

MAX-PLANCK-INSTITUT  
FÜR PHYSIK



# Reports from the publication and speakers committees

Edda Gschwendtner (CERN), Patric Muggli (MPP),  
Giovanni Zevi Della Porta (MPP/CERN)

AWAKE Collaboration Meeting

March 11-13, 2024 — Liverpool, UK

<https://indico.cern.ch/event/1368982/>

# Administrative details

- Members: “The PC consists of a Chair and typically 3 other members.”
  - Edda Gschwendtner, ex officio as CERN Project Leader
  - Patric Muggli, ex officio as Coordinator of the Physics and Experiment Board
  - [Konstantin Lotov, Chair]
    - Members of Budker Institute of Nuclear Physics and Novosibirsk State University were suspended from participation in AWAKE scientific committees in April 2022
  - GZ, junior member, Chair ad interim
  
- Email: [awake-pc@cern.ch](mailto:awake-pc@cern.ch)
- Rules: [https://edms.cern.ch/ui/file/2030472/0.2/PubRulesOriginal\\_19April2021.pdf](https://edms.cern.ch/ui/file/2030472/0.2/PubRulesOriginal_19April2021.pdf)
  - Manage internal review of papers/talks/posters concerning AWAKE by AWAKE authors
    - **Reminder: “all papers mentioning AWAKE, written by a member of the AWAKE collaboration, must be sent to the PC before submission, and also before being put on arXiv”**
  - Determine if a paper is signed by “Collaboration”, organized review, maintain Official Author List
  - Keep a list of public papers: <https://twiki.cern.ch/twiki/bin/view/AWAKE/AwakePublic>
  - **Please send talks/posters at least 1 week before conference!**

# Recent AWAKE Collaboration papers

## Hosing

Accepted: Phys. Rev. Lett. 132, 075001

## Filamentation

Ongoing review with Physical Review E

PHYSICAL REVIEW LETTERS **132**, 075001 (2024)

### Hosing of a Long Relativistic Particle Bunch in Plasma

T. Nechaeva<sup>1,\*</sup>, L. Verra,<sup>2</sup> J. Pucek,<sup>1</sup> L. Ranc,<sup>1</sup> M. Bergamaschi,<sup>1</sup> G. Zevi Della Porta,<sup>1,2</sup> P. Muggli,<sup>1</sup>

(AWAKE Collaboration)

R. Agnello,<sup>3</sup> C. C. Ahdida,<sup>2</sup> C. Amoedo,<sup>2</sup> Y. Andrebe,<sup>3</sup> O. Apsimon,<sup>4,5</sup> R. Apsimon,<sup>5,6</sup> J. M. Arnesano,<sup>2</sup> V. Bencini,<sup>2,7</sup> P. Blanchard,<sup>3</sup> P. N. Burrows,<sup>7</sup> B. Buttenschön,<sup>8</sup> A. Caldwell,<sup>1</sup> M. Chung,<sup>9</sup> D. A. Cooke,<sup>10</sup> C. Davut,<sup>4,5</sup> G. Demeter,<sup>11</sup> A. C. Dexter,<sup>5,6</sup> S. Doebert,<sup>2</sup> J. Farmer,<sup>1</sup> A. Fasoli,<sup>3</sup> R. Fonseca,<sup>12,13</sup> I. Furno,<sup>3</sup> E. Granados,<sup>2</sup> M. Granetzny,<sup>14</sup> T. Graubner,<sup>15</sup> O. Grulke,<sup>8,16</sup> E. Gschwendtner,<sup>2</sup> E. Guran,<sup>2</sup> J. Henderson,<sup>5,17</sup> M. Á. Kedves,<sup>11</sup> S.-Y. Kim,<sup>9,2</sup> F. Kraus,<sup>15</sup> M. Krupa,<sup>2</sup> T. Lefevre,<sup>2</sup> L. Liang,<sup>4,5</sup> S. Liu,<sup>18</sup> N. Lopes,<sup>13</sup> K. Lotov,<sup>19,20</sup> M. Martinez Calderon,<sup>2</sup> S. Mazzoni,<sup>2</sup> K. Moon,<sup>9</sup> P. I. Morales Guzmán,<sup>1</sup> M. Moreira,<sup>13</sup> N. Okhotnikov,<sup>19,20</sup> C. Pakuza,<sup>7</sup> F. Pannell,<sup>10</sup> A. Pardons,<sup>2</sup> K. Pepitone,<sup>21</sup> E. Poimenidou,<sup>2</sup> A. Pukhov,<sup>22,7</sup> S. Rey,<sup>2</sup> R. Rossel,<sup>2</sup> H. Saberi,<sup>4,5</sup> O. Schmitz,<sup>14</sup> E. Senes,<sup>2</sup> F. Silva,<sup>23</sup> L. Silva,<sup>13</sup> B. Spear,<sup>7</sup> C. Stollberg,<sup>3</sup> A. Sublet,<sup>2</sup> C. Swain,<sup>5,24</sup> A. Topaloudis,<sup>2</sup> N. Torrado,<sup>13,2</sup> M. Turner,<sup>2</sup> F. Velotti,<sup>2</sup> V. Verzilov,<sup>18</sup> J. Vieira,<sup>13</sup> C. Welsch,<sup>5,24</sup> M. Wendt,<sup>2</sup> M. Wing,<sup>10</sup> J. Wolfenden,<sup>5,24</sup> B. Woolley,<sup>2</sup> G. Xia,<sup>5,4</sup> V. Yarygova,<sup>19,20</sup> and M. Zepp<sup>14</sup>

### Filamentation of a Relativistic Proton Bunch in Plasma

L. Verra,<sup>1,\*</sup> C. Amoedo,<sup>1</sup> N. Torrado,<sup>1,2</sup> A. Clairembaud,<sup>1</sup> J. Mezger,<sup>3</sup> F. Pannell,<sup>4</sup> J. Pucek,<sup>3</sup> N. van Gils,<sup>1</sup> M. Bergamaschi,<sup>3</sup> G. Zevi Della Porta,<sup>1,3</sup> N. Lopes,<sup>2</sup> A. Sublet,<sup>1</sup> M. Turner,<sup>1</sup> E. Gschwendtner,<sup>1</sup> and P. Muggli<sup>3</sup>

(AWAKE Collaboration)

R. Agnello,<sup>5</sup> C. C. Ahdida,<sup>1</sup> Y. Andrebe,<sup>5</sup> O. Apsimon,<sup>6,7</sup> R. Apsimon,<sup>7,8</sup> J. M. Arnesano,<sup>1</sup> V. Bencini,<sup>1,9</sup> P. Blanchard,<sup>5</sup> P. N. Burrows,<sup>9</sup> B. Buttenschön,<sup>10</sup> A. Caldwell,<sup>3</sup> M. Chung,<sup>11</sup> D. A. Cooke,<sup>4</sup> C. Davut,<sup>6,7</sup> G. Demeter,<sup>12</sup> A. C. Dexter,<sup>7,8</sup> S. Doebert,<sup>1</sup> J. Farmer,<sup>3</sup> A. Fasoli,<sup>5</sup> R. Fonseca,<sup>13,2</sup> I. Furno,<sup>5</sup> E. Granados,<sup>1</sup> M. Granetzny,<sup>14</sup> T. Graubner,<sup>15</sup> O. Grulke,<sup>10,16</sup> E. Guran,<sup>1</sup> J. Henderson,<sup>7,17</sup> M. Á. Kedves,<sup>12</sup> F. Kraus,<sup>15</sup> M. Krupa,<sup>1</sup> T. Lefevre,<sup>1</sup> L. Liang,<sup>6,7</sup> S. Liu,<sup>18</sup> K. Lotov,<sup>19,20</sup> M. Martinez Calderon,<sup>1</sup> S. Mazzoni,<sup>1</sup> K. Moon,<sup>11</sup> P. I. Morales Guzmán,<sup>3</sup> M. Moreira,<sup>2</sup> T. Nechaeva,<sup>3</sup> N. Okhotnikov,<sup>19,20</sup> C. Pakuza,<sup>9</sup> A. Pardons,<sup>1</sup> K. Pepitone,<sup>21</sup> E. Poimenidou,<sup>1</sup> A. Pukhov,<sup>22</sup> R. L. Ramjiawan,<sup>1,9</sup> L. Ranc,<sup>3</sup> S. Rey,<sup>1</sup> R. Rossel,<sup>1</sup> H. Saberi,<sup>6,7</sup> O. Schmitz,<sup>14</sup> E. Senes,<sup>1</sup> F. Silva,<sup>23</sup> L. Silva,<sup>2</sup> B. Spear,<sup>9</sup> C. Stollberg,<sup>5</sup> C. Swain,<sup>7,24</sup> A. Topaloudis,<sup>1</sup> P. Tuev,<sup>19,20</sup> F. Velotti,<sup>1</sup> V. Verzilov,<sup>18</sup> J. Vieira,<sup>2</sup> E. Walter,<sup>25</sup> C. Welsch,<sup>7,24</sup> M. Wendt,<sup>1</sup> M. Wing,<sup>4</sup> J. Wolfenden,<sup>7,24</sup> B. Woolley,<sup>1</sup> G. Xia,<sup>7,6</sup> V. Yarygova,<sup>19,20</sup> and M. Zepp<sup>14</sup>

# Recent multi-author papers

## Streak Camera (JINST)

### A decomposition algorithm for streak camera data

Kaan Oguzhan,<sup>a,1</sup> Lucas Ranc,<sup>a</sup> Livio Verra,<sup>b,2</sup> Allen Caldwell<sup>a</sup>

<sup>a</sup>Max Planck Institute for Physics, Munich, Germany

<sup>b</sup>CERN, Geneva, Switzerland

## Ion Motion

### Transformer ratio growth due to ion motion in plasma wakefield accelerators

V.A. Minakov and K.V. Lotov  
 Novosibirsk State University, Novosibirsk, 630090, Russia  
 (Dated: November 22, 2023)

We report a recently discovered counterintuitive effect where breaking of a Langmuir wave in a plasma wakefield accelerator leads to an increase in the accelerating field rather than wave dissipation. The effect relies on the ability of transversely breaking waves to draw wave energy from nearby regions due to the inflow of electrons oscillating collectively and the outflow of electrons moving individually.

## Electron seeding of self-modulation (PRAB)

### Uniform onset of the long proton bunch self-modulation seeded by an electron bunch in an overdense plasma

K. Moon<sup>Ⓞ,\*</sup>, E. S. Yoon, and M. Chung<sup>Ⓞ†</sup>  
 UNIST, Ulsan 44919, Republic of Korea

P. Muggli<sup>‡</sup>  
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M. Moreira  
 GoLP/Instituto de Plasmas e Fusão Nuclear, Instituto Superior Técnico,  
 Universidade de Lisboa, 1049-001 Lisboa, Portugal

M. A. Bastrukov<sup>Ⓞ</sup>  
 Novosibirsk State University, 630090 Novosibirsk, Russia  
 and Budker Institute of Nuclear Physics, 630090 Novosibirsk, Russia

## Photocathodes (PRAB)

PHYSICAL REVIEW ACCELERATORS AND BEAMS **27**, 023401 (2024)

### Fabrication and rejuvenation of high quantum efficiency caesium telluride photocathodes for high brightness and high average current photoinjectors

M. Martinez-Calderon<sup>Ⓞ,1,\*</sup>, E. Chevally,<sup>1</sup> R. E. Rossel,<sup>1</sup> L. B. Jones<sup>Ⓞ,2,3</sup>,  
 G. Zevi Della Porta,<sup>1</sup> B. Marsh<sup>Ⓞ,1</sup> and E. Granados<sup>Ⓞ,1,†</sup>

<sup>1</sup>CERN, European Organization for Nuclear Research, 1211 Geneva, Switzerland

<sup>2</sup>ASTeC, STFC Daresbury Laboratory, Warrington, United Kingdom

<sup>3</sup>Cockcroft Institute of Accelerator Science, Daresbury, United Kingdom

# Recent multi-author papers

## AWAKE-style Higgs Factory

### Preliminary Investigation of a Higgs Factory based on Proton-Driven Plasma Wakefield Acceleration

J. Farmer,<sup>1,\*</sup> A. Caldwell,<sup>1,†</sup> and A. Pukhov<sup>2,‡</sup>

<sup>1</sup>Max-Planck-Institut für Physik, München, Germany

<sup>2</sup>Heinrich-Heine-Universität Düsseldorf, Düsseldorf, Germany

## Discharge Plasma Source (IEEE)

IEEE TRANSACTIONS ON PLASMA SCIENCE, VOL. 51, NO. 12, DECEMBER 2023

3619

### Double Pulse Generator for Unipolar Discharges in Long Plasma Tubes for the AWAKE Experiment

Nuno E. Torrado<sup>1</sup>, Nelson C. Lopes<sup>2</sup>, J. Fernando A. Silva<sup>3</sup>, *Senior Member, IEEE*, Carolina Amoedo<sup>4</sup>, and Alban Sublet<sup>5</sup>

## Betatron in high-density AWAKE (still with the PC)

### Elevating electron energy gain and betatron X-ray emission in proton-driven wakefield acceleration

Hossein Saberi,<sup>1,2</sup> Guoxing Xia,<sup>1,2</sup> Linbo Liang,<sup>1,2</sup> John Patrick Farmer,<sup>3,4</sup> and Alexander Pukhov<sup>5</sup>

<sup>1</sup>Department of Physics and Astronomy, University of Manchester, Manchester M13 9PL, United Kingdom

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<sup>3</sup>CERN, 1211 Geneva, Switzerland

<sup>4</sup>Max Planck Institute for Physics, 80805 Munich, Germany

<sup>5</sup>Heinrich-Heine-Universität Düsseldorf, 40225 Düsseldorf, Germany

## Foil injection (submitted PRAB)

### Numerical studies of colinear laser-assisted injection from a foil as an alternate injection method for AWAKE

T. C. Wilson<sup>1,2</sup>, J. Farmer<sup>3</sup>, A. Pukhov<sup>4</sup>, Z.-M. Sheng<sup>1,2,5,6</sup> and B. Hidding<sup>1,2</sup>

<sup>1</sup> Scottish Universities Physics Alliance, Department of Physics, University of Strathclyde, Glasgow G4 0NG, UK

<sup>2</sup> Cockcroft Institute, Sci-Tech Daresbury, Cheshire WA4 4AD, UK

<sup>3</sup> Max-Planck-Institut für Physik, 85748 Germany

<sup>4</sup> Institut für Theoretische Physik I, Universität Düsseldorf, 40225 Germany

<sup>5</sup> Key Laboratory for Laser Plasmas (MoE) and School of Physics and Astronomy, Shanghai Jiao Tong University, Shanghai 200240, People's Republic of China

<sup>6</sup> Collaborative Innovation Center of IFSA, Shanghai Jiao Tong University, Shanghai 200240, People's Republic of China

## Discharge Source (EAAC23)

### Double pulse generator for AWAKE scalable discharge plasma source

**N Torrado<sup>1,2</sup>, C Amoedo<sup>2</sup>, A Sublet<sup>2</sup>, M Taborelli<sup>2</sup>, SF Pinto<sup>3</sup>, JF Silva<sup>3</sup>, NC Lopes<sup>1</sup>**

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<sup>2</sup>European Organization for Nuclear Research, CERN, Geneva CH-1211, Switzerland

<sup>3</sup>Instituto de Engenharia de Sistemas e Computadores/INESC-ID, 1000-029 Lisbon, Portugal

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## Electron injection (EAAC23)

### External electron injection setup for the advanced wakefield experiment (AWAKE) run 2b

**N Z van Gils<sup>1,2</sup>, M Turner<sup>2</sup>, G Zevi Della Porta<sup>2,4</sup>, F Pannell<sup>3</sup>, V Bencini<sup>2,5</sup>, A Gerbershagen<sup>1</sup> and E Gschwendtner<sup>2</sup>**  
for the AWAKE Collaboration

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<sup>4</sup> Max Planck Institute for Physics, Munich, DE

<sup>5</sup> John Adams Institute for Accelerator Science, University of Oxford, Oxford, UK

E-mail: [nikita.zena.van.gils@cern.ch](mailto:nikita.zena.van.gils@cern.ch)

## Streak camera (EAAC23)

### Understanding time-resolved images of AWAKE proton bunches

**Marlene Turner<sup>1</sup> and Patric Muggli<sup>2</sup>**

<sup>1</sup> CERN, Geneva, Switzerland

<sup>2</sup> Max Planck Institute for Physics, Munich, Germany

E-mail: [marlene.turner@cern.ch](mailto:marlene.turner@cern.ch)

# Talks and Posters ... and Movies!

November 2023 Collaboration Meeting

- $\geq 20$  talks given in 2023
- 2024 has just begun:
  - Marlene invited to AAC24
  - Expecting AWAKE contributions:
    - IPAC, ALEGRO, ICOPS, MRE, EPS, ...
- AWAKE movie season has begun

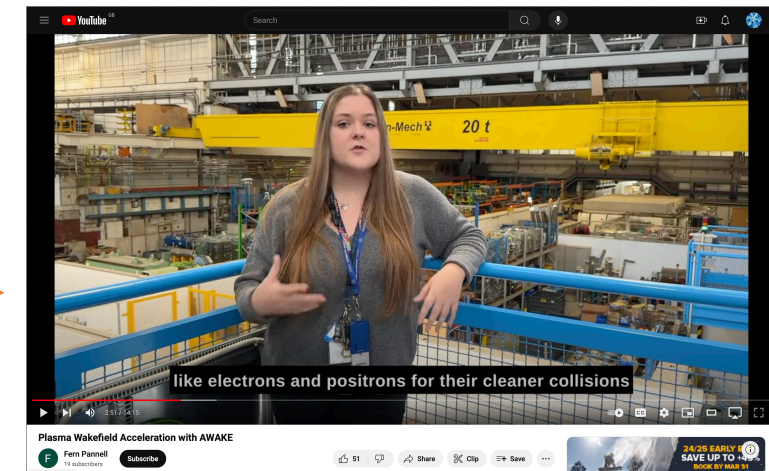
## Recent talks and posters

- IBIC
  - E. Senes: Application of a camera array for the upgrade of the AWAKE spectrometer
  - E. Senes: Sub-ps electro-optical bunch length monitoring studies for the AWAKE experiment
  - E. Senes: Dielectric Pick-up for Short bunches
- EPS HEP
  - M. Wing: The AWAKE Run 2 programme and beyond
- ICMRE
  - G. Xia: Advance WAKEfield Experiment (AWAKE) at CERN: current status and future plans
- SFP:
  - P. Muggli: Dernières nouvelles de AWAKE
- EPS Plasma
  - L. Verra: Electron Bunch Seeding of the Self-Modulation Instability in Plasma (PhD Research Award)
- APS-DPP
  - P. Muggli: AWAKE: one experiment, three beam-plasma instabilities
  - E. Walter: Towards Laboratory Astrophysics in Plasma Wakefield Accelerators
- RUPAC
  - N. Okhotnikov: Effect of linear plasma density gradient in the AWAKE experiment
- EAAC:
  - E. Gschwendtner: 2023 AWAKE Run Results
  - L. Verra: Laboratory Astrophysics and Plasma Wakefield Acceleration: Experimental Study of Magnetic Field Generation by Current Filamentation Instability of a Relativistic Proton Bunch in Plasma
  - J. P. Farmer: Wakefield regeneration in a plasma accelerator
  - M. Turner: Experimental Observation of Beam-Plasma Resonance Detuning due to Motion of Ions
  - N. Z. Van Gils: External Electron Injection for the AWAKE Run 2b Experiment
  - E. Gschwendtner: AWAKE and future colliders
  - N. Torrado: Double pulse generator for AWAKE scalable discharge plasma source
  - S. Marini: Integrated beam physics for the laser wakefield accelerator project EARLI
  - C. Amodeo: Proton Beam Self-Modulation Instability in a DC Discharge Plasma Source at AWAKE
  - G. Zevi Della Porta: A tale of three beams: towards stable and reproducible operation of the AWAKE facility
  - A. Sublet: First test of a 10 m discharge plasma source with a proton beam in the AWAKE experiment
- NWL (January 2024)
  - M. Turner: Plasma Wakefield Acceleration and the AWAKE experiment at CERN

Giovanni Zevi Della Porta, CERN

THANKS TO EVERYONE WHO HAS REPRESENTED AWAKE !

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<https://www.youtube.com/watch?v=2wcvz0Jx2RQ>