LUNDS TEKNISKA HÖGSKOLA
Lunds universitet

Magnus Ögren

770406-4679

HAR AVLAGT

Civilingenjörsexamen

i teknisk fysik

DEN 7 JUNI 2004

HAS BEEN AWARDED THE DEGREE OF

Master of Science

in Engineering Physics

ON 7 JUNE 2004

GUNILLA JONSON
REKTOR, LTH/*DEAN OF FACULTY*

Examensbeviset utfärdat 18 juni 2004
Degree certificate issued 18 June 2004

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Personnummer/*Civic registration number*

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har i enlighet med bestämmelserna i högskoleförordningen (SFS 1993:100) uppfyllt fordringarna för civilingenjörsexamen i teknisk fysik, 180 poäng. Utbildningen har omfattat kurser förtecknade på följande sidor samt ett examensarbete inom ämnet:

has fulfilled the requirements for the Degree of Master of Science in Engineering Physics, 180 credit points/270 ECTS credits, in accordance with the Higher Education Ordinance (SFS 1993:100). The education consists of the courses listed on the following pages including a thesis on the subject of:

Matematisk fysik, 20 poäng
Mathematical Physics, 20 credit points/ 30 ECTS credits

Examensarbetets titel:	Modellering av statiska och dynamiska egenskaper för 1-D Bose-gaser vid T=0
Title of the thesis:	*Modeling of Static and Dynamic Properties for 1-D Bose-gases at T=0*
Examinator/*Examiner:*	Professor Sven Åberg

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Signatur/*Signature*

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Kurskod *Code*	Obligatoriska kurser *Compulsory Courses*	Poäng (ECTS-poäng) *Credit Points (ECTS)*	Betyg *Grade*
EDA011	Programmeringsteknik *Programming, First Course*	5 *(7.5)*	Fem
EDT092	Datorsystemteknik *Introduction to Computer Systems*	4 *(6)*	Godkänd
EEM007	Mätteknik *Electrical Measurements*	3 *(4.5)*	Godkänd
ETE021	Kretsteori *Circuit Theory*	4 *(6)*	Fyra
ETE051	Elektromagnetisk fältteori *Electromagnetic Fields*	6 *(9)*	Fem
FAF005	Fysik *Physics, Basic Course*	5 *(7.5)*	Fem
FAF013	Fysik, våglära *Optics*	4 *(6)*	Fem
FAF015	Atomfysik *Atomic Physics*	5 *(7.5)*	Fem
FFF010	Fasta tillståndets fysik, grundkurs *Solid State Physics, Basic Course*	6 *(9)*	Fyra
FHL021	Hållfasthetslära, allmän kurs *Solid Mechanics, Basic Course*	5 *(7.5)*	Fem
FKF011	Kärnfysik, allmän kurs *Nuclear Physics, Basic Course*	3 *(4.5)*	Fem
FMA012	Matematik, grundkurs *Mathematics, Basic Course*	16 *(24)*	Fem
FMA013	Komplex analys *Complex Analysis*	5 *(7.5)*	Fem
FMA014	Linjär analys *Linear Analysis*	5 *(7.5)*	Fem
FMA021	Kontinuerliga system *Applied Mathematics*	5 *(7.5)*	Fem
FME011	Mekanik, grundkurs *Engineering Mechanics, Basic Course*	10 *(15)*	Fem
FMF015	Vektoranalys *Vectoranalysis*	2 *(3)*	Fyra
FMF020	Kvantmekanik, allmän kurs *Quantum Mechanics, Basic Course*	4 *(6)*	Fem
FMN040	Numerisk analys *Numerical Analysis*	4 *(6)*	Fem

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FMS011	Matematisk statistik, allmän kurs *Mathematical Statistics, Basic Course*	5 *(7.5)*	Tre
FRT010	Reglerteknik, allmän kurs *Automatic Control, Basic Course*	5 *(7.5)*	Fem

Kurskod *Code*	Valfria kurser *Optional Courses*	Poäng (ECTS-poäng) *Credit Points (ECTS)*	Betyg *Grade*
FMA110	Matematik fortsättningskurs, analysens grunder *Mathematics, Foundations of Analysis*	4 *(6)*	Fem
FMA120	Matematik fortsättningskurs, matristeori *Mathematics, Matrix Theory*	4 *(6)*	Fem
FMA141	Matematik fortsättningskurs, olinjära dynamiska system *Mathematics, Non-Linear Dynamical Systems*	6 *(9)*	Fem
FMA200	Matematik fortsättningskurs, variationskalkyl *Mathematics, Calculus of Variations*	4 *(6)*	Fem
FMA210	Matematik fortsättningskurs, spektralteori i hilbertrum *Mathematics, Spectral Theory in Hilbert Space*	4 *(6)*	Fem
FMA260	Matematik fortsättningskurs, funktionalanalys och harmonisk analys *Functional Analysis and Harmonic Analysis*	5 *(7.5)*	Fem
FMF060	Relativitetsteori *Theory of Relativity*	2 *(3)*	Fyra
FMF090	Kaos inom naturvetenskap och teknik *Chaos for Science and Technology*	4 *(6)*	Fem
FMF160	Kvantkaos *Quantum Chaos*	5 *(7.5)*	Fem
FMF170	Komplex ekonomi *Complex Economy*	5 *(7.5)*	Fyra
FRT075	Olinjär reglering och servosystem *Non-Linear Control and Servo Systems*	4 *(6)*	Fyra
MAT426	Matematik 4, särskild kurs *Mathematics 4, Special Course*	5 *(7.5)*	Väl godkänd [1)]

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Noter/*Notes*

[1] Denna kurs tillgodoräknas, enligt beslut av utbildningsnämnden, från studier vid Lunds Universitet. Tillämpade godkända betygsgrader är antingen Godkänd eller Väl Godkänd.
This course is credited, according to a decision made by the Board of Undergraduate Studies, from studies at Lund University. Passes are graded as either Pass or High Pass.

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Kommentarer/*Comments*

Samtliga kurser i examensbeviset är godkända. Utbildningsnämnden beslutar vilken betygsskala som ska tillämpas för viss kurs. Den graderade betygsskalan innehåller tre betyg: 3 (tre), 4 (fyra), 5 (fem). En högre siffra betecknar ett bättre betyg. Betyget Godkänd innebär att graderade betyg inte har tillämpats. För kurs som lästs vid annan fakultet anges betygsskalan i noten för den särskilda kursen.
All courses in the degree certificate are passed in a formal examination. The Board of Undergraduate Studies decides which marking scale should be applied to a particular course. The graded marking scale comprises three levels: 3 (three), 4 (four), 5 (five). A higher figure signifies a better grade. The grade "Godkänd" means a pass for which a graded marking scale is not applicable. Courses taken at other faculties are graded according to the scale stated in the note for the particular course.

Detta bevis är fastställt 7 januari 2003 av styrelsen för Lunds Tekniska Högskola (Dnr LTH G 41 336/2003).
This diploma was adopted by the Board of the Lund Institute of Technology on 7 January 2003 (Dnr LTH G 41 336/2003).

Särskilda upplysningar, se bifogat Diploma Supplement.
For information, see attached Diploma Supplement.

Postadress/*Postal address*: Lunds Tekniska Högskola, Box 118, SE-221 00 Lund, Sweden
Telefon/*Telephone*: +46 *(0)*46 222 00 00 Internet/*Internet*: http://www.lth.se

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LUNDS TEKNISKA HÖGSKOLA
Lunds universitet

DIPLOMA SUPPLEMENT

This Diploma Supplement follows the model developed by the European Commission, Council of Europe and UNESCO/CEPES. The purpose of the supplement is to provide sufficient independent data to improve the international "transparency" and fair academic and professional recognition of qualifications (diplomas, degrees, certificates etc.). It is designed to provide a description of the nature, level, context, content and status of the studies that were pursued and successfully completed by the individual named on the original qualification to which this supplement is appended. Information in all eight sections should be provided. Where information is not provided, an explanation should give the reason why.

1. Information identifying the holder of the qualification

1.1 **Family name:** Ögren

1.2 **Given name:** Magnus

1.3 **Date of birth (day/month/year):** 6 April 1977

1.4 **Civic registration number:** 770406-4679

2. Information identifying the qualification

2.1 **Date of issue:** 7 June 2004

2.2 **Name of qualification and (if applicable) title conferred (in original language):** Civilingenjörsexamen i teknisk fysik

2.3 **Name of qualification and (if applicable) title conferred in official translation to English:** Master of Science in Engineering Physics

2.4 **Main field(s) of study for the qualification:** Engineering Physics

2.5 Name (in original language) and status of awarding institution:
Lunds Tekniska Högskola vid Lunds Universitet (State). For further information, see 6.1.

2.6 Name (in original language) and status of institution (if different from 2.5) administering studies: Not applicable.

2.7 Language(s) of instruction: Mostly Swedish

3. Information on the level of the qualification

3.1 Level of qualification: Grundläggande högskoleutbildning (undergraduate education), 4.5 years.

This translation of level does not correspond to the British and American Systems. For further information, see 6.1.

3.2 Official length of programme: 180 credit points/270 ECTS credits

3.3 Access requirement(s): General eligibility is attained by completing an upper secondary school programme and obtaining a pass grade or better in courses comprising at least 90 per cent of the upper secondary credit points required in the programme, or by providing proof of an equivalent level of knowledge. Additional proofed of specialized knowledge in natural science and mathematics is required.

4. Information on the contents and results gained

4.1 Mode of study: Full-time equivalent.

4.2 Degree requirements:
Scope
A Master of Science in Engineering shall be obtained after completion of course requirements of 180 credit points in total.
Objectives (in addition to the general objectives set out in chapter 1, section 9 of the Higher Education Act)
In order to obtain a Master of Science in Engineering, the student shall have

- acquired knowledge of mathematics and natural science subjects to the extent required to understand and be able to apply the fundamental aspects of mathematics and natural sciences in the chosen area of technology,
- acquired knowledge of and skills in the design of products, processes and working environments, taking into account the abilities and needs of human beings as well as society's objectives as regards social conditions, economy of resources, environment and economy,
- acquired the knowledge enabling him or her, after a few years' work experience within his/her field, to take independent responsibility for development or utilisation of new technology at an internationally competitive level.

The objectives set by the institution of higher education concerned shall in addition apply.

4.3 Programme details (e.g. modules or units studied), and the individual grades/marks/credits obtained: See degree certificate.

4.4 Grading scheme and, if available, grade distribution guidance: The student has passed all courses in the certificate in a formal examination. The Board of Undergraduate Studies decides which marking scale should be applied to a particular course. The graded marking scale comprises three levels: 3 (three), 4 (four), 5 (five). A higher figure signifies a better grade. The grade "Godkänd" means a pass for which a graded marking scale is not applicable. The diploma thesis is not marked on a graded scale. The graded marking scale is not based on ranking of the students. Courses taken at other faculties are graded according to a scale stated in the certificate.

4.5 Overall classification of the qualification (in original language): Not applicable for Swedish degrees.

5. Information on the function of the qualification

5.1 Access to further study: This degree gives general eligibility to PhD studies.

5.2 Professional status (if applicable): Regulated education in accordance with the Swedish Degree Ordinance and covered by directive 89/48/EEC amended by 2001/19/EC.

6. Additional information

6.1 Additional information:

By tradition, universities or faculties of engineering in Sweden are often named "Teknisk högskola" (Institute of Technology or University of Technology). Accordingly, Lunds Tekniska Högskola, which has issued this degree, is the faculty of engineering within Lund University.

Swedish universities offer two professional degrees in engineering: Högskoleingenjör (*BSc in Engineering*) and Civilingenjör (*MSc in Engineering*). The requirement for Högskoleingenjör is normally 3 years of studies (120 credit points/180 ECTS credits). The degree normally includes the field of study, e.g. *BSc in Electrical Engineering*.

The degree Civilingenjör (*MSc*) is normally awarded as a first degree after 4.5 years of studies. Optionally, a Civilingenjör degree can be obtained following studies on top of a Högskoleingenjör (*BSc*) degree. The requirement for a Civilingenjör degree is identical, regardless of the path of studies.

Both engineering degrees give general eligibility for admission to postgraduate studies.

6.2 Further information sources:

Office of Diplomas
Lunds Tekniska Högskola
Box 118
SE-221 00 Lund
Sweden
+46 46 222 00 00
http://www.lth.se

The Higher Education Sector of Sweden (National Agency of Higher Education)
http://www.hsv.se/english/sector/

7. Certification of the supplement

7.1 Date: 18 June 2004

7.2 Signature and official stamp or seal (if used)

Marianne Abrahamsson

LUND INSTITUTE OF TECHNOLOGY
Lund University

7.3 Capacity: Degree Officer

8. Information on the national higher education system

The Swedish Higher Education System
(The following description is approved by the National Agency for Higher Education)
GENERAL
Higher education institutions have great autonomy in the organisation of studies, use of resources and general organisation. The higher education institutions in Sweden are designated as either universitet or högskola. The status of universitet is awarded by the Government to higher education institutions fulfilling certain criteria. Diplomas from all higher education institutions recognised by the Government have equal official value. The same law governs all higher education institutions. Independent higher education providers may be recognised by the Government, obtain the right to award degrees and receive state subsidies. All recognised higher education is funded by the State. All programmes and major subjects are to be evaluated by the National Agency for Higher Education every six years, starting from 2001.

GRADING
The Higher Education Ordinance states that the following grades can be awarded: Pass with Distinction (väl godkänd), Pass (godkänd) or Fail (underkänd) unless the institution decides to grade on some other scale. A number of courses use only two grades: Pass and Fail. Others, like Law and Engineering, traditionally use scales with several levels – expressed as letters or numbers. No overall grade is given for a degree and students are not ranked.

DEGREES
Higher education is provided in the form of courses. These may be combined to constitute degree programmes with varying levels of individual choice. Students themselves are also able to combine different courses for the award of a degree. A course syllabus is required for each undergraduate course and a curriculum for each degree programme.

Sweden has a system of credit points (poäng); one week of successful full-time study is equivalent to 1 credit point. One academic year usually yields 40 credit points.

In the Degree Ordinance, the Government has laid down which degrees may be awarded and the objectives for these degrees. In the Swedish higher education system there are generally no intermediate qualifications. All degrees are regarded as final qualifications, even if there is a possibility to continue studying. Degrees are divided into general degrees and professional degrees.

GENERAL DEGREES

1. Högskoleexamen requiring a minimum of 80 credit points.
2. Kandidatexamen requiring a minimum of 120 credit points with 60 credit points in the major subject including a thesis/degree project of 10 credit points.
3. Magisterexamen med ämnesdjup (Master of) requiring a minimum of 160 credit points with 80 credit points in the major subject including one thesis/degree project of 20 or two thesis/degree projects of 10 credit points each.
4. Magisterexamen med ämnesbredd (Master of) requiring a minimum of 40 credit points with specialisation including a thesis/degree project of at least 10 credit points. A prerequisite for Magisterexamen med ämnesbredd is a general or professional degree of at least 120 credit points or a comparable foreign degree.

Kandidatexamen and Magisterexamen med ämnesdjup may indicate the major subject or faculty, e.g. ekonomie magisterexamen (... of Science in Business Administration or ... of Science in Economics). The most advanced courses (at the 61–80 credit points level) for Magisterexamen med ämnesdjup can be accepted as partial fulfilment of the requirements for a doctoral programme.

PROFESSIONAL DEGREES

Professional degrees are awarded in the fields of engineering, health care, agriculture, law, education, the arts etc. There are around 60 professional degrees. Programmes leading to professional degrees vary in length depending on their character. Some of the professional degrees demand a previous undergraduate qualification as a prerequisite, especially within the field of health care. Institutions have to apply for the right to award professional degrees.

ACCESS AND ADMISSION TO HIGHER EDUCATION

Higher education in Sweden has two strata of eligibility: general/basic and (additional) specific requirements. The general eligibility is the same for all higher education. General eligibility is attained by completing an upper-secondary school programme and obtaining a pass grade or better in courses comprising at least 90 per cent of the credits required for the programme, or by providing proof of an equivalent level of knowledge. People who are at least 25 years old, who have been employed for four years and who have a command of English and Swedish corresponding to that obtained by completing a national upper-secondary programme are also considered to have general eligibility. The specific requirements vary according to the field of higher education and are expressed in terms of upper-secondary school qualifications in specific subjects. Restricted admission is used for all study programmes and courses.

POSTGRADUATE STUDIES

Higher education institutions with the status of universitet have permanent allocations of funds for research and postgraduate programmes and may award doctoral degrees, whereas at institutions designated as högskola these rights may be restricted to specific research areas only or they may have research links with a universitet.

For admission to postgraduate programmes undergraduate qualifications of at least 120 credit points are required. Furthermore, the appropriate faculty board may stipulate additional requirements for admission. Postgraduate programmes nominally comprise 160 credit points (four years of full-time study) and lead to a doktorsexamen (PhD). A PhD student must complete a number of taught courses and write a doctoral dissertation. The dissertation must be defended at a public oral examination. A licentiatexamen (licentiate degree) can be obtained after a minimum of 2 years (80 credit points) and requires course work and a thesis. Normally students aim directly for a doktorsexamen but it is also possible to take a licentiatexamen as an intermediate degree. All faculties can award a licentiatexamen or doktorsexamen, in which the discipline is named, e.g. teknologie licentiatexamen (Licentiate in Technology). However a faculty of engineering, like any other, may also award a filosofie doktorsexamen (PhD).