

The logo features a stylized red and blue graphic on the left, resembling a flame or a stylized 'F'. The text 'FEL 2004' is written in a blue, bold, sans-serif font, with 'FEL' in a smaller size than '2004'. Below this, 'Trieste, Italy' is written in a black, cursive script font.

AUGUST 29 - SEPTEMBER 3
FEL 2004
Trieste, Italy

PROCEEDINGS OF THE
26TH INTERNATIONAL
FREE ELECTRON LASER CONFERENCE
& 11TH FEL USERS WORKSHOP

RENÉ BAKKER
LUCA GIANNESI
MARINO MARSI
RICHARD WALKER

EDITORS

FEL2004

Proceedings of the
**26th International Free Electron Laser Conference and
11th FEL Users Workshop**

*August 29 to September 3, 2004
Stazione Marittima, Trieste, Italy*

René Bakker
Luca Giannessi
Marino Marsi
Richard Walker
Editors

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Foreword

The 26th International Free Electron Laser Conference and 11th FEL Users Workshop were held between August 29th and September 3rd, 2004 at the beautiful seafront location of the Stazione Marittima congress centre in Trieste, Italy. The Conference and Workshop, known as FEL2004, was organised by Sincrotrone Trieste, home of the third generation synchrotron light source ELETTRA, the EU funded storage ring free electron laser (EUFELE), and the VUV single-pass FEL project FERMI. A total of 287 participants from 18 different countries attended the conference, making this one of the biggest ever conferences. A total of 62 talks and 158 posters were presented and 184 papers were accepted for publication in these proceedings.

FEL2004 marks the 25th Anniversary of the International FEL Conference, and incidentally 20 years since the first FEL conference held in Italy, in Castelgandolfo. This marked an appropriate moment look back on the achievements since then, and to consider the future prospects for the field as well as the FEL conference itself.

At the time of the first international FEL meeting held at Stanford in 1979, later classified as the first of the International FEL Conference series, only one FEL had actually operated, namely the Stanford oscillator, which first lased in 1977. Since then remarkable progress has been made in the power and spectral range of operating FELs as well as in their scientific applications. The programme of FEL2004 reflected the very active nature of the field, and we thank the members of the International Programme Committee for putting together a balanced program highlighting both the current activity and the exciting prospects ahead. We also thank Mike Poole for a lively personal summary of the FEL field over the last 25 years in the concluding session.

The social programme of the conference included an excursion to the Roman ruins and the magnificent 11th Century basilica with its impressive floor mosaics in Aquileia, and to the town of Grado with its sandy beaches, its old historic centre, and picturesque harbour. The excursion was followed by a banquet in the Savoia Excelsior Hotel opposite the conference centre. Following tradition, the FEL Prize was awarded during the banquet and this years recipients were Hiroyuki Hama and Vladimir Litvinenko for their fundamental and pioneering contributions in Storage Ring Free Electron Lasers (SRFELs).

We would like to express our sincere gratitude to Sincrotrone Trieste for hosting the Conference and to the members of the Local Organising Committee, and in particular the Local Organising Coordinator Carlo Bocchetta, for their hard work in taking care of the many organisational aspects of the conference. Special thanks are due also to Ivan Andrian of Sincrotrone Trieste and his team for organising the abstract and paper submission as well as the new electronic proceedings.

On behalf of the International Executive Committee (IEC) and local organising committee we would also like to express our thanks for the generous financial support received from the following institutions: Area Science Park, Italy, the Council for the Central Laboratory of the Research Councils (CCLRC), UK, Consiglio Nazionale delle Ricerche (CNR), Italy, Deutsches Elektronen-Synchrotron (DESY), Germany, Ente per le Nuove Tecnologie, l'Energia e l'Ambiente (ENEA), Italy, the Istituto Nazionale di Fisica Nucleare (INFN), Italy, the Regione Autonoma Friuli Venezia Giulia. The conference also benefited from the financial support of the 12 industrial exhibitors, listed elsewhere. All of this helped to balance the conference budget as well as to provide financial support for 10 young researchers who would not otherwise have been able to attend the conference.

This year sees an end to a 20 year old tradition to publish the Conference Proceedings in the journal Nuclear Instruments and Methods in Physics Research. This decision was reached after an intense debate over several months amongst the members of the IEC, taking into account the opinion of the FEL community who had responded in November 2003 to a questionnaire on publication policy with a 2:1 vote in favour of changing to electronic publication on the Joint Accelerator Conference Website (JACoW). The organisers of FEL2004

hope that the rapid publication and the benefits of being included in the JACoW group of conferences will serve the FEL community well in future years.

In keeping with the usual policy, only those papers presented at the conference, either orally or as a poster, are included in these Proceedings. The change in publication policy has also implied a significant change in the refereeing of the papers. Since the proceedings do not have refereed status, the decision has been taken to only perform a light refereeing by members of the International Program Committee to ensure that minimum standards of readability and content are met. At the same time, authors have been encouraged to submit extended articles to the online refereed journal Physical Review Special Topics Accelerators and Beams (PRST-AB), which has agreed to publish a Special Edition of FEL Conference related papers.

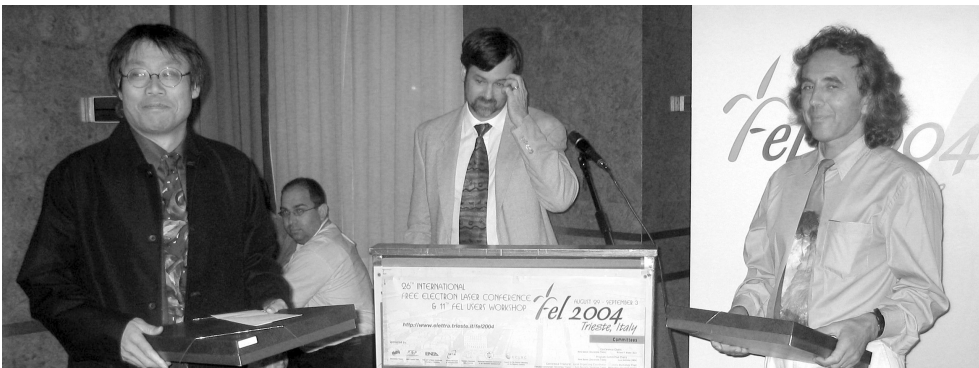
Another issue that causes continuing debate amongst the FEL community, which surfaced also at this years conference, was the question of whether to maintain annual conferences or change to conferences in alternate years. This year the IEC debated the issue at length and found itself closely divided. To resolve the issue, a poll of the conference attendees was organized in the form of a show of hands. This indicated an approximate 2:1 majority in favour of the *status quo*, which subsequently swayed the IEC to vote in favour of retaining annual conferences. Having received and considered bids for FEL2007, the decision was then taken to award the organisation of FEL2007 to the Budker Institute of Nuclear Physics in Novosibirsk, Russia.

On its 25th anniversary, this years International FEL Conference therefore marks a significant change in the way its proceedings are published. Other important aspects of the conference remain the same for some time at least: for example, the traditional annual conference, a testimony to the fact that there is no lack of interest in hosting or attending FEL conferences and of the exciting times ahead for the FEL field.

René Bakker
Luca Giannessi
Marino Marsi
Richard P. Walker

FEL Prize

The International Free Electron Laser Prize is awarded each year to recognize individual researchers for their outstanding contribution to the field. At the 26th International Free Electron Laser Conference the prize for 2004 was awarded to Hiroyuki Hama (Tohoku University) and Vladimir Litvinenko (Brookhaven National Laboratory), in recognition of their fundamental and pioneering contributions to Storage Ring Free Electron Lasers (SRFELs).



Hiroyuki Hama (left) and Vladimir Litvinenko (right) receiving the 2004 FEL Prize from the FEL Prize Committee Chairman, Stephen Benson (centre)

Vladimir Litvinenko and Hiroyuki Hama have performed fundamental and pioneering contributions in Storage Ring Free Electron Lasers (SRFELs). Thanks to their deep understanding of the FEL and to their achievements, they have promoted the use of SRFELs in a broad scientific community, from synchrotron radiation to nuclear physics.

They have both worked innovatively at the frontiers of SRFELs. V. Litvinenko installed the electromagnetic optical klystron OK4 on the by-pass of VEPP3 at Akadiemgorodok (Russia) in 1988, and H. Hama installed the first optical klystron with adjustable planar-to-helical field in 1996 on UVSOR in Okazaki (Japan). These improvements produced new short wavelength records for FELs: 240 nm for VEPP3 SRFEL in 1988, 238 nm for the UVSOR SRFEL in 1996. Then, after a move by Litvinenko to Duke University, 226 nm in 1998, and to 193 nm in 1999.

They have both been very active in advancing the understanding of storage ring FEL dynamics, H. Hama performed very early systematic sophisticated experimental analysis of the FEL micro-pulse temporal and spectral distribution versus time for different operating conditions starting in 1994. He also carried out detailed studies on FEL performances for different momentum compaction factors. V. Litvinenko developed a complete theoretical model of giant and super pulses whose findings are in good agreement with measurements performed on the DUKE FEL, and used super pulses to produce strong coherent harmonics.

They have developed technological improvements to SRFELs that improve the device for users. Hama developed a feedback system to maintain the FEL pulse at perfect synchronism, leading successful pump-probe two-color experiments in gas phase using FEL light and synchrotron radiation for the first time. A transverse feedback system was developed in Duke FEL to stabilize beam operation.

A very important contribution of their work has been the production of monochromatic gamma-rays by Compton Back-Scattering with SRFELs. Hama performed the first experimental demonstration at UVSOR

in 1996 in the MeV range. At Duke University, Litvinenko developed a high intensity gamma ray user facility (HIGS), leading to new discoveries in Nuclear Resonant Fluorescence and near-threshold break-up of Deuterium. This has broadened the use of FELs into the field of nuclear physics.

Besides their leading role in FELs, they continue to make important contributions to the field of physics as a whole. They have trained many graduate students and have assisted in the commissioning of numerous synchrotron light sources. Both operated FEL user facilities providing hundreds of hours of FEL light to users each year. Litvinenko is now working on electron-ion colliders. Hama is involved in the design of the next generation of storage rings in Japan.

The FEL Prize Committee

Previous FEL Prize Winners

- 2004** (Trieste) Vladimir Litvinenko and Hiroyuki Hama
- 2003** (Tsukuba) Li-Hua Yu
- 2002** (Argonne) H. Alan Schwettman and Alexander F.G. van der Meer
- 2001** (Darmstadt) Michel Billardon, Marie-Emmanuelle Couprie, and Jean-Michel Ortega
- 2000** (Durham) Stephen V. Benson, Eisuke J. Minehara, and George R. Neil
- 1999** (Hamburg) Claudio Pellegrini
- 1998** (Williamsburg) John Walsh
- 1997** (Beijing) Kwang-Je Kim
- 1996** (Rome) Charles Brau
- 1995** (New York) Richard Pantell and George Bekefi
- 1994** (Stanford) Alberto Renieri and Giuseppe Dattoli
- 1993** (The Hague) Roger Warren
- 1992** (Kobe) Robert Phillips
- 1991** (Santa Fe) Phillip Sprangle and Nikolai Vinokurov
- 1990** (Paris) Todd Smith and Luis Elias
- 1989** (Naples, FL) William Colson
- 1988** (Jerusalem) John Madey

A Tribute to Professor Emeritus Haruo Kuroda



Professor H. Kuroda will be remembered by the free-electron laser (FEL) community for his enthusiastic building of the mid-infrared (MIR) wavelength region FEL users facility as one of the most advanced and leading in the world at Noda campus, Science University of Tokyo in 1999 - 2003. He designed and prepared many users experimental laboratories dedicated to FEL applications in chemistry, physics, material and medical science and so on, and he started the experimental programs and proposals. After he started routine operation of the mid-infrared region free-electron laser, another FEL in the far-infrared (FIR) wavelength region was just ready to start up, and many experiments were planned using both of the MIR and FIR free-electron lasers.

It has been extremely regrettable that Professor H. Kuroda and his followers did not have the possibility to add their new and fruitful findings using the FELs to his famous, pioneering work in the early history of synchrotron radiation sciences because he passed away so suddenly, after contracting interstitial pneumonia, on the 4th May, 2004. On behalf of the FEL community in Japan, I would like to ask you, all of his friends and his acquaintances in the world, that now we would share the deep sense of loss and pray for the soul of the late Professor H.Kuroda.

After his Buddhist funeral ceremony in the 7th May 2004, the Japanese Government decided to confer a decoration from His Majesty the Japanese Emperor for his great academic contributions. His conferment is named The Order of the Sacred Treasure, Gold Rays with Neck Ribbon.

Professor H.Kuroda's biographical outline is briefly described below. As one of the heartfelt tributes given by his old friends in the synchrotron radiation community records (The Independent, England, 27th May 2004) "Haruo Kuroda was one of the world's foremost experts on the design and application of synchrotron radiation to the elucidation of a wide range of scientific problems. Haruo Kuorda was a humble, almost self-effacing individual, short in physical stature, but towering in his intellectual energy and authority". He will be sadly missed by all who knew him.

Eisuke John Minchira

Haruo Kuroda, Chemist, biographical outline

- Born in Tokyo, 28 June 1931;
- Research Associate, Department of Chemistry, University of Tokyo 1960-1968,
- Associate Professor, University of Tokyo 1968-1971,
- Professor, University of Tokyo 1971-1977,
- Department Chairman, University of Tokyo 1977-1979,
- Chairman of the Library Council, University of Tokyo 1988-1991;
- Chairman of the Advisory Council, Photon Factory, KEK, Japan 1980-2003;
- Chairman of the Library Council, National University of Japan 1988-1991;
- Professor, Science University of Tokyo 1992-2003,
- And Director of Infrared Free-Electron Laser Center 1999-2003;
- Married 1958 to Hiroko Fujimoto (two sons);
- Died in Tokyo, 4 May 2004.

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the office

via San Nicolò 14, 34121 Trieste, Italy

e-mail: theoffice@theoffice.it

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