



# Christian-Doppler-Laboratorium für integrierte Bauelemente

Dissertationen und Publikationen  
1996 – 2002

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# 1 Einleitung

Der Schwerpunkt in der Forschungsarbeit am Christian-Doppler-Laboratorium für integrierte Bauelemente am Institut für Mikroelektronik der TU Wien unter der Patenschaft der AUSTRIAMICROSYSTEMS AG lag in der Entwicklung moderner Softwarewerkzeuge, die in der Halbleiterherstellung angewandte Prozess-Schritte modellieren und die Fertigung der Bauelemente simulieren, um schließlich deren elektrisches Verhalten mit Hilfe von Bauteilsimulationen bestimmen zu können. Da durch die zunehmende Miniaturisierung bislang vernachlässigbare physikalische Effekte die Herstellungsprozesse und das Bauteilverhalten in immer stärkerem Maße beeinflussen, wurde dem Trend, dass Computersimulationen zunehmend an Bedeutung gewannen, Rechnung getragen. Moderne Computer verfügen heute über eine ausreichende Rechenleistung, um eine zeit- und kostengünstige Alternative zu Experimenten für die weitere Entwicklung und Optimierung von Bauelementen und den Technologien für ihre Herstellung darzustellen. Am Institut für Mikroelektronik wird und wurde daher an der Entwicklung eines umfassenden Halbleitertechnologie-CAD-System (TCAD-System) gearbeitet, an der auch die Mitarbeiter des Christian-Doppler-Laboratoriums teilnahmen.

Im Christian-Doppler-Laboratorium waren während der letzten sieben Jahre unter der wissenschaftlichen Leitung von o.Univ.Prof. Dipl.-Ing. Dr.techn. S. Selberherr insgesamt zehn Mitarbeiter tätig, welche ihren individuellen wissenschaftlichen Schwerpunkten (siehe Jahresberichte) nachgegangen sind. Das Ziel eines durchgehenden Simulationsflusses konnte jedoch vornehmlich durch teamorientiertes Arbeiten in enger, fachübergreifender Zusammenarbeit erreicht werden. Um in diesem Gesamtbericht einen Überblick über die vielfältigen Ergebnisse dieser Arbeiten geben zu können, werden im Folgenden alle abgeschlossenen Dissertationen und Publikationen angeführt.

## 2 Dissertationen

Zwischen 1998 und 2002 konnten sieben Mitarbeiter des Christian-Doppler-Laboratoriums ihre Dissertationen abschließen, welche in elektronischer Form über die Homepage des Institutes (<http://www.iue.tuwien.ac.at>) abgerufen werden können.

Den Beginn machte im Jahr 1998 Dr. Heinrich Kirchauer mit seiner Dissertation zum Thema *Photolithography Simulation* [D1]. Im darauffolgenden Jahr konnten drei Mitarbeiter des Christian-Doppler-Laboratoriums ihre Dissertationen abschließen, nämlich Dr. Richard Plasun [D2] über *Optimization of VLSI Semiconductor Devices*, Dr. Martin

Rottinger [D3] über *Selected Simulations of Semiconductor Structures* und Dr. Rudolf Strasser [D4] über das Thema *Rigorous TCAD Investigations on Semiconductor Fabrication Technology*,

Im Jahr 2000 konnte Dr. Wolfgang Pyka seine Dissertation, *Feature Scale Modeling for Etching and Deposition Processes in Semiconductor Manufacturing* [D5], abschließen. Dr. Markus Gritsch und Dr. Clemens Heitzinger beendeten ihre Arbeiten zu den Themen *Numerical Modeling of Silicon-on-Insulator MOSFETs* [D6] bzw. *Simulation and Inverse Modeling of Semiconductor Manufacturing Processes* [D7] im Jahr 2002.

Die Mitarbeiter des Christian-Doppler-Laboratoriums Dipl.-Ing. Johann Cervenka, Dipl.-Ing. Robert Kosik und Dipl.-Ing. Stephan Wagner vollführen ihr Dissertationsstudium plangemäß und werden dieses in absehbarer Zeit auch abschließen.

## 2.1 Gesamtverzeichnis aller Dissertationen

- [D1] H. Kirchauer. *Photolithography Simulation*. Dissertation, Technische Universität Wien, 1998.
- [D2] R. Plasun. *Optimization of VLSI Semiconductor Devices*. Dissertation, Technische Universität Wien, 1999.
- [D3] M. Rottinger. *Selected Simulations of Semiconductor Structures*. Dissertation, Technische Universität Wien, 1999.
- [D4] R. Strasser. *Rigorous TCAD Investigations on Semiconductor Fabrication Technology*. Dissertation, Technische Universität Wien, 1999.
- [D5] W. Pyka. *Feature Scale Modeling for Etching and Deposition Processes in Semiconductor Manufacturing*. Dissertation, Technische Universität Wien, 2000.
- [D6] M. Gritsch. *Numerical Modeling of Silicon-on-Insulator MOSFETs*. Dissertation, Technische Universität Wien, 2002.
- [D7] C. Heitzinger. *Simulation and Inverse Modeling of Semiconductor Manufacturing Processes*. Dissertation, Technische Universität Wien, 2002.

### 3 Publikationen

In den folgenden Abschnitten sind alle Publikationen, die von den Mitarbeitern des Christian-Doppler-Laboratoriums während der letzten Jahre veröffentlicht wurden, aufgelistet.

#### 3.1 Veröffentlichungen im Jahr 1996

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- [P11] Ch. Pichler, R. Plasun, R. Strasser, und S. Selberherr. Simulation Environment for Semiconductor Technology Analysis. In *SISPAD'96 – 1996 International Conference on Simulation of Semiconductor Processes and Devices*, Seiten 147–148, Tokyo, Japan, 1996.
- [S1] P. Fleischmann, R. Sabelka, A. Stach, R. Strasser, und S. Selberherr. Grid Generation for Three-Dimensional Process and Device Simulation. In *SISPAD'96 – 1996 International Conference on Simulation of Semiconductor Processes and Devices*, Seiten 161–166, Tokyo, Japan, 1996.

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- [P11] Ch. Pichler, R. Plasun, R. Strasser, und S. Selberherr. High-Level TCAD Task Representation and Automation. *IEEE Trans.Semiconductor Technology Modeling and Simulation*, Mai 1997.
- [P12] T. Simlinger, Ch. Pichler, R. Plasun, und S. Selberherr. Technology CAD for Smart Power Devices. In *CAS'97 – 1997 International Semiconductor Conference*, Seiten 383–393, Sinaia, Rumänien, Oktober 1997.
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- [H1] T. Binder, C. Heitzinger, and S. Selberherr. A Qualitative Study on Global and Local Optimization Techniques for TCAD Analysis Tasks, *Proceedings Intl. Conf. on Modeling and Simulation of Microsystems (MSM)*, March 2001, pages 466-469
- [H2] C. Heitzinger, T. Binder, and S. Selberherr. Parallel TCAD Optimization and Parameter Extraction for Computationally Expensive Objective Functions, *Proceedings European Simulation Multiconference ESM*, June 2001, pages 534-538
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- [G1] M. Gritsch, H. Kosina, T. Grasser, S. Selberherr, T. Linton, S. Singh, S. Yu, and M.D. Giles. The Failure of the Hydrodynamic Transport Model for Simulation of Partially Depleted SOI MOSFETs and its Revision. In *Proc. 5th Intl. Conf. on Modeling and Simulation of Microsystems (MSM 2002)*, pages 544–547, San Juan, Puerto Rico, April 2002.
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### 3.9 Statistischer Überblick

Die insgesamt 88 Publikationen wurden in den beiden nachfolgenden Tabellen aufgeschlüsselt. Dabei ist zu beachten, dass bei einer Veröffentlichung (S1/1999) Dr. R. Strasser Erstautor und Dr. R. Plasun Zweitautor ist, wodurch in Tabelle 1 die Gesamtsumme 89 beträgt.

Name	als Erstautor	als Co-Autor
Dipl.-Ing. H. Cervenka	3	1
Dr. M. Gritsch	8	4
Dr. C. Heitzinger	13	7
Dr. H. Kirchauer	7	0
Dipl.-Ing. R. Kosik	1	7
Dr. R. Plasun	4	7
Dr. W. Pyka	9	5
Dr. M. Rottinger	2	1
Dr. R. Strasser	3	4
Dipl.-Ing. S. Wagner	2	1
Summe	52	37

Tabelle 1: Anzahl an Publikationen pro Mitarbeiter als Erst- bzw. Co-Autor.

Jahr	in Zeitschriften	für Konferenzen
1996	0	5
1997	3	6
1998	3	13
1999	3	7
2000	4	4
2001	2	16
2002	4	9
i.V.b.	4	5
Summe	23	65

Tabelle 2: Anzahl an Publikationen pro Jahr in Zeitschriften bzw. für Konferenzen.