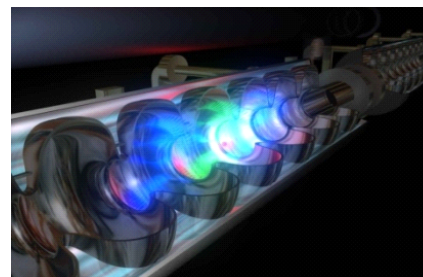
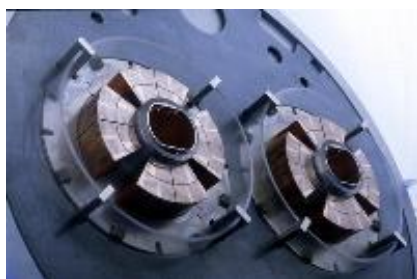


# *A new network on laser & plasma particle acceleration in FP7 EuCARD*

<http://eucard.web.cern.ch/EuCARD/>



*J.P. Koutchouk, Project Coordinator, CERN*

# Outline

EuCARD has launched a recent initiative on laser and plasma acceleration and

ESGARD is considering the possibility of some support of this new acceleration principle in the preparation of the next FP7-IA on accelerator R&D for 2013-2017.

*Let-s first present **EuCARD** and **ESGARD**, before coming to this recent initiative and its goals.*

# What is EuCARD?

European Coordination for Accelerator R&D  
a **FP7 « Integrating Activities »**, including

- **Joint Research Activities (87%)** on advanced accelerator technologies, on topics of high priority in
  - High-energy physics,
  - Nuclear Physics,
  - Linac-based light sources,
- **Scientific networks (10%)** as exchange platforms.
- EU sponsored access to two accelerator test facilities (3%).

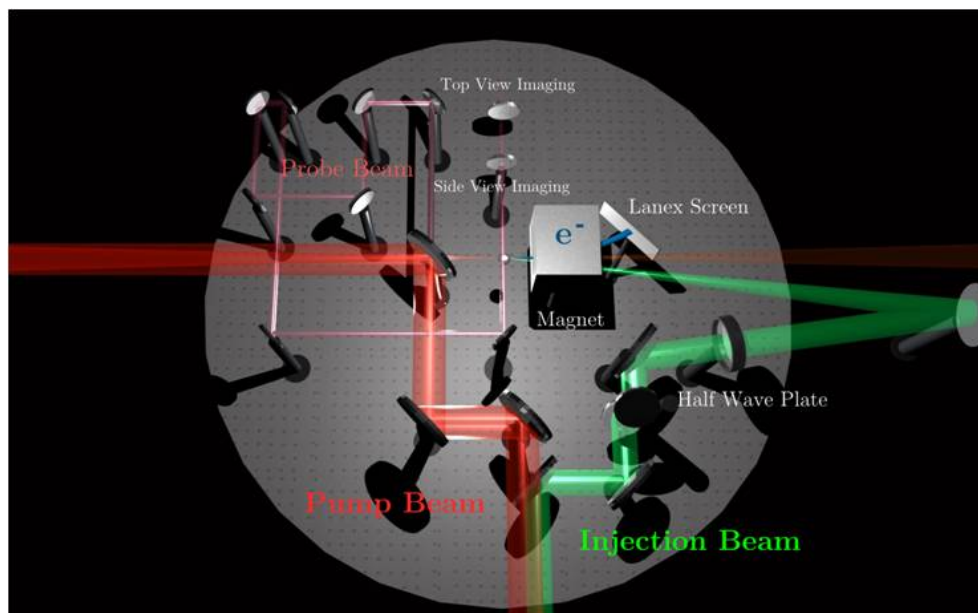
# What scientific program?

|    |                                      |   |       |
|----|--------------------------------------|---|-------|
| 1  | MGT                                  | J.P. Koutchouk, R. Assmann, S. Stavrev/CERN                   | 0.2%  |
| 2  | Dissemination                        | R. Romaniuk/WUT, K. Kahle/CERN                                | 1.5%  |
| 3  | Neutrino network                     | V. Palladino/U. Napoli  | 3%    |
| 4  | <u>Accelerator sciences networks</u> | F. Zimmermann/CERN,<br>W. Scandale/CNRS-LAL<br>P. Spiller/GSI | 6%    |
| 5  | Access to HiRadMat@SPS               | I.Efthymiopoulos/CERN   | 0.5%  |
| 6  | Access to MICE                       | N. McCubbin/STFC-RAL  | 2%    |
| 7  | High Field Magnets                   | G. De Rijk/CERN, F. Kircher/CEA                               | 21%   |
| 8  | Collimation & Materials              | R. Assmann/CERN, J. Stadlmann/GSI                             | 12.8% |
| 9  | NC linac technologies                | G. Blair/RHUL, E. Jensen/CERN                                 | 20%   |
| 10 | SC RF technologies                   | O. Napoly/CEA, O. Brunner/CERN                                | 24%   |
| 11 | <u>Novel concepts</u>                | M. Biagini/INFN, R. Edgecock/STFC-RAL                         | 9%    |

# Zoom on WP11: Novel concepts

Crab waist crossing, Non-scaling FFAG-s  
and...

Instrumentation (emittance measurement) for  
laser driven plasma wake field accelerators: V.  
Malka coordinator, with CNRS-LOA and INFN-  
LNF



*Courtesy LOA*

# Who is EuCARD?

A joint venture of 37 **European** « legal entities »  
representing some 45 accelerator laboratories, universities,  
research centers and private companies,

to which about 40 laboratories and universities are  
*associated* **worldwide** through networks,



# Partners

- **International:** CERN
- **Austria:** ARC
- **Finland:** TUT, UH
- **France:** CEA, CNRS, UJF
- **Germany:** HZB, DESY, BHTS, FZD, FZK/KIT, GSI, UROS
- **Italy:** Columbus, INFN, POLITO
- **Malta:** UM
- **Poland:** IFJPAN, IPJ, PWR, TUL, WUT
- **Russia:** BINP, RRC KI
- **Spain:** CIEMAT, CSIC
- **Sweden:** UU
- **Switzerland:** EPFL, PSI, UNIGE
- **UK:** RHUL, SOTON, STFC, ULANC, UNIMAN, UOXF-DL

# Associates via networks

- **International: JINR**

- **Europe:**

- **Belgium:** U. Catholique Louvain
- **Bulgaria:** U. Sofia
- **France:** GANIL, THALES
- **Germany:** Max Planck Inst. Heidelberg, U. Erlangen, T. U. Berlin, U. Hamburg
- **Italy:** U. Bologna, U. Sannio
- **The Netherland:** Twente University
- **Poland:** BUT, Cracow U., LUT
- **Russia:** IHEP, INR RAS, IPCP, ITEP
- **Spain:** U. A. Madrid, UCLM
- **Sweden:** U. of Stockholm
- **Switzerland:** CHIPP
- **UK:** Imperial

- **America**

- **Canada:** TRIUMF
- **Mexico:** CINVESTAV
- **USA:** ANL, BNL, FNAL, LBNL, MIT, MSU, SLAC, Texas A&M, TJNAF

- **Asia:**

- **China:** CIAE
- **India:** TIFR
- **Japan:** KEK, Osaka U.,

- **Australia: ANU**



# What budget and time scale?

Budget: 31 M€, including a EU funding of 10 M€.

Duration 2009 to 2013.

*Accelerator R&D is as well included in the new targetted FP7 Call in 2011.*

# Additional charge by the EC, beyond its scientific goals

[*Contribution to the emergence of*] sustainable collaborative structures in the field of accelerator research and development.

## Other contacts of EuCARDS

B. Cros, CNRS-LPGP was invited in the plenary 2010 EuCARD Annual Meeting in RAL, UK to present the results of the FP6 EUROLEAP project, ended in 2009 (laser/plasma acceleration to the TeV range).

A. Caldwell/MPI-Munchen et al., where some CERN support is channeled via EuCARD.

At CERN, a number of presentations and an academic training by experts in the field.



## Mandate

ESGARD develops proposals to optimize and enhance the outcome of the R&D in the field of accelerator physics in Europe. It promotes collaborations and a coherent and coordinated utilization and development of infrastructures. It prepares and/or follows up FP proposals/projects (CARE, EuCARD, EURONU, SLHC-PP, ILC-HiGrade, TIARA,...)



Members delegated by directors of large labs: R. Aleksan/CEA (chair), M. Cerrada/CIEMAT, R. Edgecock/STFC, E. Elsen/DESY, JP Koutchouk/CERN (sc. secretary), F. Richard/CNRS, L. Rivkin/PSI.

**ESGARD now prepares the accelerator R&D proposal to come after EuCARD (November 2011 call):**

*4 requests received so far for plasma wakefield acceleration from 7 labs, mostly in EuCARD*

# The EuCARD initiative

Given the charge of EuCARD, its many partners involved in accelerator R&D, given the large progress observed in plasma wakefield acceleration experiments and suggestions from within EuCARD,

- Create a **new Accelerator Network** within EuCARD WP4 “Accelerator Networks or AccNet”,
- To foster European collaborations between **laser**, **plasma** and **accelerator** scientists and engineers,
- With the goal of exploring the potential for **applications**, the need **of test stations** and the study of **demonstrators**, in collaboration with existing bodies,. e.g. ICFA/ICUIL.

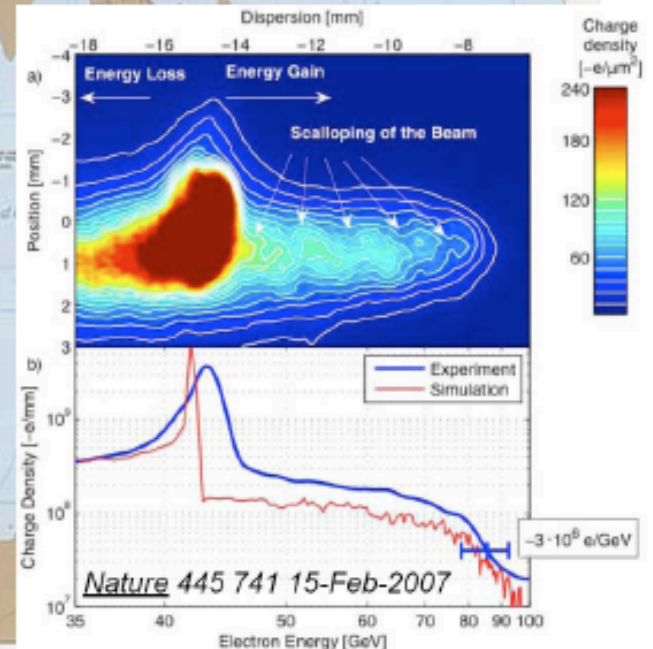
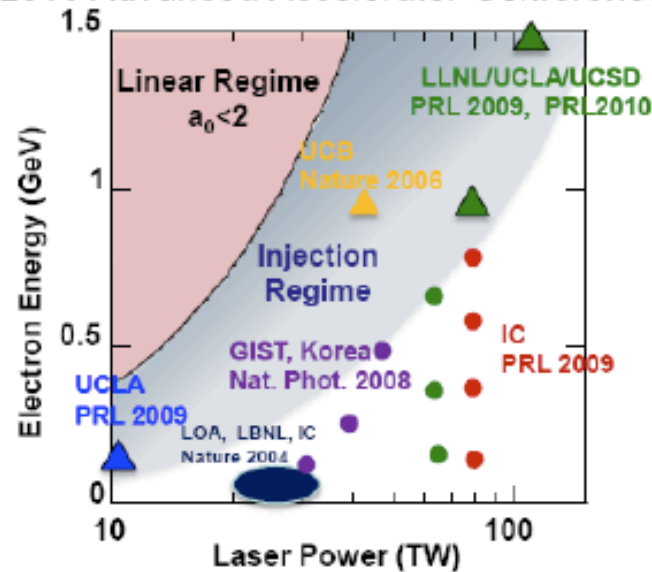
# World-Wide Interest in Plasma Acc.

Plasma Acceleration on the Globe, T. Katsouleas



D. H. Froula

2010 Advanced Accelerator Conference



● Laser Wake Expts

● Electron Wake Expts

● e-/e+ Wake Expts

Slide: T. Raubenheimer, ICHEP



# Example: Advances of Laser

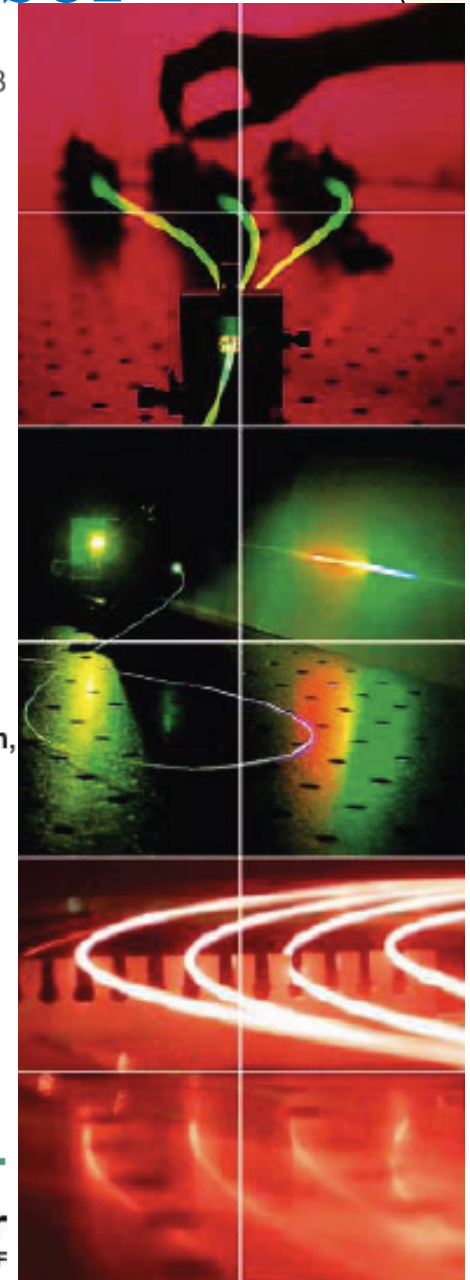
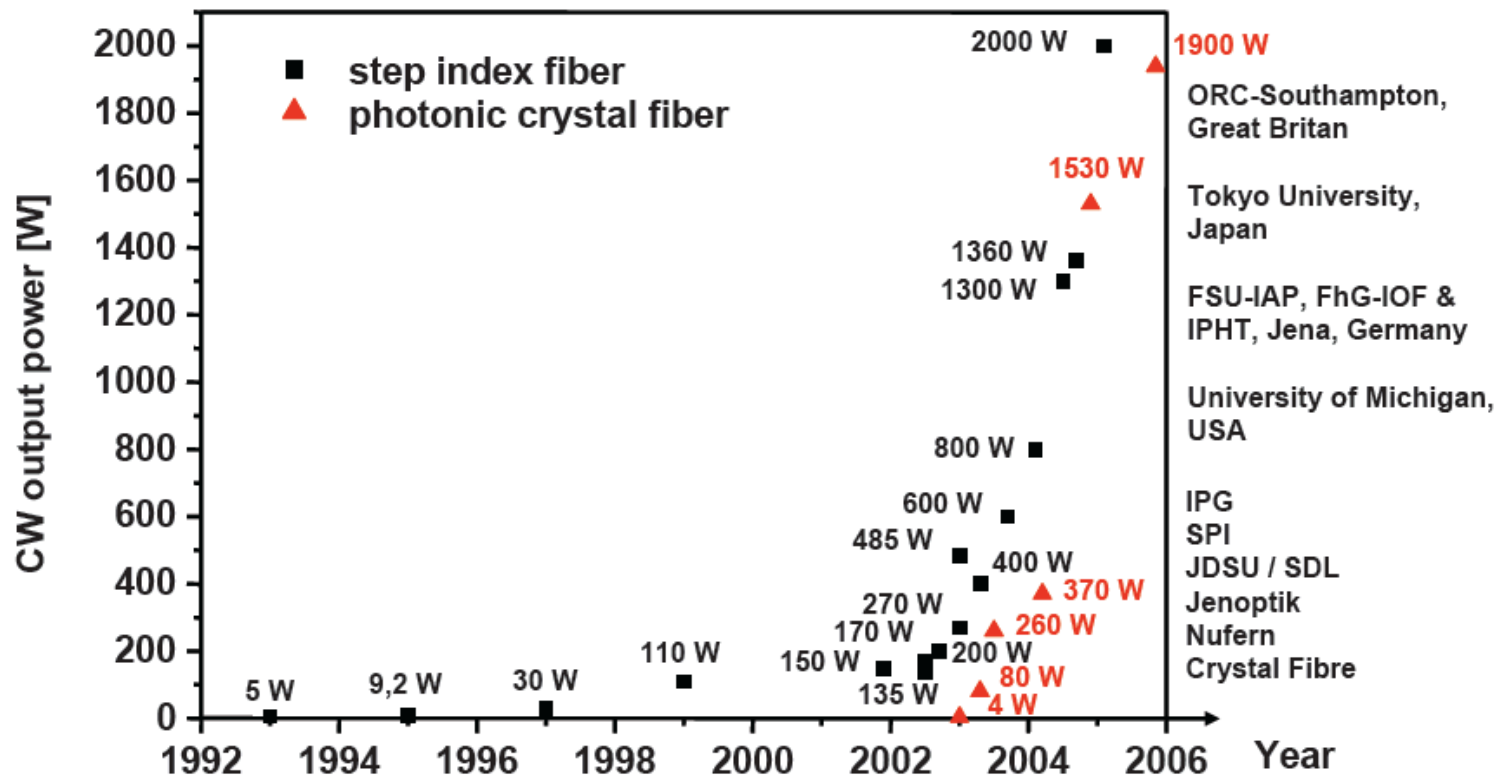
*From Andreas Tünnermann*

Tailored Light - Licht nach Maß

## Diode-pumped double clad fiber laser (cw output)

evolution of cw fiber laser

> 6 kW @ 2010





# Tentative goals of the network

1. **Assessment** of the different acceleration methods and of their suitability for practical particle acceleration.
2. Description of the needed **R&D**, of its organization (joint programs?, starting in a EC FP framework?), of the respective roles of Universities and of the support that could be provided by large accelerator laboratories (focus on parameter lists for practical accelerators, beam diagnostics, safety,...).
3. Roadmap to one or several European **test facilities**, complementing the on-going US effort with BELLA/LBNL and FACET/SLAC, including a demonstrator with concrete goals, e.g. beam for medicine.
4. Roadmap to the **energy frontier**: where is it? What is a realistic potential for High Energy Physics and on what time scale? What should be the intermediate goals, 10 GeV ?

# Organization of the network

- Imbedded in EuCARD/AccNet and benefitting from its experience, contacts and know-how,
- Led by a **coordination team** (organization) and a **Steering Board** (scientific goals).
- Network **open to all interested parties in Europe**.
- Network **invites main actors in Asia/US** for discussion and decisions.
- Self-sustained network, benefitting from an initial modest financial support of CERN via EuCARD.

# Coordination Team

- **Dr. Ralph Assmann**, CERN, deputy coordinator of EuCARD, in charge at CERN of following up the progress in laser and plasma acceleration.
- **Dr. Jens Osterhoff**, DESY, appointed by the DESY management.
- **Dr. Henri Videau**, LLR/X&CNRS.

# Scientific Steering Board: Europe

Status 11.1.2011

| Europe         | Name                  |             | Affiliation                  |
|----------------|-----------------------|-------------|------------------------------|
| EuCARD, CERN   | Dr. Assmann*          | Ralph       | EuCARD/CERN                  |
|                | Dr. Geschonke         | Günther     | CERN                         |
|                | Dr. Koutchouk         | Jean-Pierre | EuCARD/CERN                  |
|                | Dr. Zimmermann        | Frank       | EuCARD/CERN                  |
| France         | Dr. Cros              | Brigitte    | LPGP -CNRS                   |
|                | Prof. Dr. Malka       | Viktor      | LOA                          |
|                | Dr. Martin            | Philippe    | CEA                          |
|                | Prof. Dr. Mourou      | Gerard      | ILE                          |
|                | Dr. Specka            | Arnd        | Ecole polytechnique          |
|                | Dr. Videau*           | Henri       | Ecole polytechnique          |
| Germany        | Prof. Dr. Caldwell    | Allen       | MPI-P Muenchen               |
|                | Dr. Floettmann        | Klaus       | DESY                         |
|                | Prof. Dr. Grüner      | Florian     | LMU Muenchen/MPQ             |
|                | Dr. Osterhoff*        | Jens        | University Hamburg, DESY     |
|                | Prof. Dr. Sauerbrey   | Roland      | FZD Rossendorf               |
| Italy          | Dr. Ferrario          | Massimo     | LNF                          |
|                | Dr. Ghigo             | Andrea      | INFN Frascati                |
|                | Prof. Dr. Guiletti    | Danilo      | INFN Frascati                |
|                | Dr. Serafini          | Luca        | INFN Frascati                |
| Portugal       | Prof. Dr. Mendonca    | Jose Tito   | Instituto Superior Tecnico   |
| Russia         | Dr. Kostyukov         | Igor        | Institute of Applied Physics |
| Sweden         | Prof. Dr. Wahlstroem  | Claes-Goran | Lund University              |
| Switzerland    | Prof. Dr. Rivkin      | Leonid      | EPFL, PSI                    |
| United Kingdom | Prof. Dr. Jaroszynski | Dino        | University of Strathclyde    |
|                | Dr. Najmudin          | Zulfikar    | Imperial College             |
|                | Prof. Dr. Neely       | David       | Rutherford Appleton Lab      |
|                | Prof. Dr. Seryi       | Andrei      | John Adams Institute         |

# Scientific Steering Board: world

Status 11.1.2011

| Non-Europe    | Name      |                   | Affiliation               |
|---------------|-----------|-------------------|---------------------------|
| China         | Prof. Dr. | Sheng Zhengming   | Institute of Physics, CAS |
| India         | Dr.       | Naik Prasad       | RRCAT                     |
| Japan         | Prof. Dr. | Yokoya Kaoru      | KEK                       |
| United States | Prof. Dr. | Chou Weiren       | ICFA/Fermilab             |
|               | Prof. Dr. | Joshi Chan        | University of California  |
|               | Prof. Dr. | Katsouleas Thomas | Duke University           |
|               | Dr.       | Leemans Wim       | LBNL                      |
|               | Prof. Dr. | Muggli Patric     | USC                       |
|               | Prof. Dr. | Raubenheimer Tor  | SLAC                      |
|               | Prof. Dr. | Tajima Toshiki    | ICUIL/LMU                 |

# Milestones

| Time                         | Milestone   |
|------------------------------|---|
| end 2010                     | Form the Steering Board.  |
| Q1 2011                      | Kick off meeting of Steering Board, finalization of goals and milestone table, preparation of first workshop. |
| <b>May 2011 (first week)</b> | <b>PWAN Workshop at CERN: Review activities and discuss strategy and prepare proposals</b>                    |
| Jun 2011                     | First small initiative(s) into EuCARD2, if useful & possible  |
| Jun 2011 – 2012              | Prepare coherent European strategy, maximizing synergy and maintaining productive competition                 |
| 2012 – 2013                  | Agree on possibilities for a substantial FP8 proposal, prepare proposal                                       |

<http://www.cern.ch/plasma-acceleration>

## Conclusion

*It appears timely that novel acceleration methods are better integrated into the global accelerator R&D effort.*

*As a first step, EuCARD launches this network, bridging the gap between several specialties. If it demonstrates added value, its leverage effect is expected to be significant, with impact on accelerator R&D programming in Europe and amongst partners, including the major accelerator laboratories. A very first opportunity is opened with the FP7-EuCARD2 proposal.*