



Programme for UKNC Conference, Oxford

5th-6th January 2017

Meeting location

The conference will be held in the Martin Wood complex of the Physics Department of the University of Oxford, which is part of the Clarendon Laboratory, on Parks Road, (OX1 3PU)

<https://www2.physics.ox.ac.uk/enterprise/services-and-specialist-equipment/conference-facilities>

Accommodation will be provided at The Queen's College, which is situated in the High Street, (OX1 4AW)

<http://www.queens.ox.ac.uk/>

For those people arriving by car it is recommended that they use the Park and Ride facilities, which costs £8 for 2 days. A link to information on this service is given below.

<https://www.oxfordshire.gov.uk/cms/public-site/park-and-ride>

On arrival delegates should go to the first floor landing of the Martin Wood lecture theatre for coffee and to collect badges. All talks will be held in the Martin Wood lecture theatre.

Maps of these locations are shown at the end of this document.

Thursday 5th Jan.

10.15-10.40: Arrival/Registration (Landing of Martin Wood lecture theatre)

10.40-10.45

Introductory remarks: Tom Foxon, Ted Thrush, Robert Taylor

10.45-11.30

10 lessons from Industry about GaN development (invited)

Mark Gajda

GaN and MOSFET Innovation, NXP, Manchester

11.30-11.45

Surface Morphology of MOVPE-grown Nitrogen-polar AlN and Its Application as a Nucleation Layer

Quanzhong Jiang, Duncan W.E. Allsopp and Chris R. Bowen

Dept. of Electronic and Electrical Engineering, University of Bath

11.45-12.00

Buffer Design for the Suppression of Current Collapse in GaN Power Transistors

M. J. Uren and M. Kuball

Centre for Device Thermography and Reliability, H H Wills Physics Laboratory, University of Bristol

12.00-12.15

Impact of silicon nitride stoichiometry on the effectiveness of AlGaIn/GaN HEMT fieldplates

W. M. Waller¹, M. Gajda², S. Pandey², J. J. T. M. Donkers², D. Calton², J. Croon², J. Šonský², M. J. Uren¹ and M. Kuball¹

¹ *CDTR, H H Wills Physics Laboratory, University of Bristol*

² *NXP Semiconductors, Stockport, United Kingdom*

12.15-12.30

Microstructural analysis of E-mode InAlN/GaN high electron mobility transistor structures grown on silicon wafer by metal organic vapour phase epitaxy

F. Tang¹, I. Guiney¹, J. Barnard¹, D. J. Wallis¹, C. J. Humphreys¹, R. A. Oliver¹, K. B. Lee², Z. Zaidi², P. A. Houston², T. Martin³, P. Bagot³ and M. Moody³

¹ *Dept. of Materials Science and Metallurgy, University of Cambridge*

² *Dept. of Electronic and Electrical Engineering, University of Sheffield*

³ *Dept. of Materials, University of Oxford*

12.30-12.45

Self-Heating and Inverse Piezoelectric Stress in GaN Power Devices

J.W. Pomeroy, M. Power, M.J. Uren and M. Kuball

Centre for Device Thermography and Reliability (CDTR), H.H. Wills Physics Laboratory, University of Bristol

12.45-13.45: Lunch (Landing of Martin Wood lecture theatre)

13.45-14.00:

Design of Normally-off V-groove Vertical High Electron Mobility Transistors using (11-22) Semi-polar GaN

H. Qian¹, K. B. Lee¹, S. Hosseini Vajargah², S. V. Novikov³, I. Guiney², Z. H. Zaidi¹, S. Jiang¹, D. J. Wallis², C. T. Foxon³, C. J. Humphreys² and P. A. Houston¹

¹ *Dept. of Electronic and Electrical Engineering, University of Sheffield*

² *Dept. of Material Science and Metallurgy, University of Cambridge*

³ *School of Physics and Astronomy, University of Nottingham*

14.00-14.15

High Voltage All GaN Integrated Cascode Metal-Insulator-Semiconductor Heterostructure Field Effect Transistors

S. Jiang¹, K. B. Lee¹, P. F. Miaja², I. Guiney³, Z. H. Zaidi¹, H. Qian¹, D. J. Wallis³, A. J. Forsyth², C. J. Humphreys³ and P. A. Houston¹

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14.15-14.30

GaN nanocolumn based Schottky diode

V. Z. Zubialevich¹, P. Pampili^{1,2}, M. White¹, D. O'Connell¹, A. Hydes¹, A.-M. Kelleher¹, M. McLaren³, M. Arredondo-Arechavala³, G. Sabui⁴, Z. J. Shen⁴ and P. J. Parbrook^{1,2}

¹ Tyndall National Institute, University College Cork, Ireland

² School of Engineering, University College Cork, Ireland

³ School of Mathematics and Physics, Queen's University Belfast, Northern Ireland

⁴ Electrical and Computer Engineering Dept., Illinois Institute of Technology, IL-60616 Chicago, USA

14.30-14.45

Prospects for THz emission from GaN Gunn diodes.

D. R. Naylor¹, N. P. Appleyard¹, B. K. Ridley² and A. Dyson¹

¹ School of Mathematics and Physical Sciences, University of Hull

² School of Computing Science and Electronic Engineering, University of Essex, Colchester

14.45-15.00

High-Temperature Molecular Beam Epitaxy of Boron-Nitride.

T.S. Cheng¹, Y. Cho¹, A. Summerfield¹, J. Diez-Albar¹, A. Davies^{1,2}, C.J. Mellor¹, A.N. Khlobystov², L. Eaves¹, C.T. Foxon¹, P.H. Beton¹ and S.V. Novikov¹

¹ School of Physics and Astronomy, University of Nottingham

² School of Chemistry, University of Nottingham

15.00-15.15

Group III doping of the II-IV nitrides: properties of the $\text{Al}_{2x}\text{Mg}_{(1-x)}\text{Si}_{(1-x)}\text{N}_2$ alloy system

James B. Quirk¹, Mikael Råsander¹, Shiny Mathew², Jonathan Rackham¹, Robert Palgrave² and Michelle A. Moram¹

¹ Dept. of Materials, Imperial College London

² Dept. of Chemistry, University College London

15.15-15.30

The Mg acceptor in GaN: synonymity and the classical qubit

K.P. O'Donnell¹, A.K. Singh¹, P.R. Edwards¹, K. Lorenz², M.J. Kappers³ and M. Boćkowski⁴

¹ SUPA Department of Physics, University of Strathclyde, Glasgow

² IST, Universidade de Lisboa, CTN, Estrada Nacional 102695-066 Bobadela LRS Portugal

³ Department of Materials Science and Metallurgy, University of Cambridge

⁴ Institute of High Pressure Physics PAS, Sokolowska 29/37, 01-142 Warsaw, Poland

15.30-16.00: Tea (Landing of Martin Wood lecture theatre)

16.00-16.45

Emerging Applications of III-Nitride Nanostructures: From Deep UV Photonics to Artificial Photosynthesis (invited)

Zetian Mi

Department of Electrical Engineering and Computer Science, University of Michigan, Ann Arbor, USA

16.45-17.00

Nanoporous distributed Bragg reflectors for optical microcavities in non-polar GaN

J.C. Jarman¹, T. Zhu¹, Y. Liu¹, T. Ding², R.V. Kumar¹ and R.A. Oliver¹

¹ Dept. of Materials Science and Metallurgy, University of Cambridge

² NanoPhotonics Centre, University of Cambridge

17.00-17.15

Fabrication and optical properties of InGaN/GaN nanotubes for cavity based lasers

E.D. Le Boulbar¹, P.-M. Coulon¹, M. Athanasiou², J. Pugh³, G. Kusch⁴, A. Sarua³, R. Smith², R.W. Martin⁴, M. Cryan³, T. Wang², D.W.E. Allsopp¹, and P.A. Shields¹

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³ Dept. of Electrical and Electronic Engineering, University of Bristol

⁴ Dept. of Physics, SUPA, University of Strathclyde, Glasgow

17.15-17.30

Scanning electron microscope based electron diffraction studies of MOVPE grown (11-22) GaN on overgrown GaN micro rod templates

G. Naresh-Kumar¹, A. Vilalta-Clemente², Y. Zhang³, J. Bai³, Y. Hou³, R. M. Smith³, X. Yu³, Y. Gong³, T. Wang³, A. J. Wilkinson², R. W. Martin¹ and C. Trager-Cowan¹

¹ Dept. of Physics, University of Strathclyde, Glasgow

² Dept. of Materials, University of Oxford

³ Dept. of Electronic and Electrical Engineering, University of Sheffield

17.30-18.15: AGM (Small lecture room of Martin Wood complex)

19.30: Dinner (Dining Hall, Queen's College)

Friday 6th Jan.

7.30-8.45: Breakfast (Buttery, Queen's College)

9.00-9.45

AlGaIn quantum well based deep UV emitters (invited)

T. Wernicke¹, C. Kuhn¹, M. Martens¹, C. Reich¹, L. Sulmoni¹, F. Mehnke¹, J. Enslin¹, M. Guttman¹, K. Bellmann¹, A. Knauer², C. Hartmann³, S. Hagedorn², A. Mogilatenko², U. Zeimer², G. Kusch⁴, M. Feneberg⁵, P.R. Edwards⁴, A. Dittmar³, J. Wollweber³, M. Lapeyrade², J. Rass², S. Einfeldt², R.W. Martin⁴, R. Goldhahn⁵, M. Bickermann³, M. Weyers², and M. Kneissl^{1,2}

¹ Technische Universität Berlin, Institute of Solid State Physics, Berlin, Germany

² Ferdinand-Braun-Institut, Leibniz-Institut für Höchstfrequenztechnik, Berlin, Germany

³ Leibniz-Institut für Kristallzüchtung, Berlin, Germany

⁴ University of Strathclyde, SUPA, Glasgow, United Kingdom

⁵ Otto-von-Guericke-Universität, Institut für Experimentelle Physik, Magdeburg, Germany

9.45-10.00

From UVA to UVC III-Nitride nanorod template: A systematic study on the effect of etching conditions on the array properties

P.-M. Coulon¹, E. Le Boulbar¹, V. Zubialevich², P. Parbrook², D. Allsopp¹ and P.A. Shields¹

¹ Dept. Electrical & Electronic Engineering, University of Bath

² Tyndall National Institute, University College Cork, Ireland

10.00- 10.15

A computer-controlled light engine for photocatalysis based on ultra-violet light emitting diodes

A. Sergejevs¹, C.T. Clarke¹, J. Marugán², R. Timmers², C. Casado², A. Jaroenworarluck³, N. Gathercole⁴, A. Beasley¹, C.R. Bowen⁴ and D.W.E. Allsopp¹

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² *Dept. of Chemical and Environmental Technology, Universidad Rey Juan Carlos, 28933 Móstoles, Spain*

³ *National Metal and Materials Technology Center (MTEC), Pathum Thani 12120, Thailand*

⁴ *Dept. of Mechanical Engineering, University of Bath*

10.15-10.30

GaN-on-diamond electronics: Benefits and challenges

Martin Kuball

Centre for Device Thermography and Reliability (CDTR), University of Bristol

10.30-11.00: Coffee (Landing of Martin Wood lecture theatre)

11.00-11.15

Nano-cathodoluminescence reveals the effect of electron damage on the optical properties of III-nitride optoelectronics and the damage threshold

J. T. Griffiths¹, S. Zhang¹, J. Lhuillier¹, D. Zhu¹, A. Howkins², I. Boyd², D. Stowe³, D. J. Wallis¹, C. J. Humphreys¹ and R. A. Oliver¹

¹ *Dept. of Materials Science and Metallurgy, University of Cambridge*

² *Experimental Techniques Centre, Brunel University, Uxbridge*

³ *Gatan UK, Abingdon, Oxon*

11.15-11. 30

Thermal Redistribution of Carriers Amongst Localised states in InGaN/GaN Quantum Wells Investigated Using Temperature Dependent Resonant Photoluminescence

S. Hammersley¹, D. Tanner^{2,3}, M.J. Kappers⁴, R.A. Oliver⁴, C.J. Humphreys⁴, S. Schulz² and P. Dawson¹

¹ *School of Physics and Astronomy, Photon Science Institute, University of Manchester*

² *Photonics Theory Group, Tyndall National Institute, Cork, Ireland.*

³ *Dept. of Physics, University of Cork, Cork, Ireland.*

⁴ *Dept. of Materials Science and Metallurgy, University of Cambridge*

11.30-11.45

Spectroscopic studies of defects in zincblende GaN films

S. A. Church¹, S. Hammersley¹, P. W. Mitchell¹, M. J. Kappers², S. L. Sahonta², M. Frentrup², D. Nilsson³, P. J. Ward³, L. J. Shaw³, D. J. Wallis², C. J. Humphreys², R. A. Oliver², D. J. Binks¹ and P. Dawson¹

¹ *Photon Science Institute & School of Physics and Astronomy, University of Manchester.*

² *Dept. of Materials Science & Metallurgy, University of Cambridge.*

³ *Anvil Semiconductors Ltd, Cambridge.*

11.45-12.00

Investigations into high energy emission band from InGaN/GaN quantum well structures observed under high excitation power densities

G. M. Christian¹, S. Hammersley¹, M. J. Kappers², C. J. Humphreys², R. A. Oliver², D. J. Binks¹, P. Dawson¹

¹ *School of Physics and Astronomy, Photon Science Institute, University of Manchester,*

² *Dept. of Materials Science and Metallurgy, University of Cambridge*

12.00-12.15

Nanosopic insights into the effect of silicon on core-shell InGaN/GaN nanorods: luminescence, composition, and structure.

C. X. Ren, F. Tang, R. A. Oliver, T. Zhu

Dept. Materials Science and Metallurgy, University of Cambridge

12.15-13.15 Posters (Foyer of Martin Wood complex)

13.15-14.15: Lunch (Landing of Martin Wood lecture theatre).

14.15-14.30

Luminescence and conductivity studies of chevrons in semi-polar (11-22) multiple quantum well structures

C. Brasser¹, J. Bruckbauer¹, Z. Li², L. Jiu², J. Bai², P. R. Edwards¹, T. Wang² and R. W. Martin¹

¹ *Dept. of Physics, SUPA, University of Strathclyde, Glasgow*

² *Dept. of Electronic and Electrical Engineering, University of Sheffield*

14.30-14.45

Stimulated Emission from Semi-polar (11-22) GaN Overgrown on Sapphire

B. Xu, Y. Zhang, L. Jiu, Y. Gong, L. C. Wang, J. Bai and T. Wang

Dept. of Electronic and Electrical Engineering, University of Sheffield

14.45-15.00

Semipolar LEDs for High Bandwidth Visible Light Communications

B. Corbett, Z. Quan, D. V. Dinh, M. Akhter, I. Izadi, P. Maaskant, P. Parbrook and B. Roycroft

Tyndall National Institute, University College Cork, Cork, Ireland

15.00-15.15

Towards 10 Gb/s Visible Light Communication Using Gallium Nitride micro-LEDs

J.J.D. McKendry¹, R.X.G. Ferreira¹, E. Xie¹, M.S. Islam², X. He¹, S. Videv², S. Rajbhandari³, H. Chun⁴, G. Faulkner⁴, S. Viola⁵, S. Watson⁵, A.E. Kelly⁵, E. Gu¹, D.C. O'Brien⁴, H. Haas², M.D. Dawson¹

¹ *Institute of Photonics, Dept. of Physics, University of Strathclyde, Glasgow*

² *Institute for Digital Communications, Li-Fi R&D Centre, The University of Edinburgh*

³ *School of Computing, Electronics and Maths, Coventry University, Coventry CV1 5FB*

⁴ *Dept. of Engineering Science, University of Oxford*

⁵ *School of Engineering, University of Glasgow*

15.15-15.30

Digital service provided by structured illumination with GaN-LED arrays

J. Herrnsdorf, M. J. Strain, E. Gu, and M. D. Dawson

Institute of Photonics, Dept. of Physics, University of Strathclyde, Glasgow

15.30-16.00: Tea (Landing of Martin Wood lecture theatre)

16.00-16.15

Monolithically Integrated White Light Microdisk Laser from InGaN MQWs on Si

M. Athanasiou¹, R. Smith¹, Y. Gong¹, Y. Hou¹, T. Wang¹, J. Pugh² and M. J. Cryan²

¹ *Dept. of Electronic and Electrical Engineering, University of Sheffield*

² Dept. of Electrical and Electronic Engineering, University of Bristol

16.15-16.30

Sub-Poissonian electroluminescence emission from highly polarised non-polar InGaN quantum dots

C. Kocher¹, T. Puchtler¹, J. C. Jarman², T. Zhu², R. A. Oliver², R. A. Taylor¹

¹ Dept. of Physics, University of Oxford

² Dept. of Material Science, University of Cambridge

16.30-16.45

Non-classical light generation beyond the 200 K thermoelectric barrier with a-plane InGaN quantum dots

T. Wang¹, T. J. Puchtler¹, T. Zhu², S. K. Patra^{3,4}, J. C. Jarman², L. P. Nuttall¹, S. Schulz³, R. A. Oliver² and R. A. Taylor¹

¹ Dept. of Physics, University of Oxford

² Dept. of Materials Science and Metallurgy, University of Cambridge

³ Tyndall National Institute, University College Cork, Cork, Ireland

⁴ Dept. of Electrical Engineering, University College Cork, Ireland

16.45-17.00

Ultra-fast, polarized, single-photon emission from m-plane InGaN quantum dots grown on GaN nanowires

T. J. Puchtler¹, T. Wang¹, C. X. Ren², R. A. Oliver², R. A. Taylor¹ and T. Zhu²

¹ Dept. of Physics, University of Oxford

² Dept. of Materials Science and Metallurgy, University of Cambridge

17.00-17.05: Concluding remarks

Acknowledgements

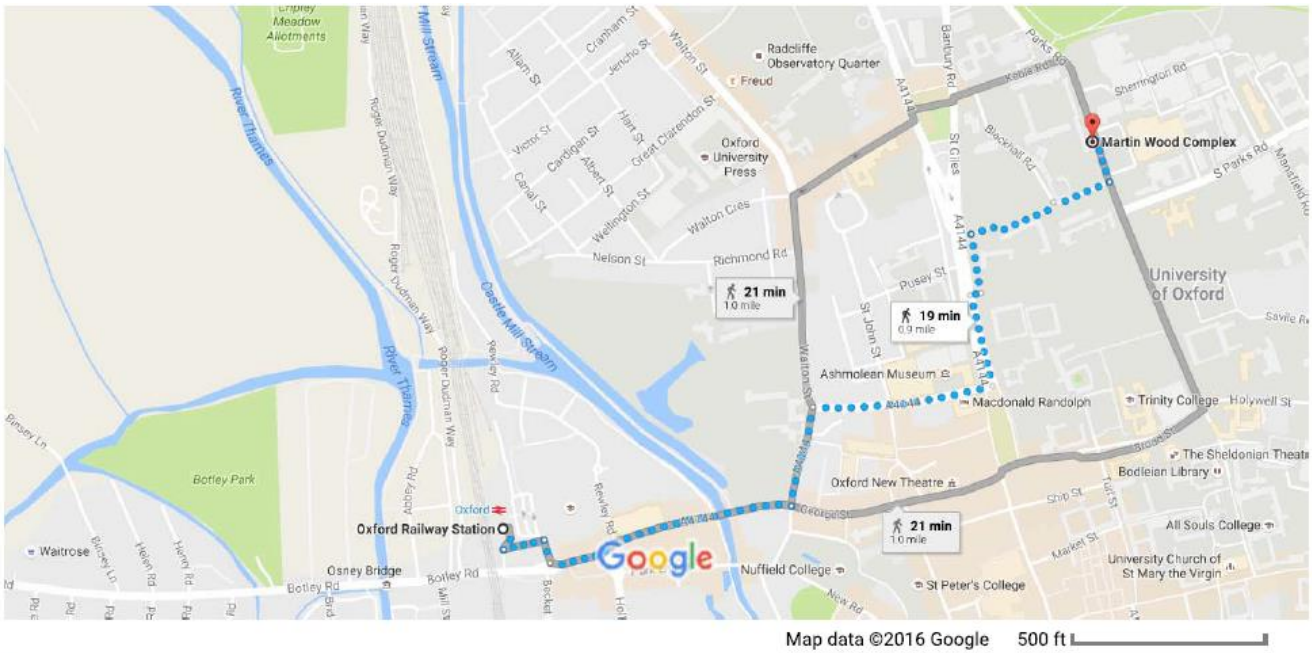
The UKNC conference organisers gratefully acknowledge the sponsorship of the Institute of Physics (IOP).

Posters

- 1 An HBr/Ar atomic layer etch process for precision gate recess etching of GaN-based transistors**
X. Li¹, K. Floros¹, S.-J. Cho¹, D. Hemakumara¹, I. Guiney², D. Moran¹, C. J. Humphreys² and I. G. Thayne¹
¹ University of Glasgow
² Dept. of Materials Science and Metallurgy, University of Cambridge
- 2 Surface preparation of free standing Al_xGa_{1-x}N (0001) layers grown by MBE using a highly efficient RF plasma source**
P.-M. Coulon¹, S. Novikov², C. T. Foxon², A. Bao³, R. A. Oliver³, C. J. Humphreys³, D. Allsopp¹ and P. Shields¹
¹ Dept. Electrical & Electronic Engineering, University of Bath
² School of Physics and Astronomy, University of Nottingham
³ Dept. of Materials Science and Metallurgy, University of Cambridge
- 3 Effects of dislocations on the optical properties of blue and green InGaN/GaN Quantum Wells grown at different temperatures**
B. Ding, F. C.-P. Massabuau, S.-L. Sahonta, M.J. Kappers, C.J. Humphreys, R. A. Oliver
Dept. of Materials Science and Metallurgy, University of Cambridge

- 4 Theoretical model of contrast produced by threading dislocations in GaN as observed in the scanning electron microscope**
E. Pascal¹, B. Hourahine¹, N. G. Kumar¹, M. Nouf-Alleghiani¹, D. Thomson¹, S. Vespucci¹, G. Kusch¹, K. Mingard² and C. Trager-Cowan¹
¹ *University of Strathclyde, Dept. of Physics, SUPA, Glasgow*
² *NPL, Teddington*
- 5 Characterization of basal stacking faults of (11-22) GaN using X-ray diffraction**
M. Pristovsek, M. Frentrup, T. Zhu, F. Tang, R. A. Oliver and C. J. Humphreys
Dept. of Materials Science and Metallurgy, University of Cambridge
- 6 Exciton Localization of Semi-polar (11-22) Al_xGa_{1-x}N with High Al Composition**
Z. Li¹, L. Wang¹, L. Jiu¹, J. Bruckbauer², Y. Gong¹, Y. Zhang¹, J. Bai¹, R. W. Martin² and T. Wang¹
¹ *Dept. of Electronic and Electrical Engineering, University of Sheffield*
² *Dept. of Physics, SUPA, University of Strathclyde*
- 7 Design and fabrication of Gallium Nitride grating couplers using Displacement Talbot Lithography**
E. D. Le Boulbar¹, S. Jia², J.R. Pugh², D.W.E. Allsopp¹, M.J. Cryan², and P.A. Shields¹
¹ *Dept. of Electrical and Electronic Engineering, University of Bath*
² *Dept. of Electrical and Electronic Engineering, University of Bristol*
- 8 Structural analysis of MOVPE-grown zincblende GaN**
M. Frentrup, S.-L. Sahonta, M.J. Kappers, C.J. Humphreys and D.J. Wallis
Dept. of Materials Science and Metallurgy, University of Cambridge
- 9 Characterization of Fe₃N and Fe_xW_(1-x)N₂ thin films grown by electron beam epitaxy**
N. I. M. Nadzri^{1,2}, R. Davies¹, M. A. Moram¹
¹ *Dept. of Materials Imperial College London, SW7 2AZ, UK*
² *School of Materials Engineering, Universiti Malaysia Perlis (UniMAP) 02600 Kompleks Pusat Pengajian Jejawi 2, Perlis, Malaysia*
- 10 Physical properties of MgSiN₂**
M. Råsander, J. B. Quirk and M. A. Moram
Imperial College London
- 11 Low-resistance, Ohmic Transparent Contacts to N-polar n-type GaN**
M. A Hopkins¹, S. Thornley², J. Dutson², G. Christmann³, S. Nicolay³, J. Niemela⁴, M. Creatore⁴, J. Ellis⁵, D.W.E. Allsopp¹
¹ *Dept. of Electrical and Electronic Engineering, University of Bath*
² *Plasma Quest Ltd, Hook, Hampshire*
³ *CSEM, Rue Jaquet-Droz 1, 2002 Neuchatel, Switzerland*
⁴ *Dept. of Applied Physics, Eindhoven University of Technology, The Netherlands*
⁵ *Plessey Semiconductors Ltd., Roborough, Plymouth*

Map showing walking directions from Railway Station to Martin Wood Complex



Map showing walking directions from Martin Wood complex to Queen's College

