

## European Network for Novel Accelerators (EuroNNAC<sub>2</sub>):

# WP7

R. Assmann (DESY), M. Ferrario (INFN Frascati),  
B. Holzer (CERN), J. Osterhoff (DESY),  
A. Seryi (JAI, Oxford), A. Specka (Ecole polytechnique  
Paris)

EuCARD2 Final Yearly Meeting  
28 – 30.3.2017, Glasgow, UK



1. Short Review Milestones and Deliverables
2. Major Achievements in EuroNNAc2
3. Outlook

- 1. Short Review Milestones and Deliverables**
- 2. Major Achievements in EuroNNAc2**
- 3. Outlook**

Y1	MS58	EuroNNAc2 2013 workshop	7	M12	<b>DONE</b>	<b>M</b>
Y2	MS59	EuroNNAc2 2014 workshop	7	M24	<b>DONE</b>	<b>M</b>
	7.1	Interim EuroNNAc2 report	7	M24	<b>DONE</b>	<b>D</b>
Y3	MS60	EuroNNAc2 2015 workshop	7	M36	<b>DONE</b>	<b>M</b>
Y4	MS61	EuroNNAc2 2016 workshop	7	M48	<b>DONE</b>	<b>M</b>
	7.2	Final EuroNNAc2 report - a European roadmap	7	M46	<b>ongoing</b>	<b>D</b>



## ANAR2017: Advanced and Novel Accelerators for High Energy Physics Roadmap Workshop 2017

25-28 April 2017

CERN

Europe/Zurich timezone

### Overview

Organizing Committee

Timetable

Registration

Registration information

└ Fee and Payment Options

Participant List

Programme

Working groups

Participants information

└ Transport and CERN access

└ CERN Internet Access for the Visitors

└ Accommodation

### Support

✉ [be.abp.secretariat@cern...](mailto:be.abp.secretariat@cern...)

☎ +41227672523

Advanced and Novel Accelerators for High Energy Physics Roadmap Workshop 2017

Organised at the initiative of the ICFA panel for [Advanced and Novel Accelerators](#), the ANAR2017 workshop aims at discussing issues to be addressed in the near future to be in a position to identify promising technologies for future advanced accelerators, and to establish an international scientific and strategic roadmap. **The general goal is to define an international roadmap towards colliders based on advanced accelerator concepts, including intermediate milestones, and to discuss the needs for international coordination.**

The workshop is open to the scientific community at large. It is organized around working groups that will examine the various schemes that are currently under active investigation (LWFA, PWFA, DWA, DLA) as well as those that need to be addressed in the near- mid- and long-term to reach parameters relevant to a high-energy collider.

The last part of the workshop will be dedicated to discussion of the working group results and to the strategy to push forward the development of advanced accelerators in the context of the next international project at the TeV scale.

The results will be synthesized in a document that will be broadly distributed.



**Starts** 25 Apr 2017 08:00

**Ends** 28 Apr 2017 14:00

Europe/Zurich



CERN

6-2-024 - BE Auditorium Meyrin

Chairpersons:  
B. Cros  
P. Muggli

EuroNNAc strategy will be presented and discussed at this workshop

Then completion of final EuroNNAc report...

1. Short Review Milestones and Deliverables
2. **Major Achievements in EuroNNAc2**
3. Outlook

## 1. Grew and nourished the network further.



# EuroNNAc<sup>2</sup>

European Network for Novel Accelerators

EINDHOVEN University of Technology

University of Oxford  
University of Strathclyde  
Manchester University  
Lancaster University  
Cockcroft Institute  
STFC Daresbury Laboratory  
John Adams Institute  
ASTeC  
STFC Central Laser Facility  
Liverpool University  
University College London  
Imperial College  
Queen's University of Belfast

Instituto Superior  
Tecnico de Lisboa

LULI  
Soleil  
LPGP  
LOA  
IRAMIS/CEA  
IRFU/CEA  
Laboratoire Leprince-Ringuet  
(Ecole polytechnique - CNRS/IN2P3)  
LAL

European Organization for  
Nuclear Research (CERN)  
PSI

University Düsseldorf  
LMU University Munich  
Stiftung Deutscher Elektronen Synchrotron (DESY)  
Gesellschaft für Schwerionenforschung (GSI)  
Max-Planck-Institute for Quantum Optics  
Max-Planck-Institute for Physics  
Helmholtz Institute Jena  
Helmholtz-Zentrum Dresden-Rossendorf (HZDR)  
University Hamburg  
University Erlangen  
University Darmstadt

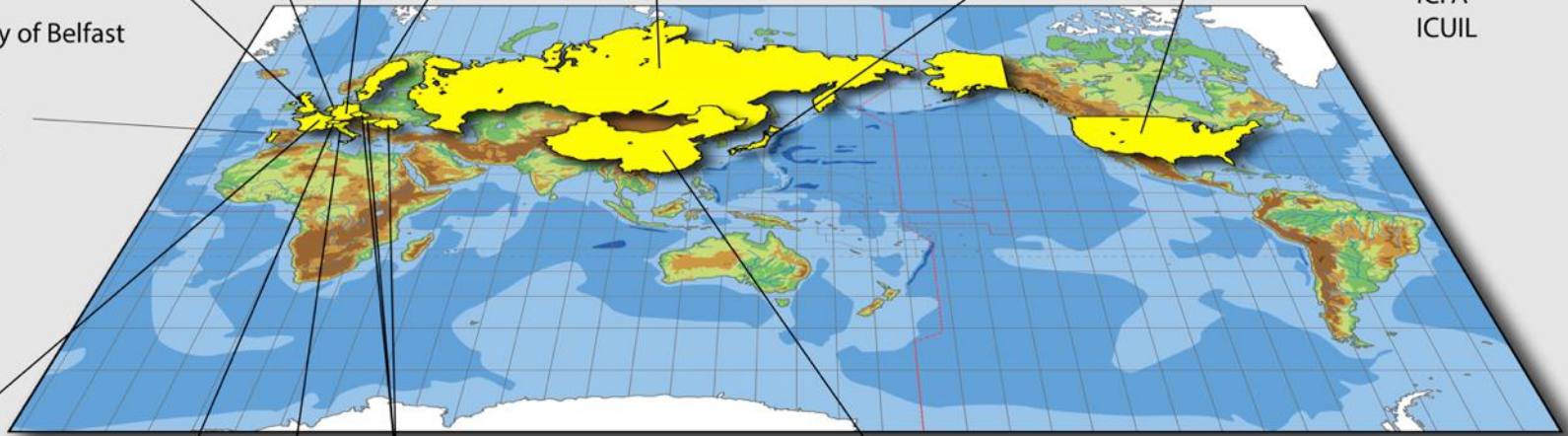
Lund University

Budker INP  
Institute of Applied Physics RAS

KEK

Fermi National Accelerator Laboratory  
SLAC National Accelerator Laboratory  
University of California Los Angeles  
Lawrence Berkely National Laboratory  
Brookhaven National Laboratory

ICFA  
ICUIL



Extreme Light Infrastructures (ELI)  
ELI Beams (Czech Republic)  
Wigner Research Center (Hungary)

Inst. of Physics, Chinese Academy of Sciences  
Tsinghua University, Beijing  
Shanghai Jiao Tong University

INFN-LNF  
Pisa University and INFN  
Consiglio Nazionale Delle Ricerche, INO  
University of Rome LA SAPIENZA





**SCAPA**

**LC** Lund Laser Centre

**STFC**  
**ASTeC**

**LAOLA**

Laboratory for Laser- and beam-driven plasma Acceleration

**ILPP**

**JuSPARCO**

**HI Jena**  
Helmholtz Institute Jena

**ELBE**  
HELMHOLTZ  
ZENTRUM DRESDEN  
ROSSENDORF

**STFC**  
**Central Laser Facility**

**PHELIX**

**eli** | beamlines

**Cilex**  
Centre Interdisciplinaire Lumière Extrême

**CALA**

Laboratoire d'optique appliquée  
UMR 7027 - Palaiseau / France

**AIVAKE**

Consiglio Nazionale delle Ricerche

**SPARC**   **INFN**  
Sezione di Roma

**CILEX Project, Plateau de Saclay, France**

- > The big French project.
- > Laser: 100 TW, 450 fs, 10 Hz, 100 pC, 1 μm norm. emittance
- > 450 m long
- > 450 m into

**5 PW laser and LWFA area**






Ralph Admann | UK Plasma Acc. Workshop | 31.1.2014 | Page 17


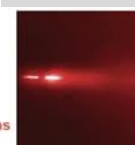
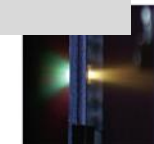
**LUND Laser Center, Sweden**

- > Well established lab, since 1992.
- > Laser: 100 TW, 450 fs, 10 Hz, 100 pC, 1 μm norm. emittance
- > Limit

**High stability LWFA**



X-rays



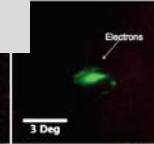
Electrons

Ralph Admann | UK Plasma Acc. Workshop | 31.1.2014 | Page 22

**SPARC LAB, Frascati, Italy**

- > Electron beam: 150 MeV, multi-bunch, bunch length below 300 fs, 200 pC, 1 μm norm. emittance
- > FLAME laser: Ti:Sa, chirped pulse amplification (CPA), 200 TW, 25 fs long, 10 Hz repetition rate
- > SPA Incu plas exp of la
- > Comb project is unique: resonant beam driven plasma wakefields.

**Comb beam → high efficiency**

Electrons

3 Deg

Ralph Admann | UK Plasma Acc. Workshop | 31.1.2014 | Page 21

**X-5 Project at LOA, France**

- > Salle Jaune Laser: 70 TW, repetition rate 10 Hz, pulse duration of 30 fs
- > Goals:
  - Exploration of new laser plasma accelerator concepts for the production of electron beams
  - production of intense X and XUV beams.

**LWFA for FEL → ERC**



Victor Malka  
Researcher at CNRS and Lecturer  
An excellence grant for LOA.

Victor Malka is CNRS researcher and lecturer in the physics department at X, works at ENSTA, in a team that he set up in 2001 to study laser-plasma particle acceleration. In July 2008, he was awarded a grant by the European Research Council of 2.2 million euros. The grant was awarded in two categories junior and senior. It was in the second category that he was rewarded for his many scientific works and for his ability to create new fields of research.




Ralph Admann | UK Plasma Acc. Workshop | 31.1.2014 | Page 18


**COXINEL Project at SOLEIL, France**

- > COXINEL: COherent Xray source INferred from Electrons accelerated by Laser.
- > Leader: Marie-Emmanuelle Couprie, SOLEIL
- > Goals:
  - CO is needed for laser plasma acceleration, it amplification
  - FEL source for intense light
  - CO and acceleration at SOLEIL particularly in terms of engineering, to turn the ideas and theories that physicists have devised into reality.
- > Closely connected to project X-5 in LOA.

**FEL R&D for LWFA → ERC**



erc European Research Council




Ralph Admann | UK Plasma Acc. Workshop | 31.1.2014 | Page 19

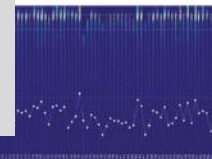
**CALA Project, Munich, Germany**

- > Builds on expertise at MPQ and LMU.
- > Successful in laser-driven generation of electron beams. See example with MPQ lasers.
- > Ongoing: 63 M€ investment. Financed by State Bavaria and LMU.
- > CALA 2014

**LWFA for science (FEL, ...)**



from gas cell: 600 MeV, 200 pC. X experiments into water window



Ralph Admann | UK Plasma Acc. Workshop | 31.1.2014 | Page 26

# Overview European Plasma Accelerator Activities



**Jülich Short-Pulse Particle and Radiation Centre**

**LWFA, polarized particles**

Material research

24 Januar 2014 Markus Büscher

**STFC – CLF and John Adams Institute in UK**

LWFA, medical imaging, training

STFC Central Laser Facility used also for LWFA.  
 John Adams Institute, Royal Holloway College, London  
 Plasma energy  
 Training of accelerator specialists, also in advanced methods.

S. Hooker, Z. Namstein, A. Sargol, R. Witzke

Ralph Assmann | Accelerator RAD-HEPAP Subpanel | 29.8.2014 | Page 66

**Strathclyde in UK/Scotland**

**SCAPA**

LWFA for radiation sources

SCAPA = Scottish Centre for the Application of Plasma-based Accelerators  
 LWFA for generation of particle beams (electrons, protons).  
 Dedicated to the Production and Application of Ultra-short Electron Bunches and Radiation Pulses.

D. Jarczyński, B. Hedgocock, Z.M. Sheng

Ralph Assmann | Accelerator RAD-HEPAP Subpanel | 29.8.2014 | Page 65

**CNR -Intense laser Irradiation Lab. (INO-Pisa, Italy)**

LWFA for medical applications

Leo Gizzi

Ultra-intense laser-plasma interactions, including advanced ICF ignition  
 Laser-driven X-ray and  $\gamma$ -ray fluorescence and scattering sources;  
 Laser driven proton beam-line development.

Luca Labate, Petra Koester

24.09.2015

**AWAKE experiment, CERN**

Proton-driven PWFA

International collaboration with approved experiment at CERN beam.  
 Driver: 450 GeV proton bunch,  $1e11$ ,  $3.5\mu\text{m}$  emittance, bunch length  $\gg$  plasma wavelength.  
 Accelerate injected electrons from several 10 MeV to GeV.

1) Protons at focusing regions survive.  
 2) Protons at defocusing regions get lost.  
 Surviving microbunches induce wake-fields.

Ralph Assmann | UK Plasma Acc. Workshop | 31.1.2014 | Page 24

**ICAN Project**

ICAN for high efficiency

Coherent Amplification Network

The future is fibre accelerators

Small structures, 800 fs, 100 kV, 100 pC, 100 fs, 100 pC, 100 fs, 100 pC

Could massive arrays of thousands of fibre lasers be the driving force behind next generation particle accelerators? The International Coherent Amplification Network project believes so and is currently performing a feasibility study.

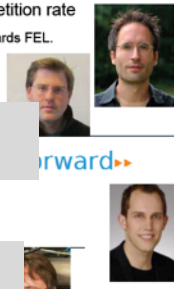
Ralph Assmann | UK Plasma Acc. Workshop | 31.1.2014 | Page 29

# Overview European Plasma Accelerator Activities

R. Assmann, EuroNNAc2 @ EuCARD2, 3/2017




- LWFA FEL: repetition rate towards FEL. Later, move to SINBAD facility.
- e- driven PWFA: Beams: forward
- PWFA modulation: Beam-driven plasma wakefields. Beam-driven plasma wakefields with shaped beams and innovative injection methods.



Ralph Admann | 31.1.2014 | Page 32

Principle: manipulation of laser-accelerated ions

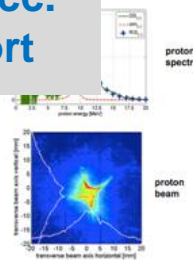


- 1. Laser-driven ion acceleration
- 2. beam conditioning (collimation)
- 3. e-space rotation

Current: initial, development, optimization

ARD test facility: 10 MeV

- Extension of the target area and
- Study for an injection into GSI's one accelerator
- Relevant laser developments (repetition rate and temporal contrast)



Ralph Admann | 31.1.2014 | Page 33

FEL, industrial applications, PWFA


- Cockcroft Institute: Universities of Lancaster, Liverpool and Manchester, the Science and Technology Facilities Council, the Natural Science and Engineering Research Council of Canada (NSERC), and the United States Department of Energy (DOE) and the National Science Foundation (NSF).
- Ultra-short CLARA proton beam
- Training.



Ralph Admann | Accelerator, RAD14

- Laser: 10-15 fs duration, up to 10 PW. End stage: a few kJ in 15 fs (~200 PW) with low repetition rate (minute based).
- 10 - 200 PW laser, also for LWFA (finally 100 GeV?) (\*)

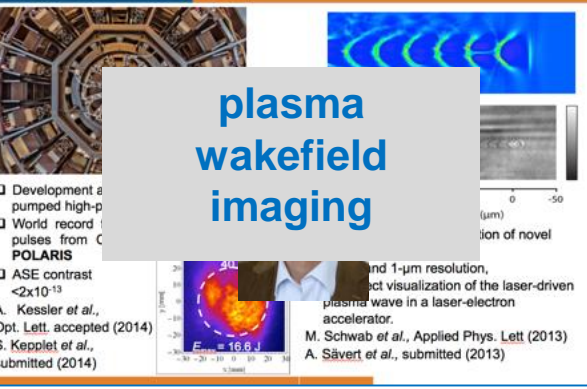
quality and low-cost proton sources for cancer therapy.



Ralph Admann | UK Plasma Acc. Workshop | 31.1.2014 | Page 23

plasma wakefield imaging

- Development of a pumped high-power laser
- World record in generating ultra-short laser pulses from a femtosecond laser
- POLARIS
- ASE contrast >2x10<sup>13</sup>
- A. Kessler et al., Opt. Lett. accepted (2014)
- S. Keppeler et al., submitted (2014)
- 1-μm resolution, direct visualization of the laser-driven plasma wave in a laser-electron accelerator.
- M. Schwab et al., Applied Phys. Lett (2013)
- A. Sävert et al., submitted (2013)



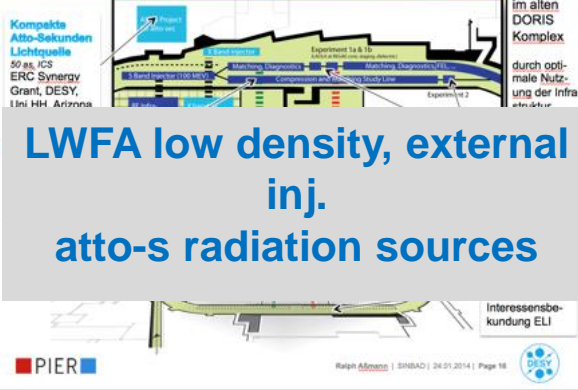
Two 1 PW laser, ion/p plasma acc., radiation therapy R&D

- Dual beam
- Diode pumped
- Synchrotron
- Dedicated
- Beam driven



Ralph Admann | Accelerator, RAD14

LWFA low density, external inj. atto-s radiation sources



ARD Spitzenforschung im alten DORIS Komplex

Interessensbeziehung ELI

Ralph Admann | SINBAD | 26.01.2014 | Page 18

\* Extreme Light Infrastructure is a European research infrastructure (1 B€) at the international forefront of laser research. This research infrastructure is funded by the EU and presently under construction in Hungary, Bulgaria and Romania. ELI is a member of the EuroNNAc2 network and an associated partner in the EuPRAXIA project. This close connection ensures:

- optimal synergetic effects between the accelerator, laser and user communities (FEL, HEP, high density plasma, laser science)
- coordinated strategy for laser-driven plasma accelerators

In particular: ELI is included into site studies for a future European plasma accelerator.

- Original focus: European **plasma acceleration** community
  - Plasma-based electron accelerators
  - Plasma-based hadron accelerators
  - Driven by lasers and/or particle beams (e- and p)
- Grown to include discussions and teams from **dielectric vacuum accelerator R&D**:
  - Dielectric vacuum accelerators driven by THz (more specifically 300 GHz) sources → **AXSIS ERC synergy grant** (DESY/UHH), **CLARA**, ...
  - Dielectric vacuum accelerators driven by optical lasers → **ACHIP international collaboration GBM grant** → Erlangen, PSI, DESY, GSI, TUD, ...





### Decisions:

Next working steps, standards to be set, optimizations for workshop organization, future spending of the network

EAAC2019 will be in Elba, Italy again

R. Assmann, EuroNNAc2 @ EuCARD2, 3/2017





## National novel accelerator projects with European network



Independent national projects\*, funded by national states. About 16 major facilities for novel plasma acceleration R&D.

Funded by EU FP7 through EuCARD2



## European novel accelerator projects with international involvement

Talk 2017 YM  
EuCARD2

ERC Synergy Grant

Talk 2016 YM  
EuCARD2

\* See note on ELI

1. Grew and nourished the network further.
- 2. Established the European Advanced Accelerator Concepts Workshop (EAAC) as a European forum for discussions and exchange on novel accelerators.**

- 258 participants + about 50 accompanying persons.
- 45 sponsored students plus non-sponsored students.
- Participants from 23 countries in 4 continents (11 EU member states):
  - EU member states: 188
  - Other Europe + Russia + Israel: 28
  - US: 30
  - Asia: 11
  - Australia: 1
- 218 male (84%), 40 female (16%) participants





- Working Groups + Summaries: 7
- Invited Talks: 30
- Special Science Talk: 1
- WG Talks: 138
- Posters: 76

*Thanks to Alban Mosnier + Program Committee*

- Proceedings - Special Volume NIM → Published in 2016  
Lead editor: Ulrich Dorda
- **81 papers, peer reviewed** *(from 50 papers at EAAC2013)*
- Already generated **83 citations** → papers are read and used!

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Sort by:

**HEP** 81 records found Search took 1.74 seconds.

**1. Transverse oscillations in plasma wakefield experiments at FACET**

E. Adli *et al.* 2018. 5 pp.  
 Published in *Nucl.Instrum.Meth. A829* (2018) 84-89  
 DOI: [10.1016/j.nima.2018.02.054](#)  
 Conference: [C15-09-12 Proceedings](#)

[References](#) | [BIBTeX](#) | [LaTeX\(US\)](#) | [LaTeX\(EU\)](#) | [HarvMac](#) | [EndNote](#)  
[Detailed record](#)

**2. Production of quasi-ellipsoidal laser pulses for next generation high brightness photoinjectors**

T. Ruback *et al.* 2018. 4 pp.  
 Published in *Nucl.Instrum.Meth. A829* (2018) 438-441  
 DOI: [10.1016/j.nima.2018.12.004](#)  
 Conference: [C15-09-12 Proceedings](#)

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**3. Staging optics considerations for a plasma wakefield acceleration linear coll**

C.A. Lindstrom, E. Adli, J.M. Allen, J.P. Delahaye, M.J. Hogan, C. Joshi, P. Muggli, T.O. Rauberheine Yakimenko. 2018. 5 pp.  
 Published in *Nucl.Instrum.Meth. A829* (2018) 224-229  
 DOI: [10.1016/j.nima.2018.12.069](#)  
 Conference: [C15-09-12 Proceedings](#)

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[Detailed record](#) - Cited by 4 records

**4. Laser-plasma-based linear collider using hollow plasma channels**

C.B. Schroeder, C. Benedetti, E. Esarey, W.P. Leemans. 2018. 4 pp.  
 Published in *Nucl.Instrum.Meth. A829* (2018) 113-118  
 DOI: [10.1016/j.nima.2018.03.001](#)  
 Conference: [C15-09-12 Proceedings](#)

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[Detailed record](#)

**5. Recent advances in high-performance modeling of plasma-based acceleration using the full PIC method**

J.-L. Vay, R. Lehe, H. Vincenti, S.B. Godfrey, I. Haber, P. Lee. 2018. 5 pp.  
 Published in *Nucl.Instrum.Meth. A829* (2018) 383-387  
 DOI: [10.1016/j.nima.2018.12.033](#)

Conference: [C15-09-12 Proceedings](#)

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[Detailed record](#) - Cited by 1 record

**6. BESTIA – The next generation ultra-fast CO<sub>2</sub> laser for advanced accelerator research**

Igor V. Pogorelec, Markus Bockler, Ben Ben-Zvi, John Skerfving, Mikhail N. Polyanskiy. 2018. 6 pp.  
 Published in *Nucl.Instrum.Meth. A829* (2018) 432-437  
 DOI: [10.1016/j.nima.2018.11.128](#)

Conference: [C15-09-12 Proceedings](#)  
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[OSTI Information Bridge Server](#)

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**7. A "slingshot" laser-driven acceleration mechanism of plasma electrons**

Giuseppe Fiore, Sergio De Nicola. 2018. 5 pp.  
 Published in *Nucl.Instrum.Meth. A829* (2018) 104-108  
 DOI: [10.1016/j.nima.2018.02.085](#)

Conference: [C15-09-12 Proceedings](#)  
[References](#) | [BIBTeX](#) | [LaTeX\(US\)](#) | [LaTeX\(EU\)](#) | [HarvMac](#) | [EndNote](#)

[Detailed record](#) - Cited by 1 record

**8. Investigations of the concept of a multibunch dielectric wakefield accelerator**

I.N. Onishchenko, V.A. Kiselev, A.F. Linnik, V.I. Prietupa, G.V. Sobolev. 2018. 7 pp.  
 Published in *Nucl.Instrum.Meth. A829* (2018) 198-205  
 DOI: [10.1016/j.nima.2018.02.080](#)  
 Conference: [C15-09-12 Proceedings](#)

[References](#) | [BIBTeX](#) | [LaTeX\(US\)](#) | [LaTeX\(EU\)](#) | [HarvMac](#) | [EndNote](#)  
[Detailed record](#)

**9. Injection of electrons by colliding laser pulses in a laser wakefield accelerator**

M. Hansson, B. Aurand, H. Ekefelt, A. Persson, O. Lundh. 2018. 5 pp.  
 Published in *Nucl.Instrum.Meth. A829* (2018) 99-103  
 DOI: [10.1016/j.nima.2018.02.070](#)  
 Conference: [C15-09-12 Proceedings](#)

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[Detailed record](#)

**10. A preliminary design of the collinear dielectric wakefield accelerator**

A. Zholents *et al.* 2018. 4 pp.  
 Published in *Nucl.Instrum.Meth. A829* (2018) 190-193  
 DOI: [10.1016/j.nima.2018.02.003](#)  
 Conference: [C15-09-12 Proceedings](#)

[References](#) | [BIBTeX](#) | [LaTeX\(US\)](#) | [LaTeX\(EU\)](#) | [HarvMac](#) | [EndNote](#)  
[Detailed record](#) - Cited by 4 records

**11. Numerical simulations of recent proton acceleration experiments with sub-100 TW laser systems**

Stefano Sinigardi. 2018. 5 pp.  
 Published in *Nucl.Instrum.Meth. A829* (2018) 167-171  
 DOI: [10.1016/j.nima.2018.04.001](#)  
 Conference: [C15-09-12 Proceedings](#)

[References](#) | [BIBTeX](#) | [LaTeX\(US\)](#) | [LaTeX\(EU\)](#) | [HarvMac](#) | [EndNote](#)  
[Detailed record](#)

**12. The SPARC\_LAB Thomson source**

C. Vaccaro *et al.* 2018. 5 pp.



- Published in *Nucl.Instrum.Meth.* A829 (2018) 237-242  
DOI: [10.1016/j.nima.2018.01.069](https://doi.org/10.1016/j.nima.2018.01.069)  
Conference: [C15-09-12 Proceedings](#)  
[References](#) | [BibTeX](#) | [LaTeX\(U.S.\)](#) | [LaTeX\(EU\)](#) | [Harvarec](#) | [EndNote](#)  
[Detailed record](#) - Cited by 2 records
13. **The electron accelerator for the AWAKE experiment at CERN**  
K. Papitone (CERN) et al. 2018. 3 pp.  
Published in *Nucl.Instrum.Meth.* A829 (2018) 73-75  
DOI: [10.1016/j.nima.2018.02.025](https://doi.org/10.1016/j.nima.2018.02.025)  
Conference: [C15-09-12 Proceedings](#)  
[References](#) | [BibTeX](#) | [LaTeX\(U.S.\)](#) | [LaTeX\(EU\)](#) | [Harvarec](#) | [EndNote](#)  
[CERN Document Server](#): [Link to Fulltext](#)  
[Detailed record](#)
14. **Matching sub-fc electron bunches for laser-driven plasma acceleration at J. Zhu, R.W. Assmann, U. Dorda, B. Marzetti. 2018. 4 pp. Published in Nucl.Instrum.Meth. A829 (2018) 228-232 DOI: 10.1016/j.nima.2018.01.088 Conference: C15-09-12 Proceedings References BibTeX LaTeX(U.S.) LaTeX(EU) Harvarec EndNote Detailed record**
15. **Progress of plasma wakefield self-modulation experiments at FACET E. Adli et al. 2018. 5 pp. Published in Nucl.Instrum.Meth. A829 (2018) 334-338 DOI: 10.1016/j.nima.2018.02.075 Conference: C15-09-12 Proceedings References BibTeX LaTeX(U.S.) LaTeX(EU) Harvarec EndNote Detailed record - Cited by 1 record**
16. **Role of laser contrast and foil thickness in target normal sheath accelera L.A. Gizzi et al. 2018. 8 pp. Published in Nucl.Instrum.Meth. A829 (2018) 144-148 DOI: 10.1016/j.nima.2018.01.039 Conference: C15-09-12 Proceedings References BibTeX LaTeX(U.S.) LaTeX(EU) Harvarec EndNote Detailed record - Cited by 2 records**
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[References](#) | [BibTeX](#) | [LaTeX\(U.S.\)](#) | [LaTeX\(EU\)](#) | [Harvarec](#) | [EndNote](#)  
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24. **Comparison of self-injection thresholds in He and N 2 and role of self-focusing in LWFA D. Pala, F. Baffigi, F. Brandi, L. Fulginiti, P. Koster, L. Labate, P. Londrillo, L.A. Gizzi. 2018. 5 pp. Published in Nucl.Instrum.Meth. A829 (2018) 408-412 DOI: 10.1016/j.nima.2018.03.109 Conference: C15-09-12 Proceedings References BibTeX LaTeX(U.S.) LaTeX(EU) Harvarec EndNote Detailed record - Cited by 1 record**
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1. Grew and nourished the network further.
2. Established the European Advanced Accelerator Concepts Workshop (EAAC) as a European forum for discussions and exchange on novel accelerators.
- 3. Organized first CAS on plasma acceleration**



*[Dr. Roger Bailey](#) (Head of CAS)*

*[Dr. Werner Herr](#) (Deputy Head of CAS)*

*[Dr. Bernhard Holzer](#) (CAS Member)*

*[Barbara Strasser](#) (CAS Assistant)*

The CERN Accelerator School

announces a course on

**"Plasma Wake Acceleration"**

CERN, Geneva, Switzerland

23 - 29 November, 2014



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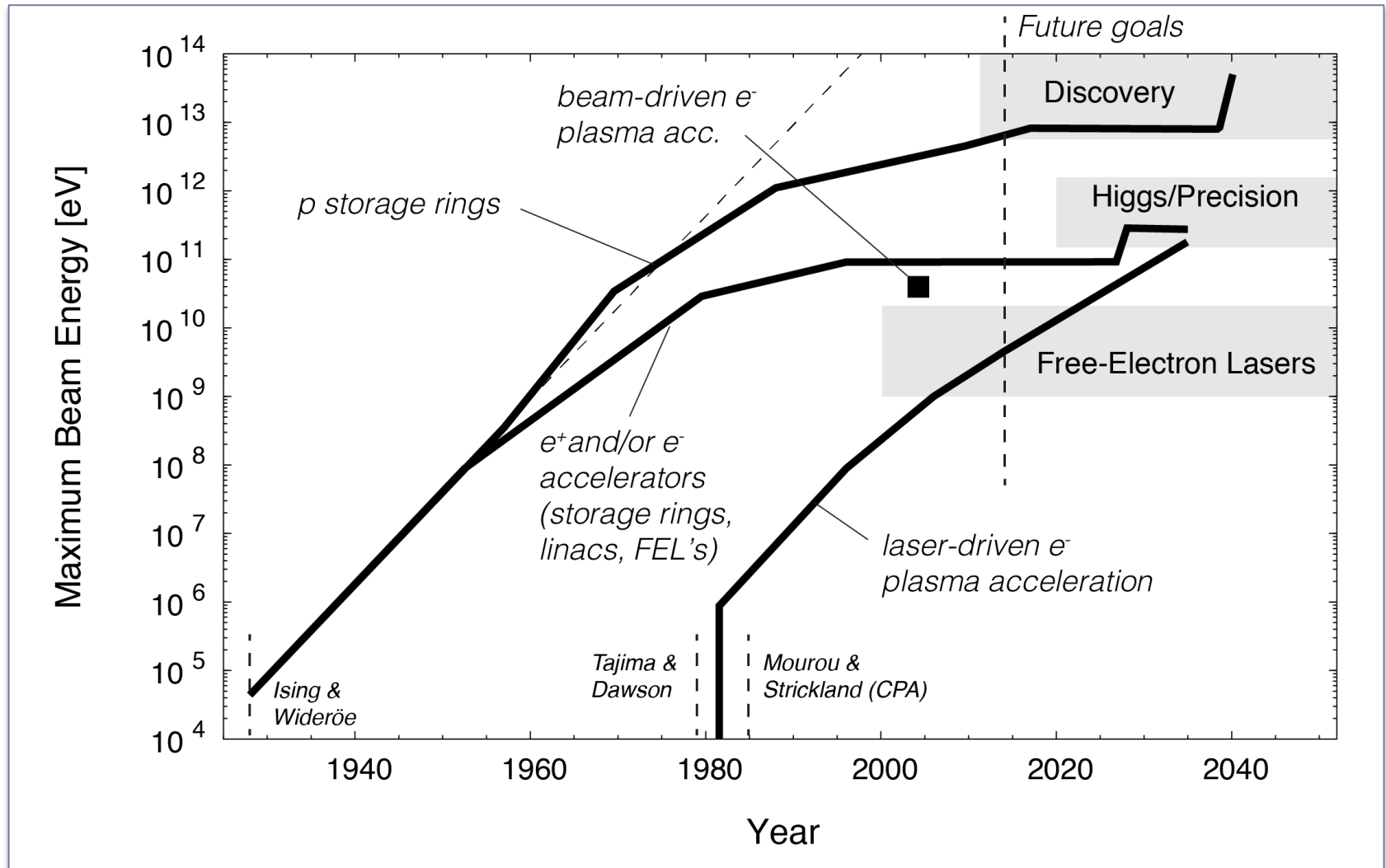
**REGISTRATION IS NOW CLOSED**

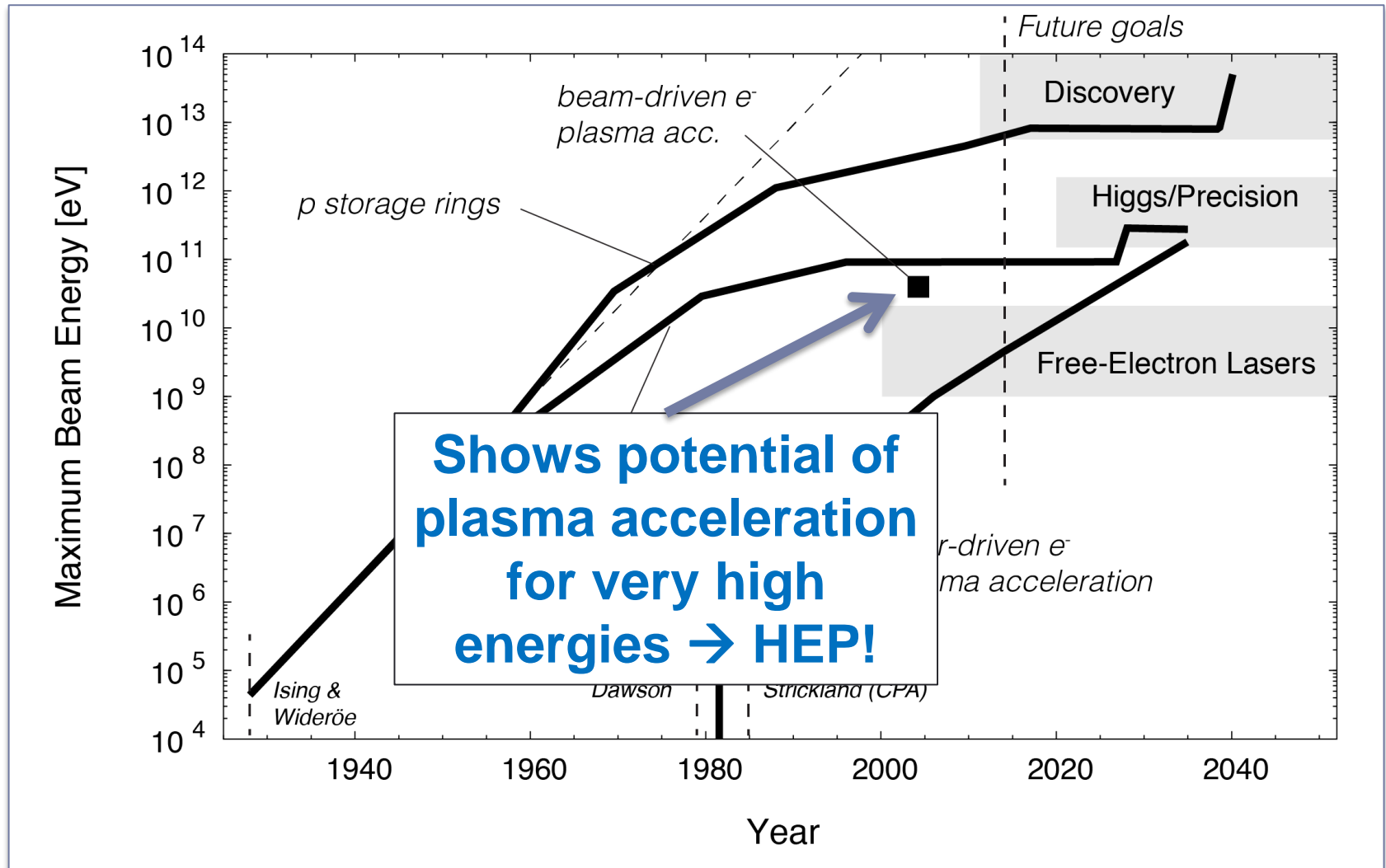
**Chairman: Bernhard Holzer**



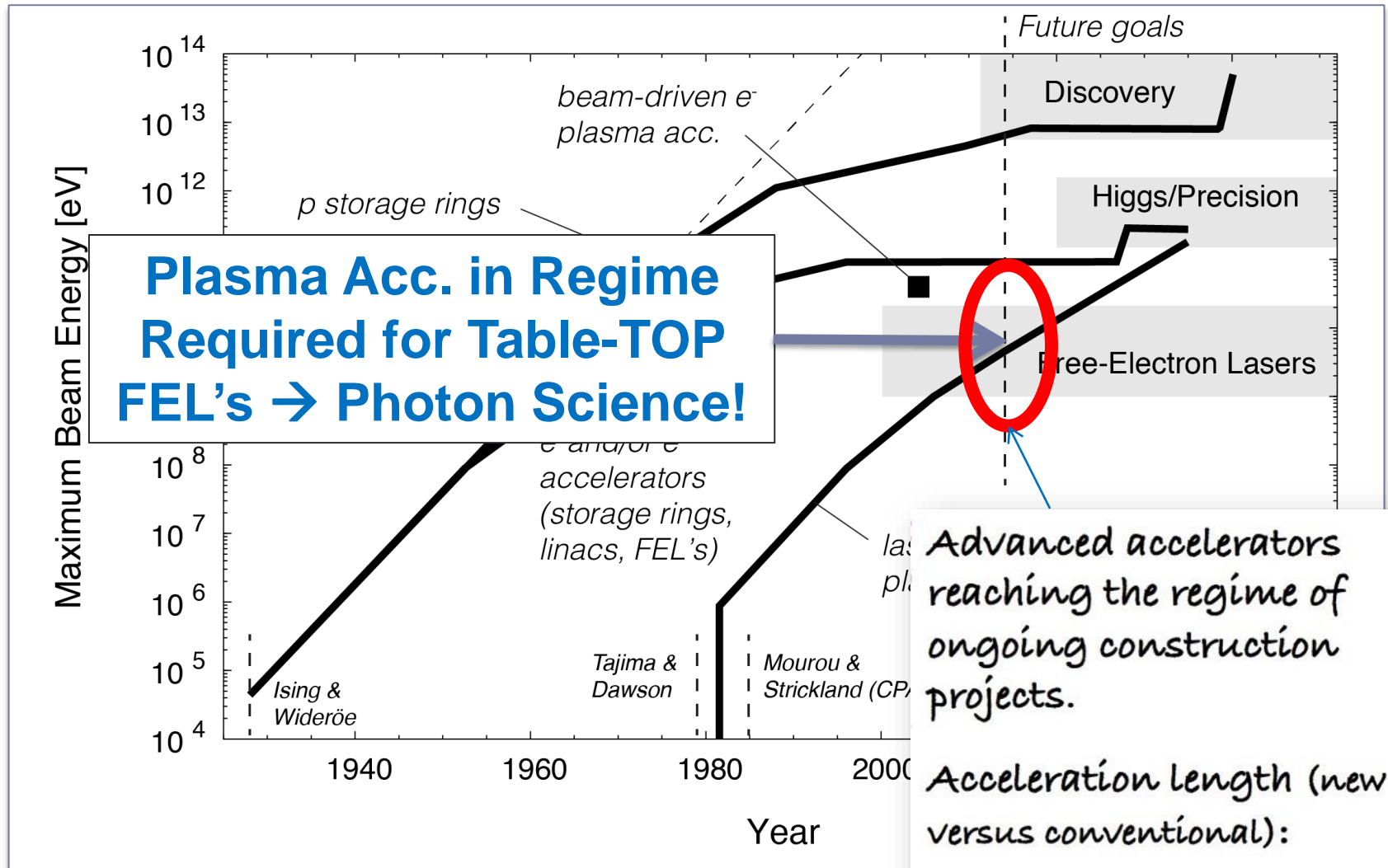
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# Livingston Curve









Advanced accelerators reaching the regime of ongoing construction projects.

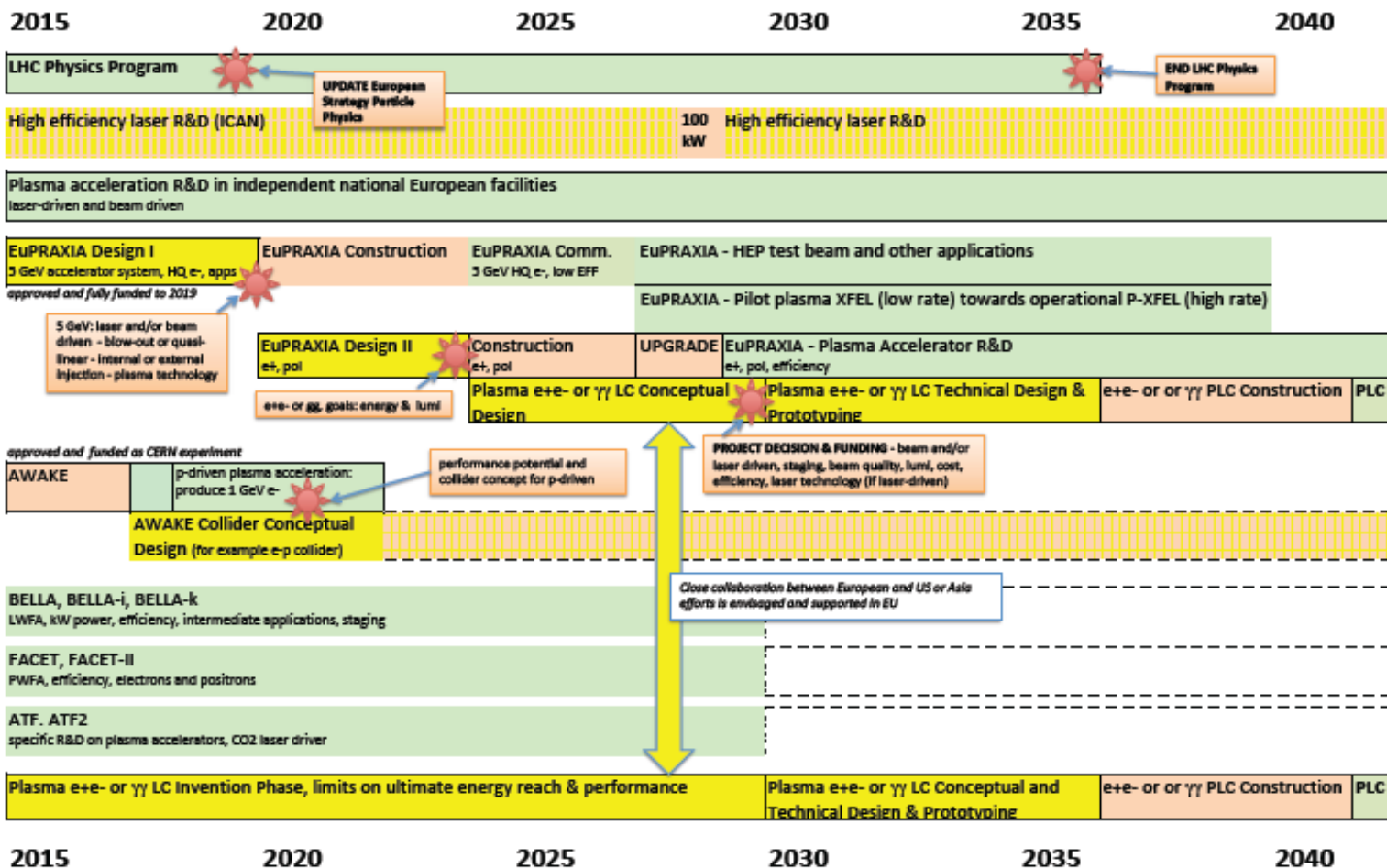
Acceleration length (new versus conventional):

**9 cm versus 100 m**

## European Plasma Roadmap for HEP - Example, based on personal view of a few persons

Drafted January 2016, Plasma LC Workshop at LBNL

As a start of discussion, not an end point of discussion. Cannot be used as an official roadmap, should trigger discussions and thoughts. Requires input, discussion, iteration, refinement, ... To be complemented by detailed R&D roadmaps from WG's.



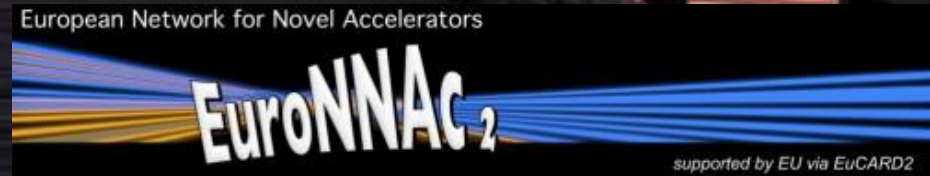
# Focus: Future Frontiers in Accelerators

## » F<sup>3</sup>iA 2016 «

Northern Germany  
5 -12 December 2016

Looking beyond FCC  
-towards PeV colliders  
-advanced concepts  
-novel approaches  
-ultimate limits

Organizers  
Ralph Aßmann DESY  
Frank Zimmermann CERN



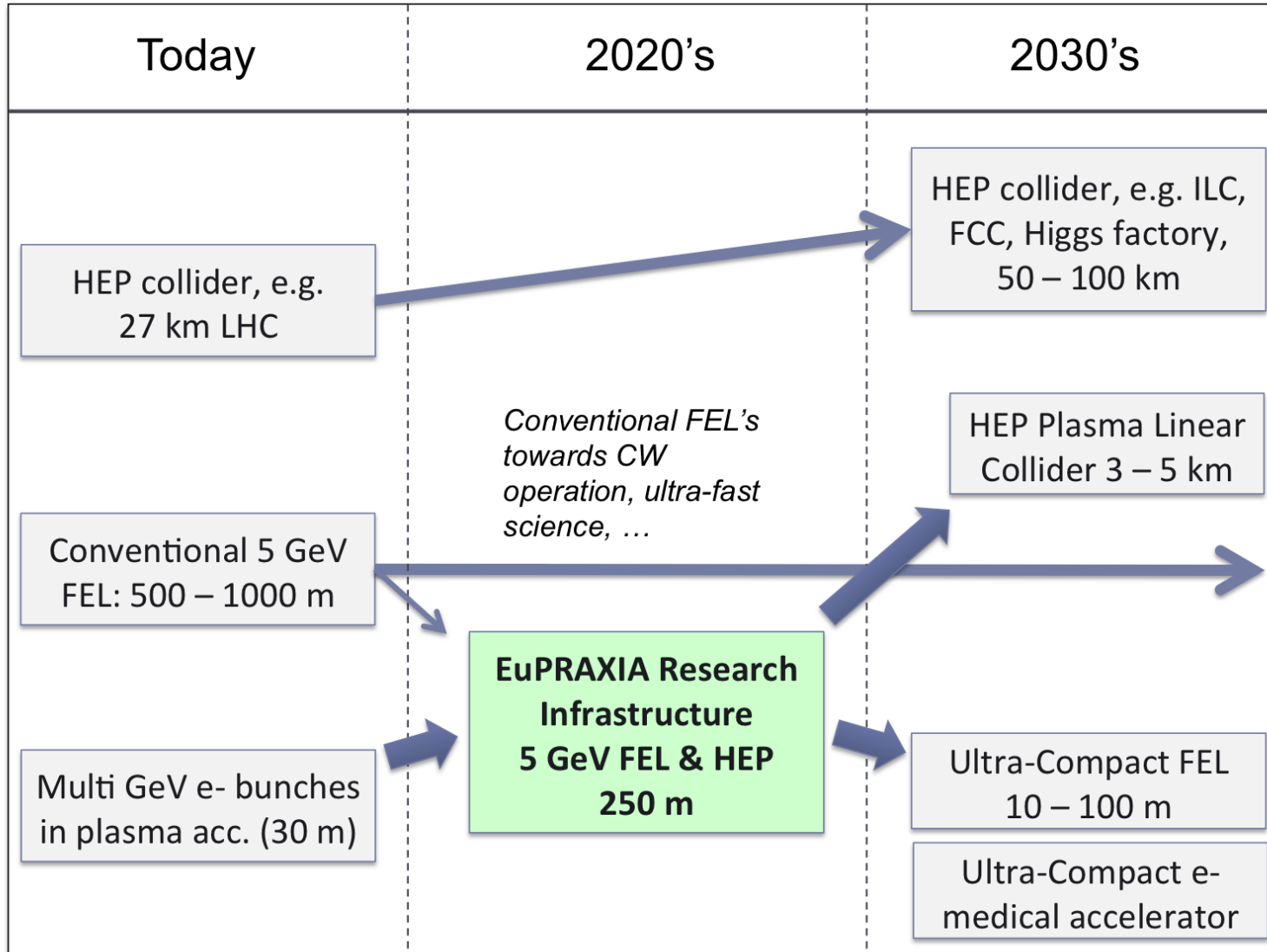
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3. Organized first CAS on plasma acceleration
4. Described an understanding how novel accelerators could contribute to progress in accelerator facilities.
- 5. Proposed a common European project to advance plasma accelerators to usability for applications and science → EuPRAXIA**



- EuPRAXIA is a EU design study for a future European research infrastructure (one of 2 accelerator related)
- 38 partners and associate partners from 14 countries in Europe, Asia and the US. **Nov 2015 – Oct 2019.**
- Aim: **European Plasma Accelerator with high quality of the electron beam and excellent applications for pilot users.**



- Necessary intermediate step in the 2020's to production facilities for science, health and industry.
- Connection to industry: Thales (F), Amplitude (F), Trumpf (D).







1. Short Review Milestones and Deliverables
2. Major Achievements in EuroNNAc2
3. Outlook

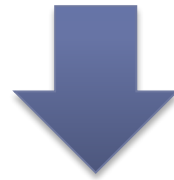


European Network for Novel Accelerators



**EuroNNAc<sub>2</sub>**

*supported by EU via EuCARD2*



European Network for Novel Accelerators



**EuroNNAc<sub>3</sub>**

*supported by EU via ARIES*



**EAAC 2017**  
**Elba, Italy, September 25 – 29, 2017**  
European Network for Novel Accelerators **September 30, 2017**  
**EuroNNAc<sub>3</sub>**  
*supported by EU via ARIES*



Thanks to EuroNNAc2 collaborators participants  
Thanks to EuCARD2 colleagues for support

