Electron and Positron Induced Chemistry
(EPIC)

EU Network contract no. HPRN-CT-2002-00179

Commencement September 2002 (Funds received December 2002)
Duration 36 months
Period covered by this report: September 2002 to October 2004

Network coordinator:
Professor N J Mason
Dept of Physics and Astronomy
The Open University
Walton Hall
Milton Keynes
MK7 6AA
UNITED KINGDOM

Telephone; **44 1908 655132**
Telefax; **44 1908 654192**
Email; **n.j.mason@open.ac.uk**

Network home page: www.isa.au.dk/epic

Part A: Research Results

A1 Scientific Highlights;

The EU Framework V Network Electron and Positron Induced Chemistry (EPIC) is a network of internationally renowned research teams in Europe dedicated to the study of electron and position interactions with molecules. Its research is broadly divided into two sub-topics based upon the type of molecular targets involved.

1. Studies of interactions with halogenated targets are relevant to industrial plasmas, in particular those used in the semiconductor industry.

2. Studies of interactions with biological molecules and in particular the nucleotide based research that is linked to study of radiation damage in DNA.

Participating institutions are;
1.Centre of Molecular and Optical Sciences, The Open University, United Kingdom
2.Department of Physics and Astronomy, University College London, United Kingdom
3.Institut fur Ionenphysik, Leopold Franzens Universitaet Innsbruck, Austria
4.Department of Physical Chemistry, Freie Universitaet Berlin, Germany
5.Department of Chemistry, Universita di Roma 'La Sapienza', Universita di Roma 'La Sapienza', Italy
6. Department of Physics, University of Aarhus, Denmark
7. J Heyrovsky Institute of Physical Chemistry, Academy of Sciences of the Czech Republic, The Czech Republic.
8. Laboratoire des Collisions Atomiques et Moléculaires Université Paris-Sud, Paris, France

Together with collaborators within:
Department of Physics, Trento University, Italy
Department of Physics, University of Bonn, Germany
Department of Physics, Charles University, Prague, Czech Republic
Institute of Physics Belgrade, Serbia
Department of Physics, Comenius University, Slovakia
CSIC, Madrid, Spain
Dept of Physics, Nuovo University of Lisbon

The Network officially started in September 2002 although funds were only received in December 2002 and most network staff were appointed in 2003. With the appointment of Younger researchers the volume and pace of research has greatly accelearated in 2004 with over 300 publications being generated by members of the Network since the commencement of the Network. The Network has shown itself to be a dynamic, rapidly evolving an innovative and unique research programme that has gained international recognition amongst leading scientists in Europe, the USA and Japan.

The study of electron impact with biomolecules has received particular attention with several partners (UIBK,FUB,ULRS,OU) producing pioneering results that provide significant consequences for the molecular description of genotoxic effects in living cells due to low-energy electrons, which are found to be the most abundant secondary species formed from ionizing radiation. Several papers have been published in internationally leading journals (PRL, J Chem. Phys.). Indeed such is the rapid development of this research topic that a new EU Network to investigate interactions with DNA and its

constituent molecules has ben submitted under Framework VI 'Interdisciplinary and Inter sectorial Call for Proposals'. This network has widened the participation to ion and photon interactions with biomolecules and establishes partnerships with the clinical community.

The second highlight concerns the potential of slow electrons to act as a soft tool to control a chemical reaction in the condensed phase. By setting the energy of a well defined electron beam to values below 3 eV it has been shown that it is possible to initiate chemistry at very low incident energies - energies less than that predicted to rupture chemical bonds. This low energy chmsitry is driven by the process of dissociaitve lecoptrn atachment. Frop exampke the FUB team have shown that the surface of a thin film of 1,2-$C_2F_4Cl_2$ molecules can be completely transformed into molecular chlorine (and byproducts, possibly perfluorinated polymers). The effect of complete transformation is based on both the *selectivity* and particular *energy dependence* of the *initial* step of the reaction which is dissociative electron attachment (DEA) to $C_2F_4Cl_2$ [1-3] and the fact that the initial molecule is efficiently decomposed by subexcitation electrons while the product Cl_2 is virtually unaffected. Such experiments suggest hat it is possible to manipulate molecular reactions on surfaces using low energy electrons, such esearch has great significance in the nanotechonology area where 'nanoscale lithography' may be induced by electron patterning (perhpas using Scanning Microscopes).

Developing the Network New EU programmes affiliated to the Network;

As a result of the establishment of collaborations between Partners and recognition of the success in developing a research strategy in those areas of research covered by EPIC the Nework has been able to deepen contacts with other members of the academic community and with several applied/industrial partners. For example the OU team in particular has provided results on several fluorocarbon replacements for the semiconductor industry that have received widespread interest amongst the industrial community particularly in Japan. This has led to the organization of an annual meeting entitled EU-Japan Symposium on Plasma Technology The fRisrt was held under the auspices of EPIC in Stockholm in Juky 2003, the Second in Tokyo, Japan February 2003 and the third in Slovakia in January 2005. The formation of an International Network of Centres of Excellence in Plasma Technology (COE Plasma) in April 2004 in Nagoya Japan included representation from the EPIC Community and in 2005 the second COE Forum will be held in Germany with EPIC participation. The COEs were established with the intention of exchanging staff and students between such centres. It is expected that some of the Young Researchers employed by the Network will take advantage of these exchanges and travel to Japan to conduct further research, their training in the EPIC Network having made them highly suitable personnel for such a programme.

The success of the Network and the demand for other academic laboratories; institures etc to participate I nthe research porgramme evolving from the EPIC Network has led to EPIC members seeking further funding to build upon EPIC, These applications have met with successand. An EU COST Action (Physics P9) on Radiation Damage (RADAM) was awarded and commenced in November 2003 to study radiation damage at the molecular level (www.isa.au.dk/cost). This five year programme links the electron/positron community with those studying ion and photon damage of biological molecules and brings EPIC network members together with radiation chemists and medical researchers. A joint meeting between EPIC and RADAM was held in Lyons 24th to 27th June 2004 http://costp9-radam.in2p3.fr/index.html and brought together over 150 reseearchers. In March 2005 a joiiutn EPIC/COST Training Workshop will be held at Potsdam Berlin and EPIC and COST RADAM will participate both in the international Miller conference on Radiation chemistry to be held in Nice in September and the micordosimetry conference in Venice in November. The COST RADAM has to date allowed over 50 short visits (1 to 4 weeks) to be organized between different groups/institutes and

laboratories many of which have involved EPIC partners either as hosts or travelling fellows including several of the Younger Researchers supported by EPIC who have thus been able to visit and collaborate with teasm not in the Network.

A major achievement of the EPIC Network has ben to demoinstrate the ability of electrons (and positrons) to induced chemistry both in the gas phase, in clusters and on surfaces. By combining our knowledge with that of the nanotechnology community we have established new opportunities for electron induced processing. Accordingly we applied for and were awarded an ESF Funded Programme entitled Electron Induced Processing at the Molecular level (EIPAM) This five yer programme brings EPIC members together with researchers in the Scanning Tunnel Microscopy (STM) community to study how nanoscale physics and chemistry may be developed using STM techniques. The Programme commenced in July 2004 and the first meeting was held as part of the 332th Wilhelm and Else Heraeus Seminar, "Processes Driven by Low Energy Electron-Molecule Interactions" 1st-4th September, 2004 at Bad Honnef, Germany. 2002. The Programme supports short visits, conferences and workshops and *Fellowships*. The frist EIPAM Fellows were been appointed in October 2004 and included several from EPIC partners. In 2005 it is planed to combine the EIPAM and EPIC annual Meetings at Castel Gondolfo in Italy June 25 to 30.

Another aspect of the research conduced under EPIC that was not initially foreseen was the relevance of such research to the cold atom community. Much of the research now developing with cold atoms and molecules involves the interaction of particles including electron-atom and electron-molecule collisions. Therefore members of the EPIC network were approached by members of the cold atom/molecule collision community to discuss areas of mutual interest. An ESF Network entitled 'Collisions in Atom Traps (CATS)' was applied for and granted and wil bring members of the cold atom community and members of EPIC to investigate electron/positron interactions with cold atoms and cold molecules, while also exploring the new world of ultracold plasmas ! This three year programme commenced in October of 2003. In February 2004 a special ESF 'Exploratoy Workshop' on ultracold collisions is to be held in Mulhouse, France that will bring younger EPIC members together with younger researchers in cold atom/molecules

Conclusions on Status of the EPIC Network; The EPIC Network has fulfilled the hopes of its participants in acting as a forum and focus for development of electron and positron research within the European Community. In the next year EPIC will seek to develop still further and explore links with research groups worldwide to ensure that a truly international research programme in electron and positron physics is developed with applications exploited from astrophysics to life sciences.

Thus the network continues to develop its activities not least due to the superb set of younger researchers we have been able ot recruit , we are confident that the third (and final) year of the Network will see even greater success and for the latest new request you view the Network webpage and those of the partners (http://www.isa.au.dk/epic)

Difficulties encountered to date

No major difficulties have been encountered to date. The Network being judged a great success by its participants and by the wider academic research community.

Recruitment was slow for some groups with delays in obtaining the funding from the EC (received only in December 2002) leading to the loss of two young researchers who had in principle agreed to join the network but who took other posts in October 2002 where funds were *immediately* available. This led to

a slower than expected start for positron based research at UCL (partner 2) and for partner 5 (ULRS, Rome). However all posts were filled by late 2003 although some staff only started their training in January 2004. This staggered appointment schedule has required some alteration in the order of training courses with the experimental programme being accelerated and theoretical slightly retarded reflecting the appointment of experimental researchers ahead of theoretical appointees. *These difficulties in appointing staff has however led to some groups not being able ot match the training motnhs in the period Sept 2002 to August 2005, therefore we request a formal extension to December 2005 (the date on which funds for the Network were actually received) – this wil allow all partners to complete their training and ensure no younger researcher's appointment is curtailed.*

In October 2002 the Network co-ordinator left University College London to take up a new post as Professor of Physics and Director of Research at the Open University. Since the original application involved a joint experimental and theoretical training programe at UCL this requires some alteration in the training arrangements between UCL and OU with UCL continuing training in theoretical aspects of the programme and OU undertaking the experimental. For this reason Postdoc appointments were not made until July 2003 (for experiment) and January 2004 (for theory). The two institutes are only an hour travel time apart so the two teams are in weekly contact. Some rearrangement of funds between OU and UCL is also necessary to meet these arrangements.

The largest 'difficulty' of the network to date has been its success ! Many other European groups as well as UC, Japanese, Australian, Brazilian and Indian groups have requested observer status to allow them to integrate with the research programme. We have been pleased to welcome them to our meetings (unpaid) and are delighted by the subsequent research that has evolved form these links. The success in obtaining support for two ESF Networks an ESF programme and a collaboration partnership with Japanese government/industry ASET consortia has show that the EPIC Network is achieving its stated goal of integrating European research in Electron and Positron Chemistry making Europe the international leader in this area. It is an environment in which the young researchers can and do thrive ! We thank the EU for their support.

Younger Resarchers Employed by the Network

The development of such a vibrant research community has proven to be ideal for the training of young research scientists. The major goal of EPIC is to train the next generation of researchers such that research in electron and positron research will continue to grow and develop in the next decade. The network has been fortunate to recruit a unique set of talented younger researchers whose work in the coming years will provide much of the momentum and creativity of the EU research programme. Training of these younger researchers has and will require a set of workshops, the first of which was held in the UK in September 2003 dedicated to training researchers in the study of biological systems and included practical courses in DNA extraction and analysis. A Vacuum training course was held in December 2003 and will be repeated in December 2004. A theoretical methods workshop will be held in Prague February 14 to 18 2005 This meeting is organized by the YRs themselves and will provde them with a unique opportunity to discuss the future development of theoretical modeling of electron/positron interactions with molecules. The meeting specifically precludes more senior staff sicne they may have preconceptions as to which methodology to follow. Younger researchers from India and Brazil will also attend the meeting (funded by non EPIC Funds).

Presentation and communication skills have been developed by their attendance at Network meetings where younger researchers present their work to the Network members and other senior researchers. All younger researchers employed by July gave presentations at the EPIC network meeting in Prague in

July 2003 and again at the Mid-term review meeting in June 2004 in Obergurgl Austria. The standard of the presentations was uniformly high.

The first of the EPIC Yrs to compete their training have all proceeded to new posts with Dr N Jones (UAR) being given a senior post at the Aarhus Storage Ring Facility commencig October 2004, testimony ot the impact she has made during her tiem there as an EPIC Younger Researcher. Dr Abdoul Carime (FUB) has applied for a 5 year research position at the Open University which if successful will become a permanent academic post. Ms Sylwia Ptasinska (UIBK) has submitted her thesis (within the three year period) and is expecte to graduate in November 2004.

A2 Publications:

Those in italic are publications involving one or more network partners. (Brackets indicate partner numbers collaborating in the work with numbers as listed in A1). Underscore indicates younger member of the network.

Partner 1; Open University

1 *Electron and photon induced processes in SF_5CF_3*
*P Limão-Vieira, P A Kendall, S Eden, N J Mason, J Heinesch, M-J Hubin-Franskin, J Delwiche and A Giuliani (2003) Radiation Physics and Chemistry **68** 193-7 (1,6)*

2. *Low Energy Electron Attachment to CH_3CN*
A Pelc, P Limao-Vieira, W Sailer, N J Mason, P Scheier, M Probst and T D Mark Chem Phys Lett (2003) (1,3)

3 Theoretical total ionization cross sections of CH_x, CF_x SiH_x SiF_x (x =1 – 4) and CCl_4 targets by electron impact
K.N. Joshipura, M. Vinodkumar, B.K. Antony and N.J. Mason
Eur. Phys. J. D **23**, 81-90 (2003)

4 Electron Driven Processes; Scientific challenges and technical opportunities
N J Mason (2003) Proceedings of 17th International Conference on the Application of Accelerators in Research and Industry 885-8

5 Study of condensed phase molecules and molecular synthesis in astrophysical environments. A Dawes, P Holtom and N J Mason Recent Developments in Chemical Physics 4 (2003) 519-32

6 *Dissociative electron attachment to formic acid (HCOOH)*
*A Pelc, W Sailer, P Scheier, M Probst, N J Mason, E Illenberger and T D Maerk Chem. Phys Lett **361** 277-84 (2002) (1,3,4)*

7 *Electron attachment to simple organic acids*
A Pelc, W Sailer, P Scheier, N J Mason, E Illenberger and T D Maerk Vacuum 20 (2003) 429-33 (1,3)

8 Temperature Dependent high-resolution infrared photoabsorption cross sections of trifluromethyl sulphur pentafluoride
P A Kendall, N J Mason, G A Buchanan, G Marston, P Tegeder, A Dawes, S Eden, P Limao Vieira and D A Newnham
Chemical Physics **287** 137 – 142 (2003)

9 *Low energy electron attachment to formic acid*
*A. Pelc, W. Sailer, P. Scheier, N.J. Mason and T.D. Märk Eur. Phys. J. D **20**, 441-444 (2002) (1,3)*

10 Shrinking Ozone layer; Global Perspectives and Remedial Measures
S K Pathak and N J Mason Resonance Indian Journal of Science Education

7 71-80 (2002)

11 *Corona discharge in gaseous mixtures: Generation of ozone*
J D Skalny, N J Mason and T Mikoviny
*Romanian Reports in Physics **54** 117- 133 (2002) (1,3)*

12 *2-methyl furan: An experimental study of the excited electronic levels by electron energy loss spectroscopy, VUVphotoabsorption and photoelectron spectroscopy*
A Giuliani, M J Hubin- Franskin, J Delwiche , P Limao Vieira and
N J Mason J. Chem. Phys. 119 (2003) 3670 (1,6)

13 Inelastic scattering and stopping power for electrons in O_2 and O_3 at intermediate and high energies, 0.3-5 keV
A. Williart, P. A. Kendall, F. Blanco, P. Tegeder, G. García, and N. J. Mason
Chem. Phys. Lett. (2003)

14 *The Electronic states of 2-Furanmethanol (Furfuryl alcohol) studied by photon absorption and electron impact spectroscopy.*
A. Giuliani , I. C. Walker ,J. Delwiche, S. V. Hoffmann, P. Limão-Vieira,
N. J. Mason, B. Heyne, M. Hoebeke and M. -J. Hubin-Franskin
J. Chem. Phys. 119 (2003) 7282. (1,6)

15 The Physics of a Thunderstorm B J Mason and N J Mason
Eur J Phys (2003) **24** S99

16 *Electron collisions with the CF radical using the R-matrix method*
*I Rozum, N J Mason and J Tennyson J. Phys B **36** 2419-32 (2003) (1,2)*

17 Electron Scattering from Atoms, Molecules, Nuclei and Bulk Matter
C T Whelan and N J Mason Plenum Press published 2003

18 Electron and Photon impact excitation of CF_3I
S Eden, P Limao Vieira, N J Mason, M Katijma, M Okomoto, D Newnham and S Hoffmann in Electron Scattering from Atoms, Molecules, Nuclei and Bulk Matter ed by C T Whelan and N J Mason Plenum Press 33 - 44 (2003)

19 Electron Energy Loss spectroscopy of Trifluromethyl Sulphur Pentaflouride
P A Kendall and N J Mason in Electron Scattering from Atoms, Molecules, Nuclei and Bulk Matter ed by C T Whelan and N J Mason
Plenum Press 99-110 (2003)

20 Electron Driven process: Scientific Challenges and Technological opportunities N J Mason in Electron Scattering from Atoms, Molecules, Nuclei and Bulk Matter Ed by C T Whelan and N J Mason
Plenum Press 179-190 (2003)

21 The electronic states of isoxazole studied by VUV absorption, electron energy loss spectroscopies and *ab initio* multi-reference configuration interaction calculations. I C Walker, M H Palmer, J Delwiche, S V Hoffman, P LVieira, N J Mason, M F Guest, M J Hubin-Franskin, J Heinsch and A Giuliani J. Chem. Phys. (2003) in press

22 Electron Scattering from Ozone. What do we know ? N J Mason
Physica Scripta (2003) **68** C37-43

23 *VUV photoabsorption of hexafluoropropene*
S. Eden and P. Limão-Vieira, S.V. Hoffmann and N. J. Mason
*Chem Phys Lett (2003) **379** 170-176 (1,6)*

24 *Low energy (0-18eV) electron interaction with free and bound SF_5CF_3: Negative ion formation from single molecules, clusters and nanofilms*
*R Balog, M Stano, P. Limão-Vieira, C Konig, I Bald, N J Mason and E Ilenberger J. Chem Phys (2003) **119** 10396 (1,4)*

25 *Electronic State spectroscopy of acetaldehyde, CH_3CHO by high resolution VUV photo-absorption*
P Limao Vieira , S Eden, N J Mason and S V Hoffmann
Chem. Phys. Lett ***376*** *737-47 (2003) (1,6)*

26 *High resolution photo-absorption studies of acrylonitrile, C_2H_3CN and acetonitrile, CH_3CN Electronic State spectroscopy of acetaldehyde, CH_3CHO by high resolution VUV photo-absorption*
S Eden, P Limao Vieira, P Kendall, N J Mason, S V Hoffmann and S M Spyrou
Eur. Phys. J D ***26*** *201-210 (2003) (1,6)*

27 *Electron collisions with the CF_3 radical using the R-matrix method*
I Rozum, N J Mason and J Tennyson New Journal of Physics (2003) ***5*** *155 (1,2)*

28 *Electronic Excitation of Tetrafluoroethylene, C_2F_4*
S. Eden, P. Limão-Vieira[1], Paul Kendall, N. J. Mason, J. Delwiche, M.-J. Hubin-Franskin, M. Kitajima, H. Tanaka, H. Cho and S.V. Hoffmann (2003)
Chem Phys ***297*** *257-269 (2003) (1,6)*

29 *Complex study of negative corona discharge in pure carbon dioxide and its mixtures with oxygen.*
T Mikoviny, M Kocan, S Matejcik, N J Mason and J D Skalny
J Phys D (2004) 37 64-73 (1,3)

30 *Ozone generation in a negative corona discharge fed with N_2O and O_2*
J D Skalny, S Matejcik, T Mikoviny, S Eden and N J Mason
J Phys D; Applied Physics (2004) ***37*** *1052-57 (1,3)*

31 *An experimental study of SF_5CF_3 by electron energy loss spectroscopy, VUV photo-absorption and photoelectron*
P. Limão-Vieira, S. Eden, P. A. Kendall, N. J. Mason, A. Giuliani, J. Heinesch, M. -J. Hubin-Franskin, J. Delwiche and S. V. Hoffmann
Int J Mass Spec. (2004) ***233*** *335-41 (1,3)*

32 Electron impact ionization studies with aeronomic molecules
B K Anthony, N J Mason and K Joshipura
International J Mass Spec. (2004) **233** 207-214

33 *An analysis of mass spectrometric study of negative ions extracted from negative corona discharge in air.*
Jan D. Skalny, Tomas Mikoviny, Stefan Matejcik, Nigel J. Mason
Int J Mass Spec. (2004) ***233*** *317-24*

34. *R-matrix calculation of low-energy electron collisions with LiH*
B K Antony, N J Mason and J Tennyson J Phys B (2004) ***37*** *1689 - 1697.(1,2)*

35 *On the valence shell electronic spectroscopy of 2-vinyl furan*
A Giuliani, I C Walker, J Delwiche, S V Hoffman, C Kech, P L Vieira,
N J Mason and M J Hubin-Franskin J. Chem Phys (2004) ***120*** *10972-10982 (1,3)*

36 Cross Sections for electron collisions with water molecules
Y Itikawa and N J Mason J Chem Phys Ref Data in press

37. *Sensitization of 5-bromouridien by slow electrons*
H Abdoul-Carime, P Limao-Vieira, S Gohlke, I Petrushko, N J Mason and E Illenberger
Chemical Physics Letters ***393*** *442-7 (2004)(1,4)*

38. *Electronic State spectroscopy of c-C_4F_8 and c- C_5F_8 studied by high resolution VUV photo-absorption*
E Vasekova, N J Mason, P Limao-Vieira and S V Hoffmann
Chem Phys Letters (submitted) (1,6)

39 *Electron interaction cross sections for CF_3I, C_2F_4 and CF_X (x=l-3)radicals*

I. Rozum, P. Limão-Vieira, S. Eden, N. J. Mason and J. Tennyson
J Chem Phys Re f Data (1,2,6)

40 Mechanistic studies on the formation of the amino acid glycine in extraterrestrial ices P D Holtom, C J Bennett, Y Osamura, N J Mason and R I Kaiser
Submitted to Nature(2004)

41. Formation of carbon monoxide and carbon dioxide during 2- 4eV carbon ion irradiation of water ice
A Dawes, M P Davis, P D Holtom, N J Mason, R W McCullough, I D Williams, R Trassl and R I Kaiser
Submitted to Icarus (2004)

42 . *Dissociative Electron Attachment to dinitrogen pentoxide N_2O_5*
P Cicman, G A Buchanan, B Gulejova, J D Skalny, N J Mason, P Scheier and T D Maerk
J Chem Phys (2004) Submitted (1,3)

43 Electron Scattering cross Section for SF_6 and SF_5CF_3 at intermediate and high energies (100 to 1000eV**)**
P Limao-Vieiria, F Blanco, J C Oller, A Munoz, J M Perez, G Garcia and N J Mason (2004) submitted

44 *Electron stimulated desorption of Cl^- from absorbed and condensed Cl_2; Effects of environment and orientation.*
P Tegeder, R Balog, N J Mason and E Illenberger
PCCP (2004) submitted (1,4)

Partner 2; University College London

1. *I Rozum, NJ Mason and J Tennyson*
Electron collisions with the CF2 radical using the R-matrix method
J. Phys. B: At. Mol. Opt. Phys., 35, 1583-1591 (2002).(1,2)
2. JD Gorfinkiel, LA Morgan and J Tennyson.
Electron impact dissociative excitation of water within the adiabatic nuclei approximation
J. Phys. B: At. Mol. Opt. Phys., 35, 543-555 (2002)
3. JD Gorfinkiel, LA Morgan and J Tennyson.
Electron impact dissociative excitation of water within the adiabatic nuclei approximation
J. Phys. B: At. Mol. Opt. Phys., 35, 543-555 (2002)
4. A Faure and J Tennyson.
R-matrix calculations for polyatomic molecular ions: electron scattering by H3+ and H3O+ J. Phys. B: At. Mol. Opt. Phys., 35, 1865-1873 (2002).
5. CS Trevisan and J Tennyson.
Calculated rates for the electron impact dissociation of molecular hydrogen, deuterium and tritium
Plasma Phys. Controlled Fusion, 44, 1263-1276 (2002).
6. A Faure and J Tennyson.
Electron-impact rotational excitation of symmetric top molecular ions
J. Phys. B: At. Mol. Opt. Phys., 35, 3945-3956 (2002).
7. CS Trevisan and J Tennyson.
Calculated rates for the electron impact dissociation of molecular hydrogen: mixed isotopomers and scaling laws
Plasma Phys. Controlled Fusion, 44, 2217-2230 (2002).

8. A Faure and J Tennyson.
Rate coefficients for electron-impact rotational excitation of H3+ and H3O+
Mon. Not. Roy. astr. Soc., 340, 468-472 (2003).
9. *I Rozum, NJ Mason and J Tennyson.*
Electron collisions with CF radicals using the R-matrix method
J. Phys. B: At. Mol. Opt. Phys., (in press) (1,2)
10. J Tennyson, JD Gorfinkiel, I Rozum, CS Trevisan and N Vinci.
Electron molecule collisions calculations using the R-matrix method
Radiation Phys. Chem., (in press).
11. A Faure, J Gorfinkiel and J Tennyson.
Electron-impact rotational excitation rates for the water molecule
Mon. Not. Roy. astr. Soc., (submitted).
12. Laricchia, S Armitage, DE Leslie and P Van Reeth.
Positron and positronium interactions with atoms and molecules
Radiation Physics and Chemistry (2003) in press
13. DE Leslie, S Armitage and G Laricchia.
Positronium Beam Production and Scattering
contributed paper, Positron03 Workshop, Denmark
14. C Arcidiacono, A Kover and G Laricchia.
Electron ejection from collisions of positrons with helium
contributed paper, Positron03 Workshop, Denmark
15. M Szluinska and G Laricchia
Ionization processes induced by positrons
contributed paper, Positron03 Workshop, Denmark
16. M Szluinska, P Van Reeth and G Laricchia.
Empirical scaling of positron- and electron- impact ionization cross-sections
contributed paper, Positron03 Workshop, Denmark
17. G Laricchia, S Armitage and DE Leslie
Positronium induced collisions
invited paper, Positron03 Workshop, Denmark
18. A Kover, C Arcidiacono and G Laricchia.
Experiment on positron-atom scattering
invited paper, Positron03 Workshop, Denmark
19. DE Leslie, S Armitage and G Laricchia.
Production of collimated positronium from molecular nitrogen
J Phys B 35 (2002) 4819-4827
20. S Armitage, DE Leslie, AJ Garner and G Laricchia.
Fragmentation of positronium in collision with He atoms
Physical Review Letters 89 (2002) 173402-1
21. M Szluinska, P Van Reeth and G Laricchia.
Empirical scaling of positron- and electron-impact ionization cross sections
J Phys B 35 (2002) 4059
22. G Laricchia, P Van Reeth, M Szluinska and J Moxom.
Total positron-impact ionization and positronium formation from the noble gases
J Phys B 35 (2002) 2525
23. G Laricchia.
Scattering of positrons and positronium by atoms and molecules in
The Physics of Electronic and Atomic Collisions
(Rinton Press, New York) (2002) 329

24. S Armitage and G Laricchia.
Positronium scattering from atoms and molecules
Nucl. Instr. Meth. B 192 (2002) 67
25. P Van Reeth, M Szluinska and G Laricchia.
On the normalization of the positron-impact direct ionization cross-section in the noble gases
Nucl. Instr. Meth. B 192 (2002) 220
26. A Kövér, K Paludan and G Laricchia.
Electron ejection by positron impact ionization
Nucl. Instr. Meth. B 192 (2002) 167
27. M Szluinska, P Van Reeth and G Laricchia.
Energy dependence of the total ionization and positronium formation cross-sections in e+ - Xe collisions
Nucl. Instr. Meth. B 192 (2002) 215
28. JW Humberston, P Van Reeth and G Laricchia.
Correlations between cross sections and threshold energies for positronium formation and direct ionization
Nucl. Instr. Meth. B 192 (2002) 44
29. M. Szluinska and G. Laricchia Investigation into the energy dependence of the annihilation cross-section for Ne and Xe below the positronium formation threshold Nucl. Instr. Meth. B221 (2004) 100-106
30. G. Laricchia, S. Armitage and D. E. Leslie Positronium induced collisions Nucl. Instr. Meth. B221 (2004) 60-68
31. M. Szłuińska and G. Laricchia Positronium formation from Ar and Xe Nucl. Instr. Meth. B221 (2004) 107-111
32. Á. Kövér, C. Arcidiacono** and G. Laricchia Differential ionization experiments on positron – atom scattering Nucl. Instr. Meth. B221 (2004) 56-59*
33. Z. D. Pešić[**], C. Arcidiacono[**], R. Hellhammer, N. Stolterfoht and G. Laricchia Ionisation and fragmentation of H2O molecule in the interaction with positrons and ions to be published in AIP conference series (2004)

3. UIBK: Institut fuer Ionen Physik, University of Innsbruck

1. L Feketeova, DJ Skalny, G Hanel, B Gstir, M Francis, TD Märk.
Production of Cl via dissociative electron attachment to Cl2
Int. Mass Spectrom., 223/224 (2003) 661-668.
2. A Pelc, W Sailer, P Scheier, NJ Mason, E Illenberger, TD Märk.
Electron attachment to simple organic acids
Vacuum, 70 (2003) 429-433.(3,1)
3. B Gstir, S Denifl, G Hanel, M Rümmele, T Fiegele, M Stano, L Feketeova, S Matejcik, K Becker, P Scheier and TD Märk.
High resolution multiple electron impact ionisation of He, Ne, Ar, Kr and Xe atoms close to threshold: appearance energies and Wannier exponents
Nucl. Instr. Methods, submitted (2002)
4. *G Hanel, B Gstir, S Denifl, D Muigg, T Fiegele, M Rümmele, W Sailer, A Pelc, N Mason, E Illenberger, S Matejcik, F Hagelberg, K Becker, A Stamatovic, M Probst, P Scheier, TD Märk. (3,4)*
High resolution electron interaction studies with atoms, molecules, biomolecules and clusters
Book (N. Mason, ed.) Cambridge Univ. Press, in print (2002)

5. S Matt, R Parajuli, O Echt, C Lifshitz, A Stamatovic, P Scheier and TD Märk.
   Kinetics and energetics of spontaneous and electron-induced fragmentation of molecular ions and cluster ions
   Book of Invited Papers of ICPEAC, in print (2002)
6. H Deutsch, K Becker, P Defrance, U Onthong, M Probst, S Matt, P Scheier and TD Märk.
   Calculated cross section for the electron impact ionisation of simple molecular ions
   Int. J. Mass Spectrometry, 223/224 (2003) 639-646.
7. JD Skalny, S Matejcik, T Mikoviny and TD Märk.
   Effect of temperature on dissociative electron attachment to CCl2F2
   Int.J.Mass Spectrom., 223/224 (2003) 217-228
8. P Cicman, M Francis, JD Skalny, TD Märk.
   The Ion Extraction Efficiency in a Crossed Beams Experiment using a Trochoidal Electron Monochromator
   Int. Mass Spectrom., 223/224 (2003) 271-278
9. P Cicman, A Pelc, W Sailer, S Matejcik, TD Märk.
   Dissociative, electron attachment to CHF2Cl
   Chem.Phys.Lett., 371 (2003) 231-237
10. S Matt-Leubner, A Stamatovic, R Parajuli, A Stamatovic, M Probst, P Scheier, TD Märk, O Echt , C Lifshitz.
    Time resolved kinetic energy release in propane
    Int.J.Mass Spectr., 222 (2003) 213-219
11. K Gluch, J Fedor, S Matt-Leubner, O Echt, A Stamatovic, M Probst, P Scheier and TD Märk.
    Kinetic energy release in Coulomb explosion of metastable C3H52+
    J.Chem.Phys., in print (2002)
12. M Stano, S Matejcik, JD Skalny and TD Märk.
    Electron impact ionisation of CH4 : ionisation energies and temperature effect
    J.Phys.B, submitted (2002)
13. *H Drexel, W Sailer, V Grill, P Scheier, E Illenberger and TD Märk.*
    Electron attachment to C2Cl4 and Trojan horse ionisation
    J.Chem.Phys., submitted 2002 (3,4)
14. P Cicman, K Gluch, A Pelc, W Sailer, S Matt-Leubner, R Compton, TD Märk.
    Electron impact ionization to CHF2Cl: unusual ordering of ionisation energies for parent and fragment ions
    J.Chem.Phys., submitted 2003.
15. K Gluch, P Scheier, W Schustereder, T Tepnual, L Feketeova, C Mair, S Matt-Leubner, TD Märk.
    Cross sections and ion kinetic energies for electron impact ionization of CH4
    Int.J.Mass Spectr., submitted, 2003
16. S Denifl, S Matejcik, B Gstir, G Hanel, M Probst, P Scheier and TD Märk.
    Electron attachment to 5-chloro uracil
    J.Chem.Phys., 118 (2003) 4107-4114
17. W Sailer, A Pelc, M Probst, J Limtrakul, P Scheier, E Illenberger and TD Märk.
    Dissociative electron attachment to acetic acid (CH3COOH)
    Chem.Phys.Lett., submitted 2003.
18. H Deutsch, K Becker, AN Grum-Grzhimailo, K Bartschat, H Summers, M Probst, S Matt-Leubner and TD Märk.
    Calculated cross sections for the electron impact ionisation of excited argon atoms using the DM formalism
    J.Phys.B, submitted 2003

19. *G Hanel, B Gstir, S Denifl, P Scheier, M Probst, B Farizon, M Farizon, E Illenberger and TD Märk. Electron attachment to uracil: effective destruction at subexcitation energies Phys.Rev.Letters, 90 (2003)188104, 1-4* (3,4)

Contributed papers:

1. L Feketeova, A Qayyum, T Tepnual, C Mair, W Schustereder, Z Herman, P Scheier and TD Märk.
   Influence of the charge state and of the internal energy of the projectile on the observed fragmentation pattern in ion/surface collisions
   XIV Symp. Applied Plasma Physics (SAPP), Jasna, 2003
2. P Cicman, K Gluch, A Plec, W Sailer, S Matejcik, M Francis, W Robertson, RN Compton, P Scheier, TD Märk.
   Electron impact ionisation of CHF2Cl
   XIV Symp. Applied Plasma Physics (SAPP), Jasna, 2003
3. J Fedor, R Parajuli, K Gluch, S Matt-Leubner, A Stamatovic, M Probst, P Scheier, TD Märk.
   Metastable decay of Rg2+ (Rg= Ne, Ar, Kr, Xe): mechanisms, dynamics and energetics
   XIV Symp. Applied Plasma Physics (SAPP), Jasna, 2003
4. P Cicman, A Pelc, W Sailer, K Gluch, S Matejcik, P Scheier, TD Märk.
   Electron impact ionization of and dissociative attachment to CHF2Cl
   DPG Frühjahrstagung, Hannover 2003
5. S Matt-Leubner, K Gluch, J Fedor, A Stamatovic, R Parajuli, P Scheier, M Probst, O Echt, C Lifshitz, TD Märk.
   Time-resolved kinetic energy realeases in propane
   DPG Frühjahrstagung, Hannover 2003
6. S Denifl, S Matejcik, S Ptasinska, G Hanel, B Gstir, A Stamatovic, P Scheier, TD Märk.
   Electron attachment and electron impact ionisation of biomolecules
   Jahres-Tagung der deutschen Massenspektrometriegesellschaft DGMS, Münster, 2003
7. K Gluch, J Fedor, R Parajuli, S Matt-Leubner, A Stamatovic, O Echt, P Scheier, TD Märk.
   Decay of ions studied by three sector field mass spectrometry
   Jahres-Tagung der deutschen Massenspektrometriegesellschaft DGMS, Münster, 2003
8. H Deutsch, K Bartschat, A Grum-Grzimailo, K Becker, H Summers, M Probst, S Matt-Leubner, TD Märk.
   Calculated cross sections for the electron impact ionization of excited argon atoms using the Deutsch-Märk (DM) formalism
   ICPIG 2003, Greifswald
9. S Denifl, G Hanel, S Ptasinska, B Gstir, S Matejcik, A Stamatovic, P Scheier, TD Märk.
   Electron impact and attachment studies of biomolecules
   15th Int. Symp. Electron Molecule Collisions and Swarms, Prag, 2003
10. *P Cicman, GA Buchanan, B Gulejova, A Abedi, G Marston, N Mason, A Stamatovic, P Scheier, TD Märk.*
    Electron attachment to N2O5
    15th Int. Symp. Electron Molecule Collisions and Swarms, Prag, 2003 (3,1)
11. S Ptasinska, S Denifl, A Abedi, P Scheier and TD Märk.
    Dissociative electron attachment to glycine by low energy electron impact
    15th Int. Symp. Electron Molecule Collisions and Swarms, Prag, 2003
12. *A Abedi, P Cicman, B Coupier, B Gulejova, GA Buchanan, G Marston, N Mason, A Stamatovic, P Scheier, TD Märk.*

Electron-impact ionization of dinitrogen pentoxide: determination of appearance energies 15th Int. Symp. Electron Molecule Collisions and Swarms, Prag, 2003 (3,1)

13. L Feketeova, B Gstir, S Denbifl, G Hanel, M Rümmele, T Fiegele, M Stano, S Matejcik, K Becker, P Scheier, TD Märk.
    High resolution multiple electron impact ionization of He, Ne, Ar, Kr and Xe atoms close to thershold: appearance energies and Wannier exponents
    15th Int. Symp. Electron Molecule Collisions and Swarms, Prag, 2003
14. S Ptasinska, S Denifl, A Abedi, P Scheier and TD Märk.
    Electron attachment to biological relevant molecules
    ÖPG Jahrestagung, Salzburg, 2003
15. S Feil, K Gluch, S Matt, P Scheier, TD Märk.
    Absolute differentielle, partielle, und totale Ionisierungswirkungsquerschnitte für C2H4 und C2H2 von der Schwellenergie bis 1000 eV
    ÖPG Jahrestagung, Salzburg, 2003

Slovakia Group(subnode)

1. *W Sailer, H Drexel, A Pelc, NJ Mason, E Illenberger, JD Skalny, T Mikoviny, P Scheier, and TD Märk.*
   Low Energy Electron Attachment to SF5CF3
   Chem. Phys. Lett. 351 (2002), 71-78. (1,3,4(
2. *NJ Mason, JD Skalny, and S Hadj-Ziane.*
   Experimental Investigations and Modelling Studies of Ozone Producing Corona Discharges
   Czech. J. Phys. 25 (2002), 85-94. (1,3)
3. *JD Skalný, T Mikovíny, NJ Mason and V Sobek.*
   The Effect of Gaseous Diluents on Ozone Generation from Oxygen
   Ozone Science and Engineering 23 (2002), 29-37.(1,3)
4. *W Sailer, H Drexel, V Grill, A Pelc, B Gstir, M Hanel, M Probst, NJ Mason, E Illenberger, J Fedor, JD Skalny, P Scheier, TD Mark.*
   Negative and positive ionisation processes in SF5-CF3
   Proc. of SAPP Going/Kitzbuhel (Austria), February 2002, pp. 201-204. (1,3,4)
5. P Cicman, JD Skalny, and TD Mark.
   Dissociative electron attachment to ozone: Rate constant
   Proc. of SASP Going/Kitzbuhel (Austria), February 2002, pp. 269-272.
6. L Feketeova, JD Skalny, G Hanel, B Gstir, TD Märk.
   Dissociative electron attachment to Cl2
   Book of Abstracts 2nd LEEMI, (Edit. B. Pezler and I. Szamrej-Forys), Chlewiska/Siedlce (Poland) 2002, p. 99-100.
7. F Pontiga, C Soria, A Castellanos, JD Skalny.
   Physicochemical modeling of negative corona discharge: the effect of boundaries
   Proc. of 2002 Annual Report Conference on Electrical Insulation and Dielectric Phenomena, (ISBN 0-7803-7502-85 IEEE Dielectrics and Insulation Society, Cancun, Quintana Roo, (Mexico), October 2002, pp.797-800.
8. P Cicman, M Francis, JD Skalny, TD Märk.
   Rate constant for dissociative electron attachment to ozone
   Conference Proceedings of Joint Conference ESCAMPIG 16th and ICRP 5th , (Edit. N. Sadeghi and H. Sugai), European Physical Society, GRENOBLE (France) 2002, p. 51-52.

9. Anto Tri Sugiarto, M Sato, T Ohshima, JD Skalny.
   Characteristics of ring-to-cylinder type electrode system on pulsed discharge in water
   J. Adv. Oxid. Technol. 5 (2002), 211-216.
10. L Aubrecht, J Koller, S Matejcik, JD Skalny.
    Spectroscopic study of corona discharges on coniferous trees
    Czech. J. Phys. 52 (2002), Suppl.D, D458-D464.
11. JD Skalny and NJ Mason.
    The effect of halomethane impurities on ozone generation from oxygen in DC negative corona discharge
    Ozone Sci. & Engineering 23 (2002), 329-341. *(1,3)*
12. Anto Tri Sugiarto, S Ito, T Ohshima, M Sato, JD Skalny.
    Oxidative decoloration by pulsed discharge plasma in water
    J. Electrost. 58 (2003), 135-145.
13. JD Skalny, S Matejcik, T Mikoviny, TD Märk.
    Effect of temperature on dissociative electron attachment to CCl2F2
    Int. J. Mass Spectrom. 223-224 (2003), 217-227.
14. S Matejcik, V Foltin, M Stano, JD Skalny.
    Temperature dependencies in dissociative electron attachment to CCl4, CCl2F2, CHCl3 and CHBr3
    Int. J. Mass Spectrom. 223-224 (2003), 9-19.
15. L Feketeova, JD Skalny, G Hanel, B Gstir, M Francis, TD Märk.
    Production of Cl- via dissociative electron attachment to Cl2
    Int. J. Mass Spectrom. 223-224 (2003), 661-667.
16. P Cicman, M Francis, JD Skalny, TD Märk.
    The ion extraction efficiency in crossed beams experiment using a trochoidal monochromator
    Int. J. Mass Spectrom. 223-224(2003), 271-278.
17. *JD Skalny, NJ Mason, T Mikoviny.*
    Corona discharge in gaseous mixtures: Generation of Ozone
    Balkan Rev. Phys. (2003), article in press. (1,3)
18. P Cicman, M Francis, JD Skalny, S Matejcik and TD Märk.
    The Rate Constant for Dissociative Electron Attachment to Ozone Revisited
    Czech. J. Phys. 53(2003), 181-190.
19. F Pontiga, C Soria, A Castellanos, JD Skalny.
    A study of ozone generation by negative corona discharge through different plasma chemistry models
    Ozone Sci. and Engineering 24(2002), 447-462.
20. F Pontiga, C Soria, A Castellanos, JD Skalny.
    Physico-Chemical modelling of negative corona discharge in oxygen
    Ozone Generation, Proc. of 14th SAPP, Liptovský Mikuláš, (Edit P. Šutta, J. Müllerova, R. Bruner) ISBN 80-8040-195-0 (2003), p. 126-127.
21. M Stano, S Matejcik, JD Skalny and TD Märk.
    Electron Impact ionization of CH4: Ionization energies and temperature effects
    J. Phys. B.: At. Mol. Opt. Phys. 36 (2003), 261-271.
22. A Schramm, MW Ruf, M Stano, S Matejcik, II Fabrikant and H Hotop.
    High-resolution study of dissociative electron attachment to dipolar molecules at low energies: CH2Br2 and CCl3Br
    J. Phys. B: At. Mol. Opt. Phys. 35 (2002) 4179–4202
23. S Denifl, B Gstir, G Hanel, L Feketeova, S Matejcik, K Becker, A Stamatovic, P Scheier and TD Märk.

Multiple ionization of helium and krypton by electron impact close to threshold: appearance energies and Wannier exponents
J. Phys. B: At. Mol. Opt. Phys. 35 (2002) 4685–4694
24. B Gstir, S Denifl, G Hanel1, M Rümmele, T Fiegele, P Cicman, M Stano, S Matejcik, P Scheier, K Becker, A Stamatovic and TD Märk.
Electron impact multiple ionization of neon, argon and xenon atoms close to threshold: appearance energies and Wannier exponent
J. Phys. B: At. Mol. Opt. Phys. 35 (2002) 2993–3007
25. *J Langer, S Matejcik and E Illenberger.*
Energy balance in dissociative electron attachment to C2F5I
Phys. Chem. Chem. Phys. (2002), 4, 5105–5109 (3,4)
26. *J Langer, S Matejcik and E Illenberger.*
Electron attachment to C2F5I molecules and clusters
International Journal of Mass Spectrometry 220 (2002) 211–220 (3,4)
27. *J Langer, M Stano, S Gohlke, A Rosa, W Barszczewska, S Matejcik, E Illenberger.*
Low energy (0–15 eV) electron stimulated reactions in single 1,2-C2F4Cl2 molecules and clusters
International Journal of Mass Spectrometry 223–224 (2003) 193–204 (3,4)
28. *M Stano, V Foltin, S Matejcik, J Langer, S Gohlke and E Illenberger.*
Dissociative electron attachment study to CHBr3 and CHI3
J. Phys. B: At. Mol. Opt. Phys. 36 (2003) 443-453 (3,4)
29. S Denifl, S Matejcik, B Gstir, G Hanel, M Probst, P Scheier and TD Märk.
Electron attachment to 5-chloro uracil
J. Chem. Phys., 118 (2003) 4107-4114
30. P Cicman, A Pelc, W Sailer, S Matejcik, P Scheier, TD Märk.
Dissociative electron Attachment to CHF2Cl
Chem. Phys. Lett., 371 (2003) 231-237
31. M Morvova, I Morva, M Janda, F Hanic, P Lukac.
Combustion and carbonization exhaust utilisation in electric discharge and its relation to prebiotic chemistry
Intern. J. Mass Spectrom. 223-224 (2003) 613-625
32. P Lukac, W Lindinger, I Morva, L Holubcik.
Energy dependence of the reaction rate constant of Ar+,Ar++ and N2+ ions with Cl2
Contributions to XIII Symp. on Atomic and Surface Physics - SASP, Going, 17-23 February 2002, (Edit. P.Scheier, T.D.Maerk), Univ. Innsbruck, 2002, pp. 153-156
33. M Morvova, I Morva, P Lukac.
Atmosfericke electricke vyboje pre katalyzu ekologicky vyznamnych reakcii (Atmospheric Electrical Discharges for catalysis of ecological important reactions)
12th conf. of Slovak Physicists, Proceedings, (Edit. M.Reiffers, L.Just), Slovak Phys. Soc., Kosice, 2002, pp.50-51, ISBN 80-968655-5-2

Partner 4: FUB Institut fuer Physikalische und Theoretische Chemie, Freie Universitaet

1. WF Schmidt, E Illenberger, AG Khrapak, Y Sakai and K Yoshino.
Electronic processes in liquid helium
J. Soc. Elect. Mat. Eng. 10 (2002) 155-156.
2. WF Schmidt, E Illenberger and Y Katsumi.
On the processes of photo-induced desorption of sodium atoms from poly-dimethylsiloxane
J. Soc. Elect. Mat. Eng. 10 (2002) 265-266.

3. *W Sailer, H Drexel, A Pelc, V Grill, NJ Mason, E Illenberger, JD Skalny, T Mikoviny, P Scheier, and TD Märk.*
   Low Energy Electron Attachment to SF5CF3
   Chem. Phys. Letters 351 (2002) 71-78. (1,3,4)
4. *J Langer, S Matejcik, E Illenberger.*
   Electron Attachment to C2F5I Molecules and Clusters
   Int. J. Mass Spectrom. 220 (2002) 211-220. (3,4)
5. WF Schmidt, E Illenberger, AG Khrapak, Y Sakai, K Yoshino.
   Electronic processes and electric breakdown of liquid helium
   Proceedings of 2002 IEEE International Conference on Dielectric Liquids, 14th, Graz, Austria, July 7-12, 2002 (2002) 159-162.
6. AG Khrapak, WF Schmidt, and E Illenberger.
   Charged particles in the bulk and near the surface of a non-polar liquid dielectric
   Proceedings of 2002 IEEE International Conference on Dielectric Liquids, 14th, Graz, Austria, July 7-12, 2002 (2002) 71-77.
7. K Yoshino, AG Khrapak, E Illenberger, and WF Schmidt.
   Structure and energy spectrum of negative ions in non-polar liquids
   Proceedings of 2002 IEEE International Conference on Dielectric Liquids, 14th, Graz, Austria, July 7-12, 2002 (2002) 56-58.
8. *R Balog, N Hedhili, F Bournel, M Penno, M Tronc, R Azria, E Illenberger.*
   Synthesis of Cl2 Induced by low Energy (0-18 eV) Electron Impact to Condensed 1,2-C2F4Cl2 Molecules
   Phys. Chem. Chem. 4 (2002) 3350 – 3355. (4,8)
9. *S Gohlke, A Rosa, F Bruening, MA Huels and E Illenberger.*
   Formation of Anion Fragments from Gas Phase Glycine by Low Energy (0-15 eV)Electron Impact
   J. Chem. Phys. 116 (2002) 10164-10169.
10. *A Pelc, W Sailer, P Scheier, M Probst, NJ Mason, E Illenberger and TD Märk.*
    Dissociative Electron Attachment to Formic Acid (HCOOH)
    Chem. Phys. Letters 361 (2002) 277. (1,3,4)
11. *W Sailer, A Pelc, S Matejcik, P Scheier, E Illenberger and TD Märk.*
    Dissociative Electron Attachment Study to Nitromethane
    J. Chem. Phys. 117 (2002) 7989-7994. (3,4)
12. *J Langer, S Matejcik, E Illenberger.*
    Energy Balance in Dissociative Attachment to C2F5I
    Chem. Phys. Phys. Chem. 4 (2002) 5105 - 5109.
13. *S Gohlke and E Illenberger. (3,4)*
    Probing Biomolecules: Gas Phase Experiments and Biological Relevance
    Europhysics news 33 (2002) 207-209.
14. *J Langer, M Stano, S Matejcik, S Gohlke, A Rosa, W Barszewska and E Illenberger.*
    Electron Attachment to 1,2-C2F4Cl2 Molecules and Clusters
    Int. J. Mass Spectrom. 223-224 (2003) 193-204. (3,4)
15. *M Stano, V Foltin, S Matejcik J Langer, S Gohlke, and E Illenberger.*
    Dissociative Electron Attachment to CHBr3 and CHI3
    J. Phys. B: At. Mol. Opt Phys. 36 (2003) 443-452 (3,4)
16. E Illenberger.
    Formation and Evolution of negative ion resonances at surfaces
    Surf. Sci. 528 (2003) 67-77.

17. *A Pelc, W Sailer, P Scheier, NJ Mason, E Illenberger and TD Märk.*
Electron Attachment to Simple Organic Acids
Vacuum 20 (2003) 429-433. (1,3,4)
18. WF Schmidt and E Illenberger,
Low Energy Electrons in Non-Polar Liquids
Nukleonika 48 (2003) 75-82.
19. E Illenberger.
Loucas G. Christophorou. On the Occasion on his 65th birthday
Nukleonika 48 (2003) 65.
20. *H Drexel, W Sailer, V Grill, P Scheier, E Illenberger and TD Märk.*
Electron Attachment to C2Cl4 and Trojan Horse Ionisation
J. Chem. Phys. 118 (2003) 7394-7400. (3,4)
21. Formation of Negative Ions from Gas Phase Halo-Uracils by Low-Energy (0-18 eV) Electron Impact
Int. J. Mass Specrom. **228** (2003) 703 -716.
22. E Krishnakumar, D Nandi, A Rosa, W-F Schmidt and E Illenberger.
Low Energy Electron Impact to Hydrogen Peroxide: A Very Effective Source for OH Radicals and OH- Anions
Chem. Phys. Letters (in print).
23. *G Hanel, B Gstir, PS Denifl, P Scheier, B Farizon, M Farizon, E Illenberger and TD Märk.*
Electron Attachment to Uracil: Effective Destruction at Subexcitation Energies
Phys. Rev. Letters 90 (2003) 188104-1 – 188104-4. (3,4)
24. *S Matejcik, I Ipolyi and E Illenberger.*
Temperature Dependence of Dissociative Electron Attachment to CH2ClBr: Competition between Cl- and Br- Formation
Chem. Phys. Lett. (submitted February 2003).(3,4)
25. *W Sailer, A Pelc , P Scheier, M Probst, J Limtrakul , E Illenberger and TD Märk.*
Low energy electron attachment to acetic acid
*Chem. Phys. Letters Chem. Phys. Letters **378** (2003) 250-256. (3,4,1)*
26. DI Zhukhovitskii, WF Schmidt and E Illenberger.
Electron detachment from negative ions at the surface of a solid
JETP (Translation of Zhurnal Eksperimental'noi i Teoreticheskoi Fiziki) **97** (2003) 606-614.
27. A.V. Berezhnov, A. G. Khrapak, E. Illenberger, W.F. Schmidt Anomalous Mobility of Negative Charges in Liquid Hydrogen: A Model of Ionic Bubble High Temperature (Translation of Teplofizika Vysokikh Temperatur) **41** (2003), 425-427.
28. Werner F. Schmidt, Eugen Illenberger (Berlin), Alexey G. Khrapak (Moscow),Yosuke Sakai (Sapporo), Katsumi Yoshino (Osaka)Electronic Conduction and Breakdown in Liquid Helium and Liquid Neo IEEE Trans. Dielectr. Electr. Insul. **10** (2003) 1012-1021.
29. *Low energy electron interaction with free and bound SF_5CF_3: negative ion formation from single molecules, clusters and nanofilms Richard Balog, Michal Stano, Paulo Limao-Vieira, Constanze Koenig, Ilko Bald, Nigel. J. Mason, Eugen Illenberger J. Chem. Phys. **119** (2003) 10396-10403.(3,1)*
30. Hassan Abdoul-Carime, Sascha Gohlke, and Eugen Illenberger Dehydrogenation of Adenine Induced by Slow (< 3 eV) Electrons Chem. Phys. Letters **380** (2003) 595-599
31. *Stephan Denifl, Stefan Metejcik, Sylwia Ptasinska, Bettina Gstir, Michael Probst, Paul Scheier, Eugen Illenberger and Tilmann D. Marrk Electron attachment to chlorouracil: A comparison between 6-ClU and 5-ClU J. Chem. Phys. **120** (2004) 704-709. (3,4)*

32. R Balog and E Illenberger.
Complete chemical transformation of a molecular film by subexcitation electrons
Phys. Rev. Letters **91** (2003) –213201-1
33. H Abdoul-Carime, S Gohlke and E Illenberger.
Site-Selective Dissociation of DNA Bases with Subexcitation Electrons. Electron Affinities of the N-Dehydrogenated Radicals
Nature (submitted 2003).
34. Hassan Abdoul-Carime, Sascha Gohlke and Eugen Illenberger, Site Specific Dissociation of DNA Bases by Slow Electrons at Early Stages of Irradiation Phys. Rev. Letters 92 (2004) 168103-1.
35. Hassan Abdoul-Carime, Sascha Gohlke, Esther Fischbach Jessica Scheike and Eugen Illenberger Thymine Excision from DNA by Subexcitation Energies Chem. Phys. Letters **387** (2004)
36. Hassan Abdoul-Carime, Sascha Gohlke and Eugen Illenberger Conversion of Amino Acids by Electrons at Subexcitation Energies Physical Chemistry Chemical Physics (PCCP) **6** (2004) 161-164.
37. Tihomir Solomun, Arnd Schimanski, Heinz Sturm, Renate Mix and Eugen Illenberger Surface Modification of Polyamides by Direct Fluorination e-Polymers **008** (2004) 1-16.
38. Reactions of Amide Group with Fluorine as Revealed with Surface Analytics Tihomir Solomun, Arnd Schimanski, Heinz Sturm, Renate Mix and Eugen Illenberger Chem. Phys. Lett. **387** (2004) 312-316.
39. Judith Langer, Richard Balog, Sascha Gohlke, Michal Stano, Hassan Abdoul-Carime and Eugen Illenberger Low Energy Electron Driven Reactions in Free and Bound Molecules: From Unimolecular to Processes in the Gas Phase to Complex Reactions in a Condensed Environment Int. J. Mass Spectrometry 233 (2004) 267-291.
40. Andrzej Pelc, Wolfgang Sailer, Paul Scheier, Tilmann D. Maerk, Eugen Illenberger Dissociation of Organic Acids by Subexcitation Electrons Chem. Phys. Letters (accepted).(3,4)
41. Hassan Abdoul-Carime, and Eugen Illenberger Degradation of Vitamin C by Electrons
Chem. Phys. Letters **390** (2004) 481-484.
42. Andrzej Rosa, Frank Brunning, S. V. K. Kumar and Eugen Illenberger Dissociative Electron Attachment to Excited SF_6: Selective IR Excitation Versus Thermal Activation Chem. Phys. Letters **391** (2004) 361-365.
43. *Fragmentation of Propanoic Acid by Subexcitation Electrons*
Andrzej Pelc, Wolfgang Sailer, Paul Scheier, Tilmann D. Märk, Eugen Illenberger
*Chem. Phys. Letters **392** (2004) 465-469.(3,4)*
44. *Electron attachment to uracil, thymine and cytosine*
S. Denifl, S. Ptasinska, G. Hanel, B. Gstir, P. Scheier, M. Probst, B. Farizon, M. Farizon, S. Matejcik, E. Illenberger, T. D. Märk (3,4)
Physica Scripta **T 110** (2004) 252-255.
45. Degradation of N-Acetyl-Tryptophan by Low-Energy (<12 eV) Electrons
Hassan Abdoul-Carime, Sascha Gohlke, and Eugen Illenberger
J. Am. Chem. Soc. **126** (2004) 12158-12161.
46. *Bromouridine Sensitization by Slow Electrons*
*Hassan Abdoul-Carime, Sascha Gohlke, Irina Petrushko, Paulo Limao-Vieira, Nigel Mason and Eugen Illenberger Chem. Phys. Letters **393** (2004) 442-447 (3,4,1)*
47. A fluorescence based method to determine electron induced damage to DNA
Tihomir Solomun, Eugen Illenberger
Chem. Phys. Letters **396** (2004) 448-451.
48. Fragmentation of proline induced by slow electrons
H. Abdoul-Carime and E. Illenberger
Chem. Phys. Letters **397** (2004) 309-313.
49 Site-Specific Dissociation of DNA Bases by Slow Electrons at Early Stages of Irradiation
Hassan Abdoul-Carime, Sascha Gohlke and Eugen Illenberger
Phys. Rev. Letters **92** (2004) 168103.

Conference Proceedings 2003

1. Evidence for Mode Selectivity in DEA to SF6 (Bunsentagung Kiel, May)
   Chemistry with Low Energy Electrons, Tag der Chemie, Berlin-Adlershof, June
2. Probing Biomolecules by Low Energy Electrons, Tag der Chemie, Berlin-Adlershof, June
3. Electron Attachment Processes: from Unimolecular Decomposition in Single Molecules to Polymerization Processes in Clusters, Tag der Chemie, Berlin-Adlershof, June
4. Electron Attachment to Selectively Excited Molecules, ICPEAC Stockholm, July
5. Dissociative Electron Attachment to H2O2, ICPEAC Stockholm, July
   Site Selective Dissociation Induced by Low Energy Electrons, ICPEAC Stockholm
6. Complete Chemical Transformation of Nanofilms by Energy Selected Electrons, EMS 03, Prague
7. Site Selective Dehydrogenation in DNA by Energy Selected Electrons, EMS 03, Prague

Partner 5: URLS. Dipartimento di Chemica Universita degli Studi di Roma 'La Sapienza', IT.

1. T Nishimura, FA Gianturco.
   Positron-impact vibrational excitation of CH4: Comparing calculations with experiments
   NIMB 192 (2002) 17
2. T Nishimura and FA Gianturco.
   Vibrational excitation of methane by positron impact: Computed quantum dynamics and sensitivity tests
   Phys. Rev. A 65 (2002) 062703
3. T Nishimura and FA Gianturco.
   Vibrational excitation of methane by electron impact: a close coupling treatment
   J. Phys. B: At. Mol. Opt. Phys. 35 (2002) 2873
4. *P Carsky, R Curik, FA Gianturco, RR Lucchese and M Polasek.*
   Computing the Exchange Interaction in Electron Scattering from Polyatomic Molecules
   Phys. Rev. A 65 (2002) 052713 (5,7)
5. RR Lucchese and FA Gianturco.
   Electron-Molecule Collisions in the Static-Exchange Correlation-Polarization Approximation in: ICAM Data and their Applications, edited by DR Schultz, PS Krstic and F Ownby (AIP, New York, 2002) pg 213
6. T Nishimura and FA Gianturco.
   Threshold efficiency of vibrational excitation of methane by electron/positron impact: a comparison
   Europhys. Lett. 59 (2002) 674
7. FA Gianturco.
   Positron and Positronium Physics in atomic and molecular gases: challenges for the 21st Century
   Europhys. News, 33 (2003) 212
8. FA Gianturco, RR Lucchese and N Sanna.
   Trapped metastable anions in low-energy electron scattering from C20 clusters
   J. Chem. Phys, 118 (2003) 4013
9. A Occhigrossi and FA Gianturco.
   Low-energy positron dynamics in small hydrocarbon gases
   J. Phys. B 36 (2003) 1383

10. T Nishimura and FA Gianturco.
Virtual state formation in positron scattering from vibrating polyatomic molecules
Phys. Rev. Lett. 90 (2003) 18320-1
11. F.A. Gianturco, T.L. Gibson, P. Nichols, R.R. Lucchese and T. Nishimura Modelling dynamical correlation forces in low-energy positron scattering from polyatomic gases: a comparison for CH_4 Rad. Phys. Chem.68 (2003) 673
12. T. Nishimura and F.A. GianturcoThe scattering of positrons from CF_4 molecules at ultralow energies J. Phys. B: At. Mol. Opt. Phys. 37 (2004) 215
13. T. Nishimura and F.A. Gianturco Vibrational excitation of water by low-energy electron scattering: calculations and experiments Europhys. Lett. 65 (2004) 179
14. A Grandi, F.A. Gianturco, N. Sanna, R.R. Lucchese Low-energy electron scattering by cubane: Resonant States and Ramsauer Features from quantum dynamics J. Chem. Phys. 120 (2004) 4172
15. T. Nishimura and F.A. Gianturco Computing vibrational effects in low-energy positron scattering from polyatomic targets: the H_20 and C_2H_2 stretching modes NIM-B 221 (2004) 24
16. F.A. Gianturco, R.R. Lucchese Radiation Damage of Biosystems Mediated by Secondary Electrons: Computing Dissociative Precursors in Uracil Molecules. J. Chem. Phys. 120 , 7446 (2004)
17. S. Telega, E. Bodo, F.A. GianturcoRotationally inelastic collisions of electrons with H_2 and N_2 molecules: A close-coupling calculations in space frameEur. Phys. J. D 29 (2004) 357
18. A Grandi, F.A. Gianturco, N. Sanna Resonant Formation of DNA Strand Breaks: H^- Desorption from Uracil via Metastable Electron Capture Phys. Rev. Lett. 93, 048103 (2004)
19. F.A. Gianturco and R.R. Lucchese Anionic Fragmentation of Glycine by Low-Energy Electrons: Resonant Precursors States from Scattering Calculations J. Phys. Chem. A 108 (2004) 7056
20. F.A. Gianturco and R.R. Lucchese Nanoscopic models for radiobiological damage: metastable precursor of dissociative electron attachment to formic acid New Journal of Physics, 6 (2004) 66

Trento University - subnode

Books:

1. Landolt-Börstein New Series, Volume I/17.
Photon and Electron Interaction, with Atoms, Molecules and Ions.
Chapter VI.1. Electron Scattering with Molecules. Total.
A.Zecca, G.P.Karwasz, R.S.Brusa, p. 6.1-6.51, Springer-Verlag, Berlin, Heidelberg, 2003

Articles:

1. Total cross sections for positron scattering on argon and krypton
at intermediate and high energies, G. P. Karwasz, M. Barozzi, R.S. Brusa, A. Zecca,
Nuclear Instruments and Methods in Physical Research B 192 (2002) 157
2. Low-energy electron collisions in nitrogen oxides: a comparative study
A. Zecca, G. P. Karwasz, R. S. Brusa and T. Wróblewski, Int. J.Mass Spectr. 223-224 (2003) 205
3. J. Mechlińska-Drewko, T. Wróblewski, Z. Lj. Petrović, V. Novaković and G. P. Karwasz, Electron scattering on N_2O - from cross sections to diffusion coefficients
Radiation in Physics and Chemistry Journal, 68 (2003) 205

4. A novel set-up for positron scattering in gases, A. Zecca, R.S. Brusa, M. Bettonte, E. Rajch, S. Mariazzi and G.P. Karwasz, Radiation in Physics and Chemistry Journal, 68 (2003) 319-22
5. Dissociation Energy of Protonated Water Clusters, T. Wróblewski, L. Ziemczonek, E. Gazda and G. P. Karwasz, Radiation in Physics and Chemistry Journal, 68 (2003) 313-318
6. Semiempirical analysis of electron scattering cross sections in N_2O and CO_2,T. Wróblewski, G. P. Karwasz, H. Nowakowska, J. Mechlinska-Drewko, V. T. Novakovic, Z. Lj. Petrovic, Czechoslovak Journal of Physics, 54 (2004), Suppl. C, C742
7. Proton transfer reactions for ionized water clusters, T. Wróblewski, L. Ziemczonek, G. P. Karwasz, Czechoslovak Journal of Physics 54 (2004), Suppl. C, C747
8. Formation Paths of Positively Ionized Water Clusters, T. Wróblewski, L. Ziemczonek, G. P. Karwasz, Molecular Physics Reports 39 (2004) 255
9. Total cross sections for positron scattering on benzene
G. P. Karwasz, A. Zecca, D. Pliszka, R. S. Brusa and M. Bettonte, J. Phys. B (submitted)
10. Virtual positronium resonances in helium
G.P. Karwasz, R.S. Brusa, D. Pliszka, C. Perazzolli, A. Zecca, Phys. Rev. Lett. (submitted)

Invited lectures
1. G.P. Karwasz, Z. Lj. Petrović and J. Mechlińska-Drewko, Integral cross sections for electron scattering on molecules – from beam to swarm experiments, 21st Summer School and International Symposium on the Physics of Ionized Gases, Sokobanja 26-30.08.2002, Yugoslavia, Book of Abstracts, Editors M.K. Radović and M.S. Jovanović, University of Niš, p.5; Invited Lectures, Topical Invited Lectures and Progress Reports, editors N. Bibić, T. Grozdanov and M. Radović, Vinča Institute of Nuclear Sciences, Belgrade, Serbia and Montenegro, p. 35
2. G.P. Karwasz, R.S. Brusa, A.Zecca - Positron Spectroscopy in Atomic and Solid State Physics, 4th FAMO Workshop on Atomic & Molecular Physics and Optics, Jurata, 19-21 September 2002, The International Society for Optical Engineering Conference Proceedings, Volume 5258, p. 96
3. G.P. Karwasz, Z.Lj. Petrović and J. Mechlińska-Drewko, Electron diffusion coefficients in triatomic gases – measurements and models
International Symposium on Electron-Molecule Collisions and Swarms, EMS-03, Prague, 30.07-02.08.2003, Program and Abstracts, Charles University, Prague, p. 46

Conference reports
1. Electron-diffusion coefficients in N_2O, J. Mechlińska-Drewko, T. Wróblewski, Z. Lj. Petrović, V. Novaković and G. P. Karwasz, 4th FAMO Workshop on Atomic & Molecular Physics and Optics, Jurata, 19-21 September 2002, The International Society for Optical Engineering Conference Proceedings, Volume 5258 (2003) p. 218
2. Positron annihilation and optical spectroscopy of silicon-related materials, D.Pliszka , G.P. Karwasz, J. Heldt, R.S. Brusa, 4th FAMO Workshop on Atomic & Molecular Physics and Optics, Jurata, 19-21 September 2002, The International Society for Optical Engineering Conference Proceedings, Volume 5258 (2003) p. 186
3. Low-energy positron-molecule scattering set-up, E. Rajch, A. Jaworek, G. Karwasz, R.S.Brusa, M.Bettonte, S.Mariazzi and A.Zecca, 4th FAMO Workshop on Atomic & Molecular Physics and Optics, Jurata, 19-21 September 2002, The International Society for Optical Engineering Conference Proceedings, Volume 5258 (2003) p.190
4. Dissociation pathways of protonated water clusters, T. Wróblewski, L. Ziemczonek, E. Gazda, G. P. Karwasz, 4th FAMO Workshop on Atomic & Molecular Physics and Optics, Jurata, 19-21 September 2002, The International Society for Optical Engineering Conference Proceedings, Volume 5258 (2003) p.214

5. L. Josić, V. Novaković, Z. Lj. Petrović, G.P. Karwasz, T. Wróblewski and J. Mechlińska-Drewko, Monte Carlo and two term calculations of electron transport coefficients in NO, 21st Summer School and Ionternational Symposium on the Physics of Ionized Gases, Sokobanja 26-30.08.2002, Yugoslavia, Book of Abstracts, Editors M.K. Radović and M.S. Jovanović, University of Niš, p.136
6. R. Panajotovic, M. Jelisavcic, V. Novakovic, G. Karwasz, Z.Lj. Petrovic and S.J. Buckman, Low energy electron collisions with NO: A cross section derived from crossed beam studies and swarm experiments, International Symposium on Electron-Molecule Collisions and Swarms, EMS-03, Prague, 30.07-02.08.2003, Program and Abstracts, Charles University, Prague, p. 87
7. A. Zecca, D. Pliszka, C. Perazzolli, G.P. Karwasz, R.S. Brusa, D. Bassi, Positron scattering in gases – first results from low energy spectrometer in Trento,
INFM Meeting, National Congress on the Physics of Matter, Genova, 8-10.2004, Abstracts p. 41

Partner 6:UAR University of Aarhus, DK

1. SL Lunt, NC Jones, J-P Ziesel.
   Cold collisions of electrons with Molecules: virtual state scattering in CO2
   Photonic, Electronic and Atomic Collisions XXII ICPEAC Santa Fe, New Mexico, July 18-24 2002. Eds. J.Burgdorfer, J.S.Cohen, S.Datz, C.R.Vane. Rinton Proess. Inc. (pp 263-271).
2. D Field, NC Jones, J-P Ziesel.
   Very low energy encounters: cold electrons and molecules
   Europhys. News, 2002.
3. D Field, NC Jones, J-P Ziesel, TA Field.
   Cold collisions of electrons with molecules
   Few Body Systems; 31: 191 197, 2002.
4. SV Hoffmann, SL Lunt, NC Jones, D Field, J-P Ziesel.
   An undulator based spherical grating monochromator beamline for low energy electron molecule scattering experiments Review of Scientific Instruments 73; 73: 4157 4163, 2002. (publication with Toulouse subnode)
5. NC Jones, D Field, J-P Ziesel, TA Field.
   Giant Resonances in cold electron scattering by CS2
   Physical Review Letters; 89: 93201 93204, 2002.
6. D Field, J-P Ziesel, NC Jones, SL Lunt.
   Collisions froides electron-molecule: etats virtuels et resonances
   PAMO 2002, French Physical Society (Atomic, Molecular and Optical Physics Division) Symposium, Bourges (2002)
7. D Field, LB Madsen.
   Time delays in cold elastic scattering
   J. Chem. Phys. 118 (4), p1679 (2003)
8. JP Ziesel, NC Jones, D Field, and LB Madsen.
   Reaction and Scattering in Cold Electron Collisions
   Phys. Rev. Lett. 90, 083201-1 (2003) (publication with Toulouse subnode)
9. D. Field, N.C. Jones, and J.-P. Ziesel, Cold electron scattering in SF_6 and C_6F_6: bound and virtual state channels: Phys. Rev. A, 69 052716-1 (2004) (publication with Toulouse subnode).

Partner 7: IPC Heyrovsky Institute of Physical Chemistry, Academy of Sciences of the Czech Republic

1. *P Carsky, R Curik, FA Gianturco, RR Lucchese and M Polasek.*
   Computing the Exchange Interaction in Electron Scattering from Polyatomic Molecules
   Phys. Rev. A 65 (2002) 052713 (5,7)
2. *Vibrationally inelastic electron scattering on polyatomic molecules by the discrete momentum representation (DMR) method*
   J.Phys.B 36, 2165 (2003) (7,5)
3. J Michl, D Popovic, D David, P Carsky, R Curik.
   Vibrational excitation of propane by electron impact: joint experimental and theoretical study
   Poster at the International Congress of Quantum Chemistry in Bonn, 2003
4. R Curik.
   Scattering calculations on vibrational electron energy loss spectra
   Lecture at the EMS03

Partner 8 UPSO Laboratoire des Collisions Atomiques et Moléculaires Université Paris-Sud, Orsay, France

1. Electron H/Si(100) interaction : H- desorption and surface vibrations
   Invited talk to EMS
2. DC Marinica, C Ramseyer, AG Borisov, D Teillet-Billy.
   Quantum well resonances and image states in the Ar/Cu(100)
   Surf. Sci. (2003) in press
3. DC Marinica, C Ramseyer, AG Borisov, D Teillet-Billy, JP Gauyacq.
   Image states on a free electron metal surface covered by an atomically thin insulator layer
   Surf. Sci. 528 (2003) 78
4. DC Marinica, C Ramseyer, AG Borisov, D Teillet-Billy, JP Gauyacq, W Berthold, P Feulner, U Höfer.
   Effect of an atomically thin dielectric film on the surface electron dynamics: image potential states in the Ar/Cu(100) system
   Phys.Rev.Lett. 89 (2002) 046802
5. A Hoffman, S Ustase, M Hadj Hamou, MN Hedhili, J-P Guillotin, A Laiktman and R Azria.
   Decay of secondary electron emission and surface charging induced by resonant electron attachment to hydrogenated diamond films
   J. of applied Phys. Vol. 91, 7, 4726, 2002
6. *R Balog, MN Hedhili, F Bournel, M Penno, M Tronc, R Azria, E Illenberger.*
   Synthesis of Cl2 induced by low energy electron impact to condensed C2F4Cl2 molecules
   Phys. Chem. Chem. Phys., 4 (14) 3350-5, 2002 (8,4)
7. A Hoffman, A Laikhtman, R Azria, Y Le-Coat, M Hadj Hamou and M Tronc.
   Stimulated desorption of D- from Diamond: surface versus sub-surface processes via resonance dissociative electron attachment
   Diamond and Related Materials, 11 (3-6) 867-71, 2002
8. A Laikhtman, Y Le-Coat, M Hadj Hamou , R Azria and A Hoffman.
   The mechanism of low energy ESD of O- from hydrogenated and hydrogen free Diamond surfaces exposed to activated oxygen
   J. Chem.Phys., 117, 346-52, 2002
9. A.Lafosse, D. Teillet-Billy, J.P. Guillotin, Y. Le Coat, R. Azria, A. Laikhtman, A. Hoffman
   Role of electronic band structure and resonances on electron reflectivity and vibrational excitation functions : the case of hydrogenated diamond Phys. Rev. B 68 (2003) 235 421

10. A.Laikhtman, A. Lafosse, Y. Le Coat, R. Azria, A. Hoffman Clarification oxygen bonding on diamond surfaces by low energy electron stimulated desorption and high resolution electron energy loss spectroscopy J. Chem. Phys. 119 (2003) 1794
11. A.Laikhtman, A. Lafosse, Y. Le Coat, R. Azria, A. Hoffman Interaction of water vapour with bare and hydrogenated diamond film surface Surf. Sci. 551 (2004) 99
12. A.Laikhtman, A. Lafosse, Y. Le Coat, R. Azria, A. Hoffman Low energy electron scattering from H-Si(100)-2x1 : reflectivity and vibrational excitation To be submitted to Surf. Sci.
13. C.D. Marinica, J.P. Gauyacq, D. Teillet-Billy Inelastic electron scattering on a molecule embedded in a host medium: role of the electronic structure of the medium To be published
14. C.D. Marinica, C. Ramseyer, D. Teillet-Billy, J.P. Gauyacq Adsorbed molecule on a metal surface covered with a rare gas Ar monolayer : adsorption site effect on the $N_2^{-}\,^2\Pi_g$ resonance To be published

For further details please see the Network webpage and those of the partners (http://www.isa.au.dk/epic)

Part B

Comparison with the Joint programme of work (ANNEX 1 of the Contract)

B1: Project Objectives

The major objectives of the proposed Network are to:
(i) Train young researchers in the latest experimental and theoretical techniques for studying electron/positron induced chemistry by providing them with the opportunity to undertake research within internationally renowned research centres.
(ii) Provide the most co-ordinated study ever undertaken, either experimental or theoretical, of the fundamental chemistry initiated by the irradiation by electrons and positrons of molecules (from diatomic to macromolecules) and
(iii) To develop a new understanding of the basic processes by which such chemical reactions are induced and how such reactions are modified by their local environment.

In particular the Network will;
1.Study fundamental electron and positron energy transfer processes.
2. Study electron and positron impact dissociation processes yielding reactive neutral, anionic and cationic species.
3. Study how such processes are modified in the different phases of matter (gases, clusters and on surfaces.
4. Probe new reaction processes initiated in denser phases of matter 9e.g. nucleophilic substitution).

Different molecular compounds have been selected to illustrate these processes; halogenated hydrocarbons and fluorocarbons; simple biomolecules (e.g. DNA and RNA bases) and water.
These objectives remain unchanged after the first year and excellent progress has ben made towards achieving these objectives.

B2 Research method and Work plan

Experimental techniques
Authoritative investigations of electron/positron-molecule interactions requires the adoption of several different experimental methods within this Network all the current state-of-the-art experimental techniques for probing electron/positron induced reactions with molecules are available to the researchers. In the first year of the Network these techniques have been developed still further making the participants amongst the leading pioneers of techniques or producing sources of biomolecules and ongoing work (led by younger researchers employed by the Network) is leading to the study of DNA itself with high resolution electron scattering apparatus (OU, FUB and UIBK) and the development of new techniques for probing DNA including use of Atomic Force Microscopy - AFM (OU and UAR). The UAR group has pioneered the development of the first synchrotron based photo-ionisation electron source, a source that is capable of producing electron beams with resolutions of 2 meV at incident energies as low as 1 meV. With such a source it is possible to study electron impact induced rotational excitation and makes it possible to probe threshold phenomena at the onset of each mode of molecular excitation and has led to the investigation of a new class of scattering processes, named cold collisions with the electrons at temperature comparable to those of cold atoms .
The UCL team has developed corresponding methods for the investigation of single and multiply charged ionization (with and without positronium formation) including the first near-threshold

measurements and the first complete (e,2e) type experiments with positrons. Techniques for generating positronium beams have also been developed and applied to the study of the interaction of simple atomic and molecular targets. Methods for extending these to more complex targets and probing those interactions that transfer energy directly into the target molecule are currently under development with the appointment of younger members of the research network.

Experimental teams in Berlin (FUB) and Paris (UPSO) have pioneered the transfer of gaseous phase experimental and theoretical techniques into the study of electron molecule collisions upon surfaces and are recognized as leaders in this field. Research performed this year through a collaboration of network members has led to a new understanding of state selective dissociation on surfaces with subsequent consequences for site selective chemistry using STM technology. In contrast the study of positron interactions in the condensed phase under single collision conditions has yet to be explored and this network is providing the first opportunity for developing techniques (both experimental and theoretical) to initiate such studies.

Theoretical Methods

The UCL team have led the modern development of the R-Matrix method for treating electron interactions with molecules. For diatomic molecules the R-matrix method has been extended to the nuclear coordinate which has allowed for the first time full, *ab initio* non-adiabatic treatments of vibrational excitation and dissociative electron attachment. UCL have recently developed a novel procedure for treating near-threshold electron impact dissociation. In addition the UCL group has recently extended their code to treat polyatomic molecules. This work is complemented by the team in Bonn (sub-node of FUB) who use a similar formalism. URLS have long employed methods based on single centre expansions to study electron interactions with polyatomic molecules. Such calculations may be used to study larger molecules still beyond the scope of the R-matrix method (e.g. biomolecules). Furthermore URLS have considerable experience of performing vibrational and rotational excitation calculations on polyatomics. UCL and URLS are collaborating in studies to provide cross sections for those targets for which experiments remain too difficult (eg radicals). The transfer of electron scattering methodologies from the gaseous phase to the treatment of inelastic electron scattering on molecules physisorbed on metal surfaces has been pioneered by the UPSO team.

The group at URLS have developed several dedicated scattering codes for treating the quantum dynamics of low-energy positron beams in a molecular gas, specifically one containing polyatomic molecules. These codes are now shared and have developed jointly with younger network members employed by ICP. This Network therefore contains the only research teams currently able to evaluate annihilation rates in polyatomic gases and who are able to evaluate total and differential elastic cross sections below the Ps formation threshold.

Thus the network has developed the research methods outlined in the original proposal with significant progress being made in the first year, progress that is expected to be accelerated still further in year 2 as younger members complete their initial training.

B3 Schedule and Milestones

The work plan is set out in terms of three inter-linked scientific strands namely the study of :

- Electron and positron induced reactions in the gaseous phase.
- Reactions in molecular clusters and aggregates and
- Reactions in the condensed phase.

In the original Annex 1 the following milestones were declared

Year 1: Advertising/ recruitment of Younger Researchers. Establishment of Network WWW site.

(Month 1 -6) First Network meeting to determine specific project schedule and identify molecular targets to be studied by each partner laboratory.

(Month 7-12) Experimental research programme on halogenated hydrocarbons and fluorocarbons commenced.
Master class in 'Theory of Molecular dynamics and symmetry' organised by UCL
Master Class in Theoretical Modelling organised by ULRS.
Master class in surface preparation and UHV techniques organised by FUB and UPSO.

Year 2: Master class in preparation and synthesis of bio-molecules organised by UIBK.
Workshop on New Chemical synthesis using positrons (arranged in collaboration with International Positron workshop).
Second Network meeting to review progress on research programme (Mid -Term review).

The First Network meeting to determine specific project schedule and identify molecular targets to be studied by each partner laboratory was held at the coordinator's new institution in February 2002.

At this meeting is was agreed to continue to organise the research of this Network in this manner. For each of these strands four specific molecular targets have been chosen since these provide the opportunity to determine the reactivity as a function of particular site and/or chemical bond. The targets selected are :

- Halogenated hydrocarbons (CH_xR_y where R is any halogen species F, Cl, Br and I and x +y = 4 and the fluorocarbons (CF_xR_y where R is Br,Cl (or H) and x +y = 4).
- Simple bio-molecules that form the bases of DNA and RNA (adenine, cytosine, guanine, thymine and uracil) often called the *building blocks of life*.
- WATER, the universal solvent.

In the course of 2003 and 2004 most if not all of the research aims have been met. The Master class in preparation and synthesis of bio-molecules was held in the UK arranged by OU in September 2003. Master class in 'Theory of Molecular dynamics and symmetry' organised by and Master Class in Theoretical Modellingwas delayed due to late appointments of Younger researchers and is to be held in Prague in February 2005. Master class in surface preparation and UHV techniques has ben h;led twice in December 2003 and December 2004.

1. Electron and positron induced reactions in the gaseous phase
Teams involved :OU, UCL, UIBK, FUB, ULRS, UAR, ICP

Experimental Programme: The different fragmentation patterns induced by low energy electrons and positrons have been explored many halogenated hydrocarbons and fluorocarbons. The electronic state spectroscopy has been extensively investigated by OU and differential cross sections measured. Yields of both anionic and cationic fragments have been measured together with their kinetic energy by UIBK and FUB. Total electron scattering cross sections have likewise be measured at low energy (< 1eV) by UAR and such cross sections provide a complementary means of determining the probability of a specified molecule to undergo dissociative attachment. This work has attracted the interest of many groups worldwide involved in plasma etching. This has led to the development of strong links with Japanese industry ,
The most dramatic progress in the network has been in the study of electron scattering from bio-molecules in particular the DNA bases adenine, cytosine, guanine, thymine and RNA base uracil and most recently the larger biomolecules including glycine, simple sugars and acids. This work has dramatic consequences for our understanding of radiation damage and has attracted worldwide attention in international media.

We have also started an extensive study of water with completion of a comprehensive review of current state of knowledge of electron interactions with water. This work is seen to be pivotal to future research radiation damage. Recent advances comprise of the assembling an authoritative data review of elecotnr interactiosn with water(OU) and the conduct of detailed gas phase dissociatve electron attachment experiments to water (UIBK/OU). These experiments have been complemented by detailed theoretical calculations (UCL and ULRS) see below.

Theoretical Programme: Methodology and general purpose codes, built upon existing codes constructed by teams in the network, have been developed to study fundamental electron interactions with halogenated hydrocarbons and fluorocarbons leading to excitation and dissociation. These have highlighted the different electron attachment processes to the CF_x radicals with CF supporting electron attachment but CF not, the consequences of which are dramatic for design of future industrial semiconductor plasmas. The UCL group have also reported the first results for electron induced dissociation of the water molecule. ULRS have performed the first calculations on complex biological molecules (glycerine) pioneering new methods for probing radiation damage studies at the molecular level. In collaboration with ICP they have likewise developed methodology to study positron interactions with simple molecular targets, results that are now being tested by experiments performed at UCL.

Task 2. Reactions in clusters and aggregates
Teams: UCLE,ULCP,FUB,UIBK,UPSO
The goals of this research programme are to compare the electron induced reactions in the gas phase with those observed in simple cluster or aggregates and to determine the importance of intra-cluster scattering phenomena (electron transfer between the cluster components) in both primary and secondary chemical reactions. Some initial work in preparing clusters of halogenated hydrocarbons and fluorocarbons to study the role of such reactions as a function of cluster size and chemical composition have been performed by FUB some of which is in collaboration with OU. These studies have shown the dramatic changes to be found when electrons interact with event simplest dimmers. This work is now to be extended to pioneering studies of electron attachment to bio-molecules and to targets consisting of a bio-molecule clustered either with water or simple organic molecules. The experimental research has been complemented by theoretical calculations at ULRS.

Task 3. Reactions in the condensed phase

Teams: OU, UIBK, FUB, UPSO. Electron induced reactions from molecules absorbed upon surfaces have be studied both theoretically and experimentally. In we have undertaken experimental studies on the formation and evolution of negative ion resonances in electron scattering from halogenated hydrocarbons and fluorocarbons absorbed on either metallic or ice surfaces. Dramatic changes in the dissociation pathways have been seen for molecules frozen on a surface compared to the gas phase. Such results suggest that with sufficient understanding it may be possible to perform selective bond breaking chemistry of surfaces using emerging STM technology, hence allowing truly nanoscale chemistry to be undertaken. This exciting prospect has led to the formation of an ESF 5 year Programme starting in 2004 in which.

- Theoretical modelling of these systems will be developed using a new R-matrix method to investigate how the environment influences the molecular inelastic scattering properties i.e. vibrational excitation, electronic excitation and dissociative attachment processes.
- Investigations for extending techniques developed for electron studies to using positrons to probe surfaces is also planned.

Network training:

A Master class in preparation and synthesis of bio-molecules planned for year 2 was organized by the co-ordinator as part of the new UK National Quantum, atomic and molecular physics meeting in September 2003 and Master class in UHV techniques was be held in December 2003 and will be repeated in December 2004. A theoretical methods workshop will be held in Prague February 14 to 18 2005 This meeting is organized by the YRs themselves and will provde them with a unique opportunity to discuss the future development of theoretical modeling of electron/positron interactions with molecules. The meeting specifically precludes more senior staff sicne they may have preconceptions as to which methodology to follow. Younger researchers from India and Brazil will also attend the meeting (funded by non EPIC Funds).

Those young researchers in post by July 2003 presented their work at formal session of the Network meeting held in Prague on July 30, 2003. All Younger researchers employed by the Network presented their work at the mid-term review in at Obergurgl in June 2004. Annual presentations by younger researchers are an essential requirement for their training in communication and presentation skills and they will be expected to give update talks at the next Annual meeting in Castelgondolfo June 25 to 30 2005.

In summary we have met and exceeded the scientific milestones set for the second year of the network.

B4 Organisation and Management

Management Committee. A Management Committee was established at the initial Network Meeting held in the UK in February 2003. The management team is comprised of the leaders of each of the 8 partners and two co-opted members elected by the Network participants (Professor Tennyson from UCL and Professor A Zecca, ULRS). Professor N J Mason chairs the committee. Professor E Illenberger acts as Secretary with special responsibility for ensuring training of the younger members is reviewed. Minutes of the Committee meetings are recorded and are available for scrutiny by the Commission. Each partner nominates a member of their research group as *mentor* for the Young Researchers employed by them in the Network. At the annual meeting all younger researchers will be interviewed by a mentor (from a different partner) and questioned as to their progress and upon the training received, these comments will be examined by the management committee and where appropriate action taken. In order to have an unbiased review of the research and training of the Network the Management Committee invited Professor Loucas Christophorou to act as external assessor of the Network. Professor Christophorou is an internationally acclaimed researcher who having spent many years in the USA as a leader of the electron scattering community has recently returned to Europe to the National Academy in Athens. His reports on the Initial Network meeting and first annual meeting are available in the meeting minutes.

Research strand leaders. To maintain focus the research programme has been divided into three inter-linked scientific strands each reviewed by task leaders.
Task 1; Electron and positron induced reactions in the gaseous phase
Strand Leader: Experimental Professor D A Field (UAR)
Task 2. Reactions in clusters and aggregates
Strand leader; Professor T Märk, (UIBK)
Task 3. Reactions in the condensed phase
Strand Leader: Dr R Azria (UPSO)

Research teams working on each strand meet at least once annually to discuss progress and plan future work. The meetings are chaired by the strand leader. As some strands obviously overlap, joint task meetings will be organised as appropriate at the annual meeting. Between meetings informal contacts are maintained by email and through the Network electronic Newsletter (See below).

Annual Scientific Meetings. An annual scientific meeting is held. In July 2003 the first network meeting was held in Prague July 30 to August 1. The first day of the meeting was a closed meeting of the network at which the younger members of the network presented their work. The remainder of the Network meeting reviewed scientific progress in the three strands and held a general discussion allowing new results to be reviewed and new research avenues to be debated. Part of this meeting was held jointly with the Electron molecule and Swarms meeting allowing international colleagues to learn of the Network research programme. This was particularly useful as it has enabled the network to establish research links with US, Australian, Japanese, Indian and Brazilian research groups, making it a catalyst for international research in electron and positron induced chemistry. The second annual meeting which included the Mid-term review was held at Obergurgl, Austria from June 19th to 22nd June 2004. As well as reciving comments from the Commision representative (which were very supportive) the meeting reviewed the progress of the Nework both in research and training. As indicated above progress in both areas were impressive. External speakers at the meeting commented upon the success of the Network both as a research and co-ordination forum.

Other network meetings were held in collaboration with the COST P9 'Radiation damage' meeting in Lyons in June 24-27 2004, The ESF Network Collisions in Atom Traps (CATS) – Durham UK March 2 - 30 2004 and the ESF Programme Electron Induced Processing of Atoms and Molecules (EIPAM) he;ld as part of the 332th Wilhelm and Else Heraeus Seminar, "Processes Driven by Low Energy Electron-Molecule Interactions" 1st-4th September, 2004 at Bad Honnef, Germany. The network also had a major presence at the Eighth European Conference of Atomic and Molecular Physics (ECAMP) to be held in Rennes, France July 6-10 2004 and for which N J Mason was the Chairman.

Network Newsletter and Communications. Communications between the Network is enhanced through a Newsletter. This is circulated electronically and will includes updated reports by each of the partners (and their sub nodes), abstracts of papers submitted for publication, meeting information and reports, adverts for postdoctoral positions, news of visits between nodes and a monthly review of latest international research papers in the electron/positron induced chemistry scattering (drawn from Web of science database). An abbreviated version of the Newsletter will be available for to all international researchers upon registration with the Network. The Newsletter is placed on the Network's WWW site which will also include full details of the partners their research interests, ongoing research, personal profiles etc. Interim reports and pre-prints of publications will be available electronically from the Network web pages. www.isa.au.dk/epic

Cohesion with Less Favoured Regions and Associate members
The Network has sought to make major interaction with the newly joined EU countries with the majority of the young researchers coming from new accession countries. This is to be expected since it is the students from those countries that would require the most training in the new techniques and skills. In addition one node (Prague) is based in Eastern Europe and sub node of Austria is based in Commenius University in Bratislava. We have in addition sought to acquire additional resources to allow members of these communities to attend Network meetings (e.g EPS and ESF funds) in the new Networks discussed above there are representations and partners from most of the Eastern European newly joined EU states. Active collaborations have been established with groups in Gdansk and Sieclce in Poland and Belgrade in Serbia. One former member of the OU group (Dr P Vieira) has recently been appointed Associate Professor in New university, Lisbon, Portugal and continues to collaborate with several partners (OU,FUB,UAR and UIBK) as well as Professor G Garcia, CSIC who has become an affiliate of the OU group.

Connections with industry A major result of the Network has been to develop contacts with the Semiconductor industry in Japan (see discussion above). As a result a series of EU Japan initiatives is in preparation to perform joint research on semiconductor plasmas and nanolithography.

B5 Training

5.1 Appointment of Younger researchers

Recruitment: Research positions available under the Network were widely advertised using electronic media, at conferences and by mail shots to major laboratories. The response was good but many of the applicants were not eligible for EU awards (being from non EU states such as the Former Soviet Union). However by January 2003 all the partners had filled their posts. Some candidates were still completing their PhD and therefore did not join their partners until later in the year or at the beginning of year 2. No Postdoctoral candidate was allowed to take up the post until they had definitively completed their PhD thesis. We therefore have a complete cohort of young researchers in post in year 2. However due to the late start of some posts we have postponed some of the training courses planned in year 1 year 2.

The following table compares the current status of young researchers (Pre-Doc and Post-Doc) as of June 2002 with the plan in the contract.

Participant	***Contract deliverable of Young Researchers to be financed by the contract (person- months)***			***Young Researchers financed by the contract Sept 2004 (person-months)***		
	Pre-doc (a)	***Post-doc (b)***	***Total (a+b)***	***Pre-doc (c)***	***Post-doc (d)***	***Total (c+d)***
OU (UCLE)	0	36	36	0	28	28
UCL (UCLP)	0	24	24	15	8	23
UIBK	36	8	44	24	0	24
FUB	12	18	30	12	18	18
ULRS	0	36	36	0	11	11
UAR	0	24	24	0	24	24
IPC	38	6	44	26	0	26
UPSO	0	30	30	0	14	14
TOTAL	86	182	268	67	84	151

Notes on recruitment:

1. OU A Postdoc has been appointed (D Mayr from Austria) from 1/7/2003 to work on experimental programme at the OU. A theoretical postdoc (Dr Simone Taioli) has been appointed from 1/1/2004. This post will be shared with UCL as computational facilities are at UCL. The movement of the Co-ordinator from UCL to the OU in October 2002 has necessitated some organisational changes in training between UCL and OU not foreseen when Annex was drawn up since the Co-ordinator was at UCL. *All months now allocated*
2. UCL. Ms Cristiana Arcidiacono pre-doc 1/9/03 24 months (appointed after node experienced difficulties finding an elegible post-doc). Dr Zoran Pesic post-doc 12/1/2004 16 months.

3. UIBK. The Predoc (Ms **S Ptasinska** was appointed from September 2002) An eight month postdoc is being appointed.
4. FUB The Postdoc Dr Abdoul-Carime was appointed in January 2003 and has recently completed his post which was extened to 20.5 months and he is now applying to the OU for a Research fellowship which if successful will become a permanent appointment. . Mr Sedlack from Slovakia has been appointed a Predoc for 7 months
5. ULRS This node was the slowest to recruit its young researchers due to loss of candidate in 2002 following late transfer of funds form EU in fall of 2002. Dr S.Telega (from Poland) was in Rome for three months during 2003 and has returned in 2004. Dr Damian Pliszka (from Poland) has been in post since December 2003. Dr. Jan Franz (from Germany) will spend six months in Rome from Sept 2004 till April 2005. Dr Kai Willner (from France) will come in 2005 *All months now allocated*
6. UAR a Postdoc (Dr Nykola Jones) was in place from 1 September 2002 and was employed for the 24 months ending September, she has now been appointed to a senior post as one facility researcher responsible for the synchtrotorn facility..
7. ICP have appointed Peter Papp (4.11.2002 – 4.5.2003); Peter Hrušč (4.11.2002 – 4.5.2003) Vincent Brems (1.5.2004 -31.10. 2004) and Barbara Pezler (1.5.2004- 31.10. 2004) Barabara was subsequently found to be ineligible on grounds of age and a replacement is being dought.
8. UPSO 2 Predoctoral students were appointed in the first year each for 9 months, two new appointments were made in late 2003 and early 2004.The first postdoctoral post was filled in March 2003 for a 12 month period Dr D Caceres who will return for a 12 month second period

Integration of Young researchers; All the young researchers are provided with detailed description of aims and objectives of the EPIC network upon commencing their studies. Attendance at the network meetings is compulsory and all in post in July 2003 were required to give a presentation of their work by that date. all in post in June 2004 will present their work at the Midterm review. Exchange of younger members between the research teams is recommended and has been enacted by most partners in year 1 (se joint publications arising from these actions) with the expectation of more intense exchanges in year 2 and 3 as the younger have become more active

5.2 Training; A Master class in preparation and synthesis of bio-molecules planned for year 2 was organized by the co-ordinator as part of the new UK National Quantum, atomic and molecular physics meeting in September 2003 and Master class in surface preparation and UHV techniques will be held in December 2003 while Master class in 'Theory of Molecular dynamics and symmetry' is now planned for later in 2004 (delayed until appointment of young theoretical researchers some of whom did not start until January 2004). Those young researchers in post by July 2003 presented their work at formal session of the Network meeting held in Prague on July 30, 2003 this was a essential requirement for their training in communication and presentation skills. In each partner laboratory the young researchers have been encouraged to make use of the institutes's own training programmes for young researchers. These include career instruction, project management and timekeeping courses. In addition several have made use of specialized language courses to allow them to integrate with the country in which they are undertaking training.

Equal opportunities: 4 of the younger researchers employed to date under the network are women and have been advised of specialize training courses at their host institutions.

Interdisciplinary Aspects: The nature of the network makes the training necessarily interdisciplinary with aspects of physics, chemistry and biology being employed in the research studies as well as some aspects of technology and computer science and IT.

Factual information on the Young researchers

Host; Open University; United Kingdom

Dr D Mayr : Nationality Austrian; Age at appointment 27; Start date July 2003 End Date December 2004; Employment as Post-doc; Previous contact PhD University of Innsbruck

Host; Open University; United Kingdom and University College London

Dr Simone Taoli Nationality Italian; Age at appointment 30; Start date January 2004 End Date July 2005; Employment as Post-doc; NO Previous contact with nodes

Host; University College London

Ms Cristiana Arcidiacono Nationality Italian; Age at appointment 27; Start date September 2003 End Date December 2005; Employment as Pre-doc; NO Previous contact with nodes

Dr Zoran Pesic Nationality Serbian; Age at appointment 33; Start date January 2004 End Date May 2005; Employment as Post-doc; NO Previous contact with nodes

Host; Free University Berlin

Dr Hassan Abdoul-Carime Nationality French; Age at appointment 35; Start date November 2003 End Date August/September 2005; Employment as Post-doc; NO Previous contact with nodes.

Host; University of Innsbruck

Ms Sylwia Ptasinska Nationality Polish; Age at appointment 35; Start date January 2003 End Date August/September 2005; Employment as Pre-doc; NO Previous contact with nodes.

Host; University of Rome

Dr S.Telega Nationality Polish; Age at appointment 33; Start date August 2003 End Date October 2003; returning in 2004 Employment as Post-doc; NO Previous contact with nodes

Dr Damian Pliszka Nationality Polish; Age at appointment 31; Start date December 2003 End Date December 2004; Employment as Post-doc; NO Previous contact with nodes

Host; University of Aarhus

Dr Nykola Jones Nationality British; Age at appointment 25; Start date September 2002 End Date August 2004; Employment as Post-doc; Previous contact with nodes PhD student UCL.

Host; ICP Prague

Peter Papp Nationality Age at appointment ; Start date November 2002 End Date May 2003; Employment as Post-doc; NO Previous contact with nodes

Peter Hrušč Nationality Slovakian Age at appointment ; Start date November 2002 End Date May 2003; Employment as Post-doc; NO Previous contact with nodes

Dr Vincent Brems Nationality German Age at appointment ; Start date may 2004 End Date October 2004; Employment as Post-doc; NO Previous contact with nodes

Barbara Pezler Nationality Polish Age at appointment 39; Start date May 2004 End Date October 2004; Employment as Post-doc; NO Previous contact with other nodes

Host: University of Paris-Sud:

Dr Daniel Caceres Nationality Spanish Age at appointment 30; Start date March 2003 End Date March 2004; Employment as Post-doc; NO Previous contact with nodes.