD Curves from Synthetic Data of Phased Array Ultrasonic Testing", Proc. Review of Progress in Quantitative Nondestructive Evaluation 31, AIP Conf. Proc 1430, 937, 2012.
29. G. Persson, P. Hammersberg and H. Wirdelius, "POD Generated by Monte Carlo Simulation using a Meta-model Based on the simSUNDT software", Proc. Review of Progress in Quantitative Nondestructive Evaluation 31, AIP Conf. Proc 1430, 1773, 2012.
30. G. Persson, P. Hammersberg and H. Wirdelius, "Synthetic Non-Parametric POD for Large Defects", Proc. 18th WCNDT, Durban, 2012.

**Developed software**

31. H. Wirdelius, "SUNDT v1", a simulation tool for ultrasonic NDT, 1998.
32. H. Wirdelius, "RePos", a software to reconstruct and reposition ultrasonic NDT data gathered with a commercial acoustic positioning system (MAPP-scan), 1998.
33. H. Wirdelius, G. Persson and P. Bövik, "simSUNDT", a simulation tool within the qualification of NDT personnel, 2003.
34. H. Wirdelius, "simSUNDT v2", a simulation tool for ultrasonic NDT, 2012.

**Other relevant publications**

35. A. Bodström, G. Persson and H. Wirdelius, "Extension and Verification of the CEGB Model for Predicting Ultrasonic Signals from Cracks", SKI report 91:3 (1991).
36. H. Wirdelius, "Ultrasonic probe modelling-radiated field patterns", Comm. CTH-1994:4, Göteborg (1994).<sup>4</sup>
37. H. Wirdelius, "Evaluation of an ultrasonic probe model", Comm. CTH-1994:12, Göteborg (1994).<sup>5</sup>
38. A.S. Eriksson, A. Boström and H. Wirdelius, "Experimental validation of UTDefect", SKI report 97:3 (1997).
39. H. Wirdelius, "User guide to SUNDT-A simulation tool for ultrasonic NDT", SKI report 00:29 (2000).
40. H. Wirdelius and E. Österberg, "Study of Defect Characteristics Essential for NDT Testing Methods ET, UT and RT", SKI report 00:42 (2000).
41. A. Boström, P. Bövik, G. Persson and H. Wirdelius, "A model of grain noise for implementation within simSUNDT, a ultrasonic NDT simulation software", Comm. S CeNDT-0301, Göteborg (2003).
42. H. Wirdelius, "Workshop on UT simulation", handouts of lectures, simulation exercises and the simSUNDT manual, Göteborg (2004).
43. J. Niklasson and H. Wirdelius and A. Boström, "Benchmarking - a validation of UTDefect", SKI report 06:30 (2006).
44. H. Wirdelius, G. Persson, K. Hamberg and K. Högberg, "ULIAS4- Experimental validation of a software that models ultrasonic wave propagation through an anisotropic weld", SKI Report 2008:05 (2008).

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<sup>4</sup> Paper III in PhD thesis

<sup>5</sup> Paper IV in PhD thesis